SUBARU

FORESTER

2005 Model Year

PDF Service Manual

GENERAL INFORMATION SECTION (Pub.No.G8090GE1)

ENGINE SECTION 1 (Pub.No.G8090GE2)

ENGINE SECTION 2 (Pub.No.G8090GE3)

TRANSMISSION SECTION (Pub.No.G8090GE4)

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This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8090GE1

FOREWORD

FW

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1. Foreword

A: FOREWORD

These manuals are used when performing maintenance, repair or diagnostic of the Subaru FORESTER.

Applied model: SG***** from 2005MY

The manuals contain the latest information at the time of publication. Changes in specifications, methods, etc. may be made without notice.

HOW TO USE THIS MANUALS

HU

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1. How to Use This Manuals

A: HOW TO USE THIS MANUAL

1. STRUCTURE

Each section consists of SCT that are broken down into SC that are divided into sections for each component. The specification, maintenance and other information for the components are included, and diagnostic information has also been added where necessary.

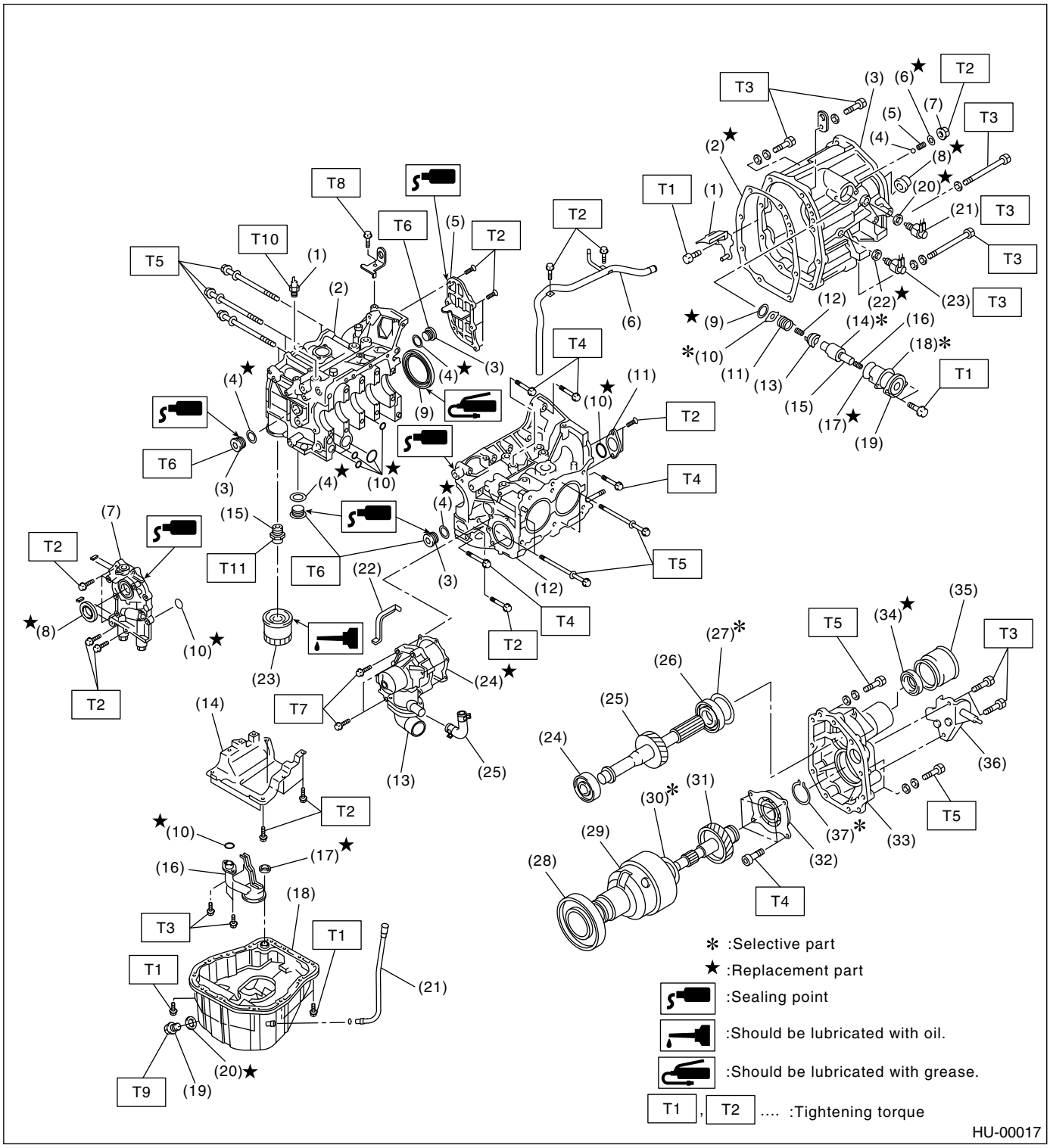
2. INDEX

The first page has an index with tabs.

3. COMPONENTS

Illustrations are listed for each component. The information necessary for repair work (tightening torque, grease up points, etc.) is described on these illustrations. Information is described using symbol. To order the parts, refer to parts catalogue.

Example:



4. SPECIFICATION

If necessary, specifications are also included.

5. INSPECTION

Inspections are included to be carried out before and after maintenance.

6. MAINTENANCE

• Maintenance instructions for serviceable parts describes work area and detailed steps with illustration. It also describes the use of special tool, tightening torque, cautions for each procedure.
• If many serviceable parts are included in one service procedure, appropriate reference are provided for each part.

Example:

15.Main Shaft Assembly for Single-Range (A)

A: REMOVAL (B)

1) Remove the manual transmission assembly from vehicie. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.> (C)

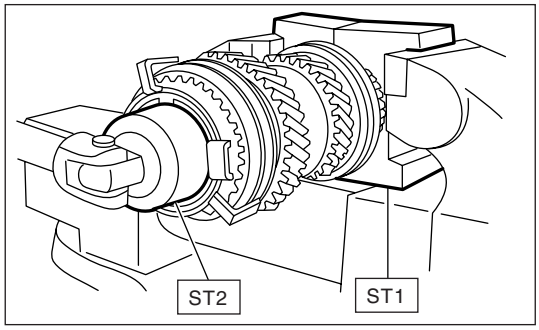
---

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE: (D)
Secure the lock nuts in two Places affer tightening.

ST2 499987003 SOCKET WRENCH
ST1 498937000 (E) TRANSMISSION HOLDER (F)

Tightening torque:
118 N·m (12.0 kgf-m, 86.8 ft-lb) (G)



(H)

HU-00020

(A) Component
(B) Process
(C) Reference
(D) Caution
(E) Tool number of special tool
(F) Name of special tool
(G) Tightening torque
(H) Illustration

7. DIAGNOSTIC

Tables showing a step-by-step process make it easy to conduct diagnostic.

8. SI UNITS

Measurements in these manuals are according to the SI units. Metric and yard/pound measurements are also included.

Example:

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

SPECIFICATION

SPC

Page

1. Forester 2

1. Forester

A: DIMENSIONS

Model			2.0 L Non-turbo	2.0 L Turbo	2.5 L Non-turbo	2.5 L Turbo
Overall length		mm (in)	4,450 (175.2)			
Overall width		mm (in)	1,735 (68.3)			
Overall height (at C.W.)		mm (in)	1,590 (62.6)	1,585 (62.4)	1,590 (62.6)	1,585 (62.4)
Compartment	Length	mm (in)	1,795 (70.7)			
	Width	mm (in)	1,455 (57.3)			
	Height	mm (in)	1,245 (49.0), 1,210 (47.6)★			
Wheelbase		mm (in)	2,525 (99.4)			
Tread	Front	mm (in)	1,495 (58.9)			
	Rear	mm (in)	1,485 (58.5)			
Minimum road clearance		mm (in)	190 (7.5)	195 (7.7)	200 (7.9)	KA: 200 (7.9) Except for KA: 19.5 (7.7)

★: With sunroof

B: ENGINE

Model		2.0 L Non-turbo	2.0 L Turbo	2.5 L Non-turbo	2.5 L Turbo
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine			
Valve arrangement		Overhead camshaft type			
Bore × Stroke	mm (in)	92 × 75 (3.62 × 2.95)		99.5 × 79 (3.92 × 3.11)	
Displacement	cm^3 (cu in)	1,994 (121.67)		2,457 (149.94)	
Compression ratio		10.0±0.2	8.0±0.2	10.0±0.2	8.2±0.2
Firing order		1 — 3 — 2 — 4			
Idle speed at Park or Neutral position	rpm	650±100	700±100	650±100	700±100
Maximum output	kW (PS)/rpm	92 (125)/5,600	130 (177)/5,600	112 (152)/5,600	155 (211)/5,600
Maximum torque	N·m (kgf-m, ft-lb)/rpm	184 (18.8, 41.4)/3,600	245 (25.0, 55.1)/3,200	223 (22.7, 50.1)/3,600	320 (32.6, 71.8)/3,600

C: ELECTRICAL

Model		2.0 L Non-turbo	2.0 L Turbo	2.5 L Non-turbo	2.5 L Turbo
Ignition timing at idling speed BTDC/rpm		10°±10°/650	12°±10°/700	MT: 10°±10°/650 AT: 15°±10°/650	17°±10°/700
Spark plug	Type and manufacturer	NGK: PFR5B-11	NGK: PFR6G	NGK: PFR5B-11	NGK: ILFR6B
Generator		12 V — 90 A			
Battery	Type and capacity (5HR)	MT: 12 V — 48 AH (55D23L) AT: 12 V — 52 AH (65D23L)		12 V — 27 AH (34B19L) 12 V — 48 AH (55D23L)★	12 V — 48 AH (55D23L)

★: For Australia model

D: TRANSMISSION

Model			2.0 L Non-turbo		2.0 L Turbo		2.5 L Non-turbo		2.5 L Turbo	
Transmission type			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Clutch type			DSPD	TCC	DSPD	TCC	DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.454	2.785	3.454	2.785	3.454	2.785	3.454	2.785
		2nd	2.062	1.545	1.947	1.545	2.062	1.545	1.947	1.545
		3rd	1.448	1.000	1.366	1.000	1.448	1.000	1.366	1.000
		4th	1.088	0.694	0.972	0.694	1.088	0.694	0.972	0.694
		5th	0.871	—	0.738	—	0.780	—	0.738	—
		Reverse	3.333	2.272	3.333	2.272	3.333	2.272	3.333	2.272
		Dual range	1.447	—	—	—	1.196	—	—	—
Reduction gear (Front)	1st reduction	Type of gear	—	Helical	—	Helical	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid							
		Gear ratio	4.111	4.444	4.444	4.111	4.111	4.444	4.444	4.444
Reduction gear (Rear)	Transfer reduction	Type of gear	Helical	—	Helical	—	Helical	—	Helical	—
		Gear ratio	1.000	—	1.081★, 1.000	—	1.000	—	1.081★, 1.000	—
	Final reduction	Type of gear	Hypoid							
		Gear ratio	4.111	4.444	4.111★, 4.444	4.111	4.111	4.444	4.111★, 4.444	4.444

5MT: 5 forward speeds with synchromesh and 1-reverse
4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse
DSPD: Dry Single Plate Diaphragm
TCC: Torque Converter Clutch
★: For Europe model

E: STEERING

Type		Rack and Pinion, Integral
Turns, lock to lock		3.0
Minimum turning circle m (ft)	Curb to curb	10.6 (34.8)
	Wall to wall	11.4 (37.4)

F: SUSPENSION

Front	Macpherson strut type, Independent, Coil spring
Rear	Dual-link type, Independent, Coil spring

G: BRAKE

Model	2.0 L Non-turbo, 2.5 L Non-turbo (LHD model)	2.0 L Turbo, 2.5 L Non-turbo (RHD model), 2.5 L Non-turbo
Service brake system	Dual circuit hydraulic with vacuum suspended power unit	
Front	Ventilated disc brake	
Rear	Drum brake	Disc brake
Parking brake	Mechanical on rear brakes	

H: TIRE

Rim size	15 × 6J	16 × 6 1/2J, 16 × 6 1/2JJ
Tire size	205/70 R15 95H	215/60 R16 95V, P215/60 R16 94H★
Type	Steel belted radial, Tubeless	

★: KA only

I: CAPACITY

Model		2.0 L Non-turbo		2.0 L Turbo		2.5 L Non-turbo		2.5 L Turbo	
Transmission		5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Fuel tank	ℓ (US gal, Imp gal)	60 (15.9, 13.2)							
Engine oil (When replacing)	ℓ (US qt, Imp qt)	Approx. 4.0 (4.2, 3.5)							
Transmission gear oil	ℓ (US qt, Imp qt)	4.0 (4.2, 3.5)	—	3.5 (3.7, 3.1), 3.9 (4.1, 3.4) ★1	—	4.0 (4.2, 3.5)	—	3.5 (3.7, 3.1), 3.9 (4.1, 3.4) ★1	—
ATF	ℓ (US qt, Imp qt)	—	8.4 (8.9, 7.4)	—	9.3 (9.8, 8.2)	—	9.3 (9.8, 8.2)	—	9.3 (9.8, 8.2)
Front differential gear oil	ℓ (US qt, Imp qt)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)
Rear differential gear oil	ℓ (US qt, Imp qt)	0.8 (0.8, 0.6)							
Power steering fluid	ℓ (US qt, Imp qt)	0.7 (0.7, 0.6)							
Engine coolant	ℓ (US qt, Imp qt)	6.6 (7.0, 5.8)	6.5 (6.9, 5.7), 6.9 (7.3, 6.1) ★3	7.4 (7.8, 6.5)	7.3 (7.7, 6.4) ★2	6.9 (7.3, 6.1)	6.8 (7.2, 6.0)	7.4 (7.8, 6.5)	7.3 (7.7, 6.4) ★2

★1: With oil pump
★2: MT model with oil cooler Included
★3: Model with ATF warmer

J: WEIGHT

1. LHD MODEL

Option code★			EC		K4		KS	
Model			2.0 L Non-turbo				2.5 L Non-turbo	
Grade			2.0 X				2.5 X	
Transmission			5MT	4AT	5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	760 (1,675)	775 (1,710)	775 (1,710)	790 (1,740)	780 (1,720)	800 (1,765)
	Rear	kg (lb)	600 (1,325)	600 (1,325)	595 (1,310)	595 (1,310)	620 (1,370)	620 (1,370)
	Total	kg (lb)	1,360 (3,000)	1,375 (3,035)	1,370 (3,020)	1,385 (3,055)	1,400 (3,090)	1,420 (3,135)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)
	Rear	kg (lb)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)
Sport package base			—	—	—	—	—	—
Aluminum wheel			—	—	—	—	—	—
Front fog light			—	—	—	—	❍	❍
Cruise control			—	—	—	—	❍	❍
High-grade audio			—	—	—	—	—	—
Sport steering			—	—	❍	❍	—	—
Leather package base			—	—	—	—	—	—
Leather seat, Leather door trim			—	—	—	—	—	—
Navigation system			—	—	—	—	—	—
Full auto A/C			—	—	❍	❍	❍	❍
Manual A/C			—	—	—	—	—	—
Side airbag			—	—	—	—	—	—
Sunroof			—	—	—	—	—	—
Self-leveling function Rr			❍	❍	—	—	—	—
VDC+VTD			—	—	—	—	—	—
Cold area function A			—	—	—	—	—	—
Cold area function B			—	—	—	—	—	—
Cold area function C			—	—	—	—	—	—
Cold area function D			—	—	—	—	—	—
Heated mirror			❍	❍	—	—	—	—
Security system			—	—	—	—	—	—

Option code★			EC		EH		K4		EC
Model			2.0 L Turbo						2.5 L Turbo
Grade			2.0 XT						2.5 XT
Transmission			5MT	4AT	5MT	4AT	5MT	4AT	5MT
Curb weight (C.W.)	Front	kg (lb)	820 (1,810)	840 (1,850)	825 (1,820)	845 (1,865)	815 (1,795)	835 (1,840)	820 (1,810)
	Rear	kg (lb)	620 (1,370)	620 (1,370)	635 (1,400)	635 (1,400)	630 (1,390)	630 (1,390)	625 (1,375)
	Total	kg (lb)	1,440 (3,180)	1,460 (3,220)	1,460 (3,220)	1,480 (3,265)	1,445 (3,185)	1,465 (3,230)	1,445 (3,185)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)
	Rear	kg (lb)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	2,000 (4,140)
Sport package base			—	—	—	—	—	—	—
Aluminum wheel			❍	❍	❍	❍	❍	❍	❍
Front fog light			❍	❍	❍	❍	❍	❍	❍
Cruise control			—	—	❍	❍	—	—	❍
High-grade audio			❍	❍	❍	—	—	—	—
Sport steering			—	—	—	—	—	—	—
Leather package base			❍	❍	❍	❍	❍	❍	❍
Leather seat, Leather door trim			—	—	❍	❍	—	—	—
Navigation system			—	—	—	—	—	—	—
Full auto A/C			❍	❍	❍	❍	❍	❍	❍
Manual A/C			—	—	—	—	—	—	—
Side airbag			❍	❍	❍	❍	❍	❍	❍
Sunroof			—	—	❍	❍	❍	❍	—
Self-leveling function Rr			❍	❍	❍	❍	—	—	❍
VDC+VTD			—	—	—	—	—	—	—
Cold area function A			—	—	—	—	—	—	—
Cold area function B			—	—	❍	❍	—	—	❍
Cold area function C			—	—	—	—	—	—	—
Cold area function D			—	—	—	—	—	—	—
Heated mirror			❍	❍	❍	❍	—	—	❍
Security system			—	—	—	—	—	—	—

★: For the option codes, refer to ID section. **<Ref. to ID-5,** MODEL NUMBER PLATE**, Identification.>**

2. RHD MODEL

Option code★			EK, ER		EN	EK, ER		
Model			2.0 L Non-turbo			2.0 L Turbo		2.5 L Turbo
Grade			2.0 X			2.0 XT		2.5 XT
Transmission			5MT	4AT	5MT	5MT	4AT	5MT
Curb weight (C.W.)	Front	kg (lb)	780 (1,720)	795 (1,750)	770 (1,698)	820 (1,810)	840 (1,850)	820 (1,810)
	Rear	kg (lb)	600 (1,325)	600 (1,325)	595 (1,312)	635 (1,400)	625 (1,378)	640 (1,410)
	Total	kg (lb)	1,380 (3,045)	1,395 (3,075)	1,365 (3,009)	1,455 (3,210)	1,465 (3,230)	1,460 (3,220)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)
	Rear	kg (lb)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,950 (4,300)	1,950 (4,300)	2,000 (4,140)
Sport package base			—	—	—	—	—	—
Aluminum wheel			—	—	❍	❍	❍	❍
Front fog light			—	—	❍	❍	❍	❍
Cruise control			—	—	—	❍	❍	❍
High-grade audio			—	—	—	❍	❍	❍
Sport steering			—	—	—	—	—	—
Leather package base			—	—	❍	❍	❍	❍
Leather seat, Leather door trim			—	—	—	—	—	—
Navigation system			—	—	—	—	—	—
Full auto A/C			❍	❍	—	❍	❍	❍
Manual A/C			—	—	❍	—	—	—
Side airbag			—	—	—	❍	❍	❍
Sunroof			—	—	—	❍	❍	❍
Self-leveling function Rr			❍	❍	❍	❍	❍	❍
VDC+VTD			—	—	—	—	—	—
Cold area function A			—	—	—	—	—	—
Cold area function B			—	—	—	—	—	—
Cold area function C			—	—	—	❍	❍	❍
Cold area function D			—	—	—	—	—	—
Heated mirror			❍	❍	—	❍	❍	❍
Security system			—	—	—	❍	❍	❍

★: For the option codes, refer to ID section. **<Ref. to ID-5,** MODEL NUMBER PLATE**, Identification.>**

Option code★			KA					
Model			2.5 L Non-turbo				2.5 L Turbo	
Grade			2.5 X		2.5 XS		2.5 XT	
Transmission			5MT	4AT	5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kg (lb)	765 (1,685)	785 (1,730)	760 (1,675)	780 (1,720)	810 (1,785)	830 (1,830)
	Rear	kg (lb)	610 (1,345)	610 (1,345)	605 (1,335)	605 (1,335)	615 (1,355)	615 (1,355)
	Total	kg (lb)	1,375 (3,030)	1,395 (3,075)	1,365 (3,010)	1,385 (3,055)	1,425 (3,140)	1,445 (3,185)
Maximum permissible axle weight (M.P.A.W.)	Front	kg (lb)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)	1,010 (2,225)
	Rear	kg (lb)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)	1,035 (2,280)
Maximum permissible weight (M.P.W.)	Total	kg (lb)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)	1,950 (4,300)
Sport package base			—	—	—	—	—	—
Aluminum wheel			—	—	❍	❍	❍	❍
Front fog light			—	—	❍	❍	❍	❍
Cruise control			❍	❍	❍	❍	❍	❍
High-grade audio			—	—	❍	❍	❍	❍
Sport steering			—	—	❍	❍	❍	❍
Leather package base			—	—	—	—	❍	❍
Leather seat, Leather door trim			—	—	—	—	—	—
Navigation system			—	—	—	—	—	—
Full auto A/C			—	—	❍	❍	❍	❍
Manual A/C			❍	❍	—	—	—	—
Side airbag			❍	❍	❍	❍	❍	❍
Sunroof			—	—	—	—	—	—
Self-leveling function Rr			—	—	❍	❍	❍	❍
VDC+VTD			—	—	—	—	—	❍
Cold area function A			—	—	—	—	—	—
Cold area function B			—	—	—	—	—	—
Cold area function C			—	—	—	—	—	—
Cold area function D			—	—	—	—	—	—
Heated mirror			—	—	—	—	—	—
Security system			—	—	—	—	—	—

★: For the option codes, refer to ID section. **<Ref. to ID-5,** MODEL NUMBER PLATE**, Identification.>**

3. OPTION

Option		Front kg (lb)	Rear kg (lb)	Total kg (lb)
Sport package base		0.1 (0.2)	0.4 (0.9)	0.5 (1.1)
Aluminum wheel	15 IN	−6.8 (−15.0)	−6.8 (−15.0)	−13.6 (−30.0)
	16 IN	−6.6 (−14.0)	−6.6 (−14.5)	−13.2 (−29.0)
Front fog light		0.7 (1.5)	−0.1 (−0.2)	0.6 (1.3)
Cruise control		1.5 (3.3)	0.2 (0.5)	1.7 (3.8)
High-grade audio		0.8 (1.8)	0.4 (0.9)	1.2 (2.7)
High-grade audio		4.4 (9.7)	0.5 (1.1)	4.9 (10.8)
Sport steering		0.2 (0.5)	0.1 (0.2)	0.3 (0.7)
Leather package base		0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Leather seat, Leather door trim		1.2 (2.6)	3.0 (6.6)	4.2 (9.2)
Navigation EC, EK built in (2 DIN)		3.0 (6.6)	0.1 (0.2)	3.1 (6.8)
Air conditioner		16.9 (37.3)	−1.4 (−3.1)	15.5 (34.2)
Side airbag		2.0 (4.4)	2.4 (5.3)	4.4 (9.7)
Sunroof		3.5 (7.7)	13.2 (29.1)	16.7 (36.8)
Self-leveling function Rr	Non-turbo	0.1 (0.2)	3.0 (6.6)	3.1 (6.8)
	Turbo	0.1 (0.2)	3.1 (6.8)	3.2 (7.0)
VDC+VTD		3.0 (6.6)	1.0 (2.2)	4.0 (8.8)
Cold area pack A		0.1 (0.2)	0.2 (0.5)	0.3 (0.7)
Cold area pack B		0.1 (0.2)	0.3 (0.7)	0.4 (0.9)
Cold area pack C		0.1 (0.2)	0.3 (0.7)	0.4 (0.9)
Cold area pack D		0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Heated mirrors		0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Security system		0.3 (0.7)	0.3 (0.7)	0.6 (1.4)

PRECAUTION

PC

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1. Precaution 2

1. Precaution

A: CAUTION

Please clearly understand and adhere to the following general precautions. They must be strictly followed to avoid minor or serious injury to the person doing the work or people in the area.

1. ABS

Handle the ABS as a total system. Do not disassemble or attempt to repair parts which are not instructed in this manual. Follow the instructions in this manual during performing the maintenance of ABSCM&H/U. To disassemble parts without instructions could prevent the ABS system from operating when needed or cause it to operate incorrectly and result in injury.

2. VEHICLE DYNAMICS CONTROL (VDC)

Handle the VDC as a total system. Do not disassemble or attempt to repair individual parts. Doing so could prevent the VDC system from operating when needed or cause it to operate incorrectly and result in injury.

3. BRAKE FLUID

If brake fluid gets in your eyes or on your skin, do the following:

- Wash out your eyes and seek immediate medical attention.
- Wash your skin with soap and then rinse thoroughly with water.

4. RADIATOR FAN

The radiator fan may rotate without warning, even when the engine is not on. Do not place your hand, cloth, tools, or other items near the fan at any time.

5. ROAD TESTS

Always conduct road tests in accordance with traffic rules and regulations to avoid bodily injury and interrupting traffic.

6. AIRBAG

To prevent bodily injury from unexpected deployment of airbags and unnecessary maintenance, follow the instructions in this manual when performing maintenance on airbag components or nearby, and airbag wiring harnesses or nearby.

To prevent unexpected deployment, perform one of the steps below and then wait at least 20 seconds to discharge electricity before beginning work.

- Step 1: Turn the ignition switch OFF.
- Step 2: Disconnect the ground cable from battery.

7. AIRBAG DISPOSAL

To prevent bodily injury from unexpected airbag deployment, do not dispose airbag modules in the same way as other refuse. Follow all government regulations concerning disposal of refuse.

8. AIRBAG MODULE

Adhere to the following when handling and storing the airbag module to prevent bodily injury from unexpected deployment:

- Do not hold the harnesses or connectors to carry module.
- Do not face the bag in the direction that it opens towards yourself or other people.
- Do not face the bag in the direction that it opens towards the floor or walls.

9. AIRBAG SPECIAL TOOLS

To prevent unexpected deployment, only use special tools.

10.WINDOW

Always wear safety glasses when working around any glass to prevent glass fragments from damaging your eyes.

11.WINDOW ADHESIVE

Always use the recommended or alternative adhesive when attaching glass to prevent it from falling, resulting in accidents and injury.

NOTE

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1. Note

A: NOTE

This is information that can improve efficiency of maintenance and assure sound work.

1. FASTENER NOTICE

Fasteners are used to prevent parts from damage and dislocation due to looseness. Fasteners must be tightened to the specified torque.
Do not apply paint, lubricant, rust retardant, or other substances to the surface around bolts, fasteners, etc. Doing so will make it difficult to obtain the correct torque and result in looseness and other problems.

2. STATIC ELECTRICITY DAMAGE

Do not touch the control unit, connectors, logic boards, and other such parts when there is a risk of static electricity. Always use a static electricity prevention cord or touch grounded metal before conducting work.

3. BATTERY

When removing the battery cables, always be sure to turn the ignition switch off to prevent electrical damage to the control unit from rush current.

4. SERVICE PARTS

Use authentic service parts for maximum performance and maintenance, when conducting repairs. Subaru/FHI will not be responsible for poor performance resulting from the use of parts not specified by a genuine dealer.

5. PROTECTING VEHICLE UNDER MAINTENANCE

Make sure to attach the fender cover, seat covers, etc. before work.

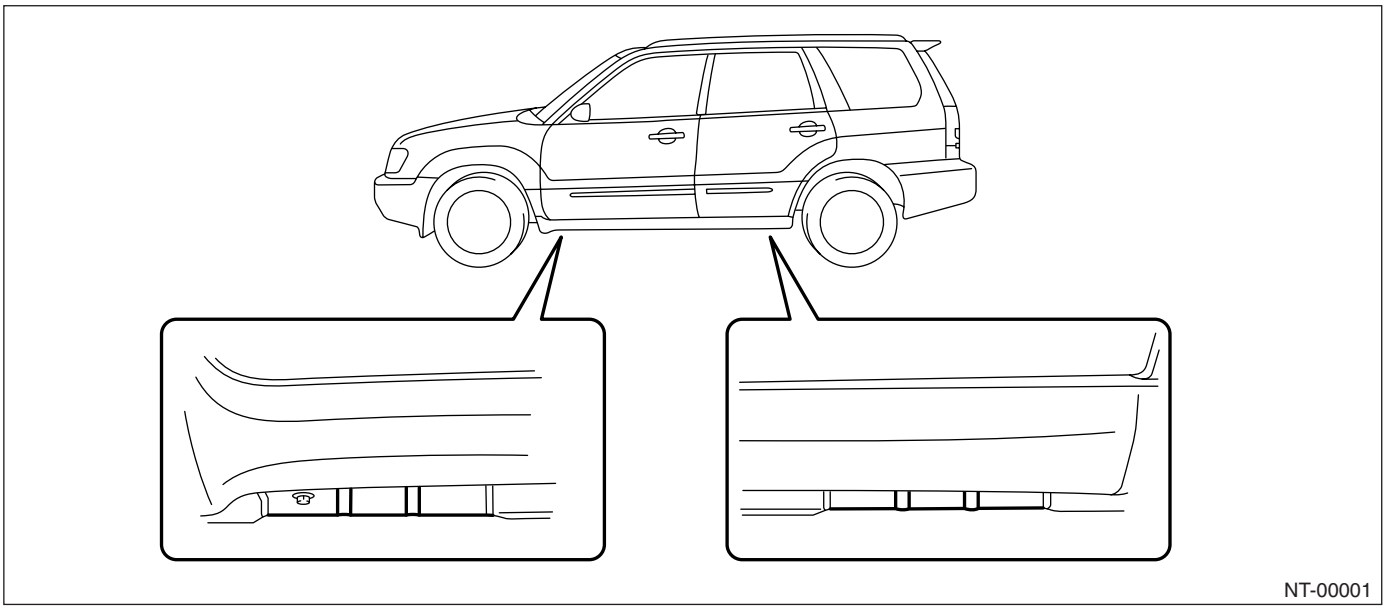
6. ENSURING SAFETY DURING WORK

When working in a group of two or more, perform the work with calling each other to ensure mutual safety.

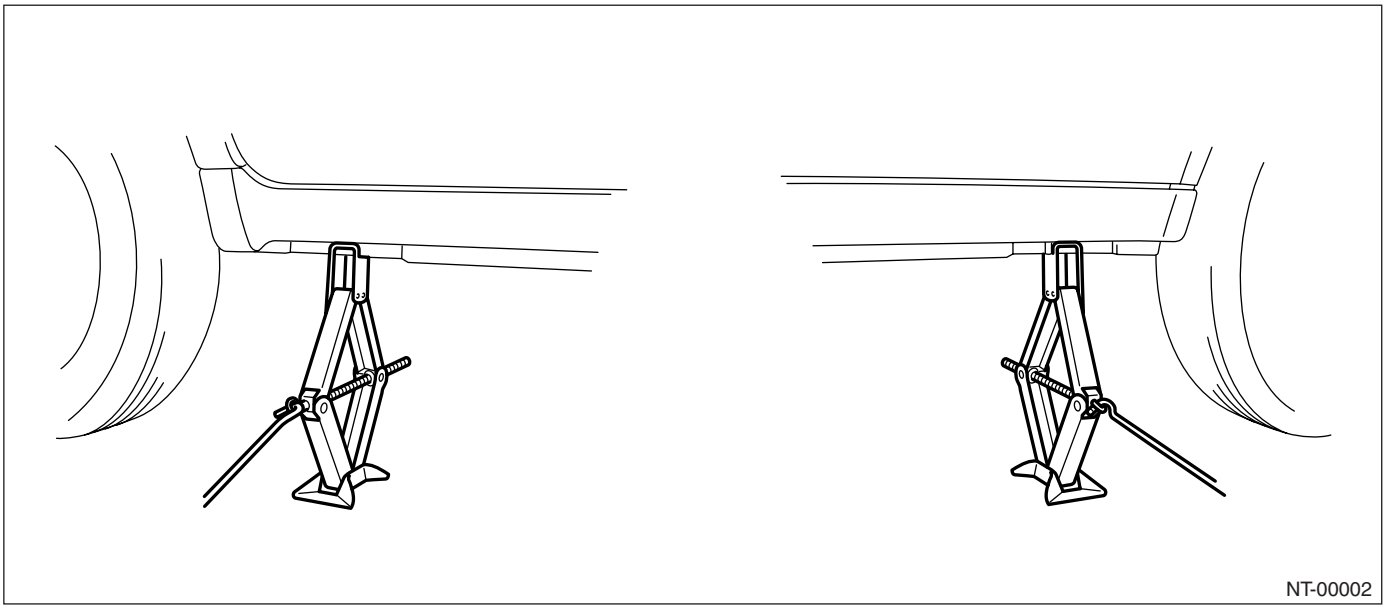
7. LIFTS AND JACKS

When using a lift or jack to raise a vehicle, always follow instructions concerning jack-up points and weight limits to prevent the vehicle from falling, which could result in injury. Be especially careful to make sure the vehicle is balanced before raising it.
Be sure to set the wheel stoppers when jacking-up only the front or rear of the vehicle.

• SUPPORT LOCATIONS

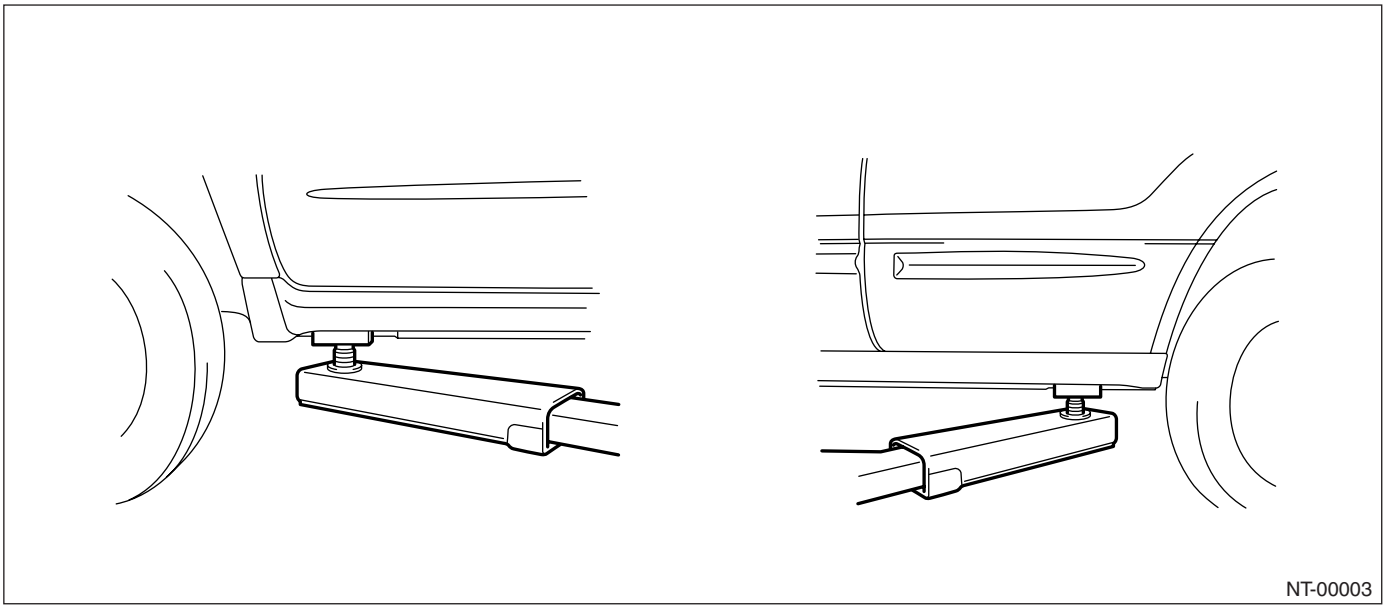


• PANTOGRAPH JACK

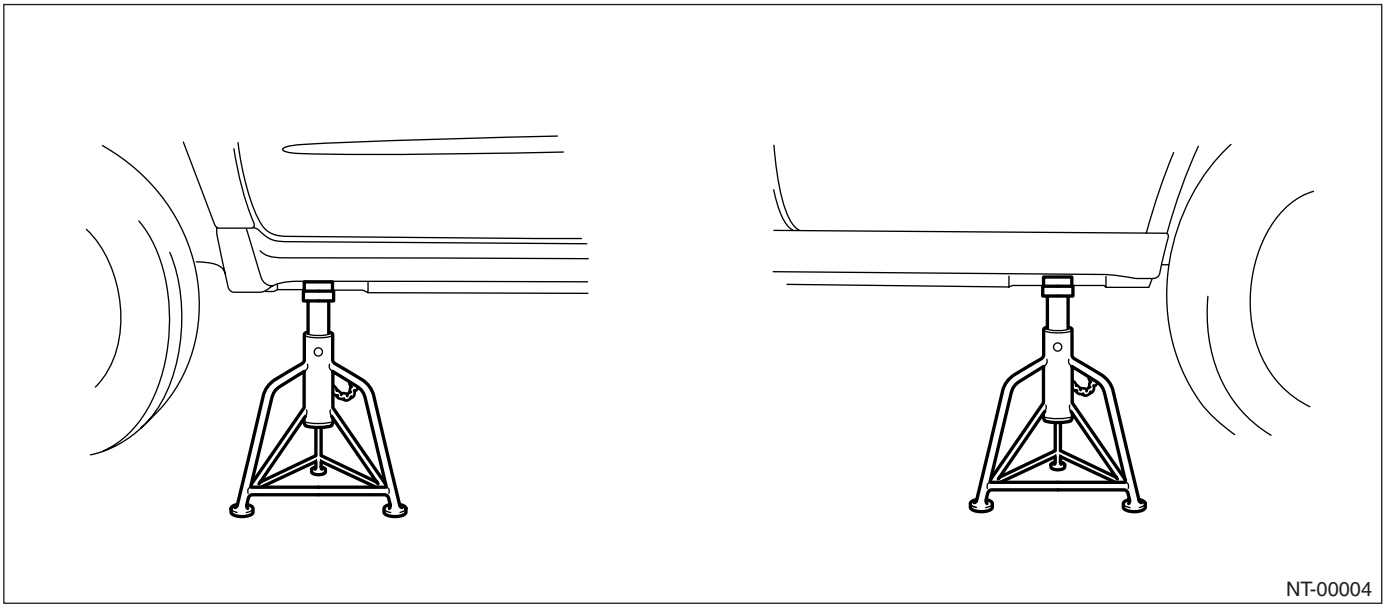


NOTE

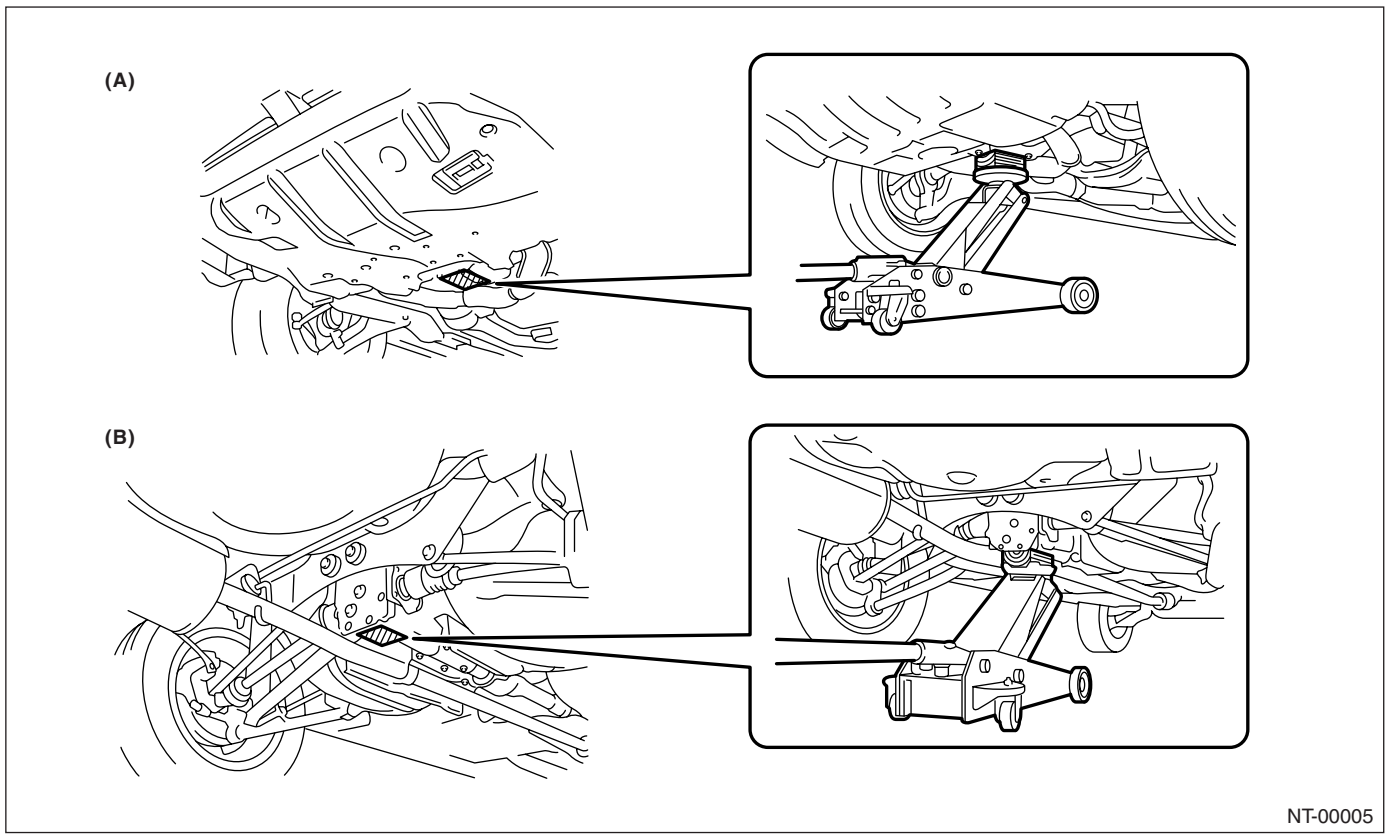
• LIFT



• RIGID RACK



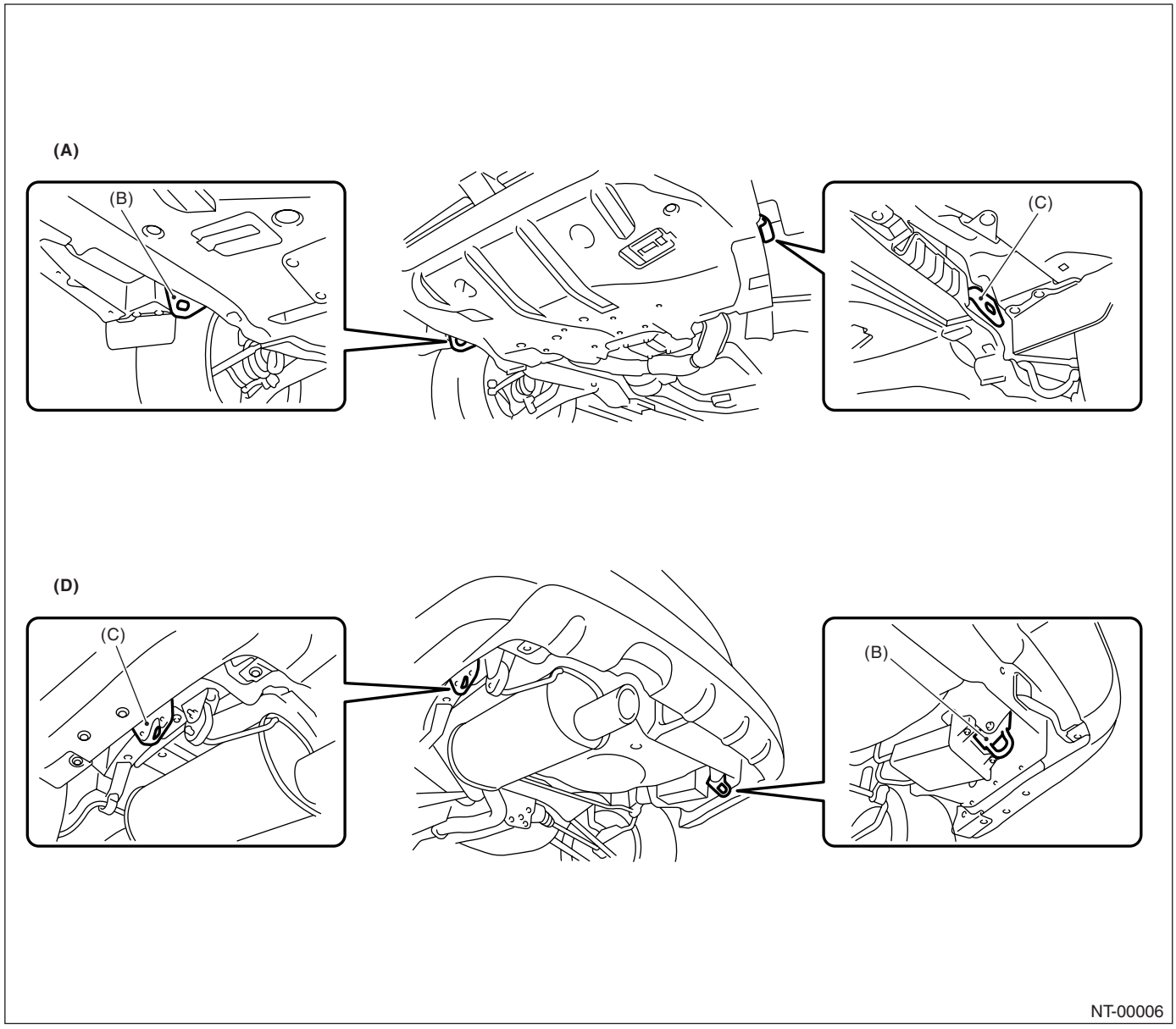
• JACK-UP POINT



(A) Front (B) Rear

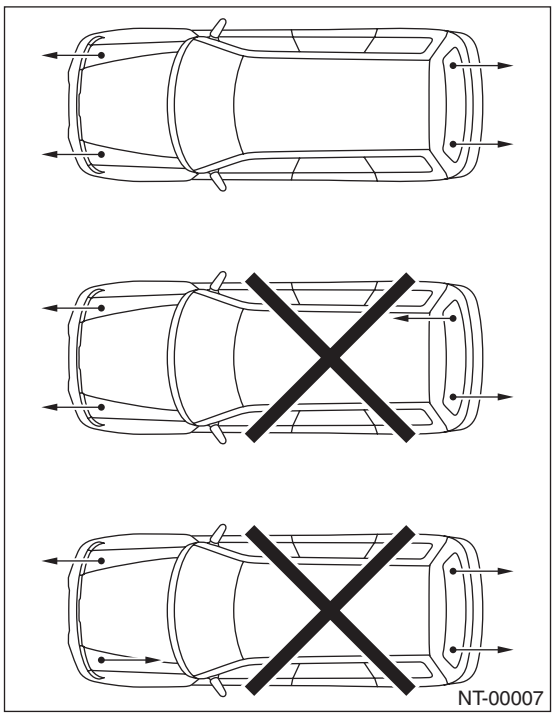
8. TIE-DOWNS

Tie-downs are used when transporting vehicles and when using the chassis dynamo. Attach tie-downs only to the specified points on the vehicle.

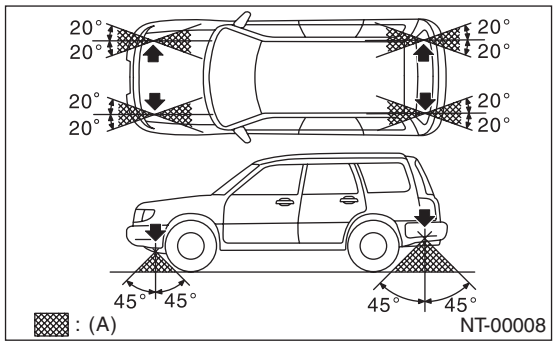


(A) Front
(B) Hook for towing and tie-down
(C) Hook for tie-down
(D) Rear

• CHAIN DIRECTION AT TIE-DOWN CONDITION



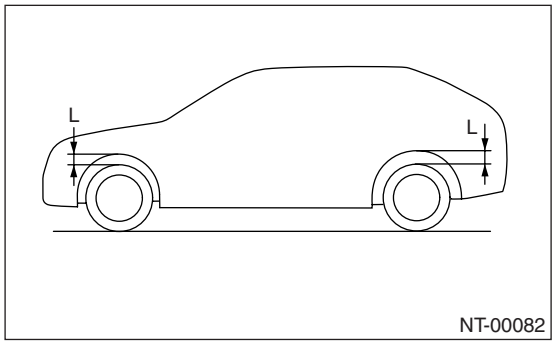
• CHAIN PULLING RANGE AT TIE-DOWN CONDITION



(A) Chain pulling range at tie-down condition

• VEHICLE SINKING VOLUME AT TIE-DOWN CONDITION

Measure the distance L between tire highest point to arch highest point before tie-down and after tie-down. Difference of measurement value (drop height) shall be within 50 mm (1.97 in). Make sure to fix the vehicle securely.



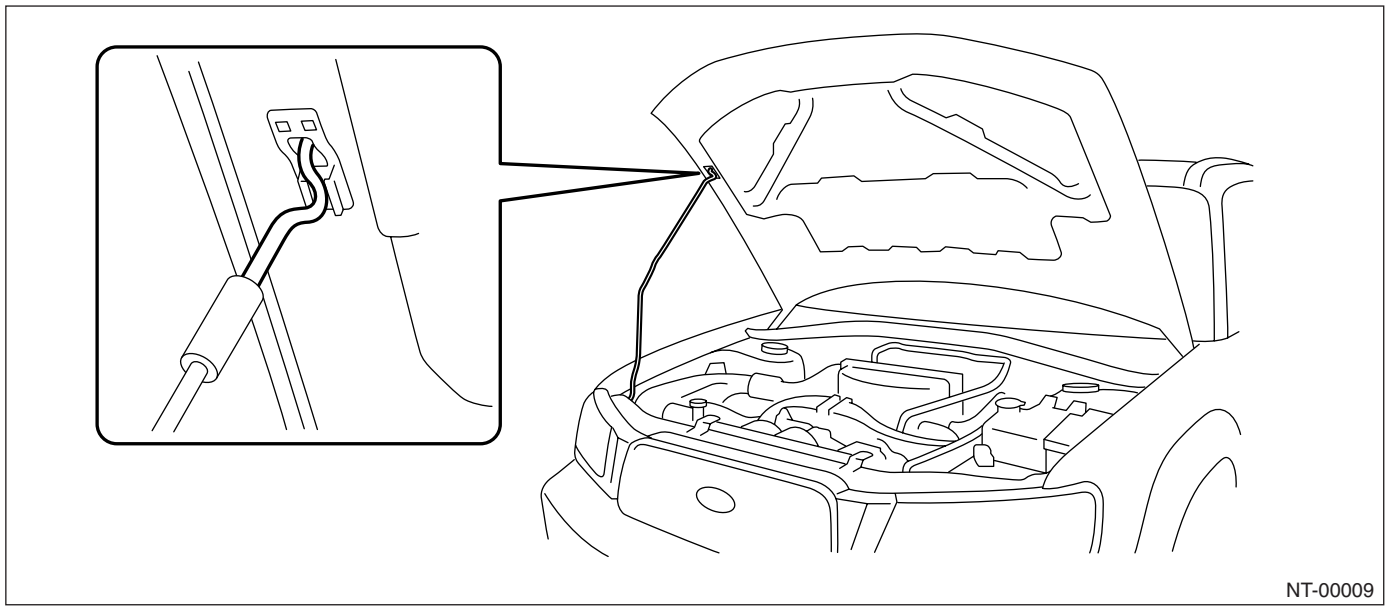
9. TOWING

Avoid towing vehicles except when the vehicle cannot be driven. For models with AWD or AT use a loader instead of towing. When towing other vehicles, to prevent excessive weight from damaging the hook or vehicle:

- Do not tow other vehicles with a front hook for tie-down.
- Make sure the vehicle towing is heavier that the vehicle being towed.

10.FRONT HOOD STAY INSTALLATION

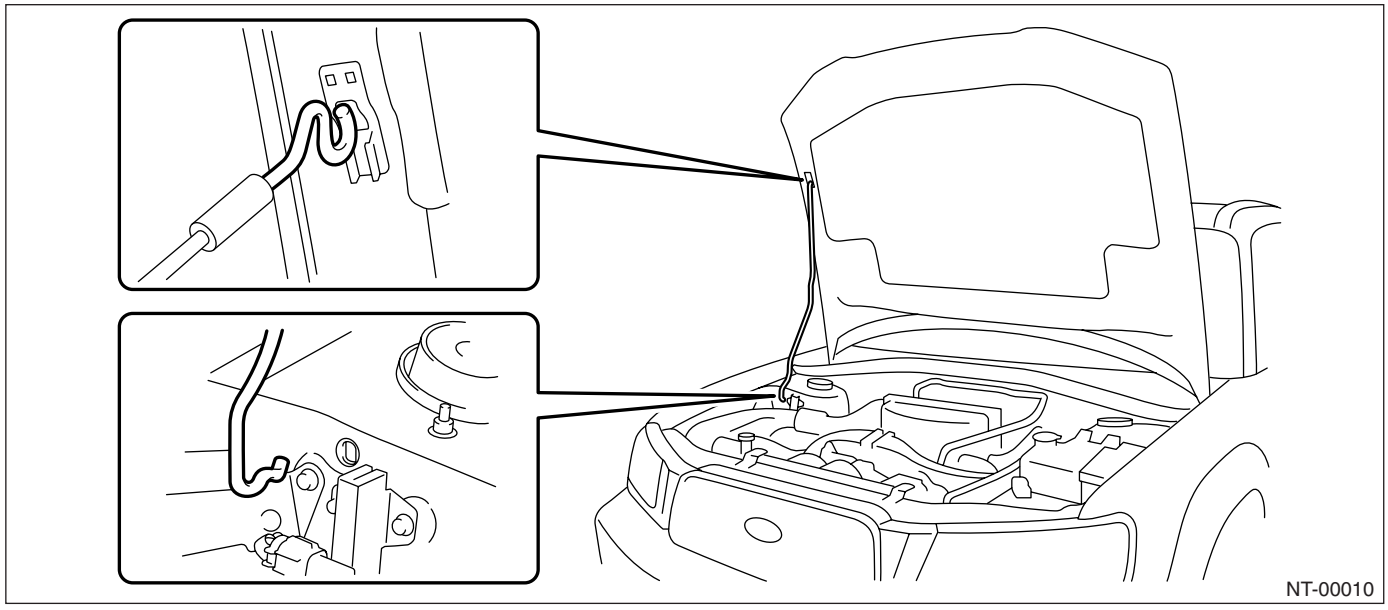
• AT THE CHECK AND GENERAL MAINTENANCE



• WHEN WIDER HOOD OPENING IS NECESSARY

Set stay into the hole of hood inner as shown in the figure below.

NOTE:
Before setting the front hood in this position, remove the windshield washer hose attaching clip from the front hood.



11.TRAINING

For information about training, contact a dealer or agent.

12.GENERAL SCAN TOOL

Using general scan tools will greatly improve efficiency of repairing engine electronic controls. The Subaru Select Monitor can be used to diagnose the engine and also the ABS, the air conditioner, and other parts.

IDENTIFICATION

ID

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1. Identification 2

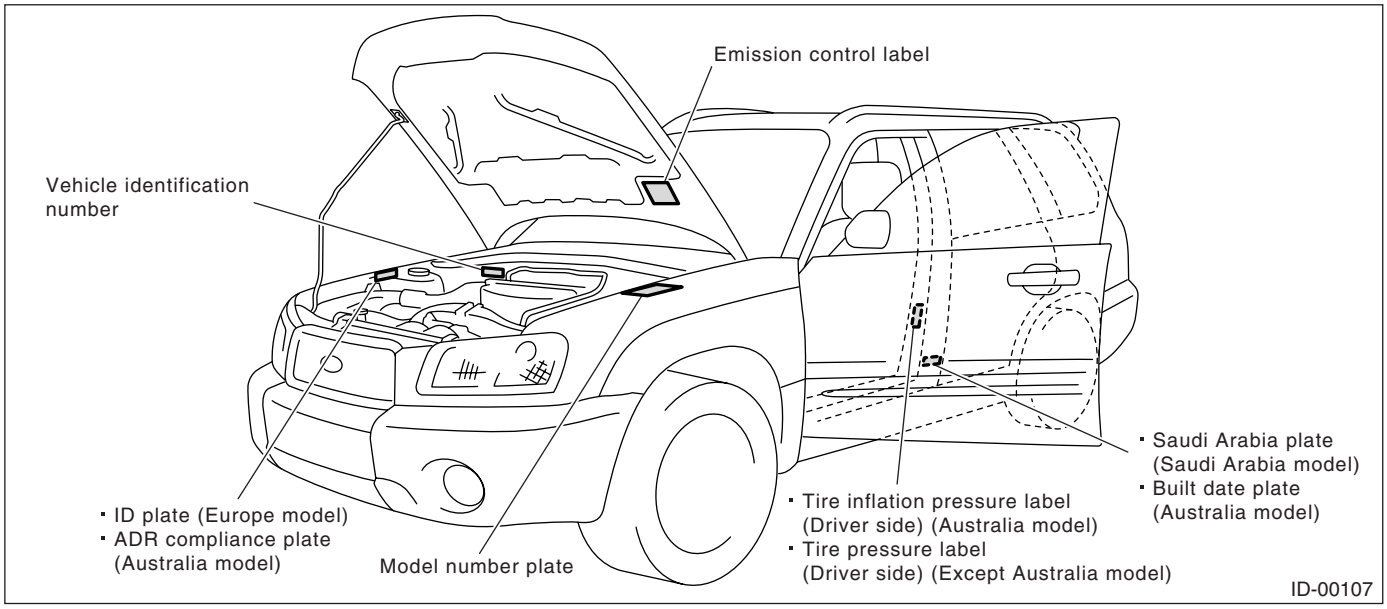
1. Identification

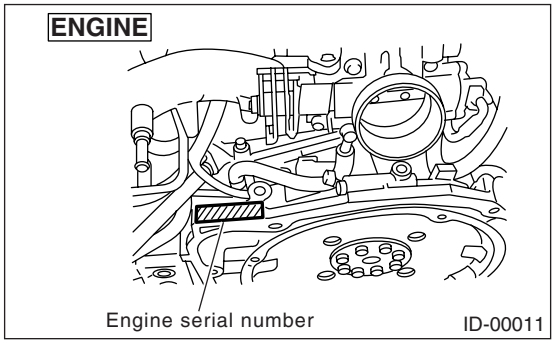
A: IDENTIFICATION

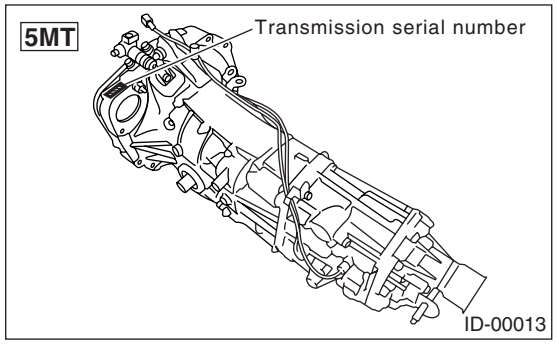
1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

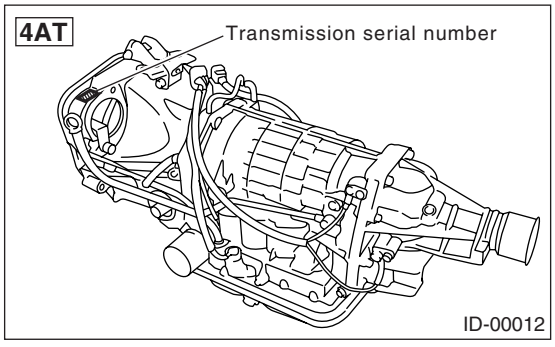
The VIN (Vehicle Identification Numbers) is used to classify the vehicle.

- **Positioning of the plate label for identification**

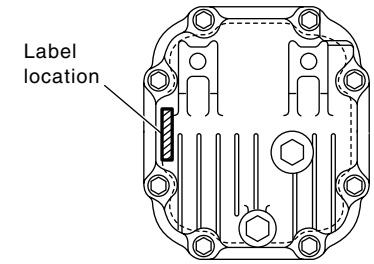




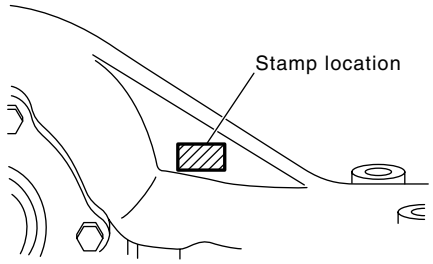




VA-type

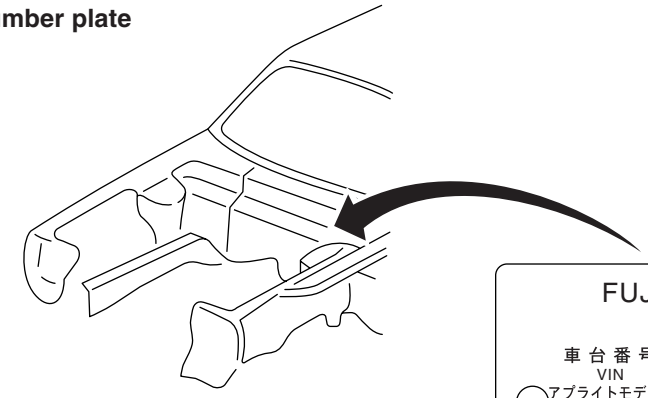


T-type



ID-00016

Model number plate



FUJI HEAVY INDUSTRIES LTD.

型　式

車台番号 VIN　JF1SG5LK45G041131

アプライトモデル applied model　SG9AY7J　オプションコード option code　U4QW

トリムコード trim code　410

外装飾コード Color code　230

エンジン型式 engine type　EJ201NWSAA

ミッション型式 transmission type　TY755XF5AA

ID-00110

2. MEANING OF V.I.N.

The meaning of the VIN is as follows:

• EUROPE, AUSTRALIA AND GENERAL (EXCEPT GCC)

]JF1SG5LK45G041131[

The starting and ending brackets ( ][ ) are stop marks.

Digits	Code	Meaning	Details
1 to 3	JF1	Manufacturer body area	JF1: Passengercar, FHI made JF2: MPV, FHI made
4	S	Car line	S: FORESTER
5	G	Body type	G: Wagon
6	5	Displacement	5: 2.0 L AWD 9: 2.5 L AWD
7	L	Steering position	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
8	K	Engine & transmission	R: SOHC MPI 4-speed AT K: SOHC MPI Full-time AWD 5-speed MT Dual range D: DOHC Turbo Full-time AWD 5-speed MT T: DOHC Turbo 4-speed D-AT
9	4	Drive type	3: Full-time AWD Single range 4: Full-time AWD Dual range 5: AWD AT
10	5	Model year	5: 2005MY
11	G	Factory location	G: FHI (Gunma)
12 to 17	041131	Serial number	—

• GCC COUNTRIES (SAUDI ARABIA, ETC.)

]JF1SG93MX5J041131[

The starting and ending brackets ( ][ ) are stop marks.

Digits	Code	Meaning	Details
1 to 3	JF1	Manufacturer body area	JF1: Passenger car, FHI made
4	S	Car line	S: FORESTER
5	G	Body type	G: Wagon
6	9	Displacement	9: 2.5 L AWD
7	3	Grade	3: 2.5X
8	M	Restraint	M: Manual belts, dual airbag
9	X	Check digit	0 — 9 & X
10	5	Model year	5: 2005MY
11	J	Transmission type	H: Full-time AWD 4-speed AT J: Full-time AWD 5-speed MT dual range
12 to 17	041131	Serial number	—

3. MODEL NUMBER PLATE

The model number plate indicates: the applied model, the option code, the trim code, the engine type, the transmission type, and the exterior color code. This information is helpful when placing orders for parts.

SG5CL1K

Digits	Code	Meaning	Details
1	S	Series	S: FORESTER
2	G	Body type	G: Wagon
3	5	Engine displacement Drive system Suspension system	5: 2.0 L AWD 9: 2.5 L AWD
4	C	Minor change	C: 2005MY
5	L	Destination	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
6	1	Grade	1: 2.0X 3: HUNTER Ver 5: 2.0XT 7: 2.5X 8: 2.5XS B: 2.5XT
7	K	Transmission, fuel feed system	R: SOHC MPI 4-speed AT K: SOHC MPI Full-time AWD 5-speed MT Dual range D: DOHC Turbo Full-time AWD 5-speed MT T: DOHC Turbo 4-speed D-AT

The engine and transmission type are as follows:

• ENGINE

EJ201NWSAA

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type	EJ: 4 cylinders
3 and 4	20	Displacement	20: 2.0 L 25: 2.5 L
5	1	Fuel feed system	1: D-MPI SOHC-A 5: L-MPI Turbo
6	N	Emission control	M: Unleaded non-STEP-III N: Unleaded STEP-III
7	W	Transmission	W: MT Y: MT (Response to CO_2 emission control) X: AT V: AT (Response to CO_2 emission control)
8	S	Minor change	S: 2005MY
9 to 10	AA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• TRANSMISSION

TY755XF5AA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	Y	Transmission type	Y: Full-time AWD MT center differential V: Full-time AWD AT VTD Z: Full-time AWD AT MPT
3 and 4	75	Classification	75: MT 1A: AT 1B: AT
5	5	Series	3: AT Non-turbo 5: MT 5: AT Turbo
6	X	Transmission specifications	V: Full-time AWD 5-speed MT with viscous coupling center differential single range X: Full-time AWD 5-speed MT Dual range with viscous coupling center differential Z: Full-time AWD 4-speed AT with MPT L: Full-time AWD 4-speed AT with MPT Turbo M: Full-time AWD AT VTD
7	F	Mounted body	F: 2.5 L SOHC R: 2.0 L SOHC N: 2.0 L DOHC Turbo W: 2.5 L DOHC Turbo
8	5	Minor change	5: MT (Initial is 3) 6: AT (Except for D-AT) (Initial is 4) X: D-AT (Initial is Z)
9 to 10	AA	Detailed specifications	Used when ordering parts. See the parts catalog for details.

• REAR DIFFERENTIAL 1

VA1REK

Digits	Code	Meaning	Details
1	V	For AWD	V: AWD
2	A	Type	A: A type
3	1	Hypoid gear diameter mm (in)	1: 152 (6.0) dia.
4	R	Installation position	R: Rear
5	E	Reduction gear ratio	E: 4.111 F: 4.444
6	K	Specification differences	—

• REAR DIFFERENTIAL 2

FF

Code	Reduction gear ratio	LSD	Oil temperature switch
FF	4.111	Viscous	Equipped
JP	4.111	Viscous	None
CF	4.444	Viscous	None
XR	4.111	Viscous	None
XS	4.444	Viscous	None

• OPTION CODE

ECAJ

Digits	Code	Meaning	Details
1 to 2	EC	Destination	EC: EC K4: K4 EH: EH KS: KS EK: EK KA: KA EN: EN ER: ER
3 to 4	AJ	Main option of vehicle	—

RECOMMENDED MATERIALS

RM

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1. Recommended Materials 2

1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or a substitute of equivalent quality.

2. FUEL

Always use a gasoline of the same or higher octane value than specified in the owner's manual. Ignoring the specifications below will result in damage or poor operation of the engine and fuel injection system. Use the specified gasoline to correct performance.

• UNLEADED GASOLINE

Use unleaded gasoline and not leaded gasoline on vehicles with catalytic converter installed to reduce air pollution. Using leaded gasoline will damage the catalytic converter.

Model	Petrol	RON
Non-turbo	Unleaded	More than 95 RON More than 90 RON*
Turbo	Unleaded	More than 98 RON

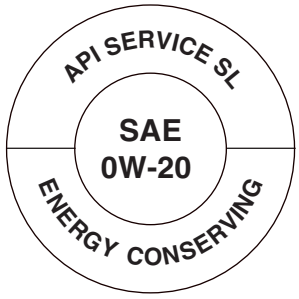
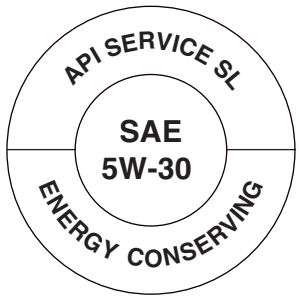
*For Australia model.

• LEADED GASOLINE

On vehicles without catalytic converter, use leaded gasoline with an octane value of 90 RON or higher.

3. LUBRICANTS

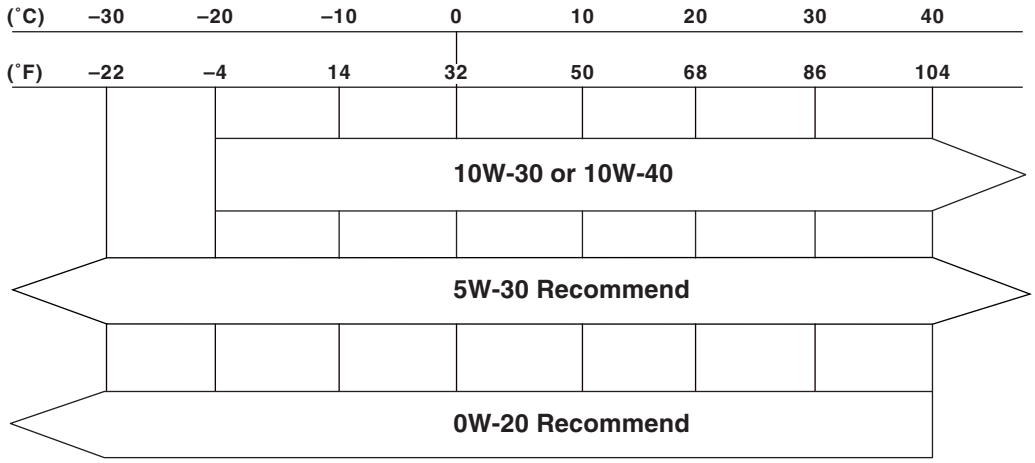
Use either the lubricants in the table below or equivalent lubricants. See the table below to choose the correct SAE viscosity.

Lubricant	Recommended		Alternative
	API Spec or ILSAC Spec.	ACEA Spec.	
Engine oil	SL or SJ Grade “Energy conserving”  RM-00006  RM-00001 GF-3 (A thing with the following mark.) RM-00002	SAE 0W-20, SAE 5W-30	SH
Manual transmission oil	GL-5	—	—
Front differential oil	GL-5	—	—
Rear differential oil	GL-5	—	—

SAE viscosity No. and applicable temperature

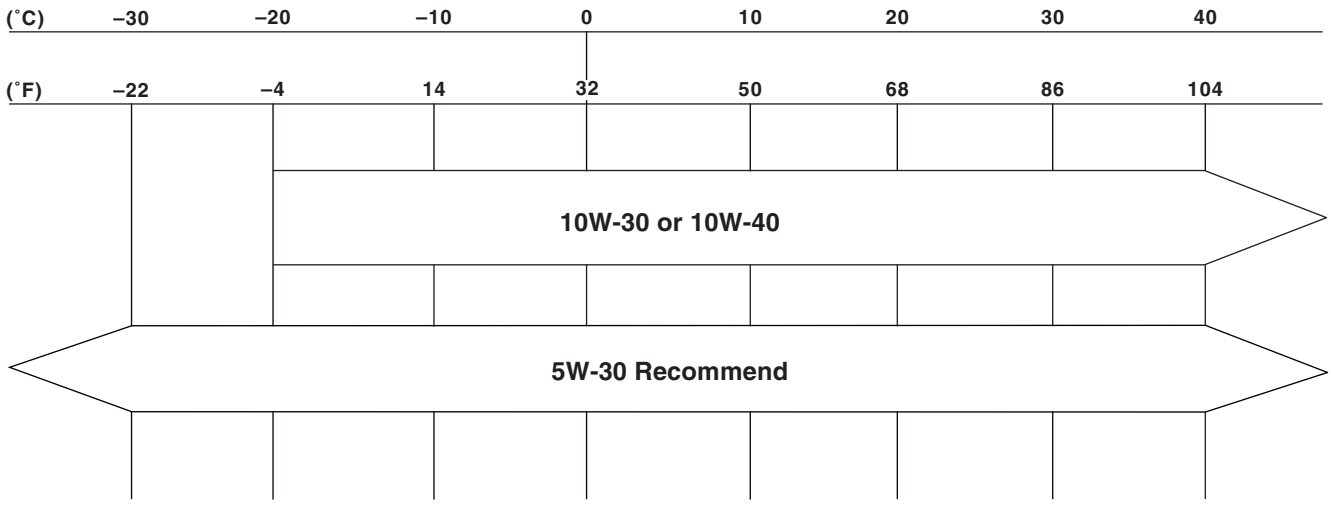
Engine oil

Non-turbo model



RM-00048

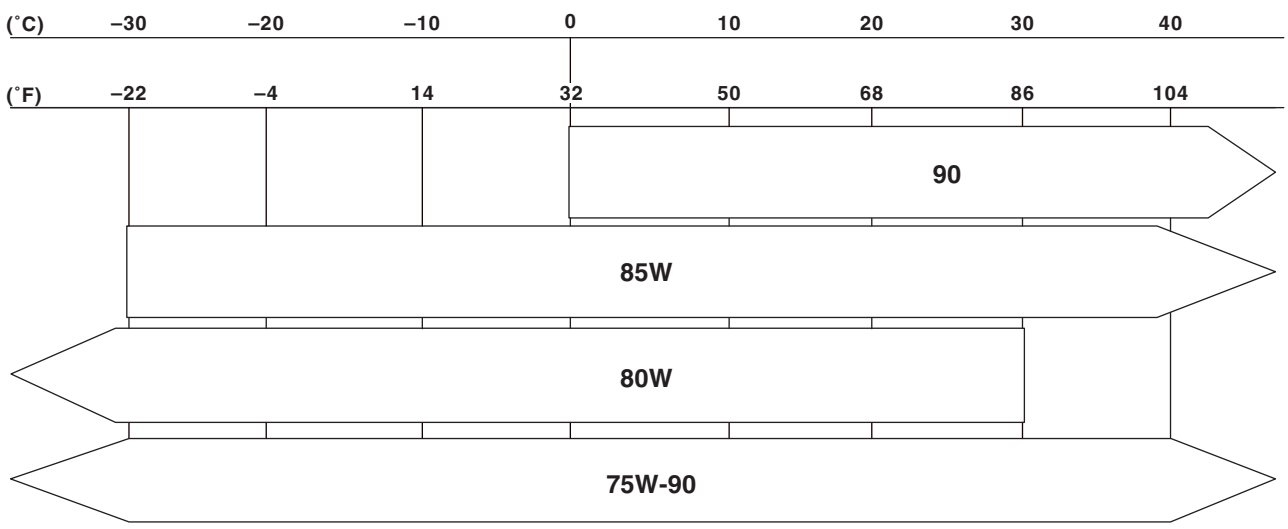
Turbo model



RM-00033

SAE viscosity No. and applicable temperature SAE J300

Manual transmission oil, front differential oil and rear differential oil



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4. FLUID

Use the fluids specified in the table below. Do not mix two different kinds or makes of fluid.

Fluid		Recommended	Alternative	Remarks
Automatic transmission fluid	EC,EK,EH model	SUBARU ATF K0410Y0700	IDEMITSU: Apoloil ATF HP Castrol: Transmax J	It is impossible to get the recommended or alternative you may use the DEXRON III
	Except for EC,EK,EH model	SUBARU ATF K0410Y0700	IDEMITSU: Apoloil ATF HP Castrol: Transmax J DEXRON III	—
Power steering fluid		DEXRON III	—	—
Brake fluid		FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	—
Clutch fluid		FMVSS No. 116 DOT3	FMVSS No. 116 DOT4	—

5. COOLANT

Use genuine coolant to protect the engine.

Coolant	Recommended	Item number	Alternative
Coolant	SUBARU coolant	000016218	None
Water for dilution	Distilled water	—	Tap water (Soft water)

6. REFRIGERANT

Standard air conditioners on Subaru vehicles use HFC134a refrigerant. Do not mix it with other refrigerants. Also, do not use any air compressor oil except for ZXL200PG.

Air conditioner	Recommended	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	ZXL200PG	—	None

7. GREASE

Use the grease and supplementary lubricants shown in the table below.

Grease	Application point	Recommended	Item number	Alternative
Supplementary lubricants	• O_2 sensor • Bolts, etc.	Splay type lubricant	—	—
Grease	MT main shaft	FX2200 clutch grease	000040901	—
	Clutch master cylinder push rod	Silicone grease G-40M	004404003	—
	• Gear shift lever • Select lever • Clutch operating cylinder • Accelerator pedal • Clutch pedal • Brake pedal • Hill holder • Clutch bearing • Clutch release lever • Steering shaft bearing	SUNLIGHT2	003602010	—
	Select lever lock plate part	Suncall GLO-244	0029408040	—
	Steering gear box	Valiant grease M-2	003608001	One luber MO or one luber SG
	• Disk brake • Drum brake wheel cylinder	Niglube RX-2	K0779GA102	—
	• Drum brake • Disk brake • Brake shoe	Molykote No.7439	003602001	—
	Brake pad	Molykote AS-880N	K0777YA010	—
	Front axle AARi	One luber C	28395SA000	—
	Front axle AC	HTBJ	—	—
	Rear axle BJ	NKG708	28495AE000	—
	Rear axle DOJ	NKG205	28495AG000	—
	• Door latch • Door striker	Silicone grease G-30M	004404002	—

8. ADHESIVES

Use the adhesives shown in the table below, or equivalent.

Adhesive	Application point	Recommended	Item number	Alternative
Adhesive	Windshield, rear window glass, rear quarter glass, rear gate and body	Dow Automotive's Adhesive: Gurit-ESSEX Betaseal 1502 or equivalent Glass primer: Betawipe VP04604, Betaprime 5001 Paint surface primer: Betaprime 5402	—	—
	Inner rearview mirror base	REPAIR KIT IN MR	65029FC000	—
	Soft vinyl	Cemedine 540	—	3M's EC-776, EC-847 or EC-1022 (Spray type)
	Momentary sealant	Cemedine 3000	—	Armstrong's Eastman 910

9. SEAL MATERIAL

Use seal material shown in the table below, or equivalent.

Seal material	Application point	Recommended	Item number	Alternative
Seal material	• Cylinder block • DOHC cam cap (Turbo model) • Torque converter clutch case	Three Bond 1215	004403007	Dow Corning's No. 7038
	Engine oil pan	Three Bond 1207C	004403012	—
	Transmission oil pan (AT model)	Three Bond 1217B	K0877YA020	—
	• Rear differential • Engine oil pressure switch	Three Bond 1324	004403042	—
	Rear differential	Three Bond 1105	004403010	Dow Corning's No. 7038
	Weatherstrip	Starcalking B-33A	000018901	Butyl Rubber sealant
	Steering adjusting screw	Three Bond 1102	004403006	—
	SOHC cam cap	Three Bond 1280B	K0877YA018	—

PRE-DELIVERY INSPECTION

PI

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1. Pre-delivery Inspection

A: GENERAL

The purposes of the pre-delivery inspection (PDI) are as follows.

- Remove the additional parts used for ensuring the vehicle quality during transportation and restore the vehicle to its normal state.
- Check if the vehicle before delivery is in a normal state.
- Check for any damage or missing parts that may have taken place during transportation or storage.
- Make sure to deliver a complete vehicle to the customer.

Because of the above reasons, all SUBARU distributor service must always carry out the PDIs before delivering a vehicle.

In addition, all SUBARU distributor service and PDI centers must check the status of every vehicle received to identify who is responsible for any possible defects.

B: PDI PROCEDURE

Follow the procedures shown in the table below.

Static Checks Just After Vehicle Receipt

Step	Check point
1. Appearance check	(1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents. If the protective coating has been removed, visually check the body paints for small areas of damage or stains. (2) Visually check the glass and light lenses for any damage and cracks or excessive gaps to the body sheet metal. (3) Visually check the plated parts for any damage.
2. Tire check	(1) Check the tires for damage, abnormal conditions and dents on the wheels. (2) Check the tire air pressure.
3. Fuse installation	If the vehicle is about to be delivered to the customer, attach a room light fuse.
4. Connection of air conditioner harness	If the vehicle is about to be delivered to the customer, connect the air conditioner harness.
5. Check the doors for lock/unlock and open/close operations.	(1) Using the key, check if the door can be locked and unlocked normally. (2) Open and close all doors to see that there are no abnormal conditions.
6. Operation check of double lock	Check that the double lock operates normally.
7. Operation check of the child safety lock system.	Check the child safety lock system operates normally.
8. Check the rear gate for lock/unlock and open/close operations.	(1) Check if the rear gate can be unlocked normally from the emergency door. (2) Open and close the rear gate to see that there are no abnormal conditions. (3) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.
9. Operation check of fuel filler flap lid opener lock release lever	Operate the fuel filler flap lid opener to check that the fuel filler flap lid is unlocked normally.
10. Accessory check	Check that the following accessories are provided. • Owner's manual • Warranty booklet • Service booklet • Spare key • Jack • Tool set • Spare tire
11. Operation check of hood lock release system	Operate the hood lock release lever to check that the hood opens normally.
12. Battery	Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
13. Brake fluid	Check the fluid amount.
14. Engine oil	Check the oil amount.
15. Transmission fluid	(1) Check the fluid amount. (2) For AT, check the front differential oil.
16. AT front differential oil	Check the AT front differential oil amount.
17. Engine coolant	Check the engine coolant amount.
18. Clutch fluid	Check the clutch fluid amount.
19. Window washer fluid	Check the window washer fluid amount.
20. Hood latch check	Check that the hood is closed and latched securely.
21. Keyless entry system	Check that the keyless entry system operates normally.
22. Seat	(1) Check the seat surfaces for smears or dirt. (2) Check the seat installation conditions and functionality.
23. Seat belt	Check the seat belt installation conditions and functionality.
24. Wheel alignment	Check that the wheel alignments are properly adjusted.

Checks with the Engine Running

Step	Check point
25. Test mode connectors	Test mode connectors
26. Immobilizer system	(1) Check that the engine starts with all keys that are equipped on vehicle. (2) 60 seconds after turning ignition switch from ON to ACC or OFF, or immediately after removing key, check that the security indicator light blinking.
27. Starting condition	Start the engine and check that the engine starts smoothly.
28. Exhaust system	Check that the exhaust noise is normal and no leaks are found.
29. Indicator and warning lights	Check that all the indicator lights operate normally.
30. Clock	Check that the clock operates normally.
31. Audio	Check the radio and CD player for normal operation.
32. Navigation system	(1) Check all display functions for normal operation. (2) Check the map disc (DVD) are provided on vehicle. (3) Check that the navigation system operates normally.
33. Front accessory power supply socket	Check that the front accessory power supply socket operates normally.
34. Lighting system	Check that the lighting systems operate normally.
35. Window washer	Check that the window washer system operates normally.
36. Wiper	Check that the wiper system operates normally.
37. Power window operation check	Check the power window for correct operations.

Dynamic Test with the Vehicle Running

Step	Check point
38. Brake test	Check that the foot brake operates normally.
39. Parking brake	Check that the parking brake operates normally.
40. AT shift control	Check the AT shift patterns are correct.
41. Heater & ventilation	Check that the heater & ventilation system operates normally.
42. Air conditioner	Check that the air conditioner operates normally.
43. Cruise control	Check that the cruise control operates normally.

Checks after Dynamic Test

Step	Check point
44. ATF level	Check that the ATF level is normal.
45. Power steering fluid level	Check that the power steering fluid level is normal.
46. Fluid leak check	Check for fluid/oil leaks.
47. Water leak check	Spray the vehicle with water and check for water leaks.
48. Appearance check 2	(1) Remove the protective coating (wrap guard).(if any) (2) Check the body paints for damage and smears. (3) Check the plated parts for damage and rust.

1. APPEARANCE CHECK

1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents.
2) If there is no protective coating, check the body paints for small areas of damage or stains and repair as necessary.
3) Check the window glass, door glass, and lights for any cracks or damage and repair or replace the parts as necessary.
4) Check the plated parts, such as the grilles and door knobs, for damage or loss of gloss and repair or replace the parts as necessary.

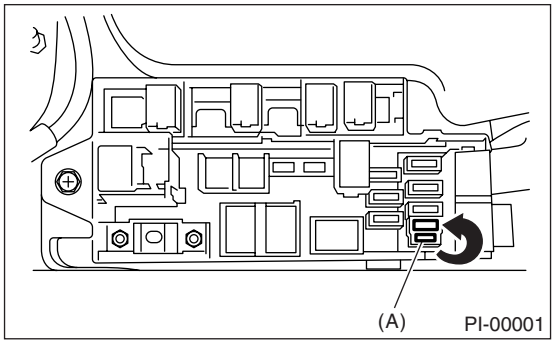
2. TIRE CHECK

- Check the tire outer faces for any damage.
- Check the tire air pressure by referring to the following table.

Tire size	Tire inflation pressure kPa (kgf/cm^2, psi)	
	Front	Rear
205/70R15	200 (2.0, 29)	190 (1.9, 28)
215/60R16		
P215/60R16		

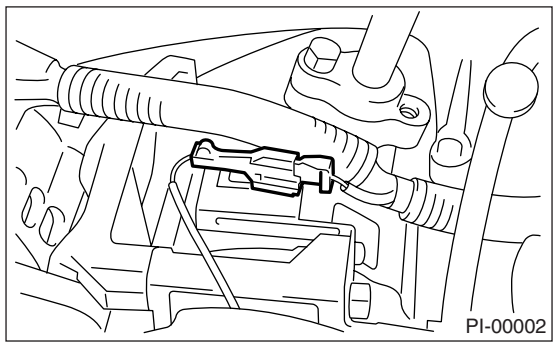
3. FUSE INSTALLATION

A vehicle just delivered has no fuse for the room lamp circuit to prevent battery discharge. Attach a 15 A fuse (A) as shown in the figure.



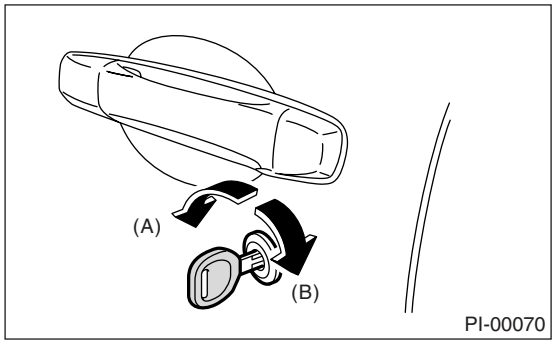
4. CONNECTION OF AIR CONDITIONER HARNESS

A vehicle just delivered has its air conditioner harness disconnected to protect the air conditioner compressor. Connect the harness as shown in the figure.



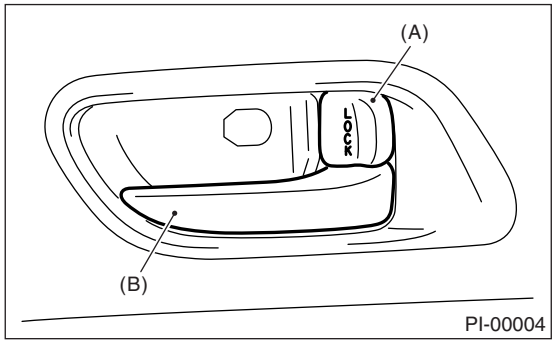
5. CHECK THE DOORS FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS.

1) Using the key, lock and unlock the door several times to check for normal operation. Open and close the door several times for smooth movement.



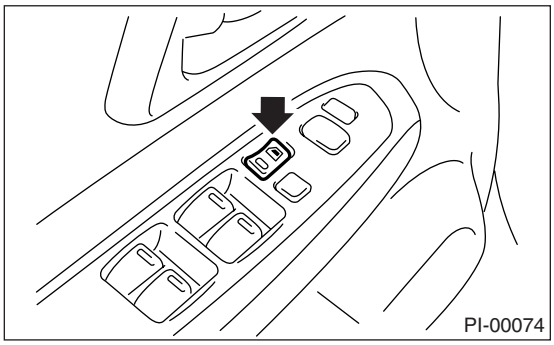
(A) Unlock
(B) Lock

2) Close the driver's door completely, and place the door lock knob (A) to the lock position. Then pull inside door handles (B) to ensure that doors will not open.
For other doors, place the door lock knob (A) to the lock positions and then pull the inside door handles to ensure that the doors will not open.

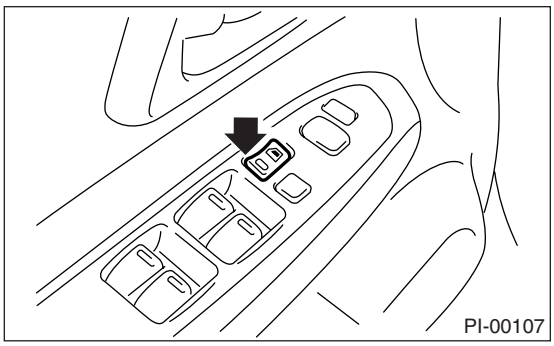


(A) Door lock knob
(B) Inside door handle

3) Press the driver's side power door lock switch to lock side. Check that all doors including rear gate are locked.



4) Press the driver's side power door lock switch to unlock side. Check that all doors including rear gate are unlocked.

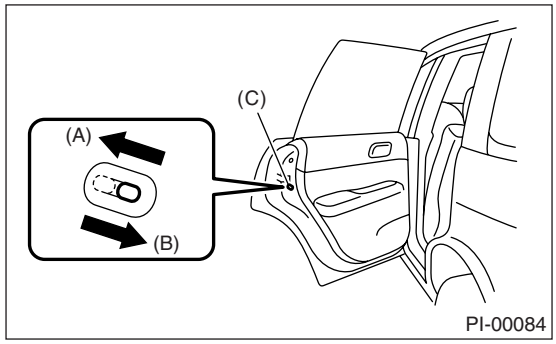


6. CHECK DOUBLE LOCK OPERATION.

1) Fully open all the windows.
2) Remove the key.
3) Lock all the doors using the key or keyless transmitter.
4) Verify that all the doors including rear gate are not unlocked when pressing power door lock switch to unlock side.
5) Verify that the door is not opened when operating door lock knob to unlock position and pulling inner remote. Perform the same check for other doors.
6) When the ignition key is turned to ON position in double lock condition, confirm all doors are released from double lock and then all doors and rear gate is unlocked.

7. CHECK THE OPERATION OF CHILD SAFETY LOCKS

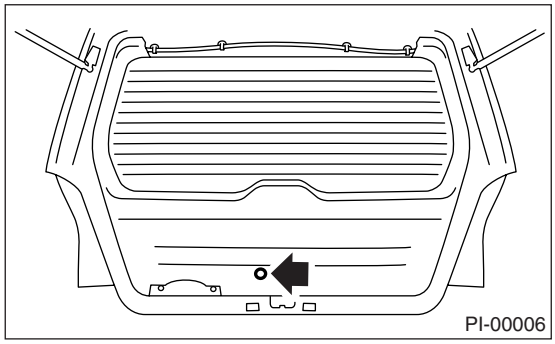
1) Set the child safety lock on both rear doors to the lock positions.
2) Close the rear doors completely.
3) Check that the lock levers of the rear doors are in the unlock positions. Then, pull the inside door handles of the rear doors to ensure that the doors will not open.
4) Next, pull the outside door handles of the rear doors to ensure that the doors will open.



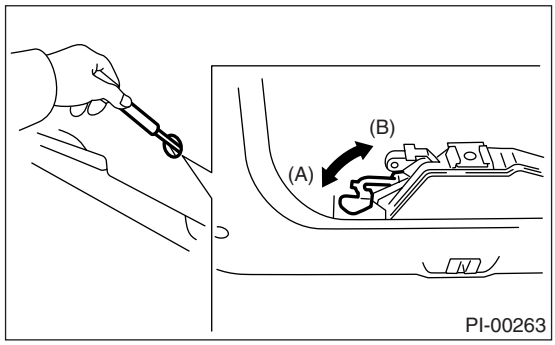
(A) Unlock
(B) Lock
(C) Child safety lock

8. CHECK THE REAR GATE FOR LOCK/ UNLOCK AND OPEN/CLOSE OPERATIONS.

1) Open and close the rear gate several times for smooth movement.
2) Operate the rear gate emergency lever to check that the rear gate is locked and unlocked normally.
(1) Remove the blind cover inside the rear gate.



(2) Using a screwdriver, check the rear gate is lock/unlock.



(A) Lock
(B) Un-lock

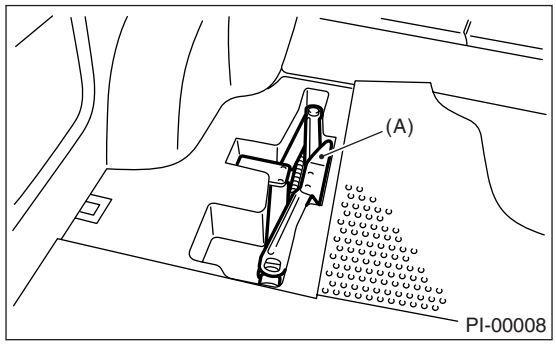
9. OPERATION CHECK OF FUDL FILLER FLAP LID OPENER LOCK RELEASE LEVER

Operate the fuel filler flap lid opener and verify that the fuel filler flap lid opens normally. Check that the filler cap is securely closed.

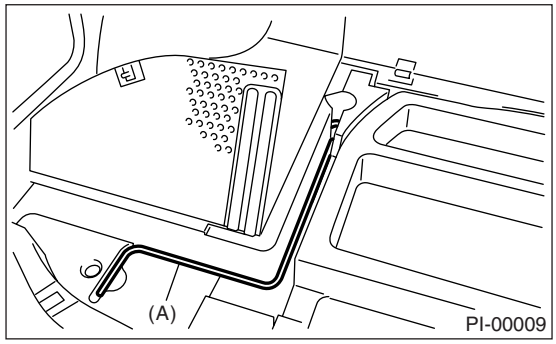
10.ACCESSORY CHECK

Check that the following accessories are provided in the luggage compartment or cargo area.

- Owner's manual
- Warranty booklet
- Service booklet
- Spare key
- Jack
- Tool set
- Spare tire



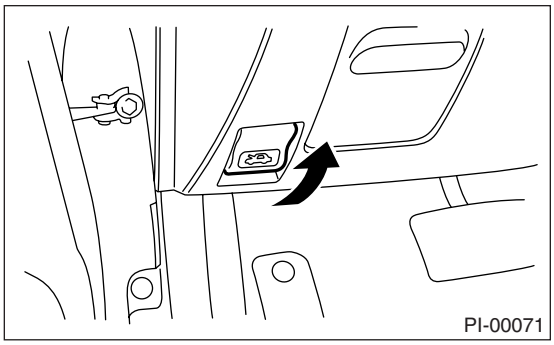
(A) Jack



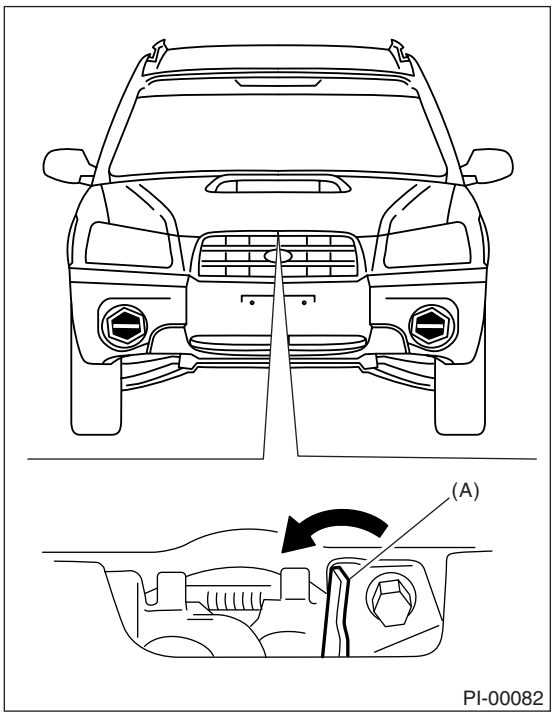
(A) Jack handle

11.OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

Operate the hood release knob and check that the hood is unlocked normally.

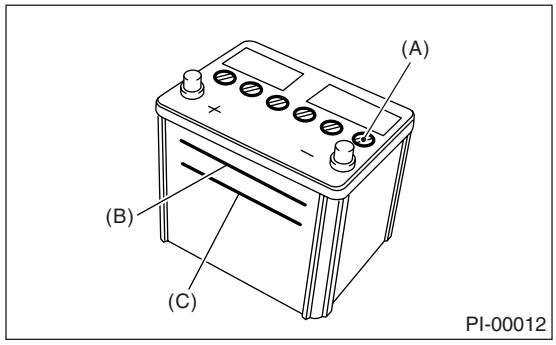


Operate the lever (A) and check that the hood is opened normally. Then support the hood with hood stay.



12.BATTERY

Check the battery terminals to make sure that no rust or corrosions due to fluid leaks are found. Check that the battery caps are securely tightened.



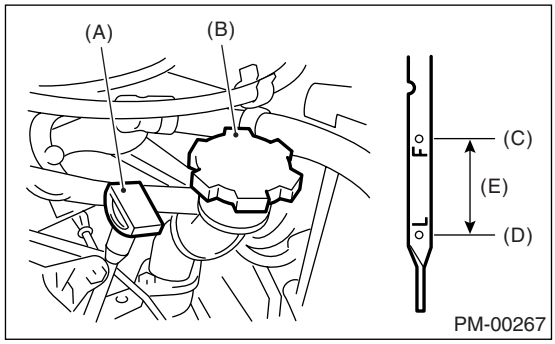
(A) Cap
(B) Upper level
(C) Lower level

13.BRAKE FLUID

Check the brake fluid amount. If the amount is insufficient, carry out a brake line test to identify brake fluid leaks and check the brake operation. After that, refill the brake fluid tank with the specified type of fluid.

14.ENGINE OIL

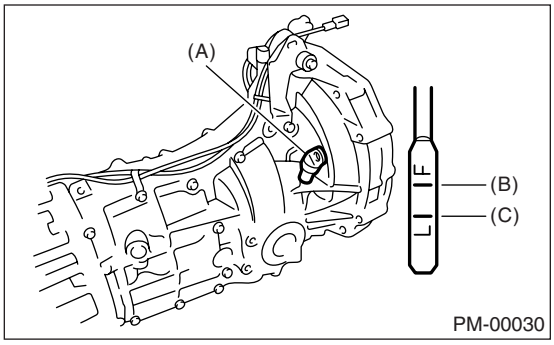
Check the engine oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.



(A) Engine oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1 ℓ (1.1 US qt, 0.9 Imp qt)

15.TRANSMISSION FLUID

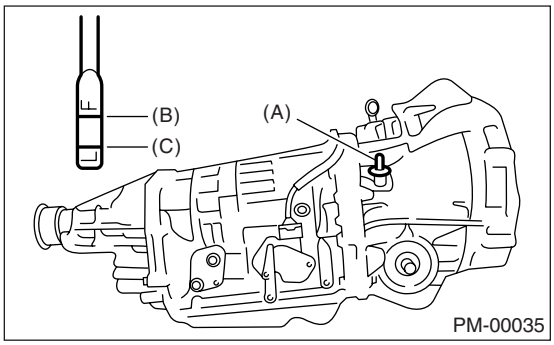
Check the transmission fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



(A) Oil level gauge
(B) Upper level
(C) Lower level

16.AT FRONT DIFFERENTIAL OIL

Check the AT front differential oil amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified AT front differential oil.



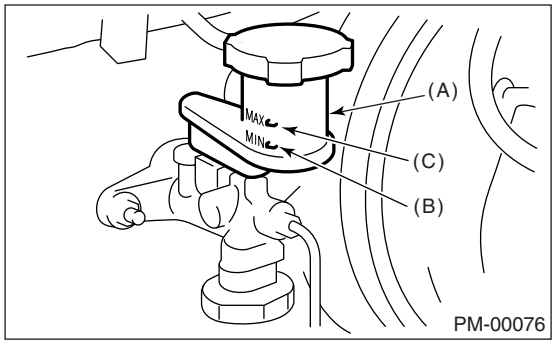
(A) Oil level gauge
(B) Upper level
(C) Lower level

17.ENGINE COOLANT

Check the engine coolant amount on the reservoir. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of engine coolant with the specified concentration.

18.CLUTCH FLUID

Check the clutch fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of the specified fluid.



(A) Reservoir tank
(B) MIN level
(C) MAX level

19.WINDOW WASHER FLUID

Check the window washer fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of washer fluid commercially available.

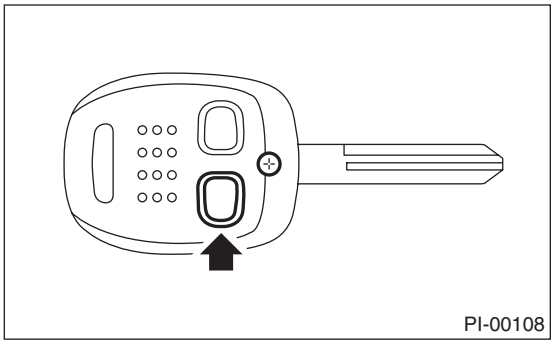
20.HOOD LATCH CHECK

Retract the hood stay and close the hood. Check that the hood is securely latched.

21.KEYLESS ENTRY SYSTEM

Check the keyless entry system operations as follows:

- Fully open all the door windows.
- Remove the key from the ignition switch and close all the doors including rear gate.
- Press the “LOCK” button on the keyless transmitter once and check if all the doors are locked, and the hazard light flashes once.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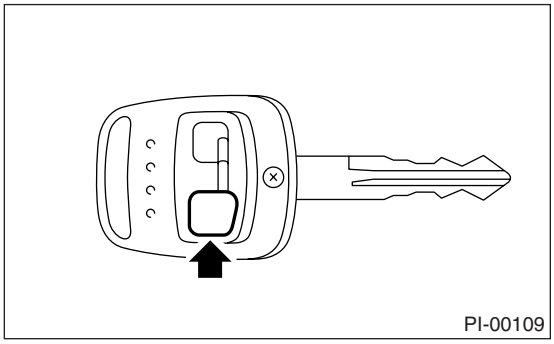
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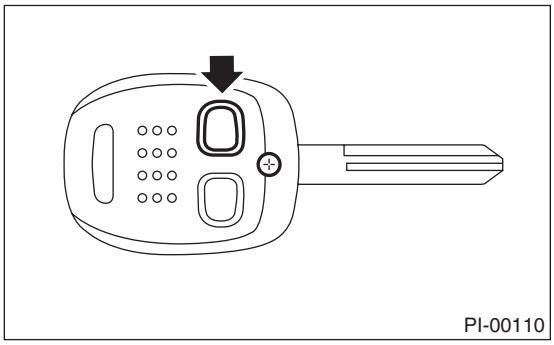
- Press the “UNLOCK” button on the keyless transmitter once and check if the all doors are unlocked, and the hazard light flashes twice.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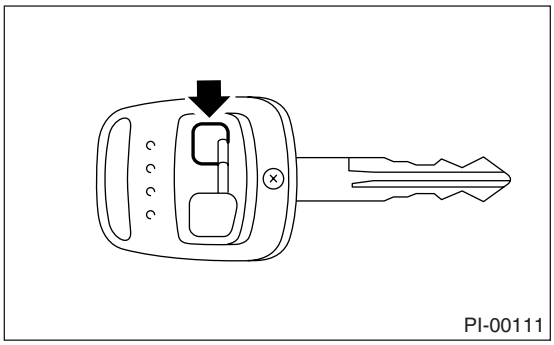
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- Close all doors and rear gate, press the “LOCK” button of the keyless transmitter. Press the “UNLOCK” button of the keyless transmitter and wait for 30 seconds. Check that all doors and the rear gate are automatically locked again. (Except for model with double lock)

22.SEAT

Check that each seat provides full functionality in sliding and reclining. Check all available functions of the rear seat.

23.SEAT BELT

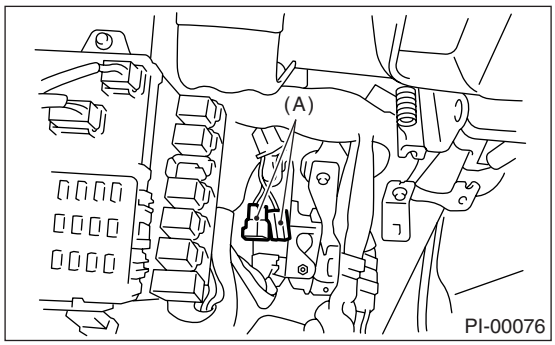
Pull out the seat belt and then release it. Check that the belt webbing retracts smoothly.

24.WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-6, Wheel Alignment.> <Ref. to RS-8, Wheel Alignment.>

25.TEST MODE CONNECTORS

Turn the ignition switch to ON and check that the malfunction indicator light starts blinking. If the light blinks, return the ignition key to LOCK and disconnect the test mode connector. Then, turn the ignition key to ON again. If the malfunction indicator light blinks at that time in spite of the disconnected test mode connector, carry out an engine diagnostic.



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(A) Test mode connector (Green)

26.IMMOBILIZER SYSTEM

1) Check that the engine starts with all keys that are equipped on vehicle.
2) 60 seconds after turning the ignition switch from ON to ACC or OFF, or immediately after removing the key, check that the security indicator light blinking.

NOTE:
If malfunctions occur, refer to “IMMOBILIZER (DIAGNOSTIC) ”.

27.STARTING CONDITION

Start the engine and check that the engine starts smoothly. If any battery voltage problems are found, recharge or replace the battery. If any noises are observed, immediately stop the engine and check and repair the necessary components.

28.EXHAUST SYSTEM

Listen to the exhaust noise to see if no unusual noises are heard.

29.INDICATOR LIGHT

Check that all the indicator lights are off.

30.CLOCK

Check the clock for normal operations and enough accuracy.

31.AUDIO

Check the radio for full functionality and normal noise level. Also check the CD unit operations.

32.NAVIGATION SYSTEM

1) Check all display function for normal operation. (For operating procedure, refer to operating manuals.)
2) Check the map disc (DVD) are provided on vehicle.
3) Check that the navigation systems operate normally.

33.FRONT ACCESSORY POWER SUPPLY SOCKET

Check the front accessory power supply socket operations.

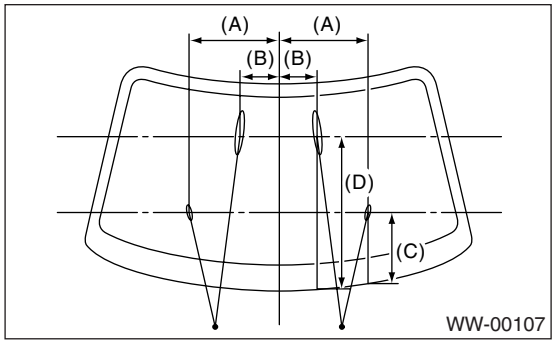
34.LIGHTING SYSTEM

- Check the headlight operations.
- Check the brake light operations.
- Check the other lights for normal operations.

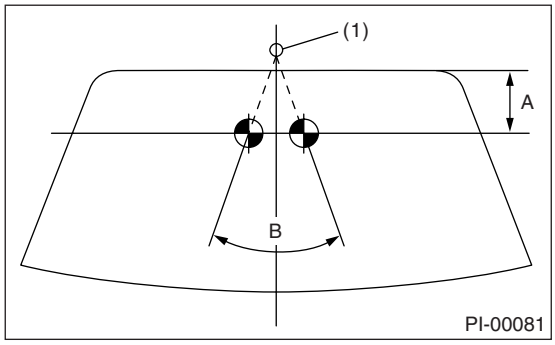
35.WINDOW WASHER

Check that the window washer system injects washer fluid to the specified area of windshield shown in the figure.

Front injection position:
(A) : 350 mm (13.78 in)
(B) : 150 mm (5.91 in)
(C) : 275 mm (10.83 in)
(D) : 600 mm (23.62 in)



Rear injection position:
A: 35 mm (1.38 in)
B: 72°



(1) Nozzle

36.WIPER

Check the front and rear wipers for normal operations.

37.POWER WINDOW OPERATION CHECK

Manipulate the power window switches one by one to check that each of the power windows goes up and down with no noises.

38.BRAKE TEST

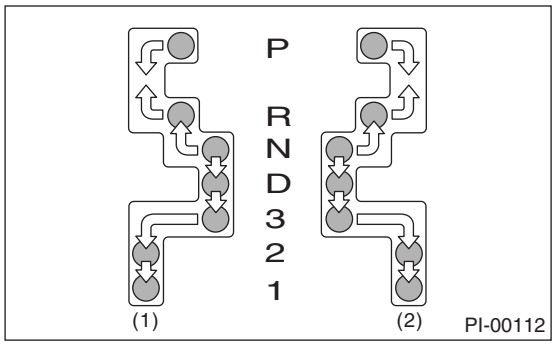
Check the foot brake for normal operations.

39.PARKING BRAKE

Check the parking brake for normal operations.

40.AT SHIFT CONTROL

1) Turn the ignition switch to ON.
2) Check that the select lever can not be moved from “P” range when brake pedal is not depressed.
3) Check that the select lever can be moved from “P” range when brake pedal is depressed.
4) Select the select lever to except “P” range.
5) Check that the ignition key can not be removed from ignition switch when ignition switch is turned to OFF.
6) Set the AT select lever to each gear position while checking that the demanded gear position is correctly attained.



(1) RHD model
(2) LHD model

Selector Position	Gear Position			
	1st	2nd	3rd	4th
D	OK	OK	OK	OK
3	OK	OK	OK	—
2	OK	OK	—	—
1	OK	—	—	—

41.HEATER & VENTILATION

Operate the heater and ventilation system to check for normal airflow outlet control, air inlet control, airflow capacity, and heating performance.

42.AIR CONDITIONER

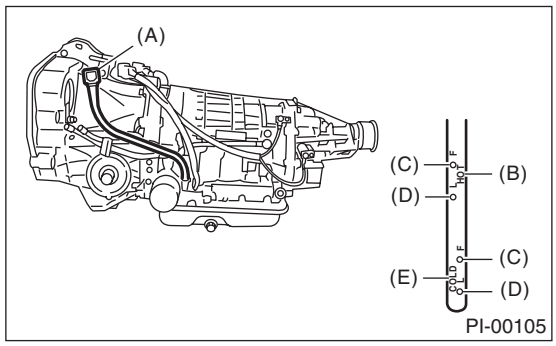
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

43.CRUISE CONTROL

Operate the cruise control system. Check that the system is activated and deactivated correctly.

44.ATF LEVEL

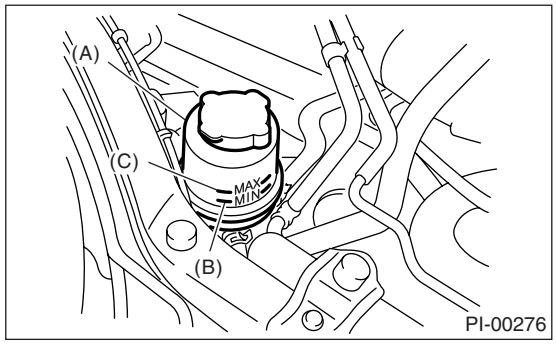
Check that the ATF level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified ATF.



(A) Level gauge
(B) Check position when “HOT”
(C) Upper level
(D) Lower level
(E) Check position when “COLD”

45.POWER STEERING FLUID LEVEL

Check that the power steering fluid level is normal. If insufficient, check that no leaks are found. Then add the necessary amount of the specified power steering fluid.



(A) Reservoir tank
(B) MIN level
(C) MAX level

46.FLUID LEAK CHECK

Check the entire areas of the vehicle for any trace of engine coolant/oil/fluid leaks.

47.WATER LEAK TEST

Spray the vehicle with water and check that no water enters the passenger compartment.

• Before performing the water leakage test, remove anything that may obstruct the operation or which must be kept dry.

• Close all windows completely, and then close all doors tightly. Close the hood before starting the test.

• Connect a hose to a tap, and spray water on the vehicle. The rate of water discharge must be approx. 20 — 25 ℓ (5.3 — 6.6 US gal, 4.4 — 5.5 Imp gal) per minute.

When spraying water on areas adjacent to the floor and wheel house, increase the pressure. When directing water on areas other than the floor portion and wheel house, decrease the pressure. But the force of water must be made strong occasionally by pressing the end of the hose.

NOTE:
Be sure to keep the hose at least 10 cm (3.9 in) from the vehicle.

Check the following areas:

• Front window and body framework mating portion
• Door mating portions
• Glass mating portions
• Rear quarter window mating portions
• Rear window and body framework mating portion
• Around roof drips

If any dampness in the compartment is discovered after the water has been applied, carefully check all areas that may have possibly contributed to the leak.

48.APPEARANCE CHECK 2

1) When vehicle body is covered with protective film (wrap guard), peel it off.

NOTE:

• Use of steam eases peeling off the wrap guard.

• When performing on the vehicles left for a long time, or during low temperature period, sprinkle some water heated to 50 — 60°C (122 — 140°F) over the vehicle to raise its surface temperature before peeling off the wrap guard.

Do not use the water heated to over 60°C (140°F).

• If the adhesive remains on the coated surface, rub the portion with a flannel rag, etc. soaked with a coat of coating wax or a solvent, such as oil benzene and IPA, and then wipe it off.

• Avoid adhesion of the solvent to resin or rubber components. Do not use coating wax or a solvent while the component surface temperature is high due to hot weather, etc.

• If the coated surface is swollen out due to seams or moisture, expose the vehicle to the sun light for a few hours. Otherwise, heat the portion with seams or moisture using a dryer, etc.

• Dispose of the peeled wrap guard as burnable industrial garbage.

2) Check the whole vehicle body for stains, flaking, damage caused by transportation, rust, dirt, cracks, or blistering.

NOTE:
• It is better to determine an inspection pattern in order to avoid missing an area, since the total inspection area is wide.
• It is desirable not to make corrections to the body paint unless absolutely needed. However, if any corrections are required to remove scratches or rust, the area to be corrected must be limited as much as possible. Re-painting and spray painting must be avoided whenever possible.

3) Carefully check each window glass for scratches. Slight damage may be removed by polishing with cerium oxide. (Half-fill a cup with cerium oxide, and add warm water to it. Then agitate the content until it turn to wax. Apply this wax to a soft cloth, and polish the glass.)
4) Check each portion of the vehicle body and underside components for the formation of rust. If rust is discovered, remove it with #80 — #180 emery paper, and treat the surface with rust preventive. After this treatment is completed, flush the portion thoroughly, and prepare the surface for repair painting.
5) Check each portion of the body and all of the exterior parts for deformation or distortion. Also check each lamp lens for cracks.

PERIODIC MAINTENANCE SERVICE

PM

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1. General Description

A: GENERAL

Be sure to perform periodic maintenance in order to maintain vehicle performance and find problems before they become serious.

2. Schedule

A: MAINTENANCE SCHEDULE 1

1. FOR EUROPE AREA

For periodic maintenance of over 120,000 km (75,000 miles) or till 96 months, carry out inspection by referring to the following table. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 120,000 km (75,000 miles) or 96 months.

			Maintenance interval [Number of months or km (miles), whichever occurs first]										
	Month				12	24	36	48	60	72	84	96	Remarks
	× 1,000 km		1.6	5	15	30	45	60	75	90	105	120	
	× 1,000 miles		1	3	9	19	28	38	47	56	66	75	
1	Engine oil				R	R	R	R	R	R	R	R	
2	Engine oil filter				R	R	R	R	R	R	R	R	
3	Spark plug	Turbo									R		
		Others				R		R		R		R	
4	Drive belt(s)				I	I	I	I	I	I	I	I	
5	Timing belt										R		
6	Fuel line					I		I		I		I	
7	Fuel filter						R			R			
8	Air cleaner element				I	R	I	R	I	R	I	R	
9	Cooling system					I		I		I		I	
10	Engine coolant					R		R		R		R	
11	Clutch system					I		I		I		I	
12	Hill-holder system					I		I		I		I	
13	Transmission oil					I		R		I		R	
14	ATF					I		R		I		R	
15	Front & rear differential					I		R		I		R	
16	Brake line					I		I		I		I	
17	Brake fluid					R		R		R		R	
18	Disk brake pads & discs				I	I	I	I	I	I	I	I	
19	Brake linings & drums					I		I		I		I	
20	Parking brake					I		I		I		I	
21	Suspension					I		I		I		I	
22	Wheel bearing											(I)	
23	Axle boot & joint				I	I	I	I	I	I	I	I	
24	Steering system					I		I		I		I	

Symbols used:
R: Replace
I: Inspection
(I): Recommended service for safe vehicle operation.

NOTE:
(1) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
(2) ATF filter is a maintenance free part. ATF filter needs replacement, when it is physically damaged or ATF leaked.

2. EXCEPT FOR EUROPE AREA

For periodic maintenance of over 50,000 km (30,000 miles) or 48 months, carry out inspections by referring to the following tables. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 50,000 km (30,000 miles) or 48 months.

		Maintenance Interval [Number of months or km (miles), whichever occurs first]					
	Months		12	24	36	48	Remarks
	× 1,000 km	5	12.5	25	37.5	50	
	× 1,000 miles	3	7.5	15	22.5	30	
1	Engine oil		R	R	R	R	
2	Engine oil filter		R	R	R	R	

For periodic maintenance of over 100,000 km (60,000 miles) or 48 months, carry out inspections by referring to the following tables. For a maintenance period gone beyond these tables, apply them repeatedly as a set of 100,000 km (60,000 miles) or 48 months.

			Maintenance Interval [Number of months or km (miles), whichever occurs first]					
	Months			12	24	36	48	Remarks
	× 1,000 km		1.6	25	50	75	100	
	× 1,000 miles		1	15	30	45	60	
3	Spark plugs	Turbo					R	
		Others		R	R	R	R	
4	Drive belt(s)			I	I	I	I	
5	Timing belt						R	
6	Fuel line				I		I	
7	Fuel filter				R		R	
8	Air cleaner element			I	R	I	R	
9	Cooling system				I		I	
10	Engine coolant				R		R	
11	Clutch system			I	I	I	I	
12	Hill-holder system			I	I	I	I	
13	Transmission oil				R		R	
14	ATF				R		R	
15	Front & rear differential oil				R		R	
16	Brake line			I	I	I	I	
17	Brake fluid				R		R	
18	Disc brake pads & discs			I	I	I	I	
19	Brake linings and drums				I		I	
20	Parking brake			I	I	I	I	
21	Suspension			I	I	I	I	
22	Wheel bearing						(I)	
23	Axle boots & joints			I	I	I	I	
24	Steering system (Power steering)			I	I	I	I	

Symbols used:
R: Replace
I: Inspection
(I): Recommended service for safe vehicle operation.

NOTE:
(1) When the vehicle is used in extremely dusty conditions, the air cleaner element should be replaced more often.
(2) ATF filter is a maintenance free part. ATF filter needs replacement, when it is physically damaged or ATF leaked.
(3) At the time of tawing enforcement, rear differential oil is replaced by 24000 km (15000 miles) or less. (KA model)

B: MAINTENANCE SCHEDULE 2

1. EUROPE AREA

Item	Every	Repeat short distance drive	Repeat rough/muddy road drive	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil		Replace more frequently		Replace more frequently			Replace more frequently
Engine oil filter		Replace more frequently		Replace more frequently			Replace more frequently
Fuel line	12 months				I		
	15,000 km						
	9,000 miles						
Transmission oil							Replace more frequently
ATF							Replace more frequently
Front & rear differential oil							Replace more frequently
Brake line	12 months				I		
	15,000 km						
	9,000 miles						
Brake fluid	12 months					R	
	15,000 km						
	9,000 miles						
Brake pads	12 months	I	I		I		I
	15,000 km						
	9,000 miles						
Brake linings and drums	12 months	I	I		I		I
	15,000 km						
	9,000 miles						
Parking brake	12 months	I	I		I		I
	15,000 km						
	9,000 miles						
Suspension	12 months		I	I	I		
	15,000 km						
	9,000 miles						
Axle boots & joints	12 months	I	I		I		I
	15,000 km						
	9,000 miles						
Steering system (Power steering)	12 months		I	I	I		
	15,000 km						
	9,000 miles						

2. EXCEPT FOR EUROPE AREA

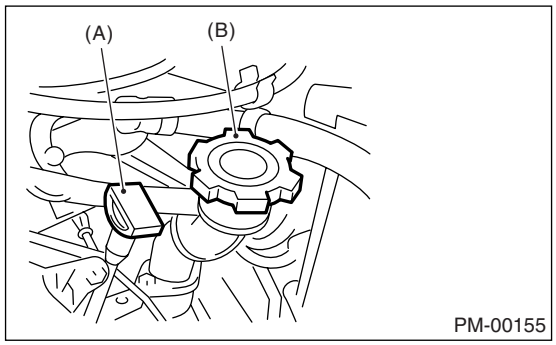
Item	Every	Repeat short distance drive	Repeat rough/muddy road drive	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil		Replace more frequently		Replace more frequently			Replace more frequently
Engine oil filter		Replace more frequently		Replace more frequently			Replace more frequently
Fuel line	6 months 12,500 km 7,500 miles				I		
Transmission oil							Replace more frequently
ATF							Replace more frequently
Front & rear differential oil							KA model Front: Replace more frequently Rear: Replace by 24000 km (15000 miles) or less. Except for KA model Replace more frequently.
Brake line	6 months 12,500 km 7,500 miles				I		
Brake fluid	12 months 25,000 km 15,000 miles					R	
Brake pads	6 months 12,500 km 7,500 miles	I	I		I		I
Brake linings and drums	6 months 12,500 km 7,500 miles	I	I		I		I
Parking brake	6 months 12,500 km 7,500 miles	I	I		I		I
Suspension	6 months 12,500 km 7,500 miles		I	I	I		
Axle boots & joints	6 months 12,500 km 7,500 miles	I	I		I		I

Item	Every	Repeat short distance drive	Repeat rough/muddy road drive	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Steering system (Power steering)	6 months		I	I	I		
	12,500 km						
	7,500 miles						

3. Engine Oil

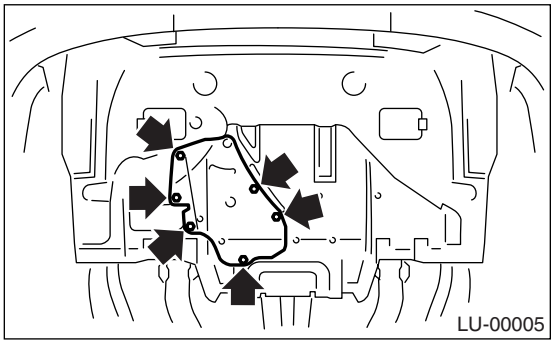
A: REPLACEMENT

1) Open the engine oil filler cap for quick draining of the engine oil.

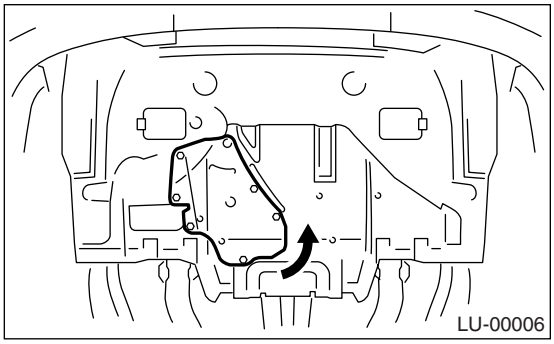


(A) Oil level gauge
(B) Engine oil filler cap

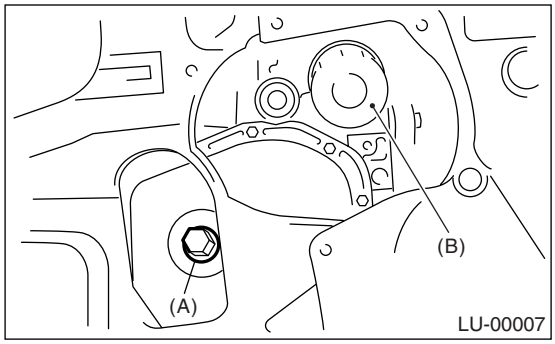
2) Remove six clips securing service hole cover.



3) Turn the service hole cover counterclockwise.



4) Drain the engine oil by loosening engine oil drain plug.

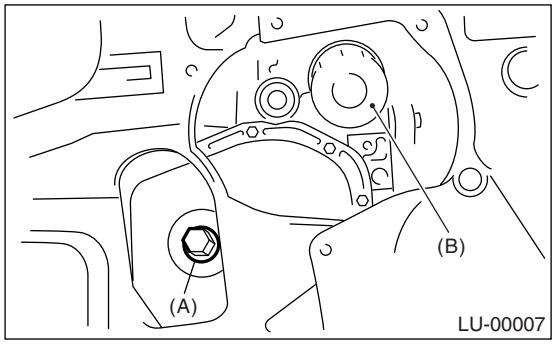


(A) Engine oil drain plug
(B) Engine oil filter

CAUTION:
If engine oil adheres to the exhaust pipe, wipe it off completely by cloth etc.

5) Replace the drain plug gasket with a new one.
6) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)



(A) Engine oil drain plug
(B) Engine oil filter

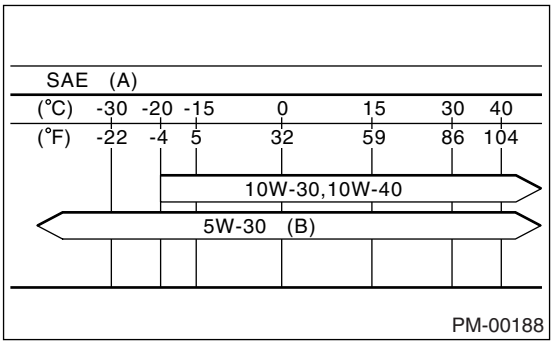
7) Fill engine oil through the filler pipe up to center between upper lever and lower level. Make sure that the vehicle is placed level when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil

API standard SL, SJ with the "Energy Conserving" logo is printed (if you cannot obtain the oil with SL, SJ or SH grades, you may use SH grades "ENERGY CONSERVING" oil.)
ACEA standard, A1, A2 or A3
ILSAC Standard GF-3
New API certification mark (Star burst mark) label is on the container.

Engine oil capacity

Upper level
Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
Approx. 3.0 ℓ (3.2 US qt, 2.6 Imp qt)



(A) Viscosity No. and applicable temperature
(B) Preferred

The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

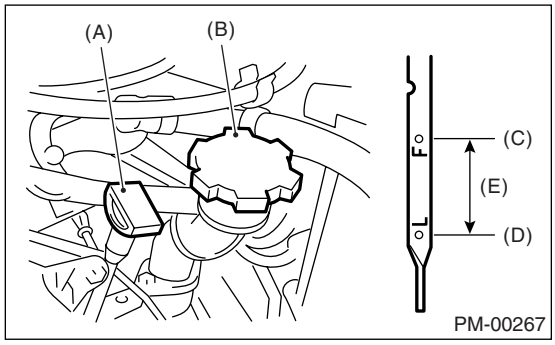
CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the ILSAC, ACEA or API standard and SAE viscosity No. designated by SUBARU.

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SL, SJ or SH
SAE Viscosity No. : 30, 40, 10W-50, 20W-40, 20W-50.

8) Close the engine oil filler cap.
9) Start the engine and warm it up for a time.
10) After the engine stops, recheck the oil level. <Ref. to PM-9, INSPECTION, Engine Oil.>

B: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.



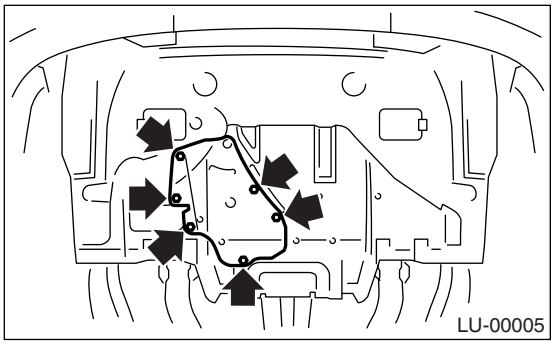
(A) Engine oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1 ℓ (1.1 US qt, 0.9 Imp qt)

5) After turning off the engine, wait a few minutes for the oil to drain back into oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the "F" line and the notch mark. This is caused by thermal expansion of the engine oil.
7) To prevent overfilling the engine oil, do not add oil above the "F" line when the engine is cold.

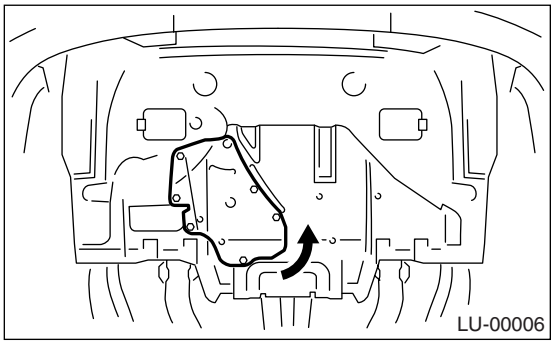
4. Engine Oil Filter

A: REPLACEMENT

1) Remove six clips securing service hole cover.

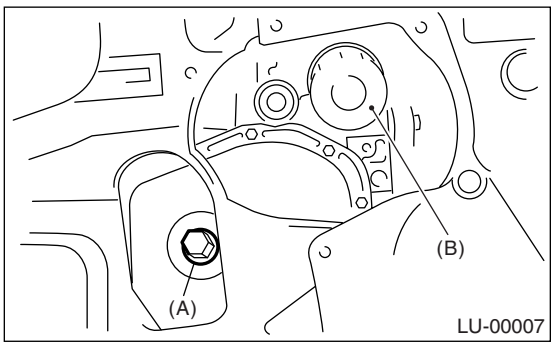


2) Turn the service hole cover counterclockwise.



3) Remove the oil filter with ST.

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



(A) Engine oil drain plug
(B) Engine oil filter

4) Wipe clean the oil filter matching surface on cylinder block or oil cooler.
5) Get a new engine oil filter and apply a thin coat of engine oil to the seal rubber.

CAUTION:
Be careful not to use the oil filter 80 mm (3.15 in) in diameter to turbo model.

6) Install the oil filter by turning it by hand, being careful not to damage the seal rubber.
• Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
• Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

7) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

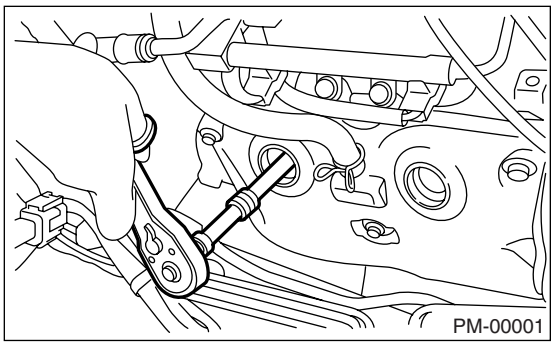
NOTE:
The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

8) Check the engine oil level. <Ref. to PI-3, PDI PROCEDURE, Pre-delivery Inspection.>

5. Spark Plug

A: REPLACEMENT

1) Remove the intake duct and intake chamber.
2) Remove the washer tank and put it aside.
3) Disconnect the spark plug cord.
4) Remove the spark plug with a plug-wrench.



5) Set the new spark plug.

Spark plug:
Non-turbo model
NGK: PFR5B-11
2.0 L Turbo model
NGK: PFR6G
2.5 L Turbo model
NGK: ILFR6B

Spark plug gap:
Non-turbo model
1.0 — 1.1 mm (0.039 — 0.043 in)
Turbo model
0.7 — 0.8 mm (0.028 — 0.031 in)

6) Tighten the spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:
21±3 N·m (2.14±0.31 kgf-m, 15.49±2.21 ft-lb)

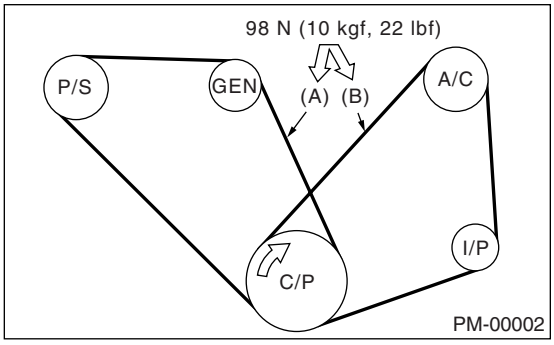
NOTE:
• Be sure to place the gasket between the cylinder head and spark plug.
• If a torque wrench is not available, tighten the spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

6. V-belt

A: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the V-belt tension and adjust it if necessary by changing the generator installing position or idler pulley installing position. <Ref. to PM-12, REPLACEMENT, V-belt.>

Belt tension
(A)
replaced: 7.0 — 9.0 mm (0.276 — 0.354 in)
reused: 9.0 — 11.0 mm (0.354 — 0.433 in)
(B)
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)



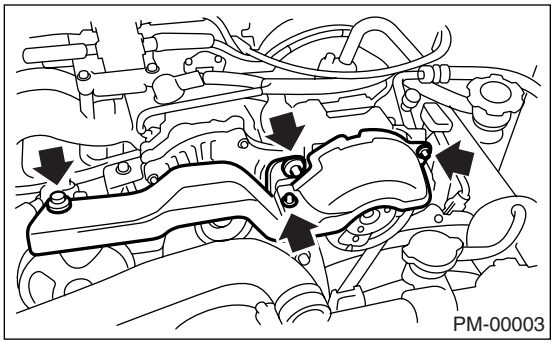
(A)	Front side belt
(B)	Rear side belt
C/P	Crank pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

B: REPLACEMENT

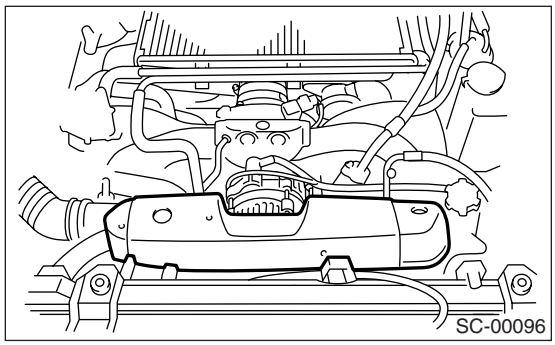
1. V-BELT COVER

Remove the V-belt cover.

- Non-turbo model



- Turbo model

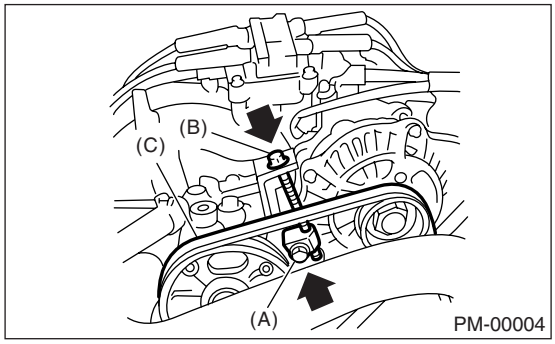


2. FRONT SIDE BELT (DRIVING POWER STEERING OIL PUMP AND GENERATOR)

NOTE:
Wipe off any oil or water on the belt and pulley.

1) Loosen the lock bolt (A).
2) Loosen the slider bolt (B).
3) Remove the front side belt (C).
4) Install a new belt, and tighten the slider bolt (B) so as to obtain the specified belt tension.
5) Tighten the lock bolt (A).
6) Tighten the slider bolt (B).

Tightening torque:
Lock bolt
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

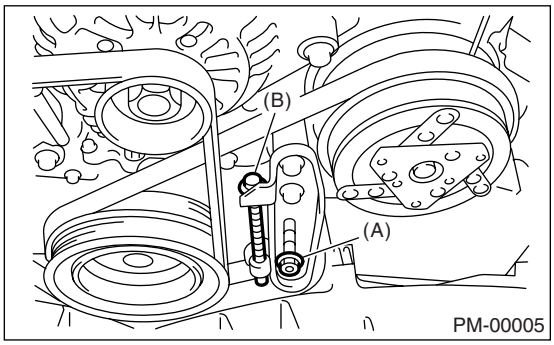


3. REAR SIDE BELT (DRIVING AIR CONDITIONER)

NOTE:
Wipe off any oil or water on the belt and pulley.

1) Remove the front side belt.
2) Loosen the lock nut (A).
3) Loosen the slider bolt (B).
4) Remove the rear side belt.
5) Install a new belt, and tighten the slider bolt (B) so as to obtain the specified belt tension.
6) Tighten the lock nut (A).
7) Install the front side belt. <Ref. to ME(H4SO)-43, REAR SIDE BELT, INSTALLATION, V-belt.>

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)

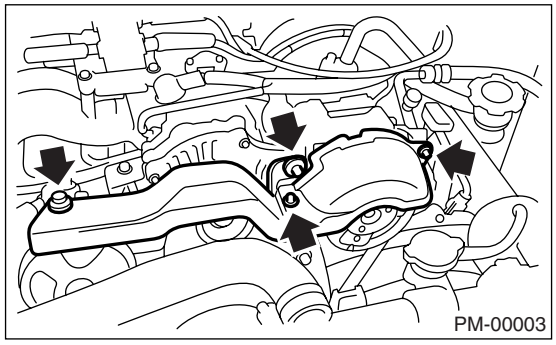


7. Timing Belt

A: REPLACEMENT

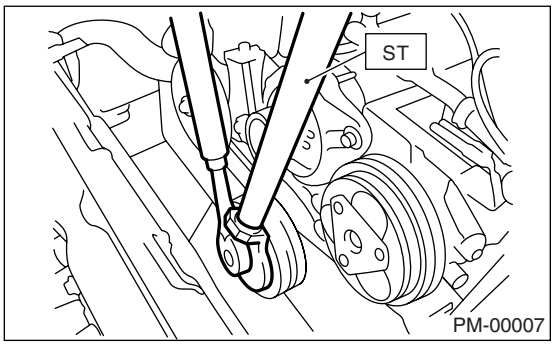
1. NON-TURBO MODEL

1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4SO)-35, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-40, Radiator Sub Fan and Fan Motor.>
2) Shield the radiator from any damage using cardboard and blanket.
3) Remove the V-belt cover.

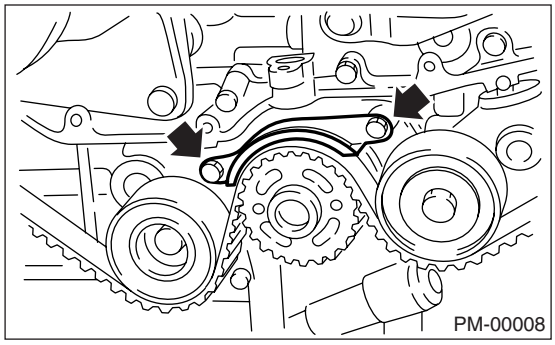


4) Remove the V-belts. <Ref. to ME(H4SO)-43, V-belt.>
5) Remove the air conditioning compressor V-belt tensioner.
6) To lock the crankshaft, use ST. Remove the pulley bolt.

ST 499977100 CRANK PULLEY WRENCH (2.5 L model)
ST 499977400 CRANK PULLEY WRENCH (2.0 L model)

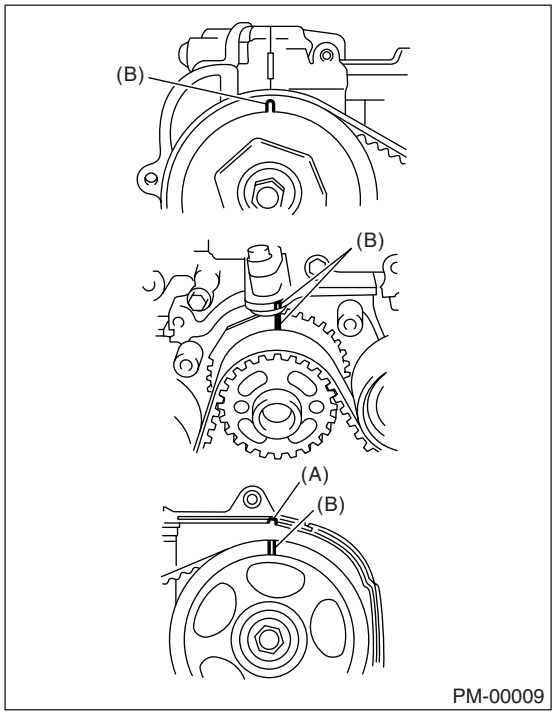


7) Remove the crank pulley.
8) Remove the left side belt cover.
9) Remove the front timing belt cover.
10) Remove the timing belt guide. (MT model)



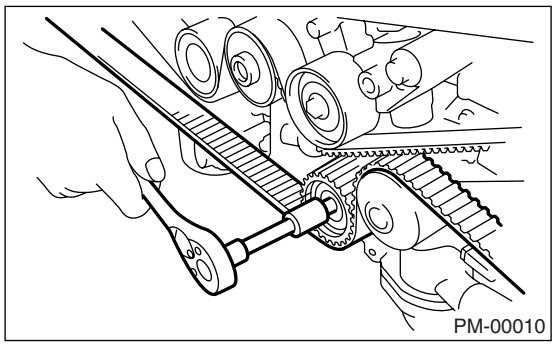
11) Turn the crankshaft and align alignment marks on crankshaft, and right and left cam sprockets with notches of belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET



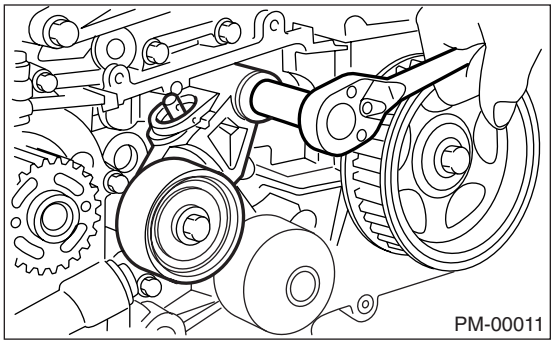
(A) Notch
(B) Alignment mark

12) Remove the belt idler.
13) Remove the belt idler (No. 2).



14) Remove the timing belt.

15) Remove the automatic belt tension adjuster assembly.

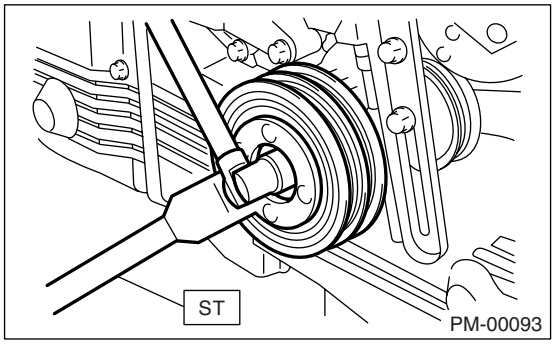


16) Install in the reverse order of removal. <Ref. to ME(H4SO)-49, INSTALLATION, Timing Belt.>

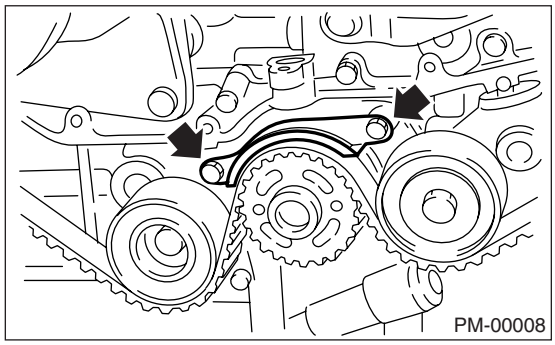
2. TURBO MODEL

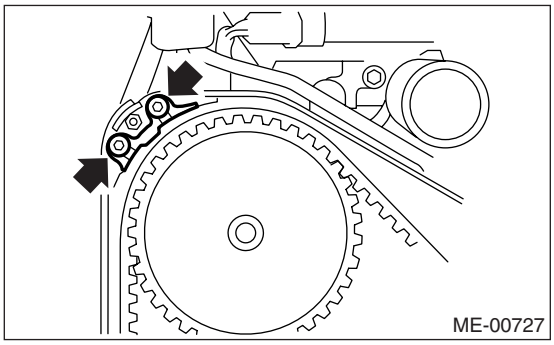
1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4SO)-35, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-40, Radiator Sub Fan and Fan Motor.>
2) Protect the radiator with cardboard and blanket.
3) Remove the V-belts. <Ref. to ME(H4SO)-43, V-belt.>
4) Remove the air conditioning compressor drive belt tensioner.
5) To lock the crankshaft, use ST. Remove the pulley bolt.

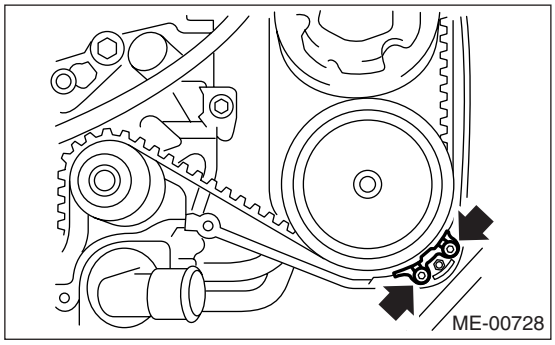
ST	499977100	CRANK PULLEY WRENCH (2.5 L model)
ST	499977400	CRANK PULLEY WRENCH (2.0 L model)

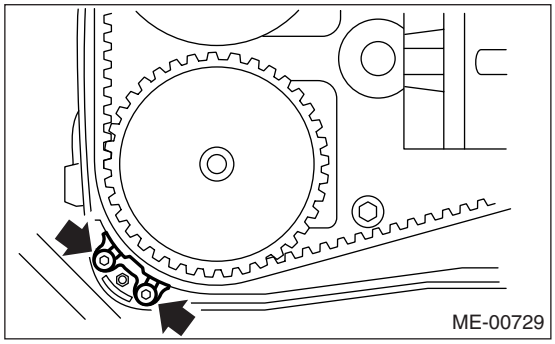


6) Remove the crank pulley.
7) Remove the air conditioning compressor drive belt tensioner.
8) Remove the belt cover (LH).
9) Remove the belt cover (RH).
10) Remove the front belt cover.
11) Remove the timing belt guide. (MT model)



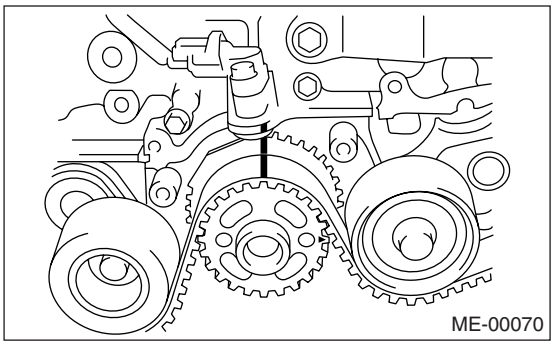


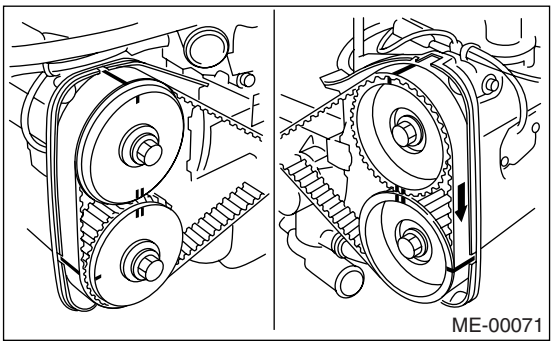




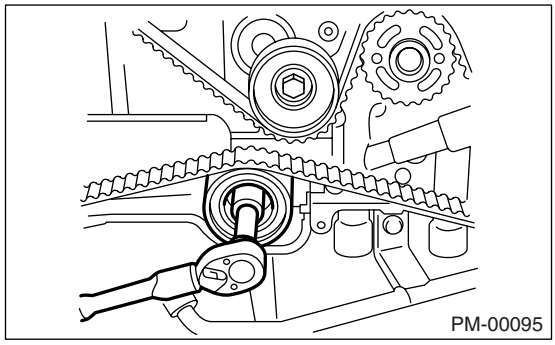
12) Turn the crankshaft and align alignment marks on crankshaft, and right and left cam sprockets with notches of belt cover and cylinder block. To turn the crankshaft, use ST.

ST 499987500 CRANKSHAFT SOCKET

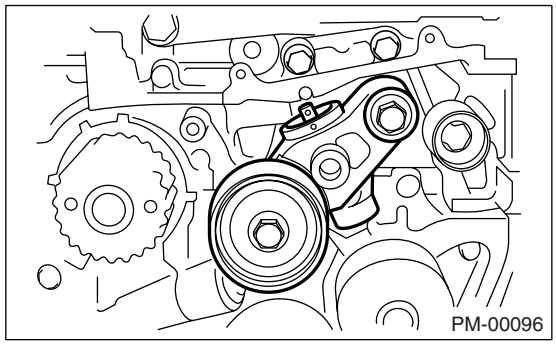




13) Remove the belt idler.



14) Remove the timing belt.
15) Remove the automatic belt tension adjuster assembly.



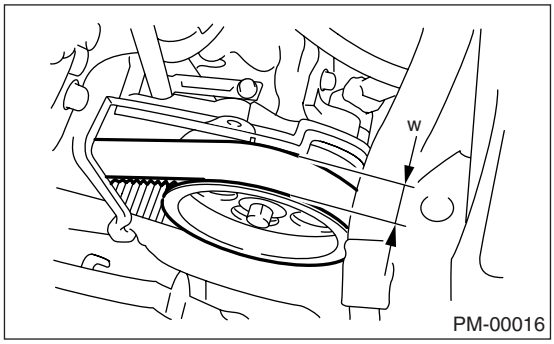
16) Install in the reverse order of removal. <Ref. to ME(H4DOTC 2.0)-60, INSTALLATION, Timing Belt.>

CAUTION:
When installing the timing belt, be sure to align all alignment marks on the belt with corresponding marks on the sprockets. If incorrectly installed, interference between pistons and valves may occur.

B: INSPECTION

1. SOHC MODEL

1) Remove the front timing belt cover and timing belt cover (LH).
2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 27 mm (1.06 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.

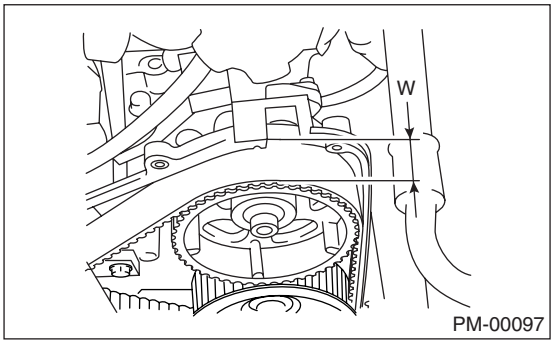


4) Install the front timing belt cover and timing belt cover (LH).

2. DOHC MODEL

1) Remove the timing belt cover (LH).
2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
3) Measure the timing belt width W. If it is less than 30 mm (1.18 in), check idlers, tensioner, water pump pulley and cam sprocket to determine idler alignment (squareness). Replace the worn timing belt.

4) Install the timing belt cover (LH).



8. Fuel Line

A: INSPECTION

Check pipes and areas near pipes for rust, hose damage, loose bands, etc. If faulty parts are found, repair or replace them. <Ref. to FU(H4SO)-63, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

For fuel filter replacement procedures, refer to “FU” section.
<Ref. to FU(H4SO)-60, Fuel Filter.>

B: INSPECTION

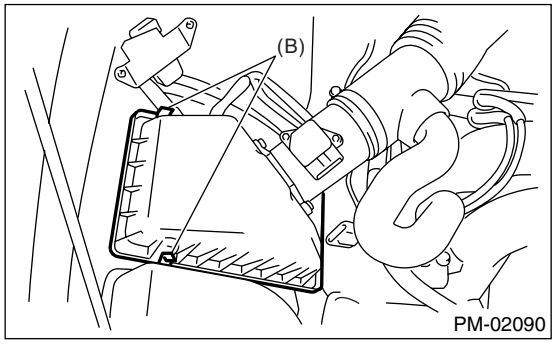
1) If fuel filter is clogged, or if replacement interval has been reached, replace it.
2) If water is found in it, shake and expel the water from inlet port.

10.Air Cleaner Element

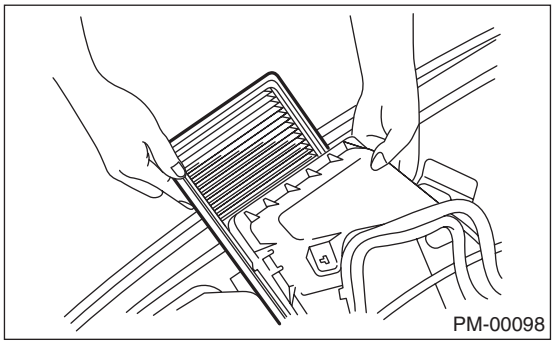
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the clip (B) above the air cleaner case.

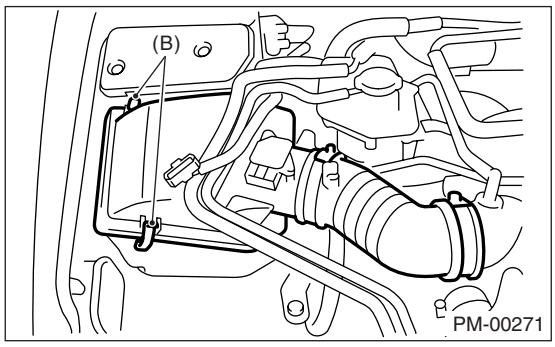


2) Remove the air cleaner.

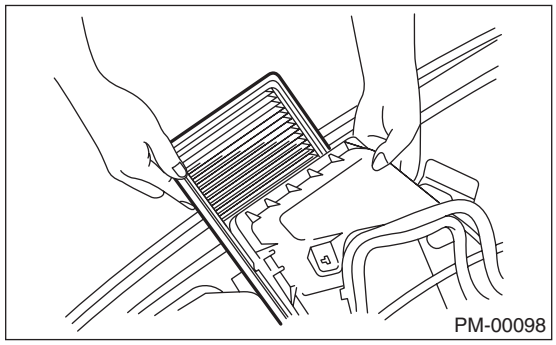


2. TURBO MODEL

1) Remove the clip (B) above the air cleaner case.



2) Remove the air cleaner.

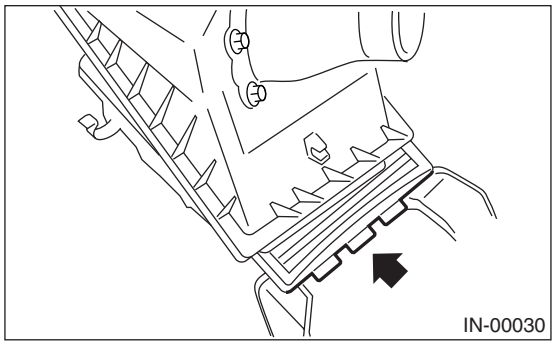


B: INSTALLATION

1. NON-TURBO MODEL

Install in the reverse order of removal.

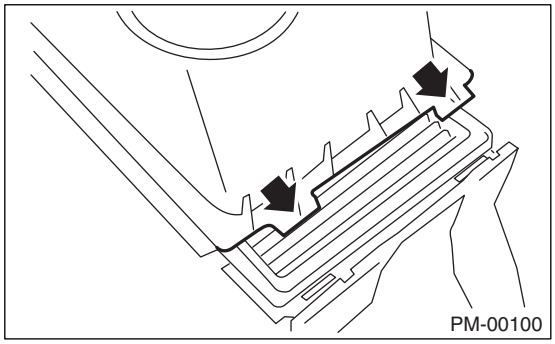
CAUTION:
Align the protruding portion of air cleaner lower case with holes of air cleaner upper cover, then secure upper cover to case.



2. TURBO MODEL

Install in the reverse order of removal.

CAUTION:
Align the protruding portion of air cleaner upper cover with holes of air cleaner lower case, then secure upper cover to case.



11.Cooling System

A: INSPECTION

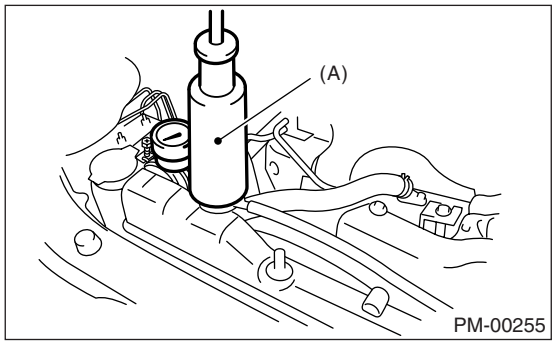
1) Check the radiator for leakage, filling it with engine coolant and attach the radiator cap tester (A) to filler neck.

PRESSURE:
157 kPa (1.6 kgf/cm^2, 23 psi)

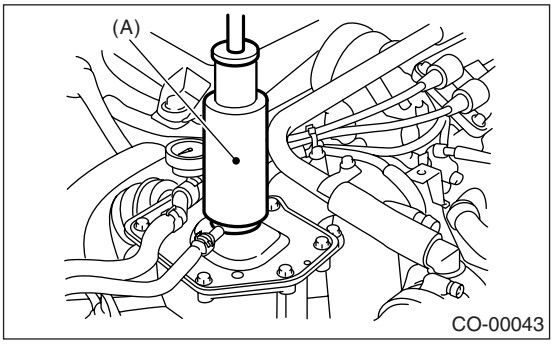
Check the following points.
- Each portion of radiator for leakage
- Hose joints and other connections for leakage

CAUTION:
• For turbo model, be sure to install tester to filler tank side.
• When attaching or detaching tester and when operating tester, use special care not to deform radiator filler neck.
• When performing this check, be sure to keep the engine stationary and fill the radiator with engine coolant.
• Wipe off check points before applying pressure.
• Use care not to spill engine coolant when detaching the tester from radiator.

- Non-turbo model



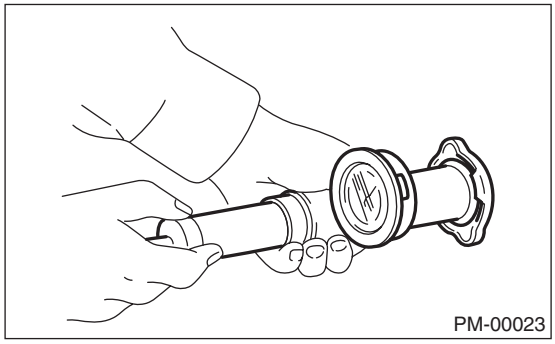
- Turbo model

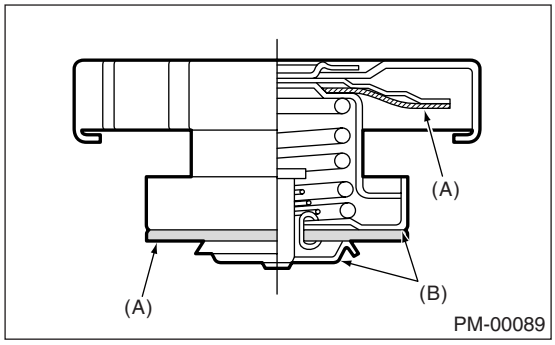


2) Check the radiator cap valve open pressure using radiator cap tester.
Raise the pressure until the needle of gauge stops and see if the pressure can be retained for 5 to 6 seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.

CAUTION:
Rust or dirt on the cap may prevent the valve from functioning normally: be sure to clean the cap before testing.

Radiator cap valve open pressure
Standard value:
93 — 123 kPa (0.95 — 1.25 kgf/cm^2, 14 — 18 psi)
Service limit:
83 kPa (0.85 kgf/cm^2, 12 psi)





(A) Deformation
(B) Deformation, damage, rust

3) Start the engine, and then check if it does not over heat or it is cooled excessively. If it overheats or it is cooled excessively, check the cooling system. <Ref. to CO(H4SO)-21, Water Pump.> <Ref. to CO(H4SO)-26, Thermostat.> <Ref. to CO(H4SO)-28, Radiator.> <Ref. to CO(H4SO)-34, Radiator Cap.>
4) Check the radiator fan operates using Subaru Select Monitor, when the engine coolant temperature exceeds 95°C (203°F). If not operate, check the radiator fan system. <Ref. to CO(H4SO)-13, Radiator Fan System.>

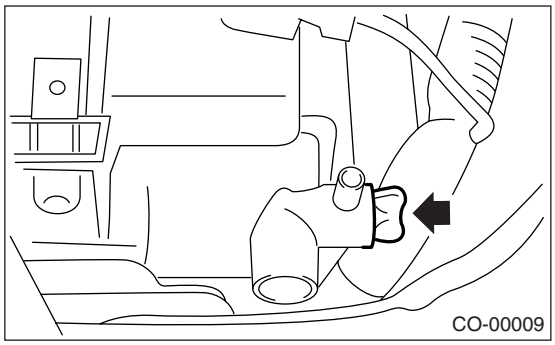
12.Engine Coolant

A: REPLACEMENT

1. REPLACEMENT OF ENGINE COOLANT

WARNING:
The radiator is of the pressurized type. Do not attempt to open the radiator cap immediately after the engine has been stopped.

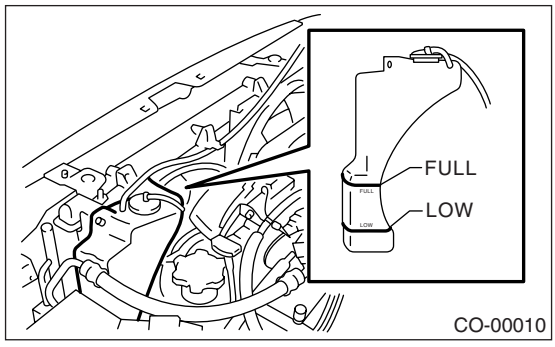
1) Lift-up the vehicle.
2) Remove the under cover.
3) Place a container under drain pipe.
4) Loosen and remove the drain cock to drain engine coolant into container.



5) For quick draining, open the radiator cap.

CAUTION:
Be careful not to spill engine coolant on the floor.

6) Drain the engine coolant from reservoir tank.
7) Tighten the radiator drain cock securely after draining engine coolant.
8) Pour the engine coolant from radiator filler port (Non-turbo model) or coolant filler tank filler port (Turbo model) to neck of filler.
9) Fill engine coolant into the reservoir tank up to “FULL” level.



Engine coolant capacity (fill up to “FULL” level)
2.0 L Non-turbo AT model
Approx. 6.5 ℓ (6.9 US qt, 5.7 Imp qt)
2.0 L Non-turbo MT model
Approx. 6.6 ℓ (7.0 US qt, 5.8 Imp qt)
2.0 L Non-turbo model with ATF warmer
Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)
2.0 L, 2.5 L Turbo AT and MT with oil cooler model
Approx. 7.3 ℓ (7.7 US qt, 6.4 Imp qt)
2.0 L, 2.5 L Turbo MT without oil cooler model
Approx. 7.4 ℓ (7.8 US qt, 6.5 Imp qt)
2.5 L Non-turbo AT model
Approx. 6.8 ℓ (7.2 US qt, 6.0 Imp qt)
2.5 L Non-turbo MT model
Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)

NOTE:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other engine coolant may cause corrosion.

10) Close the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model) and start the engine. Perform 5 or 6 times of racing with less than 3,000 rpm and then stop the engine. (Complete these procedures within 40 seconds.)
11) Wait for 1 minute after engine stopped, and open the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model). If the engine coolant level drops, add engine coolant to the filler neck position of radiator (Non-turbo model) or the filler neck position of coolant filler tank (Turbo model).
12) Perform step 10) and 11) again.
13) Attach the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model) and reservoir tank cap properly.
14) Start the engine and set the heater setting to maximum hot position and the blower speed setting to "LO".
15) Run the engine at less than 2,000 rpm until radiator fan starts and stops.

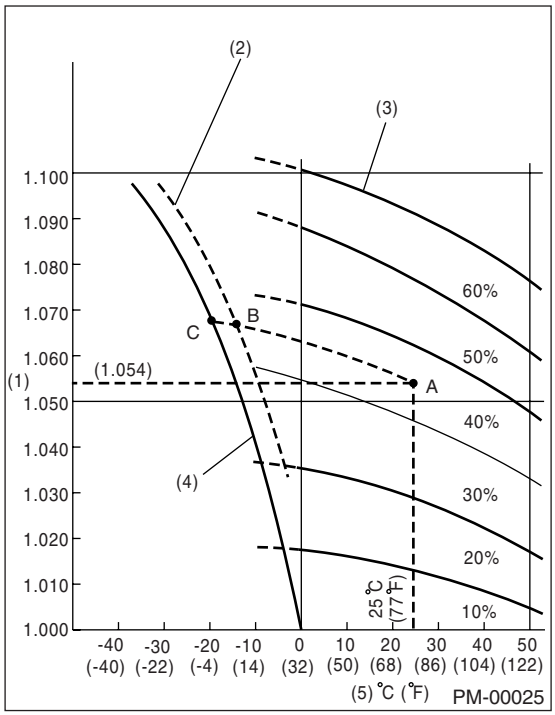
NOTE:
• Pay attention to the water temperature gauge to avoid overheating.
• If the radiator hose becomes harden by engine coolant pressure at this time, air purge seems to be mostly completed.

16) Stop the engine and wait until engine coolant temperature lowers to less than 30°C (86°C).

17) Open the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model). If the engine coolant level drops, add engine coolant to the filler neck position of radiator (Non-turbo model) or the filler neck position of coolant filler tank (Turbo model). Then, add engine coolant to the "FULL" level of reservoir tank.
18) Attach the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model) and reservoir tank cap securely.
19) Setting the heater setting to maximum hot position and the blower speed setting to "LO", start the engine and race with less than 3,000 rpm. Perform repeatedly from step 15) again if fluid sound of engine coolant is heard in heater core.

2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

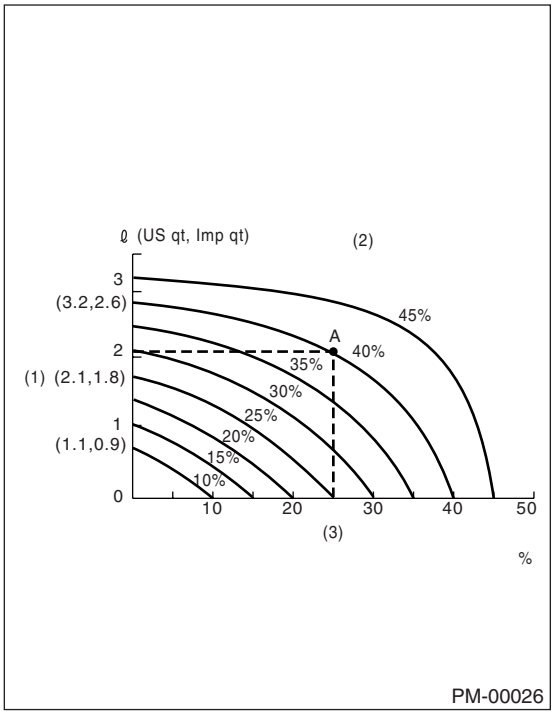
The concentration and safe operating temperature of the SUBARU Genuine Coolant is shown in the diagram. Measuring the temperature and specific gravity of the engine coolant will provide this information.
[Example]
If the engine coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



(1) Engine coolant gravity
(2) Safe operating temperature
(3) Concentration of engine coolant
(4) Freezing temperature
(5) Engine coolant temperature

3. PROCEDURE TO ADJUST THE CONC ENTRATION OF THE ENGINE COOLANT

To adjust the concentration of the engine coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of engine coolant with an undiluted solution of SUBARU Genuine Coolant (concentration 50%).
The amount of engine coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the engine coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of the engine coolant concentration intersects with the 40% curve of the necessary the engine coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of the engine coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of engine coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU Genuine Coolant.
If the engine coolant concentration of 50% is needed, drain all the engine coolant and refill with the undiluted solution only.



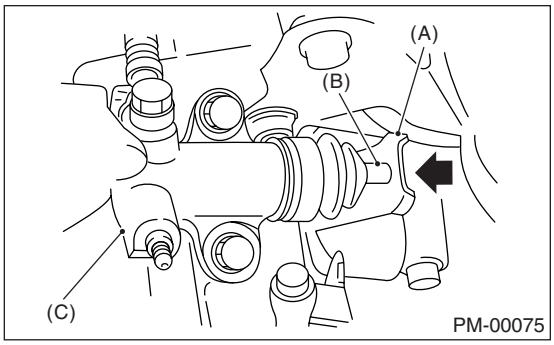
(1) Quantity of the engine coolant to be drained
(2) Necessary concentration of the engine coolant
(3) Concentration of engine coolant in vehicle the engine cooling system

13.Clutch System

A: INSPECTION AND ADJUSTMENT

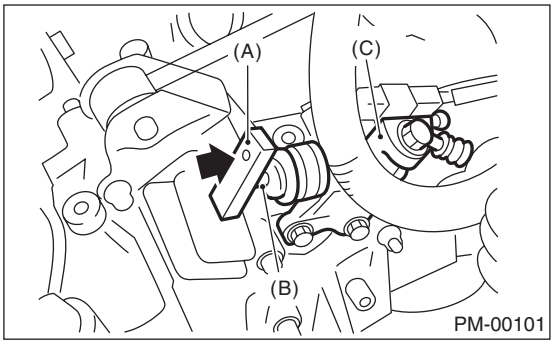
1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises or not.

- Non-turbo model



(A) Release lever
(B) Push rod
(C) Operating cylinder

- Turbo model

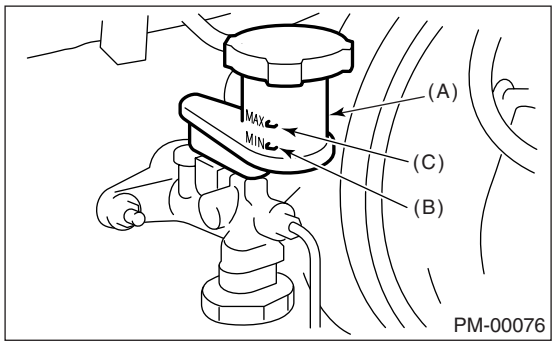


(A) Release lever
(B) Push rod
(C) Operating cylinder

2) If the fluid level rises, pedal free play is correct.
3) If the fluid level does not rise or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-32, Clutch Pedal.>
4) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below “MIN” (B), inspect the clutch master cylinder, operating cylinder and hydraulic line for fluid leaks. If fluid leaks are found, repair or replace. If fluid leaks are not found, add clutch fluid to bring it up to “MAX” (C) of clutch reservoir tank.

Recommended clutch fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

CAUTION:
• Prevent the clutch fluid from being splashed over vehicle body. If the clutch fluid is splashed over vehicle body, flush it, and then wipe it up.
• Avoid mixing different brake fluid to prevent degradation of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.
• If fluid adheres to the exhaust pipe, wipe it off completly by cloth etc.



(A) Reservoir tank
(B) MIN. level
(C) MAX. level

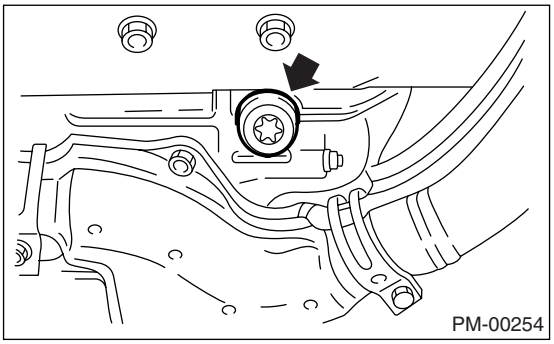
14.Transmission Gear Oil

A: REPLACEMENT

1. MANUAL TRANSMISSION

1) Drain the gear oil by removing drain plug.

CAUTION:
• Before starting work, cool off the transmission gear oil well.
• If transmission gear oil adheres to the exhaust pipe, wipe it off completely.



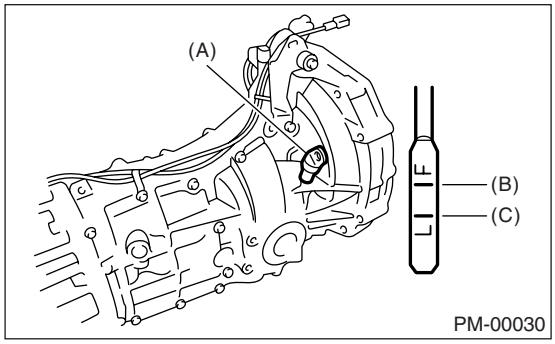
2) Replace the gasket with new one, and then tighten it to the specified torque.

Tightening torque:
Aluminum gasket:
44 N·m (4.5 kgf-m, 33 ft-lb)
Copper gasket:
70 N·m (7.1 kgf-m, 52 ft-lb)

3) Fill transmission gear oil through the oil level gauge hole up to the upper point of level gauge.

CAUTION:
• Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.
• If transmission gear oil adheres to the exhaust pipe, wipe it off completly by cloth etc.

Gear oil capacity:
Non-turbo model
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Turbo model
Without oil pump
3.5 ℓ (3.7 US qt, 3.1 Imp qt)
With oil pump
3.9 ℓ (4.1 US qt, 3.4 Imp qt)



(A) Oil level gauge
(B) Upper level
(C) Lower level

15.Hill-holder System

A: INSPECTION AND ADJUSTMENT

1) Confirm the stopping and starting performance by activating the hill-holder on an uphill road of 3° or higher inclination.

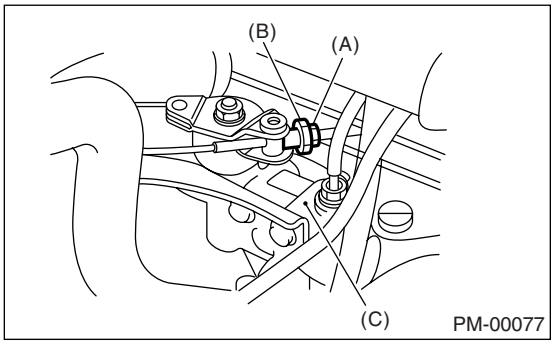
(1) When the vehicle does not stop;
Tighten the adjusting nut of PHV cable.

(2) When the vehicle does not start properly;
A; When the hill-holder is released later than engagement of clutch (engine tends to stall): Loosen the adjusting nut gradually until smooth starting is enabled.
B; When the hill-holder is released earlier than engagement to clutch (vehicle slips down slightly): Tighten the adjusting nut so that hill-holder is released later than engagement of clutch (status in A). Then make adjustment the same as in A.

CAUTION:

• Whenever turning the adjusting nut, hold the inner cable with pliers to prevent it from turning.

• Replace the pressure hold valve (PHV) or PHV cable with a new one, if they are defective and/or damaged.



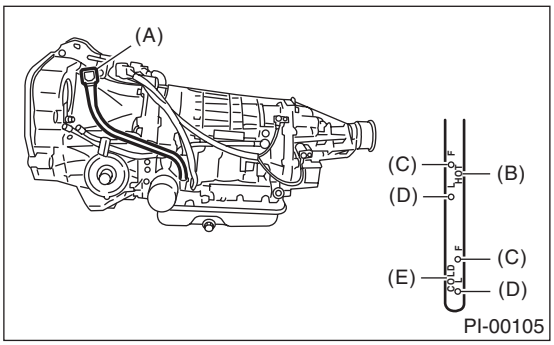
(A) Lock nut
(B) Adjusting nut
(C) Pressure hold valve

16.ATF

A: INSPECTION

CAUTION:
The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on Subaru Select Monitor. <Ref. to 4AT(diag)-16, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with the engine idling for one or two minutes.



(A) Level gauge
(B) Check position when "HOT"
(C) Upper level
(D) Lower level
(E) Check position when "COLD"

4) Make sure that ATF level is above the center of upper and lower level.

NOTE:
When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level is found above the center between upper and lower marks.

CAUTION:
• Use care not to exceed the upper limit level.
• Remember that the addition of ATF to the upper limit mark when the transmission is cold will result in overfilling of ATF, causing a transmission failure.
• If ATF adheres to the exhaust pipe, wipe it off completly by cloth etc.

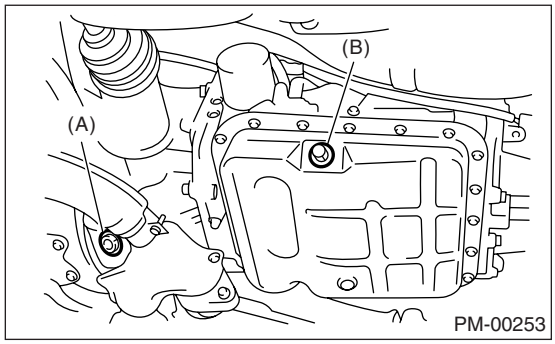
6) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.
7) Check the ATF for leaks.
Check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.

B: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

1) Drain the ATF by removing drain plug.

NOTE:
Before starting work, cool off ATF well.



(A) Front differential drain plug
(B) ATF drain plug

2) Replace the gasket with a new one, and then tighten the specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole.

Recommended fluid:
SUBARU ATF

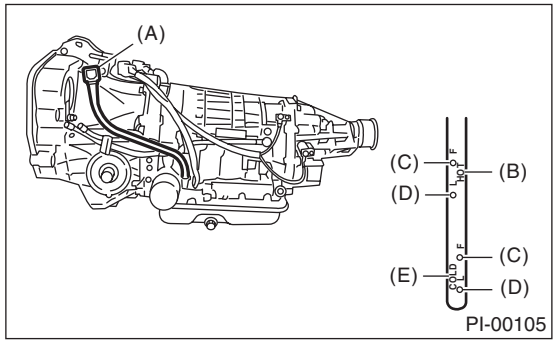
Alternative fluid:

EC, EK, EH model
IDEMITSU: Apoloil ATF HP
Castrol: Transmax J

Except for EC, EK, EH model
IDEMITSU: Apoloil ATF HP
Castrol: Transmax J
DEXRON III

Fluid capacity:
Fill the same amount drained from ATF drain plug hole.

4) Check the ATF level. <Ref. to PM-28, INSPECTION, ATF.>



(A) Level gauge
(B) Check position when “HOT”
(C) Upper level
(D) Lower level
(E) Check position when “COLD”

2. ATF FILTER

NOTE:
• ATF filter is a maintenance free part.
• ATF filter needs replacement, when it has physically damaged or ATF leaked.
• For the ATF filter replacement procedures, refer to “ATF Filter”. <Ref. to 4AT-81, ATF Filter.>

17. Front and Rear Differential Gear Oil

A: REPLACEMENT

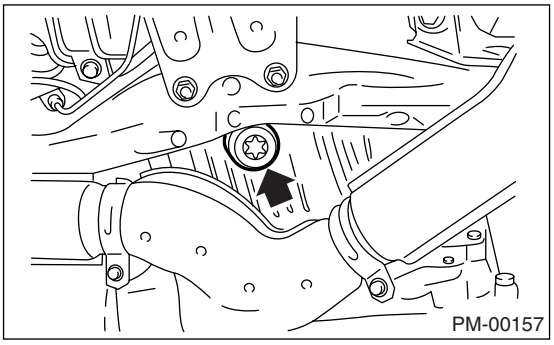
1. FRONT DIFFERENTIAL (MT MODEL)

For MT model, manual transmission oil works as differential oil to lubricate differential. Refer to "Transmission Oil". <Ref. to PM-26, Transmission Gear Oil.>

2. FRONT DIFFERENTIAL (AT MODEL)

1) Drain the differential gear oil by removing drain plug using TORX® T70.

CAUTION:
• Before starting work, cool off differential gear oil well.
• If front differential gear oil adheres to the exhaust pipe, wipe it off completely.



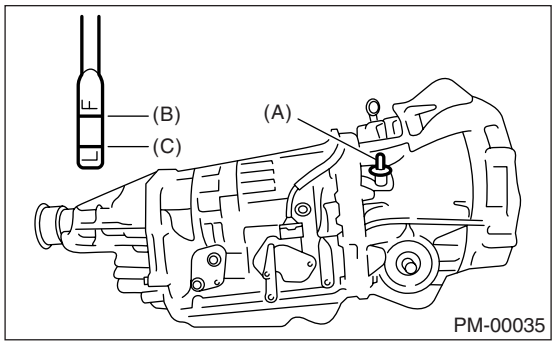
2) Replace the gasket with a new one, and then tighten the drain plug to specified torque.

Tightening torque:
Aluminum gasket:
44 N·m (4.5 kgf-m, 33 ft-lb)
Copper gasket:
70 N·m (7.1 kgf-m, 52 ft-lb)

3) Fill differential gear oil through the oil level gauge hole up to the upper point of level gauge.

CAUTION:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

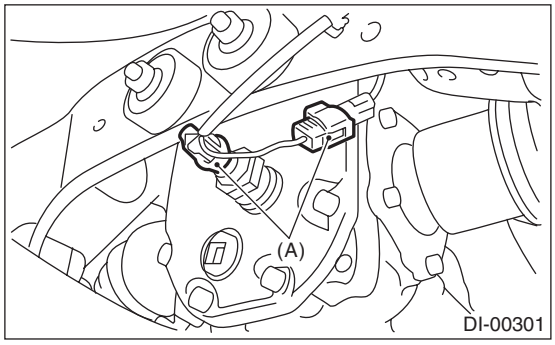
Differential gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)



(A) Oil level gauge
(B) Upper level
(C) Lower level

3. REAR DIFFERENTIAL

1) Disconnect the oil temperature switch connector (For Europe turbo model).



(A) Connector

2) Drain the differential gear oil by removing drain plug.
3) Remove the filler plug or oil temperature switch for quick draining oil.

NOTE:
Remove the oil temperature switch (For Europe turbo model) and filler plug as a unit.

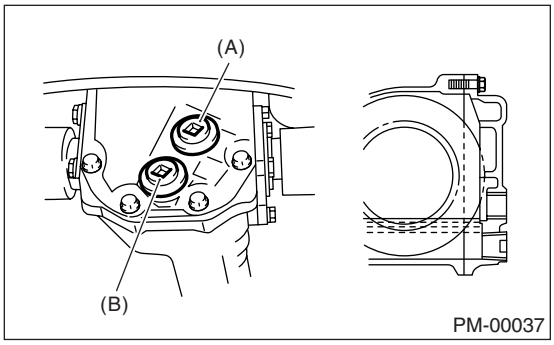
4) Install the drain plug after draining oil.

NOTE:
• Apply liquid gasket to the drain plug threads except for 2.0 L Non-turbo model.
• Use a new aluminum gasket for 2.0 L Non-turbo model.

Liquid gasket:
Three Bond 1105 (Part No. 004403010)

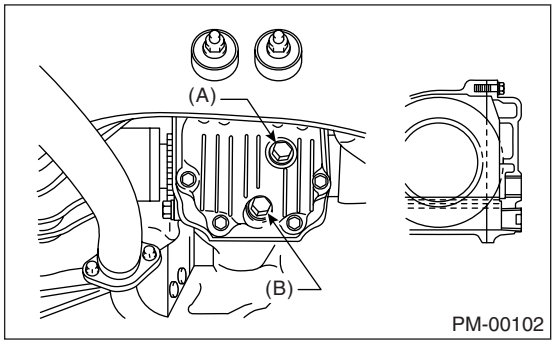
Tightening torque:
Except for 2.0 L Non-turbo model
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
2.0 L Non-turbo model
34 N·m (3.5 kgf-m, 25.3 ft-lb)

5) After installing the drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler plug.
Except for 2.0 L Non-turbo model



(A) Filler plug
(B) Drain plug

2.0 L Non-turbo model



(A) Filler plug
(B) Drain plug

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

NOTE:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

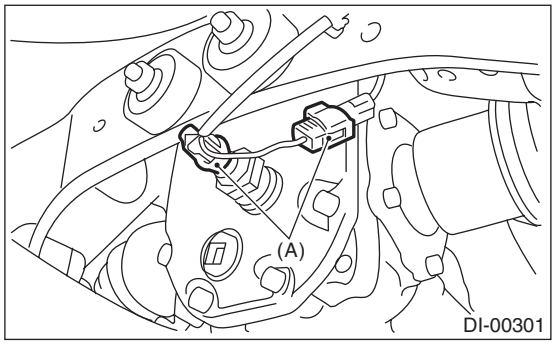
6) Install the filler plug or oil temperature switch onto rear differential gear case firmly.

NOTE:
• Install the oil temperature switch (For Europe turbo model) and filler plug as a unit.
• Apply liquid gasket to the filler plug threads except for 2.0 L Non-turbo model.
• Use a new aluminum gasket for 2.0 L Non-turbo model.

Liquid gasket:
Three Bond 1105 (Part No. 004403010)

Tightening torque:
Except for 2.0 L Non-turbo model
49.0 N·m (5.0 kgf-m, 36.2 ft-lb)
2.0 L Non-turbo model
34 N·m (3.5 kgf-m, 25.3 ft-lb)

7) Connect the oil temperature switch connector (For Europe turbo model).



(A) Connector

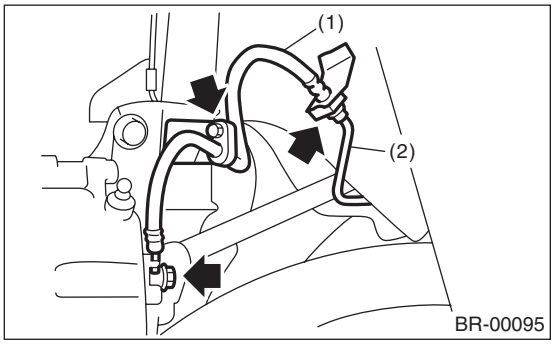
18.Brake Line

A: INSPECTION

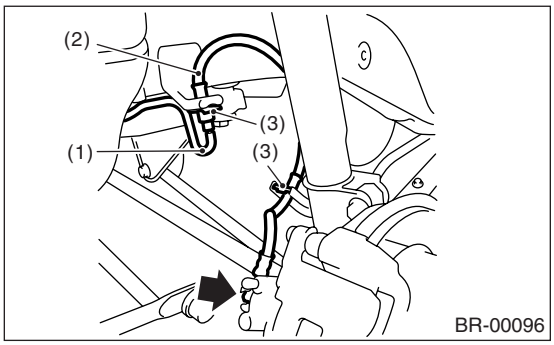
1. BRAKE LINE

1) Check scratches, swelling, corrosion, traces of fluid leakage on the brake hoses or pipe joints.
2) Check the possibility of adjacent parts interfering with brake pipes or hoses during driving and loose connections or clamps.
3) Check any trace of fluid leakage, scratches, etc. on the master cylinder, wheel cylinder and pressure control valve.

NOTE:
• When the brake fluid level in the reservoir tank is lower than the specified limit, the brake fluid warning light on the combination meter will come on.
• Visually check the brake hose (using a mirror where it is difficult to see) for any damage.



(1) Front brake hose
(2) Front brake pipe

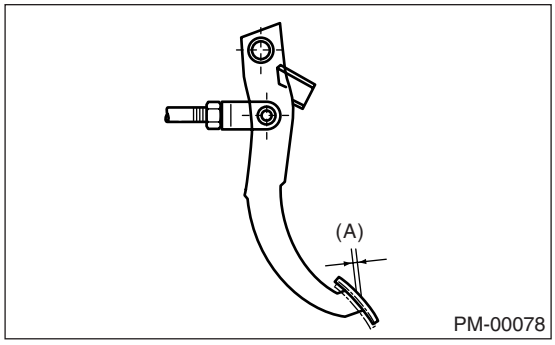


(1) Brake pipe
(2) Rear brake hose
(3) Clamp

2. SERVICE BRAKE

1) Check the free play of brake pedal with a force of less than 10 N (1 kgf, 2 lbf).

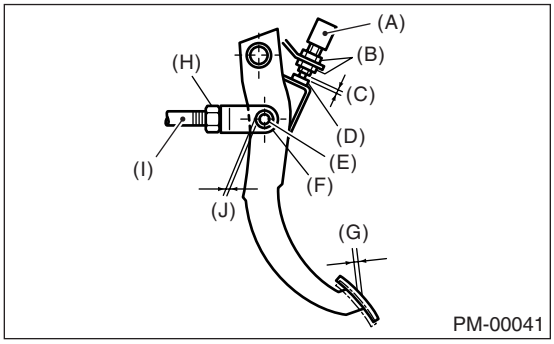
Brake pedal free play:
0.5 — 2.0 mm (0.02 — 0.08 in)



(A) Brake pedal free play

2) If the free play is out of specifications above, adjust the brake pedal as follows.
(1) Be sure the engine is off. (No vacuum is applied to brake booster.)
(2) There should be play between brake booster clevis and pin at brake pedal installing portion.
[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf) to a stroke of 0.5 to 2.0 mm (0.02 to 0.08 in).]
(3) Depress the surface of brake pad by hand.

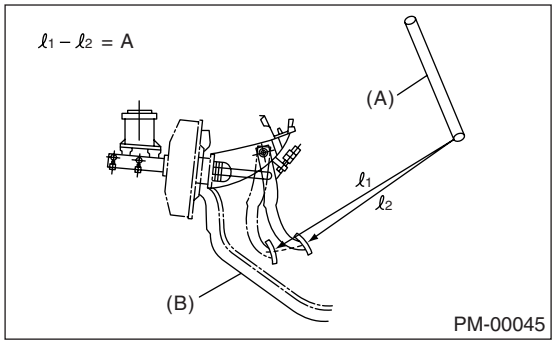
(4) If there is no free play between clevis pin and clevis, turn the brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



(A) Brake switch
(B) Adjusting nut
(C) 0.3 mm (0.012 in)
(D) Stopper
(E) Clevis pin
(F) Clevis
(G) Brake pedal free play
(H) Lock nut
(I) Brake booster operating rod
(J) Play at pin

3) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lbf) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must be less than specified value. If the distance is more than specified value, there is possibility of air inside the hydraulic unit.

Brake pedal reserve distance A:
For Australia model
105 mm (4.13 in)/ 490 N (50 kgf , 110 lbf) or less
Except for Australia model
90 mm (3.54 in)/ 490 N (50 kgf , 110 lbf) or less

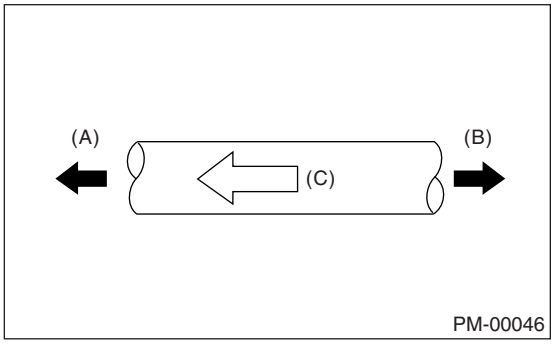


(A) Steering wheel
(B) Toe board

4) Check to see if air is in the hydraulic brake line by the feel of pedal operation. If air appears to exist in the line, bleed it from the system.
5) Check for even operation of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road.

3. BRAKE SERVO SYSTEM

1) With the engine off, depress the brake pedal several times applying the same pedal force: Make sure the travel distance should not change.
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.
3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds: Make sure the pedal height should not change.
4) Check valve is built into the vacuum hose. Disconnect the vacuum hose to inspect function of check valve.
Blow air into the vacuum hose from its brake booster side end: Air must flow out of engine side end of hose. Next blow air into the hose from engine side: Air should not to brake booster side.
Replace both check valve and vacuum hose if the check valve is faulty. Engine side of vacuum hose is indicated by marking “ENG” as shown in illustration.



(A) Engine side
(B) Brake booster side
(C) ENG

5) Check the vacuum hose for cracks or other damage.

CAUTION:
When installing the vacuum hose on the engine and brake booster, do not use soapy water or lubricating oil on their connections.

6) Check vacuum hose to make sure it is tight and secure.

19.Brake Fluid

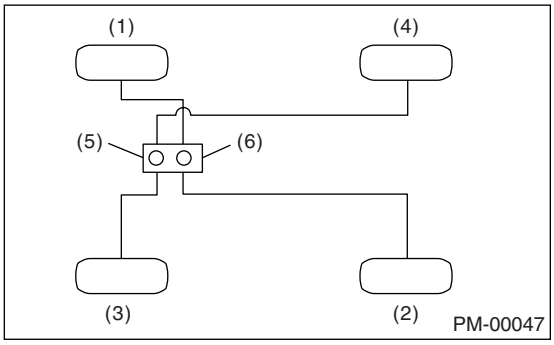
A: REPLACEMENT

1) Lift-up the vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

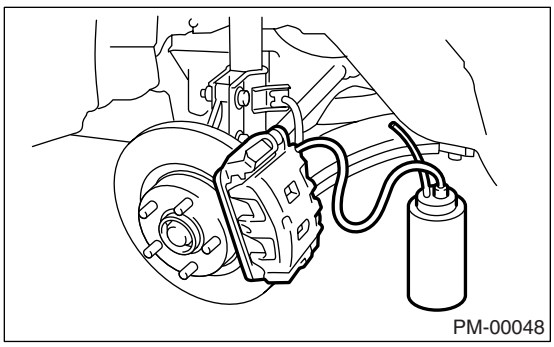
CAUTION:
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

Bleeding sequence (1) → (2) → (3) → (4)



(1) Front right
(2) Rear left
(3) Front left
(4) Rear right
(5) Secondary
(6) Primary

5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



CAUTION:
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

NOTE:
The amount of brake fluid required is approx. 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.
8) Repeat steps 6) and 7) above until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing the air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten the bleeder screw and install bleeder cap.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Bleed air from each wheel cylinder by following the previous 5 steps.
11) Depress the brake pedal with a force of approx. 294 N (30 kgf, 66 lbf) and hold it there for approx. 20 seconds. At this time check the pedal to see if it makes any unusual movement. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

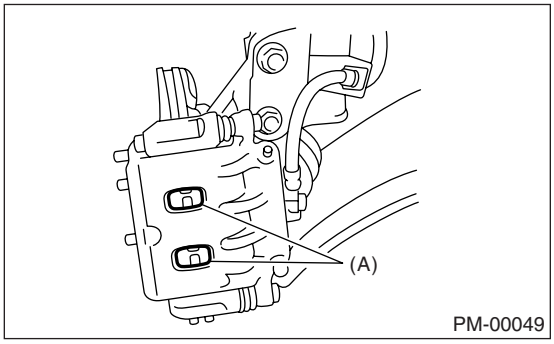
20.Disc Brake Pad and Disc

A: INSPECTION

1. DISC BRAKE PAD AND DISC

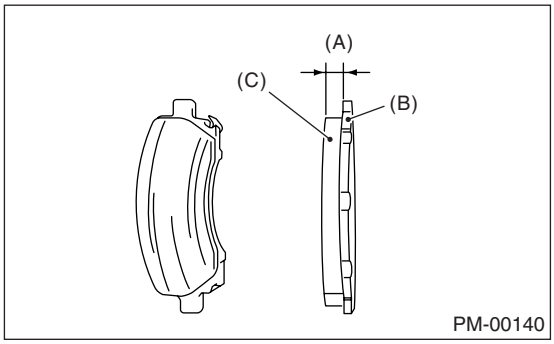
1) Lift-up the vehicle. Then remove the wheels.
2) Visually check the pad thickness through inspection hole of disc brake assembly. Replace the pad if necessary.

CAUTION:
When replacing a pad, always replace the pads for both the right and left wheels at the same time. Also replace the pad clips if they are twisted or worn.



(A) Inspection hole

Pad thickness		mm (in)
	Front	Rear
Standard	11 (0.43)	9 (0.35)
Wear limit	1.5 (0.059)	1.5 (0.059)



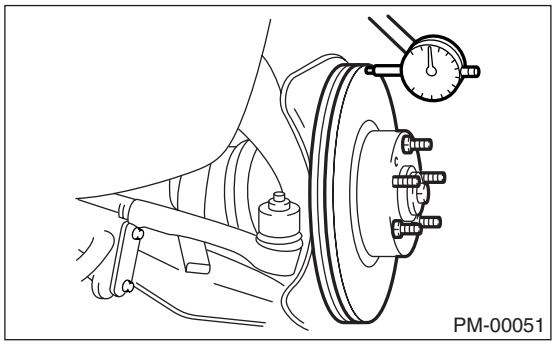
(A) Thickness of pad
(B) Back metal
(C) Lining

3) Check the disc rotor, and correct or replace if it is damaged or worn.

Brake disc thickness		mm (in)
	Front	Rear
Standard	24 (0.94)	10 (0.39)
Wear limit	22 (0.87)	8.5 (0.335)

4) Remove the caliper body. <Ref. to BR-20, Front Disc Brake Assembly.> <Ref. to BR-26, Rear Disc Brake Assembly.>
5) Tighten the wheel nuts to secure disk rotor.
6) Set a dial gauge at a point less than 10 mm (0.39 in) from outer periphery of rotor, and then measure the disk rotor runout.

Disc rotor runout limit:
Front: 0.075 mm (0.0030 in)
Rear: 0.070 mm (0.0028 in)



21.Brake Lining and Drum

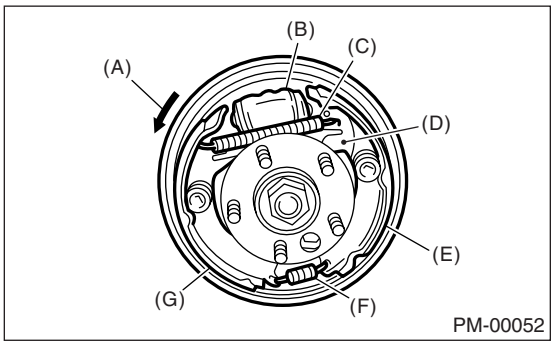
A: INSPECTION

1. REAR DRUM BRAKE

1) Remove the brake drum, and check that there is no fluid leakage from wheel cylinder.
If there is fluid leakage from wheel cylinder, inspect the wheel cylinder, and then repair or replace it.
2) Inspect the brake shoes for damage or deformities and check brake linings for wear.

CAUTION:
• Always replace both leading and trailing brake shoes for the right and left wheels at the same time.
• When either the right and left brake assembly is replaced, always replace the leading shoe and trailing shoe of the other.

Thickness of lining (except back metal)
Standard value: 4.1 mm (0.161 in)
Service limit: 1.5 mm (0.059 in)

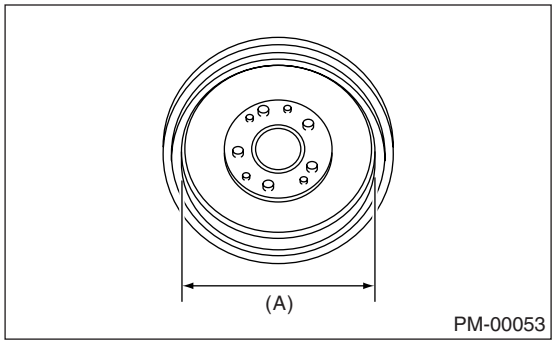


(A) Rotational direction of drum (Forward)
(B) Wheel cylinder
(C) Upper shoe return spring
(D) Adjusting lever
(E) Trailing shoe
(F) Lower shoe return spring
(G) Leading shoe

3) Check the brake drum for wear, dents or other damage.
If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered or the outside surface of brake drum is damaged, correct or replace it.

Brake drum inner diameter
Standard value: 228.6 mm (9.000 in)
Service limit: 230.6 mm (9.079 in)

If deformation or wear of back plate, shoe, etc. is noticeable, replace the affected parts.



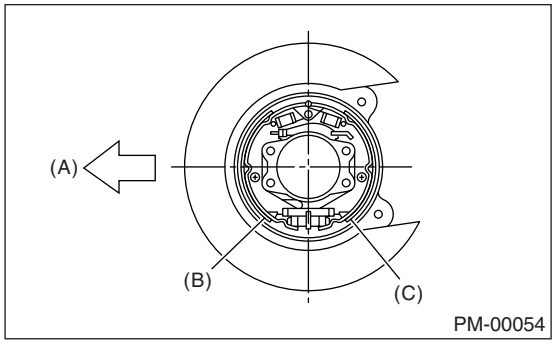
(A) Inside diameter

2. PARKING BRAKE (REAR DISC BRAKE)

Inspect the brake linings and the disk rotor inside of both sides of the rear brake at the same time by removing the disk rotor.
1) Inspect the brake shoes for damage or deformation and check brake linings for wear.

CAUTION:
Always replace both primary and secondary brake shoes for the right and left wheels at the same time.

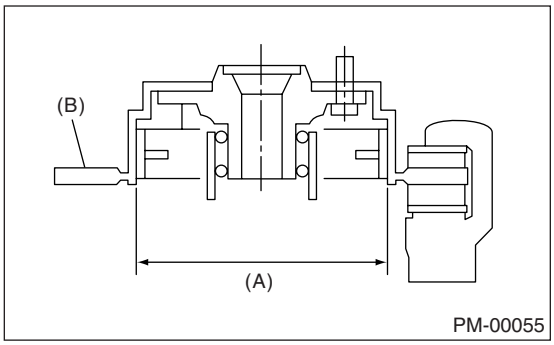
Brake lining thickness (excluding back metal)
Standard value: 3.2 mm (0.126 in)
Wear limit: 1.5 mm (0.059 in)



(A) Forward
(B) Brake shoe (Primary side)
(C) Brake shoe (Secondary side)

2) Check the disk rotor for wear, dents or other damage. If the inside surface of disk rotor is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn or tapered, correct or replace it.

Brake drum inside diameter
Standard value: 170 mm (6.69 in)
Wear limit: 171 mm (6.73 in)



(A) Inside diameter
(B) Disk

3) If the deformation or wear of back plate, shoe, etc. is noticeable, replace them.
4) When the shoe return spring tension is excessively weakened, replace it.

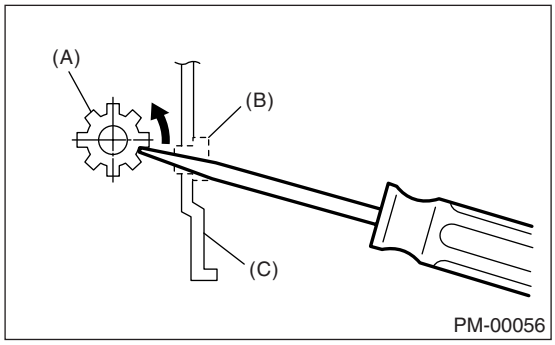
B: ADJUSTMENT

1. REAR DRUM BRAKE

The main brake is adjusted automatically, and so there is no need to adjust it.

2. PARKING BRAKE (REAR DISC BRAKE)

For rear disc brake, adjust the parking brake after bleeding air.
1) Remove the rear cover (rubber) installed at back plate.
2) Turn the adjuster toward arrow mark (upward) until it is locked slightly, by using a flat tip screwdriver as shown in illustration.



(A) Adjuster
(B) Rear cover (rubber)
(C) Back plate

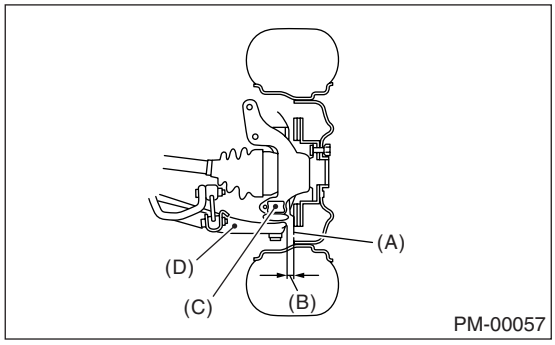
3) Turn back (downward) the adjuster 3 to 4 notches.
4) Install the rear cover (rubber) at original position correctly.

22.Suspension

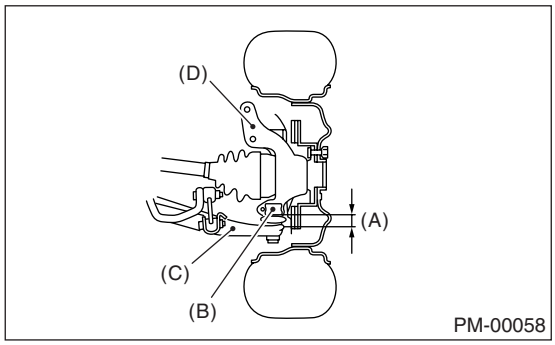
A: INSPECTION

1. SUSPENSION BALL JOINT

1) Jack-up the vehicle until front wheels are off ground.
2) Grasp the bottom of tire and move it in and out. If relative movement (B) is observed between the brake disc cover (A) and end of transverse link (D), ball joint (C) may be excessively worn.



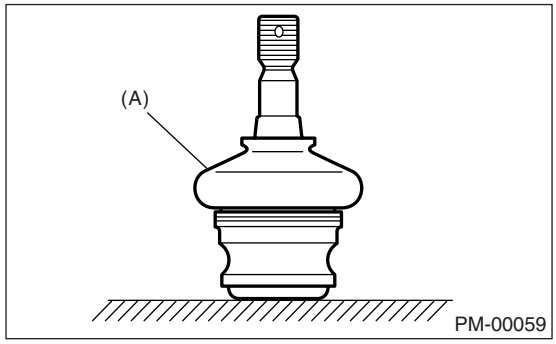
3) Grasp the end of transverse link (C) and move it up and down. Relative movement (A) between the housing (D) and transverse link boss indicates ball joint (B) may be excessively worn.



4) If relative movement is observed in the immediately preceding two steps, remove and inspect the ball joint. If free play exceeds standard, replace the ball joint. <Ref. to FS-17, Front Ball Joint.>
5) Damage of dust seal
Visually inspect the ball joint dust seal. If it is damaged, remove the transverse link. <Ref. to FS-15, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-17, Front Ball Joint.>

(1) When looseness exceeds standard value, replace the ball joint.
(2) If the dust seal is damaged, replace with the new ball joint.

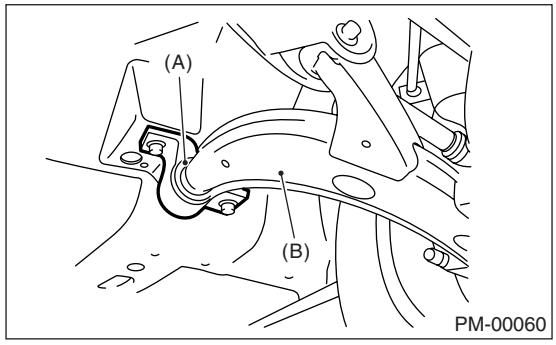
NOTE:
When the transverse link ball joint has been removed or replaced, check the toe-in of front wheel.
If the front wheel toe-in is not at permissible value, adjust the toe-in to specified value at adjustment. <Ref. to FS-6, Wheel Alignment.>



(A) Dust seal

2. TRANSVERSE LINK'S REAR BUSHING

Check oil leaks at around liquid-filled bushing. If oil leaks, replace the bushing.



(A) Rear bushing
(B) Transverse link

3. WHEEL ARCH HEIGHT

1) Unload cargoes and set the vehicle in curb weight (empty) condition.
2) Then, check the wheel arch height of front and rear suspensions to ensure that they are within permissible values. <Ref. to FS-6, Wheel Alignment.>
3) When the wheel arch height is out of permissible value, visually inspect the following components and replace deformed parts.
• Suspension components [Front strut assembly and rear strut assembly]
• Parts connecting between suspension and body.
4) When no components are deformed, adjust the wheel arch height by replacing coil spring in the suspension which wheel arch height is out of permissible value. <Ref. to FS-6, Wheel Alignment.> <Ref. to RS-8, Wheel Alignment.>

4. WHEEL ALIGNMENT OF FRONT SUSPENSION

1) Check the alignment of front suspension to ensure that following items conform to permissible values.
- Toe-in
- Camber angle
- Caster angle (Reference value)
- Steering angle

<Ref. to FS-6, Wheel Alignment.>
2) When the caster angle does not conform to reference value, visually inspect the following components and replace deformed parts.
- Suspension components [Strut assembly, crossmember, transverse link, etc.]
- Body parts to which suspensions are installed.

3) When the toe-in and camber are out of permissible value, adjust them so that they conform to specified value at adjustment. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.> <Ref. to FS-8, CAMBER, INSPECTION, Wheel Alignment.>
4) When the right-and-left turning angles of tire are out of standard, adjust to permissible value. <Ref. to FS-10, STEERING ANGLE, INSPECTION, Wheel Alignment.>

5. WHEEL ALIGNMENT OF REAR SUSPENSION

1) Check the alignment of rear suspension to ensure that following items are within permissible values.
- Toe-in
- Camber angle
- Thrust angle

<Ref. to RS-8, Wheel Alignment.>
2) When the camber angle does not conform to permissible value, visually inspect parts listed below. If deformation is observed, replace the damaged parts.
- Suspension components [Shock absorber, front lateral links, rear lateral links, trailing link, etc.]
- Body parts to which suspensions are installed.

3) When the toe-in and thrust angle are out of permissible value, adjust them so that they conform to specified value at adjustment. <Ref. to FS-11, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.> <Ref. to FS-13, THRUST ANGLE, INSPECTION, Wheel Alignment.>

6. OIL LEAKAGE OF STRUT

Visually inspect the front strut and rear strut for oil leakage as instructed. If oil leakage reaches under spring seat lower portion, replace the front strut and rear strut.

7. TIGHTNESS OF BOLTS AND NUTS

Check the bolts and nuts shown in the figure for looseness. Retighten the bolts and nuts to specified torque. If the self-lock nuts and bolts are removed, replace them with new ones.
Front suspension: <Ref. to FS-2, General Description.>
Rear suspension: <Ref. to RS-2, General Description.>

8. DAMAGE TO SUSPENSION PARTS

Check the following parts and the fastening portion of the vehicle body for deformation or excessive rusting which impairs the suspension. Remove the contaminations on spring seat lower portion with care because dirt, sand, etc. tend to accumulate on it. If necessary, replace the damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove the rust and apply remedial anti-corrosion measures.
- Front suspension
  - Transverse link
  - Crossmember
  - Strut
- Rear suspension
  - Crossmember
  - Lateral links
  - Trailing link
  - Strut
- In the district where salt is sprayed to melt snow on a road in winter, check suspension parts for damage caused by rust every 12 months after lapse of 60 months. Take rust prevention measure as required.

23.Wheel Bearing

A: INSPECTION

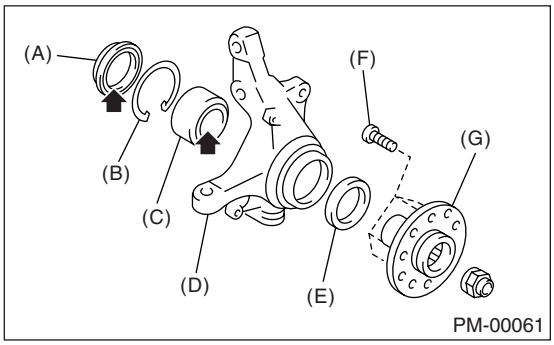
1. FRONT WHEEL BEARING

NOTE:
Inspect the condition of front wheel bearing grease.

1) Lift-up the front of vehicle.
2) While holding the front wheel by hand, swing it in and out to check bearing free play.
3) Loosen the wheel nuts and remove front wheel.
4) If bearing free play exists in step 2) above, attach a dial gauge to the hub and measure axial displacement in axial direction.

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove the bolts and self-locking nuts, and extract transverse link from front crossmember.
6) Remove the AARi of front drive shaft from transmission. <Ref. to DS-19, Front Axle.>
7) While supporting the front drive shaft horizontally with one hand, turn the hub with the other to check for noise or binding.
If the hub is noisy or binds, disassemble the front axle and check condition of oil seals, bearing, etc.



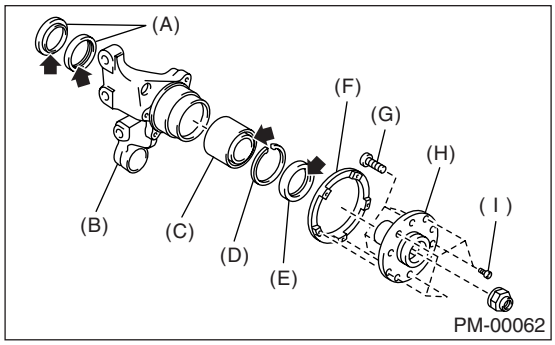
(A) Inner oil seal
(B) Snap ring
(C) Bearing
(D) Housing
(E) Outer oil seal
(F) Hub bolt
(G) Hub

2. REAR WHEEL BEARING

1) Lift-up the rear of vehicle.
2) While holding the rear wheel by hand, swing it in and out to check bearing free play.
3) Loosen the wheel nuts and remove rear wheel.
4) If the bearing free play exists in step 2) above, attach a dial gauge to the hub assembly and measure axial displacement in axial direction.

Service limit:
Straight-ahead position within 0.05 mm (0.0020 in)

5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-40, Rear Drive Shaft.>
6) While supporting the rear drive shaft horizontally with one hand, turn the hub assembly with the other to check for noise or binding.
If the hub assembly is noisy or binds, disassemble the rear axle and check condition of oil seals, bearings, etc.



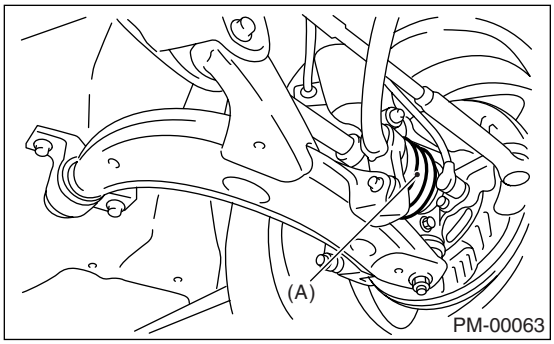
(A) Inner oil seal
(B) Rear housing
(C) Bearing
(D) Snap ring
(E) Outer oil seal
(F) Tone wheel
(G) Hub bolt
(H) Hub
(I) Socket bolt

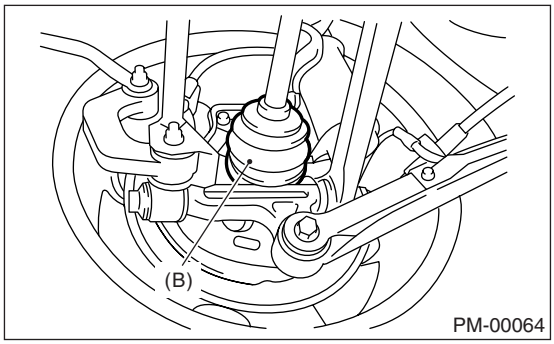
24.Axle Boots and Joints

A: INSPECTION

1. FRONT AND REAR AXLE BOOTS

Inspect the front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace them with new ones. <Ref. to DS-33, Front Drive Shaft.> <Ref. to DS-40, Rear Drive Shaft.>





2. PROPELLER SHAFT

Inspect the propeller shaft for damage or failure. If faulty, replace with a new one. <Ref. to DS-15, Propeller Shaft.>

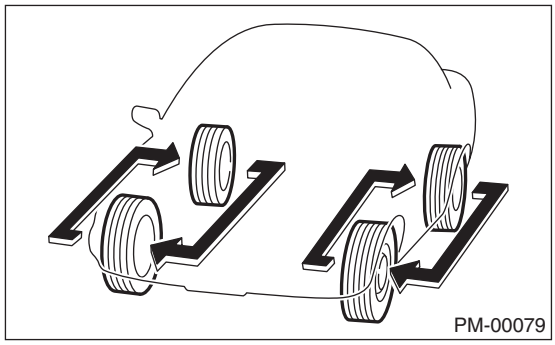
25.Tire Rotation

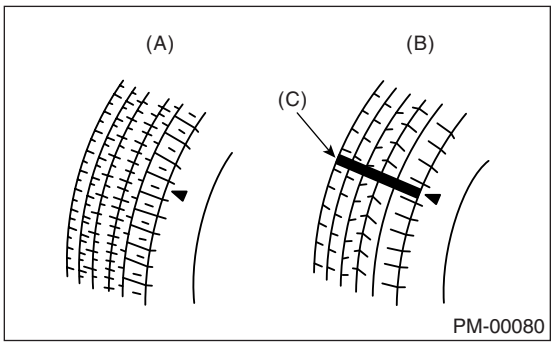
A: INSPECTION

1) Replace the tire if the tread depth is less than 1.6 mm (0.063 in) or if wear indicators appear across the tire tread.

CAUTION:
It is recommended that both right and left tires are replace as a set.

2) Adjust the wheel alignment if abnormally uneven tire wear is found.
3) Also, rotate the tires between the front and rear tires as illustrated every 10,000 km (6,200 miles) running, in order to ensure uniform tire wear.


PM-00079



PM-00080

(A) New tread
(B) Worn tread
(C) Tread wear indicator

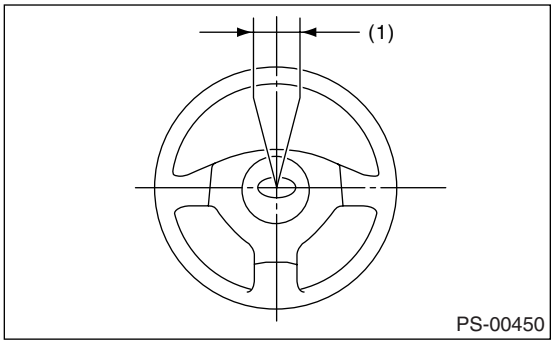
26.Steering System (Power Steering)

A: INSPECTION

1. STEERING WHEEL

1) Set the steering wheel in a straight-ahead position, and check the wheel spokes to make sure they are correctly set in their specified positions.
2) Lightly turn the steering wheel to the right and left to determine the point where front wheels start to move.
Measure the distance of the movement of steering wheel at the outer periphery of wheel.

Steering wheel free play:
0 — 17 mm (0 — 0.67 in)



(A) Steering wheel free play

Move the steering wheel vertically toward the shaft to ascertain if there is play in the direction.

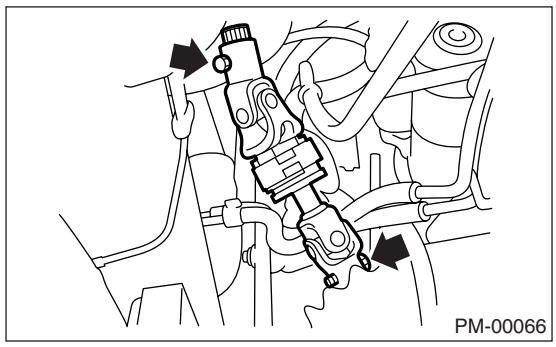
Maximum permissible play:
0.5 mm (0.020 in)

3) Drive the vehicle and check the following items.
(1) Steering force:
The effort required for steering should be smooth and even at all points, and should not vary.
(2) Pull to one side:
Steering wheel should not be pulled to either side while driving on a level surface.
(3) Wheel runout:
Steering wheel should not be runout.
(4) Return factor:
Steering wheel should return to its original position after it has been turned and then released.

2. STEERING SHAFT JOINT

When the steering wheel free play is excessive, disconnect the universal joint of steering shaft and check it for any play and yawing torque (at the point of the crossing direction). Also inspect for any damage to sealing or worn serrations. If the joint is loose, retighten the mounting bolts to the specified torque.

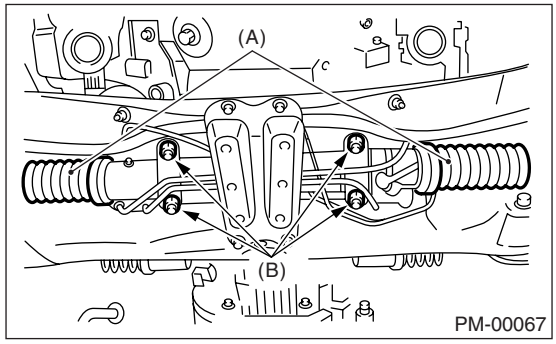
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)



3. GEARBOX

1) With wheels placed in the direction of straight ahead, turn the steering wheel 90° in both the right and left directions.
While the steering wheel is being rotated, check for looseness in gearbox.

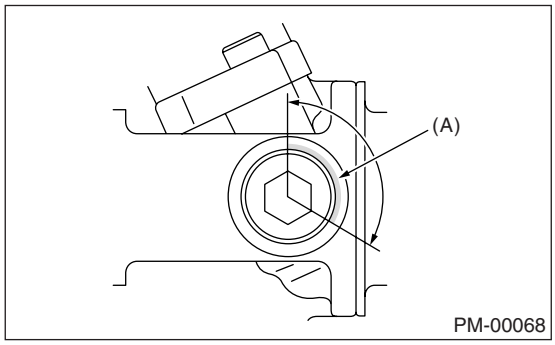
Tightening torque:
59 N·m (6.0 kgf-m, 43.4 ft-lb)



(A) Boot
(B) Gear box mounting bolt

2) Check the boot for damage, cracks or deterioration.
3) With the vehicle on a level surface, quickly turn the steering wheel to the right and left.
While the steering wheel is being rotated, check the gear backlash. If any unusual noise is noticed, adjust the gear backlash in the following manner.
(1) Tighten the adjusting screw to 9.8 N·m (1.0 kgf-m, 7.2 ft-lb) and then loosen.

(2) Tighten the adjusting screw to 4.9 N·m (0.5 kgf-m, 3.6 ft-lb) and then loosen.
(3) Retighten the adjusting screw to 4.9 N·m (0.5 kgf-m, 3.6 ft-lb) and back off 26°, and it fixes.
(4) Apply liquid gasket to at least 1/3 of entire perimeter of adjusting screw thread.



(A) Apply Liquid gasket to at least 1/3 of entire perimeter

(5) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.

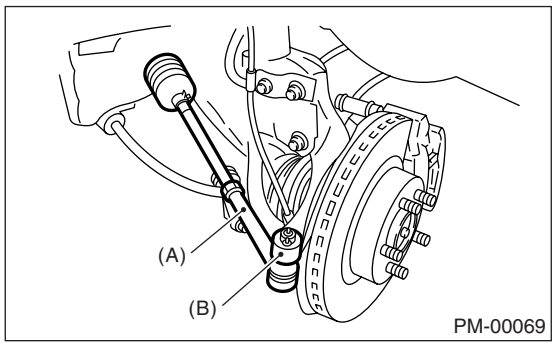
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

Hold the adjusting screw with a wrench to prevent it from turning it, while tightening the lock nut.

4. TIE-ROD

1) Check the tie-rod and tie-rod ends for bends, scratches or other damage.



(A) Tie-rod end
(B) Knuckle arm

2) Check the connections of knuckle ball joints for play, inspect for damage on dust seals, and check free play of ball studs. If the castle nut is loose, retighten it to the specified torque, then tighten further up to 60° until the cotter pin hole is aligned.

Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

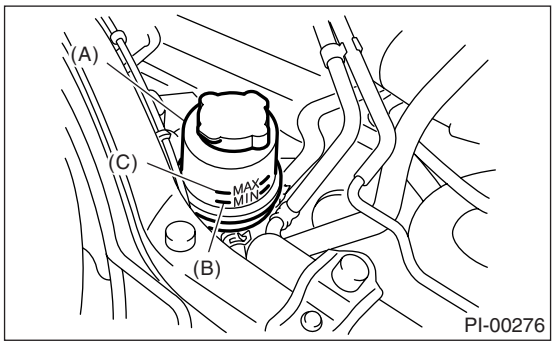
3) Check the lock nut on tie-rod end for tightness. If it is loose, retighten it to the specified torque.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

5. POWER STEERING FLUID LEVEL

NOTE:
• Check at power steering fluid temperature 20°C (68°F); read the fluid level on the “COLD” side.
• Check at power steering fluid temperature 80°C (176°F); read the fluid level on the “HOT” side.

1) Place the vehicle with engine stopped on a flat and level surface.
2) Check the fluid level using the scale on the outside of reservoir tank (A). If the level is below “MIN” (B), add fluid to bring it up to “MAX” (C).



NOTE:
If the fluid level is at “MAX” level or above, drain fluid to keep the level in specified range of indicator by using a syringe or the like.

Recommended fluid:
Dexron III

Fluid capacity:
0.7 ℓ (0.7 US qt, 0.6 Imp qt)

6. POWER STEERING FLUID FOR LEAKS

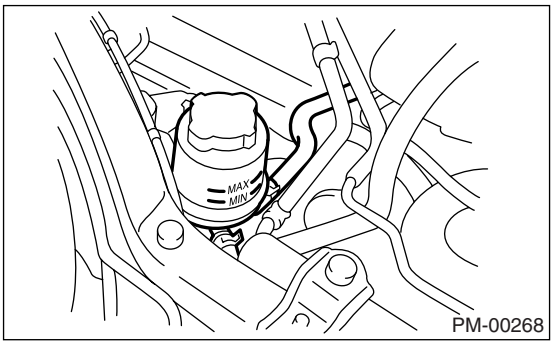
Inspect the underside of oil pump and gearbox for power steering system, hoses, piping and their couplings for fluid leaks.
If fluid leaks are found, correct them by retightening their fitting bolts (or nuts) and/or replacing their parts.

CAUTION:
• Wipe the leakage fluid off after correcting fluid leaks, or a wrong diagnostic is taken later.
• Also pay attention to clearances between hoses (or pipings) and other parts when inspecting fluid leaks.

7. HOSES OF OIL PUMP FOR DAMAGES

Check the pressure hose and return hose of oil pump for crack, swell or damage. Replace the hose with a new one if necessary.

CAUTION:
Prevent the hoses from revolving or turning when installing hoses.



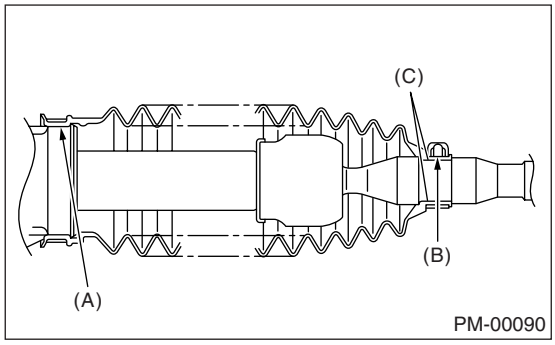
8. POWER STEERING PIPES FOR DAMAGE

Check the power steering pipes for corrosion and damage.
Replace the pipes with a new one if necessary.

9. GEARBOX BOOTS

Inspect both sides of gearbox boots as follows, and correct the defects if necessary.
1) (A) and (B) positions of gearbox boot are fitted correspondingly in (A) and (C) grooves of gearbox and the rod (C).
2) Clips are fitted outside of (A) and (B) positions of boot.
3) Boot does not have crack and hole.

NOTE:
Rotate (B) the position of gearbox boot against twist of it produced by adjustment of toe-in, etc.
Apply grease to the groove (C).



10.FITTING BOLTS AND NUTS

Inspect the fitting bolts and nuts of oil pump and bracket for looseness, and retighten them if necessary.

NOTE:
Inspect or retighten them when engine is cold.

ENGINE SECTION 1

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS)	FU(H4SO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4SO)
INTAKE (INDUCTION)	IN(H4SO)
MECHANICAL	ME(H4SO)
EXHAUST	EX(H4SO)
COOLING	CO(H4SO)
LUBRICATION	LU(H4SO)
SPEED CONTROL SYSTEMS	SP(H4SO)
IGNITION	IG(H4SO)
STARTING/CHARGING SYSTEMS	SC(H4SO)
ENGINE (DIAGNOSTICS)	EN(H4SO)(diag)

FUJI HEAVY INDUSTRIES LTD. G8090GE2

FUEL INJECTION (FUEL SYSTEMS)

FU(H4SO)

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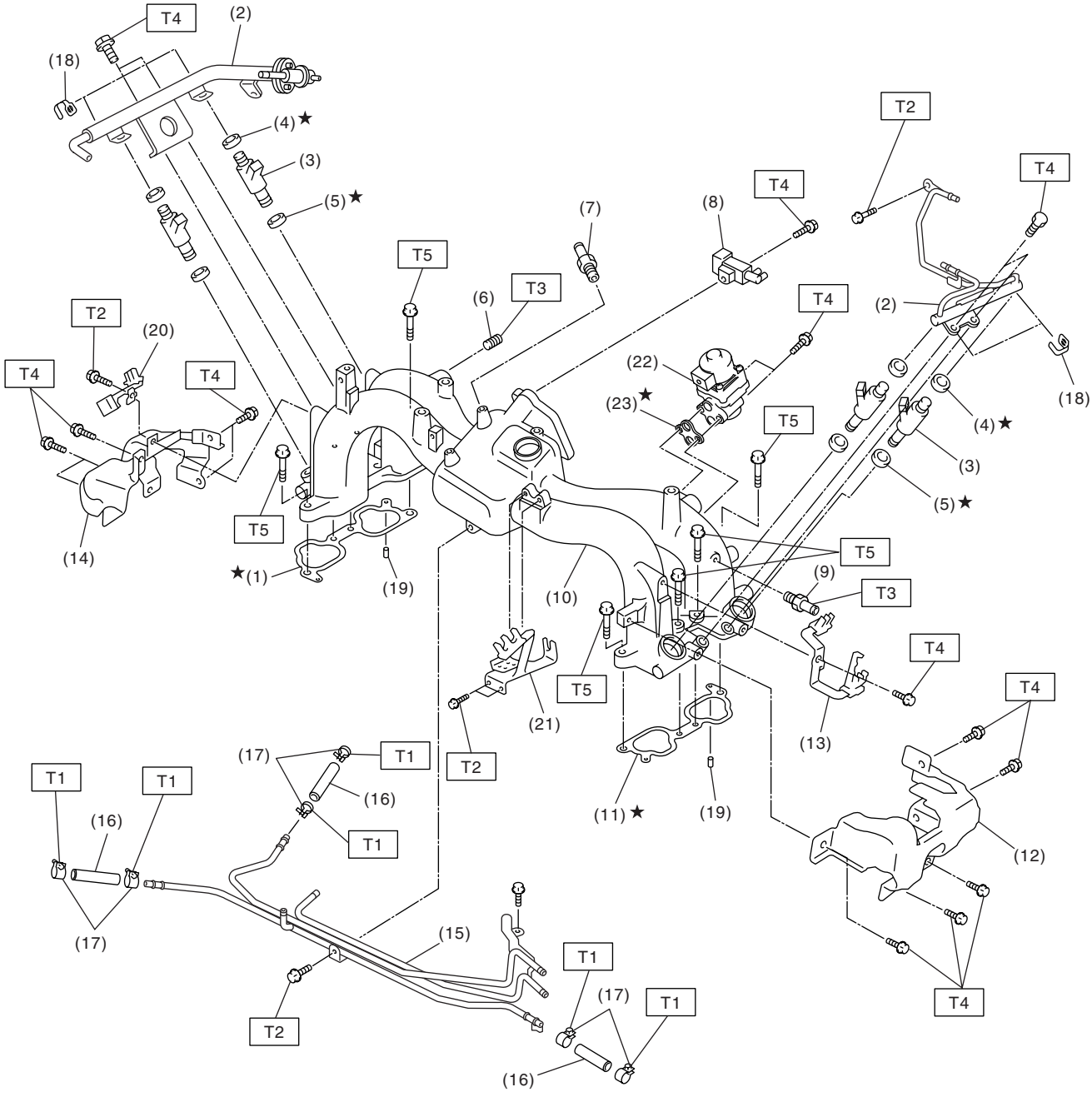
1. General Description

A: SPECIFICATION

Model		Specification
Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kgf/cm^2, 53.6 — 98 psi)
	Discharge flow	More than 65 ℓ (17.2 US gal, 14.3 Imp gal) /h [12 V at 300 kPa (3.06 kgf/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

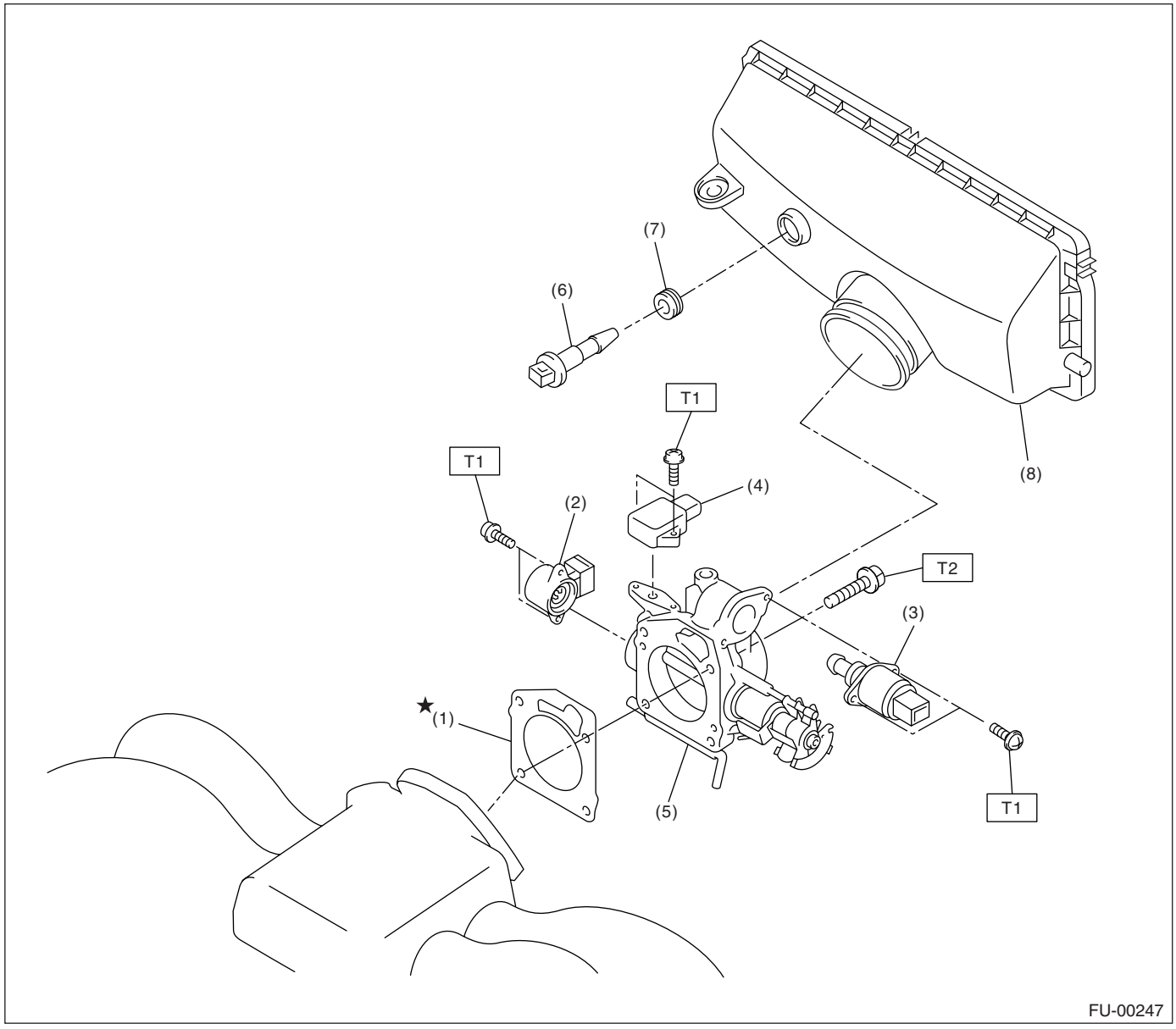


FU-02084

(1) Intake manifold gasket RH
(2) Fuel injector pipe
(3) Fuel injector
(4) O-ring
(5) O-ring
(6) Plug
(7) PCV valve
(8) Purge control solenoid valve
(9) Nipple
(10) Intake manifold
(11) Intake manifold gasket LH
(12) Fuel pipe protector LH
(13) Plug cord holder LH
(14) Fuel pipe protector RH
(15) Fuel pipe ASSY
(16) Fuel hose
(17) Clip
(18) Clip
(19) Guide pin
(20) Plug cord holder RH
(21) Accelerator cable bracket
(22) EGR valve
(23) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.5 (0.15, 1.1)
T2: 5 (0.5, 3.6)
T3: 17 (1.7, 12.5)
T4: 19 (1.9, 14.0)
T5: 25 (2.5, 18.1)

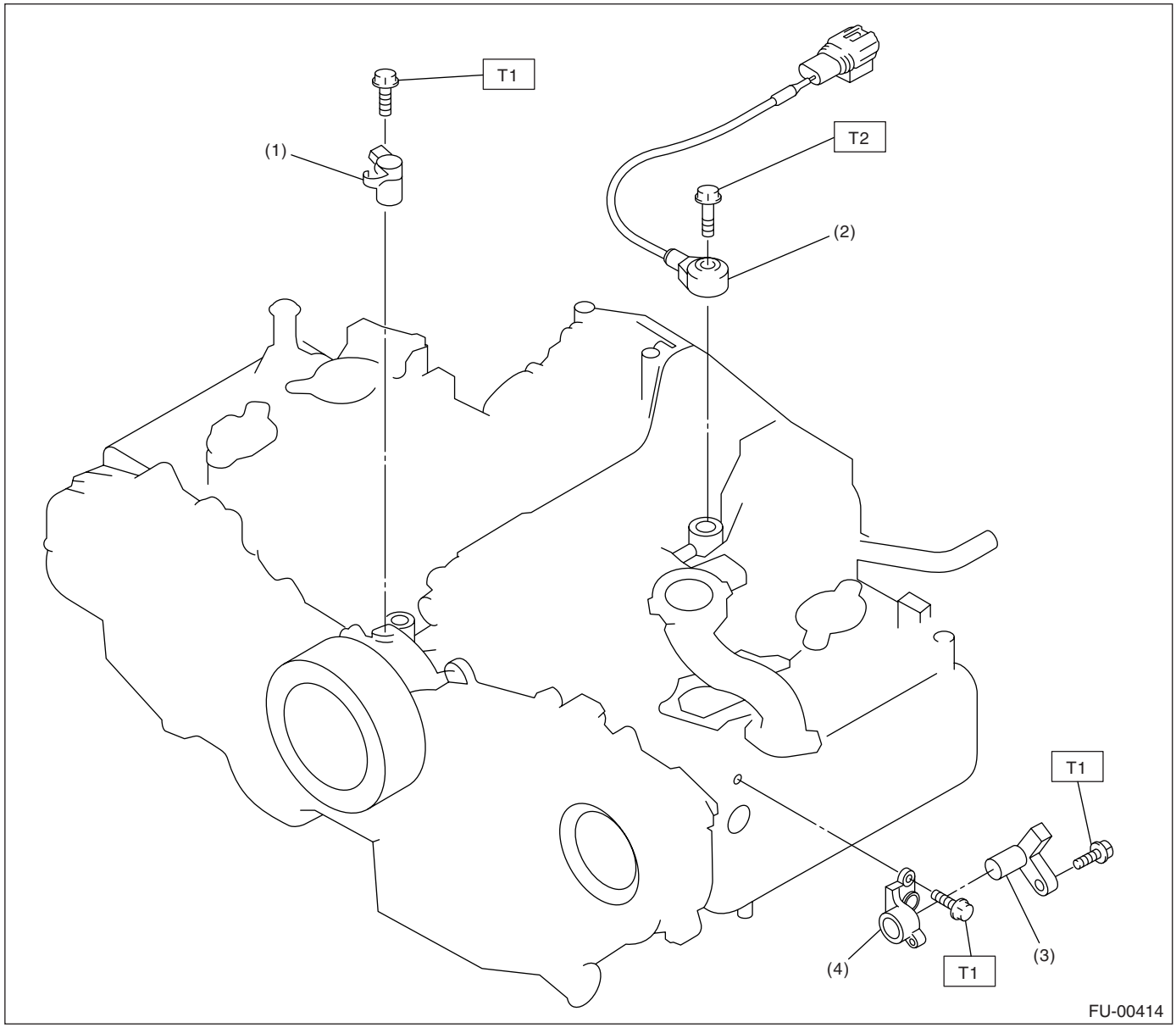
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle position sensor
(3) Idle air control solenoid valve
(4) Manifold absolute pressure sensor
(5) Throttle body
(6) Intake air temperature sensor
(7) Grommet
(8) Air cleaner case

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 11.8)
T2: 22 (2.2, 15.9)

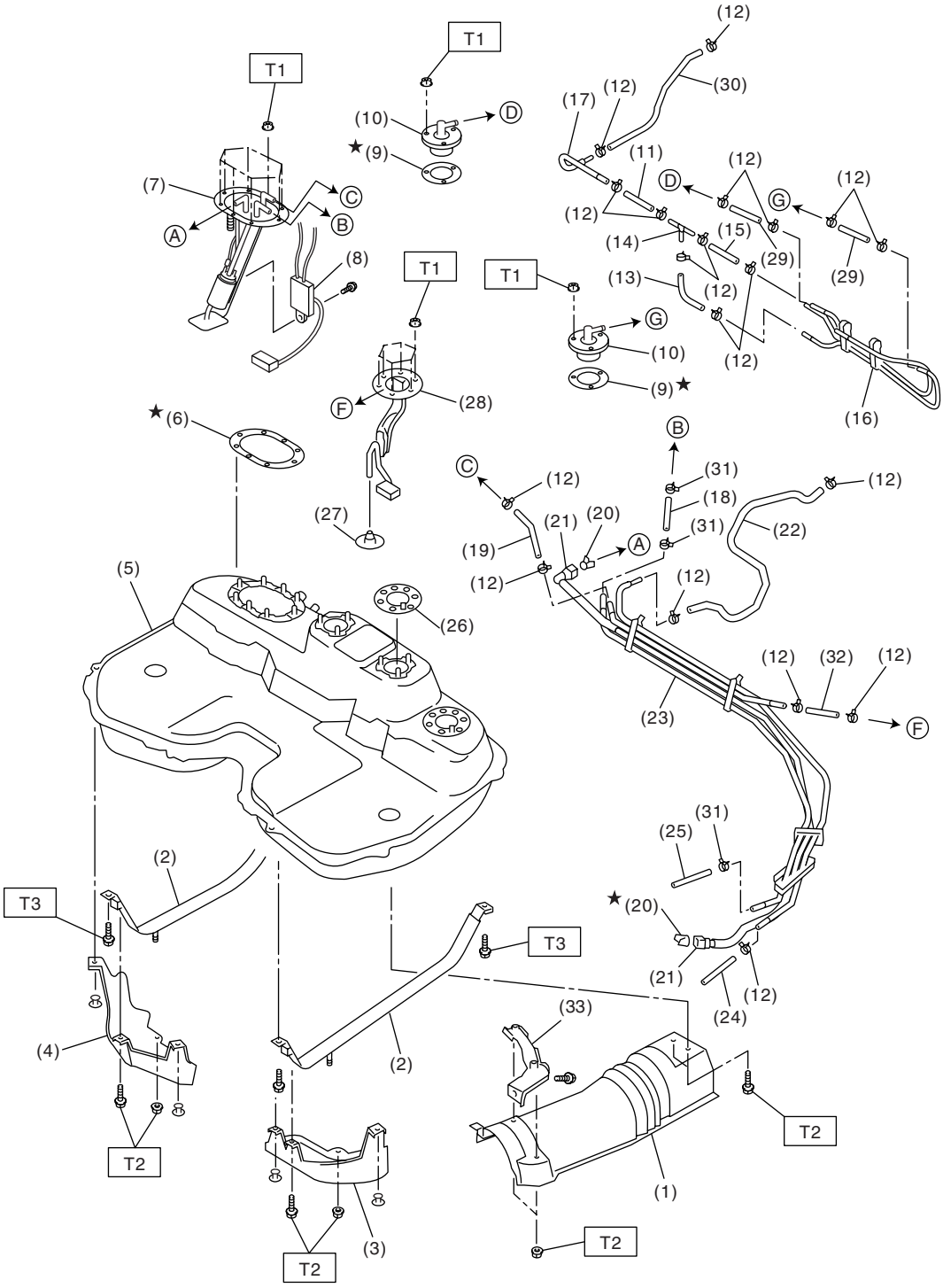
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor
(4) Camshaft position sensor support

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

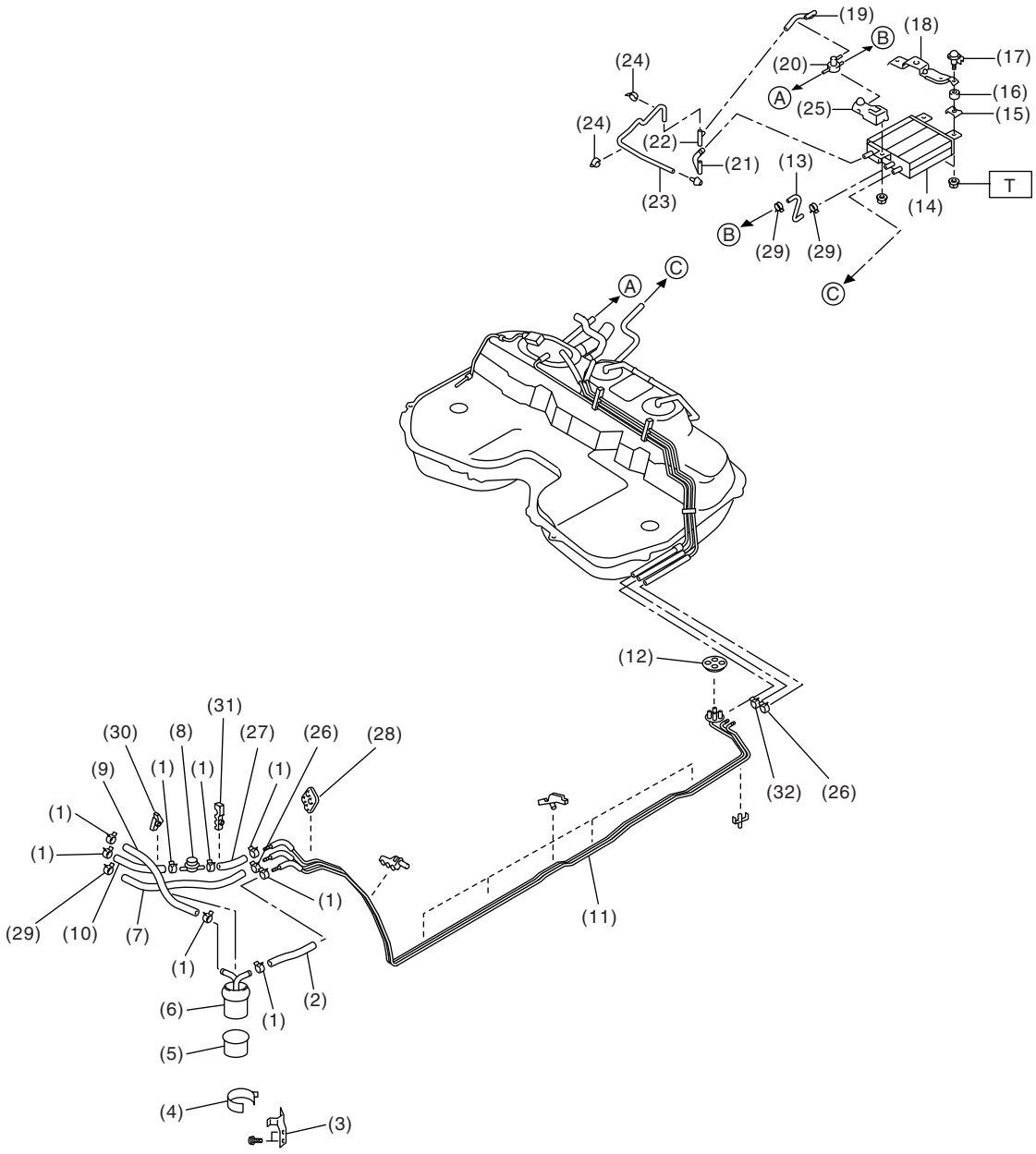


FU-02613

(1) Heat shield cover
(2) Fuel tank band
(3) Protector LH
(4) Protector RH
(5) Fuel tank
(6) Fuel pump gasket
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel cut valve gasket
(10) Fuel cut valve
(11) Evaporation hose A
(12) Clip
(13) Evaporation hose B
(14) Joint pipe
(15) Evaporation hose C
(16) Evaporation pipe ASSY
(17) Evaporation pipe
(18) Fuel return hose A
(19) Jet pump hose A
(20) Retainer
(21) Quick connector
(22) Evaporation hose E
(23) Fuel pipe ASSY
(24) Evaporation hose F
(25) Fuel return hose B
(26) Fuel sub level sensor gasket
(27) Jet pump filter
(28) Fuel sub level sensor
(29) Evaporation hose G
(30) Evaporation hose H
(31) Clip
(32) Jet pump hose B
(33) Cover bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.4 (0.75, 5.4)
T3: 33 (3.4, 25)

5. FUEL LINE

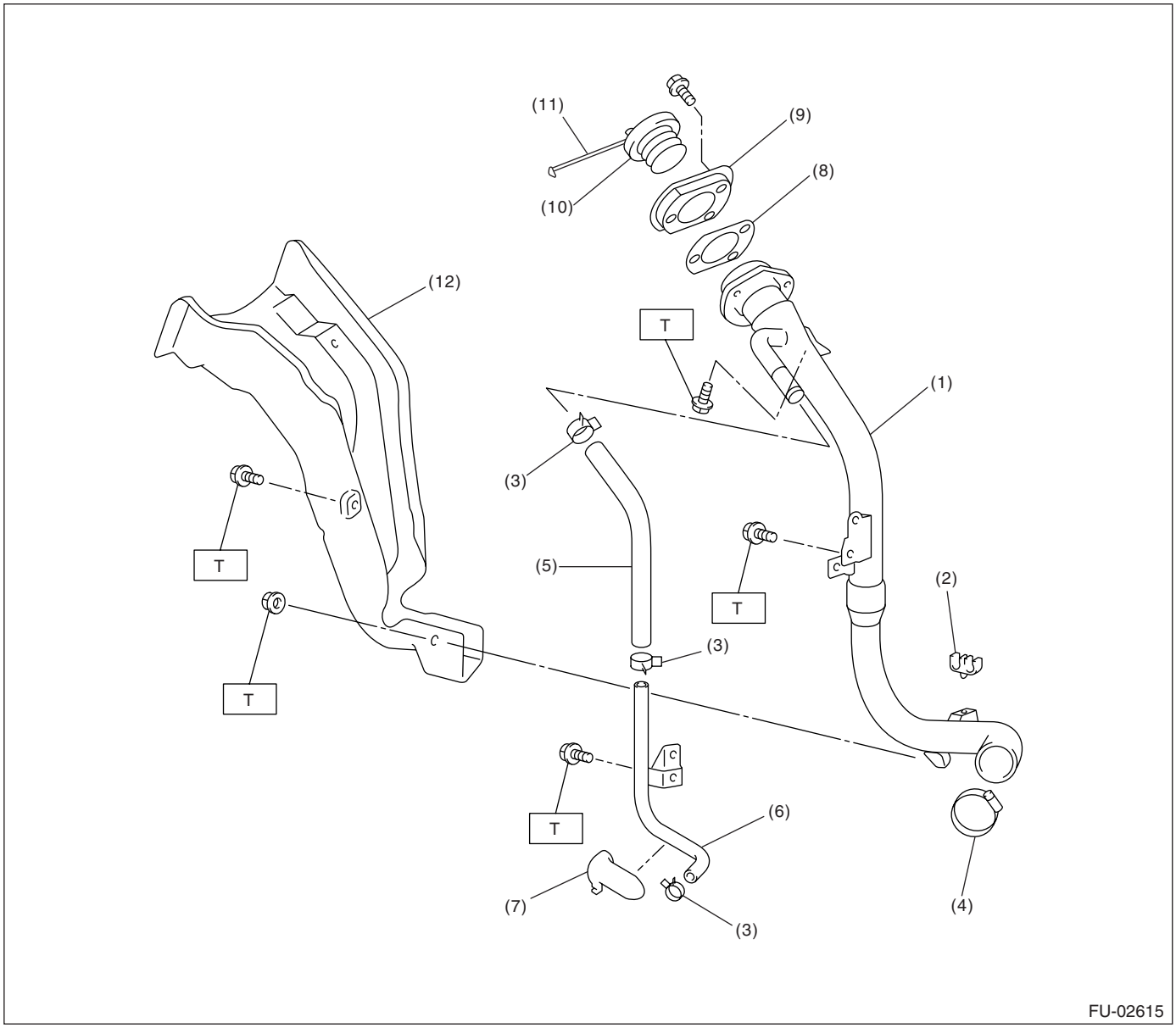


FU-02614

(1) Clip
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Fuel damper valve
(9) Fuel delivery hose B
(10) Fuel return hose A
(11) Fuel pipe ASSY
(12) Grommet A
(13) Canister hose A
(14) Canister
(15) Canister bracket plate
(16) Cushion
(17) Canister bracket spacer
(18) Rear canister bracket
(19) Two-way valve hose
(20) Two-way valve
(21) Drain hose A
(22) Connector
(23) Drain hose B
(24) Clamp
(25) Front canister bracket
(26) Clip
(27) Fuel return hose B
(28) Grommet B
(29) Clip
(30) Clamp
(31) Clamp
(32) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 23 (2.3, 17.0)

6. FUEL FILLER PIPE



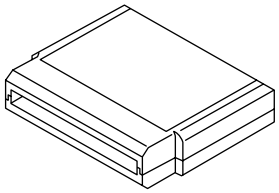
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Air vent hose
(6) Air vent pipe
(7) Air vent pipe holder
(8) Fuel filler pipe packing
(9) Fuel filler flap lid ring
(10) Fuel filler flap lid cap
(11) Fuel filler flap lid cap tether
(12) Fuel filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

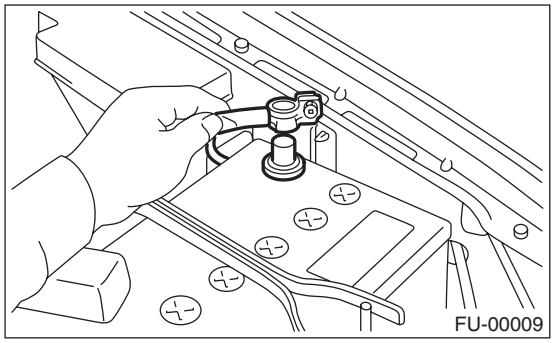
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

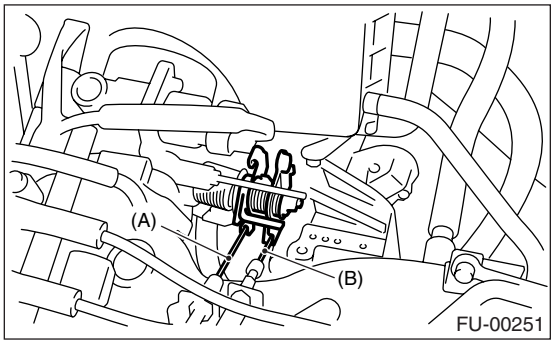
2. Throttle Body

A: REMOVAL

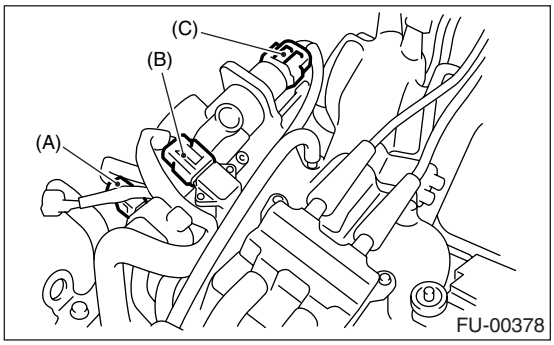
1) Disconnect the ground cable from battery.



2) Remove the air cleaner case. **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
3) Disconnect the accelerator cable (A).
4) Disconnect the cruise control cable (B). (With cruise control model)

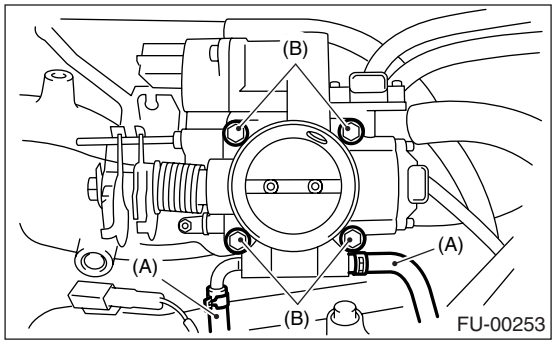


5) Disconnect the connectors from idle air control solenoid valve, throttle position sensor and manifold absolute pressure sensor.



(A) Throttle position sensor
(B) Manifold absolute pressure sensor
(C) Idle air control solenoid valve

6) Disconnect the engine coolant hoses (A) from the throttle body.
7) Remove the bolts (B) which install throttle body to the intake manifold.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

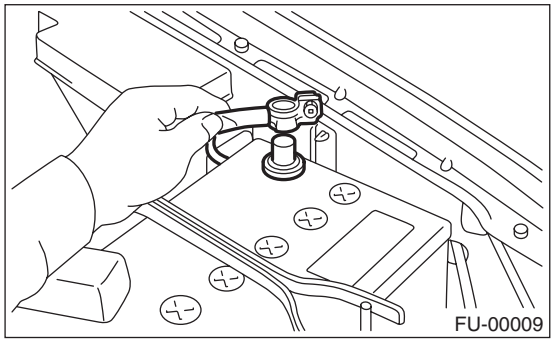
Tightening torque:
THROTTLE BODY;
22 N·m (2.2 kgf-m, 15.9 ft-lb)

2) Adjust the accelerator cable play. **<Ref. to SP(H4SO)-7,** ADJUSTMENT**, Accelerator Pedal.>**

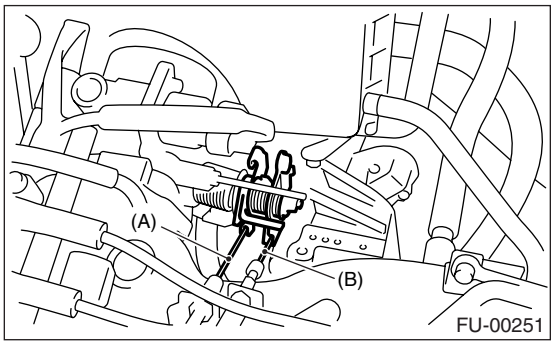
3. Intake Manifold

A: REMOVAL

1) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
2) Open the fuel filler flap lid, and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

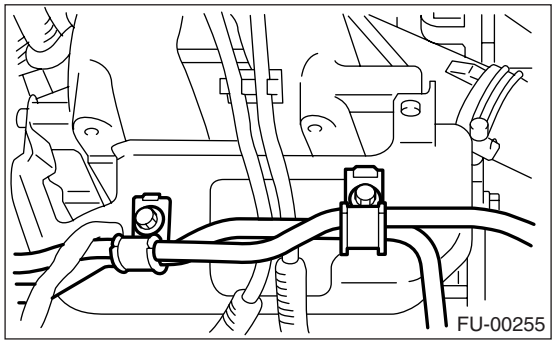


4) Remove the air intake duct and air cleaner case. **<Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.> <Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
5) Disconnect the accelerator cable (A).
6) Disconnect the cruise control cable (B). (With cruise control model)

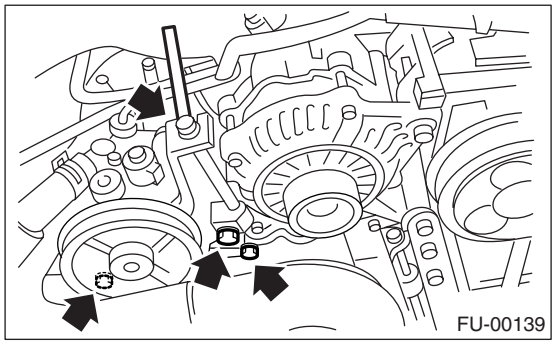


7) Remove the power steering pump and reservoir tank from bracket.
(1) Remove the resonator chamber. **<Ref. to IN(H4SO)-8,** REMOVAL**, Resonator Chamber.>**
(2) Remove the front side V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
(3) Remove the bolts which hold power steering pipes onto the intake manifold protector.

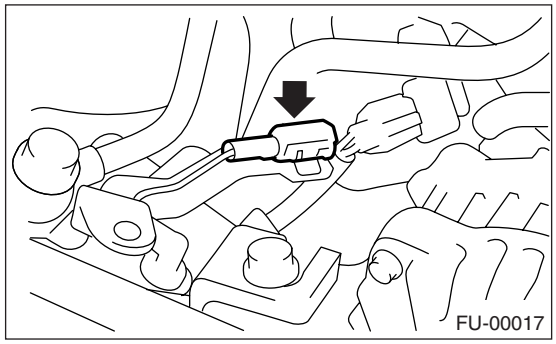
NOTE:
Do not disconnect the power steering hose.



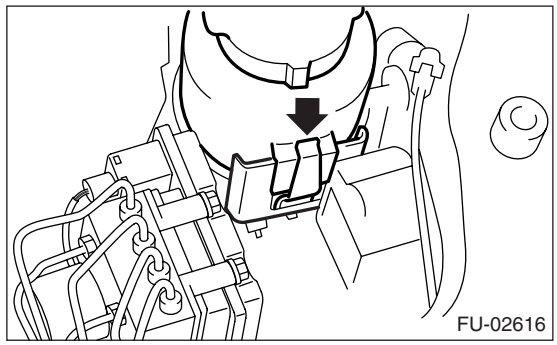
(4) Remove the bolts which install power steering pump to bracket.



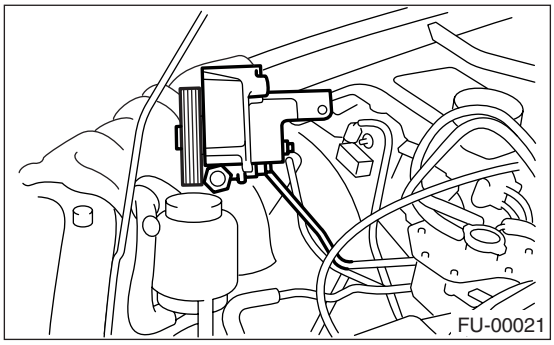
(5) Disconnect the connector from the power steering pump switch.



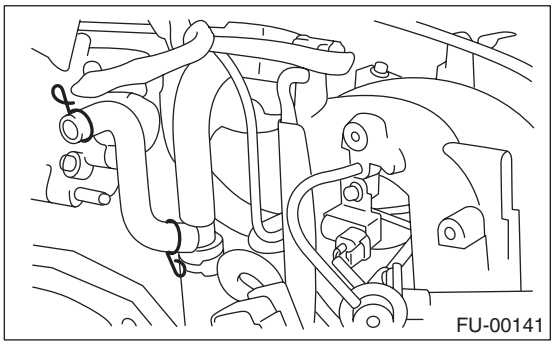
(6) Remove the power steering tank from the bracket by pulling it upwards.



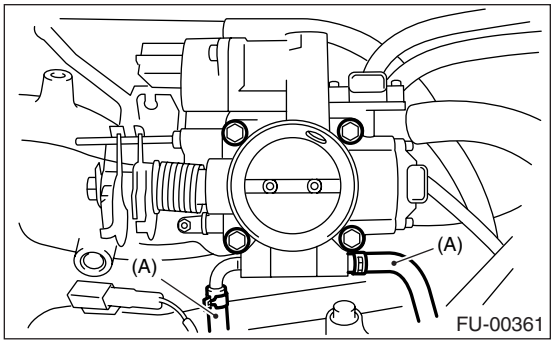
(7) Place the power steering pump on the right side wheel apron.



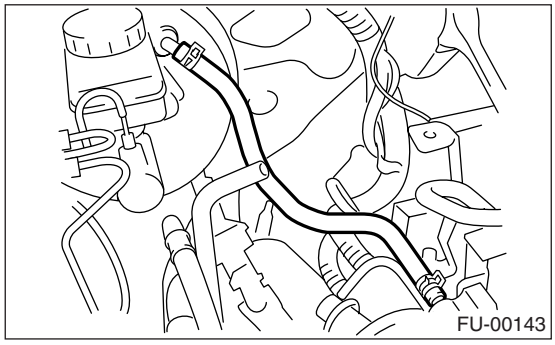
8) Disconnect the spark plug cords from the spark plugs.
9) Disconnect the PCV hose from the intake manifold.



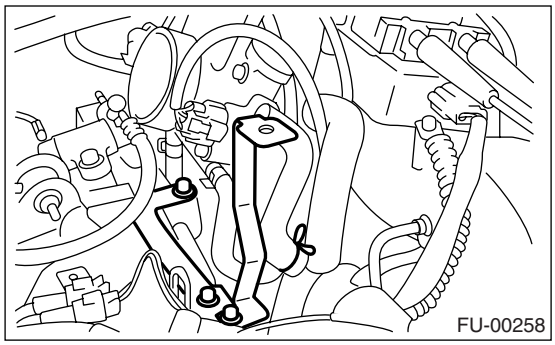
10) Disconnect the engine coolant hose (A) from the throttle body.



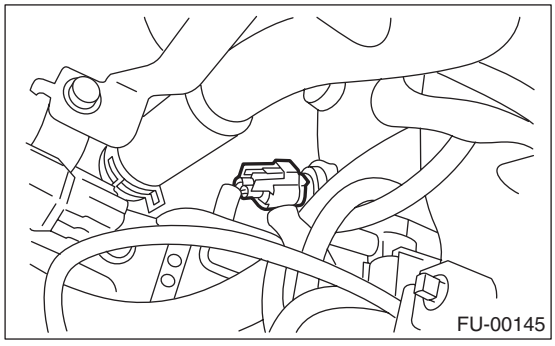
11) Disconnect the brake booster hose.



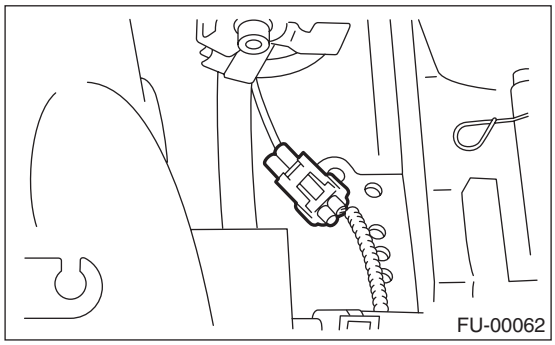
12) Remove the air cleaner case stay RH and engine harness bracket, and disconnect the engine harness connectors from the bulkhead harness connectors.



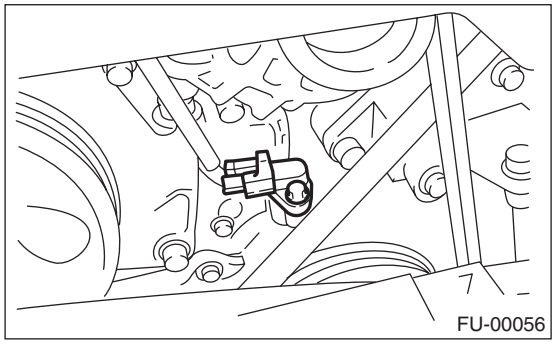
13) Disconnect the connectors from the engine coolant temperature sensor.



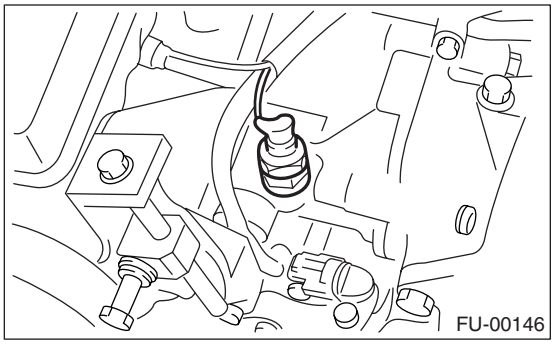
14) Disconnect the knock sensor connector.



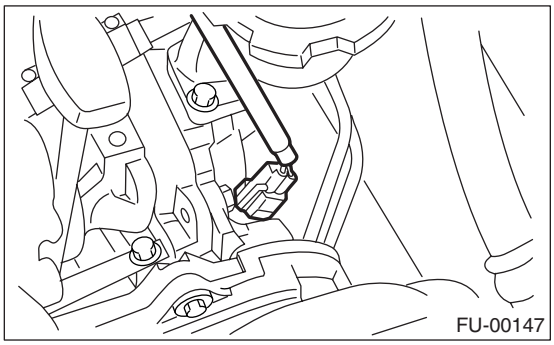
15) Disconnect the connector from the crankshaft position sensor.



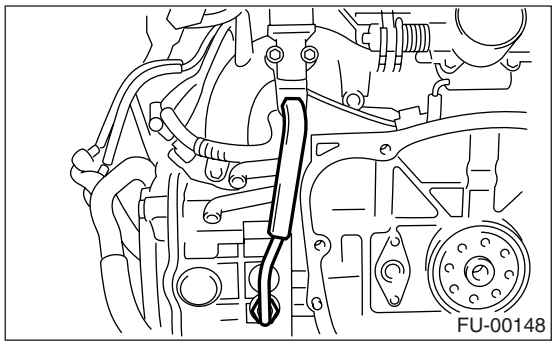
16) Disconnect the connector from the oil pressure switch.



17) Disconnect the connector from the camshaft position sensor.

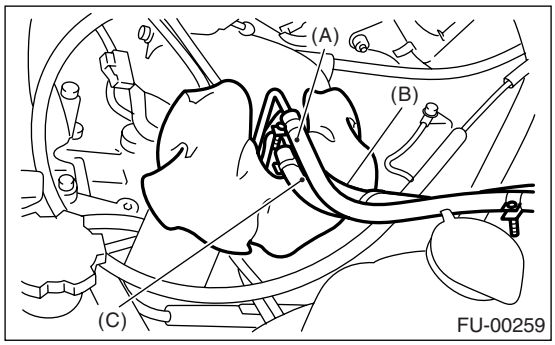


18) Remove the EGR pipe from intake manifold.



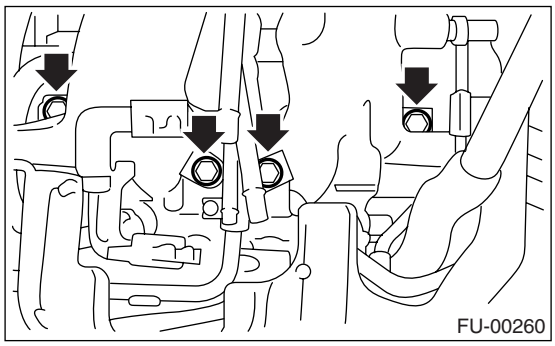
19) Disconnect the fuel hoses from the fuel pipes.

WARNING:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

20) Remove the bolts which hold intake manifold onto the cylinder heads.



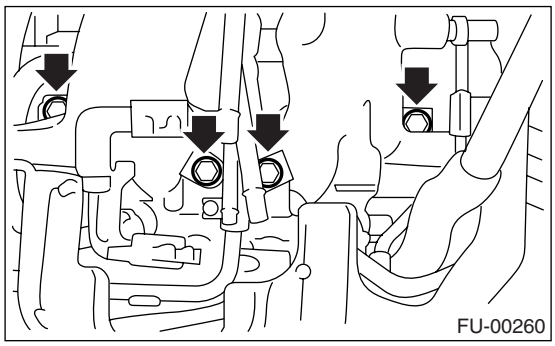
21) Remove the intake manifold.

B: INSTALLATION

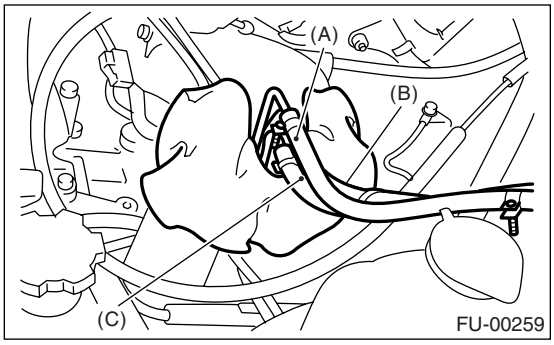
1) Install the intake manifold onto the cylinder heads.

NOTE:
Replace the gaskets with new ones.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



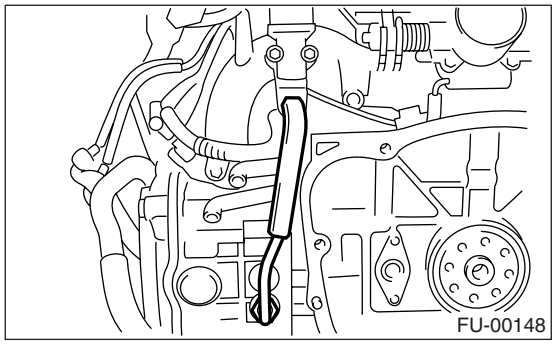
2) Connect the fuel hoses.



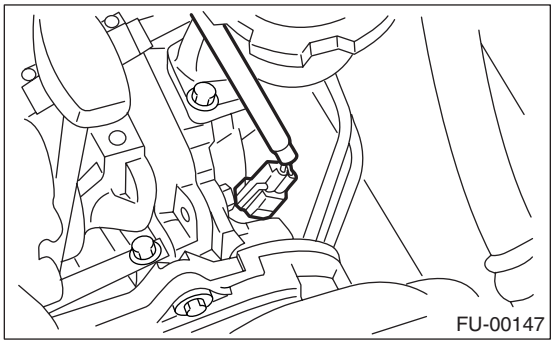
(A) Fuel delivery hose
(B) Fuel return hose
(C) Evaporation hose

3) Connect the EGR pipe to intake manifold.

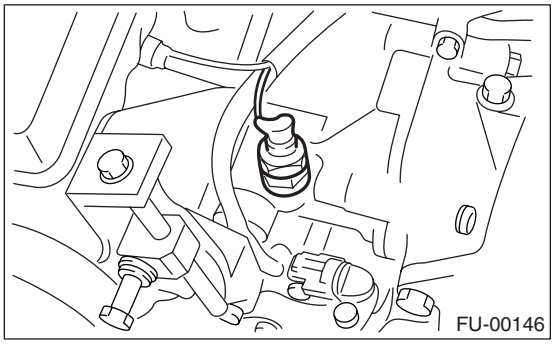
Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)



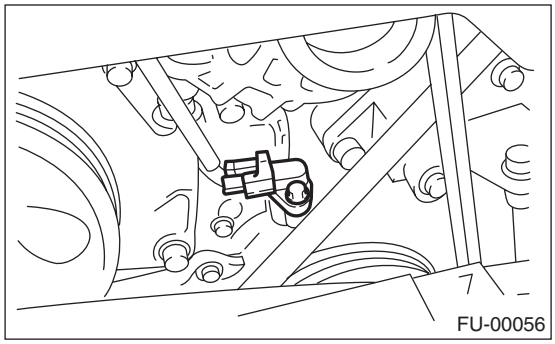
4) Connect the connector to the camshaft position sensor.



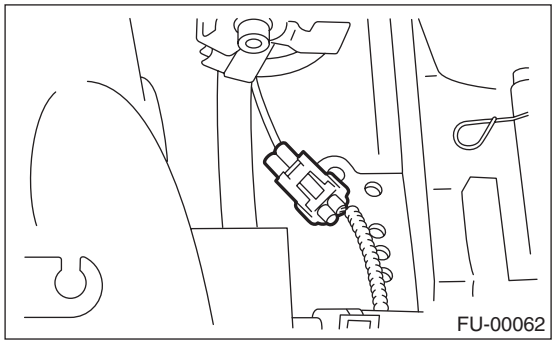
5) Connect the connector to the oil pressure switch.



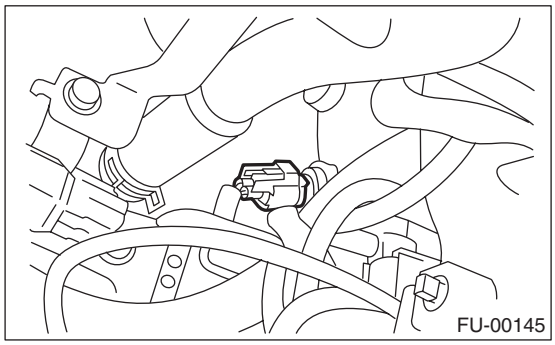
6) Connect the connector to the crankshaft position sensor.



7) Connect the knock sensor connector.

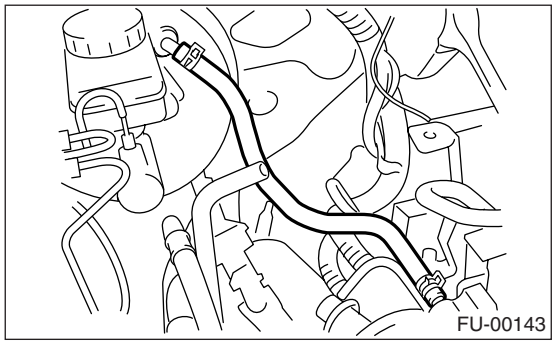


8) Connect the connectors to the engine coolant temperature sensor.

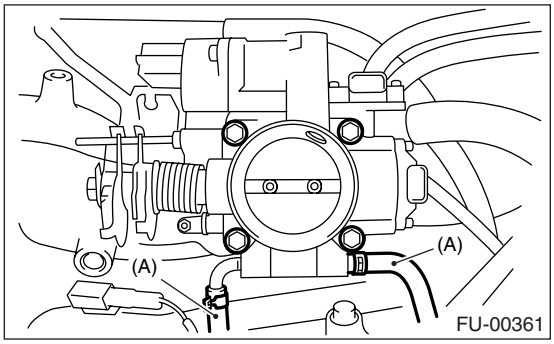


9) Install the air cleaner case stay RH and engine harness bracket, and connect the engine harness connectors to the bulkhead connectors.

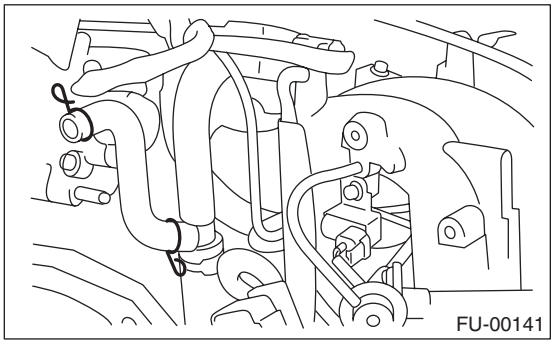
10) Connect the brake booster hose.



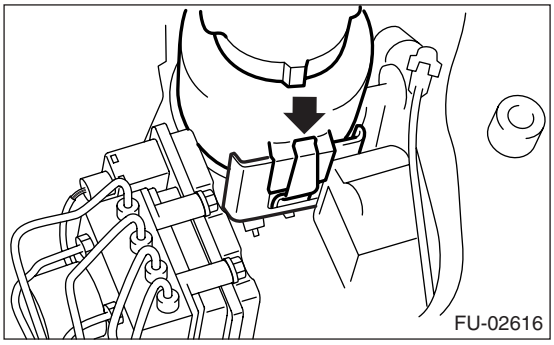
11) Connect the engine coolant hose (A) to the throttle body.



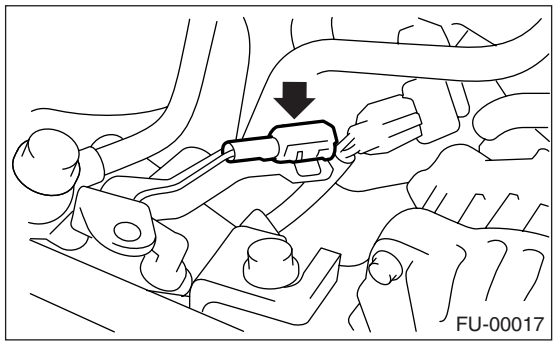
12) Connect the PCV hose to the intake manifold.



13) Connect the spark plug cords to the spark plugs.
14) Install the power steering pump and reservoir tank to bracket.
(1) Install the reservoir tank to bracket.

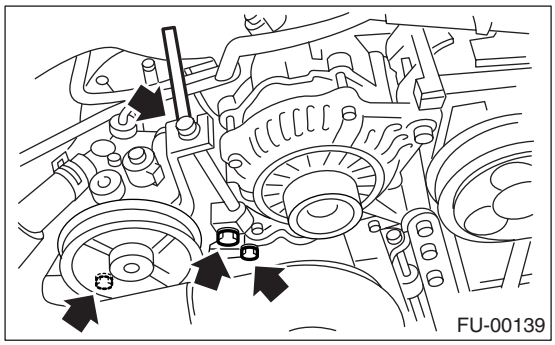


(2) Connect the connector to the power steering pump switch.

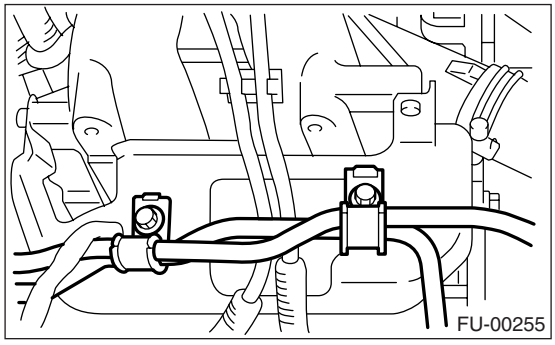


(3) Install the power steering pump bracket.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



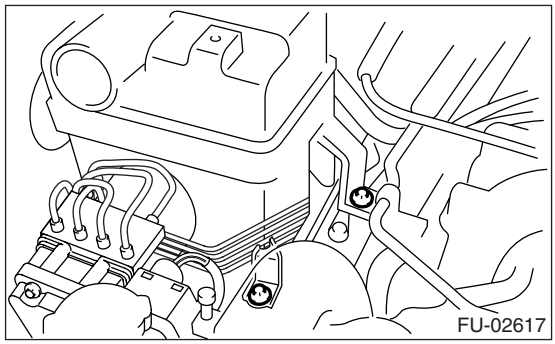
(4) Install the power steering pipes onto the intake manifold protector RH.



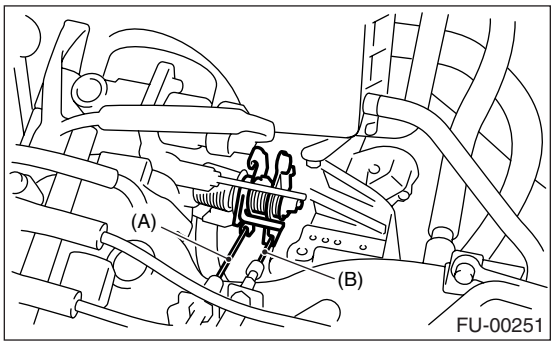
(5) Install the front side V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

(6) Install the resonator chamber.

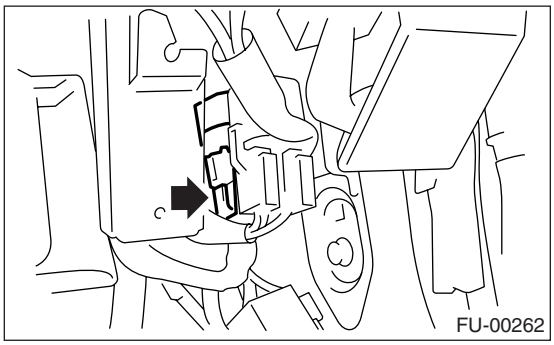
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



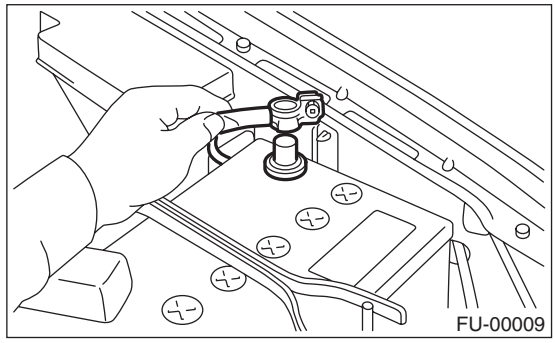
15) Connect the accelerator cable (A). **<Ref. to SP(H4SO)-9,** INSTALLATION**, Accelerator Control Cable.>**
16) Connect the cruise control cable (B). (With cruise control models)



17) Install the air intake duct and air cleaner case. **<Ref. to IN(H4SO)-7,** INSTALLATION**, Air Intake Duct.> <Ref. to IN(H4SO)-6,** INSTALLATION**, Air Cleaner Case.>**
18) Connect the connector to the fuel pump relay.

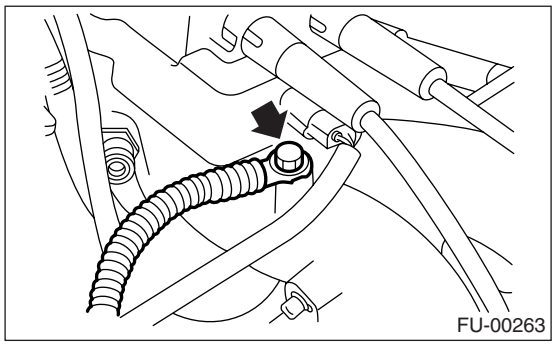


19) Connect the battery ground cable to battery.

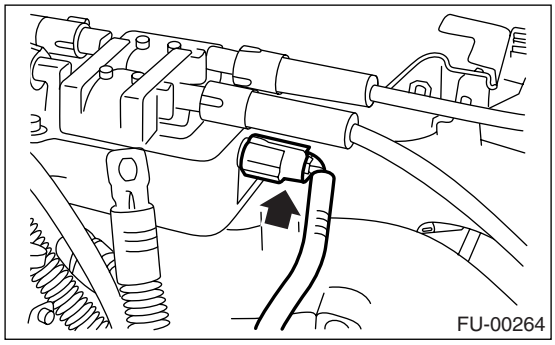


C: DISASSEMBLY

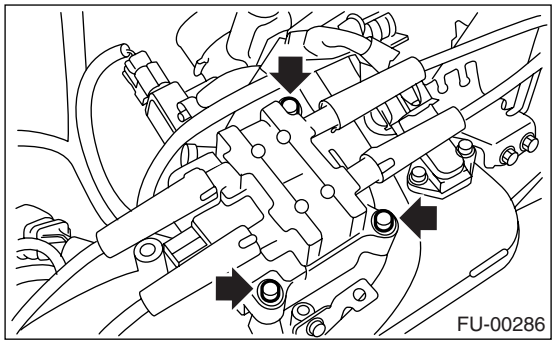
1) Disconnect the engine ground terminal from the intake manifold.



2) Disconnect the connector from the Ignition Coil and Ignitor Assembly.

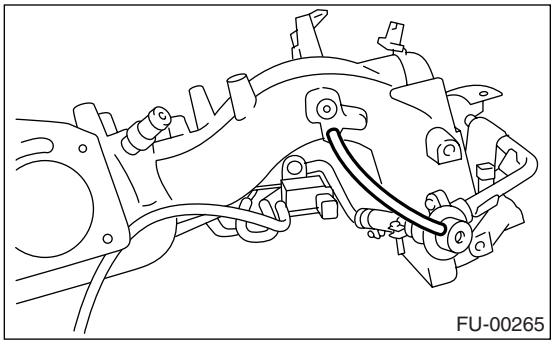


3) Remove the Ignition Coil and Ignitor Assembly.

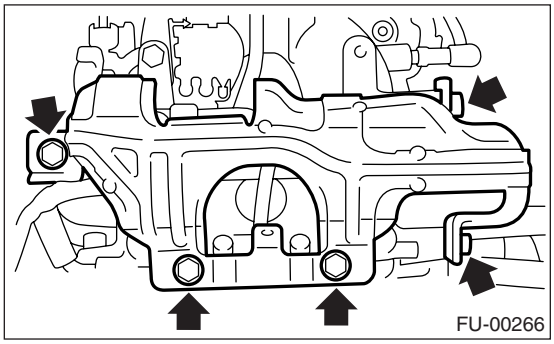


4) Remove the throttle body. **<Ref. to FU(H4SO)-13,** REMOVAL**, Throttle Body.>**
5) Remove the EGR valve. **<Ref. to FU(H4SO)-34,** REMOVAL**, EGR Valve.>**

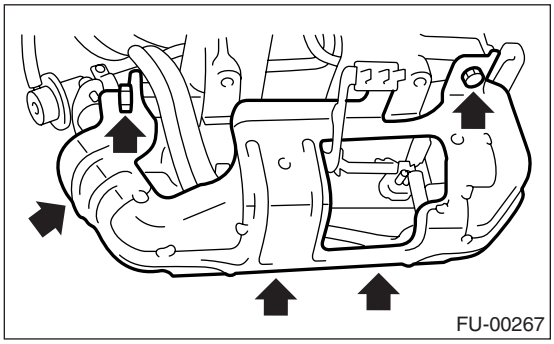
6) Disconnect the pressure regulator vacuum hose from the intake manifold.



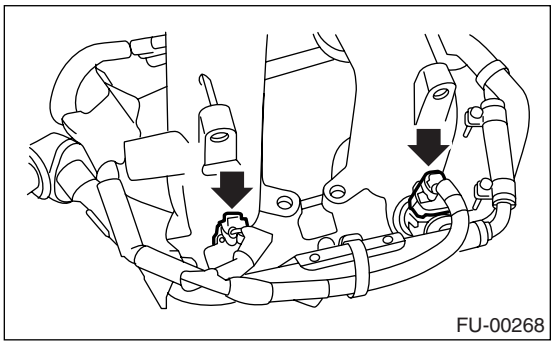
7) Remove the fuel pipe protector LH.



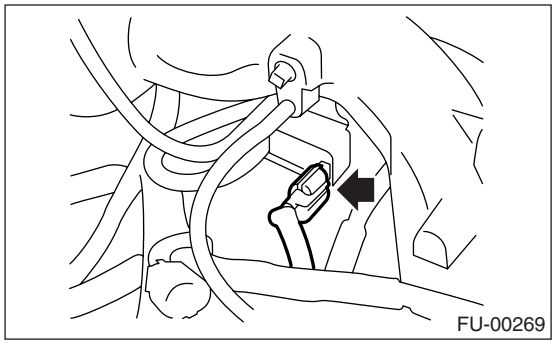
8) Remove the fuel pipe protector RH.



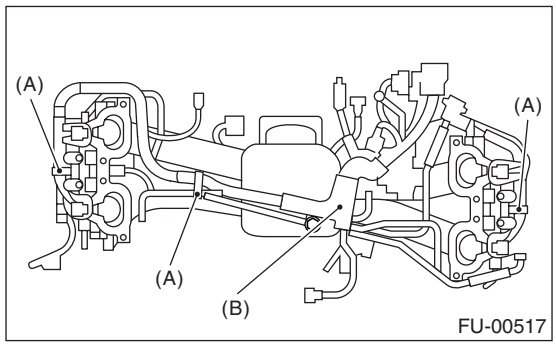
9) Disconnect the connectors from the fuel injectors.



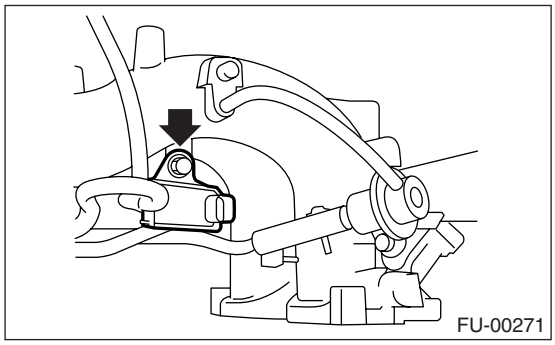
10) Disconnect the connector from the purge control solenoid valve.



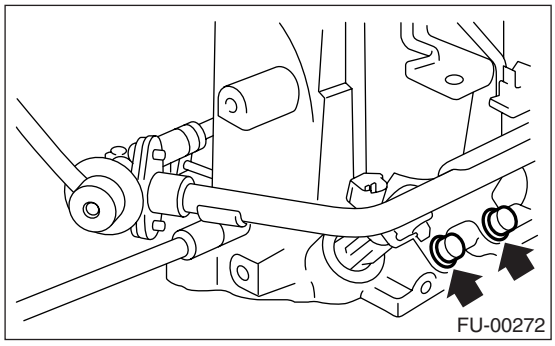
11) Disconnect the air by-pass hose from the purge control solenoid valve.
12) Remove the harness bands (A) and harness bracket (B) which hold engine harness onto the intake manifold.



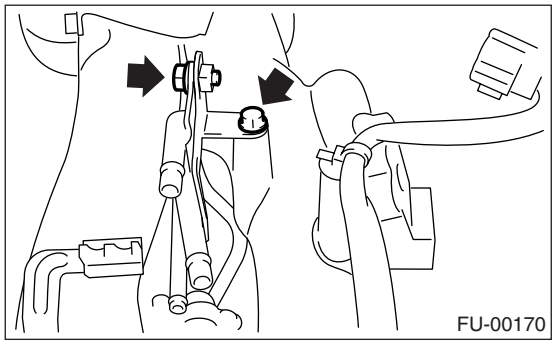
13) Remove the engine harness from the intake manifold.
14) Remove the purge control solenoid valve.



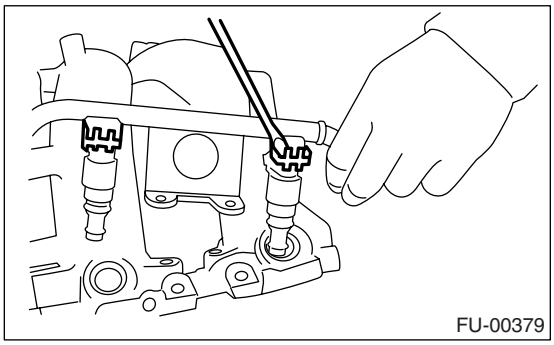
15) Remove the bolt which installs injector pipe on the intake manifold as shown in figure.



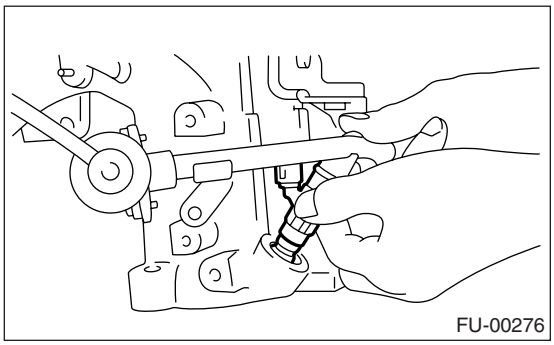
16) Remove the two bolts which hold fuel pipe assembly on the left side of intake manifold.



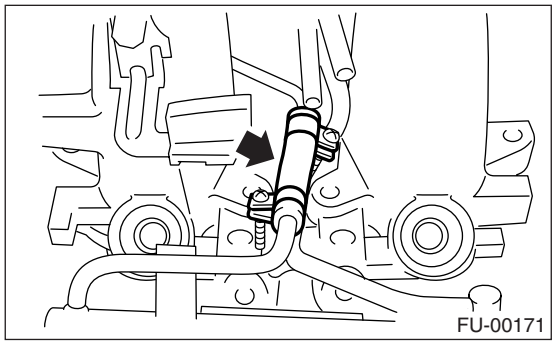
17) Remove the fuel injectors.
(1) Remove the fuel injector securing clip.



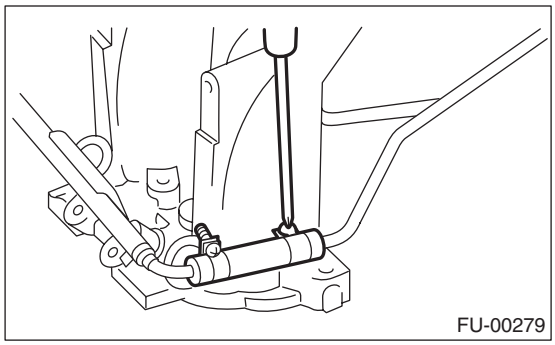
(2) Remove the fuel injector while lifting up the fuel injector pipe.



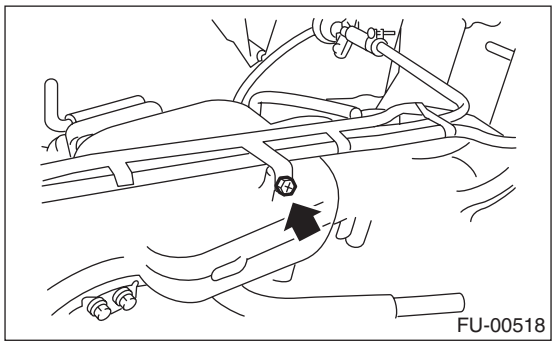
18) Loosen the clamp which holds the front left side fuel hose to the injector pipe and remove the pipe.



19) Loosen the clamp which holds the front right side fuel hose to the injector pipe and remove the pipe.



20) Remove the fuel injector pipe.
21) Remove the bolt which installs the fuel pipes on the intake manifold.

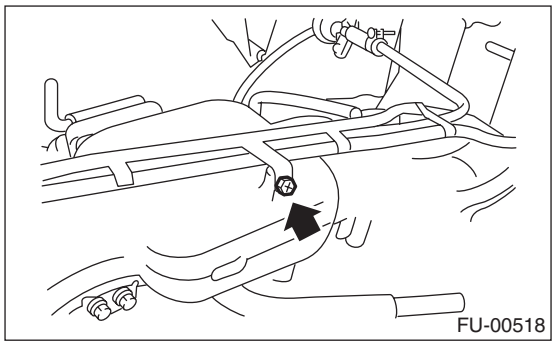


22) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.

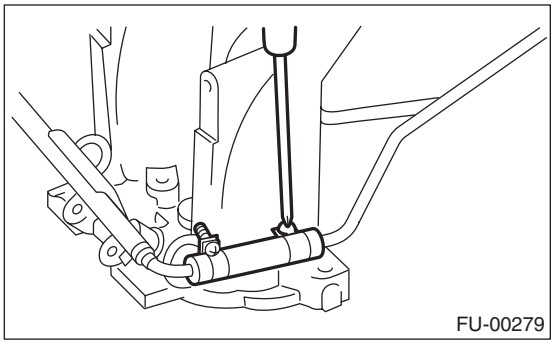
D: ASSEMBLY

1) Install the fuel pipe assembly and pressure regulator, etc. to the intake manifold.
2) Tighten the bolt which installs the fuel pipes on the intake manifold.

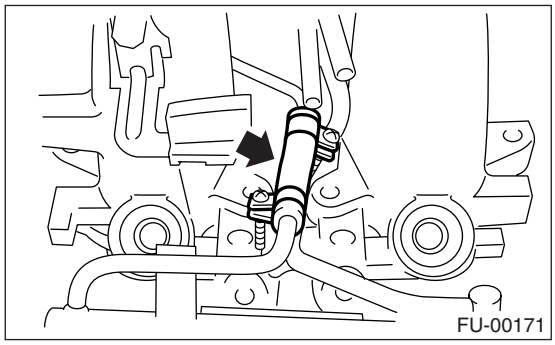
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



3) Connect the right side fuel hose to the injector pipe, and tighten the clamp screw.

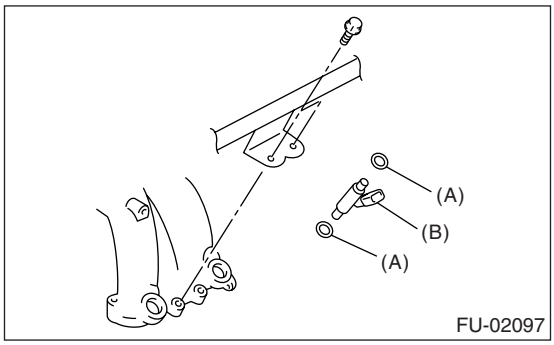


4) Install the fuel injector pipe.
5) Connect the left side fuel hose to the injector pipe, and tighten the clamp screw.



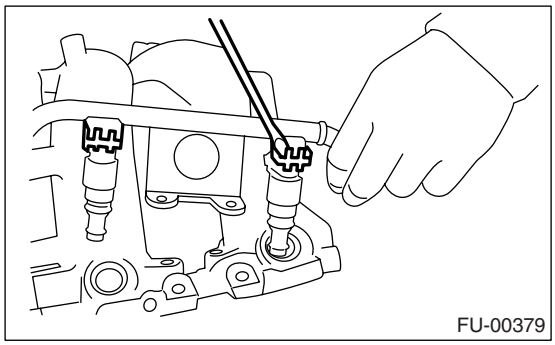
6) Install the fuel injectors.

NOTE:
Replace the O-rings with new ones.



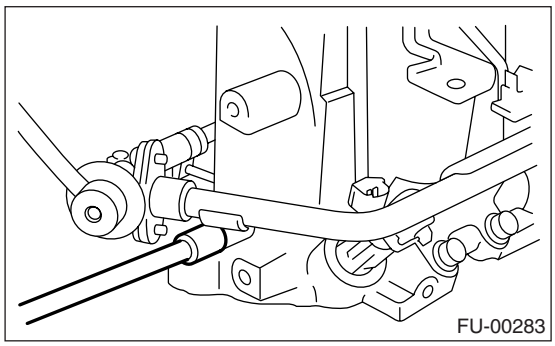
(A) O-ring
(B) Fuel injector

NOTE:
Do not forget to install the fuel injector securing clip.

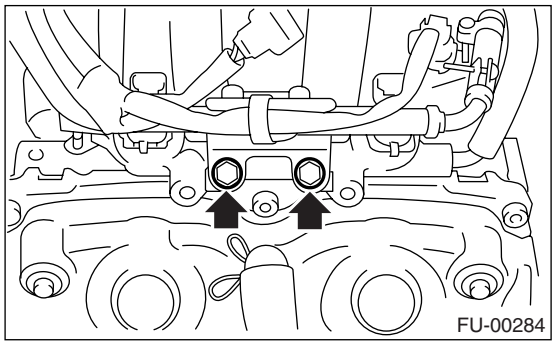


7) Tighten the bolt which installs the injector pipe on the intake manifold.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

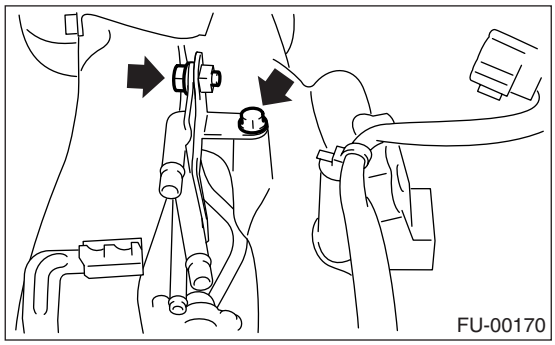


Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



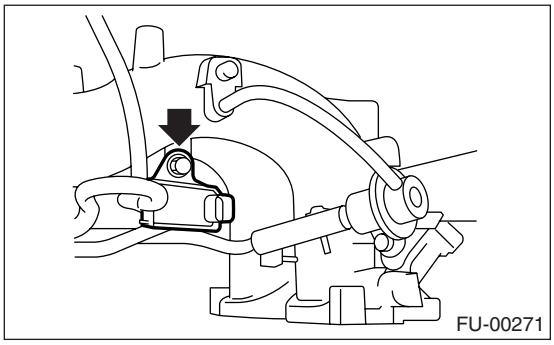
8) Tighten the two bolts which install the fuel pipe assembly on the left side of intake manifold.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



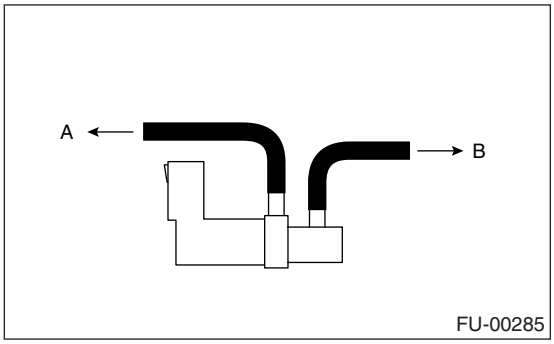
9) Install the purge control solenoid valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



10) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hose as shown in the figure.

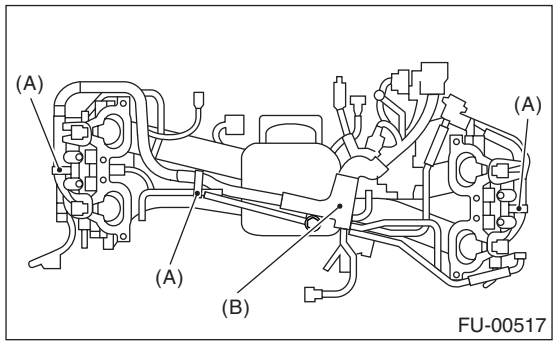


(A) To fuel pipe
(B) To intake manifold

11) Install the engine harness onto the intake manifold.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

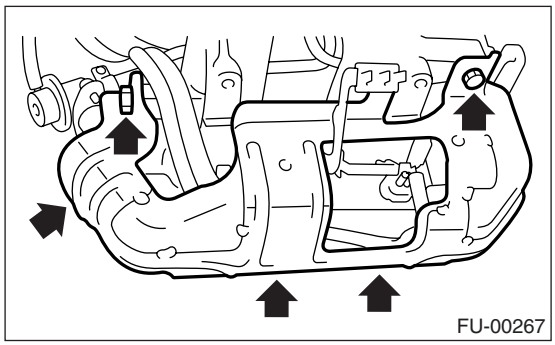
12) Connect the connectors to the fuel injectors and purge control solenoid valve.
13) Hold the engine harness by harness band (A) and harness bracket (B).



NOTE:
Do not use harness band on harnesses where they are supposed to be protected by the fuel pipe protector.

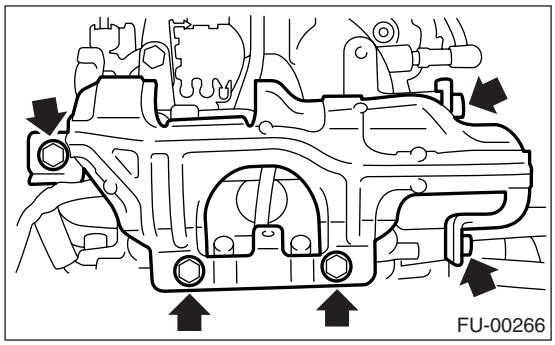
14) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

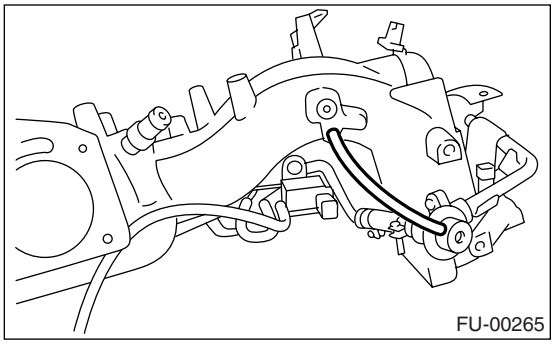


15) Install the fuel pipe protector LH.

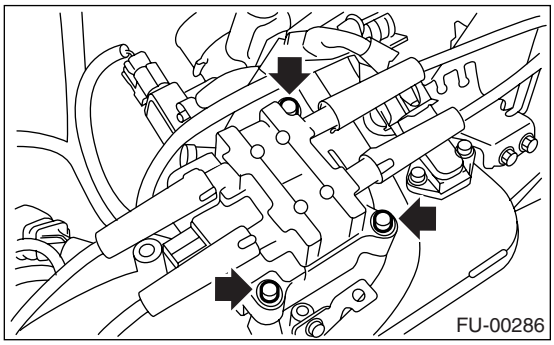
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



16) Connect the pressure regulator vacuum hose to the intake manifold.

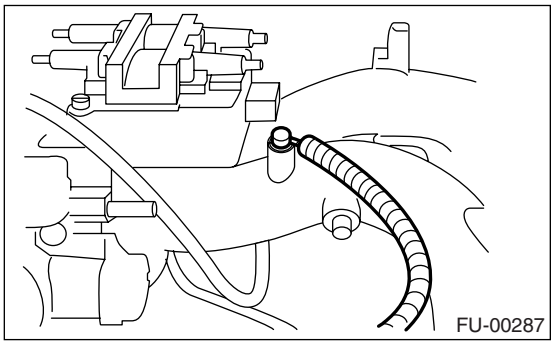


17) Install the EGR valve. **<Ref. to FU(H4SO)-34,** INSTALLATION**, EGR Valve.>**
18) Install the throttle body to the intake manifold. **<Ref. to FU(H4SO)-13,** INSTALLATION**, Throttle Body.>**
19) Install the ignition coil and ignitor assembly.



20) Connect the connector to the ignition coil and ignitor assembly.
21) Install the engine ground terminal to the intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



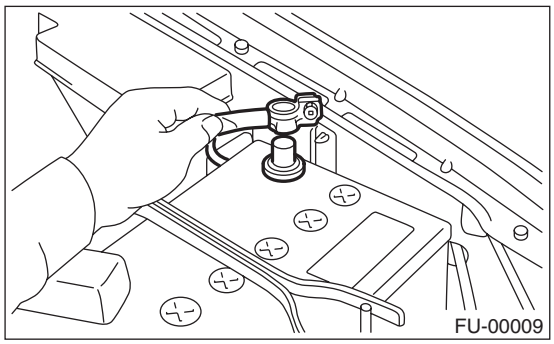
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and that connections are tight.

4. Engine Coolant Temperature Sensor

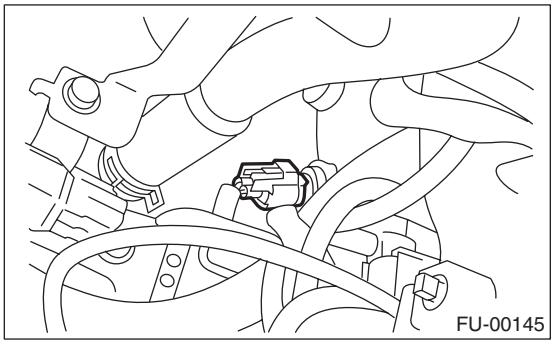
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the air intake duct and air cleaner assembly. **<Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.> <Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**

3) Disconnect the connector from the engine coolant temperature sensor.

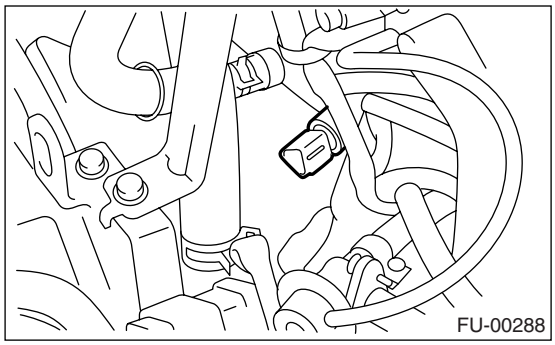


4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

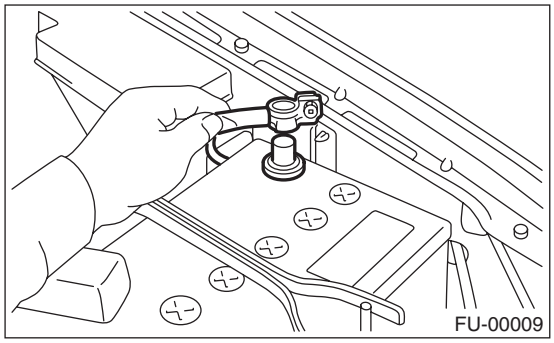
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



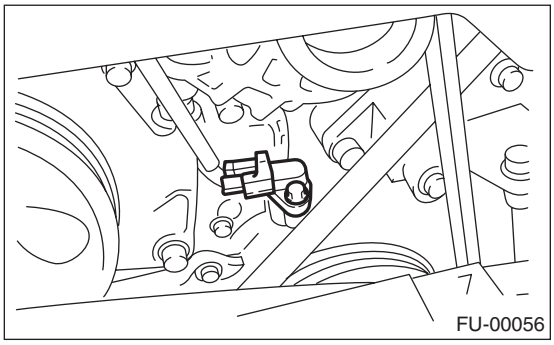
5. Crankshaft Position Sensor

A: REMOVAL

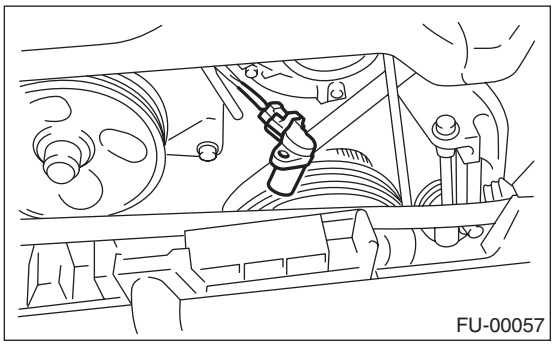
1) Disconnect the ground cable from battery.



2) Remove the bolt which install crankshaft position sensor to the cylinder block.



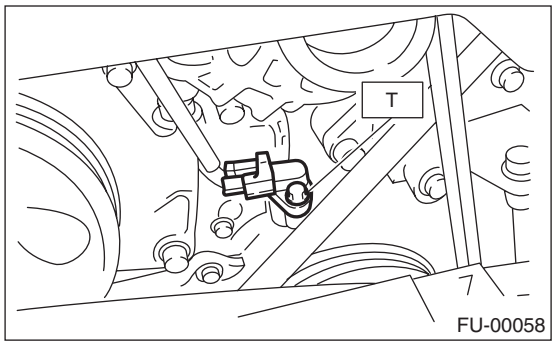
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

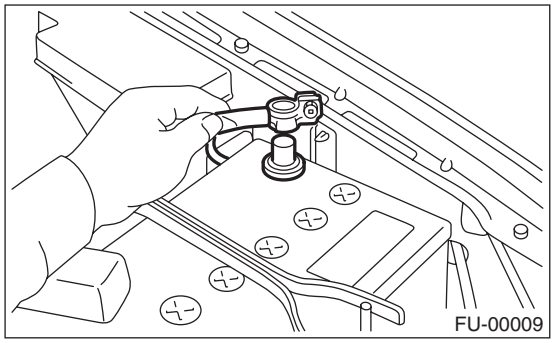
Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



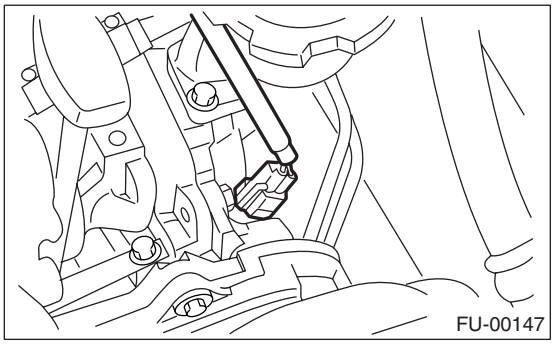
6. Camshaft Position Sensor

A: REMOVAL

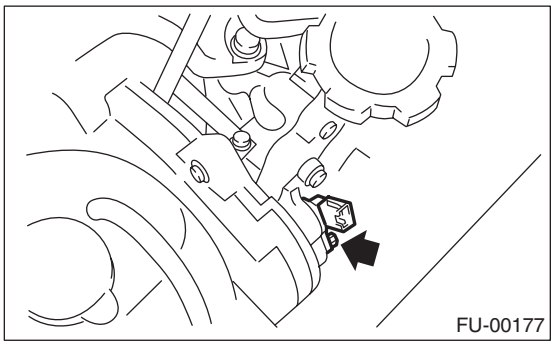
1) Disconnect the ground cable from battery.



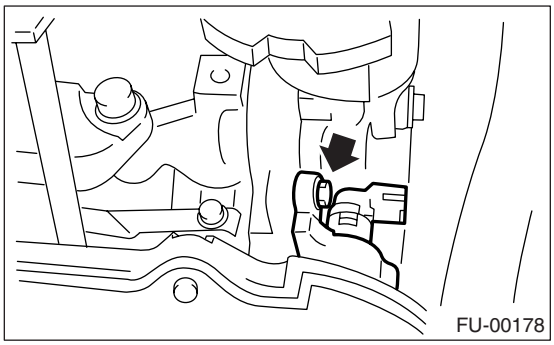
2) Disconnect the connector from the camshaft position sensor.



3) Remove the bolt which installs camshaft position sensor to the camshaft position sensor support.

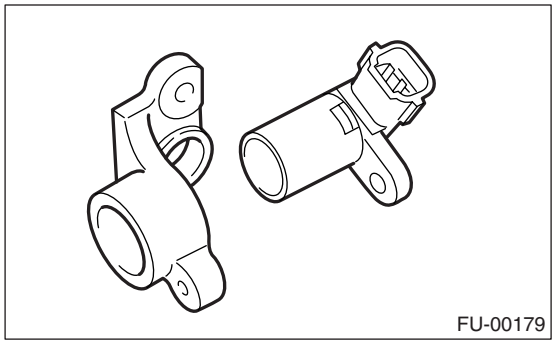


4) Remove the bolt which installs camshaft position sensor support to the camshaft cap LH.



5) Remove the camshaft position sensor and camshaft position sensor support as a unit.

6) Remove the camshaft position sensor itself.



B: INSTALLATION

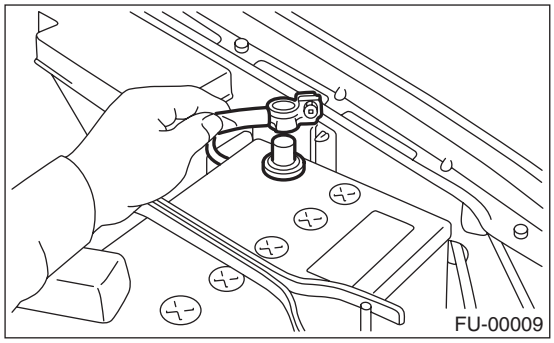
Install in the reverse order of removal.

Tightening torque:
Camshaft position sensor support
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
Camshaft position sensor
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

7. Knock Sensor

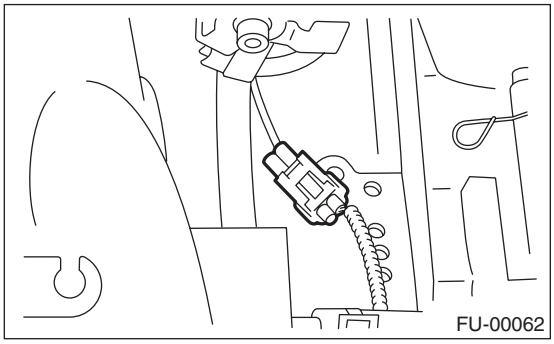
A: REMOVAL

1) Disconnect the ground cable from battery.

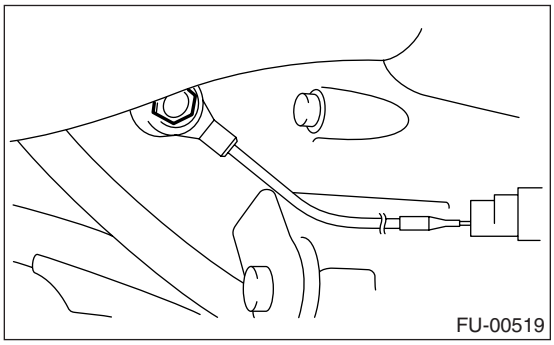


2) Remove the air cleaner case. **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**

3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

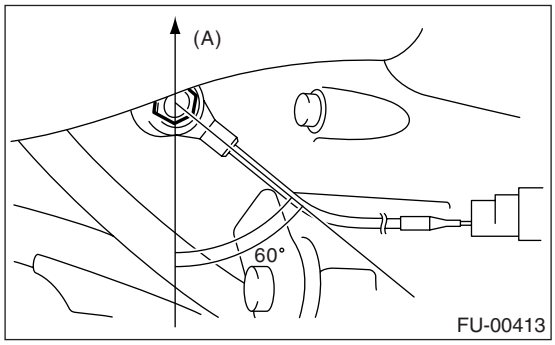


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

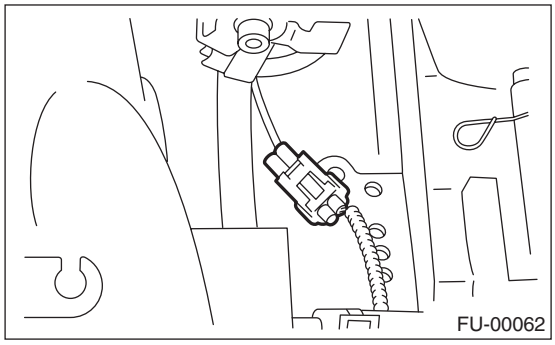
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
The extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.



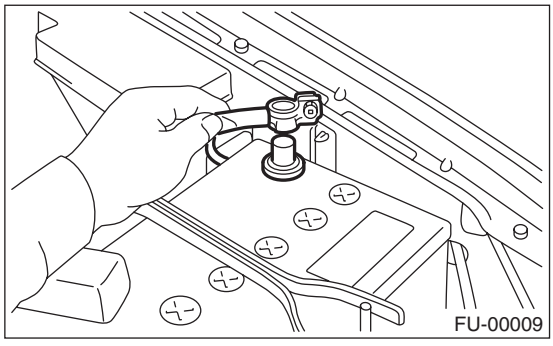
(A) Front side

2) Connect the knock sensor connector.



3) Install the air cleaner case.
<Ref. to IN(H4SO)-6, INSTALLATION**, Air Cleaner Case.>**

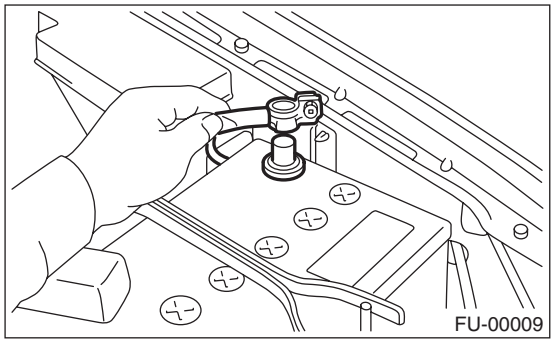
4) Connect the battery ground cable to battery.



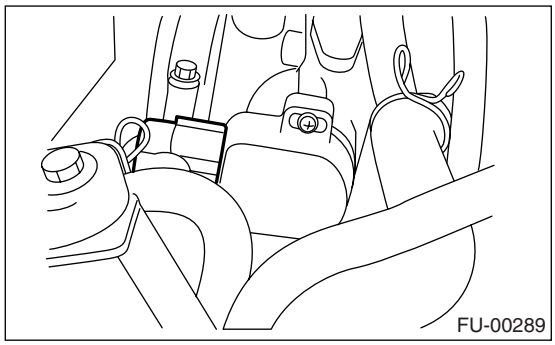
8. Throttle Position Sensor

A: REMOVAL

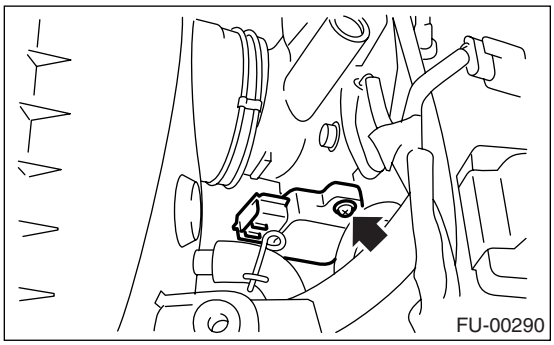
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the throttle position sensor.



3) Remove the throttle position sensor holding screws, and remove it.

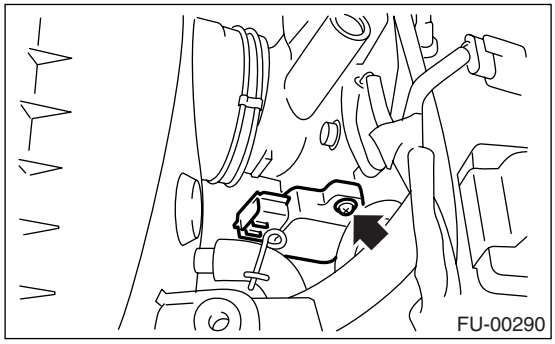


B: INSTALLATION

Install in the reverse order of removal.

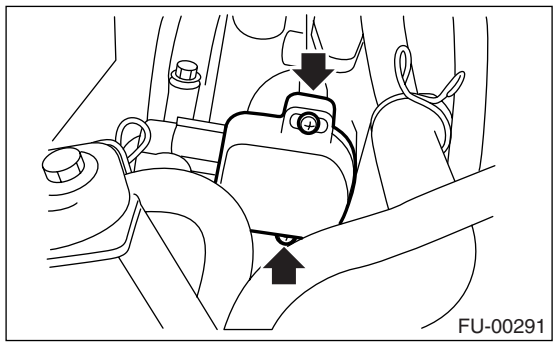
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

CAUTION:
When installing throttle position sensor, adjust to the specified data.



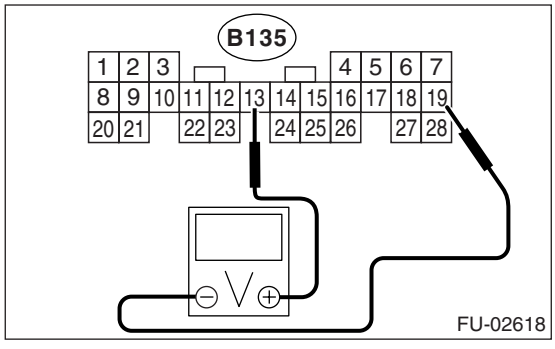
C: ADJUSTMENT

1) Turn the ignition switch to OFF.
2) Loosen the throttle position sensor holding screws.



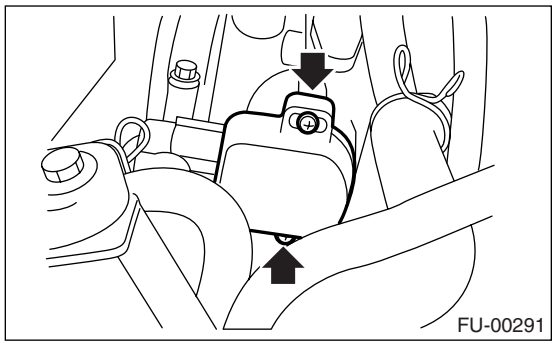
3) When using voltage meter;
(1) Take out the ECM.
(2) Turn the ignition switch to ON.
(3) Adjust the throttle position sensor to the proper position to allow the voltage signal to the ECM to be in specification.

Connector & terminal / Specified voltage
(B135) No. 13 (+) — (B135) No. 19 (–) / 0.45 — 0.55 V
[Fully closed.]

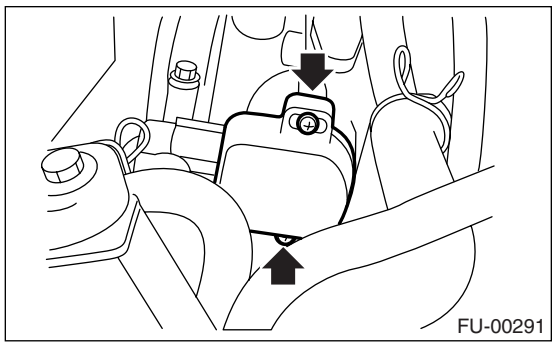


(4) Tighten the throttle position sensor holding screws.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

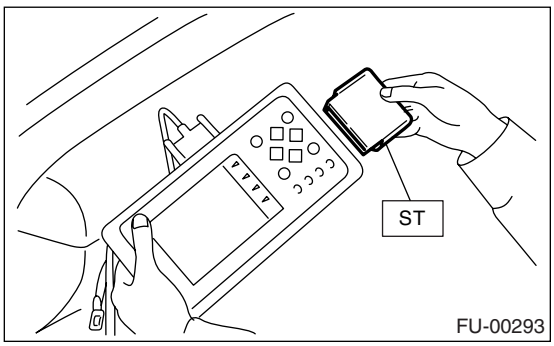


4) When using Subaru Select Monitor;
(1) Turn the ignition switch to OFF.
(2) Loosen the throttle position sensor holding screws.

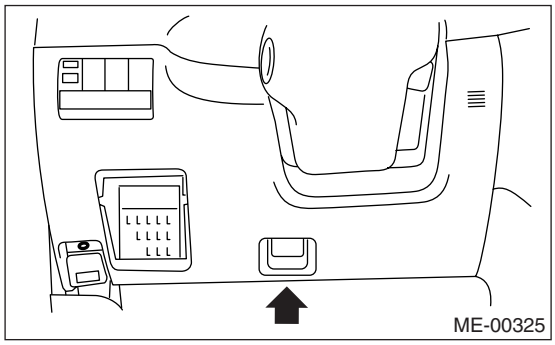


NOTE:
For detailed operation procedures, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

(3) Insert the cartridge to the Subaru Select Monitor.



(4) Connect the Subaru Select Monitor to the data link connector.

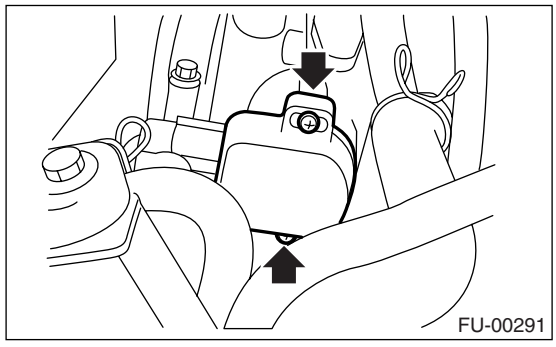


5) Turn the ignition switch to ON, and the Subaru Select Monitor switch to ON.
6) Select the {2. Each System Check} in Main Menu.
7) Select the {Engine Control System} in Selection Menu.
8) Select the {1. Current Data Display & Save} in Engine Control System Diagnostic.
9) Select the {1.12 Data Display} in Data Display Menu.
10) Adjust the throttle position sensor to the proper position to match with the following specifications.

Condition: Throttle fully closed
Throttle opening angle 0.00%
Throttle sensor voltage 0.50 V

11) Tighten the throttle position sensor holding screws.

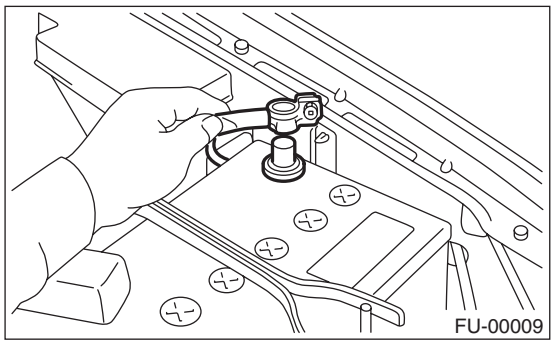
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



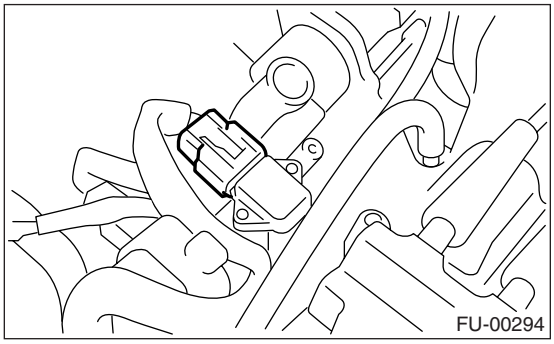
9. Manifold Absolute Pressure Sensor

A: REMOVAL

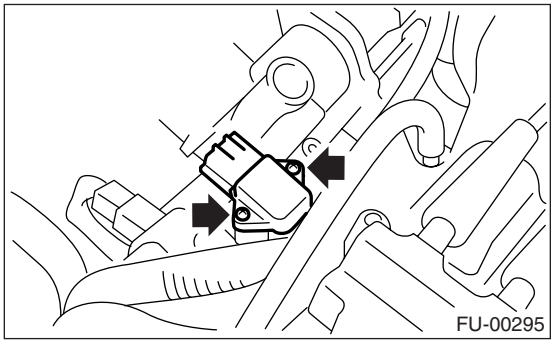
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the manifold absolute pressure sensor.



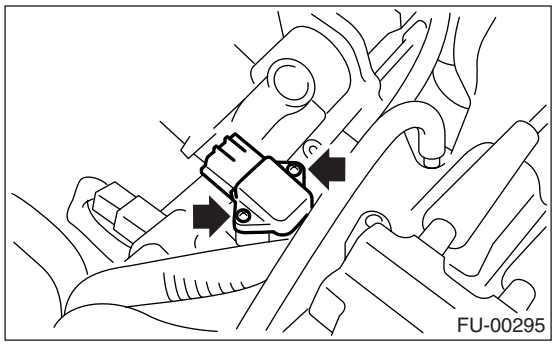
3) Remove the manifold absolute pressure sensor.



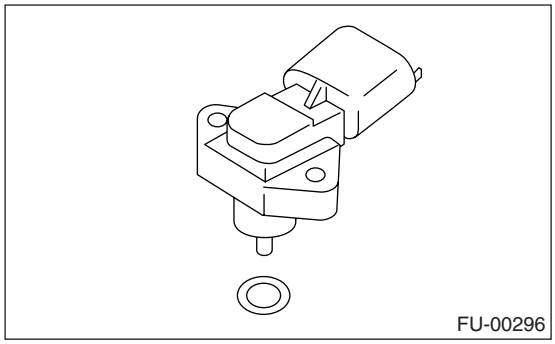
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



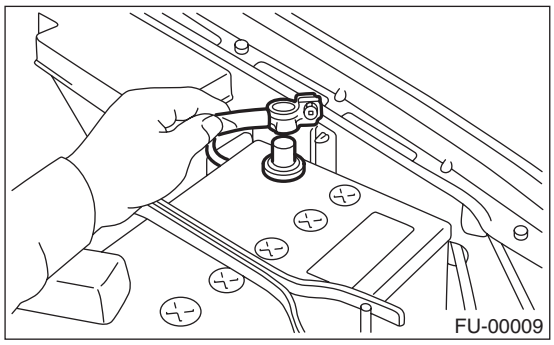
NOTE:
Replace the O-ring with a new one.



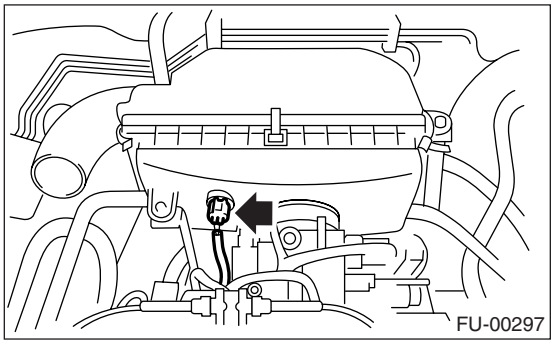
10.Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the intake air temperature sensor.
3) Remove the intake air temperature sensor from air cleaner case.



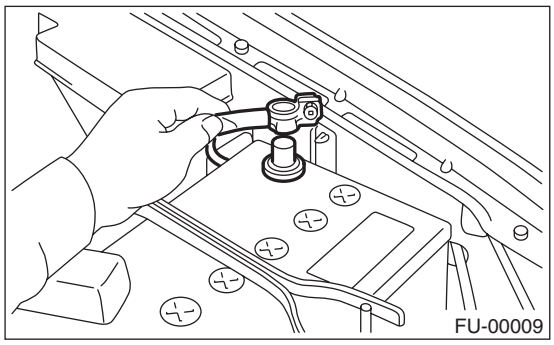
B: INSTALLATION

Install in the reverse order of removal.

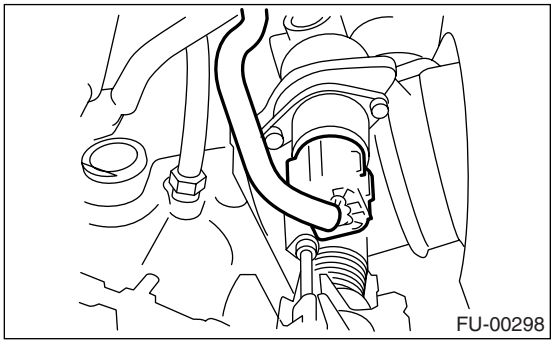
11.Idle Air Control Solenoid Valve

A: REMOVAL

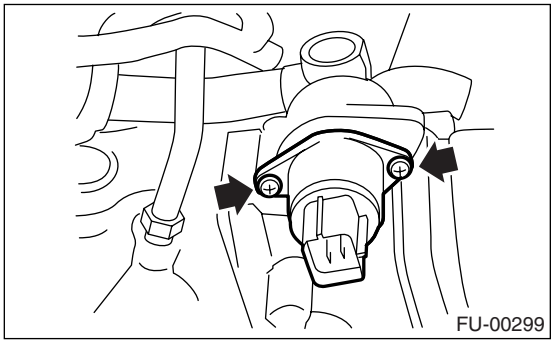
1) Disconnect the ground cable from battery.



2) Disconnect the connector from the idle air control solenoid valve.



3) Remove the idle air control solenoid valve from the throttle body.

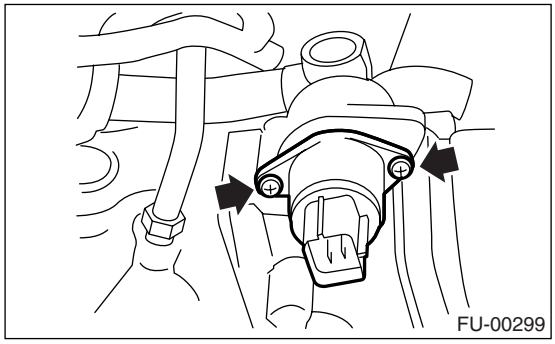


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gasket.

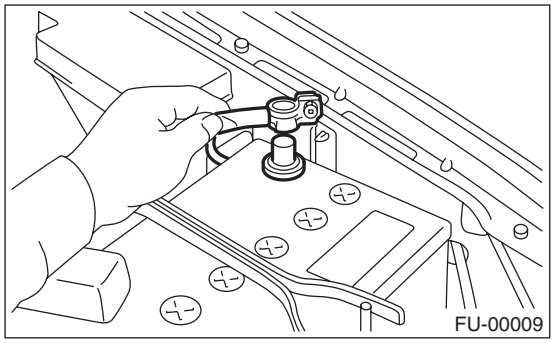
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



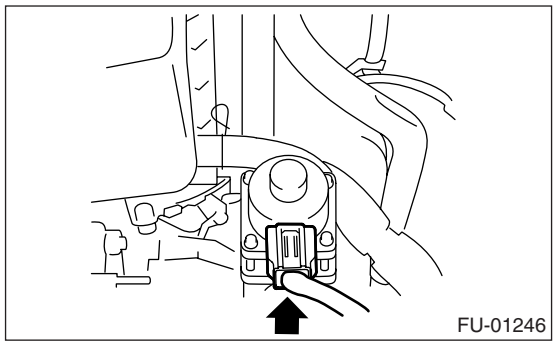
12.EGR Valve

A: REMOVAL

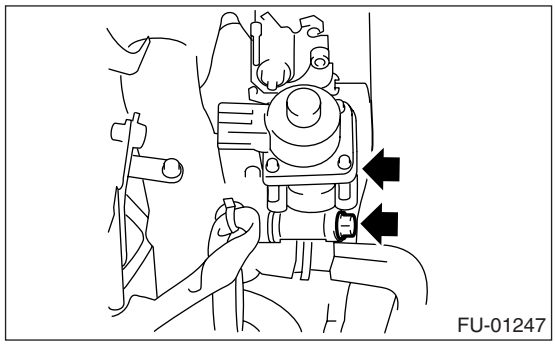
1) Disconnect the ground cable from battery.



2) Disconnect the connector from EGR valve.



3) Remove the EGR valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

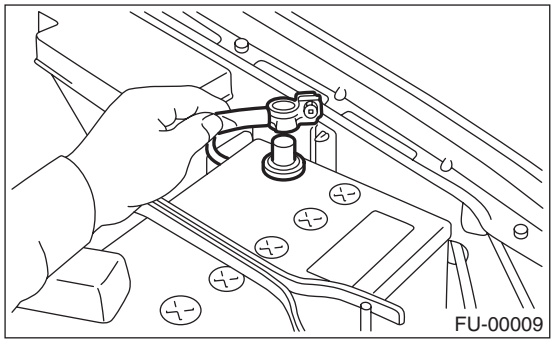
NOTE:
For tightening torque, refer to “COMPONENT”. <Ref. to FU(H4SO)-3, COMPONENT, General Description.>

13.Fuel Injector

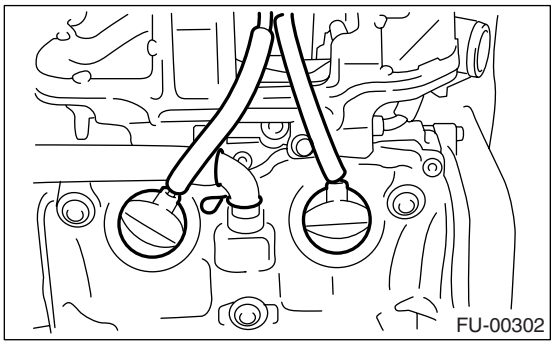
A: REMOVAL

1. RH SIDE

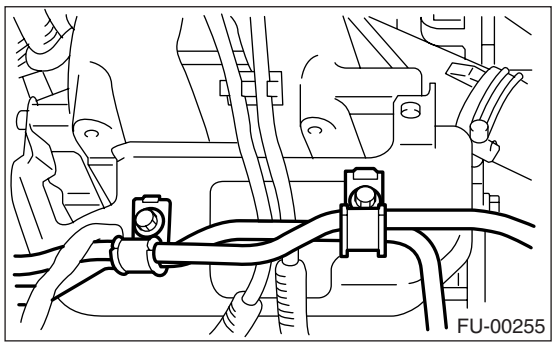
1) Release the fuel pressure.
<Ref. to FU(H4SO)-47, RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
2) Open the fuel filler flap lid, and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.



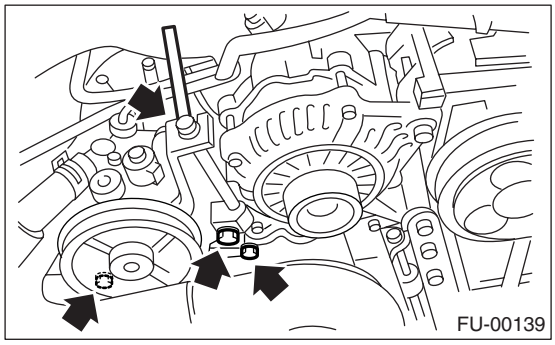
4) Remove the resonator chamber. **<Ref. to IN(H4SO)-8,** REMOVAL**, Resonator Chamber.>**
5) Remove the spark plug cords from the spark plugs (#1 and #3 cylinders).



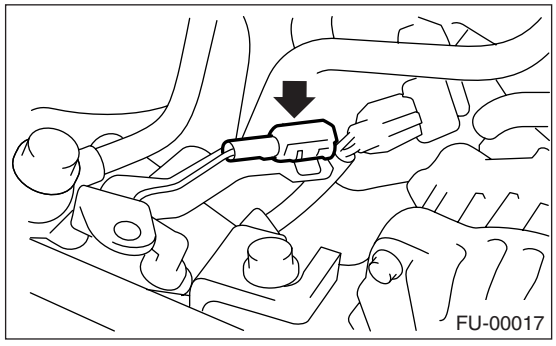
6) Remove the power steering pump and reservoir tank from the brackets.
(1) Remove the front side V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
(2) Remove the bolts which hold the power steering pipes onto the intake manifold protector.



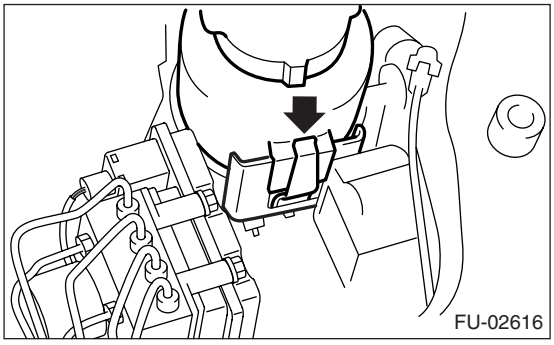
(3) Remove the bolts which install the power steering pump to the bracket.



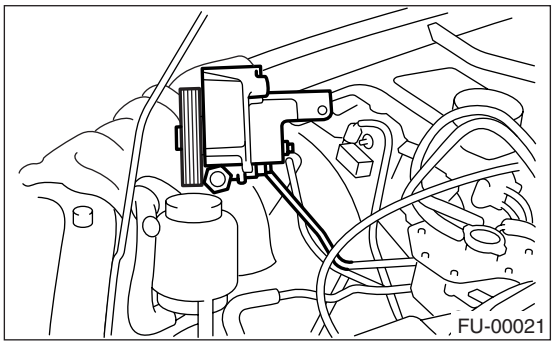
(4) Disconnect the connector from the power steering pump switch.



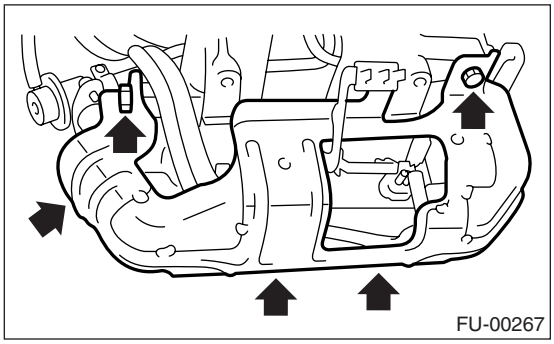
(5) Remove the power steering tank from the bracket by pulling it upwards.



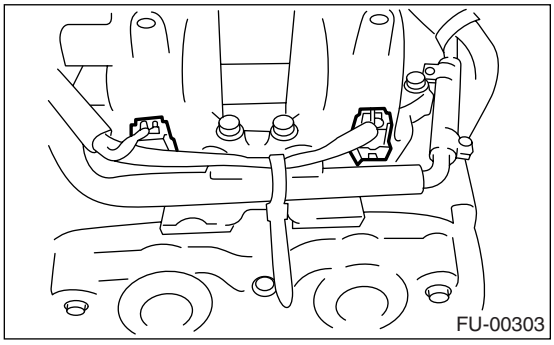
(6) Place the power steering pump and reservoir tank on the right side wheel apron.



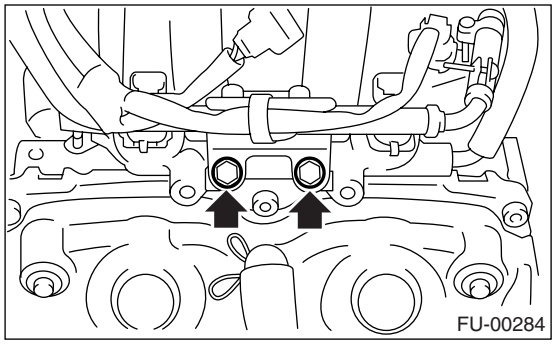
7) Remove the fuel pipe protector RH.

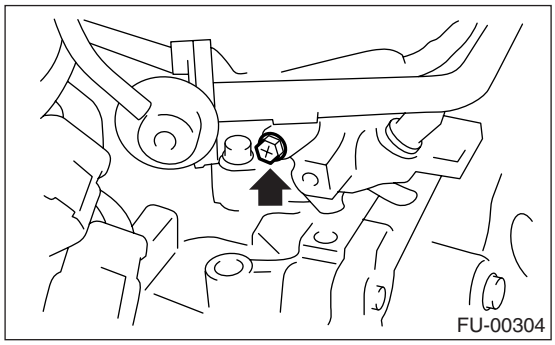


8) Disconnect the connector from fuel injector.



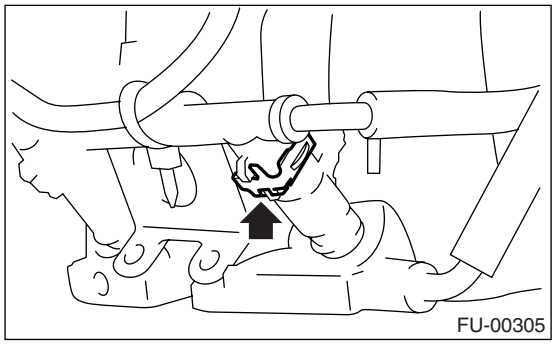
9) Remove the bolts which holds the fuel injector pipe to the intake manifold.



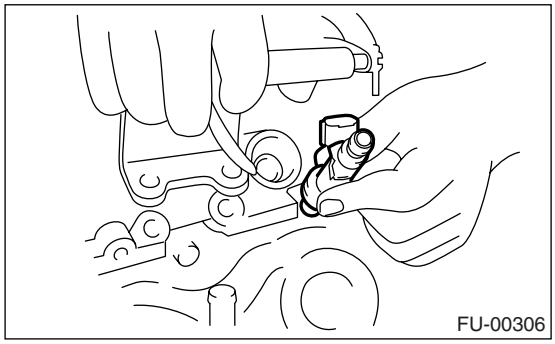


10) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.

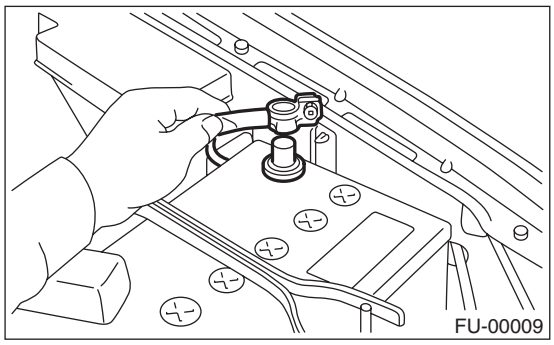


(2) Remove the fuel injector while lifting up the fuel injector pipe.

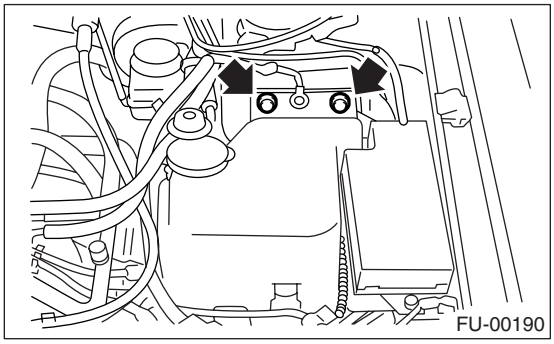


2. LH SIDE

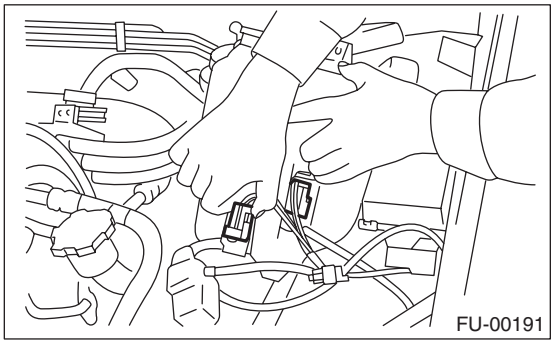
1) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
2) Open the fuel filler flap lid, and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.


FU-00009

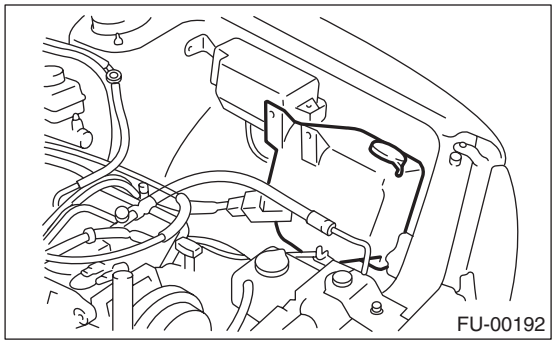
4) Remove the two bolts which install the washer tank on the body.


FU-00190

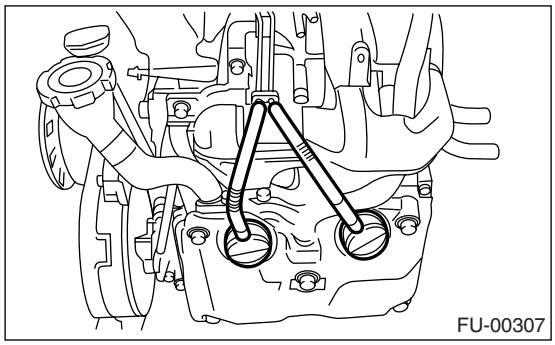
5) Disconnect the connector from the front window washer motor.
6) Disconnect the connector from the rear gate glass washer motor.


FU-00191

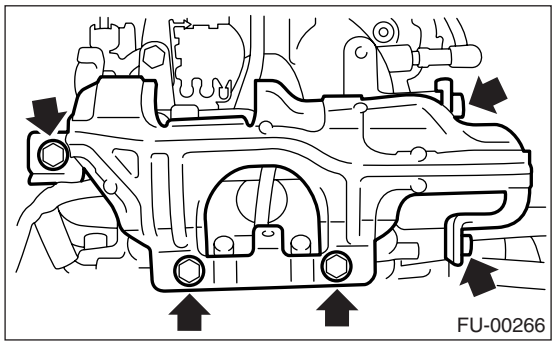
7) Disconnect the rear window glass washer hose from the washer motor, then plug the connection with a suitable cap.
8) Move the washer tank, and secure it away from the working area.


FU-00192

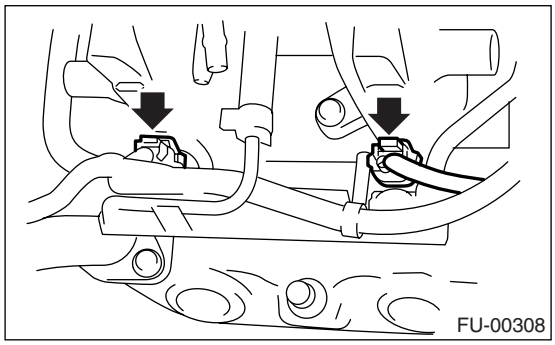
9) Remove the spark plug cords from the spark plugs (#2 and #4 cylinders).


FU-00307

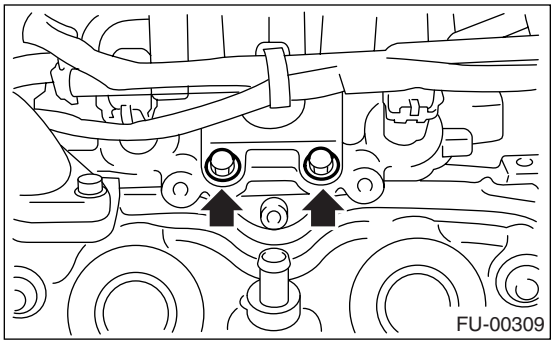
10) Remove the fuel pipe protector LH.


FU-00266

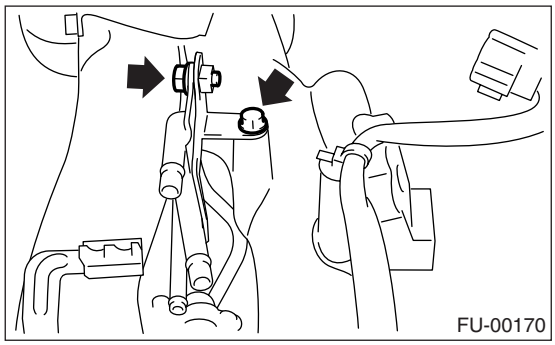
11) Disconnect the connector from the fuel injector.


FU-00308

12) Remove the bolt which holds the injector pipe to the intake manifold.

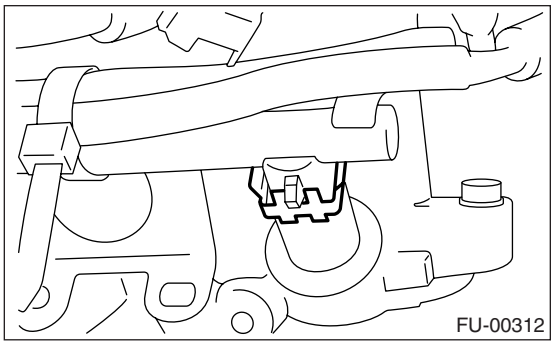


13) Remove the bolt which holds the fuel pipe on the left side intake manifold.

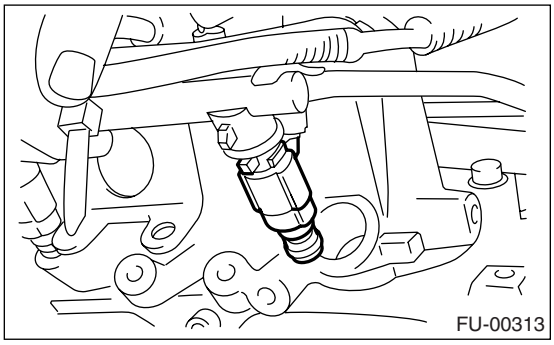


14) Remove the fuel injector from the intake manifold.

(1) Remove the fuel injector securing clip.



(2) Remove the fuel injector while lifting up the fuel injector pipe.

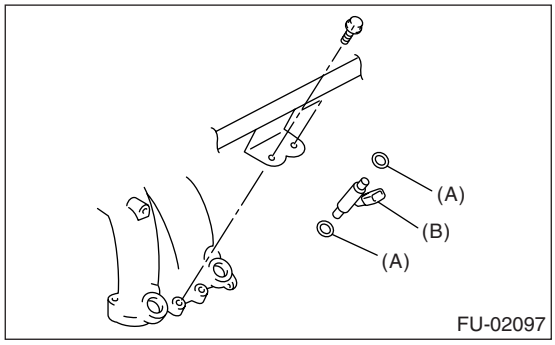


B: INSTALLATION

1. RH SIDE

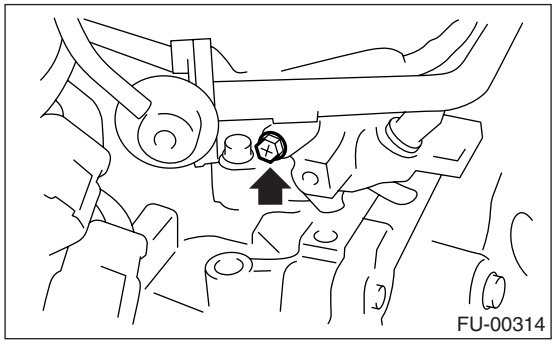
Install in the reverse order of removal.

NOTE:
Replace O-rings with new ones.

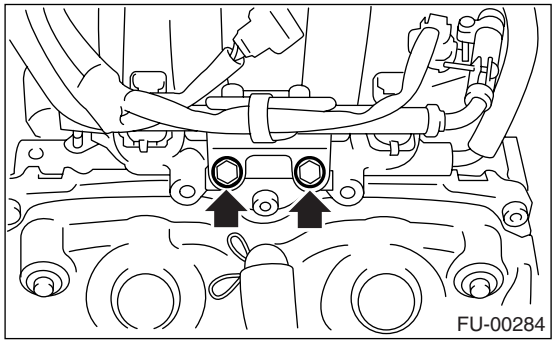


(A) O-ring
(B) Fuel injector

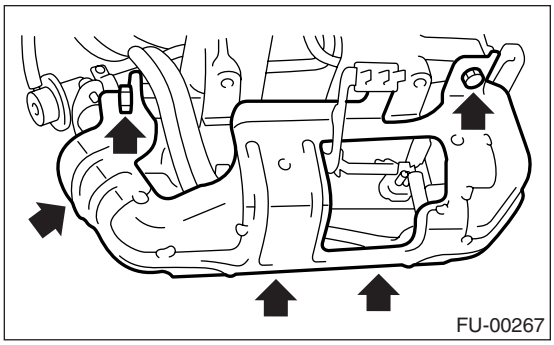
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



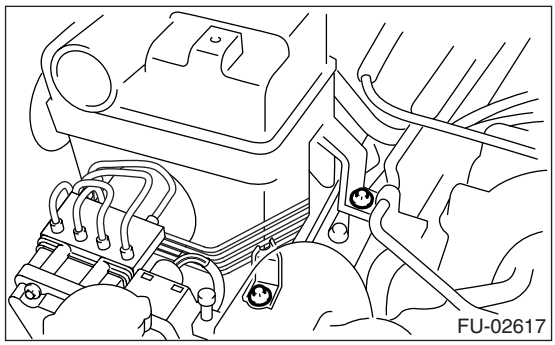
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



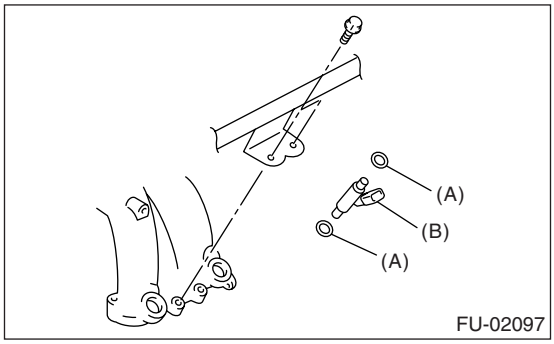
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



2. LH SIDE

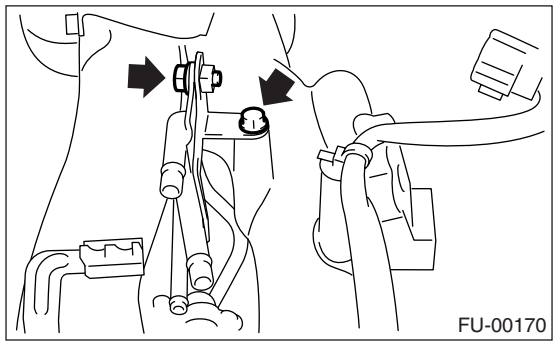
Install in the reverse order of removal.

CAUTION:
Replace O-rings with new ones.

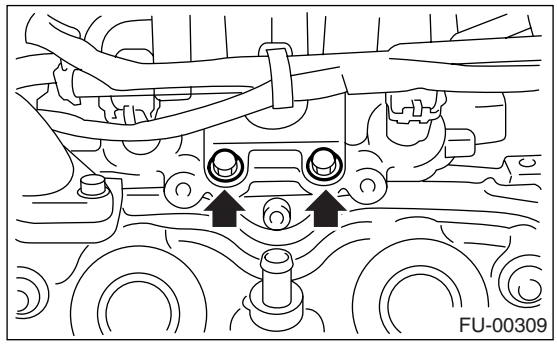


(A) O-ring
(B) Fuel injector

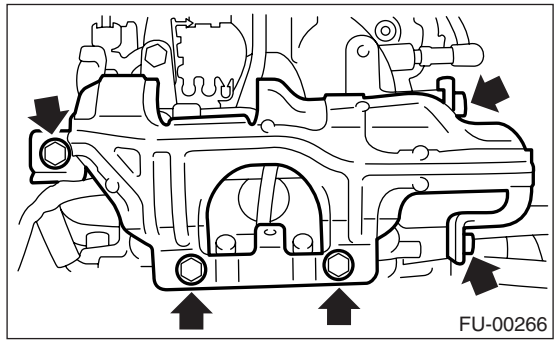
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



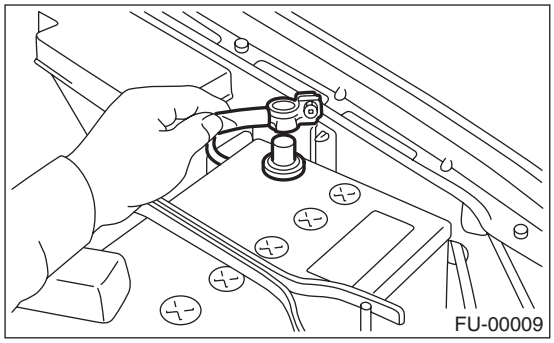
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



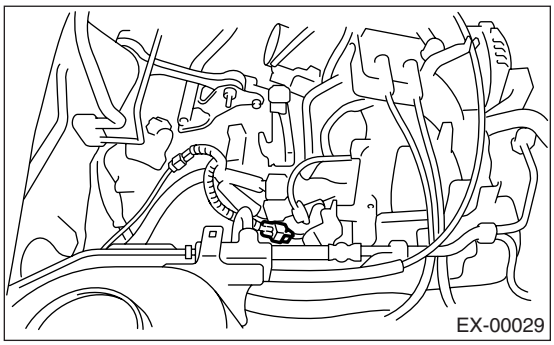
14.Front Oxygen (A/F) Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

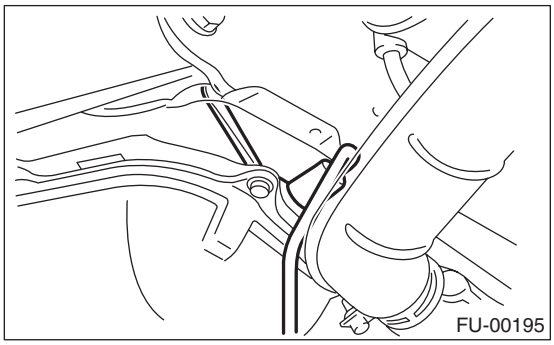


2) Disconnect the connector from engine hanger, and then disconnect the connector from front oxygen (A/F) sensor.



3) Lift-up the vehicle.
4) Apply spray type lubricant or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
5) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.

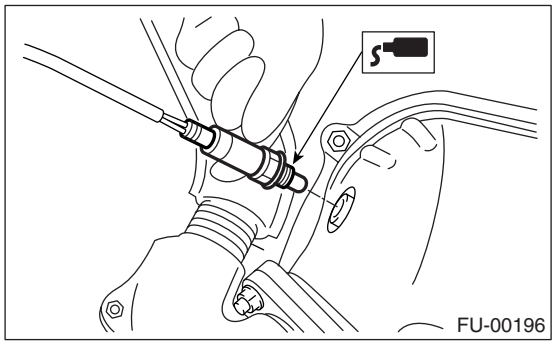


B: INSTALLATION

1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

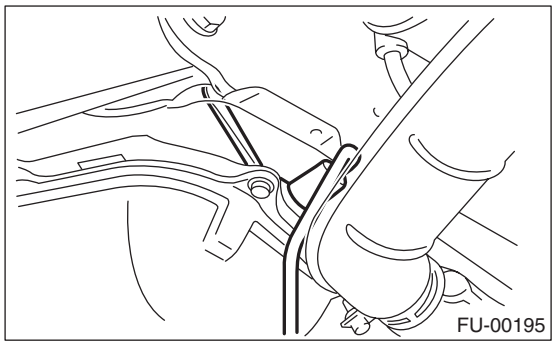
Anti-seize compound:
SS-30 JET LUBE

CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

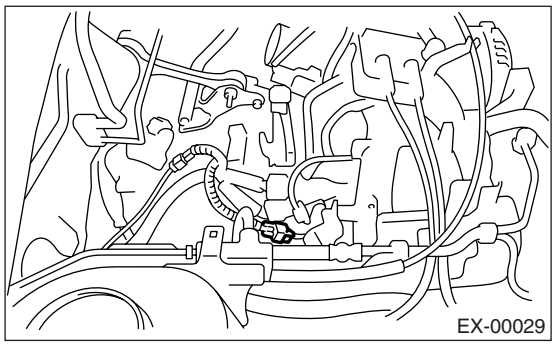


2) Install the front oxygen (A/F) sensor.

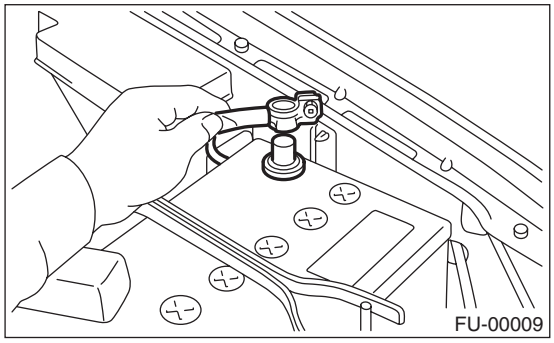
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Lower the vehicle.
4) Connect the connector to front oxygen (A/F) sensor, and then connect the connector to engine hanger.



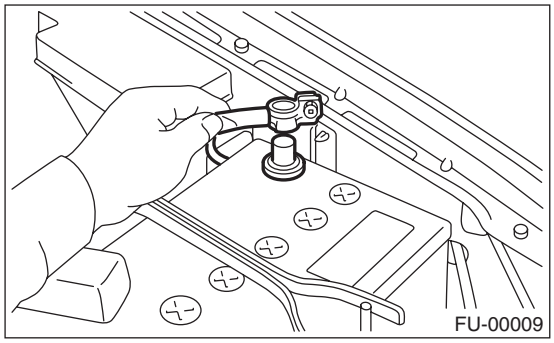
5) Connect the battery ground cable to battery.



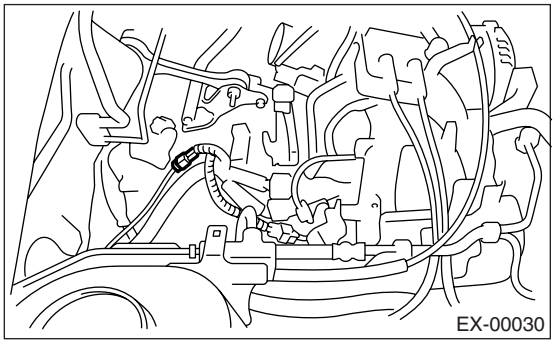
15.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

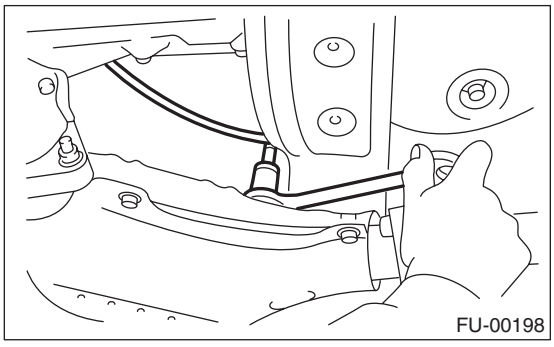


2) Lift-up the vehicle.
3) Disconnect the connector from the rear oxygen sensor.



4) Apply spray type lubricant or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
5) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools, otherwise it will damage exhaust pipe.

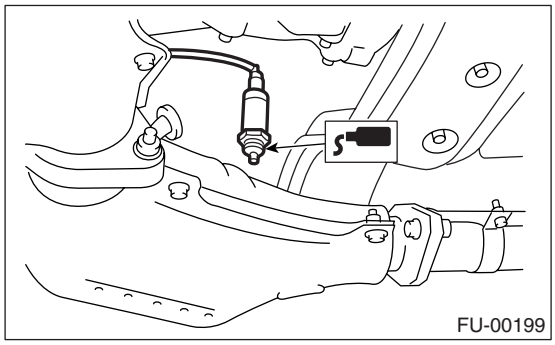


B: INSTALLATION

1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

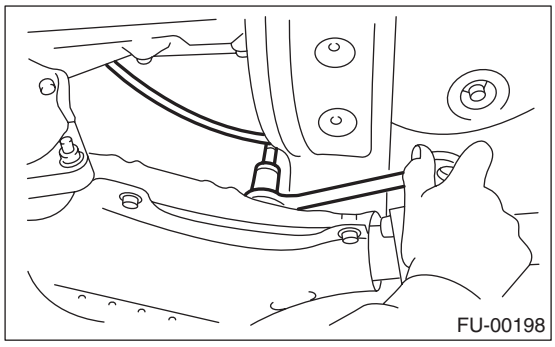
Anti-seize compound:
SS-30 JET LUBE

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

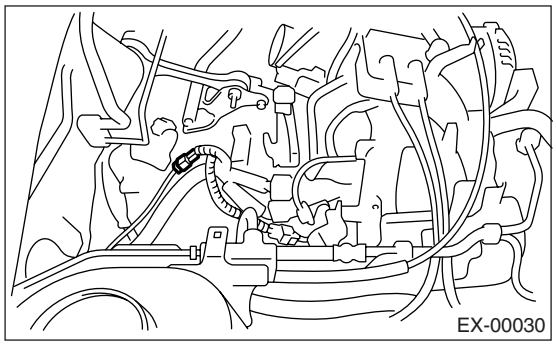


2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

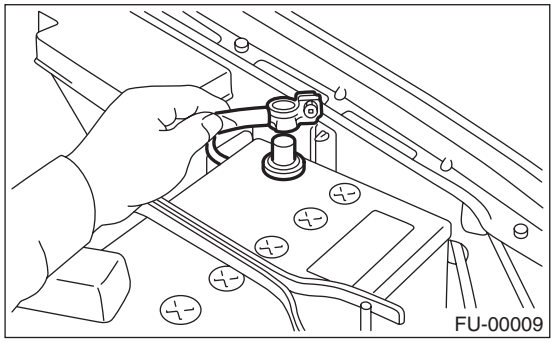


3) Connect the connector to the rear oxygen sensor.



4) Lower the vehicle.

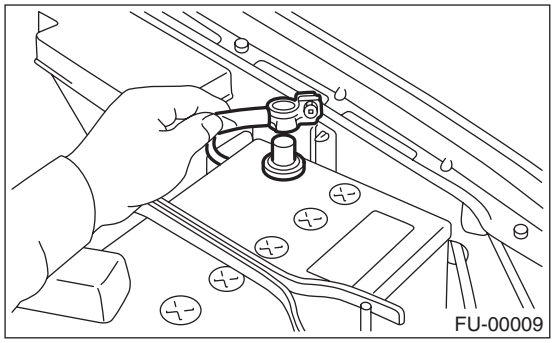
5) Connect the battery ground cable to battery.



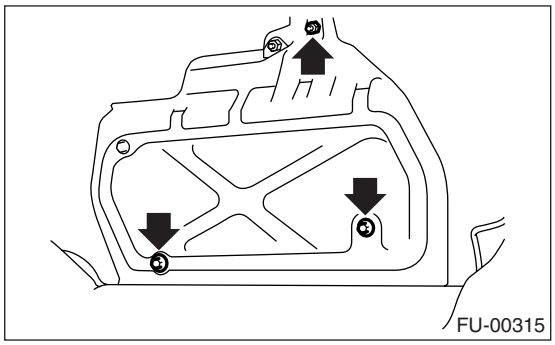
16.Engine Control Module (ECM)

A: REMOVAL

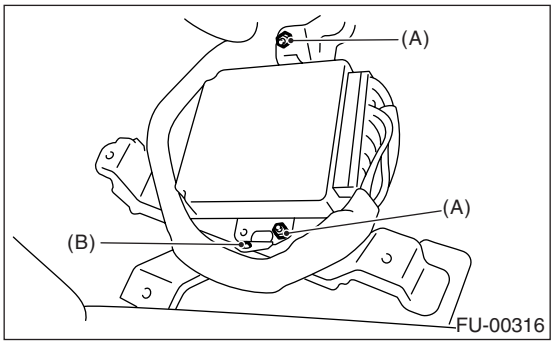
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger side.
<Ref. to EI-45, REMOVAL**, Lower Inner Trim.>**
3) Detach the floor mat of front passenger seat.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.
6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

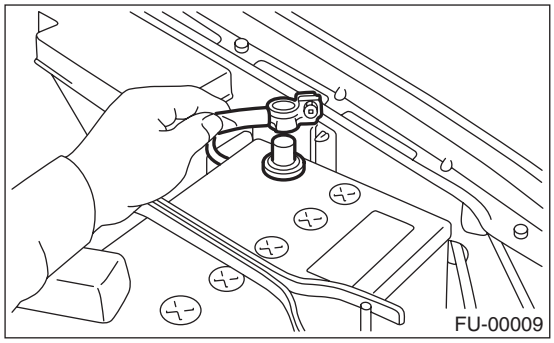
CAUTION:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

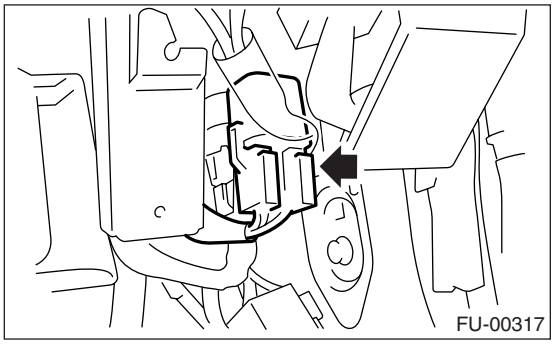
17.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds main bracket on the body.
4) Disconnect the connectors from the main relay.



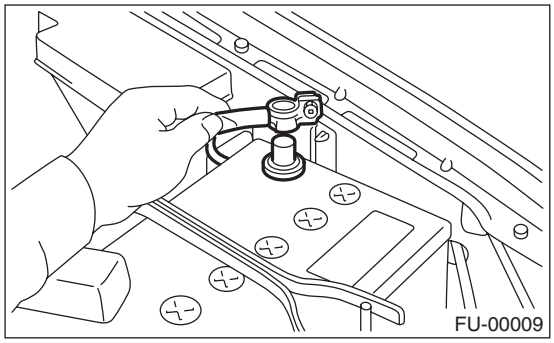
B: INSTALLATION

Install in the reverse order of removal.

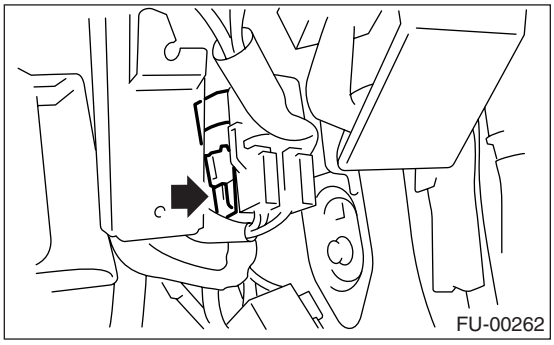
18.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the passenger's side front side sill cover.
3) Remove the bolt which holds fuel pump relay bracket on the body.
4) Disconnect the connector from the fuel pump.



5) Remove the fuel pump relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

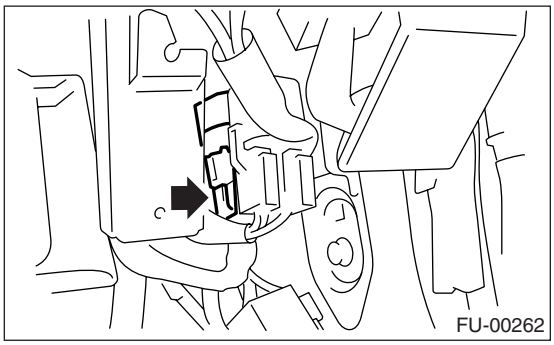
19.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Disconnect the connector from fuel pump relay.

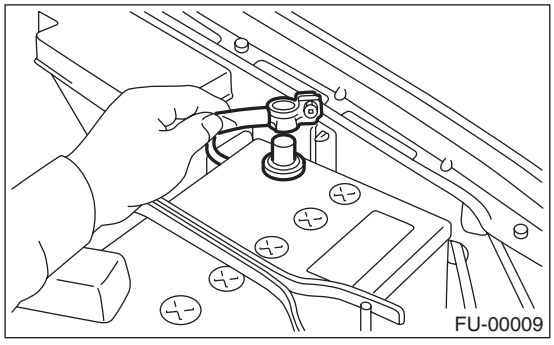


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for 5 more seconds.
4) Turn the ignition switch to OFF.

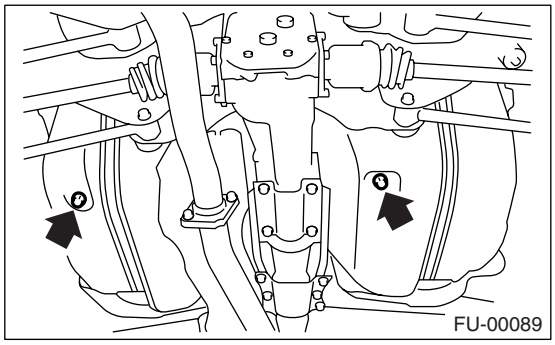
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



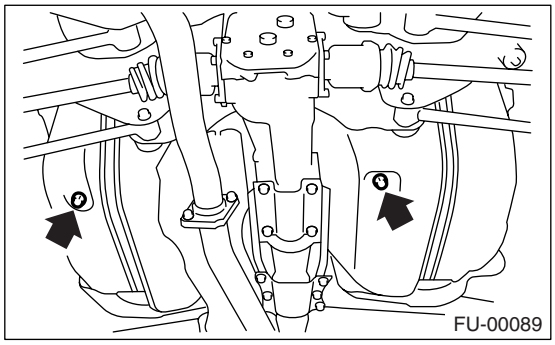
3) Open the fuel filler flap lid and remove fuel filler flap lid cap.
4) Lift-up the vehicle.
5) Drain fuel from the fuel tank.
Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

NOTE:
Use a new gasket.

Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)

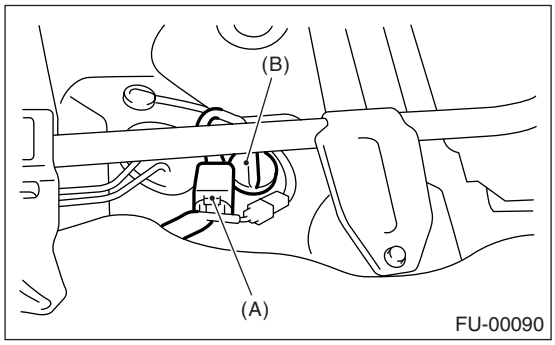


20.Fuel Tank

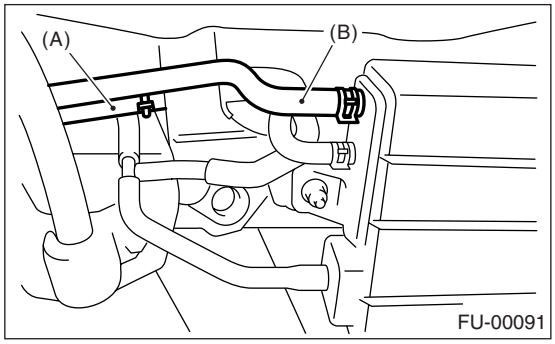
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

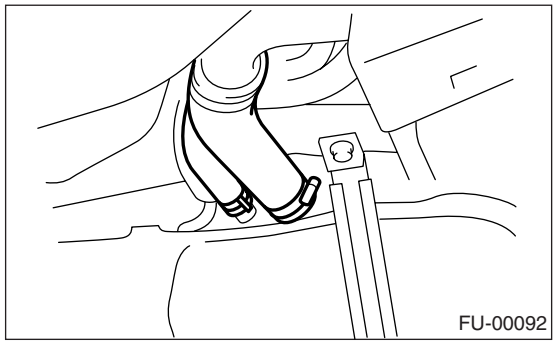
1) Set the vehicle on a lift.
2) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
3) Drain fuel from the fuel tank. **<Ref. to FU(H4SO)-47,** DRAINING FUEL, OPERATION**, Fuel.>**
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to rear harness.
6) Push the grommet (B) which holds fuel tank cord on floor panel into under the body.



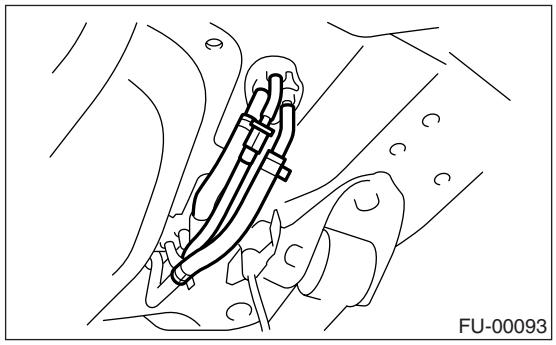
7) Remove the rear crossmember. **<Ref. to RS-18,** REMOVAL**, Rear Crossmember.>**
8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



9) Loosen the clamp and disconnect the fuel filler flap lid hose and air vent hose from fuel filler pipe.

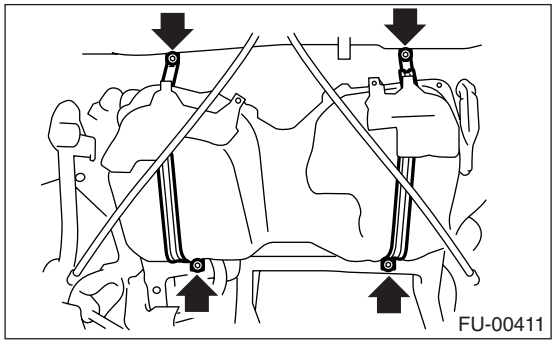


10) Move the clips, and disconnect quick connector. **<Ref. to FU(H4SO)-63,** REMOVAL**, Fuel Delivery, Return and Evaporation Lines.>**
11) Disconnect the fuel hoses.



12) Support the fuel tank with transmission jack, and remove the bolts from bands and dismount fuel tank from the vehicle.

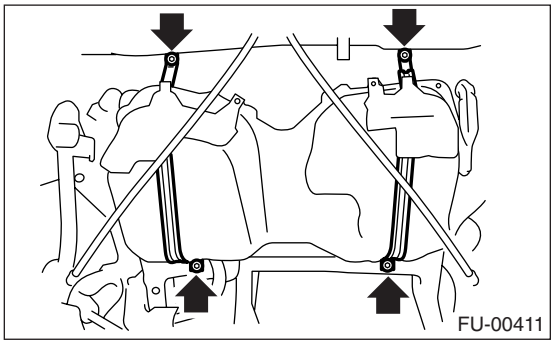
WARNING:
A helper is required to perform this work.



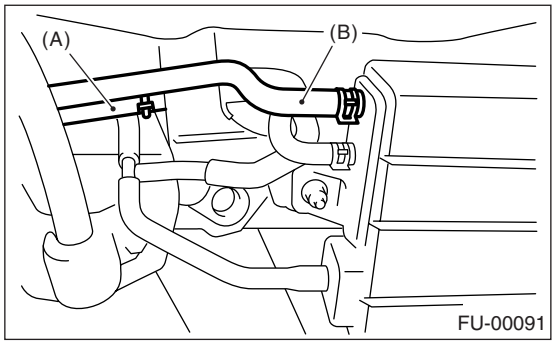
B: INSTALLATION

1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

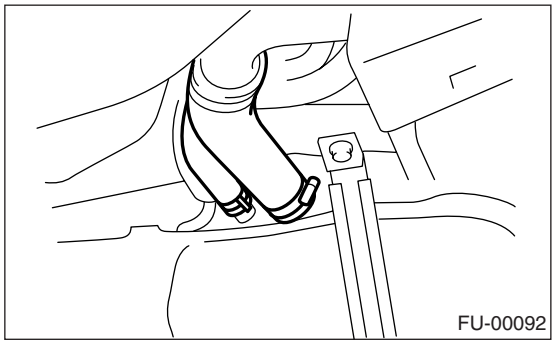
WARNING:
A helper is required to perform this work.



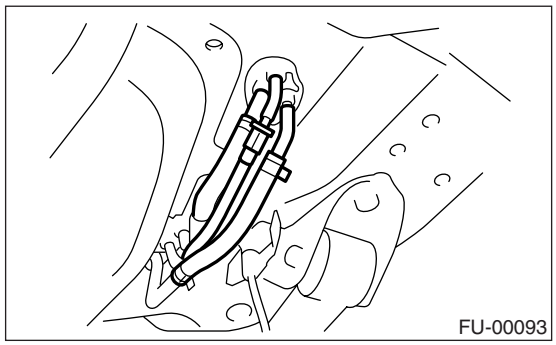
3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.



4) Connect the fuel filler flap lid hose and air vent hose.

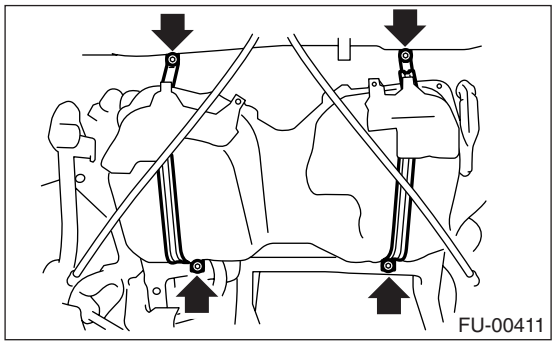


5) Connect the fuel hoses, and secure them with clips and quick connector. **<Ref. to FU(H4SO)-64,** INSTALLATION**, Fuel Delivery, Return and Evaporation Lines.>**

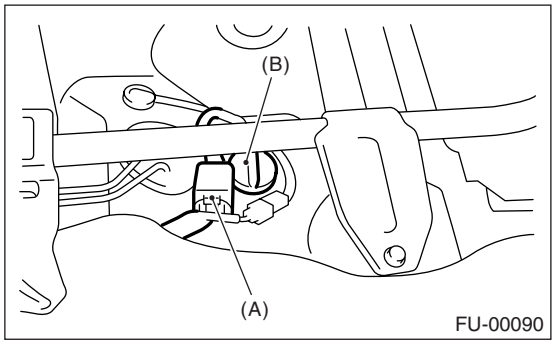


6) Tighten the band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

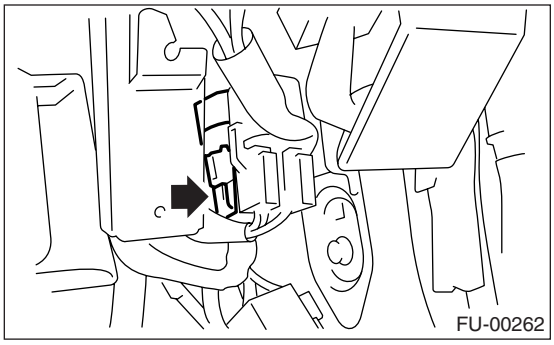


7) Install the rear crossmember. **<Ref. to RS-18,** INSTALLATION**, Rear Crossmember.>**
8) Connect the connector (A) to fuel tank cord and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.

10) Connect the connector to fuel pump relay.



C: INSPECTION

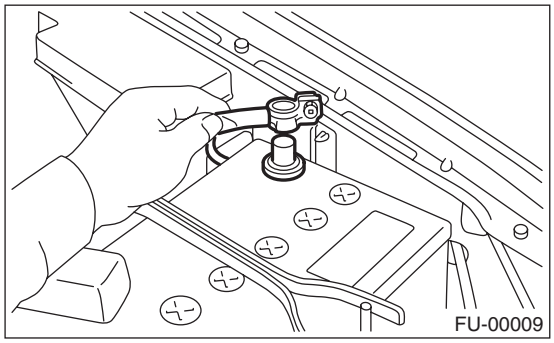
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

21.Fuel Filler Pipe

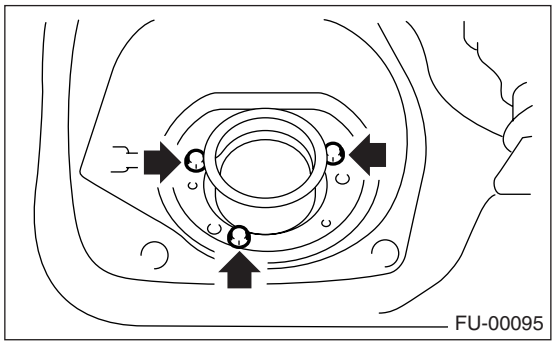
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

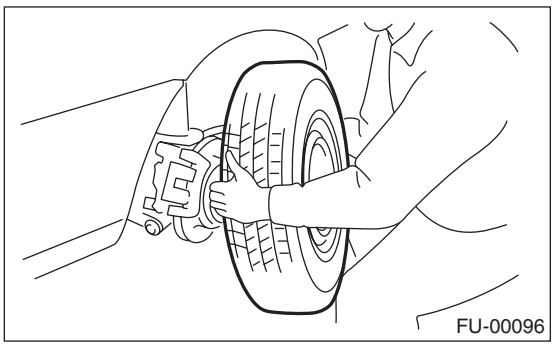
1) Set the vehicle on a lift.
2) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
3) Open the fuel filler flap lid and remove fuel filler flap lid cap.
4) Disconnect the ground cable from battery.


FU-00009

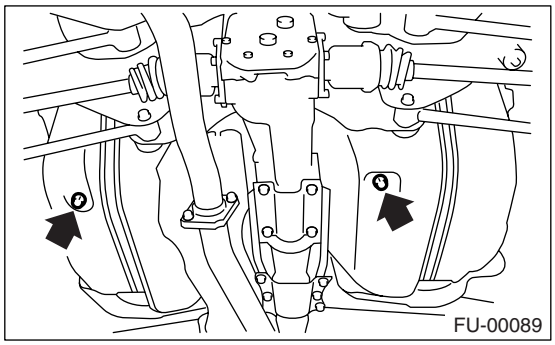
5) Remove the screws holding packing in place.


FU-00095

6) Loosen the rear right side wheel nuts.
7) Lift-up the vehicle.
8) Remove the rear right side wheel.

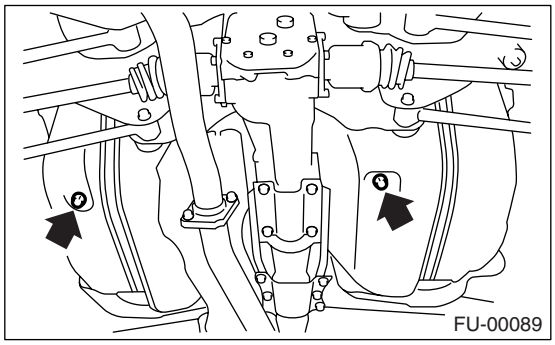

FU-00096

9) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

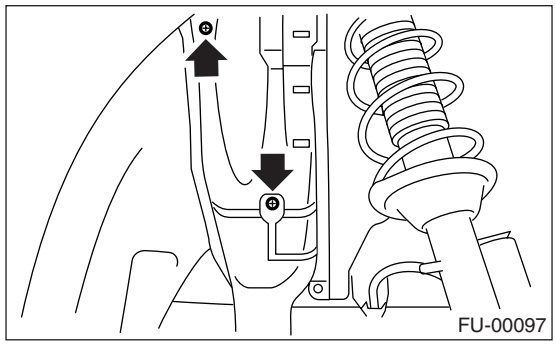

FU-00089

10) Tighten the fuel drain plug and then install the front tank cover RH.

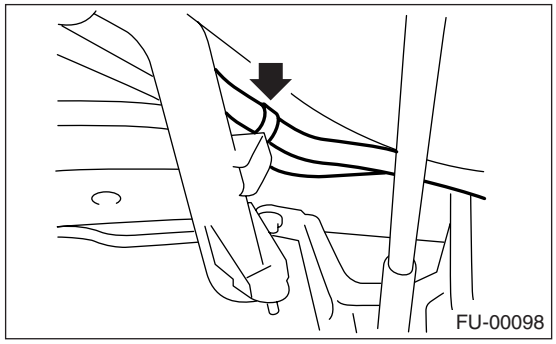
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

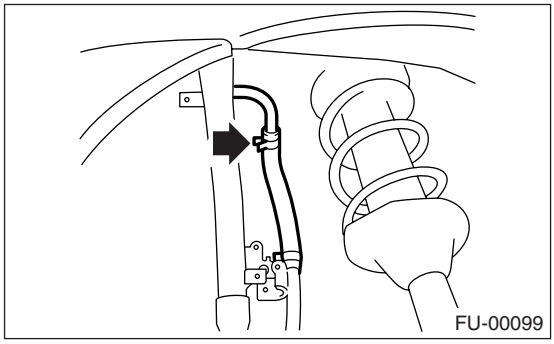
11) Remove the fuel filler pipe protector.


FU-00097

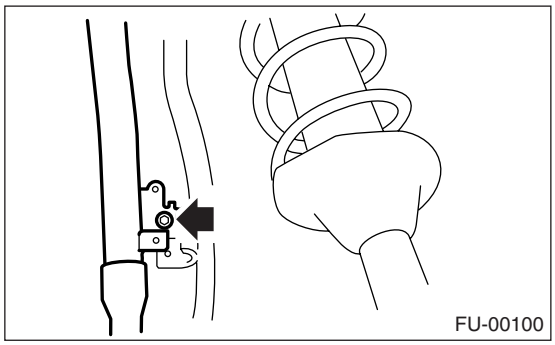
12) Separate the evaporation hoses from clip of fuel filler pipe.


FU-00098

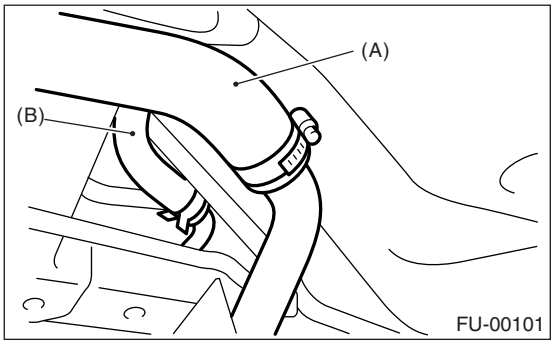
13) Disconnect the air vent hose from fuel filler pipe.



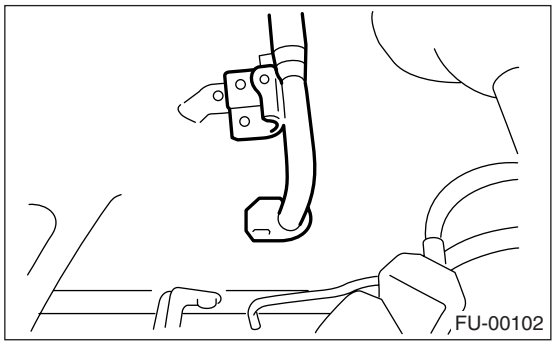
14) Remove the bolts which hold fuel filler pipe bracket on body.



15) Loosen the clamp and separate fuel filler flap lid hose (A) from fuel filler pipe.
16) Move the clip and separate air vent hose (B).



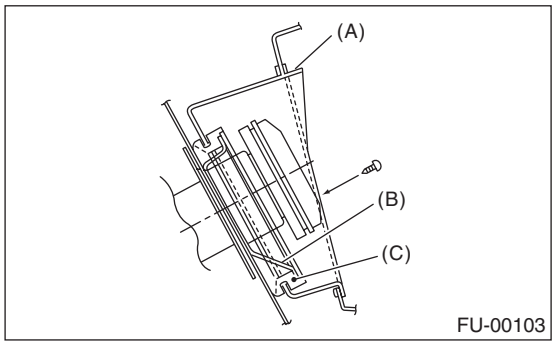
17) Remove the fuel filler pipe to under side of the vehicle.
18) Remove the air vent pipe together with clip from body.



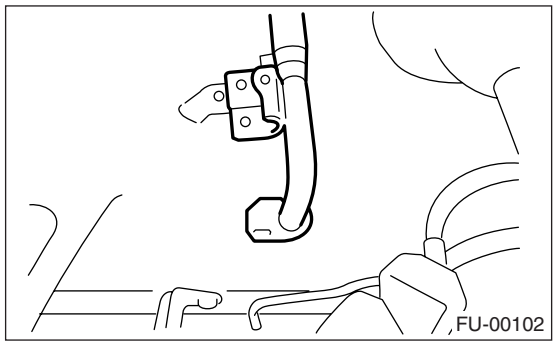
B: INSTALLATION

1) Hold the fuel filler flap lid.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set cup (B), and tighten the screws.

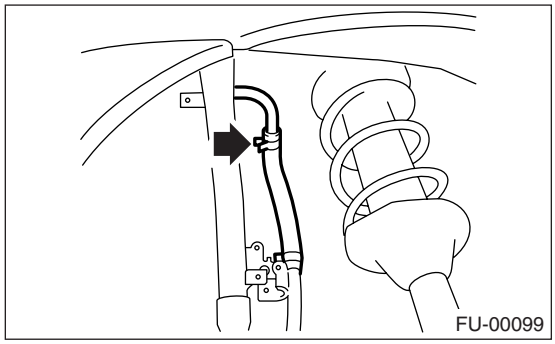
NOTE:
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



4) Install the air vent pipe.

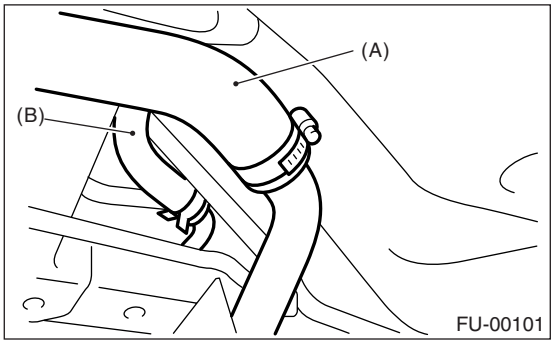


5) Connect the air vent hose to fuel filler pipe.



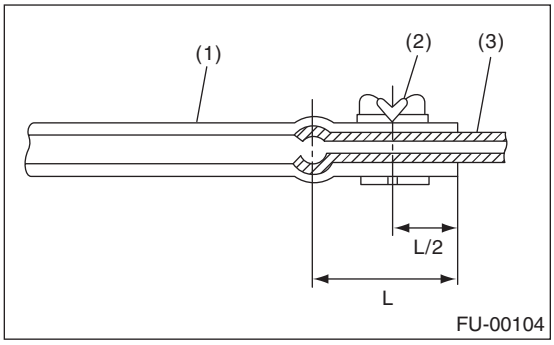
6) Insert the fuel filler flap lid hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:
Do not allow clips to touch the air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold clip.

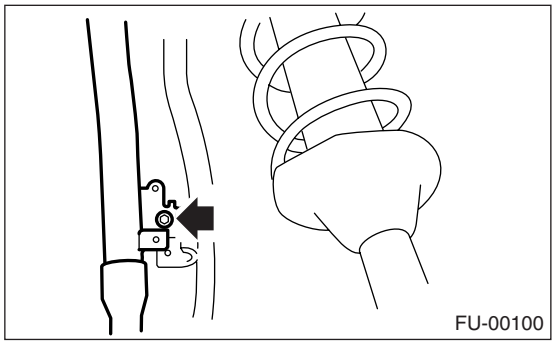
L = 27.5±2.5 mm (1.083±0.098 in)



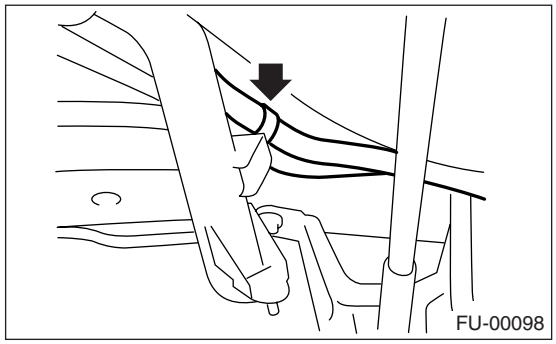
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds fuel filler pipe bracket on body.

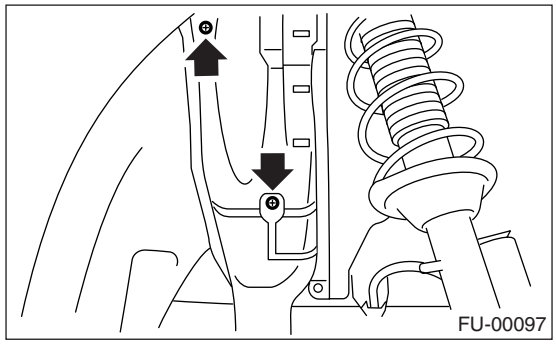
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



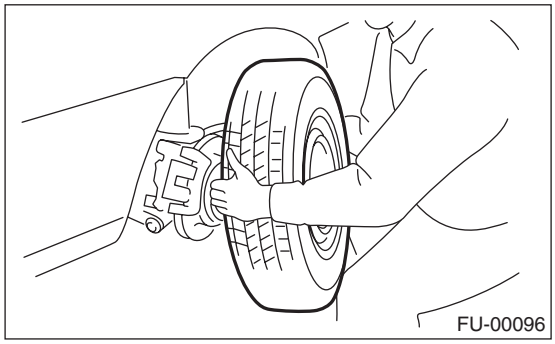
9) Hold the evaporation hoses onto clip of fuel filler pipe.



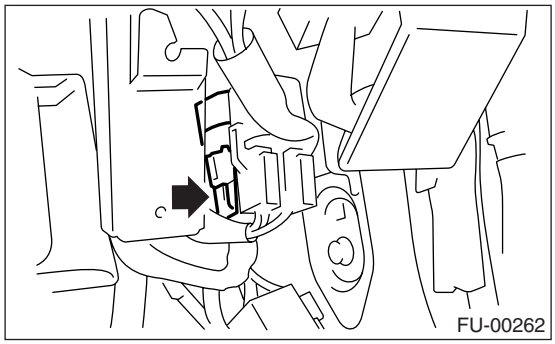
10) Install the fuel filler pipe protector.



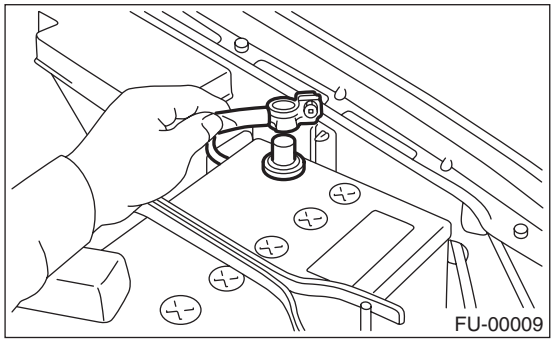
11) Install the rear wheel RH.



12) Lower the vehicle.
13) Tighten the wheel nuts.
14) Connect the connector to fuel pump relay.



15) Connect the battery ground cable to battery.



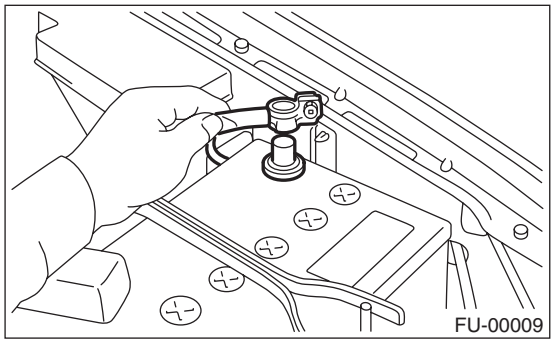
22.Fuel Pump

A: REMOVAL

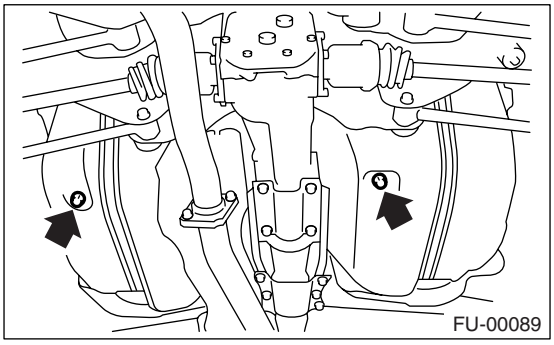
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
2) Open the fuel filler flap lid and remove fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

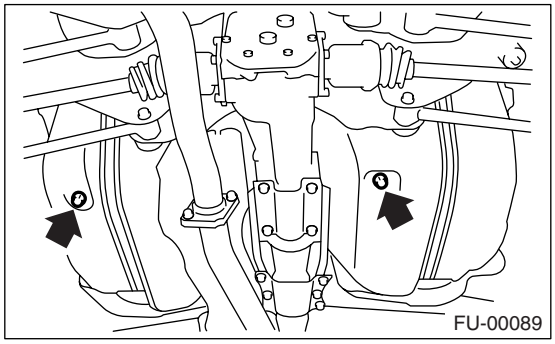

FU-00009

4) Lift-up the vehicle.
5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

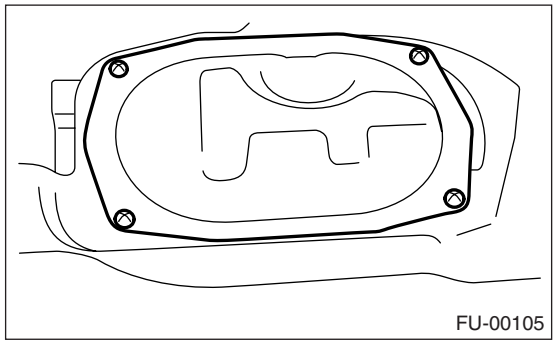

FU-00089

6) Tighten the fuel drain plug.

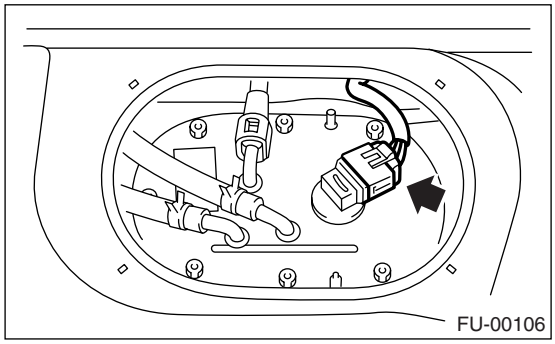
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

7) Raise the rear seat and turn floor mat up.
8) Remove the access hole lid.

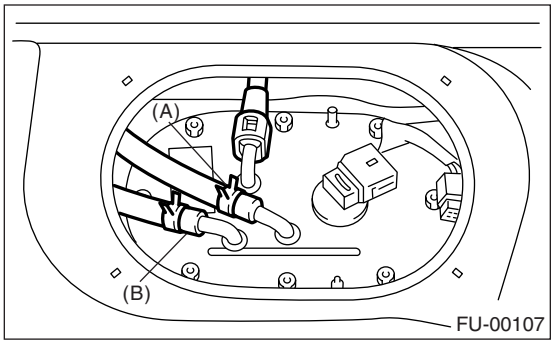

FU-00105

9) Disconnect the connector from fuel pump.

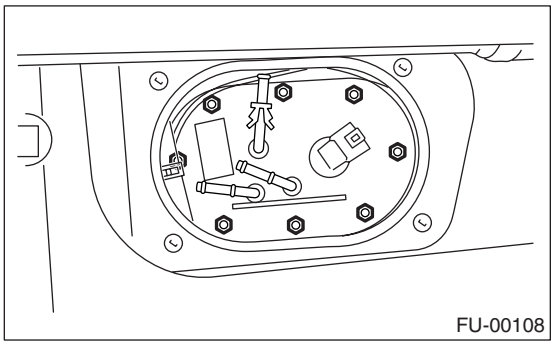

FU-00106

10) Disconnect the quick connector and then disconnect fuel delivery hose. **<Ref. to FU(H4SO)-63,** REMOVAL**, Fuel Delivery, Return and Evaporation Lines.>**

11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



12) Remove the nuts which install fuel pump assembly onto fuel tank.



13) Take off the fuel pump assembly from fuel tank.

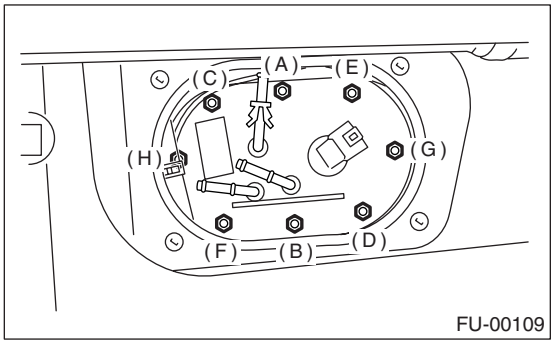
B: INSTALLATION

Install in the reverse order of removal. Do the following:

NOTE:
Always use new gaskets.

(1) Ensure sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

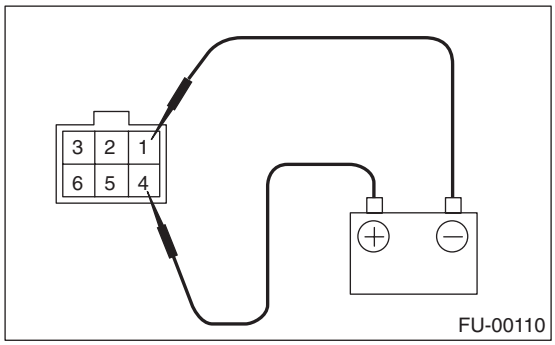
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Connect the lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operates.

WARNING:
• Wipe off the fuel completely.
• Keep the battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on battery side.
• Do not run the fuel pump for a long time under non-load condition.



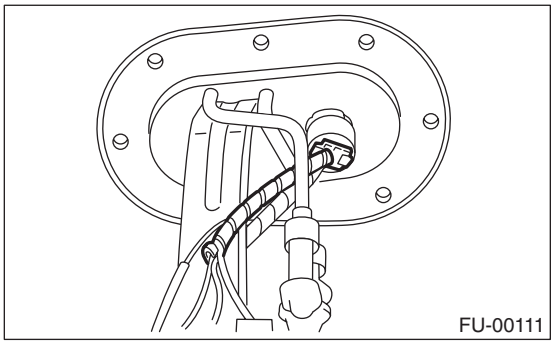
23.Fuel Level Sensor

A: REMOVAL

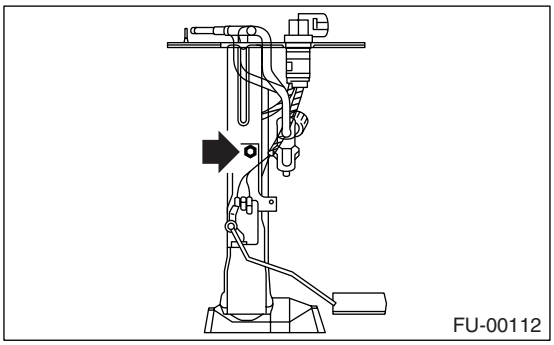
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly. **<Ref. to FU(H4SO)-55,** REMOVAL**, Fuel Pump.>**
2) Disconnect the connector from fuel pump bracket.



3) Remove the bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

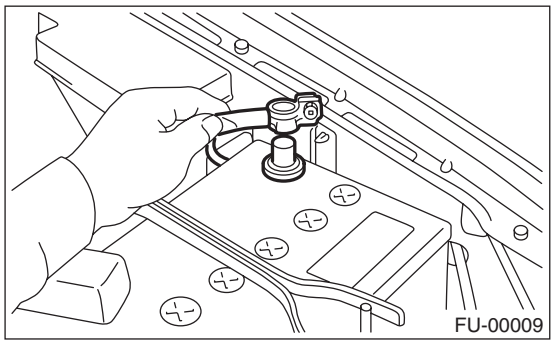
Install in the reverse order of removal.

24.Fuel Sub Level Sensor

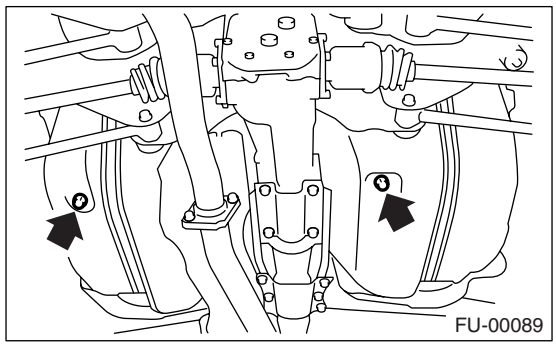
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Disconnect the ground cable from battery.

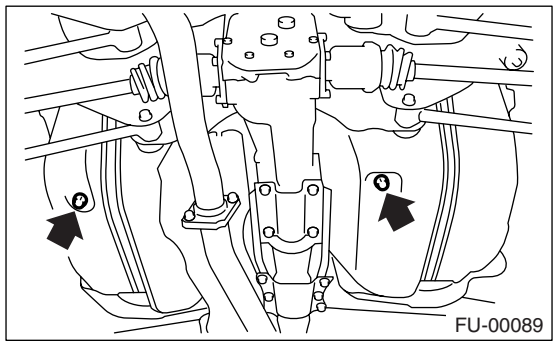


2) Lift-up the vehicle.
3) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

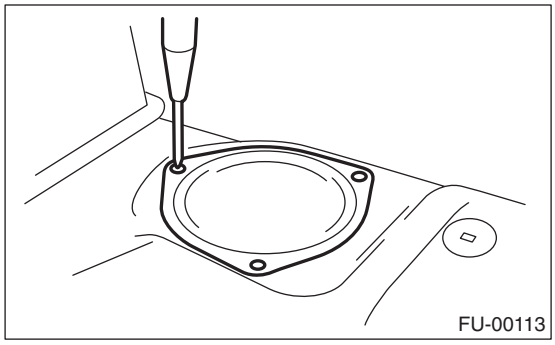


4) Tighten the fuel drain plug.

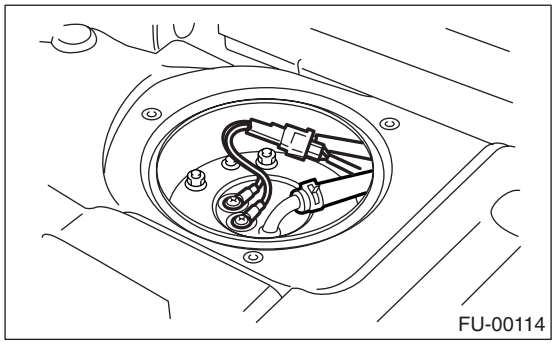
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)



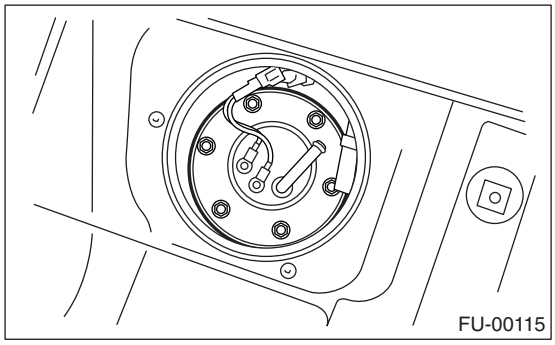
5) Remove the rear seat.
6) Remove the service hole cover.



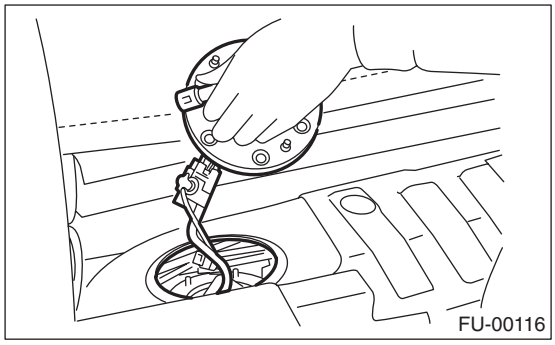
7) Disconnect the connector from fuel sub level sensor.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install fuel sub level sensor on fuel tank.



10) Remove the fuel sub level sensor.

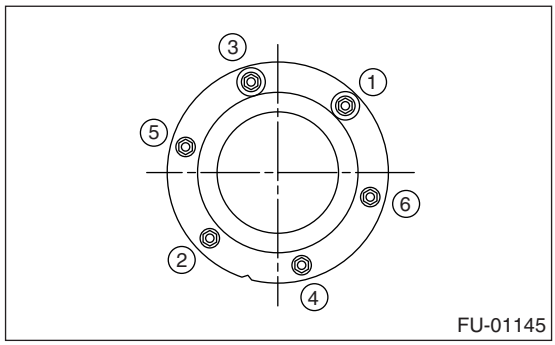


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.
(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts and bolts to specified torque in the order as shown in the figure.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

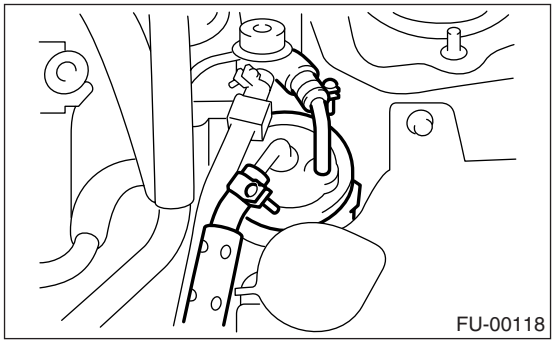


25.Fuel Filter

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
2) Disconnect the fuel delivery hoses from fuel filter.



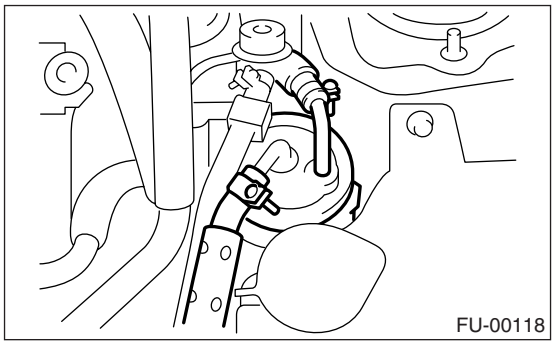
3) Remove the filter from holder.

B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at the connecting portion, replace it with a new one.**
- **If clamps are badly damaged, replace with new ones.**

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



C: INSPECTION

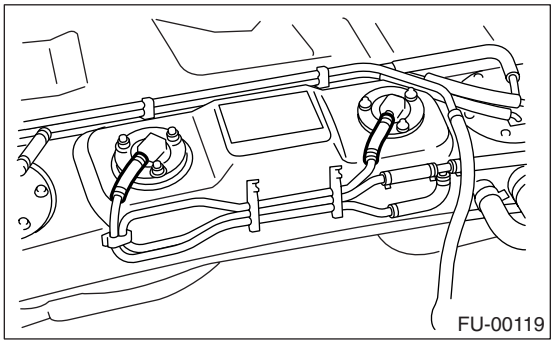
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

26.Fuel Cut Valve

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel.**

1) Remove the fuel tank. **<Ref. to FU(H4SO)-48,** REMOVAL**, Fuel Tank.>**
2) Move the clip and disconnect the evaporation hose from fuel cut valve.

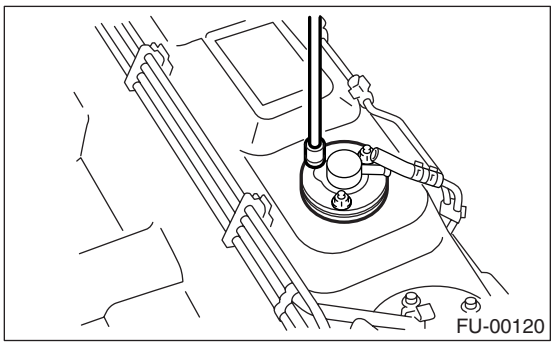


3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

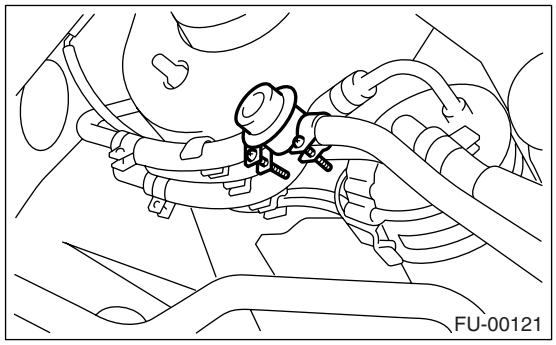
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



27.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
2) Remove the fuel damper valve from fuel return hose.



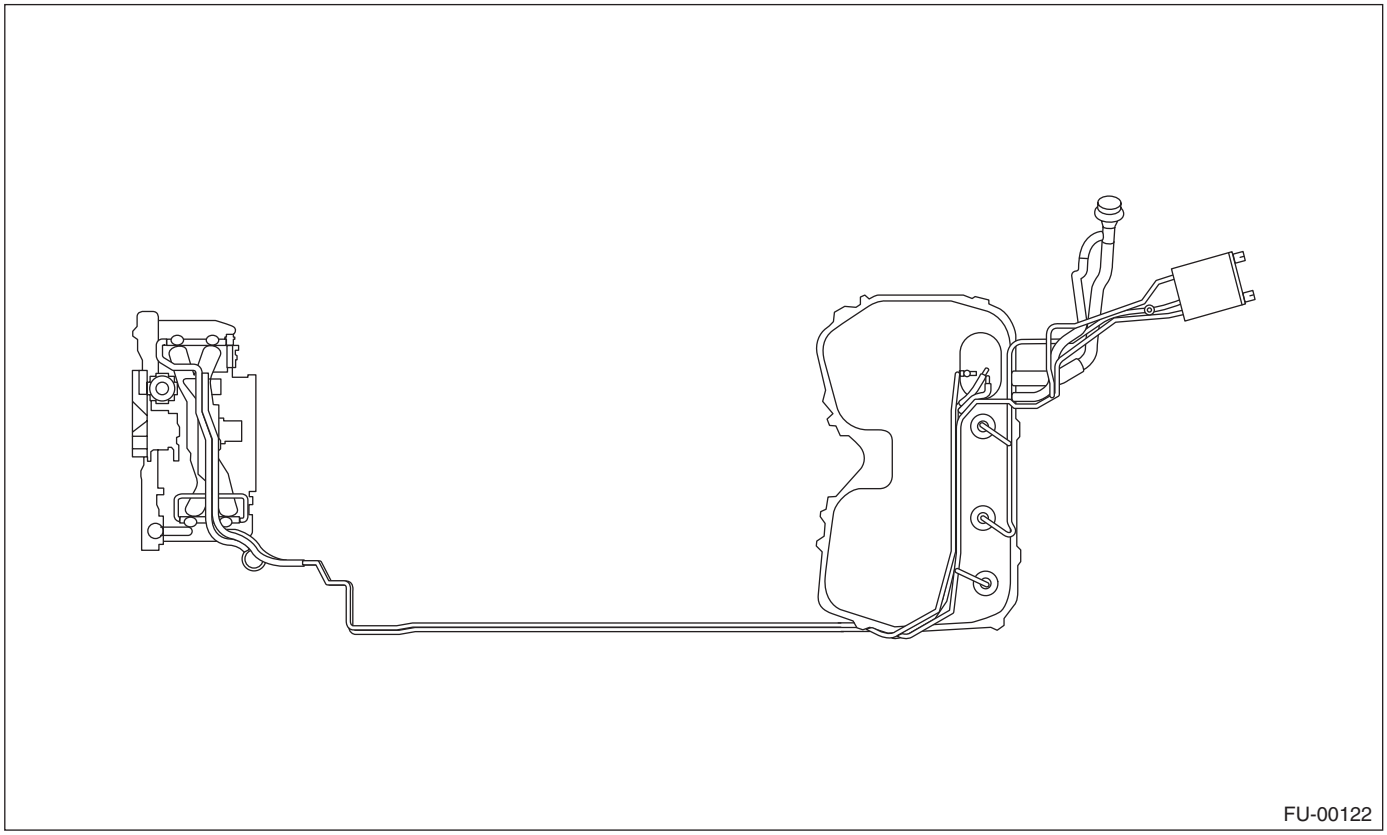
B: INSTALLATION

Install in the reverse order of removal.

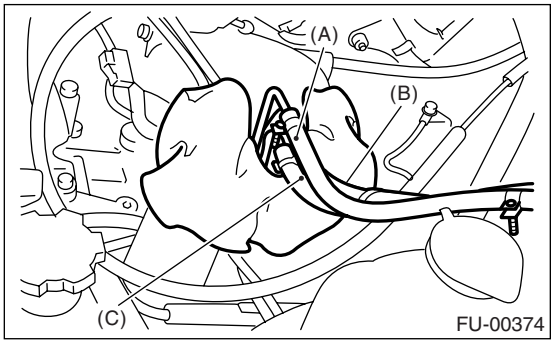
28.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
3) Open the fuel filler flap lid and remove fuel filler flap lid cap.
4) Remove the floor mat. **<Ref. to EI-50,** REMOVAL**, Floor Mat.>**
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

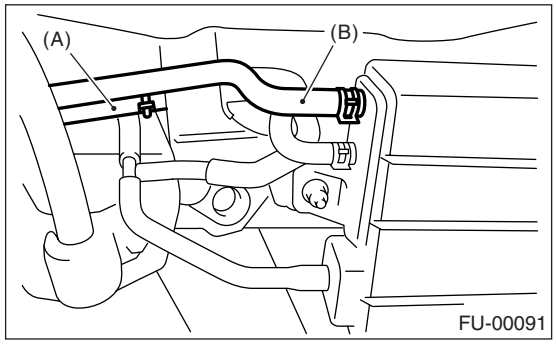

FU-00122

6) In the engine compartment, detach the fuel delivery hose (A), return hose (B) and evaporation hose (C).



FU-00374

8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



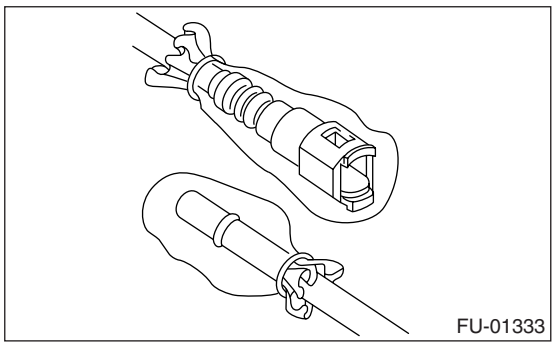
FU-00091

7) Lift-up the vehicle.

9) Disconnect the quick connector on the fuel delivery line.

(1) Clean the pipe and connector, if they are covered with dust.

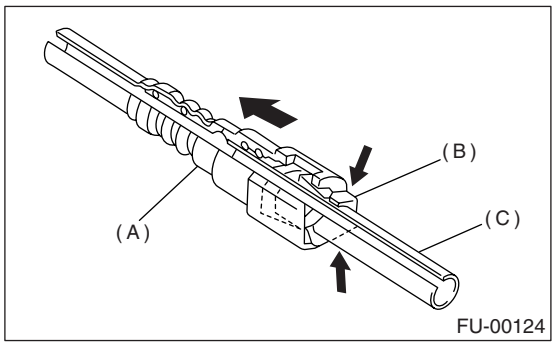
(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



(3) Hold the connector (A) and push retainer (B) down.

(4) Pull out the connector (A) from retainer (B).

CAUTION:
Replace the retainer except for it in engine room with a new one.

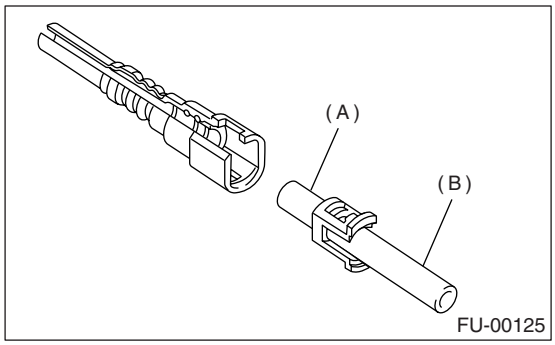


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

NOTE:
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.

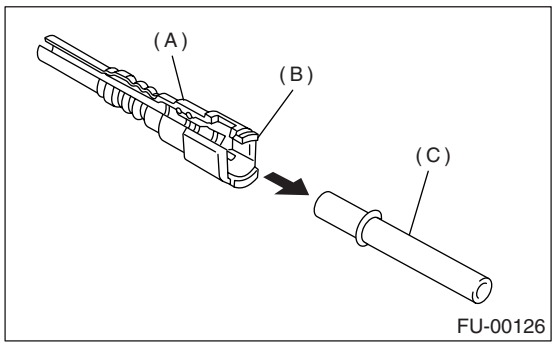


(A) Seal surface
(B) Pipe

(1) Set the new retainer (B) to connector (A).

(2) Push the pipe into connector completely.

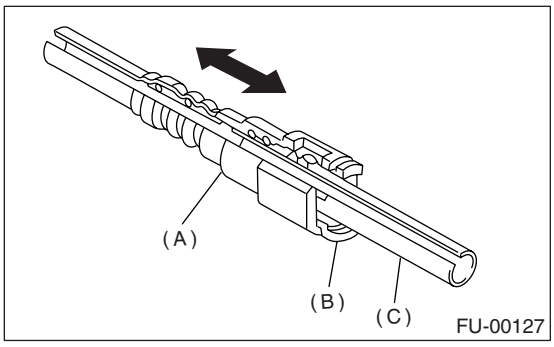
NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
- **Pull the connector to ensure it is connected securely.**
- **Ensure the two retainer pawls are engaged in their mating positions in the connector.**

• Be sure to inspect the hoses and their connections for any leakage of fuel.

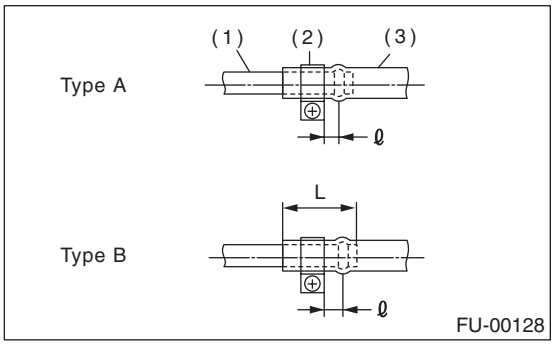


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

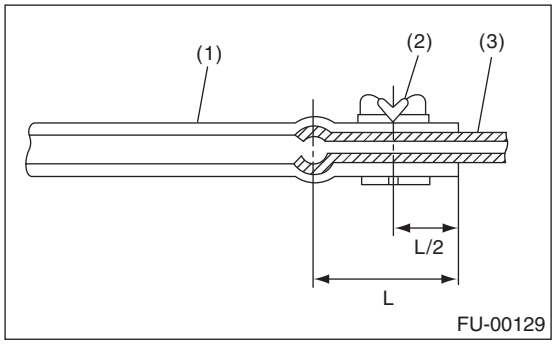


(1) Fitting
(2) Clamp
(3) Hose

3) Connect the evaporation hose to pipe by approx. 15 — 20 mm (0.59 — 0.79 in) from the hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect the hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

29.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing tightness on the fuel filler cap.	Correct or replace the packing.
3)	Inoperative fuel pump.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
• When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4SO)

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2. Front Catalytic Converter 3
3. Rear Catalytic Converter 6
4. EGR Valve 7
5. Canister 8
6. Purge Control Solenoid Valve 9
7. Two-way Valve 10

1. General Description

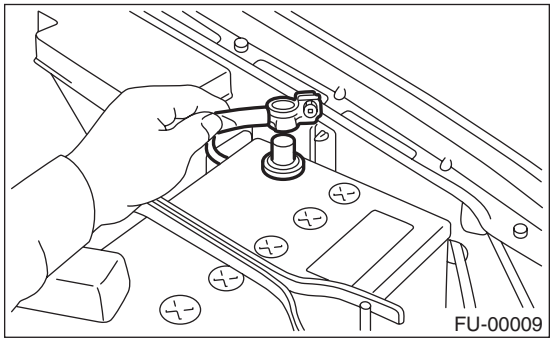
A: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

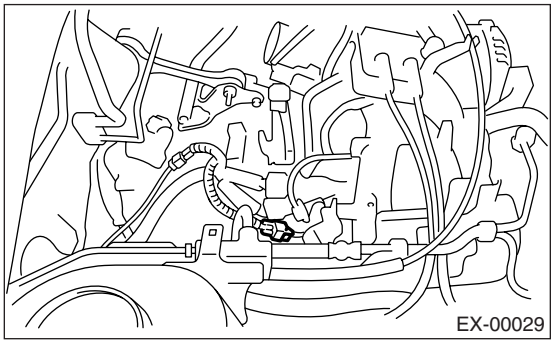
2. Front Catalytic Converter

A: REMOVAL

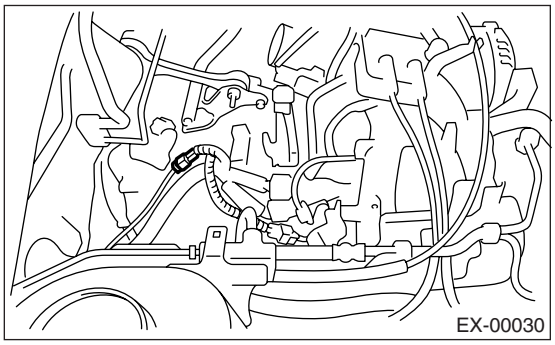
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Disconnect the front oxygen (A/F) sensor connector.

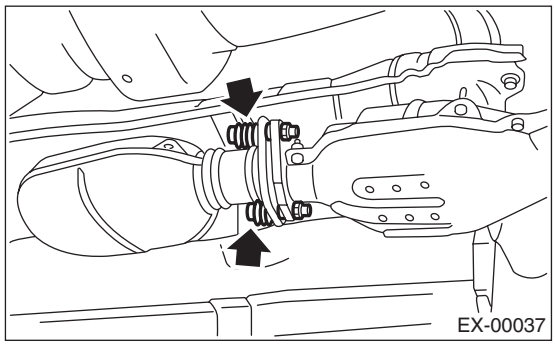


4) Disconnect the connector from rear oxygen sensor connector.

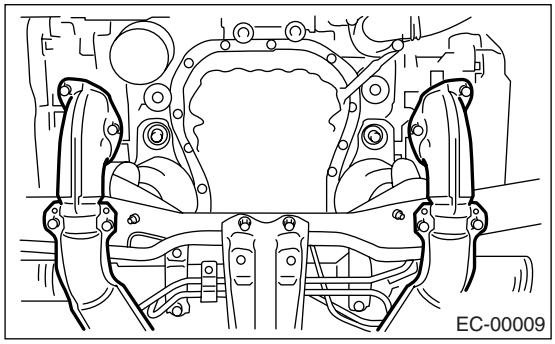


5) Lift-up the vehicle.
6) Remove the under cover.
7) Separate the center exhaust pipe from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

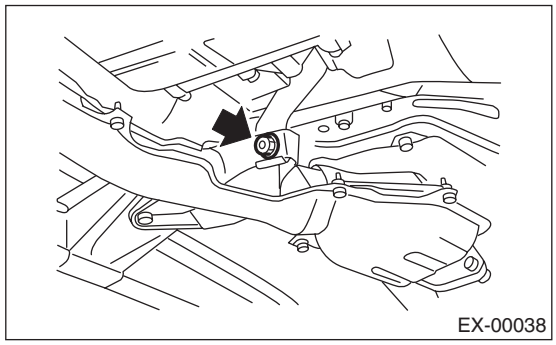


8) Remove the nuts which hold front exhaust pipe onto cylinder heads.

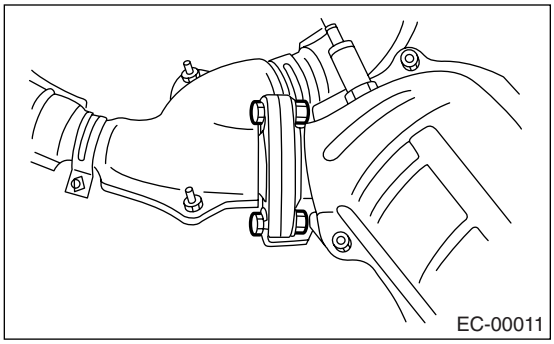


9) Remove the front and center exhaust pipe from hanger bracket.

CAUTION:
Be careful not to pull down the front exhaust pipe and center exhaust pipe.



10) Separate the front catalytic converter from front exhaust pipe.

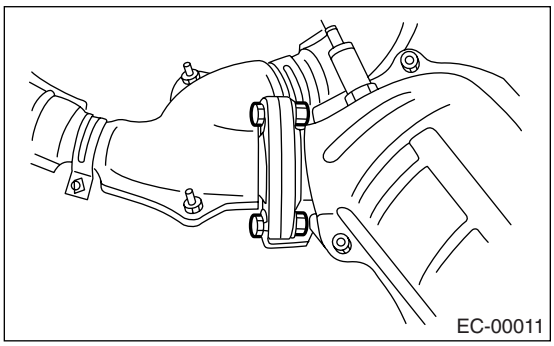


B: INSTALLATION

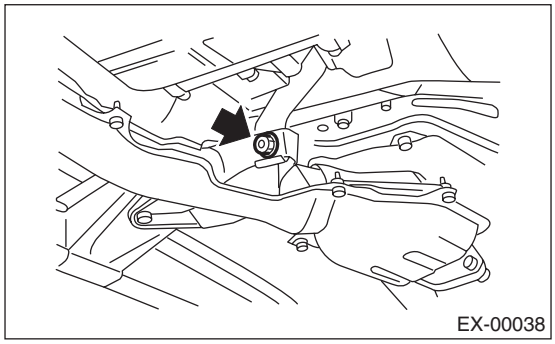
NOTE:
Replace gaskets with new ones.

1) Install the front catalytic converter to front exhaust pipe.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

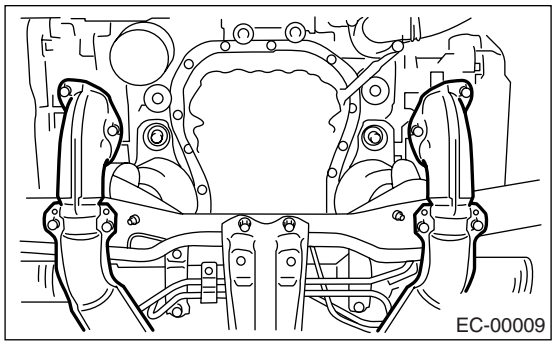


2) Install the front and center exhaust pipe assembly to the vehicle. And temporarily tighten the bolt which installs center exhaust pipe to hanger bracket.



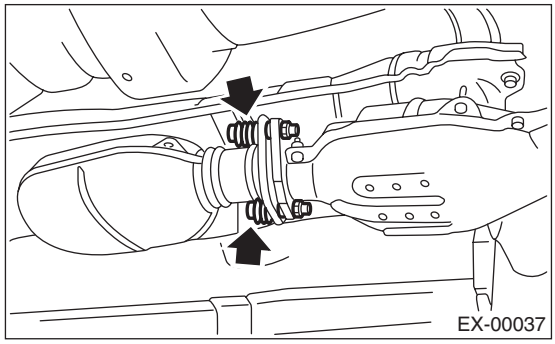
3) Tighten the nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



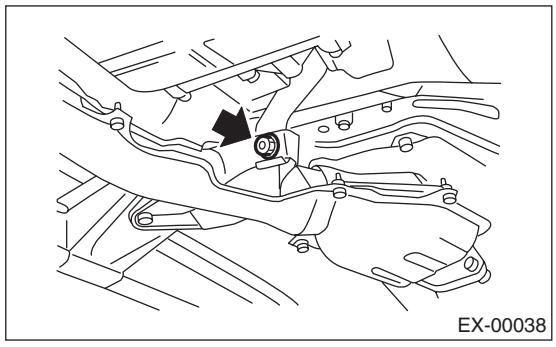
4) Tighten the bolts which install front and center exhaust pipe to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



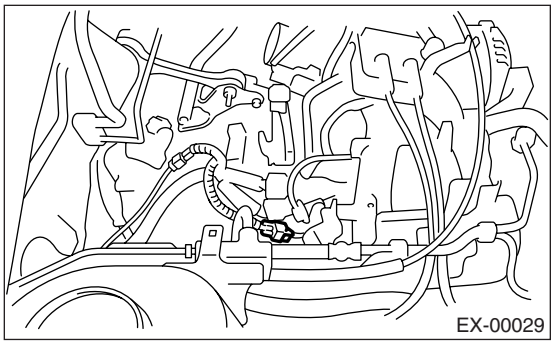
5) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

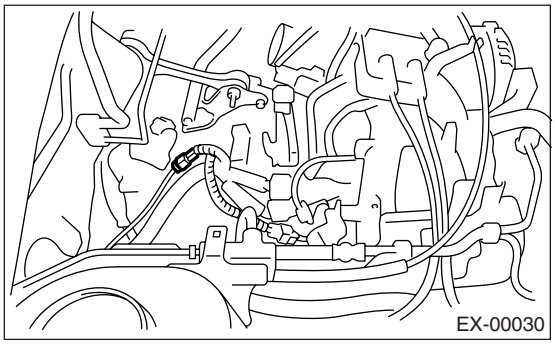


6) Install the under cover.

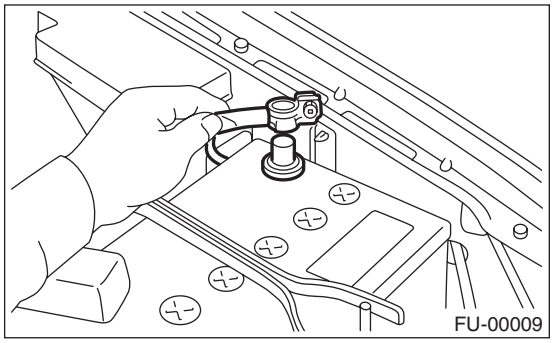
7) Lower the vehicle.
8) Connect the front oxygen (A/F) sensor connector.



9) Connect the connector to rear oxygen sensor connector.



10) Connect the battery ground cable to battery.



C: INSPECTION

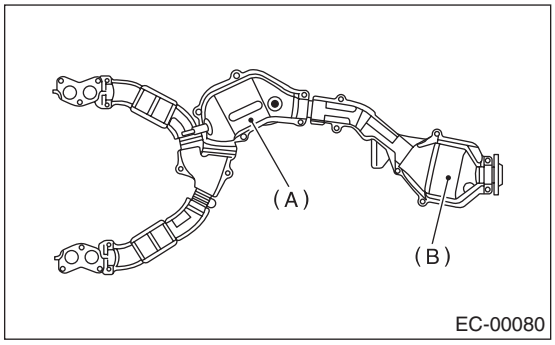
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

A: REMOVAL

1. WITH OBD

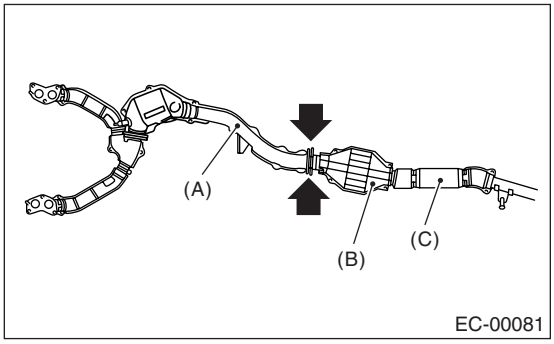
The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. **<Ref. to EC(H4SO)-3,** REMOVAL**, Front Catalytic Converter.>**



(A) Front catalytic converter
(B) Rear catalytic converter

2. WITHOUT OBD

Rear catalytic converter and rear exhaust pipe are integrated into one unit. Refer to Rear Exhaust Pipe for removal procedures. **<Ref. to EX(H4SO)-11,** REMOVAL**, Rear Exhaust Pipe.>**

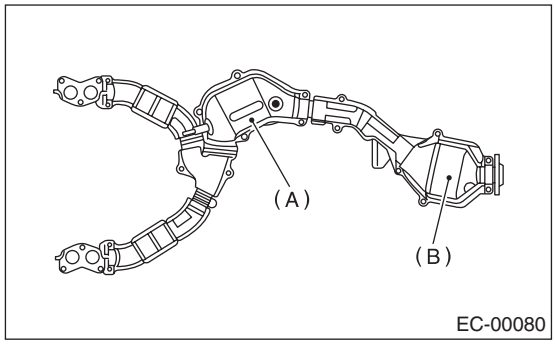


(A) Front exhaust pipe
(B) Rear catalytic converter
(C) Rear exhaust pipe

B: INSTALLATION

1. WITH OBD

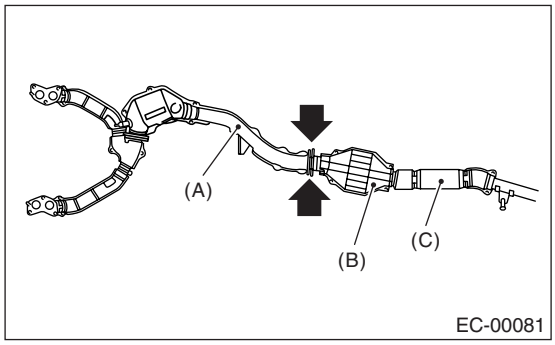
Install in the reverse order of removal.



(A) Front catalytic converter
(B) Rear catalytic converter

2. WITHOUT OBD

Install in the reverse order of removal.



(A) Front exhaust pipe
(B) Rear catalytic converter
(C) Rear exhaust pipe

C: INSPECTION

1. WITH OBD

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

2. WITHOUT OBD

Inspect in the same procedures as the vehicle with OBD.

4. EGR Valve

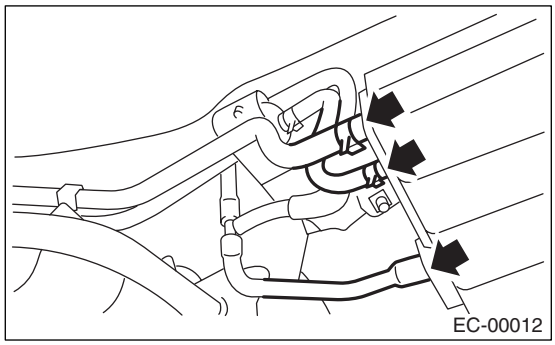
A: SPECIFICATION

Refer to “EGR Valve” for removal and installation.
<Ref. to FU(H4SO)-34, EGR Valve.>

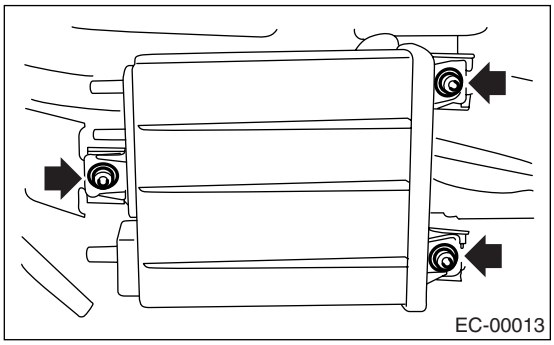
5. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the two clamps which hold two canister hoses, and disconnect the three evaporation hoses from canister.



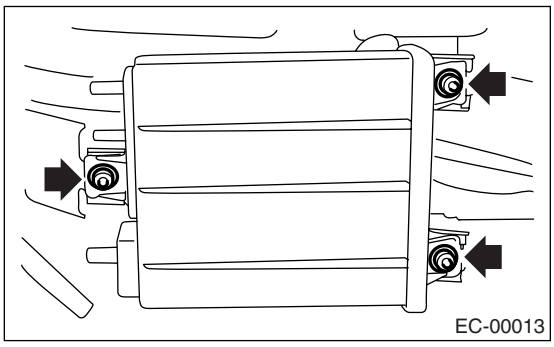
3) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



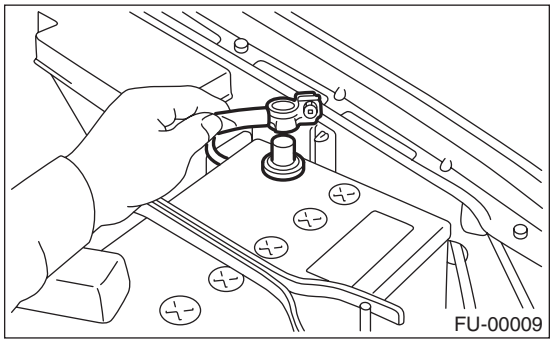
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

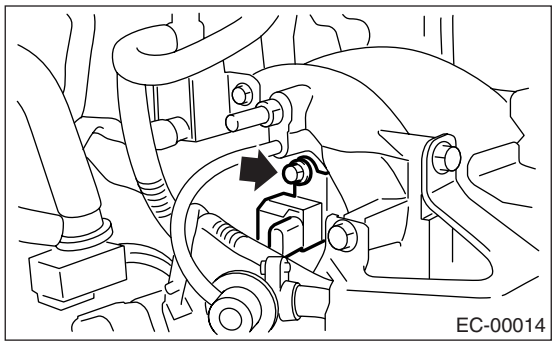
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



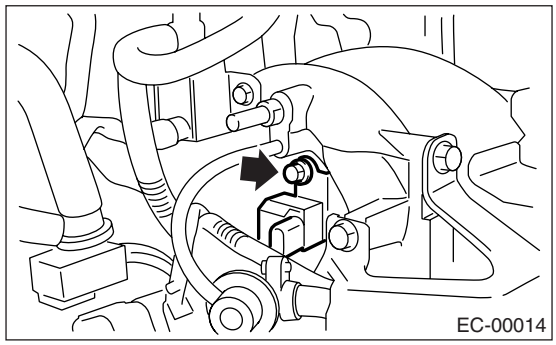
2) Disconnect the connector and hoses from purge control solenoid valve, and then remove the purge control solenoid valve.



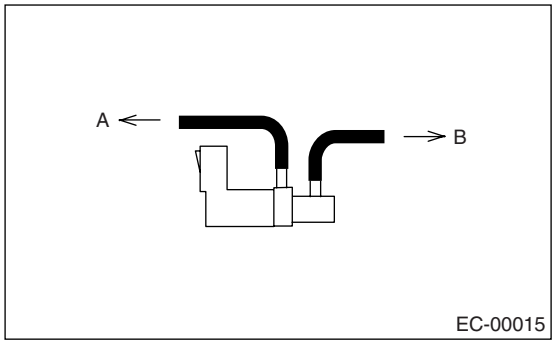
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To fuel pipe
(B) To intake manifold

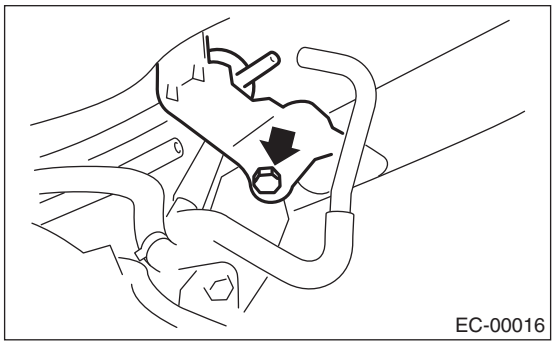
C: INSPECTION

Make sure hoses are not cracked or loose.

7. Two-way Valve

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the canister from body. **<Ref. to EC(H4SO)-8,** REMOVAL**, Canister.>**
3) Remove the two-way valve with bracket as a single unit from body.



4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure that the hoses are not cracked or loose.

INTAKE (INDUCTION)

IN(H4SO)

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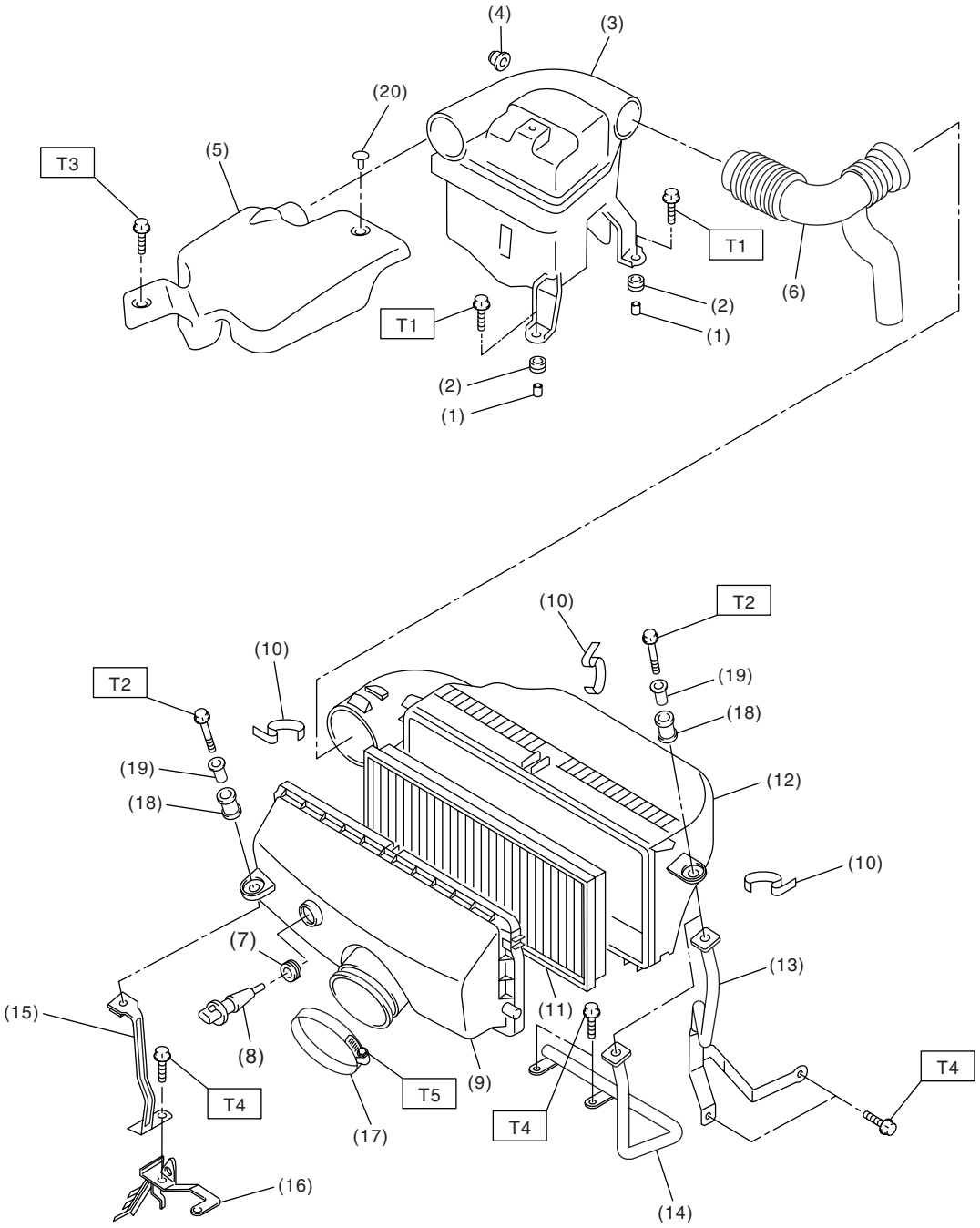
1. General Description 2
2. Air Cleaner Element 5
3. Air Cleaner Case 6
4. Air Intake Duct 7
5. Resonator Chamber 8

1. General Description

A: COMPONENT



IN-00076

(1) Spacer
(2) Bushing
(3) Resonator chamber
(4) Cushion
(5) Air intake duct A
(6) Air intake duct B
(7) Bushing
(8) Intake air temperature sensor
(9) Air cleaner case A
(10) Clip
(11) Air cleaner element
(12) Air cleaner case B
(13) Stay LH (MT model)
(14) Stay LH (AT model)
(15) Stay RH
(16) Engine harness bracket
(17) Clamp
(18) Bushing
(19) Spacer
(20) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T1: 33 (3.4, 25)
T2: 6.5 (0.66, 4.8)
T3: 7.5 (0.76, 5.5)
T4: 16 (1.6, 11.8)
T5: 3 (0.3, 2.2)

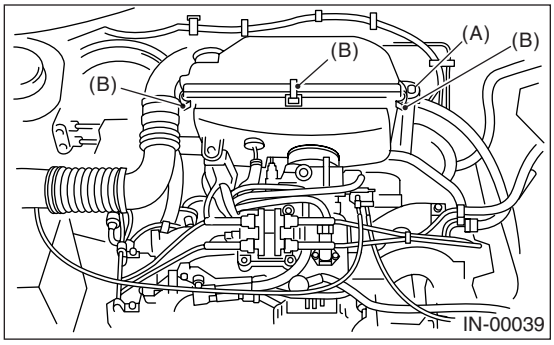
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

2. Air Cleaner Element

A: REMOVAL

1) Remove the air intake duct from air cleaner case.
2) Remove the bolt (A) which secures air cleaner case to stay.
3) Remove the clip (B) above the air cleaner case.



4) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
• Fasten with a clip after inserting the lower tab of the case.
• Refer to “COMPONENT” for tightening torque. **<Ref. to IN(H4SO)-2,** COMPONENT**, General Description.>**

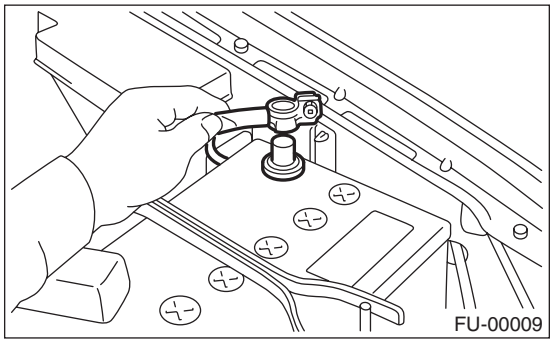
C: INSPECTION

Replace if excessively damaged or dirty.

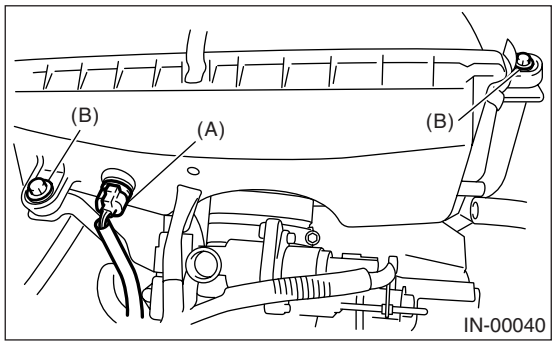
3. Air Cleaner Case

A: REMOVAL

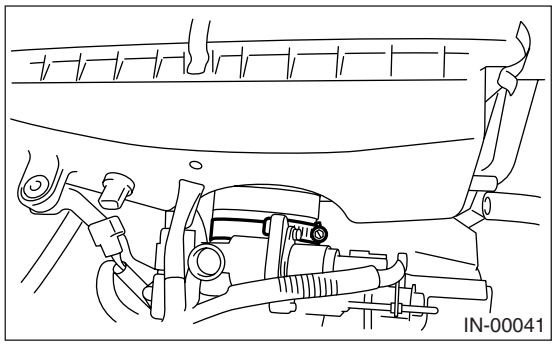
1) Disconnect the ground cable from battery.



2) Disconnect the connector (A) of intake air temperature sensor.
3) Remove the bolt (B) which installs air cleaner case to stay.



4) Disconnect the hoses and intake duct from air cleaner case.
5) Loosen the clamp which connects air cleaner case to throttle body.



6) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. **<Ref. to IN(H4SO)-2,** COMPONENT**, General Description.>**

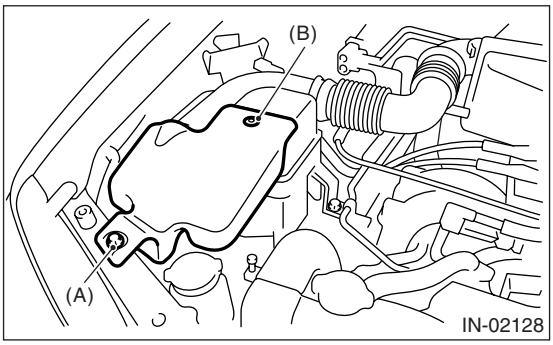
C: INSPECTION

Inspect for cracks and loose connections.

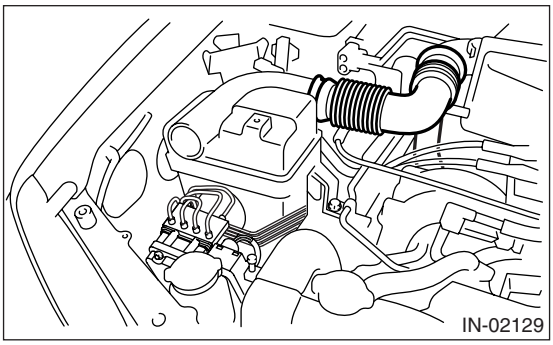
4. Air Intake Duct

A: REMOVAL

1) Remove the bolt (A) which installs air intake duct A on the front side of body.
2) Remove the clip (B) which connects air intake duct A to resonator chamber.
3) Remove the air intake duct.



4) Remove the air intake duct from resonator chamber and air cleaner case.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. **<Ref. to IN(H4SO)-2,** COMPONENT**, General Description.>**

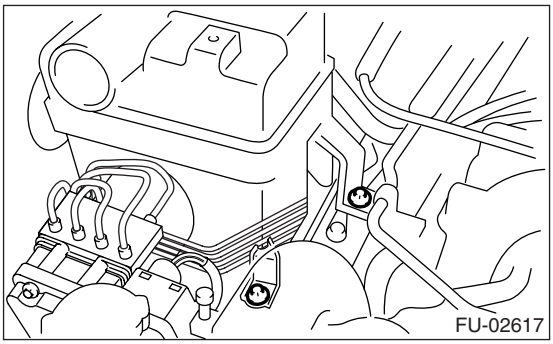
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in the air intake duct.

5. Resonator Chamber

A: REMOVAL

1) Remove the air intake duct. **<Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.>**
2) Remove the resonator chamber.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to “COMPONENT” for tightening torque. **<Ref. to IN(H4SO)-2,** COMPONENT**, General Description.>**

C: INSPECTION

Inspect for cracks and loose connections.

MECHANICAL

ME(H4SO)

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1. General Description

A: SPECIFICATION

Engine	Model			2.0 L	2.5 L
	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, single over-head camshaft, 4-valve/cylinder	
	Bore × Stroke		mm (in)	92 × 75 (3.62 × 2.95)	99.5 × 79.0 (3.917 × 3.110)
	Displacement		cm^3 (cu in)	1,994 (121.67)	2,457 (150)
	Compression ratio			10.0	
	Compression pressure (at 200 — 300 rpm)		kPa (kgf/cm^2, psi)	1,079 — 1,275 (11.0 — 13.0, 156 — 185)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Open		4° BTDC	1° BTDC
		Close		48° ABDC	51° ABDC
	Exhaust valve timing	Open		48° BBDC	50° BBDC
		Close		4° ATDC	6° ATDC
	Valve clearance	Intake	mm (in)	0.20±0.04 (0.0079±0.0016)	
		Exhaust	mm (in)	0.25±0.04 (0.0098±0.0016)	
	Idling speed [at neutral position on MT, or “P” or “N” range on AT]		rpm	650±100 (No load) 850±100 (A/C switch ON)	
	Firing order			1 → 3 → 2 → 4	
	Ignition timing		BTDC/rpm	10°±10°/650	

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter US: Undersize OS: Oversize

Belt tensioner adjuster	Protrusion of adjuster rod			mm (in)	5.2 — 6.2 (0.205 — 0.244)
Belt tensioner	Spacer O.D.			mm (in)	17.955 — 17.975 (0.7069 — 0.7077)
	Tensioner bush I.D.			mm (in)	18.00 — 18.08 (0.7087 — 0.7118)
	Clearance between spacer and bush			mm (in)	STD: 0.025 — 0.125 (0.0010 — 0.0049) Limit: 0.175 (0.0069)
	Side clearance of spacer			mm (in)	STD: 0.20 — 0.55 (0.0079 — 0.0217) Limit: 0.81 (0.0319)
Valve rocker arm	Clearance between shaft and arm			mm (in)	STD: 0.020 — 0.054 (0.0008 — 0.0021) Limit: 0.10 (0.0039)
Camshaft	Bend limit			mm (in)	0.025 (0.0010)
	Thrust clearance			mm (in)	STD: 0.030 — 0.090 (0.0012 — 0.0035) Limit: 0.10 (0.0039)
	Cam lobe height mm (in)	2.0 L	Intake		STD: 38.732 — 38.832 (1.5249 — 1.5288) Limit: 38.632 (1.5209)
			Exhaust		STD: 39.259 — 39.359 (1.5456 — 1.5496) Limit: 39.157 (1.5417)
		2.5 L	Intake		STD: 39.485 — 39.585 (1.5545 — 1.5585) Limit: 39.385 (1.5506)
			Exhaust		STD: 39.259 — 39.359 (1.5456 — 1.5496) Limit: 39.159 (1.5417)
	Camshaft journal O.D.			mm (in)	31.928 — 31.945 (1.2570 — 1.2577)
	Camshaft journal hole I.D. (Cylinder head)			mm (in)	32.000 — 32.018 (1.2598 — 1.2605)
	Oil clearance			mm (in)	STD: 0.055 — 0.090 (0.0022 — 0.0035) Limit: 0.10 (0.0039)

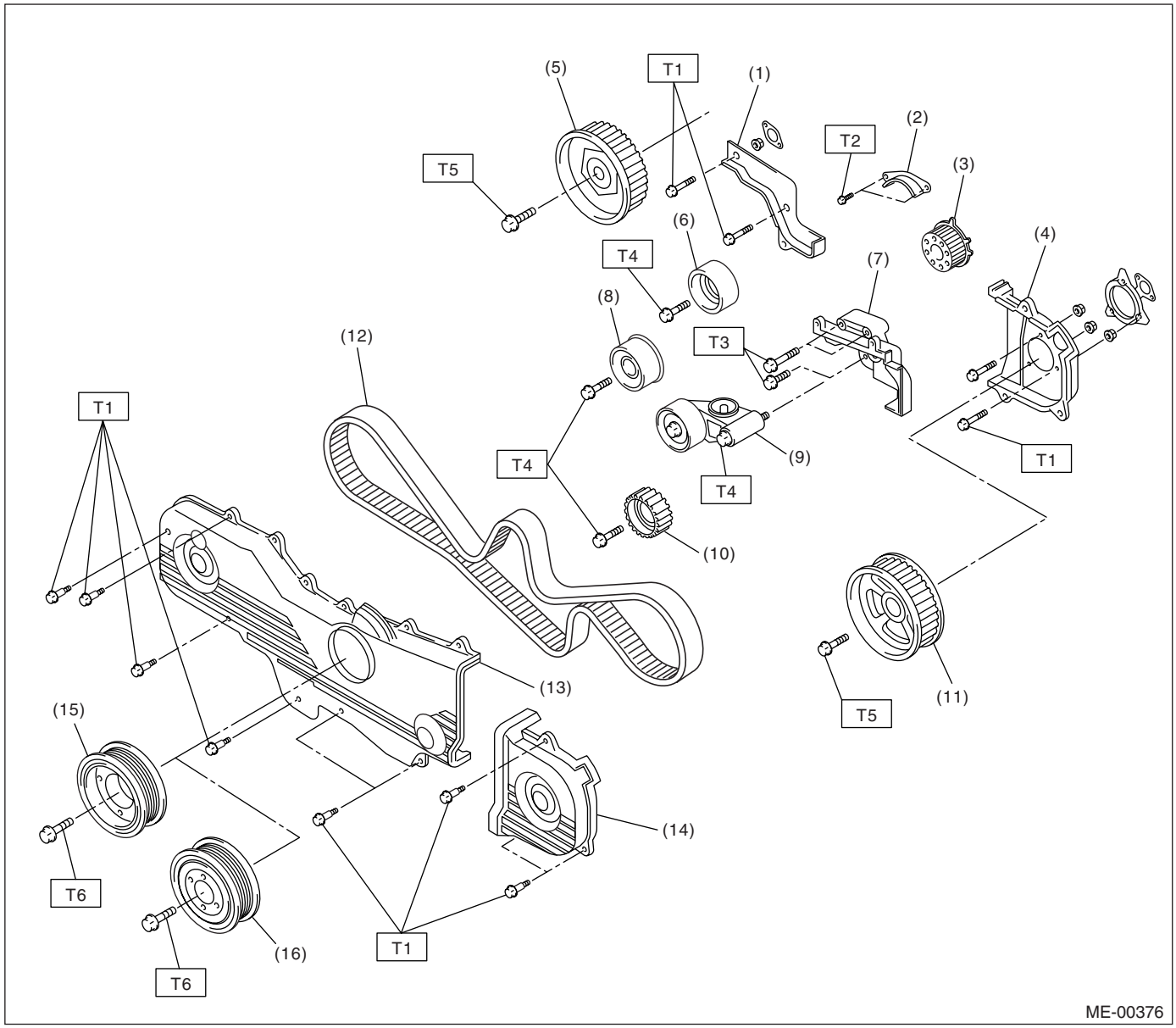
Cylinder head	Surface warpage limit (mating with cylinder block) mm (in)				0.035 (0.0014)
	Grinding limit mm (in)				0.1 (0.004)
	Standard height mm (in)				97.5 (3.84)
Valve seat	Refacing angle				90°
	Contacting width mm (in)		Intake	STD	0.8 — 1.4 (0.003 — 0.055)
				Limit	1.8 (0.070)
			Exhaust	STD	1.2 — 1.8 (0.047 — 0.071)
				Limit	2.2 (0.087)
Valve guide	Inner diameter mm (in)				6.000 — 6.012 (0.2362 — 0.2367)
	Protrusion above head mm (in)			Intake	20.0 — 21.0 (0.787 — 0.819)
				Exhaust	16.5 — 17.5 (0.650 — 0.683)
Valve	Head edge thickness mm (in)		Intake	STD	0.8 — 1.2 (0.03 — 0.047)
				Limit	0.6 (0.024)
			Exhaust	STD	1.0 — 1.4 (0.039 — 0.055)
				Limit	0.6 (0.024)
	Stem outer diameter mm (in)			Intake	5.950 — 5.965 (0.2343 — 0.2348)
				Exhaust	5.945 — 5.960(0.2341 — 0.2346)
	Stem oil clearance mm (in)		STD	Intake	0.035 — 0.062 (0.0014 — 0.0024)
				Exhaust	0.040 — 0.067 (0.0016 — 0.0026)
			Limit	—	0.15 (0.0059)
	Overall length mm (in)			Intake	120.6 (4.75)
				Exhaust	121.7 (4.79)
Valve spring	Free length mm (in)				54.30 (2.1378)
	Squareness mm (in)				2.5°, 2.4 (0.094) or less
	Tension/spring height N (kgf, lbf)/mm (in)			Set	214 — 246 (22 — 25, 48 — 55)/ 45.0 (1.772)
				Lift	526 — 582 (54 — 59, 119 — 130)/ 34.7 (1.366)
Cylinder block	Surface warpage limit (mating with cylinder head) mm (in)				0.025 (0.00098)
	Grinding limit mm (in)				0.1 (0.004)
	Cylinder inner diameter mm (in)	2.0 L	STD	A	92.005 — 92.015 (3.6222 — 3.6226)
				B	91.995 — 92.005 (3.6218 — 3.6222)
		2.5 L	STD	A	99.505 — 99.515 (3.9175 — 3.9179)
				B	99.495 — 99.505 (3.9171 — 3.9175)
	Taper mm (in)			STD	0.015 (0.0006)
				Limit	0.050 (0.0020)
	Out-of-roundness mm (in)			STD	0.010 (0.0004)
				Limit	0.050 (0.0020)
	Piston clearance mm (in)			STD	0.010 — 0.030 (0.0004 — 0.0012)
				Limit	0.050 (0.0020)
	Boring mm (in)				0.5 (0.020)
Piston	Outer diameter mm (in)	2.0 L	STD	A	91.985 — 91.995 (3.6214 — 3.6218)
				B	91.975 — 91.985 (3.6211 — 3.6214)
			0.25 (0.0098) OS		92.225 — 92.245 (3.6309 — 3.6317)
			0.50 (0.0197) OS		92.475 — 92.495 (3.6407 — 3.6415)
		2.5 L	STD	A	99.485 — 99.495 (3.9167 — 3.9171)
				B	99.475 — 99.485 (3.9163 — 3.9167)
			0.25 (0.0098) OS		99.725 — 99.745 (3.9262 — 3.9270)
			0.50 (0.0197) OS		99.975 — 99.995 (3.9360 — 3.9368)
	Piston pin standard diameter mm (in)				23.000 — 23.006 (0.9055 — 0.9057)

Piston pin	Outer diameter mm (in)				22.994 — 23.000 (0.9053 — 0.9055)
	Standard clearance between piston and piston pin mm (in)				0.004 — 0.008 (0.0002 — 0.0003)
	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Ring closed gap mm (in)	Top ring	STD		0.20 — 0.35 (0.0079 — 0.0138)
			Limit		1.0 (0.039)
		Second ring	2.0 L	STD	0.40 — 0.50 (0.0160 — 0.0197)
				Limit	1.0 (0.039)
			2.5 L	STD	0.37 — 0.52 (0.0146 — 0.0204)
				Limit	1.0 (0.039)
		Oil ring	STD		0.20 — 0.50 (0.0079 — 0.0197)
			Limit		1.5 (0.059)
	Ring groove gap mm (in)	Top ring	STD		0.040 — 0.080 (0.0016 — 0.0031)
			Limit		0.15 (0.0059)
		Second ring	STD		0.030 — 0.070 (0.0012 — 0.0028)
			Limit		0.15 (0.0059)
Connecting rod	Bend or twist per 100 mm (3.94 in) in length mm (in)		Limit		0.10 (0.0039)
	Thrust clearance at large end mm (in)		STD		0.070 — 0.330 (0.0028 — 0.0130)
			Limit		0.4 (0.016)
Connecting rod bearing	Oil clearance mm (in)		STD		0.016 — 0.044 (0.0006 — 0.0017)
			Limit		0.05 (0.0020)
	Thickness at center portion mm (in)		STD		1.492 — 1.501 (0.0587 — 0.0591)
			0.03 (0.0012) US		1.510 — 1.513 (0.0594 — 0.0596)
			0.05 (0.0020) US		1.520 — 1.523 (0.0598 — 0.0600)
			0.25 (0.0098) US		1.620 — 1.623 (0.0638 — 0.0639)
Connecting rod bushing	Clearance between piston pin and bushing mm (in)		STD		0 — 0.022 (0 — 0.0009)
			Limit		0.030 (0.0012)
Crankshaft	Bend limit mm (in)				0.035 (0.0014)
	Crank pin mm (in)	2.5 L	Out-of-roundness		0.003 (0.0001)
			Cylindrically		0.004 (0.0002)
			Grinding limit (dia.)		51.750 (2.0374)
	Crank pin mm (in)	2.0 L	Out-of-roundness		0.005 (0.0002)
			Cylindrically		0.006 (0.0002)
			Grinding limit (dia.)		51.750 (2.0374)
	Crank journal mm (in)	Out-of-roundness			0.005 (0.0002)
		Cylindrically			0.006 (0.0002)
		Grinding limit (dia.)			59.750 (2.3524)
	Crank pin outer diameter mm (in)		STD		51.984 — 52.000 (2.0466 — 2.0472)
			0.03 (0.0012) US		51.954 — 51.970 (2.0454 — 2.0461)
			0.05 (0.0020) US		51.934 — 51.950 (2.0446 — 2.0453)
			0.25 (0.0098) US		51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter mm (in)		STD		59.992 — 60.008 (2.3619 — 2.3625)
			0.03 (0.0012) US		59.962 — 59.978 (2.3607 — 2.3613)
			0.05 (0.0020) US		59.942 — 59.958 (2.3599 — 2.3605)
			0.25 (0.0098) US		59.742 — 59.758 (2.3520 — 2.3527)
	Thrust clearance mm (in)		STD		0.030 — 0.115 (0.0012 — 0.0045)
			Limit		0.25 (0.0098)
	Oil clearance mm (in)		STD		0.010 — 0.030 (0.0004 — 0.0012)
			Limit		0.040 (0.0016)

Main bearing	Main bearing thickness mm (in)	#1, #3	STD	1.998 — 2.011 (0.0787 — 0.0792)
			0.03 (0.0012) US	2.017 — 2.020 (0.0794 — 0.0795)
			0.05 (0.0020) US	2.027 — 2.030 (0.0798 — 0.0799)
			0.25 (0.0098) US	2.127 — 2.130 (0.0837 — 0.0839)
		#2, #4, #5	STD	2.000 — 2.013 (0.0787 — 0.0793)
			0.03 (0.0012) US	2.019 — 2.022 (0.0795 — 0.0796)
			0.05 (0.0020) US	2.029 — 2.032 (0.0799 — 0.0800)
			0.25 (0.0098) US	2.129 — 2.132 (0.0838 — 0.0839)

B: COMPONENT

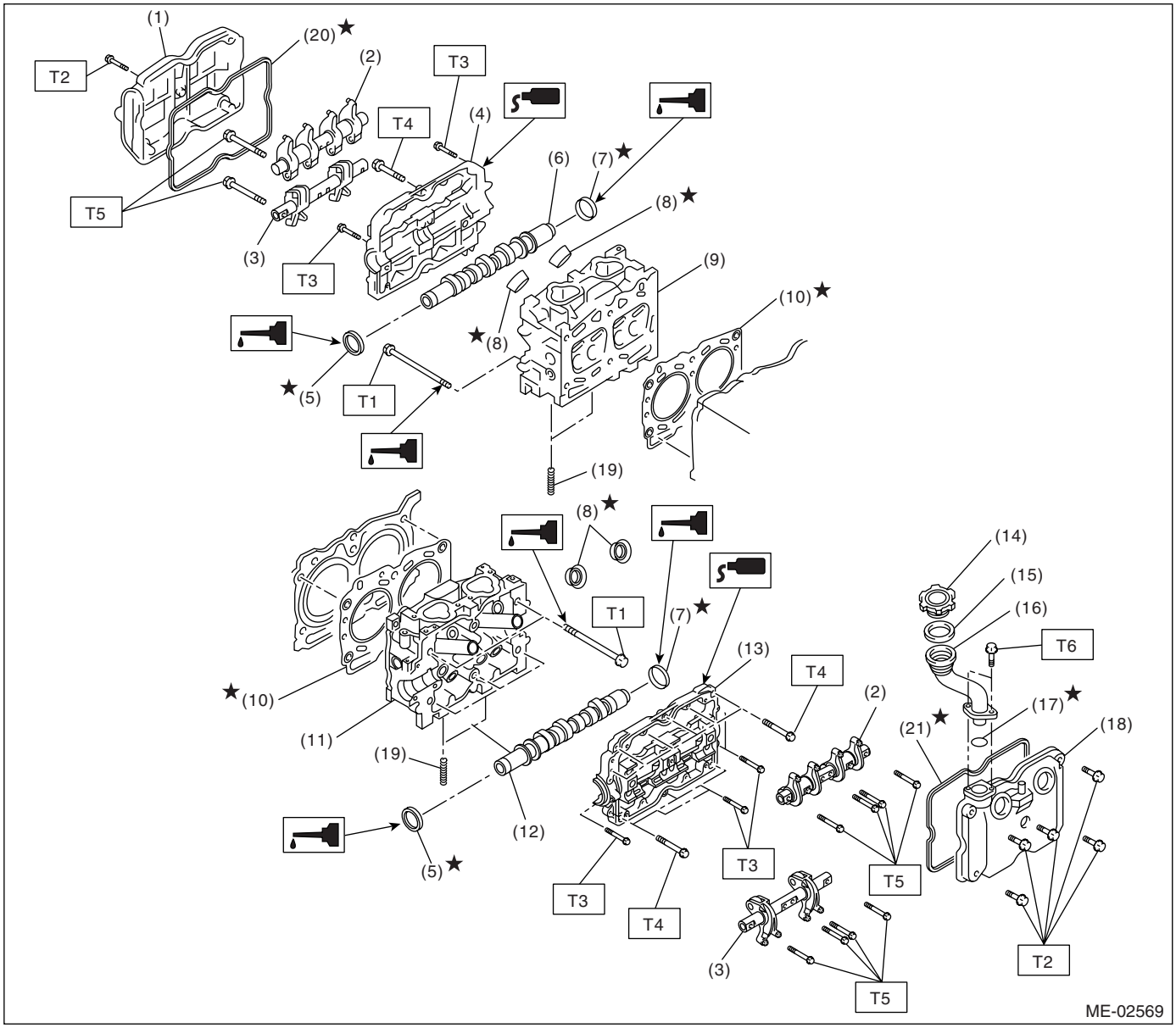
1. TIMING BELT



(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crank sprocket
(4) Timing belt cover No. 2 (LH)
(5) Cam sprocket No. 1
(6) Belt idler (No. 1)
(7) Tensioner bracket
(8) Belt idler (No. 2)
(9) Automatic belt tension adjuster ASSY
(10) Belt idler No. 2
(11) Cam sprocket No. 2
(12) Timing belt
(13) Front timing belt cover
(14) Timing belt cover (LH)
(15) Crank pulley (2.0 L model)
(16) Crank pulley (2.5 L model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 78 (8.0, 57.9)
T6: <Ref. to ME(H4SO)-45, INSTALLATION, Crank Pulley.>

2. CYLINDER HEAD AND CAMSHAFT

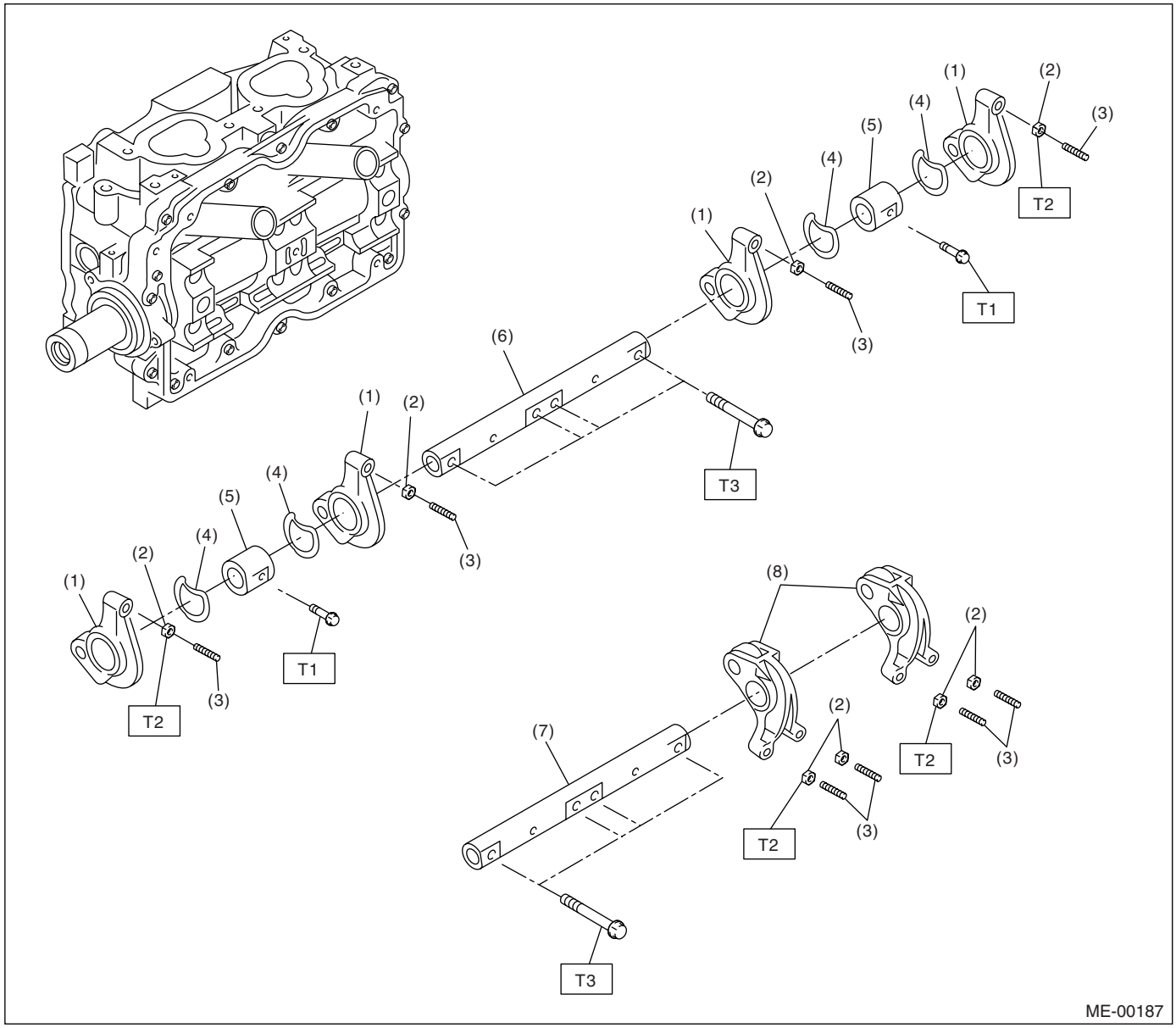


(1) Rocker cover (RH)
(2) Intake valve rocker ASSY
(3) Exhaust valve rocker ASSY
(4) Camshaft cap (RH)
(5) Oil seal
(6) Camshaft (RH)
(7) Plug
(8) Spark plug pipe gasket
(9) Cylinder head (RH)
(10) Cylinder head gasket
(11) Cylinder head (LH)
(12) Camshaft (LH)
(13) Camshaft cap (LH)
(14) Oil filler cap
(15) Gasket
(16) Oil filler duct
(17) O-ring
(18) Rocker cover (LH)
(19) Stud bolt
(20) Rocker cover gasket (RH)
(21) Rocker cover gasket (LH)

Tightening torque: N·m (kgf-m, ft-lb)

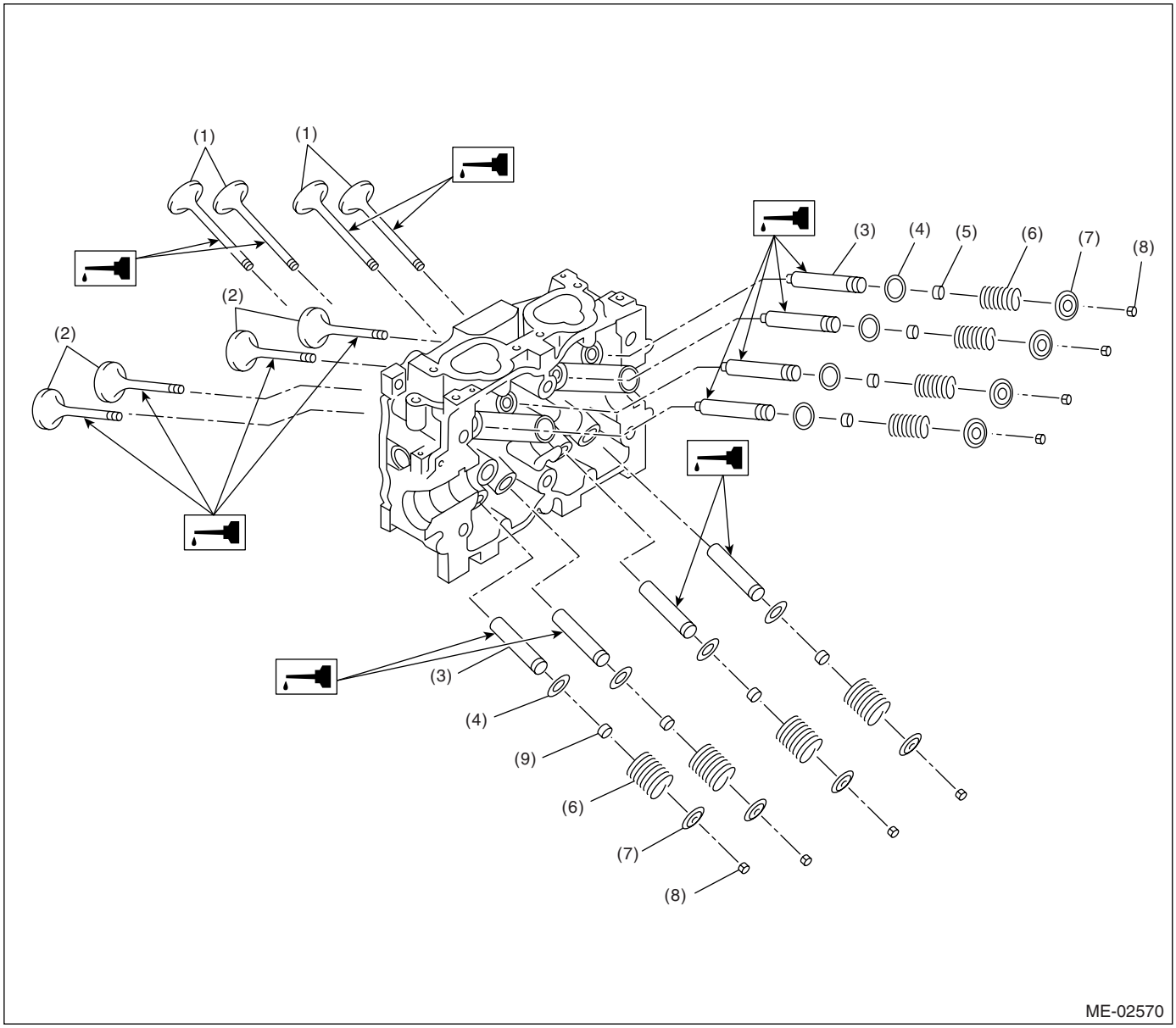
T1: <Ref. to ME(H4SO)-62, INSTALLATION, Cylinder Head.>
T2: 5 (0.5, 3.6)
T3: 9.75 (1.0, 7.2)
T4: 18 (1.8, 13.0)
T5: 25 (2.5, 18.1)
T6: 6.4 (0.65, 4.7)

3. VALVE ROCKER ASSEMBLY



(1)	Intake valve rocker arm	(5)	Rocker shaft spacer	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Valve rocker nut	(6)	Intake rocker shaft	***T1: 5 (0.5, 3.6)***
(3)	Valve rocker adjust screw	(7)	Exhaust rocker shaft	***T2: 9.75 (1.0, 7.2)***
(4)	Spring	(8)	Exhaust valve rocker arm	***T3: 25 (2.5, 18.1)***

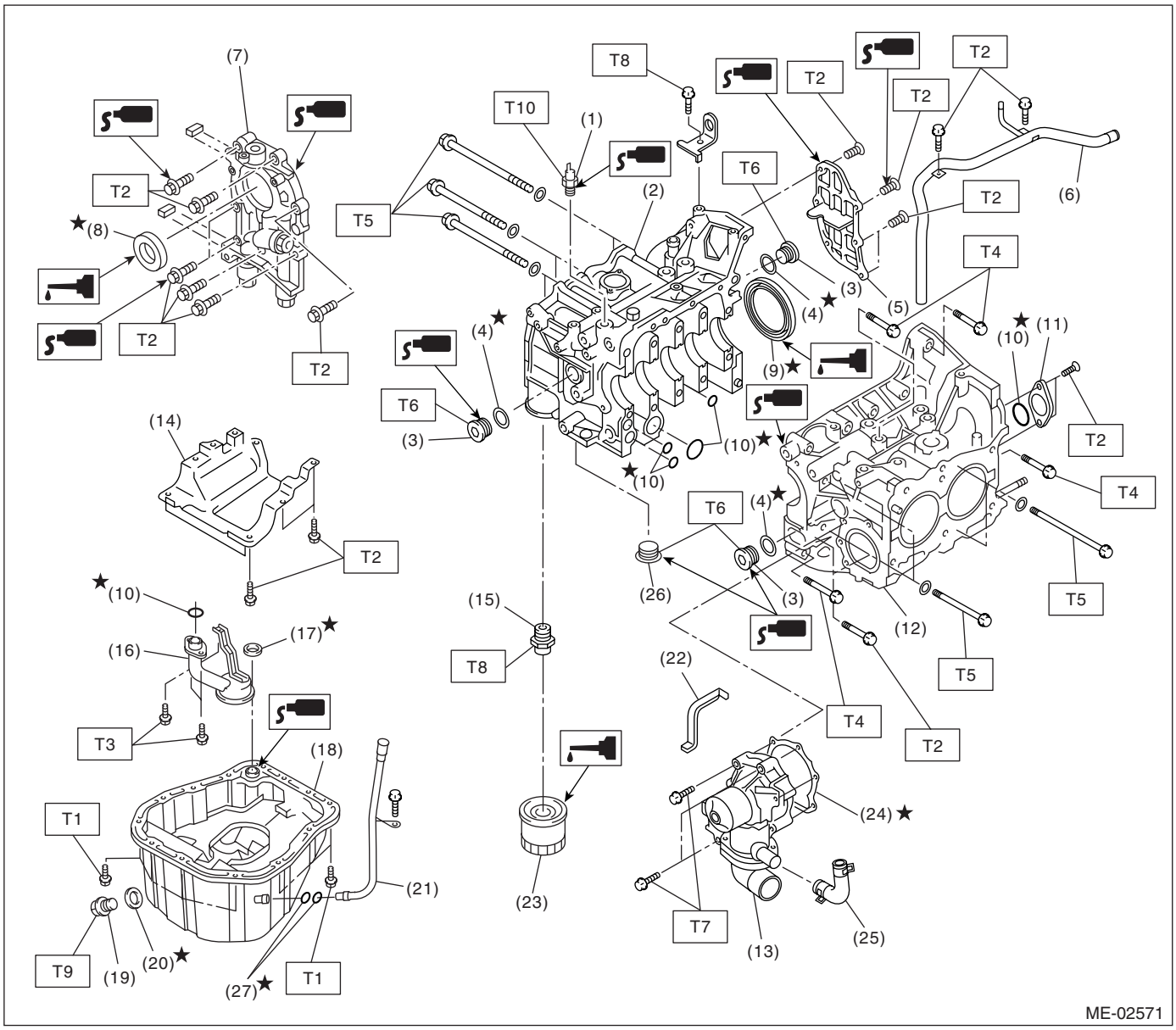
4. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Valve guide
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Exhaust valve oil seal

5. CYLINDER BLOCK

• MODEL WITHOUT ATF WARMER

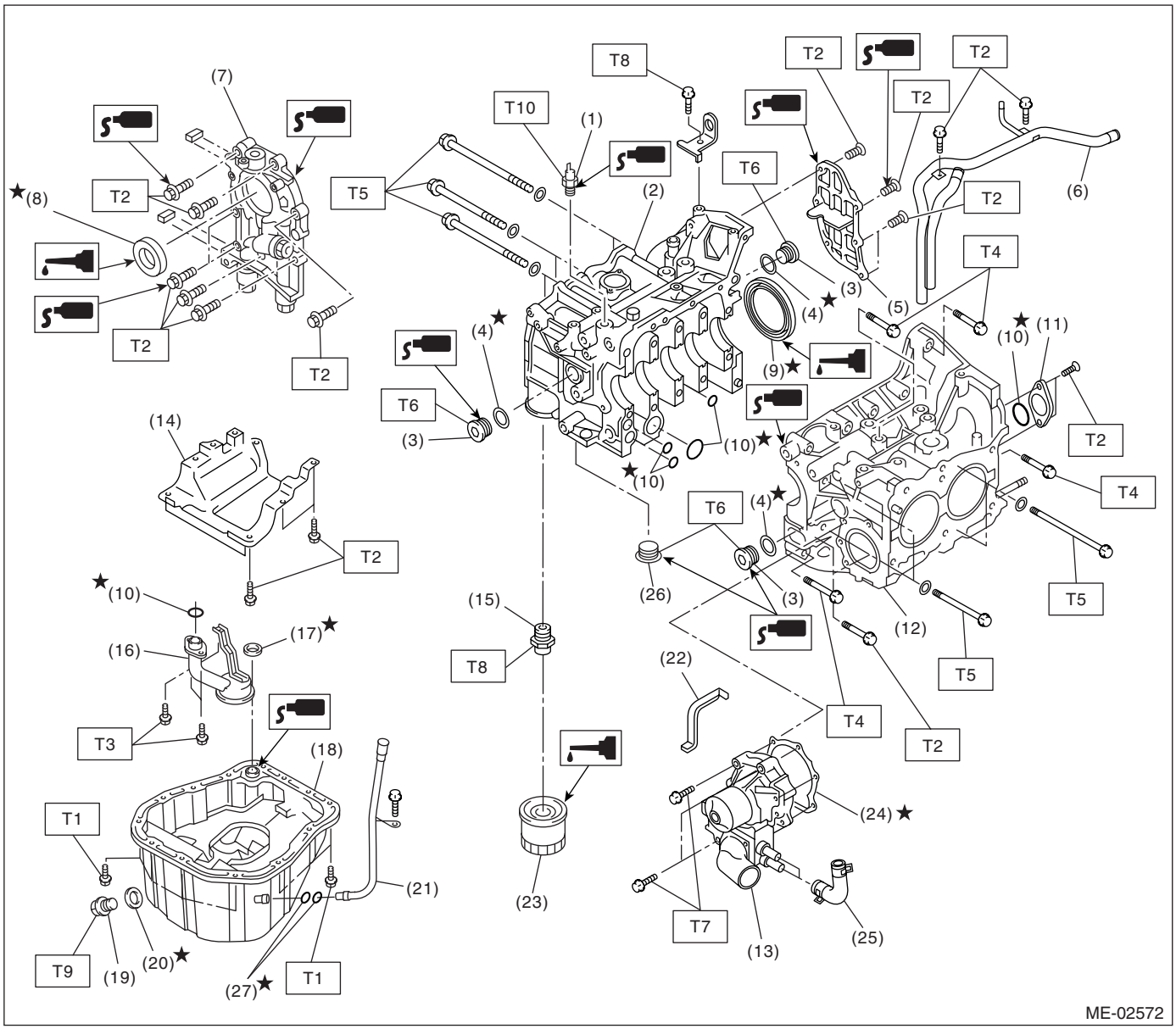


(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil filter connector
(16) Oil strainer
(17) Gasket
(18) Oil pan
(19) Drain plug
(20) Metal gasket
(21) Oil level gauge guide
(22) Water pump sealing
(23) Oil filter
(24) Gasket
(25) Water pump hose
(26) Plug
(27) O-ring

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(H4SO)-73, INSTALLATION, Cylinder Block.>
T6: 70 (7.1, 52)
T7: First 12 (1.2, 9.0) Second 12 (1.2, 9.0)
T8: 45 (4.6, 33)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)

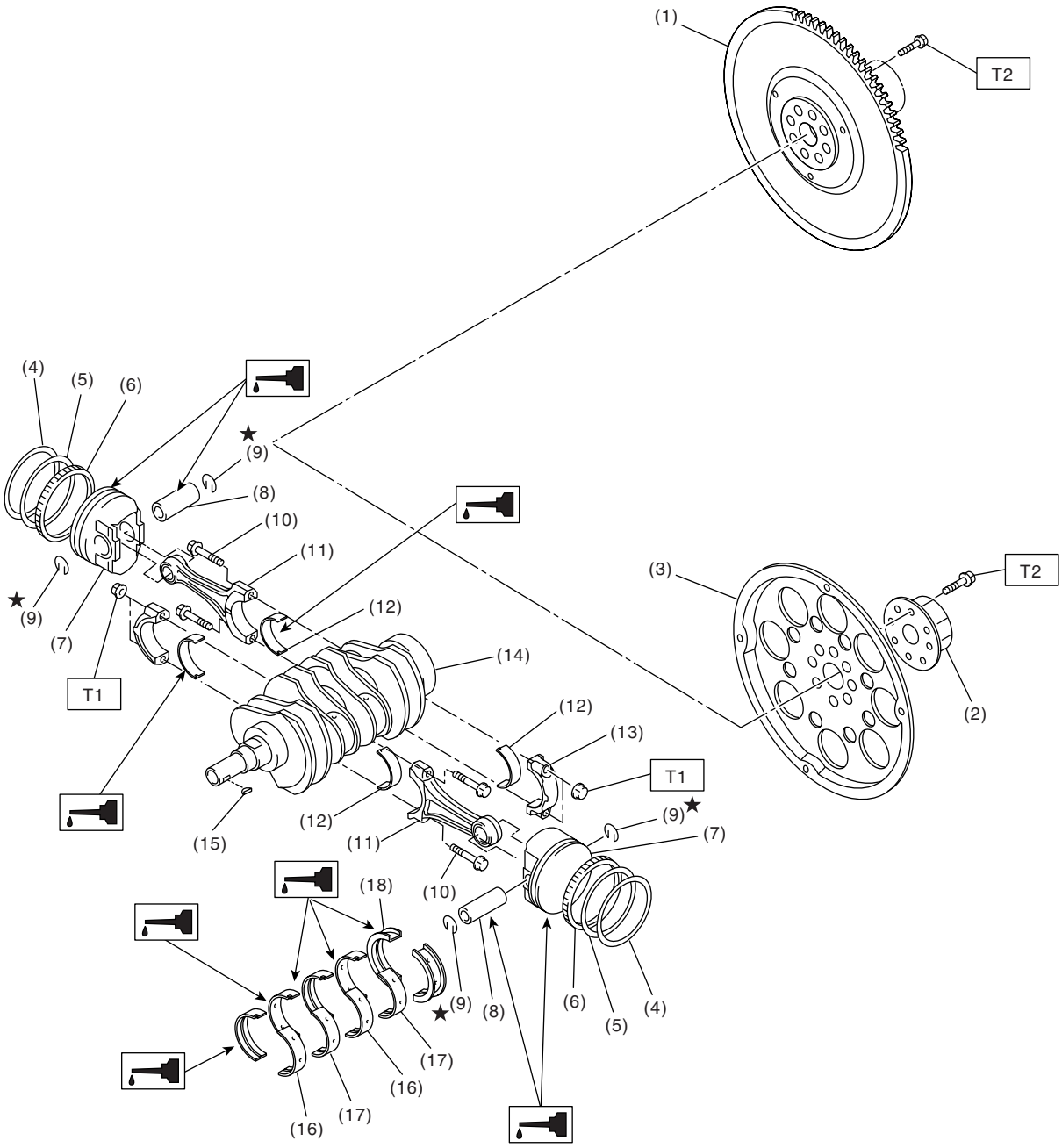
• MODEL WITH ATF WARMER



(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil filter connector
(16) Oil strainer
(17) Gasket
(18) Oil pan
(19) Drain plug
(20) Metal gasket
(21) Oil level gauge guide
(22) Water pump sealing
(23) Oil filter
(24) Gasket
(25) Water pump hose
(26) Plug
(27) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(H4SO)-73, INSTALLATION, Cylinder Block.>
T6: 70 (7.1, 52)
T7: First 12 (1.2, 9.0)
Second 12 (1.2, 9.0)
T8: 45 (4.6, 33)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)

6. CRANKSHAFT AND PISTON

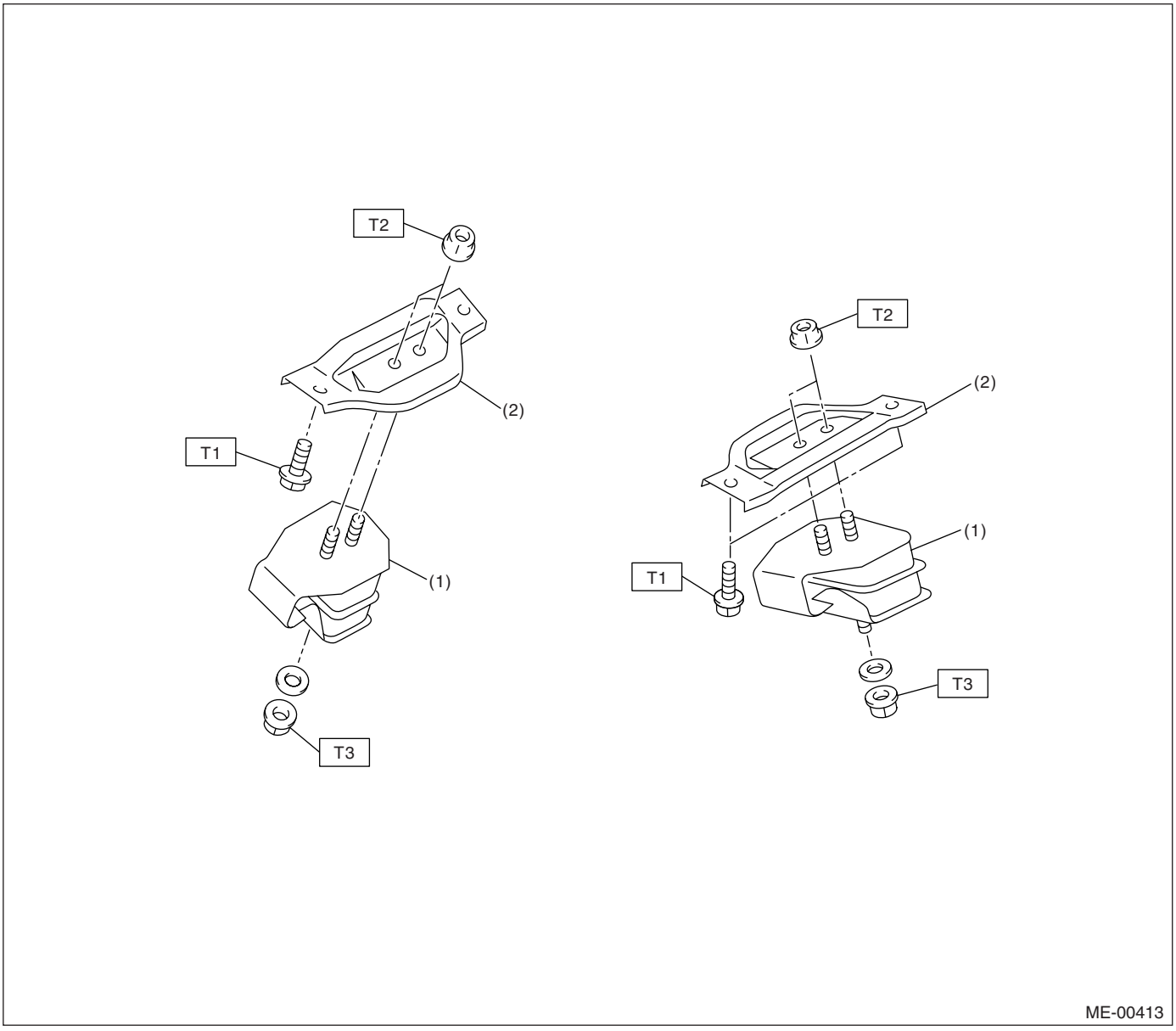


ME-02517

(1) Flywheel (MT model)
(2) Reinforcement (AT model)
(3) Drive plate (AT model)
(4) Top ring
(5) Second ring
(6) Oil ring
(7) Piston
(8) Piston pin
(9) Snap ring
(10) Connecting rod bolt
(11) Connecting rod
(12) Connecting rod bearing
(13) Connecting rod cap
(14) Crankshaft
(15) Woodruff key
(16) Crankshaft bearing #1, #3
(17) Crankshaft bearing #2, #4
(18) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33)
T2: 72 (7.3, 53.1)

7. ENGINE MOUNTING



(1) Front cushion rubber
(2) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26.0)
T2: 42 (4.3, 31.0)
T3: 85 (8.7, 63)

C: CAUTION

• Wear working clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part in the vehicle is hot after running.
• Be sure to tighten bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or engine coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools, or not to stain seats and windows with engine coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch engine coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOL

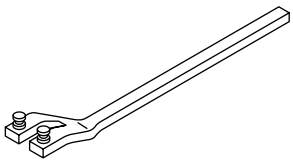
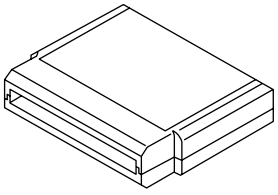
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18231AA010	18231AA010	CAM SPROCKET WRENCH	• Used for removing and installing cam sprocket. (LH side) • Also the CAM SPROCKET WRENCH (499207100) can be used.
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.

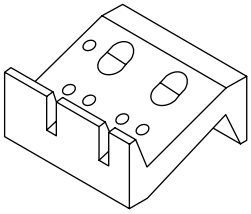
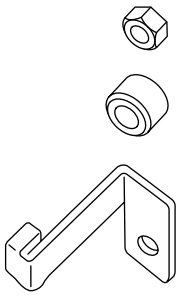
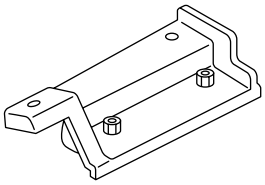
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)
 ST-498267800	498267800	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

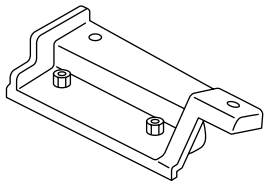
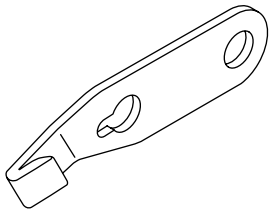
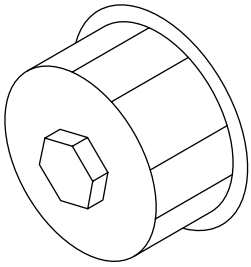
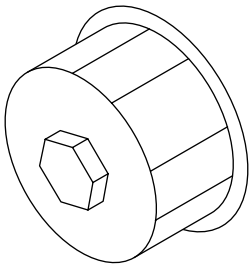
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crank pulley bolt, etc.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter : 80 mm (3.15 in))
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter : 68 mm (2.68 in))

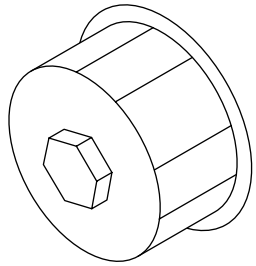
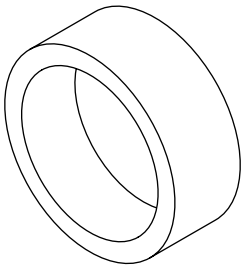
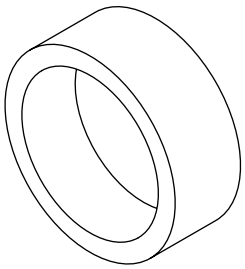
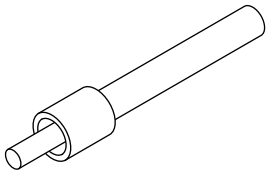
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter : 65 mm (2.56 in))
 ST-398744300	398744300 (2.0 L model)	PISTON GUIDE	Used for installing piston in cylinder.
 ST-498747300	498747300 (2.5 L model)	PISTON GUIDE	Used for installing piston in cylinder.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.

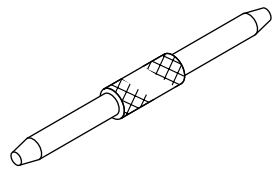
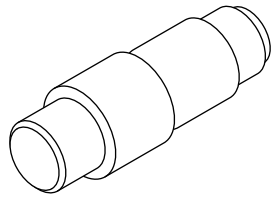
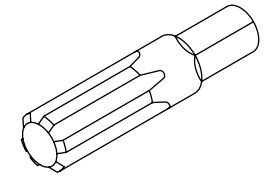
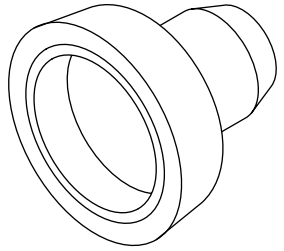
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499057000	499057000	TORX PLUS®	Used for removing flywheel (Dual mass flywheel).
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

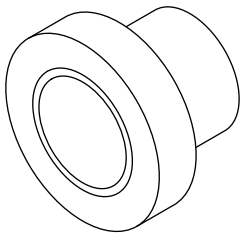
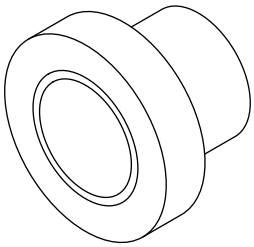
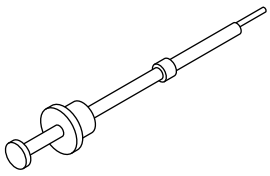
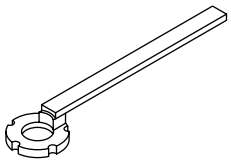
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587500	499587500	OIL SEAL INSTALLER	Used for installing camshaft oil seal.
 ST-499587700	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin. (2.5 L model)
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (RH side)

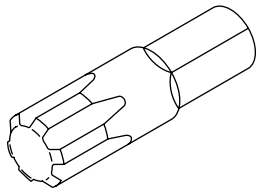
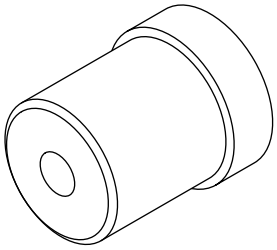
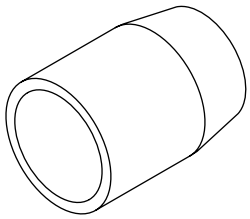
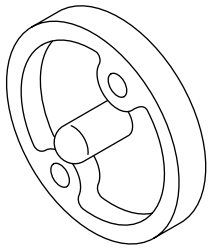
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499497000	499497000	TORX PLUS®	Used for removing and installing camshaft cap.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499597000	499597000	OIL SEAL GUIDE	• Used for installing camshaft oil seal. • Used with CAMSHAFT OIL SEAL INSTALLER (499587500).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).

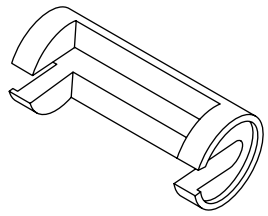
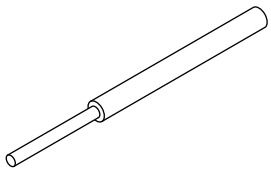
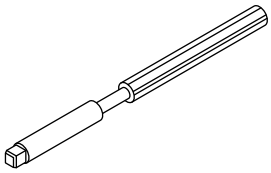
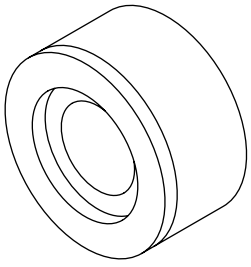
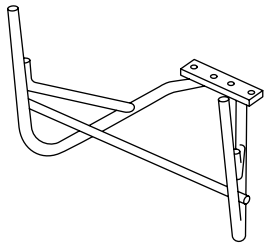
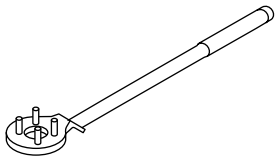
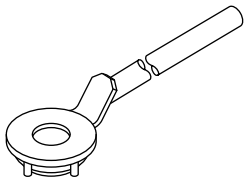
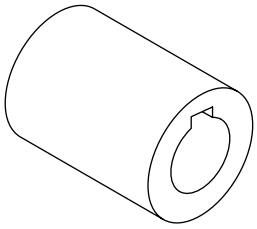
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499767700	499767700 (Intake side) 499767800 (Exhaust side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499817100	499817100	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts. (2.5 L model)
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts. (2.0 L model)
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Tachometer (secondary pick-up type)	Used for measuring idle speed.
Timing light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

2. Compression

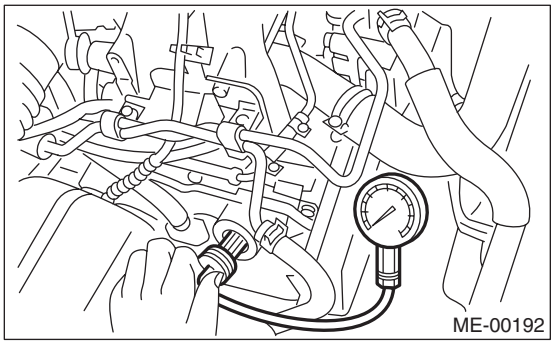
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
4) Remove all the spark plugs. **<Ref. to IG(H4SO)-5,** REMOVAL**, Spark Plug.>**
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



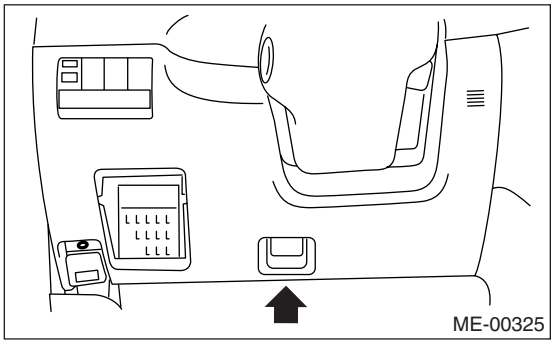
9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard:
1,275 kPa (13.0 kgf/cm^2, 185 psi)
Limit:
1,020 kPa (10.4 kgf/cm^2, 148 psi)
Difference between cylinders:
49 kPa (0.5 kgf/cm^2, 7 psi), or less

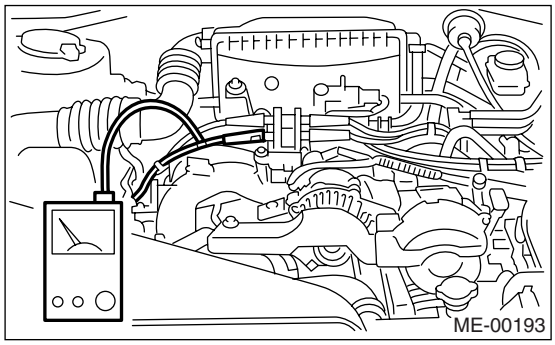
3. Idle Speed

A: INSPECTION

1) Before checking idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and the hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) When using the Subaru Select Monitor, refer to the following. **<Ref. to ME(H4SO)-15,** SPECIAL TOOL, PREPARATION TOOL**, General Description.>**
   (1) Insert the cartridge to Subaru Select Monitor.
   (2) Connect the Subaru Select Monitor to data link connector.



   (3) Turn the ignition switch to ON, and Subaru Select Monitor switch to ON.
   (4) Select the {Each System Check} in Main Menu.
   (5) Select the {Engine Control System} in Selection Menu.
   (6) Select the {Current Data Display & Save} in Engine Control System Diagnostic.
   (7) Select the {Data Display} in Data Display Menu.
   (8) Start the engine, and then read the engine idle speed.
5) When using the tachometer (Secondary pick-up type).
   (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
   (2) Start the engine, and then read the engine idle speed.



NOTE:
- When using the general scan tool, carefully read its operation manual.
- This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

6) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in "N" or "P" range]:
650±100 rpm

7) Check the idle speed when loaded. (Turn the air conditioning switch to "ON" and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C "ON", no load and gears in "N" or "P" range]:
850±100 rpm

NOTE:
Idle speed can not be adjusted manually, because the idle speed is automatically adjusted.
If the specified idle speed can not be maintained, refer to General On-board Diagnostic Table under "Engine Control System". **<Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>**

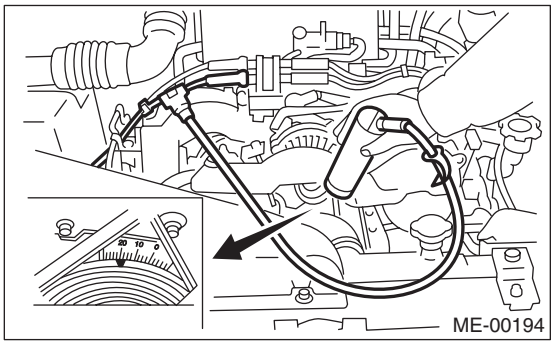
4. Ignition Timing

A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) Warm-up the engine.
2) To check the ignition timing, connect a timing light to #1 cylinder spark plug cord, and illuminate the timing mark with timing light.
3) Start the engine at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:
10°±10°/650



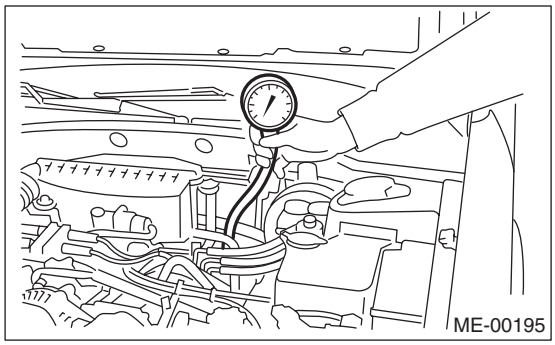
If the timing is not correct, check the ignition control system. **<Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>**

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose from intake manifold, and then install the vacuum gauge.
3) Keep the engine at idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



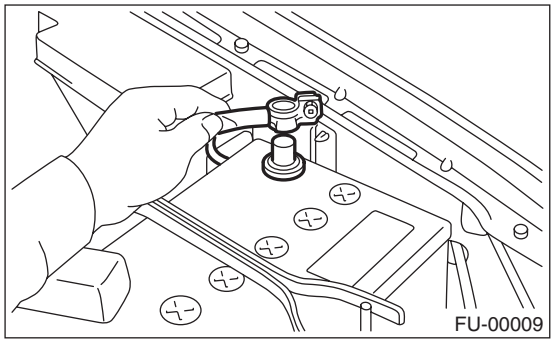
Vacuum pressure (at idling, A/C "OFF"):
Less than −60.0 kPa (−450 mmHg, −17.72 in-Hg)

Diagnostic of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Air leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Exhaust pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system

6. Engine Oil Pressure

A: INSPECTION

1) Disconnect the ground cable from battery.



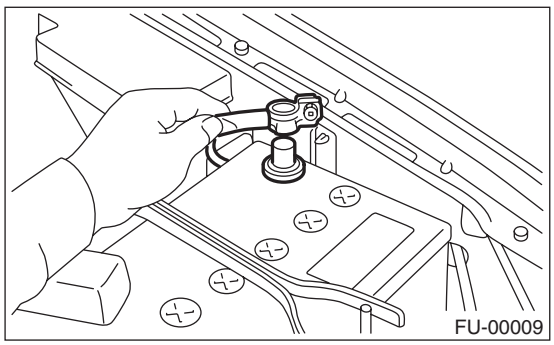
2) Remove the generator from bracket. **<Ref. to SC(H4SO)-15,** REMOVAL**, Generator.>**

3) Disconnect the connector from oil pressure switch.

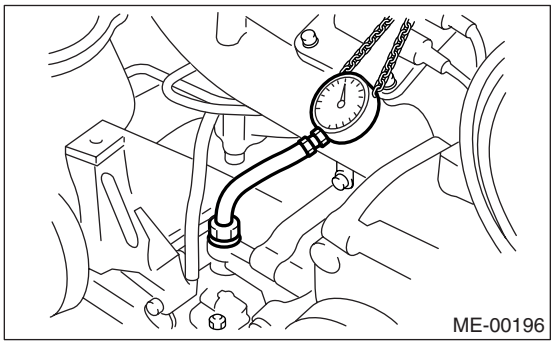
4) Remove the oil pressure switch from cylinder block. **<Ref. to LU(H4SO)-22,** REMOVAL**, Oil Pressure Switch.>**

5) Connect the oil pressure gauge hose to cylinder block.

6) Connect the battery ground cable to battery.



7) Start the engine, and then measure the oil pressure.



Oil pressure:
Standard:
98 kPa (1.0 kgf/cm^2, 14 psi) or more at 600 rpm
294 kPa (3.0 kgf/cm^2, 43 psi) or more at 5,000 rpm

CAUTION:
• If the oil pressure is out of specification, check the oil pump, oil filter and lubrication line. <Ref. to LU(H4SO)-26, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4SO)-26, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

8) After measuring the oil pressure, install the oil pressure switch. **<Ref. to LU(H4SO)-22,** INSTALLATION**, Oil Pressure Switch.>**

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

9) Install the generator and V-belt in the reverse order of removal, and then adjust the V-belt deflection. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

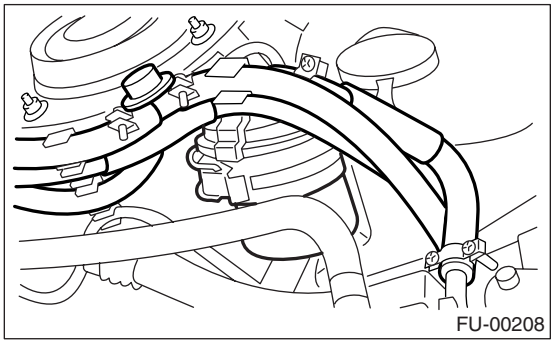
7. Fuel Pressure

A: INSPECTION

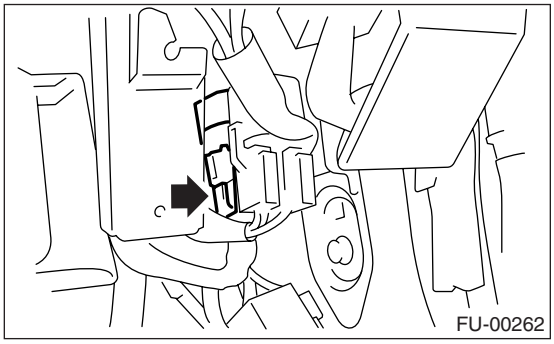
WARNING:
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
2) Open the fuel filler flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses from fuel filter, and then connect the fuel pressure gauge.

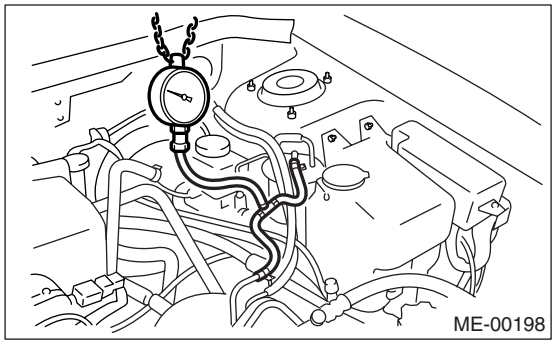

FU-00208

4) Connect the connector of fuel pump relay.


FU-00262

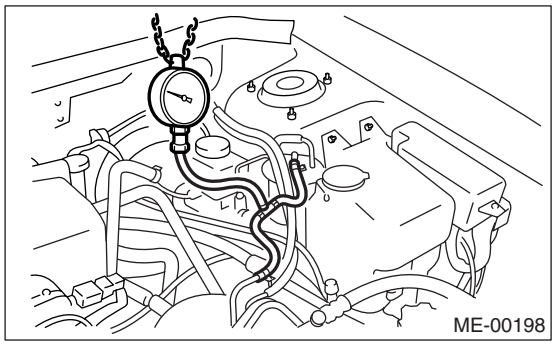
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard:
284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)


ME-00198

7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard:
206 — 235 kPa (2.1 — 2.4 kgf/cm^2, 30 — 34 psi)


ME-00198

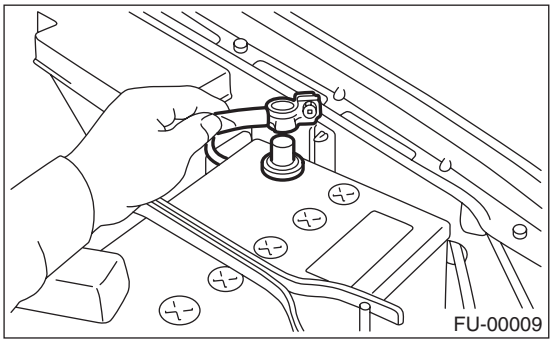
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

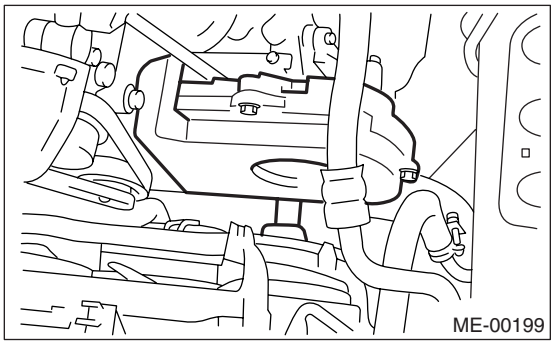
A: INSPECTION

NOTE:
Inspection and adjustment of the valve clearance should be performed while engine is cold.

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Lower the vehicle.
5) Disconnect the ground cable from battery.

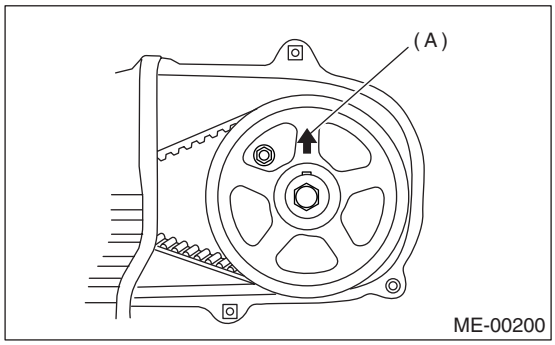


6) Remove the belt cover (LH).



7) When inspecting the #1 and #3 cylinders:
   (1) Disconnect the spark plug cords from spark plugs RH side. **<Ref. to IG(H4SO)-5,** RH SIDE, REMOVAL**, Spark Plug.>**
   (2) Disconnect the PCV hose from rocker cover (RH).
   (3) Remove the bolts, and then remove the rocker cover (RH).
8) When inspecting the #2 and #4 cylinders:
   (1) Disconnect the spark plug cords from spark plugs (LH Side) **<Ref. to IG(H4SO)-5,** LH SIDE, REMOVAL**, Spark Plug.>**
   (2) Disconnect the PCV hose from rocker cover (LH).
   (3) Remove the bolts, and then remove the rocker cover (LH).
9) Set the #1 cylinder piston to top dead center of compression stroke by rotating crank pulley clockwise using a socket wrench.

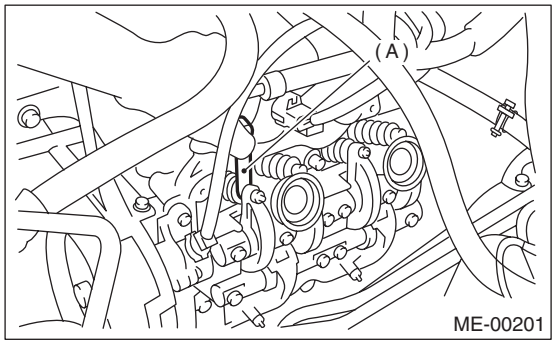
NOTE:
When arrow mark (A) on the cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



10) Measure the #1 cylinder valve clearance by using thickness gauge.

CAUTION:
• Insert the thickness gauge (A) in as horizontal a direction as possible with respect to the valve stem end face.
• Measure the exhaust valve clearances while lifting-up the vehicle.

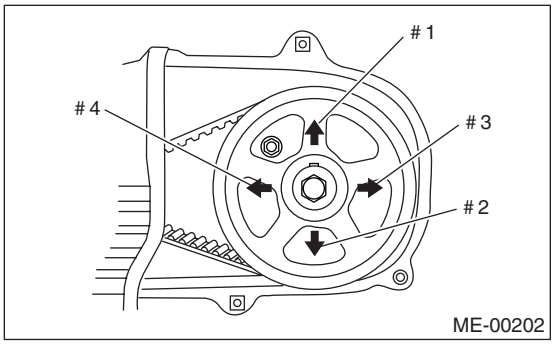
Valve clearance (Standard):
Intake:
0.20±0.04 mm (0.0079±0.0016 in)
Exhaust:
0.25±0.04 mm (0.0098±0.0016 in)



11) If necessary, adjust the valve clearance. **<Ref. to ME(H4SO)-32,** ADJUSTMENT**, Valve Clearance.>**
12) Similar to measurement procedures used for #1 cylinder, measure the #2, #3 and #4 cylinder valve clearances.

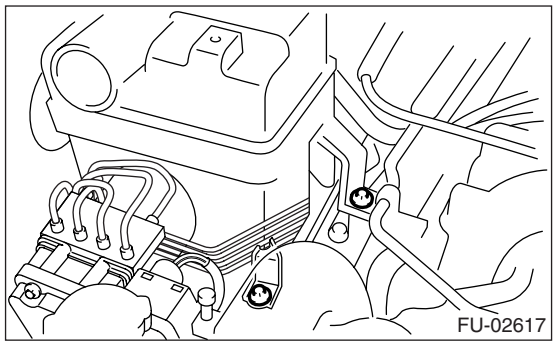
NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.

• To set the #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn the crank pulley clockwise 90° at a time starting with arrow mark on cam sprocket (LH) facing up.



13) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
Resonator chamber;
33 N·m (3.4 kgf-m, 25 ft-lb)

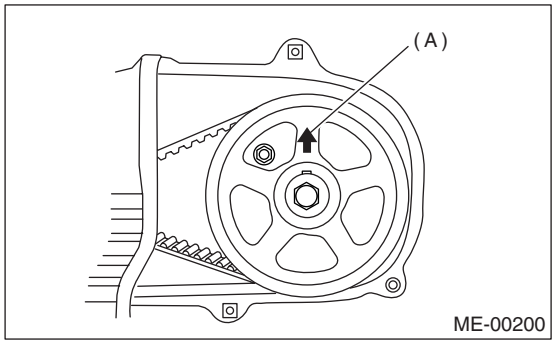


B: ADJUSTMENT

NOTE:
Adjustment of the valve clearance should be performed while engine is cold.

1) Set the #1 cylinder piston to top dead center of compression stroke by rotating crank pulley clockwise using socket wrench.

NOTE:
When arrow mark (A) on the cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.

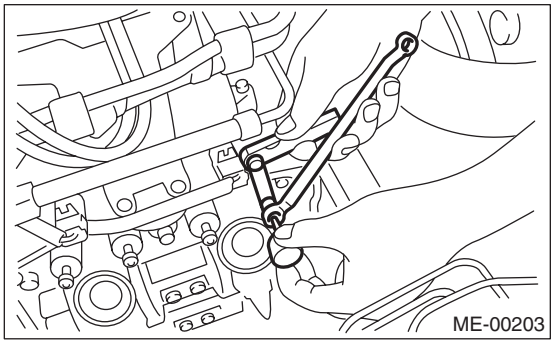


2) Adjust the #1 cylinder valve clearance.
(1) Loosen the valve rocker nut and screw.
(2) Place suitable thickness gauge.
(3) While noting the valve clearance, tighten the valve rocker adjusting screw.
(4) When specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

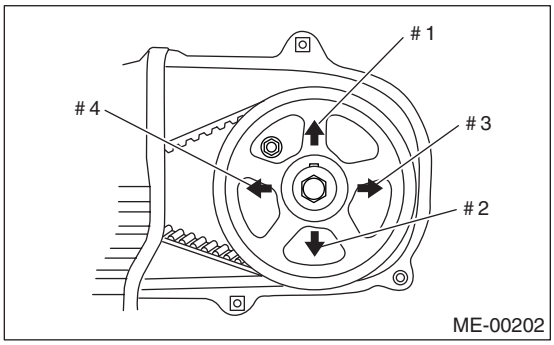
CAUTION:
• Insert the thickness gauge in as horizontally as possible with respect to the valve stem end face.
• Adjust the exhaust valve clearances while lifting up the vehicle.

Valve clearance:
Intake:
0.20±0.04 mm (0.0079±0.0016 in)
Exhaust:
0.25±0.04 mm (0.0098±0.0016 in)



3) Ensure the valve clearances are within specifications.
4) Turn the crankshaft two complete rotations until #1 cylinder piston is again set to the top dead center of compression stroke.
5) Ensure the valve clearances are within specifications. If necessary, readjust the valve clearances.
6) Similar to adjustment procedures used for #1 cylinder, adjust the #2, #3 and #4 cylinder valve clearances.

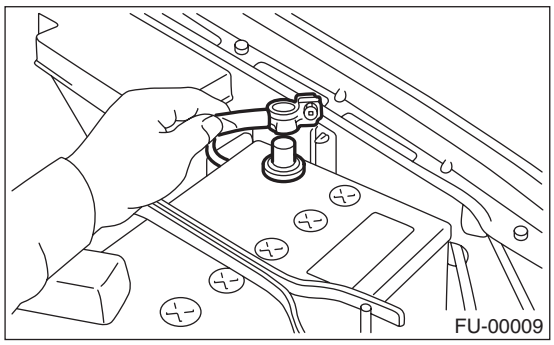
NOTE:
• Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
• To set the #3, #2 and #4 cylinder pistons to their top dead centers of compression stroke, turn the crank pulley clockwise 90° at a time starting with arrow mark on cam sprocket (LH) facing up.



9. Engine Assembly

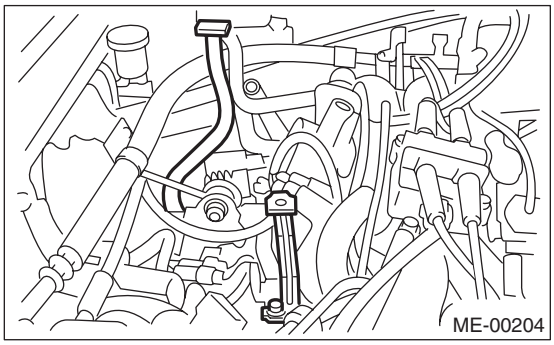
A: REMOVAL

1) Set the vehicle on lift arms.
2) Open the front hood fully, and then support with the front hood stay.
3) Release the fuel pressure. **<Ref. to FU(H4SO)-47,** RELEASING OF FUEL PRESSURE, OPERATION**, Fuel.>**
4) Discharge the refrigerant from the A/C system. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
5) Remove the fuel filler cap.
6) Disconnect the ground cable from battery.

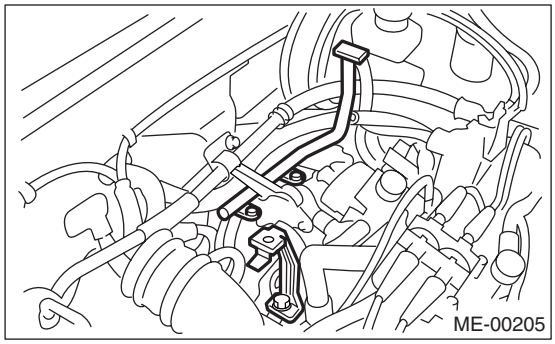


7) Remove the air intake duct and air cleaner case. **<Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.> <Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
8) Remove the under cover.
9) Remove the radiator from vehicle. **<Ref. to CO(H4SO)-28,** REMOVAL**, Radiator.>**
10) Remove the air cleaner case stay.

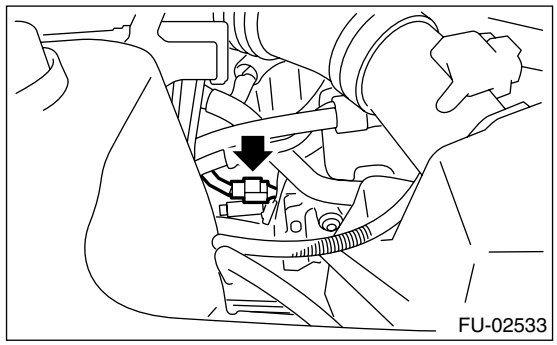
- MT model



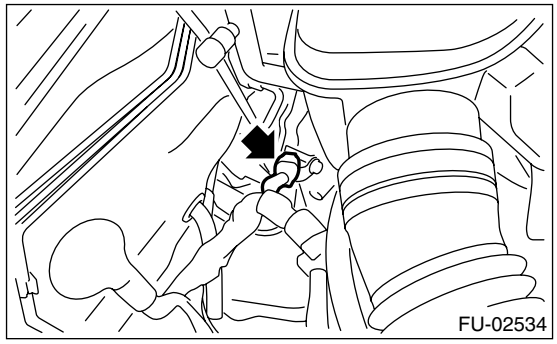
- AT model



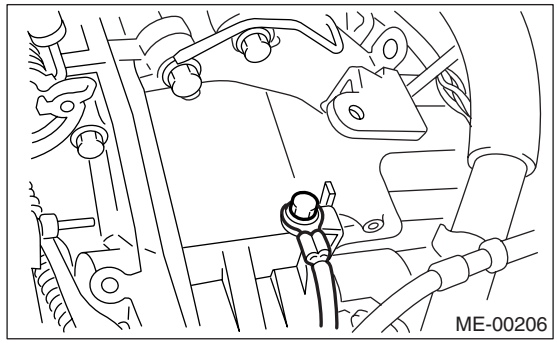
11) Disconnect the following connectors and cables.
(1) Front oxygen (A/F) sensor connector



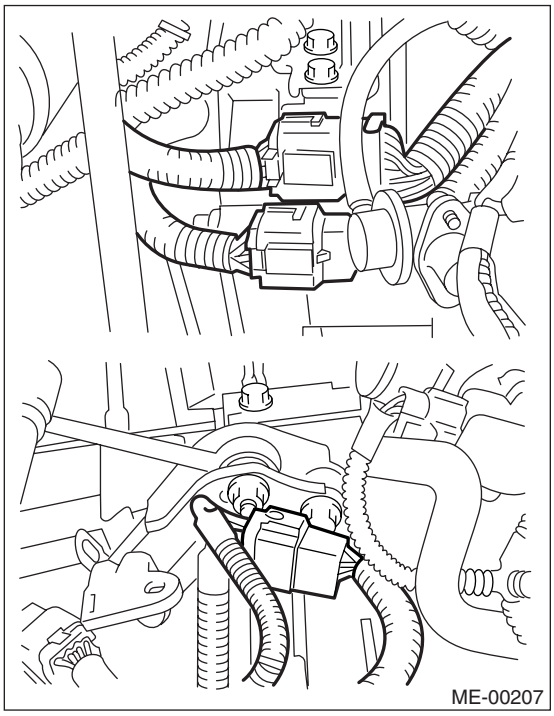
(2) Rear oxygen sensor connector



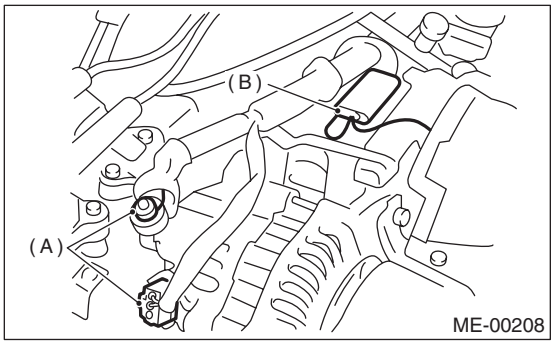
(3) Engine ground cable



(4) Engine harness connectors

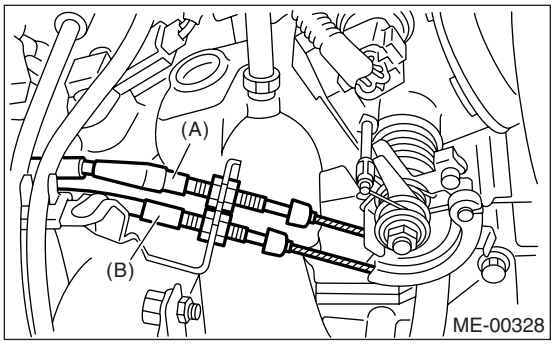


(5) Generator connector, terminal and A/C compressor connector

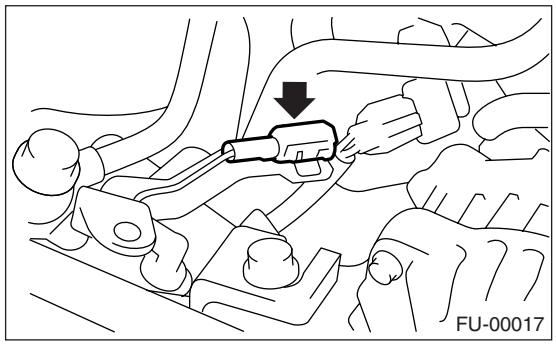


(A) Generator connector and terminal
(B) A/C compressor connector

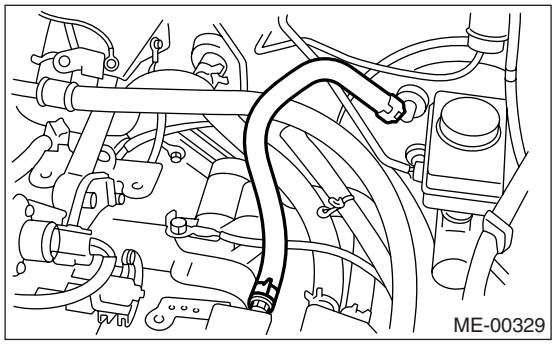
(6) Accelerator cable (A) and cruise control cable (B)



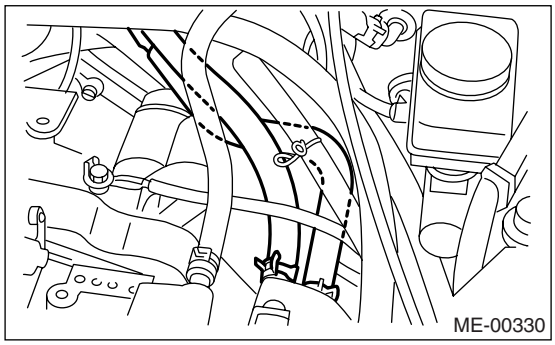
(7) Pressure switch



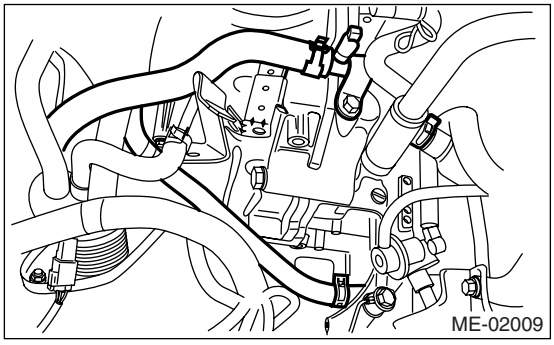
12) Disconnect the following hoses.
(1) Brake booster vacuum hose



(2) Heater inlet and outlet hose

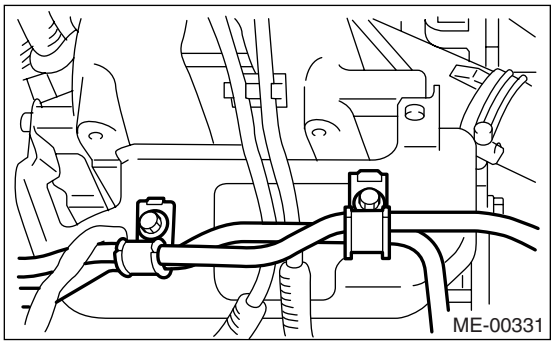


(3) Heater inlet and outlet hose (with ATF warmer model)

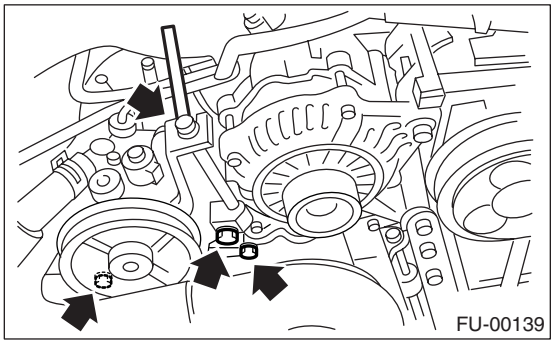


13) Remove the power steering pump from bracket.
(1) Remove the resonator chamber.

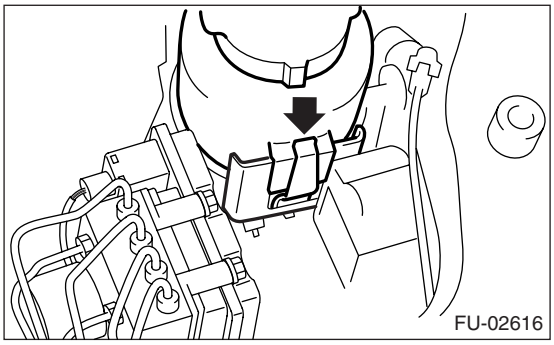
(2) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. **<Ref. to ME(H4SO)-43,** FRONT SIDE BELT, REMOVAL**, V-belt.>**
(3) Remove the pipe with bracket.


ME-00331

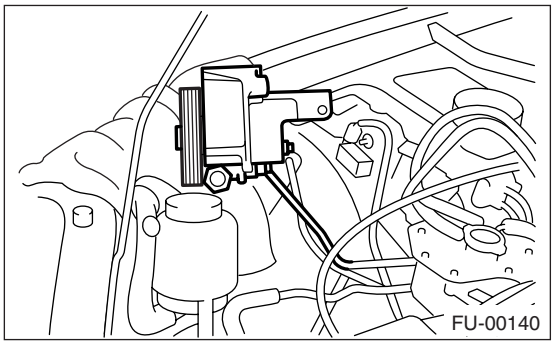
(4) Remove the bolts which install power steering pump bracket.


FU-00139

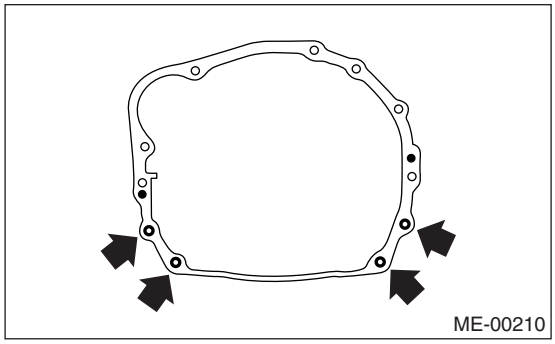
(5) Remove the reservoir tank from bracket by pulling it upward.


FU-02616

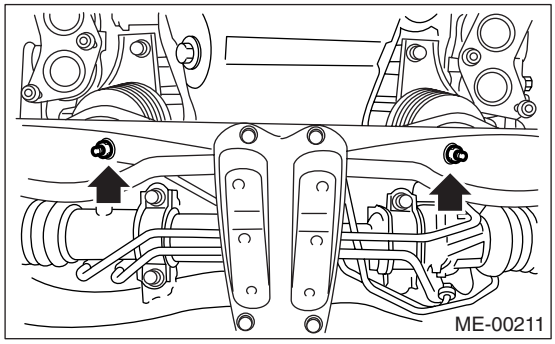
(6) Place the power steering pump on right side wheel apron.


FU-00140

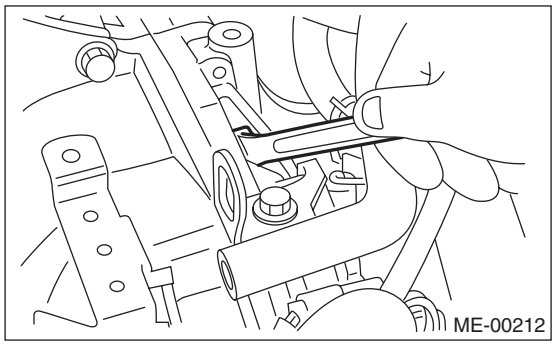
14) Remove the front and center exhaust pipe. **<Ref. to EX(H4SO)-7,** REMOVAL**, Front Exhaust Pipe.>**
15) Remove the nuts which hold lower side of transmission to engine.


ME-00210

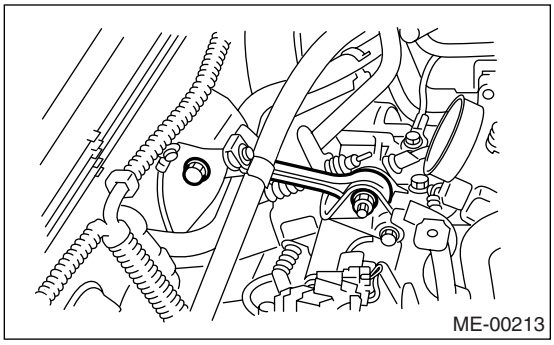
16) Remove the nuts which install front cushion rubber onto front crossmember.


ME-00211

17) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the engine using socket wrench.

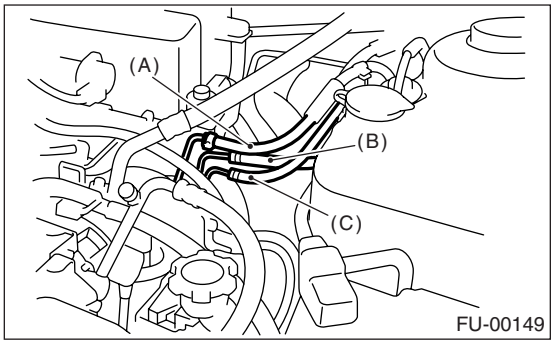

ME-00212

18) Remove the pitching stopper.

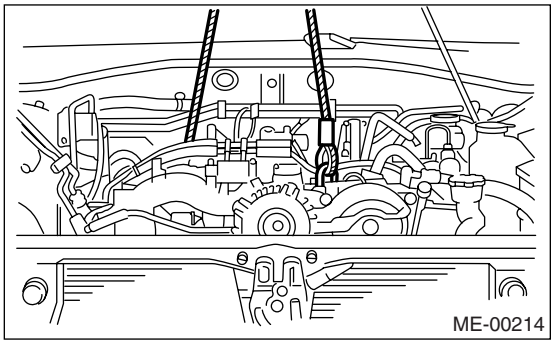


19) Disconnect the fuel delivery hose (A), return hose (B) and evaporation hose (C).

CAUTION:
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.
• Catch fuel from the hose into container.

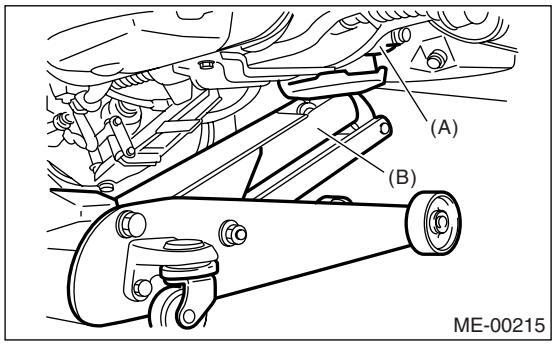


20) Support the engine with a lifting device and wire ropes.



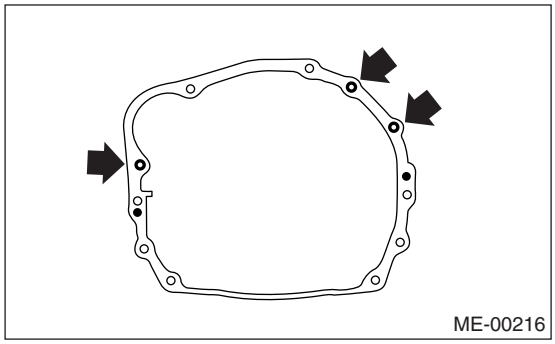
21) Support the transmission with a garage jack.

CAUTION:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because the transmission lowers under its own weight.

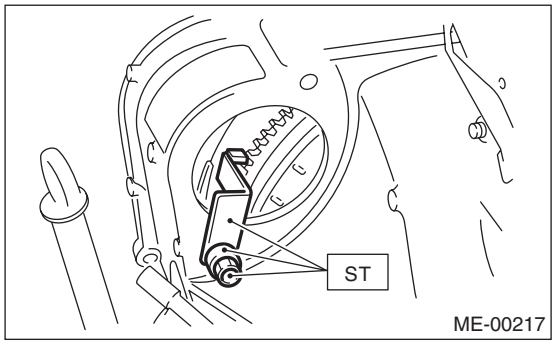


(A) Transmission
(B) Garage jack

22) Separation of the engine and transmission.
(1) Remove the starter. **<Ref. to SC(H4SO)-6,** REMOVAL**, Starter.>**
(2) Remove the bolts which hold upper side of transmission to engine.



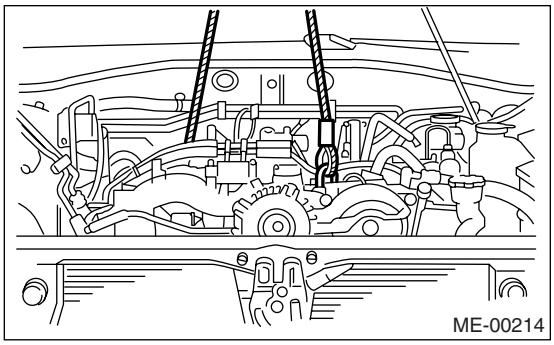
23) Install the ST to torque converter clutch case. (AT model)
ST 498277200 STOPPER SET



24) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.

(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil level gauge, etc.



25) Remove the front cushion rubbers.

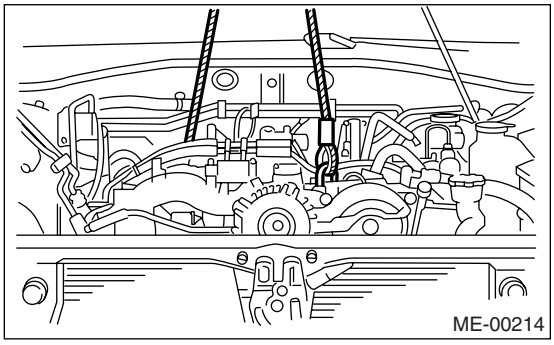
B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:
34 N·m (3.5 kgf-m, 25.3 ft-lb)

2) Install the engine onto transmission.
(1) Position the engine in engine compartment and align it with transmission.

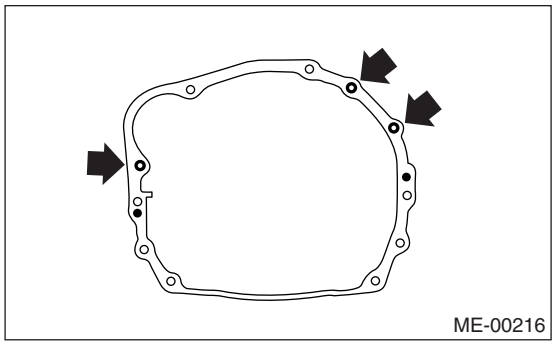
NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil level gauge, etc.



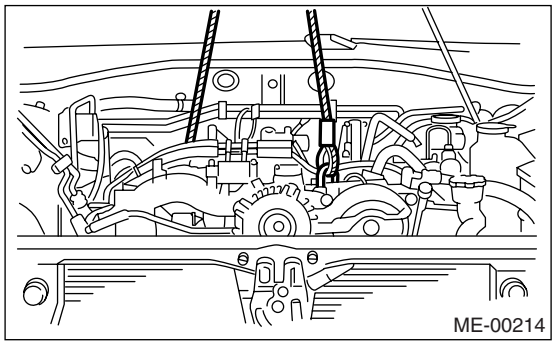
(2) Apply a small amount of grease to the spline of main shaft. (MT model)

3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

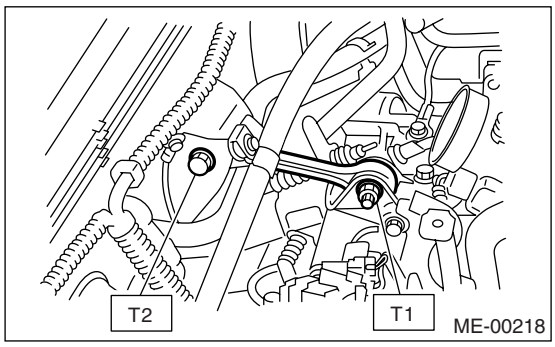


4) Remove the lifting device and wire ropes.



5) Remove the garage jack.
6) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



7) Remove the ST from torque converter clutch case. (AT model)

NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.

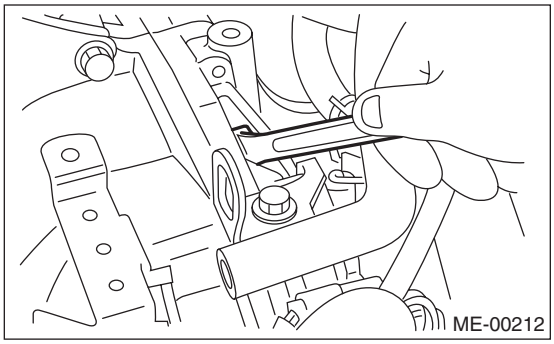
ST 498277200 STOPPER SET

8) Install the starter. **<Ref. to SC(H4SO)-6,** INSTALLATION**, Starter.>**
9) Install the torque converter clutch onto drive plate. (AT model)

(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using a socket wrench.

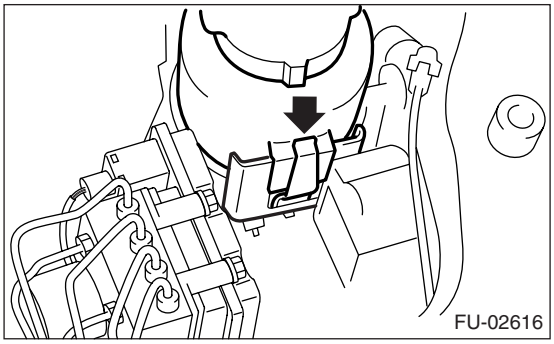
NOTE:
Be careful not to drop the bolts into torque converter clutch housing.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



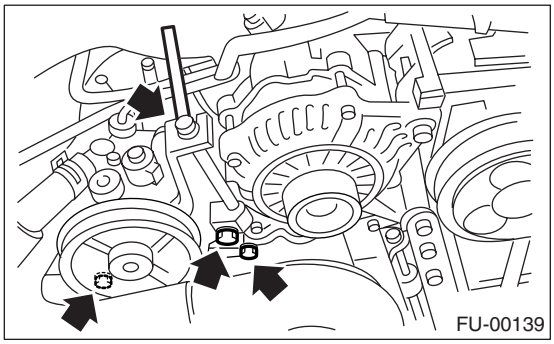
(3) Plug up the service hole and prevent foreign matters from getting in.

10) Install the power steering pump on bracket.
(1) Install the reservoir tank on bracket.

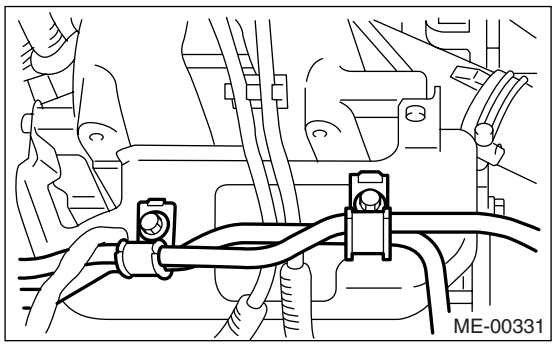


(2) Install the power steering pump on bracket, and then tighten the bolts.

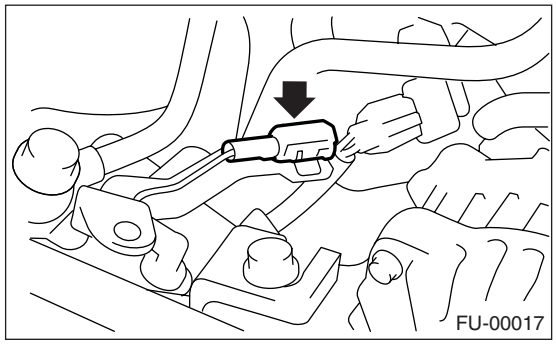
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Tighten the bolts which install power steering pump bracket, and then install the spark plug cords.

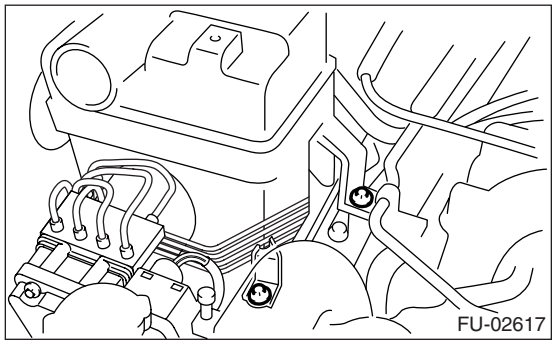


(4) Connect the power steering switch connector.



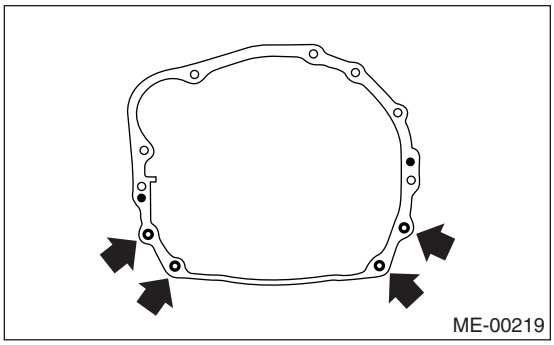
(5) Install the front side V-belt, and adjust it. **<Ref. to ME(H4SO)-43,** FRONT SIDE BELT, INSTALLATION**, V-belt.>**
(6) Install the resonator chamber.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



11) Tighten the nuts which hold lower side of transmission to engine.

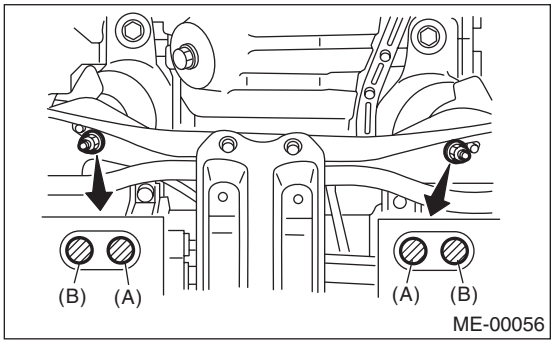
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



12) Tighten the nuts which install front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



13) Install the front and center exhaust pipe. **<Ref. to EX(H4SO)-8,** INSTALLATION**, Front Exhaust Pipe.>**
14) Connect the following hoses.
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
15) Connect the following connectors.
(1) Engine ground cables

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)

(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors
(5) Power steering pressure switch
16) Connect the following cables.
(1) Accelerator cable
(2) Cruise control cable (With cruise control)
17) Adjust each connected cable.
18) Install the air cleaner case stay.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

19) Install the A/C pressure hoses. <Ref. to AC-41, INSTALLATION, Hose and Tube.>
20) Install the radiator to vehicle. **<Ref. to CO(H4SO)-30,** INSTALLATION**, Radiator.>**
21) Install the air intake duct and air cleaner case. **<Ref. to IN(H4SO)-7,** INSTALLATION**, Air Intake Duct.> <Ref. to IN(H4SO)-6,** INSTALLATION**, Air Cleaner Case.>**
22) Install the under cover.
23) Install battery in the vehicle, and then connect the cables.
24) Fill engine coolant.
<Ref. to CO(H4SO)-19, FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
25) Check the ATF level and correct if necessary. (AT model)
<Ref. to 4AT-32, INSPECTION**, Automatic Transmission Fluid.>**
26) Charge the A/C system with refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>
27) Remove the front hood stay, and then close the front hood.
28) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure the pipes and hoses are installed correctly.
2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. **<Ref. to ME(H4SO)-34,** REMOVAL**, Engine Assembly.>**
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Engine mounting:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

C: INSPECTION

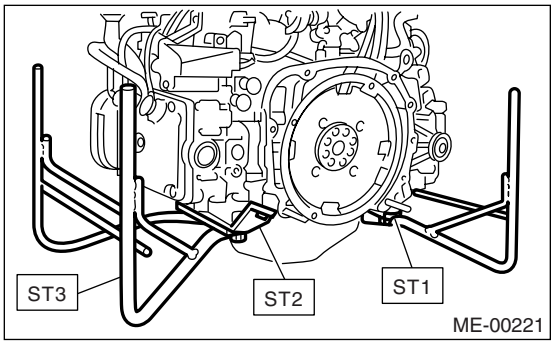
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817100	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

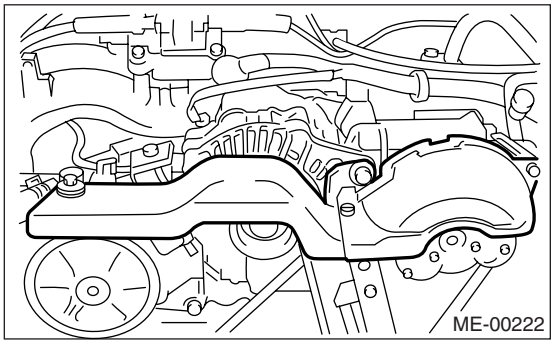
12.V-belt

A: REMOVAL

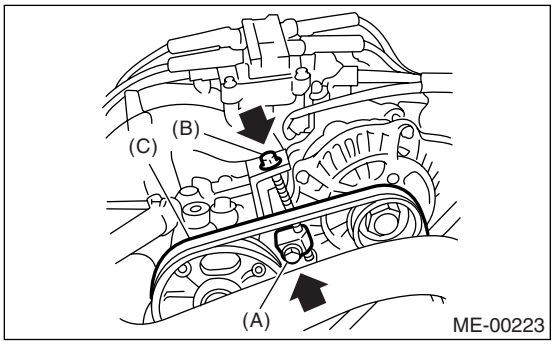
1. FRONT SIDE BELT

NOTE:
Perform the following procedures 1) to 4) with the engine installed to body.

1) Remove the V-belt cover.

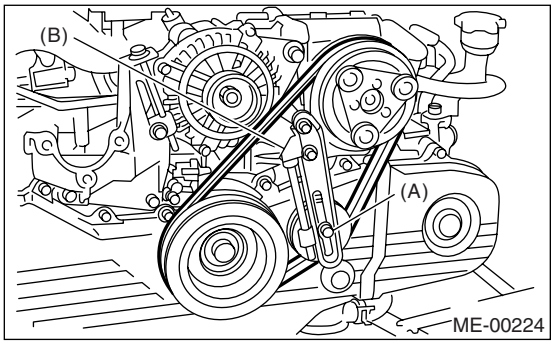


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

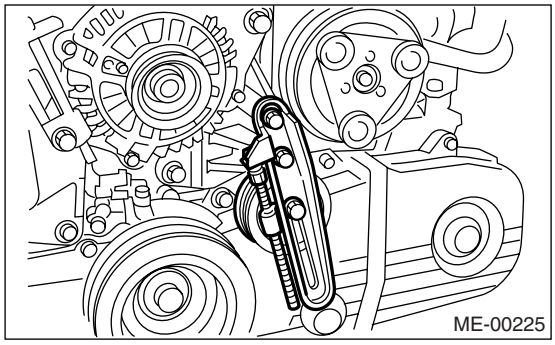


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.

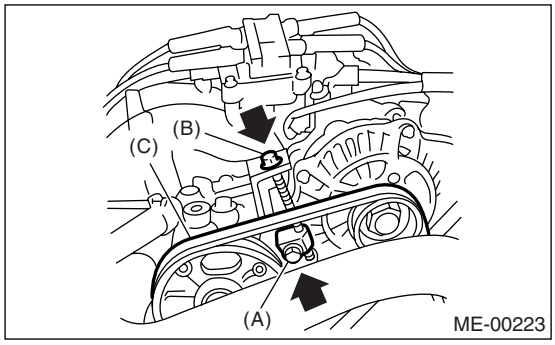


B: INSTALLATION

1. FRONT SIDE BELT

1) Wipe off any oil or water on the belt and pulley.
2) Install the V-belt (C), and tighten the slider bolt so as to obtain the specified belt tension **<Ref. to ME(H4SO)-44,** INSPECTION**, V-belt.>**
3) Tighten the lock bolt (A).
4) Tighten the slider bolt (B).

Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

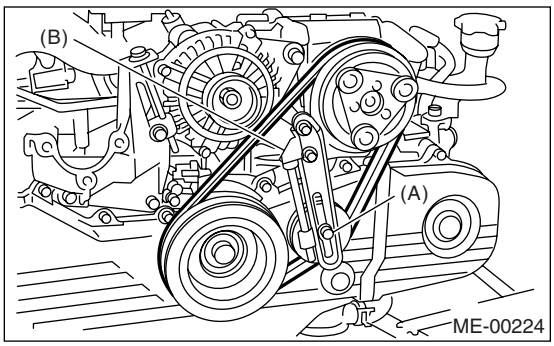


2. REAR SIDE BELT

1) Install the V-belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. **<Ref. to ME(H4SO)-44,** INSPECTION**, V-belt.>**

2) Tighten the lock nut (A).

Tightening torque:
Lock nut (A)
22.6 N·m (2.3 kgf-m, 16.7 ft-lb)



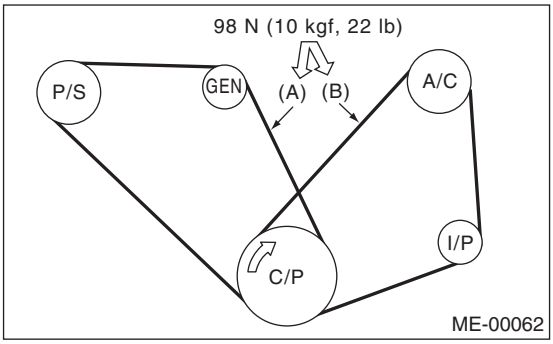
C: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the V-belt tension and adjust it if necessary by changing the generator installing position or idler pulley installing position.

Belt tension

(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)

(B)
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)



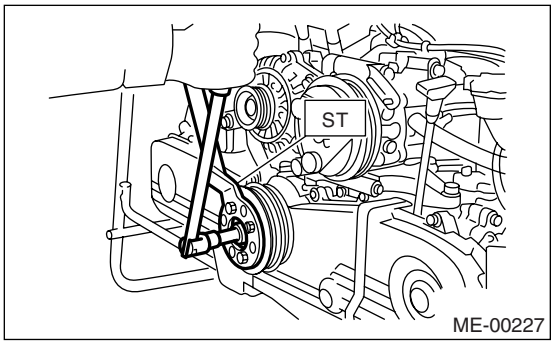
C/P	Crank pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

13.Crank Pulley

A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
2) Remove the crank pulley bolt. Use ST to lock the crankshaft.

ST 499977400 CRANK PULLEY WRENCH (2.0 L model)
ST 499977100 CRANK PULLEY WRENCH (2.5 L model)



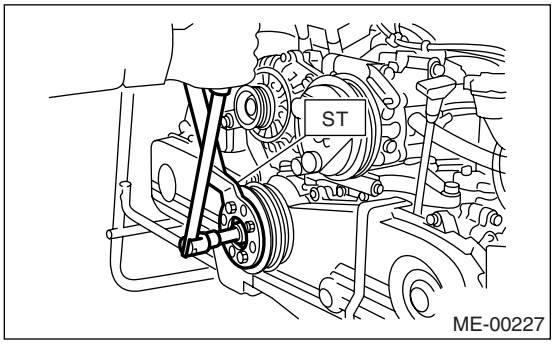
3) Remove the crank pulley.

B: INSTALLATION

1. 2.0 L MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
Use ST to lock the crankshaft.
ST 499977400 CRANK PULLEY WRENCH
(1) Clean the crank pulley thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
130 N·m (13.0 kgf-m, 94.0 ft-lb)



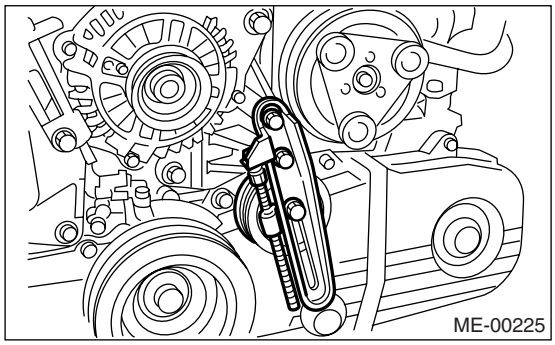
3) Confirm that the tightening angle of crank pulley bolt is 45° or more. If the tightening angle of crank pulley bolt is less than 45°, conduct the following procedures.
(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:
12369AA011

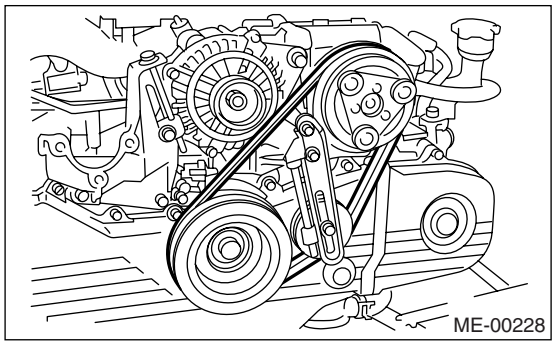
(2) Clean the crankshaft thread using compressed air.
(3) Apply engine oil to the crank pulley bolt seat and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crank pulley bolts keeping them in an angle between 45° and 60°.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on belt cover.

4) Install the A/C belt tensioner.



5) Install the A/C belt.

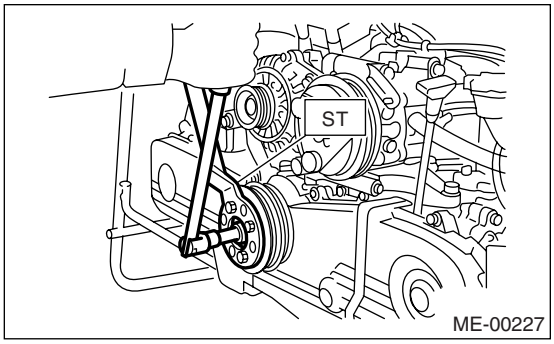


2. 2.5 L MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
Use ST to lock the crankshaft.
ST 499977100 CRANK PULLEY WRENCH
(1) Clean the crank pulley thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).

(4) Tighten the crank pulley bolts.

Tightening torque:
180 N·m (18.3 kgf-m, 132.8 ft-lb)



3) Confirm that the tightening angle of crank pulley bolt is 65° or more. If the tightening angle of crank pulley bolt is less than 65°, conduct the following procedures.

(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:
12369AA011

(2) Clean the crankshaft thread using compressed air.

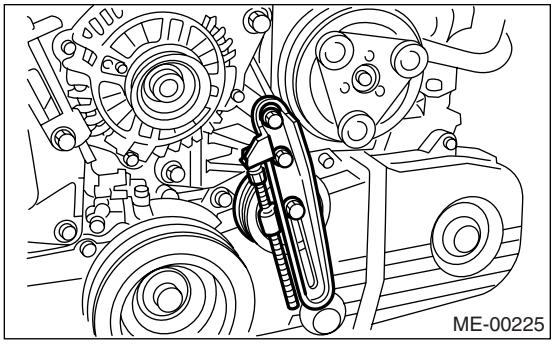
(3) Apply engine oil to the crank pulley bolt seat and thread.

(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).

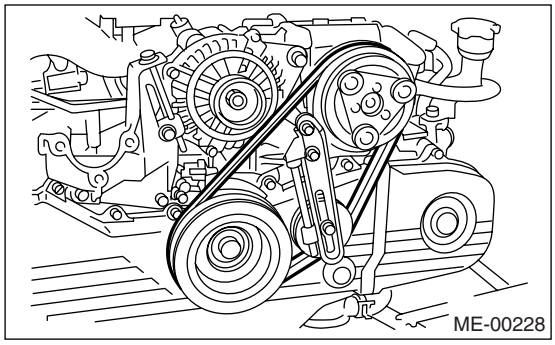
(5) Tighten the crank pulley bolts keeping them in an angle between 65° and 75°.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on belt cover.

4) Install the A/C belt tensioner.



5) Install the A/C belt.



C: INSPECTION

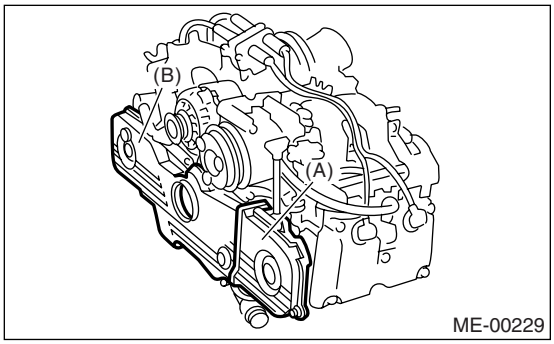
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. **<Ref. to ME(H4SO)-44,** INSPECTION**, V-belt.>**

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
3) Remove the belt cover (LH).
4) Remove the front belt cover.



(A) Timing belt cover (LH)
(B) Front timing belt cover

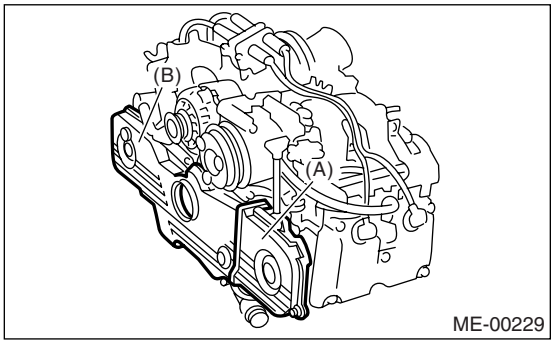
B: INSTALLATION

1) Install the front belt cover.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the belt cover (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



(A) Timing belt cover (LH)
(B) Front timing belt cover

3) Install the crank pulley. **<Ref. to ME(H4SO)-45,** INSTALLATION**, Crank Pulley.>**
4) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

C: INSPECTION

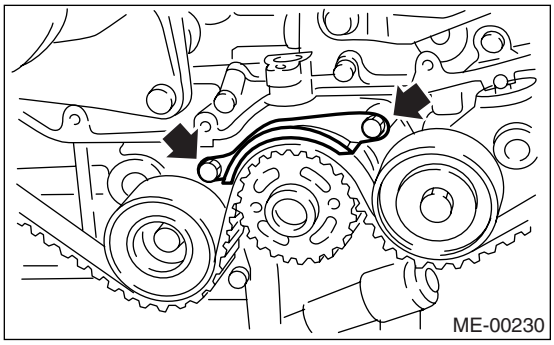
Make sure the cover is not damaged.

15.Timing Belt

A: REMOVAL

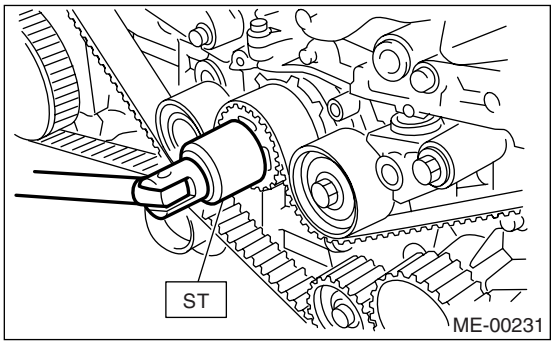
1. TIMING BELT

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
3) Remove the belt cover. **<Ref. to ME(H4SO)-47,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt guide. (MT model)

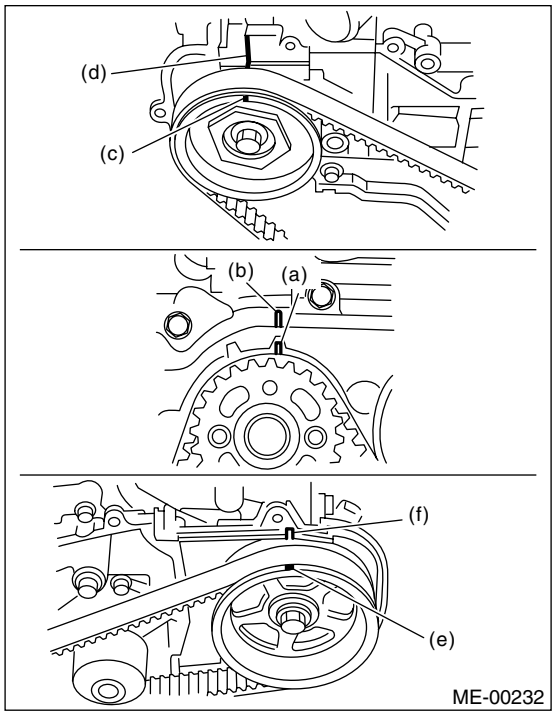

ME-00230

5) If the alignment mark (a) or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.
   (1) Turn the crankshaft using ST. Align the mark (a) of sprocket to cylinder block notch (b) and ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) or left side cam sprocket mark (e) and belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET

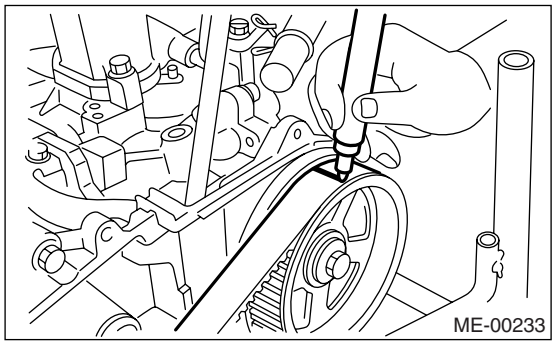


ME-00231

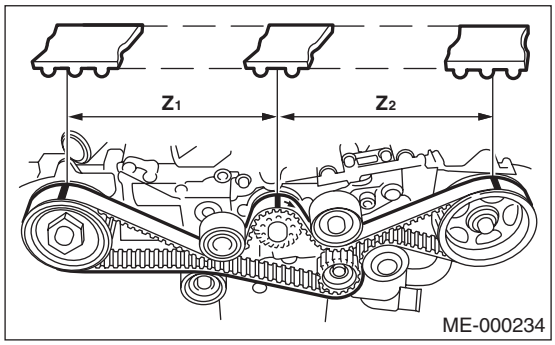


ME-00232

(2) Using white paint, put alignment or arrow marks on the timing belts in relation to crank sprocket and cam sprockets.


ME-00233

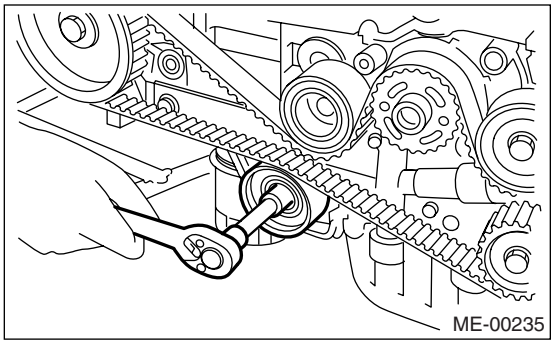
Specified data:
Z_1: 46.8 teeth length
Z_2: 43.7 teeth length



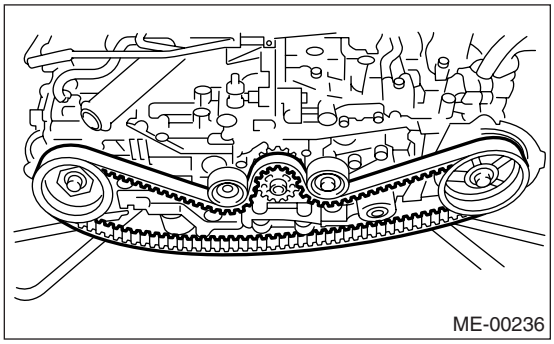
ME-000234

6) Remove the belt idler No. 2.

7) Remove the belt idler No. 2.

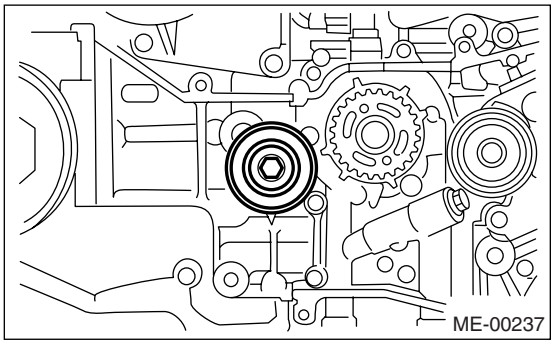


8) Remove the timing belt.

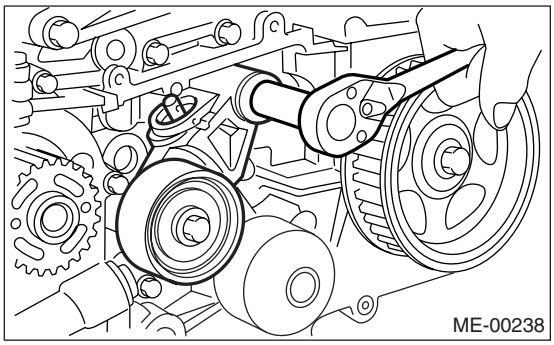


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler No. 1.



2) Remove the automatic belt tension adjuster assembly.



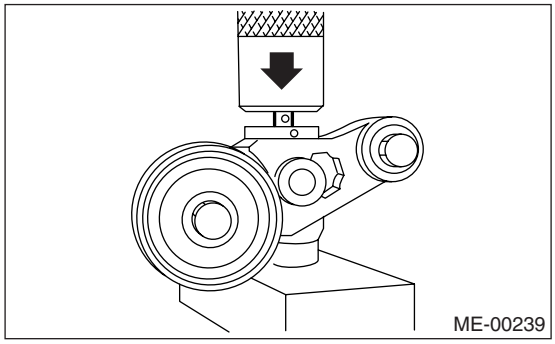
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

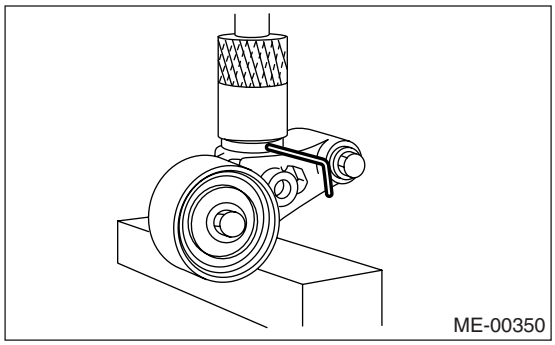
1) Preparation for installation of automatic belt tension adjuster assembly

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lbf) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.

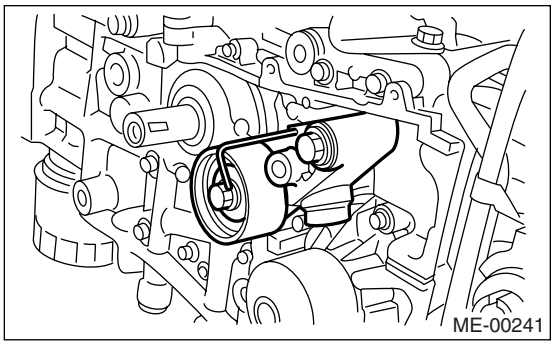


(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



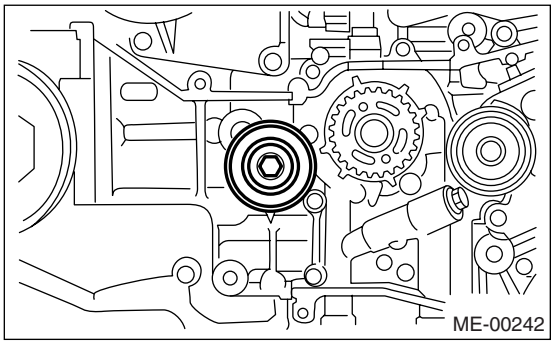
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install the belt idler No. 1.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



2. TIMING BELT

1) Preparation for the installation of automatic belt tension adjuster assembly **<Ref. to ME(H4SO)-49,** AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION**, Timing Belt.>**

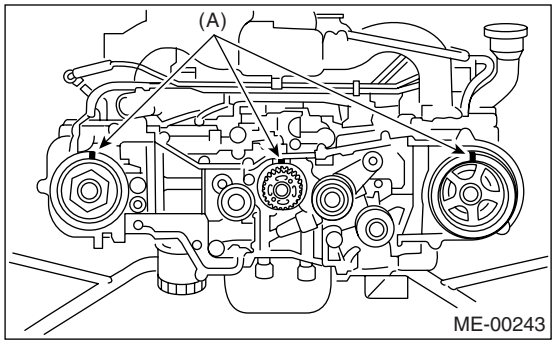
2) Installation of timing belt

(1) Turn the cam sprocket No. 2 using ST1, and then turn the cam sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

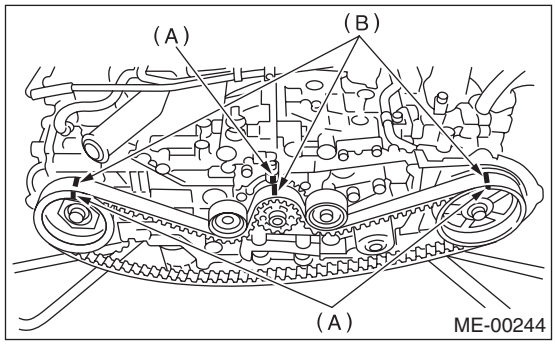
ST1 18231AA010 CAM SPROCKET WRENCH

NOTE:
Also the CAM SPROCKET WRENCH (499207100) can be used.

ST2 499207400 CAM SPROCKET WRENCH



(2) While aligning alignment marks (B) on the timing belt with marks (A) on sprockets, position the timing belt properly.

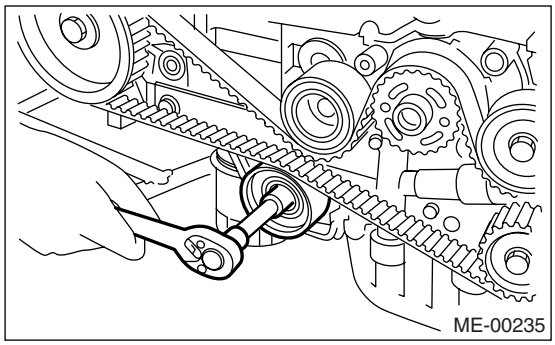


3) Install the belt idler No. 2.

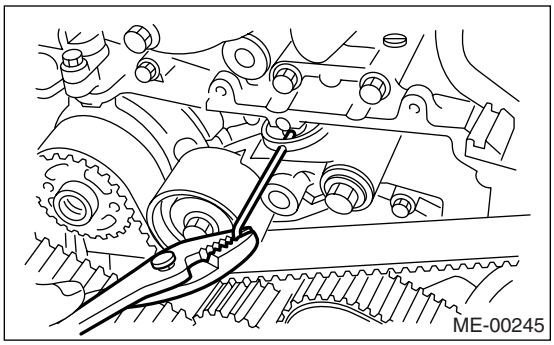
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

4) Install the belt idler No. 2.

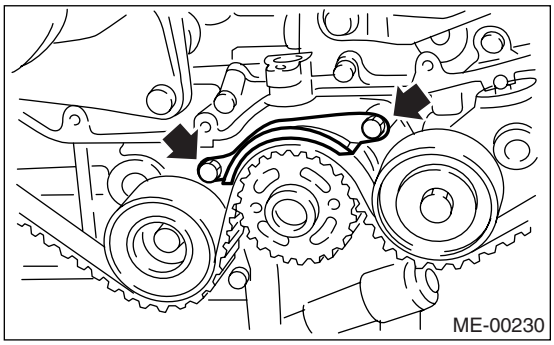
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



5) After ensuring that the marks on timing belt and cam sprockets are aligned, remove the stopper pin from belt tension adjuster.

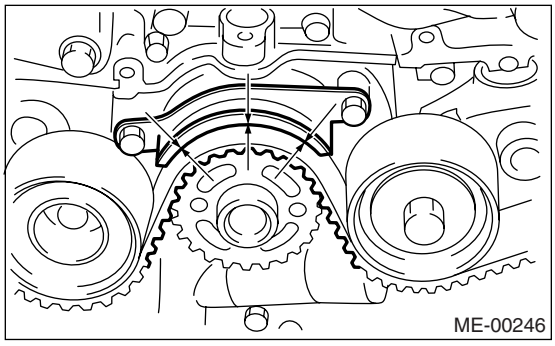


6) Install the timing belt guide. (MT model)
(1) Temporarily tighten the remaining bolts.



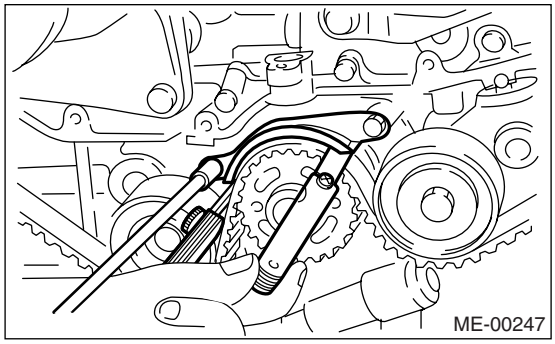
(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



(3) Tighten the remaining bolts.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



7) Install the belt cover. **<Ref. to ME(H4SO)-47,** INSTALLATION**, Timing Belt Cover.>**
8) Install the crank pulley. **<Ref. to ME(H4SO)-45,** INSTALLATION**, Crank Pulley.>**
9) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

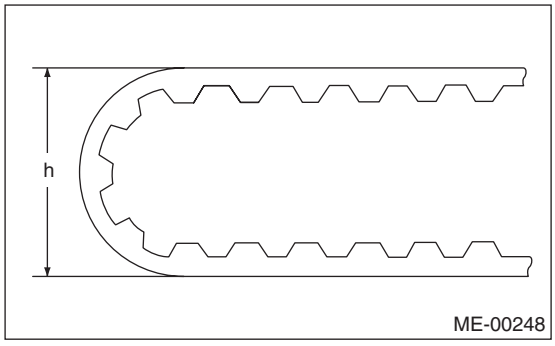
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

CAUTION:
• Be careful not to let oil, grease or engine coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the timing belt sharply.

In radial diameter h:
60 mm (2.36 in) or more



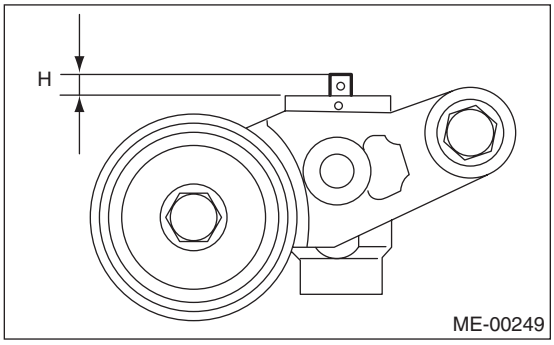
2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace faulty parts.
2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lbf) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lbf), check it using the following procedures:
   (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
   (2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lbf) to it. Check adjuster rod stiffness.
   (3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

CAUTION:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension H:
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.
2) Check the tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the tension pulley for grease leakage.

4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the belt outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

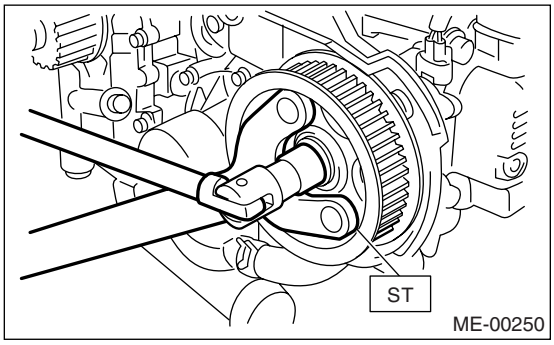
16.Cam Sprocket

A: REMOVAL

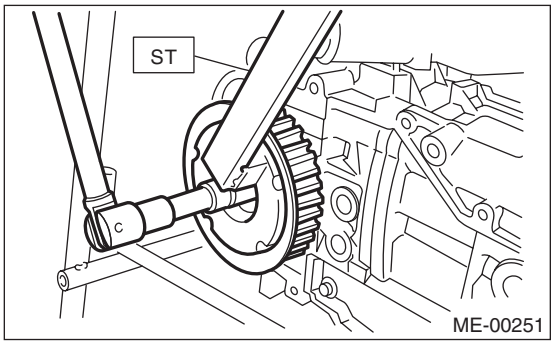
1. REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
3) Remove the belt cover. **<Ref. to ME(H4SO)-47,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4SO)-48,** REMOVAL**, Timing Belt.>**
5) Remove the camshaft position sensor. **<Ref. to FU(H4SO)-27,** REMOVAL**, Camshaft Position Sensor.>**
6) Remove the cam sprocket No. 2 to lock the camshaft, use ST.
ST 18231AA010 CAM SPROCKET WRENCH

NOTE:
Also the CAM SPROCKET WRENCH (499207100) can be used.



7) Remove the cam sprocket No. 1 use ST to lock the camshaft.
ST 499207400 CAM SPROCKET WRENCH

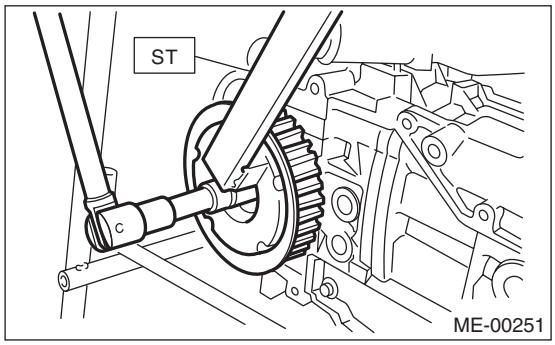


B: INSTALLATION

1) Install the cam sprocket No. 1 to lock the camshaft, use ST.
ST 499207400 CAM SPROCKET WRENCH

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)

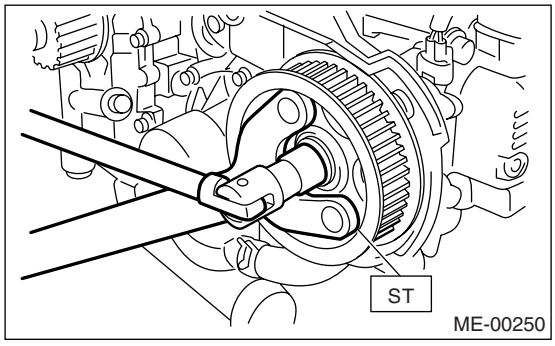
NOTE:
Do not confuse the right and left side cam sprockets during installation. The cam sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



2) Install the cam sprocket No. 2 use ST to lock camshaft.
ST 18231AA010 CAM SPROCKET WRENCH

NOTE:
Also the CAM SPROCKET WRENCH (499207100) can be used.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



3) Install the camshaft position sensor. **<Ref. to FU(H4SO)-27,** INSTALLATION**, Camshaft Position Sensor.>**
4) Install the timing belt assembly. **<Ref. to ME(H4SO)-49,** INSTALLATION, Timing Belt.>
5) Install the belt cover. **<Ref. to ME(H4SO)-47,** INSTALLATION**, Timing Belt Cover.>**
6) Install the crank pulley.
<Ref. to ME(H4SO)-45, INSTALLATION**, Crank Pulley.>**
7) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

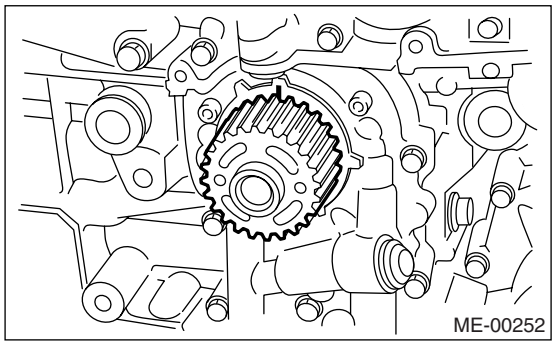
C: INSPECTION

1) Check the cam sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between cam sprocket and key.
3) Check the cam sprocket notch for sensor for damage and contamination of foreign matter.

17.Crank Sprocket

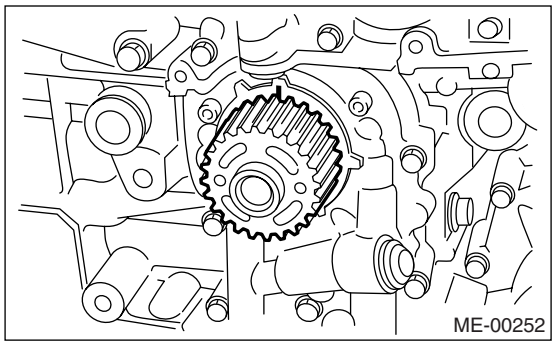
A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
3) Remove the belt cover. **<Ref. to ME(H4SO)-47,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4SO)-48,** REMOVAL**, Timing Belt.>**
5) Remove the cam sprocket. **<Ref. to ME(H4SO)-53,** REMOVAL**, Cam Sprocket.>**
6) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.



2) Install the cam sprocket. **<Ref. to ME(H4SO)-53,** INSTALLATION**, Cam Sprocket.>**
3) Install the timing belt assembly. **<Ref. to ME(H4SO)-49,** INSTALLATION, Timing Belt.>
4) Install the belt cover. **<Ref. to ME(H4SO)-47,** INSTALLATION**, Timing Belt Cover.>**
5) Install the crank pulley. **<Ref. to ME(H4SO)-45,** INSTALLATION**, Crank Pulley.>**
6) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

C: INSPECTION

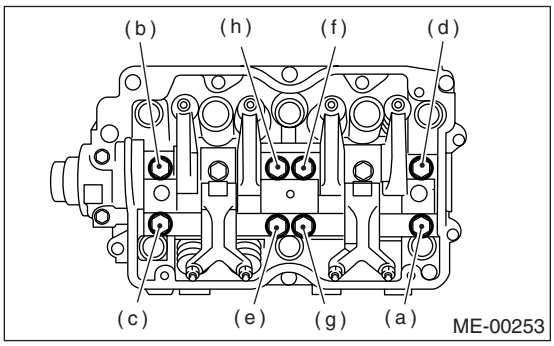
1) Check the crank sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between crank sprocket and key.
3) Check the crank sprocket notch for sensor for damage and contamination of foreign matter.

18.Valve Rocker Assembly

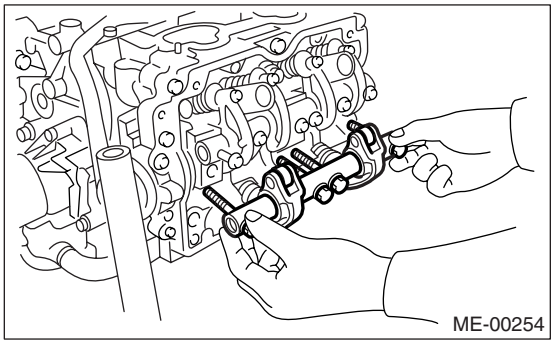
A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
3) Remove the belt cover. **<Ref. to ME(H4SO)-47,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4SO)-48,** REMOVAL**, Timing Belt.>**
5) Remove the cam sprocket. **<Ref. to ME(H4SO)-53,** REMOVAL**, Cam Sprocket.>**
6) Disconnect the PCV hose and remove rocker cover.
7) Removal of valve rocker assembly
   (1) Remove the bolts (a) through (h) in alphabetical sequence.

NOTE:
Leave two or three threads of bolts (g and h) engaged to retain the valve rocker assembly.



   (2) Remove the valve rocker assembly.



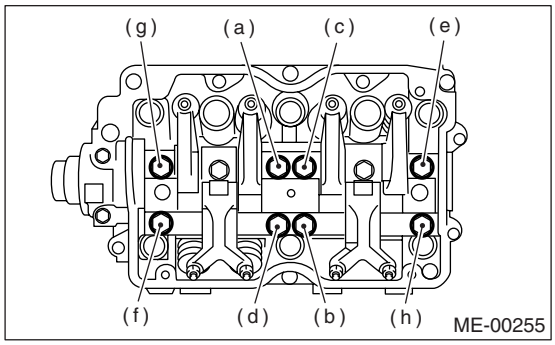
B: INSTALLATION

1) Installation of valve rocker assembly
   (1) Temporarily tighten the bolts (a) through (d) equally as shown in the figure.

NOTE:
Do not allow the valve rocker assembly to gouge knock pins.

   (2) Tighten the bolts (e) through (h) to specified torque.
   (3) Tighten the bolts (a) through (d) to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Adjust the valve clearances. **<Ref. to ME(H4SO)-32,** ADJUSTMENT**, Valve Clearance.>**
3) Install the rocker cover and connect PCV hose.
4) Install the cam sprocket. **<Ref. to ME(H4SO)-53,** INSTALLATION**, Cam Sprocket.>**
5) Install the timing belt assembly. **<Ref. to ME(H4SO)-49,** INSTALLATION, Timing Belt.>
6) Install the belt cover. **<Ref. to ME(H4SO)-47,** INSTALLATION**, Timing Belt Cover.>**
7) Install the crank pulley. **<Ref. to ME(H4SO)-45,** INSTALLATION**, Crank Pulley.>**
8) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

C: DISASSEMBLY

1) Remove the bolts which secure rocker shaft.
2) Extract the rocker shaft. Remove the valve rocker arms, springs and shaft supports from rocker shaft.

NOTE:
Arrange all removed parts in order so that they can be installed in their original positions.

3) Remove the nut and adjusting screw from valve rocker.

D: ASSEMBLY

1) Install the adjusting screw and nut to valve rocker.
2) Arrange the valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

Tightening torque (Shaft supports installing bolts):
5 N·m (0.5 kgf-m, 3.6 ft-lb)

NOTE:
Valve rocker arms, rocker shaft and shaft supports have identification marks. Ensure the parts with same markings are properly assembled.

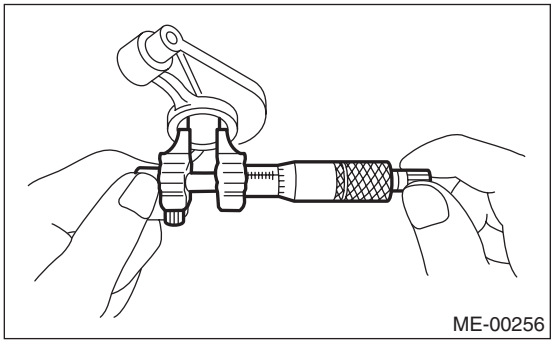
3) Install the valve rocker shaft securing bolts.

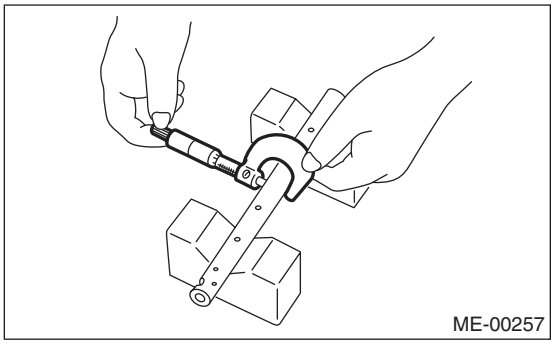
E: INSPECTION

1. VALVE ROCKER ARM AND ROCKER SHAFT

1) Measure the inside diameter of valve rocker arm and outside diameter of valve rocker shaft, and determine the difference between the two (= oil clearance).

Clearance between arm and shaft:
Standard:
0.020 — 0.054 mm (0.0008 — 0.0021 in)
Limit:
0.10 mm (0.0039 in)


ME-00256


ME-00257

2) If oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:
22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:
21.987 — 22.000 mm (0.8656 — 0.8661 in)

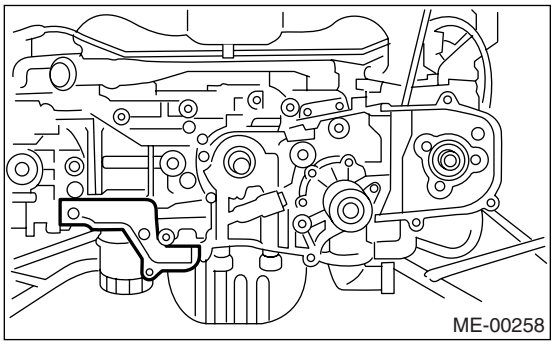
3) If cam or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.
4) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.

19.Camshaft

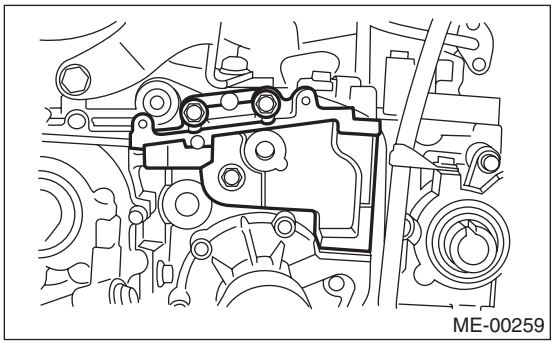
A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
3) Remove the belt cover. **<Ref. to ME(H4SO)-47,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4SO)-48,** REMOVAL**, Timing Belt.>**
5) Remove the cam sprocket. **<Ref. to ME(H4SO)-53,** REMOVAL**, Cam Sprocket.>**
6) Remove the crank sprocket. **<Ref. to ME(H4SO)-55,** REMOVAL**, Crank Sprocket.>**
7) Remove the belt cover No. 2 (LH).
8) Remove the belt cover No. 2 (RH).

NOTE:
Do not damage or lose the seal rubber when removing belt covers.

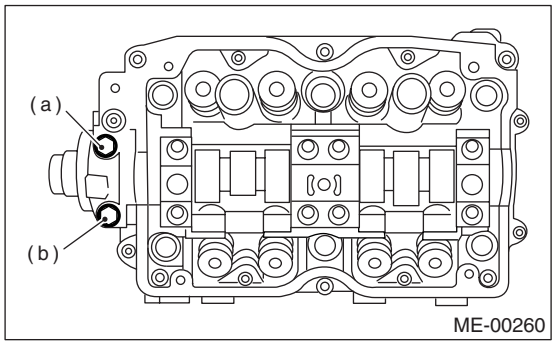

ME-00258

9) Remove the tensioner bracket.


ME-00259

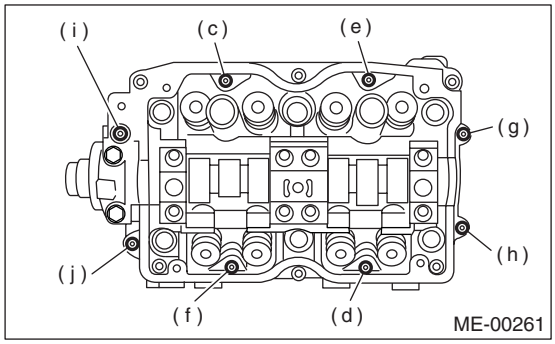
10) Remove the camshaft position sensor support. (LH side only)
11) Remove the oil level gauge guide. (LH side only)
12) Remove the valve rocker assembly. **<Ref. to ME(H4SO)-56,** REMOVAL**, Valve Rocker Assembly.>**
13) Remove the camshaft cap.

(1) Remove the bolts (a) through (b) in alphabetical sequence.



ME-00260

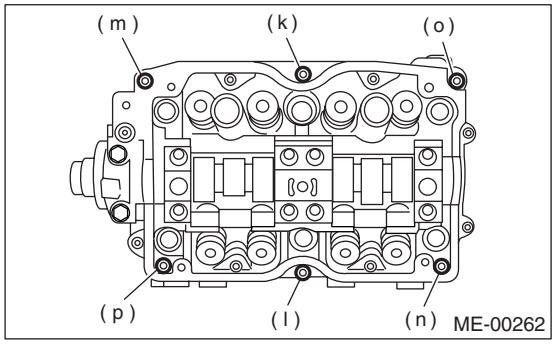
(2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.



ME-00261

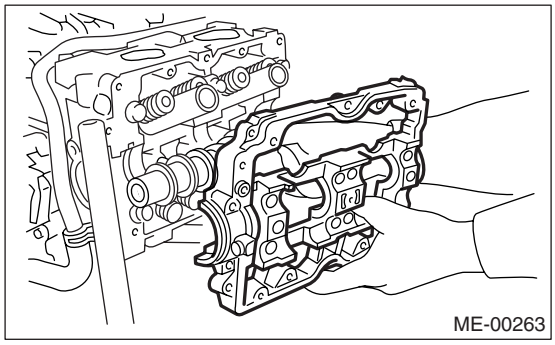
(3) Remove the bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS®



ME-00262

(4) Remove the camshaft cap.


ME-00263

14) Remove the camshaft.
15) Remove the oil seal.

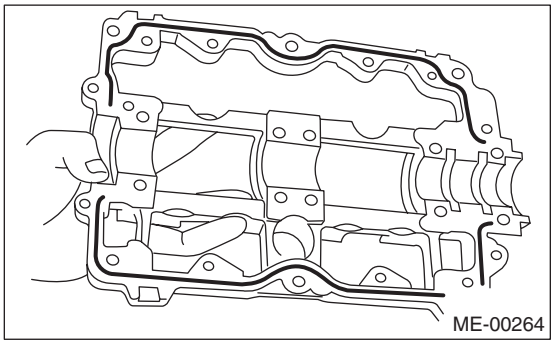
16) Remove the plug from rear side of camshaft.

CAUTION:
- **Do not remove the oil seal unless necessary.**
- **Do not scratch the journal surface when removing oil seal.**

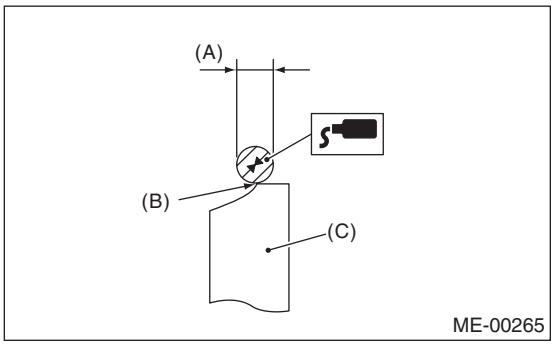
B: INSTALLATION

1) Apply a coat of engine oil to the camshaft journals, and then install the camshaft.
2) Install the camshaft cap.
   (1) Apply liquid gasket on the around of camshaft cap.

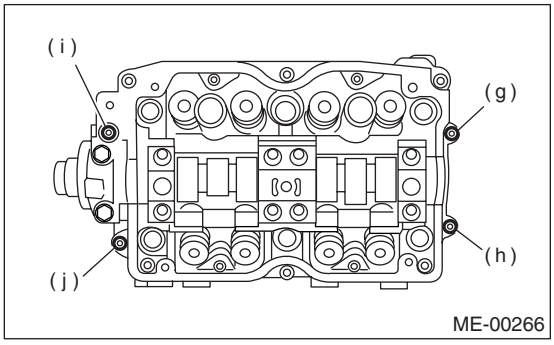
Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)



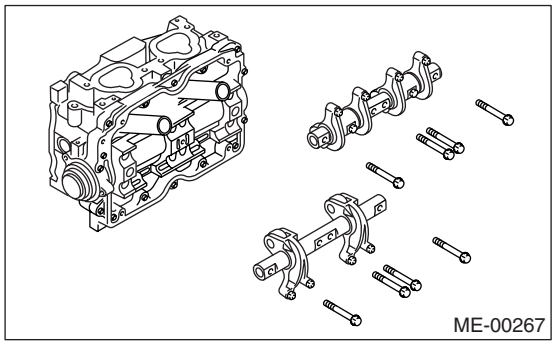
NOTE:
Apply a coat of 3 mm (0.12 in) dia (A). liquid gasket along edge (B) of the camshaft cap (C) mating surface.



(2) Temporarily tighten the bolts (g) through (j) in alphabetical sequence.

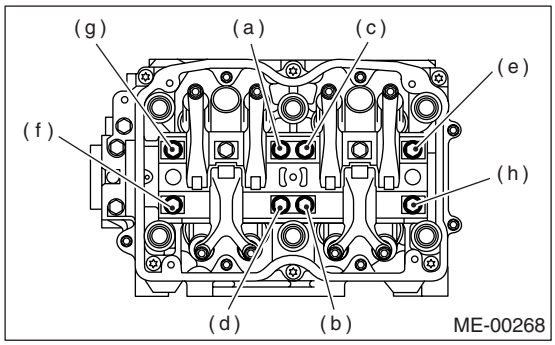


(3) Install the valve rocker assembly.



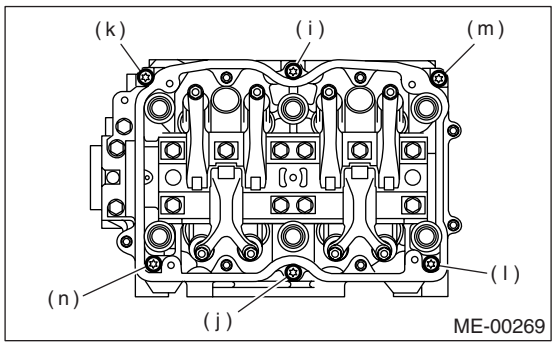
(4) Tighten the bolts (a) through (h) in alphabetical sequence.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



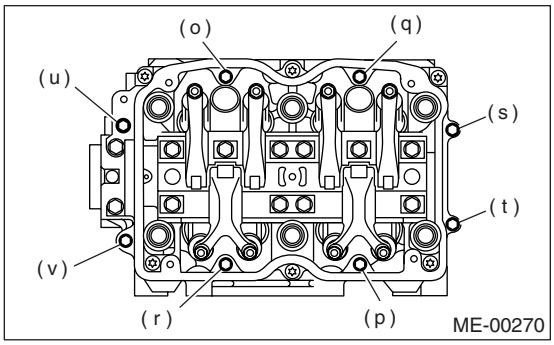
(5) Tighten the TORX® bolts (i) through (n) in alphabetical sequence using ST.
ST 499497000 TORX PLUS®

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



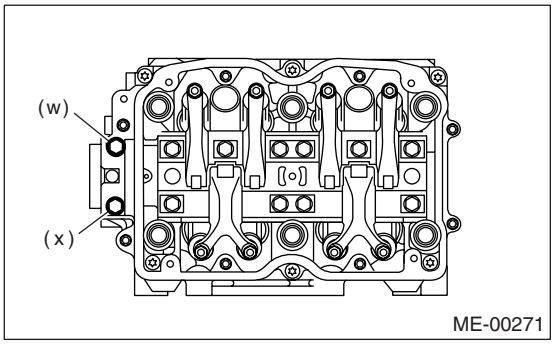
(6) Tighten the bolts (o) through (v) in alphabetical sequence.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



(7) Tighten the bolts (w) through (x) in alphabetical sequence.

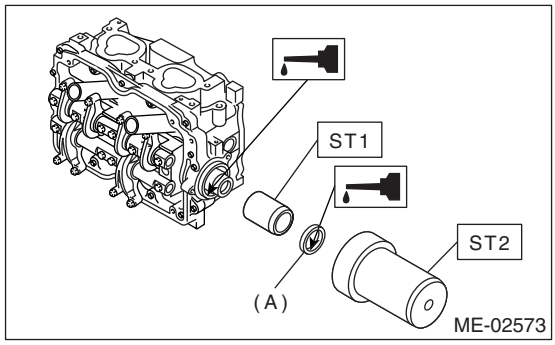
Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Apply a coat of engine oil to oil seal pressing part and oil seal lips, and then install the oil seal (A) on camshaft using ST1 and ST2.

NOTE:
Use a new oil seal.

ST1 499597000 OIL SEAL GUIDE
ST2 499587500 OIL SEAL INSTALLER



4) Apply a coat of engine oil to plug pressing part, and then install the plug using ST.

ST 499587700 CAMSHAFT OIL SEAL INSTALLER

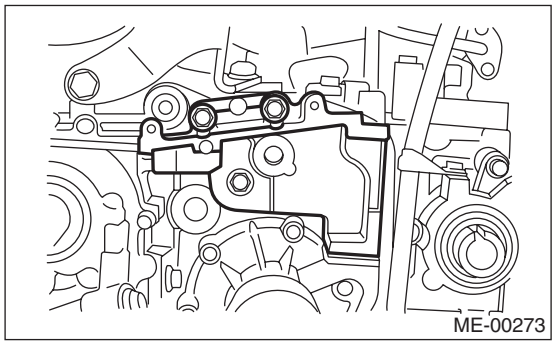
5) Adjust the valve clearance. **<Ref. to ME(H4SO)-32,** ADJUSTMENT**, Valve Clearance.>**

6) Install the rocker cover and rocker cover gasket, and then connect PCV hose.

NOTE:
Use a new rocker cover gasket.

7) Install the oil level gauge guide. (LH side only)
8) Install the camshaft position sensor support. (LH side only)
9) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

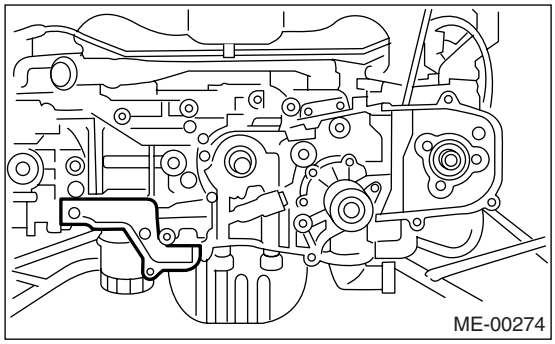


10) Install the belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

11) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



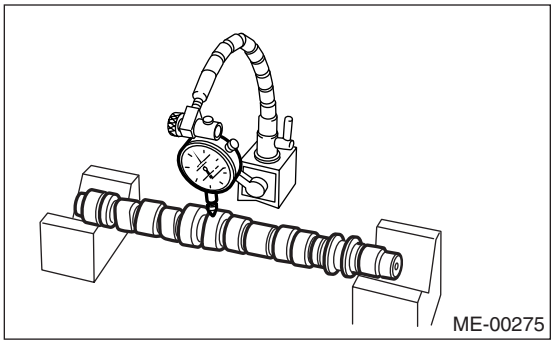
12) Install the crank sprocket. **<Ref. to ME(H4SO)-55,** INSTALLATION**, Crank Sprocket.>**
13) Install the cam sprocket. **<Ref. to ME(H4SO)-53,** INSTALLATION**, Cam Sprocket.>**
14) Install the timing belt assembly. **<Ref. to ME(H4SO)-49,** INSTALLATION, Timing Belt.>
15) Install the belt cover. **<Ref. to ME(H4SO)-47,** INSTALLATION**, Timing Belt Cover.>**
16) Install the crank pulley. **<Ref. to ME(H4SO)-45,** INSTALLATION**, Crank Pulley.>**
17) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Limit:
0.025 mm (0.0010 in)



2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal and inside diameter of cylinder head journal, and determine the difference between two (= oil clearance). If the oil clearance exceeds specifications, replace the camshaft or cylinder head as necessary.

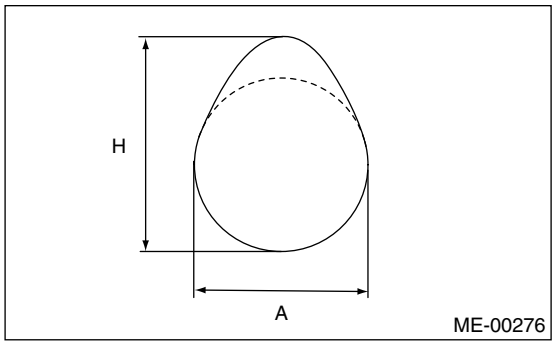
		Unit: mm (in)
Clearance at journal	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

4) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height H:

Model	Item		Unit: mm (in)
2.0 L	Intake	STD	38.732 — 38.832 (1.5249 — 1.528885)
		Limit	38.632 (1.5209)
	Exhaust	STD	39.259 — 39.359 (1.5456 — 1.5496)
		Limit	39.159 (1.5417)
2.5 L	Intake	STD	39.485 — 39.585 (1.5545 — 1.5585)
		Limit	39.385 (1.5506)
	Exhaust	STD	39.259 — 39.359 (1.5456 — 1.5496)
		Limit	39.159 (1.5417)

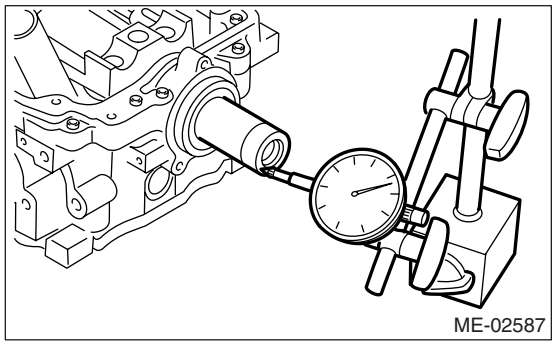
Cam base circle diameter A:
Intake: 34.00 mm (1.3386 in)
Exhaust: 34.00 mm (1.3386 in)



5) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the cylinder head assembly.

Standard:
0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:
0.10 mm (0.0039 in)

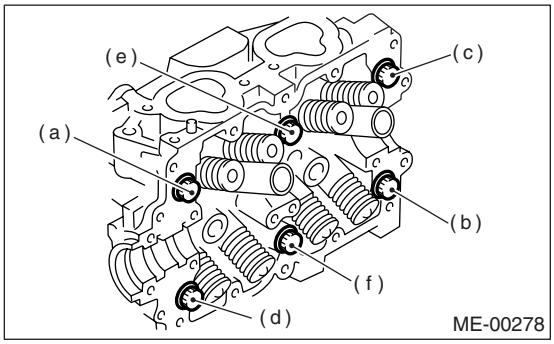


20.Cylinder Head

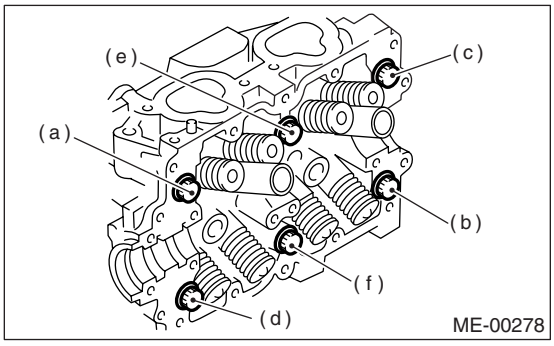
A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
3) Remove the timing belt cover. **<Ref. to ME(H4SO)-47,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt. **<Ref. to ME(H4SO)-48,** REMOVAL**, Timing Belt.>**
5) Remove the cam sprocket. **<Ref. to ME(H4SO)-53,** REMOVAL**, Cam Sprocket.>**
6) Remove the intake manifold. **<Ref. to FU(H4SO)-14,** REMOVAL**, Intake Manifold.>**
7) Remove the bolt which installs A/C compressor bracket on cylinder head.
8) Remove the valve rocker assembly. **<Ref. to ME(H4SO)-56,** REMOVAL**, Valve Rocker Assembly.>**
9) Remove the camshaft. **<Ref. to ME(H4SO)-58,** REMOVAL**, Camshaft.>**
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

NOTE:
Leave the bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
12) Remove the bolts (a) and (c) to remove cylinder head.



13) Remove the cylinder head gasket.

CAUTION:
Do not scratch the mating surface of cylinder head and cylinder block.

14) Similarly, remove the right side cylinder head.

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

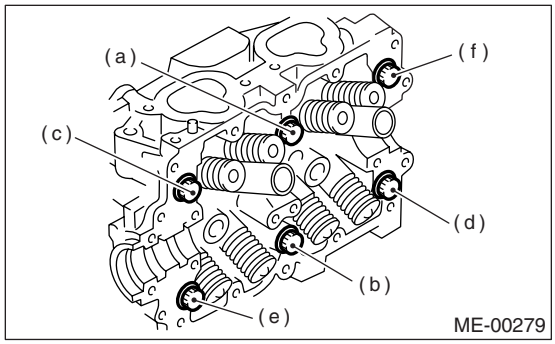
CAUTION:
- **Use new cylinder head gaskets.**
- **Be careful not to scratch the mating surface of cylinder block and cylinder head.**

2) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to washers and bolt threads.
(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° in reverse order of installation, and back them off again by 180°.
(4) Tighten all bolts to 42 N·m (3.9 kgf-m, 31 ft-lb) in alphabetical sequence.
(5) Tighten all bolts by 80° — 90° in alphabetical sequence.
(6) Tighten all bolts by 40° — 45° in alphabetical sequence.

NOTE:
Do not tighten the bolts more than 45°.

(7) Further tighten bolts (a) and (b) by 40° — 45°.

NOTE:
Ensure the total “re-tightening angle” in the [former two steps], do not exceed 90°.



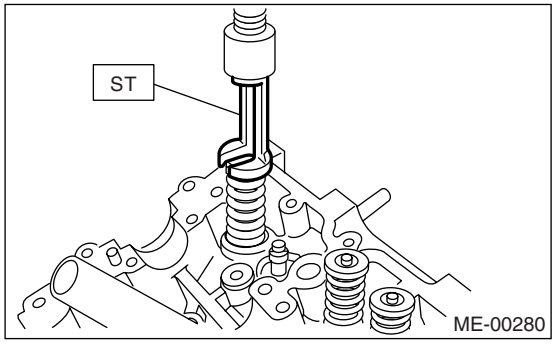
3) Install the camshaft. **<Ref. to ME(H4SO)-59,** INSTALLATION**, Camshaft.>**
4) Install the valve rocker assembly. **<Ref. to ME(H4SO)-56,** INSTALLATION**, Valve Rocker Assembly.>**
5) Install the A/C compressor bracket on cylinder head.
6) Install the intake manifold. **<Ref. to FU(H4SO)-16,** INSTALLATION**, Intake Manifold.>**

7) Install the cam sprocket. **<Ref. to ME(H4SO)-53,** INSTALLATION**, Cam Sprocket.>**
8) Install the timing belt assembly. **<Ref. to ME(H4SO)-49,** INSTALLATION, Timing Belt.>
9) Install the timing belt cover. **<Ref. to ME(H4SO)-47,** INSTALLATION**, Timing Belt Cover.>**
10) Install the crank pulley. **<Ref. to ME(H4SO)-45,** INSTALLATION**, Crank Pulley.>**
11) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**

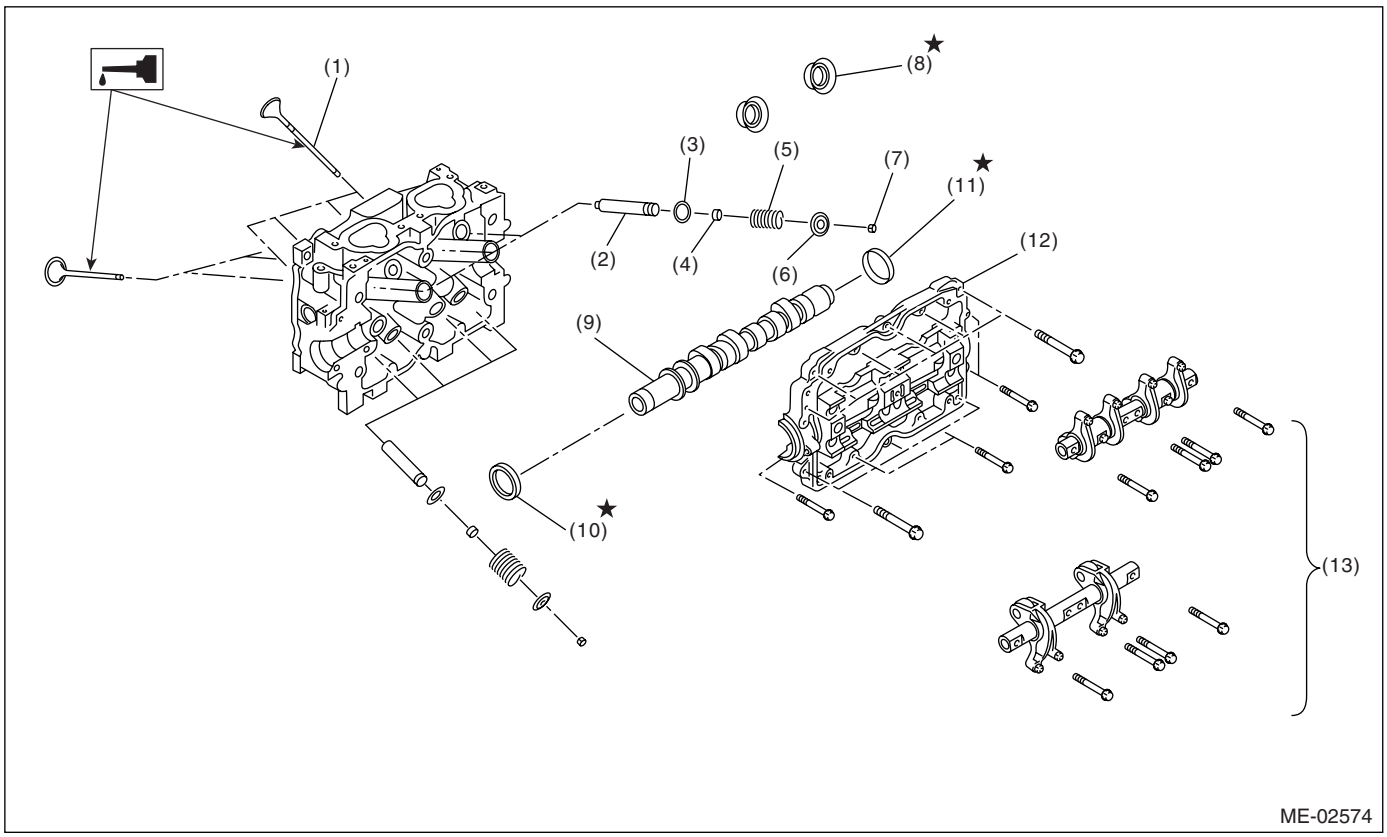
C: DISASSEMBLY

1) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
2) Set the ST on valve spring. Compress the valve spring, and then remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

CAUTION:
- **Mark each valve to prevent confusion.**
- **Use extreme care not to damage the lips of intake valve oil seals and exhaust valve oil seals.**



D: ASSEMBLY



(1)	Valve	(6)	Retainer	(11)	Plug
(2)	Valve guide	(7)	Retainer key	(12)	Camshaft cap
(3)	Valve spring seat	(8)	Spark plug gasket	(13)	Valve rocker ASSY
(4)	Oil seal	(9)	Camshaft		
(5)	Valve spring	(10)	Oil seal		

1) Installation of valve spring and valve
   (1) Place the cylinder head on ST.

ST 498267800 CYLINDER HEAD TABLE

   (2) Coat the stem of each valve with engine oil and insert valve into valve guide.

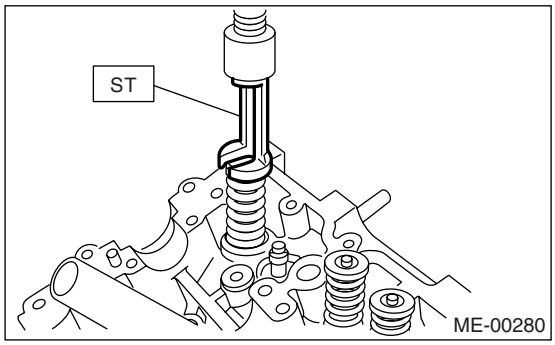
NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

   (3) Install the valve spring and retainer.

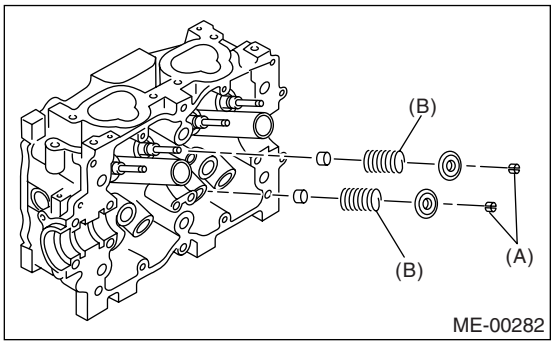
NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.

   (4) Set the ST on valve spring.

ST 499718000 VALVE SPRING REMOVER



(5) Compress the valve spring, and then fit the valve spring retainer key.



(A) Retainer
(B) Valve spring

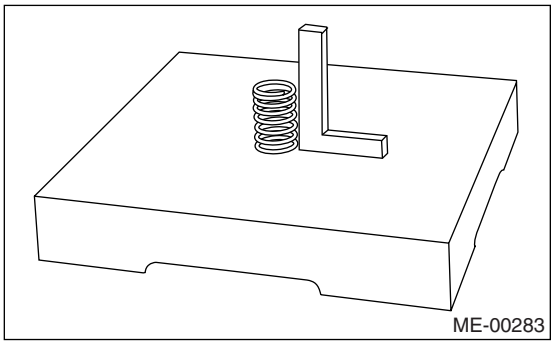
(6) After installing, tap the valve spring retainers lightly with plastic hammer for better seating.

E: INSPECTION

1. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value presented in the table.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	54.30 mm (2.1378 in)
Squareness	2.5°, 2.4 mm (0.094 in) or less
Tension/spring height	214 — 246 N (21.8 — 25.1 kgf, 48.2 — 55.3 lbf)/ 45.0 mm (1.772 in)
	526 — 582 N (53.7 — 59.3 kgf, 118.1 — 130.8 lbf)/ 34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL SEAL

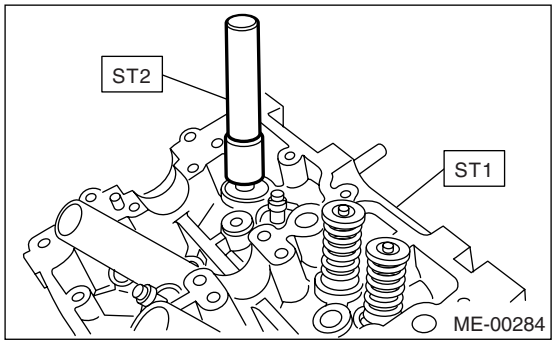
In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.
- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

1) Place the cylinder head on ST1.
2) Using ST2, press-fit the oil seal.

CAUTION:
• Apply engine oil to oil seal before press-fitting.
• When press-fitting oil seal, do not use hammer or strike in.
• Differentiate between intake valve oil seal and exhaust valve oil seal by noting their difference in color.

ST1 498267800 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

Color of rubber part:
Intake [Gray]
Exhaust [Green]



F: ADJUSTMENT

1. CYLINDER HEAD

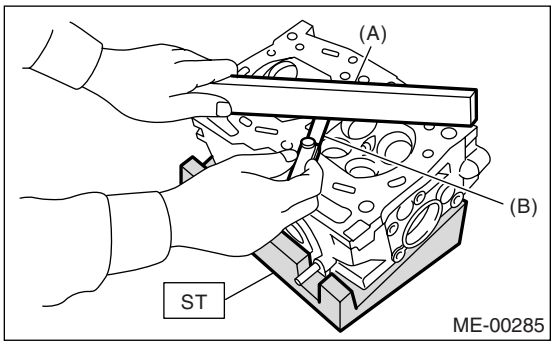
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect important areas by means of red lead check.
Also make sure that gasket installing surface shows no trace of gas and water leaks.
2) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.
If the warping exceeds the limit, regrind the surface with a surface grinder.

Warping limit:
0.035 mm (0.00014 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

NOTE:
Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



(A) Straight edge
(B) Thickness gauge

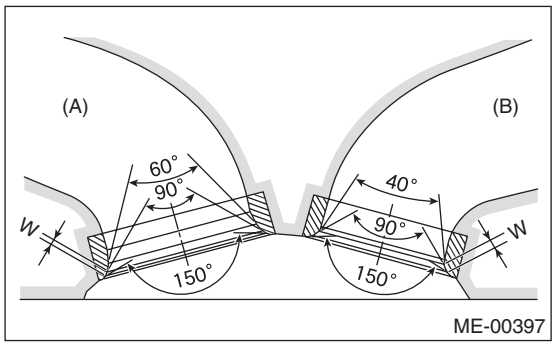
2. VALVE SEAT

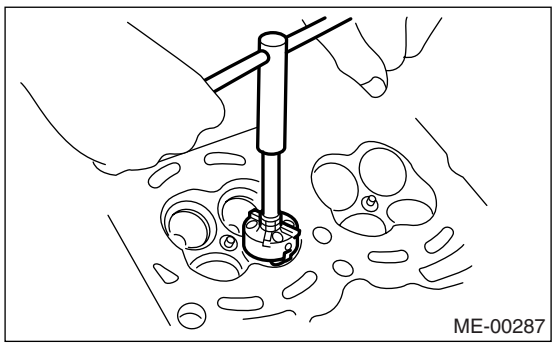
Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width W:

Intake (A)
Standard:
0.8 — 1.4 mm (0.03 — 0.055 in)
Limit:
1.8 mm (0.071 in)

Standard (B)
Standard:
Standard: 1.2 — 1.8 mm (0.047 — 0.071 in)
Limit:
2.2 mm (0.087 in)





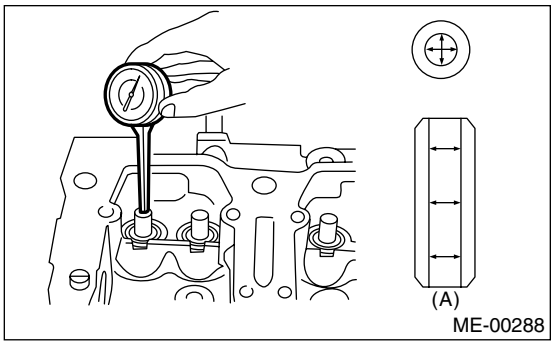
3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

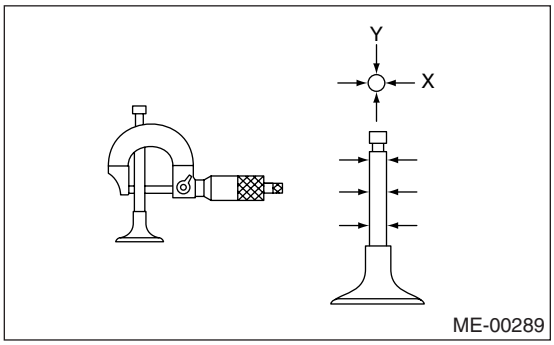
Clearance between the valve guide and valve stem:

Standard:
Intake
0.035 — 0.062 mm (0.0014 — 0.0024 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit:
0.15 mm (0.0059 in)



(A) Valve guide



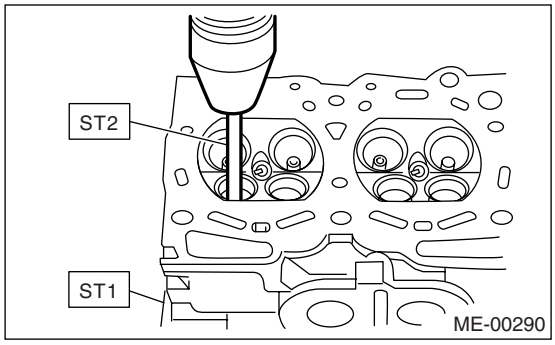
2) If the clearance between valve guide and stem exceeds the standard value, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake
5.950 — 5.965 mm (0.2343 — 0.2348 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

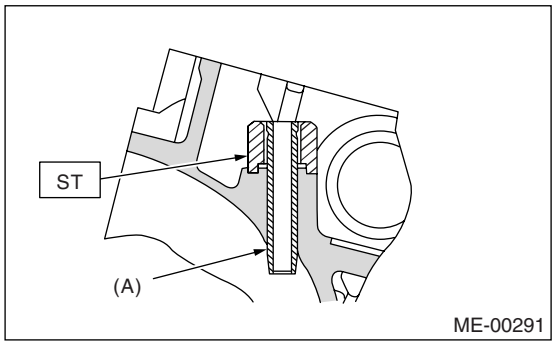
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

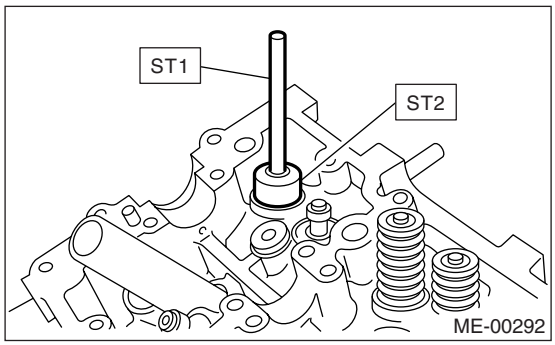
Intake side:
ST 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST 499767800 VALVE GUIDE ADJUSTER



(A) Valve guide

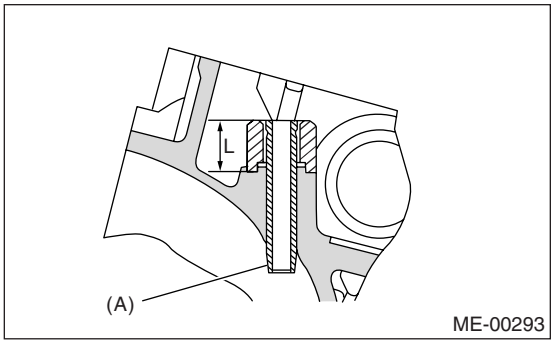
(4) Before installing new oversize valve guide, make sure that neither scratches nor damages exist on the inside surface of valve guide holes in cylinder head.
(5) Put new valve guide, coated with sufficient oil, in the cylinder, and then insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
Intake side:
ST2 499767700 VALVE GUIDE ADJUSTER
Exhaust side:
ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:
Intake
20.0 — 21.0 mm (0.787 — 0.819 in)
Exhaust
16.5 — 17.5 mm (0.650 — 0.683 in)

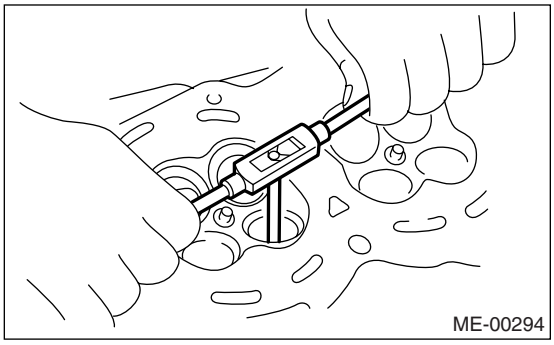


(A) Valve guide

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

CAUTION:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

ST 499767400 VALVE GUIDE REAMER



(8) Recheck the contact condition between valve and valve seat after replacing valve guide.

4. INTAKE AND EXHAUST VALVE

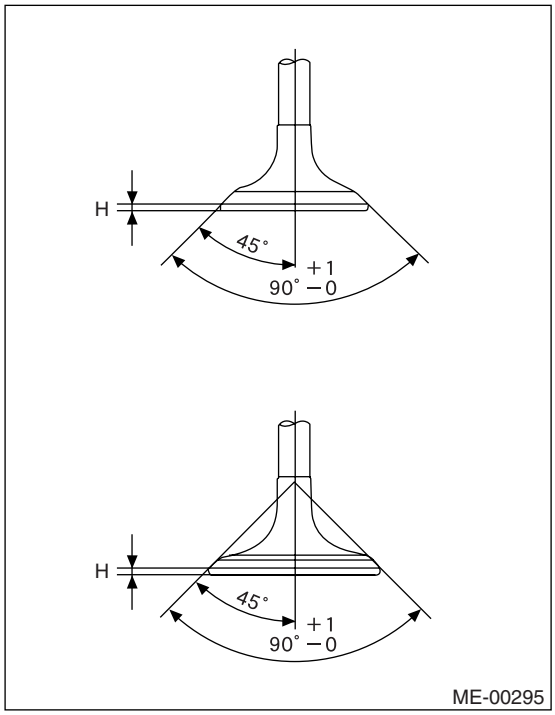
1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:

Intake
Standard:
0.8 — 1.2 mm (0.03 — 0.047 in)
Limit:
0.6 mm (0.024 in)

Exhaust
Standard:
1.0 — 1.4 mm (0.039 — 0.055 in)
Limit:
Limit: 0.6 mm (0.024 in)

Valve overall length:
Intake
120.6 mm (4.75 in)
Exhaust
121.7 mm (4.79 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. **<Ref. to ME(H4SO)-66,** VALVE SEAT, ADJUSTMENT**, Cylinder Head.>** Install a new intake valve oil seal after lapping.

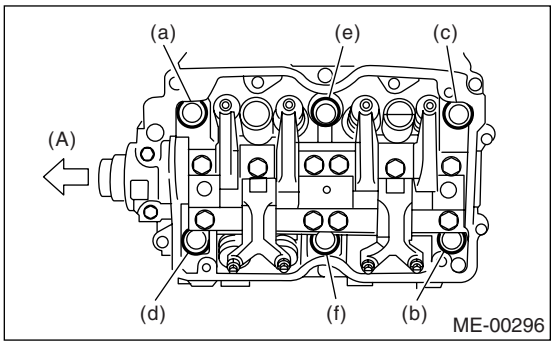
21.Cylinder Block

A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely.

1) Remove the intake manifold. **<Ref. to FU(H4SO)-14,** REMOVAL**, Intake Manifold.>**
2) Remove the V-belt. **<Ref. to ME(H4SO)-43,** REMOVAL**, V-belt.>**
3) Remove the crank pulley. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
4) Remove the timing belt cover. **<Ref. to ME(H4SO)-47,** REMOVAL**, Timing Belt Cover.>**
5) Remove the timing belt. **<Ref. to ME(H4SO)-48,** REMOVAL**, Timing Belt.>**
6) Remove the cam sprocket. **<Ref. to ME(H4SO)-53,** REMOVAL**, Cam Sprocket.>**
7) Remove the crank sprocket. **<Ref. to ME(H4SO)-45,** REMOVAL**, Crank Pulley.>**
8) Remove the generator and A/C compressor with their brackets.
9) Remove the rocker cover.
10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

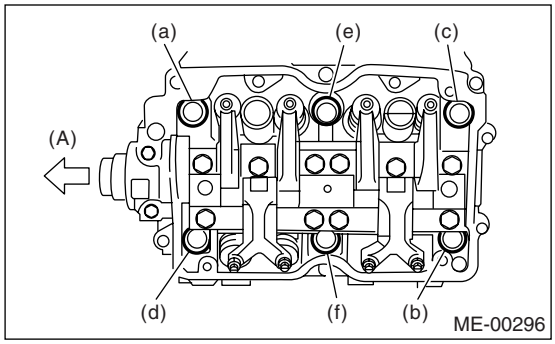
NOTE:
Leave bolts (a) and (c) engaged by three or four threads to prevent cylinder head from falling.



(A) Front

11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

12) Remove the bolts (a) and (c) to remove cylinder head.



(A) Front

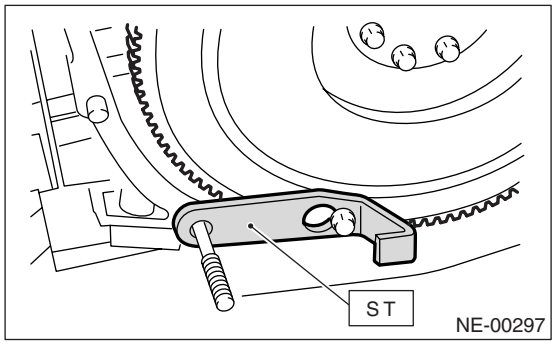
13) Remove the cylinder head gasket.

NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

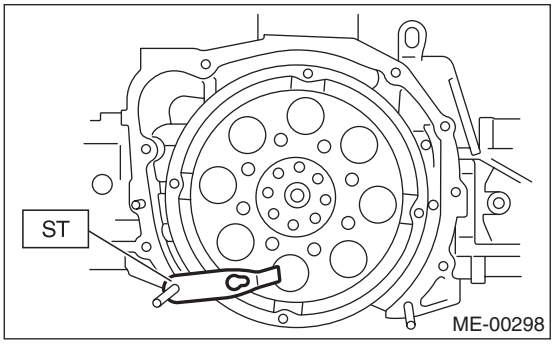
14) Similarly, remove the right side cylinder head.
15) Remove the clutch housing cover. (MT model)
16) Remove the flywheel (MT model) or drive plate (AT model).
(1) Using the ST, lock the crankshaft.

ST 498497100 CRANKSHAFT STOPPER

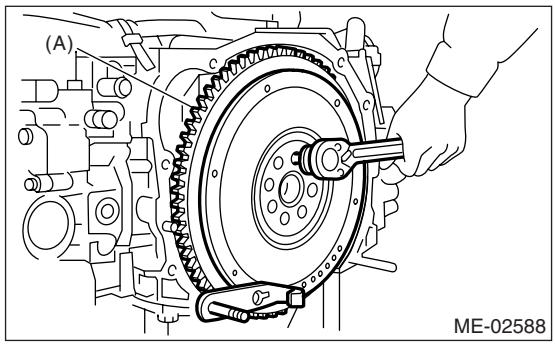
- MT model



- AT model

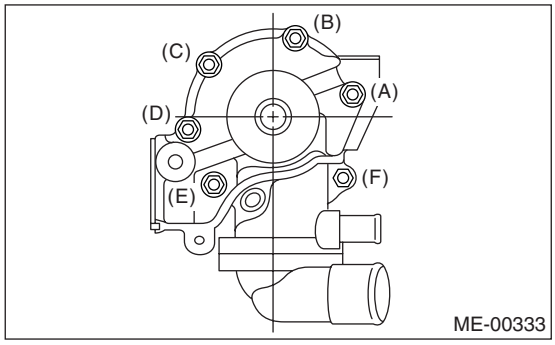


(2) Remove the flywheel.



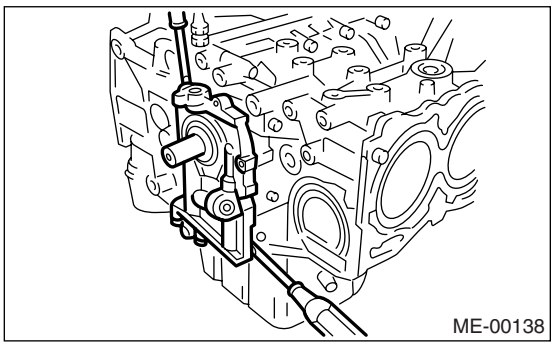
(A) Flywheel

17) Remove the oil separator cover.
18) Remove the water by-pass pipe for heater.
19) Loosen the bolts in alphabetical sequence as shown in the figure, and then remove water pump.



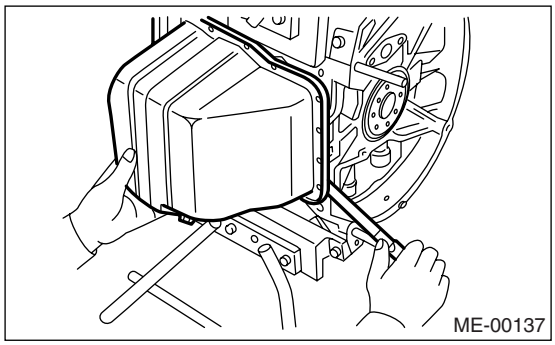
20) Remove the oil pump from cylinder block.
Use a flat-tip screwdriver as shown in the figure when removing the oil pump.

NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.



21) Removal of oil pan
(1) Turn the cylinder block to face the #2 and #4 piston sides upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

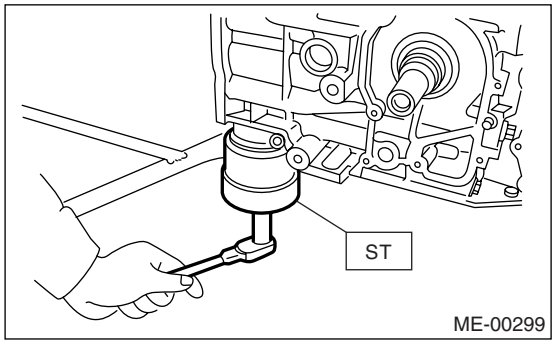
NOTE:
Do not use a screwdriver or similar tool in place of oil pan cutter.



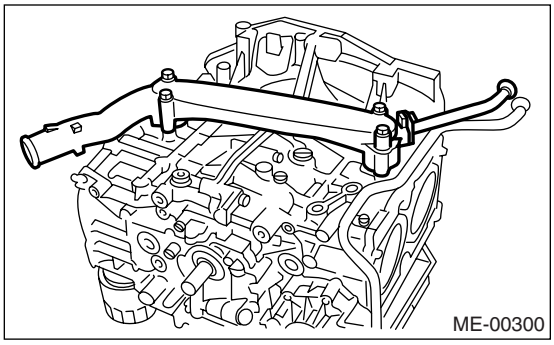
22) Remove the oil strainer stay.
23) Remove the oil strainer.
24) Remove the baffle plate.
25) Remove the oil filter using ST.

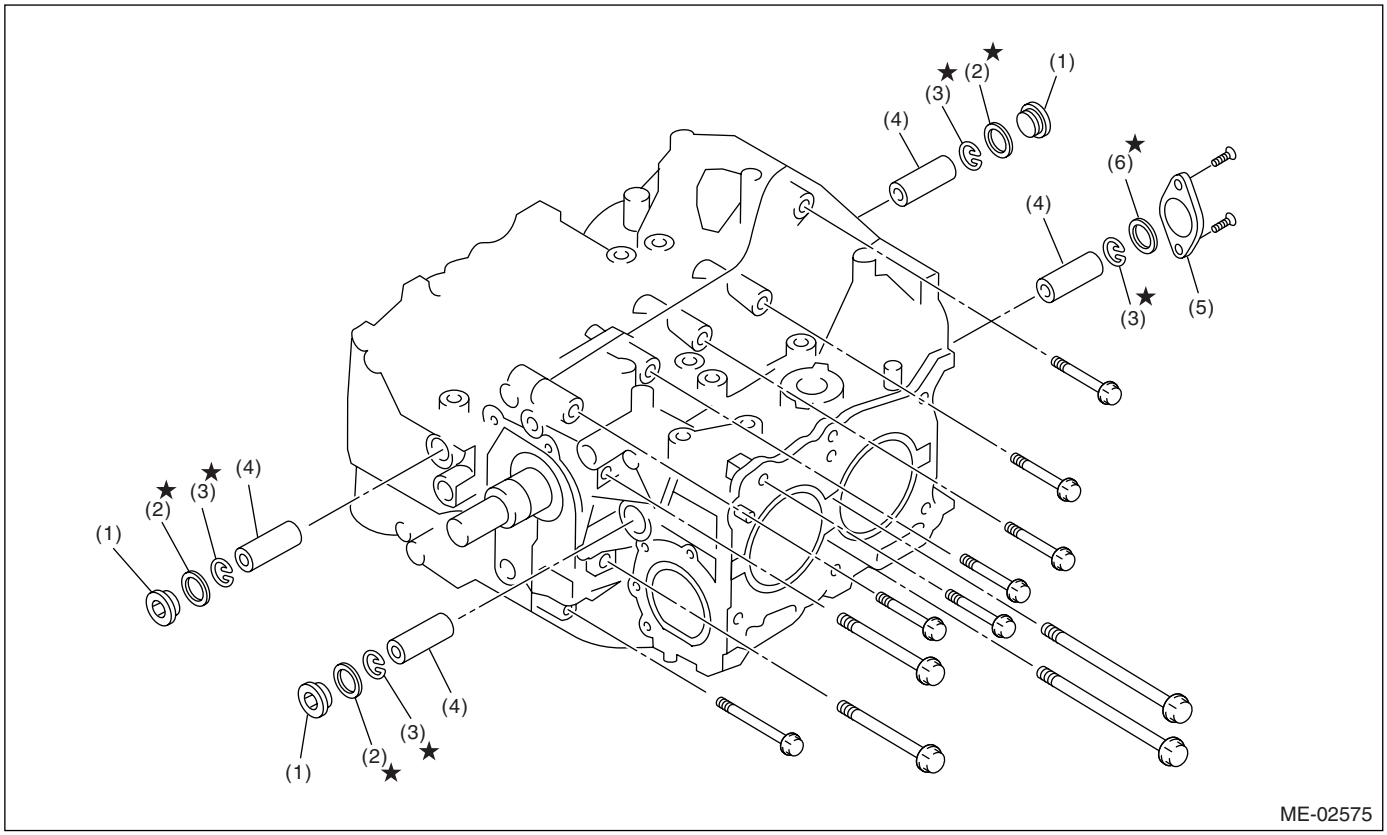
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))

NOTE:
Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) or 80 mm (3.15 in) can also be used.



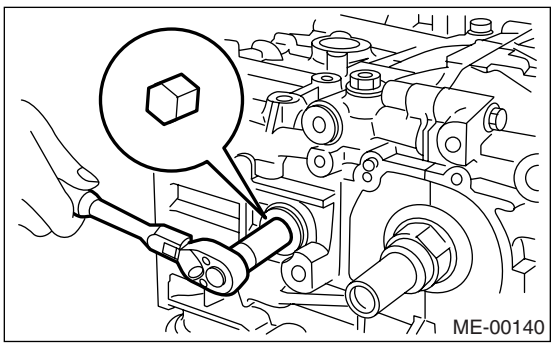
26) Remove the water pipe.



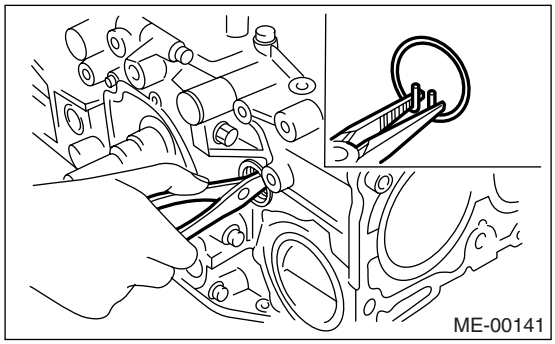


(1) Service hole plug
(2) Gasket
(3) Snap ring
(4) Piston pin
(5) Service hole cover
(6) O-ring

27) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm].

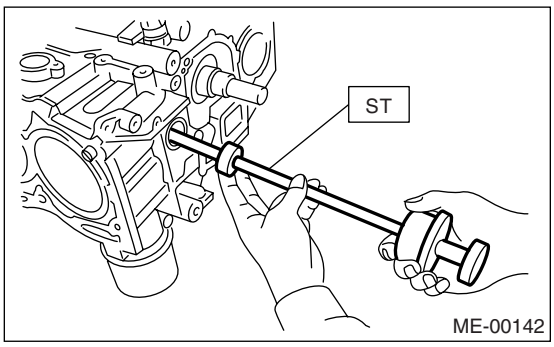


28) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston snap ring through service hole of #1 and #2 cylinders using needle nose plier.



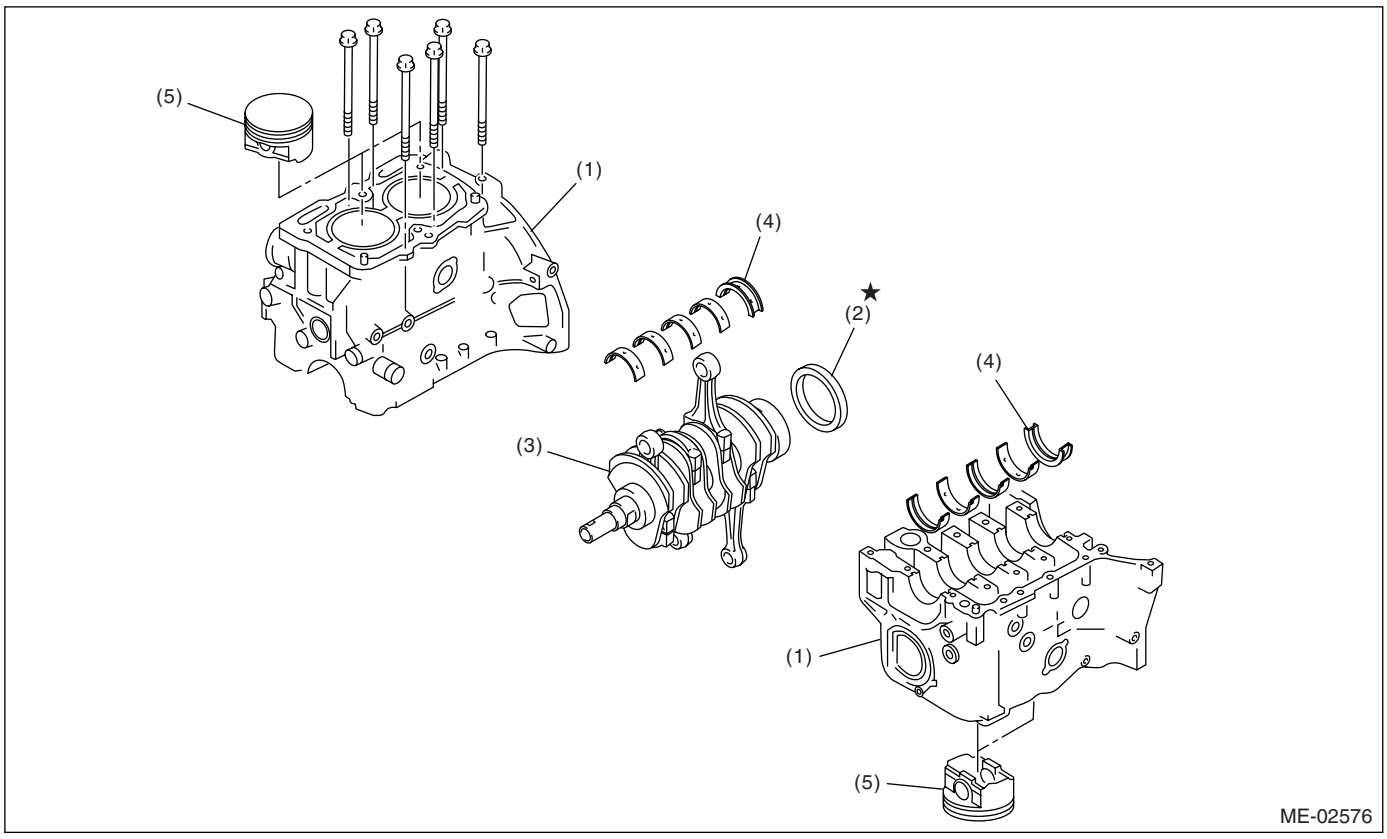
29) Draw out the piston pin from #1 and #2 pistons using ST.
ST 499097700 PISTON PIN REMOVER

CAUTION:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



30) Similarly remove the piston pins from #3 and #4 pistons.
31) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.
32) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.
33) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, and then remove the cylinder block connecting bolts.
34) Separate the cylinder blocks (RH) and (LH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

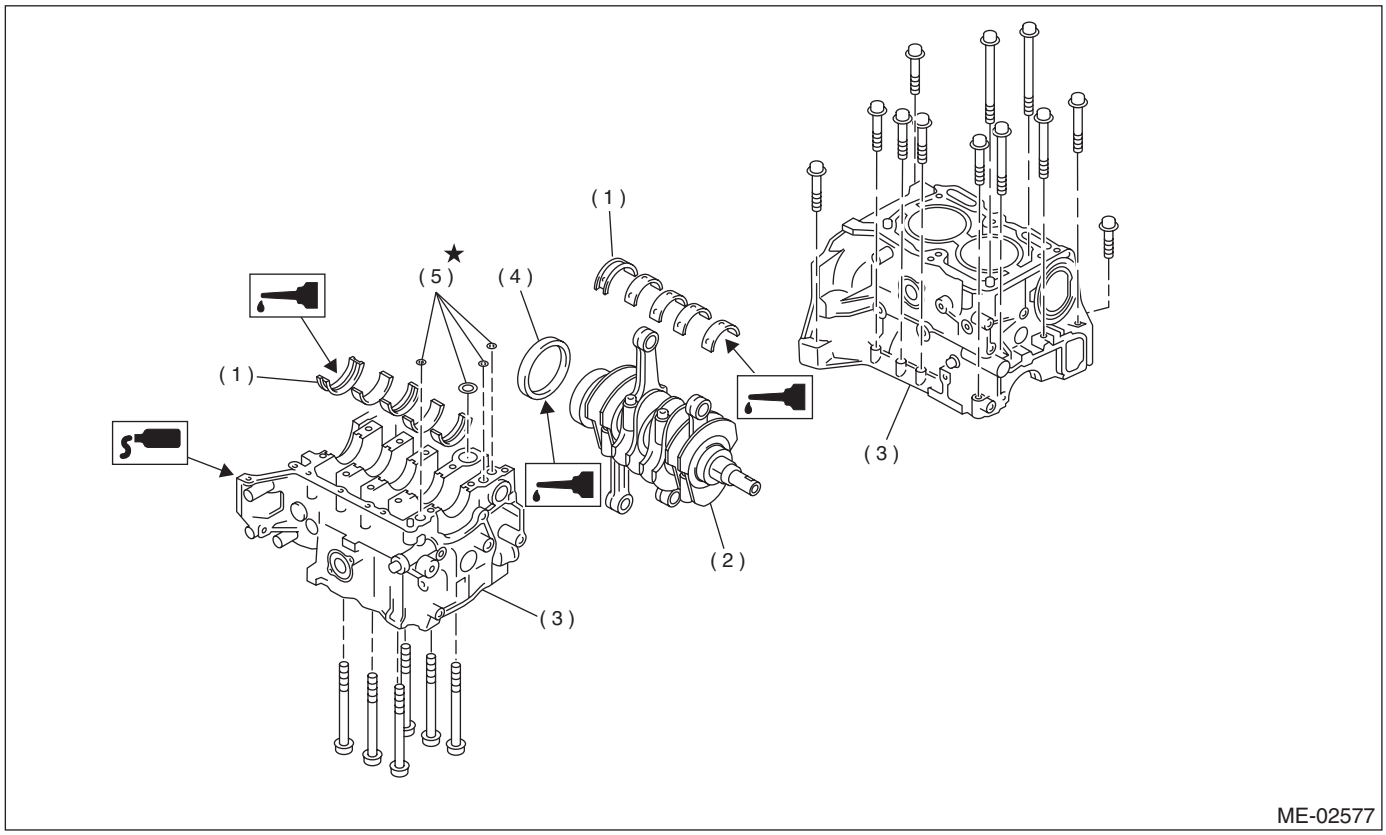
35) Remove the rear oil seal.
36) Remove the crankshaft together with connecting rod.
37) Remove the crankshaft bearings from cylinder block using hammer handle.

NOTE:
Do not confuse the combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

38) Draw out each piston from cylinder block using wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION



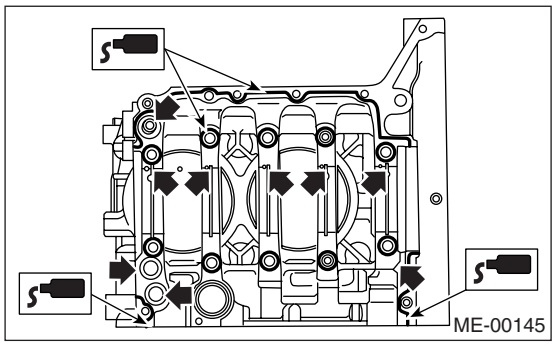
(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal
(5) O-ring

NOTE:
Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.

1) Position the crankshaft on #2 and #4 cylinder block.
2) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

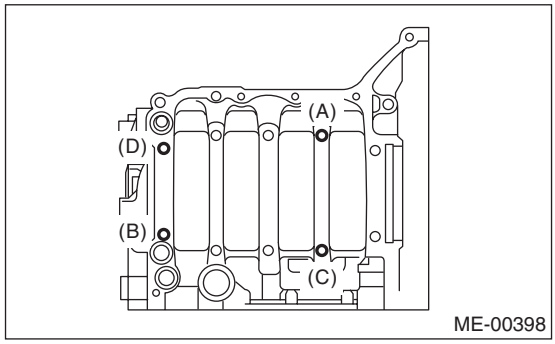
NOTE:
Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



3) Apply engine oil to washers and bolt threads.

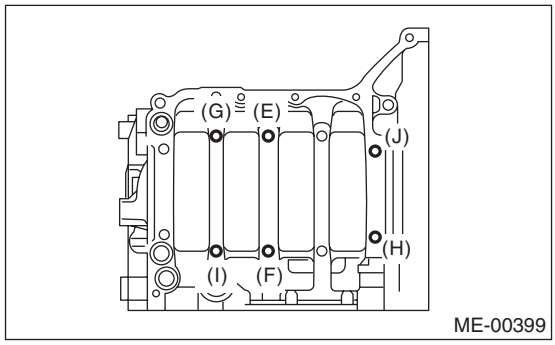
4) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



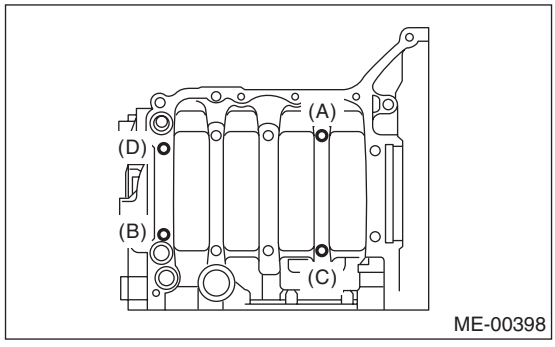
5) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



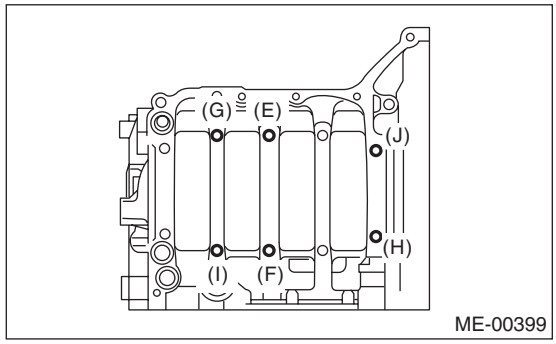
6) Further tighten the LH side bolts (A — D) in alphabetical sequence.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)



7) Further tighten the RH side bolts (E — J) in alphabetical sequence.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)



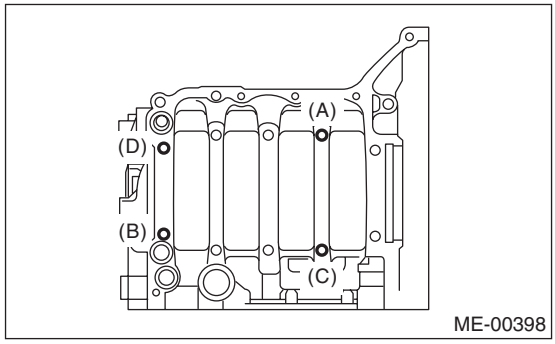
8) Further tighten the LH side bolts (A — D) in alphabetical sequence.

- (A), (C): Tighten with specified angle.

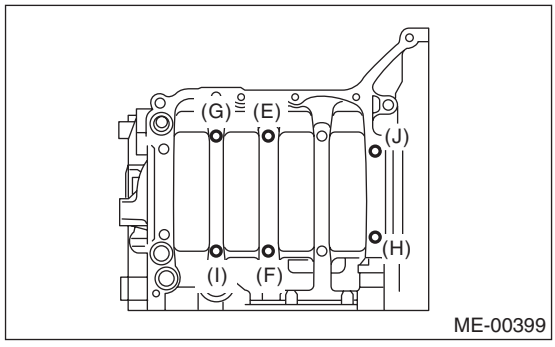
Tightening angle:
90°

- (B), (D): Tighten with specified torque.

Tightening torque:
40 N·m (4.1 kgf-m, 30 ft-lb)

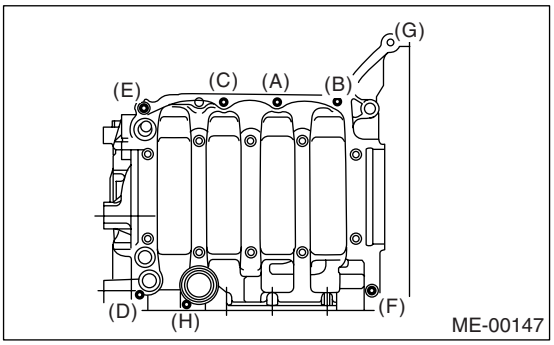


9) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

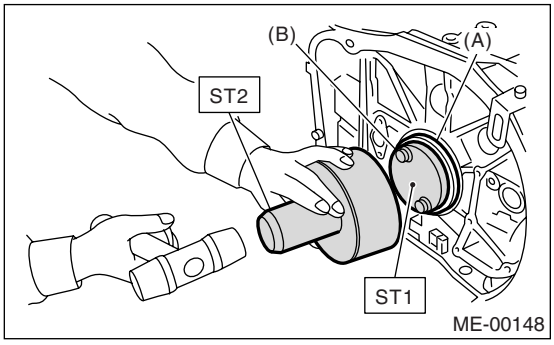


10) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

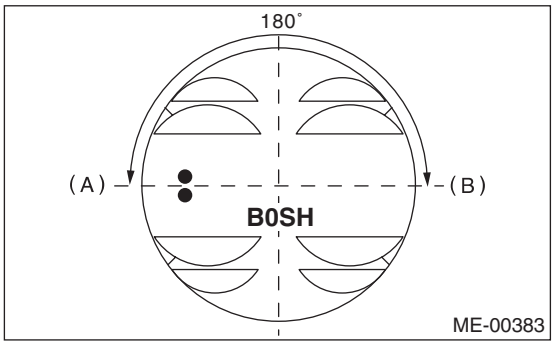


11) Apply a coat of engine oil to oil seal pressing part, install the rear oil seal using ST1 and ST2.
ST1 499597100 OIL SEAL GUIDE
ST2 499587200 OIL SEAL INSTALLER

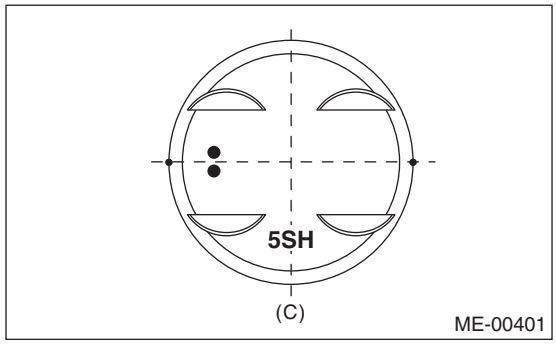


(A) Rear oil seal
(B) Fly wheel attaching bolt

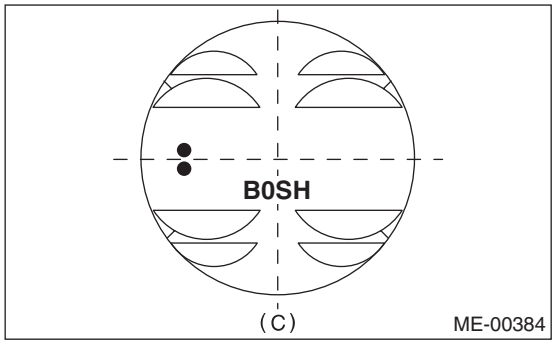
12) Position the top ring gap at (A) or (B) in the figure.
13) Position the second ring gap at 180° on the reverse side for top ring gap.
• 2.0 L model



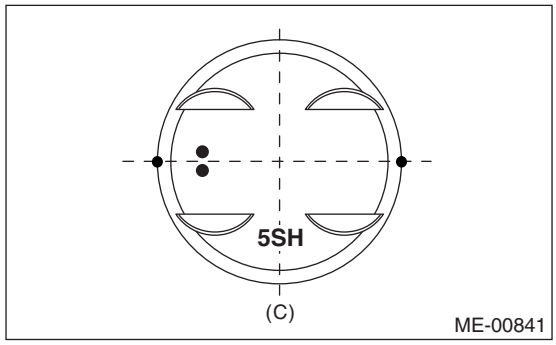
• 2.5 L model



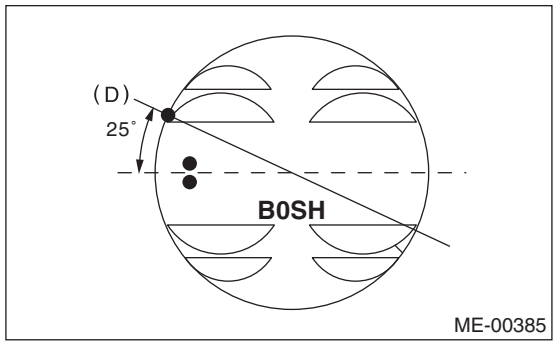
14) Position the expander gap at (C) in the figure.
• 2.0 L model



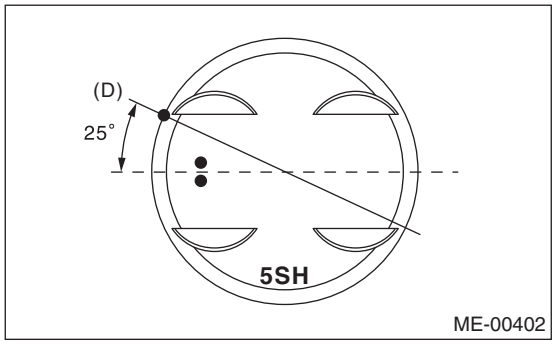
• 2.5 L model



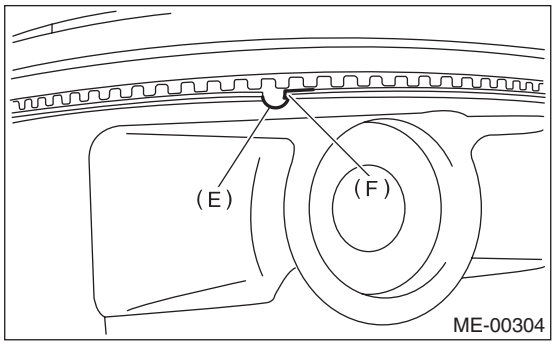
15) Position the lower rail gap at (D) in the figure.
• 2.0 L model



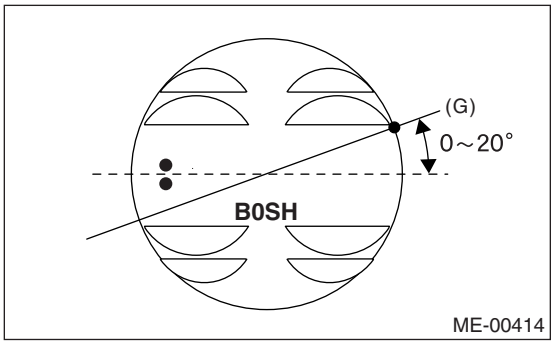
• 2.5 L model



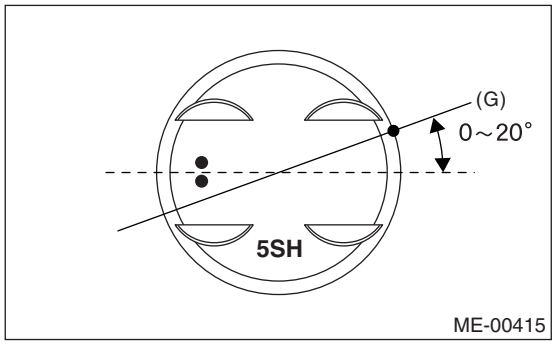
NOTE:
Align the lower rail stopper (F) to the lateral hole (E) on the piston.



16) Position the upper rail gap at (G) in the figure.
• 2.0 L model



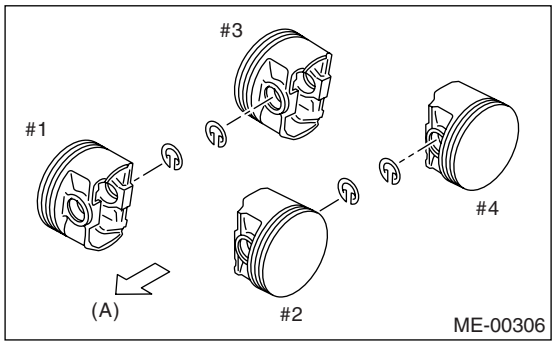
• 2.5 L model



CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.

17) Install snap ring.
Install snap rings in the piston holes located opposite service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

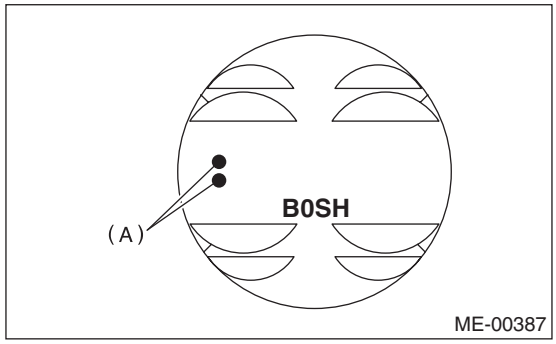
NOTE:
Use new snap rings.



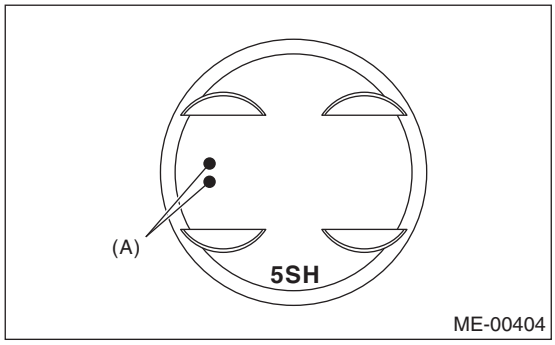
(A) Front side

CAUTION:
Piston front mark faces towards the front of the engine.

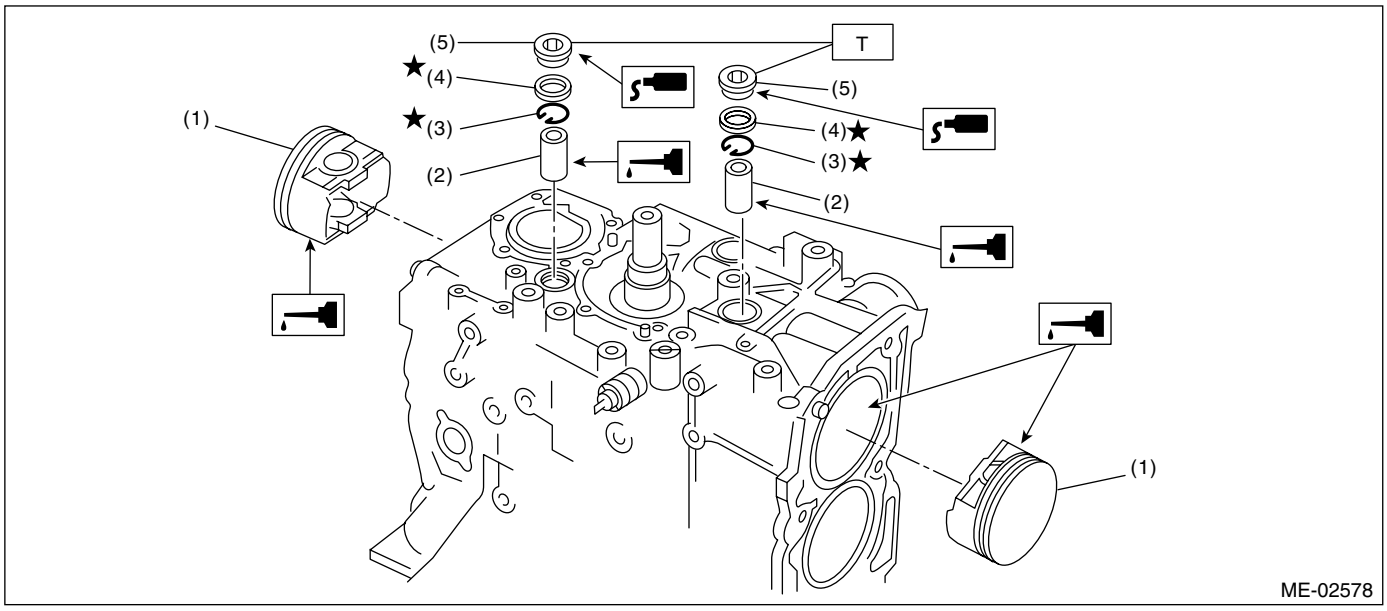
• 2.0 L model



- 2.5 L model



(A) Front mark



(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 52)

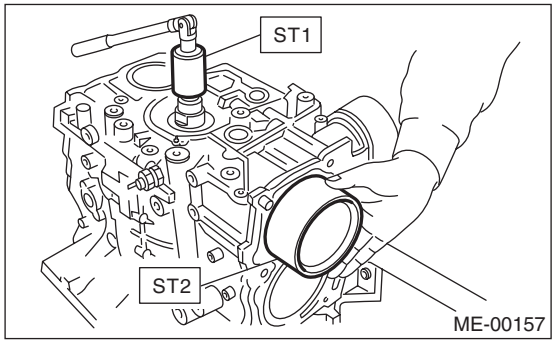
18) Installing piston
(1) Turn the cylinder block to face the #1 and #2 piston side upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to pistons and cylinders, and then insert the pistons in their cylinders using ST2.

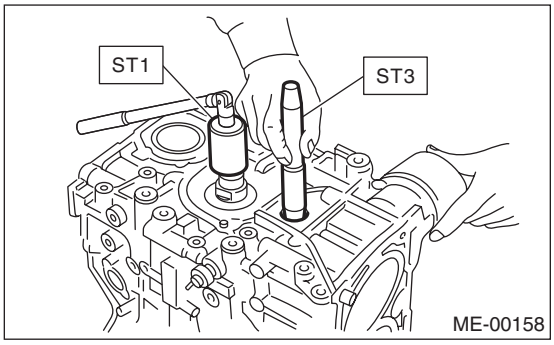
ST2 398744300 PISTON GUIDE (2.0 L model)

ST2 498747300 PISTON GUIDE (2.5 L model)



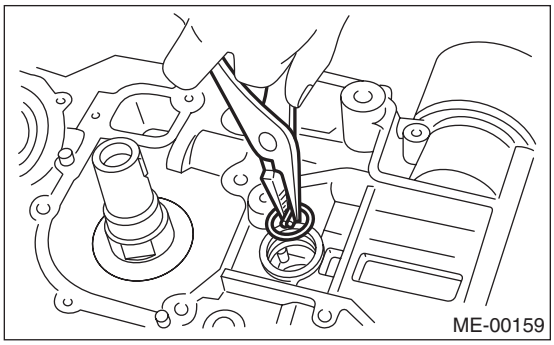
19) Installing piston pin
(1) Apply a coat of engine oil to the ST3 before insertion.
(2) Insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



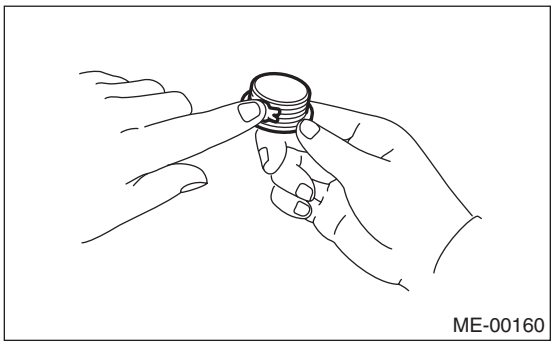
(3) Apply a coat of engine oil to the piston pin, and then insert the piston pin into piston and connecting rod through service hole.
(4) Install the snap ring using needle nose plier.

NOTE:
Use new snap rings.



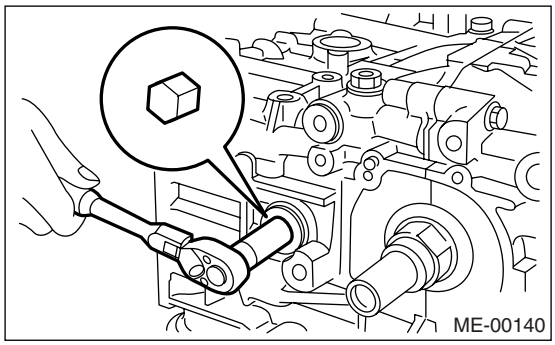
(5) Apply liquid gasket around the service hole plug.

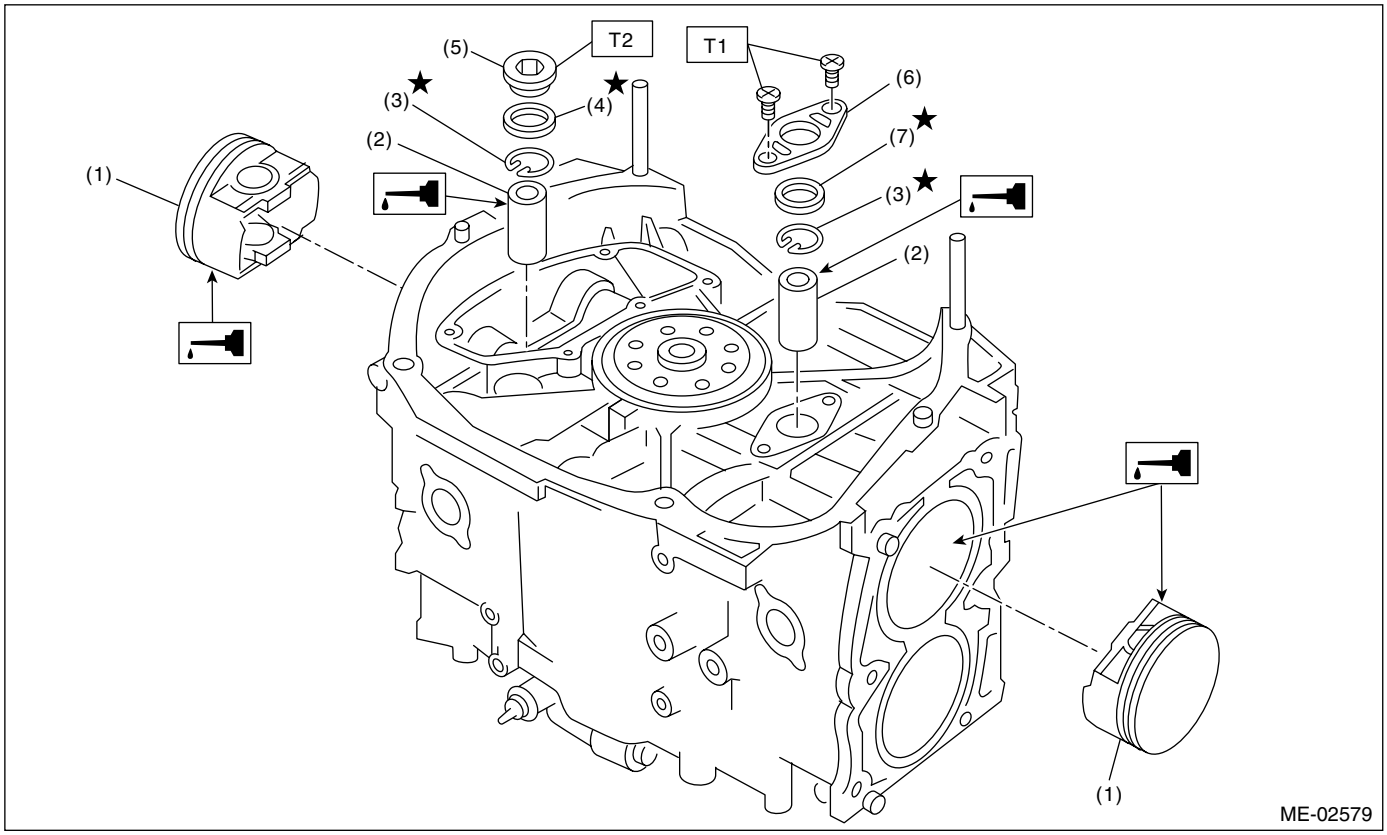
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(6) Install the service hole plug and gasket.

NOTE:
Use a new gasket.



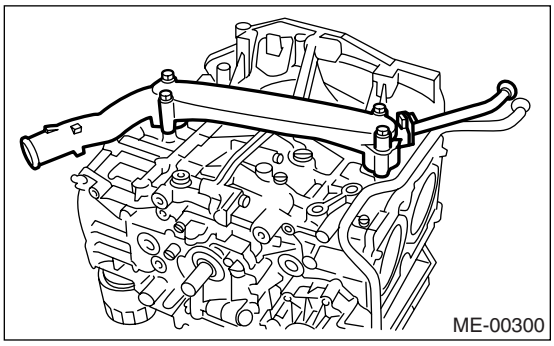


(1) Piston
(2) Piston pin
(3) Snap ring
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 52)

(7) Turn the cylinder block to face the #3 and #4 piston side upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

20) Install the water pipe.



21) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

22) Install the oil strainer and O-ring.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

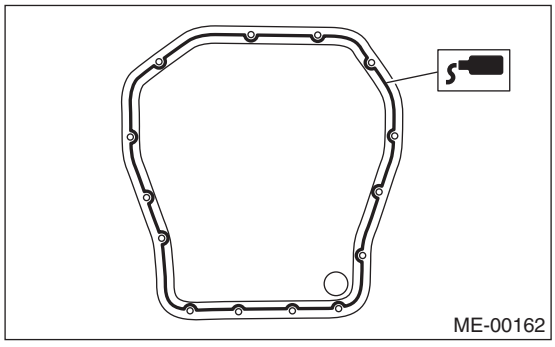
23) Install the oil strainer stay.

24) Apply liquid gasket to the matching surfaces, and then install the oil pan.

NOTE:
Assemble them within 20 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

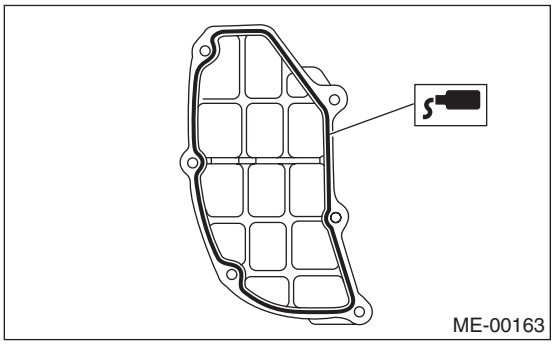


25) Apply liquid gasket to the matching surfaces, and then install the oil separator cover.

NOTE:
Assemble them within 20 min. after applying liquid gasket.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

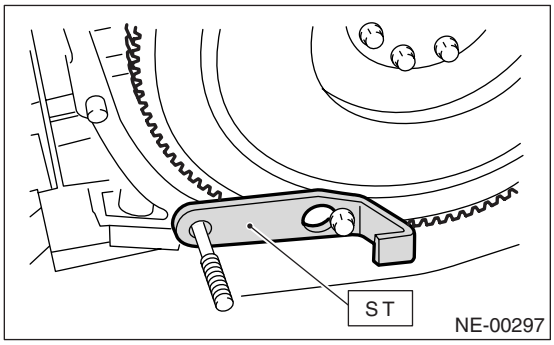
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



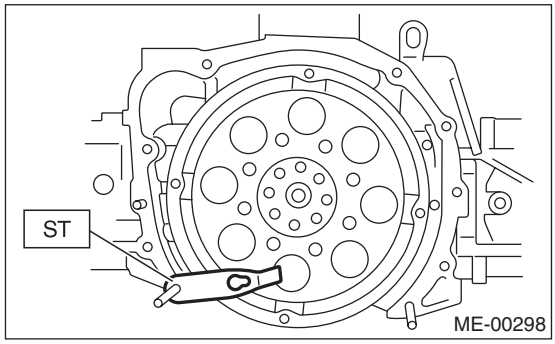
26) Install the flywheel (MT model) or drive plate (AT model).
(1) Using ST, lock the crankshaft.

ST 498497100 CRANKSHAFT STOPPER

- MT model

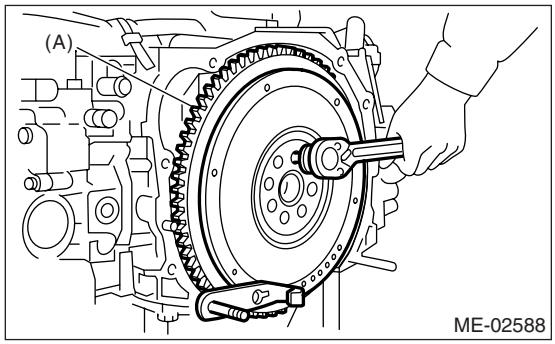


- AT model



(2) Install the flywheel.

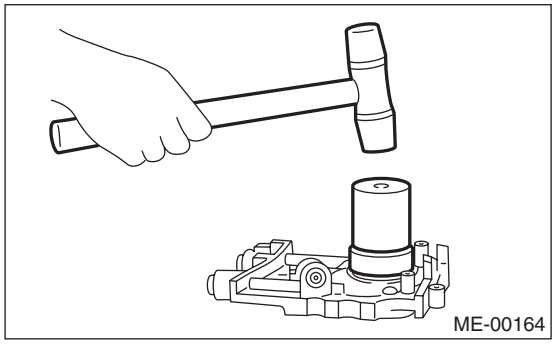
Tightening torque:
72 N·m (7.3 kgf-m, 53.1 ft-lb)



(A) Flywheel

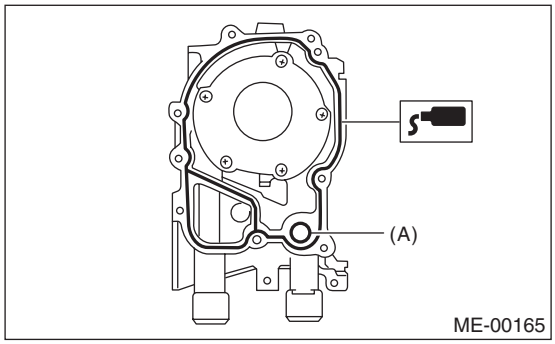
27) Install the housing cover.
28) Installation of oil pump
(1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER



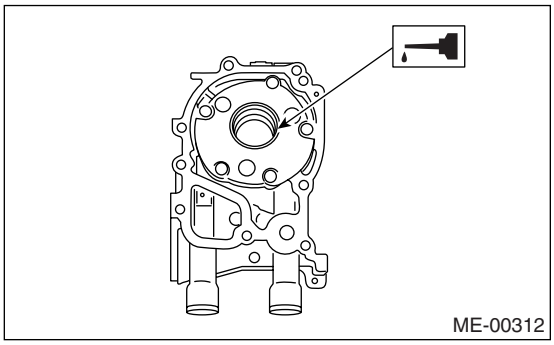
(2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

(5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

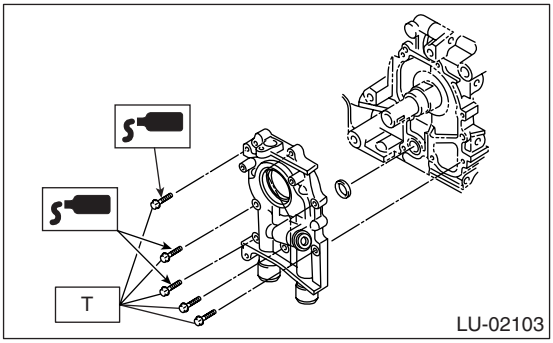
CAUTION:
• Make sure the oil seal lip is not folded.
• Do not forget to install the O-ring and seal when installing the oil pump.

(6) Install the oil pump.

(7) Apply liquid gasket to the threaded portion of three bolts.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

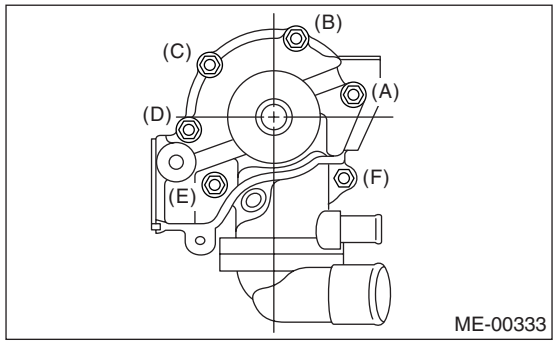


29) Install the water pump and gasket.

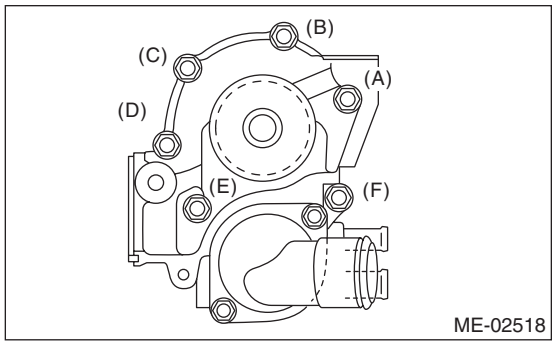
Tightening torque:
Firs: 12 N·m (1.2 kgf-m, 9 ft-lb)
Second: 12 N·m (1.2 kgf-m, 9 ft-lb)

CAUTION:
• Be sure to use a new gasket.
• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.

• Model without ATF warmer



• Model with ATF warmer



30) Install the water by-pass pipe for heater.

31) Get a engine oil filter and apply a thin coat of engine oil to the seal rubber.

32) Install the oil filter using ST.

ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))

NOTE:
Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) or 80 mm (3.15 in) can also be used.

Install the oil filter by turning it by hand, being careful not to damage the seal rubber.

• Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

• Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

33) Tighten the cylinder head bolts.

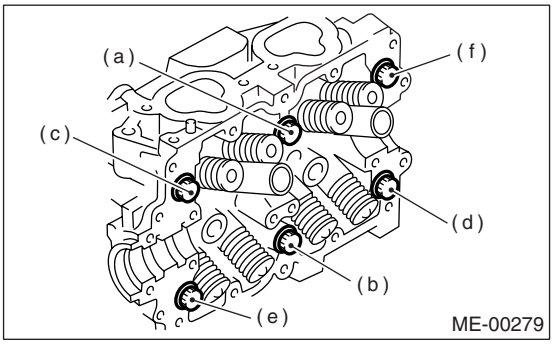
(1) Apply a coat of engine oil to washers and bolt threads.

(2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
(3) Back off all bolts by 180° in reverse order of installation, and back them off again by 180°.
(4) Tighten all bolts to 42 N·m (3.9 kgf-m, 31 ft-lb) in alphabetical sequence.
(5) Tighten all bolts by 80° — 90° in alphabetical sequence.
(6) Tighten all bolts by 40° — 45° in alphabetical sequence.

NOTE:
Do not tighten the bolts more than 45°.

(7) Further tighten bolts (a) and (b) by 40° — 45°.

NOTE:
Ensure the total “re-tightening angle” in the [former two steps], do not exceed 90°.

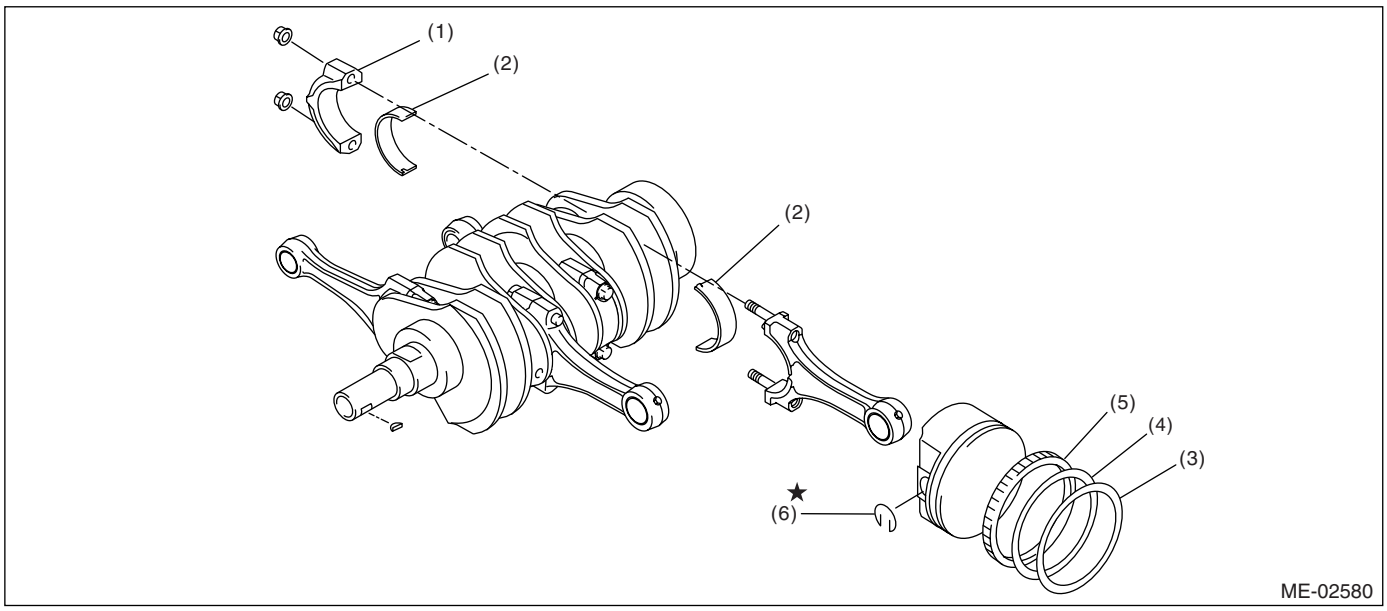


34) Install the oil level gauge guide and tighten the attaching bolt (left side only).
35) Install the rocker cover and rocker cover gasket.

NOTE:
Use a new rocker cover gasket.

36) Install the crank sprocket. **<Ref. to ME(H4SO)-55,** INSTALLATION**, Crank Sprocket.>**
37) Install the cam sprocket. **<Ref. to ME(H4SO)-53,** INSTALLATION**, Cam Sprocket.>**
38) Install the timing belt assembly. **<Ref. to ME(H4SO)-49,** INSTALLATION, Timing Belt.>
39) Install the belt cover. **<Ref. to ME(H4SO)-47,** INSTALLATION**, Timing Belt Cover.>**
40) Install the crank pulley. **<Ref. to ME(H4SO)-45,** INSTALLATION**, Crank Pulley.>**
41) Install the generator and A/C compressor brackets on cylinder head.
42) Install the V-belt. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**
43) Install the intake manifold. **<Ref. to FU(H4SO)-16,** INSTALLATION**, Intake Manifold.>**

C: DISASSEMBLY



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Snap ring

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

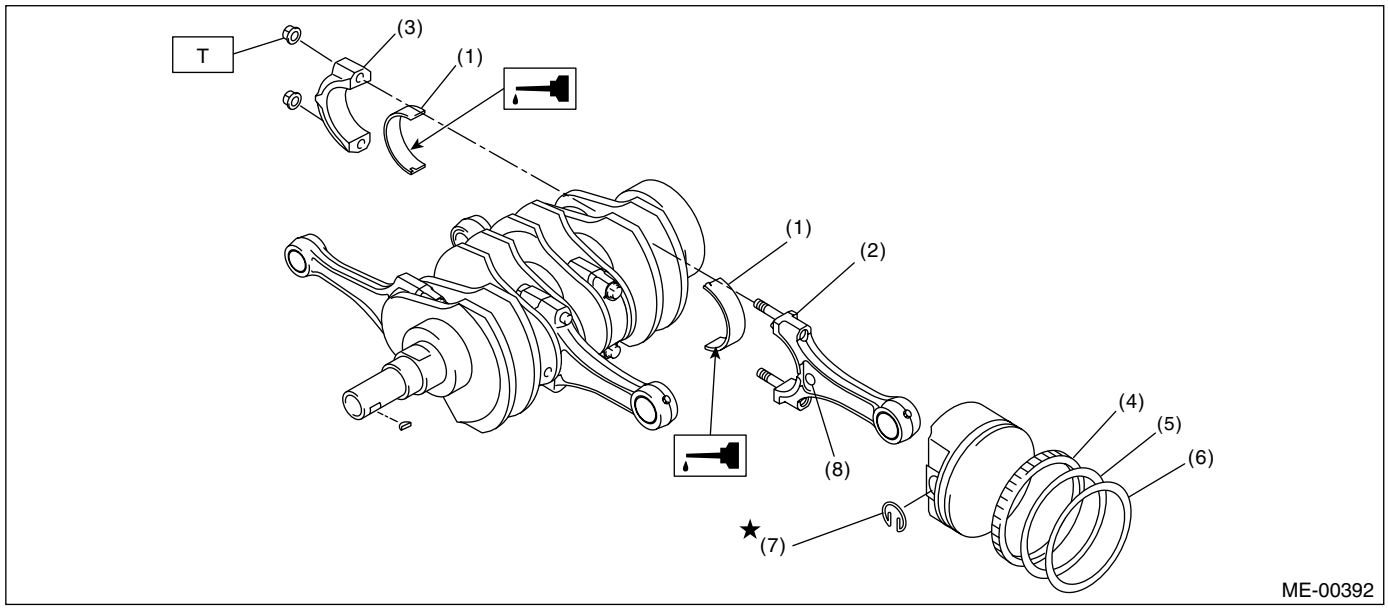
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in good order to prevent confusion.

5) Remove the snap ring.

D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Snap ring
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings.
2) Install the connecting rod bearings on connecting rods and connecting rod caps.
3) Position each connecting rod with the marked side facing forward, and then install them.
4) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

CAUTION:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

5) Install the expander, lower rail and upper rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.025 mm (0.00098 in)

Grinding limit:
0.1 mm (0.004 in)

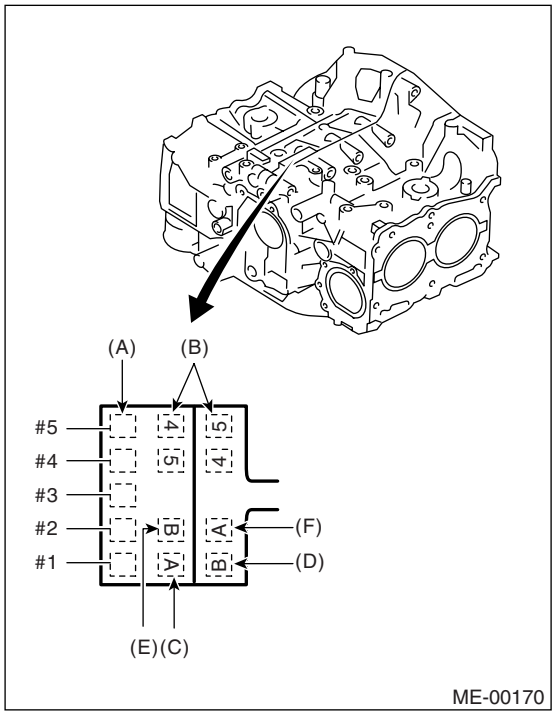
Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

NOTE:
• Measurement should be performed at a temperature 20°C (68°F).
• Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
2.0 L model
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)
2.5 L model
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



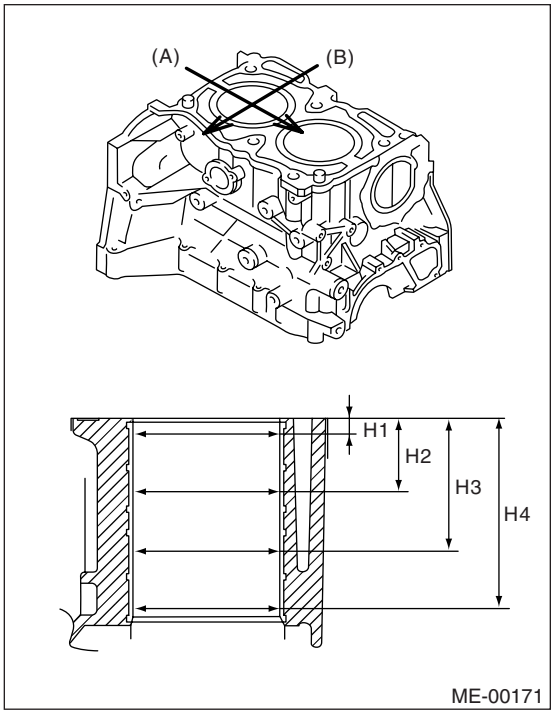
(A) Main journal size mark
(B) Cylinder block RH-LH combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature 20°C (68°F).

Taper:
Standard:
0.015 mm (0.0006 in)
Limit:
0.050 mm (0.0020 in)

Out-of-roundness:
Standard:
0.010 mm (0.0004 in)
Limit:
0.050 mm (0.0020 in)



(A) Piston pin direction
(B) Thrust direction
H1 10 mm (0.39 in)
H2 45 mm (1.77 in)
H3 80 mm (3.15 in)
H4 115 mm (4.35 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each piston
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

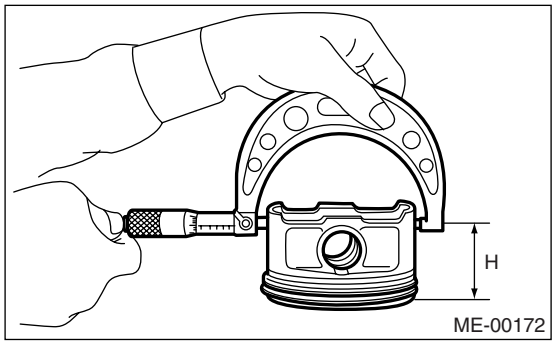
Piston grade point H:
2.0 L model
40.0 mm (1.575 in)
2.5 L model
37.0 mm (1.457 in)

Piston outer diameter:

Standard:

2.0 L model
A: 91.985 — 91.995 mm (3.6214 — 3.6218 in)
B: 91.975 — 91.985 mm (3.6211 — 3.6214 in)
0.25 mm (0.0098 in) oversize
92.225 — 92.245 mm (3.6309 — 3.6317 in)
0.50 mm (0.0197 in) oversize
92.475 — 92.495 mm (3.6407 — 3.6415 in)

2.5 L model
A: 99.485 — 99.495 mm (3.9167 — 3.9171 in)
B: 99.475 — 99.485 mm (3.9163 — 3.9167 in)
0.25 mm (0.0098 in) oversize
99.725 — 99.745 mm (3.9262 — 3.9270 in)
0.50 mm (0.0197 in) oversize
99.975 — 99.995 mm (3.9360 — 3.9368 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):
Standard:
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit:
0.050 mm (0.0020 in)

6) Boring and honing
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the crankcase.

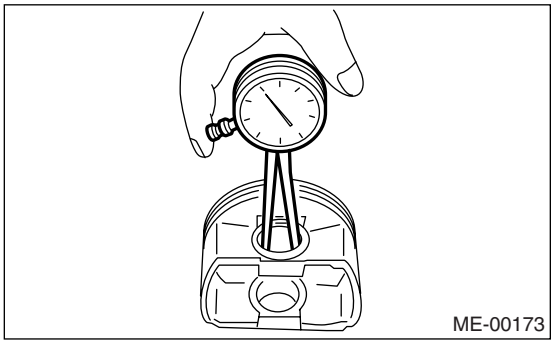
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

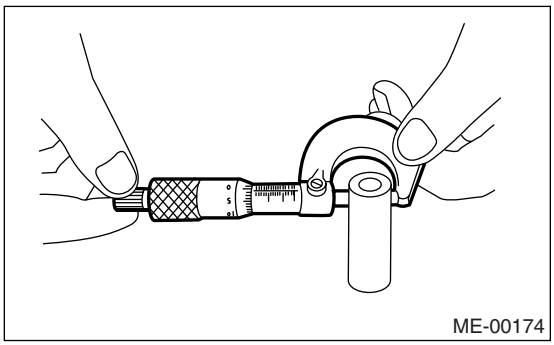
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

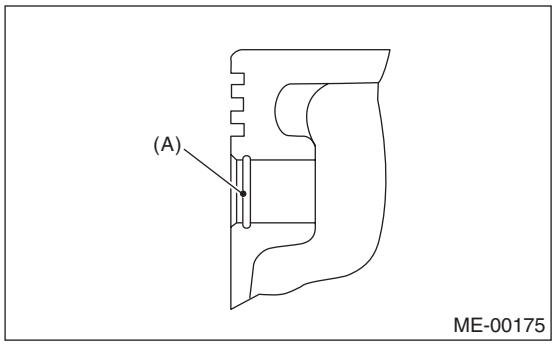
1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. **<Ref. to ME(H4SO)-85,** CYLINDER AND PISTON, INSPECTION**, Cylinder Block.>** If any of the clearances is not to specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make the sure that piston pin can be inserted into piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard:
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit:
0.020 mm (0.0008 in)


ME-00173


ME-00174

4) Check the circlip installation groove (A) on piston for burr. If necessary, remove the burr from groove so that piston pin can lightly move.



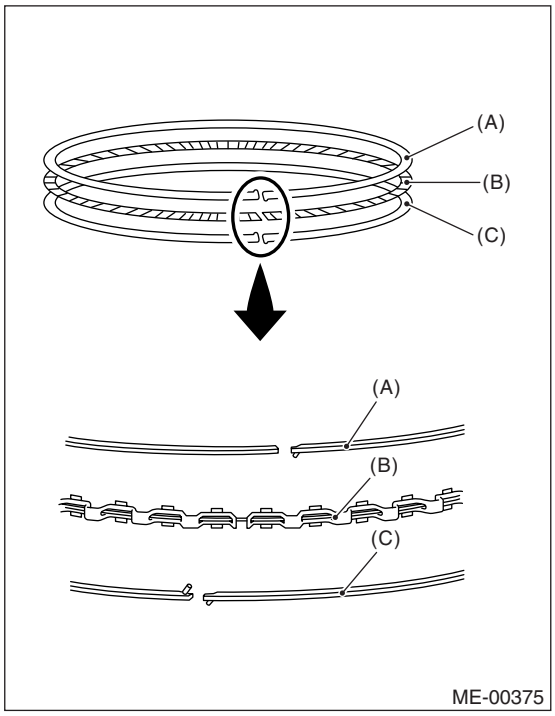
ME-00175

5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

CAUTION:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face these marks upward.
• Oil ring is composed of upper rail, expander and lower rail. Be careful of the rail direction when installing oil ring to the piston.



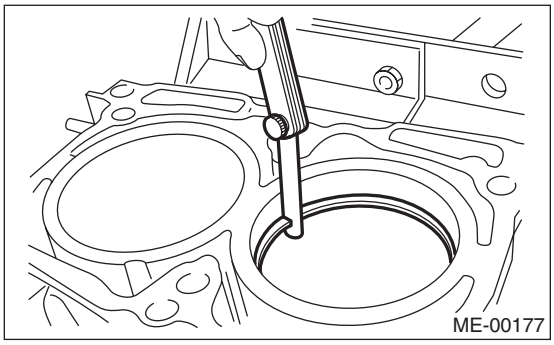
ME-00375

(A) Upper rail
(B) Expander
(C) Lower rail

2) Clean the piston ring groove and piston ring.
3) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

Unit: mm (in)

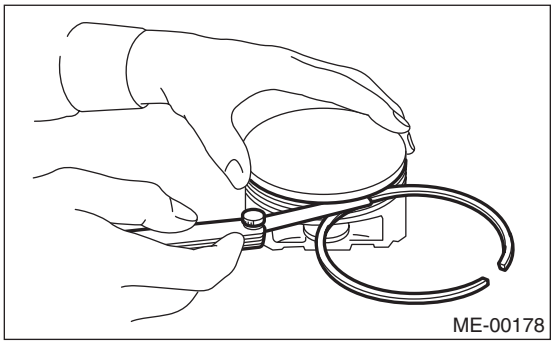
			Standard	Limit
Piston ring gap	Top ring		0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	2.0 L	0.40 — 0.50 (0.0160 — 0.0197)	1.0 (0.039)
		2.5 L	0.37 — 0.52 (0.0146 — 0.0204)	
	Oil ring rail		0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)


ME-00177

4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

Unit: mm (in)

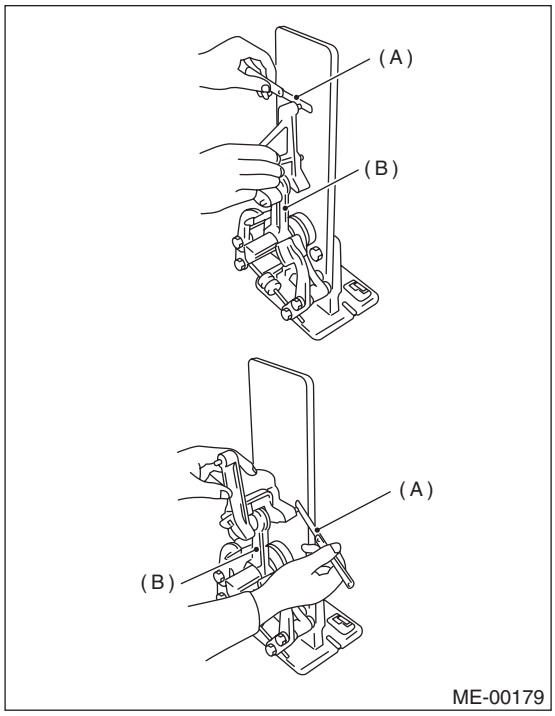
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)


ME-00178

5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)

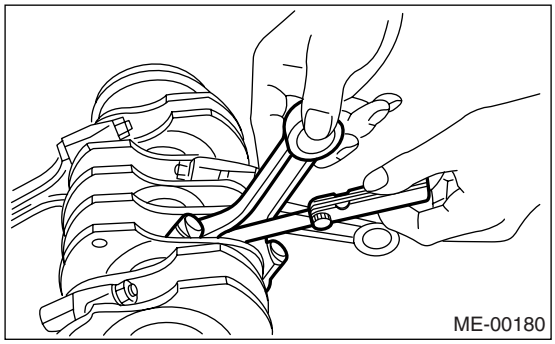


ME-00179

(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod thrust clearance:
Standard:
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit:
0.4 mm (0.016 in)


ME-00180

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigage. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

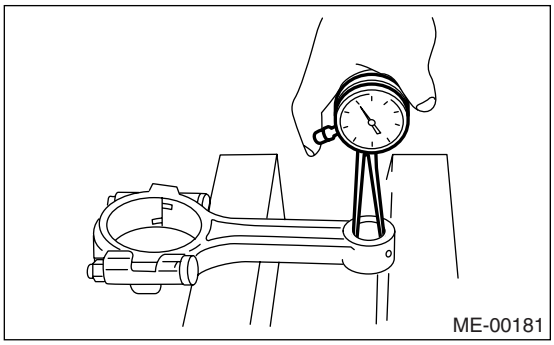
Connecting rod oil clearance:
Standard:
0.016 — 0.044 mm (0.0006 — 0.0017 in)
Limit:
0.05 mm (0.0020 in)

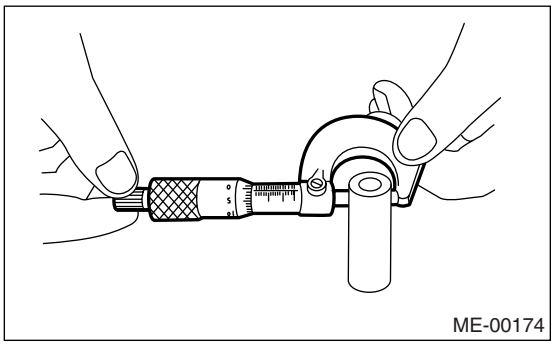
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.492 — 1.501 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

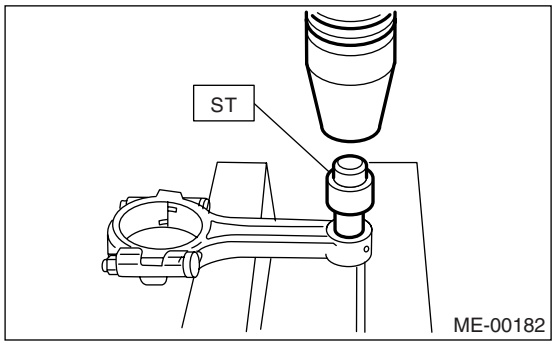
Clearance between piston pin and bushing:
Standard:
0 — 0.022 mm (0 — 0.0009 in)
Limit:
0.030 mm (0.0012 in)


ME-00181


ME-00174

7) Replacement procedure is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

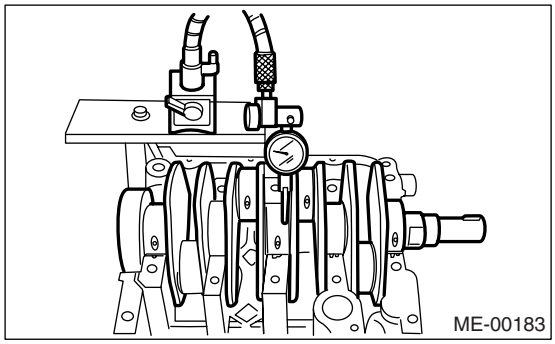
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

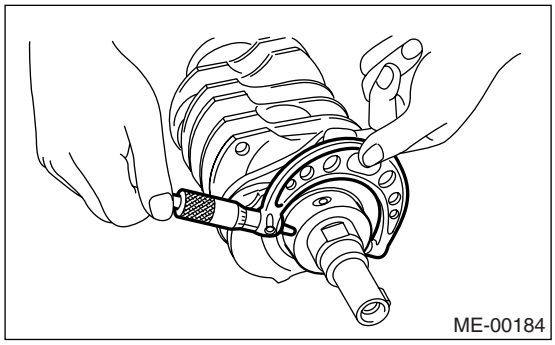
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness:
0.020 mm (0.0008 in) or less
Taper limit:
0.07 mm (0.0028 in)
Grinding limit:
0.250 mm (0.0098 in)



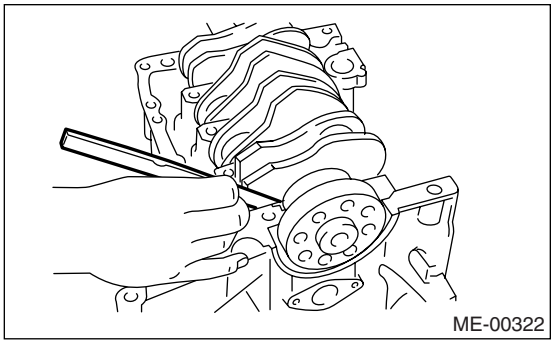
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3	#2, #4, #5	2.0 L
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.501 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the standard, replace bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)


ME-00322

5) Inspect the individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigage. If the measurement is not within the specification, replace the defective bearing with an undersize one, and then replace or recondition the crankshaft as necessary.

Crankshaft oil clearance:
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit
0.040 mm (0.0016 in)

22.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refer to the possibility of reason for the trouble in order (“Very often” to “Rarely”)
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Poor terminal connection	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B
		Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	B
7. After burning in exhaust system	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Malfunction of evaporative emission control system	C
8. Knocking	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter seal	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Accelerator cable out of adjustment	B

23.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Worn cam sprocket • Worn camshaft journal bore in cylinder head assy
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve noise	—	Incorrect valve clearance

NOTE*:
When disconnecting fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, carry out the clear memory mode **<Ref. to EN(H4SO)(diag)-45,** OPERATION**, Clear Memory Mode.>** and inspection mode **<Ref. to EN(H4SO)(diag)-38,** OPERATION**, Inspection Mode.>** after connecting fuel injector connector.

EXHAUST

EX(H4SO)

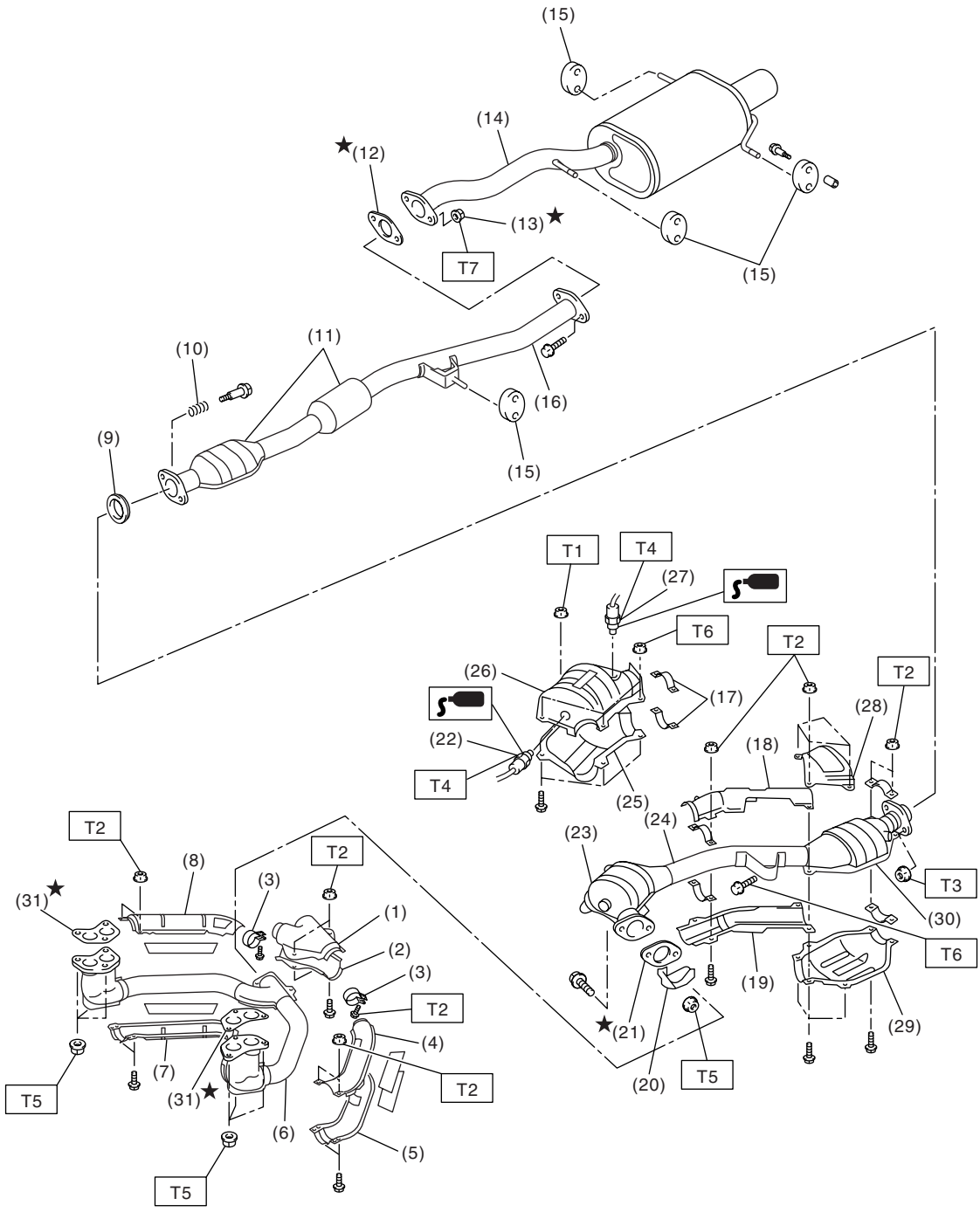
Page

1. General Description 2
2. Front Exhaust Pipe 7
3. Center Exhaust Pipe 10
4. Rear Exhaust Pipe 11
5. Muffler 13

1. General Description

A: COMPONENT

1. 2.0 L MODEL



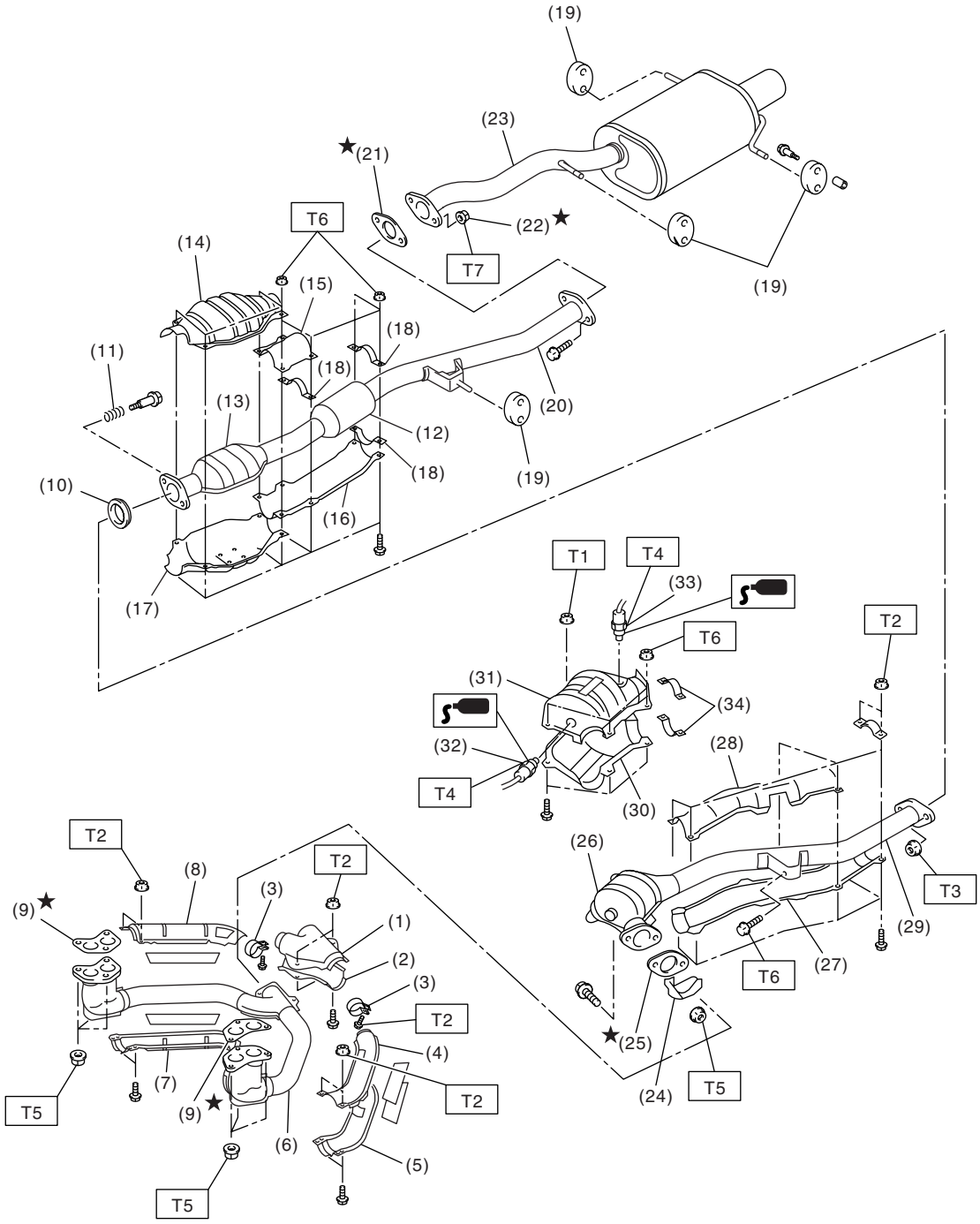
EX-02010

(1) Front exhaust pipe upper cover CTR
(2) Front exhaust pipe lower cover CTR
(3) Clamp
(4) Front exhaust pipe upper cover LH
(5) Front exhaust pipe lower cover LH
(6) Front exhaust pipe
(7) Front exhaust pipe lower cover RH
(8) Front exhaust pipe upper cover RH
(9) Gasket
(10) Spring
(11) Chamber
(12) Gasket
(13) Self-locking nut
(14) Muffler
(15) Cushion rubber
(16) Rear exhaust pipe
(17) Clamp
(18) Center exhaust pipe upper cover
(19) Center exhaust pipe lower cover
(20) Protector
(21) Gasket
(22) Front oxygen (A/F) sensor
(23) Front catalytic converter
(24) Center exhaust pipe
(25) Front catalytic converter lower cover
(26) Front catalytic converter upper cover
(27) Rear oxygen sensor
(28) Rear catalytic converter upper cover
(29) Rear catalytic converter lower cover
(30) Rear catalytic converter
(31) Gasket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 21 (2.1, 15.2)
T5: 30 (3.1, 22.1)
T6: 35 (3.6, 26.0)
T7: 48 (4.9, 35.4)

2. 2.5 L MODEL



EX-02011

(1) Front exhaust pipe upper cover CTR
(2) Front exhaust pipe lower cover CTR
(3) Clamp
(4) Front exhaust pipe upper cover LH
(5) Front exhaust pipe lower cover LH
(6) Front exhaust pipe
(7) Front exhaust pipe lower cover RH
(8) Front exhaust pipe upper cover RH
(9) Gasket
(10) Gasket
(11) Spring
(12) Chamber
(13) Rear catalytic converter
(14) Rear catalytic converter upper cover
(15) Rear exhaust upper cover
(16) Rear exhaust lower cover
(17) Rear catalytic lower converter cover
(18) Clamp
(19) Cushion rubber
(20) Rear exhaust pipe
(21) Gasket
(22) Self-locking nut
(23) Muffler
(24) Protector
(25) Gasket
(26) Front catalytic converter
(27) Center exhaust lower cover
(28) Center exhaust upper cover
(29) Center exhaust pipe
(30) Front catalytic converter lower cover
(31) Front catalytic converter upper cover
(32) Front oxygen (A/F) sensor
(33) Rear oxygen sensor
(34) Clamp

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 21 (2.1, 15.2)
T5: 30 (3.1, 22.1)
T6: 35 (3.6, 26.0)
T7: 48 (4.9, 35.4)

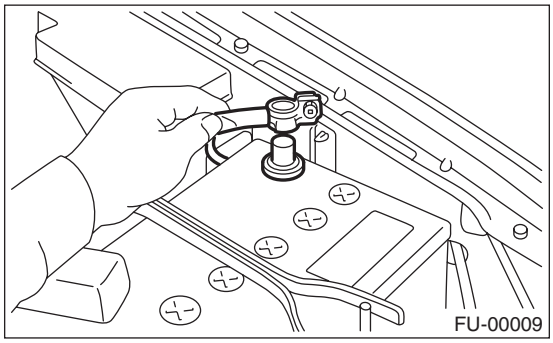
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

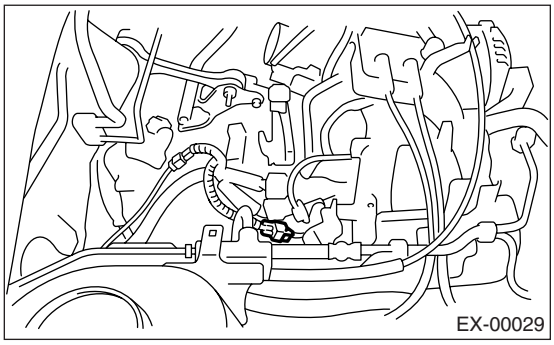
2. Front Exhaust Pipe

A: REMOVAL

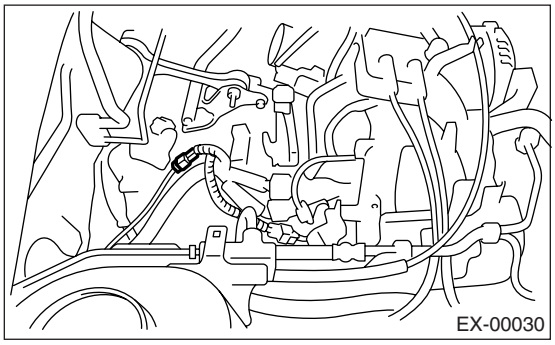
1) Disconnect the ground cable from battery.



2) Disconnect the front oxygen (A/F) sensor connector.



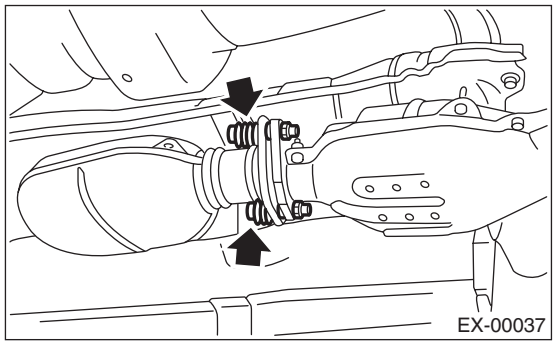
3) Disconnect the rear oxygen sensor connector.



4) Lift-up the vehicle.

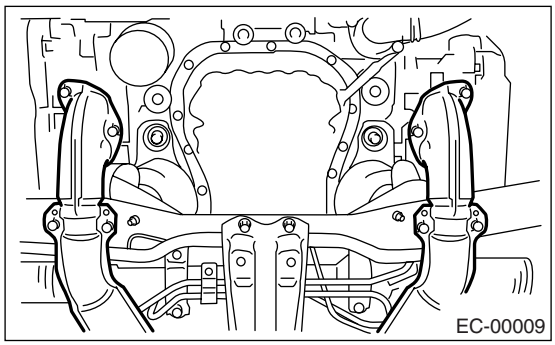
5) Separate the front and center exhaust pipe assembly from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

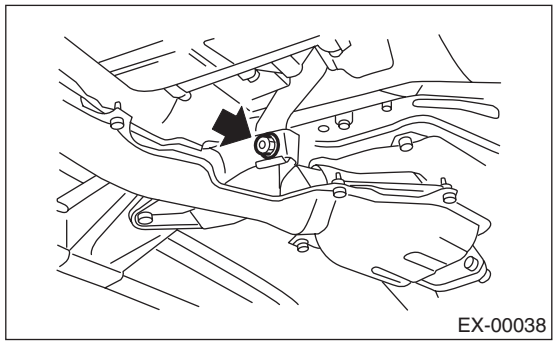


6) Remove the under cover.

7) Remove the nuts which hold front exhaust pipe onto cylinder heads.



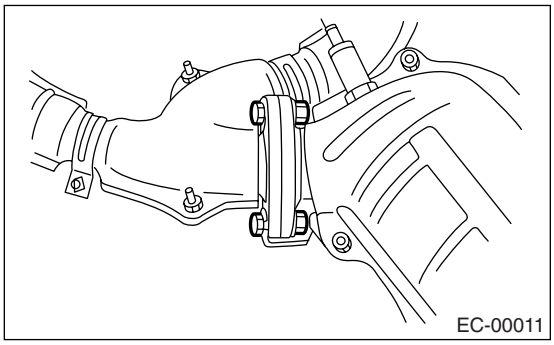
8) Remove the bolt which installs front and center exhaust pipe assembly to hanger bracket.



9) Remove the front and center exhaust pipe assembly from vehicle.

CAUTION:
• Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.
• After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.

10) Separate the front exhaust pipe from center exhaust pipe.



11) Remove the front oxygen (A/F) sensor and the rear oxygen sensor. **<Ref. to FU(H4SO)-40,** REMOVAL**, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4SO)-42,** REMOVAL**, Rear Oxygen Sensor.>**

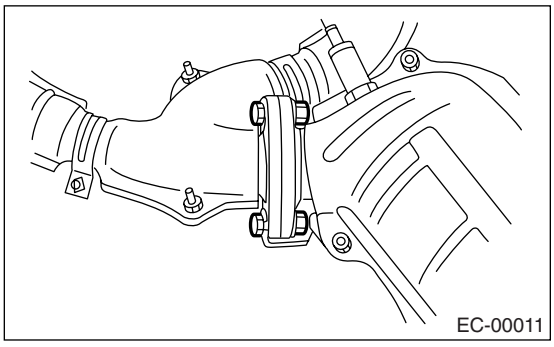
B: INSTALLATION

1) Install the front oxygen (A/F) sensor and the rear oxygen sensor. **<Ref. to FU(H4SO)-40,** INSTALLATION**, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4SO)-42,** INSTALLATION**, Rear Oxygen Sensor.>**

2) Install the front exhaust pipe to center exhaust pipe.

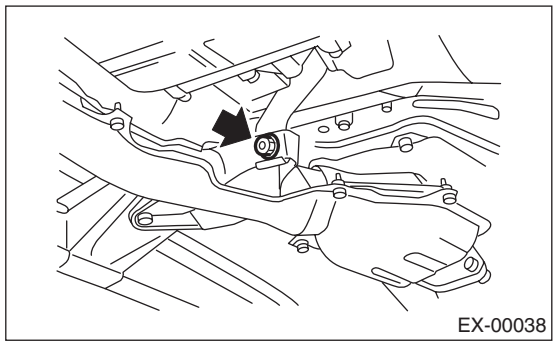
NOTE:
Replace the gaskets with new ones.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



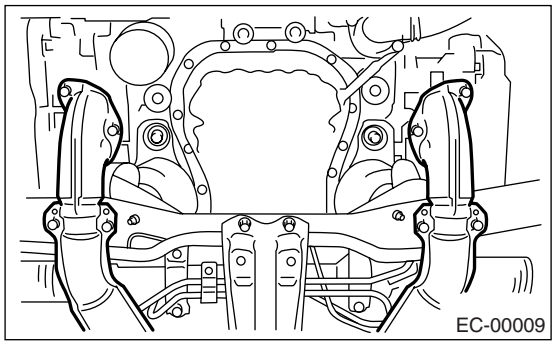
3) Install the front and center exhaust pipe assembly to vehicle.

4) Temporarily tighten the bolt which installs front and center exhaust pipe assembly to hanger bracket.



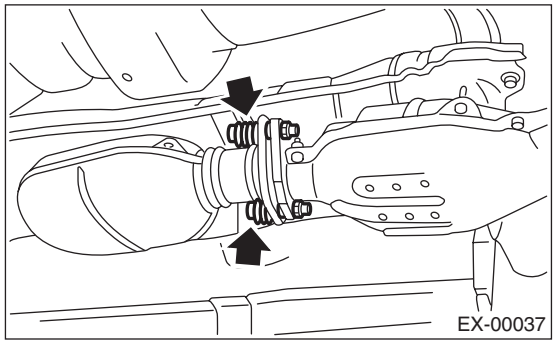
5) Tighten the nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



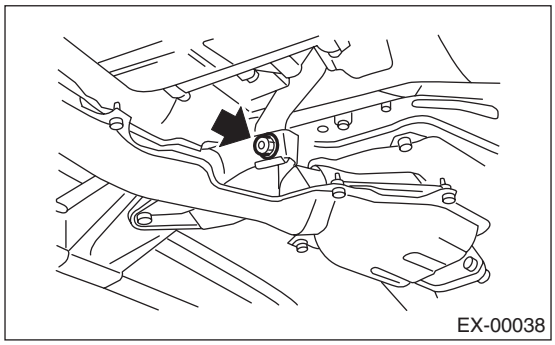
6) Install the under cover.
7) Tighten the bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

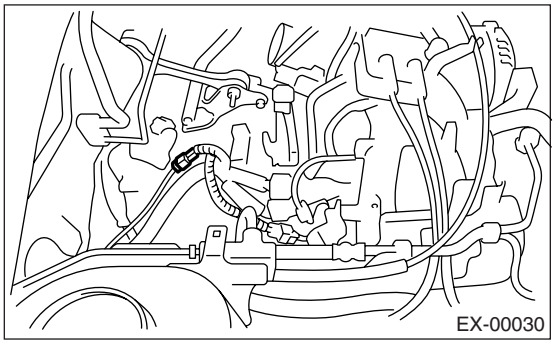


8) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

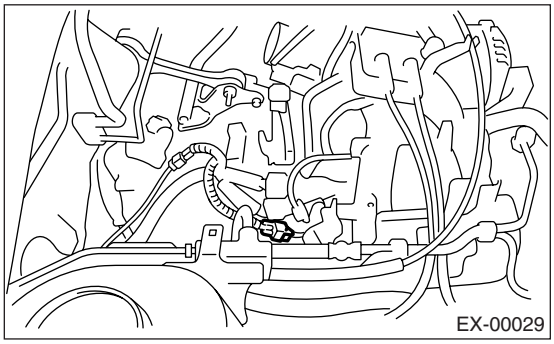
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)


EX-00038

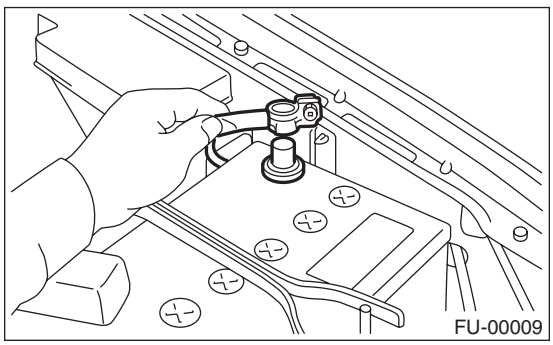
9) Lower the vehicle.
10) Connect the rear oxygen sensor connector.


EX-00030

11) Connect the front oxygen (A/F) sensor connector.


EX-00029

12) Connect the battery ground cable to battery.


FU-00009

C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to the procedure for removing the front exhaust pipe. **<Ref. to EX(H4SO)-7,** REMOVAL**, Front Exhaust Pipe.>**

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to the procedure for installing the front exhaust pipe. **<Ref. to EX(H4SO)-8,** INSTALLATION**, Front Exhaust Pipe.>**

C: INSPECTION

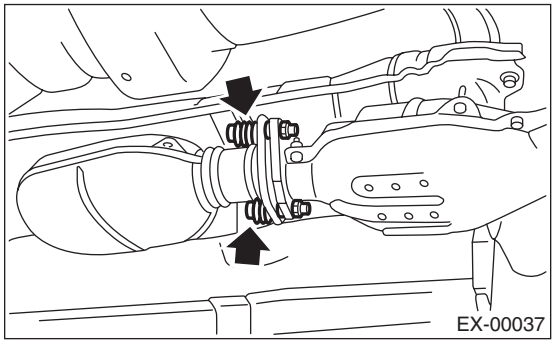
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Rear Exhaust Pipe

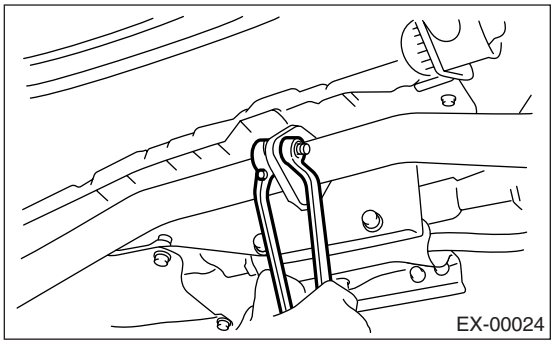
A: REMOVAL

1) Separate the rear exhaust pipe from center exhaust pipe.

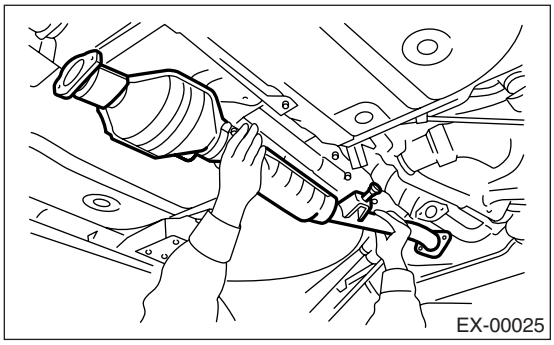
CAUTION:
Be careful, the exhaust pipe is hot.



2) Separate the rear exhaust pipe from muffler.

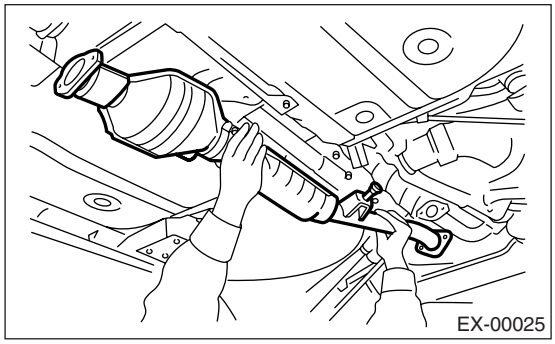


3) Apply a coat of spray type lubricant to mating area of the cushion rubbers in advance.
4) Remove the rear exhaust pipe bracket from the cushion rubber.



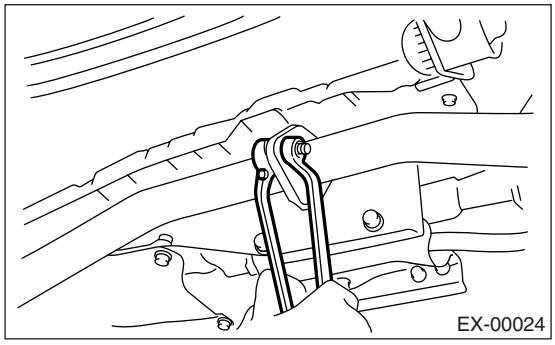
B: INSTALLATION

1) Apply a coat of spray type lubricant to mating area of the cushion rubbers in advance.
2) Install the rear exhaust pipe bracket to cushion rubber.



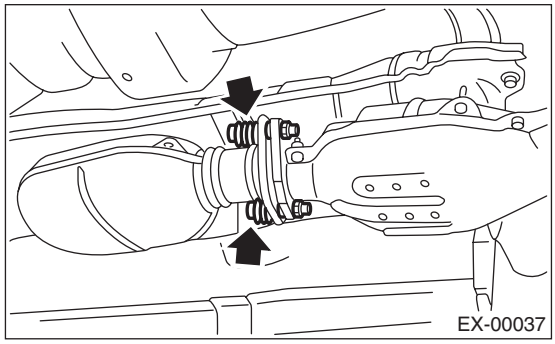
NOTE:
Replace the gaskets with new ones.
3) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



4) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



C: INSPECTION

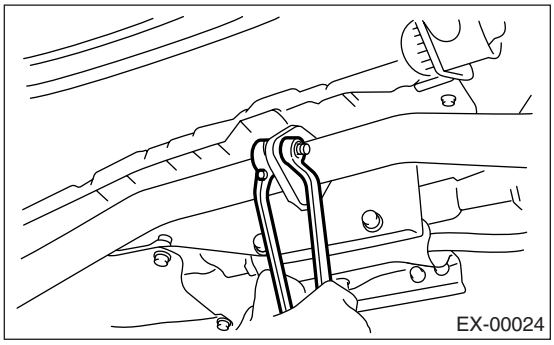
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

5. Muffler

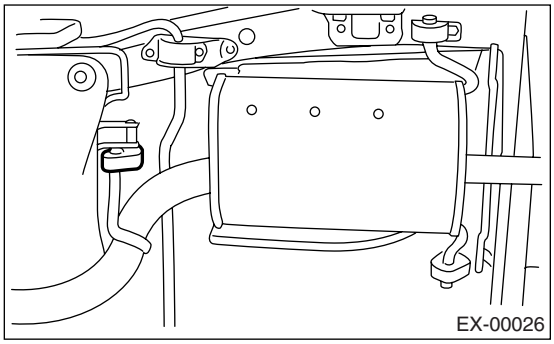
A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



2) Apply a coat of spray type lubricant to mating area of the cushion rubbers in advance.



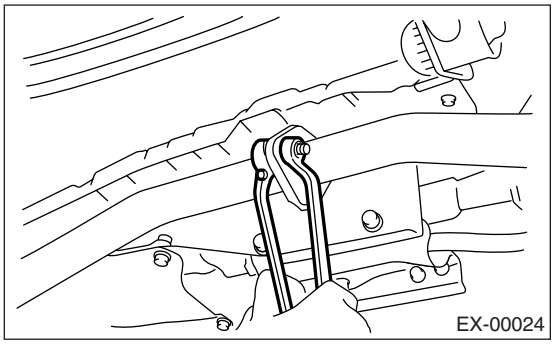
3) Remove the front, right and left cushion rubber, and detach the muffler assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

COOLING

CO(H4SO)

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3. Engine Coolant 19
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7. Radiator Cap 34
8. Radiator Main Fan and Fan Motor 35
9. Radiator Sub Fan and Fan Motor 40
10. Reservoir Tank 41
11. Coolant Filler Tank 42
12. Engine Cooling System Trouble in General 43

1. General Description

A: SPECIFICATION

Model			Non-turbo	Turbo
Cooling system			Electric fan+Forced engine coolant circulation system	
Total engine coolant capacity ℓ (US qt, Imp qt)			2.0 L with ATF warmer: Approx. 6.9 (7.29, 6.07) 2.0 L AT: Approx. 6.5 (6.87, 5.72) 2.0 L MT: Approx. 6.6 (6.98, 5.81) 2.5 L AT: Approx. 6.8 (7.19, 5.98) 2.5 L MT: Approx. 6.9 (7.29, 6.07)	AT: Approx. 7.3 (7.71, 6.42) MT: Approx. 7.4 (7.82, 6.51)
Water pump	Type		Centrifugal impeller type	
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.	
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)	
		Engine coolant temperature	80°C (176°F)	
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.	
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)	
		Engine coolant temperature	80°C (176°F)	
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.	
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)	
		Engine coolant temperature	80°C (176°F)	
	Impeller diameter		76 mm (2.99 in)	
	Number of impeller vanes		8	
	Pump pulley diameter		60 mm (2.36 in)	
	Clearance between impeller and case	Standard	0.5 — 0.7 mm★2 (0.020 — 0.028 in)	0.5 — 1.5 mm★3 (0.020 — 0.060 in)
	"Thrust" runout of impeller end		0.5 mm★2 (0.020 in)	—
Thermostat	Type		Wax pellet type	
	Starts to open		80 — 84°C (176 — 183°F)	76 — 80°C (169 — 176°F)
	Fully opened		95°C (203°F)	91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more	
	Valve bore		35 mm (1.38 in)	
Radiator fan	Motor	Main fan	70 W	2.0 L AT (K4★1) : 70 W 2.0 L AT (EC, EK★1) : 120 W 2.0 L MT: 70 W 2.5 L: 120 W
		Sub fan	70 W	2.0 L AT (K4★1) : 70 W 2.0 L AT (EC, EK★1) : 120 W 2.0 L MT: 70 W 2.5 L: 120 W
	Fan diameter/Blade		320 mm (12.60 in)/5 (main fan) 320 mm (12.60 in)/7 (sub fan)	

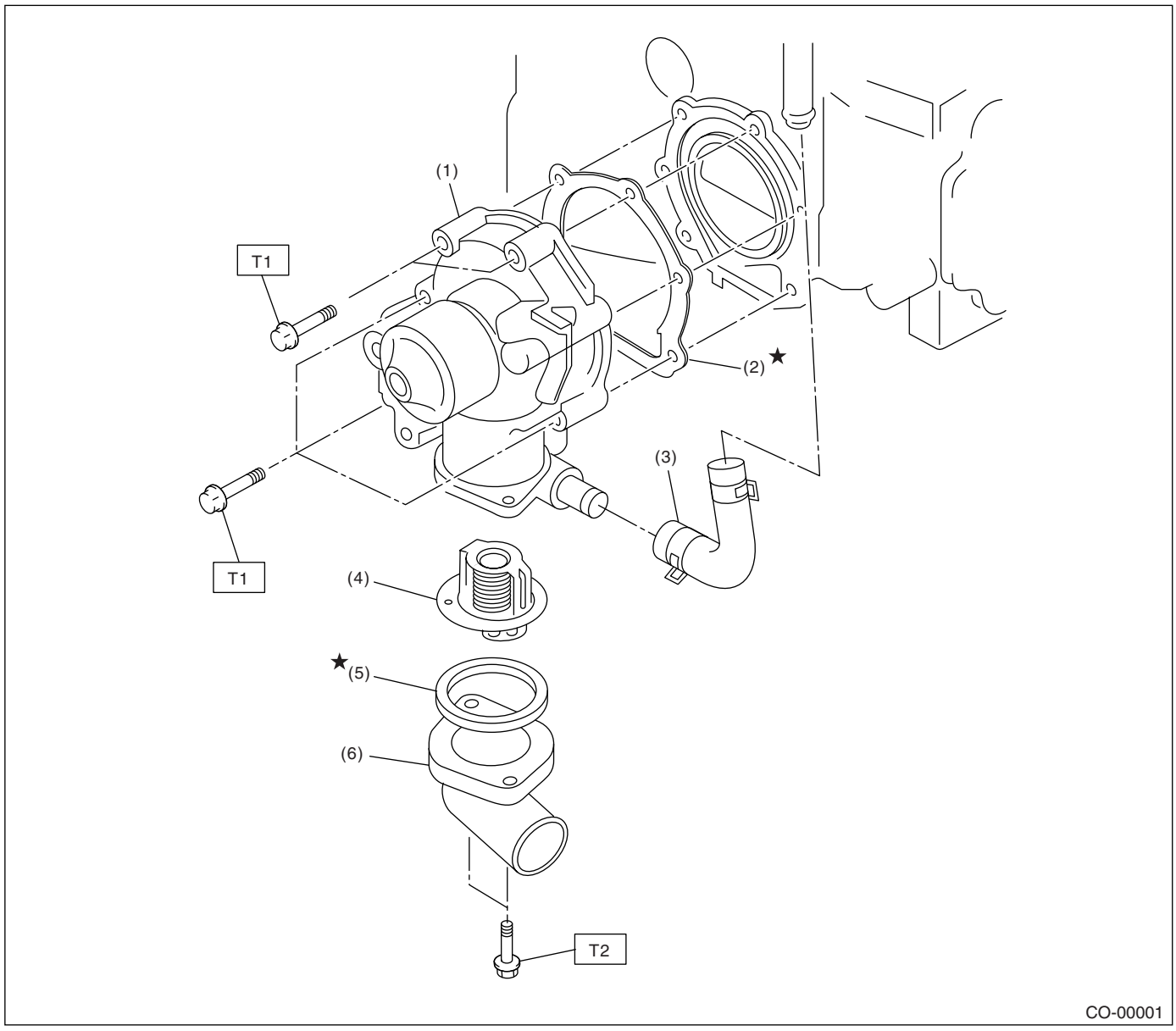
Model			Non-turbo	Turbo
Radiator	Type		Down flow, pressure type	
	Core dimensions	Width × Height × Thickness	691.5 × 360 × 16 mm (27.22 × 14.17 × 0.63 in)	
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kgf/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kgf/cm^2, −0.1 to −0.7 psi)	
	Fins		Corrugated fin type	
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)	

★1: For option code, refer to ID section. <Ref. to ID-2, Identification.>
★2: Except for 2.0 L model with ATF warmer and 2.0 L MT model with heater cock.
★3: Including 2.0 L non-turbo model with ATF warmer and 2.0 L non-turbo MT model with heater cock.

B: COMPONENT

1. WATER PUMP

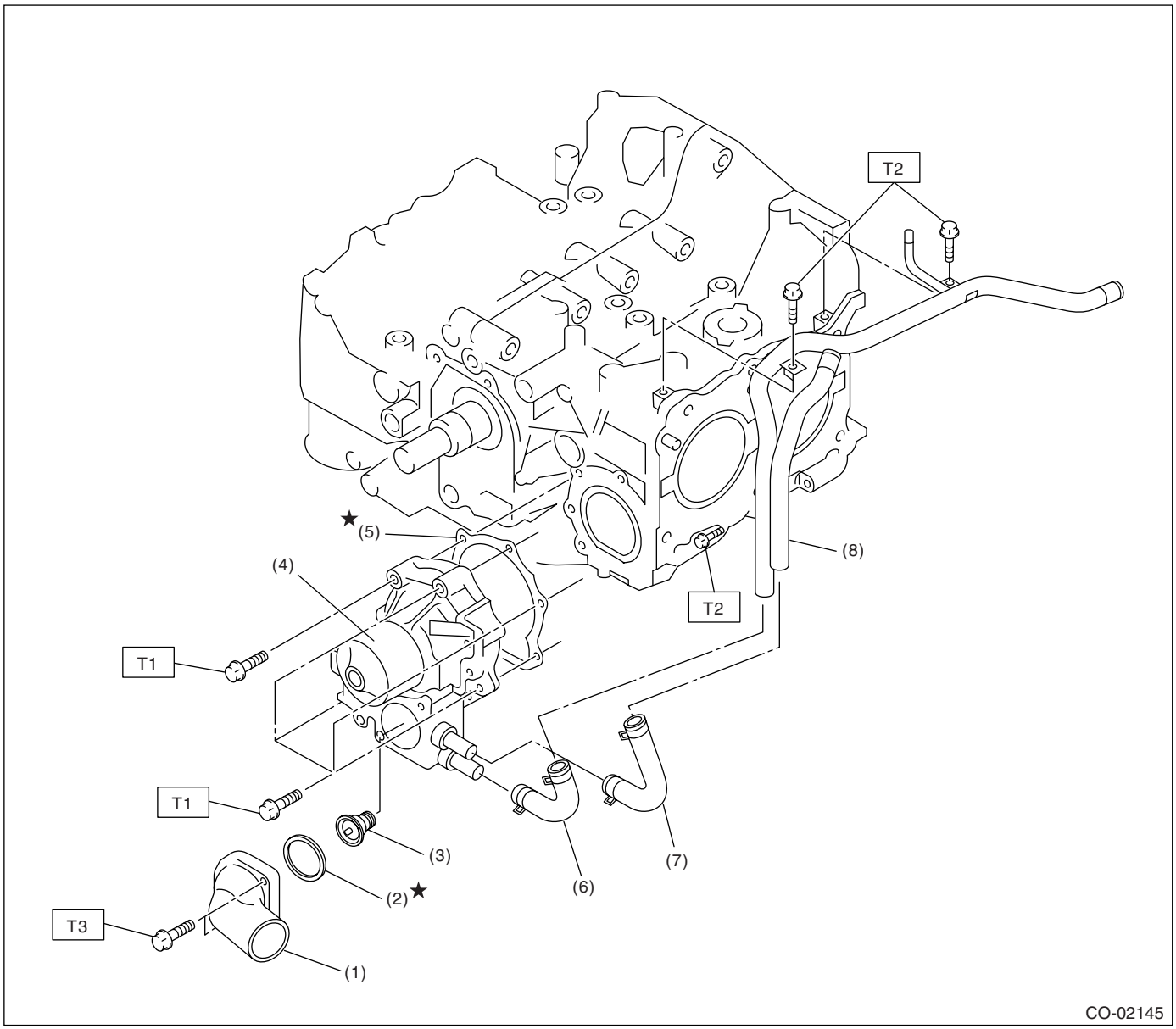
• NON-TURBO MODEL



(1) Water pump ASSY
(2) Gasket
(3) Heater by-pass hose
(4) Thermostat
(5) Gasket
(6) Thermostat cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 9)
Second 12 (1.2, 9)
T2: 6.5 (0.66, 4.8)

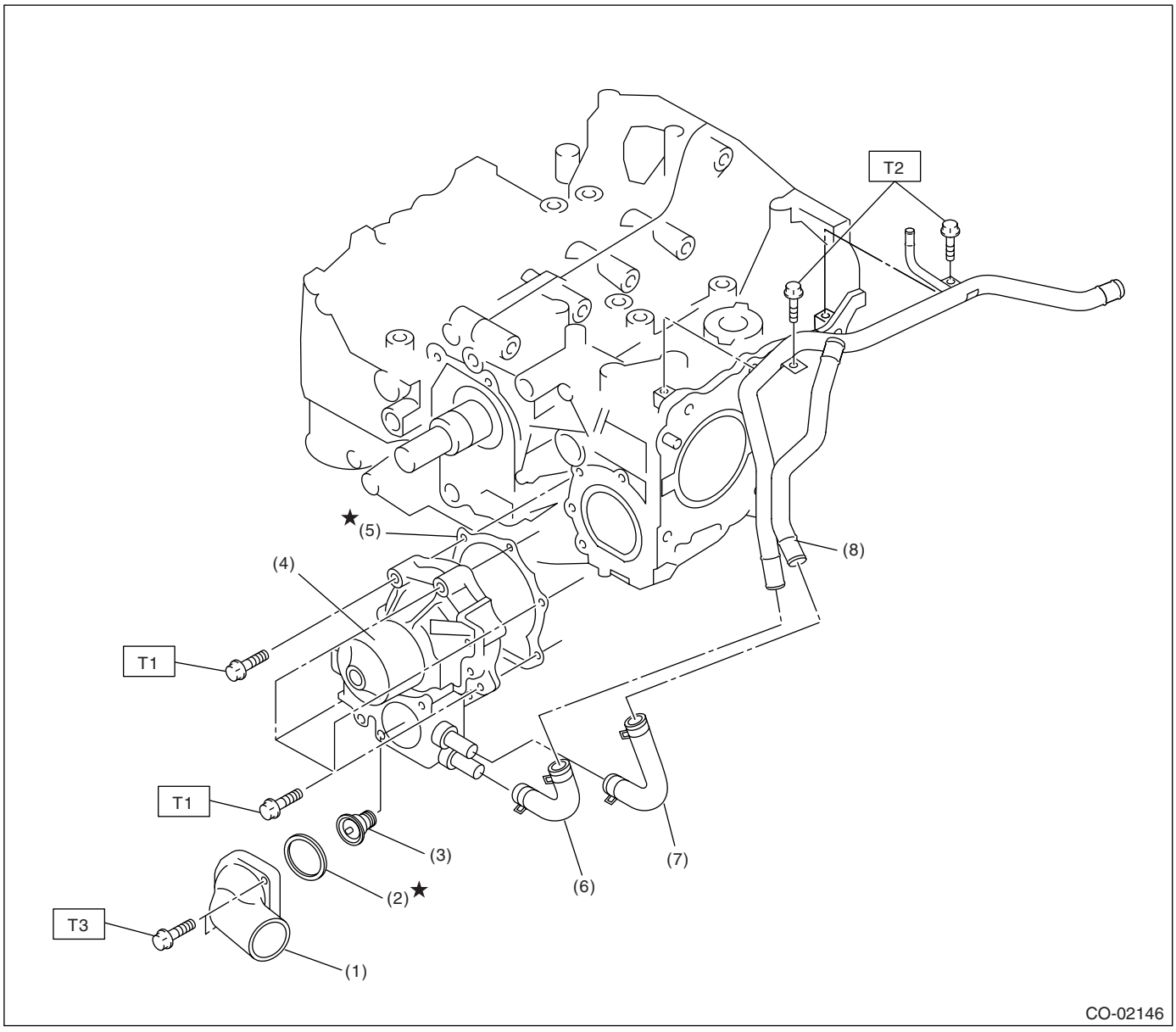
• TURBO MODEL



(1) Thermostat cover
(2) Gasket
(3) Thermostat
(4) Water pump ASSY
(5) Gasket
(6) Heater by-pass hose
(7) Coolant filler tank by-pass hose
(8) Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 9)
Second 12 (1.2, 9)
T2: 6.5 (0.66, 4.8)
T3: 12 (1.2, 9)

• MODEL WITH ATF WARMER

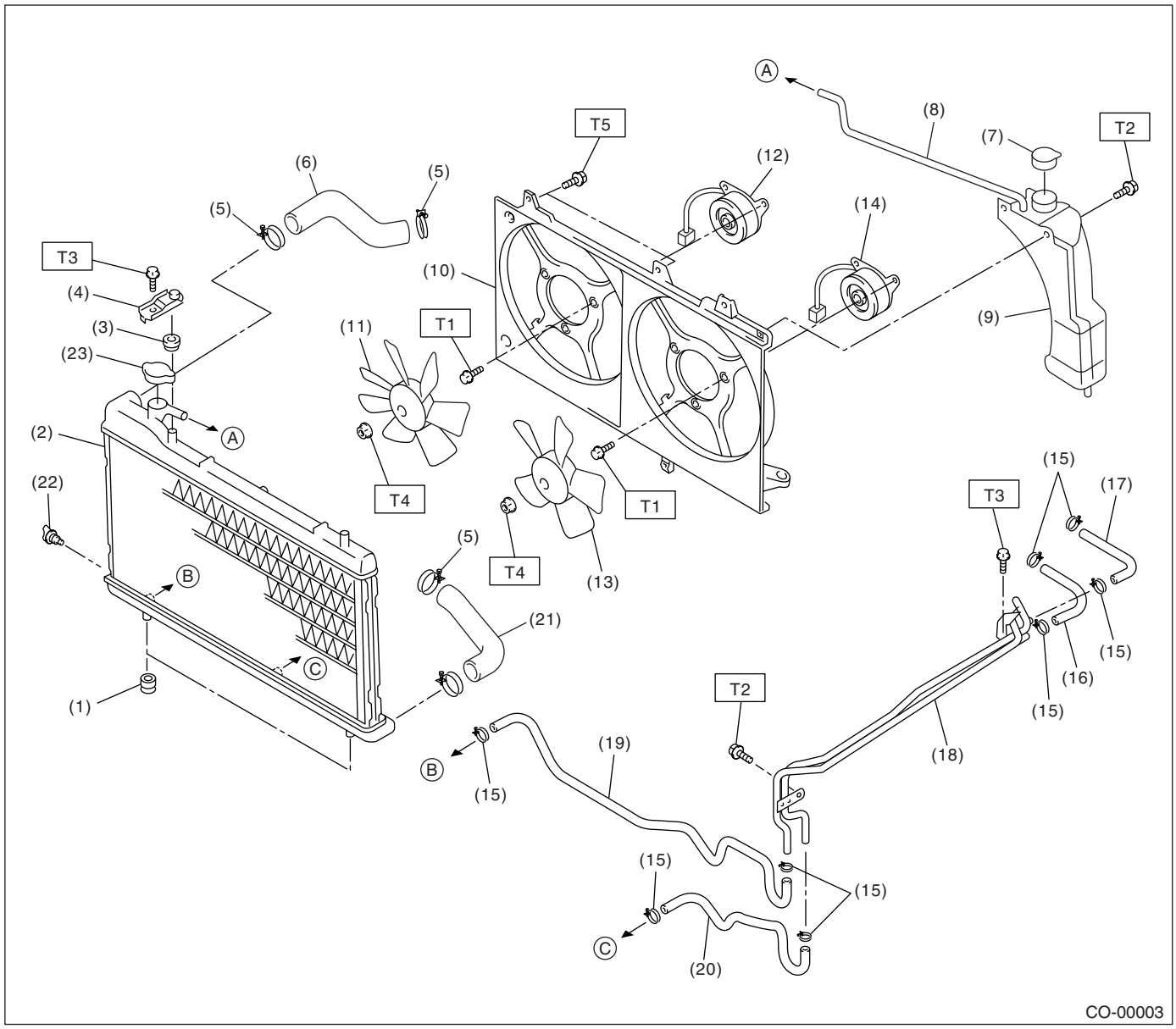


(1)	Thermostat cover	(5)	Gasket
(2)	Gasket	(6)	Heater by-pass hose
(3)	Thermostat	(7)	Coolant filler tank by-pass hose
(4)	Water pump ASSY	(8)	Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 9)
Second 12 (1.2, 9)
T2: 6.5 (0.66, 4.8)
T3: 12 (1.2, 9)

2. RADIATOR AND RADIATOR FAN

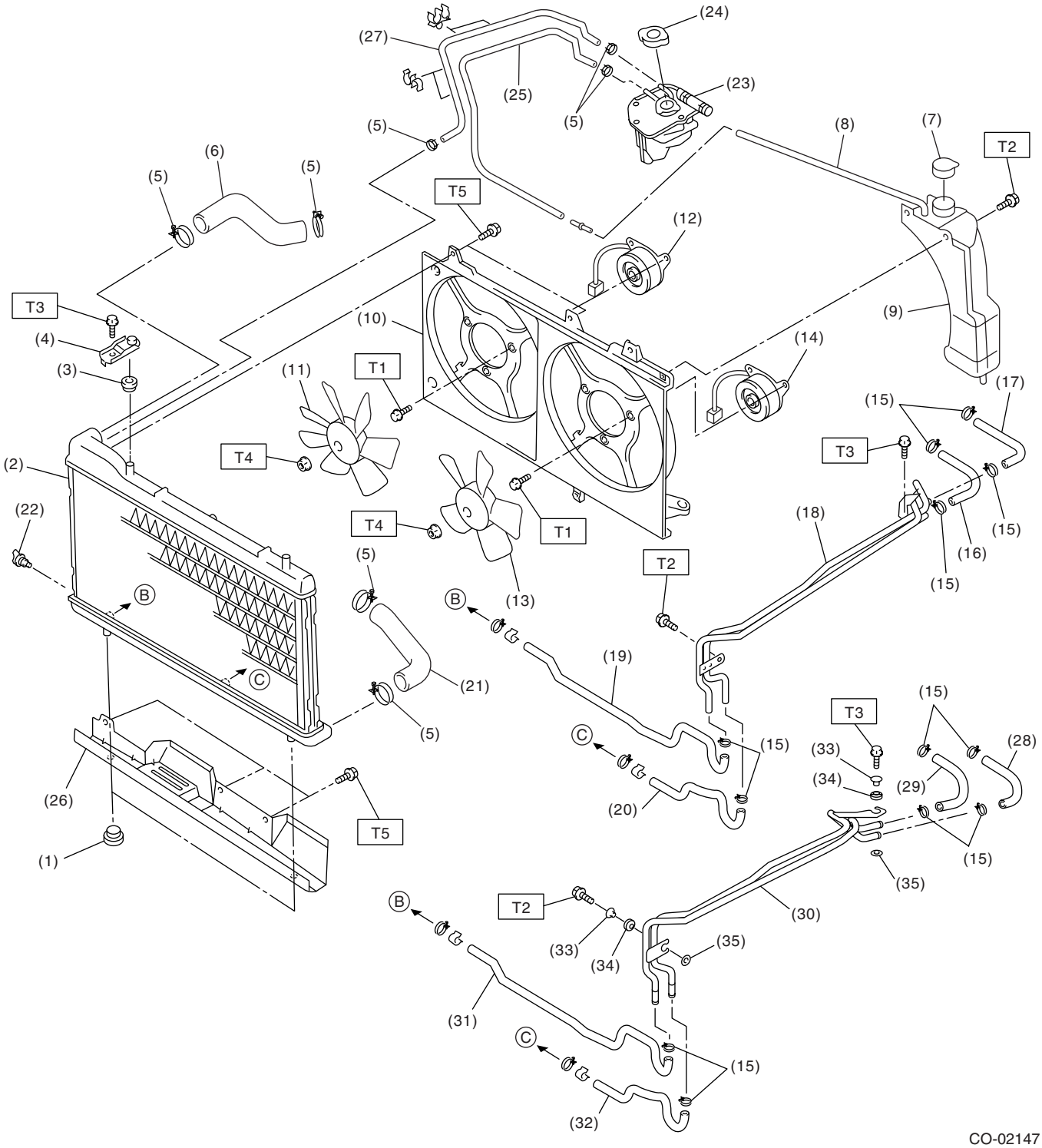
• NON-TURBO MODEL



(1)	Radiator lower cushion	(11)	Radiator sub fan	(21)	Radiator outlet hose
(2)	Radiator	(12)	Radiator sub fan motor	(22)	Radiator drain plug
(3)	Radiator upper cushion	(13)	Radiator main fan	(23)	Radiator cap
(4)	Radiator upper bracket	(14)	Radiator main fan motor		
(5)	Clamp	(15)	ATF hose clamp (AT model)		
(6)	Radiator inlet hose	(16)	ATF inlet hose A (AT model)		
(7)	Engine coolant reservoir tank cap	(17)	ATF outlet hose A (AT model)		
(8)	Overflow hose	(18)	ATF pipe (AT model)		
(9)	Engine coolant reservoir tank	(19)	ATF inlet hose B (AT model)		
(10)	Radiator sub fan shroud	(20)	ATF outlet hose B (AT model)		

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*4.4 (0.45, 3.3)*
T2:	*7.5 (0.76, 5.5)*
T3:	*18 (1.8, 13.0)*
T4:	*3.4 (0.35, 2.5)*
T5:	*4.9 (0.50, 3.6)*

• TURBO MODEL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T1
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T5
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C
CO-02147

(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Over flow hose
(9) Engine coolant reservoir tank
(10) Radiator fan shroud
(11) Radiator sub fan
(12) Radiator sub fan motor
(13) Radiator main fan
(14) Radiator main fan motor
(15) ATF hose clamp (AT model)
(16) ATF inlet hose A (AT model)
(17) ATF outlet hose A (AT model)
(18) ATF pipe (AT model)
(19) ATF inlet hose B (AT model)
(20) ATF outlet hose B (AT model)
(21) Radiator outlet hose
(22) Radiator drain plug
(23) Engine coolant filler tank
(24) Engine coolant filler tank cap
(25) Engine overflow hose
(26) Radiator under cover (AT model)
(27) Engine air breather hose
(28) Oil cooler inlet hose A
(29) Oil cooler outlet hose A
(30) Oil cooler pipe
(31) Oil cooler inlet hose B
(32) Oil cooler outlet hose B
(33) Spacer
(34) Cushion
(35) Setting washer

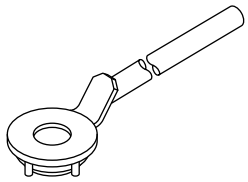
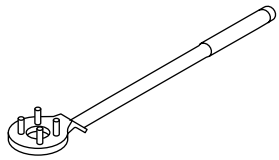
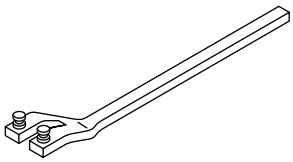
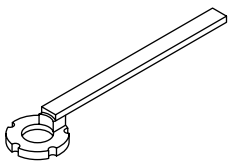
Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 3.4 (0.35, 2.5)
T5: 4.9 (0.50, 3.6)

C: CAUTION

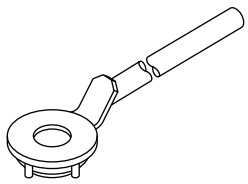
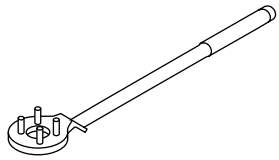
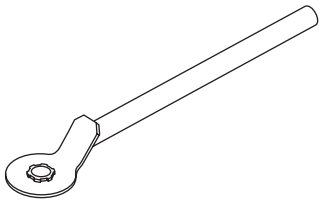
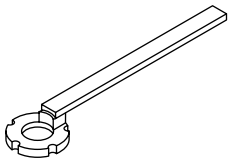
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

1. NON-TURBO MODEL

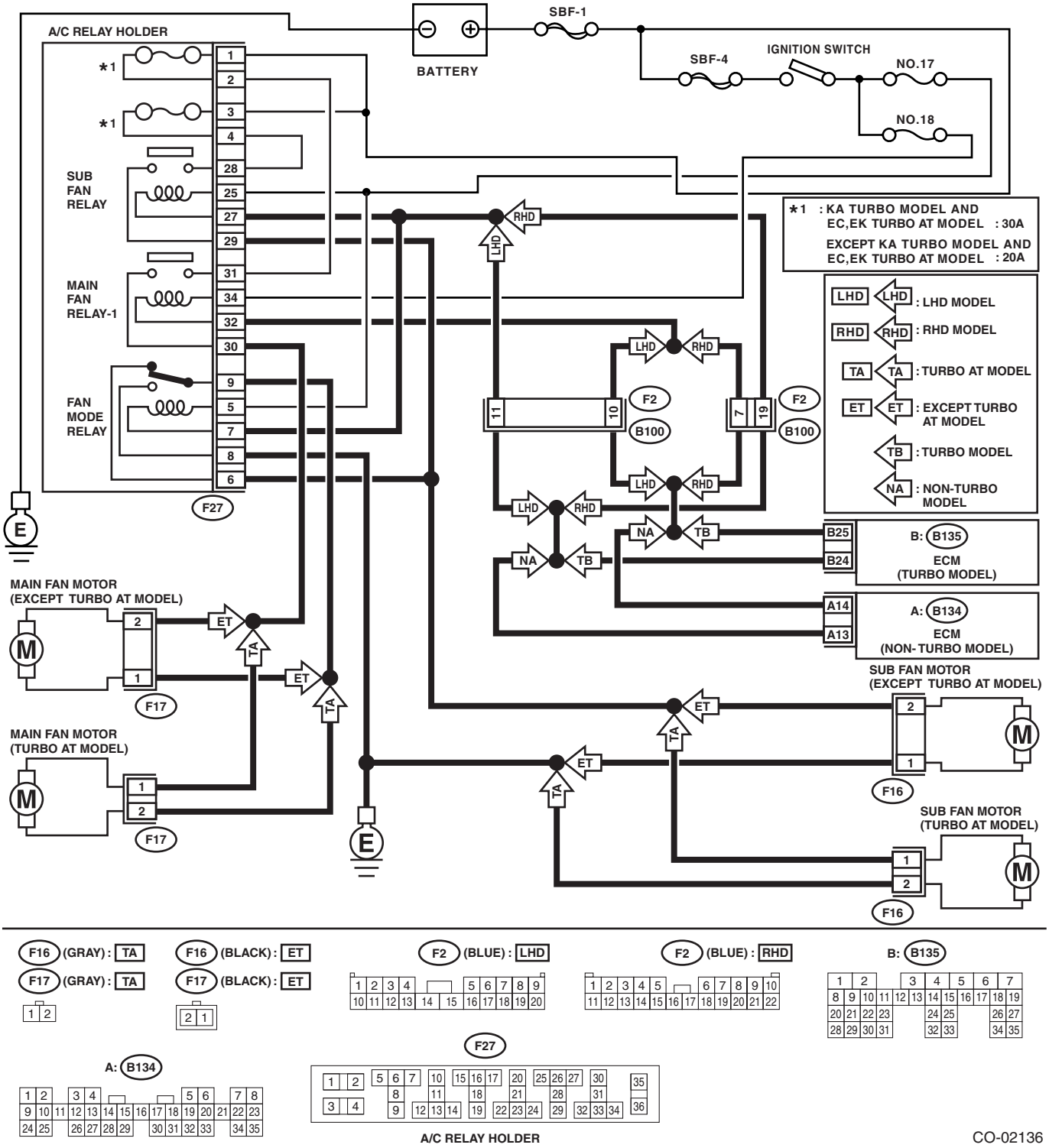
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400 (2.0 L model)	CRANK PULLEY WRENCH	Used for stopping crank pulley when loosening and tightening crank pulley bolts.
 ST-499977100	499977100 (2.5 L model)	CRANK PULLEY WRENCH	Used for stopping crank pulley when loosening and tightening crank pulley bolts.
 ST18231AA010	18231AA010	CAM SPROCKET WRENCH (For left side)	• Used for removing and installing cam sprocket (LH). • Also the CAM SPROCKET WRENCH (499207100) can be used.
 ST-499207400	499207400	CAM SPROCKET WRENCH (For right side)	Used for removing and installing cam sprocket (RH). (For resin pulley)

2. TURBO MODEL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400 (2.0 L model)	CRANK PULLEY WRENCH	Used for stopping crank pulley when loosening and tightening crank pulley bolts.
 ST-499977100	499977100 (2.5 L model)	CRANK PULLEY WRENCH	Used for stopping crank pulley when loosening and tightening crank pulley bolts.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Intake)
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (For resin pulley)

2. Radiator Fan System

A: WIRING DIAGRAM



CO-02136

B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

Radiator main fan and sub fan does not rotate under the above conditions.

	Step	Check	Yes	No
1	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan relay. NOTE: • With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4SO)(diag)-46, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fan rotate at low speed?	Go to step **2.**	Go to step **3.**
2	**CHECK OPERATION OF RADIATOR FAN.** 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan relay. NOTE: • With Subaru Select Monitor When checking the compulsory operation of radiator fan, the radiator main and sub fan repeat the rotation in order of following: low speed rotation → high speed rotation → off. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4SO)(diag)-46, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fan rotate at high speed?	Radiator main fan system is normal.	Go to step **32.**
3	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the fan relay 1 from A/C relay holder. 3) Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 31 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POWER SUPPLY TO MAIN FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Go to step **7.**
5	**CHECK FUSE.** 1) Remove the fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS OF FUSE TERMINAL AND MAIN FAN RELAY TERMINAL.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between 20 A fuse terminal and main fan relay terminal. ***Terminal*** ***No. 2 — No. 31:***	Is the resistance less than 1 Ω?	Repair the power supply line.	Repair the open harness.
7	**CHECK FUSE.** 1) Turn the ignition switch to OFF 2) Remove the fuse No. 18. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
8	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 30 — No. 31:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Replace the main fan relay.
9	**CHECK MAIN FAN RELAY.** 1) Connect the battery to main fan relay terminals No. 32 and No. 34. 2) Measure the resistance between main fan relay terminals. ***Terminal*** ***No. 30 — No. 31:***	Is the resistance less than 1 Ω?	Go to step **10.**	Replace the main fan relay.
10	**CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR.** 1) Disconnect the connector from main fan motor. 2) Measure the resistance between main fan relay terminal and main fan motor connector. ***Connector & terminal*** ***Turbo AT model*** ***(F17) No. 1 — (F27) No. 30:*** ***Except turbo AT model*** ***(F17) No. 2 — (F27) No. 30:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair the open harness between main fan relay terminal and main fan motor connector.
11	**CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND FAN MODE RELAY CONNECTOR.** 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance between main fan motor connector and fan mode relay connector. ***Connector & terminal*** ***Turbo AT model*** ***(F17) No. 2 — (F27) No. 9:*** ***Except turbo AT model*** ***(F17) No. 1 — (F27) No. 9:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open harness between main fan motor connector and fan mode relay connector.
12	**CHECK POOR CONTACT.** Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step **13.**
13	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2 (except turbo AT model), No. 1 (turbo AT model), and ground (–) terminal to terminal No. 1 (except turbo AT model), No. 2 (turbo AT model) of main fan motor.	Does the main fan rotate?	Go to step **14.**	Replace the main fan motor with new one.

	Step	Check	Yes	No
14	**CHECK FAN MODE RELAY.** Measure the resistance of fan mode relay. ***Terminal*** ***No. 6 — No. 9:***	Is the resistance less than 1 Ω?	Go to step **15.**	Replace the fan mode relay.
15	**CHECK RESISTANCE BETWEEN FAN MODE RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from sub fan motor. 2) Measure the resistance between fan mode relay terminal and sub fan motor connector. ***Connector & terminal*** ***Turbo AT model*** ***(F16) No. 1 — (F27) No. 6:*** ***Except turbo AT model*** ***(F16) No. 2 — (F27) No. 6:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open harness between fan mode relay terminal and sub fan motor connector.
16	**CHECK SUB FAN MOTOR AND GROUND CIRCUIT.** Measure the resistance between sub fan motor connector and chassis ground. ***Connector & terminal*** ***Turbo AT model*** ***(F16) No. 2 — Chassis ground:*** ***Except turbo AT model*** ***(F16) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **17.**	Repair the open harness between sub fan motor connector and chassis ground.
17	**CHECK POOR CONTACT.** Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step **18.**
18	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2 (except turbo AT model), No. 1 (turbo AT model), and ground (−) terminal to terminal No. 1 (except turbo AT model), No. 2 (turbo AT model) of sub fan motor.	Does the sub fan rotate?	Go to step **19.**	Replace the sub fan motor with new one.
19	**CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between fan relay 1 terminal and ECM connector. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 14 — (F27) No. 32:*** ***Turbo model*** ***(B135) No. 25 — (F27) No. 32:***	Is the resistance less than 1 Ω?	Go to step **20.**	Repair the open harness between fan relay 1 terminal and ECM.
20	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact with SUBARU dealers.
21	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 28 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **22.**	Go to step **23.**

	Step	Check	Yes	No
22	**CHECK POWER SUPPLY TO SUB FAN RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **26.**	Go to step **25.**
23	**CHECK FUSE.** 1) Remove the fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **24.**
24	**CHECK HARNESS BETWEEN FUSE TERMINAL AND SUB FAN RELAY TERMINAL.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuse terminal and sub fan relay terminal. ***Terminal*** ***No. 4 — No. 28:***	Is the resistance less than 1 Ω?	Repair the power supply line.	Repair the open harness.
25	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
26	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the resistance of sub fan relay. ***Terminal*** ***No. 28 — No. 29:***	Is the resistance more than 1 MΩ?	Go to step **27.**	Replace the sub fan relay.
27	**CHECK SUB FAN RELAY.** 1) Connect the battery to terminals No. 25 and No. 27 of sub fan relay. 2) Measure the resistance of sub fan relay. ***Terminal*** ***No. 28 — No. 29:***	Is the resistance less than 1 Ω?	Go to step **28.**	Replace the sub fan relay.
28	**CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR.** 1) Disconnect the connector from sub fan motor. 2) Measure the resistance between sub fan relay terminal and sub fan motor connector. ***Connector & terminal*** ***Turbo AT model*** ***(F16) No. 1 — (F27) No. 29:*** ***Except turbo AT model*** ***(F16) No. 2 — (F27) No. 29:***	Is the resistance less than 1 Ω?	Go to step **30.**	Repair the open harness between sub fan relay terminal and sub fan motor connector.
29	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance between sub fan relay terminal and ECM connector. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 — (F27) No. 27:*** ***Turbo model*** ***(B135) No. 24 — (F27) No. 27:***	Is the resistance less than 1 Ω?	Go to step **30.**	Repair the open harness between sub fan relay terminal and ECM.

	Step	Check	Yes	No
30	**CHECK HARNESS BETWEEN FAN MODE RELAY AND ECM.** Measure the resistance between fan mode relay terminal and ECM connector. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 — (F27) No. 7:*** ***Turbo model*** ***(B135) No. 24 — (F27) No. 7:***	Is the resistance less than 1 Ω?	Go to step **31.**	Repair the open harness between fan mode relay terminal and ECM.
31	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact with SUBARU dealers. NOTE: Probable cause is deterioration of multiple parts.
32	**CHECK OPERATION OF RADIATOR FAN.**	Does the radiator main fan rotate when the radiator main and sub fan do not rotate at high speed?	Go to step **21.**	Go to step **33.**
33	**CHECK GROUND CIRCUIT OF FAN MODE RELAY.** 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance between fan mode relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 8 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **34.**	Repair the open harness between fan mode relay and chassis ground.
34	**CHECK POWER SUPPLY TO FAN MODE RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fan mode relay terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **35.**	Repair the power supply line.
35	**CHECK FAN MODE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the fan mode relay. 3) Measure the resistance of fan mode relay. ***Terminal*** ***(F27) No. 8 — (F27) No. 9:***	Is the resistance more than 1 MΩ?	Go to step **36.**	Replace the fan mode relay.
36	**CHECK FAN MODE RELAY.** 1) Connect the battery to terminals No. 5 and No. 7 of fan mode relay. 2) Measure the resistance of fan mode relay. ***Terminal*** ***(F27) No. 8 — (F27) No. 9:***	Is the resistance less than 1 Ω?	Go to step **29.**	Replace the fan mode relay.

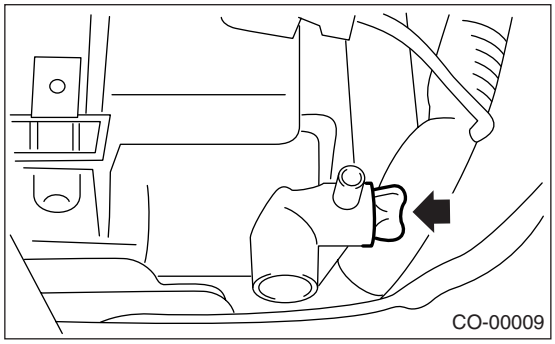
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain cock to drain engine coolant into container.

NOTE:
Remove the radiator cap so that engine coolant will drain faster.



4) Install the drain cock.

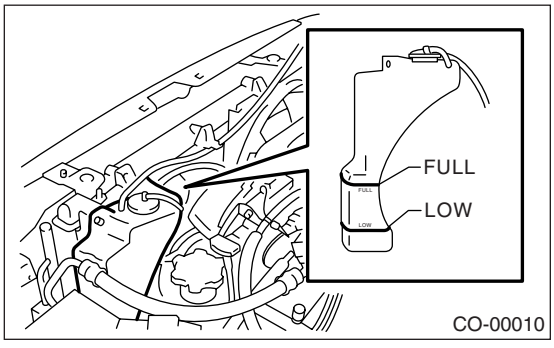
2. FILLING OF ENGINE COOLANT

1) Fill engine coolant into the radiator up to filler neck position (For turbo model is filler neck of engine coolant tank.).

Engine coolant capacity (fill up to "FULL" level): <Ref. to CO(H4SO)-2, SPECIFICATION, General Description.>

NOTE:
The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

2) Fill engine coolant into the reservoir tank up to Full level.



3) Close the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model) and start the engine. Perform 5 or 6 times of racing with less than 3,000 rpm and then stop the engine. (Complete these procedures within 40 seconds.)
4) Wait for 1 minute after engine stopped, and open the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model). If the engine coolant level drops, add engine coolant to the filler neck position of radiator (Non-turbo model) or the filler neck position of coolant filler tank (Turbo model).
5) Perform step 3) and 4) again.
6) Attach the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model) and reservoir tank cap properly.
7) Start the engine and set the heater setting to maximum hot position and the blower speed setting to "LO".
8) Run the engine at less than 2,000 rpm until radiator fan starts and stops.

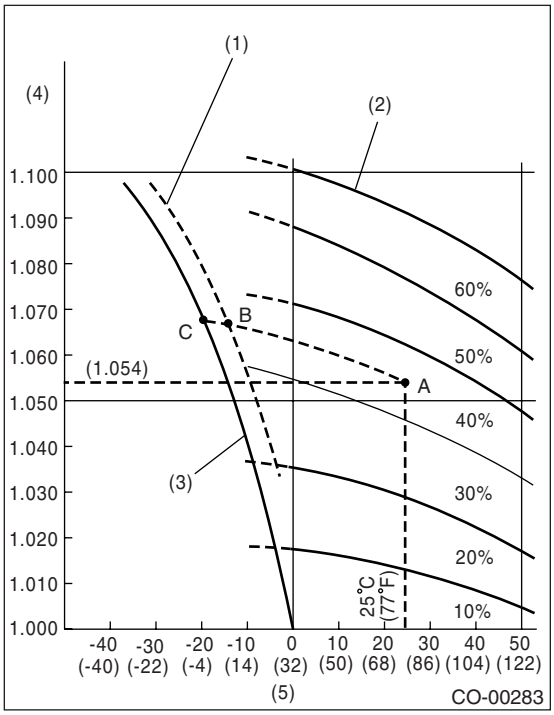
NOTE:
• Pay attention to the water temperature gauge to avoid overheating.
• If the radiator hose becomes harden by engine coolant pressure at this time, air purge seems to be mostly completed.

9) Stop the engine and wait until engine coolant temperature lowers to less than 30°C (86°C).
10) Open the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model). If the engine coolant level drops, add engine coolant to the filler neck position of radiator (Non-turbo model) or the filler neck position of coolant filler tank (Turbo model). Then, add engine coolant to the "FULL" level of reservoir tank.
11) Attach the radiator cap (Non-turbo model) or coolant filler tank cap (Turbo model) and reservoir tank cap securely.
12) Setting the heater setting to maximum hot position and the blower speed setting to "LO", start the engine and race with less than 3,000 rpm. Perform repeatedly from step 8) again if fluid sound of engine coolant is heard in heater core.

B: INSPECTION

1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

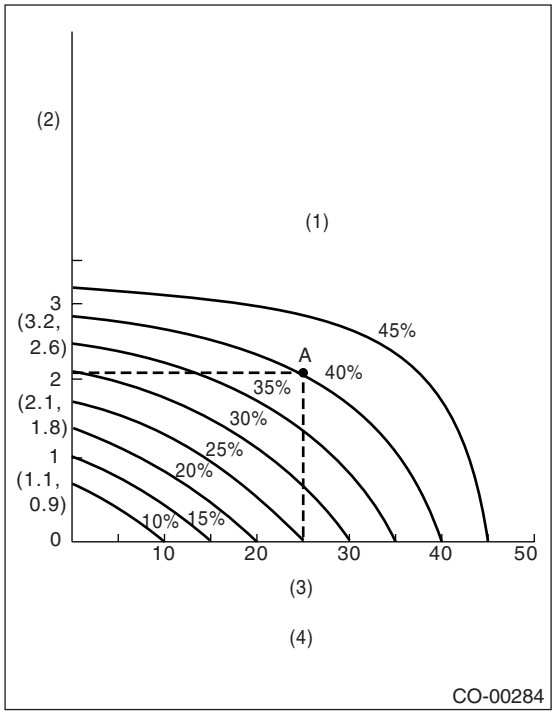
The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the engine coolant will provide this information.
[Example]
If the engine coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



(1) Safe operating temperature
(2) Concentration of coolant
(3) Freezing temperature
(4) Specific gravity of coolant
(5) Coolant temperature °C (°F)

2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE ENGINE COOLANT

To adjust the concentration of the engine coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of the engine coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).
The amount of the engine coolant that should be replaced can be determined using the diagram.
[Example]
Assume that the engine coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of the engine coolant concentration intersects with the 40% curve of the necessary the engine coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of engine coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the engine coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.
If a engine coolant concentration of 50% is needed, drain all the engine coolant and refill with the undiluted solution only.



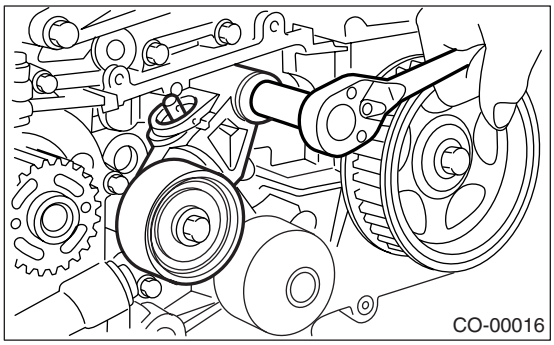
(1) Necessary concentration of coolant
(2) Quantity of coolant to be drained ℓ (US qt, Imp qt)
(3) Concentration of coolant in the vehicle cooling system%
(4) Concentration of coolant in vehicle and quantity to be drained

4. Water Pump

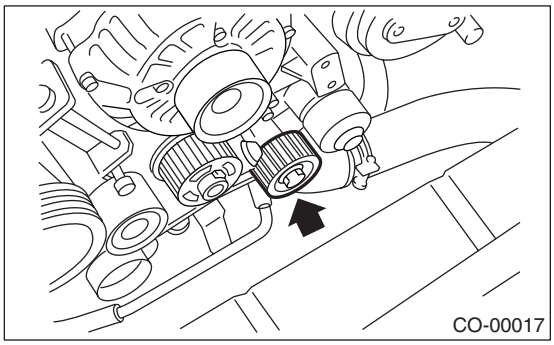
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the radiator. **<Ref. to CO(H4SO)-28,** REMOVAL**, Radiator.>**
2) Remove the V-belts.
<Ref. to ME(H4SO)-43, REMOVAL**, V-belt.>**
3) Remove the timing belt.
<Ref. to ME(H4SO)-48, TIMING BELT, REMOVAL**, Timing Belt.>**
4) Remove the automatic belt tension adjuster.

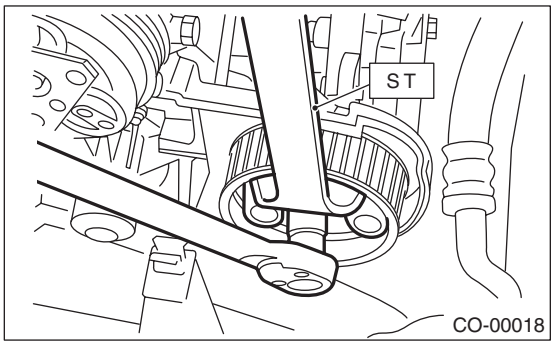

CO-00016

5) Remove the belt idler No. 2.


CO-00017

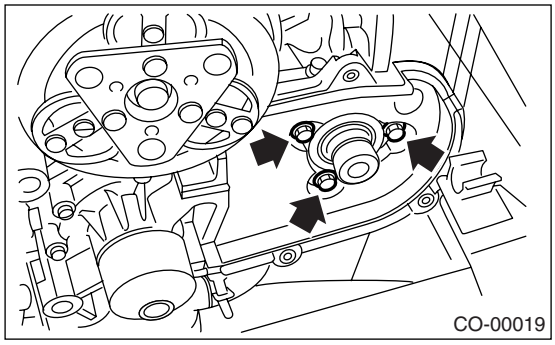
6) Remove the cam sprocket (LH) by using ST.
ST 18231AA010 CAM SPROCKET WRENCH

NOTE:
Also the CAM SPROCKET WRENCH (499207100) can be used.

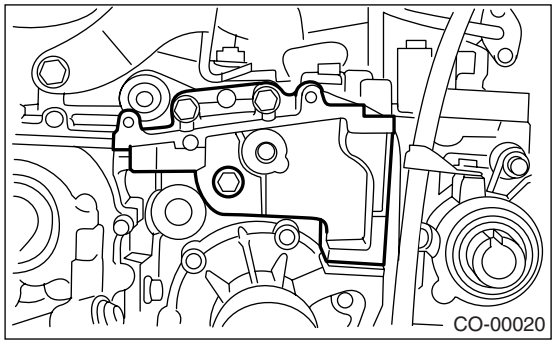


CO-00018

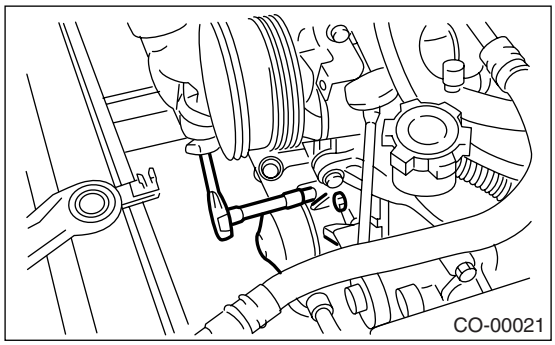
7) Remove the belt cover No. 2 (LH).


CO-00019

8) Remove the tensioner bracket.

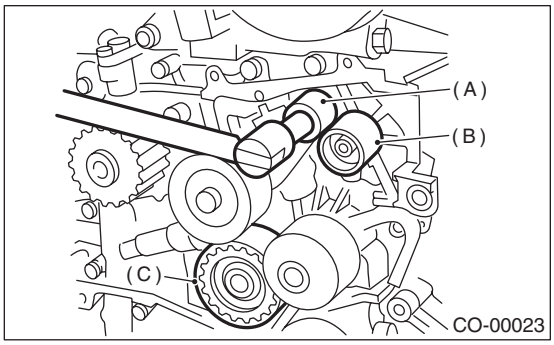

CO-00020

9) Disconnect the hose from water pump.
10) Remove the water pump.


CO-00021

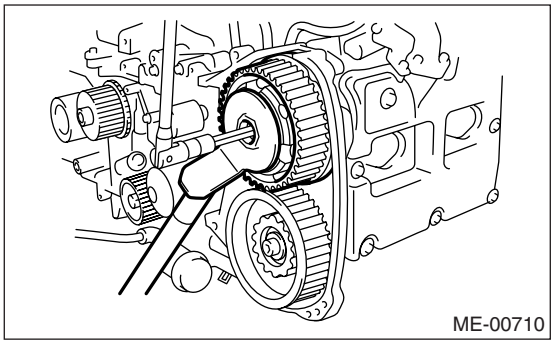
2. TURBO MODEL

1) Remove the radiator. **<Ref. to CO(H4SO)-28,** REMOVAL**, Radiator.>**
2) Remove the V-belts. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
3) Remove the timing belt. **<Ref. to ME(H4DOTC 2.0)-59,** REMOVAL**, Timing Belt.>**
4) Remove the automatic belt tension adjuster (A).
5) Remove the belt idler (B).
6) Remove the belt idler No. 2 (C).

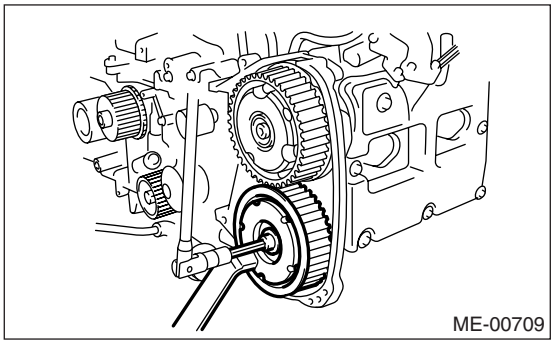


7) Remove the camshaft position sensor. (2.0 L model) **<Ref. to FU(H4DOTC 2.0)-31,** REMOVAL**, Camshaft Position Sensor.>**
8) Remove the cam sprockets (LH) by using ST.

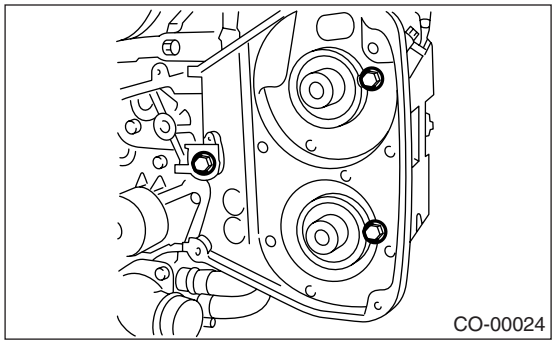
ST 499977500 CAM SPROCKET WRENCH (Intake)



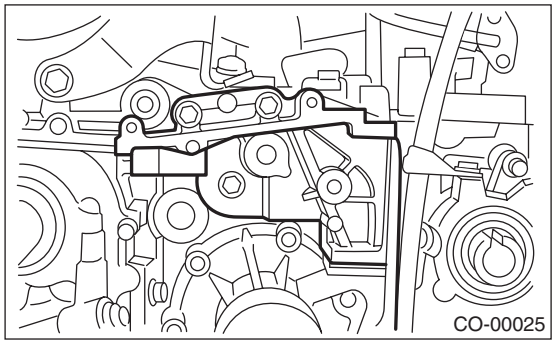
ST 499207400 CAM SPROCKET WRENCH (Exhaust)



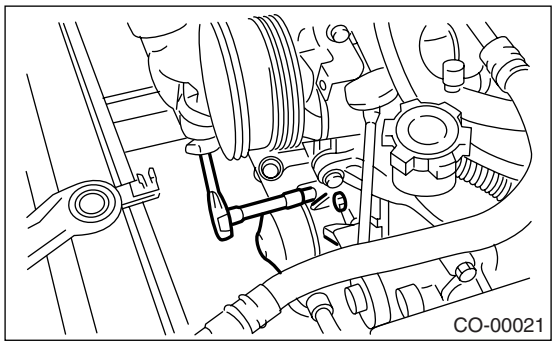
9) Remove the belt cover No. 2 (LH).



10) Remove the tensioner bracket.



11) Disconnect the hose from water pump.
12) Remove the water pump.



B: INSTALLATION

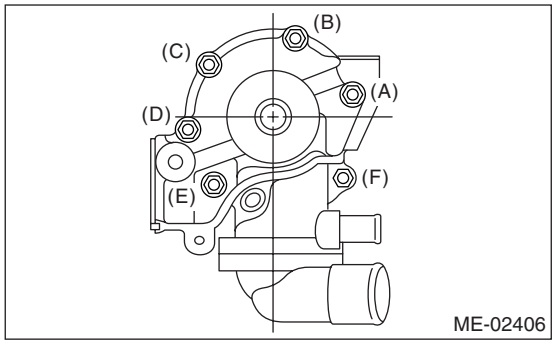
1. NON-TURBO MODEL

1) Install water pump onto cylinder block (LH).

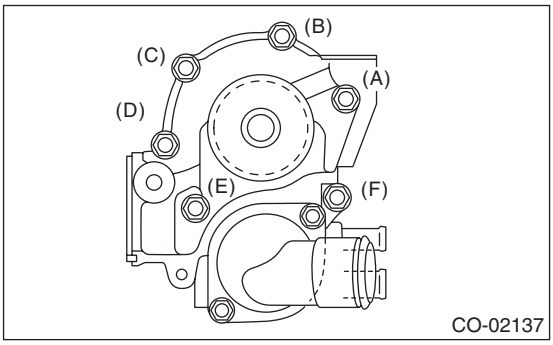
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 9 ft-lb)
Second:
12 N·m (1.2 kgf-m, 9 ft-lb)

- Model without ATF warmer

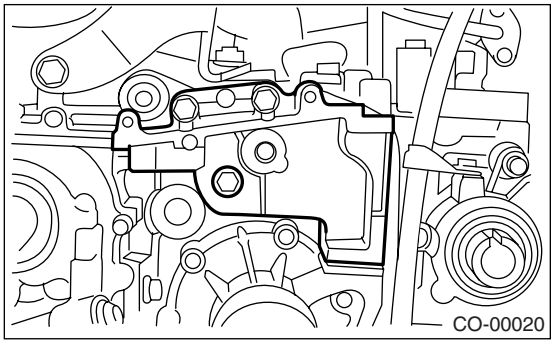


- Model with ATF warmer



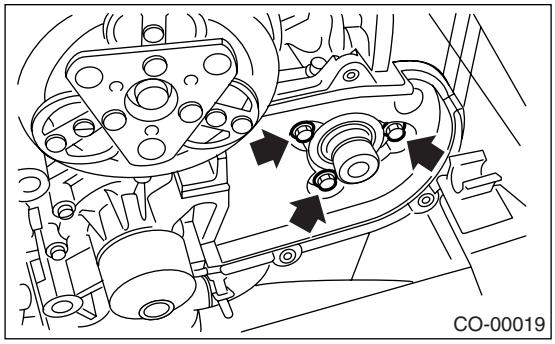
2) Connect the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the belt cover No. 2 (LH).

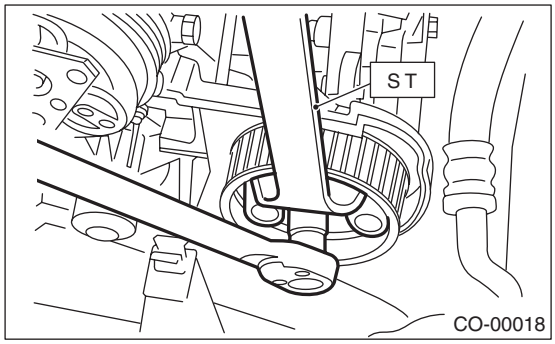
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the camshaft sprockets (LH) by using ST.
ST 18231AA010 CAM SPROCKET WRENCH

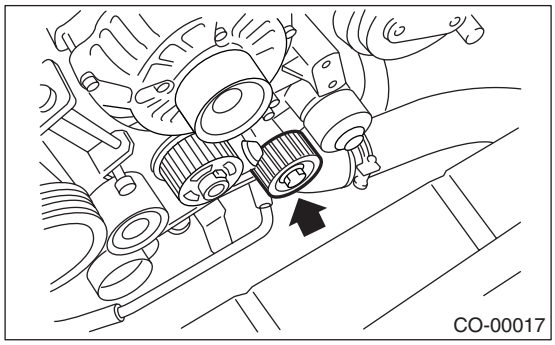
NOTE:
Also the CAM SPROCKET WRENCH (499207100) can be used.

Tightening torque:
78 N·m (8.0 kgf-m, 57.9 ft-lb)



6) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



7) Install the automatic belt tension adjuster which tension rod is holded with pin. **<Ref. to ME(H4SO)-49,** AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION**, Timing Belt.>**
8) Install the timing belt. **<Ref. to ME(H4SO)-50,** TIMING BELT, INSTALLATION**, Timing Belt.>**

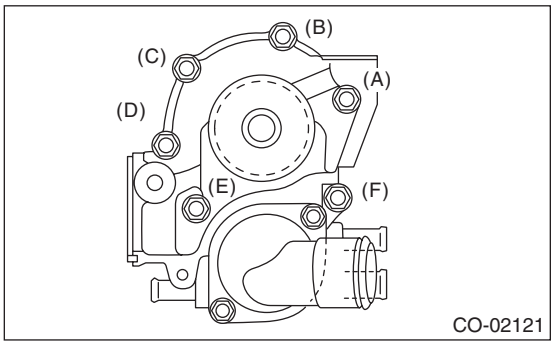
9) Install the V-belts. **<Ref. to ME(H4SO)-43,** INSTALLATION**, V-belt.>**
10) Install the radiator. **<Ref. to CO(H4SO)-30,** INSTALLATION**, Radiator.>**

2. TURBO MODEL

1) Install the water pump onto cylinder block (LH).

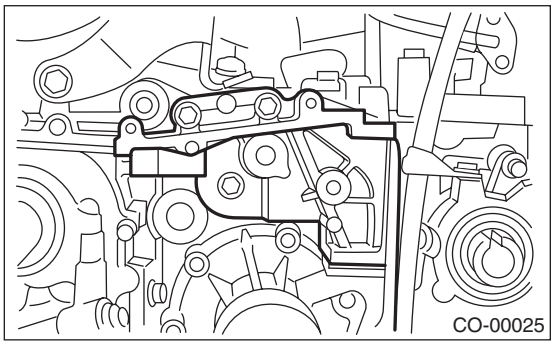
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

Tightening torque:
First:
12 N·m (1.2 kgf-m, 9 ft-lb)
Second:
12 N·m (1.2 kgf-m, 9 ft-lb)



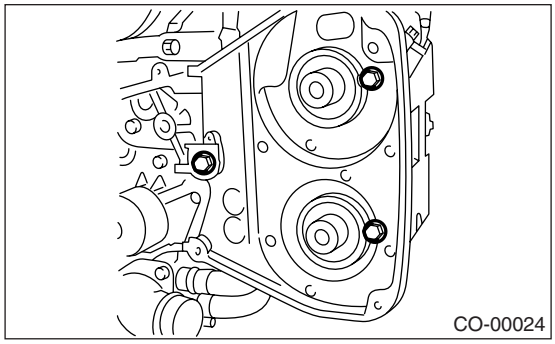
2) Connect the hose to water pump.
3) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



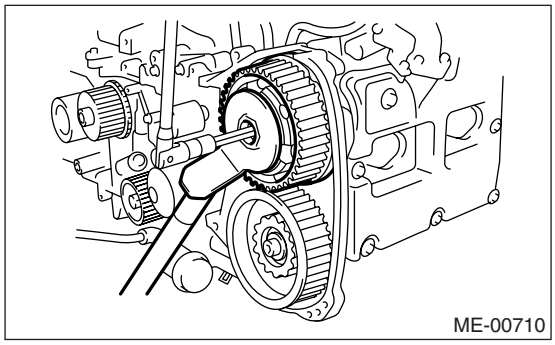
4) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



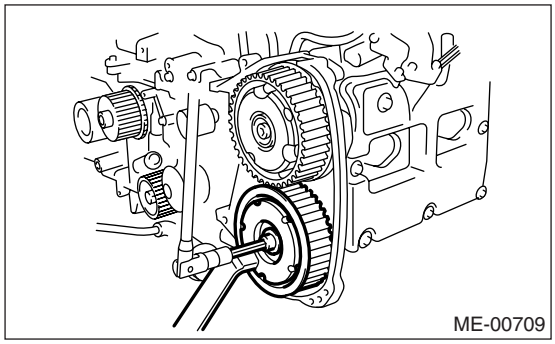
5) Install the cam sprockets (LH) by using ST.
ST 499977500 CAM SPROCKET WRENCH (Intake)

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb), and then tighten 45° furthermove



ST 499207400 CAM SPROCKET WRENCH (Exhaust)

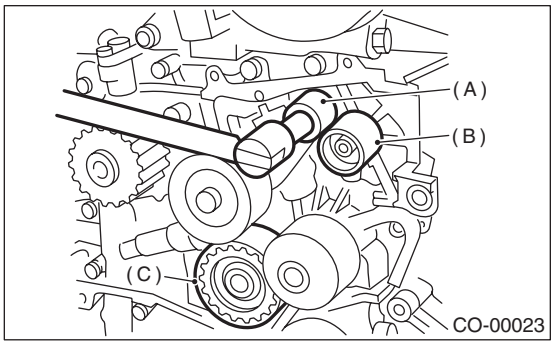
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb), and then tighten 45° furthermove



6) Install the camshaft position sensor. (2.0 L model) **<Ref. to FU(H4DOTC 2.0)-31,** INSTALLATION**, Camshaft Position Sensor.>**
7) Install the belt idler No. 2 (C).
8) Install the belt idler (B).
9) Install the automatic belt tension adjuster (A) which has tension rod held by pin. **<Ref. to**

ME(H4DOTC 2.0)-60, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION**, Timing Belt.>**

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)



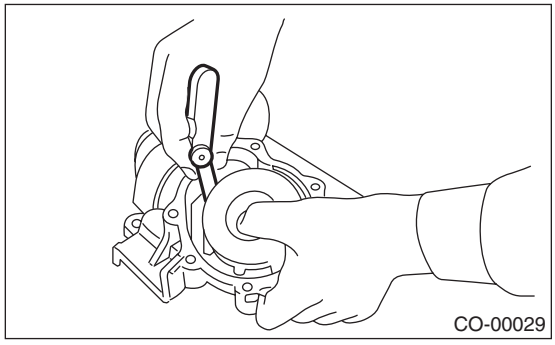
10) Install the timing belt. **<Ref. to ME(H4DOTC 2.0)-62,** TIMING BELT, INSTALLATION**, Timing Belt.>**
11) Install the V-belts. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**
12) Install the radiator. **<Ref. to CO(H4SO)-30,** INSTALLATION**, Radiator.>**

C: INSPECTION

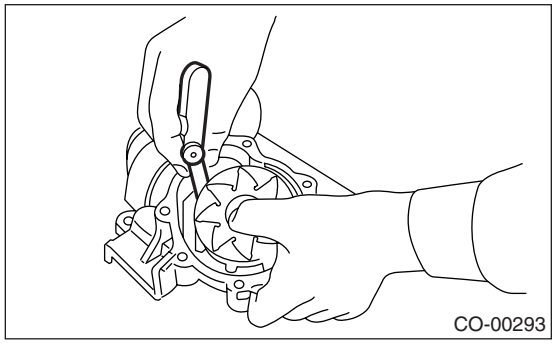
1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Make sure the impeller is not deformed or damaged.
4) Inspect the clearance between impeller and pump case.

Clearance between impeller and pump case:

Standard value:
Non-turbo model (Except for 2.0 L model with ATF warmer and 2.0 L MT model with heater cock)
0.5 — 0.7 mm (0.020 — 0.028 in)

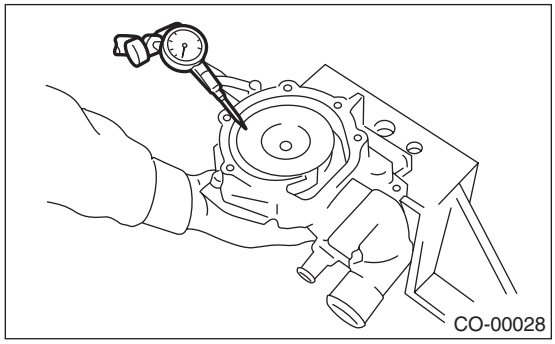


Turbo model, 2.0 L non-turbo model with ATF warmer and 2.0 L non-turbo MT model with heater cock
0.5 — 1.5 mm (0.020 — 0.060 in)



5) Using a dial gauge, measure the impeller runout in thrust direction while rotating the pulley. (Non-turbo model except for 2.0 L model with ATF warmer and 2.0 L MT model with heater cock)

"Thrust" runout limit:
0.5 mm (0.020 in)

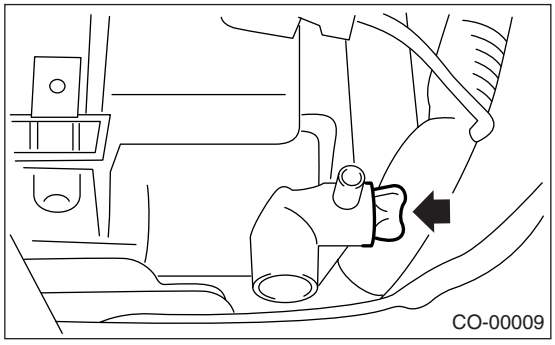


6) After water pump installation, check the pulley shaft for engine coolant leaks and noise. If leaks or noise are noted, replace the water pump assembly.

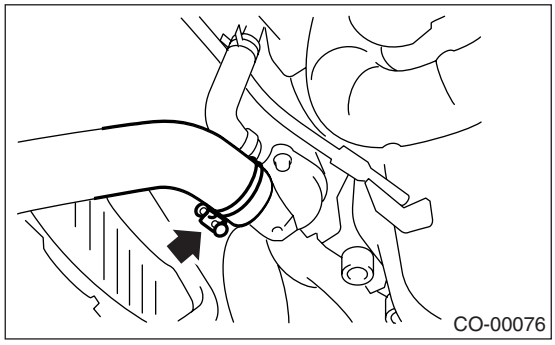
5. Thermostat

A: REMOVAL

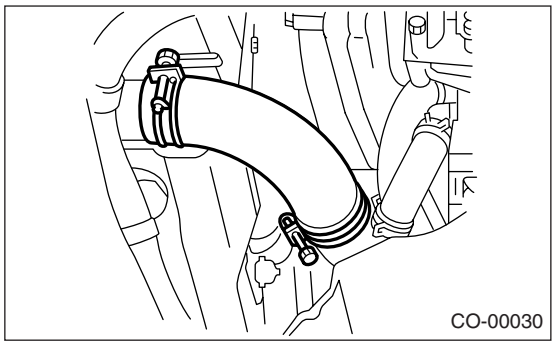
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine coolant completely. **<Ref. to CO(H4SO)-19,** DRAINING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**



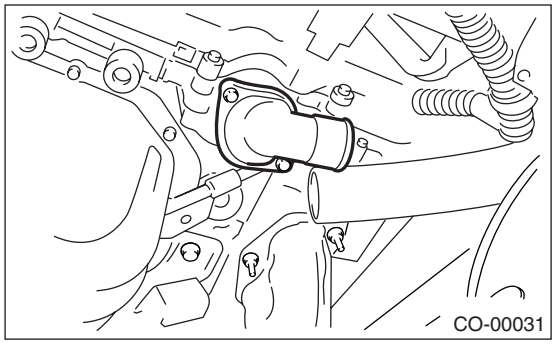
5) Disconnect the radiator outlet hose from thermostat cover.
Non-turbo model (Except for model with ATF warmer)



6) Disconnect the radiator outlet hose.
Turbo model and model with ATF warmer



7) Remove the thermostat cover and gasket, and pull out the thermostat.

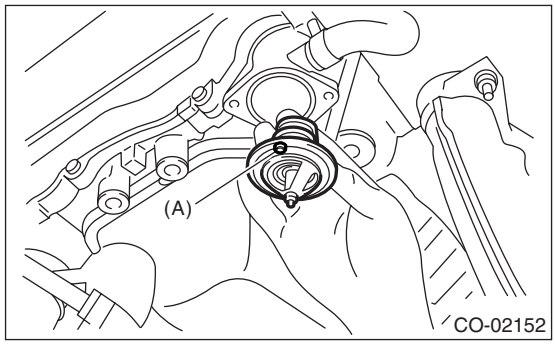


B: INSTALLATION

1) Install the gasket to thermostat, and install the thermostat and gasket as a unit in the water pump. And then install the thermostat cover.

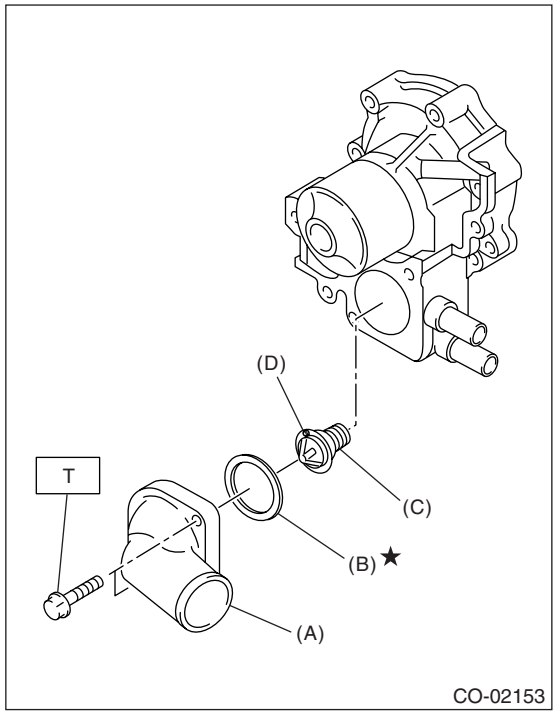
NOTE:
• When installing the thermostat, use a new gasket.
• When installing the thermostat, install the jiggle pin facing to up side (For turbo model and model with ATF warmer). For any other model, install the jiggle pin facing to front side of vehicle.

Tightening torque:
Non-turbo model (Except for model with ATF warmer)
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



(A) Jiggle pin (Front side of vehicle)

Turbo model and model with ATF warmer
12 N·m (1.2 kgf-m, 9 ft-lb)



(A) Thermostat cover
(B) Gasket
(C) Thermostat
(D) Jiggle pin (up side)

2) Fill engine coolant. **<Ref. to CO(H4SO)-19,** FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

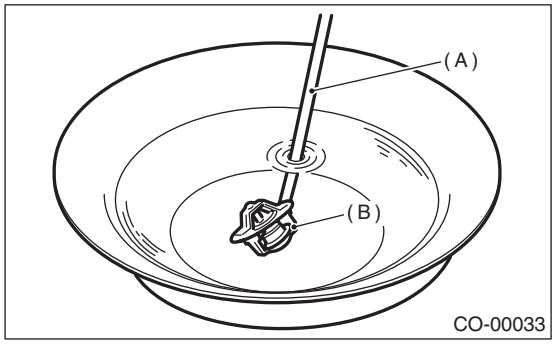
• Inspection method

Immerse the thermostat and thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

NOTE:
• Leave the thermostat in the boiling water for more than five minutes before measuring the valve lift.
• Hold the thermostat with a wire or the like to avoid contacting with container bottom.

Starts to open:
Non-turbo model
80 — 84°C (176 — 183°F)
Turbo model
76 — 80°C (169 — 176°F)

Fully opens:
Non-turbo model
95°C (203°F)
Turbo model
91°C (196°F)



(A) Thermometer
(B) Thermostat

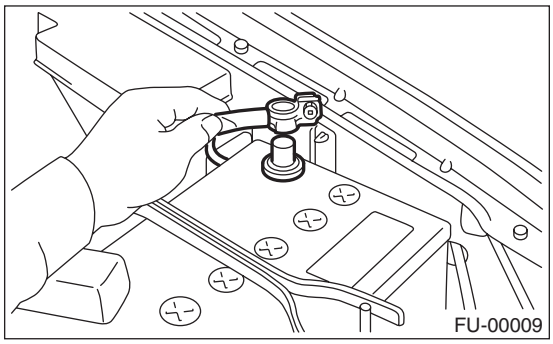
6. Radiator

A: REMOVAL

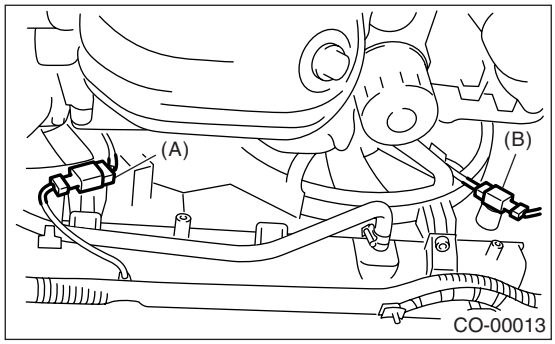
1. NON-TURBO MODEL

WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

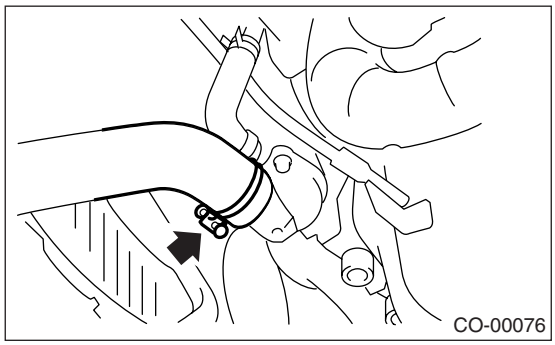
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



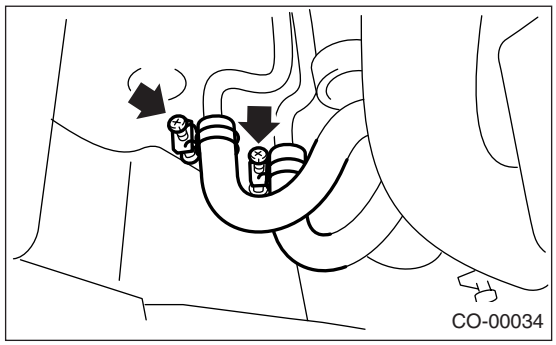
3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. **<Ref. to CO(H4SO)-19,** DRAINING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



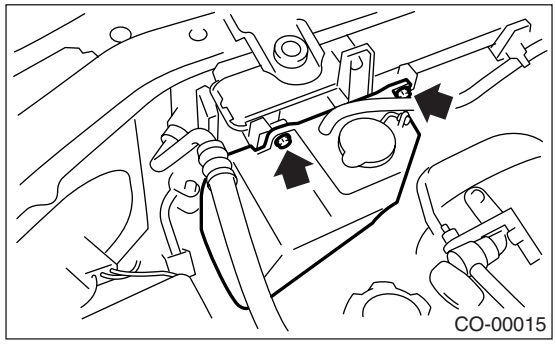
7) Disconnect the radiator outlet hose from water pump.



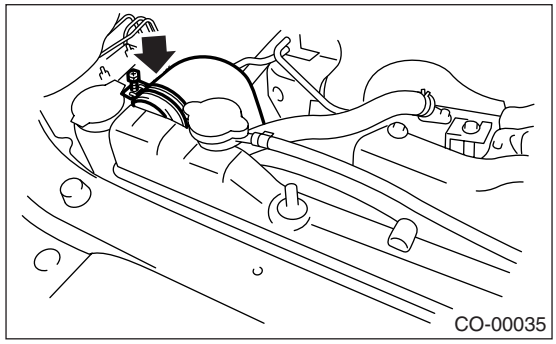
8) Disconnect the ATF cooler hoses from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



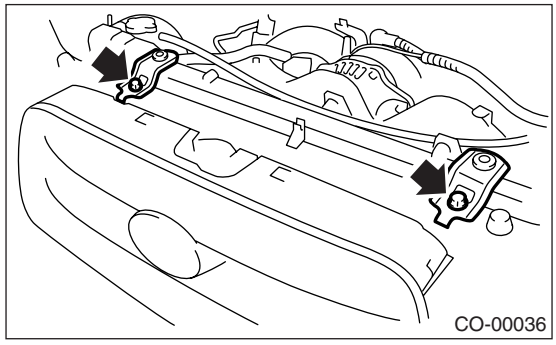
9) Lower the vehicle.
10) Disconnect the over flow hose.
11) Remove the reservoir tank.



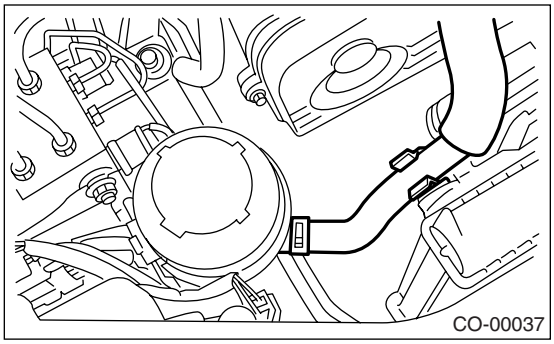
12) Disconnect the radiator inlet hose from engine.



13) Remove the radiator upper brackets.



14) Detach the power steering hose from clip on radiator.

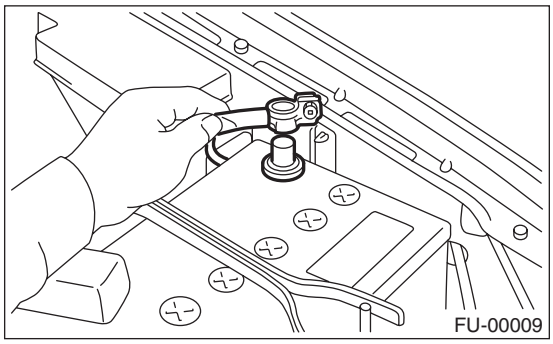


15) Lift the radiator up and away from the vehicle.

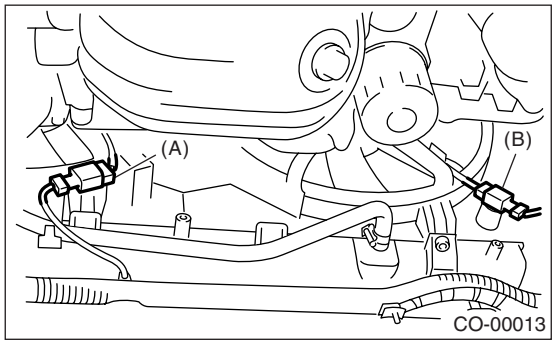
2. TURBO MODEL

WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

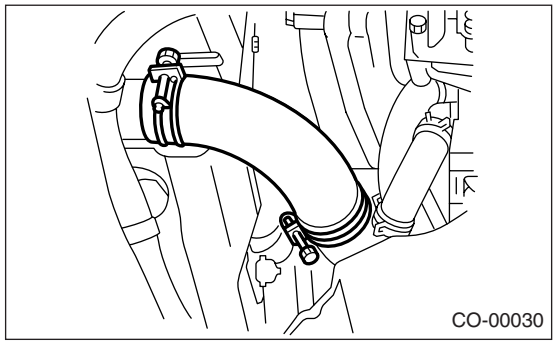
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



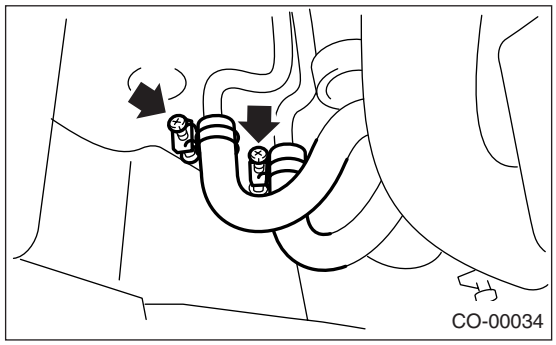
3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. **<Ref. to CO(H4SO)-19,** DRAINING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



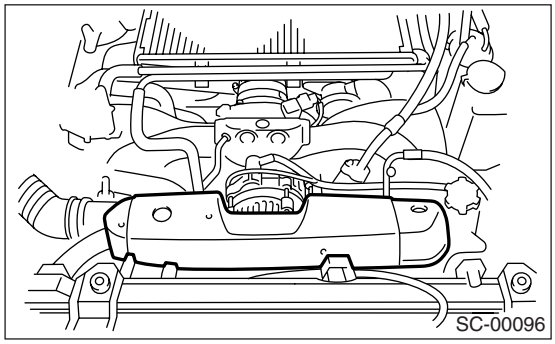
7) Disconnect the radiator outlet hose from thermostat cover.



8) Disconnect the ATF cooler hose from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.
9) Disconnect the oil cooler hose from oil cooler pipe. (MT model with oil cooler)
Install the cap to prevent oil from leaking.

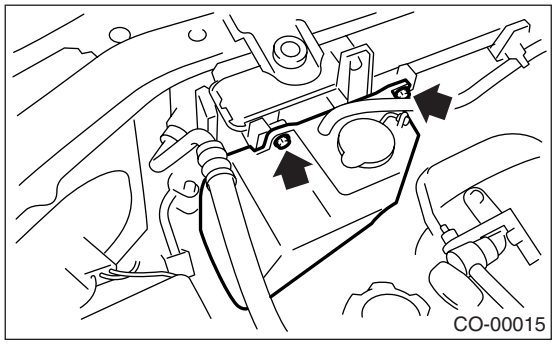


10) Lower the vehicle.
11) Remove the V-belt covers.

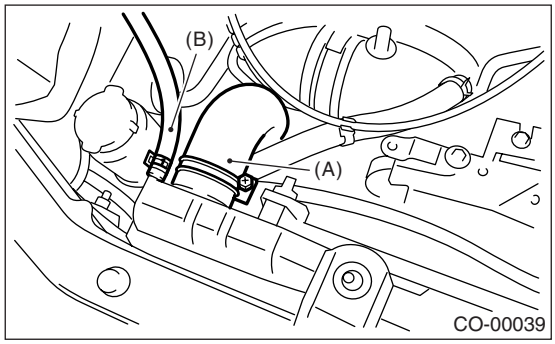


12) Disconnect the overflow hose.

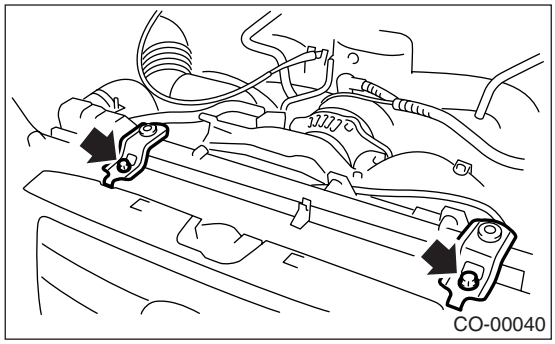
13) Remove the reservoir tank.



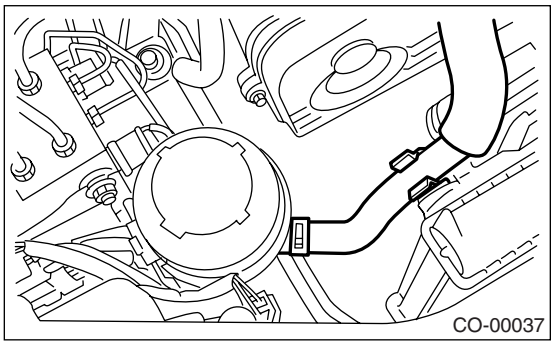
14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.



15) Remove the radiator upper brackets.

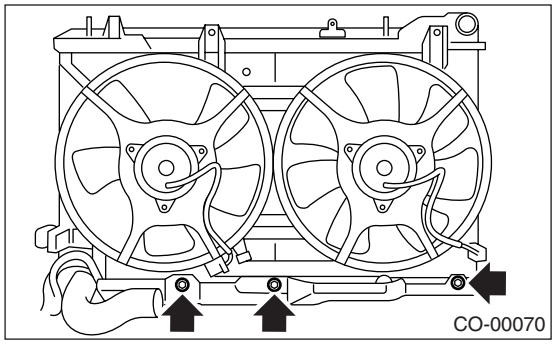


16) Disconnect the power steering hose from clips on radiator.



17) Lift the radiator up and away from the vehicle.

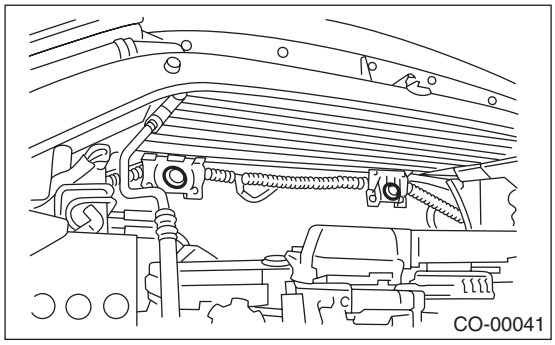
18) Remove the radiator under cover (AT model).



B: INSTALLATION

1. NON-TURBO MODEL

1) Attach the radiator lower cushions to holes on the vehicle.

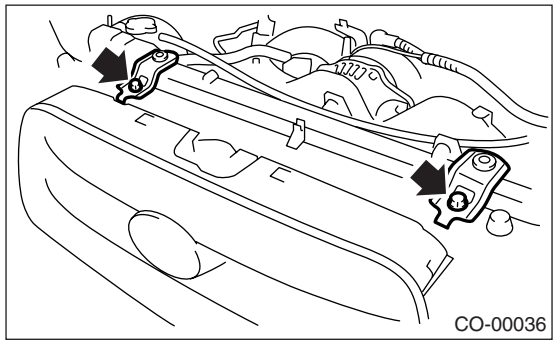


2) Install the radiator to vehicle.

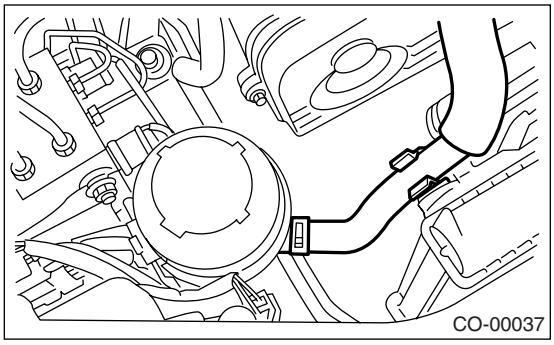
NOTE:
Fit pins on the lower side of radiator into cushions on the body side.

3) Install the radiator upper brackets and tighten bolts.

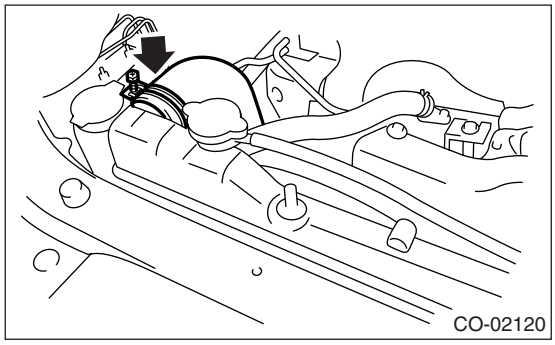
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Attach the power steering hose to radiator.

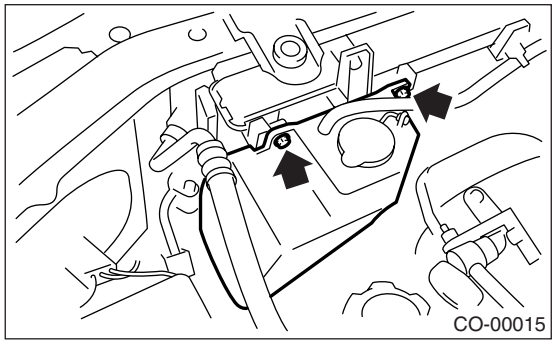


5) Connect the radiator inlet hose.

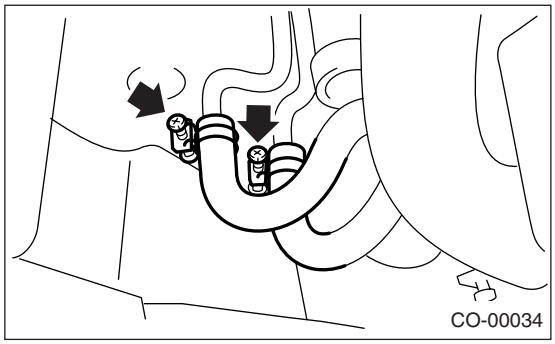


6) Install the reservoir tank.

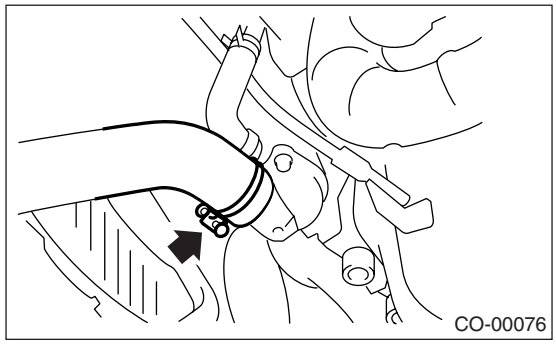
Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



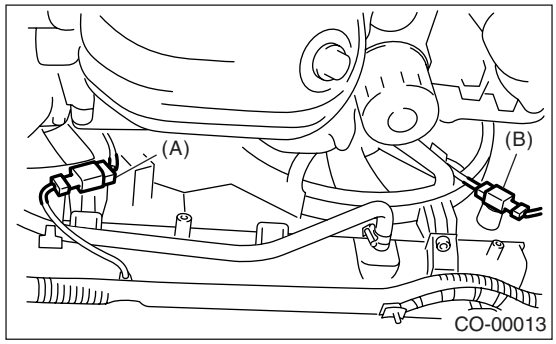
7) Connect the overflow hose.
8) Lift-up the vehicle.
9) Connect the ATF cooler hoses. (AT model)



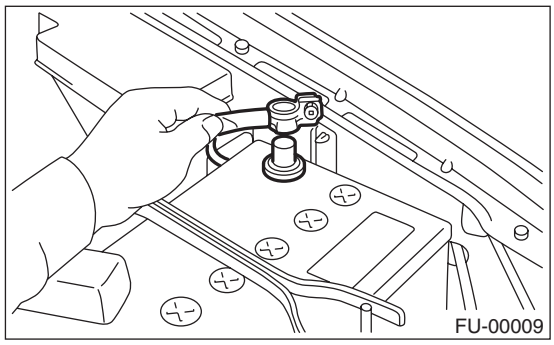
10) Connect the radiator outlet hose.



11) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



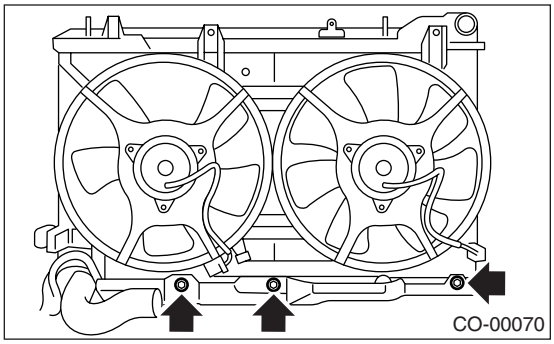
12) Install the under cover.
13) Lower the vehicle.
14) Connect the battery ground cable to battery.



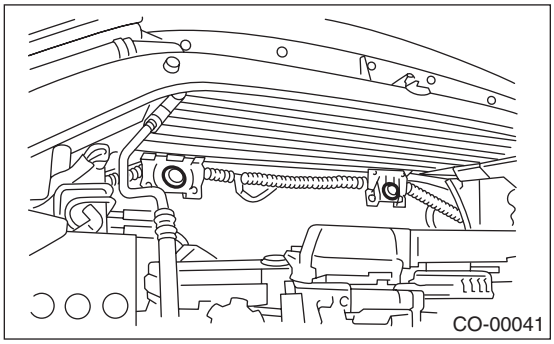
15) Fill engine coolant. **<Ref. to CO(H4SO)-19,** FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
16) Check the ATF level. **<Ref. to 4AT-32,** INSPECTION**, Automatic Transmission Fluid.>**

2. TURBO MODEL

1) Install the radiator under cover to radiator.



2) Attach the radiator lower cushions to holes on the vehicle.

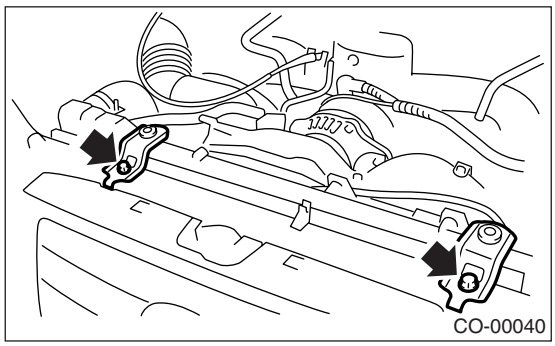


3) Install the radiator to vehicle.

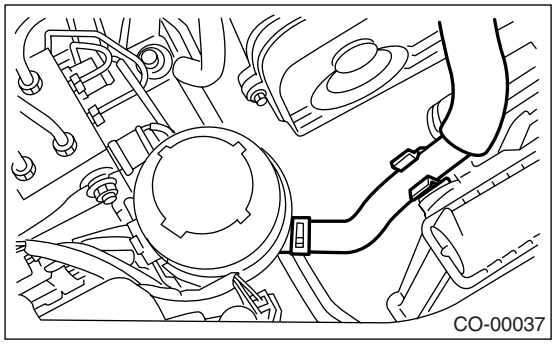
NOTE:
Fit pins on the lower side of radiator into cushions on body side.

4) Install the radiator upper brackets, and then tighten the bolts.

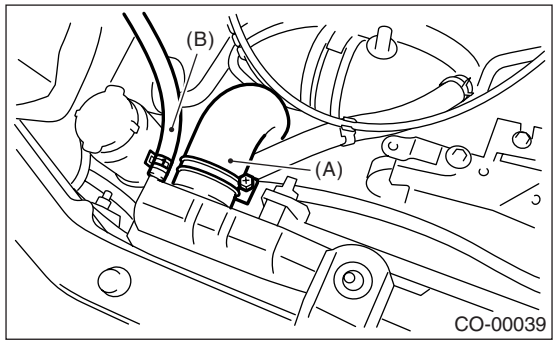
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Connect the power steering hose to radiator.

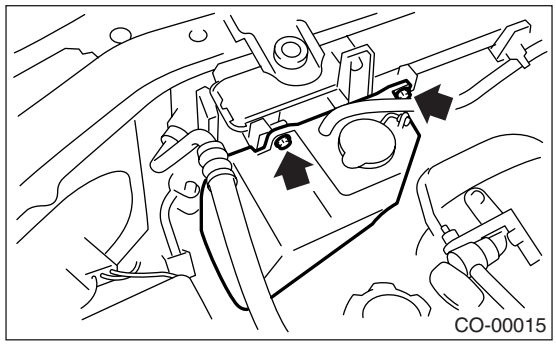


6) Connect the radiator inlet hose (A) and water tank hose (B).

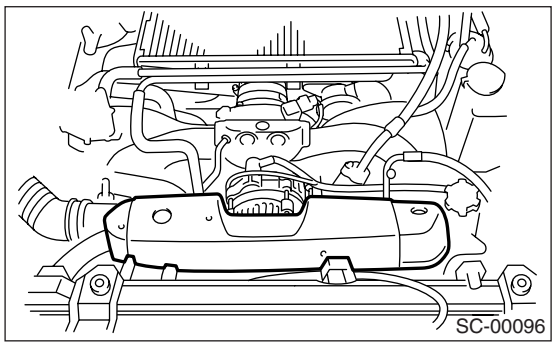


7) Install the reservoir tank.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

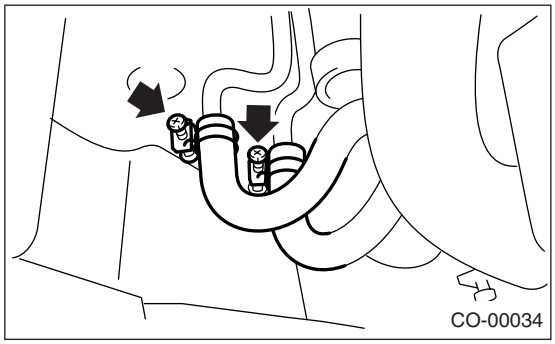


8) Connect the over flow hose.
9) Install the V-belt cover.

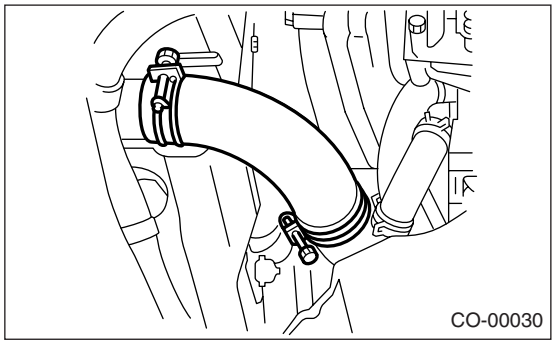


10) Lift-up the vehicle.
11) Connect the ATF cooler hoses. (AT model).

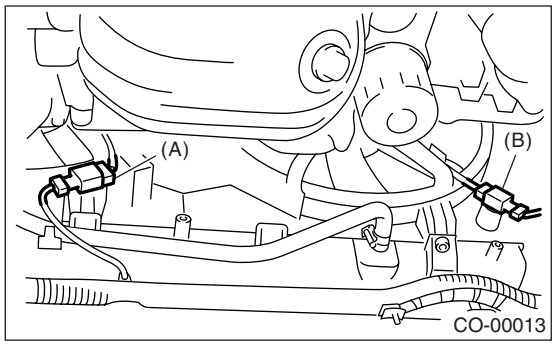
12) Connect the oil cooler hose. (MT model with oil cooler)



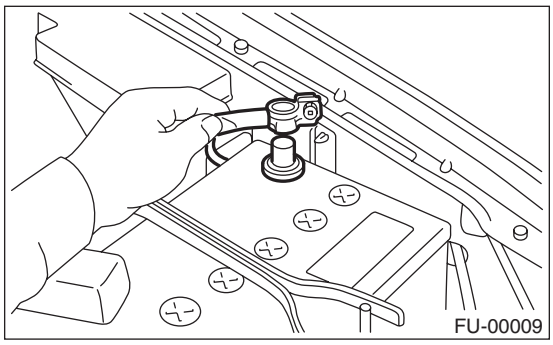
13) Connect the radiator outlet hose.



14) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



15) Install the under cover.
16) Lower the vehicle.
17) Connect the battery ground cable to battery.



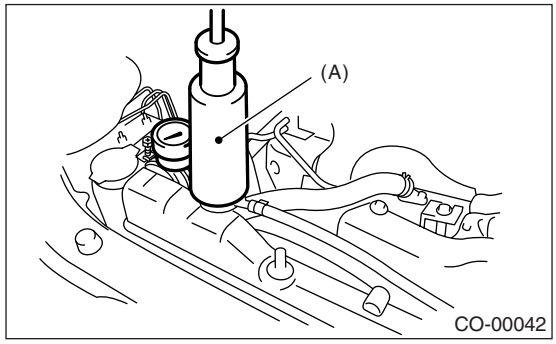
18) Fill engine coolant. **<Ref. to CO(H4SO)-19,** FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**

19) Check the ATF level. **<Ref. to 4AT-32,** INSPECTION**, Automatic Transmission Fluid.>**

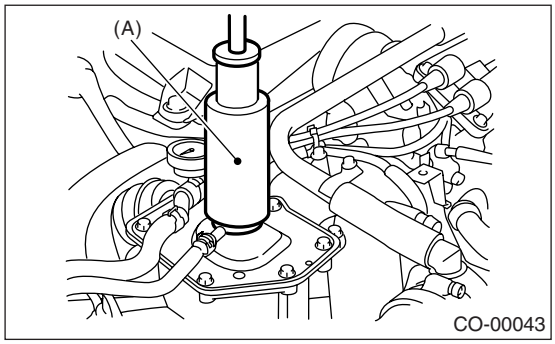
C: INSPECTION

1) Remove the radiator cap, top off radiator, and then attach the tester (A) to radiator in place of cap.

- NON-TURBO MODEL



- TURBO MODEL



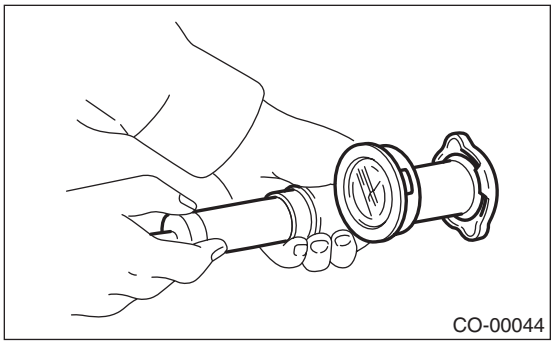
2) Apply a pressure of 157 kPa (1.6 kgf/cm^2, 23 psi) to the radiator to check if:
   (1) Engine coolant leaks at/around radiator.
   (2) Engine coolant leaks at/around hoses or connections.

CAUTION:
• Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.
• Engine should be off.
• Wipe engine coolant from check points in advance.
• Be careful to prevent engine coolant from spurting out when removing the tester.
• Be careful also not to deform the filler neck of radiator when installing or removing tester.

7. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

Standard pressure:
93 — 123 kPa (0.95 — 1.25 kgf/cm^2 , 14 — 18 psi)

Service limit pressure:
83 kPa (0.85 kgf/cm^2, 12 psi)

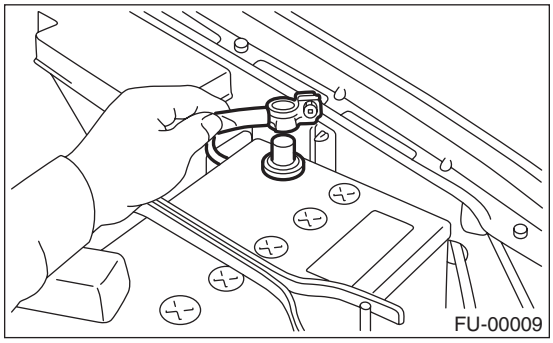
CAUTION:
Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

8. Radiator Main Fan and Fan Motor

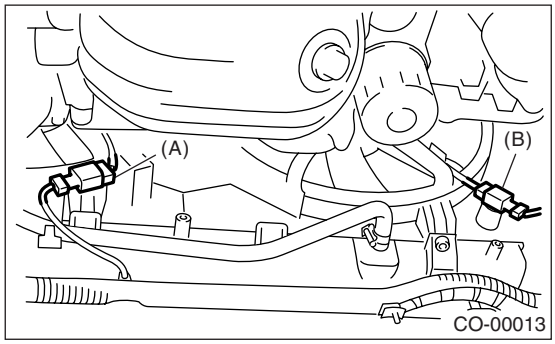
A: REMOVAL

1. NON-TURBO MODEL

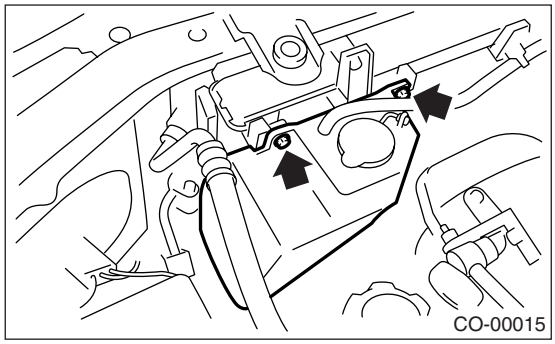
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



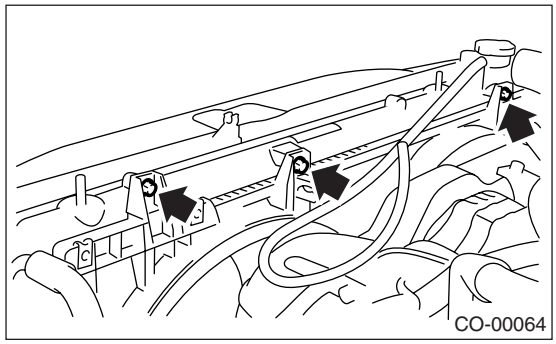
3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant aprrox. 1 ℓ (1.06 US qt, 0.88 Imp qt). **<Ref. to CO(H4SO)-19,** DRAINING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
6) Disconnect the connector of main fan motor (A) and sub fan motor (B).



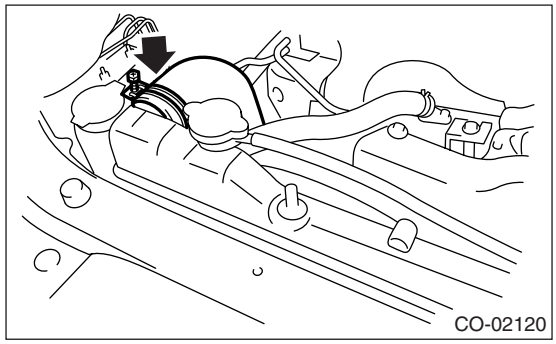
7) Remove the ATF hose from two clips of radiator fan motor assembly. (AT model)
8) Lower the vehicle.
9) Disconnect the over flow hose.
10) Remove the reservoir tank.



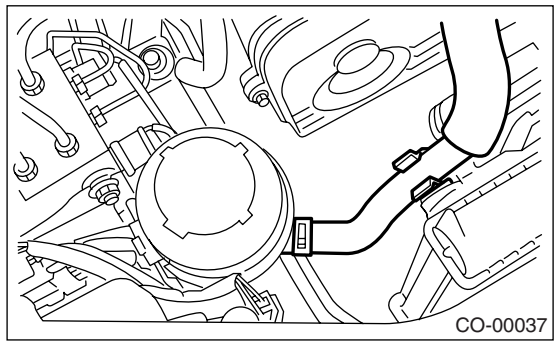
11) Remove the radiator fan motor assembly mounting bolts.



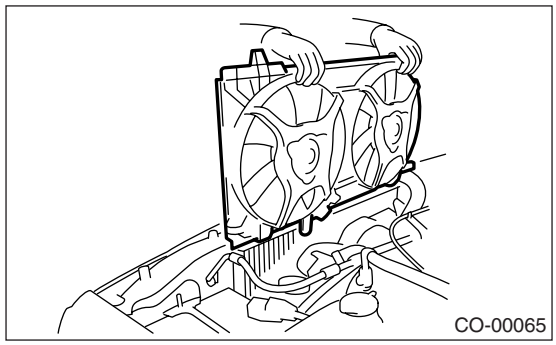
12) Disconnect the radiator inlet hose from engine.



13) Detach the power steering hose from clip on radiator.

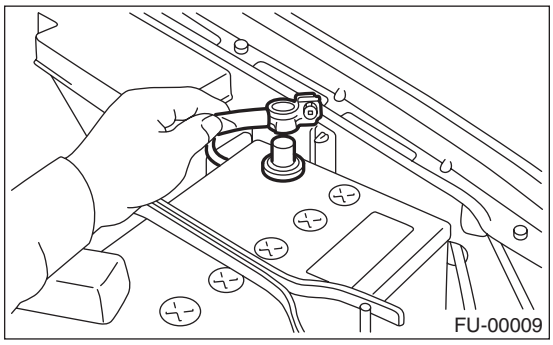


14) Rise up the radiator fan motor assembly to remove it from vehicle.

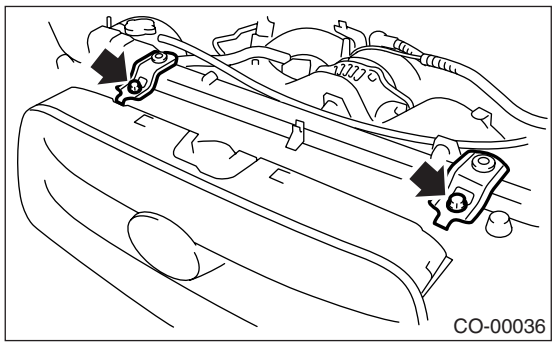


2. TURBO MODEL

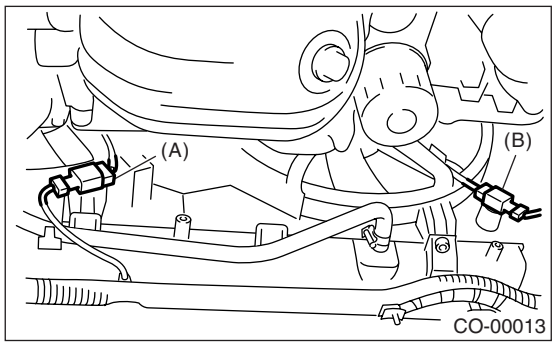
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



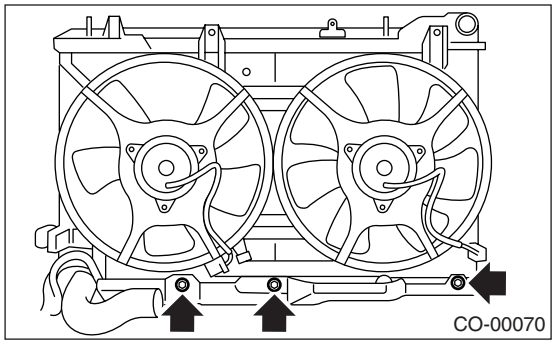
3) Remove the radiator upper bracket. (AT model)



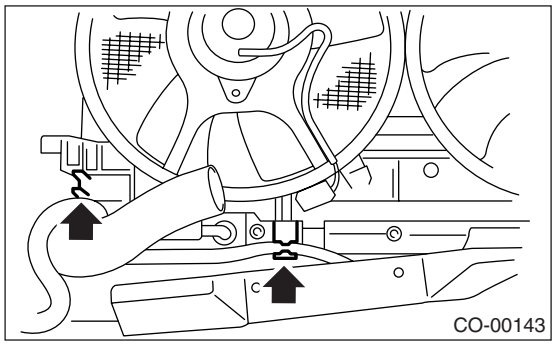
4) Lift-up the vehicle.
5) Remove the under cover.
6) Drain the engine coolant approx. 1 ℓ (1.06 US qt, 0.88 Imp qt). **<Ref. to CO(H4SO)-19,** DRAINING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
7) Disconnect the radiator main fan motor connector (A) and sub fan motor connector (B).



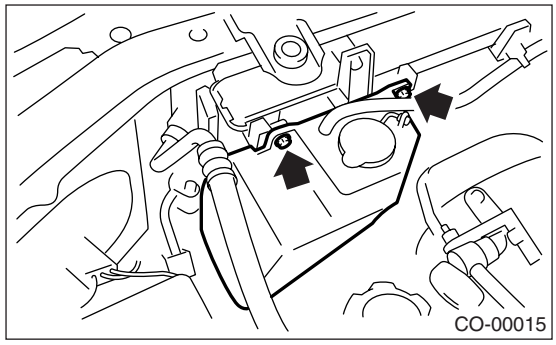
8) Remove the radiator under cover securing bolt. (AT model)



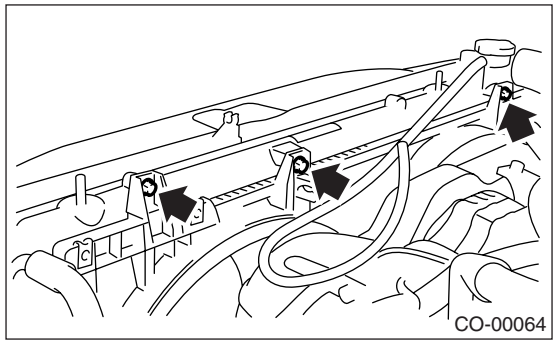
9) Pull the radiator lower hose upward to space radiator from radiator under cover. Remove the ATF hose to radiator fan motor assembly two clips. (AT model)



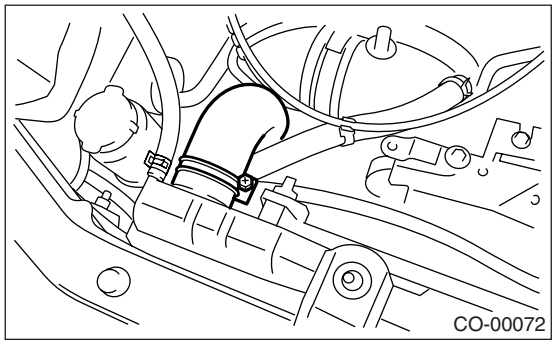
10) Lower the vehicle.
11) Remove the V-belt cover.
12) Disconnect the overflow hose.
13) Remove the reservoir tank.



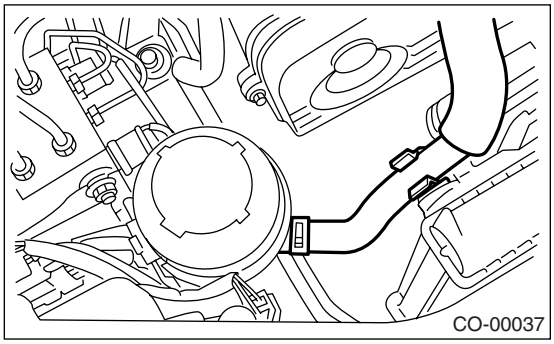
14) Remove the radiator main fan motor assembly securing bolt.



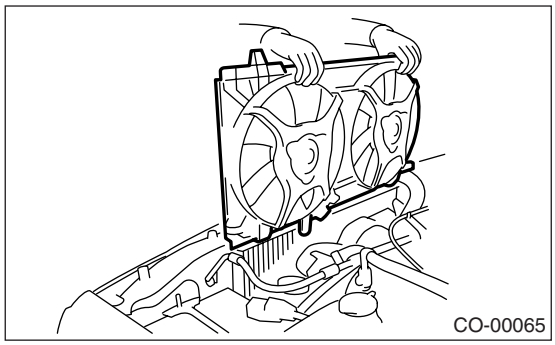
15) Disconnect the radiator inlet hose.



16) Disconnect the power steering hose from radiator clip.



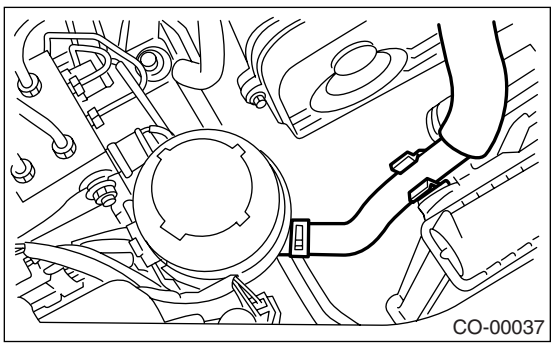
17) Remove the radiator main fan motor assembly from vehicle.



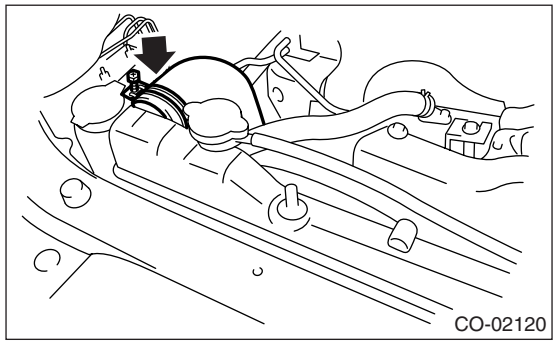
B: INSTALLATION

1. NON-TURBO MODEL

1) install the radiator main fan motor assembly to radiator.
2) Connect the power steering hose to radiator.

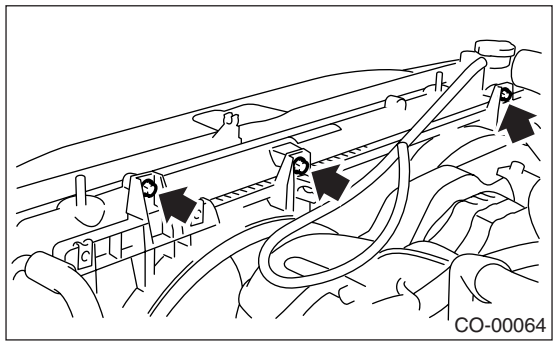


3) Connect the radiator inlet hose.



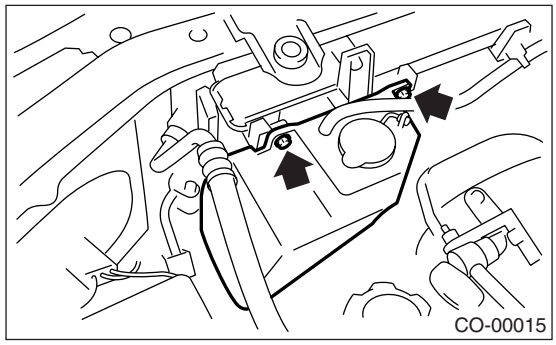
4) Install the radiator main fan motor assembly mounting bolts.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



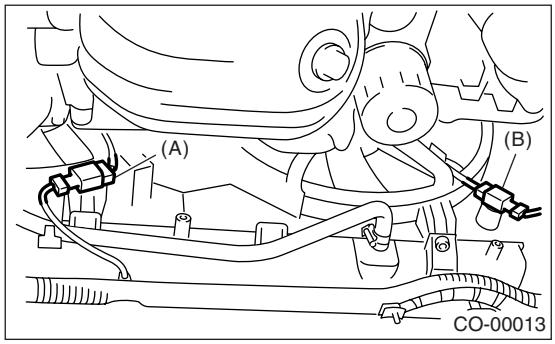
5) Install the reservoir tank.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

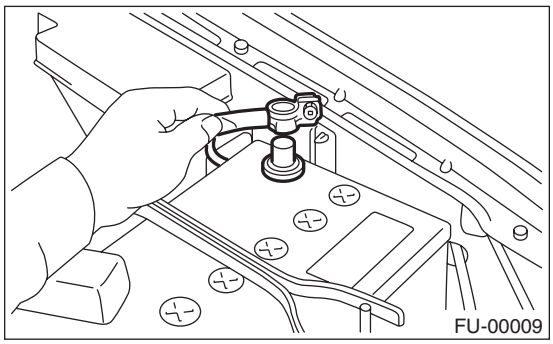


6) Install the over-flow hose.
7) Lift-up the vehicle.
8) Install the ATF hose to two clips of radiator main fan motor assembly. (AT model)

9) Connect the main fan motor (A) and sub fan motor (B).



10) Install the under cover.
11) Lower the vehicle.
12) Connect the battery ground cable to battery.

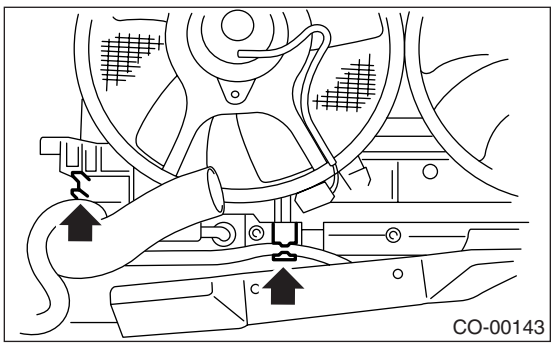


13) Fill the engine coolant. **<Ref. to CO(H4SO)-19,** FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**

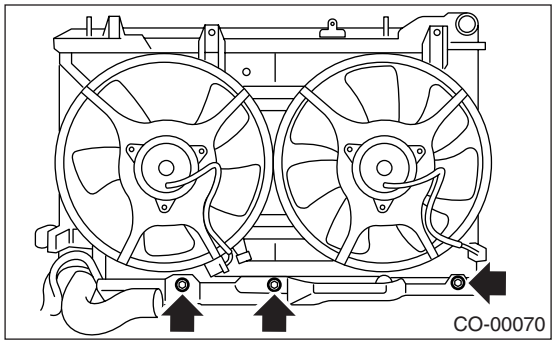
2. TURBO MODEL

1) Install the radiator main fan motor assembly.
2) Lift-up the vehicle.
3) Pull the radiator lower hose upward to space radiator from radiator under cover. Install the ATF hose to radiator main fan motor assembly two clips. (AT model)

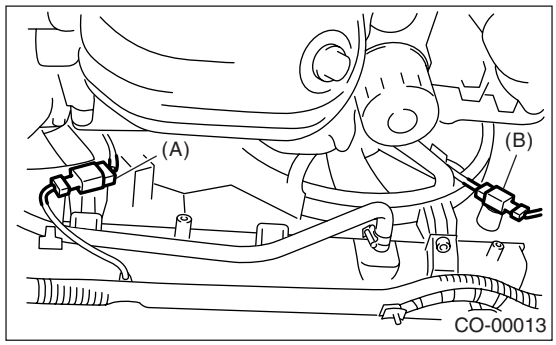
NOTE:
Fit securely the pins on lower side of radiator into body side.



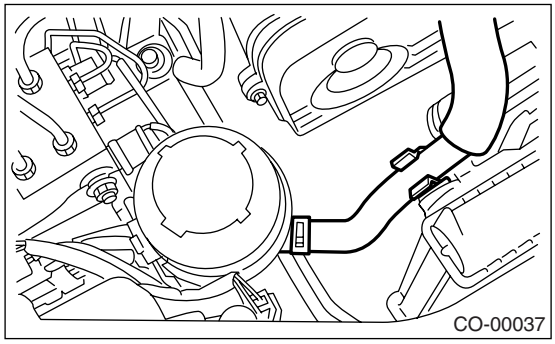
4) Tighten the radiator under cover securing bolt. (AT model)



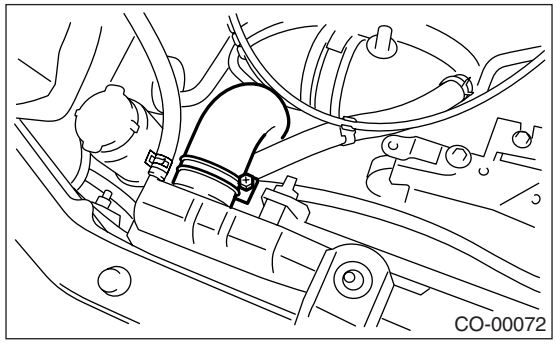
5) Connect the radiator main fan motor connector (A) and sub fan motor connector (B).



6) Install the under cover.
7) Lower the vehicle.
8) Connect the power steering hose to radiator clip.

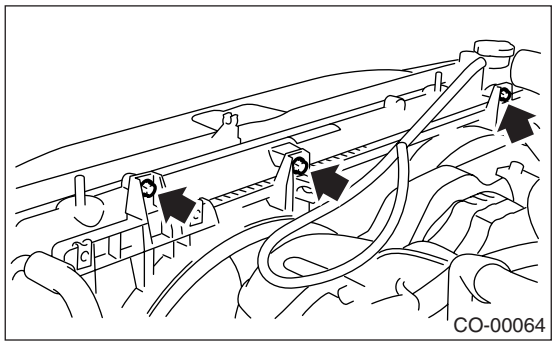


9) Connect the radiator inlet hose to radiator.



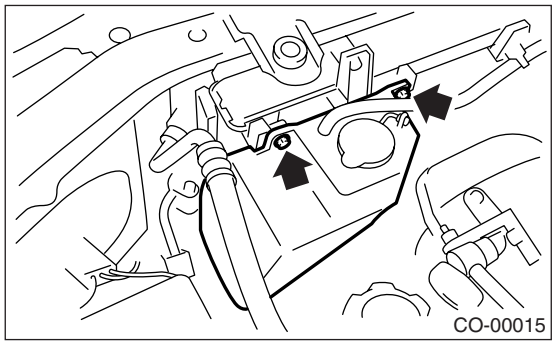
10) Install the radiator main fan motor assembly mounting bolts.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

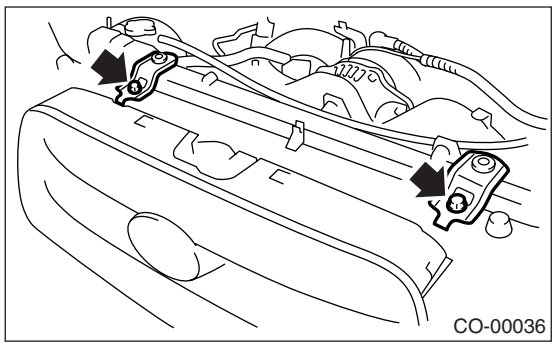

CO-00064

11) Install the reservoir tank.

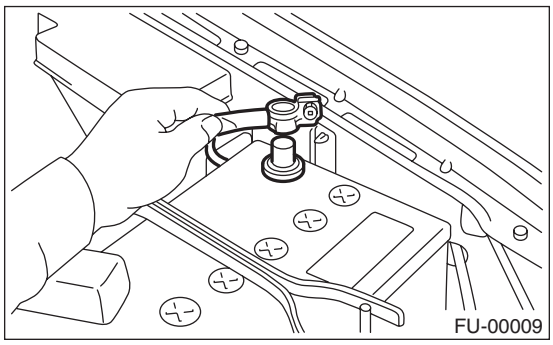
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)


CO-00015

12) Connect the overflow hose.
13) Install the V-belt cover.
14) Install the radiator upper bracket. (AT model)


CO-00036

15) Connect the battery ground cable to battery.

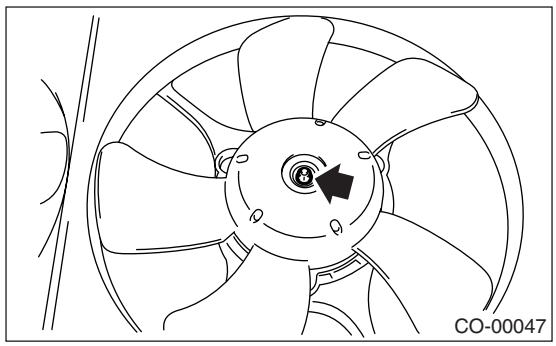

FU-00009

16) Fill the engine coolant. **<Ref. to CO(H4SO)-19,** FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**

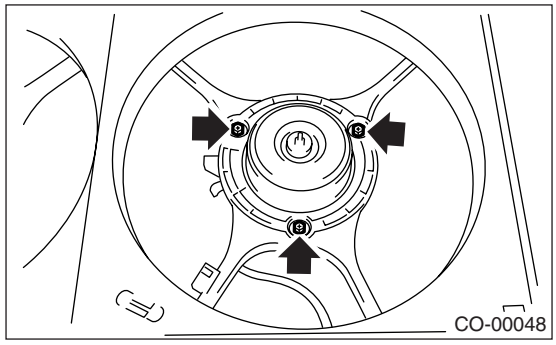
NOTE:
If it is difficult to install the radiator main fan motor assembly, first loosen the bolts which hold the radiator sub fan motor assembly.

C: DISASSEMBLY

1) Remove the clip which holds motor connector onto shroud.
2) Remove the nut which holds fan itself onto fan motor and shroud assembly.


CO-00047

3) Remove the bolts which install fan motor onto shroud.


CO-00048

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Refer to COMPONENT for tightening torque. **<Ref. to CO(H4SO)-4,** COMPONENT**, General Description.>**

9. Radiator Sub Fan and Fan Motor

A: REMOVAL

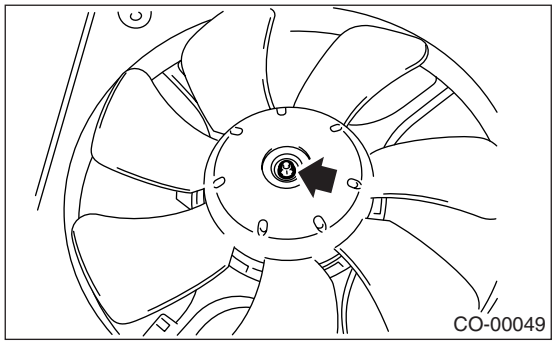
Refer to Radiator Main Fan and Fan Motor. <Ref. to CO(H4SO)-35, REMOVAL, Radiator Main Fan and Fan Motor.>

B: INSTALLATION

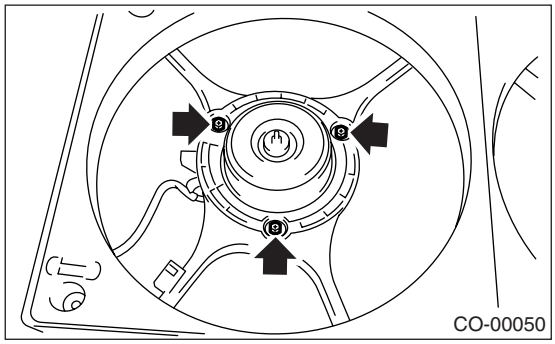
Refer to Radiator Main Fan and Fan Motor. <Ref. to CO(H4SO)-37, INSTALLATION, Radiator Main Fan and Fan Motor.>

C: DISASSEMBLY

1) Remove the clip which holds motor connector onto shroud.
2) Remove the nut which holds fan itself onto fan motor and shroud assembly.



3) Remove the bolts which install fan motor onto shroud.



D: ASSEMBLY

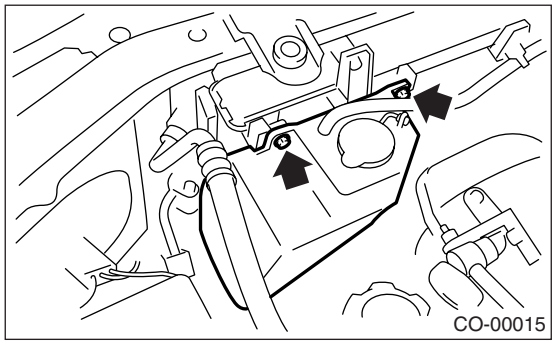
Assemble in the reverse order of disassembly.

NOTE:
Refer to COMPONENT for tightening torque. **<Ref. to CO(H4SO)-4,** COMPONENT**, General Description.>**

10.Reservoir Tank

A: REMOVAL

1) Disconnect the over flow hose from radiator filler neck position.
2) Remove the bolts which install reservoir tank onto radiator main fan shroud.
3) Remove the reservoir tank.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Refer to COMPONENT for tightening torque. **<Ref. to CO(H4SO)-4,** COMPONENT**, General Description.>**

C: INSPECTION

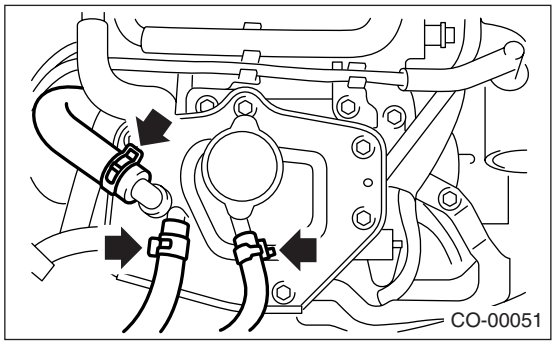
Make sure the engine coolant level is between “FULL” and “LOW”.

11.Coolant Filler Tank

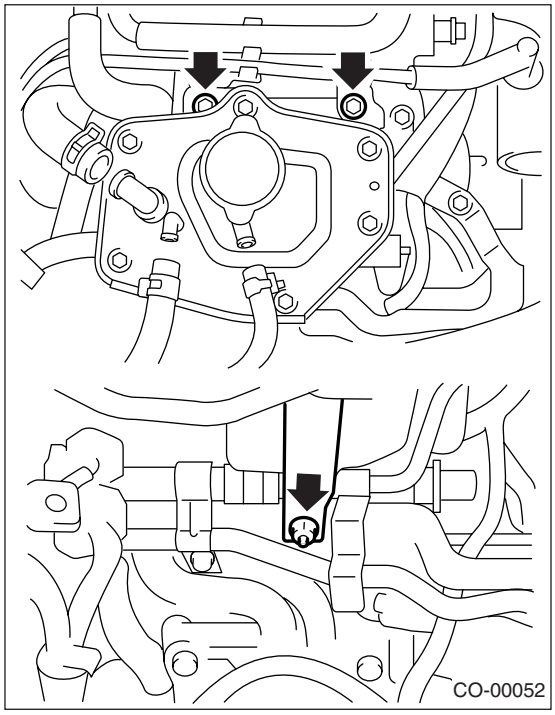
A: REMOVAL

WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

1) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). **<Ref. to CO(H4SO)-19,** DRAINING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
2) Remove the air cleaner upper cover and air intake boot. **<Ref. to IN(H4DOTC 2.0)-7,** REMOVAL**, Air Cleaner Case.>**
3) Remove the air cleaner element.
4) Disconnect the engine coolant hoses from coolant filler tank.



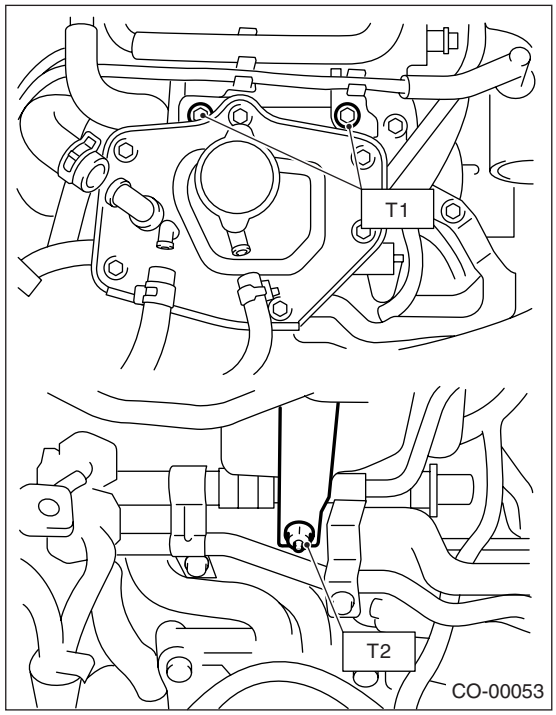
5) Remove the bolts and nut which install coolant filler tank.
6) Disconnect the engine coolant hose which connects under side of coolant filler tank.
7) Remove the coolant filler tank.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 14.0 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



2) Fill engine coolant. **<Ref. to CO(H4SO)-19,** FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H4SO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC 2.0)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean, repair or replace.
	i. Improper engine oil in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4SO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC 2.0)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
	o. Malfunction of radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten the cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.

LUBRICATION

LU(H4SO)

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3. Engine Oil 11
4. Oil Pump 14
5. Oil Pan and Strainer 18
6. Oil Pressure Switch 22
7. Engine Oil Cooler 23
8. Engine Oil Filter 25
9. Engine Lubrication System Trouble in General 26

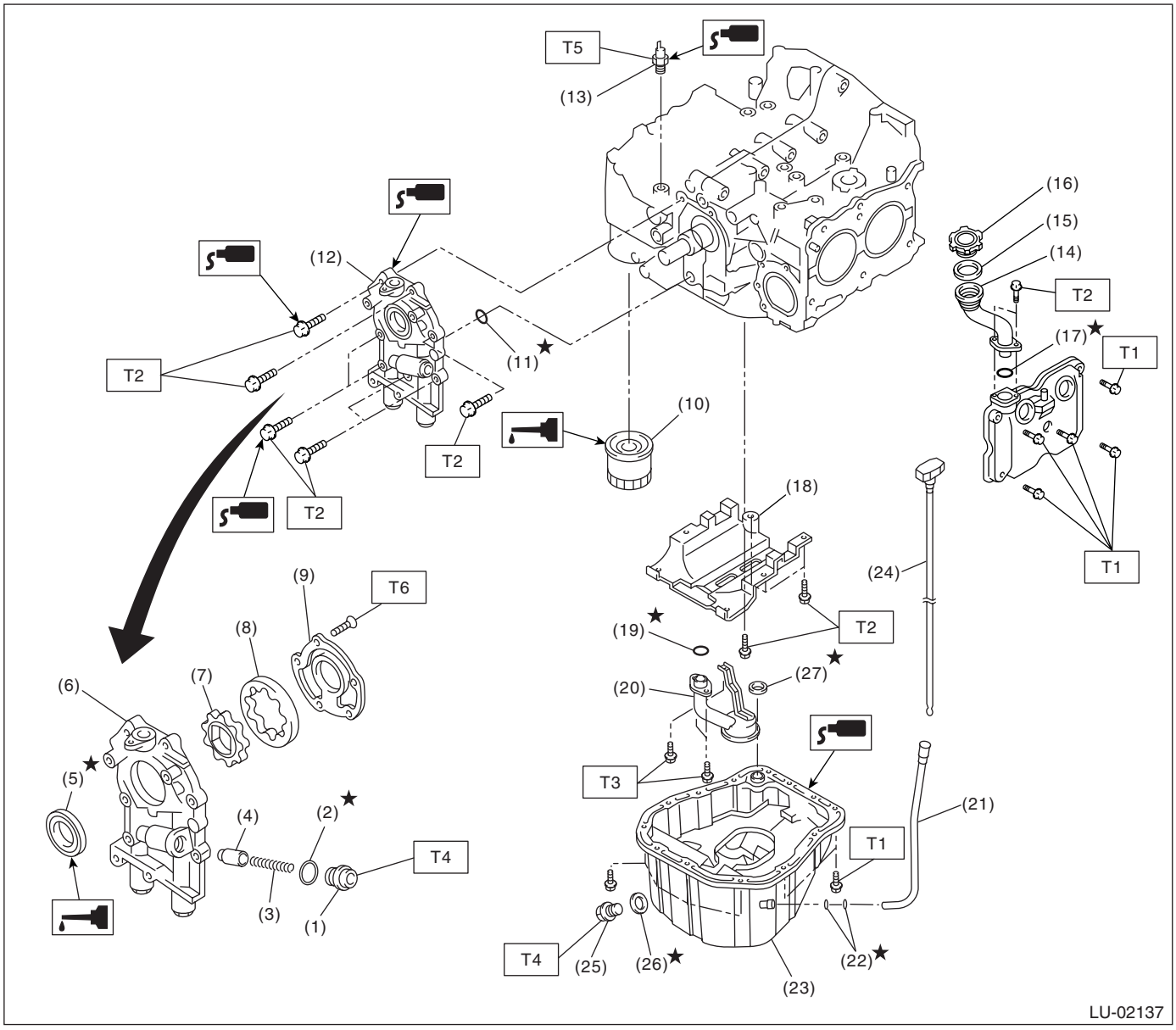
1. General Description

A: SPECIFICATION

Lubrication method					Forced lubrication
Oil pump	Pump type				Trochoid type
	Number of teeth		Inner rotor		9
			Outer rotor		10
	Outer rotor diameter × thickness		Non-turbo model		78 × 7 mm (3.07 × 0.28 in)
			Turbo model		78 × 10 mm (3.07 × 0.39 in)
	Tip clearance between inner and outer rotor			Standard	0.04 — 0.14 mm (0.0016 — 0.0055 in)
				Limit	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case			Standard	0.02 — 0.07 mm (0.0008 — 0.0028 in)
				Limit	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case			Standard	0.10 — 0.175 mm (0.0039 — 0.0069 in)
				Limit	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	Non-turbo model	600 rpm	Discharge pressure	98 kPa (1.0 kgf/cm^2, 14 psi)
				Discharge quantity	3.2 ℓ (3.4 US qt, 2.8 Imp qt)/min.
			5,000 rpm	Discharge pressure	294 kPa (3.0 kgf/cm^2, 43 psi)
				Discharge quantity	32.6 ℓ (34.4 US qt, 28.7 Imp qt)/min.
		Turbo model	600 rpm	Discharge pressure	98 kPa (1.0 kgf/cm^2, 14 psi)
				Discharge quantity	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
			5,000 rpm	Discharge pressure	294 kPa (3.0 kgf/cm^2, 43 psi)
				Discharge quantity	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.
	Relief valve operation pressure		Non-turbo model		490 kPa (5.0 kgf/cm^2, 71 psi)
			Turbo model		588 kPa (6.0 kgf/cm^2, 85 psi)
Oil filter	Type				Full-flow filter type
	Filtration area		Diameter 80 mm (3.15 in)		760 cm^2 (118 sq in)
			Diameter 68 mm (2.68 in)		800 cm^2 (124 sq in)
			Diameter 65 mm (2.56 in)		470 cm^2 (73 sq in)
	By-pass valve opening pressure				160 kPa (1.63 kgf/cm^2, 23.2 psi)
	Outer diameter × width		Diameter 80 mm (3.15 in)		80 × 70 mm (3.15 × 2.76 in)
			Diameter 68 mm (2.68 in)		68 × 65 mm (2.68 × 2.56 in)
			Diameter 65 mm (2.56 in)		65 × 74.4 mm (2.56 × 2.93 in)
	Oil filter to engine thread size				M 20 × 1.5
Oil pressure switch	Type				Immersed contact point type
	Working voltage — wattage				12 V — 3.4 W or less
	Warning light activation pressure				14.7 kPa (0.15 kgf/cm^2, 2.1 psi)
	Proof pressure				More than 981 kPa (10 kgf/cm^2, 142 psi)
Oil capacity (at replacement)					4.0 ℓ (4.2 US qt, 3.5 Imp qt)

B: COMPONENT

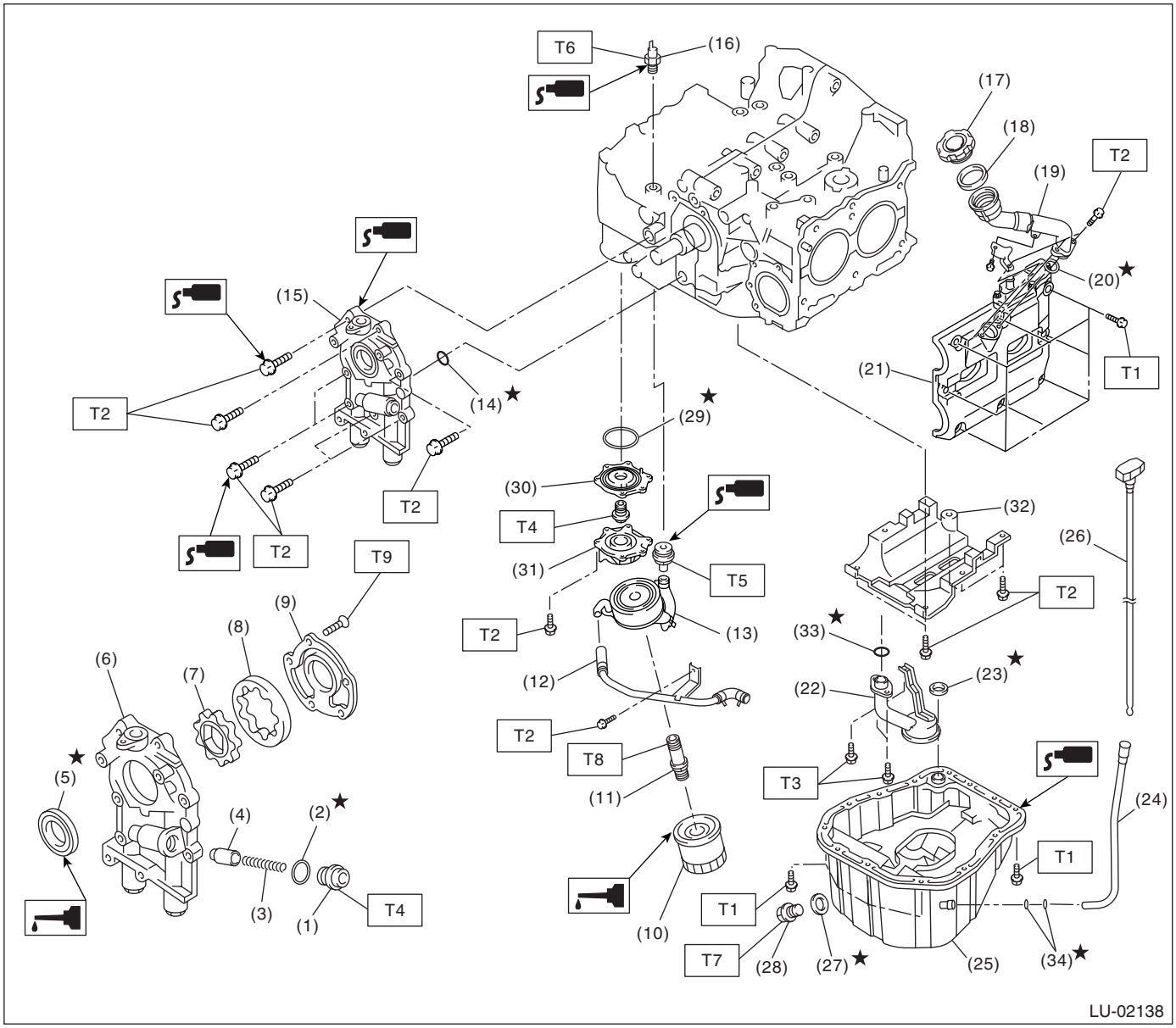
1. NON-TURBO MODEL



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) O-ring
(12) Oil pump ASSY
(13) Oil pressure switch
(14) Oil filler duct
(15) O-ring
(16) Oil filler cap
(17) O-ring
(18) Baffle plate
(19) O-ring
(20) Oil strainer
(21) Oil level gauge guide
(22) O-ring
(23) Oil pan
(24) Oil level gauge
(25) Drain plug
(26) Metal gasket
(27) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 44 (4.5, 33)
T5: 25 (2.5, 18.1)
T6: 5.4 (0.55, 4.0)

2. TURBO MODEL



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector
(12) Water by-pass pipe
(13) Oil cooler
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler cap
(18) O-ring
(19) Oil filler duct
(20) O-ring
(21) Rocker cover
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Adapter (1)
(31) Adapter (2)
(32) Baffle plate
(33) O-ring
(34) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 45 (4.6, 33)
T5: 69 (7.0, 51)
T6: 25 (2.5, 18.1)
T7: 44 (4.5, 33)
T8: 54 (5.5, 40)
T9: 5.4 (0.55, 4.0)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOL

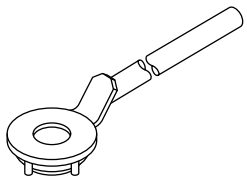
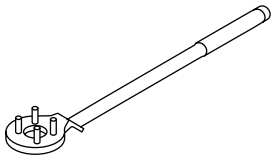
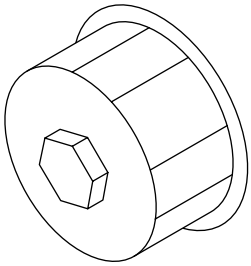
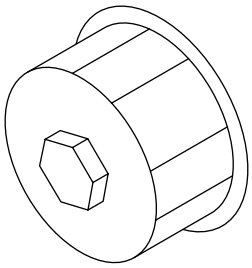
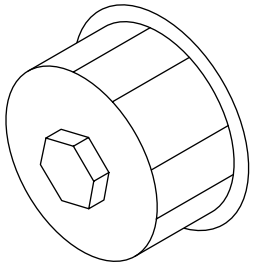
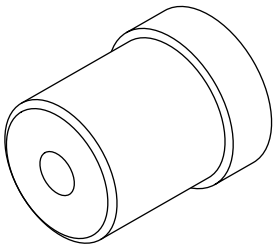
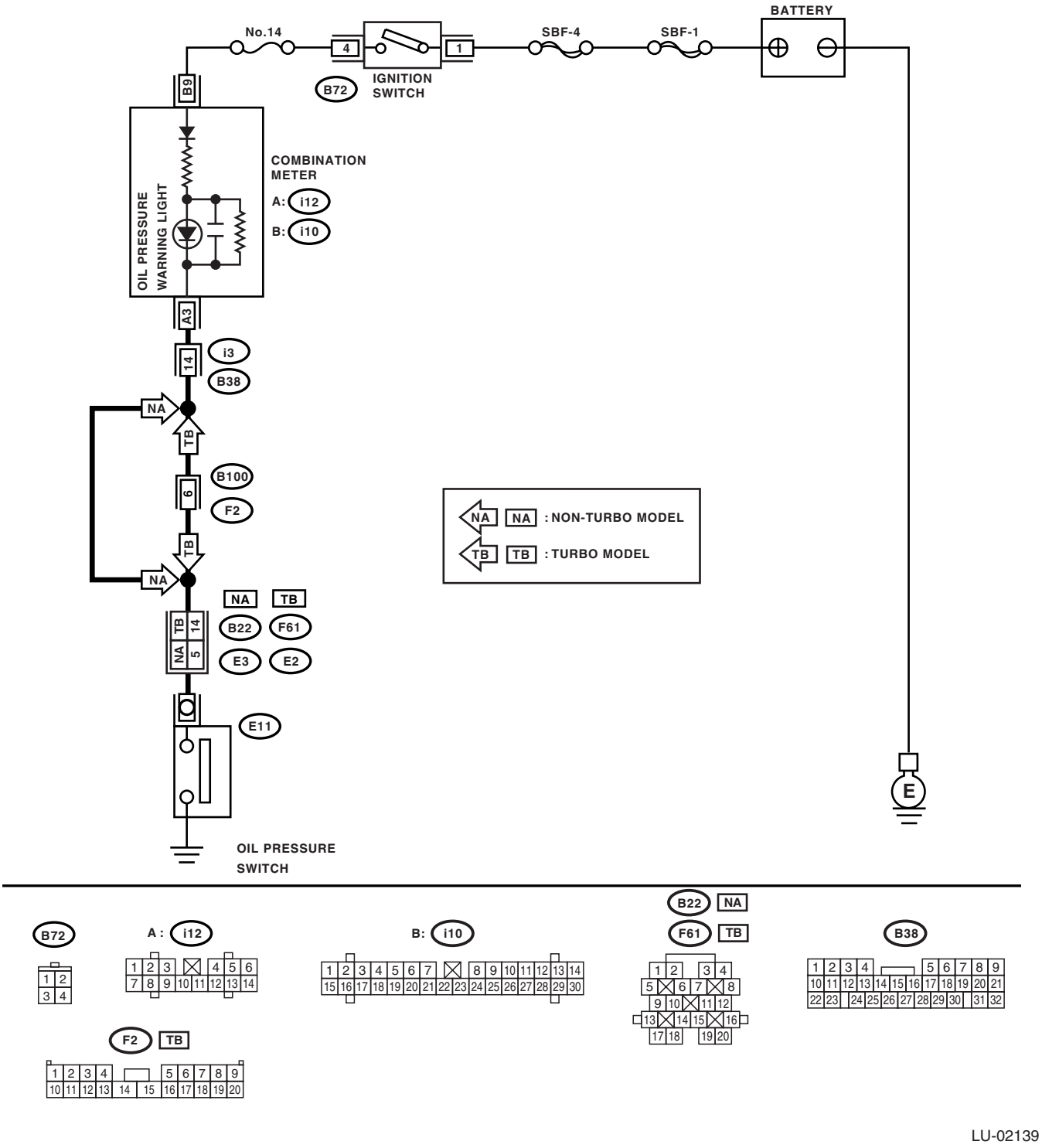
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400 (2.0 L model)	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolt.
 ST-499977100	499977100 (2.5 L model)	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 80 mm (3.15 in))
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

2. Oil Pressure System

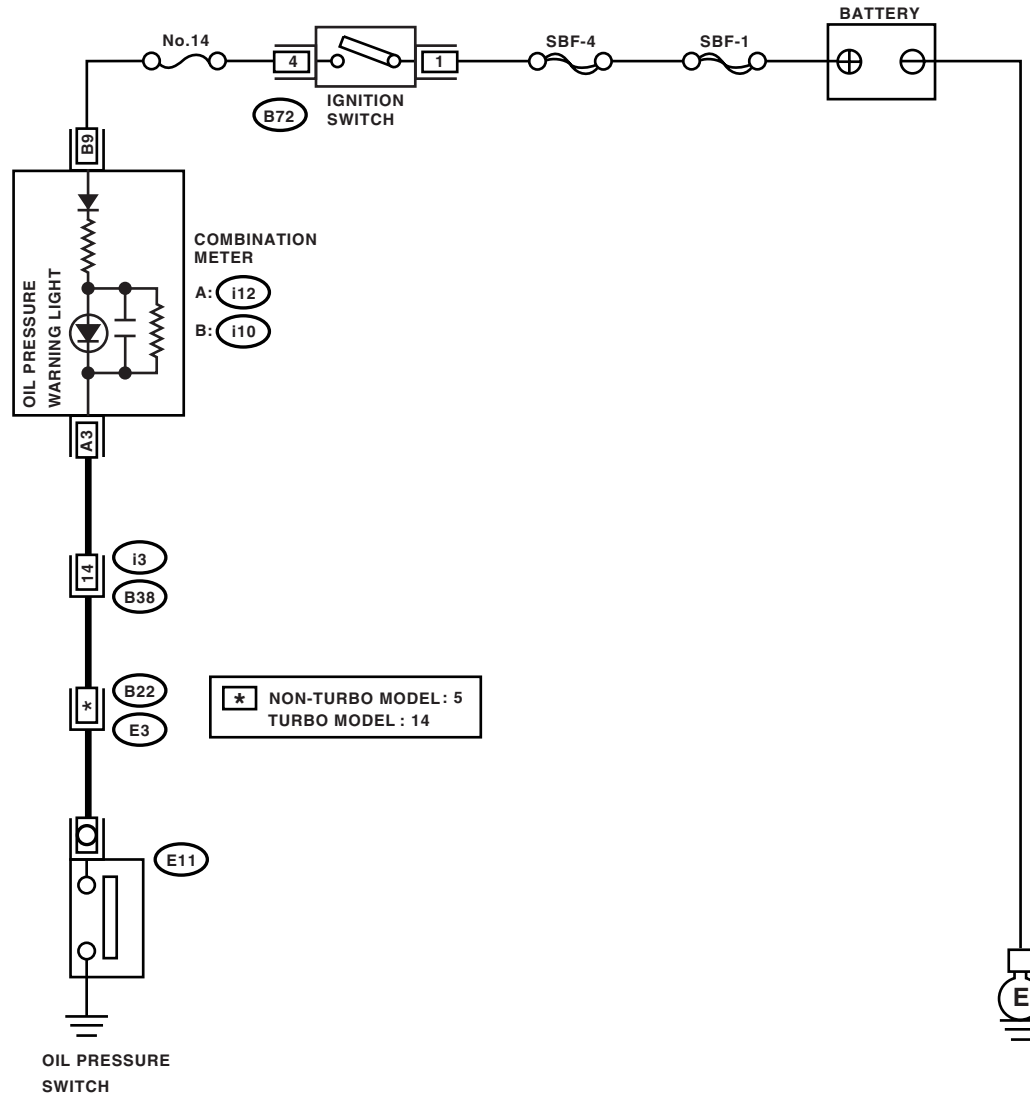
A: WIRING DIAGRAM

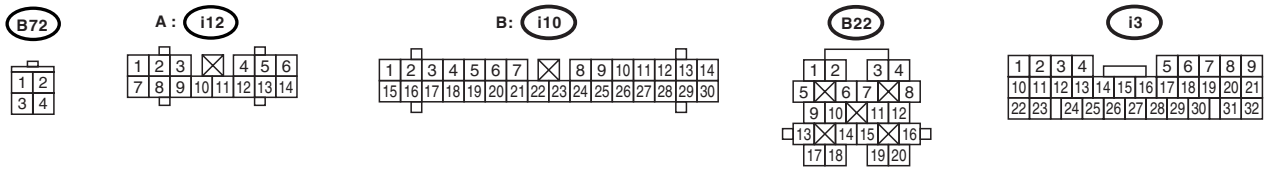
1. LHD MODEL



LU-02139

2. RHD MODEL





LU-02140

B: INSPECTION

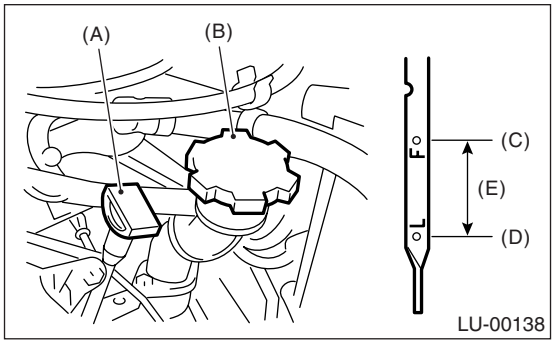
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (engine OFF) 2) Check other warning lights.	Does the warning lights illuminate?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-4, INSPECTION, Combination Meter System.>
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(E11) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step **3.**
3	**CHECK COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. ***Terminal*** ***(i10) No. 9 — (i12) No. 3:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter and the oil pressure switch warning light bulb.

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and notch mark. This is caused by thermal expansion of the engine oil.

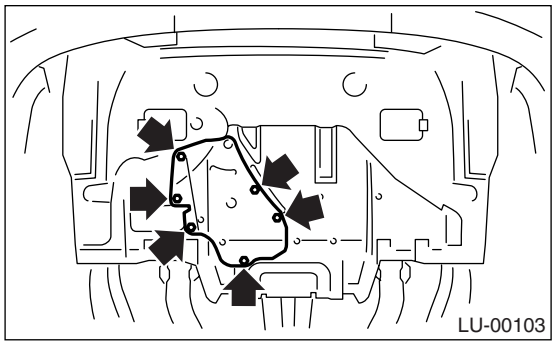
NOTE:
To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.



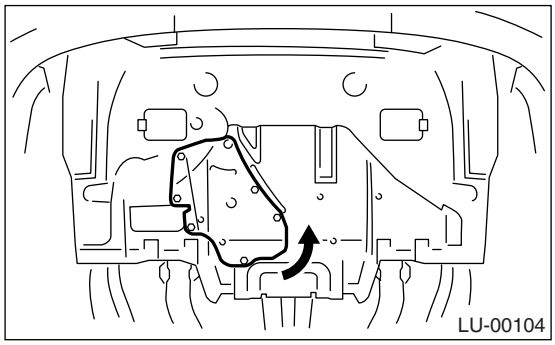
(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

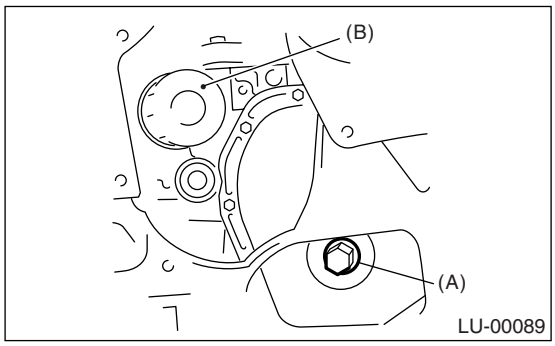
1) Open the engine oil filler cap for quick draining of the engine oil.
2) Remove six clips.



3) Turn the service hole cover counterclockwise.



4) Drain the engine oil by loosening the engine oil drain plug.

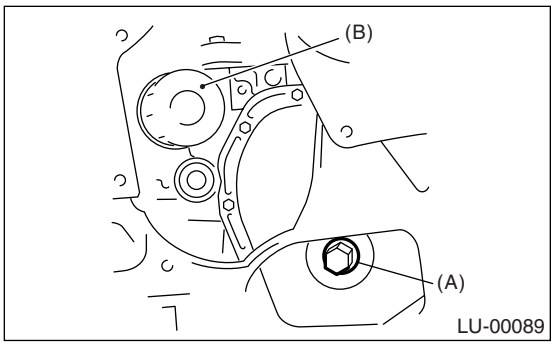


(A) Drain plug
(B) Oil filter

5) Replace the drain plug gasket.

6) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)



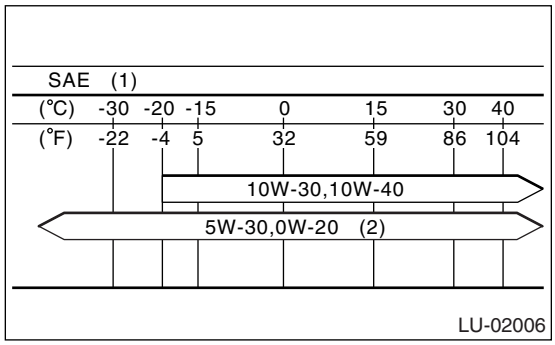
(A) Drain plug
(B) Oil filter

7) Install the service hole cover.
8) Fill engine oil through the filler pipe up to upper point on level gauge. Make sure that the vehicle is placed level when checking oil level. Use the engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil
API standard SL, SJ with the "Energy Conserving" logo is printed (if you cannot obtain the oil with SL, SJ grades, you may use SH grades "ENERGY CONSERVING" oil.)
ACEA specification, A1, A2 or A3
ILSAC Standard GF-3 (Star burst mark) label is on the container.

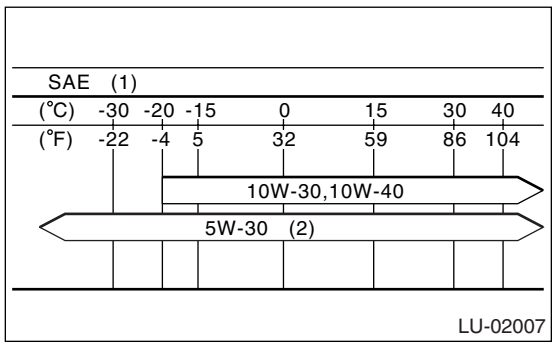
Engine oil capacity:
Upper level
4.0 ℓ (4.2 US qt, 3.5 Imp qt)
Lower level
3.0 ℓ (3.2 US qt, 2.6 Imp qt)

- Non-turbo model



(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

- Turbo model



(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

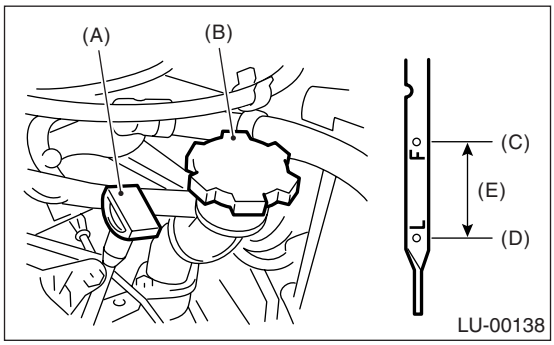
The proper viscosity helps vehicle get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SL or SJ
SAE Viscosity No. : 30, 40, 10W-50, 20W-40, 20W-50.

9) Close the engine oil filler cap.
10) Start the engine and warm it up for a time.

11) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

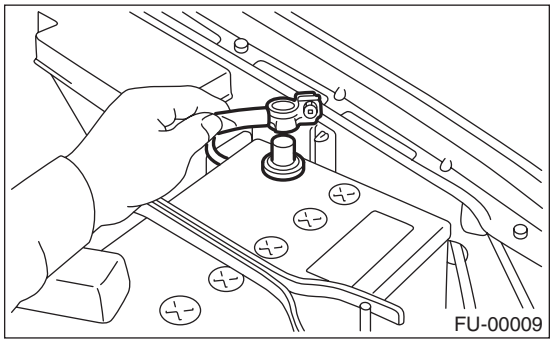


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

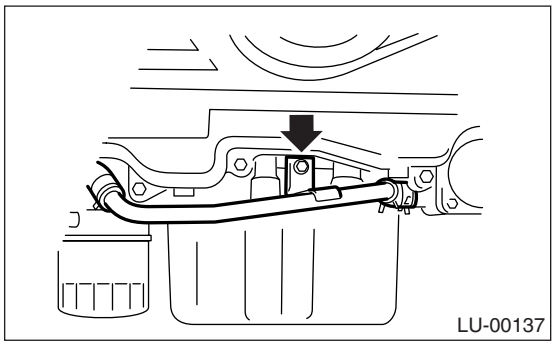
4. Oil Pump

A: REMOVAL

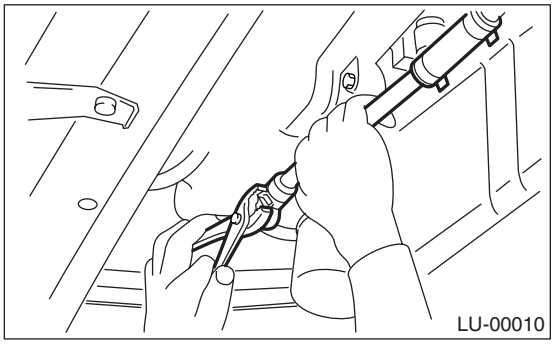
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the bolts which install water pipe of oil cooler to oil pump. (Turbo model)

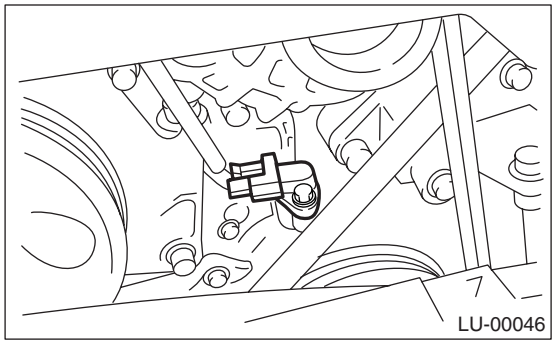


5) Remove the water pipe and hoses between oil cooler and water pump. (Turbo model)

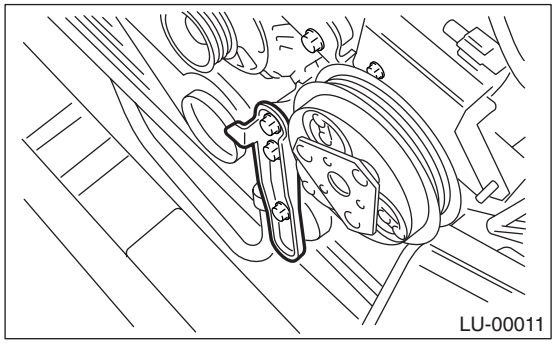


6) Remove the radiator. <Ref. to CO(H4SO)-28, REMOVAL, Radiator.>

7) Remove the crankshaft position sensor.

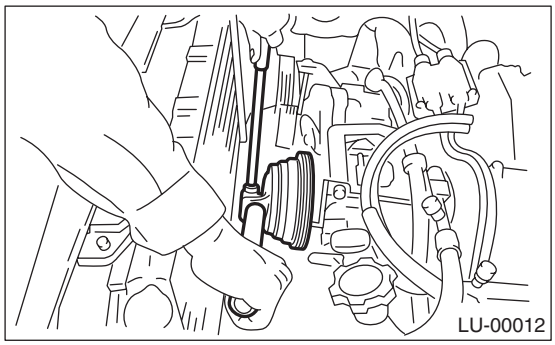


8) Remove the V-belts.
<Ref. to ME(H4SO)-43, REMOVAL**, V-belt.>** <Ref. to ME(H4DOTC 2.0)-53, REMOVAL, V-belt.>
9) Remove the rear side V-belt tensioner.



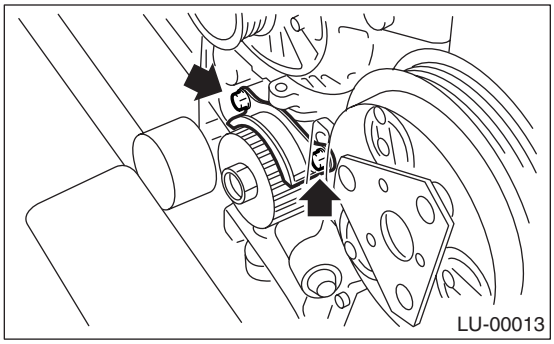
10) Remove the crank pulley by using ST.

ST	499977400	CRANK PULLEY WRENCH (2.0 L model)
ST	499977100	CRANK PULLEY WRENCH (2.5 L model)

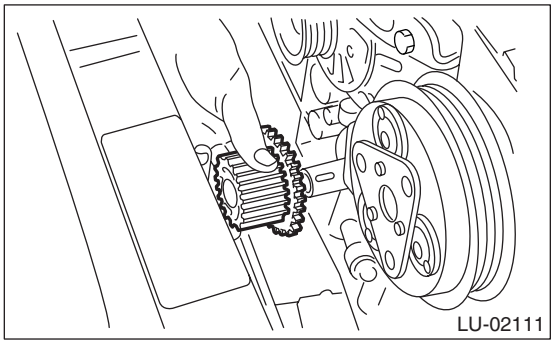


11) Remove the water pump. <Ref. to CO(H4SO)-21, REMOVAL, Water Pump.>

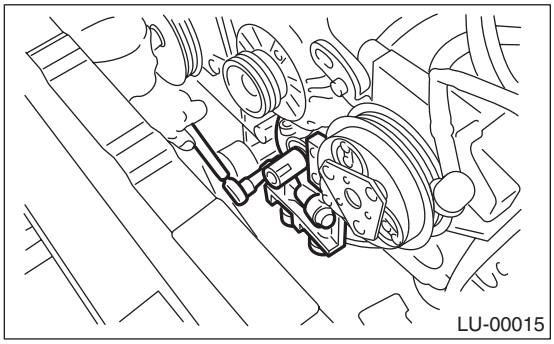
12) Remove the timing belt guide. (MT model)



13) Remove the crank sprocket.

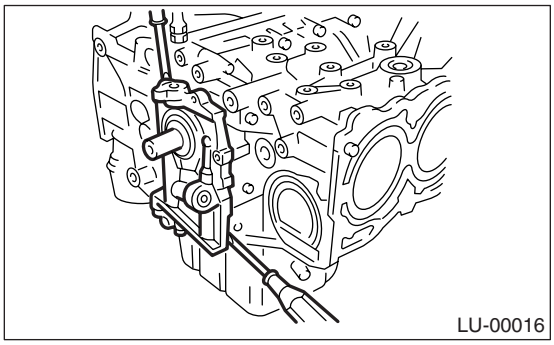


14) Remove the bolts which install oil pump onto cylinder block.



15) Remove the oil pump by using flat tip screwdriver.

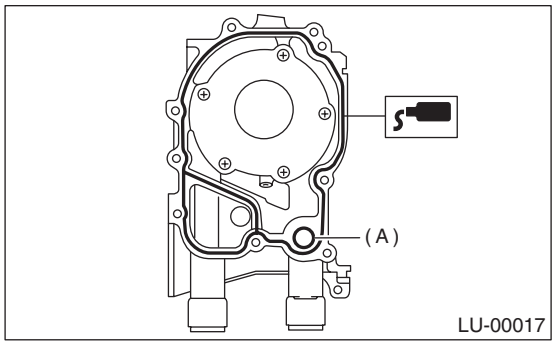
CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.



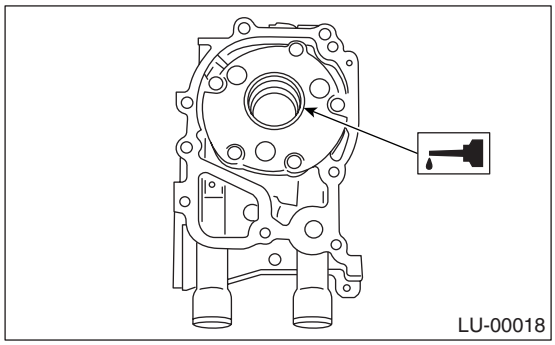
B: INSTALLATION

Install in the reverse order of removal.
Do the following:
1) Apply liquid gasket to the matching surfaces of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



2) Replace the O-ring (A) with a new one.
3) Apply a coat of engine oil to the inside of oil seal.



4) Be careful not to scratch the oil seal when installing oil pump on cylinder block.
5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

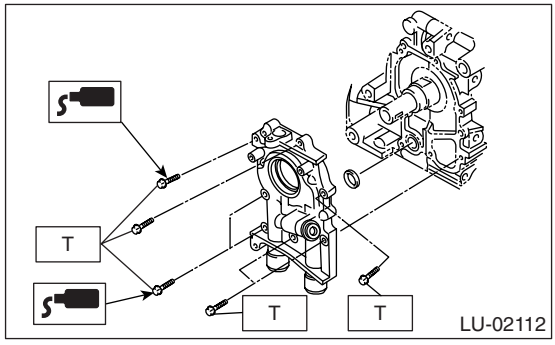
CAUTION:
Make sure the oil seal lip is not folded.

6) Install the oil pump.

Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:
Apply liquid gasket to the thread of installing bolt designated for sealing.

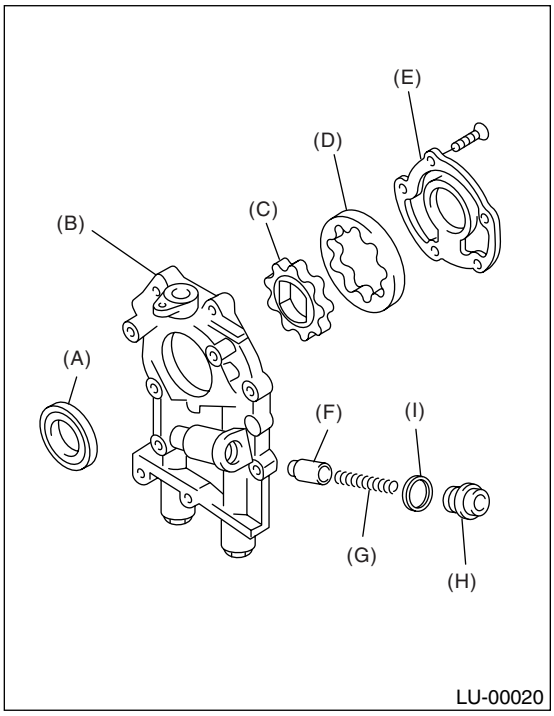
Liquid gasket:
THREE BOND 1324 (Parts No. 004403042) or equivalent



C: DISASSEMBLY

Remove the screws which secure oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:
Before disassembling the oil pump, remove the relief valve.

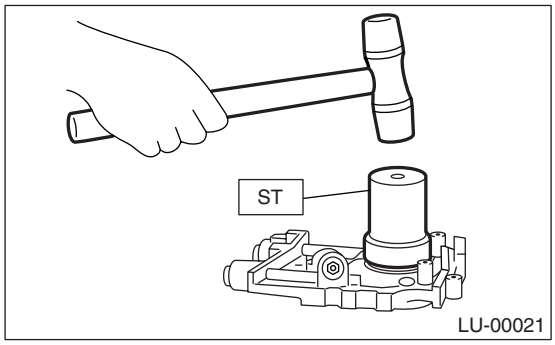


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

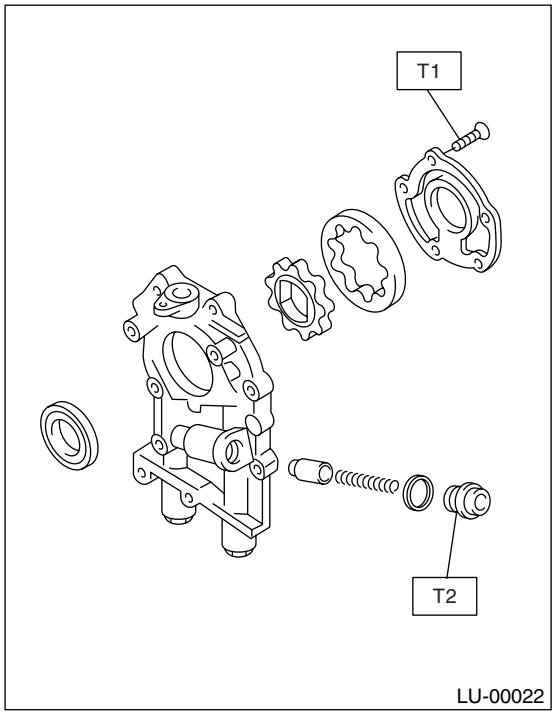


2) Apply a coat of engine oil to the inner and outer rotors.
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve and relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)
T2: 44 N·m (4.5 kgf-m, 33 ft-lb)

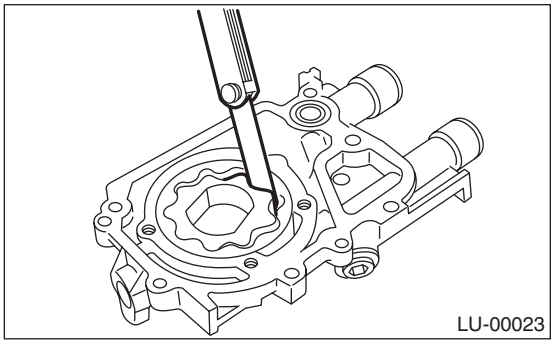


E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

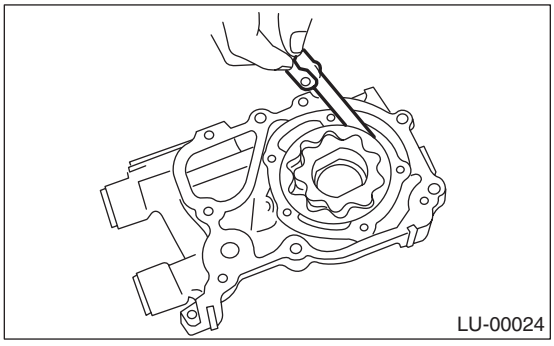
Tip clearance:
Standard:
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit:
0.18 mm (0.0071 in)


LU-00023

2. CASE CLEARANCE

Measure the clearance between the outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

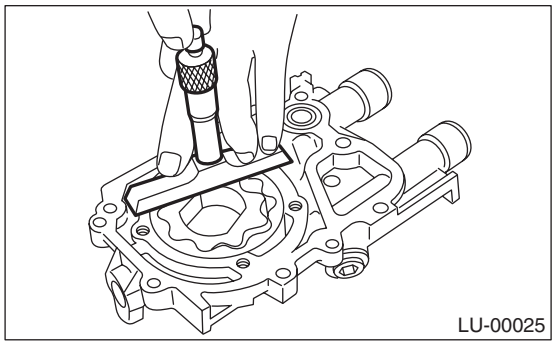
Case clearance:
Standard:
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit:
0.20 mm (0.0079 in)


LU-00024

3. SIDE CLEARANCE

Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

Side clearance:
Standard:
0.02 — 0.07 mm (0.0008 — 0.0028 in)
Limit:
0.12 mm (0.0047 in)


LU-00025

4. OIL RELIEF VALVE

Check the valve for fitting condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring:

Non-turbo model
Free length
72.8 mm (2.866 in)
Installed length
54.7 mm (2.154 in)
Load when installed
81.4 N (8.3 kgf, 18.3 lbf)

Turbo model
Free length
73.7 mm (2.902 in)
Installed length
54.7 mm (2.154 in)
Load when installed
93.2 N (9.5 kgf, 20.9 lbf)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

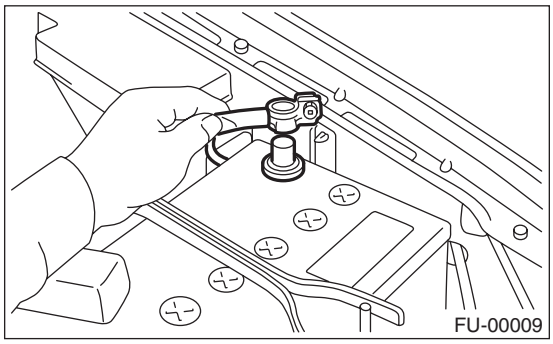
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

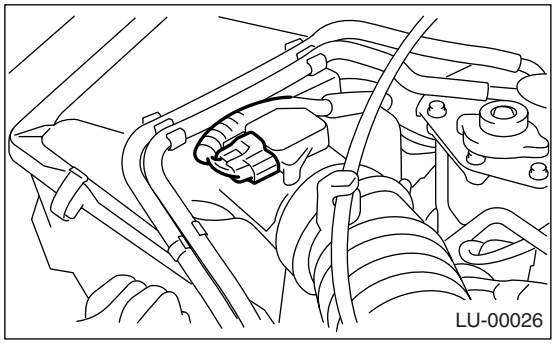
5. Oil Pan and Strainer

A: REMOVAL

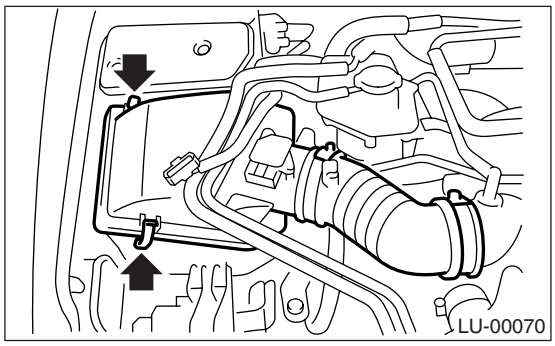
1) Set the vehicle on lift arms.
2) Remove the front wheels.
3) Disconnect the ground cable from battery.



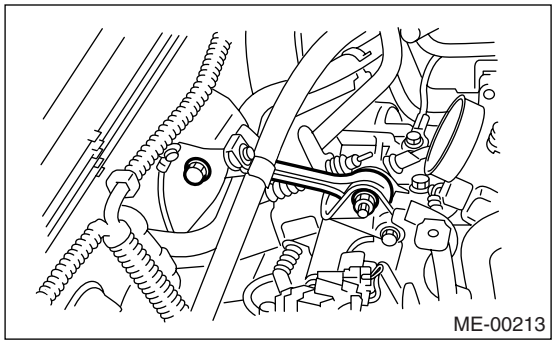
4) Remove the air intake duct and air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-7, REMOVAL**, Air Intake Duct.> <Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
5) Disconnect the connector from mass air flow sensor. (Turbo model)



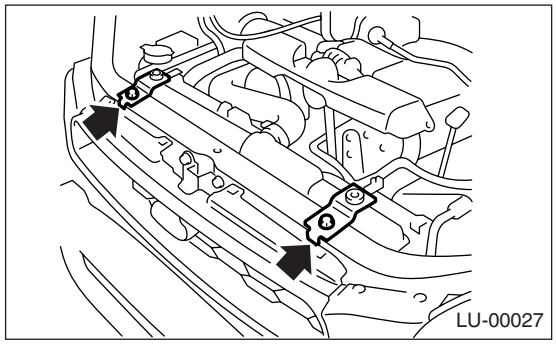
6) Remove the air intake boot and air cleaner upper cover. (Turbo model)



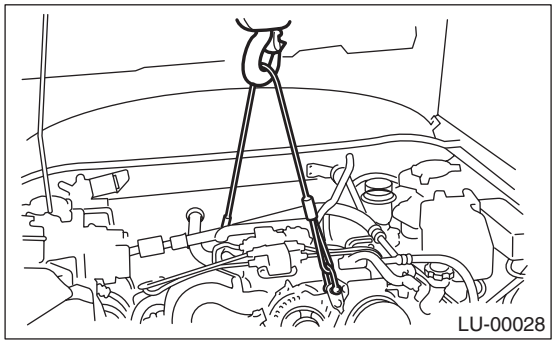
7) Remove the intercooler (Turbo model) <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
8) Remove the pitching stopper.



9) Remove the radiator upper brackets.



10) Support the engine with a lifting device and wire ropes.

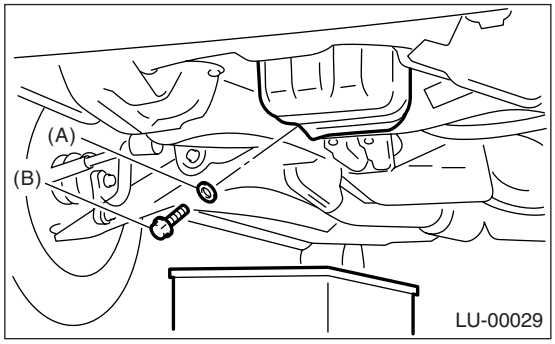


11) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, rise up the wire rope together.

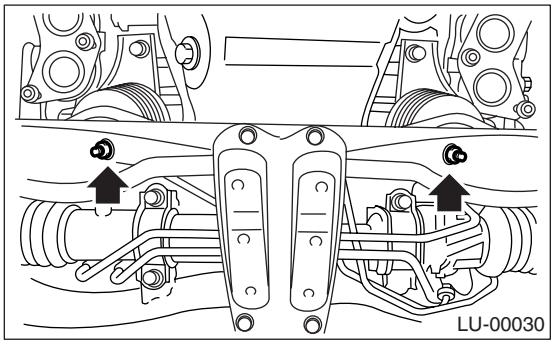
12) Remove the under cover.

13) Drain the engine oil.
Set a container under the vehicle, and remove the drain plug from oil pan.



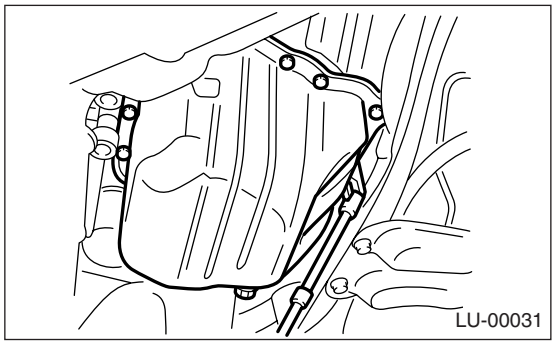
(A) Gasket
(B) Drain plug

14) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX(H4SO)-7, REMOVAL, Front Exhaust Pipe.>
15) Remove the nuts which install front cushion rubber onto front crossmember.

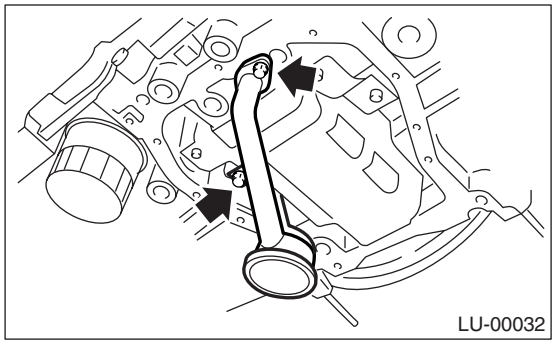


16) Remove the bolts which install oil pan on cylinder block while raising up engine.
17) Insert the oil pan cutter blade between the cylinder block to oil pan clearance.

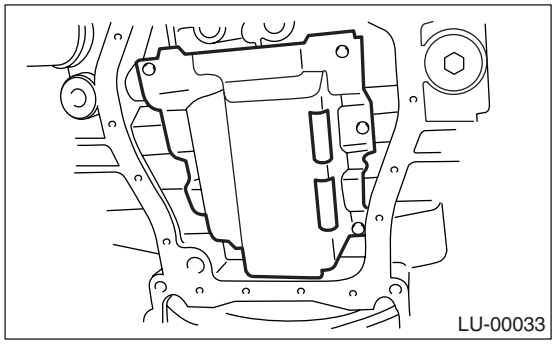
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.



18) Remove the oil strainer.



19) Remove the baffle plate.

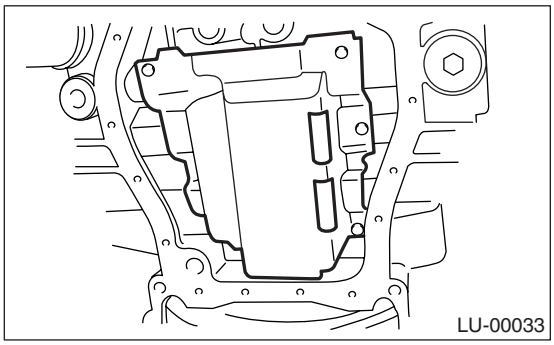


B: INSTALLATION

CAUTION:
Before installing the oil pan, clean sealant from oil pan and engine block.

1) Install the baffle plate.

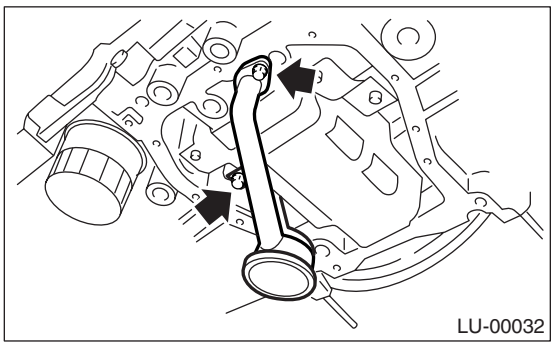
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Install the oil strainer onto baffle plate.

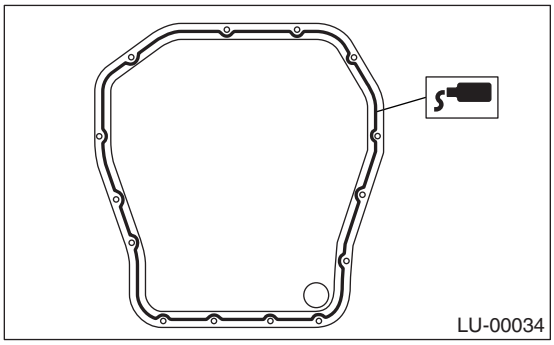
NOTE:
Replace the O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



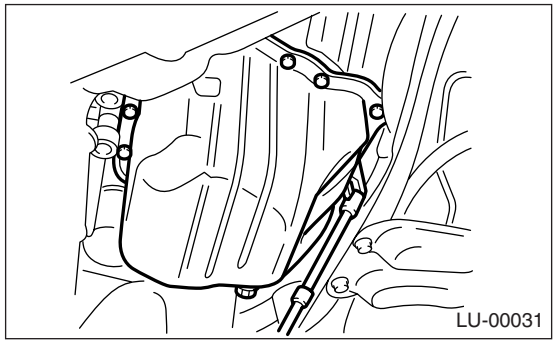
3) Apply liquid gasket to the mating surfaces and install oil pan.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent



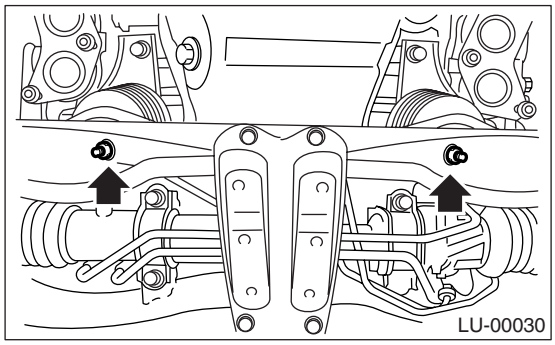
4) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



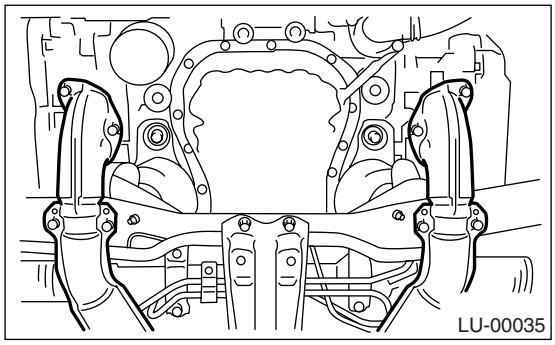
5) Lower the engine onto front crossmember.
6) Tighten the nuts which install front cushion rubber onto front crossmember.

Tightening torque:
69 N·m (7.0 kgf-m, 51 ft-lb)



7) Install the front and center exhaust pipes. (Non-Turbo model) <Ref. to EX(H4SO)-8, INSTALLATION, Front Exhaust Pipe.>

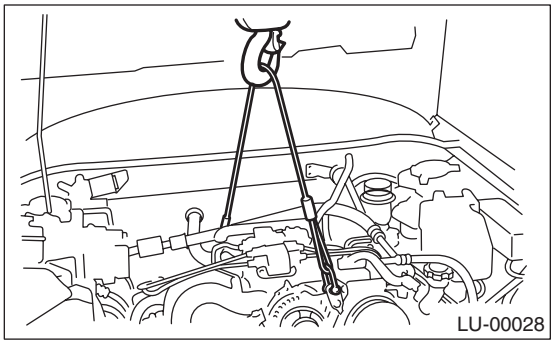
NOTE:
Always use new gaskets.



8) Install the under cover.
9) Lower the vehicle.

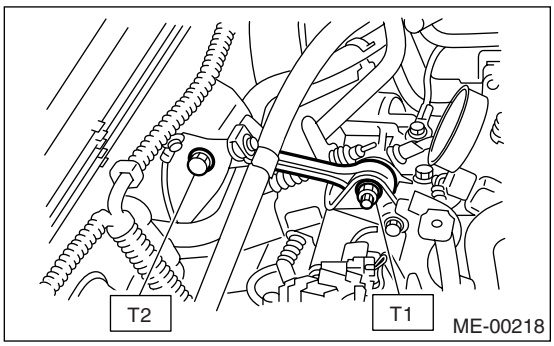
CAUTION:
When lowering the vehicle, lower the lifting device and wire rope together.

10) Remove the lifting device and wire ropes.

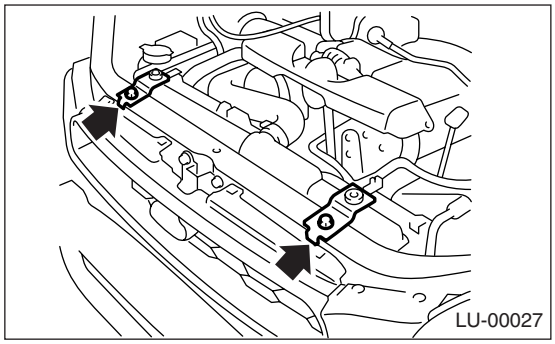


11) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



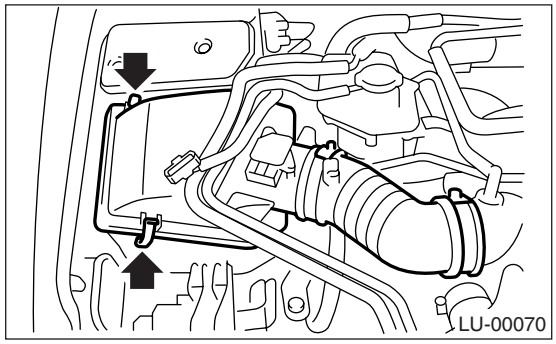
12) Install the radiator upper brackets.



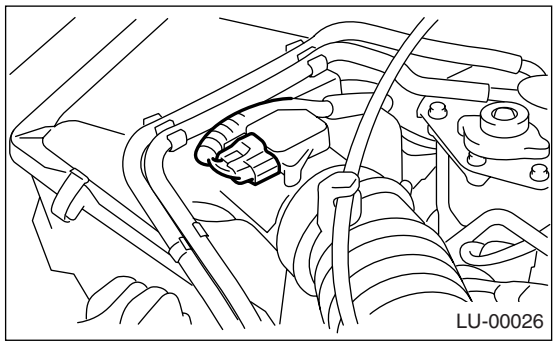
13) Install the air intake duct and air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-7,** INSTALLATION**, Air Intake Duct.> <Ref. to IN(H4SO)-6,** INSTALLATION**, Air Cleaner Case.>**

14) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>

15) Install the air intake boot and air cleaner upper cover. (Turbo model)

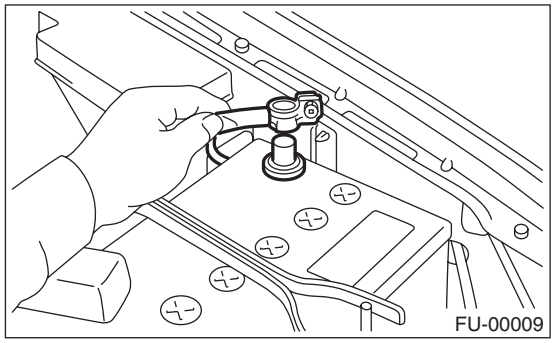


16) Connect the connector to mass air flow sensor. (Turbo model)



17) Install the front wheels.

18) Connect the battery ground cable to battery.



19) Fill engine oil. **<Ref. to LU(H4SO)-11,** INSPECTION**, Engine Oil.>**

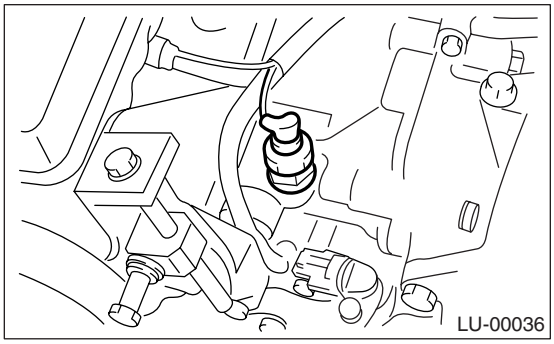
C: INSPECTION

By visual check make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

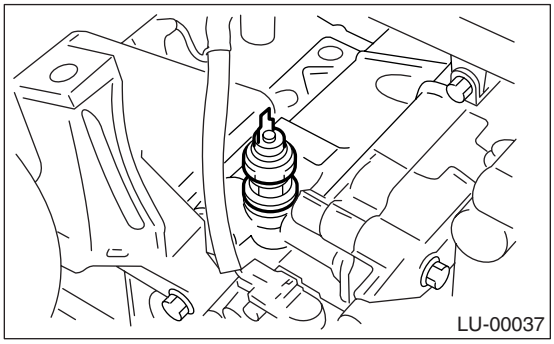
6. Oil Pressure Switch

A: REMOVAL

1) Remove the generator from bracket. **<Ref. to SC(H4SO)-15,** REMOVAL**, Generator.>**
2) Disconnect the terminal from oil pressure switch.



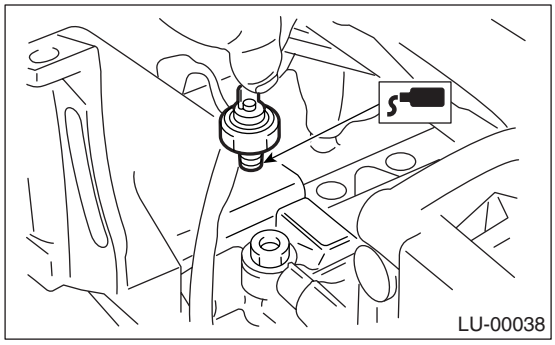
3) Remove the oil pressure switch.



B: INSTALLATION

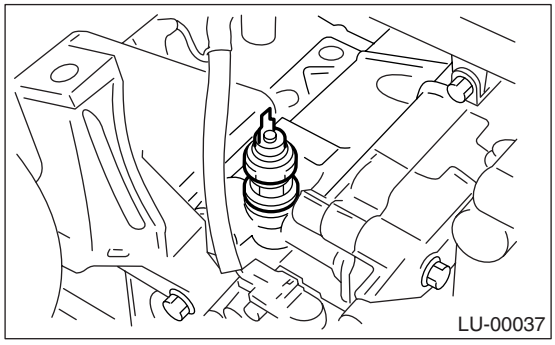
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403007) or equivalent

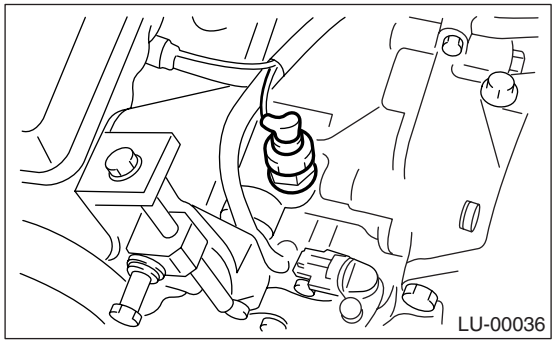


2) Install the oil pressure switch onto engine block.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Connect the terminal of oil pressure switch.



4) Install the generator on bracket. <Ref. to SC(H4SO)-15, INSTALLATION, Generator.>

C: INSPECTION

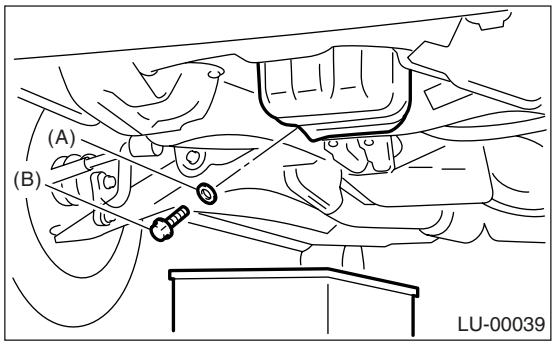
Make sure oil does not leak or seep from where the oil pressure switch is installed.

7. Engine Oil Cooler

A: REMOVAL

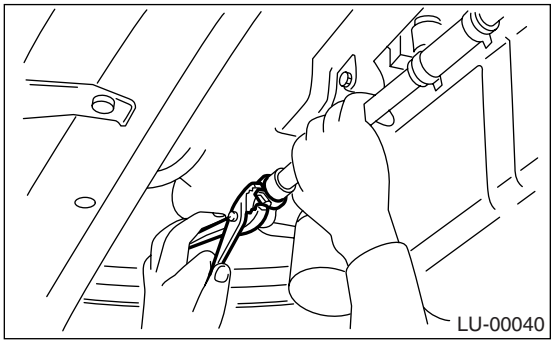
NOTE:
Engine oil cooler is equipped with turbo model only.

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain the engine oil. Set a container under the vehicle, and remove the drain plug from oil pan.

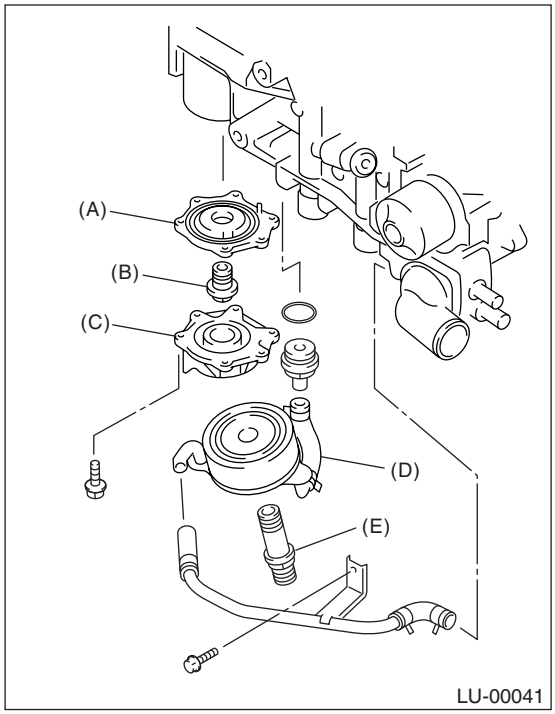


(A) Gasket
(B) Drain plug

4) Drain the engine coolant.
5) Remove the water by-pass pipe between oil cooler and water pump.



6) Remove the engine oil filter. **<Ref. to LU(H4SO)-25,** REMOVAL**, Engine Oil Filter.>**
7) Disconnect the connector and remove oil cooler.
8) Remove the adapters (1) and (2).

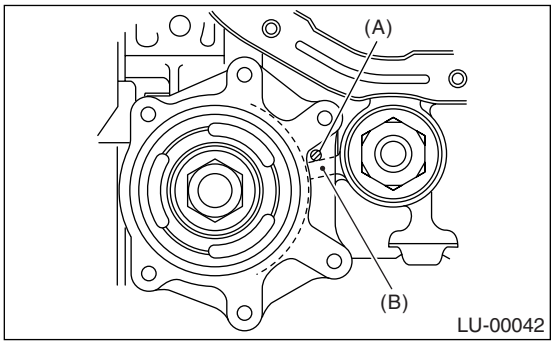


(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

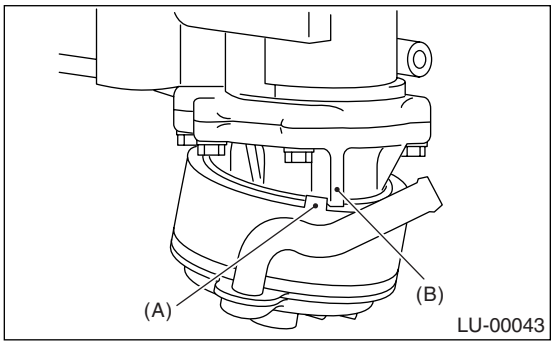
B: INSTALLATION

NOTE:
Engine oil cooler is equipped with turbo model only.

1) Install in the reverse order of removal.
2) Contact the knock pin (A) of adapter (1) to cylinder block rib (B) to install adapter (1).



3) Install the adapter (2).
4) Contact the engine oil cooler stopper (A) to adapter (2) rib (B) to install engine oil cooler.

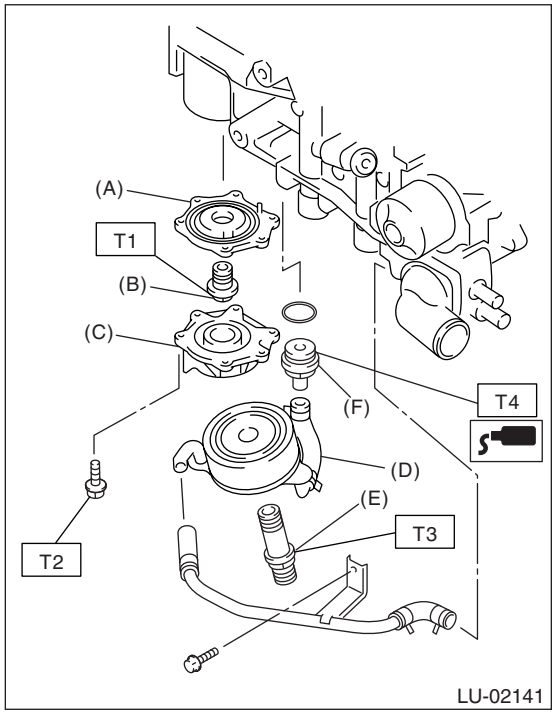


5) Apply liquid gasket to the plug thread when installing it.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

Tightening torque:
T1: 45 N·m (4.6 kgf-m, 33 ft-lb)
T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T3: 54 N·m (5.5 kgf-m, 40 ft-lb)
T4: 69 N·m (7.0 kgf-m, 51 ft-lb)

NOTE:
Always use a new O-ring.



(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector
(F) Plug

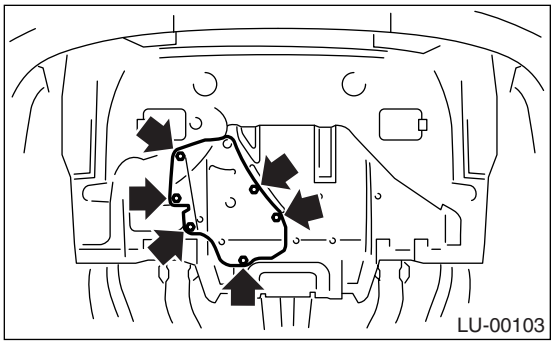
C: INSPECTION

1) Check that the coolant passages are not clogged using air blow method.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

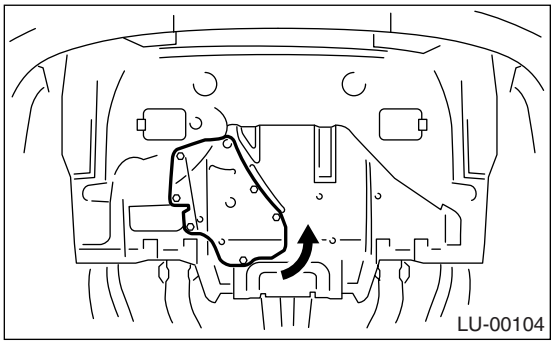
8. Engine Oil Filter

A: REMOVAL

1) Remove six clips on the under cover.

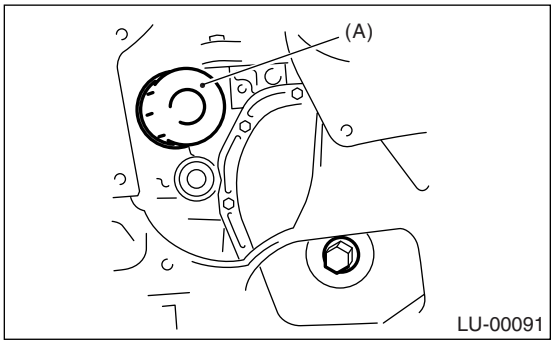


2) Turn the service hole cover counterclockwise.



3) Remove the oil filter with ST.

ST	498547000	OIL FILTER WRENCH (Outer diameter: 80 mm (3.15 in))
ST	18332AA000	OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))
ST	18332AA010	OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))



(A) Oil filter

B: INSTALLATION

1) Wipe and clean the oil filter matching surface on cylinder block and oil cooler.
2) Get a new oil filter and apply a thin coat of engine oil to the seal rubber.

CAUTION:
Be careful not to use the oil filter 80 mm (3.15 in) in diameter to turbo model.

3) Install the oil filter by turning it by hand, being careful not to damage seal rubber.

- Tighten the oil filter 80 mm (3.15 in) or 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.
- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler.

CAUTION:
Do not tighten excessively, or oil may leak.

C: INSPECTION

1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

NOTE:
The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

2) Check the engine oil level. **<Ref. to LU(H4SO)-11,** INSPECTION**, Engine Oil.>**

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil level	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Malfunction of combination meter		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1) — 2).

SPEED CONTROL SYSTEMS

SP(H4SO)

Page

1. General Description 2
2. Accelerator Pedal 4
3. Accelerator Control Cable 9

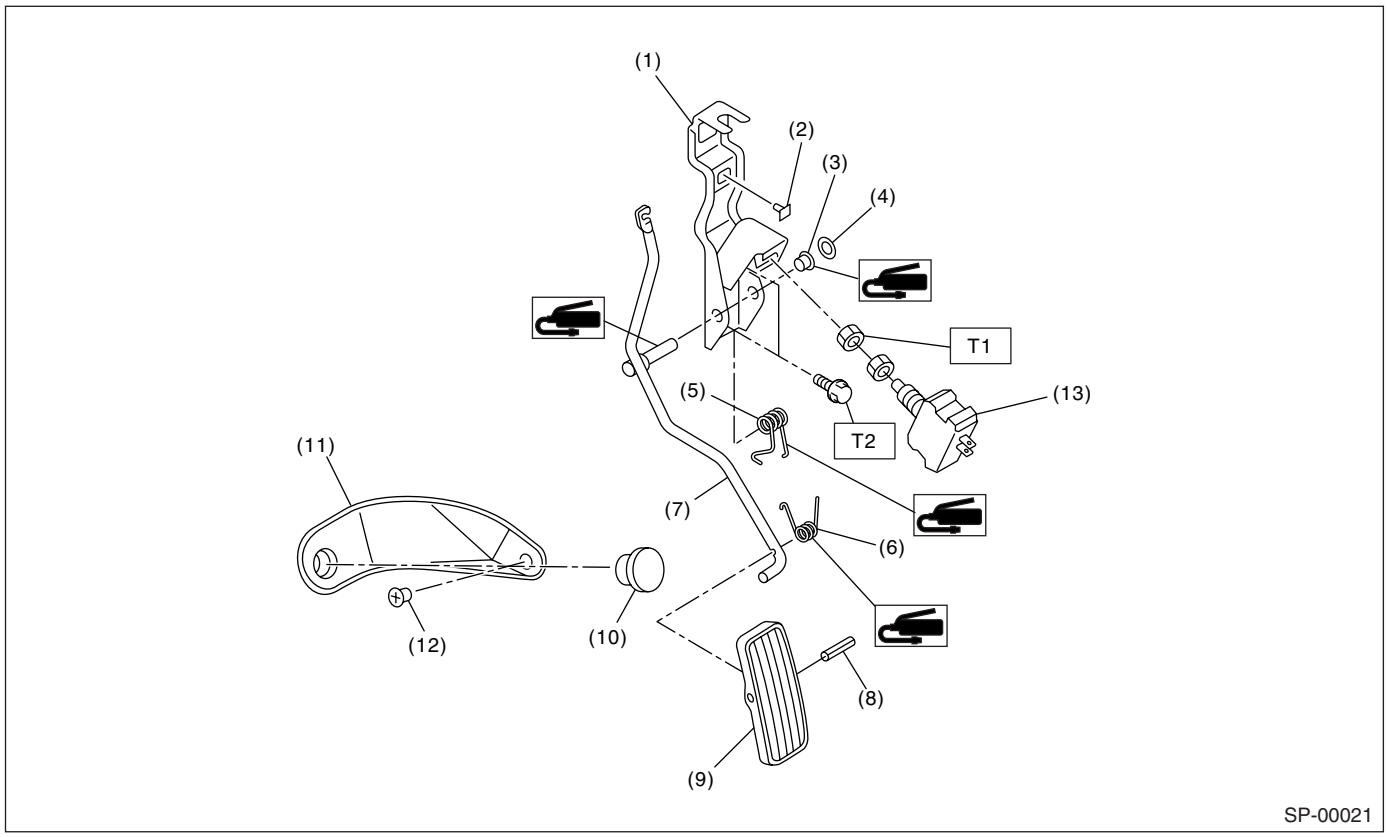
1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT

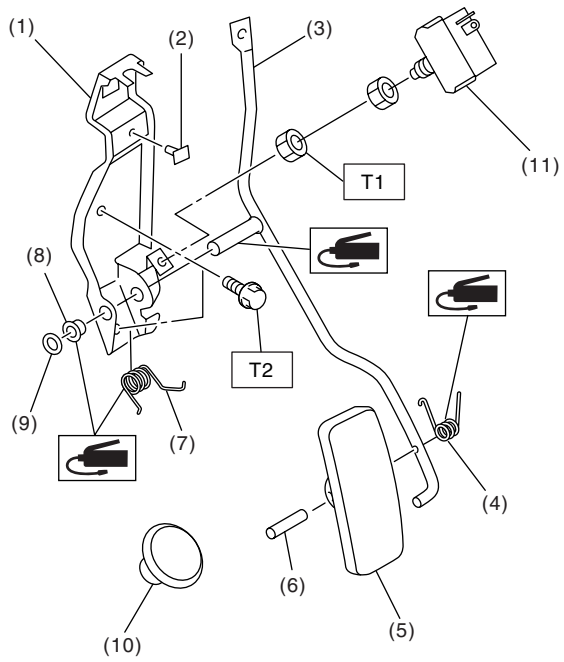
1. LHD MODEL



(1) Accelerator bracket
(2) Stopper
(3) Bushing
(4) Clip
(5) Accelerator spring
(6) Accelerator pedal spring
(7) Accelerator pedal lever
(8) Spring pin
(9) Accelerator pedal
(10) Accelerator stopper
(11) Accelerator plate
(12) Clip
(13) Kick-down switch (AT model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 12 (1.2, 9.0)
T2: 18 (1.8, 13.0)

2. RHD MODEL



SP-00022

(1) Accelerator bracket
(2) Stopper
(3) Accelerator pedal lever
(4) Accelerator pedal spring
(5) Accelerator pedal
(6) Spring pin
(7) Accelerator spring
(8) Bushing
(9) Clip
(10) Accelerator stopper
(11) Kick-down switch (AT model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 12 (1.2, 9.0)
T2: 18 (1.8, 13.0)

C: CAUTION

- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

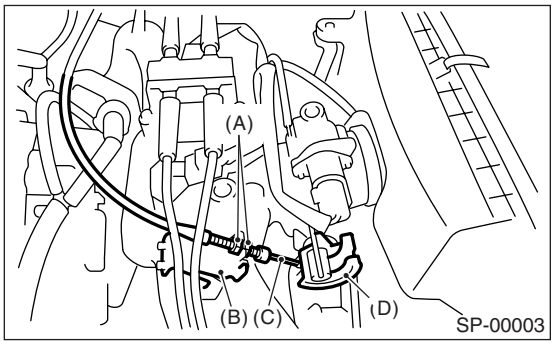
2. Accelerator Pedal

A: REMOVAL

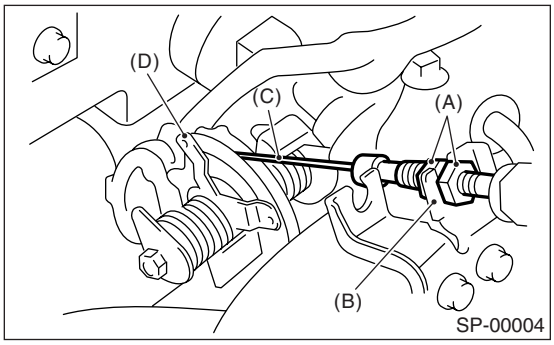
1) Disconnect the ground cable from battery.
2) Remove the lock nut from accelerator cable bracket.
3) Separate the accelerator cable from bracket.
4) Remove the accelerator cable end from throttle cam.

NOTE:
Be careful not to kink the accelerator cable.

- Non-turbo model



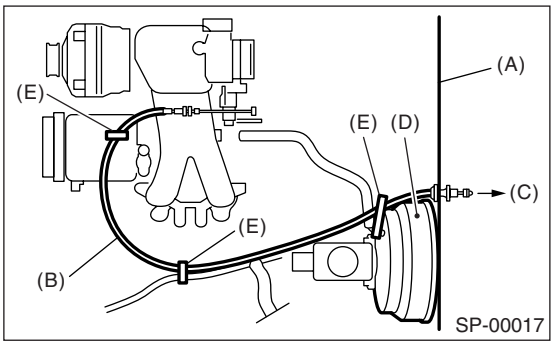
- Turbo model



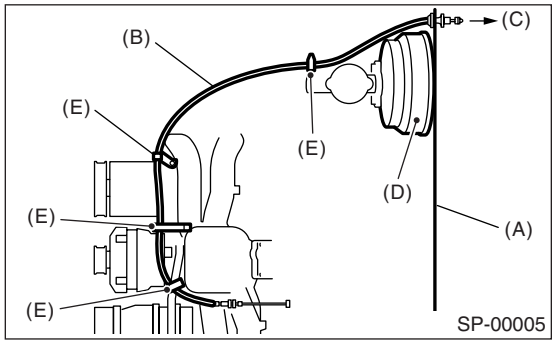
(A) Lock nut
(B) Accelerator cable bracket
(C) Accelerator cable
(D) Throttle cam

5) Remove the clip inside engine compartment.

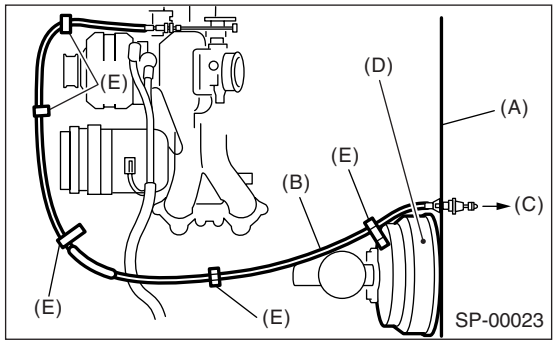
- LHD Non-turbo model



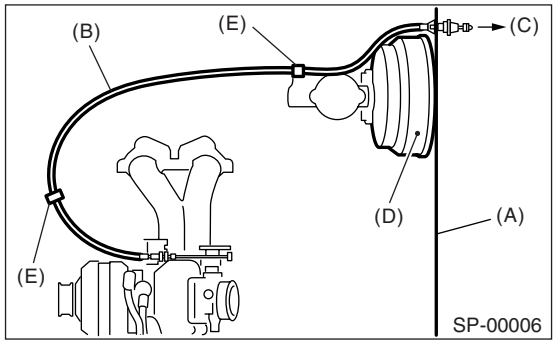
- RHD Non-turbo model



- LHD Turbo model



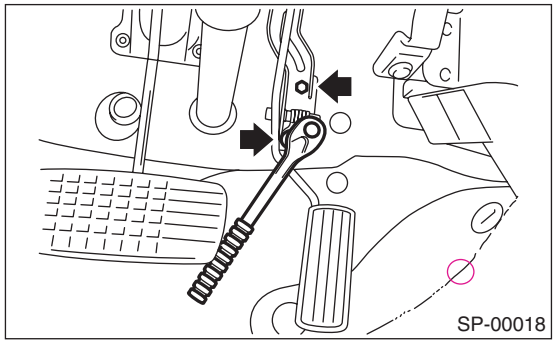
- RHD Turbo model



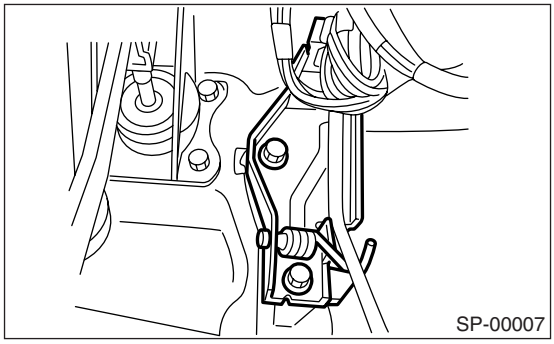
(A) Toe board
(B) Accelerator cable
(C) To accelerator pedal
(D) Brake booster
(E) Clip

6) Remove the instrument panel lower cover from instrument panel, and connector.
7) Disconnect the connector from kick-down switch. (AT model)
8) Remove the accelerator pedal mounting bolt from accelerator pedal bracket.

- LHD model

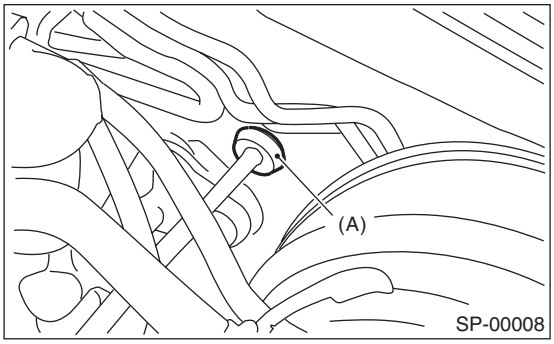


- RHD model

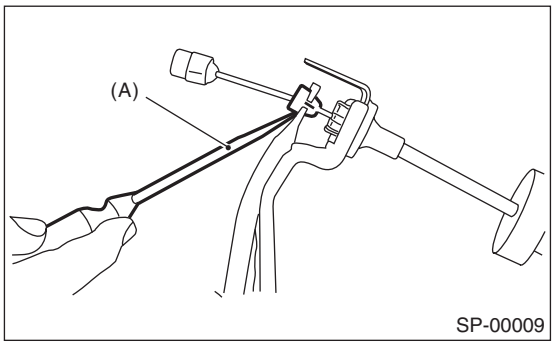


9) Disconnect the grommet from toe board.

NOTE:
From the inside compartment, push the grommet (A) into hole.

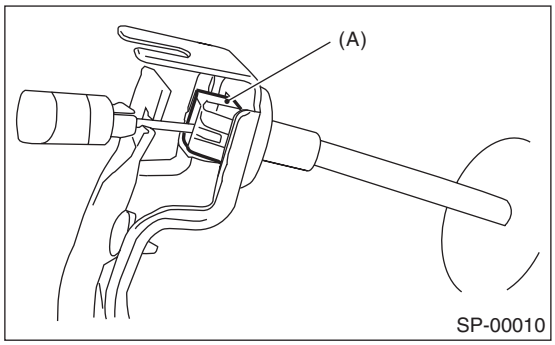


10) Pull out the cable from toe board hole.
11) Disconnect the accelerator cable bushing from accelerator pedal lever.



(A) Flat tip screwdriver

12) Disconnect the accelerator cable stopper (A) from bracket.



13) Separate the accelerator cable and accelerator bracket.

B: INSTALLATION

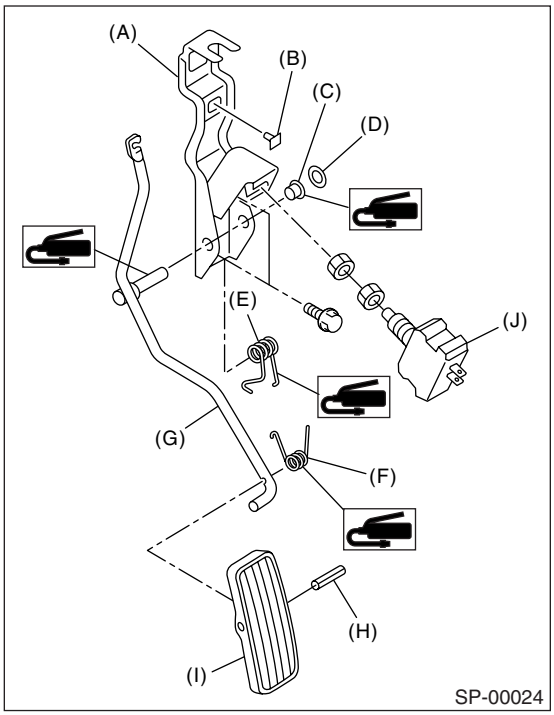
Install in the reverse order of removal.

NOTE:
- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- For tightening torque, refer to “COMPONENT”. **<Ref. to SP(H4SO)-2,** COMPONENT**, General Description.>**

C: DISASSEMBLY

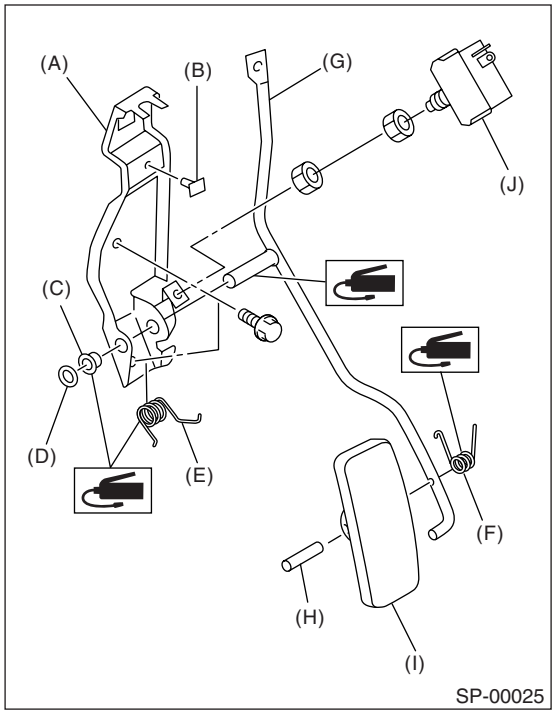
1) Remove the clip, and then remove the accelerator pedal lever from accelerator bracket.
2) Pull out the spring pin, and then remove the accelerator pedal from accelerator pedal lever.

- LHD model



(A) Accelerator bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal
(J) Kick-down switch (AT model)

- RHD model



(A) Accelerator bracket
(B) Stopper
(C) Bushing
(D) Clip
(E) Accelerator spring
(F) Accelerator pedal spring
(G) Accelerator pedal lever
(H) Spring pin
(I) Accelerator pedal
(J) Kick-down switch (AT model)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Clean and apply grease to the portions indicated in the figure.

Grease:
SUNLIGHT No. 2 (Part No. 003602010)

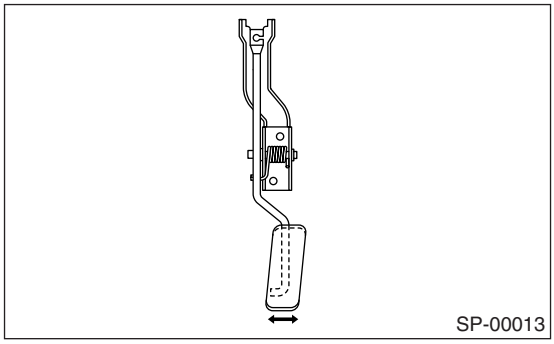
E: INSPECTION

1. ACCELERATOR PEDAL

Lightly move the pedal pad in lateral direction to ensure that pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushing and clip with new ones.

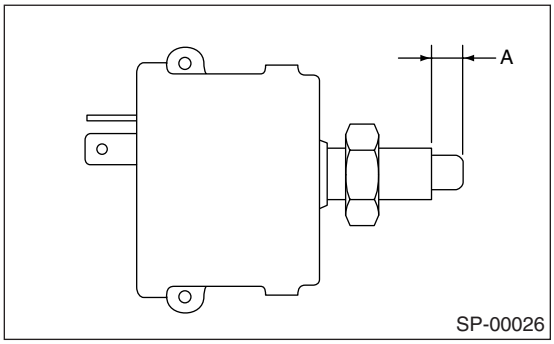
Deflection of accelerator pedal:
Service limit :
±2.0 mm (±0.079 in) or less



2. KICK-DOWN SWITCH

If the kick-down switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position A:
2.0 — 3.5 mm (0.079 — 0.098 in)

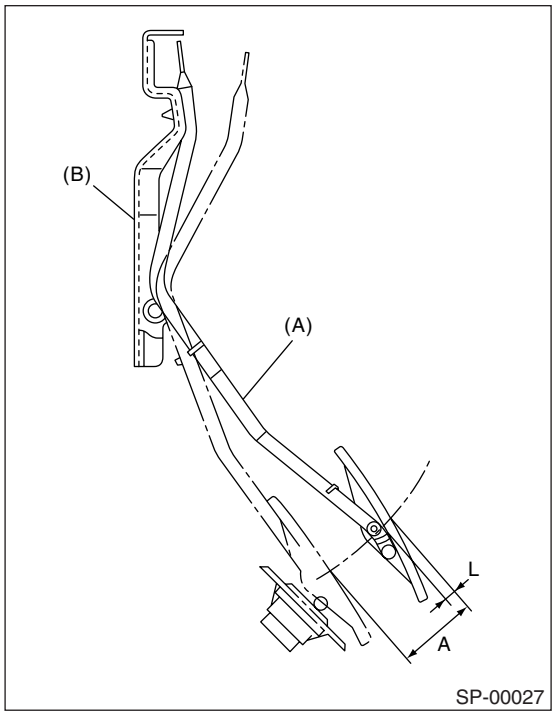


F: ADJUSTMENT

1) Check the pedal stroke and free play by operating accelerator pedal by hand.
2) If it is not within specified value, adjust it by turning the nut connecting the accelerator cable to throttle body.

Free play at pedal pad L:
0 — 4 mm (0 — 0.16 in)

Stroke at pedal pad A:
52 — 57 mm (2.05 — 2.24 in)



(A) Accelerator pedal
(B) Accelerator pedal bracket

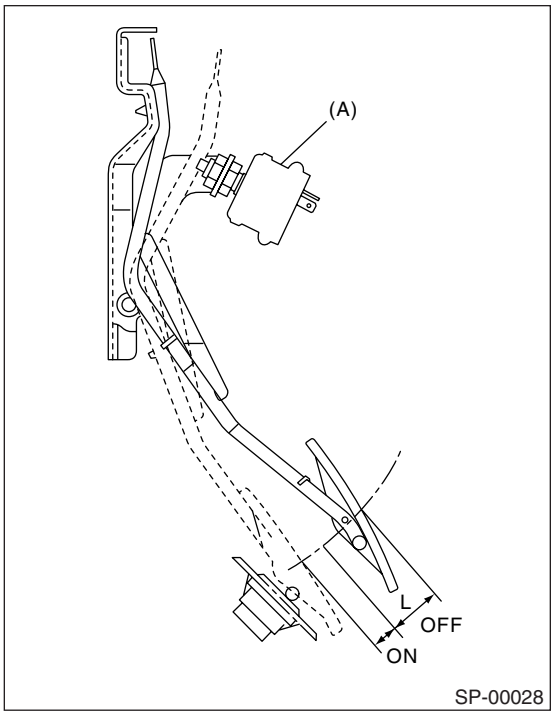
Accelerator cable lock nut tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

3) Check to ensure the kick-down switch operates at the specified value in relation to the stroke of the accelerator pedal.
If it is not within specified value, adjust it by adjusting the position of kick-down switch.

CAUTION:
Be careful not to rotate the kick-down switch.

Kick-down switch stroke L:
47 — 49 mm (1.85 — 1.93 in)

Kick-down switch tightening torque:
12 N·m (1.2 kgf-m, 9.0 ft-lb)



(A) Kick down switch

3. Accelerator Control Cable

A: REMOVAL

1) Remove the accelerator pedal. **<Ref. to SP(H4SO)-4,** REMOVAL**, Accelerator Pedal.>**
2) Separate the accelerator cable and accelerator pedal.

B: INSTALLATION

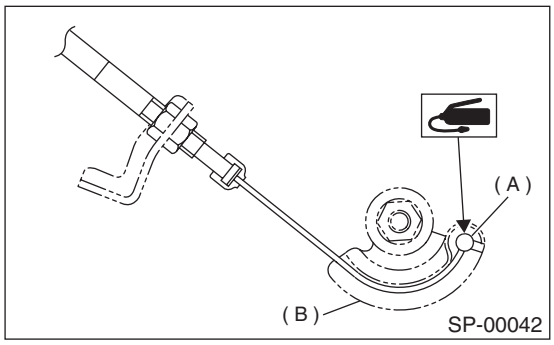
1) Install in the reverse order of removal.

NOTE:
- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.

CAUTION:
Do not apply grease to except specified part.

2) Apply grease to engine side accelerator cable end.

Grease:
Slicolube G-30M (Part No. 004404002)



(A) Accelerator cable end
(B) Throttle cam

3) Adjustment after pedal installation. **<Ref. to SP(H4SO)-7,** ADJUSTMENT**, Accelerator Pedal.>**

C: INSPECTION

1) Make sure the inner cable is not twisted or worn.
2) Make sure the outer cable is not cracked.

IGNITION

IG(H4SO)

Page

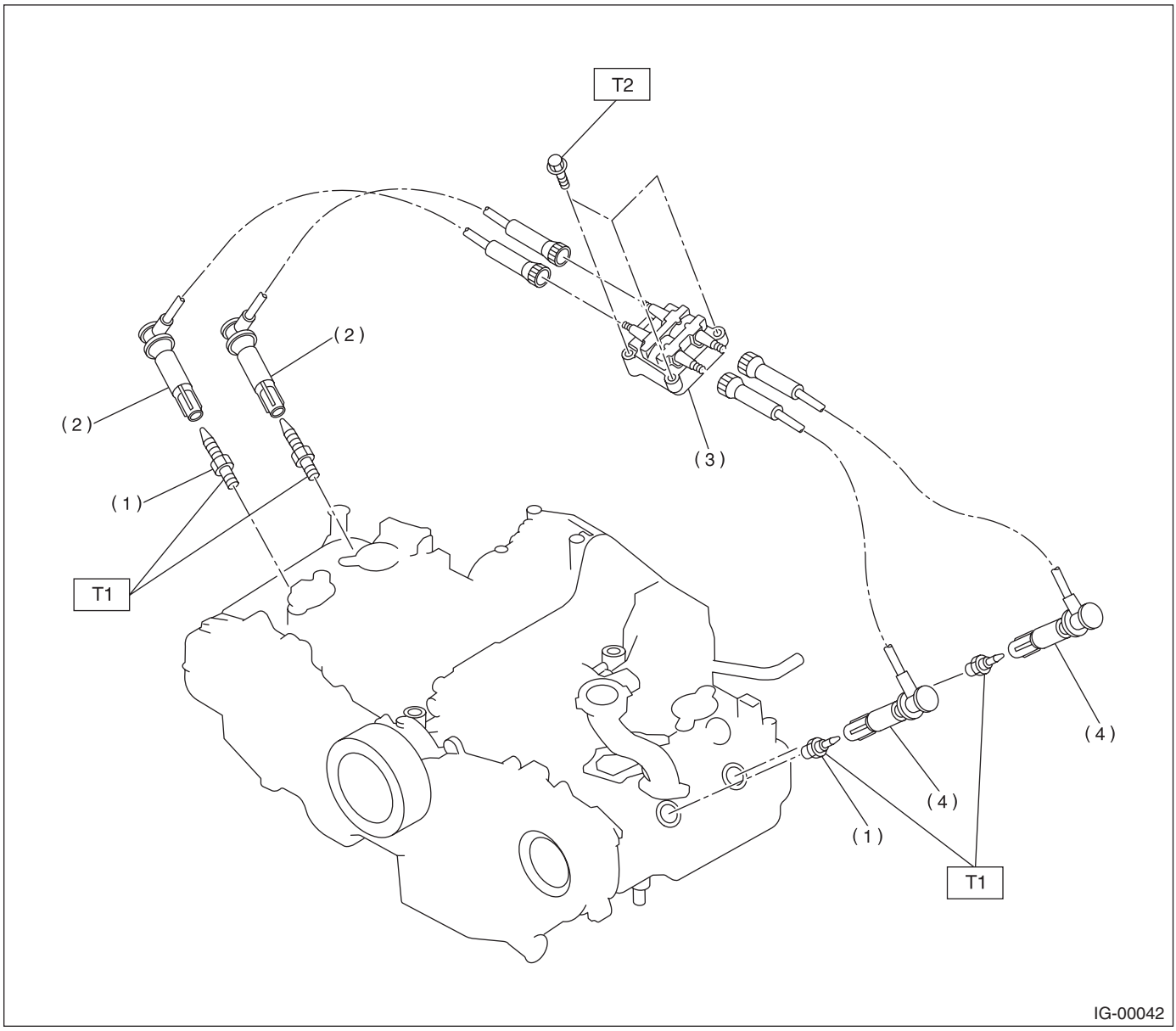
1. General Description 2
2. Spark Plug 5
3. Ignition Coil & Ignitor Assembly 8
4. Spark Plug Cord 9

1. General Description

A: SPECIFICATION

Item		Designation
Ignition coil/ignitor assembly	Model	FH0137
	Manufacturer	DIAMOND
	Primary coil resistance	0.73 Ω±10%
	Secondary coil resistance	12.8 kΩ±15%
	Insulation resistance between primary terminal and case	More than 100 MΩ
Spark plug	Manufacturer and type	CHAMPION: RC10YC4 NGK: BKR5E-11 (Alternate)
	Thread size mm	14, P = 1.25
	Spark plug gap mm (in)	1.0 — 1.1 (0.039 — 0.043)

B: COMPONENT



(1) Spark plug
(2) Spark plug cord (#1, #3)
(3) Ignition coil & ignitor ASSY
(4) Spark plug cord (#2, #4)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 6.4 (0.65, 4.7)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

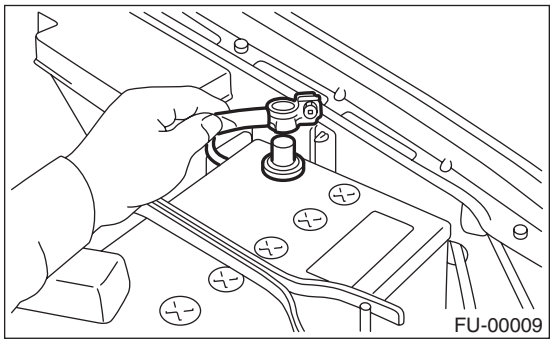
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

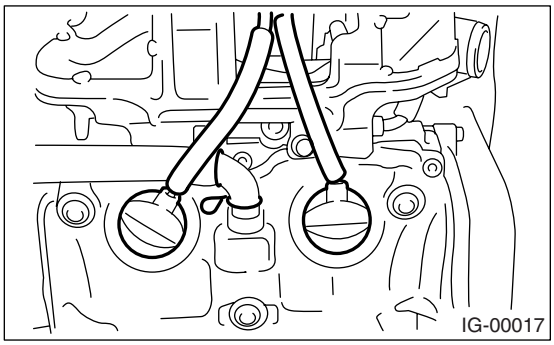
Spark plug
CHAMPION: RC10YC4 NGK: BKR5E-11 (Alternate)

1. RH SIDE

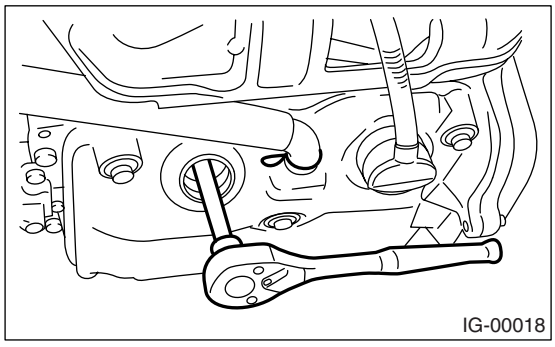
1) Disconnect the ground cable from battery.



2) Remove the air cleaner case. **<Ref. to IN(H4SO)-8,** REMOVAL**, Resonator Chamber.>**
3) Remove the spark plug cords by pulling boot, not the cord itself.

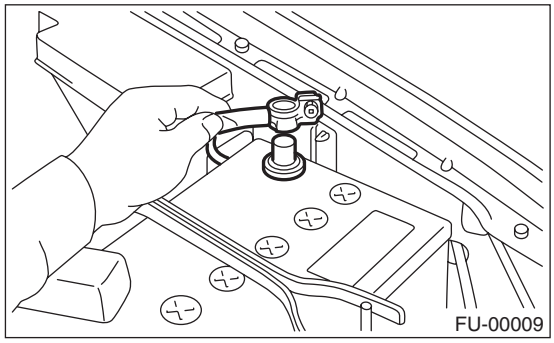


4) Remove the spark plugs with spark plug sockets.

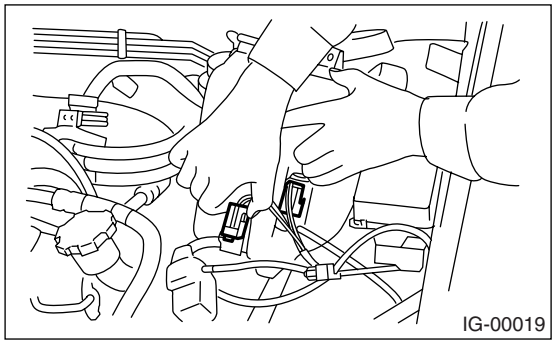


2. LH SIDE

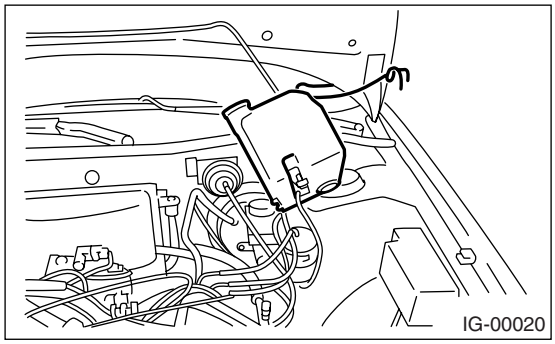
1) Disconnect the ground cable from battery.



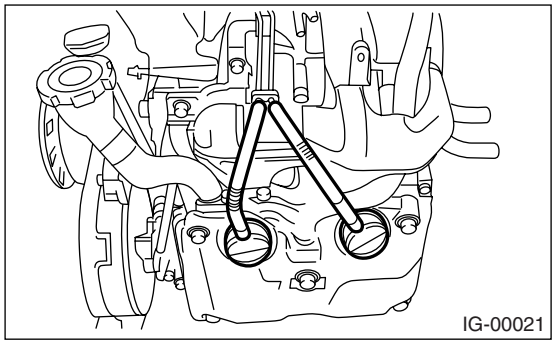
2) Disconnect the washer motor connector.



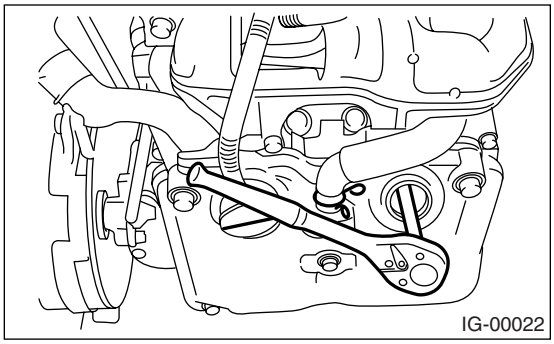
3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold washer tank, then take the tank away from the working area.



5) Remove the spark plugs cord by pulling boot, not the cord itself.



6) Remove the spark plugs with spark plug sockets.


IG-00022

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

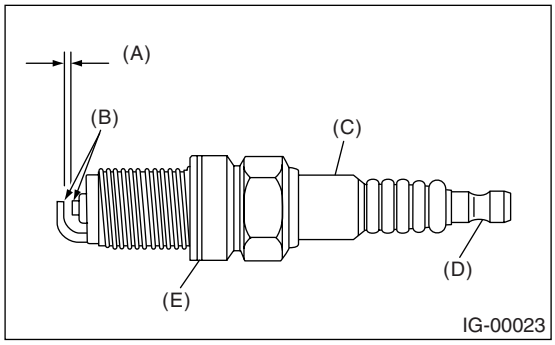
Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

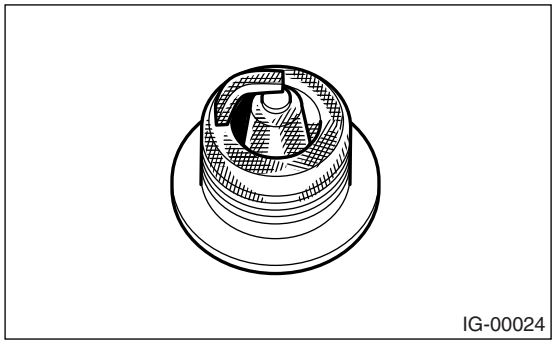
Check the electrodes and inner and ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



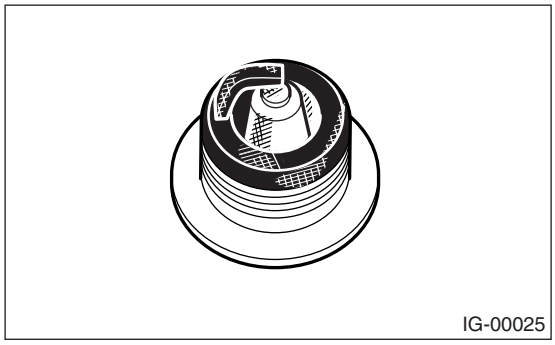
IG-00023

(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

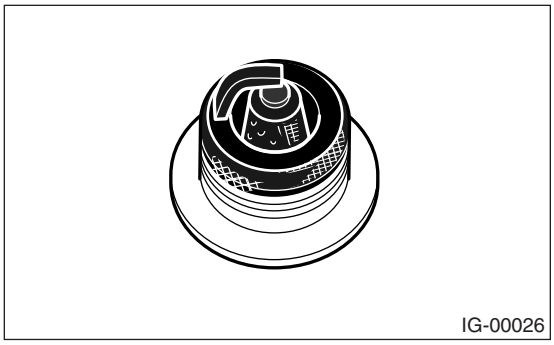
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.


IG-00024

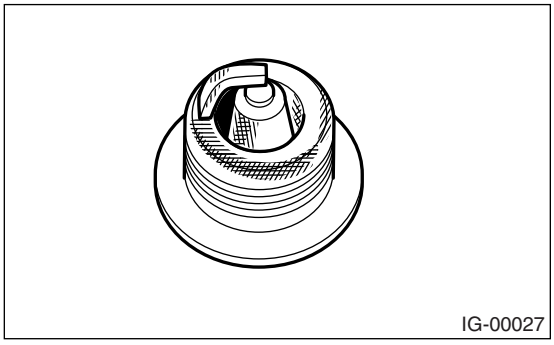
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.


IG-00025

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.


IG-00026

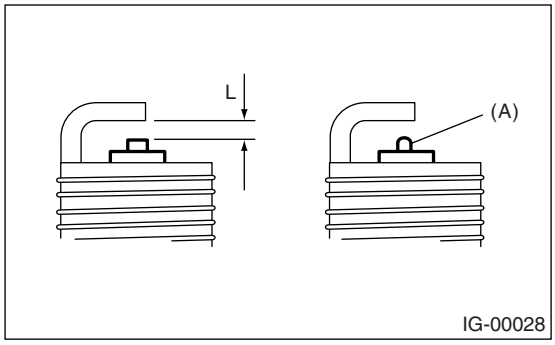
4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc.


IG-00027

D: CLEANING
Clean the spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove the carbon or oxide deposits, but do not wear away ceramic insulator.
If deposits are too stubborn, replace the spark plugs.

E: ADJUSTMENT
Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

Spark plug gap: L
1.0 — 1.1 mm (0.039 — 0.043 in)



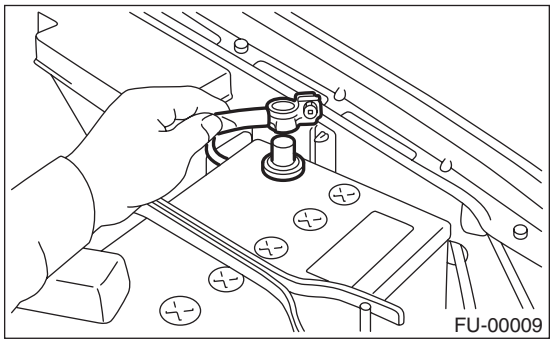
IG-00028

NOTE:
Replace with a new spark plug if this area (A) is worn to “ball” shape.

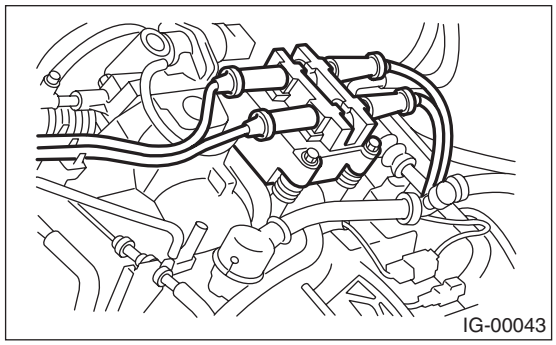
3. Ignition Coil & Ignitor Assembly

A: REMOVAL

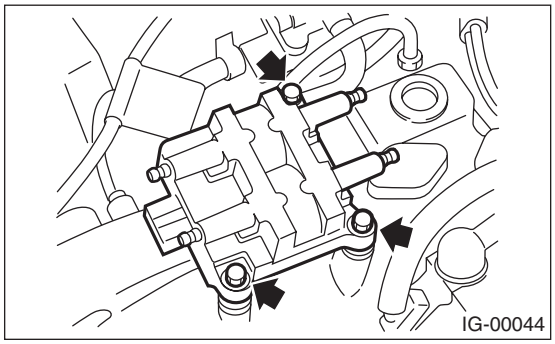
1) Disconnect the ground cable from battery.



2) Disconnect the spark plug cords from ignition coil & ignitor assembly.



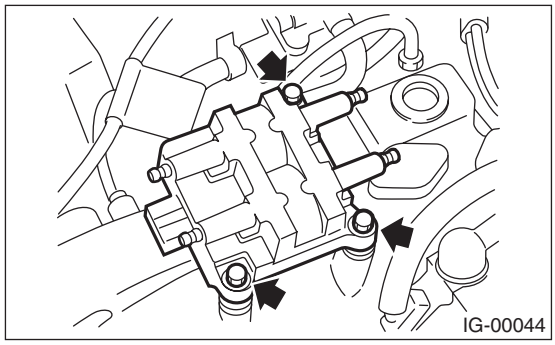
3) Disconnect the connector from ignition coil & ignitor assembly.
4) Remove the ignition coil & ignitor assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



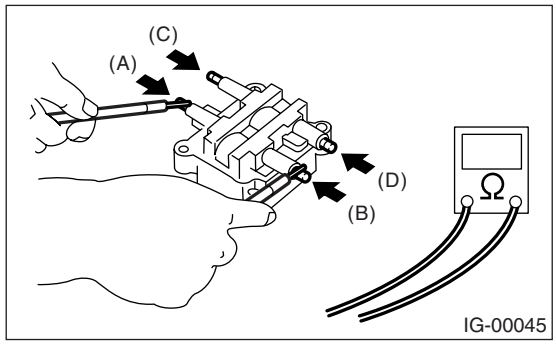
C: INSPECTION

Using the accurate tester, inspect the secondary coil resistance, and replace if defective.

CAUTION:
• If the resistance is extremely low, this indicates the presence of a short-circuit.
• Ignitor is integrated in coil. Therefore, primary coil resistance can not be measured.

Specified resistance:

[Secondary side]
Between (A) and (B)
12.8 kΩ±15%
Between (C) and (D)
12.8 kΩ±15%



Insulation between primary terminal and case is 100 MΩ or more.

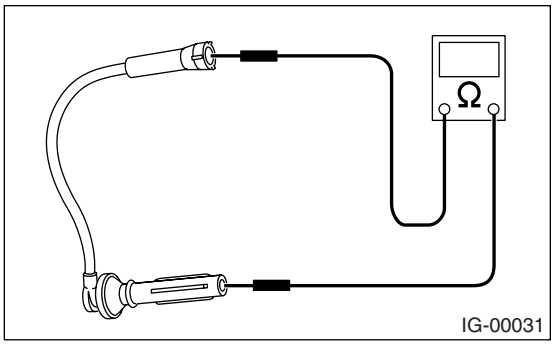
4. Spark Plug Cord

A: INSPECTION

Check for:
1) Damage to cords, deformation, burning or rust formation of terminals
2) Resistance values of cords

Resistance value:

#1 cord: 5.6 — 10.6 kΩ
#2 cord: 7.3 — 13.7 kΩ
#3 cord: 5.9 — 11.1 kΩ
#4 cord: 7.3 — 13.7 kΩ



Spark Plug Cord

STARTING/CHARGING SYSTEMS

SC(H4SO)

Page

1. General Description 2
2. Starter 6
3. Generator 15
4. Battery 21

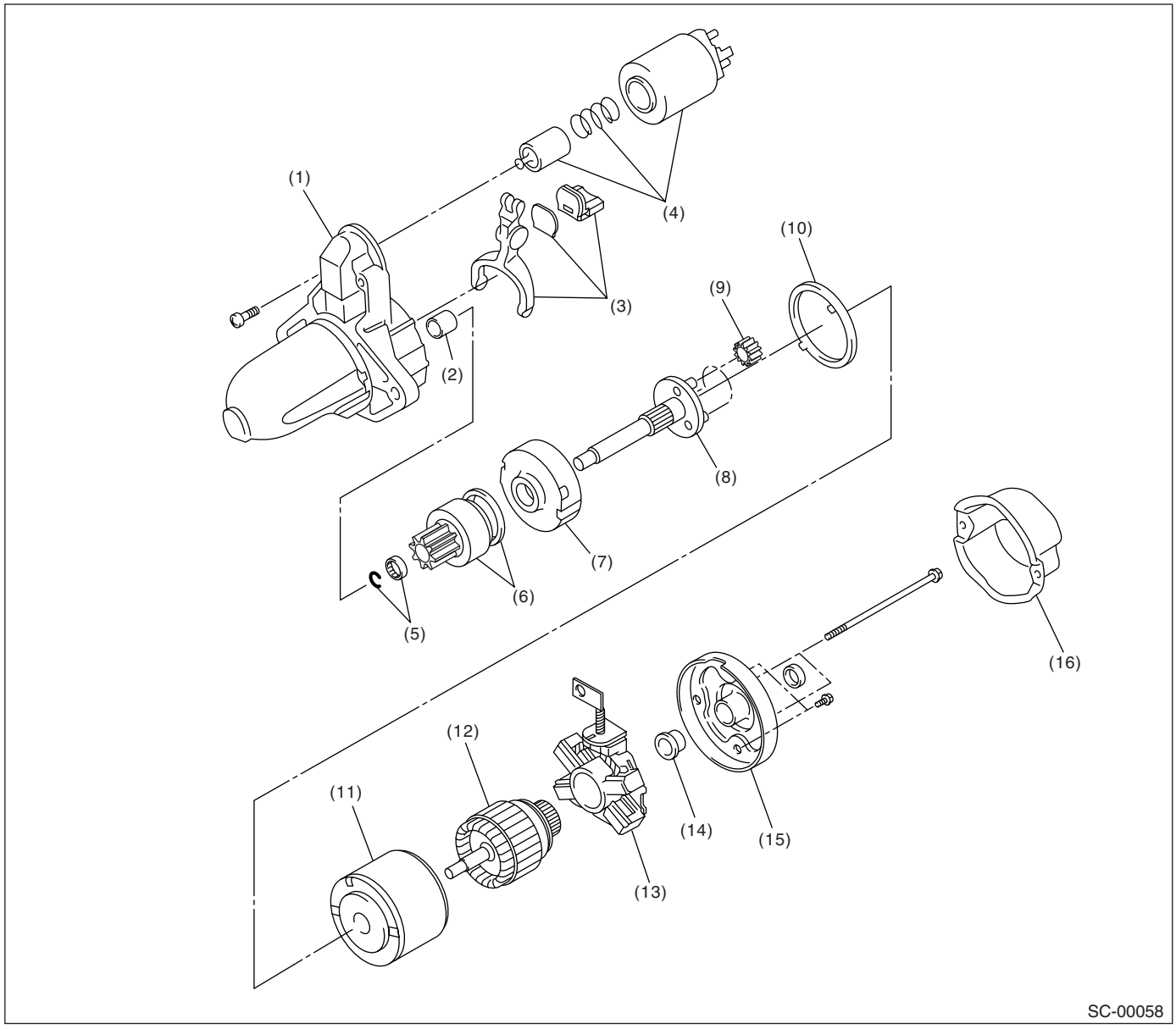
1. General Description

A: SPECIFICATION

Item			Designation	
Starter	Type		Reduction type	
	Vehicle type		MT model	AT model
	Model		M000T30471	M000T20171
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 1.0 kW	12 V — 1.4 kW
	Direction of rotation		Counterclockwise (viewed from pinion gear side)	
	Number of pinion teeth		8	9
	No-load characteristics	Voltage	11 V	
		Current	95 A or less	90 A or less
		Rotating speed	2,500 rpm or more	2,000 rpm or more
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.84 N (0.90 kgf, 1.99 lbf) or more	16.7 N (1.70 kgf, 3.75 lbf) or more
		Rotating speed	870 rpm or more	710 rpm or more
	Lock characteristics	Voltage	4 V	3.5 V
		Current	680 A or less	960 A or less
		Torque	17 N (1.73 kgf, 12.5 lbf) or more	31 N (3.16 kgf, 22.9 lbf) or more
Generator	Type		Rotating-field three-phase type, Voltage regulator built-in type, with load response control system	
	Model		2.0 L Non-turbo, 2.0 L Turbo, 2.5 L Turbo model: A2TG0391 2.5 L Non-turbo model: A2TB6991	
	Manufacturer		Mitsubishi Electric	
	Voltage and output		12 V — 90 A	
	Polarity on ground side		Negative	
	Rotating direction		Clockwise (viewed from pulley side)	
	Armature connection		3-phase Y-type	
	Output current	2.0 L Non-turbo, 2.0 L Turbo, 2.5 L Turbo model	1,500 rpm — 40 A or more 2,500 rpm — 74 A or more 5,000 rpm — 84 A or more	
		2.5 L Non-turbo model	1,500 rpm — 36 A or more 2,500 rpm — 65 A or more 5,000 rpm — 86 A or more	
	Regulated voltage		14.1 — 14.8 V [20°C (68°F)]	

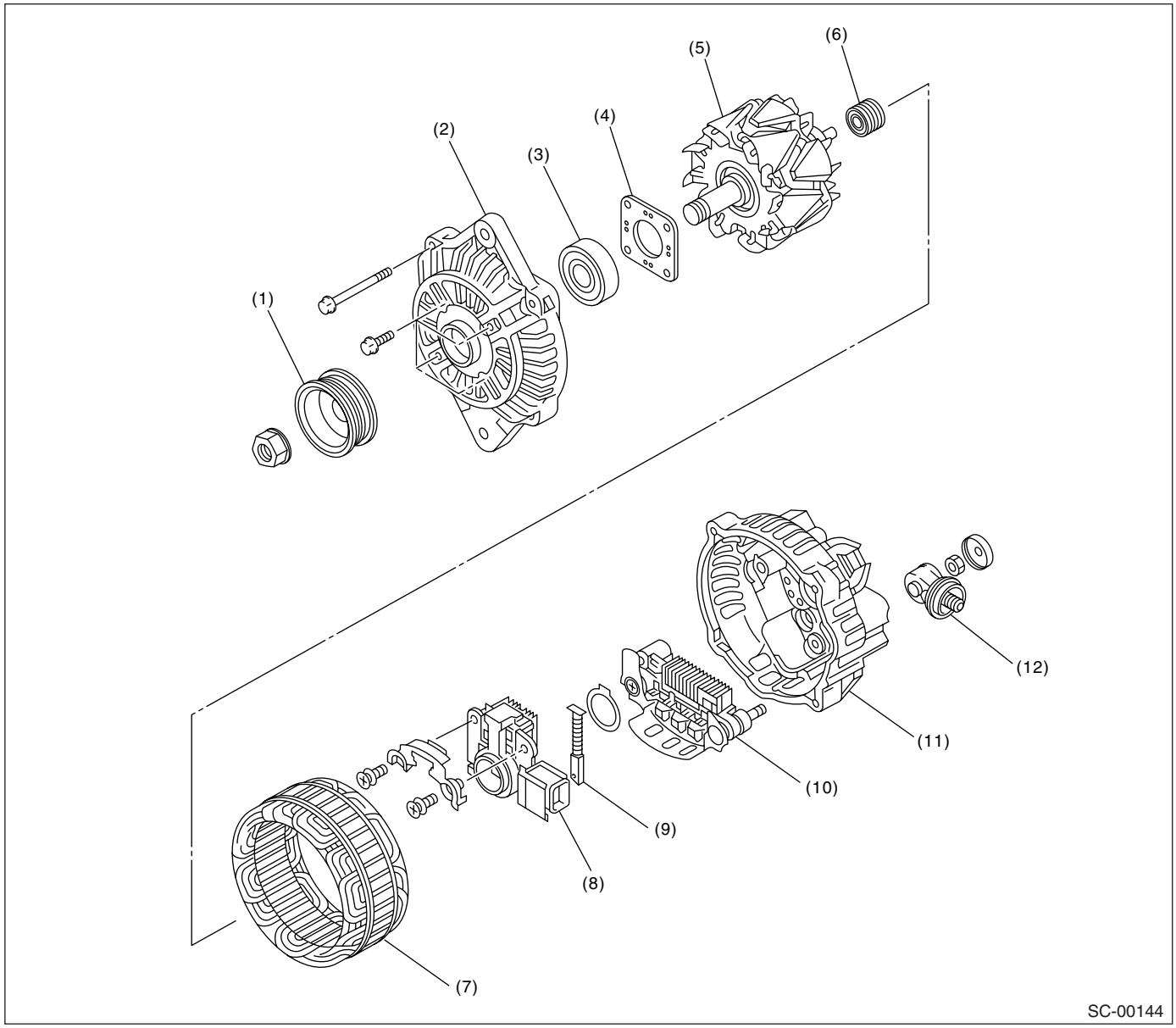
B: COMPONENT

1. STARTER



(1) Front bracket
(2) Sleeve bearing
(3) Lever set
(4) Magnet switch ASSY
(5) Stopper set
(6) Over running clutch
(7) Internal gear ASSY
(8) Shaft ASSY
(9) Gear ASSY
(10) Packing
(11) Yoke ASSY
(12) Armature
(13) Brush holder ASSY
(14) Sleeve bearing
(15) Rear cover
(16) Rear cover set

2. GENERATOR



(1) Pulley
(2) Front cover
(3) Ball bearing
(4) Bearing retainer
(5) Rotor
(6) Bearing
(7) Stator coil
(8) IC regulator with brush
(9) Brush
(10) Rectifier
(11) Rear cover
(12) Terminal

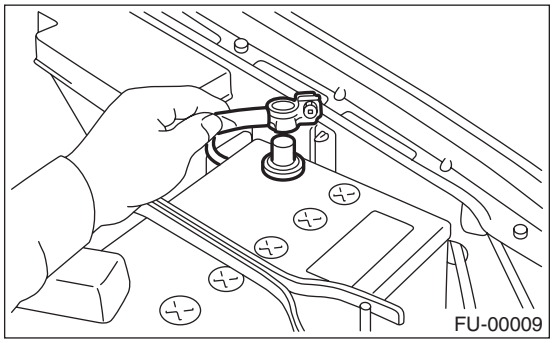
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Starter

A: REMOVAL

1) Disconnect the ground cable from battery.

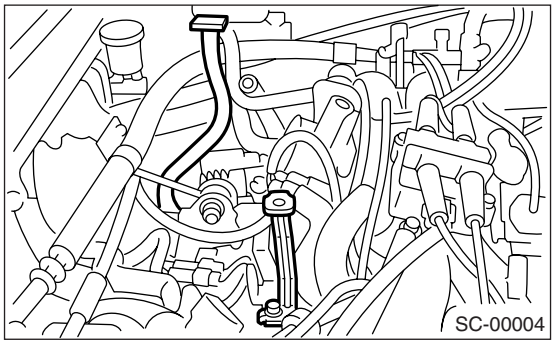


2) Remove the air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**

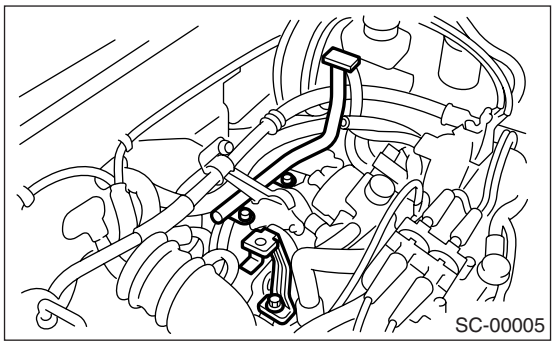
3) Remove the intercooler. (Turbo model) **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>

4) Remove the air cleaner case stay. (Non-turbo model)

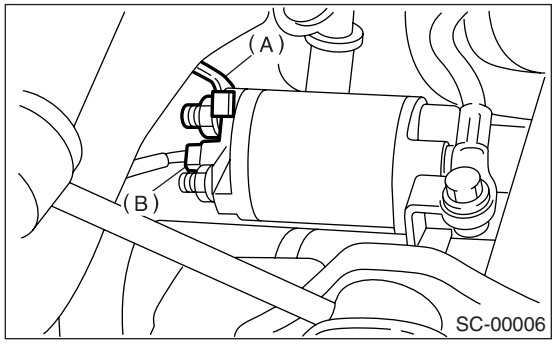
- MT model



- AT model

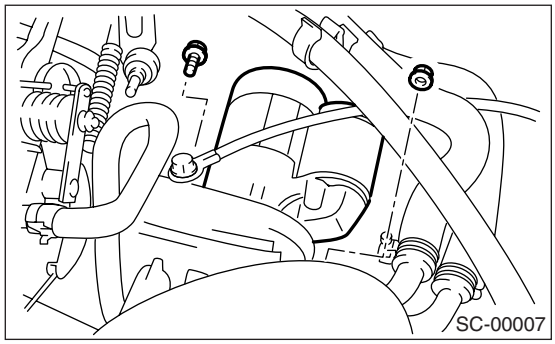


5) Disconnect the connector and terminal from starter.



(A) Terminal
(B) Connector

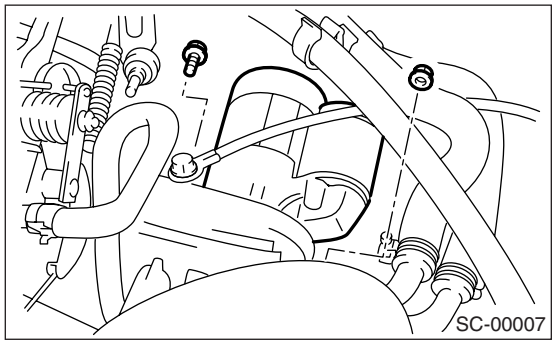
6) Remove the starter from transmission.



B: INSTALLATION

Install in the reverse order of removal.

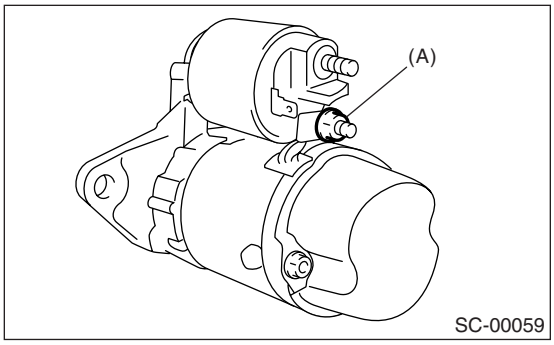
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



C: DISASSEMBLY

1. STARTER ASSEMBLY

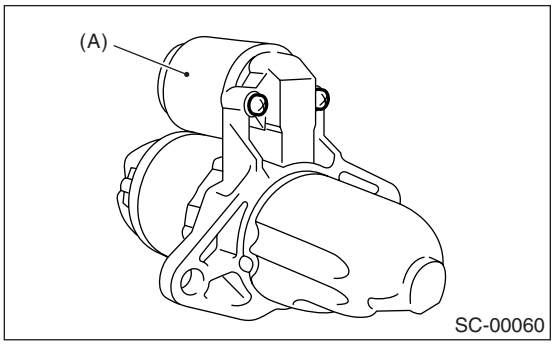
1) Loosen the nut which holds terminal M of switch assembly, and then disconnect the connector.



(A) Terminal M

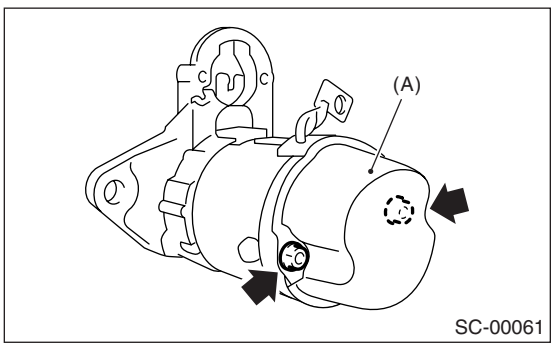
2) Remove the bolts which hold switch assembly, and then remove the switch assembly, plunger and plunger spring from starter as a unit.

NOTE:
Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.



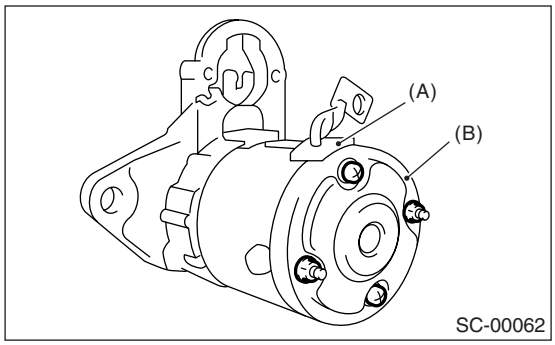
(A) Switch ASSY

3) Remove both the nuts, and then remove rear cover set.



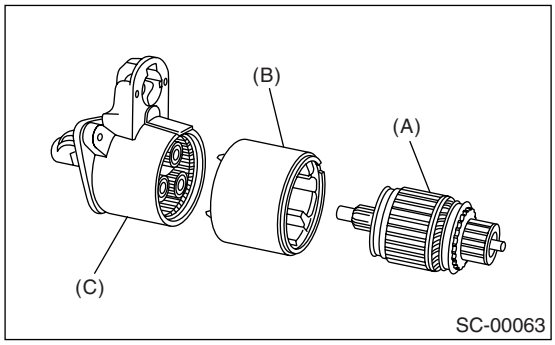
(A) Rear cover set

4) Remove both through-bolts and brush holder screws, and then detach the rear cover and brush holder assembly.



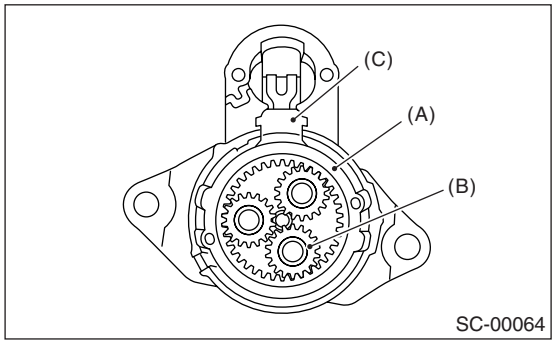
(A) Brush holder ASSY
(B) Rear cover

5) Remove the armature and yoke assembly from front bracket.



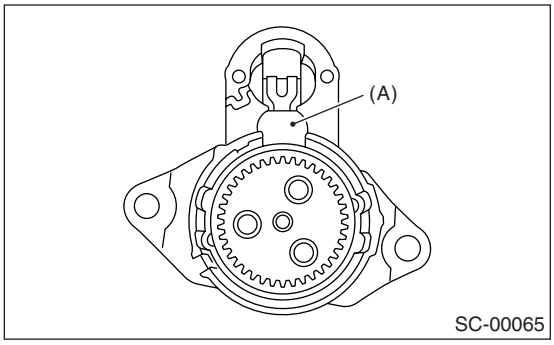
(A) Armature
(B) Yoke ASSY
(C) Front bracket

6) Remove the packing A, planetary gear and packing B.



(A) Packing A
(B) Planetary gear
(C) Packing B

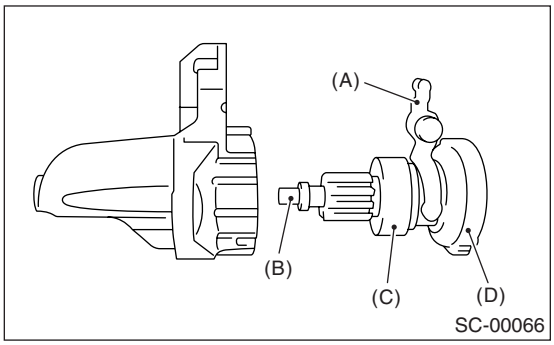
7) Remove the plate.



(A) Plate

8) Remove the shaft assembly and overrunning clutch from front bracket as a unit.

NOTE:
Check the following points before removal.
- Lever direction
- Position of internal gear assembly

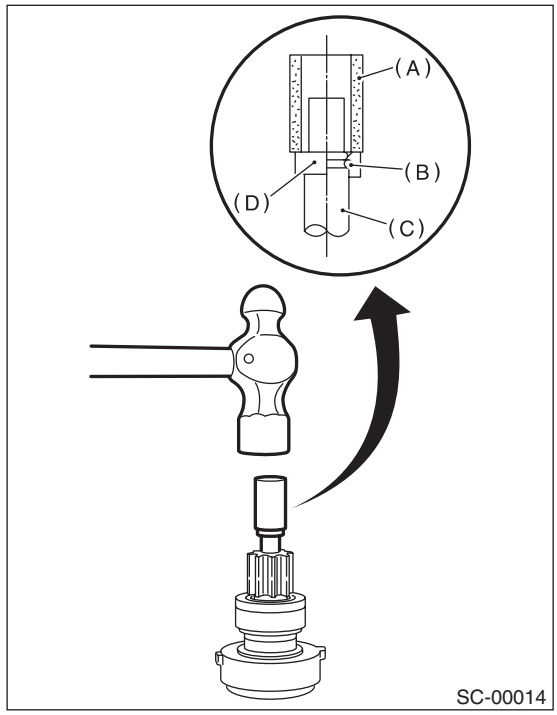


(A) Lever
(B) Shaft ASSY
(C) Overrunning clutch
(D) Internal gear ASSY

9) Remove the overrunning clutch from shaft assembly as follows:

(1) Remove the stopper from ring by lightly tapping the stopper with an appropriate tool (such as a 14 mm (0.55 in) a fit socket wrench).

(2) Remove the ring, stopper and clutch from shaft.

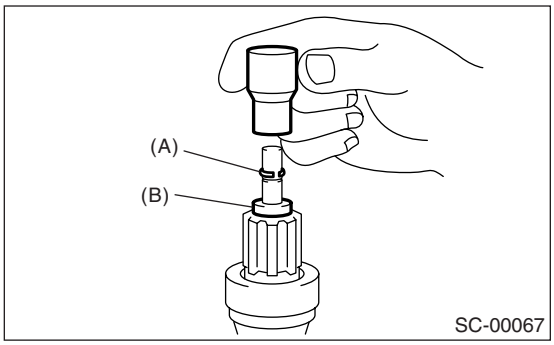


(A) Socket wrench
(B) Ring
(C) Shaft
(D) Stopper

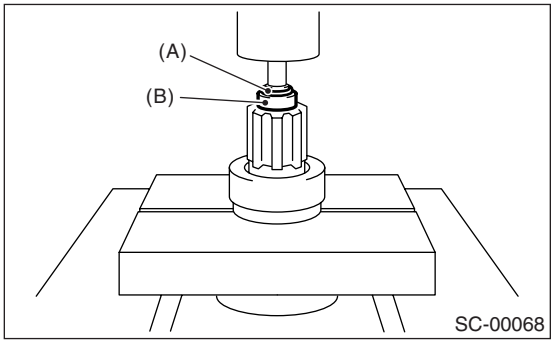
D: ASSEMBLY

NOTE:
Apply grease to the following parts before assembly.
- Sleeve bearing
- Pinion shaft rotational portion
- Shaft spline portion
- Inside of reduction system
- Lever fulcrum/Clutch rotational portion

1) Install the overrunning clutch to shaft assembly.
2) Install the stopper to shaft assembly as follows.
   (1) Insert the ring into the shaft groove by lightly tapping it with an appropriate tool (such as a fit socket wrench).

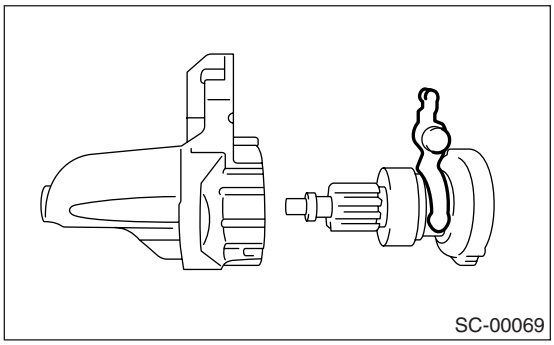


   (2) Install the stopper to ring using a press.

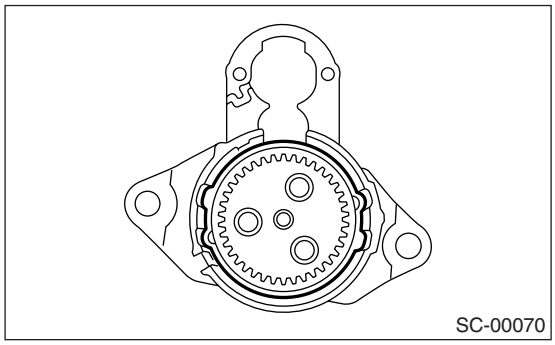


   (A) Ring
   (B) Stopper

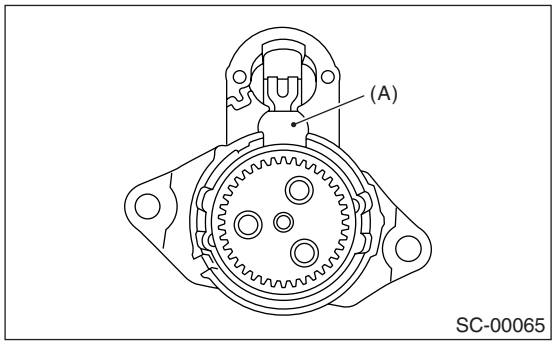
3) Install the shaft assembly to front bracket while taking care of the following points.
   (1) Lever direction



   (2) Internal gear position

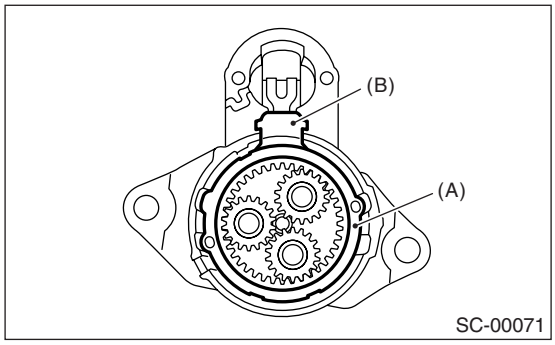


4) Install the plate.



   (A) Plate

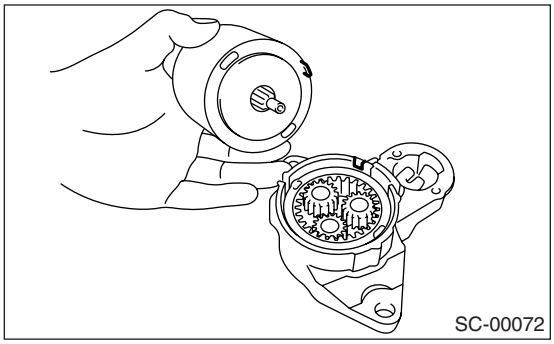
5) Install the planetary gear.
6) Install packing A and B while taking care of installing positions.



   (A) Packing A
   (B) Packing B

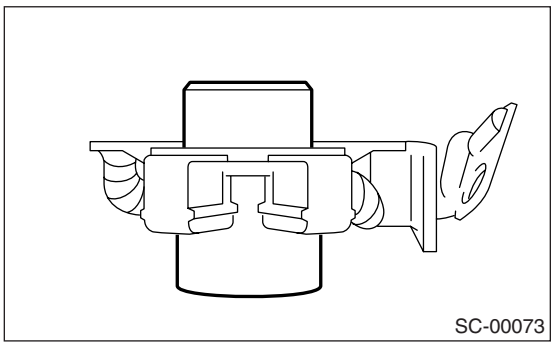
7) Install the armature to yoke assembly.

8) Install the yoke to front bracket matching front bracket to groove of yoke assembly.

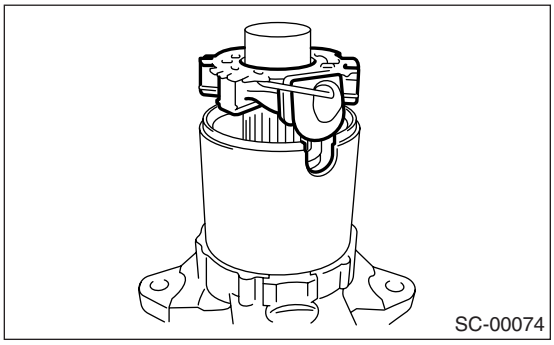


9) Install the brush holder to yoke assembly as follows.

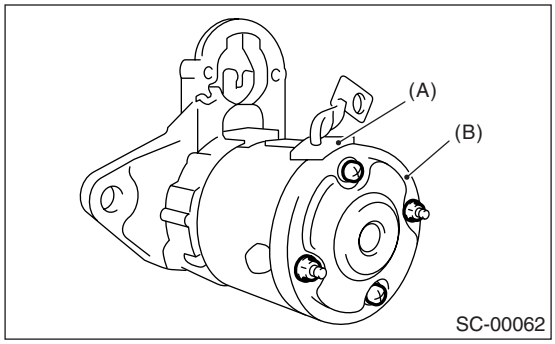
(1) Press the brush down into brush holder, and then fix the brush in that position using an appropriate tool (such as a fit socket wrench).



(2) Match the brush holder to groove of yoke, and then slide the brush holder into yoke assembly to install.

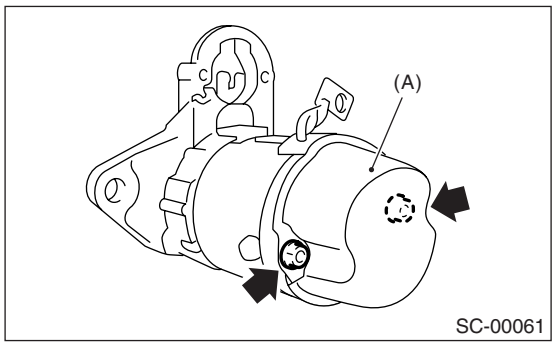


10) Install the rear cover matching it's groove to brush holder assembly.



(A) Brush holder ASSY
(B) Rear cover

11) Install rear cover set.

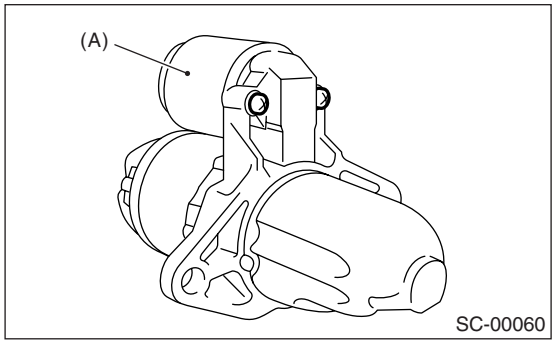


(A) Rear cover set

12) Install the switch assembly to front bracket as follows.

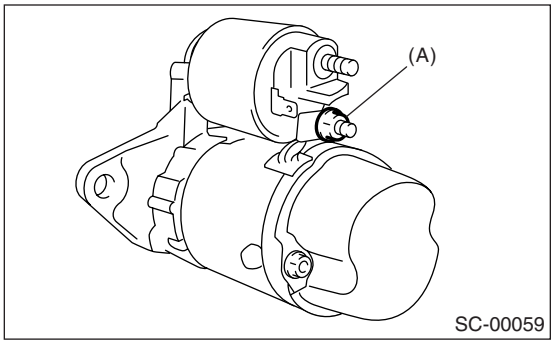
(1) Insert the plunger and plunger spring into switch assembly.

(2) Hook the plunger protrusion on lever edge to install plunger to front bracket.



(A) Switch ASSY

13) Connect the connector to terminal M of switch assembly.



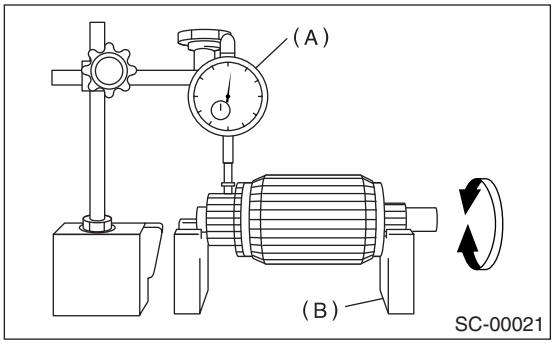
(A) Terminal M

E: INSPECTION

1. ARMATURE

1) Check the commutator for any sign of burns of rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.
2) Run-out test
Check the commutator run-out, and then replace if it exceeds the limit.

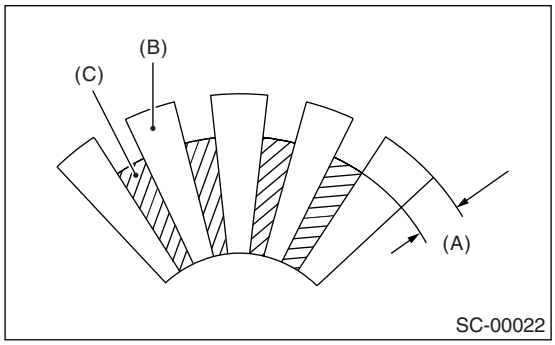
Commutator run-out:
Standard:
0.05 mm (0.0020 in)
Service limit:
Less than 0.10 mm (0.0039 in)



(A) Dial gauge
(B) V-block

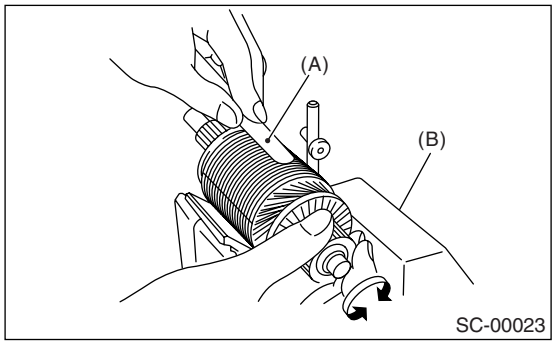
3) Depth of segment mold
Check the depth of segment mold.

Depth of segment mold:
0.5 mm (0.020 in)



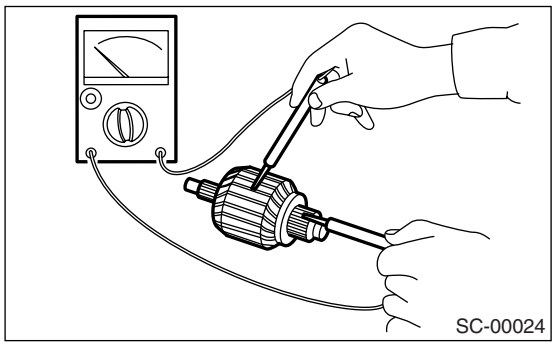
(A) Depth of mold
(B) Segment
(C) Mold

4) Armature short-circuit test
Check the armature for short-circuit by placing it on growler tester. Hold a iron sheet against the armature core while slowly rotating armature. A short-circuited armature will cause the iron sheet to vibrate and to be attracted to core. If the iron sheet is attracted or vibrates, the armature, which is short-circuited, must be replaced or repaired.



(A) Iron sheet
(B) Grower tester

5) Armature ground test
Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.
Replace the armature if it is grounded.



2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

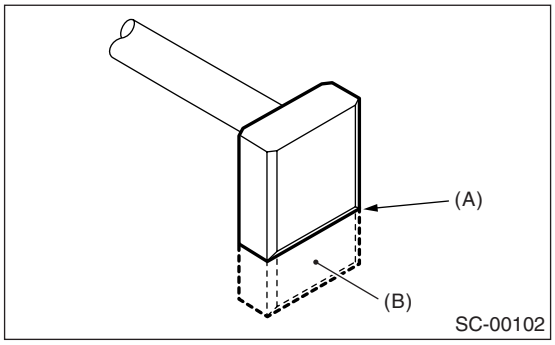
Inspect the teeth of pinion for wear and damage. Replace if it is damaged. Rotate the pinion in direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:
Do not clean the overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length
Measure the brush length, and then replace if it exceeds the service limit.
Replace if abnormal wear or cracks are noticed.

Brush length:
Standard:
12.3 mm (0.484 in)
Service limit:
7.0 mm (0.276 in)



(A) Service limit line
(B) Brush

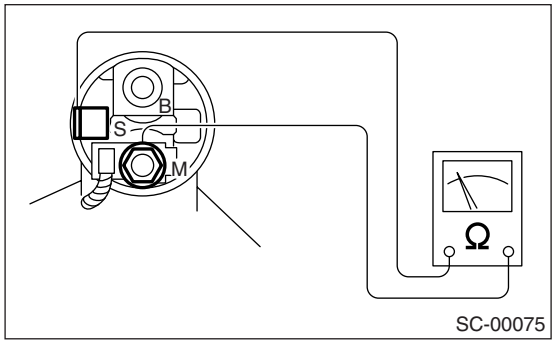
2) Brush movement
Be sure the brush moves smoothly inside brush holder.
3) Brush spring force
Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:
Standard:
15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lbf) (when new)
Service limit:
2.5 N (0.25 kgf, 0.56 lbf)

5. SWITCH ASSEMBLY

Be sure there is continuity between the terminals S and M, and between terminal S and ground. Use a circuit tester (set in “ohm”).
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:
S — M / Less than 1 Ω
S — Ground / Less than 1 Ω
M — B / More than 1 MΩ

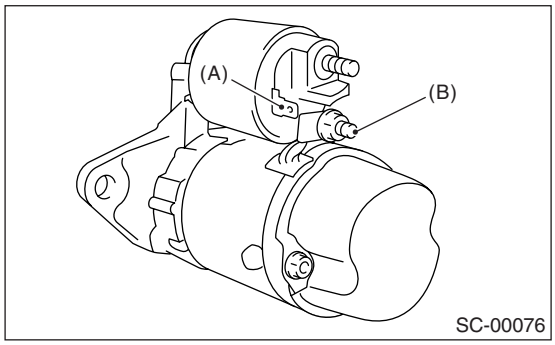


6. SWITCH ASSEMBLY OPERATION

1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

NOTE:
With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.
In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.

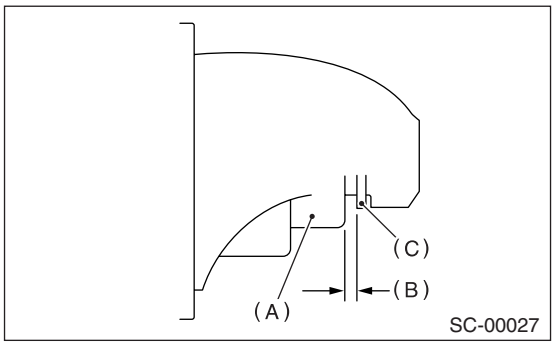


(A) Terminal S
(B) Terminal M

7. PINION GAP

1) Measure the pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap (B) :
0.5 — 2.0 mm (0.020 — 0.079 in)

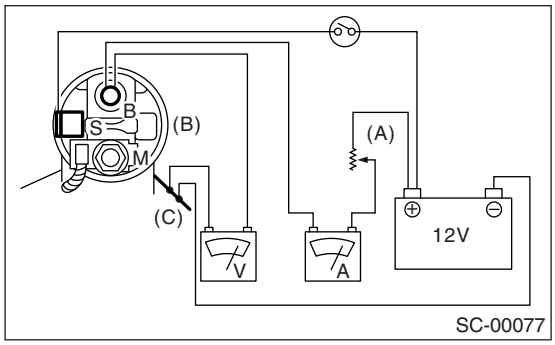


(A) Pinion
(B) Pinion gap
(C) Stopper

If the motor is running with the pinion forced endwise on shaft, disconnect the connector from terminal M of switch assembly, and then connect terminal M to ground terminal (–) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.
Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.
For these performance tests, use the circuit shown in figure.



(A) Variable resistance
(B) Starter body
(C) Magnetic switch

1) No-load test
With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading, and then measure the starter speed. Compare these values with the specifications.

No-load test (Standard):

Voltage / Current:
MT model
MAX. 11 V / 95 A
AT model
MAX. 11 V / 90 A

Rotating speed:
MT model
2,500 rpm or more
AT model
2,000 rpm or more

2) Load test
Apply the specified braking torque to starter. The condition is satisfactory if the current draw and starter speed are within the specifications.

Load test (Standard):

Voltage / Load:
MT model
7.5 V / 8.84 N (0.90 kgf, 1.99 lbf)
AT model
7.7 V / 16.7 N (1.70 kgf, 3.75 lbf)

Current / Speed:
MT model
300 A / 870 rpm or more
AT model
400 A / 710 rpm or more

3) Lock test
With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

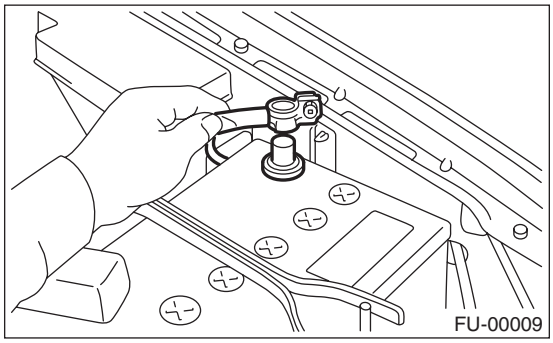
Voltage / Current:
MT model
4 V / 680 A or less
AT model
3.5 V / 960 A or less

Torque:
MT model
17.0 N (1.73 kgf, 3.82 lbf) or more
AT model
31.0 N (3.16 kgf, 6.97 lbf) or more

3. Generator

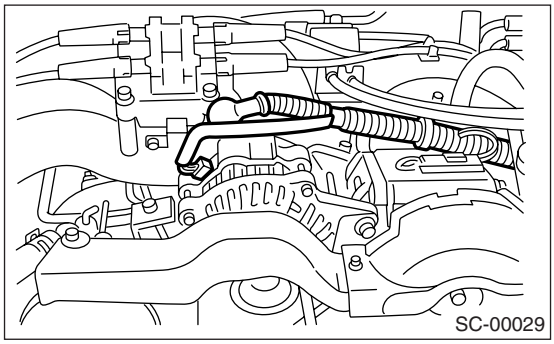
A: REMOVAL

1) Disconnect the ground cable from battery.

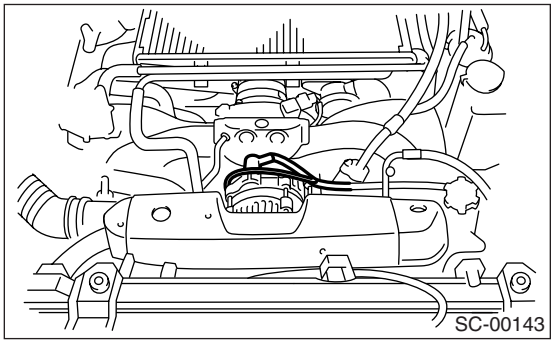


2) Disconnect the connector and terminal from generator.

- Non-turbo model

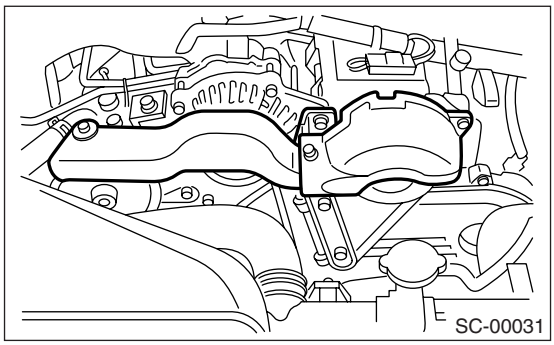


- Turbo model

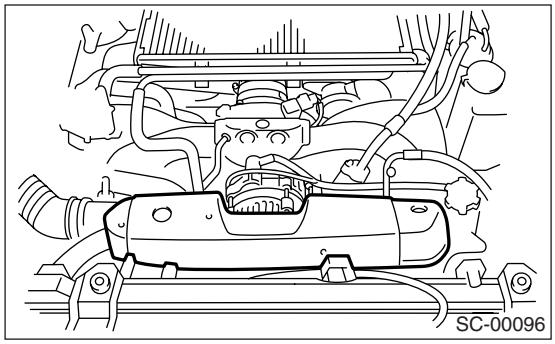


3) Remove the V-belt cover.

- Non-turbo model

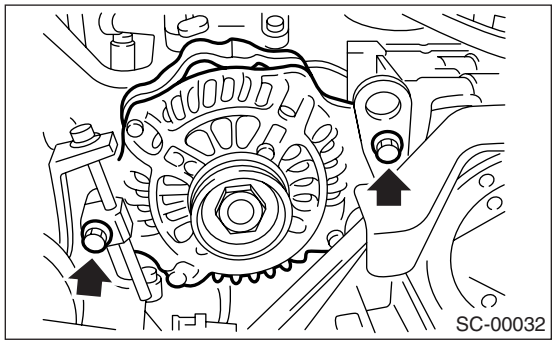


- Turbo model



4) Remove the front side V-belt.
<Ref. to ME(H4SO)-43, FRONT SIDE BELT, REMOVAL**, V-belt.>** or **<Ref. to ME(H4DOTC 2.0)-53,** FRONT SIDE BELT, REMOVAL**, V-belt.>**

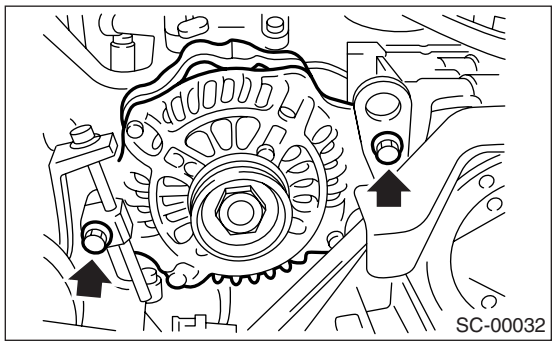
5) Remove the bolts which install generator onto bracket.



B: INSTALLATION

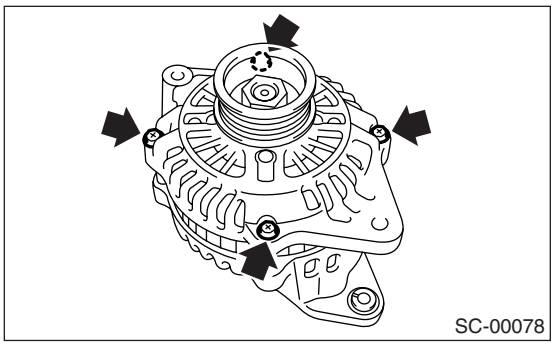
Install in the reverse order of removal.

CAUTION:
Check and adjust the V-belt tension. <Ref. to ME(H4SO)-44, INSPECTION, V-belt.> or <Ref. to ME(H4DOTC 2.0)-54, INSPECTION, V-belt.>

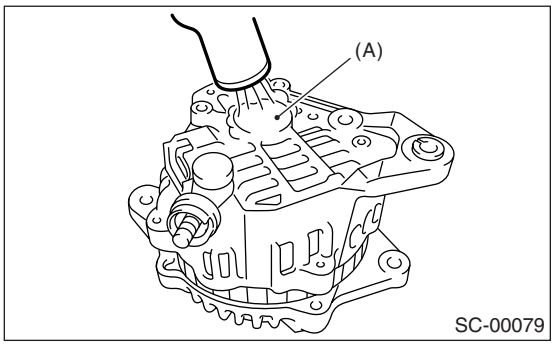


C: DISASSEMBLY

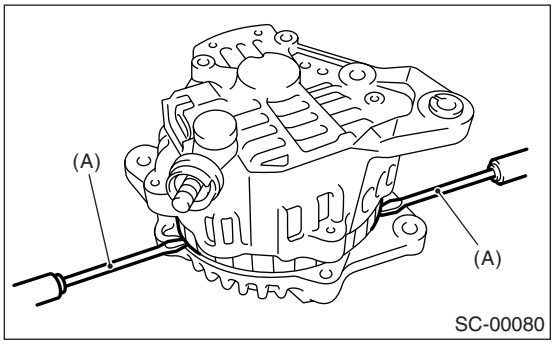
1) Remove the four through-bolts.



2) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.

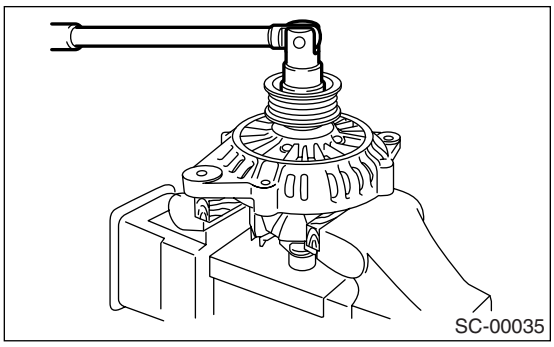


3) Then insert the tip of a flat tip screwdriver into the gap between stator core and front cover. Pry them apart to disassemble.

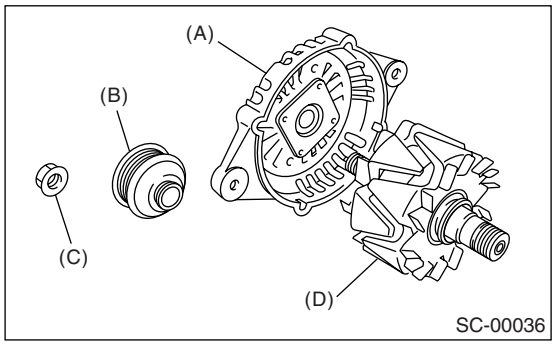


(A) Screwdriver

4) Hold the rotor with a vise and remove pulley nut.

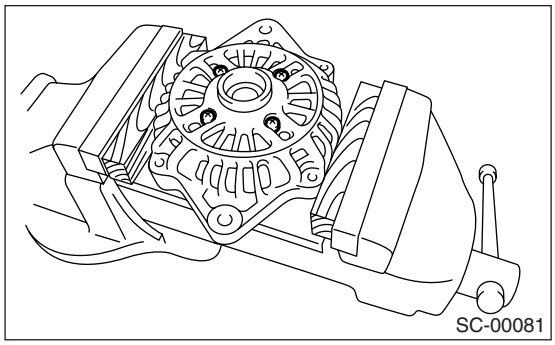


CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.

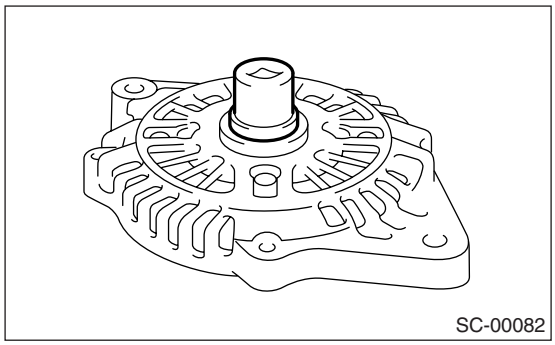


(A) Front cover
(B) Pulley
(C) Nut
(D) Rotor

5) Remove the ball bearing as follows.
(1) Remove the bolt, and then remove the bearing retainer.

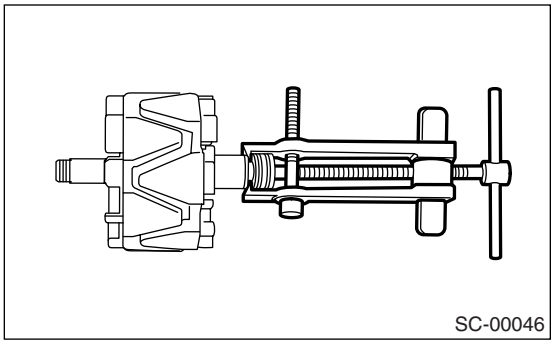


(2) Firmly install an appropriate tool (such as a fit socket wrench) to bearing inner race.



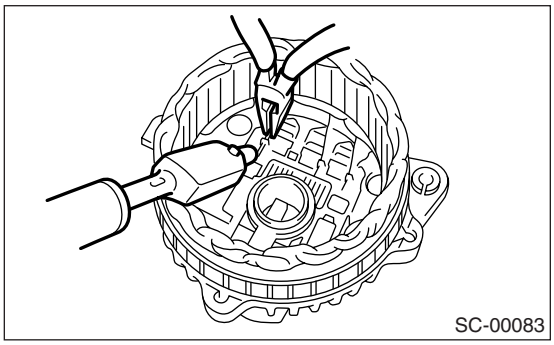
(3) Push the ball bearing off the front cover using a press.

6) Remove the bearing from rotor using a bearing puller.

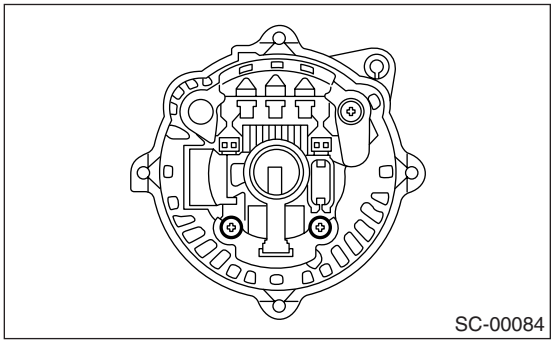

SC-00046

7) Unsolder connection between rectifier and stator coil to remove the stator coil.

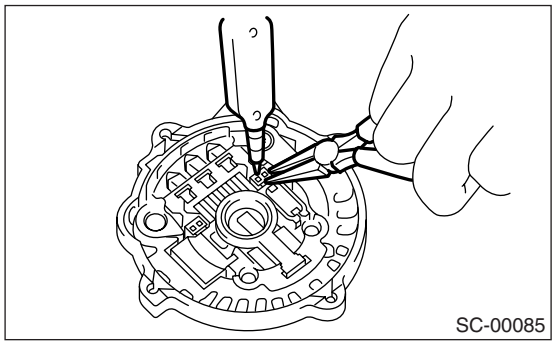
CAUTION:
Do not allow the 180 — 270 W soldering bit to contact the terminals for more than 5 seconds at a time because the rectifier cannot withstand heat very well.


SC-00083

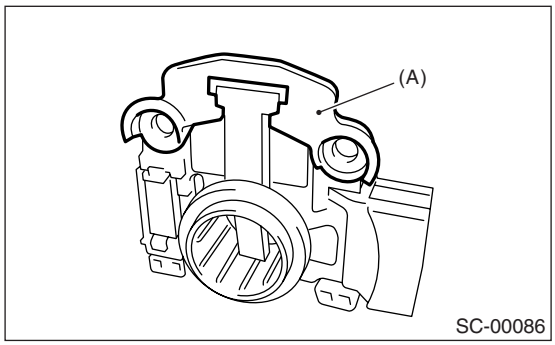
8) Remove the IC regulator as follows.
(1) Remove the screws which secure IC regulator to rear cover.


SC-00084

(2) Unsolder the connection between IC regulator and rectifier to remove the IC regulator.


SC-00085

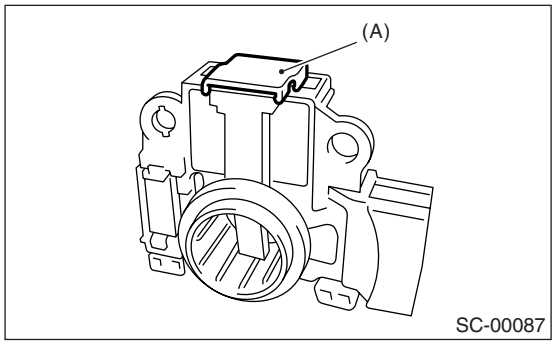
9) Remove the brush as follows.
(1) Remove cover A.



SC-00086

(A) Cover A

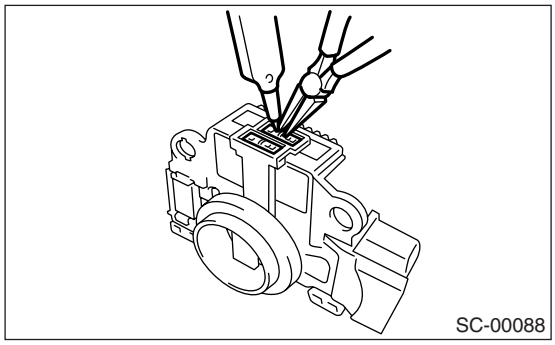
(2) Remove the cover B.



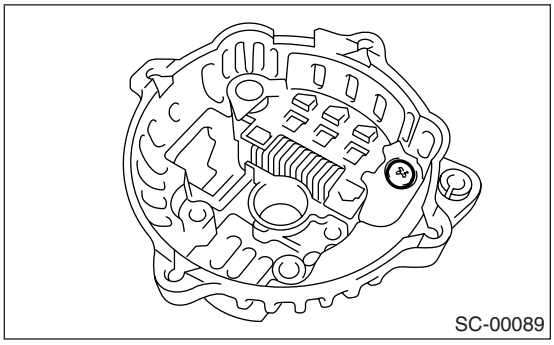
SC-00087

(A) Cover B

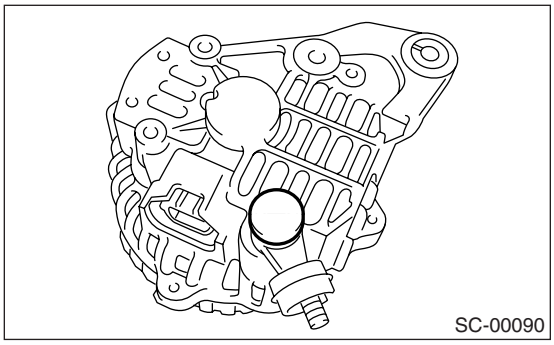
(3) Separate the brush from connection to remove.


SC-00088

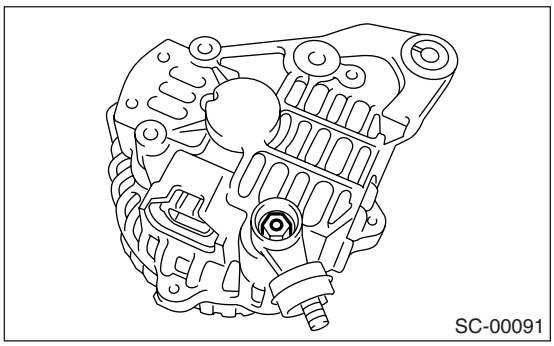
10) Remove the rectifier as follows.
(1) Remove the bolts which secure the rectifier.



(2) Remove the cover of terminal B.



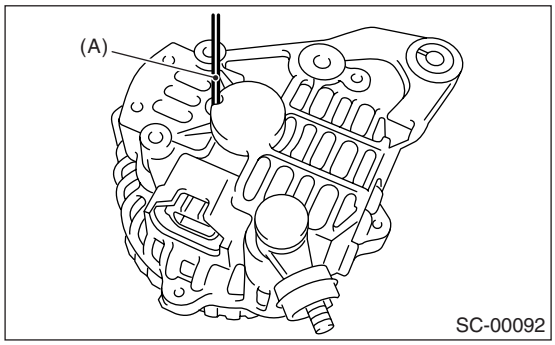
(3) Remove the nut of terminal B, and then remove the rectifier.



D: ASSEMBLY

To assemble, reverse order of disassembly.
1) Pulling up brush
Before assembling, press the brush down into brush holder, and then fix them in that position by passing a [1 mm (0.08 in) dia. length 4 to 5 cm (1.6 to 2.0 in)] wire through the hole shown in the figure.

CAUTION:
Be sure to remove the wire after reassembly.



(A) Wire

2) Install the ball bearing.
(1) Set the ball bearing on the front cover, and then securely install an appropriate tool (such as a fit socket wrench) to the bearing outer race.
(2) Press the ball bearing into the specified position using a press.
(3) Install the bearing retainer.
3) Press the bearing (rear side) into the rotor shaft using a press to install.
4) Heat the bearing box in rear cover [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear cover.

CAUTION:
Grease should not be applied to rear bearing.
Remove the oil completely if it is found on bearing box.

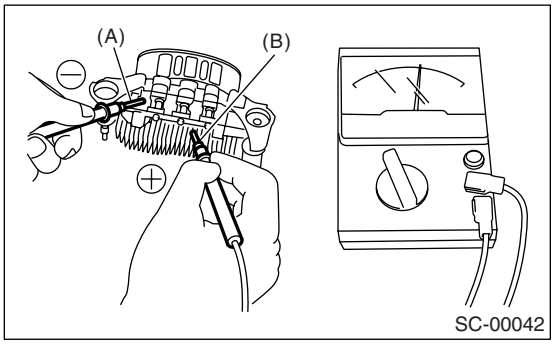
5) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

E: INSPECTION

1. DIODE

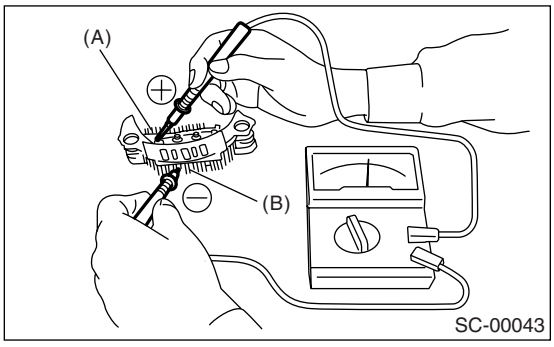
CAUTION:
Never use a mega tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode
Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.



(A) Diode lead
(B) Heat sink (Positive side)

2) Checking negative diode
Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1 Ω or less only in the direction from the heat sink to diode lead.



(A) Diode lead
(B) Heat sink (Negative side)

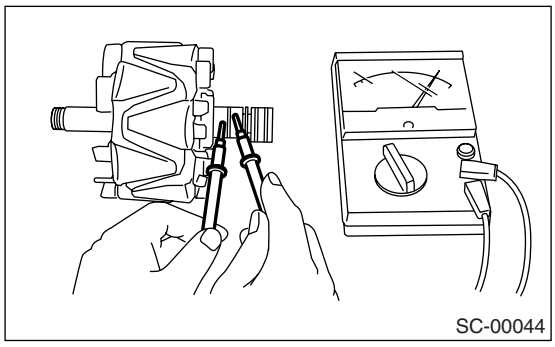
2. ROTOR

1) Slip ring surface
Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.
2) Slip ring outer diameter
Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

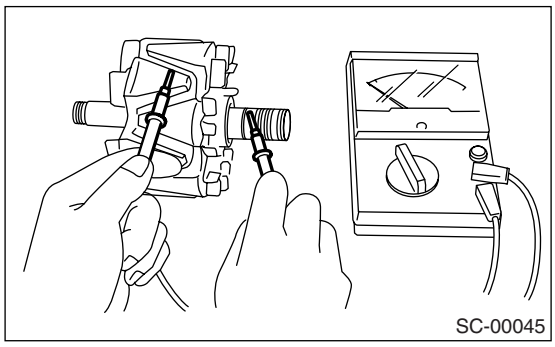
Slip ring outer diameter:
Standard:
22.7 mm (0.894 in)
Limit:
22.1 mm (0.870 in)

3) Continuity test
Check the resistance between slip rings using circuit tester.
If the resistance is not within specification, replace the rotor assembly.

Specified resistance:
Approx. 1.8 — 2.2 Ω



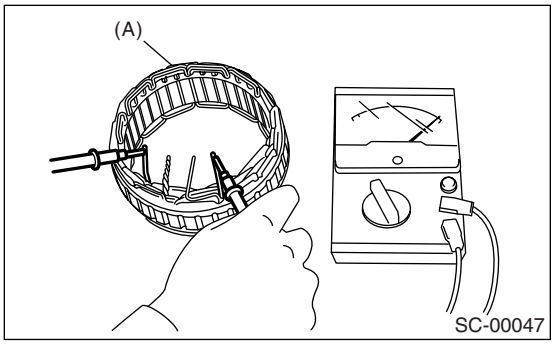
4) Insulation test
Check the continuity between slip ring and rotor core or shaft. If resistance is 1 Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)
Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

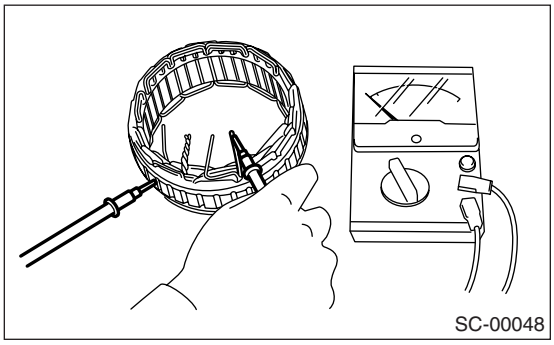
3. STATOR

1) Continuity test
Inspect the stator coil for continuity between each end of the lead wires. If resistance is 1 M Ω or more, the lead wire is broken, and so replace the stator assembly.



(A) Stator

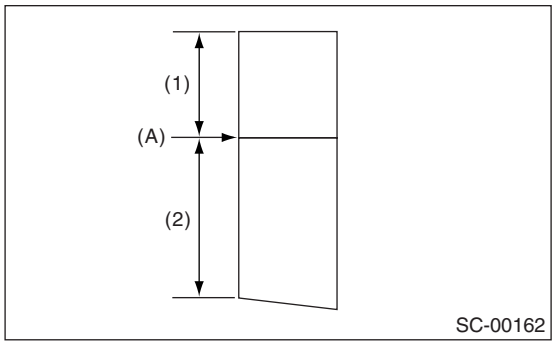
2) Insulation test
Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1 Ω or less, the stator coil is grounded, and so replace the stator assembly.



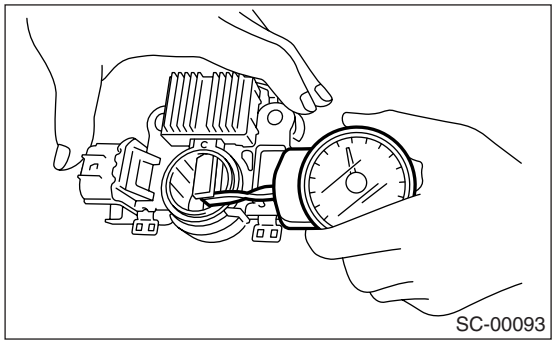
4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

Brush length:
Service limit (1):
5.0 mm (0.197 in)
Standard (2):
18.5 mm (0.728 in)



2) Check the brush spring for proper pressure.
Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.2 N (224 g, 7.91 oz), replace the brush spring with a new one. The new spring must have a pressure of 4.8 to 6.0 N (489 to 612 g, 17.26 to 21.60 oz).



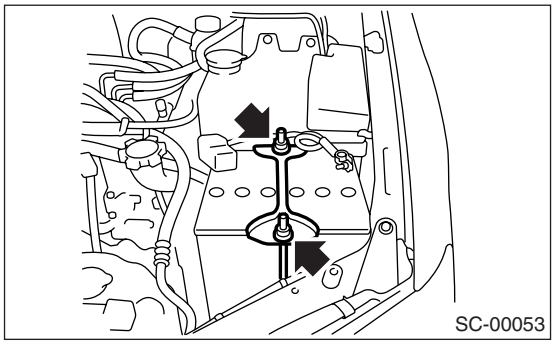
5. BEARING (FRONT SIDE)

Check the front ball bearing. If the resistance is felt while rotating, or if noise is heard, replace the ball bearing.

4. Battery

A: REMOVAL

1) Disconnect the positive (+) cable after disconnecting the ground (–) cable of battery.
2) Remove the flange nuts from battery rods, and then take off the battery holder.



3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:
• Clean the battery cable terminals, and then apply grease to retard formation of corrosion.
• Connect the positive (+) cable of battery and then the ground (–) cable of battery.

C: INSPECTION

WARNING:
• Electrolyte has toxicity; be careful handling the fluid.
• Avoid contact with skin, eyes or clothing. Especially at contact with eyes, blush with water for 15 minutes and get prompt medical attention.
• Batteries produce explosive gasses. Keep sparks, flame, cigarettes away.
• Ventilate when charging or using in enclosed space.
• For safety, in case an explosion does occur, wear eye protection or shield your eyes when working near any battery. Never lean over a battery.
• Do not let the battery fluid contact eyes, skin, fabrics or paint-work because battery fluid is corrosive acid.
• To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.
Apply a thin coat of grease on the terminal posts to prevent corrosion.

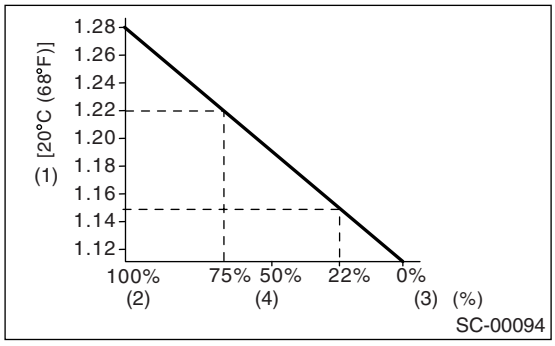
2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure the specific gravity of electrolyte using a hydrometer and a thermometer.
Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

S_{20} = St+0.0007 × (t–20)
S_{20}: Specific gravity corrected at electrolyte temperature of 20°C
St: Measured specific gravity
t: Measured temperature (°C)
Determine whether or not battery must be charged, according to corrected specific gravity.
Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



(1) Specific gravity
(2) Complete charge
(3) Charging condition
(4) Specific gravity and state of charge

2) Measuring the specific gravity of the electrolyte in battery will disclose the state of charge of battery. The relation between specific gravity and state of charge is as shown in the figure.

D: MEASUREMENT

WARNING:
• Do not bring an open flame close to the battery at this time.

CAUTION:
• Prior to charging, corroded terminals should be cleaned with a brush and common baking soda solution.
• Be careful since the battery electrolyte overflows while charging the battery.
• Observe the instructions when handling battery charger.
• Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)
*: Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approx. 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.
Since a large current flow raises electrolyte temperature, the battery is subject to damage if large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).
It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:
• Observe the items in 3. NORMAL CHARGING.
• Never use more than 10 amperes when charging the battery because that will shorten battery life.

ENGINE (DIAGNOSTICS)

EN(H4SO)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4SO)(diag)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Starting Failure". <Ref. to EN(H4SO)(diag)-58, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does malfunction indicator light illuminate?	Go to step **3.**	Inspection using "General Diagnostic Table". <Ref. to EN(H4SO)(diag)-263, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool switch to ON. 4) Read the DTC on the Subaru Select Monitor or general scan tool.	Does the Subaru Select Monitor or general scan tool indicate DTC?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4SO)(diag)-48, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSTIC.** 1) Perform the Clear Memory Mode. <Ref. to EN(H4SO)(diag)-45, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H4SO)(diag)-38, Inspection Mode.>	Does the Subaru Select Monitor or general scan tool indicate DTC?	Check on "Diagnostic Procedure with Diagnostic Trouble Code (DTC)" <Ref. to EN(H4SO)(diag)-79, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnostic.

2. AUTOMATIC TRANSMISSION

When the DTC about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.

1) ATF level check <Ref. to 4AT-32, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-35, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-32, Automatic Transmission Fluid.>
4) Differential gear oil level check <Ref. to 4AT-35, Differential Gear Oil.>
5) Stall Test <Ref. to 4AT-37, Stall Test.>
6) Line Pressure Test <Ref. to 4AT-40, Line Pressure Test.>
7) Transfer Clutch Pressure Test <Ref. to 4AT-42, Transfer Clutch Pressure Test.>
8) Time Lag Test <Ref. to 4AT-39, Time Lag Test.>
9) Road Test <Ref. to 4AT-36, Road Test.>
10) Shift characteristics <Ref. to 4AT-42, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
V.I.N.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Ambient air temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	km/h (MPH)		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON / ❑ OFF	Rear defogger	❑ ON / ❑ OFF
Blower	❑ ON / ❑ OFF	Audio	❑ ON / ❑ OFF
A/C compressor	❑ ON / ❑ OFF	Car phone	❑ ON / ❑ OFF
Radiator fan	❑ ON / ❑ OFF		
Front wiper	❑ ON / ❑ OFF		
Rear wiper	❑ ON / ❑ OFF		

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostic indicator light ❑ ABS Warning light ❑ Oil pressure indicator light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Experienced running out of fuel: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of other parts except genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift. ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
- The ECM will be destroyed immediately.
- The fuel injector and other part will be damaged.

3) Do not disconnect the battery terminals while the engine is running.
A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

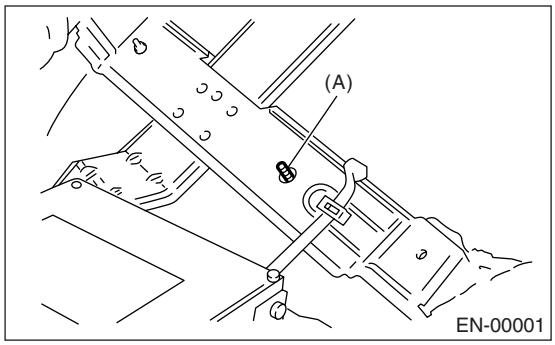
5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Remove the ECM from the located position after disconnecting two cables on battery.
Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

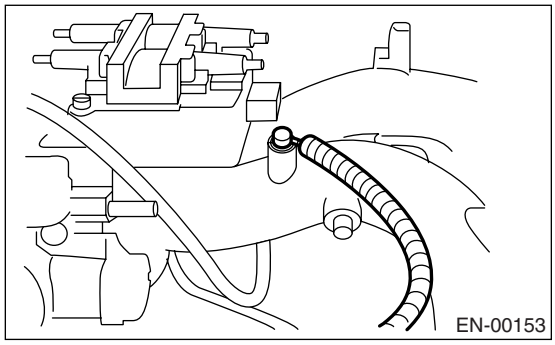
7) Connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts as the grounding point to body when measuring voltage and resistance inside the passenger compartment.

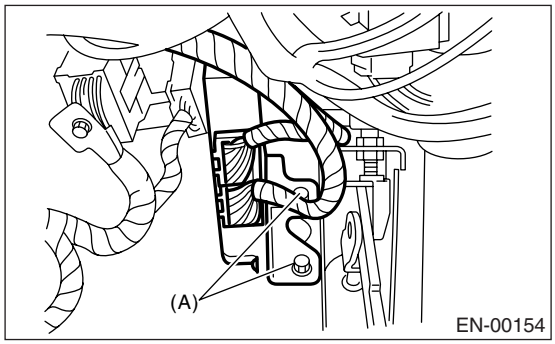


(A) Stud bolt

9) Use engine ground terminal or engine proper as the grounding point to body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts as the grounding point to body when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit. (The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) In AT models, do not continue the stall for more than five seconds. (from closed throttle, fully open throttle to stall engine speed.)
17) On the model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnostic of engine control system, perform the ABS memory clearance procedure of self-diagnosis function.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

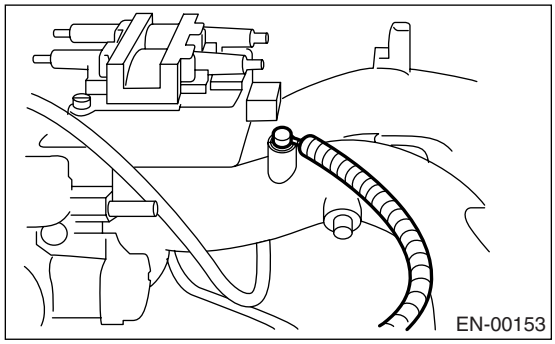
Standard voltage:
12 V

Specific gravity:
Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. GENERAL DESCRIPTION

• On-board diagnostic (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with E-OBD regulation. The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, the DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• When troubleshooting the vehicles complied with E-OBD regulation, connect Subaru Select Monitor or the general scan tool to the vehicle.

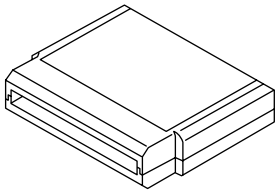
2. ENGINE AND EMISSION CONTROL SYSTEM

• MFI system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric signal applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Excellent engine start and warm-up performance by the correction of engine coolant temperature and intake air temperature.

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, TCM and the hydraulic controller including solenoid valves. The system controls the transmission body including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

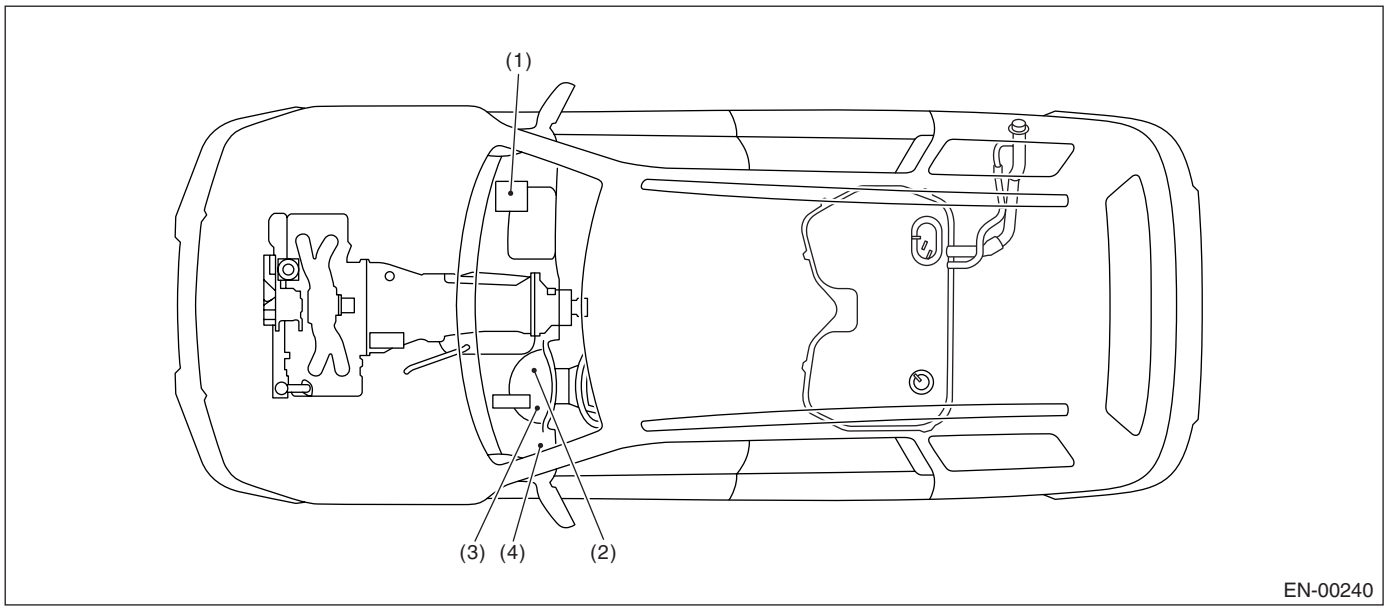
4. Electrical Component Location

A: LOCATION

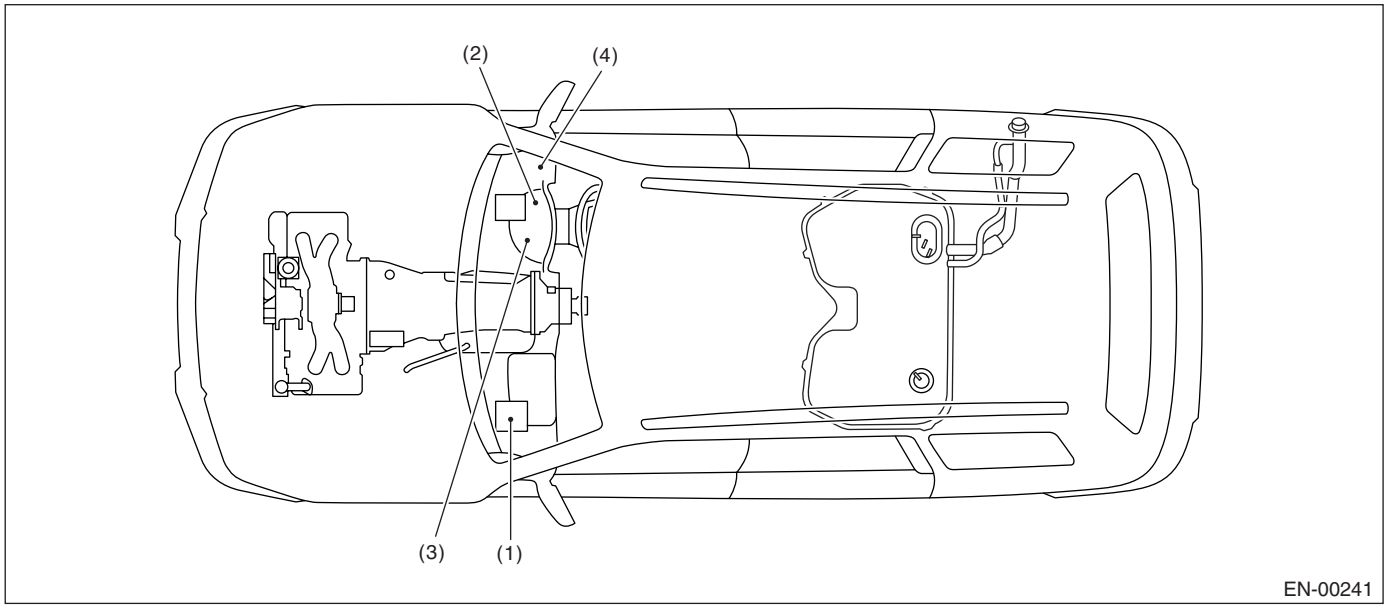
1. ENGINE

• CONTROL MODULE

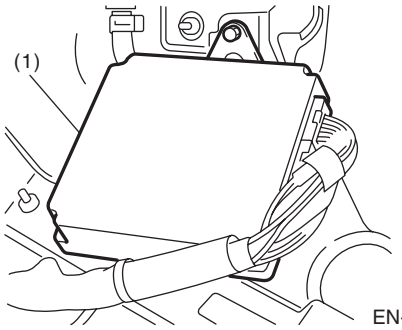
• LHD MODEL



• RHD MODEL



(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector



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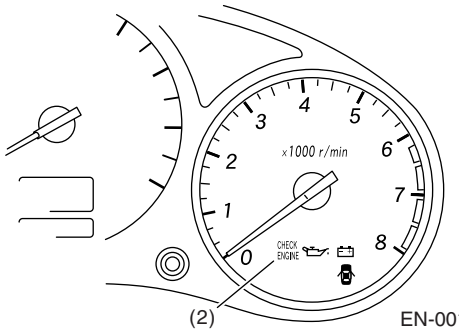

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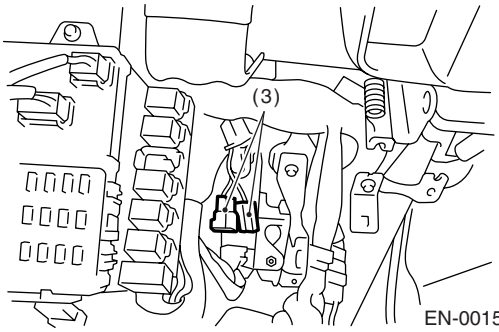

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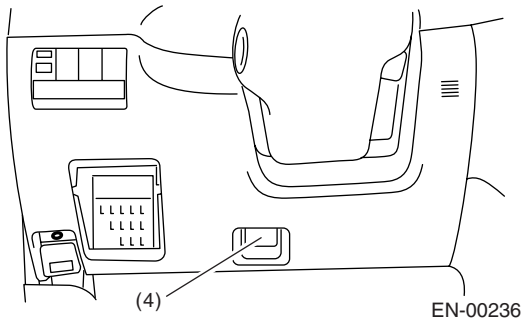
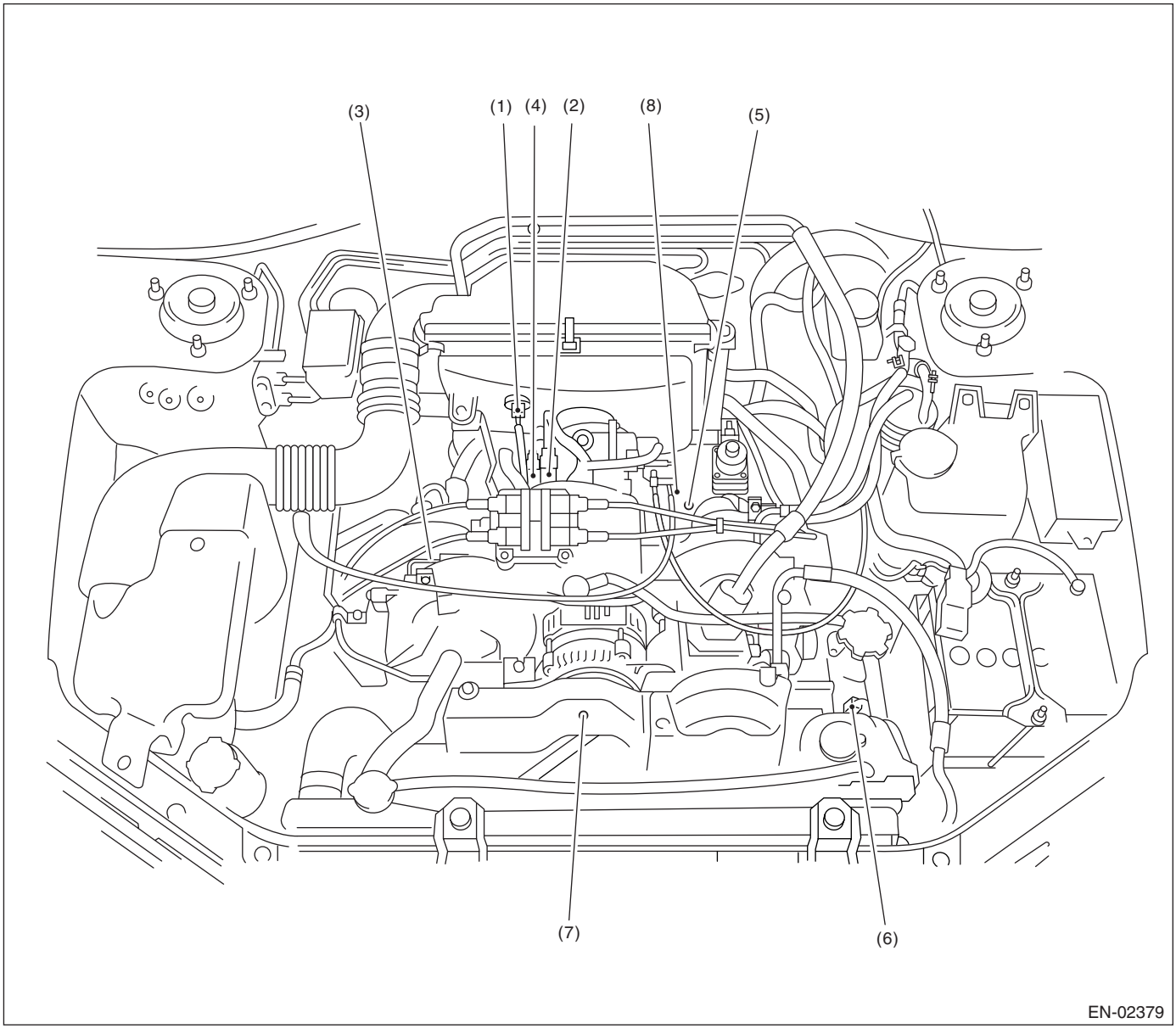
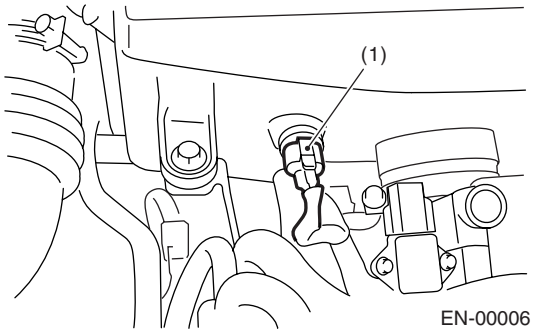


EN-00236

• SENSOR



(1) Intake air temperature sensor
(2) Manifold absolute pressure sensor
(3) Engine coolant temperature sensor (without ATF warmer)
(4) Throttle position sensor
(5) Knock sensor
(6) Camshaft position sensor
(7) Crankshaft position sensor
(8) Engine coolant temperature sensor (with ATF warmer)


(1)
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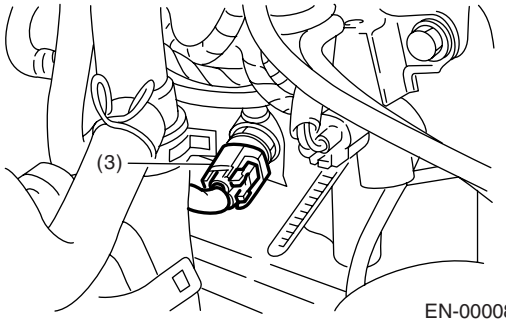
(2)
EN-00160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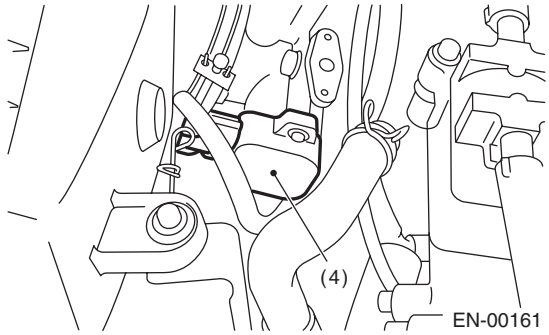
EN-00008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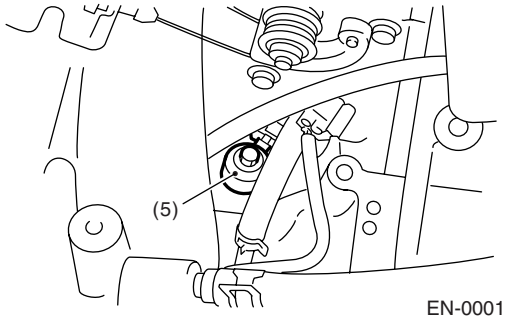
EN-00161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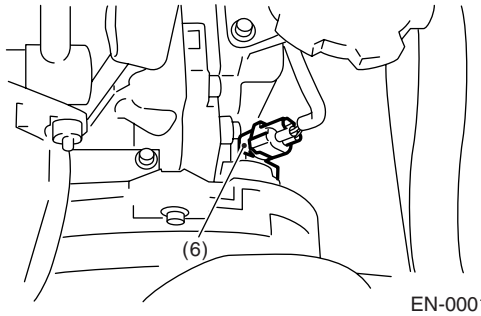
EN-00010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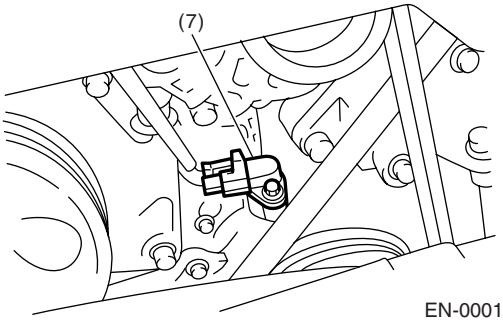
EN-00011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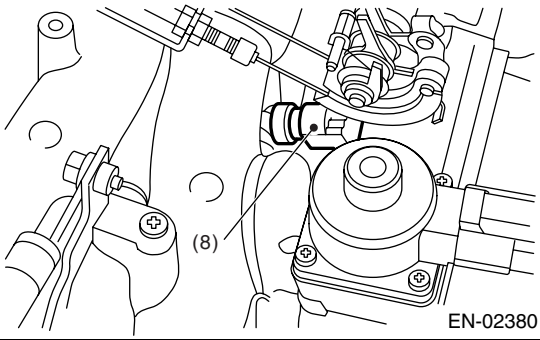
EN-00012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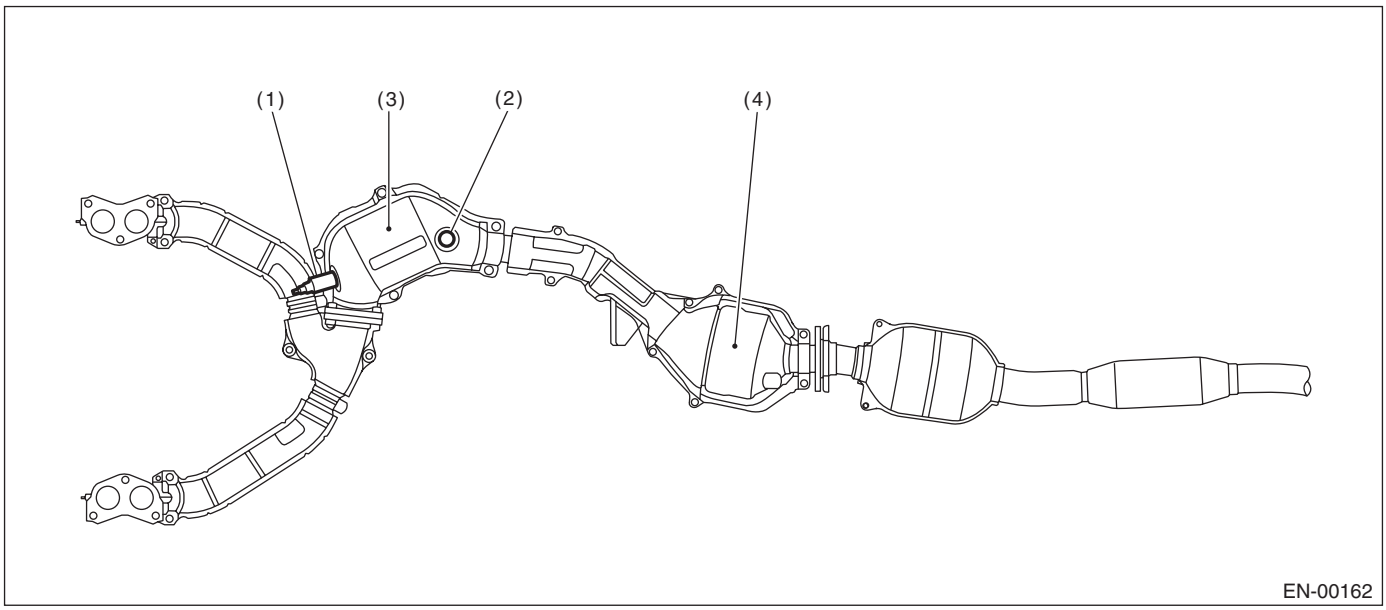
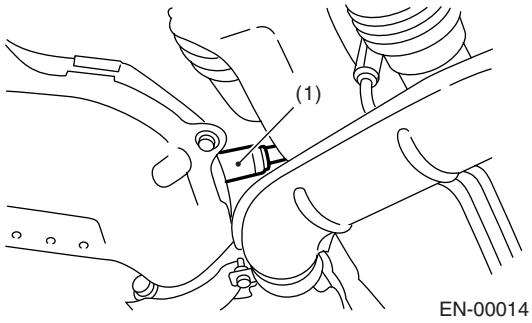
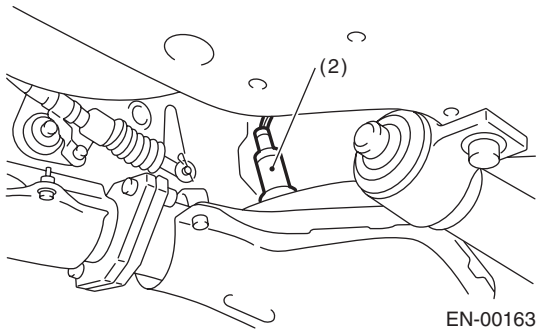
EN-02380

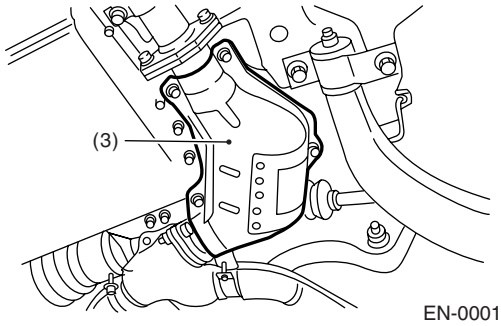
Electrical Component Location

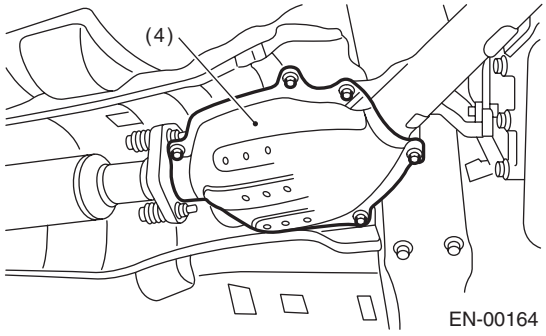


(1) Front oxygen (A/F) sensor
(2) Rear oxygen sensor
(3) Front catalytic converter
(4) Rear catalytic converter

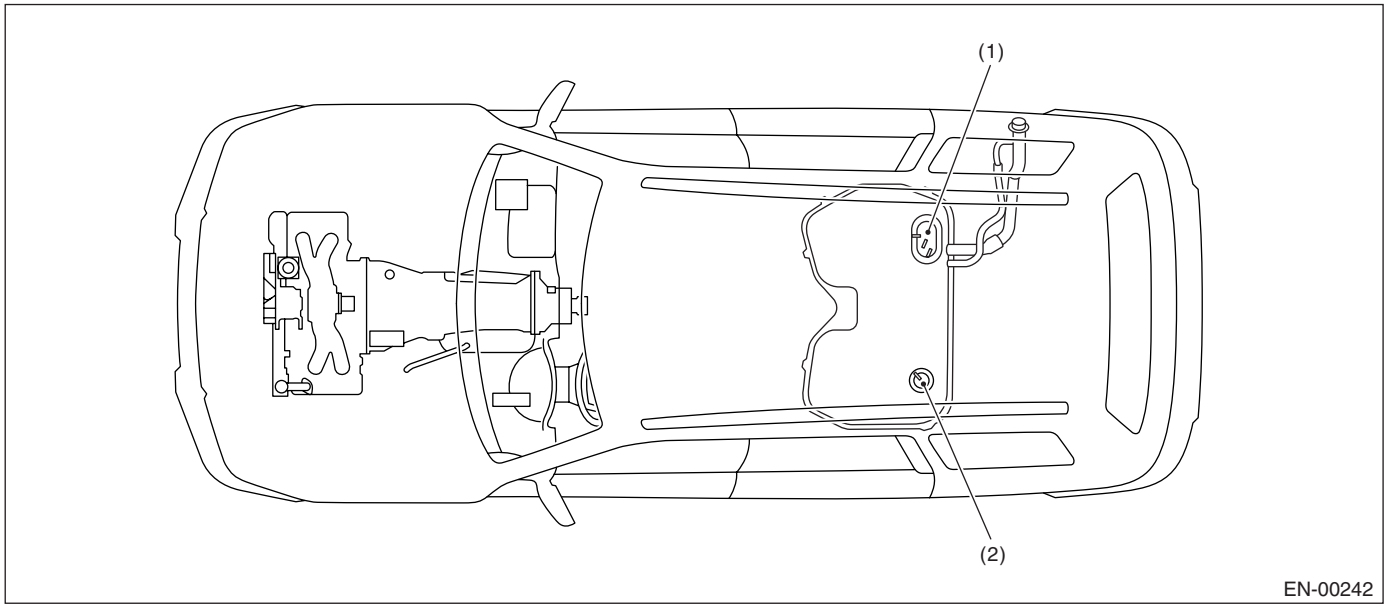




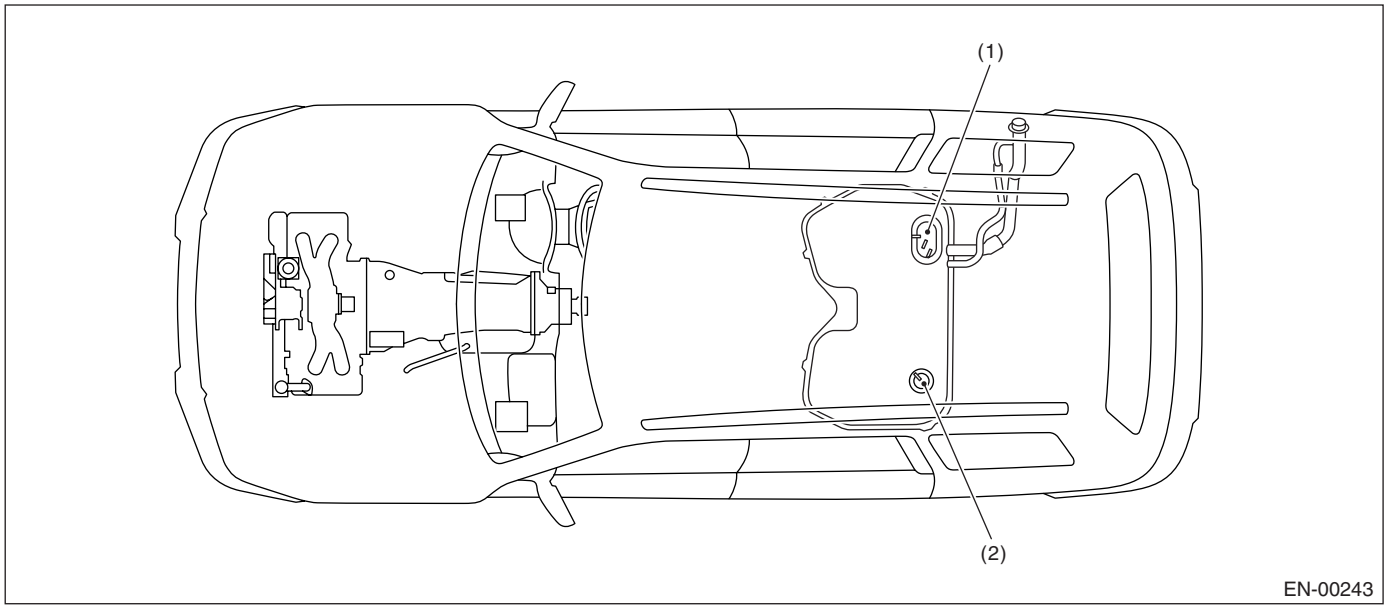




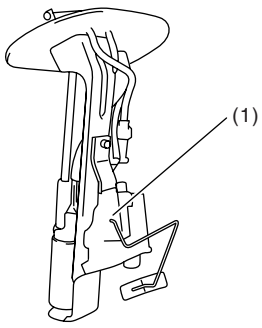
- LHD MODEL

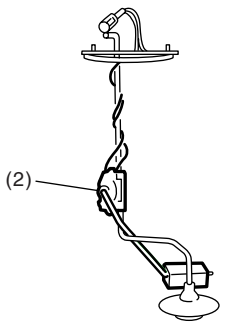


- RHD MODEL

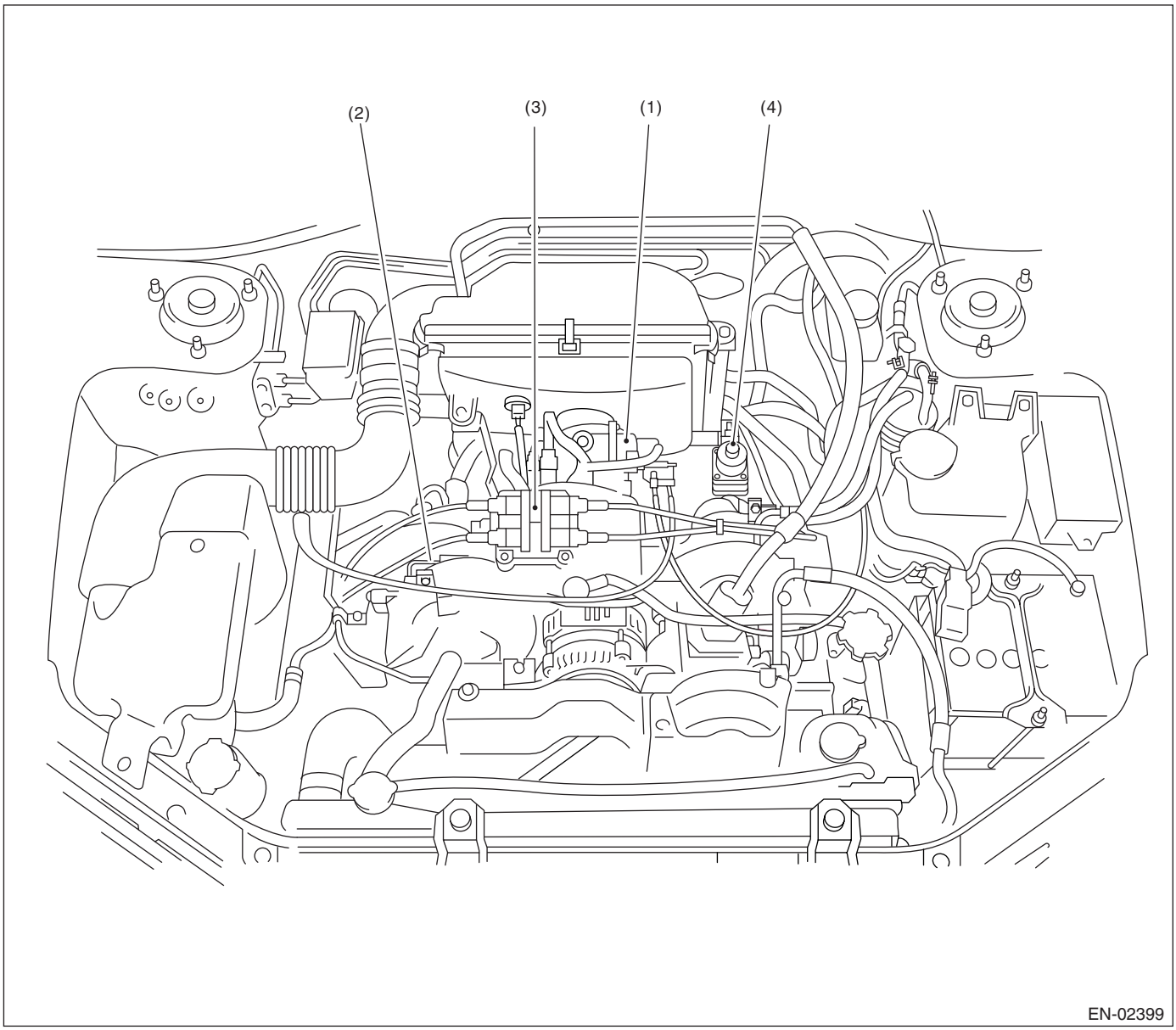


(1) Fuel level sensor (2) Fuel sub level sensor

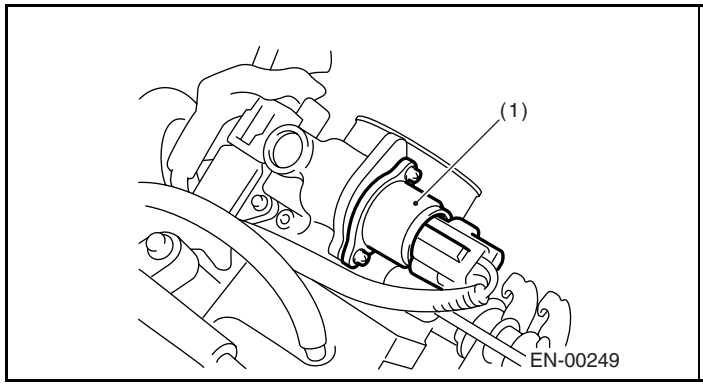


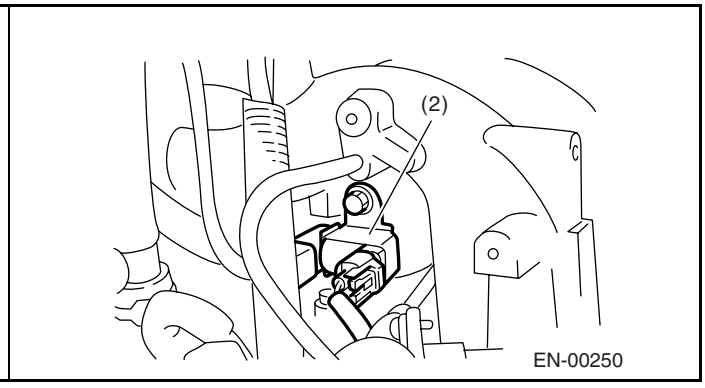


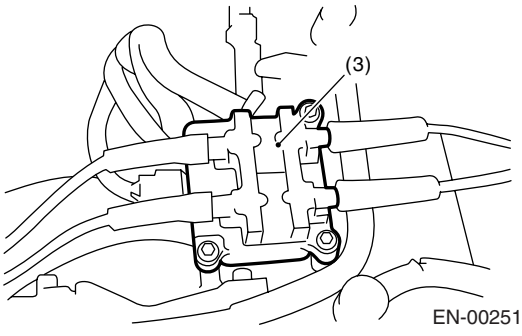
• SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS

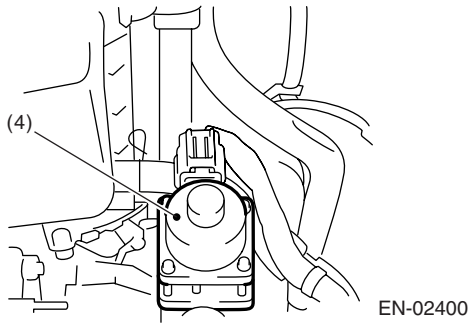


(1) Idle air control solenoid valve
(2) Purge control solenoid valve
(3) Ignition coil & ignitor ASSY
(4) EGR valve

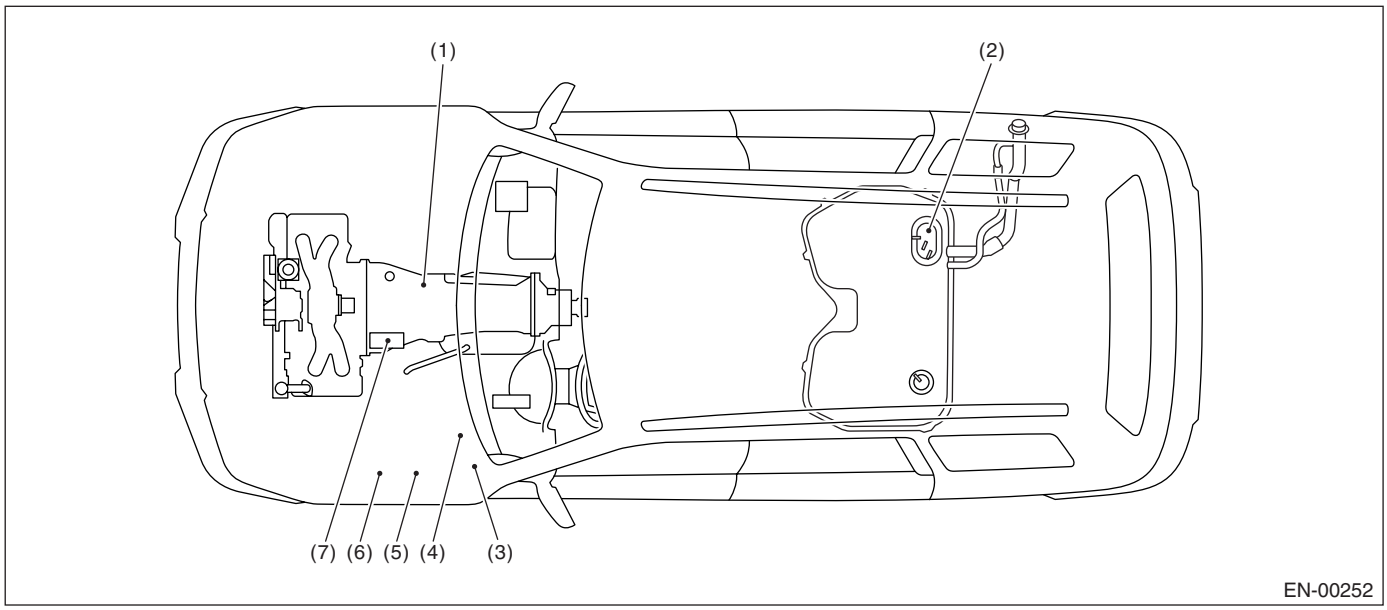




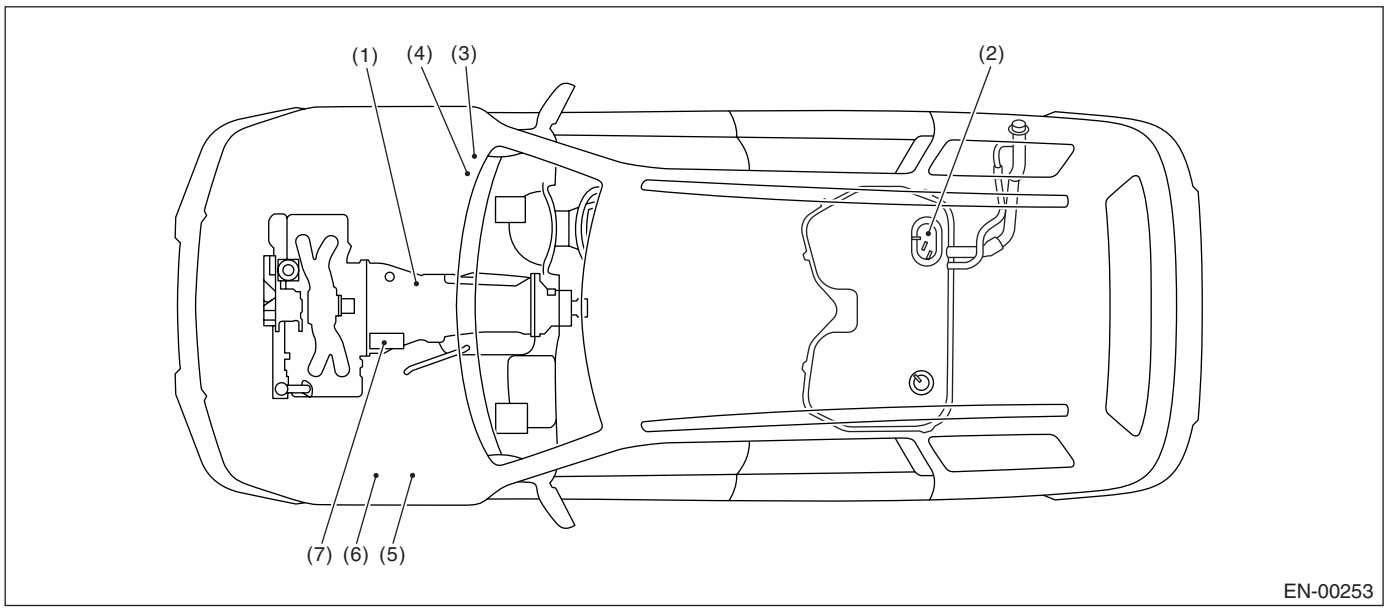




- LHD MODEL

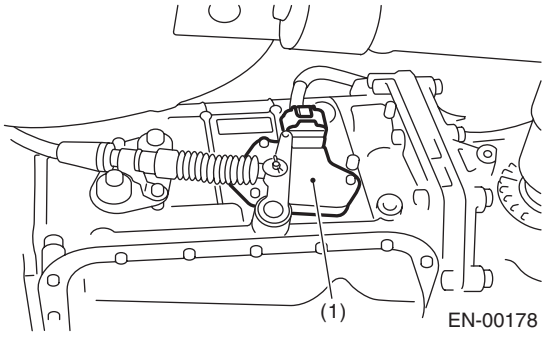


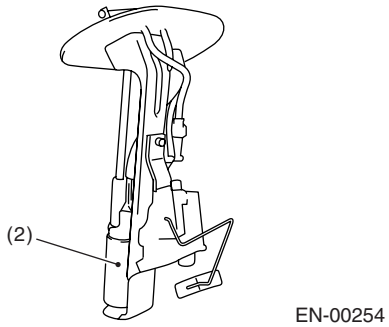
- RHD MODEL

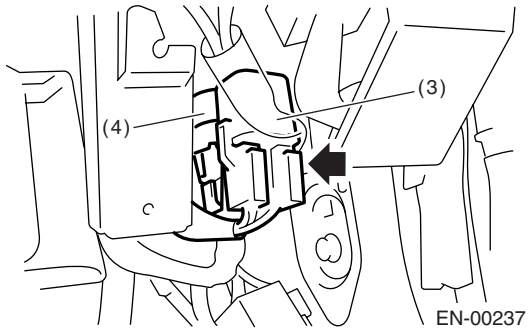


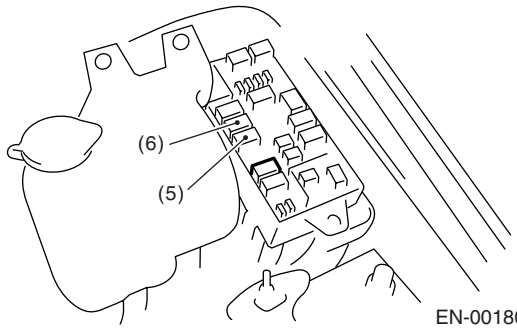
(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Radiator main fan relay
(6) Radiator sub fan relay
(7) Starter

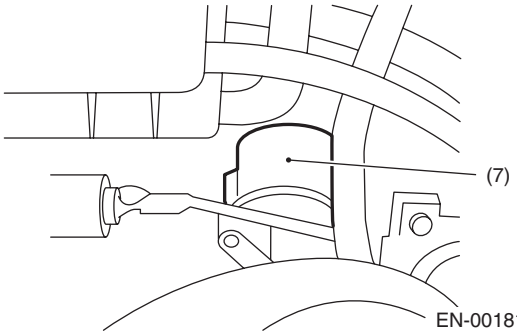
Electrical Component Location







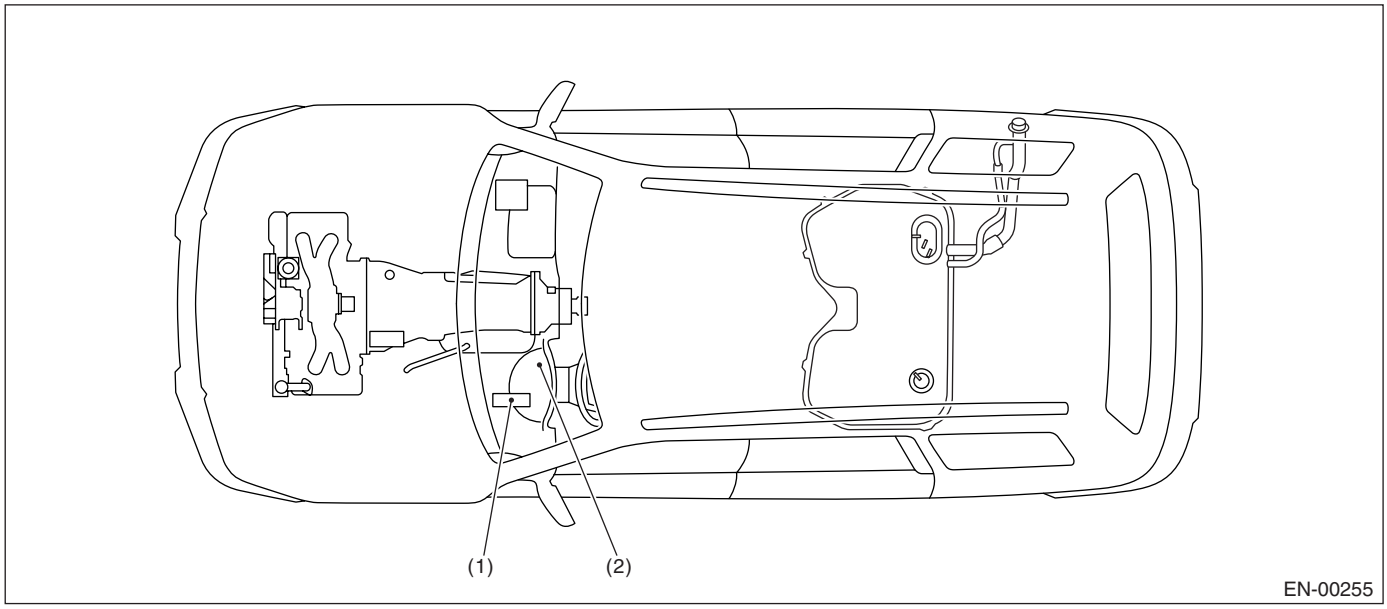




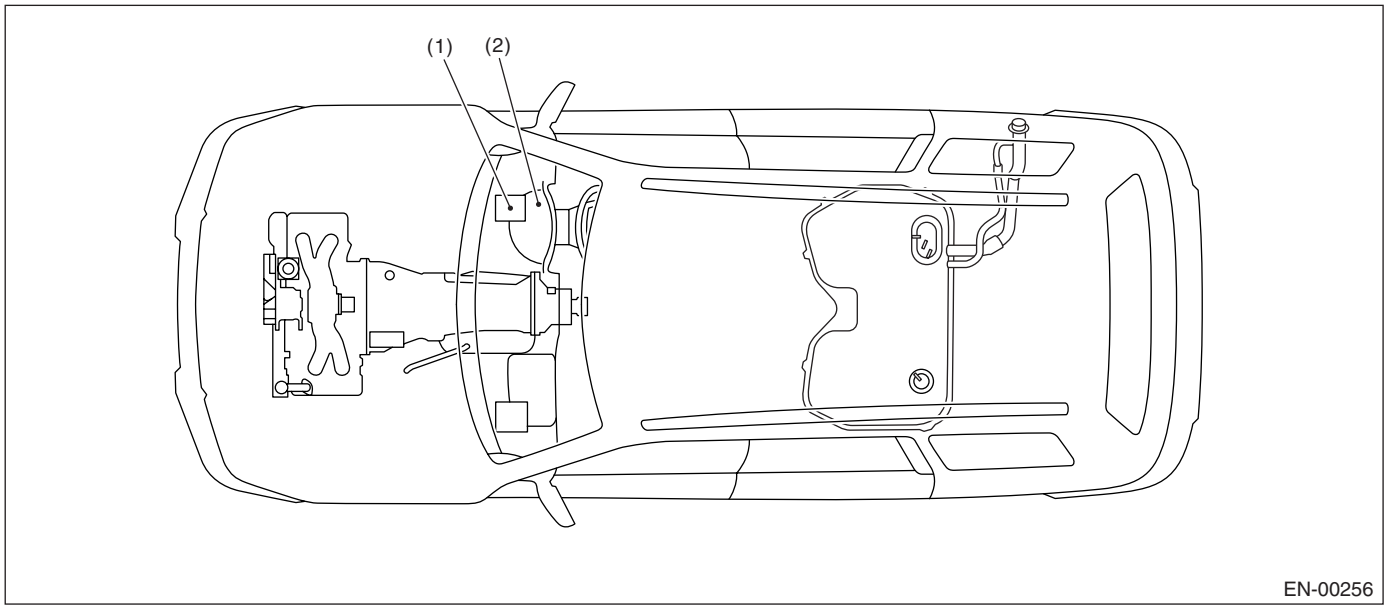
2. TRANSMISSION

• CONTROL MODULE

• LHD MODEL



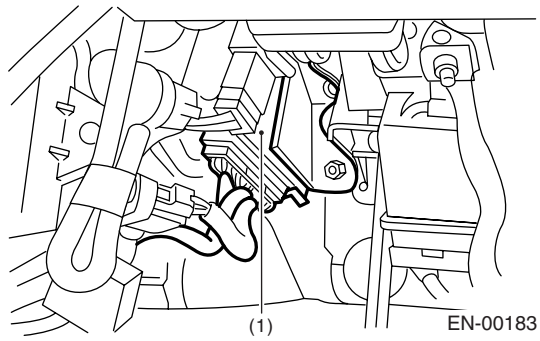
• RHD MODEL

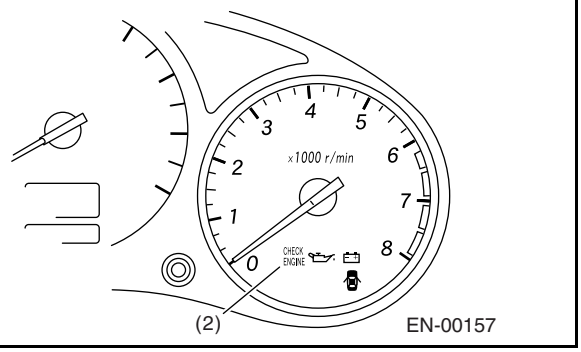


(1) Transmission control module (TCM) (for AT model)

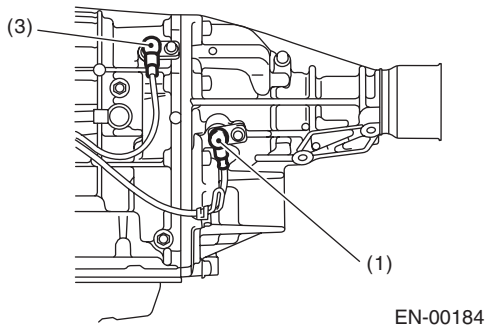
(2) AT diagnostic indicator light (for AT model)

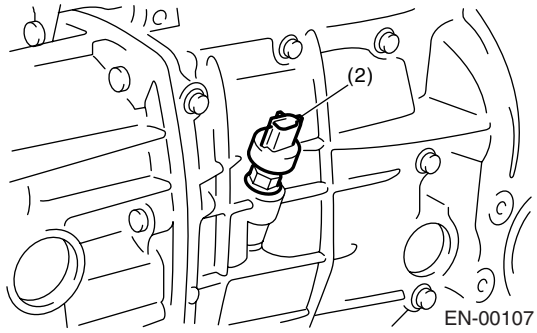
Electrical Component Location

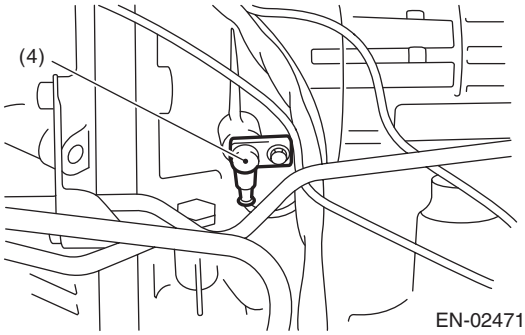


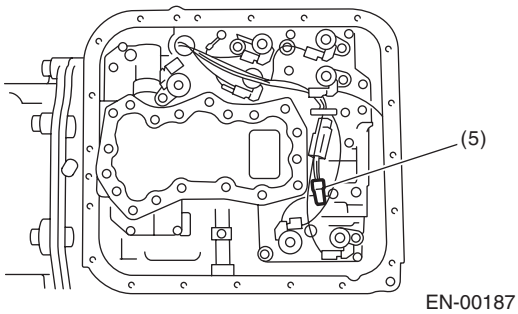


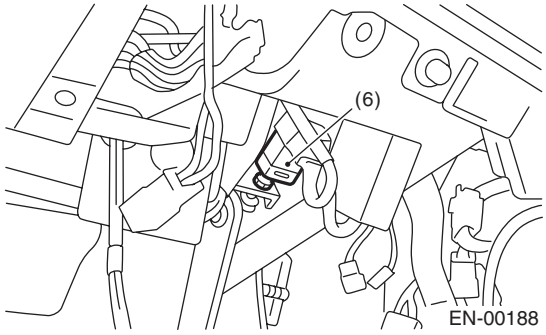
• SENSOR





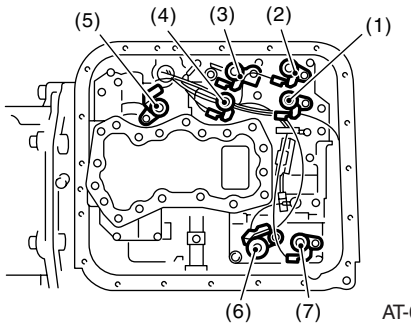


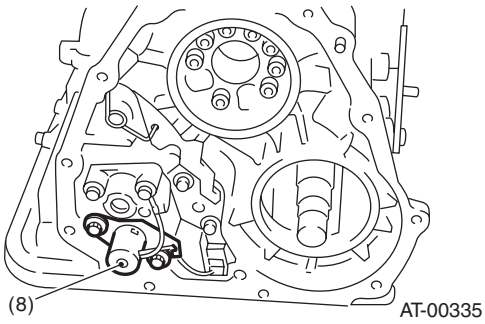


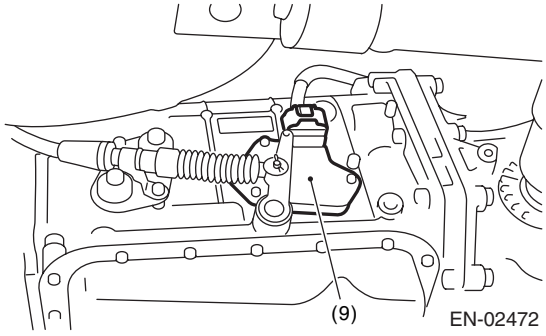


(1) Rear vehicle speed sensor (AT model)
(2) Front vehicle speed sensor (MT model)
(3) Front vehicle speed sensor (AT model)
(4) Torque converter turbine speed sensor
(5) ATF temperature sensor (AT model)
(6) Brake light switch

• SOLENOID VALVE & SWITCH (AT MODEL)



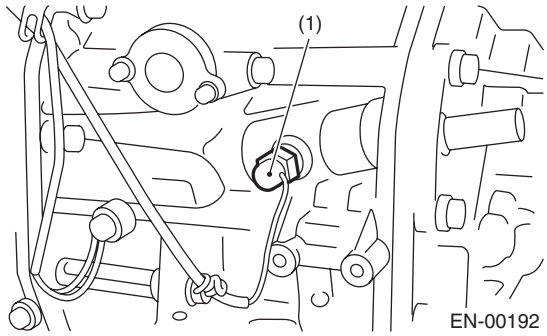




SUBARU.

(1) Shift solenoid valve 1
(2) Shift solenoid valve 2
(3) Line pressure duty solenoid
(4) Low clutch timing solenoid
(5) Lock-up duty solenoid
(6) 2-4 brake duty solenoid
(7) 2-4 brake timing solenoid
(8) Transfer duty solenoid
(9) Inhibitor switch

• SOLENOID VALVE & SWITCH (MT MODEL)

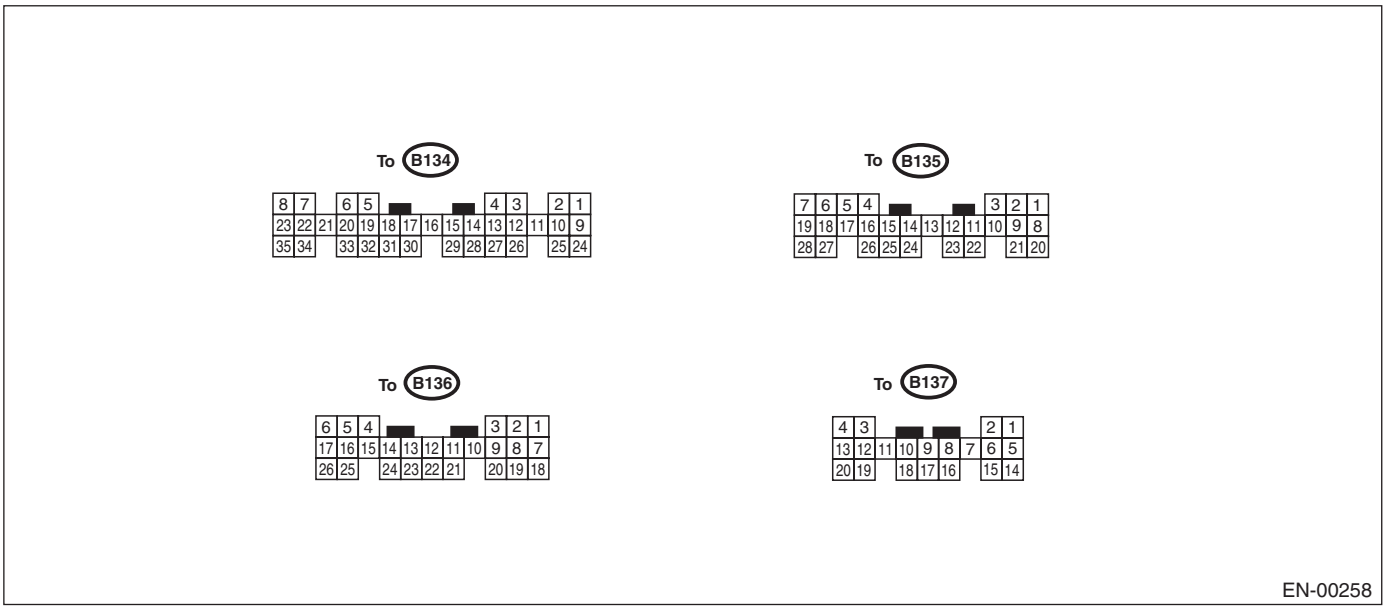


SUBARU.

(1) Neutral position switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



DESCRIPTION		Connector No.	Terminal No.	Signal (V)		NOTE
				Ignition SW ON (engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	6	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	17	0	0	—
	Shield	B135	28	0	0	—
Camshaft position sensor	Signal (+)	B135	7	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	18	0	0	—
	Shield	B135	28	0	0	—
Throttle position sensor	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	3	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	14	0	0 — 0.9	—
	Shield	B137	15	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	13	0 — 1.0	0 — 1.0	—
	Signal 2	B136	22	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B136	4	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B135	12	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	GND (sensor)	B135	19	0	0	After engine is warmed-up.
Vehicle speed signal		B137	10	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Starter switch		B136	20	0	0	Cranking: 8 — 14

DESCRIPTION		Connector No.	Terminal No.	Signal (V)		NOTE
				Ignition SW ON (engine OFF)	Engine ON (Idling)	
A/C switch		B136	11	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B136	10	10 — 13	12 — 14	—
Neutral Position Switch	MT	B136	21	ON: 0 OFF: 12±0.5		Switch is ON when gear is in neutral position.
	AT	B136	21	ON: 0 OFF: 12±0.5		Switch is ON when shifted into “P” or “N” range.
Test Mode Connector		B136	3	5	5	When connected: 0
Knock sensor	Signal	B135	16	2.8	2.8	—
	Shield	B135	27	0	0	—
Back-up power supply		B135	9	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B135	1	10 — 13	12 — 14	—
		B135	2	10 — 13	12 — 14	—
Sensor power supply		B135	3	5	5	—
Ignition control	#1, #2	B134	33	0	1 — 3.4	Waveform
	#3, #4	B134	32	0	1 — 3.4	Waveform
Fuel injector	#1	B134	34	10 — 13	1 — 14	Waveform
	#2	B134	23	10 — 13	1 — 14	Waveform
	#3	B134	22	10 — 13	1 — 14	Waveform
	#4	B134	8	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal 1	B134	20	—	1 — 13	Waveform
	Signal 2	B134	6	—	1 — 13	Waveform
	Signal 3	B134	5	—	1 — 13	Waveform
	Signal 4	B134	19	—	1 — 13	Waveform
	Power supply	B135	2	10 — 13	12 — 14	—
Fuel pump relay control		B134	2	ON: 0.5, or less OFF: 10 — 13	0.5, or less	—
A/C relay control		B134	9	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 12 — 14	—
Heater cock solenoid		B134	11	10 — 13	12 — 14	—
Radiator fan relay 1 control		B134	14	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 12 — 14	—
Radiator fan relay 2 control		B134	13	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 12 — 14	Model with A/C
Self-shutoff control		B136	12	10 — 13	12 — 14	—
Malfunction indicator light		B134	28	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B134	10	—	0 — 13, or more	Waveform
Torque control 1 signal		B136	1	5	5	—
Torque control 2 signal		B136	18	5	5	—
Torque control cut signal		B136	15	8	8	—
Purge control solenoid valve		B134	29	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 12 — 14	—
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
EGR valve	Signal 1	B134	18	0 or 10 — 13	0 or 10 — 13	—
	Signal 2	B134	17	0 or 10 — 13	0 or 10 — 13	—
	Signal 3	B134	16	0 or 10 — 13	0 or 10 — 13	—
	Signal 4	B134	15	0 or 10 — 13	0 or 10 — 13	—
AT diagnostic input signal		B137	19	Less than 1←→ More than 4	Less than 1←→ More than 4	Waveform

Engine Control Module (ECM) I/O Signal

DESCRIPTION	Connector No.	Terminal No.	Signal (V)		NOTE
			Ignition SW ON (engine OFF)	Engine ON (Idling)	
Small light switch	B137	20	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Blower fan switch	B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Rear defogger switch	B137	4	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sensor signal 1	B136	13	—	2.05 — 2.25	—
Front oxygen (A/F) sensor signal 2	B136	22	—	1.75 — 1.95	—
Manifold absolute pressure sensor	B135	15	4.0 — 4.8	1.1 — 1.9	—
Intake air temperature sensor	B137	6	3.15 — 3.33	3.15 — 3.33	Intake air temperature: 25°C (75°F)
SSM/GST communication line	B137	16	Less than 1←→ More than 4	Less than 1←→ More than 4	—
GND (sensor)	B136	19	0	0	—
GND (injector)	B134	35	0	0	—
GND (ignition system)	B136	26	0	0	—
GND (power supply)	B134	7	0	0	—
GND (control system)	B137	14	0	0	—
	B135	21	0	0	—
GND (oxygen sensor heater 1)	B136	5	0	0	—
GND (oxygen sensor heater 2)	B136	16	0	0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Remarks	Specification
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm Racing

Measuring condition:
- After engine is warmed-up.
- Gear position is in “N” or “P” range.
- Turn off the A/C.
- Turn all accessory switches to OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

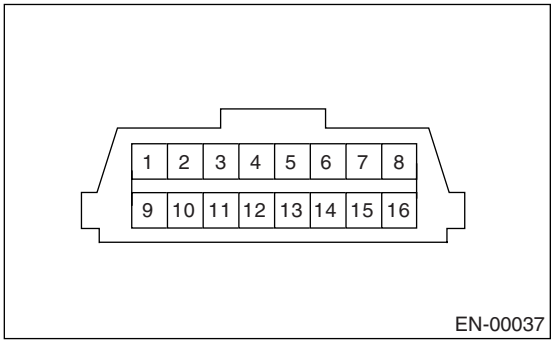
For the electrical specification of TCM I/O signal, refer to 4AT(H4SO) section. <Ref. to 4AT(diag)-12, ELECTRICAL SPECIFICATION, Transmission Control Module (TCM) I/O Signal.>

8. Data Link Connector

A: NOTE

- This connector is used both for the Subaru Select Monitor and general scan tools.
- Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:
Do not connect any scan tools other than the Subaru Select Monitor and general scan tools, because the circuit for the Subaru Select Monitor may be damaged.



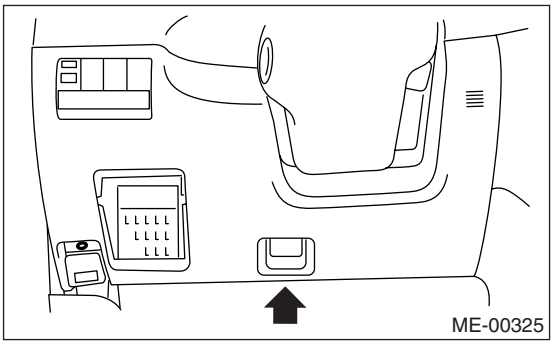
Terminal No.	Remarks	Terminal No.	Remarks
1	Power supply	9	Empty
2	Empty	10	K line of ISO 9141 CARB
3	Empty	11	Empty
4	Empty	12	Ground
5	Empty	13	Ground
6	Line end check signal	14	Empty
7	Empty	15	Empty
8	Empty	16	Empty

9. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

1) Prepare a general scan tool required by SAE J1978.
2) Connect the general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).



3) Using the general scan tool, call up the DTC and freeze frame data.
General scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
Read out data according to repair procedures. (For detailed operation procedures, refer to the General Scan Tool Instruction Manual.)

NOTE:
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine speed	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
10	Air flow rate of manifold absolute pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
14	Oxygen sensor output voltage and short term fuel trim — bank 1 associated with oxygen sensor	V and %
15	Oxygen sensor output voltage and short term fuel trim — bank 2 associated with oxygen sensor	V and %
1C	On-board diagnostic system	—

NOTE:
Refer to general scan tool manufacturer's instruction manual to access current powertrain diagnostic data (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnostic system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine speed	rpm
0D	Vehicle speed	km/h

NOTE:
Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODES)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4SO)(diag)-37, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (General scan tool trouble diagnostic information).

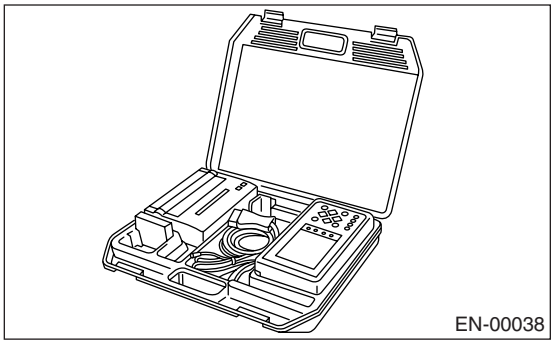
NOTE:
Refer to general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

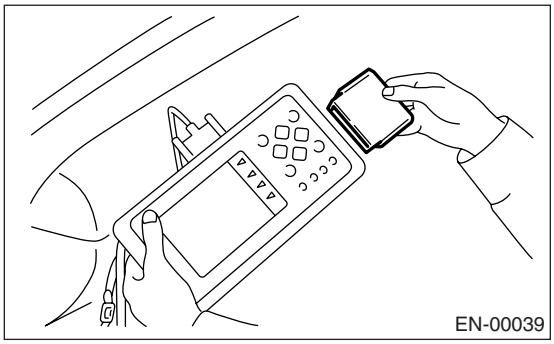
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-9, PREPARATION TOOL, General Description.>

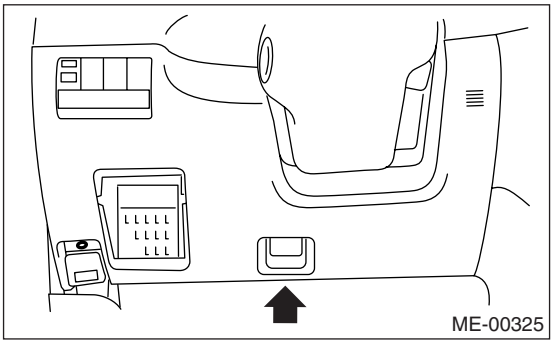


2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-9, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

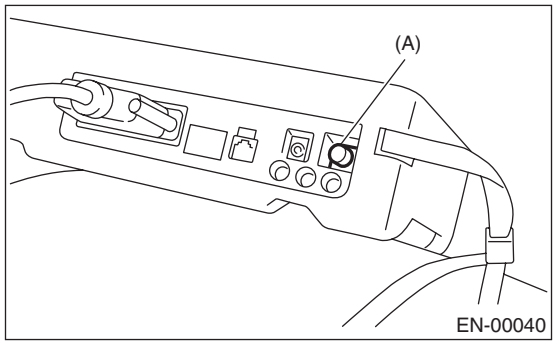
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTC. <Ref. to EN(H4SO)(diag)-37, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTC. <Ref. to EN(H4SO)(diag)-37, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Description	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Meter vehicle speed	km/h or MPH
Engine speed signal	Engine speed	rpm
Engine coolant temperature signal	Engine coolant temperature	°C or (°F)
Ignition timing signal	Ignition timing	deg
Throttle position signal	Amount of intake air	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel injection pulse width	ms
Idle air control signal	ISC Steps	STEP
Engine load data	Engine load	%
Front oxygen (A/F) sensor resistance	A/F sensor resistance value 1	ohm
Front oxygen (A/F) sensor output signal	A/F sensor current value 1	—
Rear oxygen sensor output signal	Rear oxygen sensor voltage value	V
Short term fuel trim	A/F Compensation 1	%
Knock sensor signal	Knock Correction	deg
Atmospheric absolute pressure signal	Atmospheric pressure	mmHg, kPa, inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg, kPa, inHg or psi
Intake manifold absolute pressure signal	Intake manifold absolute pressure	mmHg, kPa, inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Compensation 3	%
Long term whole fuel trim	A/F learning 1	%
Front oxygen (A/F) sensor heater current	Front O2 heater current value	A
Rear oxygen sensor heater current	Rear O2 heater current value	A
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Fuel level signal	Fuel level voltage	V
Intake air temperature signal	Intake air temperature	°C or (°F)
Learned ignition timing	Ignition learning value	deg
EGR signal	EGR Steps	STEP
Ignition switch signal	Ignition SW	ON or OFF
Test mode connector signal	Test mode signal	ON or OFF
Neutral position switch signal	Neutral SW	ON or OFF
Air conditioning switch signal	A/C SW	ON or OFF
Air conditioning compressor signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator fan relay 1	ON or OFF
Fuel pump relay signal	Fuel pump relay	ON or OFF
Knocking signal	Knock signal	ON or OFF
Radiator sub fan relay signal	Radiator fan relay 2	ON or OFF
Power steering switch signal	Power steering SW input signal	ON or OFF
Engine torque control signal #1	AT coordinate request signal 1	ON or OFF
Engine torque control signal #2	AT coordinate request signal 2	ON or OFF

Description	Display	Unit of measure
Engine torque control permission signal	AT coordinate permission signal	ON or OFF
Rear oxygen sensor rich signal	Rear O2 monitor	ON or OFF
Starter switch signal	Starter SW	ON or OFF
Idle switch signal	Soft idle SW	ON or OFF
Crankshaft position sensor signal	Crankshaft position signal	ON or OFF
Camshaft position sensor signal	Camshaft position signal	ON or OFF
Rear defogger switch signal	Rear defogger SW	ON or OFF
Blower fan switch signal	Blower fan SW	ON or OFF
Small light switch signal	Light SW	ON or OFF
AT vehicle ID signal	AT/MT identification terminal	AT or MT
A/C middle pressure switch signal	A/C middle pressure SW	ON or OFF

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

5. READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD system} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display & Save}, and press the [YES] key.
6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, scroll the display screen up or down until the desired data is shown.

• A list of the support data is shown in the following table.

Description	Display	Unit of measure
Number of DTC	Number of diagnosis code	—
Condition of malfunction indicator light	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire Monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel System Diagnosis	Complete or incomplete
Monitoring test of comprehensive component	Component Diagnosis	Complete or incomplete
Test of catalyst	Catalyst diagnosis	Complete or incomplete
Test of heating-type catalyst	Heated catalyst diagnosis	No support
Test of evaporative emission purge control system	Evap. purge diagnosis	Complete or incomplete
Test of secondary air system	Secondary air diagnosis	No support
Test of air conditioning system refrigerant	A/C refrigerant diagnosis	No support
Test of oxygen sensor	O2 sensor diagnosis	Complete or incomplete
Test of oxygen sensor heater	O2 heater diagnosis	Complete or incomplete
Test of EGR system	EGR diagnosis	—
Air fuel ratio control system for bank 1	Fuel System for bank 1	—
Engine load data	Engine load	%
Engine coolant temperature signal	Engine coolant temperature	°C or (°F)
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Intake manifold absolute pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine speed	rpm
Vehicle speed signal	Meter vehicle speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake air temperature	°C or (°F)
Amount of intake air	Amount of intake air	g/s
Throttle position signal	Throttle valve angle	%
Rear oxygen sensor output signal	O2 sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD system	—
Oxygen sensor #11	O2 sensor #11	With support
Oxygen sensor #12	O2 sensor #12	With support
A/F sensor #11	A/F sensor #11	—

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.

- A list of the support data is shown in the following table.

Description	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank 1	ON or OFF
Engine load data	Engine load	%
Engine coolant temperature signal	Engine coolant temperature	°C or (°F)
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Intake manifold absolute pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine speed	rpm
Vehicle speed signal	Meter vehicle speed	km/h or MPH

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Description	Display	Message	LED “ON” requirements
Ignition switch signal	Ignition SW	ON or OFF	When ignition switch is ON
Test mode connector signal	Test mode signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral SW	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C SW	ON or OFF	When air conditioning switch is ON
Air conditioning relay signal	A/C Compressor Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator fan relay 1	ON or OFF	When radiator main fan relay is in function.
Fuel pump relay signal	Fuel pump relay	ON or OFF	When fuel pump relay is in function.
Knocking signal	Knock signal	ON or OFF	When knocking signal is input.
Radiator sub fan relay signal	Radiator fan relay 2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	AT coordinate request signal 1	ON or OFF	When engine torque control signal 1 is entered
Engine torque control signal #2	AT coordinate request signal 2	ON or OFF	When engine torque control signal 2 is entered
Engine torque control permission signal	AT coordinate permission signal	ON or OFF	When engine torque control permission signal is entered.
Front oxygen (A/F) sensor rich signal	Front O2 Rich Signal #1	ON or OFF	When front oxygen (A/F) sensor mixture ratio is rich.
Rear oxygen sensor rich signal	RrO2 monitor	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter SW	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft position signal	ON or OFF	When crankshaft position sensor signal is input.
Camshaft position sensor signal	Camshaft position signal	ON or OFF	When camshaft position sensor signal is entered.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

8. READ CURRENT DATA FOR AT

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Transmission Diagnosis» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Description	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine speed	rpm
ATF temperature signal	ATF Temp.	°C or °F
Throttle position sensor	Throttle Sensor Voltage	V
Gear Position	Gear position	—
Line pressure control duty ratio	Line pressure duty	%
Lock up clutch control duty ratio	L/U Duty	%
Transfer clutch control duty ratio	AWD duty	%
Throttle position sensor power supply	Throttle sensor power supply	V
Turbine revolution signal	Turbine Revolution Speed	rpm
2-4 Brake timing pressure control duty ratio	2-4 B Pressure Duty	%
Intake manifold pressure sensor voltage	Mani. Relative Voltage	V
FWD switch signal	FWD SW	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Stop light switch signal	Stop Light SW	ON or OFF
Anti lock brake system signal	ABS signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P range	ON or OFF
Reverse range signal	R Range	ON or OFF
Drive range signal	D Range	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque control output signal 1	ON or OFF
Torque control output signal #2	Torque control output signal 2	ON or OFF
Torque control cut signal	Torque Control Cut Sig	ON or OFF
2-4 brake timing control solenoid valve	2-4B Timing Solenoid	ON or OFF
Low clutch timing control solenoid valve	L/C timing solenoid	ON or OFF
Automatic transmission diagnostic light output signal	Diagnosis Lamp	ON or OFF

11. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» screen, select the {DTC Display}, and then press the [YES] key.
5) On the «Diagnostic Code(s) Display» screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
• For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to general scan tool manufacturer’s instruction manual to access powertrain DTC (MODE $03).

12.Inspection Mode

A: OPERATION

Perform the diagnostic on the “Diagnostic Trouble Codes (DTC) List” below.
Refer to the item of drive cycle when perform the diagnostic not on the “Diagnostic Trouble Codes (DTC) List” below. <Ref. to EN(H4SO)(diag)-43, Drive Cycle.>

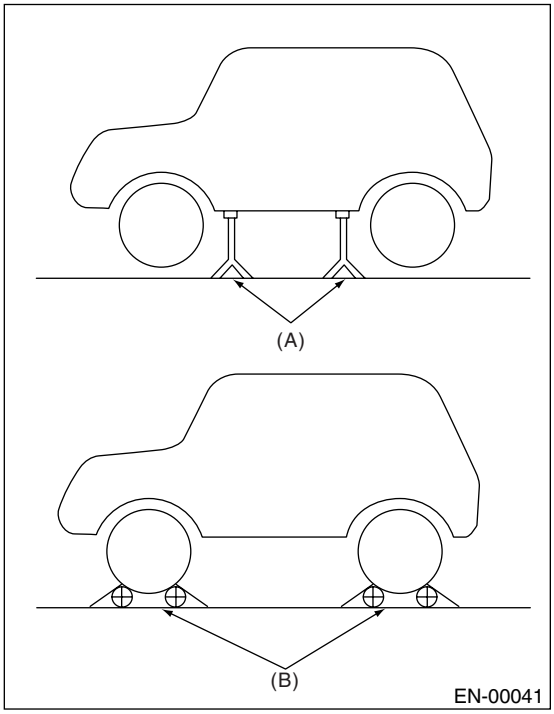
DTC	Item
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)
P0068	Manifold Pressure Sensor Range/Performance
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input
P0112	Intake Air Temperature Circuit Low Input
P0113	Intake Air Temperature Circuit High Input
P0117	Engine Coolant Temperature Circuit Low Input
P0118	Engine Coolant Temperature Circuit High Input
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input
P0129	Barometric Pressure Too Low
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)
P0335	Crankshaft Position Sensor “A” Circuit
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low
P0462	Fuel Level Sensor Circuit Low Input
P0463	Fuel Level Sensor Circuit High Input
P0502	Vehicle Speed Sensor Circuit Low Input
P0503	Vehicle Speed Sensor Intermittent/Erratic/High
P0512	Starter Request Circuit
P0513	Incorrect Immobilizer Key
P0519	Idle Control System Malfunction (Fail-Safe)
P0565	Cruise Control On Signal
P0604	Internal Control Module Random Access Memory (RAM) Error
P0703	Torque Converter/Brake Switch “B” Circuit
P0705	Transmission Range Sensor Circuit (PRNDL Input)
P0710	Transmission Fluid Temperature Sensor Circuit
P0716	Torque converter turbine speed sensor
P0720	AT Vehicle Speed Sensor Circuit Malfunction
P0726	Engine Speed Input Circuit Malfunction
P0731	Gear 1 Incorrect Ratio
P0732	Gear 2 Incorrect Ratio
P0733	Gear 3 Incorrect Ratio

DTC	Item
P0734	Gear 4 Incorrect Ratio
P0741	Torque Converter Clutch Circuit Performance or Stuck Off
P0743	Torque Converter Clutch Circuit Electrical
P0748	Pressure Control Solenoid “A” Electrical
P0753	Shift Solenoid “A” Electrical
P0758	Shift Solenoid “B” Electrical
P0771	Low clutch timing solenoid
P0778	Pressure Control Solenoid “B” Electrical
P0785	Shift/Timing Solenoid
P0851	Neutral Switch Input Circuit Low
P0852	Neutral Switch Input Circuit High
P0864	TCM Communication Circuit Range/Performance
P0865	TCM Communication Circuit Low
P0866	TCM Communication Circuit Low
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)
P1492	EGR Valve Signal #1 Circuit Malfunction (Low Input)
P1493	EGR Valve Signal #1 Circuit Malfunction (High Input)
P1494	EGR Valve Signal #2 Circuit Malfunction (Low Input)
P1495	EGR Valve Signal #2 Circuit Malfunction (High Input)
P1496	EGR Valve Signal #3 Circuit Malfunction (Low Input)
P1497	EGR Valve Signal #3 Circuit Malfunction (High Input)
P1498	EGR Valve Signal #4 Circuit Malfunction (Low Input)
P1499	EGR Valve Signal #4 Circuit Malfunction (High Input)
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)
P1518	Starter Switch Circuit Low Input
P1560	Back-Up Voltage Circuit Malfunction
P1570	Antenna
P1571	Reference Code Incompatibility
P1572	EGI — Immobilizer Communication
P1574	Key — Communication Failure
P1576	EGI Control Module EEPROM
P1577	IMM Control Module EEPROM
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)
P1700	Throttle Position Sensor Circuit Malfunction For AT
P1711	Engine Torque Control Signal #1 Circuit Malfunction
P1712	Engine Torque Control Signal #2 Circuit Malfunction

1. PREPARATION FOR THE INSPECTION MODE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) Lift-up the vehicle using a garage jack and place it on rigid racks or drive the vehicle onto free rollers.

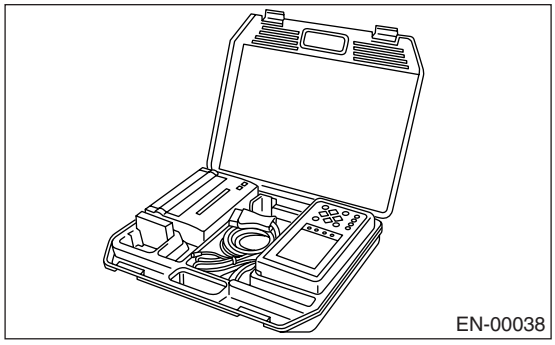
WARNING:
• Before lifting-up the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



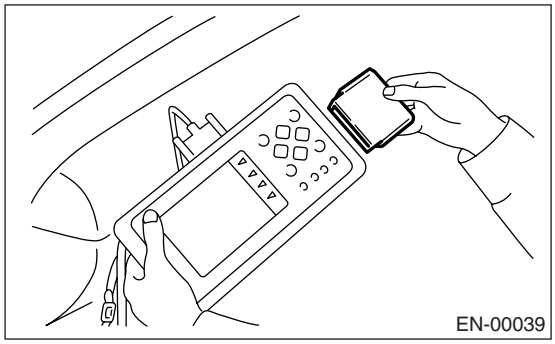
(A) Rigid rack
(B) Free rollers

2. SUBARU SELECT MONITOR

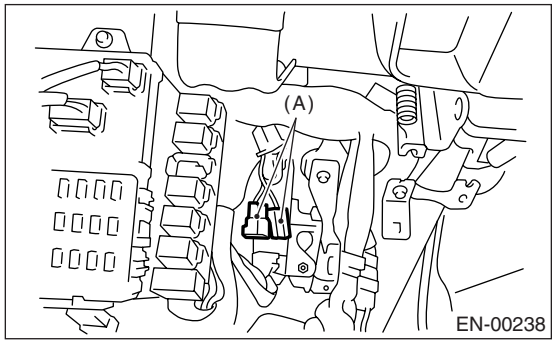
1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-45, Clear Memory Mode.>
2) Idle the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-9, PREPARATION TOOL, General Description.>



4) Connect the diagnostic cable to Subaru Select Monitor.
5) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-9, PREPARATION TOOL, General Description.>

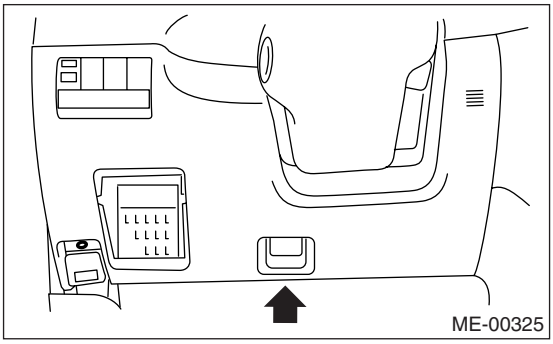


6) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



7) Connect the Subaru Select Monitor to data link connector.

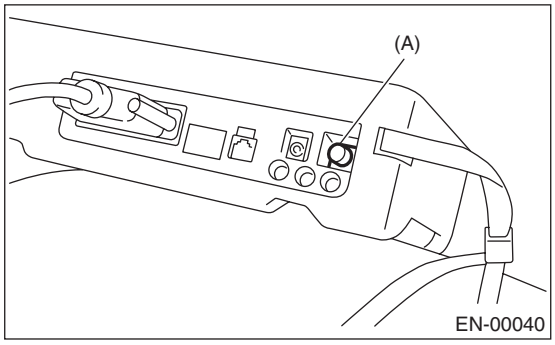
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

8) Turn ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON.



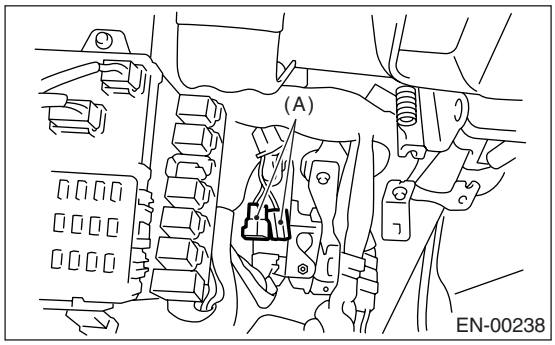
(A) Power switch

9) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
11) Press the [YES] key after the information of engine type was displayed.
12) On the «Engine Diagnosis» screen, select the {D Check} and press the [YES] key.
13) When the "Perform D Check?" is shown on the screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.
If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnostic is finished, perform the ABS memory clearance procedure of self-diagnosis function.

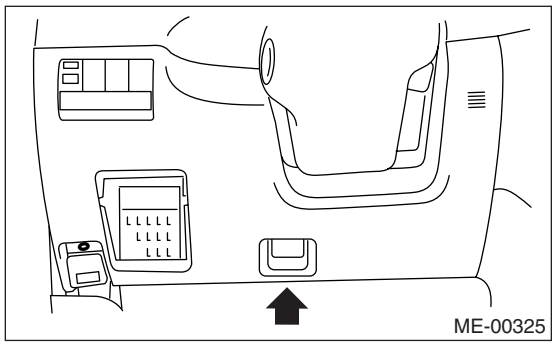
3. GENERAL SCAN TOOL

1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-45, Clear Memory Mode.>
2) Idle the engine.
3) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



4) Connect the general scan tool to its data link connector in the lower portion of the instrument panel lower panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



5) Start the engine.

NOTE:
• Ensure the select lever is placed in the “P” range before starting. (AT model)
• Depress the clutch pedal when starting the engine. (MT model)

6) Using the selector lever or shift lever, turn the “P” range switch and the “N” range switch to ON.
7) Depress the brake pedal to turn the brake switch ON. (AT model)
8) Keep the engine speed in the 2,500 — 3,000 rpm range for 40 seconds.
9) Place the select lever or shift lever in the “D” range (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnostic is finished, perform the ABS memory clearance procedure of self-diagnosis function.

10) Using the general scan tool, check DTC(s) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are three driving patterns on diagnostic. Following trouble can be diagnosed with driving specified patterns. After repair the following trouble, be sure to check that the trouble is cleared correctly by the driving specified patterns.

1. PREPARATION FOR DRIVE CYCLE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-45, Clear Memory Mode.>
3) Separate the test mode connector.

NOTE:
• Be sure to perform the diagnostic after idling from starting the cooled engine except when the engine coolant temperature is specified.
• Perform the diagnostic twice when the DTC is marked with *. After the completion of first diagnostic, stop the engine and perform the second diagnostic on same condition.

2. DRIVE THE VEHICLE 20 MINUTES AT THE SPEED OF 80 KM/H (50 MPH), AND THEN IDLE THE ENGINE 1 MINUTE.

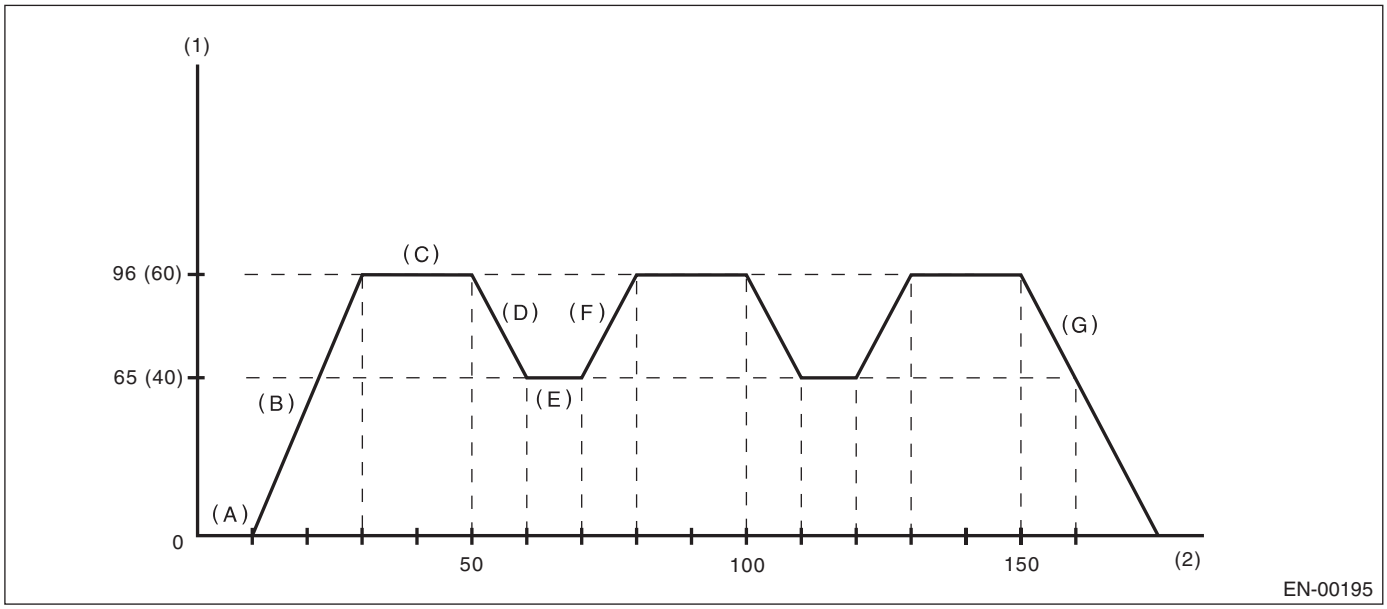
DTC	Item	On condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0111	Intake Air Temperature Sensor Circuit Range/Performance Problem	Engine coolant temperature at start is less than 30°C (86°F)
*P0125	Insufficient coolant temperature for closed loop fuel control	Engine coolant temperature at start is less than 20°C (68°F)
*P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	—
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
*P0461	Fuel Level Sensor Circuit Range/Performance	—
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P1137	O_2 Sensor Circuit (Bank 1 Sensor 1)	—

3. 10 MINUTES IDLING

NOTE:
Drive the vehicle more than 4 km/h (6 MPH) before diagnostic.

DTC	Item	On condition
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—

4. DRIVE THE VEHICLE WITH FOLLOWING DRIVE PATTERNS



(A) Run the engine at idle for a minute.
(B) Accelerate the vehicle to 97 km/h (60 MPH) within 20 seconds.
(C) Drive the vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Slowdown the vehicle to 64 km/h (40 MPH) with throttle fully closed condition.
(E) Drive the vehicle at 64 km/h (40 MPH) for 10 seconds.
(F) Accelerate the vehicle to 97 km/h (60 MPH) within 10 seconds.
(G) Stop the vehicle with throttle fully closed condition.

(1) Vehicle speed km/h (MPH)
(2) Seconds

DTC	Item	On condition
*P0121	Throttle/Pedal Position Sensor/Switch “A” Circuit Range/Performance	—
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System too Lean (Bank 1)	—
*P0172	System too Rich (Bank 1)	—
*P0301	Cylinder 1 Misfire Detected	—
*P0302	Cylinder 2 Misfire Detected	—
*P0303	Cylinder 3 Misfire Detected	—
*P0304	Cylinder 4 Misfire Detected	—
*P0400	Exhaust Gas Recirculation Flow	—

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {Memory Clear} and press the [YES] key.
5) When the “Done” and “Turn Ignition Switch OFF” are shown on the display screen, turn the ignition switch to OFF and then Subaru Select Monitor switch to OFF.

NOTE:
• After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Clear} and press the [YES] key.
6) When the “Perform Diagnostic Code(s) Clear?” is shown on the screen, press the [YES] key.
7) Turn the ignition switch to OFF and then turn the Subaru Select Monitor to OFF.

NOTE:
After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.

3. GENERAL SCAN TOOL

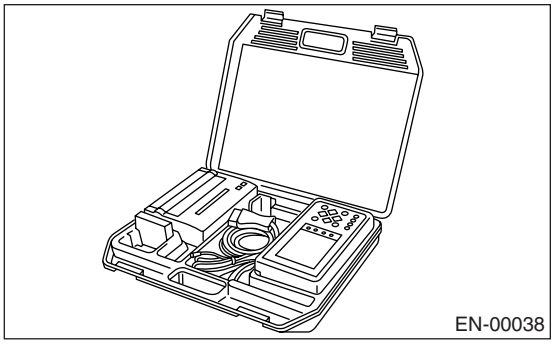
For clear memory procedures using the general scan tool, refer to the General Scan Tool Instruction Manual.

After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to the ON position. Wait 3 seconds before starting the engine.

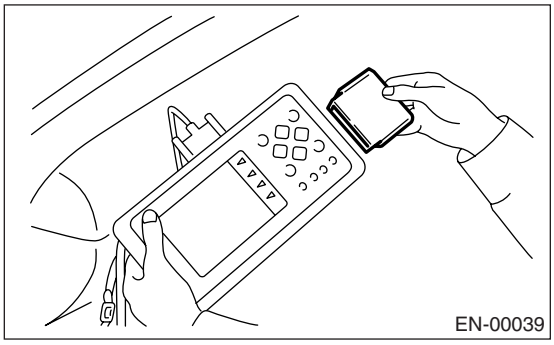
15. Compulsory Valve Operation Check Mode

A: OPERATION

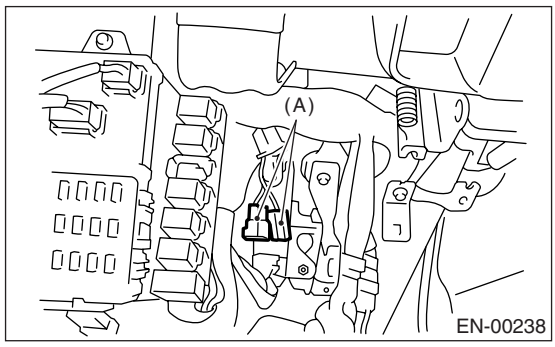
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-9, PREPARATION TOOL, General Description.>



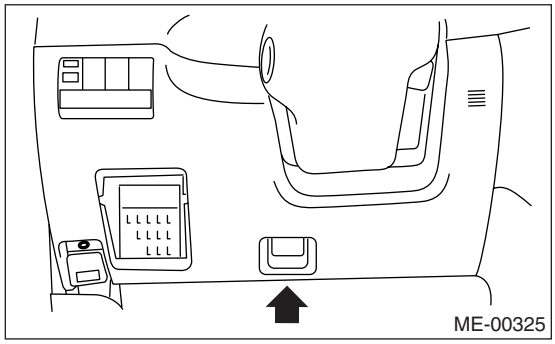
2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-9, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) located at the lower portion of glove box.

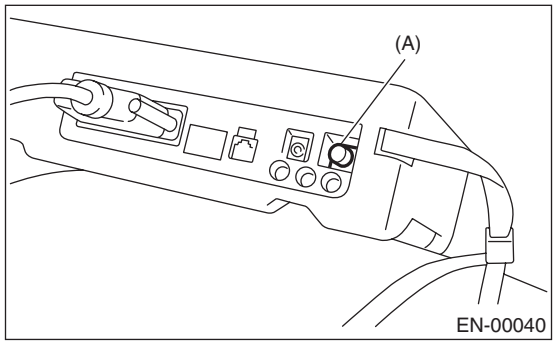


5) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

6) Turn ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
9) Press the [YES] key after the information of engine type was displayed.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory valve operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of the support data is shown in the following table.

Description	Display
Compulsory fuel pump relay operation check	Fuel Pump
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid

NOTE:
• “EGR solenoid” is not indicated but EGR solenoid valve is installed to the vehicle.
• The following parts will be displayed but not functional because vehicle are not equipped with them.

Display
ASV Solenoid
FICD Solenoid
Pressure switching solenoid 1
Pressure switching solenoid 2
PCV Solenoid
Vent Control Solenoid
Atmospheric pressure switching solenoid

• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

16.Malfunction Indicator Light

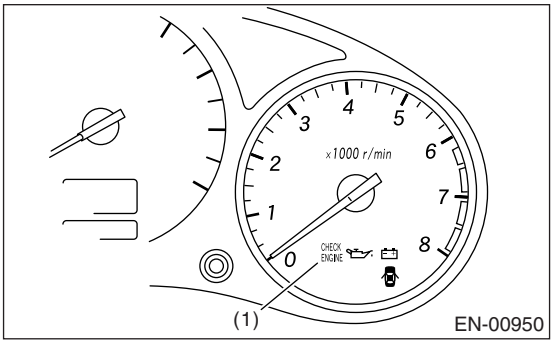
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4SO)(diag)-48, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4SO)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4SO)(diag)-53, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink. <Ref. to EN(H4SO)(diag)-54, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking. <Ref. to EN(H4SO)(diag)-56, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING., Malfunction Indicator Light.>

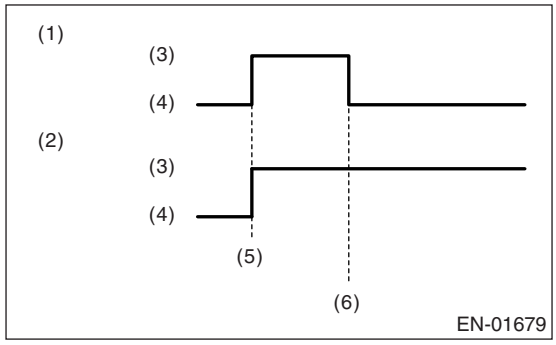
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light (1) in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform the diagnostic of malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4SO)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

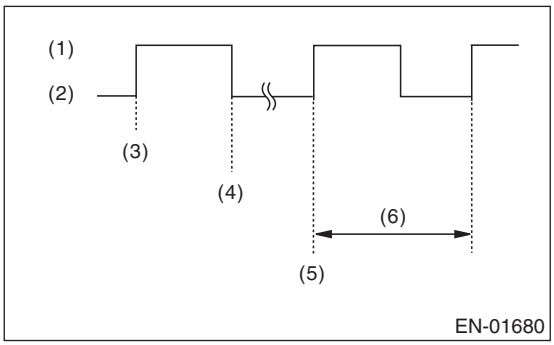


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



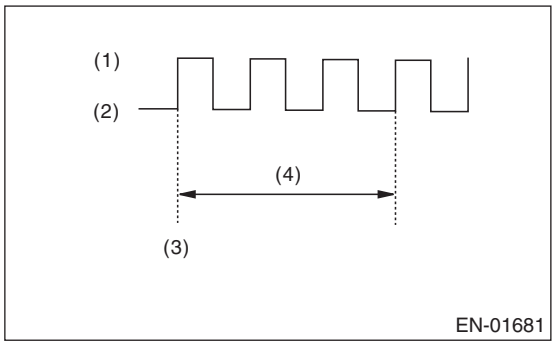
(1) No faulty
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnostic system detects a misfire which could damage the catalyst, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) When the ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

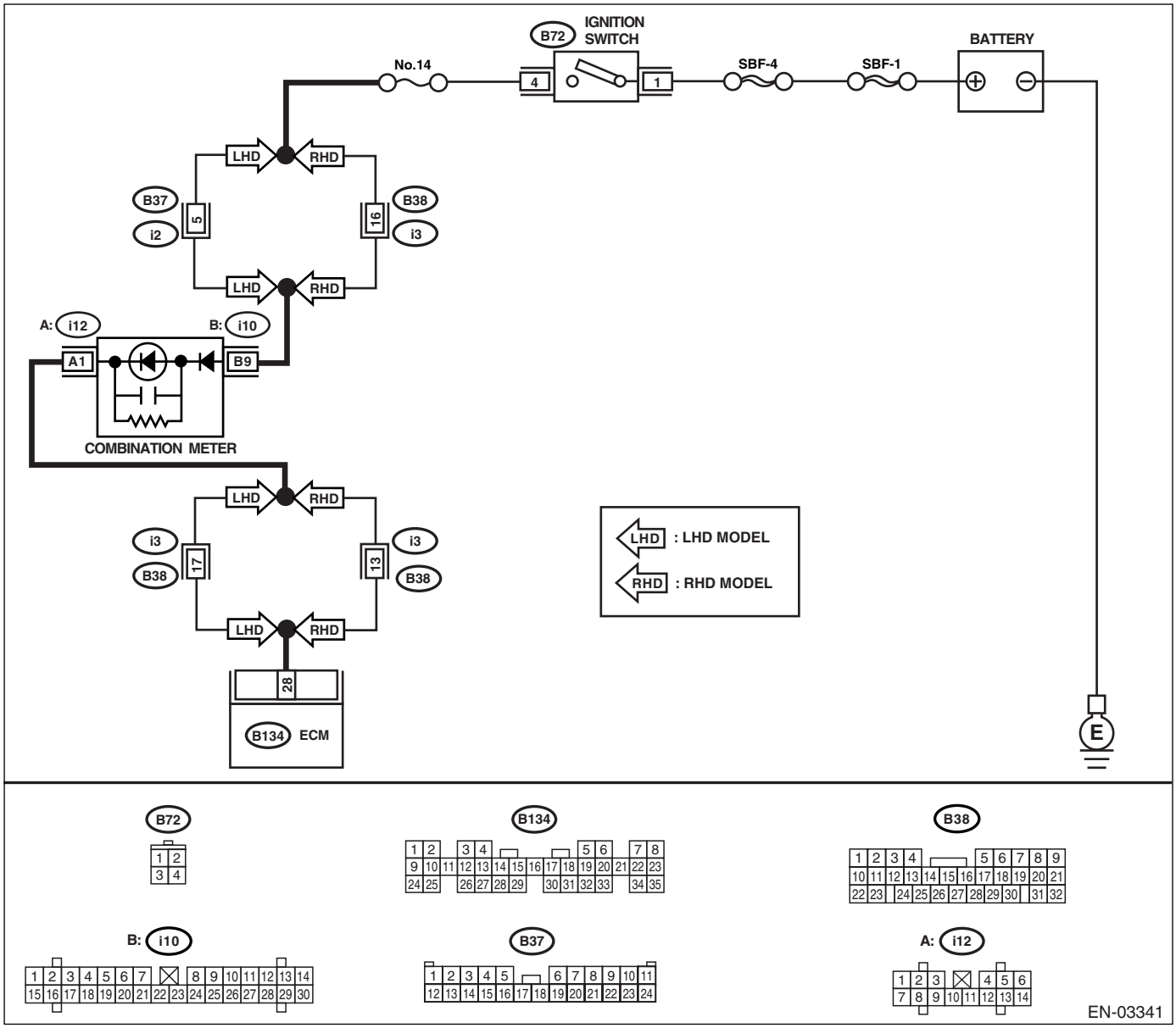
DIAGNOSTIC:

The malfunction indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned ON (engine OFF), malfunction indicator light does not come on.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 28 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check for poor connection when shaking or pulling ECM connector and harness.	Does malfunction indicator light illuminate?	Repair the poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 28 — (i12) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Check the following and repair if necessary. NOTE: • Broken down ignition relay. • Blown out fuse (No. 5) • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7	**CHECK BULB.**	Is the malfunction indicator light bulb OK?	Repair combination meter connector.	Replace the bulb.

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

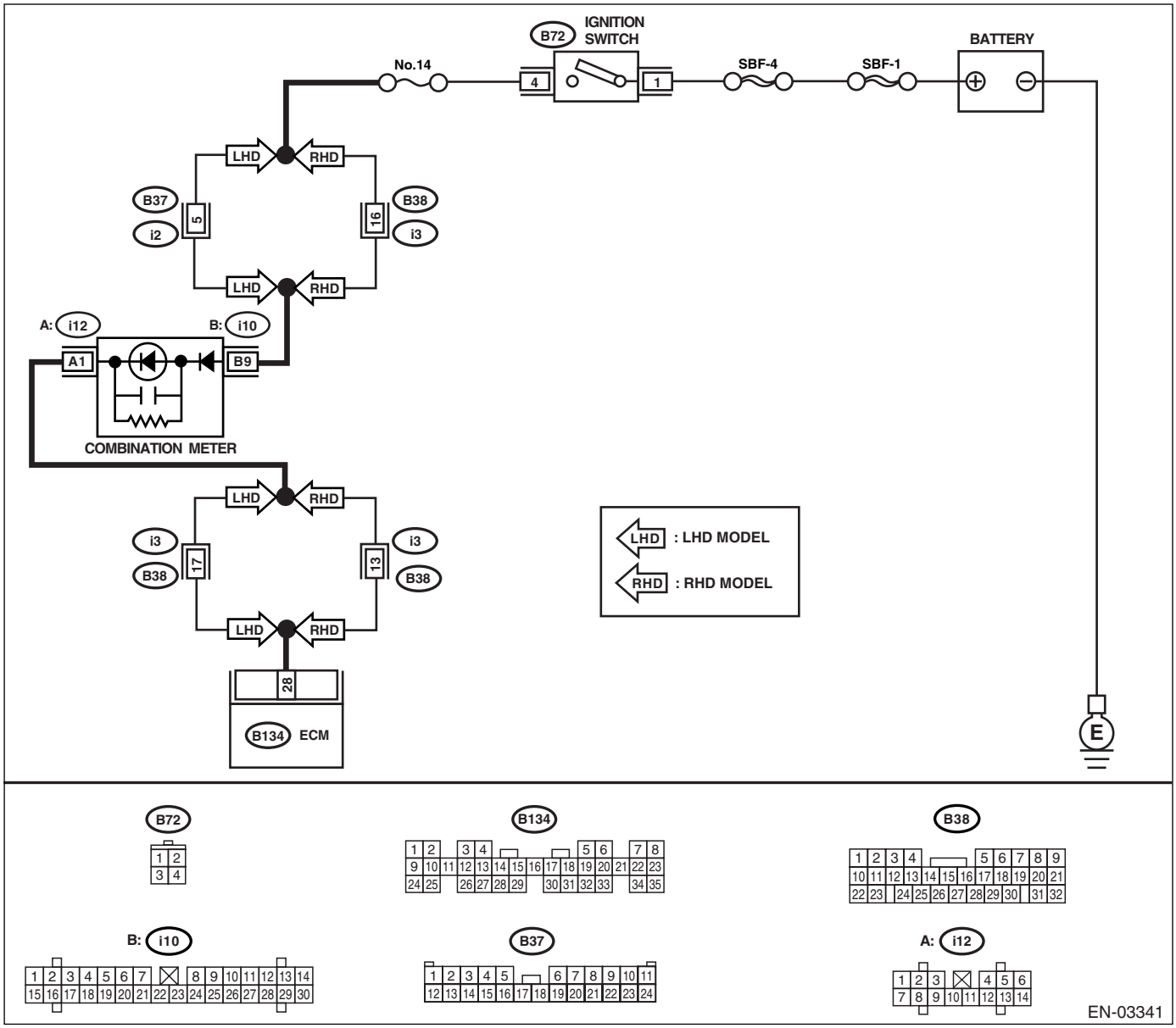
DIAGNOSTIC:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does malfunction indicator light illuminate?	Repair short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK.

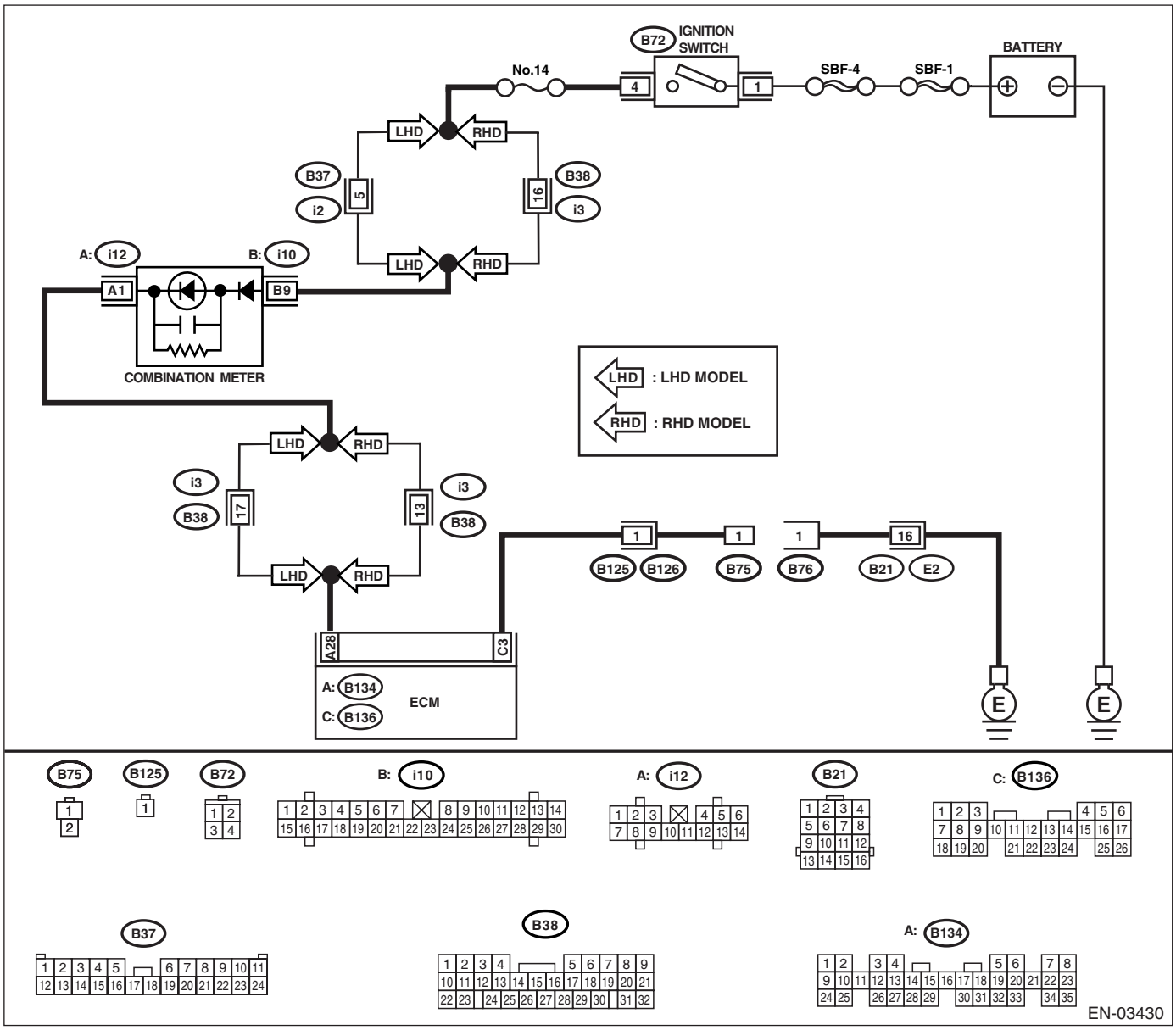
DIAGNOSTIC:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is in open.

TROUBLE SYMPTOM:

Malfunction indicator light does not blink during inspection mode.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connectors 3) Turn the ignition switch to ON. (engine OFF)	Does malfunction indicator light illuminate?	Go to step **2.**	Repair the malfunction indictor light circuit. <Ref. to EN(H4SO)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does malfunction indicator light illuminate?	Repair short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case repair the following: Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING.

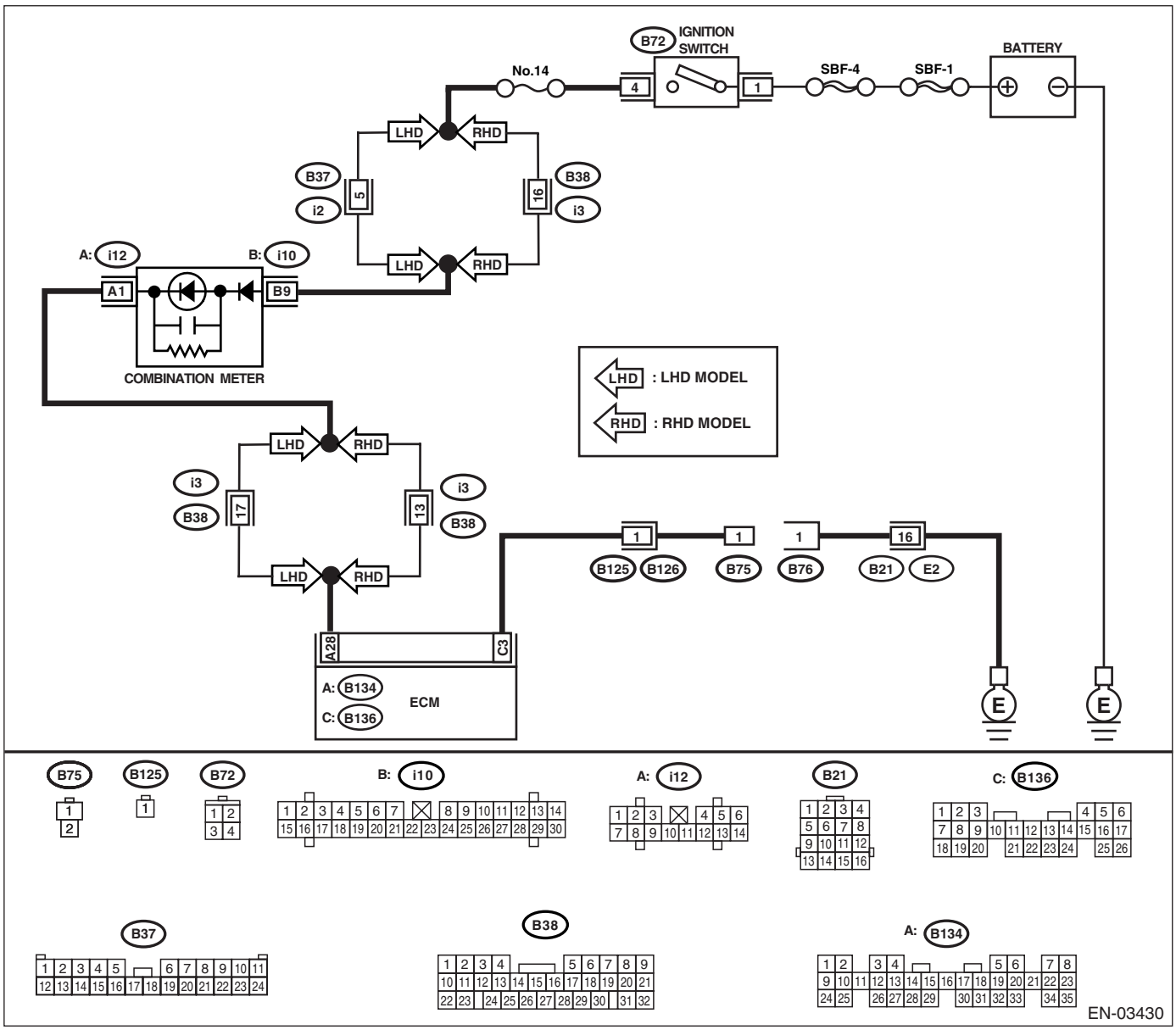
DIAGNOSTIC:

Test mode connector circuit is shorted.

TROUBLE SYMPTOM:

Malfunction indicator light blinks when test mode connector is not connected.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connectors 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND CHASSIS GROUNDING TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

17.Diagnostics for Engine Starting Failure

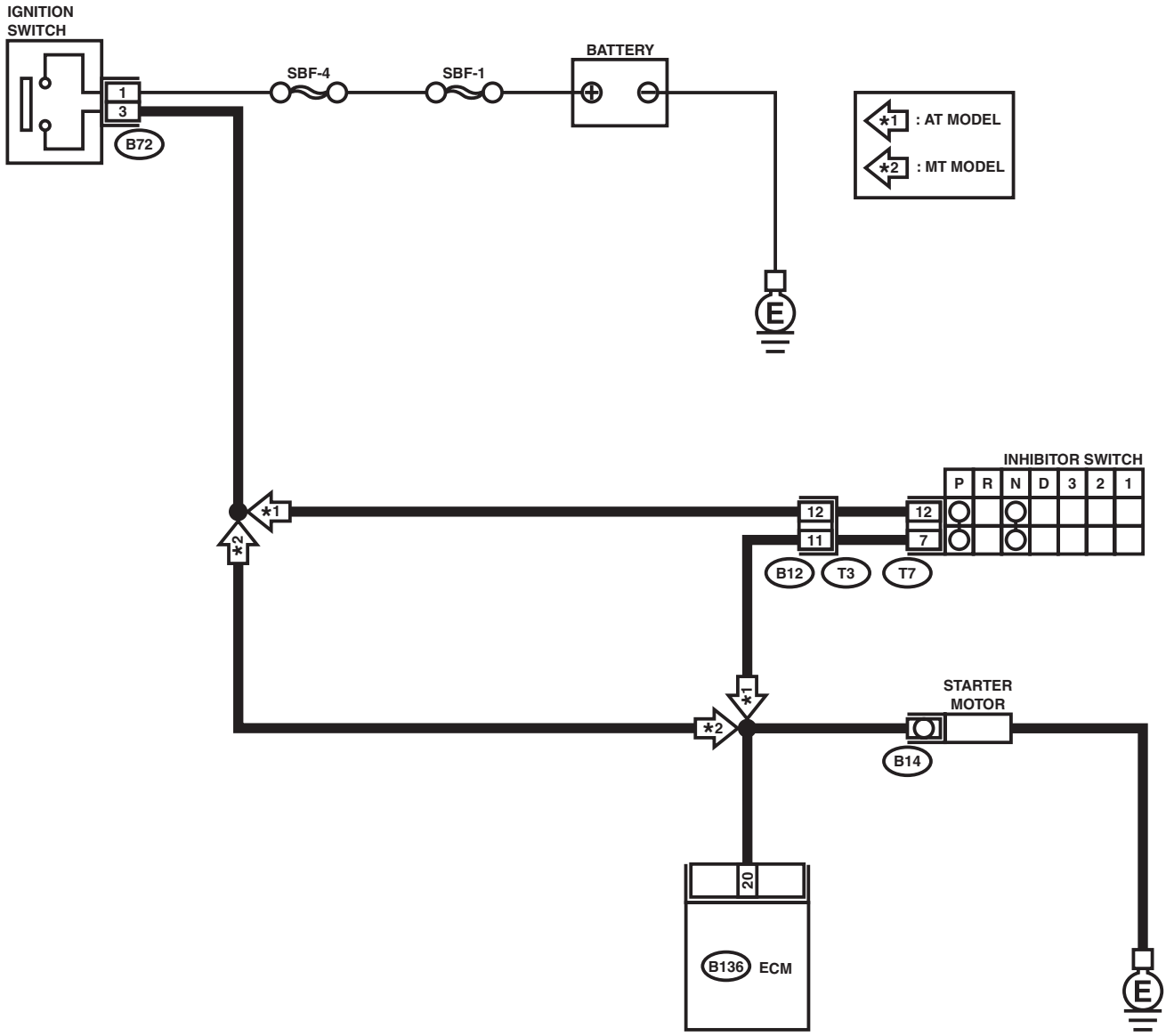
A: PROCEDURE

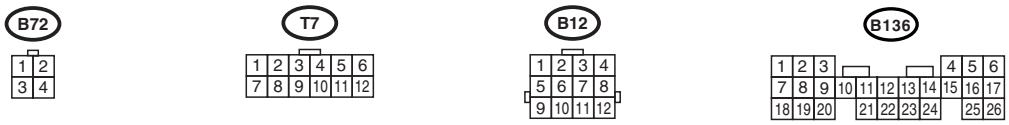
1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4SO)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4SO)(diag)-62, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4SO)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4SO)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-00261

Diagnostics for Engine Starting Failure

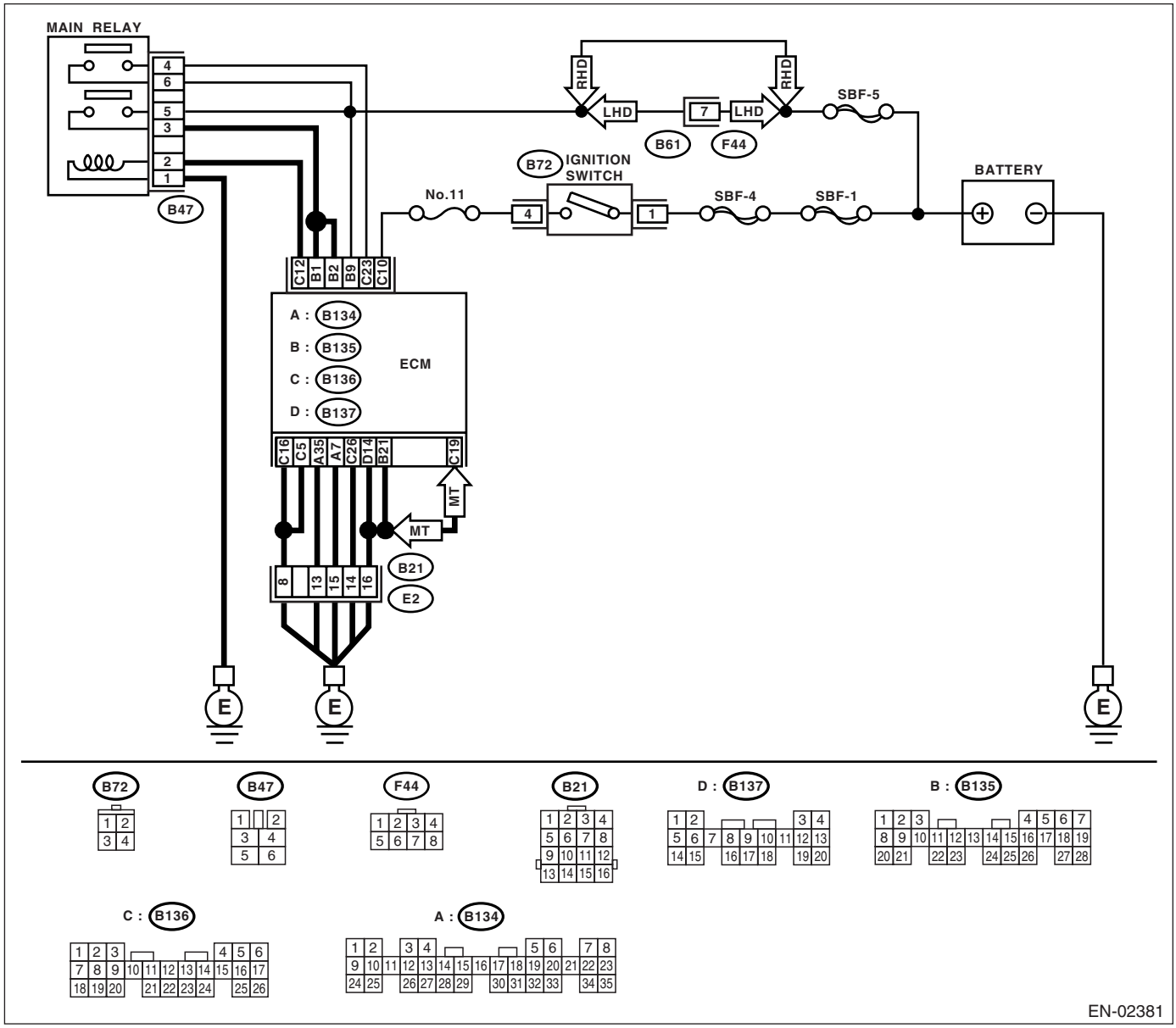
	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage more than 12 V?	Go to step **2.**	Charge or replace the battery.
2	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (–):*** NOTE: • For AT model, shift the select lever to "P" or "N" range. • For MT model, depress the clutch pedal.	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the ground cable terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-6, Starter.>	Repair open circuit of ground cable.
4	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **5.**	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
5	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning the ignition switch to START position. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **6.**	Replace the ignition switch.
6	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **7.**	Temporary poor contact occurs. Check poor contact in each connectors.
7	**CHECK INHIBITOR SWITCH INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning the ignition switch to START position. ***Connector & terminal*** ***(B12) No. 12 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open or ground short circuit in harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped).

	Step	Check	Yes	No
8	**CHECK INHIBITOR SWITCH.** 1) Shift the select lever in the “P” or “N” range. 2) Measure the resistance between inhibitor switch terminals. ***Connector & terminal*** ***(T3) No. 11 — No. 12:***	Is the resistance less than 1 Ω?	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



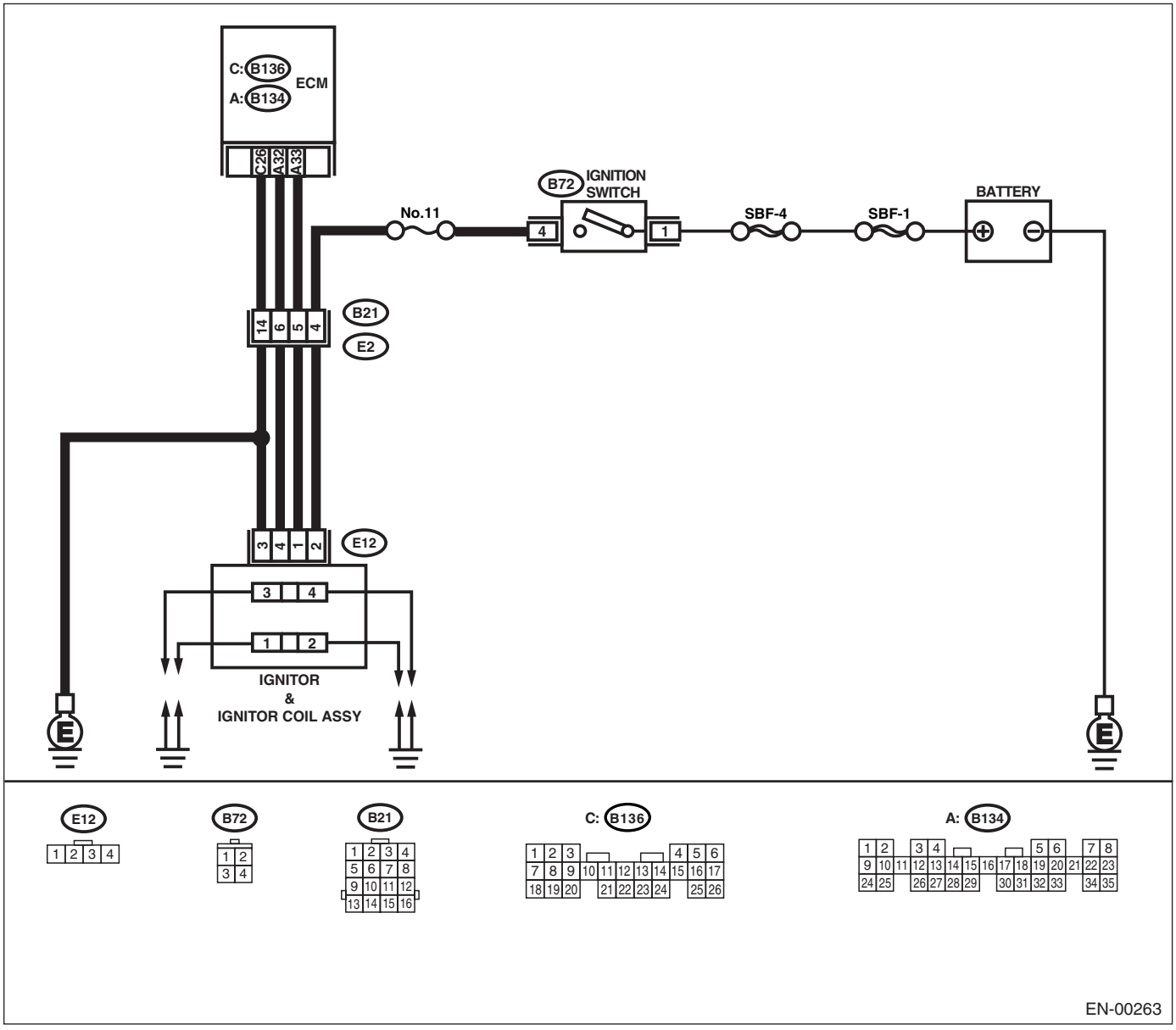
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 35 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 19 — Chassis ground: (MT model)*** ***(B136) No. 26 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine ground terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM connector and main relay connector, then replace the ECM.
6	**CHECK OUTPUT VOLTAGE FROM ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
7	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Repair open circuit in harness between ECM connector and main relay connector.

	Step	Check	Yes	No
8	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between main relay and chassis ground.
9	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (−):*** ***(B47) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **10.**	Repair open or ground short circuit in harness of power supply circuit.
10	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (−):*** ***(B135) No. 2 (+) — Chassis ground (−):*** ***(B136) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

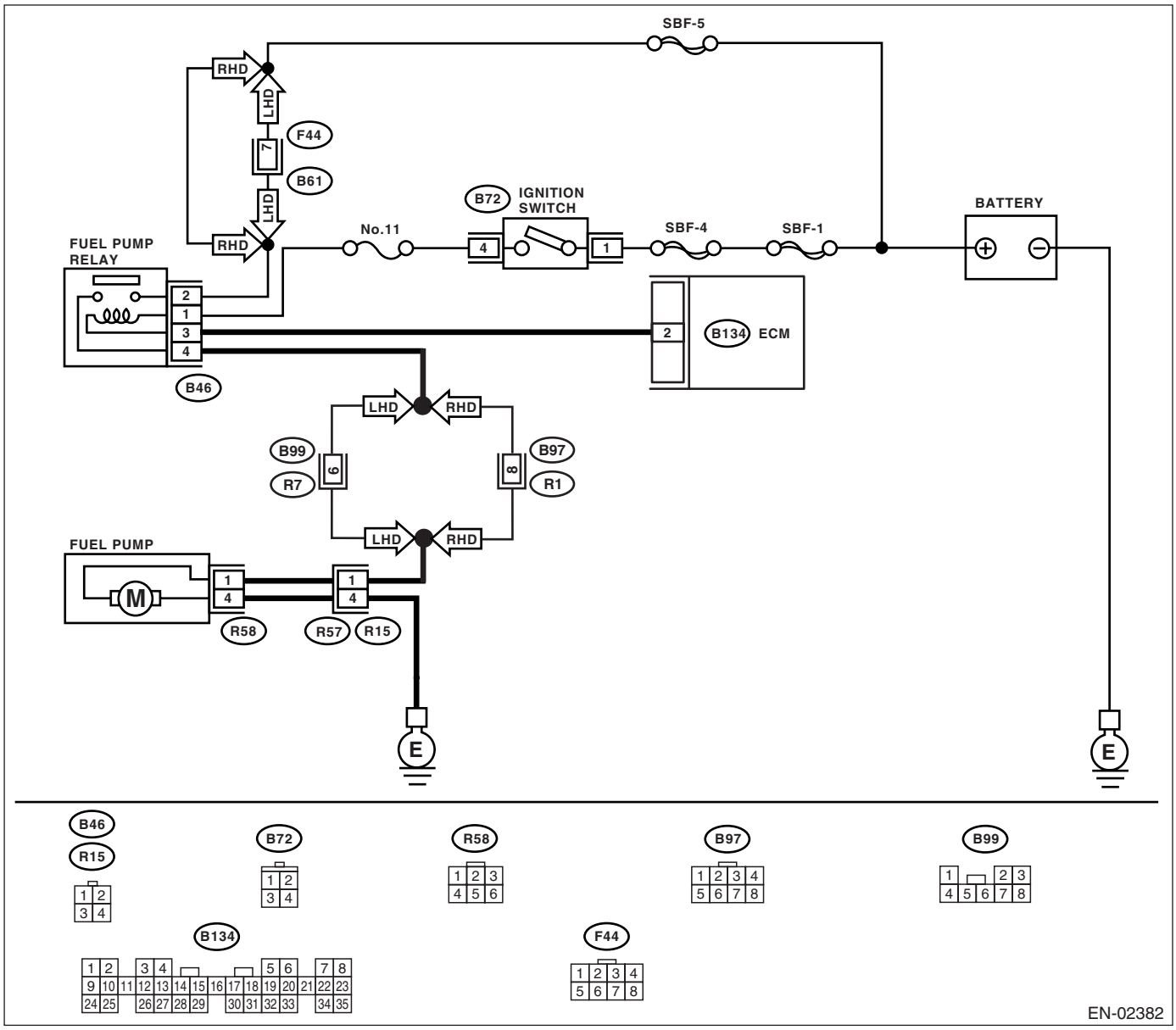
	Step	Check	Yes	No
1	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Remove the plug cord cap from each spark plug. 2) Install the new spark plug on plug cord cap. **CAUTION:** **Do not remove the spark plug from engine.** 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4SO)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor ASSY. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ignition coil & ignitor ASSY, and main relay connector • Poor contact in coupling connector • Blown out fuse
3	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case repair the following: Open circuit in harness between ignition coil & ignitor ASSY connector and engine ground terminal
4	**CHECK IGNITION COIL & IGNITOR ASSY.** 1) Remove the spark plug cords. 2) Measure the resistance between spark plug cord contact portions to check secondary coil. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 4:***	Is the resistance 10 — 15 kΩ?	Go to step **5.**	Replace the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-8, Ignition Coil & Ignitor Assembly.>
5	**CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSY.** 1) Connect the connector to ignition coil & ignitor ASSY. 2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E12) No. 1 (+) — Engine ground (−):*** ***(E12) No. 4 (+) — Engine ground (−):***	Does the voltage vary more than 10 V?	Go to step **6.**	Replace the ignition coil & ignitor ASSY. <Ref. to IG(H4SO)-8, Ignition Coil & Ignitor Assembly.>

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor ASSY. 4) Measure the resistance of harness between ECM and ignition coil & ignitor ASSY connector. ***Connector & terminal*** ***(B134) No. 33 — (E12) No. 1:*** ***(B134) No. 32 — (E12) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and ignition coil & ignitor ASSY connector. • Poor contact in coupling connector
7	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B134) No. 32 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor ASSY connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4SO)(diag)-68, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



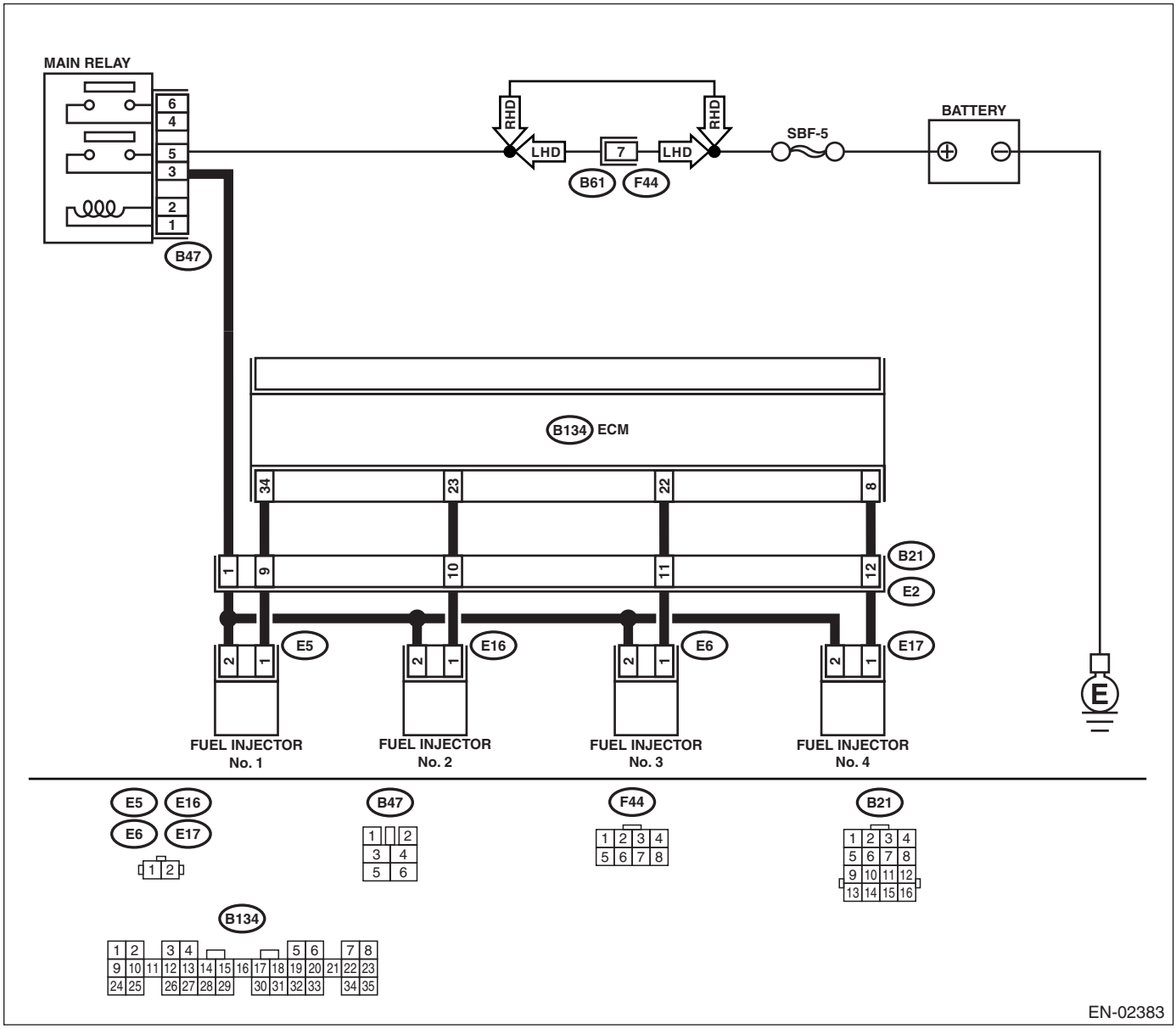
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Check that the fuel pump is in operation for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor. Refer to "Compulsory Valve Operation Check Mode" for procedures. <Ref. to EN(H4SO)(diag)-46, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check the fuel injector circuit. <Ref. to EN(H4SO)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF FUEL PUMP.** 1) Turn the ignition switch to OFF. 2) Remove the fuel pump access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the resistance of harness connector between fuel pump and chassis ground. ***Connector & terminal*** ***(R58) No. 4 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
3	**CHECK POWER SUPPLY TO FUEL PUMP.** 1) Turn the ignition switch to ON. 2) Measure the voltage of power supply circuit between fuel pump connector and chassis ground. ***Connector & terminal*** ***(R58) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the fuel pump. <Ref. to FU(H4SO)-55, Fuel Pump.>	Go to step **4.**
4	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness connector between fuel pump and fuel pump relay. ***Connector & terminal*** ***(R58) No. 1 — (B46) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
5	**CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR.** Measure the resistance of harness between fuel pump and fuel pump relay connector. ***Connector & terminal*** ***(R58) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair short circuit in harness between fuel pump and fuel pump relay connector.
6	**CHECK FUEL PUMP RELAY.** 1) Disconnect the connectors from fuel pump relay and main relay. 2) Remove the fuel pump relay and main relay with bracket. 3) Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure the resistance between connector terminals of fuel pump relay. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 10 Ω?	Go to step **7.**	Replace the fuel pump relay. <Ref. to FU(H4SO)-55, Fuel Pump.>

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel pump relay connector. ***Connector & terminal (B134) No. 2 — (B46) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and fuel pump relay connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Check the fuel injector circuit. <Ref. to EN(H4SO)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.**

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits operating sound. Use a sound scope or apply a screwdriver to the injector for this check.	Does the fuel pump emit operating sound?	Check the fuel pressure. <Ref. to ME(H4SO)-30, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 34 — (E5) No. 1:*** ***#2 (B134) No. 23 — (E16) No. 1:*** ***#3 (B134) No. 22 — (E6) No. 1:*** ***#4 (B134) No. 8 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***#1 (B134) No. 34 — Chassis ground:*** ***#2 (B134) No. 23 — Chassis ground:*** ***#3 (B134) No. 22 — Chassis ground:*** ***#4 (B134) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table” <Ref. to EN(H4SO)(diag)-263, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	NOTE
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-79, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-81, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-84, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-86, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-89, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Pressure Sensor Range/ Performance	<Ref. to EN(H4SO)(diag)-91, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4SO)(diag)-93, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4SO)(diag)-96, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-99, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4SO)(diag)-101, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4SO)(diag)-103, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4SO)(diag)-106, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4SO)(diag)-108, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-111, DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(H4SO)(diag)-113, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(H4SO)(diag)-116, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to EN(H4SO)(diag)-118, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-120, DTC P0130 O2 SENSOR CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	NOTE
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-123, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-125, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-127, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-129, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-131, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-134, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-137, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4SO)(diag)-138, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4SO)(diag)-139, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4SO)(diag)-141, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4SO)(diag)-141, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4SO)(diag)-141, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4SO)(diag)-142, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-148, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-150, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4SO)(diag)-152, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-154, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-156, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-158, DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust Gas Recirculation Flow	<Ref. to EN(H4SO)(diag)-161, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4SO)(diag)-164, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4SO)(diag)-166, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4SO)(diag)-169, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-171, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4SO)(diag)-173, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(H4SO)(diag)-176, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4SO)(diag)-179, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(H4SO)(diag)-181, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4SO)(diag)-183, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to EN(H4SO)(diag)-184, DTC P0503 VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(H4SO)(diag)-186, DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(H4SO)(diag)-188, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4SO)(diag)-190, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4SO)(diag)-193, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0562	System Voltage Low	<Ref. to EN(H4SO)(diag)-195, DTC P0562 SYSTEM VOLTAGE LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0563	System Voltage High	<Ref. to EN(H4SO)(diag)-197, DTC P0563 SYSTEM VOLTAGE HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise Control On Signal	<Ref. to EN(H4SO)(diag)-199, DTC P0565 CRUISE CONTROL ON SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4SO)(diag)-201, DTC P0604 INTERNAL CONTROL MODULE READ ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4SO)(diag)-203, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4SO)(diag)-206, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to EN(H4SO)(diag)-209, DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to 4AT(diag)-91, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to 4AT(diag)-35, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Torque converter turbine speed sensor	<Ref. to 4AT(diag)-46, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	AT Vehicle Speed Sensor Circuit Malfunction	<Ref. to 4AT(diag)-42, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine Speed Input Circuit Malfunction	<Ref. to 4AT(diag)-33, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-211, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-211, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-211, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 Incorrect Ratio	<Ref. to EN(H4SO)(diag)-212, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to EN(H4SO)(diag)-213, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to 4AT(diag)-71, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to 4AT(diag)-65, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	<Ref. to 4AT(diag)-53, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	<Ref. to 4AT(diag)-56, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Low clutch timing solenoid	<Ref. to 4AT(diag)-59, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to 4AT(diag)-68, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/Timing Solenoid	<Ref. to 4AT(diag)-62, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4SO)(diag)-215, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4SO)(diag)-217, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4SO)(diag)-220, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4SO)(diag)-223, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM Communication Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-226, DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM Communication Circuit Low	<Ref. to EN(H4SO)(diag)-228, DTC P0865 TCM COMMUNICATION CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM Communication Circuit Low	<Ref. to EN(H4SO)(diag)-230, DTC P0866 TCM COMMUNICATION CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F Sensor Micro-Computer Problem	<Ref. to EN(H4SO)(diag)-232, DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1137	O_2 Sensor Circuit (Lambda= 1) (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-234, DTC P1137 O2 SENSOR CIRCUIT (LAMBDA=1) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P1492	EGR Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-237, DTC P1492 EGR VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1493	EGR Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-237, DTC P1493 EGR VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-237, DTC P1494 EGR VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1495	EGR Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-237, DTC P1495 EGR VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-237, DTC P1496 EGR VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-237, DTC P1497 EGR VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-238, DTC P1498 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-240, DTC P1499 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1510	ISC Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-242, DTC P1510 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1511	ISC Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-242, DTC P1511 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1512	ISC Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-242, DTC P1512 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1513	ISC Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-242, DTC P1513 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1514	ISC Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-242, DTC P1514 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1515	ISC Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-242, DTC P1515 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1516	ISC Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-243, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1517	ISC Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-245, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4SO)(diag)-247, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4SO)(diag)-250, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	NOTE
P1572	IMM Circuit Failure	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key IMM Circuit Failure	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-22, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1698	Engine Torque Control Cut Signal Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-252, DTC P1698 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine Torque Control Cut Signal Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-254, DTC P1699 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle Position Sensor Circuit Malfunction For AT	<Ref. to 4AT(diag)-38, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine Torque Control Signal #1 Circuit Malfunction	<Ref. to EN(H4SO)(diag)-256, DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine Torque Control Signal #2 Circuit Malfunction	<Ref. to EN(H4SO)(diag)-258, DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2503	Generator Circuit Low Input	<Ref. to EN(H4SO)(diag)-260, DTC P2503 GENERATOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2504	Generator Circuit High Input	<Ref. to EN(H4SO)(diag)-261, DTC P2504 GENERATOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

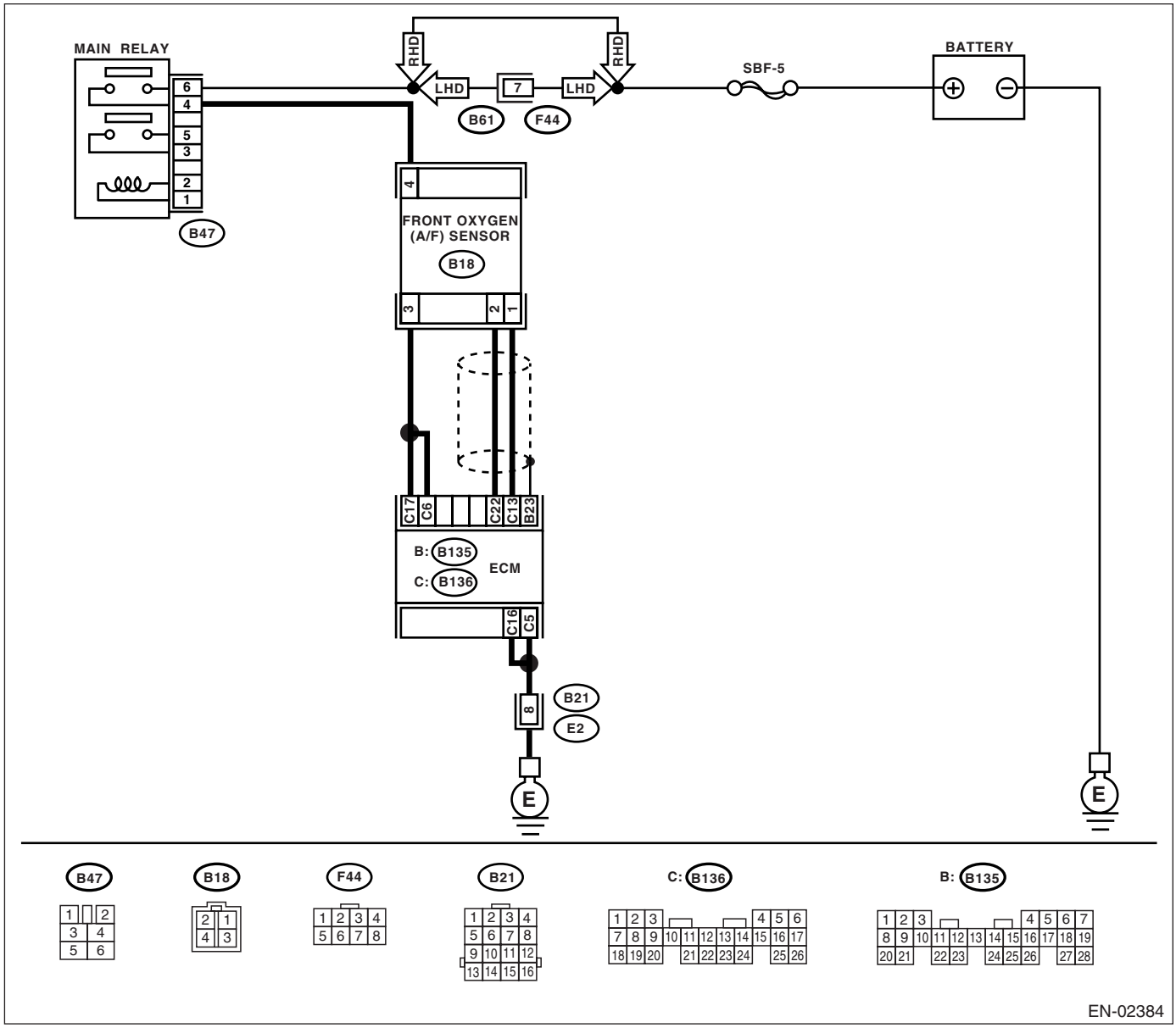
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine, and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connector from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 6 — (B18) No. 3:*** ***(B136) No. 17 — (B18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

B: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

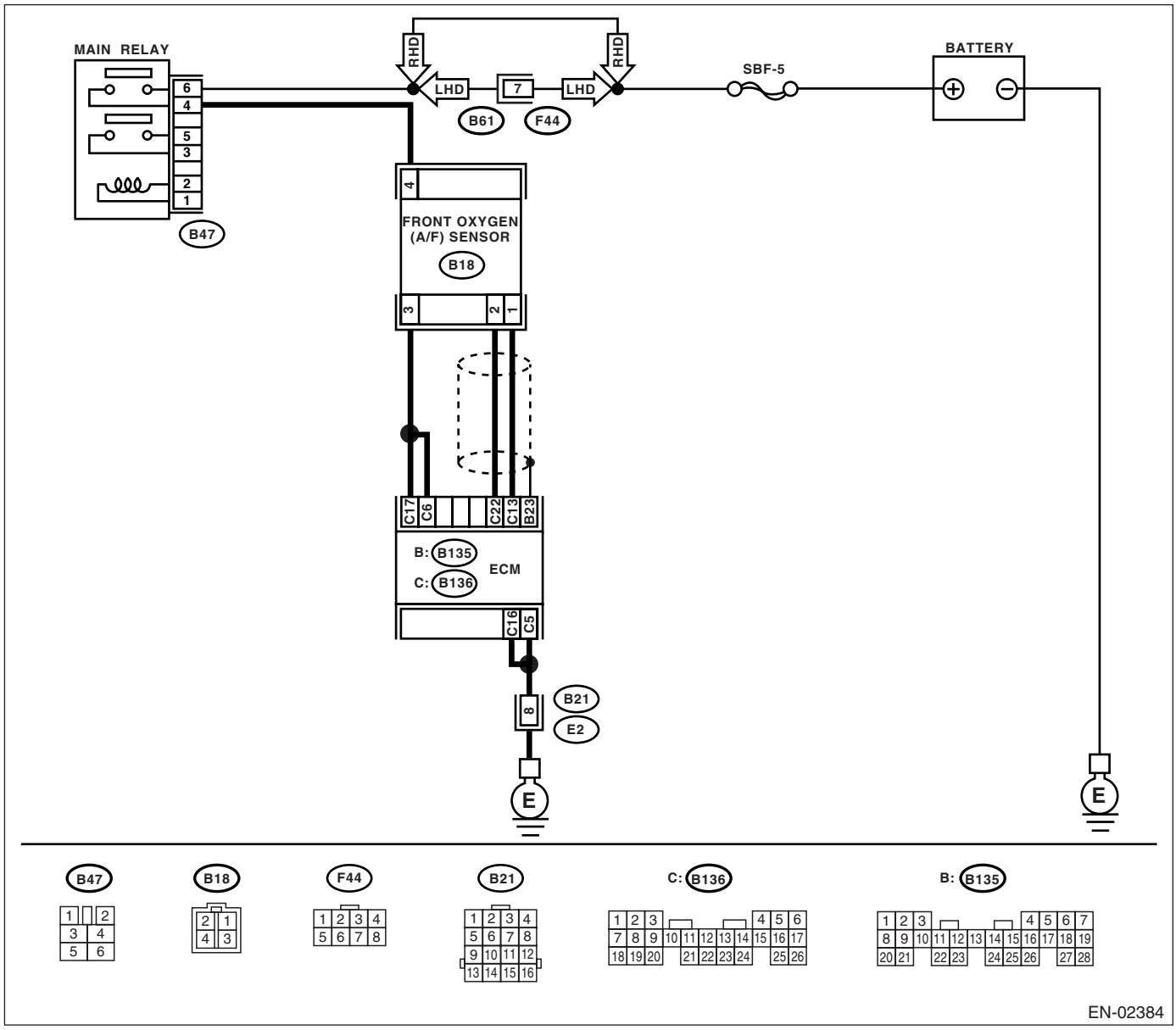
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or general scan tool indicate DTC P0031 and P0037 at the same time?	Go to step **2.**	Go to step **5.**
2	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the power supply line. NOTE: In this case repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector. • Poor contact in coupling connector
4	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair poor contact connector. NOTE: In this case repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector.	Go to step **5.**
5	**CHECK INPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (–):*** ***(B136) No. 17 (+) — Chassis ground (–):***	Is the voltage less than 1 V by shaking the ECM harness and connector while monitoring the value of voltage meter?	Repair the poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance less than 10 Ω?	Repair harness and connector. NOTE: In this case repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-47, Fuel.>

C: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

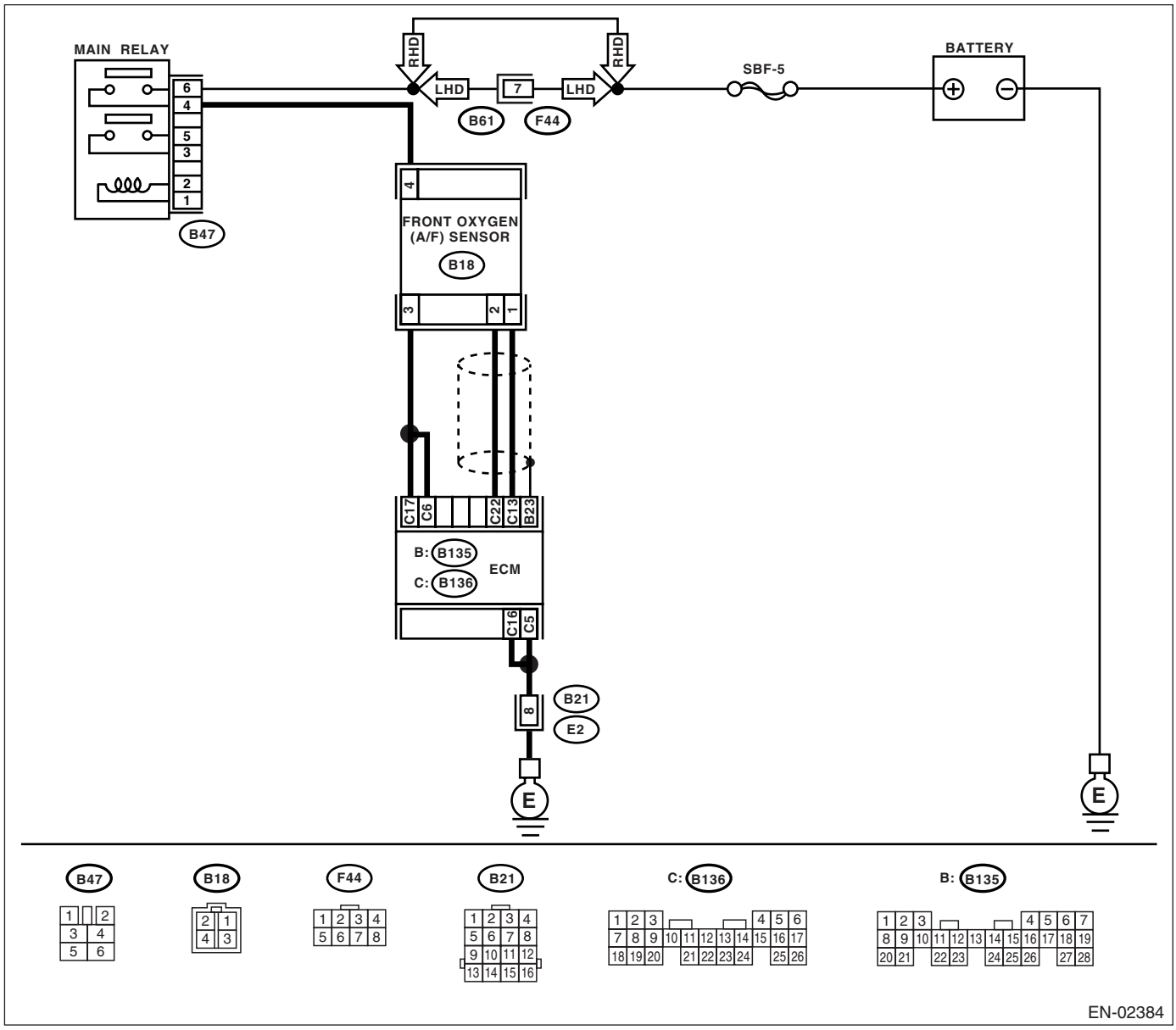
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (−):*** ***(B136) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	END.
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 6 (+) — Chassis ground (−):*** ***(B136) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 8 V by shaking the ECM harness and connector?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END.

D: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

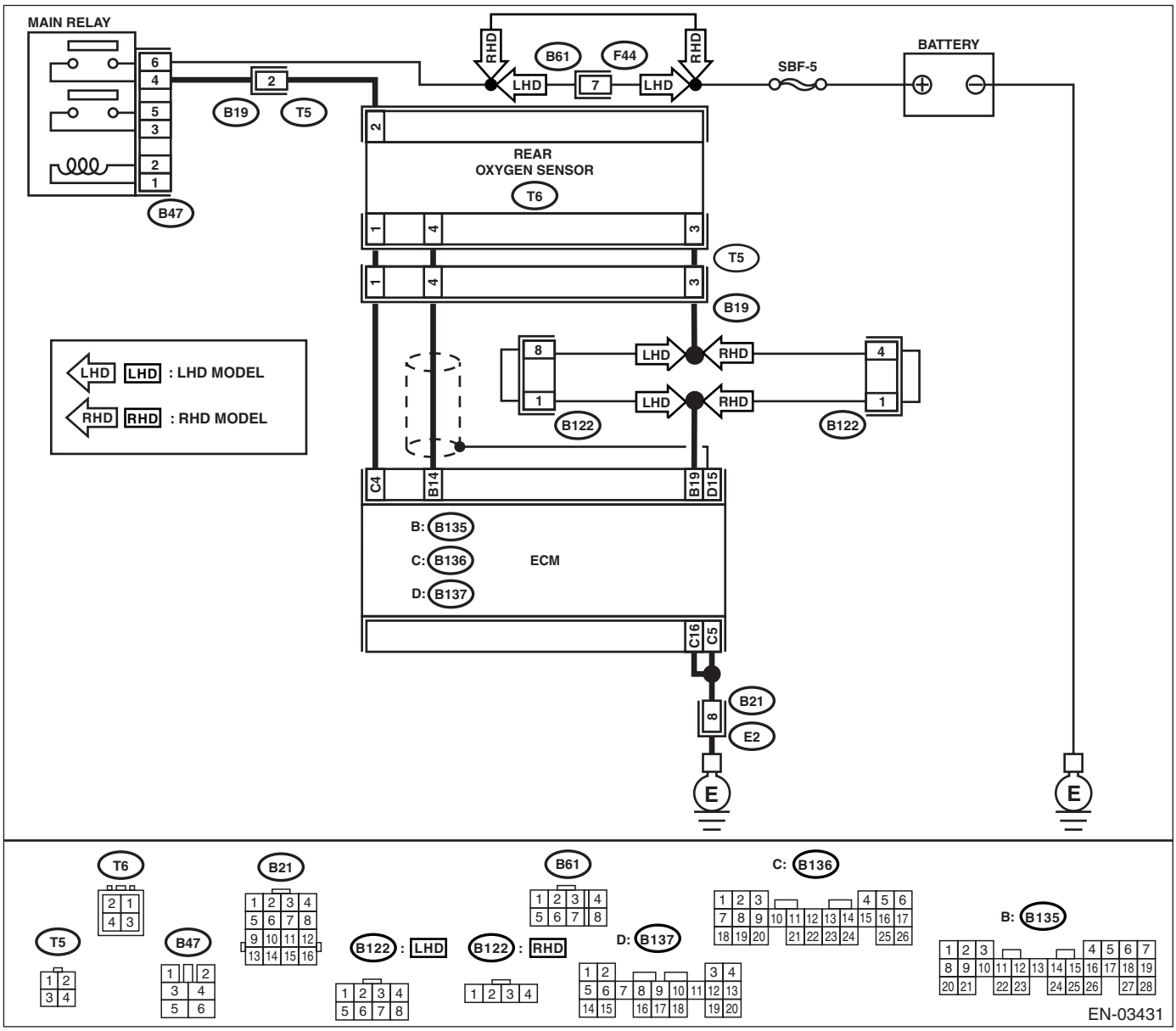
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Does the voltage change within the range of 1 V by shaking the ECM harness and connector while monitoring the value of voltage meter?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect the connector from rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(T6) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the power supply line. NOTE: In this case repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

E: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

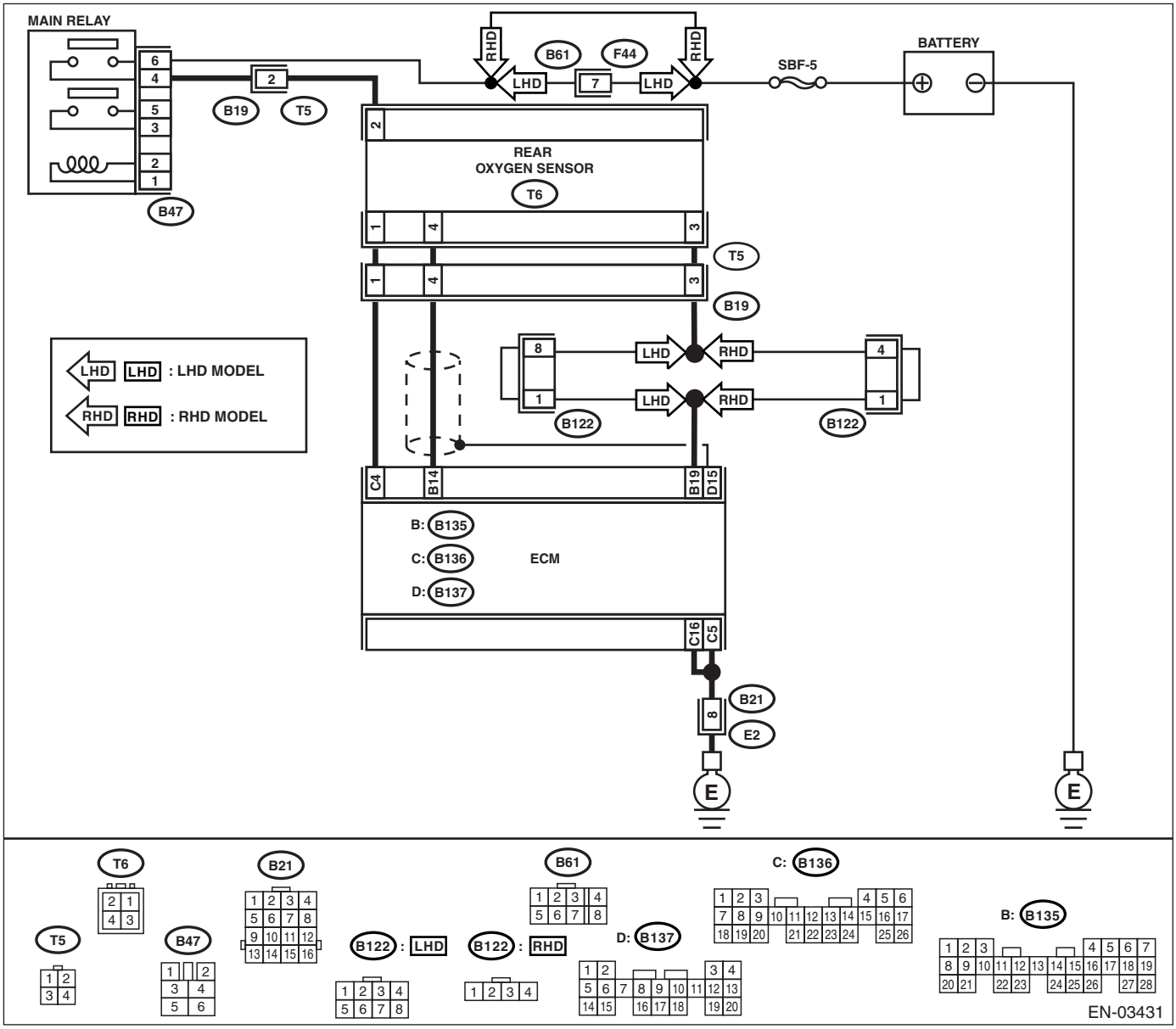
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	END.
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	END.

F: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

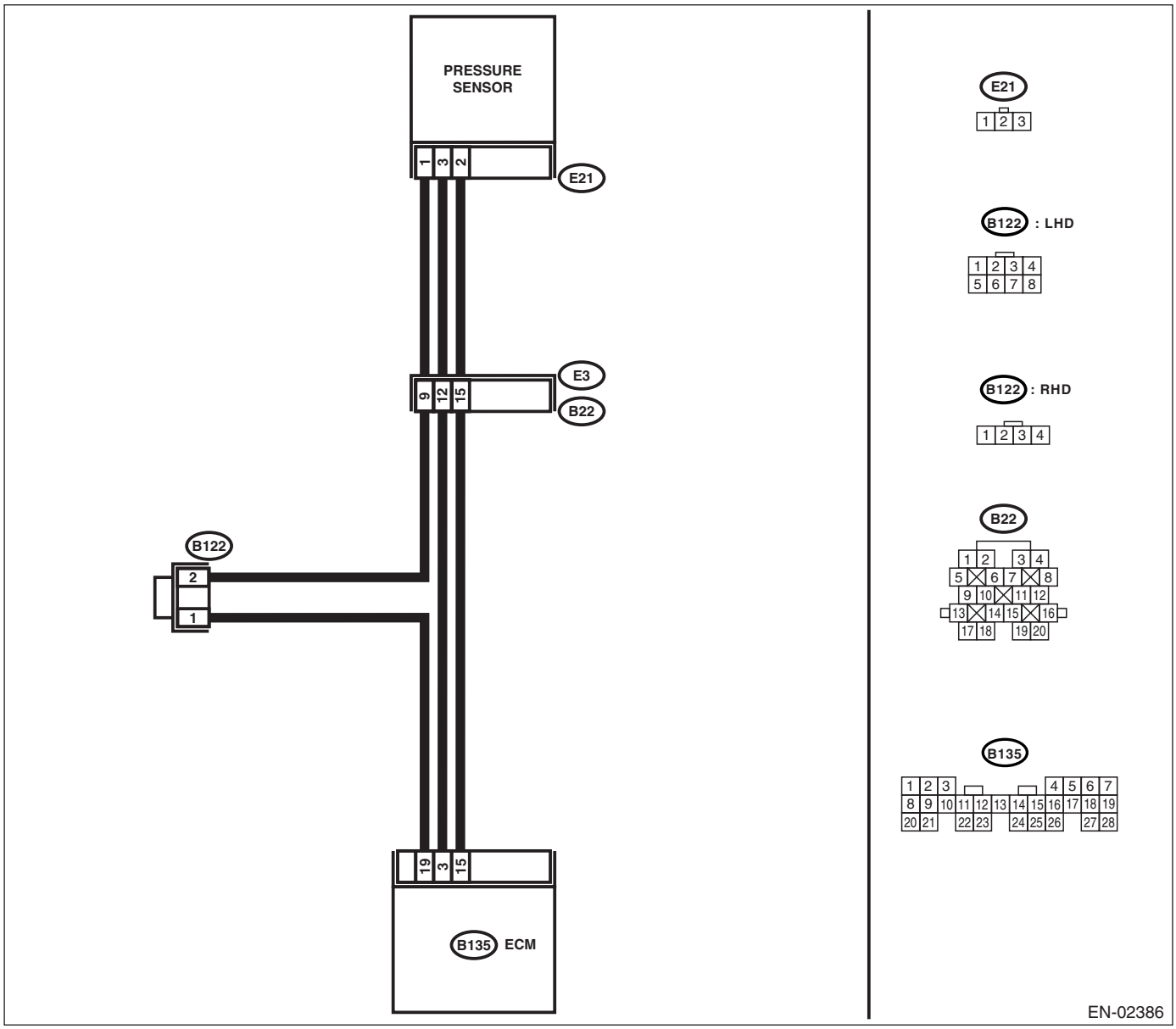
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK PRESSURE SENSOR.** 1) Start and warm-up the engine until engine coolant temperature is greater than 60°C (140°F). 2) Shift the select lever in the "P" or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of manifold absolute pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value at Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 20.0 — 46.7 kPa (150 — 310 mmHg, 5.91 — 12.20 inHg)?	Go to step **4.**	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-31, Manifold Absolute Pressure Sensor.>
4	**CHECK THROTTLE POSITION.** Read the data of throttle position signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than 5% when the throttle fully closed?	Go to step **5.**	Adjust or replace the throttle position sensor. <Ref. to FU(H4SO)-29, Throttle Position Sensor.>
5	**CHECK THROTTLE POSITION.**	Is the value more than 85% when the throttle fully opens?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-31, Manifold Absolute Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU(H4SO)-29, Throttle Position Sensor.>

G: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

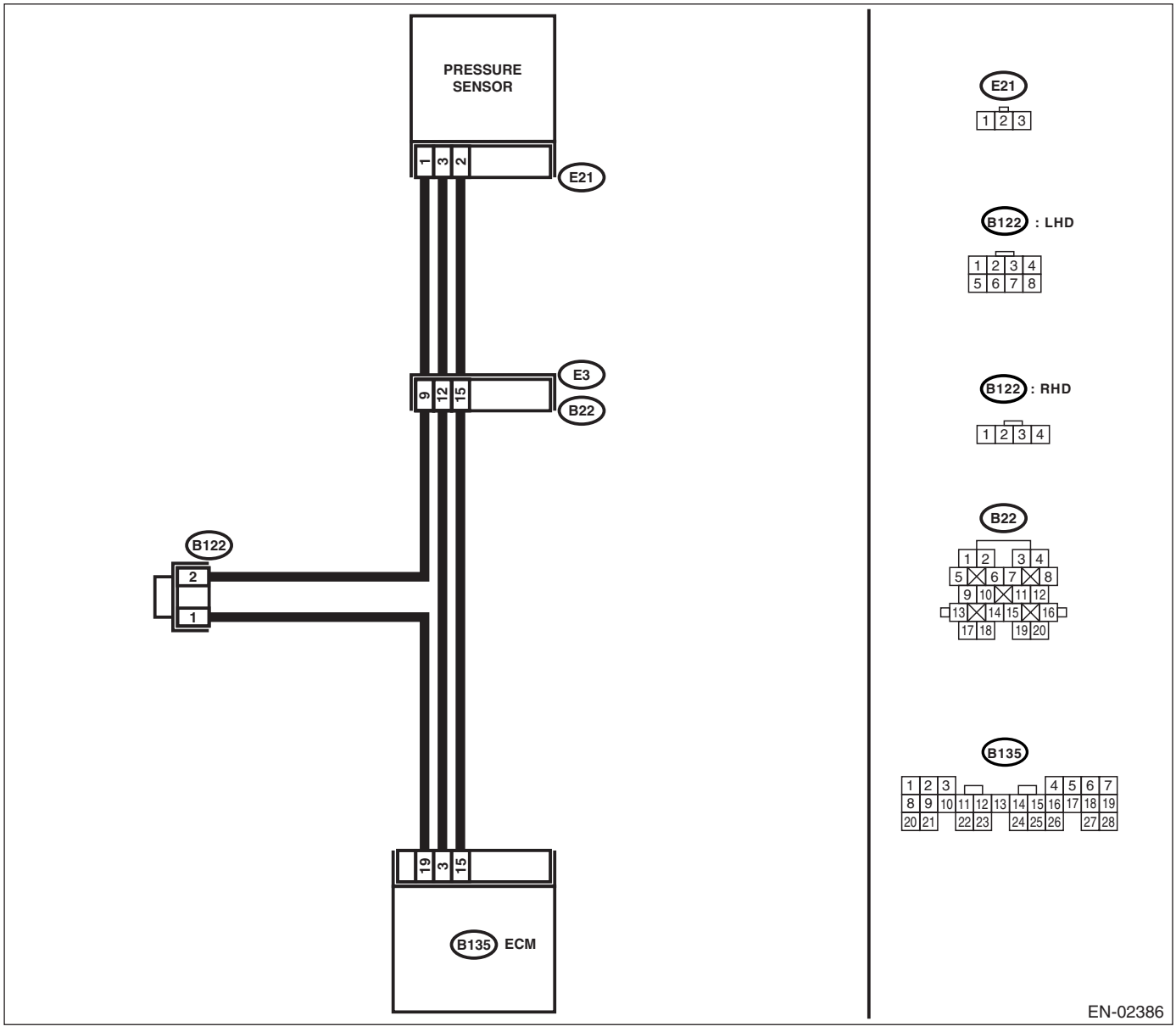
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and manifold pressure sensor connector.	Is there poor contact in ECM or manifold pressure sensor connector?	Repair poor contact in ECM or manifold pressure sensor connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Read the data of barometric absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Is the value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **8.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-31, Manifold Absolute Pressure Sensor.>

H: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

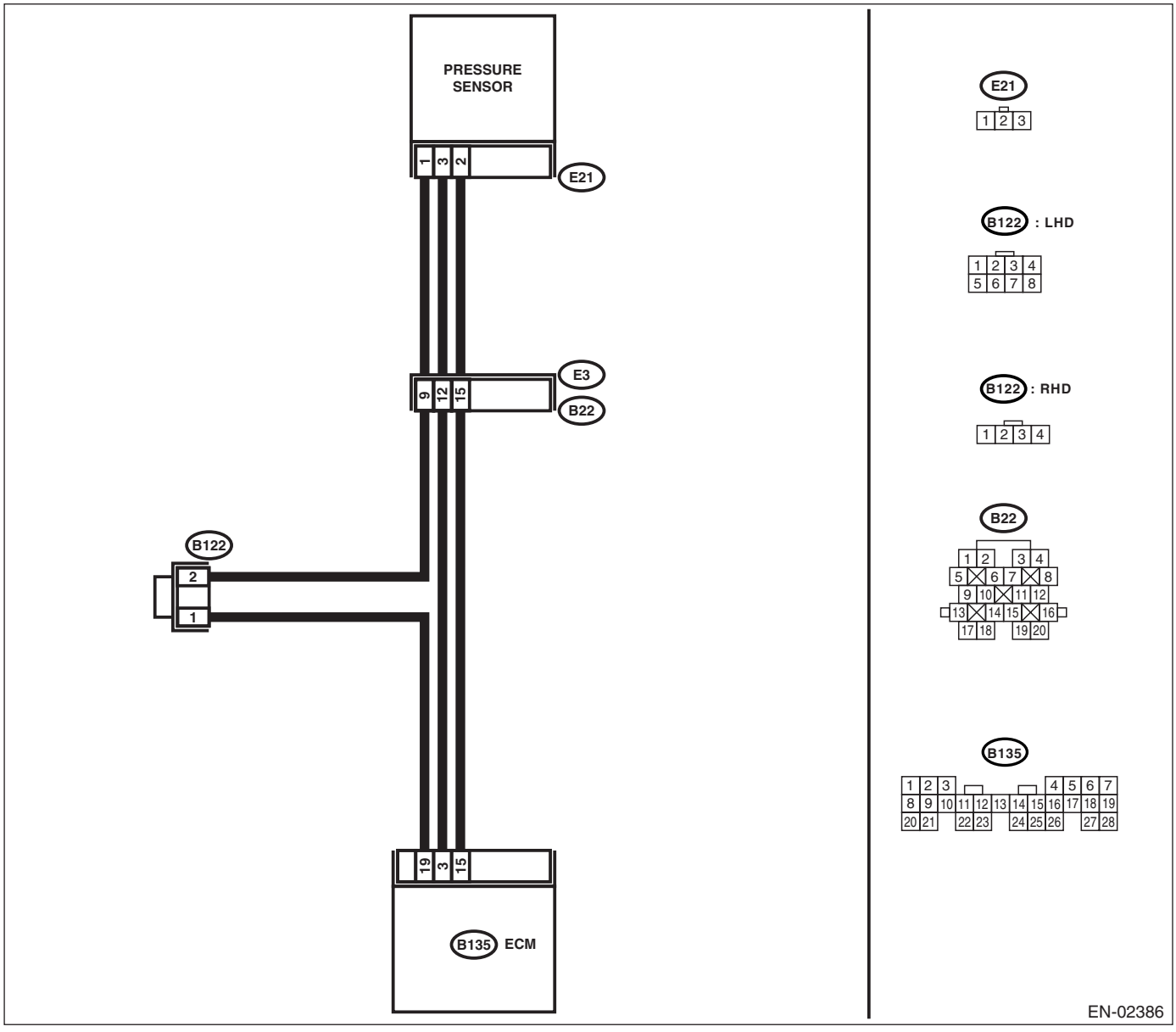
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Go to step **10.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Is the value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 15 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
8	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B135) No. 19 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
9	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-31, Manifold Absolute Pressure Sensor.>
10	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF and Subaru Select Monitor or the general scan tool switch to OFF. 2) Disconnect the connector from the manifold absolute pressure sensor. 3) Turn the ignition switch to ON and Subaru Select Monitor or the general scan tool switch to ON. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value more than 119.5 kPa (896.5 mmHg, 35.29 inHg)?	Repair battery short in harness between ECM and manifold pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-31, Manifold Absolute Pressure Sensor.>

I: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

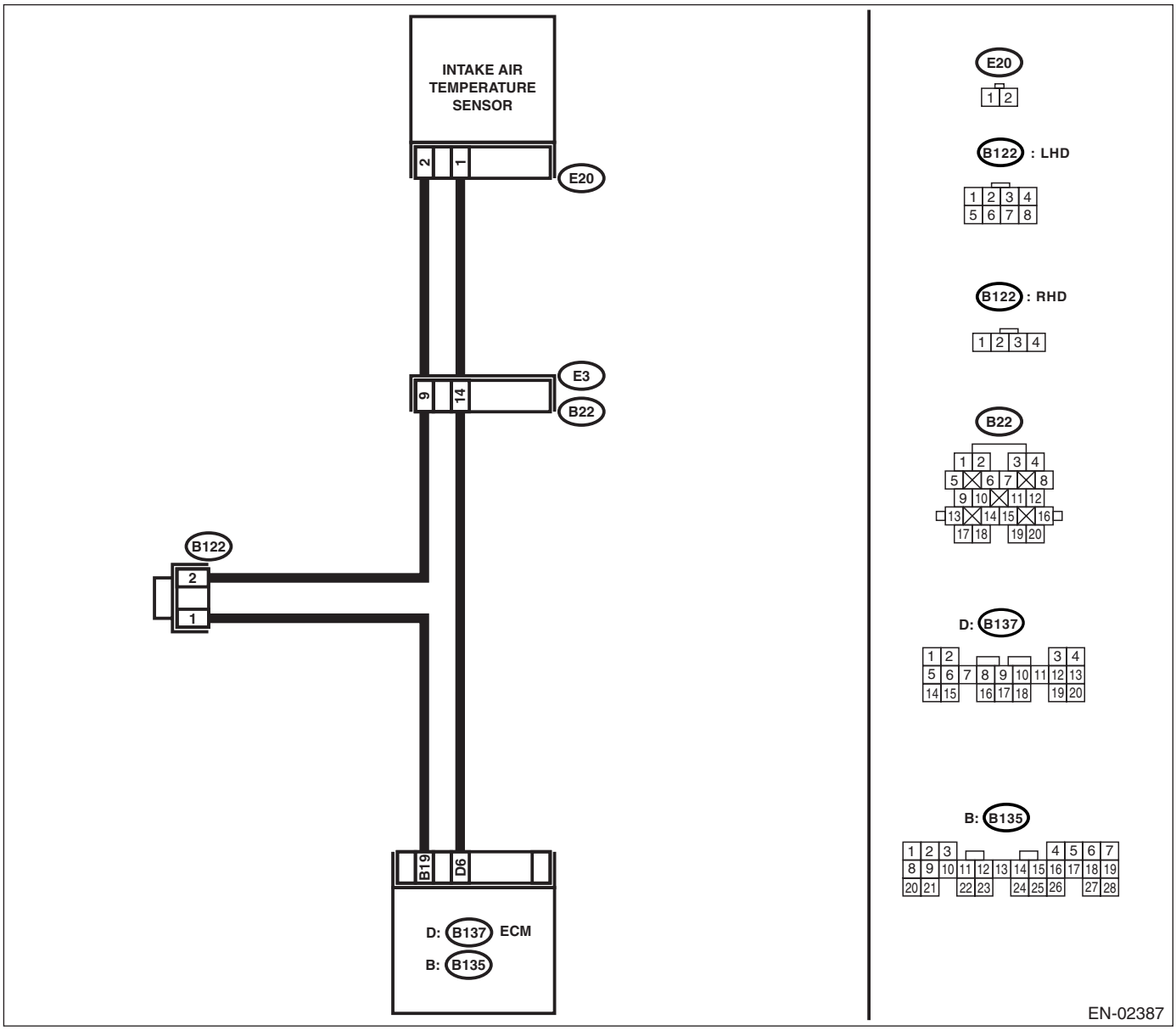
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT.** 1) Start the engine and warm-up completely. 2) Measure the engine coolant temperature using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE”. <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the engine coolant temperature 75 — 95°C (167 — 203°F)?	Replace the intake air temperature sensor. <Ref. to FU(H4SO)-32, Intake Air Temperature Sensor.>	Inspect the DTC P0125 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>

J: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

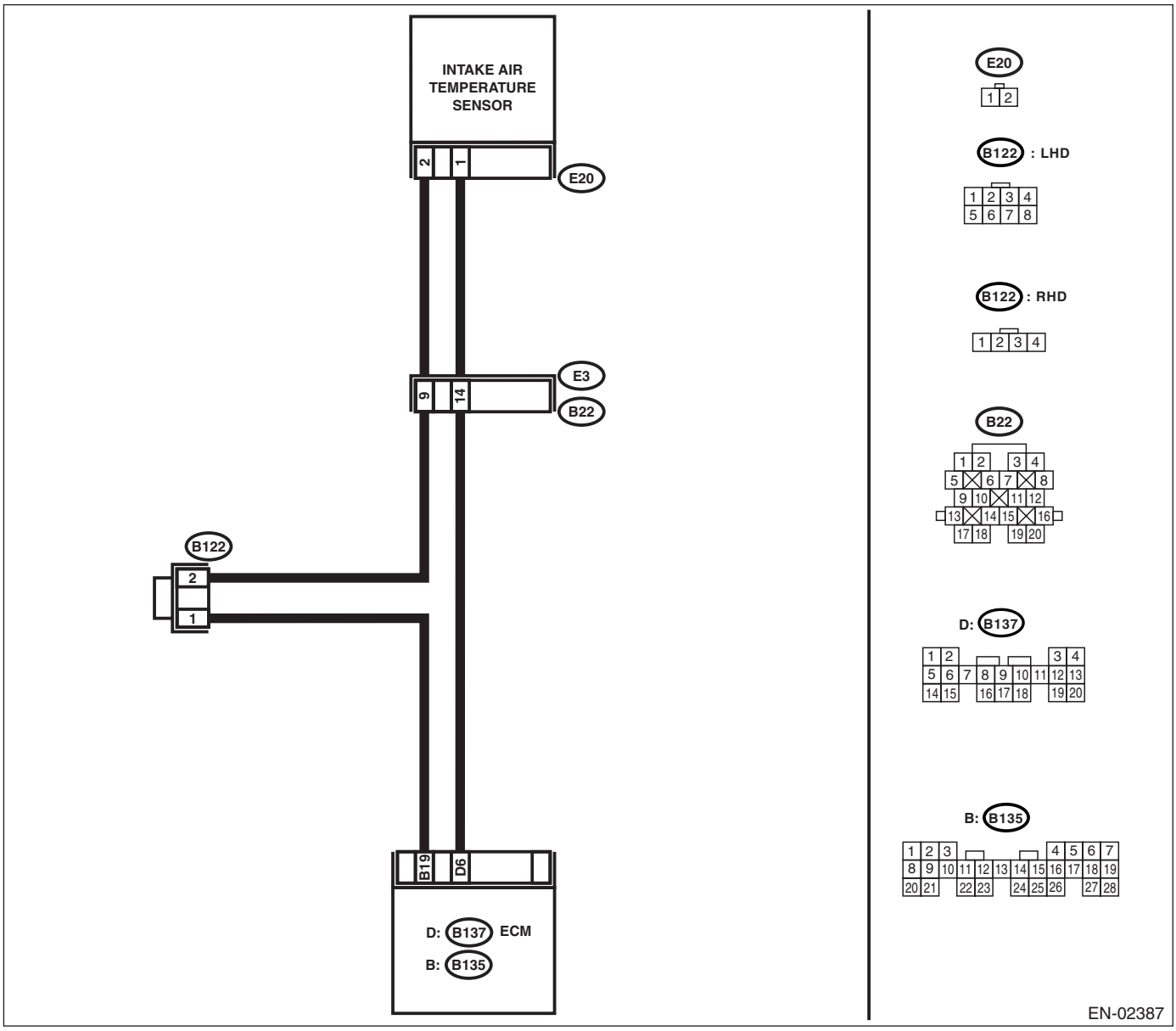
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the intake air temperature more than 120°C (248°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the intake air temperature less than −40°C (−40°F)?	Replace the intake air temperature sensor. <Ref. to FU(H4SO)-32, Intake Air Temperature Sensor.>	Repair ground short circuit in harness between intake air temperature sensor and ECM connector.

K: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

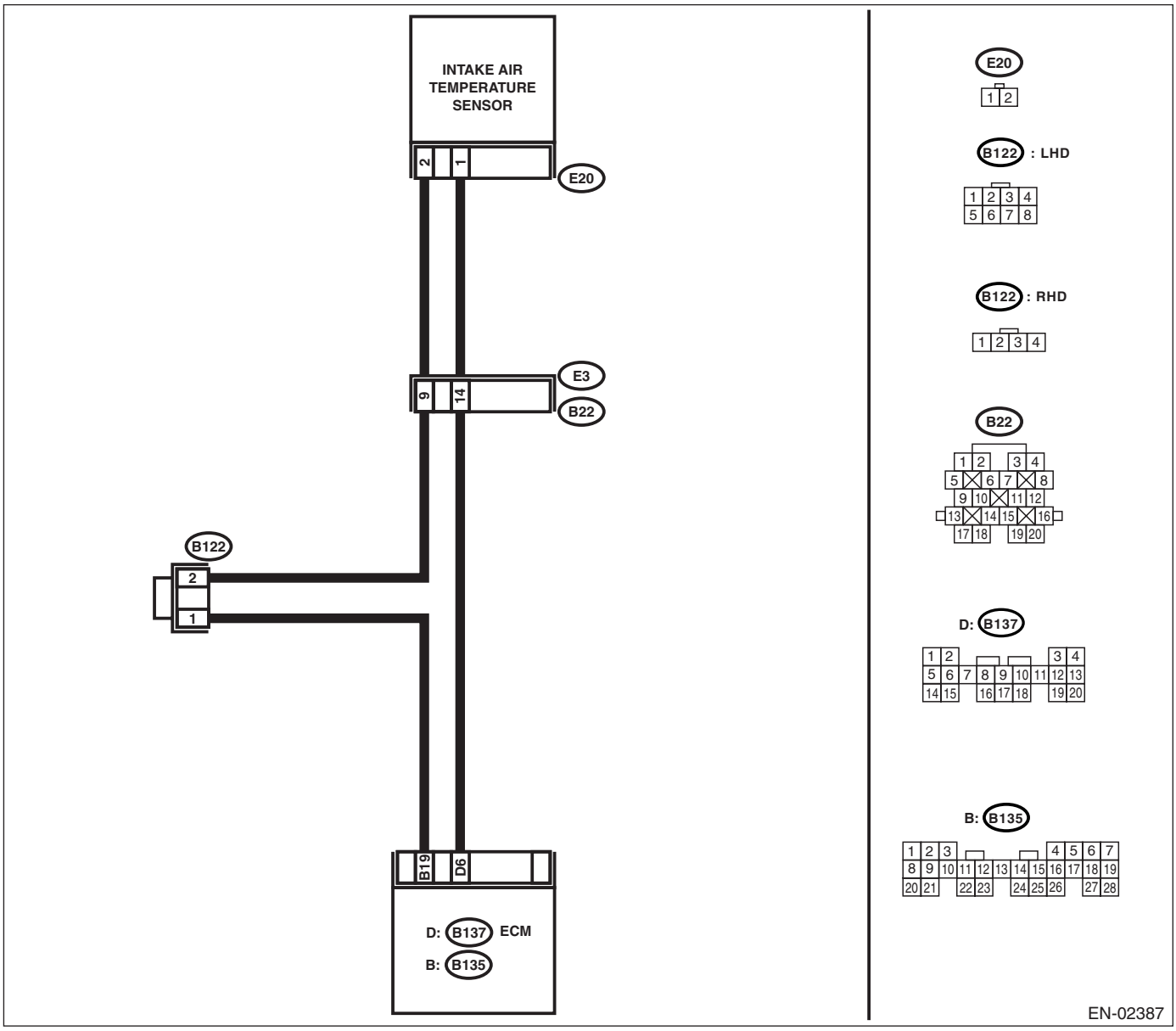
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the intake air temperature less than −40°C (−40°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector intake air temperature sensor. 3) Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 1 (+) — Engine ground (−):***	Is the voltage more than 3 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(E20) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the intake air temperature sensor. <Ref. to FU(H4SO)-32, Intake Air Temperature Sensor.>	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

L: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

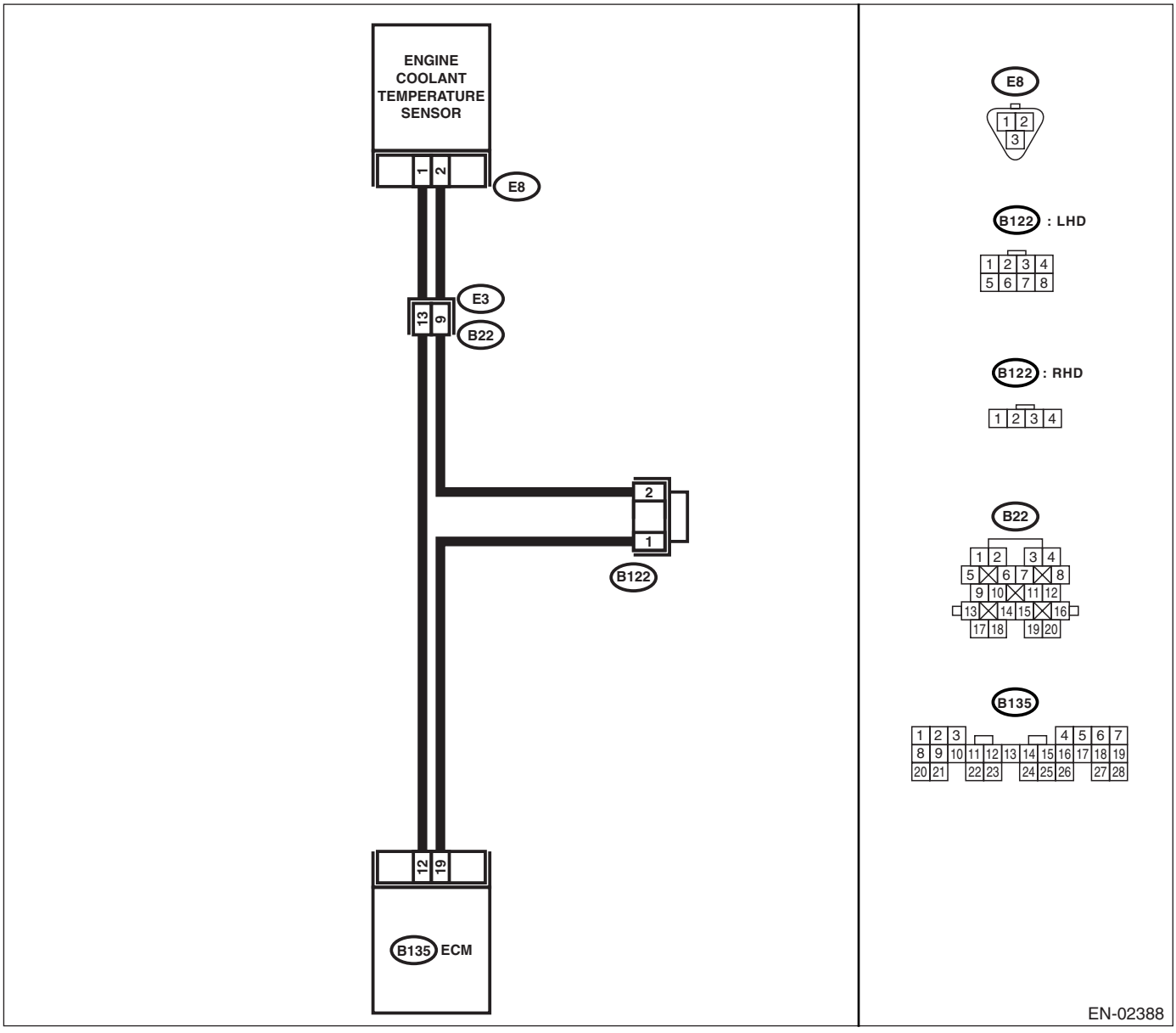
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 150°C (302°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-25, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

M: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

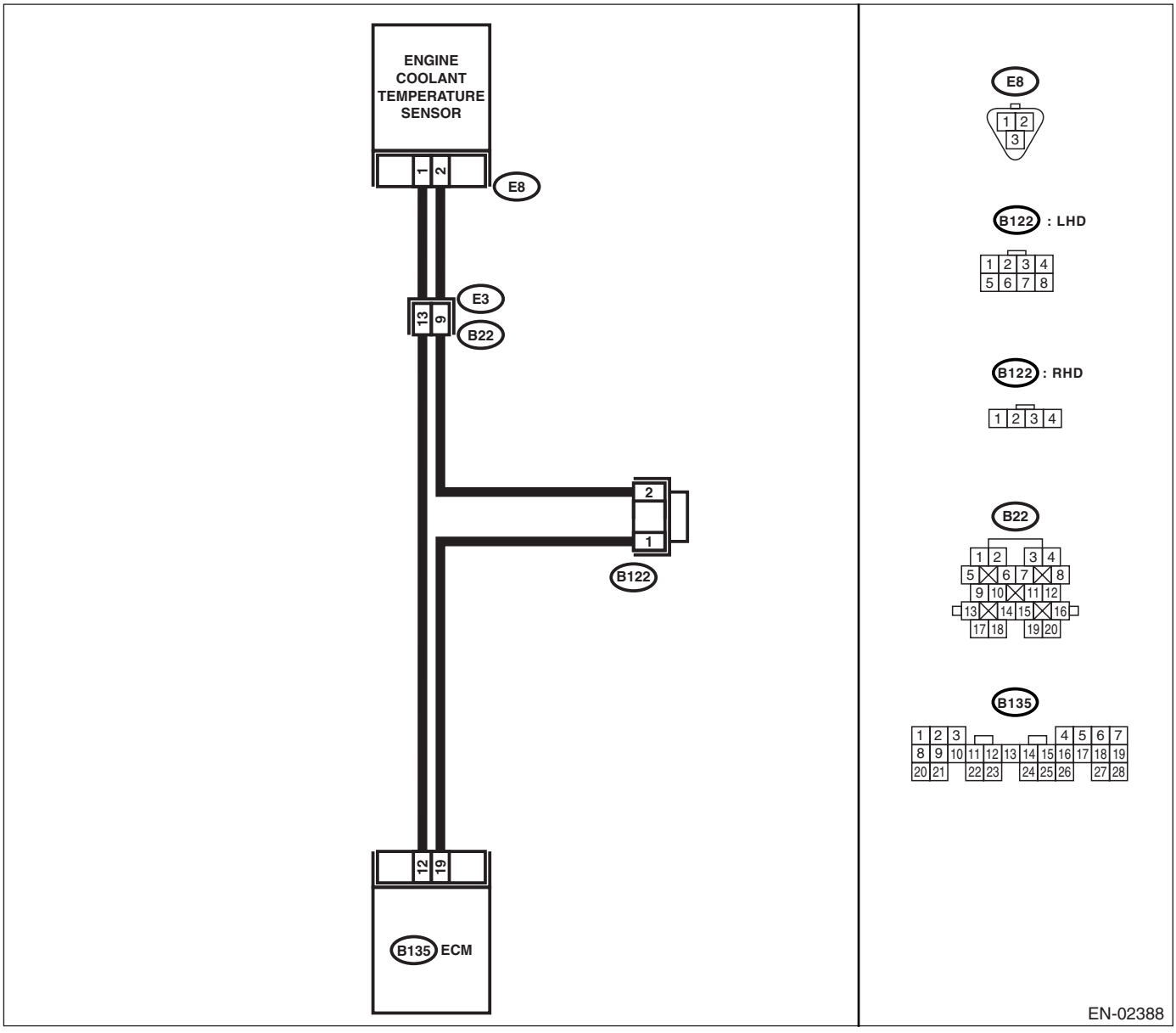
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature less than −40°C (−40°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-25, Engine Coolant Temperature Sensor.>	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector

N: DTC P0121 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

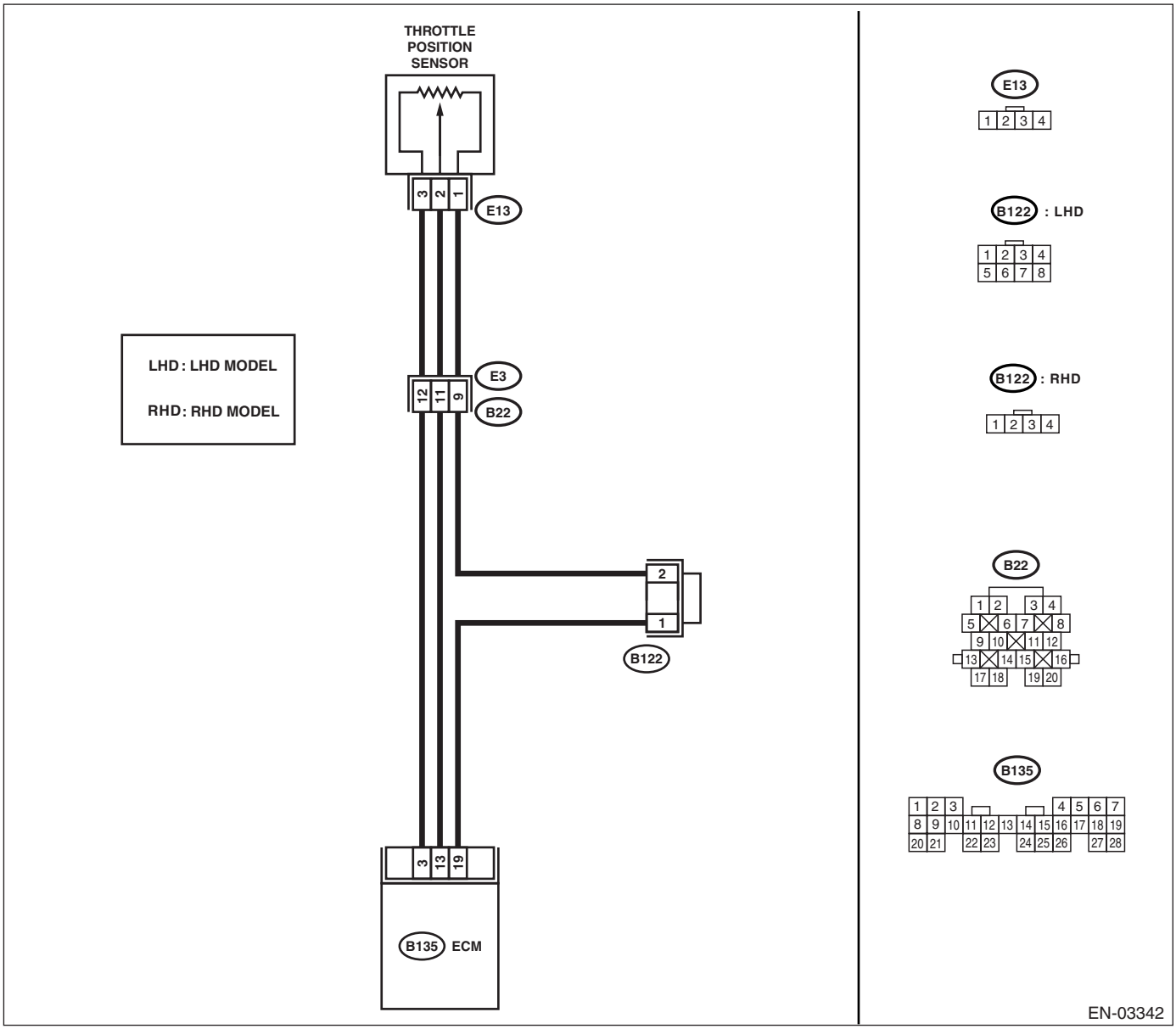
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC P0122 or P0123 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(H4SO)-29, Throttle Position Sensor.>

O: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

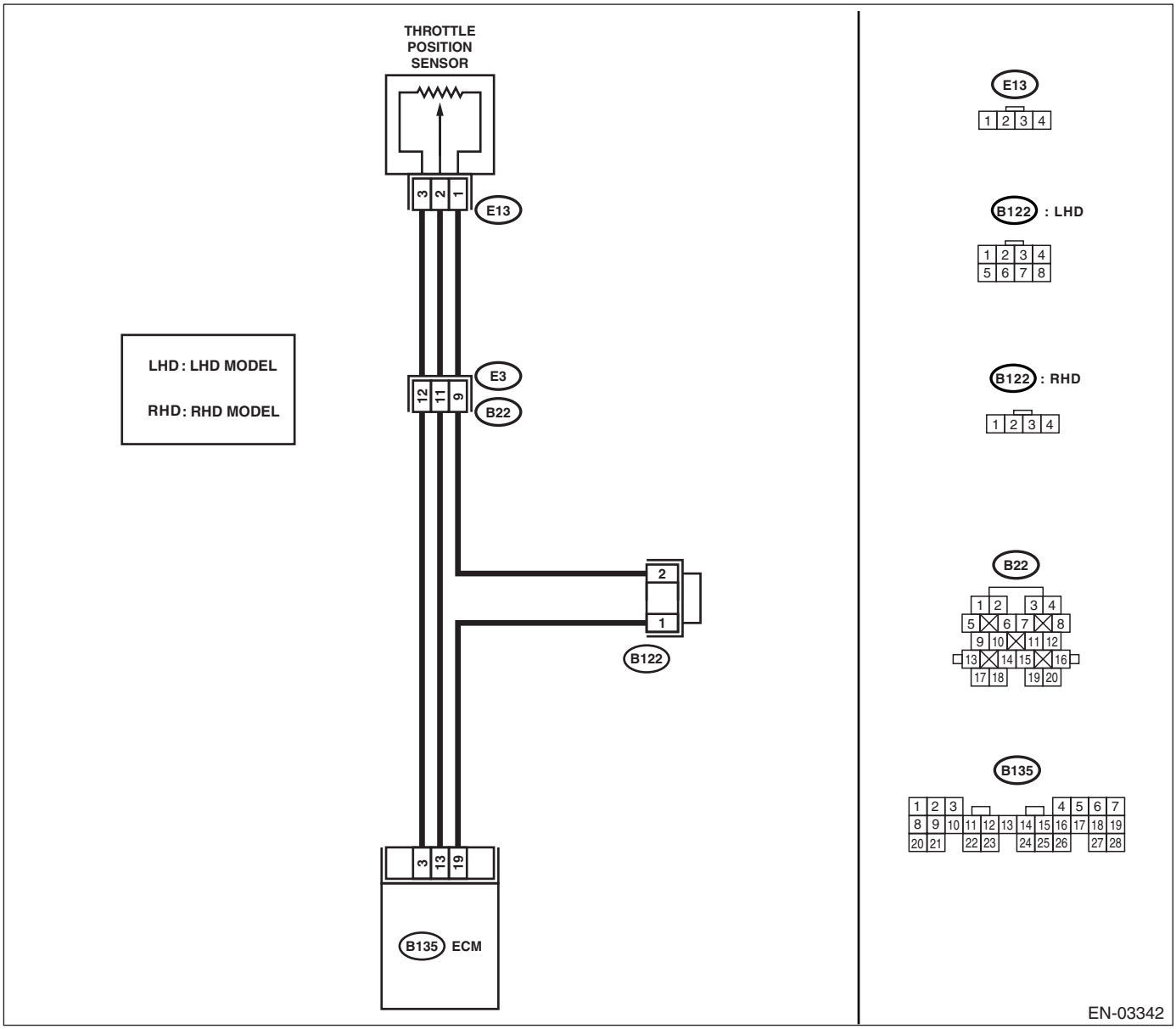
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (–):***	Is the voltage more than 0.1 V by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 13 — (E13) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between throttle position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor?	Repair poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(H4SO)-29, Throttle Position Sensor.>

P: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

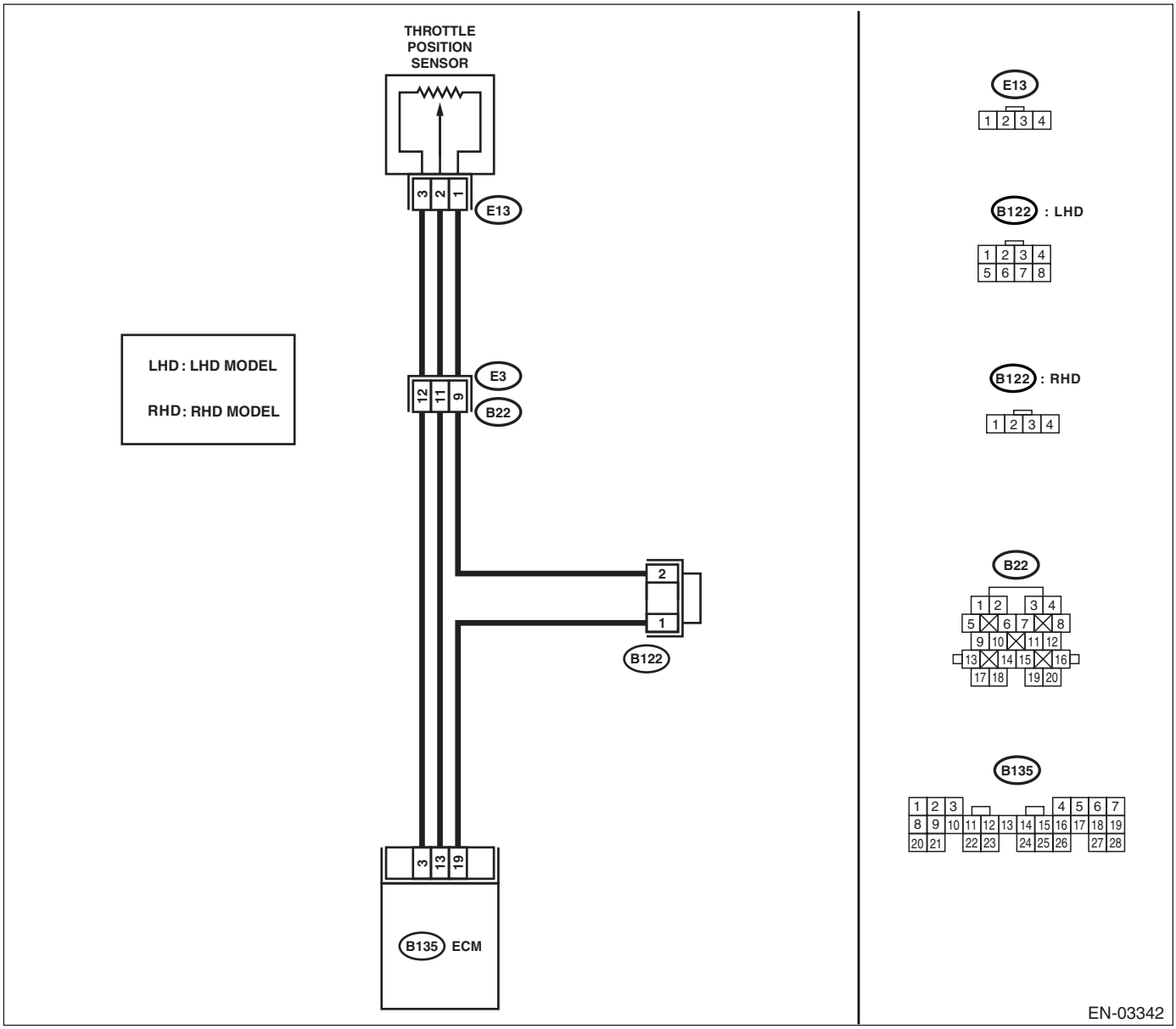
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Replace the throttle position sensor. <Ref. to FU(H4SO)-29, Throttle Position Sensor.>

Q: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

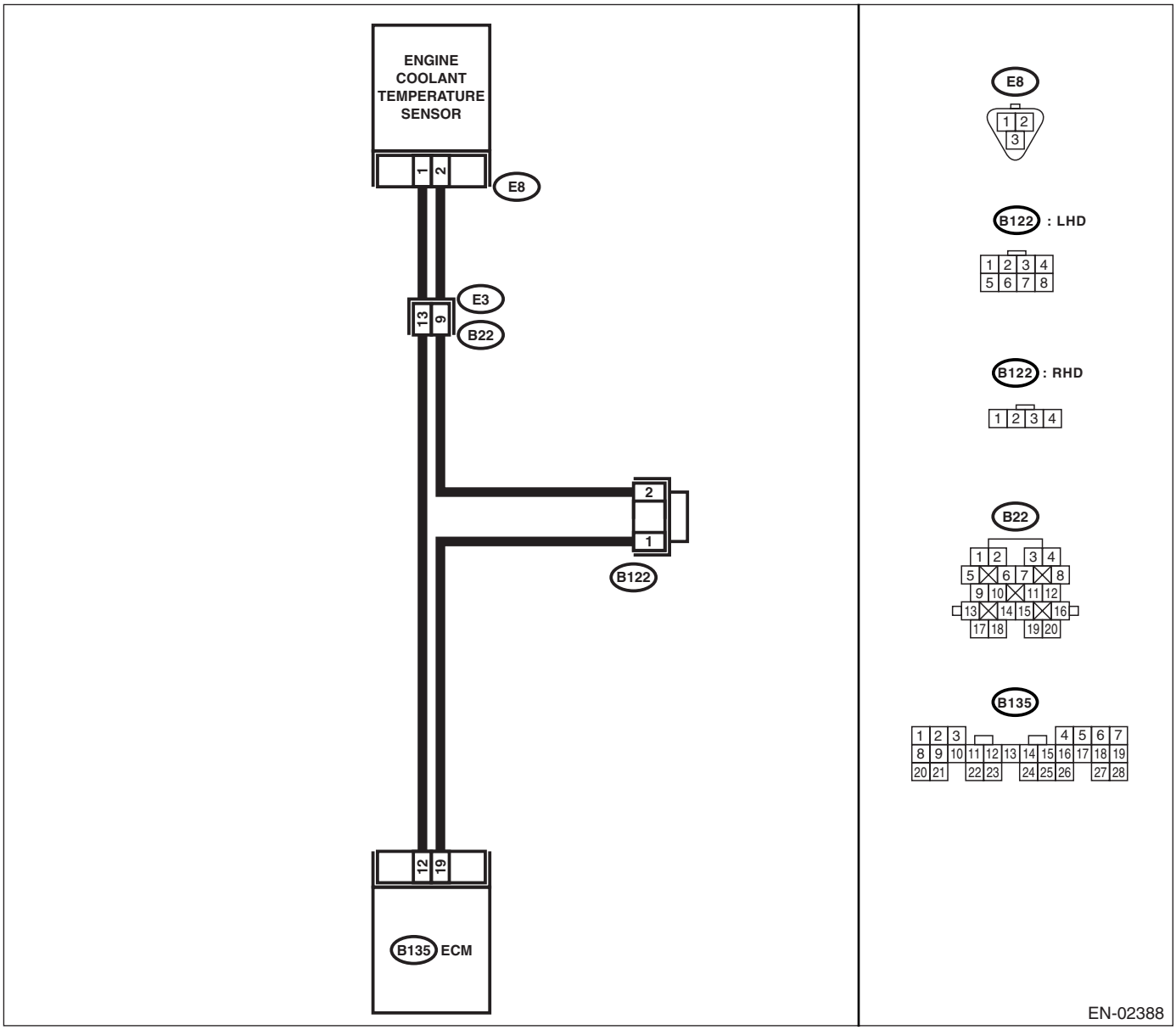
TROUBLE SYMPTOM:

Engine would not return to idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4SO)-26, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-25, Engine Coolant Temperature Sensor.>

R: DTC P0130 O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1)

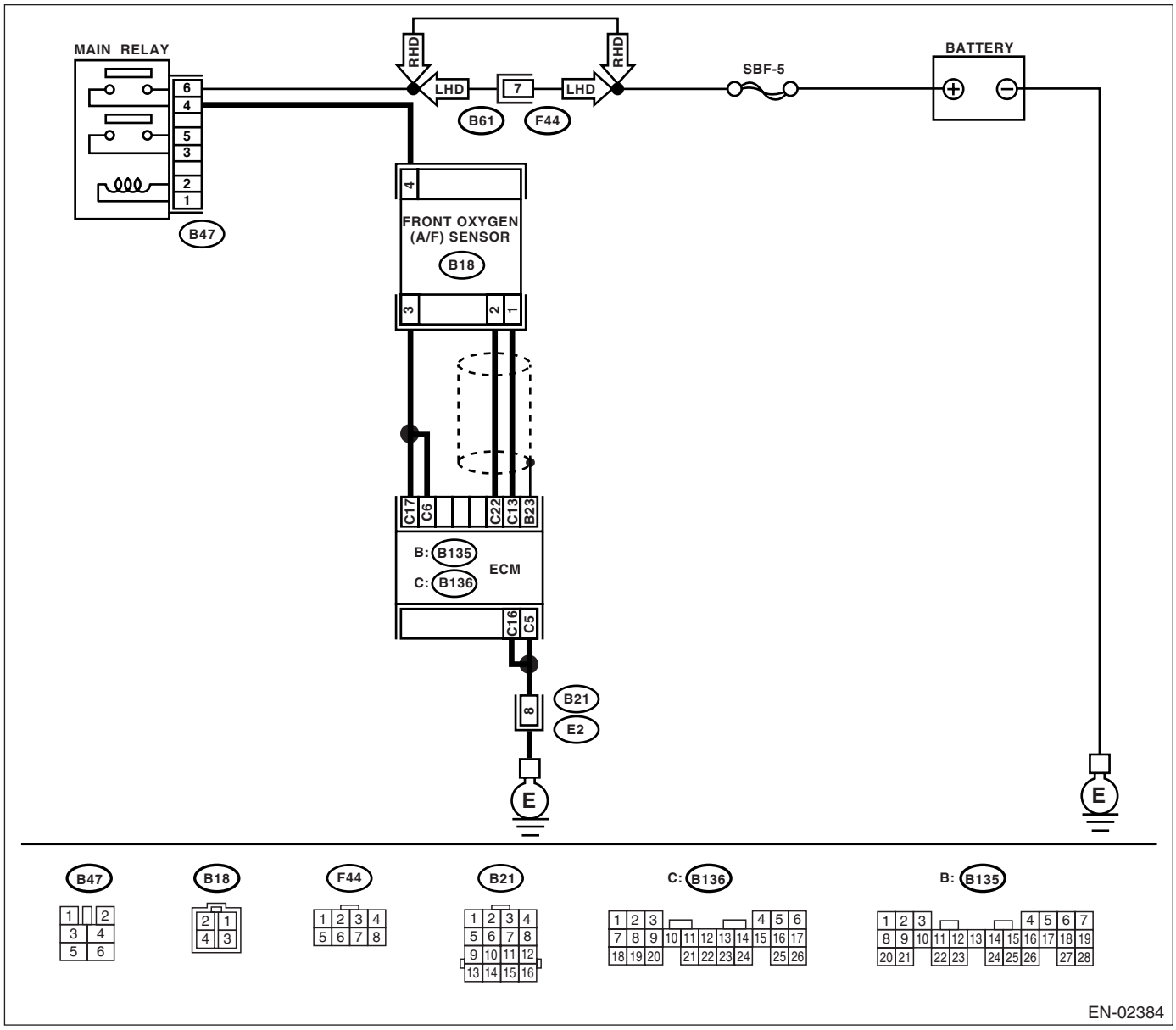
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or general scan tool screen, warm-up the engine until coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE”. <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.85 — 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. 2) Read the data of front oxygen (A/F) sensor signal at racing using Subaru Select Monitor or general scan tool. NOTE: • Normally the air fuel ratio be rich at racing. • To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the voltage more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminal*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

S: DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

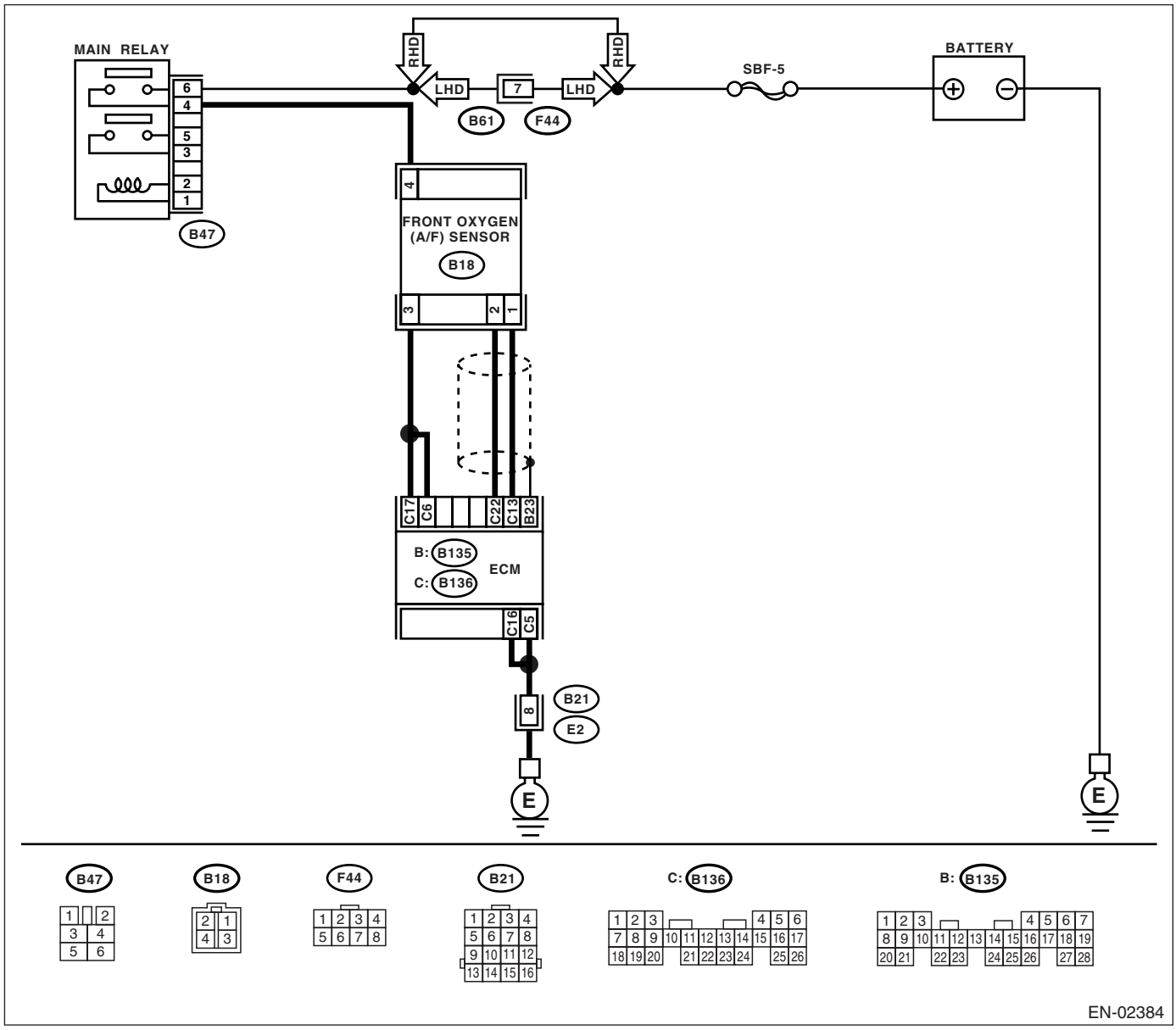
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

T: DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

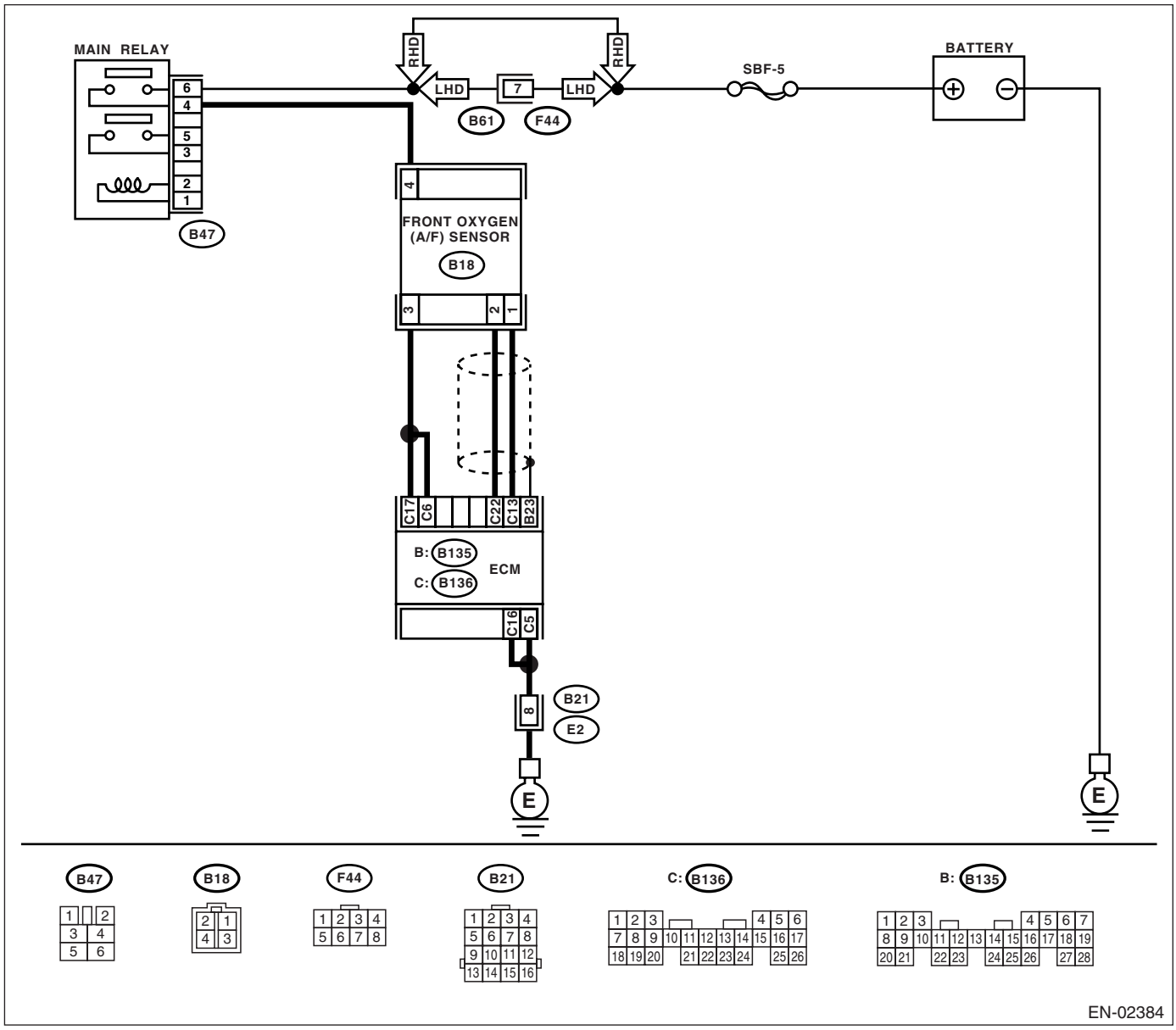
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 13 (+) — Chassis ground (−):*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

U: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

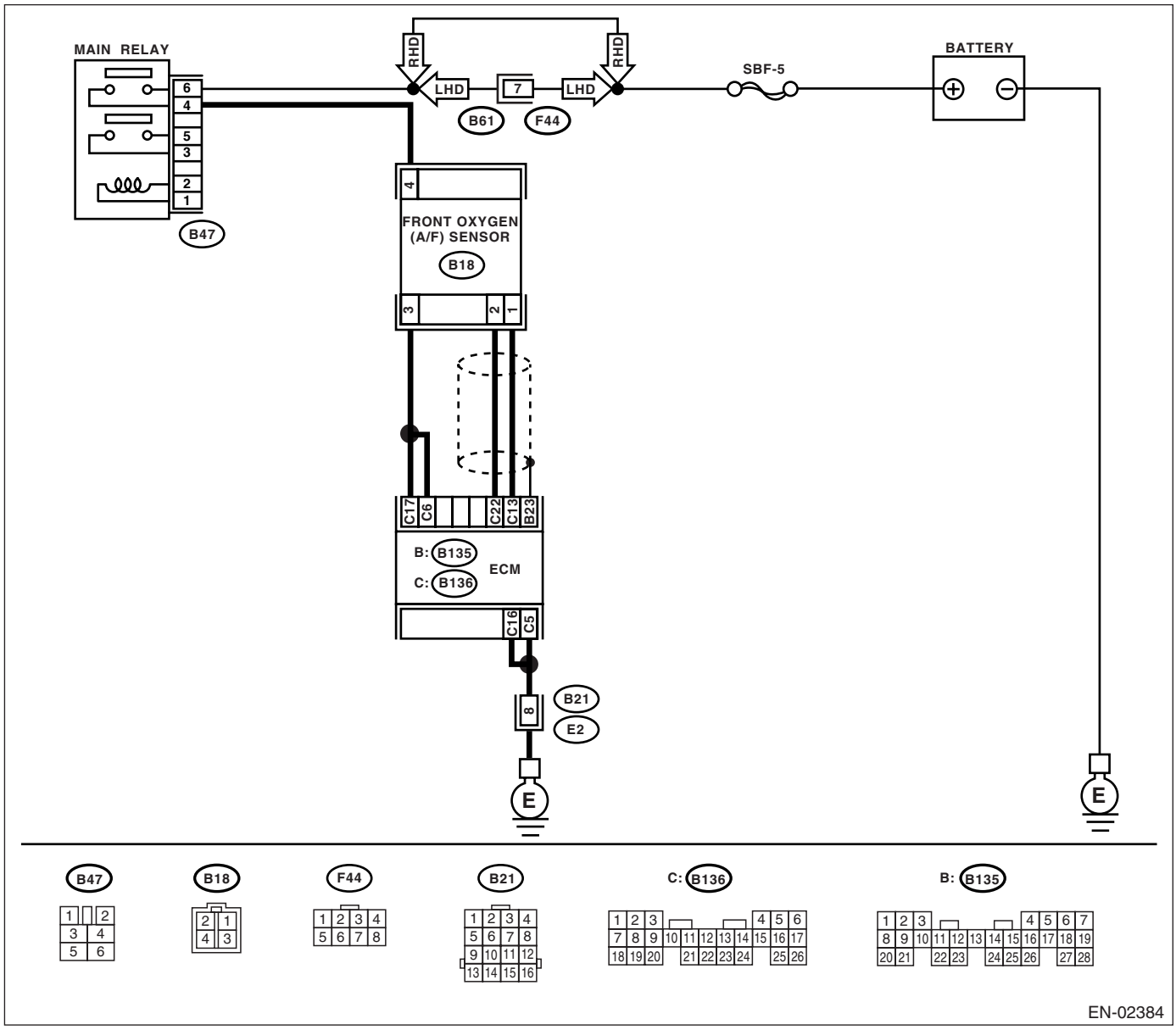
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items: • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

V: DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

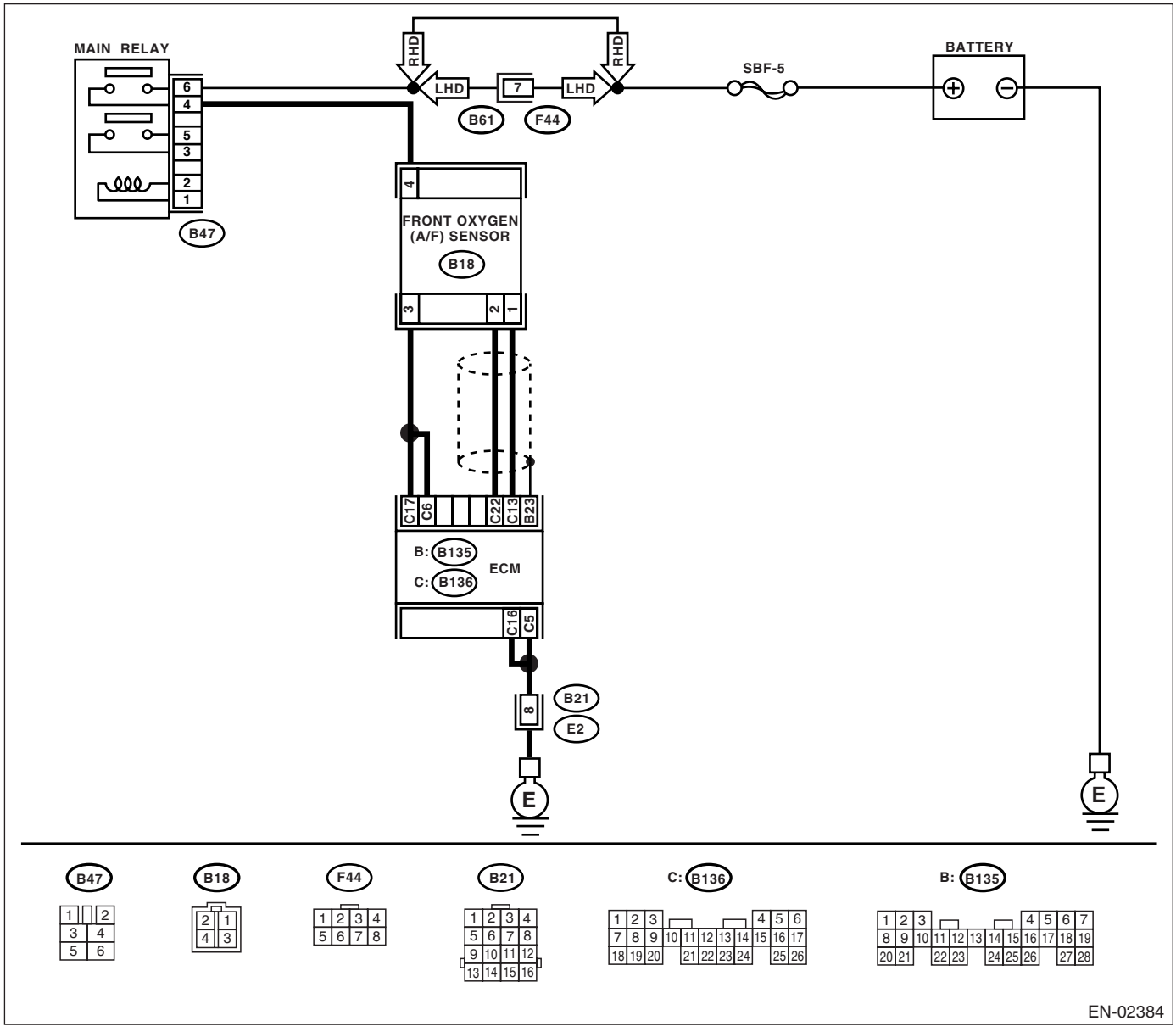
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (E18) No. 1:*** ***(B136) No. 22 — (E18) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector.
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

W: DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

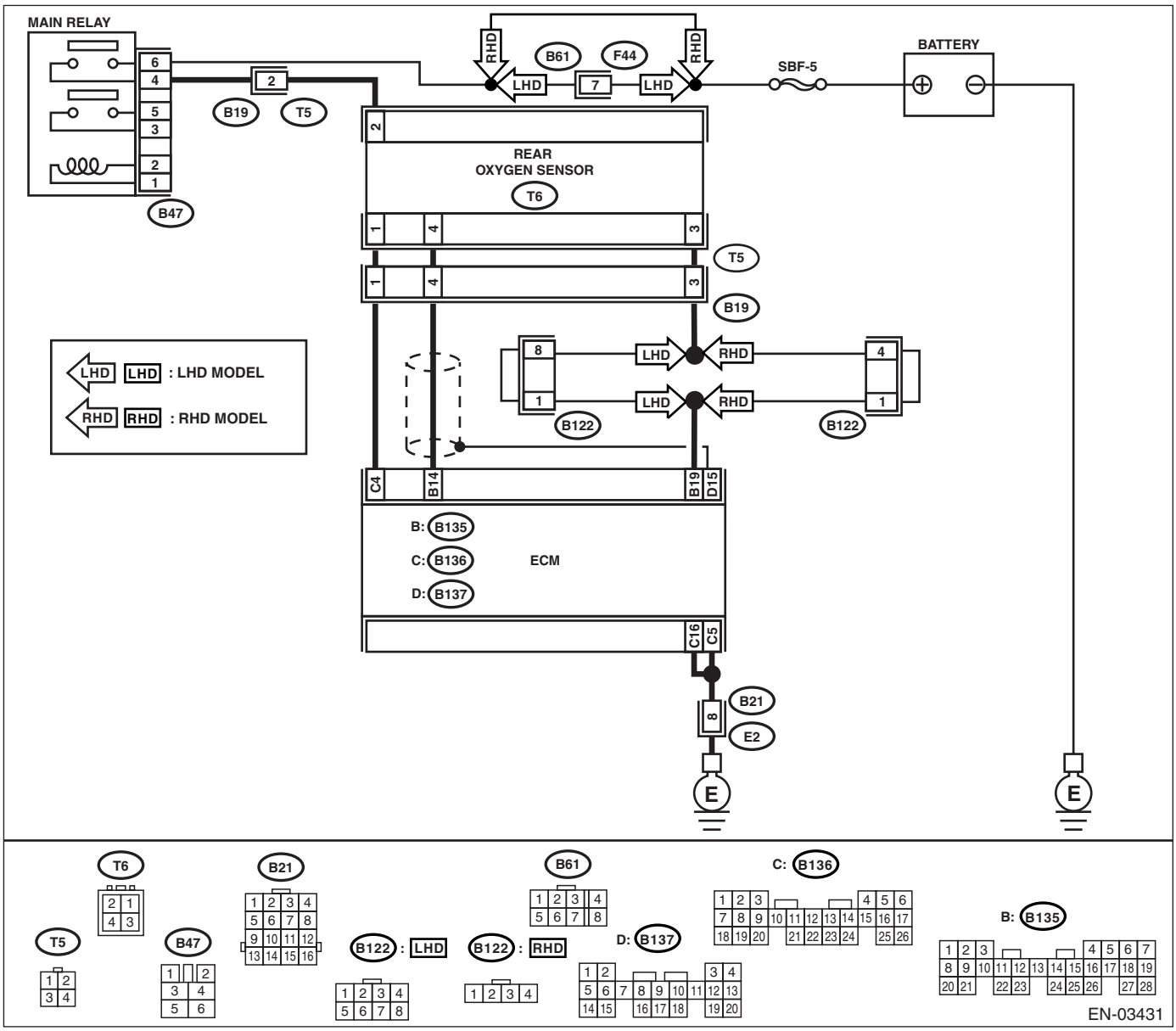
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance in harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (T6) No. 4:*** ***(B135) No. 19 — (T6) No. 3:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector.

	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose part of exhaust system and incomplete installation • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

X: DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

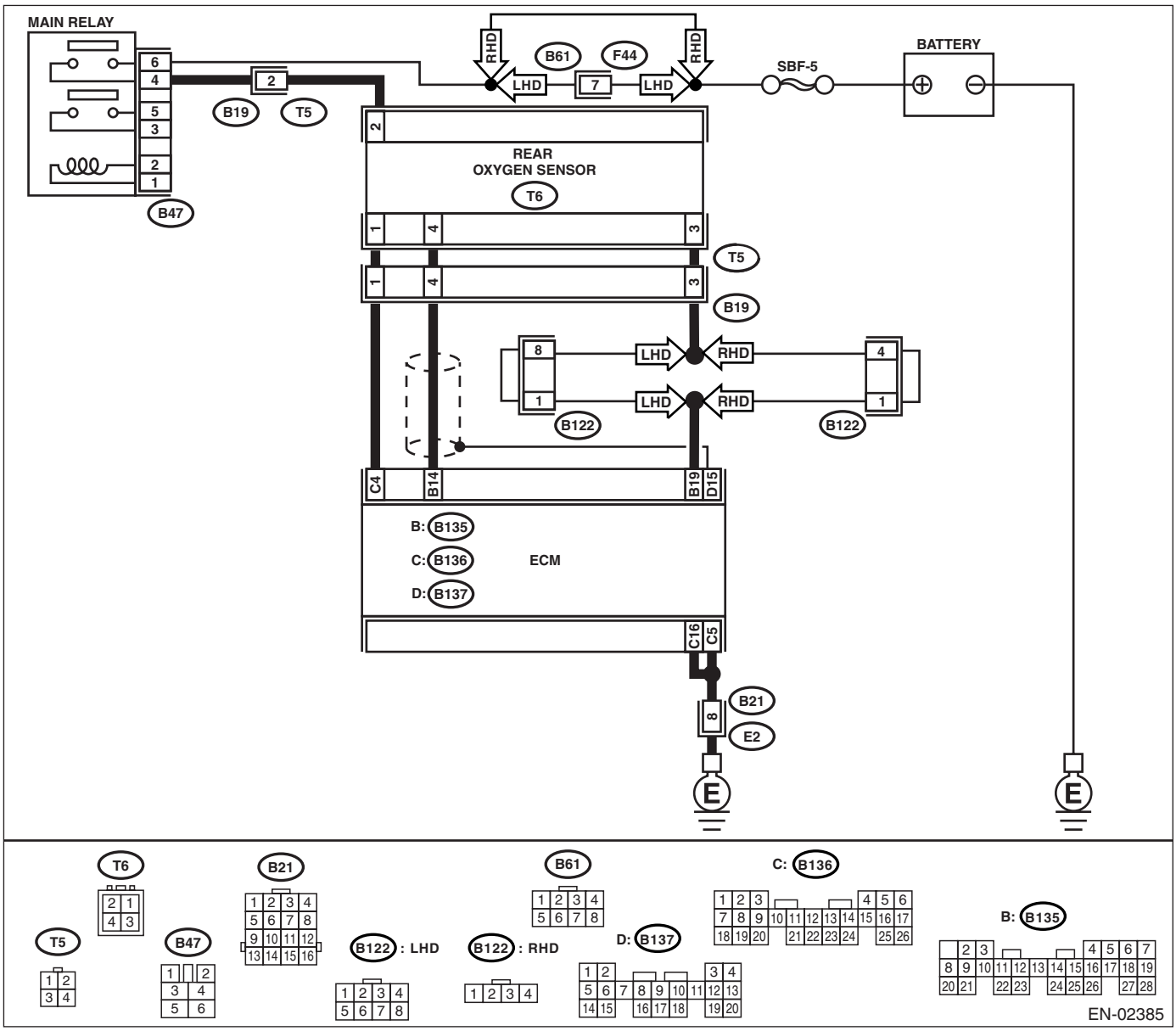
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and lower the engine speed rapidly from 5,000 rpm. 2) Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE”. <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Does the voltage vary from 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance in harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B135) No. 14 — (T6) No. 4:*** ***(B135) No. 19 — (T6) No. 3:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector.

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose part of exhaust system and incomplete installation • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

Y: DTC P0139 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

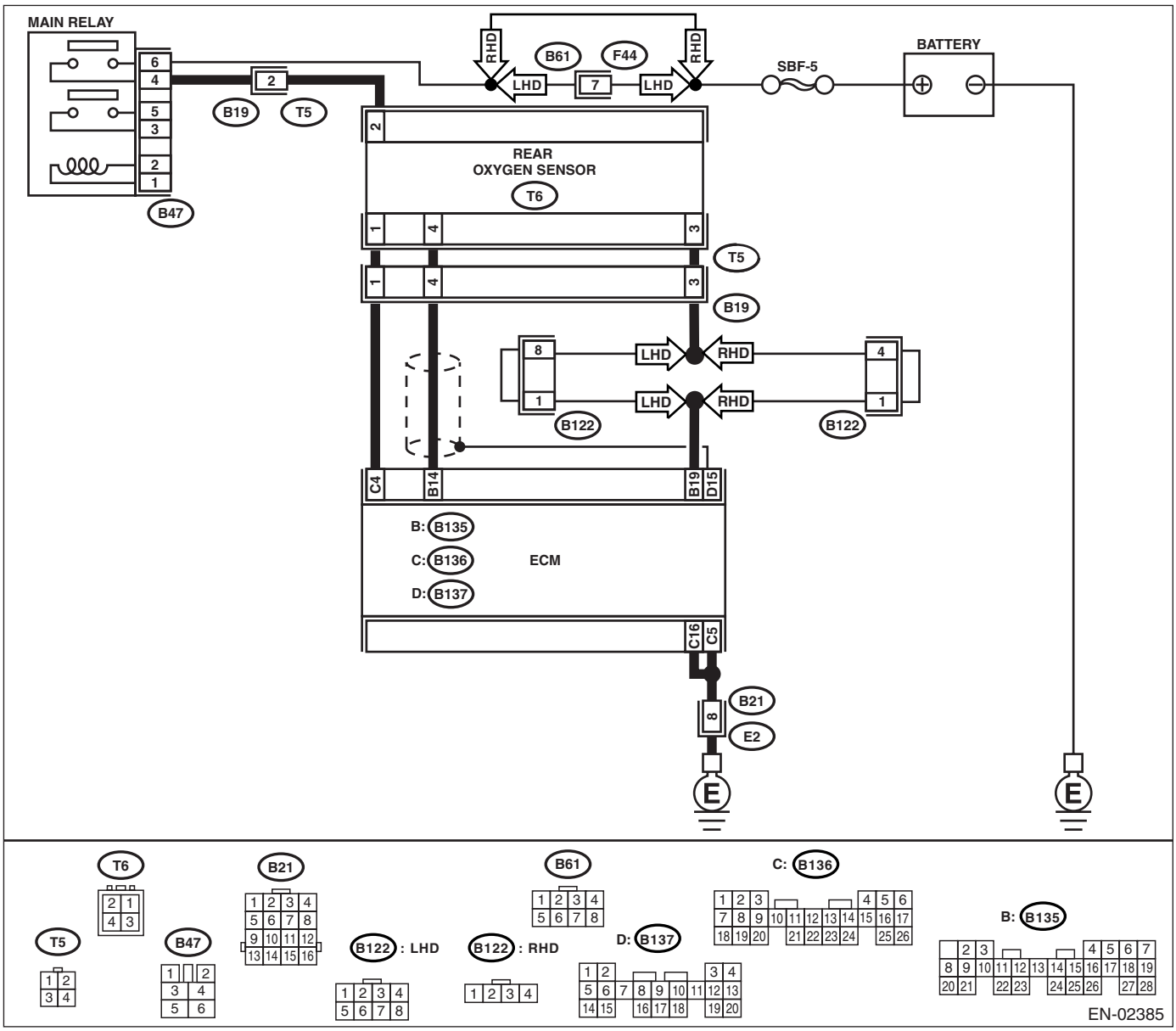
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-42, Rear Oxygen Sensor.>

Z: DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-139, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AA:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **2.**
2	**CHECK EGR VALVE.**	Is the EGR valve stuck?	Replace the EGR valve.	Go to step **3.**
3	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **4.**
4	**CHECK PURGE CONTROL SOLENOID VALVE.**	Is the purge control solenoid valve stuck?	Replace the purge control solenoid valve.	Go to step **5.**
5	**CHECK PCV VALVE.**	Is the PCV valve stuck?	Replace the PCV valve.	Go to step **6.**
6	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose, and connect the fuel pressure gauge. 4) Install the fuel filler flap lid cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **7.**	Repair the following items. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
7	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is measured value 206 — 235 kPa (2.1 — 2.4 kgf/cm^2, 30 — 34 psi)?	Go to step **8.**	Repair the following items. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the engine coolant temperature 70 — 100°C (158 — 212°F)?	Go to step **9.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-25, Engine Coolant Temperature Sensor.>
9	**CHECK MANIFOLD PRESSURE SENSOR SIGNAL.** 1) Start and warm-up the engine until engine coolant temperature is greater than 60°C (140°F). 2) Shift the select lever to "N" or "P" range. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of manifold absolute pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measurement value at idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg), at ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)?	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-31, Manifold Absolute Pressure Sensor.>

AB:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-142, DTC P0304 CYLINDER 4 MISFIRE DETECTED, DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

AC:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-142, DTC P0304 CYLINDER 4 MISFIRE DETECTED, DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

AD:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-142, DTC P0304 CYLINDER 4 MISFIRE DETECTED, DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

AE:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

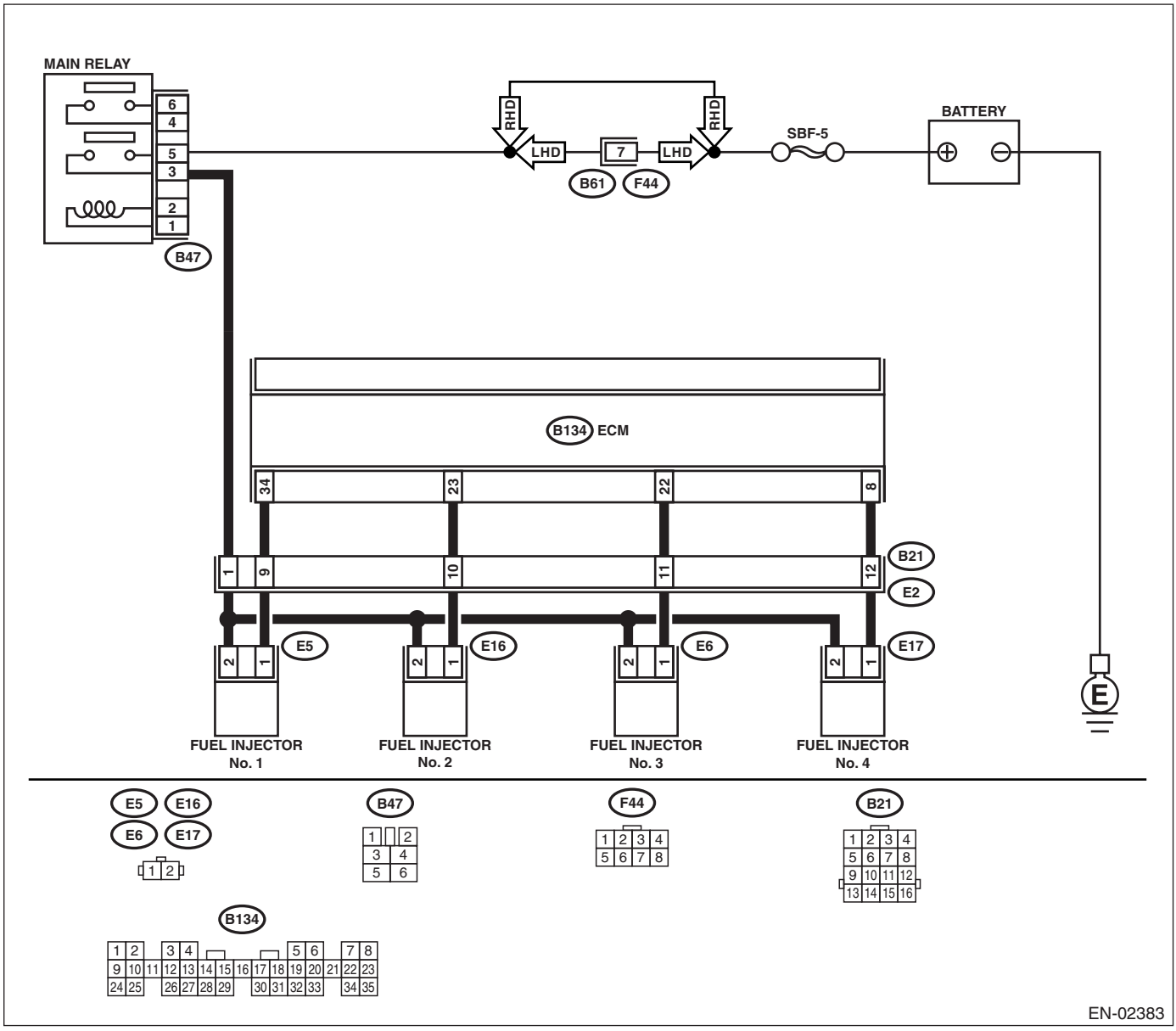
TROUBLE SYMPTOM:

- Engine stalls
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Measure the voltage between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 — (E5) No. 1:*** ***#2 (B134) No. 23 — (E16) No. 1:*** ***#3 (B134) No. 22 — (E6) No. 1:*** ***#4 (B134) No. 8 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(H4SO)-35, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B134) No. 34 (+) — Chassis ground (–):*** ***#2 (B134) No. 23 (+) — Chassis ground (–):*** ***#3 (B134) No. 22 (+) — Chassis ground (–):*** ***#4 (B134) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector<Ref. to FU(H4SO)-35, Fuel Injector.> and ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the installation of camshaft position sensor or crankshaft position sensor loosened?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANK SPROCKET.** Remove the timing belt cover.	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4SO)-55, Crank Sprocket.>	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-48, Timing Belt.>	Go to step **12.**
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**

	Step	Check	Yes	No
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-45, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire diagnosed when the engine is running? Ex. Removed spark plug cord, etc.	Finish diagnostics operation, if the engine has no abnormality.	1. Repair the poor contact. NOTE: In this case repair the following: • Poor contact in ignitor connector • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector. • Poor contact in coupling connector 2. If there is no poor contact, check the following items and contact SUBARU dealer. Fuel condition Contained additive Plug condition Plug cord condition Engine oil condition
15	**CHECK AIR INTAKE SYSTEM.**	Is there any fault in air intake system?	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**

	Step	Check	Yes	No
16	**CHECK MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) READ DTC. • Subaru Select Monitor <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual. NOTE: Perform diagnostic according to the items listed below.	Does the Subaru Select Monitor or general scan tool indicate a DTC?	Go to step **21.**	Go to step **17.**
17	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0301 and P0302 displayed?	Go to step **22.**	Go to step **18.**
18	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0303 and P0304 displayed?	Go to step **23.**	Go to step **19.**
19	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0301 and P0303 displayed?	Go to step **24.**	Go to step **20.**
20	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0302 and P0304 displayed?	Go to step **25.**	Go to step **26.**
21	**ONLY ONE CYLINDER.**	Is there a fault in that cylinder?	Repair or replace the faulty part. NOTE: Check the following items: • Spark plug • Spark plug cord • Fuel injector • Compression ratio	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-138, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	**GROUP OF #1 AND #2 CYLINDERS.**	Are there faults in #1 and #2 cylinders?	Repair or replace the faulty part. NOTE: • Check the following items: • Spark plug • Fuel injector • Ignition coil • Compression ratio • If no abnormal is discovered, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-138, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

	Step	Check	Yes	No
23	**GROUP OF #3 AND #4 CYLINDERS.**	Are there faults in #3 and #4 cylinders?	Repair or replace the faulty part. NOTE: • Check the following items: • Spark plug • Fuel injector • Ignition coil • If no abnormal is discovered, check for “16. D: IGNITION CONTROL SYSTEM” of #3 and #4 cylinders side. <Ref. to EN(H4SO)(diag)-65, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-138, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	**GROUP OF #1 AND #3 CYLINDERS.**	Are there faults in #1 and #3 cylinders?	Repair or replace the faulty part. NOTE: Check the following items: • Spark plug • Fuel injector • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-138, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	**GROUP OF #2 AND #4 CYLINDERS.**	Are there faults in #2 and #4 cylinders?	Repair or replace the faulty part. NOTE: Check the following items: • Spark plug • Fuel injector • Compression ratio • Skipping timing belt teeth	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-138, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	**CYLINDER AT RANDOM.**	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-138, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace the faulty part. NOTE: Check the following items: • Spark plug • Fuel injector • Compression ratio

AF:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

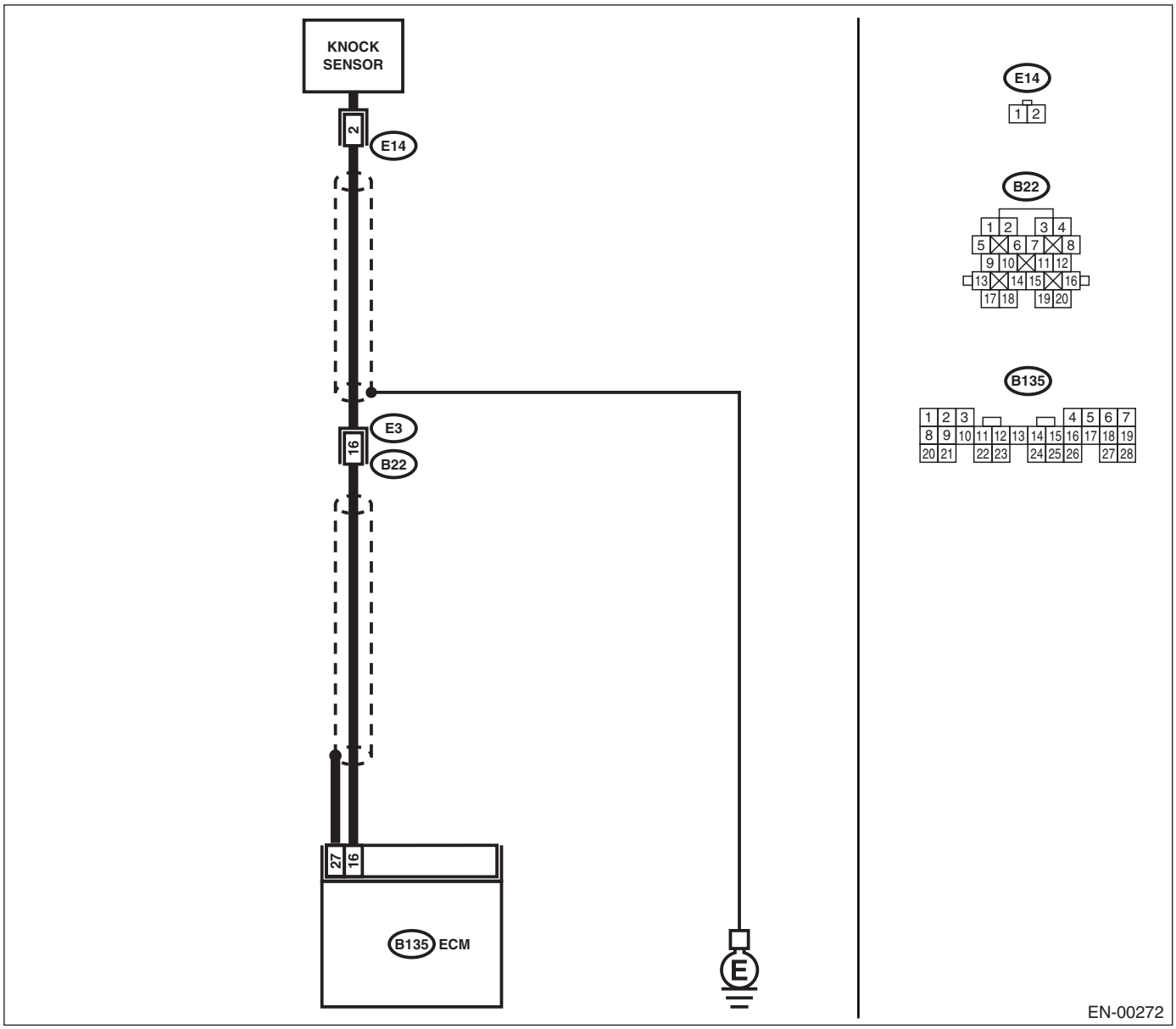
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminal*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: Poor contact in knock sensor connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4SO)-28, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AG:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

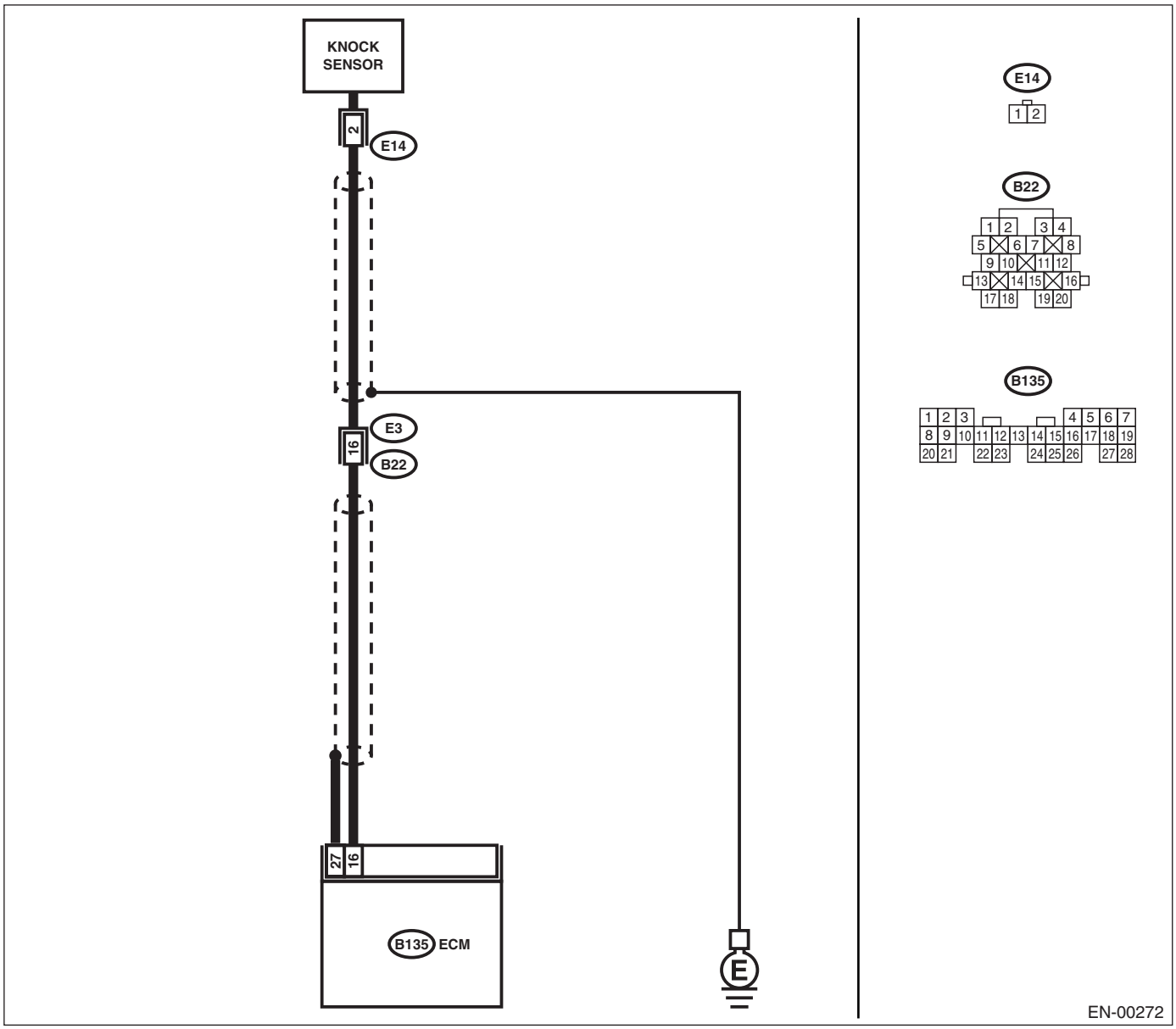
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 16 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4SO)-28, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair short circuit in harness covered with shield.
3	**CHECK INPUT SIGNAL FROM ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AH:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

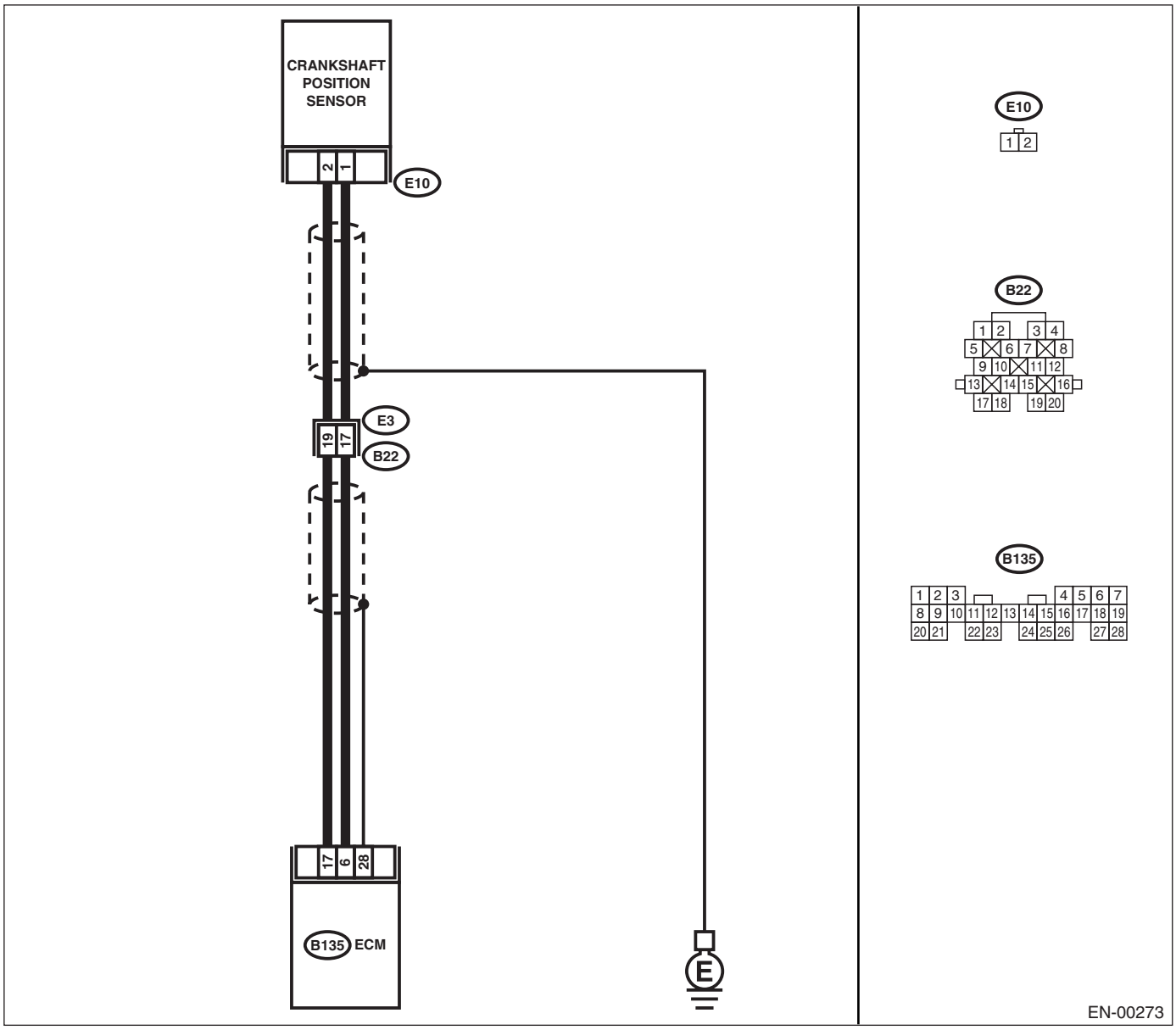
TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



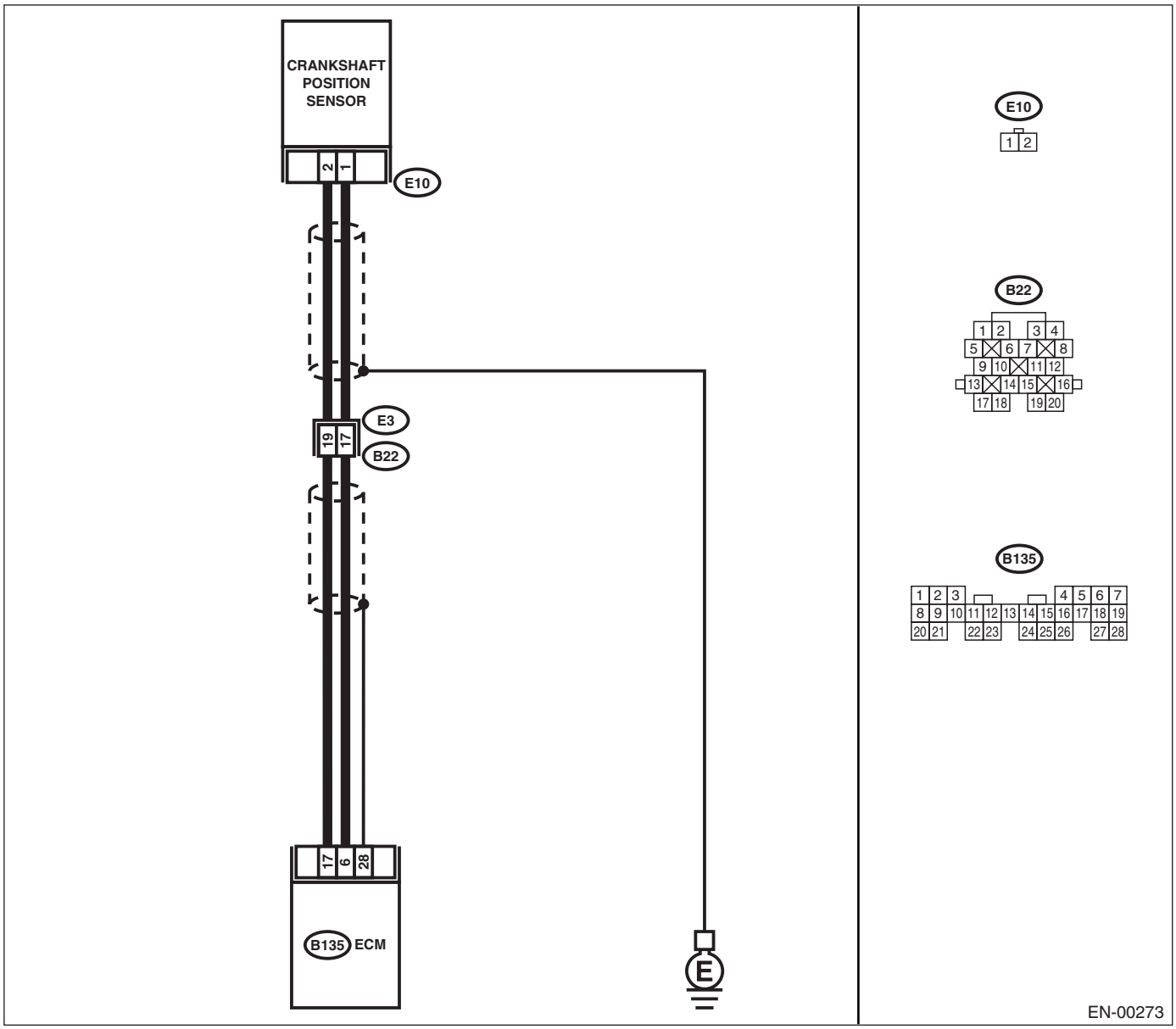
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4SO)-26, Crankshaft Position Sensor.>

AI: DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANK SPROCKET.** Remove the front belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to ME(H4SO)-55, Crank Sprocket.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft using ST, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-48, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4SO)-26, Crankshaft Position Sensor.>

AJ:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

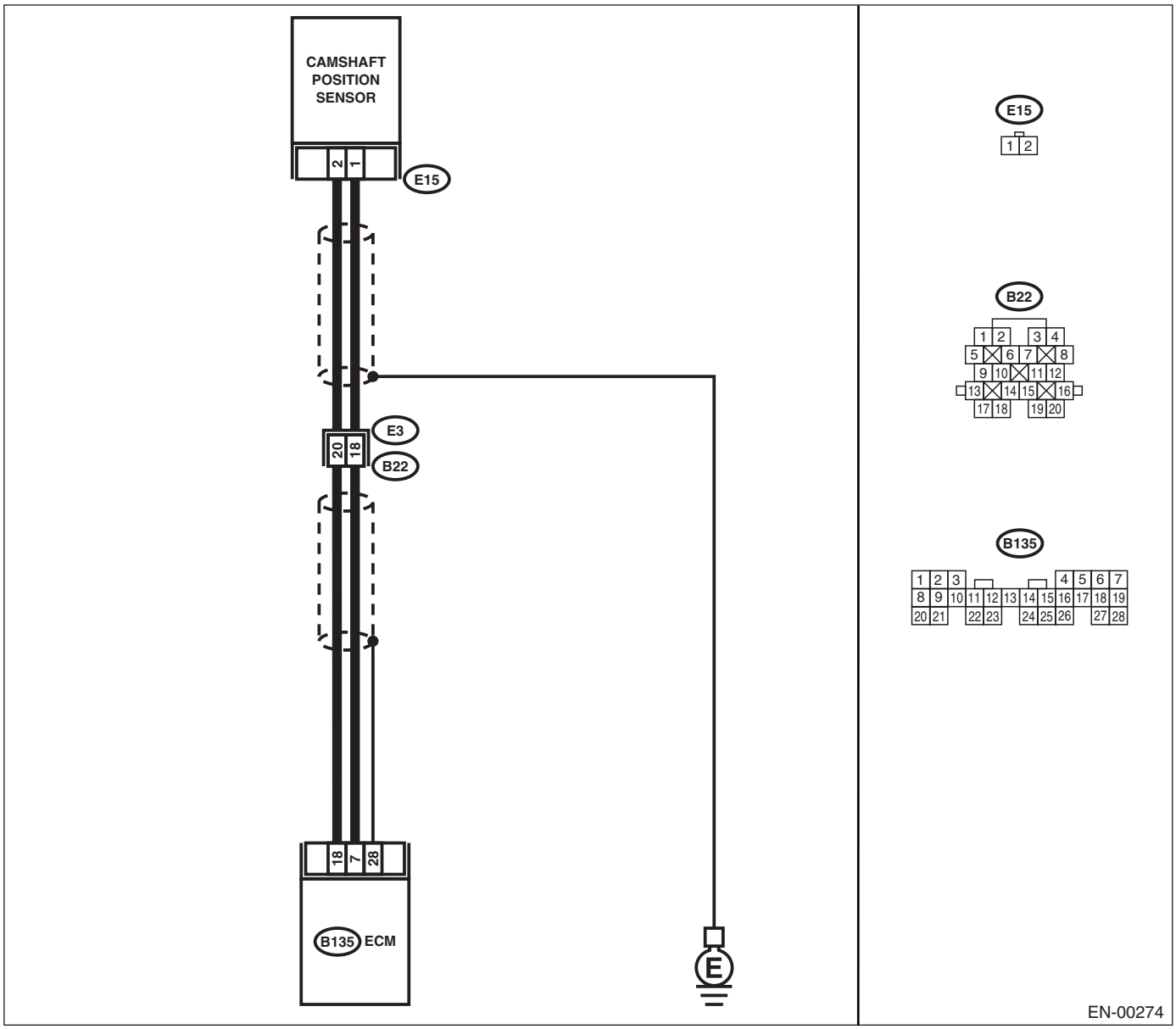
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4SO)-27, Camshaft Position Sensor.>

AK:DTC P0341 CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

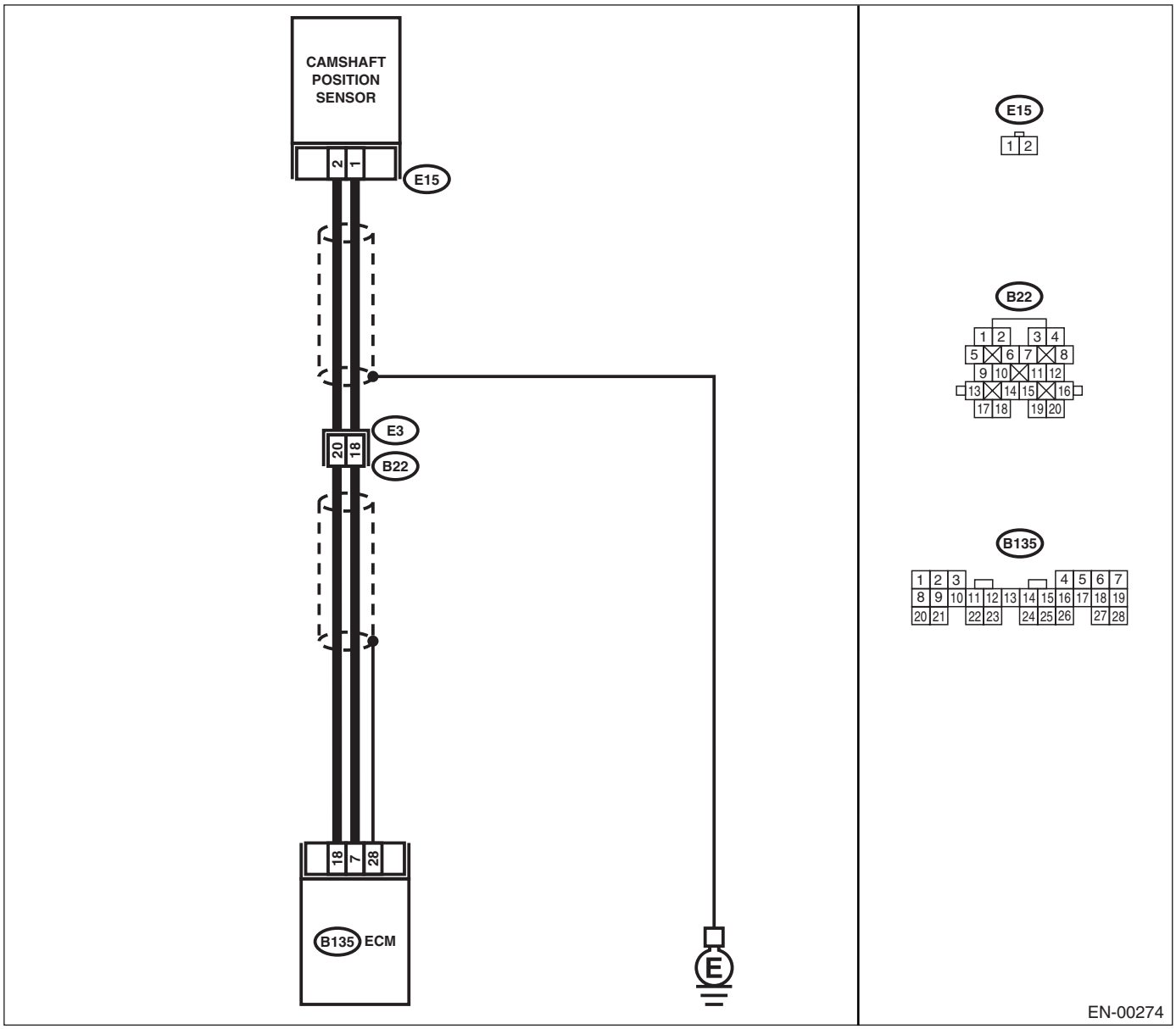
TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **4.**
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.

	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(H4SO)-27, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step **8.**	Tighten the camshaft position sensor installation bolt securely.
8	**CHECK CAM SPROCKET.** Remove the front belt cover. <Ref. to ME(H4SO)-47, Timing Belt Cover.>	Are cam sprocket teeth cracked or damaged?	Replace the cam sprocket. <Ref. to ME(H4SO)-53, Cam Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft using ST, and align alignment mark on cam sprocket with alignment mark on timing belt cover LH. ST 499207100 CAM SPROCKET WRENCH	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4SO)-48, Timing Belt.>	Replace the camshaft position sensor. <Ref. to FU(H4SO)-27, Camshaft Position Sensor.>

AL:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

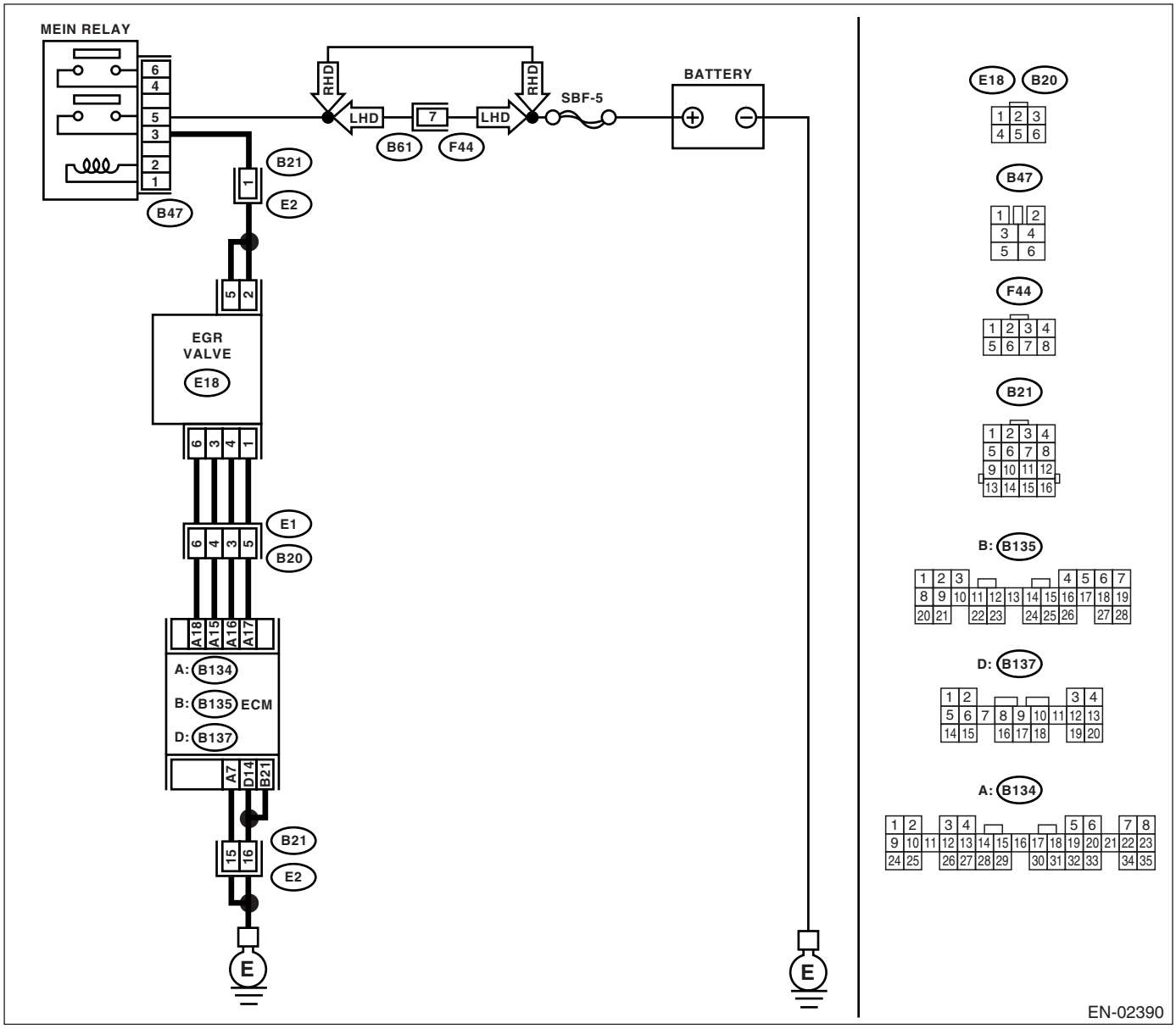
TROUBLE SYMPTOM:

- Movement performance problem when engine low speed
- Erroneous idling
- Movement performance problem

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value more than 53.3 kPa (400 mmHg, 15.75 inHg)?	Make sure that the EGR valve, manifold absolute pressure sensor and throttle body are tightened firmly.	Go to step **3.**
3	**CHECK THE POWER SUPPLY OF EGR VALVE.** 1) Disconnect the connector from EGR valve. 2) Turn the ignition switch to ON. 3) Measure the voltage between EGR valve and engine ground. ***Connector & terminal*** ***(E18) No. 2 — Engine ground:*** ***(E18) No. 5 — Engine ground:***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between main relay and EGR valve connector.
4	**CHECK EGR VALVE.** Measure the resistance between EGR valve terminals. NOTE: Make sure there is no foreign material between EGR valve and valve seat. ***Terminals*** ***No. 1 — No. 2:*** ***No. 3 — No. 2:*** ***No. 4 — No. 5:*** ***No. 6 — No. 5:***	Is the resistance 20 — 30 Ω?	Go to step **5.**	Replace the EGR valve. <Ref. to FU(H4SO)-34, EGR Valve.>
5	**OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM and EGR valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 15 (+) — Chassis ground (−):*** ***(B134) No. 16 (+) — Chassis ground (−):*** ***(B134) No. 17 (+) — Chassis ground (−):*** ***(B134) No. 18 (+) — Chassis ground (−):***	Is the voltage 0 — 10 V?	Repair poor contact portion in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN EGR VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Detach the connector from EGR valve and ECM. 3) Measure the resistance of harness between EGR valve and ECM connector. ***Connector & terminal*** ***(B134) No. 18 — (E18) No. 6:*** ***(B134) No. 17 — (E18) No. 1:*** ***(B134) No. 16 — (E18) No. 4:*** ***(B134) No. 15 — (E18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair open circuit in harness between ECM and EGR valve connector.
7	**CHECK HARNESS BETWEEN EGR VALVE AND ECM CONNECTOR.** Measure the resistance of harness between EGR valve and chassis ground. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:*** ***(B134) No. 16 — Chassis ground:*** ***(B134) No. 17 — Chassis ground:*** ***(B134) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair short circuit in harness between main relay and EGR valve connector.
8	**CHECK POOR CONTACT.** Check that the poor contact of ECM and EGR valve connector.	Is there poor contact of ECM and EGR valve connector?	Repair the poor contact portion of ECM and EGR valve connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a specified condition at this time.

AM:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

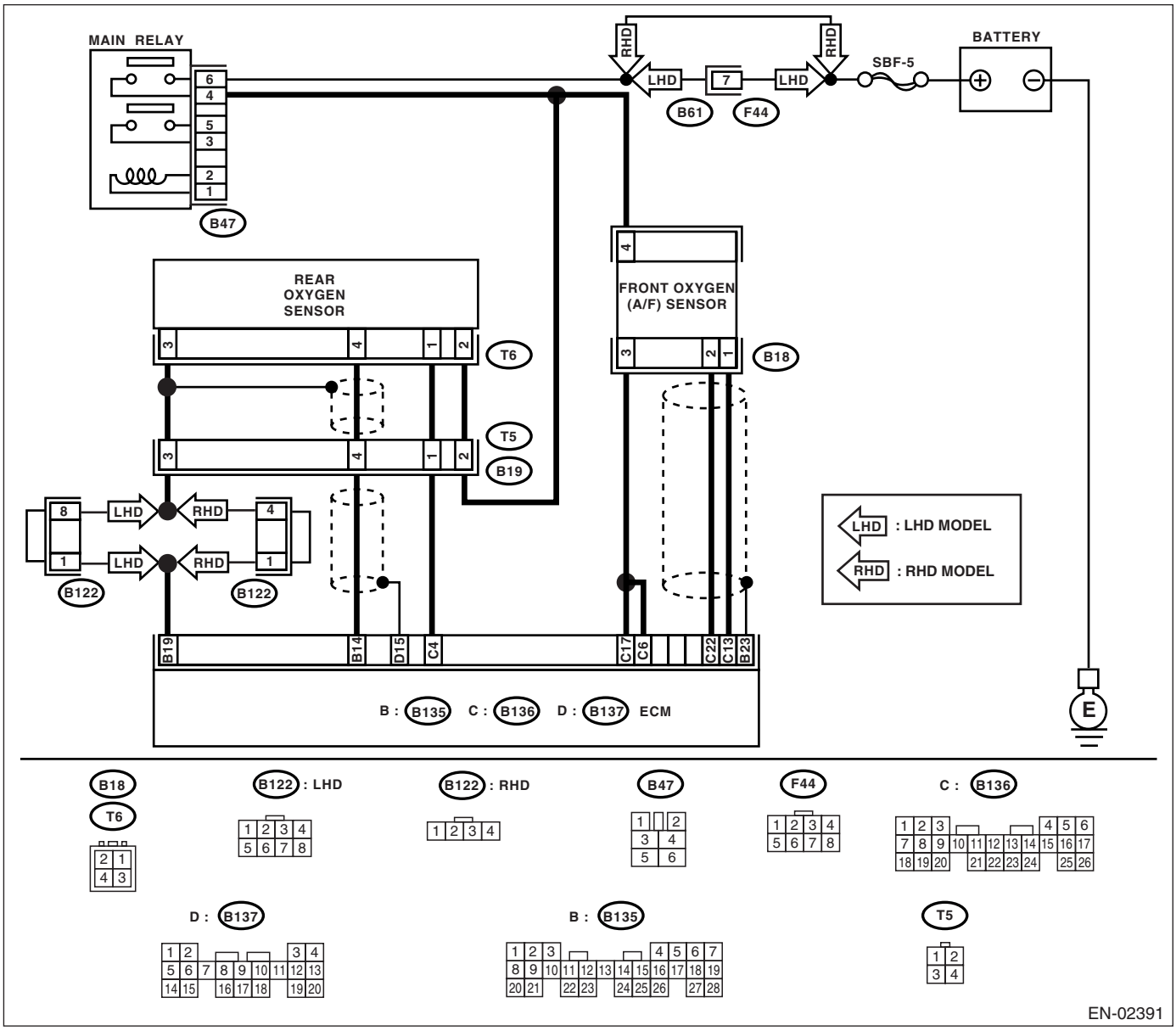
TROUBLE SYMPTOM:

- Engine stalls
- Idle mixture is out of specifications

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4SO)-2, General Description.>	Go to step **3.**
3	**CHECK CATALYTIC CONVERTER.**	Is there damage at rear face or front face of catalytic converter?	Replace catalytic converter. <Ref. to EC(H4SO)-3, Front Catalytic Converter.>	Go to step **4.**
4	**CHECK REAR OXYGEN SENSOR CIRCUIT MALFUNCTION.** 1) Disconnect the connector from rear oxygen sensor and ECM. 2) Measure the resistance between rear oxygen sensor connector and ECM connector. ***Connector & terminal*** ***(T6) No. 3 — (B135) No. 19:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair battery open circuit in harness between ECM and rear oxygen sensor.
5	**CHECK SHIELD WIRE.**	Is the shield wire opened?	Repair the shield wire.	Contact the SUBARU dealer.

AN:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

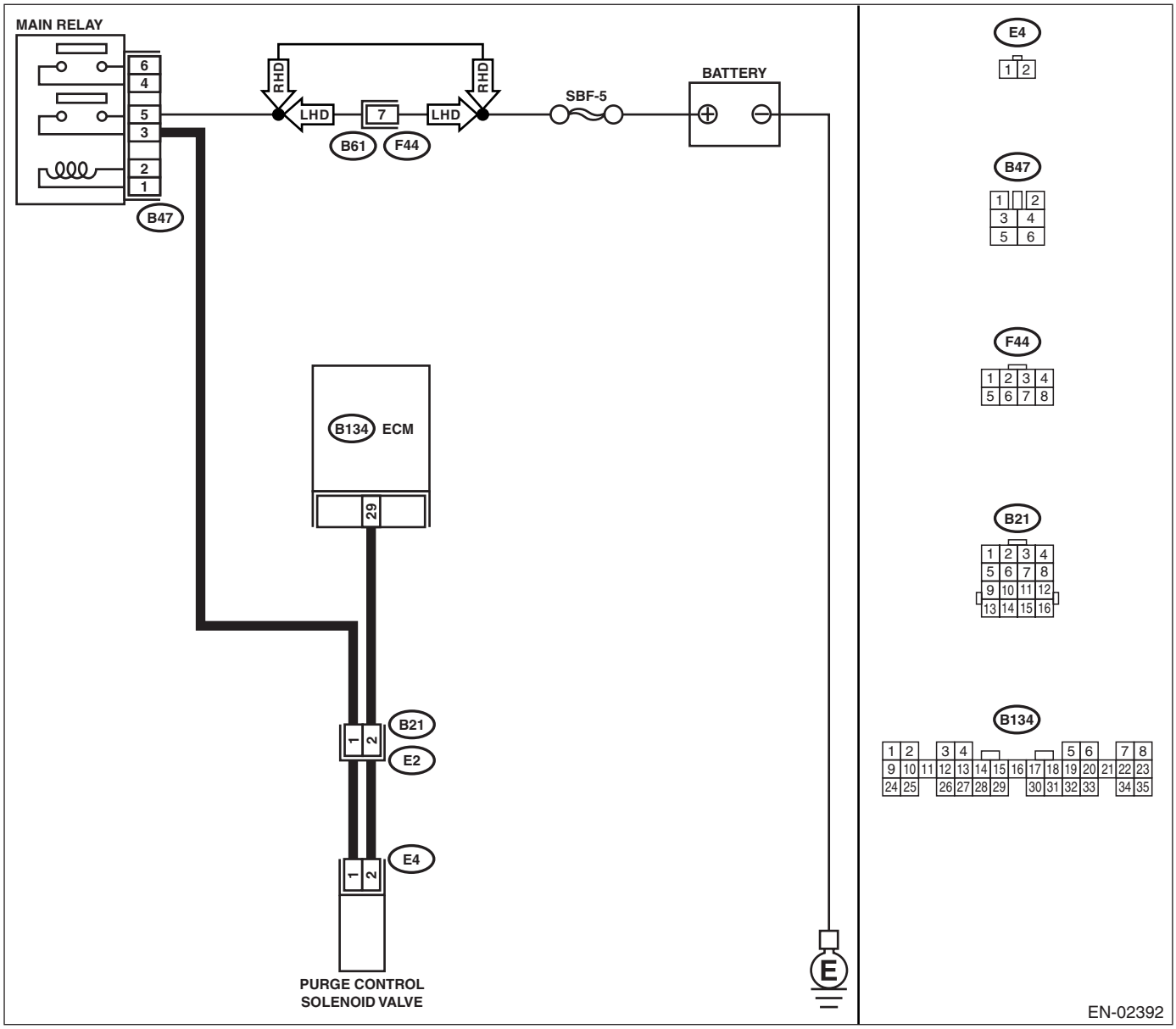
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 29 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-9, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.

Step		Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AO:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

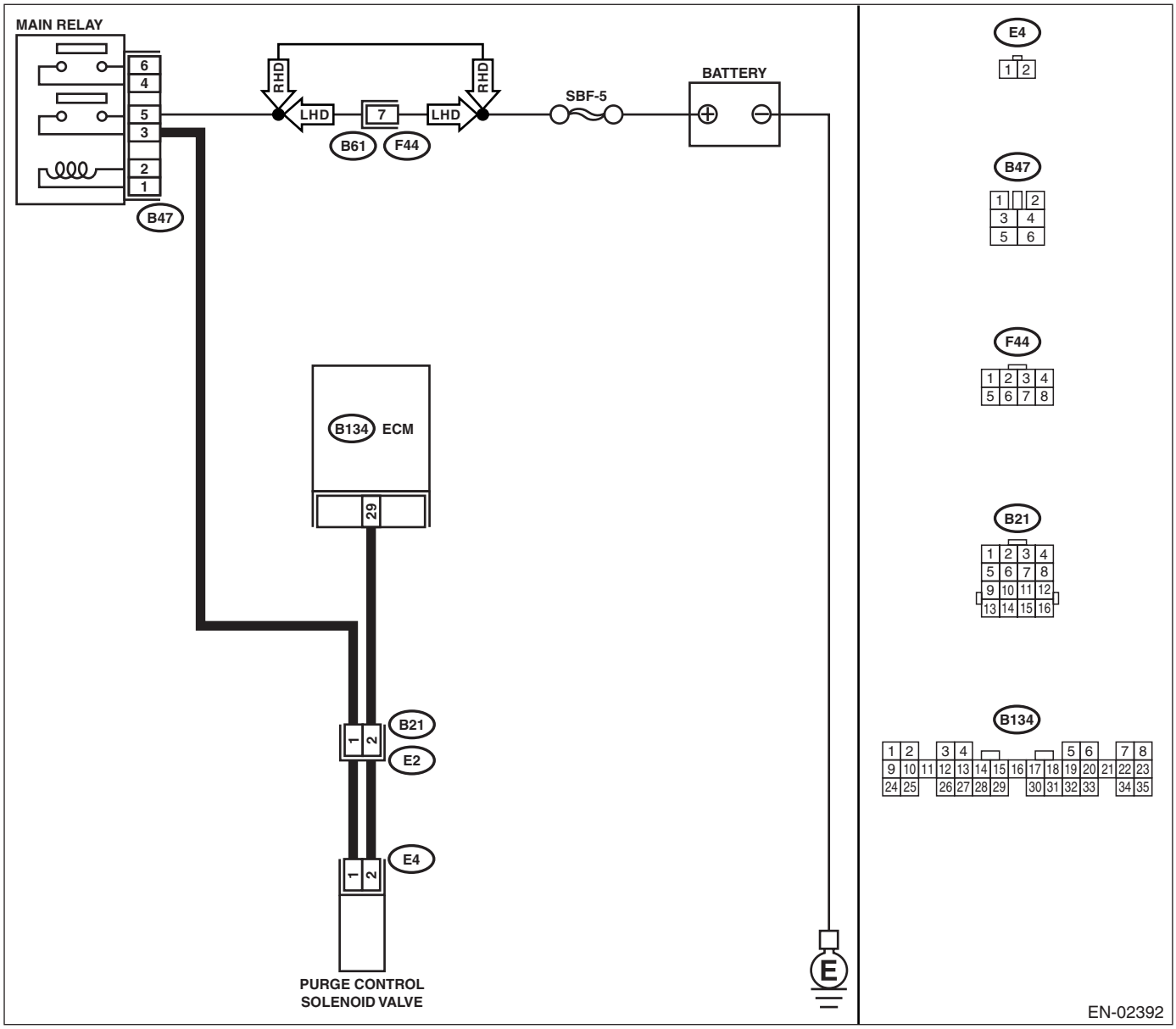
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Refer to "Compulsory Valve Operation Check Mode" for procedures. <Ref. to EN(H4SO)(diag)-46, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the voltage 0 — 10 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 29 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(H4SO)-9, Purge Control Solenoid Valve.> and ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

AP:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE

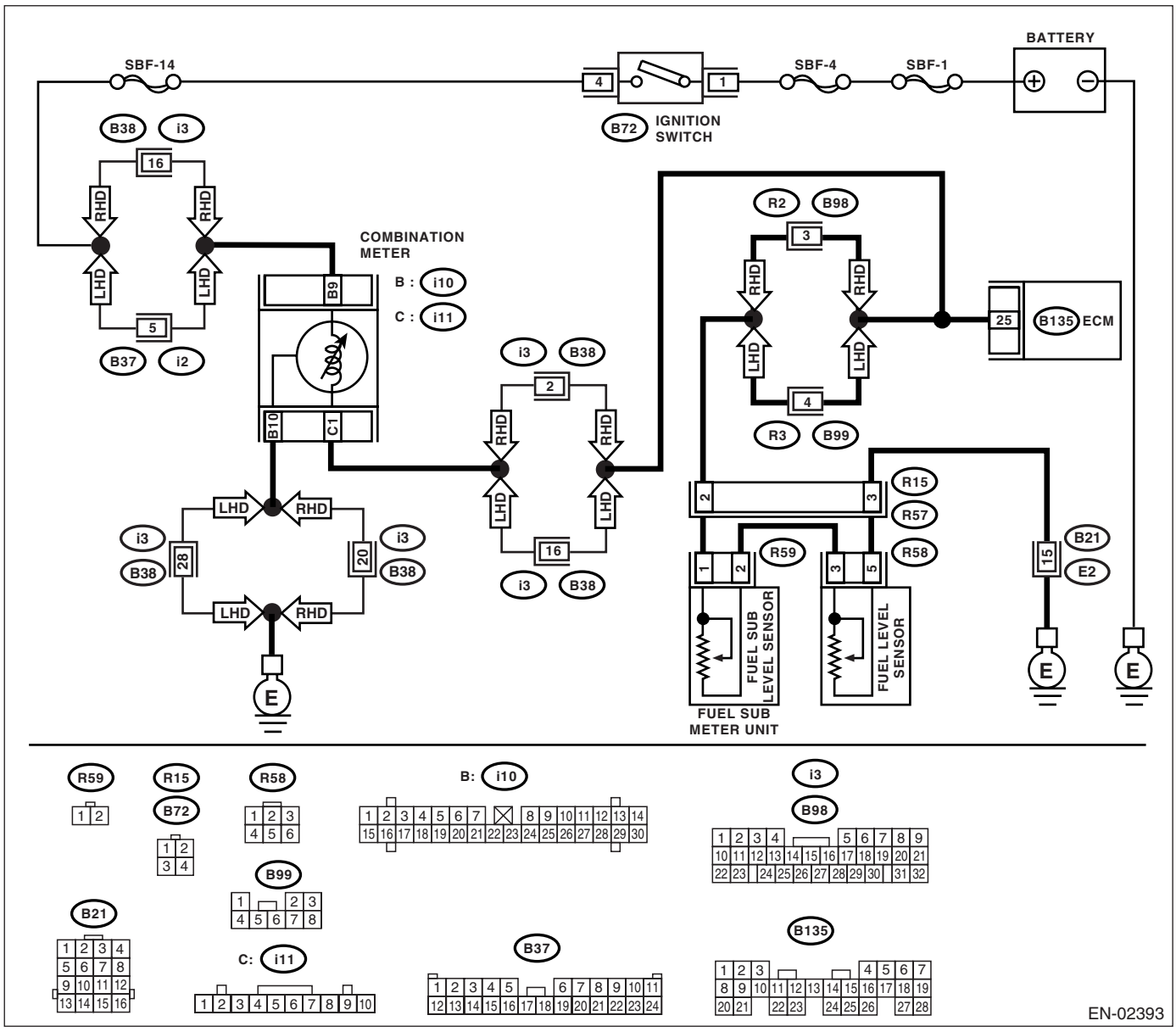
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Replace the fuel level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.>

AQ:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

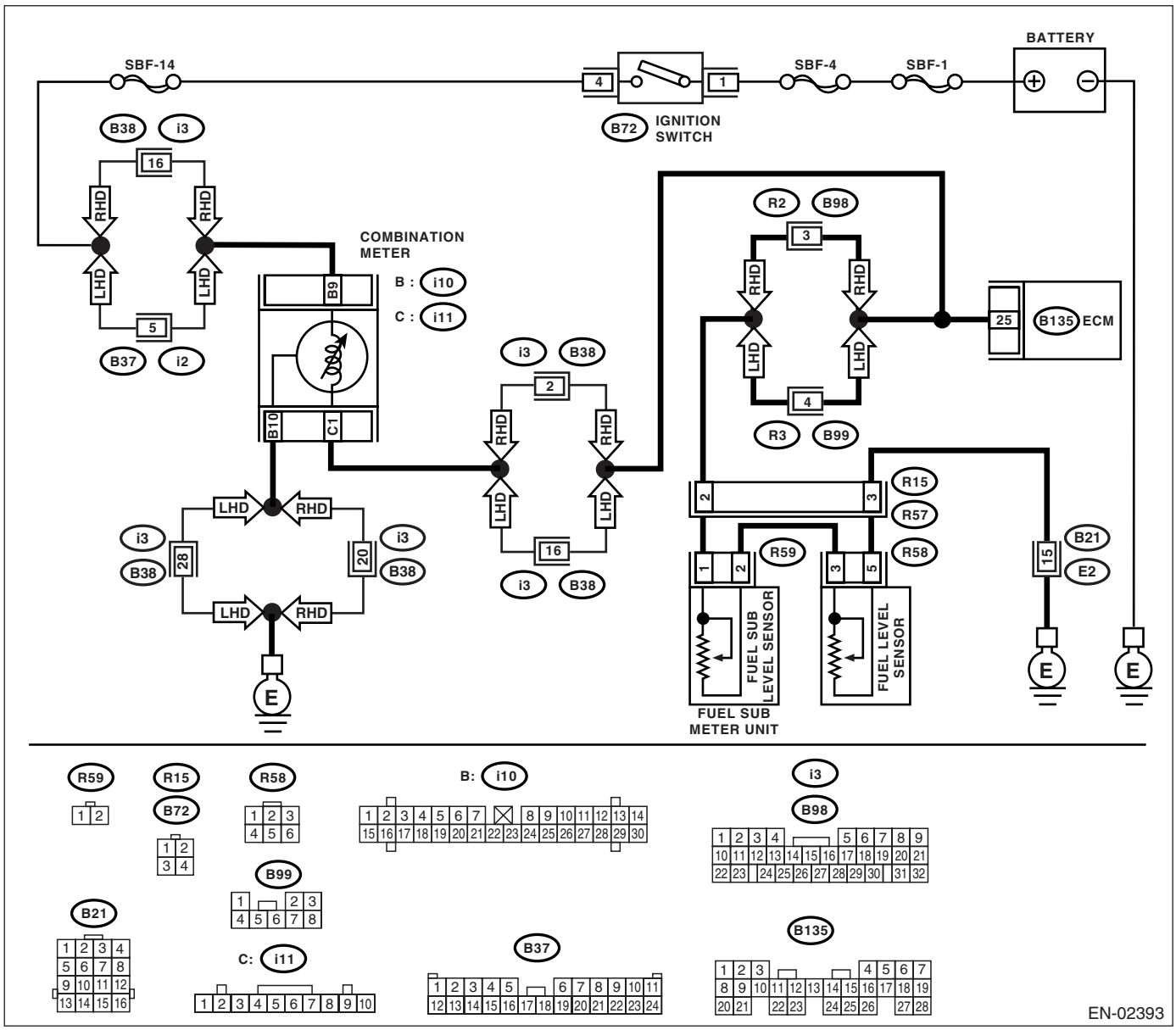
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.>	Is the voltage less than 0.12 V by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector. • Poor contact in coupling connector
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i10) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (i11) No. 1:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case repair the following: Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-57, Fuel Level Sensor.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 5:***	Is the resistance 0.5 — 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 — 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

AR:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

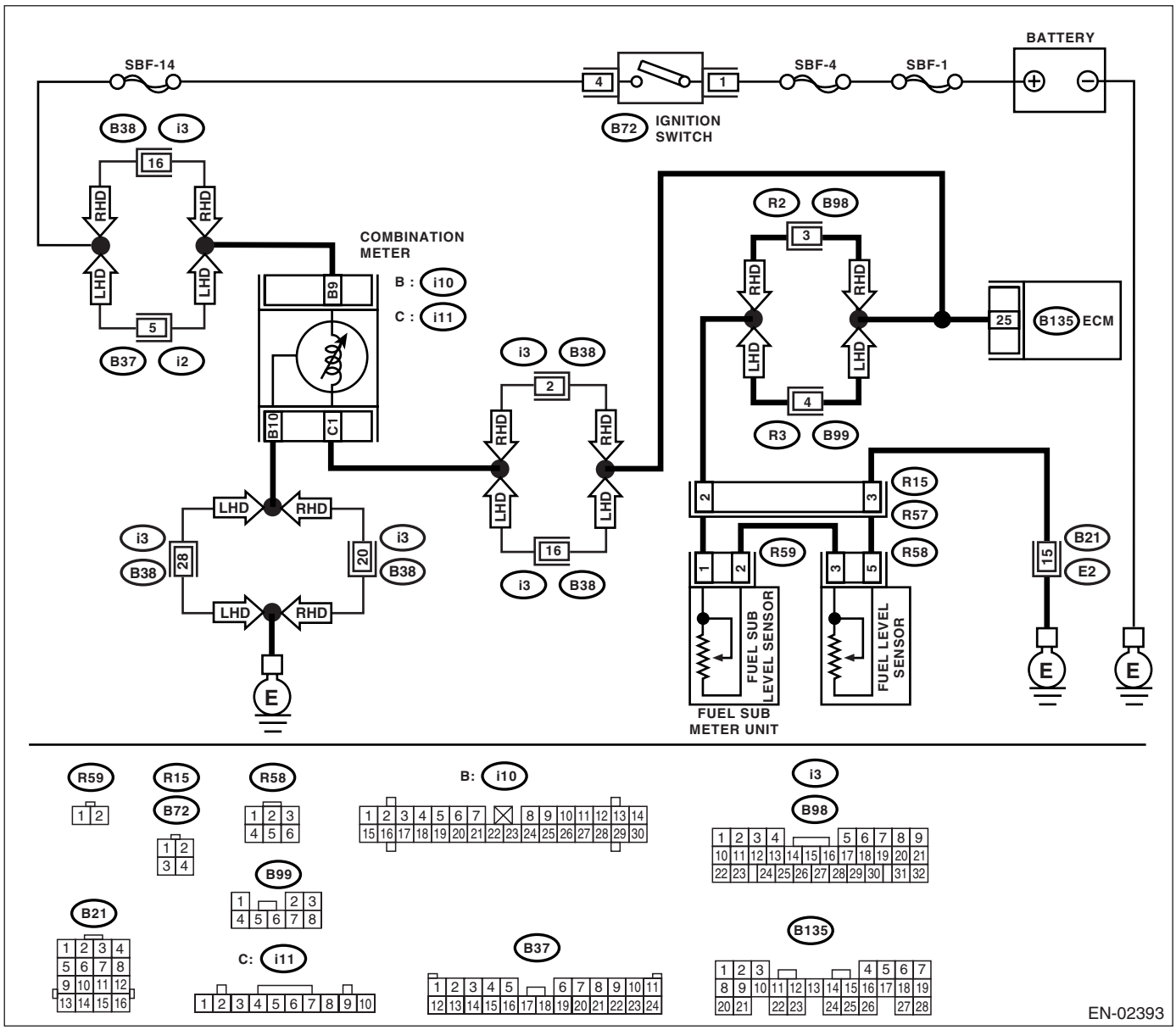
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **3.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 2:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case repair the following: Poor contact in coupling connector.
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupler connector. ***Connector & terminal*** ***(R57) No. 3 — (R58) No. 5:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel level sensor and coupler connector. ***Connector & terminal*** ***(R57) No. 2 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-57, Fuel Level Sensor.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 5:***	Is the resistance more than 54.5 Ω?	Replace the fuel level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 41.5 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

AS:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

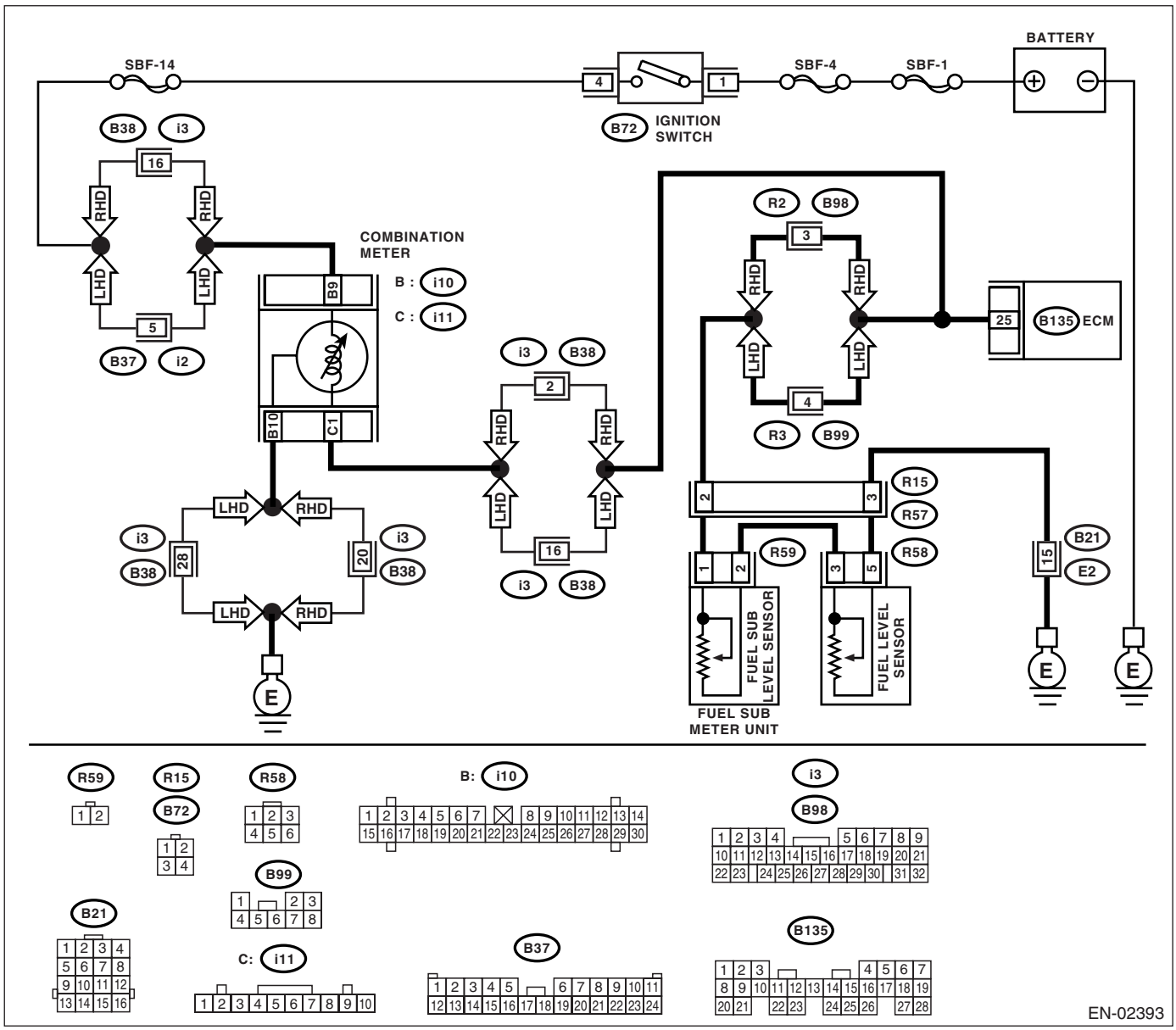
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC P0462 or P0463 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-55, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 5:***	Does the resistance change slowly?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(H4SO)-57, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 1 — No. 2:***	Does the resistance change slowly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4SO)-58, Fuel Sub Level Sensor.>

AT:DTC P0483 COOLING FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Occurrence of noise
- Over-heating

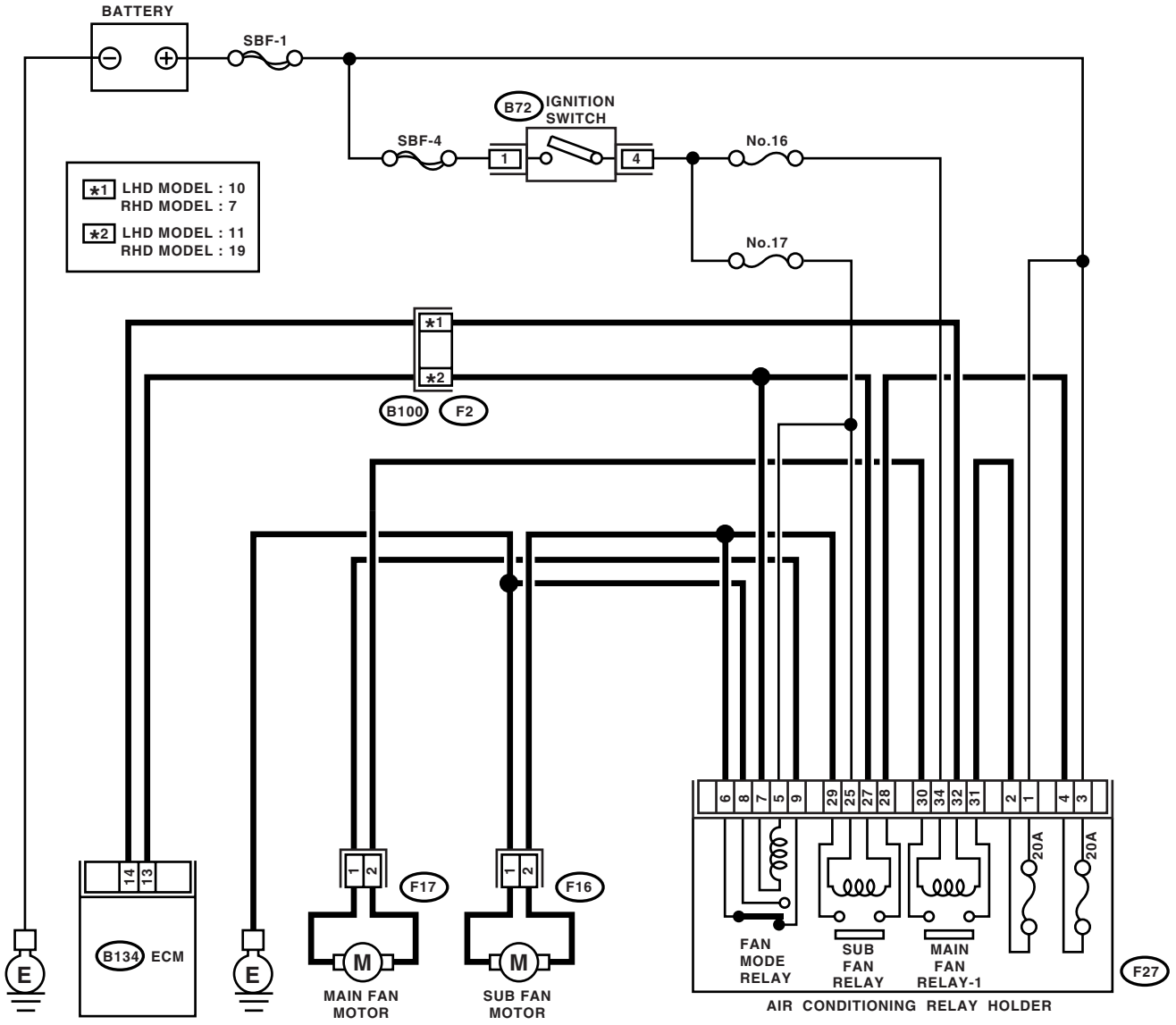
CAUTION:

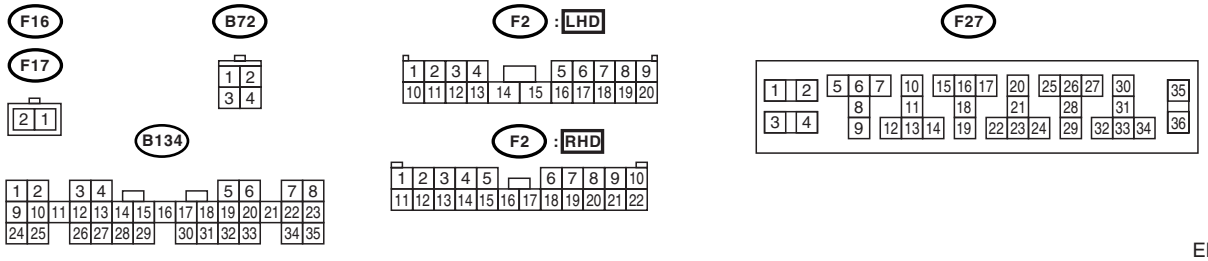
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

WIRING DIAGRAM:





EN-02394

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Check radiator fan and fan motor, and poor contact in connectors. <Ref. to CO(H4SO)-35, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-40, Radiator Sub Fan and Fan Motor.>

AU:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

NOTE:
For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4SO)(diag)-184, DTC P0503 VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT, DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

AV:DTC P0503 VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT

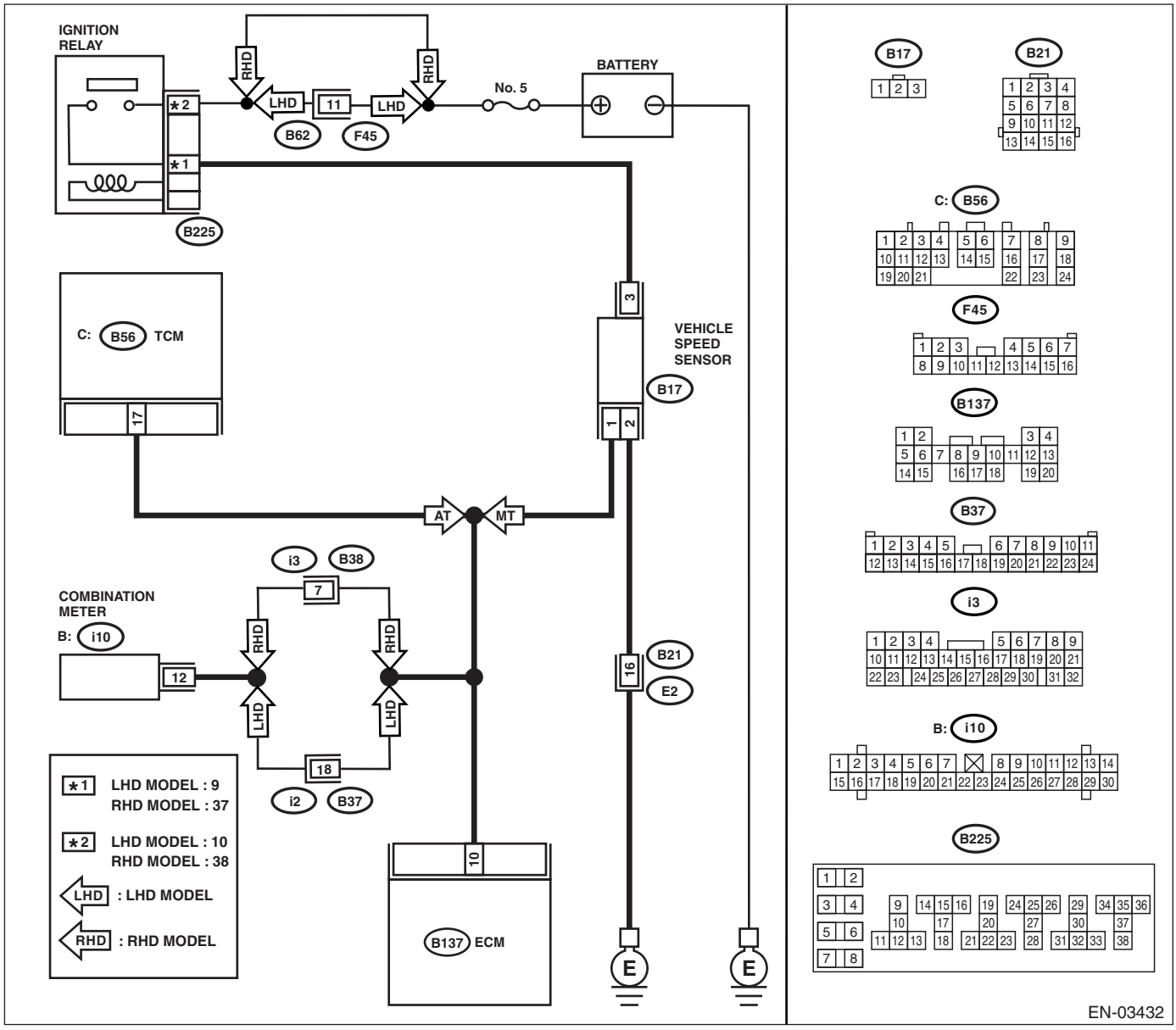
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or general scan tool indicate DTC P0720?	Check front vehicle speed sensor signal circuit. <Ref. to 4AT(diag)-42, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does speedometer operate normally?	Go to step **4.**	Check speedometer and vehicle speed sensor. <Ref. to IDI-13, Speedometer.> <Ref. to 4AT-59, Front Vehicle Speed Sensor.> <Ref. to 4AT-64, Rear Vehicle Speed Sensor.> <Ref. to 4AT-65, Torque Converter Turbine Speed Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B137) No. 10 — (i10) No. 12:***	Is the resistance less than 10 Ω?	Repair the poor contact in ECM connector.	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector. • Poor contact in combination meter connector • Poor contact in coupling connector

AW:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

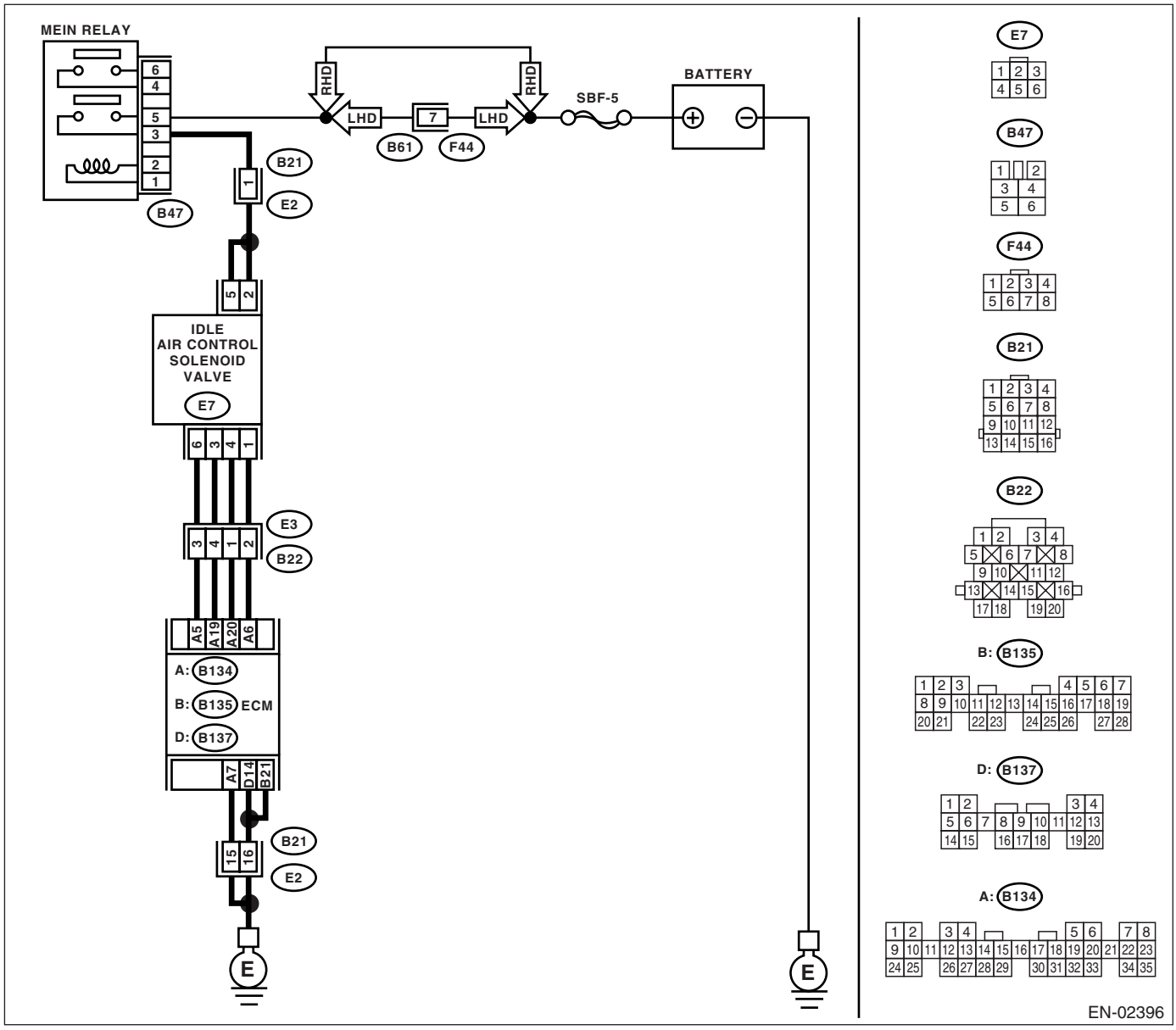
TROUBLE SYMPTOM:

- Engine is difficult to start
- Engine does not start
- Erroneous idling
- Engine stalls

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from the throttle body. <Ref. to FU(H4SO)-33, REMOVAL, Idle Air Control Solenoid Valve.> 3) Remove the throttle body to intake manifold. **<Ref. to FU(H4SO)-13,** REMOVAL**, Throttle Body.>** 4) Using an air gun, force air into the idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from throttle body.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-33, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace the throttle body. **<Ref. to FU(H4SO)-13,** INSTALLATION**, Throttle Body.>**

AX:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

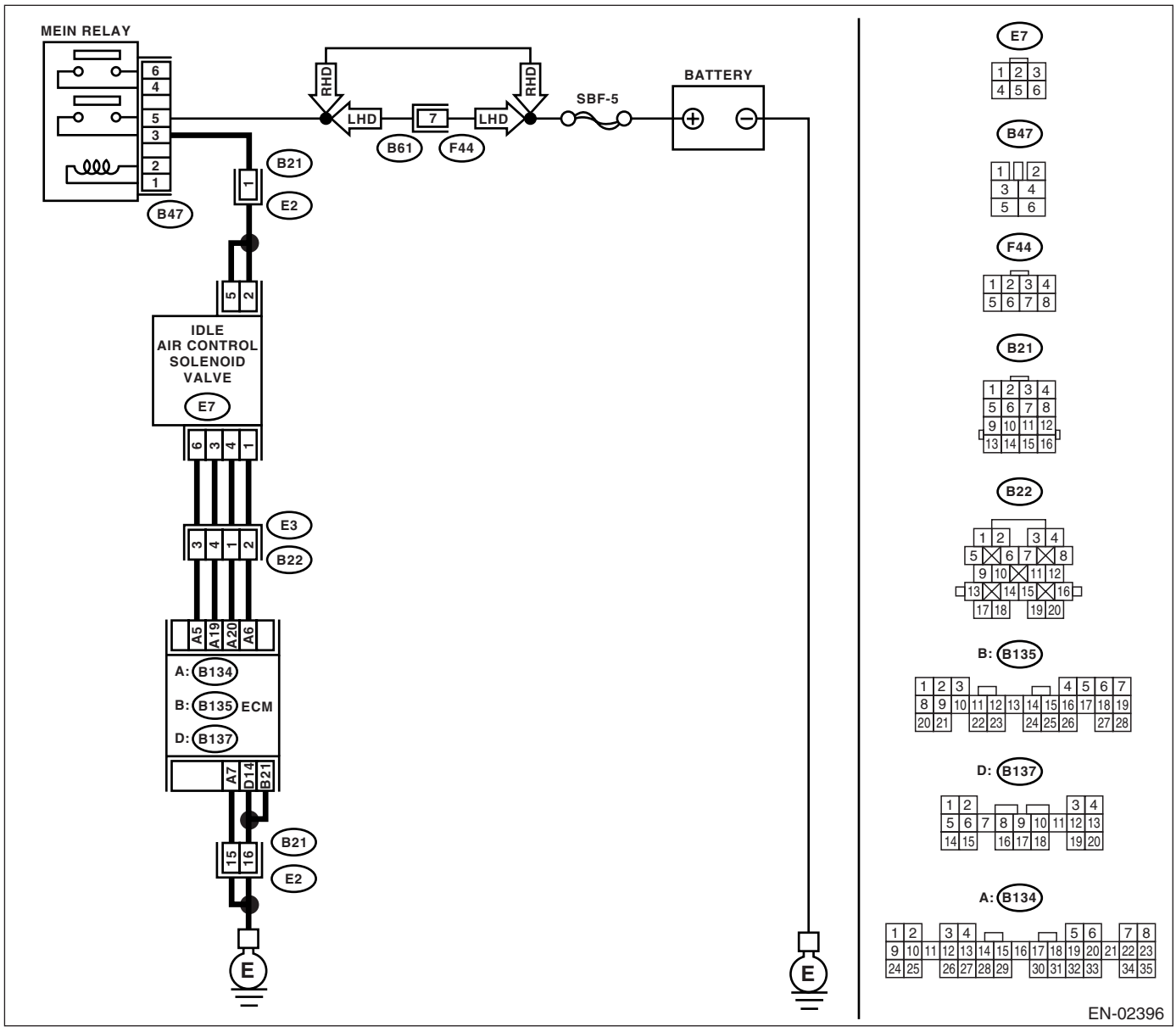
TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items: • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Is the free play of throttle cable appropriate?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from the throttle body. <Ref. to FU(H4SO)-33, REMOVAL, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in air by-pass line.	Are foreign particles in air by-pass line?	Remove foreign particles from air by-pass line.	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-33, INSTALLATION, Idle Air Control Solenoid Valve.>

AY:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

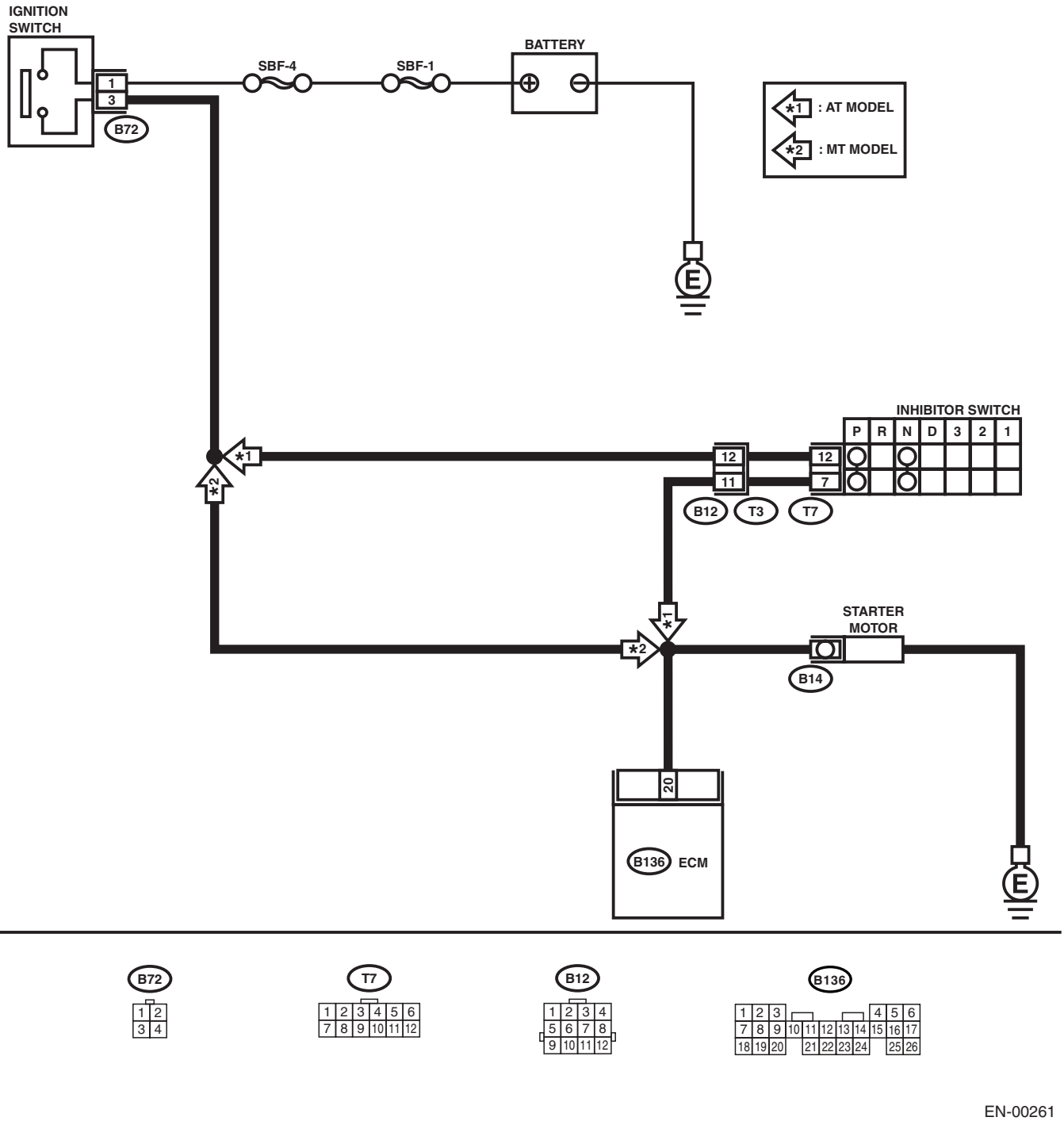
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



EN-00261

Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Turn the ignition switch to ON. NOTE: • Place the inhibitor switch in each position. (At model) • Depress the clutch pedal. (MT model)	Does the starter motor operate?	Repair battery short circuit in starter motor circuit.	Check starter motor circuit. <Ref. to EN(H4SO)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

AZ:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

Immediately at fault recognition

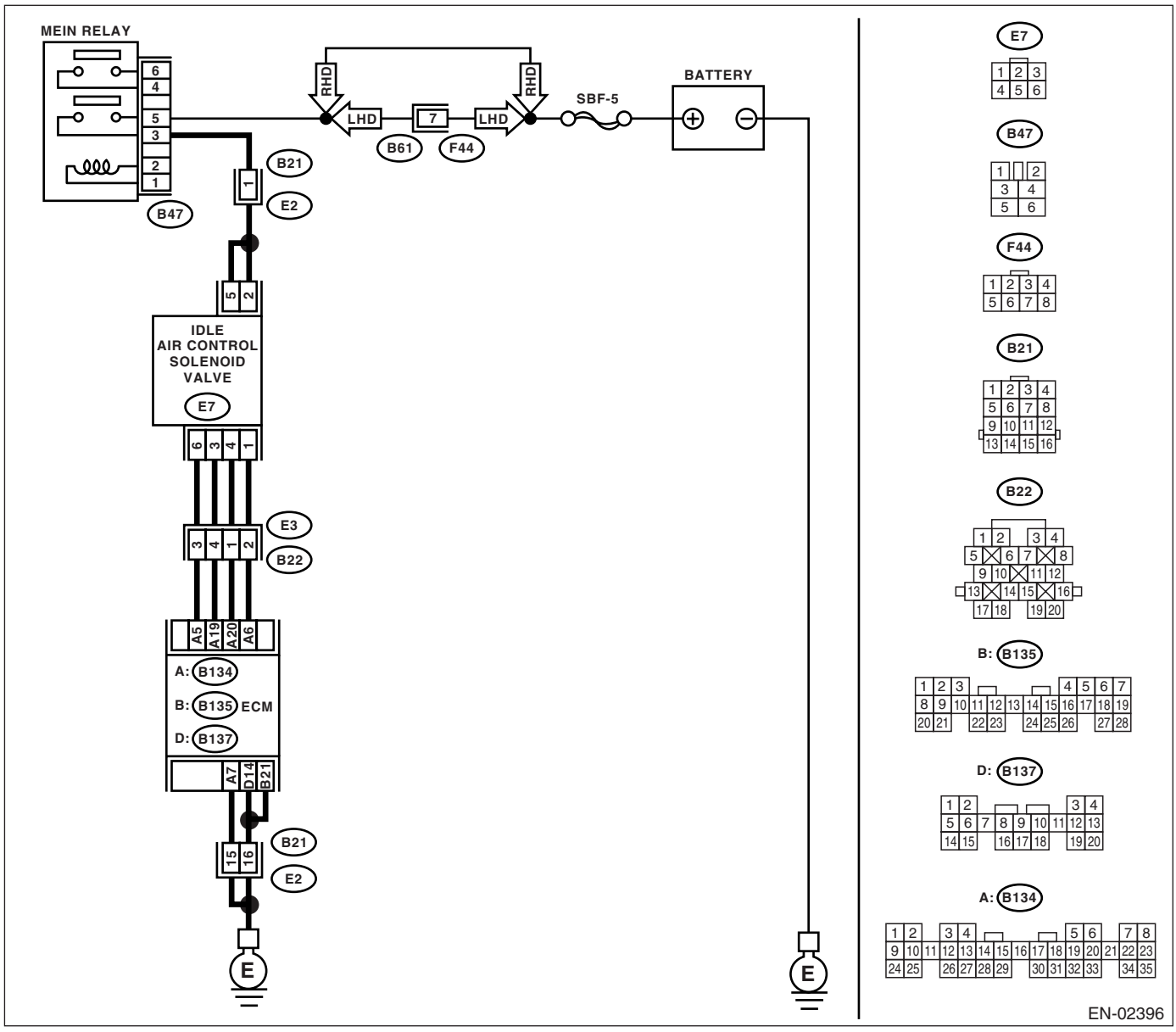
TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items: • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Is the free play of throttle cable appropriate?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from the throttle body. <Ref. to FU(H4SO)-33, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in air by-pass line.	Are foreign particles in air by-pass line?	Remove foreign particles from air by-pass line.	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-33, Idle Air Control Solenoid Valve.>

BA:DTC P0562 SYSTEM VOLTAGE LOW

DTC DETECTING CONDITION:

Detected in case of low power supply voltage of ECM.

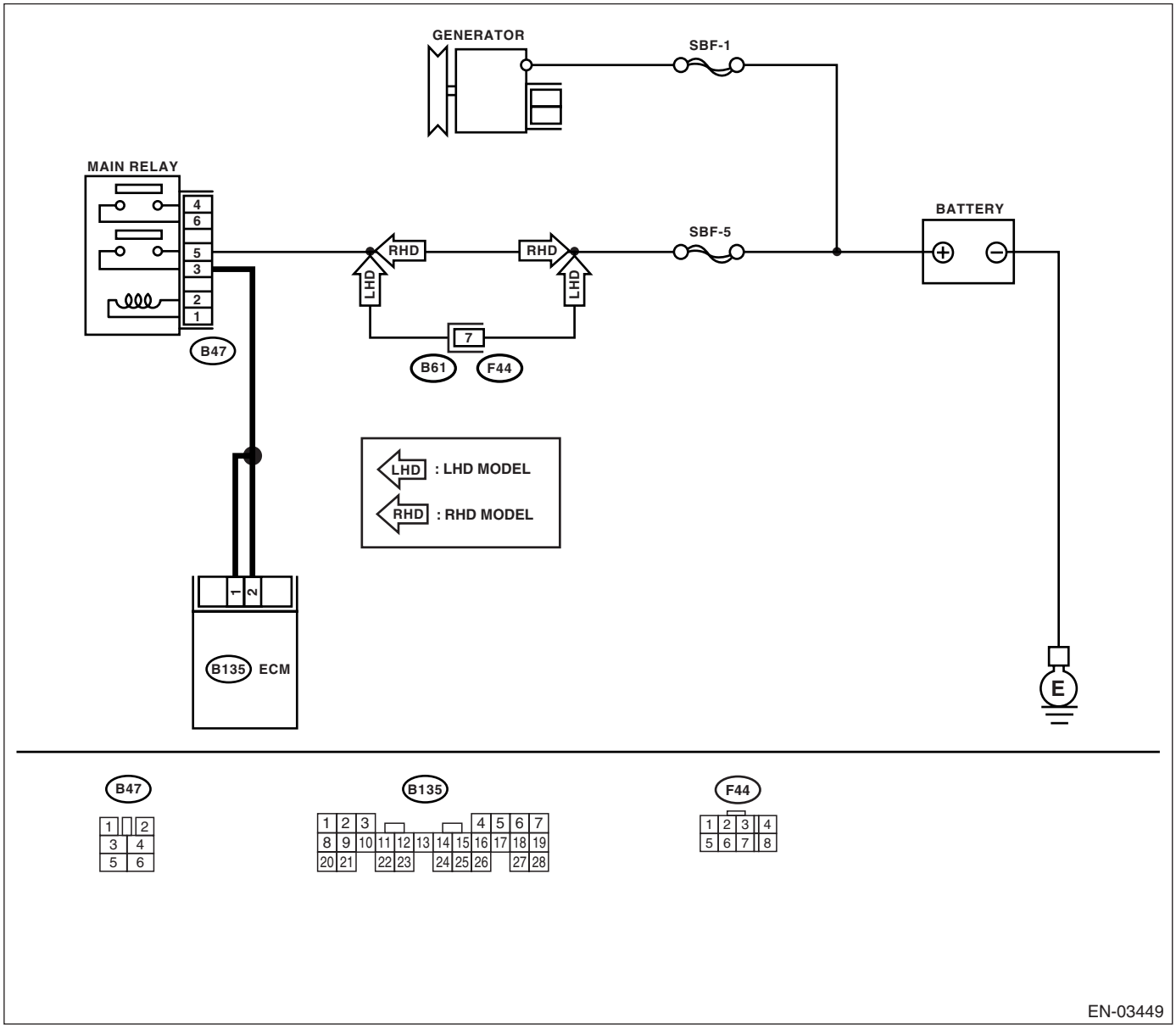
TROUBLE SYMPTOM:

Charge warning light comes on.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idling after warm-up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
2	**CHECK GENERATOR.** 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **3.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
3	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and ground battery terminals tightly clamped?	Go to step **4.**	Tighten the clamp of terminal.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (−):*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **5.**	Repair the harness connectors between battery, main relay and ECM.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ECM?	Repair the connector.	Go to step **6.**
6	**CHECK ECM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed as in the current diagnostic still being output?	Replace the generator. <Ref. to SC(H4SO)-15, Generator.>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

BB:DTC P0563 SYSTEM VOLTAGE HIGH

DTC DETECTING CONDITION:

Power supply voltage of ECM is high.

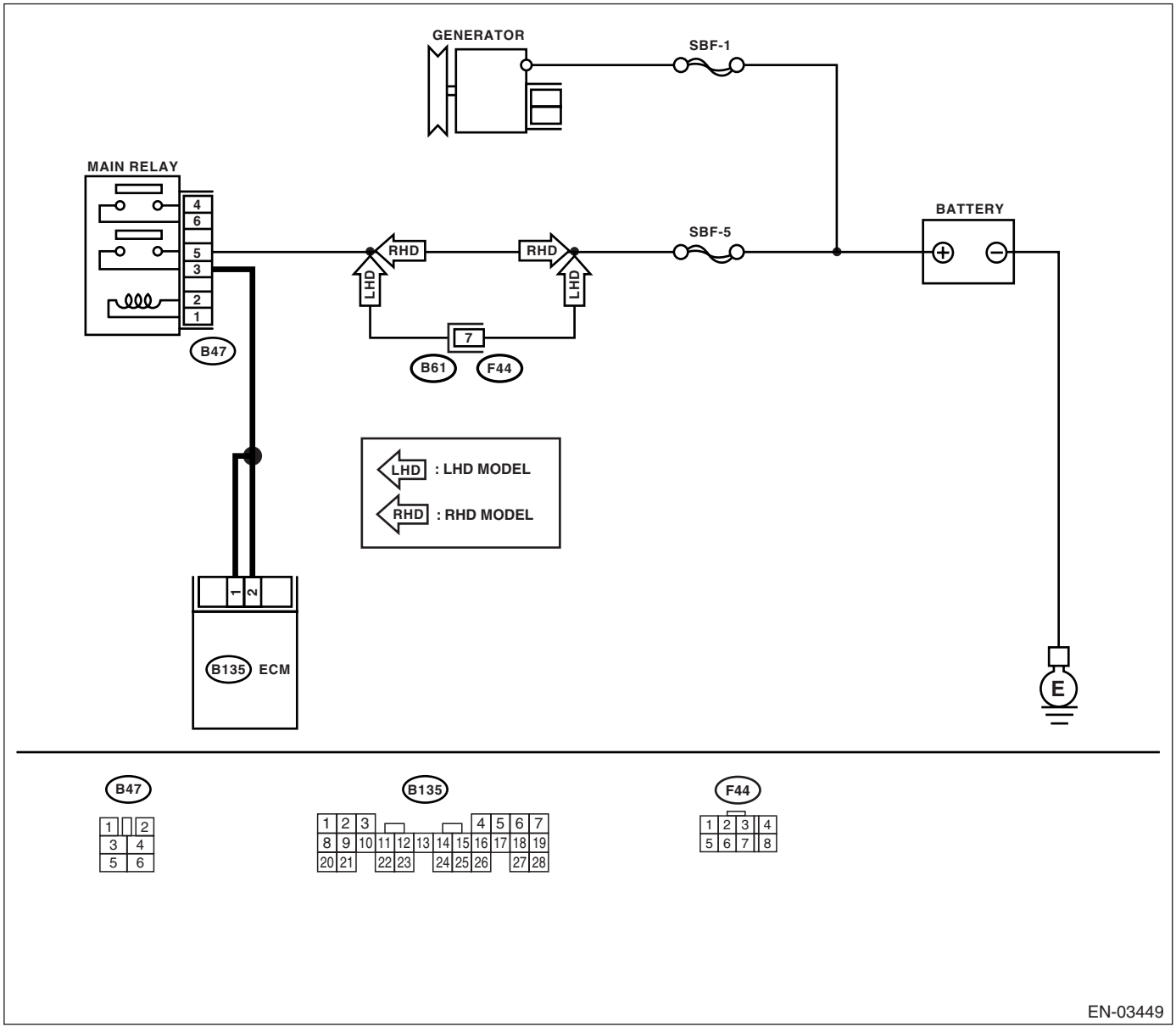
TROUBLE SYMPTOM:

Charge warning light comes on

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idling after warm-up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
2	**CHECK GENERATOR.** 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **3.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
3	**CHECK BATTERY TERMINAL.** 1) Turn the ignition switch to OFF. 2) Check the installation of positive and negative terminals of battery.	Is the battery terminals installed securely?	Go to step **4.**	Tighten the clamp of terminal.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 1 (+) — Chassis ground (−):*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **5.**	Repair the harness connectors between battery, main relay and ECM.
5	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between generator, battery and ECM?	Repair the connector.	Go to step **6.**
6	**CHECK ECM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed as in the current diagnostic still being output?	Replace the generator. <Ref. to SC(H4SO)-15, Generator.>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC output?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

BC:DTC P0565 CRUISE CONTROL ON SIGNAL

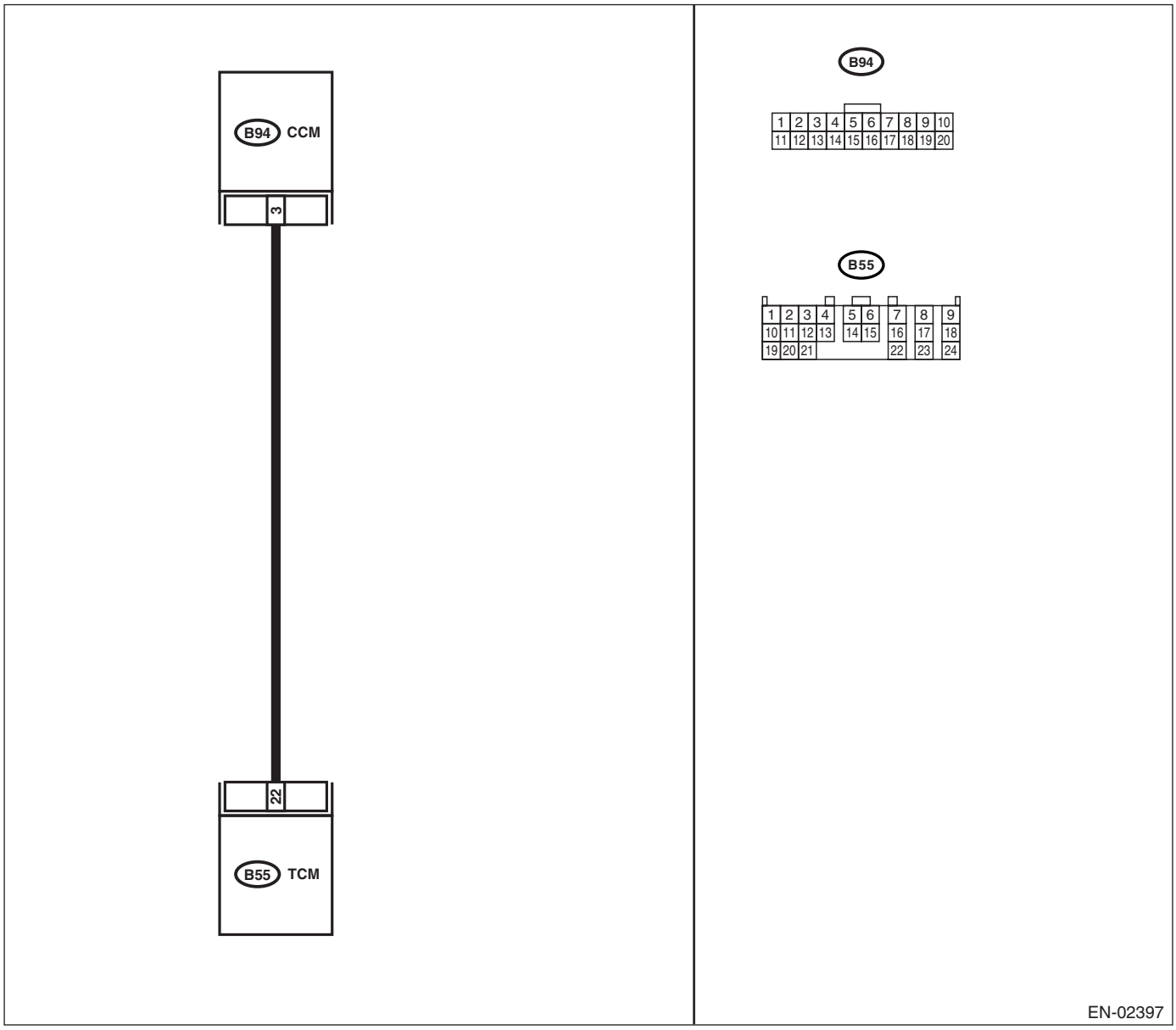
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CRUISE CONTROL UNIT CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and cruise control unit. 3) Measure the resistance of harness between TCM and cruise control unit connector. ***Connector & terminal*** ***(B55) No. 22 — (B94) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between cruise control unit and TCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CRUISE CONTROL UNIT CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit of harness between TCM and cruise control unit connector.
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and cruise control unit. 2) Lift up the vehicle or set it to the free roller. **CAUTION:** **For AWD model, all wheels up from floor.** 3) Start the engine. 4) Turn the cruise control main switch to ON. 5) Shift the select lever to “D” range and slowly increase the vehicle speed to 50 km/h (31 MPH). 6) Turn the cruise control command switch to ON. 7) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Check cruise control command switch circuit. <Ref. to CC-8, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

BD:DTC P0604 INTERNAL CONTROL MODULE READ ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

Immediately at fault recognition

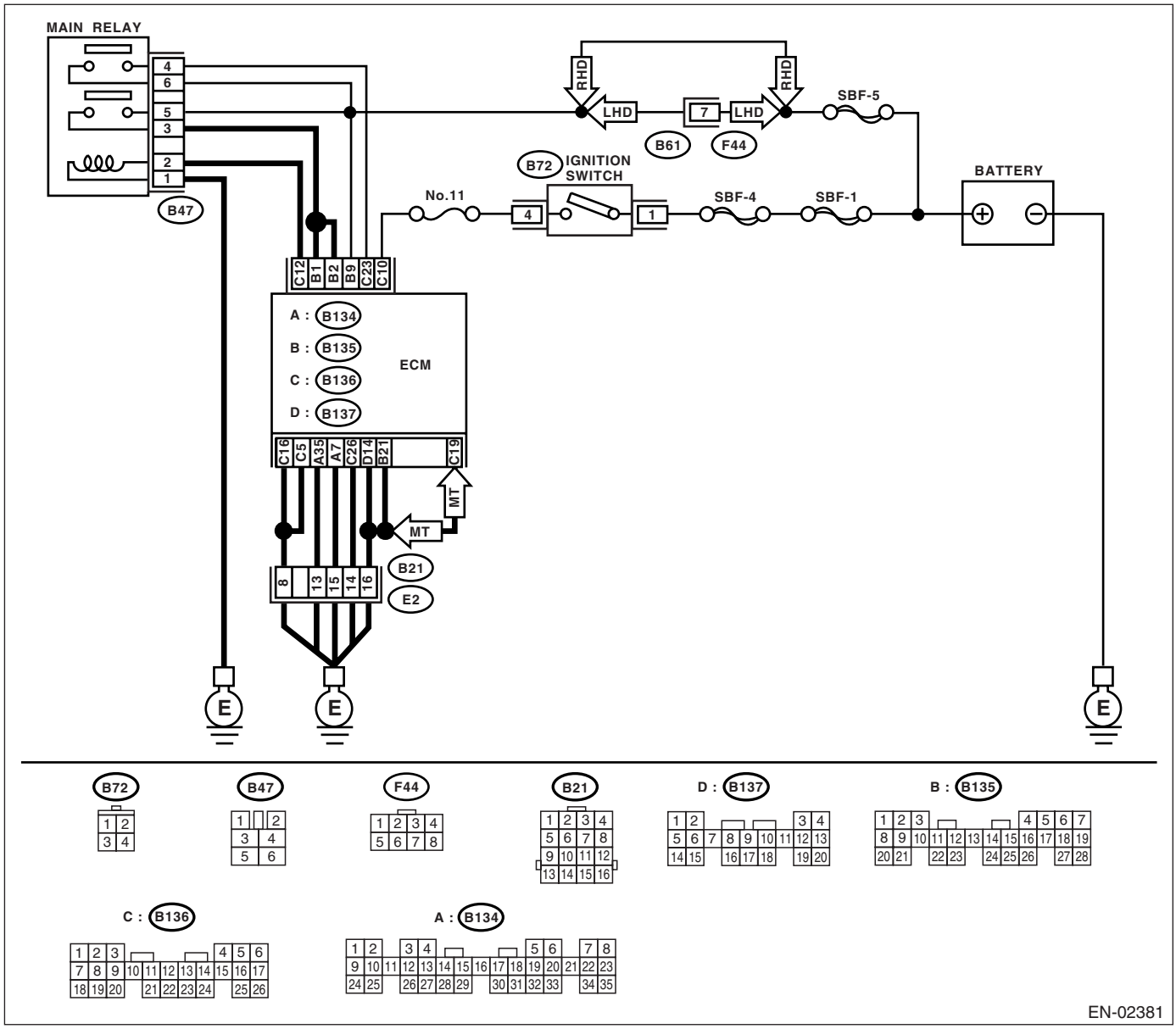
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	It is not necessary to inspect DTC P0601.

BE:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

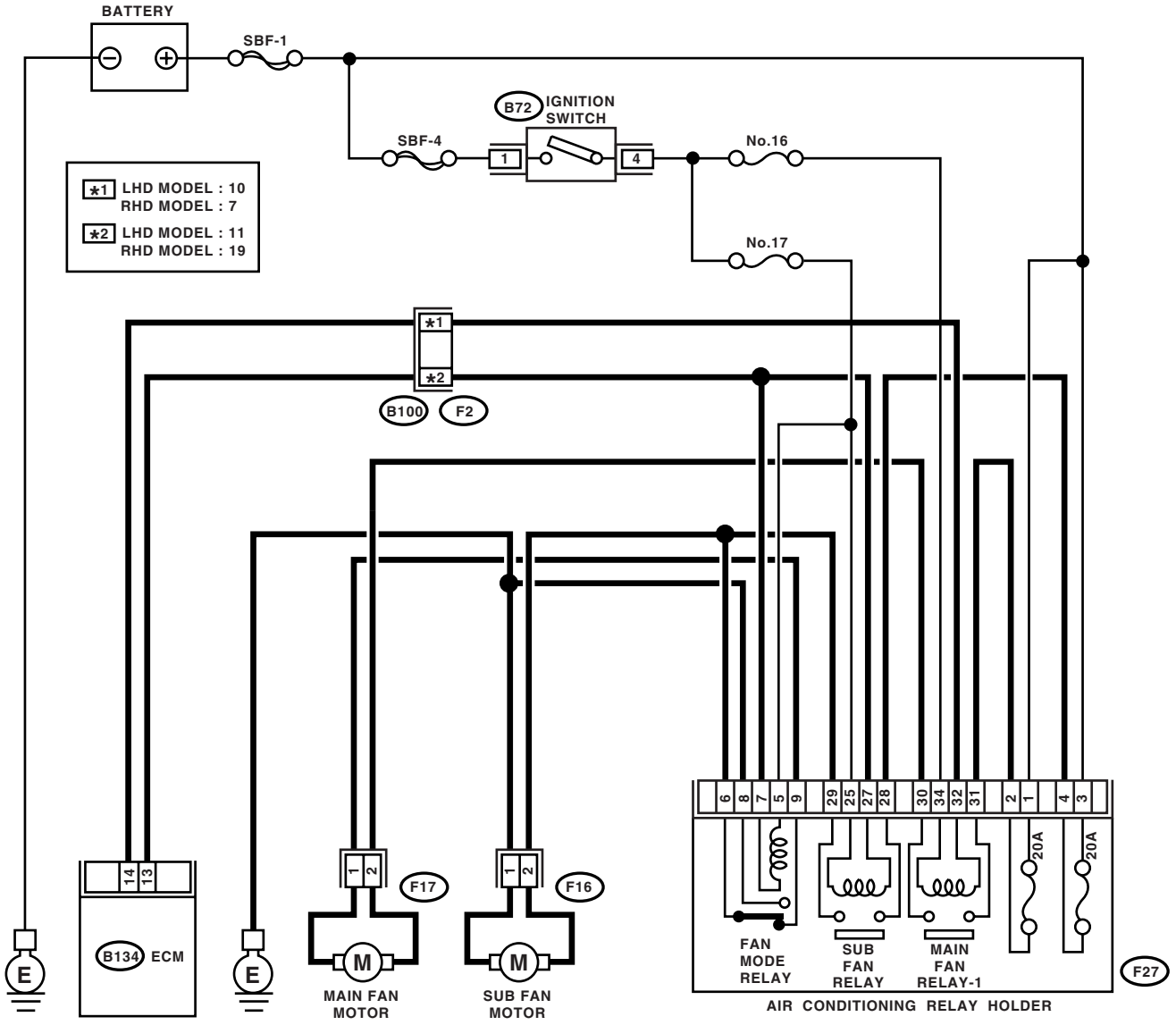
TROUBLE SYMPTOM:

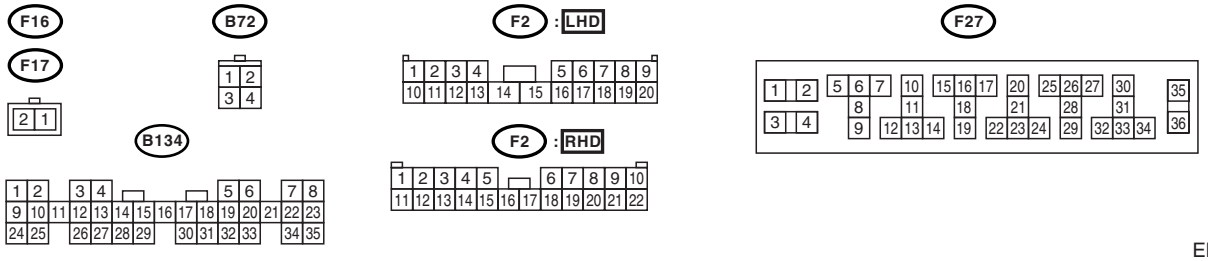
- Radiator fan does not operate properly
- Over-heating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-02394

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage 0 — 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR MAIN FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 14 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in radiator main fan relay control circuit.	Go to step **3.**
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the main fan relay from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 34 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 32 — No. 34:***	Is the resistance 87 — 107 Ω?	Go to step **5.**	Replace the main fan relay.
5	**CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and main fan relay connector. ***Connector & terminal*** ***(B134) No. 14 — (F27) No. 32:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector
6	**CHECK POOR CONTACT.** Check poor contact in ECM or main fan relay connector.	Is there poor contact in ECM or main fan relay connector?	Repair the poor contact in ECM or main fan relay connector.	Contact the SUBARU dealer.

BF:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

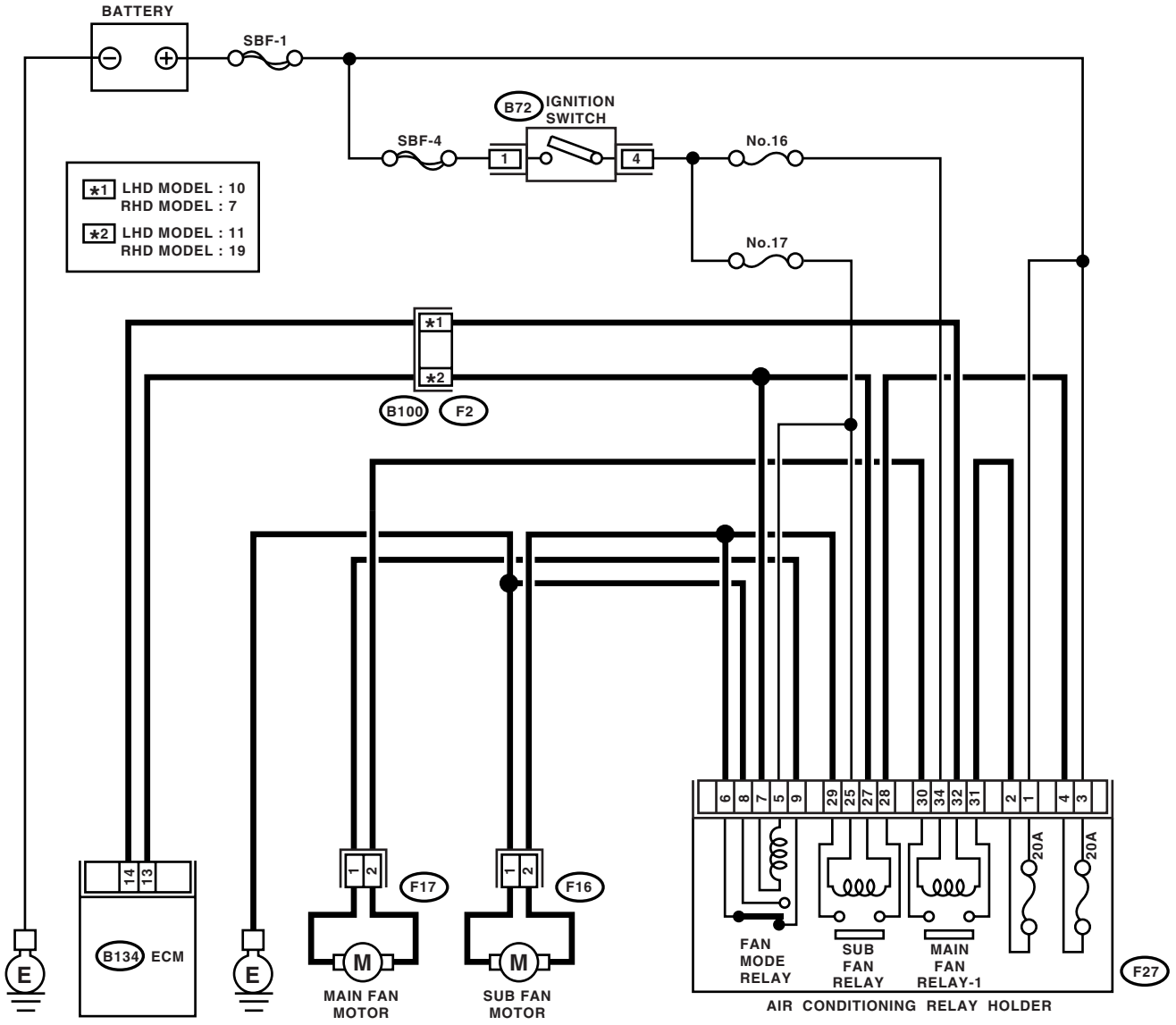
TROUBLE SYMPTOM:

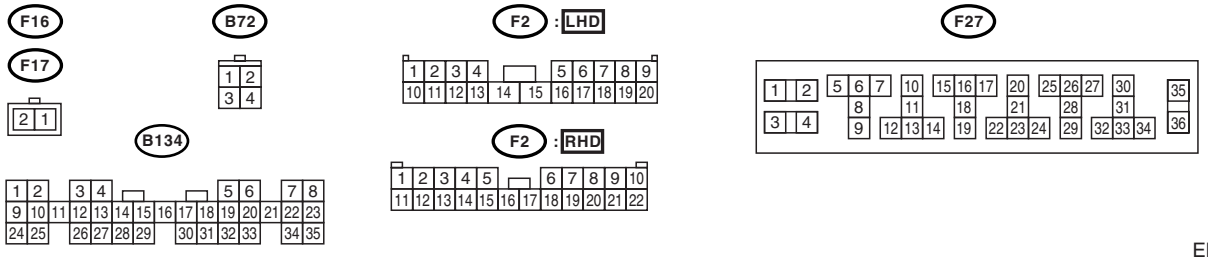
- Radiator fan does not operate properly
- Over-heating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-02394

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-46, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):*** ***(B134) No. 13 (+) — Chassis ground (−):***	Is the voltage 0 — 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay and sub fan relay. (model with A/C) 3) Disconnect the test mode connectors 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):*** ***(B134) No. 13 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK MAIN FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals. ***Terminals*** ***No. 30 — No. 31:***	Is the resistance less than 1 Ω?	Replace the main fan relay and ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 28 — No. 29:***	Is the resistance less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

BG:DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT

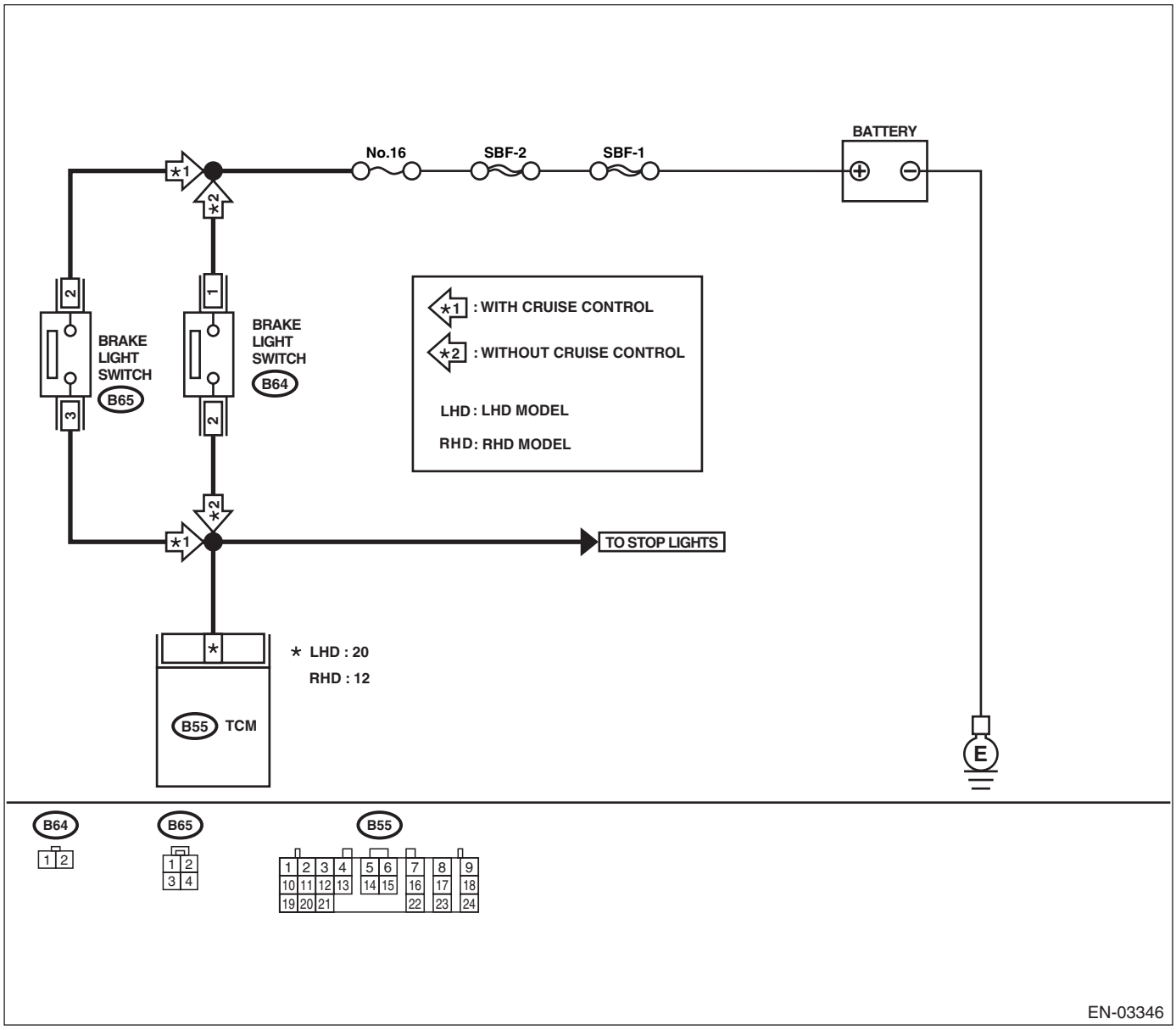
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.**	Does the brake light come on when depressing the brake pedal?	Go to step **2.**	Repair or replace the brake light circuit.
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1) Disconnect the connectors from TCM and brake light switch. 2) Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***LHD MODEL*** ***WITHOUT CRUISE CONTROL*** ***(B55) No. 20 — (B64) No. 2:*** ***WITH CRUISE CONTROL*** ***(B55) No. 20 — (B65) No. 3:*** ***RHD MODEL*** ***WITHOUT CRUISE CONTROL*** ***(B55) No. 12 — (B64) No. 2:*** ***WITH CRUISE CONTROL*** ***(B55) No. 12 — (B64) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B55) No. 20 — Chassis ground:*** ***RHD MODEL*** ***(B55) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and brake light switch. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B55) No. 20 (+) — Chassis ground (−):*** ***RHD MODEL*** ***(B55) No. 12 (+) — Chassis ground (−):***	Is the voltage less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B55) No. 20 (+) — Chassis ground (−):*** ***RHD MODEL*** ***(B55) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

BH:DTC P0731 GEAR 1 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)(diag)-212, DTC P0734 GEAR 4 INCORRECT RATIO, DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

BI: DTC P0732 GEAR 2 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)(diag)-212, DTC P0734 GEAR 4 INCORRECT RATIO, DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

BJ:DTC P0733 GEAR 3 INCORRECT RATIO

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4SO)(diag)-212, DTC P0734 GEAR 4 INCORRECT RATIO, DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

BK:DTC P0734 GEAR 4 INCORRECT RATIO

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Shift point too high or too low
- Engine brake not effected in 3rd range
- Excessive shift shock
- Excessive tight corner braking

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to 4AT(diag)-38, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check front vehicle speed sensor circuit. <Ref. to 4AT(diag)-42, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front vehicle speed sensor circuit?	Repair or replace the front vehicle speed sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(diag)-46, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-36, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

BL:DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up)
- No shift or excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check lock-up duty solenoid circuit. <Ref. to 4AT(diag)-71, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to 4AT(diag)-38, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check torque converter turbine speed sensor circuit. <Ref. to 4AT(diag)-46, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check engine speed input circuit. <Ref. to 4AT(diag)-33, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check inhibitor switch circuit. <Ref. to 4AT(diag)-91, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace the inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check brake light switch circuit. <Ref. to 4AT(diag)-84, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check ATF temperature sensor circuit. <Ref. to 4AT(diag)-35, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-36, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

BM:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

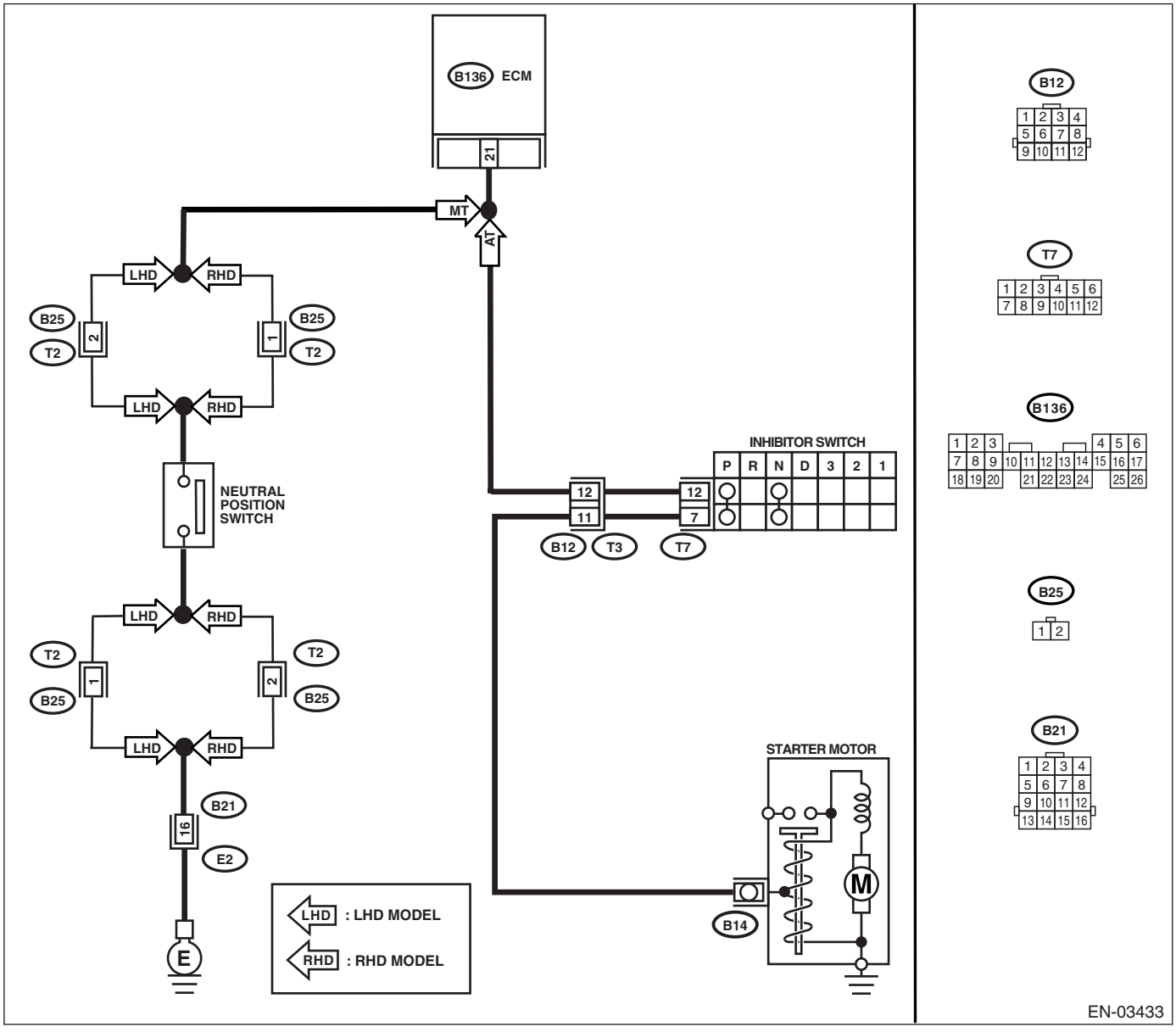
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0705 displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Shift the select lever to other than "N" and "P" ranges. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T7) No. 12 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals with select lever at other than "N" and "P" range. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>
6	**CHECK SELECT CABLE CONNECTION.**	Is there any fault in select cable connection to inhibitor switch?	Repair the select cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BN:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

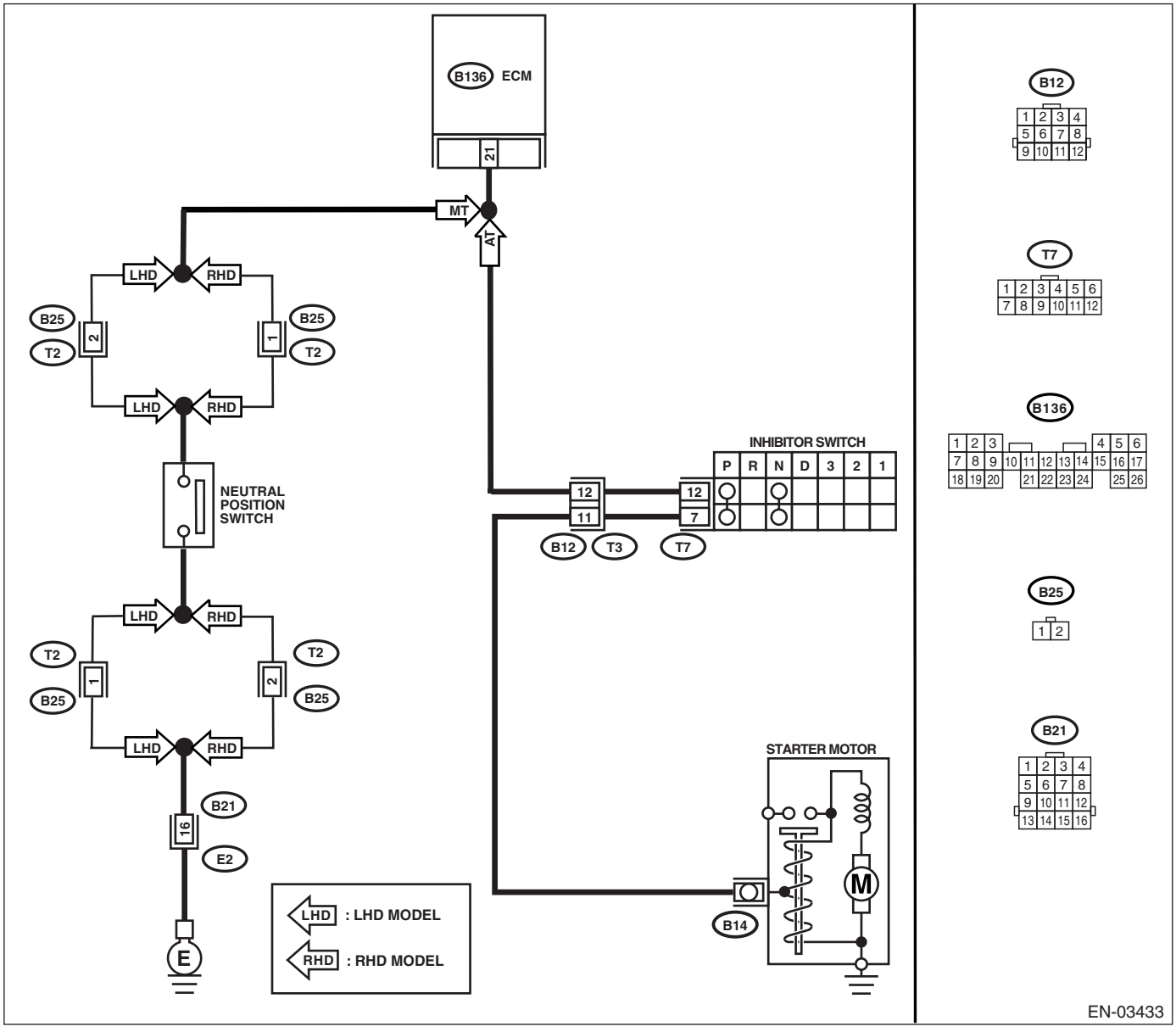
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Place the shift lever except in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in transmission harness or replace the neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair short circuit in transmission harness or replace the neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***LHD MODEL*** ***(B136) No. 21 — (B25) No. 1:*** ***RHD MODEL*** ***(B136) No. 21 — (B25) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.

	Step	Check	Yes	No
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***LHD MODEL*** ***(B25) No. 2 — Engine ground:*** ***RHD MODEL*** ***(B25) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact the SUBARU dealer.

BO:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

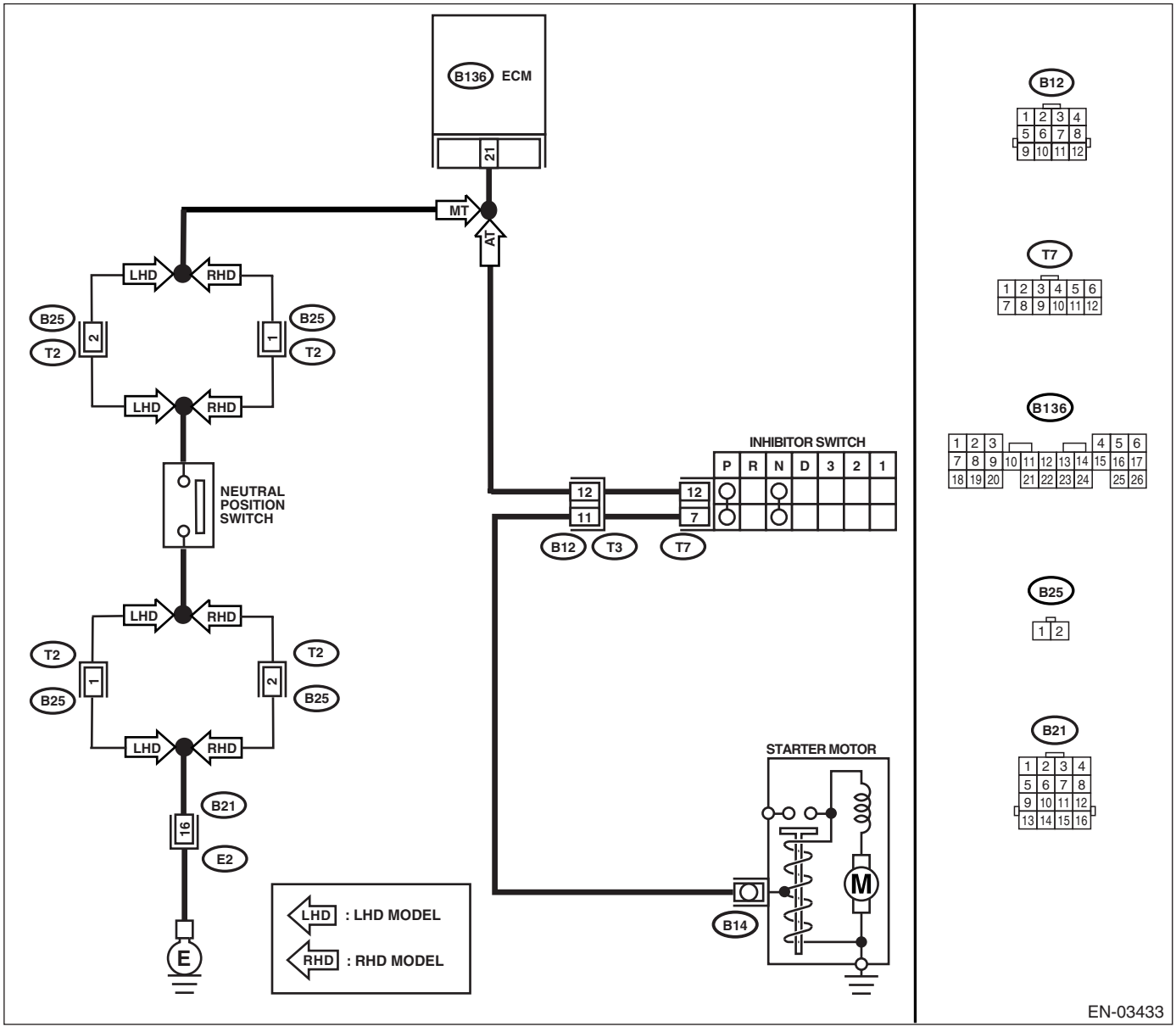
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground with select lever at "N" and "P" ranges. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground with select lever at except "N" and "P" ranges. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage between 4.5 — 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B136) No. 21 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and inhibitor switch connector. • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector.

	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and ground line. NOTE: In this case repair the following: Open circuit in harness between inhibitor switch connector and ground line
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals with select lever at "N" and "P" ranges. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>
9	**CHECK SELECT CABLE CONNECTION.**	Is there any fault in select cable connection to inhibitor switch?	Repair the select cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BP:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

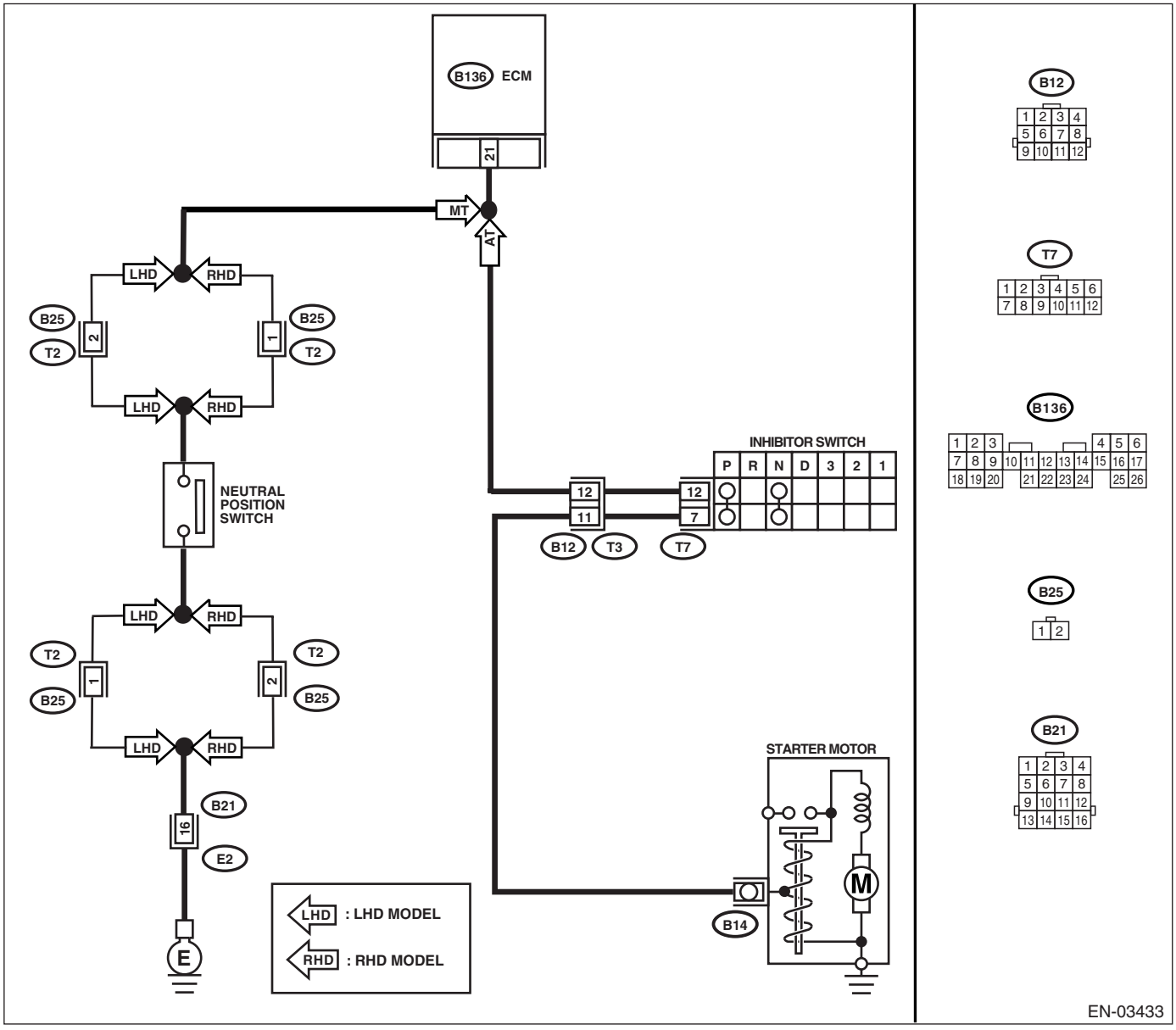
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION<REF-TITLEC>, CLEAR MEMORY MODE.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1) Turn ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1) Place the shift lever in a position except for neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 21 (+) — Chassis ground (−):***	Is the voltage less than 10 V?	Go to step **3.**	Go to step **5.**
3	**CHECK FOR POOR CONTACT.** Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in a position except for neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***(T2) No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair open circuit in transmission harness or replace neutral switch.
5	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***LHD model*** ***(B136) No. 21 — (B25) No. 2:*** ***RHD model*** ***(B136) No. 21 — (B25) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and transmission harness connector.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***LHD model*** ***(B25) No. 1 — Engine ground:*** ***RHD model*** ***(B25) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between transmission harness connector and engine ground • Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FOR POOR CONTACT.** Check for poor contact in transmission harness connector.	Is there a poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BQ:DTC P0864 TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE

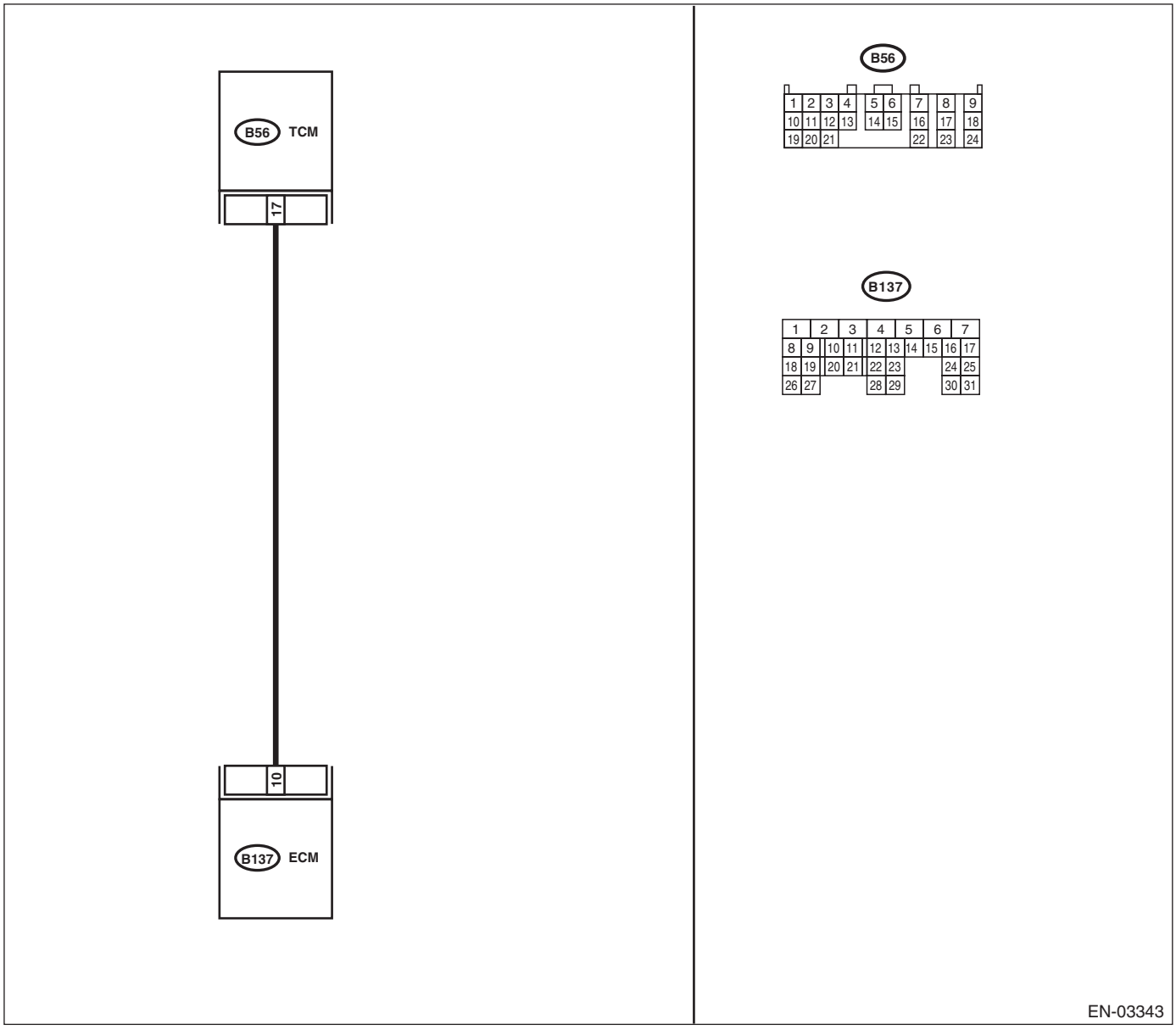
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1) Start and warm-up the engine until the radiator fan makes one complete rotation. 2) Drive the vehicle.	Is the AT shift control functioning properly?	Go to step **2.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
2	**CHECK ACCESSORY.**	Are car phone/CB installed on vehicle?	Repair grounding line of car phone or CB system.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

BR:DTC P0865 TCM COMMUNICATION CIRCUIT LOW

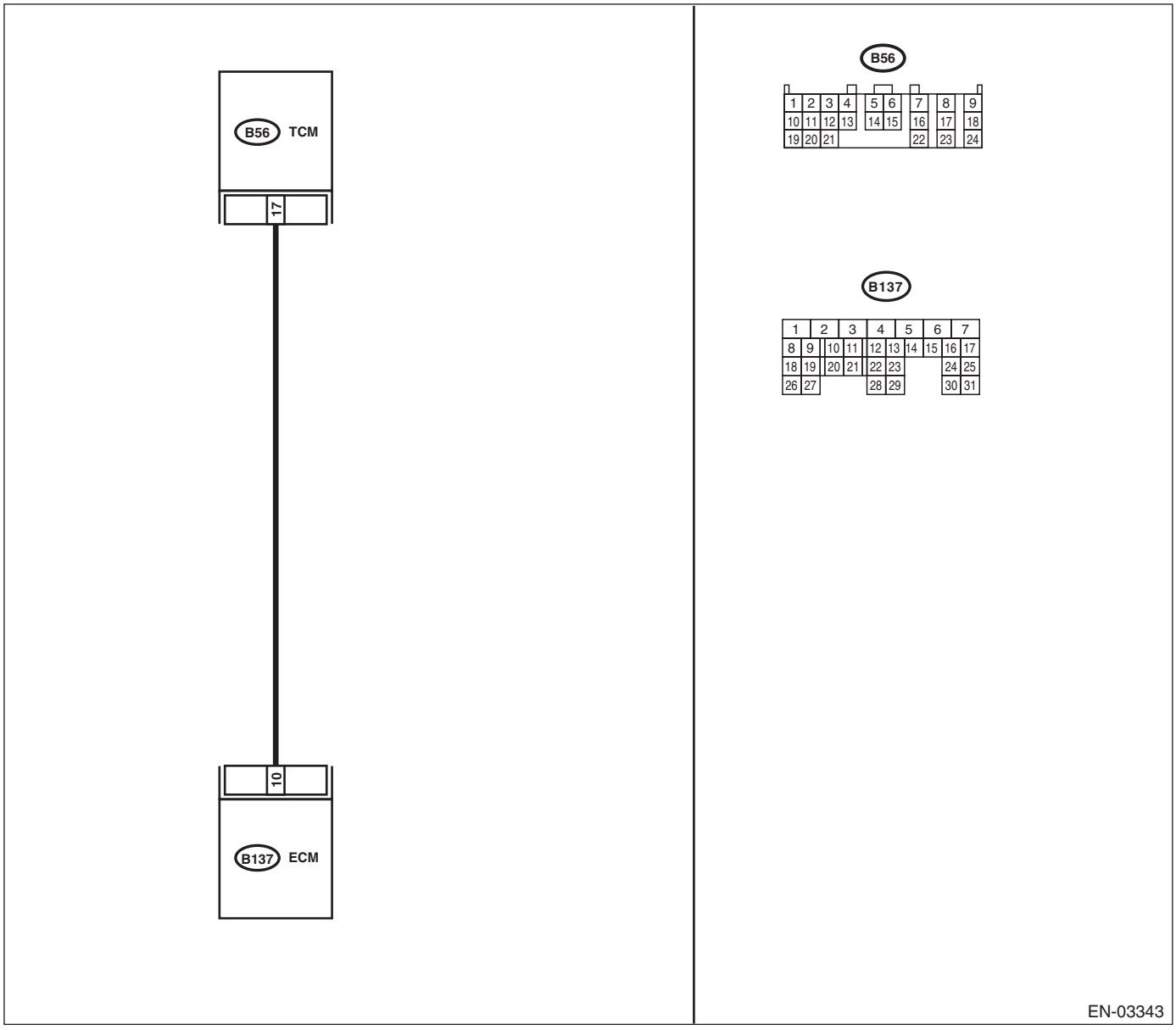
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. NOTE: In this case repair the following: • Poor contact in ECM connector. • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **4.**	Repair the poor contact in ECM connector.
4	**CHECK DTC FOR AUTOMATIC TRANSMISSION.** Read DTC for automatic transmission. <Ref. to 4AT(diag)-18, Read Diagnostic Trouble Code (DTC).>	Does the DTC appear for automatic transmission?	Check the DTC for automatic transmission. <Ref. to 4AT(diag)-33, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

BS:DTC P0866 TCM COMMUNICATION CIRCUIT HIGH

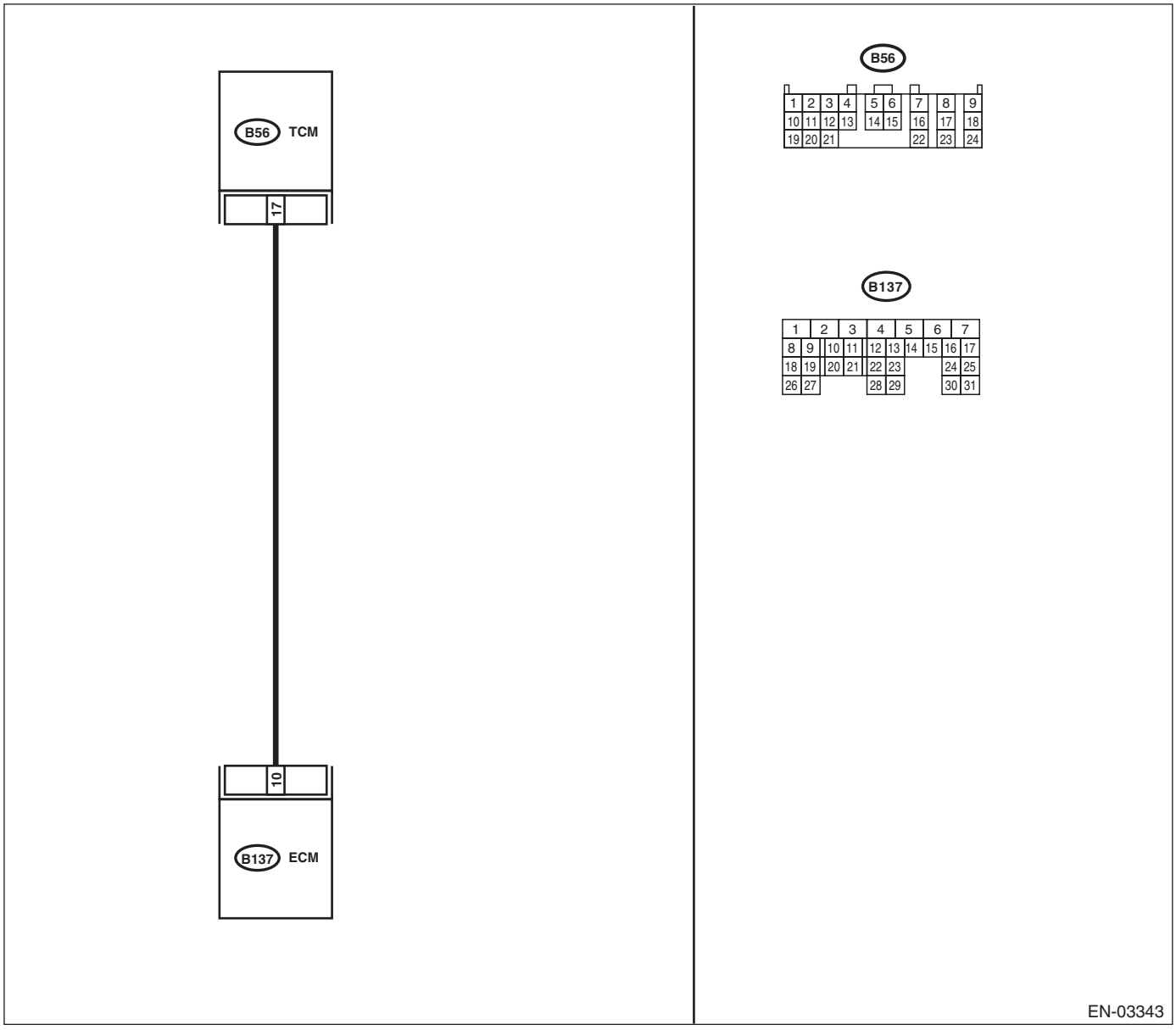
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage 1 — 4 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. NOTE: In this case repair the following: • Poor contact in ECM connector. • Poor contact in TCM connector	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **6.**	Repair the open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Check TCM power supply line and grounding line.

BT:DTC P1134 A/F SENSOR MICRO-COMPUTER PROBLEM

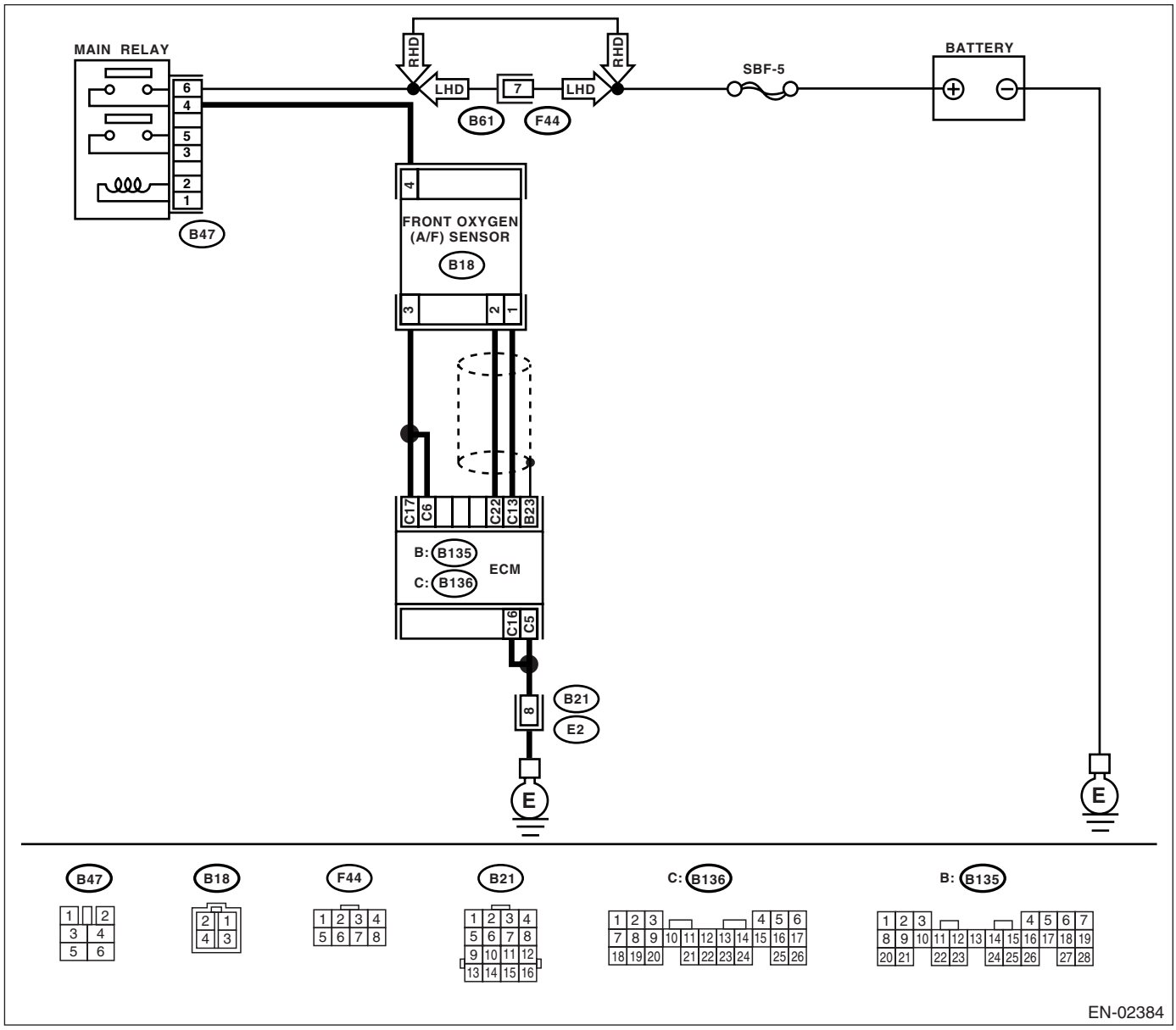
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P1134.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

BU:DTC P1137 O_2 SENSOR CIRCUIT (LAMBDA=1) (BANK 1 SENSOR 1)

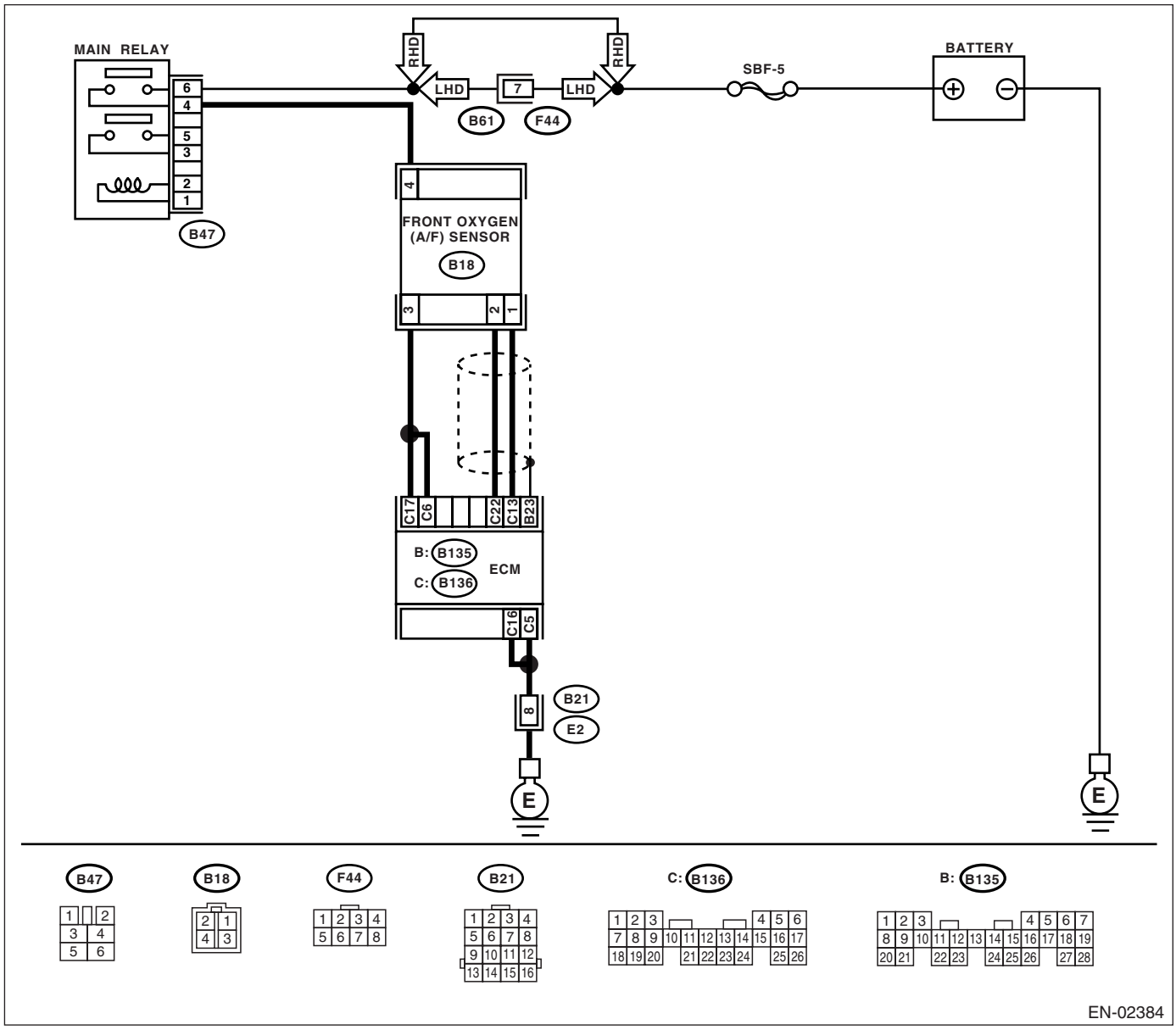
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or general scan tool screen, warm-up the engine until engine coolant temperature is above 70°C (160°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal at idling using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4SO)(diag)-30, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.85 — 1.15 V?	Go to step **3.**	Go to step **4.**
3	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: • Normally the air fuel ratio be rich at racing. • To increase engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.	Is the voltage more than 1.1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and front oxygen (A/F) sensor. ***Connector & terminal*** ***(B136) No. 13 — (B18) No. 1:*** ***(B136) No. 22 — (B18) No. 2:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and front oxygen (A/F) sensor.
5	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit between ECM and front oxygen (A/F) sensor.

Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-40, Front Oxygen (A/F) Sensor.>

BV:DTC P1492 EGR VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)(diag)-238, DTC P1498 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BW:DTC P1493 EGR VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)(diag)-240, DTC P1499 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BX:DTC P1494 EGR VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)(diag)-238, DTC P1498 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BY:DTC P1495 EGR VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)(diag)-240, DTC P1499 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P1496 EGR VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)(diag)-238, DTC P1498 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CA:DTC P1497 EGR VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)(diag)-240, DTC P1499 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CB:DTC P1498 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

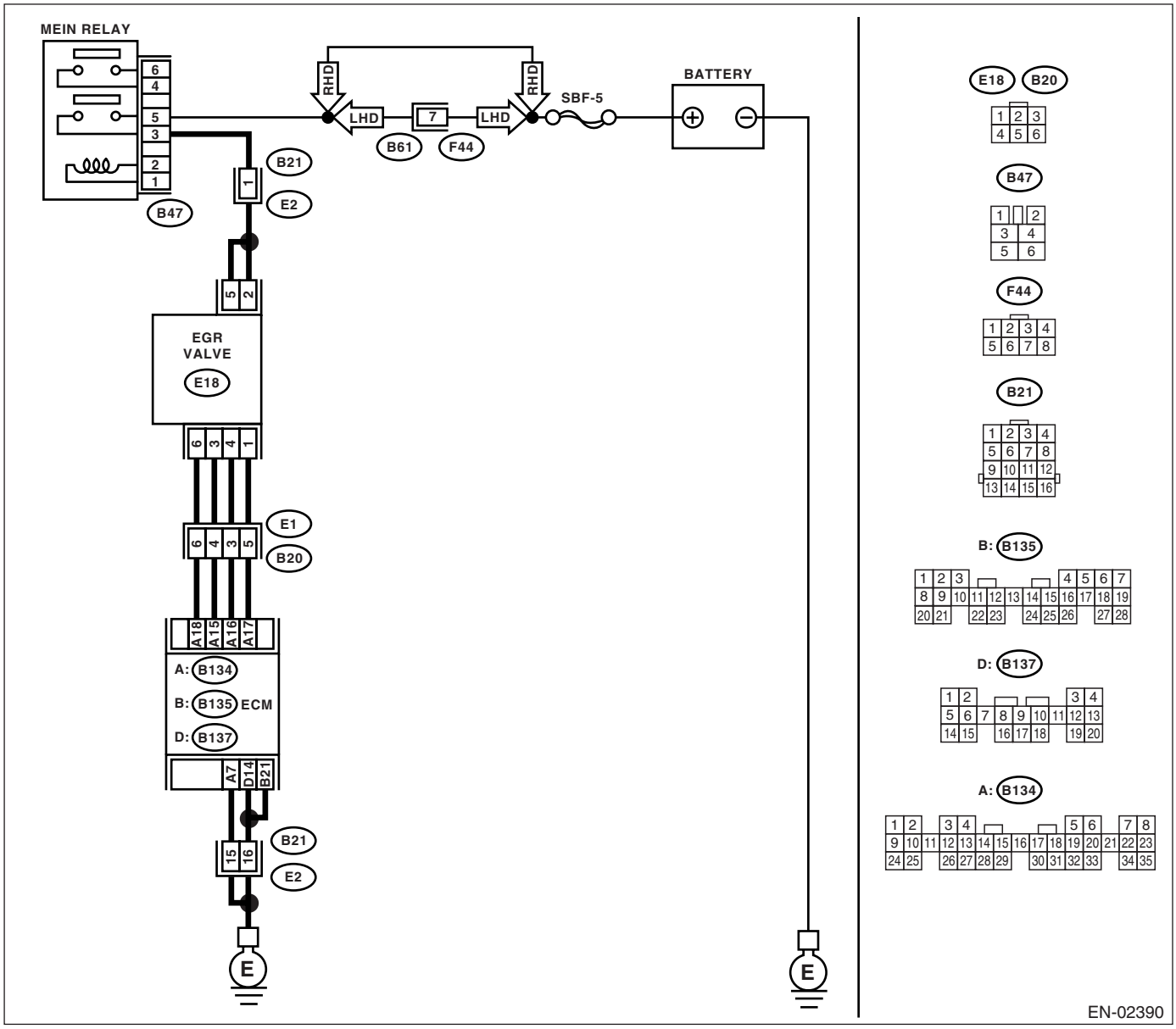
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO EGR VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between EGR valve connector and engine ground. ***Connector & terminal*** ***(E18) No. 2 (+) — Engine ground (−):*** ***(E18) No. 5 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between EGR valve and main relay connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND EGR VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and EGR valve connector. ***Connector & terminal*** ***DTC P1492; (B134) No. 18 — (E18) No. 6:*** ***DTC P1494; (B134) No. 17 — (E18) No. 1:*** ***DTC P1496; (B134) No. 16 — (E18) No. 4:*** ***DTC P1498; (B134) No. 15 — (E18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and EGR valve connector. • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR VALVE CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1492; (B134) No. 18 — Chassis ground:*** ***DTC P1494; (B134) No. 17 — Chassis ground:*** ***DTC P1496; (B134) No. 16 — Chassis ground:*** ***DTC P1498; (B134) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short in harness between ECM and EGR valve connector.
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector and EGR valve connector.	Is there poor contact in ECM connector or EGR valve connector?	Repair poor contact in ECM connector or EGR valve connector.	Replace the EGR valve. <Ref. to FU(H4SO)-34, EGR Valve.>

CC:DTC P1499 EGR VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

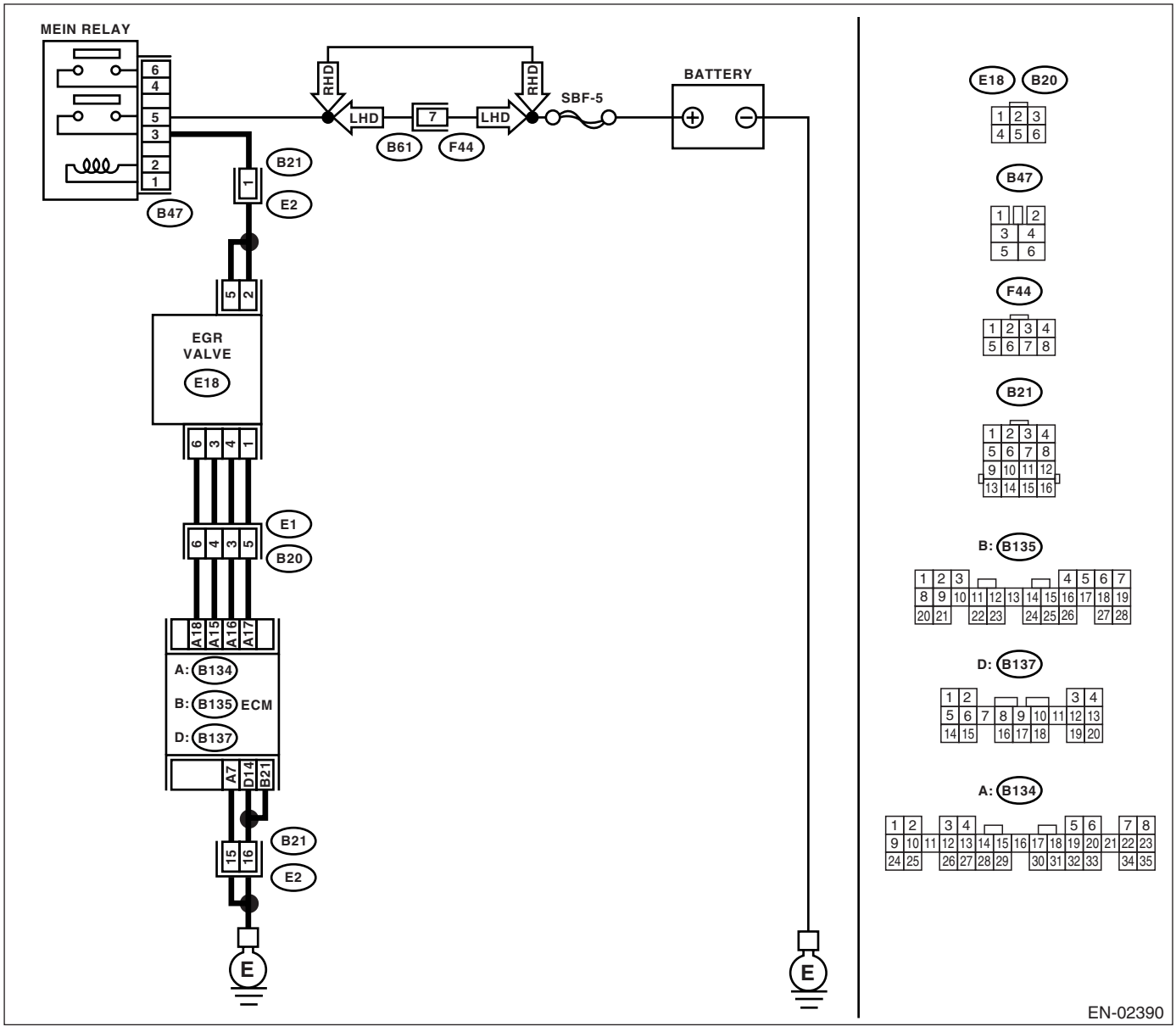
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector. • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1493; (B134) No. 18 (+) — Chassis ground (−):*** ***DTC P1495; (B134) No. 17 (+) — Chassis ground (−):*** ***DTC P1497; (B134) No. 16 (+) — Chassis ground (−):*** ***DTC P1499; (B134) No. 15 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short in harness between ECM and EGR valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

CD:DTC P1510 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)(diag)-243, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

CE:DTC P1511 ISC SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)(diag)-245, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

CF:DTC P1512 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)(diag)-243, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

CG:DTC P1513 ISC SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)(diag)-245, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

CH:DTC P1514 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1516. <Ref. to EN(H4SO)(diag)-243, DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

CI: DTC P1515 ISC SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1517. <Ref. to EN(H4SO)(diag)-245, DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC).>

CJ:DTC P1516 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

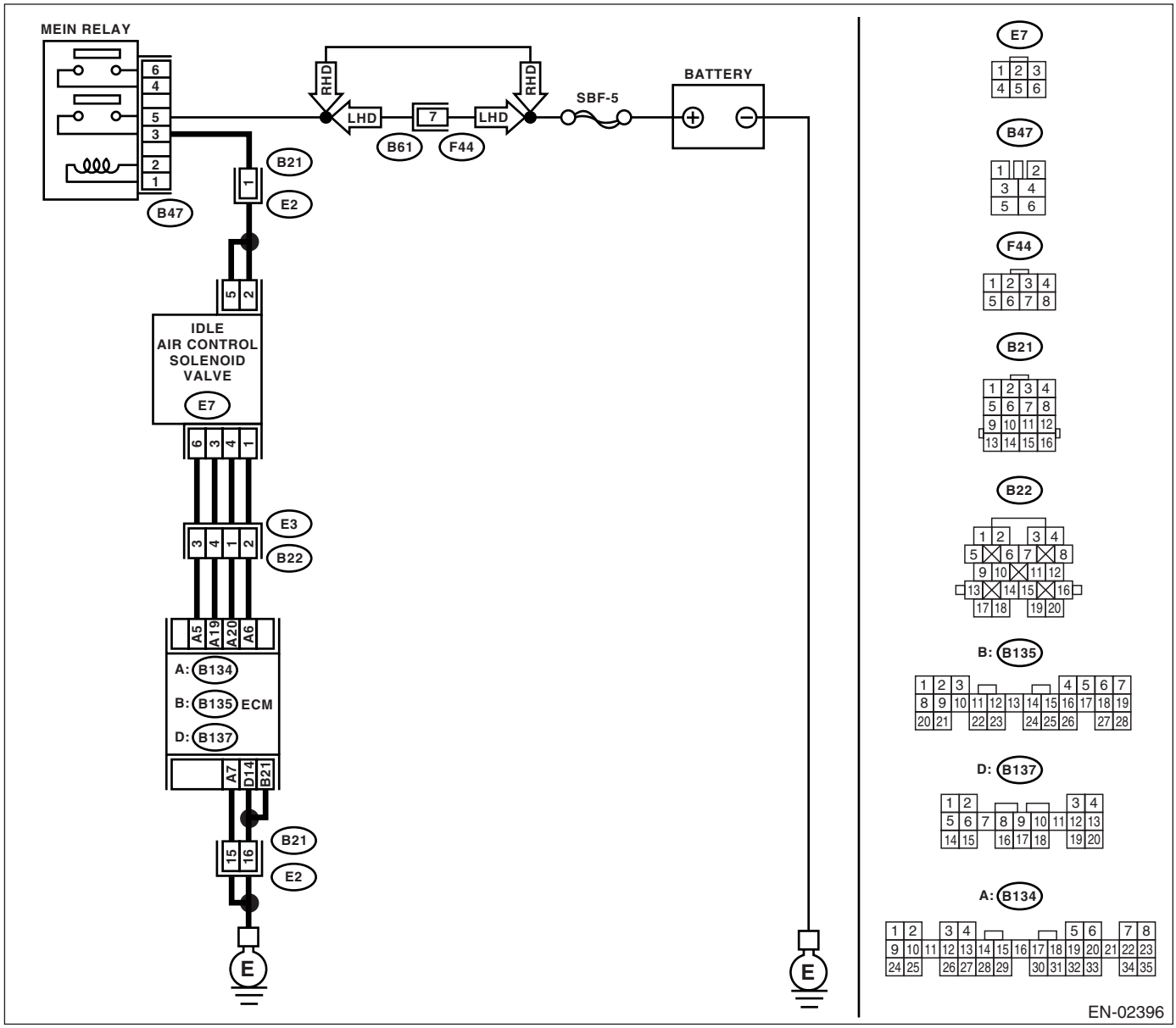
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (−):*** ***(E7) No. 5 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — (E7) No. 4:*** ***DTC P1512; (B134) No. 6 — (E7) No. 1:*** ***DTC P1514; (B134) No. 5 — (E7) No. 6:*** ***DTC P1516; (B134) No. 19 — (E7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1510; (B134) No. 20 — Chassis ground:*** ***DTC P1512; (B134) No. 6 — Chassis ground:*** ***DTC P1514; (B134) No. 5 — Chassis ground:*** ***DTC P1516; (B134) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector and idle air control solenoid valve connector.	Is there poor contact in ECM connector or idle air control solenoid valve connector?	Repair the poor contact in ECM connector or idle air control solenoid valve connector.	Replace the idle air control solenoid valve. <Ref. to FU(H4SO)-33, Idle Air Control Solenoid Valve.>

CK:DTC P1517 ISC SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

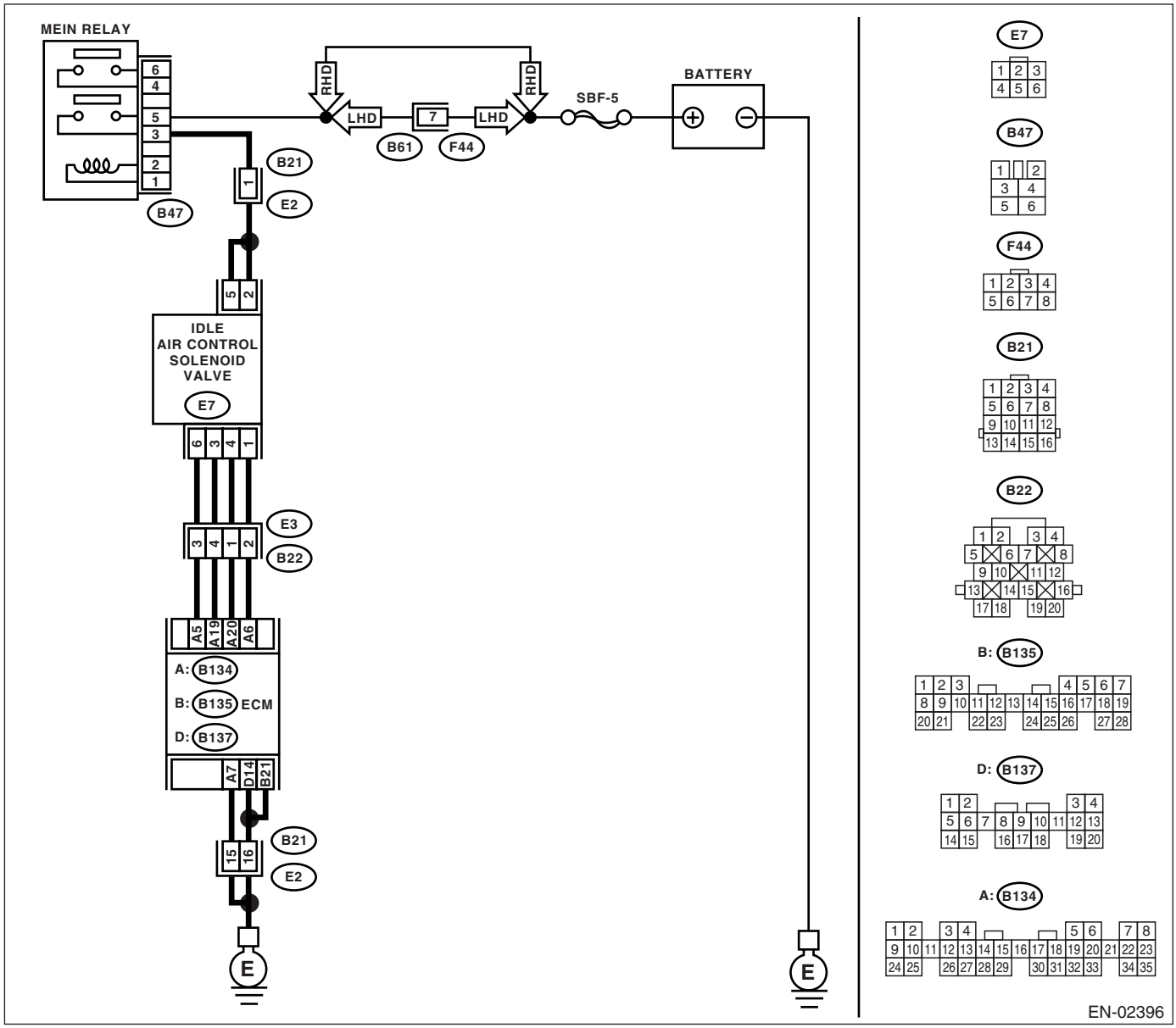
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B135) No. 21 — Chassis ground:*** ***(B137) No. 14 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM connector and engine ground terminal • Poor contact in ECM connector. • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1511; (B134) No. 20 (+) — Chassis ground (−):*** ***DTC P1513; (B134) No. 6 (+) — Chassis ground (−):*** ***DTC P1515; (B134) No. 5 (+) — Chassis ground (−):*** ***DTC P1517; (B134) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

CL:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

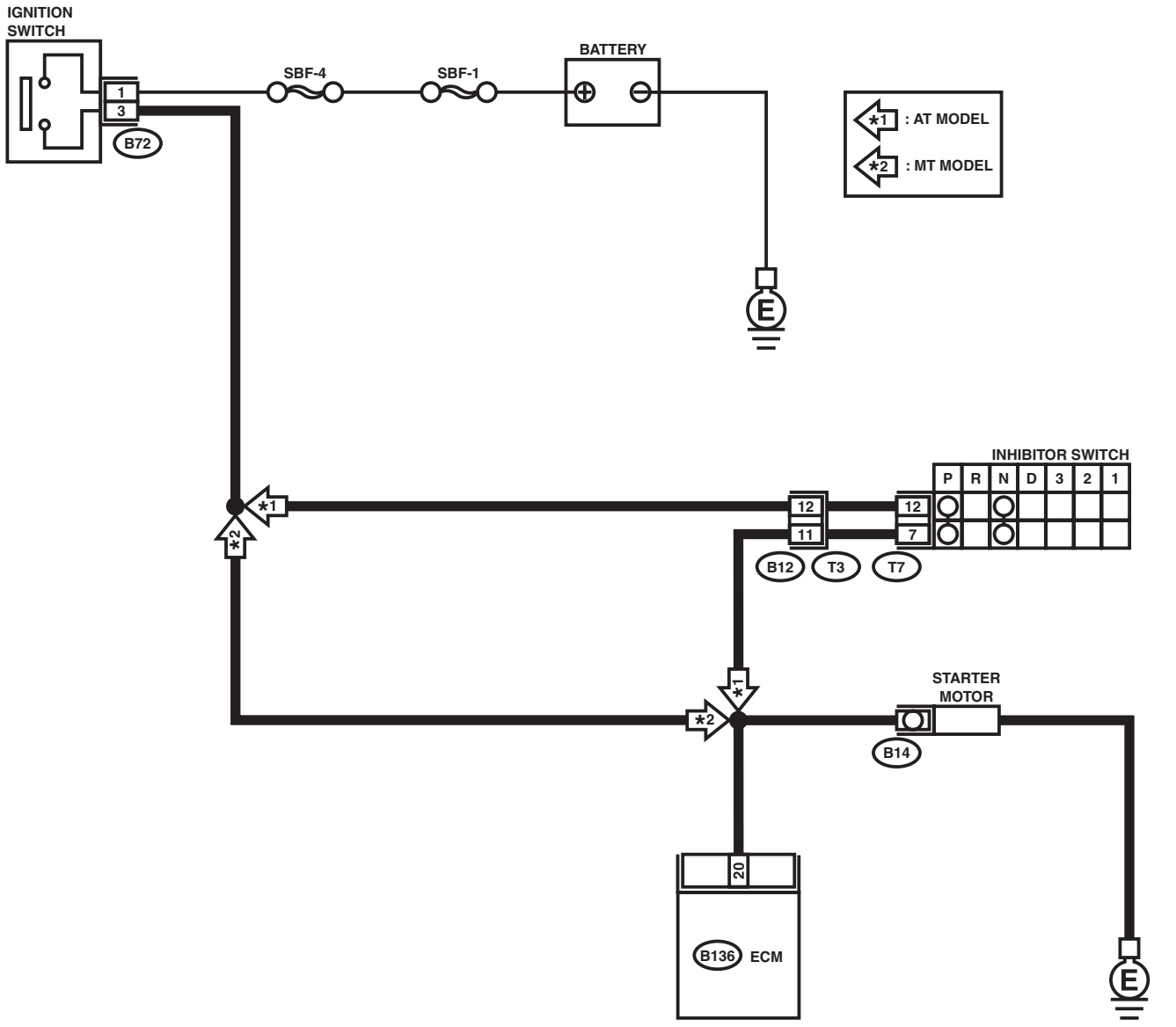
TROUBLE SYMPTOM:

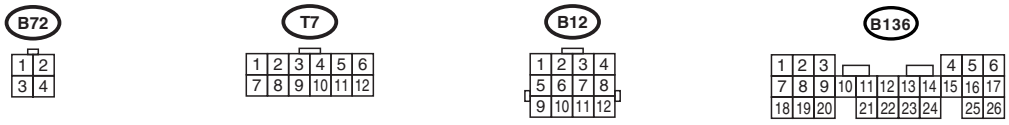
Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-00261

Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** • Place the inhibitor switch in the “P” or “N” range. (AT model) • Depress the clutch pedal. (MT model)	Does the starter motor operate when ignition switch to START?	Repair harness and connector. NOTE: In this case repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H4SO)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

CM:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

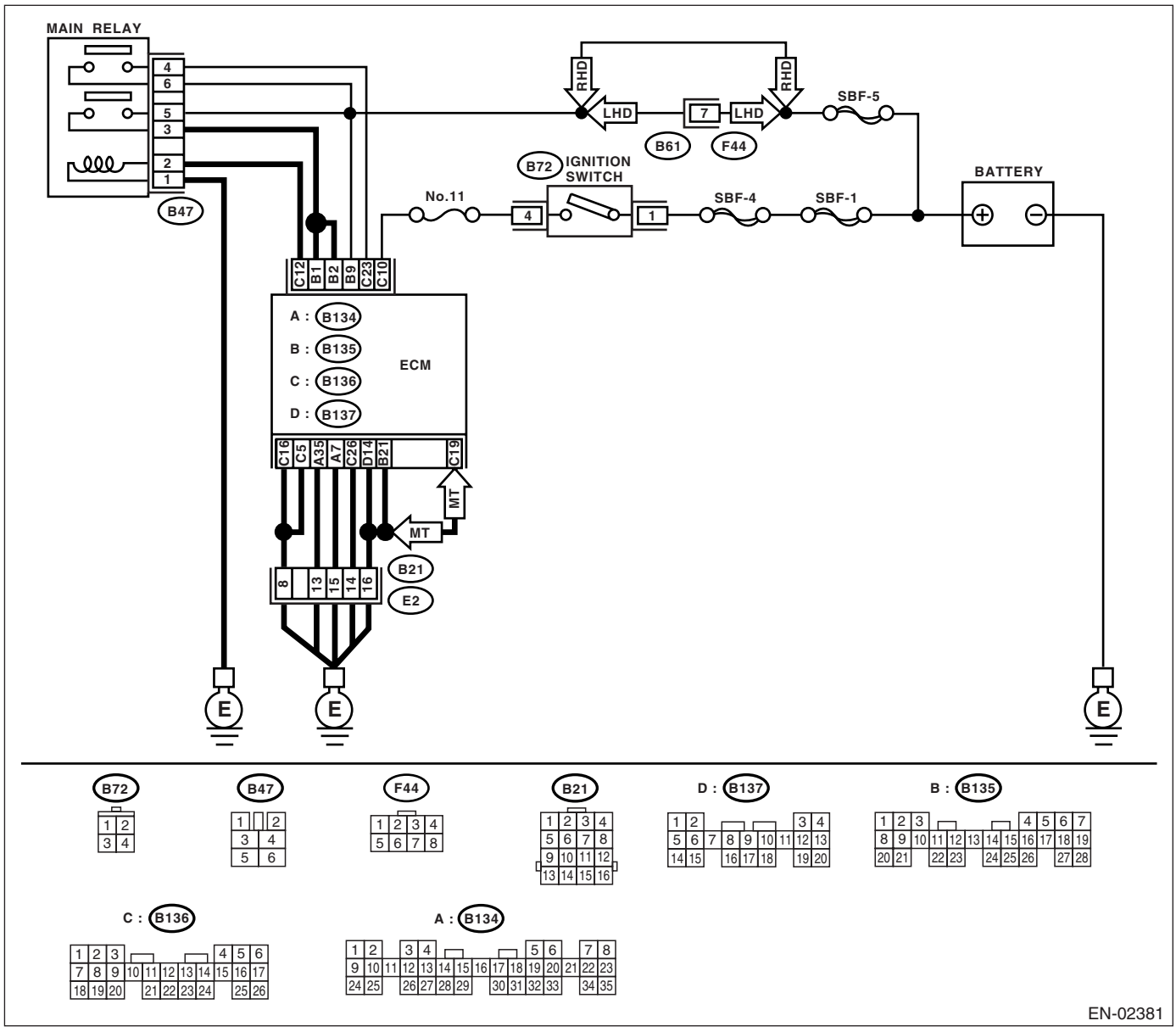
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 9 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown out?	Replace the fuse.	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector. • Poor contact in battery terminal

CN:DTC P1698 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (LOW INPUT)

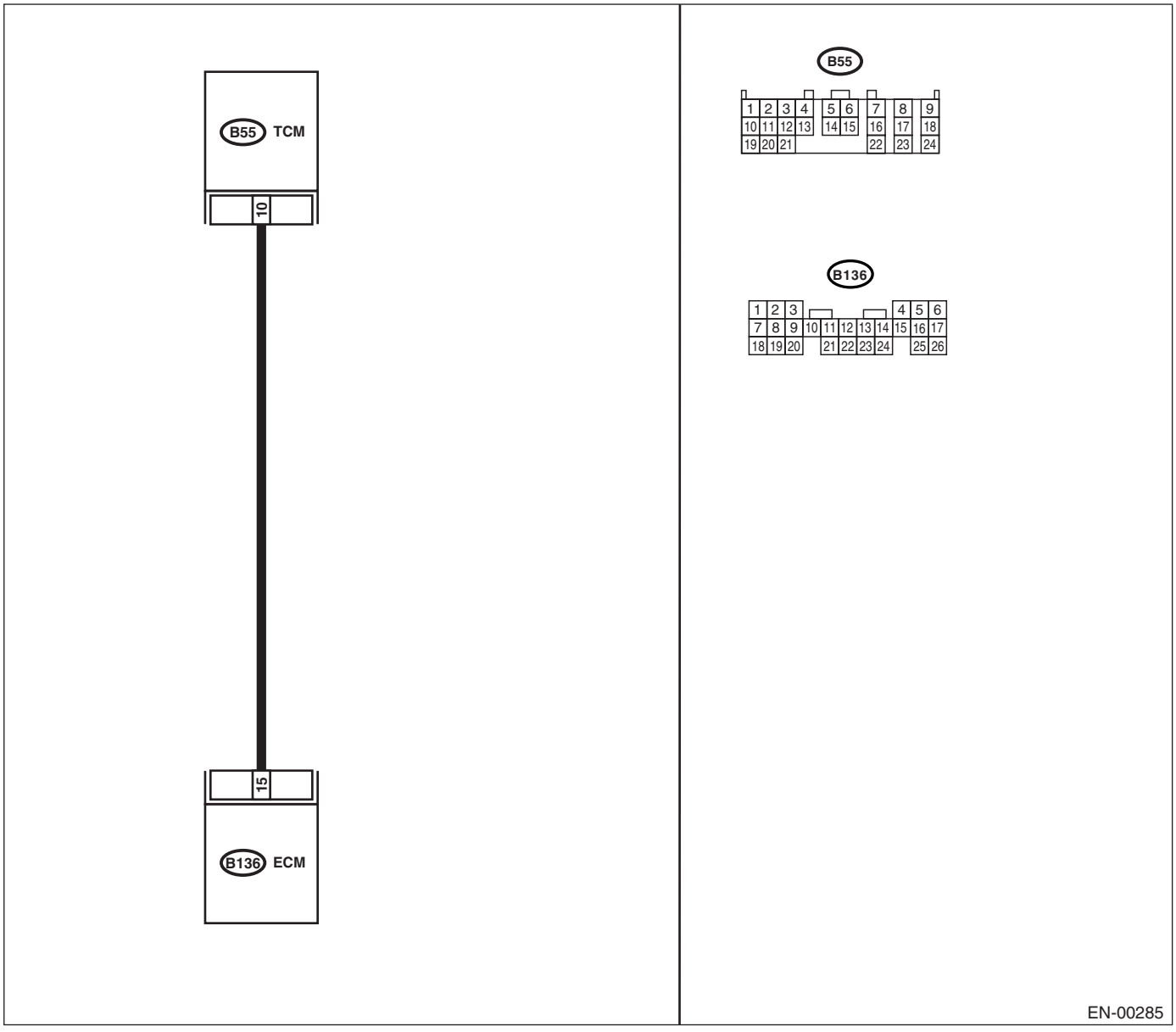
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start the engine, and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (−):***	Is the voltage more than 3 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B136) No. 15 — (B55) No. 10:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM or TCM connector.	Repair the open circuit in harness between ECM and TCM connector.

CO:DTC P1699 ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT MALFUNCTION (HIGH INPUT)

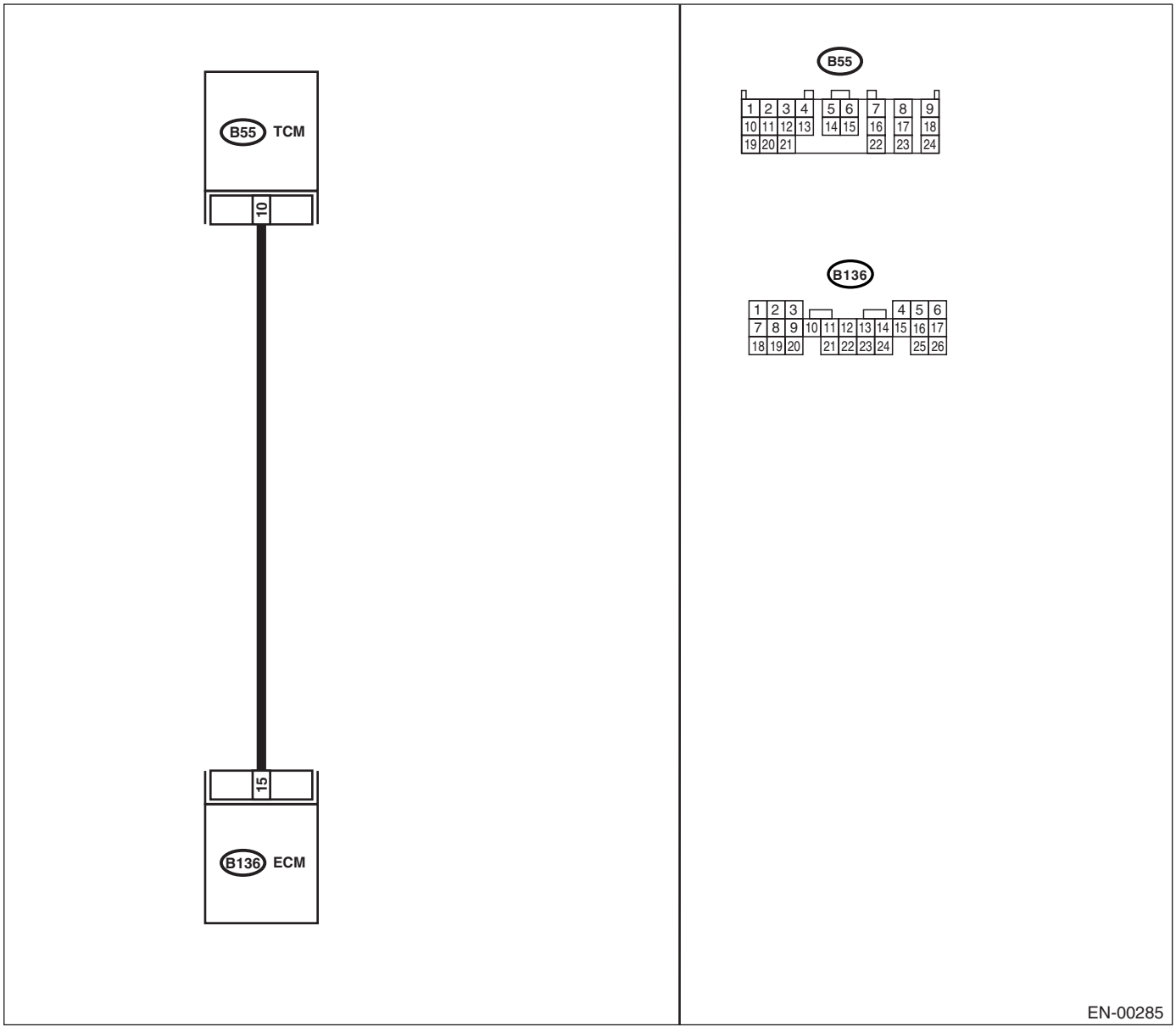
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start the engine, and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connector from TCM. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 3 V?	Go to step **2.**	Repair battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 10 V by shaking the ECM harness and connector?	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

CP:DTC P1711 ENGINE TORQUE CONTROL SIGNAL #1 CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

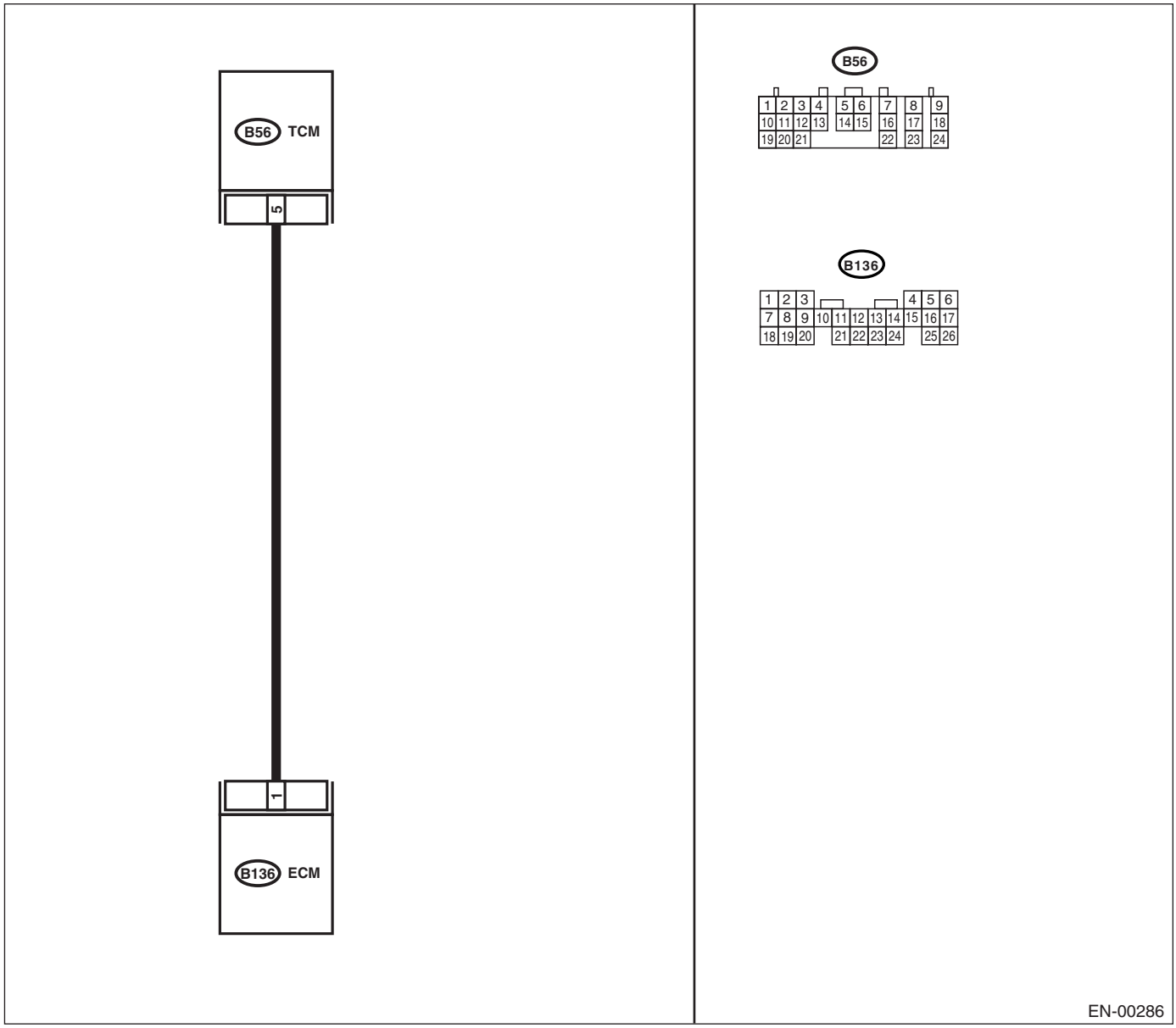
TROUBLE SYMPTOM:

Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B136) No. 1 — (B56) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

CQ:DTC P1712 ENGINE TORQUE CONTROL SIGNAL #2 CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

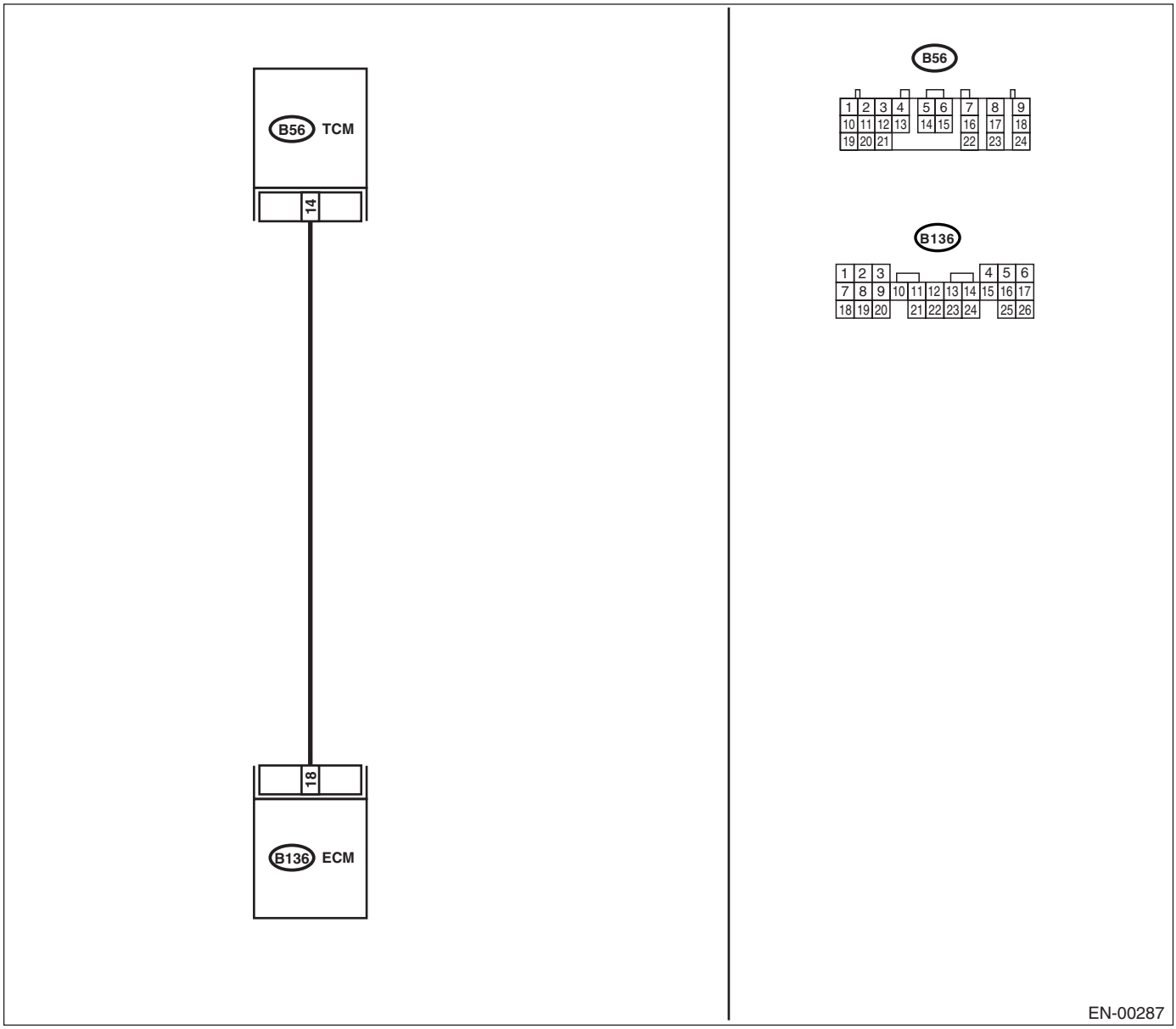
TROUBLE SYMPTOM:

Excessive shift shock

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B136) No. 18 — (B56) No. 14:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

CR:DTC P2503 GENERATOR CIRCUIT LOW INPUT

NOTE:
Refer to DTC P2504 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-261, DTC P2504 GENERATOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CS:DTC P2504 GENERATOR CIRCUIT HIGH INPUT

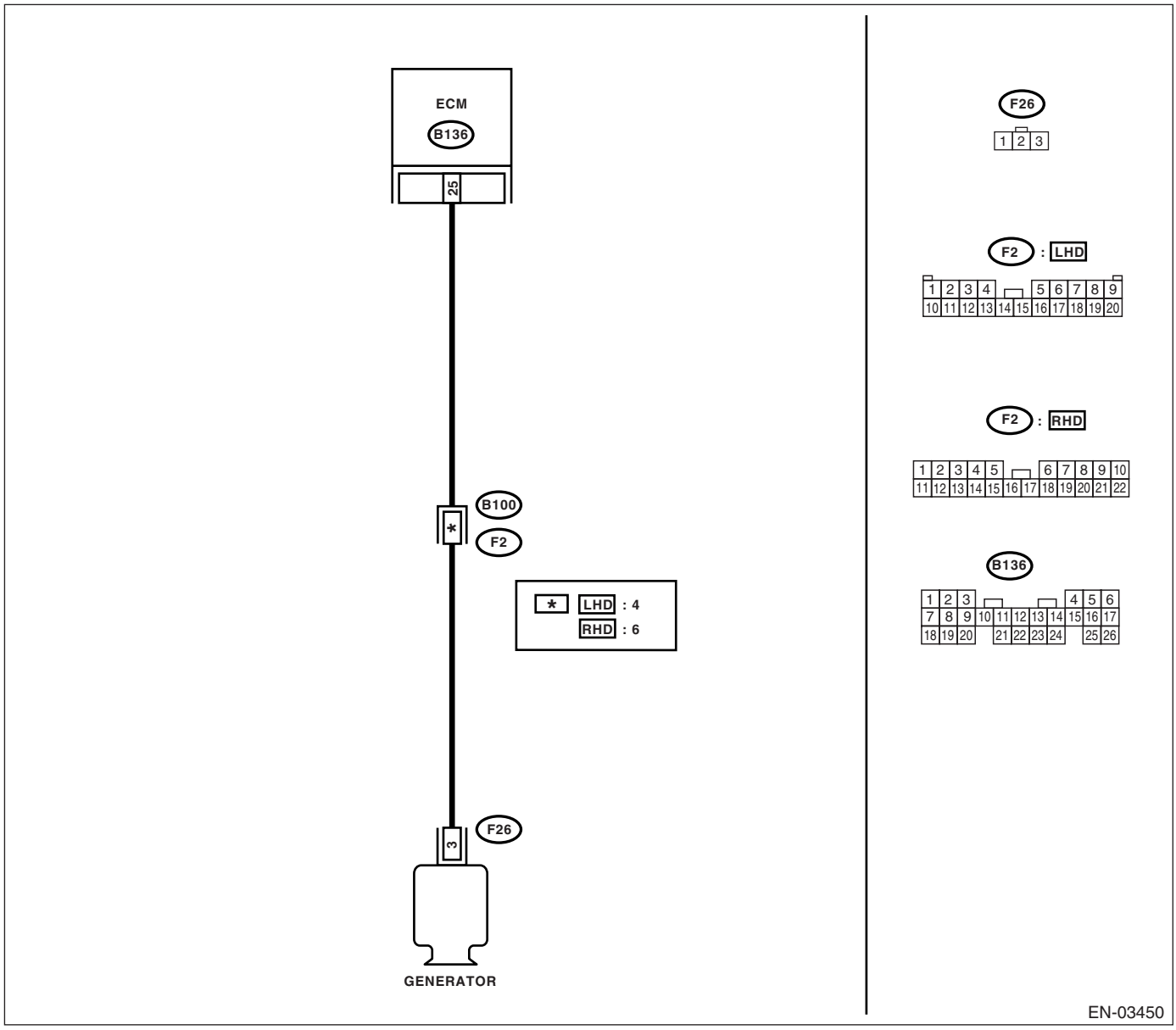
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4SO)(diag)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-38, OPERATION.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from generator and ECM. 3) Measure the resistance of harness between generator connector and engine ground. ***Connector & terminal*** ***(F26) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
2	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and generator. ***Connector & terminal*** ***(B136) No. 25 — (F26) No. 3:***	Is the resistance less than 1 Ω?	Repair poor contact connector.	Repair open circuit in harness between ECM and generator connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and generator connector • Poor contact in coupling connector

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-92, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Manifold absolute pressure sensor 6) Intake air temperature sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Intake air temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay

Symptom	Problem parts
6. Surging	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay
7. Spark knock	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor 5) Knock sensor 6) Fuel injection parts (*4) 7) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Intake manifold pressure sensor 2) Intake air temperature sensor 3) Manifold absolute pressure sensor 4) Engine coolant temperature sensor (*2) 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust the accelerator cable.

2. AUTOMATIC TRANSMISSION

NOTE:
Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>

ENGINE SECTION 2

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUEL INJECTION (FUEL SYSTEMS)	FU(H4DOTC 2.0)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DOTC 2.0)
INTAKE (INDUCTION)	IN(H4DOTC 2.0)
MECHANICAL	ME(H4DOTC 2.0)
EXHAUST	EX(H4DOTC 2.0)
COOLING	CO(H4DOTC 2.0)
LUBRICATION	LU(H4DOTC 2.0)
SPEED CONTROL SYSTEMS	SP(H4DOTC 2.0)
IGNITION	IG(H4DOTC 2.0)
STARTING/CHARGING SYSTEMS	SC(H4DOTC 2.0)
ENGINE (DIAGNOSTICS)	EN(H4DOTC 2.0) (diag)
FUEL INJECTION (FUEL SYSTEMS)	FU(H4DOTC 2.5)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DOTC 2.5)
INTAKE (INDUCTION)	IN(H4DOTC 2.5)
MECHANICAL	ME(H4DOTC 2.5)
EXHAUST	EX(H4DOTC 2.5)
COOLING	CO(H4DOTC 2.5)

FUJI HEAVY INDUSTRIES LTD. G8090GE3

ENGINE SECTION 2

LUBRICATION	LU(H4DOTC 2.5)
SPEED CONTROL SYSTEMS	SP(H4DOTC 2.5)
IGNITION	IG(H4DOTC 2.5)
STARTING/CHARGING SYSTEMS	SC(H4DOTC 2.5)
ENGINE (DIAGNOSTICS)	EN(H4DOTC 2.5) (diag)

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC 2.0)

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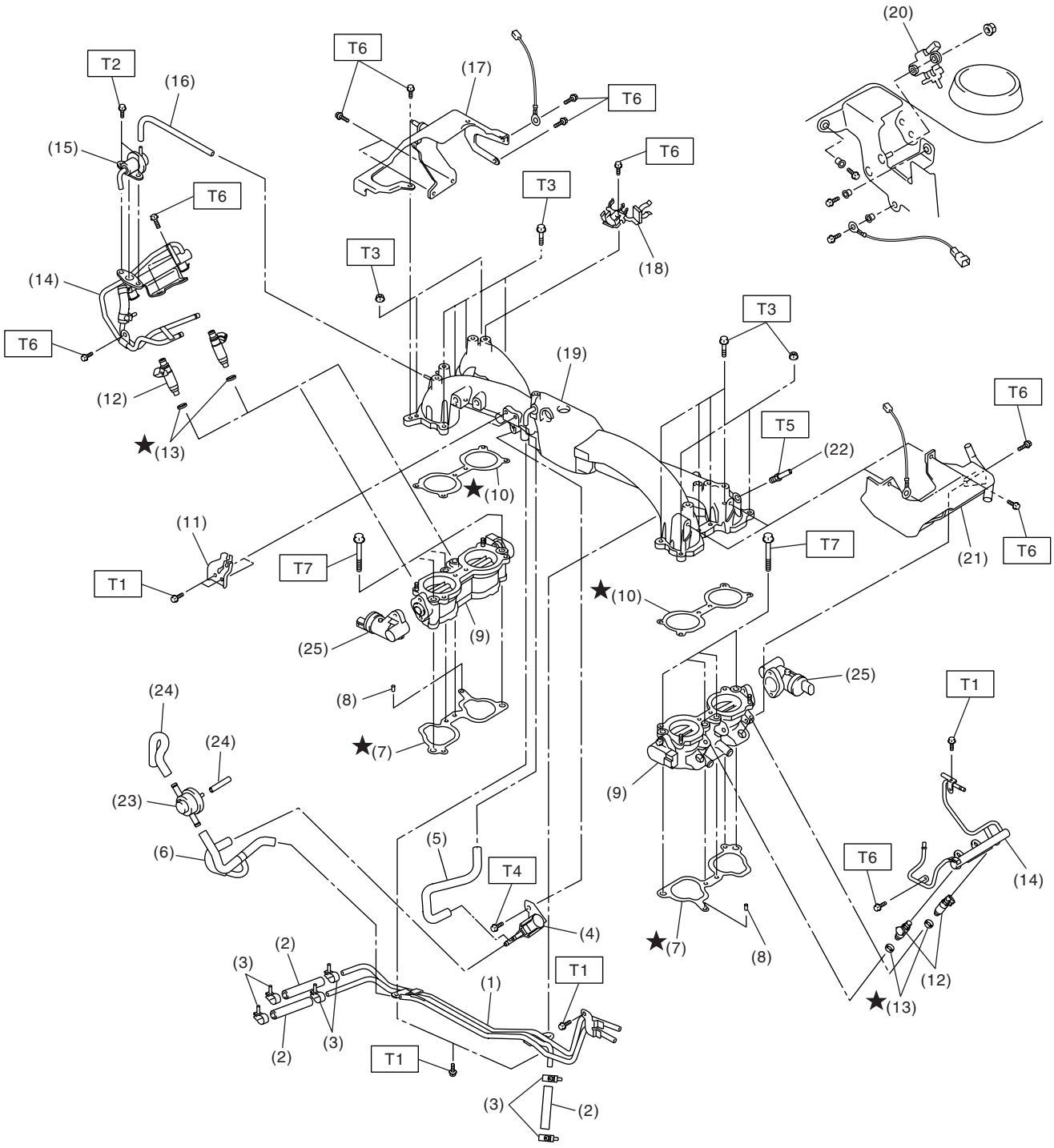
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kgf/cm^2, 65.27 — 98.2 psi)
	Discharge flow	More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h [12 V at 300 kPa (3.06 kgf/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD

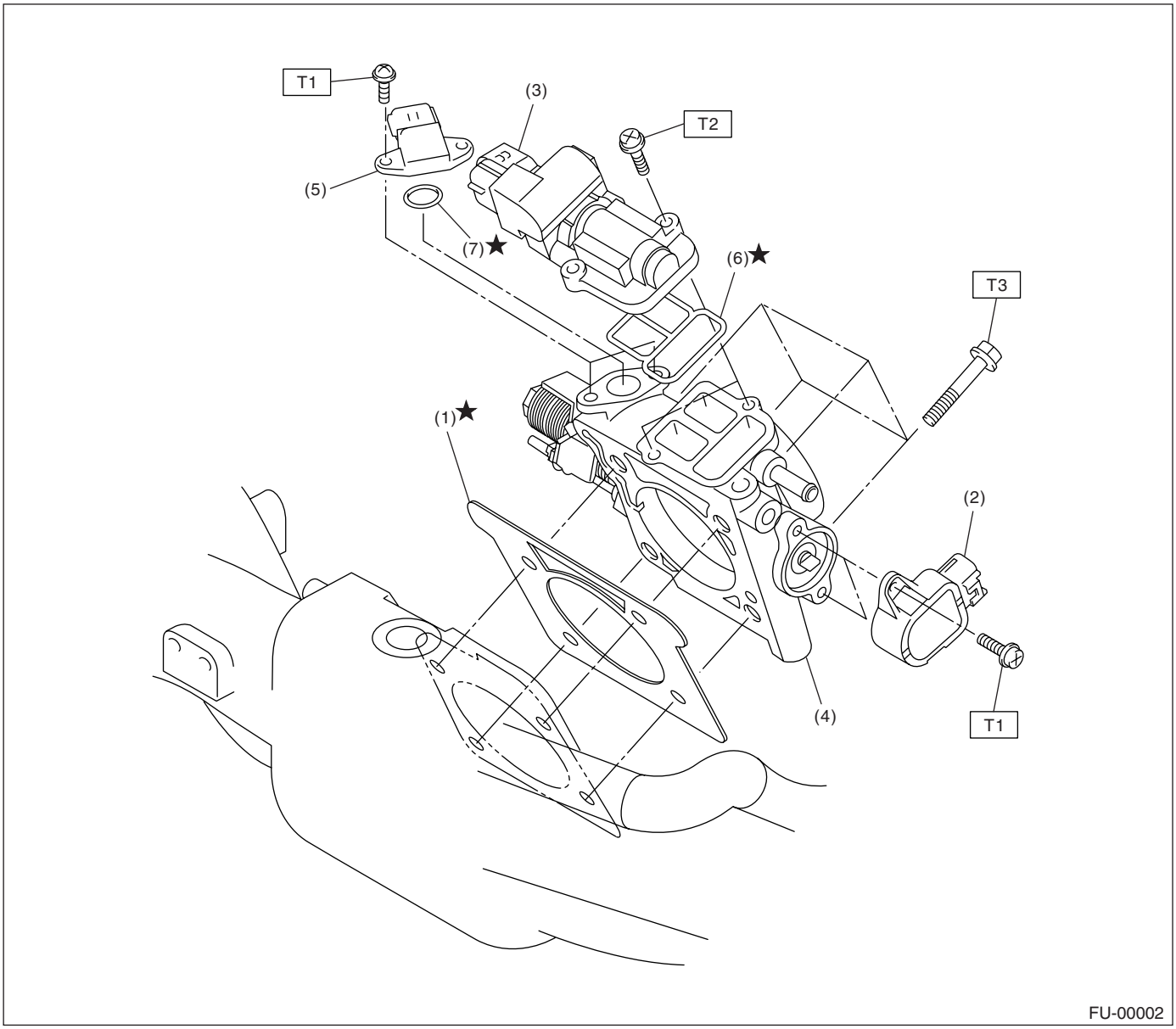


FU-02085

(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clamp
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY
(10) Gasket
(11) Accelerator cable bracket
(12) Fuel injector
(13) Insulator
(14) Fuel injector pipe
(15) Pressure regulator
(16) Pressure regulator hose
(17) Fuel pipe protector RH
(18) Blow-by hose stay
(19) Intake manifold
(20) Wastegate control solenoid valve ASSY
(21) Fuel pipe protector LH
(22) Nipple
(23) Purge valve
(24) Purge hose
(25) Tumble generator valve actuator

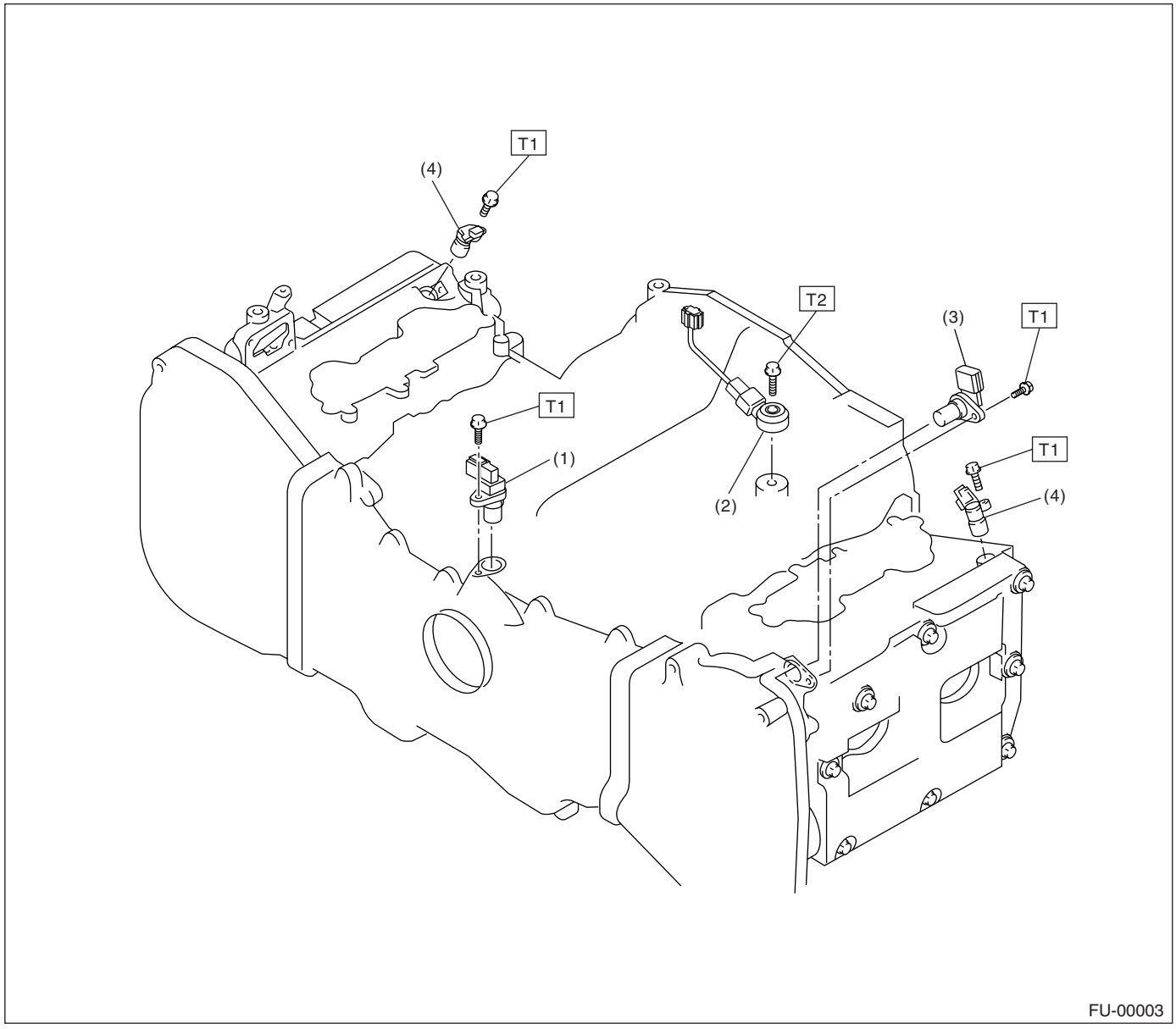
Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 8.25 (0.84, 6.1)
T4: 16 (1.6, 11.8)
T5: 17 (1.7, 12.5)
T6: 19 (1.9, 14.0)
T7: 25 (2.5, 18.1)

2. AIR INTAKE SYSTEM



(1)	Gasket	(5)	Manifold absolute pressure sensor	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Throttle position sensor	(6)	Gasket	***T1: 1.6 (0.16, 1.2)***
(3)	Idle air control solenoid valve	(7)	O-ring	***T2: 2.8 (0.29, 2.1)***
(4)	Throttle body			***T3: 22 (2.2, 15.9)***

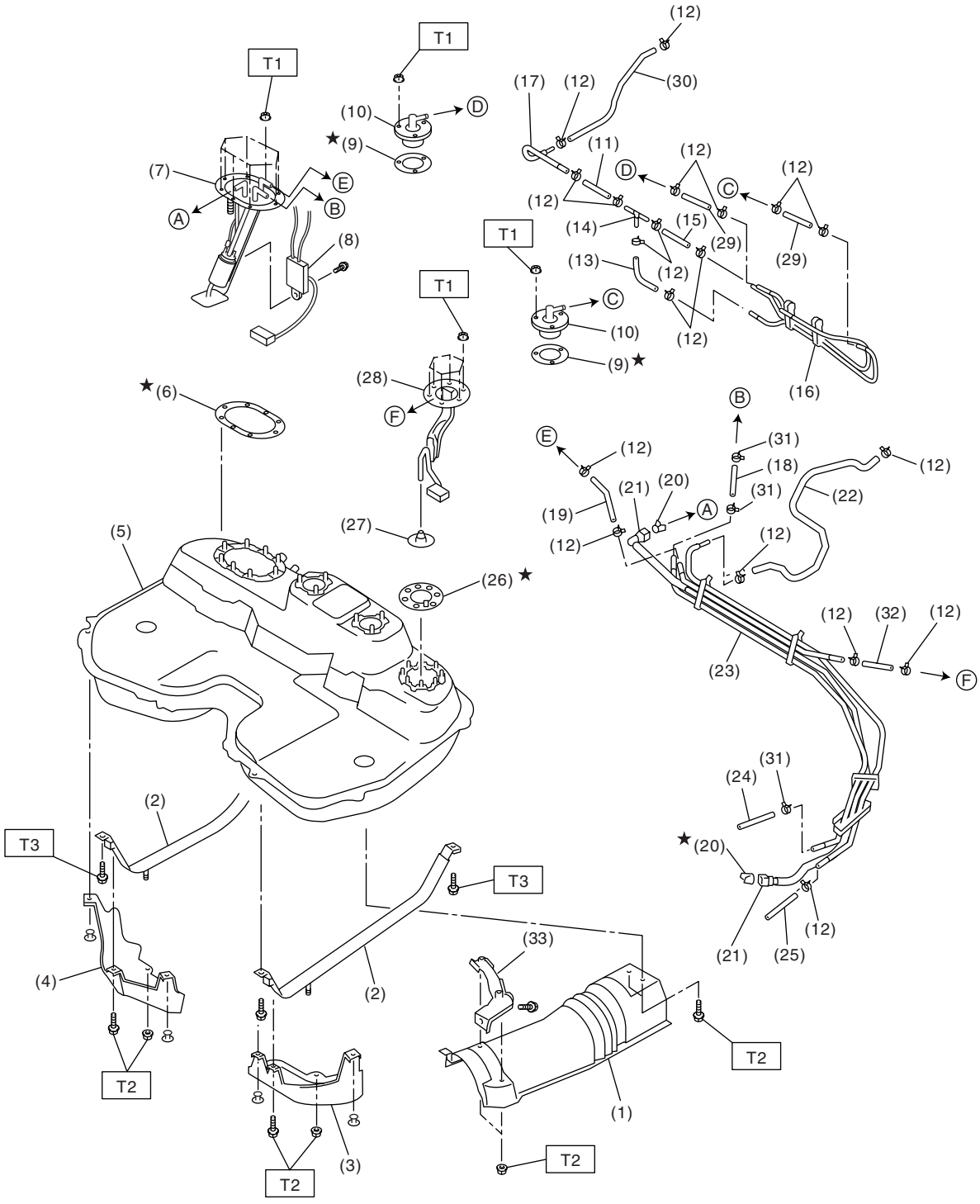
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor
(4) AVCS camshaft position sensor

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

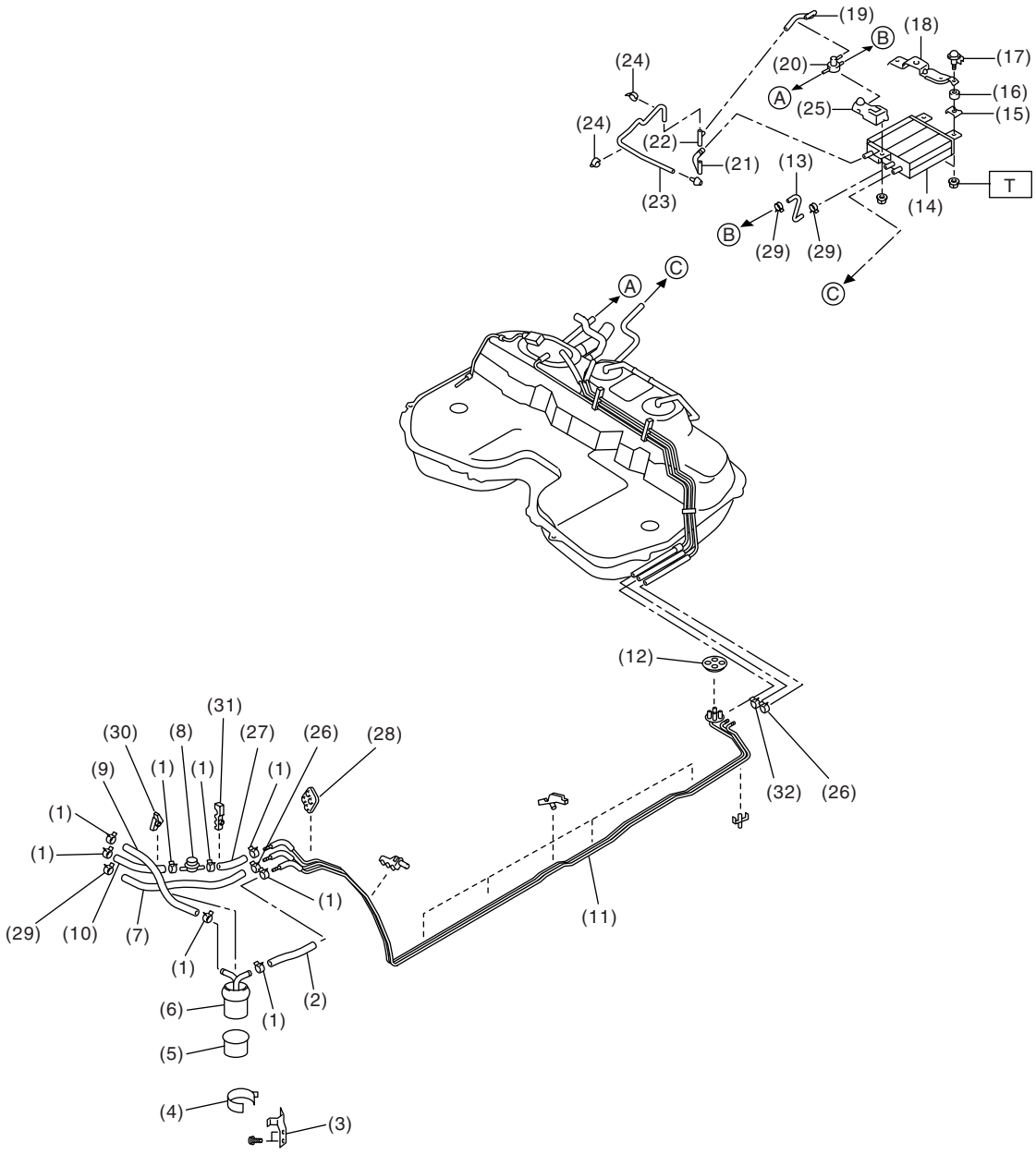


FU-02619

(1) Heat shield cover
(2) Fuel tank band
(3) Protector LH
(4) Protector RH
(5) Fuel tank
(6) Fuel pump gasket
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel cut valve gasket
(10) Fuel cut valve
(11) Evaporation hose A
(12) Clip
(13) Evaporation hose B
(14) Joint pipe
(15) Evaporation hose C
(16) Evaporation pipe ASSY
(17) Evaporation pipe
(18) Fuel return hose A
(19) Jet pump hose A
(20) Retainer
(21) Quick connector
(22) Evaporation hose D
(23) Fuel pipe ASSY
(24) Fuel return hose B
(25) Evaporation hose E
(26) Fuel sub level sensor gasket
(27) Jet pump filter
(28) Fuel sub level sensor
(29) Evaporation hose F
(30) Evaporation hose G
(31) Clip
(32) Jet pump hose B
(33) Cover bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.4 (0.75, 5.4)
T3: 33 (3.4, 25)

5. FUEL LINE

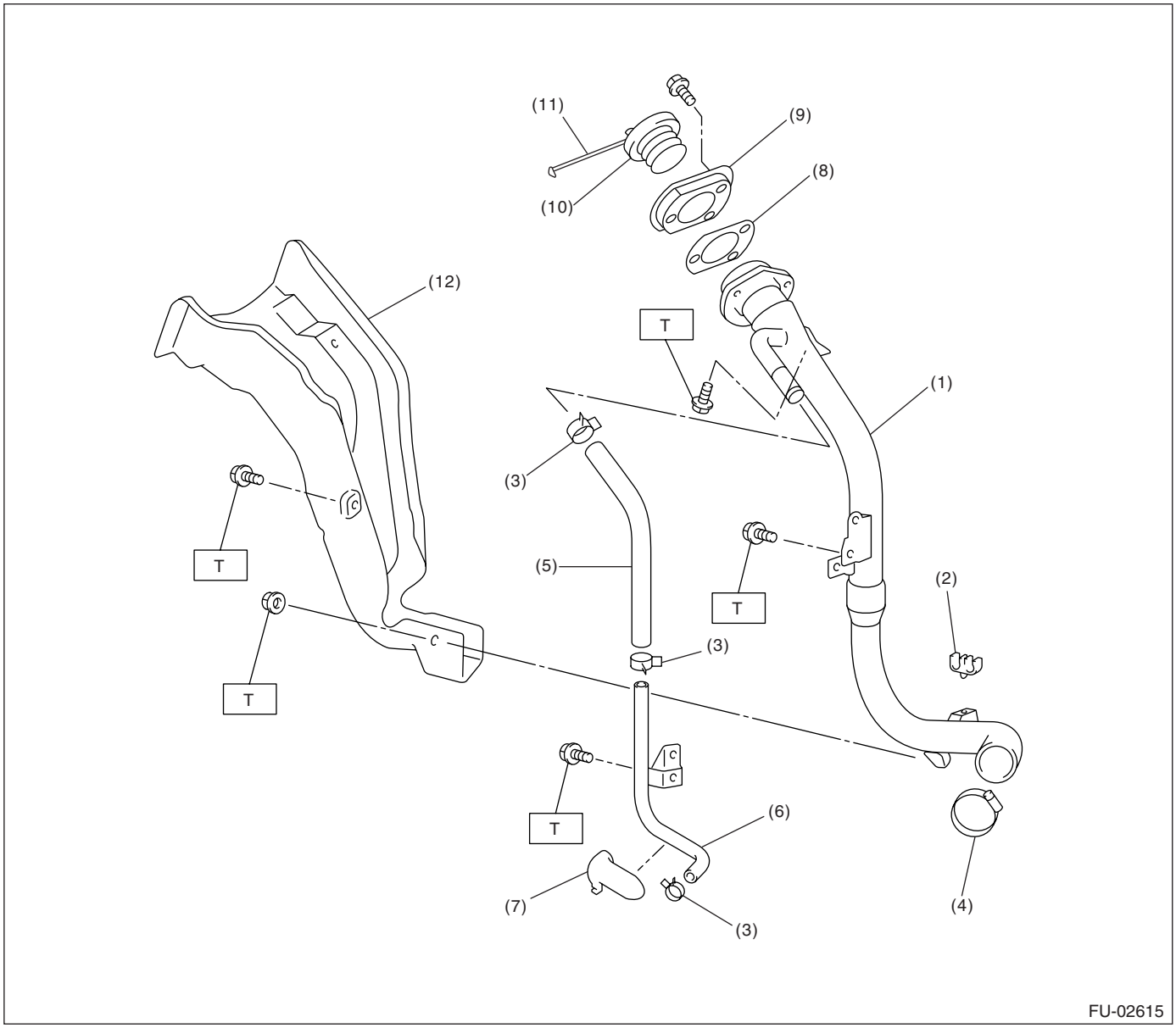


FU-02614

(1) Clip
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Fuel damper valve
(9) Fuel delivery hose B
(10) Fuel return hose A
(11) Fuel pipe ASSY
(12) Grommet A
(13) Canister hose A
(14) Canister
(15) Canister bracket plate
(16) Cushion
(17) Canister bracket spacer
(18) Rear canister bracket
(19) Two-way valve hose
(20) Two-way valve
(21) Drain hose A
(22) Connector
(23) Drain hose B
(24) Clamp
(25) Front canister bracket
(26) Clip
(27) Fuel return hose B
(28) Grommet B
(29) Clip
(30) Clamp
(31) Clamp
(32) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 23 (2.3, 17.0)

6. FUEL FILLER PIPE



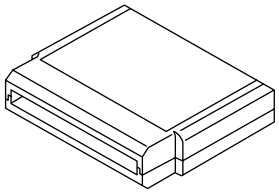
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Air vent hose
(6) Air vent pipe
(7) Air vent pipe holder
(8) Fuel filler pipe packing
(9) Fuel filler flap lid ring
(10) Fuel filler flap lid cap
(11) Fuel filler flap lid cap tether
(12) Fuel filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

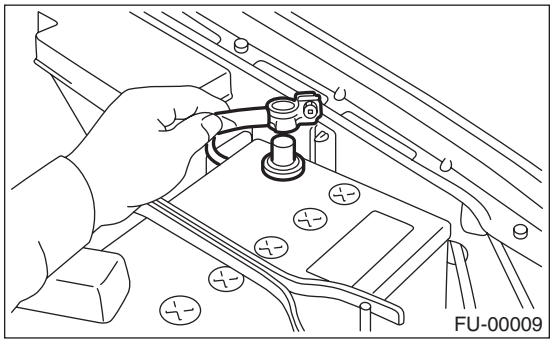
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. Throttle Body

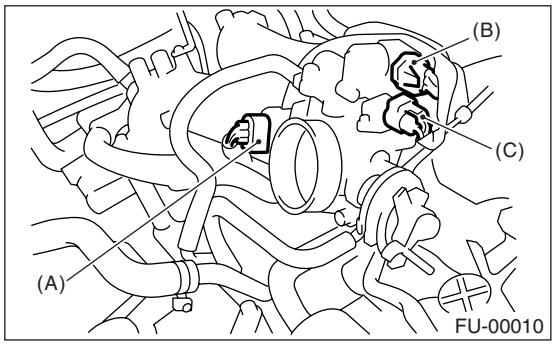
A: REMOVAL

1) Disconnect the ground cable from battery.

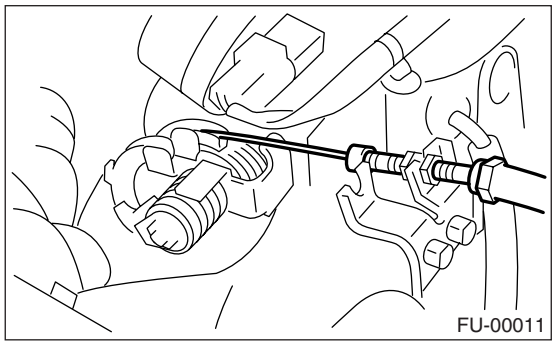


2) Remove the intercooler. **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>

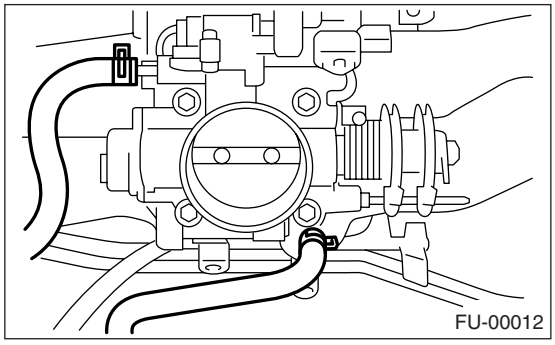
3) Disconnect the connector from the throttle position sensor (A) and idle air control solenoid valve (B) and manifold absolute pressure sensor (C).



4) Disconnect the accelerator cable.



5) Disconnect the engine coolant hoses from throttle body.



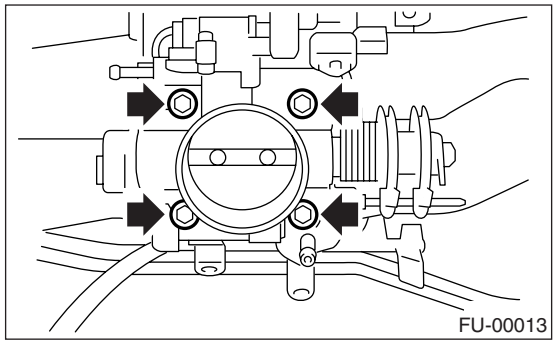
6) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Always use a new gasket.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

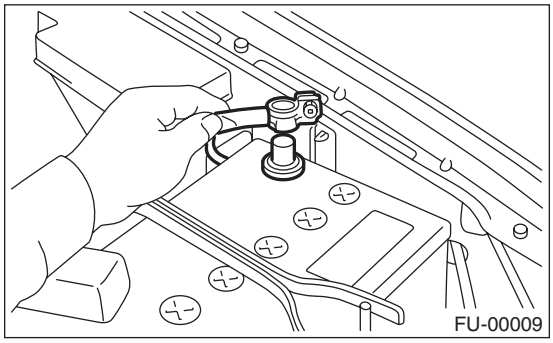


2) Adjust the accelerator cable play. **<Ref. to SP(H4SO)-7,** ADJUSTMENT**, Accelerator Pedal.>**

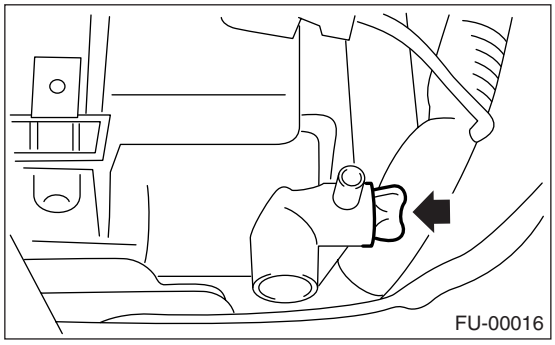
3. Intake Manifold

A: REMOVAL

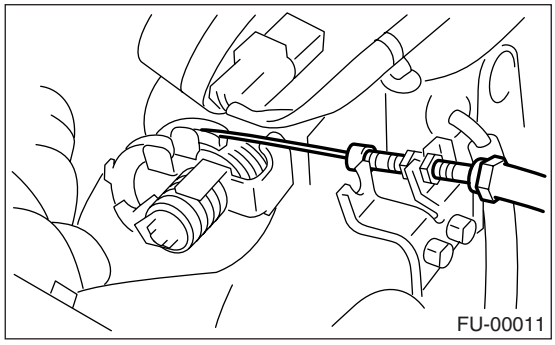
1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.


FU-00009

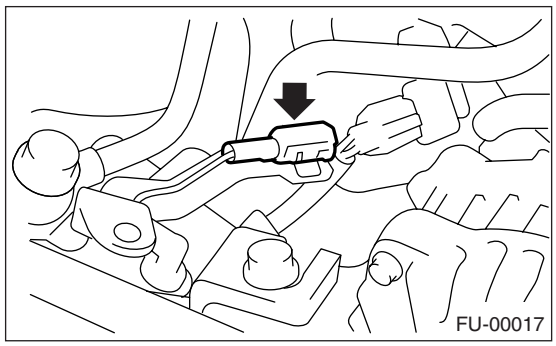
4) Lift-up the vehicle.
5) Remove the under cover.
6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).


FU-00016

7) Remove the air cleaner upper cover and air intake boot. **<Ref. to IN(H4DOTC 2.0)-7,** REMOVAL**, Air Cleaner Case.>**
8) Remove the air cleaner element.
9) Remove the intercooler. **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>
10) Disconnect the accelerator cable.

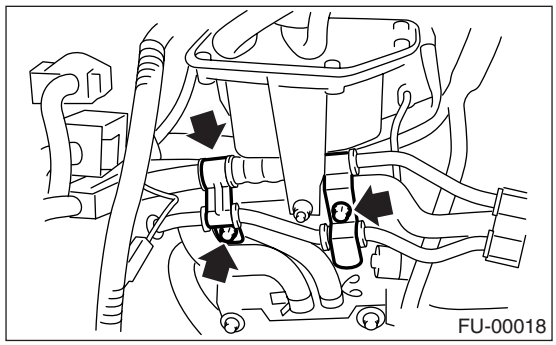

FU-00011

11) Remove the coolant filler tank. **<Ref. to CO(H4SO)-42,** REMOVAL**, Coolant Filler Tank.>**
12) Remove the power steering pump.
(1) Remove the front side V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

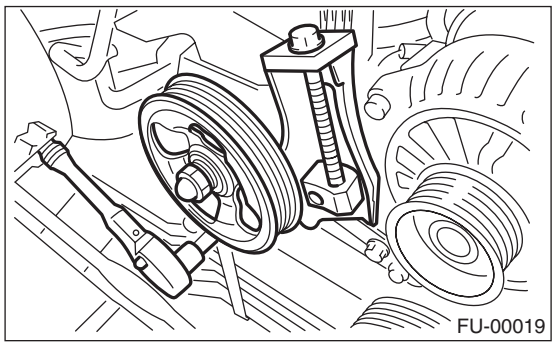

FU-00017

(3) Remove the bolts which secure the power steering pipe brackets to intake manifold.

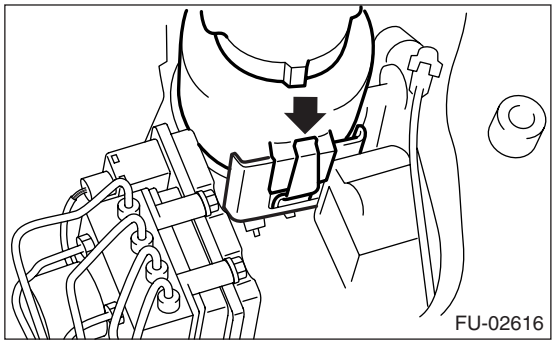
CAUTION:
Do not disconnect the power steering hose.


FU-00018

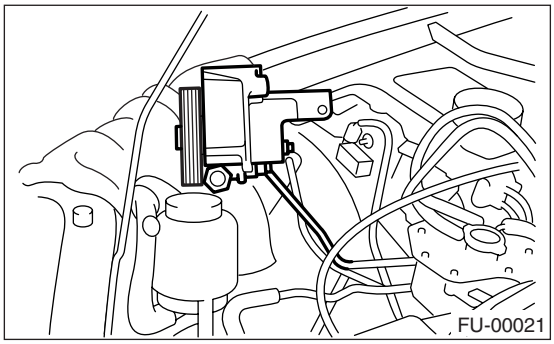
(4) Remove the bolts which secure the power steering pump bracket.


FU-00019

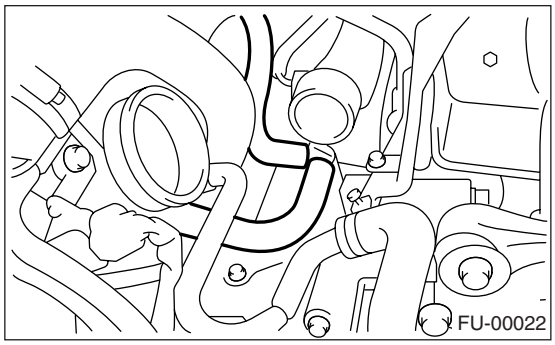
(5) Remove the power steering tank from the bracket by pulling it upward.


FU-02616

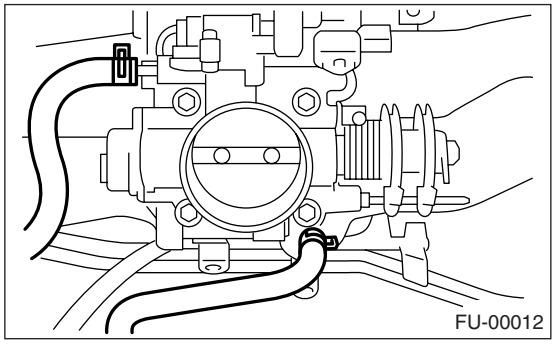
(6) Place the power steering pump on right side wheel apron.



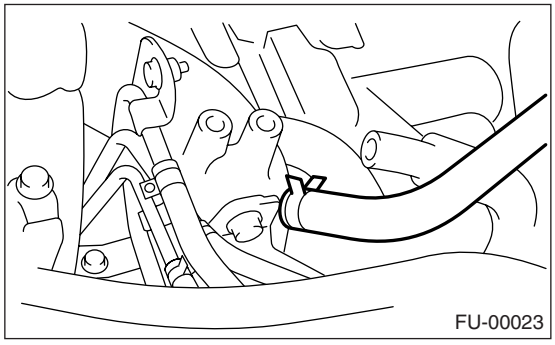
13) Disconnect the emission hose from PCV valve.



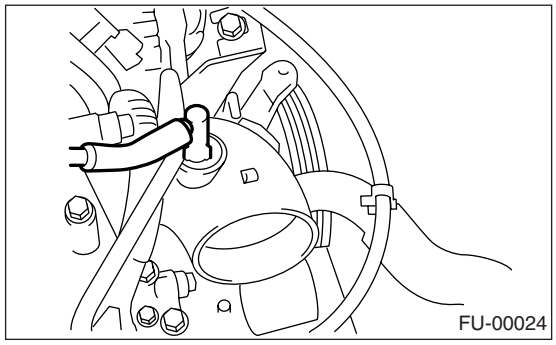
14) Disconnect the engine coolant hoses from throttle body.



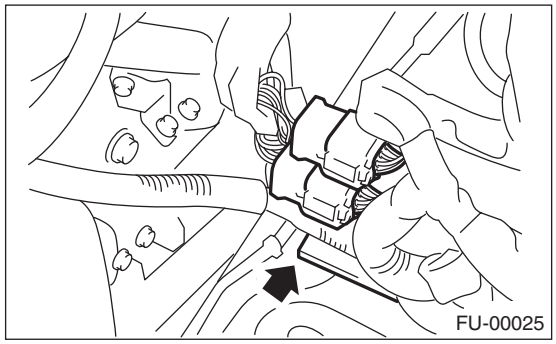
15) Disconnect the brake booster hose.

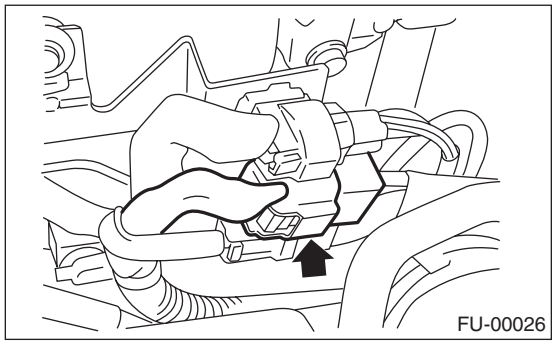


16) Disconnect the pressure hose from intake duct.

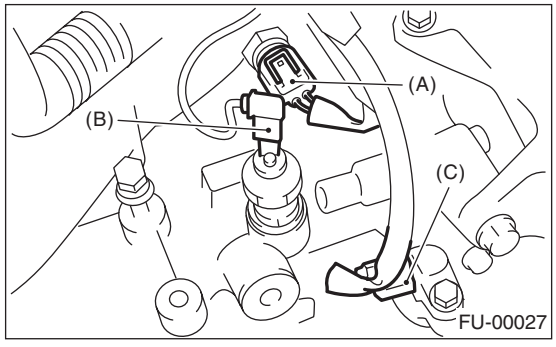


17) Disconnect the engine harness connectors from bulkhead harness connectors.

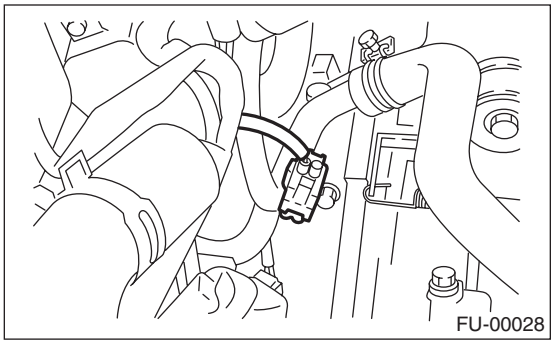




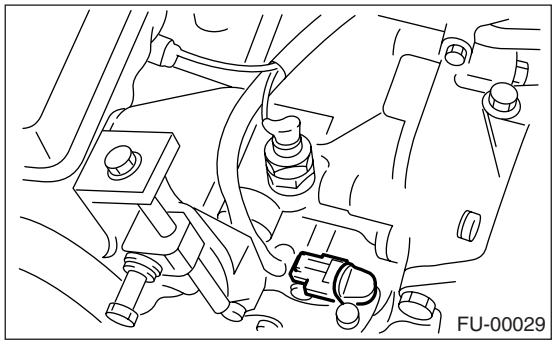
18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



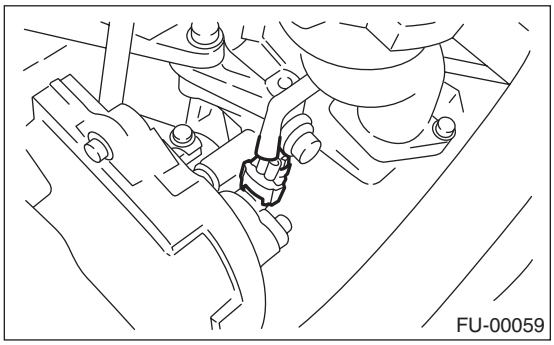
19) Disconnect the knock sensor connector.



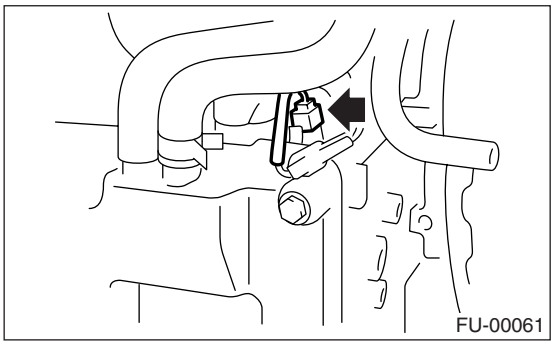
20) Disconnect the connector from crankshaft position sensor.



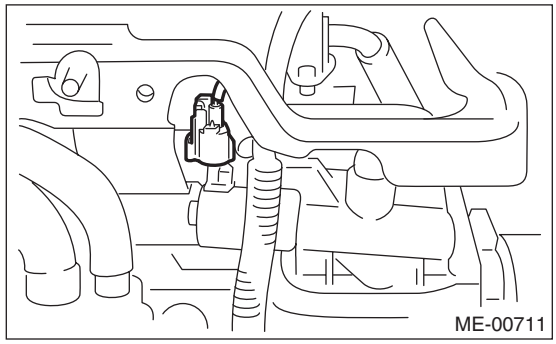
21) Disconnect the connector from camshaft position sensor.



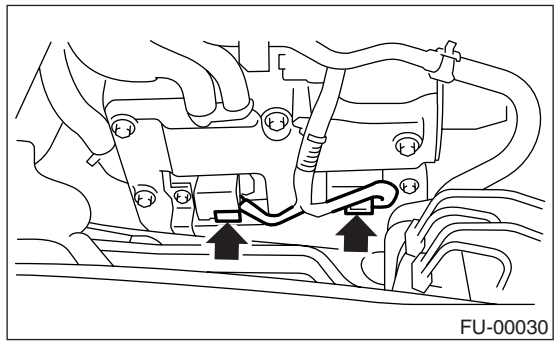
22) Disconnect the connector from AVCS camshaft position sensor.



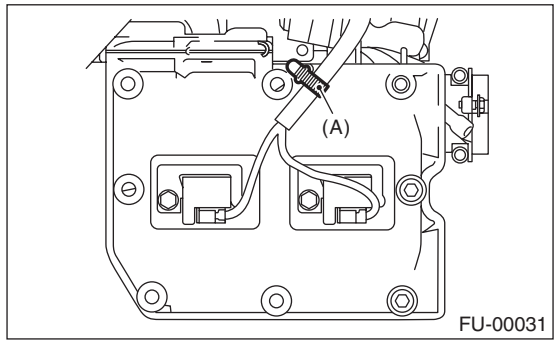
23) Disconnect the connector from oil flow control solenoid valve.



24) Disconnect the connector from ignition coil.

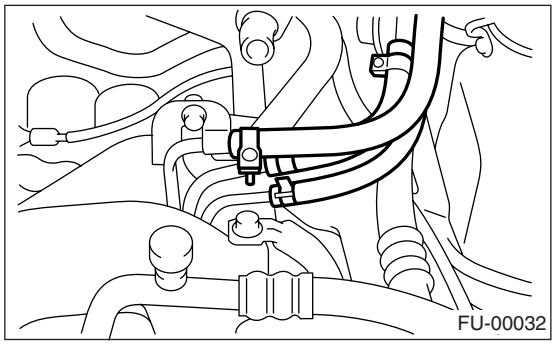


25) Disconnect the engine harness fixed by clip (A) from bracket.

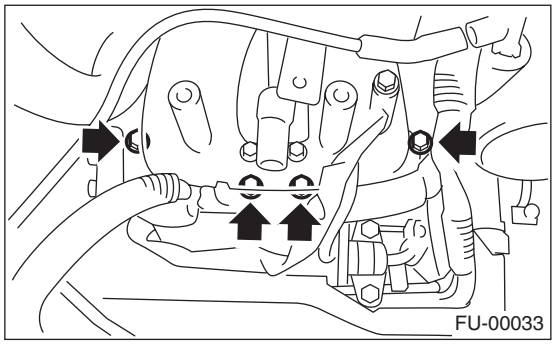


26) Disconnect the fuel delivery hose, return hose and evaporation hose.

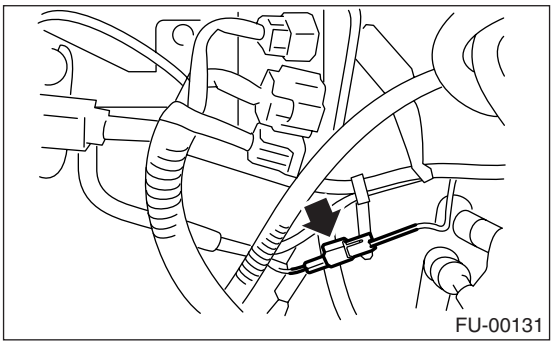
CAUTION:
• Do not spill fuel.
• Catch the fuel from hoses in a container or cloth.

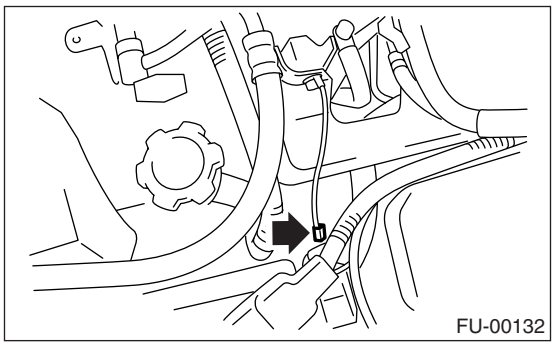


27) Remove the bolts which secure the intake manifold to cylinder heads.



28) Disconnect the ground cable connector.





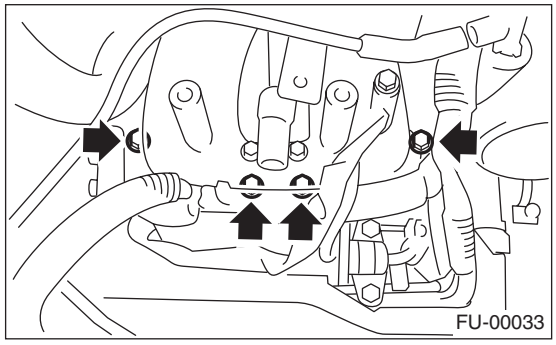
29) Remove the intake manifold.

B: INSTALLATION

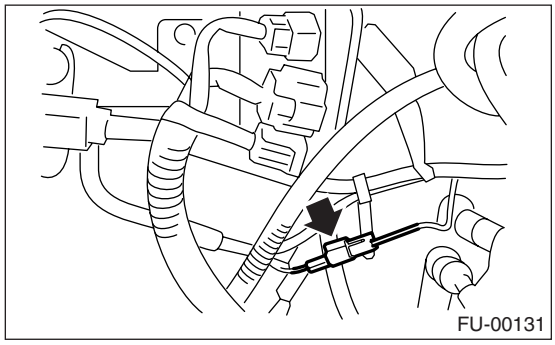
1) Install the intake manifold onto cylinder heads.

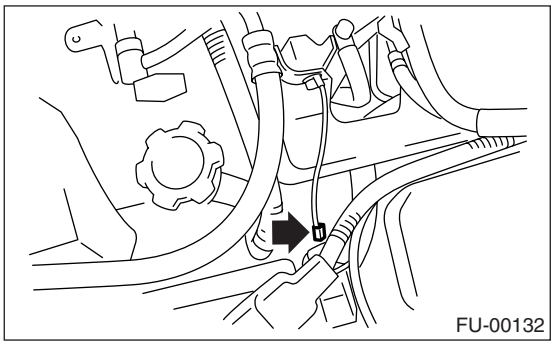
NOTE:
Always use new gaskets.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

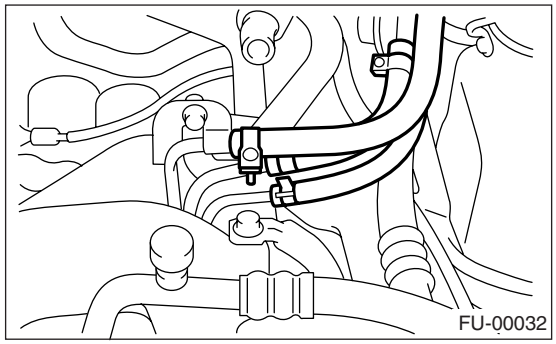


2) Connect the ground cable.

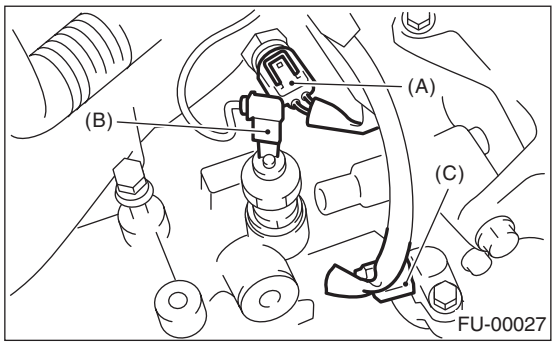




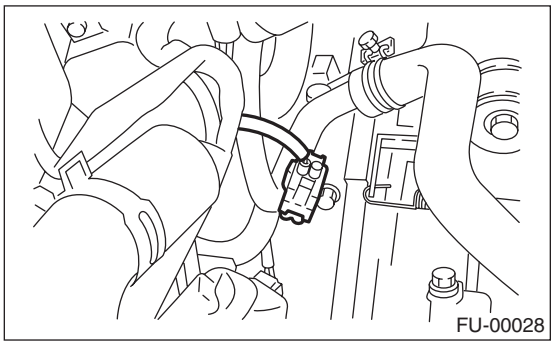
3) Connect the fuel delivery hose, return hose and evaporation hose.



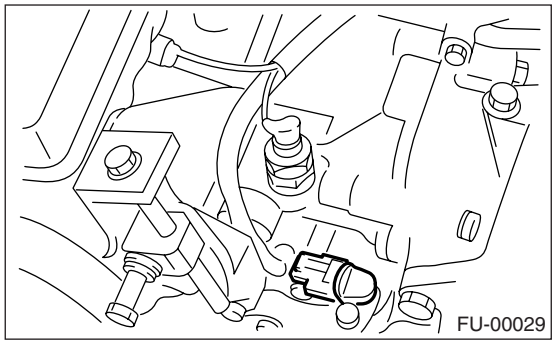
4) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



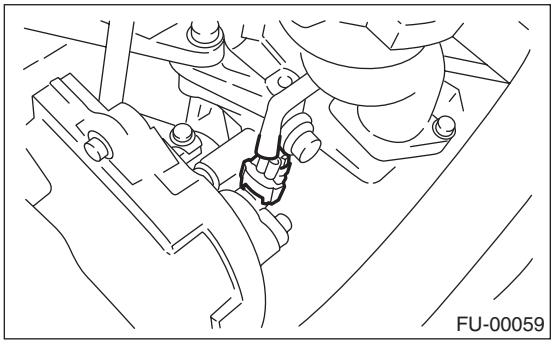
5) Connect the connector to knock sensor.



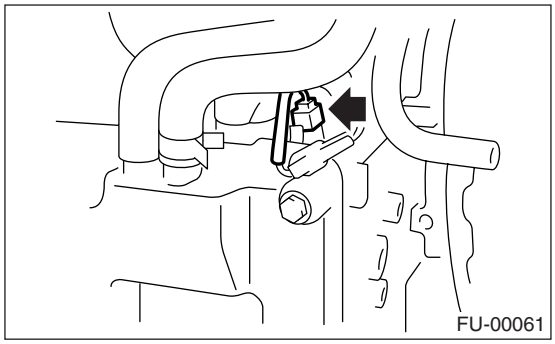
6) Connect the connector to crankshaft position sensor.



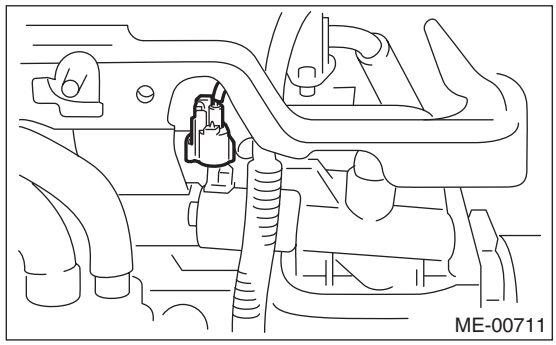
7) Connect the connector to camshaft position sensor.



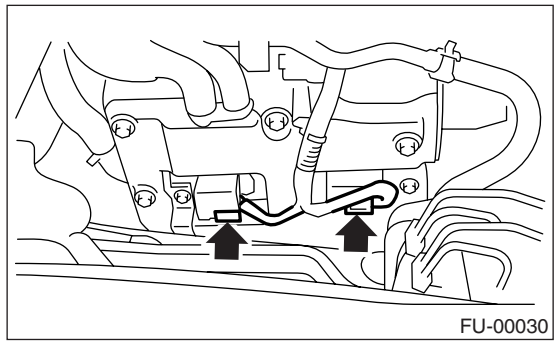
8) Connect the connector to AVCS camshaft position sensor.



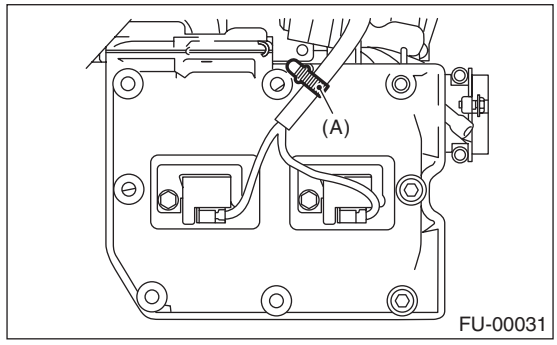
9) Connect the connector to oil flow control solenoid valve.



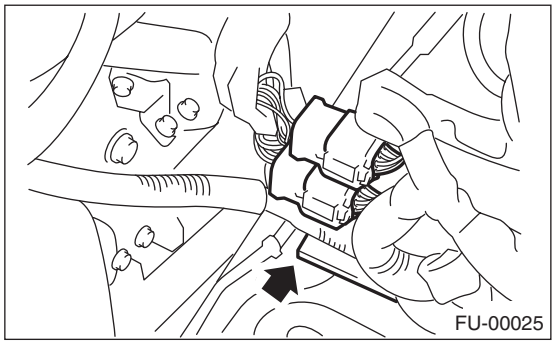
10) Connect the connector to ignition coil.

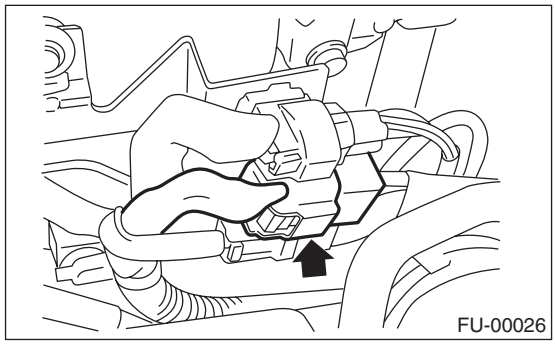


11) Connect the engine harness with clip (A) to the bracket.

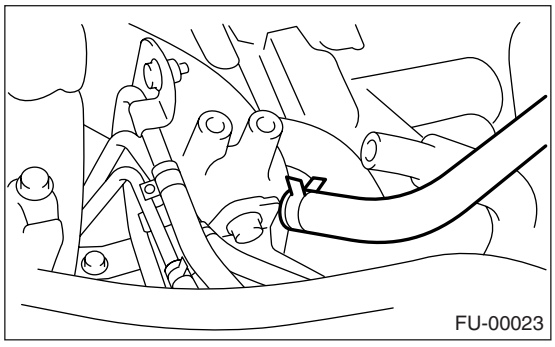


12) Connect the engine harness connector to bulkhead harness connectors.

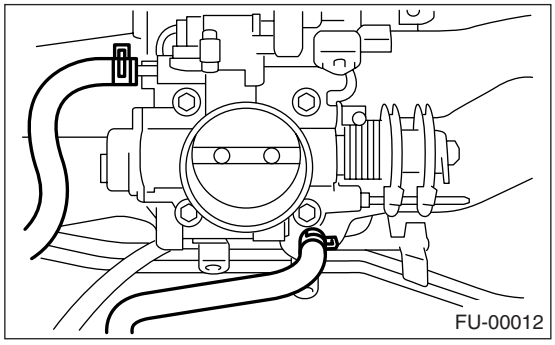




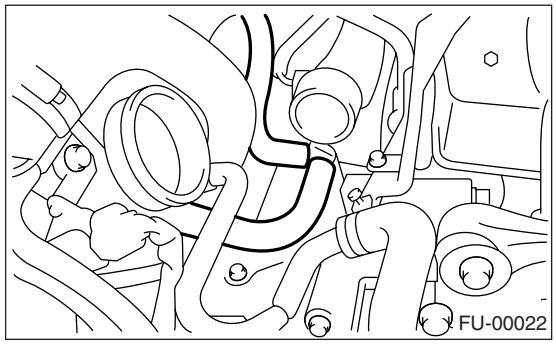
13) Connect the brake booster vacuum hose.



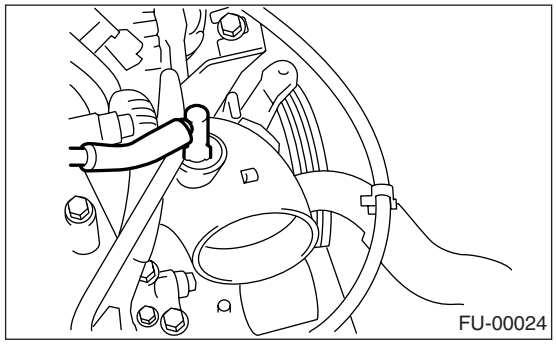
14) Connect the engine coolant hoses to throttle body.



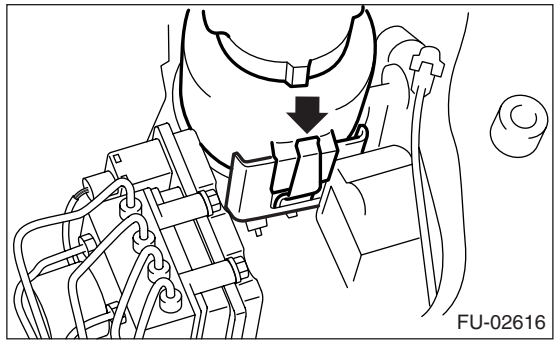
15) Connect the emission hose to PCV valve.



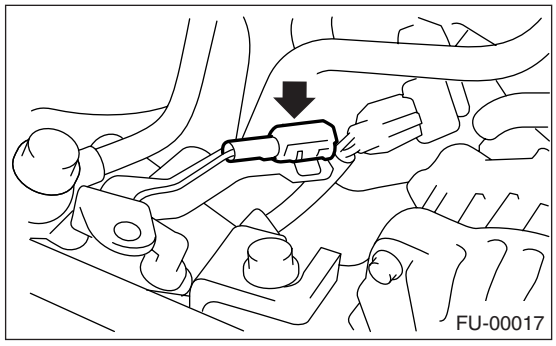
16) Connect the pressure hose to intake duct.



17) Install the power steering pump.
(1) Install the power steering tank on bracket.

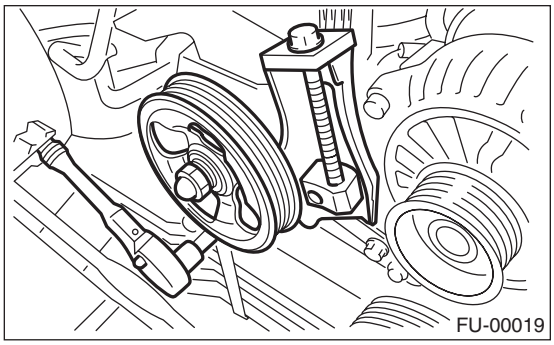


(2) Connect the connector to the power steering pump switch.

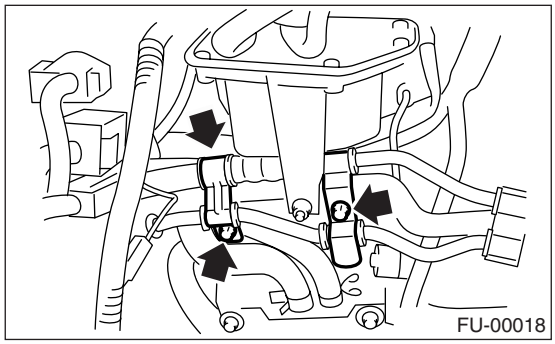


(3) Install the power steering pump, and then tighten the bolts.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)



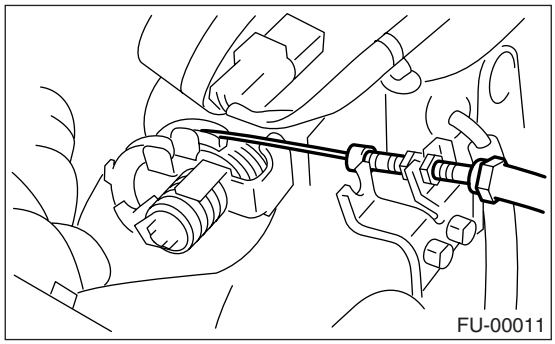
(4) Install the power steering pipe brackets on right side intake manifold.



(5) Install the front side V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

18) Install the coolant filler tank. **<Ref. to CO(H4SO)-42,** INSTALLATION**, Coolant Filler Tank.>**

19) Connect the accelerator cable. **<Ref. to SP(H4SO)-9,** INSTALLATION**, Accelerator Control Cable.>**

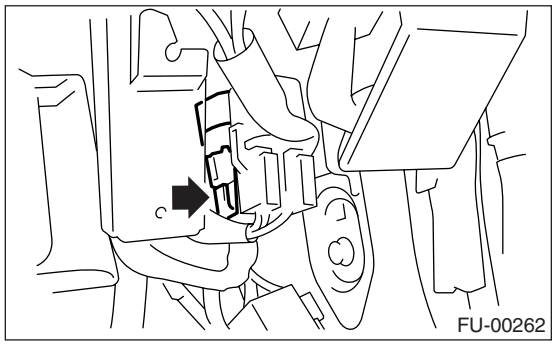


20) Install the intercooler. **<Ref. to IN(H4DOTC 2.0)-11,** INSTALLATION, Intercooler.>

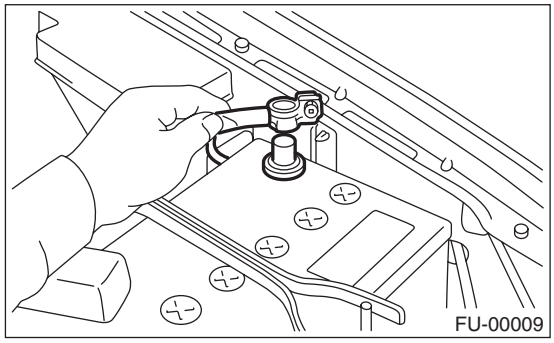
21) Install the air cleaner element.

22) Install the air cleaner upper cover and air intake duct as a unit. **<Ref. to IN(H4DOTC 2.0)-7,** INSTALLATION**, Air Cleaner Case.>**

23) Connect the connector to the fuel pump relay.



24) Connect the battery ground cable to battery.



25) Lift-up the vehicle.

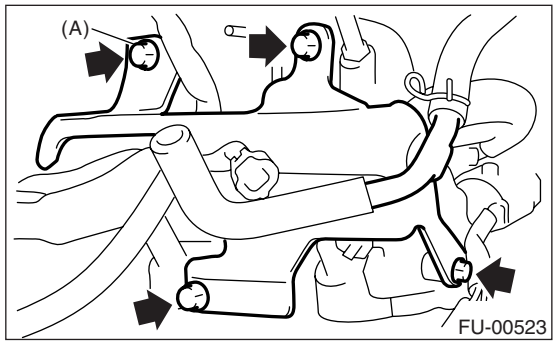
26) Install the under cover.

27) Fill the engine coolant. **<Ref. to CO(H4SO)-19,** FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**

C: DISASSEMBLY

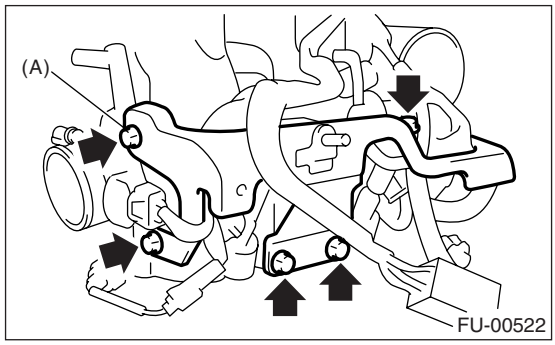
1) Remove the fuel pipe protector LH.

NOTE:
Bolt (A) is tightened together with ground cable.

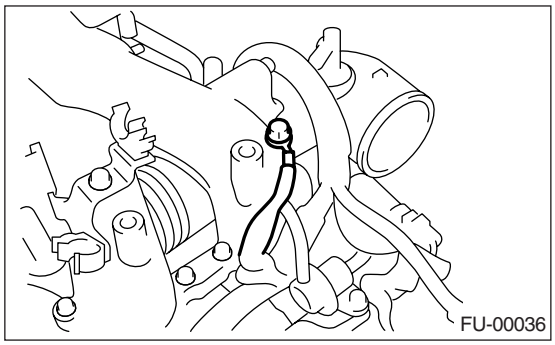


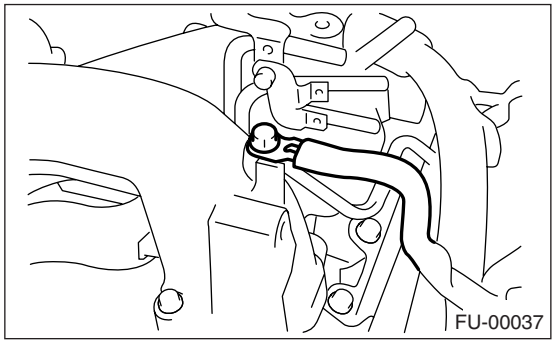
2) Remove the fuel pipe protector RH.

NOTE:
Bolt (A) is tightened together with ground cable.

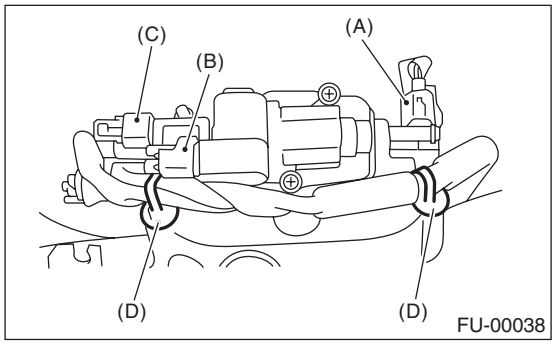


3) Remove the engine ground cable from intake manifold.

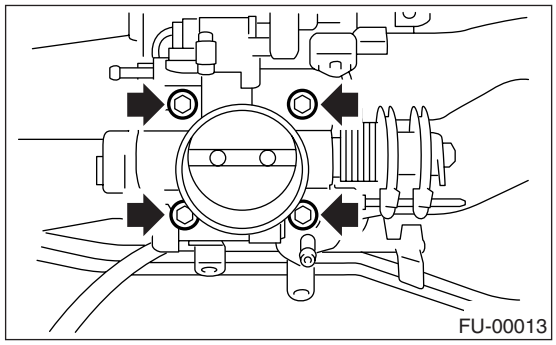




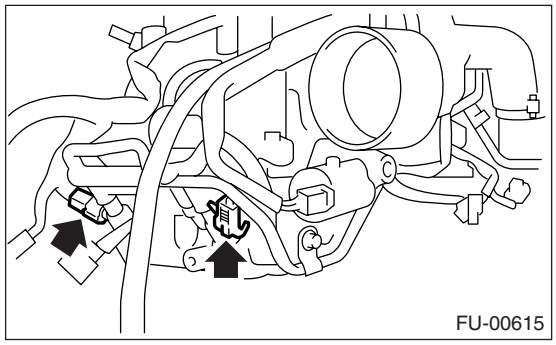
4) Disconnect the connector from the throttle position sensor (A), idle air control solenoid valve (B) and manifold absolute pressure sensor (C).
5) Disconnect the engine harness fixed by clip (D) from intake manifold.



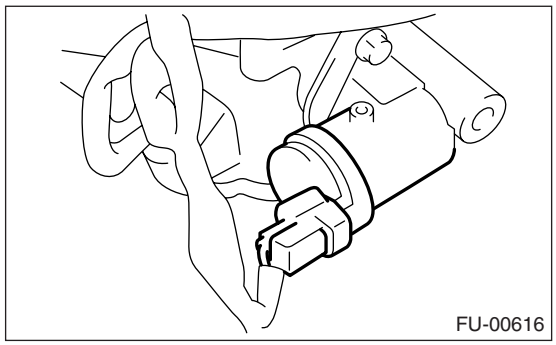
6) Remove the throttle body from intake manifold.



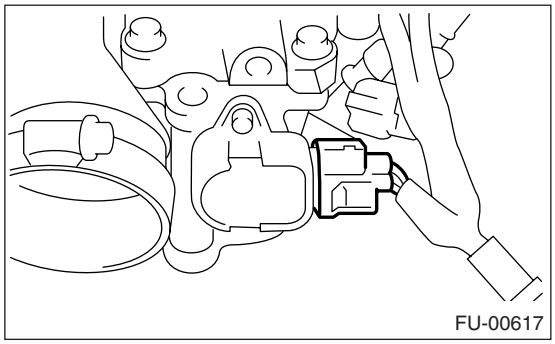
7) Disconnect the connector from fuel injector.



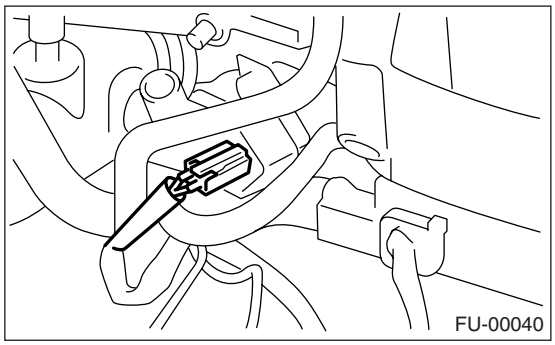
8) Disconnect the connector from tumble generator valve actuator.



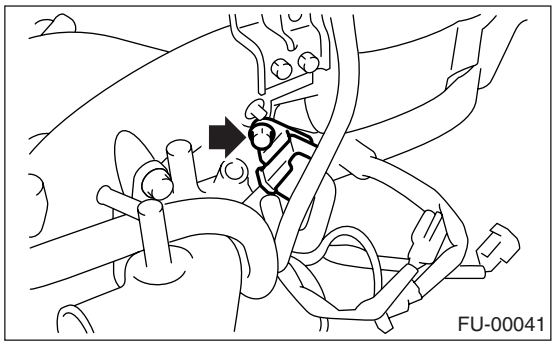
9) Disconnect the connector from tumble generator valve sensor.



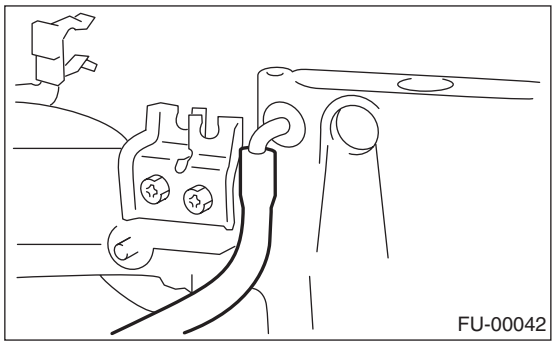
10) Disconnect the connector from purge control solenoid valve.



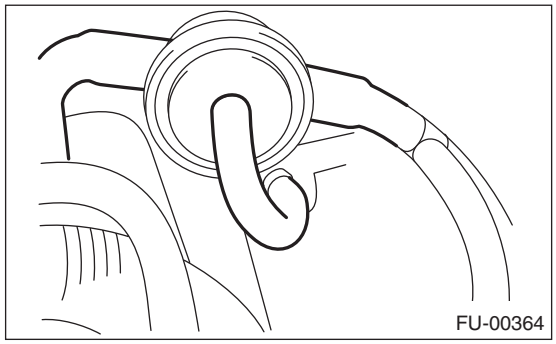
11) Remove the purge control solenoid valve.



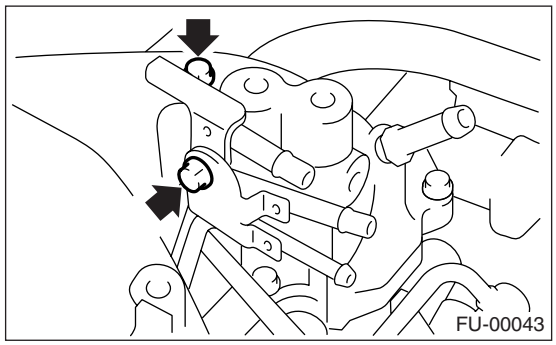
12) Disconnect the evaporation hose from intake manifold.



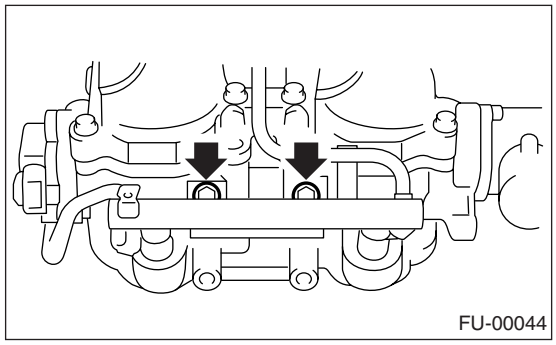
13) Disconnect the evaporation hose from purge valve.

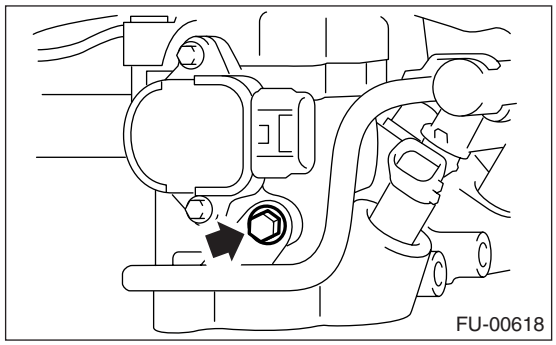


14) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.

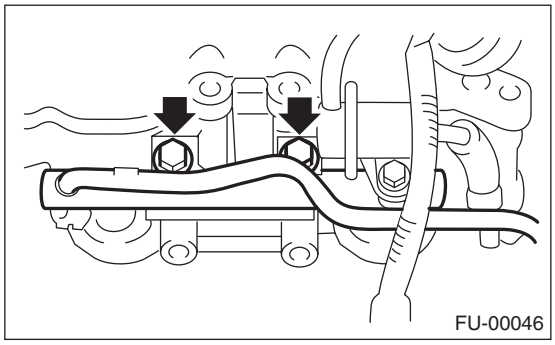


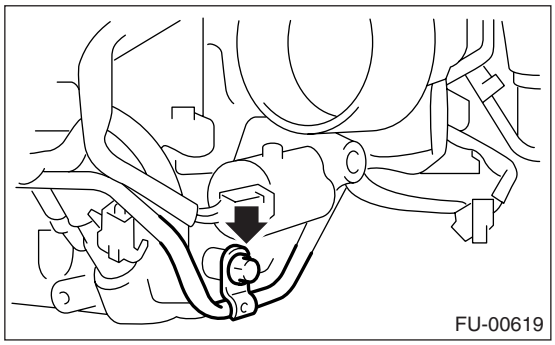
15) Remove the bolts which hold the fuel injector pipe onto intake manifold.
- LH SIDE



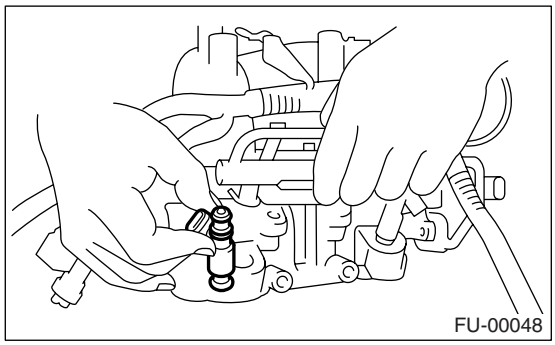


- RH SIDE

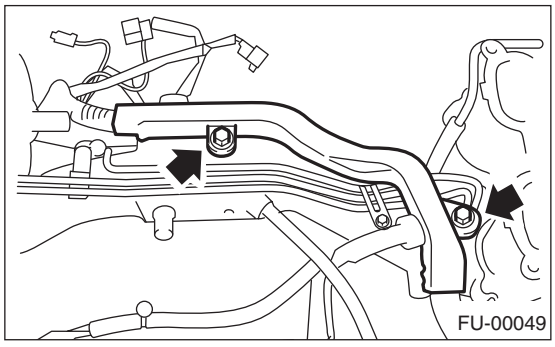




16) Remove the fuel injector.

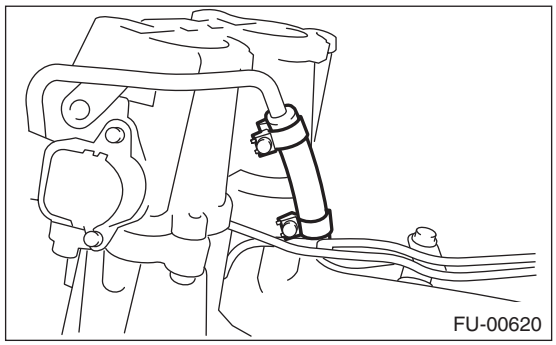


17) Remove the harness bracket which holds the engine harness onto intake manifold.

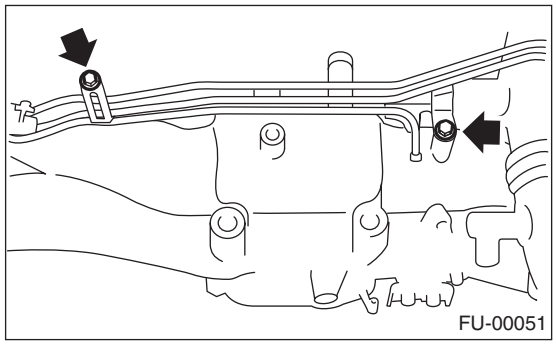


18) Remove the engine harness from intake manifold.

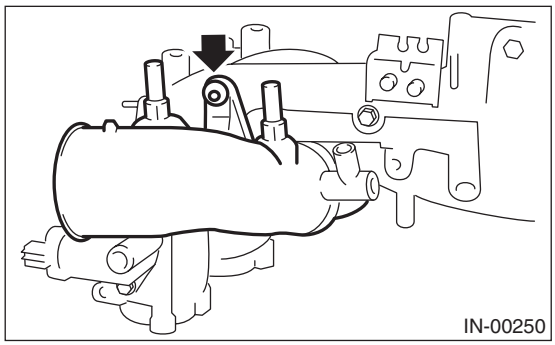
19) Loosen the clamp which holds the front left side fuel hose to injector pipe, and remove the pipe from clamp.



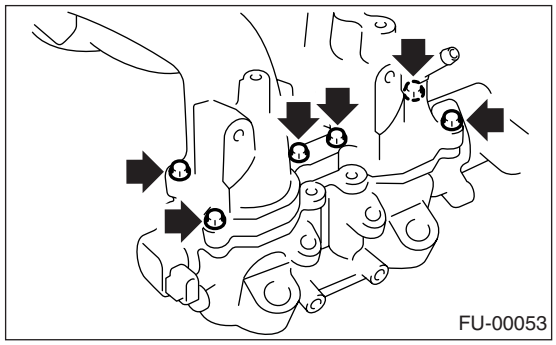
20) Remove the fuel injector pipe LH.
21) Remove the bolts which install the fuel pipe on intake manifold.



22) Remove the fuel pipe assembly and pressure regulator from intake manifold.
23) Remove the intake duct from intake manifold.



24) Remove the intake manifold.

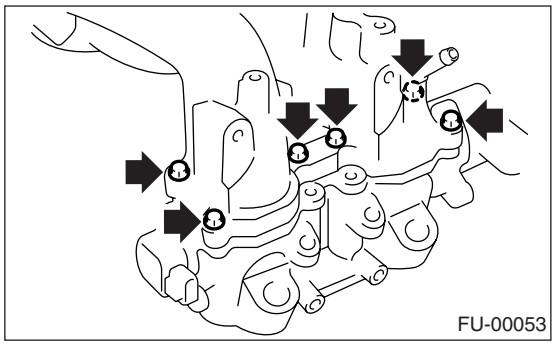


D: ASSEMBLY

NOTE:
Replace the gasket with a new one.

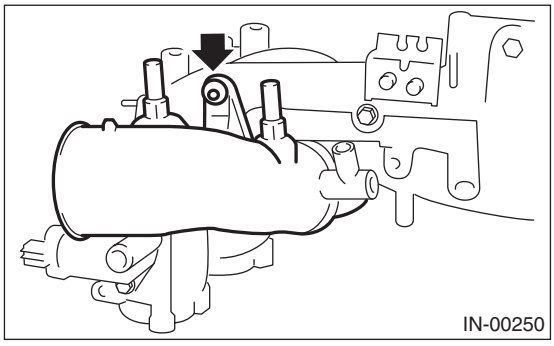
1) Install the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



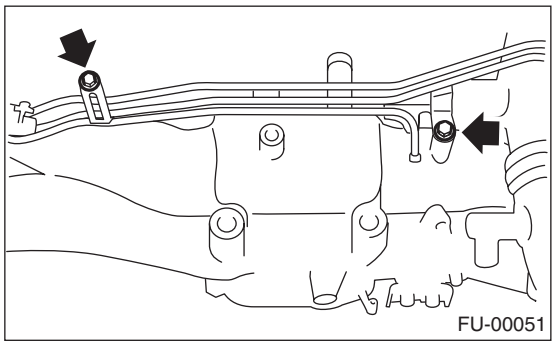
2) Install the air intake duct to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



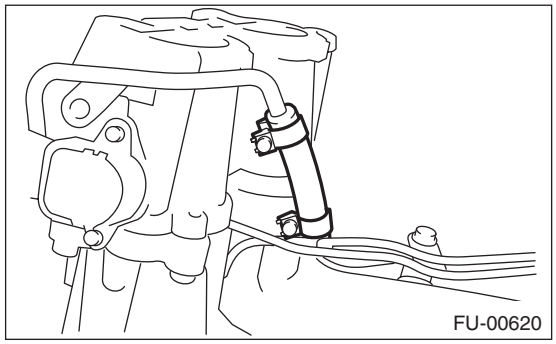
3) Install the fuel pipe assembly and pressure regulator to intake manifold.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



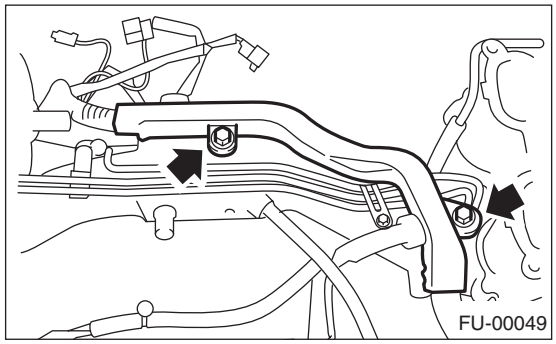
4) Install the fuel injector pipe LH.

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.

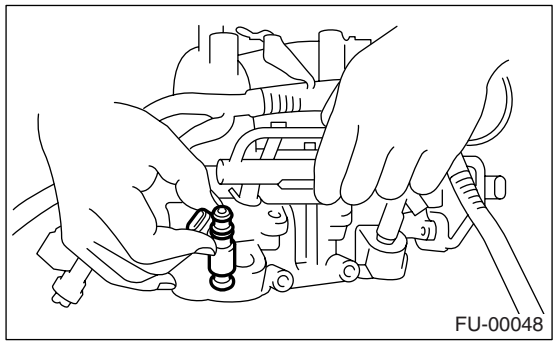


6) Install the engine harness to intake manifold.
7) Install the harness bracket which holds the engine harness onto intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



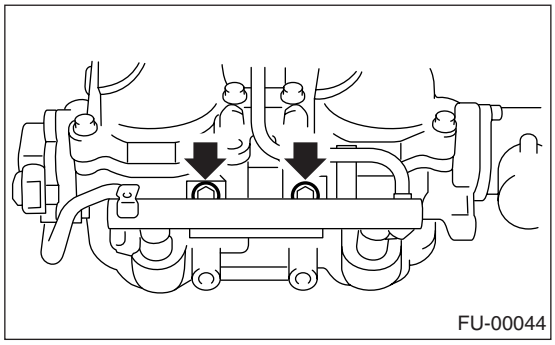
8) Install the fuel injector.

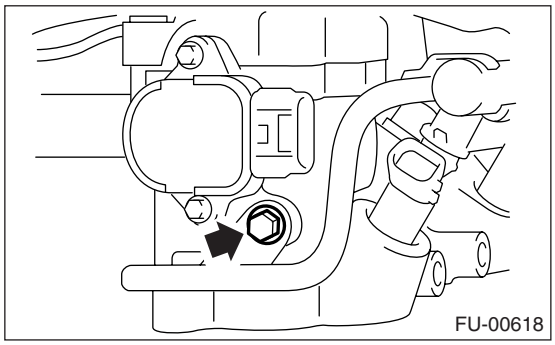


9) Tighten the bolts which install the fuel injector pipe onto intake manifold.

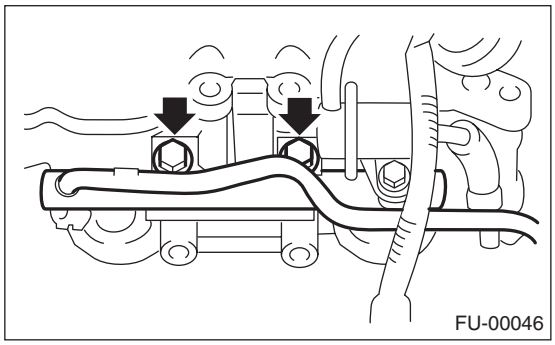
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

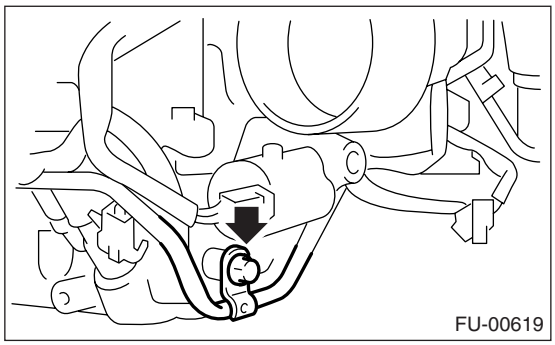
- LH SIDE





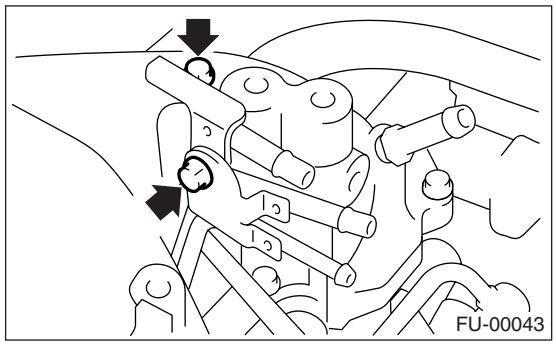
- RH SIDE





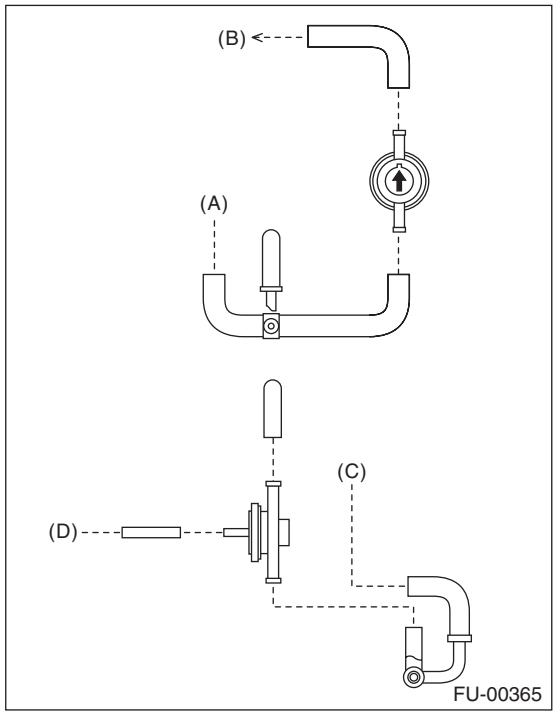
10) Tighten the two bolts which install the fuel pipe assembly on the left side of intake manifold.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



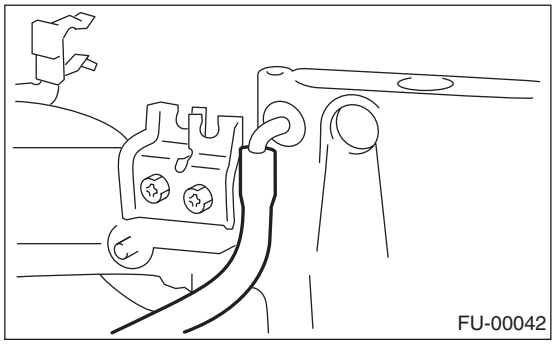
11) Connect the evaporation hoses to the purge valve. (Except Australia model)

NOTE:
Connect the evaporation hose as shown in the figure.



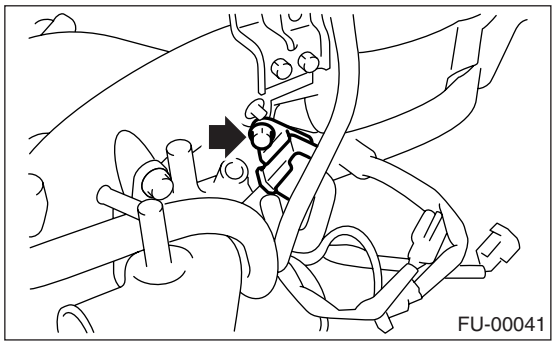
(A) To fuel pipe ASSY
(B) To intake duct
(C) To purge control solenoid valve
(D) To intake manifold

12) Connect the evaporation hose to intake manifold.



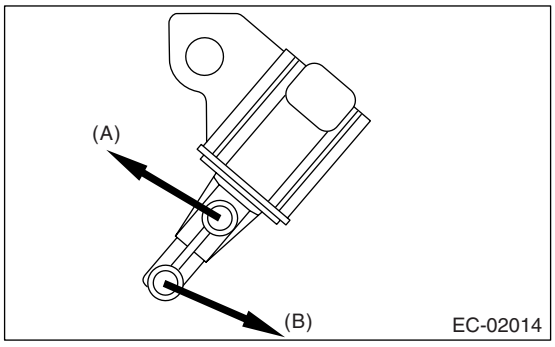
13) Install the purge control solenoid valve.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



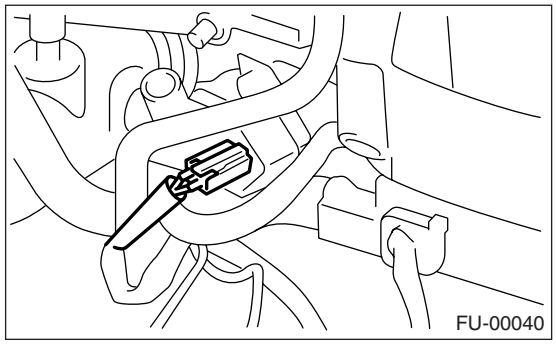
14) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hose as shown in the figure.

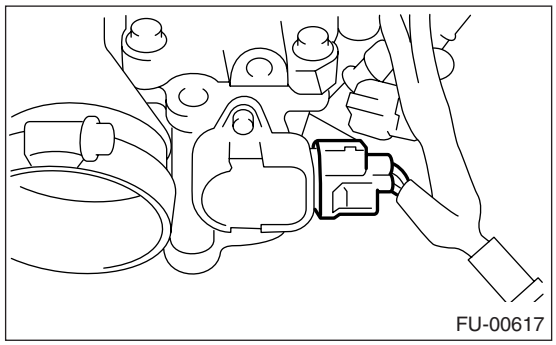


(A) To intake manifold
(B) To purge valve

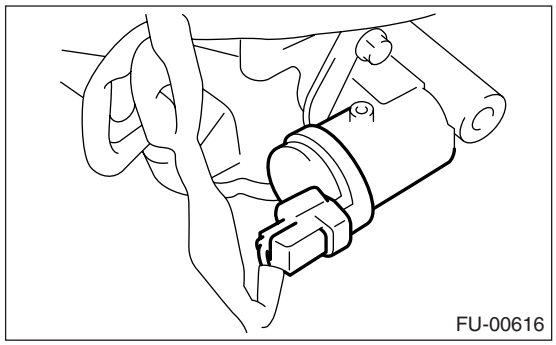
15) Connect the connector to the purge control solenoid valve.



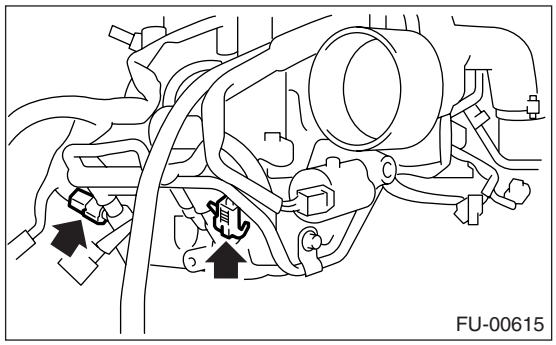
16) Connect the connector to the tumble generator valve sensor.



17) Connect the connector to the tumble generator valve actuator.



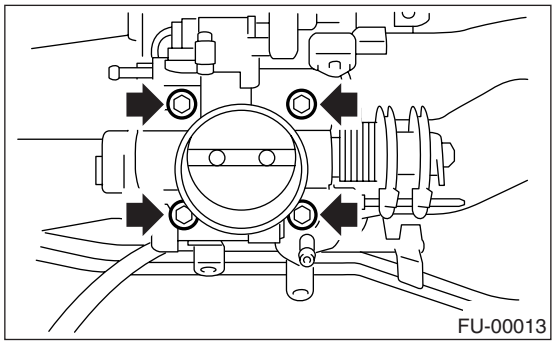
18) Connect the connector to fuel injector.



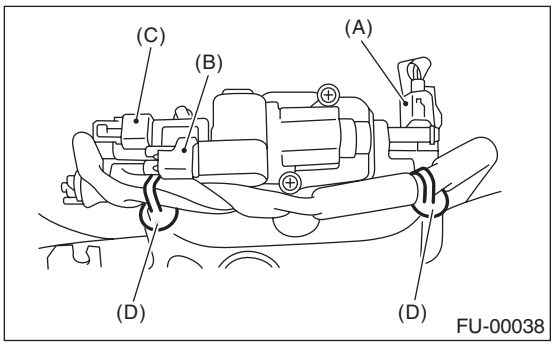
19) Install the throttle body to intake manifold.

NOTE:
Replace the gasket with a new one.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

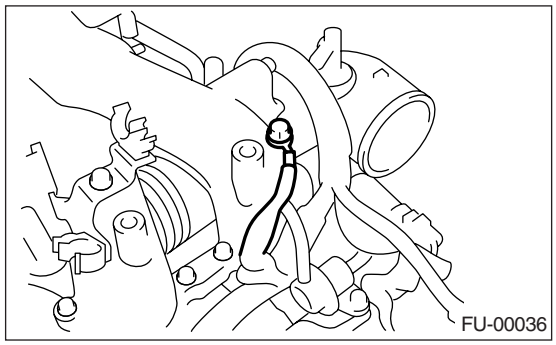


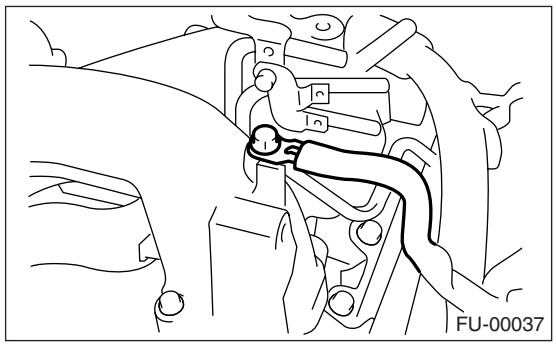
20) Connect the connector to the throttle position sensor (A), idle air control solenoid valve (B) and manifold absolute pressure sensor (C).
21) Connect the engine harness with clip (D) to intake manifold.



22) Install the engine ground cable to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

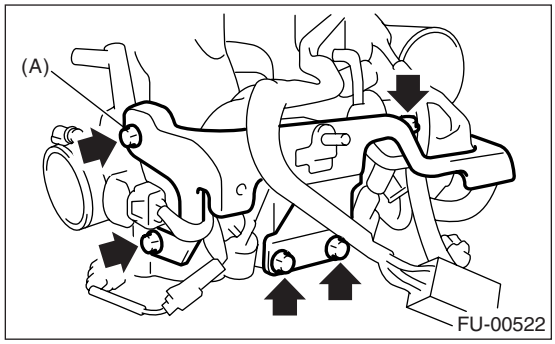




23) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

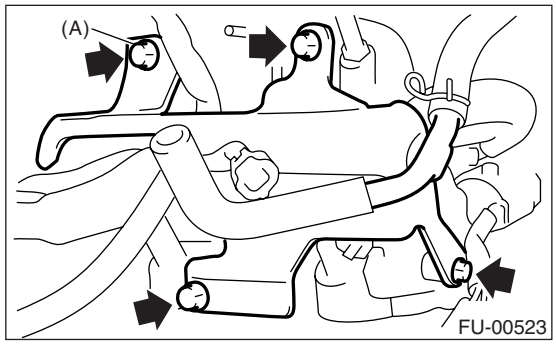
NOTE:
Bolt (A) is tightened together with ground cable. Tighten it securely.



24) Install the fuel pipe protector LH.

NOTE:
Bolt (A) is tightened together with ground cable. Tighten it securely.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



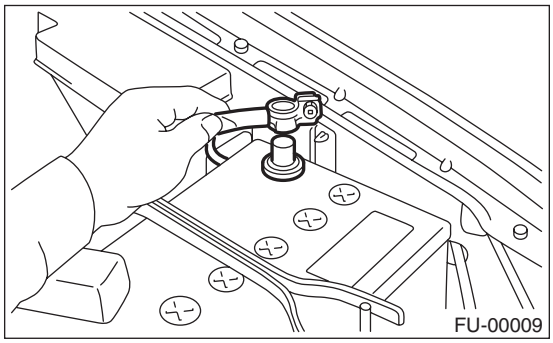
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened firmly.

4. Engine Coolant Temperature Sensor

A: REMOVAL

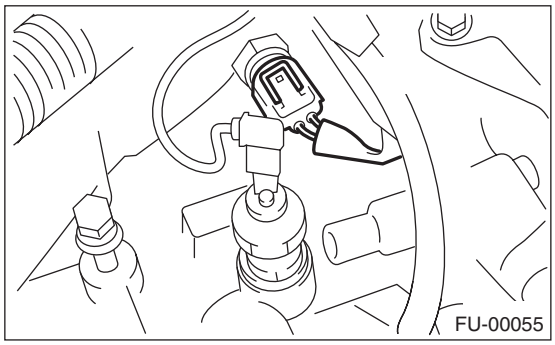
1) Disconnect the ground cable from battery.



2) Remove the generator. **<Ref. to SC(H4SO)-15,** REMOVAL**, Generator.>**

3) Drain the engine coolant.
<Ref. to CO(H4SO)-19, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

4) Disconnect the connector from engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

B: INSTALLATION

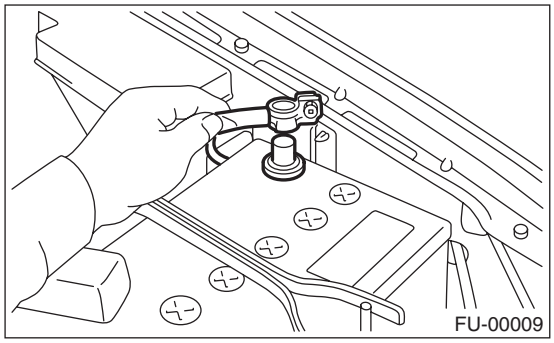
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

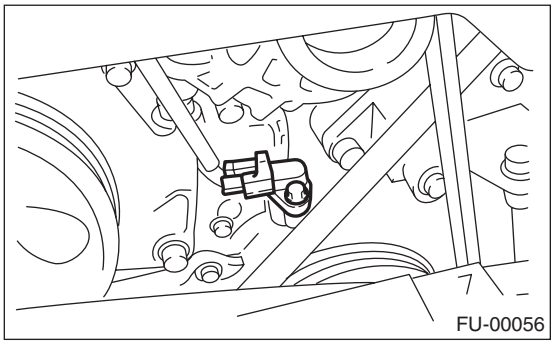
5. Crankshaft Position Sensor

A: REMOVAL

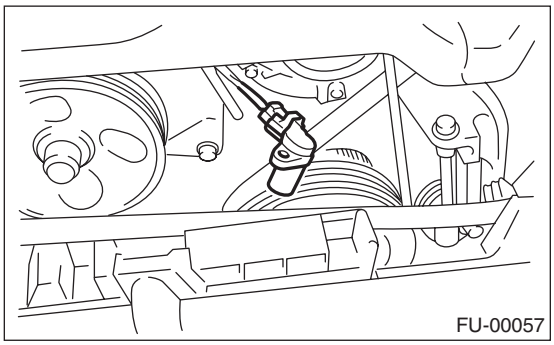
1) Disconnect the ground cable from battery.



2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



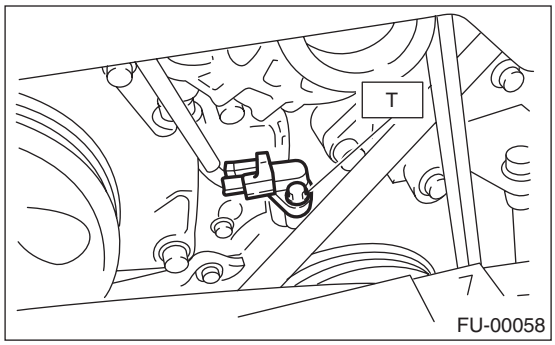
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

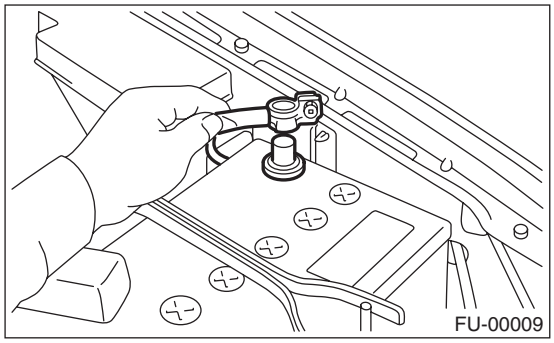
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



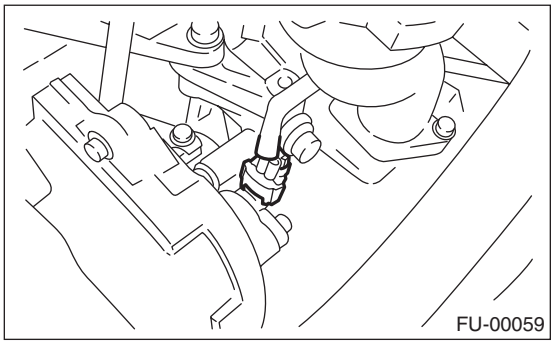
6. Camshaft Position Sensor

A: REMOVAL

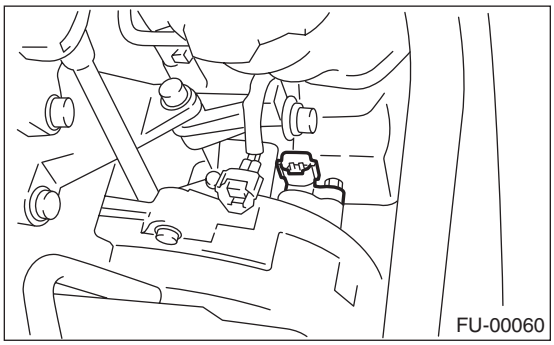
1) Disconnect the ground cable from battery.



2) Disconnect the connector from camshaft position sensor.



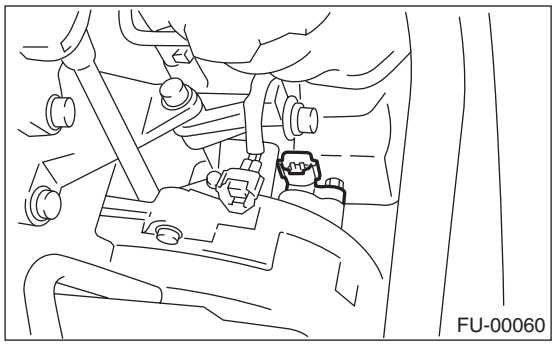
3) Remove the camshaft position sensor from camshaft support LH.



B: INSTALLATION

Install in the reverse order of removal.

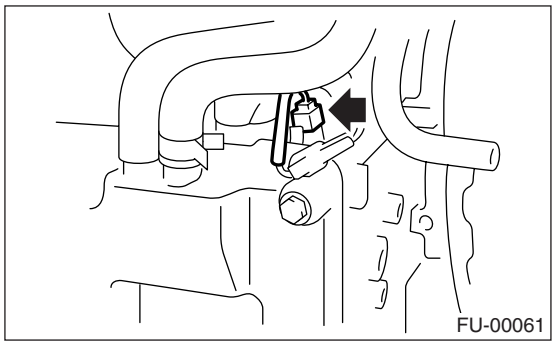
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



7. AVCS Camshaft Position Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the intercooler. **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>
3) Remove the intake manifold. **<Ref. to FU(H4DOTC 2.0)-14,** REMOVAL**, Intake Manifold.>**
4) Disconnect the AVCS camshaft position sensor connector.
5) Remove the AVCS camshaft position sensor.



B: INSTALLATION

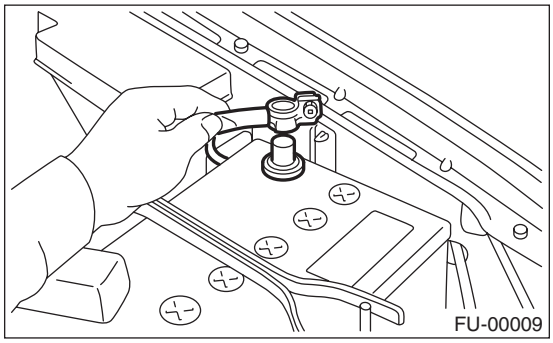
Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

8. Knock Sensor

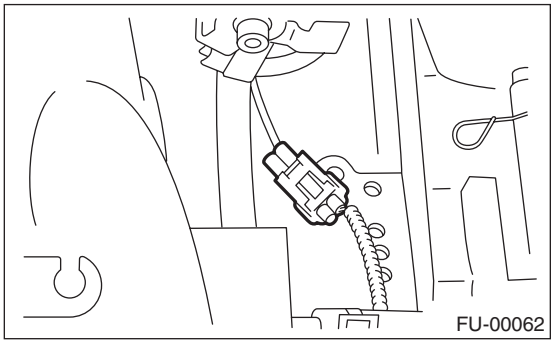
A: REMOVAL

1) Disconnect the ground cable from battery.

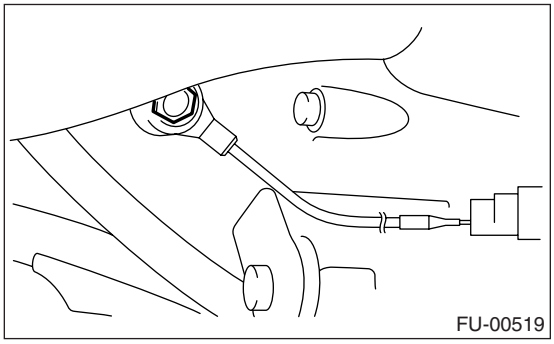


2) Remove the intercooler. **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>

3) Disconnect the knock sensor connector.



4) Remove the knock sensor from cylinder block.

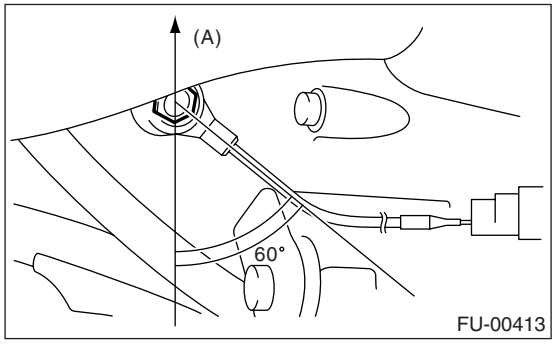


B: INSTALLATION

1) Install the knock sensor to cylinder block.

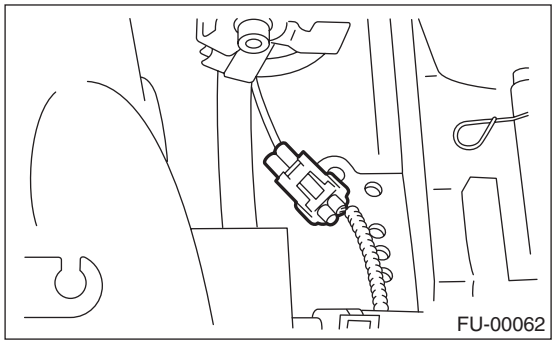
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
Extraction area of knock sensor cord must be positioned at a 60° angle relative to engine rear.



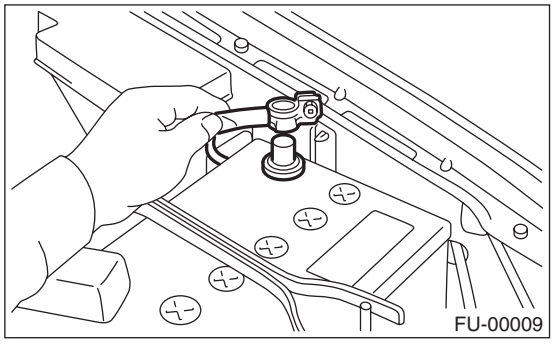
(A) Front side

2) Connect the knock sensor connector.



3) Install the intercooler. **<Ref. to IN(H4DOTC 2.0)-11,** INSTALLATION, Intercooler.>

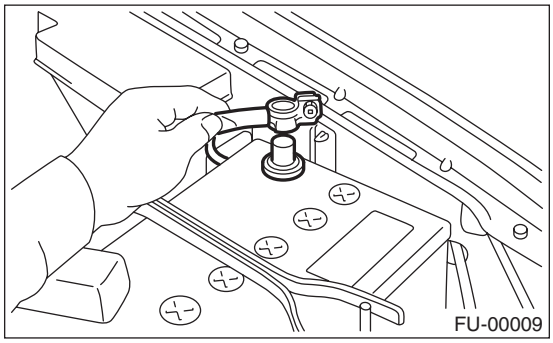
4) Connect the battery ground cable to battery.



9. Throttle Position Sensor

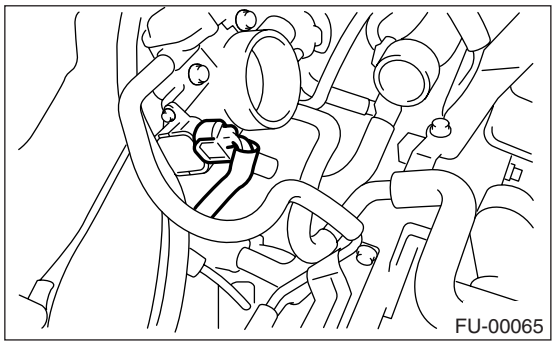
A: REMOVAL

1) Disconnect the ground cable from battery.

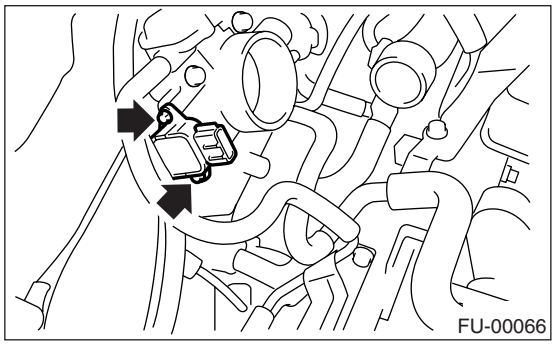


2) Remove the intercooler. **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>

3) Disconnect the connector from throttle position sensor.



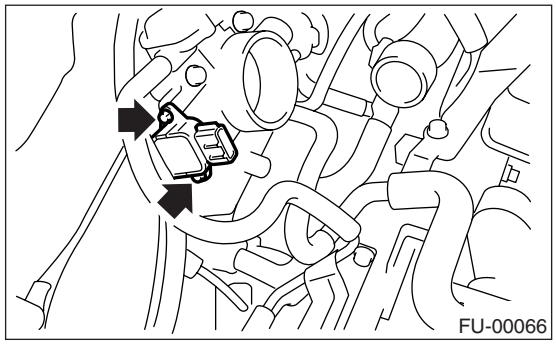
4) Remove the throttle position sensor holding screws, and remove it.



B: INSTALLATION

Install in the reverse order of removal.

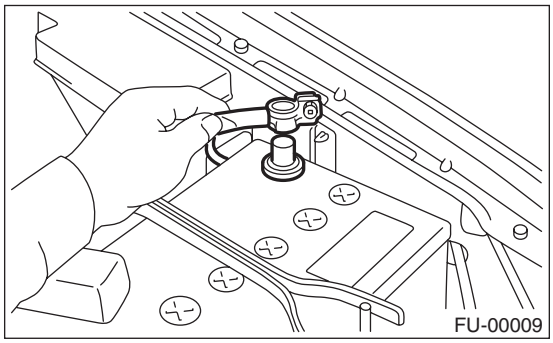
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



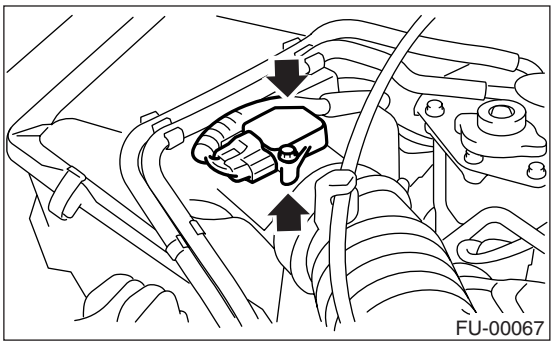
10.Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

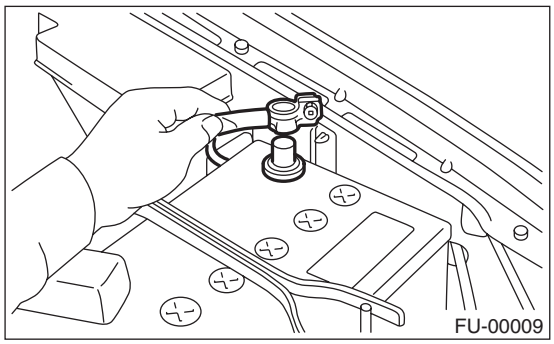
Install in the reverse order of removal.

Tightening torque:
1.7 N·m (0.17 kgf-m, 1.2 ft-lb)

11.Manifold Absolute Pressure Sensor

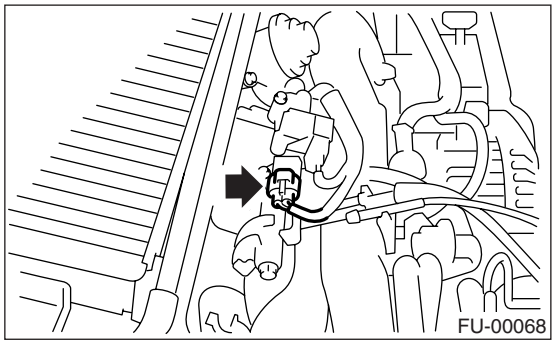
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the idle air control solenoid valve. **<Ref. to FU(H4DOTC 2.0)-37,** REMOVAL**, Idle Air Control Solenoid Valve.>**

3) Disconnect the connectors from manifold absolute pressure sensor.



4) Remove the manifold absolute pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

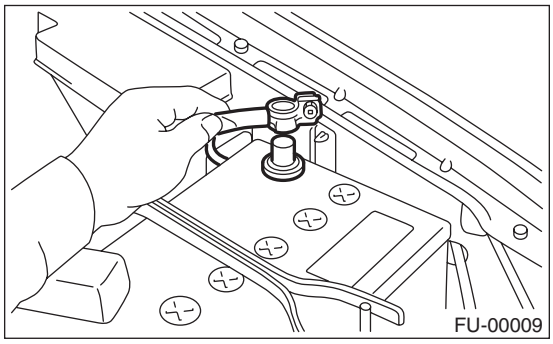
NOTE:
Replace the O-rings for manifold absolute pressure sensor with new ones.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

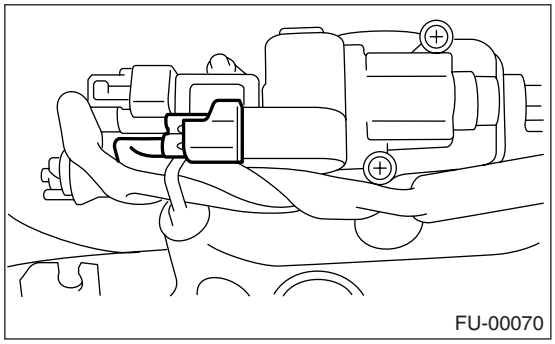
12.Idle Air Control Solenoid Valve

A: REMOVAL

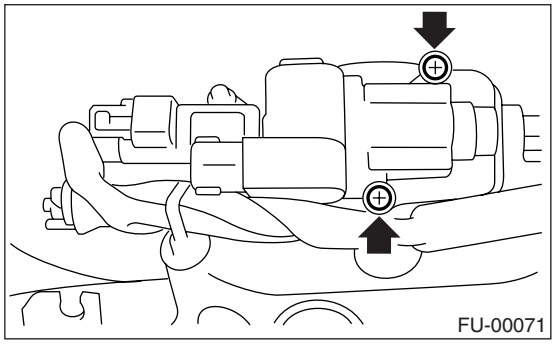
1) Disconnect the ground cable from battery.



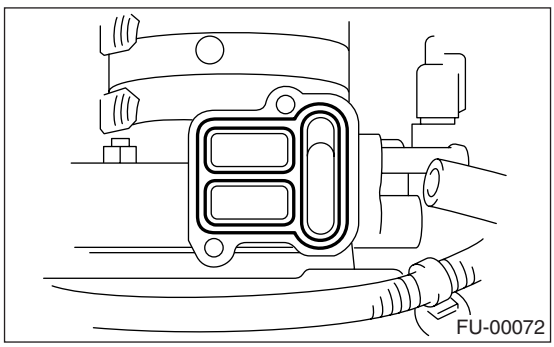
2) Disconnect the connector from idle air control solenoid valve.



3) Remove the idle air control solenoid valve from throttle body.



4) Remove the gasket from throttle body.

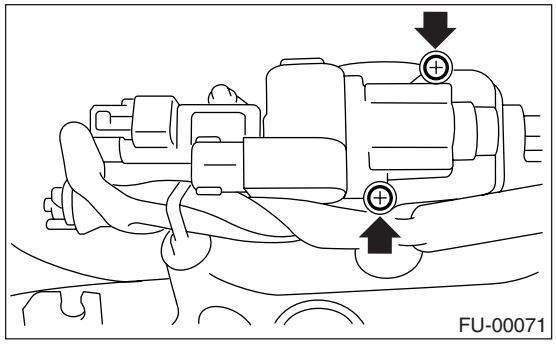


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
2.8 N·m (0.29 kgf-m, 2.1 ft-lb)

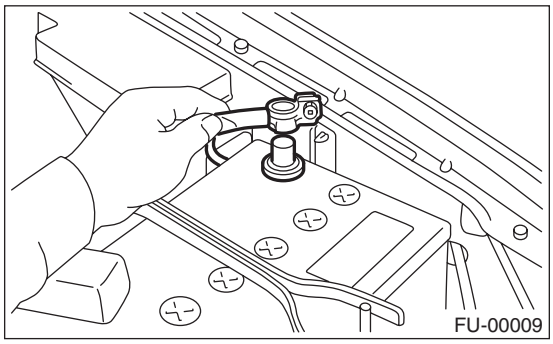


13.Fuel Injector

A: REMOVAL

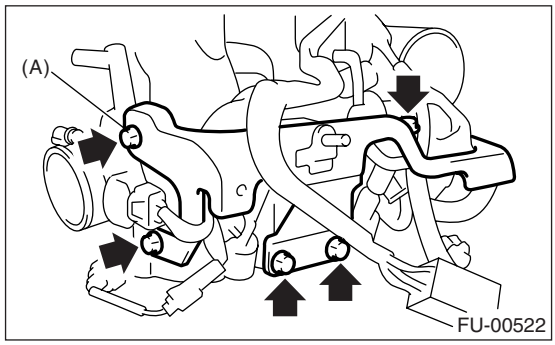
1. RH SIDE

1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

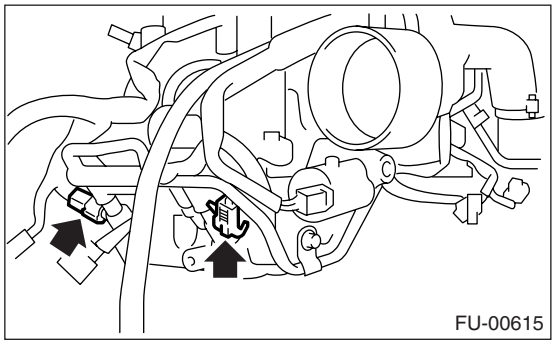


4) Remove the intake manifold. **<Ref. to FU(H4DOTC 2.0)-14,** REMOVAL**, Intake Manifold.>**
5) Remove the fuel pipe protector RH.

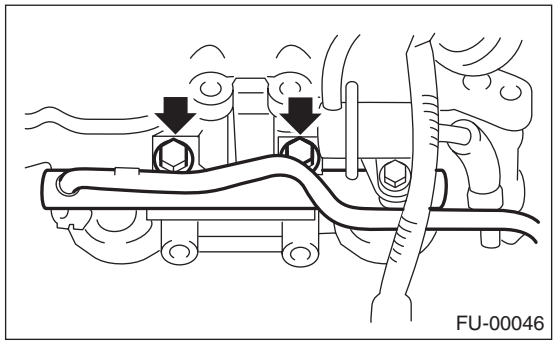
NOTE:
Bolt (A) is tightened together with ground cable.

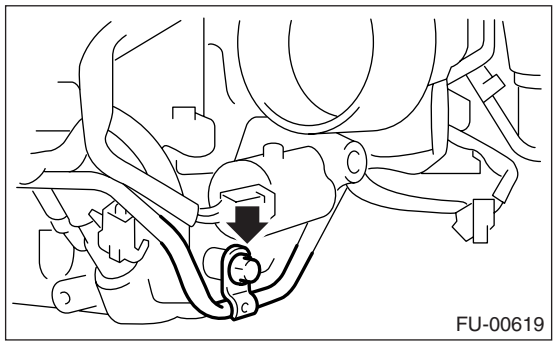


6) Disconnect the connector from fuel injector.

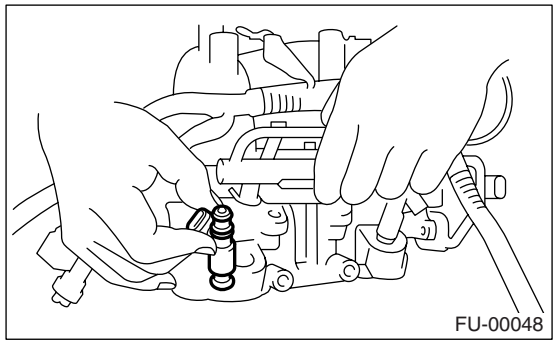


7) Remove the bolts which hold the injector pipe to intake manifold.



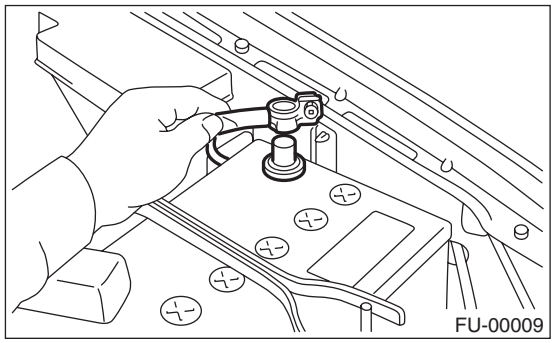


8) Remove the fuel injector while lifting up the fuel injector pipe.



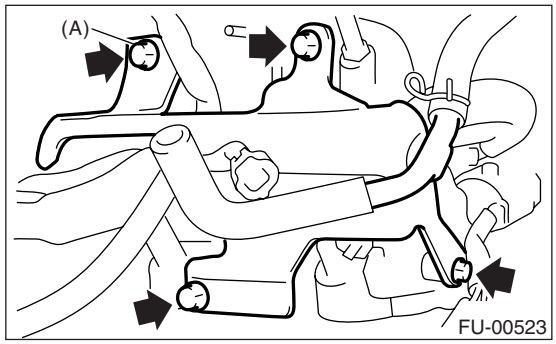
2. LH SIDE

1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

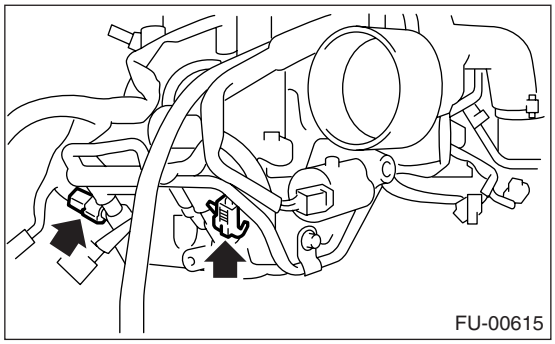


4) Remove the intake manifold. **<Ref. to FU(H4DOTC 2.0)-14,** REMOVAL**, Intake Manifold.>**
5) Remove the fuel pipe protector LH.

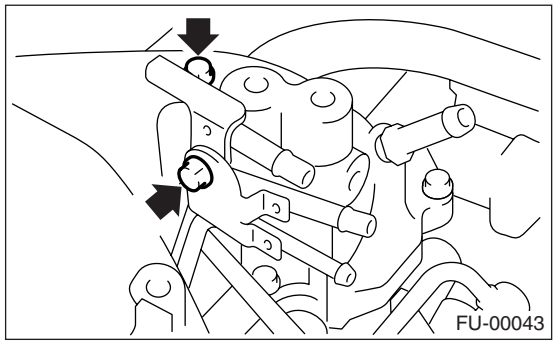
NOTE:
Bolt (A) is tightened together with ground cable.

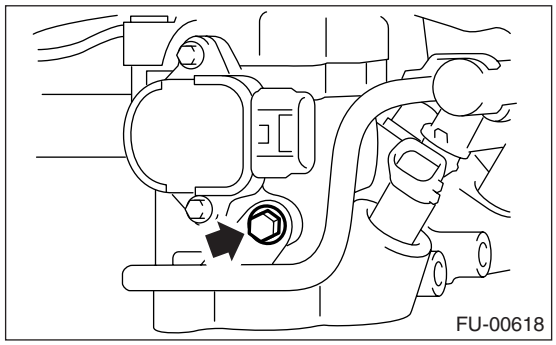


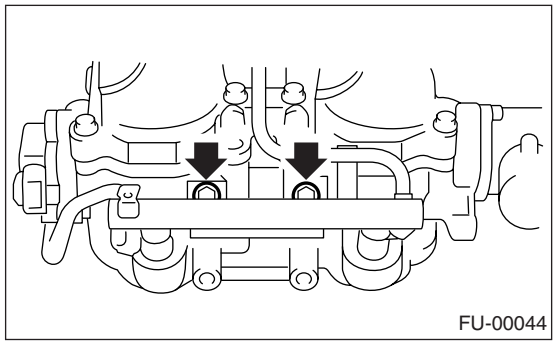
6) Disconnect the connector from fuel injector.



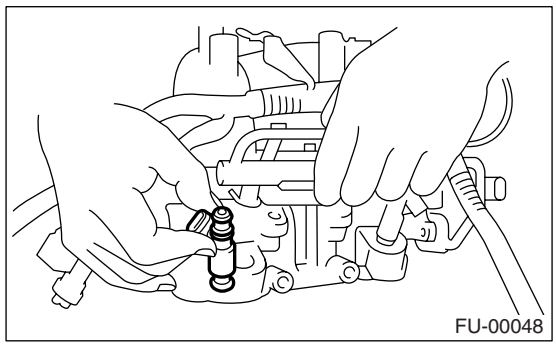
7) Remove the bolts which hold the fuel injector pipe to intake manifold.







8) Remove the fuel injector while lifting up the fuel injector pipe.

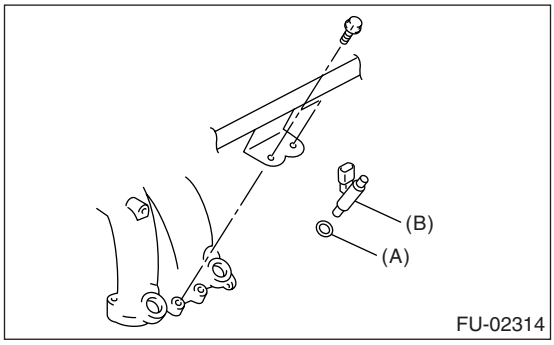


B: INSTALLATION

1. RH SIDE

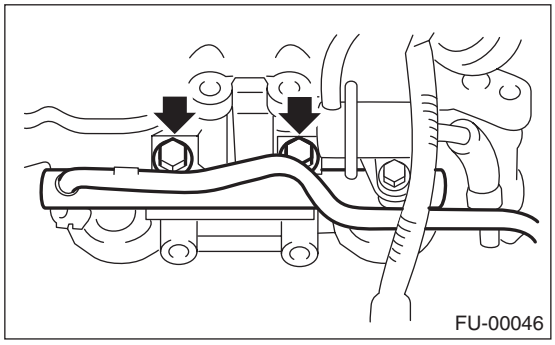
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

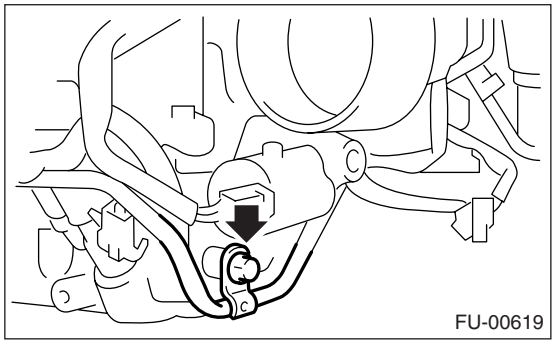


(A) Insulator
(B) Fuel injector

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

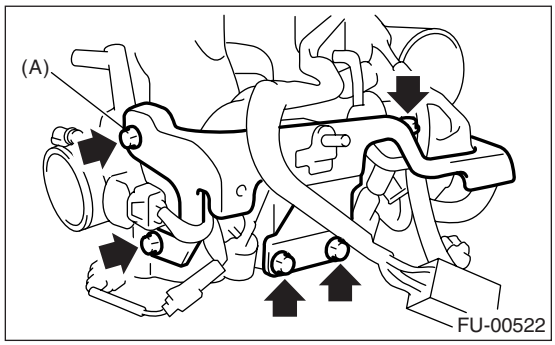


Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



NOTE:
Bolt (A) is tightened together with ground cable. Tighten it securely.

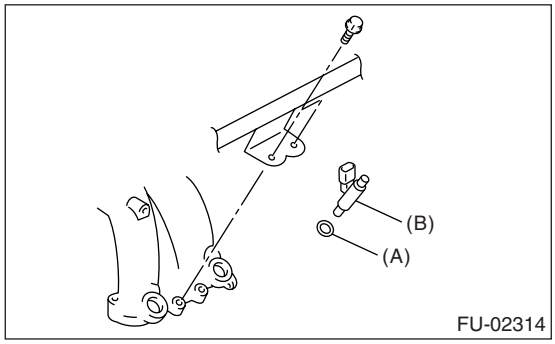
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



2. LH SIDE

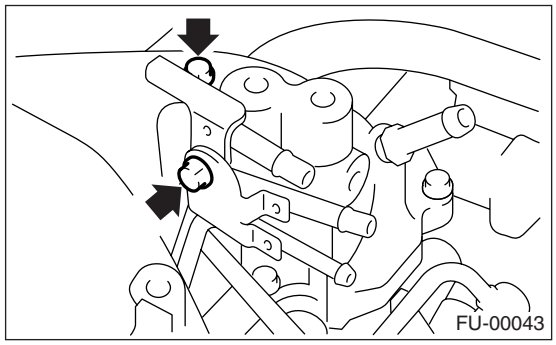
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

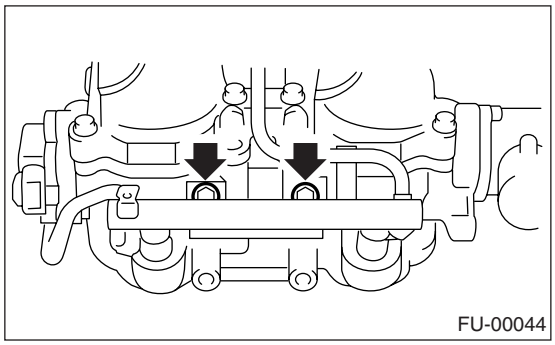


(A) Insulator
(B) Fuel injector

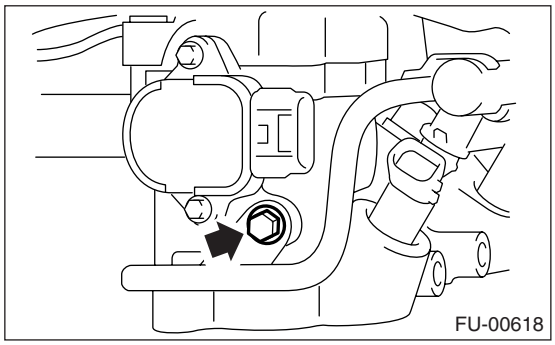
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

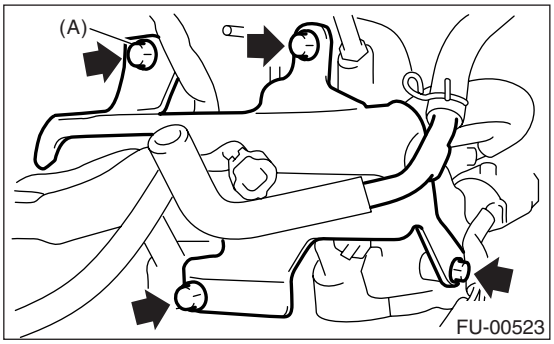


Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



NOTE:
Bolt (A) is tightened together with ground cable. Tighten it securely.

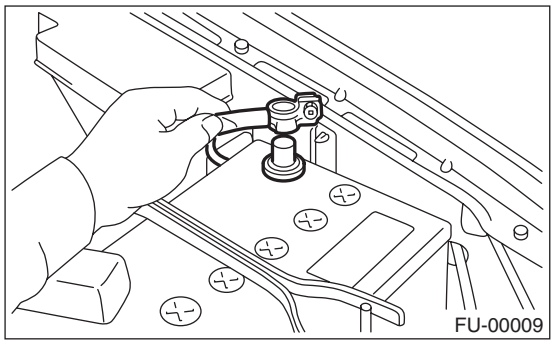
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



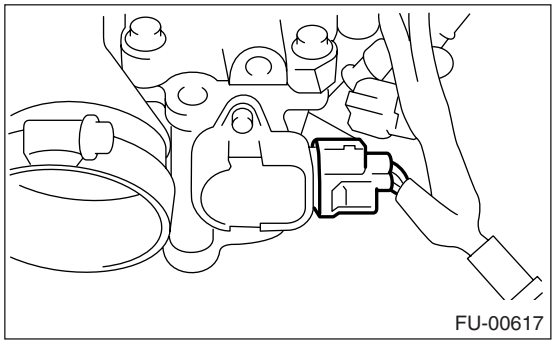
14.Tumble Generator Valve Assembly

A: REMOVAL

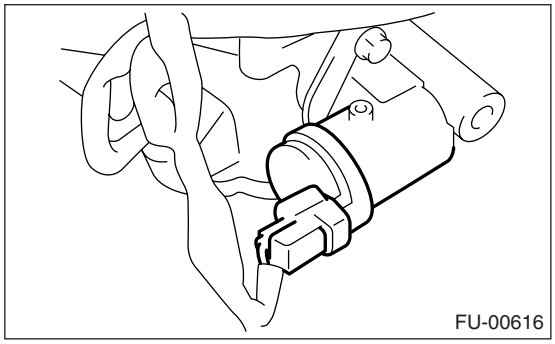
1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Open the fuel filler flap lid, and then remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.


FU-00009

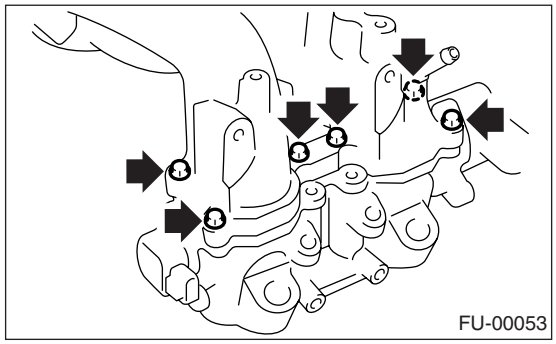
4) Remove the intake manifold. **<Ref. to FU(H4DOTC 2.0)-14,** REMOVAL**, Intake Manifold.>**
5) Disconnect the connector from tumble generator valve sensor.


FU-00617

6) Disconnect the connector from tumble generator valve actuator.


FU-00616

7) Remove the fuel injector. **<Ref. to FU(H4DOTC 2.0)-38,** REMOVAL**, Fuel Injector.>**
8) Remove the tumble generator valve body from intake manifold.

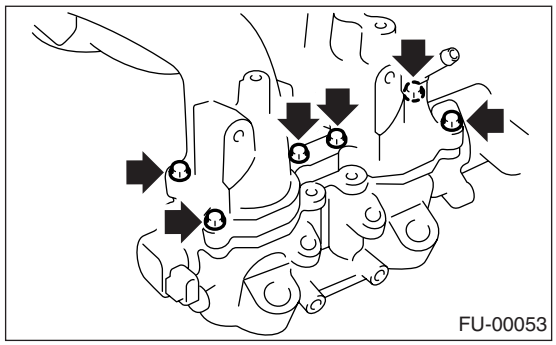

FU-00053

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gaskets.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)

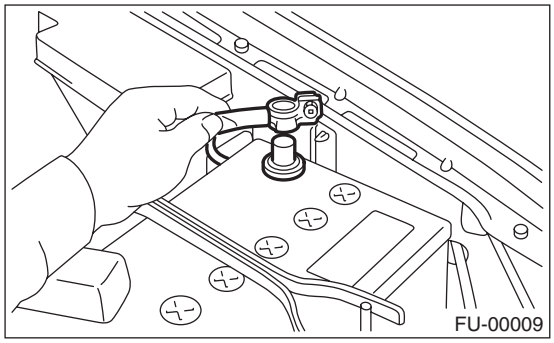

FU-00053

15. Tumble Generator Valve Actuator

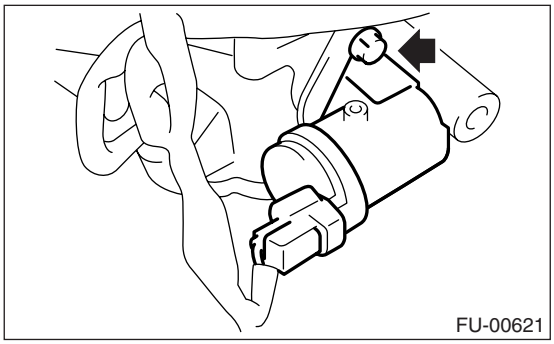
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

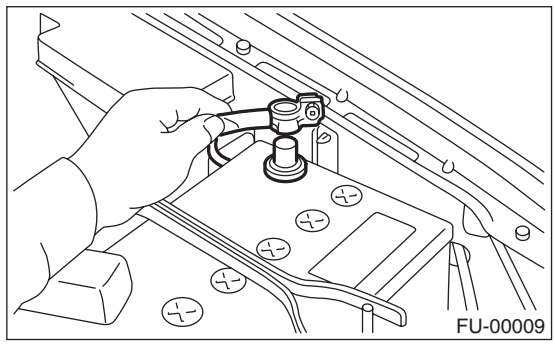


4) Remove the intake manifold. **<Ref. to FU(H4DOTC 2.0)-14,** REMOVAL**, Intake Manifold.>**
5) Disconnect the connector from tumble generator valve actuator RH.
6) Remove the tumble generator valve RH.

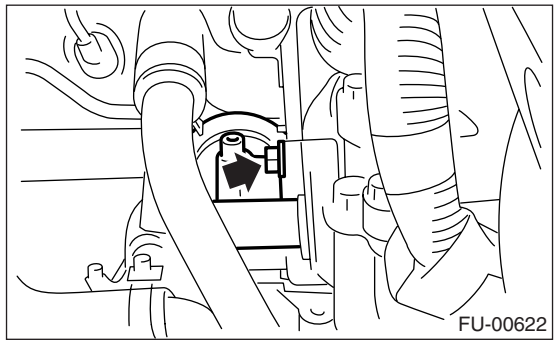


2. LH SIDE

1) Disconnect the ground cable from battery.



2) Disconnect the connector from tumble generator valve LH.
3) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

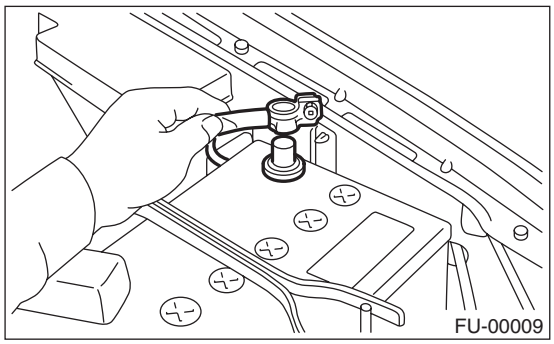
2. LH SIDE

Install in the reverse order of removal.

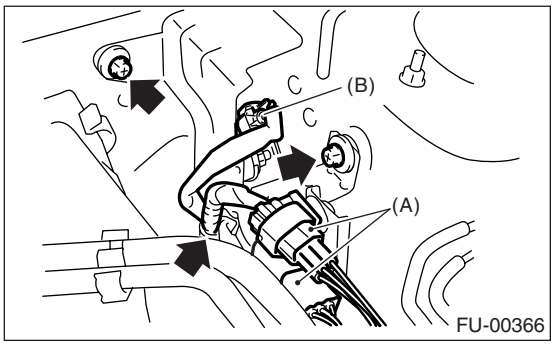
16. Wastegate Control Solenoid Valve

A: REMOVAL

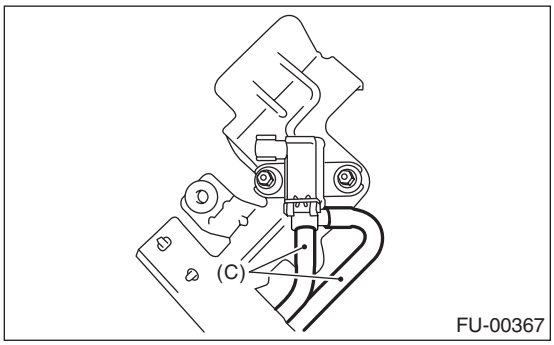
1) Disconnect the ground cable from battery.



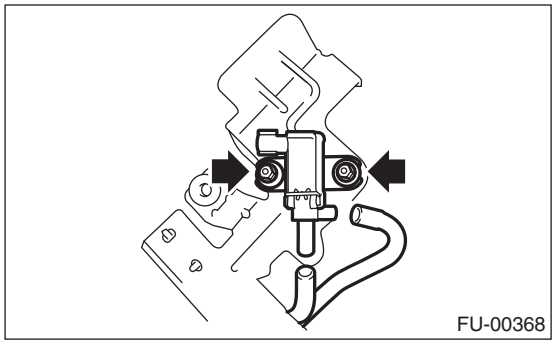
2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from body.



5) Disconnect the pressure hoses (C) from wastegate control solenoid valve assembly.



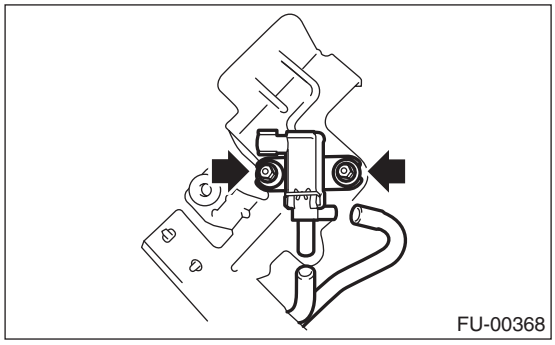
6) Remove the wastegate control solenoid valve assembly from bracket.



B: INSTALLATION

Install in the reverse order of removal.

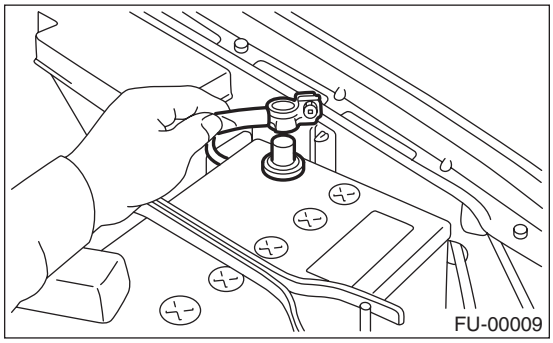
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



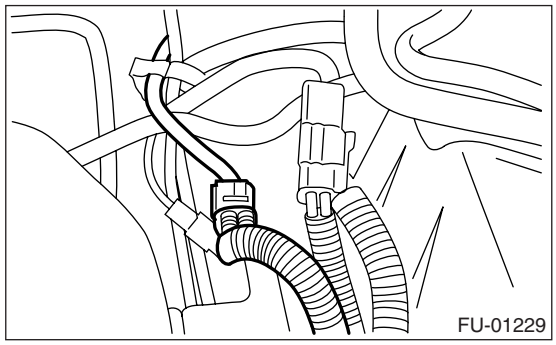
17.Front Oxygen (A/F) Sensor

A: REMOVAL

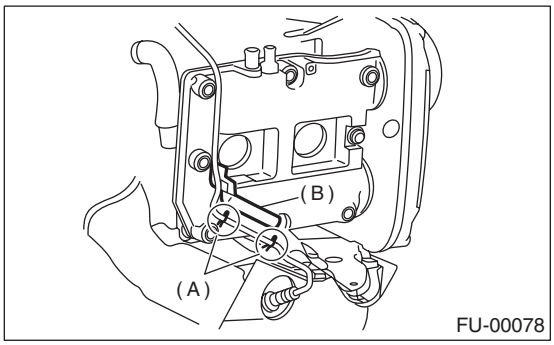
1) Disconnect the ground cable from battery.



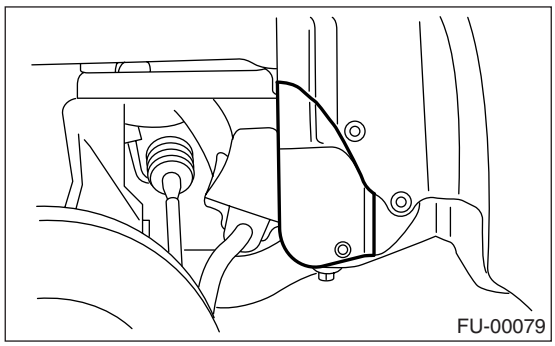
2) Disconnect the connector from front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A) from bracket (B).

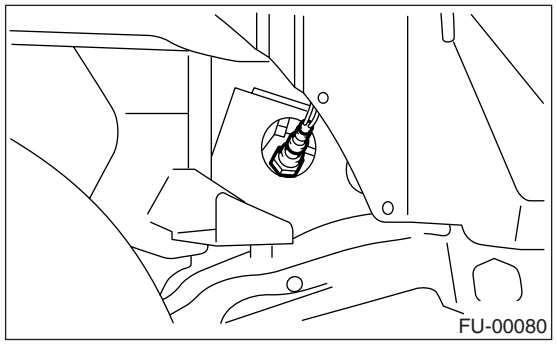


4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.



7) Apply spray type lubricant or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for 1 minute or more.
8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the oxygen (A/F) sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

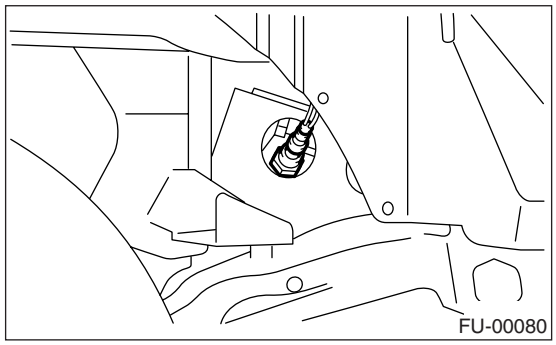
1) Before installing the front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make next removal easier.

Anti-seize compound:
SS-30 JET LUBE

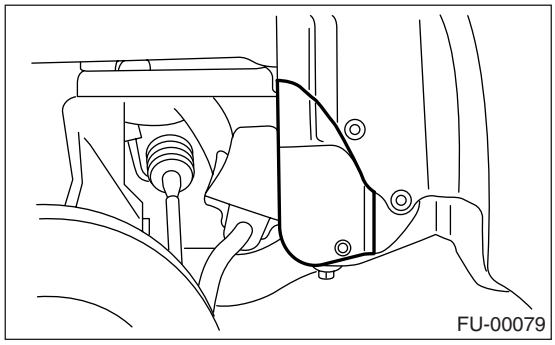
CAUTION:
Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

2) Install the front oxygen (A/F) sensor.

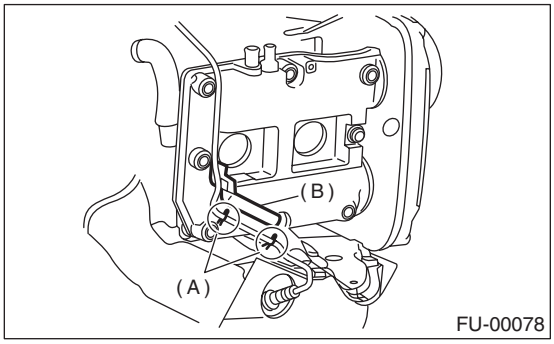
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



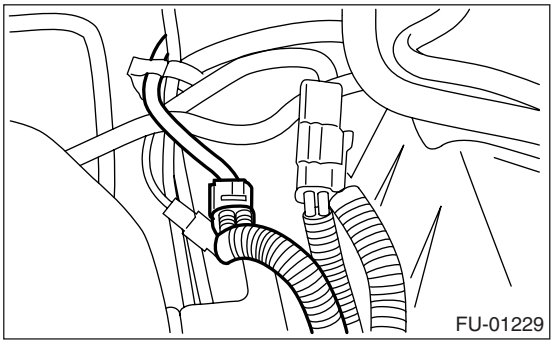
3) Install the service hole cover.



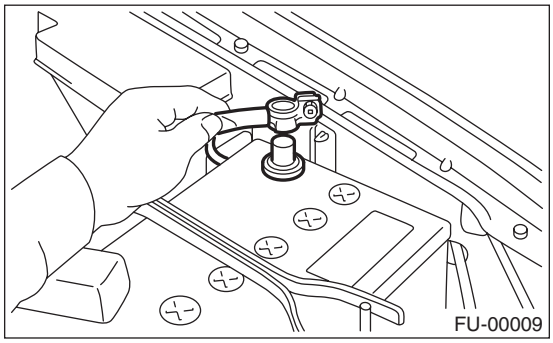
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness with clip (A) to bracket (B).



7) Connect the connector of front oxygen (A/F) sensor.



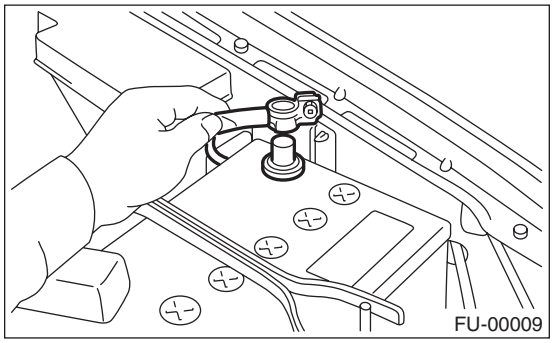
8) Connect the battery ground cable to battery.



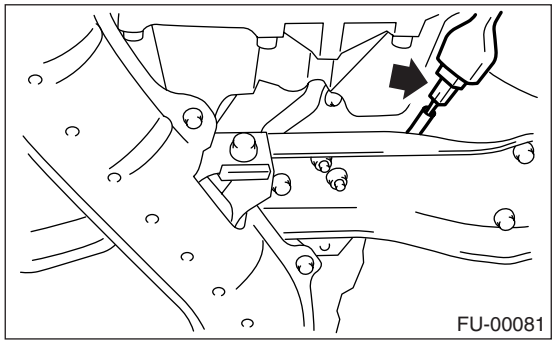
18.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

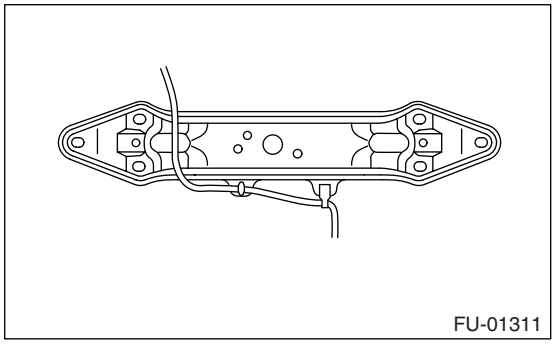


2) Lift-up the vehicle.
3) Disconnect the connector from rear oxygen sensor.

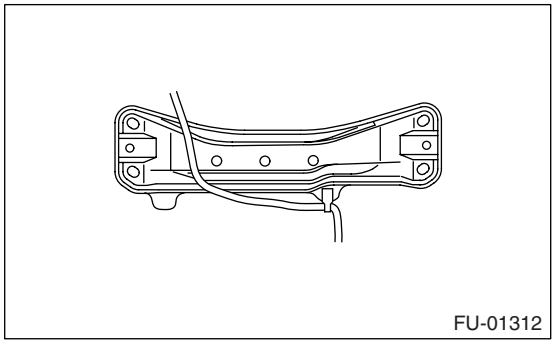


4) Remove the clip by pulling it out from the upper side of crossmember.

- AT model

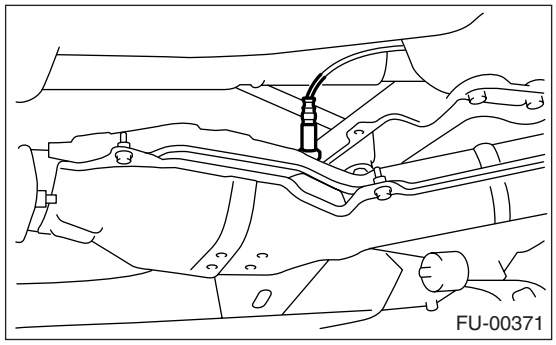


- MT model



5) Apply spray type lubricant or its equivalent to the threaded portion of rear oxygen sensor, and leave it for 1 minute or more.
6) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

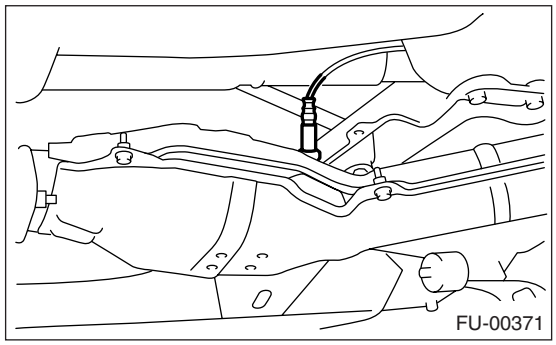
1) Before installing the rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make next removal easier.

CAUTION:
Never apply anti-seize compound to the protector of rear oxygen sensor.

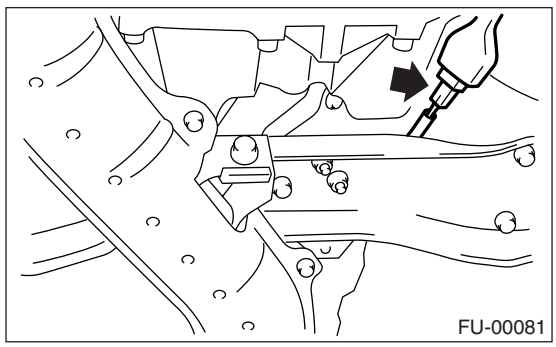
Anti-seize compound:
SS-30 JET LUBE

2) Install the rear oxygen sensor.

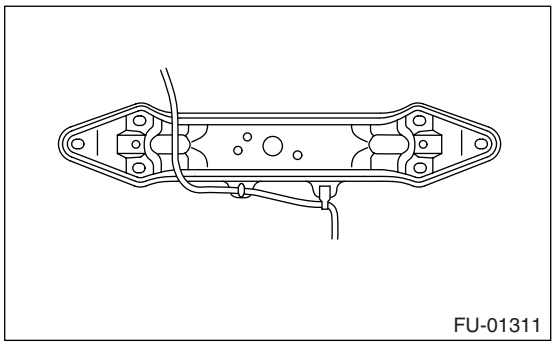
Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



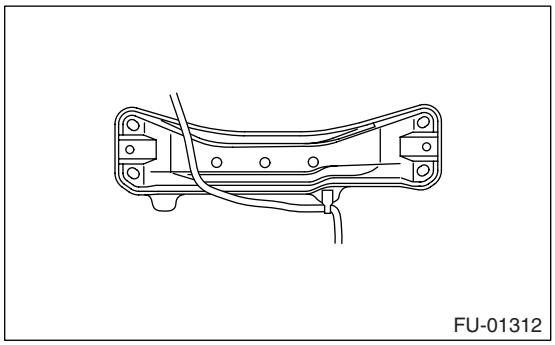
3) Connect the connector to rear oxygen sensor.



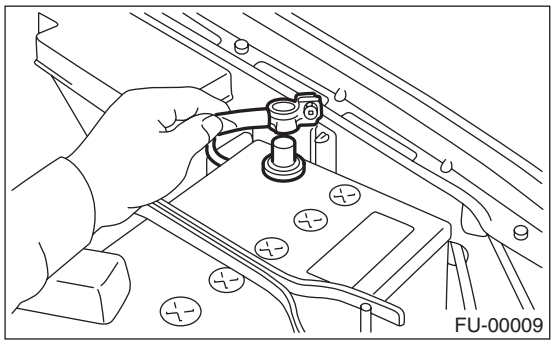
4) Connect the clip to crossmember.
- AT model



- MT model



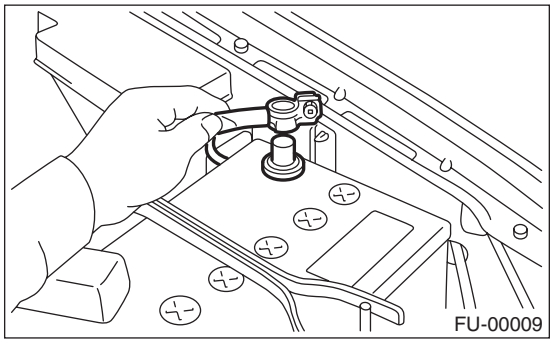
5) Lower the vehicle.
6) Connect the battery ground cable to battery.



19.Exhaust Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

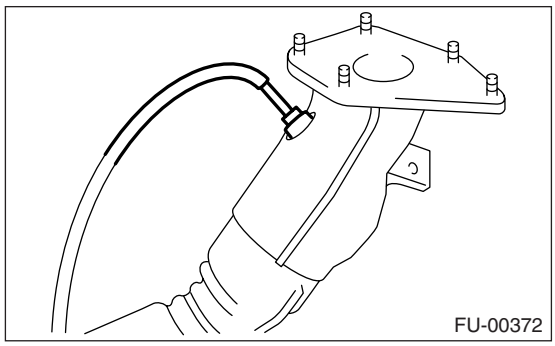


2) Remove the joint pipe. **<Ref. to EX(H4DOTC 2.0)-13,** REMOVAL**, Joint Pipe.>**

3) Apply spray type lubricant or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for 1 minute or more.

4) Remove the exhaust temperature sensor.

CAUTION:
When removing the exhaust temperature sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

1) Before installing the exhaust temperature sensor, apply anti-seize compound only to the threaded portion of the exhaust temperature sensor to make next removal easier.

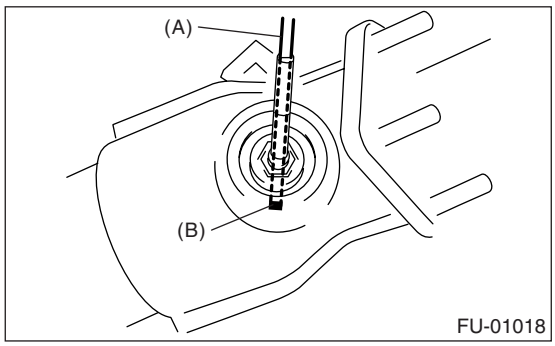
CAUTION:
Never apply anti-seize compound to the protector of exhaust temperature sensor.

Anti-seize compound:
SS-30 JET LUBE

2) Install the exhaust temperature sensor.

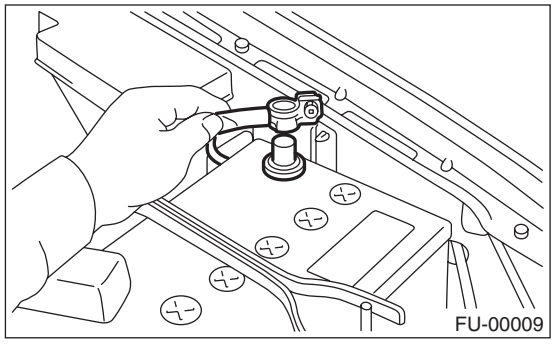
NOTE:
Align the harness (A) direction of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Install the joint pipe. <Ref. to EX(H4DOTC 2.0)-13, INSTALLATION, Joint Pipe.>

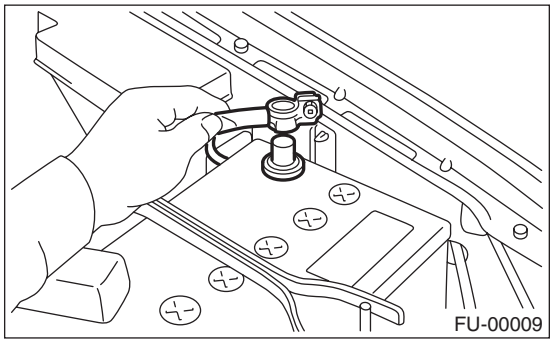
4) Connect the battery ground cable to battery.



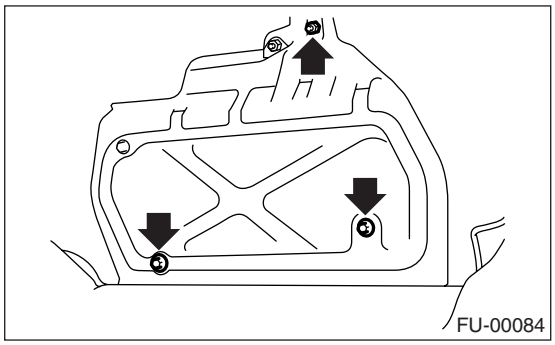
20.Engine Control Module (ECM)

A: REMOVAL

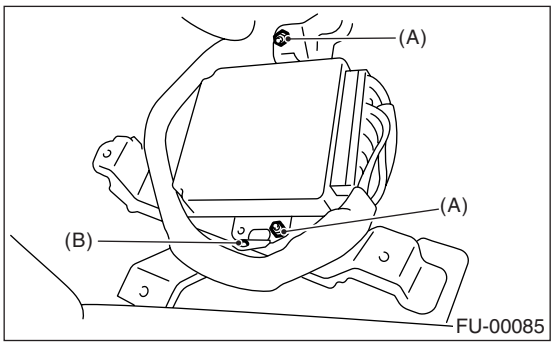
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger side.
<Ref. to EI-45, REMOVAL**, Lower Inner Trim.>**
3) Detach the floor mat of front passenger seat side.
4) Remove the protect cover.



5) Remove the nuts (A) which hold the ECM to bracket.
6) Remove the clip (B) from bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

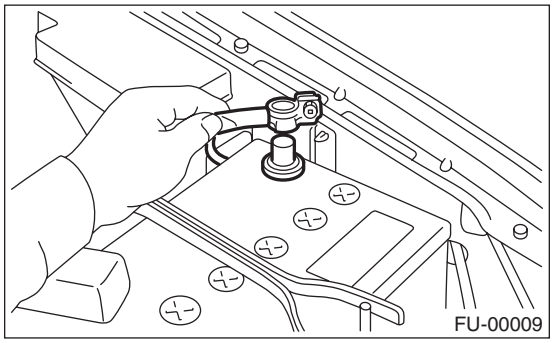
Install in the reverse order of removal.

NOTE:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

21.Main Relay

A: REMOVAL

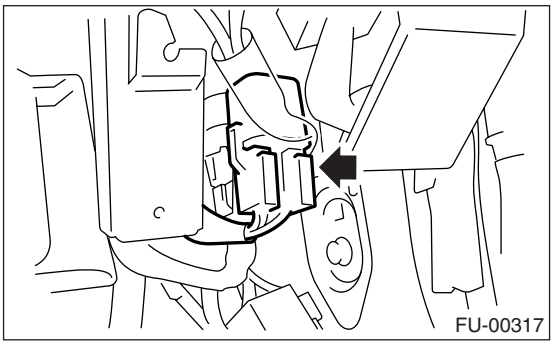
1) Disconnect the ground cable from battery.



2) Remove the glove box. **<Ref. to EI-37,** REMOVAL**, Glove Box.>**

3) Remove the bolt which holds the main relay bracket on body.

4) Disconnect the connectors from main relay.



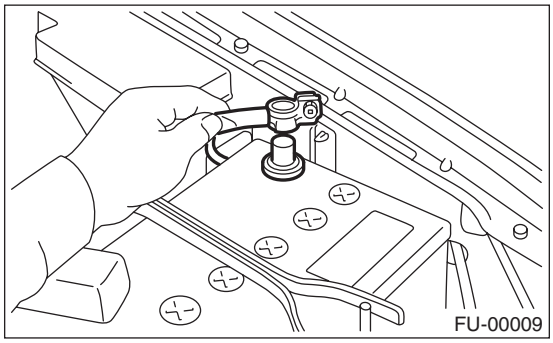
B: INSTALLATION

Install in the reverse order of removal.

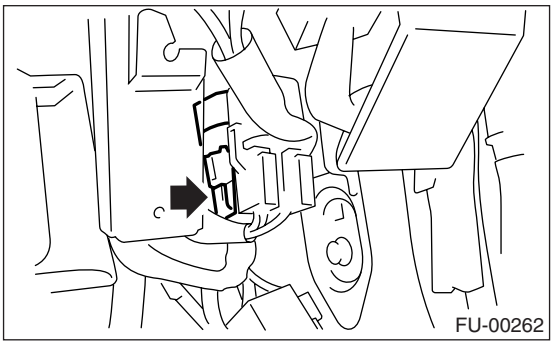
22.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box. **<Ref. to EI-37,** REMOVAL**, Glove Box.>**
3) Remove the bolt which holds the fuel pump relay bracket on body.
4) Disconnect the connector from fuel pump relay.



5) Remove the fuel pump relay from mounting bracket.

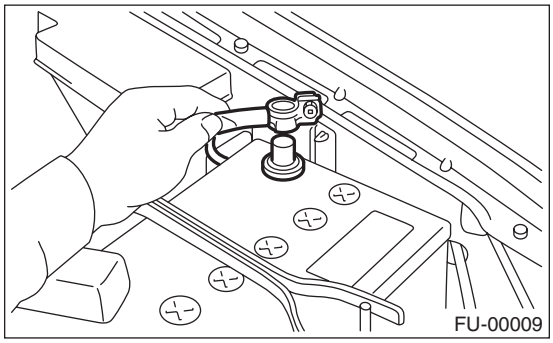
B: INSTALLATION

Install in the reverse order of removal.

23.Fuel Pump Control Unit

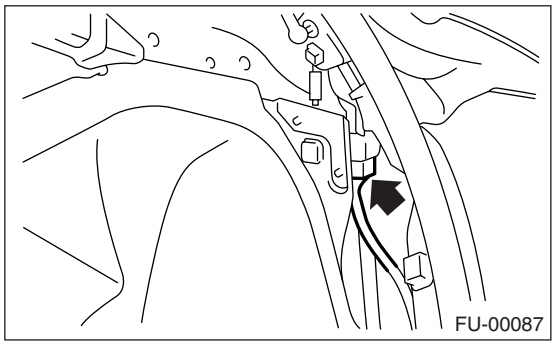
A: REMOVAL

1) Disconnect the ground cable from battery.

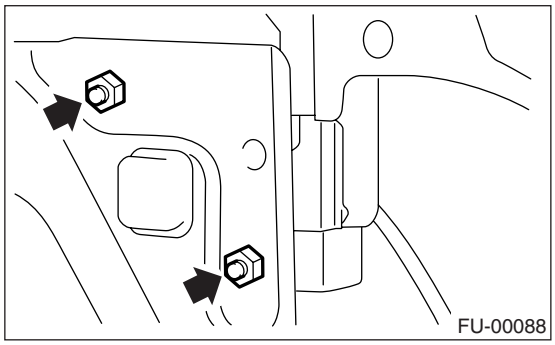


2) Remove the rear quarter trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**

3) Disconnect the connector from fuel pump control unit.



4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

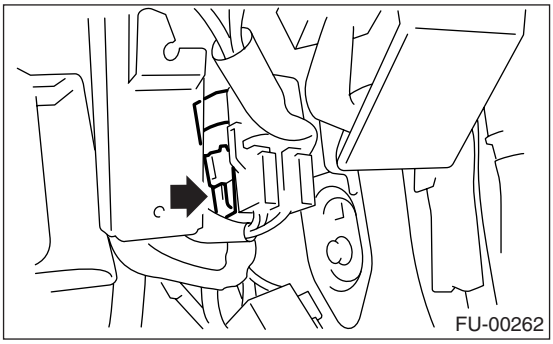
24.Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

1) Disconnect the connector from fuel pump relay.

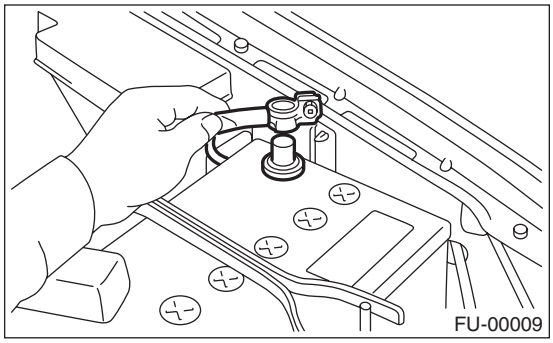


2) Start and run the engine until it stalls.
3) After the engine stalls, crank it for 5 more seconds.
4) Turn the ignition switch to OFF.

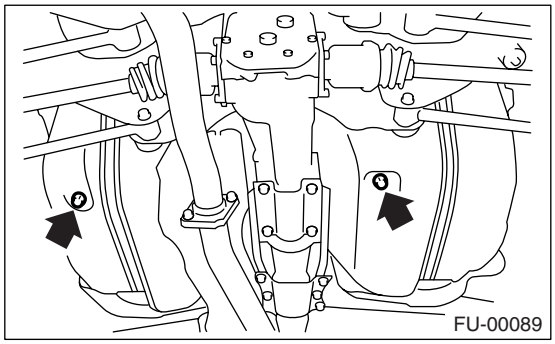
2. DRAINING FUEL

WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



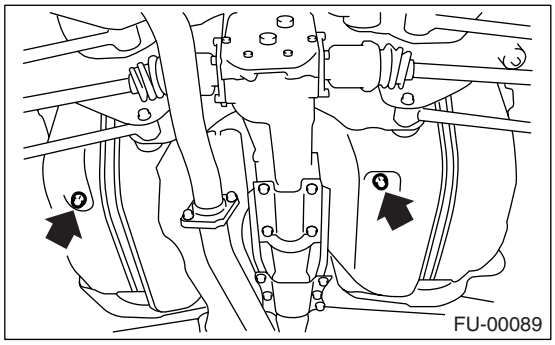
3) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
4) Lift-up the vehicle.
5) Drain fuel from the fuel tank.
Set a container under vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

NOTE:
Always use new gasket.

Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)

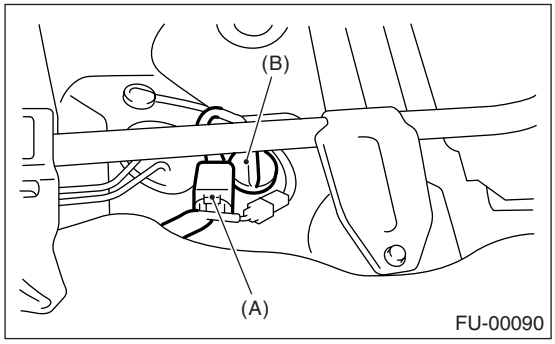


25.Fuel Tank

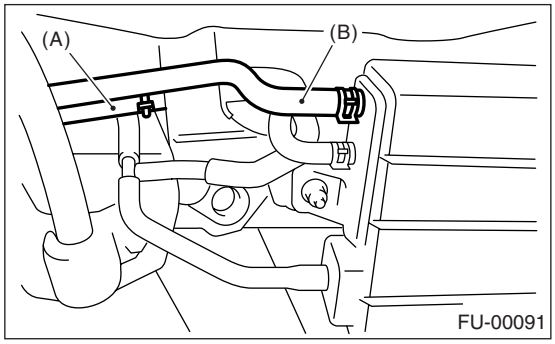
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near working area.**
- **Be careful not to spill fuel on floor.**

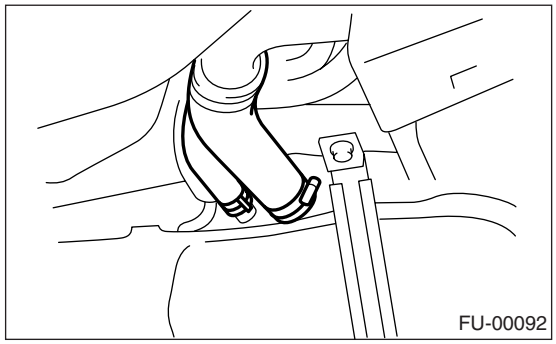
1) Set the vehicle on a lift.
2) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
3) Drain fuel from fuel tank. **<Ref. to FU(H4DOTC 2.0)-54,** DRAINING FUEL, PROCEDURE**, Fuel.>**
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to rear harness.
6) Push the grommet (B) which holds the fuel tank cord on floor panel down under body.



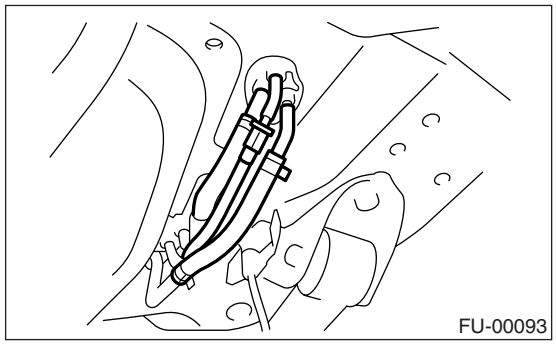
7) Remove the rear crossmember. **<Ref. to RS-18,** REMOVAL**, Rear Crossmember.>**
8) Disconnect the two-way valve hose (A) from two-way valve, and disconnect the canister hose (B) from canister.



9) Loosen the clamp and disconnect the fuel filler flap lid hose and air vent hose from fuel filler pipe.

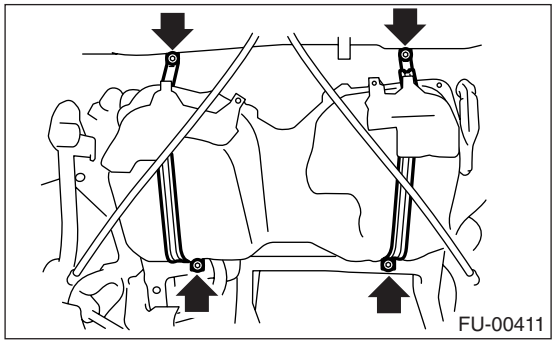


10) Move the clips and disconnect the quick connector. **<Ref. to FU(H4DOTC 2.0)-70,** REMOVAL**, Fuel Delivery, Return and Evaporation Lines.>**
11) Disconnect the fuel hoses.



12) Support the fuel tank with transmission jack, remove the bolts from bands, and then dismount the fuel tank from vehicle.

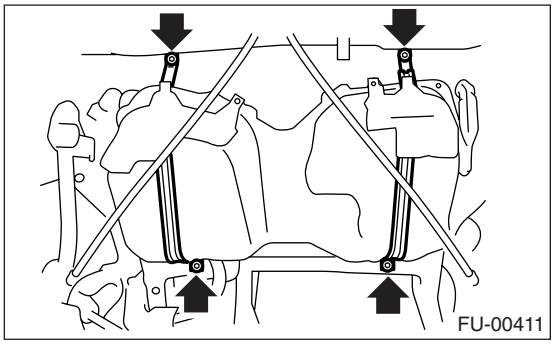
WARNING:
A helper is required to perform this work.



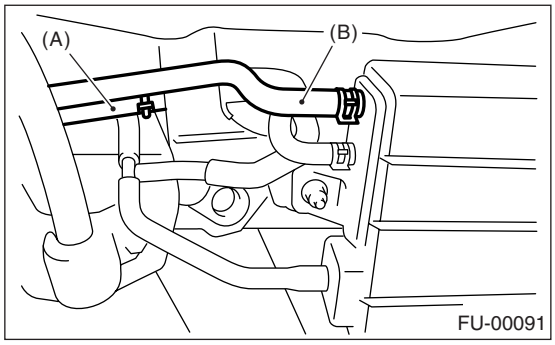
B: INSTALLATION

1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

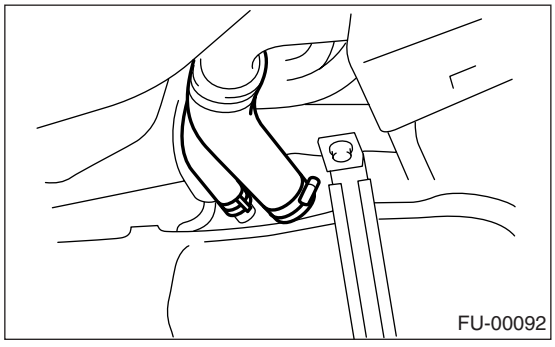
WARNING:
A helper is required to perform this work.



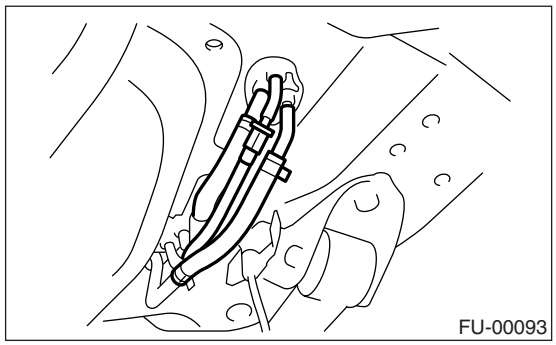
3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.



4) Connect the fuel filler flap lid hose and air vent hose.

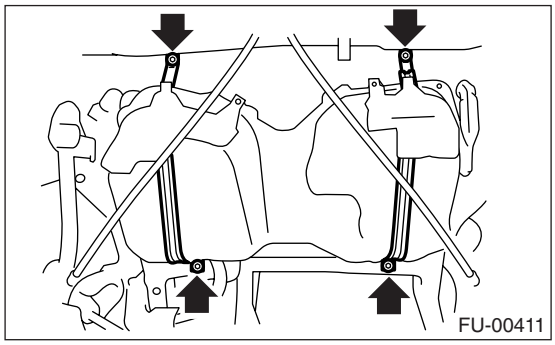


5) Connect the fuel hoses, and secure them with clips and quick connector. **<Ref. to FU(H4DOTC 2.0)-71,** INSTALLATION**, Fuel Delivery, Return and Evaporation Lines.>**

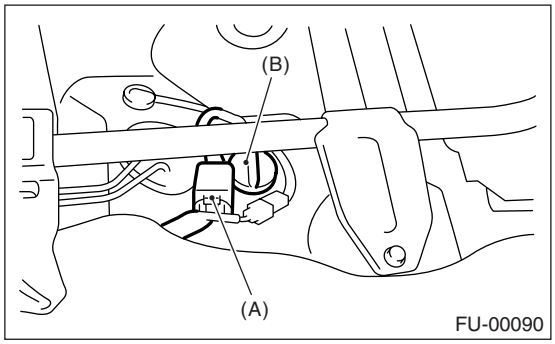


6) Tighten the band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

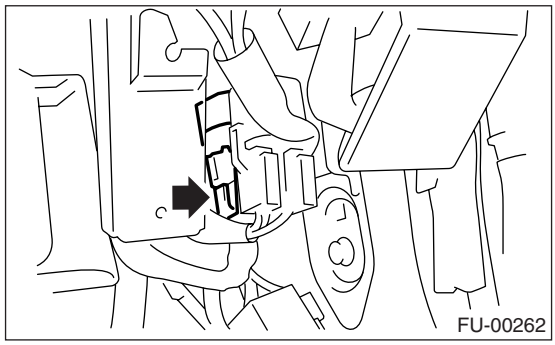


7) Install the rear crossmember. **<Ref. to RS-18,** INSTALLATION**, Rear Crossmember.>**
8) Connect the connector (A) to the fuel tank cord, and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.

10) Connect the connector to the fuel pump relay.



C: INSPECTION

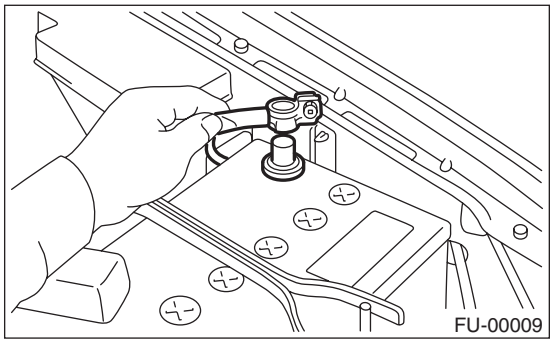
1) Make sure there are no cracks, holes or other damage on fuel tank.
2) Make sure the fuel hoses and fuel pipes are not cracked and the connections are tightened firmly.

26.Fuel Filler Pipe

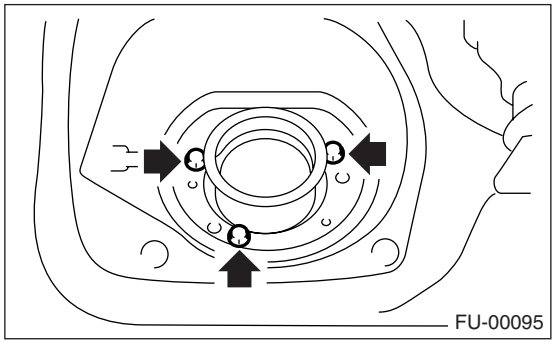
A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

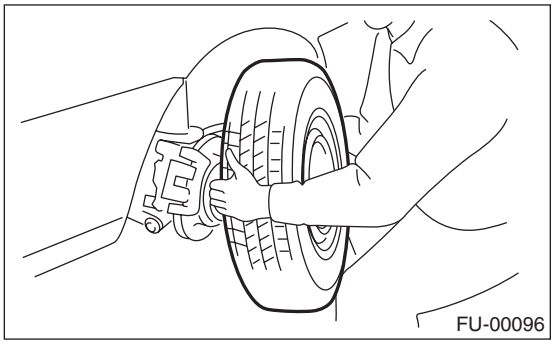
1) Set the vehicle on a lift.
2) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
3) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
4) Disconnect the ground cable from battery.



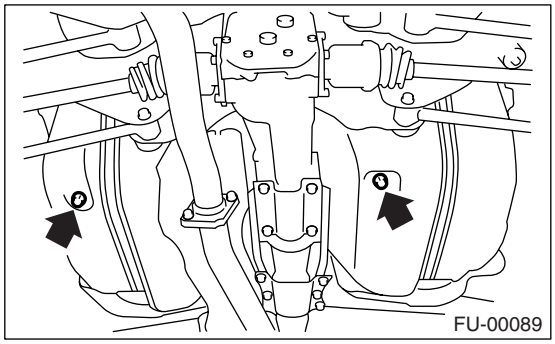
5) Remove the screws holding the packing in place.



6) Loosen the rear right side wheel nuts.
7) Lift-up the vehicle.
8) Remove the rear right side wheel.

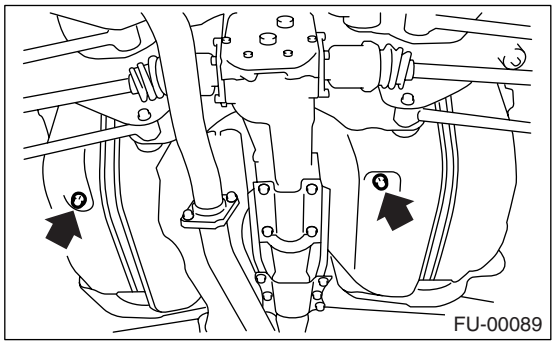


9) Drain fuel from fuel tank. Set a container under vehicle and remove the drain plug from fuel tank.

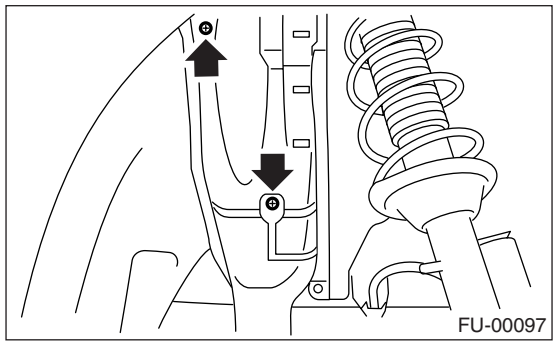


10) Tighten the fuel drain plug, and install the front right side tank cover.

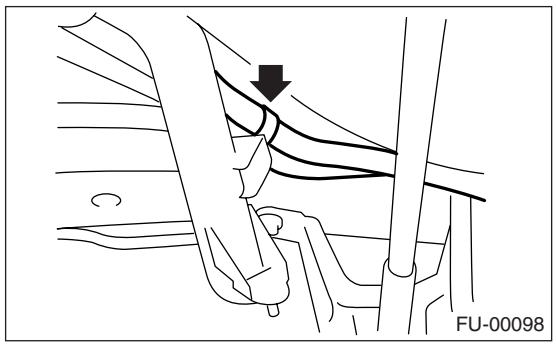
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)



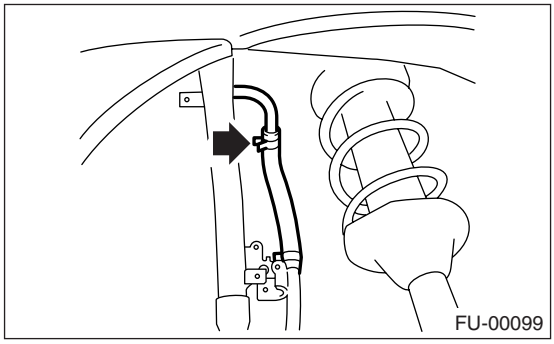
11) Remove the fuel filler pipe protector.



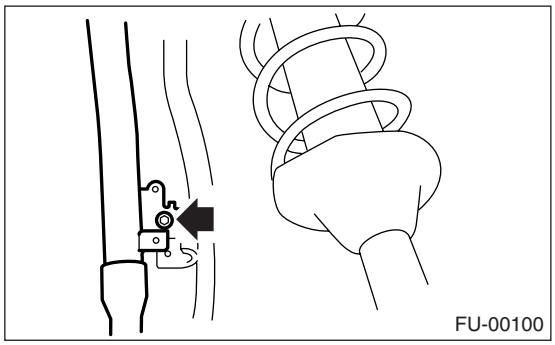
12) Separate the evaporation hoses from clip of fuel filler pipe.



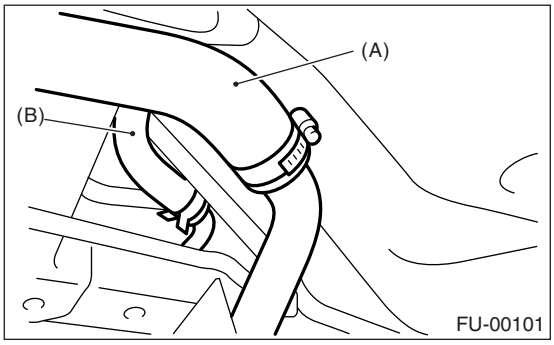
13) Disconnect the air vent hose from fuel filler pipe.



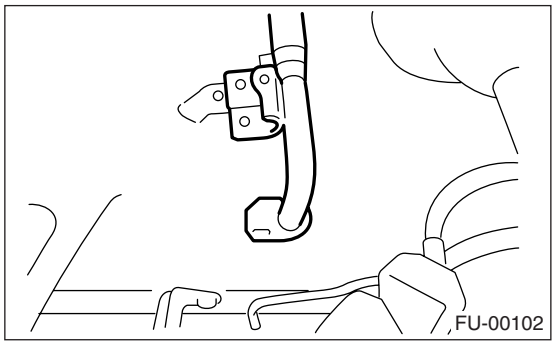
14) Remove the bolts which hold the fuel filler pipe bracket on body.



15) Loosen the clamp and separate the fuel filler flap lid hose (A) from fuel filler pipe.
16) Move the clip and separate the air vent hose (B).



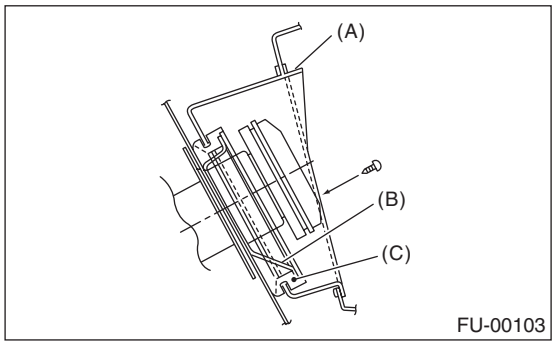
17) Remove the fuel filler pipe to under side of vehicle.
18) Remove the air vent pipe together with clip from body.



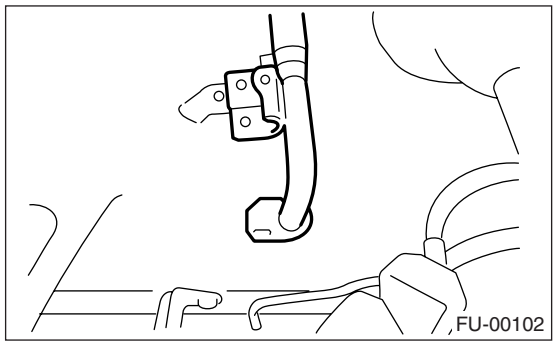
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck, set the cup (B), and then tighten the screws.

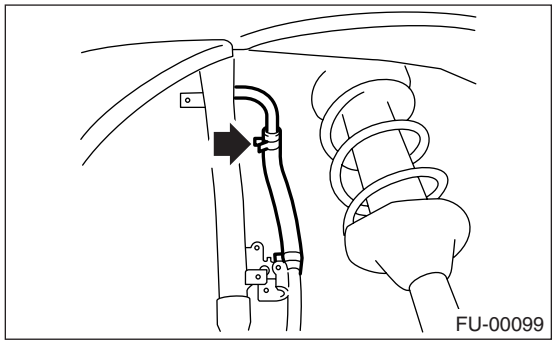
NOTE:
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



4) Install the air vent pipe.

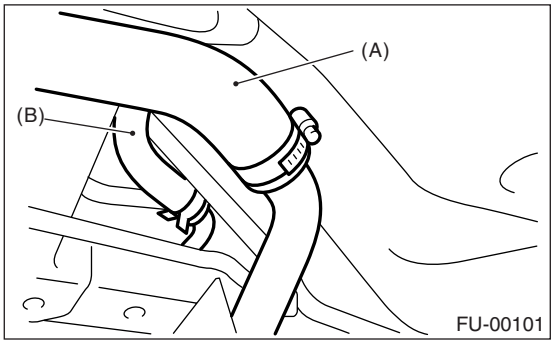


5) Connect the air vent hose to the fuel filler pipe.



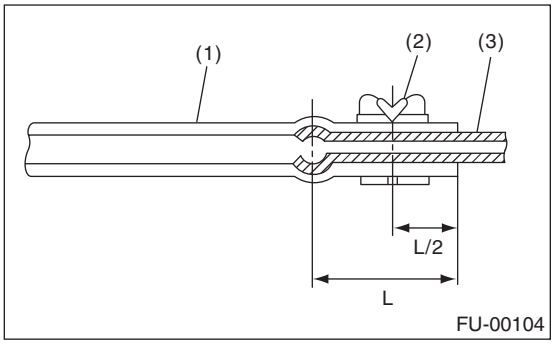
6) Insert the fuel filler flap lid hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:
Do not allow clips to touch the air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

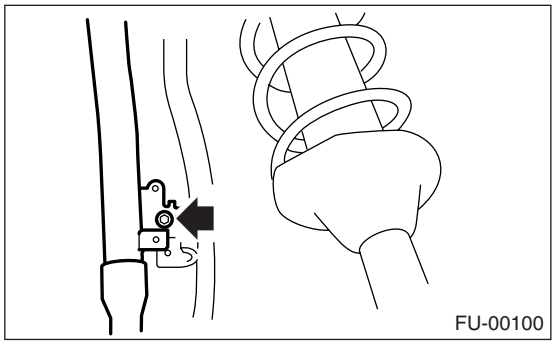
L = 27.5±2.5 mm (1.083±0.098 in)



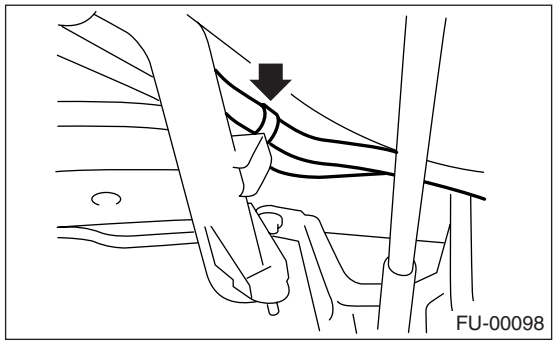
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds the fuel filler pipe bracket on body.

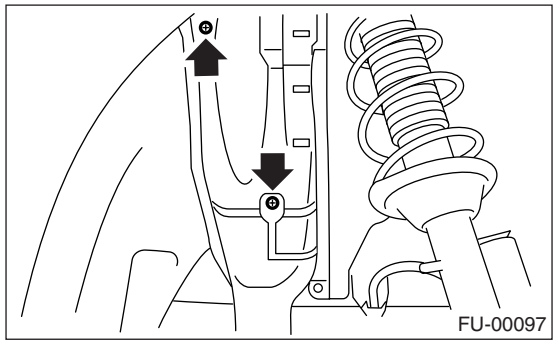
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



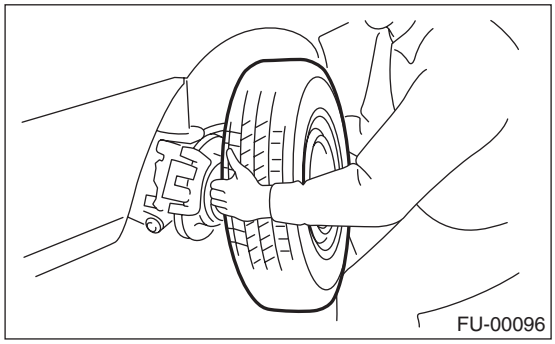
9) Hold the evaporation hoses onto clip of fuel filler pipe.



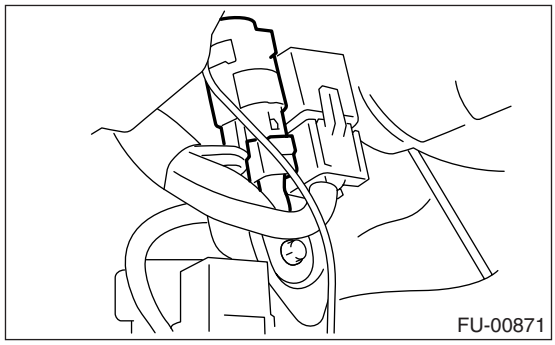
10) Install the fuel filler pipe protector.



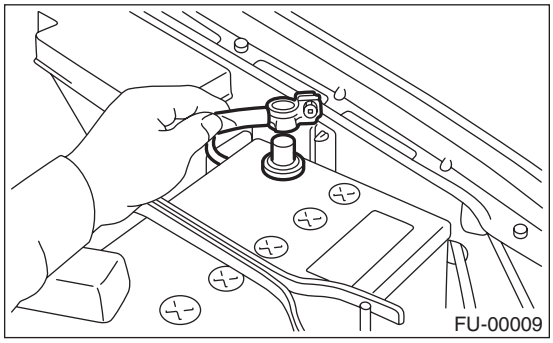
11) Install the rear right wheel.



12) Lower the vehicle.
13) Tighten the wheel nuts.
14) Connect the connector to the fuel pump relay.



15) Connect the battery ground cable to battery.



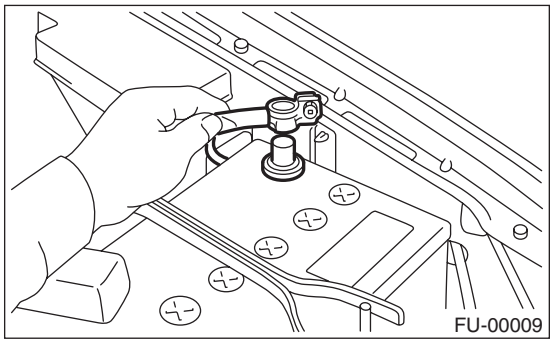
27.Fuel Pump

A: REMOVAL

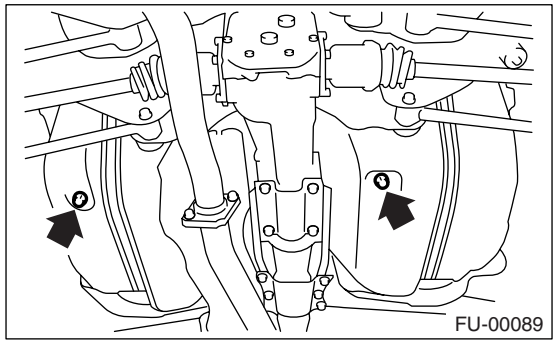
WARNING:
- **Place "NO FIRE" signs near working area.**
- **Be careful not to spill fuel on floor.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

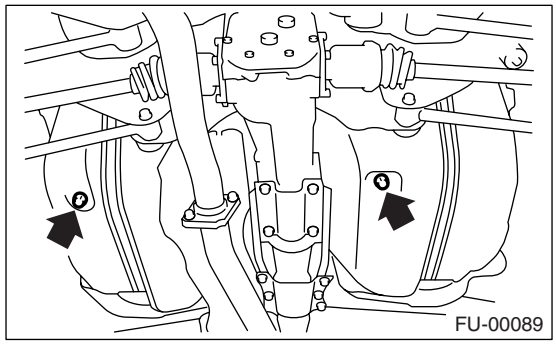

FU-00009

4) Lift-up the vehicle.
5) Drain fuel from fuel tank. Set a container under vehicle and remove the drain plug from fuel tank.

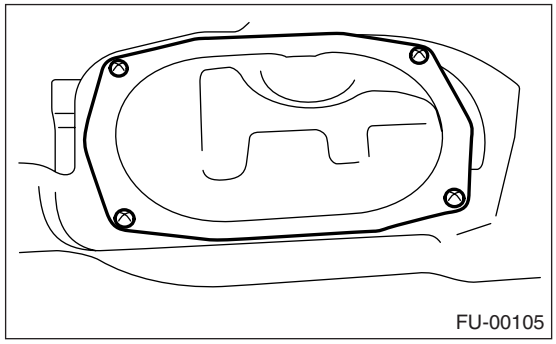

FU-00089

6) Tighten the fuel drain plug.

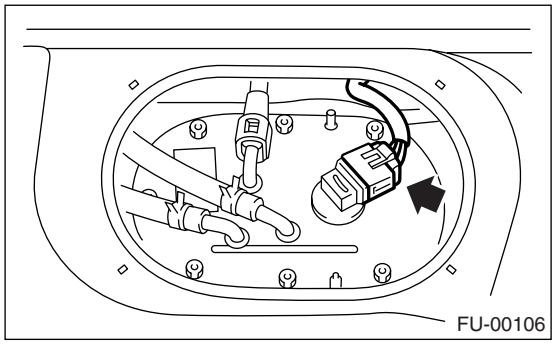
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

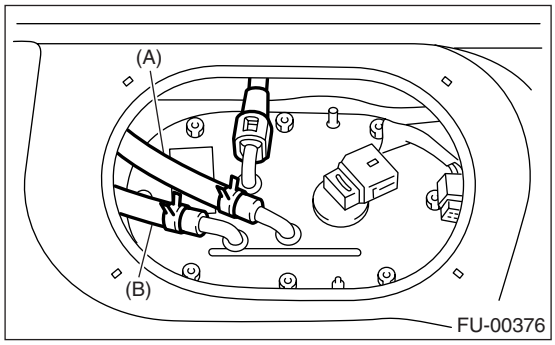
7) Raise the rear seat and turn the floor mat up.
8) Remove the access hole lid.


FU-00105

9) Disconnect the connector from fuel pump.

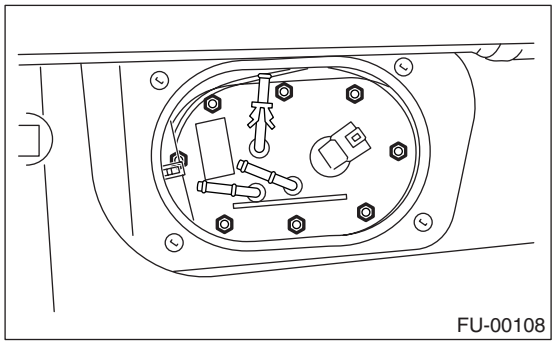

FU-00106

10) Disconnect the quick connector, and disconnect the fuel delivery hose. **<Ref. to FU(H4DOTC 2.0)-70, Fuel Delivery, Return and Evaporation Lines.>**
11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



FU-00376

12) Remove the nuts which install the fuel pump assembly onto fuel tank.


FU-00108

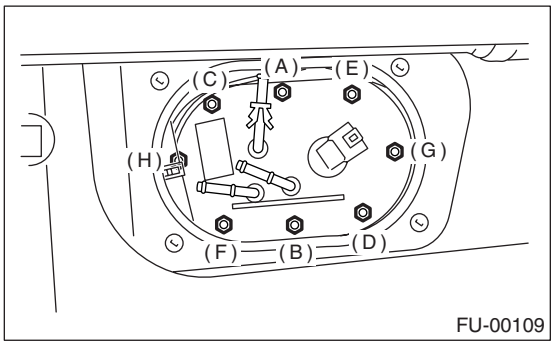
13) Take off the fuel pump assembly from fuel tank.

B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

(1) Ensure sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts to specified torque in alphabetical sequence as shown in the figure.

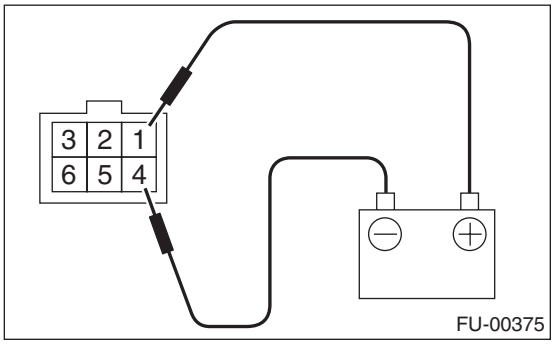
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Connect the lead harness to connector terminal of fuel pump, and then apply battery power supply to check whether the pump operates.

WARNING:
• Wipe off the fuel completely.
• Keep the battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on battery side.
• Do not run the fuel pump for a long time under non-load condition.



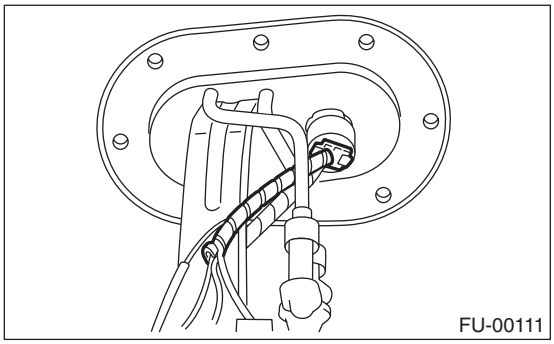
28.Fuel Level Sensor

A: REMOVAL

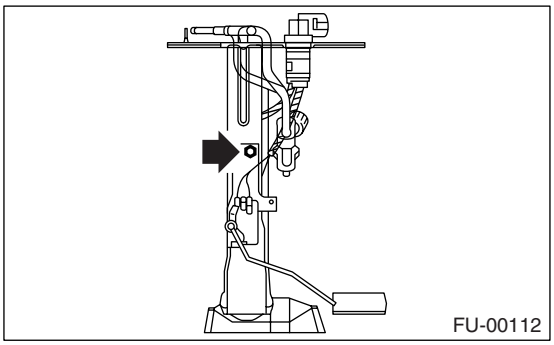
WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly. **<Ref. to FU(H4DOTC 2.0)-62,** REMOVAL**, Fuel Pump.>**
2) Disconnect the connector from fuel pump bracket.



3) Remove the bolt which installs the fuel level sensor on mounting bracket.



B: INSTALLATION

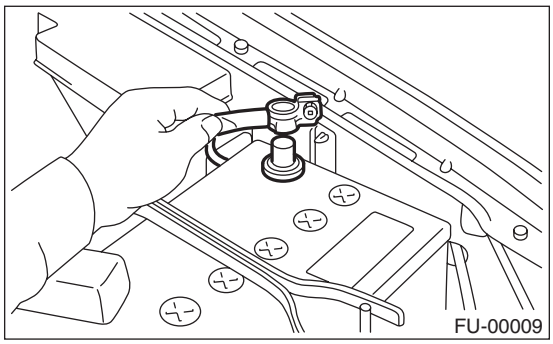
Install in the reverse order of removal.

29.Fuel Sub Level Sensor

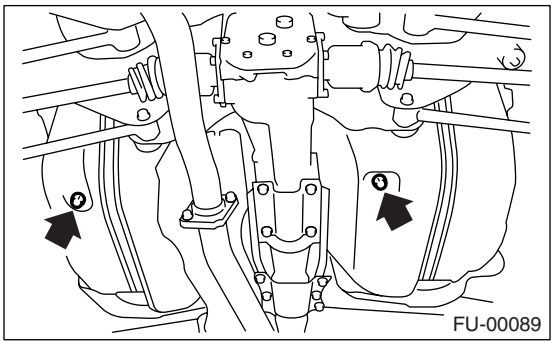
A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

1) Disconnect the ground cable from battery.

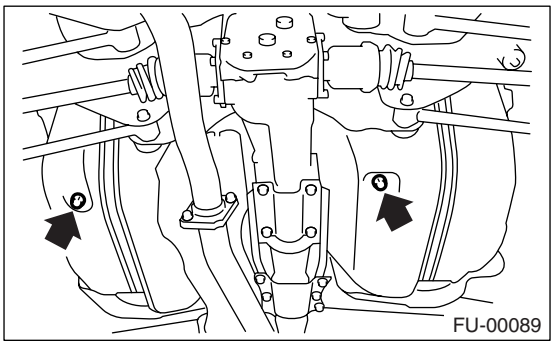


2) Lift-up the vehicle.
3) Drain fuel from fuel tank. Set a container under vehicle and remove the drain plug from fuel tank.

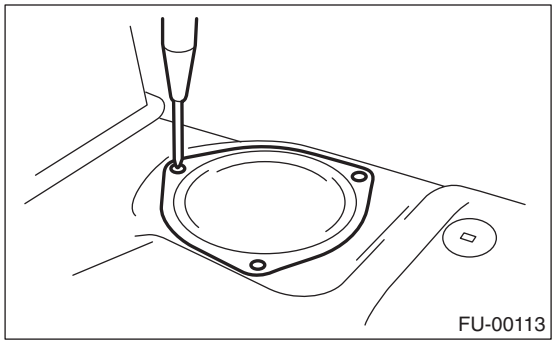


4) Tighten the fuel drain plug.

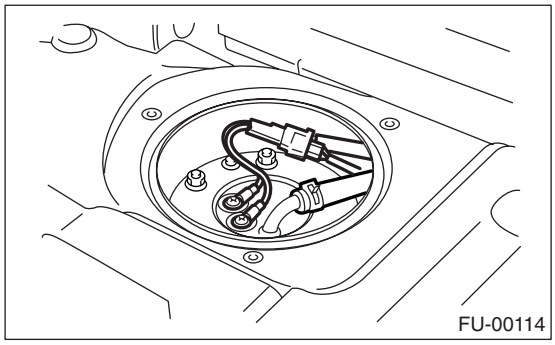
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)



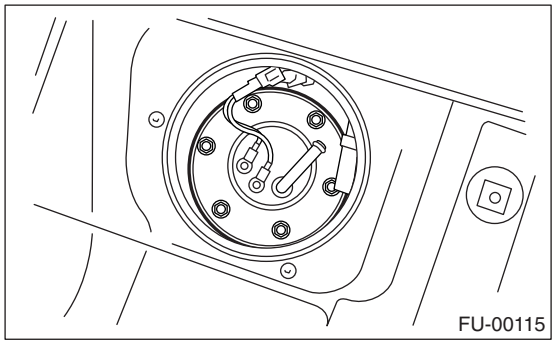
5) Remove the rear seat.
6) Remove the service hole cover.



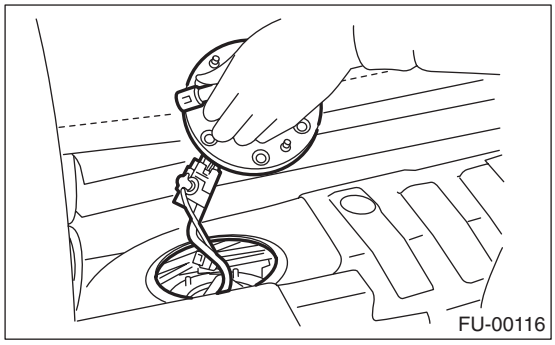
7) Disconnect the connector from fuel sub level sensor.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install the fuel sub level sensor on fuel tank.



10) Remove the fuel sub level sensor.

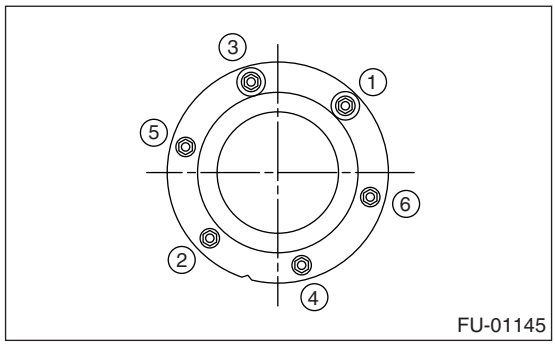


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.
(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts and bolts to specified torque in the order as shown in the figure.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

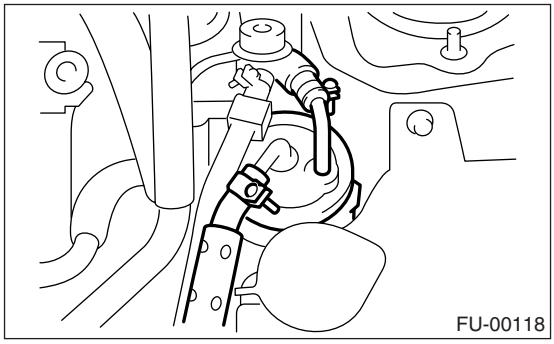


30.Fuel Filter

A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Disconnect the fuel delivery hoses from fuel filter.



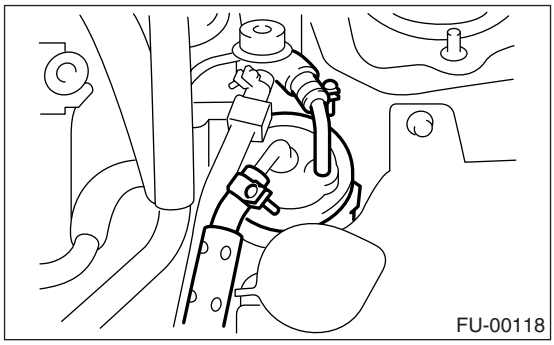
3) Remove the filter from holder.

B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at connecting portions, replace them with new ones.**
- **If clamps are badly damaged, replace them with new ones.**

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



C: INSPECTION

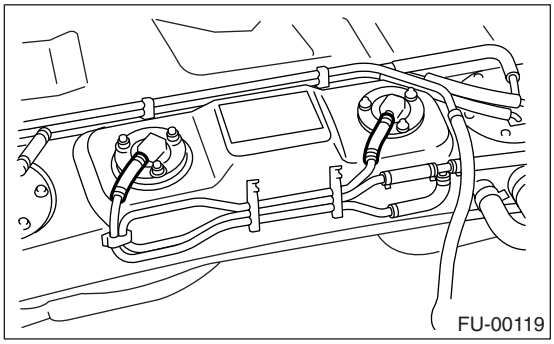
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

31.Fuel Cut Valve

A: REMOVAL

WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

1) Remove the fuel tank. **<Ref. to FU(H4DOTC 2.0)-55,** REMOVAL**, Fuel Tank.>**
2) Move the clip and disconnect the evaporation hose from fuel cut valve.

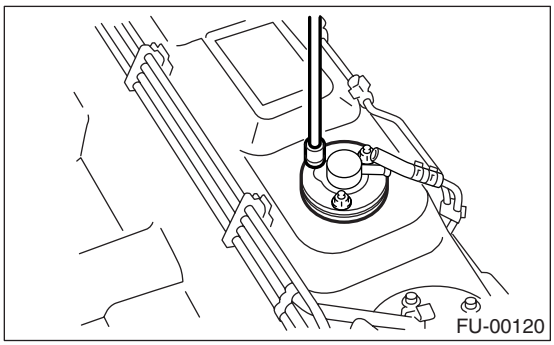


3) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

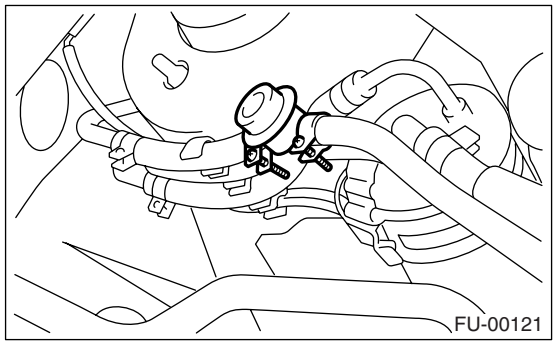
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



32.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Remove the fuel damper valve from fuel return hose.



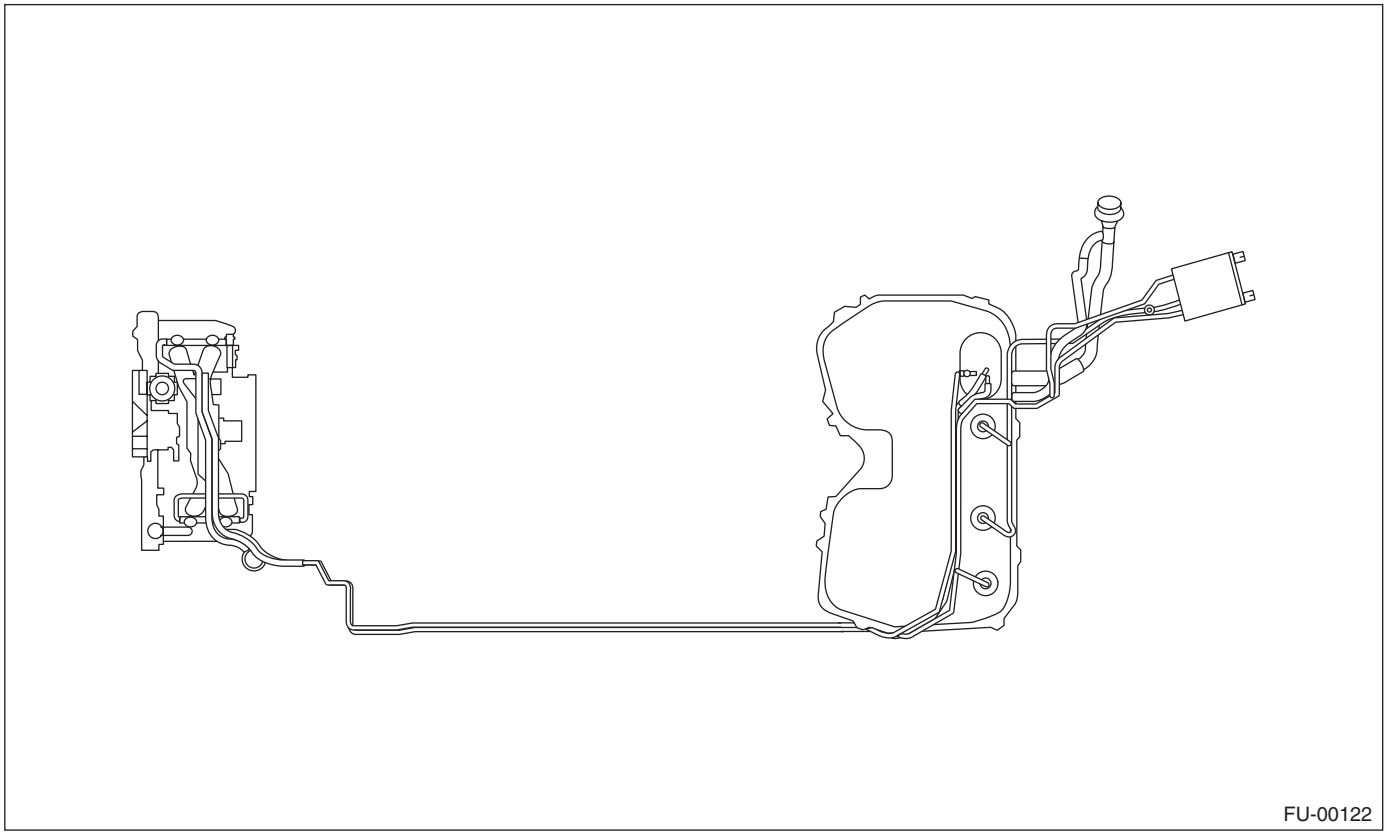
B: INSTALLATION

Install in the reverse order of removal.

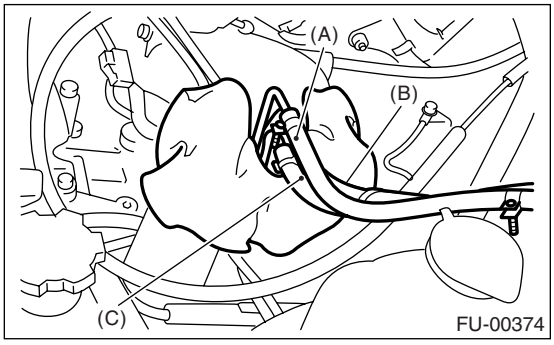
33.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

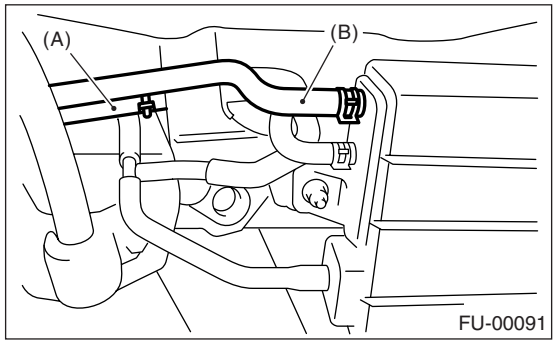
1) Set the vehicle on a lift.
2) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
3) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
4) Remove the floor mat. **<Ref. to EI-50,** REMOVAL**, Floor Mat.>**
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



6) In the engine compartment, detach the fuel delivery hoses (A), return hoses (B) and evaporation hoses (C).



8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.

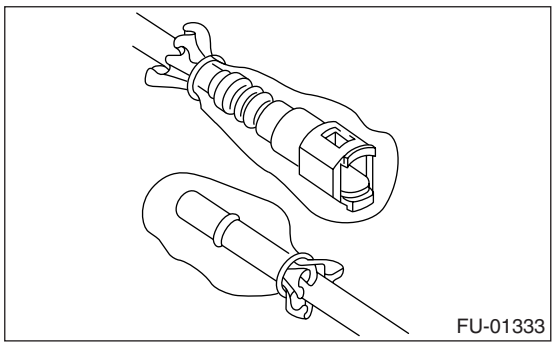


7) Lift-up the vehicle.

9) Disconnect the quick connector on the fuel delivery line.

(1) Clean the pipe and connector, if they are covered with dust.

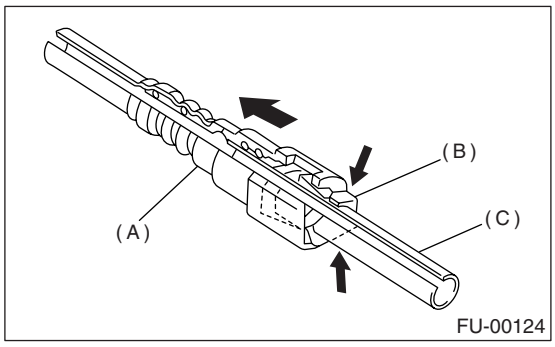
(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



(3) Hold the connector (A) and push retainer (B) down.

(4) Pull out the connector (A) from retainer (B).

CAUTION:
Replace the retainer except for it in engine room with a new one.



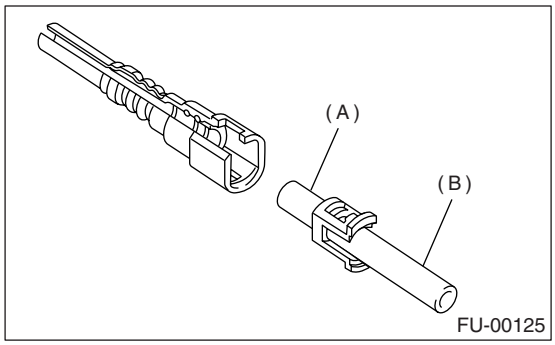
(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

NOTE:
• Replace the retainer with a new one.

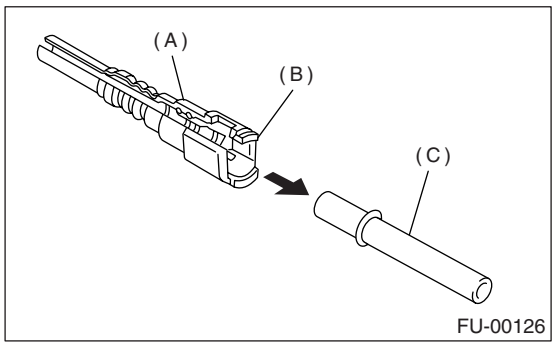
• Make sure the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



(A) Seal surface
(B) Pipe

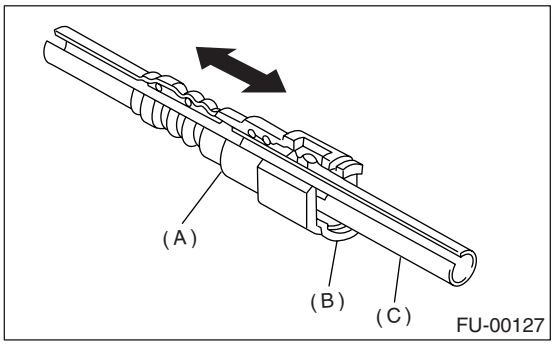
(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into connector completely.

NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
• Pull the connector to ensure it is connected securely.
• Ensure the two retainer pawls are engaged in their mating positions in connector.
• Be sure to inspect the hoses and their connections for any leakage of fuel.

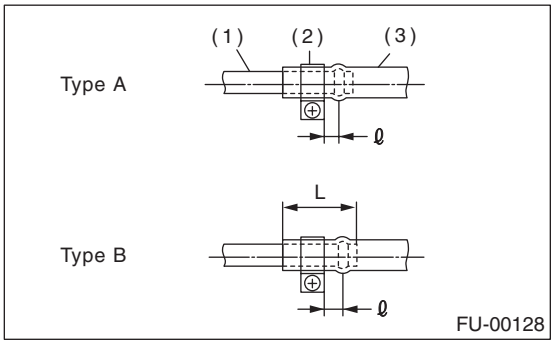


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to pipe with an overlapof 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

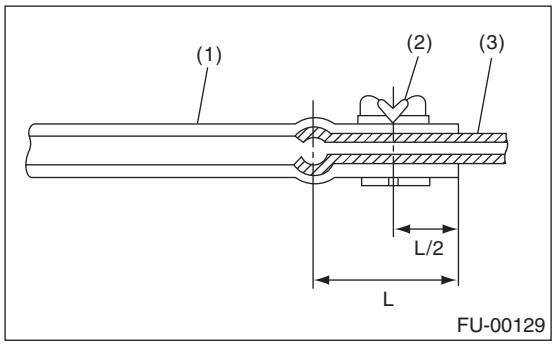


(1) Fitting
(2) Clamp
(3) Hose

3) Connect the evaporation hose to pipe by approx. 15 — 20 mm (0.59 — 0.79 in) from hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect the hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure there are no cracks on fuel pipes and fuel hoses.
2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

34.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing tightness on the fuel filler cap.	Correct or replace the packing.
3)	Inoperative fuel pump.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
• When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4DOTC 2.0)

Page

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3. Rear Catalytic Converter 4
4. Precatalytic Converter 5
5. Canister 6
6. Purge Control Solenoid Valve 7
7. Two-way Valve 8

1. General Description

A: CAUTION

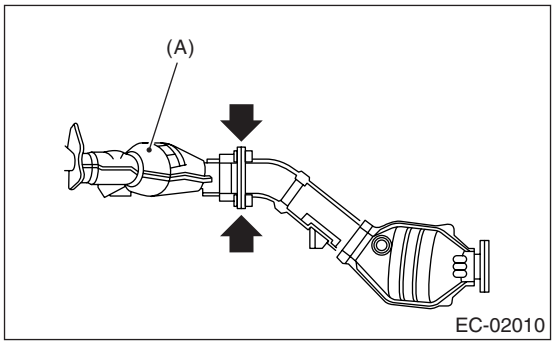
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Front Catalytic Converter

A: REMOVAL

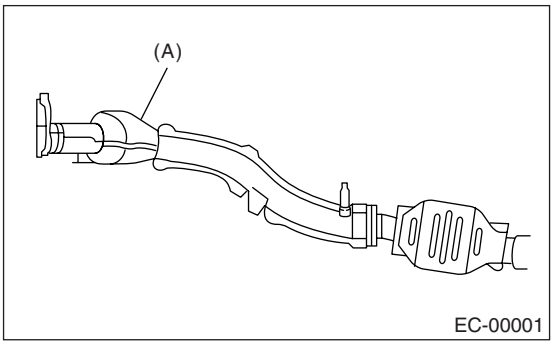
1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL**, Center Exhaust Pipe.>**
2) Separate the front catalytic converter from center exhaust pipe. (2.0 L model and 2.5 L (EK, EC) model)

- 2.0 L model and 2.5 L (EK, EC) model



(A) Front catalytic converter

- 2.5 L (KA) model



(A) Front catalytic converter

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gaskets with new ones.

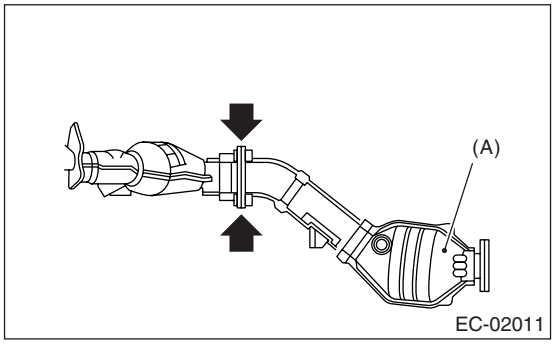
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

3. Rear Catalytic Converter

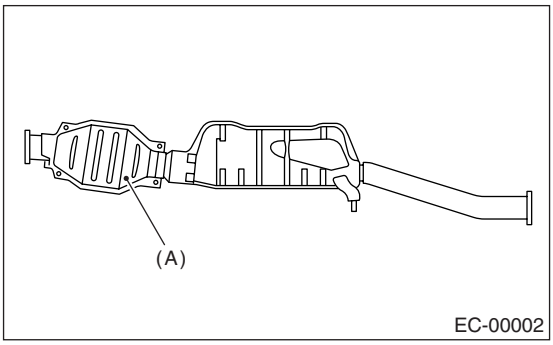
A: REMOVAL

1) Remove the center exhaust pipe.
(2.0 L model and 2.5 L (EK, EC) model)
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL**, Center Exhaust Pipe.>**
2) Separate the rear catalytic converter from front center exhaust pipe.
(2.0 L model and 2.5 L (EK, EC) model)



(A) Rear catalytic converter

3) Remove the rear exhaust pipe.
(2.5 L (KA) model)
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL**, Rear Exhaust Pipe.>**



(A) Rear catalytic converter

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gaskets with new ones.

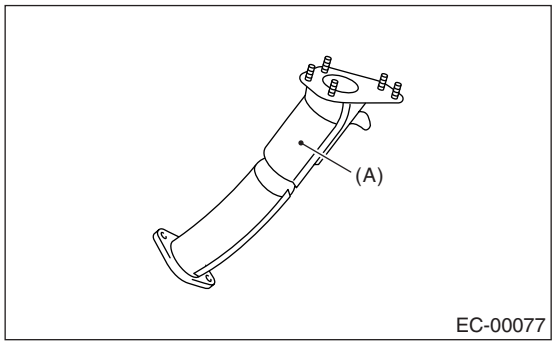
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

4. Precatalytic Converter

A: REMOVAL

Precatalytic converter (A) is built in the joint pipe. Refer to the removal of joint pipe for removal procedure. **<Ref. to EX(H4DOTC 2.0)-13,** REMOVAL**, Joint Pipe.>**



B: INSTALLATION

Refer to the installation of joint pipe for installation procedure. **<Ref. to EX(H4DOTC 2.0)-13,** INSTALLATION, Joint Pipe.>

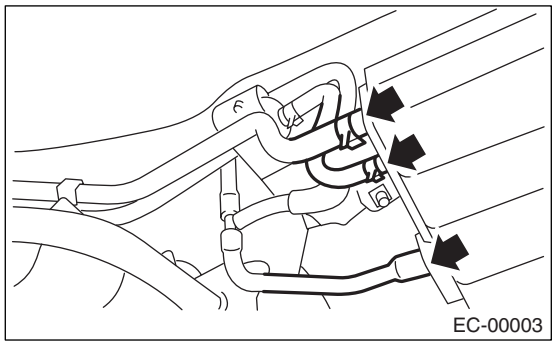
C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

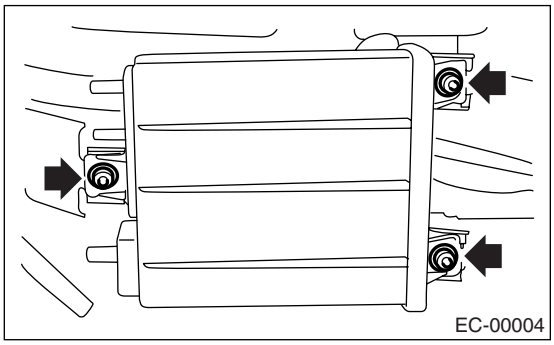
5. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the two clamps which hold two canister hoses, and disconnect the three evaporation hoses from canister.



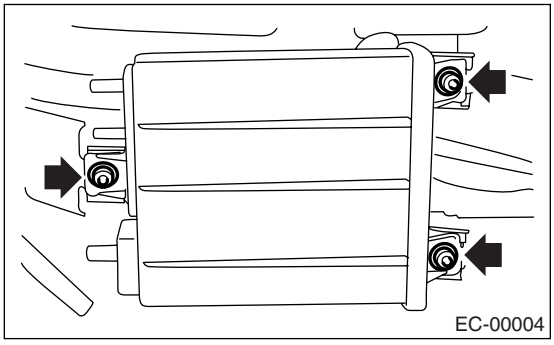
3) Remove the canister from body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



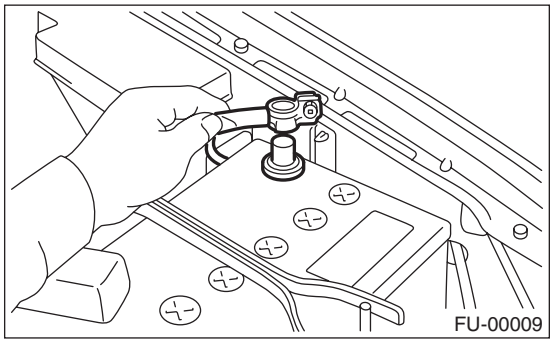
C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

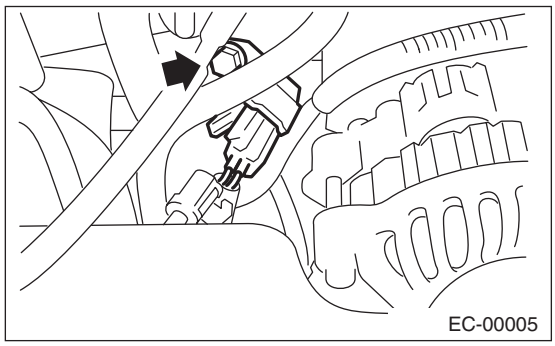
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



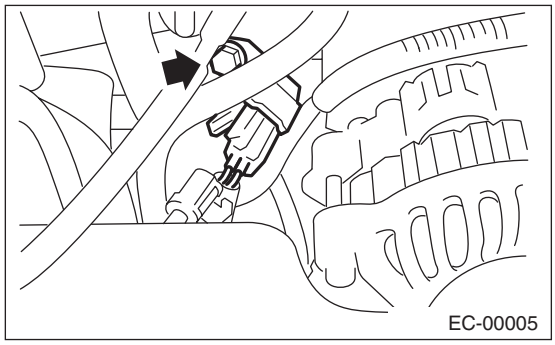
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.



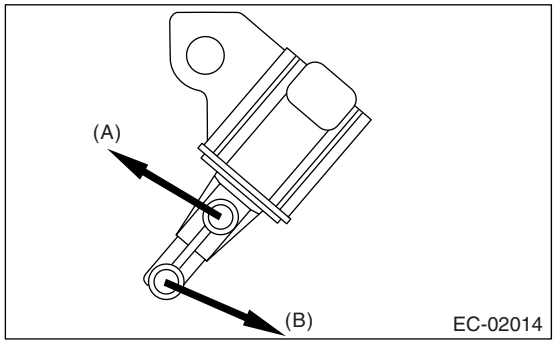
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To intake manifold
(B) To purge valve

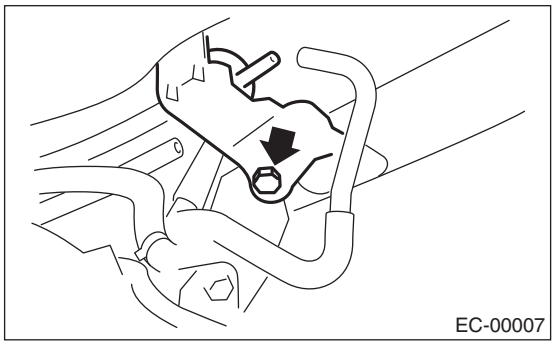
C: INSPECTION

Make sure the hoses are not cracked or loose.

7. Two-way Valve

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the canister from body. **<Ref. to EC(H4DOTC 2.0)-6,** REMOVAL**, Canister.>**
3) Remove the two-way valve with bracket as a single unit from body.



4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure that the hoses are not cracked or loose.

INTAKE (INDUCTION)

IN(H4DOTC 2.0)

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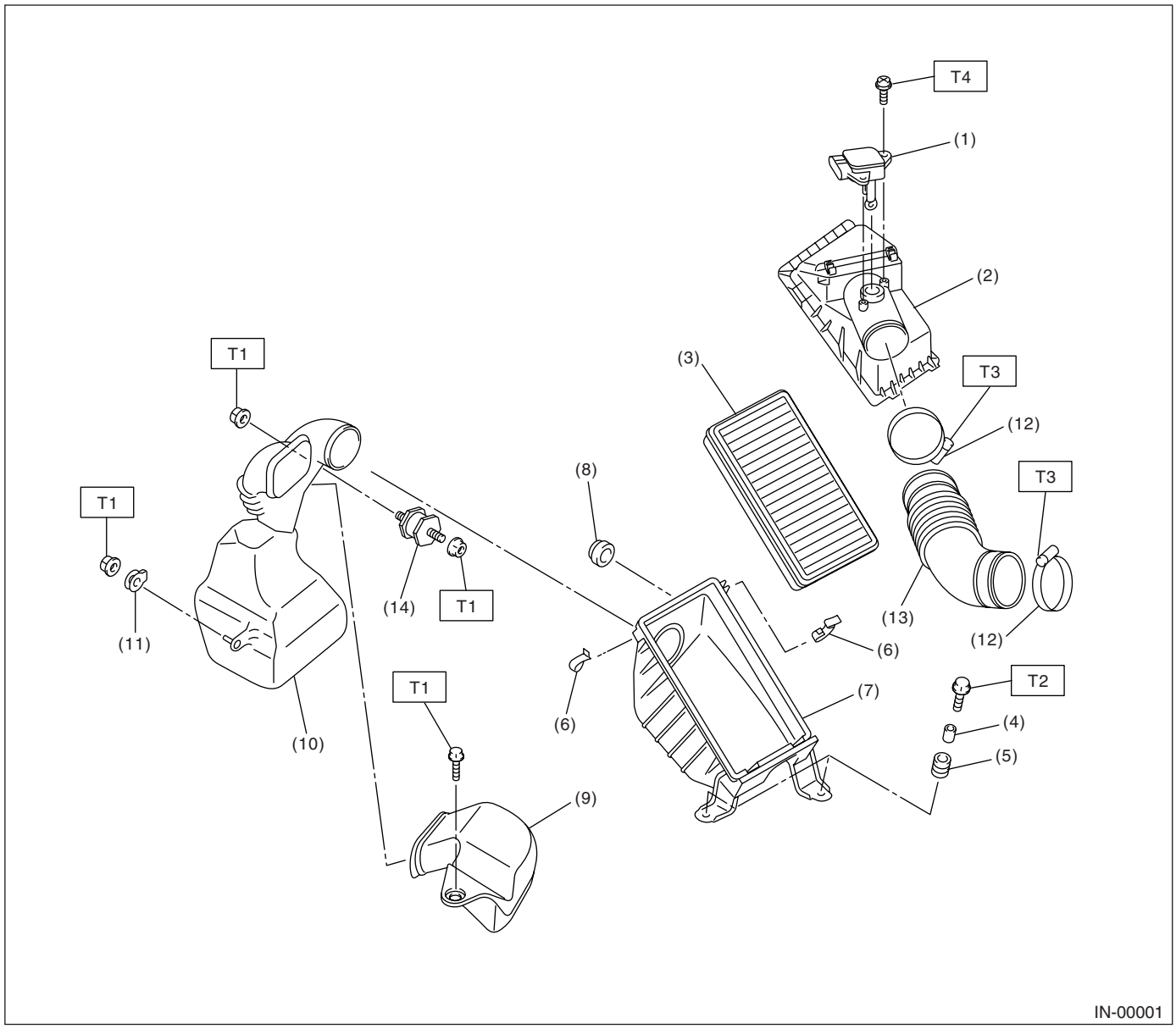
1. General Description 2
2. Air Cleaner Case 7
3. Air Intake Duct 8
4. Intake Duct 9
5. Intercooler 10
6. Turbocharger 12
7. Air By-pass Valve 15
8. Resonator Chamber 16

1. General Description

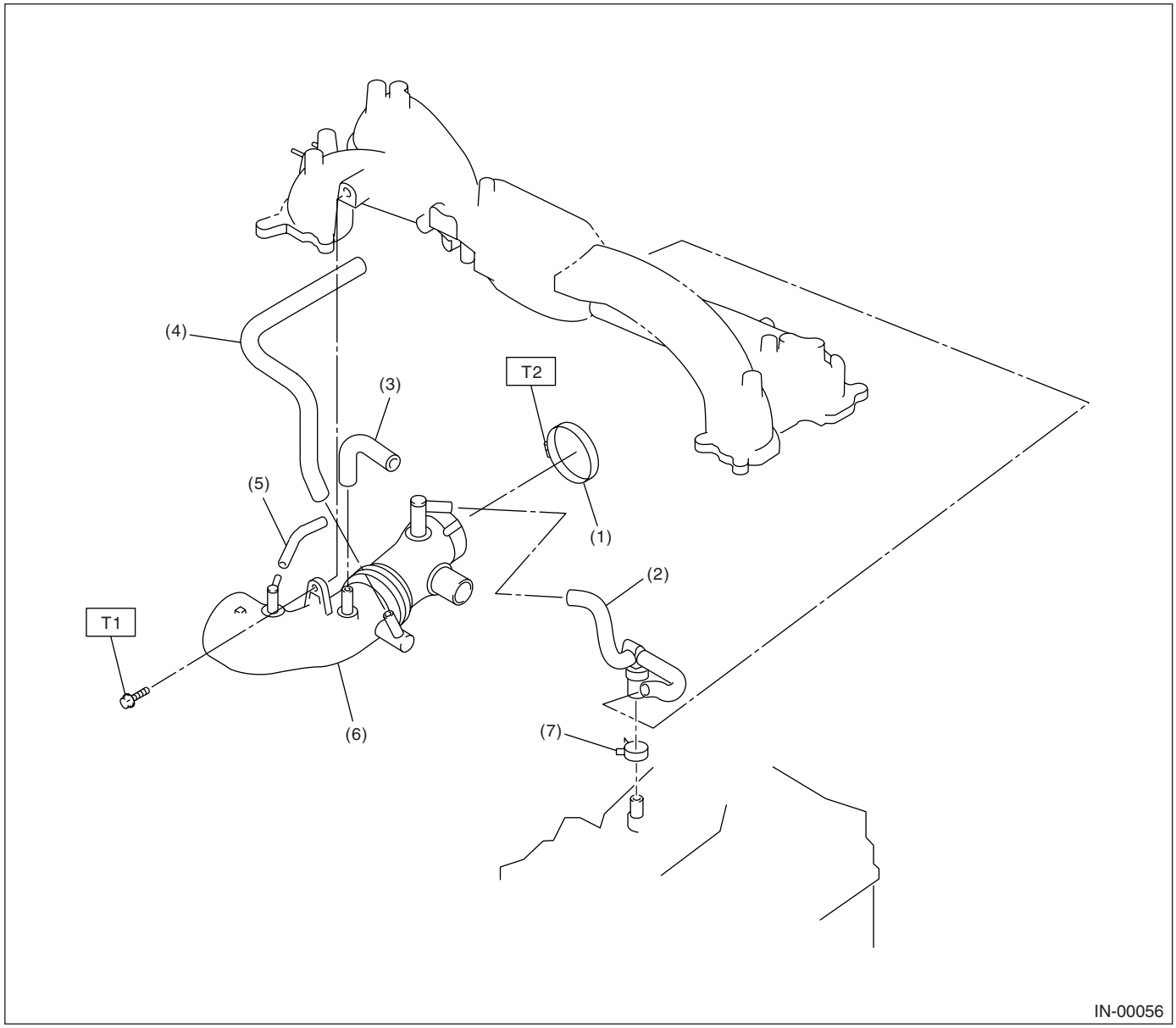
A: COMPONENT

1. AIR CLEANER



(1)	Mass air flow and intake air temperature sensor	(7)	Air cleaner lower case	(14)	Cushion
(2)	Air cleaner upper cover	(8)	Cushion rubber		
(3)	Air cleaner element	(9)	Air intake duct	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Spacer	(10)	Resonator chamber ASSY	***T1: 7.5 (0.76, 5.5)***	
(5)	Bushing	(11)	Cushion rubber	***T2: 33 (3.4, 25)***	
(6)	Clip	(12)	Clamp	***T3: 2.5 (0.25, 1.8)***	
		(13)	Air intake boot	***T4: 1.7 (0.17, 1.2)***	

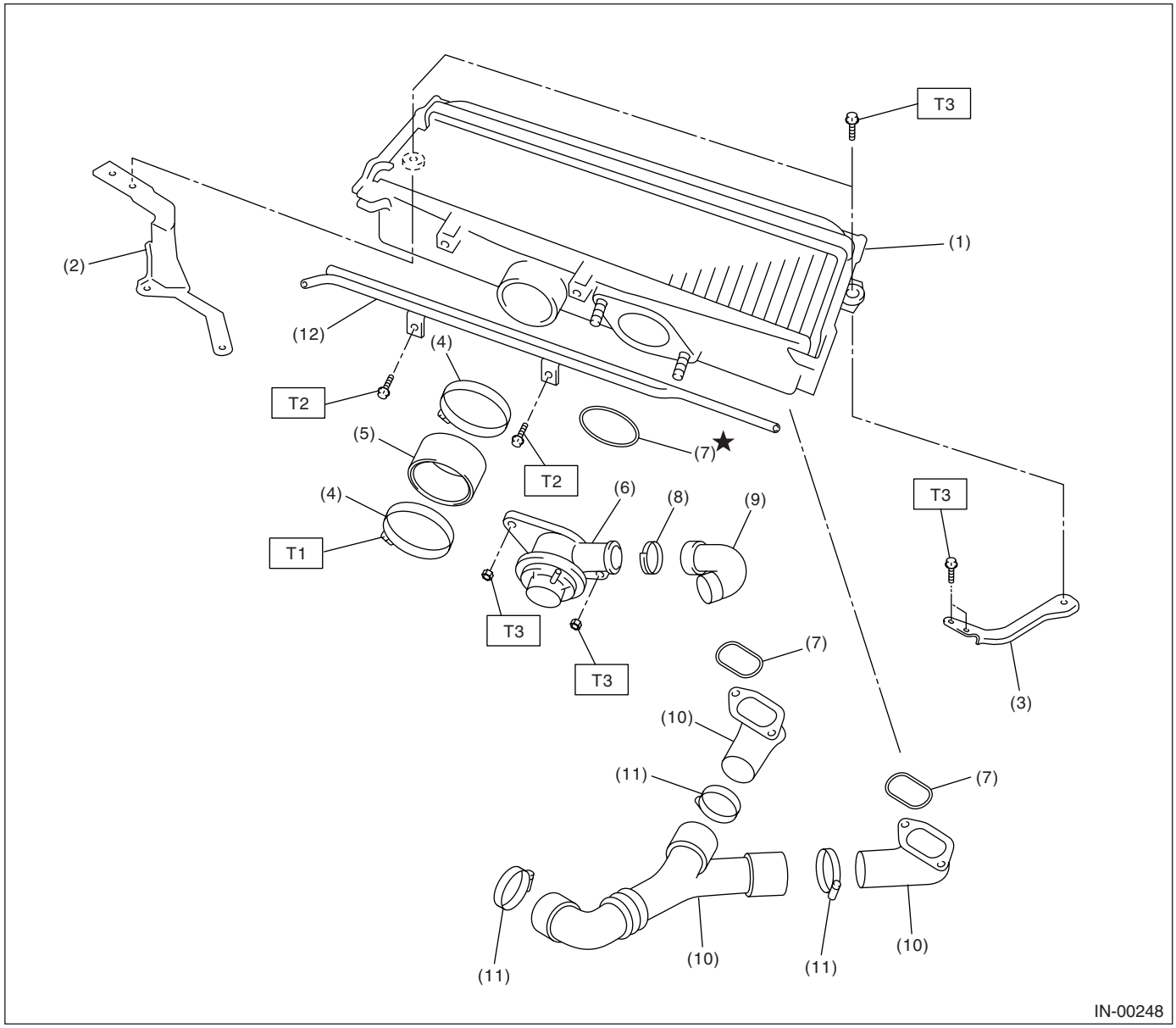
2. INTAKE DUCT



(1) Clamp
(2) PCV hose ASSY
(3) Air by-pass hose A
(4) Air by-pass hose B
(5) Air by-pass hose C
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 14.0)
T2: 3 (0.3, 2.2)

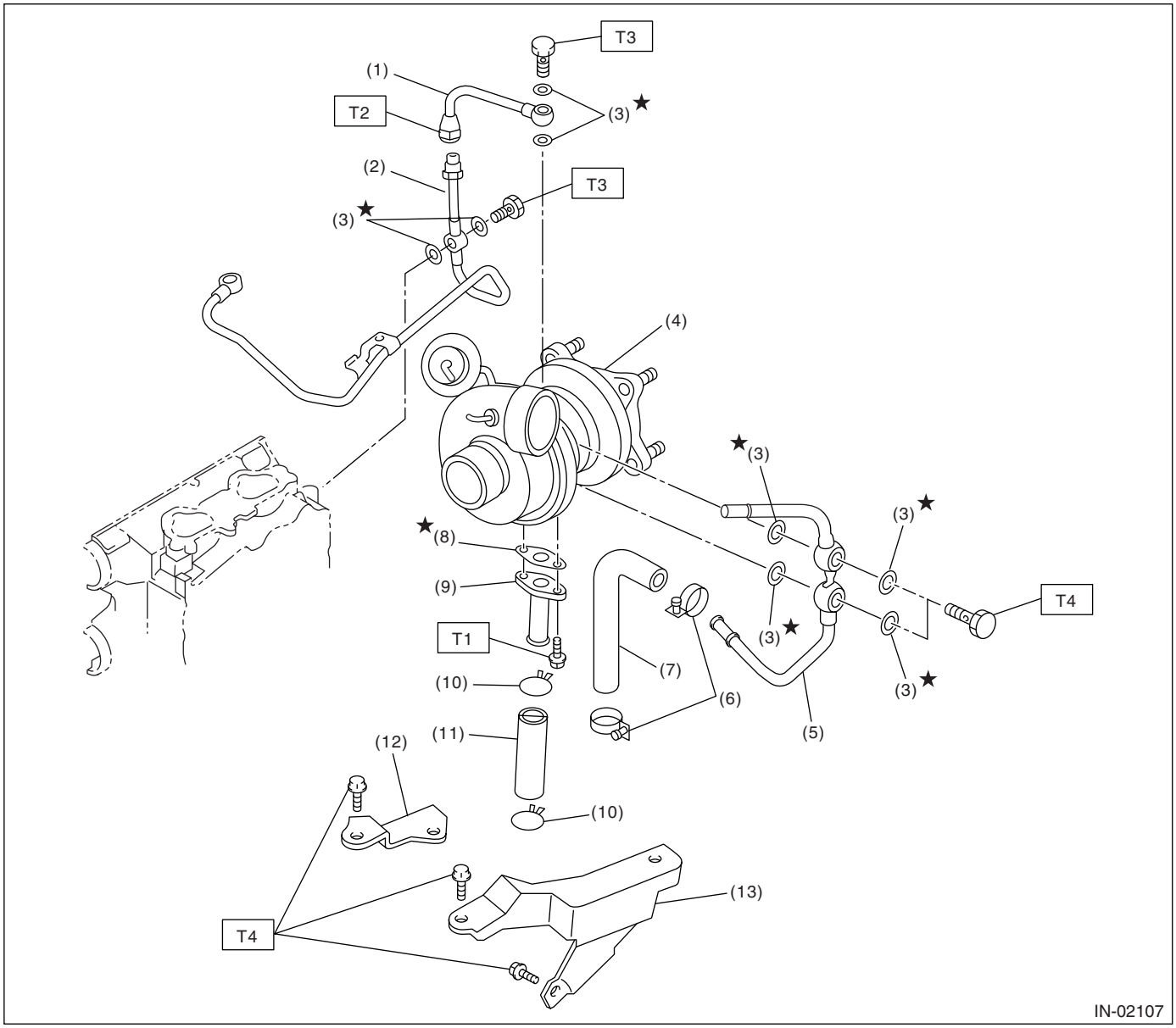
3. INTERCOOLER



(1)	Intercooler	(7)	O-ring
(2)	Intercooler bracket RH	(8)	Clamp
(3)	Intercooler bracket LH	(9)	Air by-pass hose A
(4)	Clamp	(10)	Intercooler duct
(5)	Air intake duct	(11)	Clamp
(6)	Air by-pass valve	(12)	PCV pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 6.1 (0.62, 4.5)
T3: 16 (1.6, 11.8)

4. TURBOCHARGER



(1) Oil inlet pipe A
(2) Oil inlet pipe B
(3) Metal gasket
(4) Turbocharger
(5) Water pipe
(6) Clamp
(7) Engine coolant hose
(8) Gasket
(9) Oil outlet pipe
(10) Clip
(11) Oil outlet hose
(12) Turbocharger bracket RH
(13) Turbocharger bracket LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 20 (2.0, 14.5)
T3: 16 (1.6, 11.8)
T4: 33 (3.4, 25)

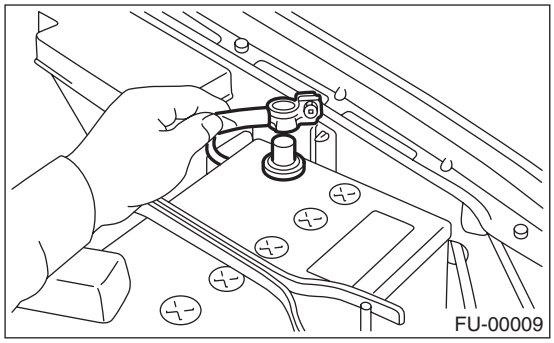
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

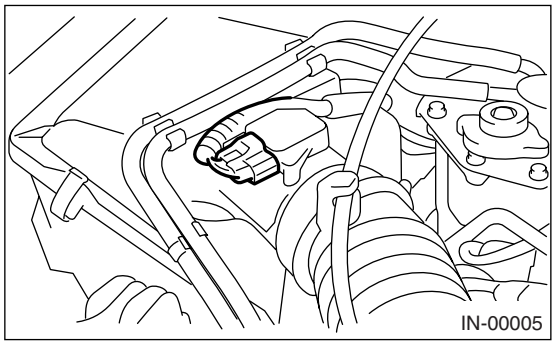
2. Air Cleaner Case

A: REMOVAL

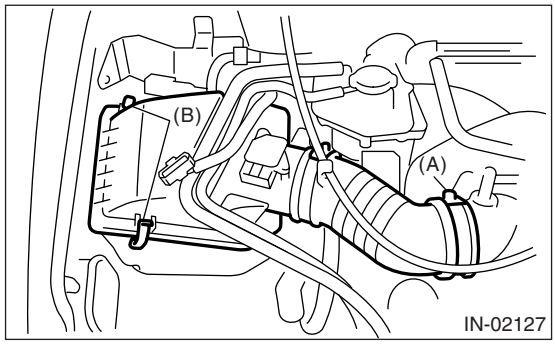
1) Disconnect the ground cable from battery.



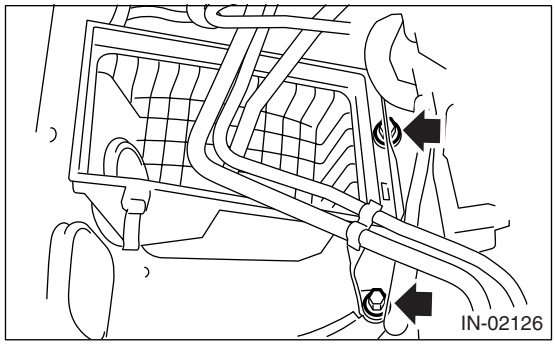
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects air intake boot and intake duct.
4) Remove the clip (B) from air cleaner upper cover.



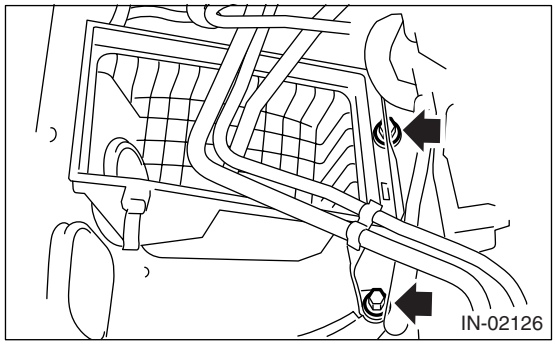
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



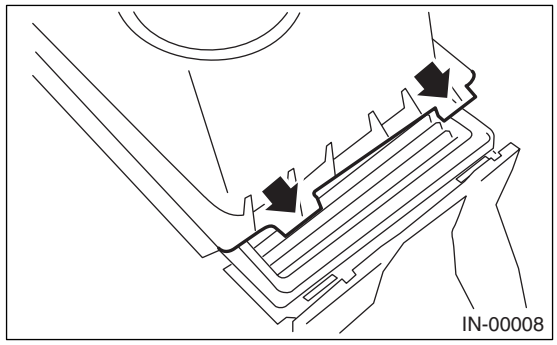
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



NOTE:
Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to lower case.



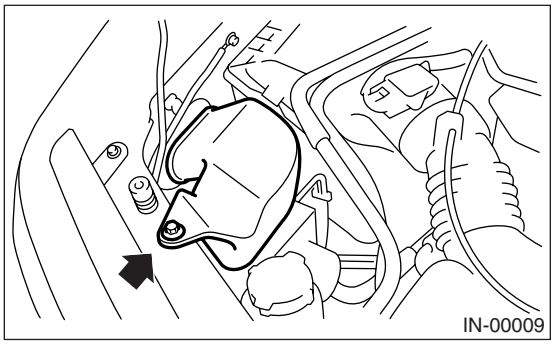
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Intake Duct

A: REMOVAL

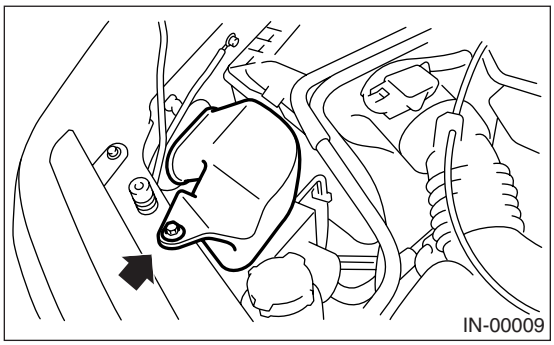
1) Remove the bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



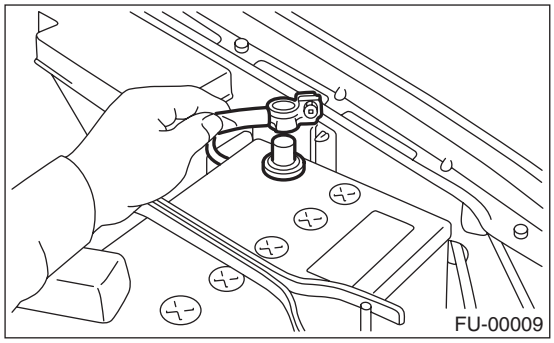
C: INSPECTION

1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in the air intake duct.

4. Intake Duct

A: REMOVAL

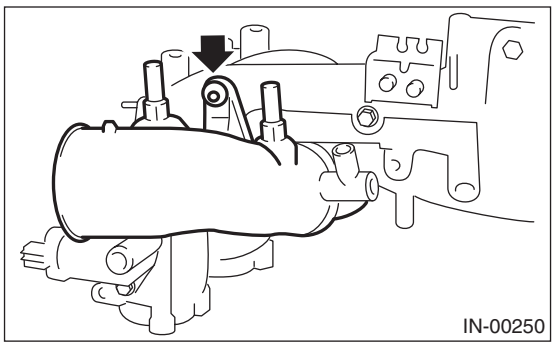
1) Disconnect the ground cable from battery.



2) Remove the intake manifold. <Ref. to FU(H4DOTC 2.0)-14, REMOVAL, Intake Manifold.> or <Ref. to FU(H4DOTC 2.5)-14, REMOVAL, Intake Manifold.>

3) Remove the sensor, engine harness, and fuel pipe attached to intake manifold. <Ref. to FU(H4DOTC 2.0)-21, DISASSEMBLY, Intake Manifold.> or <Ref. to FU(H4DOTC 2.5)-20, DISASSEMBLY, Intake Manifold.>

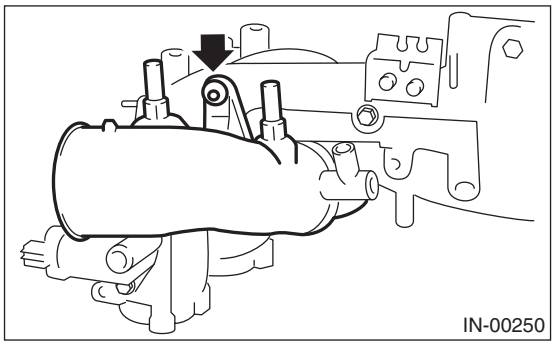
4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

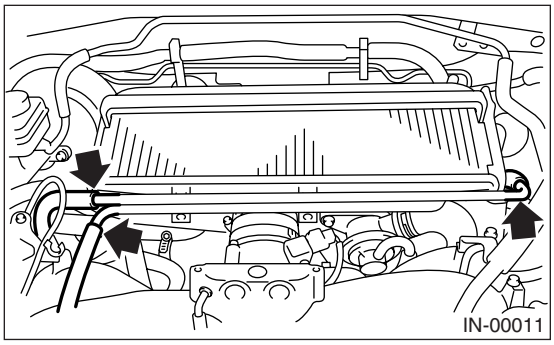
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



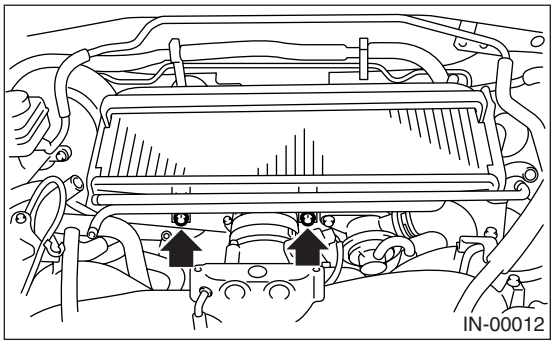
5. Intercooler

A: REMOVAL

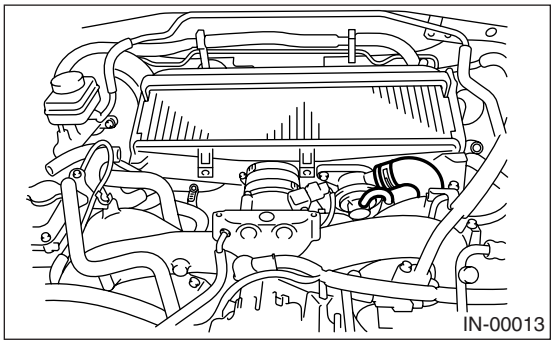
1) Disconnect the PCV hose from PCV pipe.



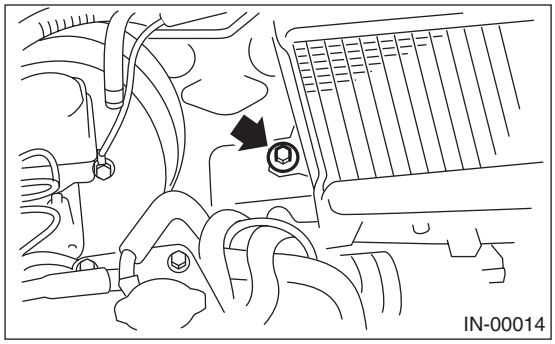
2) Remove the PCV pipe from intercooler.

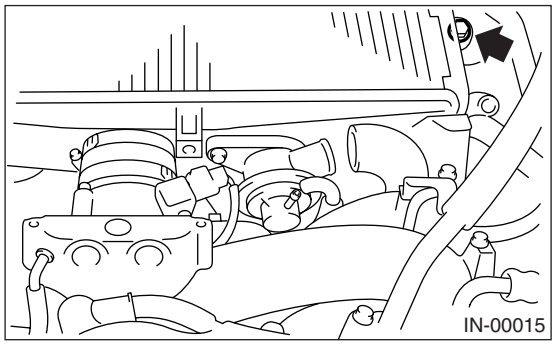


3) Disconnect the hose from air by-pass valve.

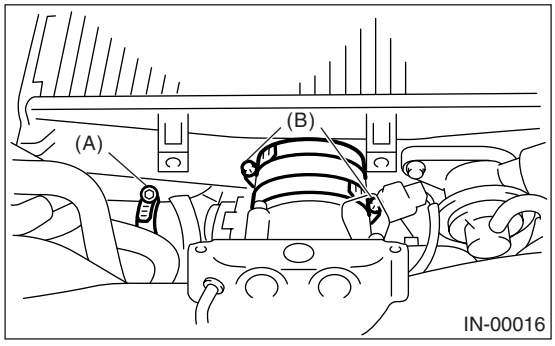


4) Remove the bolts which secure intercooler to bracket.





5) Loosen the clamp (A) which connects turbocharger and intercooler duct.
6) Loosen the clamp (B) which connects throttle body and intercooler.

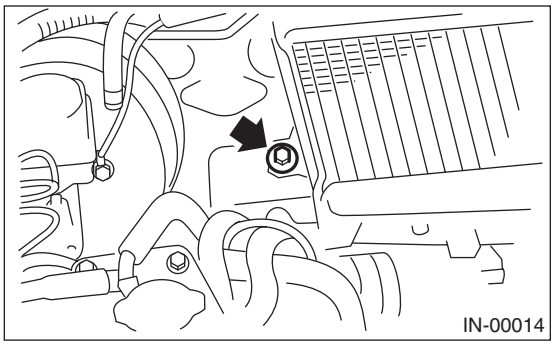


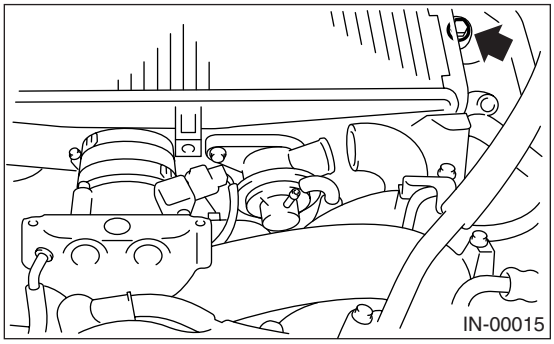
7) Disconnect the intercooler duct from turbocharger.
8) Remove the intercooler from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

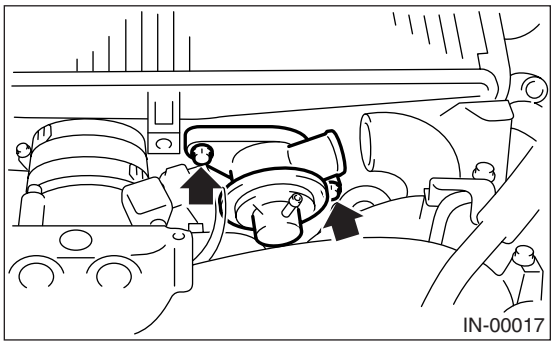
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)


IN-00014

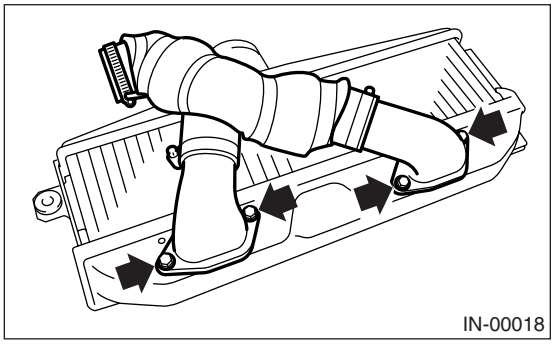

IN-00015

C: DISASSEMBLY

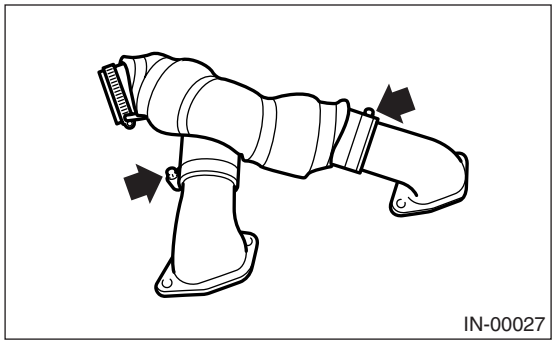
1) Remove the air by-pass valve from intercooler.


IN-00017

2) Remove the intercooler ducts from intercooler.


IN-00018

3) Separate the ducts.

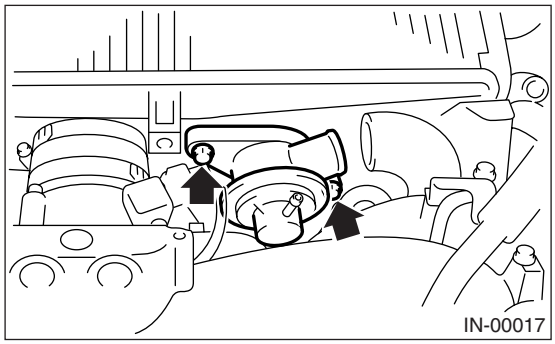

IN-00027

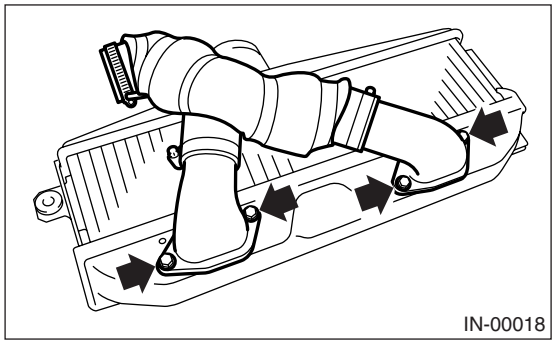
D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:
Install the O-ring in proper position.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

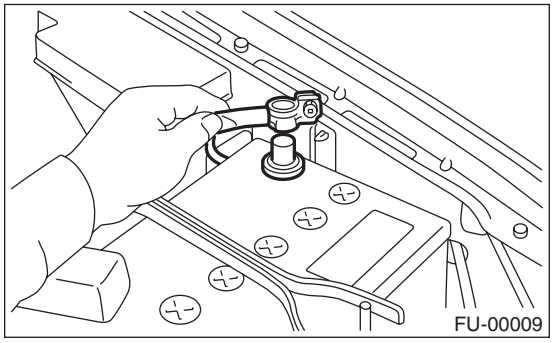

IN-00017


IN-00018

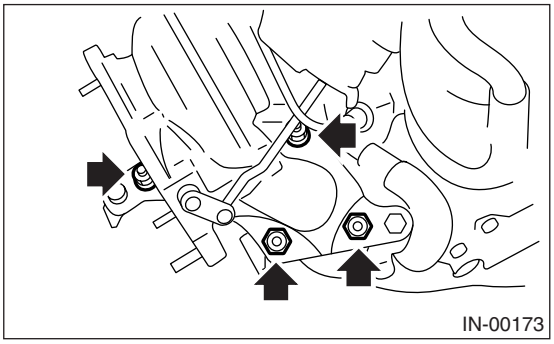
6. Turbocharger

A: REMOVAL

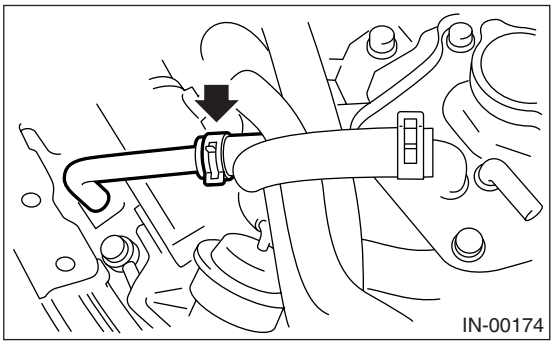
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



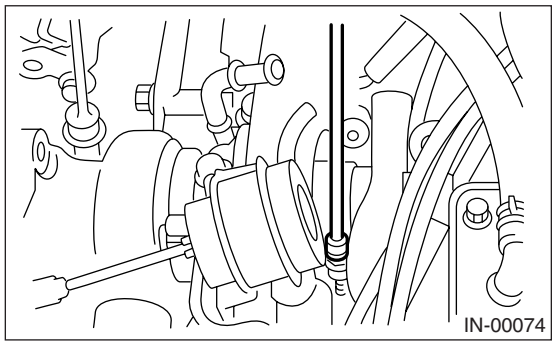
3) Remove the center exhaust pipe. **<Ref. to EX(H4DOTC 2.0)-9,** REMOVAL**, Center Exhaust Pipe.>**
4) Lower the vehicle.
5) Separate the turbocharger joint pipe from turbocharger.



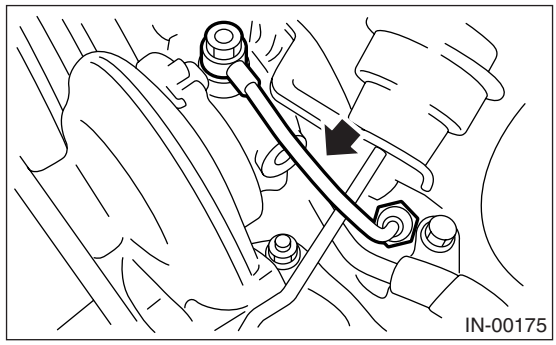
6) Disconnect the engine coolant hose which is connected to coolant filler tank.



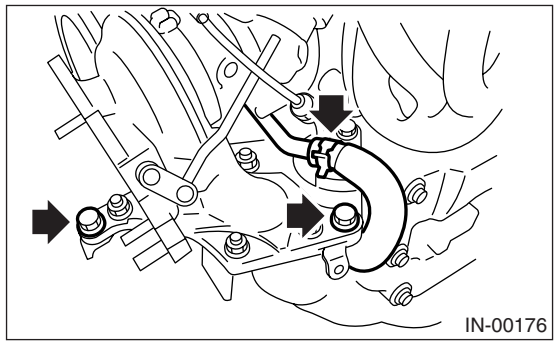
7) Loosen the clamp which secures turbocharger to intake duct.



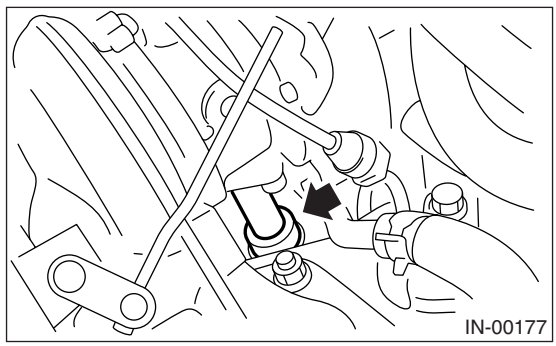
8) Remove the bolt which secures bracket of oil pipe to turbocharger.
9) Remove the oil pipe from turbocharger.



10) Remove the turbocharger bracket.



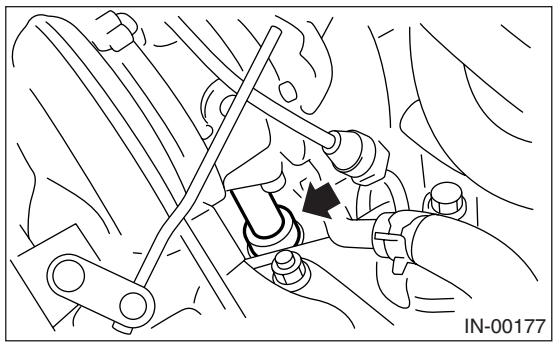
11) Disconnect the oil outlet hose from pipe.



12) Take out the turbocharger from engine compartment.

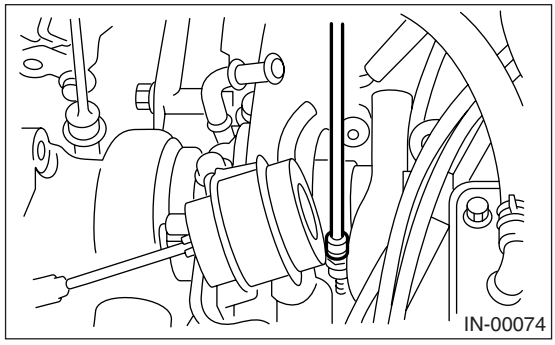
B: INSTALLATION

1) Connect the oil outlet hose to outlet pipe.



2) Install the turbocharger to intake duct.

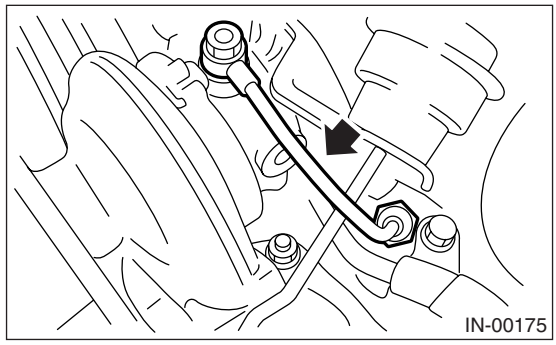
Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

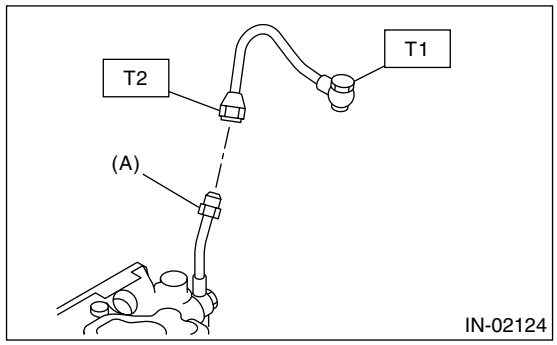


3) Temporarily tighten the oil pipe, and then tighten to specified torque.

NOTE:
• Use a new gasket.
• Do not turn the A part shown in a figure when tightening.

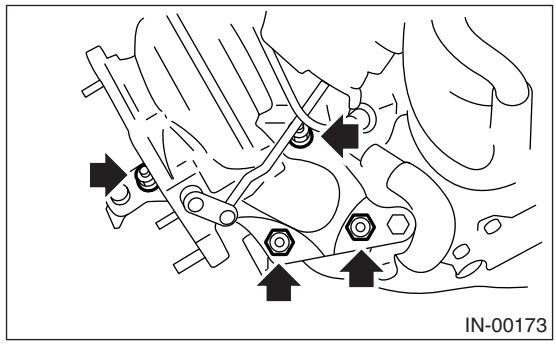
Tightening torque:
T : 16 N·m (1.6 kgf-m, 11.8 ft-lb)
T : 20 N·m (2.0 kgf-m, 14.5 ft-lb)





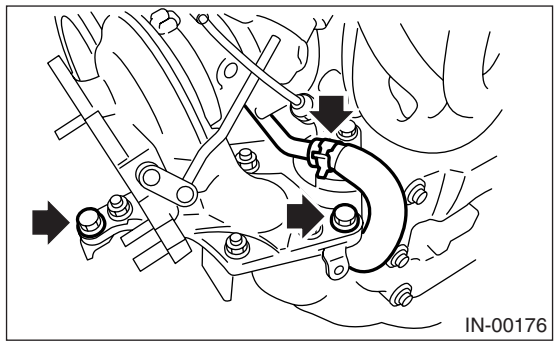
4) Install the joint pipe to turbocharger.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

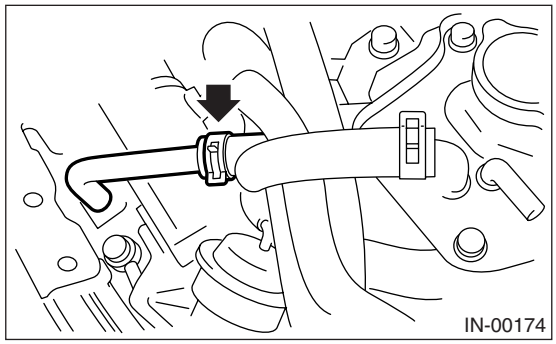


5) Install the turbocharger bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



6) Connect the engine coolant hose which is connected to coolant filler tank.

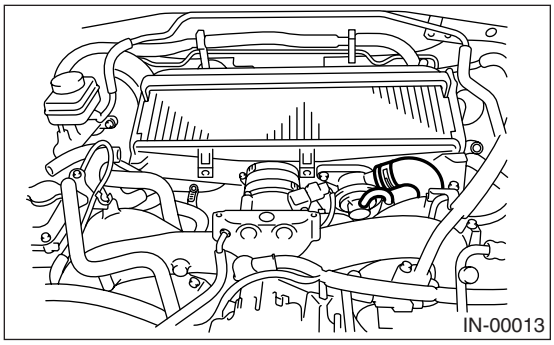


7) Lift-up the vehicle.
8) Install the center exhaust pipe. <Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.>

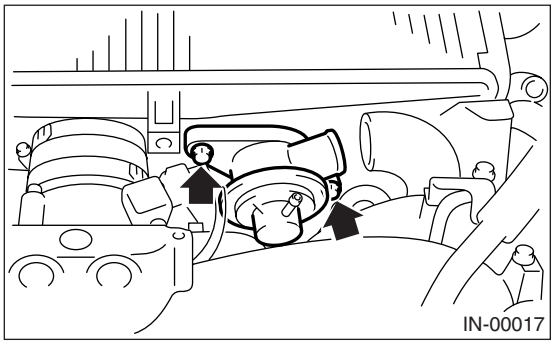
7. Air By-pass Valve

A: REMOVAL

1) Disconnect the air by-pass hoses from air by-pass valve.



2) Remove the air by-pass valve from intercooler.

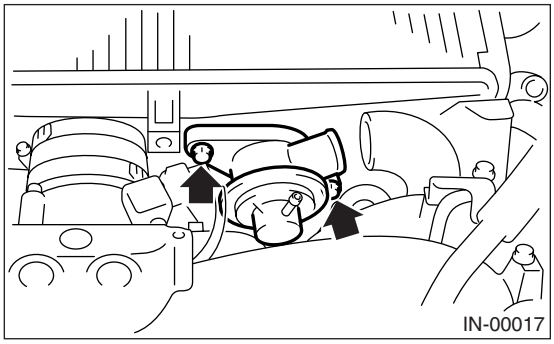


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Install the O-ring in proper position.

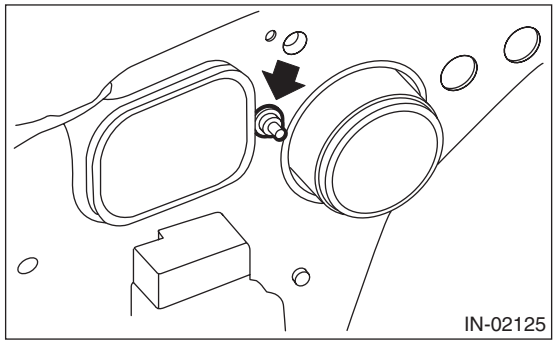
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



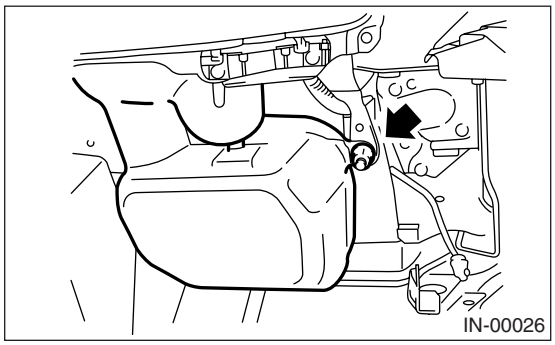
8. Resonator Chamber

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the air intake duct. **<Ref. to IN(H4DOTC 2.0)-8,** REMOVAL**, Air Intake Duct.>**
3) Remove the air cleaner lower case. **<Ref. to IN(H4DOTC 2.0)-7,** REMOVAL**, Air Cleaner Case.>**
4) Remove the resonator chamber mounting bolt on the right of engine compartment.



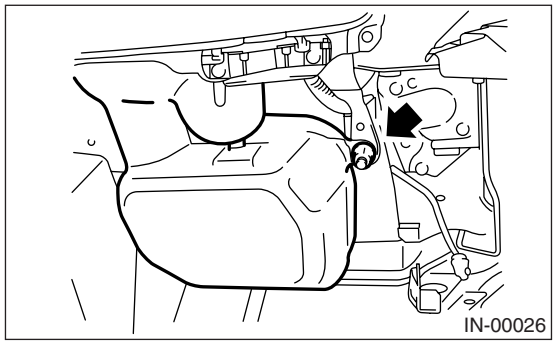
5) Remove the front right tire, and lift the vehicle.
6) Remove the front mudguard RH.
7) Remove the resonator chamber from the inside front fender.

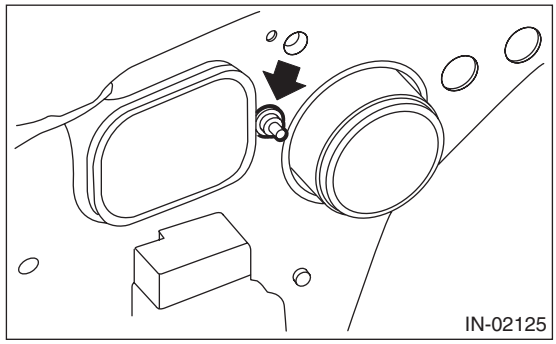


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)





C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the resonator chamber.

MECHANICAL

ME(H4DOTC 2.0)

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1. General Description

A: SPECIFICATION

1. 2.0 L MODEL

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke mm (in)			92 × 75 (3.62 × 2.95)	
	Piston displacement cm^3 (cu in)			1,994 (121.67)	
	Compression ratio			8.0	
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)			981 — 1,177 (10 — 12, 142 — 171)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening	Max. retard	BTDC 3°	
			Min. advance	BTDC 33°	
		Closing	Max. retard	ABDC 33°	
			Min. advance	ABDC 3°	
	Exhaust valve timing	Opening		BBDC 33°	
		Closing		ATDC 3°	
	Valve clearance	Intake mm (in)		0.20±0.02 (0.0079±0.0008)	
		Exhaust mm (in)		0.35±0.02 (0.0138±0.0008)	
	Idling speed [At neutral position on MT, or "P" or "N" range on AT] rpm		No load	MT: 700±100 AT: 700±100	
			A/C ON	A/C Refrigerant pressure (LOW)	MT: 725±100 AT: 750±100
				A/C Refrigerant pressure (HIGH)	MT: 800±100 AT: 825±100
	Firing order			1 → 3 → 2 → 4	
	Ignition timing BTDC/rpm			12°±10°/700	

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod		5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.		17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.		18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush	STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
		Limit	0.175 mm (0.0069 in)
	Side clearance of spacer	STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
		Limit	0.81 mm (0.0319 in)

Camshaft	Bend limit			0.020 mm (0.0008 in)
	Thrust clearance		STD	0.068 — 0.116 mm (0.0027 — 0.0046 in)
			Limit	0.14 mm (0.0055 in)
	Cam lobe height	Intake	STD	44.75 — 44.85 mm (1.762 — 1.766 in)
			Limit	44.65 mm (1.758 in)
		Exhaust	STD	44.75 — 44.85 mm (1.762 — 1.766 in)
			Limit	44.65 mm (1.758 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.035 mm (0.0014 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	0.85 — 1.15 mm (0.033 — 0.045 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.35 — 1.65 mm (0.053 — 0.064 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.0 — 1.4 mm (0.039 — 0.055 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.3 — 1.7 mm (0.051 — 0.067 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.65 mm (4.120 in)
Valve spring	Free length			44.67 mm (1.759 in)
	Squareness			2.5°, 2.0 mm (0.079 in) or less
	Tension/spring height		Set	206 — 236 N (21.0 — 24.1 kgf, 46.3 — 53.1 lbf)/ 36.0 mm (1.417 in)
			Lift	485 — 537 N (49.5 — 54.8 kgf, 109 — 121 lbf)/ 26.6 mm (1.047 in)
Cylinder block	Surface warpage limit (mating with cylinder head)			0.025 mm (0.00098 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)
			B	91.995 — 92.005 mm (3.6218 — 3.6222 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)

Piston	Outer diameter	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)
			B	91.975 — 91.985 mm (3.6211 — 3.6214 in)
		0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)
		0.50 mm (0.020 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	Outer circle side: 0.20 — 0.25 mm (0.0079 — 0.0098 in)
				Inner circle side: 0.20 — 0.30 mm (0.0079 — 0.0117 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.40 — 0.50 mm (0.016 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.026 — 0.052 mm (0.001 — 0.002 in)
			Limit	0.052 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.005 mm (0.0002 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter		STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

2. 2.5 L MODEL

Engine	Model			2.5 L	
	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke mm (in)			99.5 × 79.0 (3.92 × 3.11)	
	Piston displacement cm^3 (cu in)			2,457 (149.93)	
	Compression ratio			8.2	
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)			981 — 1,177 (10 — 12, 142 — 171)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Opening	Max. retard	ATDC 5°	
			Min. advance	BTDC 15°	
		Closing	Max. retard	ABDC 65°	
			Min. advance	ABDC 45°	
	Exhaust valve timing	Opening		BBDC 55°	
		Closing		ATDC 5°	
	Valve clearance	Intake mm (in)		0.20±0.02 (0.0079±0.0008)	
		Exhaust mm (in)		0.35±0.02 (0.0138±0.0008)	
	Idling speed [At neutral position on MT, or “P” or “N” range on AT] rpm		No load	MT: 700±100 AT: 700±100	
			A/C ON	A/C Refrigerant pressure (LOW)	MT: 725±100 AT: 750±100
				A/C Refrigerant pressure (HIGH)	MT: 800±100 AT: 825±100
	Firing order			1 → 3 → 2 → 4	
	Ignition timing BTDC/rpm		MT model	17°±10°/700	
			AT model	17°±10°/700	

NOTE:
STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

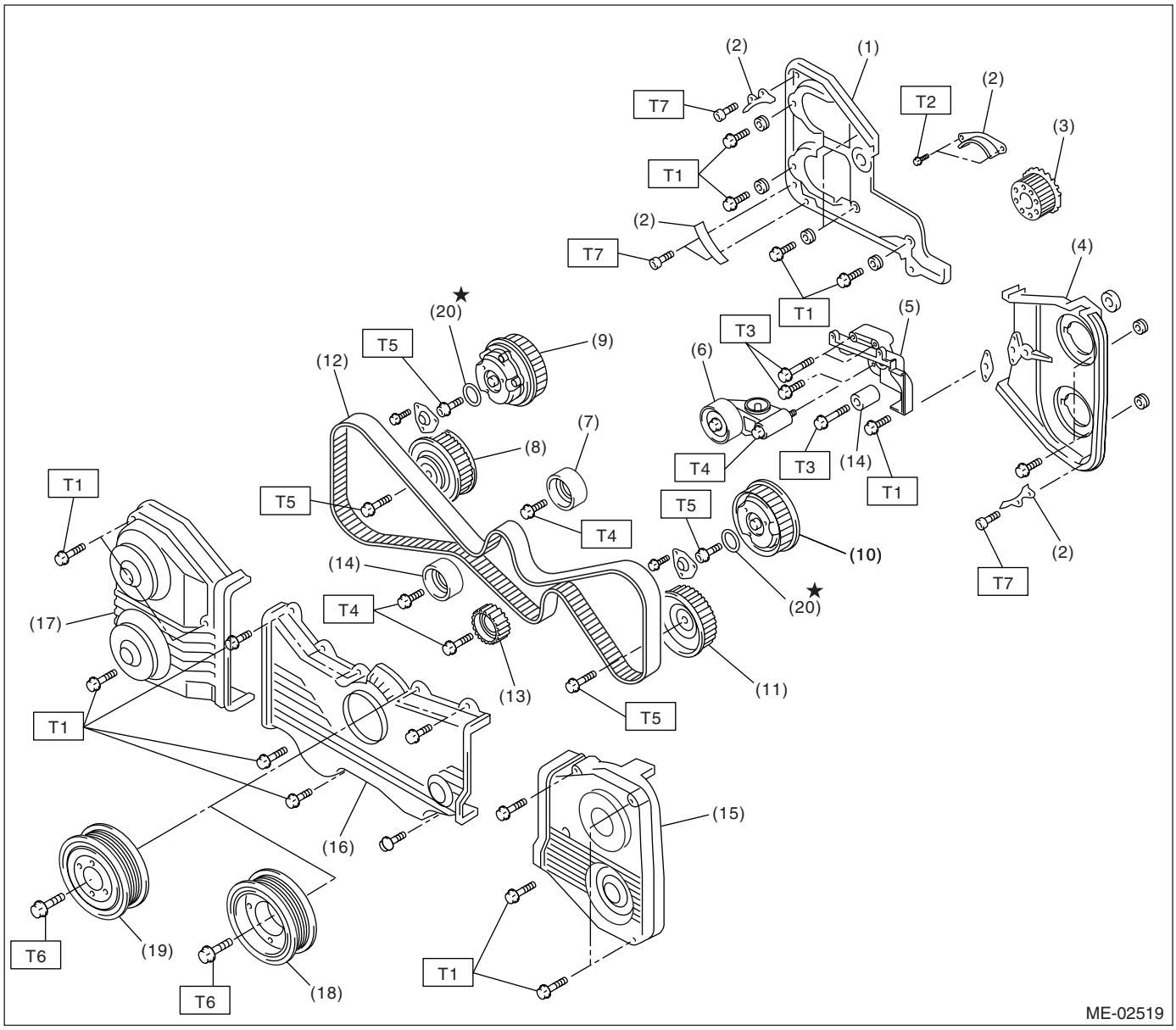
Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.0008 in)
	Thrust clearance		STD	0.068 — 0.116 mm (0.0027 — 0.0046 in)
			Limit	0.14 mm (0.0055 in)
	Cam lobe height	Intake	STD	46.55 — 46.65 mm (1.833 — 1.837 in)
			Limit	46.45 mm (1.829 in)
		Exhaust	STD	46.75 — 46.85 mm (1.841 — 1.844 in)
			Limit	46.65 mm (1.837 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit (mating with cylinder block)			0.035 mm (0.0014 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	0.6 — 1.4 mm (0.024 — 0.055 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.2 — 1.8 mm (0.047 — 0.071 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.0 — 1.4 mm (0.039 — 0.055 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.3 — 1.7 mm (0.051 — 0.067 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.65 mm (4.120 in)
Valve spring	Free length			47.32 mm (1.863 in)
	Squareness			2.5°, 2.1 mm (0.083 in) or less
	Tension/spring height		Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lbf)/ 36.0 mm (1.417 in)
			Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lbf)/ 26.50 mm (1.043 in)

Cylinder block	Surface warpage limit (mating with cylinder head)			0.025 mm (0.0098 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Standard height			201.0 mm (7.91 in)
	Cylinder bore	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	−0.010 — 0.010 mm (−0.0004 — 0.0004 in)
			Limit	0.030 mm (0.0012 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
		0.25 mm (0.0098 in) OS		99.745 — 99.765 mm (3.9270 — 3.9277 in)
		0.50 mm (0.020 in) OS		99.995 — 100.015 mm (3.9368 — 3.9376 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.37 — 0.52 mm (0.015 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.017 — 0.045 mm (0.0007 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin	Out-of-roundness		0.003 mm (0.0001 in)
		Cylindrically		0.004 mm (0.0002 in)
		Grinding limit (dia.)		51.750 mm (2.0374 in)
	Crank journal	Out-of-roundness		0.005 mm (0.0002 in)
		Cylindrically		0.006 mm (0.0002 in)
		Grinding limit (dia.)		59.750 mm (2.3524 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472 in)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0446 — 2.0453 in)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)
	Crank journal outer diameter		STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
Main bearing	Main bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

B: COMPONENT

1. TIMING BELT



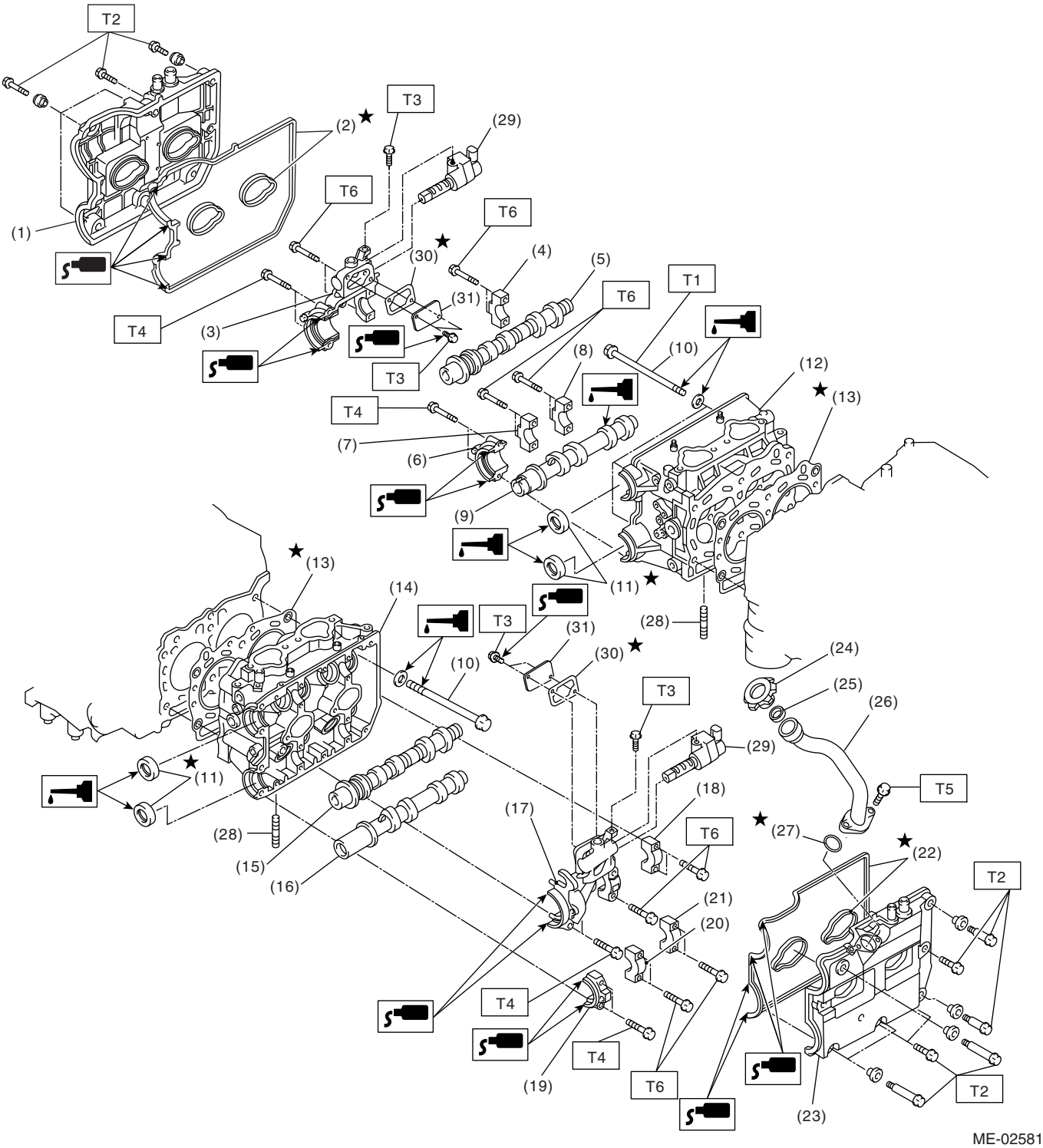
(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crank sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust cam sprocket (RH)
(9) Intake cam sprocket (RH)
(10) Intake cam sprocket (LH)
(11) Exhaust cam sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crank pulley (2.0 L model)
(19) Crank pulley (2.5 L model)
(20) O-Ring

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: <Ref. to ME(H4DOTC 2.0)-67, INSTALLATION, Cam Sprocket.>
T6: <Ref. to ME(H4DOTC 2.0)-56, INSTALLATION, Crank Pulley.>
T7: 6.4 (0.65, 4.7)

2. CYLINDER HEAD AND CAMSHAFT

• 2.0 L MODEL

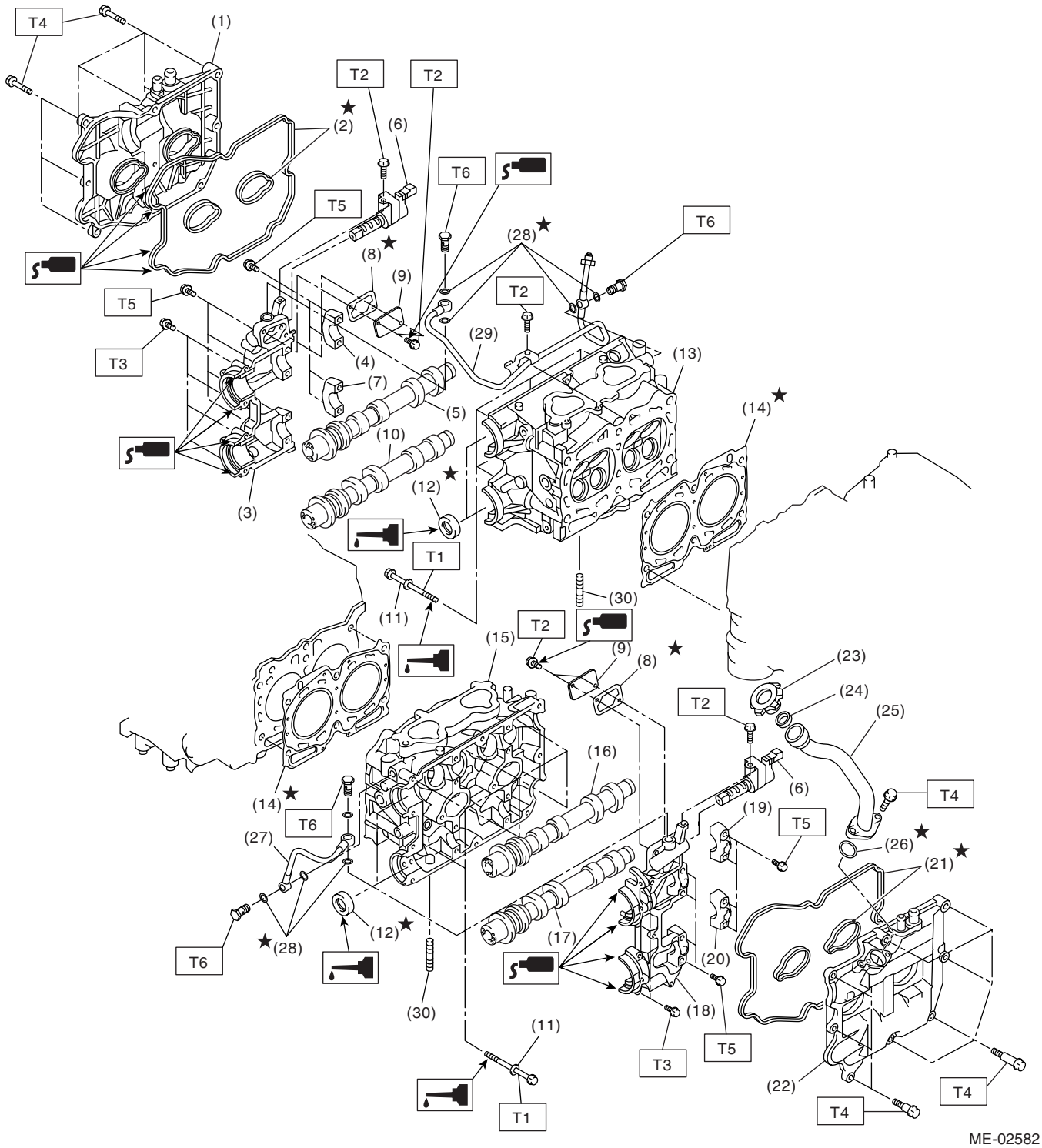


(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Intake camshaft cap (Front RH)
(4) Intake camshaft cap (Rear RH)
(5) Intake camshaft (RH)
(6) Exhaust camshaft cap (Front RH)
(7) Exhaust camshaft cap (Center RH)
(8) Exhaust camshaft cap (Rear RH)
(9) Exhaust camshaft (RH)
(10) Cylinder head bolt
(11) Oil seal
(12) Cylinder head (RH)
(13) Cylinder head gasket
(14) Cylinder head (LH)
(15) Intake camshaft (LH)
(16) Exhaust camshaft (LH)
(17) Intake camshaft cap (Front LH)
(18) Intake camshaft cap (Rear LH)
(19) Exhaust camshaft cap (Front LH)
(20) Exhaust camshaft cap (Center LH)
(21) Exhaust camshaft cap (Rear LH)
(22) Rocker cover gasket (LH)
(23) Rocker cover (LH)
(24) Oil filler cap
(25) Gasket
(26) Oil filler duct
(27) O-ring
(28) Stud bolt
(29) Oil flow control solenoid valve
(30) Gasket
(31) Oil return cover

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***<Ref. to ME(H4DOTC 2.0)-76, INSTALLATION, Cylinder Head.>***
T2:	***5 (0.5, 3.6)***
T3:	***8 (0.8, 5.8)***
T4:	***<Ref. to ME(H4DOTC 2.0)-70, INSTALLATION, Camshaft.>***
T5:	***6.4 (0.65, 4.7)***
T6:	***<Ref. to ME(H4DOTC 2.0)-70, INSTALLATION, Camshaft.>***

• 2.5 L MODEL


T4
(1)
T2
T2
(2)
(6)
T6
T5
T6
(28)
(8)
(9)
T5
T2
T3
(29)
(13)
(4)
(7)
(14)
(5)
(10)
(12)
(3)
T1
(30)
(11)
T2
(15)
(9)
(8)
(23)
(24)
T2
(25)
(16)
(6)
T4
(14)
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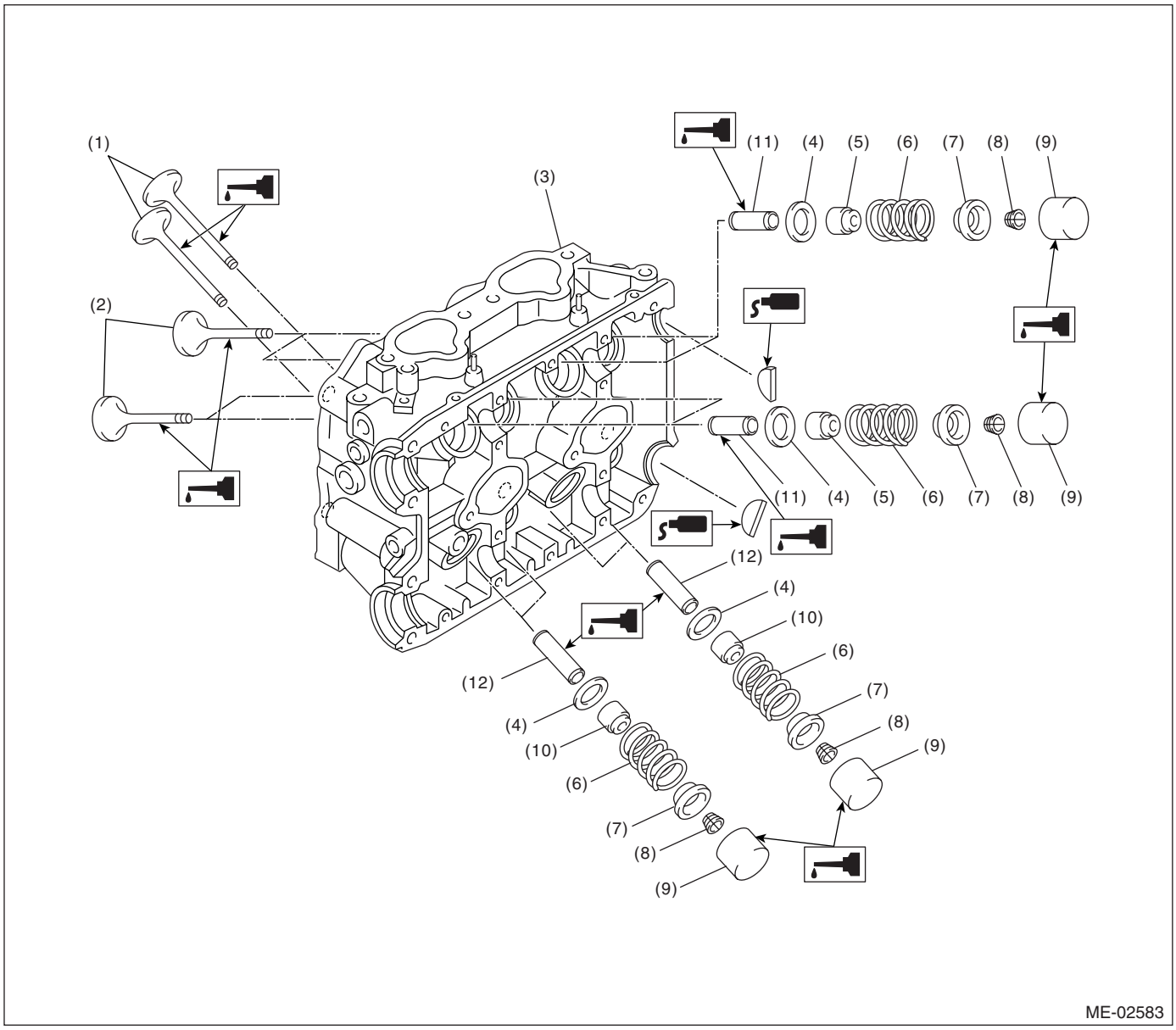
(19)
T5
(27)
(26)
(21)
(12)
(17)
(28)
T6
(20)
(18)
(30)
(11)
T3
T5
(22)
T4
T4
T1
ME-02582

(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Camshaft cap (Front RH)
(4) Intake camshaft cap (Rear RH)
(5) Intake camshaft (RH)
(6) Oil flow control solenoid valve
(7) Exhaust camshaft cap (Rear RH)
(8) Gasket
(9) Oil return cover
(10) Exhaust camshaft (RH)
(11) Cylinder head bolt
(12) Oil seal
(13) Cylinder head (RH)
(14) Cylinder head gasket
(15) Cylinder head (LH)
(16) Intake camshaft (LH)
(17) Exhaust camshaft (LH)
(18) Camshaft cap (Front LH)
(19) Intake camshaft cap (Rear LH)
(20) Exhaust camshaft cap (Rear LH)
(21) Rocker cover gasket (LH)
(22) Rocker cover (LH)
(23) Oil filler cap
(24) Gasket
(25) Oil filler duct
(26) O-ring
(27) Oil pipe (LH)
(28) Gasket
(29) Oil pipe (RH)
(30) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

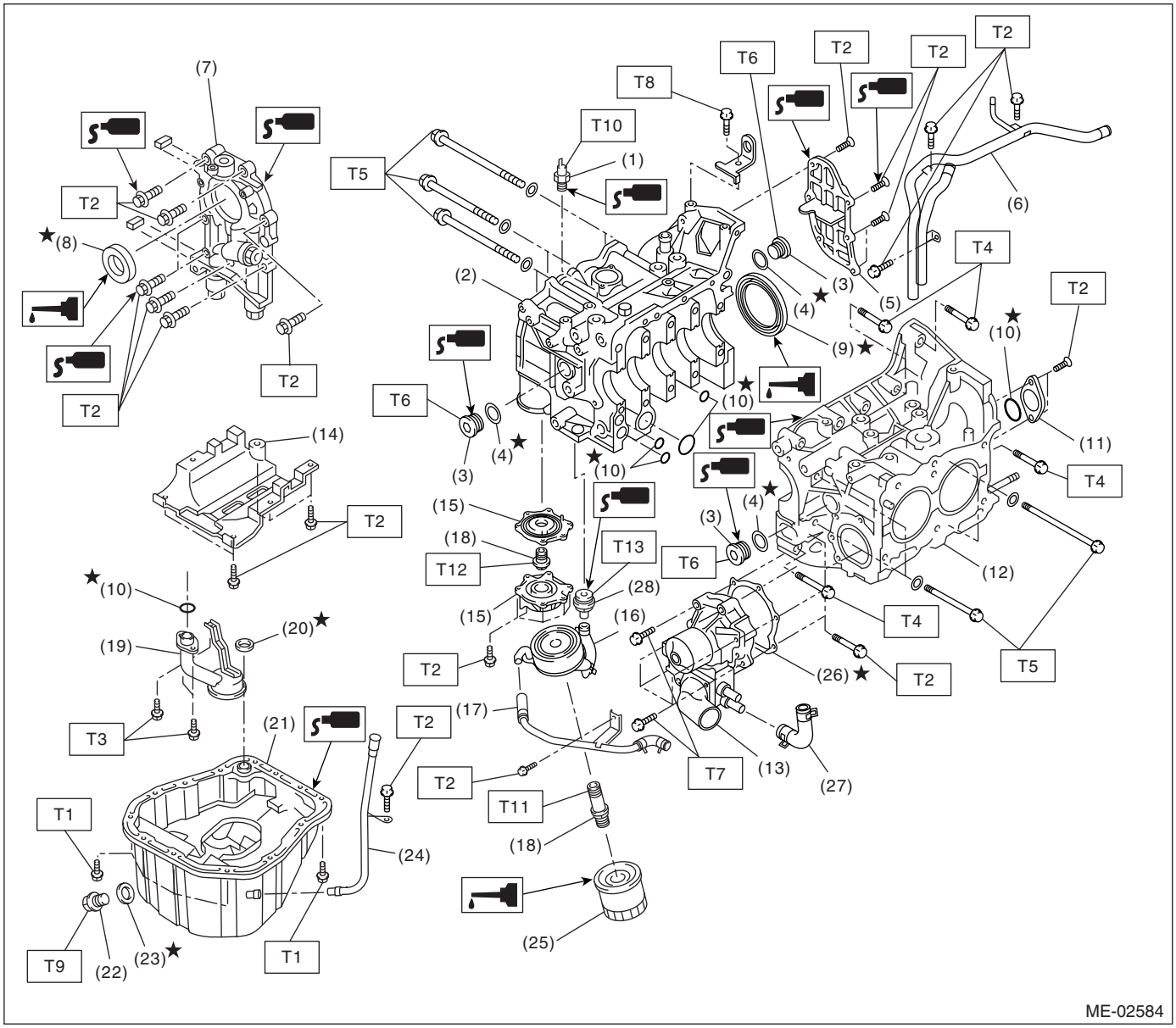
T1: <Ref. to ME(H4DOTC 2.0)-76, INSTALLATION, CYLINDER HEAD.>
T2: 8 (0.8, 5.8)
T3: <Ref. to ME(H4DOTC 2.0)-70, INSTALLATION, Camshaft.>
T4: 6.4 (0.65, 4.7)
T5: <Ref. to ME(H4DOTC 2.0)-70, INSTALLATION, Camshaft.>
T6: 29 (3.0, 22)

3. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

4. CYLINDER BLOCK



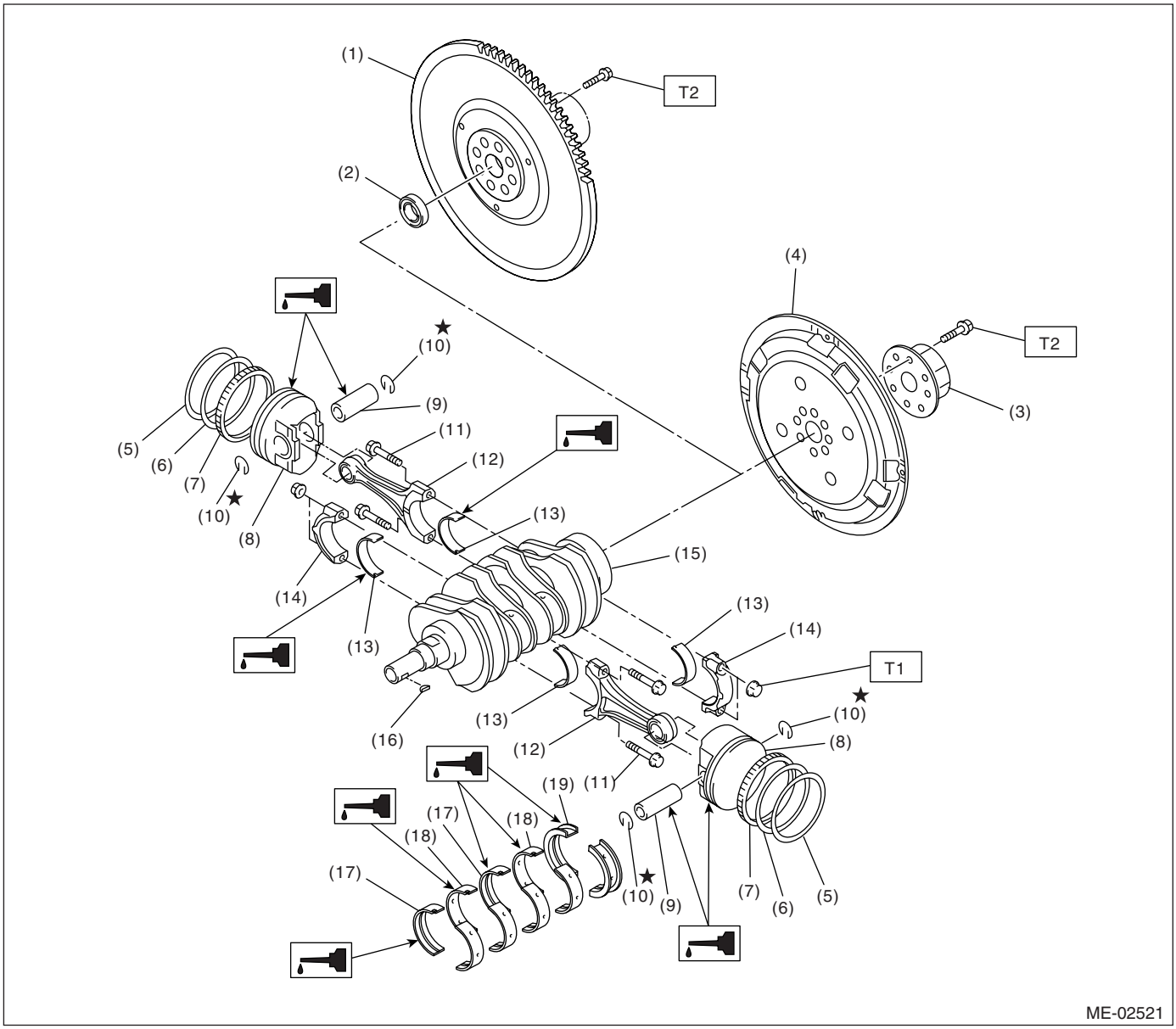
(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Adapter
(16) Oil cooler
(17) Waster by-pass pipe
(18) Connector
(19) Oil strainer
(20) Gasket
(21) Oil pan
(22) Drain plug
(23) Metal gasket
(24) Oil level gauge guide
(25) Oil filter
(26) Gasket
(27) Water pump hose
(28) Plug

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***5 (0.5, 3.6)***
T2:	***6.4 (0.65, 4.7)***
T3:	***10 (1.0, 7.2)***
T4:	***25 (2.5, 18.1)***
T5:	***<Ref. to ME(H4DOTC 2.0)-87, INSTALLATION, CYLINDER BLOCK.>***
T6:	***70 (7.1, 52)***
T7:	***First 12 (1.2, 9) Second 12 (1.2, 9)***
T8:	***16 (1.6, 11.8)***
T9:	***44 (4.5, 33)***
T10:	***25 (2.5, 18.1)***
T11:	***54 (5.5, 40)***
T12:	***45 (4.6, 33)***
T13:	***69 (7.0, 51)***

5. CRANKSHAFT AND PISTON

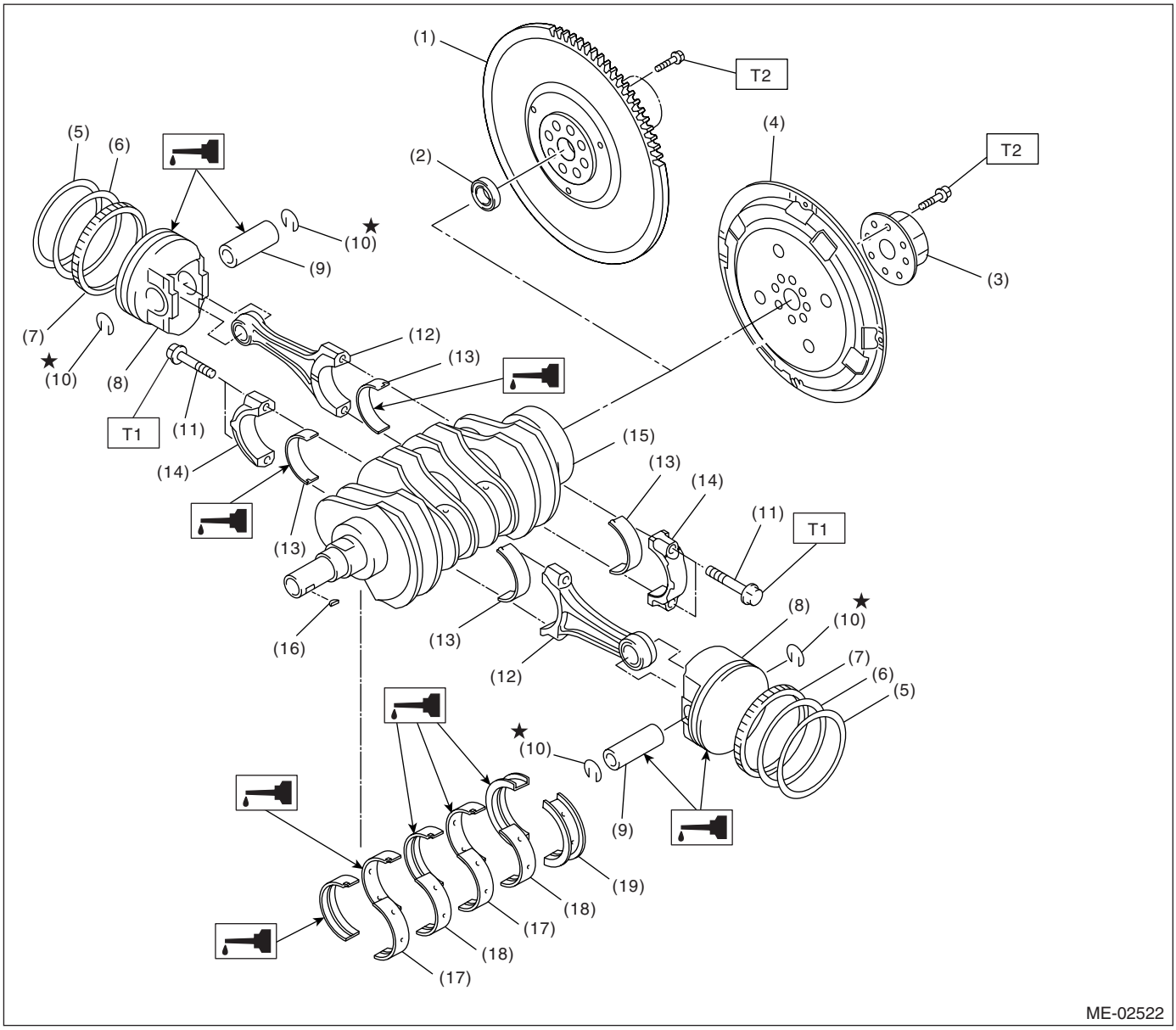
• 2.0 L MODEL



(1) Flywheel (MT model)
(2) Ball bearing (MT model)
(3) Reinforcement (AT model)
(4) Drive plate (AT model)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Circlip
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft
(16) Woodruff key
(17) Crankshaft bearing #1, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33)
T2: 72 (7.3, 53.1)

• 2.5 L MODEL

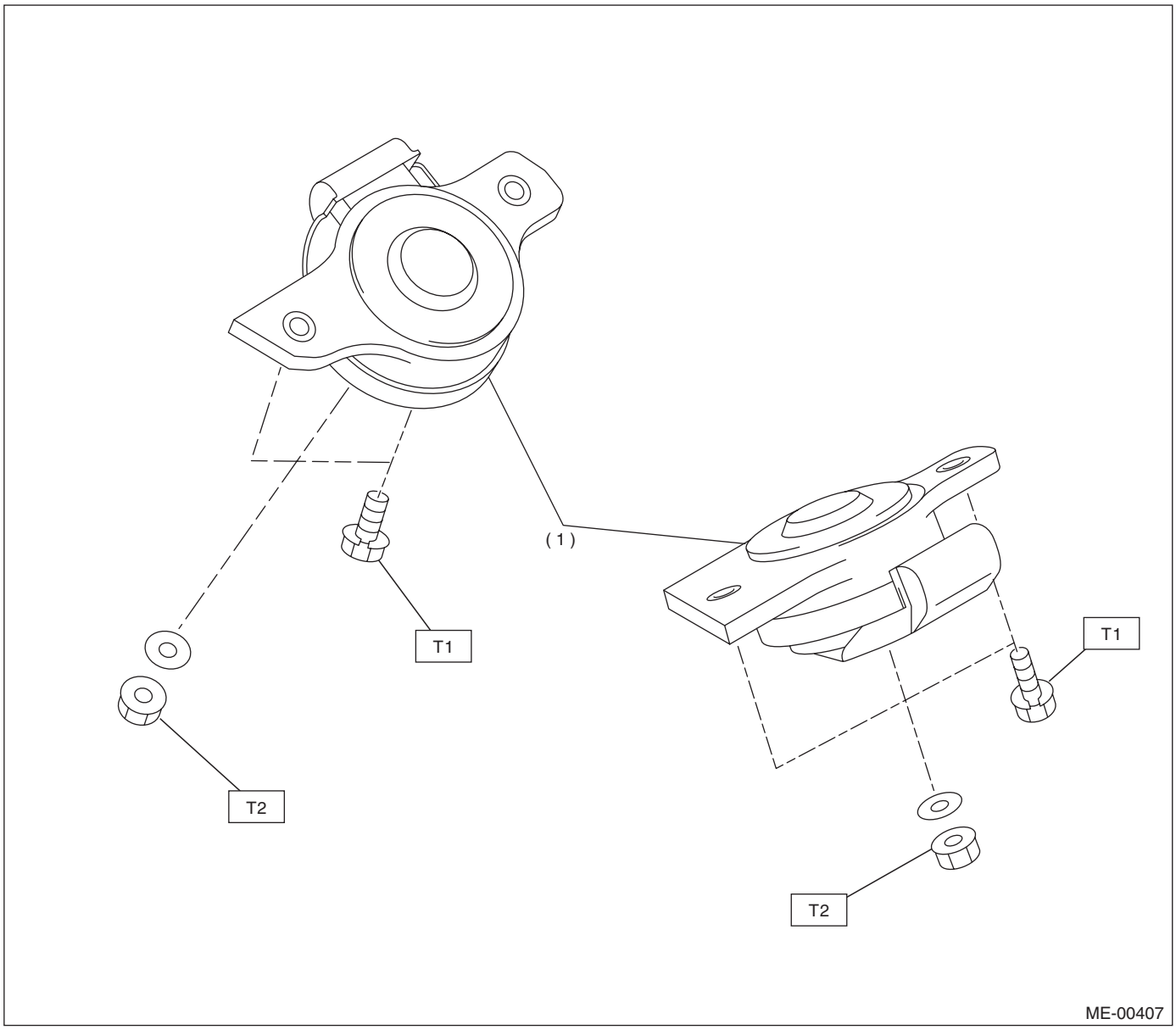


(1) Flywheel (MT model)
(2) Ball bearing (MT model)
(3) Reinforcement (AT model)
(4) Drive plate (AT model)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Circlip
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft
(16) Woodruff key
(17) Crankshaft bearing #1, #3
(18) Crankshaft bearing #2, #4
(19) Crankshaft bearing #5

Tightening torque: N·m (kgf-m, ft-lb)
T1: 52 (5.3, 38.3)
T2: 72 (7.3, 53.1)

6. ENGINE MOUNTING

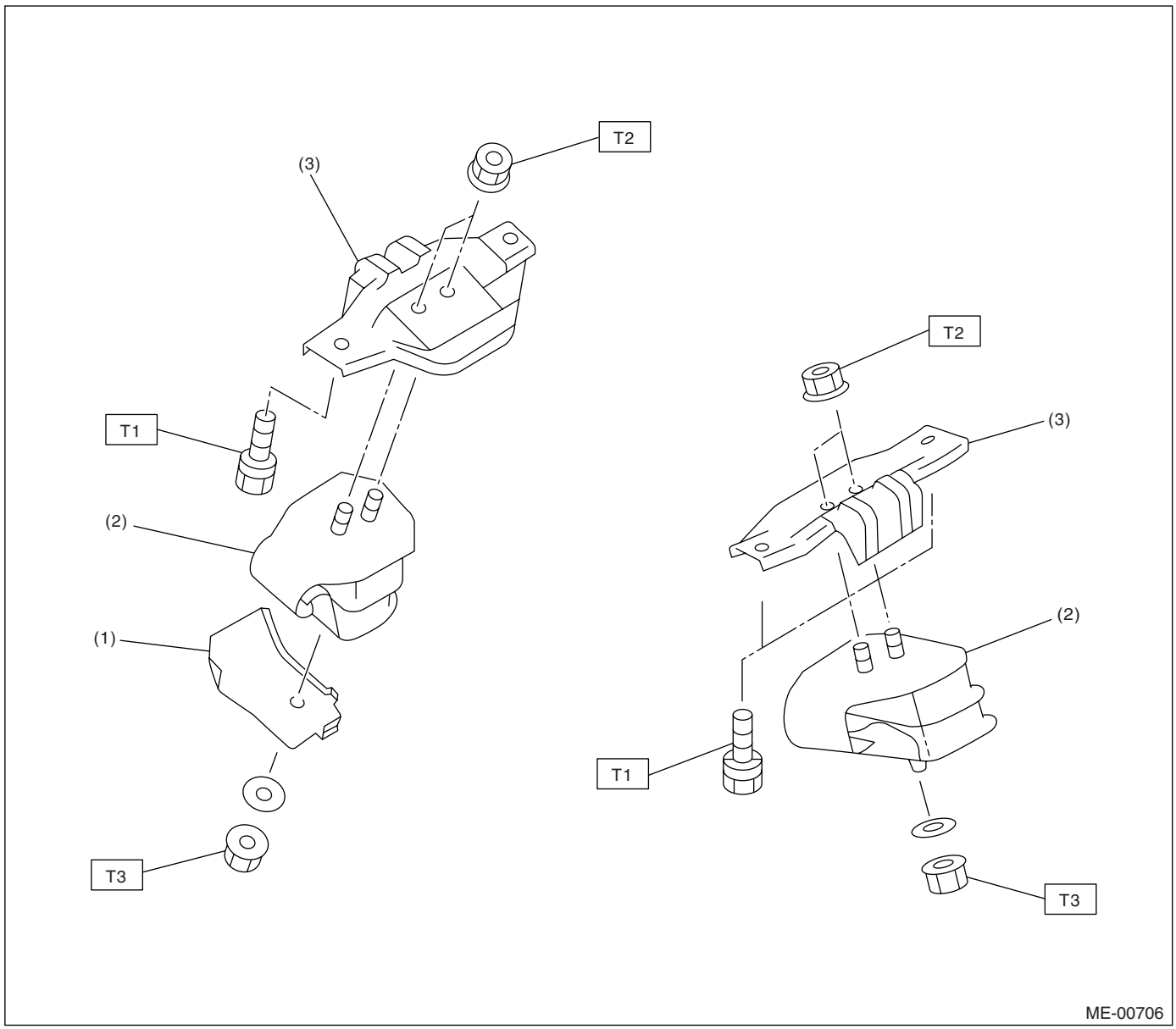
• 2.0 L MODEL



(1) Front cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26.0)
T2: 85 (8.7, 63)

• 2.5 L MODEL



(1) Heat shield cover
(2) Front cushion rubber
(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26.0)
T2: 42 (4.3, 31.0)
T3: 85 (8.7, 63)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or engine coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be reinstalled in the original positions and directions.
• Bolts, nuts and washers should be replaced with new ones as required.
• Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
• Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
• Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with engine coolant or oil. Place a cover over fenders, as required, for protection.
• Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch engine coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
• Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOL

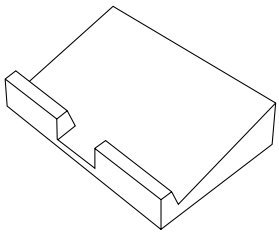
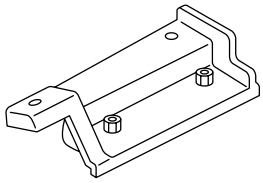
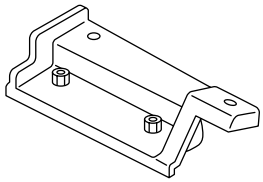
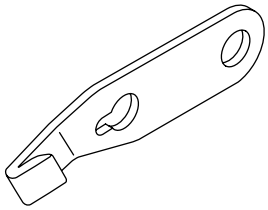
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crank pulley bolt, etc.

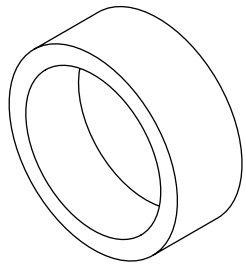
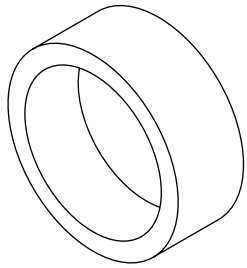
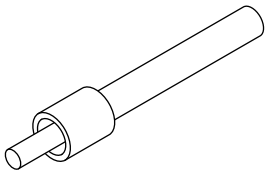
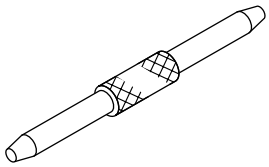
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston in cylinder for 2.0 L engine.
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder for 2.5 L engine.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.

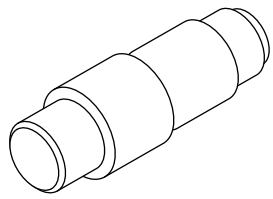
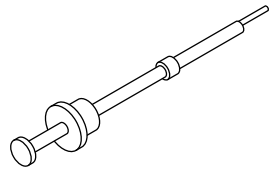
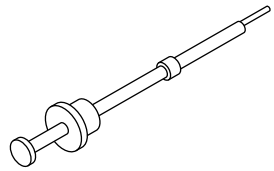
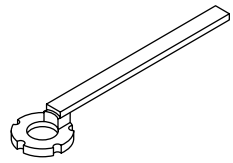
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097600	499097600	PISTON PIN REMOVER ASSY	Used for removing piston pin. (2.0 L model)
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin. (2.5 L model)
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket

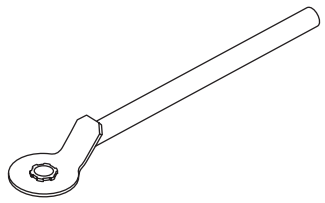
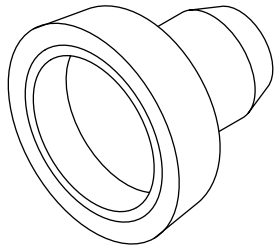
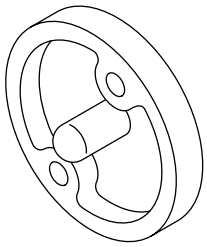
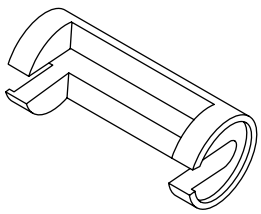
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket
 ST-499587200	499587200	CRANK OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

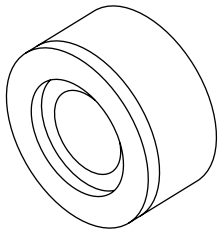
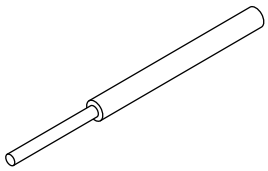
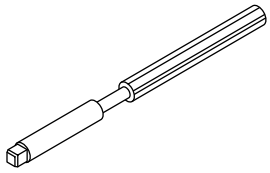
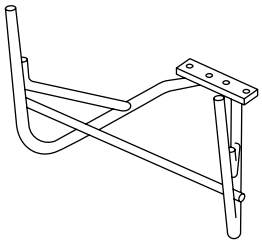
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

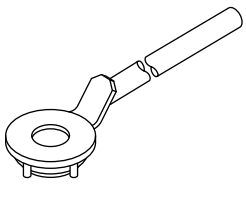
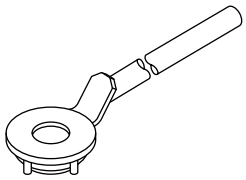
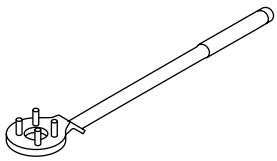
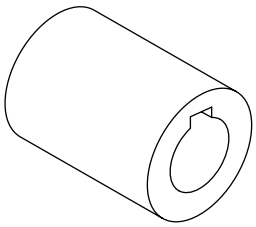
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977300	499977300	CRANK PULLEY WRENCH	Used for stopping rotating of crankshaft pulley when loosening and tightening crank pulley bolts.
 ST-499977400	499977400	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts. (2.0 L model)
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts. (2.5 L model)
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

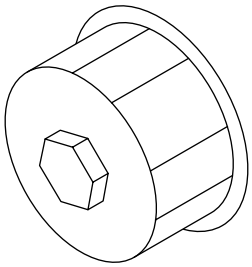
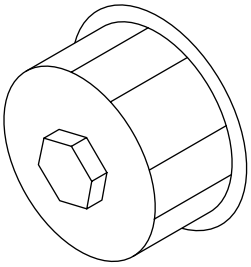
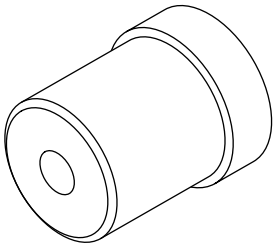
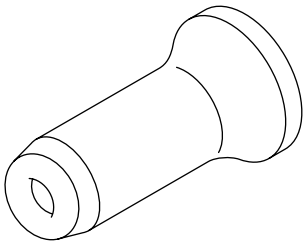
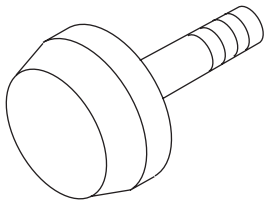
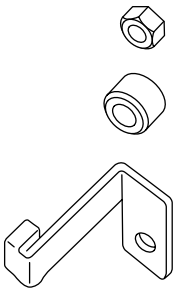
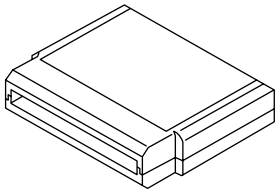
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing the oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597200	499597200	OIL SEAL GUIDE	Used for installing camshaft oil seal for DOHC engine. Used with OIL SEAL INSTALLER (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

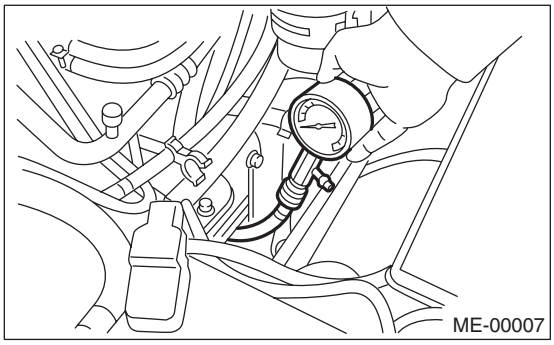
A: INSPECTION

CAUTION:
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
4) Remove all the spark plugs. **<Ref. to IG(H4DOTC 2.0)-5,** REMOVAL**, Spark Plug.>**
5) Fully open the throttle valve.
6) Check the starter motor for satisfactory performance and operation.
7) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):
Standard:
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Limit:
883 kPa (9.0 kgf/cm^2, 128 psi)
Difference between cylinders
Less than 49 kPa (0.5 kgf/cm^2, 7 psi)

3. Idle Speed

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to Subaru Select Monitor.
5) Connect the Subaru Select Monitor to data link connector.
6) Turn the ignition switch to ON, and Subaru Select Monitor switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnostic.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine, and then read the engine idle speed.
12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:
700±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral]:
A/C Refrigerant pressure (LOW) :
725±100 rpm (MT model)
750±100 rpm (AT model)
A/C Refrigerant pressure (HIGH) :
800±100 rpm (MT model)
825±100 rpm (At model)

NOTE:
As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnostic Table under “Engine Control System”. **<Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>**

4. Ignition Timing

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the ignition timing speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to Subaru Select Monitor.
5) Connect the Subaru Select Monitor to data link connector.
6) Turn the ignition switch to ON, and Subaru Select Monitor switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnostic.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

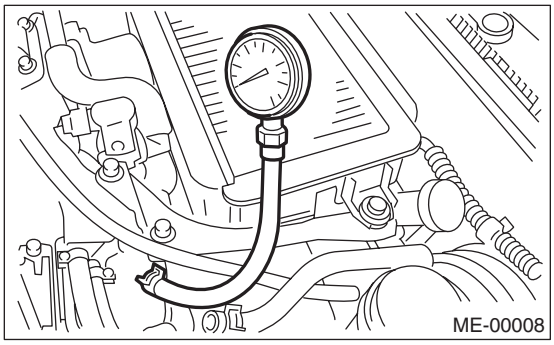
Ignition timing [BTDC/rpm]:
2.0 L model
12°±10°/700
2.5 L model
17°±10°/700

If the timing is not correct, check the ignition control system. Refer to Engine Control System. **<Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>**

5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
3) Keep the engine at the idle speed, and then read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



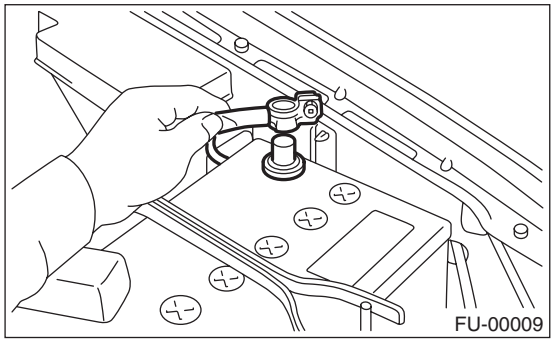
Vacuum pressure (at idling, A/C "OFF"):
Less than −60.0 kPa (−450 mmHg, −17.72 inHg)

Diagnostic of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

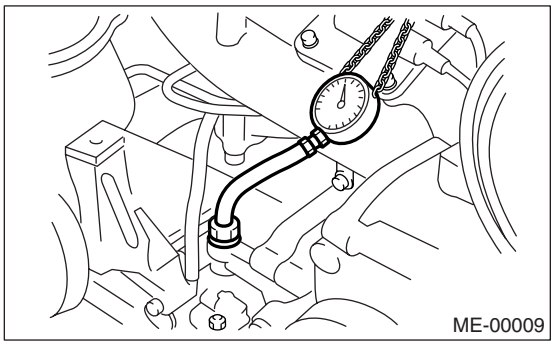
6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from engine cylinder block. **<Ref. to LU(H4SO)-22,** REMOVAL**, Oil Pressure Switch.>**
2) Connect the oil pressure gauge hose to cylinder block.
3) Connect the battery ground cable to battery.



4) Start the engine, and then measure the oil pressure.



Oil pressure:
98 kPa (1.0 kgf/cm^2, 14 psi) or more at 600 rpm
294 kPa (3.0 kgf/cm^2, 43 psi) or more at 5,000 rpm

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. **<Ref. to LU(H4SO)-26,** INSPECTION**, Engine Lubrication System Trouble in General.>**
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. **<Ref. to LU(H4SO)-26,** INSPECTION**, Engine Lubrication System Trouble in General.>**

NOTE:
The specified data is based on an engine oil temperature of 80°C (176°F).

5) After measuring the oil pressure, install the oil pressure switch. **<Ref. to LU(H4SO)-22,** INSTALLATION**, Oil Pressure Switch.>**

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

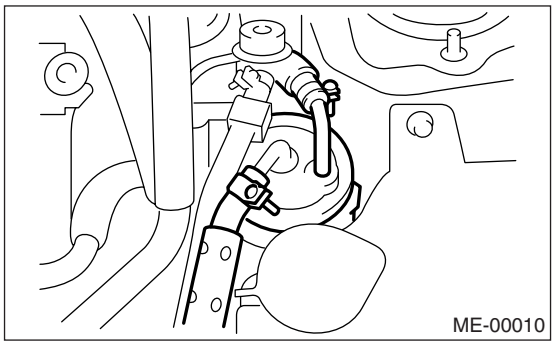
7. Fuel Pressure

A: INSPECTION

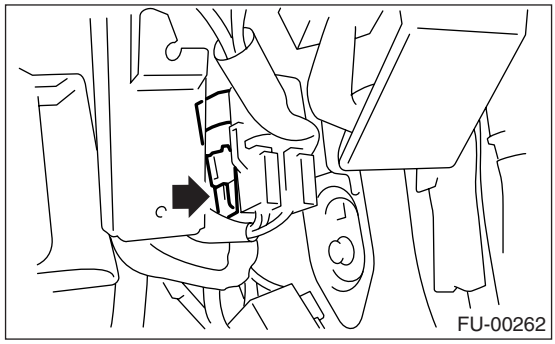
CAUTION:
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.0)-54,** RELEASING OF FUEL PRESSURE, PROCEDURE**, Fuel.>**
2) Open the fuel filler flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses from fuel filter, and then connect the fuel pressure gauge.

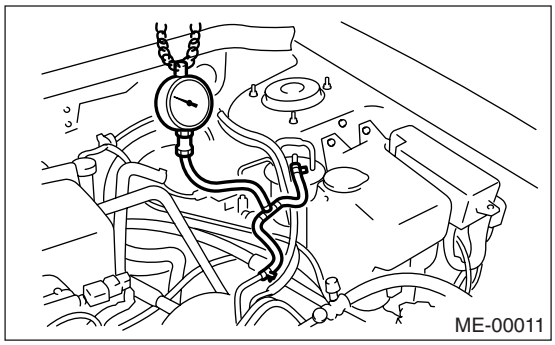


4) Connect the connector of fuel pump relay.



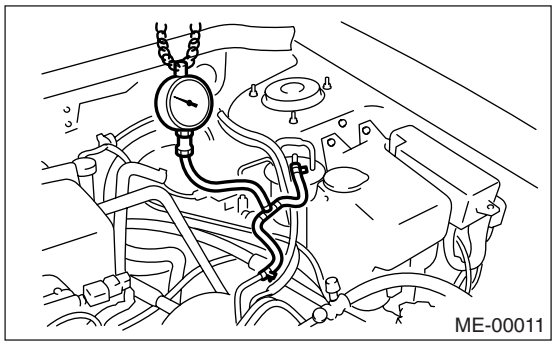
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard:
284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:
Standard:
230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)



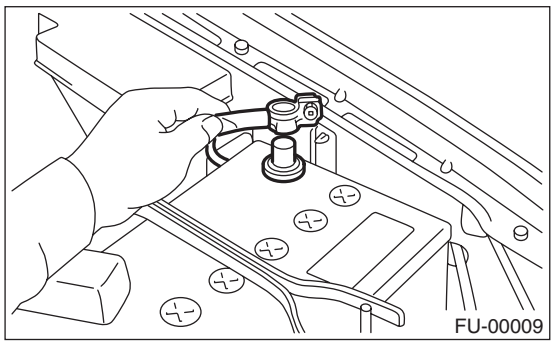
NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

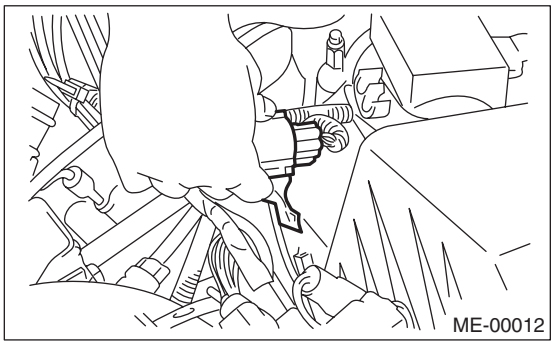
A: INSPECTION

Inspection and adjustment of the valve clearance should be performed while engine is cold.

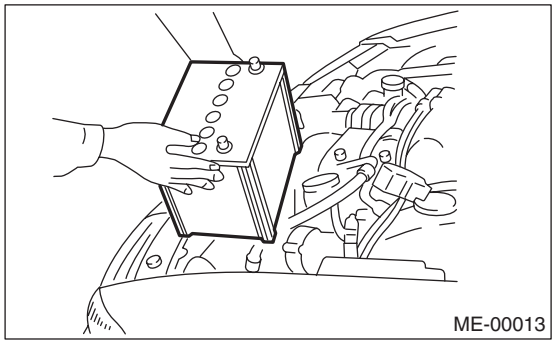
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



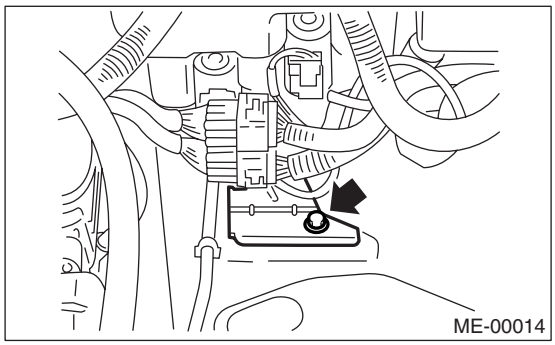
3) Remove the air intake duct. **<Ref. to IN(H4DOTC 2.0)-8,** REMOVAL**, Air Intake Duct.>**
4) Remove the bolts which secure the timing belt cover (RH).
5) Lift-up the vehicle.
6) Remove the under cover.
7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
8) Lower the vehicle.
9) When inspecting the #1 and #3 cylinders:
   (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



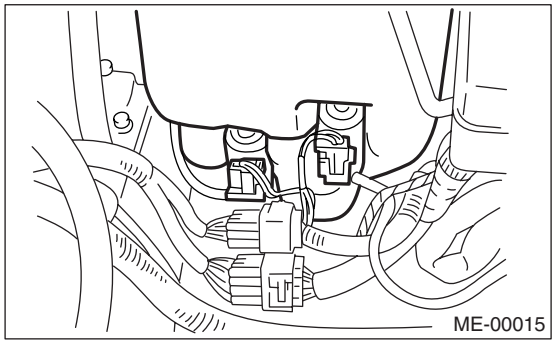
   (2) Remove the air cleaner case. **<Ref. to IN(H4DOTC 2.0)-7,** REMOVAL**, Air Cleaner Case.>**
   (3) Disconnect the ignition coil connector.
   (4) Remove the ignition coil.
   (5) Place a suitable container under the vehicle.
   (6) Disconnect the PCV hose from rocker cover (RH).
   (7) Remove the bolts, and then remove the rocker cover (RH).
10) When inspecting the #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.



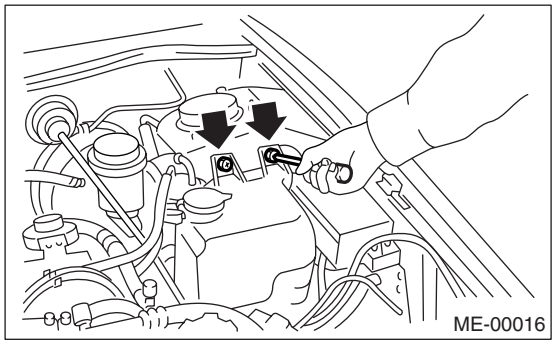
   (2) Remove the bolt which secures the engine harness bracket onto body.



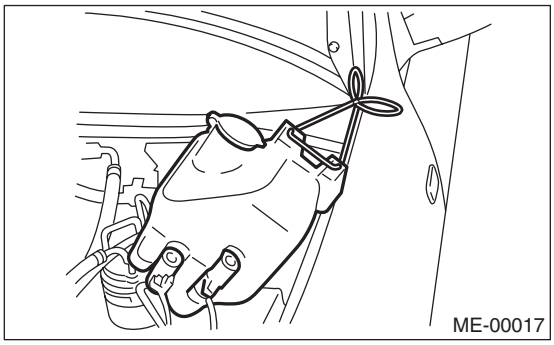
   (3) Disconnect the washer motor connectors.



   (4) Remove the washer tank mounting bolts.



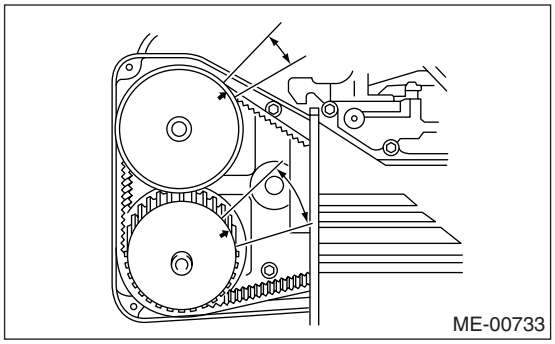
(5) Move the washer tank upward.



(6) Disconnect the ignition coil connector.
(7) Remove the ignition coil.
(8) Place a suitable container under the vehicle.
(9) Disconnect the PCV hose from rocker cover (LH).
(10) Remove the bolts, and then remove the rocker cover (LH).

11) Turn the crank pulley clockwise until arrow mark on the cam sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

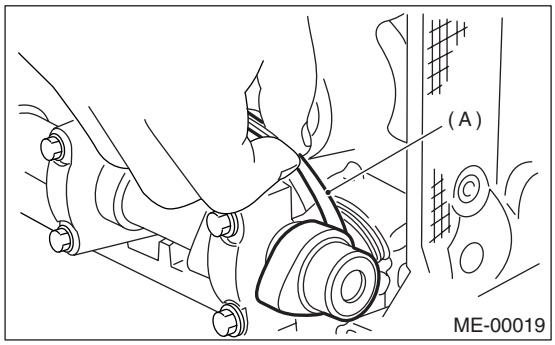


12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake:
0.20±0.02 mm (0.0079±0.0008 in)
Exhaust:
0.35±0.02 mm (0.0138±0.0008 in)

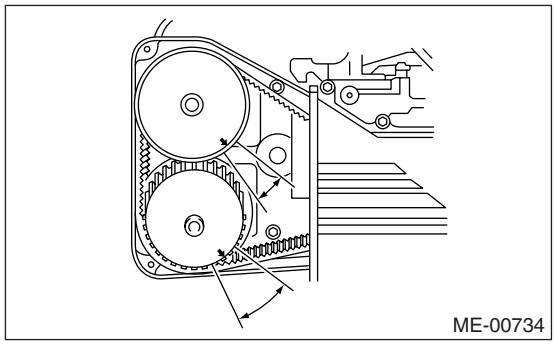
NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



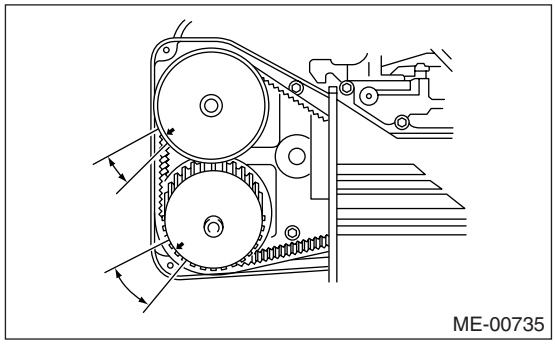
13) If necessary, adjust the valve clearance. **<Ref. to ME(H4DOTC 2.0)-40,** ADJUSTMENT**, Valve Clearance.>**

14) Further turn the crank pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

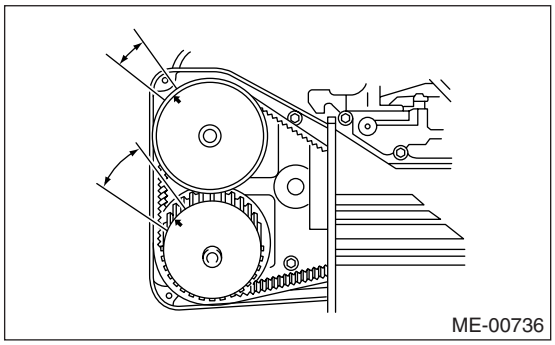
(1) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



(2) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.

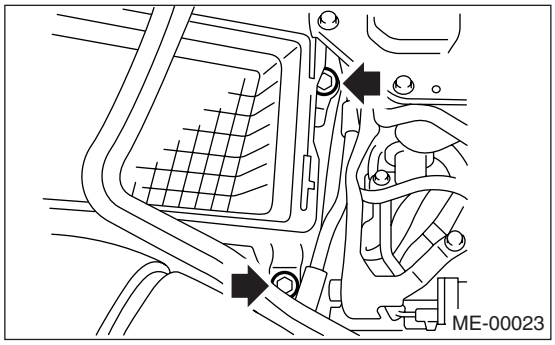


(3) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.


ME-00736

15) After inspection, install the related parts in the reverse order of removal.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

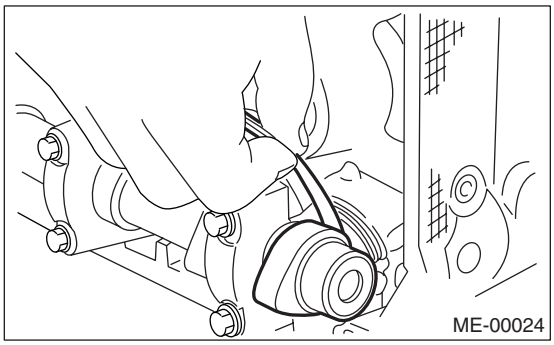

ME-00023

B: ADJUSTMENT

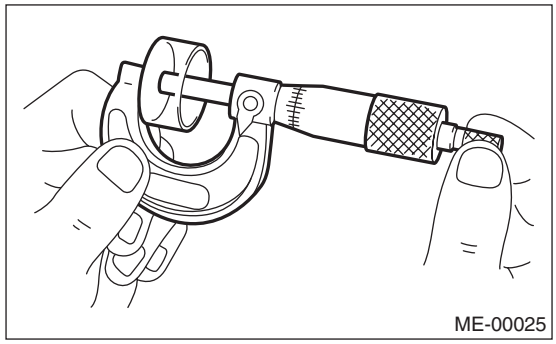
CAUTION:
Adjustment of the valve clearance should be performed while engine is cold.

1) Measure all valve clearances. **<Ref. to ME(H4DOTC 2.0)-38,** INSPECTION**, Valve Clearance.>**

NOTE:
Record each valve clearance after it has been measured.


ME-00024

2) Remove the camshaft. **<Ref. to ME(H4DOTC 2.0)-69,** REMOVAL**, Camshaft.>**
3) Remove the valve lifter.
4) Measure the thickness of valve lifter with a micrometer.


ME-00025

5) Select a shim of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

Unit: mm
Intake valve: S = (V+T) –0.20 Exhaust valve: S = (V+T) –0.35
S: Required thickness of valve lifter V: Measured valve clearance T: Used valve lifter thickness

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)

Part No.	Thickness mm (in)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)

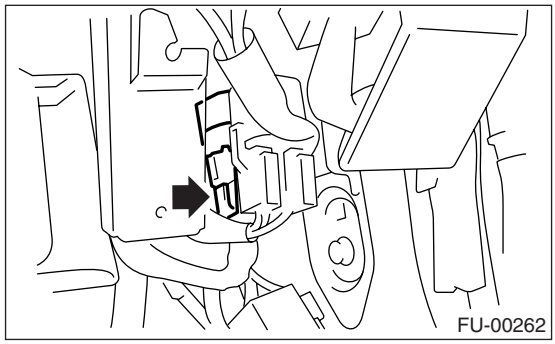
Part No.	Thickness mm (in)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

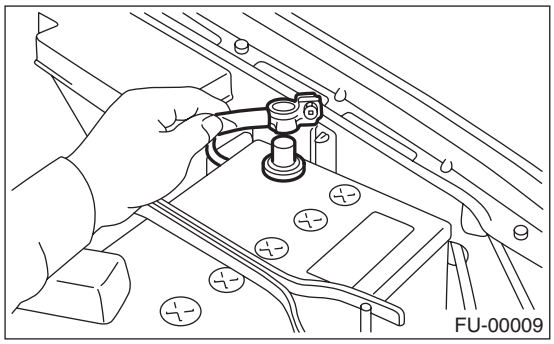
9. Engine Assembly

A: REMOVAL

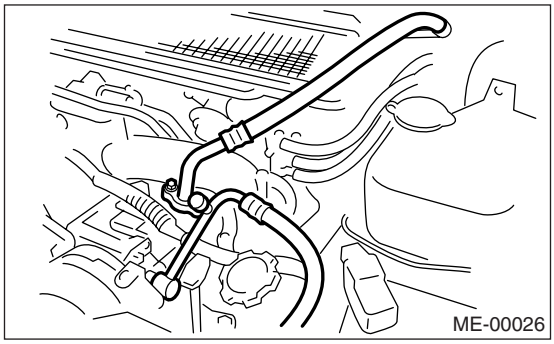
1) Set the vehicle on a lift.
2) Open the front hood fully, and then support with the hood stay.
3) Collect the refrigerant from A/C system.
<Ref. to AC-26, Refrigerant Recovery Procedure.>
4) Release the fuel pressure.
(1) Disconnect the fuel pump relay connector.



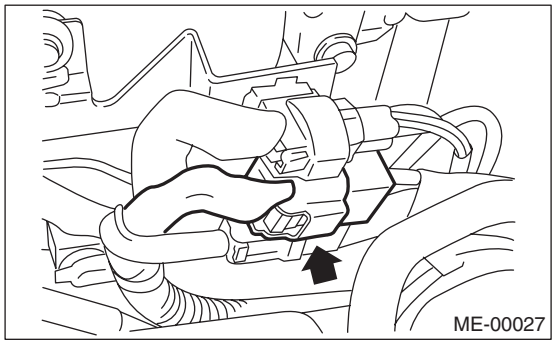
(2) Start the engine, and run until stalls.
(3) After the engine stalls, crank it for 5 seconds more.
(4) Turn the ignition switch to OFF.
5) Remove the filler cap.
6) Disconnect the ground cable from battery.



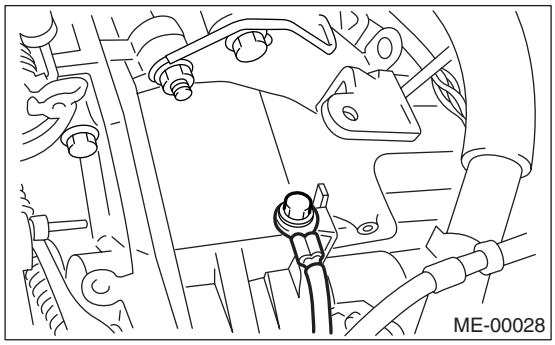
7) Remove the radiator from vehicle. **<Ref. to CO(H4SO)-28,** REMOVAL, Radiator.>
8) Remove the coolant filler tank. **<Ref. to CO(H4SO)-42,** REMOVAL**, Coolant Filler Tank.>**
9) Disconnect the A/C pressure hoses from A/C compressor.



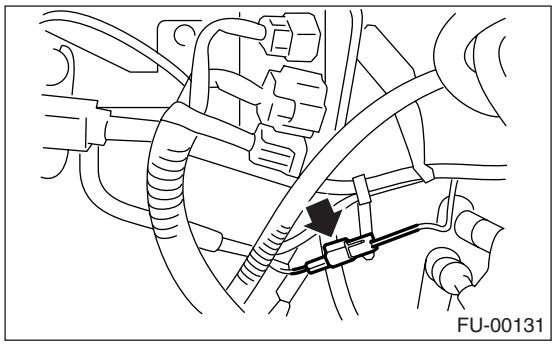
10) Remove the intercooler. **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>
11) Disconnect the following connectors and cable.
(1) Engine harness connector

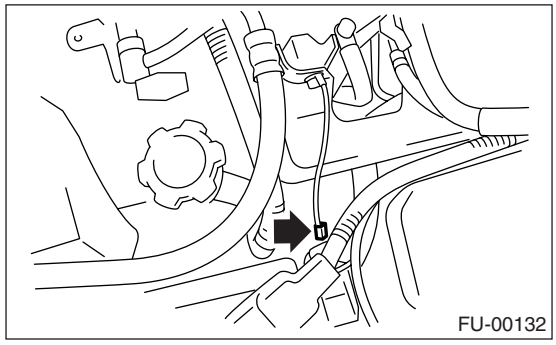


(2) Engine ground terminal

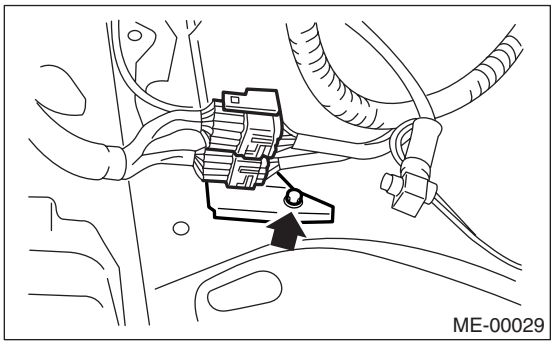


(3) Disconnect the right and left side engine ground cables.

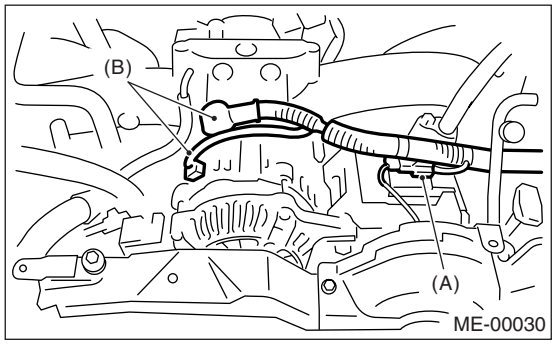




(4) Engine harness connector

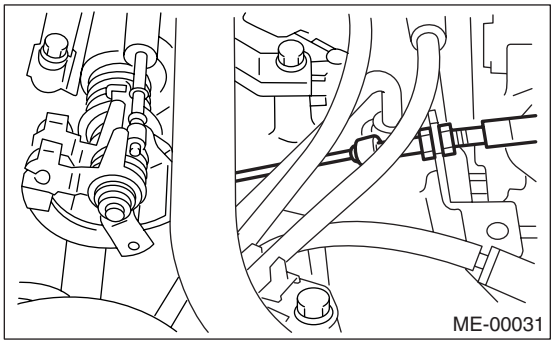


(5) Generator connector, terminal and A/C compressor connectors

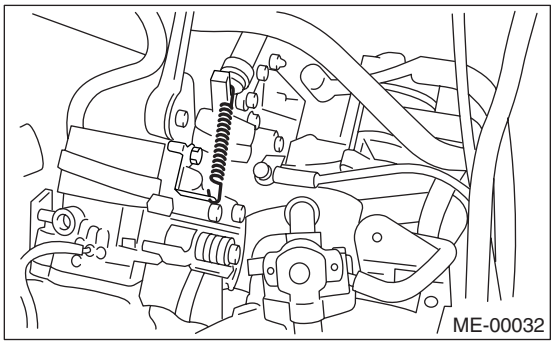


(A) A/C compressor connector
(B) Generator connector and terminal

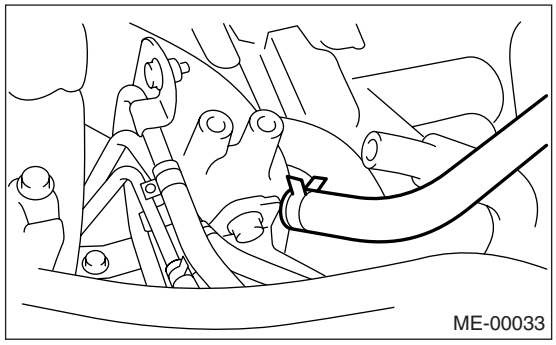
(6) Accelerator cable (2.0 L model)



(7) Clutch release spring (MT model)

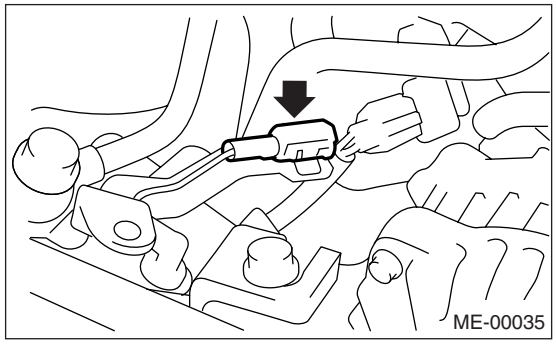


12) Disconnect the following hoses.
(1) Brake booster vacuum hose

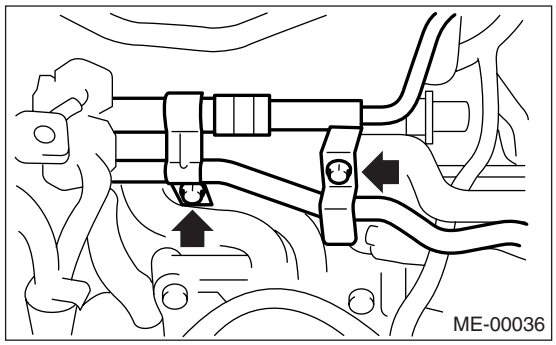


(2) Heater inlet hose/outlet hose

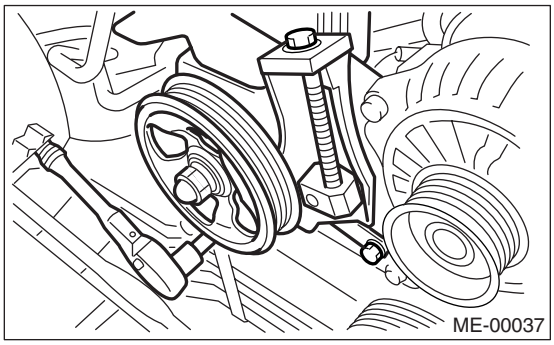
13) Remove the power steering pump from bracket.
(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** FRONT SIDE BELT, REMOVAL**, V-belt.>**
(2) Disconnect the power steering switch connector.



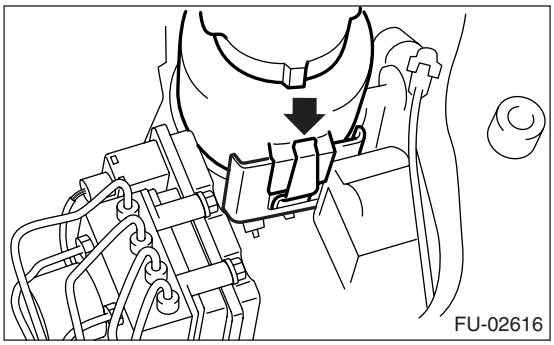
(3) Remove the pipe with bracket from intake manifold.



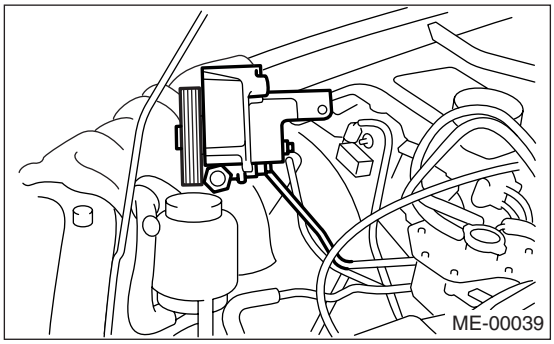
(4) Remove the power steering pump from engine.



(5) Remove the reservoir tank from bracket by pulling it upward.

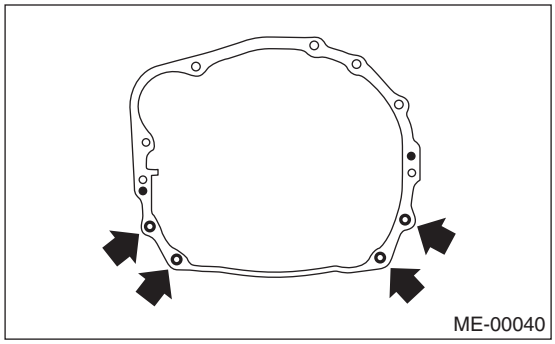


(6) Place the power steering pump on RH side wheel apron.

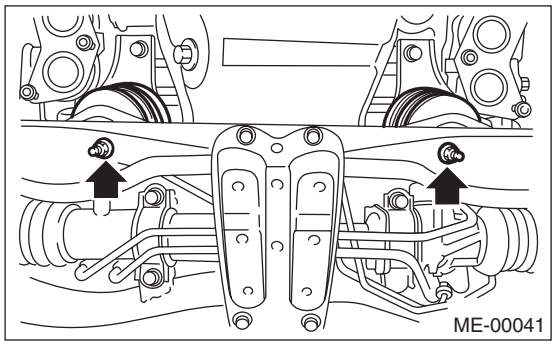


14) Lift-up the vehicle.
15) Remove the ATF cooler pipe from frame. (AT model)
16) Remove the center exhaust pipe. **<Ref. to EX(H4DOTC 2.0)-9,** REMOVAL**, Center Exhaust Pipe.>**

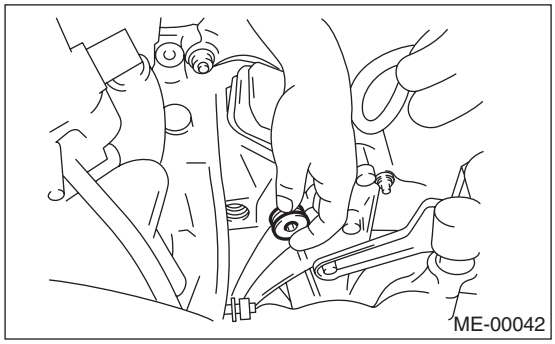
17) Remove the nuts which hold the lower side of transmission to engine.



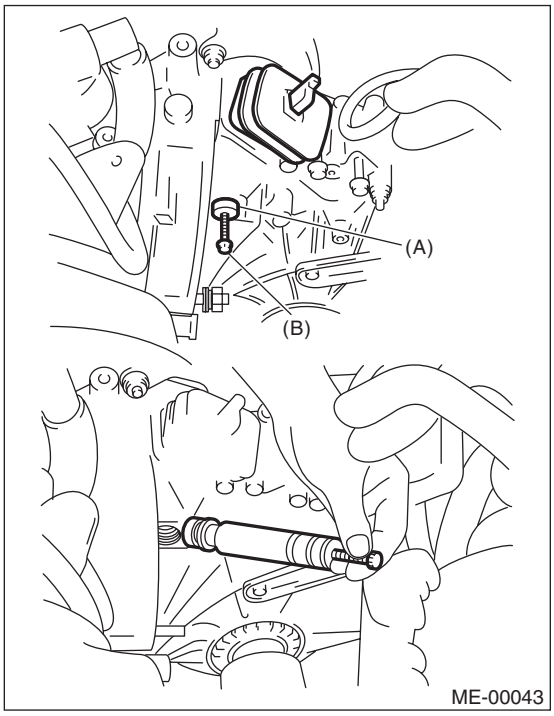
18) Remove the nuts which install the front cushion rubber onto front crossmember.



19) Lower the vehicle.
20) Separate the clutch release fork from release bearing. (MT model)
(1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.

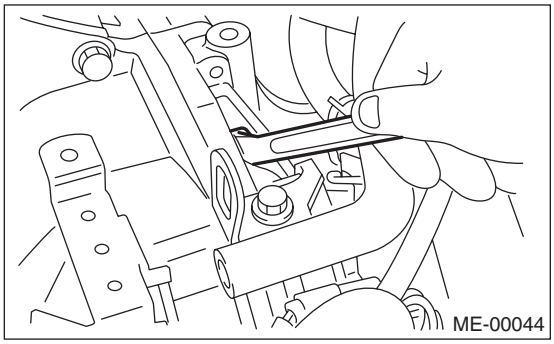


(A) Shaft
(B) Bolt

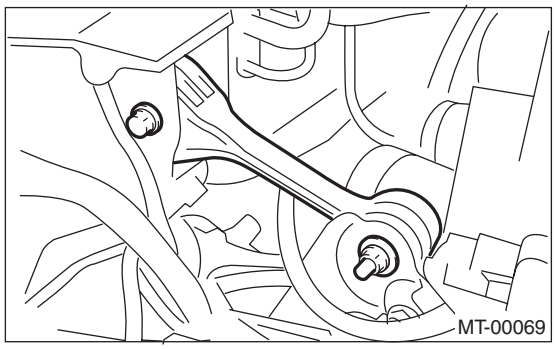
(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

21) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold the torque converter clutch to drive plate.
(4) Remove the other bolts while rotating the engine using socket wrench.

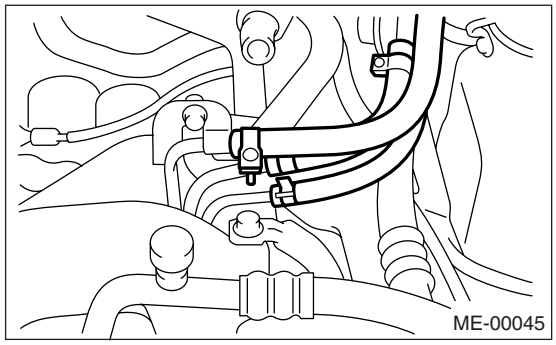


22) Remove the pitching stopper.

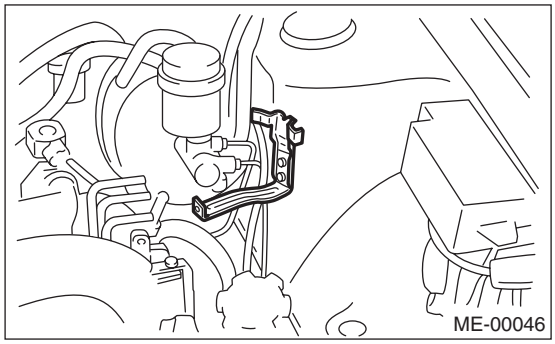


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

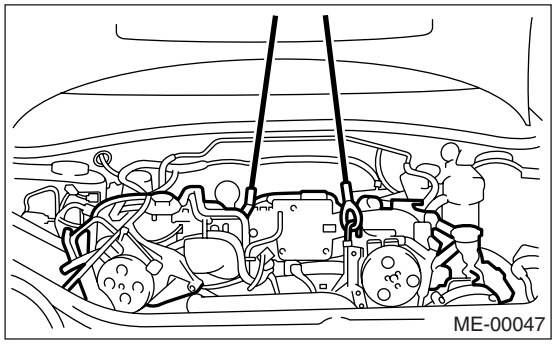
NOTE:
• Catch fuel from the hose into container.
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



24) Remove the fuel filter and bracket.

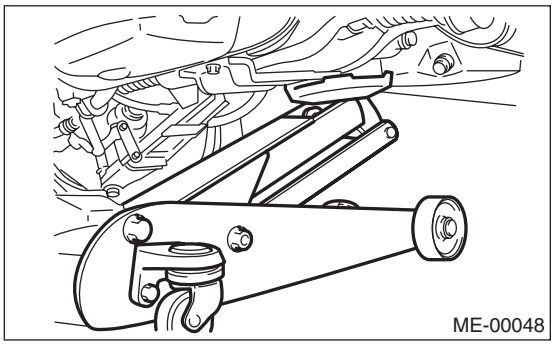


25) Support the engine with a lifting device and wire ropes.



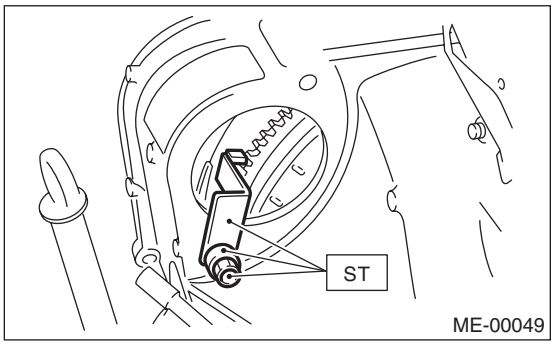
26) Support the transmission with a garage jack.

NOTE:
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.


ME-00048

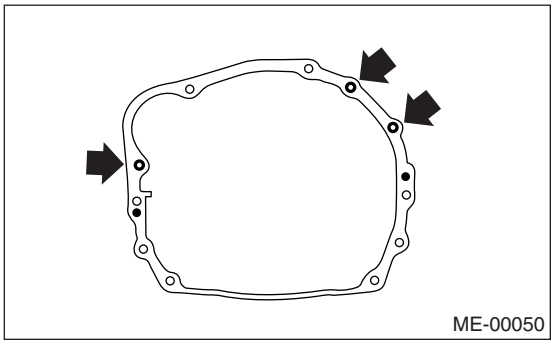
27) Separation of the engine and transmission.
(1) Remove the starter. **<Ref. to SC(H4SO)-6,** REMOVAL**, Starter.>**
(2) Install the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



ME-00049

(3) Remove the bolts which hold the right upper side of transmission to engine.


ME-00050

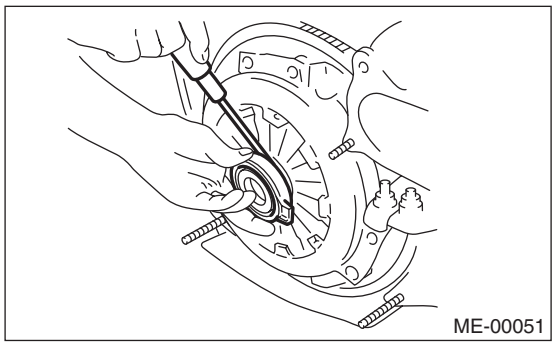
28) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until the mainshaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

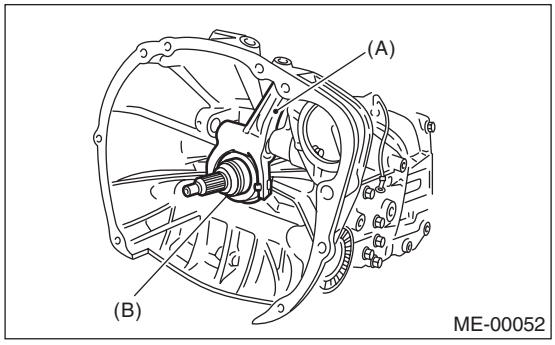
29) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the clutch release fork and bearing onto transmission. (MT model)
(1) Remove the release bearing from clutch cover with flat type screw driver.


ME-00051

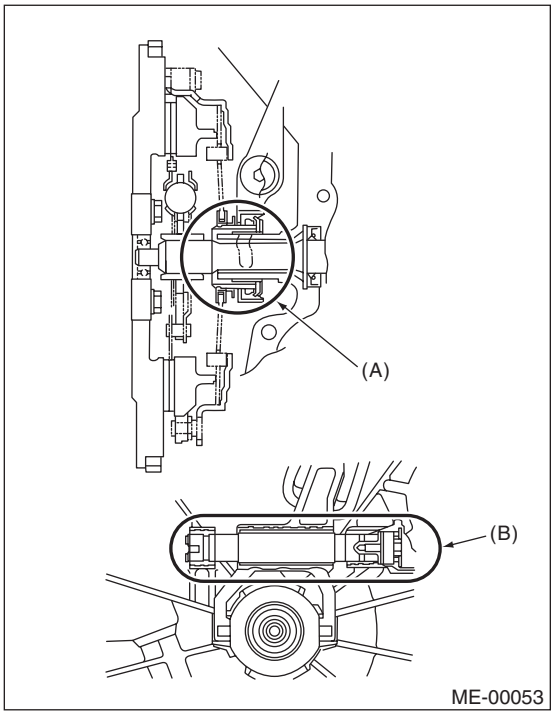
(2) Install the release bearing on transmission.
(3) Install the release fork into release bearing tab.



ME-00052

(A) Release fork
(B) Release bearing

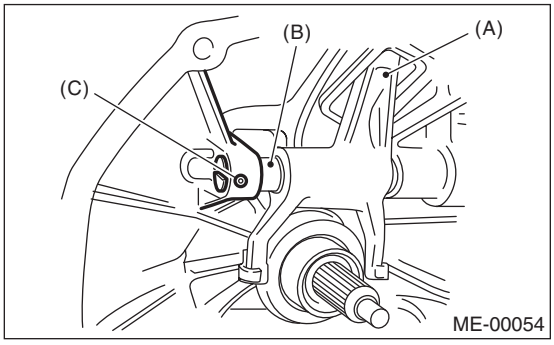
(4) Apply grease to the specified points.
- Spline: FX2200
- Shaft: SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

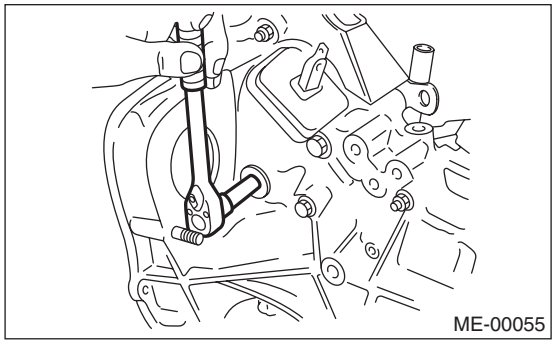
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

(6) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)



2) Install the front cushion rubbers to engine.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

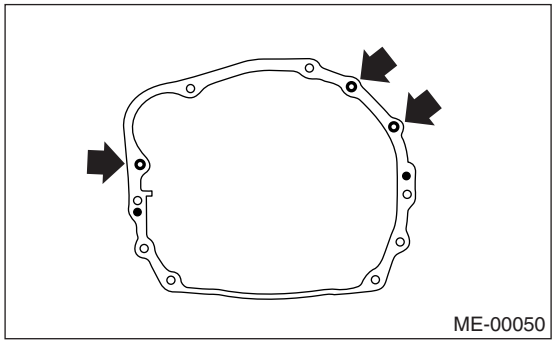
3) Install the engine onto transmission.
(1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

(2) Apply a small amount of grease to the splines of mainshaft. (MT model)

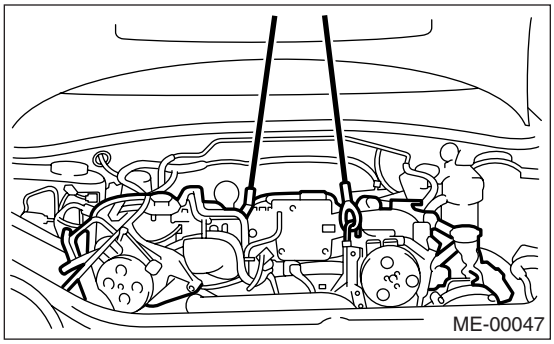
4) Tighten the bolts which hold the right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



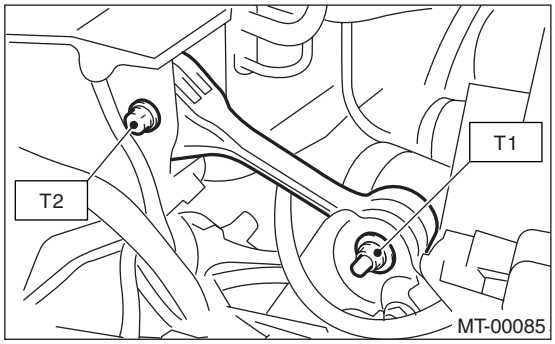
5) Remove the lifting device and wire ropes.

6) Remove the garage jack.



7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



8) Remove the ST from torque converter clutch case. (AT model)

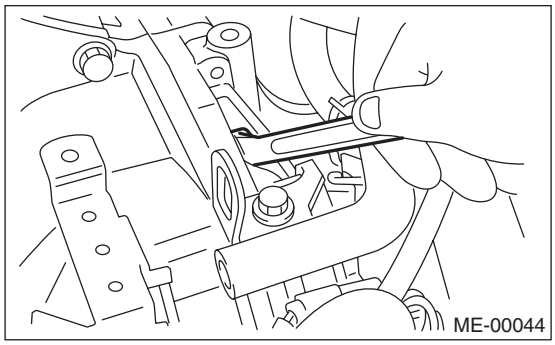
NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.
ST 498277200 STOPPER SET

9) Install the starter. **<Ref. to SC(H4SO)-6,** INSTALLATION**, Starter.>**

10) Install the torque converter clutch onto drive plate. (AT model)
(1) Tighten the bolts which hold the torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine by using ST.

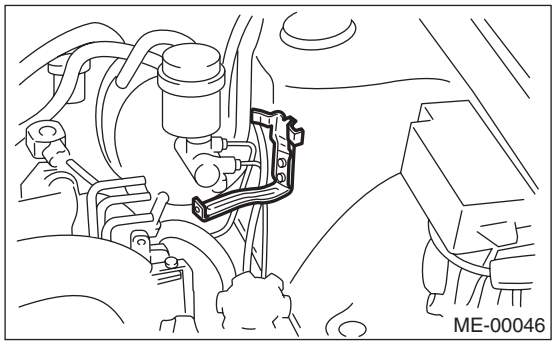
CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.
ST 499977300 CRANK PULLEY WRENCH

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

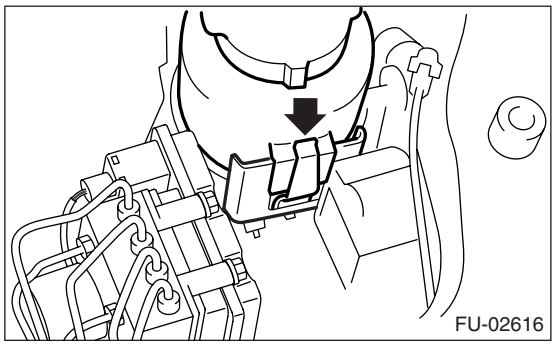


(3) Clog the service hole with plug.

11) Install the fuel filter and bracket.

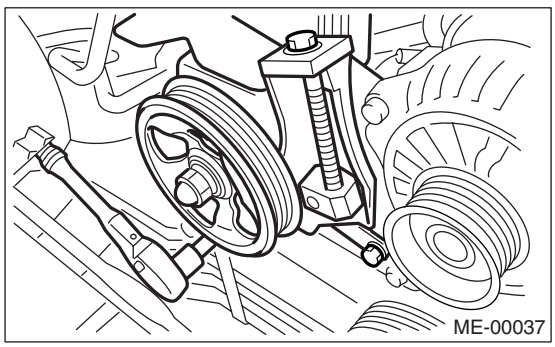


12) Install the power steering pump on bracket.
(1) Install the reservoir tank on bracket.

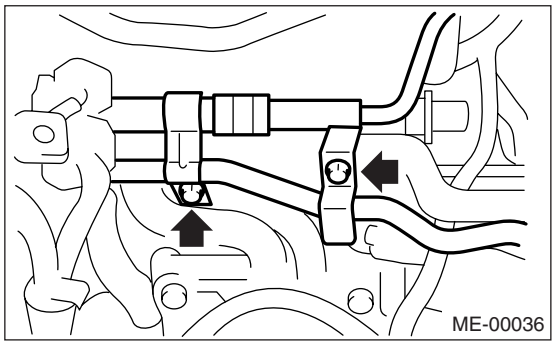


(2) Install the power steering pump.

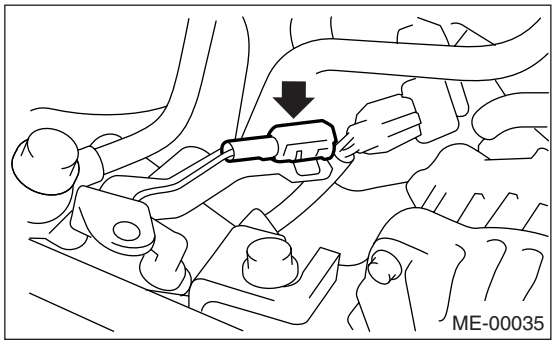
Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Install the power steering pipe bracket on intake manifold RH.



(4) Connect the power steering switch connector.

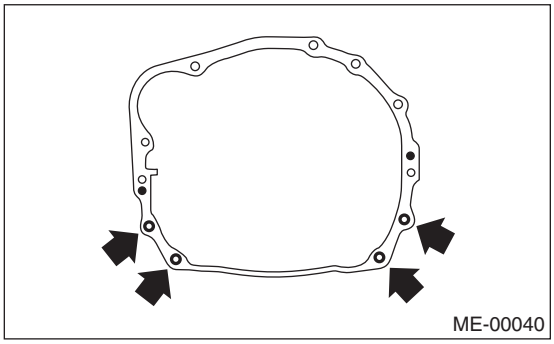


(5) Install the front side V-belt, and adjust it. **<Ref. to ME(H4DOTC 2.0)-53,** FRONT SIDE BELT, INSTALLATION**, V-belt.>**

13) Lift-up the vehicle.

14) Tighten the nuts which hold the lower side of transmission to engine.

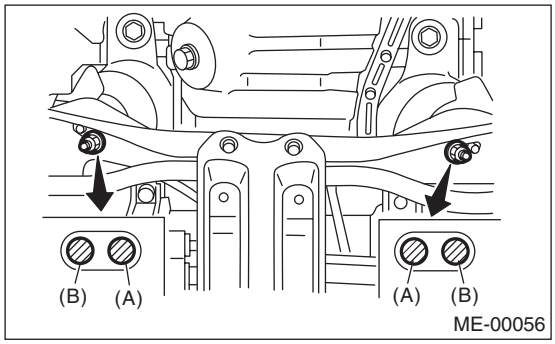
Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



15) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



16) Install the ATF cooler pipe to frame. (AT model)

17) Install the center exhaust pipe.
<Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.>

18) Lower the vehicle.

19) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose

20) Connect the following connectors and terminals:
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors

21) Connect the following cables:
(1) Accelerator cable
(2) Clutch release spring

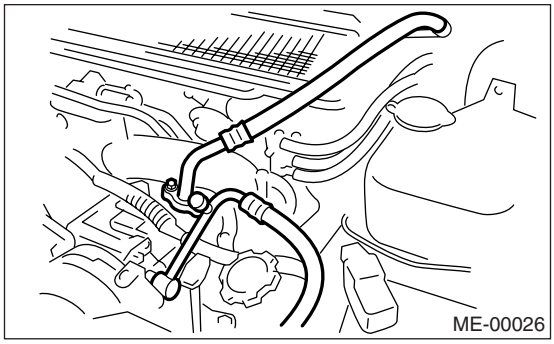
22) After connecting each cable, adjust them.

23) Install the air intake system.
(1) Install the intercooler. **<Ref. to IN(H4DOTC 2.0)-11,** INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner upper cover.
(3) Install the engine harness connector bracket.
(4) Install the filler hose to air cleaner case.

24) Install the A/C pressure hoses.

NOTE:
Use new O-rings.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)



25) Install the radiator. **<Ref. to CO(H4SO)-30,** INSTALLATION**, Radiator.>**
26) Install the coolant filler tank. **<Ref. to CO(H4SO)-42,** INSTALLATION**, Coolant Filler Tank.>**
27) Install the window washer tank.
28) Install the battery in the vehicle, and then connect the cables.
29) Fill engine coolant.
<Ref. to CO(H4SO)-19, FILLING OF ENGINE COOLANT, REPLACEMENT**, Engine Coolant.>**
30) Charge the A/C system with refrigerant.
<Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>
31) Remove the front hood stay, and close the front hood.
32) Take off the vehicle from lift arms.

C: INSPECTION

1) Make sure the pipes and hoses are installed correctly.
2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. **<Ref. to ME(H4DOTC 2.0)-42,** REMOVAL**, Engine Assembly.>**
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
ENGINE MOUNTING;
35 N·m (3.6 kgf-m, 26.0 ft-lb)

C: INSPECTION

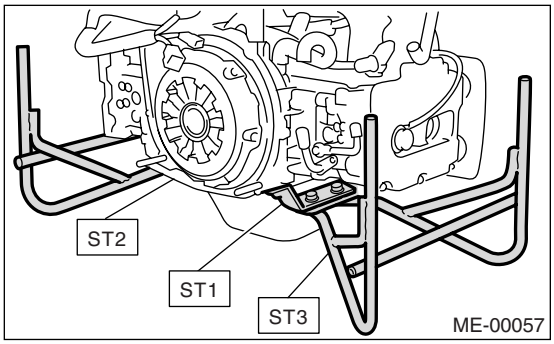
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



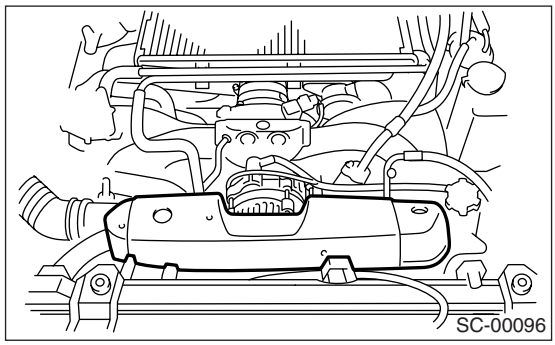
2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

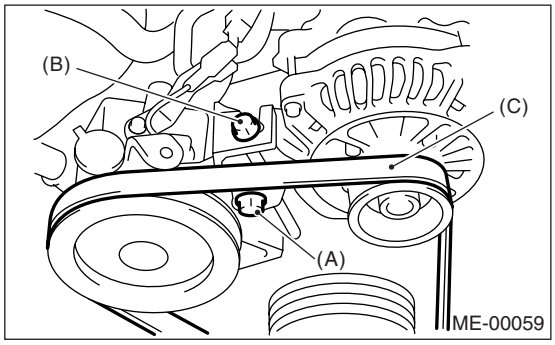
A: REMOVAL

1. FRONT SIDE BELT

1) Remove the V-belt cover.

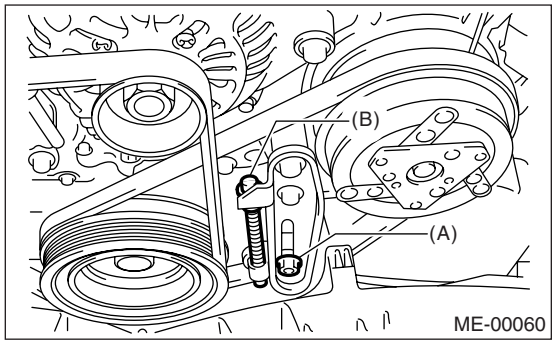


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

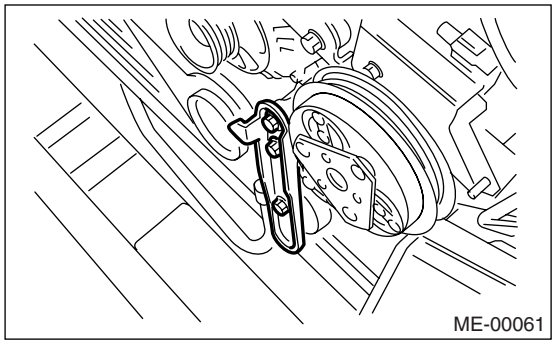


2. REAR SIDE BELT

1) Loosen the lock nut (A).
2) Loosen the slider bolt (B).



3) Remove the A/C belt.
4) Remove the A/C belt tensioner.



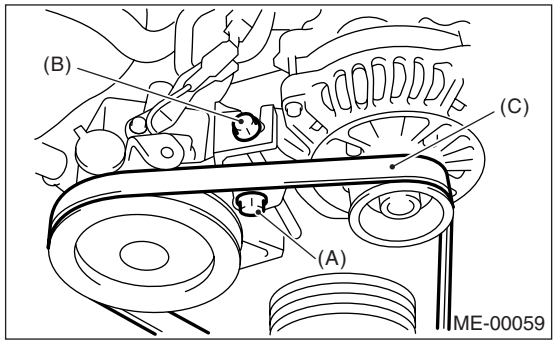
B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:
Wipe off any oil or water on the belt and pulley.

1) Install the belt (C), and tighten the slider bolt (B) so as to obtain the specified belt tension **<Ref. to ME(H4DOTC 2.0)-54,** INSPECTION**, V-belt.>**
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

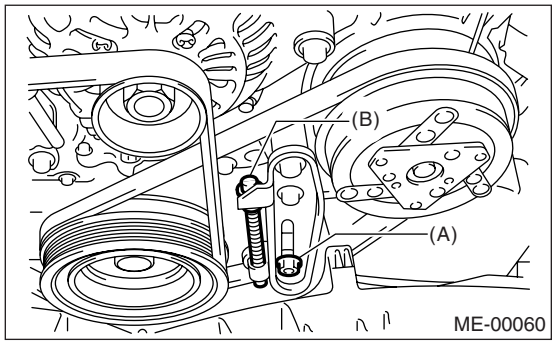
Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



2. REAR SIDE BELT

1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. **<Ref. to ME(H4DOTC 2.0)-54,** INSPECTION**, V-belt.>**
2) Tighten the lock nut (A).

Tightening torque:
Lock nut (A):
22.6 N·m (2.3 kgf-m, 16.7 ft-lb)



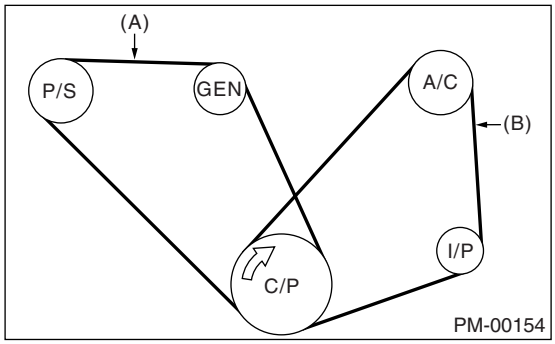
C: INSPECTION

1) Replace the belts, if cracks, fraying or wear is found.
2) Check the V-belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension (With using belt tension gauge)

(A)
Replaced:
640 — 780 N (65 — 80 kgf, 144 — 175 lbf)
Reused: 490 — 640 N (50 — 65 kgf, 110 — 144 lbf)

(B)*
Replaced:
740 — 880 N (75 — 90 kgf, 166 — 198 lbf)
Reused:
350 — 450 N (36 — 46 kgf, 79 — 101 lbf)
****: With air conditioner***

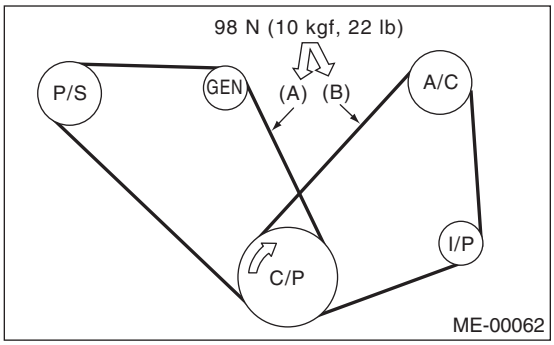


(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

Belt tension (Without using belt tension gauge)

(A)
Replaced:
7 — 9 mm (0.276 — 0.354 in)
Reused:
9 — 11 mm (0.354 — 0.433 in)

(B)*
Replaced:
7.5 — 8.5 mm (0.295 — 0.335 in)
Reused:
9.0 — 10.0 mm (0.354 — 0.394 in)
****: With air conditioner***



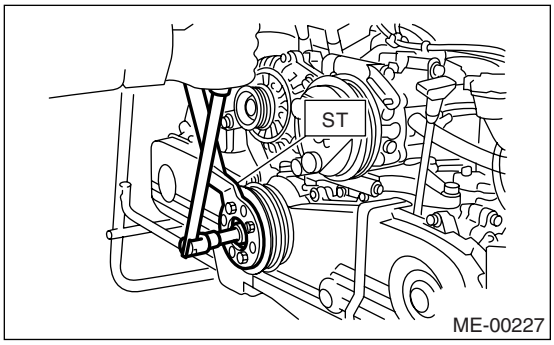
(A) Front side belt
(B) Rear side belt
C/P Crank pulley
GEN Generator
P/S Power steering oil pump pulley
A/C Air conditioning compressor pulley
I/P Idler pulley

13.Crank Pulley

A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977400 CRANK PULLEY WRENCH (2.0 L model)
ST 499977100 CRANK PULLEY WRENCH (2.5 L model)



3) Remove the crank pulley.

B: INSTALLATION

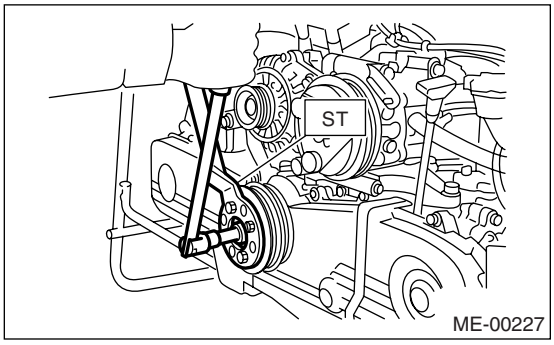
1. 2.0 L MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.

ST 499977400 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
130 N·m (13 kgf-m, 94.0 ft-lb)



3) Confirm that the tightening angle of crank pulley bolt is 45 degrees or more. If the tightening angle of crank pulley bolt is less than 45 degrees, conduct the following procedures.

CAUTION:
If the tightening angle of crank pulley bolt is less than 45 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

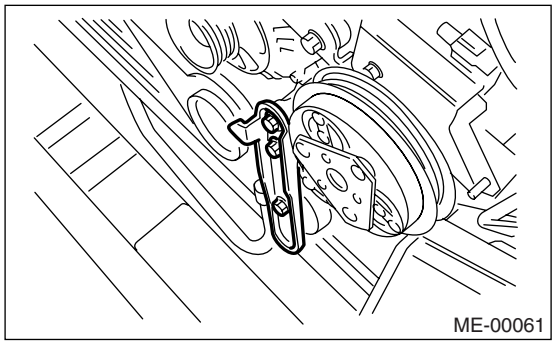
(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:
12369AA011

(2) Clean the crankshaft thread using compressed air.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

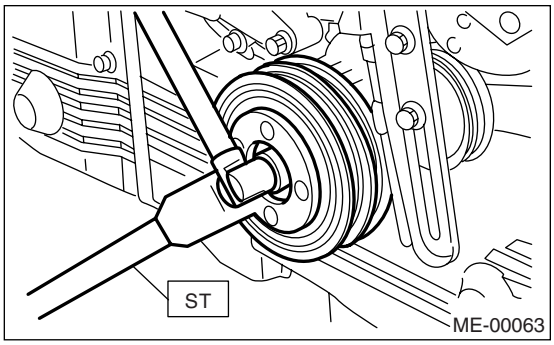
2. 2.5 L MODEL

1) Install the crank pulley.
2) Install the pulley bolt.
To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using compressed air.
(2) Apply engine oil to the crank pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crank pulley bolts.

Tightening torque:
180 N·m (18.3 kgf-m, 132.8 ft-lb)



3) Confirm that the tightening angle of crank pulley bolt is 65 degrees or more. If the tightening angle of crank pulley bolt is less than 65 degrees, conduct the following procedures.

CAUTION:
If the tightening angle of crank pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

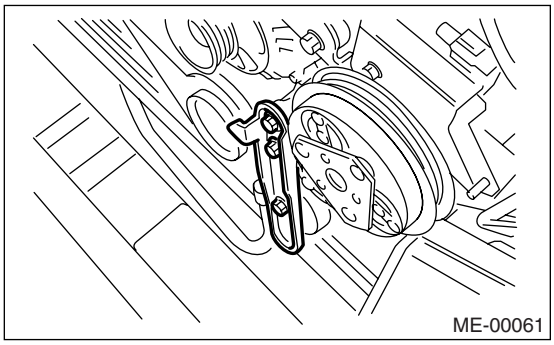
(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:
12369AA011

(2) Clean the crankshaft thread using compressed air.
(3) Apply engine oil to the crank pulley bolt seat and thread.
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(5) Tighten the crank pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the A/C belt tensioner.



5) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

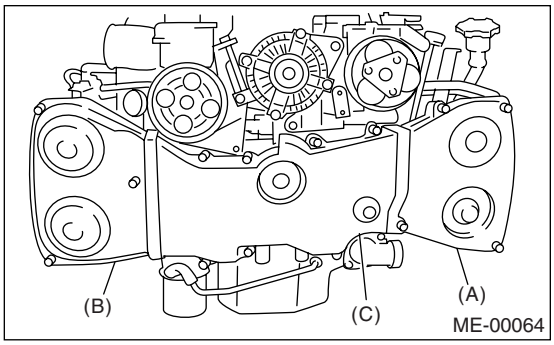
C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. **<Ref. to ME(H4DOTC 2.0)-54,** INSPECTION**, V-belt.>**

14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** REMOVAL**, Crank Pulley.>**
3) Remove the timing belt cover (LH) (A).
4) Remove the timing belt cover (RH) (B).
5) Remove the front timing belt cover (C).



B: INSTALLATION

1) Install the front timing belt cover (C).

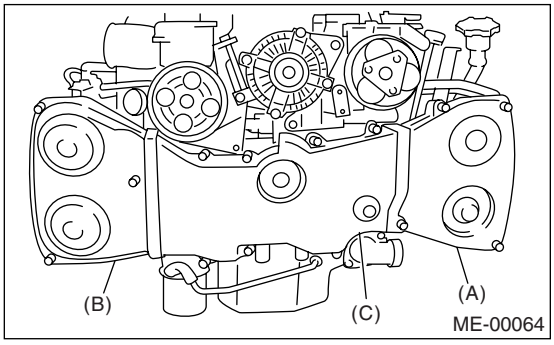
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

2) Install the timing belt cover (RH) (B).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

3) Install the timing belt cover (LH) (A).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



4) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
5) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

C: INSPECTION

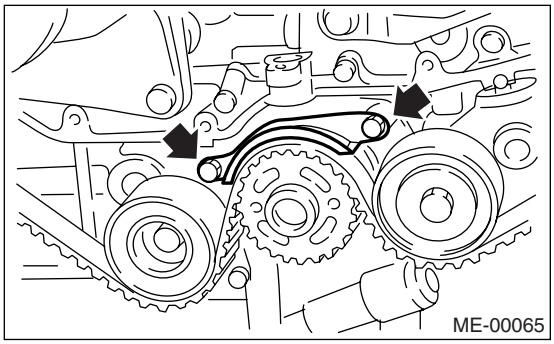
Make sure the cover is not damaged.

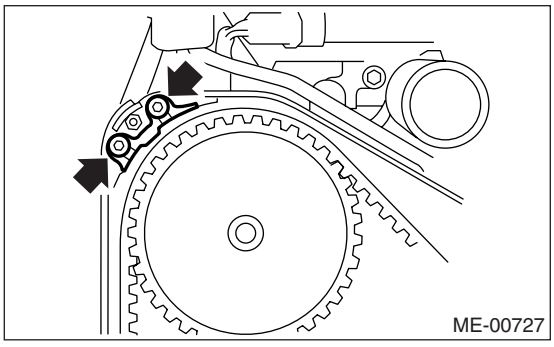
15.Timing Belt

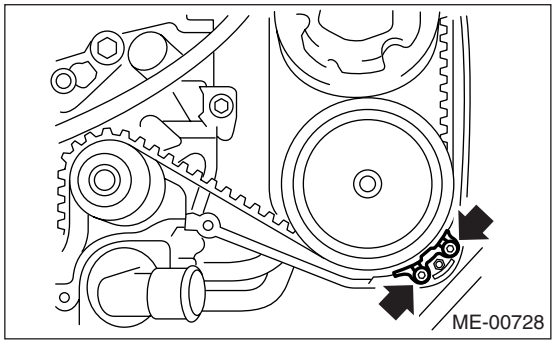
A: REMOVAL

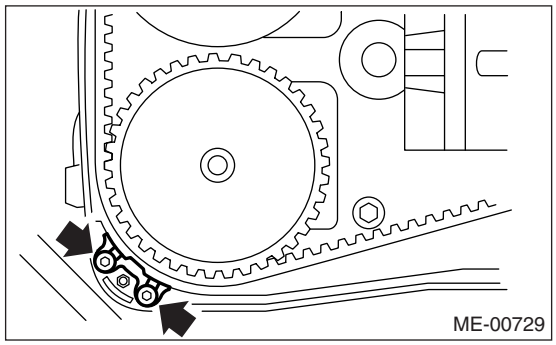
1. TIMING BELT

1) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** REMOVAL**, Crank Pulley.>**
3) Remove the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt guides. (MT model)



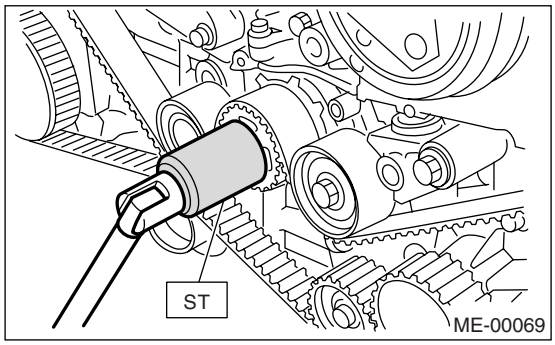




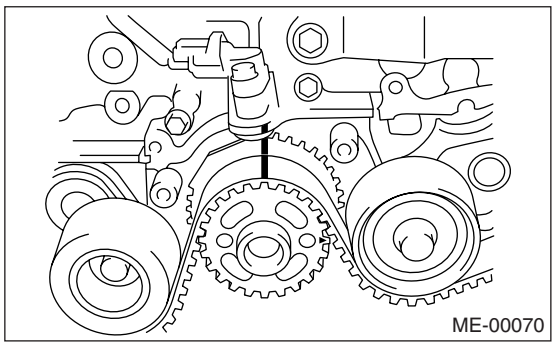


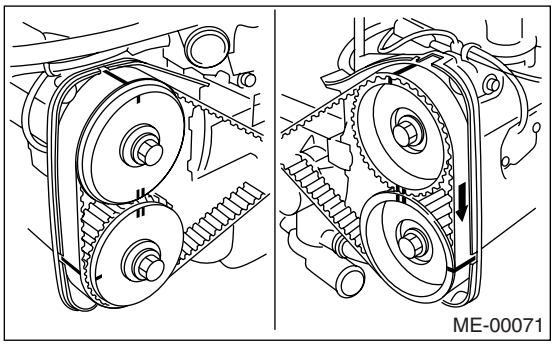
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:
   (1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET

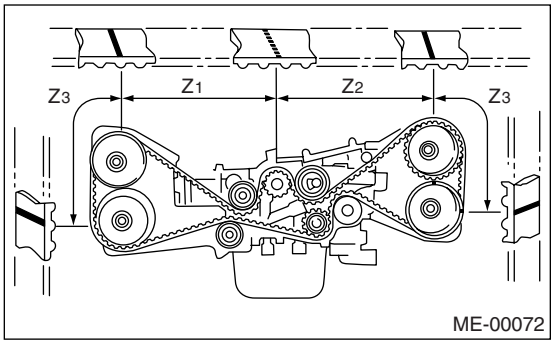


(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.


ME-00070

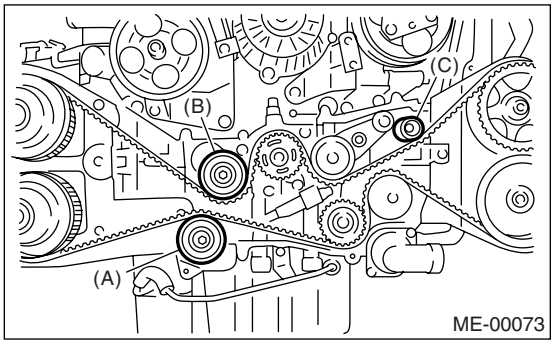

ME-00071

Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



ME-00072

6) Remove the belt idler (A).



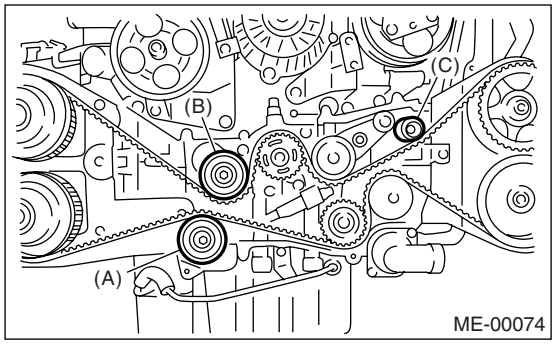
ME-00073

7) Remove the timing belt.

CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust, cam sprocket. If the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

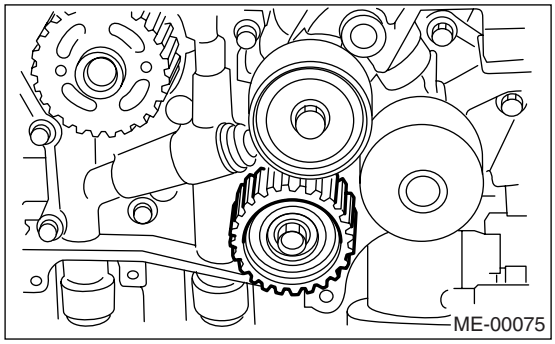
2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (B) and (C).

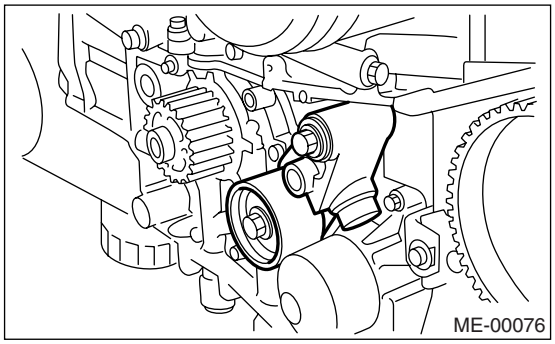


ME-00074

2) Remove the belt idler No. 2.


ME-00075

3) Remove the automatic belt tension adjuster assembly.


ME-00076

B: INSTALLATION

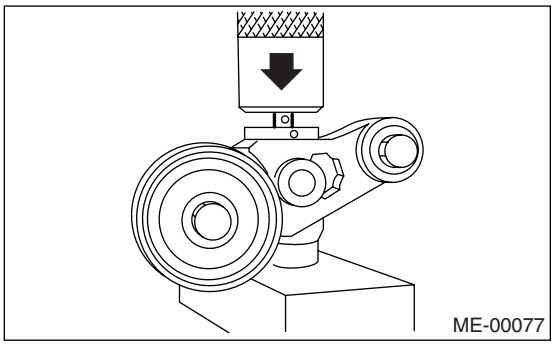
1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

1) Preparation for installation of automatic belt tension adjuster assembly.

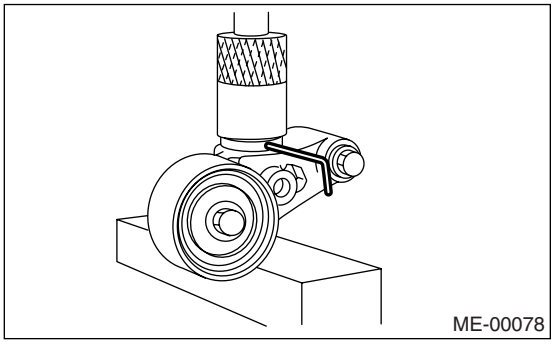
NOTE:
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.

• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
• Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
• Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of move than 294 N (30 kgf, 66 lbf) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

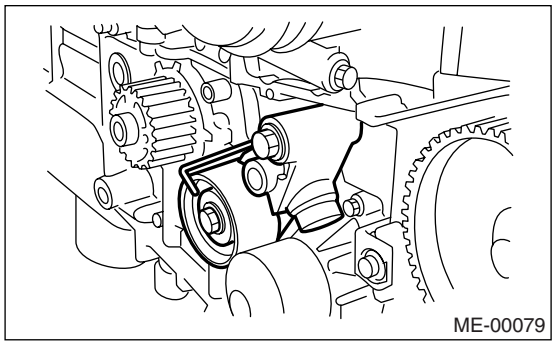

ME-00077

(3) With a 2 mm (0.079 in) dia. stopper pin or a 2 mm (0.079 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.


ME-00078

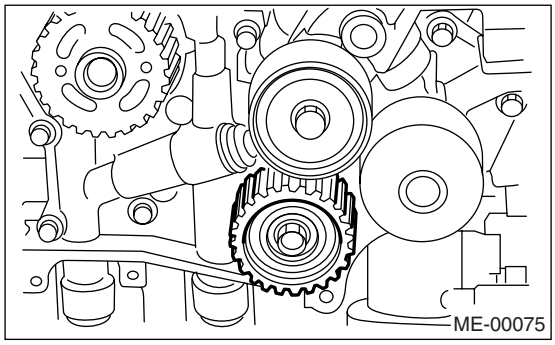
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00079

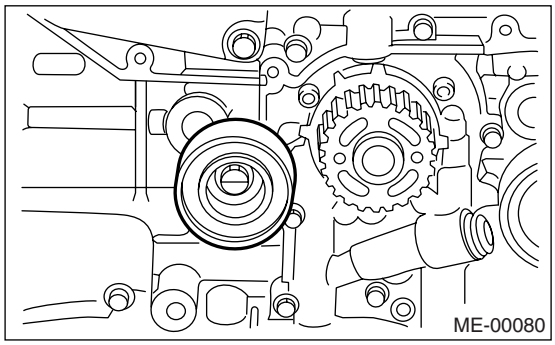
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00075

4) Install the belt idler.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

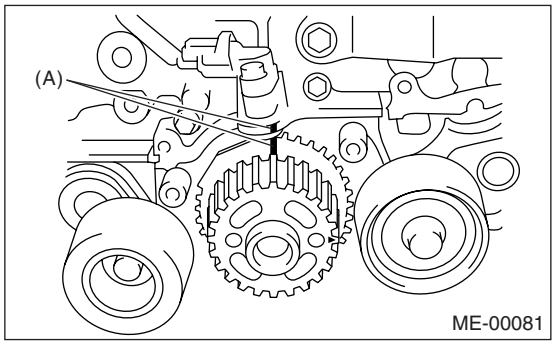

ME-00080

2. TIMING BELT

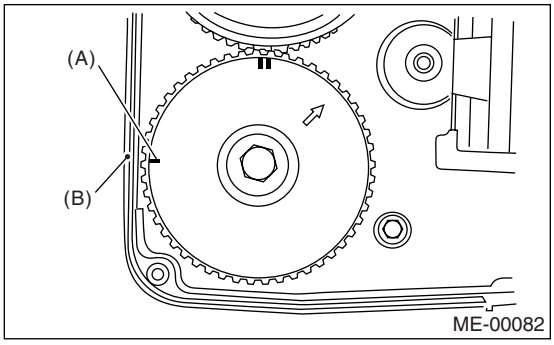
1) Preparation for installation of automatic belt tension adjuster assembly. **<Ref. to ME(H4DOTC 2.0)-60,** AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION**, Timing Belt.>**

2) Crankshaft and cam sprocket alignment.

(1) Align mark (A) on the crank sprocket with mark on the oil pump cover at cylinder block.

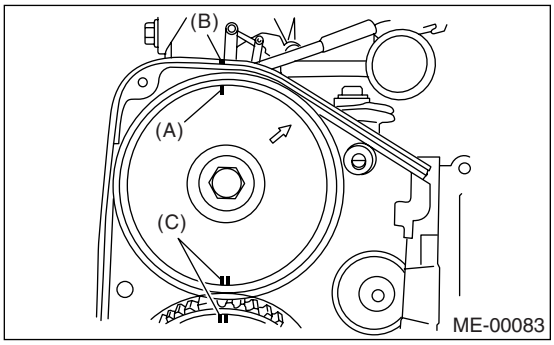


(2) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.

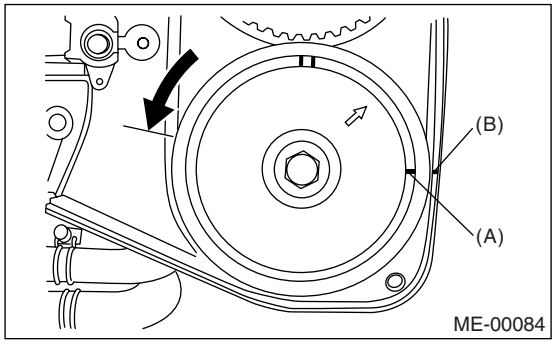


(3) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover.

(Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)

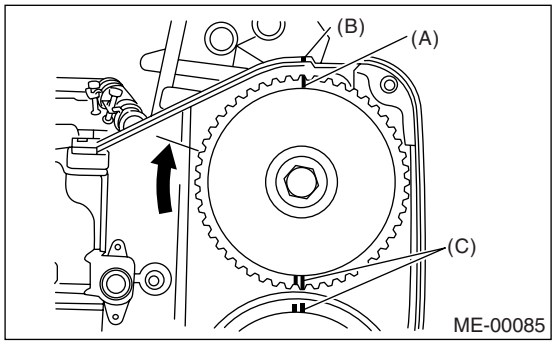


(4) Align single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



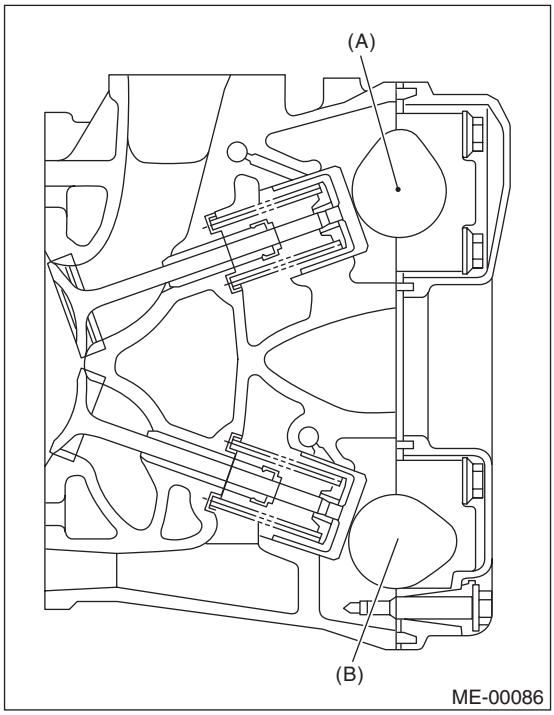
(5) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).

Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.



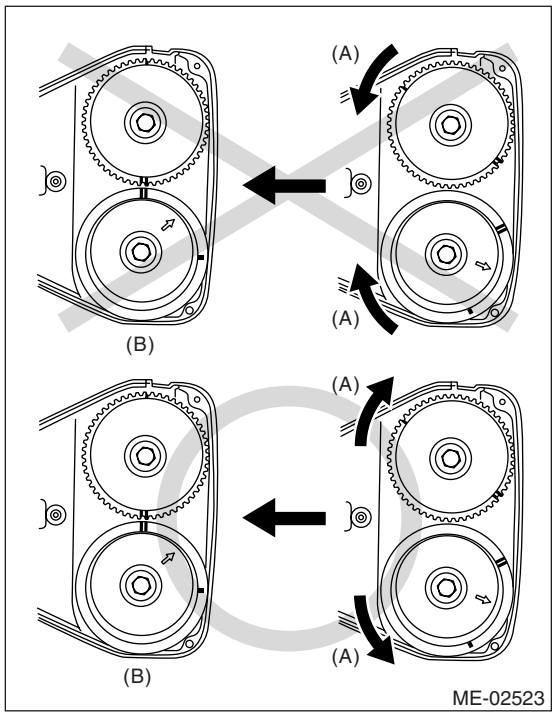
(6) Ensure the camshaft and crankshaft sprockets are positioned properly.

CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



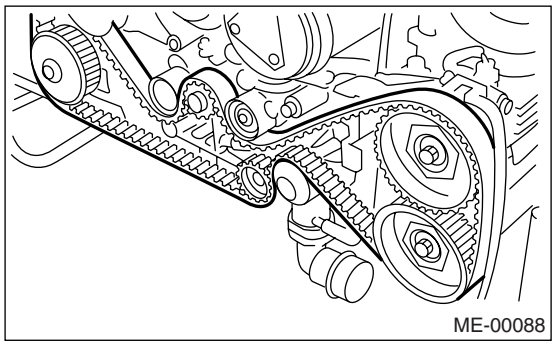
(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
• Camshafts (LH) must be rotated from the "zero-lift" position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
• Do not allow the camshafts to rotate in the direction shown in the upper of figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



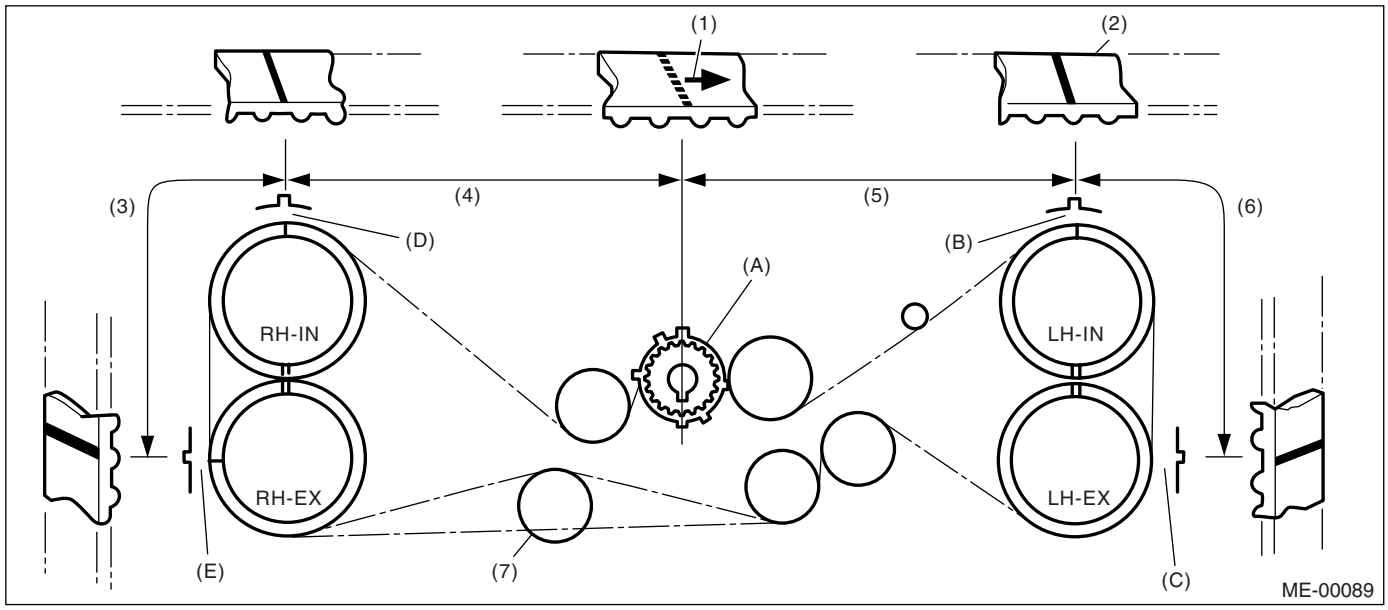
(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt.



Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:
• Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
• Ensure the belt's rotating direction is correct.

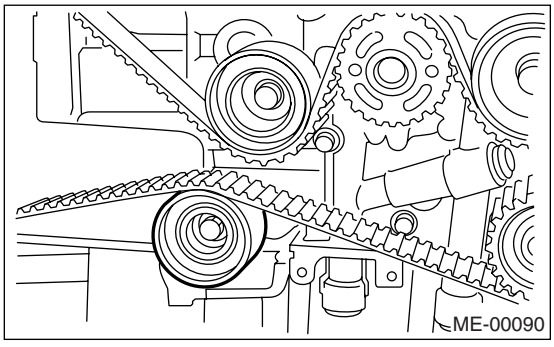


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

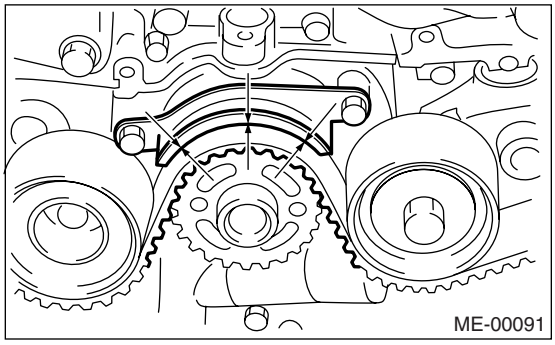
NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

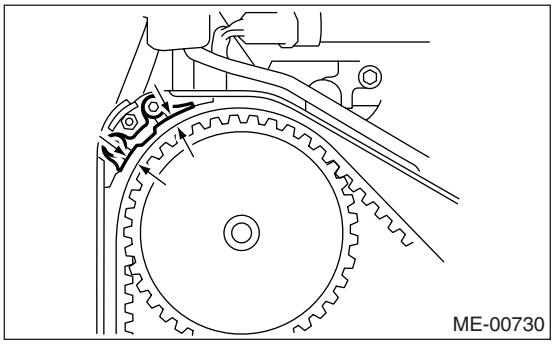


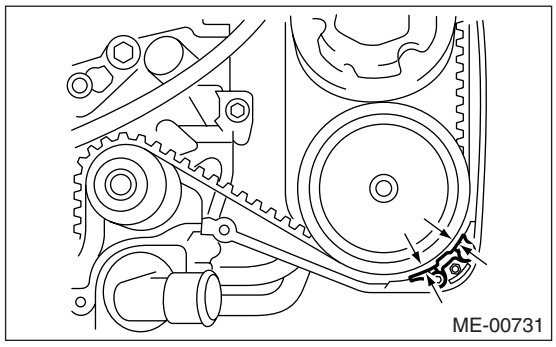
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

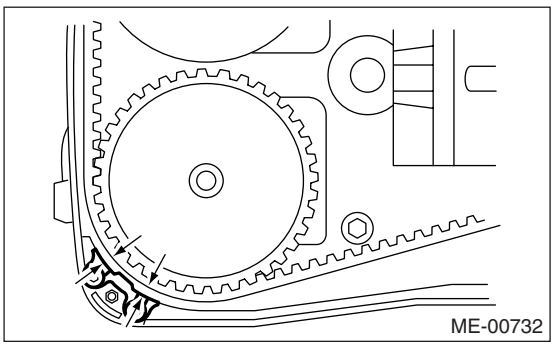
6) Install the timing belt guide. (MT model)
(1) Temporarily tighten the bolts.
(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)



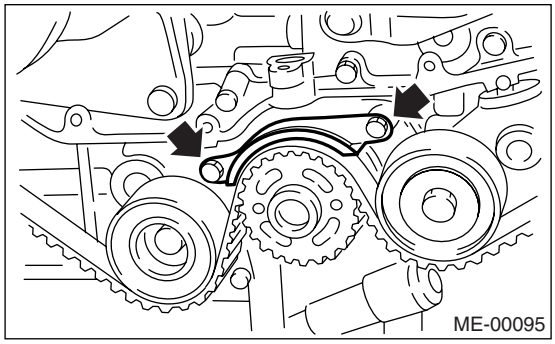




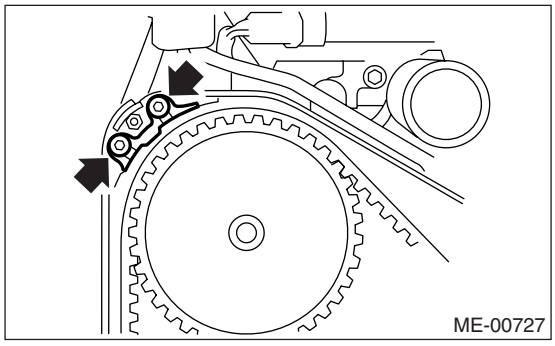


(3) Tighten the bolts.

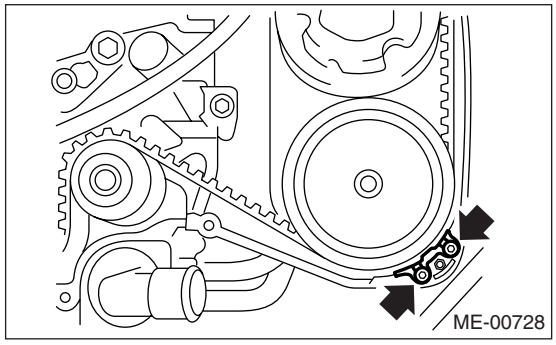
Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



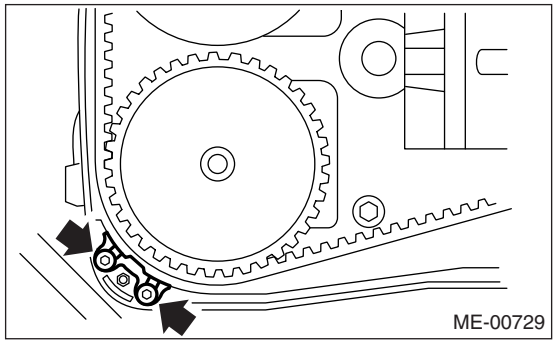
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



7) Install the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** INSTALLATION**, Timing Belt Cover.>**
8) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
9) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

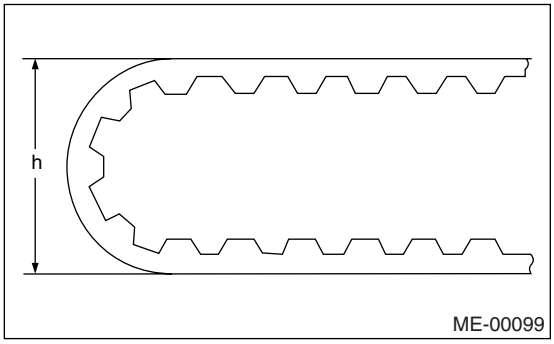
C: INSPECTION

1. TIMING BELT

1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
2) Check the condition of back side of belt; if any crack is found, replace the belt.

NOTE:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius h:
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

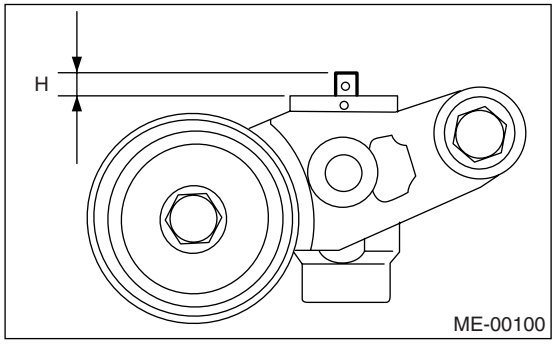
NOTE:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lbf) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lbf), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lbf) to it. Check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.
• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension H:
5.7±0.5 mm (0.225±0.020 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

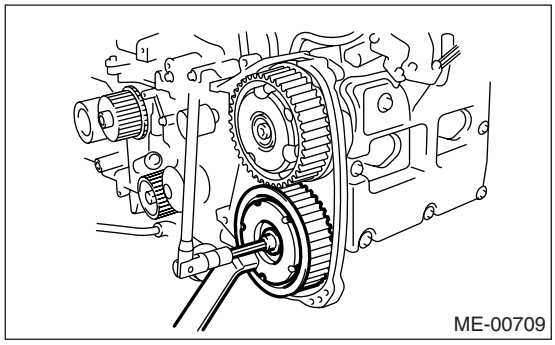
1) Check the belt idler for smooth rotation. Replace if noise or excessive play is noted.
2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
3) Check the belt idler for grease leakage.

16.Cam Sprocket

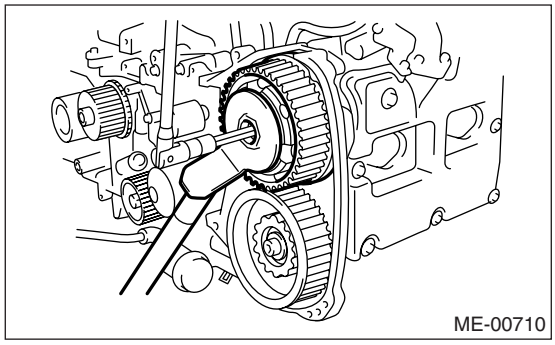
A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** REMOVAL**, Crank Pulley.>**
3) Remove the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-59,** REMOVAL**, Timing Belt.>**
5) Remove the camshaft position sensor. (2.0 L model) **<Ref. to FU(H4DOTC 2.0)-31,** REMOVAL**, Camshaft Position Sensor.>**
6) Remove the cam sprockets. To lock the camshaft, use ST.

ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH

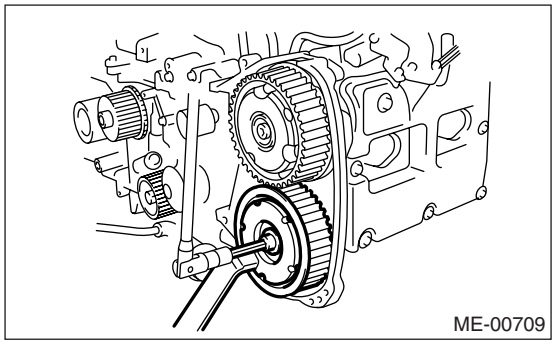


B: INSTALLATION

1) Install the cam sprocket. To lock the camshaft, use ST.

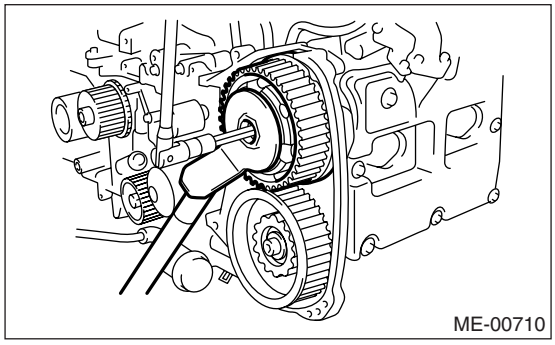
ST 499207400 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb) of torque, and then tighten further by 45°



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:
Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb) of torque, and then tighten further by 45°



2) Install the camshaft position sensor. **<Ref. to FU(H4DOTC 2.0)-31,** INSTALLATION**, Camshaft Position Sensor.>**
3) Install the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-60,** INSTALLATION, Timing Belt.>
4) Install the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** INSTALLATION**, Timing Belt Cover.>**
5) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
6) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

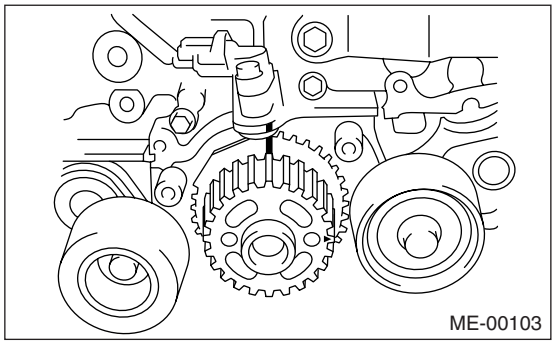
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the cam sprocket notch used for sensor for damage and contamination of foreign matter.

17.Crank Sprocket

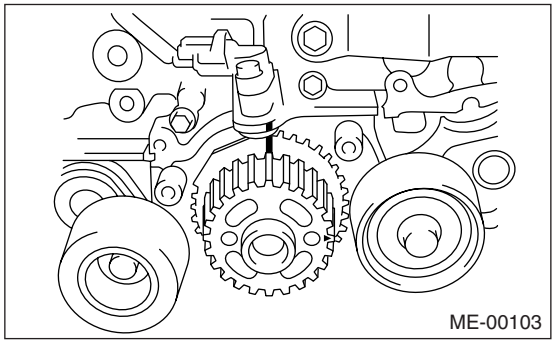
A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** REMOVAL**, Crank Pulley.>**
3) Remove the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-59,** REMOVAL**, Timing Belt.>**
5) Remove the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** REMOVAL**, Cam Sprocket.>**
6) Remove the crank sprocket.



B: INSTALLATION

1) Install the crank sprocket.



2) Install the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** INSTALLATION**, Cam Sprocket.>**
3) Install the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-60,** INSTALLATION, Timing Belt.>
4) Install the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** INSTALLATION**, Timing Belt Cover.>**
5) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
6) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

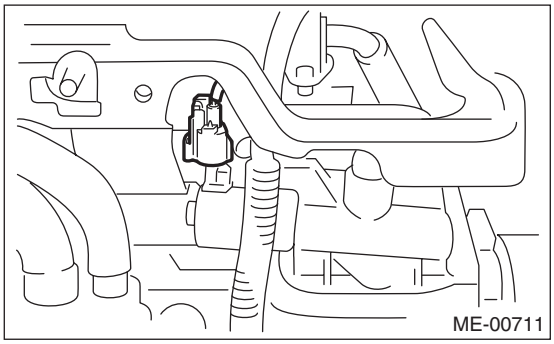
C: INSPECTION

1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

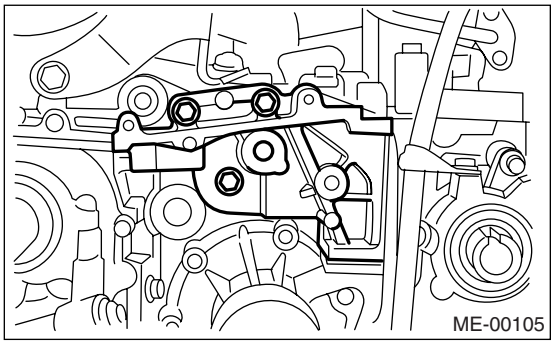
18.Camshaft

A: REMOVAL

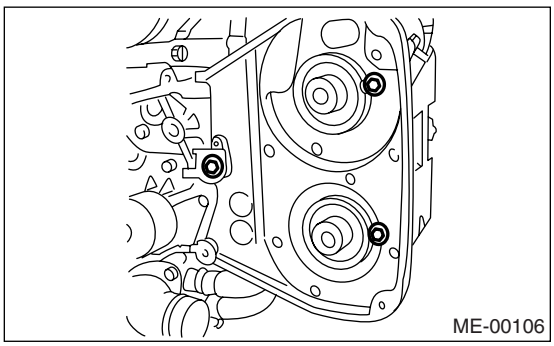
1) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** REMOVAL**, Crank Pulley.>**
3) Remove the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-59,** REMOVAL**, Timing Belt.>**
5) Remove the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** REMOVAL**, Cam Sprocket.>**
6) Remove the crank sprocket. **<Ref. to ME(H4DOTC 2.0)-68,** REMOVAL**, Crank Sprocket.>**
7) Disconnect the oil flow control solenoid valve assembly connector.


ME-00711

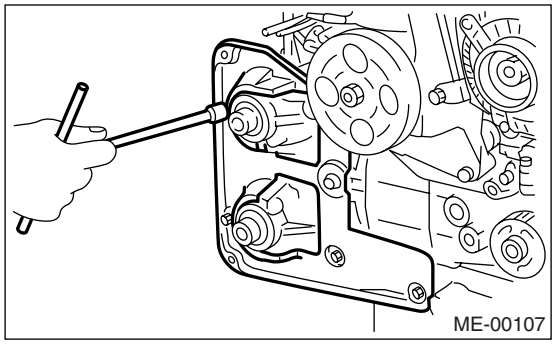
8) Remove the tensioner bracket.


ME-00105

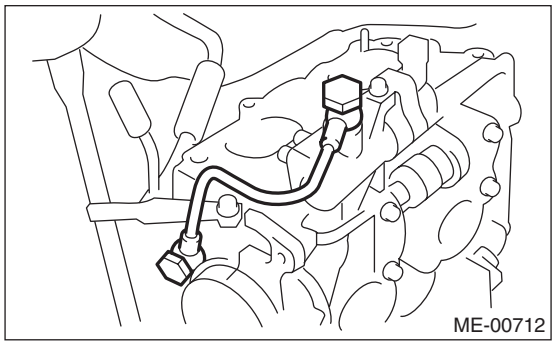
9) Remove the timing belt cover No. 2 (LH).


ME-00106

10) Remove the timing belt cover No. 2 (RH).

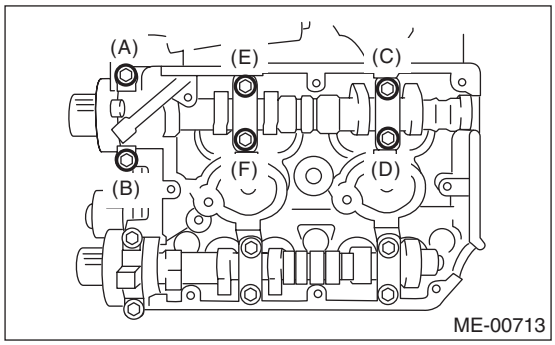

ME-00107

11) Remove the spark plug cord.
12) Remove the oil level gauge guide. (LH side)
13) Remove the rocker cover and gasket.
14) Remove the oil pipe.


ME-00712

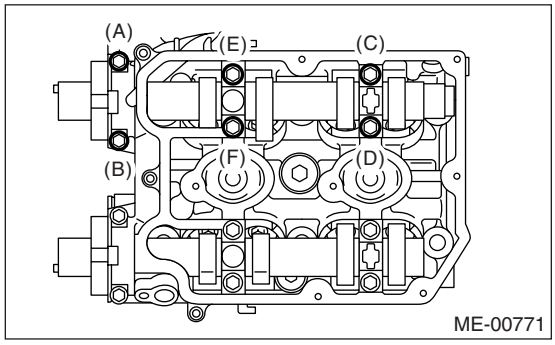
15) Loosen the variable oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.

- 2.0 L MODEL



ME-00713

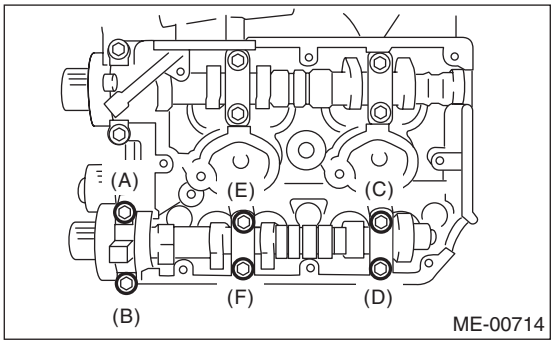
- 2.5 L MODEL



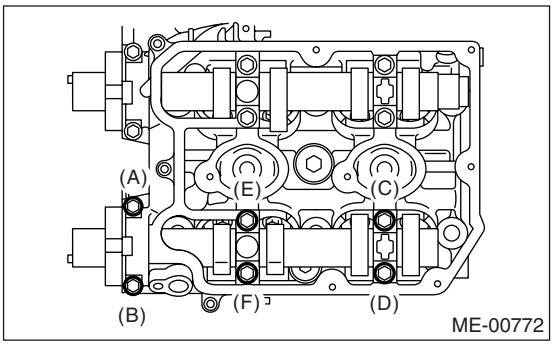
ME-00771

16) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.

• 2.0 L MODEL



• 2.5 L MODEL



17) Remove the oil flow control solenoid valve assembly, intake camshaft cap, and camshaft.

18) Remove the exhaust camshaft cap and camshaft.

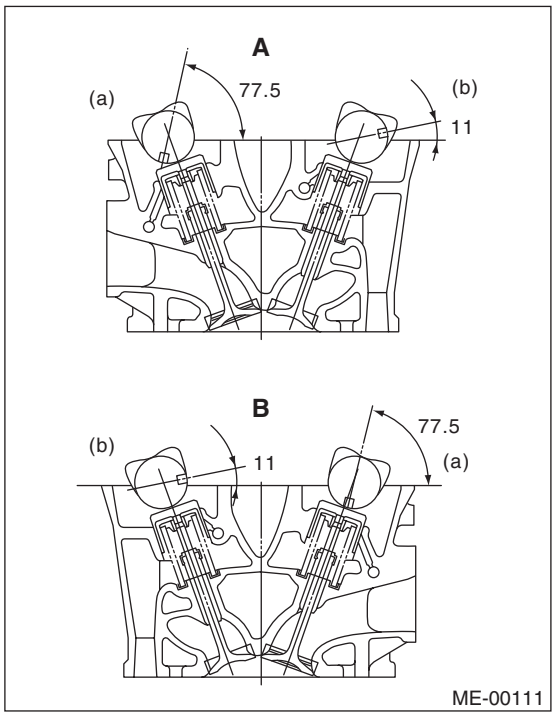
NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

19) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation: Apply engine oil to cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

NOTE:
• When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
• Camshaft (RH) need not be rotated when set at position shown in the figure. Intake camshaft (LH): Rotate 80° clockwise. Exhaust camshaft (LH): Rotate 45° counterclockwise.



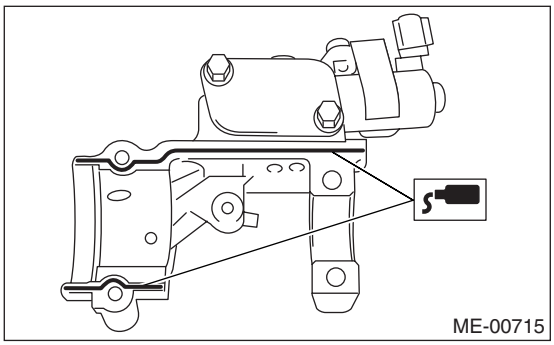
A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap and oil flow control solenoid valve assembly installation:
(1) Apply liquid gasket sparingly to cap mating surface.

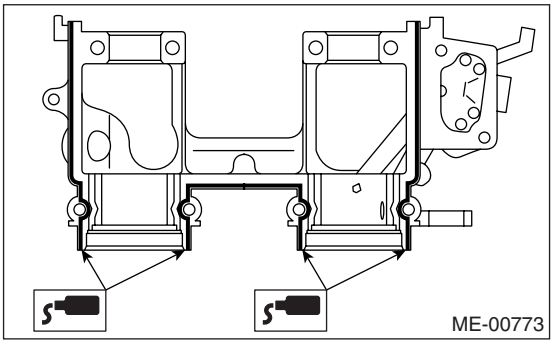
NOTE:
Do not apply liquid gasket excessively. Failure to do so may cause excess packing to come out and flow toward the oil seal, resulting in oil leaks.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

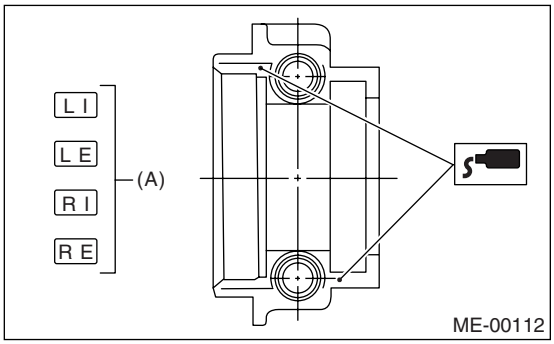
- 2.0 L MODEL



- 2.5 L MODEL



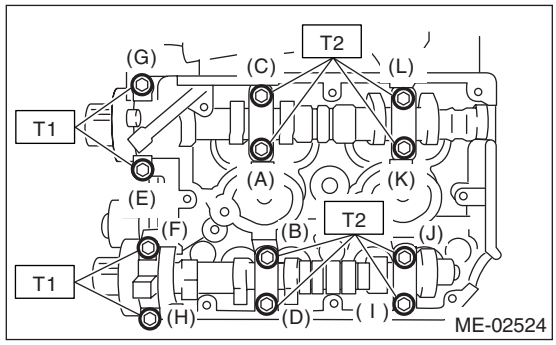
(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).



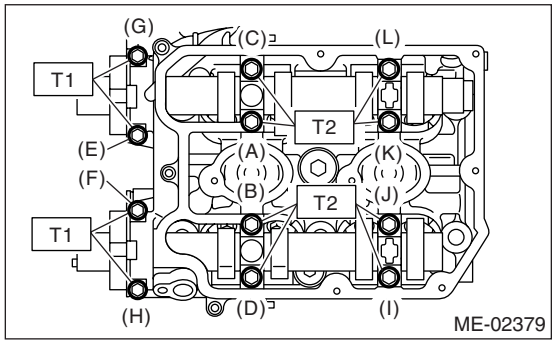
(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

- 2.0 L MODEL



- 2.5 L MODEL

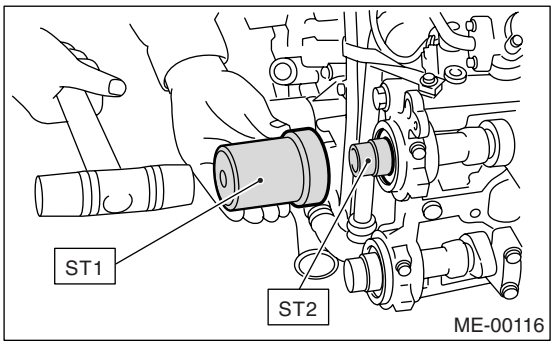


(4) After tightening camshaft cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

3) Camshaft oil seal installation: Apply grease to new oil seal lips and press onto front end of camshaft by using ST1 and ST2.

NOTE:
Use a new oil seal.

ST1	499587600	OIL SEAL INSTALLER
ST2	499597200	OIL SEAL GUIDE

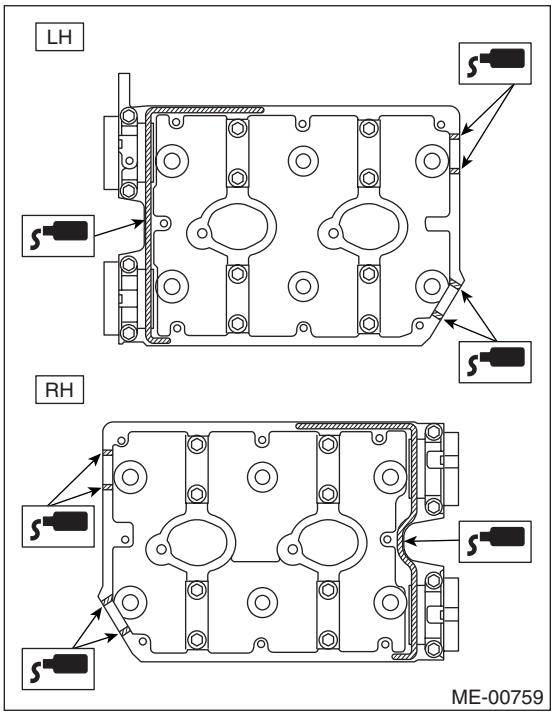


4) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.
(2) Apply liquid gasket to four front open edges of peripheral gasket.

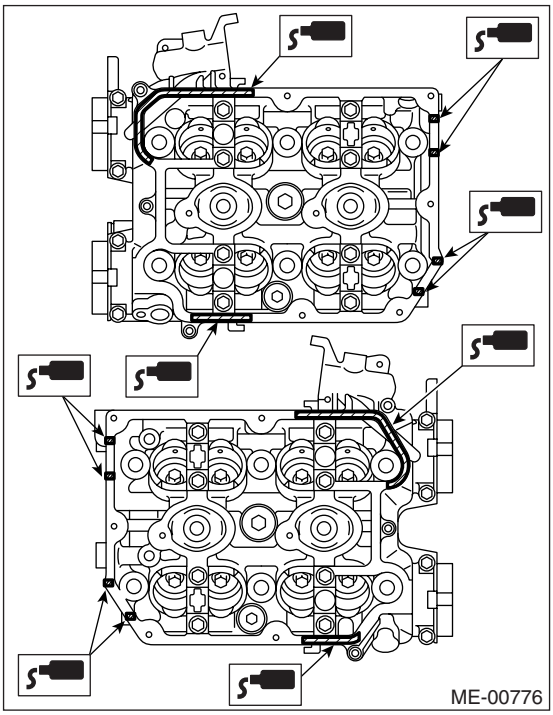
NOTE:
Use a new rocker cover gasket.

Liquid gasket:
(Part No. 004403007)
THREE BOND 1215 or equivalent

- 2.0 L MODEL



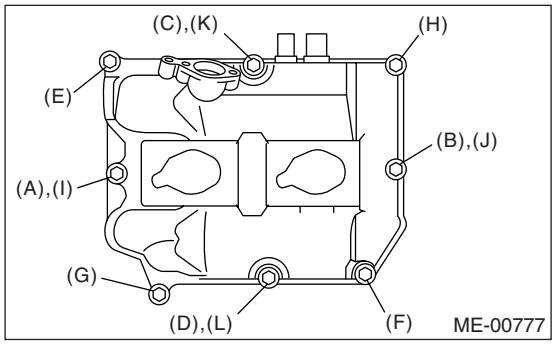
- 2.5 L MODEL



(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

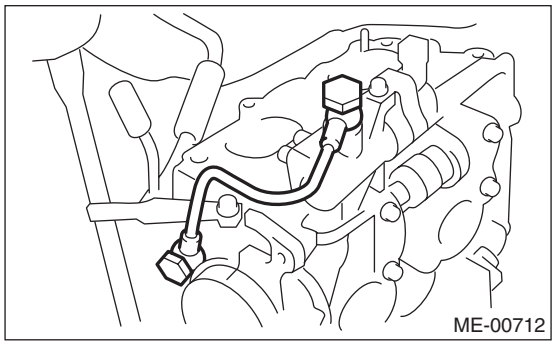
(4) Tighten the rocker cover tightening bolt in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
2.0 L model
5.0 N·m (0.5 kgf-m, 3.6 ft-lb)
2.5 L model
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

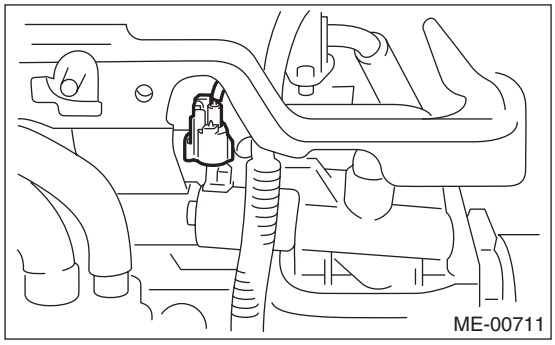


5) Install the oil pipe.

Tightening torque:
29 N·m (3.0 kgf-m, 22 ft-lb)



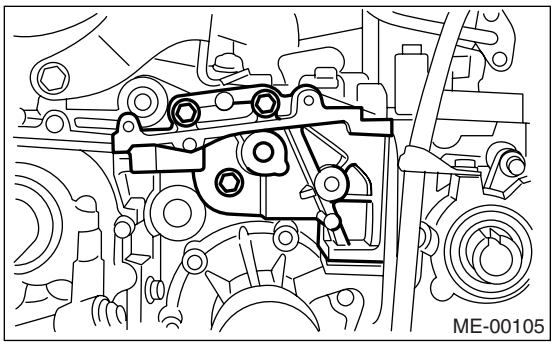
6) Connect the oil flow control solenoid valve connector.



7) Install the spark plug cord.
8) Similarly, install the parts on right-hand side.

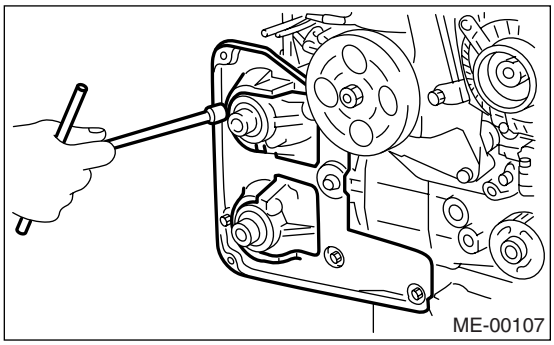
9) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



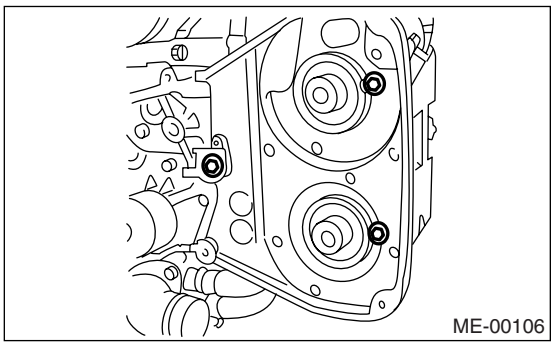
10) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



11) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

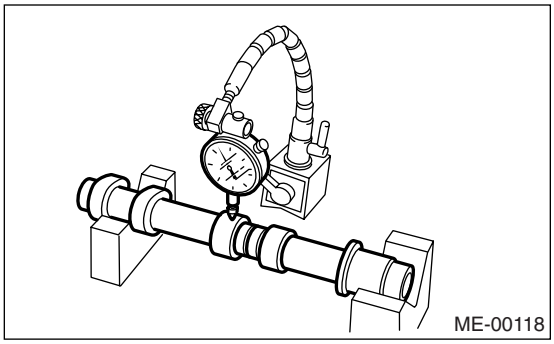


12) Install the crank sprocket. **<Ref. to ME(H4DOTC 2.0)-68,** INSTALLATION**, Crank Sprocket.>**
13) Install the cam sprockets. **<Ref. to ME(H4DOTC 2.0)-67,** INSTALLATION**, Cam Sprocket.>**
14) Install the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-60,** INSTALLATION, Timing Belt.>
15) Install the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** INSTALLATION**, Timing Belt Cover.>**
16) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
17) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Limit:
0.020 mm (0.0008 in)



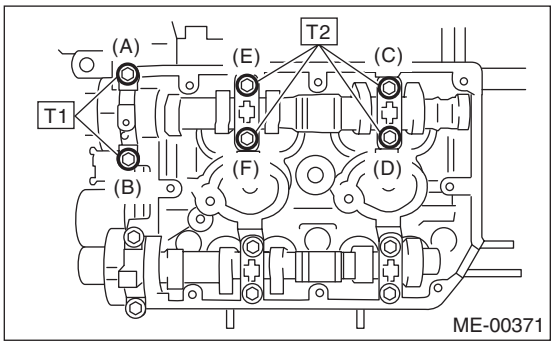
2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

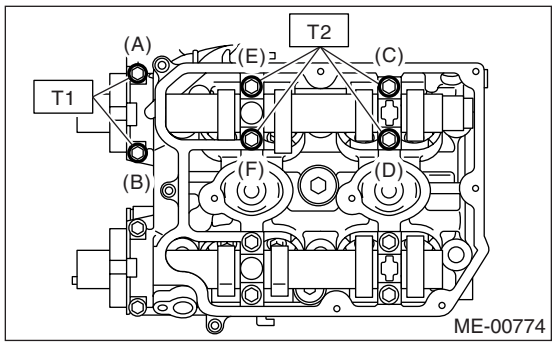
4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
(3) Place a plastigage across each of the camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.
Do not turn the camshaft.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

- 2.0 L model



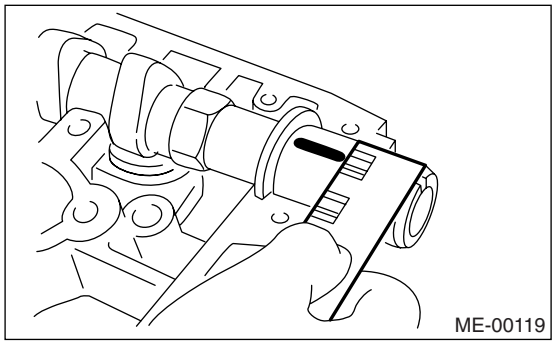
- 2.5 L model



(5) Remove the bearing caps.
(6) Measure the widest point of plastigage on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)



(7) Completely remove the plastigage.
5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H, replace if the limit has been exceeded.

Cam height H:

Standard:

2.0 L model
Intake:
44.75 — 44.85 mm (1.762 — 1.766 in)
Exhaust:
44.75 — 44.85 mm (1.762 — 1.766 in)

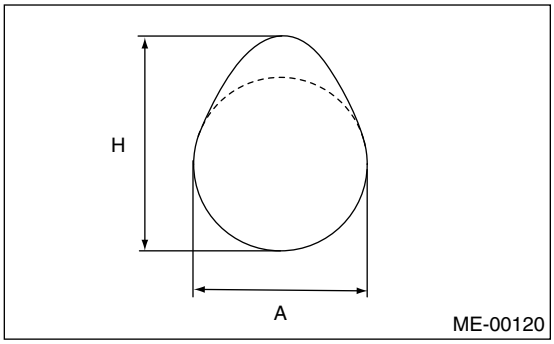
2.5 L model
Intake:
46.55 — 46.65 mm (1.833 — 1.837 in)
Exhaust:
46.75 — 46.85 mm (1.841 — 1.844 in)

Limit:

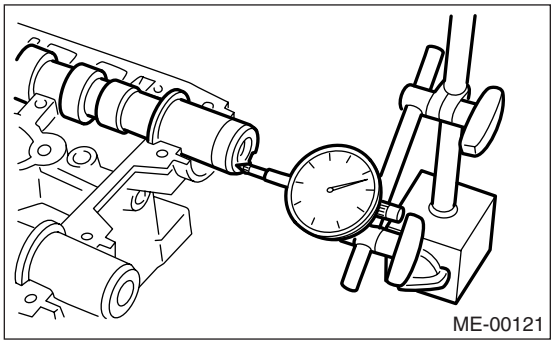
2.0 L model
Intake:
44.65 mm (1.758 in)
Exhaust:
44.65 mm (1.758 in)

2.5 L model
Intake:
46.45 mm (1.829 in)
Exhaust:
46.65 mm (1.837 in)

Cam base circle diameter A:
37.0 mm (1.457 in)



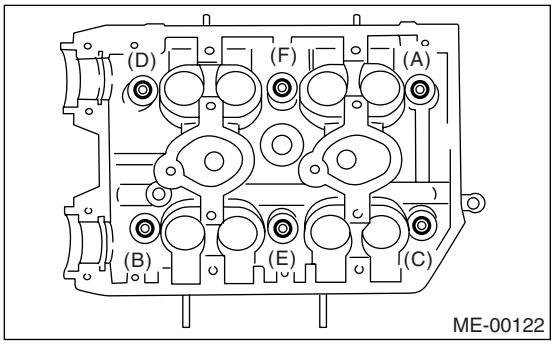
6) Measure the thrust clearance of camshaft with dial gauge. If the thrust clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.
Standard:
0.068 — 0.116 mm (0.0027 — 0.0046 in)
Limit:
0.14 mm (0.0055 in)



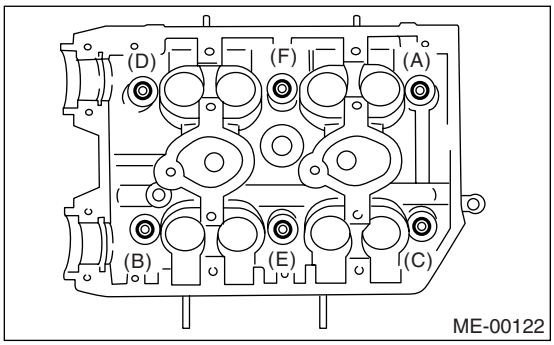
19.Cylinder Head

A: REMOVAL

1) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
2) Remove the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** REMOVAL**, Crank Pulley.>**
3) Remove the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** REMOVAL**, Timing Belt Cover.>**
4) Remove the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-59,** REMOVAL**, Timing Belt.>**
5) Remove the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** REMOVAL**, Cam Sprocket.>**
6) Remove the intake manifold. **<Ref. to FU(H4DOTC 2.0)-14,** REMOVAL, Intake Manifold.>
7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
8) Remove the camshaft. **<Ref. to ME(H4DOTC 2.0)-69,** REMOVAL**, Camshaft.>**
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

NOTE:
Do not scratch the mating surface of cylinder head and cylinder block.

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

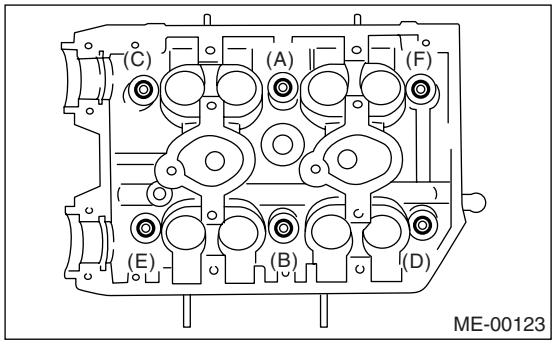
NOTE:
- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

2) Tighten the cylinder head bolts.
   (1) Apply a coat of engine oil to the washers and bolt threads.
   (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
   (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
   (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
   (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
   (6) Tighten all bolts 80 to 90° in alphabetical sequence.
   (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

NOTE:
Do not tighten the bolts by more than 45°.

   (8) Further tighten all bolts (A) and (B) by 40 to 45°.

NOTE:
Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



3) Install the camshaft. **<Ref. to ME(H4DOTC 2.0)-70,** INSTALLATION**, Camshaft.>**
4) Install the A/C compressor bracket on cylinder head.
5) Install the intake manifold. **<Ref. to FU(H4DOTC 2.0)-17,** INSTALLATION**, Intake Manifold.>**

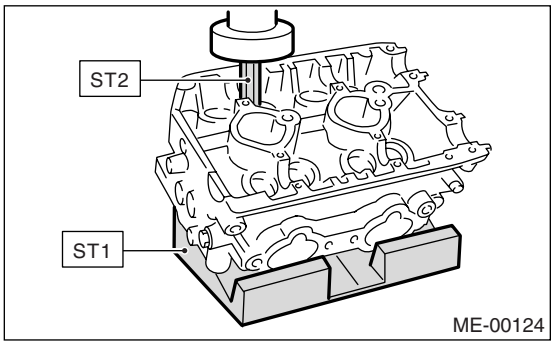
6) Install the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** INSTALLATION**, Cam Sprocket.>**
7) Install the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-60,** INSTALLATION, Timing Belt.>
8) Install the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** INSTALLATION**, Timing Belt Cover.>**
9) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
10) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**

C: DISASSEMBLY

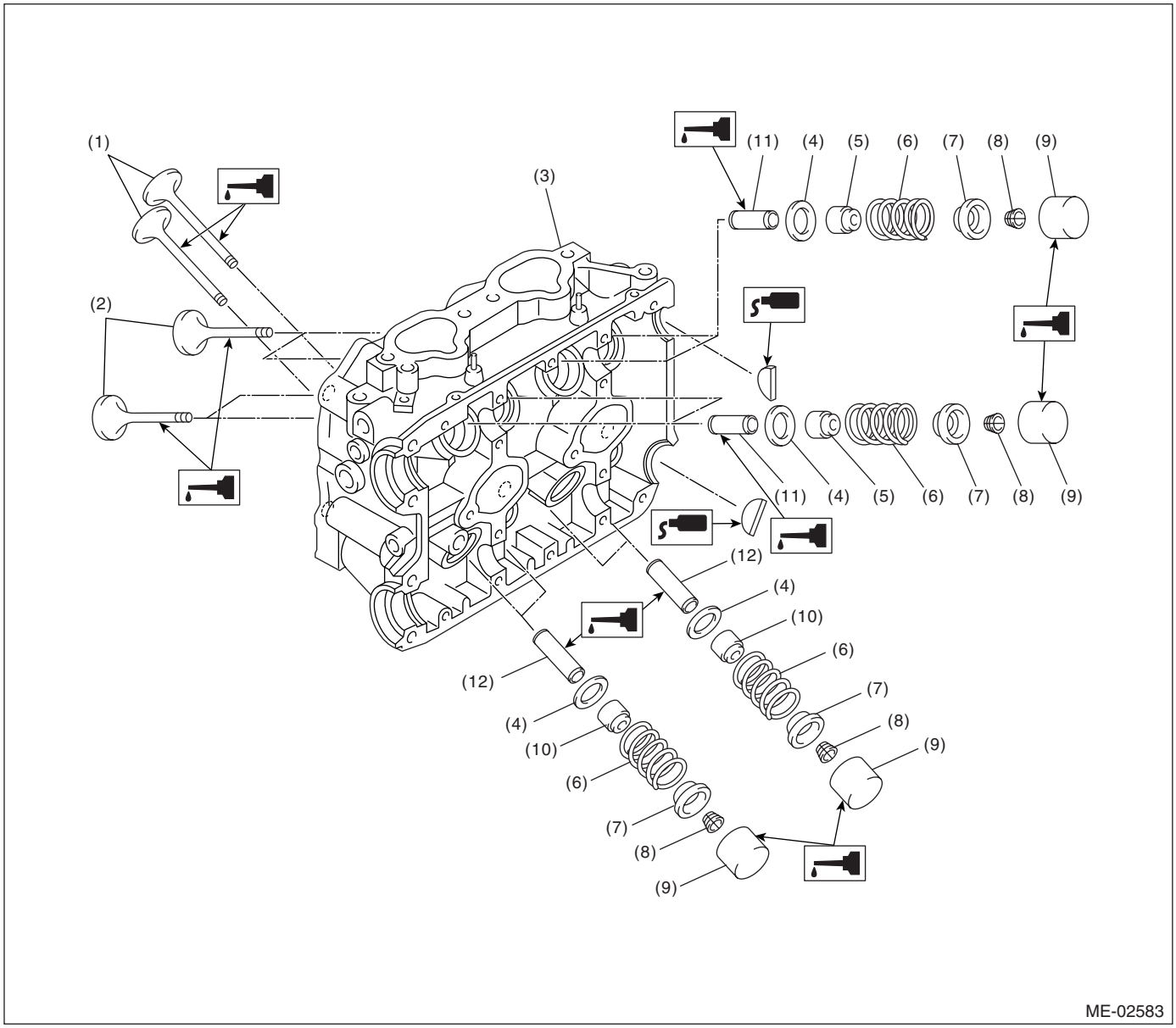
1) Remove the valve lifters.
2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
• Keep the removed parts in order for re-installing in their original positions.
• Mark each valve to prevent confusion.
• Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



D: ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Cylinder head
(4) Valve spring seat
(5) Intake valve oil seal
(6) Valve spring
(7) Retainer
(8) Retainer key
(9) Valve lifter
(10) Exhaust valve oil seal
(11) Intake valve guide
(12) Exhaust valve guide

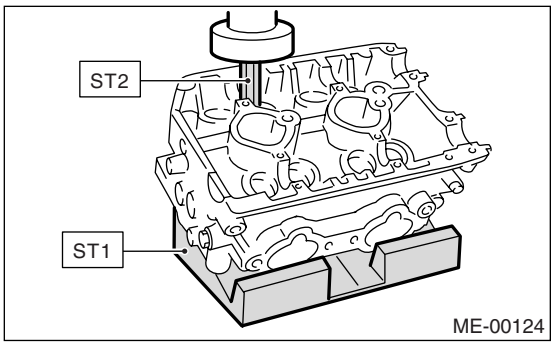
1) Installation of valve spring and valve.
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(2) Set the cylinder head on ST1.
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
Be sure to install the valve springs with their close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring, and then fit the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

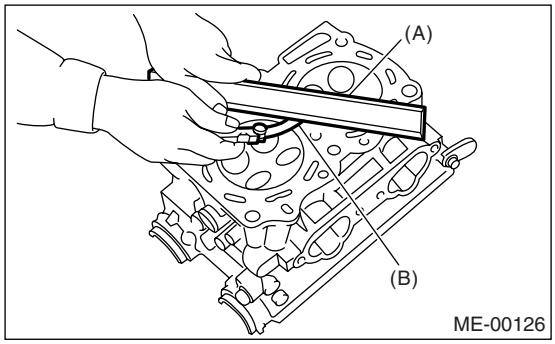
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.035 mm (0.0014 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

NOTE:
Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



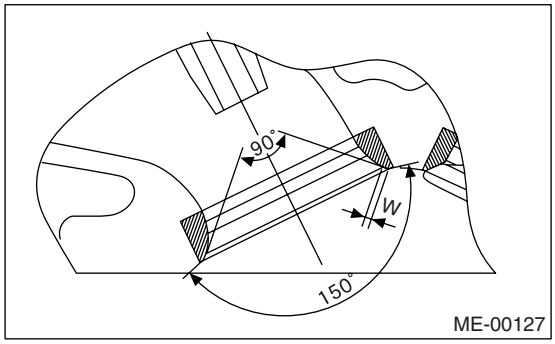
2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width W:

Intake:
Standard:
0.85 — 1.15 mm (0.033 — 0.045 in)
Limit:
1.7 mm (0.067 in)

Exhaust:
Standard:
1.35 — 1.65 mm (0.053 — 0.064 in)
Limit :
2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard:
Intake:
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust:
0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit:
0.15 mm (0.0059 in)

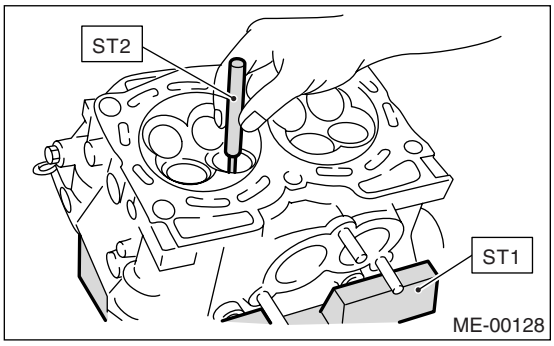
2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
Intake:
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust:
5.945 — 5.960 mm (0.2341 — 0.2346 in)

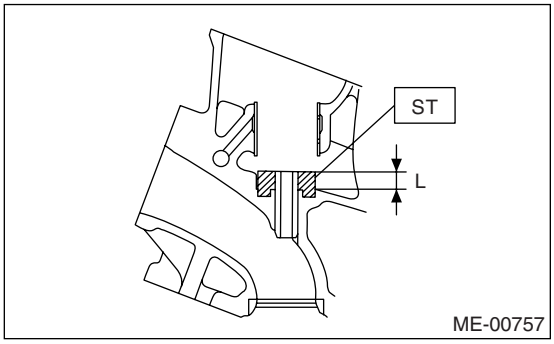
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



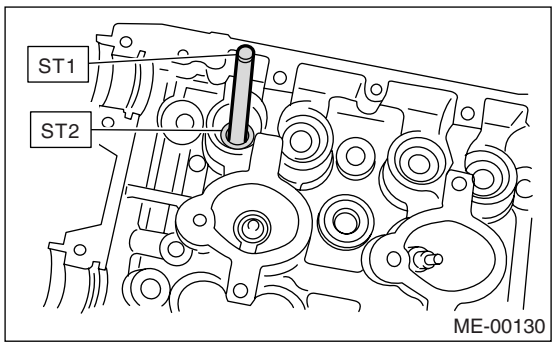
(3) Turn the cylinder head upside down and place ST as shown in the figure.

ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.
(5) Put a new valve guide, coated with sufficient oil, in cylinder head, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:
15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise.
(8) After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

CAUTION:
Apply engine oil to ST when reaming.

NOTE:
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

(9) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

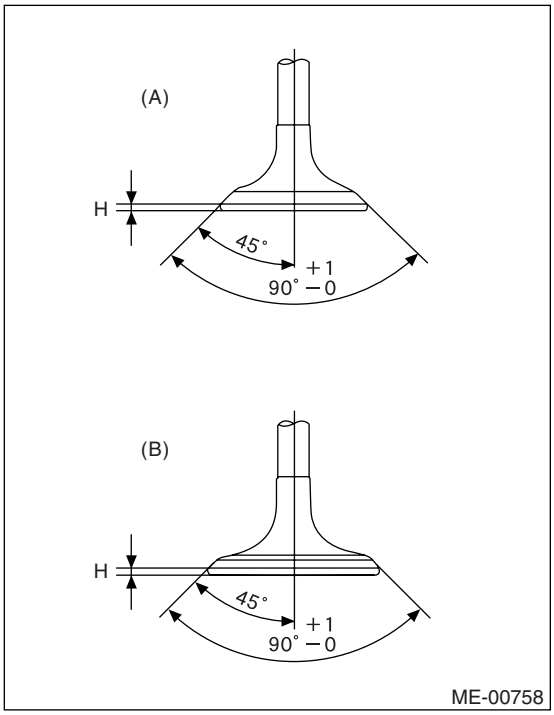
1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:

Intake (A):
Standard :
1.0 — 1.4 mm (0.039 — 0.055 in)
Limit:
0.8 mm (0.031 in)

Exhaust (B):
Standard:
1.3 — 1.7 mm (0.051 — 0.067 in)
Limit:
0.8 mm (0.031 in)

Valve overall length:
Intake (A):
104.4 mm (4.110 in)
Exhaust (B):
104.65 mm (4.120 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new valve oil seal after lapping.

NOTE:
• Replace intake valve oil seal with a new one if the valve and seat are lapped.
• Differentiate intake valve and exhaust valve by overall length.

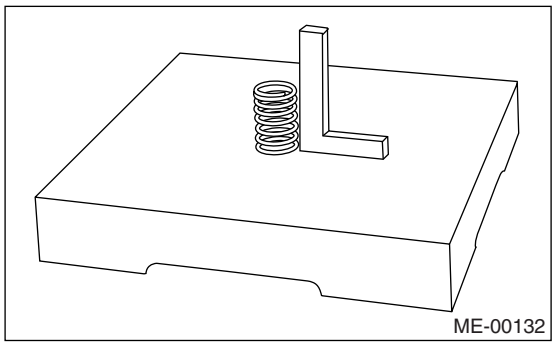
5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.
• 2.0 L model

		Valve spring
Free length		44.67 mm (1.759 in)
Tension/spring height	Set	206 — 236 N (21.0 — 24.1 kgf, 46.3 — 53.1 lbf) /36.0 mm (1.417 in)
	Lift	485 — 537 N (49.5 — 54.8 kgf, 109 — 121 lbf) /26.6 mm (1.047 in)
Squareness		2.5°, 2.0 mm (0.0787 in) or less

• 2.5 L model

		Valve spring
Free length		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lbf) /36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lbf) /26.5 mm (1.043 in)
Squareness		2.5°, 2.1 mm (0.083 in) or less



6. INTAKE AND EXHAUST VALVE OIL SEAL

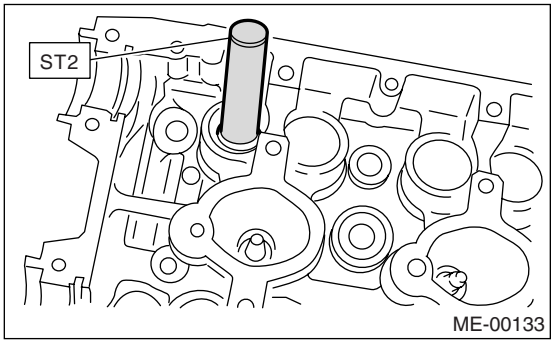
1) Replace the oil seal with a new one in the following condition, Refer to procedure 2) for replacement procedure.
- Lip portion is damaged.
- Spring is out of place.
- Valve and valve seat are reconditioned.
- Valve guide is replaced.

2) Place the cylinder head on ST1.
3) Press-fit oil seal to the specified dimension indicated in the figure by using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

CAUTION:
- **Apply engine oil to oil seal before press-fit.**
- **When press-fitting oil seal, do not use hammer or strike in.**
- **Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.**

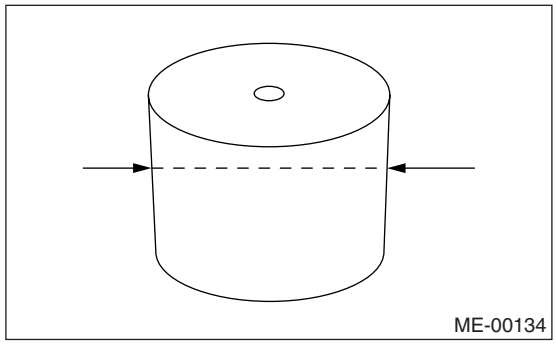
Color of rubber part:
Intake [Gray]
Exhaust [Green]



7. VALVE LIFTER

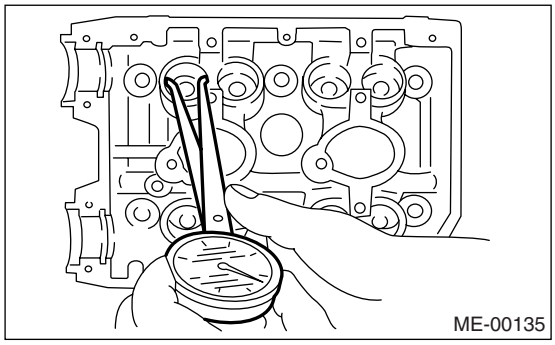
1) Visually check the valve lifter.
2) Measure the outer diameter of valve lifter.

Outer diameter:
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:
34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:
0.100 mm (0.0039 in)

F: DISPOSAL (2.5 L MODEL)

CAUTION:
- **Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.**
- **Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.**

If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

1) Wearing rubber gloves, remove the damaged valve from the cylinder head.

2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 ℓ (10 US qt, 9 Imp qt)).

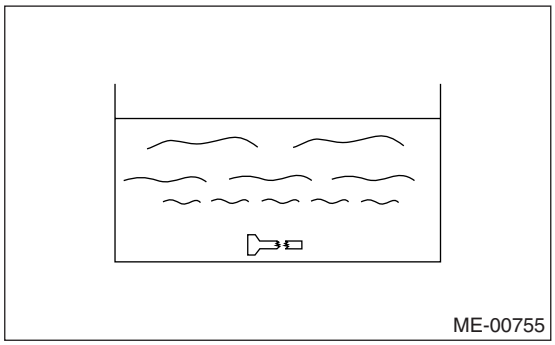
3) Immerse the damaged valve in the receptacle.

CAUTION:
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.

5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:
Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.

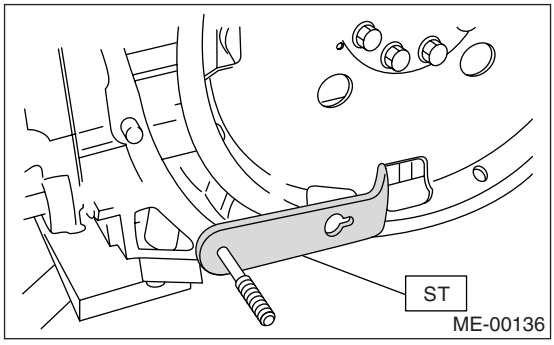


20.Cylinder Block

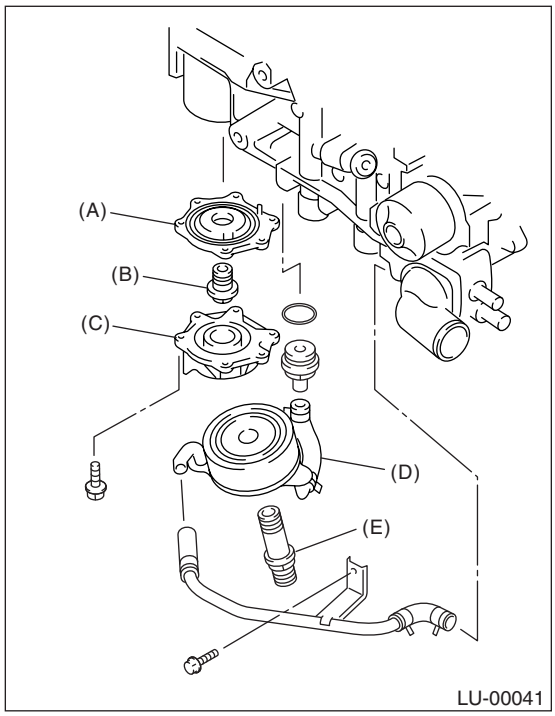
A: REMOVAL

NOTE:
Before conducting this procedure, drain the engine oil completely if applicable.

1) Remove the intake manifold. **<Ref. to FU(H4DOTC 2.0)-14,** REMOVAL, Intake Manifold.> or **<Ref. to FU(H4DOTC 2.5)-14,** REMOVAL, Intake Manifold.>
2) Remove the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** REMOVAL**, V-belt.>**
3) Remove the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** REMOVAL**, Crank Pulley.>**
4) Remove the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** REMOVAL**, Timing Belt Cover.>**
5) Remove the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-59,** REMOVAL**, Timing Belt.>**
6) Remove the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** REMOVAL**, Cam Sprocket.>**
7) Remove the crank sprocket. **<Ref. to ME(H4DOTC 2.0)-68,** REMOVAL**, Crank Sprocket.>**
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head assembly. **<Ref. to ME(H4DOTC 2.0)-76,** REMOVAL**, Cylinder Head.>**
10) Remove the clutch disc and cover. (MT model) **<Ref. to CL-16,** REMOVAL**, Clutch Disc and Cover.>**
11) Remove the flywheel. (MT model) **<Ref. to CL-18,** REMOVAL**, Flywheel.>**
12) Remove the drive plate. (AT model)
Using the ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



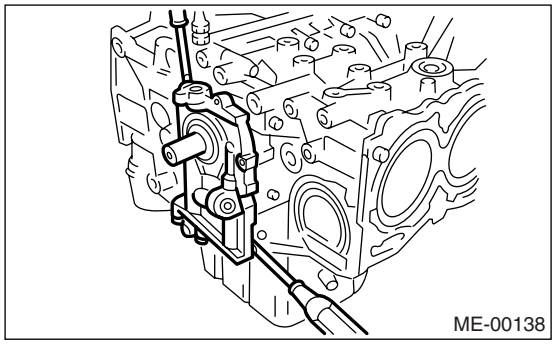
13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter using ST.
<Ref. to LU(H4SO)-25, REMOVAL, Engine Oil Filter.>
16) Remove the oil cooler.



(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

17) Remove the water pump.
18) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

NOTE:
Be careful not to scratch the mating surface of cylinder block and oil pump.



19) Removal of oil pan:
(1) Turn the cylinder block with #2 and #4 piston sides facing upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

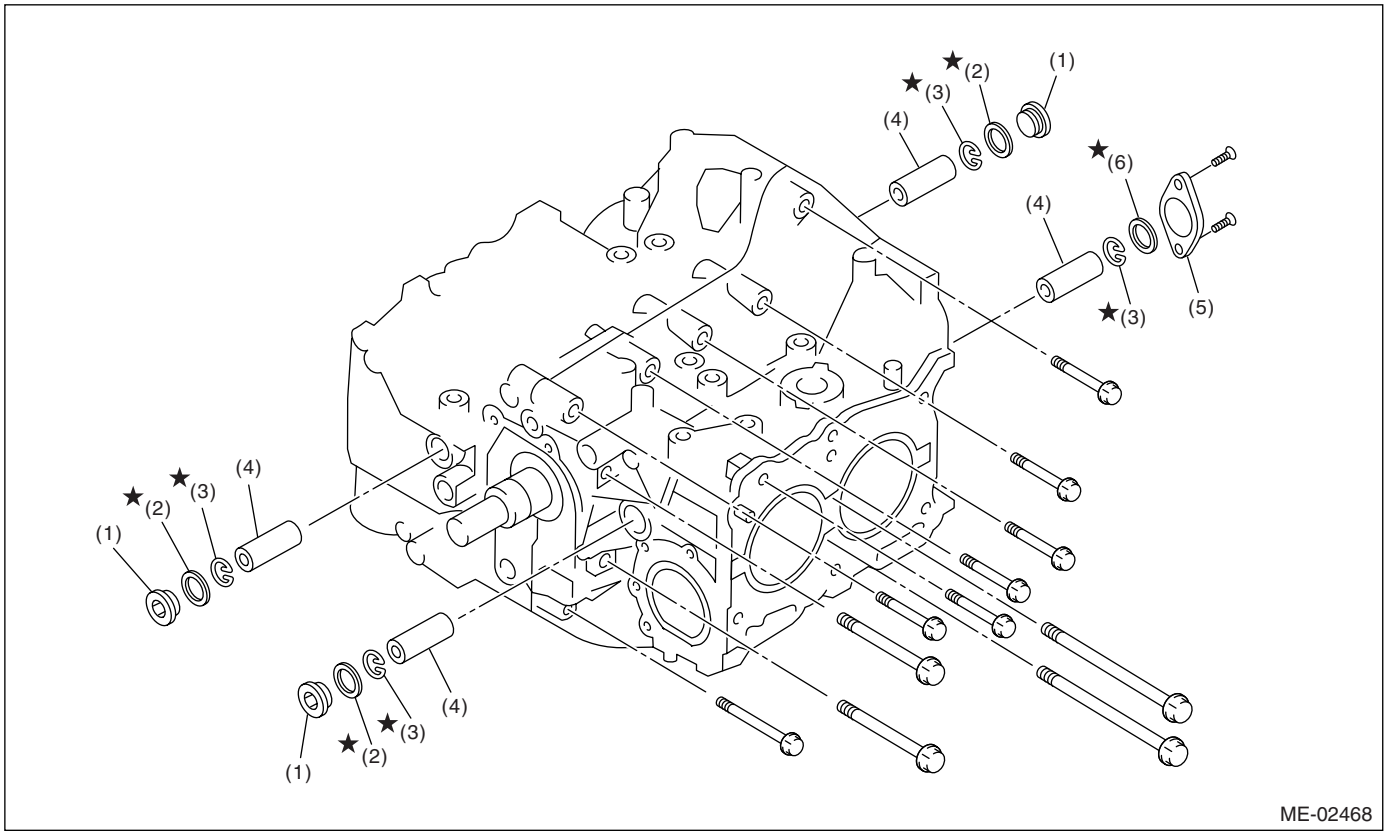
Do not use a screwdriver or similar tool in place of oil pan cutter.

20) Remove the oil strainer stay.

21) Remove the oil strainer.

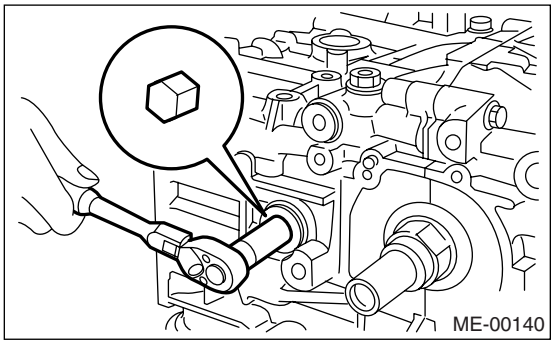
22) Remove the baffle plate.

23) Remove the water pipes.

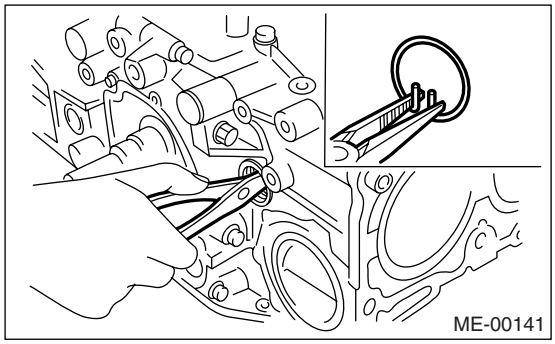


(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

24) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm].



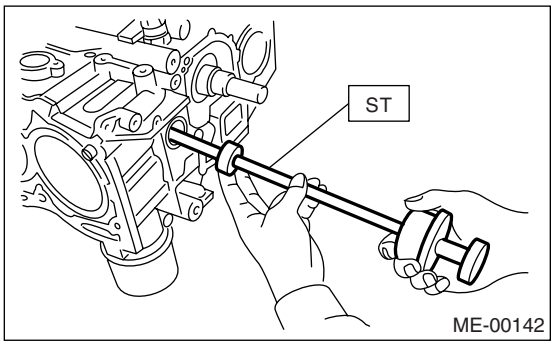
25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.



26) Draw out the piston pin from #1 and #2 pistons using ST.

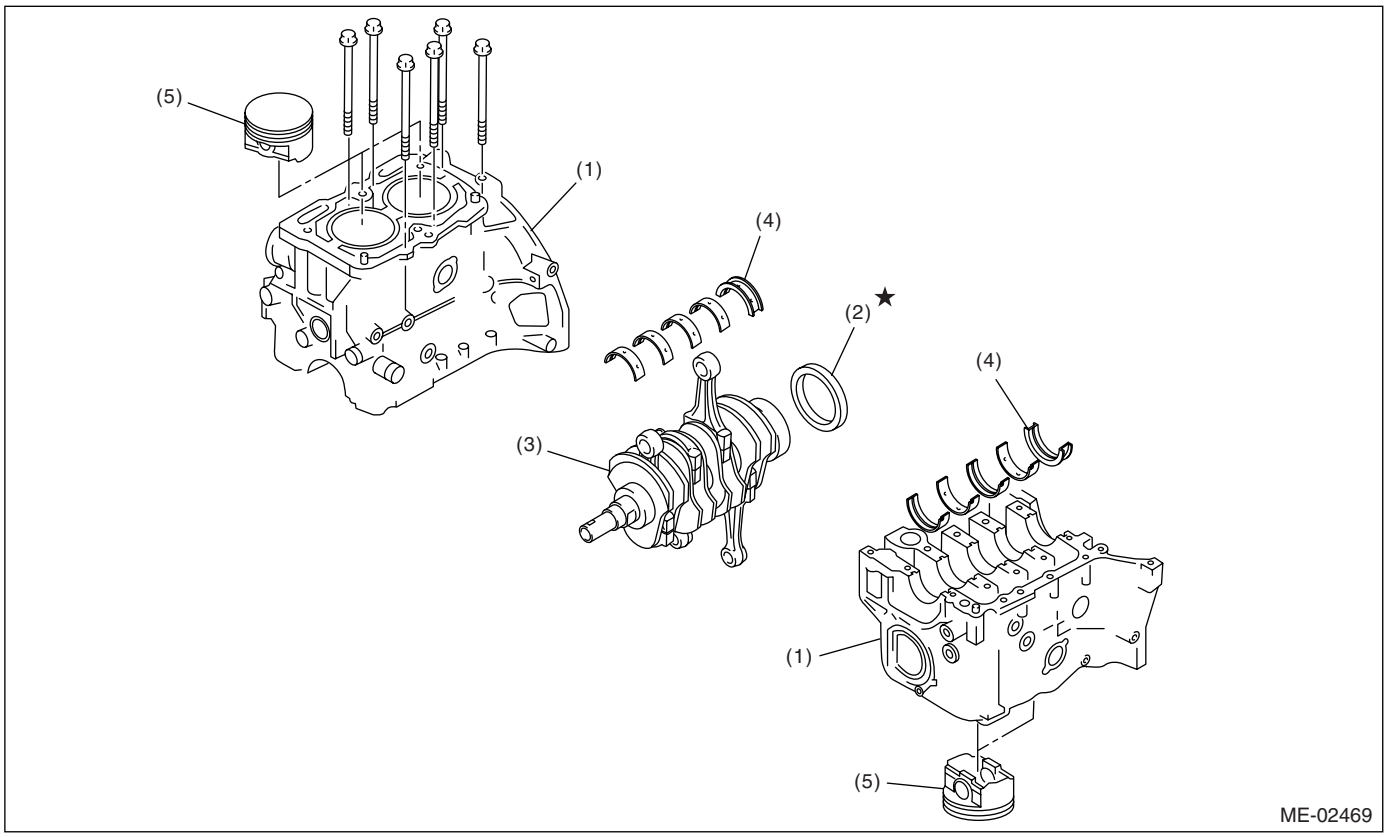
ST 499097600 PISTON PIN REMOVER (2.0 L model)
ST 499097700 PISTON PIN REMOVER (2.5 L model)

NOTE:
Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.
28) Remove the bolts which connect the cylinder block on the side of #2 and #4 cylinders.
29) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.
30) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.
31) Separate the cylinder blocks (LH) and (RH).

NOTE:
When separating the cylinder block, do not allow the connecting rod to fall and damage the cylinder block.



(1) Cylinder block
(2) Rear oil seal
(3) Crankshaft
(4) Crankshaft bearing
(5) Piston

32) Remove the rear oil seal.
33) Remove the crankshaft together with connecting rod.
34) Remove the crankshaft bearings from cylinder block using a hammer handle.

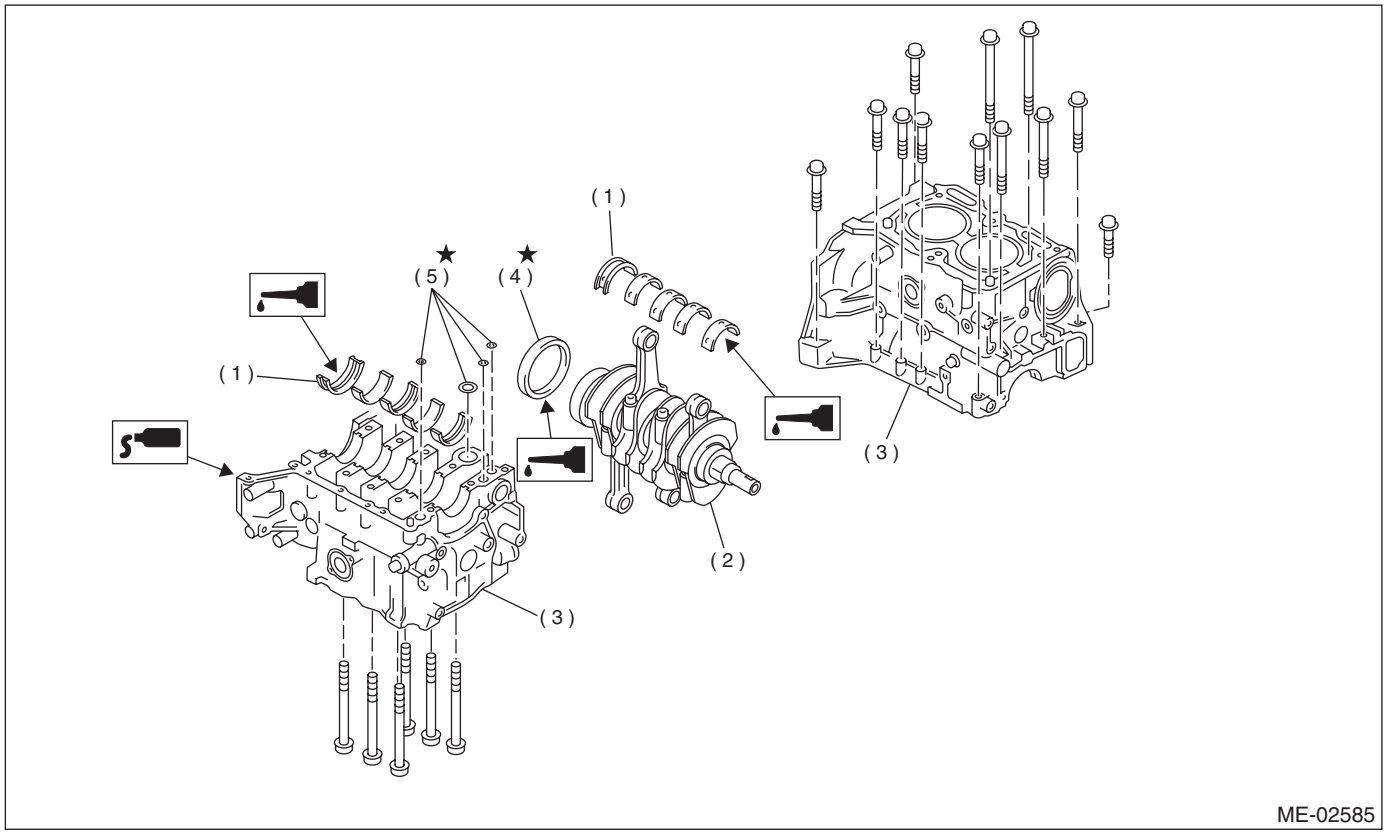
NOTE:
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

35) Draw out each piston from cylinder block using a wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

B: INSTALLATION

1. 2.0 L MODEL

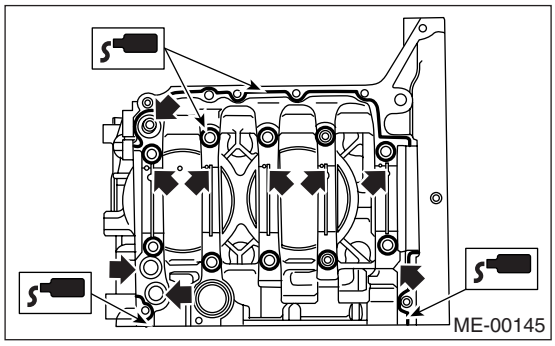


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal
(5) O-ring

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.
2) Position the crankshaft on #2 and #4 cylinder block.
3) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

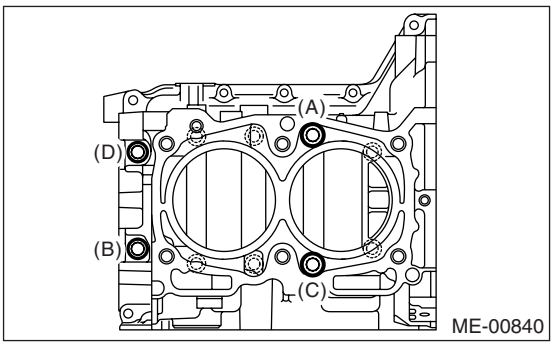
NOTE:
Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



4) Apply a coat of engine oil to washers and bolt threads.

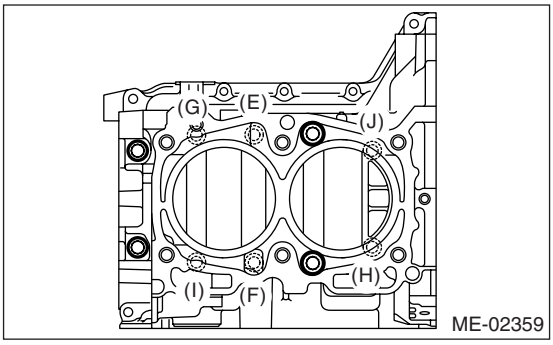
5) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



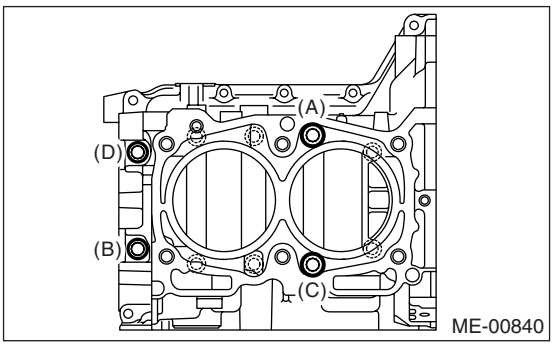
6) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



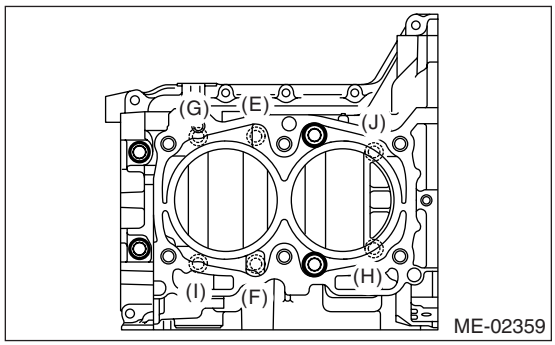
7) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



8) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



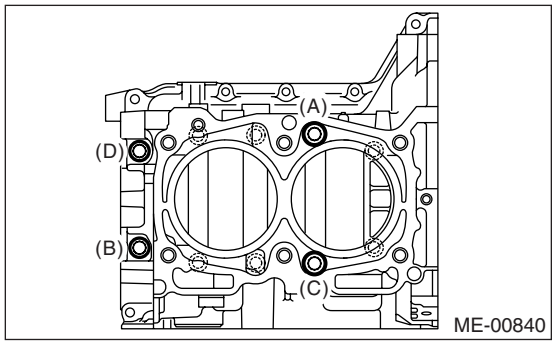
9) Further tighten the LH side bolts (A — D) in alphabetical sequence.

- (A), (C): Tighten with specified angle

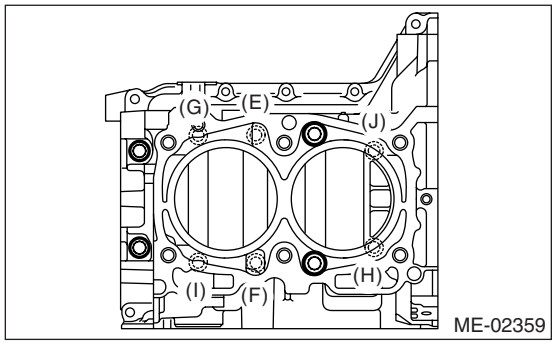
Tightening angle:
90°

- (B), (D): Tighten with specified torque

Tightening torque:
40 N·m (4.1 kgf-m, 30 ft-lb)

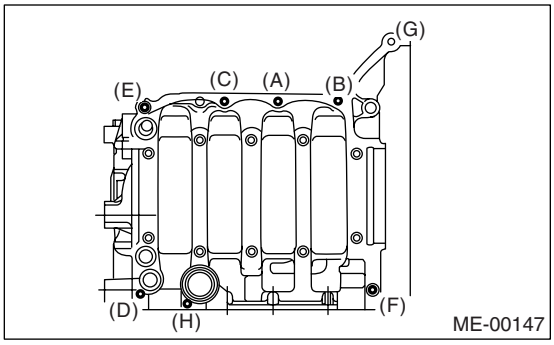


10) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.



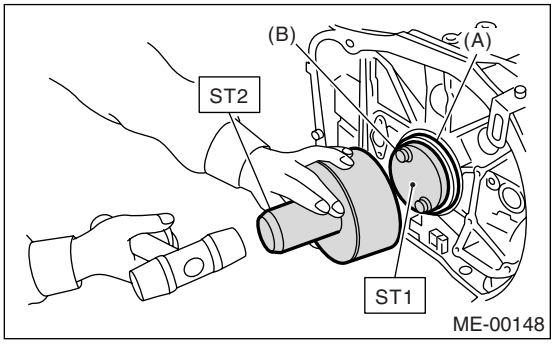
11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



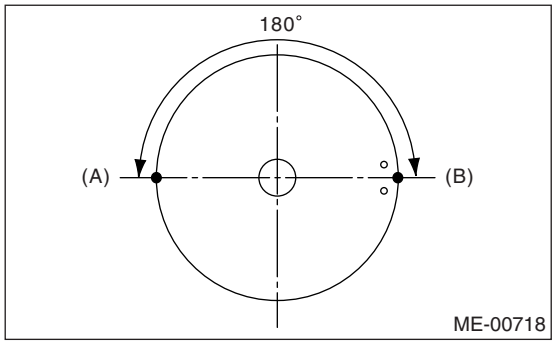
12) Install the rear oil seal using ST1 and ST2.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

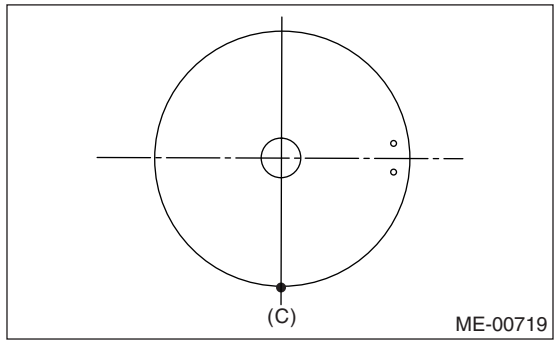


(A) Rear oil seal
(B) Flywheel attaching bolt

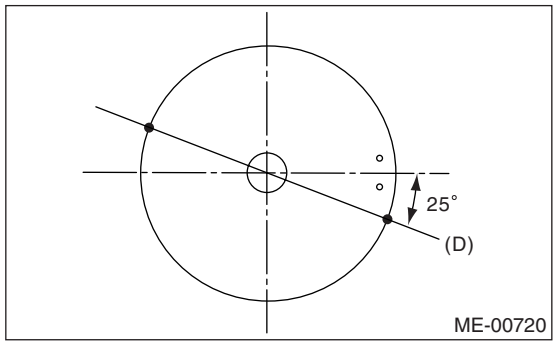
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



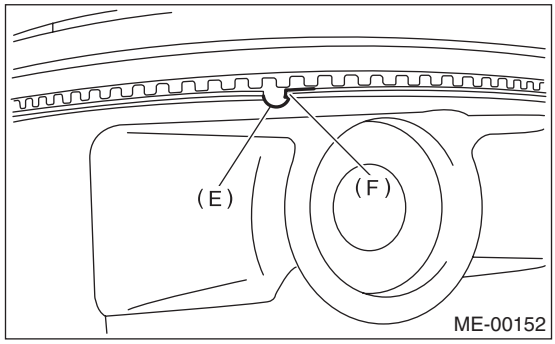
15) Position the expander gap at (C) in the figure.



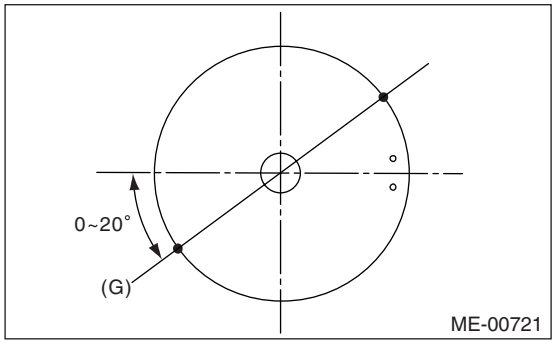
16) Position the lower rail gap at (D) in the figure.



17) Align lower rail spin stopper (F) with piston side surface hole (E).



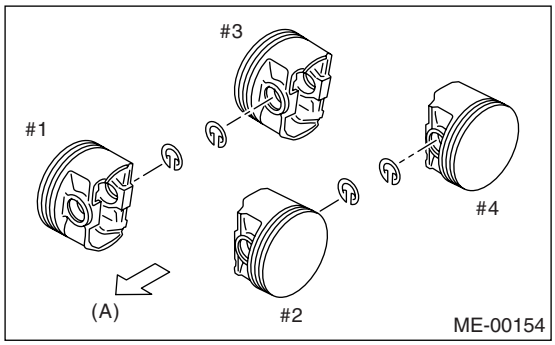
18) Position the upper rail gap at (G) in the figure.



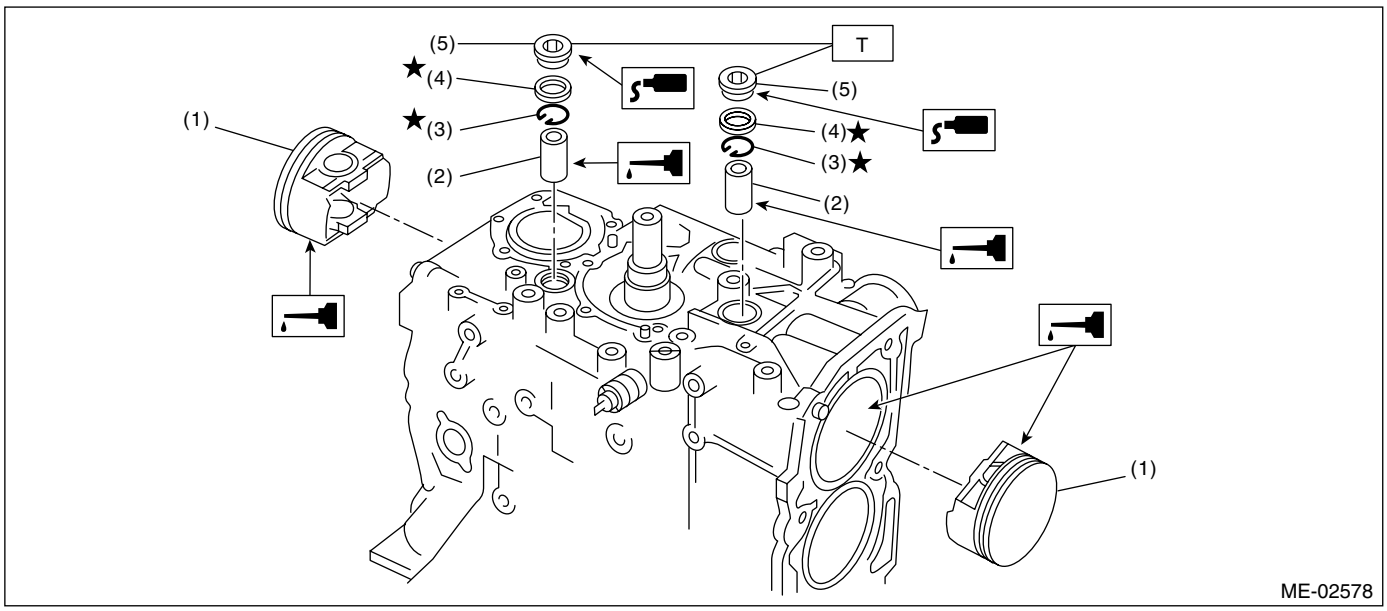
NOTE:
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

19) Install the circlip.
Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.



(A) Front side



(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

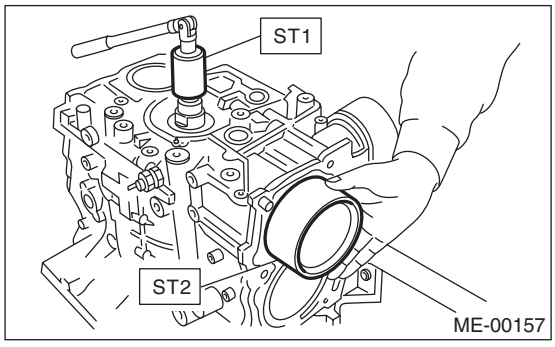
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 52)

20) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

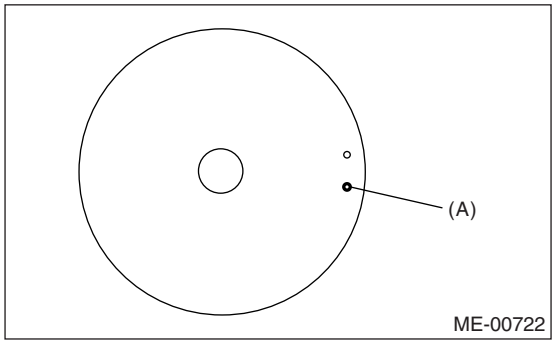
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 398744300 PISTON GUIDE



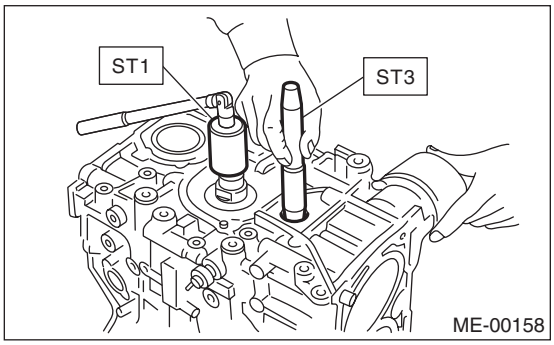
NOTE:
Piston front mark faces towards the front of the engine.



(A) Front mark

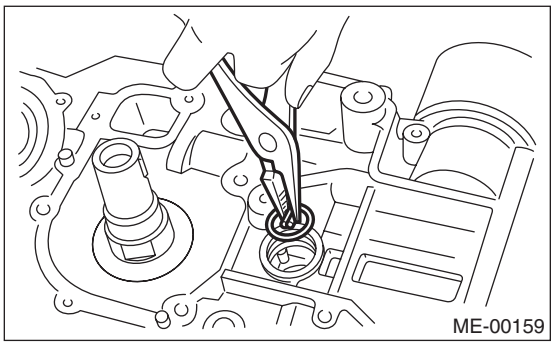
21) Installing piston pin:
(1) Apply a coat of engine oil to ST3.
(2) Insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



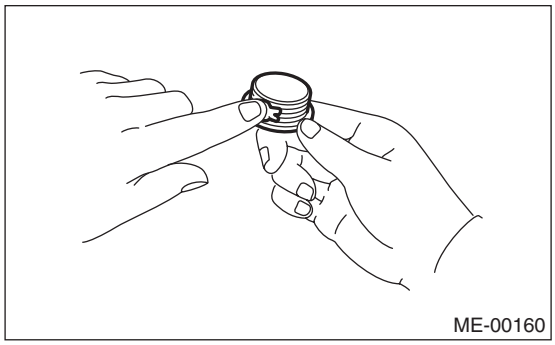
(3) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
(4) Using the needle nose plier, install the circlip.

NOTE:
Use new circlips.



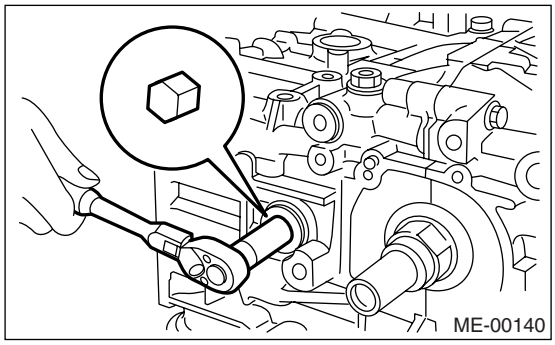
(5) Apply liquid gasket around the service hole plug.

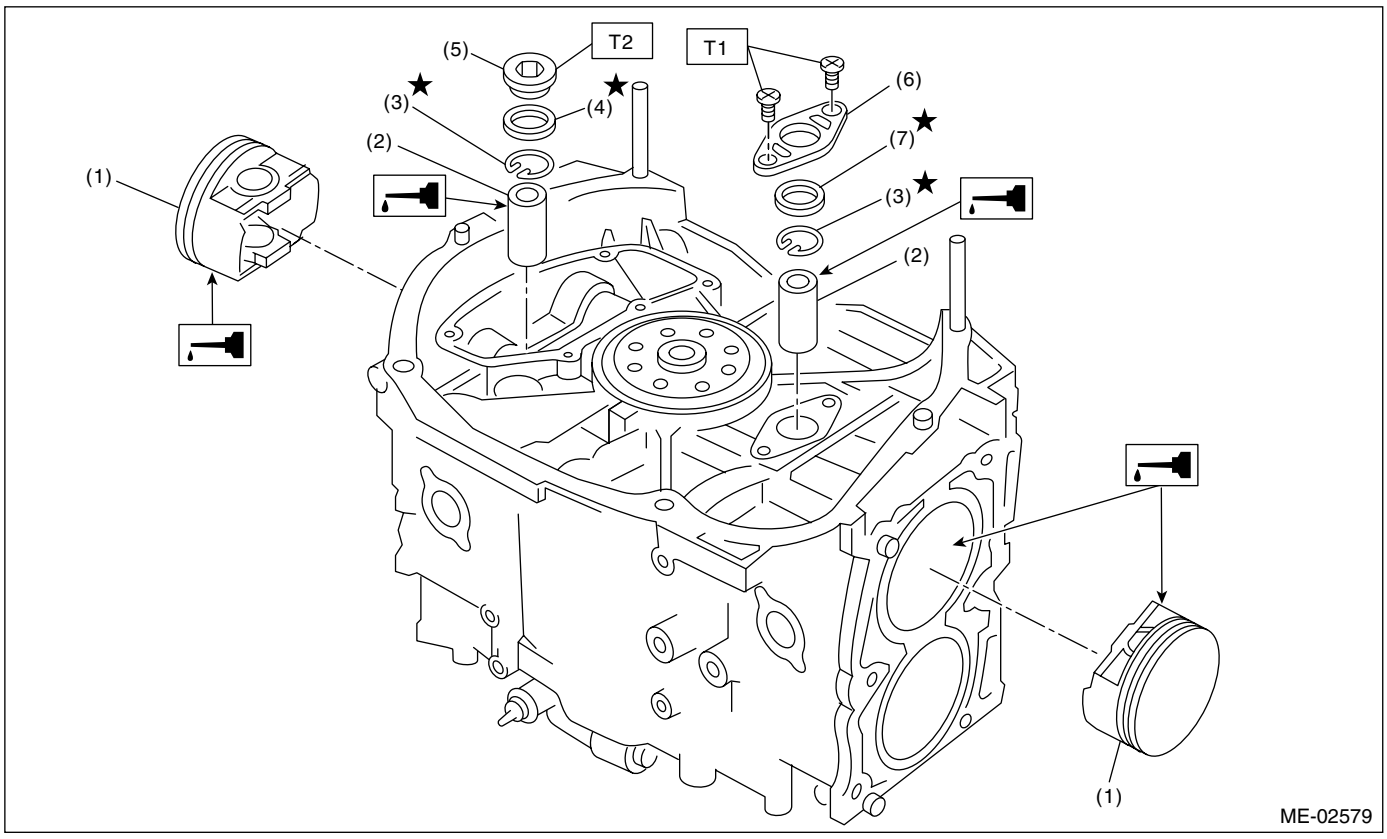
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(6) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 52)

(7) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.

23) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

24) Install the oil strainer and O-ring.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

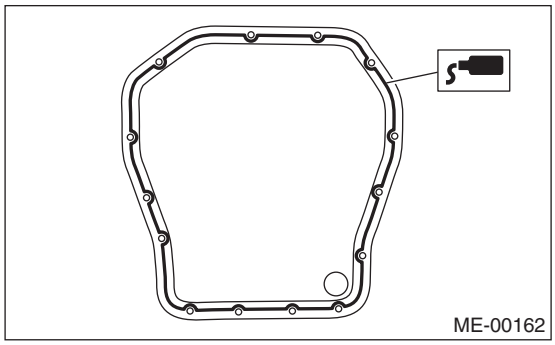
25) Install the oil strainer stay.

26) Apply liquid gasket to the matching surfaces, and then install the oil pan.

NOTE:
Install it within twenty minutes after applying liquid gasket.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

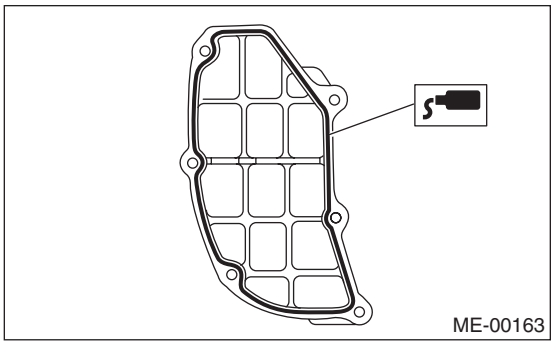


27) Apply liquid gasket to the matching surfaces, and then install the oil separator cover.

NOTE:
Install it within twenty minutes after applying liquid gasket.

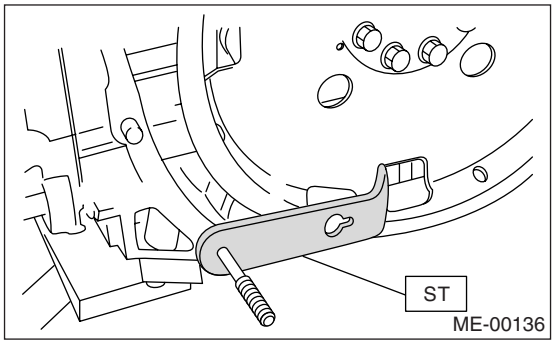
Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

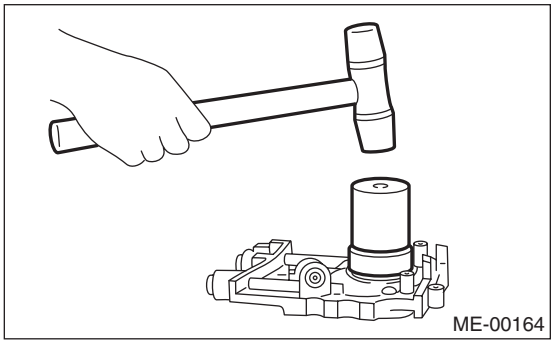


28) Install the drive plate. (AT model)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 53.1 ft-lb)

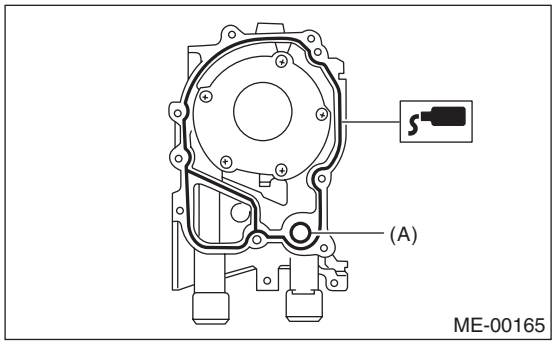


29) Install the flywheel. (MT model) **<Ref. to CL-18,** INSTALLATION**, Flywheel.>**
30) Install the clutch disc and cover. (MT model) **<Ref. to CL-16,** INSTALLATION**, Clutch Disc and Cover.>**
31) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using the ST.
ST 499587100 OIL SEAL INSTALLER



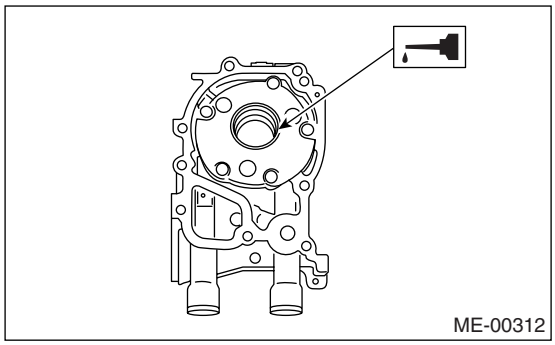
(2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



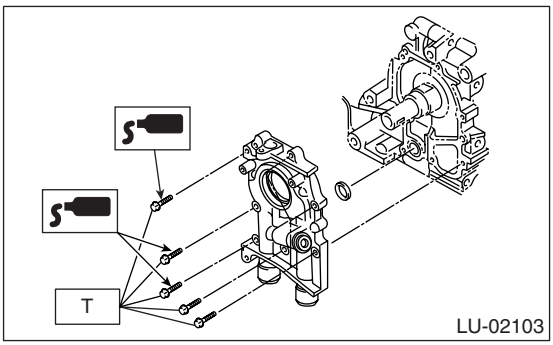
(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.
(5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
• Make sure the oil seal lip is not folded.
• Do not forget to install the O-ring and seal when installing the oil pump.

(6) Install the oil pump.
(7) Apply liquid gasket to the threaded portion of three bolts.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

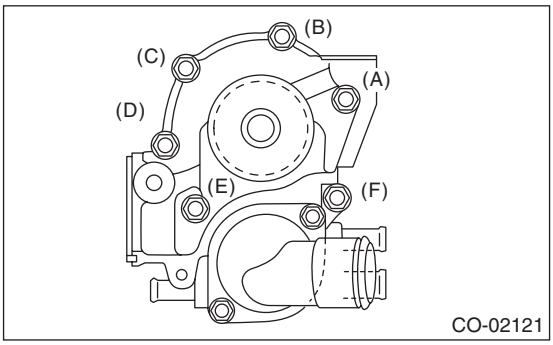
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



32) Install the water pump and gasket.

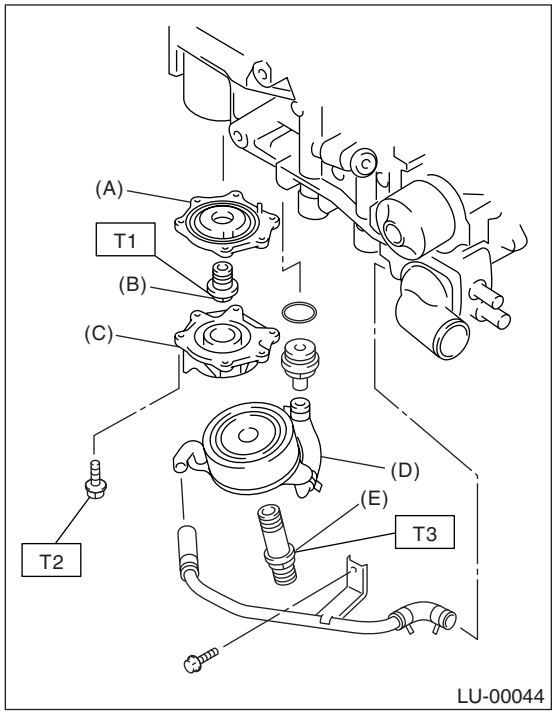
Tightening torque:
First:
12 N·m (1.2 kgf-m, 9 ft-lb)
Second:
12 N·m (1.2 kgf-m, 9 ft-lb)

NOTE:
• Be sure to use a new gasket.
• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



33) Install the water by-pass pipe for heater.
34) Install the oil cooler.

Tightening torque:
T1: 45 N·m (4.6 kgf-m, 33 ft-lb)
T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T3: 54 N·m (5.5 kgf-m, 40 ft-lb)



(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

35) Install the oil filter using ST. **<Ref. to LU(H4SO)-25,** INSTALLATION**, Engine Oil Filter.>**
36) Install the water by-pass pipe between oil cooler and water pump.
37) Install the water pipe.

NOTE:
Always use a new O-ring.

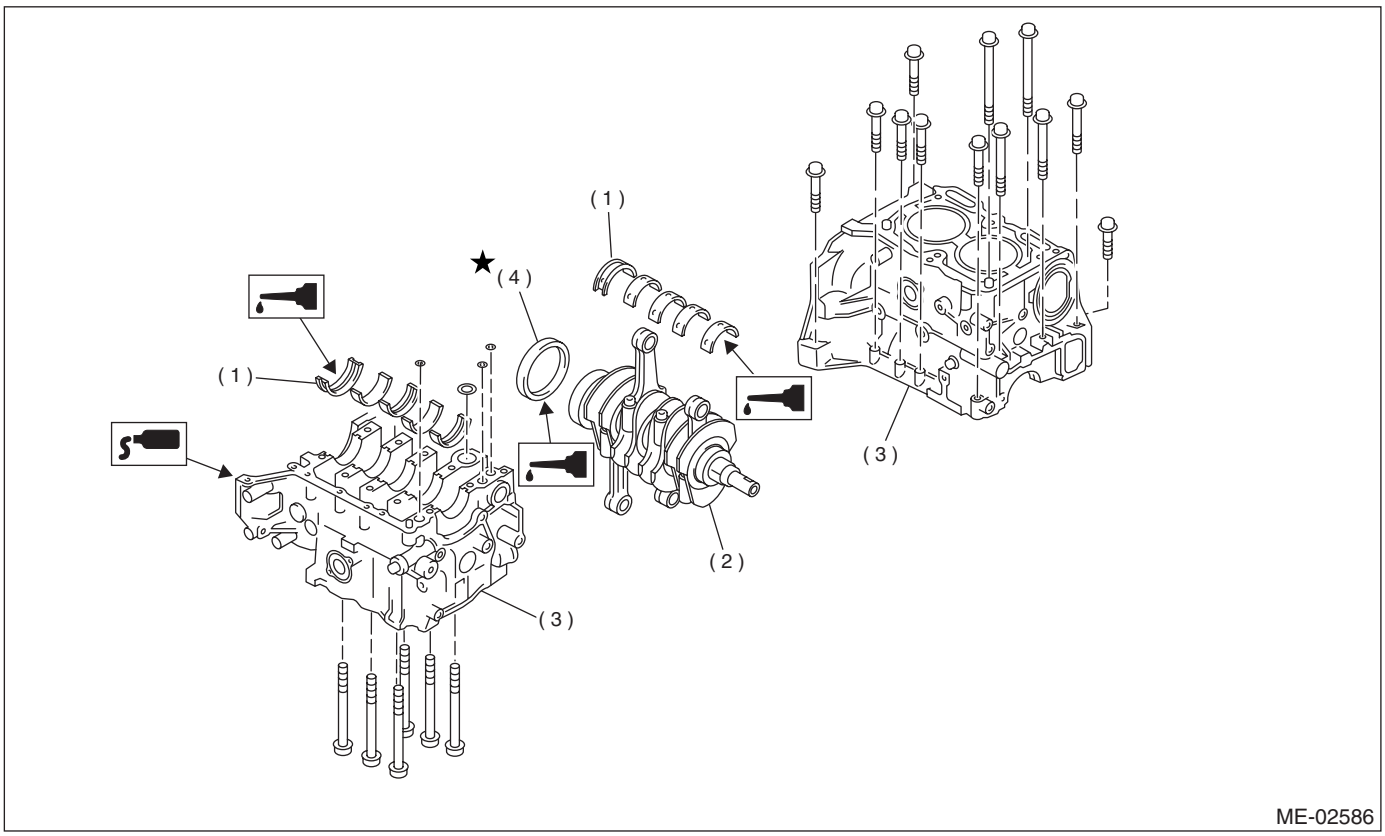
38) Install the cylinder head assembly. **<Ref. to ME(H4DOTC 2.0)-76,** INSTALLATION**, Cylinder Head.>**
39) Install the oil level gauge guide and tighten the attaching bolt (LH side).
40) Install the rocker cover and rocker cover gasket.

NOTE:
Use a new rocker cover gasket.

41) Install the crank sprocket. **<Ref. to ME(H4DOTC 2.0)-68,** INSTALLATION**, Crank Sprocket.>**
42) Install the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** INSTALLATION**, Cam Sprocket.>**

43) Install the timing belt assembly. **<Ref. to ME(H4DOTC 2.0)-60,** INSTALLATION, Timing Belt.>
44) Install the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** INSTALLATION**, Timing Belt Cover.>**
45) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
46) Install the generator and A/C compressor brackets on cylinder head.
47) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**
48) Install the intake manifold. **<Ref. to FU(H4DOTC 2.0)-17,** INSTALLATION**, Intake Manifold.>**

2. 2.5 L MODEL

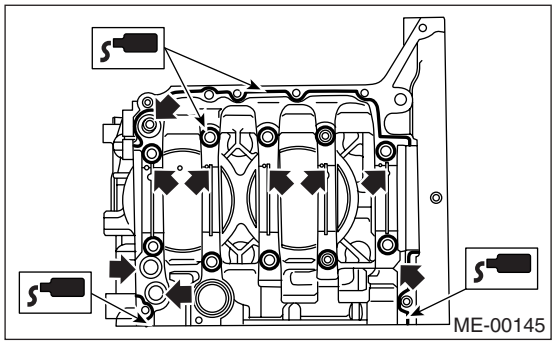


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

1) Remove oil in the mating surface of bearing and cylinder block before installation. Apply a coat of engine oil to crankshaft pins.
2) Install crankshaft bearings on the cylinder block, apply a coat of engine oil to crankshaft bearings, and position the crankshaft on #2 and #4 cylinder block.
3) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

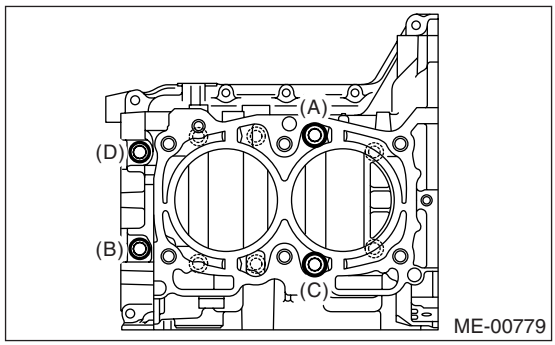
NOTE:
Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



4) Apply engine oil to washers and thread of bolts.

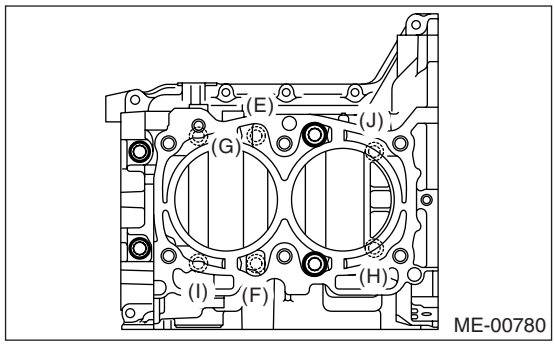
5) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



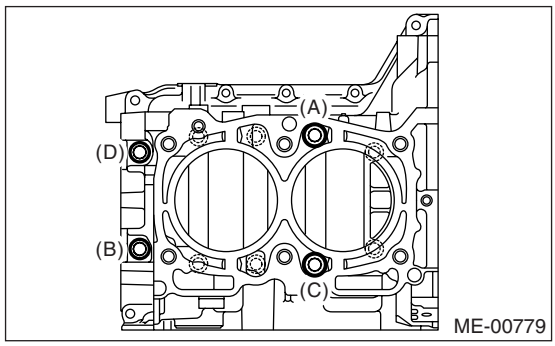
6) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)



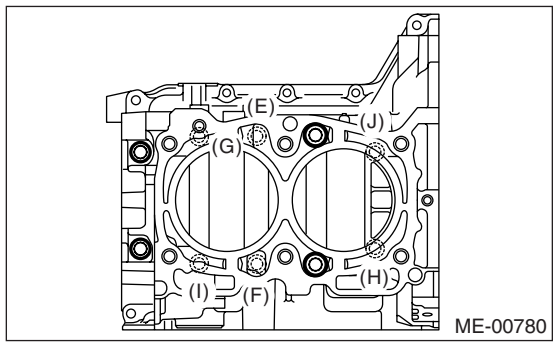
7) Tighten the 10 mm cylinder block connecting bolts on LH side (A — D) in alphabetical sequence.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



8) Tighten the 10 mm cylinder block connecting bolts on RH side (E — J) in alphabetical sequence.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



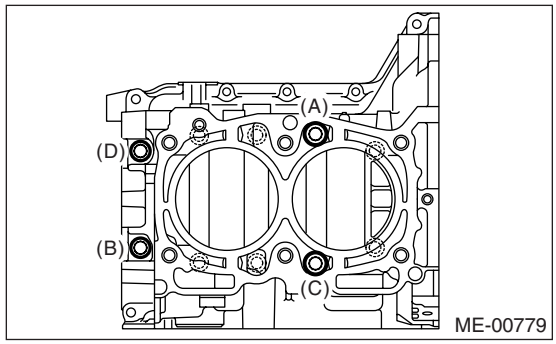
9) Further tighten the LH side bolts (A — D) in alphabetical sequence.

- (A), (C): Tighten with specified angle

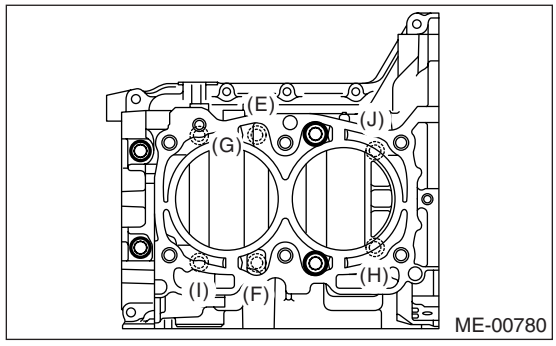
Tightening angle:
90°

- (B), (D): Tighten with specified torque

Tightening torque:
40 N·m (4.1 kgf-m, 30 ft-lb)

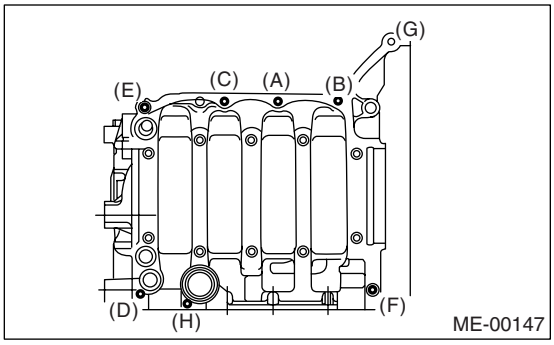


10) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.



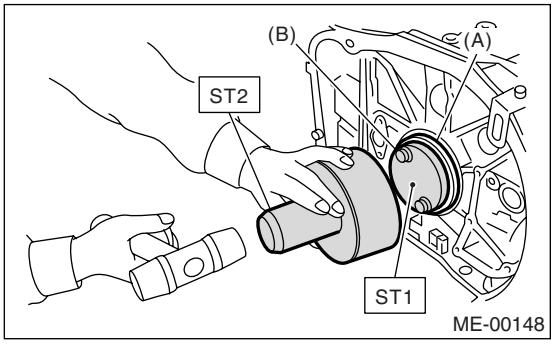
11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



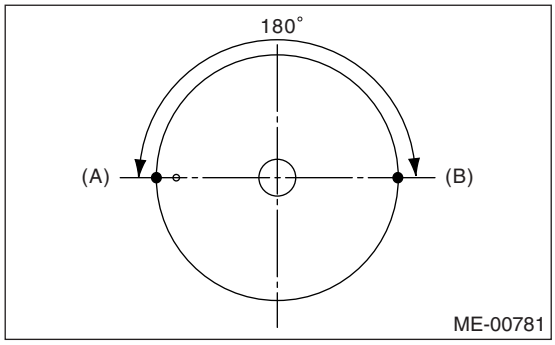
12) Install the rear oil seal using ST1 and ST2.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

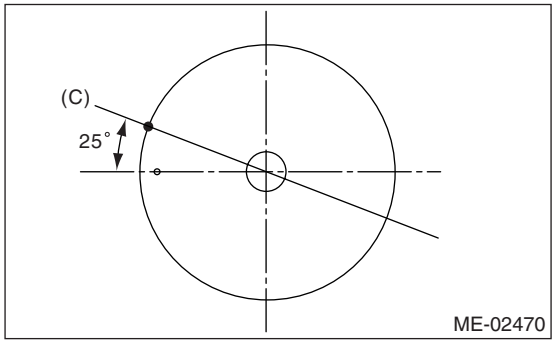


(A) Rear oil seal
(B) Flywheel attaching bolt

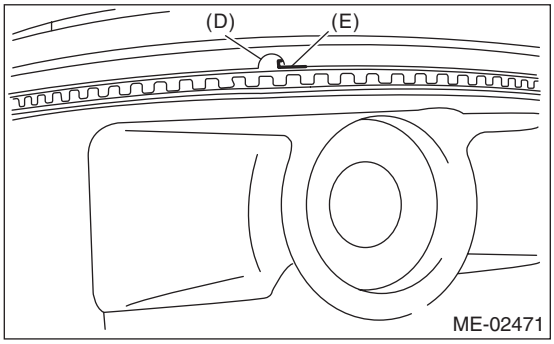
13) Position the top ring gap at (A) or (B) in the figure.
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



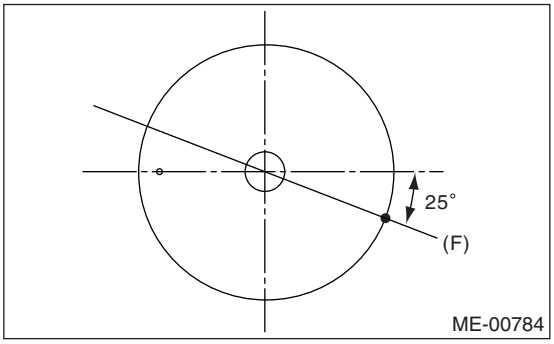
15) Position the upper rail gap at (C) in the figure.



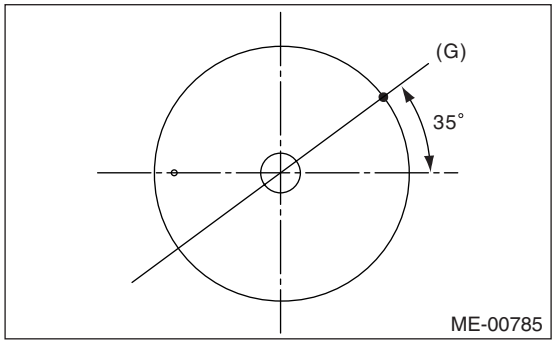
16) Align upper rail spin stopper (E) with piston side surface hole (D).



17) Position the expander gap at (F) in the figure.



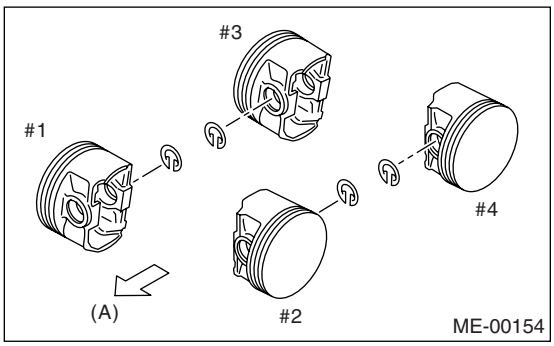
18) Position the lower rail gap at (G) in the figure.



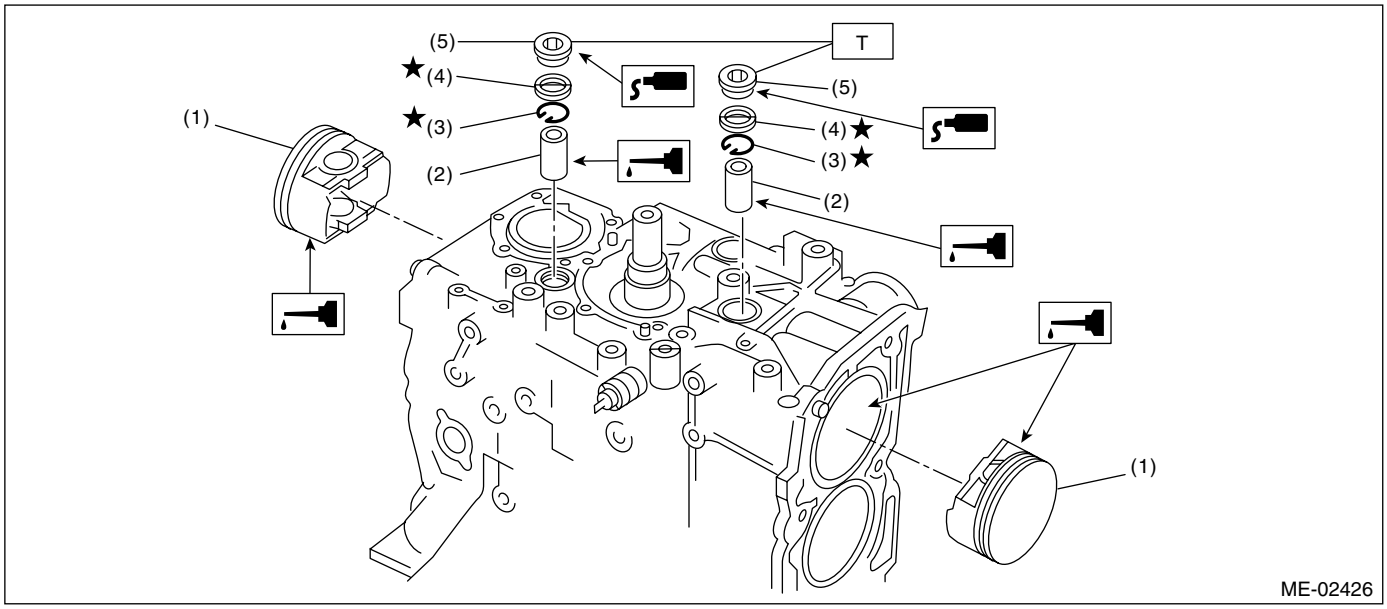
NOTE:
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

19) Install the circlip.
Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new circlips.



(A) Front side



(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug

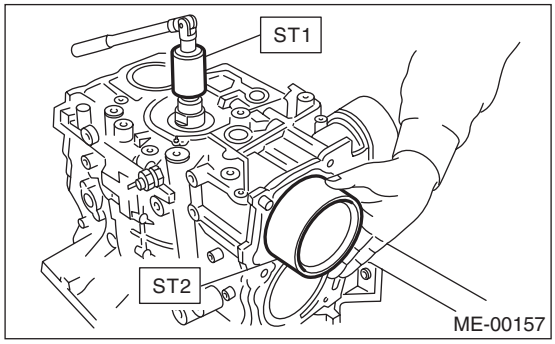
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 52)

20) Installing the piston:
(1) Turn the cylinder block so that #1 and #2 cylinders face upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

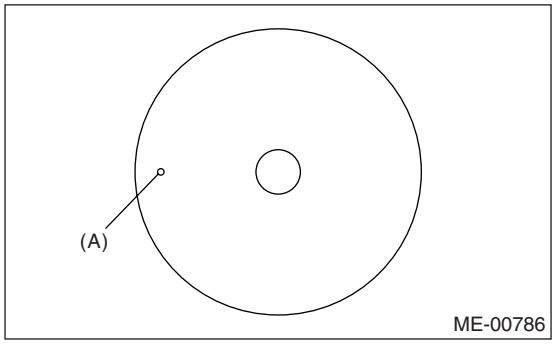
ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



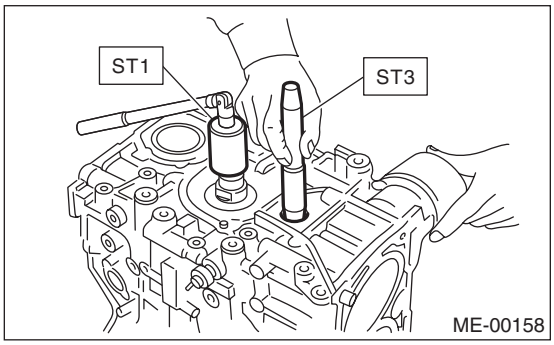
NOTE:
Piston front mark faces towards the front of the engine.



(A) Front mark

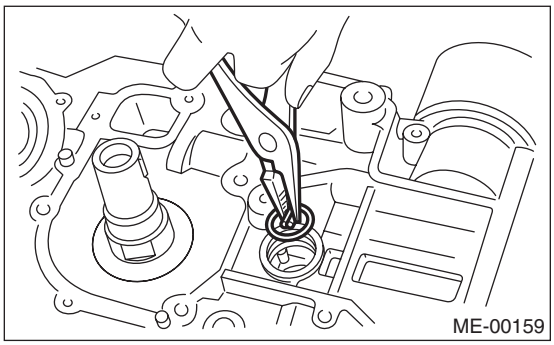
21) Installing piston pin:
(1) Apply a coat of engine oil to ST3.
(2) Insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



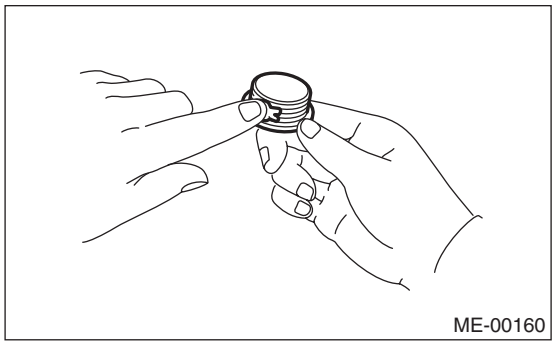
(3) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
(4) Using the needle nose plier, install the circlip.

NOTE:
Use new circlips.



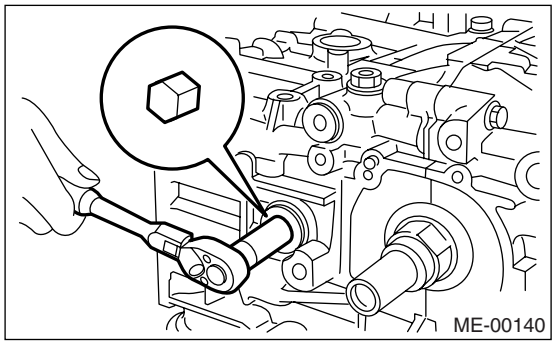
(5) Apply liquid gasket around the service hole plug.

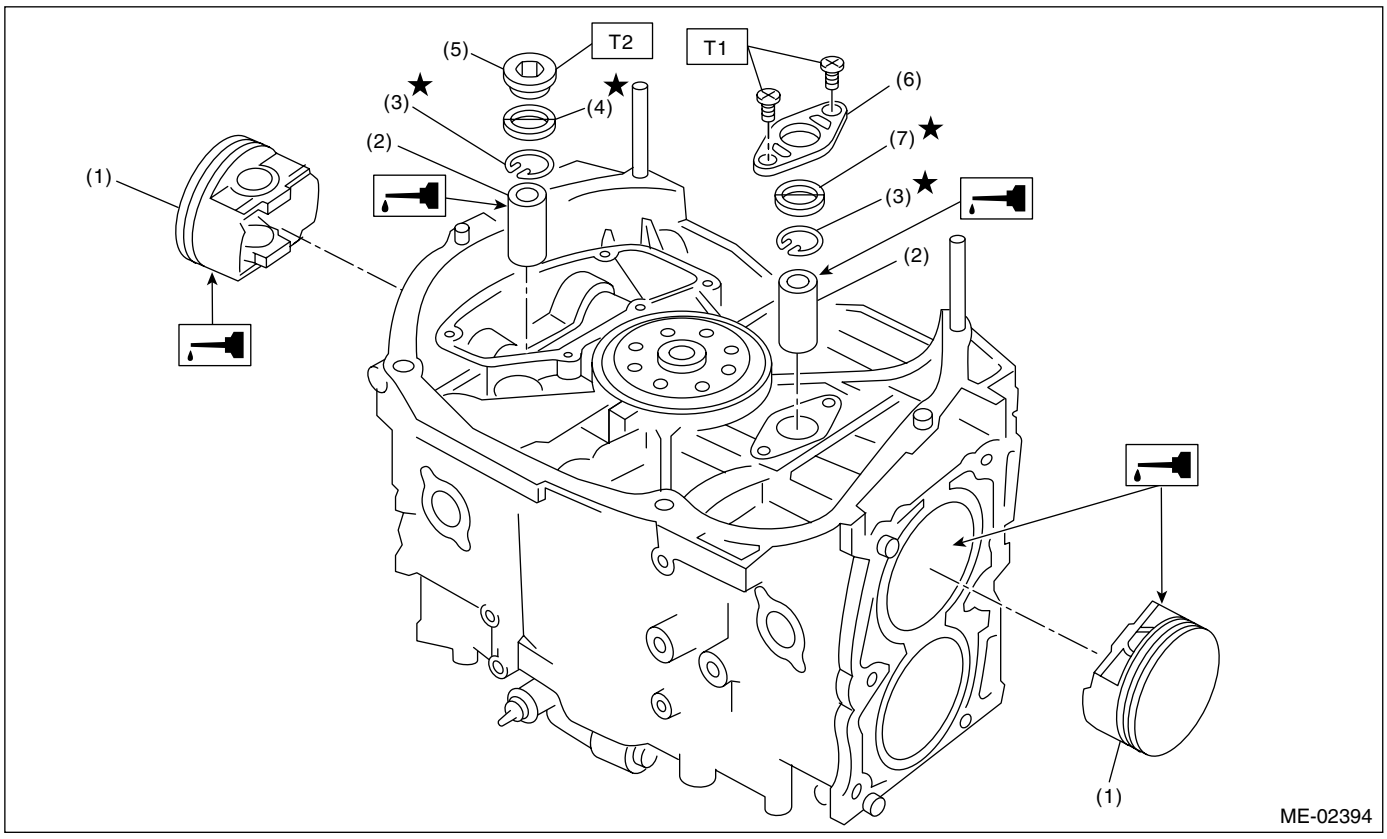
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(6) Install the service hole plug and gasket.

NOTE:
Use a new gasket.





(1) Piston
(2) Piston pin
(3) Circlip
(4) Gasket
(5) Service hole plug
(6) Service hole cover
(7) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 52)

(7) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.

23) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

24) Install the oil strainer and O-ring

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

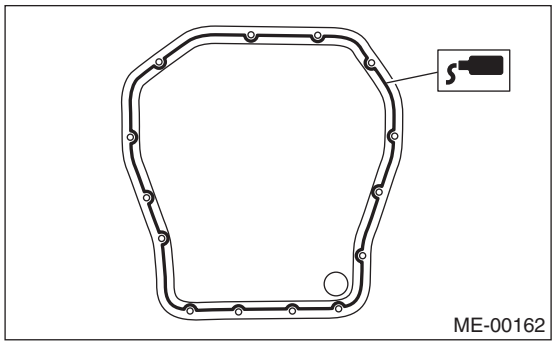
25) Install the oil strainer stay.

26) Apply liquid gasket to the matching surfaces, and then install the oil pan.

NOTE:
Install it within twenty minutes after applying liquid gasket.

Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

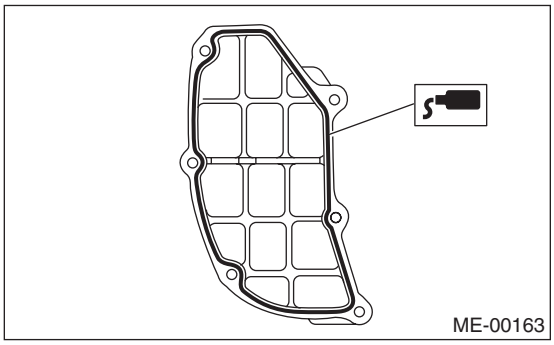


27) Apply liquid gasket to the matching surfaces, and then install the oil separator cover.

NOTE:
Install it within twenty minutes after applying liquid gasket.

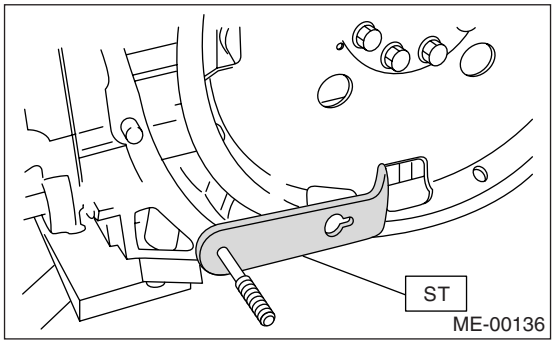
Liquid gasket:
THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



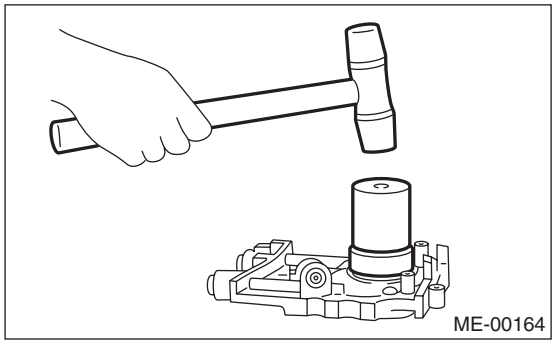
28) Install the drive plate. (AT model)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 53.1 ft-lb)



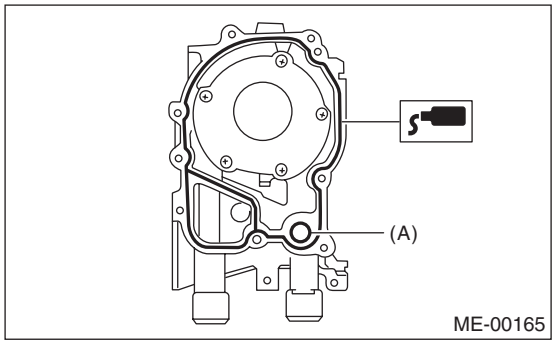
29) Install the flywheel. **<Ref. to CL-18,** INSTALLATION**, Flywheel.>**
30) Install the clutch disc and cover. **<Ref. to CL-16,** INSTALLATION**, Clutch Disc and Cover.>**
31) Installation of oil pump:

(1) Discard the front oil seal after removal. Replace with a new one using the ST.
ST 499587100 OIL SEAL INSTALLER



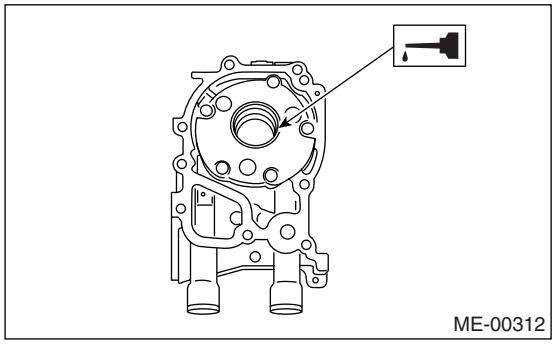
(2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



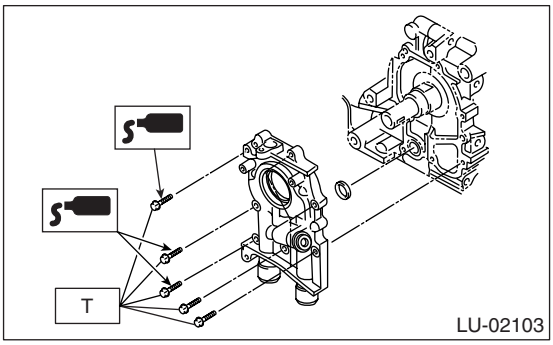
(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.
(5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
• Make sure the oil seal lip is not folded.
• Do not forget to install the O-ring and seal when installing the oil pump.

(6) Install the oil pump.
(7) Apply liquid gasket to the threaded portion of three bolts.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

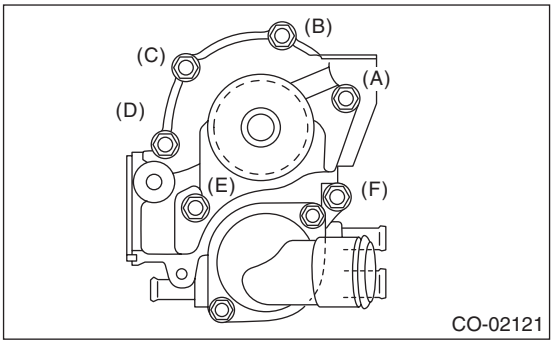
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



32) Install the water pump and gasket.

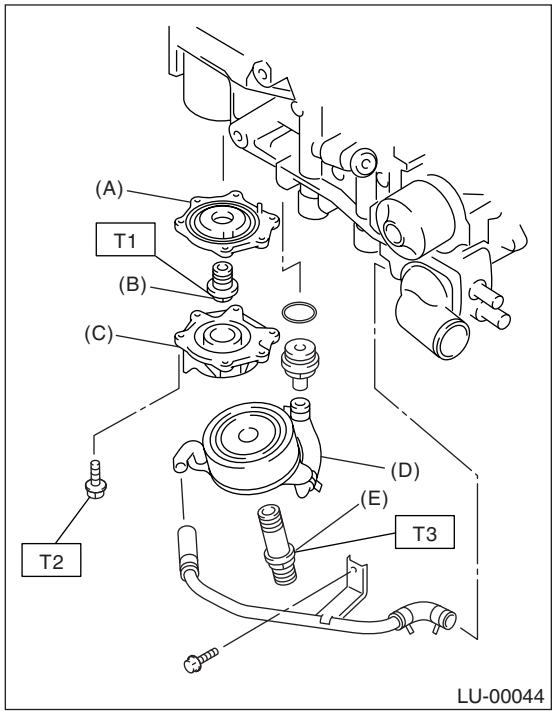
Tightening torque:
First:
12 N·m (1.2 kgf-m, 9 ft-lb)
Second:
12 N·m (1.2 kgf-m, 9 ft-lb)

NOTE:
• Be sure to use a new gasket.
• When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



33) Install the water by-pass pipe for heater.
34) Install the oil cooler.

Tightening torque:
T1: 45 N·m (4.6 kgf-m, 33 ft-lb)
T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
T3: 54 N·m (5.5 kgf-m, 40 ft-lb)



(A) Adapter (1)
(B) Adapter connector
(C) Adapter (2)
(D) Oil cooler
(E) Oil cooler connector

35) Install the oil filter using ST. **<Ref. to LU(H4SO)-25,** INSTALLATION**, Engine Oil Filter.>**
ST 498547000 OIL FILTER WRENCH
36) Install the water by-pass pipe between oil cooler and water pump.
37) Install the water pipe.

CAUTION:
Always use a new O-ring.

38) Install the cylinder head assembly. **<Ref. to ME(H4DOTC 2.0)-76,** INSTALLATION**, Cylinder Head.>**
39) Install the oil level gauge guide and tighten the attaching bolt (LH side).
40) Install the rocker cover and rocker cover gasket.

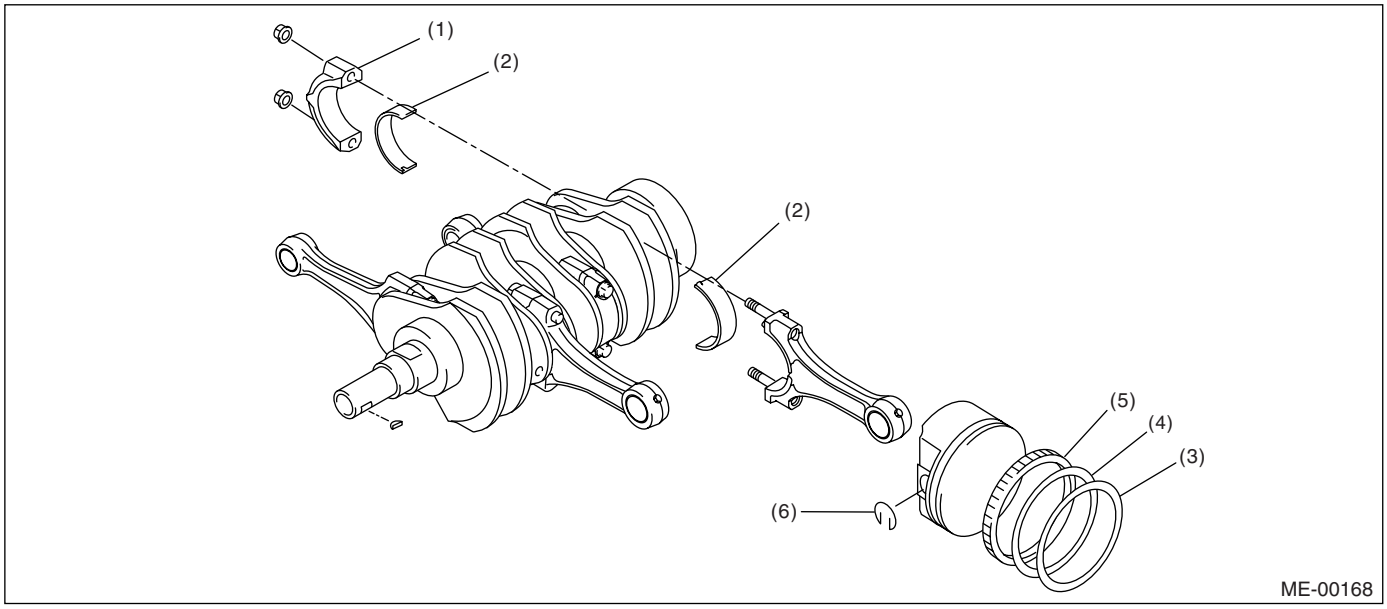
NOTE:
Use a new rocker cover gasket.

41) Install the crank sprocket. **<Ref. to ME(H4DOTC 2.0)-68,** INSTALLATION**, Crank Sprocket.>**

42) Install the cam sprocket. **<Ref. to ME(H4DOTC 2.0)-67,** INSTALLATION**, Cam Sprocket.>**
43) Install the timing belt assembly. <Ref. to ME(H4DOTC 2.0)-60, INSTALLATION, Timing Belt.>
44) Install the timing belt cover. **<Ref. to ME(H4DOTC 2.0)-58,** INSTALLATION**, Timing Belt Cover.>**
45) Install the crank pulley. **<Ref. to ME(H4DOTC 2.0)-56,** INSTALLATION**, Crank Pulley.>**
46) Install the generator and A/C compressor brackets on cylinder head.
47) Install the V-belt. **<Ref. to ME(H4DOTC 2.0)-53,** INSTALLATION**, V-belt.>**
48) Install the intake manifold. <Ref. to FU(H4DOTC 2.5)-17, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY

1. 2.0 L MODEL



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Circlip

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

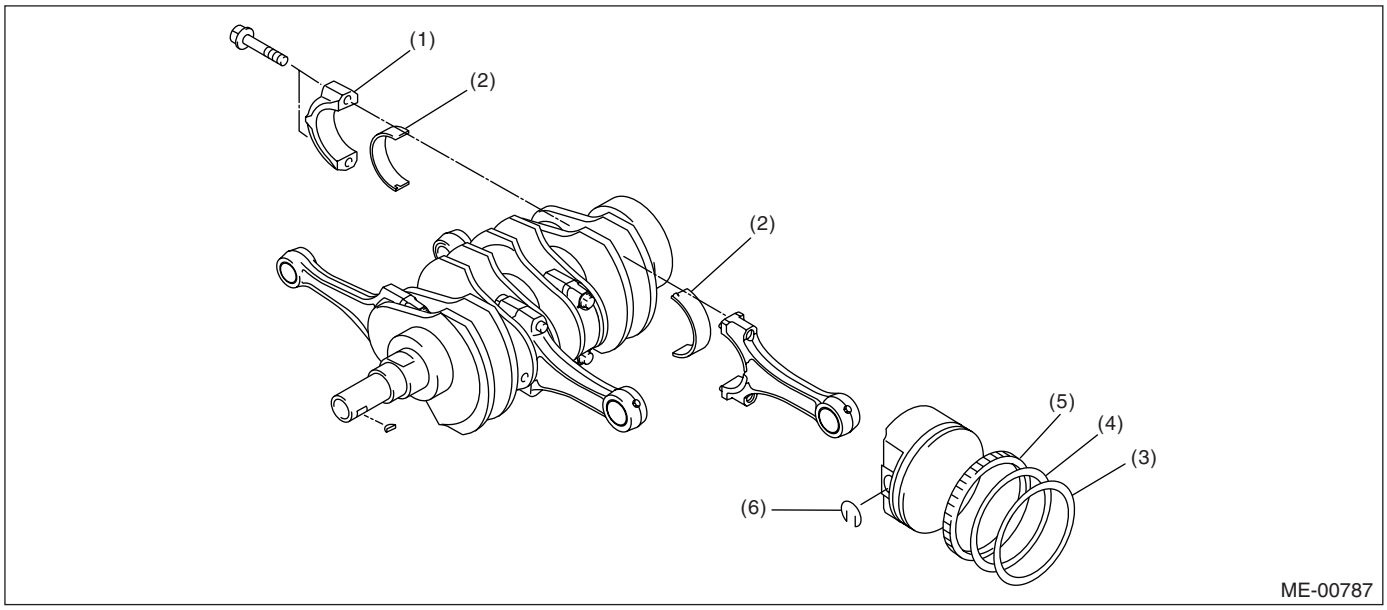
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the circlip.

2. 2.5 L MODEL



(1) Connecting rod cap
(2) Connecting rod bearing
(3) Top ring
(4) Second ring
(5) Oil ring
(6) Snap ring

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order, to prevent confusion.

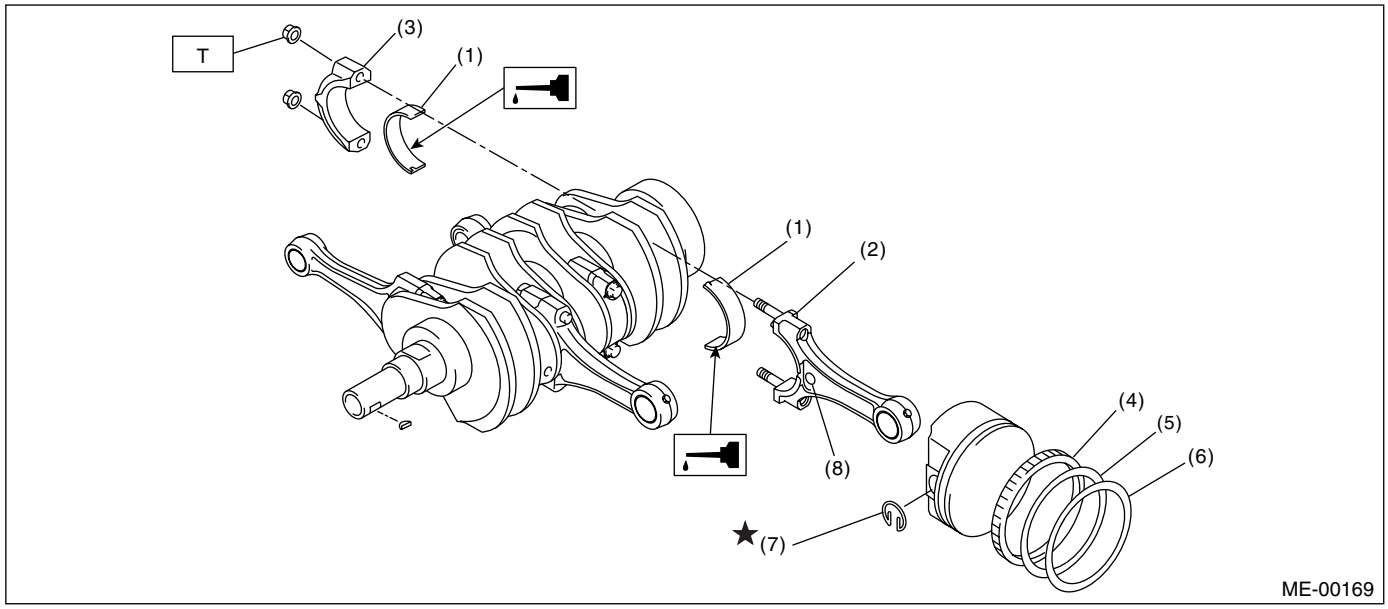
3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order, to prevent confusion.

5) Remove the snap ring.

D: ASSEMBLY

1. 2.0 L MODEL



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

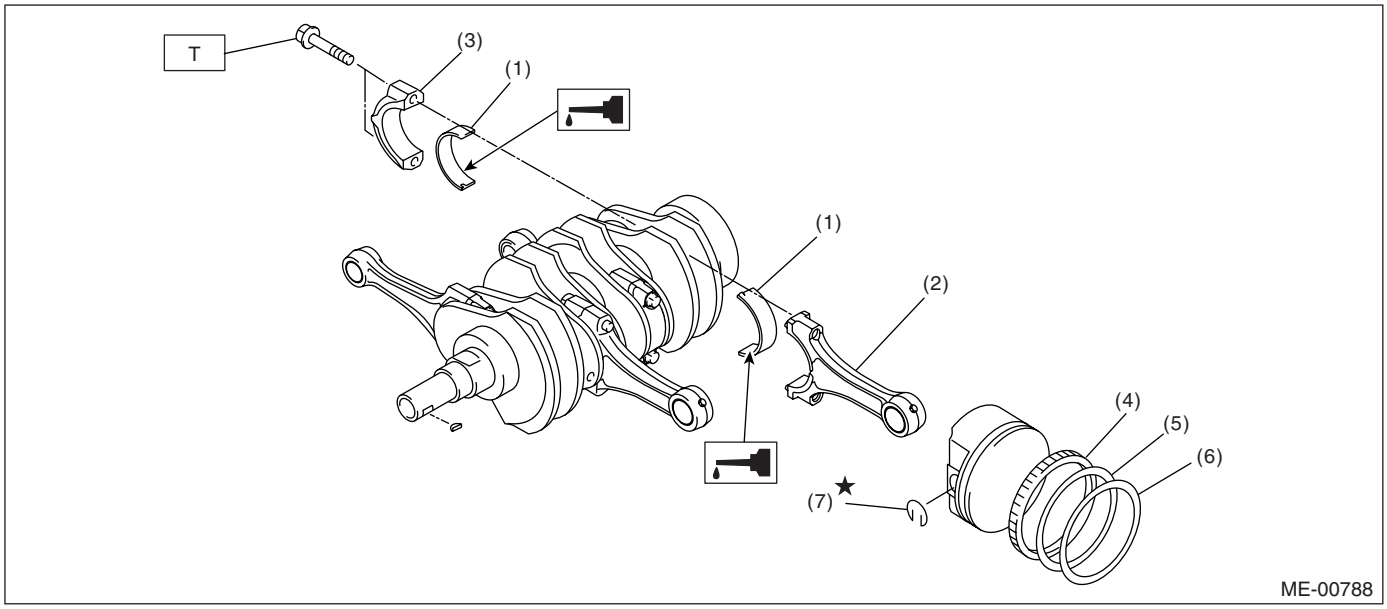
NOTE:
Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

4) Install the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

2. 2.5 L MODEL



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Snap ring
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod to crankshaft.

NOTE:
Position each connecting rod with the marked side facing forward.

3) Install the connecting rod cap with connecting rod bolt.
Ensure the arrow on connecting rod cap faces toward front during installation.

CAUTION:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod bolts, apply oil on the threads.

4) Install the expander, lower rail and upper rail in this order by hand. Install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.025 mm (0.00098 in)

Grinding limit:
0.1 mm (0.0039 in)

Standard height of cylinder block:
201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

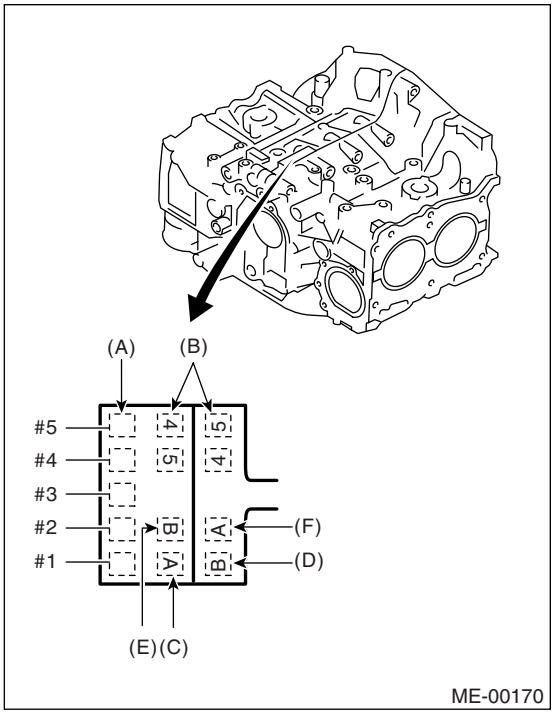
NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

2.0 L model

Standard diameter:
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)

2.5 L model

Standard diameter:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



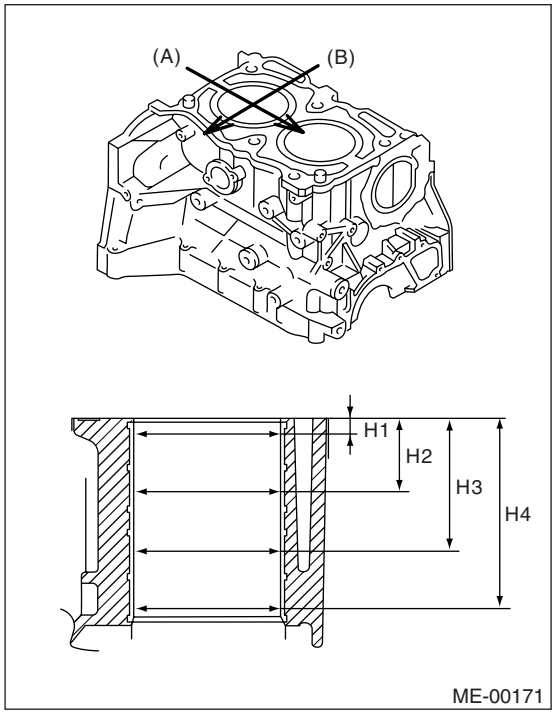
(A) Main journal size mark
(B) Cylinder block (RH)-(LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Taper:
Standard:
0.015 mm (0.0006 in)
Limit:
0.050 mm (0.0020 in)

Out-of-roundness:
Standard:
0.010 mm (0.0004 in)
Limit:
0.050 mm (0.0020 in)



(A) Piston pin direction
(B) Thrust direction
H1: 10 mm (0.39 in)
H2: 45 mm (1.77 in)
H3: 80 mm (3.15 in)
H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

2.0 L model

Piston grade point H:
40.0 mm (1.57 in)

Piston outer diameter:

Standard:
A: 91.985 — 91.995 mm (3.6214 — 3.6218 in)
B: 91.975 — 91.985 mm (3.6211 — 3.6214 in)

0.25 mm (0.0098 in) oversize
92.225 — 92.235 mm (3.6309 — 3.6313 in)

0.50 mm (0.020 in) oversize
92.475 — 92.485 mm (3.6407 — 3.6411 in)

2.5 L model

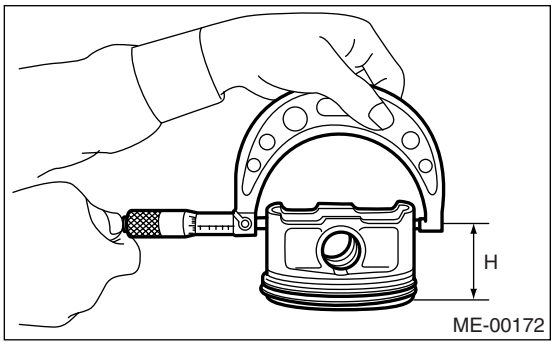
Piston grade point H:
38.2 mm (1.50 in)

Piston outer diameter:

Standard:
A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

0.25 mm (0.0098 in) oversize
99.745 — 99.765 mm (3.9270 — 3.9277 in)

0.50 mm (0.020 in) oversize
99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

2.0 L model
Standard:
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit:
0.050 mm (0.0020 in)

2.5 L model
Standard:
–0.010 — 0.010 mm (–0.0004 — 0.0004 in)
Limit:
0.030 mm (0.0012 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, reboring it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only, nor use an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

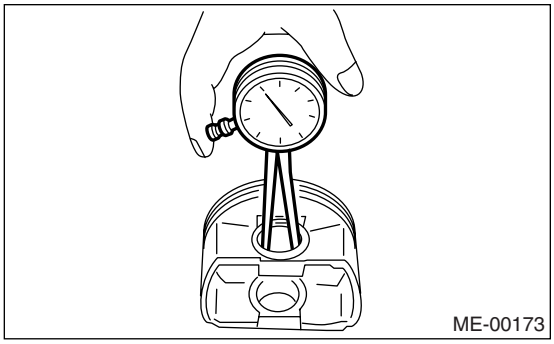
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

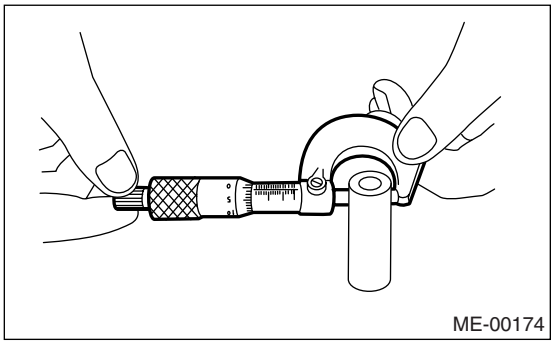
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

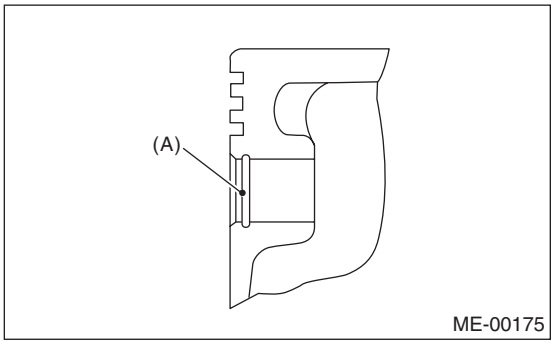
1) Check the pistons and piston pins for damage, cracks and wear, Replace if defective.
Check the piston ring grooves for wear and damage, Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. **<Ref. to ME(H4DOTC 2.0)-106,** CYLINDER AND PISTON, INSPECTION**, Cylinder Block.>** If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.
3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

Standard clearance between piston pin and hole in piston:
Standard:
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit:
0.020 mm (0.0008 in)





4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.

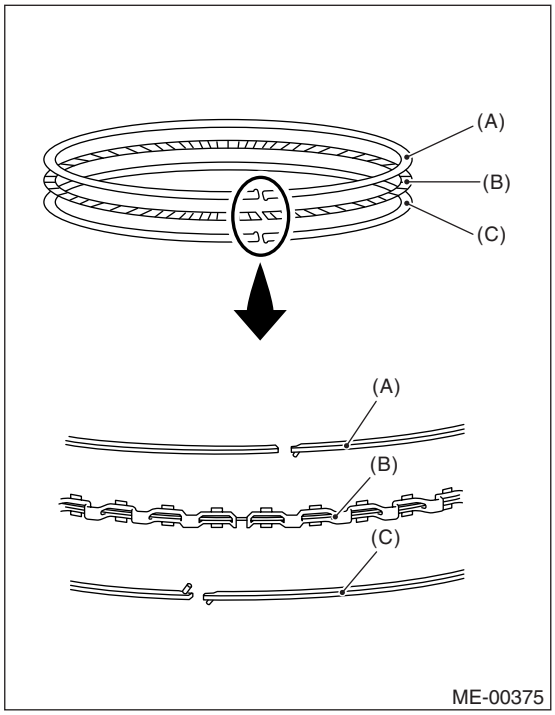


5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

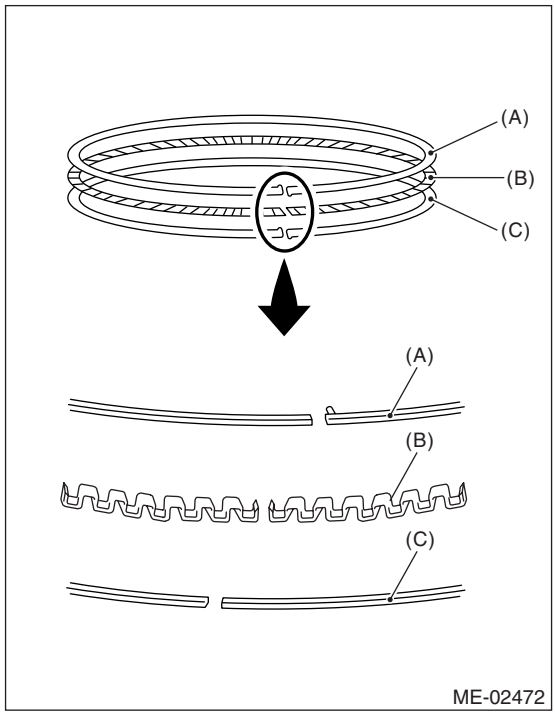
1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
• Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.
• 2.0 L model



(A) Upper rail
(B) Expander
(C) Lower rail

• 2.5 L model



(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

• 2.0 L MODEL

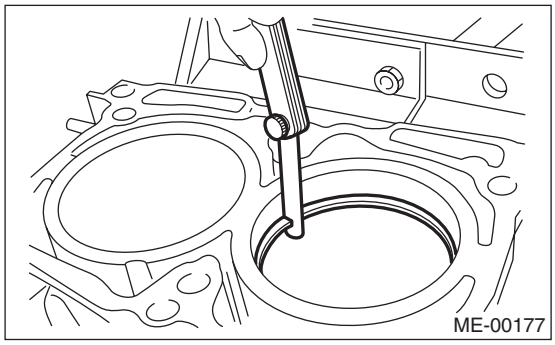
Unit: mm (in)

		Standard	Limit
Piston ring gap	Top ring	Outer circle side: 0.20 — 0.25 (0.0079 — 0.0098) Inner circle side: 0.20 — 0.30 (0.0079 — 0.0117)	1.0 (0.039)
	Second ring	0.40 — 0.50 (0.016 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.020)	1.5 (0.059)

• 2.5 L MODEL

Unit: mm (in)

		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.015 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.020)	1.5 (0.059)

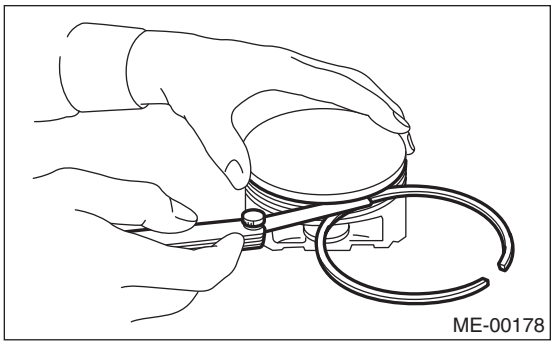


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)

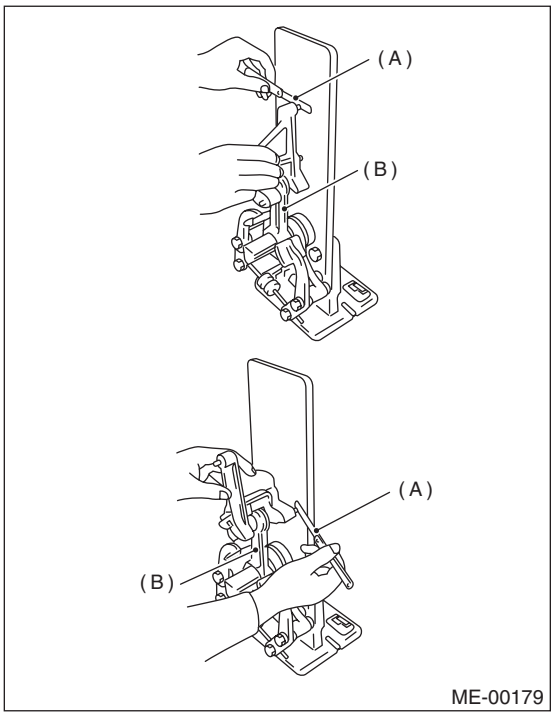
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



5. CONNECTING ROD

1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

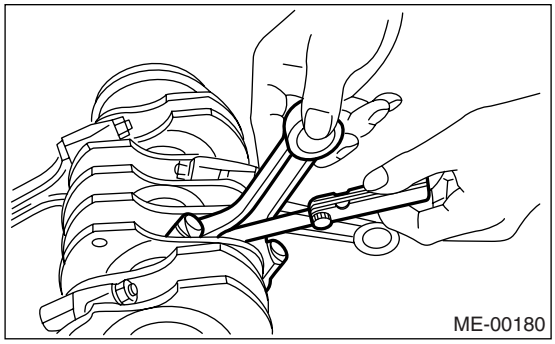
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

Connecting rod side clearance:
Standard:
0.070 — 0.330 mm (0.0028 — 0.0130 in)
Limit:
0.40 mm (0.016 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigage. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary (See the table).

2.0 L MODEL

Connecting rod oil clearance:
Standard:
0.026 — 0.052 mm (0.001 — 0.002 in)
Limit:
0.052 mm (0.0020 in)

Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

2.5 L MODEL

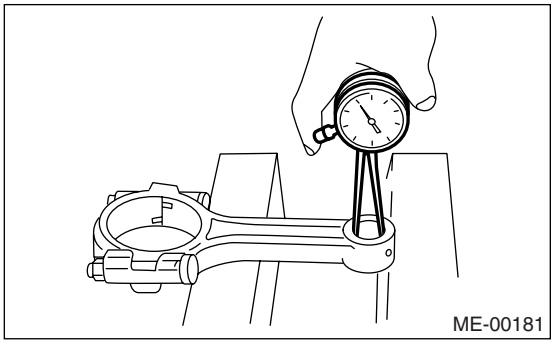
Connecting rod oil clearance:
Standard:
0.017 — 0.045 mm (0.0007 — 0.0018 in)
Limit:
0.05 mm (0.0020 in)

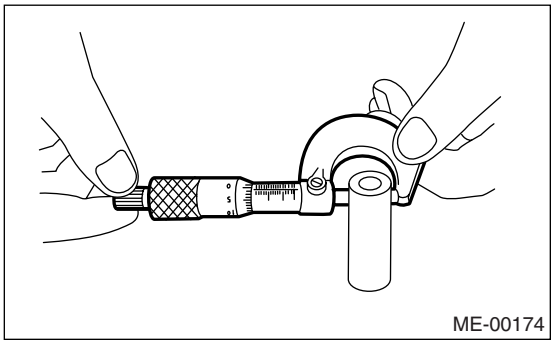
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

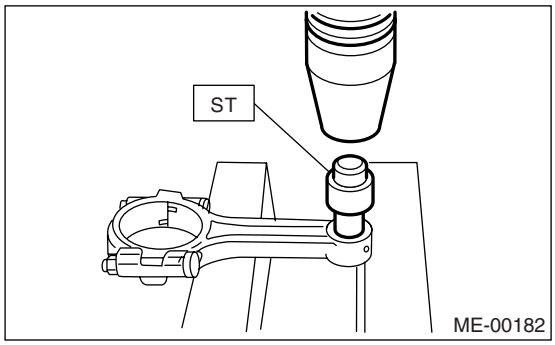
Clearance between piston pin and bushing:
Standard:
0 — 0.022 mm (0 — 0.0009 in)
Limit:
0.030 mm (0.0012 in)


ME-00181


ME-00174

7) Replacement procedure is as follows:
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



ME-00182

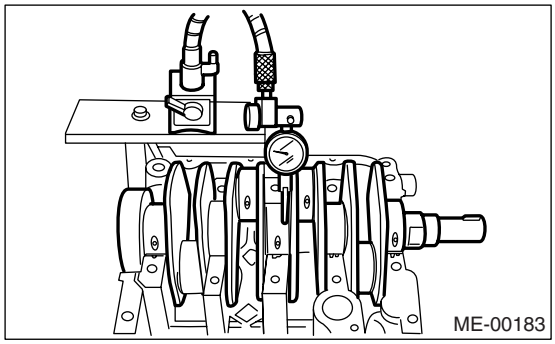
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

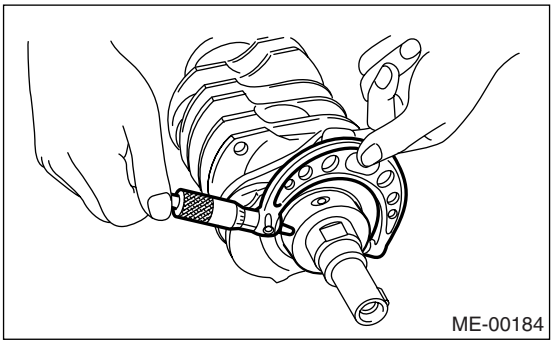
3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin:

2.0 L model
- ***Out-of-roundness***
  - ***0.005 mm (0.0002 in)***
- ***Cylindrically***
  - ***0.06 mm (0.0002 in)***
- ***Grinding limit (dia.)***
  - ***51.750 mm (2.0374 in)***

2.5 L model
- ***Out-of-roundness***
  - ***0.003 mm (0.0001 in)***
- ***Cylindericality***
  - ***0.004 mm (0.0002 in)***
- ***Grinding limit (dia.)***
  - ***51.750 mm (2.0374 in)***

Crank journal:
- ***Out-of-roundness***
  - ***0.005 mm (0.0002 in)***
- ***Cylindericality***
  - ***0.006 mm (0.0002 in)***
- ***Grinding limit***
  - ***59.750 mm (2.3524 in)***



- 2.0 L MODEL

Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

- 2.5 L MODEL

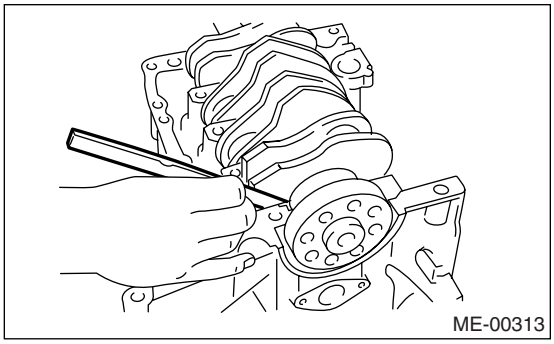
Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft thrust clearance:
Standard:
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit:
0.25 mm (0.0098 in)


ME-00313

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.
6) Measure the oil clearance on each crankshaft bearing by means of plastigage. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Crankshaft oil clearance:
Standard:
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit:
0.040 mm (0.0016 in)

21.Intake and Exhaust Valve

A: REMOVAL AND INSTALLATION

For operations related to intake and exhaust valve, refer to “19. Cylinder Head.” **<Ref. to ME(H4DOTC 2.0)-76,** REMOVAL**, Cylinder Head.> <Ref. to ME(H4DOTC 2.0)-76,** INSTALLATION**, Cylinder Head.>**

22.Piston

A: REMOVAL AND INSTALLATION

For operations related to piston, refer to “20. Cylinder Block.” **<Ref. to ME(H4DOTC 2.0)-84,** REMOVAL**, Cylinder Block.> <Ref. to ME(H4DOTC 2.0)-87,** INSTALLATION**, Cylinder Block.>**

23.Connecting Rod

A: REMOVAL AND INSTALLATION

For operations related to connecting rod, refer to “20. Cylinder Block.” **<Ref. to ME(H4DOTC 2.0)-84,** REMOVAL**, Cylinder Block.> <Ref. to ME(H4DOTC 2.0)-87,** INSTALLATION**, Cylinder Block.>**

24.Crankshaft

A: REMOVAL AND INSTALLATION

For operations related to crankshaft, refer to “20. Cylinder Block.” **<Ref. to ME(H4DOTC 2.0)-84,** REMOVAL**, Cylinder Block.> <Ref. to ME(H4DOTC 2.0)-87,** INSTALLATION**, Cylinder Block.>**

25.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)
A — Very often
B — Sometimes
C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Poor terminal connection	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Defective (deterioration, etc.)	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Defective valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective (deterioration, etc.)	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Defective valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective (deterioration, etc.)	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Defective valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Defective valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B
		Accelerator cable out of adjustment	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Defective valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Defective valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	C

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment (2.0 L model)	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	B
7. Afterburning in exhaust system	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Defective valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Malfunction of evaporative emission control system	C
8. Knocking	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
		Loosened oil pan fitting bolts or defective oil pan	B

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Defective valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Incorrect accelerator cable adjustment (2.0 L model)	B

26.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Valve mechanism is defective. • Incorrect valve clearance • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong heat range of spark plug • Improper octane number of gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam sprocket • Worn camshaft journal bore in cylinder head assembly
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE **<Ref. to EN(H4DOTC 2.0)(diag)-47,** OPERATION**, Clear Memory Mode.>** and INSPECTION MODE **<Ref. to EN(H4DOTC 2.0)(diag)-40,** OPERATION**, Inspection Mode.>** after connecting the fuel injector connector.

EXHAUST

EX(H4DOTC 2.0)

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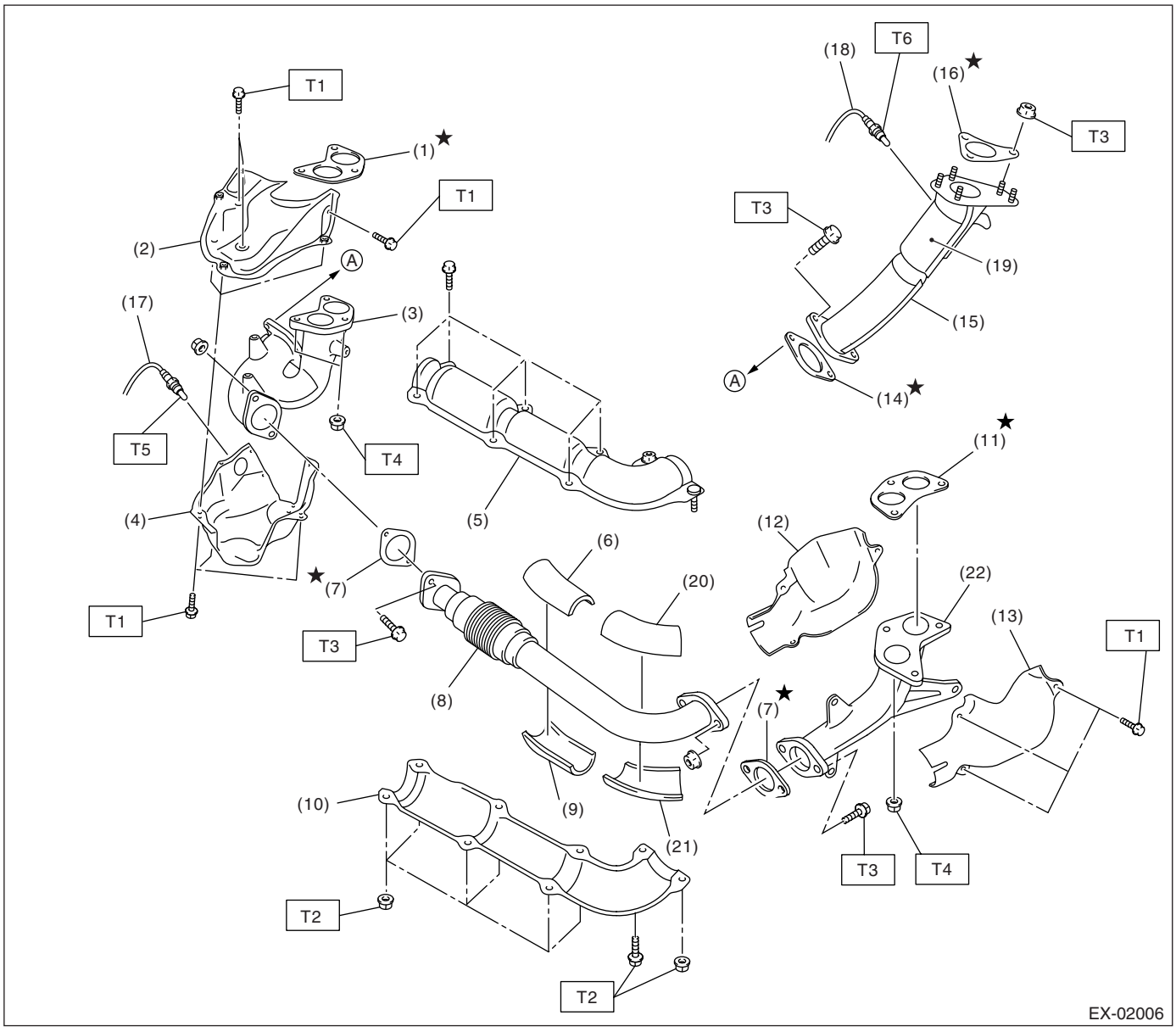
2. Front Exhaust Pipe.....7
3. Center Exhaust Pipe 9
4. Joint Pipe 13
5. Rear Exhaust Pipe 14
6. Muffler 16

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



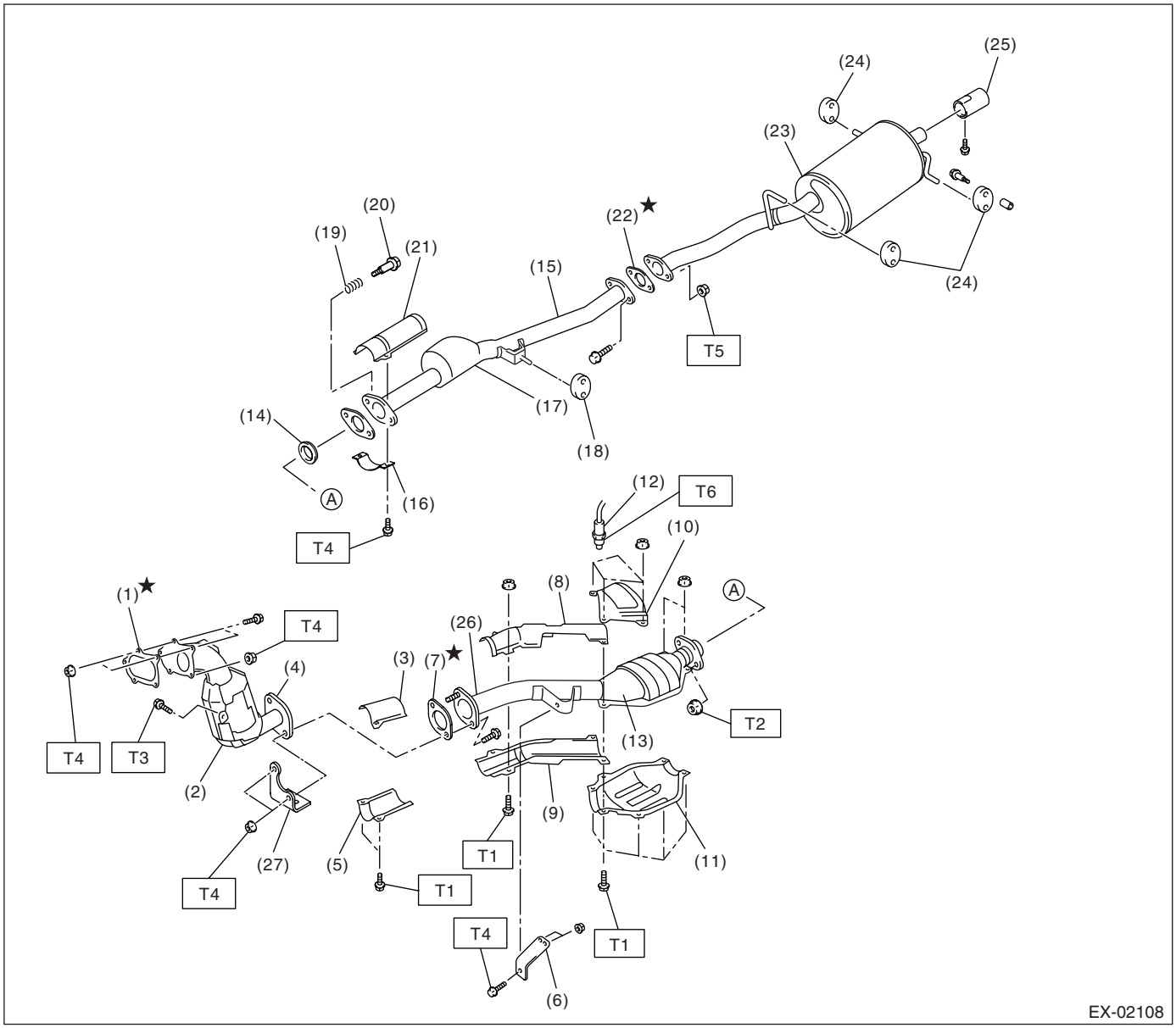
(1) Gasket
(2) Exhaust manifold upper cover (RH)
(3) Exhaust manifold (RH)
(4) Exhaust manifold lower cover (RH)
(5) Front exhaust pipe upper cover
(6) Front exhaust pipe upper insulator (RH)
(7) Gasket
(8) Front exhaust pipe
(9) Front exhaust pipe lower insulator (RH)
(10) Front exhaust pipe lower cover
(11) Gasket
(12) Exhaust manifold upper cover (LH)
(13) Exhaust manifold lower cover (LH)
(14) Gasket
(15) Turbocharger joint pipe
(16) Gasket
(17) Front oxygen (A/F) sensor
(18) Exhaust temperature sensor
(19) Precatalytic converter
(20) Front exhaust pipe upper insulator (LH)
(21) Front exhaust pipe lower insulator (LH)
(22) Exhaust manifold (LH)

Tightening torque: N·m (kgf-m, ft-lb)

- ***T1: 19 (1.9, 14.0)***
- ***T2: 7.5 (0.76, 5.5)***
- ***T3: 35 (3.6, 26.0)***
- ***T4: 40 (4.1, 30)***
- ***T5: <Ref. to FU(H4DOTC 2.0)-45, INSTALLATION, Front Oxygen (A/F) Sensor.> or <Ref. to FU(H4DOTC 2.5)-39, INSTALLATION, Front Oxygen (A/F) Sensor.>***
- ***T6: <Ref. to FU(H4DOTC 2.0)-49, INSTALLATION, Exhaust Temperature Sensor.> or <Ref. to FU(H4DOTC 2.5)-42, INSTALLATION, Exhaust Temperature Sensor.>***

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER

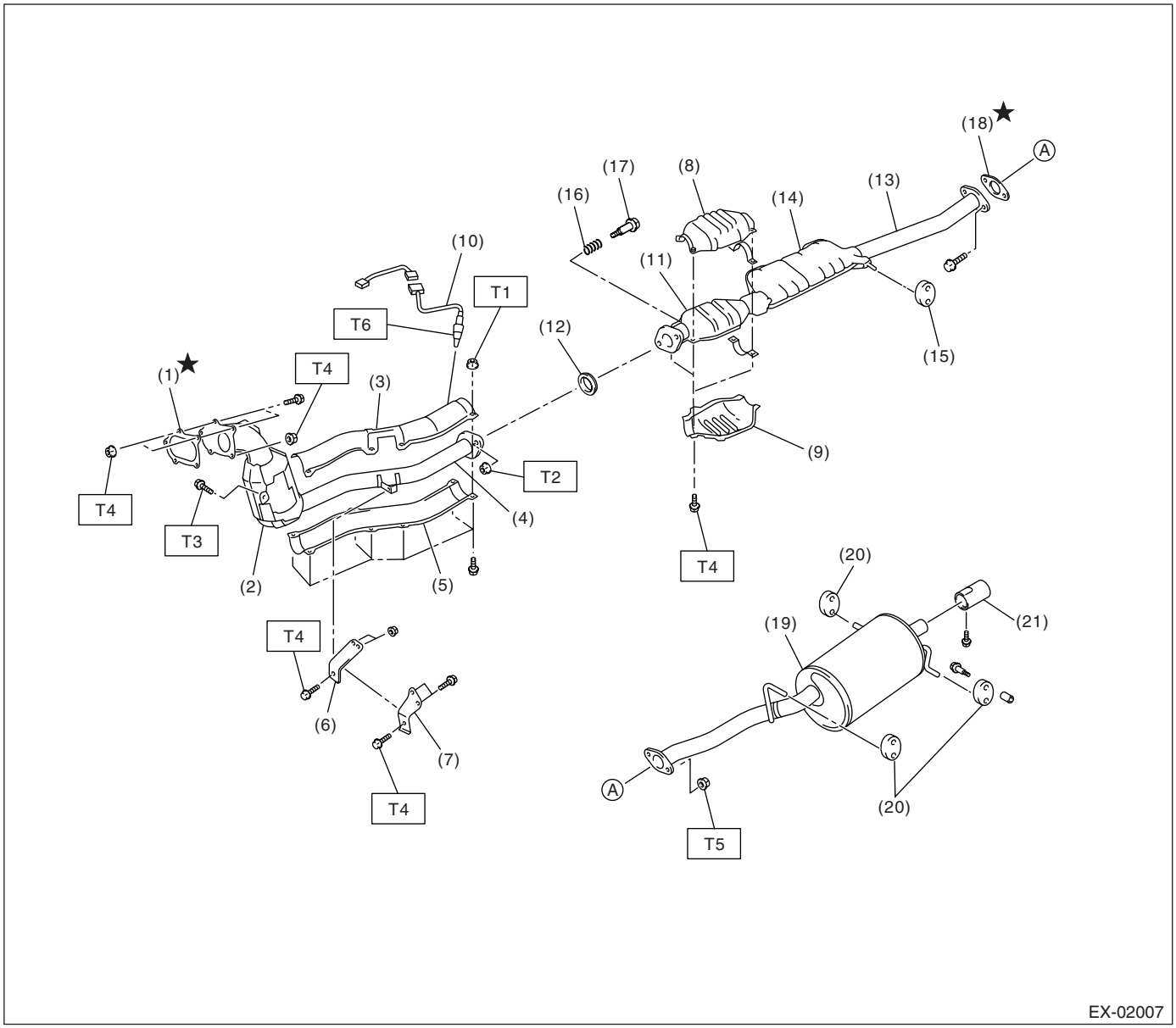
- 2.0 L model and 2.5 L (EK, EC) model



(1) Gasket
(2) Front catalytic converter
(3) Center pipe upper cover (Front)
(4) Center exhaust pipe (Front)
(5) Center pipe lower cover (Front)
(6) Bracket
(7) Gasket
(8) Center pipe upper cover (Rear)
(9) Center pipe lower cover (Rear)
(10) Upper rear catalytic converter cover
(11) Lower rear catalytic converter cover
(12) Rear oxygen sensor
(13) Rear catalytic converter
(14) Gasket
(15) Rear exhaust pipe
(16) Clamp
(17) Chamber
(18) Cushion
(19) Spring
(20) Bolt
(21) Upper rear exhaust pipe cover (Front)
(22) Gasket
(23) Muffler
(24) Cushion rubber
(25) Muffler cutter
(26) Center exhaust pipe (Rear)
(27) Frange cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.1)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC 2.0)-47, INSTALLATION, Rear Oxygen Sensor.>

- 2.5 L (KA) model



EX-02007

(1) Gasket
(2) Front catalytic converter
(3) Center pipe upper cover
(4) Center exhaust pipe
(5) Center pipe lower cover
(6) Bracket (MT model)
(7) Bracket (AT model)
(8) Catalytic converter upper cover
(9) Catalytic converter lower cover
(10) Rear oxygen sensor
(11) Rear catalytic converter
(12) Gasket
(13) Rear exhaust pipe
(14) Chamber
(15) Cushion rubber
(16) Spring
(17) Bolt
(18) Gasket
(19) Muffler
(20) Cushion rubber
(21) Muffler cutter

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.1)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC 2.5)-40, INSTALLATION, Rear Oxygen Sensor.>

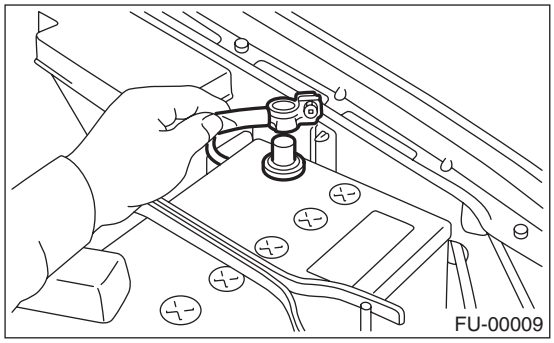
B: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

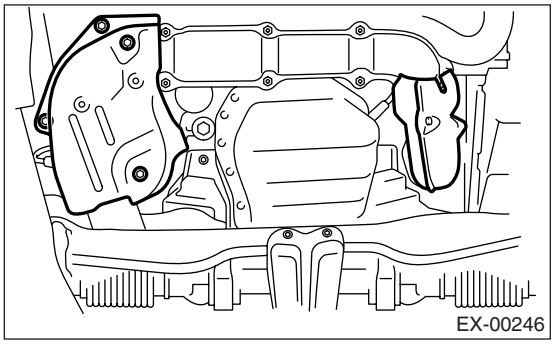
2. Front Exhaust Pipe

A: REMOVAL

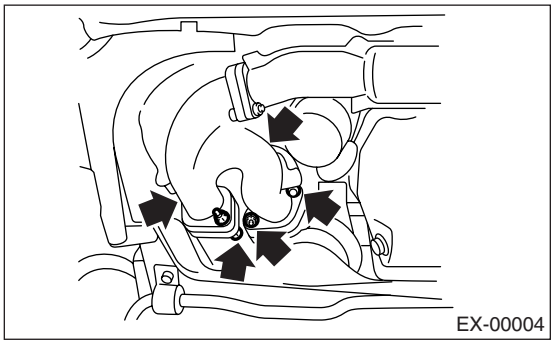
1) Disconnect the ground cable from battery.

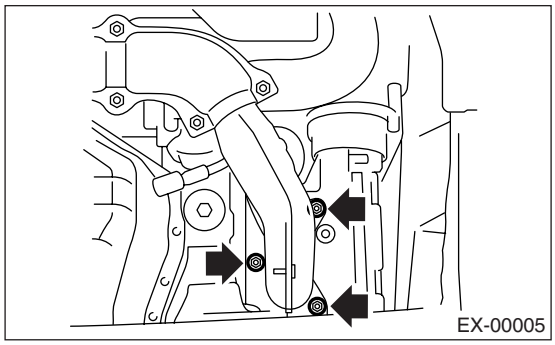


2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, REMOVAL, Front Oxygen (A/F) Sensor.> or <Ref. to FU(H4DOTC 2.5)-38, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove the under cover.
4) Remove the lower exhaust manifold cover.

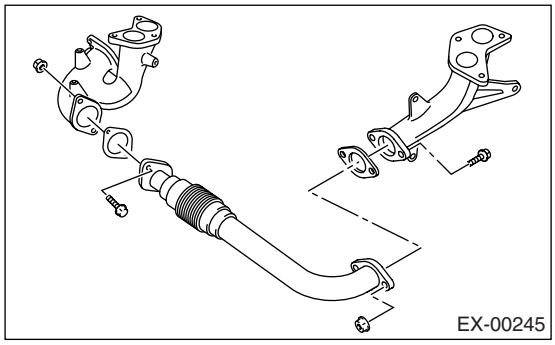


5) Remove the nuts which hold front exhaust pipe assembly to turbocharger joint pipe.
6) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold front exhaust pipe assembly to cylinder head exhaust port.





7) Remove the front exhaust pipe assembly.
8) Remove the covers from exhaust manifold and front exhaust pipe.
9) Separate the front exhaust pipe from exhaust manifolds.

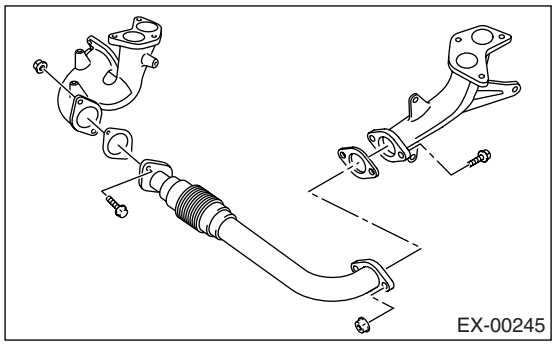


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

1) Assemble the front exhaust pipe and exhaust manifolds.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe covers.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

3) Install the exhaust manifold upper cover (RH).

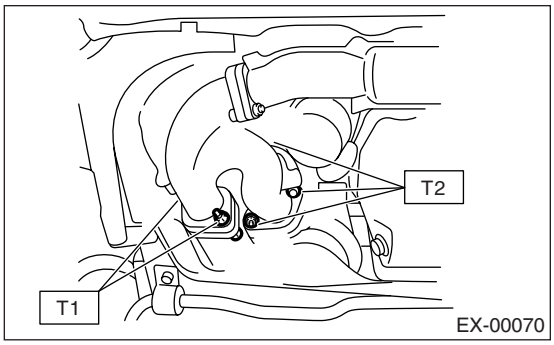
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

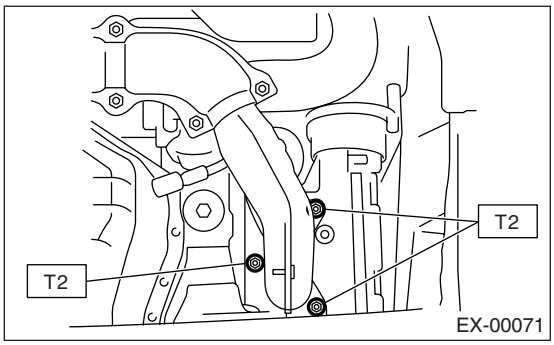
4) Install the front exhaust pipe assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

5) Connect the exhaust manifold (RH) to turbocharger joint pipe.

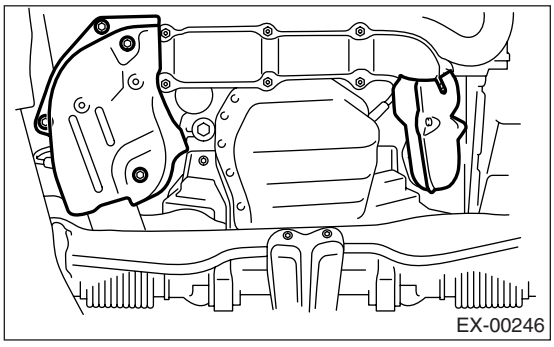
Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26.0 ft-lb)
T2: 40 N·m (4.1 kgf-m, 30 ft-lb)





6) Install the exhaust manifold lower cover.

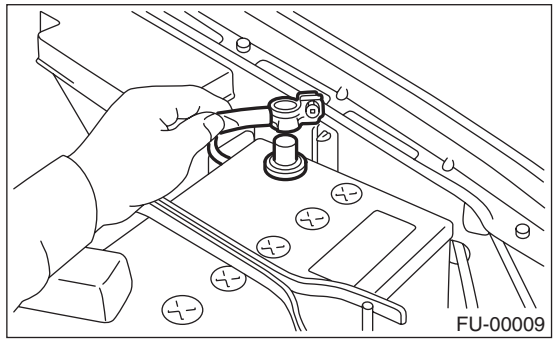
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



7) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, INSTALLATION, Front Oxygen (A/F) Sensor.> or <Ref. to FU(H4DOTC 2.5)-39, INSTALLATION, Front Oxygen (A/F) Sensor.>

8) Install the under cover.

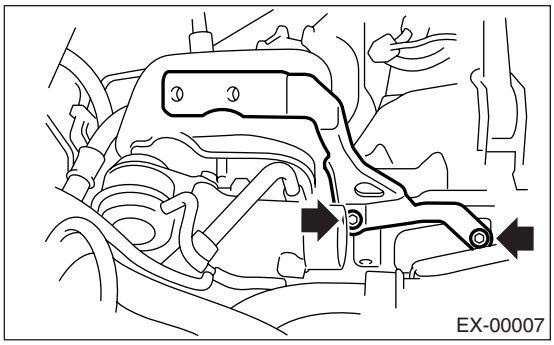
9) Connect the battery ground cable to battery.



3. Center Exhaust Pipe

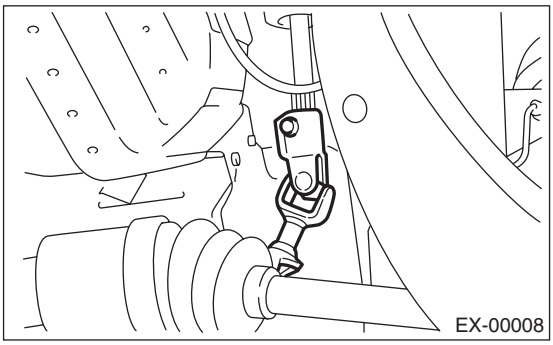
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the intercooler.
<Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
4) Remove the intercooler bracket.


EX-00007

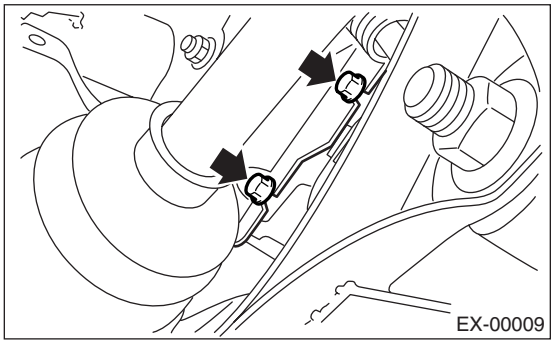
5) Lift-up the vehicle.
6) Remove the under cover.
7) Remove the universal joint bolts and then remove the universal joint. (RHD model only)

CAUTION:
Scribe alignment marks on the universal joint so that it can be reassembled at the original serration.

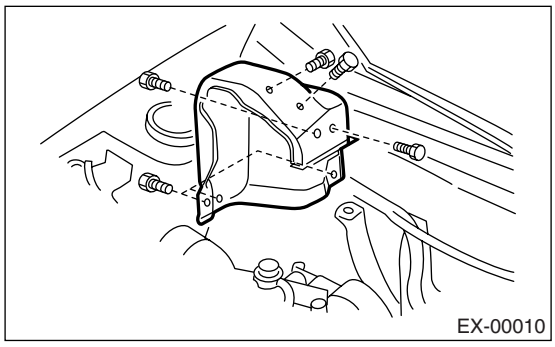

EX-00008

8) Remove the bolts which install lower side of turbocharger upper cover.

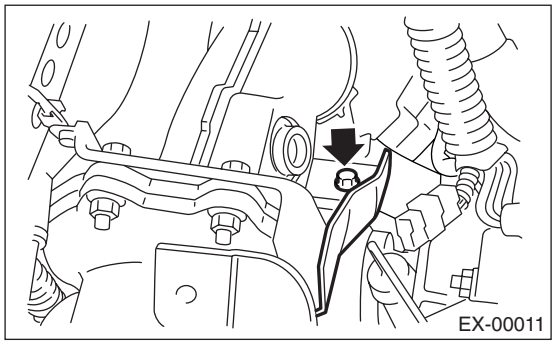
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.


EX-00009

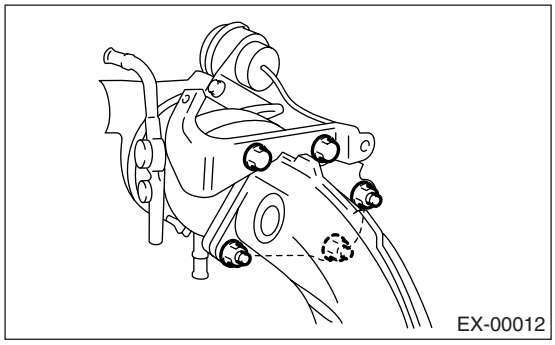
9) Lower the vehicle.
10) Remove the turbocharger upper cover.


EX-00010

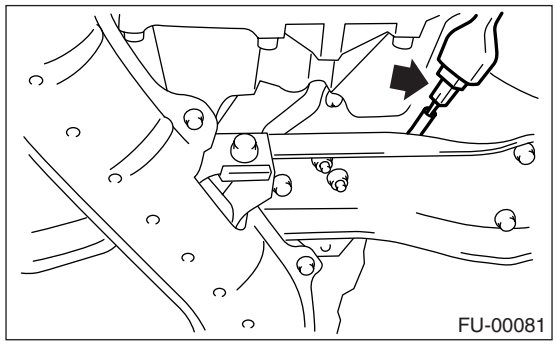
11) Remove the bolts which install upper side of turbocharger upper cover, and remove it.


EX-00011

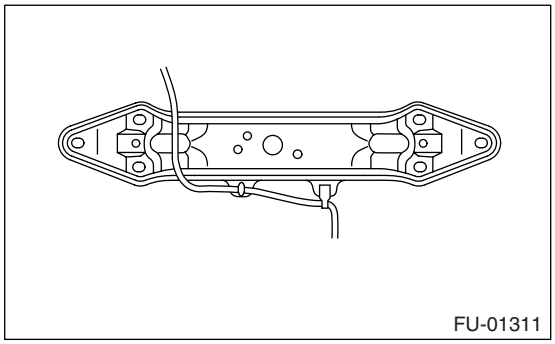
12) Separate the center exhaust pipe from turbocharger.


EX-00012

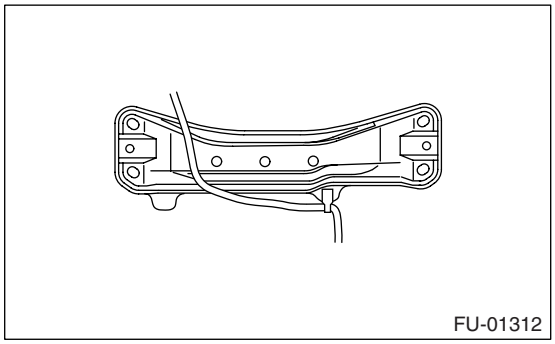
13) Lift-up the vehicle.
14) Disconnect the connector from rear oxygen sensor.


FU-00081

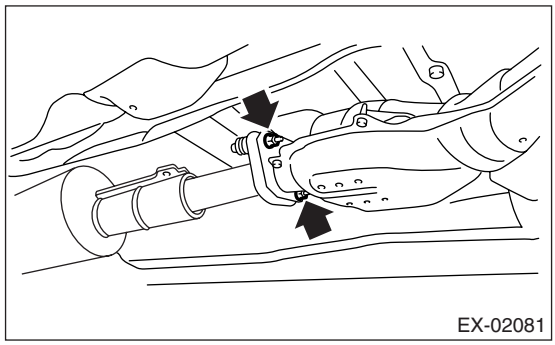
15) Remove the clip by pulling out from the upper side of crossmember.
- AT model



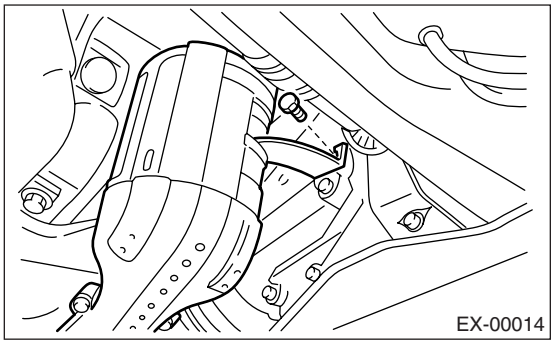
- MT model



16) Separate the center exhaust pipe from rear exhaust pipe.

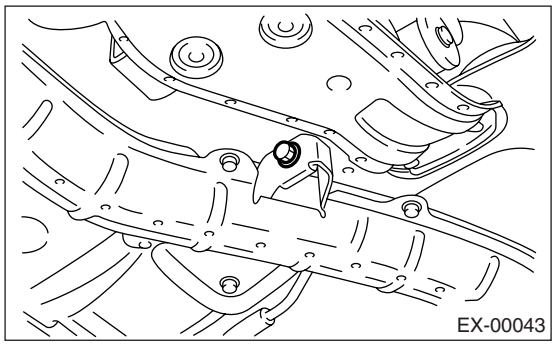


17) Remove the bolt which holds center exhaust pipe bracket to transmission.

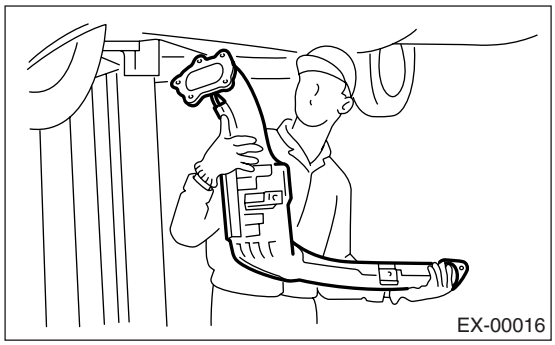


18) Remove the intercooler bracket.
19) Remove the bolt which holds center exhaust pipe to hanger bracket.

CAUTION:
Be careful not to pull down the center exhaust pipe.



20) Remove the center exhaust pipe.

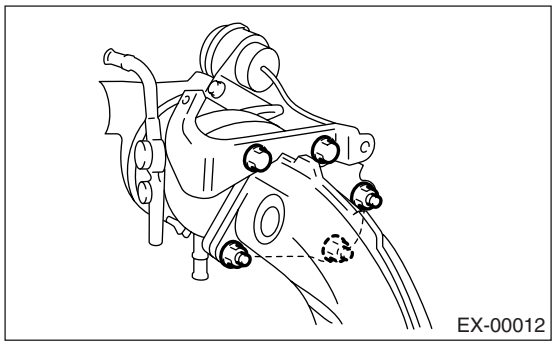


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

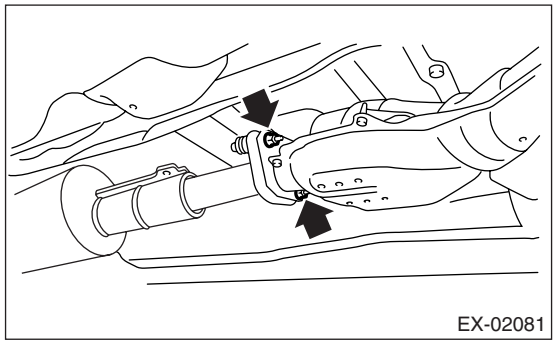
1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

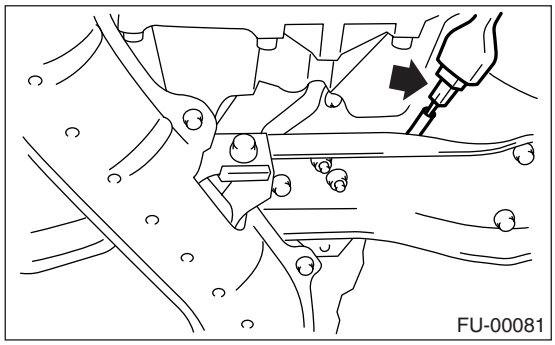


4) Install the center exhaust pipe to rear exhaust pipe.

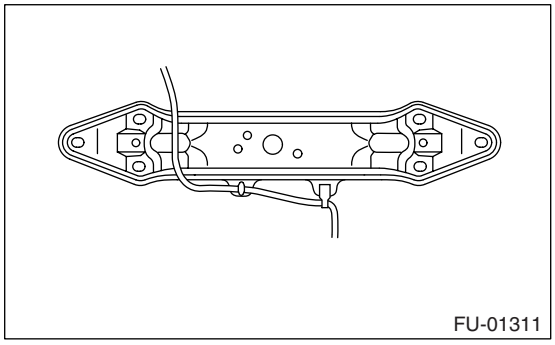
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



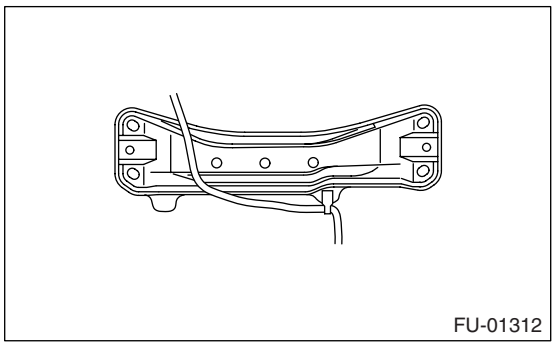
5) Connect the connector to rear oxygen sensor.



6) Secure the clip on crossmember.
- AT model

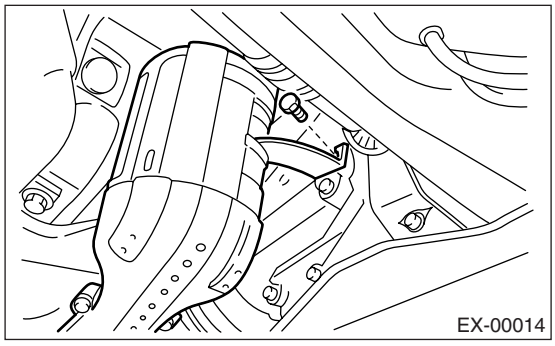


- MT model



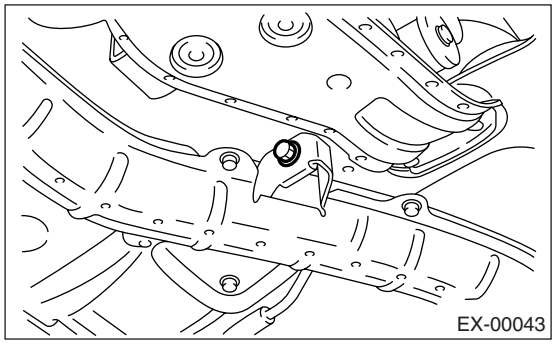
7) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



8) Tighten the bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



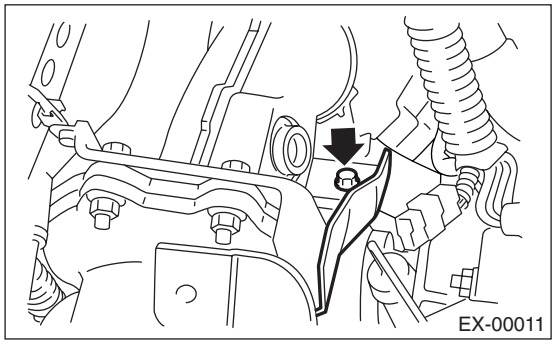
9) Tighten the bolts which hold intercooler bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

10) Lower the vehicle.

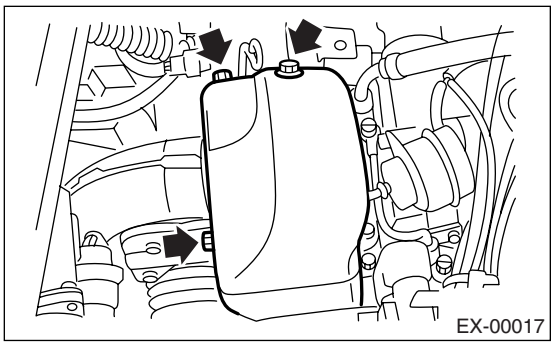
11) Place the turbocharger lower cover, and tighten the bolts which install upper side of lower cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



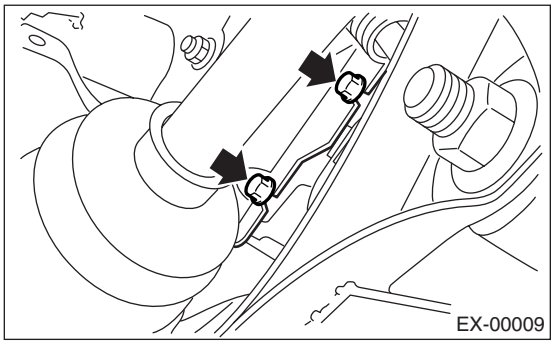
12) Place the turbocharger upper cover, and tighten the bolts which install upper side of upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



13) Lift-up the vehicle.
14) Tighten the bolts which install under side of turbocharger upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

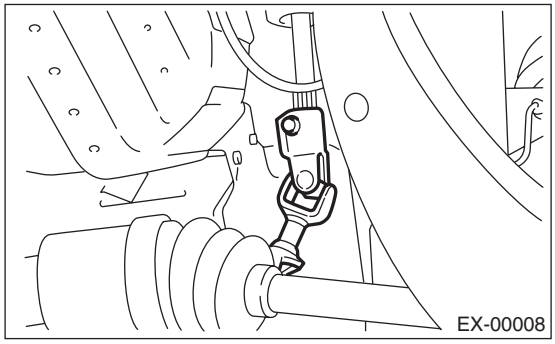


15) Install the universal joint. (RHD model)
(1) Align the bolt hole on long yoke side of universal joint with the cutout at serrated section of shaft end, and insert the universal joint.
(2) Align the bolt hole on short yoke side of universal joint with the cutout at serrated section of gearbox assembly. Lower the universal joint completely.
(3) Temporarily tighten the bolt on short yoke side. Raise the universal joint to make sure the bolt is properly passing through the cutout at serrated section.
(4) Tighten the bolt on long yoke side, then that on the short yoke side.

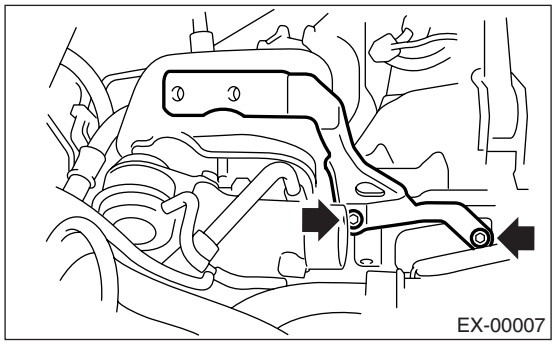
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
• Make sure that the universal joint bolts are tightened through notches in shaft serration.
• Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 15 mm (0.59 in)



16) Install the under cover.
17) Lower the vehicle.
18) Install the intercooler bracket.

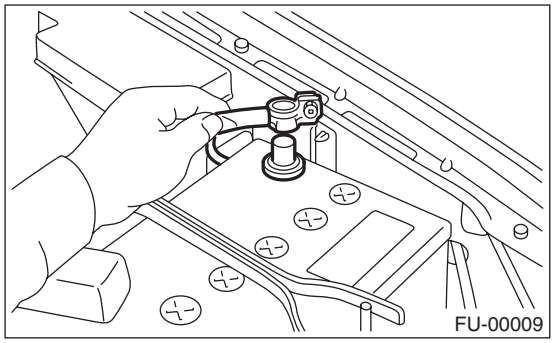


19) Install the intercooler.
<Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>
20) Align the center of roll connector. (RHD model)
<Ref. to AB-13, ROLL CONNECTOR, INSPECTION, Inspection Locations After a Collision.>

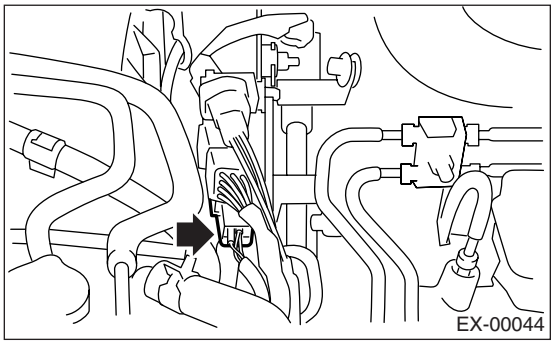
4. Joint Pipe

A: REMOVAL

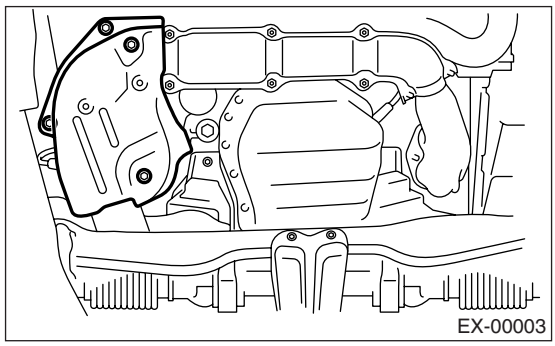
1) Disconnect the ground cable from battery.



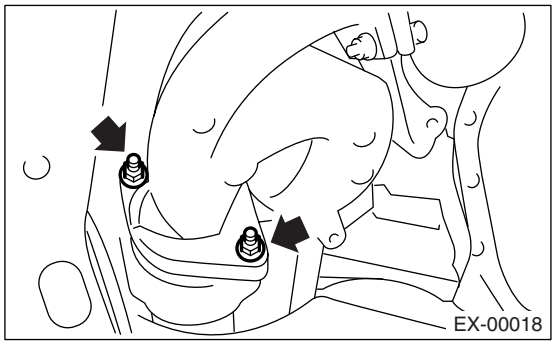
2) Disconnect the exhaust temperature sensor connector.



3) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, REMOVAL, Front Oxygen (A/F) Sensor.> or <Ref. to FU(H4DOTC 2.5)-38, REMOVAL, Front Oxygen (A/F) Sensor.>
4) Remove the under cover.
5) Remove the exhaust manifold lower cover (RH).



6) Remove the nuts which hold front exhaust manifold to joint pipe.

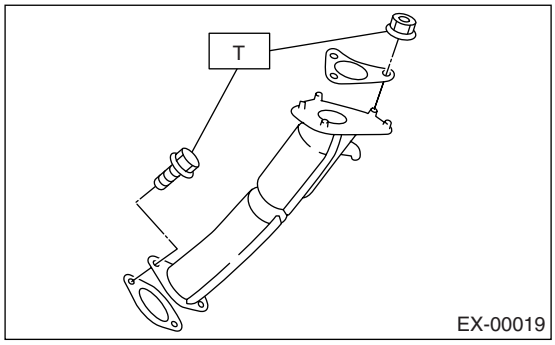


7) Remove the center exhaust pipe. **<Ref. to EX(H4DOTC 2.0)-9,** REMOVAL**, Center Exhaust Pipe.>**
8) Remove the turbocharger.
<Ref. to IN(H4DOTC 2.0)-12, REMOVAL, Turbocharger.>
9) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

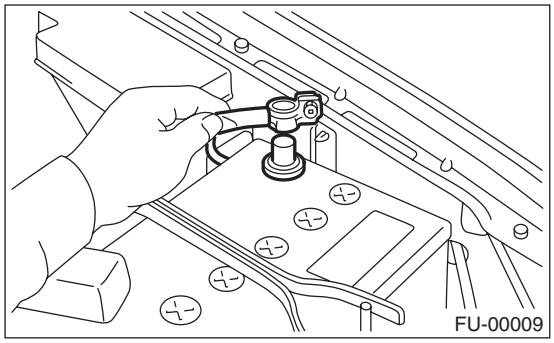
Tightening torque:
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

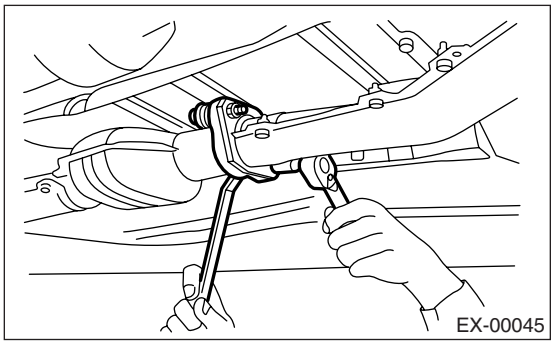
A: REMOVAL

1) Disconnect the ground cable from battery.



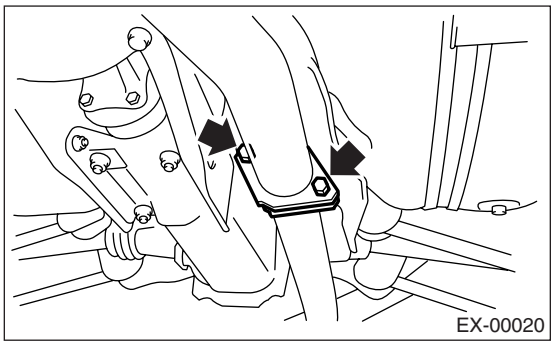
2) Lift-up the vehicle.
3) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

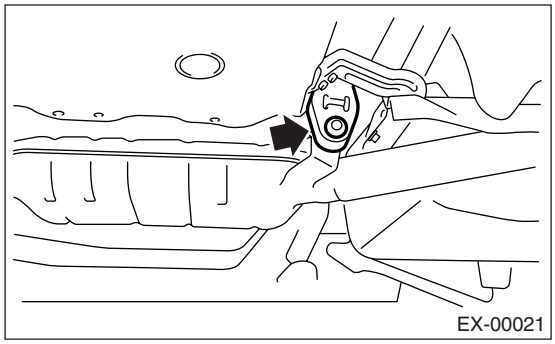


4) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.



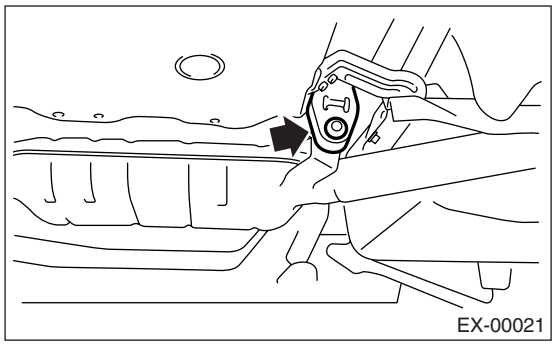
5) Separate the rear exhaust pipe from cushion rubber, and then remove.



B: INSTALLATION

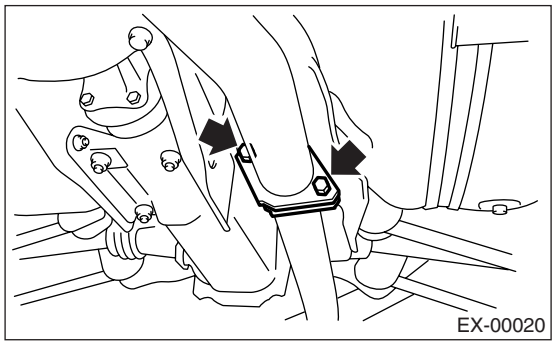
NOTE:
Replace the gasket and nuts with new ones.

1) Install the rear exhaust pipe to cushion rubber.



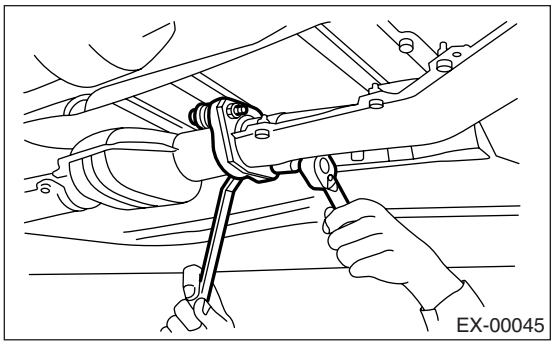
2) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

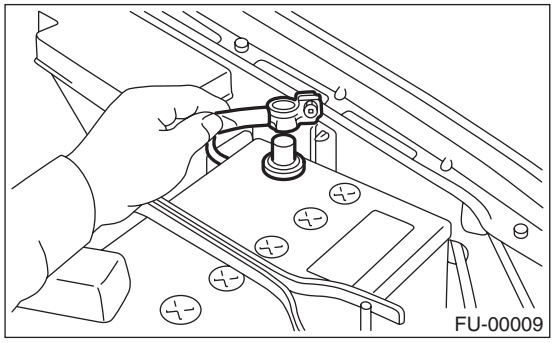


3) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



4) Lower the vehicle.
5) Connect the battery ground cable to battery.



C: INSPECTION

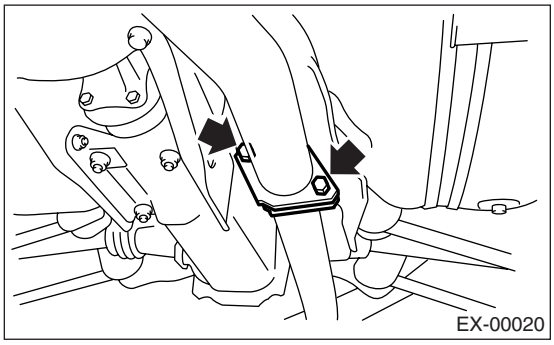
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

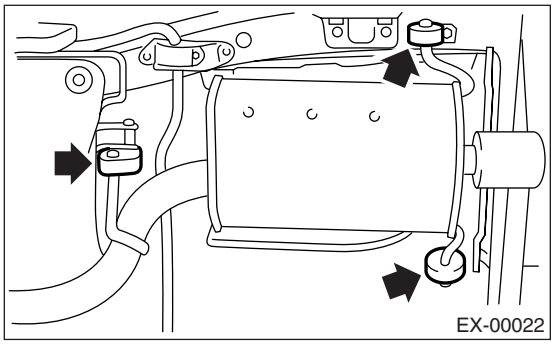
CAUTION:
Be careful, the exhaust pipe is hot.



2) Remove the cushions rubber, and detach the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

NOTE:
To facilitate removal, apply a coat of spray type lubricant to the mating area of cushions rubber in advance.

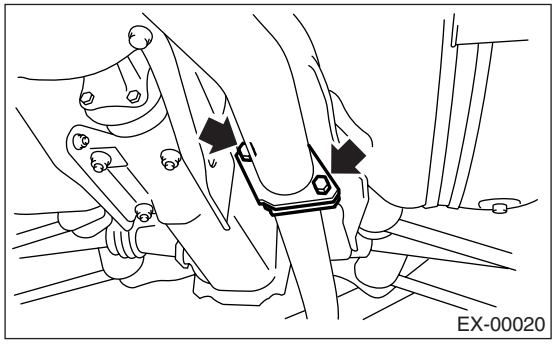


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket and nuts with new ones.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushions rubber is not worn or cracked.

COOLING

CO(H4DOTC 2.0)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.0 L model is included in CO(H4SO) section. <Ref. to CO(H4SO)-2, General Description.>

LUBRICATION

LU(H4DOTC 2.0)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.0 L model is included in LU(H4SO) section. <Ref. to LU(H4SO)-2, General Description.>

SPEED CONTROL SYSTEMS

SP(H4DOTC 2.0)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.0 L model is included in SP(H4SO) section. <Ref. to SP(H4SO)-2, General Description.>

IGNITION

IG(H4DOTC 2.0)

Page

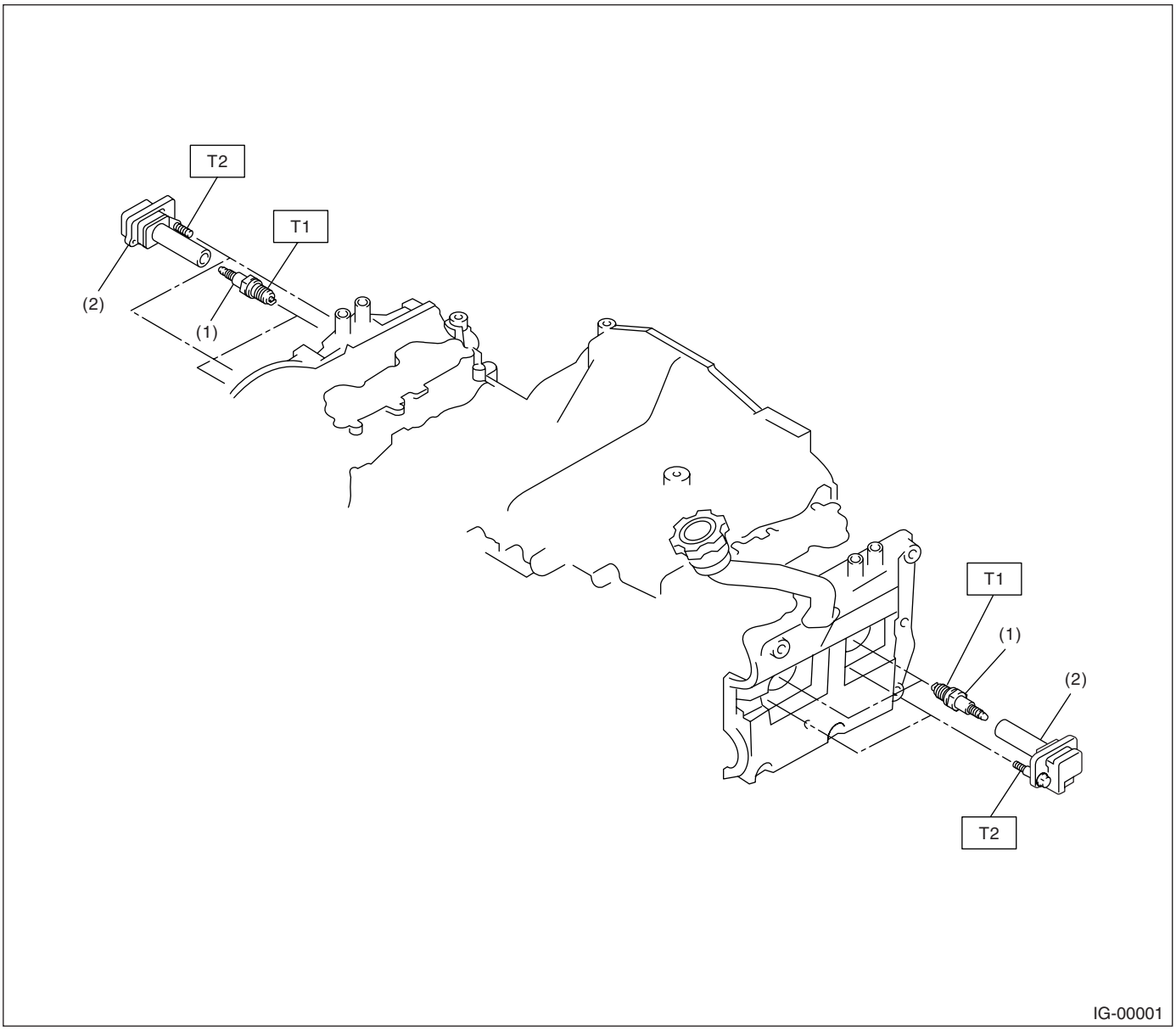
1. General Description 2
2. Spark Plug 5
3. Ignition Coil & Ignitor ASSY 8

1. General Description

A: SPECIFICATION

Item			Designation	
Ignition coil and ignitor ASSY	Model		FK0186	
	Ignition type		Direct ignition	
	Manufacturer		DIAMOND	
Spark plug	Manufacturer and type		2.0 L model	NGK: PFR6G
			2.5 L model	NGK: ILFR6B
	Thread diameter, pitch, length	mm	NGK: PFR6G	14, 1.25, 26.5
			NGK: ILFR6B	14, 1.25, 19.0
	Spark gap	mm (in)	0.7 — 0.8 (0.028 — 0.031)	
	Center electrode		2.0 L model	Platinum
			2.5 L model	Irigium

B: COMPONENT



(1) Spark plug

(2) Ignition coil & ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.8)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

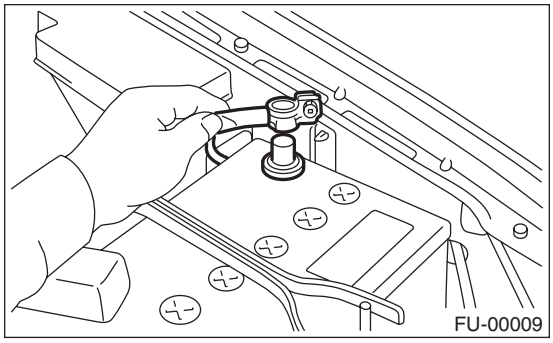
2. Spark Plug

A: REMOVAL

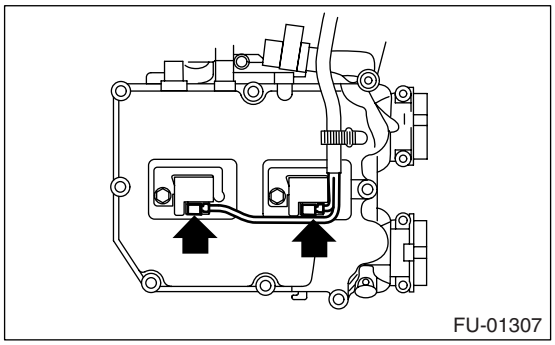
CAUTION:
All spark plugs installed on an engine, must be of the same heat range. <Ref. to IG(H4DOTC 2.0)-2, General Description.>

1. RH SIDE

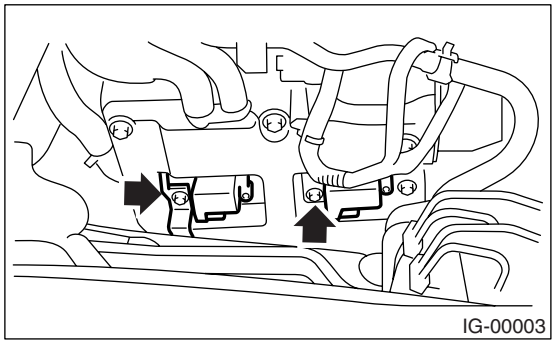
1) Disconnect the ground cable from battery.



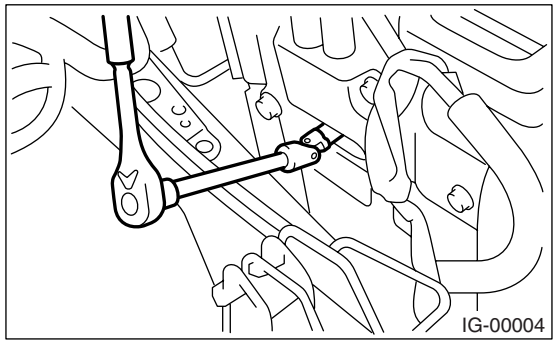
2) Remove the air cleaner lower case. **<Ref. to IN(H4DOTC 2.0)-7,** REMOVAL**, Air Cleaner Case.>**
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

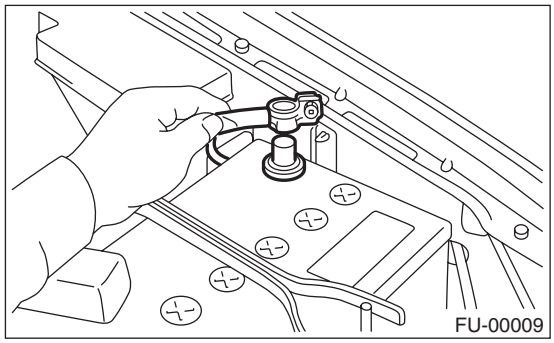


5) Remove the spark plugs with the spark plug sockets.

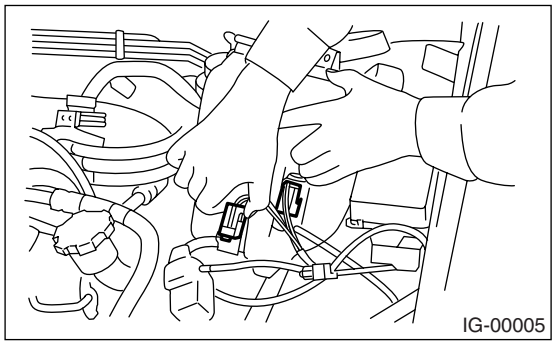


2. LH SIDE

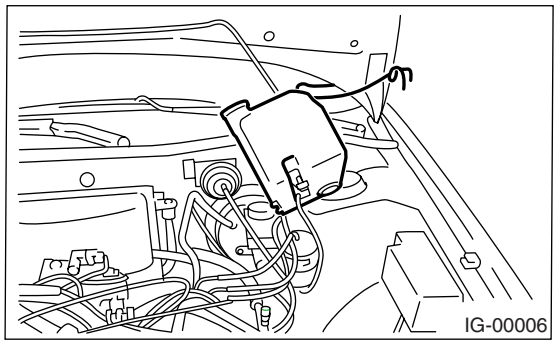
1) Disconnect the battery cables, and then remove the battery and battery carrier.



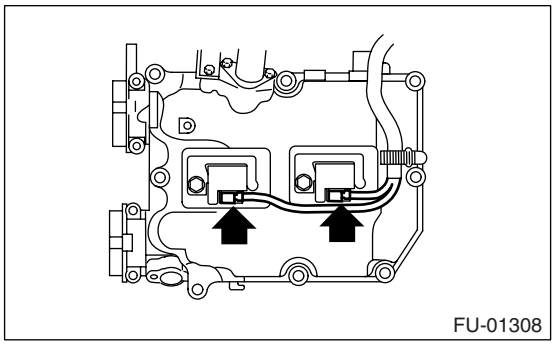
2) Disconnect the washer motor connector.



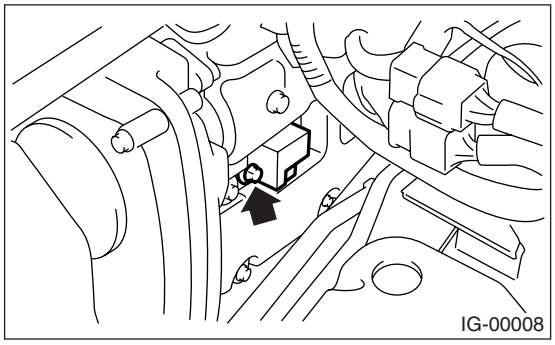
3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold washer tank, then take the tank away from working area.



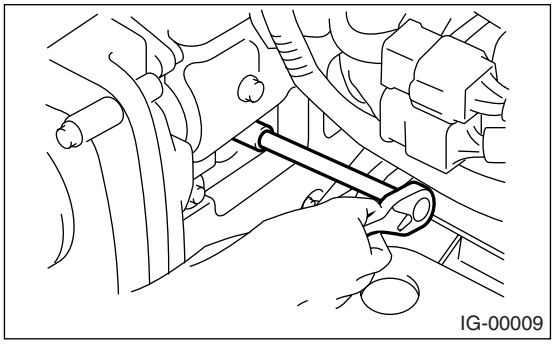
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.8 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

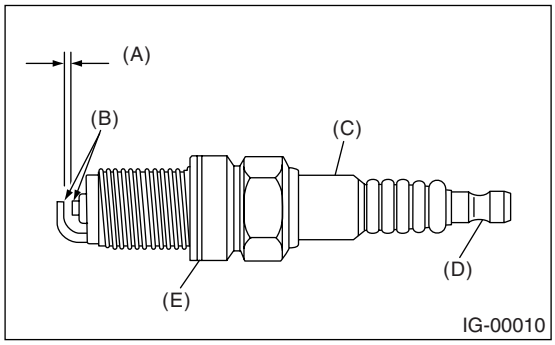
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.8 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

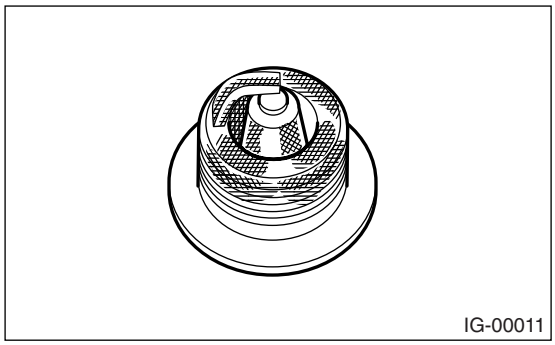
C: INSPECTION

Check the electrodes and inner and ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.

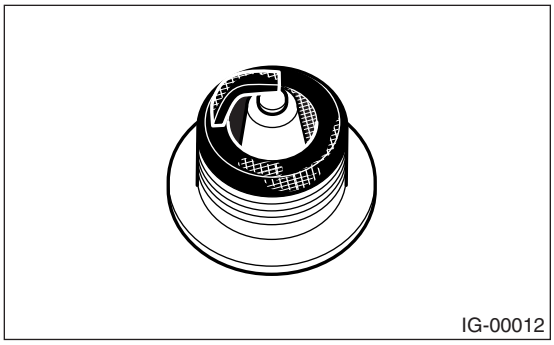


(A) Electrode gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

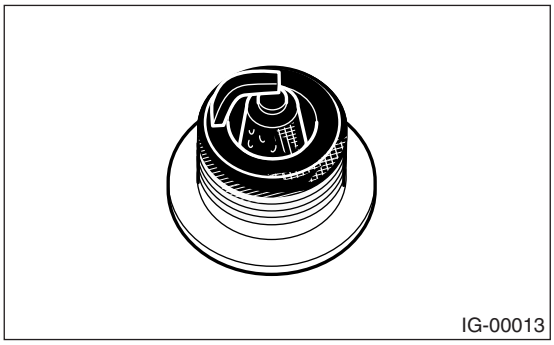
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



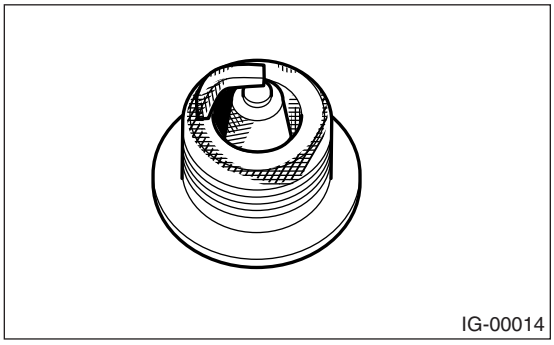
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.


IG-00012

3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.


IG-00013

4) Overheating:
White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc.


IG-00014

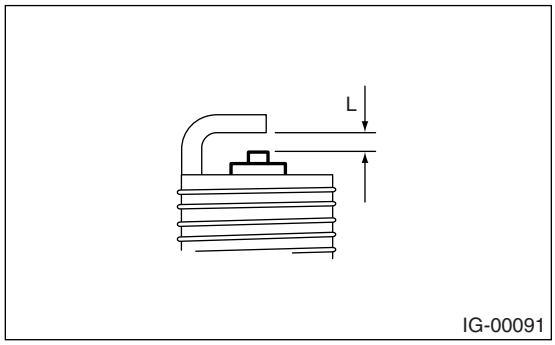
D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear ceramic insulator.
If deposits are too stubborn, replace the plugs.

After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:
Do not use spark plug cleaners, because the spark plugs are applied with platinum or irigium tips.

Spark plug gap L:
0.7 — 0.8 mm (0.028 — 0.031 in)



IG-00091

3. Ignition Coil & Ignitor ASSY

A: REMOVAL

Direct ignition type has been adopted. Refer to the “Spark Plug Removal” for removal procedure. **<Ref. to IG(H4DOTC 2.0)-5,** REMOVAL**, Spark Plug.>**

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

C: INSPECTION

Ignitor is integrated with the coil. Therefore resistance cannot be measured.

STARTING/CHARGING SYSTEMS

SC(H4DOTC 2.0)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.0 L model is included in SC (H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4DOTC 2.0)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4DOTC 2.0)(diag)-4, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC 2.0)(diag)-59, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does malfunction indicator light illuminate?	Go to step **3.**	Inspection using "General Diagnostic Table". <Ref. to EN(H4DOTC 2.0)(diag)-264, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool switch to ON. 4) Read the DTC on the Subaru Select Monitor or general scan tool.	Does the Subaru Select Monitor or general scan tool indicate DTC?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnostics for malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC 2.0)(diag)-50, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSTIC.** 1) Perform clear memory mode. <Ref. to EN(H4DOTC 2.0)(diag)-47, Clear Memory Mode.> 2) Perform the "INSPECTION MODE". <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>	Does the Subaru Select Monitor or general scan tool indicate DTC?	Check on "Diagnostic Chart with Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC 2.0)(diag)-79, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnostic.

2. AUTOMATIC TRANSMISSION

When the DTC about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.
1) ATF level check <Ref. to 4AT-32, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-35, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-32, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to 4AT-35, Differential Gear Oil.>
5) Stall Test <Ref. to 4AT-37, Stall Test.>
6) Line Pressure Test <Ref. to 4AT-40, Line Pressure Test.>
7) Transfer Clutch Pressure Test <Ref. to 4AT-42, Transfer Clutch Pressure Test.>
8) Time Lag Test <Ref. to 4AT-39, Time Lag Test.>
9) Road Test <Ref. to 4AT-36, Road Test.>
10) Shift characteristics <Ref. to 4AT-42, Transfer Clutch Pressure Test.>

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
V.I.N.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Ambient air temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	km/h (MPH)		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON / ❑ OFF	Rear defogger	❑ ON / ❑ OFF
Blower	❑ ON / ❑ OFF	Radio	❑ ON / ❑ OFF
A/C compressor	❑ ON / ❑ OFF	CD/Cassette	❑ ON / ❑ OFF
Radiator fan	❑ ON / ❑ OFF	Car phone	❑ ON / ❑ OFF
Front wiper	❑ ON / ❑ OFF	CB	❑ ON / ❑ OFF
Rear wiper	❑ ON / ❑ OFF		

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes / ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostic indicator light ❑ ABS Warning Light ❑ Oil pressure indicator light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Had run out of gas before: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of other parts except genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start. ❑ Engine stalls during idling. ❑ Engine stalls while driving. ❑ Engine speed decreases. ❑ Engine speed does not decrease. ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift. ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• All airbag system wiring harness and connectors are all colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the Airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
- The ECM will be destroyed immediately.
- The fuel injector and other part will be damaged.

3) Do not disconnect the battery terminals while the engine is running.
A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

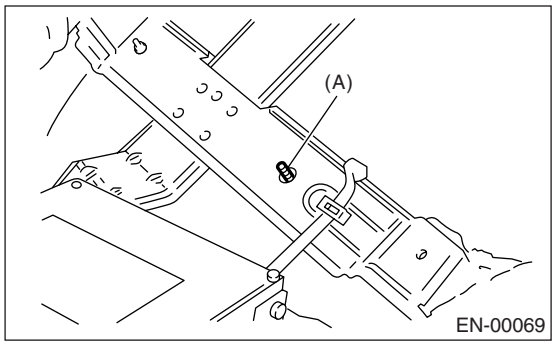
5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Remove the ECM from the located position after disconnecting two cables on battery.
Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid damaging the fuel injection system.

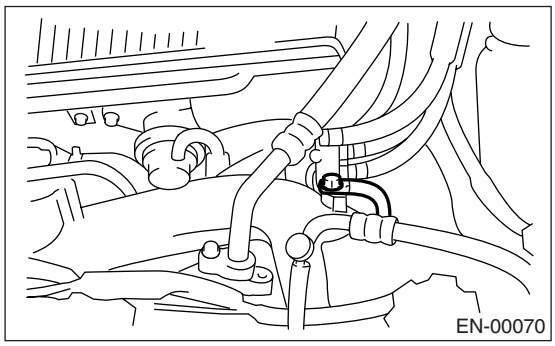
7) Connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts on the body grounding point when measuring voltage and resistance inside the passenger compartment.

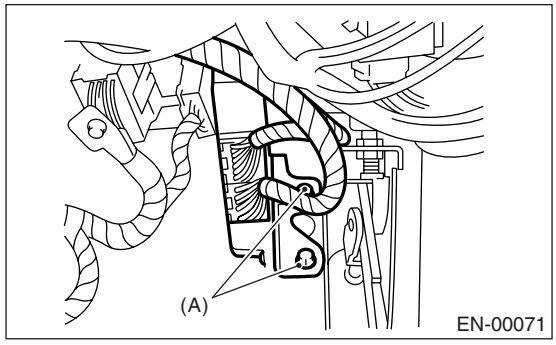


(A) Stud bolt

9) Use engine ground terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Use TCM mounting stud bolts on the grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit. (The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes (engine, electronic control system, transmission) must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) On the model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnostic of engine control system, perform the ABS memory clearance procedure of self-diagnosis function.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems:

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

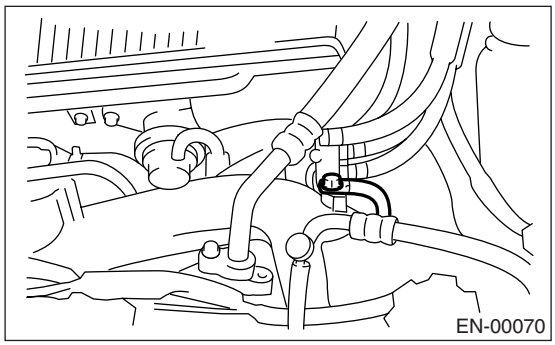
Standard voltage:
12 V

Specific gravity:
Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

Make sure the engine ground terminal is properly connected to the engine.



C: NOTE

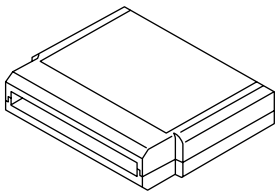
1. GENERAL DESCRIPTION

• On-board diagnostic (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with E-OBD regulation. The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, the DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• When troubleshooting the vehicles complied with E-OBD regulation, connect Subaru Select Monitor or the general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• MFI system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric signal applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Excellent engine start and 3warm-up performance by the correction of engine coolant temperature and intake air temperature.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

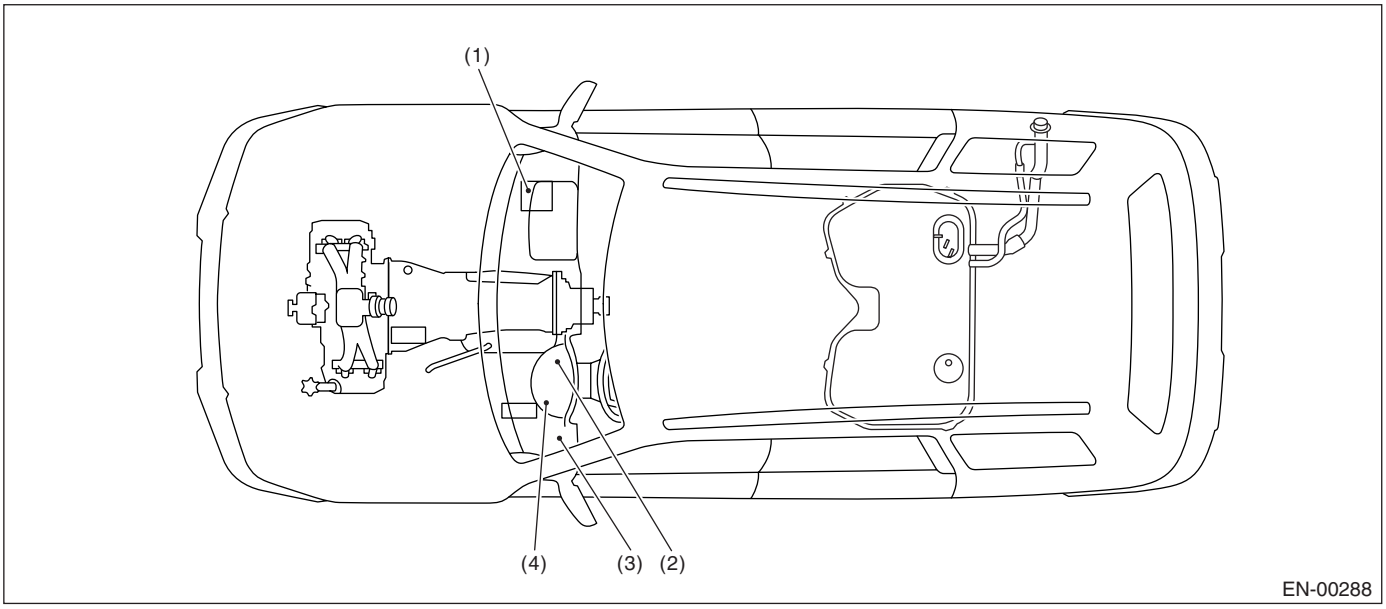
4. Electrical Component Location

A: LOCATION

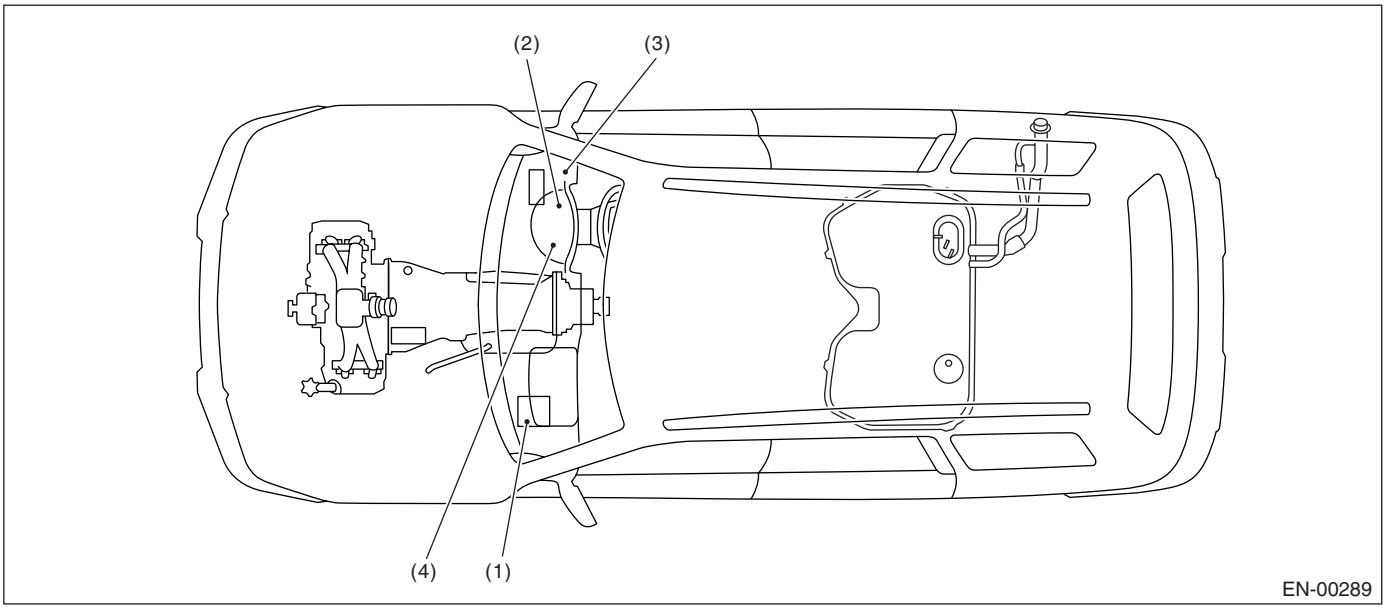
1. ENGINE

• CONTROL MODULE

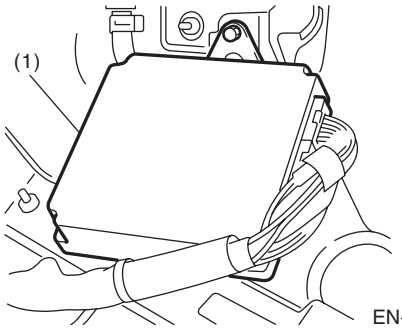
• LHD model



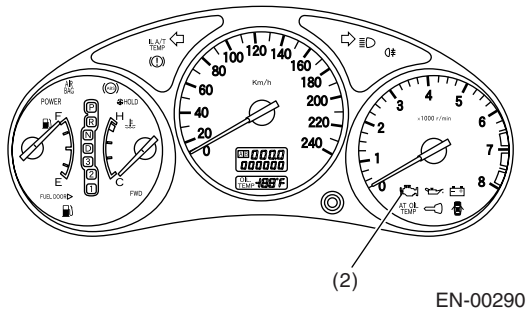
• RHD model



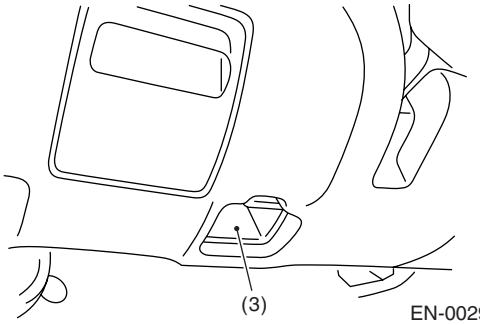
(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Data link connector
(4) Test Mode Connector



EN-00156



EN-00290



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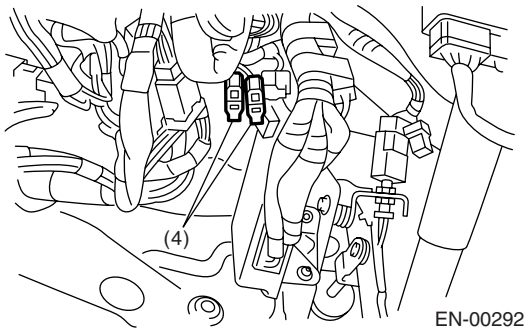
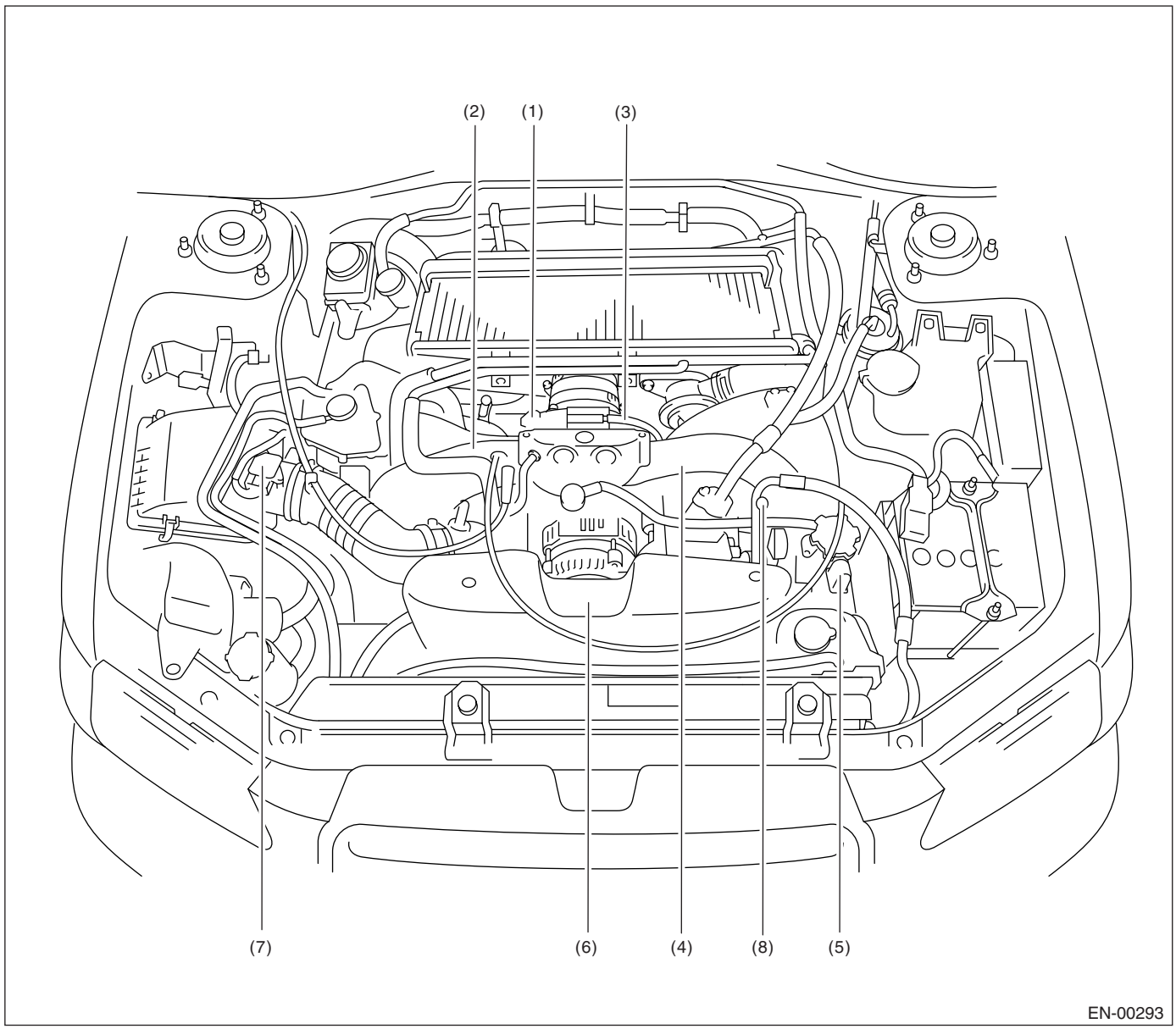


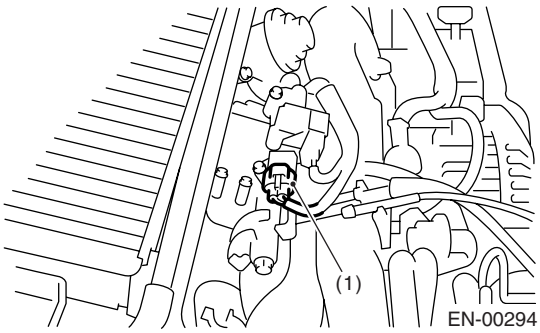
EN-00292

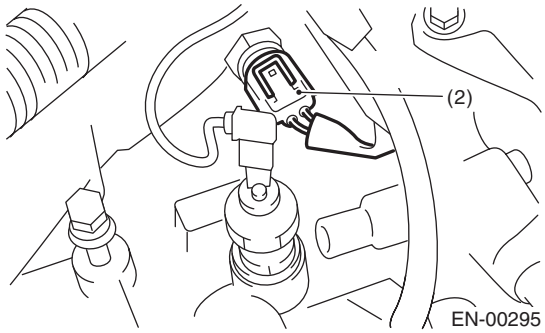
• SENSOR

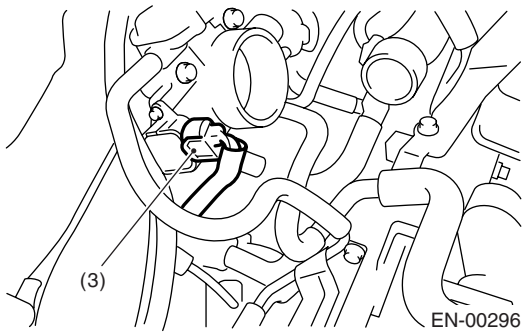


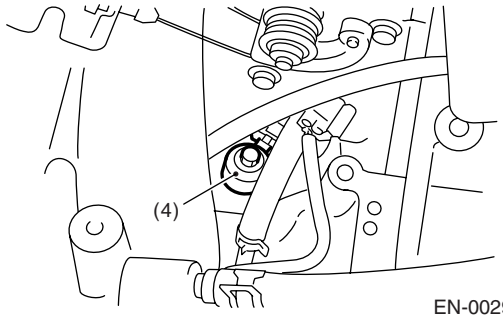
(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Throttle position sensor
(4) Knock sensor
(5) Camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve position sensor

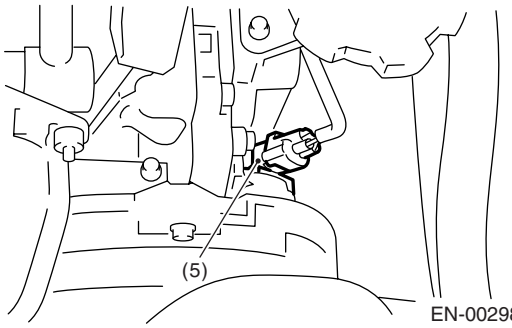
Electrical Component Location

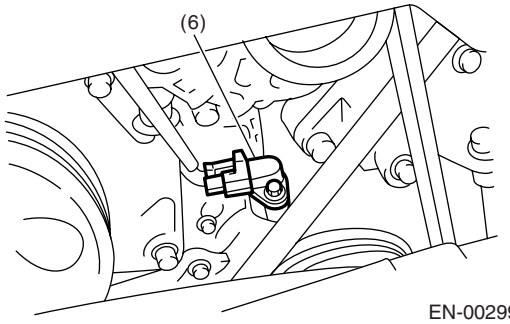


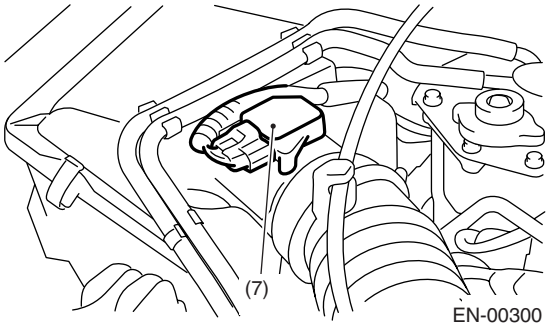


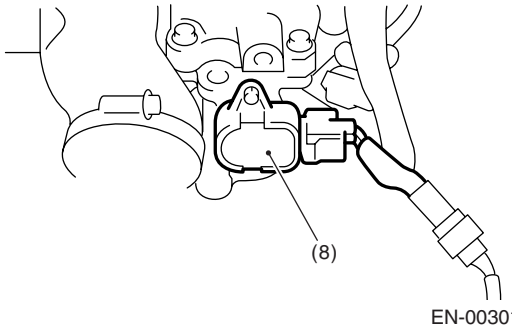


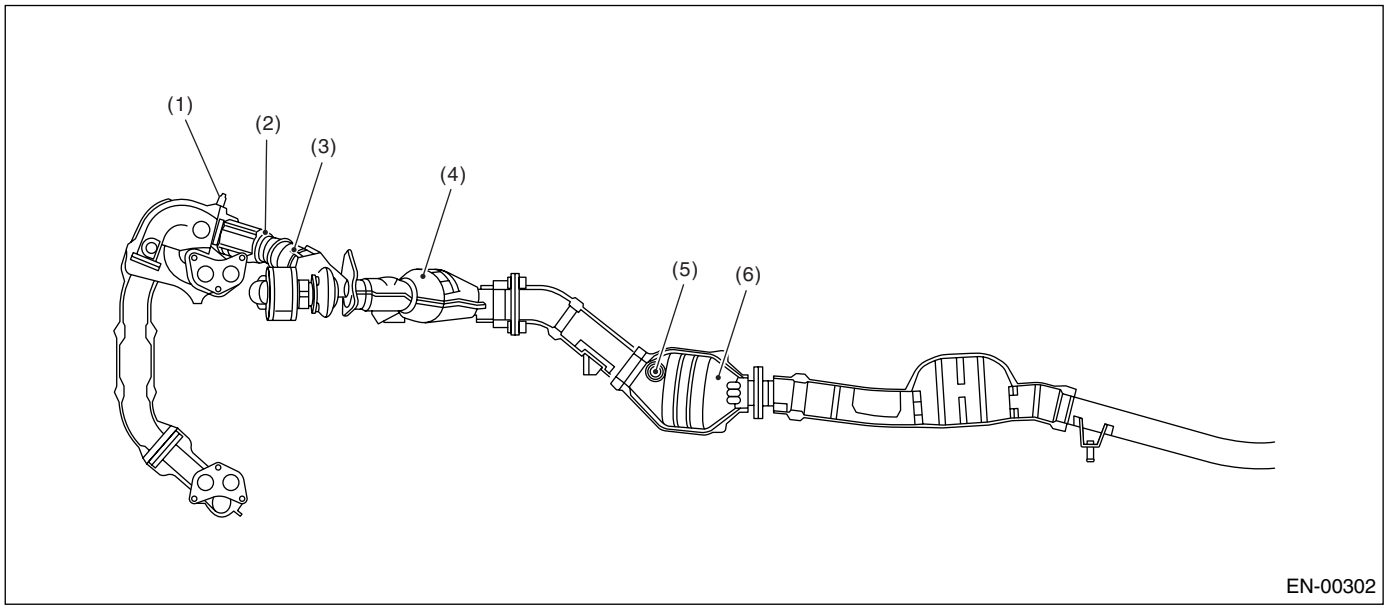




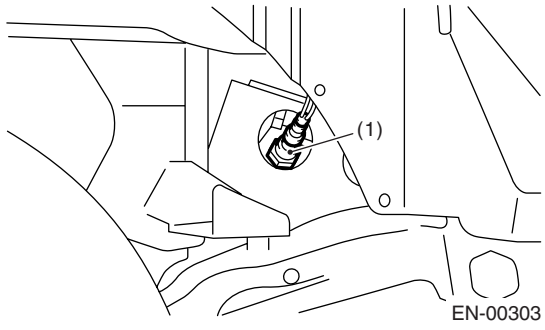




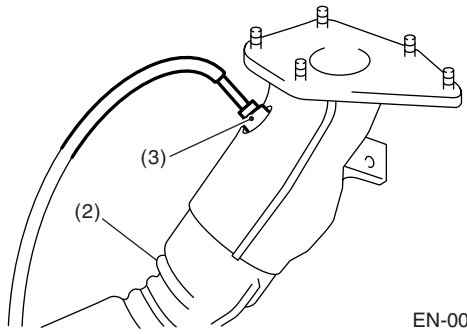




(1) Front oxygen (A/F) sensor
(2) Precatalytic converter
(3) Exhaust gas temperature sensor
(4) Front catalytic converter
(5) Rear Oxygen Sensor
(6) Rear catalytic converter



EN-00303



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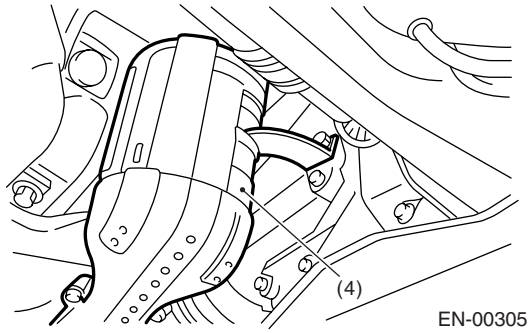

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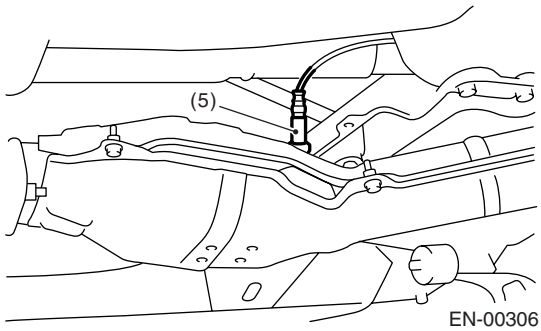

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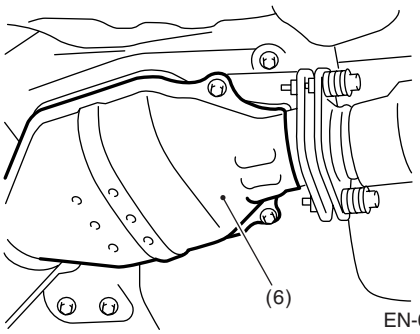
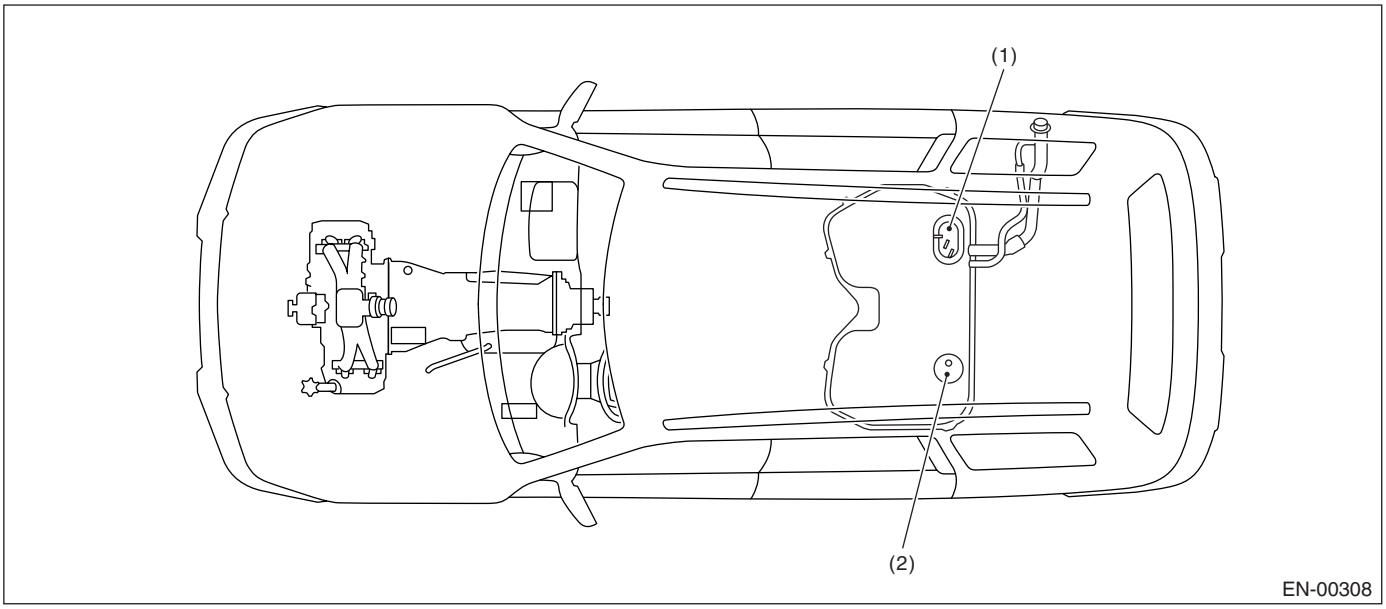
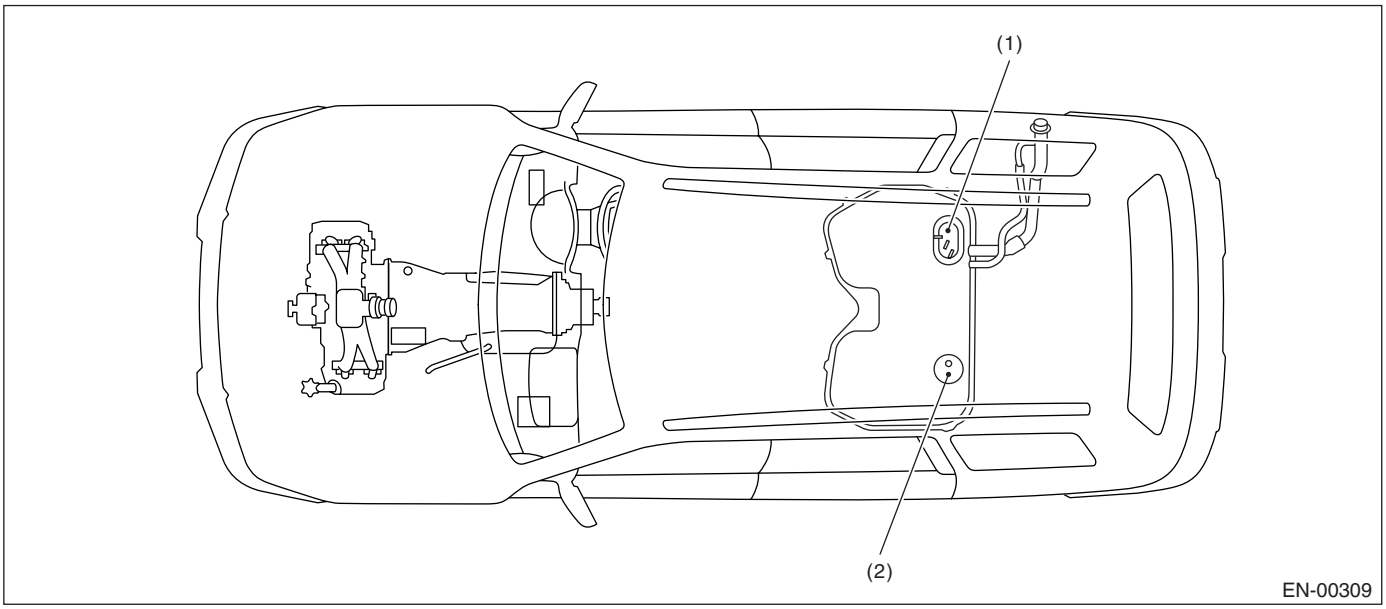


EN-00307

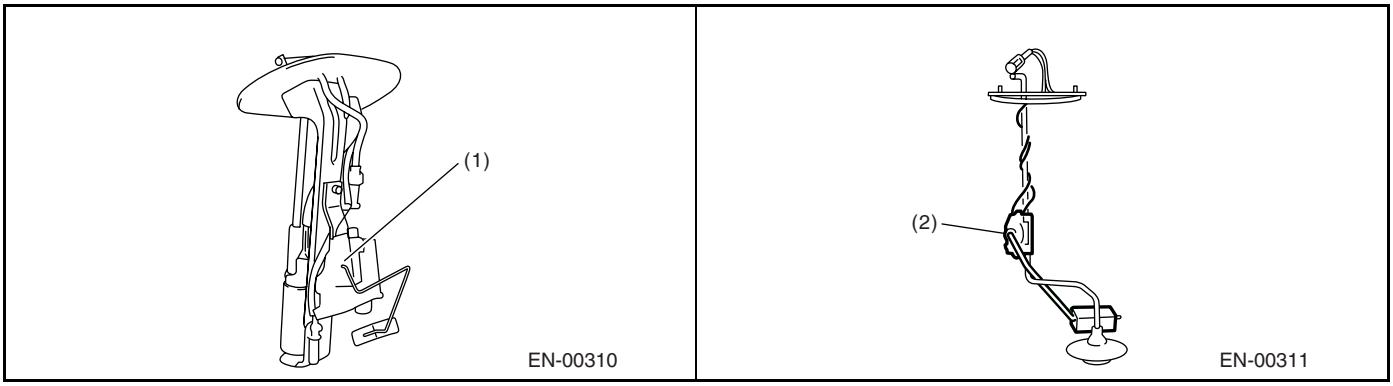
- LHD model



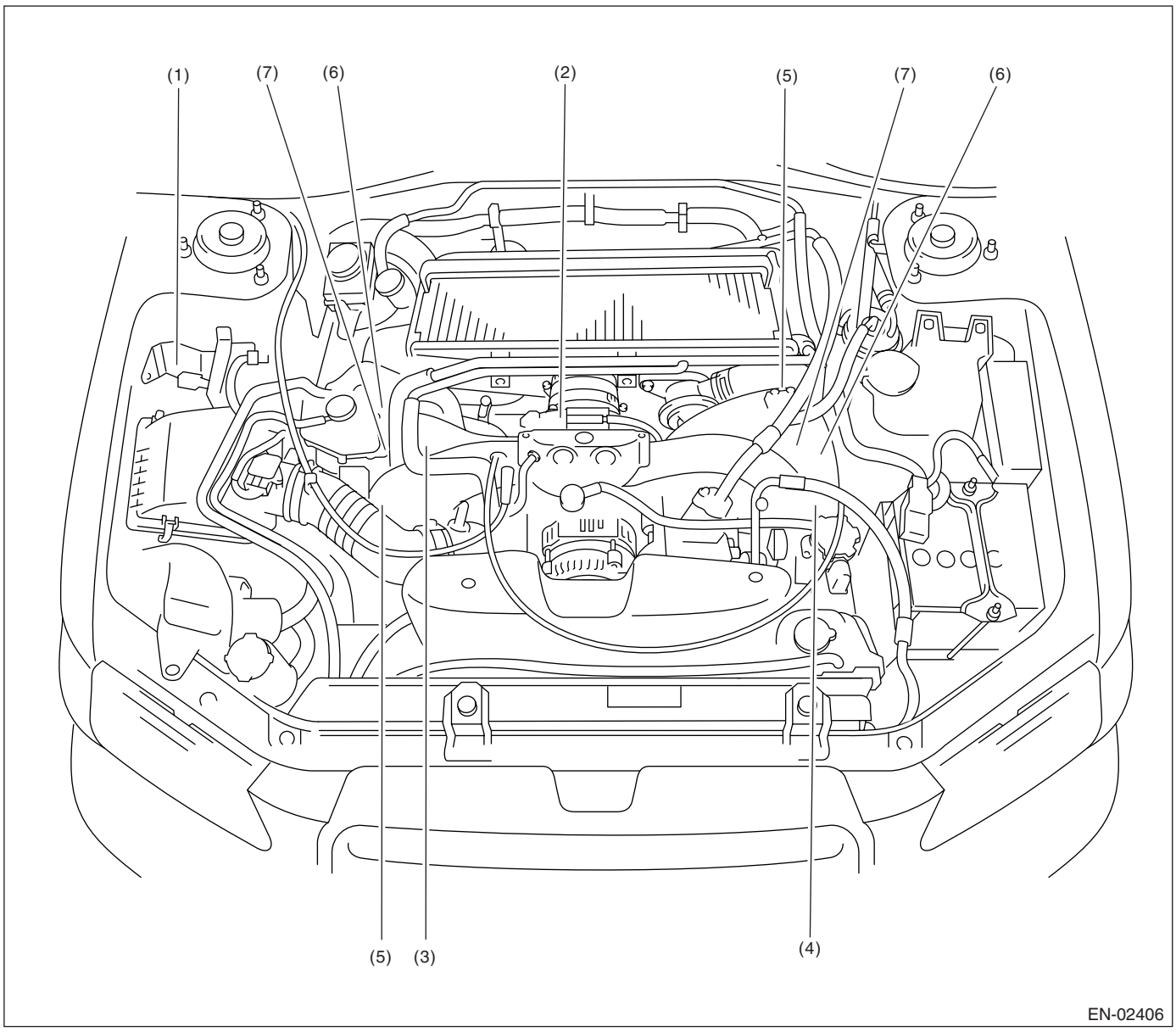
- RHD model



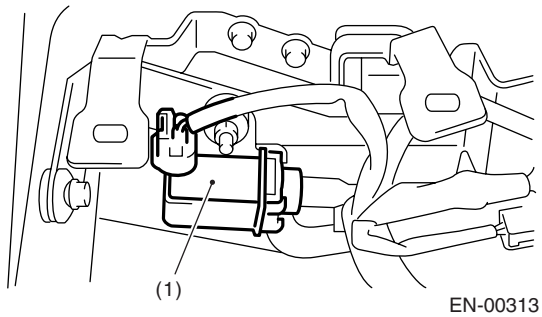
(1) Fuel level sensor (2) Fuel sub level sensor



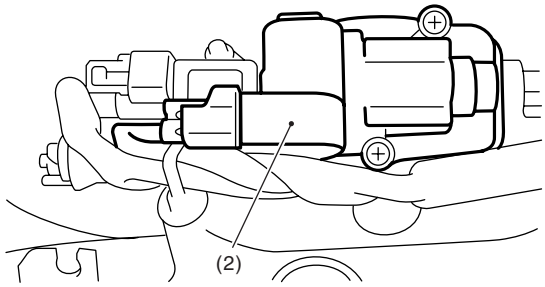
• SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



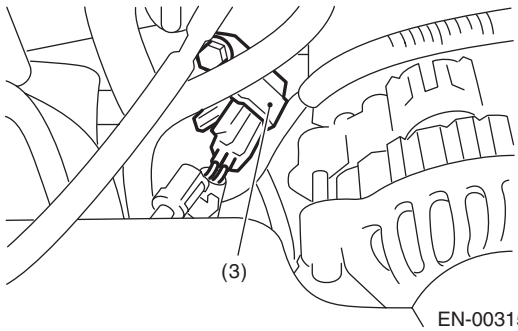
(1) Wastegate control solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) Ignition coil
(5) Tumble generator valve actuator
(6) Oil frow control solenoid valve
(7) Injector



EN-00313



EN-00314



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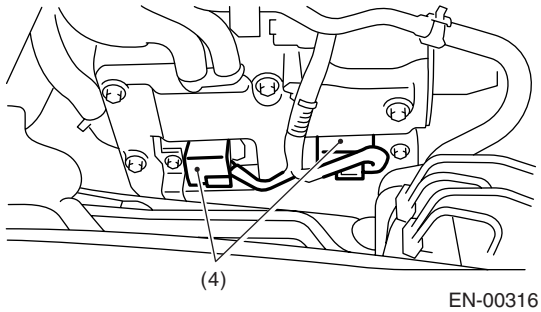

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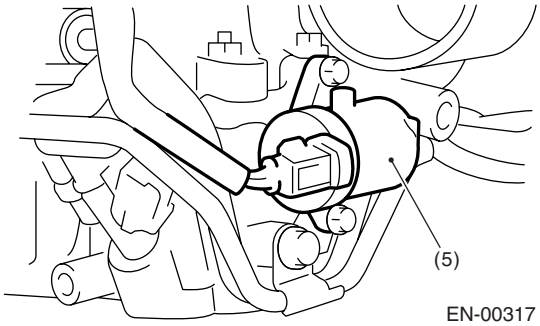
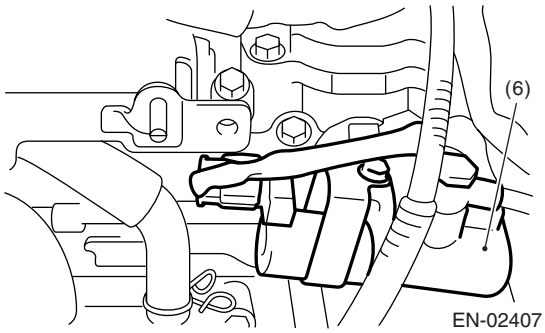
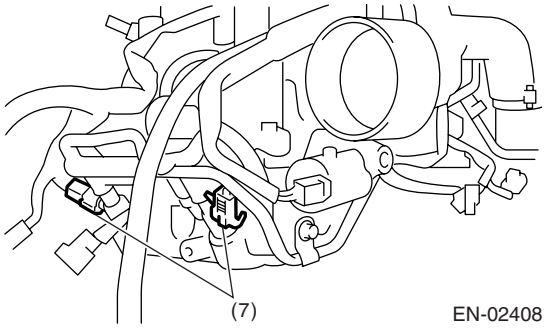


EN-00317



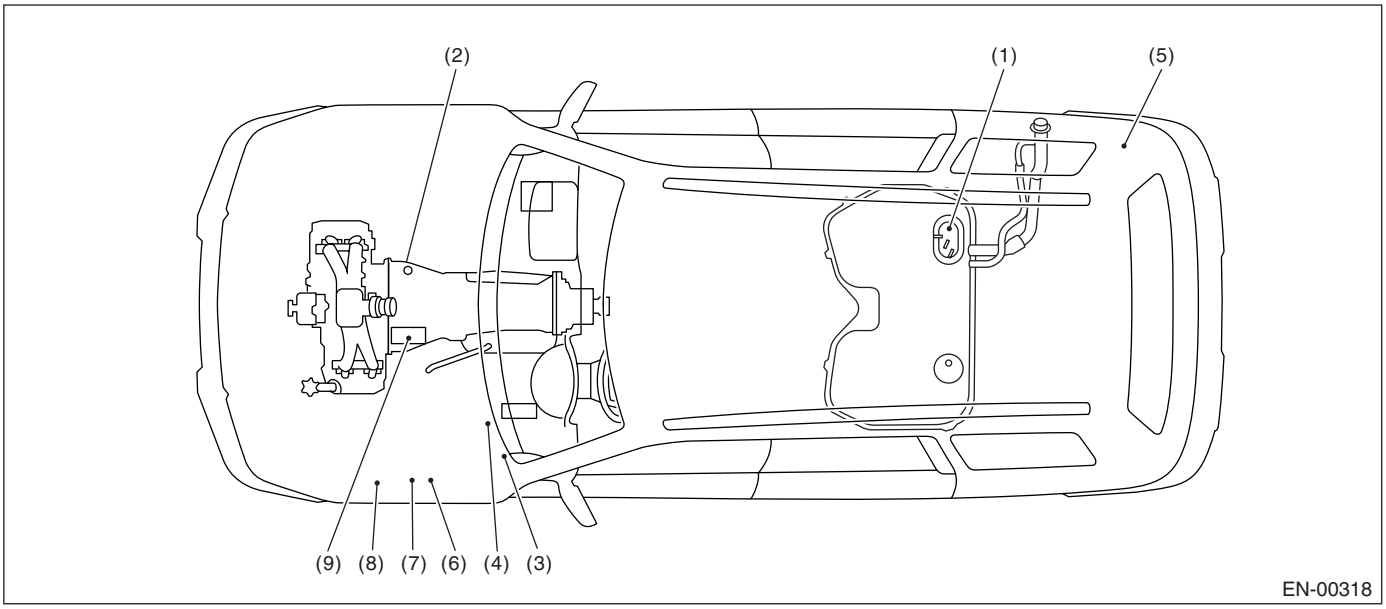
EN-02407



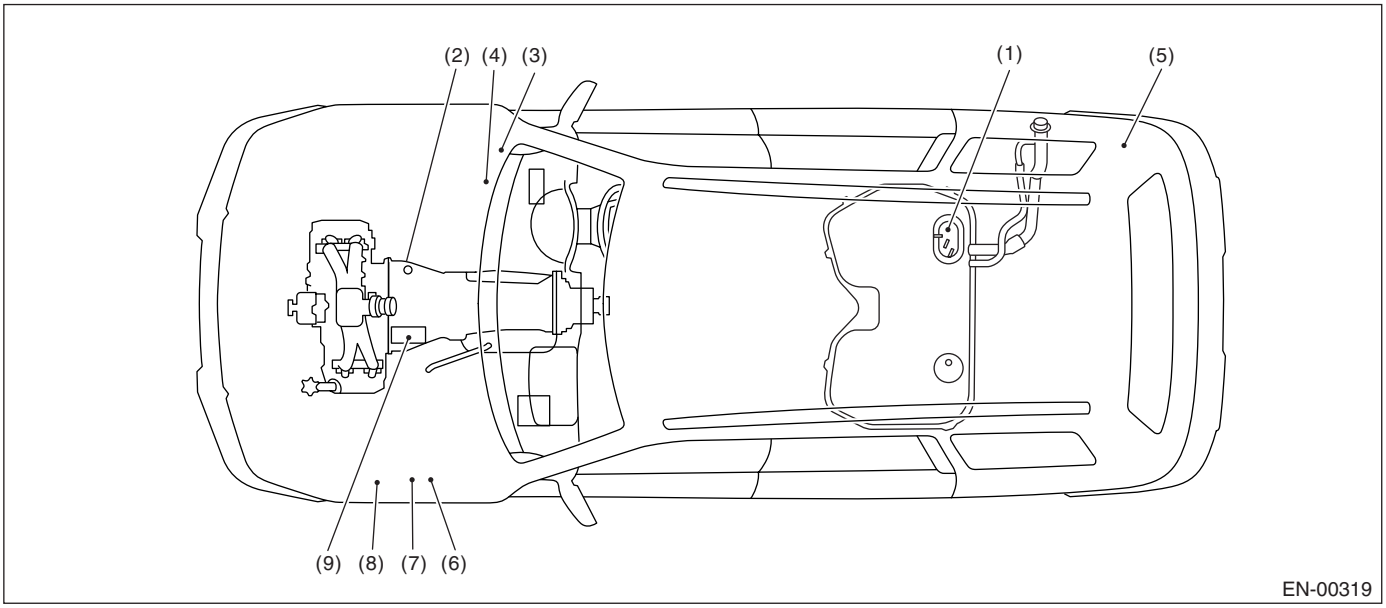
EN-02408

Electrical Component Location

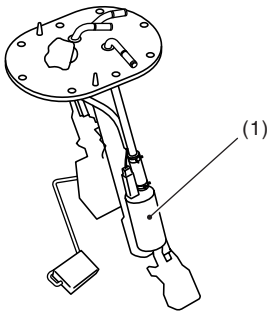
- LHD model



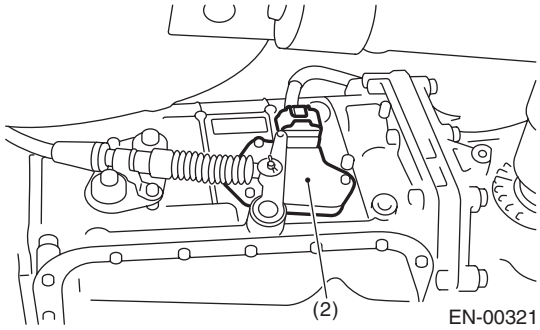
- RHD model



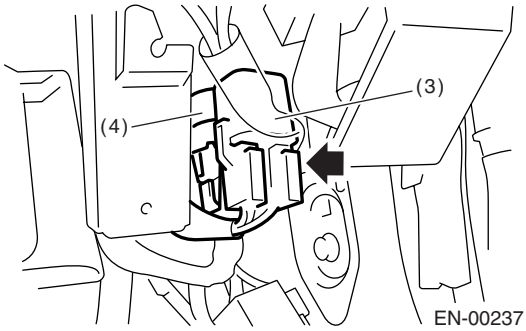
(1) Fuel pump
(2) Inhibitor switch
(3) Main relay
(4) Fuel pump relay
(5) Fuel pump control unit
(6) Radiator main fan relay
(7) Radiator sub fan relay
(8) Radiator fan mode relay
(9) Starter



EN-00320



EN-00321



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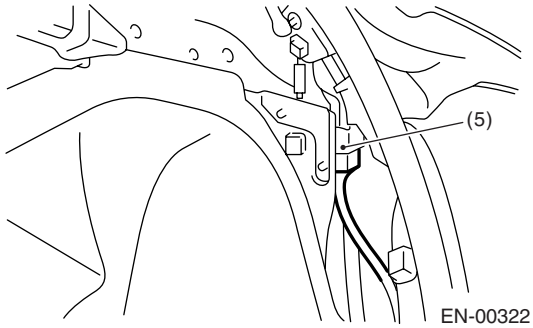

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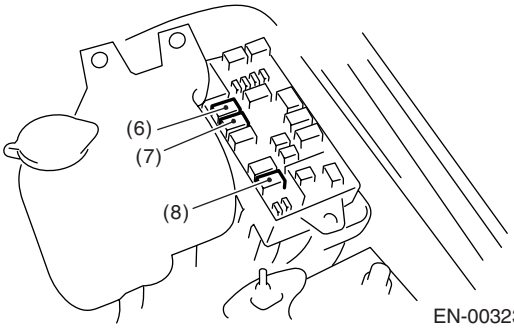

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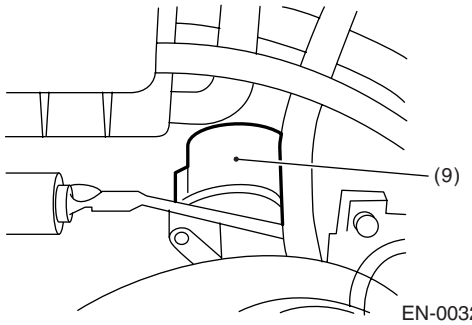
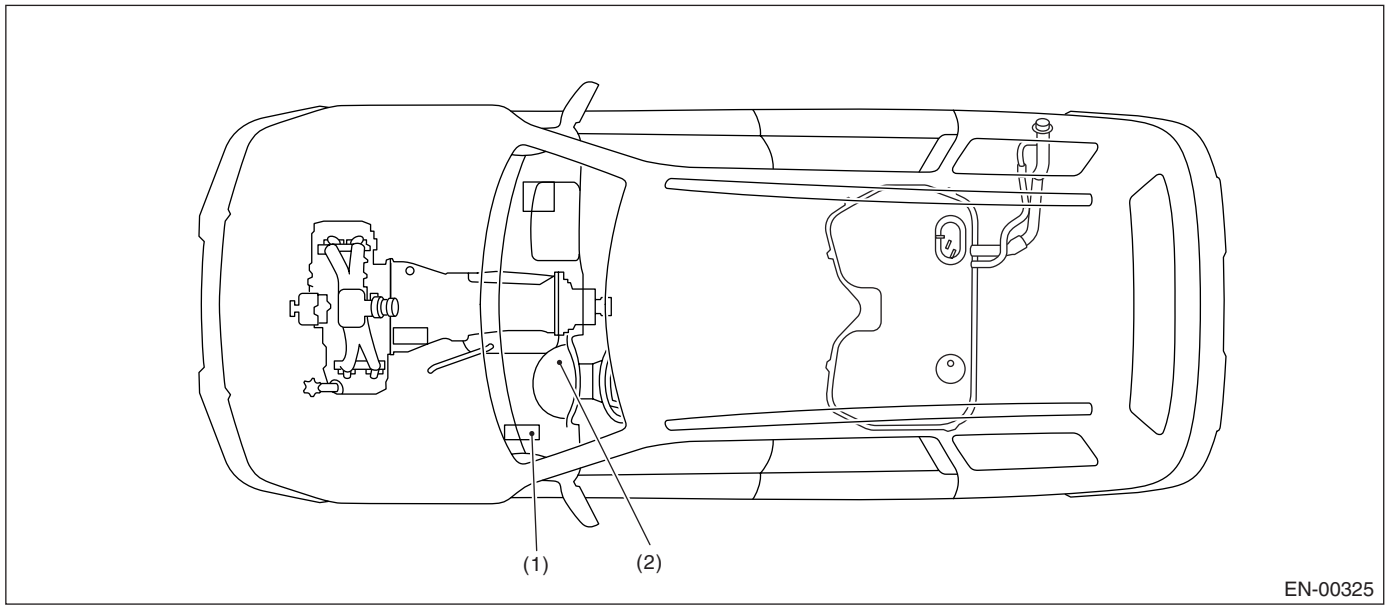


EN-00324

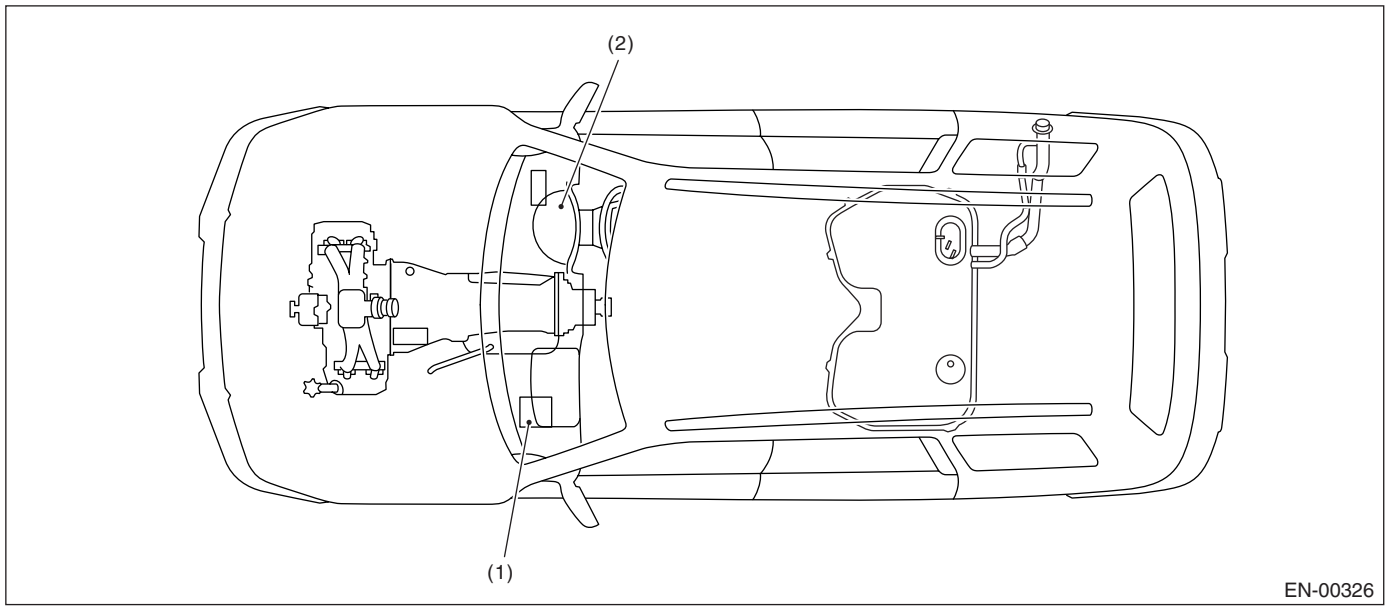
2. TRANSMISSION

• UNIT

• LHD model

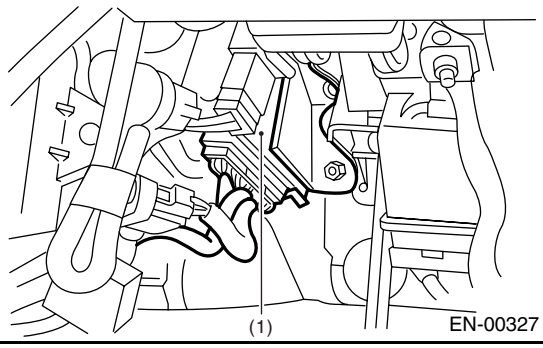


• RHD model

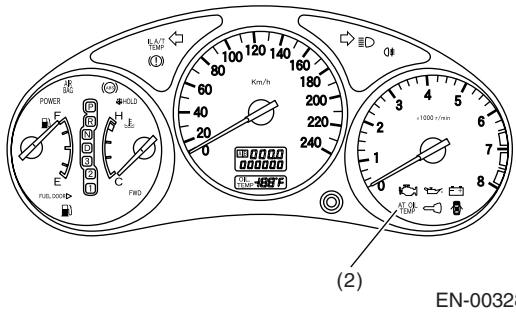


(1) Transmission Control Module (TCM) (for AT model)

(2) AT diagnostic indicator light (for AT model)

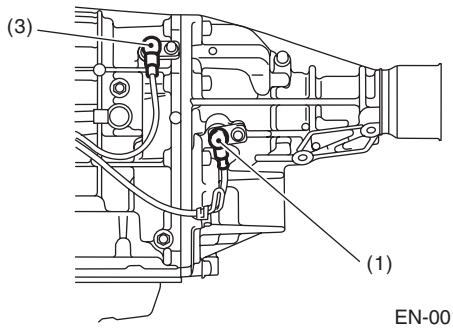


EN-00327

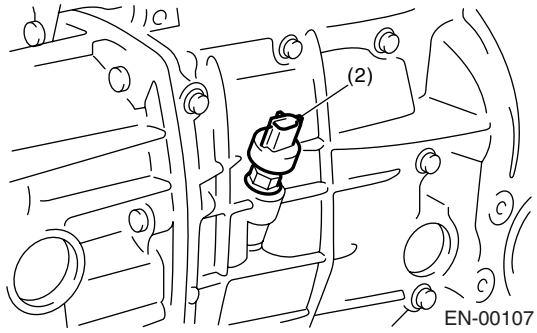


EN-00328

• SENSOR



EN-00184



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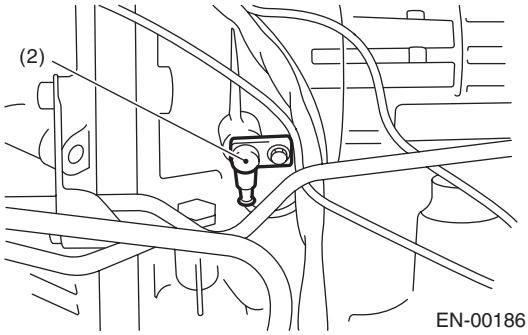
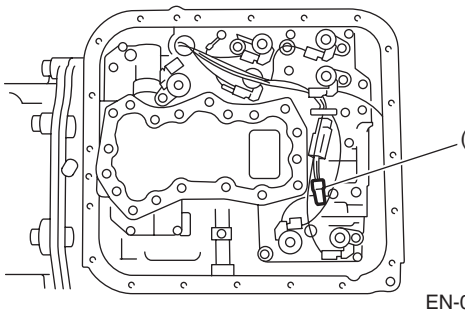
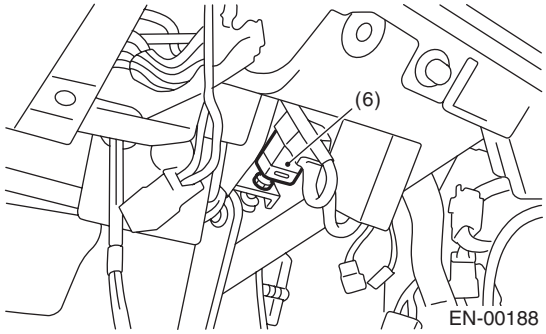


EN-00186



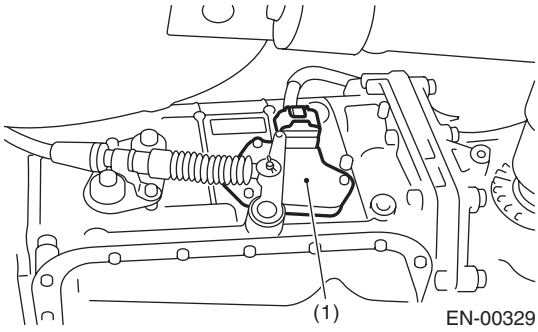
EN-00187

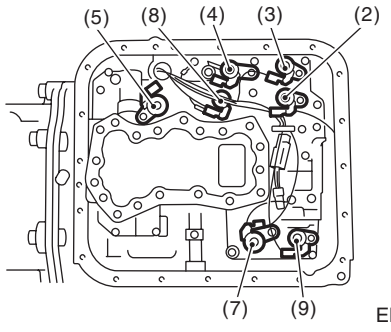


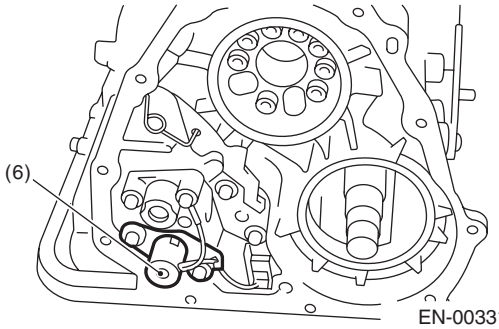
EN-00188

(1) Rear vehicle speed sensor (AT model)
(2) Front vehicle speed sensor (MT model)
(3) Front vehicle speed sensor (AT model)
(4) Torque converter turbine speed sensor (AT model)
(5) ATF temperature sensor (AT model)
(6) Brake light switch

• SOLENOID VALVE & SWITCH (AT MODEL)



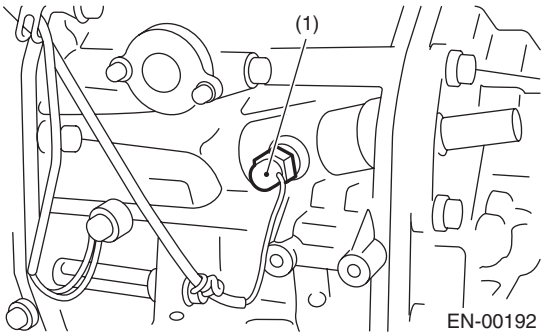




SUBARU.

(1) Inhibitor switch
(2) Shift solenoid valve 1
(3) Shift solenoid valve 2
(4) Line pressure duty solenoid
(5) Lock-up duty solenoid
(6) Transfer duty solenoid
(7) 2-4 brake duty solenoid
(8) Low clutch timing solenoid valve
(9) 2-4 brake timing solenoid valve

• SOLENOID VALVE & SWITCH (MT MODEL)

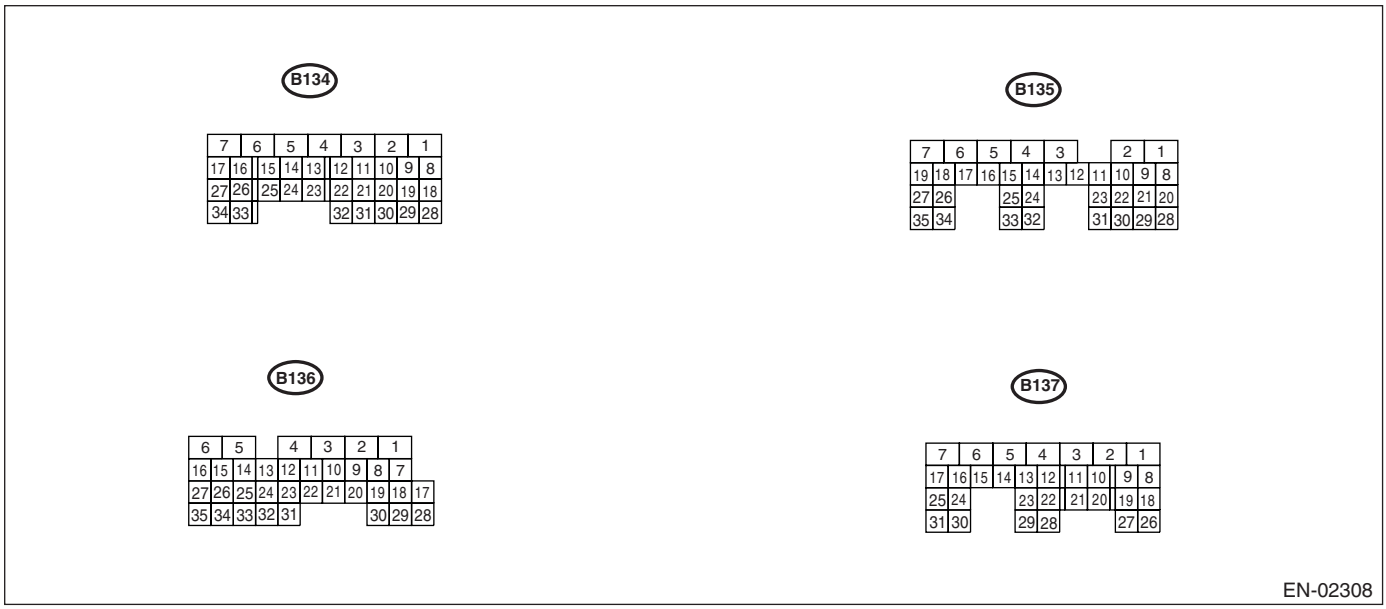


SUBARU.

(1) Neutral Position Switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



DESCRIPTION		Connector No.	Terminal No.	Signal (V)		NOTE
				Ignition SW ON (engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	–7 — +7	Waveform
	Signal (–)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Camshaft position sensor	Signal (+)	B135	11	0	–7 — +7	Waveform
	Signal (–)	B135	23	0	0	—
	Shield	B135	31	0	0	—
Throttle position sensor	Signal	B136	18	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B136	16	5	5	—
	GND (sensors)	B136	35	0	0	—
Rear Oxygen Sensor	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
	GND (sensors)	B136	35	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	3	0 — 1.0	—	Waveform
	Signal 2	B134	2	0 — 1.0	—	Waveform
Rear oxygen sensor heater signal		B135	2	0 — 1.0	—	Waveform
Engine coolant temperature sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	GND (sensors)	B136	35	0	0	After engine is warmed-up.
Vehicle speed signal		B135	26	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.

Engine Control Module (ECM) I/O Signal

DESCRIPTION		Connector No.	Terminal No.	Signal (V)		NOTE
				Ignition SW ON (engine OFF)	Engine ON (Idling)	
AVCS camshaft position sensor RH	Signal (+)	B135	21	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Waveform
	Signal (–)	B135	29	0	0	—
	Shield	B135	30	0	0	—
AVCS camshaft position sensor LH	Signal (+)	B135	20	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Waveform
	Signal (–)	B135	28	0	0	—
	Shield	B135	30	0	0	—
Generator signal		B134	22	ON: 1, or less OFF: 5 — 6.5	ON: 1, or less OFF: 5 — 6.5	Waveform
Air flow sensor	Signal	B136	23	—	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	GND	B136	31	0	0	—
Intake air temperature sensor signal		B136	13	0.3 — 4.6	0.3 — 4.6	—
Exhaust gas temperature sensor	Signal	B136	24	—	—	—
	GND (sensor)	B136	35	0	0	—
Tumble generator valve position sensor RH	Signal	B136	27	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—
Tumble generator valve position sensor LH	Signal	B136	26	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—
Tumble generator valve RH (open)		B134	9	0 or 10 — 13	0 or 13 — 14	Waveform
Tumble generator valve RH (close)		B134	8	0 or 10 — 13	0 or 13 — 14	Waveform
Tumble generator valve LH (open)		B134	11	0 or 10 — 13	0 or 13 — 14	Waveform
Tumble generator valve LH (close)		B134	10	0 or 10 — 13	0 or 13 — 14	Waveform
Wastegate control solenoid valve		B134	32	0 or 10 — 13	0 or 13 — 14	—
Starter switch		B137	8	0	0	Cranking: 8 — 14
A/C switch		B137	17	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B137	14	10 — 13	13 — 14	—
Neutral Position Switch		B137	9	ON: 0 OFF: 10 — 13		Switch is ON when gear is in neutral position.
Test Mode Connector		B137	15	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B136	25	2.8	2.8	—
	Shield	B136	33	0	0	—
Back-up power supply		B135	19	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B135	5	10 — 13	13 — 14	—
		B135	6	10 — 13	13 — 14	—

DESCRIPTION		Connector No.	Terminal No.	Signal (V)		NOTE
				Ignition SW ON (engine OFF)	Engine ON (Idling)	
Sensor power supply		B136	16	5	5	—
Oil flow control solenoid valve RH	Signal (+)	B134	18	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	28	0	0	—
Oil flow control solenoid valve LH	Signal (+)	B134	19	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	29	0	0	—
Ignition control	#1	B135	18	0	13 — 14	Waveform
	#2	B135	17	0	13 — 14	Waveform
	#3	B135	16	0	13 — 14	Waveform
	#4	B135	15	0	13 — 14	Waveform
Fuel injector	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal	B134	27	0 or 13 — 14	0 or 13 — 14	Waveform
Fuel pump control unit	Diagnostic signal	B137	28	10 — 13	13 — 14	Waveform
	Control signal	B135	27	0 or 5	0 or 5	—
A/C relay control		B135	33	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B135	25	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B135	24	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	Model with A/C
Malfunction indicator light		B134	17	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B134	23	—	0 — 13, or more	Waveform
Purge control solenoid valve		B134	14	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	Waveform
Manifold absolute pressure sensor	Signal	B136	22	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B136	16	5	5	
	GND (sensors)	B136	35	0	0	
Fuel level sensor		B136	20	0.12 — 4.75	0.12 — 4.75	—
Small light switch		B137	12	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B137	11	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B137	10	10 — 13	ON: 0 OFF: 13 — 14	—
Wiper switch		B137	23	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—

Engine Control Module (ECM) I/O Signal

DESCRIPTION	Connector No.	Terminal No.	Signal (V)		NOTE
			Ignition SW ON (engine OFF)	Engine ON (Idling)	
Front oxygen (A/F) sensor signal (+)	B134	33	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)	B134	26	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield	B134	25	0	0	—
SSM/GST communication line	B137	20	Less than 1←→ More than 4	Less than 1←→ More than 4	—
CAN Communication (+)	B137	18	Pulse signal	Pulse signal	
CAN Communication (–)	B137	26	Pulse signal	Pulse signal	
GND (sensor)	B136	35	0	0	—
GND (injector)	B137	7	0	0	—
GND (ignition system)	B135	12	0	0	—
GND (power supply)	B135	1	0	0	—
	B135	4	0	0	—
GND (control system)	B137	1	0	0	—
	B137	2	0	0	—
GND (oxygen sensor heater 1)	B134	7	0	0	—
GND (oxygen sensor heater 2)	B134	6	0	0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Remarks	Specification
Engine load	1.3 — 2.6 (%): Idling
	4.4 — 9.6 (%): 2,500 rpm racing

Measuring condition:
- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C to OFF.
- Turn all accessory switches to OFF.

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

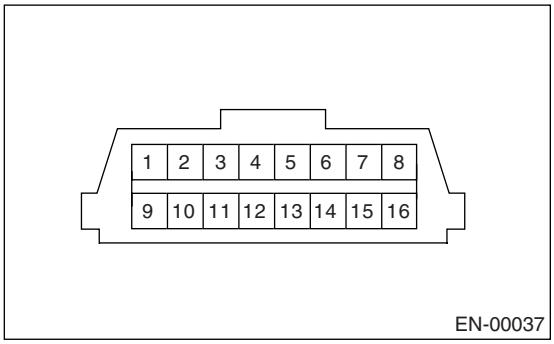
<Ref. to 4AT(diag)-12, Transmission Control Module (TCM) I/O Signal.>

8. Data Link Connector

A: NOTE

This connector is used both for general scan tools and the Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than the general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



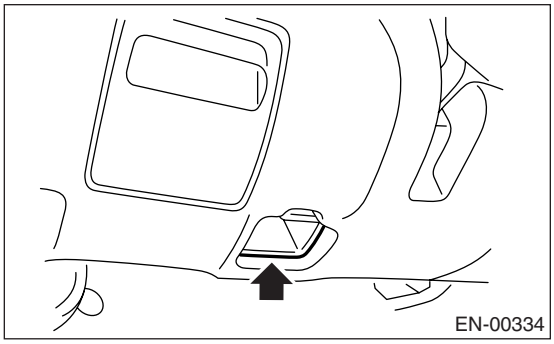
Terminal No.	Remarks	Terminal No.	Remarks
1	Power supply	9	Empty
2	Empty	10	Subaru Select Monitor signal
3	Empty	11	Empty
4	Empty	12	Ground
5	Empty	13	Ground
6	Empty	14	Empty
7	Empty	15	Empty
8	Empty	16	Empty

9. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

1) Prepare a general scan tool required by SAE J1978.
2) Open the cover and connect the general scan tool to the data link connector located in the lower portion of the instrument panel (on the driver's side).



3) Using the general scan tool, call up the DTC and freeze frame data.
General scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information

Read out data according to repair procedures.(For detailed operation procedures, refer to the General Scan Tool Instruction Manual.)

NOTE:
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status Diagnostic support data	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term whole fuel trim	%
0B	Intake manifold absolute pressure	kPa, mmHg
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate of manifold absolute pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor — bank 1	V and %
1C	On-board diagnostic system	—
21	MI illuminating process	—
24	A/F sensor 1 output voltage and short term fuel trim associated with A/F sensor 1	V and %
34	A/F sensor 1 current and lambda	A and —

NOTE:
Refer to general scan tool manufacturer's instruction manual to access current powertrain diagnostic data (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnostic system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term whole fuel trim	%
0B	Intake manifold absolute pressure	kPa, mmHg
0C	Engine speed	rpm
0D	Vehicle speed	km/h
0E	Ignition timing	°
0F	Intake air temperature	°C
10	Amount of intake air	g/s
11	Throttle opening	%

NOTE:
Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODES)

Refer to “Read Diagnostic Trouble Code (DTC)” for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(H4DOTC 2.0)(diag)-39, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (General scan tool trouble diagnostic information).

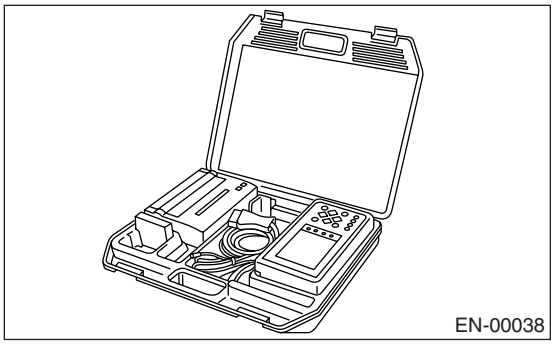
NOTE:
Refer to general scan tool manufacturer’s instruction manual to clear or reset emission-related diagnostic information (MODE $04).

10.Subaru Select Monitor

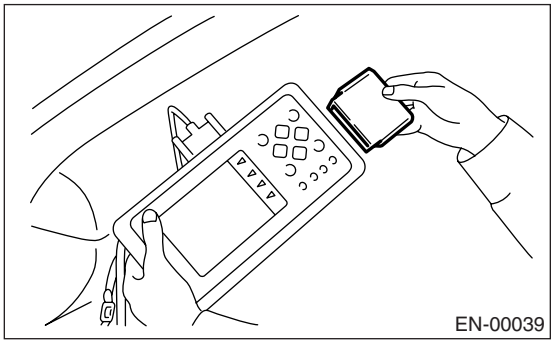
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit.
<Ref. to EN(H4DOTC 2.0)(diag)-8, PREPARATION TOOL, General Description.>

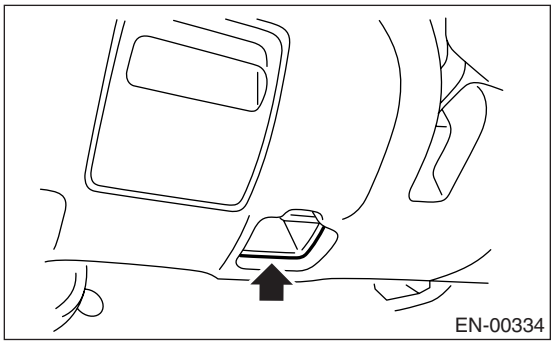


2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC 2.0)(diag)-8, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

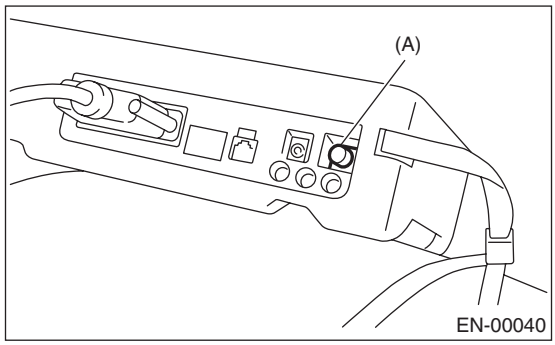
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTC. <Ref. to EN(H4DOTC 2.0)(diag)-39, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTC. <Ref. to EN(H4DOTC 2.0)(diag)-39, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

• A list of the support data is shown in the following table.

Remarks	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Generated duty control signal	ALT Duty	%
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor correction	Knocking Correction	deg
Atmospheric pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg, kPa, inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generated valve position sensor signal (RH side)	TGV Position Sensor R	V
Tumble generated valve position sensor signal (LH side)	TGV Position Sensor L	V
Tumble generated valve drive signal	TGV Drive	OPEN or CLOSE
Fuel level signal	Fuel Level Voltage	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Valve Timing Signal	VVT Adv. Ang. amount R	deg
Valve Timing Signal	VVT Adv. Ang. amount L	deg
Oil flow control solenoid valve signal	OCV Duty R	%
Oil flow control solenoid valve signal	OCV Duty L	%
Oil flow control solenoid valve current	OCV current R	mA
Oil flow control solenoid valve current	OCV Current L	mA
AT/MT identification signal	AT Vehicle ID Signal	AT or MT
Test Mode Signal	Test Mode Signal	ON or OFF
Load switch signal	Electric Load Signal	ON or OFF
Ignition switch signal	Ignition Switch	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF

Remarks	Display	Unit of measure
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear Oxygen Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Tumble generated valve output signal	TGV Output	ON or OFF
Exhaust temperature signal	Exhaust Gas Temperature	°C
Estimated cumulative driving distance	Odd Meter	km
Roughness Monitor for #1 cylinder	Roughness Monitor #1	—
Roughness Monitor for #2 cylinder	Roughness Monitor #2	—
Roughness Monitor for #3 cylinder	Roughness Monitor #3	—
Roughness Monitor for #4 cylinder	Roughness Monitor #4	—
Wiper switch signal	Wiper Switch	ON or OFF
A/C middle pressure switch signal	A/C Mid Pressure Switch	ON or OFF
AT retard angle demand signal	Retard Signal from AT	ON or OFF
AT fuel cut demand signal	Fuel Cut Signal from AT	ON or OFF

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

5. READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» screen, select the {Current Data Display/Save}, and then press the [YES] key.
6) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Description	Display	Unit of measure
Number of diagnostic code	Number of Diag. Code	—
Condition of malfunction indicator light	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heating-type catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	No support
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	Oxygen Heater Diagnosis	Complete or incomplete
Test of EGR system	EGR system	No support

Description	Display	Unit of measure
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
Rear oxygen sensor signal	Oxygen Sensor #11	—
Rear oxygen sensor signal	Oxygen Sensor #12	—
Malfunction indicator light illuminating process	Lighted MI Lamp History	—
A/F sensor output signal (voltage)	A/F sensor #11	V
A/F lambda signal	A/F sensor #11	—
A/F sensor lambda signal	A/F sensor #11	—
A/F sensor signal (power supply)	A/F sensor #11	mA

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.

- A list of the support data is shown in the following table.

Description	Display	Unit of measure
Diagnostic code of freeze frame data	Freeze frame data	Diagnostic code
Air fuel ratio control system for bank 1	Fuel system for Bank 1	—
Air fuel ratio control system for bank 2	Fuel System for Bank 2	—
Engine load data	Calculated Load Valve	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display» screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Description	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is input.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control permission signal	Torque Control Permission	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Signal	ON or OFF	When crankshaft position sensor signal is input.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is ON.
Light switch signal	Light Switch	ON or OFF	When small light switch is ON.
Wiper switch signal	Wiper Switch	ON or OFF	When wiper switch is ON.
A/C middle pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When A/C switch is ON.
AT retard angle demand signal	Retard Signal from AT	ON or OFF	When AT retard angle demand signal exists.
AT fuel cut demand signal	Fuel Cut Signal from AT	ON or OFF	When AT fuel cut demand signal exists.
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF	For AT model
Tumble generated valve actuator signal	TGV Output	ON or OFF	When TGV actuator signal is output.
Tumble generated valve drive signal	TGV Drive	OPEN or CLOSE	When TGV operates and valve opens.

NOTE:
For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

8. READ CURRENT DATA FOR AT

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission} and press the [YES] key.
3) Press the [YES] key after displayed the information of transmission type.
4) On the «Transmission Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.
• A list of the support data is shown in the following table.

Description	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
ATF temperature signal	ATF Temp.	°C or °F
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Throttle position sensor power supply	Throttle Sensor Power	V
Turbine revolution signal	Turbine Revolution Speed	rpm
2-4 Brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Stop light switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnostic indicator lamp	Diagnosis Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

11. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» screen, select the {DTC Display}, and then press the [YES] key.
5) On the «Diagnostic Code(s) Display» screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to general scan tool manufacturer's instruction manual to access powertrain diagnostic trouble codes (MODE $03).

12.Inspection Mode

A: OPERATION

Perform the diagnostic on the “Diagnostic Trouble Codes (DTC) List” below.
Refer to the item of drive cycle when perform the diagnostic not on the “Diagnostic Trouble Codes (DTC) List” below. <Ref. to EN(H4DOTC 2.0)(diag)-45, Drive Cycle.>

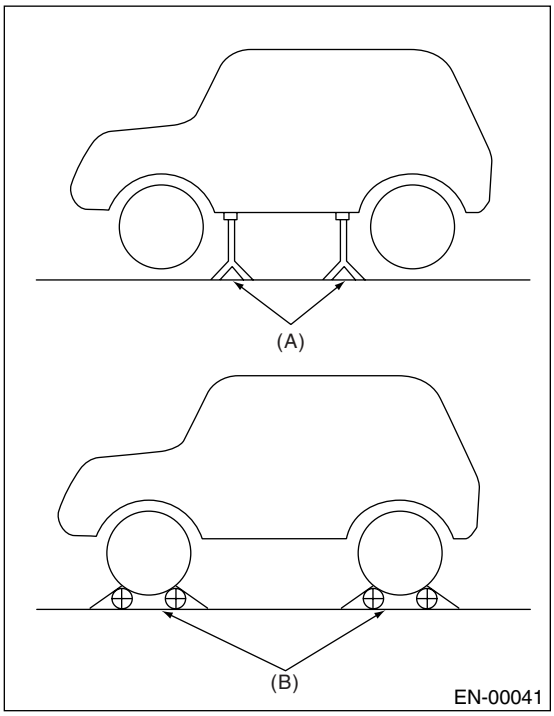
DTC	Item	On condition
P0011	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	—
P0021	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	—
P0031	HO2S Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0032	HO2S Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0037	HO2S Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0038	HO2S Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input	—
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	—
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0171	System Too Lean (Bank 1)	—
P0172	System Too Rich (Bank 1)	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/MSC Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)	—
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)	—
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0509	Idle Control System Circuit High	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Control System Malfunction (Fail-Safe)	—
P0545	Exhaust Gas Temperature Sensor Circuit Low - Bank 1	—
P0565	Cruise Control On Signal	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—

DTC	Item	On condition
P0691	Cooling Fan 1 Control Circuit Low	—
P0692	Cooling Fan 1 Control Circuit High	—
P0700	Transmission Control System (MIL Request)	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P1518	Starter Switch Circuit Low Input	—
P1544	Exhaust Gas Temperature Too High	—
P1560	Back-Up Voltage Circuit Malfunction	—
P1570	ANTENNA	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure (Except Antenna Circuit)	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P1578	Meter Failure	—
P2006	Tumble Generated Valve System 1 (Valve Close)	—
P2007	Tumble Generated Valve System 2 (Valve Close)	—
P2008	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	—
P2009	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	—
P2011	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	—
P2012	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	—
P2016	Tumble Generated Valve Position Sensor 1 Circuit Low	—
P2017	Tumble Generated Valve Position Sensor 1 Circuit High	—
P2021	Tumble Generated Valve Position Sensor 2 Circuit Low	—
P2022	Tumble Generated Valve Position Sensor 2 Circuit High	—
P2088	OCV Solenoid Valve Signal 1 Circuit Malfunction (Open)	—
P2089	OCV Solenoid Valve Signal 1 Circuit Malfunction (Short)	—
P2092	OCV Solenoid Valve Signal 2 Circuit Malfunction (Open)	—
P2093	OCV Solenoid Valve Signal 2 Circuit Malfunction (Short)	—
P2228	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	—
P2229	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	—
P2503	Generator Circuit Low Input	—
P2504	Generator Circuit High Input	—

1. PREPARATION FOR THE INSPECTION MODE

1) Check battery voltage is more than 12 V and fuel remains half [20 to 40 ℓ (5.3 to 10.6 US gal, 4.4 to 8.8 Imp gal)].
2) Lift-up the vehicle using a garage jack and place it on rigid racks or drive the vehicle onto free rollers.

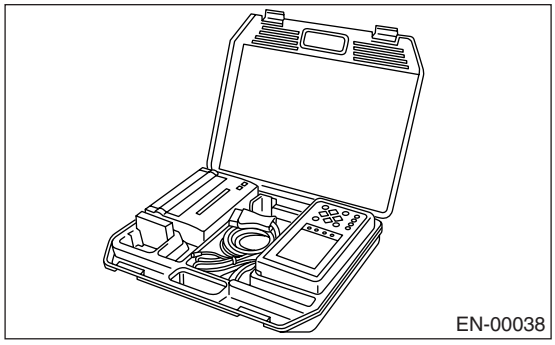
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



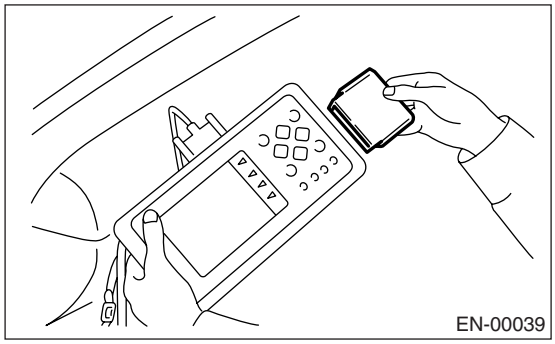
(A) Rigid rack
(B) Free rollers

2. SUBARU SELECT MONITOR

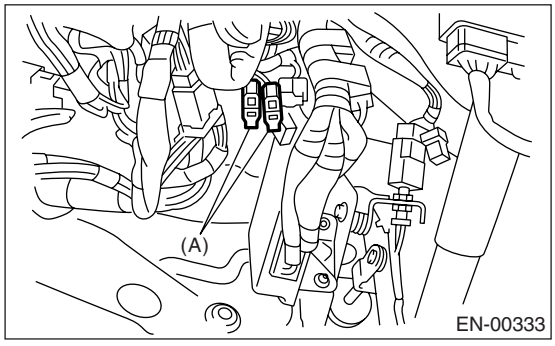
1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC 2.0)(diag)-47, Clear Memory Mode.>
2) Idle the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC 2.0)(diag)-8, PREPARATION TOOL, General Description.>



4) Connect the diagnostic cable to Subaru Select Monitor.
5) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC 2.0)(diag)-8, PREPARATION TOOL, General Description.>



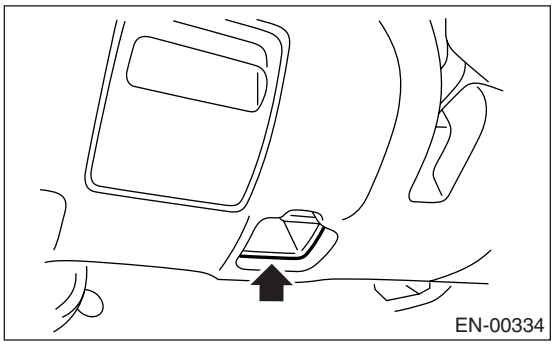
6) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

7) Connect the Subaru Select Monitor to data link connector.

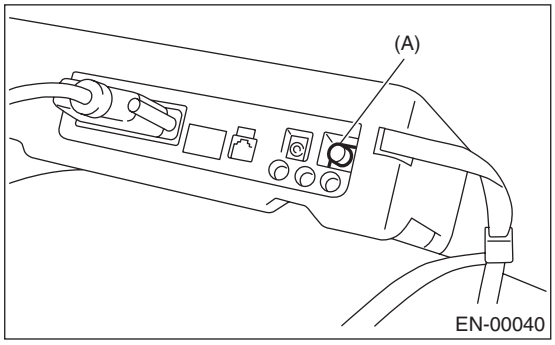
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



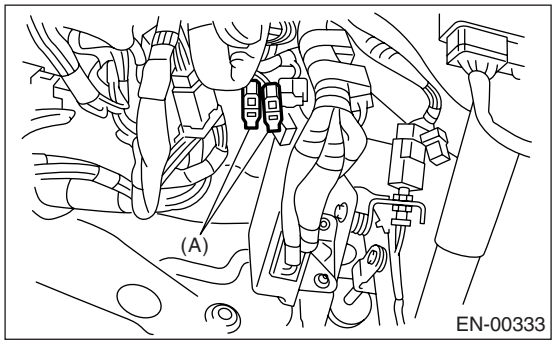
(A) Power switch

9) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
11) Press the [YES] key after the information of engine type was displayed.
12) On the «Engine Diagnosis» screen, select the {D Check} and press the [YES] key.
13) When the "Perform D Check?" is shown on the screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.
If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnostic is finished, perform the ABS memory clearance procedure of self-diagnosis function.

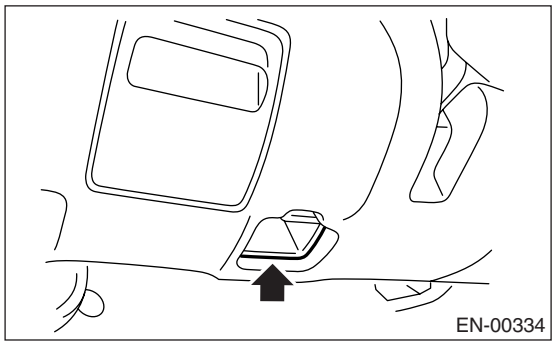
3. GENERAL SCAN TOOL

1) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC 2.0)(diag)-47, Clear Memory Mode.>
2) Idle the engine.
3) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



4) Connect the general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



5) Start the engine.

NOTE:
• Ensure the select lever is placed in the “P” range before starting.(AT model)
• Depress the clutch pedal when starting the engine.(MT model)

6) Using the selector lever or shift lever, turn the “P” range switch and the “N” range switch to ON.
7) Depress the brake pedal to turn the brake switch ON.(AT model)
8) Keep the engine speed in the 2,500 — 3,000 rpm range for 40 seconds.
9) Place the select lever or shift lever in the “D” range (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnostic is finished, perform the ABS memory clearance procedure of self-diagnosis function.

10) Using the general scan tool, check DTC(s) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>

13.Drive Cycle

A: OPERATION

There are three driving patterns on diagnostic. Following trouble can be diagnosed with driving specified patterns. After repair the following trouble, be sure to check that the trouble is cleared correctly by the driving specified patterns.

1. PREPARATION FOR DRIVE CYCLE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC 2.0)(diag)-47, Clear Memory Mode.>
3) Separate the test mode connector.

NOTE:
• Be sure to perform the diagnostic after idling from starting the cooled engine except when the engine coolant temperature is specified.
• Perform the diagnostic twice when the DTC is marked * and after the completion of first diagnostic, stop the engine and perform the second diagnostic in the same condition.

2. DRIVE THE VEHICLE 20 MINUTES AT THE SPEED OF 80 KM/H (50 MPH), AND THEN IDLE THE ENGINE 1 MINUTE.

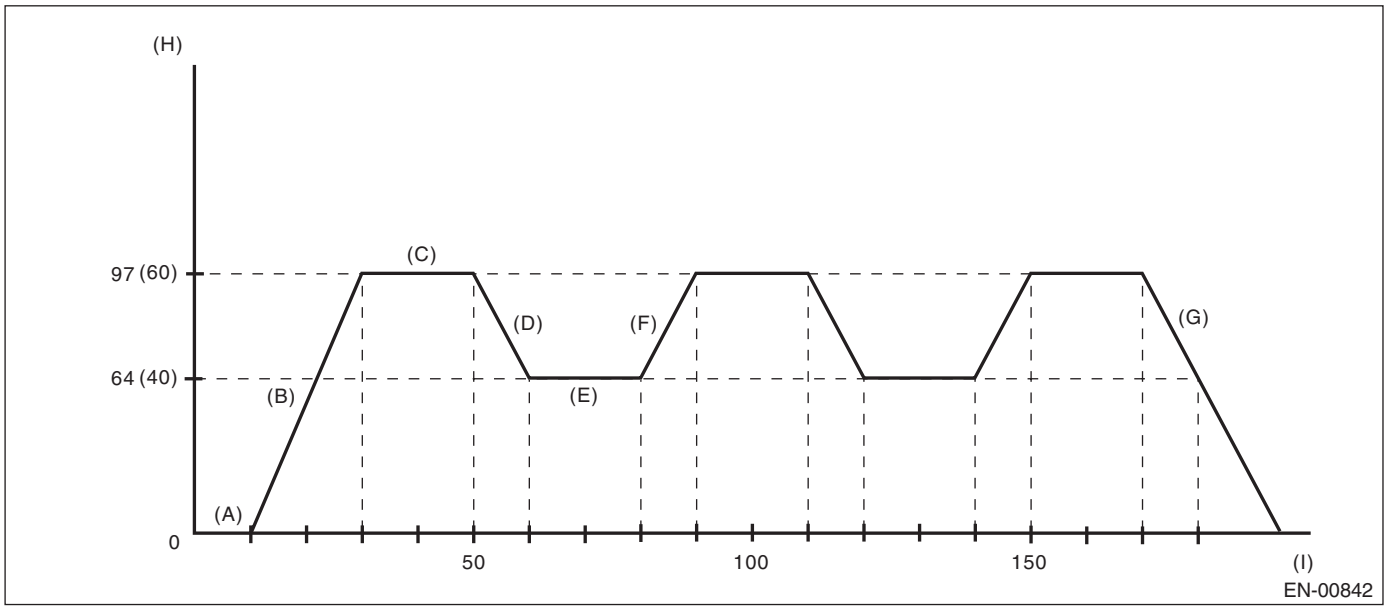
DTC	Item	On condition
*P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	Engine coolant temperature at start is less than 20°C (68°F)
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P0546	Exhaust Gas Temperature Sensor Circuit High - Bank 1	—

3. 10 MINUTES IDLING

NOTE:
Drive the vehicle more than 10 km/h (6 MPH) before diagnostic.

DTC	Item	On condition
P0508	Idle Control System Circuit Low	—

4. DRIVE THE VEHICLE WITH FOLLOWING DRIVE PATTERNS



(A) Run the engine at idle for more than 10 seconds.
(B) Accelerate the vehicle to 97 km/h (60 MPH) within 20 seconds.
(C) Drive the vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Slowdown the vehicle to 64 km/h (40 MPH) with throttle fully closed condition.
(E) Drive the vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate the vehicle to 97 km/h (60 MPH) within 10 seconds.
(G) Stop the vehicle with throttle fully closed condition.
(H) Vehicle speed km/h (MPH)
(I) (Sec.)

DTC	Item	On condition
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0244	Turbo/MSC Wastegate Solenoid “A” Range/Performance	—
P0246	Turbo/MSC Wastegate Solenoid “A” High	—
*P0301	Cylinder 1 Misfire Detected	Diagnostic may be completed at once
*P0302	Cylinder 2 Misfire Detected	Diagnostic may be completed at once
*P0303	Cylinder 3 Misfire Detected	Diagnostic may be completed at once
*P0304	Cylinder 4 Misfire Detected	Diagnostic may be completed at once
P1301	Misfire Detected (High Temperature Exhaust Gas)	—
P2004	Tumble Generated Valve System 1 (Valve Open)	Engine coolant temperature at start is –5 — 5°C (–41 — 41°F)
P2005	Tumble Generated Valve System 2 (Valve Open)	Engine coolant temperature at start is –5 — 5°C (–41 — 41°F)

14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {Memory Clear} and press the [YES] key.
5) When the “Done” are shown on the display screen, turn the Subaru Select Monitor to OFF after turning the ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Clear} and press the [YES] key.
6) When the “Perform Diagnostic Code(s) Clear?” is shown on the screen, press the [YES] key.
7) Turn the ignition switch to OFF and then turn the SUBARU SELECT MONITOR to OFF.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

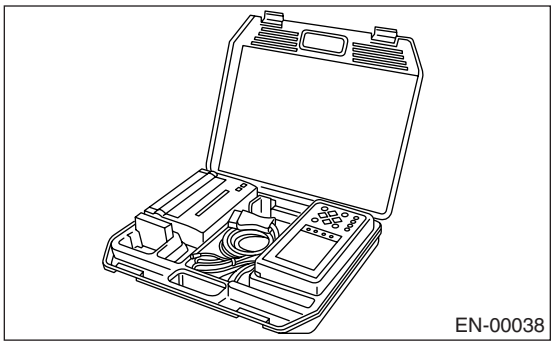
3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the General Scan Tool Instruction Manual.

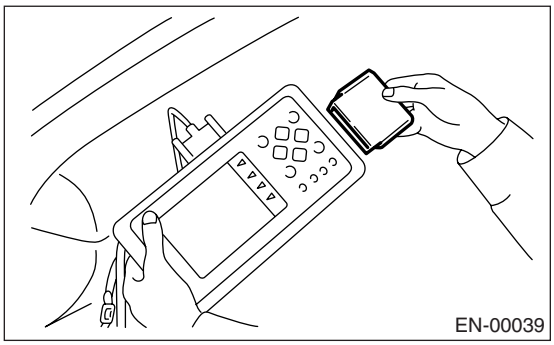
15. Compulsory Valve Operation Check Mode

A: OPERATION

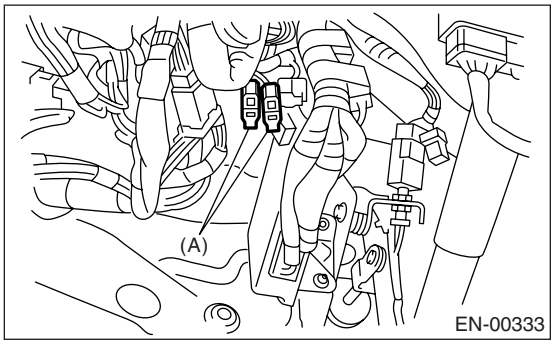
1) Prepare the Subaru Select Monitor kit.
<Ref. to EN(H4DOTC 2.0)(diag)-8, PREPARATION TOOL, General Description.>



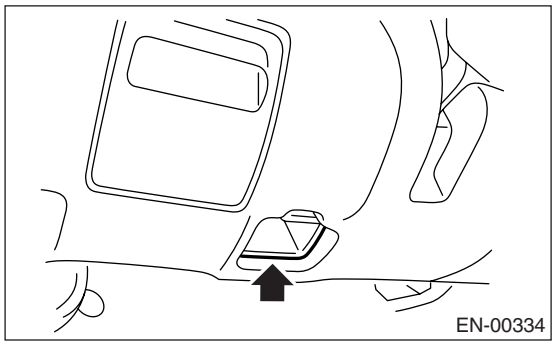
2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor.
<Ref. to EN(H4DOTC 2.0)(diag)-8, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



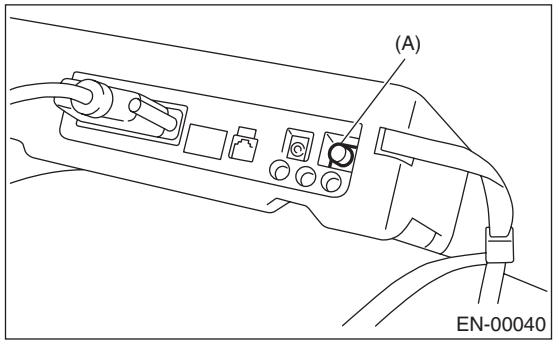
5) Connect the Subaru Select Monitor to data link connector.
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
9) Press the [YES] key after the information of engine type was displayed.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) On the «Actuator ON/OFF Operation» screen, select the desired compulsory actuator and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of the support data is shown in the following table.

Description	Display
Compulsory fuel pump relay operation check	Fuel Pump
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid
Compulsory wastegate control solenoid valve operation check	Wastegate control solenoid

NOTE:

• The following parts will be displayed but not functional.

Display
EGR Solenoid
ASV Solenoid
PCV Solenoid
Vent Control Solenoid
FICD Solenoid
Pressure Switching Solenoid1
Pressure Switching Solenoid2
EXH. Bypass Control Permit Flag
AAI Solenoid
Atmospheric Pressure Switching Solenoid

• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

16.Malfunction Indicator Light

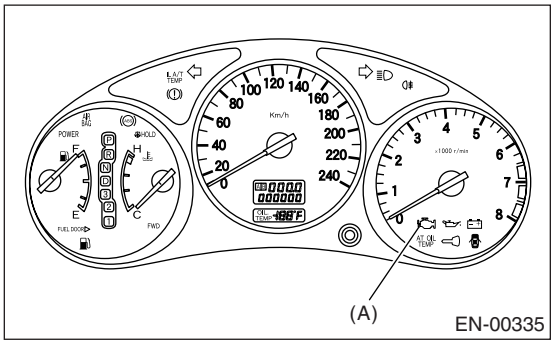
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC 2.0)(diag)-51, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC 2.0)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC 2.0)(diag)-54, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOTC 2.0)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ, Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOTC 2.0)(diag)-57, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ, Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

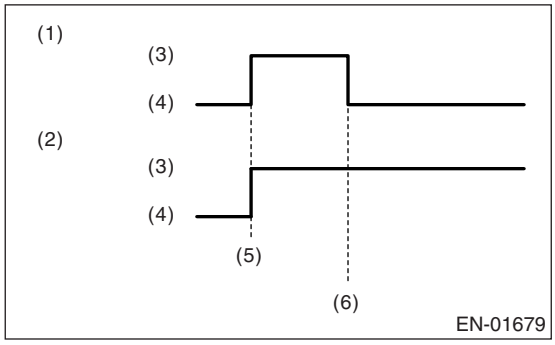
1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform the diagnostic of malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC 2.0)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>



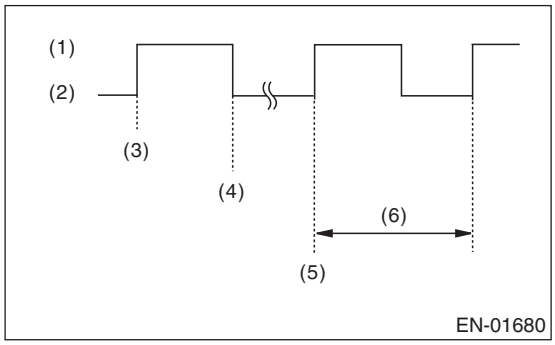
(A) Malfunction indicator light

2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



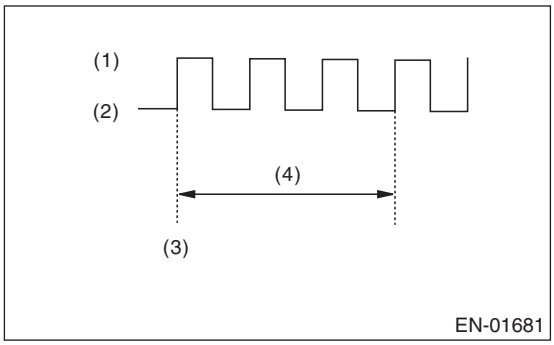
(1) No faulty
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnostic system detects a misfire which could damage the catalyst, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) When the ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

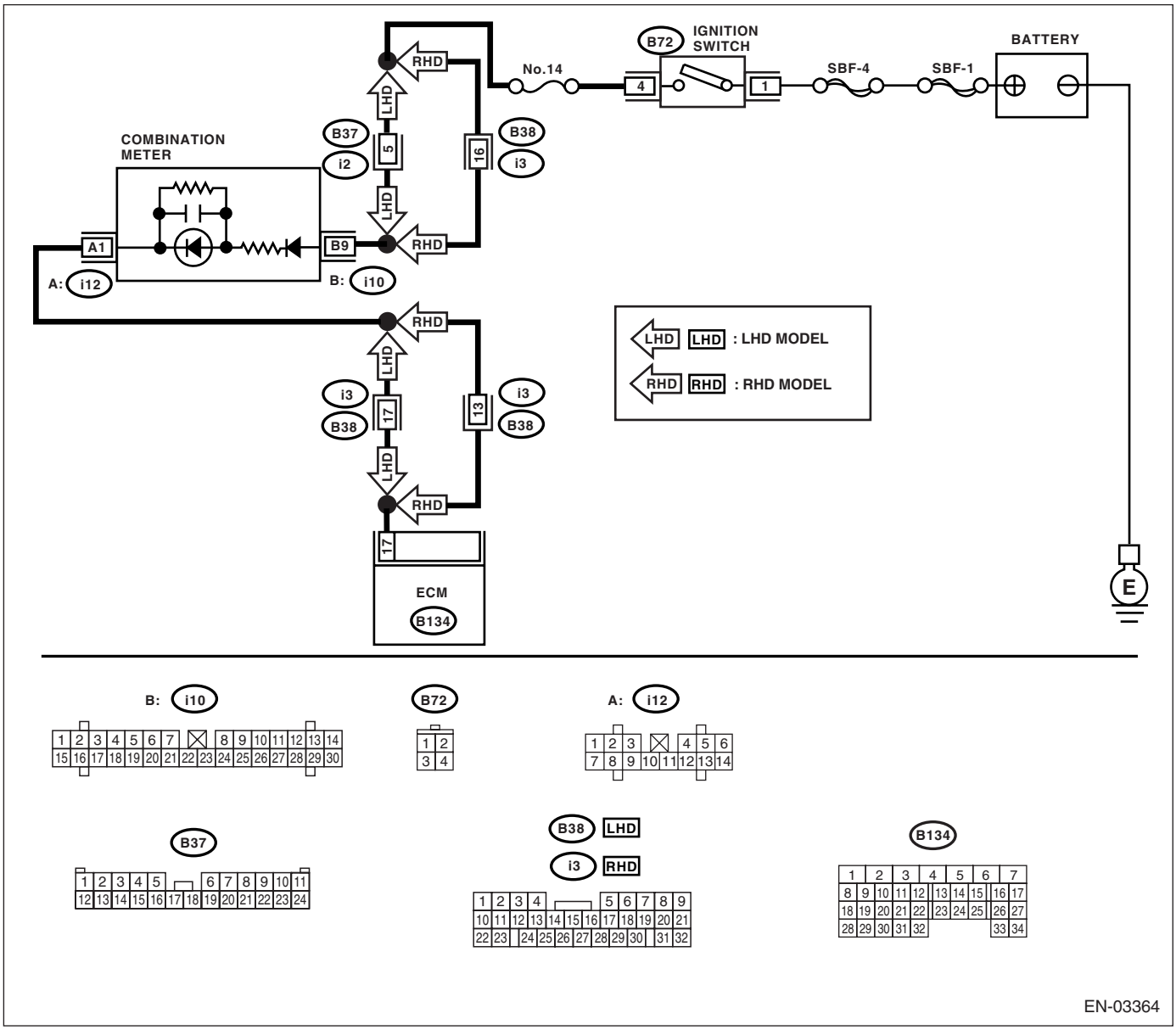
DIAGNOSTIC:

The malfunction indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the malfunction indicator light come on when shaking or pulling the ECM connector and harness?	Repair the poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 17 — (i12) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the board of combination meter. <Ref. to IDI-10, Combination Meter.>	Check the following and repair if necessary. NOTE: • Blown out of fuse (No. 14) • Open or short circuit in harness between fuse (No. 14) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

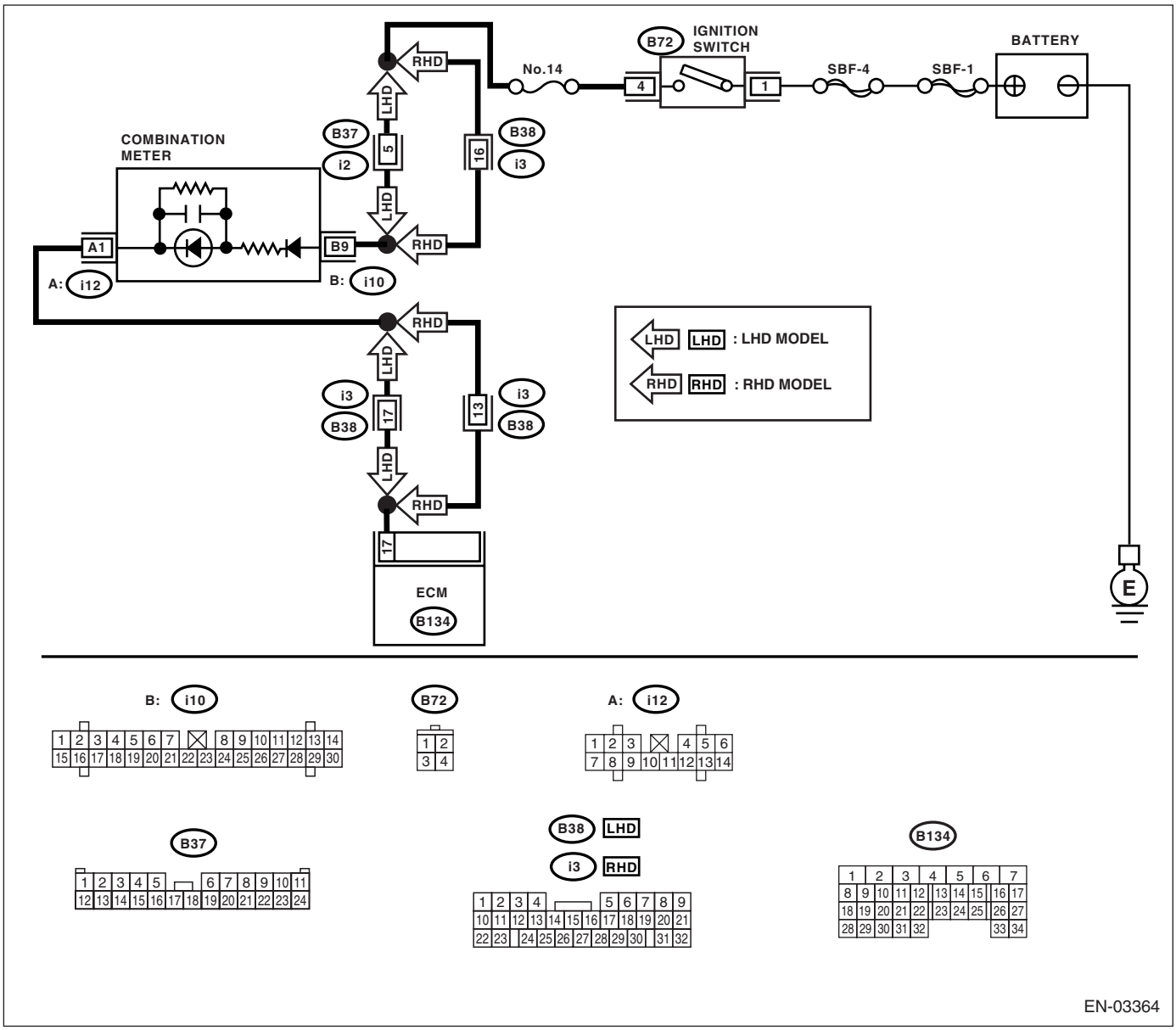
DIAGNOSTIC:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor or general scan tool display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does malfunction indicator light illuminate?	Repair short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz

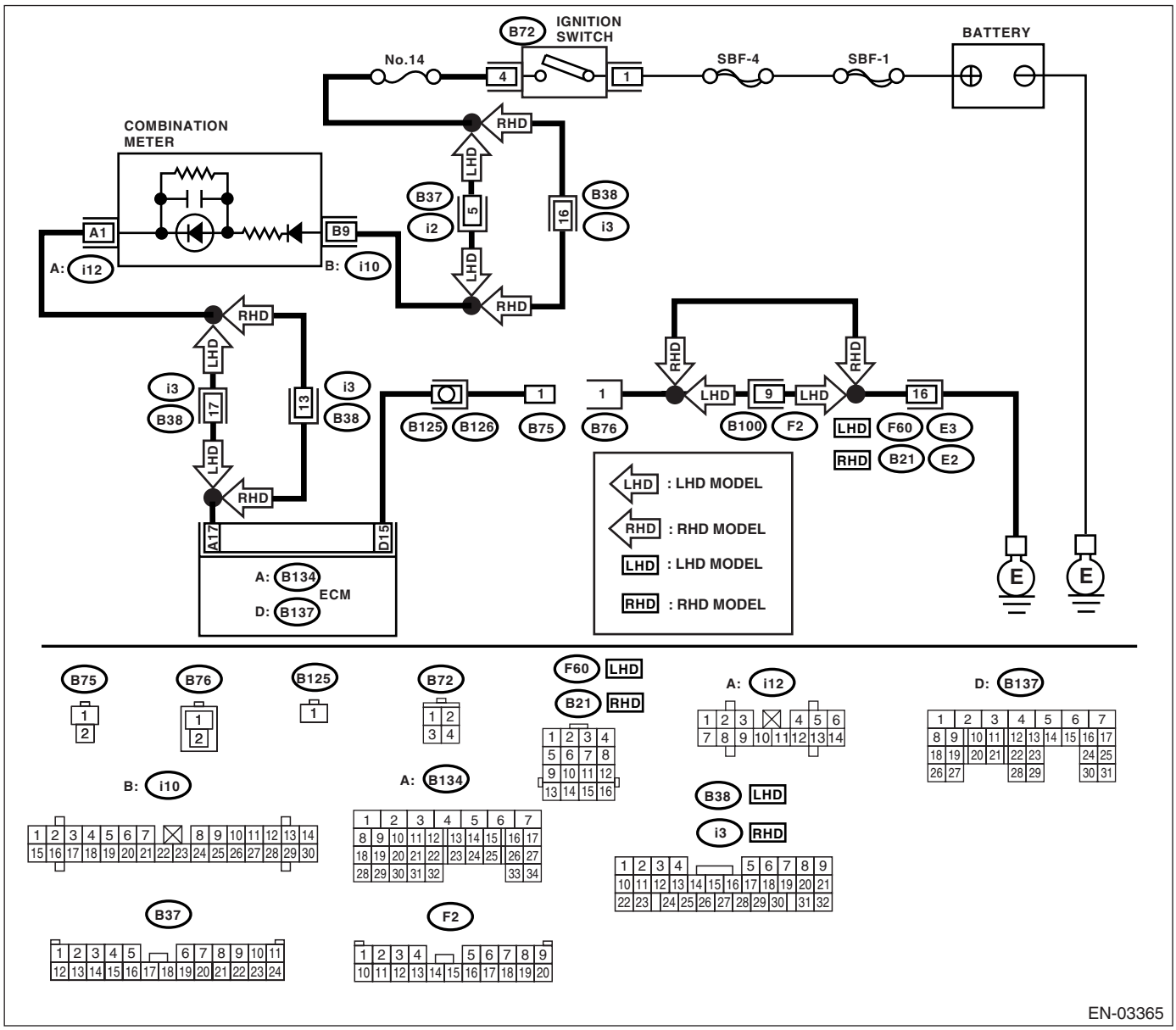
DIAGNOSTIC:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is in open.

TROUBLE SYMPTOM:

When in inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connectors 3) Turn the ignition switch to ON.(engine OFF)	Does malfunction indicator light illuminate?	Go to step **2.**	Repair the malfunction indictor light circuit. <Ref. to EN(H4DOTC 2.0)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does malfunction indicator light illuminate?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz

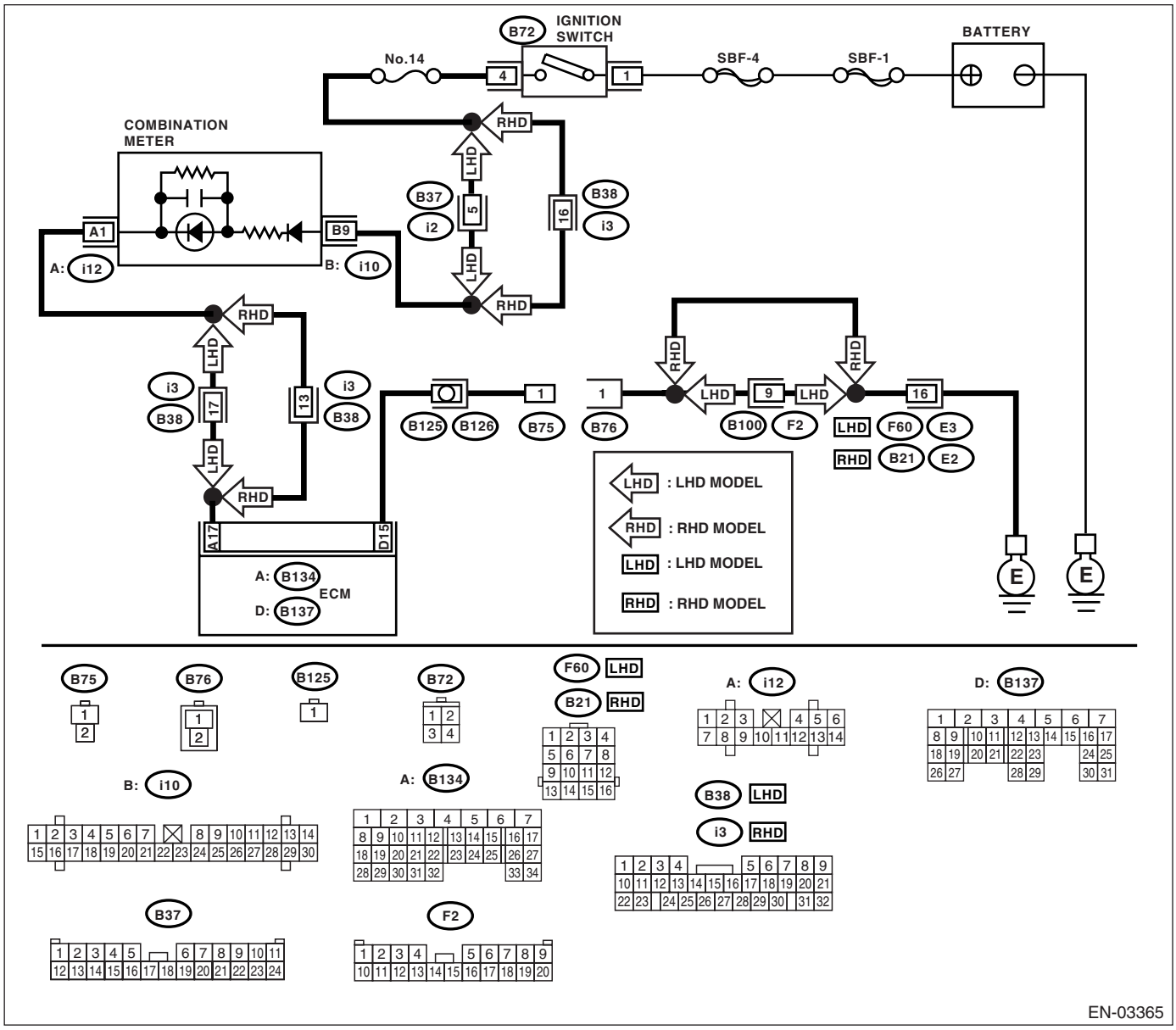
DIAGNOSTIC:

Test mode connector circuit is shorted.

TROUBLE SYMPTOM:

Malfunction indicator light blinks at a cycle of 3 Hz when the ignition switch is turned to ON.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connectors 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

17.Diagnostics for Engine Starting Failure

A: PROCEDURE

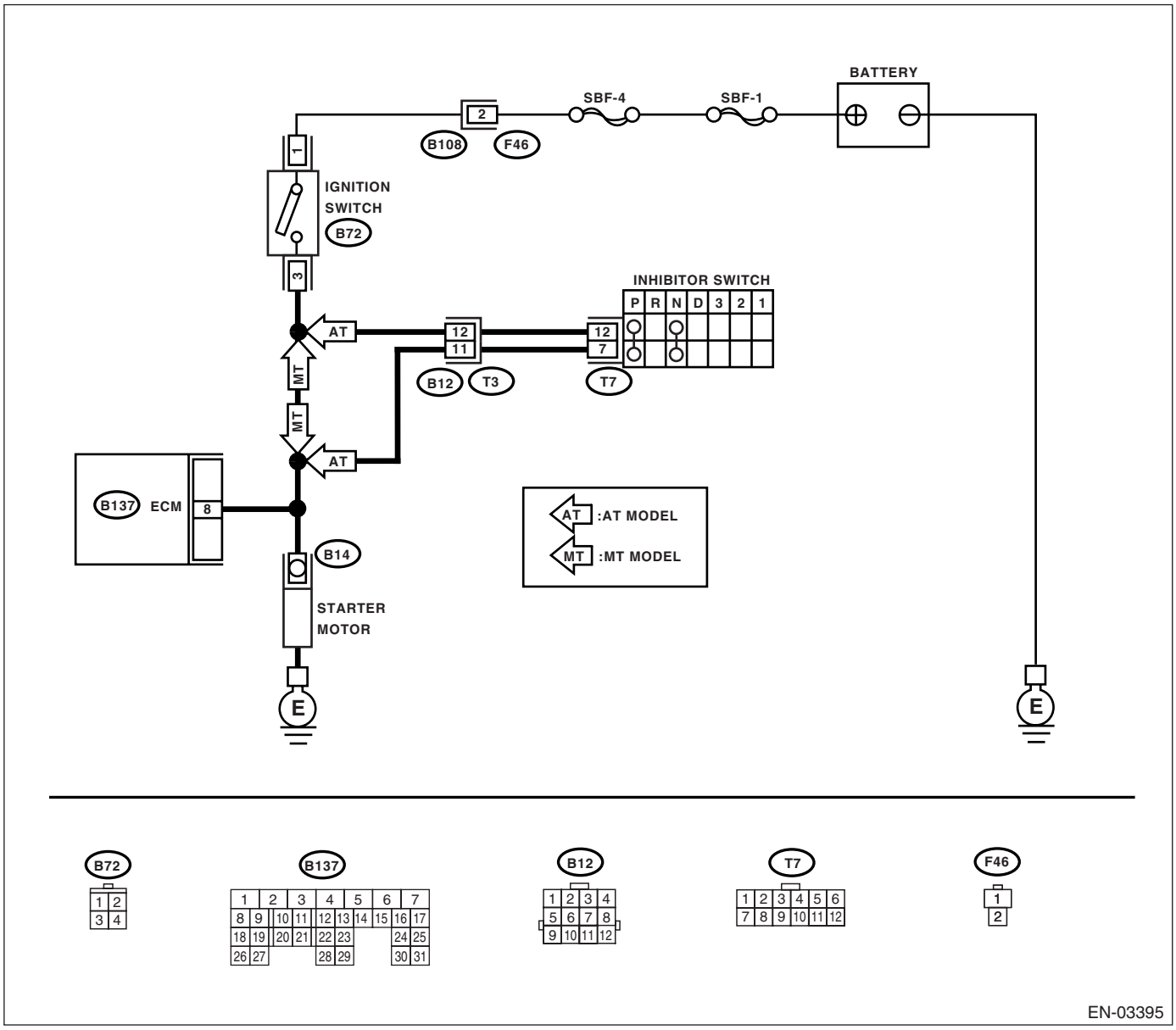
1. Inspection of starter motor circuit. <Ref. to EN(H4DOTC 2.0)(diag)-60, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC 2.0)(diag)-63, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4DOTC 2.0)(diag)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC 2.0)(diag)-69, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC 2.0)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

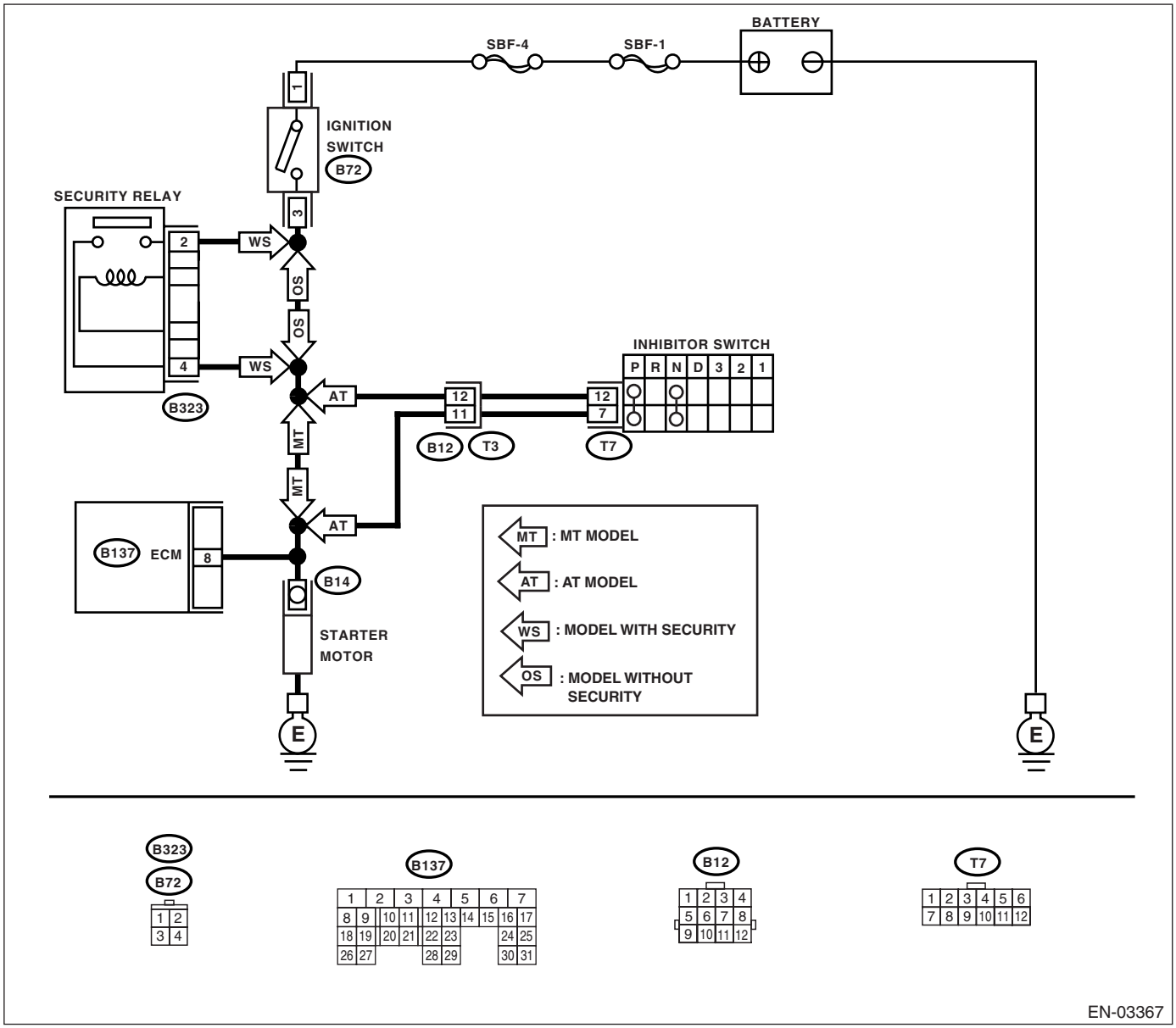
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


BATTERY
SBF-4
SBF-1
IGNITION SWITCH
B72
SECURITY RELAY
B323
WS
OS
INHIBITOR SWITCH
P R N D 3 2 1
AT
MT
B12
T3
T7
B137 ECM
B14
STARTER MOTOR
E
MT : MT MODEL
AT : AT MODEL
WS : MODEL WITH SECURITY
OS : MODEL WITHOUT SECURITY
EN-03367

Diagnostics for Engine Starting Failure

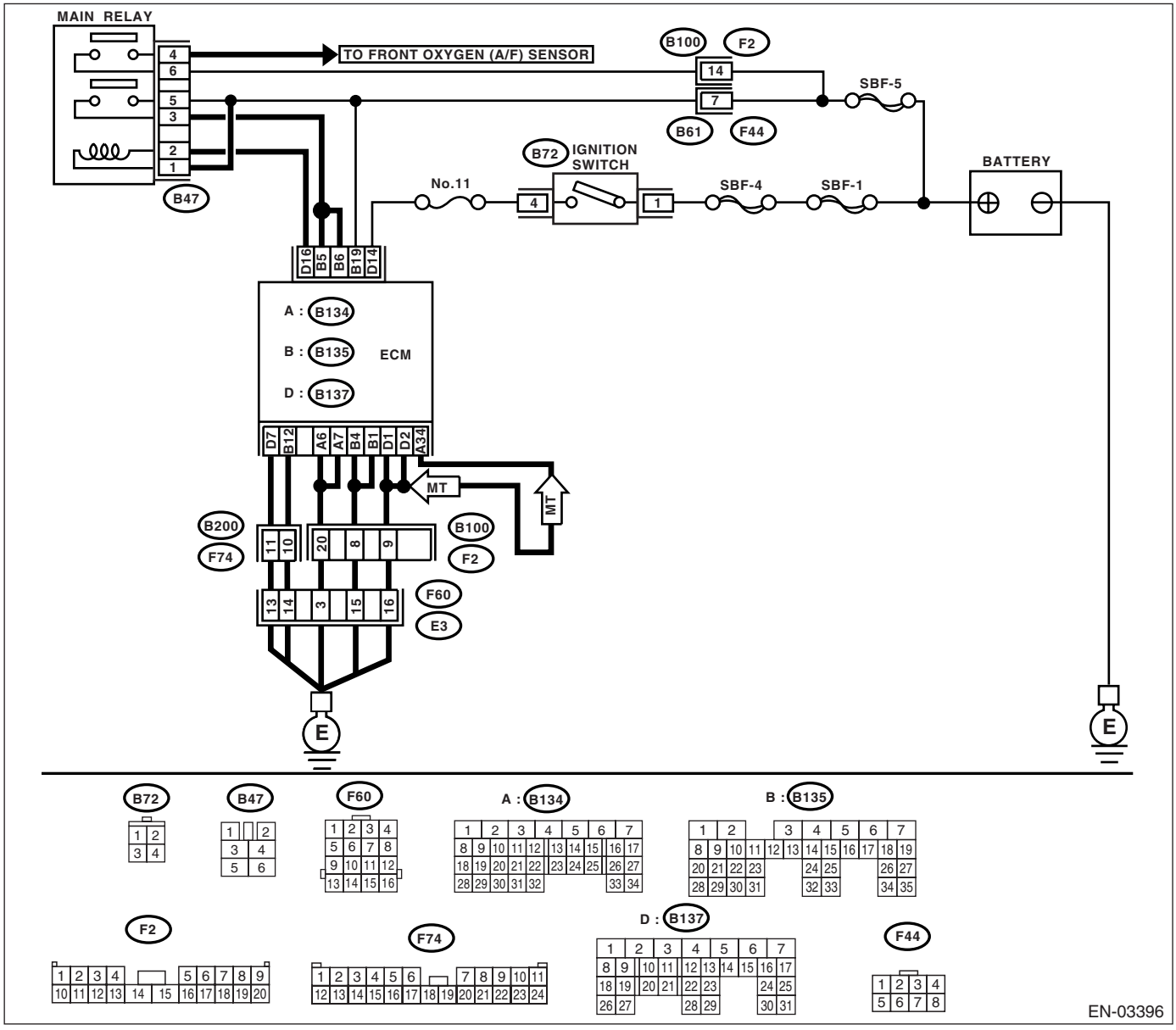
	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H4DOTC 2.0)(diag)-39, OPERATION, Read Diagnostic Trouble Code (DTC).>	Inspect the relevant DTC using List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-6, Starter.>	Repair open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Check the following and repair if necessary. • Brown out fuse • Open circuit in harness between ignition switch and battery.
6	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Connect the connector to ignition switch. 2) Turn the ignition switch to START. 3) Measure the voltage between ignition switch and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair open circuit between ignition switch and starter motor circuit.	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ignition switch connector.	Is there poor contact in ignition switch connector?	Repair poor contact in ignition switch connector.	Replace the ignition switch.

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

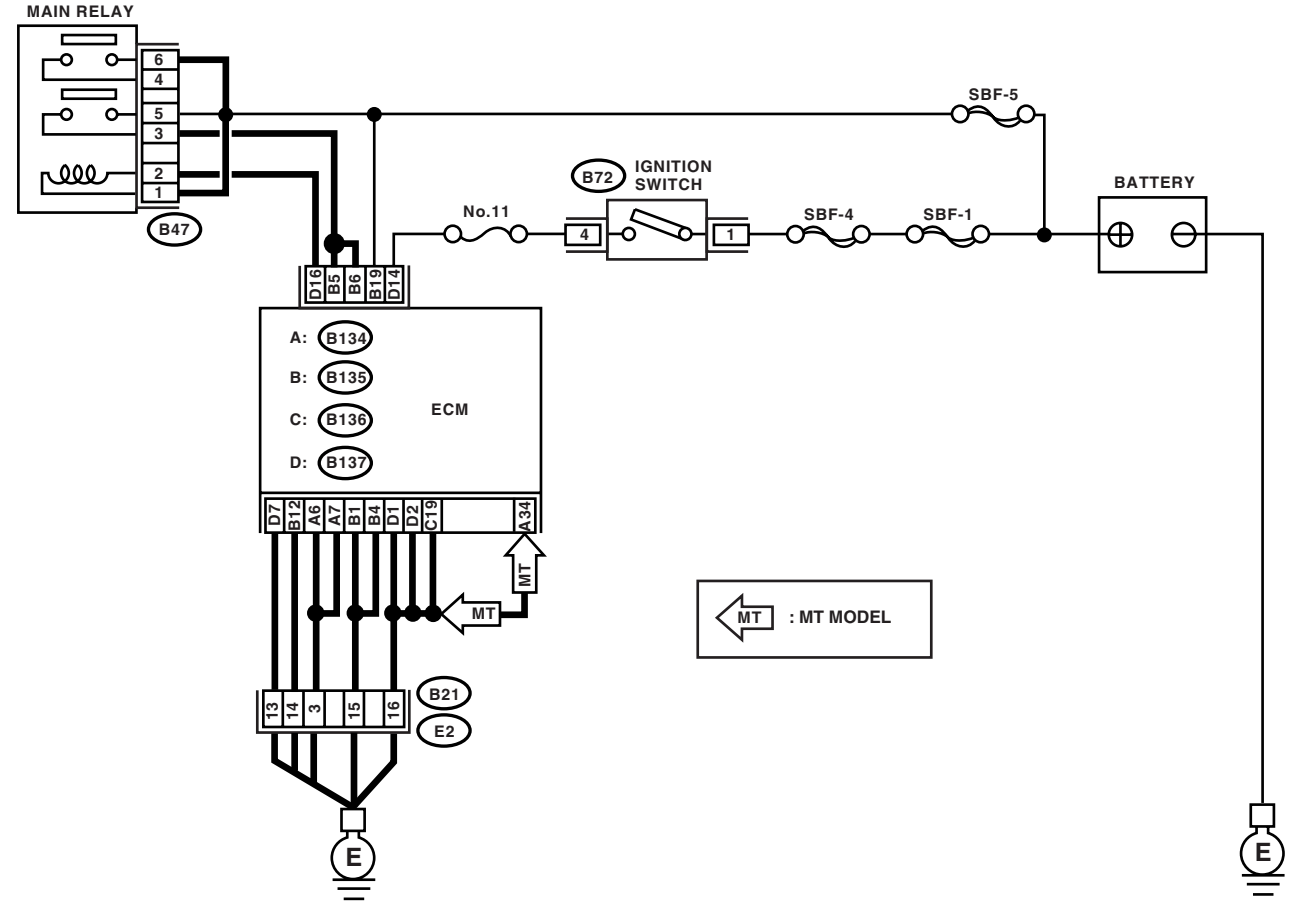
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

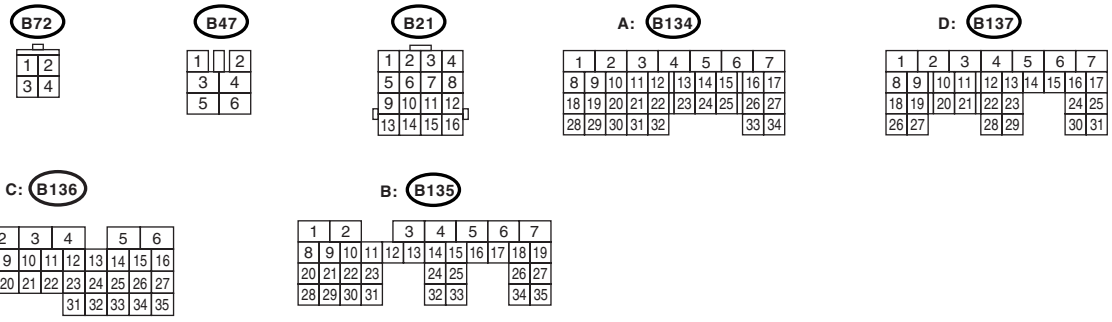
WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**





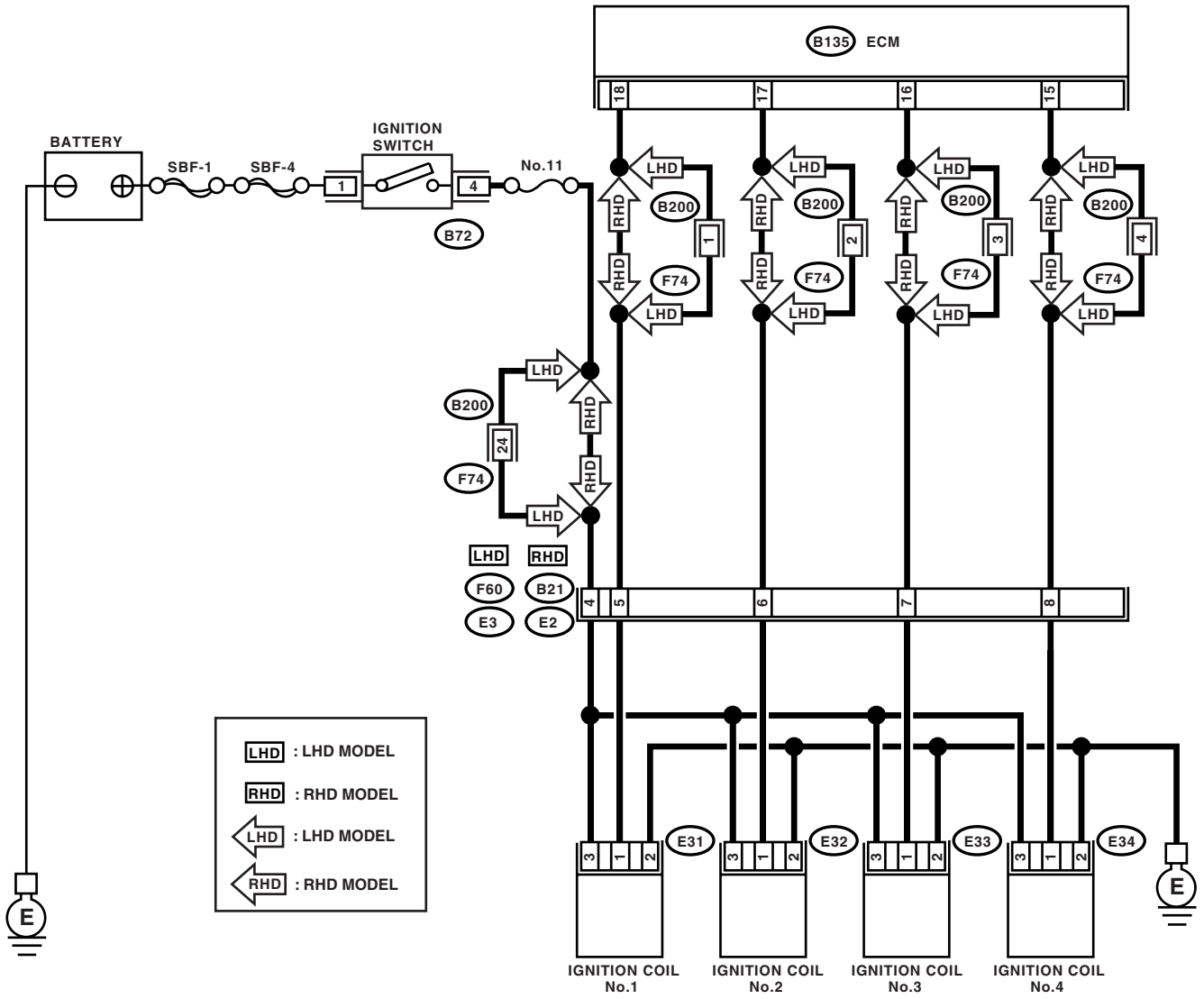
EN-03369

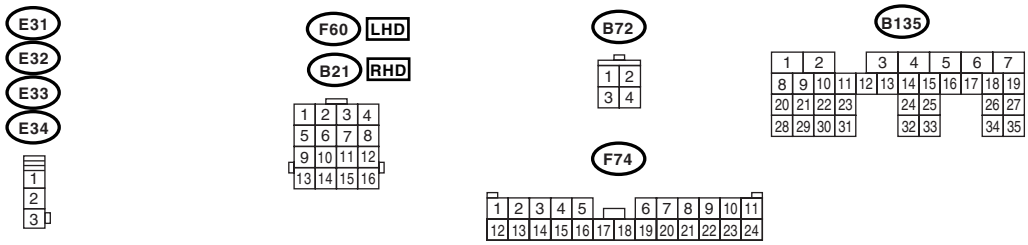
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 34 — Chassis ground: (MT model)*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 12 — Chassis ground:*** ***(B136) No. 19 — Chassis ground: (RHD model)*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine ground terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair open or ground short circuit of power supply circuit.
5	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 (+) — Chassis ground (−):*** ***(B47) No. 5 (+) — Chassis ground (−):*** ***(B47) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open or ground short circuit of power supply circuit.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay and ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):*** ***(B137) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H4DOTC 2.0)(diag)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:





EN-03370

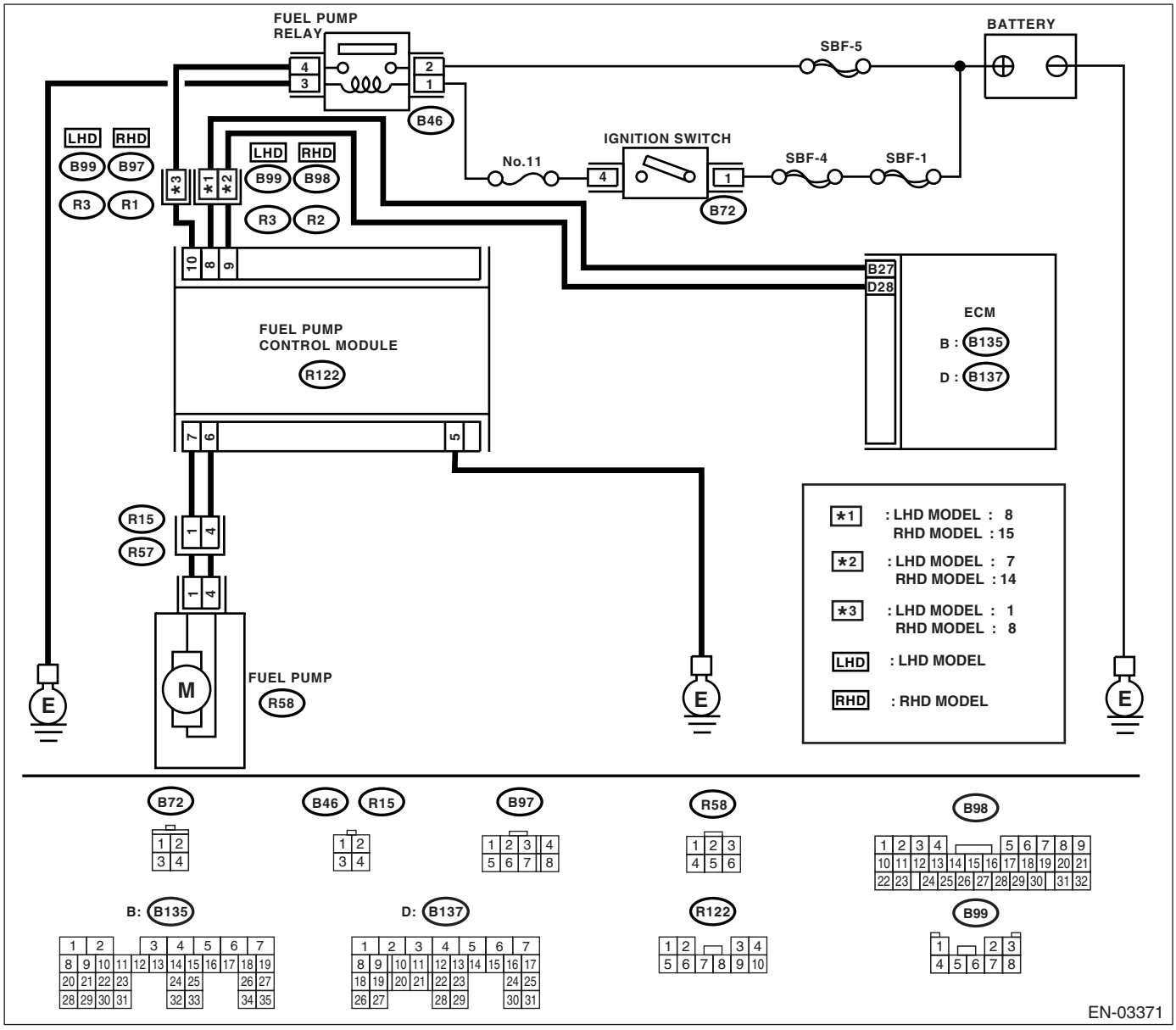
	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. **<Ref. to IG(H4DOTC 2.0)-5,** REMOVAL**, Spark Plug.>** 2) Check the spark plug condition. <Ref. to IG(H4DOTC 2.0)-6, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC 2.0)-54, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4DOTC 2.0)(diag)-69, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor ASSY. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (−):*** ***(E32) No. 3 (+) — Engine ground (−):*** ***(E33) No. 3 (+) — Engine ground (−):*** ***(E34) No. 3 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ignition coil & ignitor ASSY, and ignition switch connector • Poor contact in coupling connector
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: Open circuit in harness between ignition coil & ignitor ASSY connector and engine ground terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor ASSY. 4) Measure the resistance of harness between ECM and ignition coil & ignitor ASSY connector. ***Connector & terminal*** ***(B135) No. 15 — (E34) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 18 — (E31) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case repair the following: • OPEN CIRCUIT IN HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR. • Poor contact in coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B135) No. 15 — Engine ground:*** ***(B135) No. 16 — Engine ground:*** ***(B135) No. 17 — Engine ground:*** ***(B135) No. 18 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor ASSY connector.
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ignition coil & ignitor ASSY.

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



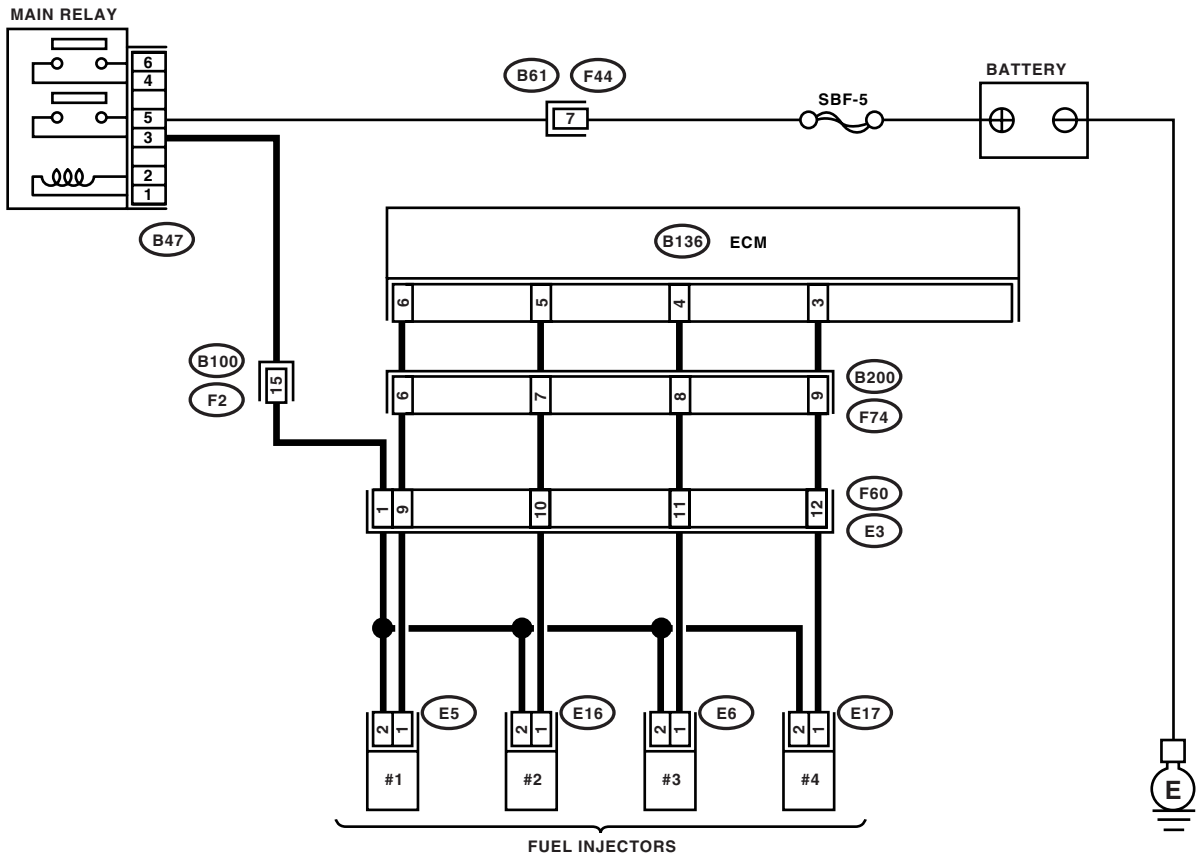
Diagnostics for Engine Starting Failure

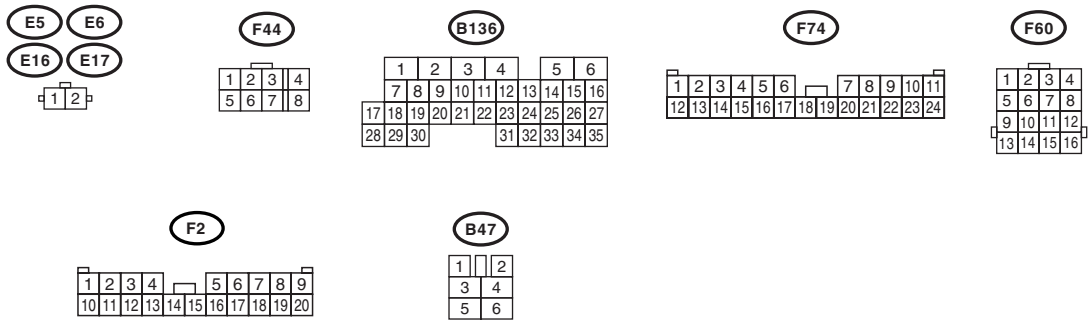
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that fuel pump is in operation for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor. For the procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC 2.0)(diag)-48, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC 2.0)(diag)-71, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display DTC. <Ref. to EN(H4DOTC 2.0)(diag)-39, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.**

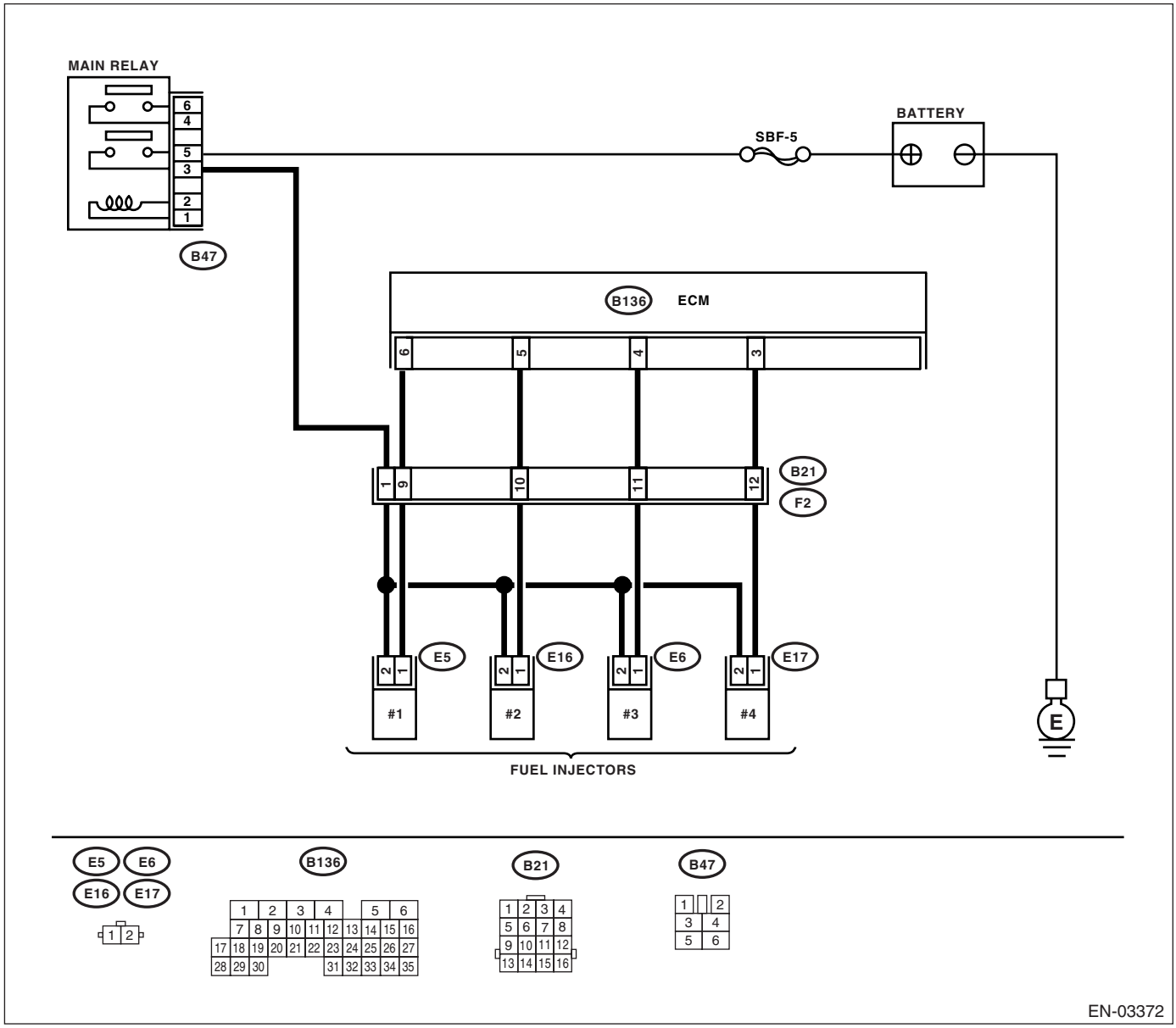
WIRING DIAGRAM:
- **LHD MODEL**





EN-03373

- **RHD MODEL**


MAIN RELAY
6
4
5
3
2
1
B47
SBF-5
BATTERY
B136
ECM
6
5
4
3
1
9
10
11
12
B21
F2
E5
E16
E6
E17
2
1
#1
#2
#3
#4
FUEL INJECTORS
E
E5
E6
E16
E17
1 2
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
B21
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
B47
1 2
3 4
5 6
EN-03372

	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel pump produce operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC 2.0)-37, INSPECTION, Fuel Pressure.>	Go to step **2.**
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — (E5) No. 1:*** ***(B136) No. 5 — (E16) No. 1:*** ***(B136) No. 4 — (E6) No. 1:*** ***(B136) No. 3 — (E6) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table” <Ref. to EN(H4DOTC 2.0)(diag)-264, INSPECTION, General Diagnostic Table.>

18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	NOTE
P0011	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(H4DOTC 2.0)(diag)-79, DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER - ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	A Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC 2.0)(diag)-80, DTC P0021 “A” CAMSHAFT POSITION - TIMING OVER - ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.0)(diag)-81, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.0)(diag)-83, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.0)(diag)-86, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.0)(diag)-88, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.0)(diag)-91, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-93, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC 2.0)(diag)-96, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-98, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC 2.0)(diag)-101, DTC P0108 INTAKE AIR PRESSURE SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-104, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC 2.0)(diag)-106, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-109, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4DOTC 2.0)(diag)-111, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-114, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input	<Ref. to EN(H4DOTC 2.0)(diag)-118, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to EN(H4DOTC 2.0)(diag)-121, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.0)(diag)-123, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.0)(diag)-125, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.0)(diag)-127, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.0)(diag)-129, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.0)(diag)-131, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.0)(diag)-134, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC 2.0)(diag)-136, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DOTC 2.0)(diag)-137, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC 2.0)(diag)-140, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/MSC Wastegate Solenoid “A” Range/Performance	<Ref. to EN(H4DOTC 2.0)(diag)-143, DTC P0244 TURBO/MSC WASTEGATE SOLENOID “A” RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/MSC Wastegate Solenoid “A” Low	<Ref. to EN(H4DOTC 2.0)(diag)-145, DTC P0245 TURBO/MSC WASTEGATE SOLENOID “A” LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/MSC Wastegate Solenoid “A” High	<Ref. to EN(H4DOTC 2.0)(diag)-147, DTC P0246 TURBO/MSC WASTEGATE SOLENOID “A” HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4DOTC 2.0)(diag)-149, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC 2.0)(diag)-149, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC 2.0)(diag)-149, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC 2.0)(diag)-150, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC 2.0)(diag)-156, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC 2.0)(diag)-158, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4DOTC 2.0)(diag)-160, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC 2.0)(diag)-162, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)	<Ref. to EN(H4DOTC 2.0)(diag)-164, DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	NOTE
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)	<Ref. to EN(H4DOTC 2.0)(diag)-166, DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC 2.0)(diag)-168, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC 2.0)(diag)-170, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC 2.0)(diag)-172, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-175, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(H4DOTC 2.0)(diag)-178, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-181, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to EN(H4DOTC 2.0)(diag)-183, DTC P0503 VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle Control System Circuit Low	<Ref. to EN(H4DOTC 2.0)(diag)-185, DTC P0508 IDLE CONTROL SYSTEM CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle Control System Circuit High	<Ref. to EN(H4DOTC 2.0)(diag)-187, DTC P0509 IDLE CONTROL SYSTEM CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC 2.0)(diag)-189, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4DOTC 2.0)(diag)-191, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust Gas Temperature Sensor Circuit Low - Bank 1	<Ref. to EN(H4DOTC 2.0)(diag)-193, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust Gas Temperature Sensor Circuit High - Bank 1	<Ref. to EN(H4DOTC 2.0)(diag)-195, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR HIGH - BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0562	System Voltage Low	<Ref. to EN(H4DOTC 2.0)(diag)-198, DTC P0562 SYSTEM VOLTAGE LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0563	System Voltage High	<Ref. to EN(H4DOTC 2.0)(diag)-200, DTC P0563 SYSTEM VOLTAGE HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC 2.0)(diag)-202, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC 2.0)(diag)-204, DTC P0604 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC 2.0)(diag)-206, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4DOTC 2.0)(diag)-210, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC 2.0)(diag)-213, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC 2.0)(diag)-213, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC 2.0)(diag)-215, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4DOTC 2.0)(diag)-217, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC 2.0)(diag)-220, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Misfire Detected (High Temperature Exhaust Gas)	<Ref. to EN(H4DOTC 2.0)(diag)-222, DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC 2.0)(diag)-224, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	Exhaust Gas Temperature Too High	<Ref. to EN(H4DOTC 2.0)(diag)-226, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC 2.0)(diag)-228, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	ANTENNA	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-22, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(H4DOTC 2.0)(diag)-231, DTC P2004 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2005	Tumble Generated Valve System 2 (Valve Open)	<Ref. to EN(H4DOTC 2.0)(diag)-231, DTC P2005 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2006	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(H4DOTC 2.0)(diag)-232, DTC P2006 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2007	Tumble Generated Valve System 2 (Valve Close)	<Ref. to EN(H4DOTC 2.0)(diag)-232, DTC P2007 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2008	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC 2.0)(diag)-233, DTC P2008 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	NOTE
P2009	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC 2.0)(diag)-235, DTC P2009 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2011	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC 2.0)(diag)-237, DTC P2011 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC 2.0)(diag)-239, DTC P2012 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2016	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(H4DOTC 2.0)(diag)-241, DTC P2016 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2017	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(H4DOTC 2.0)(diag)-245, DTC P2017 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2021	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to EN(H4DOTC 2.0)(diag)-248, DTC P2021 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2022	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to EN(H4DOTC 2.0)(diag)-252, DTC P2022 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(H4DOTC 2.0)(diag)-255, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(H4DOTC 2.0)(diag)-257, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(H4DOTC 2.0)(diag)-259, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to EN(H4DOTC 2.0)(diag)-261, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4DOTC 2.0)(diag)-262, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4DOTC 2.0)(diag)-263, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 “A” CAMSHAFT POSITION - TIMING OVER - ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

TROUBLE SYMPTOM:

- Engine stalls
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and idle it. 2) Check the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE”. <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the AVCS system operating angle approx. 0 degree and oil flow control solenoid valve duty output approx. 10%?	A temporary poor malfunction. Perform the following to clean oil routing. Replace the engine oil, and then idle the engine for 5 minutes and replace the oil filter and engine oil.	Check the following and repair or replace it if necessary. • Oil pipe (clogging) • Oil flow control solenoid valve (clogging or dirt of oil routing, spring setting, clogging of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (alignment of timing mark)

B: DTC P0021 "A" CAMSHAFT POSITION - TIMING OVER - ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

TROUBLE SYMPTOM:

- Engine stalls
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and idle it. 2) Check the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the AVCS system operating angle approx. 0 degree and oil flow control solenoid valve duty output approx. 10%?	A temporary poor malfunction. Perform the following to clean oil routing. Replace the engine oil, and then idle the engine for 5 minutes and replace the oil filter and engine oil.	Check the following and repair or replace it if necessary. • Engine oil (amount, dirt) • Oil pipe (clogging) • Oil flow control solenoid valve (clogging or dirt of oil routing, spring setting, clogging of valve) • Intake camshaft (dirt, damage of camshaft) • Timing belt (alignment of timing mark)

C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

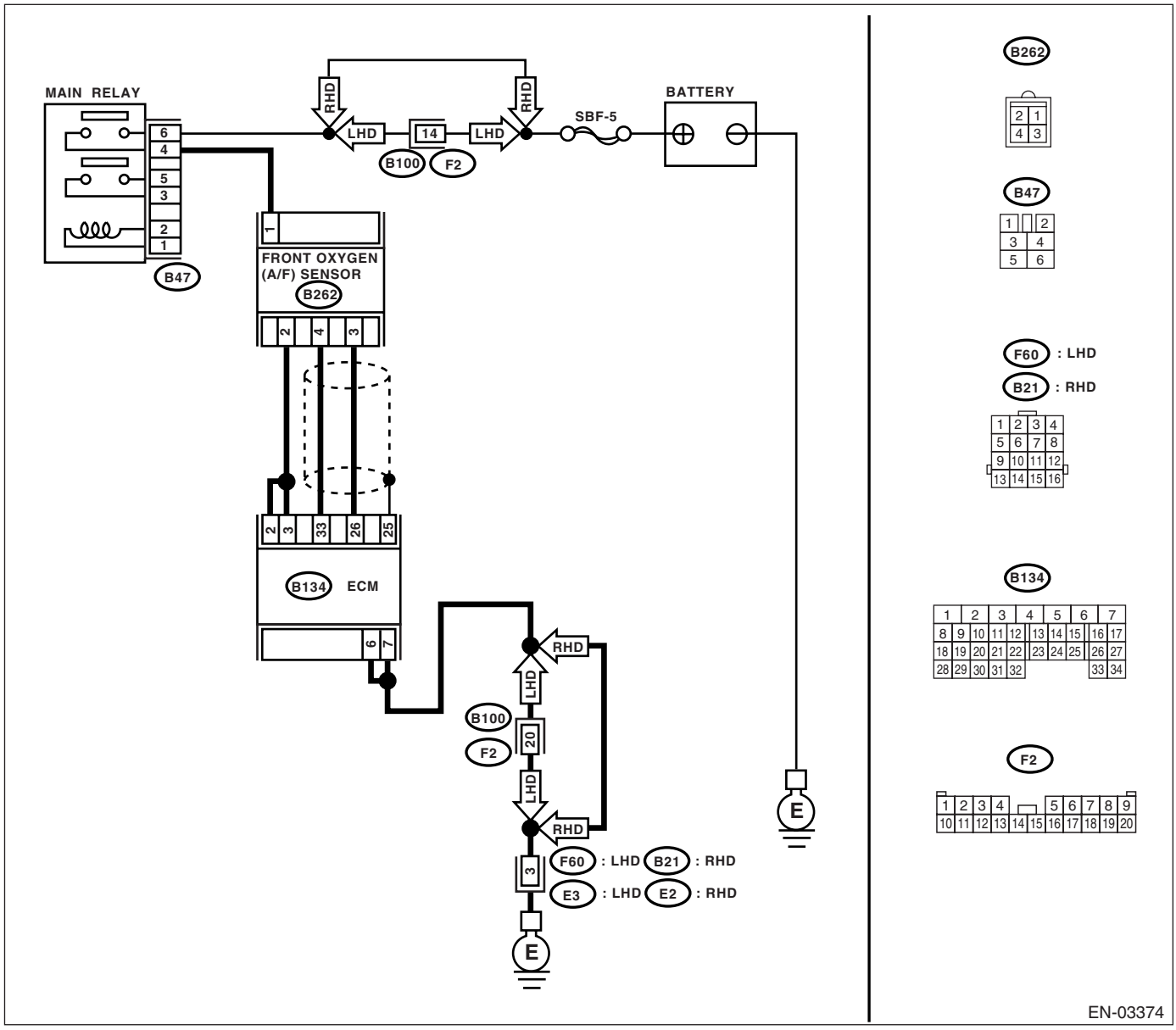
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine, and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connector from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134)No. 2 — (B262)No. 2:*** ***(B134)No. 3 — (B262)No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 33 — (B262) No. 4:*** ***(B134) No. 26 — (B262) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B262) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM and front oxygen (A/F) sensor.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>

D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

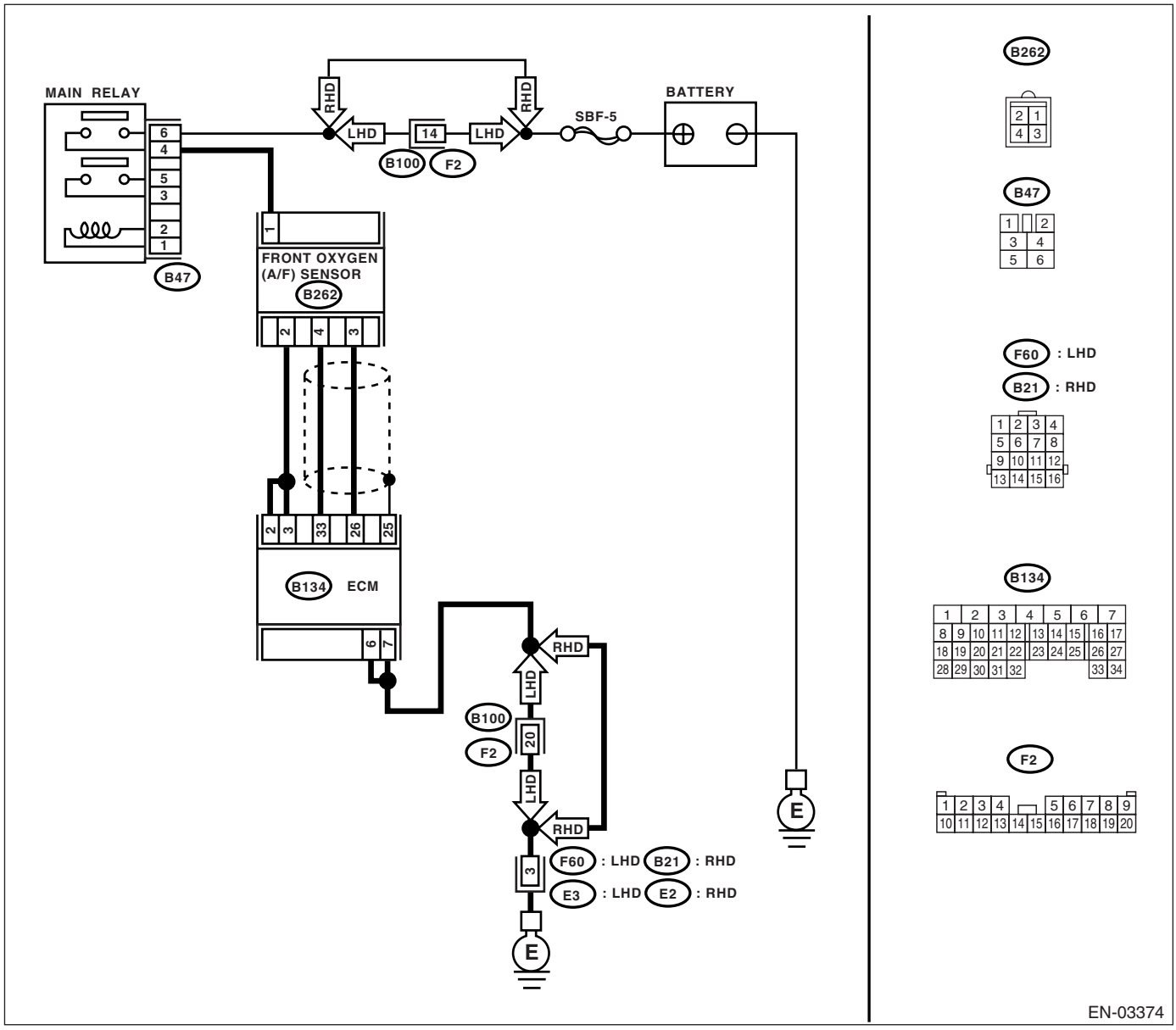
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B262) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply line. NOTE: In this case repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor • CHECK POOR CONTACT OF FRONT OXYGEN (A/F) SENSOR. • Poor contact in main relay connector
2	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector. • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE”. <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair poor contact connector. NOTE: In this case repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Go to step **7.**
7	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step **8.**
8	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>

E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

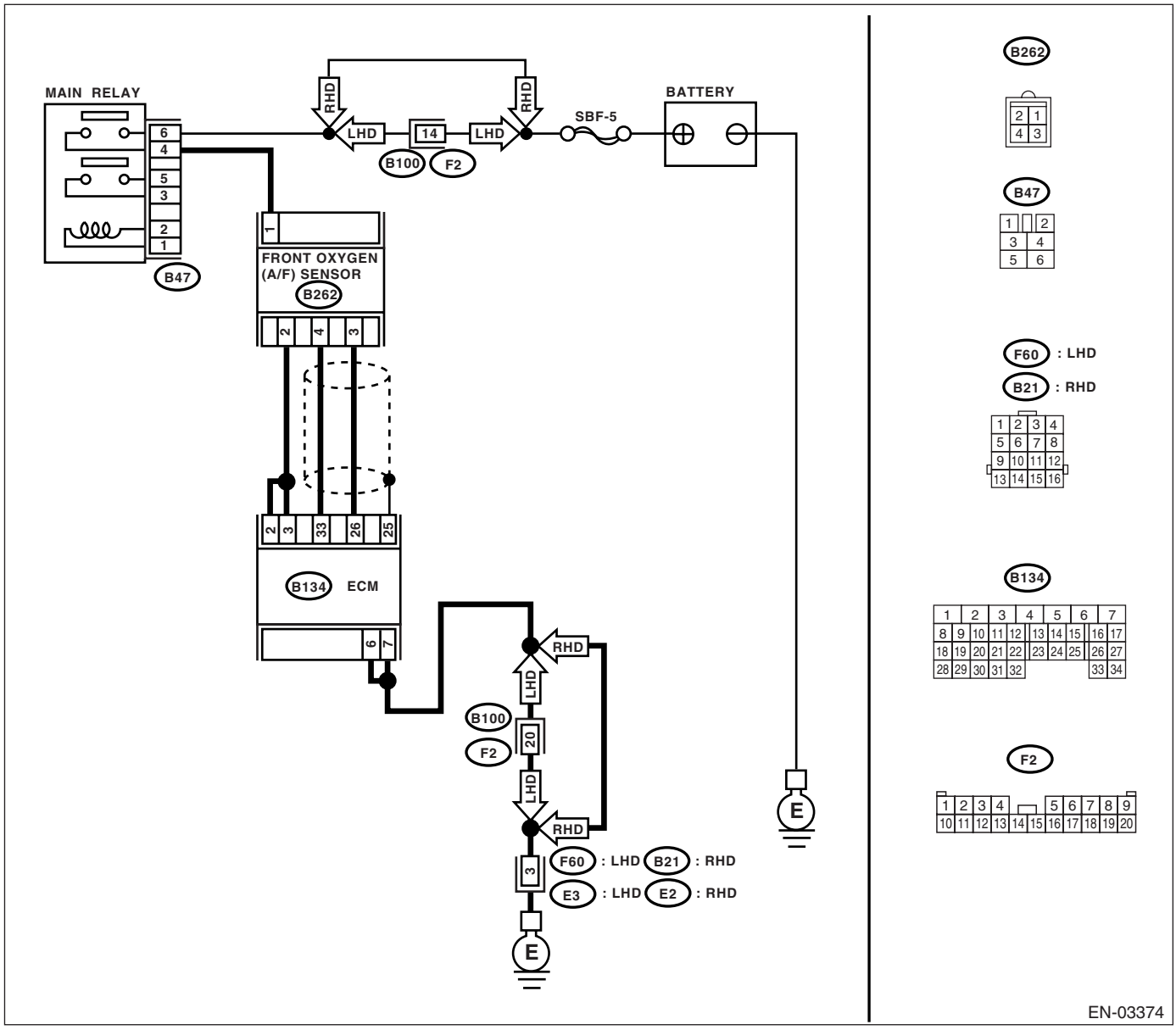
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	END.
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END.

F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

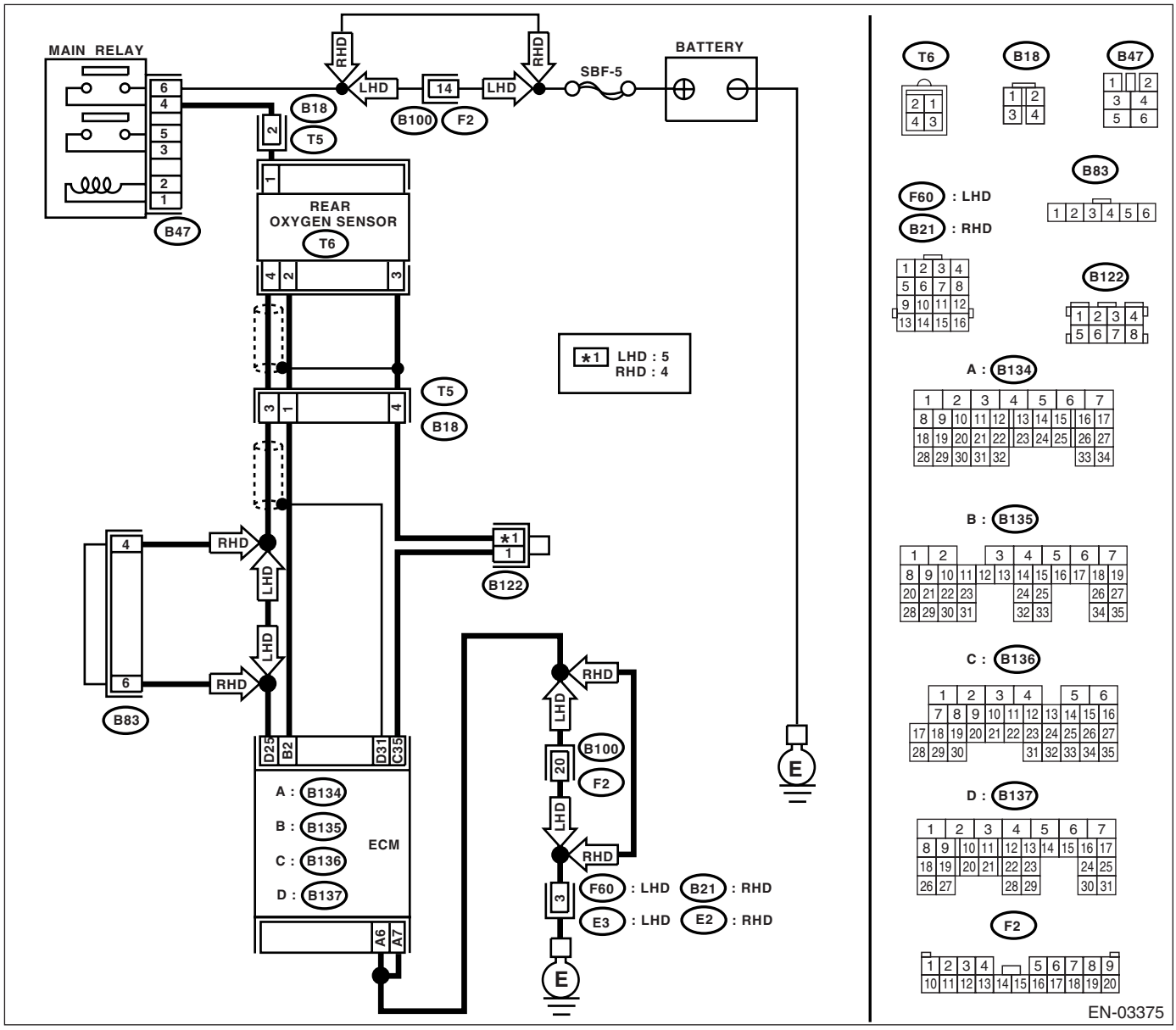
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the power supply line. NOTE: In this case repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>

G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

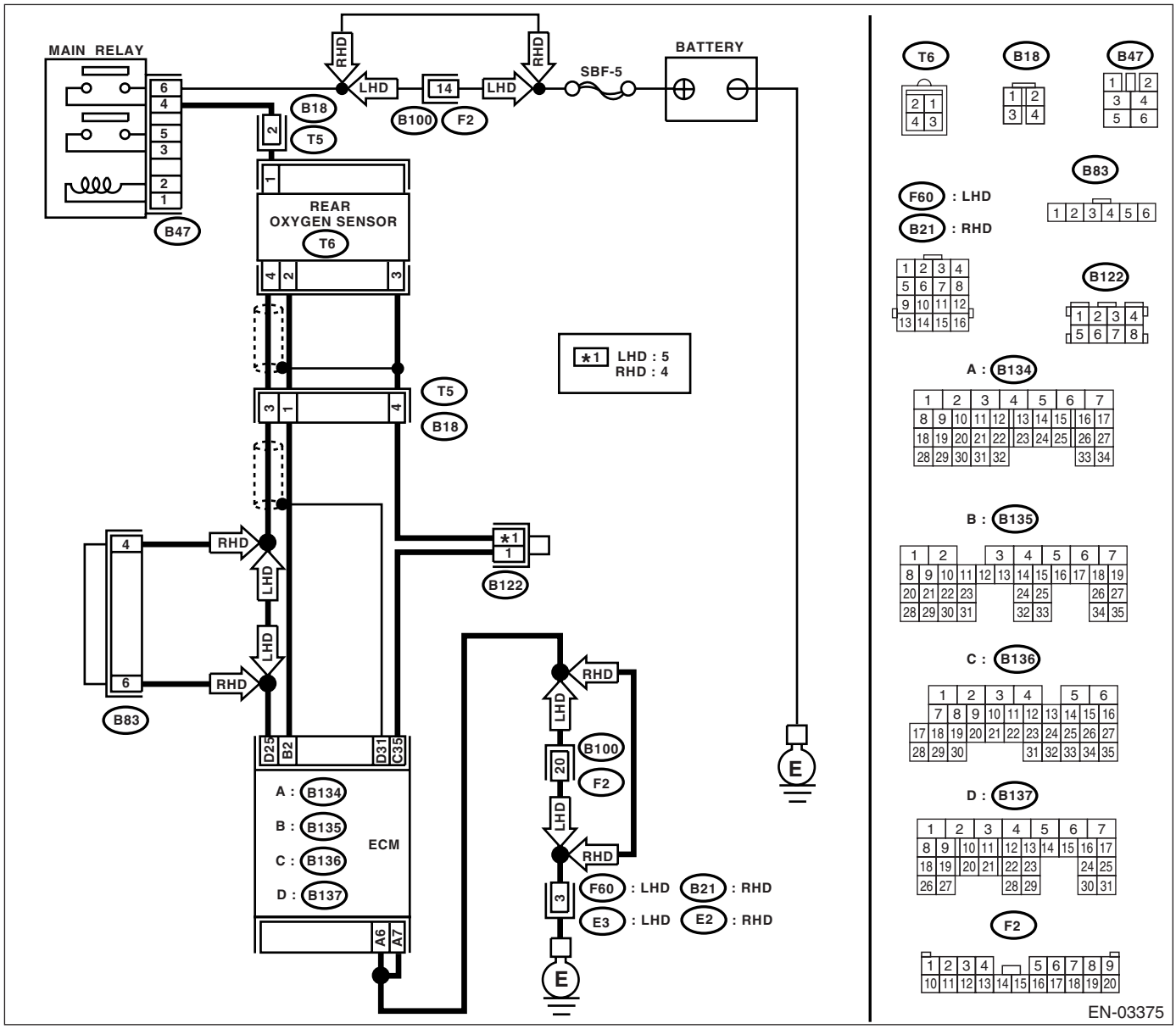
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	END.
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	END.

H: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

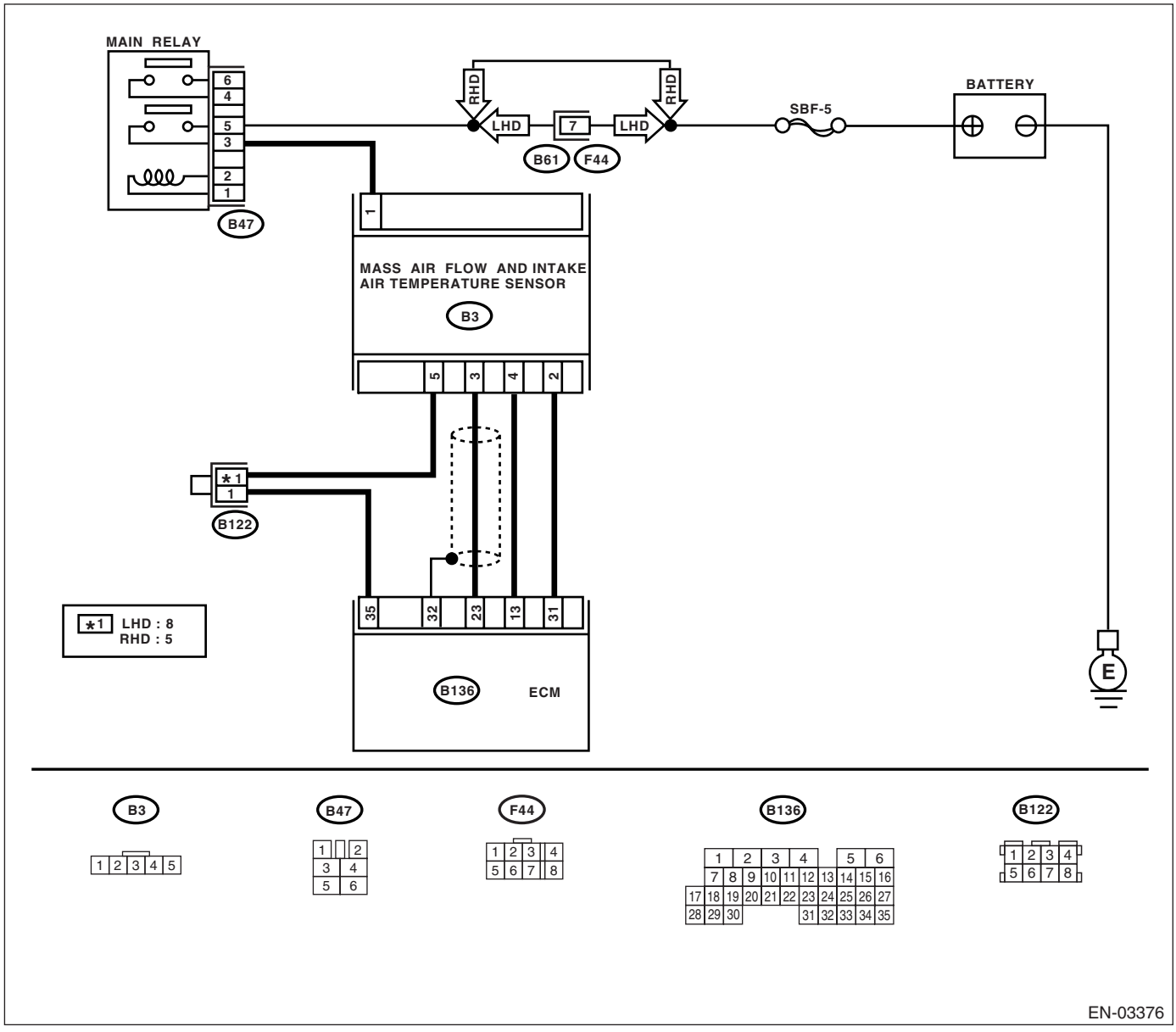
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool switch to ON. 4) Start the engine. 5) Connect the Subaru Select Monitor or general scan tool, and read the mass air flow sensor voltage. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the mass air flow sensor. NOTE: In this case repair the following: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **5.**	Repair open circuit between mass air flow sensor and main relay

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (B3) No. 3:*** ***(B136) No. 31 — (B3) No. 2:*** ***(B136) No. 35 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit between ECM and mass air flow sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:*** ***(B136) No. 31 — Chassis ground:*** ***(B136) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.0)-35, Mass Air Flow and Intake Air Temperature Sensor.>

I: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

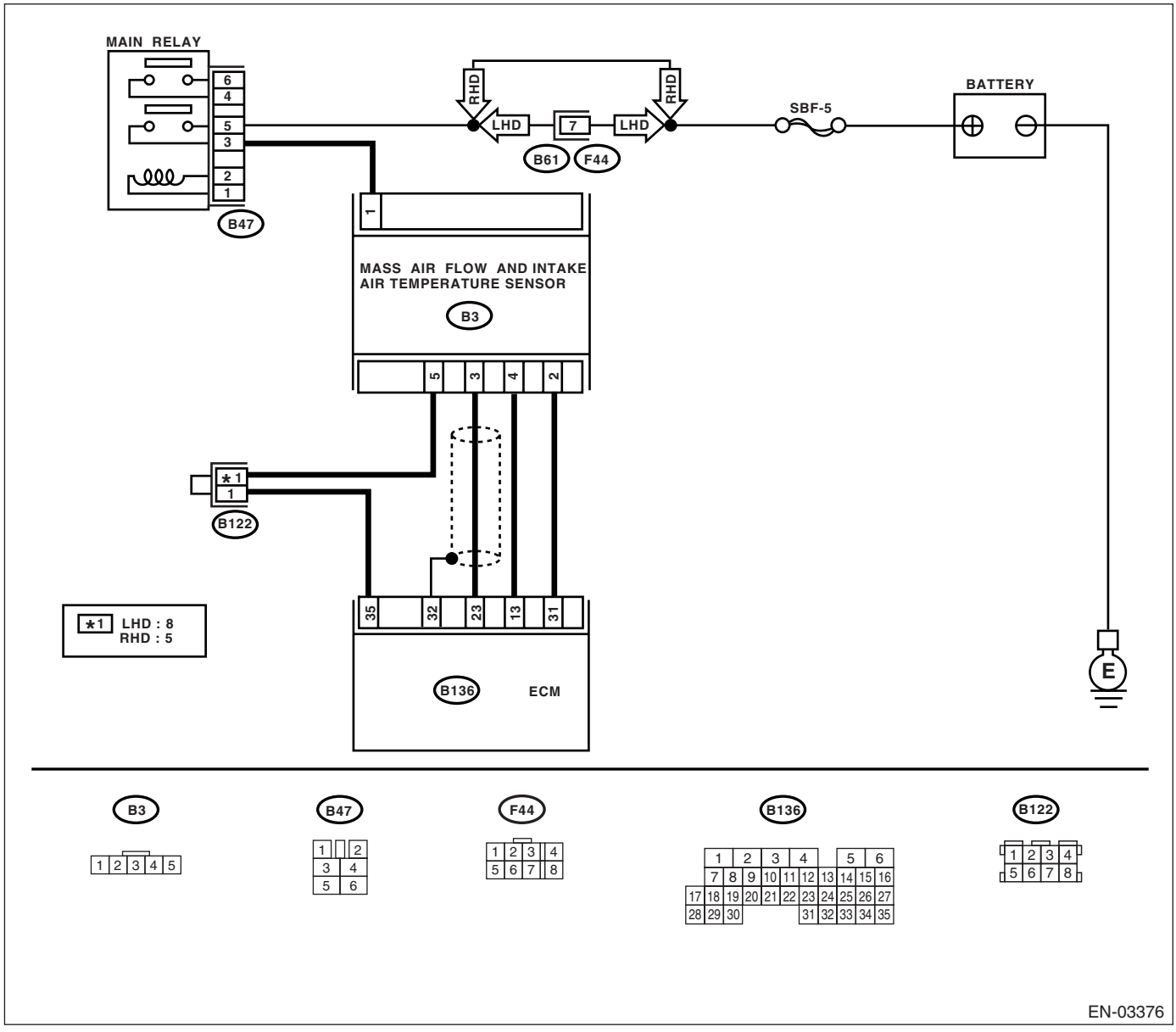
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool switch to ON. 4) Start the engine. 5) Connect the Subaru Select Monitor or general scan tool, and read the mass air flow sensor voltage. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass airflow sensor. 3) Turn the ignition switch to ON. 4) Measure voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Repair battery short circuit in harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 31:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H4DOTC 2.0)-35, Mass Air Flow and Intake Air Temperature Sensor.>	Repair open circuit in harness between mass air flow sensor connector and ECM connector.

J: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

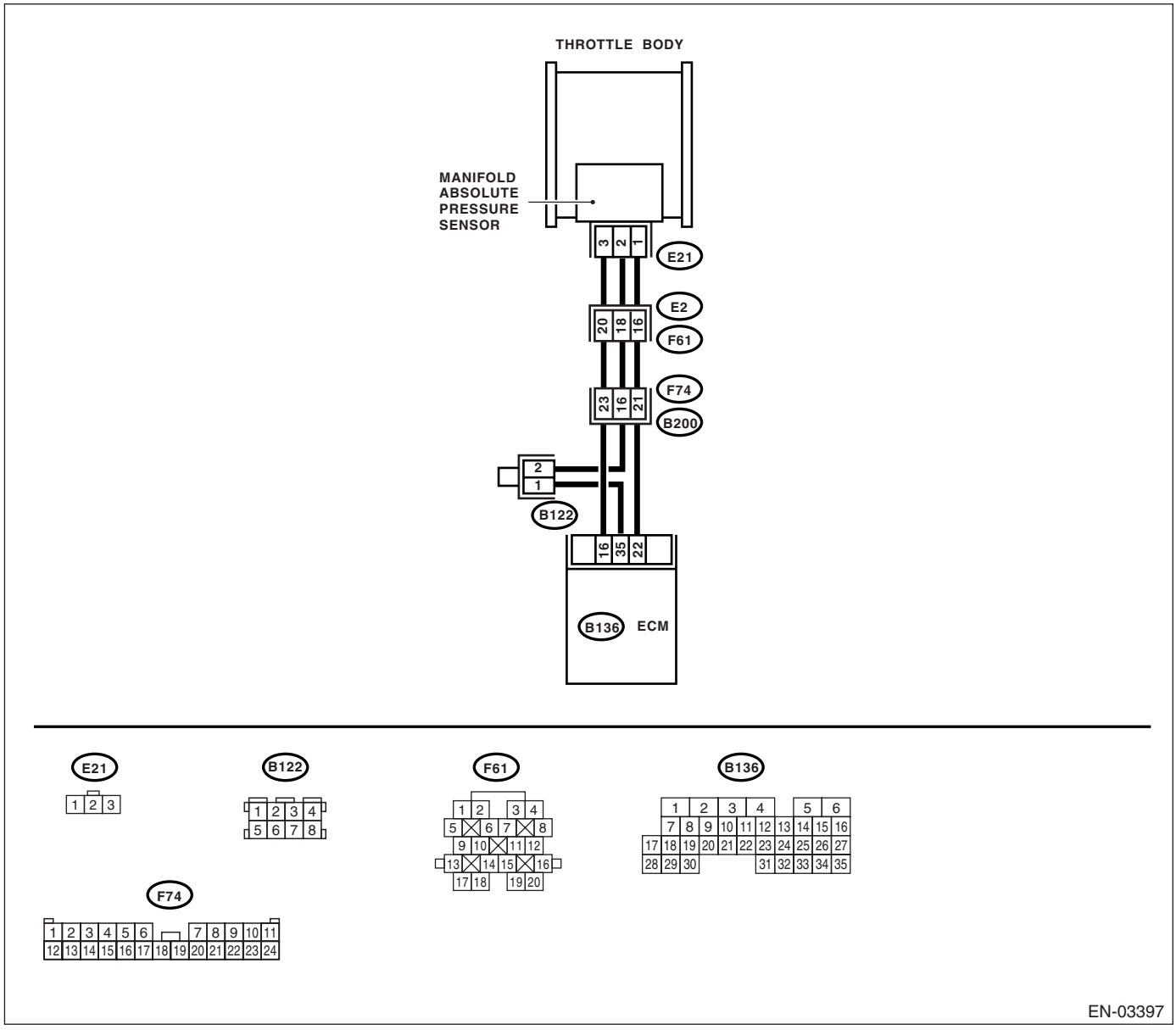
Immediately at fault recognition

CAUTION:

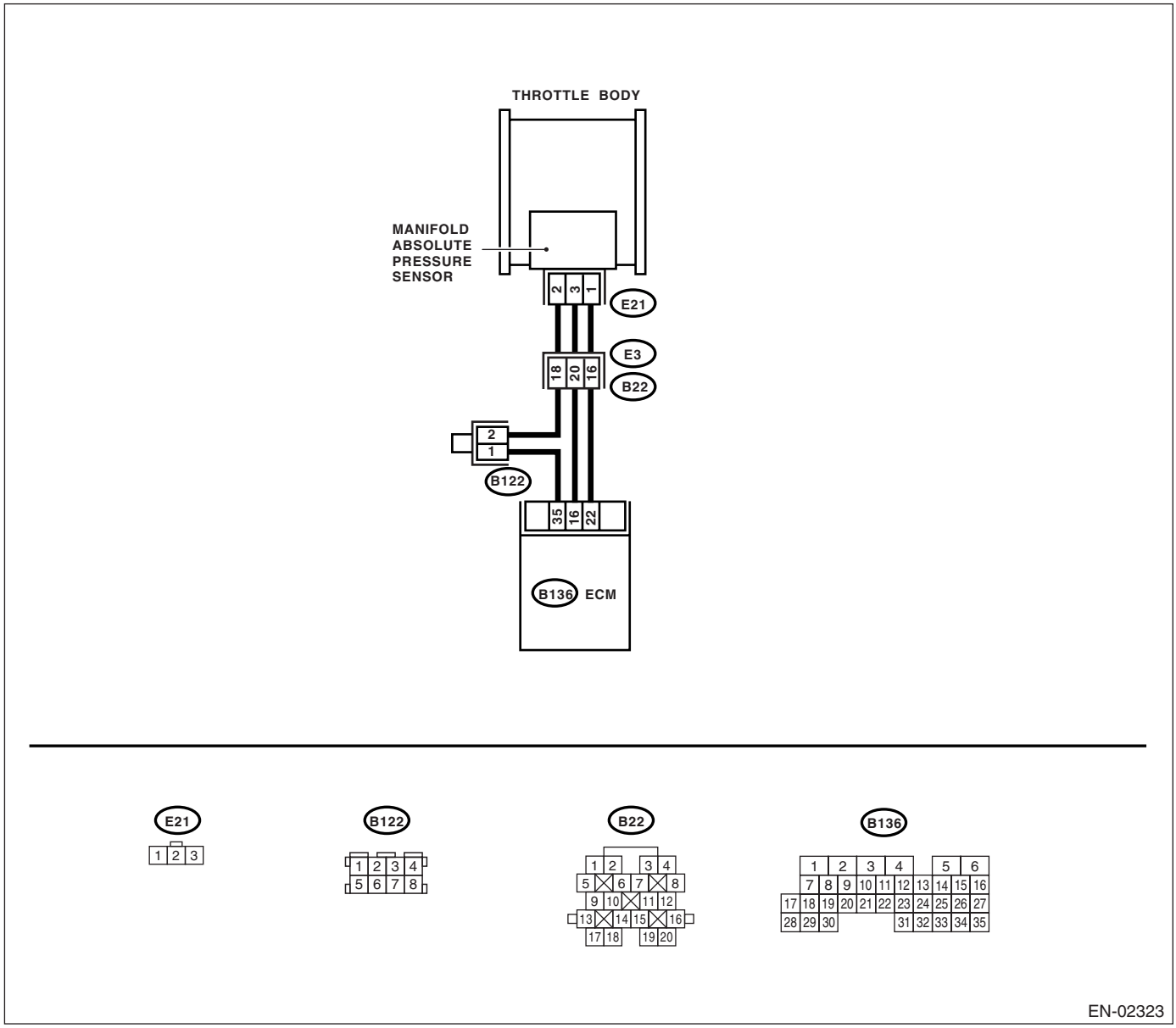
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


THROTTLE BODY
MANIFOLD ABSOLUTE PRESSURE SENSOR
2 3 1
E21
E3
18 20 16
B22
2 1
B122
35 16 22
B136 ECM
E21
1 2 3
B122
1 2 3 4
5 6 7 8
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02323

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 0.7 V?	Go to step **4.**	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC 2.0)-36, Manifold Absolute Pressure Sensor.>

K: DTC P0108 INTAKE AIR PRESSURE SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

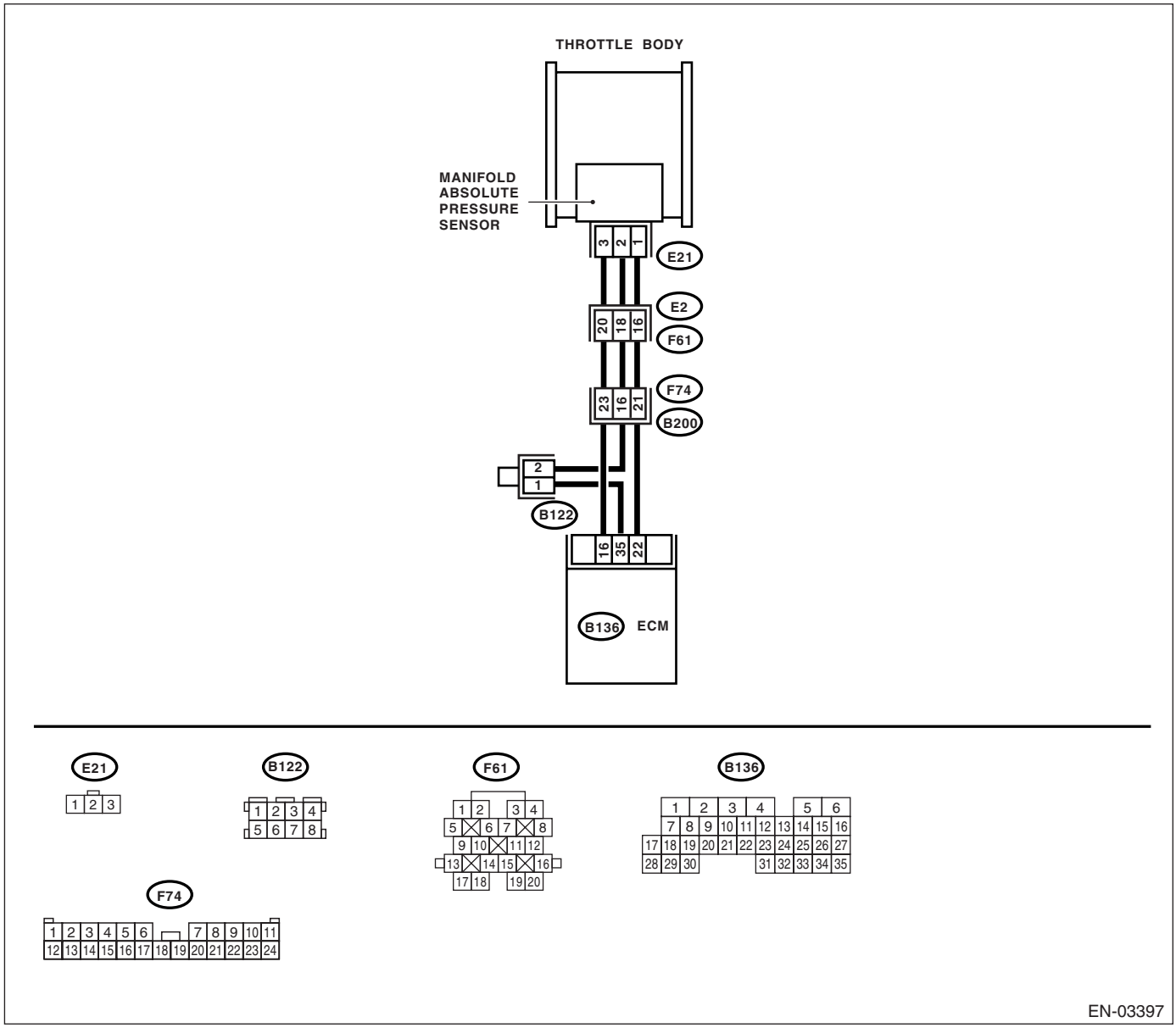
Immediately at fault recognition

CAUTION:

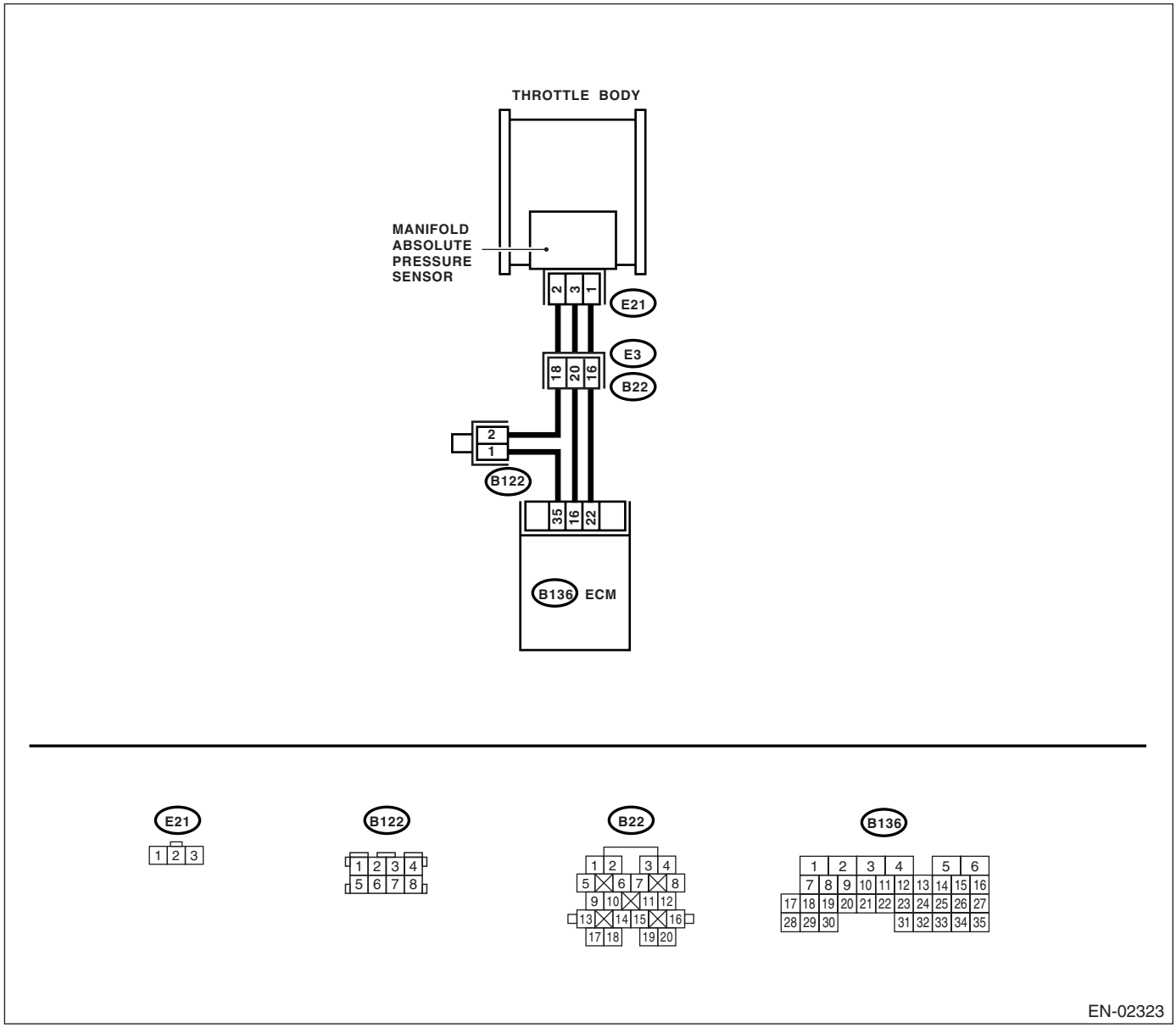
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


THROTTLE BODY
MANIFOLD ABSOLUTE PRESSURE SENSOR
2 3 1
E21
E3
18 20 16
B22
2 1
B122
35 16 22
B136 ECM
E21
1 2 3
B122
1 2 3 4
5 6 7 8
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02323

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC 2.0)-36, Manifold Absolute Pressure Sensor.>

L: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

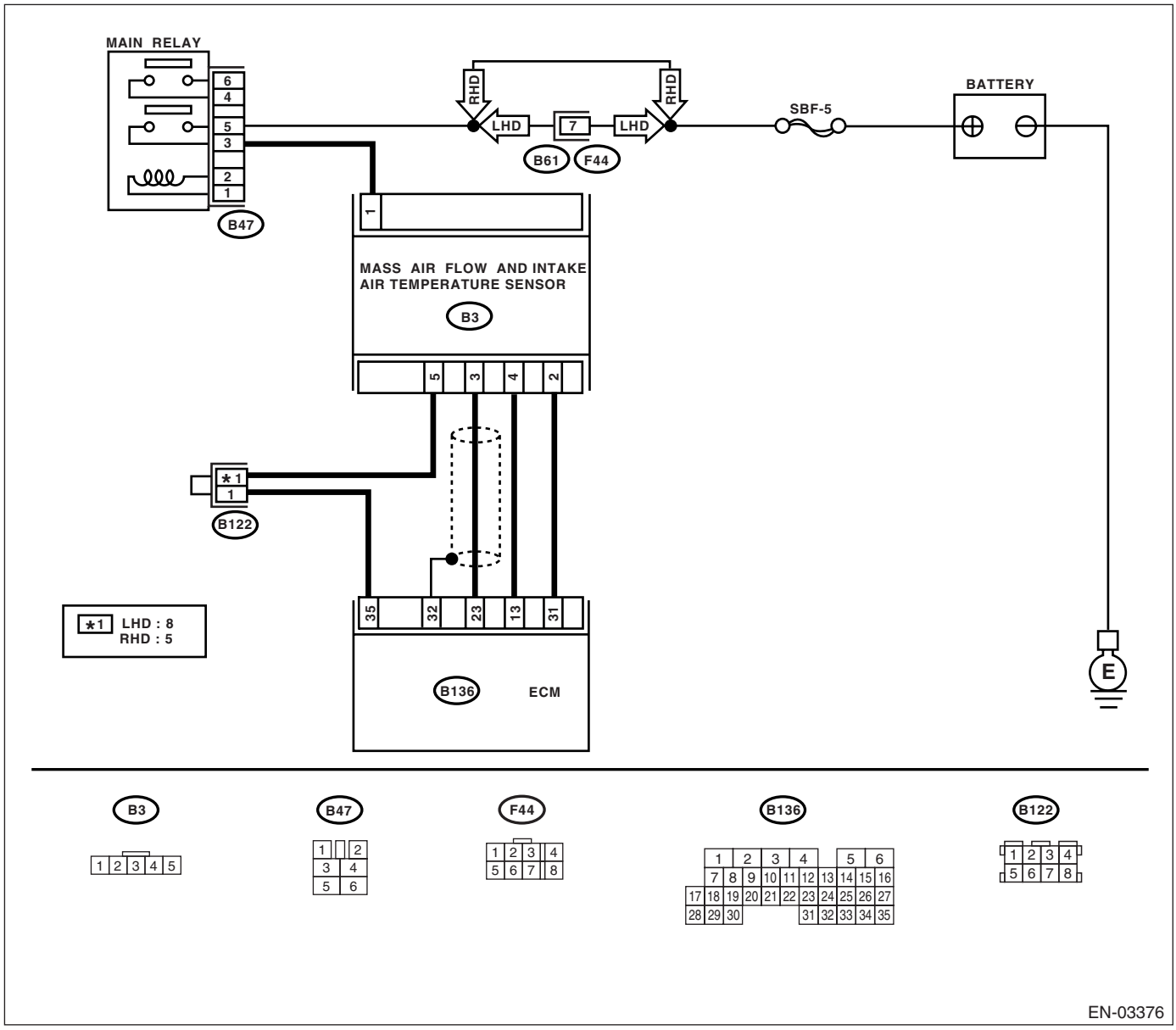
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 55°C (131°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than –36°C (–33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.0)-35, Mass Air Flow and Intake Air Temperature Sensor.>	Repair ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

M: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

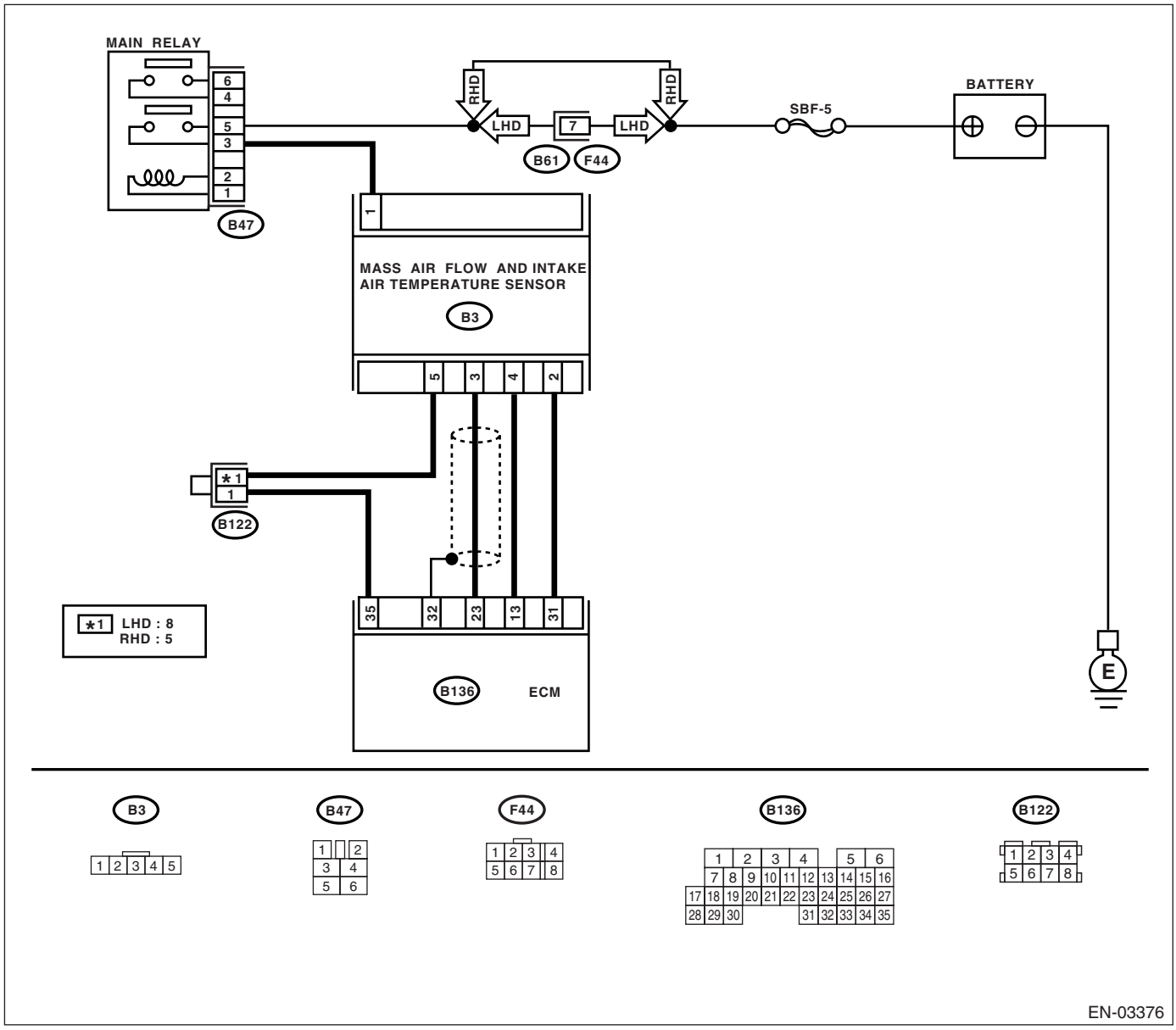
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than –36°C (–33°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.0)-35, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

N: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

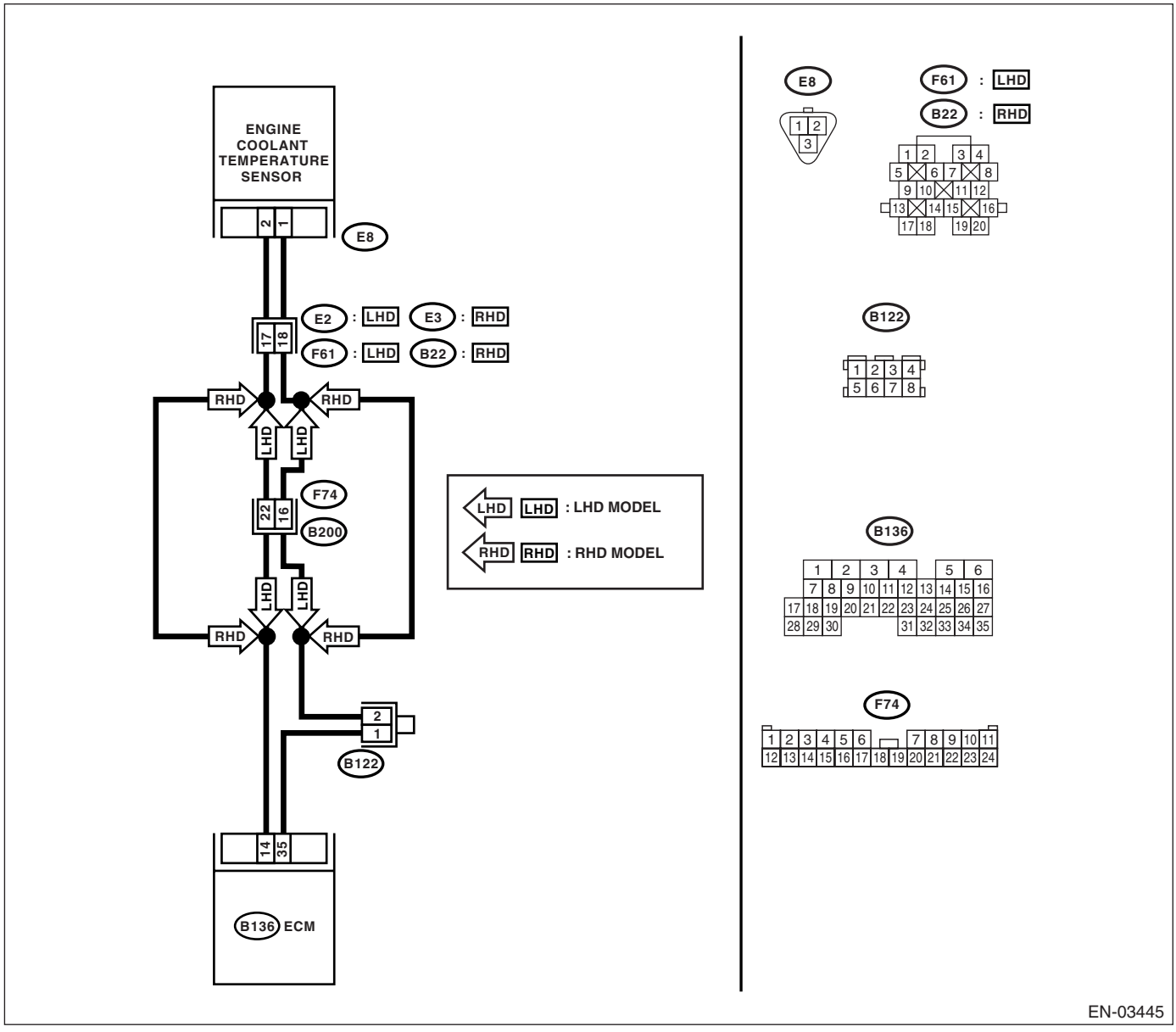
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 120°C (248°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC 2.0)-29, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

O: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

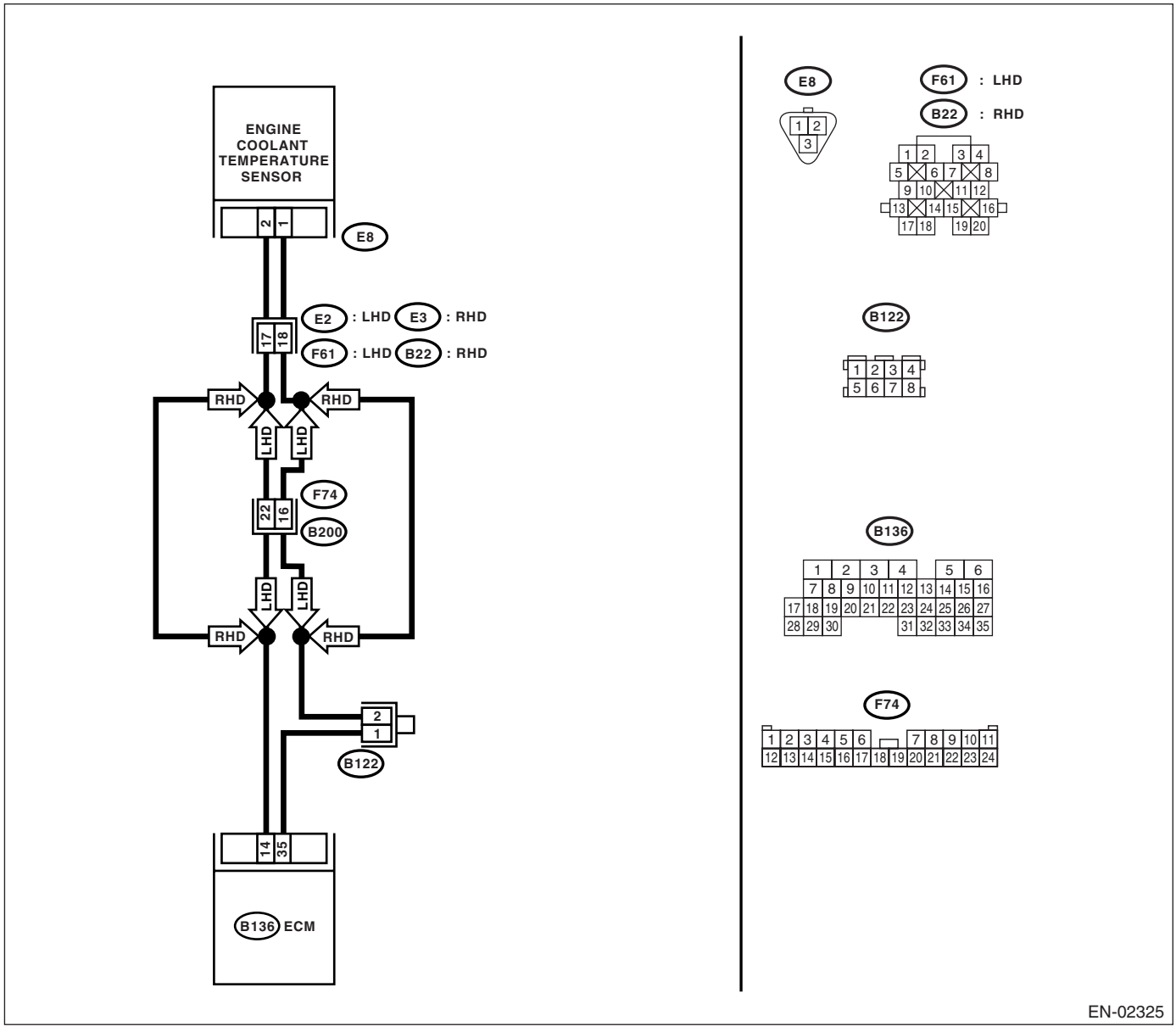
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC 2.0)-29, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector

P: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

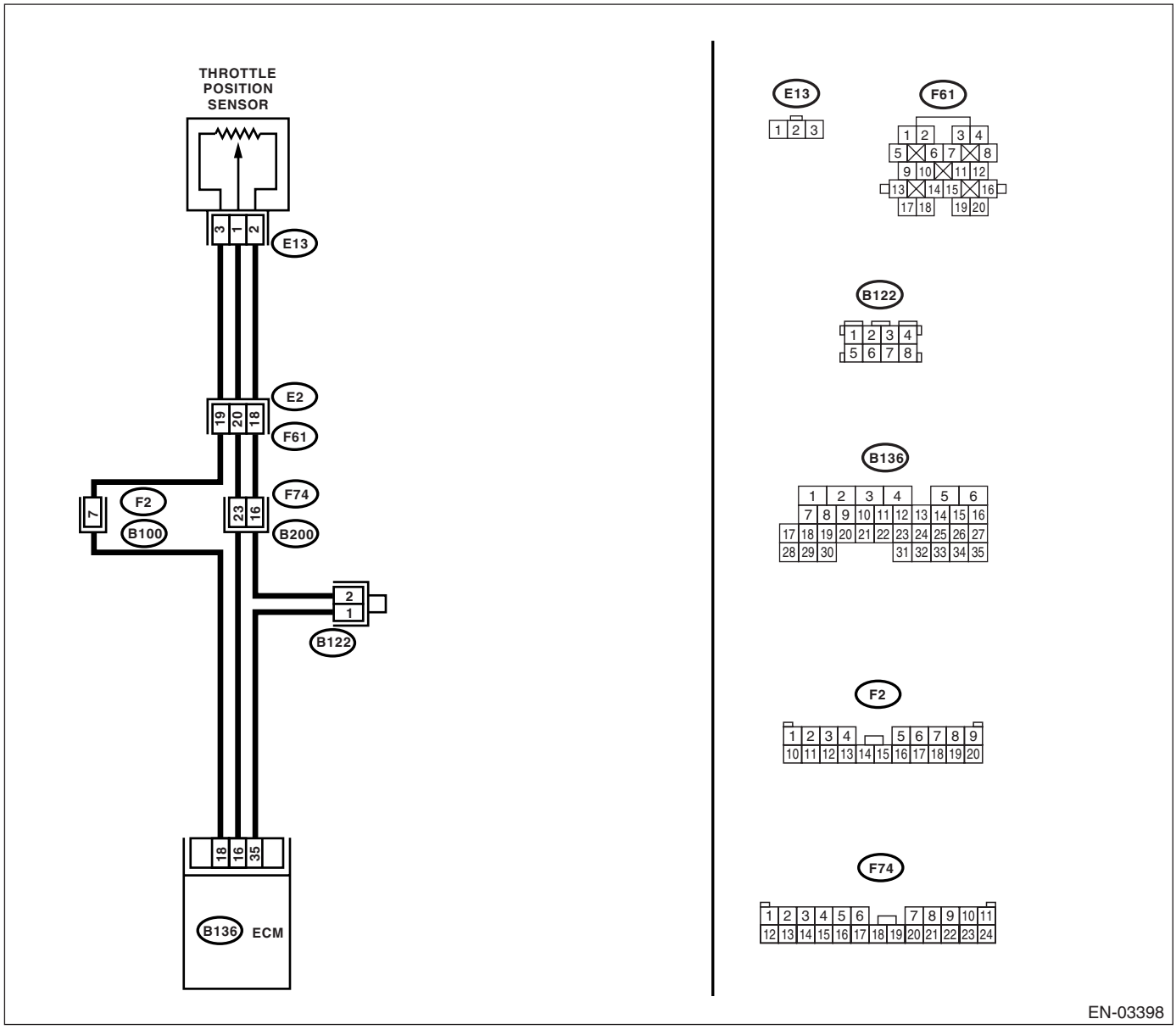
- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

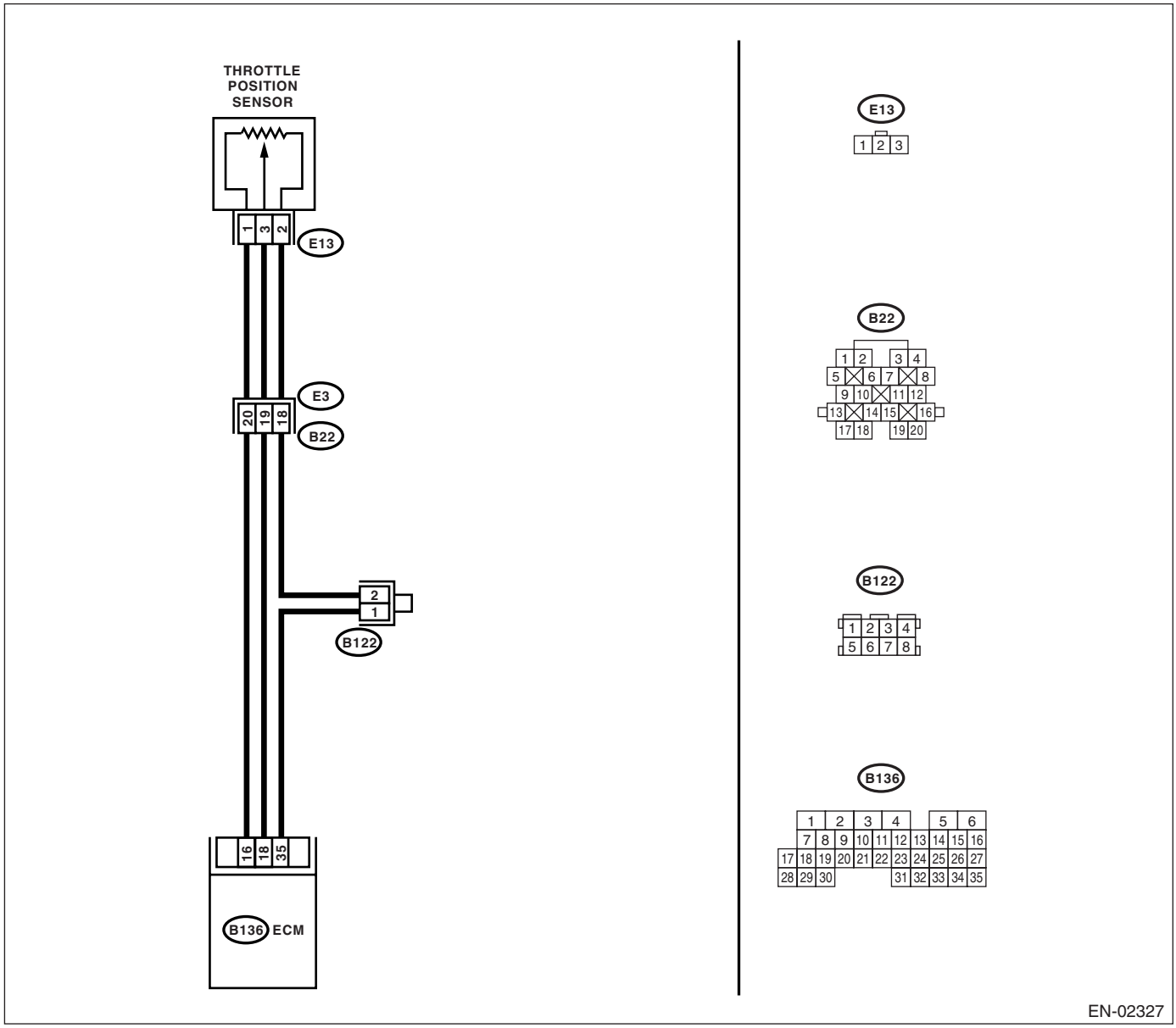
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


THROTTLE POSITION SENSOR
1
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2
E13
E3
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B22
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1
B122
16
18
35
B136 ECM
E13
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02327

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.15 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 (+) — Chassis ground (−):***	Is the voltage less than 0.15 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B136) No. 18 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between throttle position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(H4DOTC 2.0)-34, Throttle Position Sensor.>

Q: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:
Immediately at fault recognition

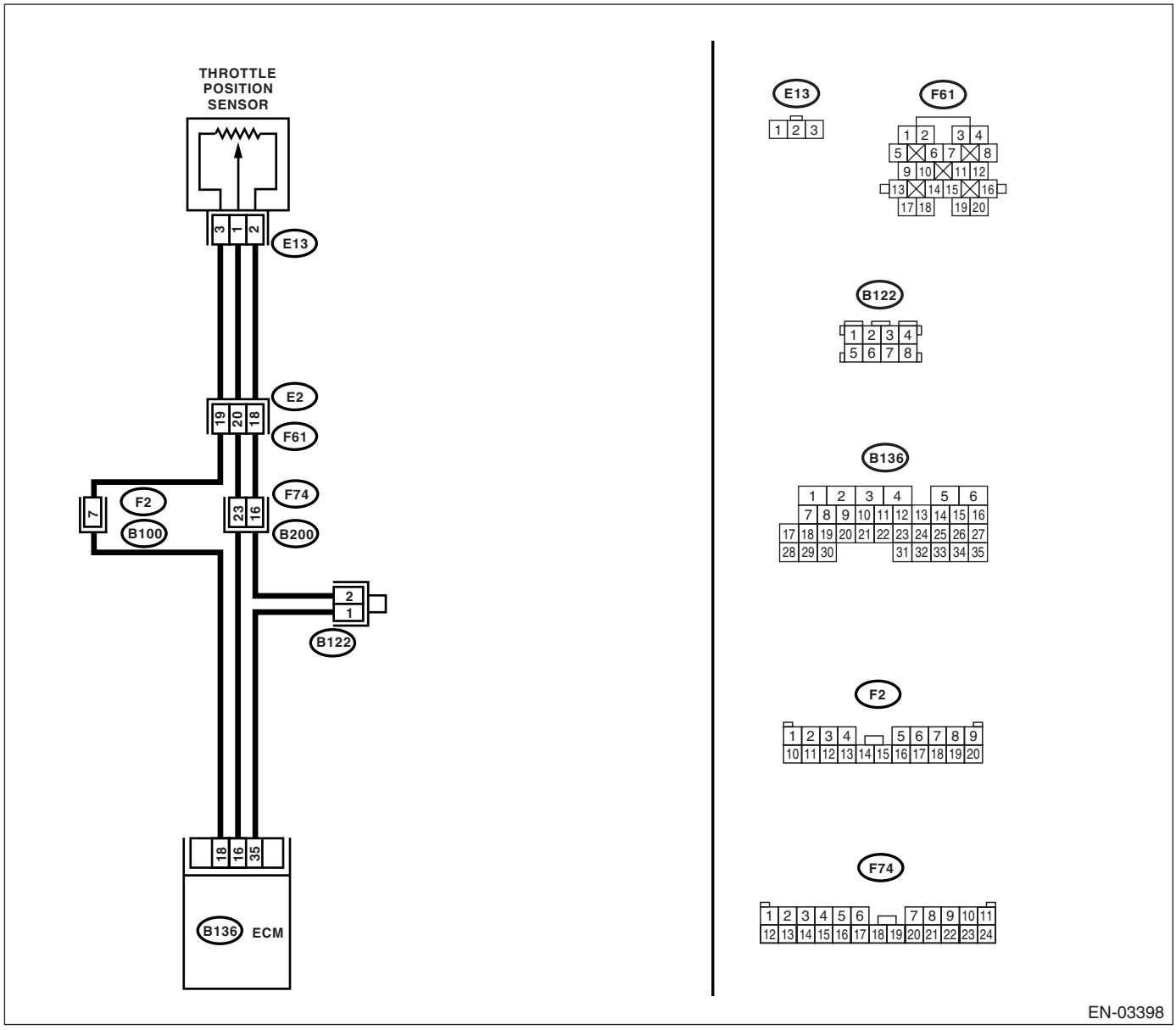
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

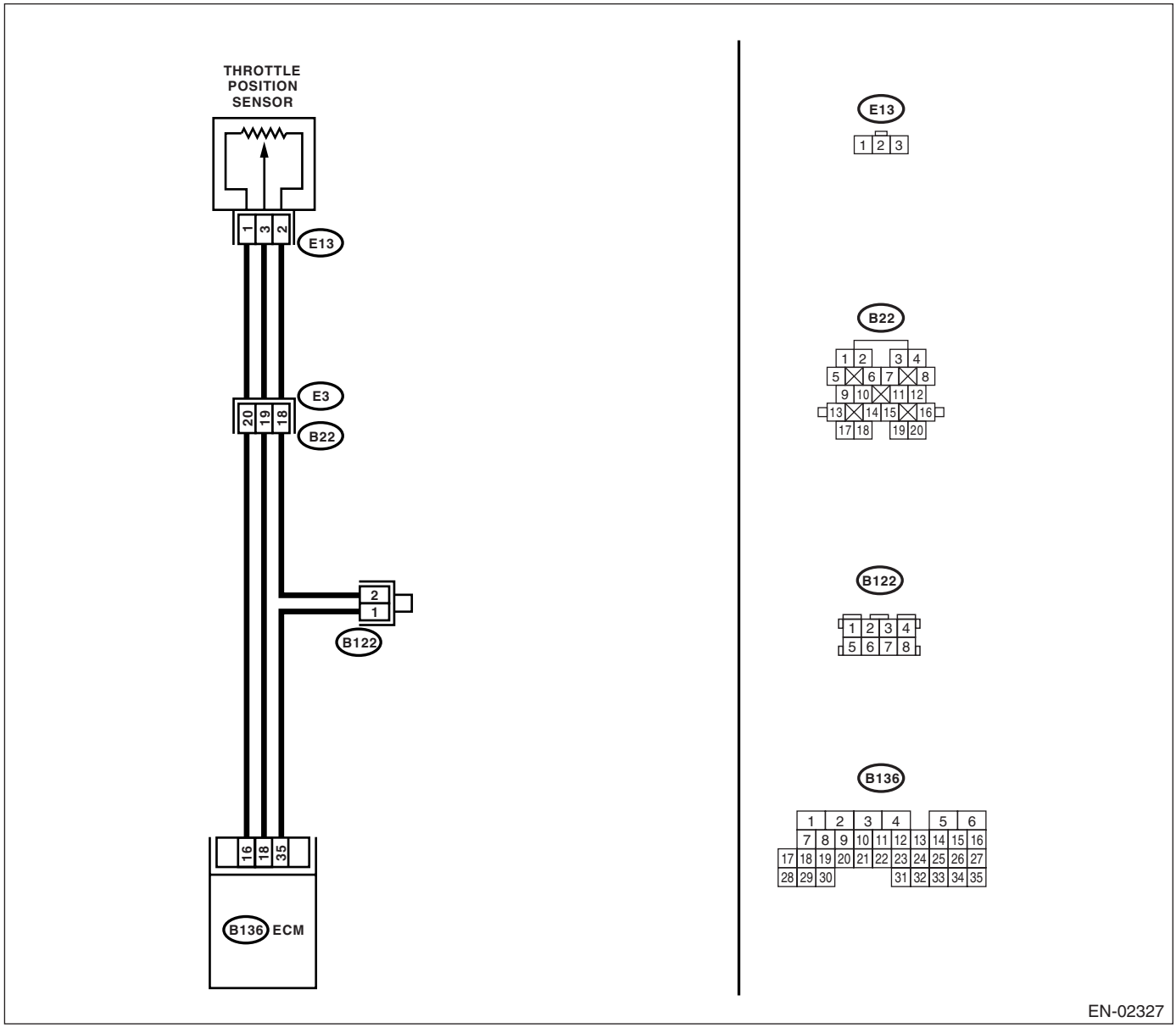
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


THROTTLE POSITION SENSOR
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E13
E3
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B22
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B122
16
18
35
B136 ECM
E13
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02327

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.7 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.7 V?	Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Replace the throttle position sensor. <Ref. to FU(H4DOTC 2.0)-34, Throttle Position Sensor.>

R: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

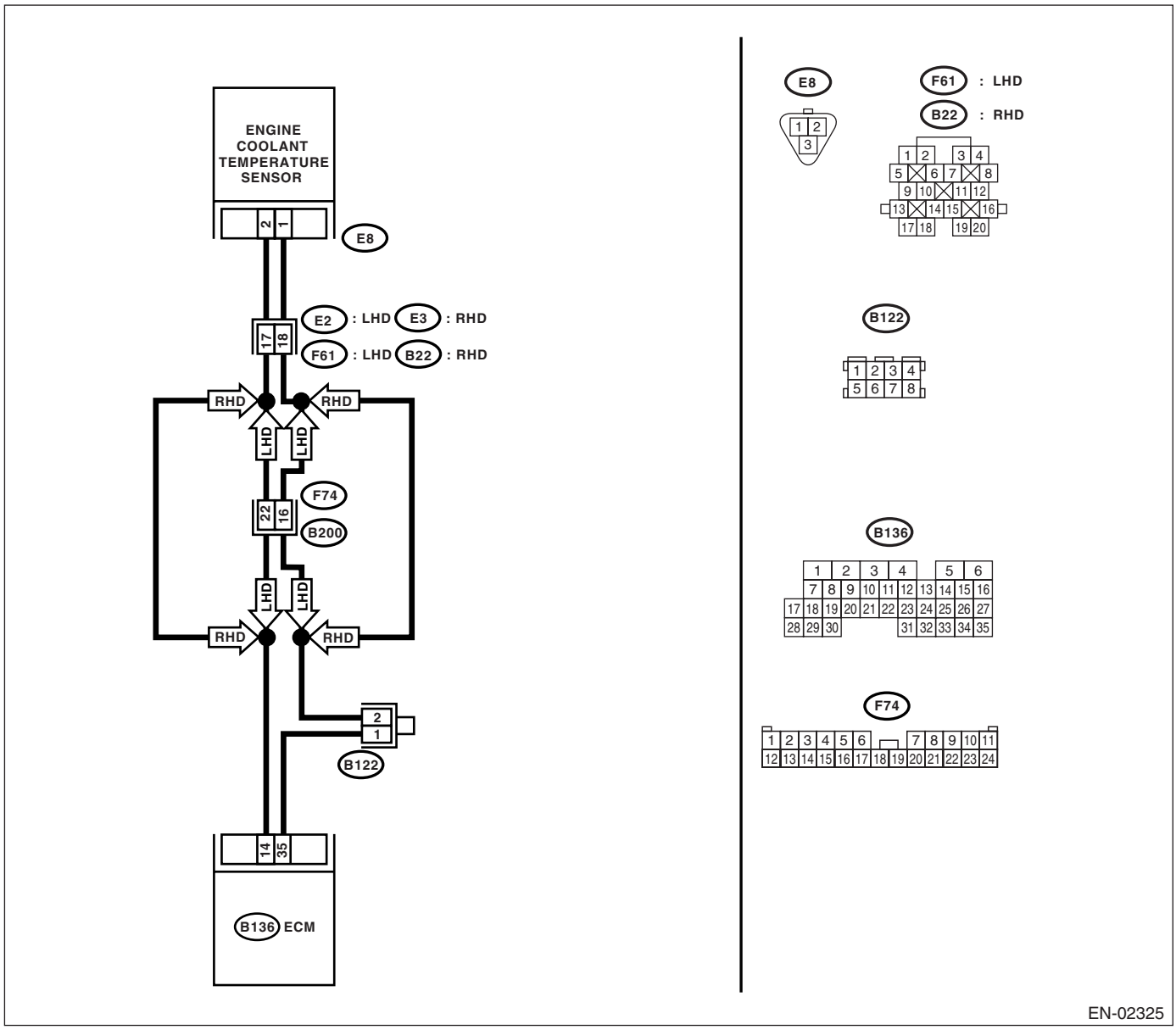
TROUBLE SYMPTOM:

Engine would not return to idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following items: • Thermostat open stuck • Engine coolant level • Engine coolant freeze • Tire diameter	Is there a fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-26, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC 2.0)-29, Engine Coolant Temperature Sensor.>

S: DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR1)

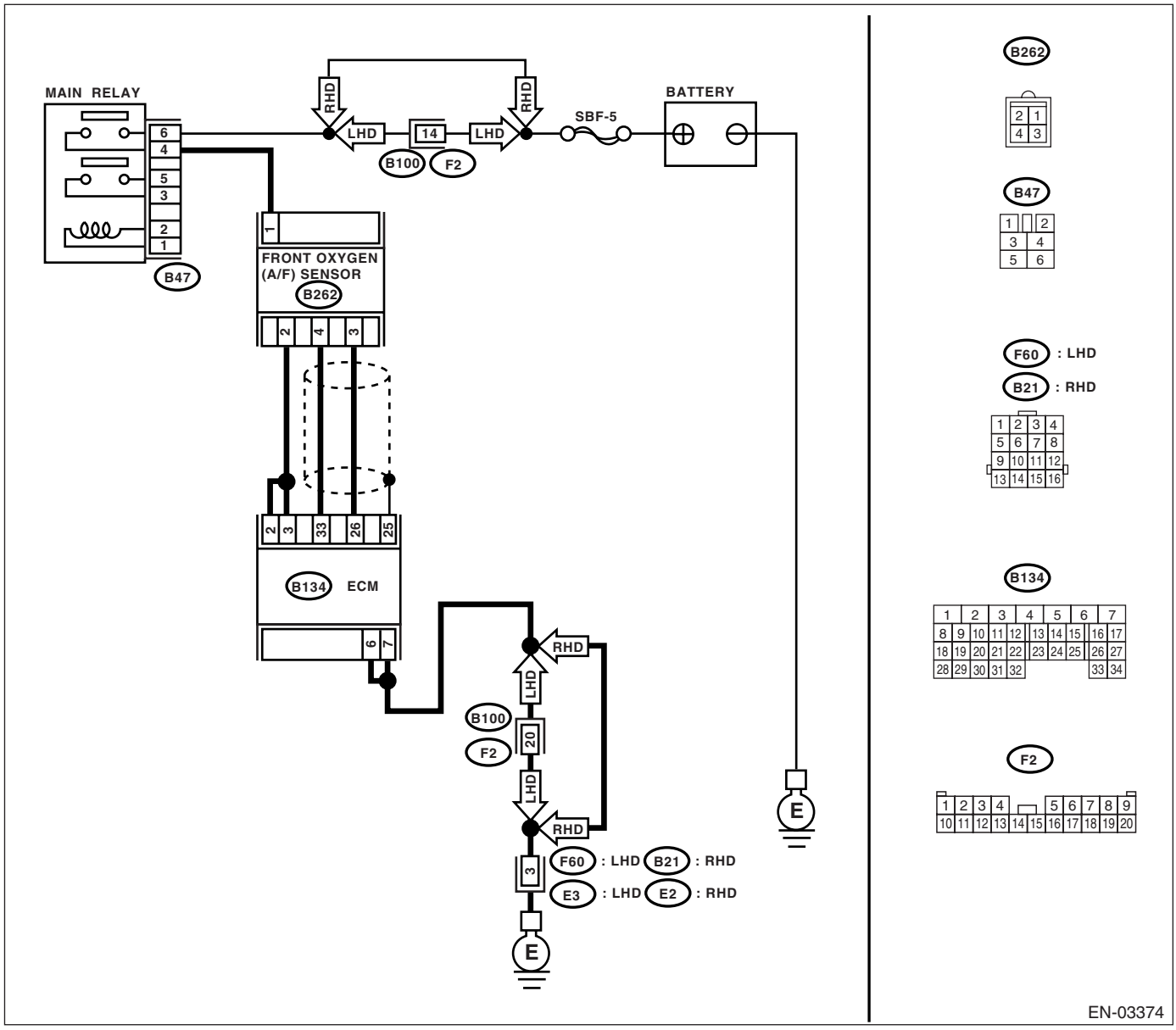
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

T: DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

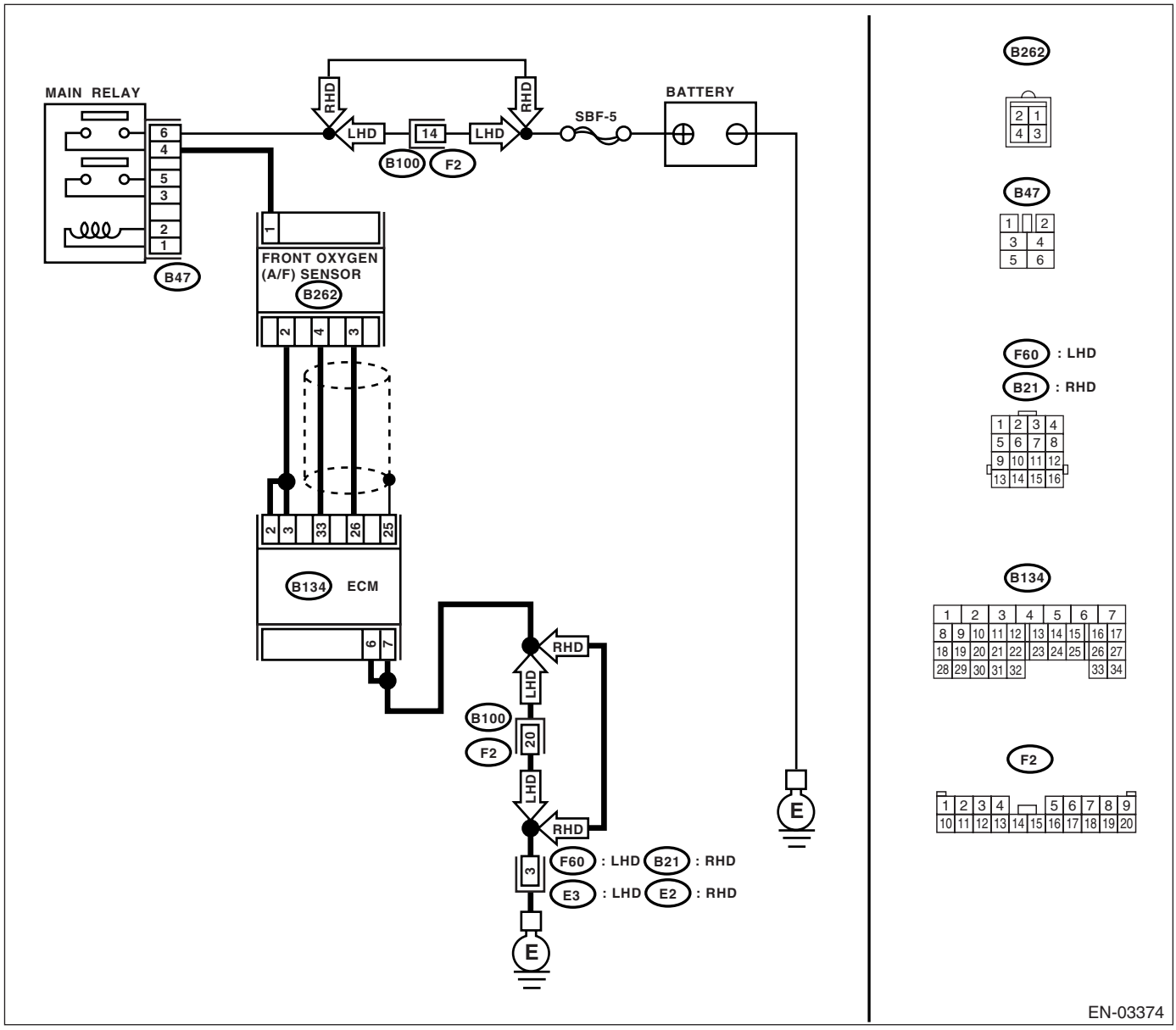
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (−):*** ***(B134) No. 33 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

U: DTC P0133 O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

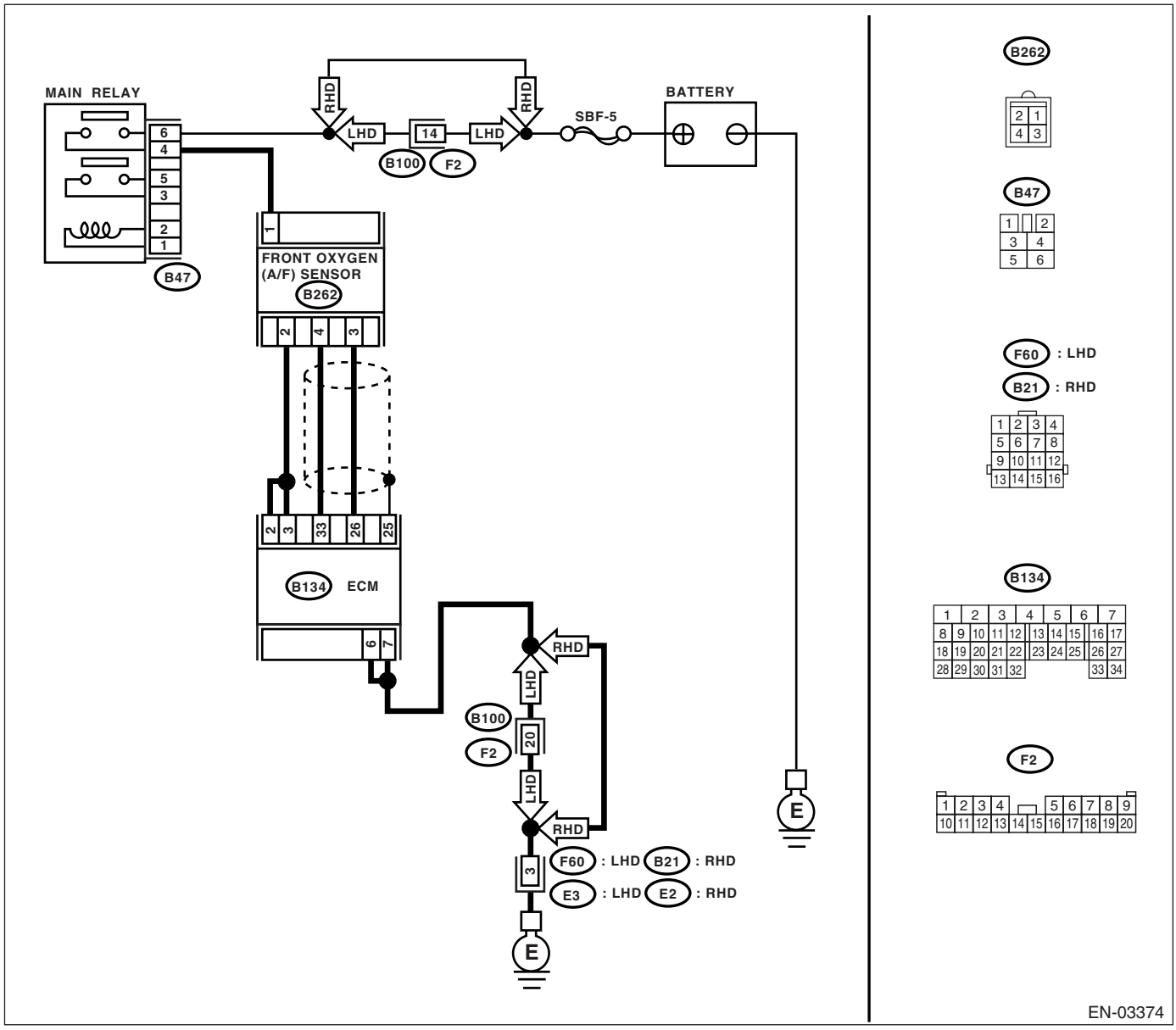
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items: • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>

V: DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

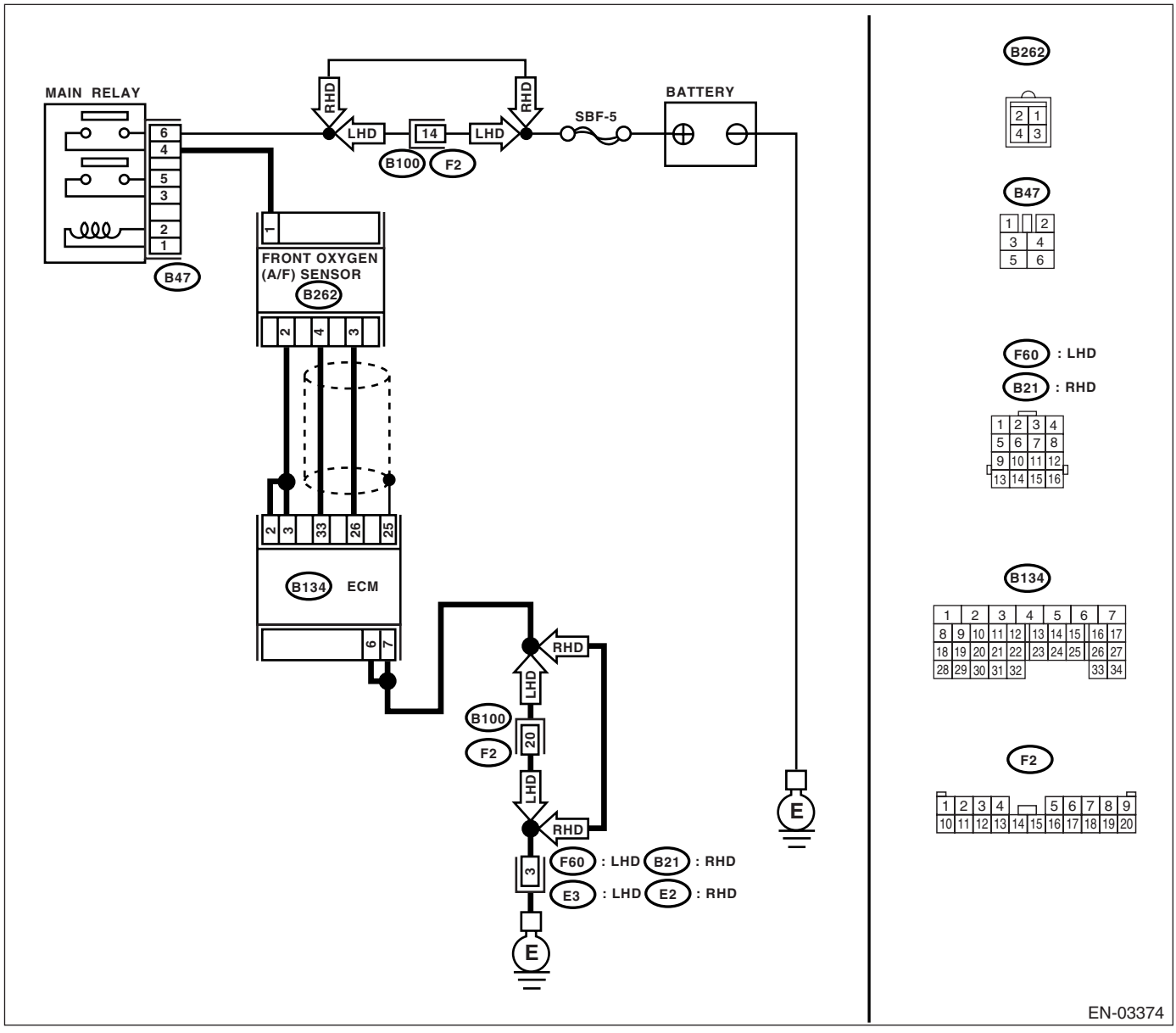
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1) Start the engine. 2) While observing the Subaru Select Monitor or general scan tool screen, warm-up the engine until engine coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3) Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value 0.85 — 1.15 (in idling)?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1) Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approx. 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2) Operate the LED operation mode for engine. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.>	Does the LED of {Rear O_2 Rich Signal} blink?	Repair the poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check the rear oxygen sensor circuit. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>

W: DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

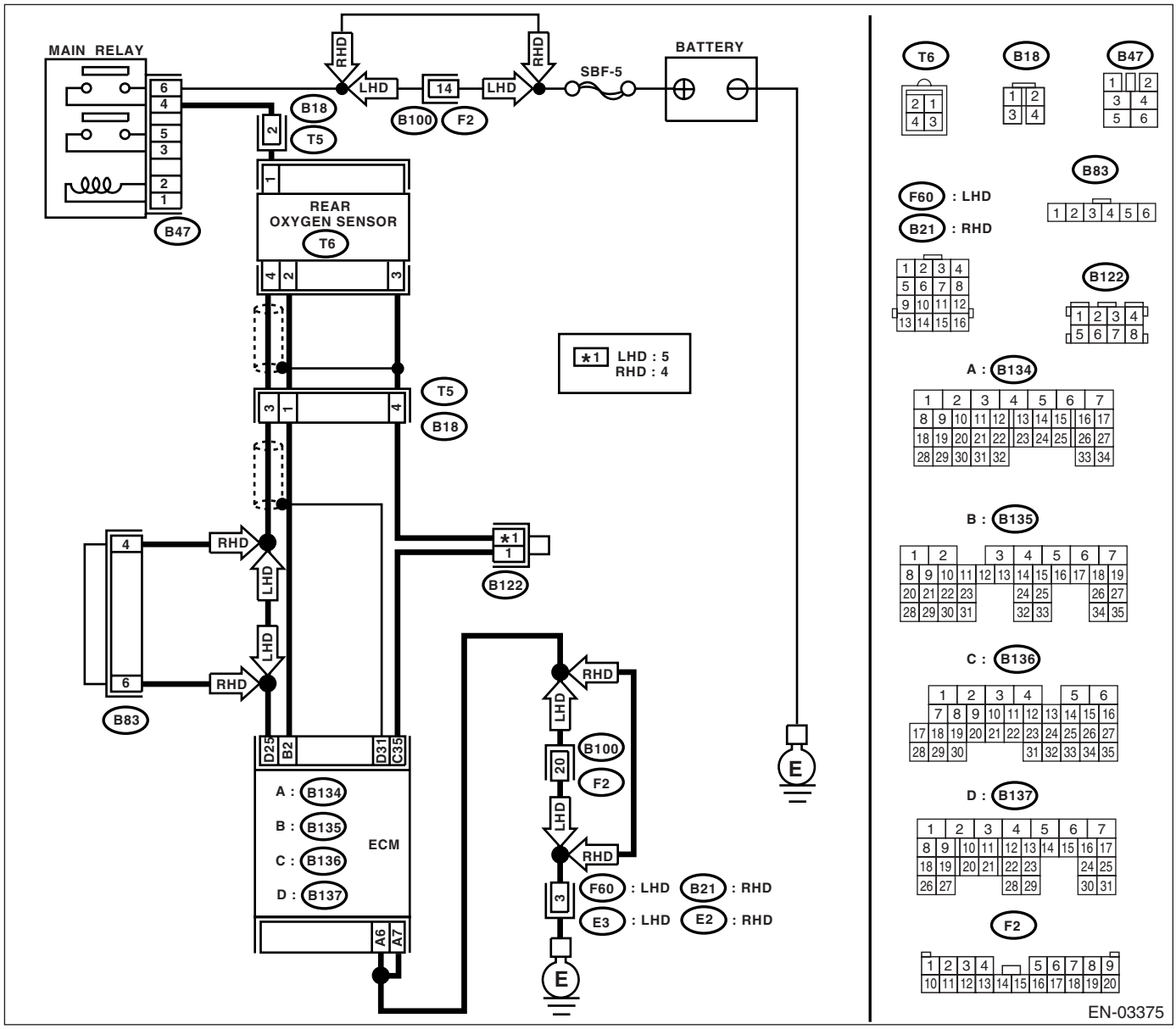
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance in harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance more than 3 Ω?	Repair battery short circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR and ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector.

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose part of exhaust system and incomplete installation • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>

X: DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

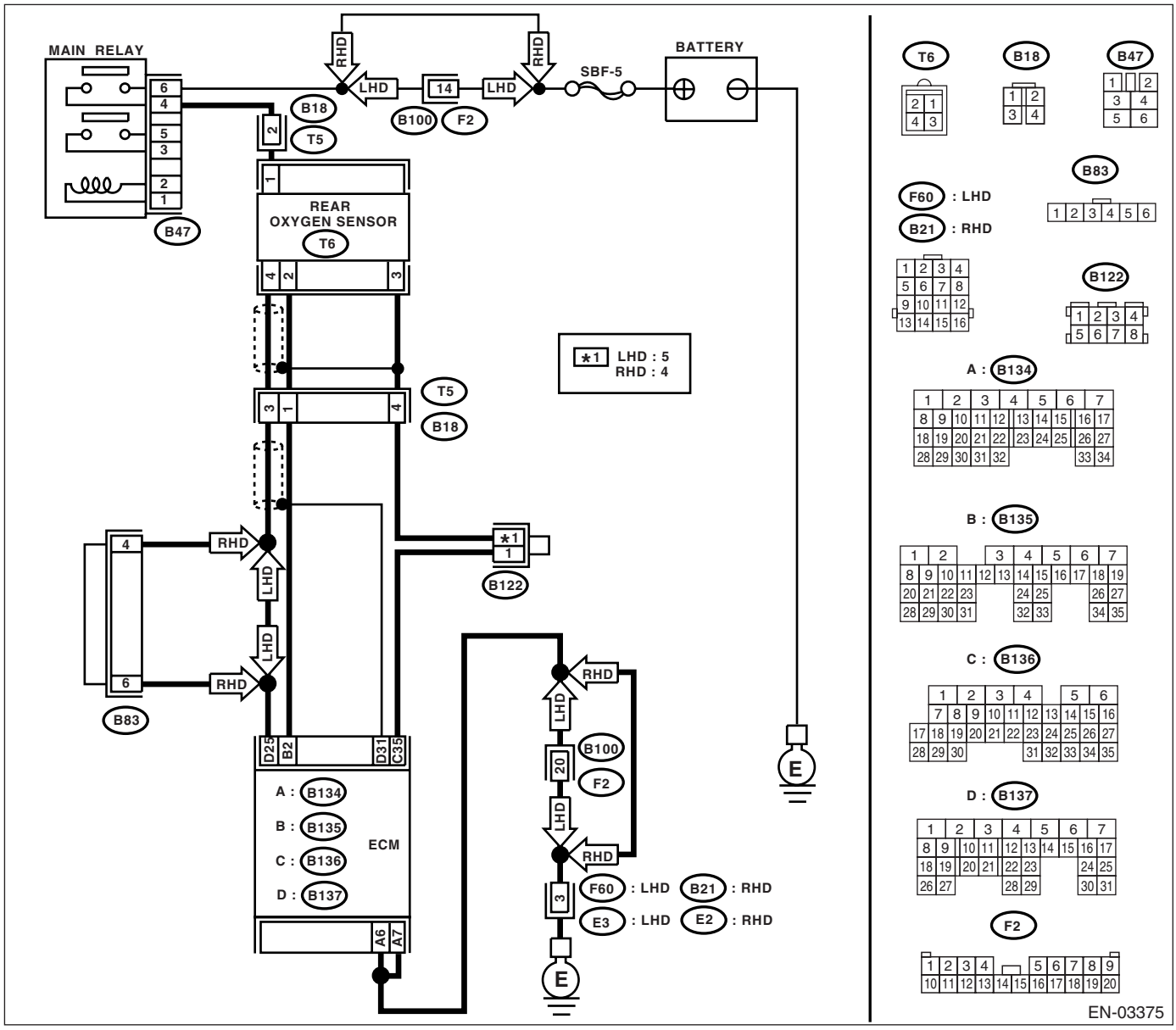
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance in harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance more than 3 Ω?	Repair battery short circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR and ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose part of exhaust system and incomplete installation • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.0)-47, Rear Oxygen Sensor.>

Y: DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
For diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC 2.0)(diag)-137, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Z: DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or looseness of the bolts on exhaust system?	Repair exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect the fuel pressure gauge. 4) Install the fuel filler flap lid cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is measured value 206 — 235 kPa (2.1 — 2.4 kgf/cm^2, 30 — 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC 2.0)-29, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start and warm-up the engine until engine coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value within the following? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.0)-35, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.** 1) Start and warm-up the engine until engine coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Subtract the ambient temperature from intake air temperature, and is the value from −10°C (14°F) to 50°C (122°F)?	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.0)-35, Mass Air Flow and Intake Air Temperature Sensor.>

AA:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

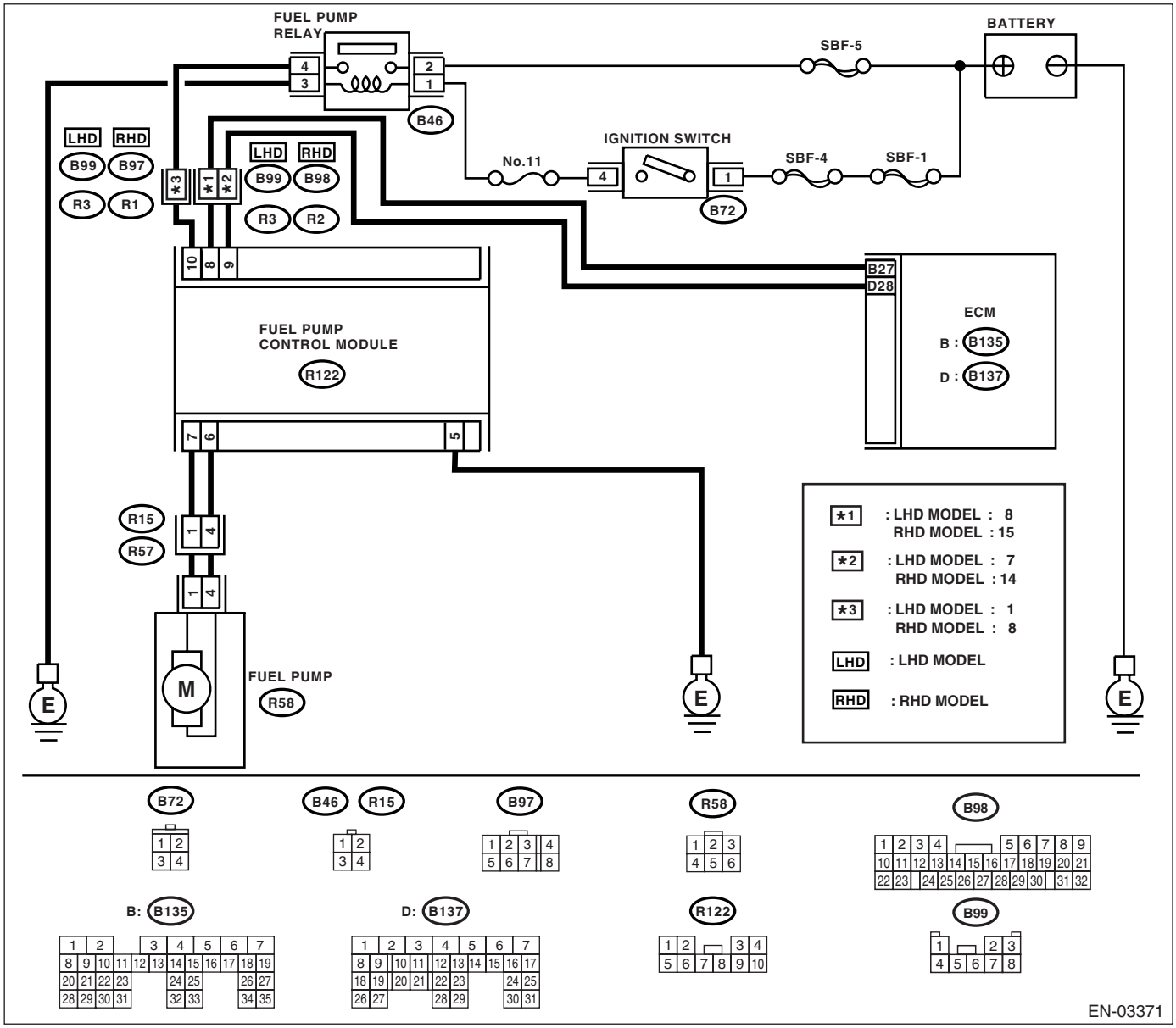
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump control unit. • Poor contact in fuel pump control unit connector. • Poor contact in fuel pump relay connector.
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit between fuel pump control unit and chassis ground. • Poor contact in fuel pump control unit connector.
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 7 — (R58) No. 1:*** ***(R122) No. 6 — (R58) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit between fuel pump control unit and fuel pump.

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance in harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 8 — (B135) No. 27:*** ***(R122) No. 9 — (B137) No. 28:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit between fuel pump control unit and ECM. • Poor contact in fuel pump control unit and ECM connector
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 8 — Chassis ground:*** ***(R122) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between fuel pump control unit and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Go to step **8.**
8	**CHECK EXPERIENCE OF OUT OF GAS.**	Have the vehicle been out of gas before?	Complete the diagnostic. NOTE: DTC may be recorded due to the idle running of fuel pump at out of gas.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC 2.0)-53, Fuel Pump Control Unit.>

AB:DTC P0244 TURBO/MSC WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

DTC DETECTING CONDITION:

Immediately at fault recognition

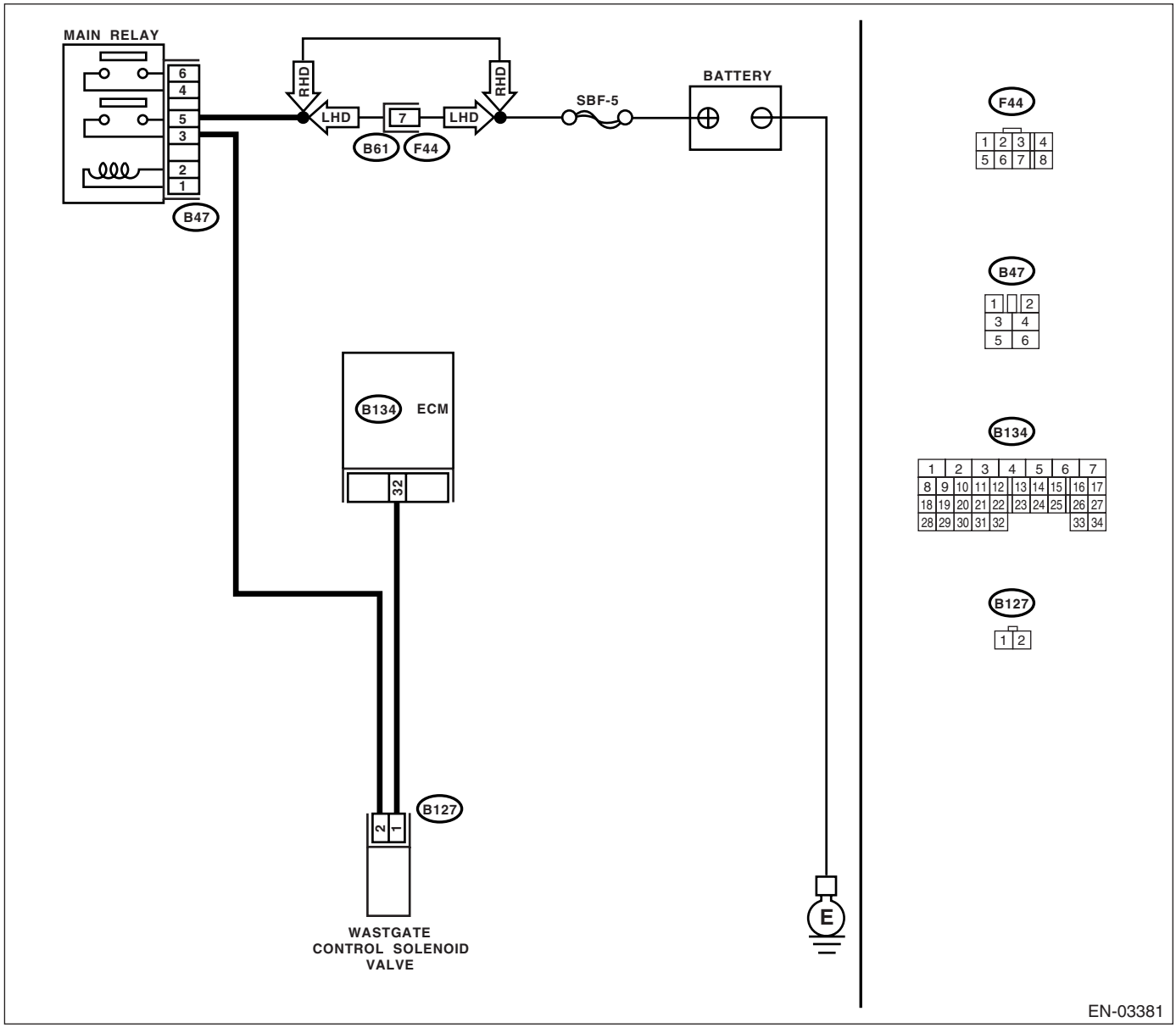
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC 2.0)-44, Wastegate Control Solenoid Valve.>

AC:DTC P0245 TURBO/MSC WASTEGATE SOLENOID “A” LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

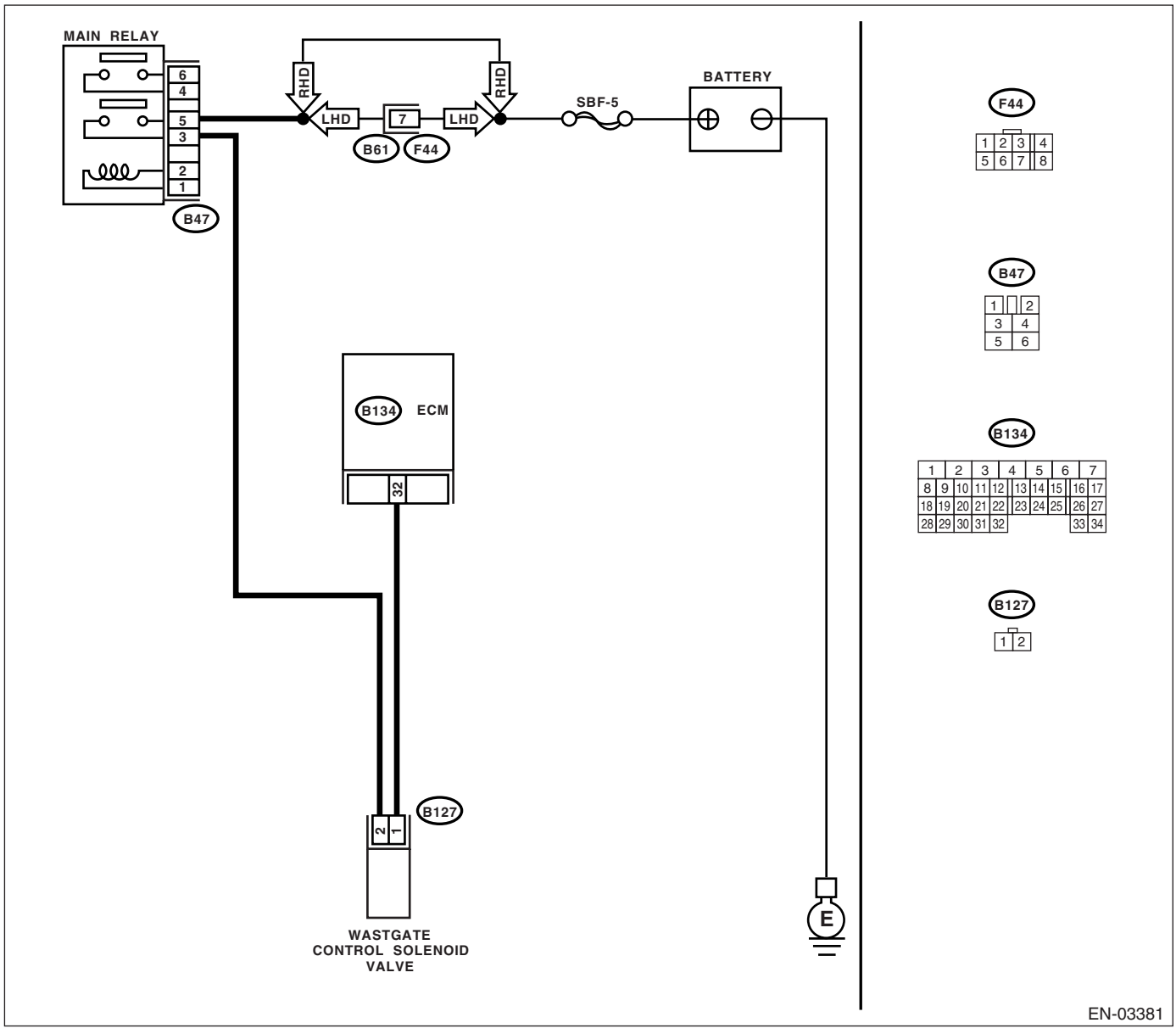
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance in harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B127) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between wastegate control solenoid valve and ECM. ***Connector & terminal*** ***(B134) No. 32 — (B127) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case repair the following: Open circuit in harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 30 — 34 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC 2.0)-44, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(B127) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair poor contact in wastegate control solenoid valve connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AD:DTC P0246 TURBO/MSC WASTEGATE SOLENOID “A” HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

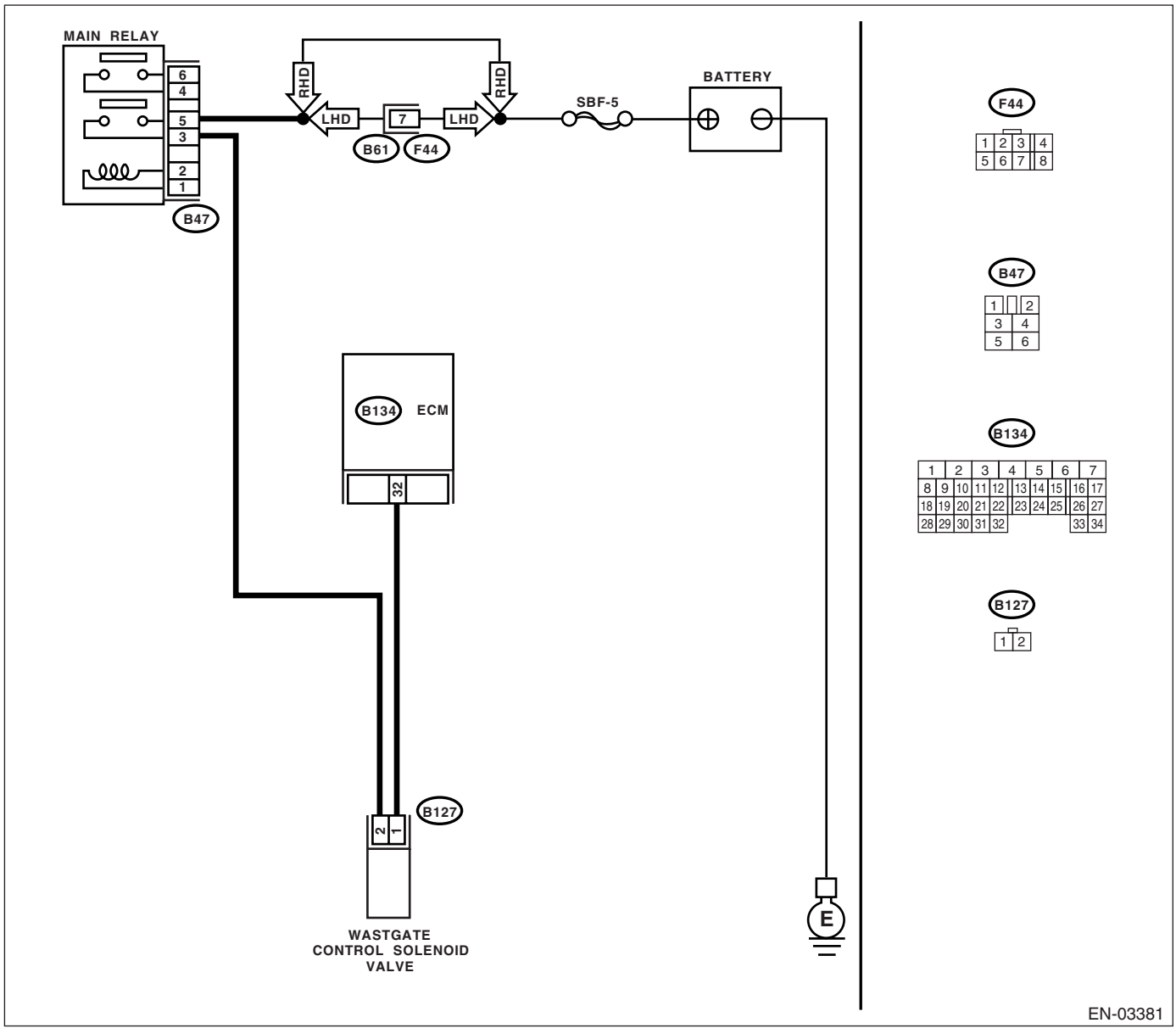
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve and ECM. <Ref. to FU(H4DOTC 2.0)-44, Wastegate Control Solenoid Valve.> <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

AE:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC 2.0)(diag)-150, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AF:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC 2.0)(diag)-150, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AG:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC 2.0)(diag)-150, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AH:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

TROUBLE SYMPTOM:

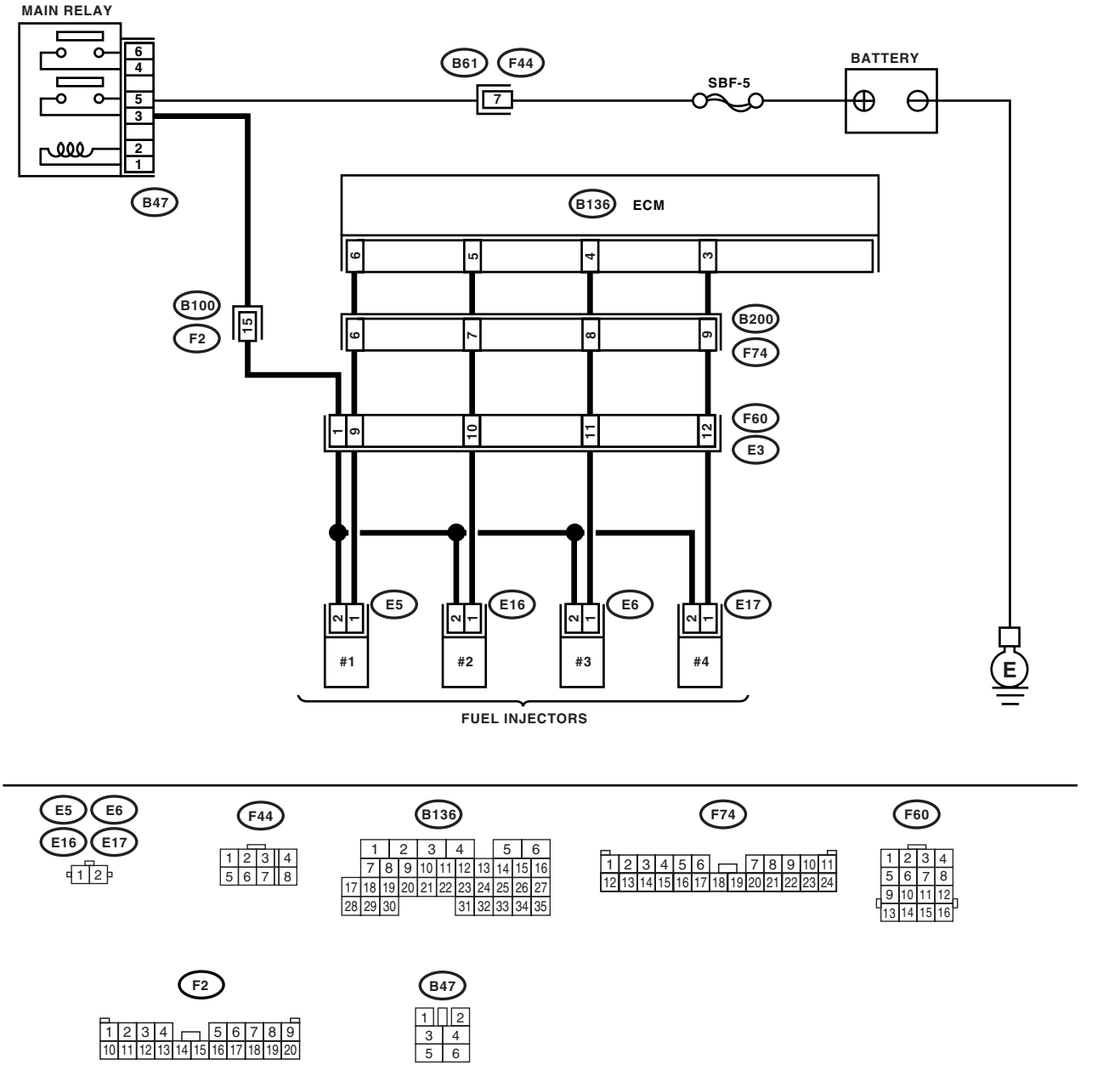
- Engine stalls
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

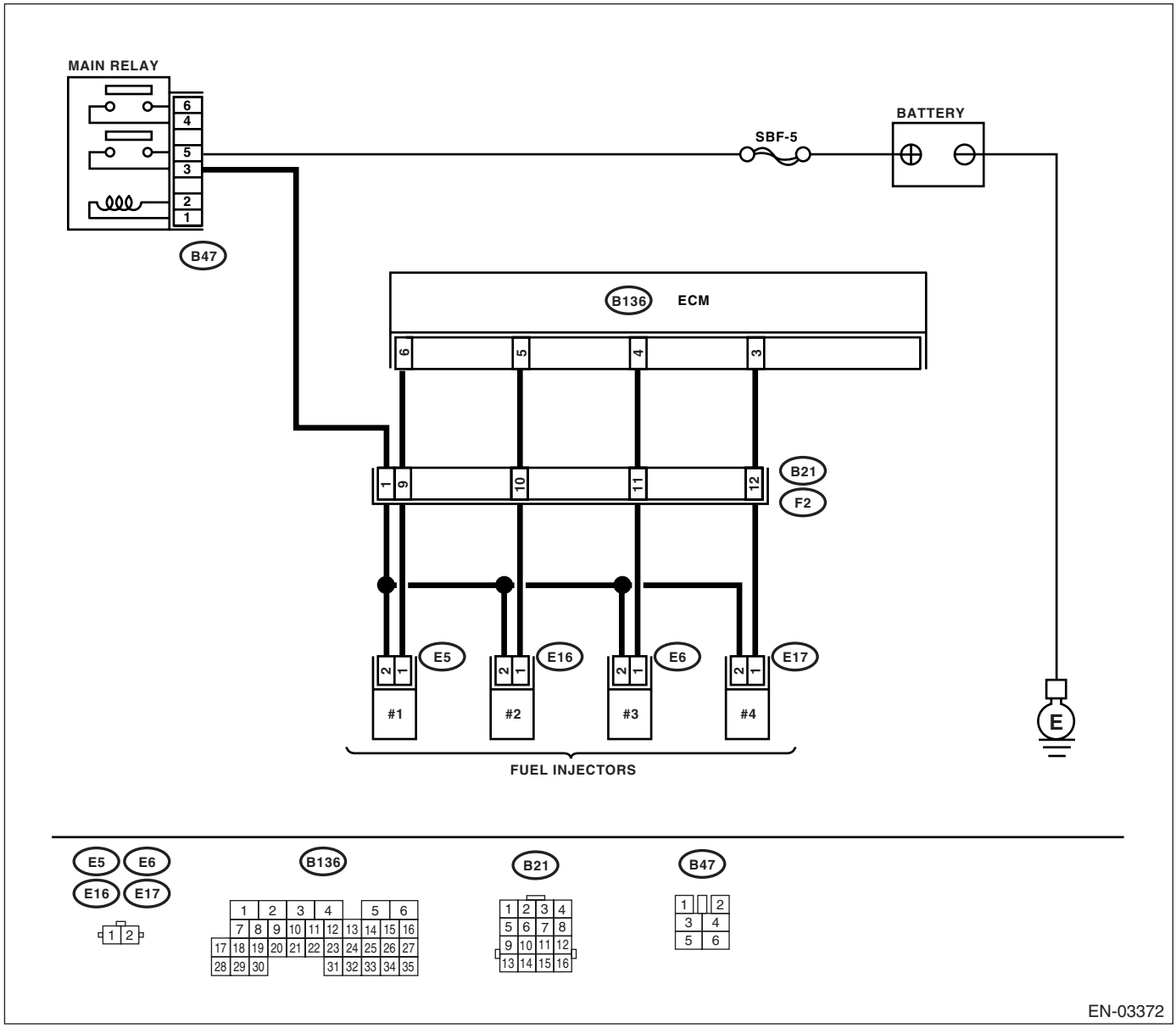
WIRING DIAGRAM:

- **LHD MODEL**



EN-03373

- **RHD MODEL**


MAIN RELAY
6
4
5
3
2
1
B47
SBF-5
BATTERY
B136
ECM
6
5
4
3
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9
10
11
12
B21
F2
2
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E5
E16
E6
E17
#1
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#3
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FUEL INJECTORS
E5
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E16
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1 2
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
B21
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
B47
1 2
3 4
5 6
EN-03372

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (−):*** ***#2 (B136 No. 5 (+) — Chassis ground (−):*** ***#3 (B136 No. 4 (+) — Chassis ground (−):*** ***#4 (B136 No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Disconnect the connector from ECM. 4) Measure the voltage between ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 — (E5) No. 1:*** ***#2 (B136) No. 5 — (E16) No. 1:*** ***#3 (B136) No. 4 — (E6) No. 1:*** ***#4 (B136) No. 3 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5	**CHECK FUEL INJECTOR.** Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(H4DOTC 2.0)-38, Fuel Injector.>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair poor contact in all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
7	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (−):*** ***#2 (B136) No. 5 (+) — Chassis ground (−):*** ***#3 (B136) No. 4 (+) — Chassis ground (−):*** ***#4 (B136) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **8.**
8	**CHECK FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector and ECM. <Ref. to FU(H4DOTC 2.0)-38, Fuel Injector.> <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the installation of camshaft position sensor or crankshaft position sensor loosened?	Tighten camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANK SPROCKET.** Remove the timing belt cover.	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC 2.0)-68, Crank Sprocket.>	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair installation condition of timing belt. <Ref. to ME(H4DOTC 2.0)-59, Timing Belt.>	Go to step **12.**

Step		Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC 2.0)(diag)-47, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Was the cause of misfire diagnosed when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector. • Poor contact in coupling connector
15	**CHECK AIR INTAKE SYSTEM.**	Is there any fault in air intake system?	Repair air intake system. NOTE: Check the following items: • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step **16.**
16	**CHECK CYLINDER.**	Is there a fault in that cylinder?	Repair or replace the faulty part. NOTE: Check the following items: • Spark plug • Fuel injector • Compression	Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC 2.0)(diag)-136, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

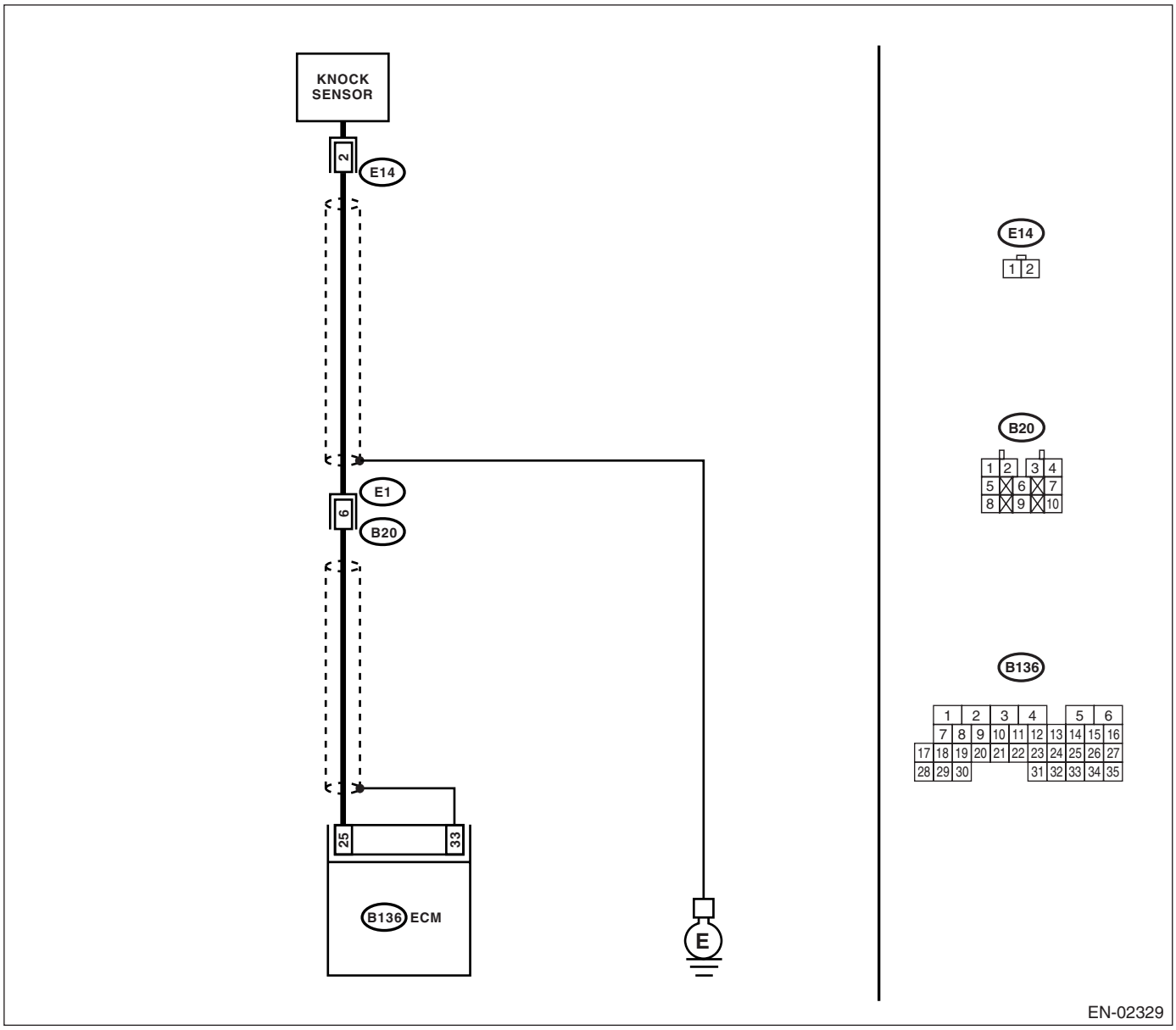
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC 2.0)-33, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AJ:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

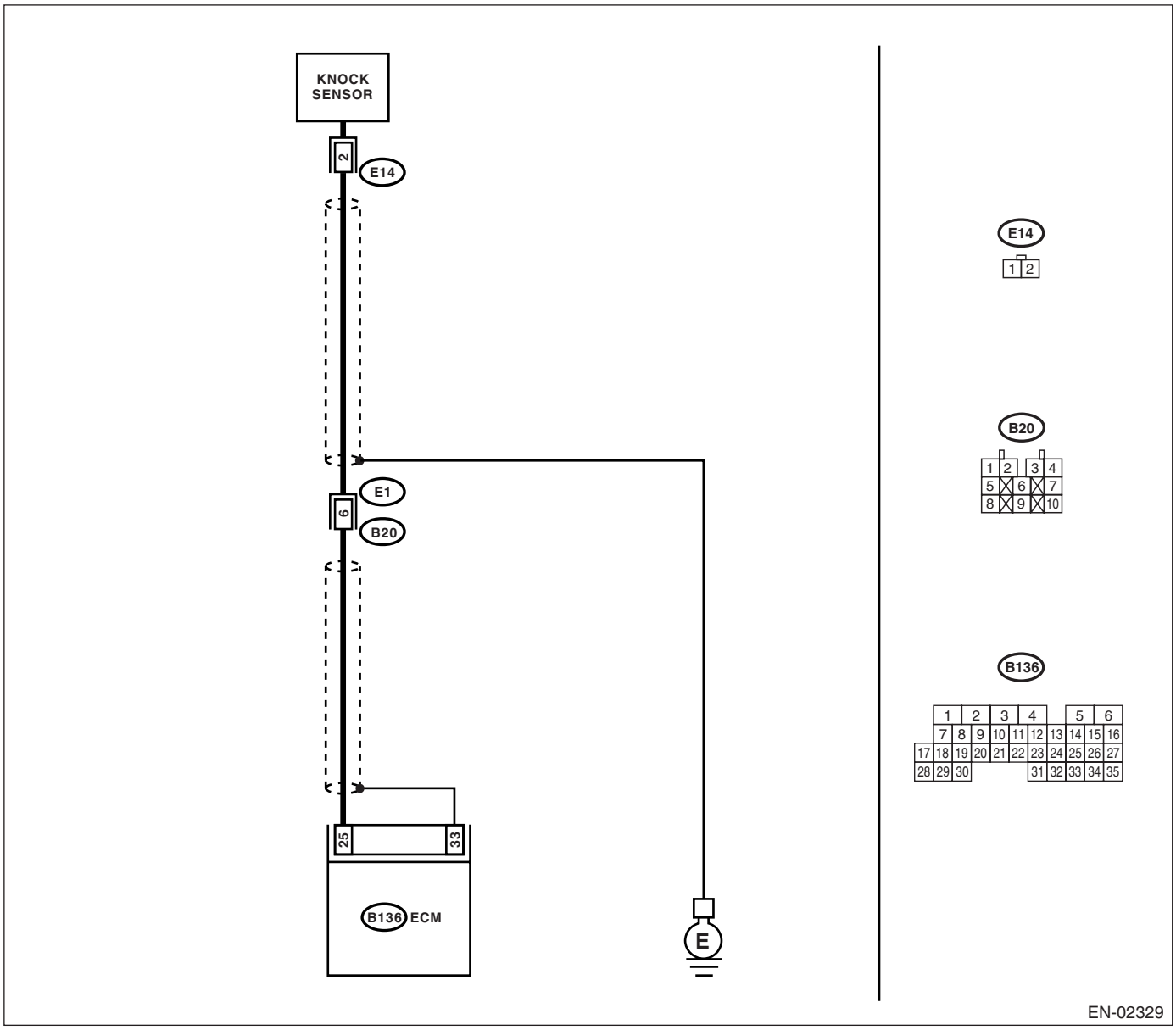
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC 2.0)-33, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair short circuit in harness covered with shield.
3	**CHECK INPUT SIGNAL FROM ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.(However, the possibility of poor contact still remains.) NOTE: In this case repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AK:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

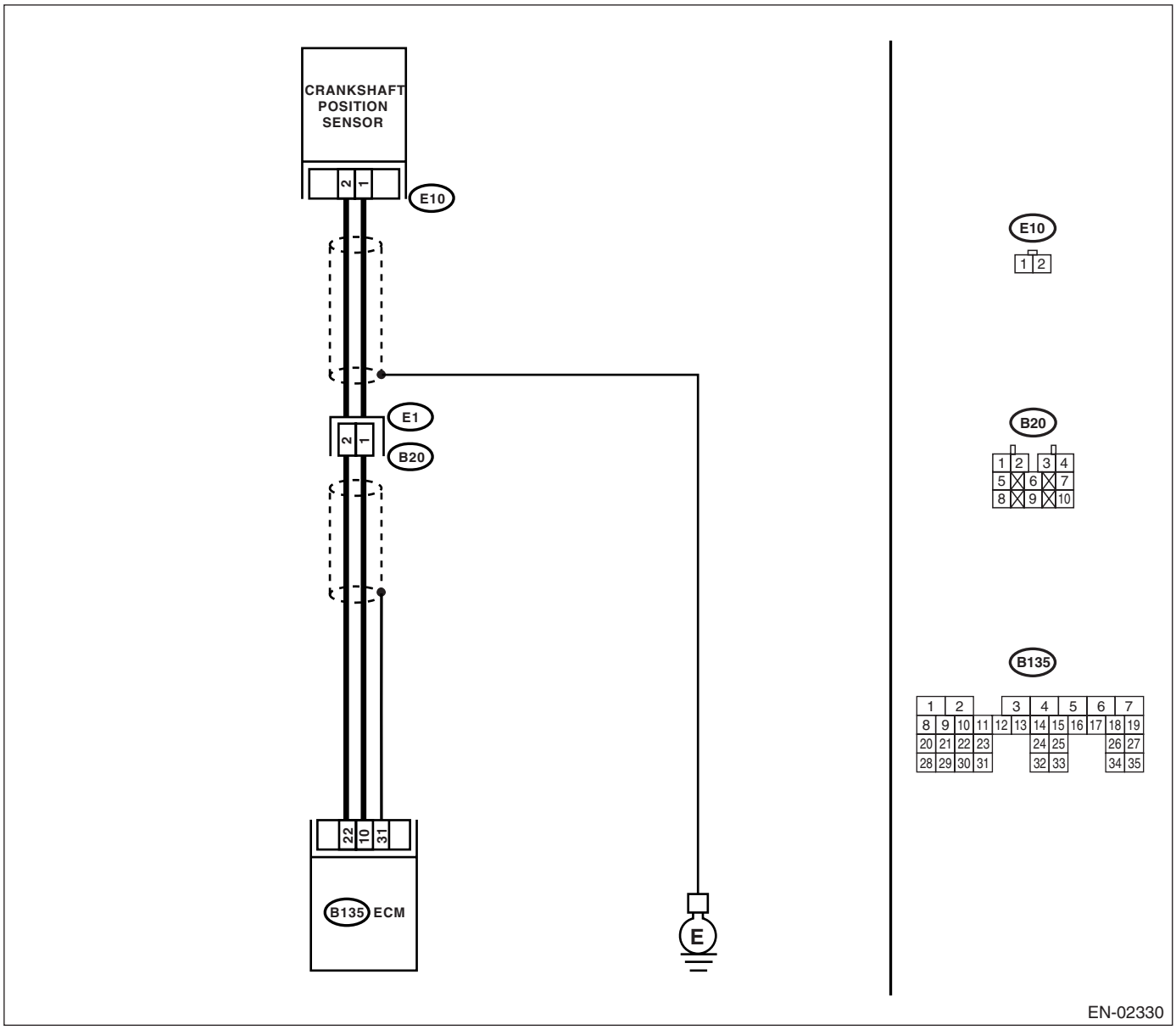
TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC 2.0)-30, Crankshaft Position Sensor.>

AL:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

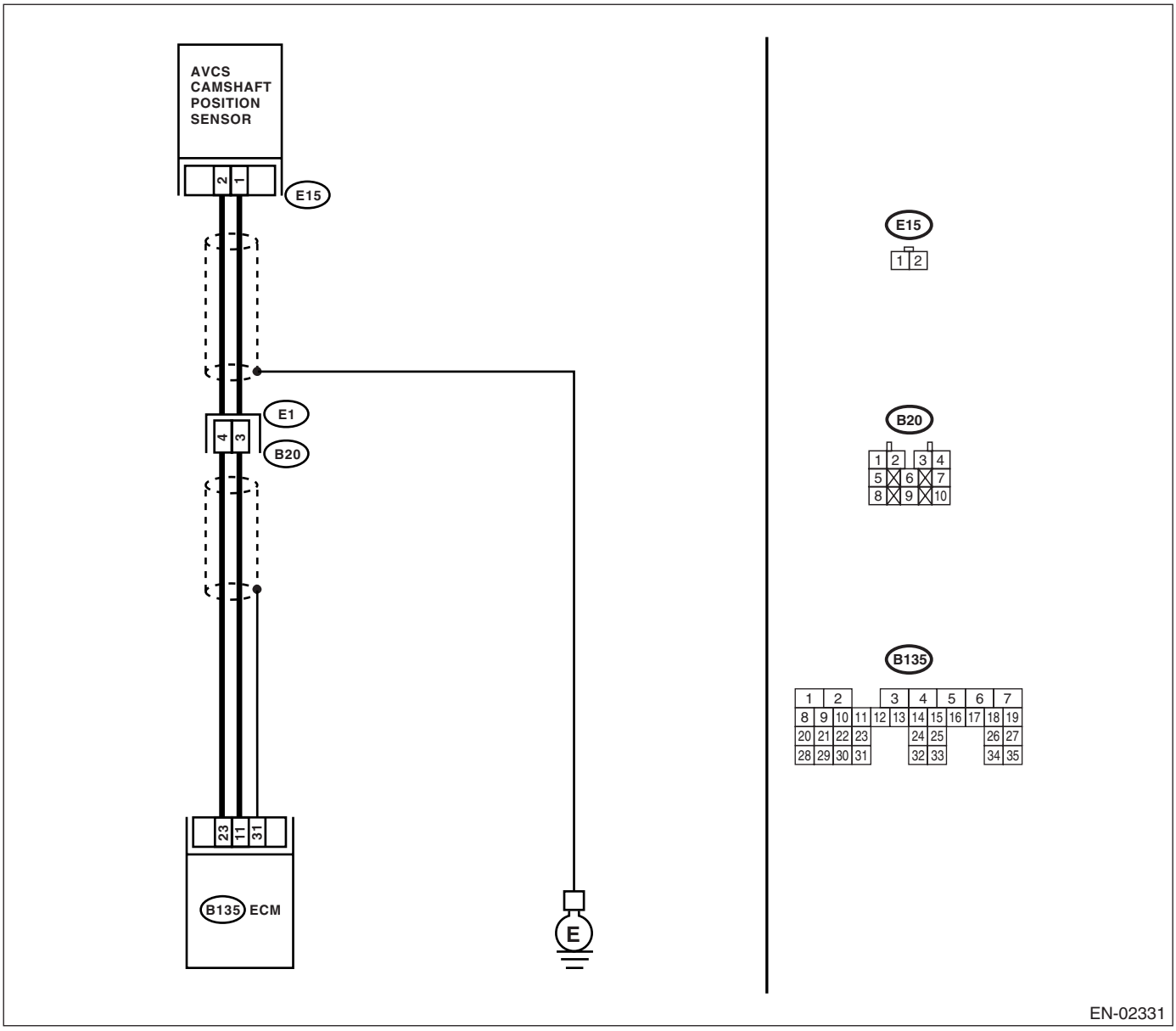
TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor connector. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between camshaft position sensor connector and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between camshaft position sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between camshaft position sensor connector and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR CONNECTOR.**	Is the camshaft position sensor connector installation bolt tightened securely?	Go to step **5.**	Tighten the camshaft position sensor connector installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Disconnect the camshaft position sensor connector. 2) Measure the resistance between connector terminals of camshaft position sensor connector. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair poor contact in camshaft position sensor connector.	Replace the camshaft position sensor connector. <Ref. to FU(H4DOTC 2.0)-31, Camshaft Position Sensor.>

AM:DTC P0365 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1)

DTC DETECTING CONDITION:

Immediately at fault recognition

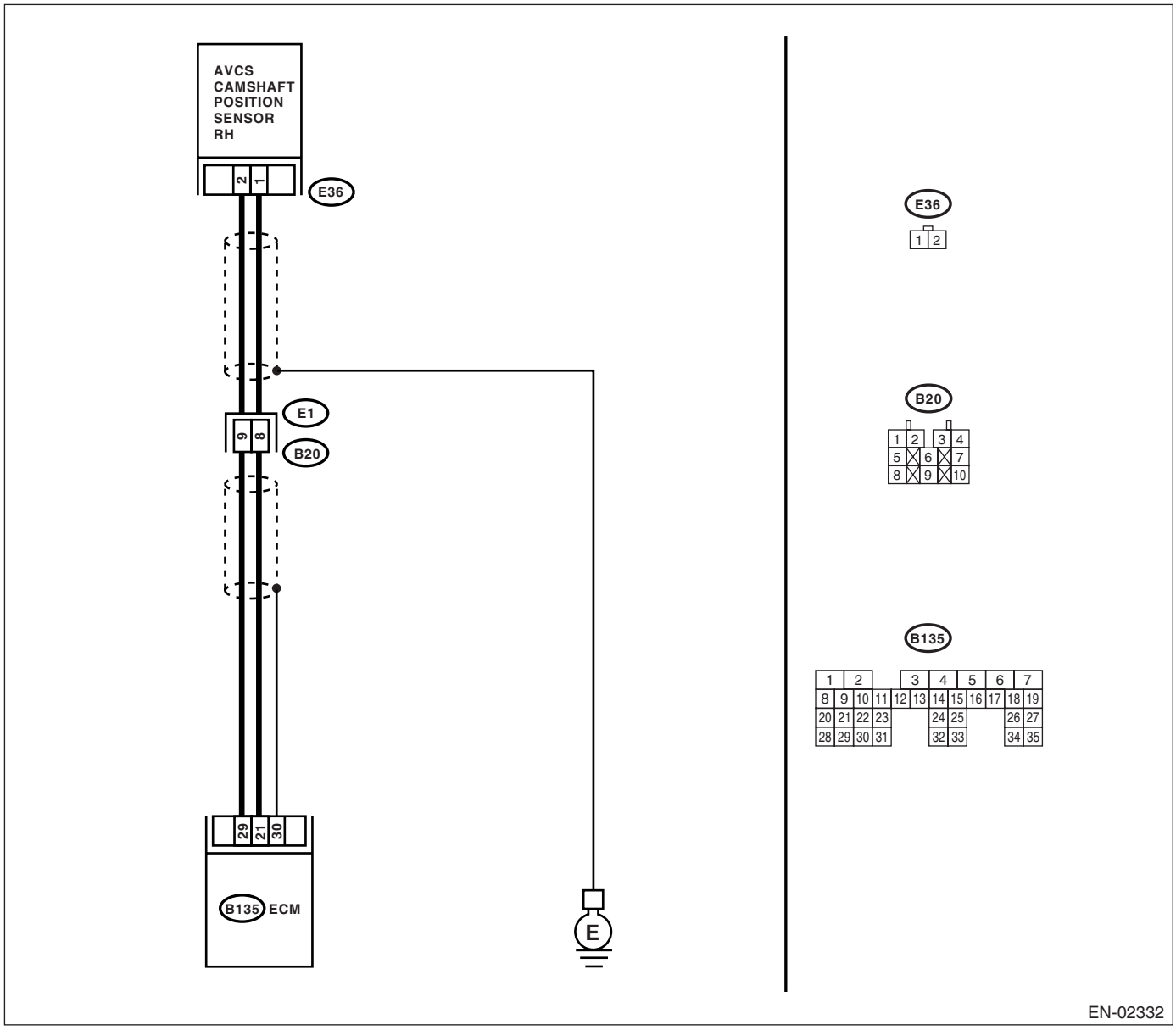
TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Drive the vehicle at the speed of approx. 30 km/h (19 MPH), and then measure the ignition timing advance angle using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Does the ignition timing advance angle changed smoothly according to engine output? Idling: −2 — +2° Driving: −2 — +50°	Repair the poor contact connector. NOTE: In this case, repair the following. • Poor contact of AVCS camshaft position sensor connector. • Poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from AVCS camshaft position sensor connector and ECM. 3) Measure the resistance of harness between AVCS camshaft position sensor connector and ECU connector. ***Connector & terminal*** ***(B36) No. 1 — (B135) No. 21:*** ***(B36) No. 2 — (B135) No. 29:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following. • Open circuit in harness between AVCS camshaft position sensor connector and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between AVCS camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 — Engine ground:*** ***(E36) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between AVCS camshaft position sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
4	**CHECK CONDITION OF AVCS CAMSHAFT POSITION SENSOR CONNECTOR.**	Is the AVCS camshaft position sensor connector installation bolt tightened securely?	Go to step **5.**	Tighten the AVCS camshaft position sensor connector installation bolt securely.
5	**CHECK AVCS CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Disconnect the AVCS camshaft position sensor. 2) Measure the resistance between the AVCS camshaft position sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Check for the clogging on oil pressure routing of oil flow control solenoid valve.	Replace the AVCS camshaft position sensor connector. <Ref. to FU(H4DOTC 2.0)-32, AVCS Camshaft Position Sensor.>

AN:DTC P0390 CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

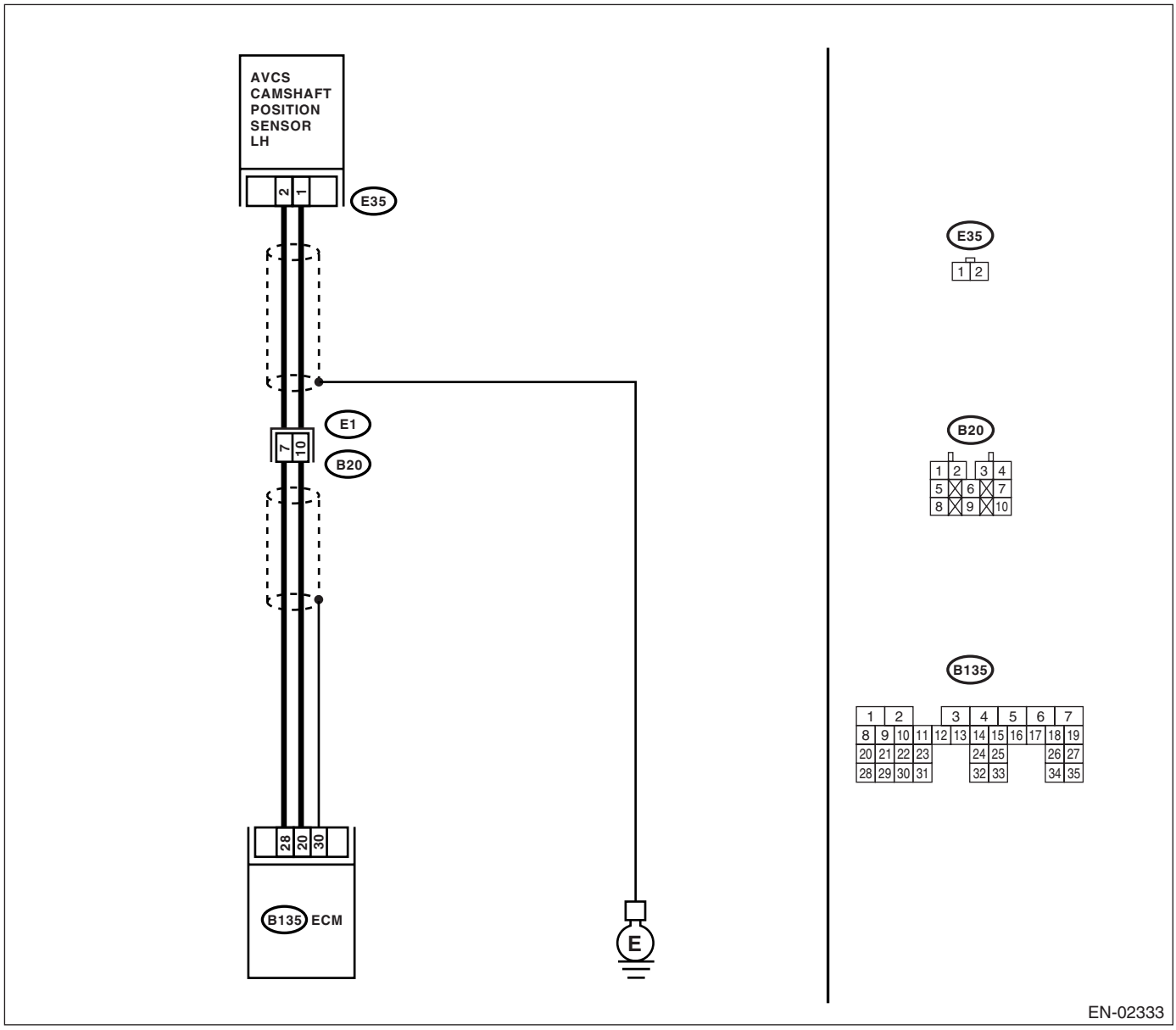
TROUBLE SYMPTOM:

- Engine stalls
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Drive the vehicle at the speed of approx. 30 km/h (19 MPH), and then measure the ignition timing advance angle using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Does the ignition timing advance angle changed smoothly according to engine output? Idling: −2 — +2° Driving: −2 — +50°	Repair the poor contact connector. NOTE: In this case, repair the following. • Poor contact of AVCS camshaft position sensor connector. • Poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from AVCS camshaft position sensor connector and ECM. 3) Measure the resistance of harness between AVCS camshaft position sensor connector and ECU connector. ***Connector & terminal*** ***(E35) No. 1 — (B135) No. 20:*** ***(E35) No. 2 — (B135) No. 28:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following. • Open circuit in harness between AVCS camshaft position sensor connector and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR CONNECTOR AND ECM CONNECTOR.** Measure the resistance of harness between AVCS camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 — Engine ground:*** ***(E35) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between AVCS camshaft position sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
4	**CHECK CONDITION OF AVCS CAMSHAFT POSITION SENSOR CONNECTOR.**	Is the AVCS camshaft position sensor connector installation bolt tightened securely?	Go to step **5.**	Tighten the AVCS camshaft position sensor connector installation bolt securely.
5	**CHECK AVCS CAMSHAFT POSITION SENSOR CONNECTOR.** 1) Disconnect the AVCS camshaft position sensor connector. 2) Measure the resistance between the AVCS camshaft position sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Check for the oil clogging on oil pressure routing of oil flow control solenoid valve.	Replace the AVCS camshaft position sensor connector. <Ref. to FU(H4DOTC 2.0)-32, AVCS Camshaft Position Sensor.>

AO:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

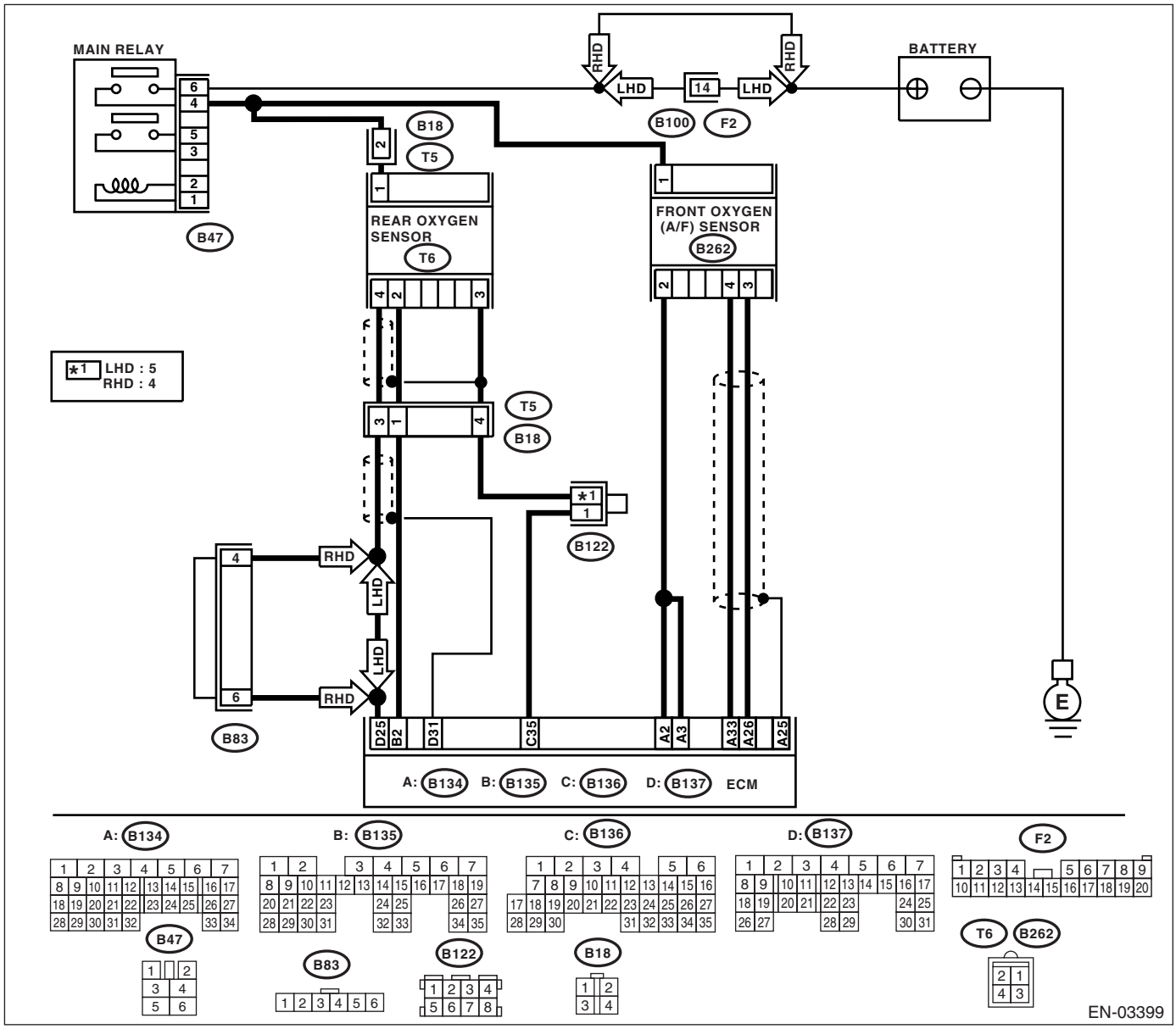
TROUBLE SYMPTOM:

- Engine stalls
- Idle mixture is out of specifications

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC 2.0)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front and rear catalytic converter <Ref. to EC(H4DOTC 2.0)-3, Front Catalytic Converter.> <Ref. to EC(H4DOTC 2.0)-4, Rear Catalytic Converter.>	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace the front catalytic converter. <Ref. to EC(H4DOTC 2.0)-3, Front Catalytic Converter.>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AP:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

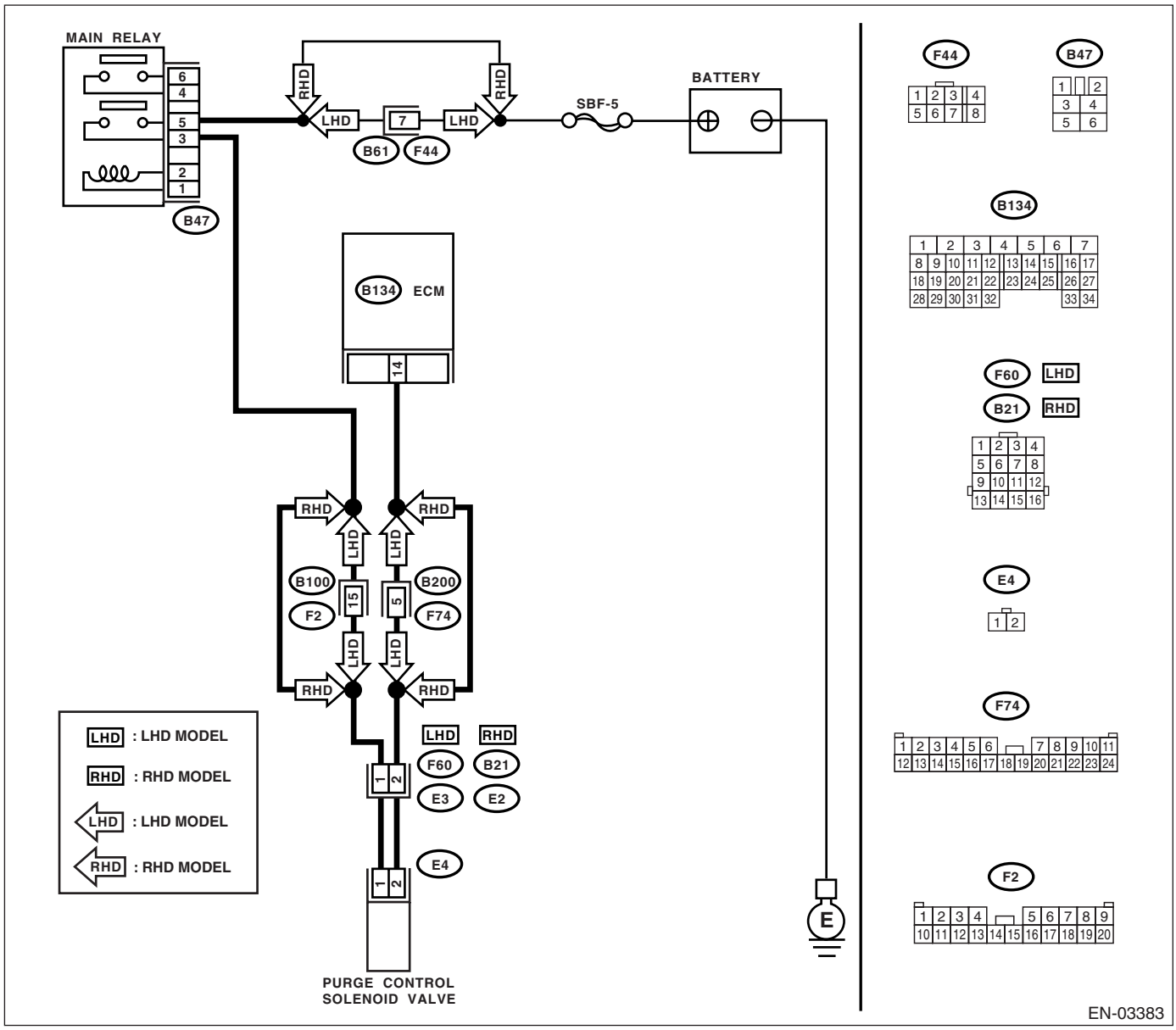
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 14 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC 2.0)-7, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AQ:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

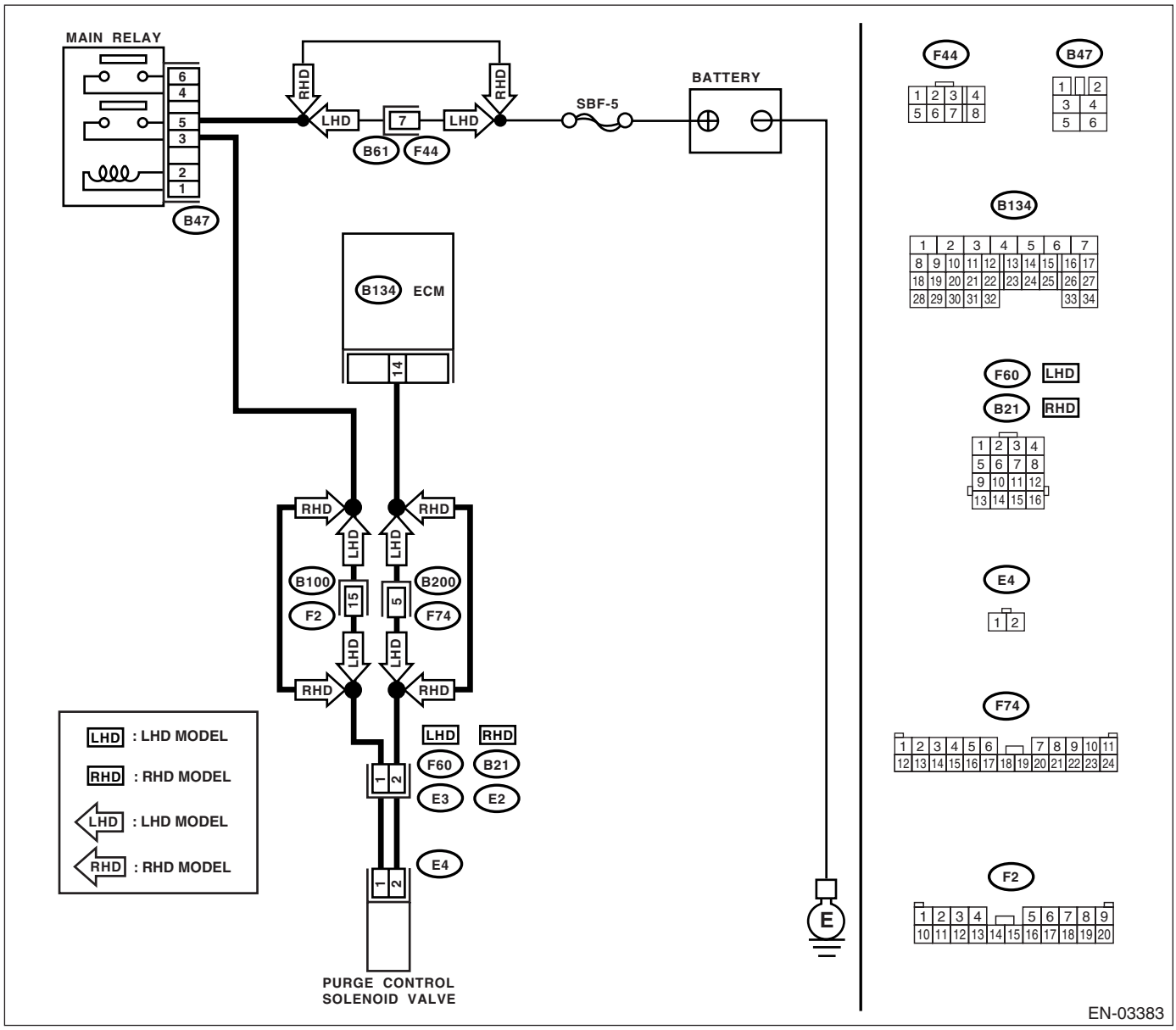
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC 2.0)(diag)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage 0 — 13 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve and ECM. <Ref. to EC(H4DOTC 2.0)-7, Purge Control Solenoid Valve.> <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **6.**

Step		Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

AR:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

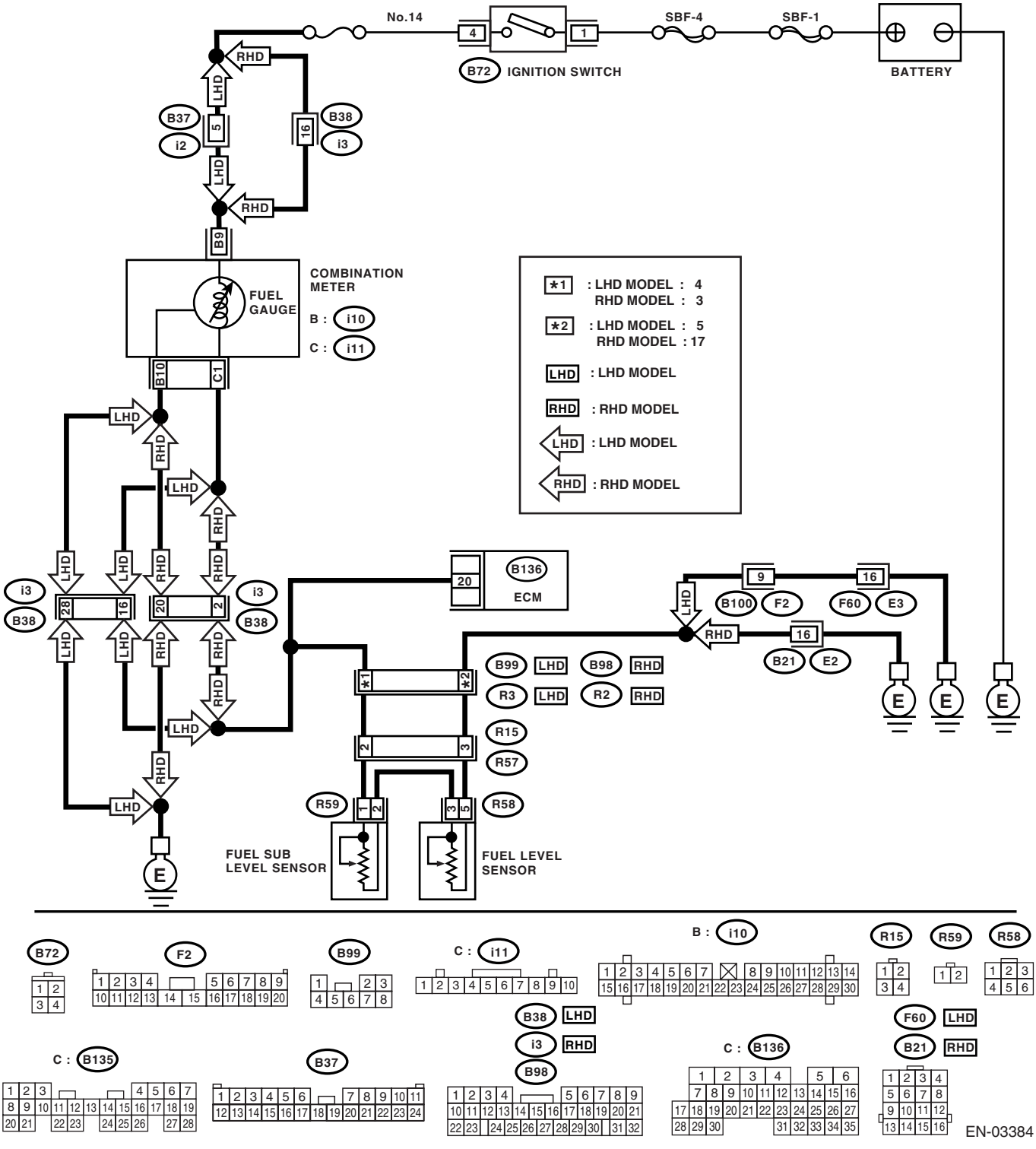
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



EN-03384

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON.(engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (–):***	Is the voltage less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.>	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (–):***	Is the voltage more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i10), (i11) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B136) No. 20 — (i11) No. 1:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case repair the following: Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC 2.0)-62, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 5:***	Is the resistance 0.5 — 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC 2.0)-65, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 — 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

AS:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

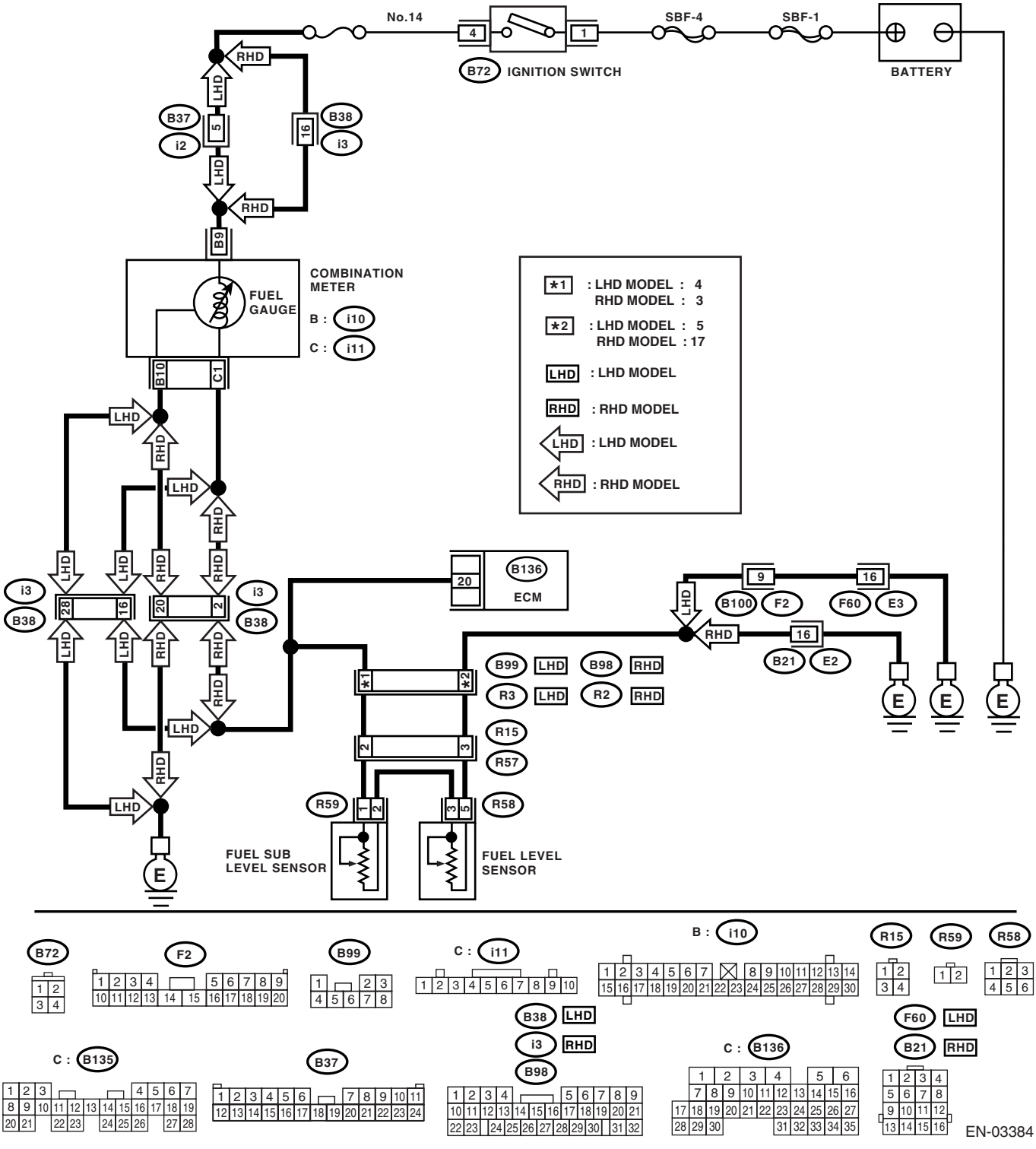
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON.(engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **3.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B136) No. 20 — (R15) No. 2:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case repair the following: Poor contact in coupling connector
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupler connector. ***Connector & terminal*** ***(R57) No. 3 — (R58) No. 5:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupler connector. ***Connector & terminal*** ***(R57) No. 2 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC 2.0)-62, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 5:***	Is the resistance more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(H4DOTC 2.0)-64, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC 2.0)-65, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 45 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC 2.0)-65, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

AT:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

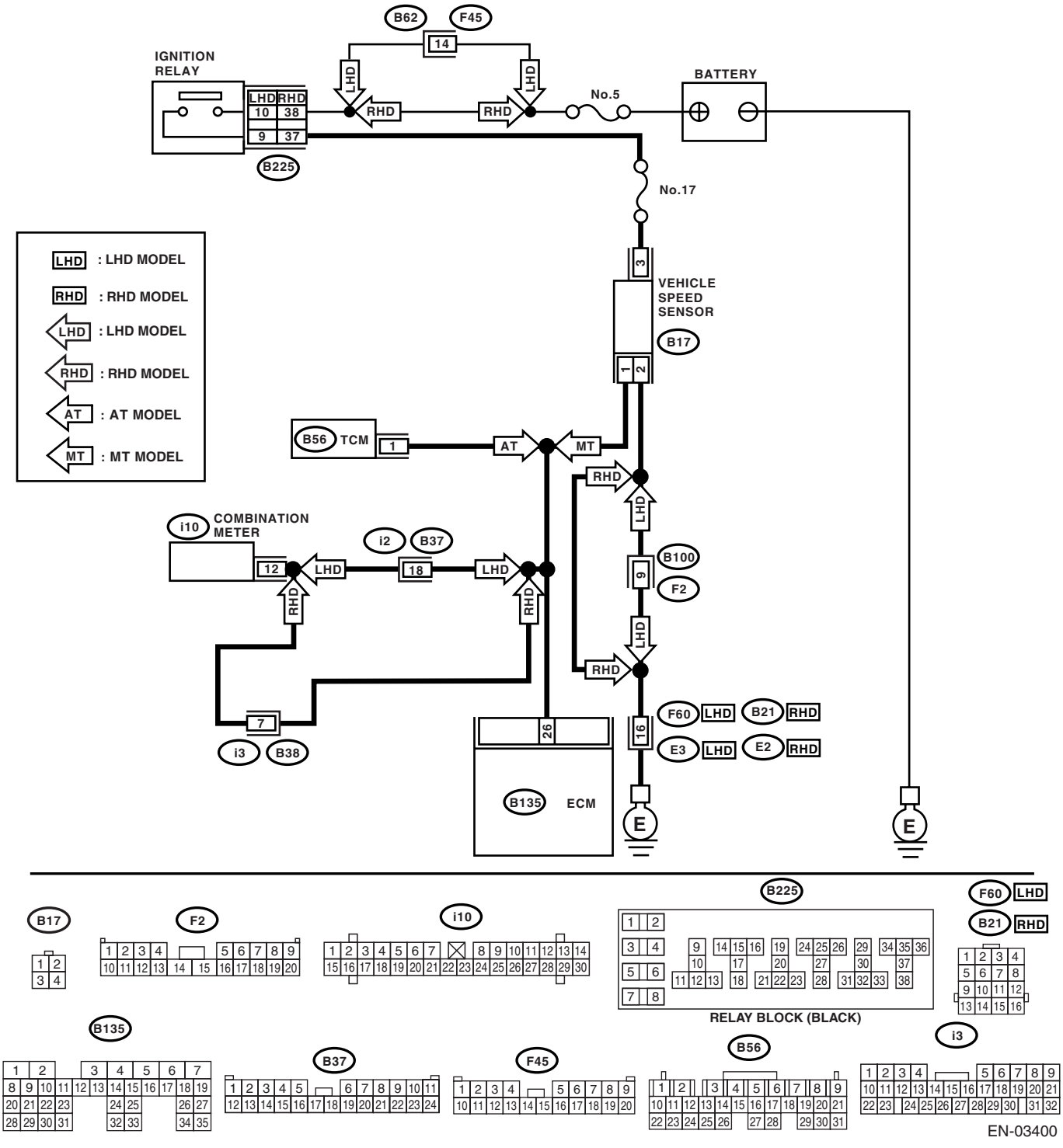
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



EN-03400

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **4.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and TCM connector.
3	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Contact the SUBARU dealer.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from vehicle speed sensor ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. ***Connector & terminal*** ***(B17) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between vehicle speed sensor and ECM connector.
5	**CHECK POOR CONTACT.** Check poor contact in vehicle speed sensor connector.	Is there poor contact in vehicle speed sensor connector?	Repair poor contact in vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-46, Vehicle Speed Sensor.>

AU:DTC P0503 VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT

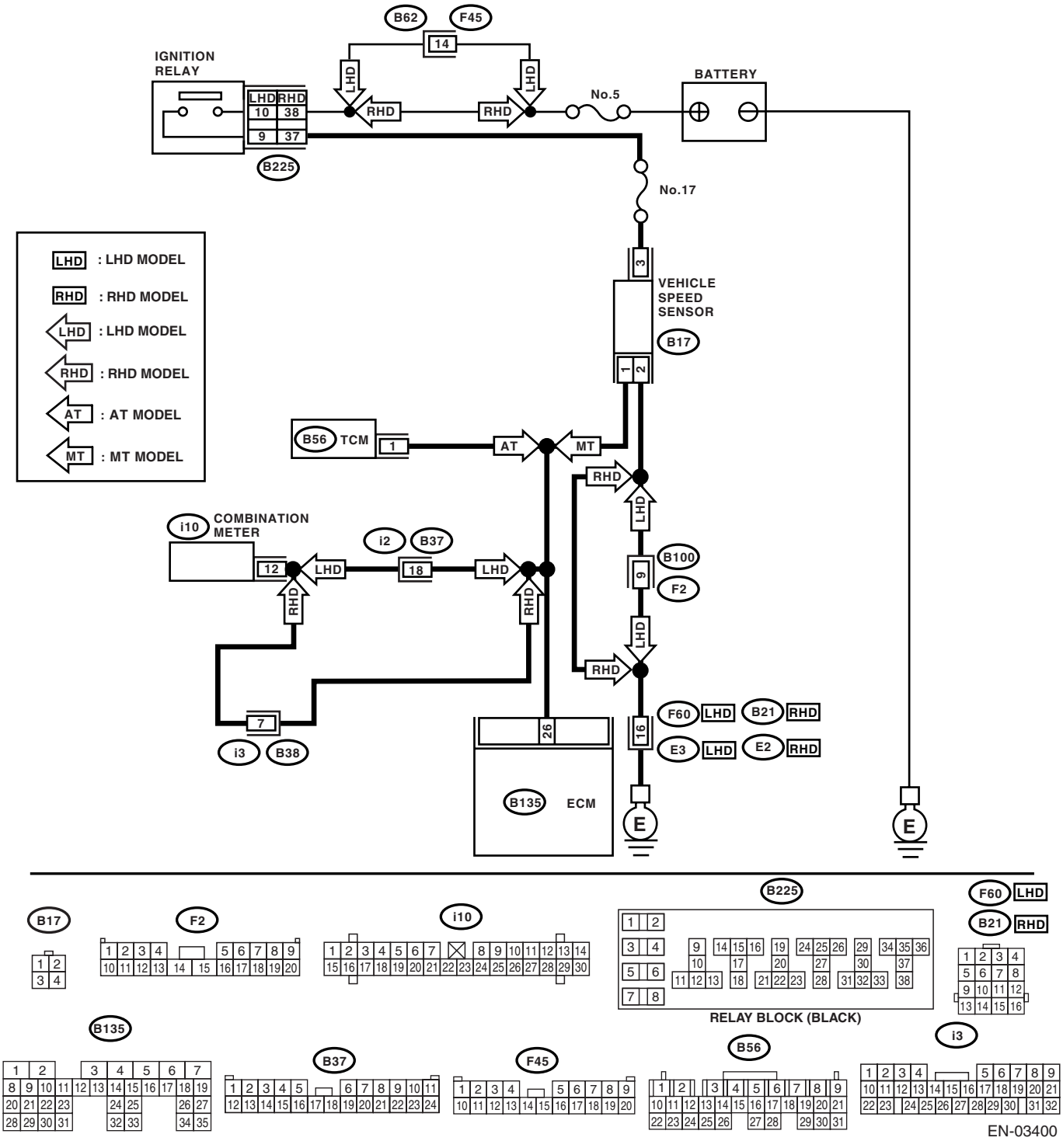
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



EN-03400

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **3.**
2	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does speedometer operate normally?	Go to step **3.**	Check the speedometer. <Ref. to IDI-13, Speedometer.>
3	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 26 — (i10) No. 12:***	Is the resistance less than 10 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector. • Poor contact in combination meter connector • Poor contact in coupling connector

AV:DTC P0508 IDLE CONTROL SYSTEM CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

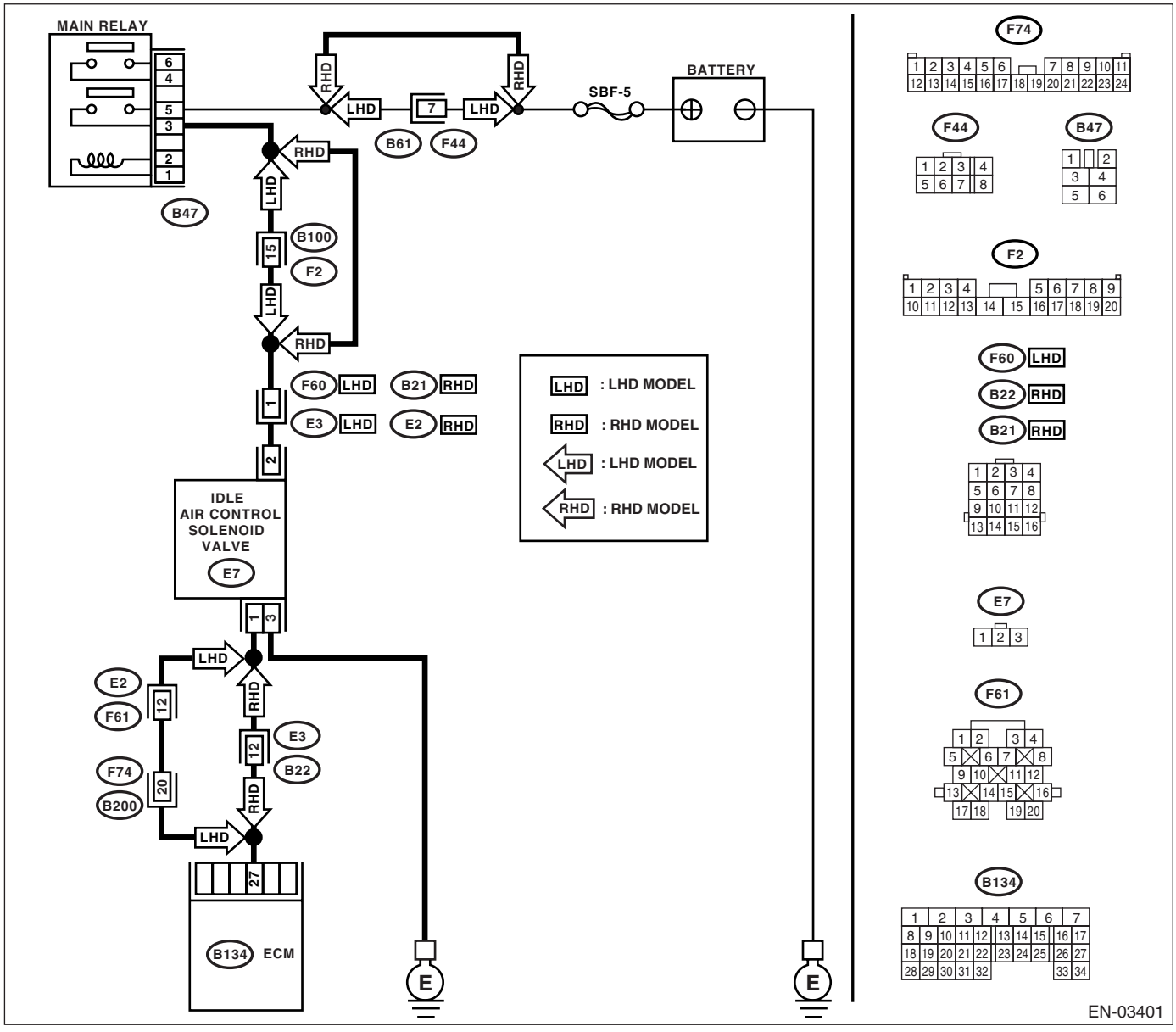
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 (+) — Chassis ground (−):***	Is the voltage more than 3 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***(B134) No. 27 — (E7) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and idle air control solenoid valve connector.
5	**CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.** Measure the resistance of harness between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit in harness between idle air control solenoid valve connector and engine ground cable.
6	**CHECK POOR CONTACT.** Check poor contact in ECM and idle air control solenoid valve connectors.	Is there poor contact in ECM and idle air control solenoid valve connectors?	Repair poor contact in ECM and idle air control solenoid valve connectors.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC 2.0)-37, Idle Air Control Solenoid Valve.>

AW:DTC P0509 IDLE CONTROL SYSTEM CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

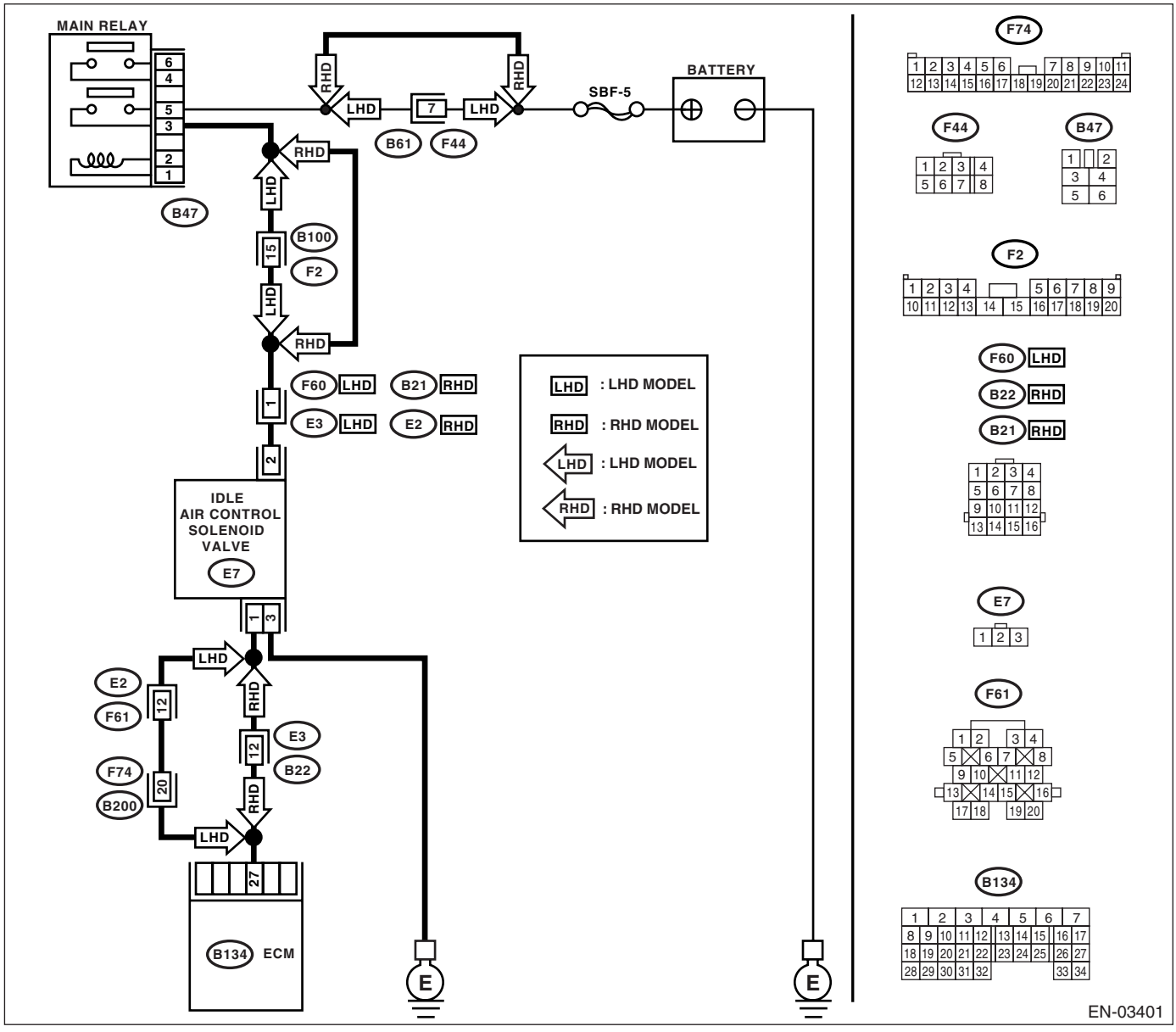
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **2.**	Adjust throttle cable. <Ref. to SP(H4SO)-9, Accelerator Control Cable.>
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Replace the idle air control solenoid valve and ECM. <Ref. to FU(H4DOTC 2.0)-37, Idle Air Control Solenoid Valve.> <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AX:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

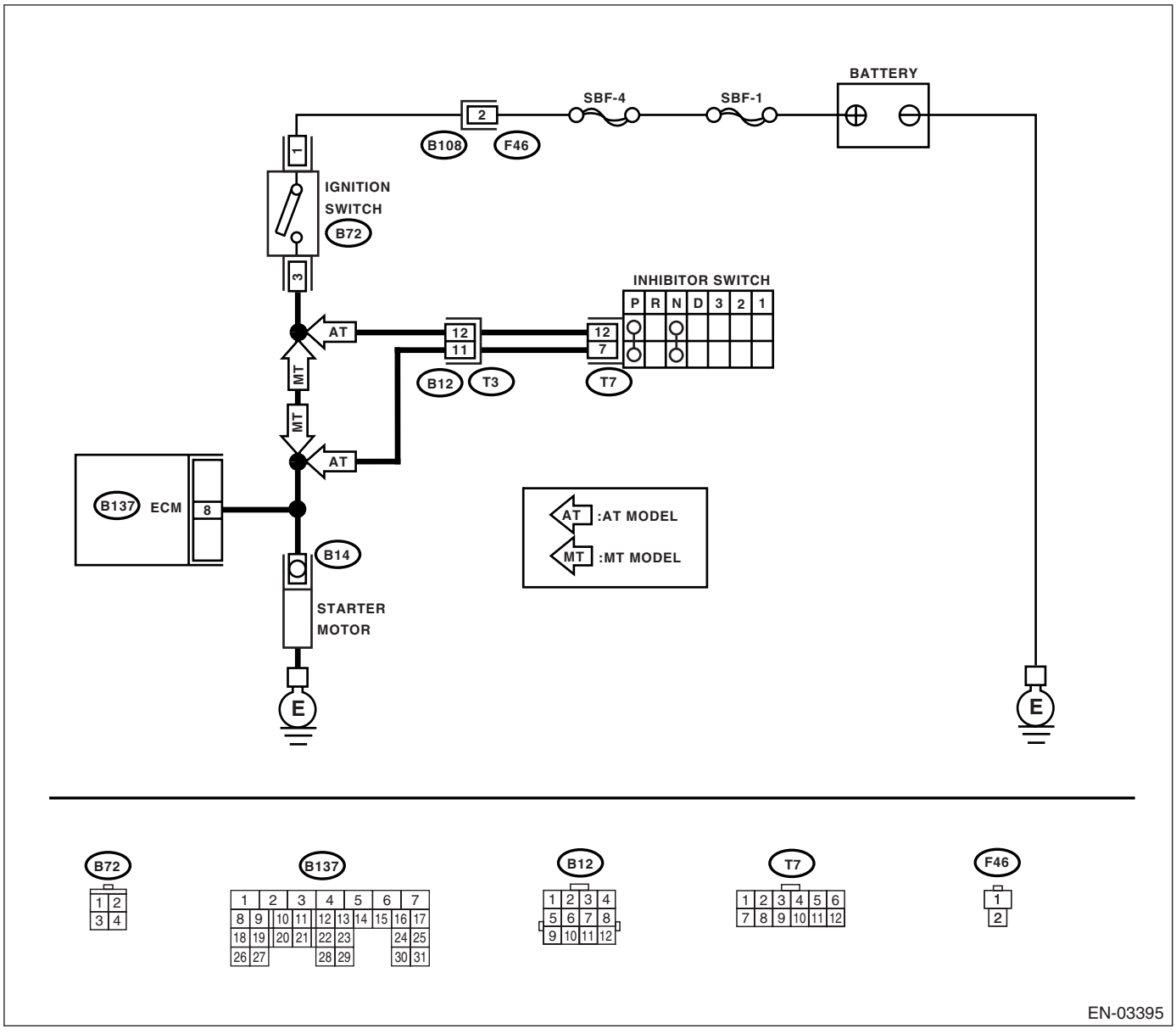
Failure of engine to start

CAUTION:

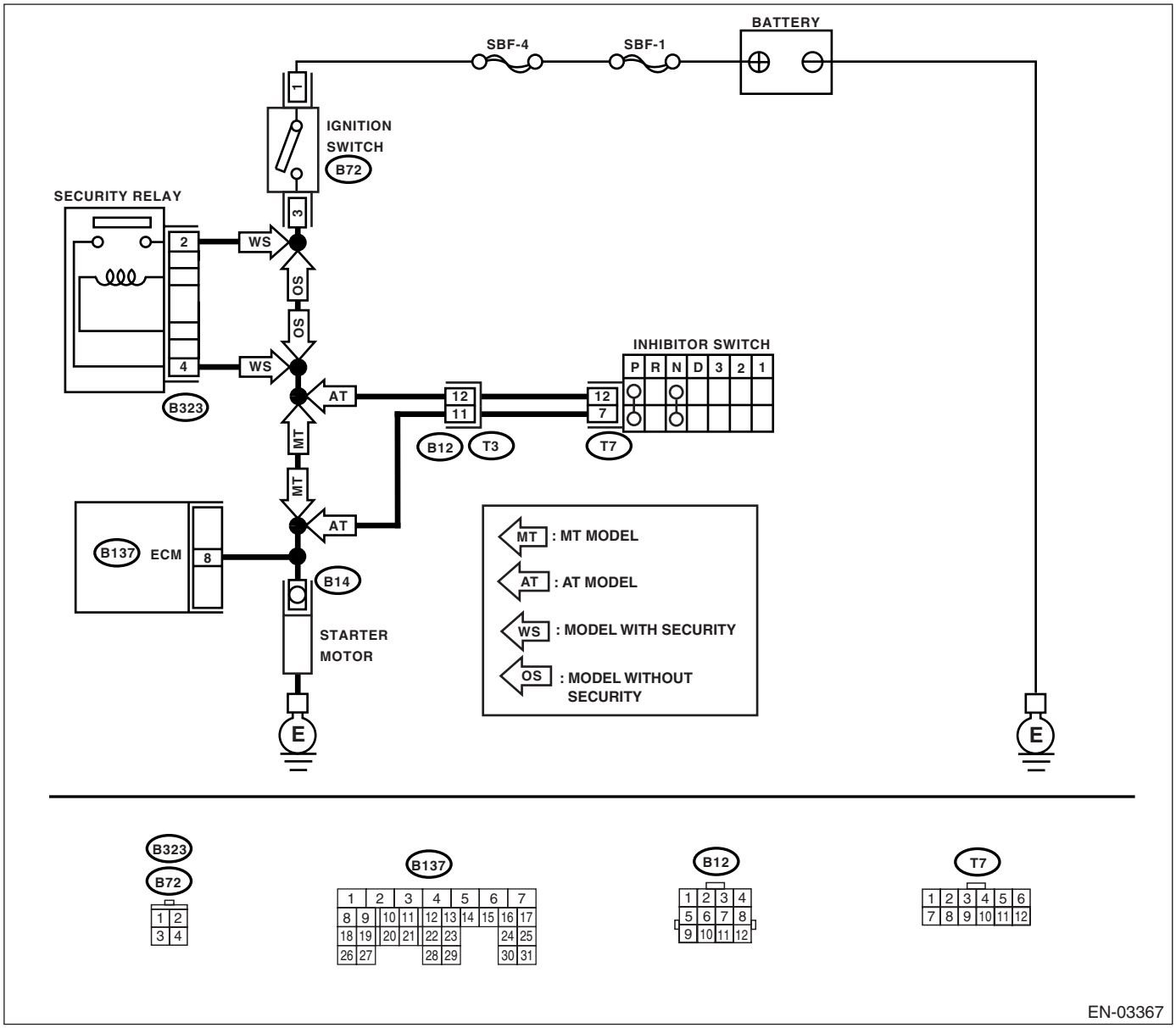
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**



Step	Check	Yes	No
1 **CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate when ignition switch to ON?	Repair battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Check starter motor circuit. <Ref. to EN(H4DOTC 2.0)(diag)-60, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

AY:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

Immediately at fault recognition

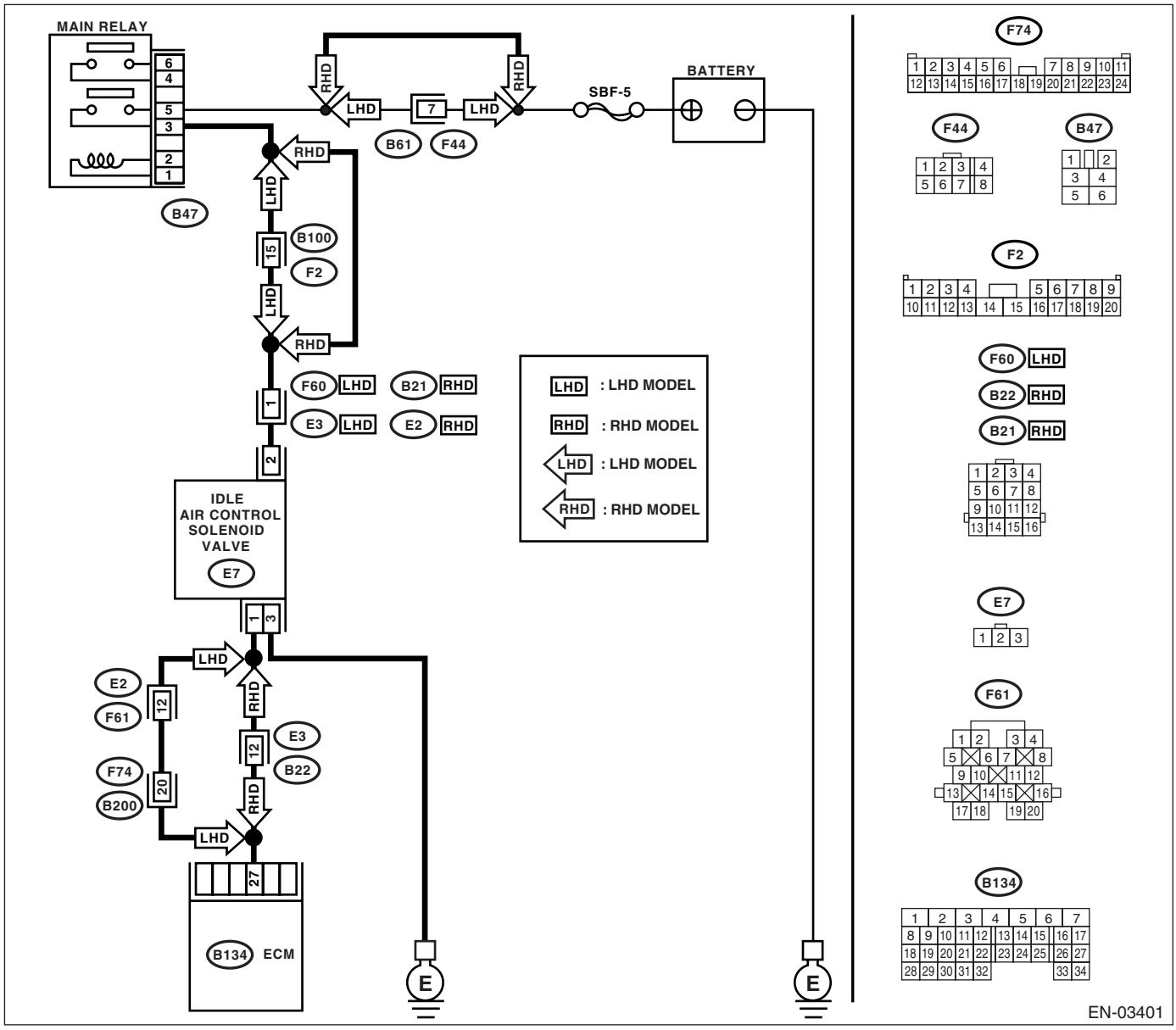
TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



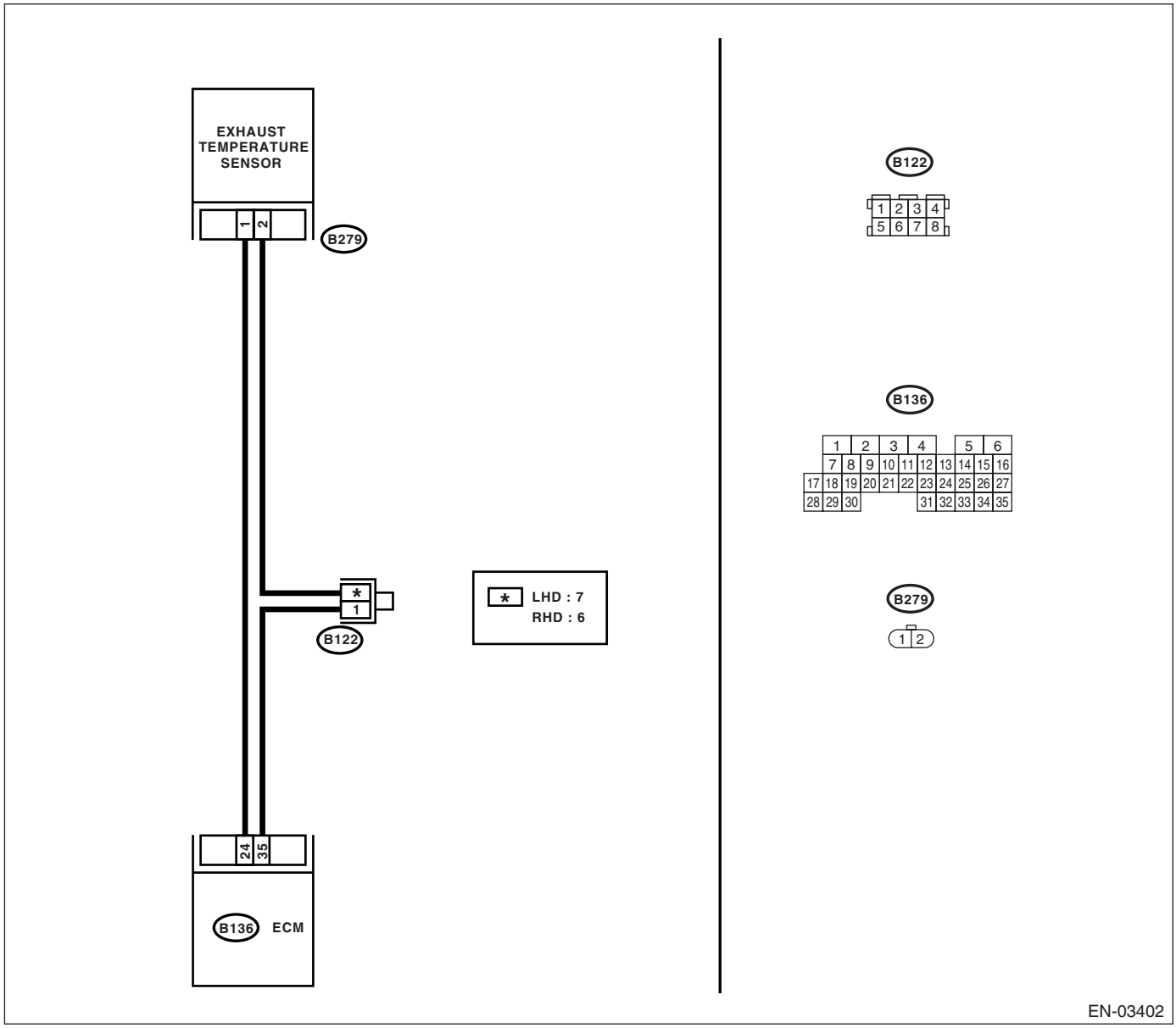
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items: • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **4.**	Adjust throttle cable. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from the throttle body. <Ref. to FU(H4DOTC 2.0)-37, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC 2.0)-37, Idle Air Control Solenoid Valve.>

AZ:DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK 1

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 1200°C (2192°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact of exhaust temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Replace the exhaust temperature sensor. <Ref. to FU(H4DOTC 2.0)-49, Exhaust Temperature Sensor.>	Repair ground short circuit in harness between exhaust temperature sensor and ECM connector.

BA:DTC P0546 EXHAUST GAS TEMPERATURE SENSOR HIGH - BANK 1

DTC DETECTING CONDITION:

Immediately at fault recognition

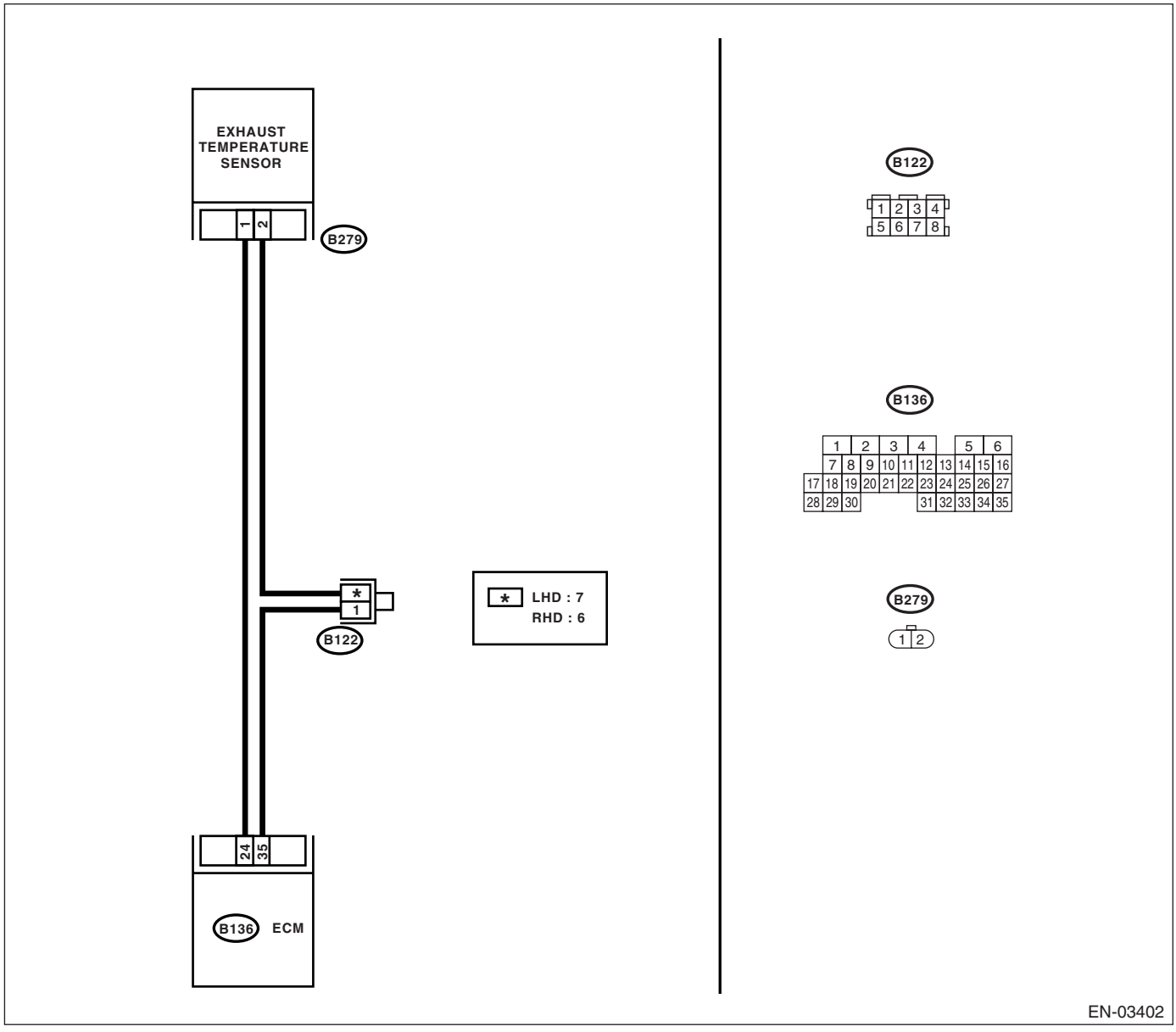
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact of exhaust temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust temperature sensor. 3) Measure the voltage between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and exhaust temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and exhaust temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and exhaust temperature sensor connector • Poor contact of exhaust temperature sensor connector • Poor contact in ECM connector. • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the exhaust temperature sensor. <Ref. to FU(H4DOTC 2.0)-49, Exhaust Temperature Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and exhaust temperature sensor connector • Poor contact of exhaust temperature sensor connector • Poor contact in ECM connector. • Poor contact in joint connector

BB:DTC P0562 SYSTEM VOLTAGE LOW

DTC DETECTING CONDITION:

Detect in case of low power supply voltage of ECM.

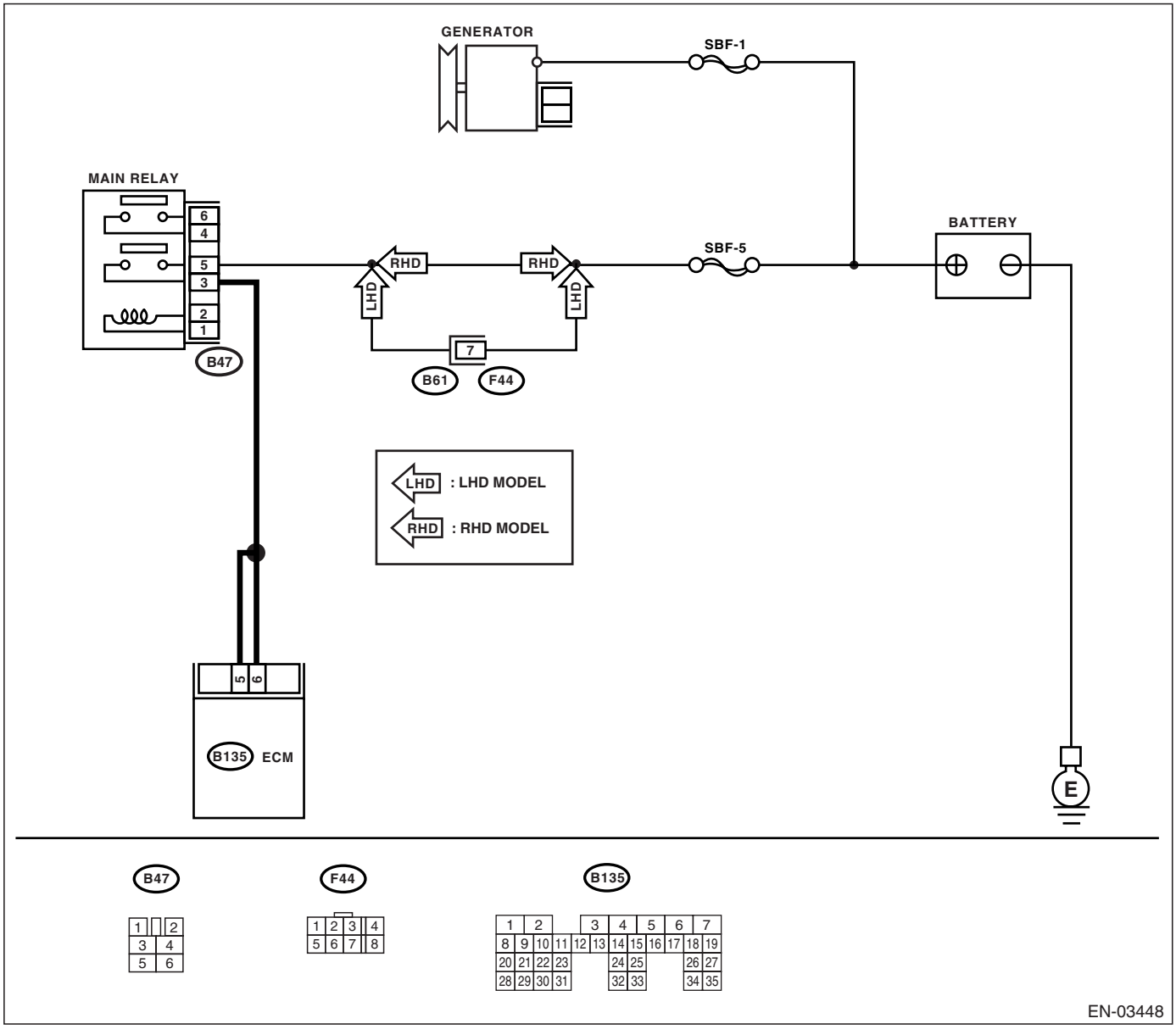
TROUBLE SYMPTOM:

Charge warning light illuminates

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idling after warm-up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
2	**CHECK GENERATOR.** 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **3.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
3	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF. Check the installation of positive and negative terminals of battery.	Are the positive and negative battery terminals clamped tightly?	Go to step **4.**	Tighten the clamp of terminal.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10.8 V?	Go to step **5.**	Repair the harness connectors between battery, main relay and ECM.
5	**CHECK POOR CONTACT IN CONNECTORS.** Check the poor contact in connectors between generator, battery and ECM.	Is there poor contact in connectors between generator, battery and ECM?	Repair the poor contact.	Go to step **6.**
6	**CHECK ECM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC. Check if the same DTC is displayed.	Is the same DTC displayed?	Replace the generator.	Go to step **7.**
7	**CHECK ANY OTHER DTC IS DISPLAYED.** Check if any other DTC is displayed.	Is any other DTC displayed?	Perform the Diagnostic of DTC displayed.	Temporary poor contact occurs.

BC:DTC P0563 SYSTEM VOLTAGE HIGH

DTC DETECTING CONDITION:

Detect in case of high power supply voltage of ECM.

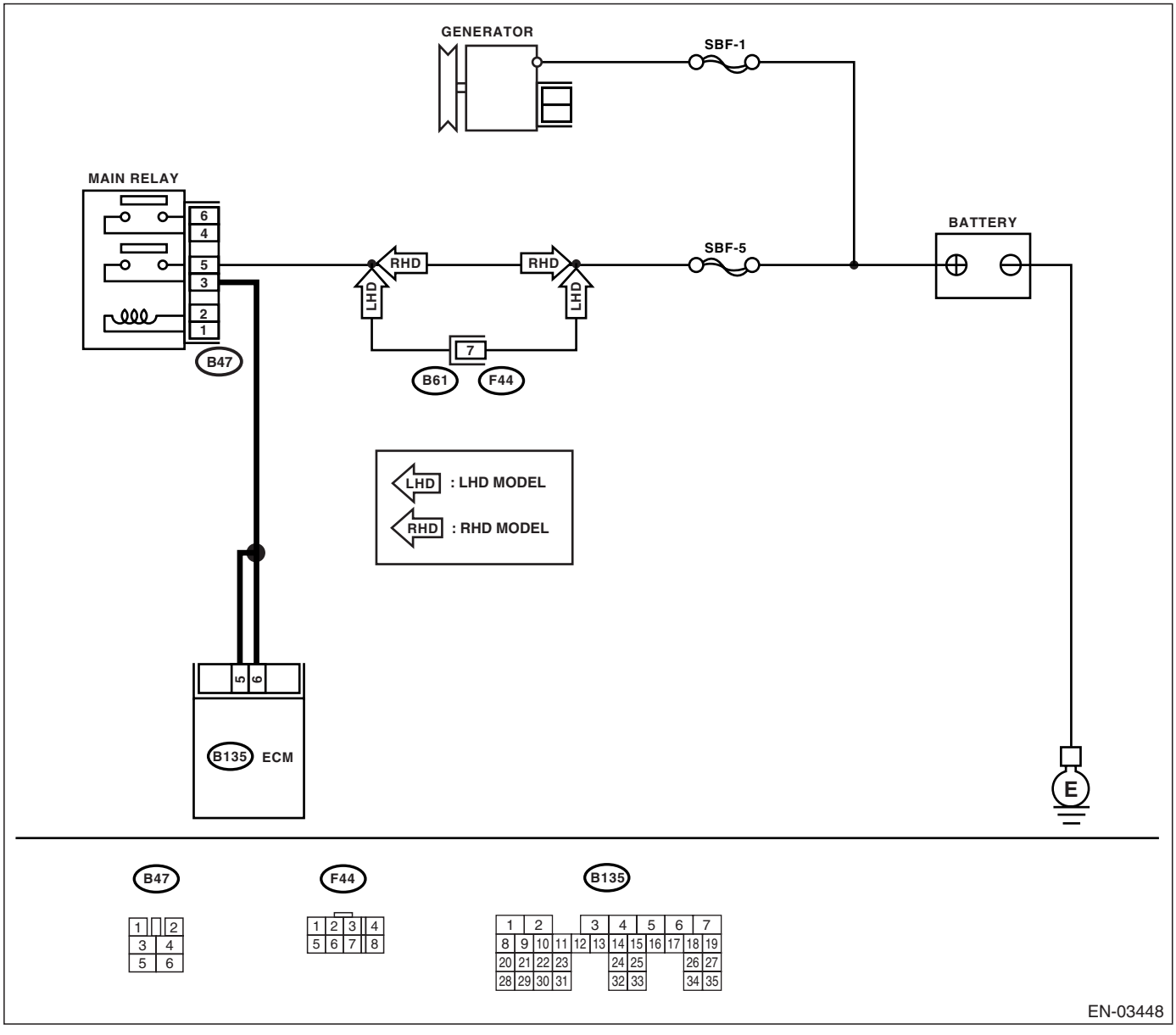
TROUBLE SYMPTOM:

Charge warning light illuminates

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idling after warm-up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **2.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
2	**CHECK GENERATOR.** 1) Run the engine at 5,000 rpm. 2) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **3.**	Repair the generator. <Ref. to SC(H4SO)-15, Generator.>
3	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF. Check the installation of positive and negative terminals of battery.	Are the positive and negative battery terminals clamped tightly?	Go to step **4.**	Tighten the clamp of terminal.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Run the engine at idle. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 16.2 V?	Go to step **5.**	Repair the harness connectors between battery, main relay and ECM.
5	**CHECK POOR CONTACT IN CONNECTORS.** Check the poor contact in connectors between generator, battery and ECM.	Is there poor contact in connectors between generator, battery and ECM?	Repair the poor contact.	Go to step **6.**
6	**CHECK ECM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC. Check if the same DTC is displayed.	Is the same DTC displayed?	Replace the generator.	Go to step **7.**
7	**CHECK ANY OTHER DTC IS DISPLAYED.** Check if any other DTC is displayed.	Is any other DTC displayed?	Perform the diagnostic of DTC displayed.	Temporary poor contact occurs.

BD:DTC P0600 SERIAL COMMUNICATION LINK

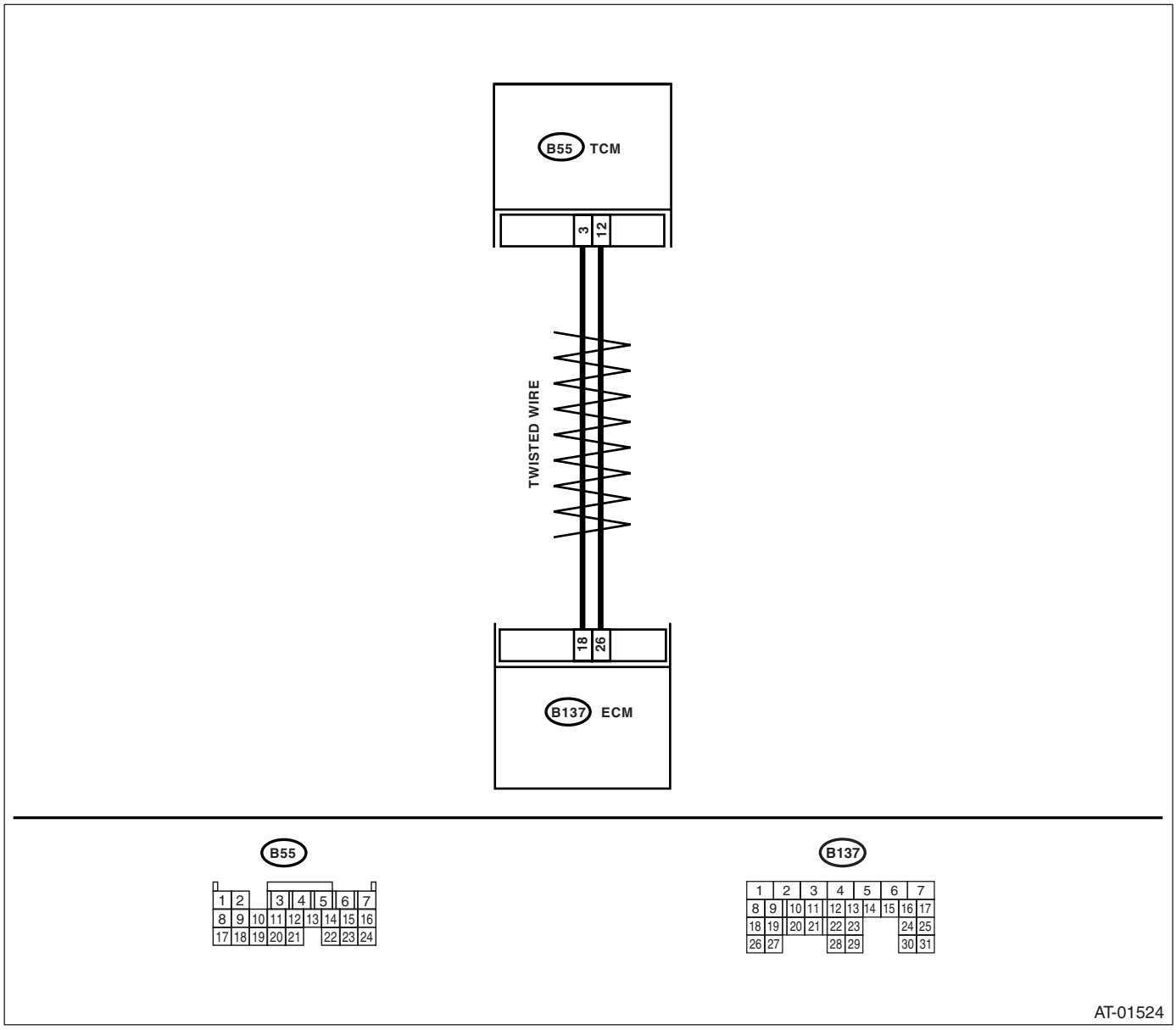
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from TCM. 4) Measure the resistance between connectors of ECM and TCM. ***Connector & terminal*** ***(B137) No. 18 — (B55) No. 3:*** ***(B137) No. 26 — (B55) No. 12:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the harness connector.
2	**CHECK HARNESS BETWEEN ECM AND TCM.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 18 — Chassis ground:*** ***(B137) No. 26 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the harness connector.
3	**CHECK HARNESS BETWEEN ECM AND TCM.** Measure the resistance of ECM connectors. ***Connector & terminal*** ***(B137) No. 18 — (B137) No. 26:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the harness connector.
4	**CHECK AT SYSTEM STATUS.** Check the AT using Subaru Select Monitor.	Does the Subaru Select Monitor display DTC P1718?	Inspect the AT system.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

BE:DTC P0604 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

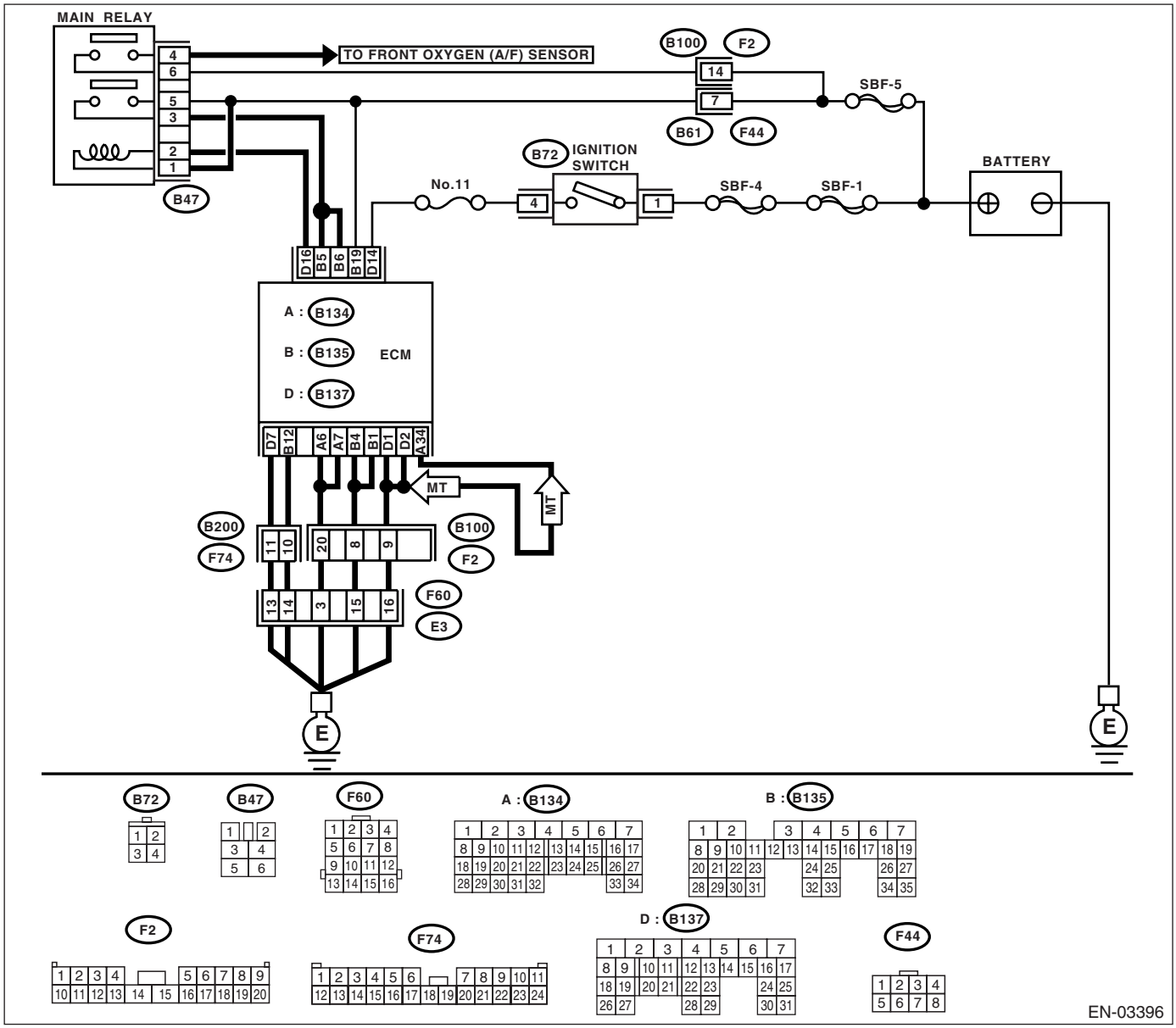
- Engine does not start
- Engine stalls

CAUTION:

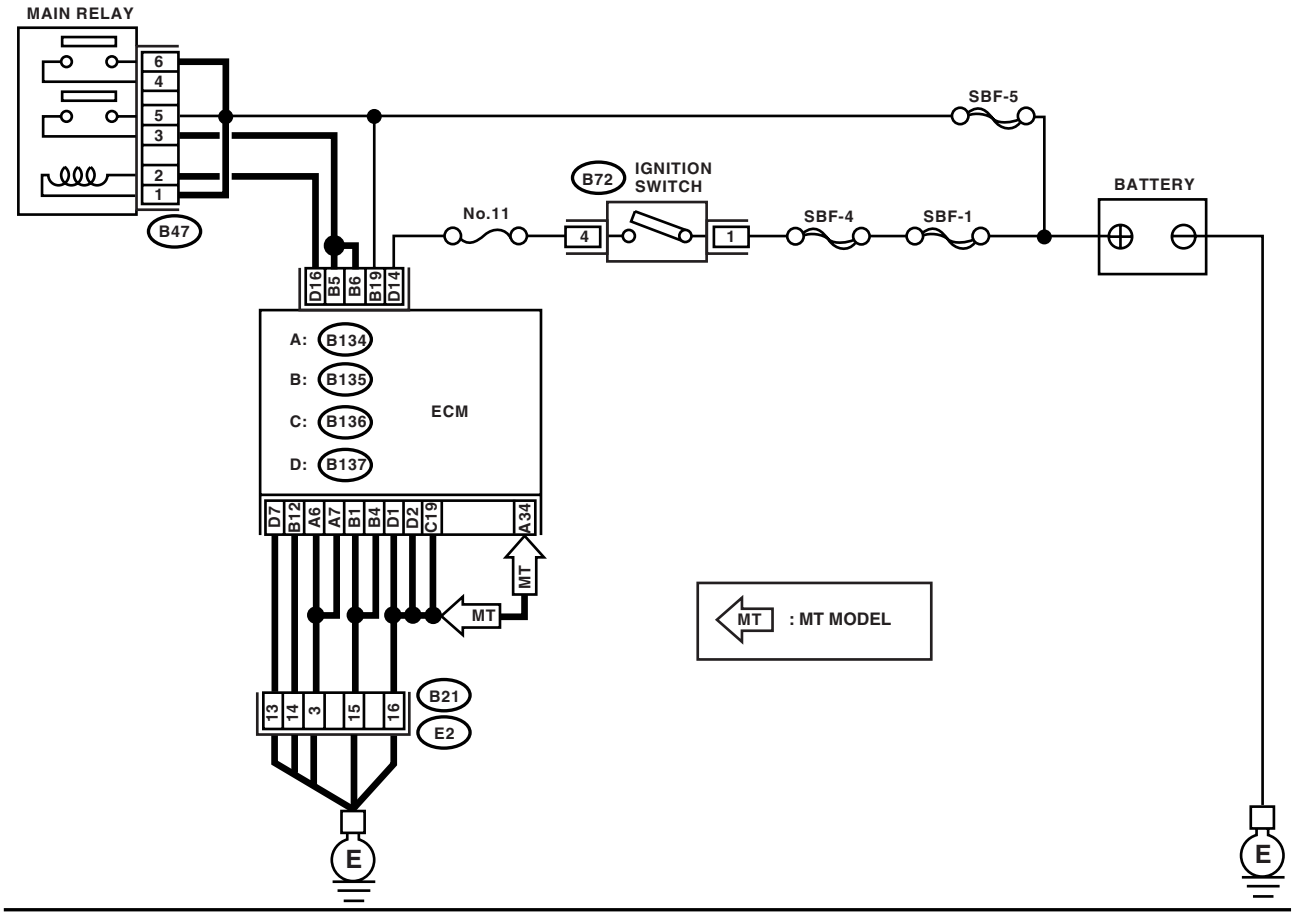
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

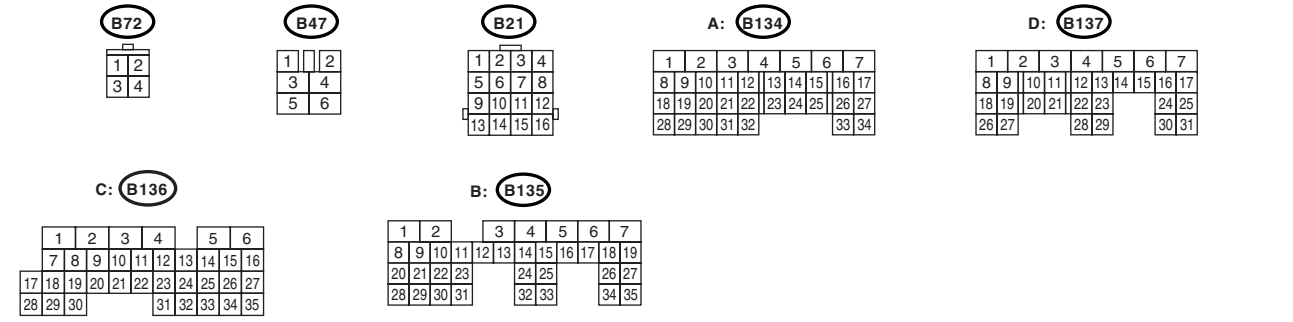
WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**





EN-03369

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Temporary poor contact occurs.

BF:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

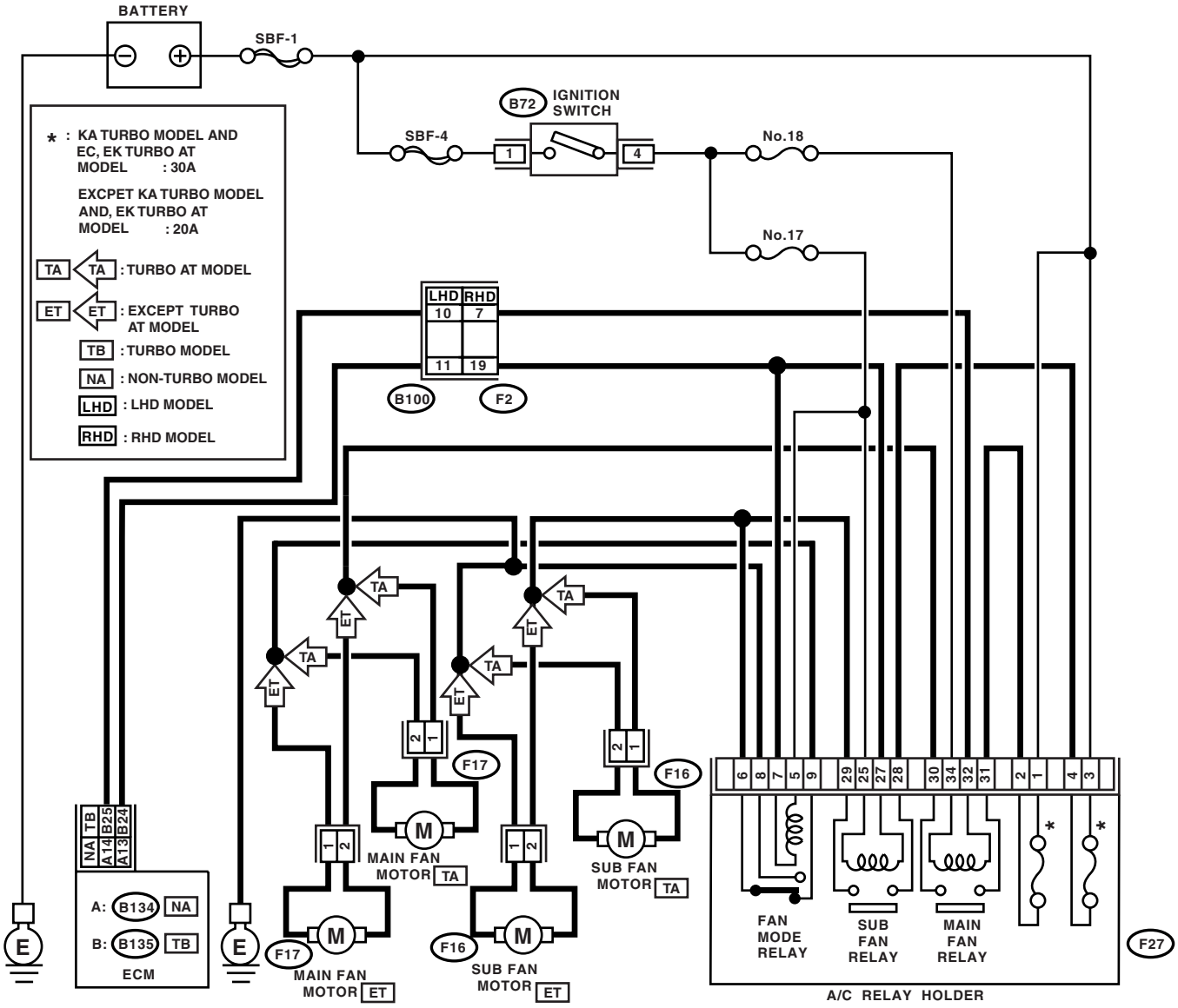
TROUBLE SYMPTOM:

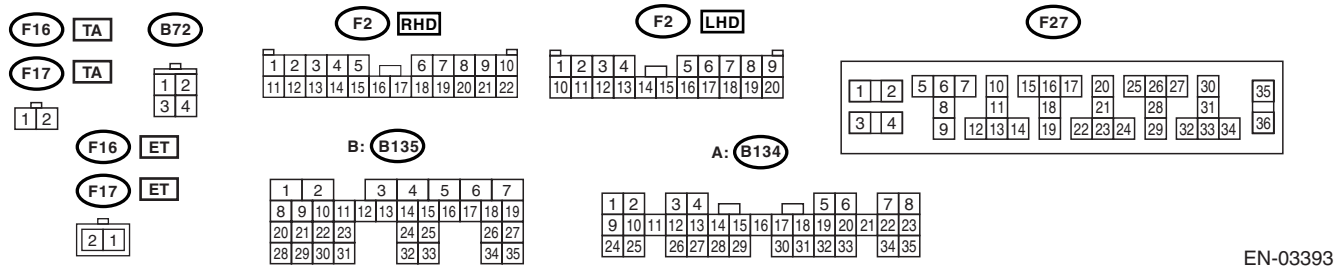
- Radiator fan does not operate properly.
- Over-heating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-03393

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC 2.0)(diag)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 (+) — Chassis ground (−):*** ***(B134) No. 14 (+) — Chassis ground (−):*** ***Turbo model*** ***(B135) No. 24 (+) — Chassis ground (−):*** ***(B135) No. 25 (+) — Chassis ground (−):***	Does the voltage vary between 0 — 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 — Chassis ground:*** ***(B134) No. 14 — Chassis ground:*** ***Turbo model*** ***(B135) No. 24 — Chassis ground:*** ***(B135) No. 25 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the main fan relay 1 and sub fan relay from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 25 (+) — Chassis ground (−):*** ***(F27) No. 34 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK MAIN FAN RELAY 1.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of main fan relay 1 terminals. ***Terminals*** ***No. 32 — No. 34:***	Is the resistance 87 — 107 Ω?	Go to step **5.**	Replace the main fan relay 1.
5	**CHECK SUB FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 25 — No. 27:***	Is the resistance 87 — 107 Ω?	Go to step **6.**	Replace the sub fan relay.

	Step	Check	Yes	No
6	**CHECK OPEN CIRCUIT IN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and fan relay connector. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 — (F27) No. 27:*** ***(B134) No. 14 — (F27) No. 32:*** ***Turbo model*** ***(B135) No. 24 — (F27) No. 27:*** ***(B135) No. 25 — (F27) No. 32:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector
7	**CHECK POOR CONTACT.** Check poor contact in ECM or fan relay connector.	Is there poor contact in ECM or fan relay connector?	Repair the poor contact in ECM or fan relay connector.	Contact the SUBARU dealer.

BG:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

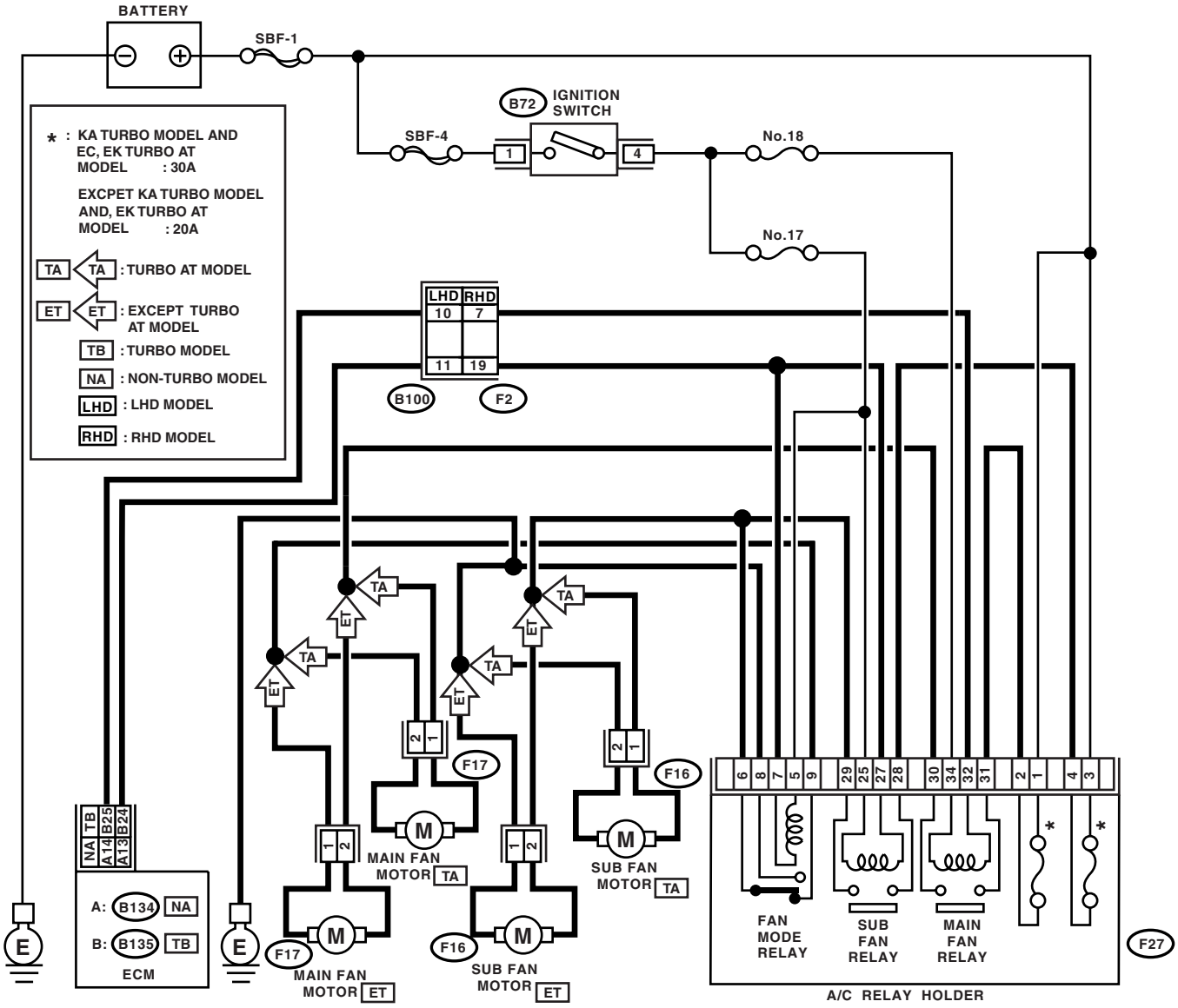
TROUBLE SYMPTOM:

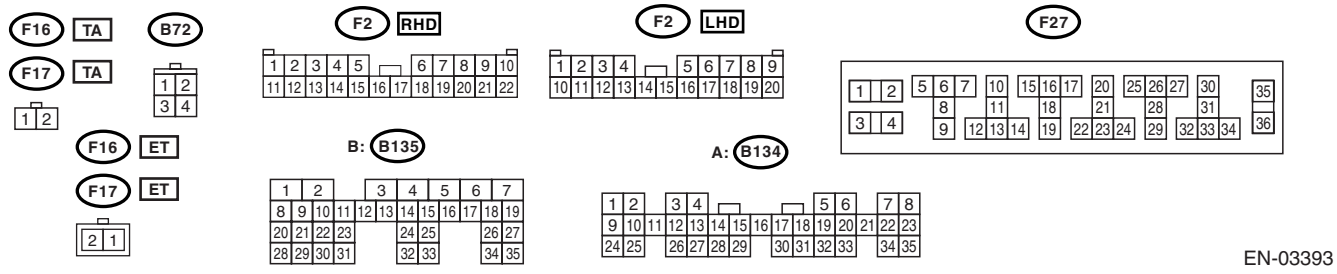
- Radiator fan does not operate properly.
- Over-heating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:





EN-03393

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC 2.0)(diag)-48, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 (+) — Chassis ground (–):*** ***(B134) No. 14 (+) — Chassis ground (–):*** ***Turbo model*** ***(B135) No. 24 (+) — Chassis ground (–):*** ***(B135) No. 25 (+) — Chassis ground (–):***	Does the voltage vary between 0 — 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 1, sub fan relay and fan mode relay. 3) Disconnect the test mode connectors 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 (+) — Chassis ground (–):*** ***(B134) No. 14 (+) — Chassis ground (–):*** ***Turbo model*** ***(B135) No. 24 (+) — Chassis ground (–):*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK MAIN FAN RELAY 1.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1. 3) Measure the resistance of main fan relay 1 terminals. ***Terminals*** ***No. 30 — No. 31:***	Is the resistance less than 1 Ω?	Replace the main fan relay 1 and ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK SUB FAN RELAY.** 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals. ***Terminals*** ***No. 28 — No. 29:***	Is the resistance less than 1 Ω?	Replace the sub fan relay and ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>

BH:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

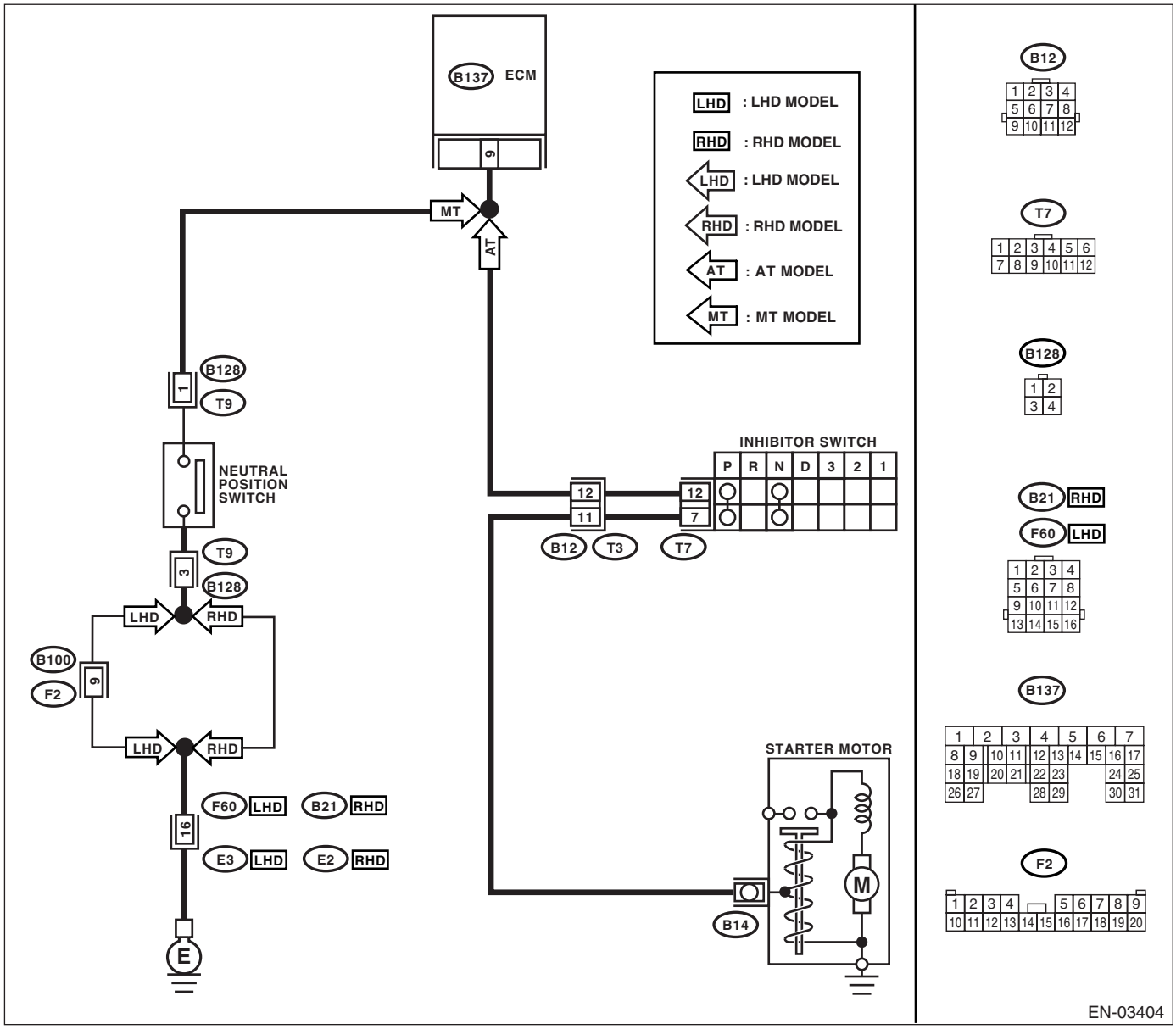
BI: DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:
Two consecutive driving cycles with fault

TROUBLE SYMPTOM:
Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Shift the select lever to other than “N” and “P” ranges. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and transmission harness connector.
3	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
4	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle’s terminals in selector lever except for “N” range. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>
5	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BJ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

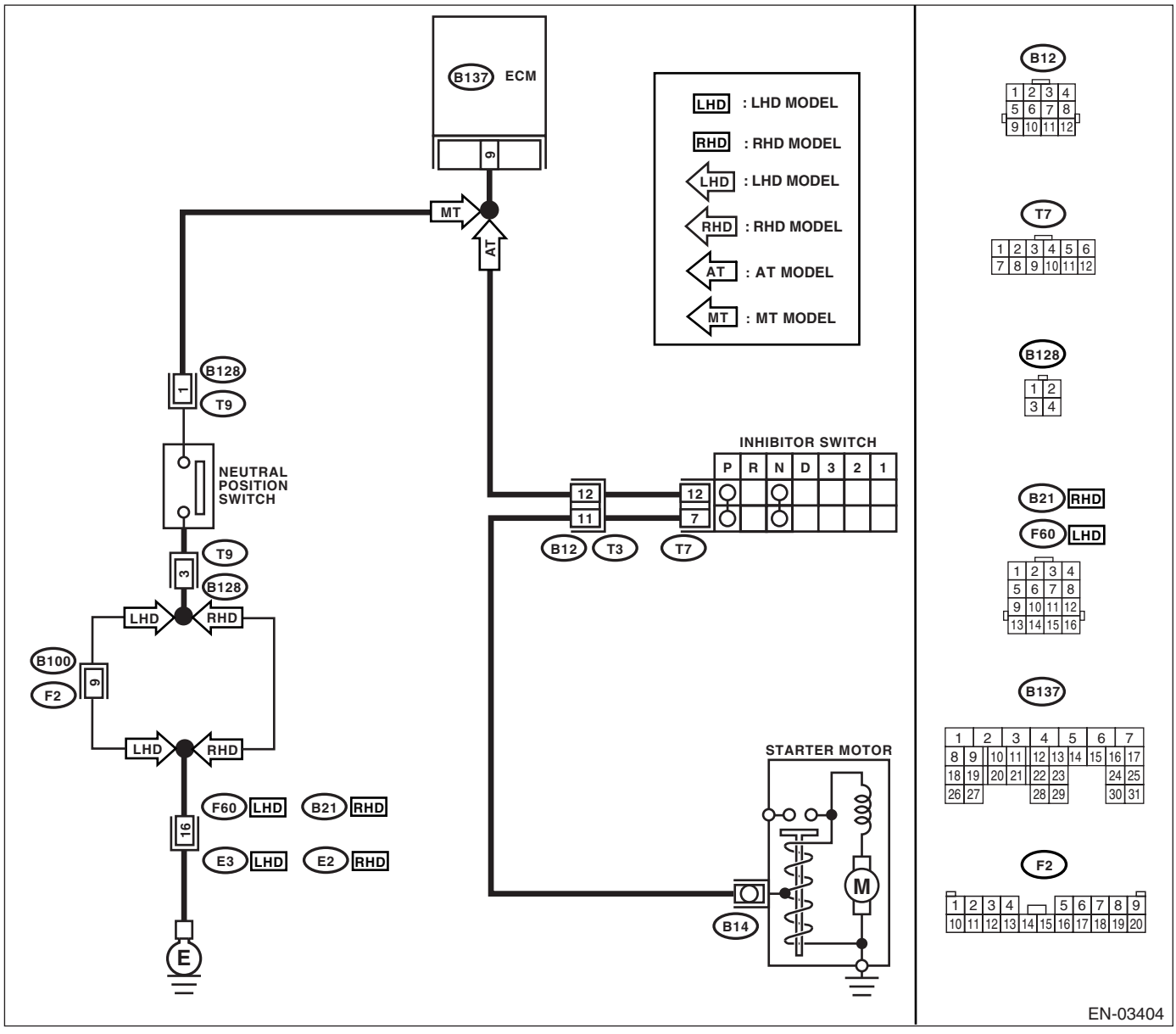
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Place the shift lever except in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T9) No. 1 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace the neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral. 2) Measure the resistance between transmission harness connector terminals. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair short circuit in transmission harness or replace the neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B137) No. 9 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact the SUBARU dealer.

BK:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

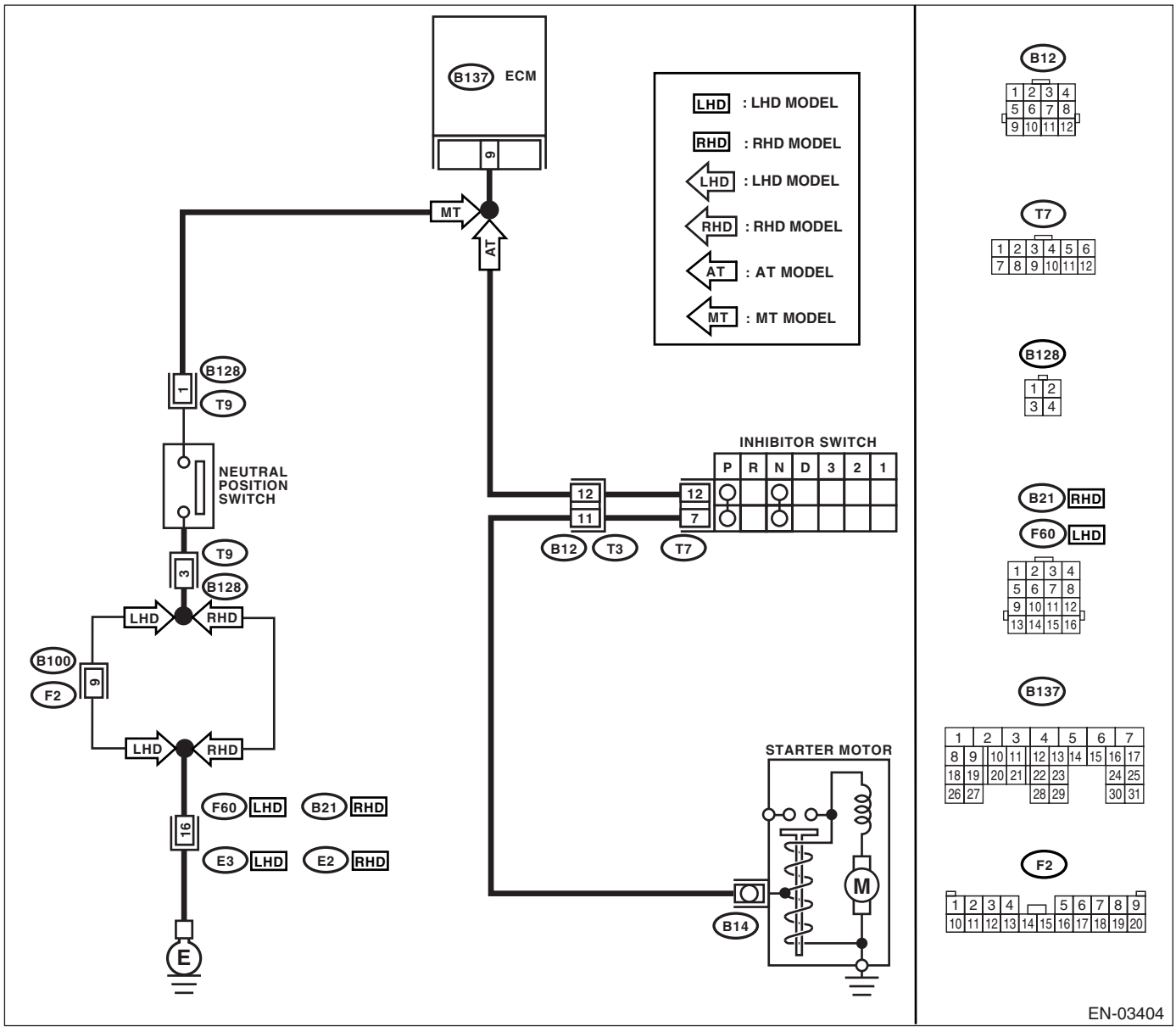
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground with select lever at "N" and "P" ranges. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground with select lever at except "N" and "P" ranges. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B137) No. 9 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and inhibitor switch connector. • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector.

	Step	Check	Yes	No
6	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
7	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals with select lever at "N" and "P" ranges. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace the inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>
8	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BL:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

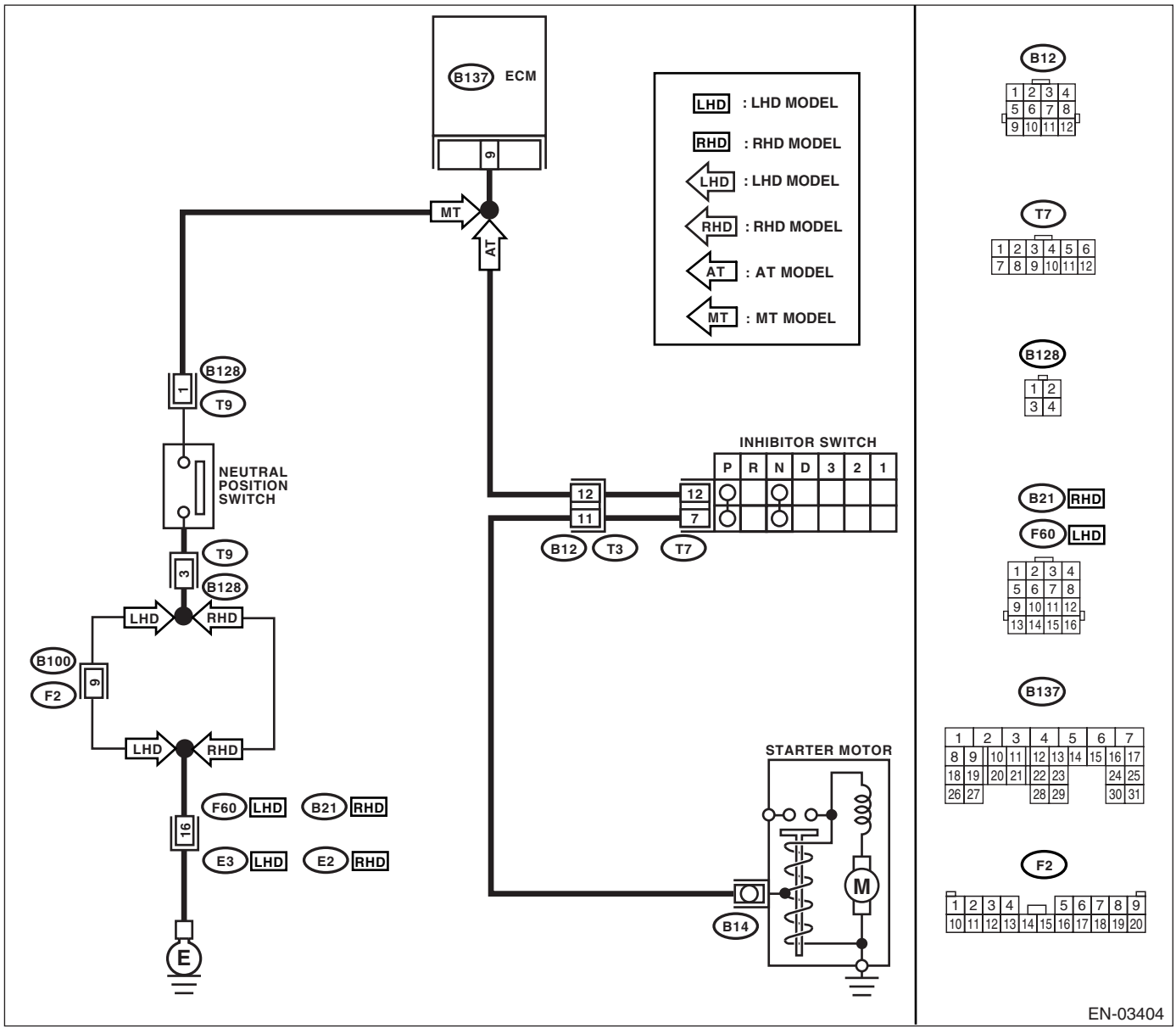
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever except in neutral position. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Place the shift lever in neutral position. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer.
4	**CHECK INPUT SIGNAL FROM ECM.** 1) Disconnect the connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and transmission harness connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. ***Connector & terminal*** ***(B137) No. 9 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and transmission harness connector • Poor contact in transmission harness connector. • Poor contact in ECM connector.
6	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair open circuit in the neutral position switch ground line.
7	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral position. 2) Measure the resistance between transmission harness connector socket terminals. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace the neutral position switch.
8	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact the SUBARU dealer.

BM:DTC P1301 MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

DTC DETECTING CONDITION:

Immediately at fault recognition

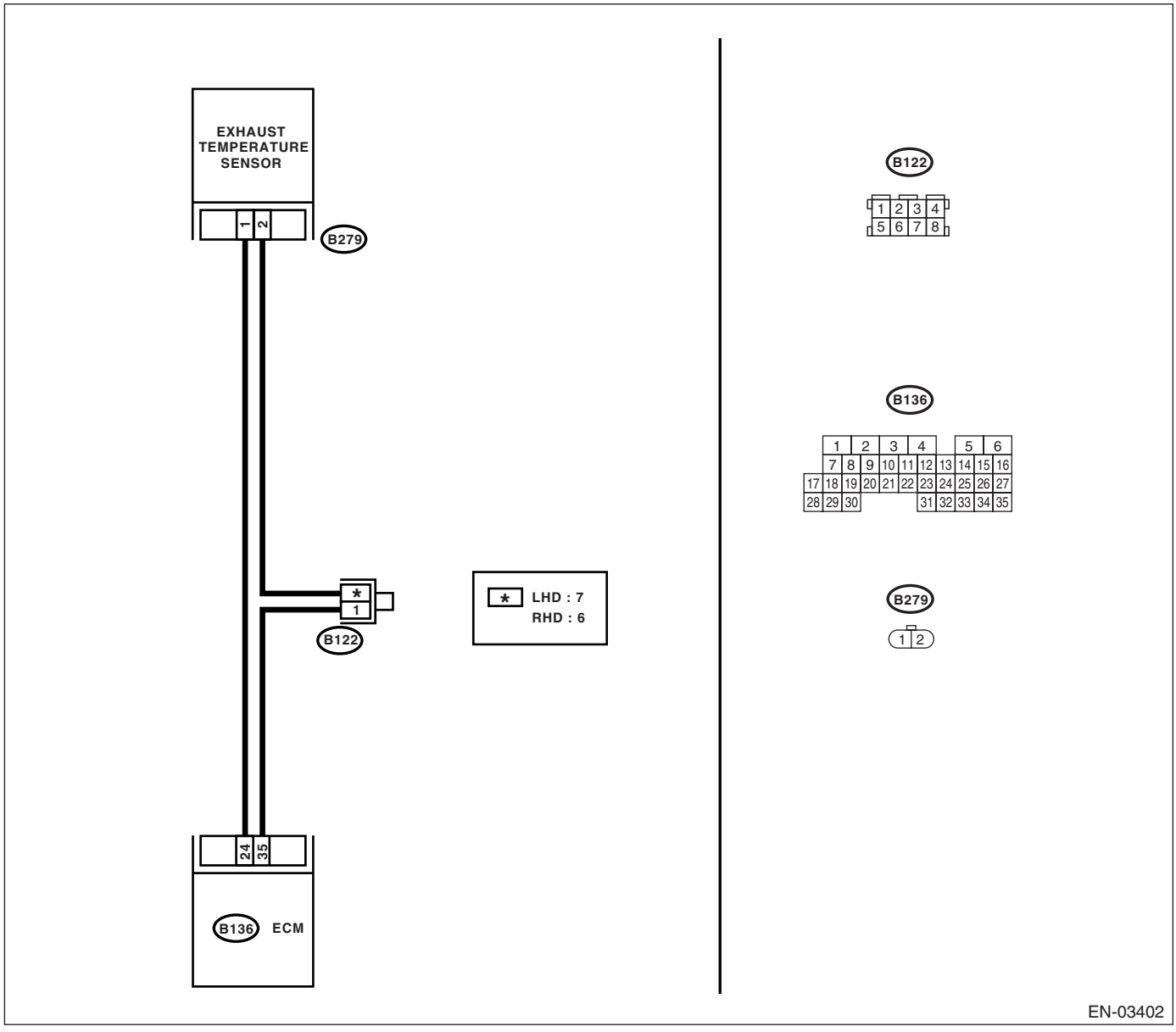
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK DTC.** Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Does failure for repair or replacement exist?	Repair or replace failure, then replace the precatalytic converter.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BN:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

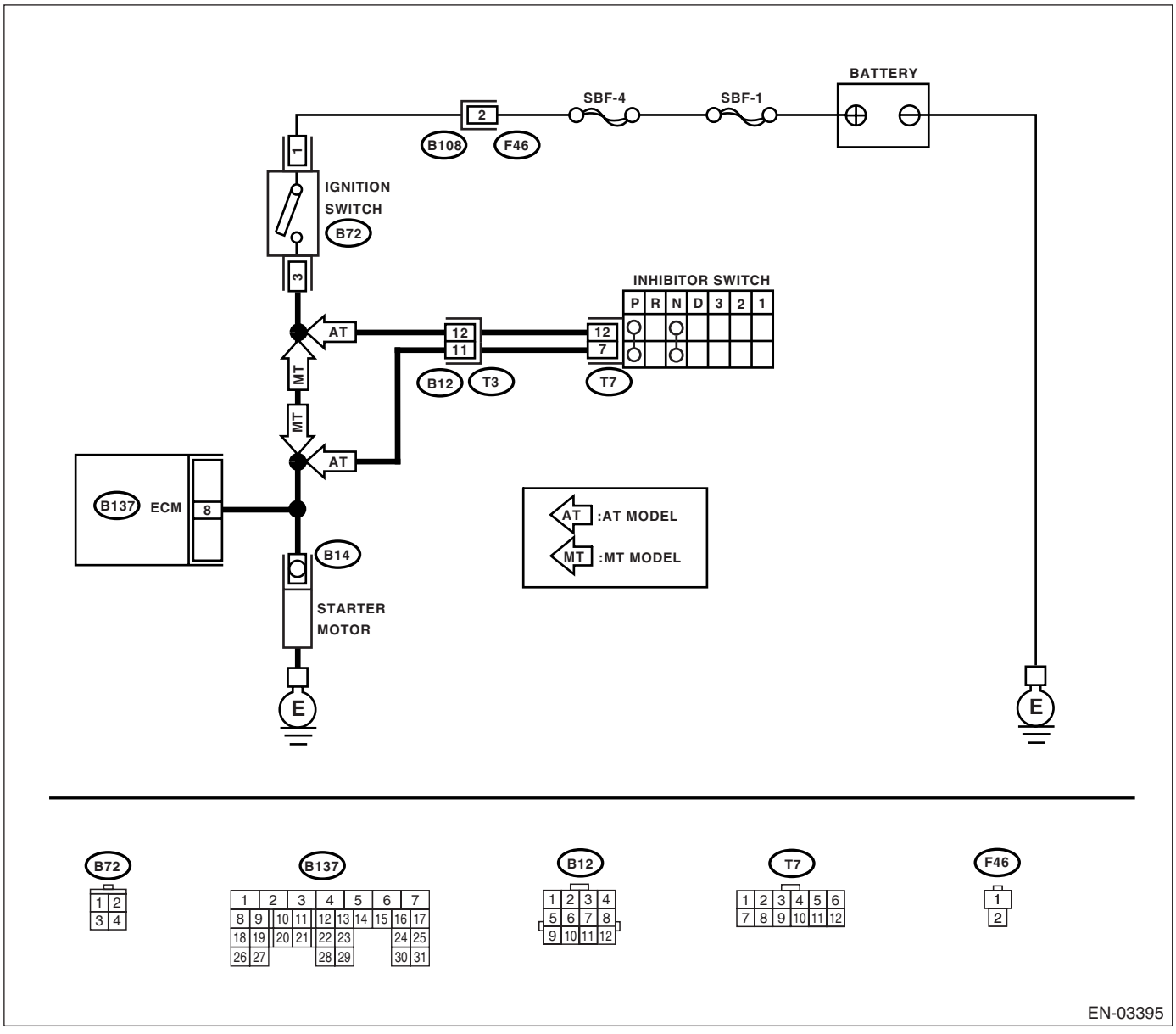
Failure of engine to start

CAUTION:

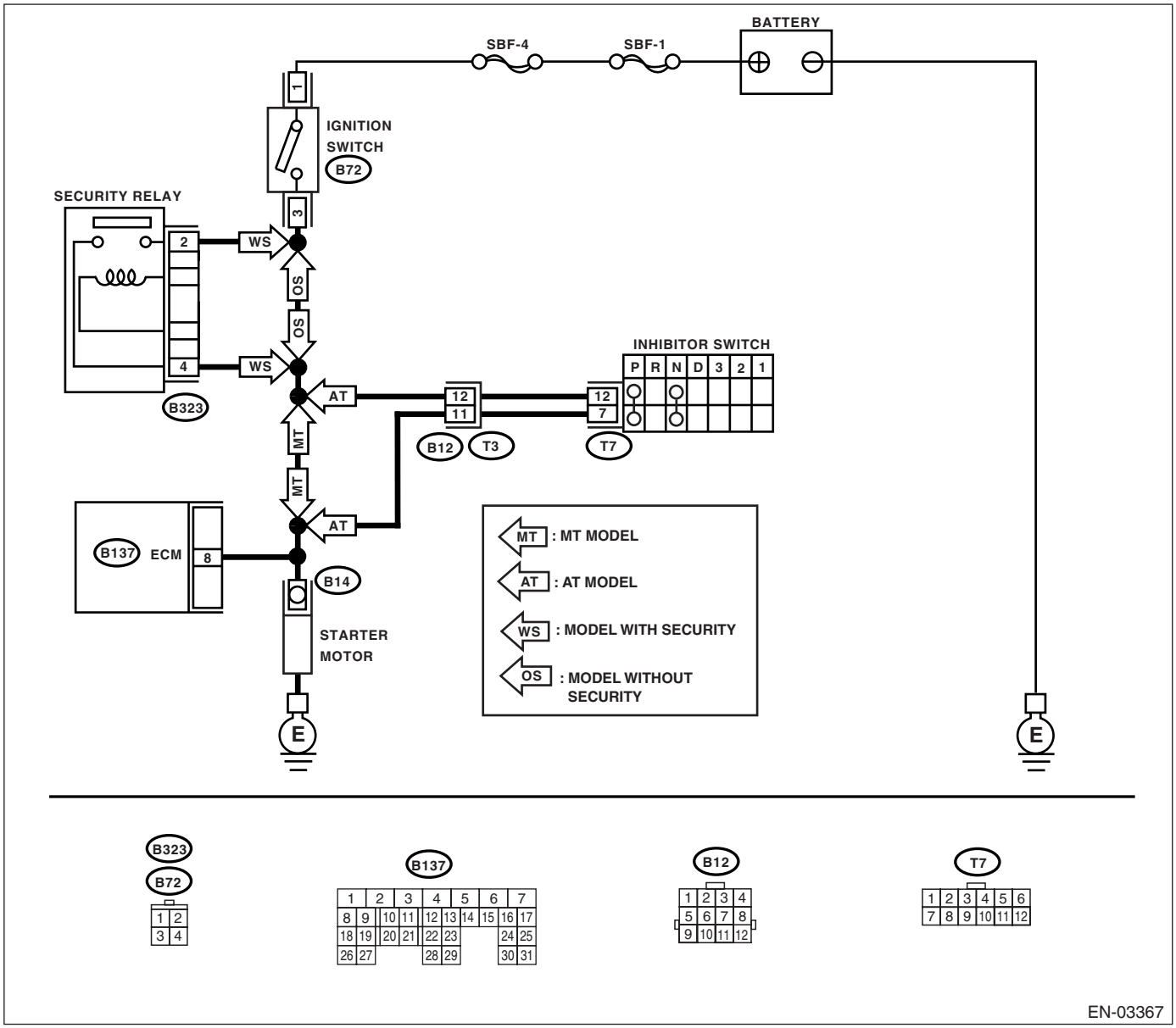
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**



Step	Check	Yes	No
1 **CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate when ignition switch to START?	Repair the harness and connector. NOTE: In this case repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H4DOTC 2.0)(diag)-60, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BO:DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

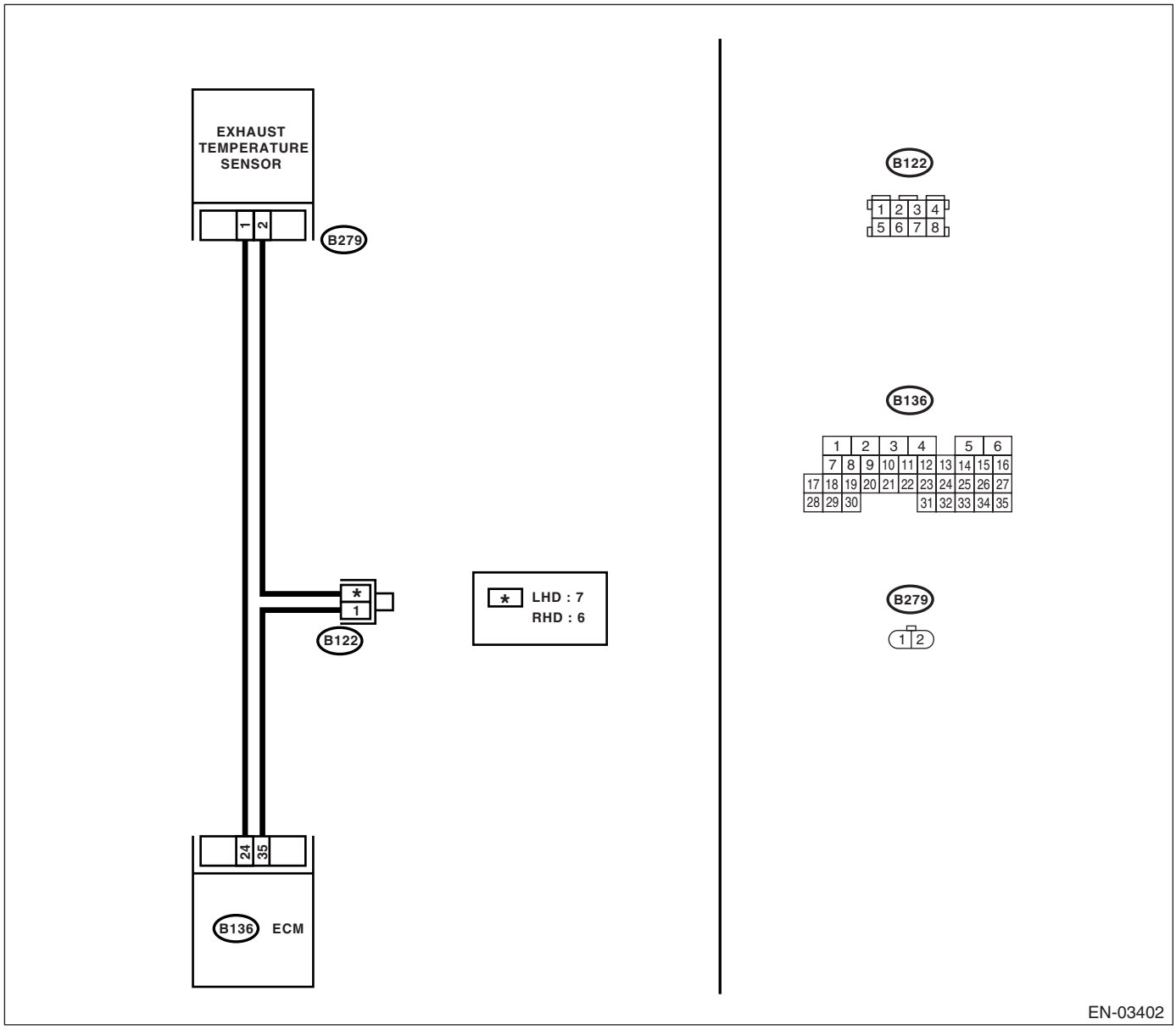
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose installation of exhaust manifold • Cracks or hole of exhaust manifold • Loose installation of front oxygen (A/F) sensor	Is there a fault in exhaust system?	Repair or replace failure, then replace the precatalytic converter.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BP:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

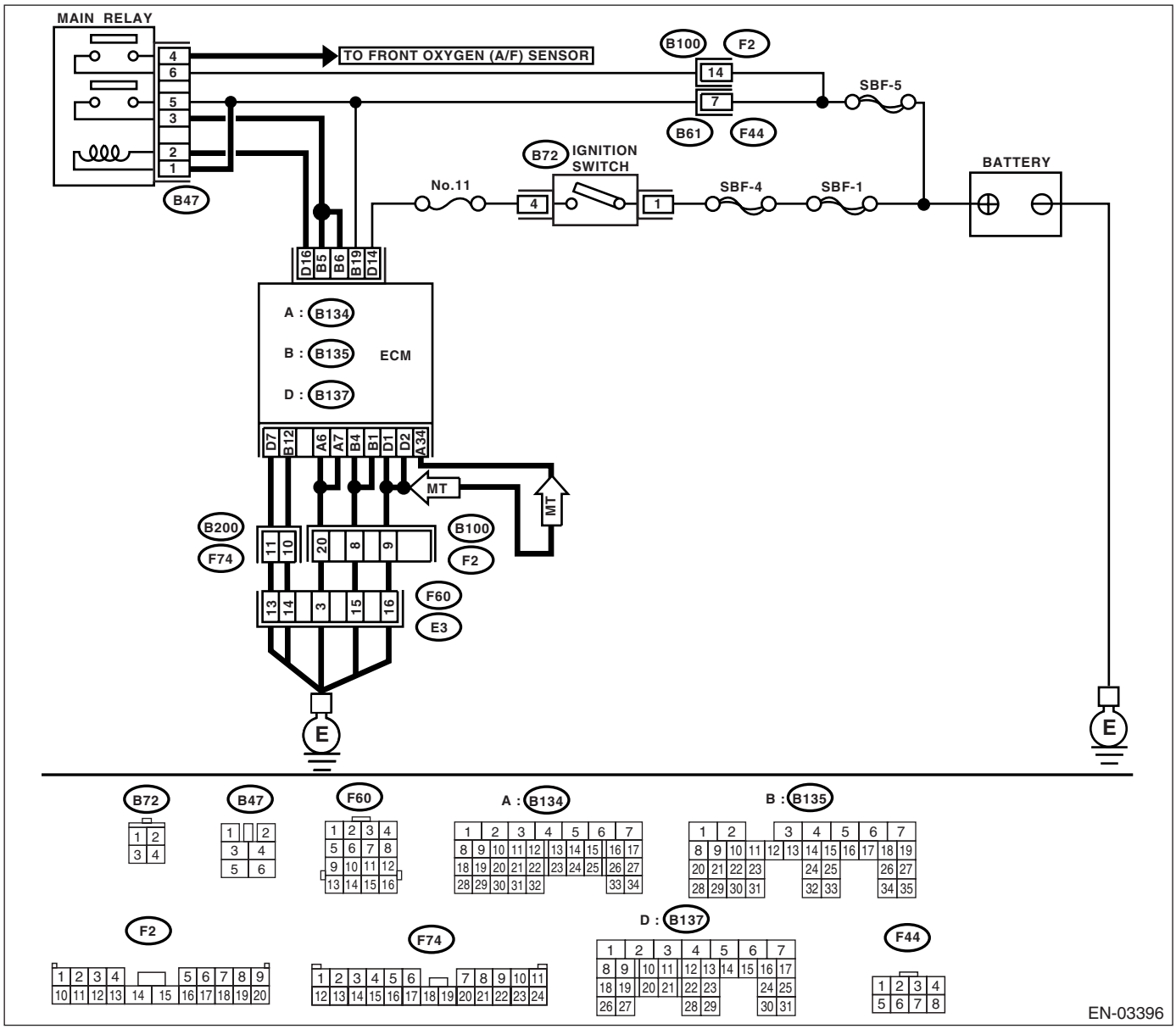
Immediately at fault recognition

CAUTION:

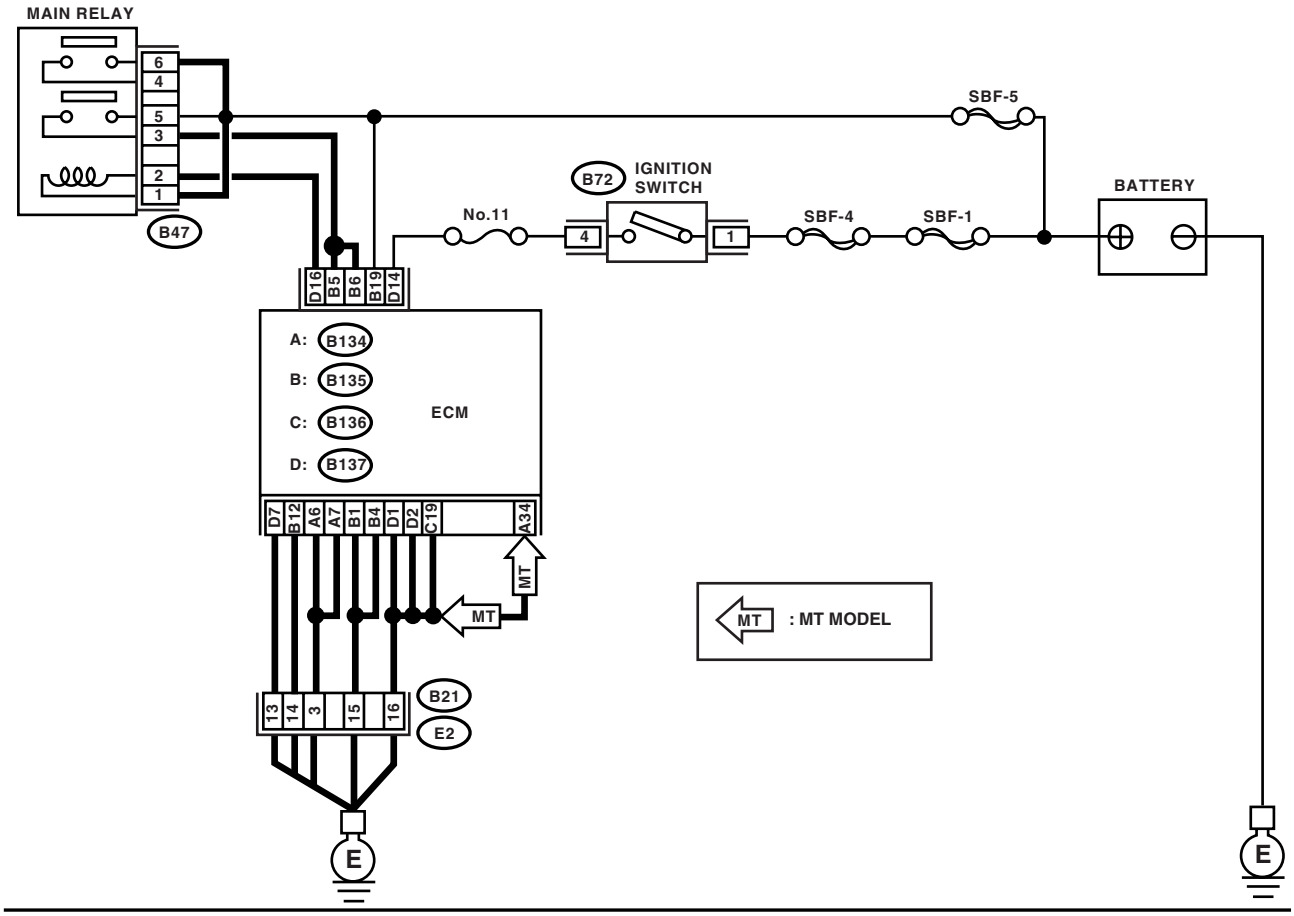
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

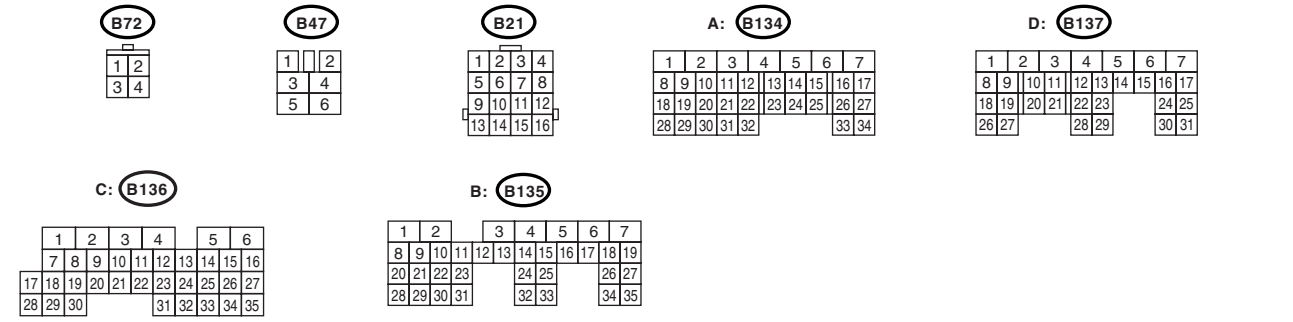
WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**





EN-03369

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector. • Poor contact in battery terminal

BQ:DTC P2004 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BR:DTC P2005 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BS:DTC P2006 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BT:DTC P2007 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BU:DTC P2008 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN)

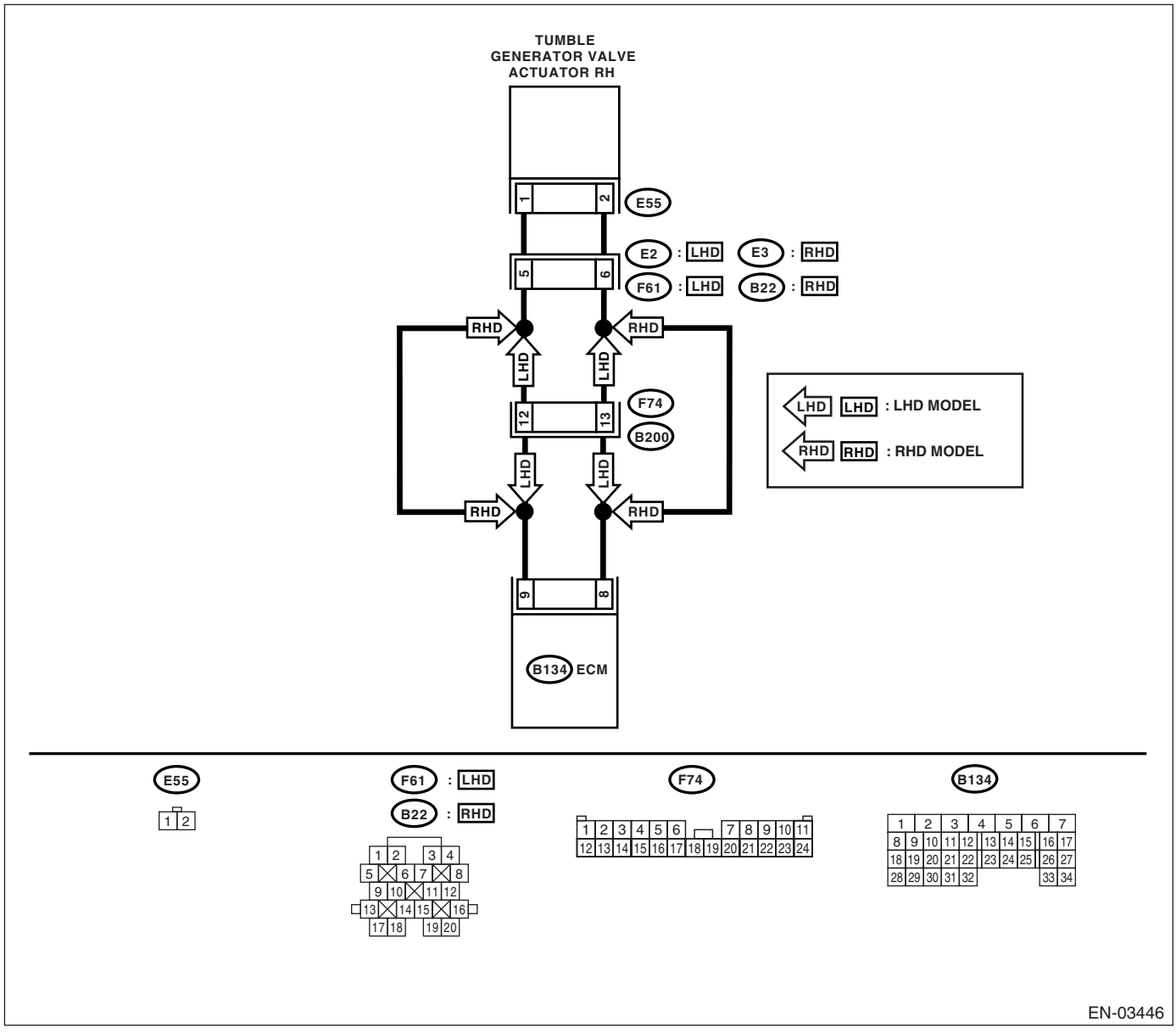
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B134) No. 9:*** ***(E55) No. 2 — (B134) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>

BV:DTC P2009 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT)

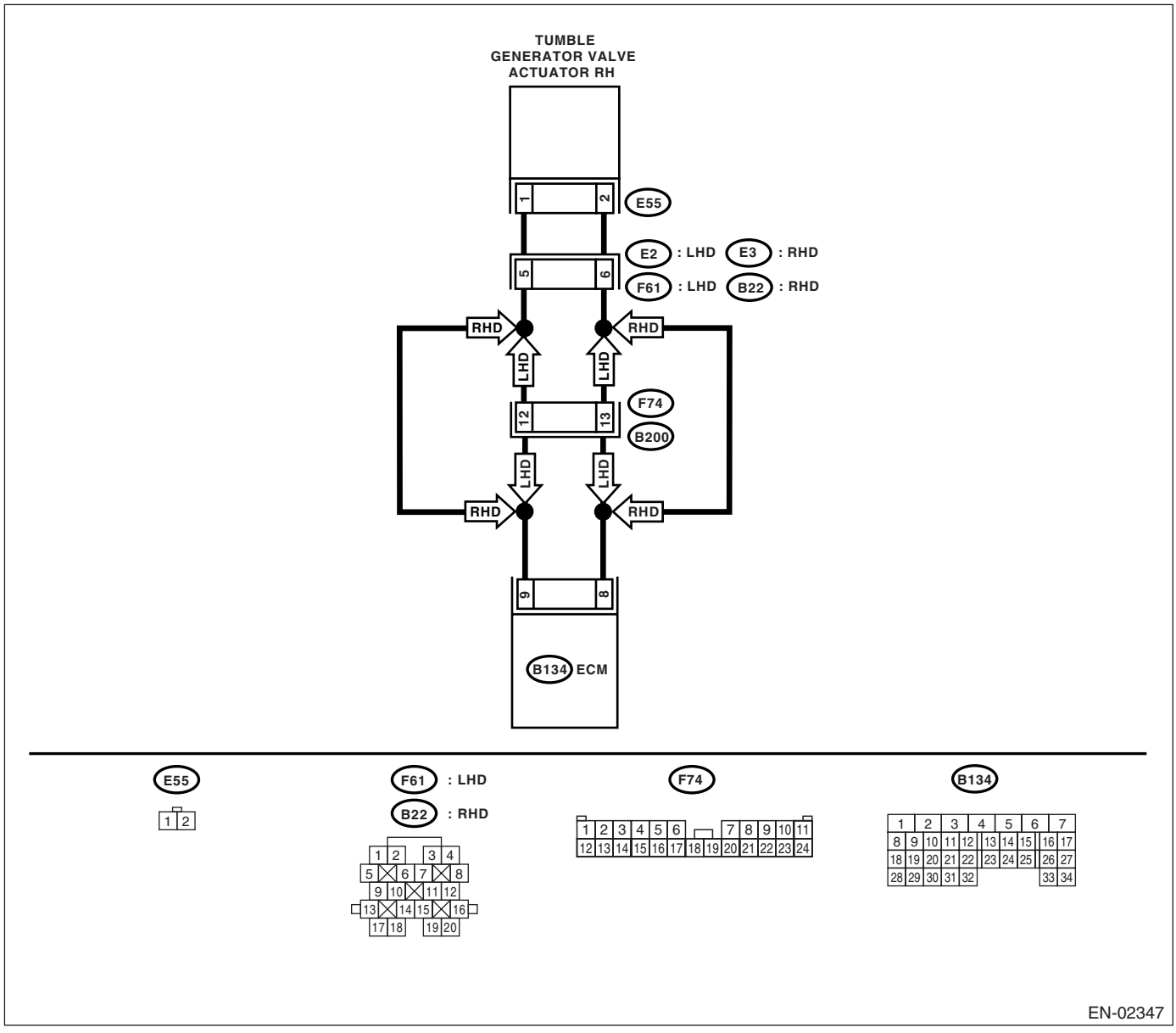
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (−):*** ***(E55) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 5 V?	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

BW:DTC P2011 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN)

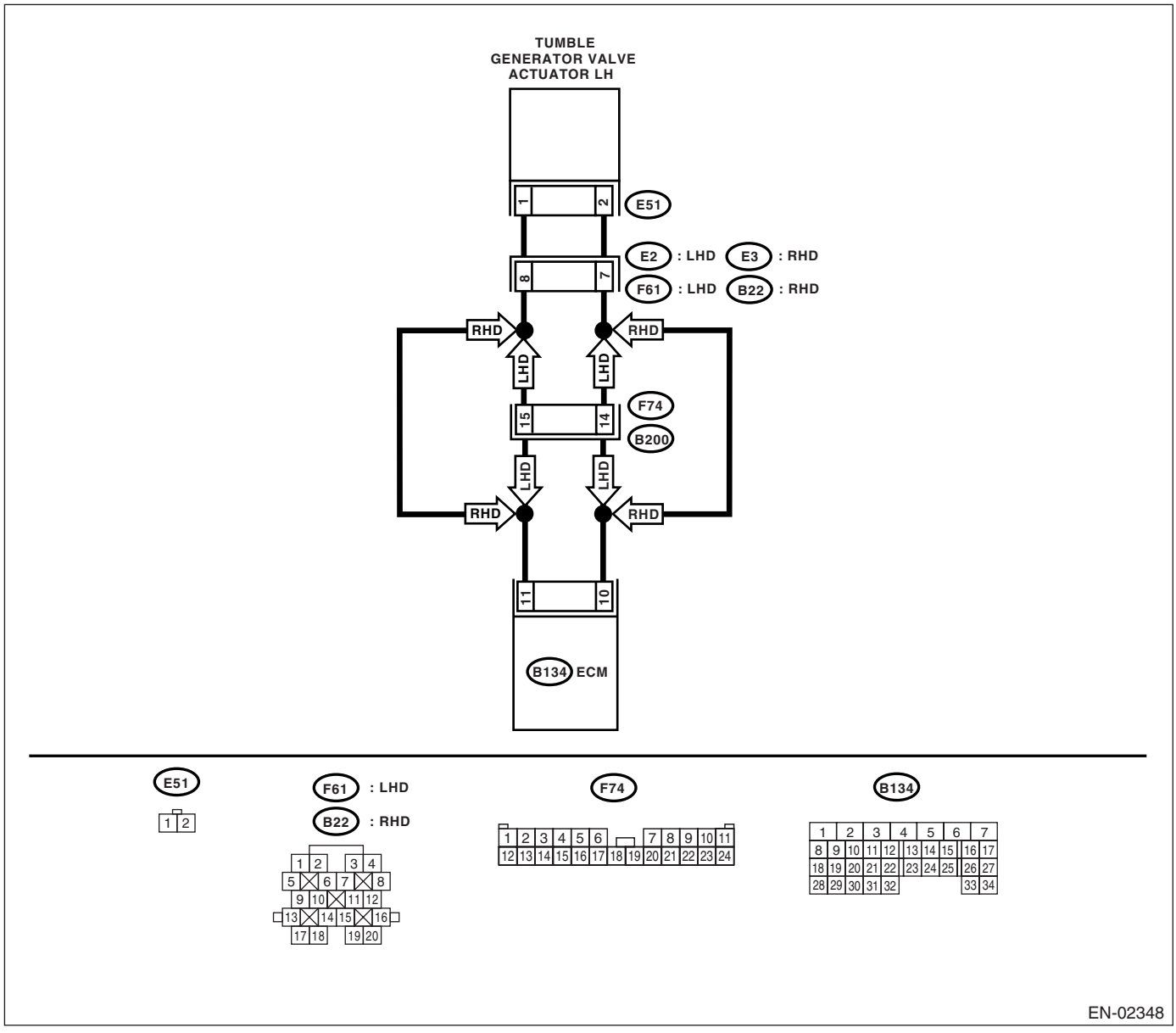
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B134) No. 11:*** ***(E51) No. 2 — (B134) No. 10:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>

BX:DTC P2012 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT)

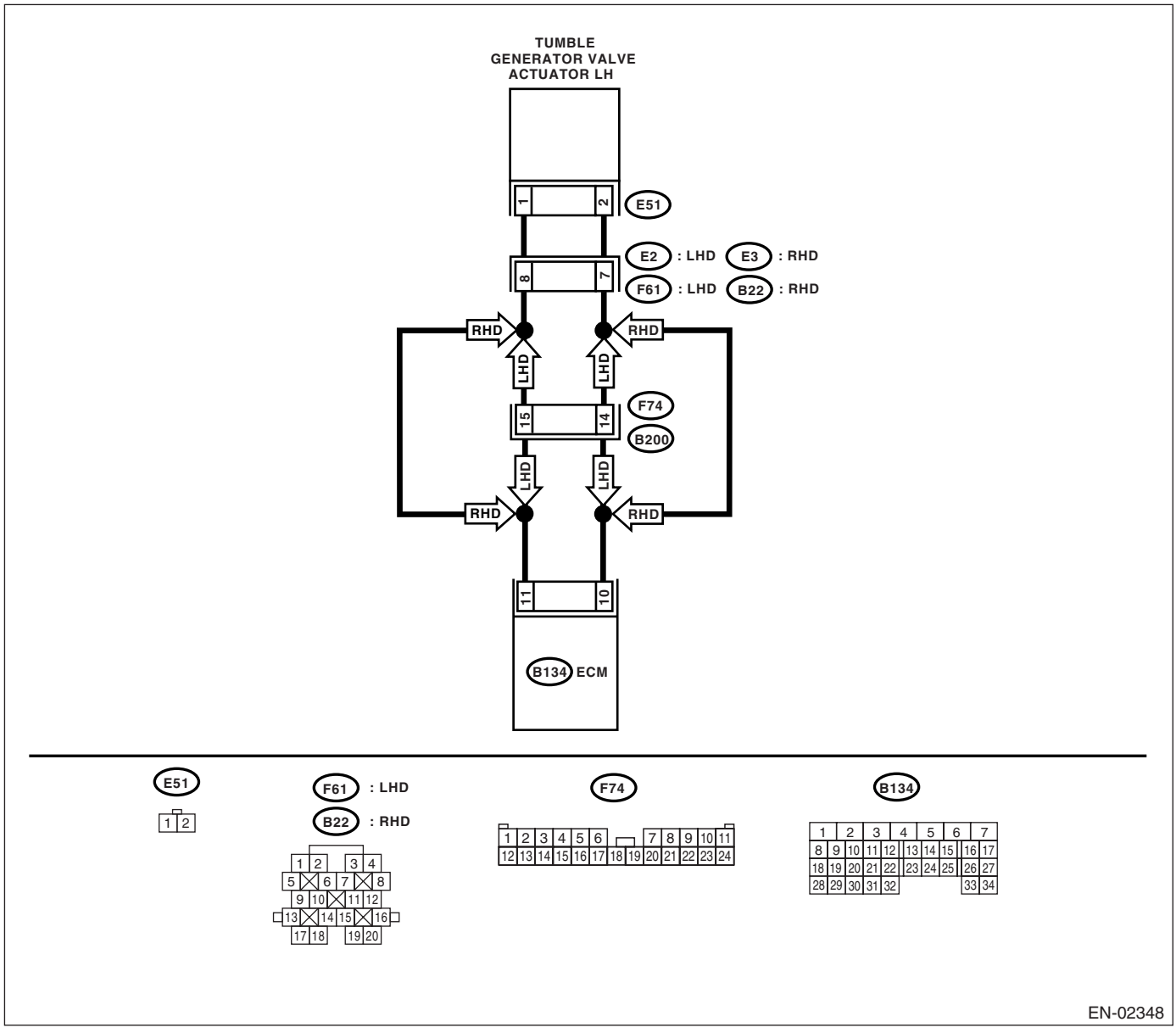
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (−):*** ***(E51) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 5 V?	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

BY:DTC P2016 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

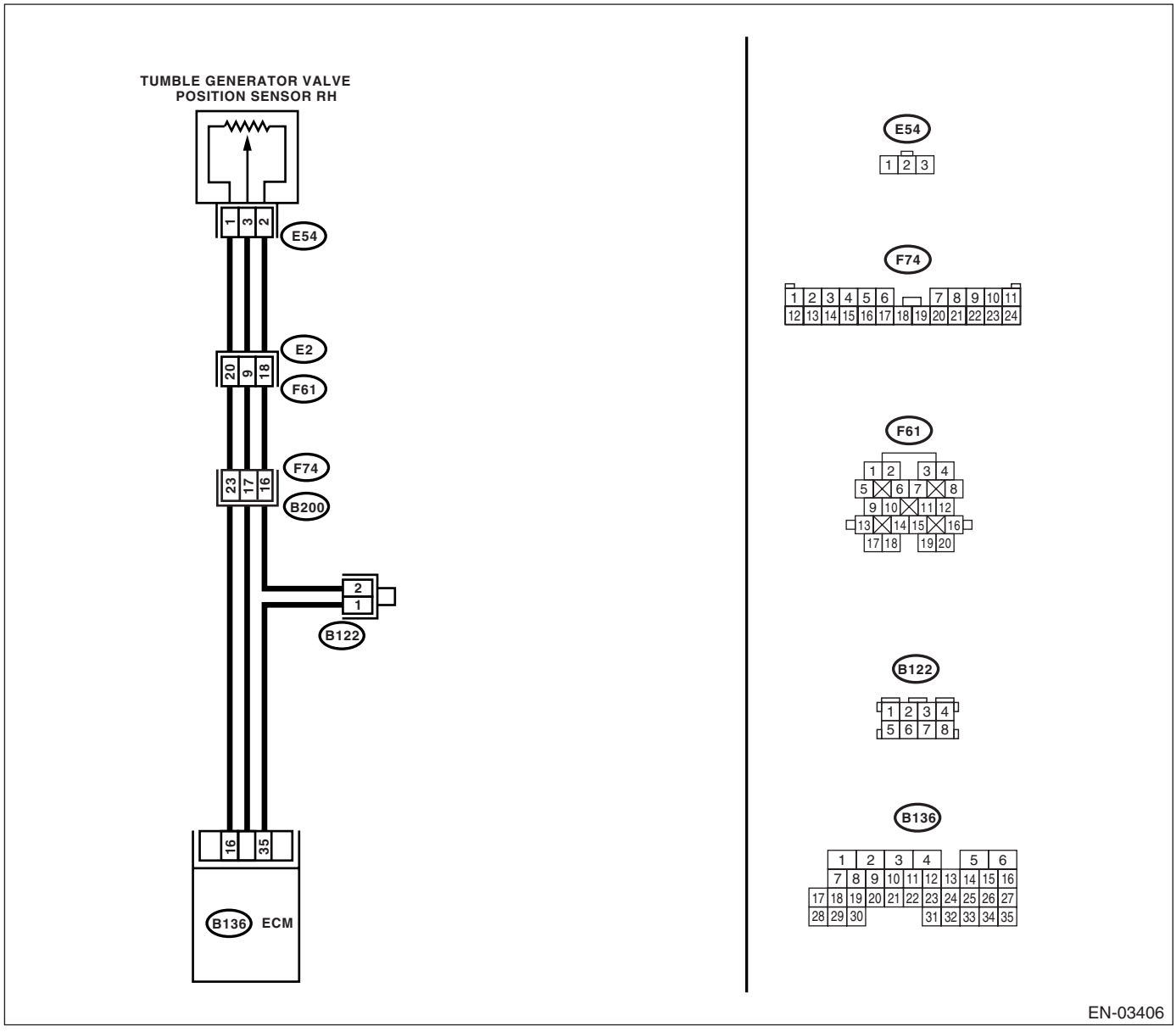
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

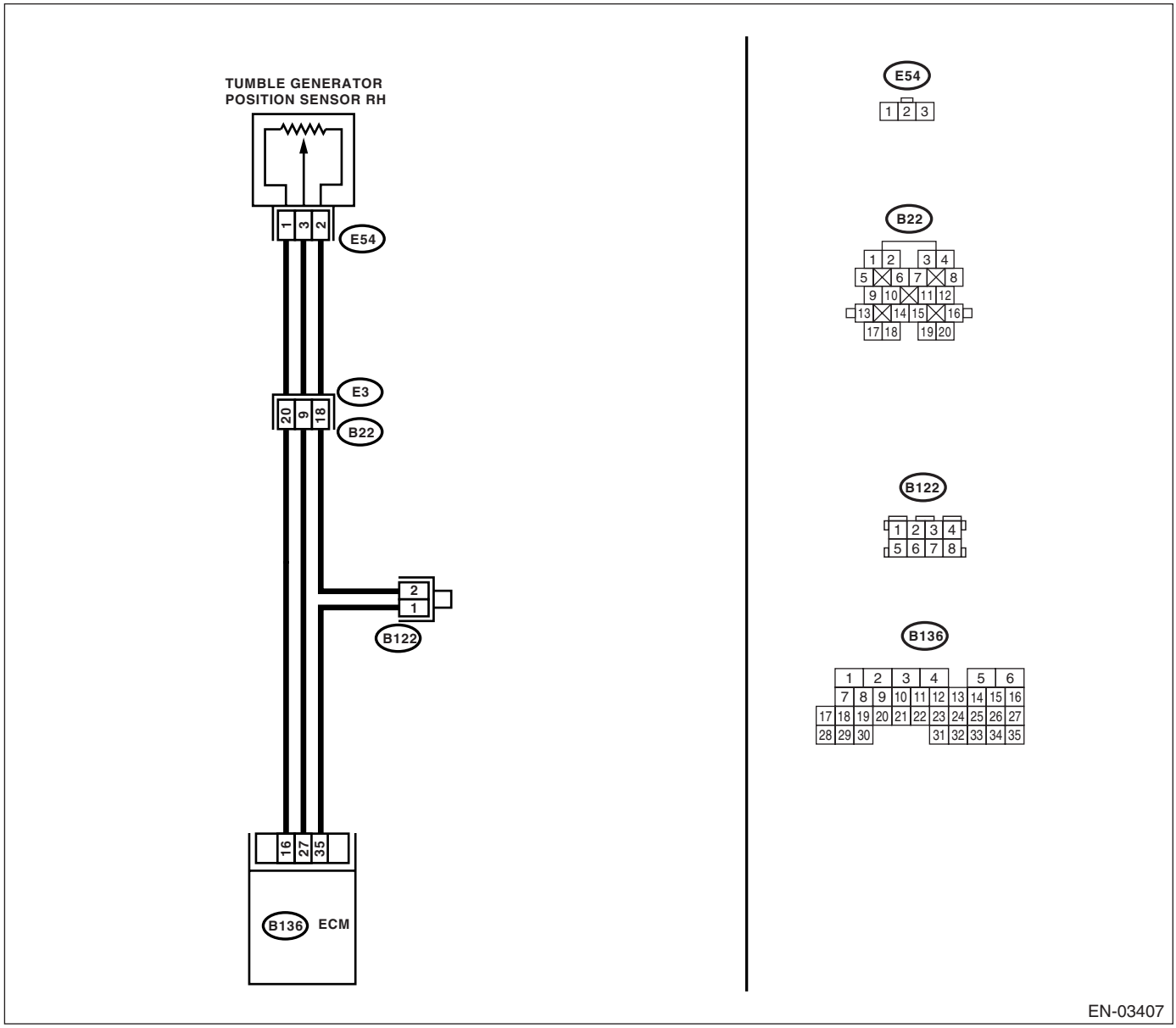
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR
POSITION SENSOR RH
1
3
2
E54
E3
20
9
18
B22
2
1
B122
16
27
35
B136
ECM
E54
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-03407

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B136) No. 27 — (E54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Repair poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>

BZ:DTC P2017 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

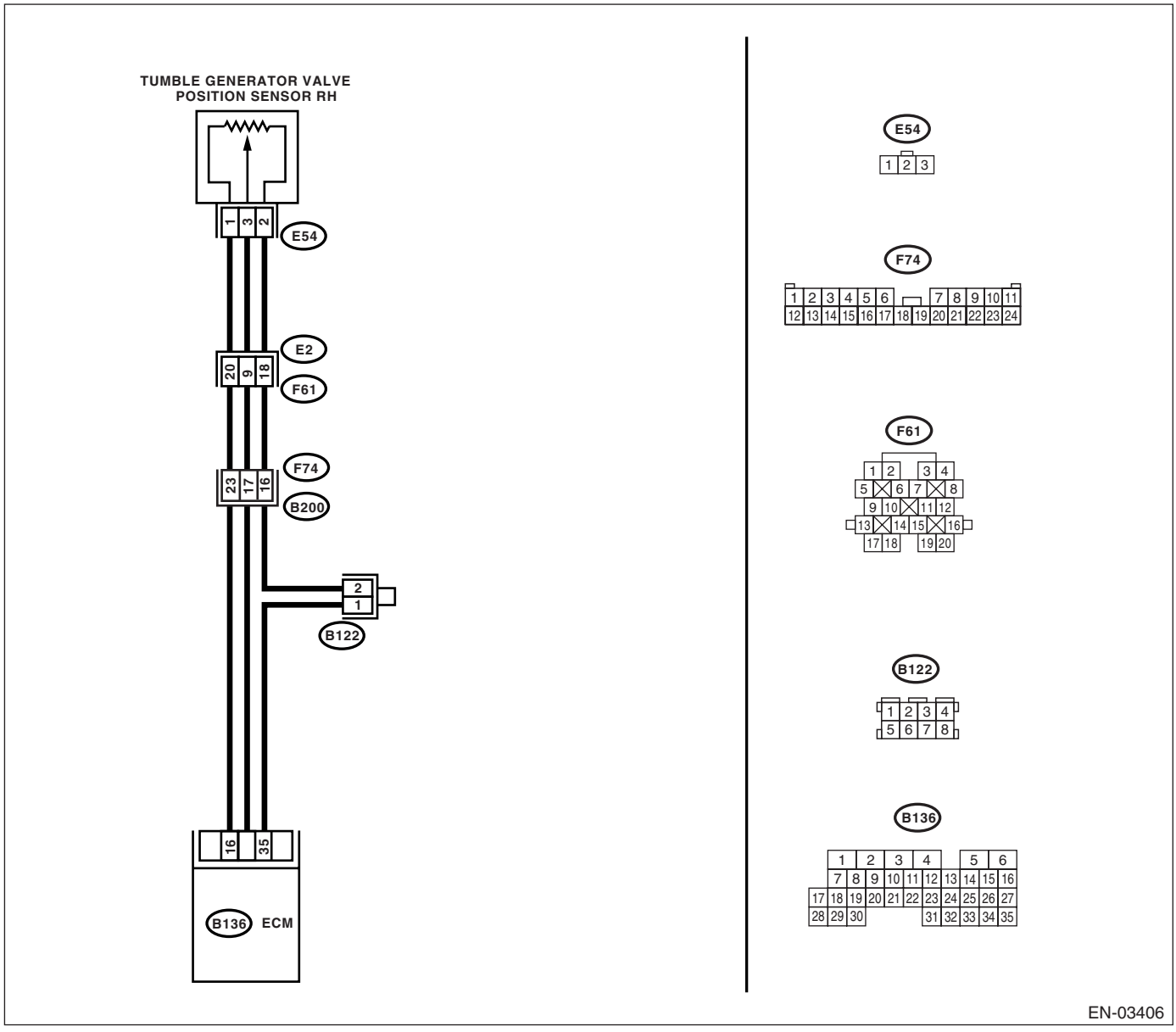
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

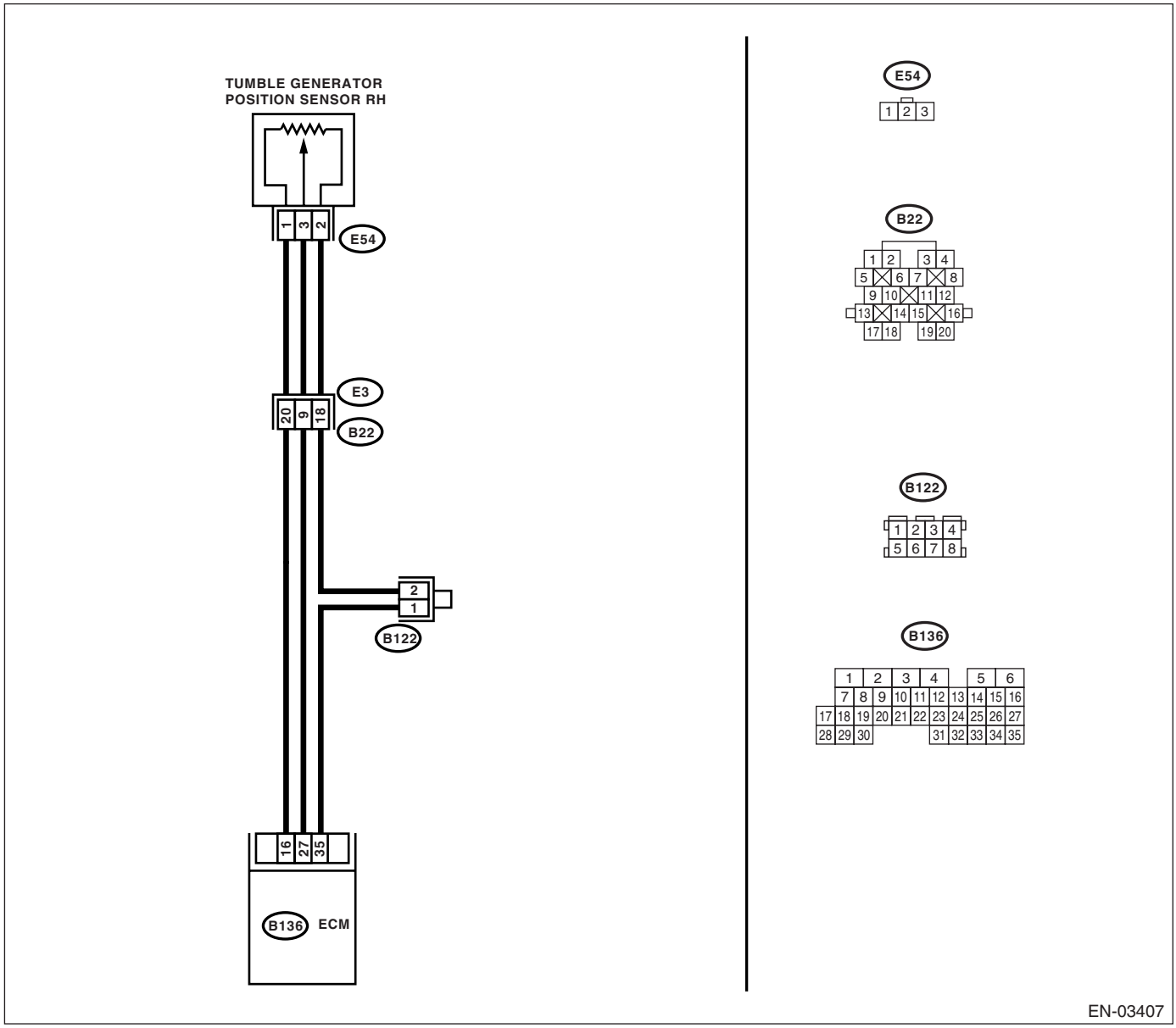
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR
POSITION SENSOR RH
1
3
2
E54
E3
20
9
18
B22
2
1
B122
16
27
35
B136
ECM
E54
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-03407

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>

CA:DTC P2021 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

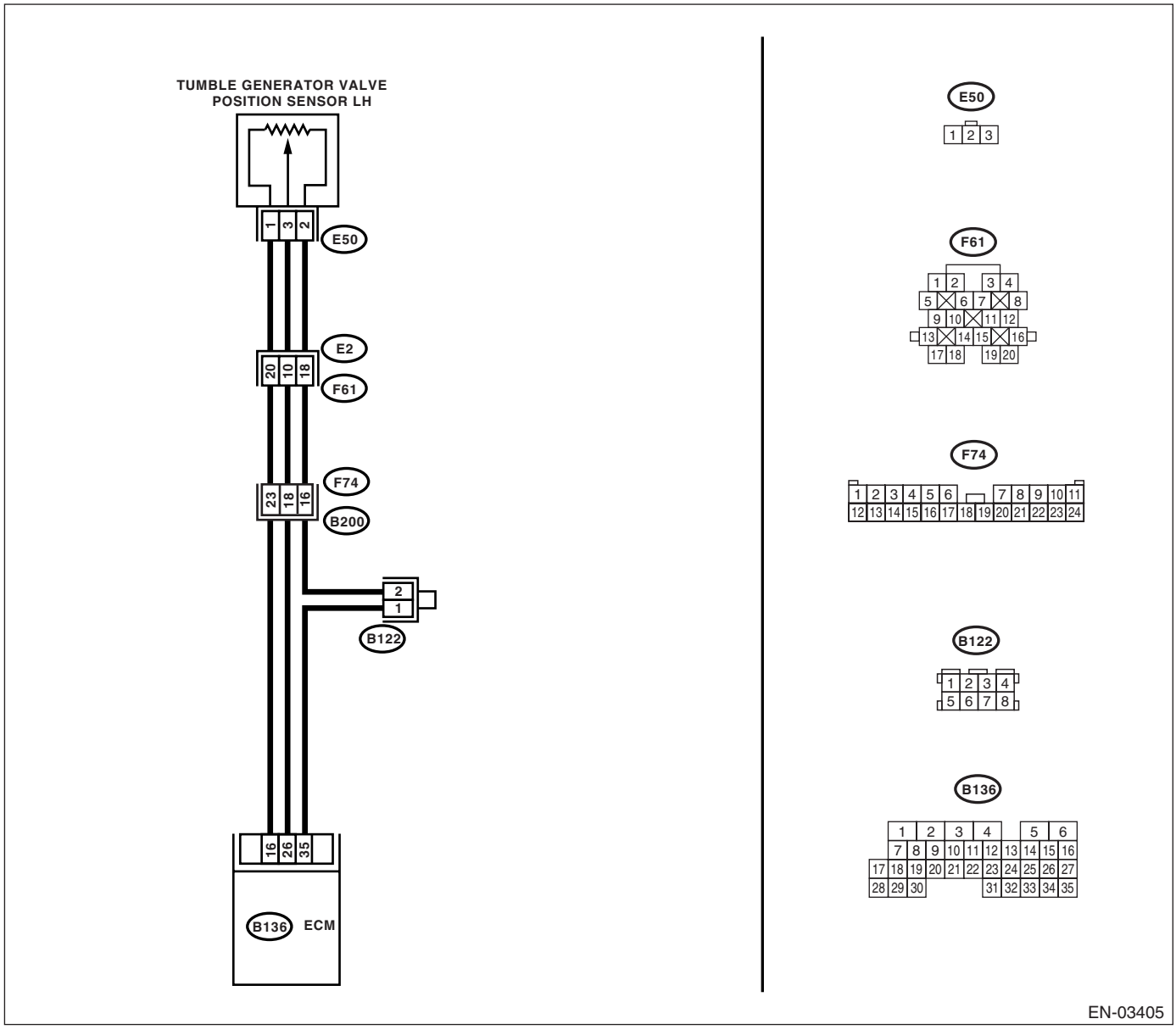
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

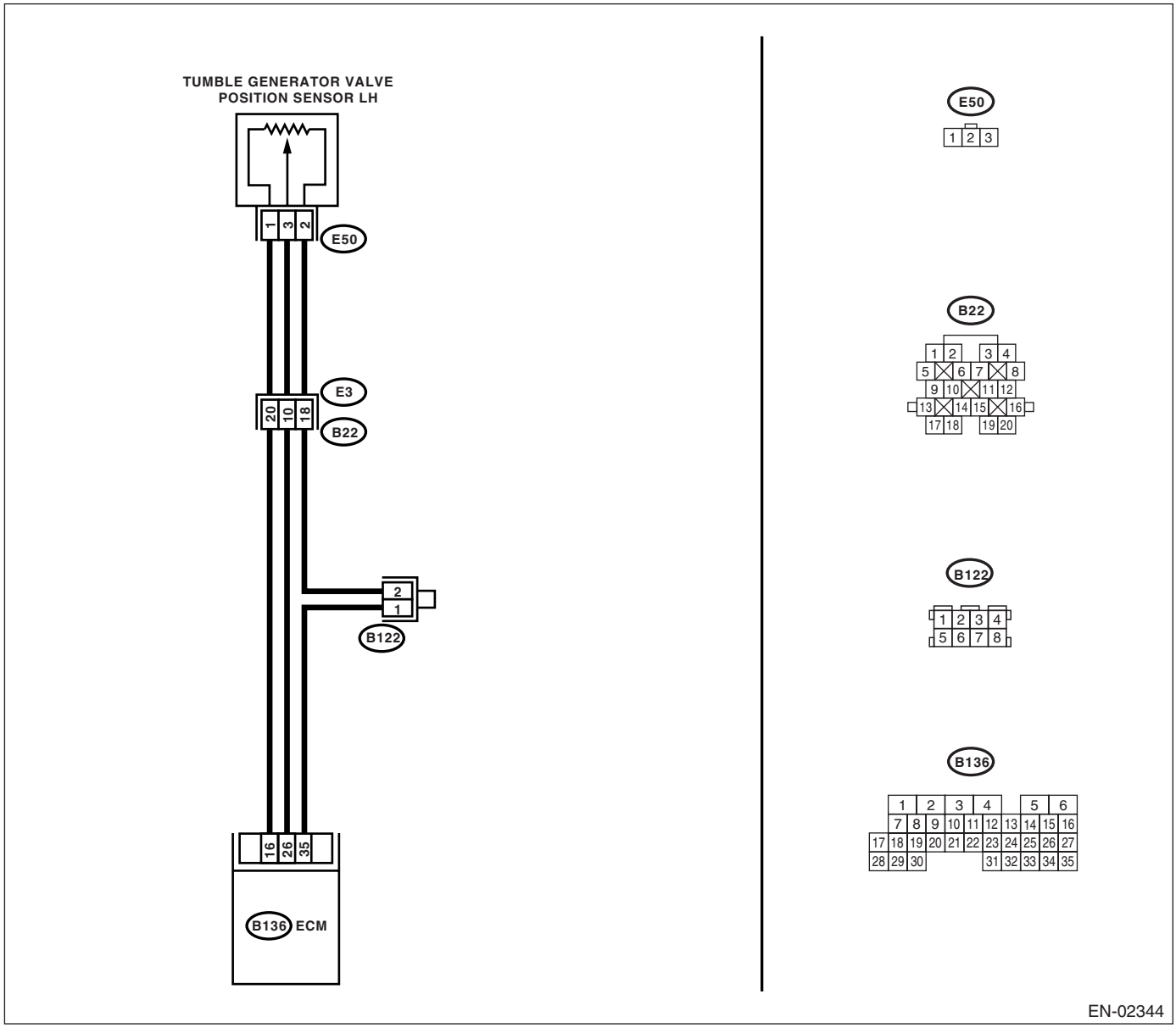
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR VALVE POSITION SENSOR LH
1
3
2
E50
E3
20
10
18
B22
2
1
B122
16
26
35
B136
ECM
E50
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02344

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while tumble generator valve is fully closed. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 26 (+) — Chassis ground (−):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 26 — (E50) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Repair poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>

CB:DTC P2022 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

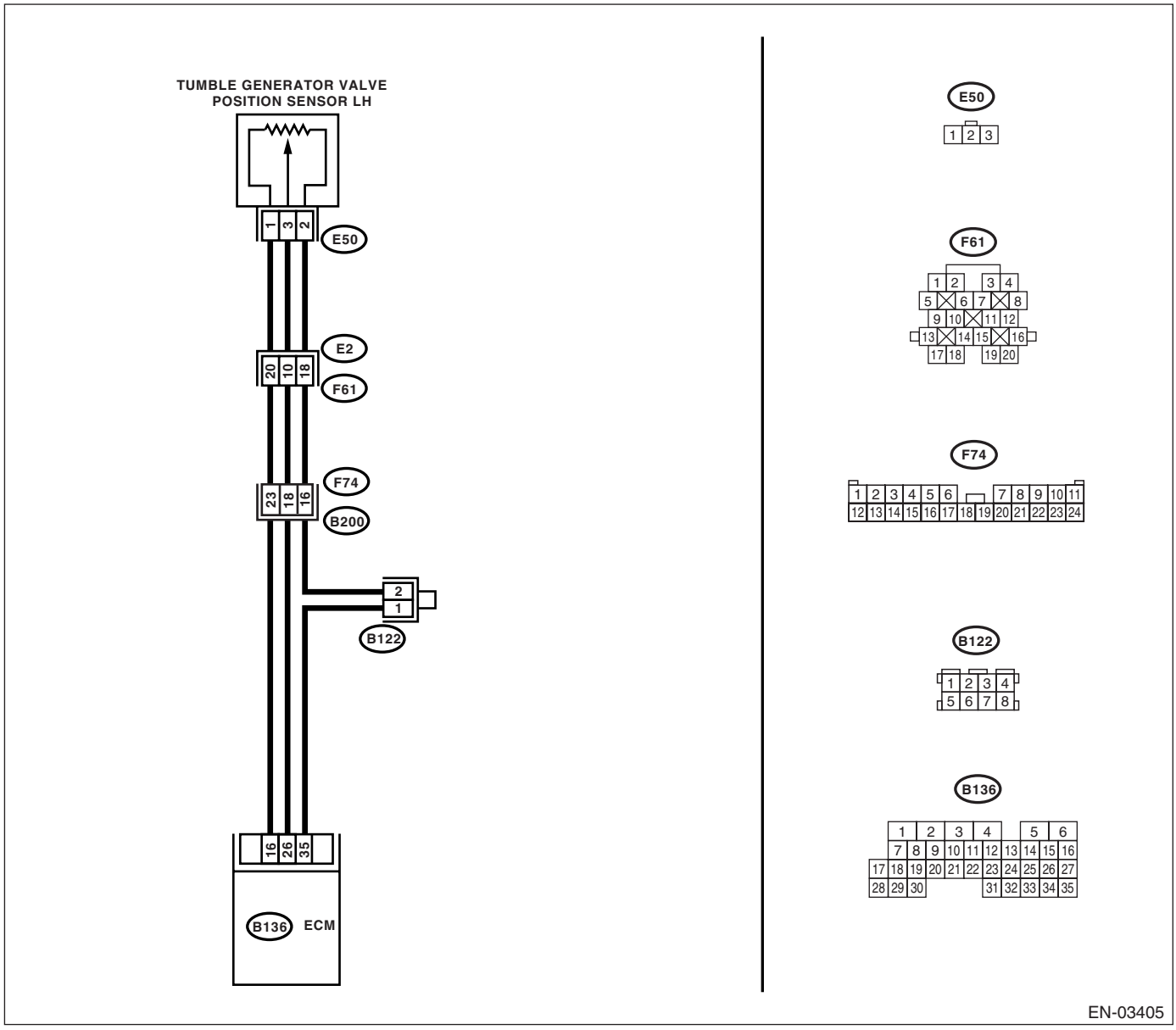
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

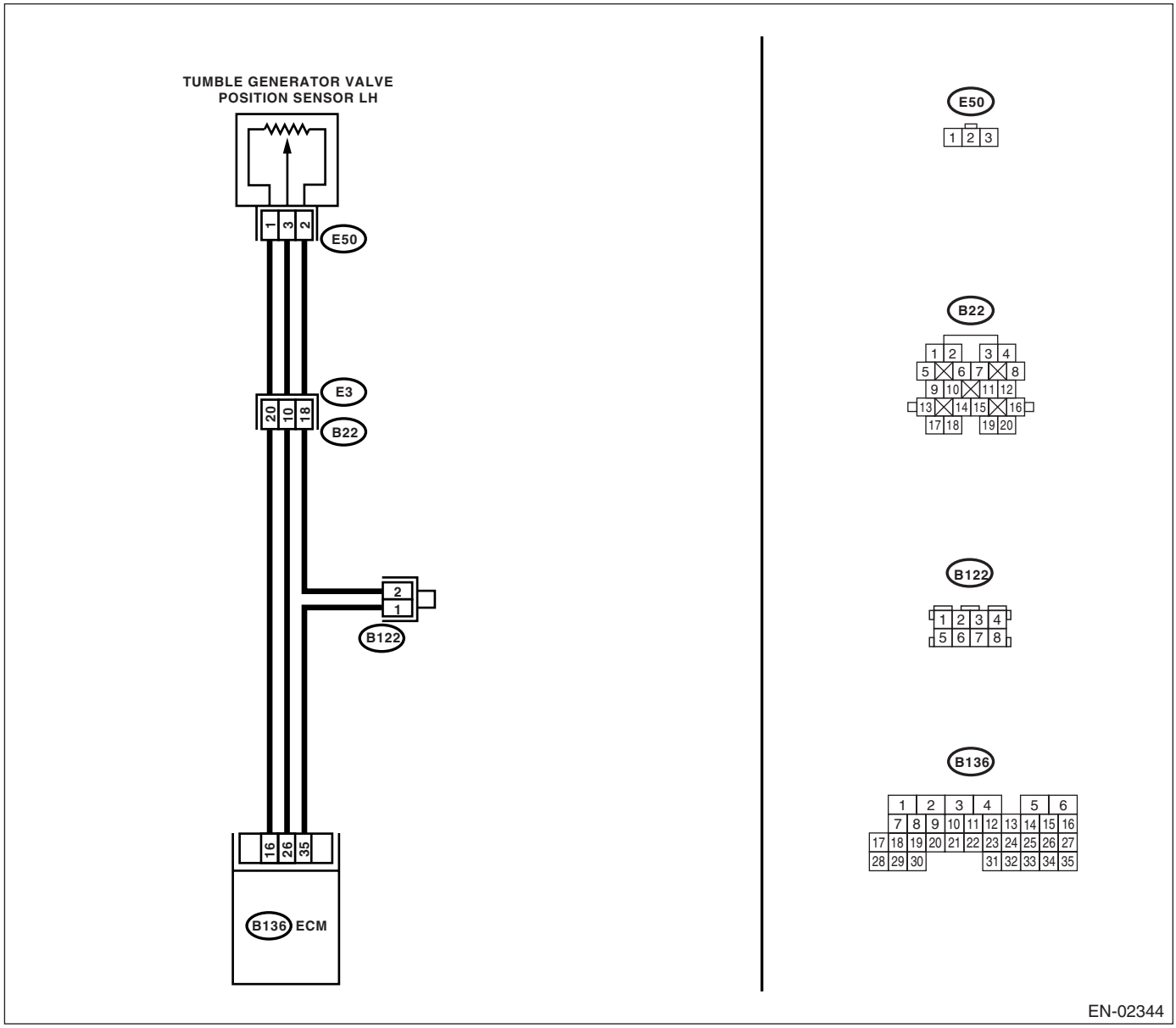
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR VALVE POSITION SENSOR LH
1
3
2
E50
E3
20
10
18
B22
2
1
B122
16
26
35
B136
ECM
E50
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02344

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.0)(diag)-33, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.0)-42, Tumble Generator Valve Assembly.>

CC:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

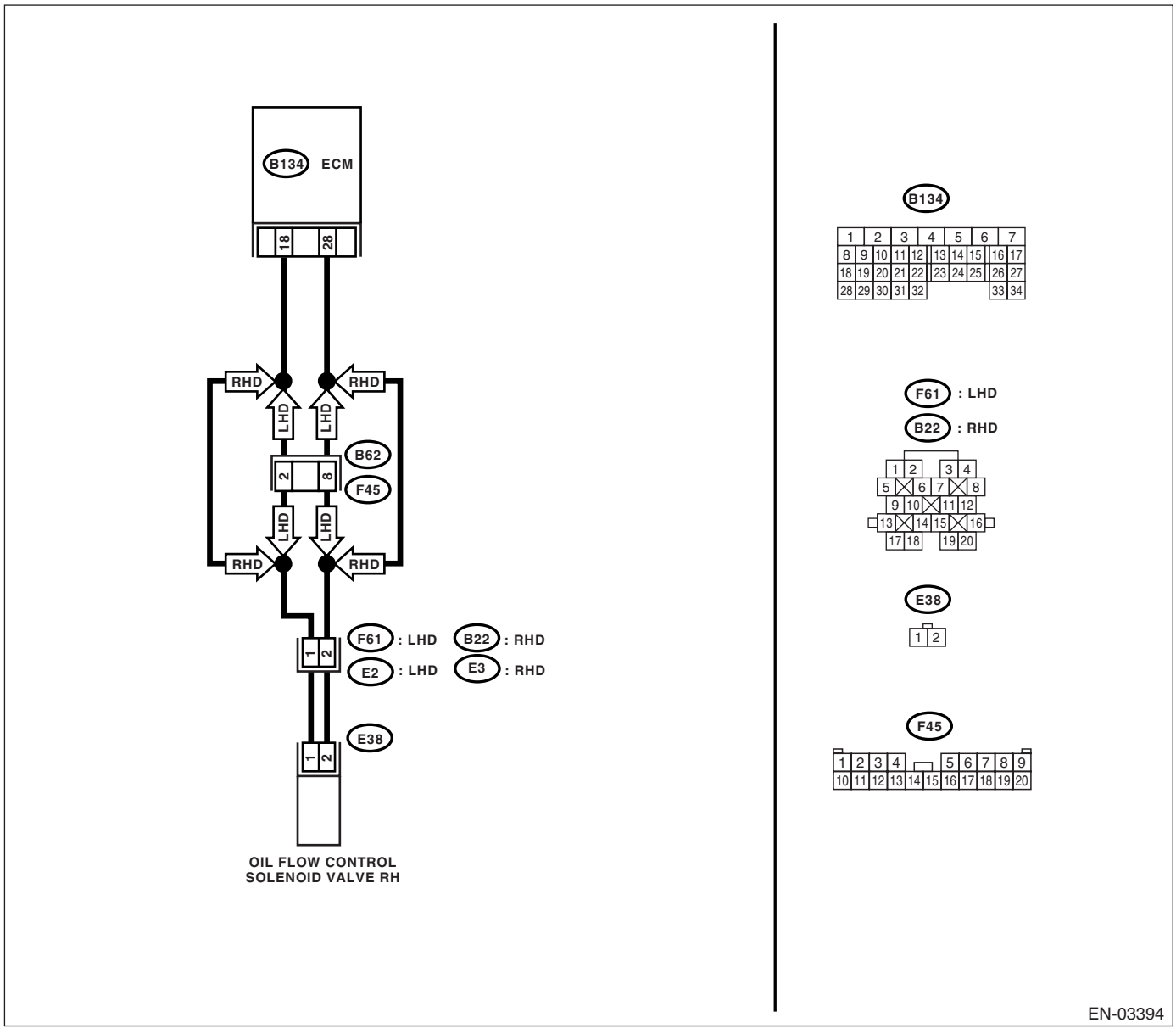
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

CD:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

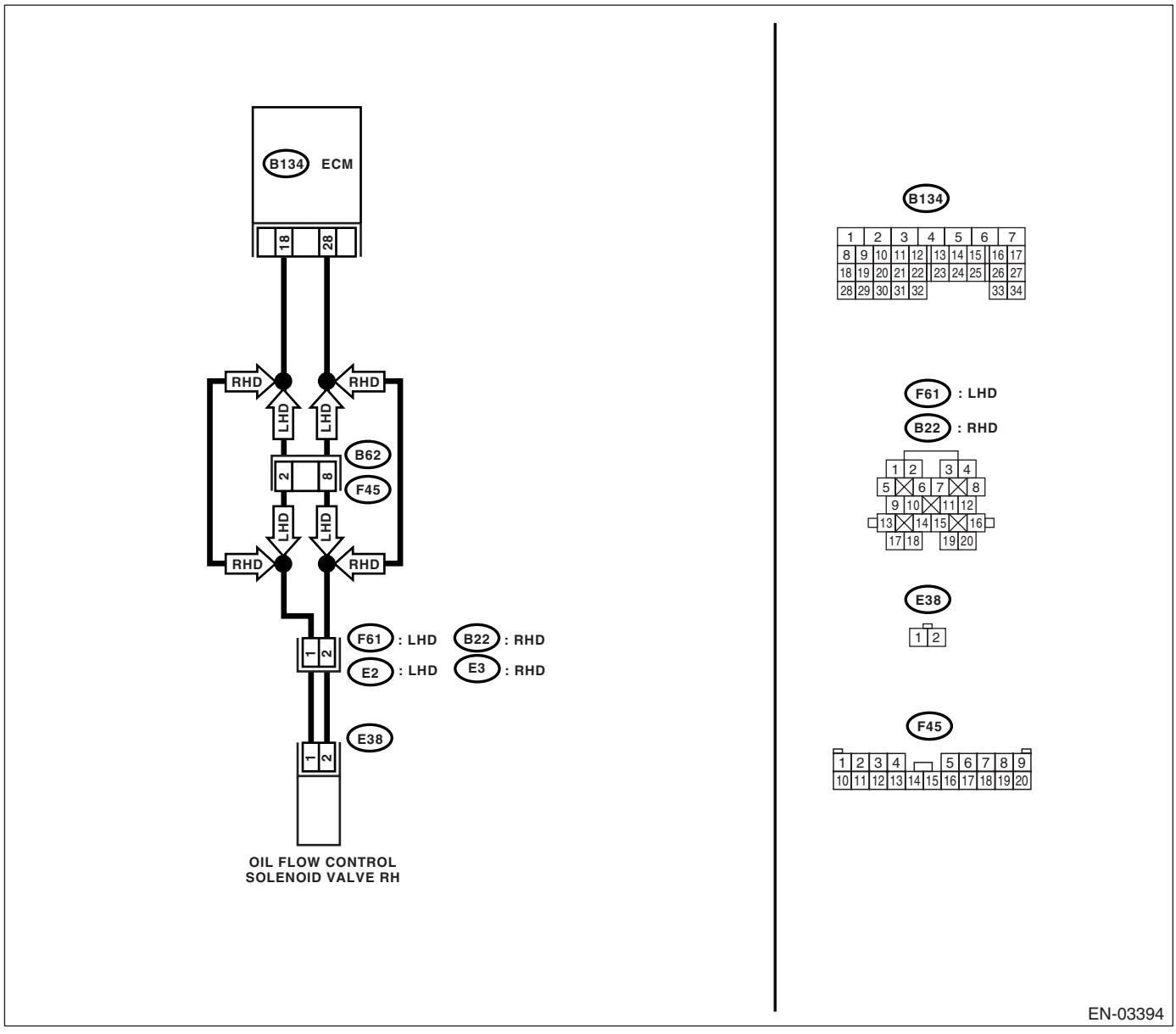
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

CE:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

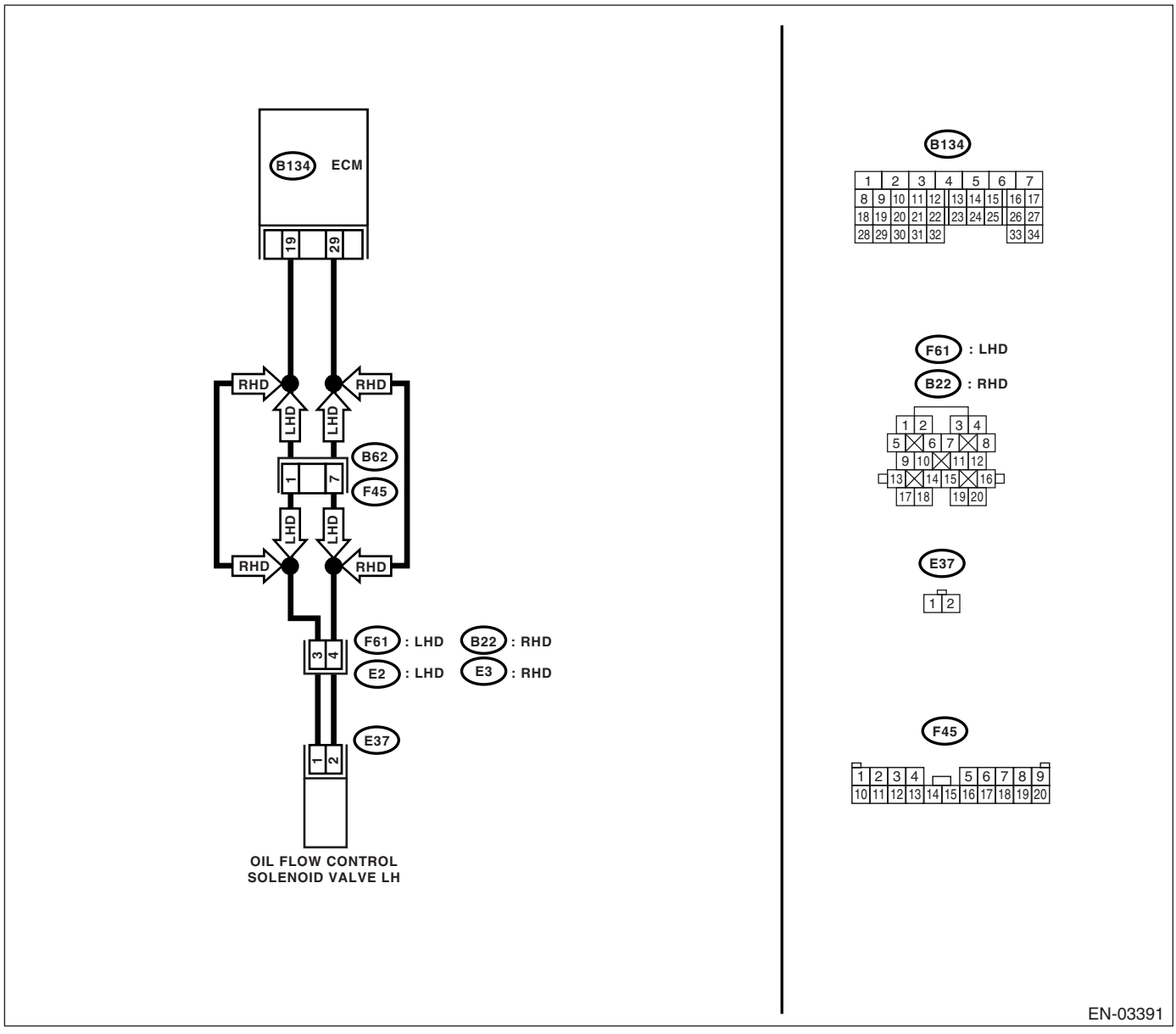
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

CF:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

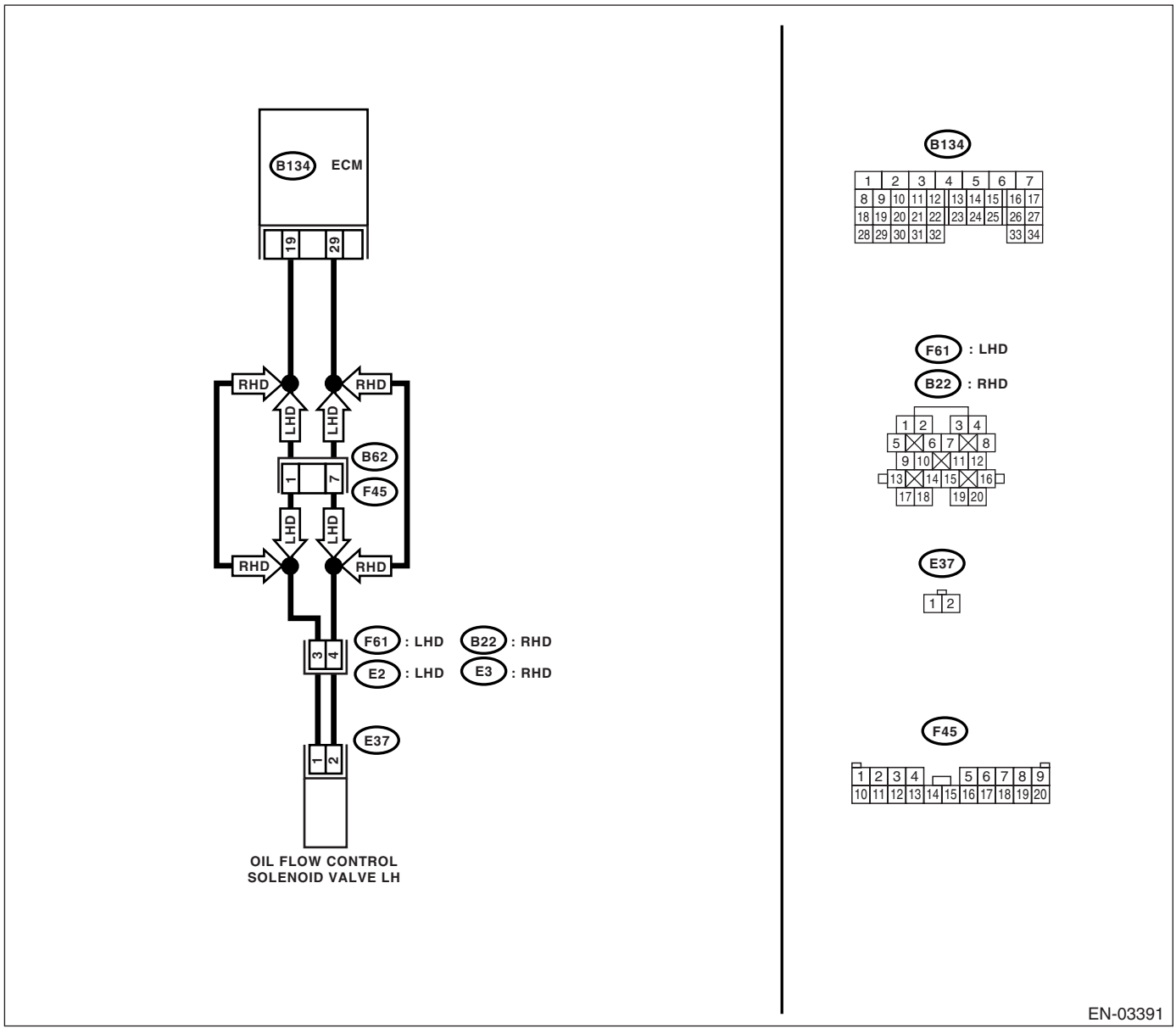
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Disconnect the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

CG:DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or general scan tool indicate DTC P2228?	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built in ECM.	Temporary poor contact occurs.

CH:DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.0)(diag)-47, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.0)(diag)-40, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or general scan tool indicate DTC P2229?	Replace the ECM. <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built in ECM.	Temporary poor contact occurs.

20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC 2.0)-120, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Idle air control solenoid valve 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Manifold absolute pressure sensor 6) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Throttle position sensor 9) Fuel pump and fuel pump relay

Symptom	Problem parts
6. Surging	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC 2.5)

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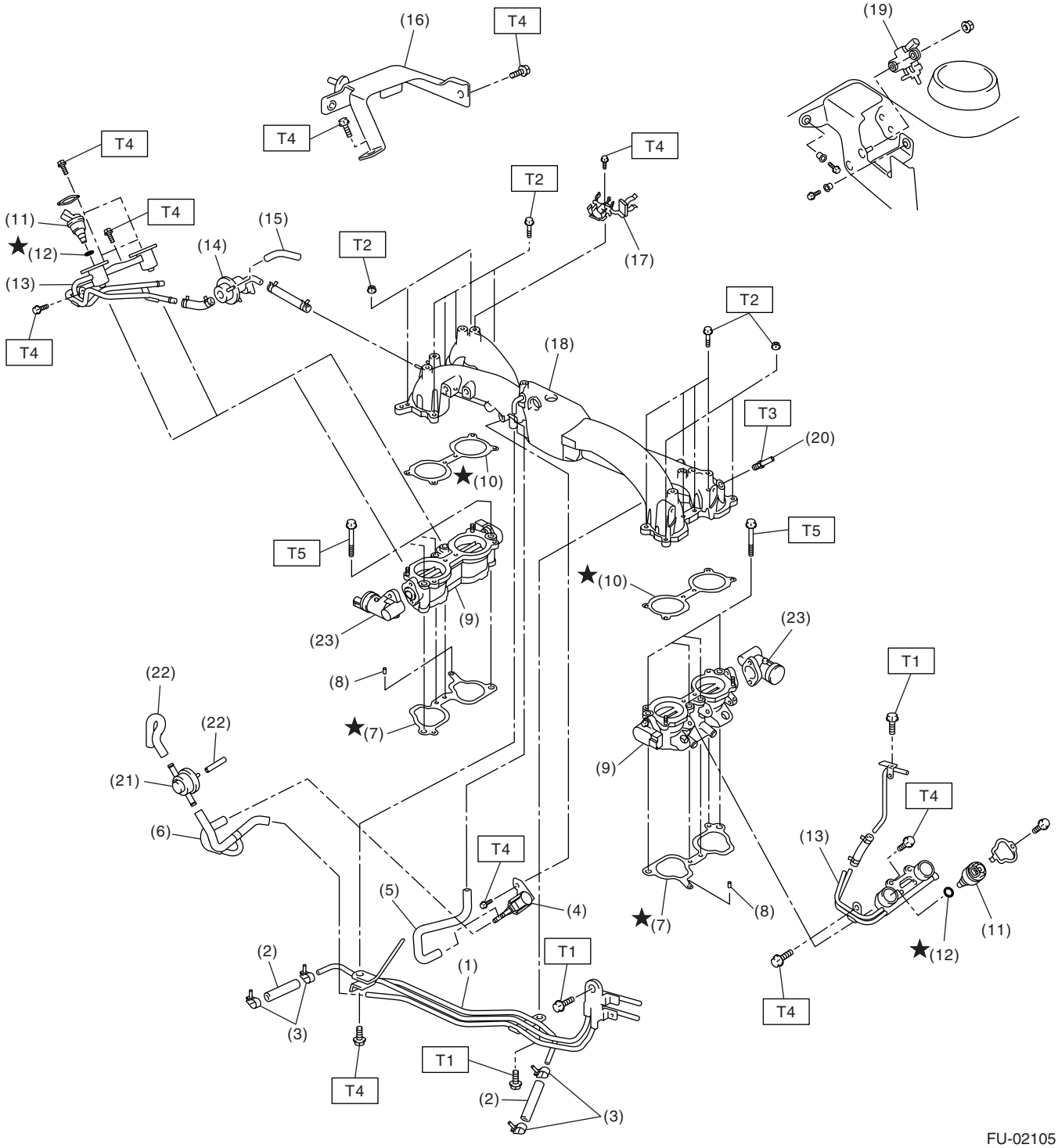
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kgf/cm^2, 65.27 — 98.2 psi)
	Discharge flow	More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h [12 V at 300 kPa (3.06 kgf/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

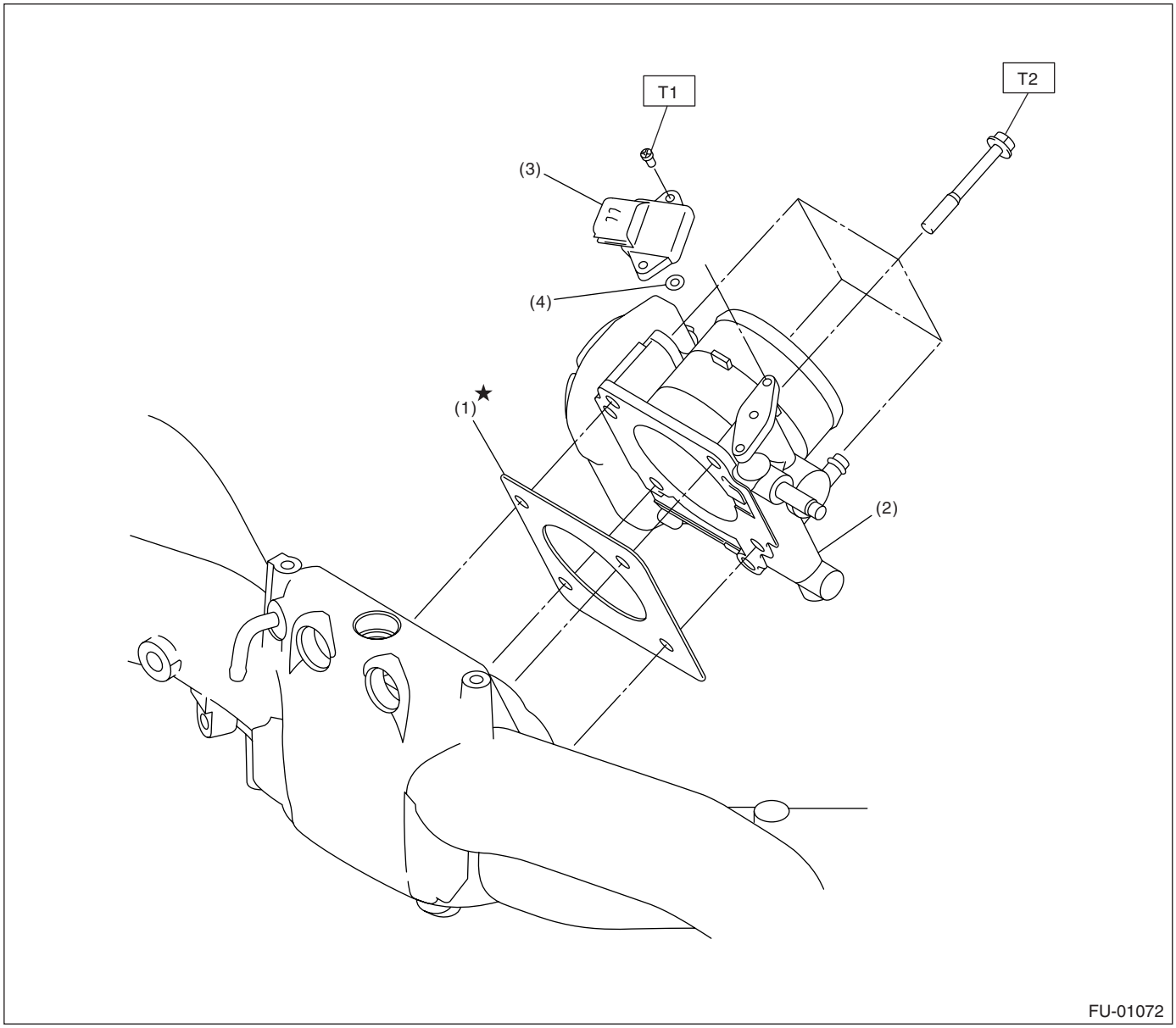
1. INTAKE MANIFOLD



(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clamp
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY
(10) Tumble generator valve gasket
(11) Fuel injector
(12) O-ring
(13) Fuel injector pipe
(14) Pressure regulator
(15) Pressure regulator hose
(16) Fuel pipe protector RH
(17) Blow-by hose stay
(18) Intake manifold
(19) Wastegate control solenoid valve ASSY
(20) Nipple
(21) Purge valve
(22) Purge hose
(23) Tumble generator valve actuator

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 8.25 (0.84, 6.1)
T3: 17 (1.73, 12.5)
T4: 19 (1.9, 14.0)
T5: 25 (2.5, 18.1)

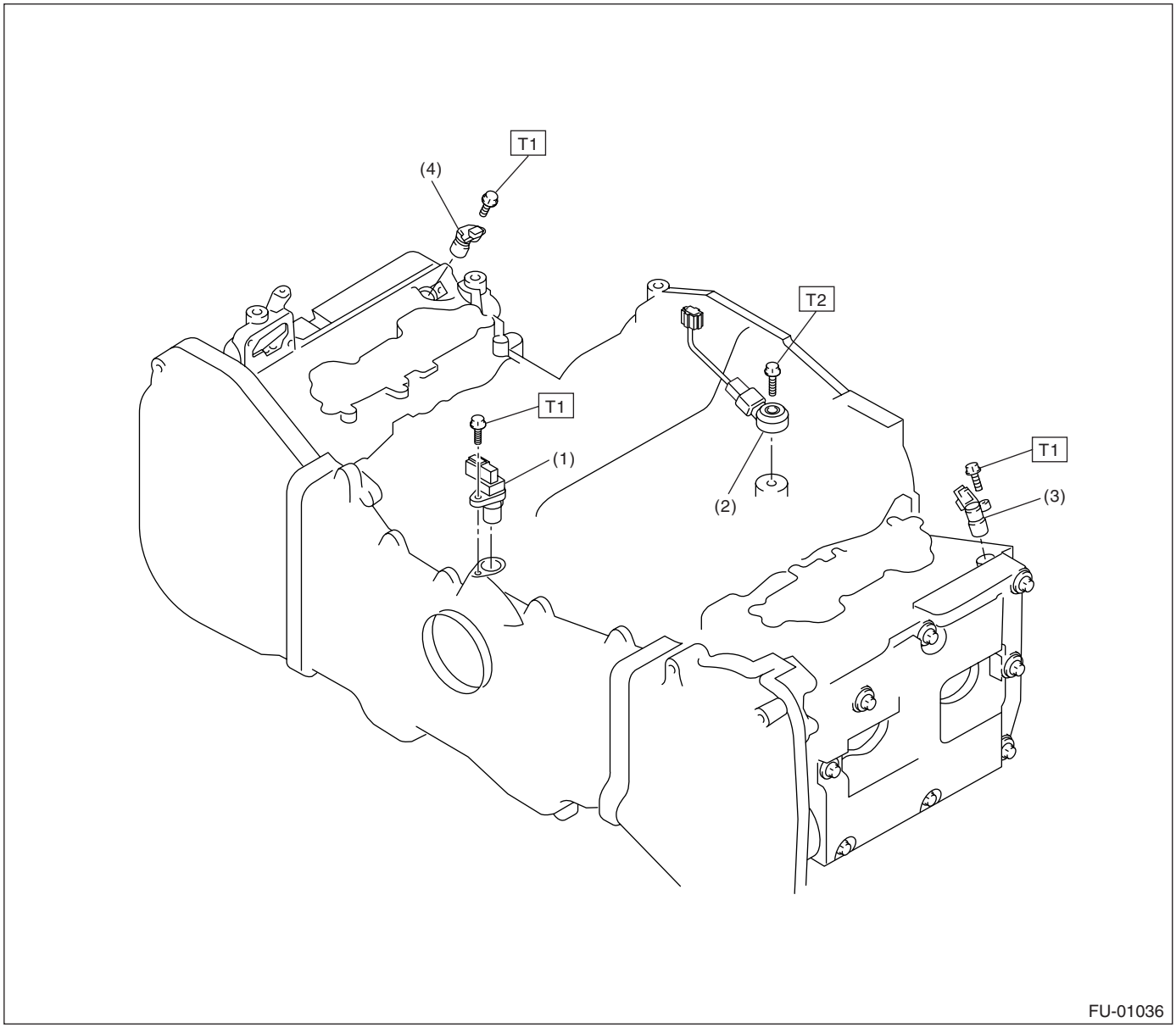
2. AIR INTAKE SYSTEM



(1) Gasket
(2) Throttle body
(3) Manifold absolute pressure sensor
(4) O-ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 8 (0.8, 5.8)

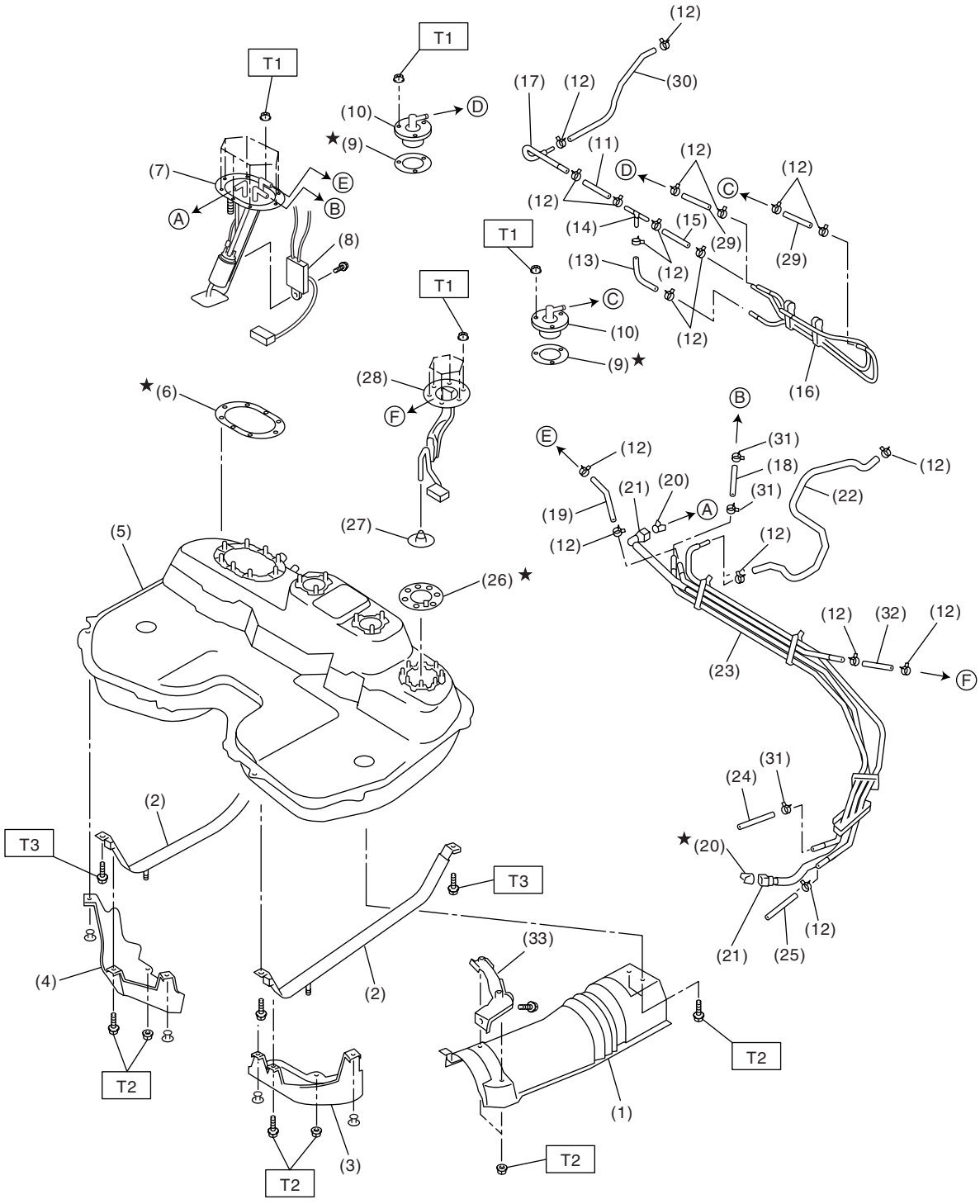
3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor LH
(4) Camshaft position sensor RH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

4. FUEL TANK

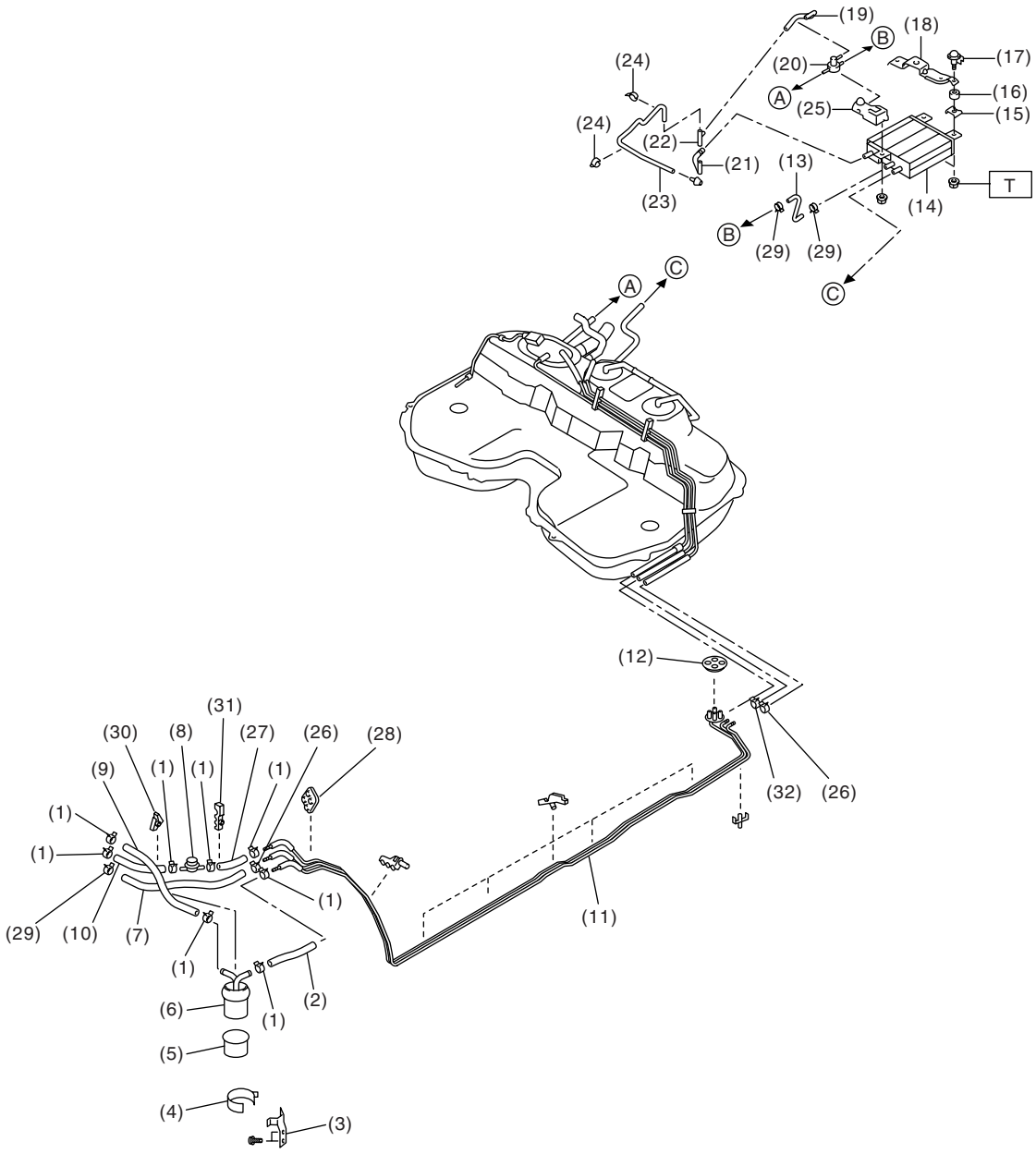


FU-02619

(1) Heat shield cover
(2) Fuel tank band
(3) Protector LH
(4) Protector RH
(5) Fuel tank
(6) Fuel pump gasket
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel cut valve gasket
(10) Fuel cut valve
(11) Evaporation hose A
(12) Clip
(13) Evaporation hose B
(14) Joint pipe
(15) Evaporation hose C
(16) Evaporation pipe ASSY
(17) Evaporation pipe
(18) Fuel return hose A
(19) Jet pump hose A
(20) Retainer
(21) Quick connector
(22) Evaporation hose D
(23) Fuel pipe ASSY
(24) Fuel return hose B
(25) Evaporation hose E
(26) Fuel sub level sensor gasket
(27) Jet pump filter
(28) Fuel sub level sensor
(29) Evaporation hose F
(30) Evaporation hose G
(31) Clip
(32) Jet pump hose B
(33) Cover bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.4 (0.75, 5.4)
T3: 33 (3.4, 25)

5. FUEL LINE

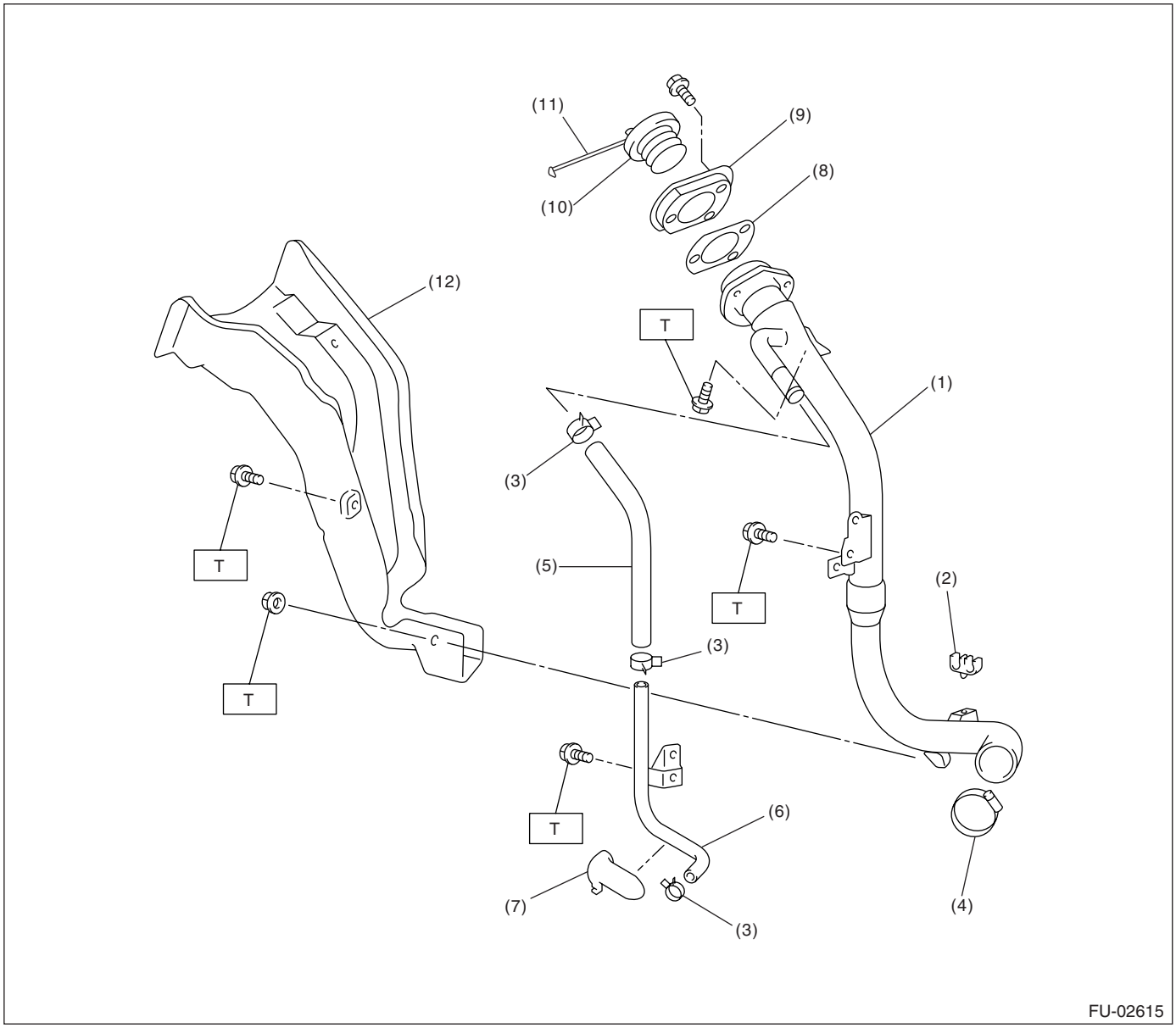


FU-02614

(1) Clip
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Fuel damper
(9) Fuel delivery hose B
(10) Fuel return hose A
(11) Fuel pipe ASSY
(12) Grommet A
(13) Canister hose A
(14) Canister
(15) Canister bracket plate
(16) Cushion
(17) Canister bracket spacer
(18) Rear canister bracket
(19) Two-way valve hose
(20) Two-way valve
(21) Drain hose A
(22) Connector
(23) Drain hose B
(24) Clamp
(25) Front canister bracket
(26) Clip
(27) Fuel return hose B
(28) Grommet B
(29) Clip
(30) Clamp
(31) Clamp
(32) Clip

Tightening torque: N·m (kgf-m, ft-lb)
T: 23 (2.3, 17.0)

6. FUEL FILLER PIPE



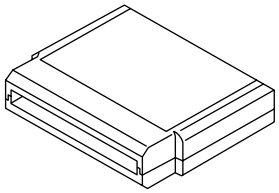
(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Air vent hose
(6) Air vent pipe
(7) Air vent pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Filler cap tether
(12) Filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

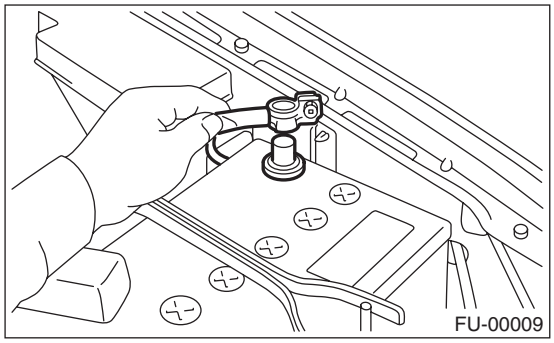
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. Throttle Body

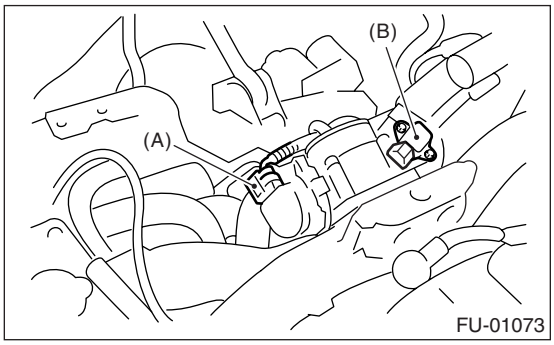
A: REMOVAL

1) Disconnect the ground cable from battery.

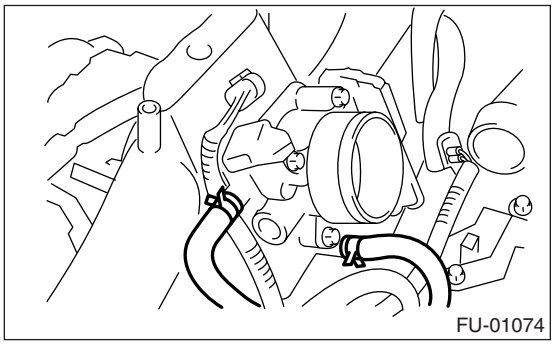


2) Remove the intercooler. <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>

3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



4) Disconnect the engine coolant hoses from the throttle body.



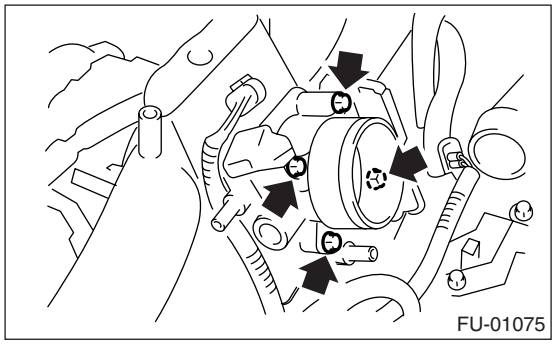
5) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use a new gasket.

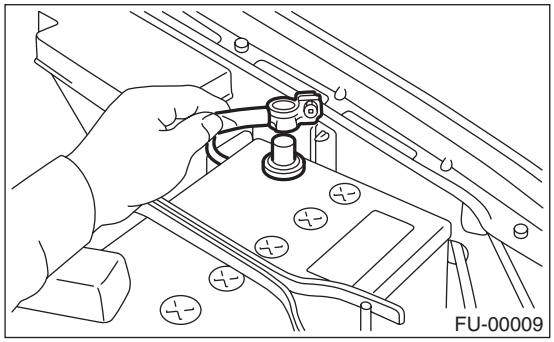
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



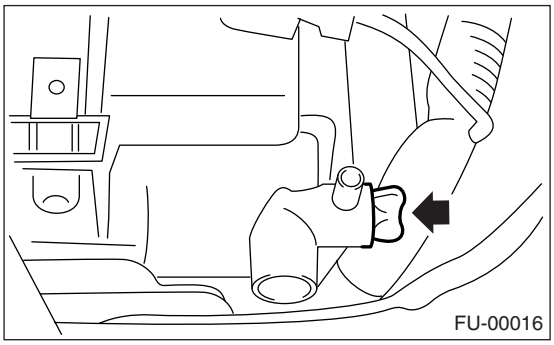
3. Intake Manifold

A: REMOVAL

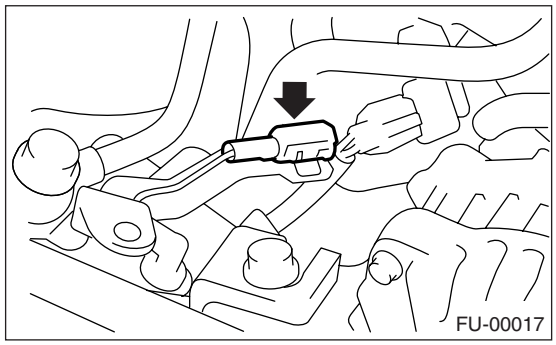
1) Release the fuel pressure. <Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.



4) Lift up the vehicle.
5) Remove the under cover.
6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).

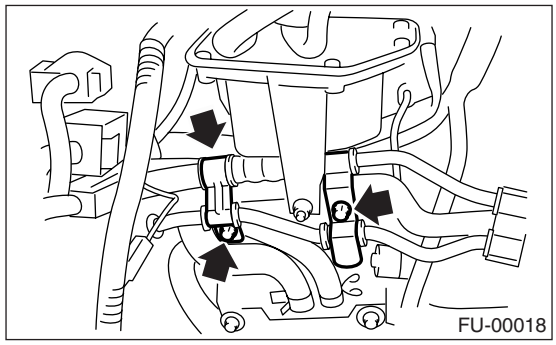


7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC 2.0)-7, REMOVAL, AIR CLEANER CASE.>
8) Remove the air cleaner element.
9) Remove the intercooler. <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
10) Remove the coolant filler tank. <Ref. to CO(H4SO)-42, REMOVAL, COOLANT FILLER TANK.>
11) Remove the power steering pump.
(1) Remove the front side V-belt. <Ref. to ME(H4DOTC 2.0)-53, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

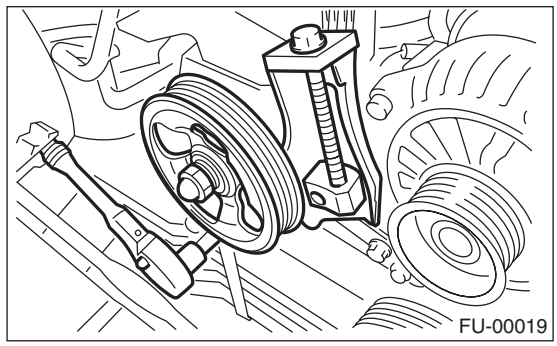


(3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

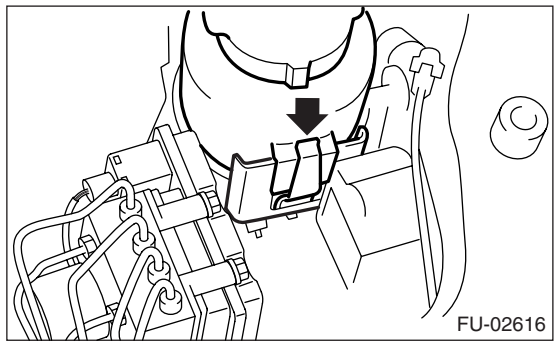
NOTE:
Do not disconnect the power steering hose.



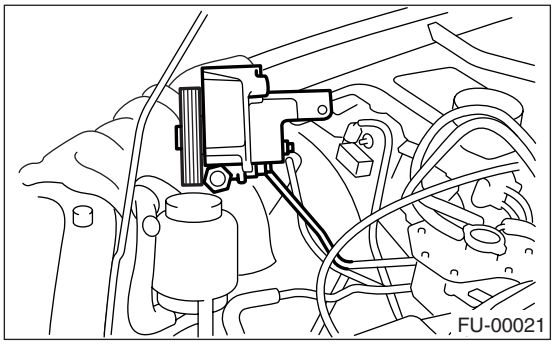
(4) Remove the bolts which secure the power steering pump bracket.



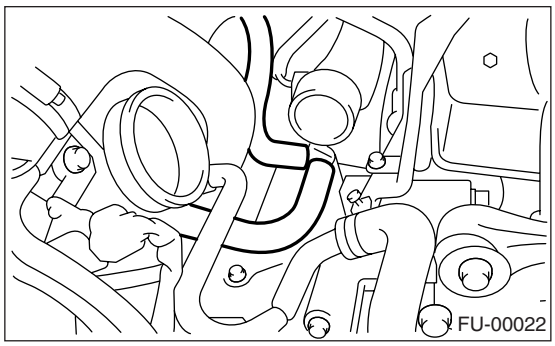
(5) Remove the reservoir tank from the bracket by pulling it upward.



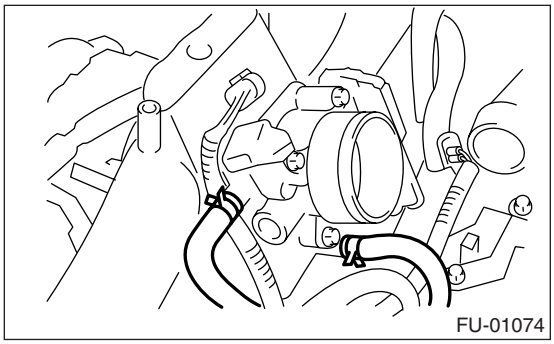
(6) Place the power steering pump on the right side wheel apron.



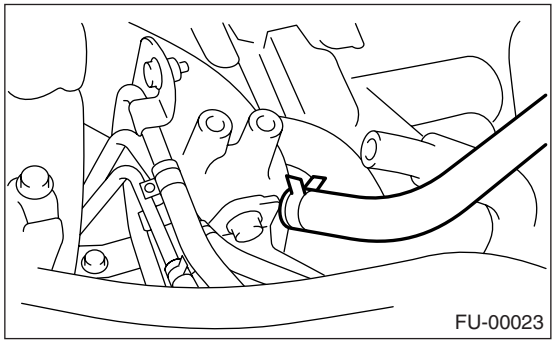
12) Disconnect the emission hose from the PCV valve.



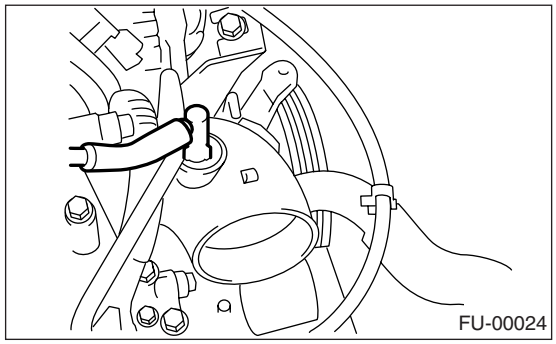
13) Disconnect the engine coolant hoses from the throttle body.



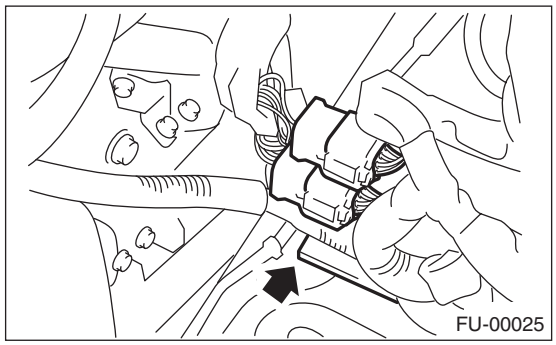
14) Disconnect the brake booster hose.

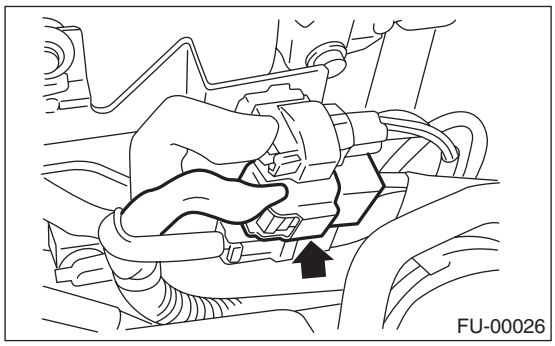


15) Disconnect the pressure hose from the intake duct.

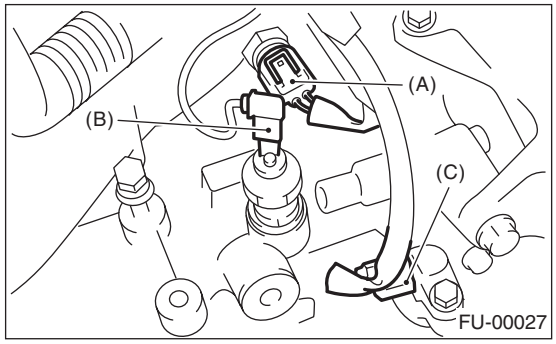


16) Disconnect the engine harness connectors from the bulkhead harness connectors.

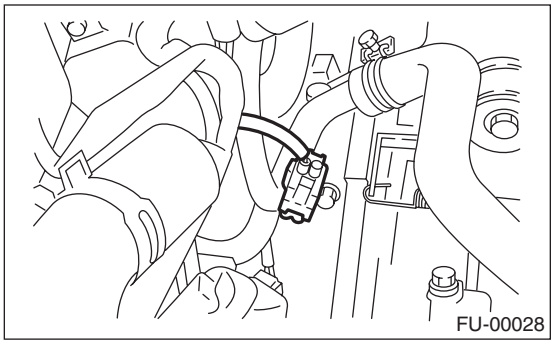




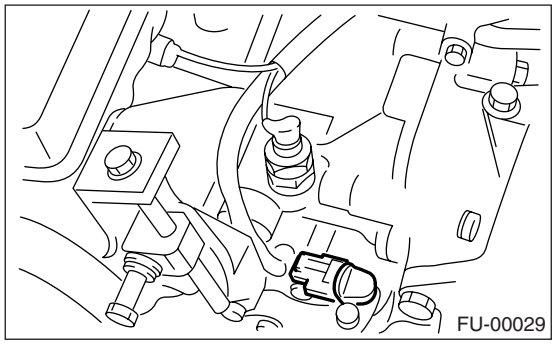
17) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



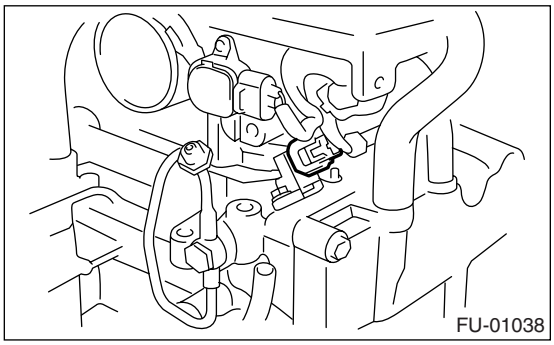
18) Disconnect the knock sensor connector.



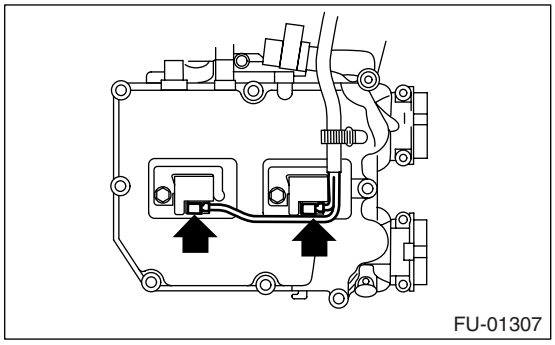
19) Disconnect the connector from crankshaft position sensor.



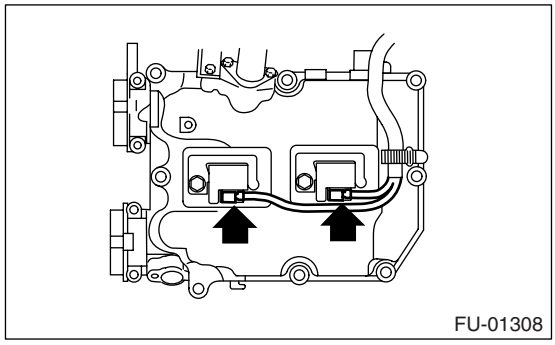
20) Disconnect the connector from the camshaft position sensor.



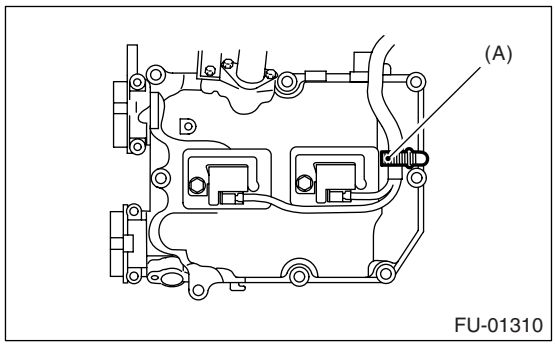
21) Disconnect the connector from the ignition coil.
- RH SIDE



- LH SIDE

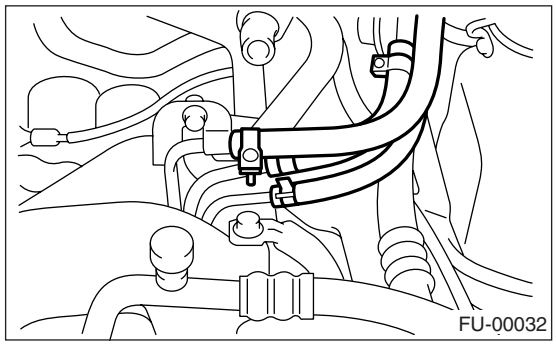


22) Disconnect the engine harness fixed by clip (A) from the bracket.
- RH SIDE
- LH SIDE

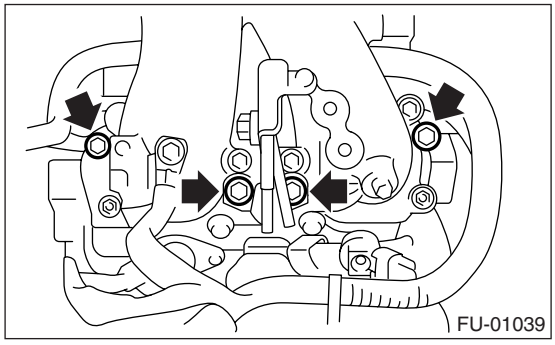


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

CAUTION:
- **Do not spill fuel.**
- **Catch fuel from hoses in a container or cloth.**



24) Remove the bolts which secure the intake manifold to the cylinder heads.



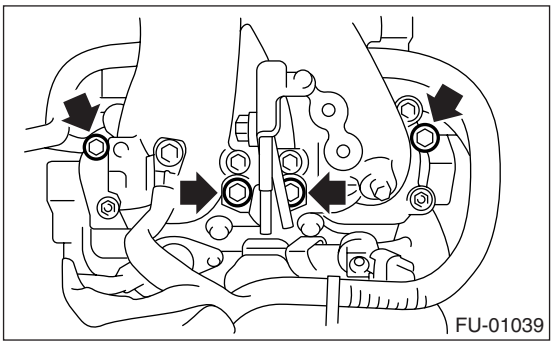
25) Remove the intake manifold.

B: INSTALLATION

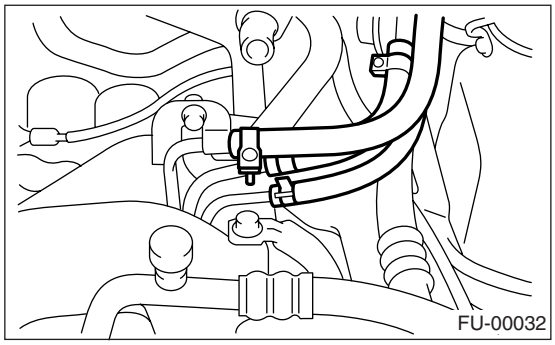
1) Install the intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

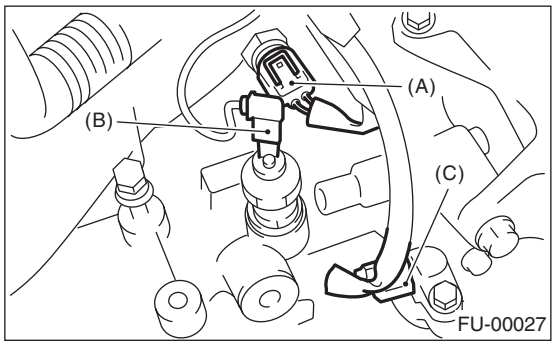
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



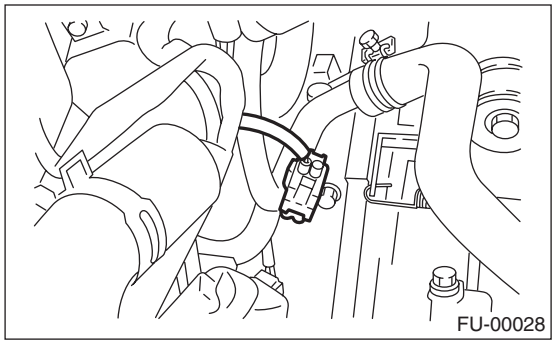
2) Connect the fuel delivery hose, return hose and evaporation hose.



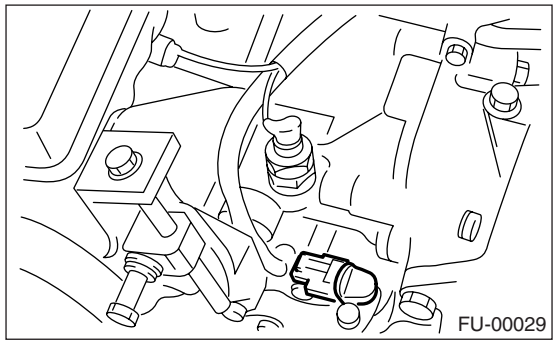
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



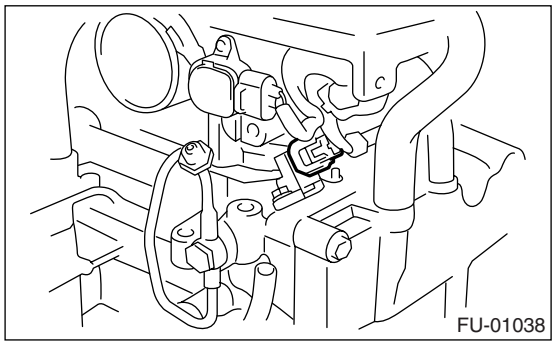
4) Connect the connector to the knock sensor.



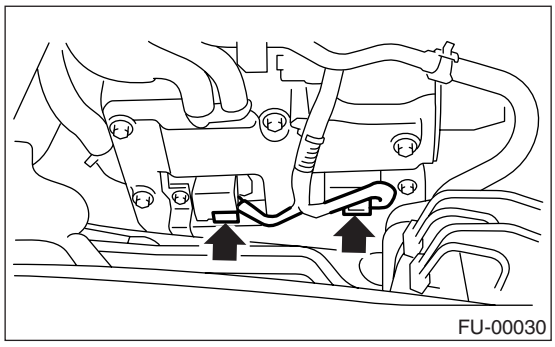
5) Connect the connector to crankshaft position sensor.



6) Connect the connector to the camshaft position sensor.

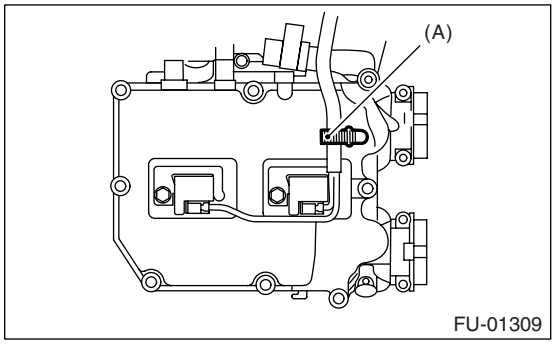


7) Connect the connector to the ignition coil.

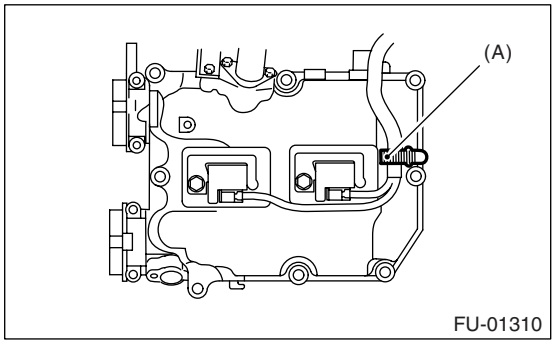


8) Connect the engine harness with clip (A) to the bracket.

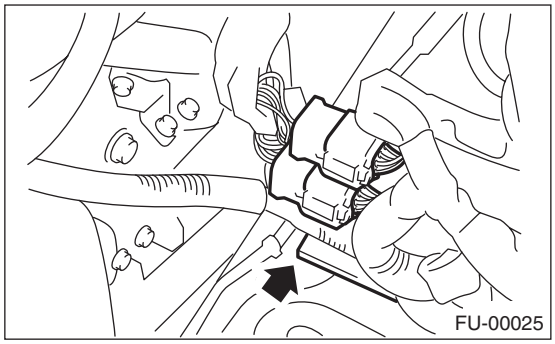
- RH SIDE

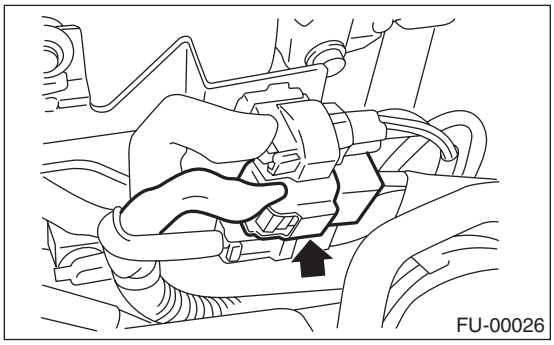


- LH SIDE

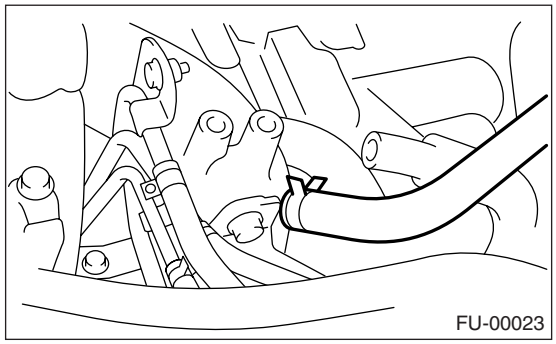


9) Connect the engine harness connector to the bulkhead harness connectors.

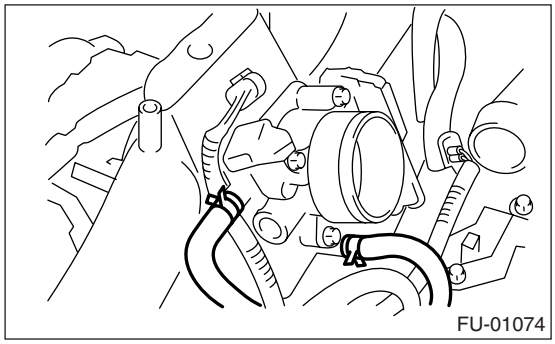




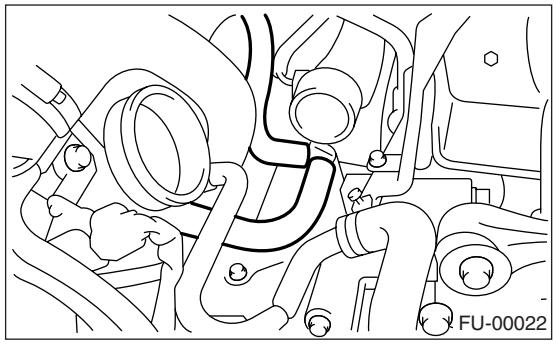
10) Connect the brake booster vacuum hose.



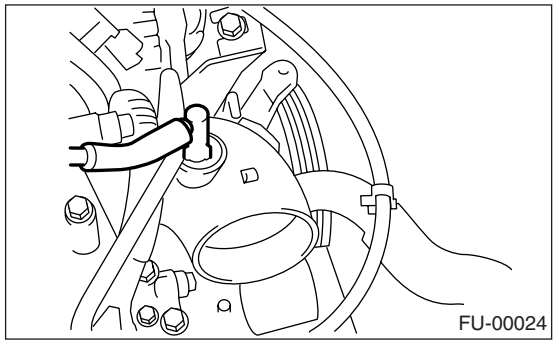
11) Connect the engine coolant hoses to the throttle body.



12) Connect the emission hose to the PCV valve.

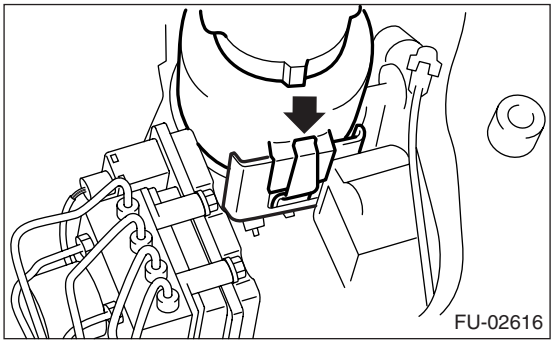


13) Connect the pressure hose to the intake duct.

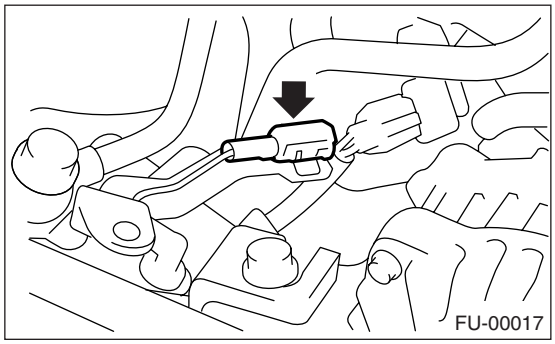


14) Install the power steering pump.

(1) Install the reservoir tank on the bracket.

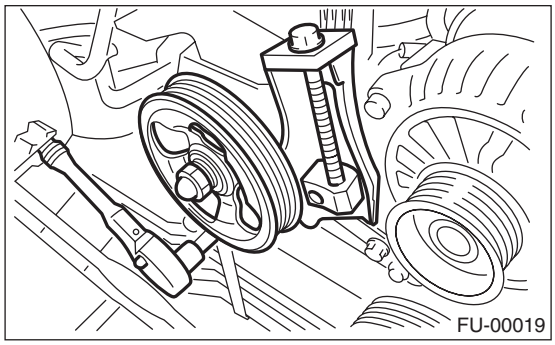


(2) Connect the connector to the power steering pump switch.

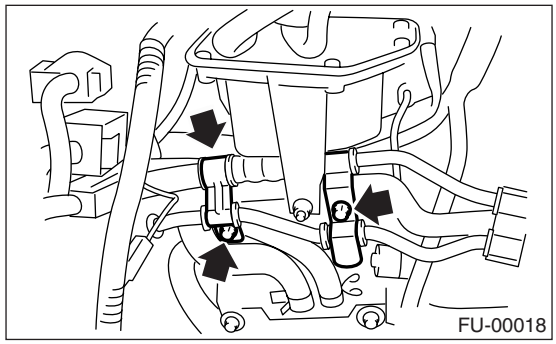


(3) Install the power steering pump, and tighten the bolts.

Tightening torque:
22 N·m (2.2 kgf-m, 15.9 ft-lb)

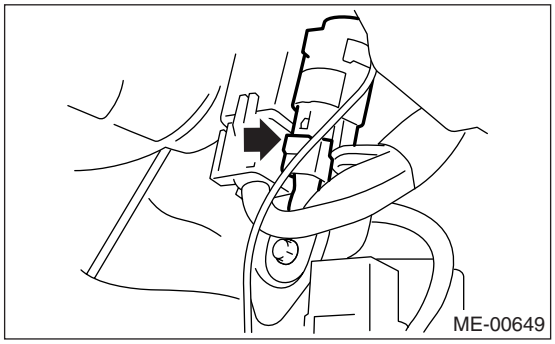


(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt. <Ref. to ME(H4DOTC 2.0)-53, INSTALLATION, V-BELT.>

15) Install the coolant filler tank. <Ref. to CO(H4SO)-42, INSTALLATION, COOLANT FILLER TANK.>
16) Install the intercooler. <Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>
17) Install the air cleaner element.
18) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC 2.0)-7, REMOVAL, AIR CLEANER CASE.>
19) Connect the connector to the fuel pump relay.

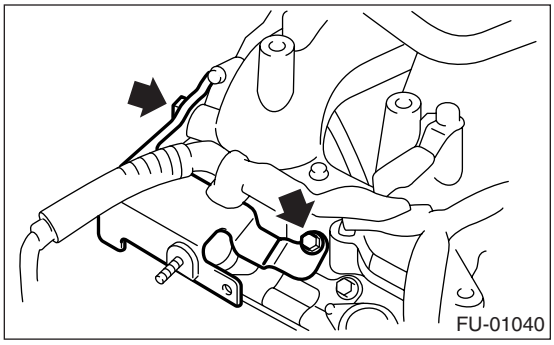


20) Connect the battery ground cable to battery.
21) Lift up the vehicle.
22) Install the under cover.

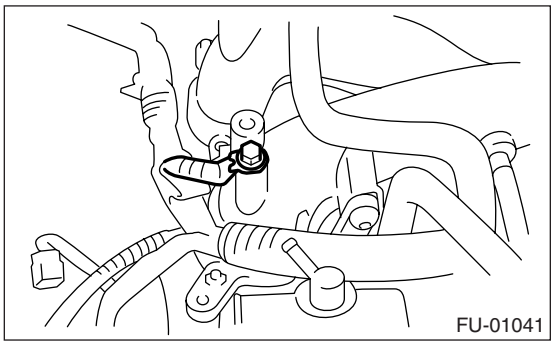
23) Fill the engine coolant. <Ref. to CO(H4SO)-19, FILLING OF ENGINE COOLANT, REPLACEMENT, ENGINE COOLANT.>

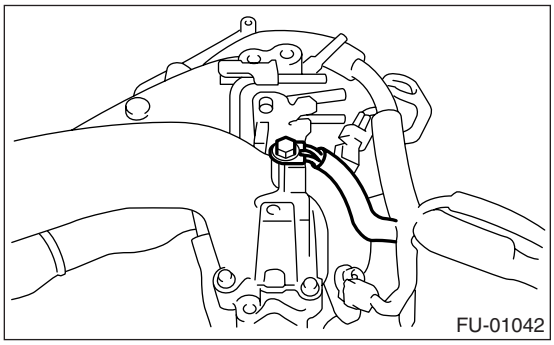
C: DISASSEMBLY

1) Remove the fuel pipe protector RH.

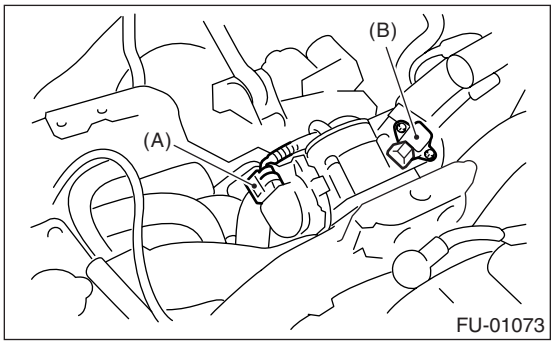


2) Remove the engine ground terminal from the intake manifold.

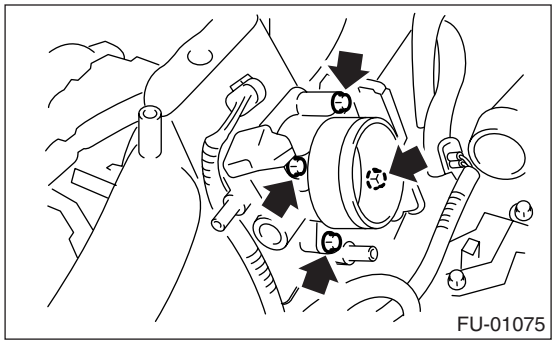




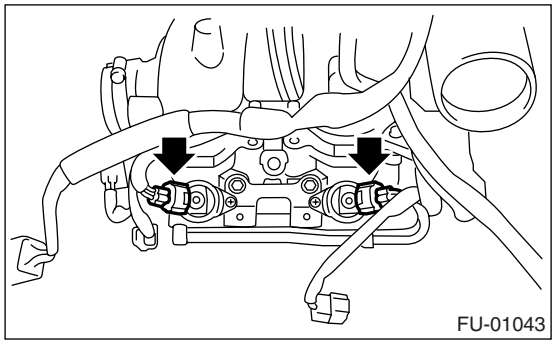
3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



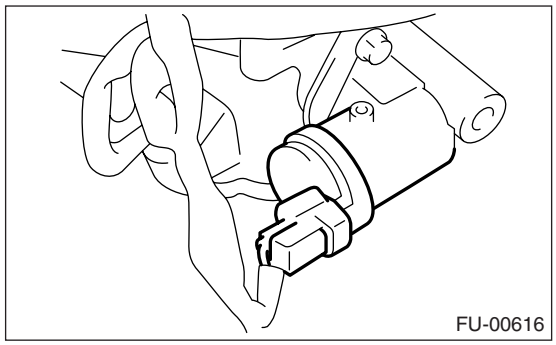
4) Remove the throttle body from the intake manifold.



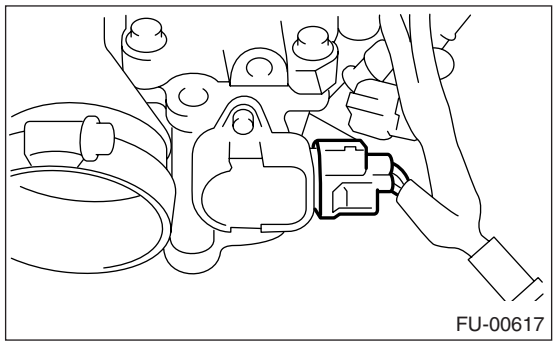
5) Disconnect the connector from the fuel injector.



6) Disconnect the connector from the tumble generator valve actuator.

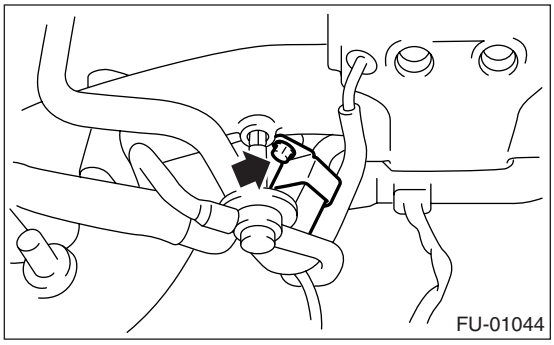


7) Disconnect the connector from the tumble generator valve sensor.

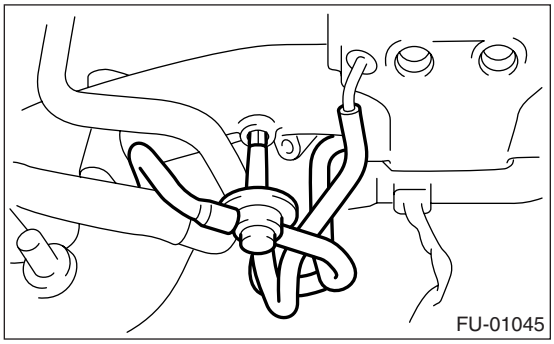


8) Disconnect the connector from the purge control solenoid valve.

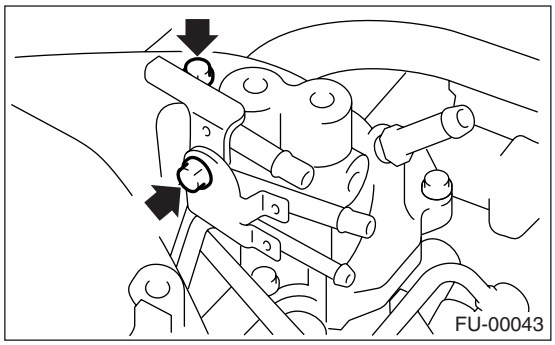
9) Remove the purge control solenoid valve.



10) Disconnect the evaporation hose and purge valve from the intake manifold.

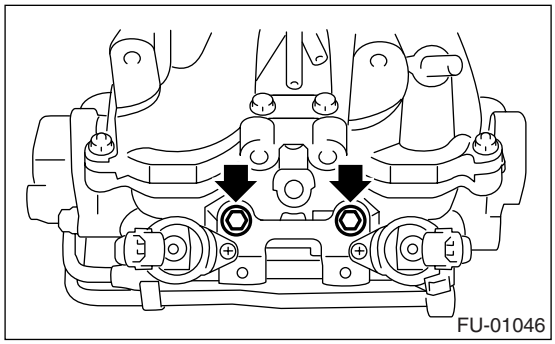


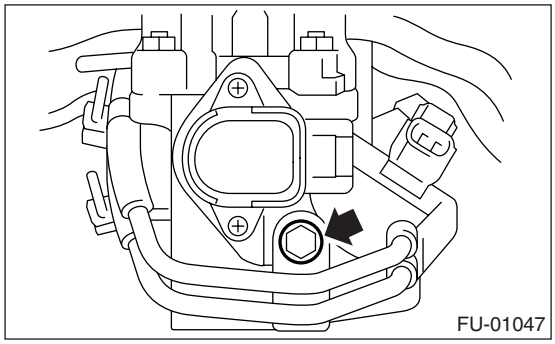
11) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.



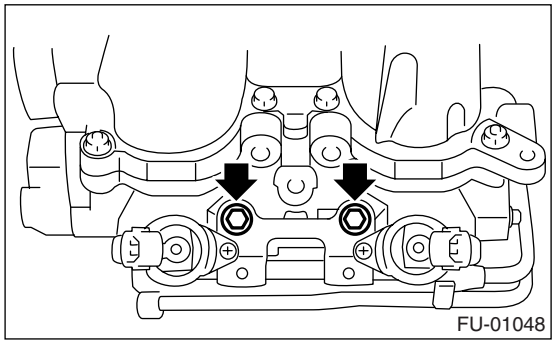
12) Remove the bolt which hold the fuel injector pipe onto intake manifold.

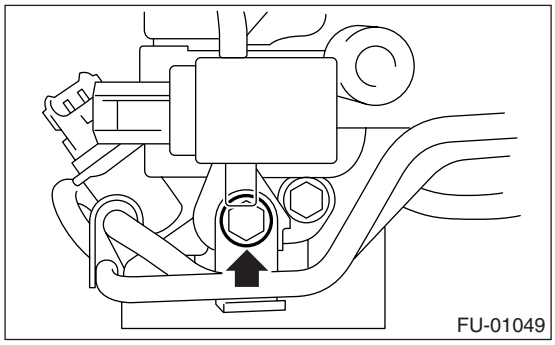
- LH SIDE



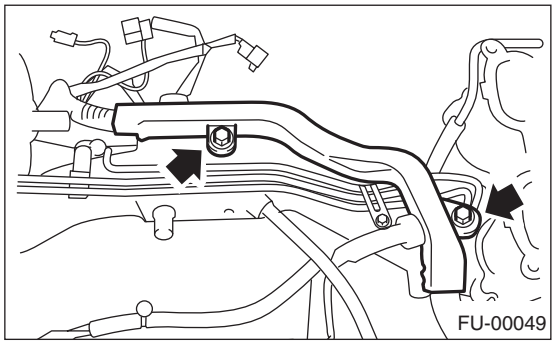


- RH SIDE

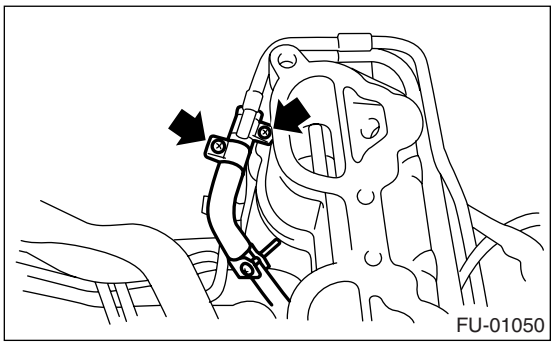




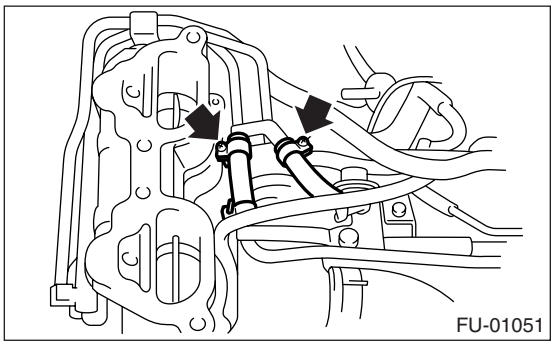
13) Remove the harness bracket which holds the engine harness onto intake manifold.



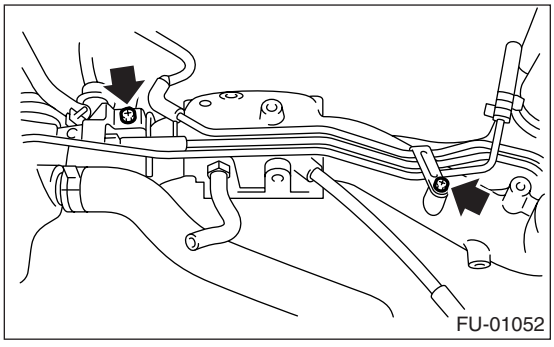
14) Remove the engine harness from the intake manifold.
15) Loosen the clamp which holds the front left side fuel hose to injector pipe, and then remove the pipe from clamp.



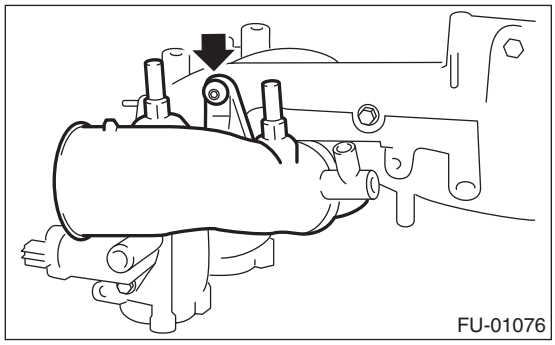
16) Loosen the clamp which holds the right side fuel hose to injector pipe, and then remove the pipe from clamp.



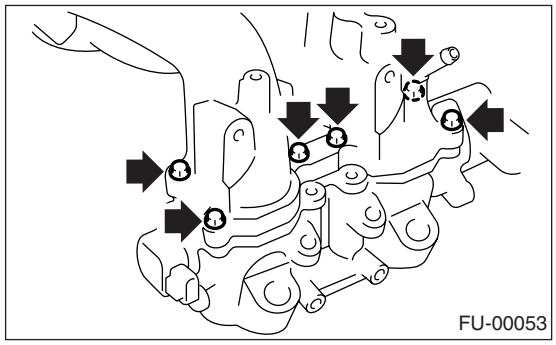
17) Remove the bolts which install the fuel pipe on intake manifold.



18) Remove the fuel pipe assembly and pressure regulator from the intake manifold.
19) Remove the intake duct from the intake manifold.



20) Remove the tumble generator valve assembly from the intake manifold.

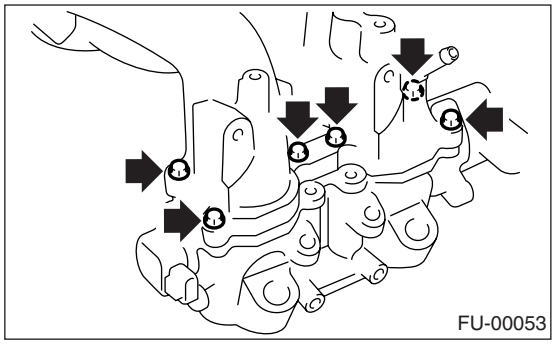


D: ASSEMBLY

NOTE:
Replace the gasket with a new one.

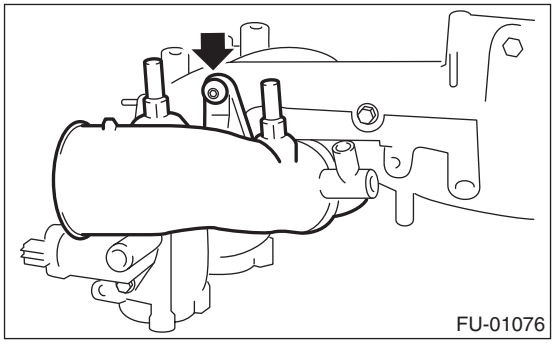
1) Install the tumble generator valve assembly to the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



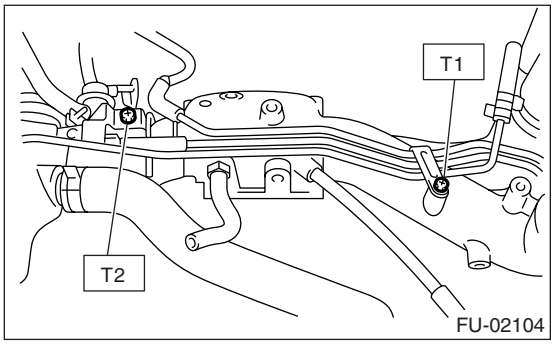
2) Install the air intake duct to the intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



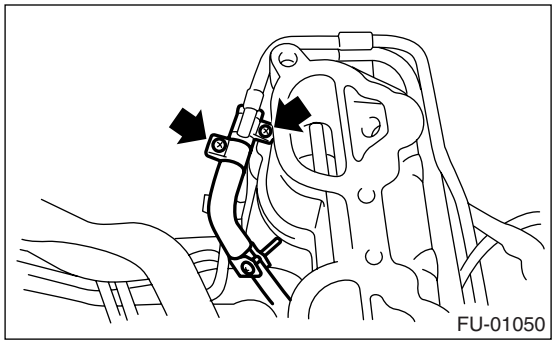
3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 19 N·m (1.9 kgf-m, 14.0 ft-lb)

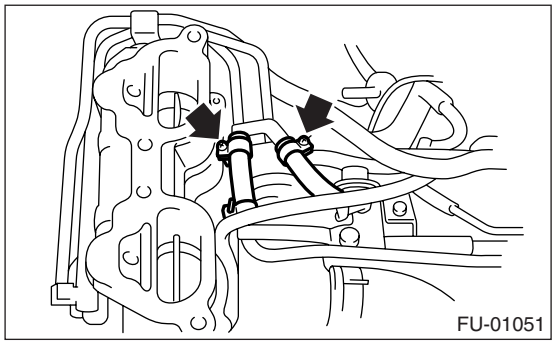


4) Install the fuel injector pipe LH.

5) Connect the left side fuel hose to injector pipe, and tighten the clamp screw.

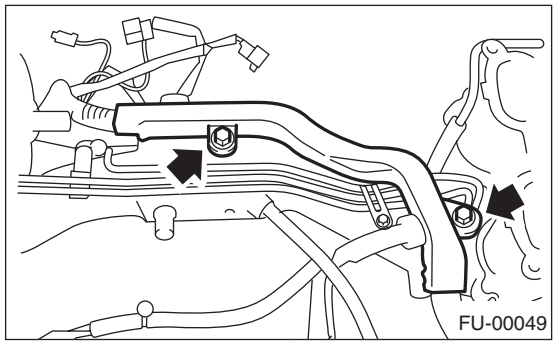


6) Install the fuel injector pipe RH.
7) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.



8) Install the engine harness to the intake manifold.
9) Install the harness bracket which holds the engine harness onto intake manifold.

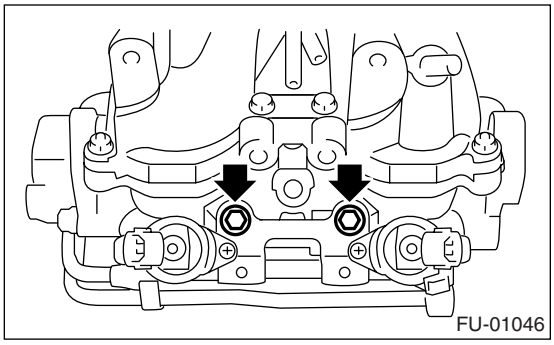
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

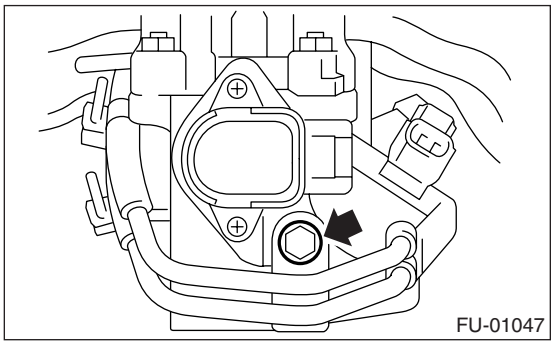


10) Tighten the bolts which install the fuel injector pipe onto intake manifold.

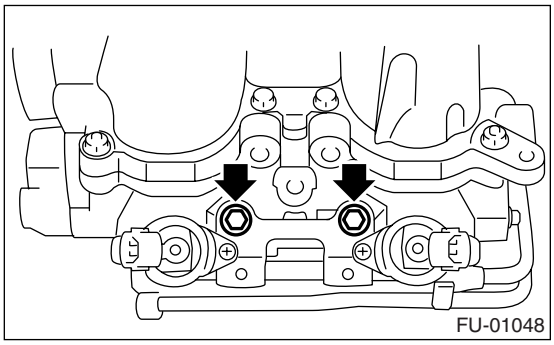
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

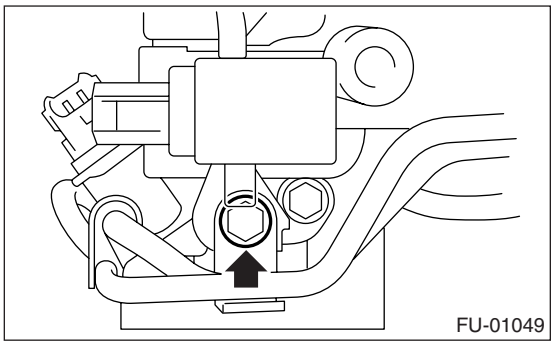
- LH SIDE





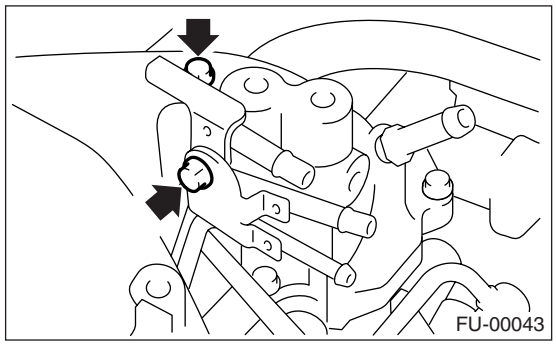
- RH SIDE





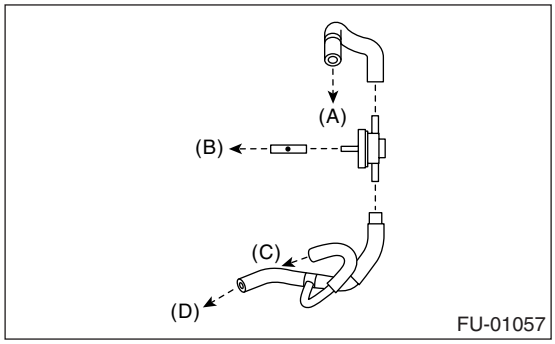
11) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



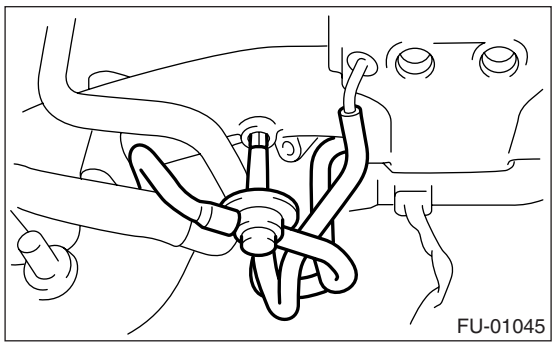
12) Connect the evaporation hoses to the purge valve.

NOTE:
Connect the evaporation hoses as shown in the figure.



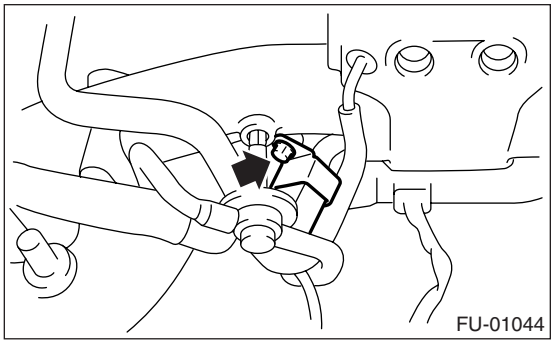
(A) To intake duct
(B) To intake manifold
(C) To purge control solenoid valve
(D) To fuel pipe ASSY

13) Connect the evaporation hose and purge valve to the intake manifold.



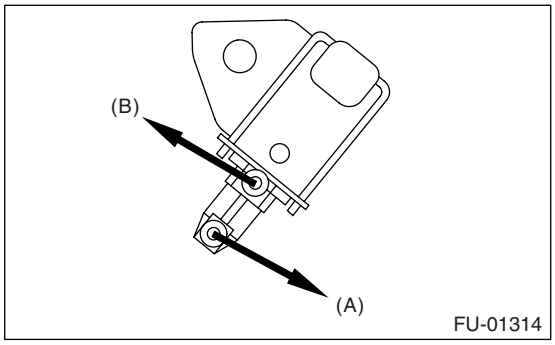
14) Install the purge control solenoid valve.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



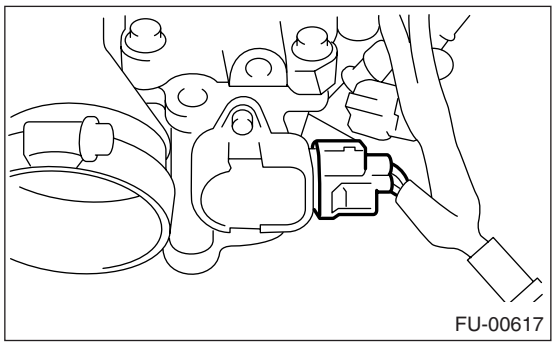
15) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hoses as shown in the figure.

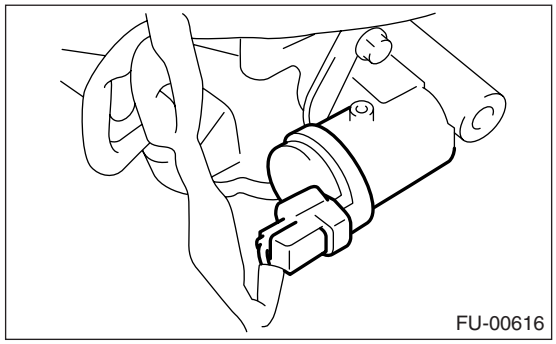


(A) To purge valve
(B) To intake manifold

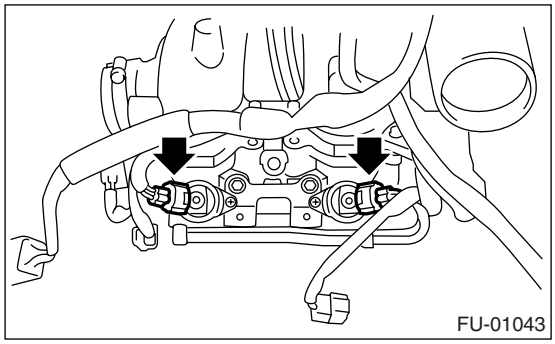
16) Connect the connector to the purge control solenoid valve.
17) Connect the connector to the tumble generator valve sensor.



18) Connect the connector to the tumble generator valve actuator.



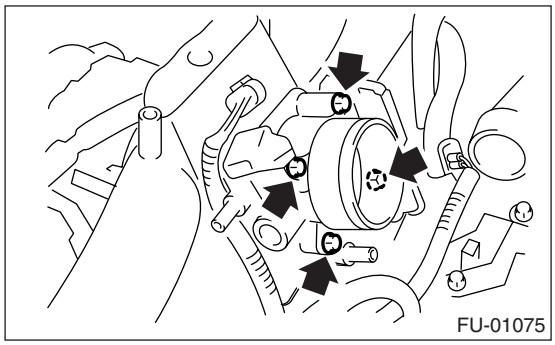
19) Connect the connector to the fuel injector.



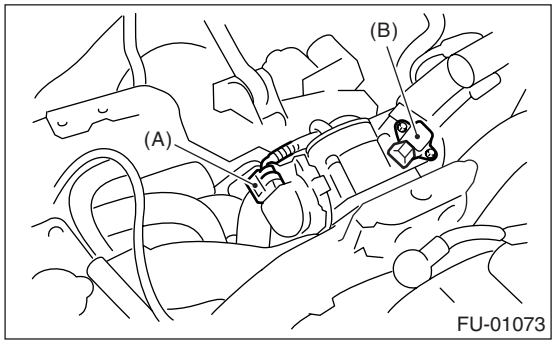
20) Install the throttle body to the intake manifold.

NOTE:
Replace the gasket with a new one.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

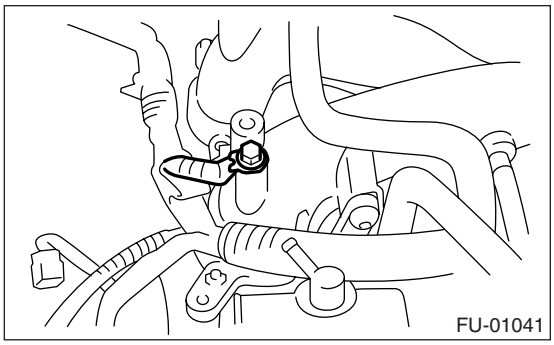


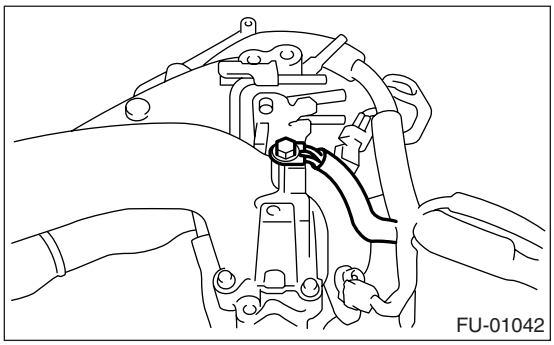
21) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).



22) Install the engine ground terminal to the intake manifold.

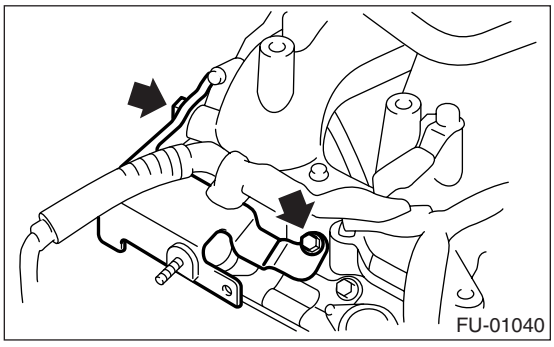
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)





23) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



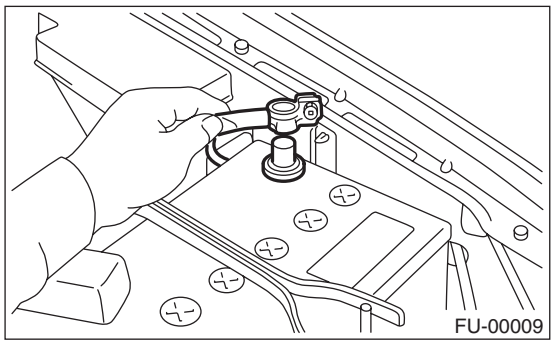
E: INSPECTION

Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened.

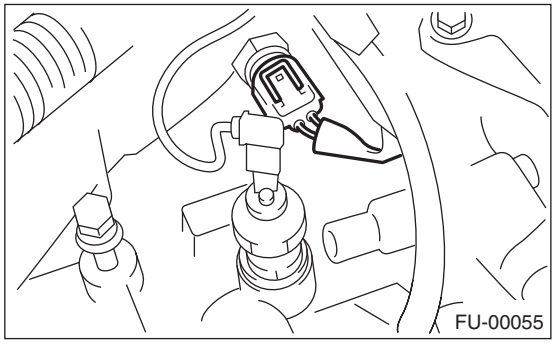
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the generator. <Ref. to SC(H4SO)-15, REMOVAL, GENERATOR.>
3) Drain the engine coolant. <Ref. to CO(H4SO)-19, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Disconnect the connector from the engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

B: INSTALLATION

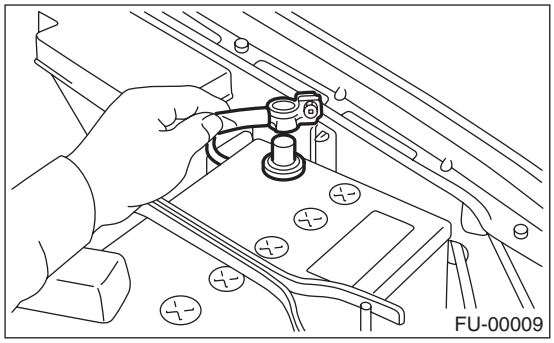
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

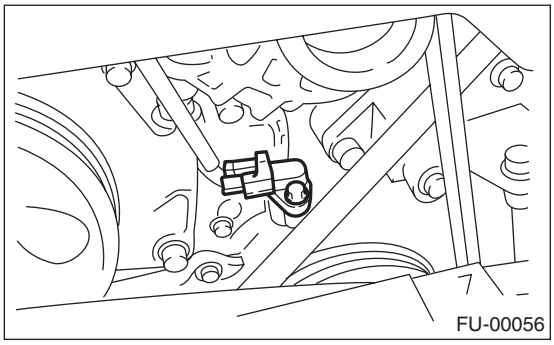
5. Crankshaft Position Sensor

A: REMOVAL

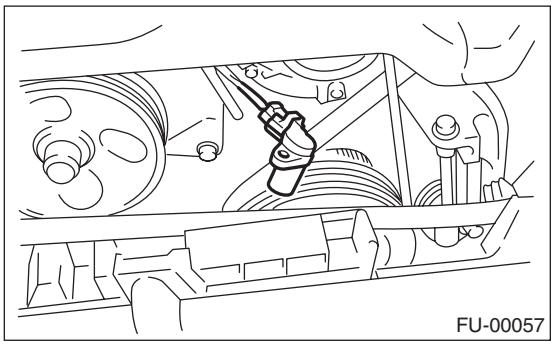
1) Disconnect the ground cable from battery.



2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



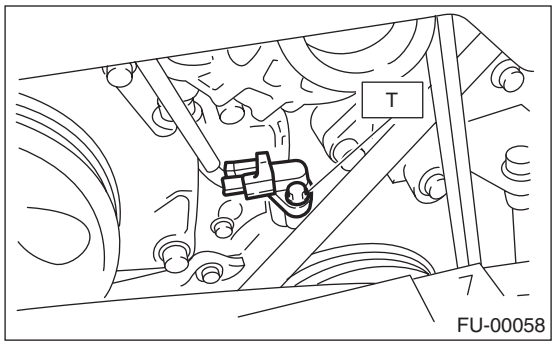
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

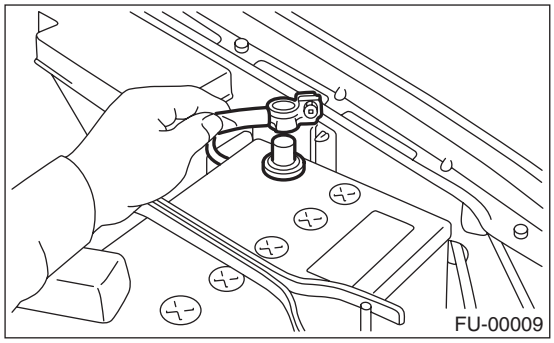
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



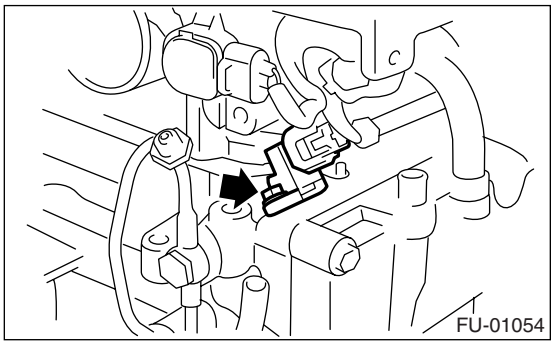
6. Camshaft Position Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from the camshaft position sensor RH.
3) Remove the camshaft position sensor RH from the backside of cylinder head.

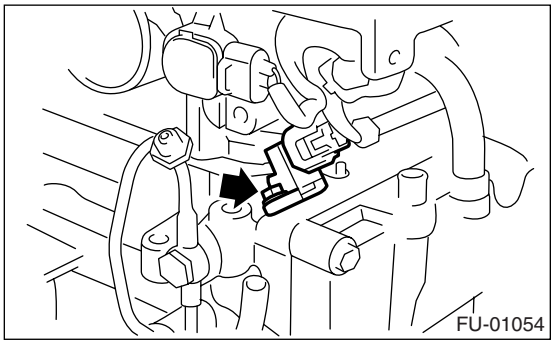


4) Remove the camshaft position sensor LH same as RH side.

B: INSTALLATION

Install in the reverse order of removal.

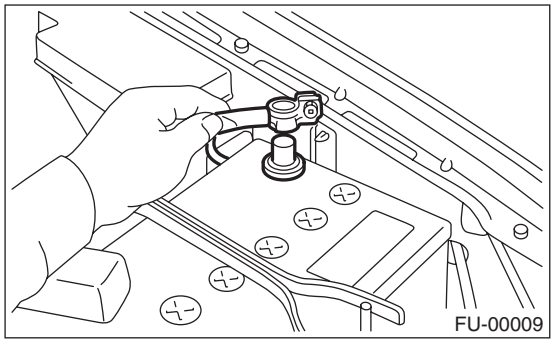
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



7. Knock Sensor

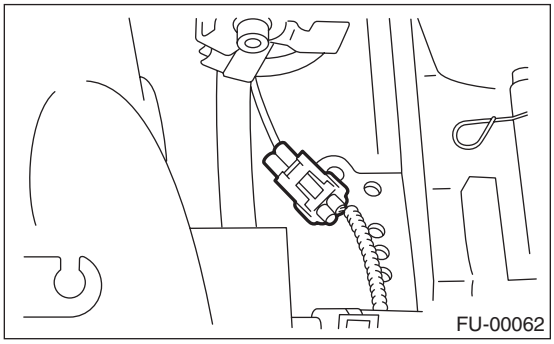
A: REMOVAL

1) Disconnect the ground cable from battery.

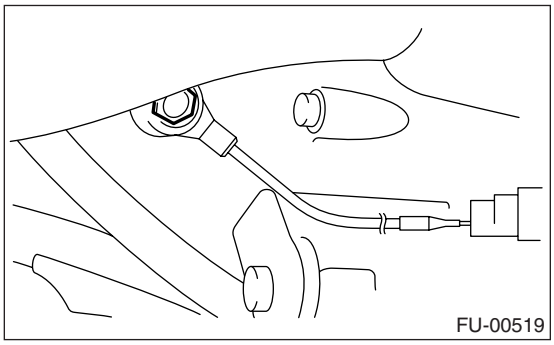


2) Remove the intercooler. <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>

3) Disconnect the knock sensor connector.



4) Remove the knock sensor from the cylinder block.

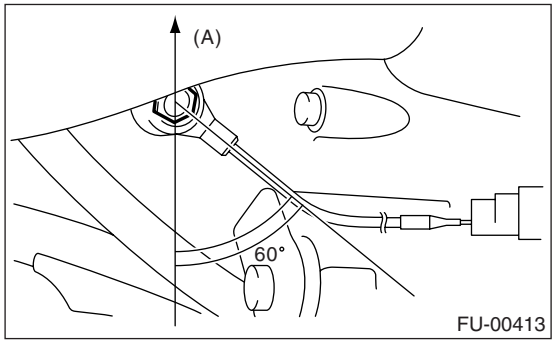


B: INSTALLATION

1) Install the knock sensor to the cylinder block.

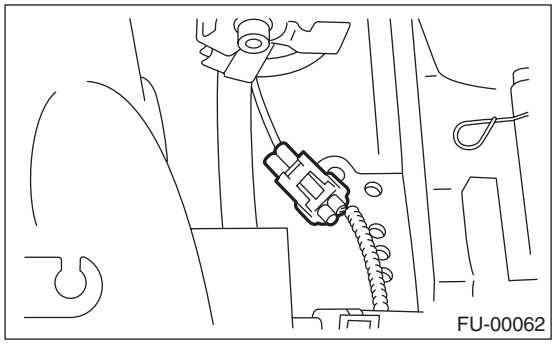
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
Extraction area of the knock sensor cord must be positioned at a 60° angle relative to the engine rear.



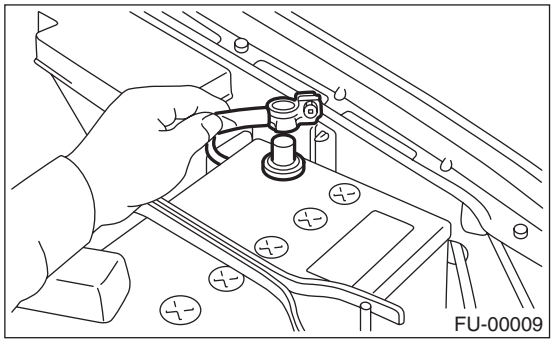
(A) Front side

2) Connect the knock sensor connector.



3) Install the intercooler. <Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>

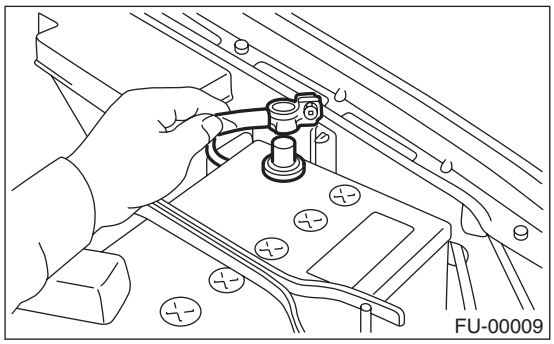
4) Connect the battery ground cable to battery.



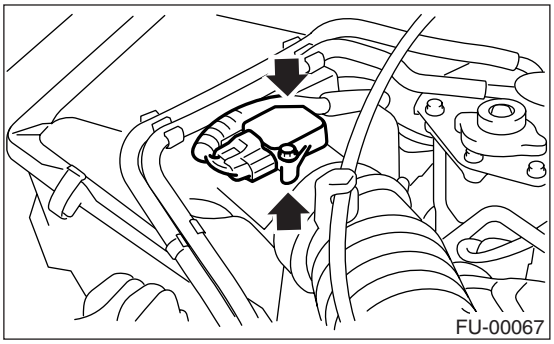
8. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.
3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

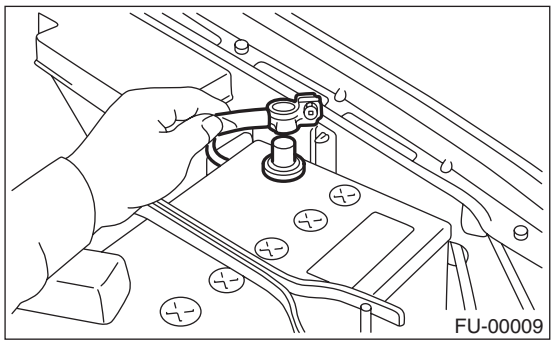
Install in the reverse order of removal.

Tightening torque:
1.7 N·m (0.17 kgf-m, 1.2 ft-lb)

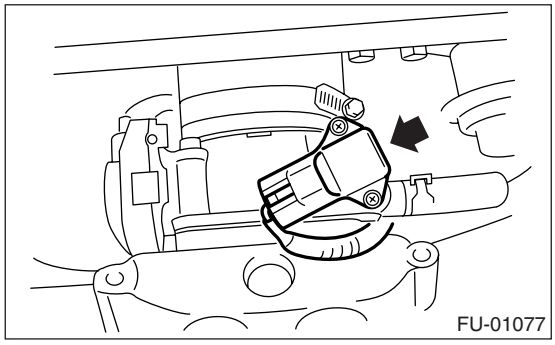
9. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connectors from manifold absolute pressure sensor.



3) Remove the manifold absolute pressure sensor from the throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the O-rings for the manifold absolute pressure sensor with new ones.

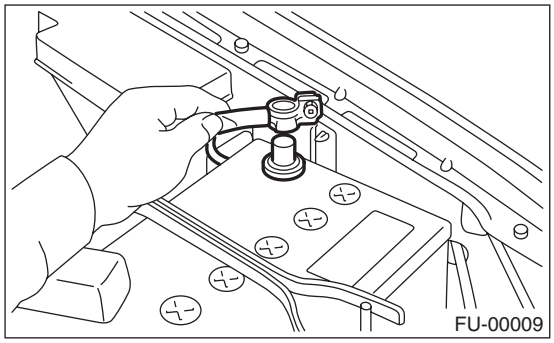
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

10.Fuel Injector

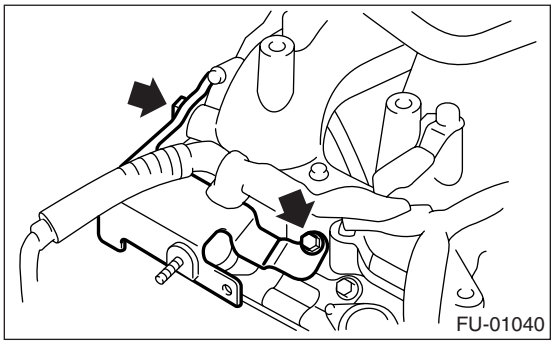
A: REMOVAL

1. RH SIDE

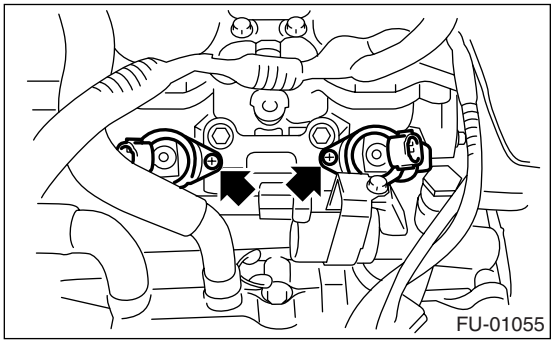
1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.



4) Remove the fuel pipe protector RH.

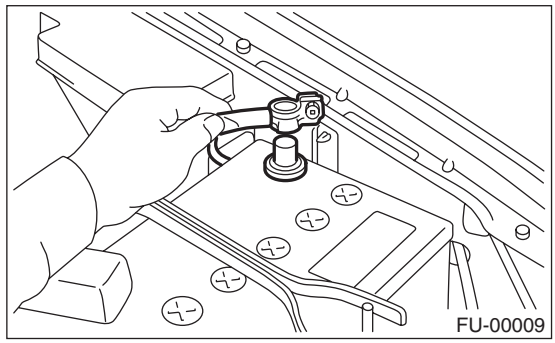


5) Disconnect the connector from the fuel injector.
6) Remove the screw and remove the fuel injector.

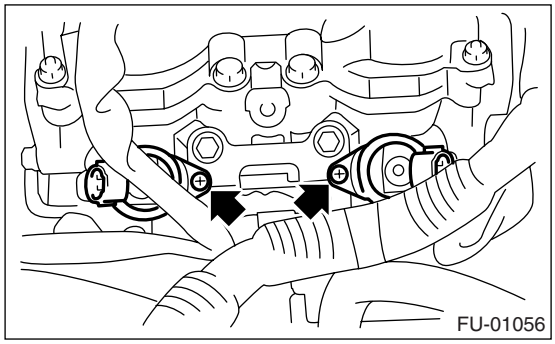


2. LH SIDE

1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.



4) Remove the intake manifold.
<Ref. to FU(H4DOTC 2.5)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the fuel injector.
6) Remove the screw and remove the fuel injector.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:
Replace the O-rings with new ones.

2. LH SIDE

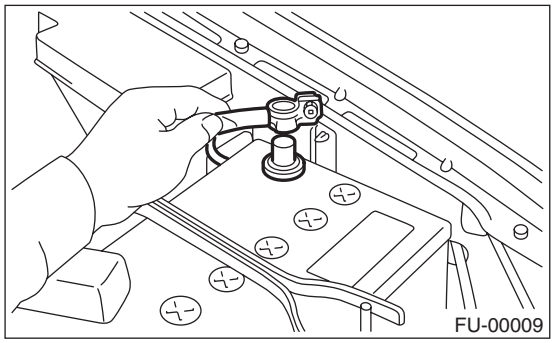
Install in the reverse order of removal.

NOTE:
Replace the O-rings with new ones.

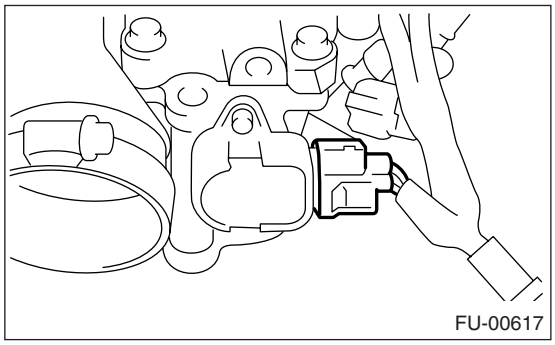
11.Tumble Generator Valve Assembly

A: REMOVAL

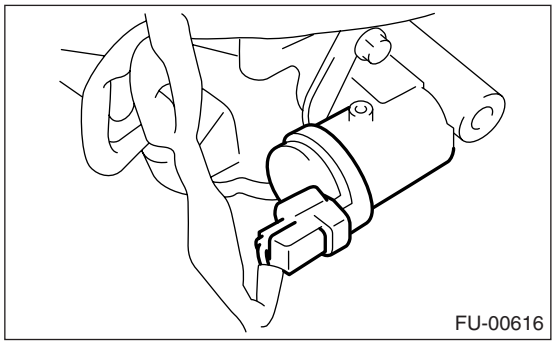
1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.


FU-00009

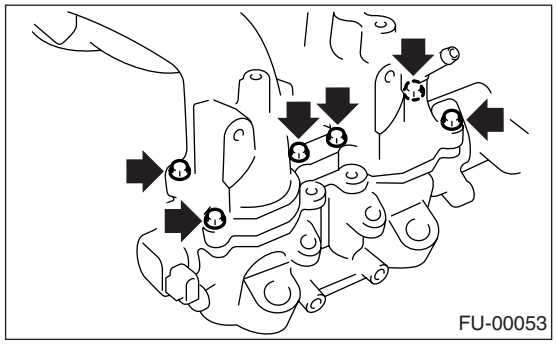
4) Remove the intake manifold.
<Ref. to FU(H4DOTC 2.5)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from the tumble generator valve sensor.


FU-00617

6) Disconnect the connector from the tumble generator valve actuator.


FU-00616

7) Remove the fuel injector.
<Ref. to FU(H4DOTC 2.5)-33, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve body from the intake manifold.

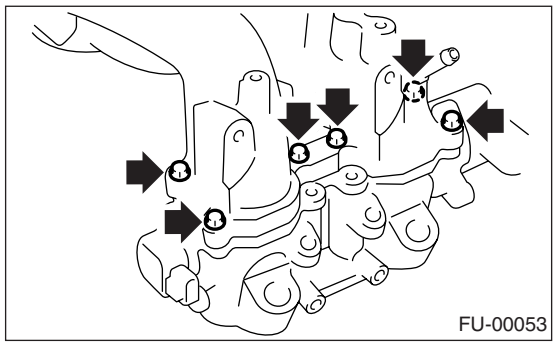

FU-00053

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Always use new gaskets.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)

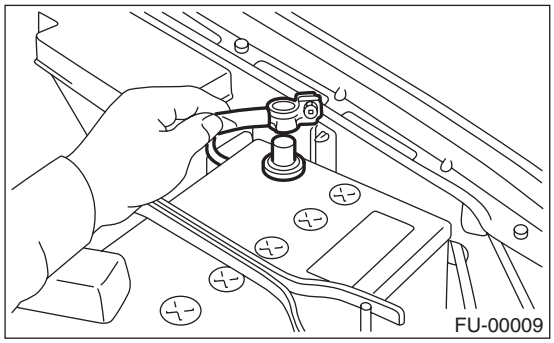

FU-00053

12.Tumble Generator Valve Actuator

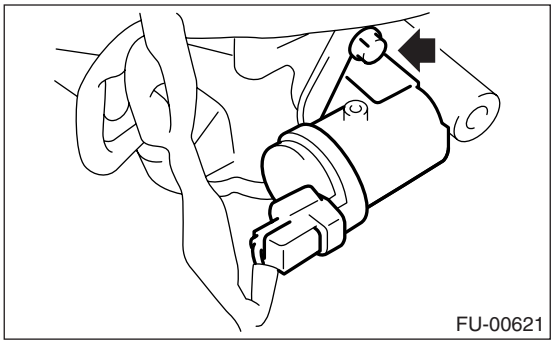
A: REMOVAL

1. RH SIDE

1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

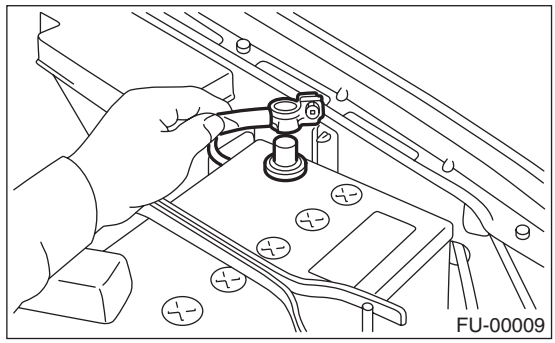


4) Remove the intake manifold.
<Ref. to FU(H4DOTC 2.5)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve actuator RH.
6) Remove the tumble generator valve actuator RH.

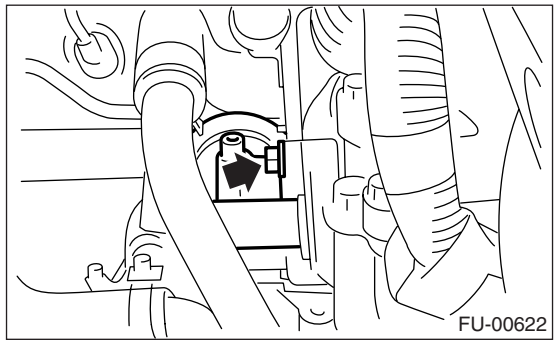


2. LH SIDE

1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler flap lid cap.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from tumble generator valve actuator LH.
5) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

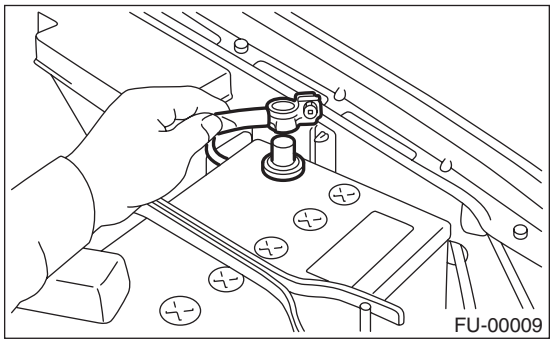
2. LH SIDE

Install in the reverse order of removal.

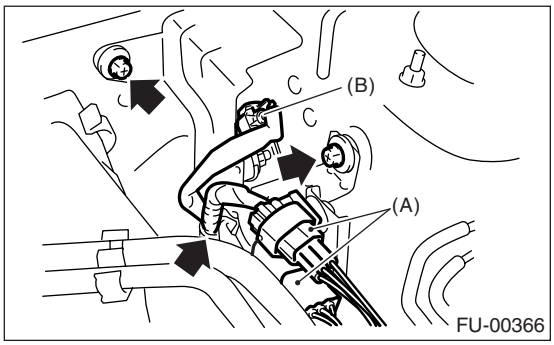
13. Wastegate Control Solenoid Valve

A: REMOVAL

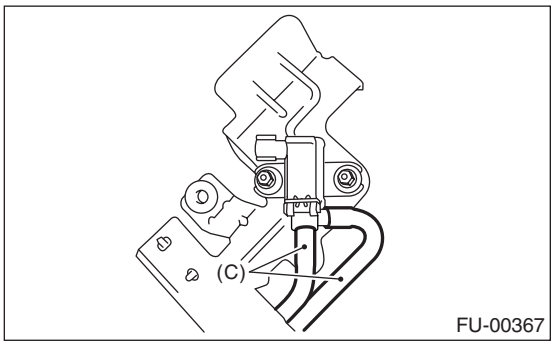
1) Disconnect the ground cable from battery.



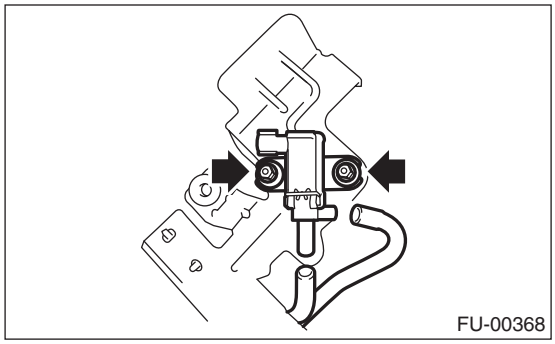
2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from body.



5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



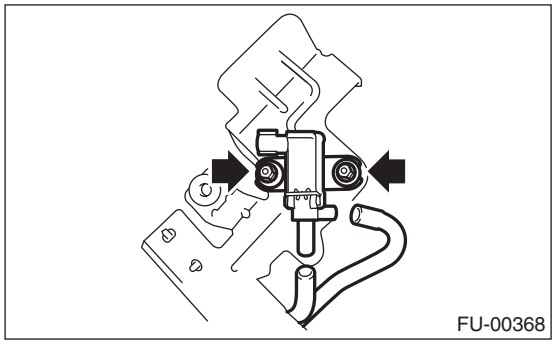
6) Remove the wastegate control solenoid valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

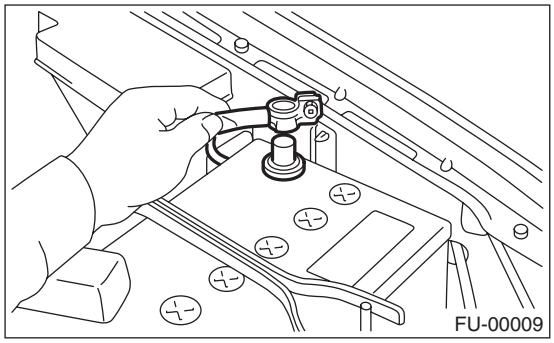
Tightening torque:
6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



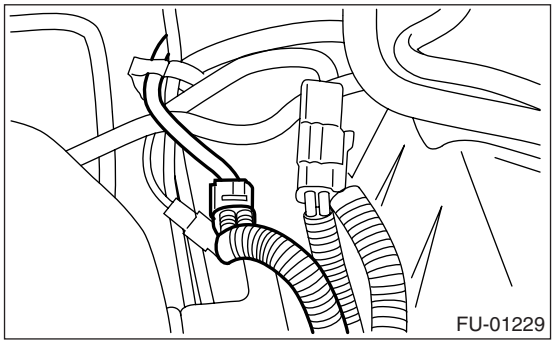
14.Front Oxygen (A/F) Sensor

A: REMOVAL

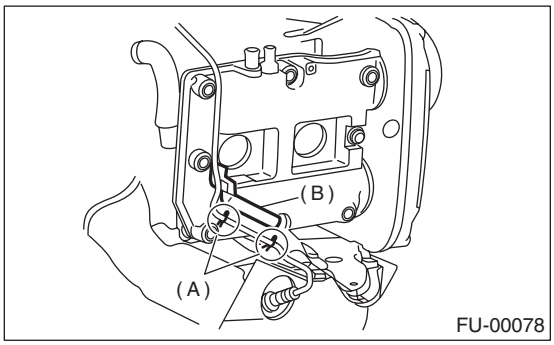
1) Disconnect the ground cable from battery.



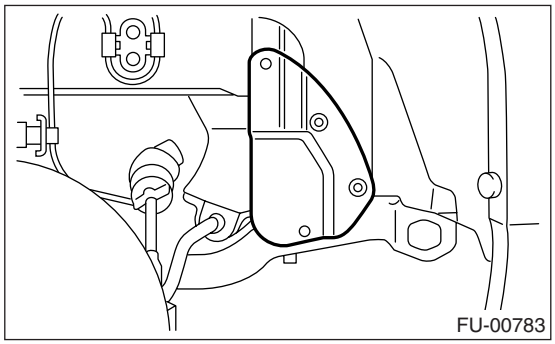
2) Disconnect the connector from the front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A) from the bracket (B).

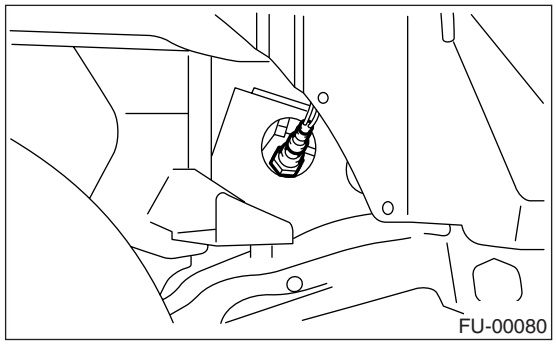


4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.



7) Apply spray type lubricant or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
8) Remove the front oxygen (A/F) sensor.

CAUTION:
When removing the front oxygen (A/F) sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



B: INSTALLATION

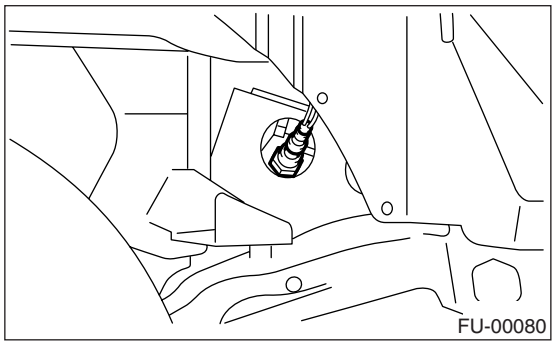
1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 JET LUBE

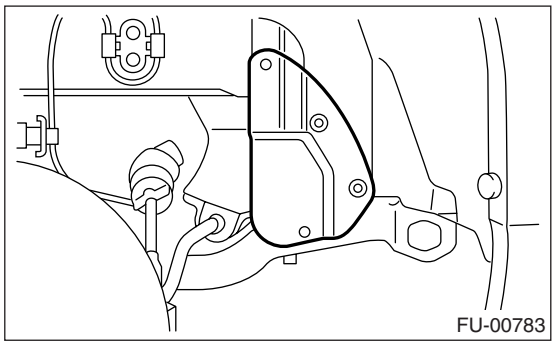
CAUTION:
Never apply anti-seize compound to protector of front oxygen (A/F) sensor.

2) Install the front oxygen (A/F) sensor.

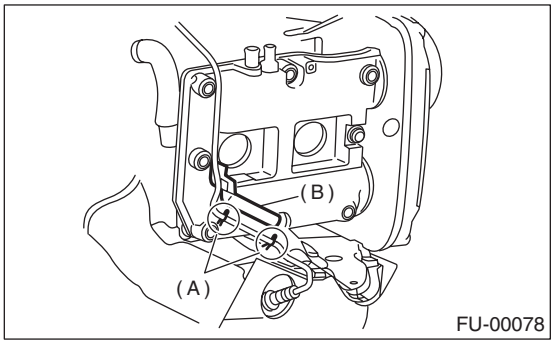
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)


FU-00080

3) Install the service hole cover.

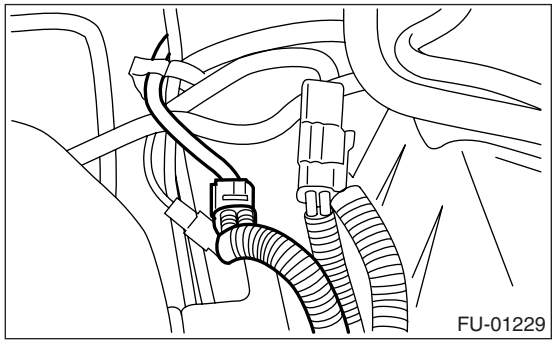

FU-00783

4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness to the bracket (B) using clips (A).

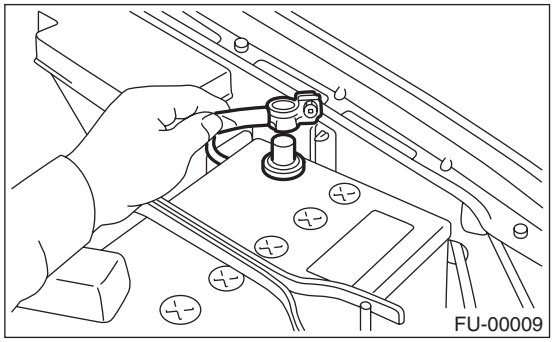


FU-00078

7) Connect the connector of front oxygen (A/F) sensor.


FU-01229

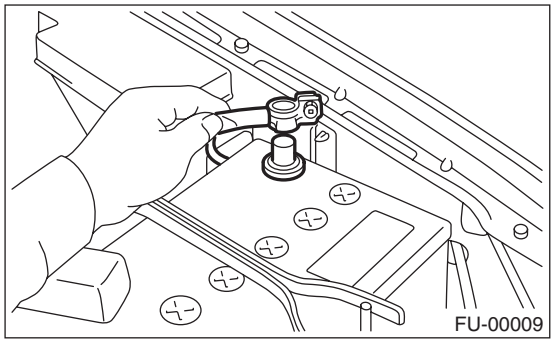
8) Connect the battery ground cable to battery.


FU-00009

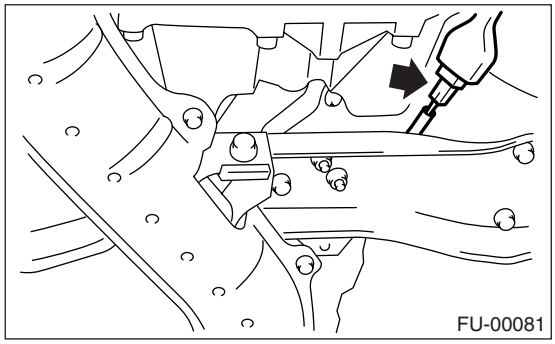
15.Rear Oxygen Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

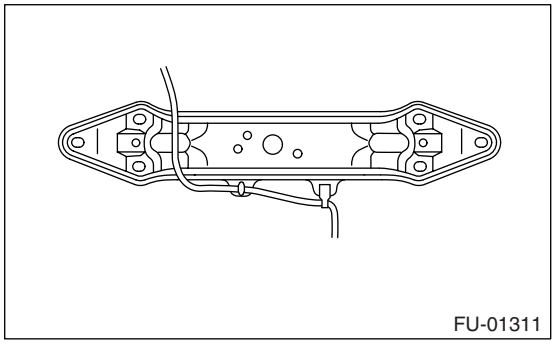


2) Lift-up the vehicle.
3) Disconnect the connector from the rear oxygen sensor.

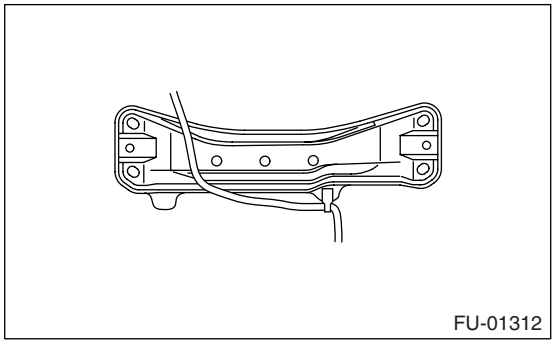


4) Remove the clip by pulling out from the upper side of crossmember.

- AT model

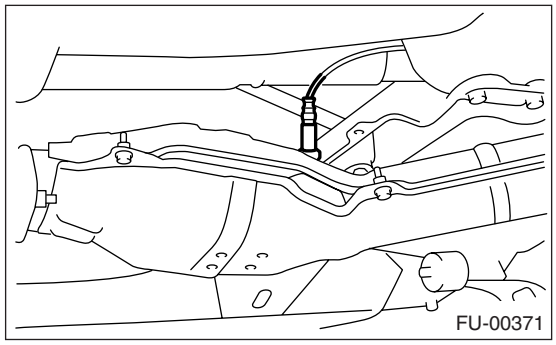


- MT model



5) Apply spray type lubricant or its equivalent to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
6) Remove the rear oxygen sensor.

CAUTION:
When removing the oxygen sensor, wait until exhaust pipe cools; otherwise, it will damage exhaust pipe.



B: INSTALLATION

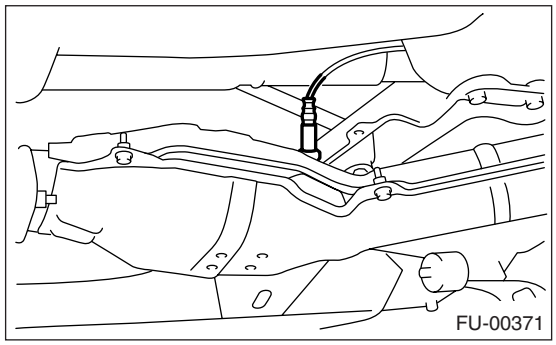
1) Before installing rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:
Never apply anti-seize compound to protector of rear oxygen sensor.

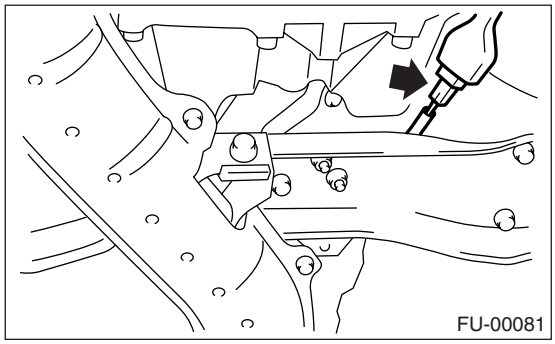
Anti-seize compound:
JET LUBE SS-30

2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

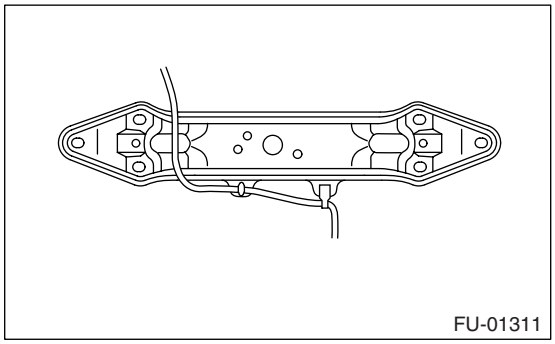


3) Connect the connector to the rear oxygen sensor.

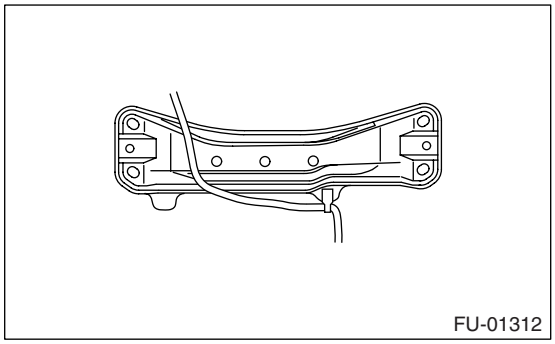


4) Connect the clip to the crossmember.

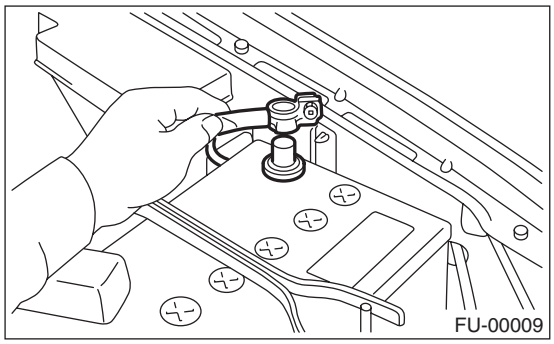
- AT model



- MT model



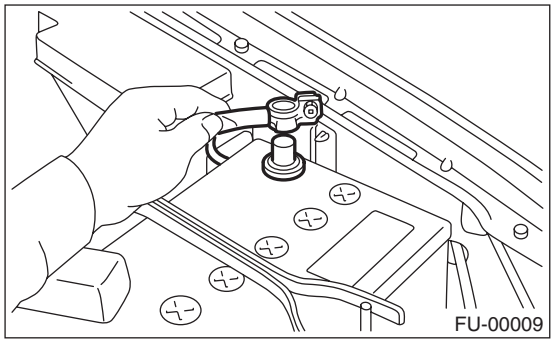
5) Lower the vehicle.
6) Connect the battery ground cable to battery.



16.Exhaust Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

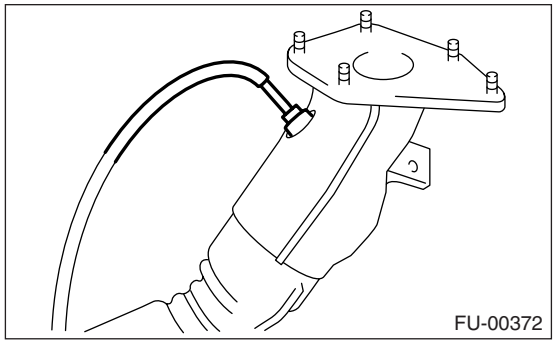


2) Remove the joint pipe. <Ref. to EX(H4DOTC 2.0)-13, REMOVAL, JOINT PIPE.>

3) Apply spray type lubricant or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for 1 minute or more.

4) Remove the exhaust temperature sensor.

CAUTION:
When removing the exhaust temperature sensor, wait until the exhaust pipe cools, otherwise it will damage exhaust pipe.



B: INSTALLATION

1) Before installing the exhaust temperature sensor, apply anti-seize compound only to the threaded portion of exhaust temperature sensor to make the next removal easier.

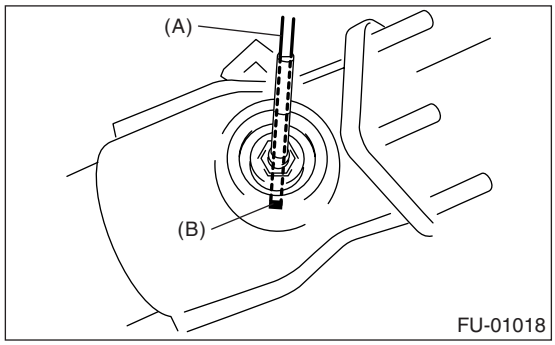
CAUTION:
Never apply anti-seize compound to the protector of exhaust temperature sensor.

Anti-seize compound:
SS-30 JET LUBE

2) Install the exhaust temperature sensor.

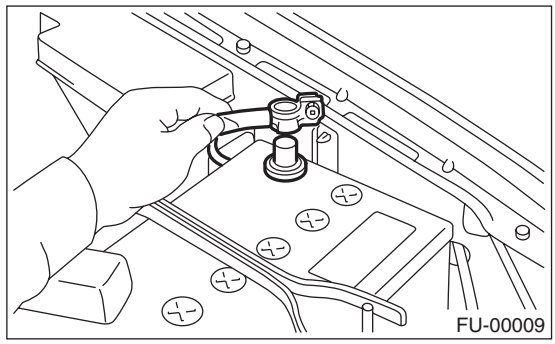
NOTE:
Align the harness (A) of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Install the joint pipe. <Ref. to EX(H4DOTC 2.0)-13, INSTALLATION, Joint Pipe.>

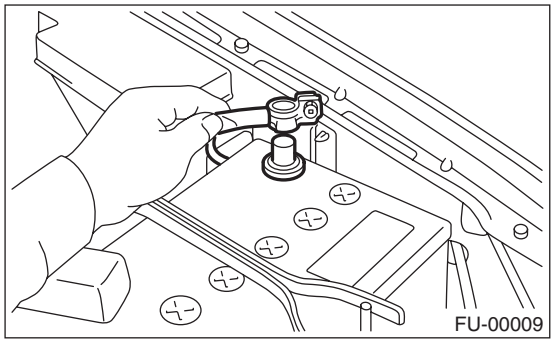
4) Connect the battery ground cable to battery.



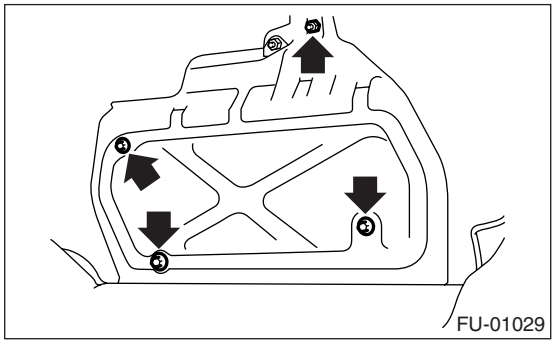
17.Engine Control Module (ECM)

A: REMOVAL

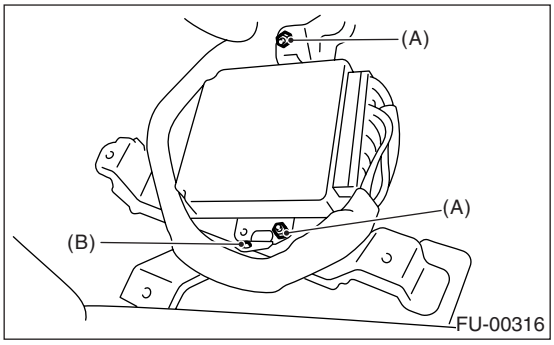
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of the passenger side. <Ref. to EI-45, REMOVAL, LOWER INNER TRIM.>
3) Detach the floor mat of the front passenger seat.
4) Remove the protect cover.



5) Remove the nuts (A) which hold ECM to the bracket.
6) Remove the clip (B) from the bracket.



7) Disconnect the ECM connectors and take out the ECM.

B: INSTALLATION

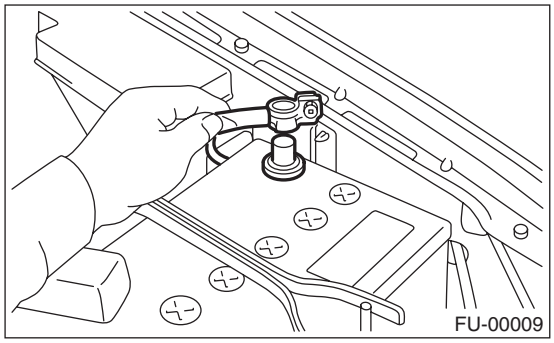
Install in the reverse order of removal.

NOTE:
When replacing ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

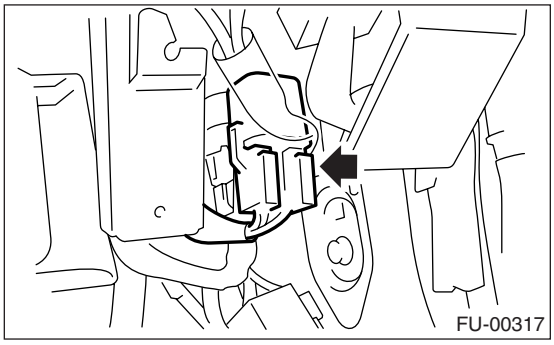
18.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-37, REMOVAL, GLOVE BOX.>
3) Remove the bolt which holds the main relay bracket on the body.
4) Disconnect the connectors from the main relay.



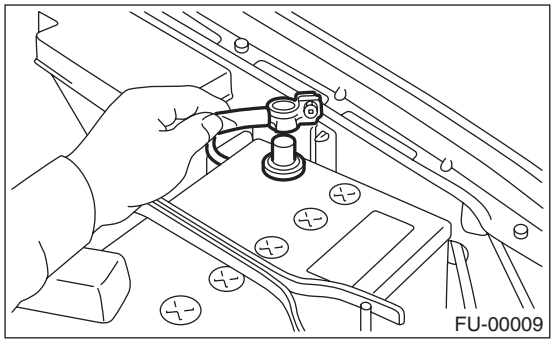
B: INSTALLATION

Install in the reverse order of removal.

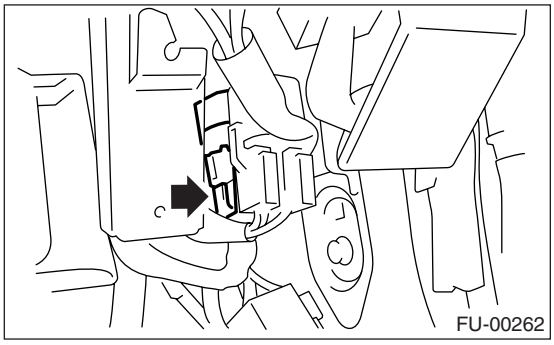
19.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-37, REMOVAL, GLOVE BOX.>
3) Remove the bolt which holds fuel pump relay bracket on the body.
4) Disconnect the connector from the fuel pump relay.



5) Remove the fuel pump relay from the mounting bracket.

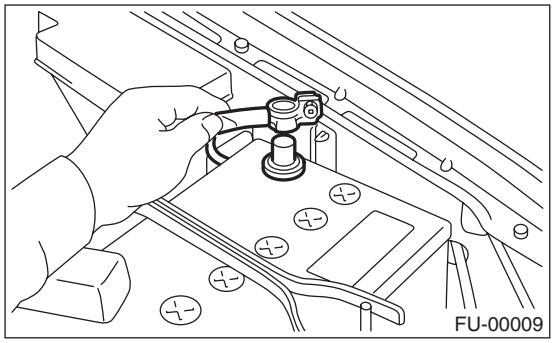
B: INSTALLATION

Install in the reverse order of removal.

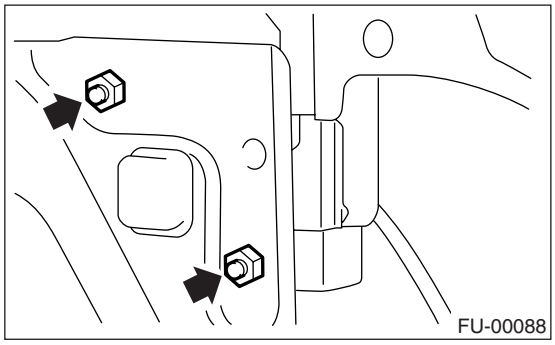
20.Fuel Pump Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the rear quarter trim. <Ref. to EI-46, REMOVAL, REAR QUARTER TRIM.>
3) Disconnect the connector from the fuel pump control unit.
4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

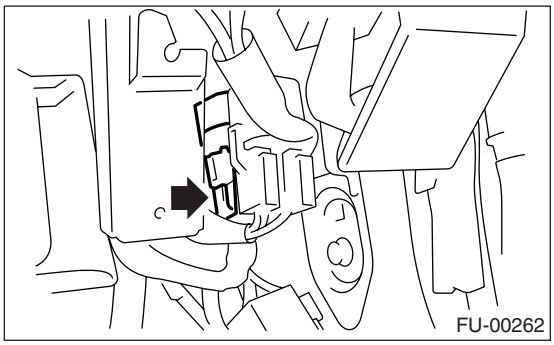
21.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect the connector from fuel pump relay.

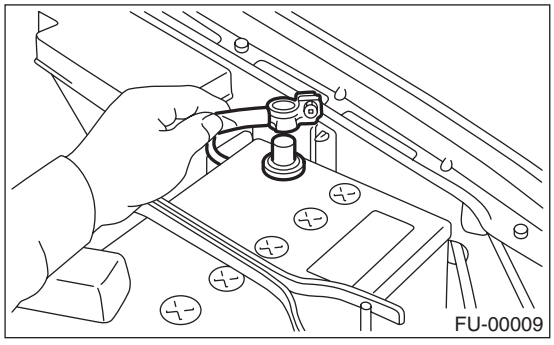


2) Start the engine and run it until it stalls.
3) After the engine stalls, crank it for 5 more seconds.
4) Turn the ignition switch to OFF.

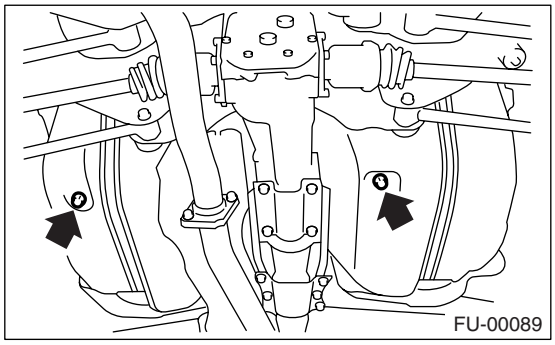
2. DRAINING FUEL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



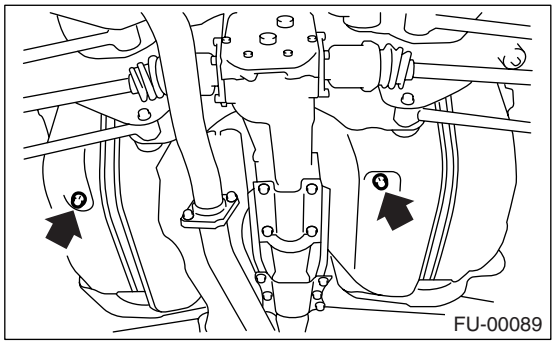
3) Open the fuel filler flap lid and remove fuel filler flap lid cap.
4) Lift-up the vehicle.
5) Drain fuel from the fuel tank.
Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

NOTE:
Always use new gasket.

Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)

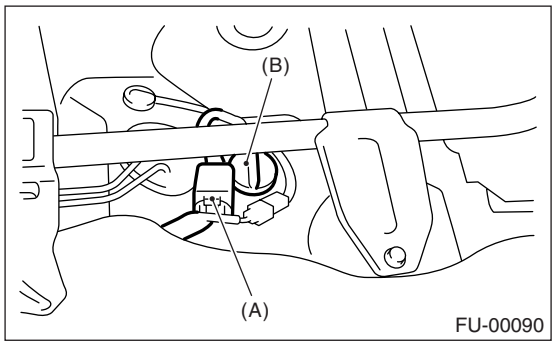


22.Fuel Tank

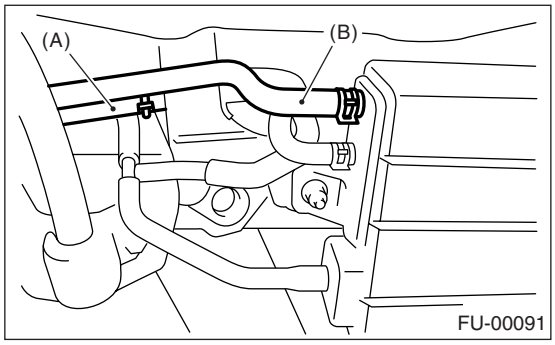
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

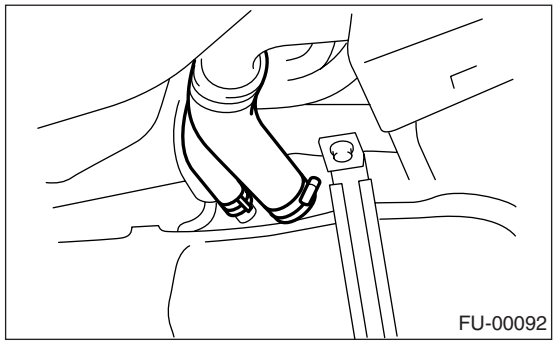
1) Set the vehicle on a lift.
2) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, FUEL.>
3) Drain fuel from the fuel tank.
<Ref. to FU(H4DOTC 2.5)-47, DRAINING FUEL, OPERATION, FUEL.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to rear harness.
6) Push the grommet (B) which holds fuel tank cord on floor panel into under the body.



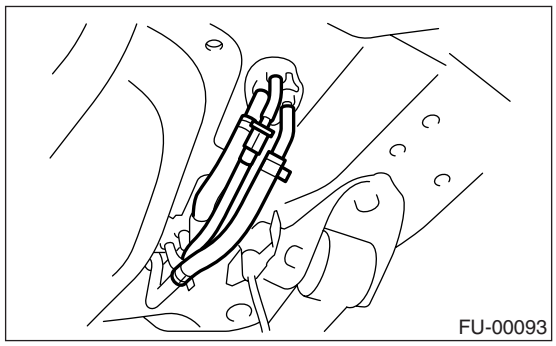
7) Remove the rear crossmember. <Ref. to RS-18, REMOVAL, REAR CROSSMEMBER.>
8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



9) Loosen the clamp and disconnect the fuel filler hose and air vent hose from fuel filler pipe.

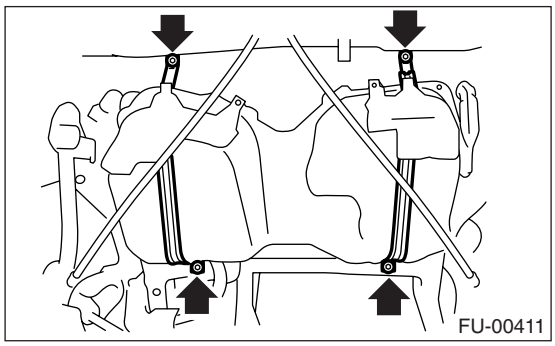


10) Move the clips, and disconnect quick connector. **<Ref. to FU(H4DOTC 2.5)-63,** REMOVAL, FUEL DELIVERY, RETURN AND EVAPORATION LINES.>
11) Disconnect the fuel hoses.



12) Support the fuel tank with transmission jack, and remove the bolts from bands and dismount fuel tank from the vehicle.

WARNING:
A helper is required to perform this work.

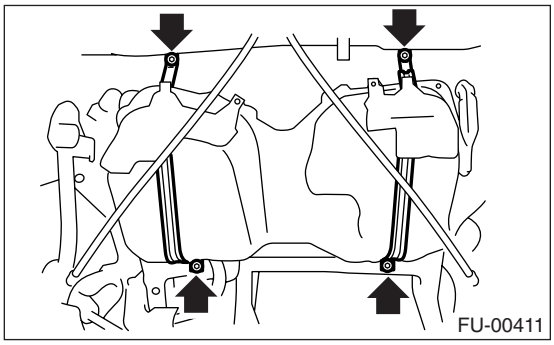


B: INSTALLATION

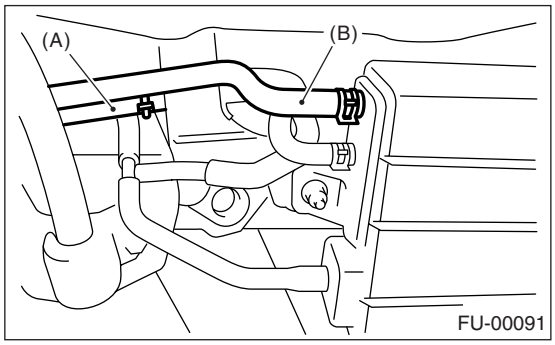
1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.

2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

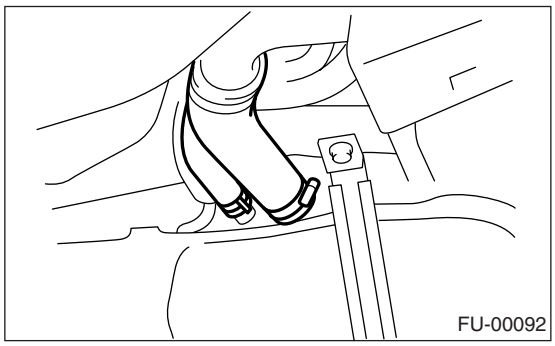
WARNING:
A helper is required to perform this work.



3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.

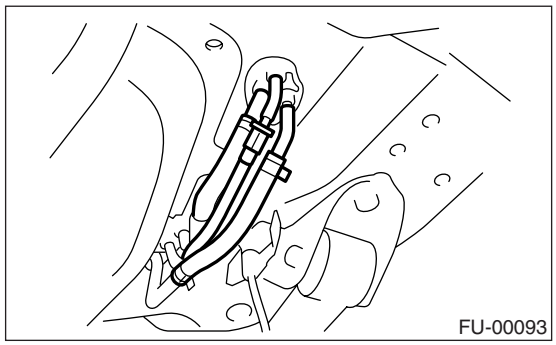


4) Connect the fuel filler flap lid hose and air vent hose.



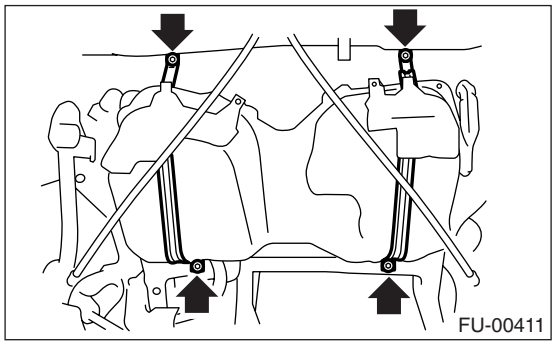
5) Connect the fuel hoses, and secure them with clips and quick connector.

<Ref. to FU(H4DOTC 2.5)-64, INSTALLATION, FUEL DELIVERY, RETURN AND EVAPORATION LINES.>

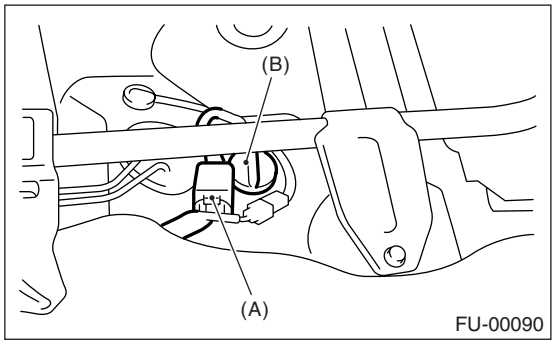


6) Tighten the band mounting bolts.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

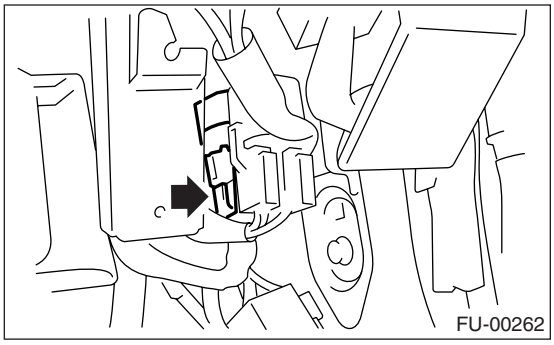


7) Install the rear crossmember. <Ref. to RS-18, INSTALLATION, REAR CROSSMEMBER.>
8) Connect the connector (A) to fuel tank cord and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.

10) Connect the connector to fuel pump relay.



C: INSPECTION

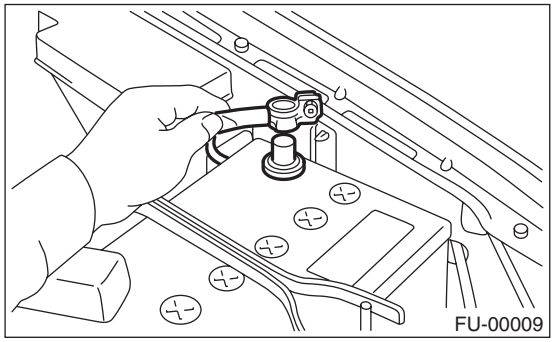
1) Make sure there are no cracks, holes, or other damage on the fuel tank.
2) Make sure that the fuel hoses and fuel pipes are not cracked and that connections are tight.

23.Fuel Filler Pipe

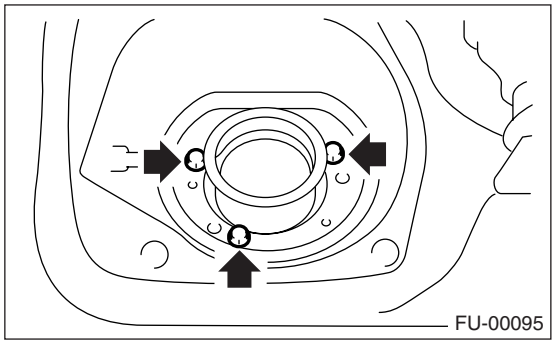
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

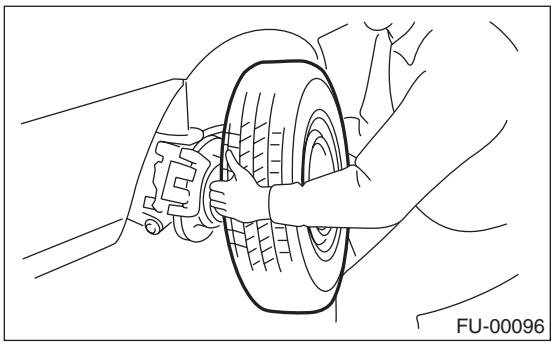
1) Set the vehicle on a lift.
2) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, FUEL.>
3) Open the fuel filler flap lid and remove fuel filler flap lid cap.
4) Disconnect the ground cable from battery.



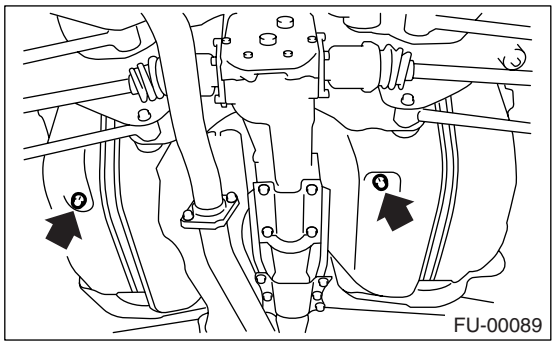
5) Remove the screws holding packing in place.



6) Loosen the rear right side wheel nuts.
7) Lift-up the vehicle.
8) Remove the rear right side wheel.

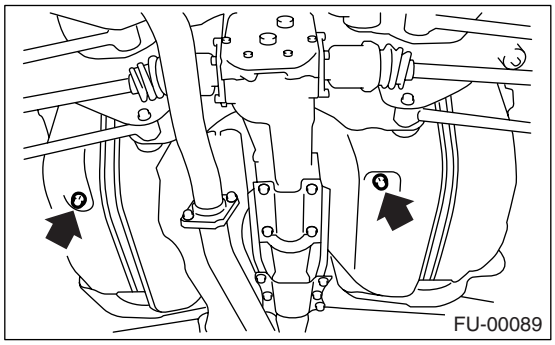


9) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

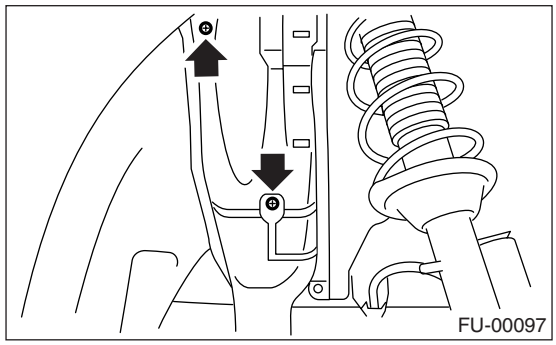


10) Tighten the fuel drain plug and then install the front right side tank cover.

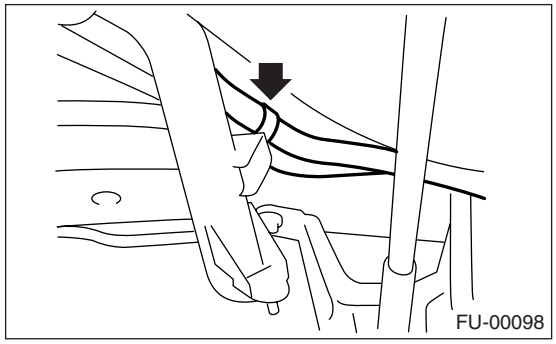
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)



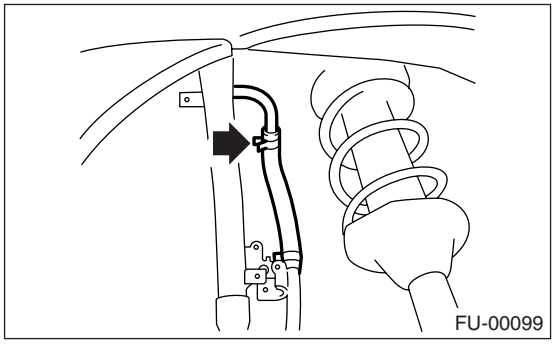
11) Remove the fuel filler pipe protector.



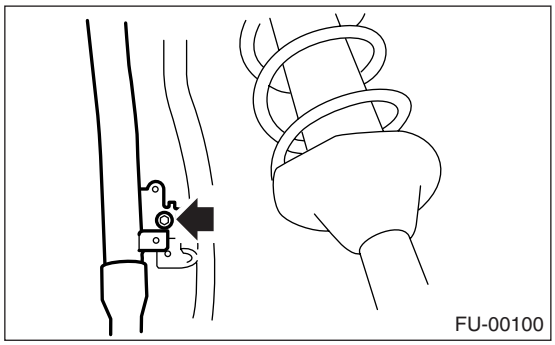
12) Separate the evaporation hoses from clip of fuel filler pipe.



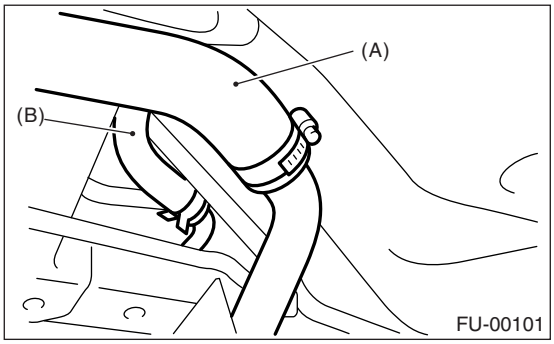
13) Disconnect the air vent hose from fuel filler pipe.



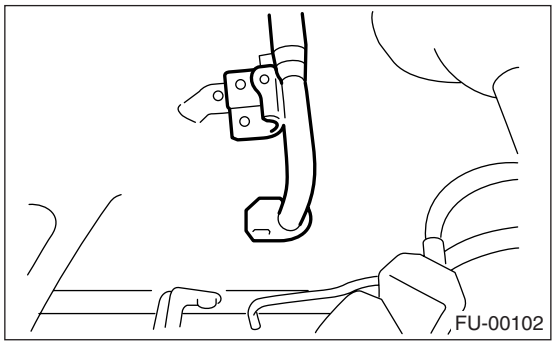
14) Remove the bolts which hold fuel filler pipe bracket on body.



15) Loosen the clamp and separate fuel filler flap lid hose (A) from fuel filler pipe.
16) Move the clip and separate air vent hose (B).



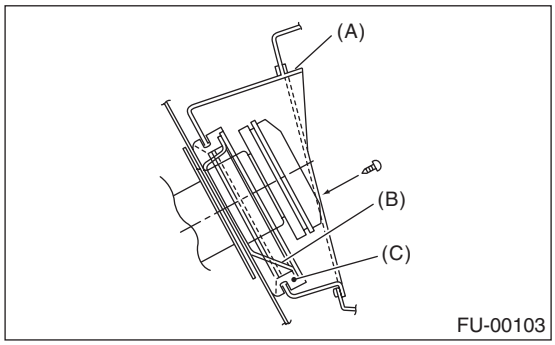
17) Remove the fuel filler pipe to under side of the vehicle.
18) Remove the air vent pipe together with clip from body.



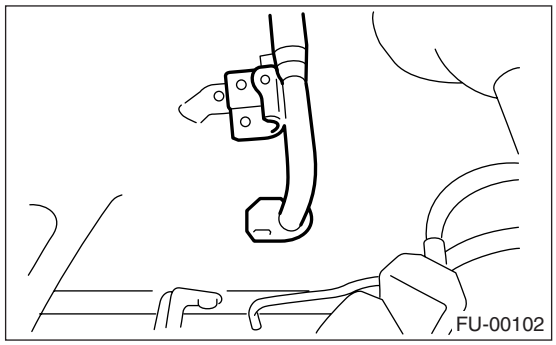
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set cup (B), and tighten the screws.

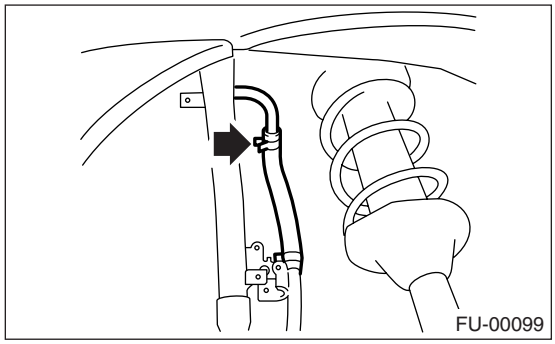
NOTE:
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



4) Install the air vent pipe.

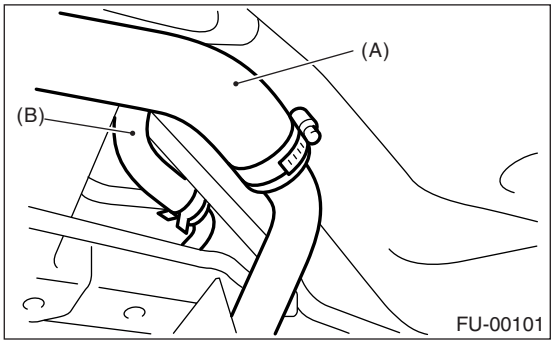


5) Connect the air vent hose to fuel filler pipe.



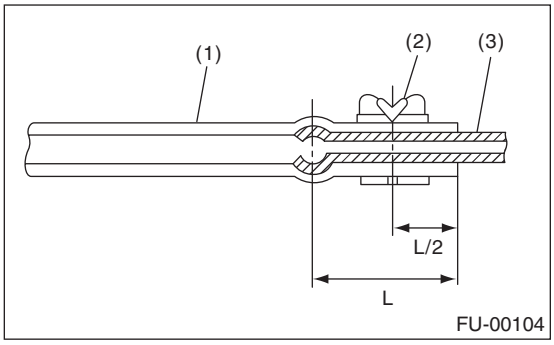
6) Insert the fuel filler flap lid hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

CAUTION:
Do not allow clips to touch the air vent hose (B) and rear suspension crossmember.



7) Insert the air vent hose approx. 25 to 30 mm (0.98 to 1.18 in) into the lower end of air vent pipe and hold clip.

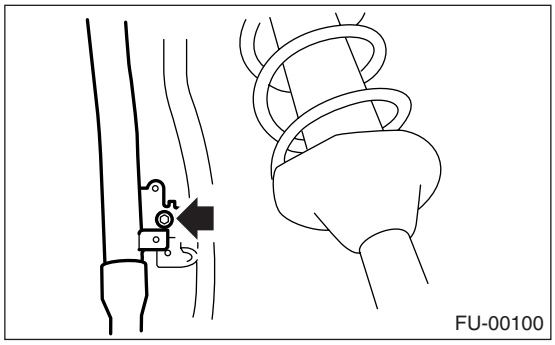
L = 27.5±2.5 mm (1.083±0.098 in)



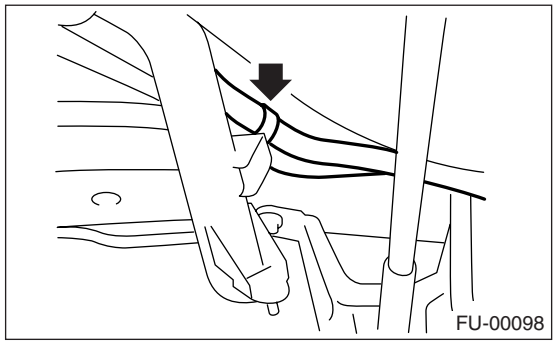
(1) Hose
(2) Clip
(3) Pipe

8) Tighten the bolt which holds fuel filler pipe bracket on body.

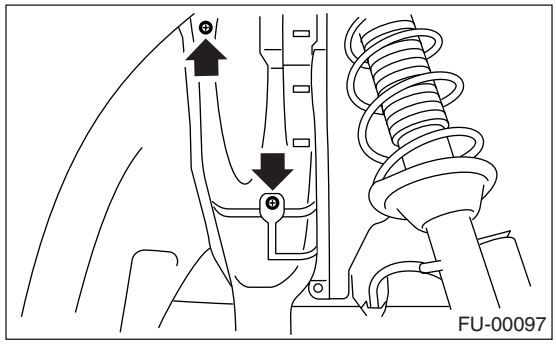
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



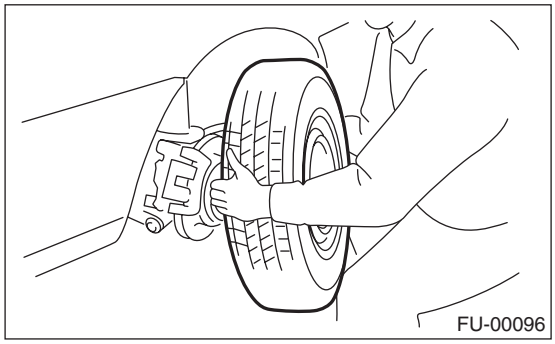
9) Hold the evaporation hoses onto clip of fuel filler pipe.



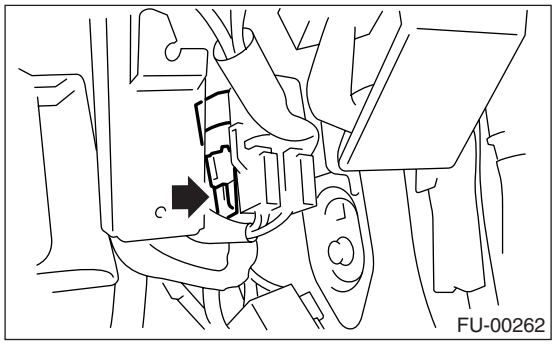
10) Install the fuel filler pipe protector.



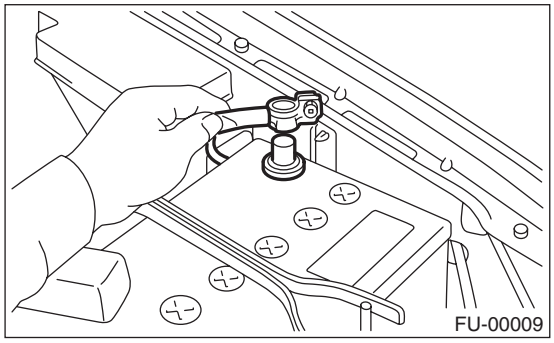
11) Install the rear right wheel.



12) Lower the vehicle.
13) Tighten the wheel nuts.
14) Connect the connector to fuel pump relay.



15) Connect the battery ground cable to battery.



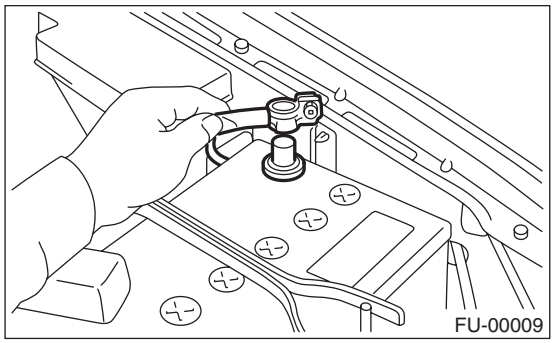
24.Fuel Pump

A: REMOVAL

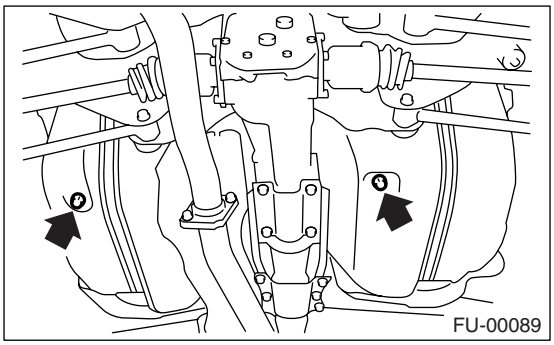
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel pump assembly consists of fuel pump and fuel level sensor.

1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, FUEL.>
2) Open the fuel filler flap lid and remove fuel filler flap lid cap.
3) Disconnect the ground cable from battery.

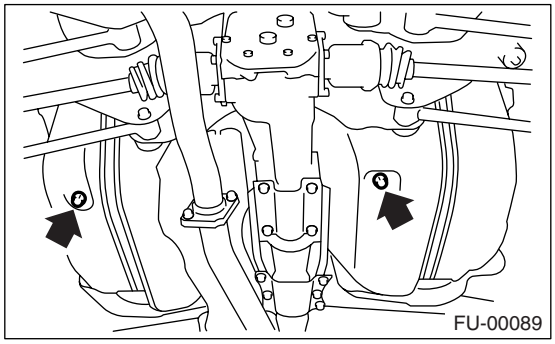

FU-00009

4) Lift-up the vehicle.
5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

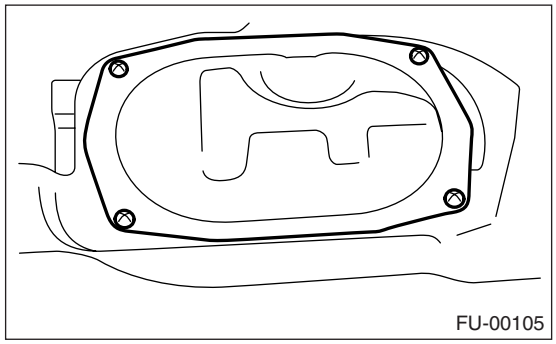

FU-00089

6) Tighten the fuel drain plug.

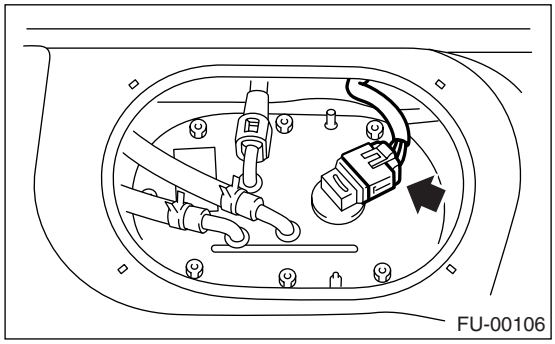
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

7) Raise the rear seat and turn floor mat up.
8) Remove the access hole lid.

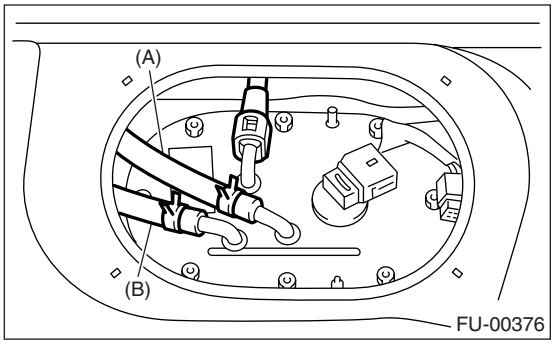

FU-00105

9) Disconnect the connector from fuel pump.

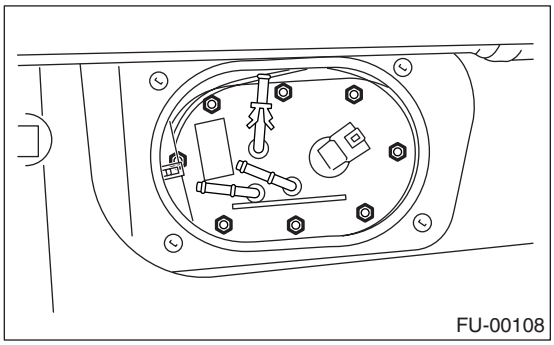

FU-00106

10) Disconnect the quick connector and then disconnect fuel delivery hose.
<Ref. to FU(H4DOTC 2.5)-63, Fuel Delivery, Return and Evaporation Lines.>

11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



12) Remove the nuts which install fuel pump assembly onto fuel tank.



13) Take off the fuel pump assembly from fuel tank.

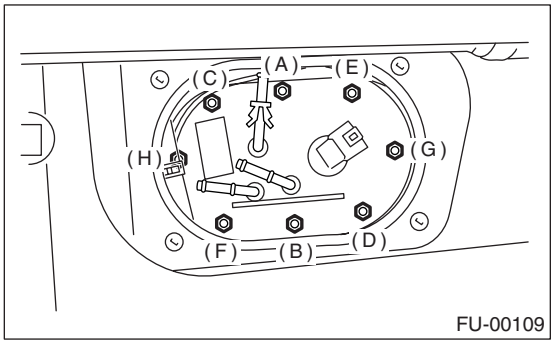
B: INSTALLATION

Install in the reverse order of removal. Do the following:

NOTE:
Replace the gaskets with new ones.

(1) Ensure sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts in alphabetical sequence shown in the figure to specified torque.

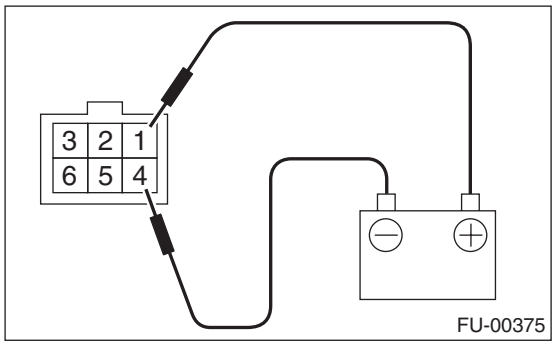
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Connect the lead harness to connector terminal of fuel pump and apply battery power supply to check whether the pump operates.

WARNING:
• Wipe off the fuel completely.
• Keep the battery as far apart from fuel pump as possible.
• Be sure to turn the battery supply ON and OFF on battery side.
• Do not run the fuel pump for a long time under non-load condition.



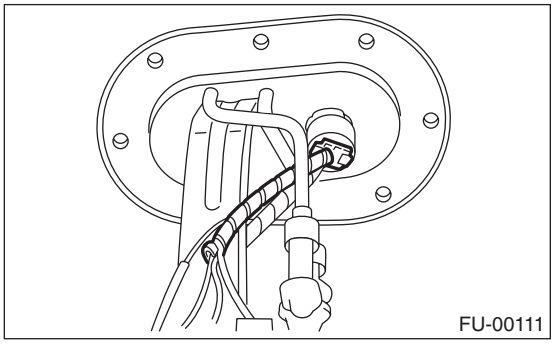
25.Fuel Level Sensor

A: REMOVAL

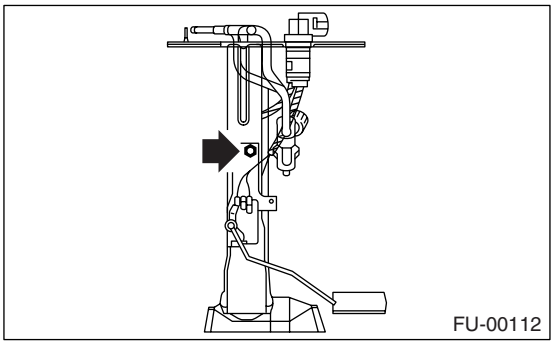
WARNING:
- **Place “NO FIRE” signs near the working area.**
- **Be careful not to spill fuel on the floor.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly.
<Ref. to FU(H4DOTC 2.5)-55, REMOVAL, FUEL PUMP.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the bolt which installs fuel level sensor on mounting bracket.



B: INSTALLATION

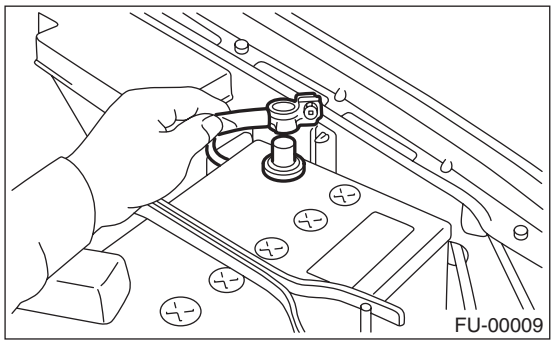
Install in the reverse order of removal.

26.Fuel Sub Level Sensor

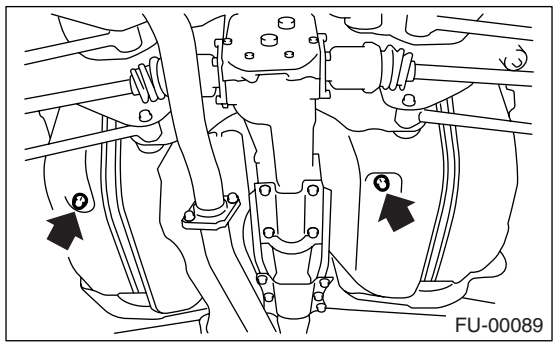
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Disconnect the ground cable from battery.

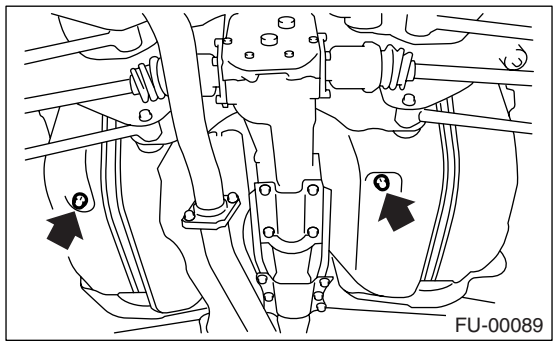


2) Lift-up the vehicle.
3) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

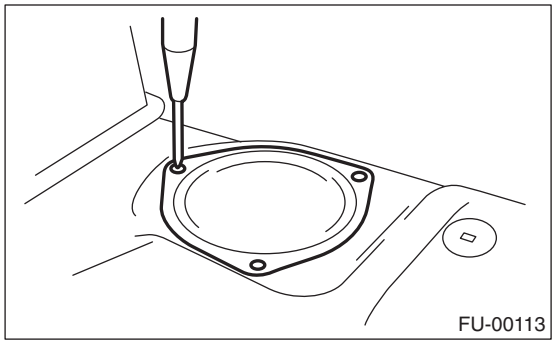


4) Tighten the fuel drain plug.

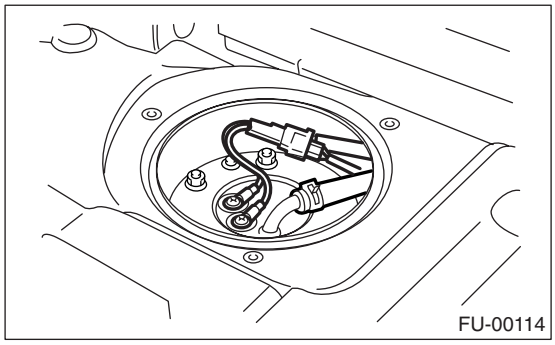
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)



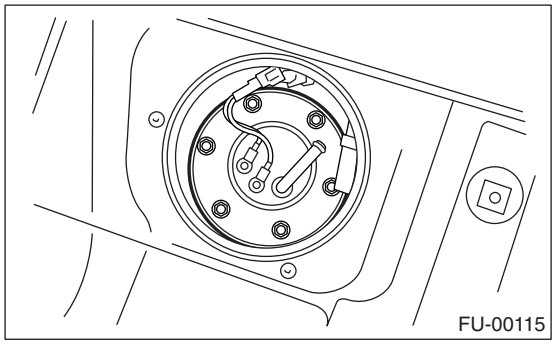
5) Remove the rear seat.
6) Remove the service hole cover.



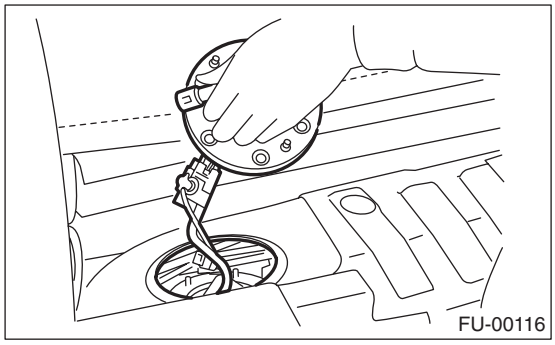
7) Disconnect the connector from fuel sub level sensor.
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install fuel sub level sensor on fuel tank.



10) Remove the fuel sub level sensor.

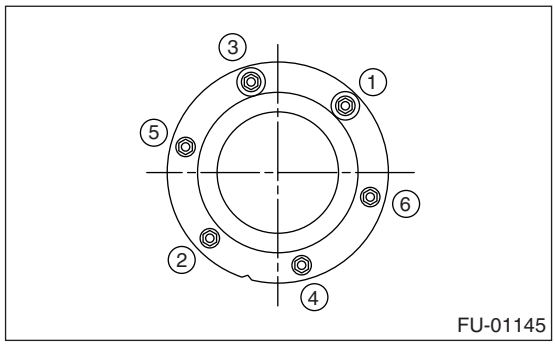


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.
(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts and bolts to specified torque in the order as shown in the figure.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

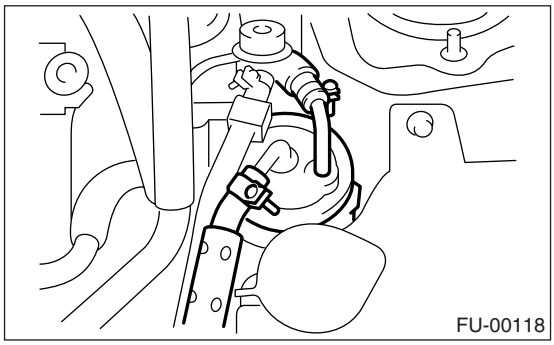


27.Fuel Filter

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, FUEL.>
2) Disconnect the fuel delivery hoses from fuel filter.



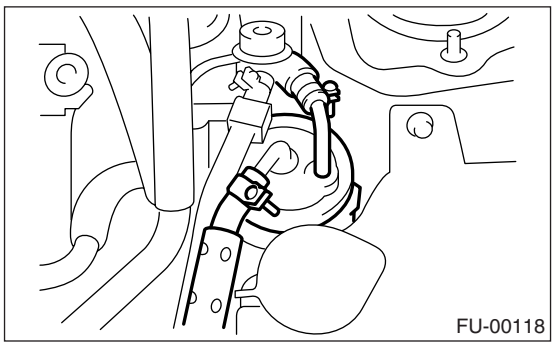
3) Remove the filter from holder.

B: INSTALLATION

CAUTION:
• If fuel hoses are damaged at the connecting portion, replace it with a new one.
• If clamps are badly damaged, replace with new ones.

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



C: INSPECTION

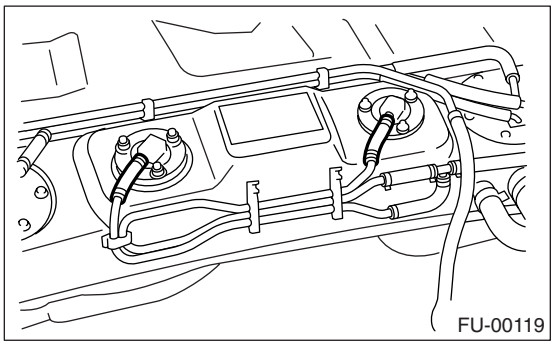
1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

28.Fuel Cut Valve

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**

1) Remove the fuel tank.
<Ref. to FU(H4DOTC 2.5)-48, REMOVAL, FUEL TANK.>
2) Move the clip and disconnect the evaporation hose from fuel cut valve.

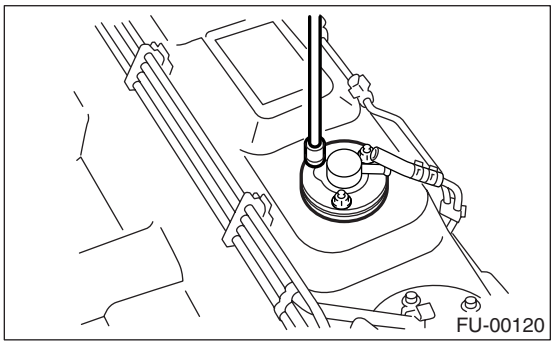


3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

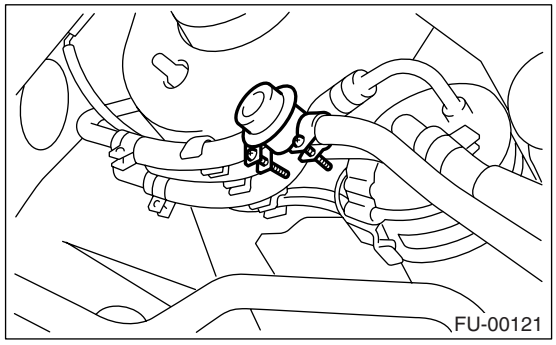
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



29.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure.
<Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, FUEL.>
2) Remove the fuel damper valve from fuel return line.



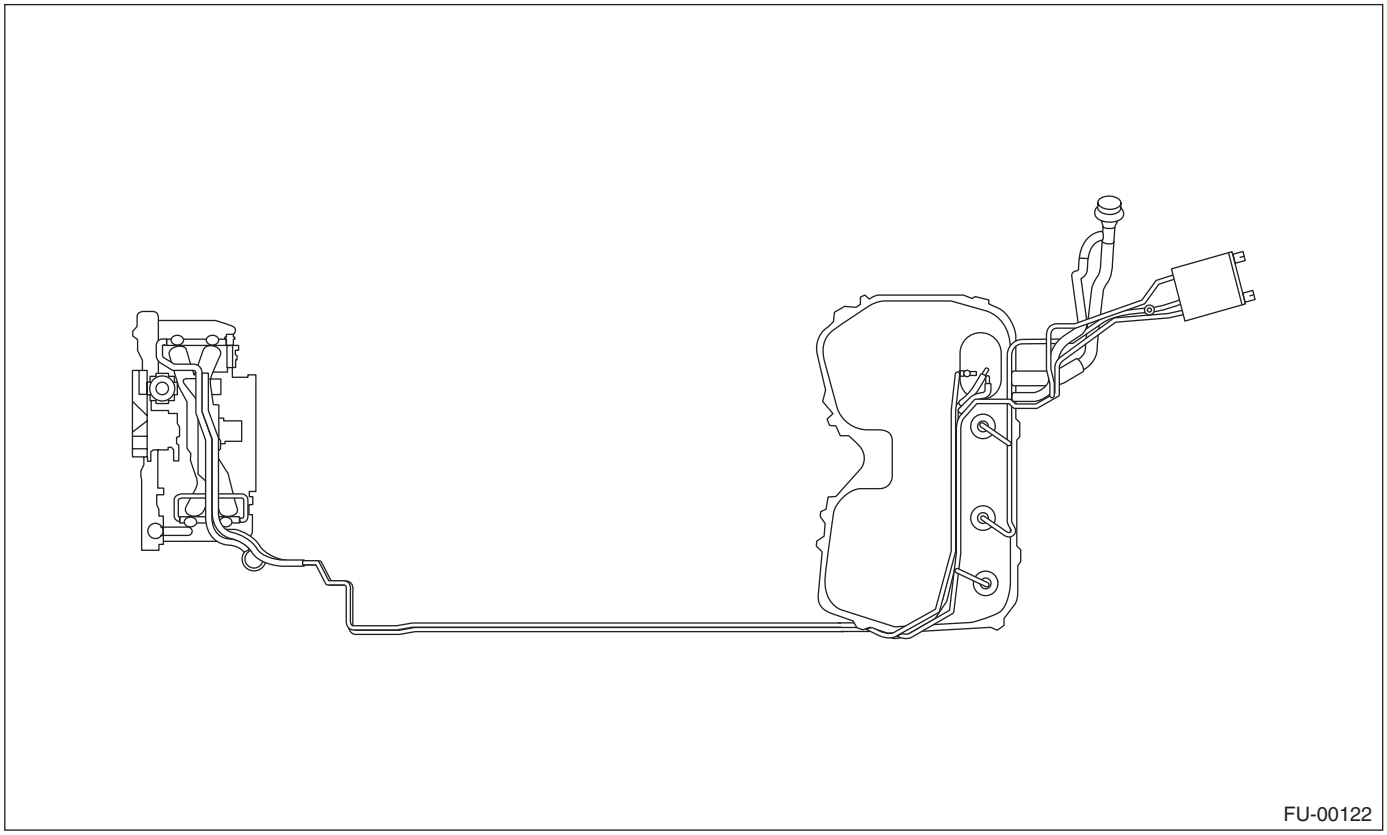
B: INSTALLATION

Install in the reverse order of removal.

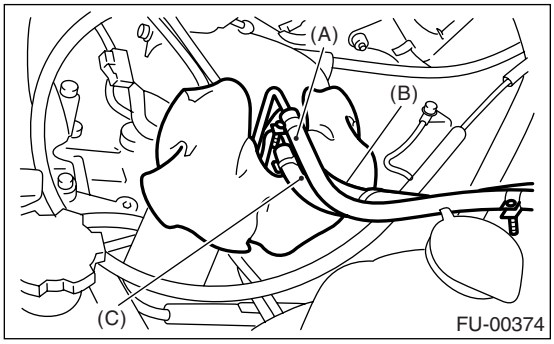
30.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. **<Ref. to FU(H4DOTC 2.5)-47,** RELEASING OF FUEL PRESSURE, OPERATION, FUEL.>
3) Open the fuel filler flap lid and remove fuel filler flap lid cap.
4) Remove the floor mat. <Ref. to EI-50, REMOVAL, FLOOR MAT.>
5) Disconnect the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

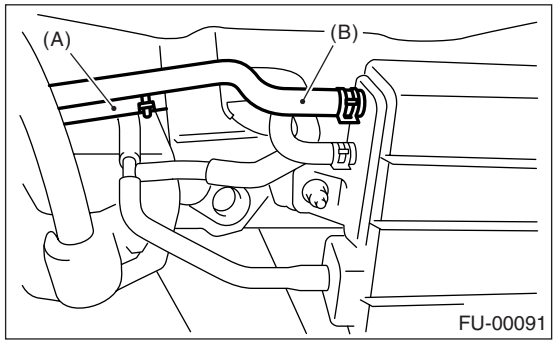

FU-00122

6) In the engine compartment, disconnect the fuel delivery hoses (A), return hoses (B) and evaporation hoses (C).



FU-00374

8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



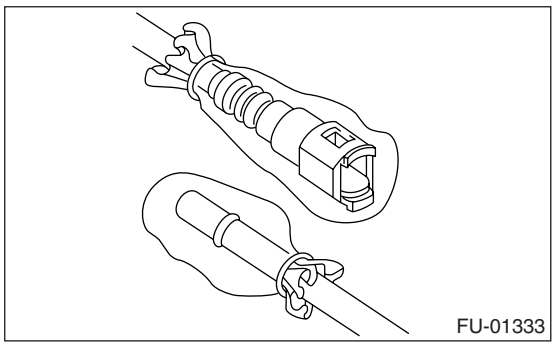
FU-00091

7) Lift-up the vehicle.

9) Disconnect the quick connector on the fuel delivery line.

(1) Clean the pipe and connector, if they are covered with dust.

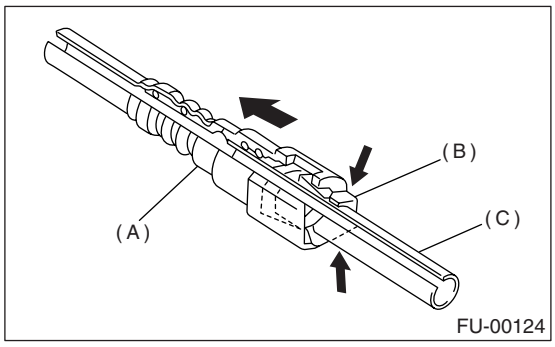
(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



(3) Hold the connector (A) and push retainer (B) down.

(4) Pull out the connector (A) from retainer (B).

CAUTION:
Replace the retainer except for it in engine room with a new one.

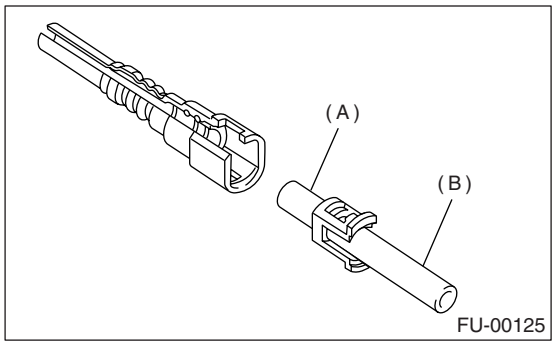


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

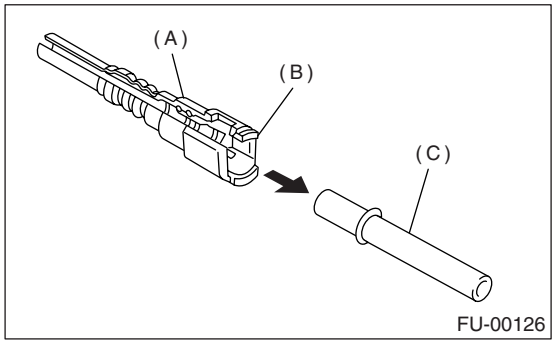
NOTE:
- Replace the retainer with a new one.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



(A) Seal surface
(B) Pipe

(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into connector completely.

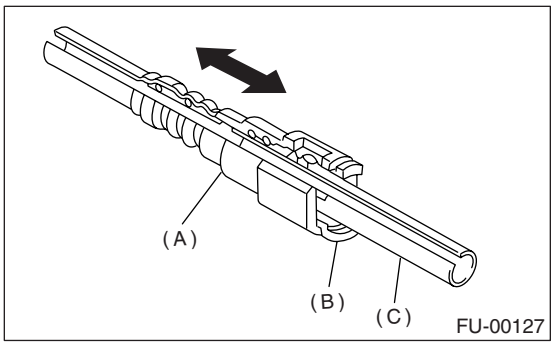
NOTE:
At this time, two clicking sounds are heard.



(A) Connector
(B) Retainer
(C) Pipe

CAUTION:
- **Pull the connector to ensure it is connected securely.**
- **Ensure the two retainer pawls are engaged in their mating positions in the connector.**

• Be sure to inspect the hoses and their connections for any leakage of fuel.

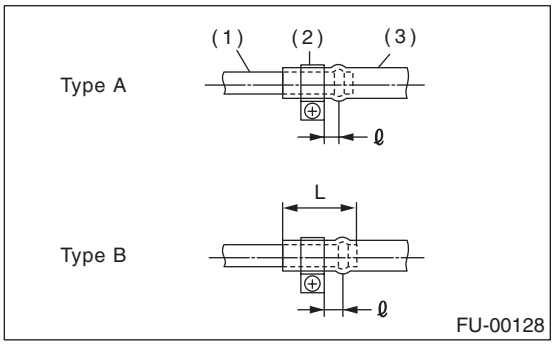


(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

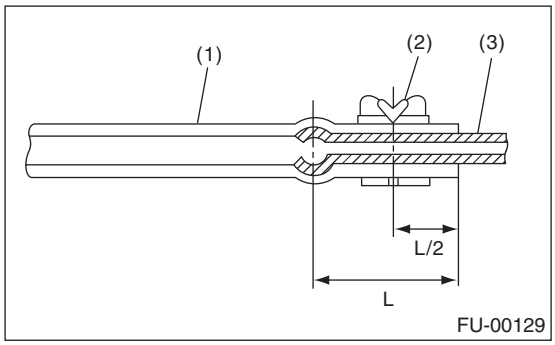


(1) Fitting
(2) Clamp
(3) Hose

3) Connect the evaporation hose to pipe by approx. 15 — 20 mm (0.59 — 0.79 in) from the hose end.

L = 17.5±2.5 mm (0.689±0.098 in)

CAUTION:
Be sure to inspect the hoses and their connections for any leakage of fuel.



(1) Hose
(2) Clip
(3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
2) Make sure that the fuel pipe and fuel hose connections are tight.

31.Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	❍ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	❍ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing tightness on the fuel filler cap.	Correct or replace the packing.
3)	Inoperative fuel pump.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	Replace.
2)	Defective operation of fuel meter.	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump.	Replace.

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
• When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4DOTC 2.5)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is included in EC(H4DOTC 2.0) section. <Ref. to EC(H4DOTC 2.0)-2, General Description.>

INTAKE (INDUCTION)

IN(H4DOTC 2.5)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is the same as 2.0 L model. <Ref. to IN(H4DOTC 2.0)-2, General Description.>

MECHANICAL

ME(H4DOTC 2.5)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is included in ME(H4DOTC 2.0) section. <Ref. to ME(H4DOTC 2.0)-2, General Description.>

EXHAUST

EX(H4DOTC 2.5)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is included in EX(H4DOTC 2.0) section. <Ref. to EX(H4DOTC 2.0)-2, General Description.>

COOLING

CO(H4DOTC 2.5)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is included in CO(H4SO) section. <Ref. to CO(H4SO)-2, General Description.>

LUBRICATION

LU(H4DOTC 2.5)

Page
1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is included in LU(H4SO) section. <Ref. to LU(H4SO)-2, General Description.>

SPEED CONTROL SYSTEMS

SP(H4DOTC 2.5)

Page

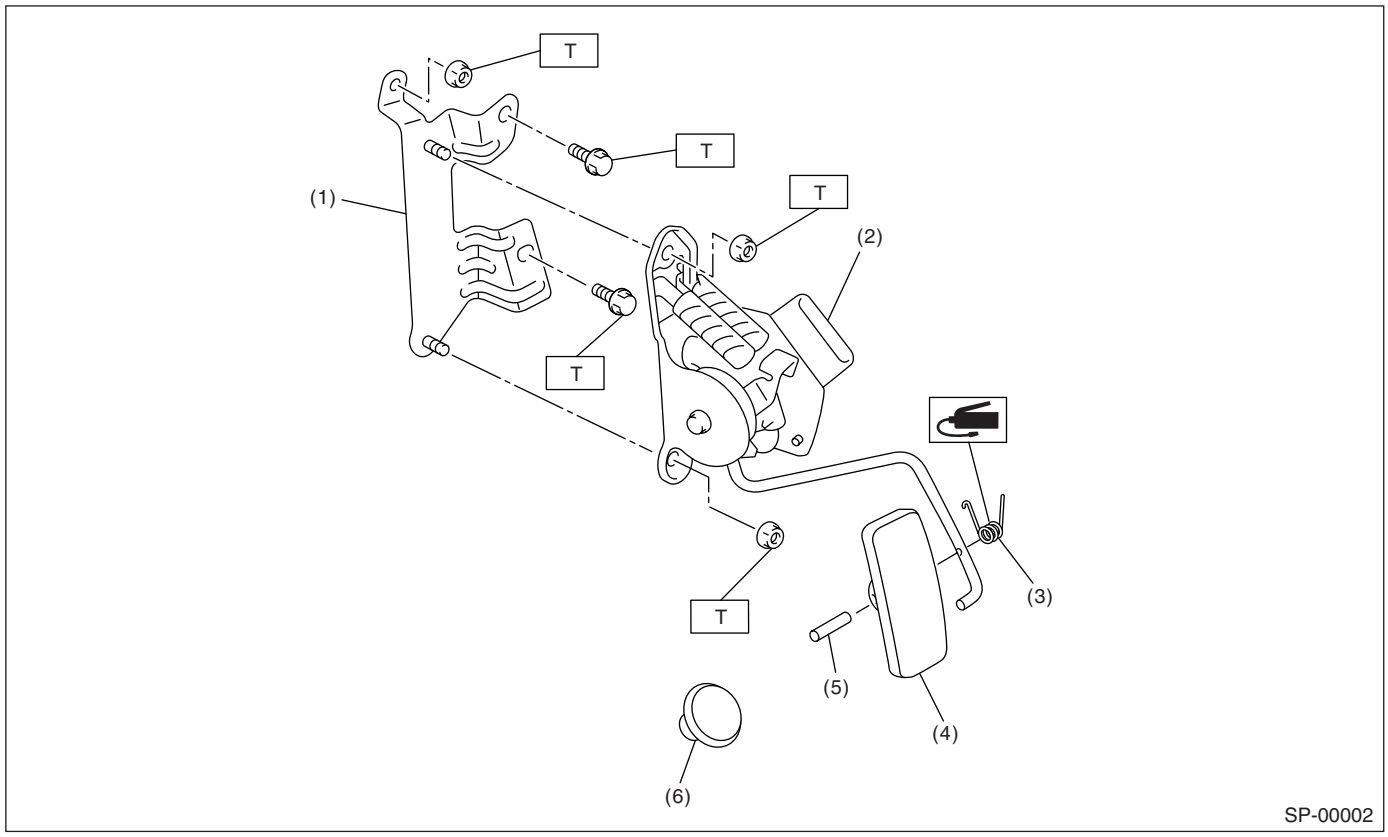
1. General Description 2
2. Accelerator Pedal 4

1. General Description

A: SPECIFICATION

Accelerator pedal	Free play	At pedal pad	0 — 4 mm (0 — 0.16 in)
	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)

B: COMPONENT



(1) Accelerator pedal bracket
(2) Accelerator pedal ASSY
(3) Accelerator pedal spring
(4) Accelerator pedal
(5) Spring pin
(6) Accelerator stopper

Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

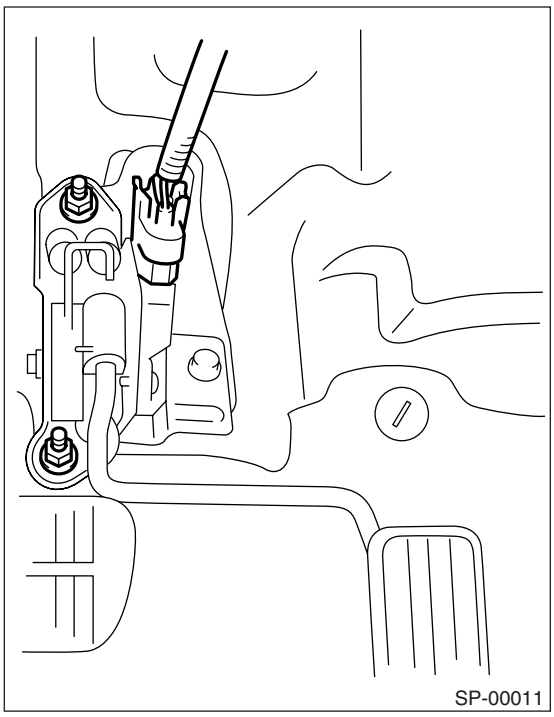
C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination, including dirt and corrosion, before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Accelerator Pedal

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the connector.
3) Remove the nuts which securing accelerator pedal assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: DISASSEMBLY

NOTE:
Accelerator pedal for 2.5 L model is a non-disassemble part.

IGNITION

IG(H4DOTC 2.5)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is included in IG(H4DOTC 2.0) section. <Ref. to IG(H4DOTC 2.0)-2, General Description.>

STARTING/CHARGING SYSTEMS

SC(H4DOTC 2.5)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 2.5 L model is included in SC(H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H4DOTC 2.5)(diag)

		Page
1.	Basic Diagnostic Procedure	2
2.	Check List for Interview	3
3.	General Description	5
4.	Electrical Component Location	8
5.	Engine Control Module (ECM) I/O Signal	17
6.	Engine Condition Data	22
7.	Data Link Connector	23
8.	General Scan Tool	24
9.	Subaru Select Monitor	27
10.	Read Diagnostic Trouble Code (DTC)	34
11.	Inspection Mode	35
12.	Drive Cycle	40
13.	Clear Memory Mode	42
14.	Compulsory Valve Operation Check Mode	43
15.	Malfunction Indicator Light	45
16.	Diagnostics for Engine Starting Failure	54
17.	List of Diagnostic Trouble Code (DTC)	69
18.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	74
19.	General Diagnostic Table	291

1. Basic Diagnostic Procedure

A: PROCEDURE

1. ENGINE

	Step	Check	Yes	No
1	**CHECK ENGINE START FAILURE.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4DOTC 2.5)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC 2.5)(diag)-54, Diagnostics for Engine Starting Failure.>
2	**CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.**	Does malfunction indicator light illuminate?	Go to step **3.**	Inspection using "General Diagnostic Table". <Ref. to EN(H4DOTC 2.5)(diag)-291, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool switch to ON. 4) Read the DTC on the Subaru Select Monitor or general scan tool.	Does the Subaru Select Monitor or general scan tool indicate DTC?	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnostics for malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC 2.5)(diag)-45, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSTIC.** 1) Perform clear memory mode. <Ref. to EN(H4DOTC 2.5)(diag)-42, Clear Memory Mode.> 2) Perform the "INSPECTION MODE". <Ref. to EN(H4DOTC 2.5)(diag)-35, Inspection Mode.>	Does the Subaru Select Monitor or general scan tool indicate DTC?	Check on "Diagnostic Chart with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-74, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnostic.

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
V.I.N.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Ambient air temperature	°C (°F)		
	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Place	❑ Highway ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Engine temperature	❑ Cold ❑ Warming-up ❑ After warming-up ❑ Any temperature ❑ Others:		
Engine speed	rpm		
Vehicle speed	km/h (MPH)		
Driving conditions	❑ Not affected ❑ At starting ❑ While idling ❑ At racing ❑ While accelerating ❑ While cruising ❑ While decelerating ❑ While turning (RH/LH)		
Headlight	❑ ON / ❑ OFF	Rear defogger	❑ ON / ❑ OFF
Blower	❑ ON / ❑ OFF	Radio	❑ ON / ❑ OFF
A/C compressor	❑ ON / ❑ OFF	CD/Cassette	❑ ON / ❑ OFF
Radiator fan	❑ ON / ❑ OFF	Car phone	❑ ON / ❑ OFF
Front wiper	❑ ON / ❑ OFF	CB	❑ ON / ❑ OFF
Rear Wiper	❑ ON / ❑ OFF		

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:
Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ❑ Yes/ ❑ No
❑ Low fuel warning light ❑ Charge indicator light ❑ AT diagnostic indicator light ❑ ABS Warning Light ❑ Oil pressure indicator light
b) Fuel level
• Lack of gasoline: ❑ Yes / ❑ No • Indicator position of fuel gauge: • Experienced running out of fuel: ❑ Yes / ❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes / ❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of other parts except genuine parts: ❑ Yes / ❑ No
• What: • Where:
f) Occurrence of noise: ❑ Yes / ❑ No
• From where: • What kind:
g) Occurrence of smell: ❑ Yes / ❑ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ❑ Yes / ❑ No
i) Troubles occurred
❑ Engine does not start ❑ Engine stalls during idling ❑ Engine stalls while driving ❑ Engine speed decreases ❑ Engine speed does not decrease ❑ Rough idling ❑ Poor acceleration ❑ Back fire ❑ After fire ❑ Does not shift ❑ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:
• All airbag system wiring harness and connectors are all colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the Airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.
• The ECM will be destroyed immediately.
• The fuel injector and other part will be damaged.

3) Do not disconnect the battery terminals while the engine is running.
• A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn OFF the ignition switch.

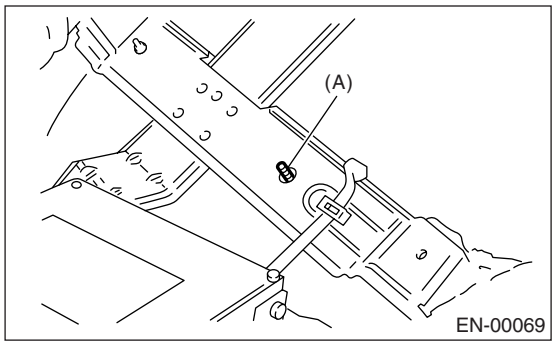
5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Remove the ECM from the located position after disconnecting two cables on battery.
Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid damaging the fuel injection system.

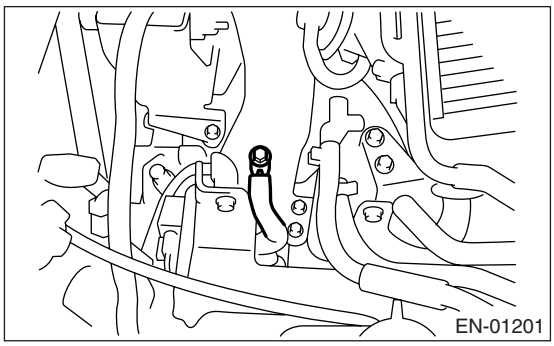
7) Connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts on the body head grounding point when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

9) Use engine ground terminal or engine proper as the grounding point to the body when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items above mentioned.
• Incorrect installation of the radio may affect the operation of the ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than five seconds to release pressure in the fuel system. If engine starts during this operation, run it until it stops.

13) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
14) On the model with ABS, when performing driving test in jacked-up or lifted-up position, sometimes the warning light may be lit, but this is not a malfunction of the system. The reason for this is the speed difference between the front and rear wheels. After diagnostic of engine control system, perform the ABS memory clearance procedure of self-diagnosis function.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems.

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

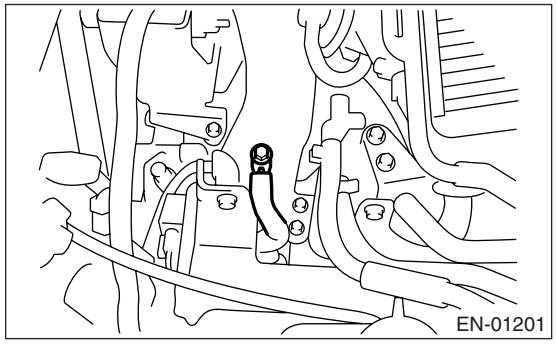
Standard voltage:
12 V

Specific gravity:
Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

Make sure the engine ground terminal is properly connected to the engine.



C: NOTE

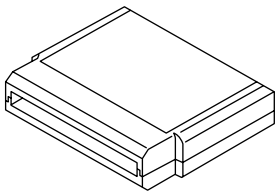
1. GENERAL DESCRIPTION

• On-board diagnostic (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with E-OBD Regulation. The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, the DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• When troubleshooting the vehicles complied with E-OBD regulation, connect Subaru Select Monitor or the general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• MFI system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric signal applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Excellent engine start and warm-up performance by the correction of engine coolant temperature and intake air temperature.

D: PREPARATION TOOL

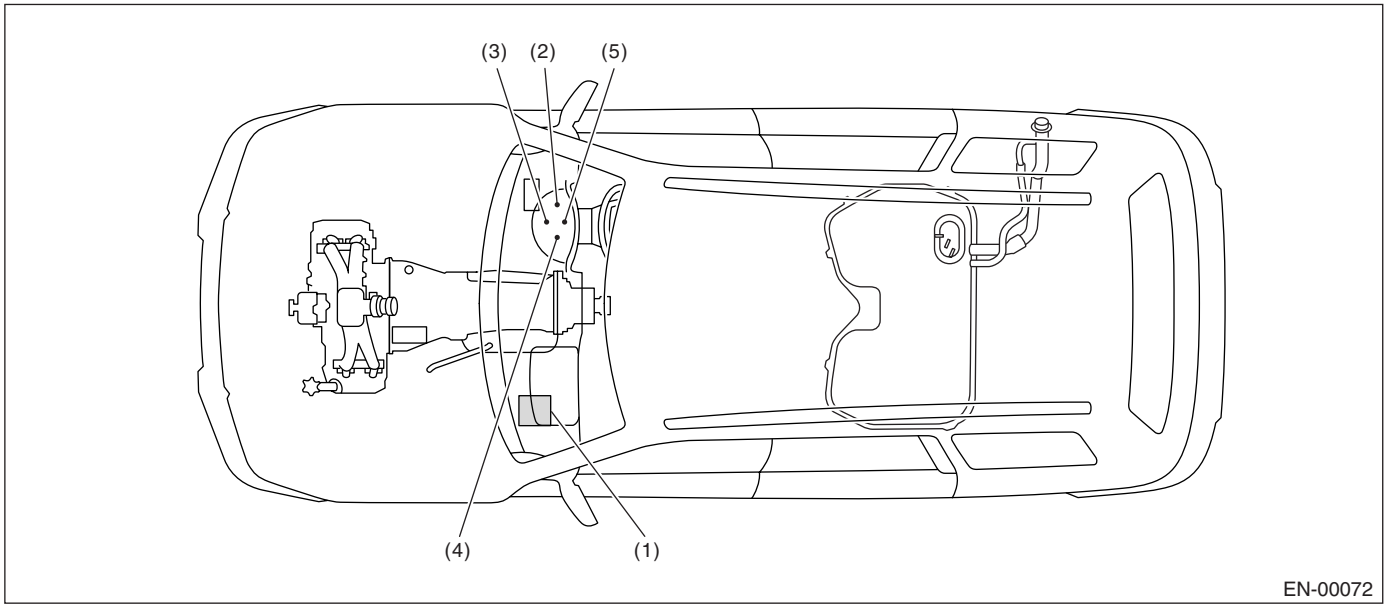
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

4. Electrical Component Location

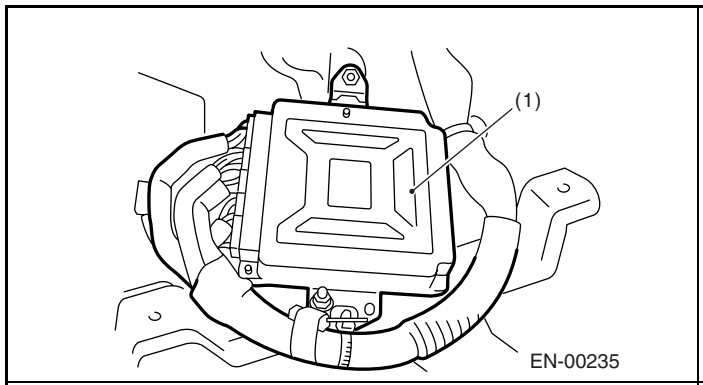
A: LOCATION

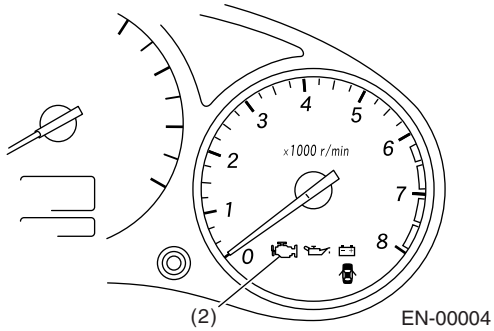
1. ENGINE

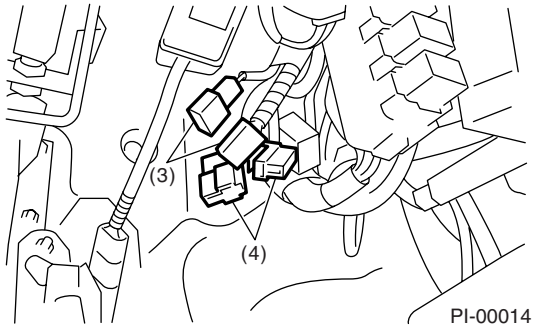
• CONTROL MODULE

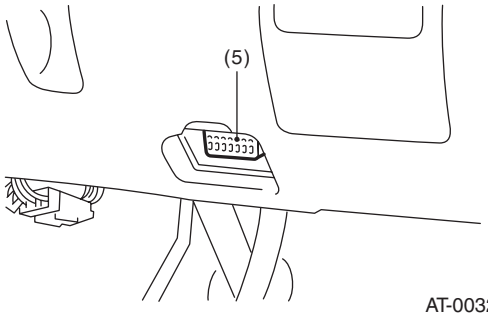


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test Mode Connector
(4) Diagnostic connector
(5) Data link connector

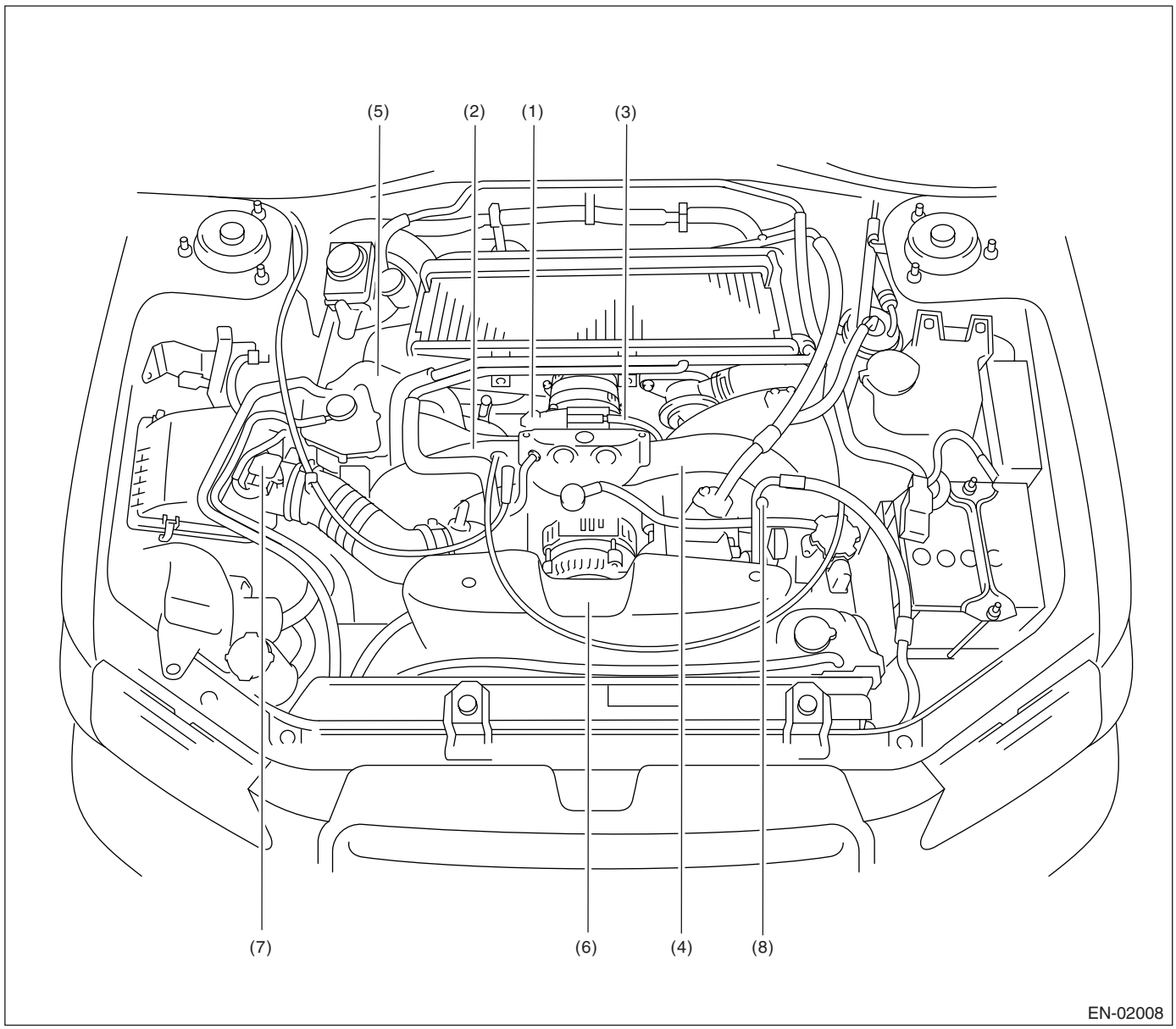




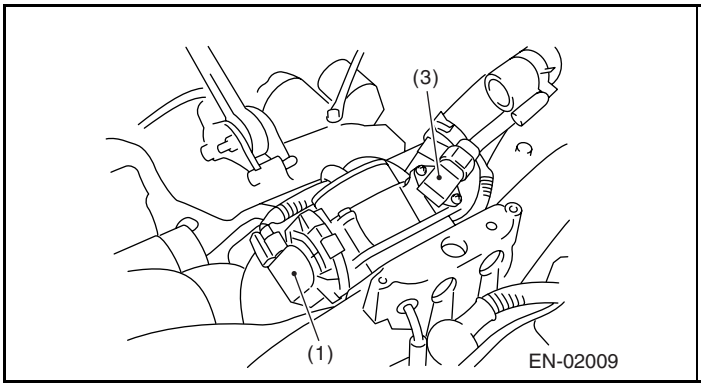


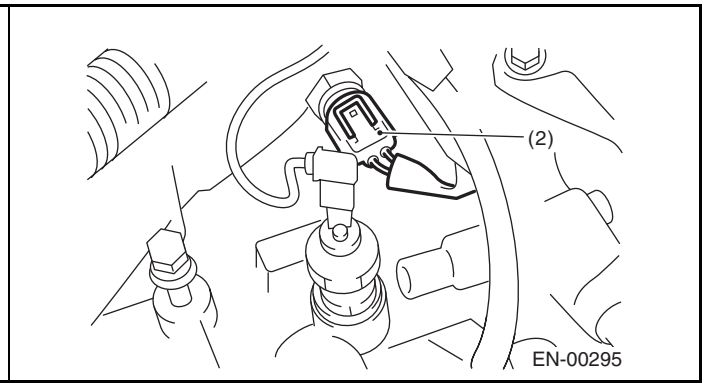


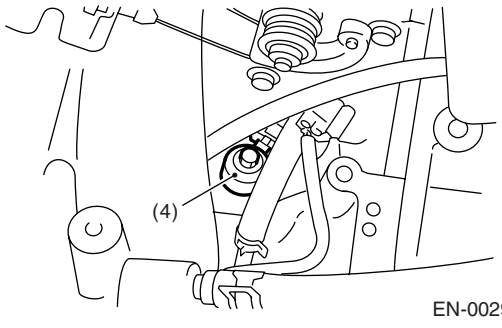
• SENSOR



(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Electronic throttle control
(4) Knock sensor
(5) Camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve position sensor



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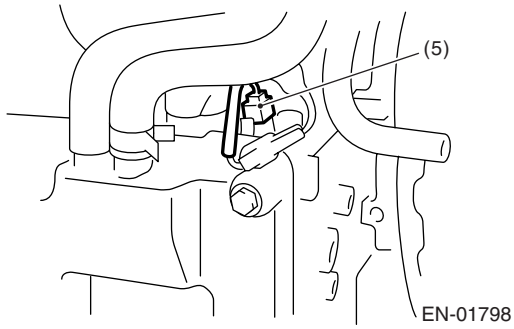
EN-00297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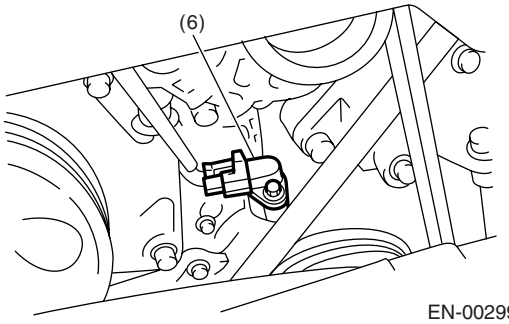
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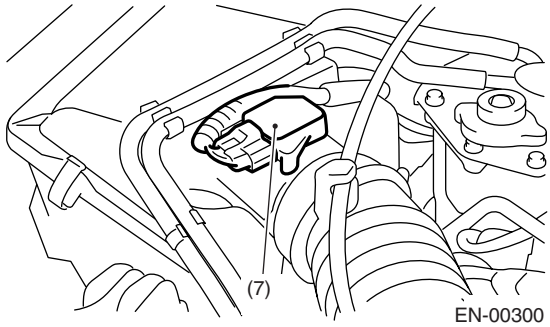
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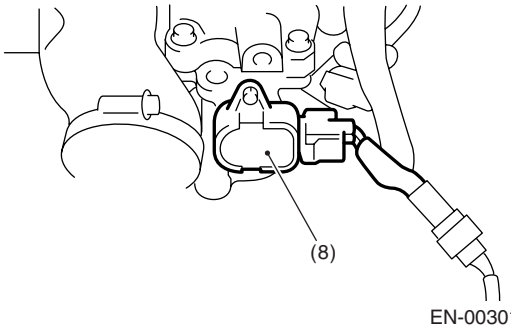
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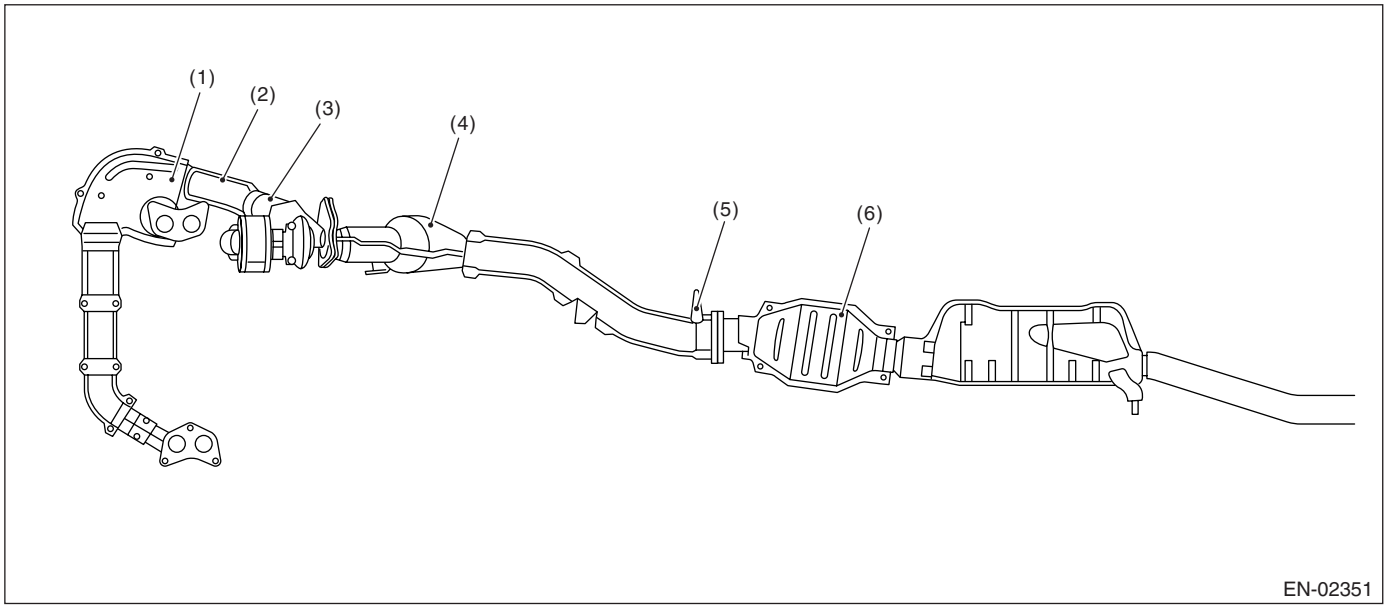
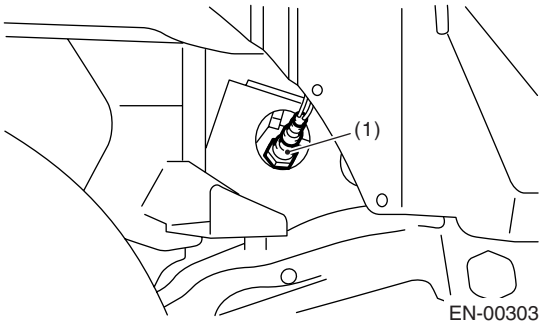
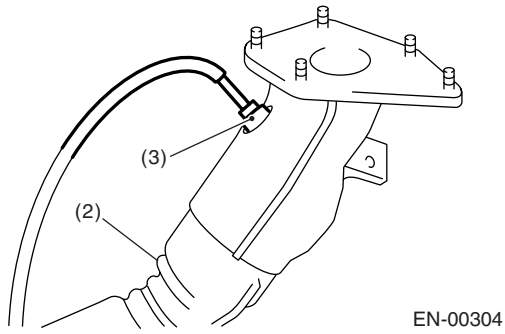
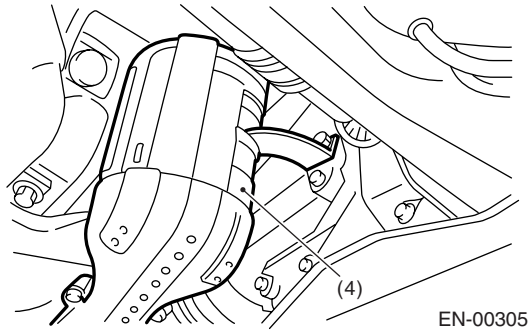
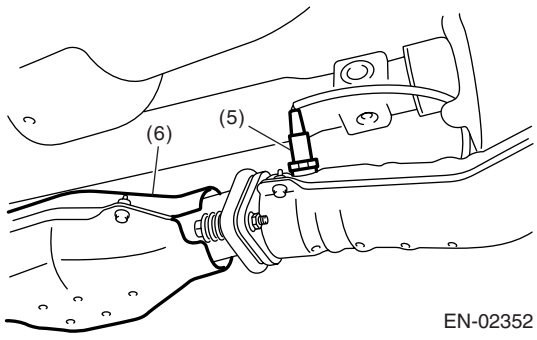


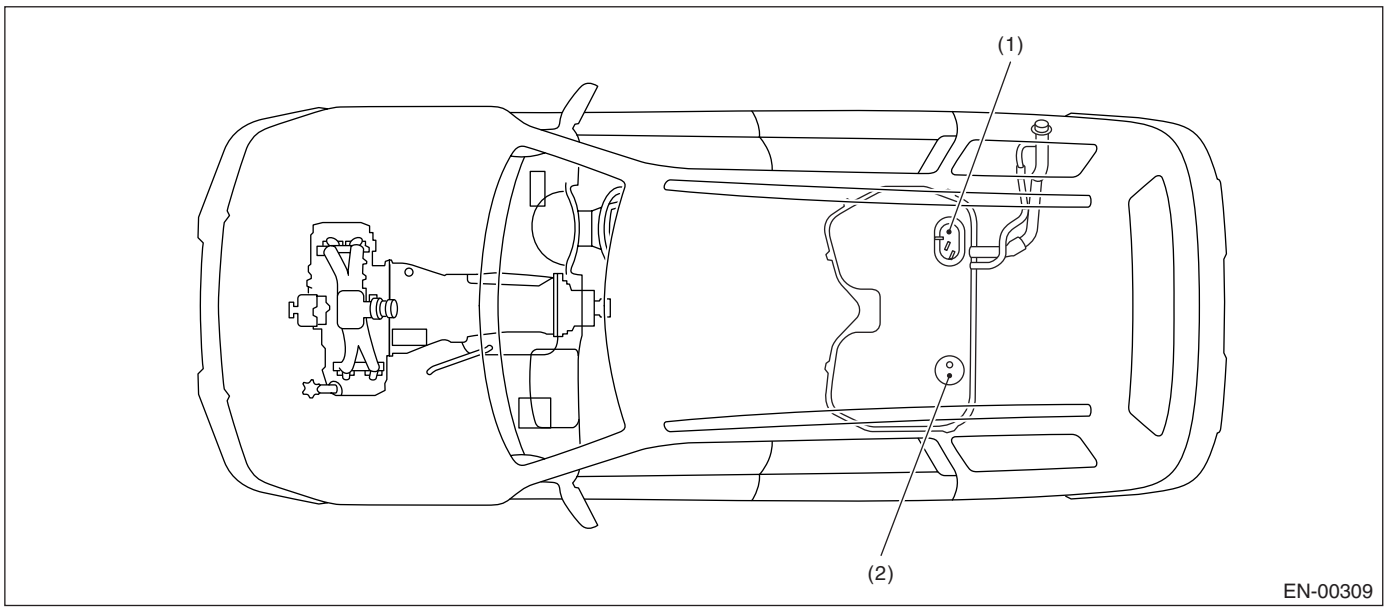
(1) Front oxygen (A/F) sensor
(2) Precatalytic converter
(3) Exhaust gas temperature sensor
(4) Front catalytic converter
(5) Rear oxygen sensor
(6) Rear catalytic converter



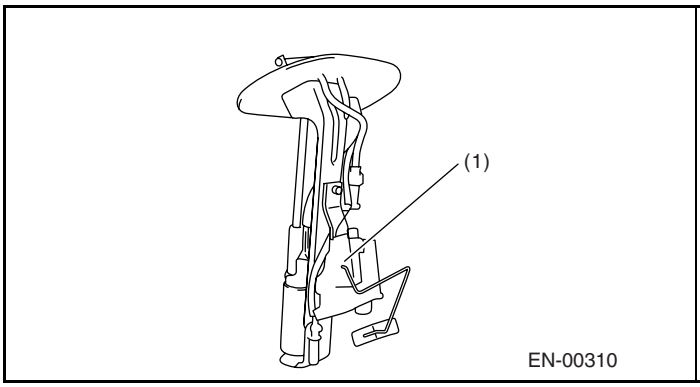


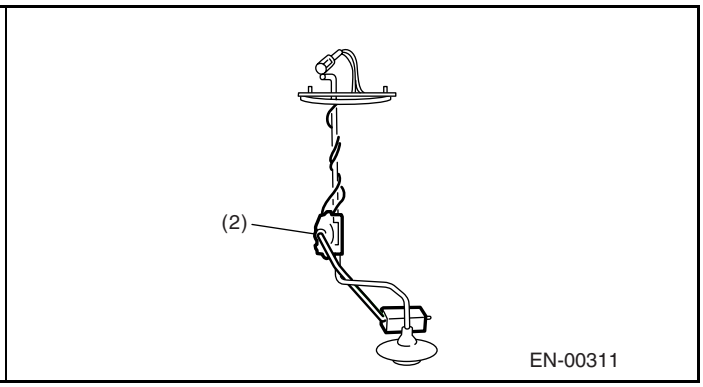




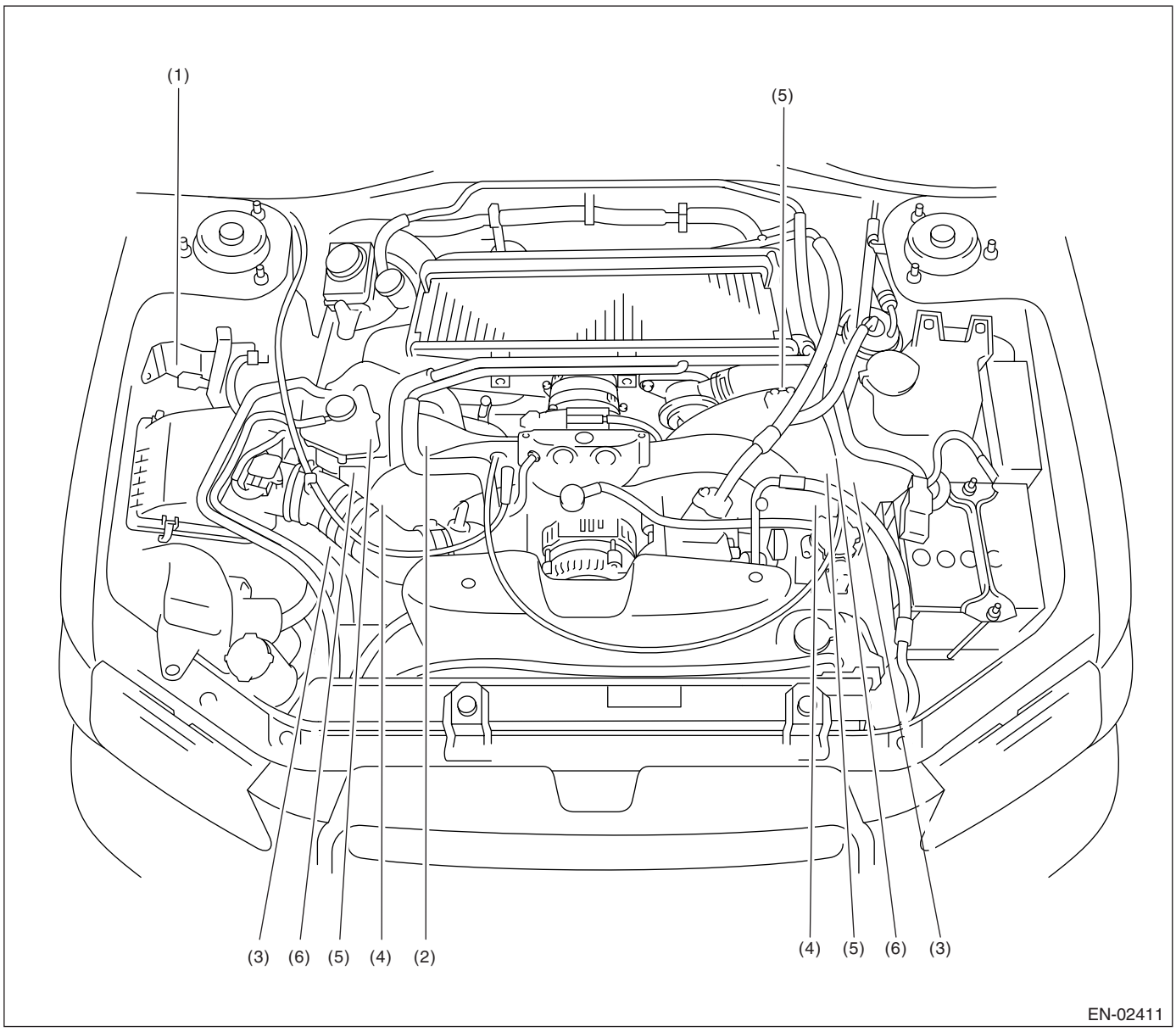


(1) Fuel level sensor (2) Fuel sub level sensor



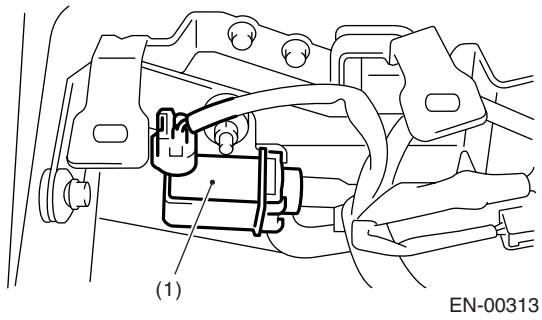


• SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



(1) Wastegate control solenoid valve
(2) Purge control solenoid valve
(3) Ignition coil
(4) Tumble generator valve actuator
(5) Oil flow control solenoid valve
(6) Injector

Electrical Component Location



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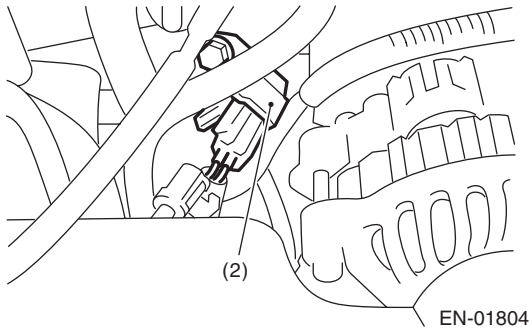

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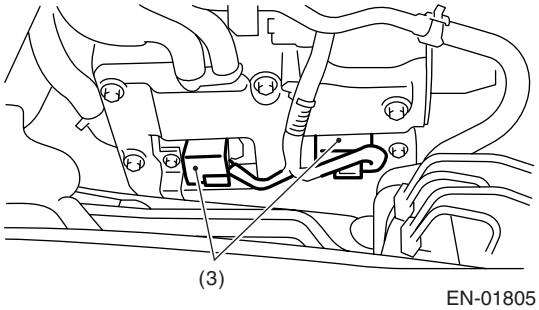

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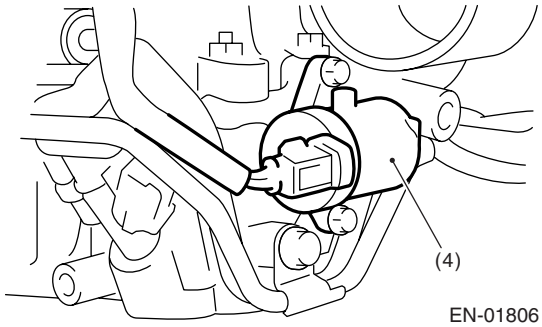

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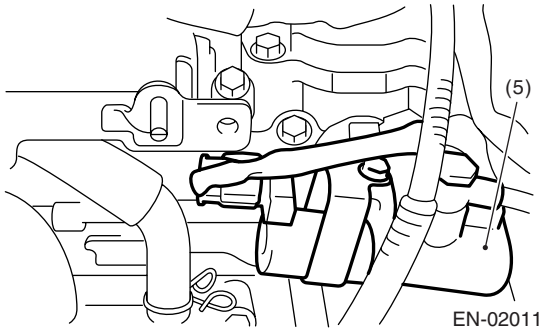

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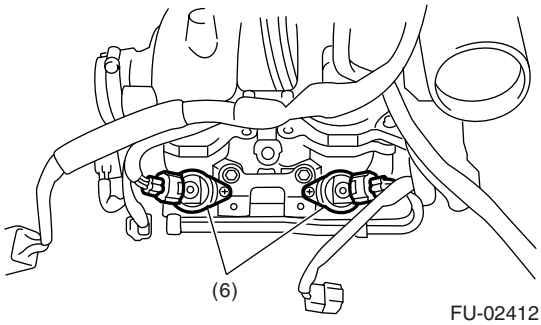
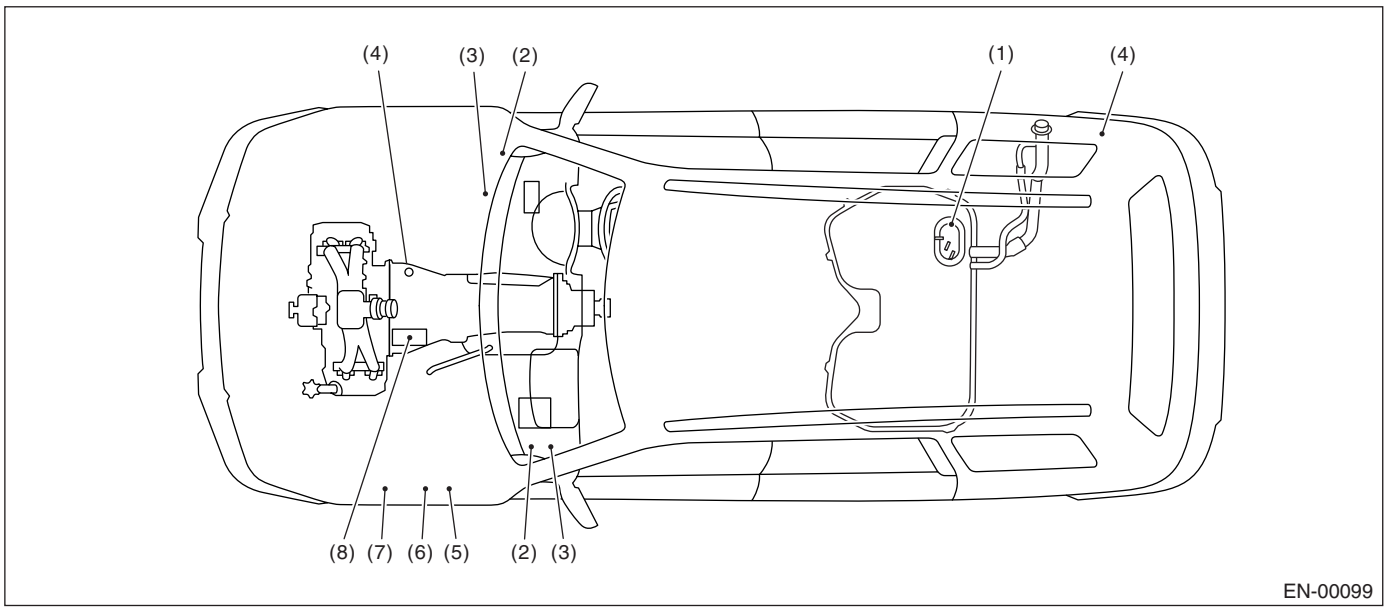
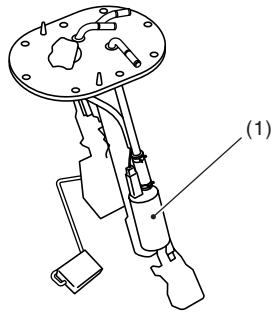


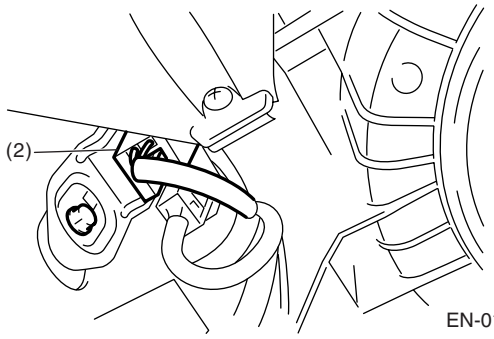
FU-02412



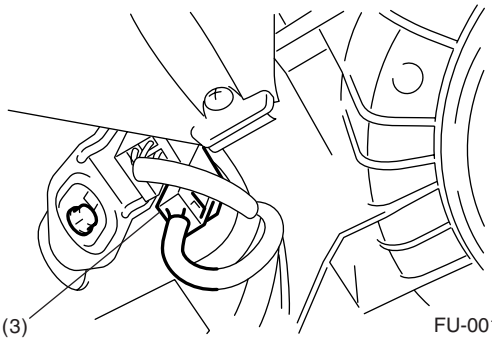
(1) Fuel pump
(2) Main relay
(3) Fuel pump relay
(4) Fuel pump control unit
(5) Radiator main fan relay
(6) Radiator sub fan relay
(7) Fan mode relay
(8) Starter



EN-00100

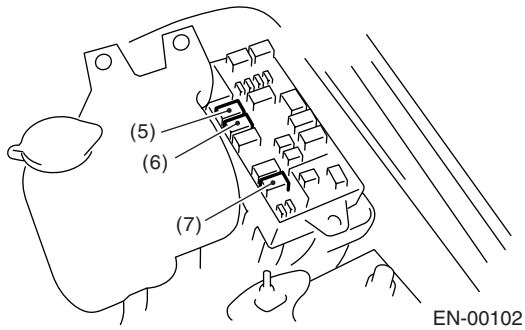


EN-01268

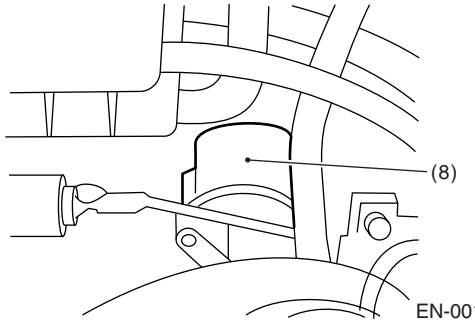


FU-00130

EN-00101



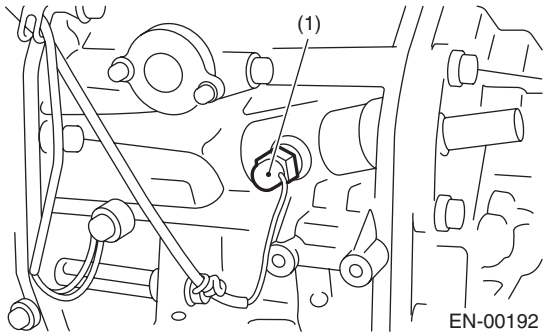
EN-00102



EN-00103

2. TRANSMISSION

• SOLENOID VALVE & SWITCH (MT MODEL)

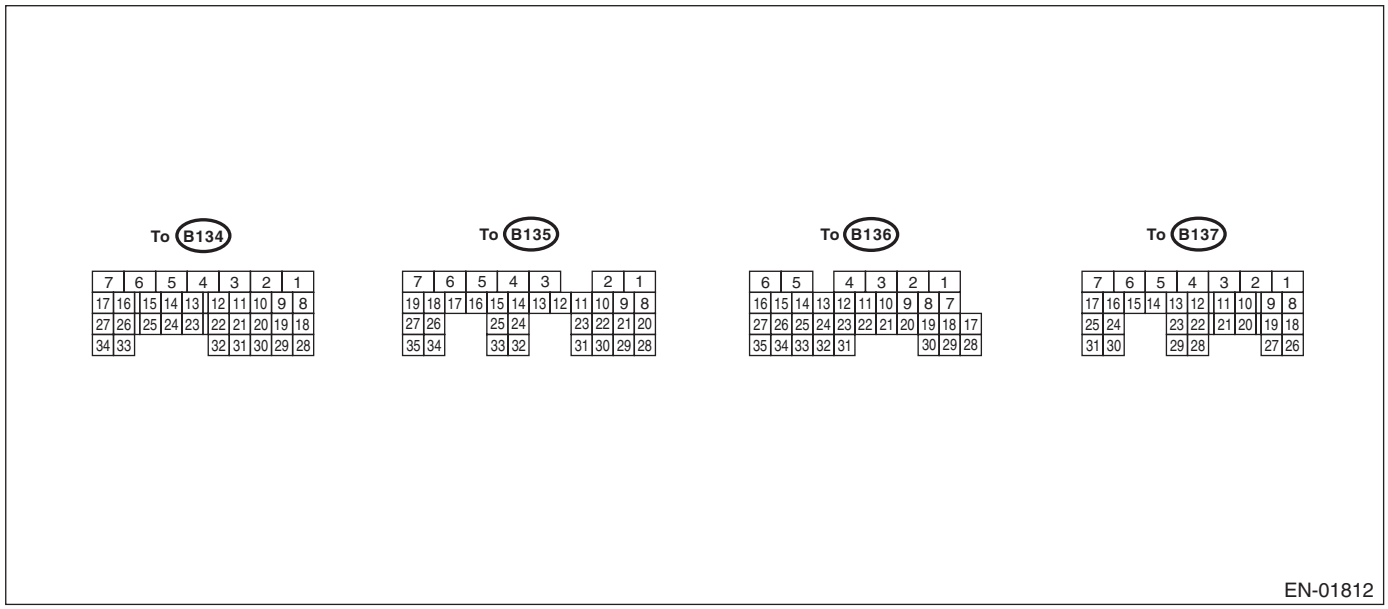


EN-00192

(1) Neutral Position Switch

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	–7 — +7	Waveform
	Signal (–)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Rear oxygen sensor	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
	GND (sensors)	B136	35	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	3	0 — 1.0	—	Waveform
	Signal 2	B134	2	0 — 1.0	—	Waveform
Rear oxygen sensor heater signal		B135	2	0 — 1.0	—	Waveform
Engine coolant temperature sensor	Signal	B136	14	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	GND (sensors)	B136	35	0	0	After engine is warmed-up.
Vehicle speed signal		B135	26	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.
Air flow sensor	Signal	B136	23	—	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	GND	B136	31	0	0	—
Intake air temperature sensor signal		B136	13	0.3 — 4.6	0.3 — 4.6	—
Exhaust gas temperature sensor	Signal	B136	24	—	—	—
	GND (sensors)	B136	35	0	0	—

Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Tumble generator valve position sensor RH	Signal	B136	27	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—
Tumble generator valve position sensor LH	Signal	B136	26	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B136	16	5	5	—
	GND (sensor)	B136	35	0	0	—
Tumble generator valve RH (open)		B134	9	0 or 10 — 13	0 or 13 — 14	Waveform
Tumble generator valve RH (close)		B134	8	0 or 10 — 13	0 or 13 — 14	Waveform
Tumble generator valve LH (open)		B134	11	0 or 10 — 13	0 or 13 — 14	Waveform
Tumble generator valve LH (close)		B134	10	0 or 10 — 13	0 or 13 — 14	Waveform
Wastegate control solenoid valve		B134	32	0 or 10 — 13	0 or 13 — 14	Waveform
Starter switch		B137	8	0	0	Cranking: 8 — 14
A/C switch		B137	17	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B137	16	10 — 13	13 — 14	—
Neutral Position Switch		B137	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 10 — 13	—
Test Mode Connector		B137	15	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B136	25	2.8	2.8	—
	Shield	B136	33	0	0	—
Back-up power supply		B135	19	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B135	5	10 — 13	13 — 14	—
		B135	6	10 — 13	13 — 14	—
Sensor power supply		B136	16	5	5	—
Ignition control	#1	B135	18	0	13 — 14	Waveform
	#2	B135	17	0	13 — 14	Waveform
	#3	B135	16	0	13 — 14	Waveform
	#4	B135	15	0	13 — 14	Waveform
Fuel injector	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
Fuel pump control unit	Diagnostic signal	B137	28	0 or 5	0 or 5	Waveform
	Control signal	B135	27	10 — 13	13 — 14	—
A/C relay control		B135	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan relay 1 control		B135	25	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Radiator fan relay 2 control		B135	24	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	Model with A/C only
Malfunction indicator light		B134	17	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B134	23	—	0 — 13 or more	Waveform
Purge control solenoid valve		B134	14	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	Waveform
Manifold absolute pressure sensor	Signal	B136	22	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B136	16	5	5	
	GND (sensors)	B136	35	0	0	
Small light switch		B137	12	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B137	13	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B137	11	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B137	10	10 — 13	ON: 0 OFF: 13 — 14	—
Front oxygen (A/F) sensor signal (+)		B134	33	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (−)		B134	26	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B134	25	0	0	—
SSM/GST communication line		B137	20	1 ←→ 4	1 ←→ 4	—
GND (injector)		B137	7	0	0	—
GND (ignition system)		B135	12	0	0	—
GND (power supply)		B135	4	0	0	—
		B135	1	0	0	—
GND (control system)		B137	1	0	0	—
		B137	2	0	0	—
GND (Front oxygen (A/F) sensor heater 1)		B134	7	0	0	—
GND (Front oxygen (A/F) sensor heater 2)		B134	6	0	0	—
Camshaft position sensor (LH)		B135	8	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Waveform
Camshaft position sensor (RH)		B135	9	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Waveform
Fuel level sensor		B136	20	0.12 — 4.75	0.12 — 4.75	—
Electronic throttle control	Main	B136	18	0.64 — 0.72 Fully opens: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully opens: 3.96
	Sub	B136	29	1.51 — 1.58 Fully opens: 4.17	1.51 — 1.58 (After engine is warmed-up)	Fully closed: 1.48 Fully opens: 4.17
	Power supply	B136	16	5	5	—
	GND (sensor)	B137	3	0	0	—

Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B137	6	10 — 13	13 — 14	—
Electronic throttle control motor relay		B135	35	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	When ignition switch is turned to ON: ON
Oil flow control solenoid (LH)	Signal (+)	B134	19	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	29	0	0	—
Oil flow control solenoid (RH)	Signal (+)	B134	18	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
	Signal (–)	B134	28	0	0	—
Accelerator Pedal Position Sensor	Main	B136	17	Fully closed: 1 Fully opens: 3.5	Fully closed: 1 Fully opens: 3.5	—
	Power supply	B136	15	5	5	—
	GND (sensor)	B136	34	0	0	—
	Sub	B136	28	Fully closed: 1 Fully opens: 3.5	Fully closed: 1 Fully opens: 3.5	—
Main light		B134	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Clutch switch		B134	1	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 13 — 14	—
Brake switch 1		B136	9	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 13 — 14	—
Brake switch 2		B136	8	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 13 — 14 When brake pedal is released: 0	—
Main switch		B136	7	ON: 0 OFF: 5	ON: 0 OFF: 5	—
CAN Communication	Signal (+)	B137	18	Pulse signal		—
	Signal (–)	B137	26	Pulse signal		—
Immobilizer input/output		B137	19	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—
Immobilizer input/output		B137	27	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—

Description	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
Generator control	B134	22	0 — 6.5	0 — 6.5	—
Cruise control command switch	B136	7	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—
		11			

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Remarks	Specification
Engine load	1.9 — 3.9 (%): Idling
	6.7 — 14.6 (%): 2,500 rpm Racing

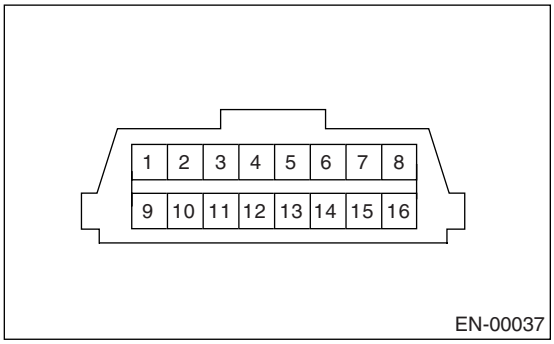
Measuring condition:
- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C to OFF.
- Turn all accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used both for general scan tools and the Subaru Select Monitor.

CAUTION:
Do not connect any scan tools other than the general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



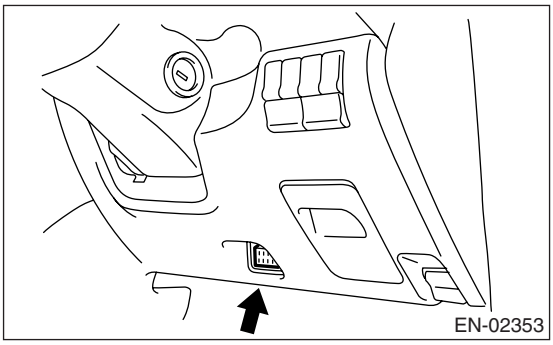
Terminal No.	Remarks	Terminal No.	Remarks
1	Power supply	9	Empty
2	Empty	10	Subaru Select Monitor/general scan tool signal
3	Empty	11	Empty
4	Empty	12	Ground
5	Empty	13	Ground
6	Line end check signal 1	14	Empty
7	Empty	15	Empty
8	Empty	16	Empty

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

1) Prepare a general scan tool required by SAE J1978.
2) Open the cover and connect the general scan tool to the data link connector located in the lower portion of the instrument panel (on the driver's side).



3) Using the general scan tool, call up the DTC and freeze frame data.
General scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain diagnostic trouble codes
(4) MODE $04: Clear/Reset emission-related diagnostic information
(5) MODE $06: Request of on-board monitoring test result for intermittent monitor system
(6) MODE $07: Request of on-board monitoring test result for continuous monitor system
(7) MODE $09: Request of vehicle information
Read out data according to repair procedures. (For detailed operation procedures, refer to the General Scan Tool Instruction Manual.)

NOTE:
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output or the powertrain system.

- A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC, malfunction indicator light status and diagnostic support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term whole fuel trim	%
0B	Intake manifold absolute pressure	kPa, mmHg
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate of mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Available OBD system	—
24	A/F value and A/F sensor output voltage	— and V
34	A/F value and A/F sensor current	— and mA

NOTE:
Refer to general scan tool manufacturer's instruction manual to access current powertrain diagnostic data (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnostic system.

- A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term whole fuel trim	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine speed	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate of mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%

NOTE:
Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

4. MODE $03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODES)

Refer to “Read Diagnostic Trouble Code (DTC)” for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(H4DOTC 2.5)(diag)-34, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (General scan tool trouble diagnostic information).

NOTE:
Refer to general scan tool manufacturer’s instruction manual to clear or reset emission-related diagnostic information (MODE $04).

6. MODE $07

Refers to the data of DTC (pending code) that for the first diagnostic result related emission.

7. MODE $09

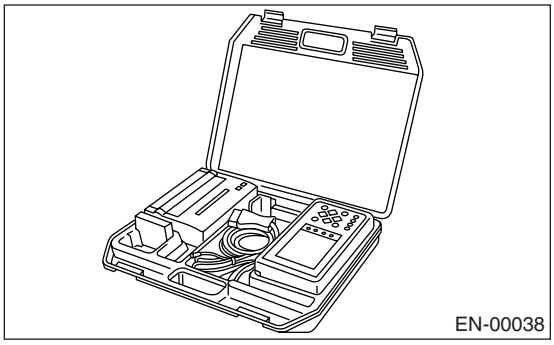
Refer to the data of vehicle specifications (V.I.N., calibration ID and etc.).

9. Subaru Select Monitor

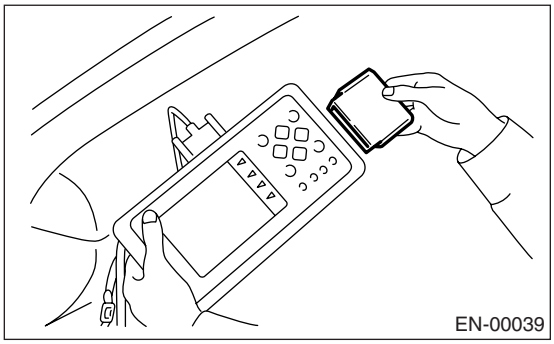
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

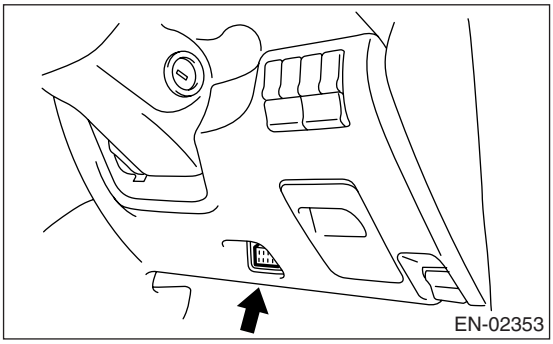
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC 2.5)(diag)-7, PREPARATION TOOL, General Description.>



2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC 2.5)(diag)-7, PREPARATION TOOL, General Description.>



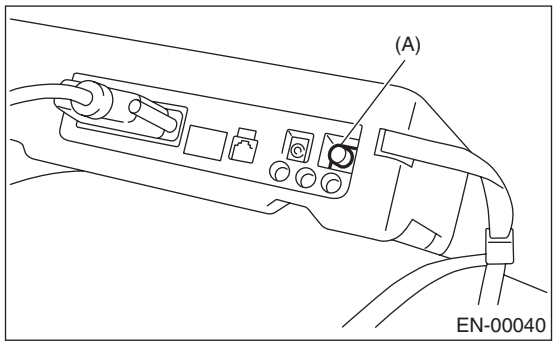
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTC. <Ref. to EN(H4DOTC 2.5)(diag)-34, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to indicate DTC. <Ref. to EN(H4DOTC 2.5)(diag)-34, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

• A list of the support data is shown in the following table.

Remarks	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Injection pulse width	Fuel Injection #1 Pulse	ms
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor lambda value	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor compensation	Knocking Correction	deg
Atmospheric pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg, kPa, inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generated valve position sensor signal (RH side)	TGV Position Sensor R	V
Tumble generated valve position sensor signal (LH side)	TGV Position Sensor L	V
Acceleration opening angle	Accel Opening Angle	%
VVT advance angle amount (R)	VVT Adv. Amount R	deg
VVT advance angle amount (L)	VVT Adv. amount L	deg
OCV duty R	OCV Duty R	%
OCV duty L	OCV Duty L	%
OCV current R	OCV current R	mA
OCV current L	OCV Current L	mA
Throttle motor duty	Throttle Motor Duty	%
Throttle power supply voltage	Throttle Motor Voltage	V
Sub throttle sensor voltage	Sub-Throttle Sensor	V
Main throttle sensor voltage	Main-Throttle Sensor	V
Sub acceleration sensor voltage	Sub-Accelerator Sensor	V
Main acceleration sensor voltage	Main-Accelerator Sensor	V
Memory vehicle speed	Memorized Cruise Speed	km/h
Alternate duty ratio	ALT Duty	%
Exhaust gas temperature signal	Exhaust gas temperature	°C
Estimated cumulative driving distance	Odd Meter	Km
Fuel level signal	Fuel Level Voltage	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Mass air flow sensor signal	Mass Air Flow	g/s

Remarks	Display	Unit of measure
Mass air flow sensor signal	Air Flow Sensor Voltage	V
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF
ETC motor relay	ETC Motor Relay	ON or OFF
Clutch SW	Clutch Switch	ON or OFF
Stop Light SW	Stop Light Switch	ON or OFF
SET/COAST SW	SET/COAST Switch	ON or OFF
RESUME/ACCEL SW	RESUME/ACCEL Switch	ON or OFF
Brake SW	Brake Switch	ON or OFF
Main SW	Main Switch	ON or OFF
Ignition switch signal	Ignition Switch	ON or OFF
Test Mode Signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch Signal	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Handle switch signal	Handle Switch	—
Wiper switch signal	Wiper Switch	ON or OFF
A/C mid pressure switch signal	A/C mid Pressure Switch	ON or OFF
AT coordinate retard angle demand	Retard Signal form AT	ON or OFF
AT coordinate fuel cut demand	Fuel Cut Signal from AT	ON or OFF
AT coordinate permission signal	Torque Permission Signal	ON or OFF
VDC not torque down output	Ban of Torque Down	ON or OFF
VDC torque down demand	Request Torque Down UDC	ON or OFF
Tumble generated valve output signal	TGV Output	ON or OFF
Tumble generated valve drive signal	TGV Drive	OPEN or CLOSE

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

5. READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» screen, select the {Current Data Display/Save}, and then press the [YES] key.
6) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.

• A list of the support data is shown in the following table.

Description	Display	Unit of measure
Number of diagnostic code	Number of Diagnosis Code	—
Condition of malfunction indicator light	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	No support
Monitoring test of fuel system	Fuel system monitoring	No support
Monitoring test of comprehensive component	Component monitoring	No support
Test of catalyst	Catalyst Diagnosis	No support
Test of heating-type catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	No support
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	No support
Test of oxygen sensor heater	O_2 Heater Diagnosis	No support
Test of EGR system	EGR system	No support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor #11	Oxygen Sensor #11	—
Oxygen sensor #12	Oxygen Sensor #12	—
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	others
A/F sensor output signal	A/F sensor #11	V
A/F lambda signal	A/F sensor #11	—
A/F lambda signal #11	A/F sensor #11	—
A/F sensor current #11	A/F sensor #11	mA

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.

• A list of the support data is shown in the following table.

Description	Display	Unit of measure
Diagnostic code of freeze frame data	Freeze Frame Data	Diagnostic code
Air fuel ratio control system for bank 1	Fuel System for Bank 1	Closed loop or open loop
Air fuel ratio control system for bank 2	Fuel System for Bank 2	—
Engine load data	Calculated load valve	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

7. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display» screen, select the {Data & LED Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

- A list of the support data is shown in the following table.

Description	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is ON.
Test Mode Signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is input.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Signal	ON or OFF	When crankshaft position sensor signal is input.
Camshaft position sensor signal	Camshaft Position Signal	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is ON.
Tumble generated valve actuator signal	TGV Output	ON or OFF	When TGV actuator signal is entered.
Tumble generated valve drive signal	TGV Drive	Close or Open	When TGV operates and valve opens.
Handle switch signal	Handle SW	Low Input or High Input	Illuminates in Low Input.
AT/MT identification terminal	AT Vehicle ID Signal	ON or OFF	ON (AT model).
Wiper switch signal	Wiper Switch	ON or OFF	When wiper switch is turned to ON.
A/C mid pressure switch signal	A/C Mid Pressure Switch	ON or OFF	When A/C mid pressure switch is turned to ON.
AT coordinate retard angle demand	Retard Signal from AT	ON or OFF	When AT retard angle signal is exists.
AT coordinate fuel cut demand	Fuel Cut Signal from AT	ON or OFF	When AT coordinate fuel cut demand signal is exists.
AT coordinate permission signal	Torque Permission Signal	ON or OFF	When AT coordinate permission signal is exists.
VDC not torque down out put	Ban of Torque Down	ON or OFF	When VDC not torque down output signal is exists.
VDC torque down demand	Request Torque Down VDC	ON or OFF	When VDC torque down demand signal is exists.
ETC motor relay signal	ETC Motor Relay	ON or OFF	When electronic throttle control relay is in function.
Clutch switch signal	Clutch Switch	ON or OFF	When clutch switch is ON.
Stop switch signal	Stop Light Switch	ON or OFF	When stop light switch is ON.

Description	Display	Message	LED “ON” requirements
SET/CST switch signal	SET/COAST Switch	ON or OFF	When SET/COAST switch is ON.
RES/ACC switch signal	RESUME/ACCEL Switch	ON or OFF	When RESUME/ACCEL switch is ON.
Brake switch signal	Brake Switch	ON or OFF	When brake switch is ON.
Main switch signal	Main Switch	ON or OFF	When main switch is ON.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

10. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» screen, select the {DTC Display}, and then press the [YES] key.
5) On the «Diagnostic Code(s) Display» screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes.
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to general scan tool manufacturer's instruction manual to access powertrain diagnostic trouble codes (MODE $03).

11.Inspection Mode

A: OPERATION

Perform the diagnostic on the “Diagnostic Trouble Codes (DTC) List” below.
Refer to the item of drive cycle when perform the diagnostic not on the “Diagnostic Trouble Codes (DTC) List” below. <Ref. to EN(H4DOTC 2.5)(diag)-40, Drive Cycle.>

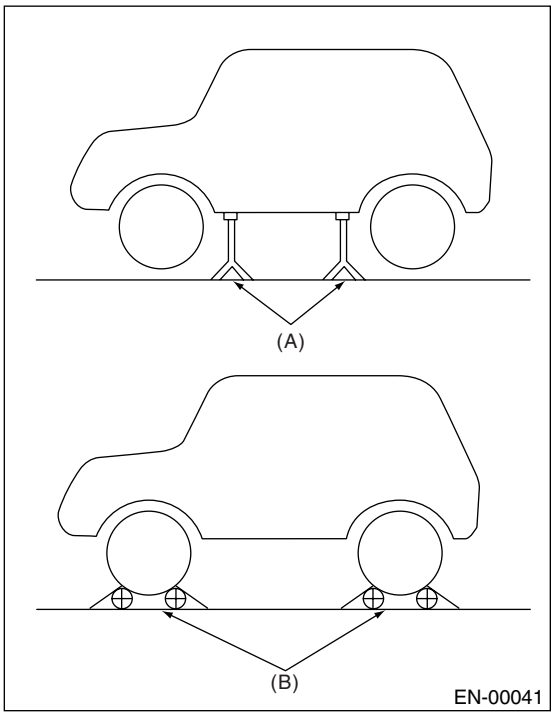
DTC	Item	On condition
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High Input	—
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low Input	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High Input	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Control System Malfunction (Fail-Safe)	—
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank 1	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0700	Transmission Control System (MIL Request)	—
P0851	Neutral Switch Input Circuit Low	—

DTC	Item	On condition
P0852	Neutral Switch Input Circuit High	—
P1160	Return Spring Failure	—
P1518	Starter Switch Circuit Low Input	—
P1544	High exhaust temperature detected	—
P1560	Back-Up Voltage Circuit Malfunction	—
P1570	ANTENNA	—
P1571	Reference Code Incompatibility	—
P1572	IMM Circuit Failure (Except Antenna Circuit)	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P1578	Meter Failure	—
P1579	Remote Control Starter Abnormal	—
P2006	Tumble Generated Valve System 1 (Valve Close)	—
P2007	Tumble Generated Valve System 2 (Valve Close)	—
P2008	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	—
P2009	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	—
P2011	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	—
P2012	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	—
P2016	Tumble Generated Valve Position Sensor 1 Circuit Low	—
P2017	Tumble Generated Valve Position Sensor 1 Circuit High	—
P2021	Tumble Generated Valve Position Sensor 2 Circuit Low	—
P2022	Tumble Generated Valve Position Sensor 2 Circuit High	—
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	—
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	—
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	—
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Rationality	—
P2138	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Rationality	—
P2228	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	—
P2229	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	—

1. PREPARATION FOR THE INSPECTION MODE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) Lift-up the vehicle using a garage jack and place it on rigid racks or drive the vehicle onto free rollers.

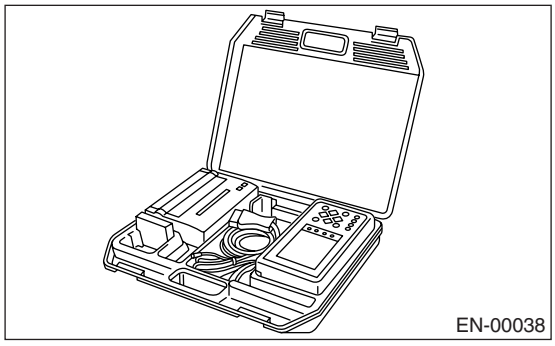
WARNING:
• Before raising the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



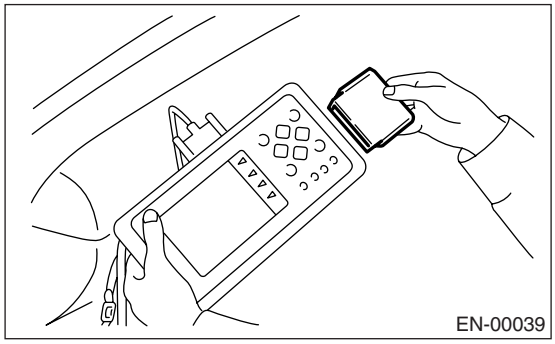
(A) Rigid rack
(B) Free rollers

2. SUBARU SELECT MONITOR

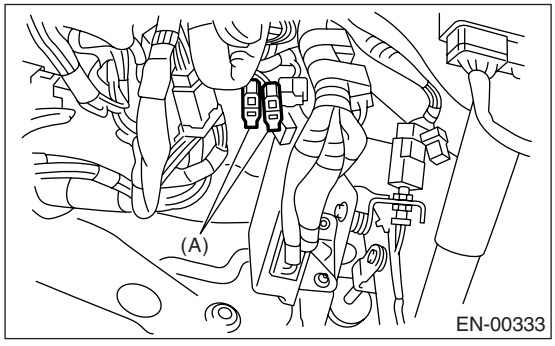
1) Idle the engine.
2) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC 2.5)(diag)-7, PREPARATION TOOL, General Description.>



3) Connect the diagnostic cable to Subaru Select Monitor.
4) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC 2.5)(diag)-7, PREPARATION TOOL, General Description.>

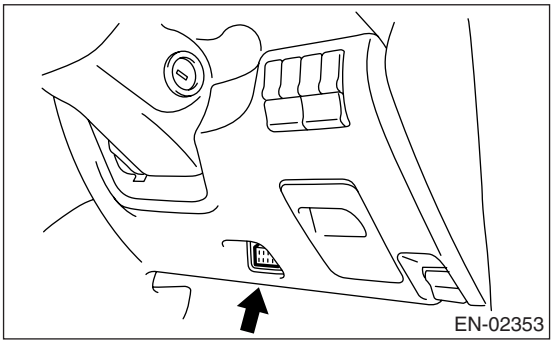


5) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



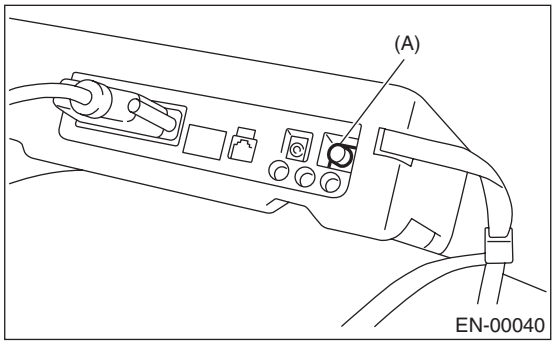
(A) Test Mode Connector

6) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

7) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

8) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
9) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
10) Press the [YES] key after the information of engine type was displayed.
11) On the «Engine Diagnosis» screen, select the {D Check} and press the [YES] key.
12) When the "Perform D Check?" is shown on the screen, press the [YES] key.
13) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:

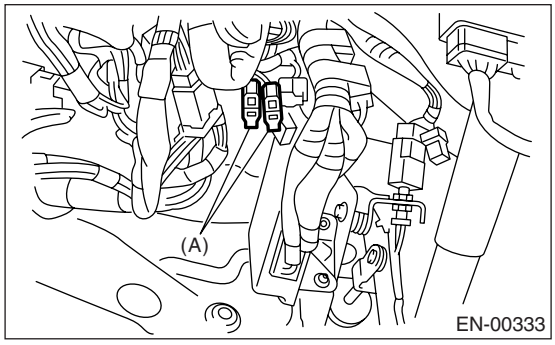
- For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
- For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>

- Release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnostic is finished, perform the ABS memory clearance procedure of self-diagnosis function. <Ref. to ABS(diag)-27, Clear Memory Mode.>

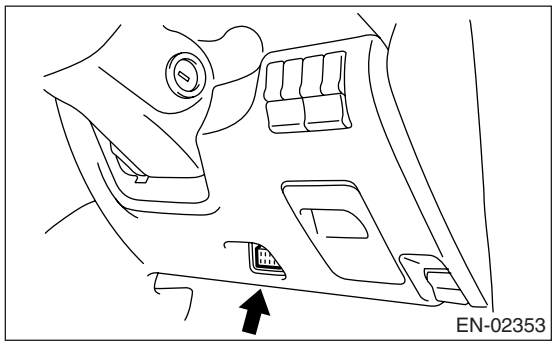
3. GENERAL SCAN TOOL

1) Idle the engine.
2) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



3) Connect the general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



4) Start the engine.

NOTE:

- Ensure the select lever is placed in the "P" range before starting. (AT model)
- Depress the clutch pedal when starting the engine. (MT model)

5) Using the select lever or shift lever, turn the "P" position switch and the "N" position switch to ON.
6) Depress the brake pedal to turn the brake switch ON. (AT model)
7) Keep the engine speed in the 2,500 — 3,000 rpm range for 40 seconds.

8) Place the select lever or shift lever in the “D” range (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When engine control diagnostic is finished, perform the ABS memory clearance procedure of self-diagnosis function. <Ref. to ABS(diag)-27, Clear Memory Mode.>

9) Using the general scan tool, check DTC(s) and record the result(s).

NOTE:
• For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
• For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: OPERATION

There are three driving patterns on diagnostic. Following trouble can be diagnosed with driving specified patterns. After repair the following trouble, be sure to check that the trouble is cleared correctly by the driving specified patterns.

1. PREPARATION FOR DRIVE CYCLE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) Disconnect the test mode connectors.

NOTE:
Be sure to perform the diagnostic after idling from starting the cooled engine except when the engine coolant temperature is specified.

2. DRIVE THE VEHICLE 20 MINUTES AT THE SPEED OF 80 KM/H (50 MPH), AND THEN IDLE THE ENGINE 1 MINUTE.

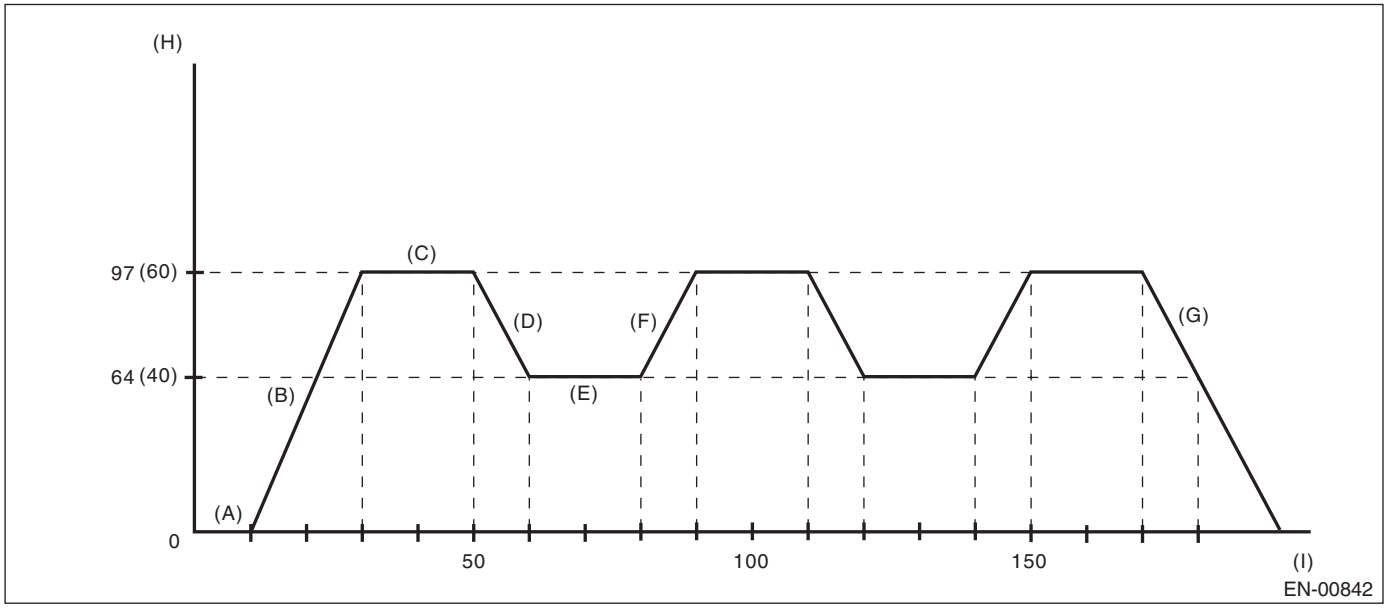
DTC	Item	On condition
P0546	Exhaust Gas Temperature Sensor Circuit High - Bank 1	—
P0692	Cooling Fan 1 Control Circuit High	—

3. 10 MINUTES IDLING

NOTE:
Drive the vehicle more than 10 km/h (6 MPH) before diagnostic.

DTC	Item	On condition
P0171	System Too Lean (Bank 1)	—
P0172	System Too Rich (Bank 2)	—

4. DRIVE THE VEHICLE WITH FOLLOWING DRIVE PATTERNS



(A) Run the engine at idle for more than 10 seconds.
(B) Accelerate the vehicle to 97 km/h (60 MPH) within 20 seconds.
(C) Drive the vehicle at 97 km/h (60 MPH) for 20 seconds.
(D) Slowdown the vehicle to 64 km/h (40 MPH) with throttle fully closed condition.
(E) Drive the vehicle at 64 km/h (40 MPH) for 20 seconds.
(F) Accelerate the vehicle to 97 km/h (60 MPH) within 10 seconds.
(G) Stop the vehicle with throttle fully closed condition.
(H) Vehicle speed km/h (MPH)
(I) (Sec.)

DTC	Item	On condition
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	—
P2004	Tumble Generated Valve System 1 (Valve Open)	—
P2005	Tumble Generated Valve System 2 (Valve Open)	—

13.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnostic» display screen, select the {Memory Clear} and press the [YES] key.
5) When the “Done” are shown on the display screen, turn the Subaru Select Monitor to OFF after turning the ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type was displayed.
4) On the «Engine Diagnostic» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Clear} and press the [YES] key.
6) When the “Perform Diagnostic Code(s) Clear?” is shown on the screen, press the [YES] key.
7) Turn the ignition switch to OFF and then turn the SUBARU SELECT MONITOR to OFF.

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

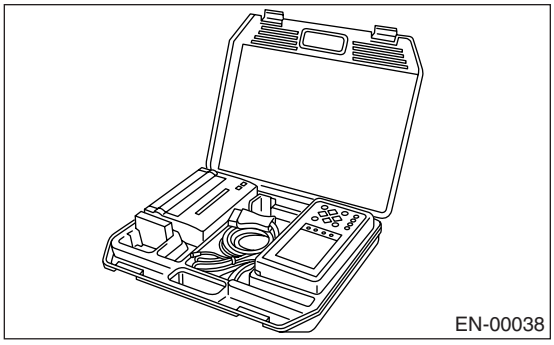
3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the General Scan Tool Instruction Manual.

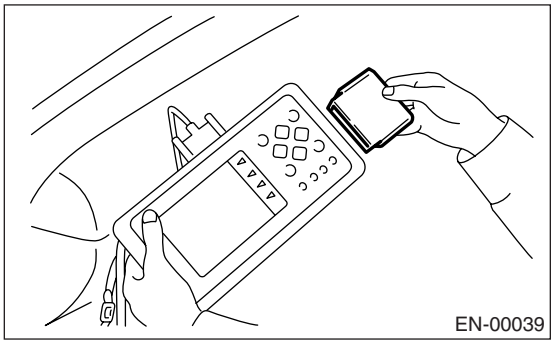
14. Compulsory Valve Operation Check Mode

A: OPERATION

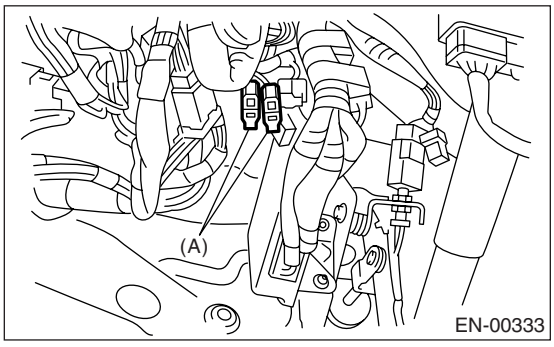
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC 2.5)(diag)-7, PREPARATION TOOL, General Description.>



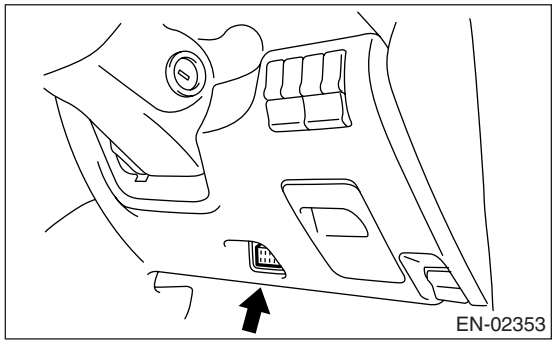
2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H4DOTC 2.5)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).

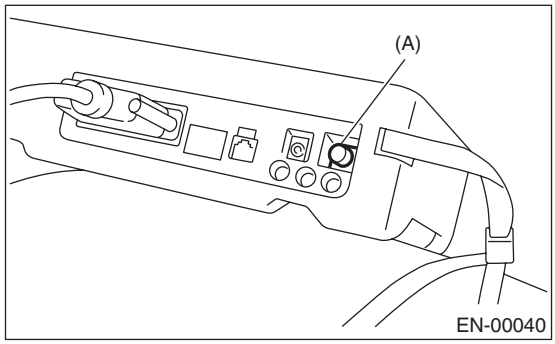


5) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
9) Press the [YES] key after the information of engine type was displayed.
10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.
11) On the «System Operation Check Mode» screen, select the {Actuator ON/OFF Operation} and press the [YES] key.
12) On the «Actuator ON/OFF Operation» screen, select the desired compulsory actuator and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

• A list of the support data is shown in the following table.

Description	Display
Compulsory fuel pump relay operation check	Fuel Pump
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid
Compulsory wastegate control solenoid operation check	Wastegate control solenoid

NOTE:

• The following parts will be displayed but not functional.

Display
EGR Solenoid
ASV Solenoid
FICD Solenoid
Vent. solenoid
Atmospheric pressure switching solenoid 1
AAI Solenoid
PCV Solenoid
Atmospheric pressure switching solenoid 2
EXH. Bypass control permit flag

• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

15.Malfunction Indicator Light

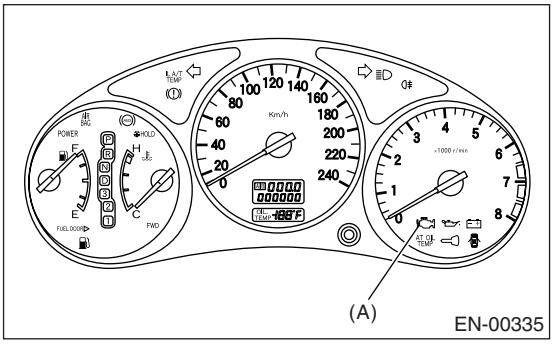
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC 2.5)(diag)-45, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC 2.5)(diag)-47, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC 2.5)(diag)-49, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>
↓
4. Malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOTC 2.5)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ, Malfunction Indicator Light.>
↓
5. Malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOTC 2.5)(diag)-52, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ, Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

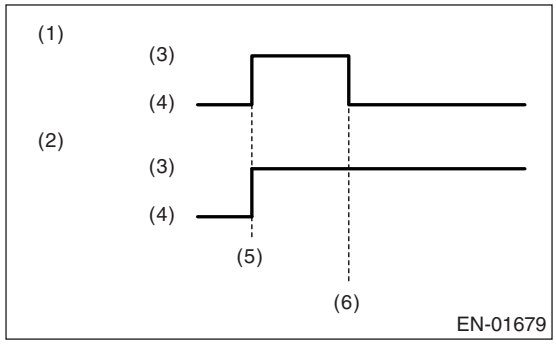
1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

NOTE:
If the malfunction indicator light does not illuminate, perform the diagnostic of malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC 2.5)(diag)-47, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>



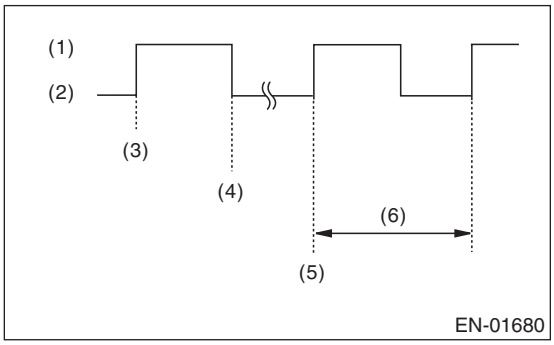
(A) Malfunction indicator light

2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



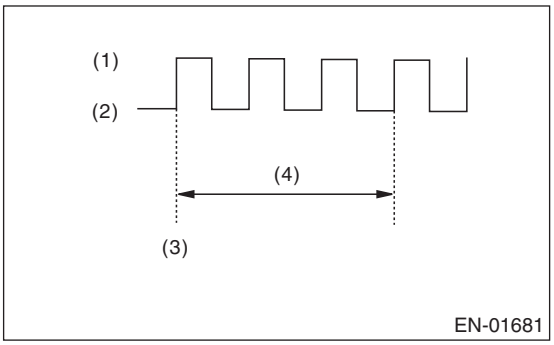
(1) No faulty
(2) Trouble occurs
(3) ON
(4) OFF
(5) Ignition switch ON
(6) Engine start

3) If the diagnostic system detects a misfire which could damage the catalyst, the malfunction indicator light will blink at a cycle of 1 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) Engine start
(5) Misfire start
(6) 1 second

4) When the ignition switch is turned to ON (engine off) or to “START” with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



(1) ON
(2) OFF
(3) Ignition switch ON
(4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

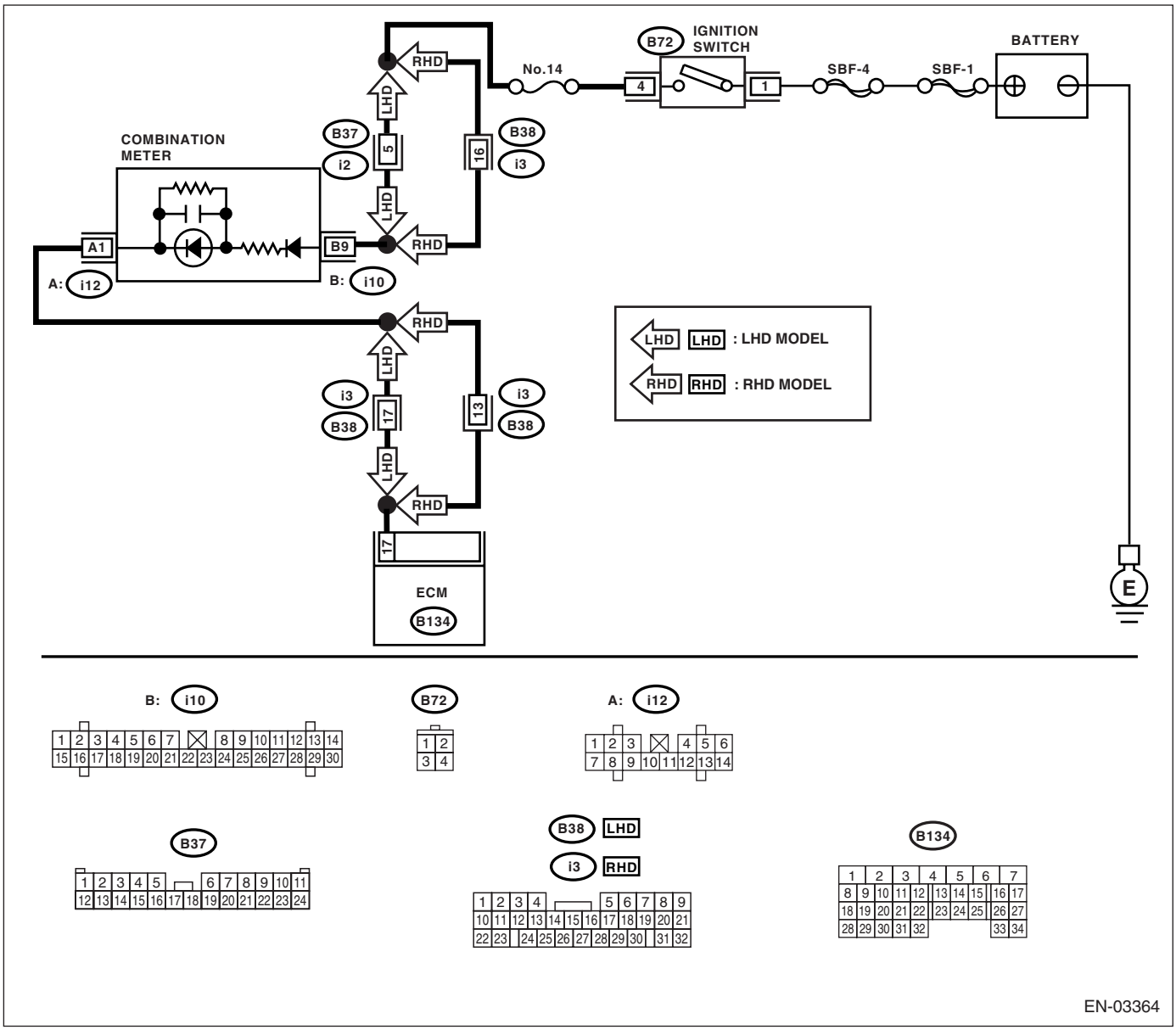
DIAGNOSTIC:

The malfunction indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the malfunction indicator light come on when shaking or pulling the ECM connector and harness?	Repair the poor contact in ECM connector.	Go to step **3.**
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 17 — (i12) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the board of combination meter. <Ref. to IDI-10, Combination Meter.>	Check the following and repair if necessary. NOTE: • Blown out of fuse (No. 14) • Open or short circuit in harness between fuse (No. 14) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

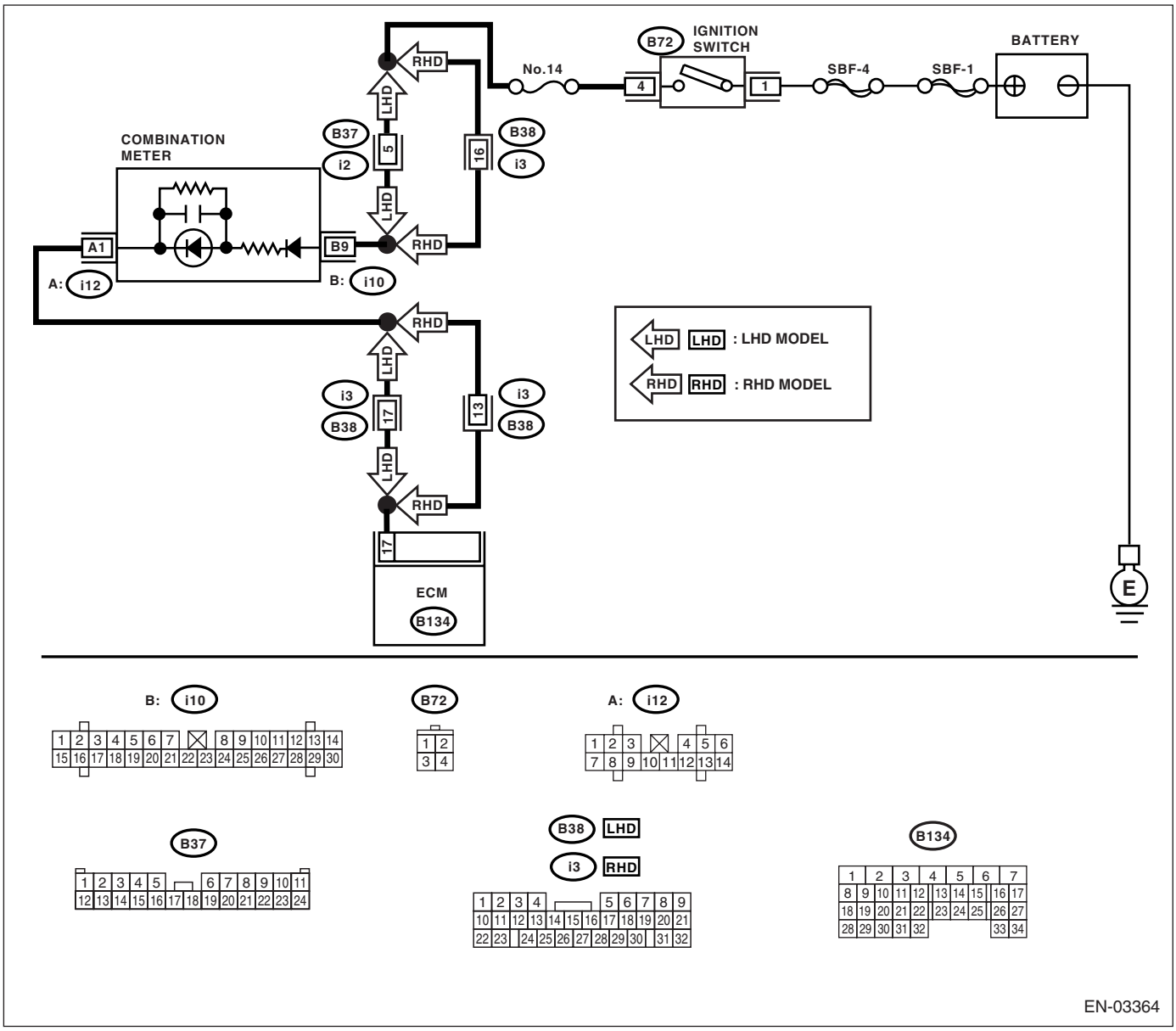
DIAGNOSTIC:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor or general scan tool display.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does malfunction indicator light illuminate?	Repair short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz

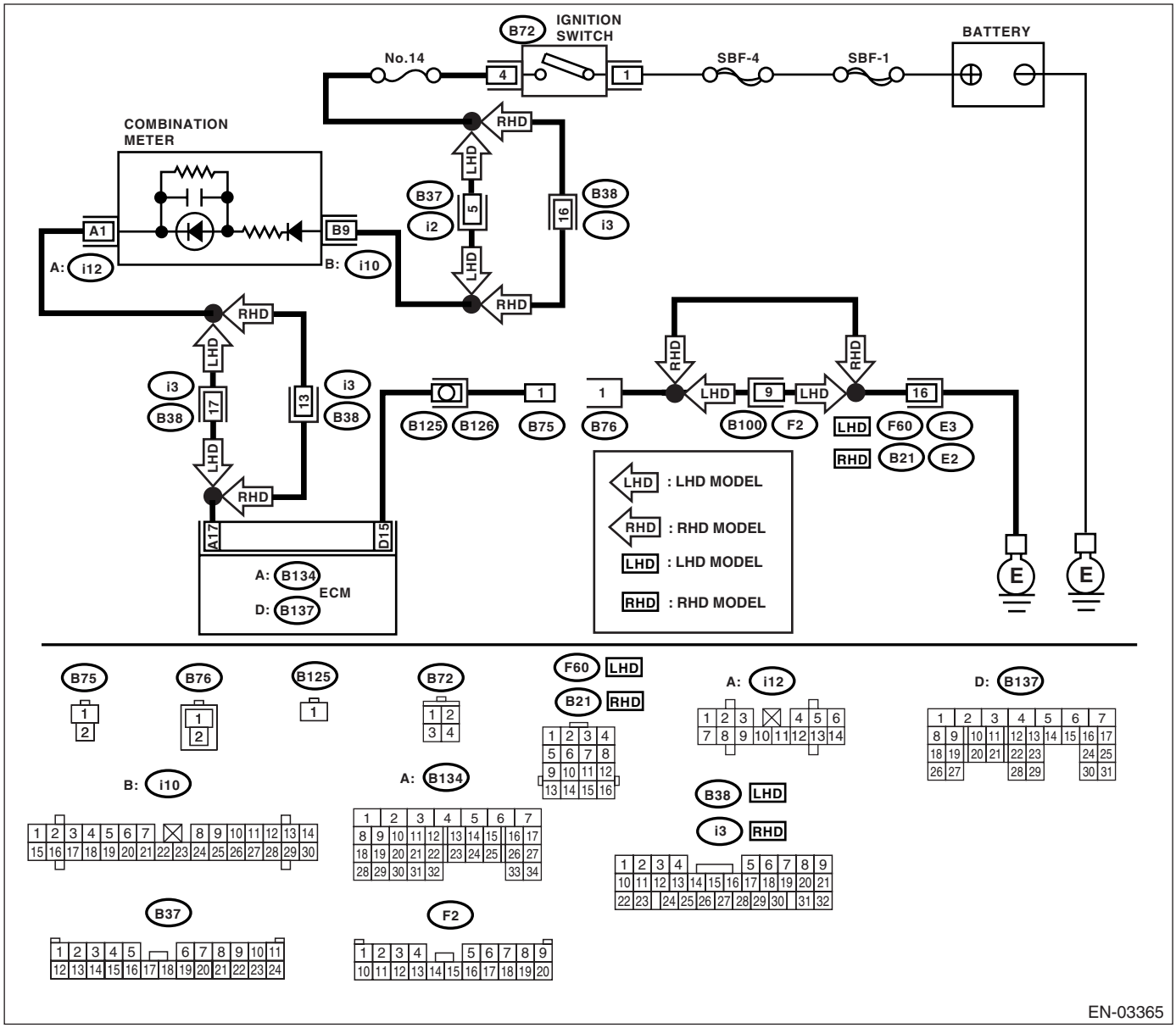
DIAGNOSTIC:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is in open.

TROUBLE SYMPTOM:

When in inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connectors. 3) Turn the ignition switch to ON. (engine OFF)	Does malfunction indicator light illuminate?	Go to step **2.**	Repair the malfunction indictor light circuit. <Ref. to EN(H4DOTC 2.5)(diag)-47, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does malfunction indicator light illuminate?	Repair ground short circuit in harness between combination meter and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and test mode connector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz

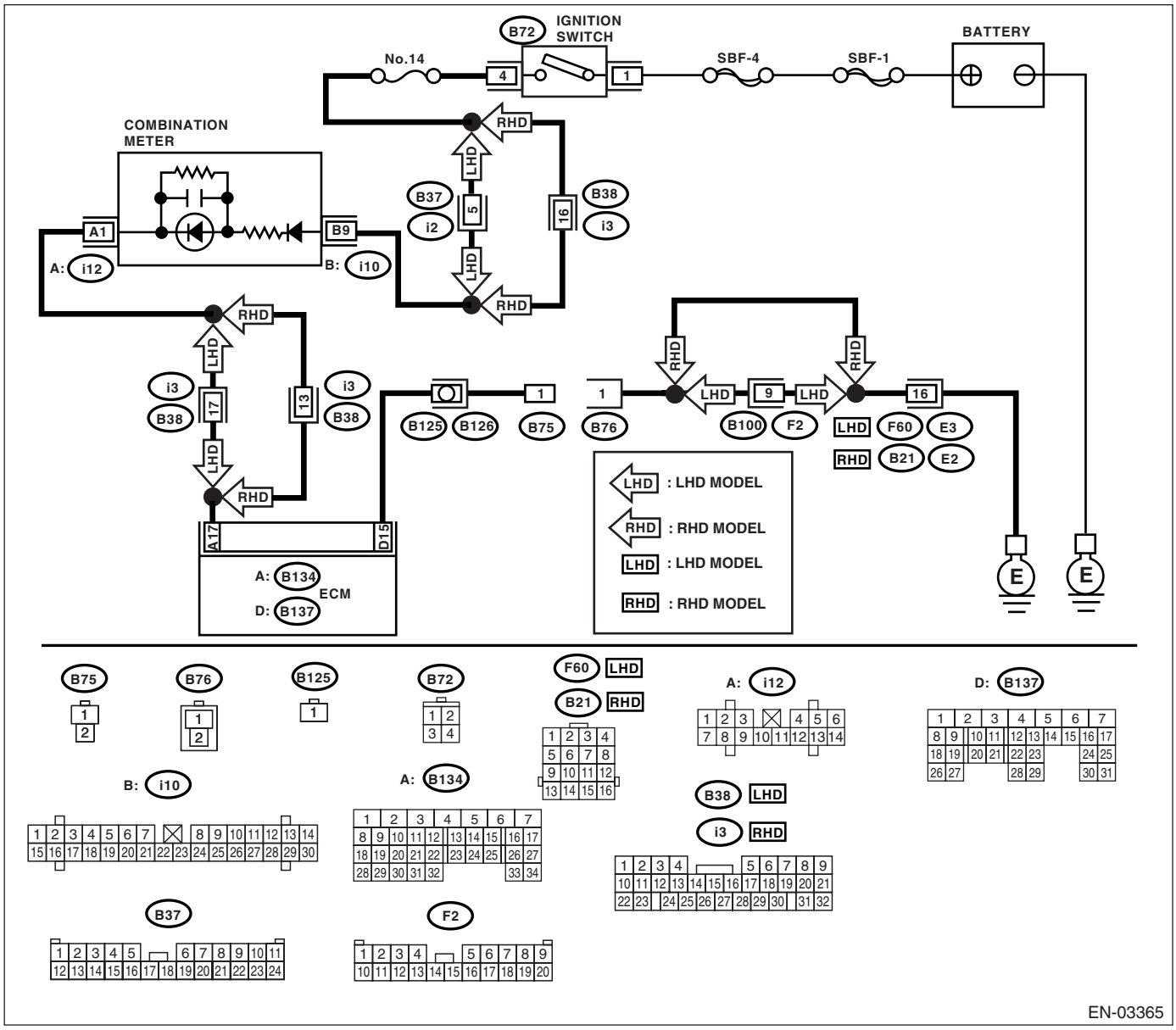
DIAGNOSTIC:

Test mode connector circuit is shorted.

TROUBLE SYMPTOM:

Malfunction indicator light blinks at a cycle of 3 Hz when the ignition switch is turned to ON.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connectors 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step **2.**	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUND TERMINAL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 15 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

16.Diagnostics for Engine Starting Failure

A: PROCEDURE

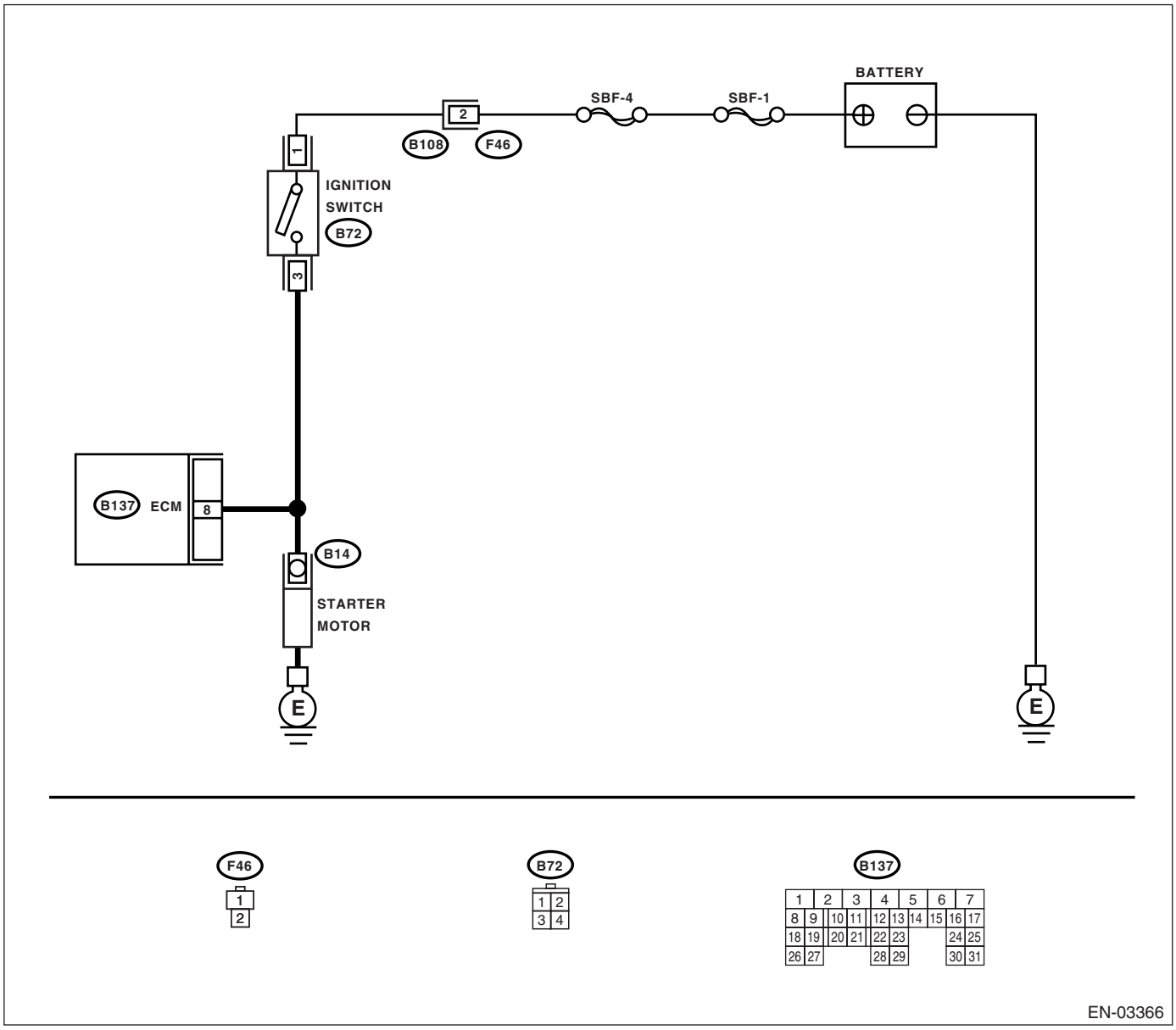
1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC 2.5)(diag)-55, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC 2.5)(diag)-58, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4DOTC 2.5)(diag)-61, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC 2.5)(diag)-64, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC 2.5)(diag)-66, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

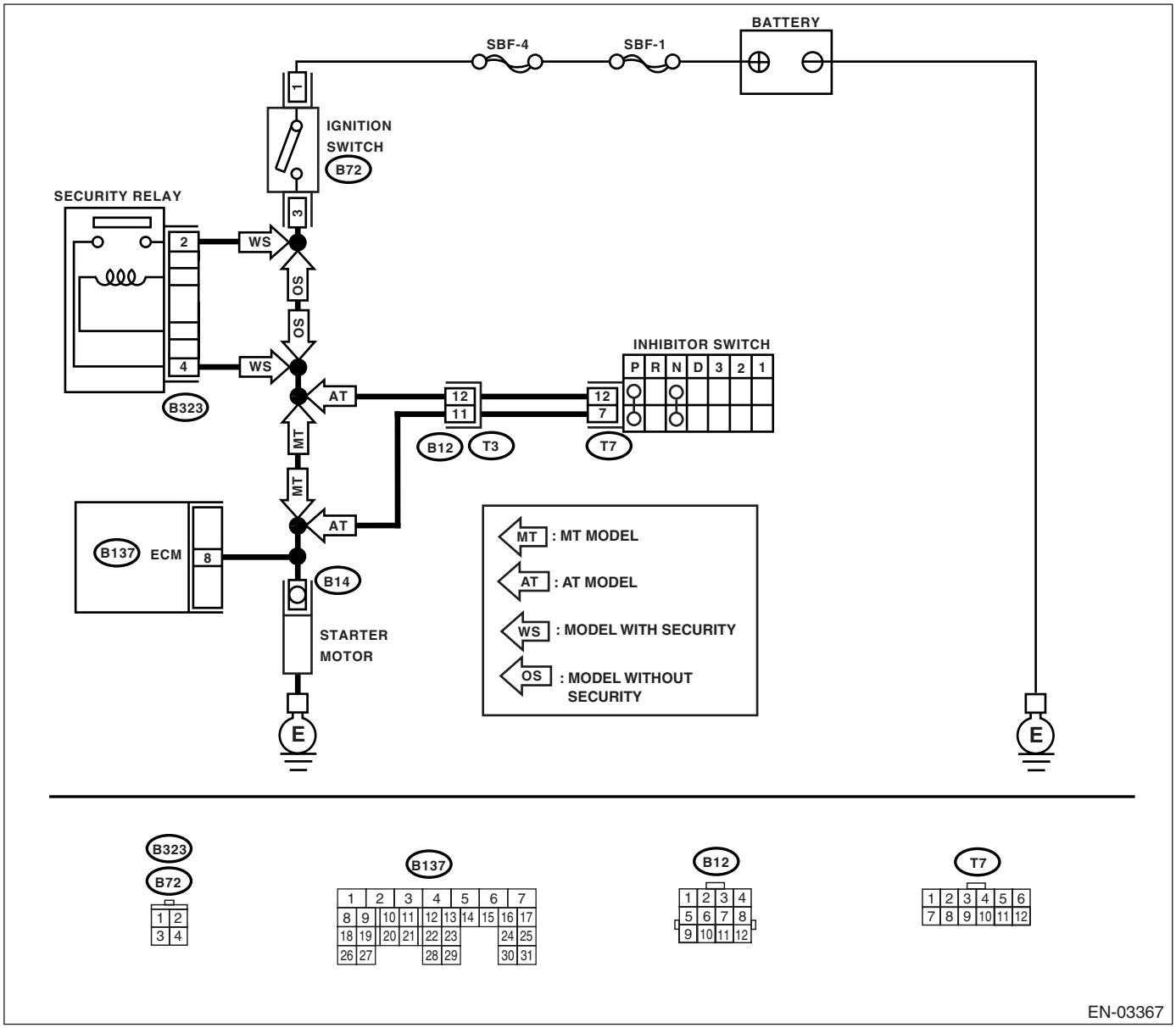
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


BATTERY
SBF-4
SBF-1
IGNITION SWITCH
B72
SECURITY RELAY
B323
INHIBITOR SWITCH
P R N D 3 2 1
B12
T3
T7
B137
ECM
B14
STARTER MOTOR
MT : MT MODEL
AT : AT MODEL
WS : MODEL WITH SECURITY
OS : MODEL WITHOUT SECURITY
E
EN-03367

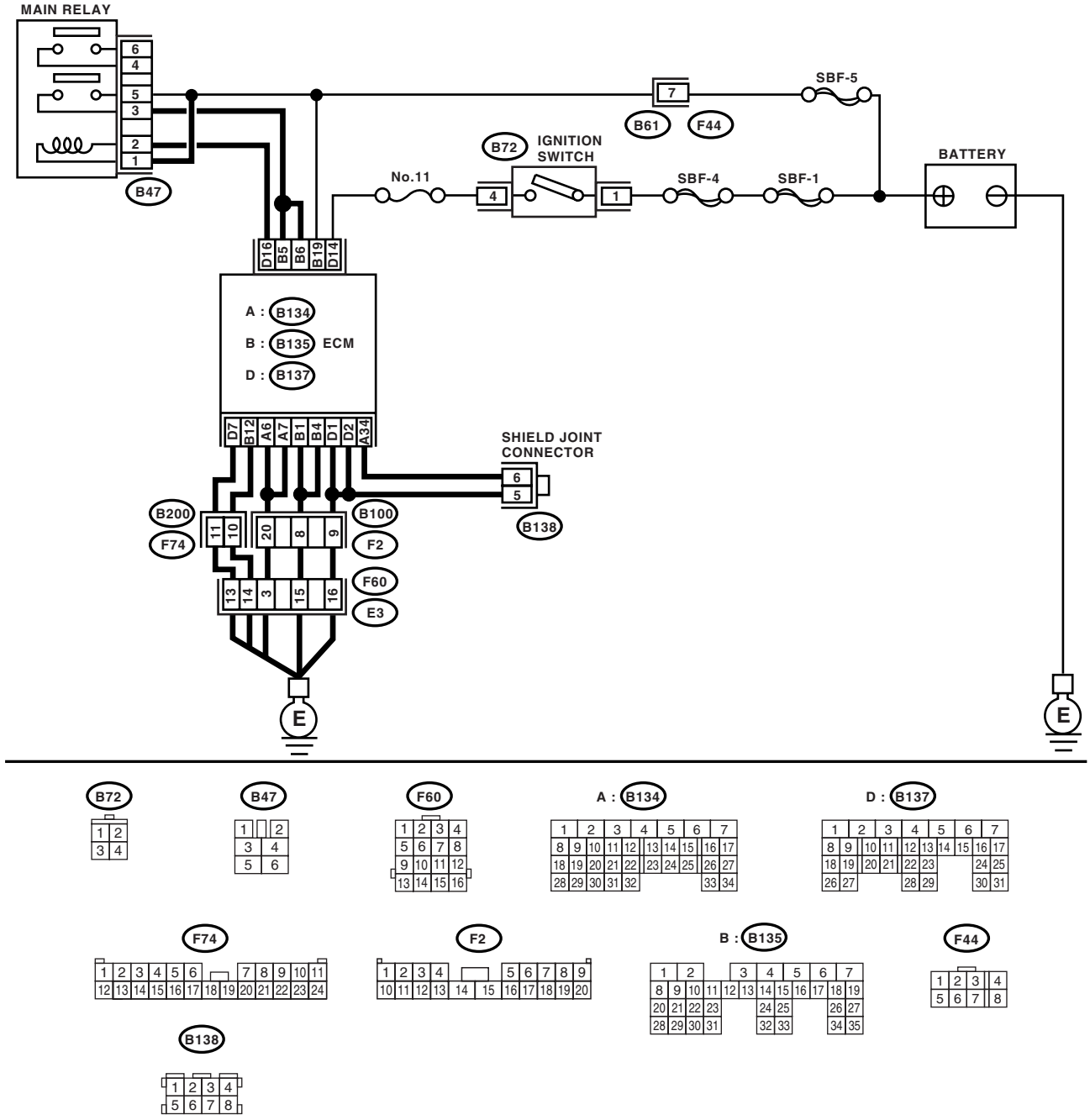
	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage more than 12 V?	Go to step **2.**	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Check ECM power supply and ground line. <Ref. to EN(H4DOTC 2.5)(diag)-58, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):*** NOTE: • For AT model, shift the select lever to “P” or “N” range. • For MT model, depress the clutch pedal.	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-6, Starter.>	Repair open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning the ignition switch to START. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 5 Ω?	Repair the poor contact in ignition switch.	Replace the ignition switch.

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

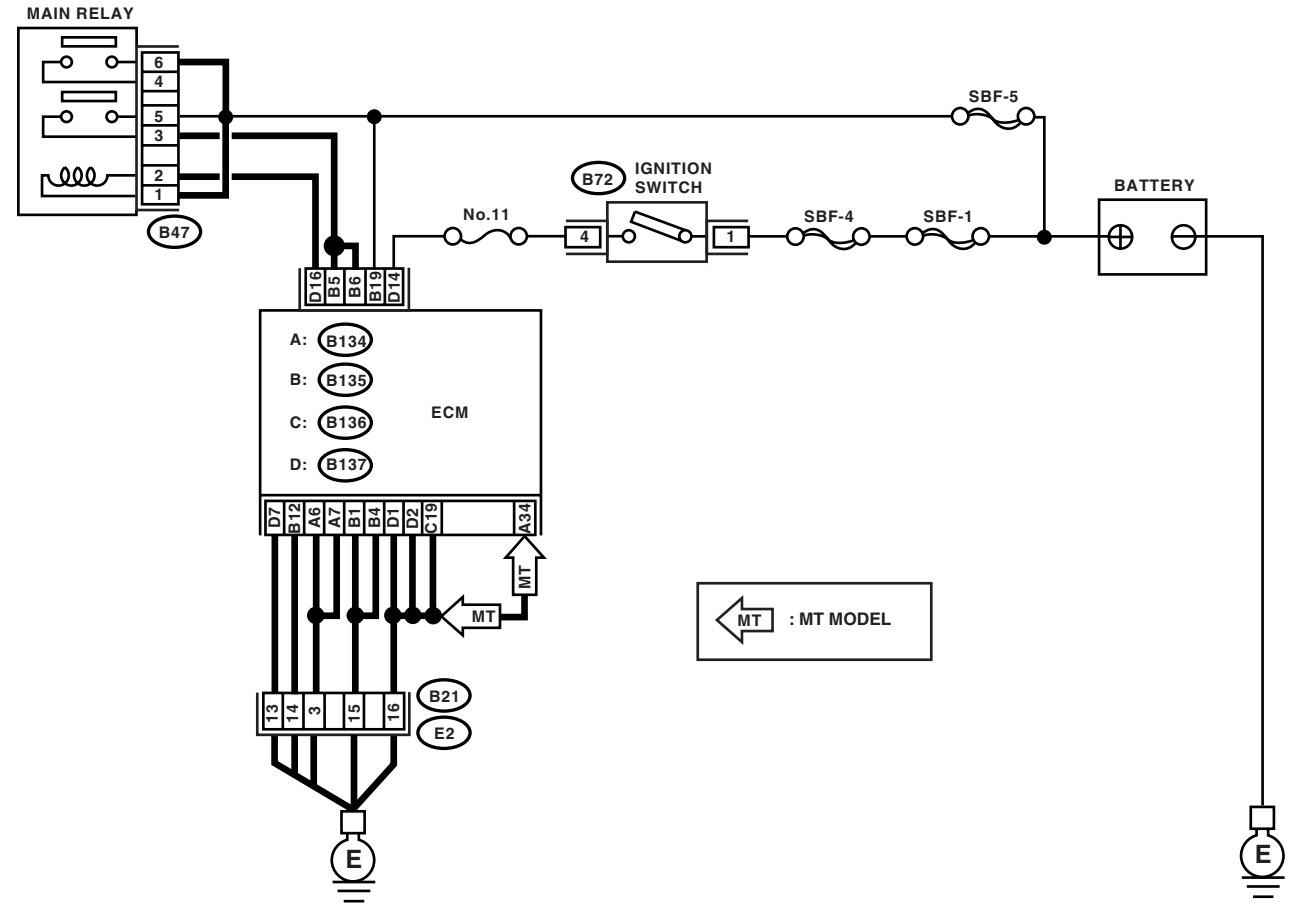
WIRING DIAGRAM:

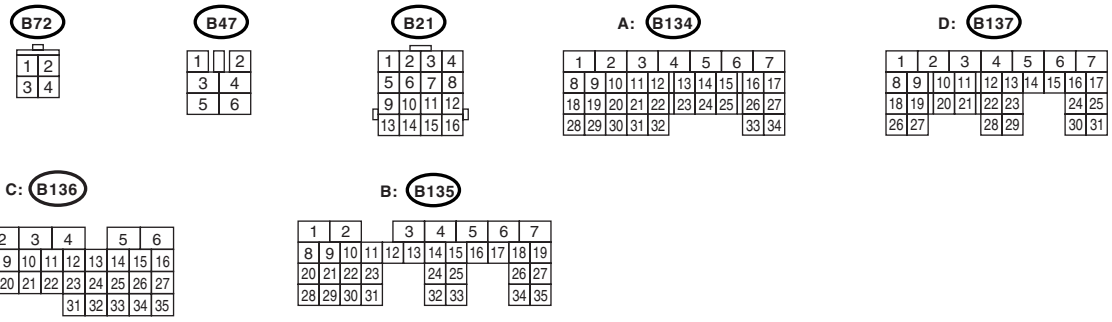
- **LHD MODEL**



EN-03368

- **RHD MODEL**





EN-03369

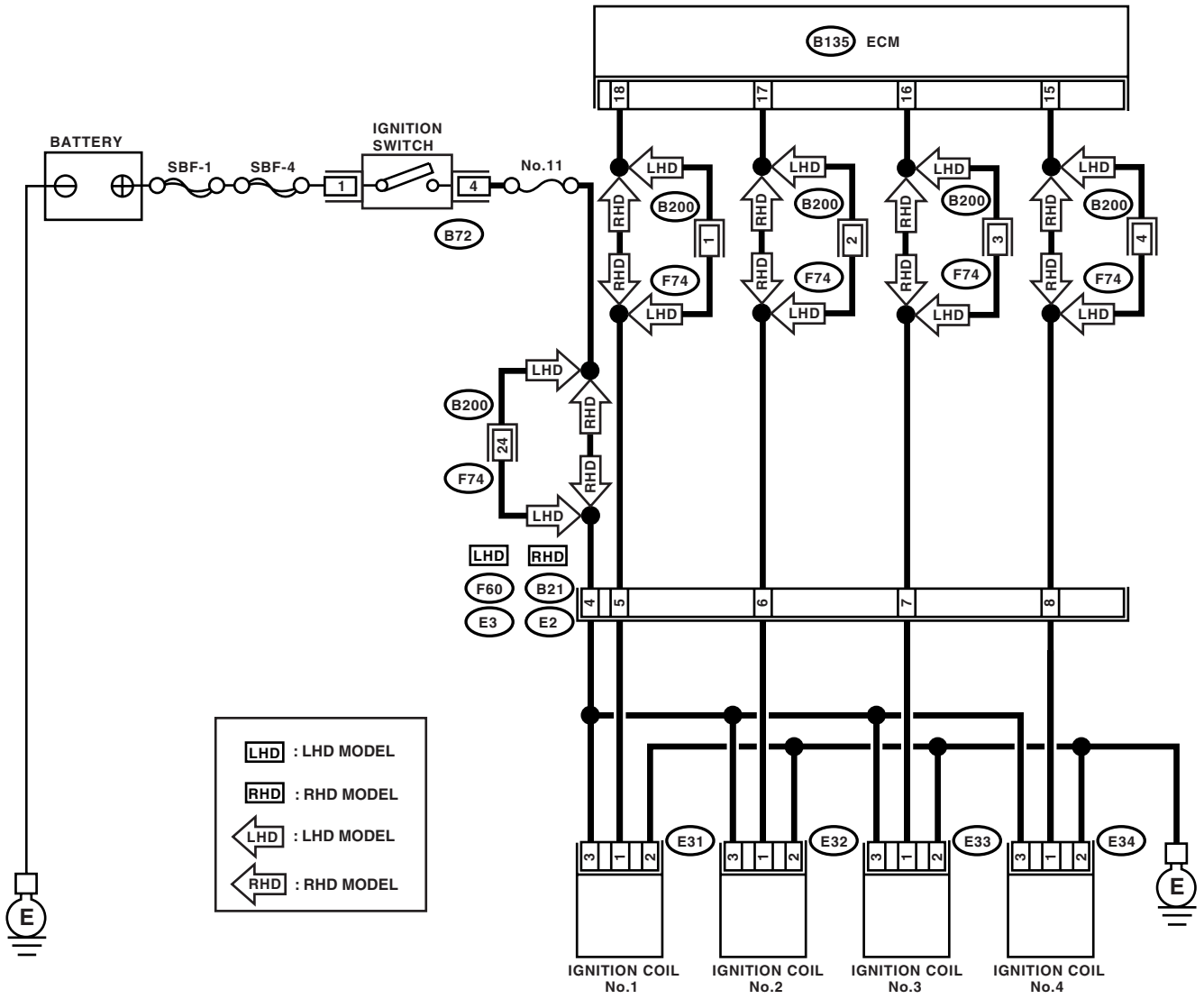
Diagnostics for Engine Starting Failure

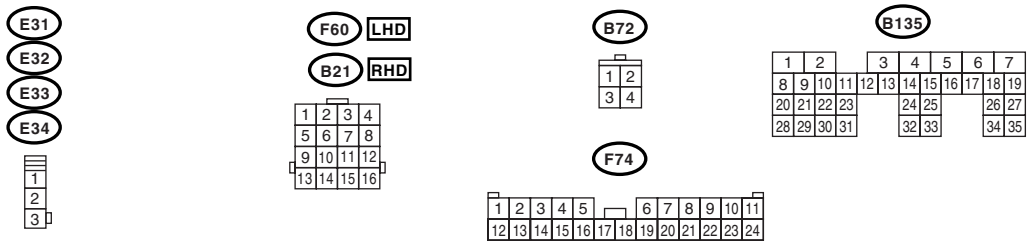
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 34 — Chassis ground: (LHD model, RHD·MT model)*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 12 — Chassis ground:*** ***(B136) No. 19 — Chassis ground: (RHD model)*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair open circuit in harness between ECM connector and engine ground terminal.
3	**CHECK INPUT VOLTAGE OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):*** ***(B137) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 (+) — Chassis ground (−):*** ***(B47) No. 5 (+) — Chassis ground (−):*** ***(B47) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair open or ground short circuit in harness of power supply circuit.
5	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):*** ***(B137) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H4DOTC 2.5)(diag)-61, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair open or ground short circuit in harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-03370

Diagnostics for Engine Starting Failure

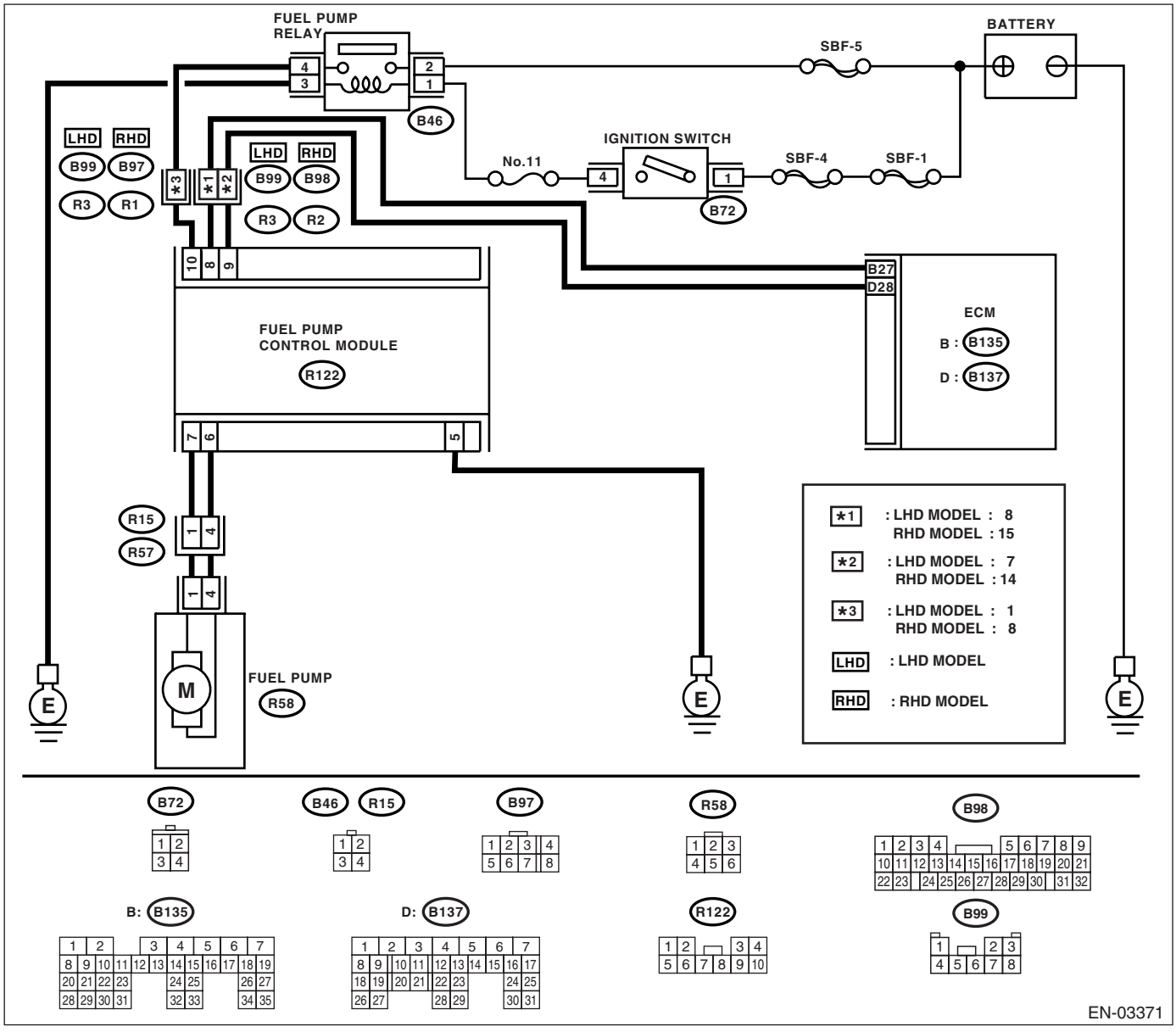
	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H4DOTC 2.0)-6, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC 2.0)-6, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step **2.**	Replace the spark plug.
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC 2.5)-47, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4DOTC 2.5)(diag)-64, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor ASSY. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (−):*** ***(E32) No. 3 (+) — Engine ground (−):*** ***(E33) No. 3 (+) — Engine ground (−):*** ***(E34) No. 3 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ignition coil & ignitor ASSY, and ignition switch connector • Poor contact in coupling connector
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSY GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor ASSY connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ignition coil & ignitor ASSY connector and engine ground terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor ASSY. 4) Measure the resistance of harness between ECM and ignition coil & ignitor ASSY connector. ***Connector & terminal*** ***(B135) No. 15 — (E34) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 18 — (E31) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assy connector. • Poor contact in coupling connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B135) No. 15 — Engine ground:*** ***(B135) No. 16 — Engine ground:*** ***(B135) No. 17 — Engine ground:*** ***(B135) No. 18 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and ignition coil & ignitor ASSY connector.
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4DOTC 2.5)(diag)-64, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

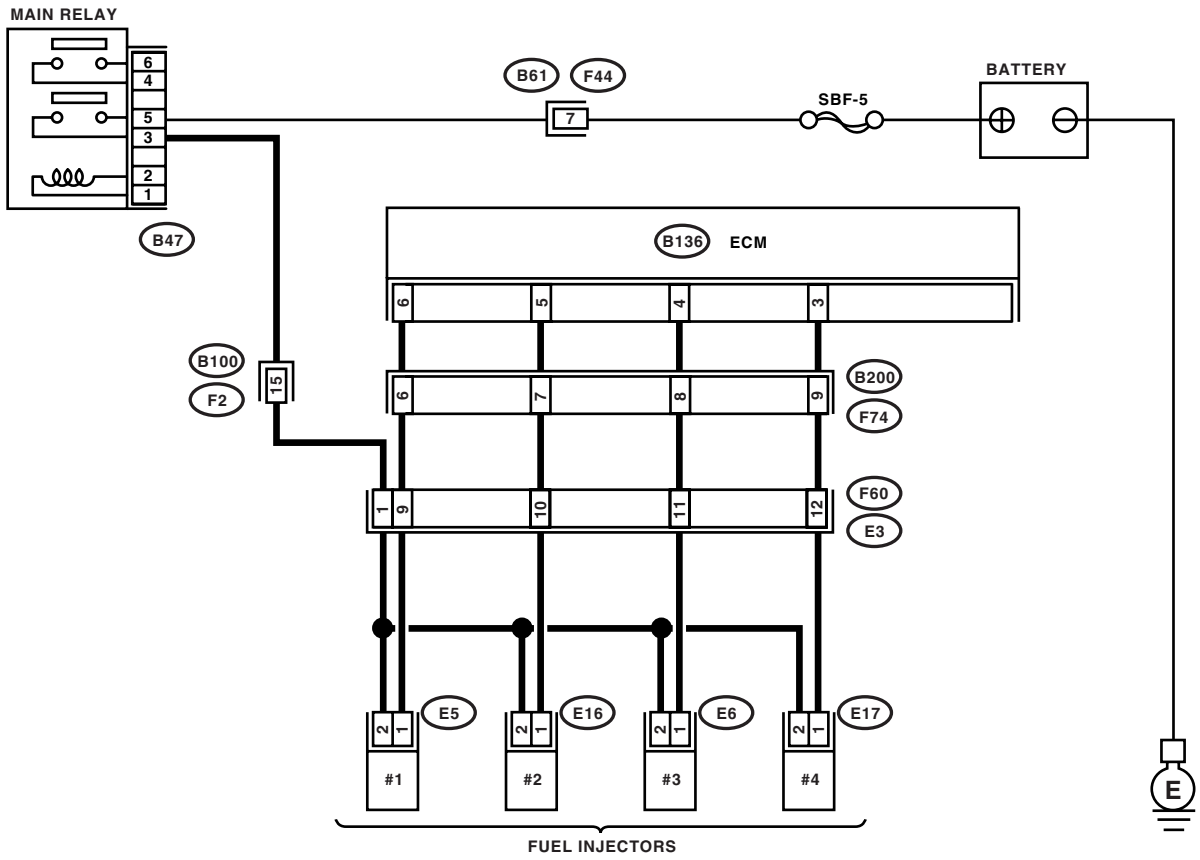


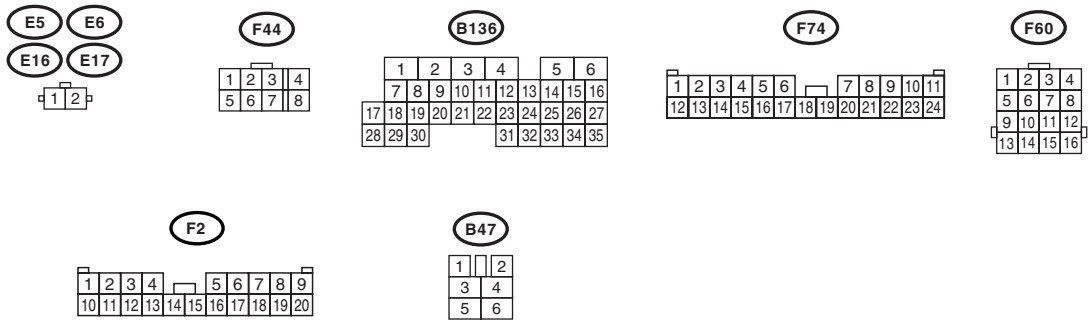
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that fuel pump is in operation for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor. For the procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC 2.5)(diag)-43, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce operating sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC 2.5)(diag)-66, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display DTC. <Ref. to EN(H4DOTC 2.5)(diag)-34, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.**

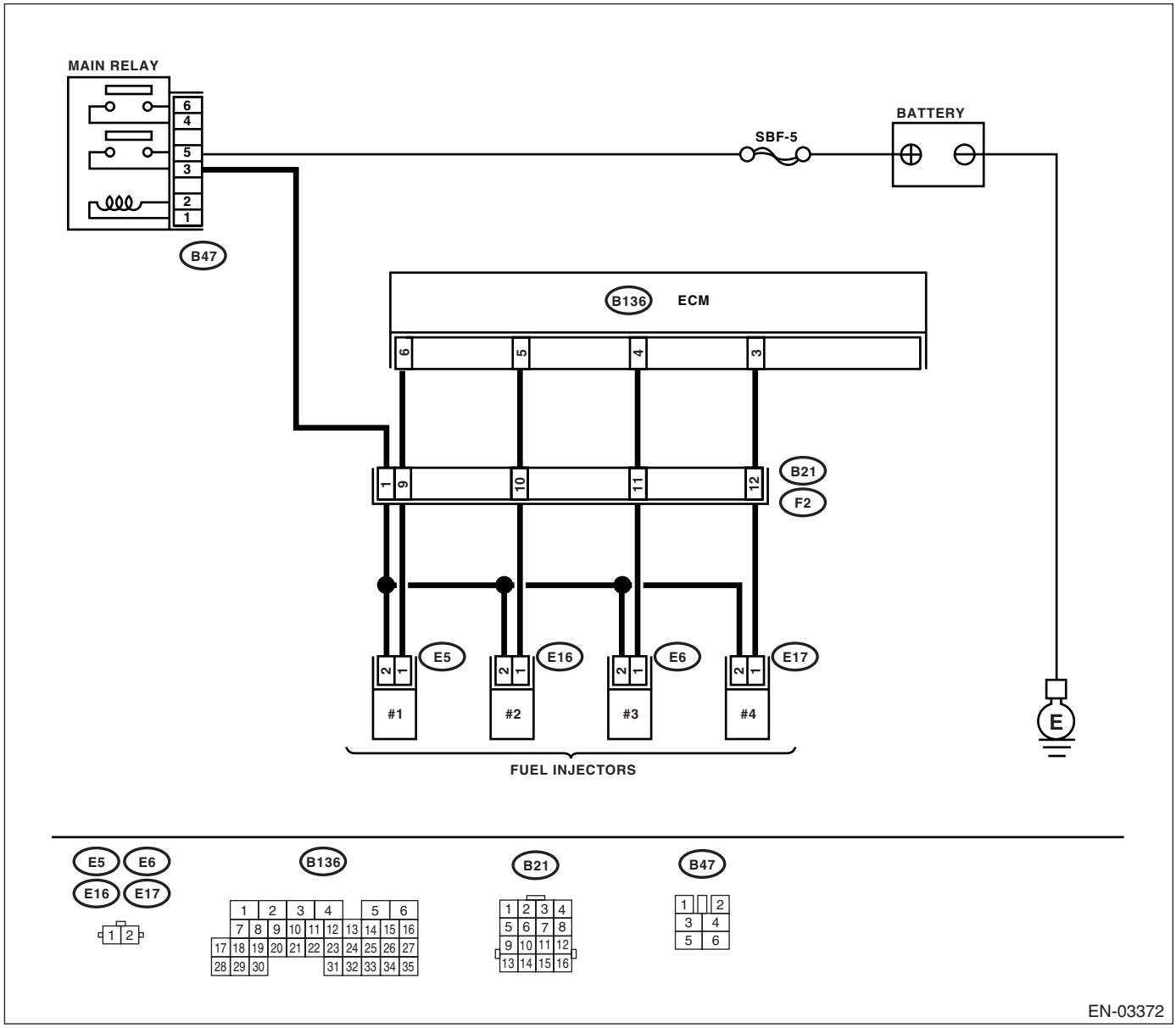
WIRING DIAGRAM:
- **LHD MODEL**





EN-03373

- **RHD MODEL**



	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check that each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel pump produce operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC 2.0)-37, INSPECTION, Fuel Pressure.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY TO EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 6 — (E5) No. 1:*** ***(B136) No. 5 — (E16) No. 1:*** ***(B136) No. 4 — (E6) No. 1:*** ***(B136) No. 3 — (E17) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR.** Measure the resistance of harness between ECM and fuel injector connector. ***Connector & terminal*** ***(B136) No. 3 — Chassis ground:*** ***(B136) No. 4 — Chassis ground:*** ***(B136) No. 5 — Chassis ground:*** ***(B136) No. 6 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω?	Go to step **6.**	Replace the faulty fuel injector.
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using “General Diagnostic Table”. <Ref. to EN(H4DOTC 2.5)(diag)-291, INSPECTION, General Diagnostic Table.>

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Note
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.5)(diag)-74, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.5)(diag)-76, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.5)(diag)-79, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.5)(diag)-81, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.5)(diag)-84, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-86, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-89, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-91, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-94, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-97, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-99, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-102, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-104, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-107, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-111, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.5)(diag)-115, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.5)(diag)-117, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O_2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC 2.5)(diag)-119, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0137	O_2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.5)(diag)-121, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O_2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC 2.5)(diag)-124, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC 2.5)(diag)-126, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DOTC 2.5)(diag)-127, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-130, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-134, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC 2.5)(diag)-138, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	<Ref. to EN(H4DOTC 2.5)(diag)-141, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid “A” High	<Ref. to EN(H4DOTC 2.5)(diag)-143, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC 2.5)(diag)-145, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC 2.5)(diag)-147, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H4DOTC 2.5)(diag)-149, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC 2.5)(diag)-151, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(H4DOTC 2.5)(diag)-153, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC 2.5)(diag)-155, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC 2.5)(diag)-157, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-159, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-162, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-165, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/ Erratic/High	<Ref. to EN(H4DOTC 2.5)(diag)-168, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC 2.5)(diag)-171, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4DOTC 2.5)(diag)-174, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank 1	<Ref. to EN(H4DOTC 2.5)(diag)-178, DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank 1	<Ref. to EN(H4DOTC 2.5)(diag)-180, DTC P0546 EXHAUST GAS TEMPERATURE SENSOR HIGH - BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC 2.5)(diag)-183, DTC P0604 INTERNAL CONTROL MODULE READ ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Access Memory (RAM) Error	<Ref. to EN(H4DOTC 2.5)(diag)-186, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4DOTC 2.5)(diag)-186, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/ Performance (Bank 1)	<Ref. to EN(H4DOTC 2.5)(diag)-190, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC 2.5)(diag)-190, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4DOTC 2.5)(diag)-194, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC 2.5)(diag)-196, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC 2.5)(diag)-197, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC 2.5)(diag)-199, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4DOTC 2.5)(diag)-202, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC 2.5)(diag)-205, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC 2.5)(diag)-208, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-209, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	Exhaust Gas Temperature Too High	<Ref. to EN(H4DOTC 2.5)(diag)-212, DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC 2.5)(diag)-214, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	ANTENNA	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-22, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(H4DOTC 2.5)(diag)-218, DTC P2004 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2005	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(H4DOTC 2.5)(diag)-219, DTC P2005 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2006	Tumble Generated Valve System 2 (Valve Open)	<Ref. to EN(H4DOTC 2.5)(diag)-220, DTC P2006 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2007	Tumble Generated Valve System 2 (Valve Close)	<Ref. to EN(H4DOTC 2.5)(diag)-221, DTC P2007 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2008	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC 2.5)(diag)-222, DTC P2008 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2009	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC 2.5)(diag)-224, DTC P2009 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2011	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC 2.5)(diag)-226, DTC P2011 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC 2.5)(diag)-228, DTC P2012 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2016	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(H4DOTC 2.5)(diag)-230, DTC P2016 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2017	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(H4DOTC 2.5)(diag)-234, DTC P2017 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2021	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to EN(H4DOTC 2.5)(diag)-237, DTC P2021 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2022	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to EN(H4DOTC 2.5)(diag)-241, DTC P2022 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(H4DOTC 2.5)(diag)-244, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(H4DOTC 2.5)(diag)-246, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(H4DOTC 2.5)(diag)-248, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Note
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	<Ref. to EN(H4DOTC 2.5)(diag)-250, DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4DOTC 2.5)(diag)-252, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4DOTC 2.5)(diag)-260, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4DOTC 2.5)(diag)-264, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to EN(H4DOTC 2.5)(diag)-267, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-268, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-271, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to EN(H4DOTC 2.5)(diag)-274, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to EN(H4DOTC 2.5)(diag)-277, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Rationality	<Ref. to EN(H4DOTC 2.5)(diag)-280, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Rationality	<Ref. to EN(H4DOTC 2.5)(diag)-286, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE RATIONALITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4DOTC 2.5)(diag)-290, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4DOTC 2.5)(diag)-290, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

18.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

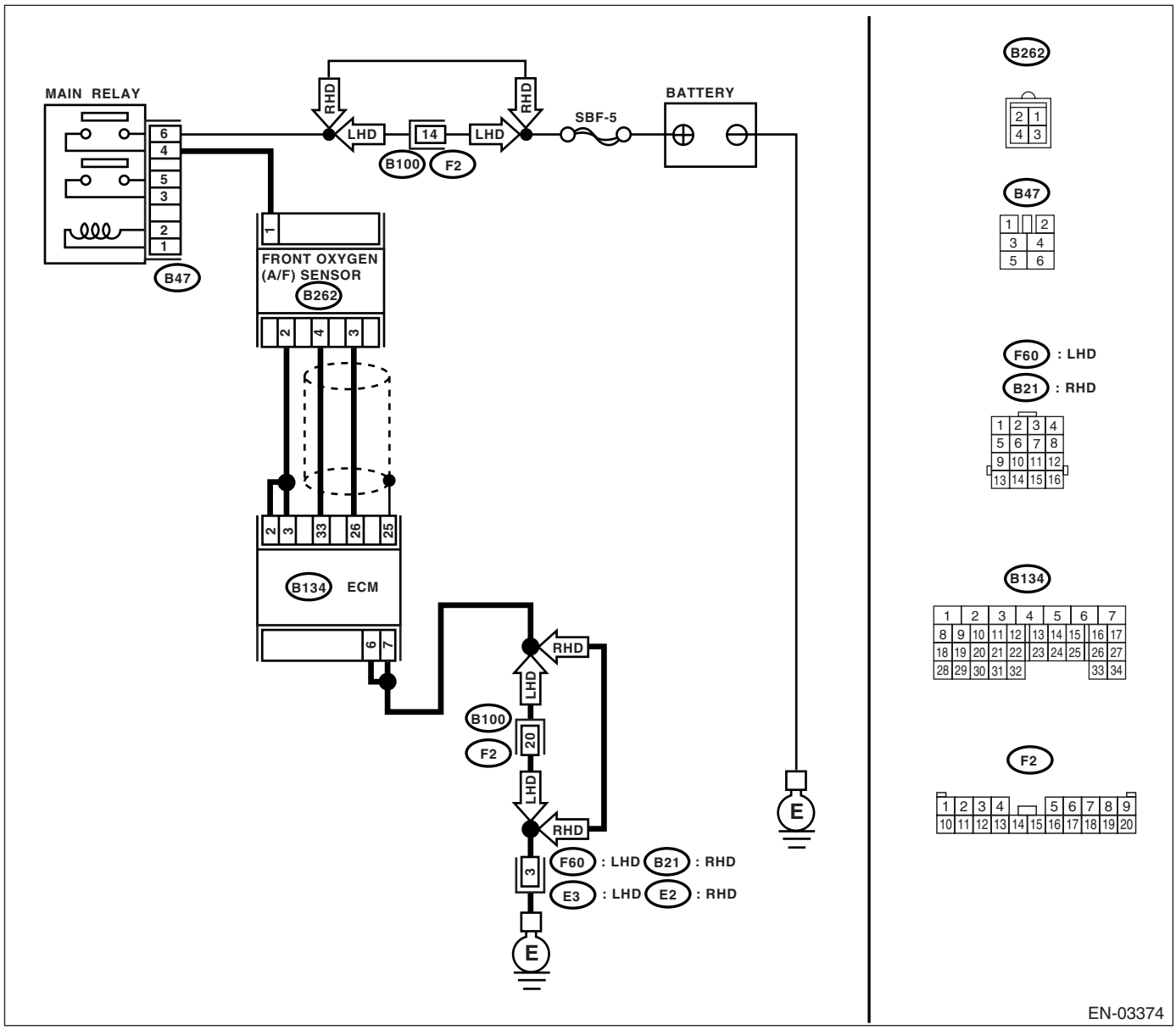
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start the engine, and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connector from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134)No. 2 — (B262)No. 2:*** ***(B134)No. 3 — (B262)No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 33 — (B262) No. 4:*** ***(B134) No. 26 — (B262) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B47) No. 4 — (B262) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4	**CHECK FRONT OXYGEN (A/F) SENSOR.** Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is the resistance less than 5 Ω?	Go to step **5.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM and front oxygen (A/F) sensor.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.0)-45, Front Oxygen (A/F) Sensor.>

B: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

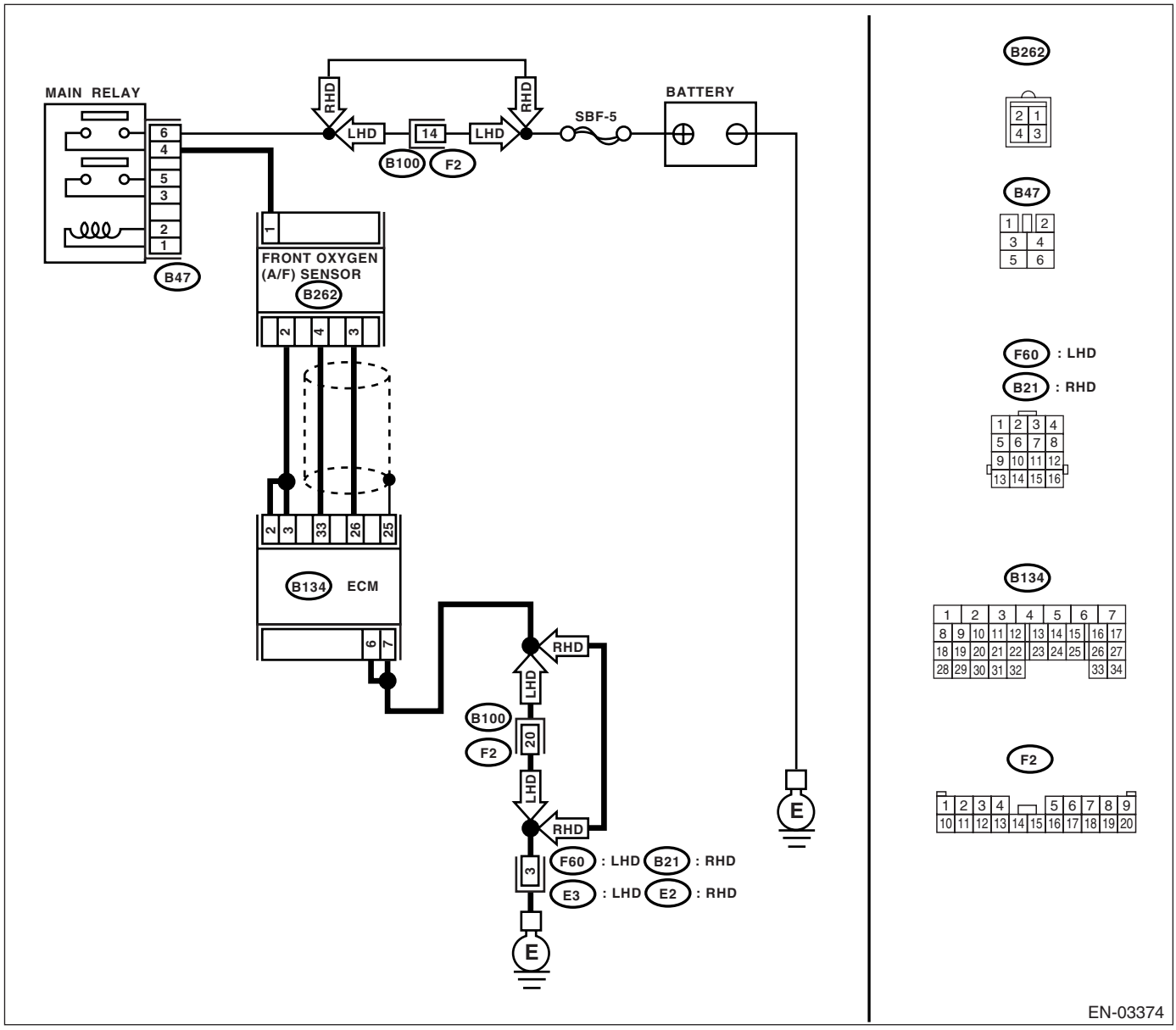
DTC DETECTING CONDITION:

Immediately at fault recognition.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B262) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply line. NOTE: In this case repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
2	**CHECK GROUND CIRCUIT FOR ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector. • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair poor contact connector. NOTE: In this case repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 10 Ω?	Repair the harness and connector. NOTE: In this case repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.5)-38, Front Oxygen (A/F) Sensor.>

C: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

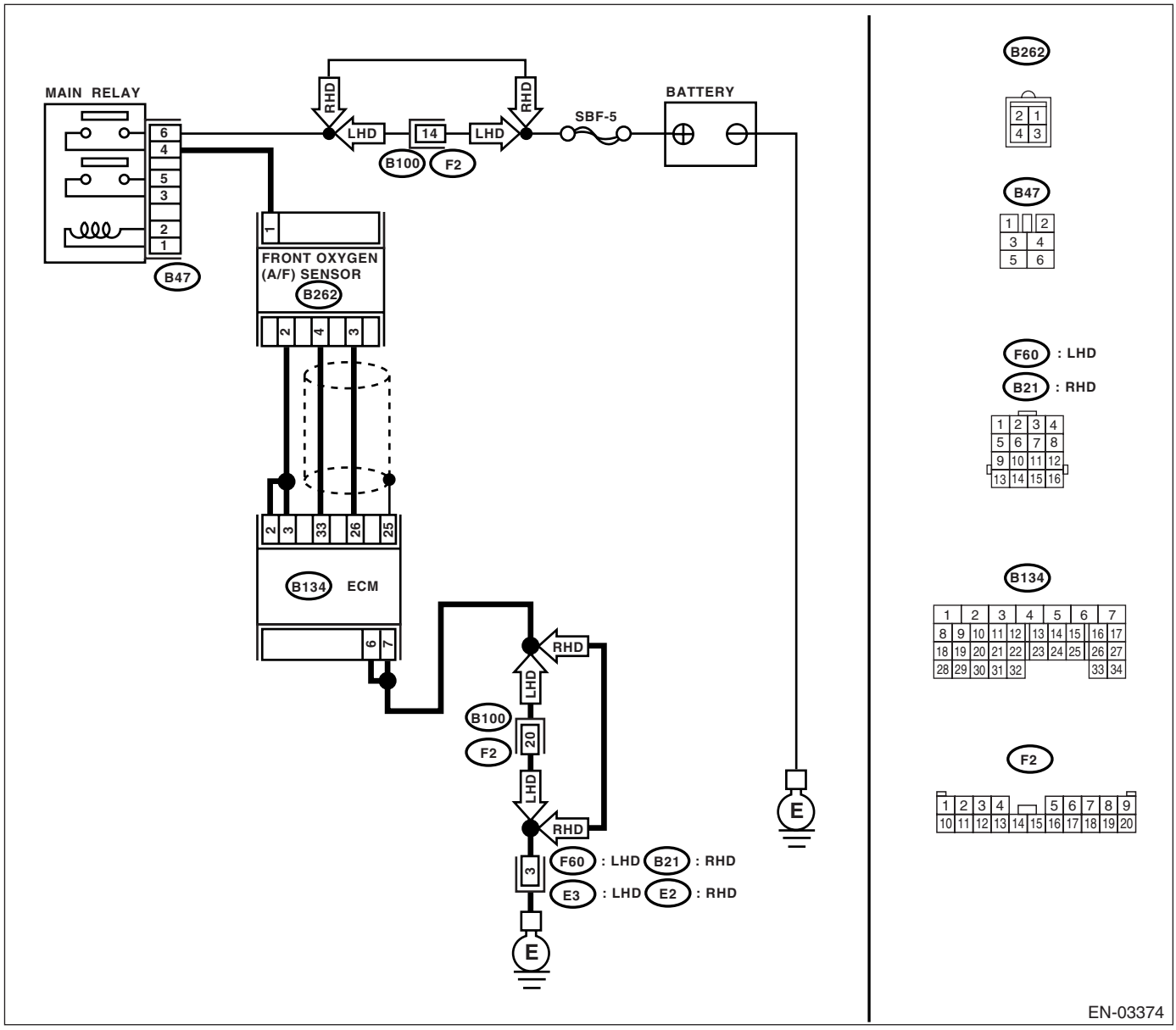
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **3.**	Go to step **2.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	END.
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END.

D: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

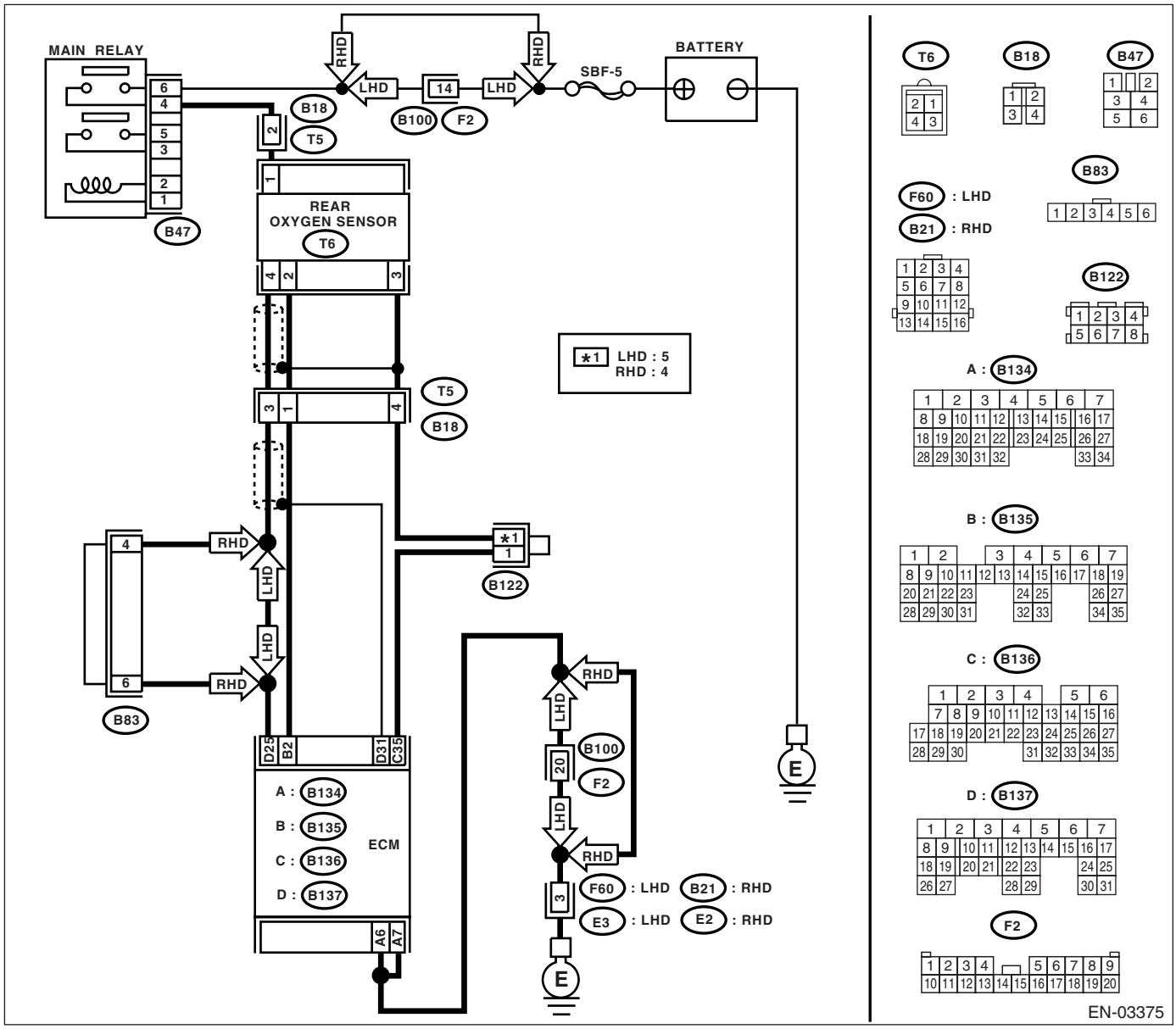
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **2.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Repair battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

	Step	Check	Yes	No
6	**CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and chassis ground. ***Connector & terminal*** ***(B18) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the power supply line. NOTE: In this case repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 30 Ω?	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.5)-40, Rear Oxygen Sensor.>

E: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

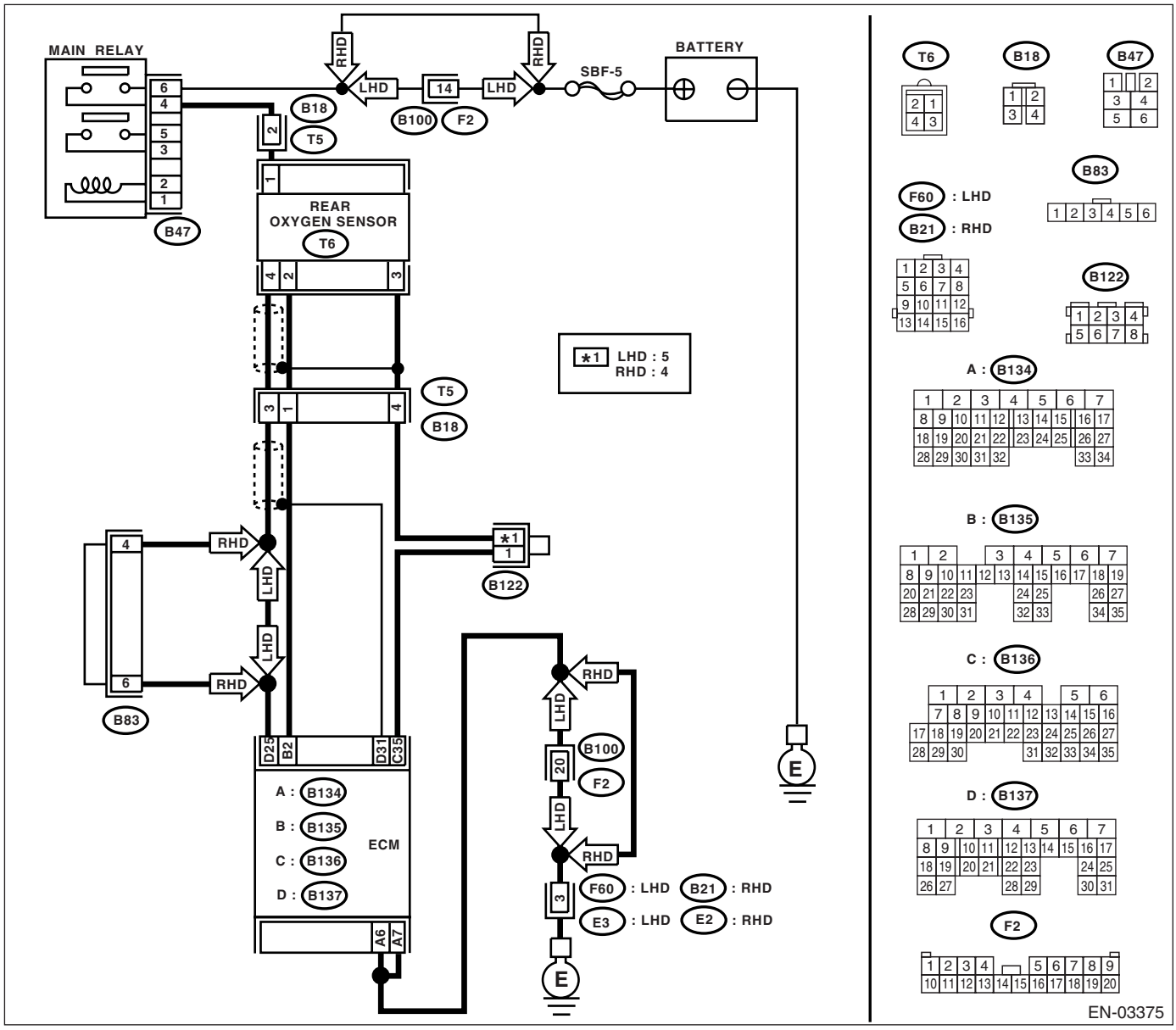
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Repair battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	END.
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	END.

F: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

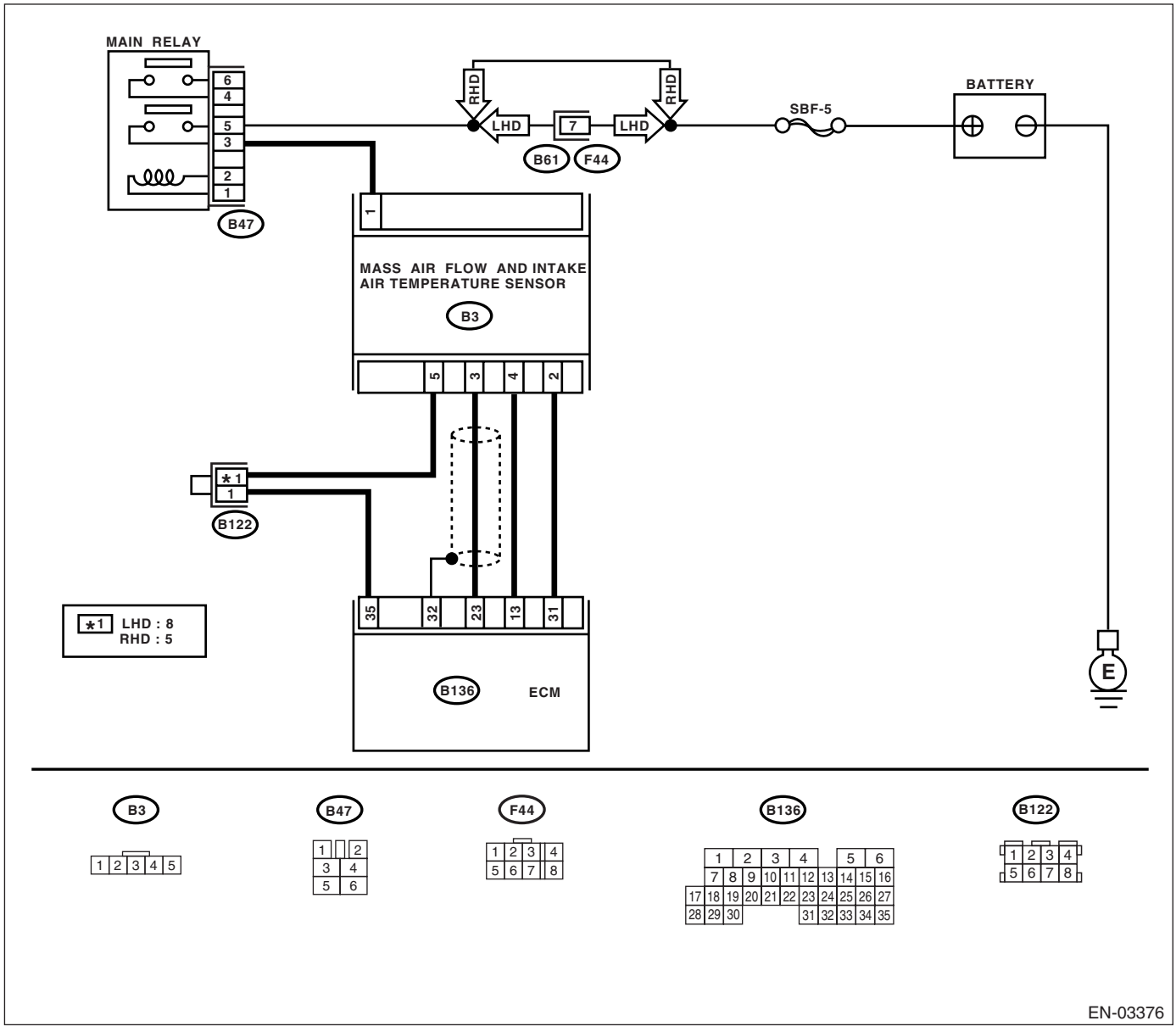
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool switch to ON. 4) Start the engine. 5) Connect the Subaru Select Monitor or general scan tool, and read the mass air flow sensor voltage. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the mass air flow sensor. NOTE: In this case repair the following: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (WITH SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **5.**	Repair open circuit between mass air flow sensor and main relay
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (B3) No. 3:*** ***(B136) No. 31 — (B3) No. 2:*** ***(B136) No. 35 — (B3) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit between ECM and mass air flow sensor connector.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:*** ***(B136) No. 31 — Chassis ground:*** ***(B136) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit between ECM and mass air flow sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.5)-31, Mass Air Flow and Intake Air Temperature Sensor.>

G: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

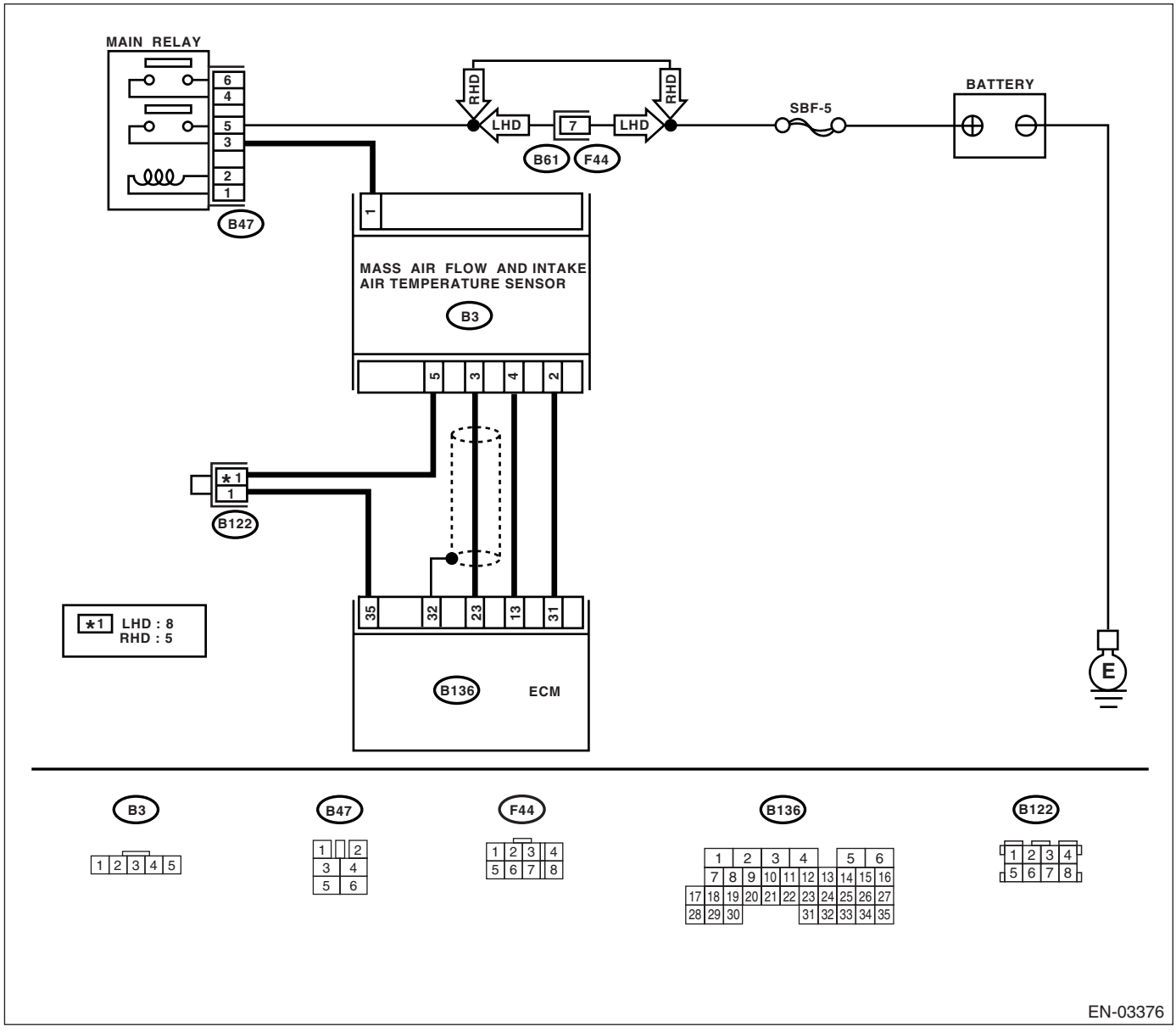
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or the general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool switch to ON. 4) Start the engine. 5) Connect the Subaru Select Monitor or general scan tool, and read the mass air flow sensor voltage. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass airflow sensor. 3) Turn the ignition switch to ON. 4) Measure voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Repair battery short circuit in harness between mass air flow sensor connector and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 31:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H4DOTC 2.5)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair open circuit in harness between mass air flow sensor connector and ECM connector.

H: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

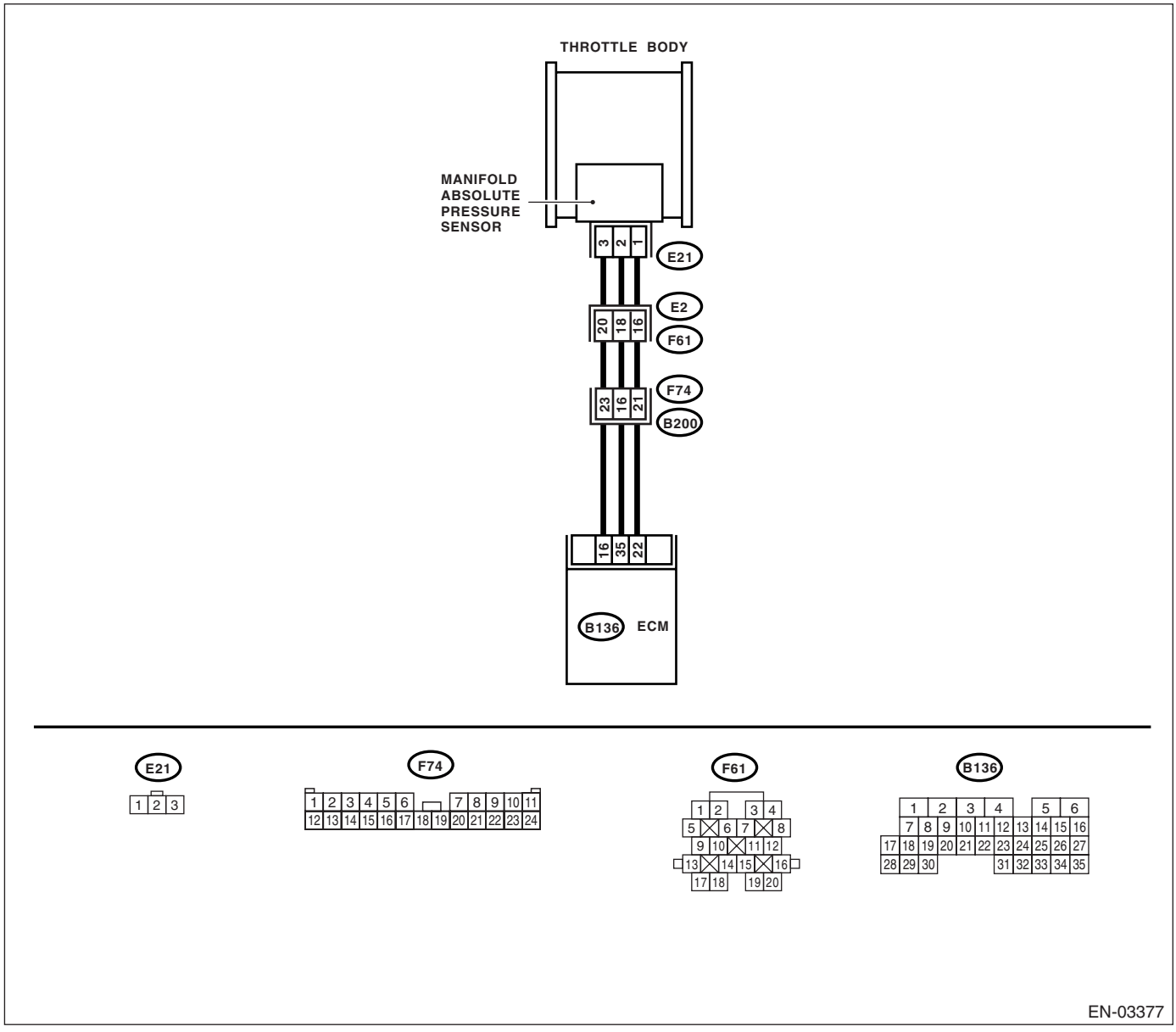
Immediately at fault recognition

CAUTION:

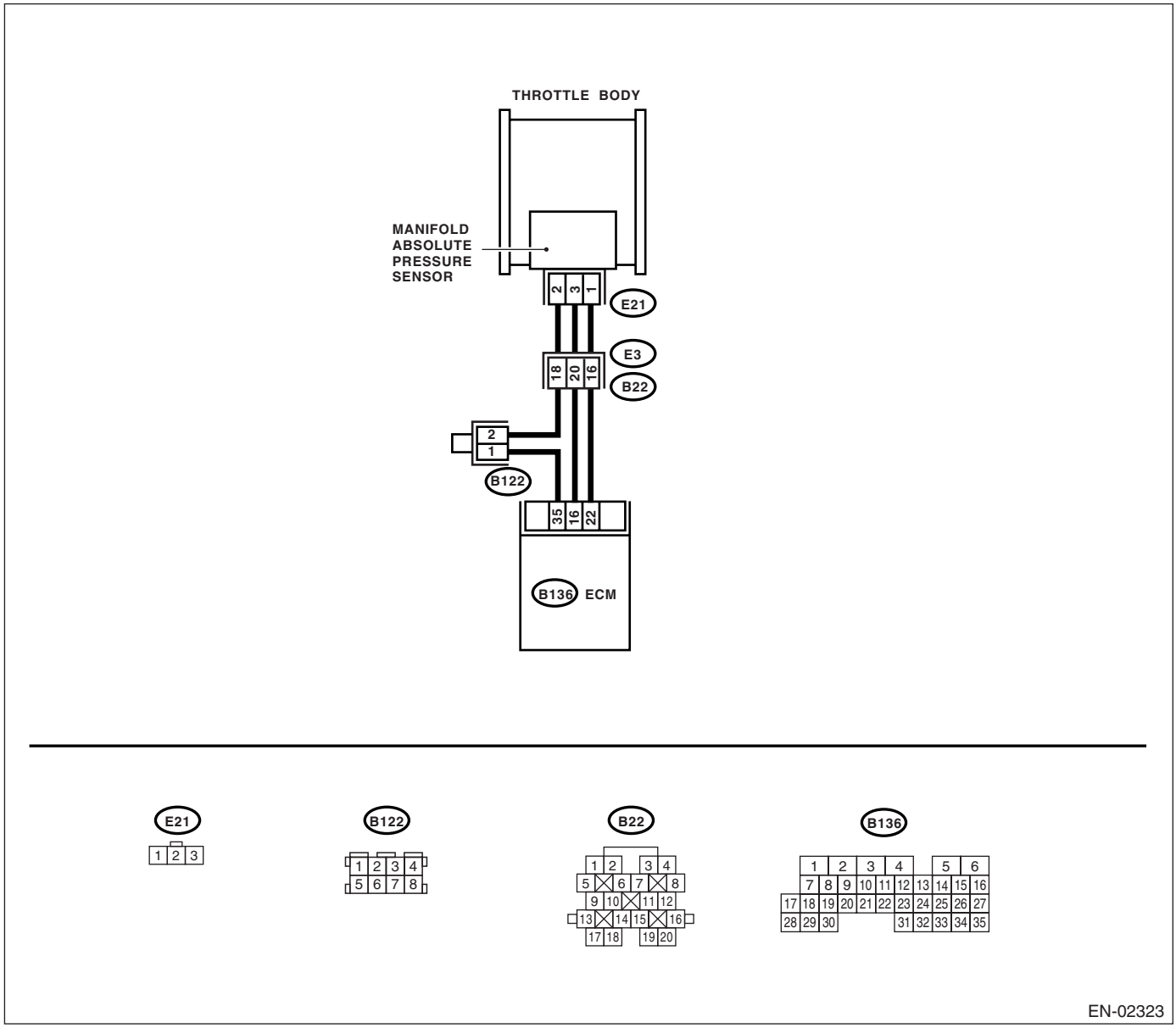
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


THROTTLE BODY
MANIFOLD ABSOLUTE PRESSURE SENSOR
2 3 1
E21
E3
18 20 16
B22
2 1
B122
35 16 22
B136 ECM
E21
1 2 3
B122
1 2 3 4
5 6 7 8
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02323

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 0.7 V?	Go to step **4.**	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC 2.5)-32, Manifold Absolute Pressure Sensor.>

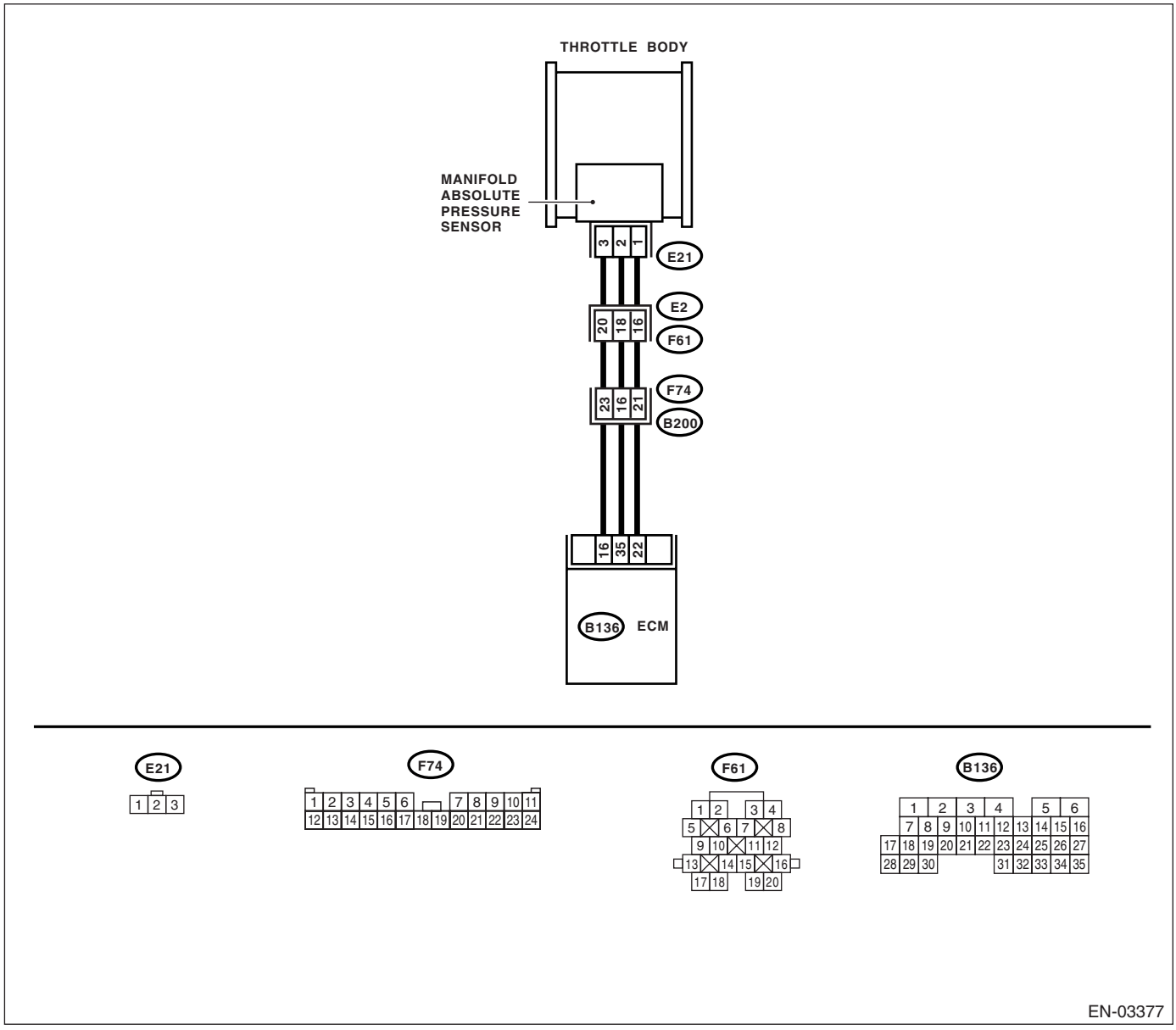
I: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:
Immediately at fault recognition

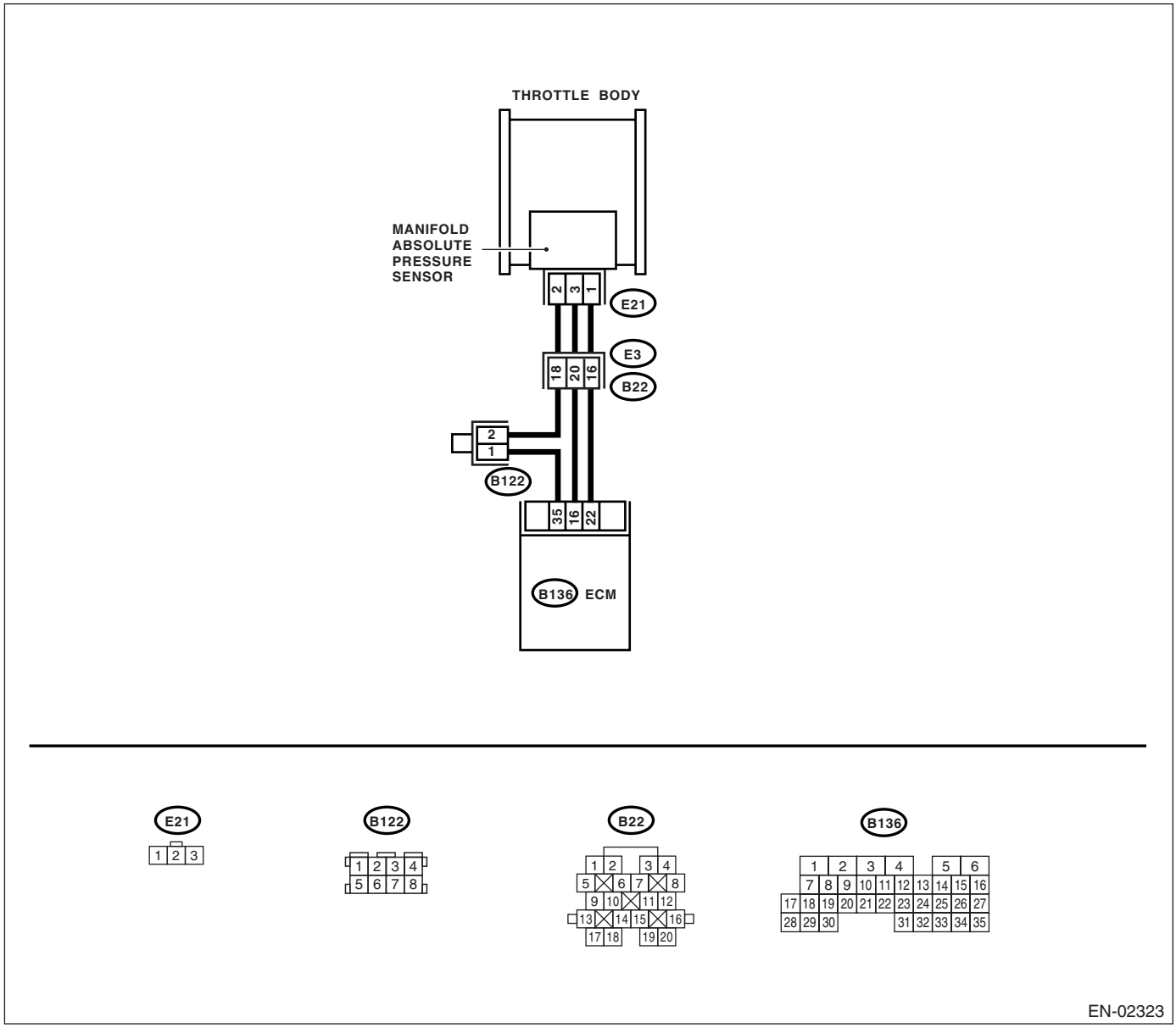
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


THROTTLE BODY
MANIFOLD ABSOLUTE PRESSURE SENSOR
2 3 1
E21
E3
18 20 16
B22
2 1
B122
35 16 22
B136 ECM
E21
1 2 3
B122
1 2 3 4
5 6 7 8
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02323

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(E21) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 22 — (E21) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E21) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK POOR CONTACT.** Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC 2.5)-32, Manifold Absolute Pressure Sensor.>

J: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

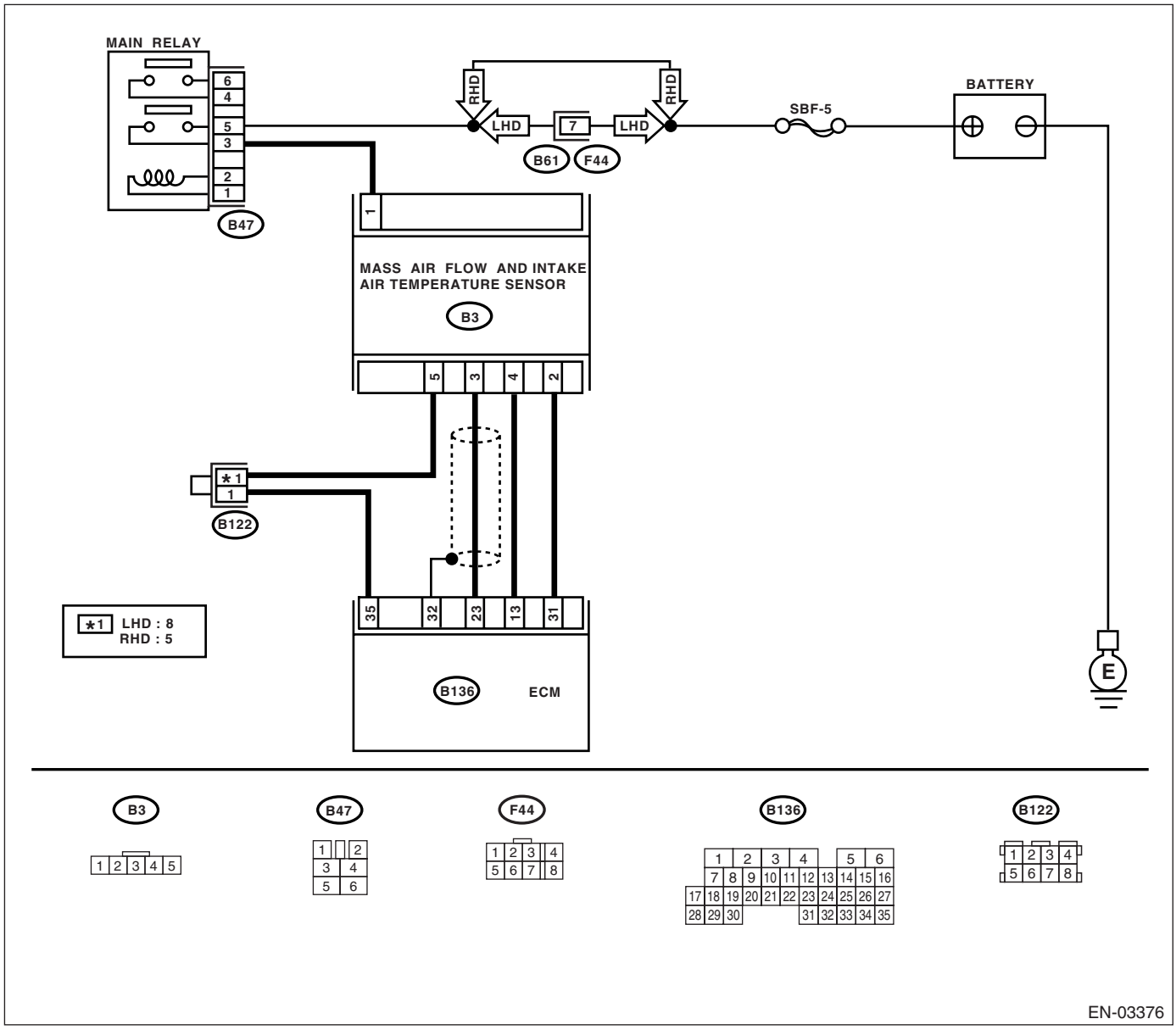
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 55°C (131°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than –36°C (–33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.5)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

K: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

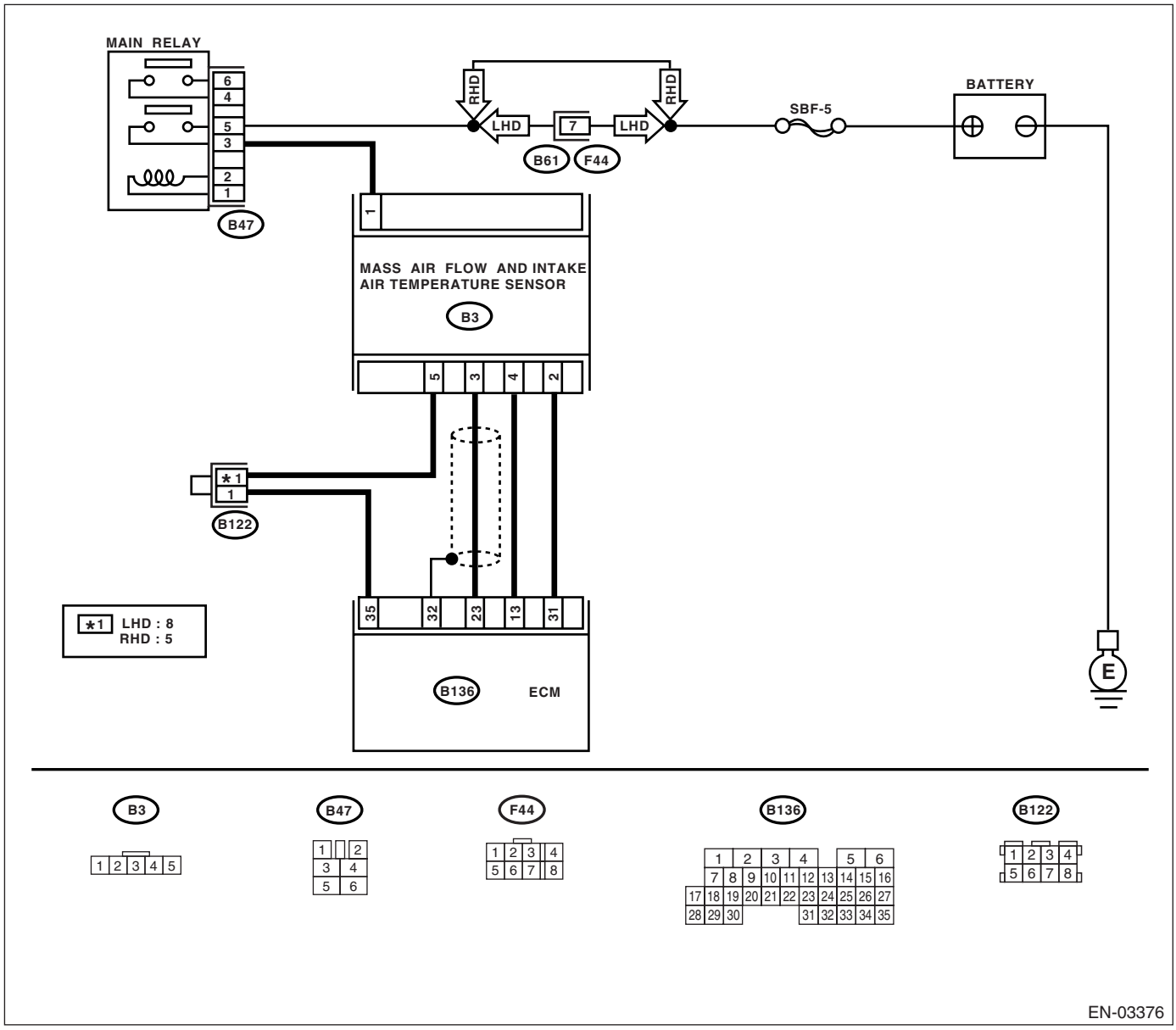
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than –36°C (–33°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between mass air flow and intake air temperature sensor and manifold absolute pressure sensor connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. ***Connector & terminal*** ***(B3) No. 5 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.5)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

L: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

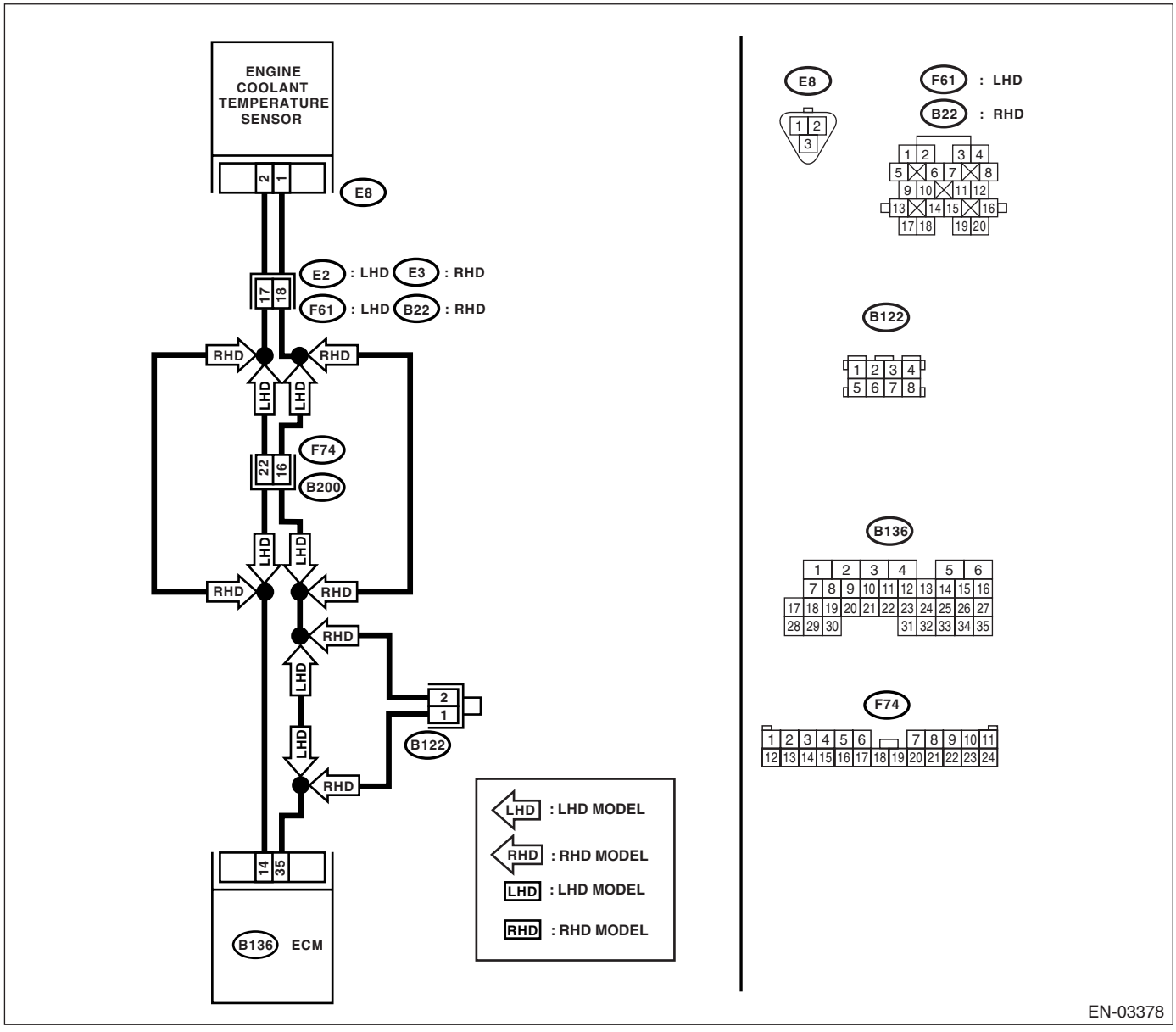
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 120°C (248°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC 2.5)-27, Engine Coolant Temperature Sensor.>	Repair ground short circuit in harness between engine coolant temperature sensor and ECM connector.

M: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

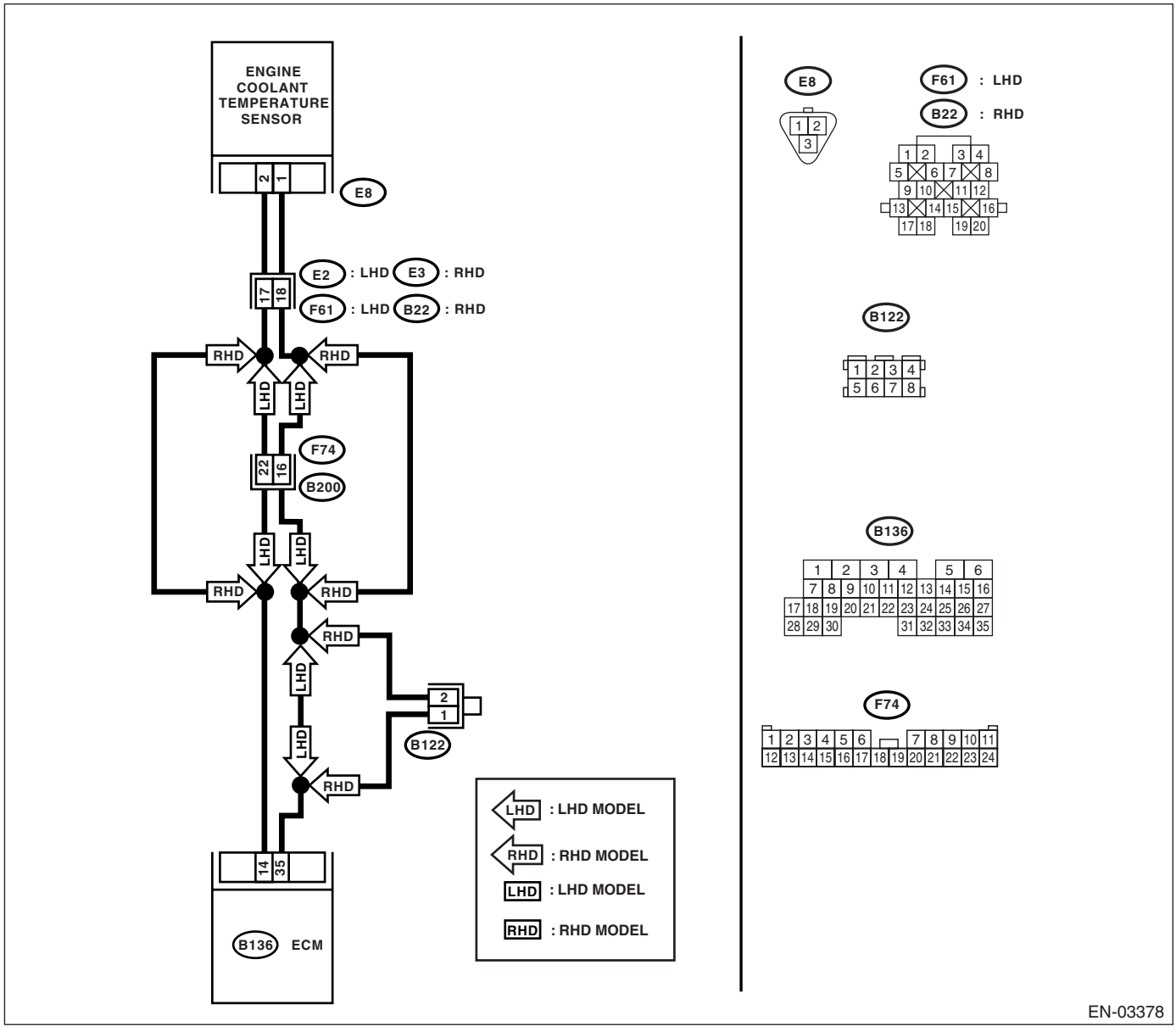
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the value less than –40°C (–40°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 2 (+) — Engine ground (–):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. ***Connector & terminal*** ***(E8) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC 2.5)-27, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector

N: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

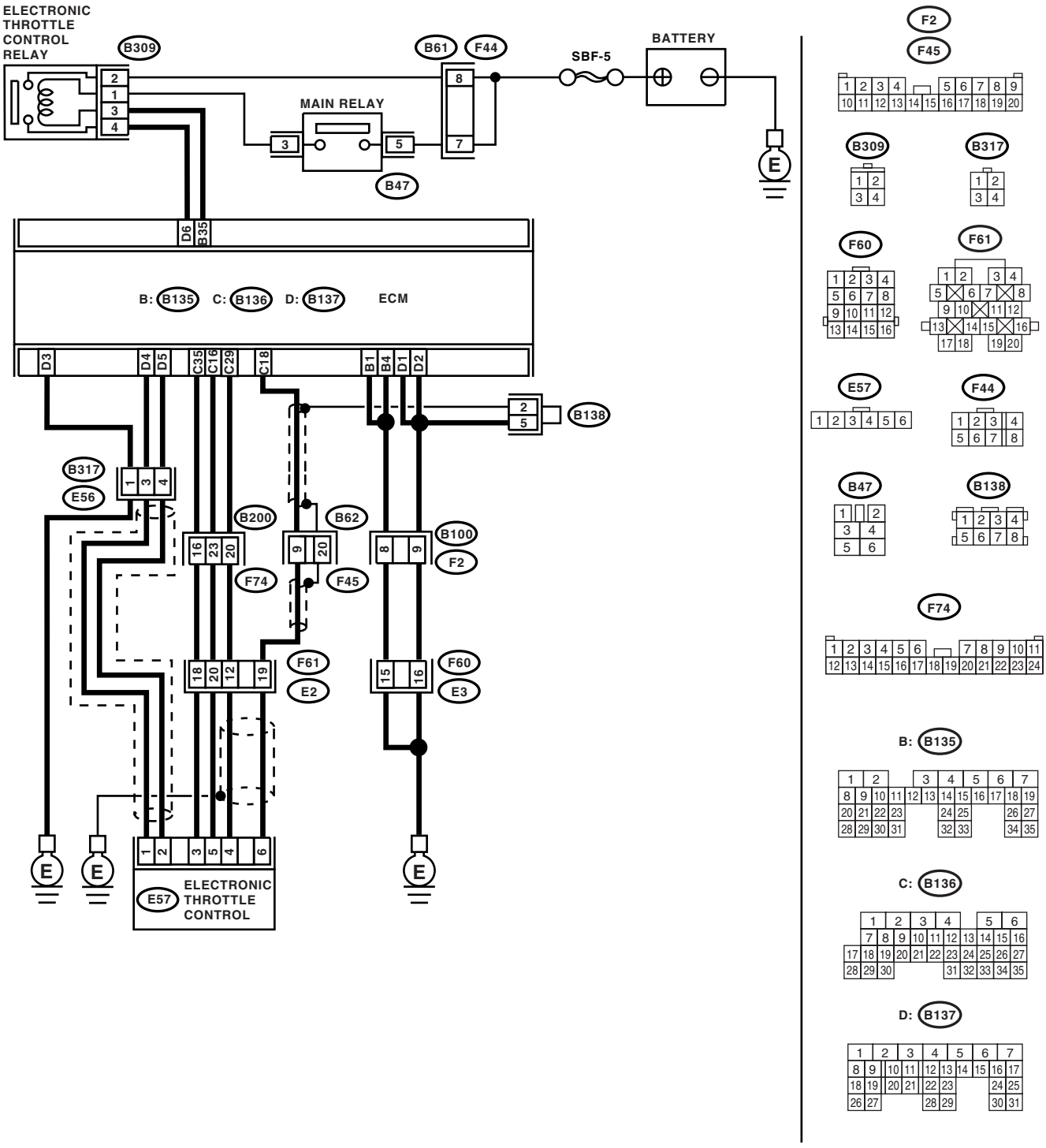
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

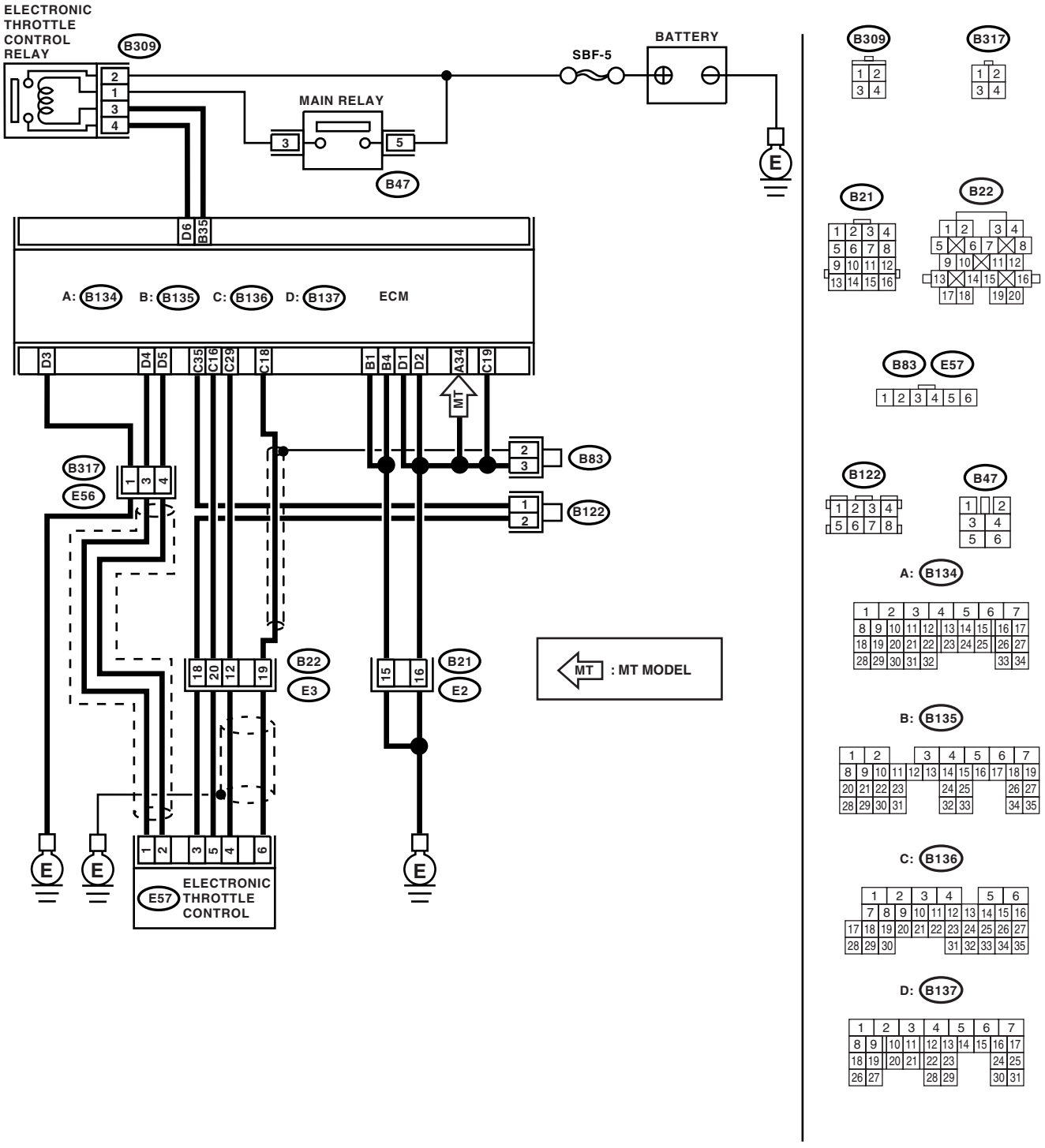
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and terminal. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 3) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Repair poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

O: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

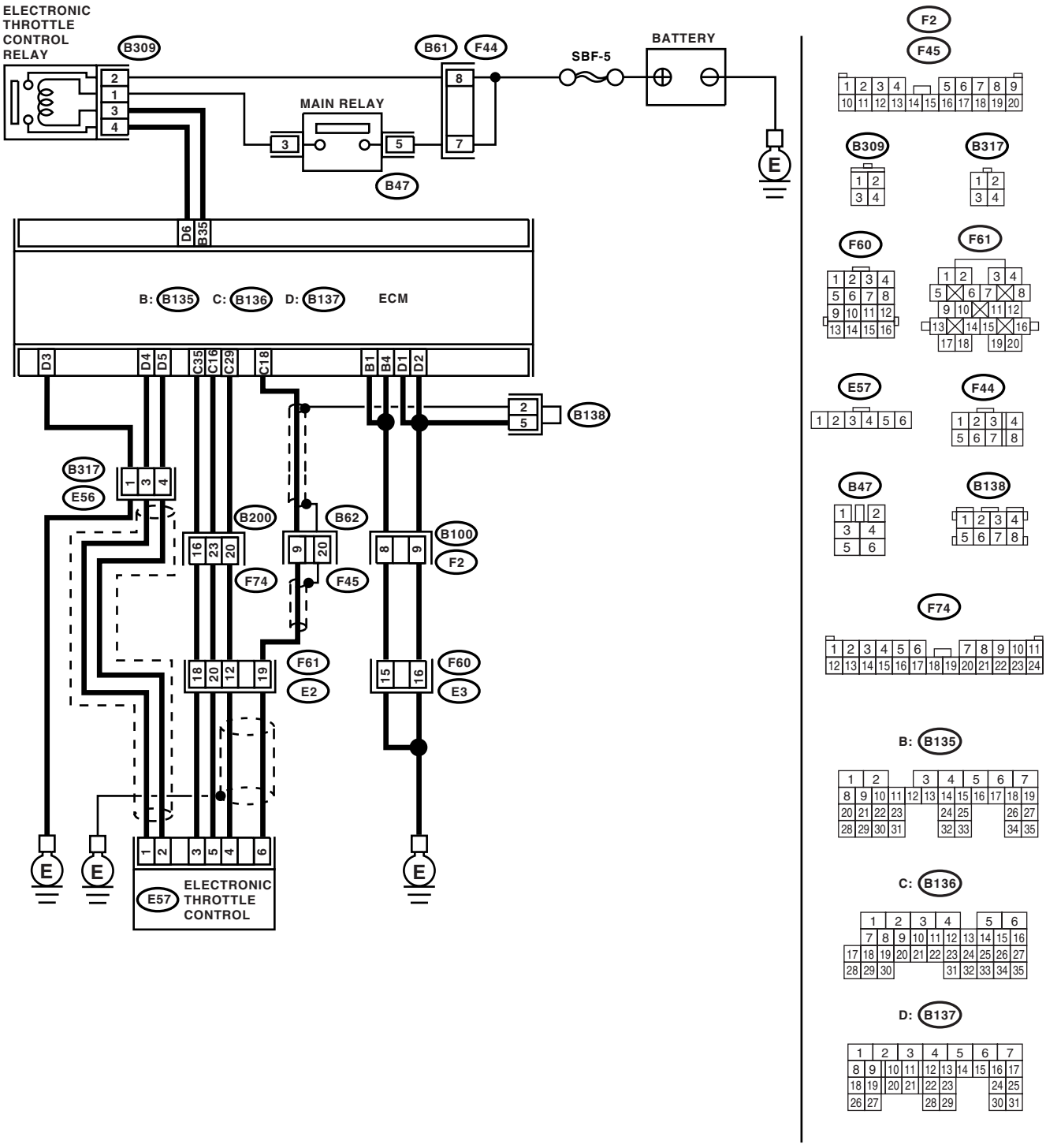
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

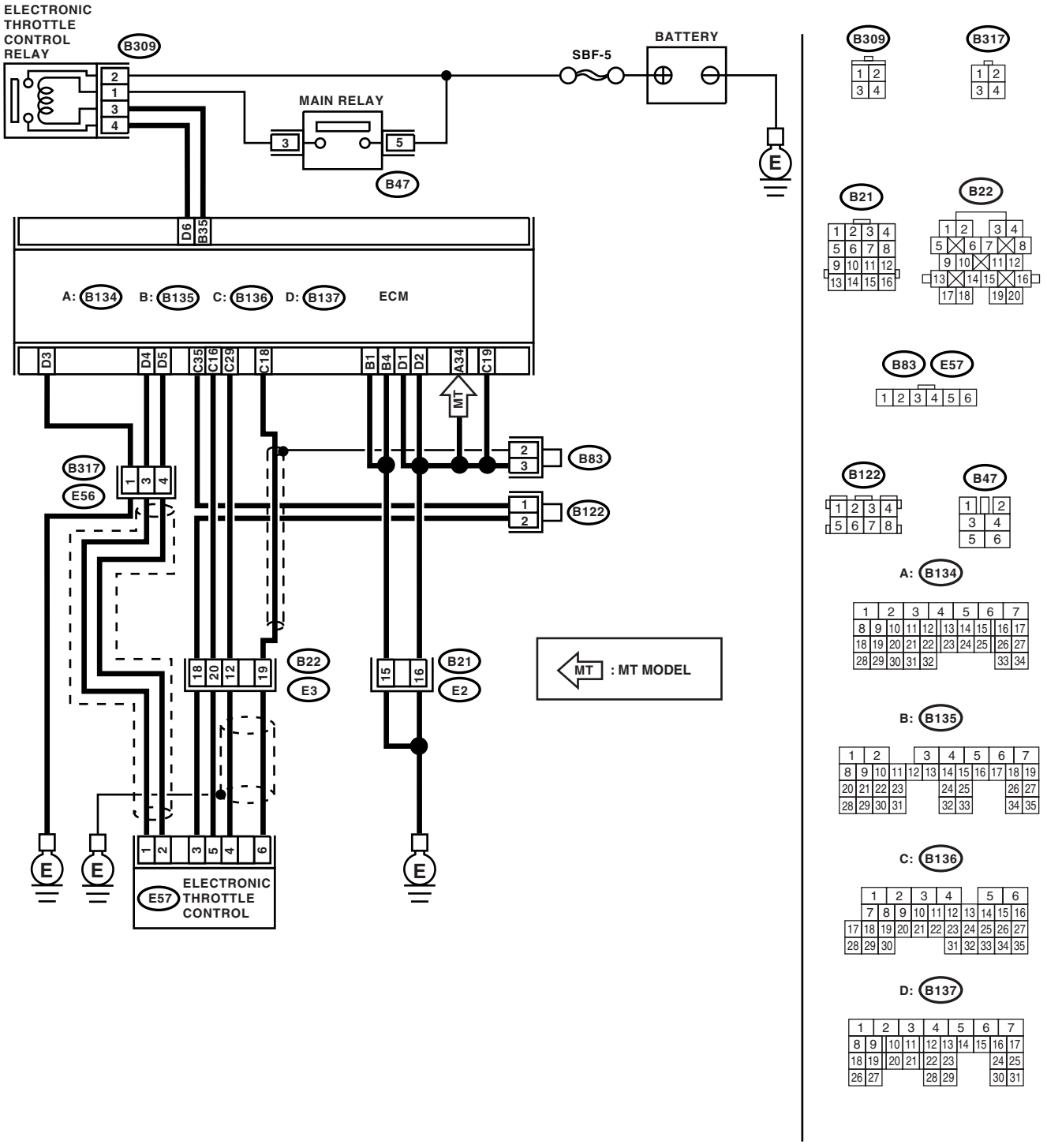
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. 3) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage less than 4.63 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 3) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage more than 10 V?	Go to step **6.**	Repair battery short circuit in harness between ECM connector and electronic throttle control connector.
6	**CHECK SENSOR OUTPUT POWER SUPPLY.** 1) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **7.**	Repair battery short circuit in harness between ECM connector and electronic throttle control connector.
7	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair poor contact in harness. Repair the electronic throttle control.	Repair short circuit to sensor power supply.

P: DTC P0131 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

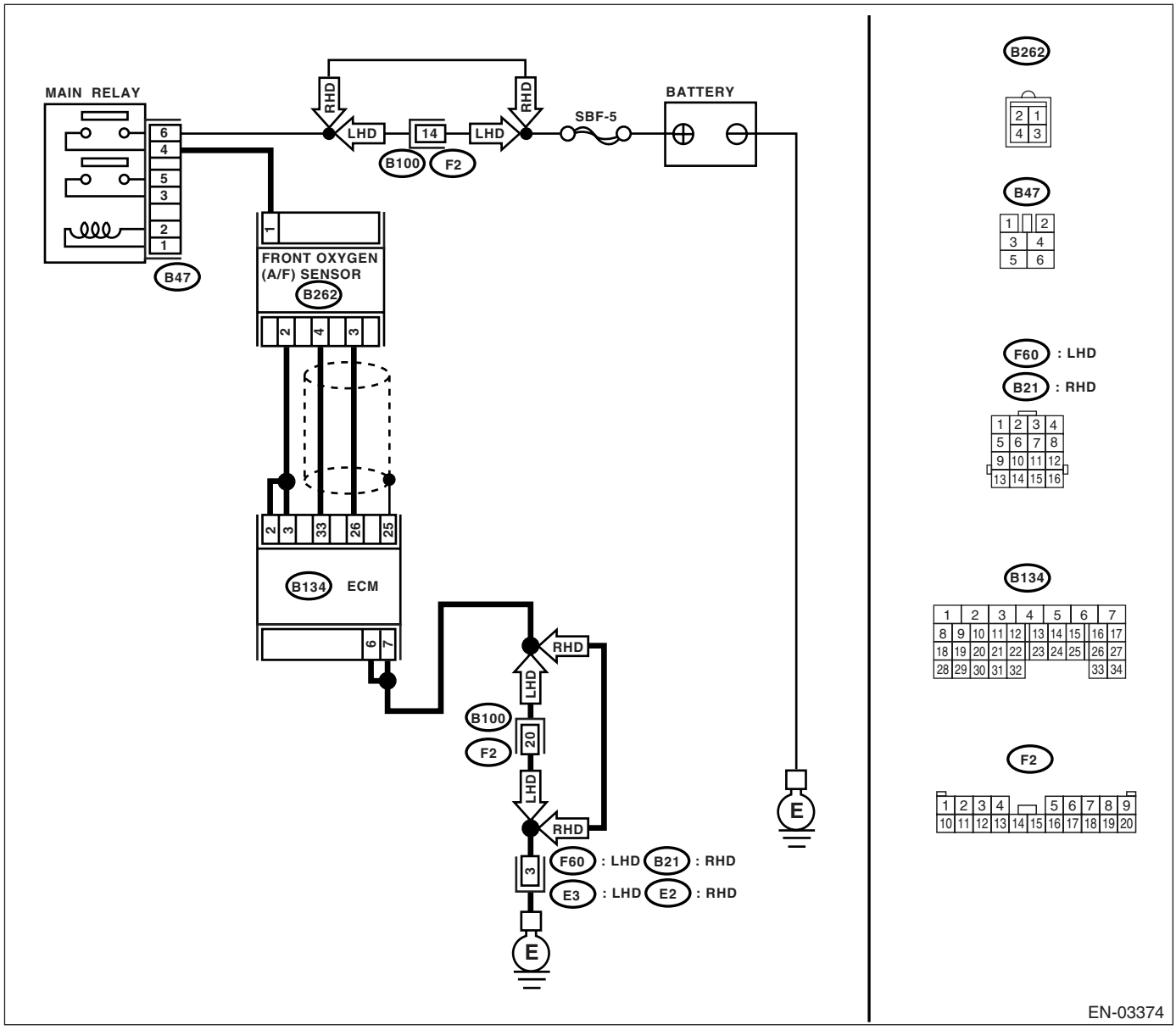
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.5)-38, Front Oxygen (A/F) Sensor.>	Repair ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.

Q: DTC P0132 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

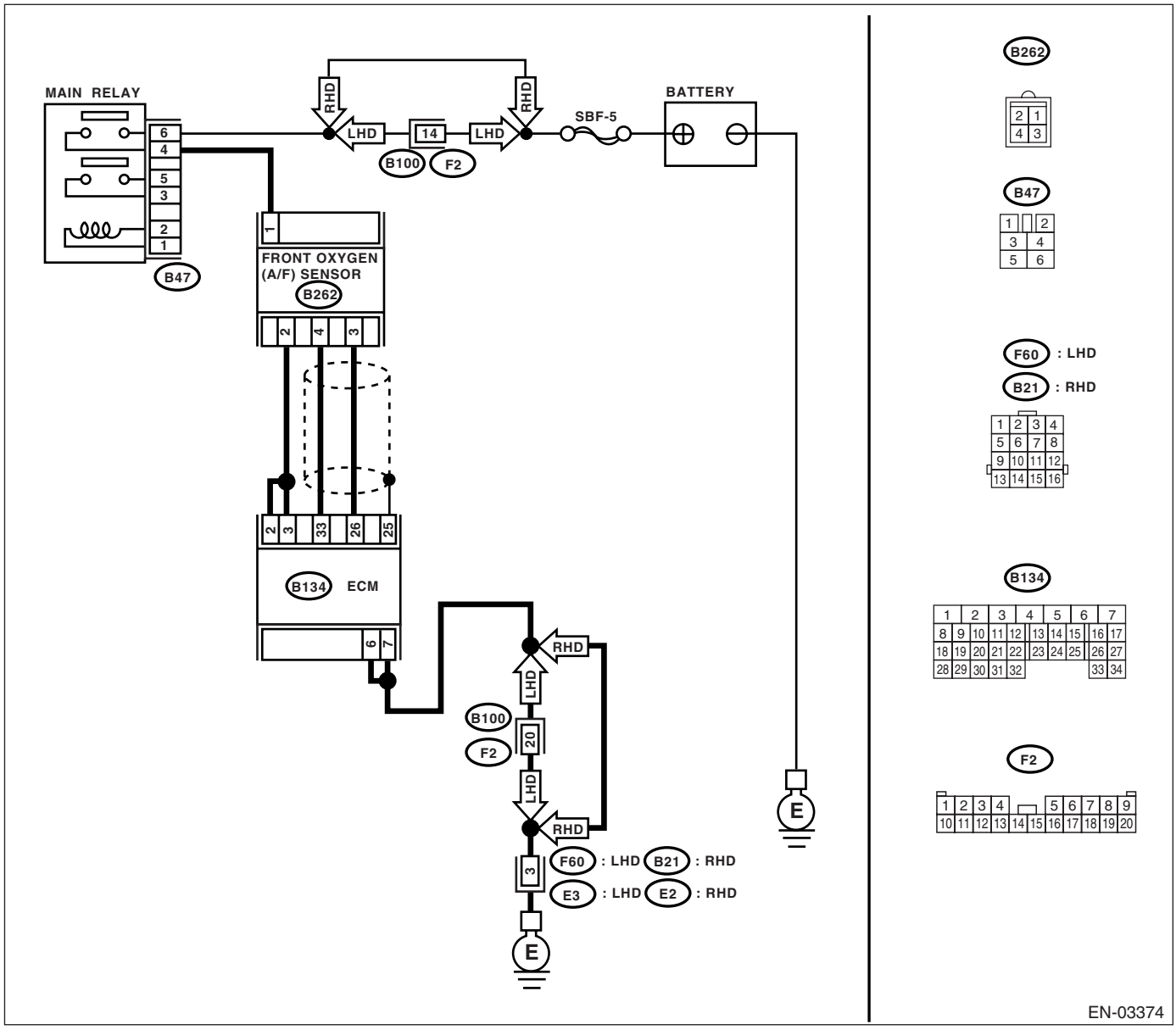
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (−):*** ***(B134) No. 33 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.5)-38, Front Oxygen (A/F) Sensor.>	Repair battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.

R: DTC P0134 O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

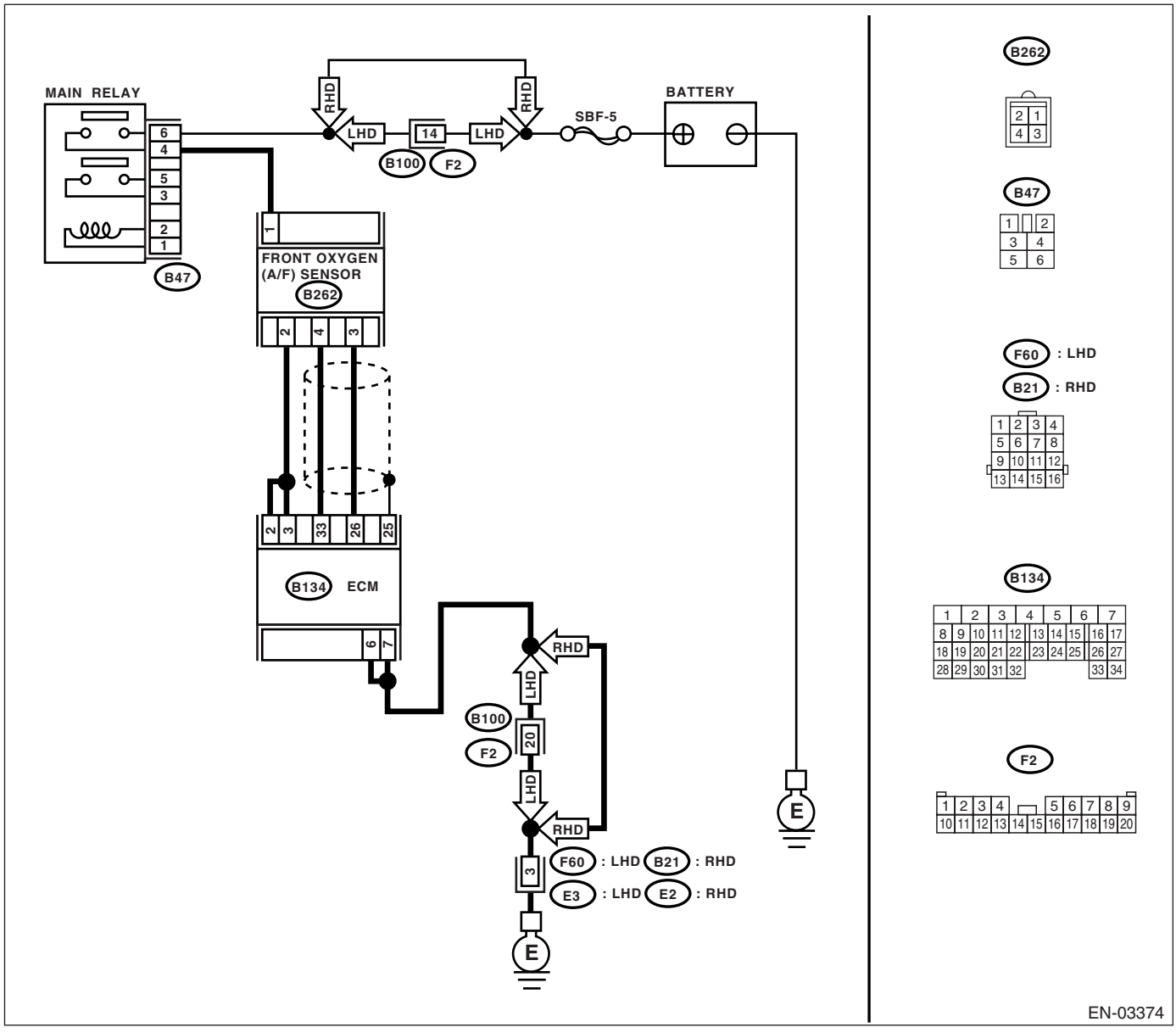
DTC DETECTING CONDITION:

Detect as soon as the malfunction occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (B262) No. 3:*** ***(B134) No. 33 — (B262) No. 4:***	Is the resistance less than 1 Ω?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC 2.5)-38, Front Oxygen (A/F) Sensor.>	Repair open circuit in harness between ECM and front oxygen (A/F) sensor connector.

S: DTC P0137 O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

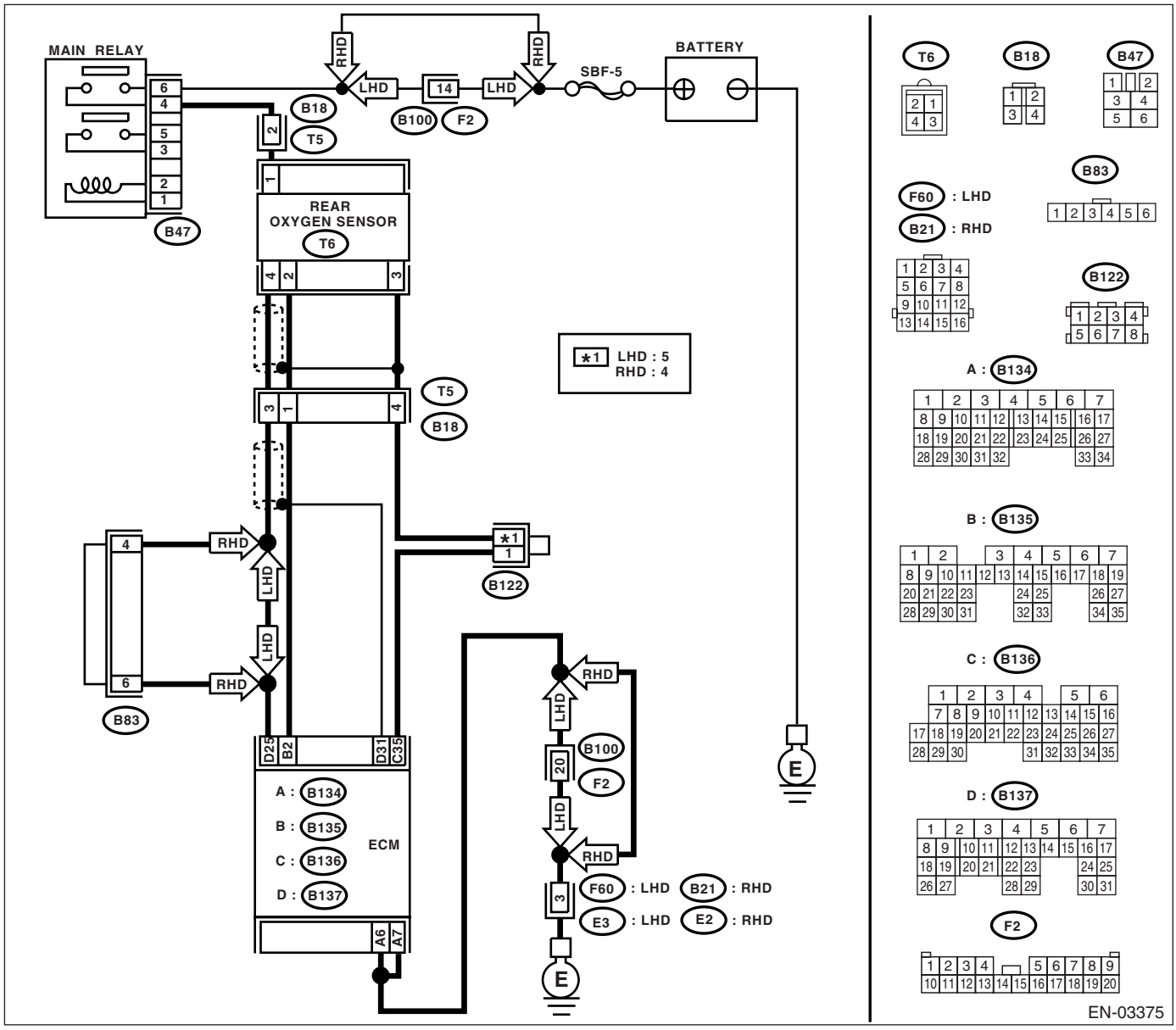
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.5)-40, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance in harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.5)-40, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose part of exhaust system and incomplete installation • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.5)-40, Rear Oxygen Sensor.>

T: DTC P0138 O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

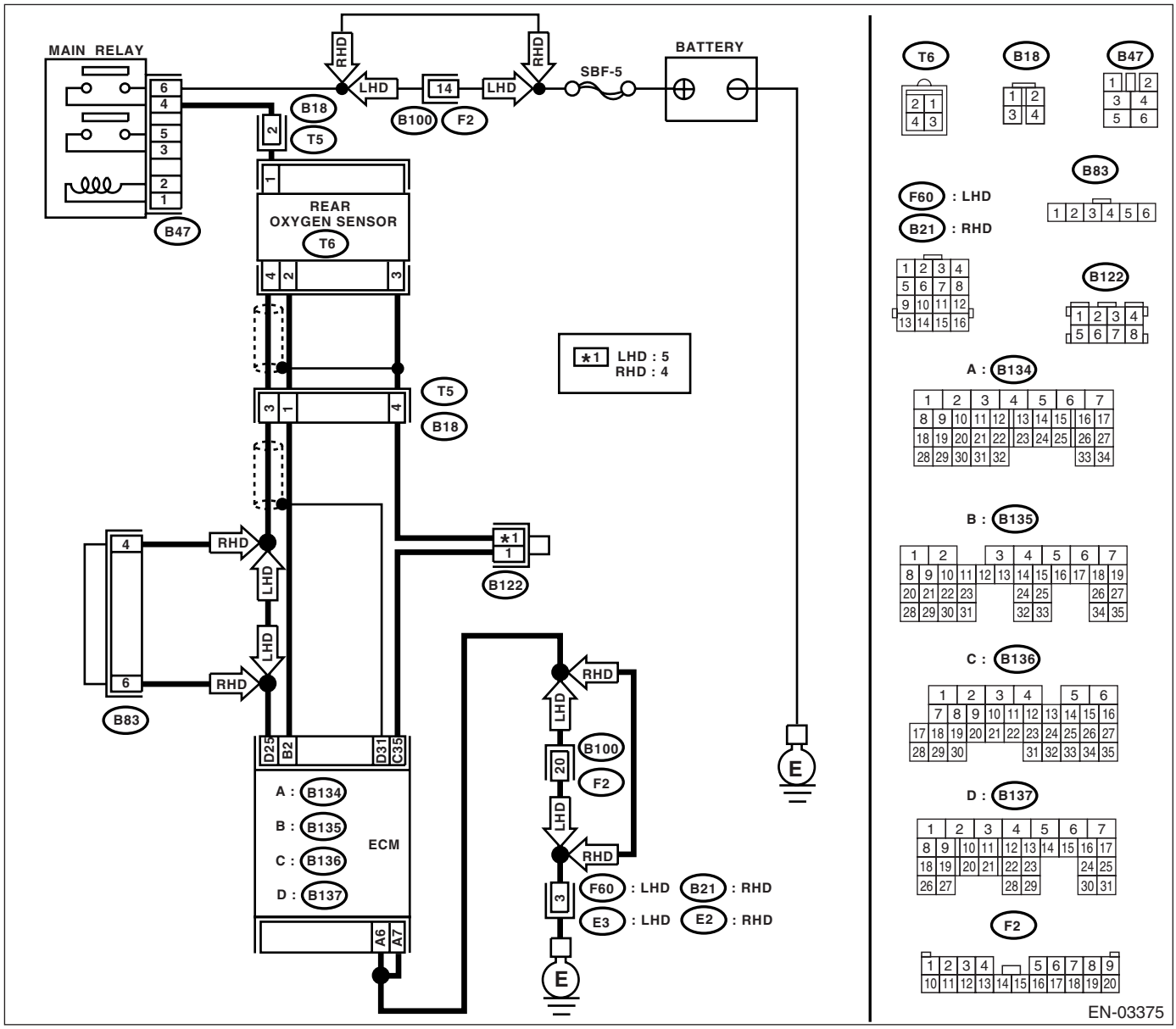
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for two minutes. 2) Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen (A/F) sensor signal using Subaru Select Monitor or general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.5)-40, Rear Oxygen Sensor.>
4	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance in harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (T6) No. 4:***	Is the resistance more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(T6) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.5)-40, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose part of exhaust system and incomplete installation • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty part.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC 2.5)-40, Rear Oxygen Sensor.>

U: DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:
For diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC 2.5)(diag)-127, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose from fuel filter, and connect the fuel pressure gauge. 4) Install the fuel filler flap lid cap. 5) Start the engine and idle while gear position is neutral. 6) Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If out of specification as measured at this step, check or replace pressure regulator and pressure regulator vacuum hose.	Is measured value 206 — 235 kPa (2.1 — 2.4 kgf/cm^2, 30 — 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is engine coolant temperature more than 60°C (140°F)?	Go to step **6.**	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC 2.5)-27, Engine Coolant Temperature Sensor.>
6	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR** 1) Start and warm-up the engine until engine coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value within the following? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.5)-31, Mass Air Flow and Intake Air Temperature Sensor.>

	Step	Check	Yes	No
7	**CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR** 1) Start and warm-up the engine until engine coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Subtract the ambient temperature from intake air temperature, and is the value −10 — 50°C (14 — 122°F)?	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC 2.5)-31, Mass Air Flow and Intake Air Temperature Sensor.>

W: DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

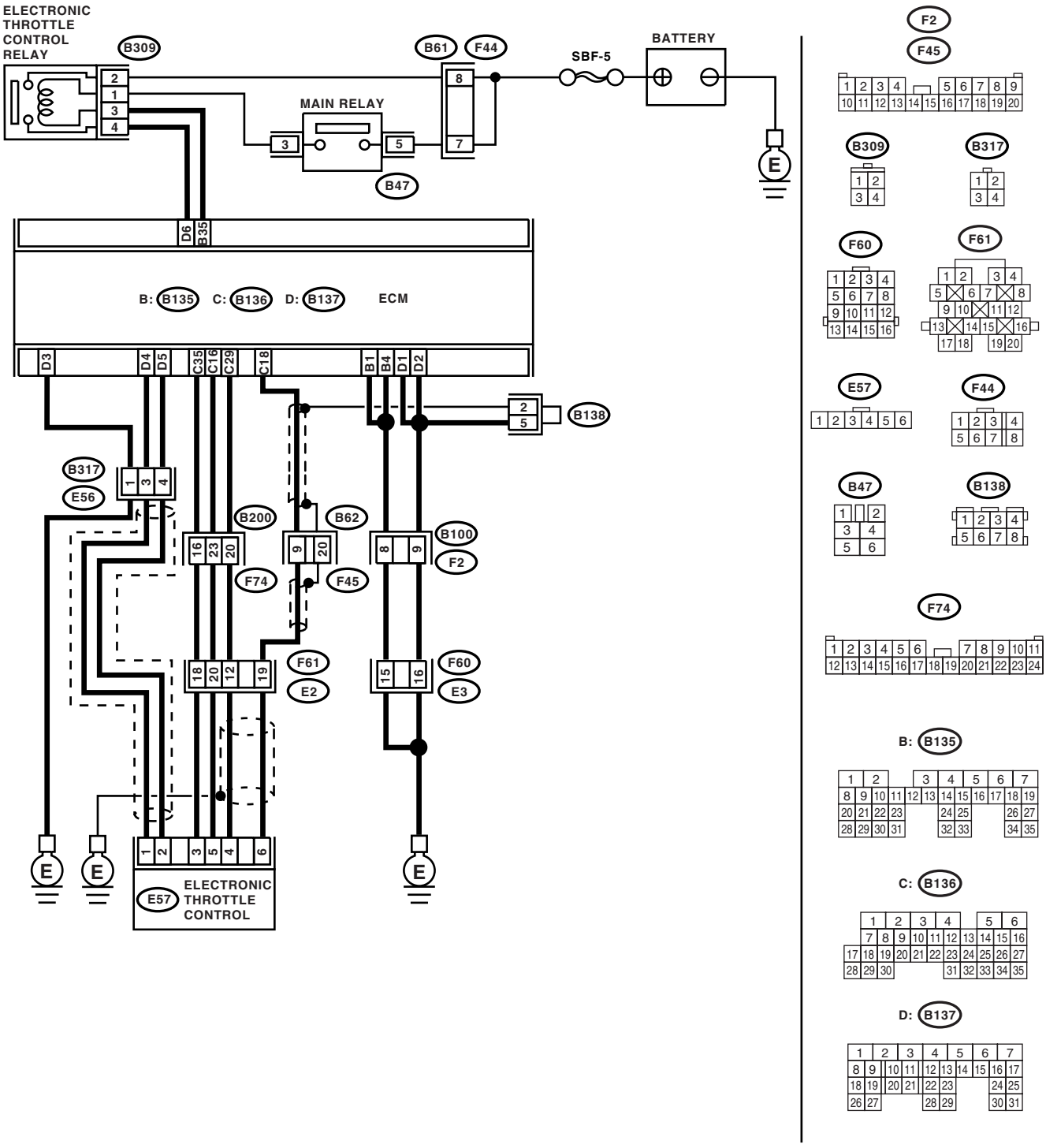
- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

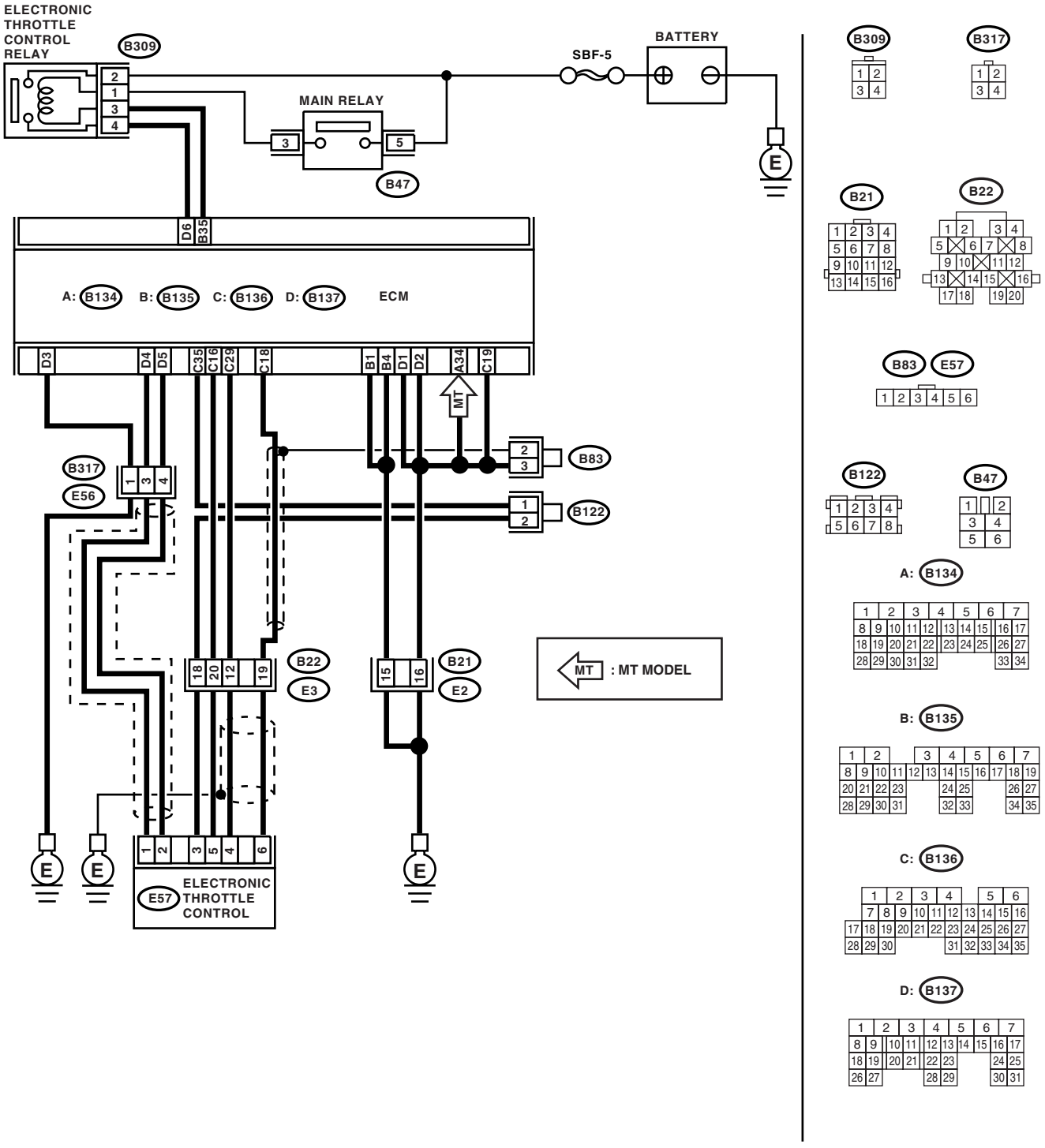
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and terminal. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 3) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage more than 0.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Repair poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

X: DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

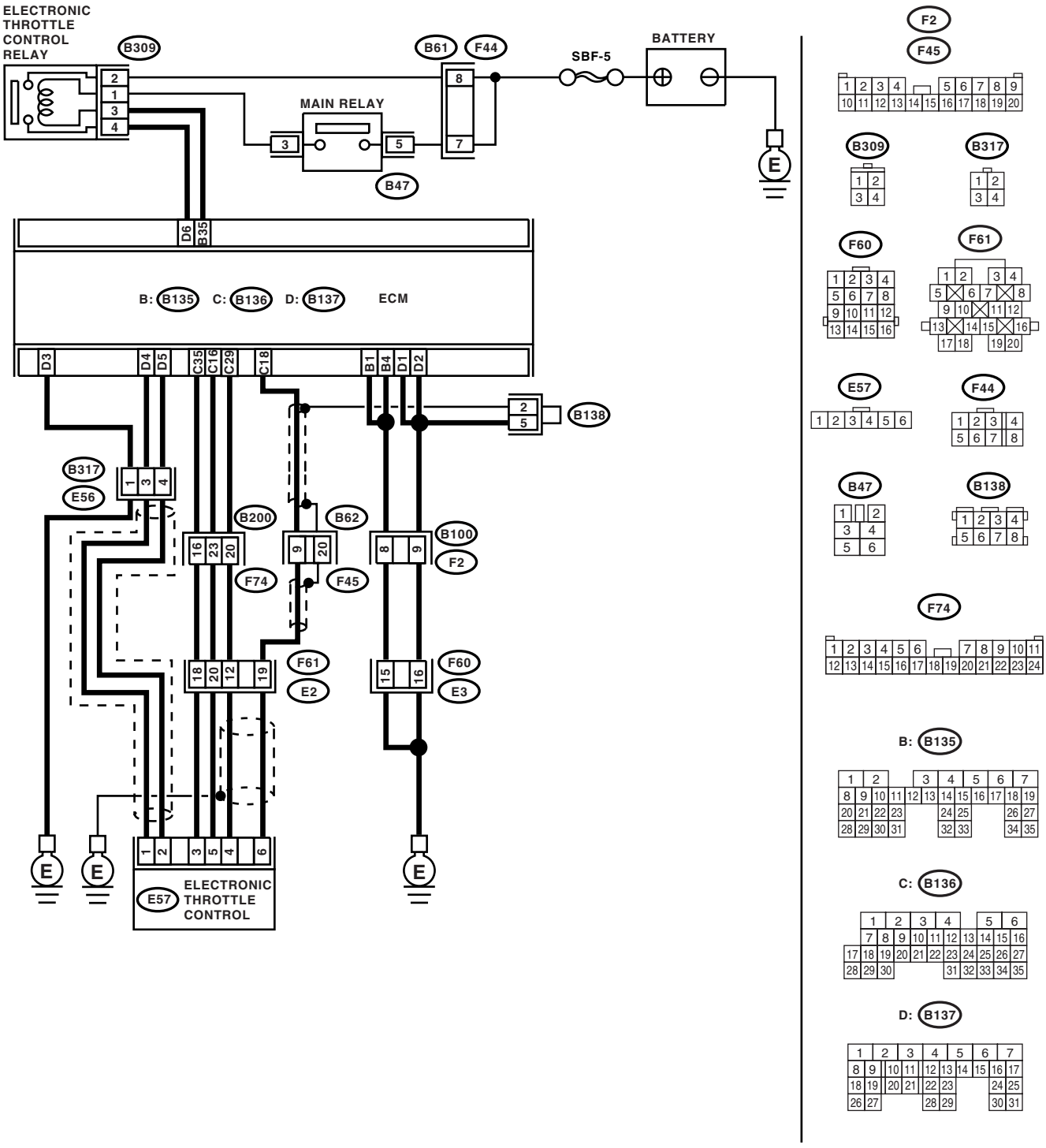
- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

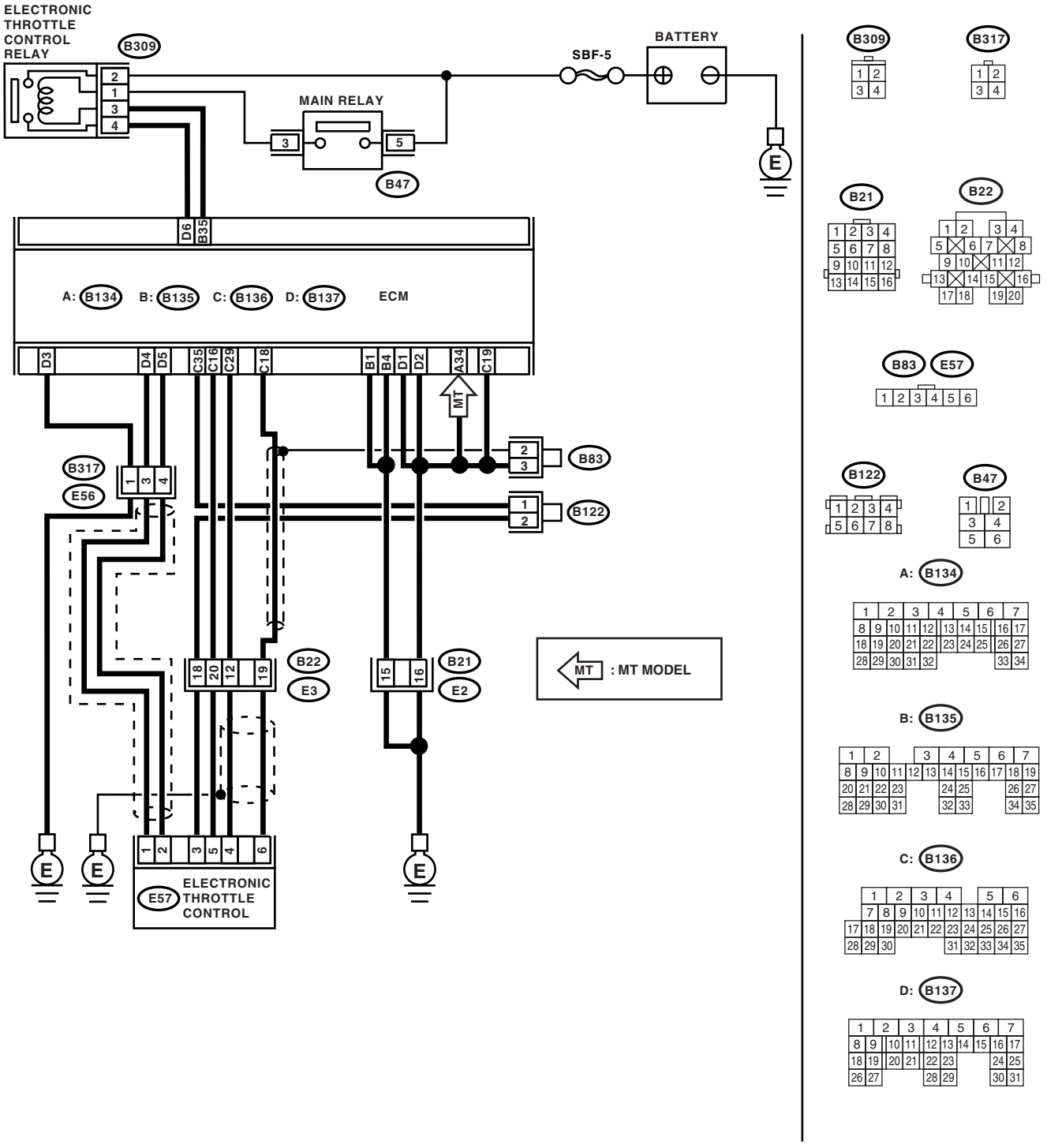
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

Step		Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. 3) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage less than 4.73 V?	Go to step **2.**	Go to step **3.**

	Step	Check	Yes	No
2	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 29 — (E57) No. 4:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage more than 10 V?	Go to step **6.**	Repair battery short circuit in harness between ECM connector and electronic throttle control connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (−):*** 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **7.**	Repair battery short circuit in harness between ECM connector and electronic throttle control connector.
7	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between connector terminals. ***Connector & terminal*** ***(B136) No. 29 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact. Replace the electronic throttle control if defective.	Sensor power supply circuit may be shorted.

Y: DTC P0230 FUEL PUMP PRIMARY CIRCUIT

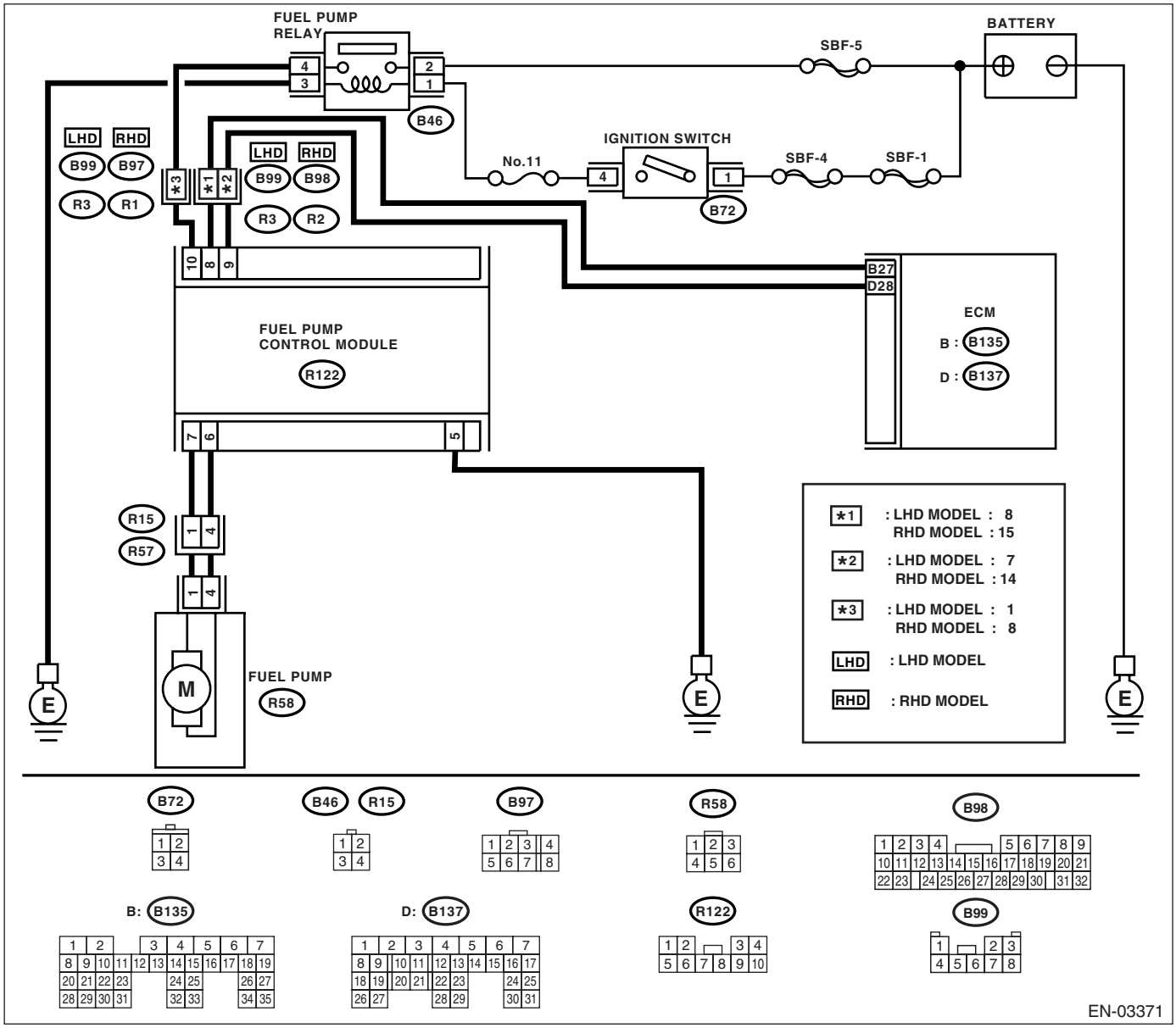
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump control unit. • Poor contact in fuel pump control unit connector. • Poor contact in fuel pump relay connector.
2	**CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit between fuel pump control unit and chassis ground. • Poor contact in fuel pump control unit connector.
3	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. ***Connector & terminal*** ***(R122) No. 6 — (R58) No. 4:*** ***(R122) No. 7 — (R58) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit between fuel pump control unit and fuel pump.
4	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 6 — Chassis ground:*** ***(R122) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit between fuel pump control unit and fuel pump.
5	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance in harness between fuel pump control unit and ECM connector. ***Connector & terminal*** ***(R122) No. 8 — (B135) No. 27:*** ***(R122) No. 9 — (B137) No. 28:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit between fuel pump control unit and ECM. • Poor contact in fuel pump control unit and ECM connector

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.** Measure the resistance of harness between fuel pump control unit and chassis ground. ***Connector & terminal*** ***(R122) No. 8 — Chassis ground:*** ***(R122) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit between fuel pump control unit and ECM.
7	**CHECK POOR CONTACT.** Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Go to step **8.**
8	**CHECK EXPERIENCE OF RUNNING OUT OF FUEL.**	Did the vehicle experience running out of fuel?	Finish the diagnostic. NOTE: DTC record may be conducted as a result of fuel pump idling while running out of gas.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC 2.5)-46, Fuel Pump Control Unit.>

Z: DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

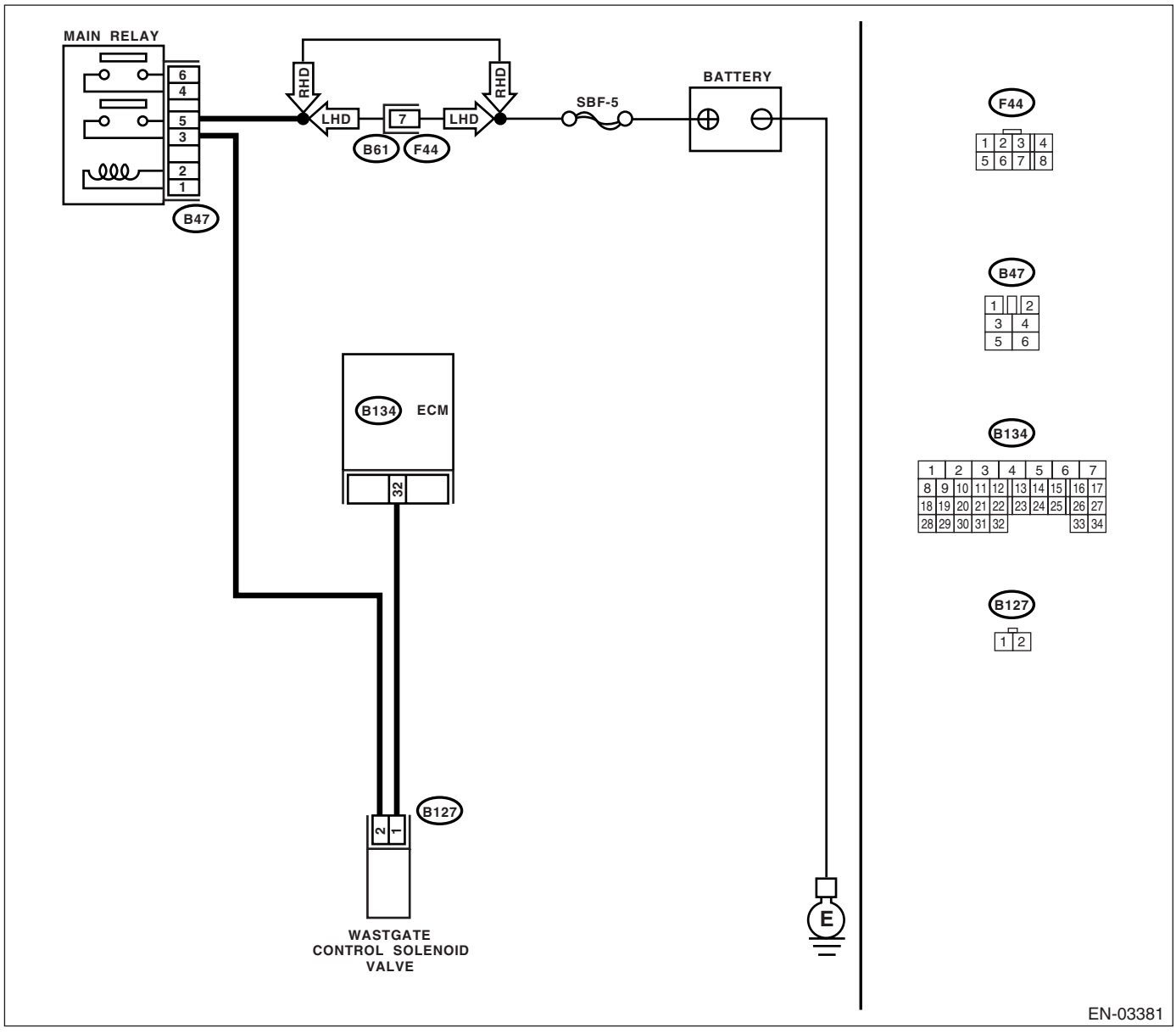
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance in harness between wastegate control solenoid valve connector and engine ground. ***Connector & terminal*** ***(B127) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM and wastegate control solenoid valve connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between wastegate control solenoid valve and ECM. ***Connector & terminal*** ***(B134) No. 32 — (B127) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and wastegate control solenoid valve connector
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 30 — 34 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC 2.5)-37, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. ***Connector & terminal*** ***(B127) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and wastegate control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in wastegate control solenoid valve connector.	Is there poor contact in wastegate control solenoid valve connector?	Repair poor contact in wastegate control solenoid valve connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AA:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

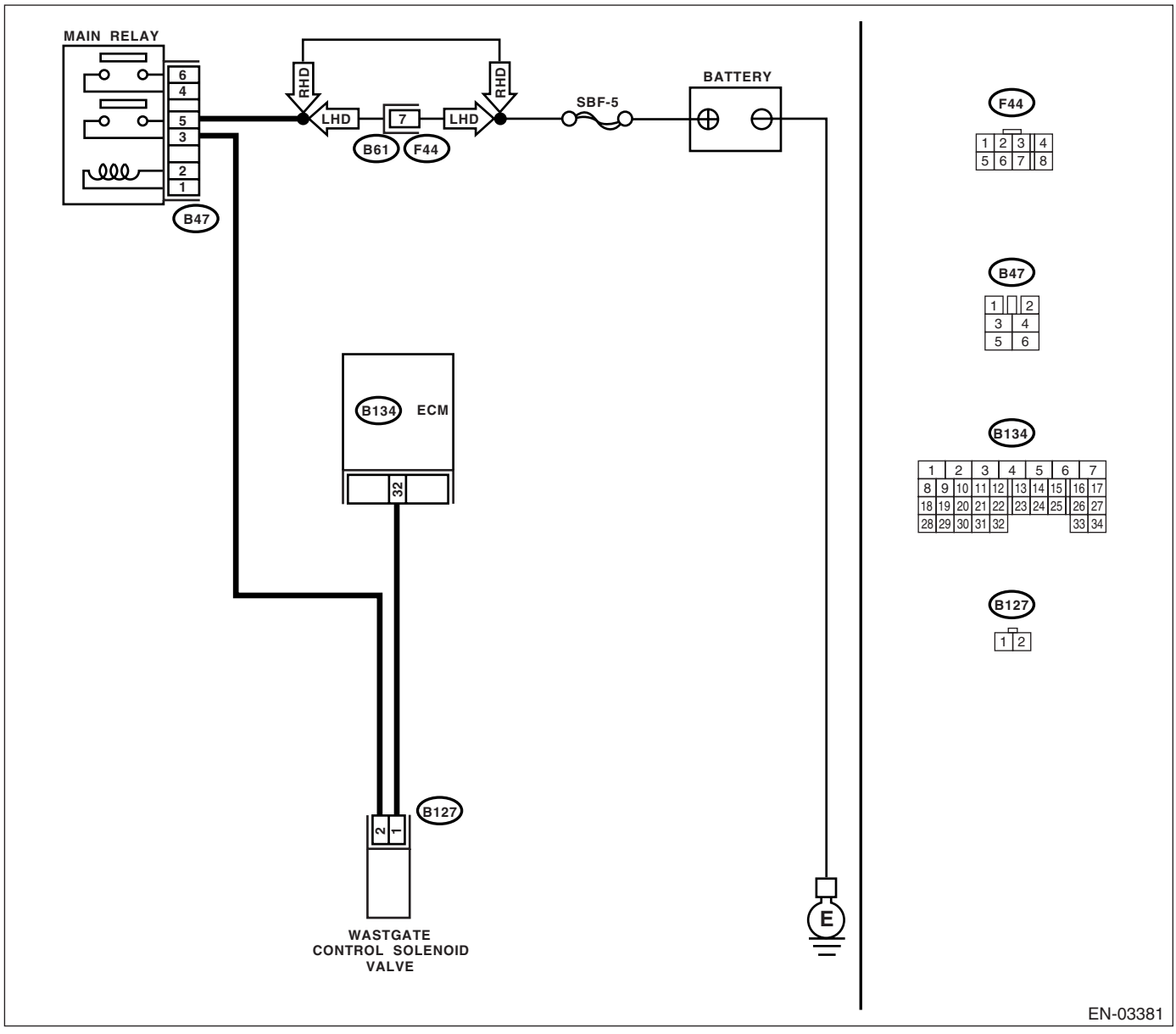
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
3	**CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK WASTEGATE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the wastegate control solenoid valve and ECM. <Ref. to FU(H4DOTC 2.5)-37, Wastegate Control Solenoid Valve.> <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

AB:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

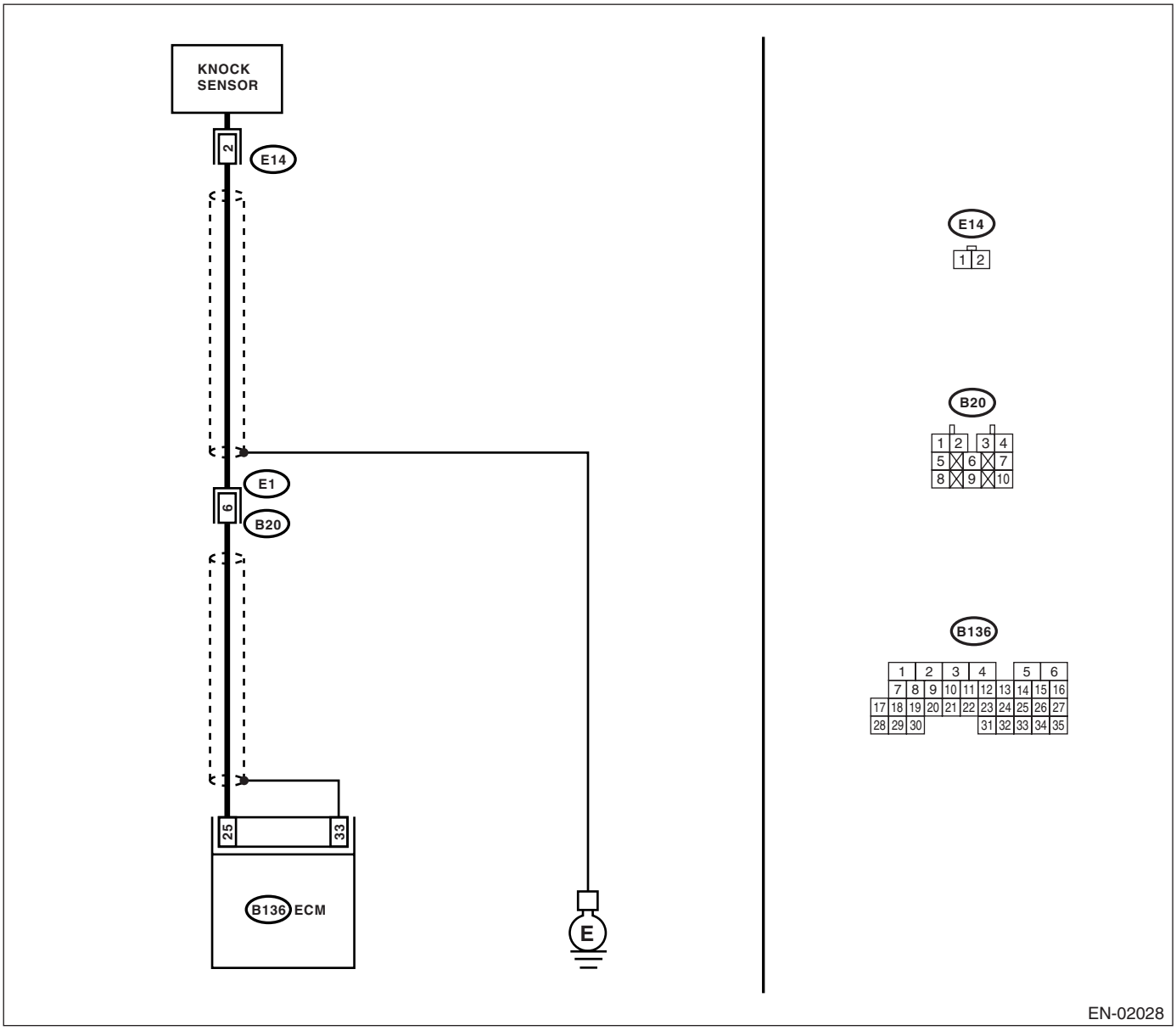
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Connector & terminal*** ***(E14) No. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC 2.5)-30, Knock Sensor.>	Tighten knock sensor installation bolt securely.

AC:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

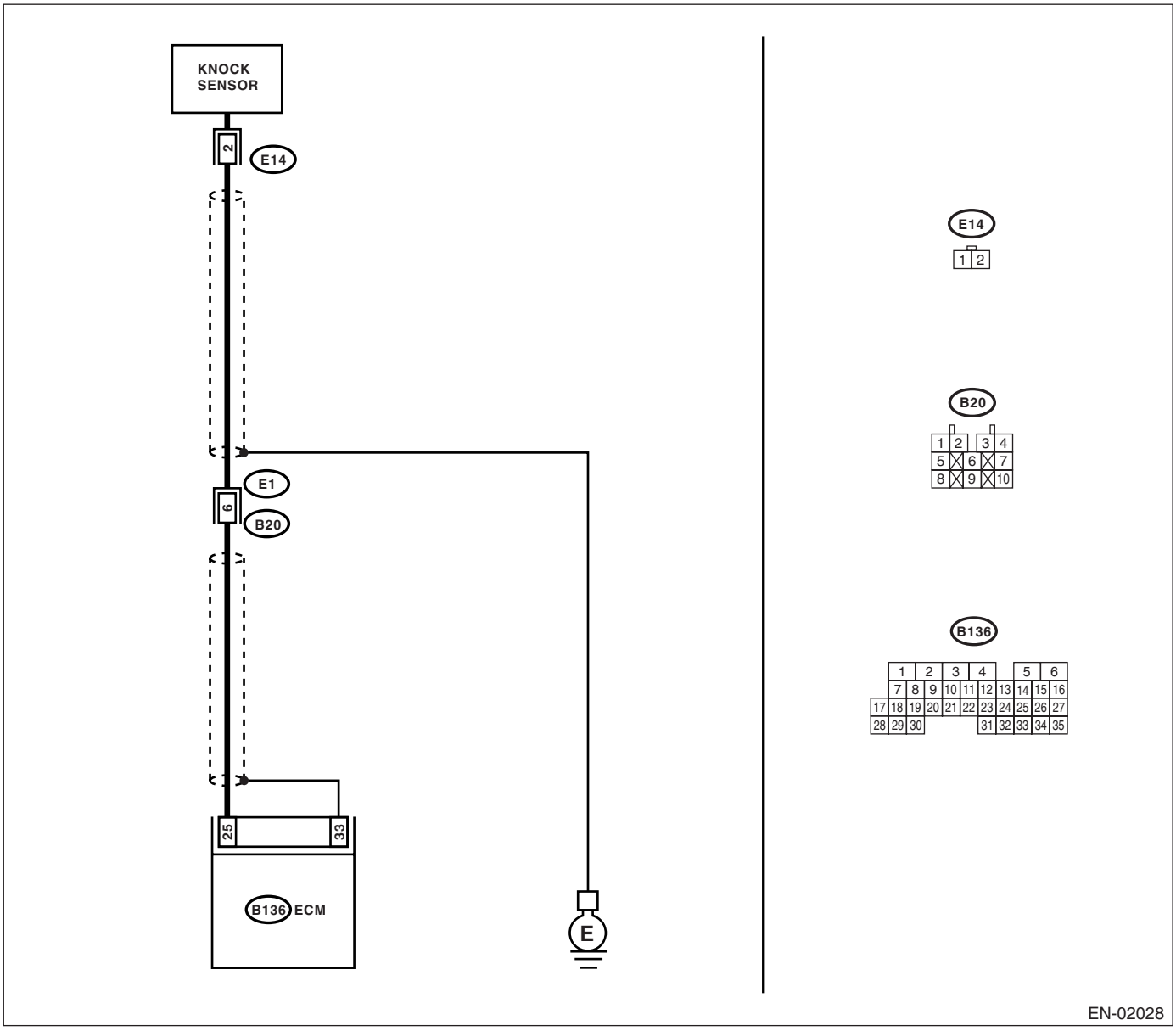
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance less than 400 kΩ?	Go to step **2.**	Go to step **3.**
2	**CHECK KNOCK SENSOR.** 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. ***Terminals*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC 2.5)-30, Knock Sensor.>	Repair ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair short circuit in harness covered with shield.
3	**CHECK INPUT SIGNAL FROM ECM.** 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AD:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

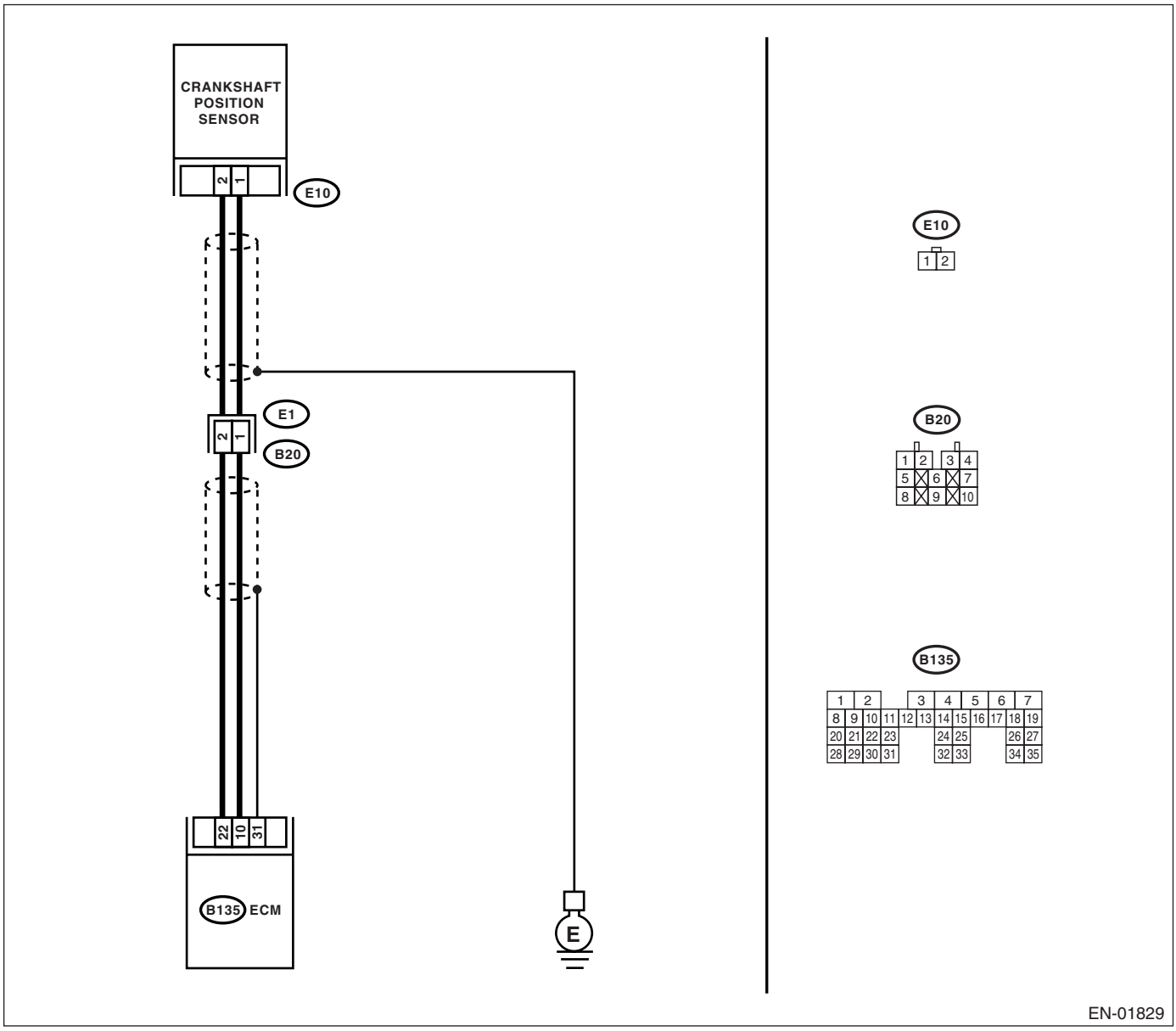
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
3	**CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between crankshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E10) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in coupling connector
4	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.**	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the crankshaft position sensor installation bolt securely.
5	**CHECK CRANKSHAFT POSITION SENSOR.** 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC 2.5)-28, Crankshaft Position Sensor.>

AE:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

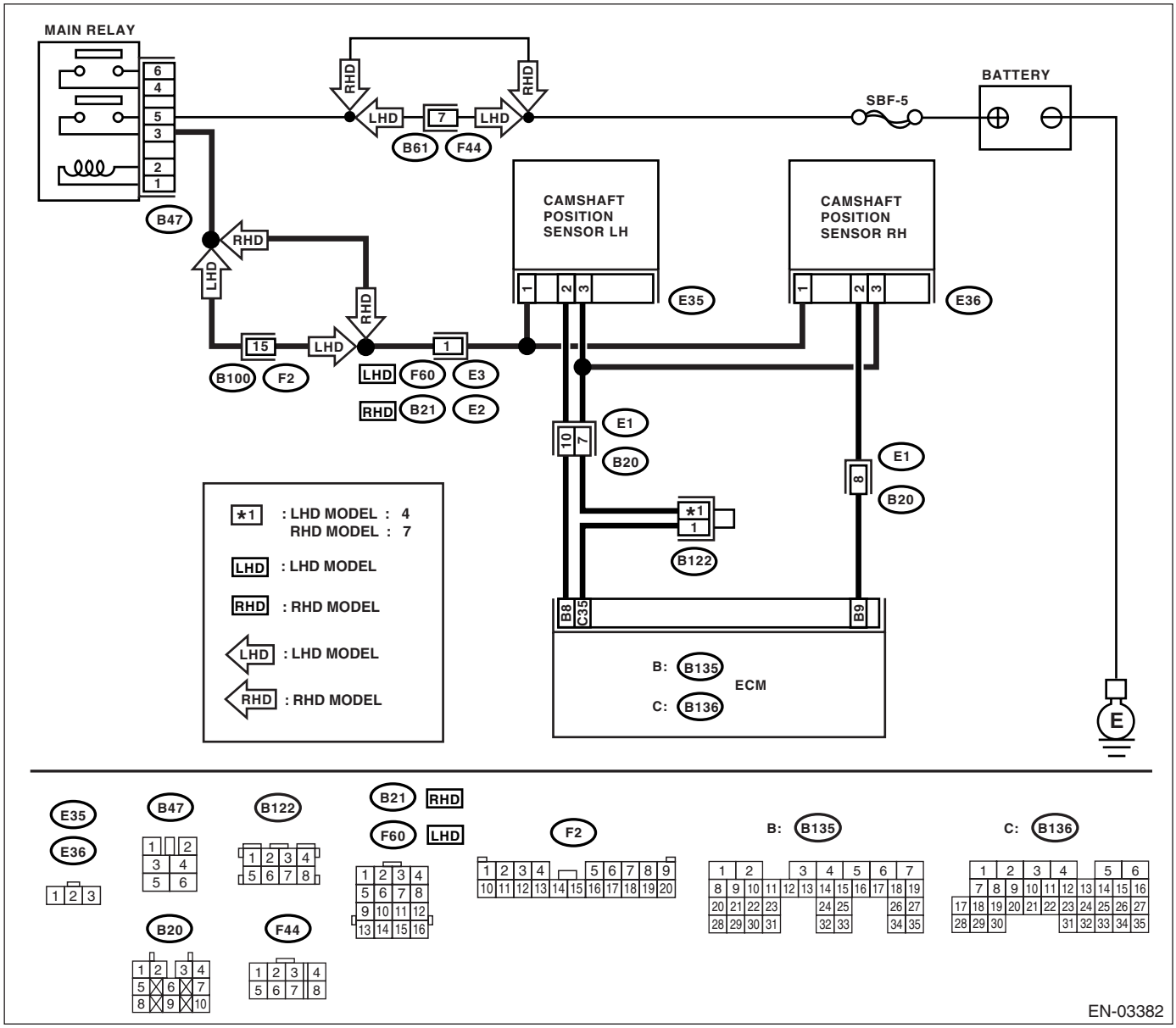
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair open or battery short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E36) No. 2 — (B135) No. 9:*** ***(E36) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E36) No. 2 — Engine ground:*** ***(E36) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC 2.5)(diag)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC 2.5)-29, Camshaft Position Sensor.>	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

AF:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

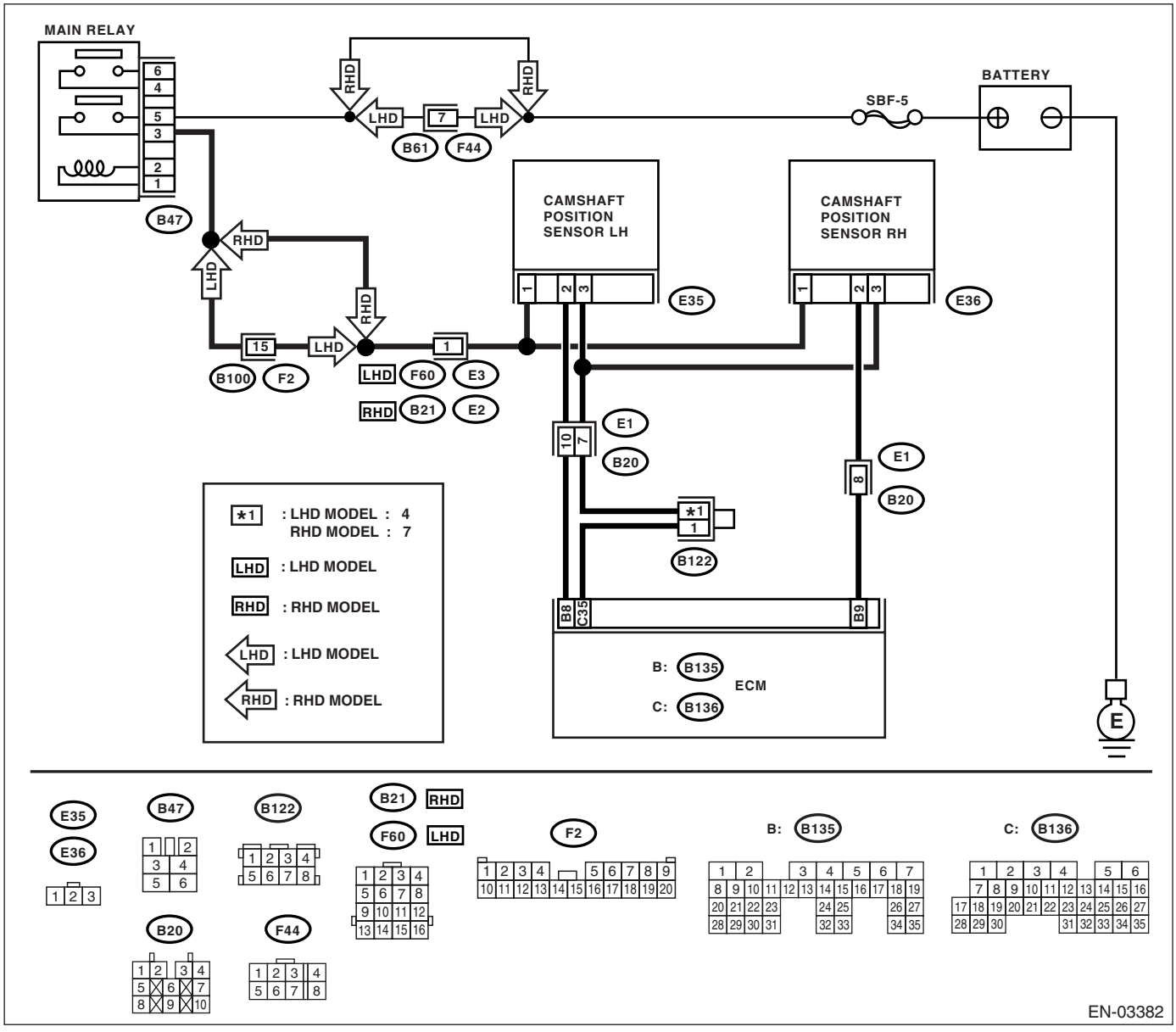
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **2.**
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair open or battery short circuit between main relay connector and camshaft position sensor connector.
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. ***Connector & terminal*** ***(E35) No. 2 — (B135) No. 8:*** ***(E35) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit between camshaft position sensor and ECM.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM.** Measure the resistance between camshaft position sensor and engine ground. ***Connector & terminal*** ***(E35) No. 2 — Engine ground:*** ***(E35) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit between camshaft position sensor and ECM.
5	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **6.**	Tighten the camshaft position sensor installation bolt securely.
6	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC 2.5)(diag)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC 2.5)-29, Camshaft Position Sensor.>	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

AG:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

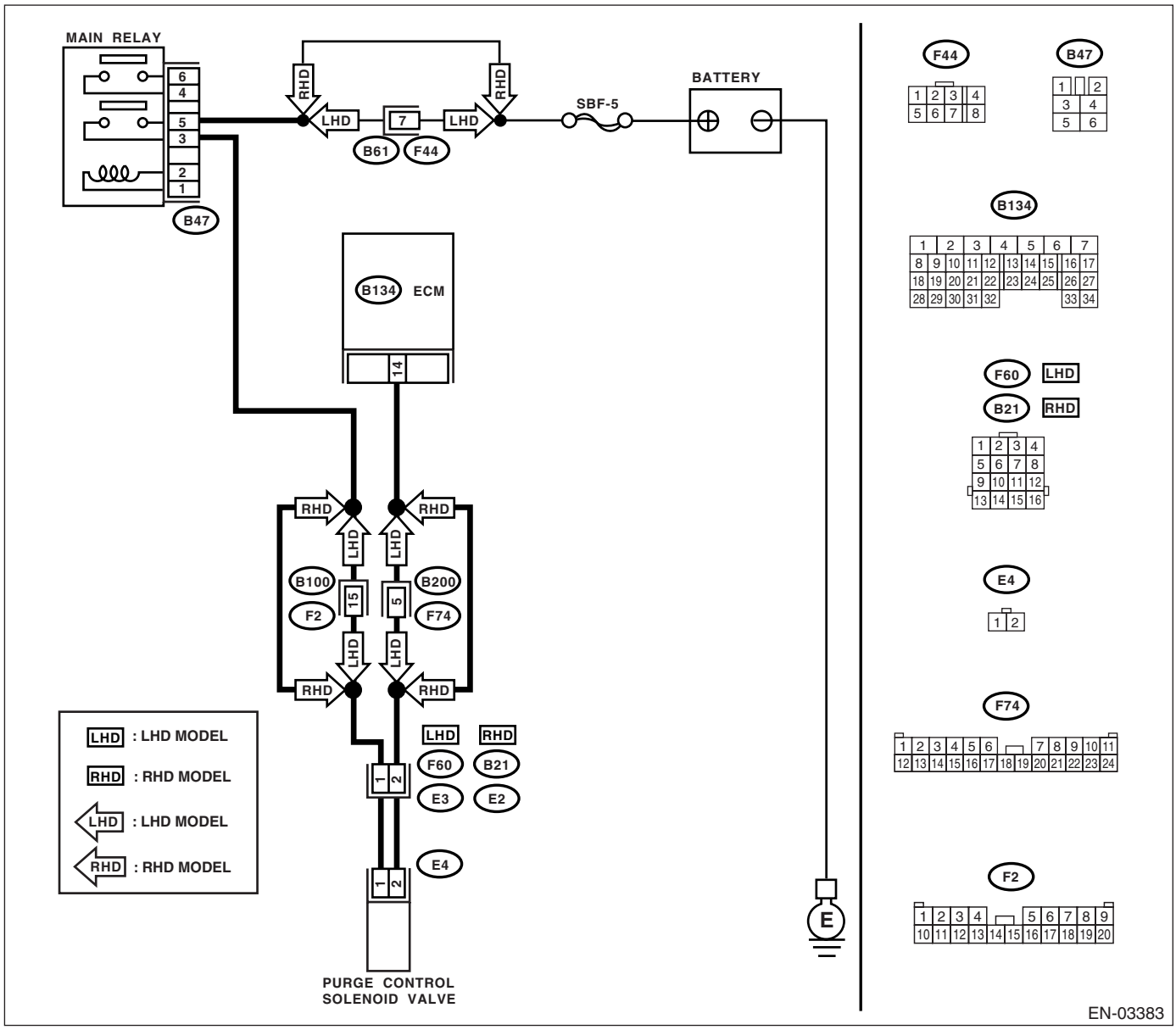
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E4) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and purge control solenoid valve connector.
3	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. ***Connector & terminal*** ***(B134) No. 14 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC 2.0)-7, Purge Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. ***Connector & terminal*** ***(E4) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair open circuit in harness between main relay and purge control solenoid valve connector.
6	**CHECK POOR CONTACT.** Check poor contact in purge control solenoid valve connector.	Is there poor contact in purge control solenoid valve connector?	Repair poor contact in purge control solenoid valve connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AH:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

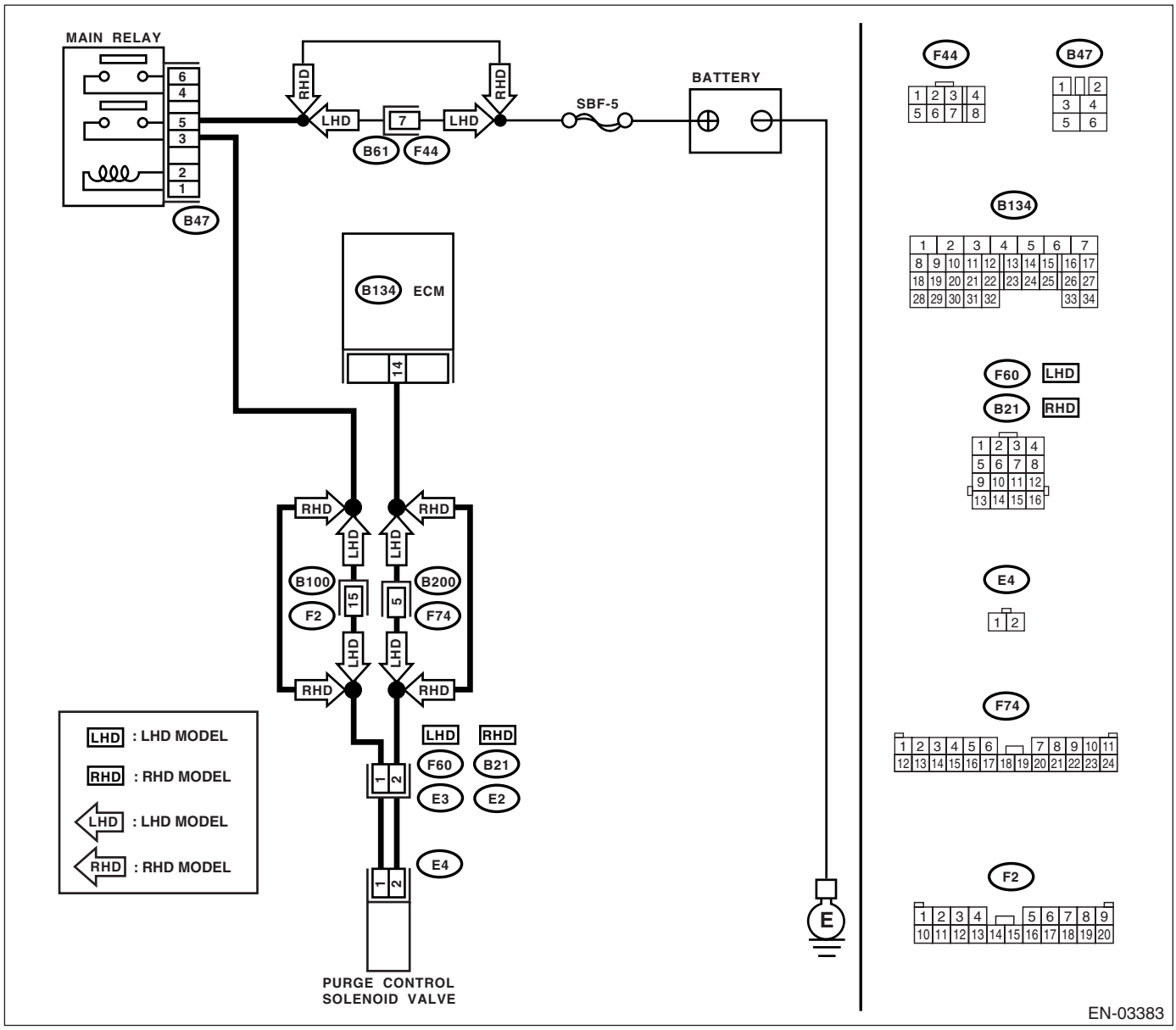
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC 2.5)(diag)-43, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage 0 — 13 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK PURGE CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve and ECM. <Ref. to EC(H4DOTC 2.0)-7, Purge Control Solenoid Valve.> <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Go to step **6.**
6	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

AI: DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

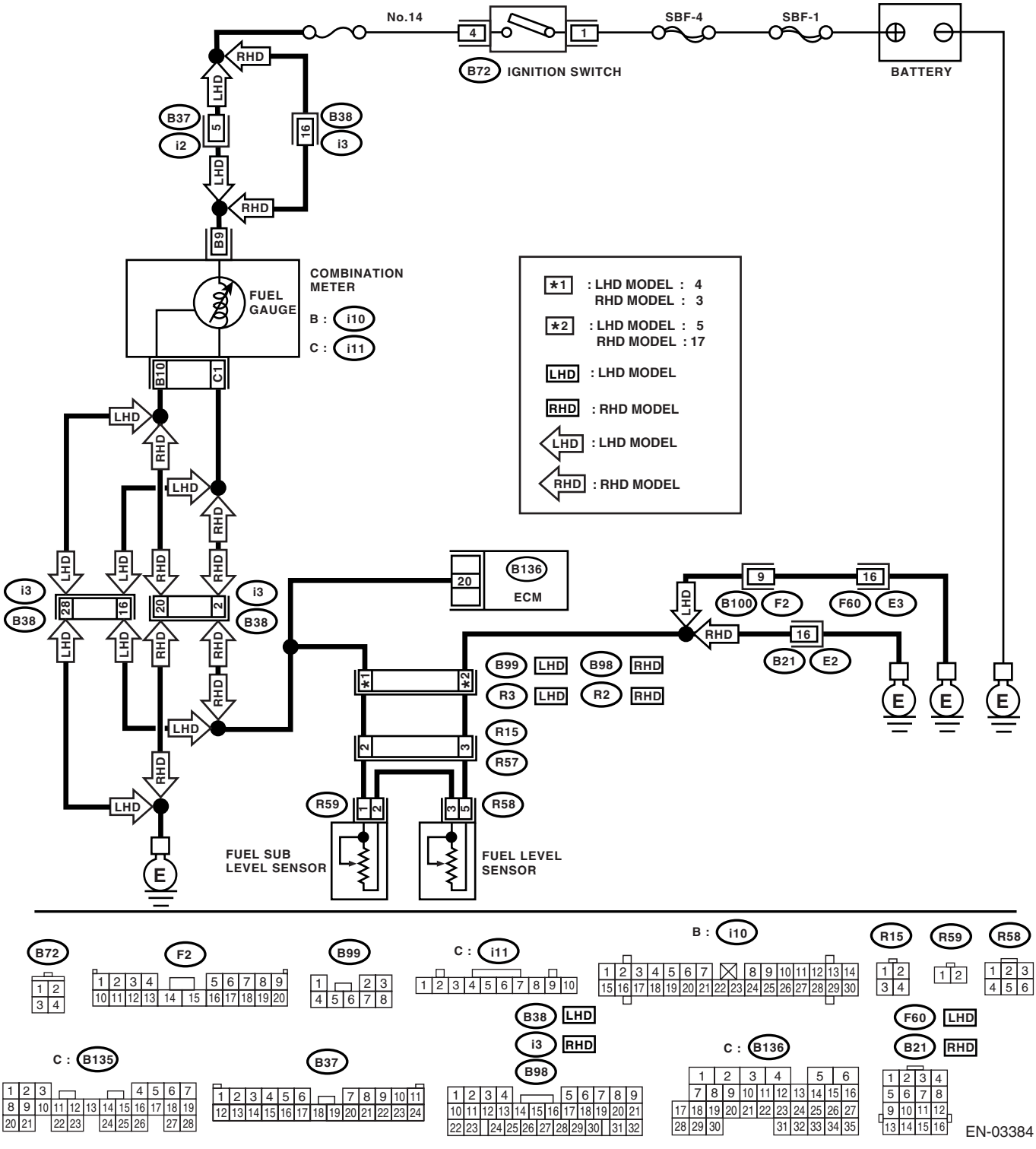
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage less than 0.12 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM WITH SUBARU SELECT MONITOR.** Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.>	Does the voltage change by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in combination meter connector • Poor contact in ECM connector. • Poor contact in coupling connector
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 0.12 V?	Go to step **5.**	Go to step **6.**
5	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i10), (i11) and ECM connector. 3) Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B136) No. 20 — (i11) No. 1:***	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair open circuit between ECM and combination meter connector. NOTE: In this case repair the following: Poor contact in coupling connector

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC 2.0)-62, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.5 — 2.5 Ω?	Go to step **10.**	Replace the fuel level sensor.
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC 2.5)-58, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 — 2.5 Ω?	Repair poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

AJ:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

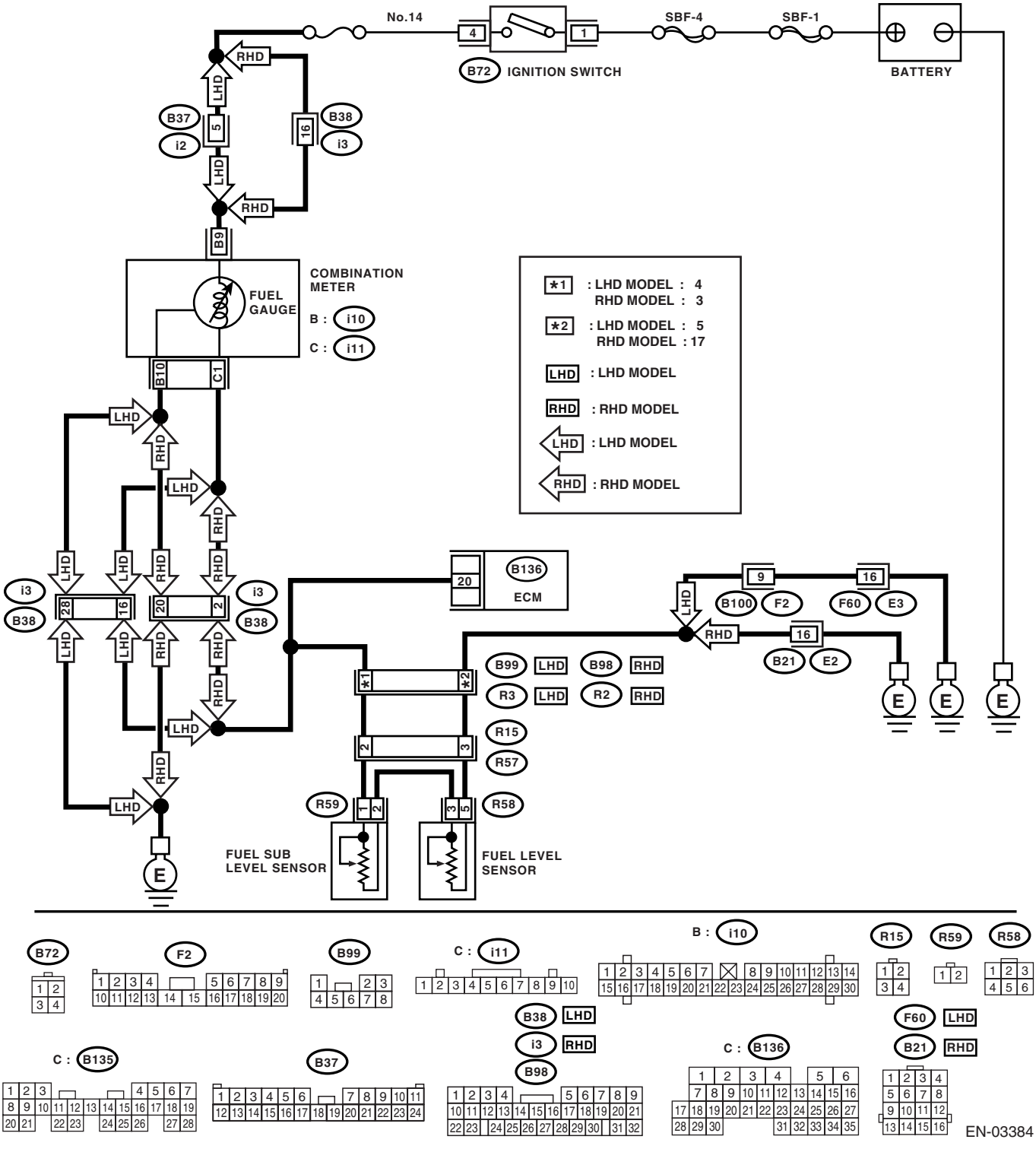
DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.**	Does the speedometer and tachometer operate normally?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **3.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B136) No. 20 — (R15) No. 2:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair open circuit between fuel tank cord and chassis ground. NOTE: In this case repair the following: Poor contact in coupling connector
6	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupler connector. ***Connector & terminal*** ***(R57) No. 3 — (R58) No. 5:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair open circuit between coupling connector and fuel level sensor.

	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1) Disconnect the connector from fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair open circuit between fuel level sensor and fuel sub level sensor.
8	**CHECK FUEL TANK CORD.** Measure the resistance between fuel sub level sensor and coupler connector. ***Connector & terminal*** ***(R57) No. 2 — (R59) No. 1:***	Is the resistance less than 10 Ω?	Go to step **9.**	Repair open circuit between coupling connector and fuel sub level sensor.
9	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC 2.5)-55, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(H4DOTC 2.5)-57, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC 2.5)-58, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 45 Ω?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC 2.5)-58, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

AK:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

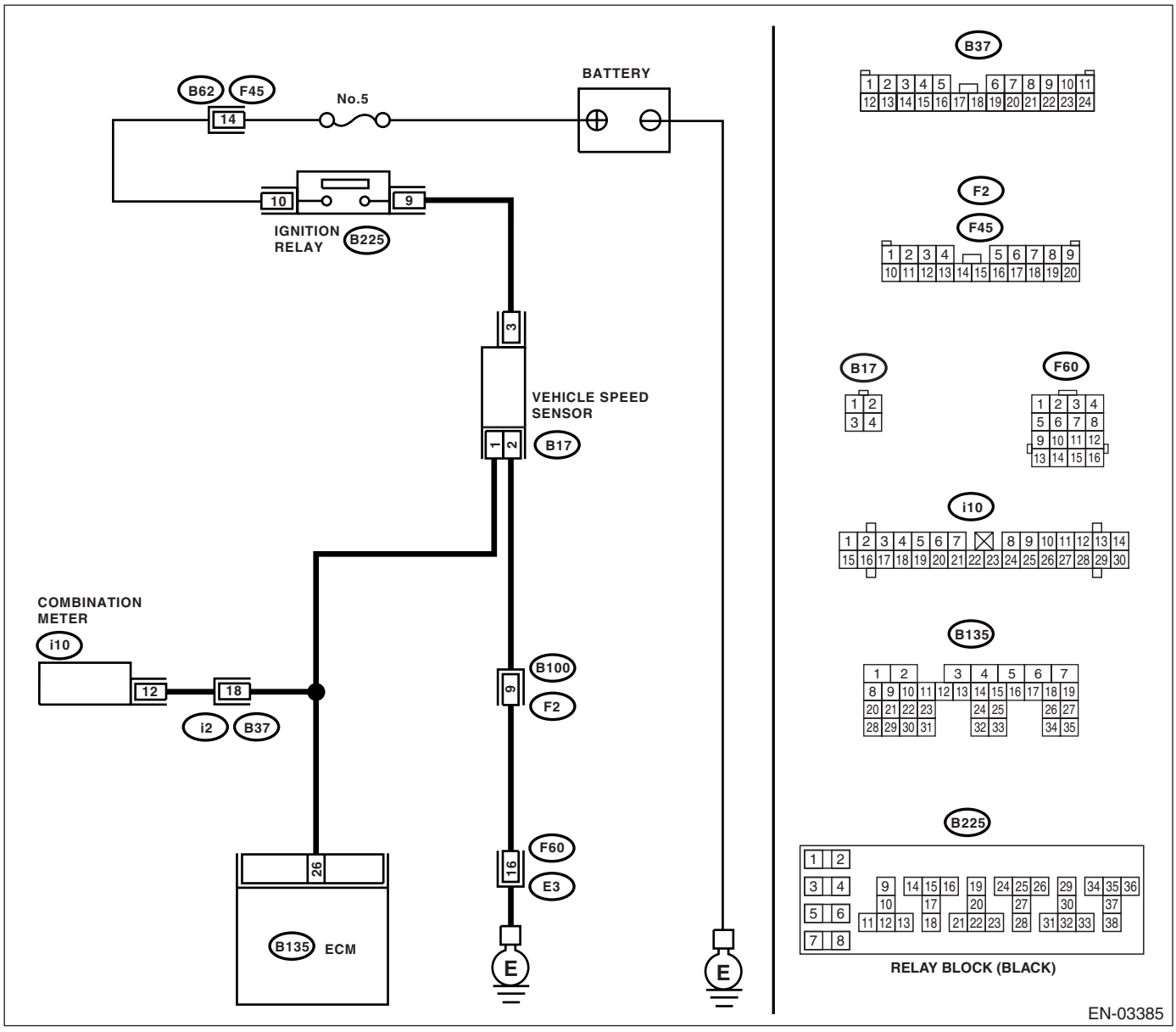
Immediately at fault recognition

CAUTION:

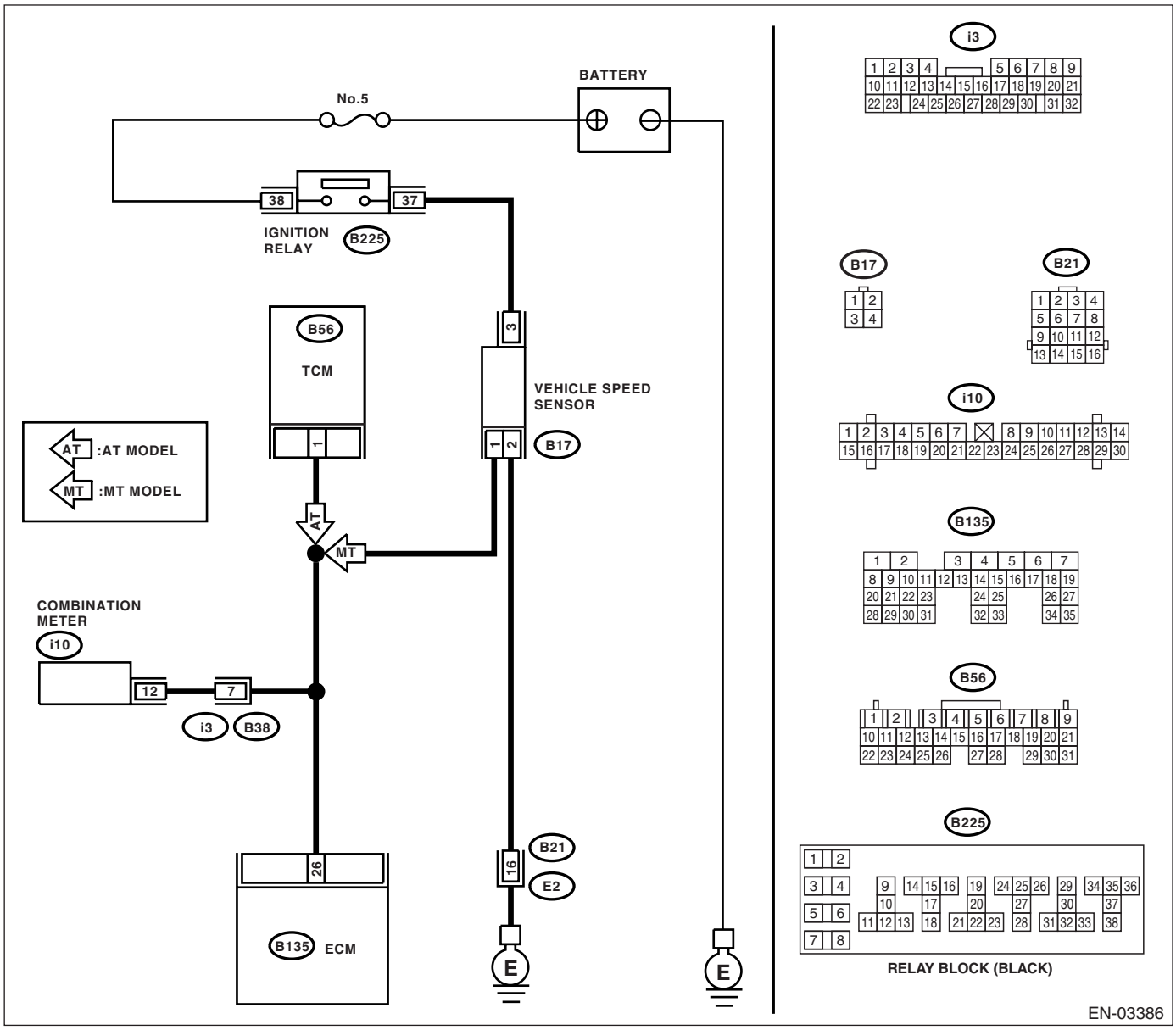
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


BATTERY
No.5
38
37
IGNITION RELAY
B225
B56
TCM
VEHICLE SPEED SENSOR
B17
AT :AT MODEL
MT :MT MODEL
COMBINATION METER
i10
12
7
i3
B38
26
B135
ECM
16
B21
E2
E
i3
B17
B21
i10
B135
B56
B225
RELAY BLOCK (BLACK)
EN-03386

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from vehicle speed sensor ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. ***Connector & terminal*** ***(B17) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair ground short circuit in harness between vehicle speed sensor and ECM connector.
2	**CHECK POOR CONTACT.** Check poor contact in vehicle speed sensor connector.	Is there poor contact in vehicle speed sensor connector?	Repair poor contact in vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-46, Vehicle Speed Sensor.>

AL:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

DTC DETECTING CONDITION:

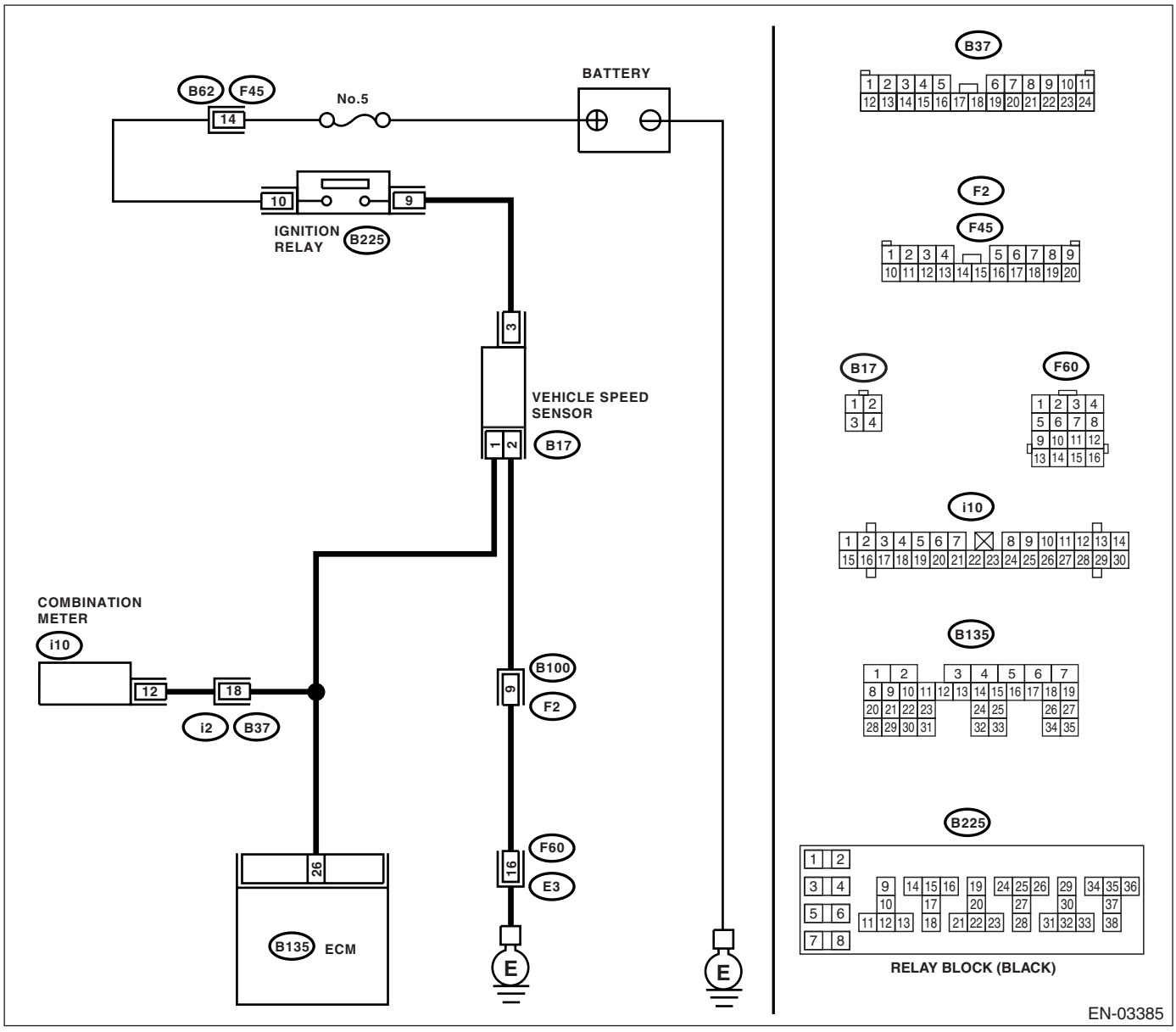
Immediately at fault recognition

CAUTION:

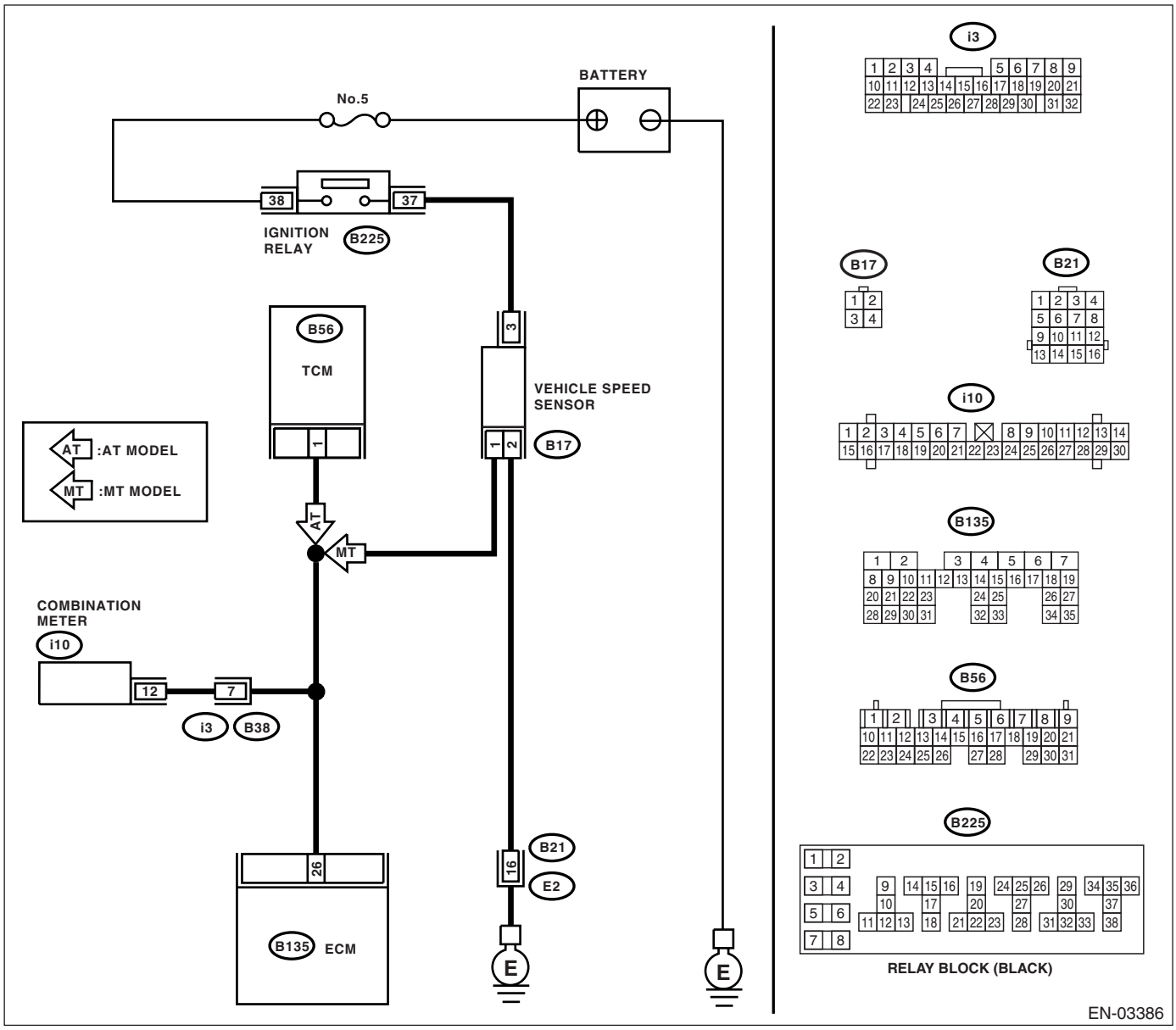
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


BATTERY
No.5
38
37
IGNITION RELAY
B225
B56
TCM
VEHICLE SPEED SENSOR
B17
AT :AT MODEL
MT :MT MODEL
COMBINATION METER
i10
12
7
i3
B38
26
B135
ECM
16
B21
E2
E
i3
B17
B21
i10
B135
B56
B225
RELAY BLOCK (BLACK)
EN-03386

	Step	Check	Yes	No
1	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does speedometer operate normally?	Go to step **2.**	Check the speedometer. <Ref. to IDI-13, Speedometer.>
2	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 26 — (i10) No. 12:***	Is the resistance less than 10 Ω?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector. • Poor contact in combination meter connector • Poor contact in coupling connector

AM:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

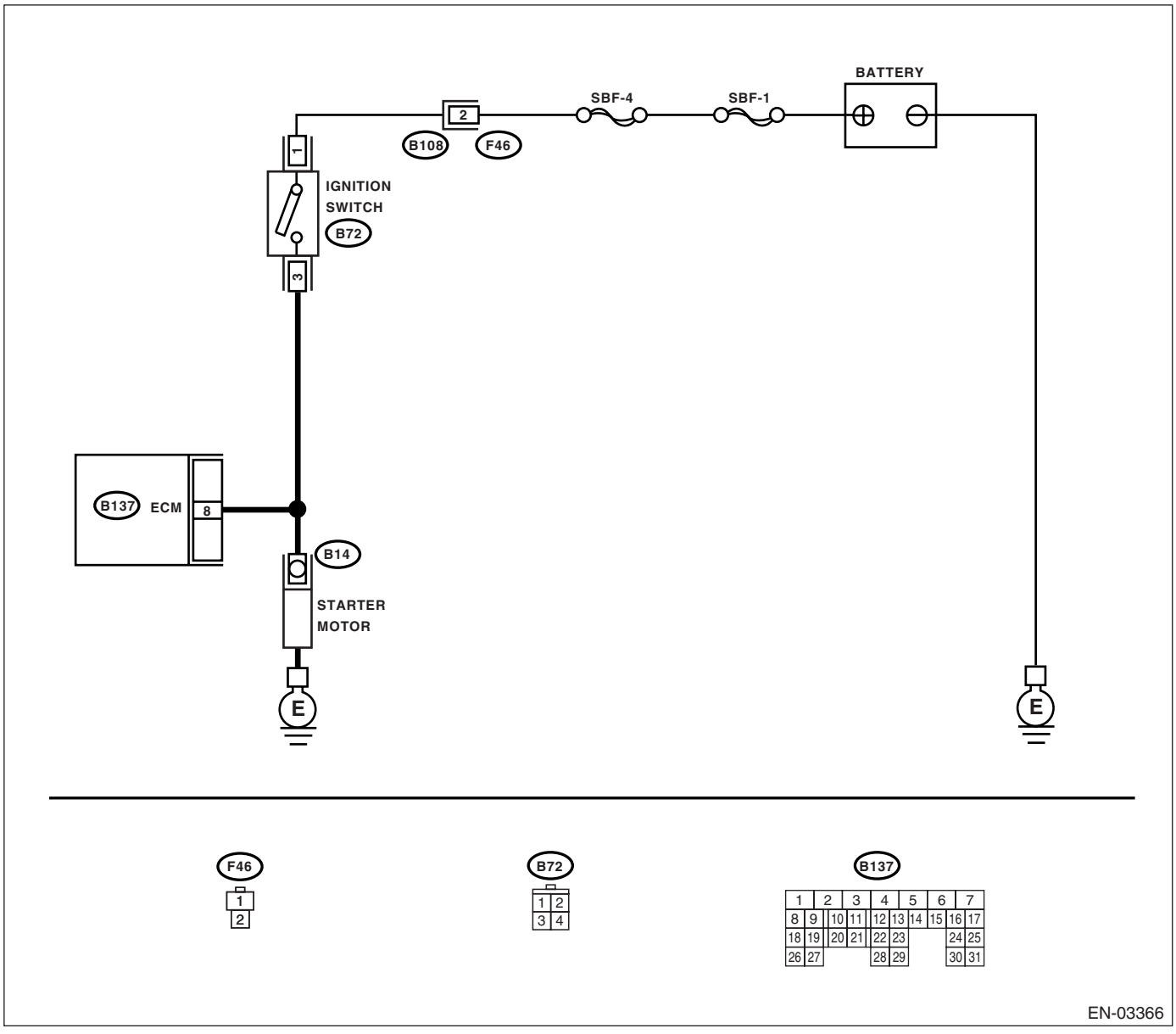
Failure of engine to start

CAUTION:

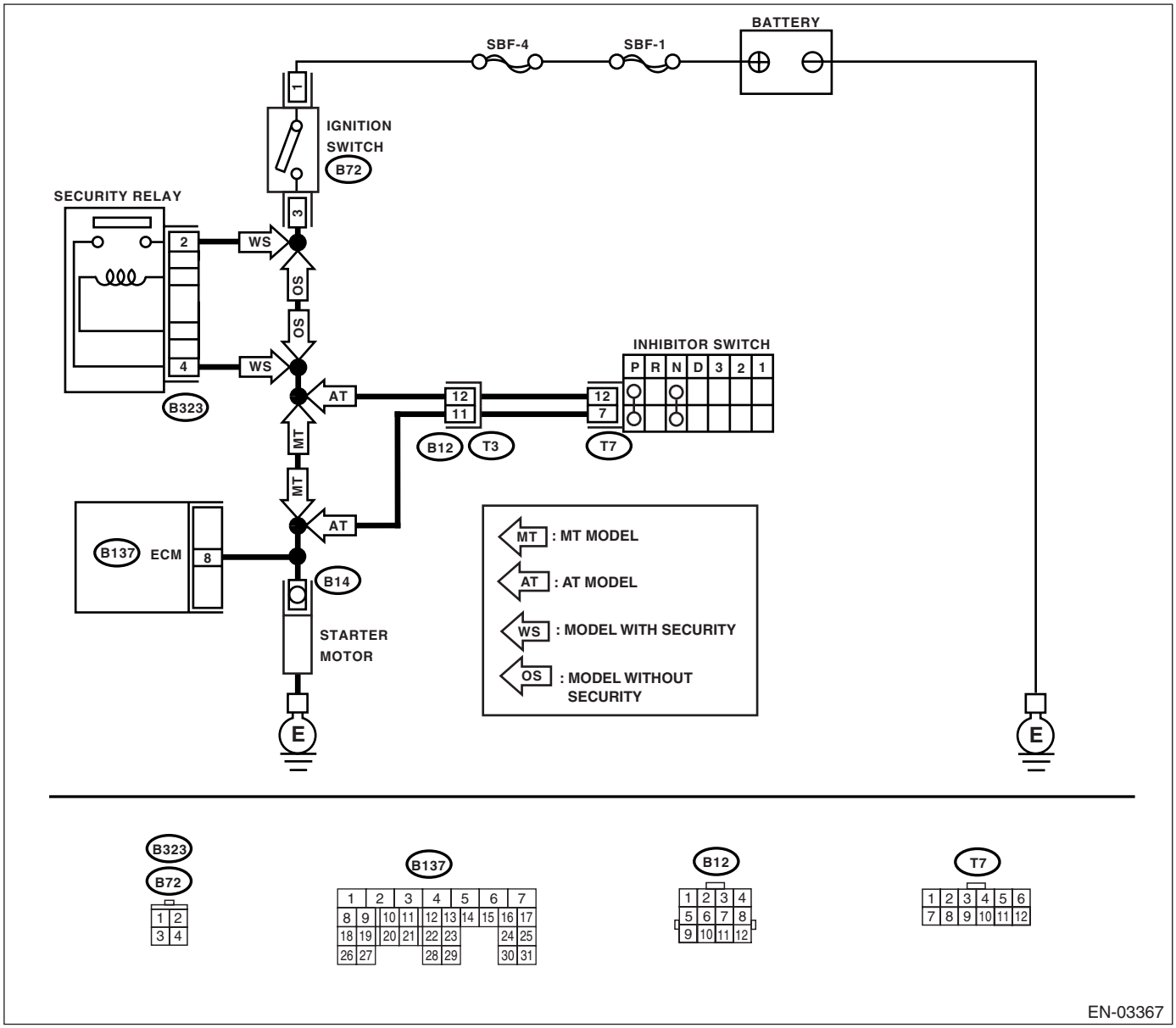
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


BATTERY
SBF-4
SBF-1
IGNITION SWITCH
B72
SECURITY RELAY
B323
INHIBITOR SWITCH
P R N D 3 2 1
B12
T3
T7
B137
ECM
B14
STARTER MOTOR
MT : MT MODEL
AT : AT MODEL
WS : MODEL WITH SECURITY
OS : MODEL WITHOUT SECURITY
E
EN-03367

Step		Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch to ON?	Repair battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Check starter motor circuit. <Ref. to EN(H4DOTC 2.5)(diag)-55, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

AN:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

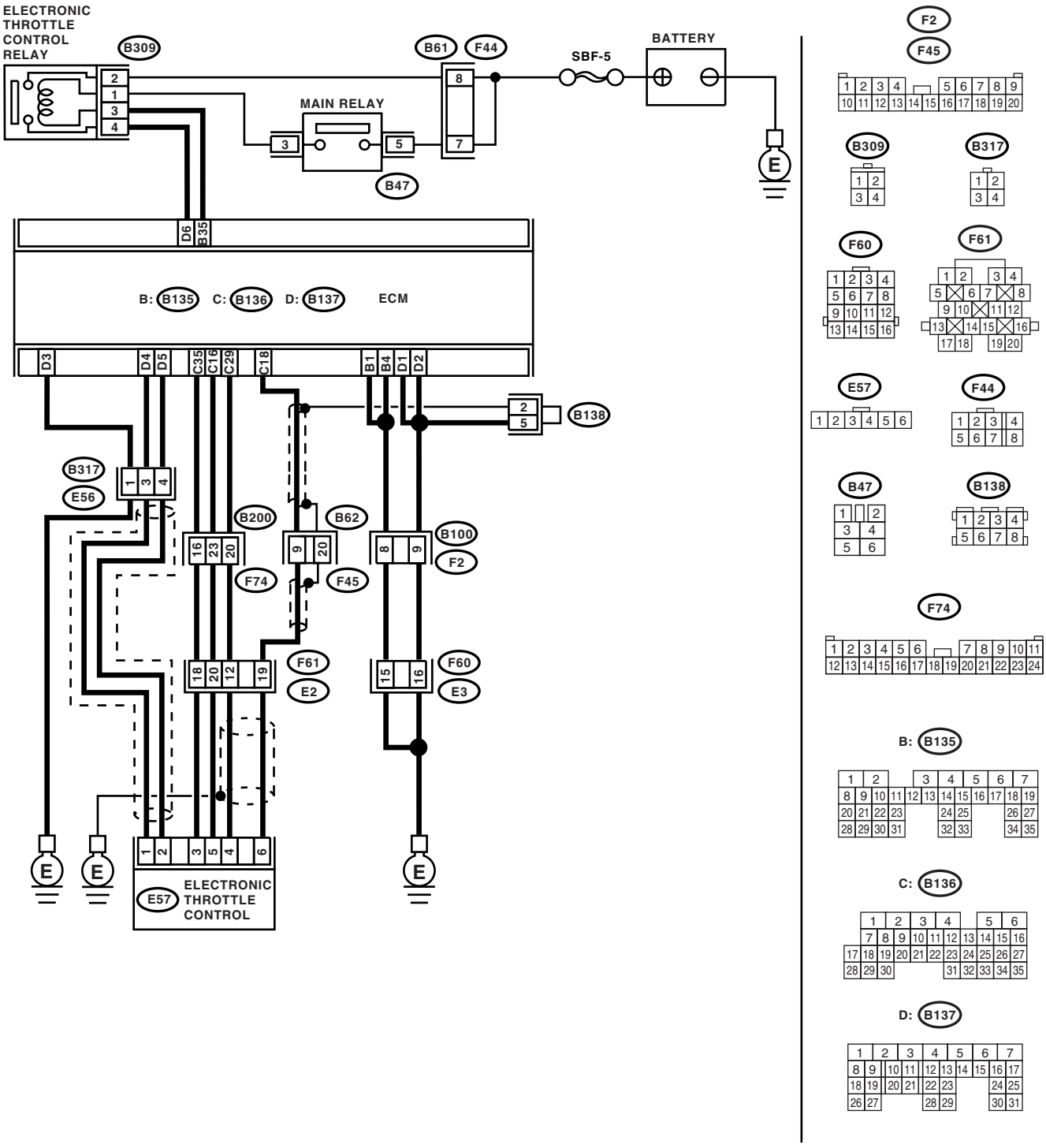
- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

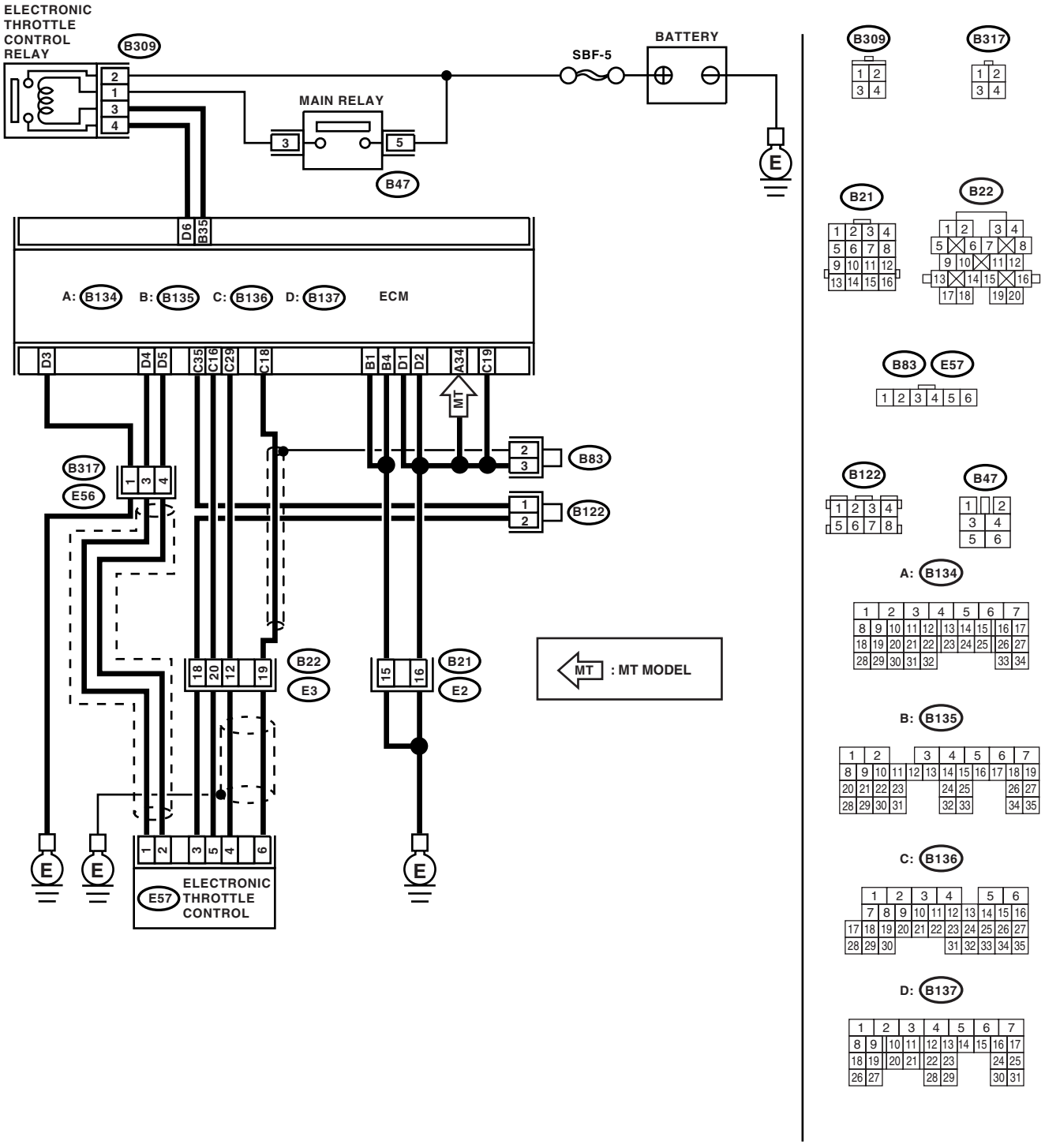
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.** 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items: • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Replace the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matters found inside the electronic throttle control?	Remove foreign matters from the electronic throttle control.	Perform the diagnostic of DTC P2101.

AO:DTC P0545 EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW - BANK 1

DTC DETECTING CONDITION:

Immediately at fault recognition

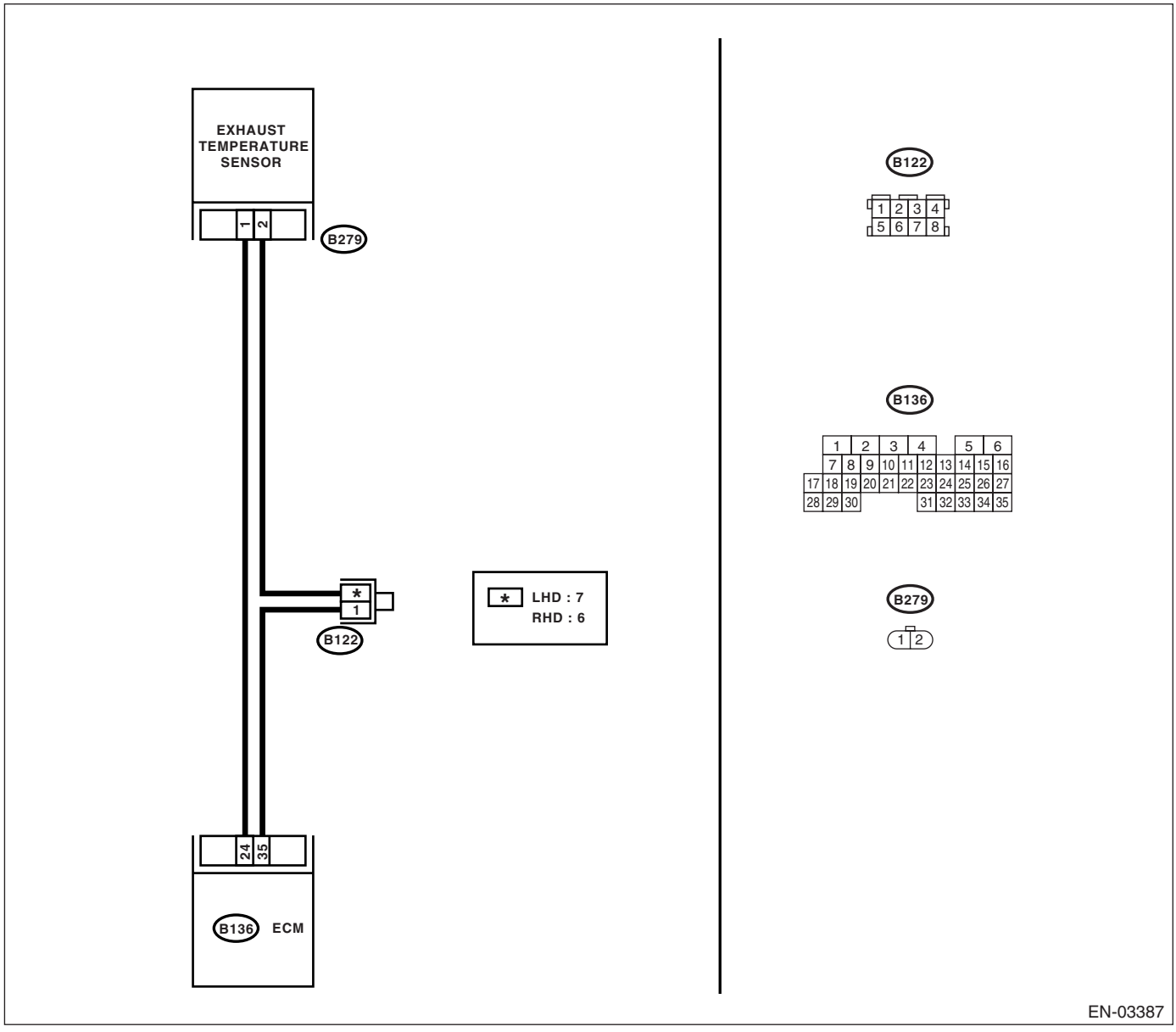
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 1,200°C (2,192°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact of exhaust temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Replace the exhaust temperature sensor. <Ref. to FU(H4DOTC 2.5)-42, Exhaust Temperature Sensor.>	Repair ground short circuit in harness between exhaust temperature sensor and ECM connector.

AP:DTC P0546 EXHAUST GAS TEMPERATURE SENSOR HIGH - BANK 1

DTC DETECTING CONDITION:

Immediately at fault recognition

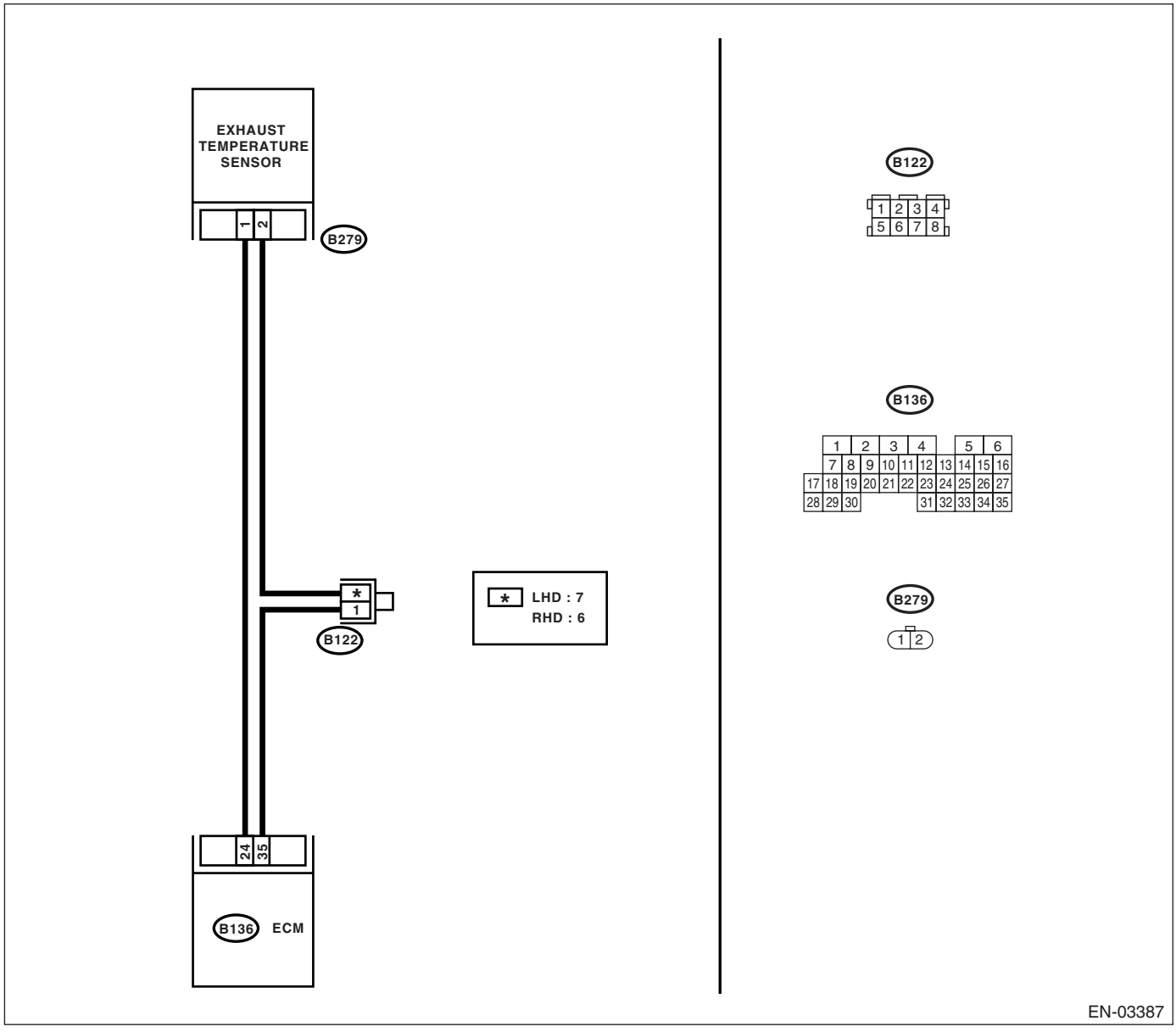
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of exhaust temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case repair the following: • Poor contact of exhaust temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from exhaust temperature sensor. 3) Measure the voltage between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and exhaust temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and exhaust temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and exhaust temperature sensor connector • Poor contact of exhaust temperature sensor connector • Poor contact in ECM connector. • Poor contact in joint connector

	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between exhaust temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the exhaust temperature sensor. <Ref. to FU(H4DOTC 2.5)-42, Exhaust Temperature Sensor.>	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and exhaust temperature sensor connector • Poor contact of exhaust temperature sensor connector • Poor contact in ECM connector. • Poor contact in joint connector

AQ:DTC P0604 INTERNAL CONTROL MODULE READ ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

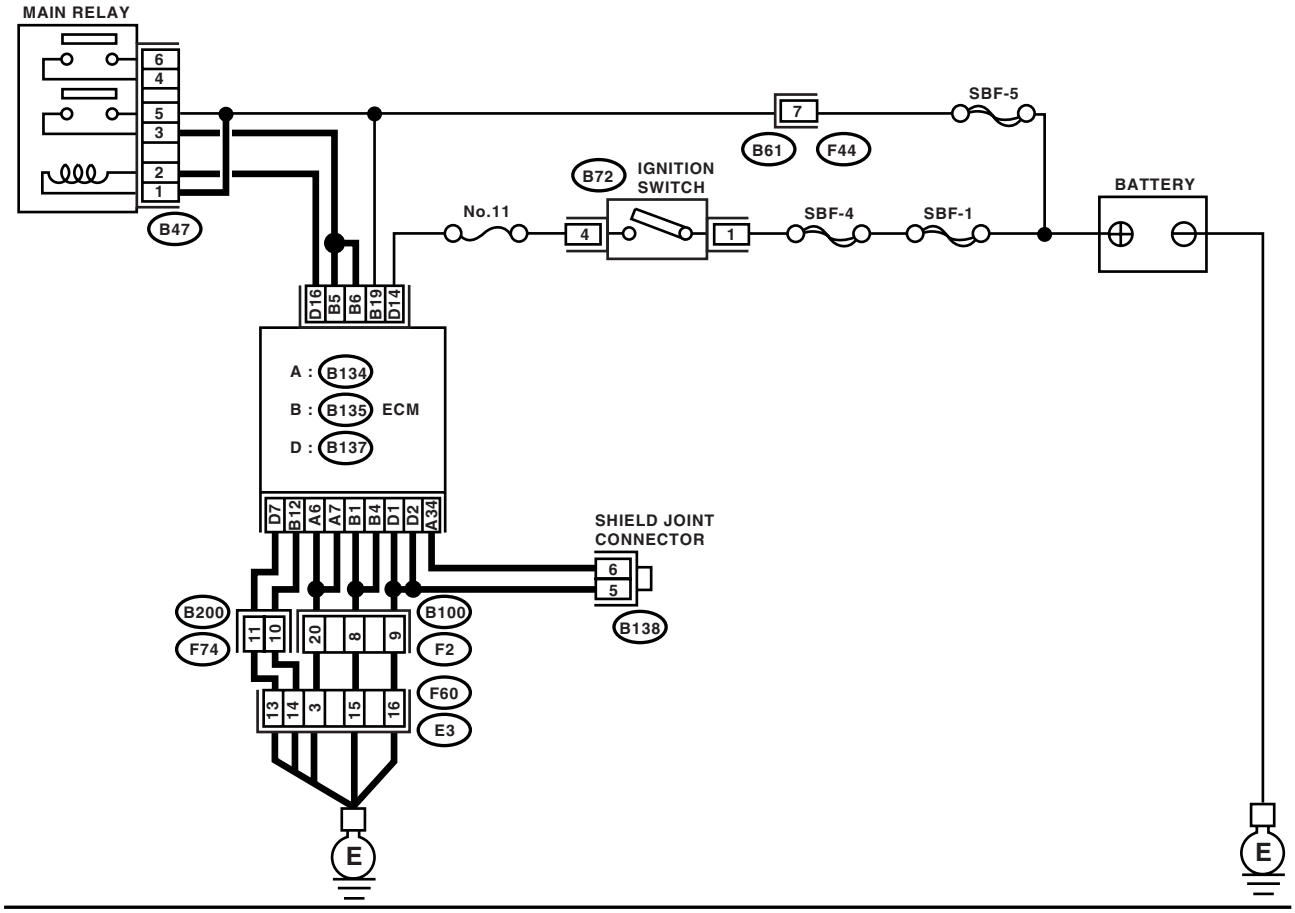
- Engine does not start.
- Engine stalls.

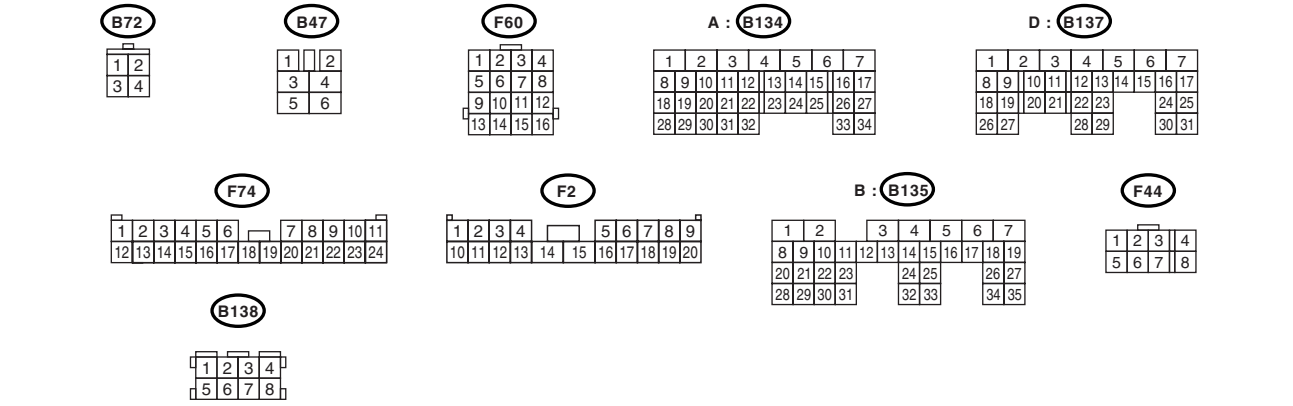
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

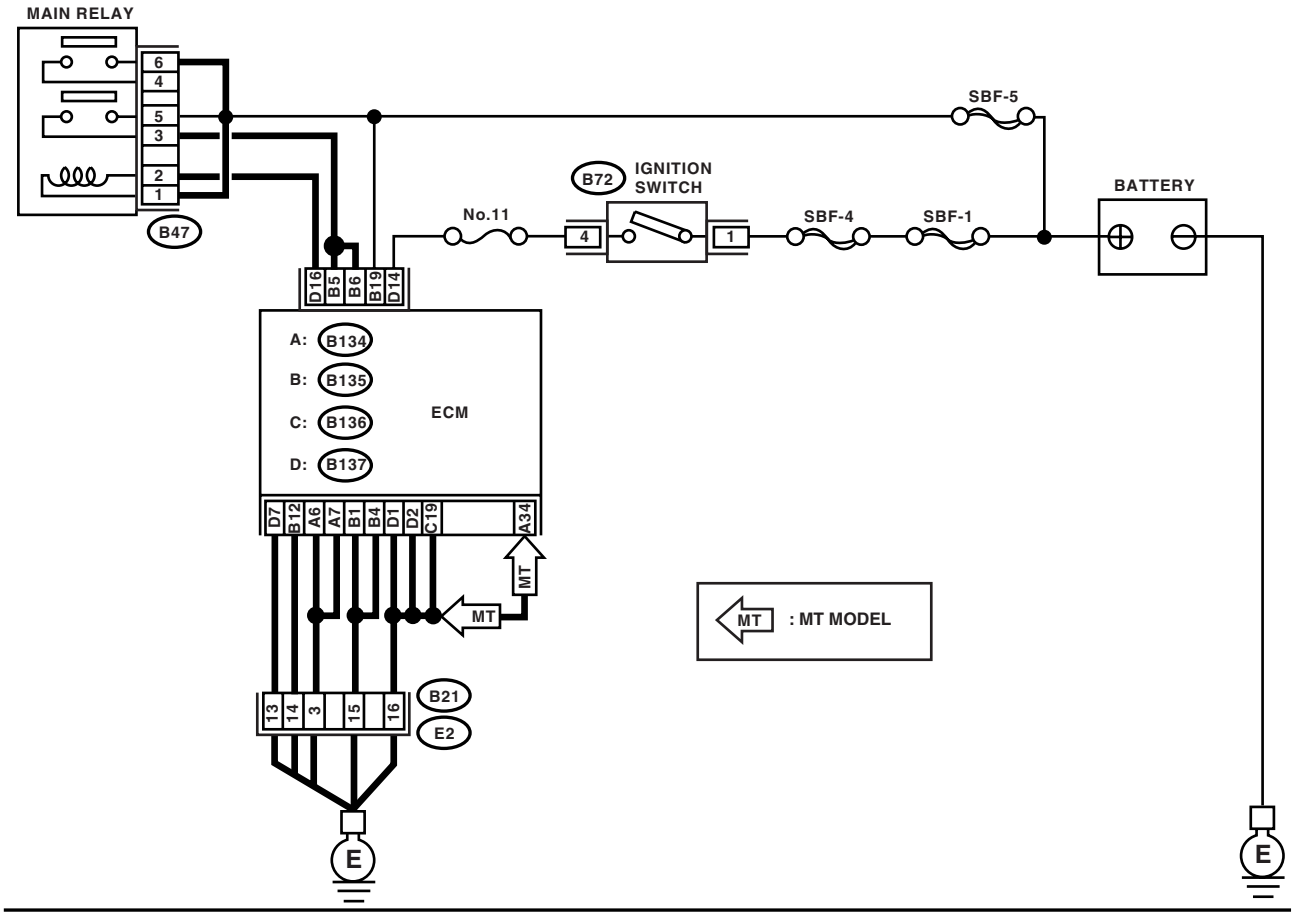
- **LHD MODEL**

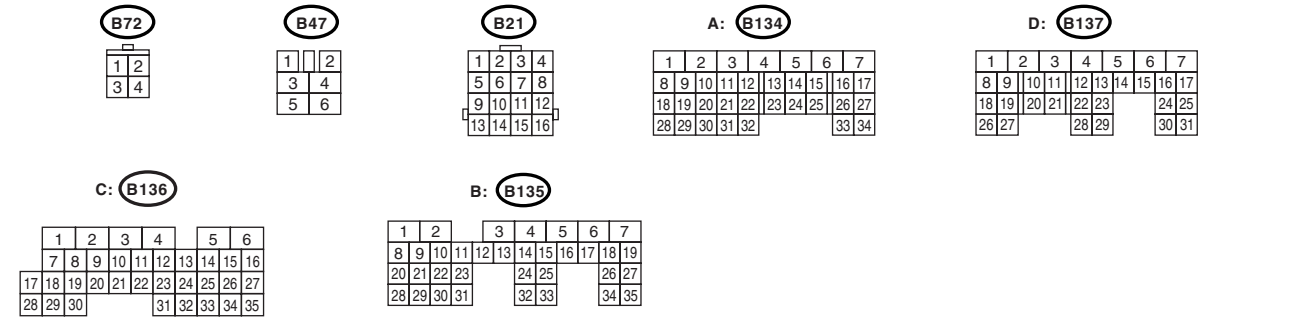




EN-03368

- **RHD MODEL**





EN-03369

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Temporary poor contact occurs.

AR:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC 2.5)(diag)-186, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0607 CONTROL MODULE PERFORMANCE

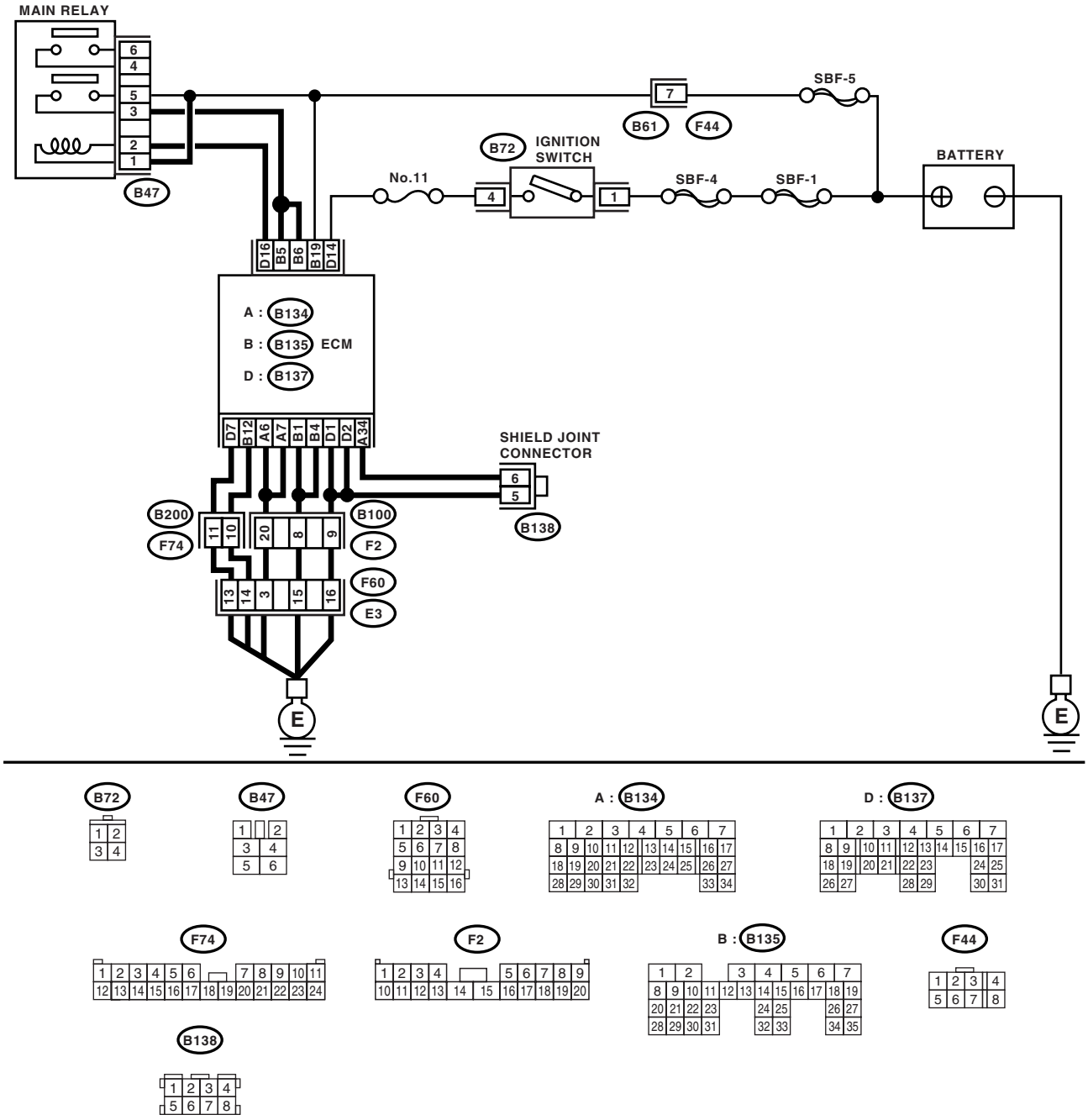
DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

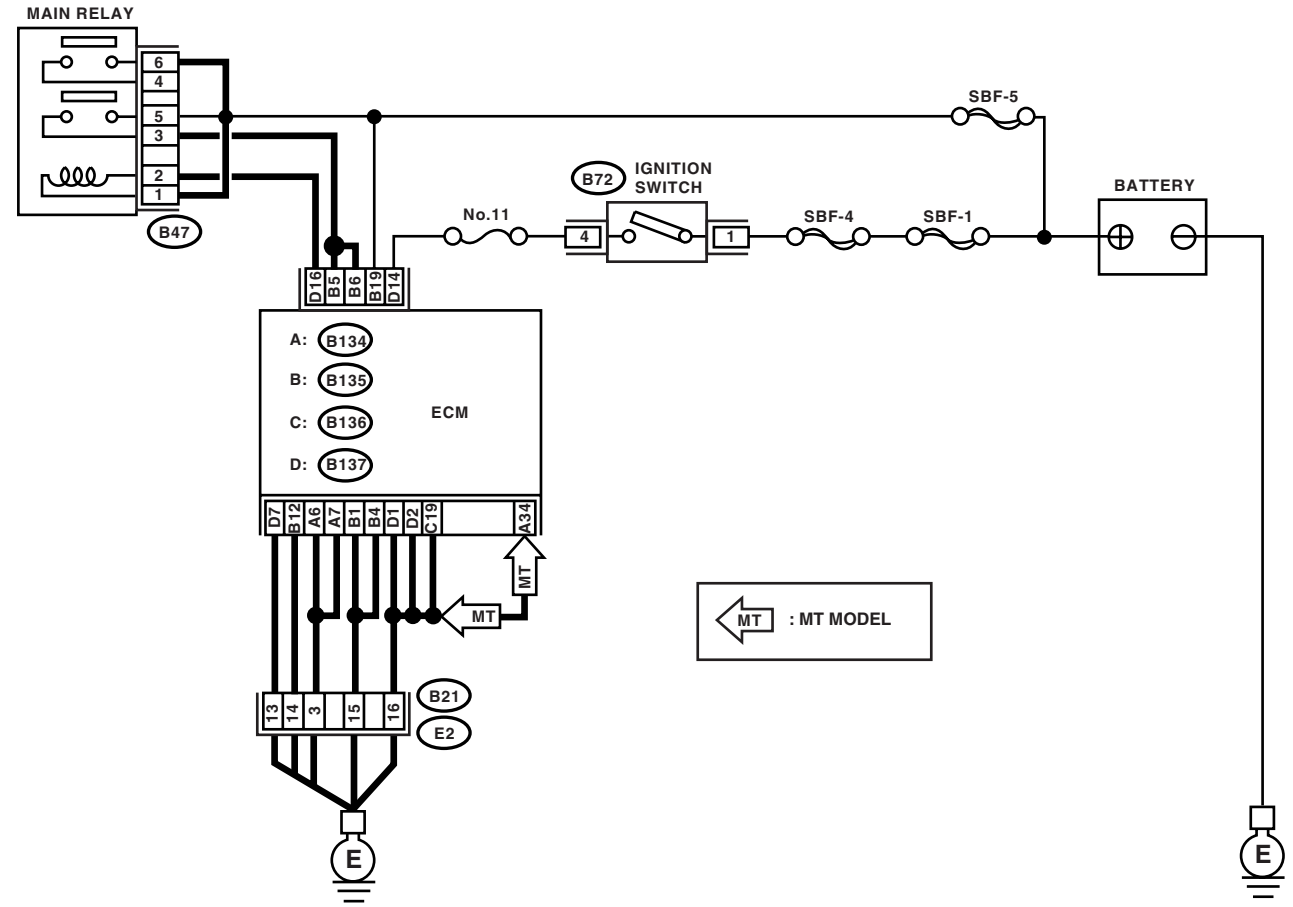
WIRING DIAGRAM:

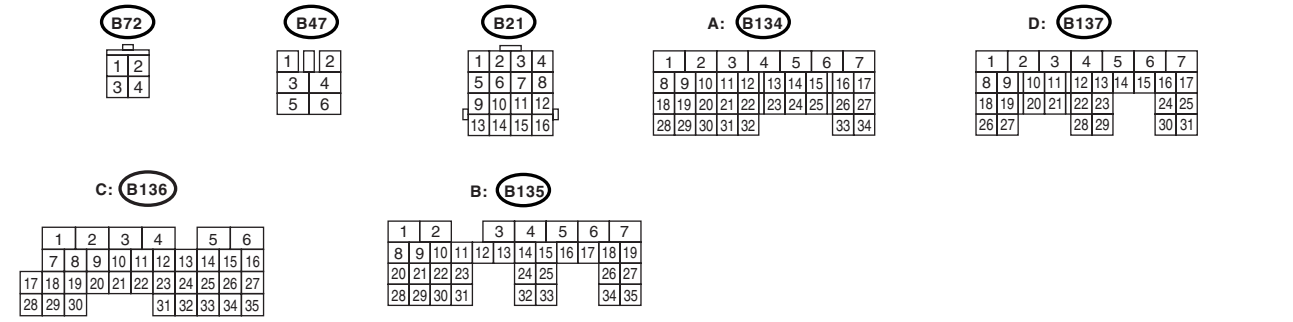
- **LHD MODEL**



EN-03368

- **RHD MODEL**





EN-03369

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 10 — 13 V?	Go to step **2.**	Repair open or ground short circuit of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM.** 1) Start the engine. 2) Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 13 — 15 V?	Go to step **3.**	Repair open or ground short circuit of power supply circuit.
3	**CHECK ECM GROUND HARNESS.** Measure the voltage between ECM connector and ground. ***Connector & terminal*** ***(B137) No. 1 (+) — Chassis ground (−):*** ***(B137) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Further tighten the engine ground terminal.

AT:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:
For diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC 2.5)(diag)-252, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

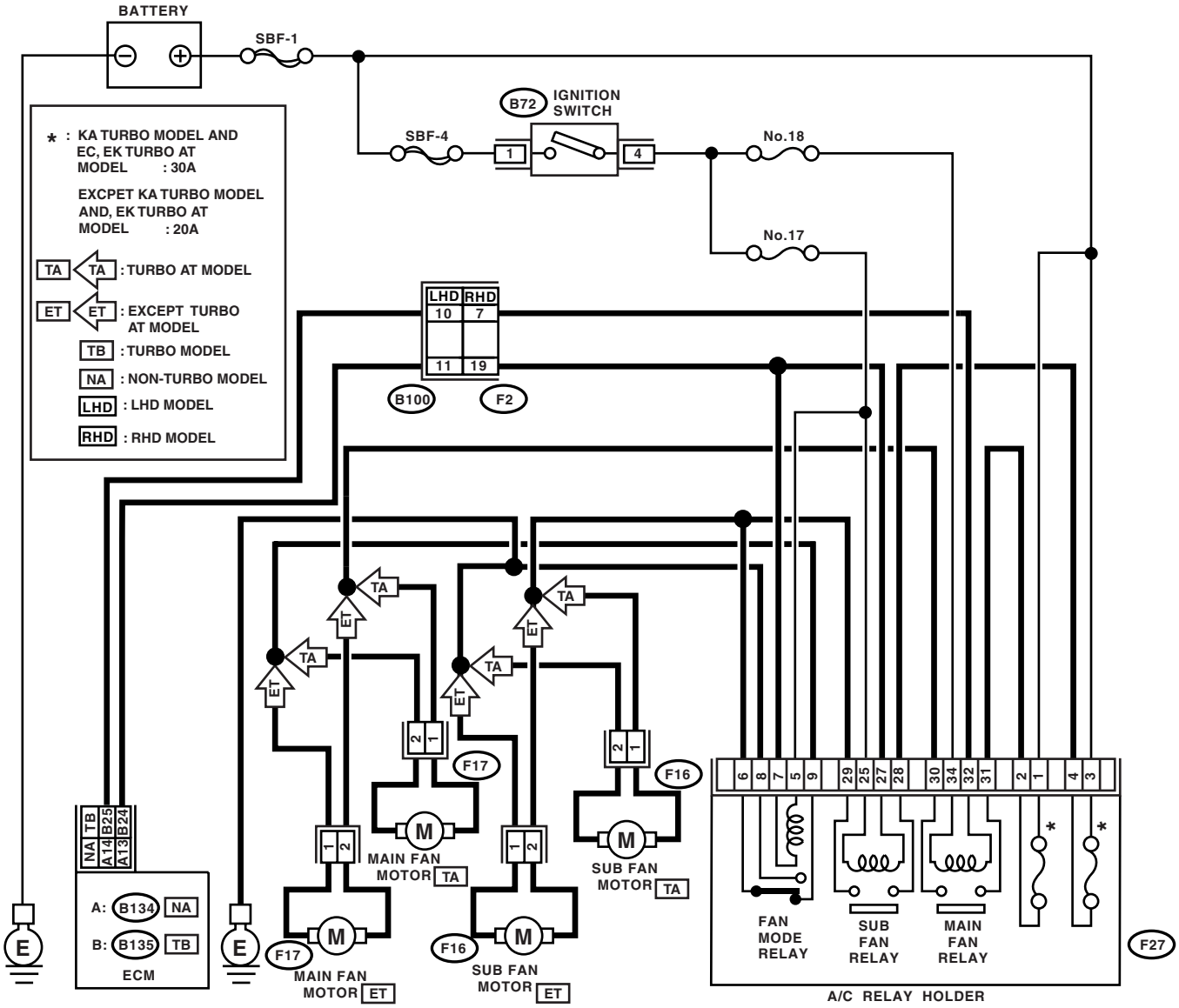
AU:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

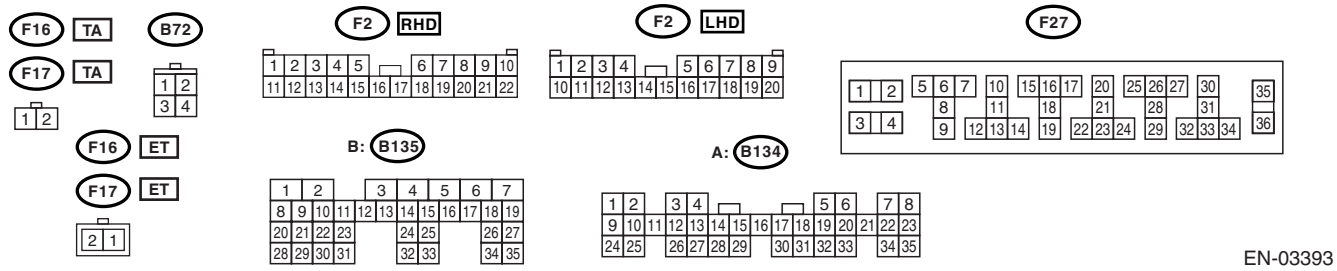
DTC DETECTING CONDITION:
Two consecutive driving cycles with fault
TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Over-heating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-03393

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 (+) — Chassis ground (−):*** ***(B134) No. 14 (+) — Chassis ground (−):*** ***Turbo model*** ***(B135) No. 24 (+) — Chassis ground (−):*** ***(B135) No. 25 (+) — Chassis ground (−):***	Does the voltage vary between 0 — 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 — Chassis ground:*** ***(B134) No. 14 — Chassis ground:*** ***Turbo model*** ***(B135) No. 24 — Chassis ground:*** ***(B135) No. 25 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1) Remove the main fan relay and sub fan relay from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 27 (+) — Chassis ground (−):*** ***(F27) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between fan relay terminals. ***Terminals*** ***No. 32 — No. 34 (Main fan relay)*** ***No. 25 — No. 27 (Sub fan relay)***	Is the resistance 87 — 107 Ω?	Go to step **5.**	Replace the fan relay.
5	**CHECK OPEN CIRCUIT IN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and fan relay connector. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 — (F27) No. 27:*** ***(B134) No. 14 — (F27) No. 32:*** ***Turbo model*** ***(B135) No. 24 — (F27) No. 27:*** ***(B135) No. 25 — (F27) No. 32:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.** Check poor contact in ECM or fan relay connector.	Is there poor contact in ECM or fan relay connector?	Repair the poor contact in ECM or fan relay connector.	Contact the SUBARU dealer.

AV:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

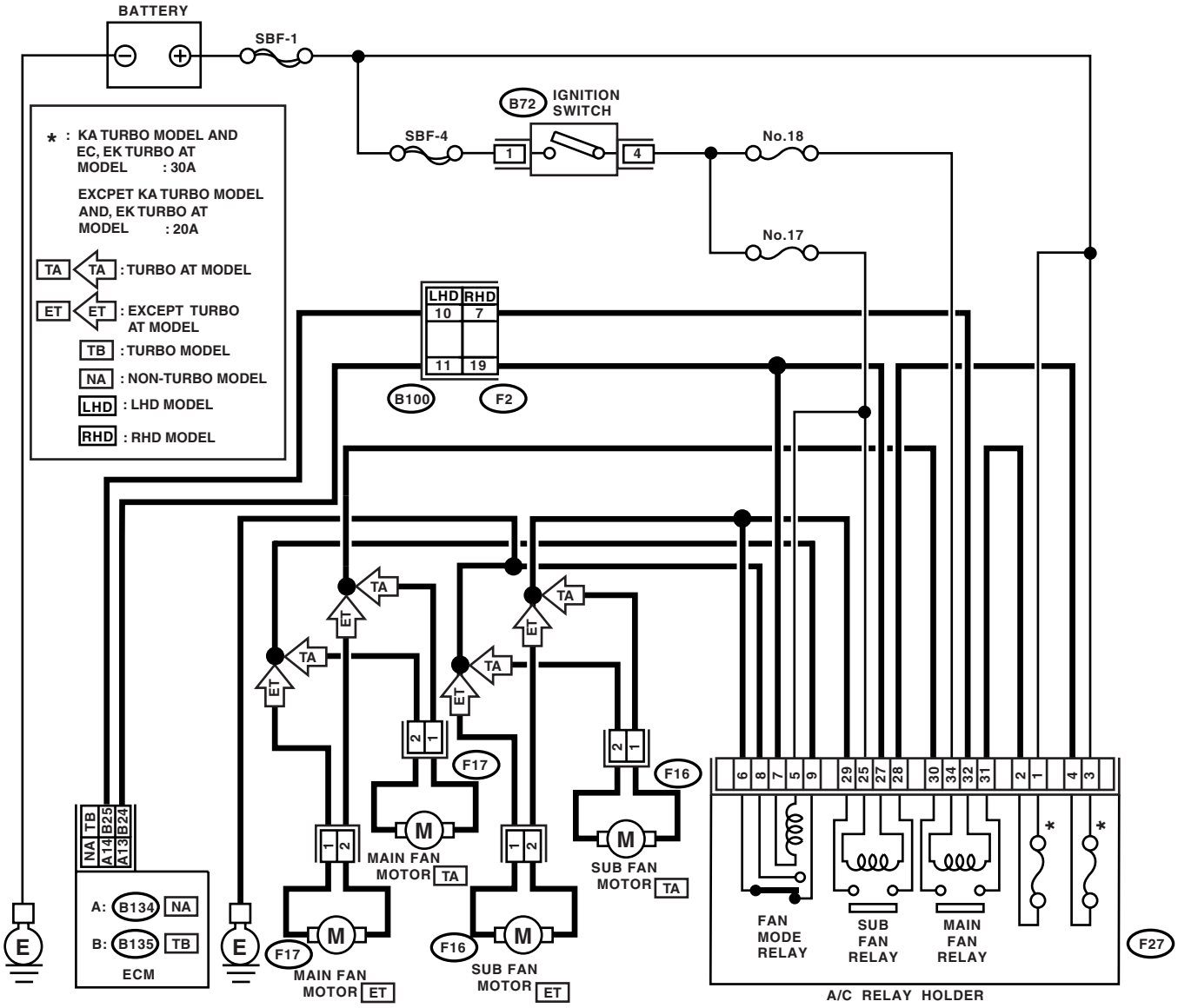
TROUBLE SYMPTOM:

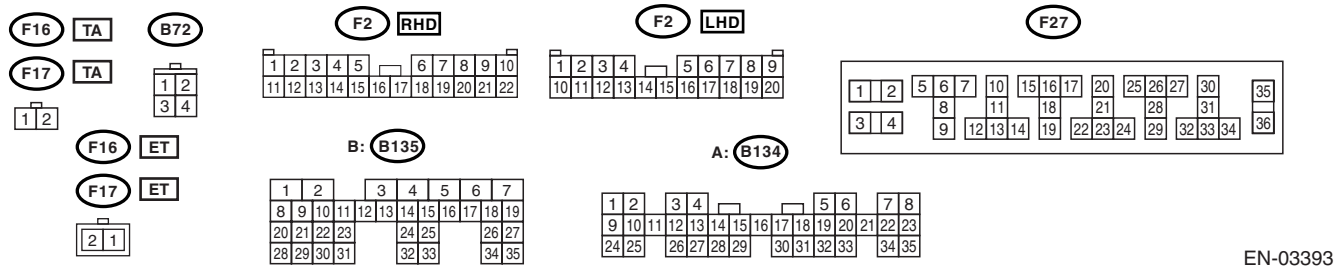
- Radiator fan does not operate properly.
- Over-heating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:





EN-03393

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Connect the test mode connector. 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC 2.5)(diag)-43, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 (+) — Chassis ground (–):*** ***(B134) No. 14 (+) — Chassis ground (–):*** ***Turbo model*** ***(B135) No. 24 (+) — Chassis ground (–):*** ***(B135) No. 25 (+) — Chassis ground (–):***	Does the voltage vary between 0 — 10 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay, sub fan relay and fan mode relay. 3) Disconnect the test mode connectors 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 13 (+) — Chassis ground (–):*** ***(B134) No. 14 (+) — Chassis ground (–):*** ***Turbo model*** ***(B135) No. 24 (+) — Chassis ground (–):*** ***(B135) No. 25 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK FAN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the fan relay. 3) Measure the resistance between fan relay terminals. ***Terminals*** ***No. 30 — No. 31 (Main fan relay)*** ***No. 28 — No. 29 (Sub fan relay)***	Is the resistance less than 1 Ω?	Replace the fan relay and ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK FAN MODE RELAY.** 1) Remove the fan mode relay. 2) Measure the resistance between fan mode relay terminals. ***Terminals*** ***No. 8 — No. 9: (Fan mode relay)***	Is the resistance less than 1 Ω?	Replace the fan mode relay and ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>

AW:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:
For the diagnostic procedure, refer to AT section. <Ref. to 4AT(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

AX:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

Erroneous idling.

CAUTION:

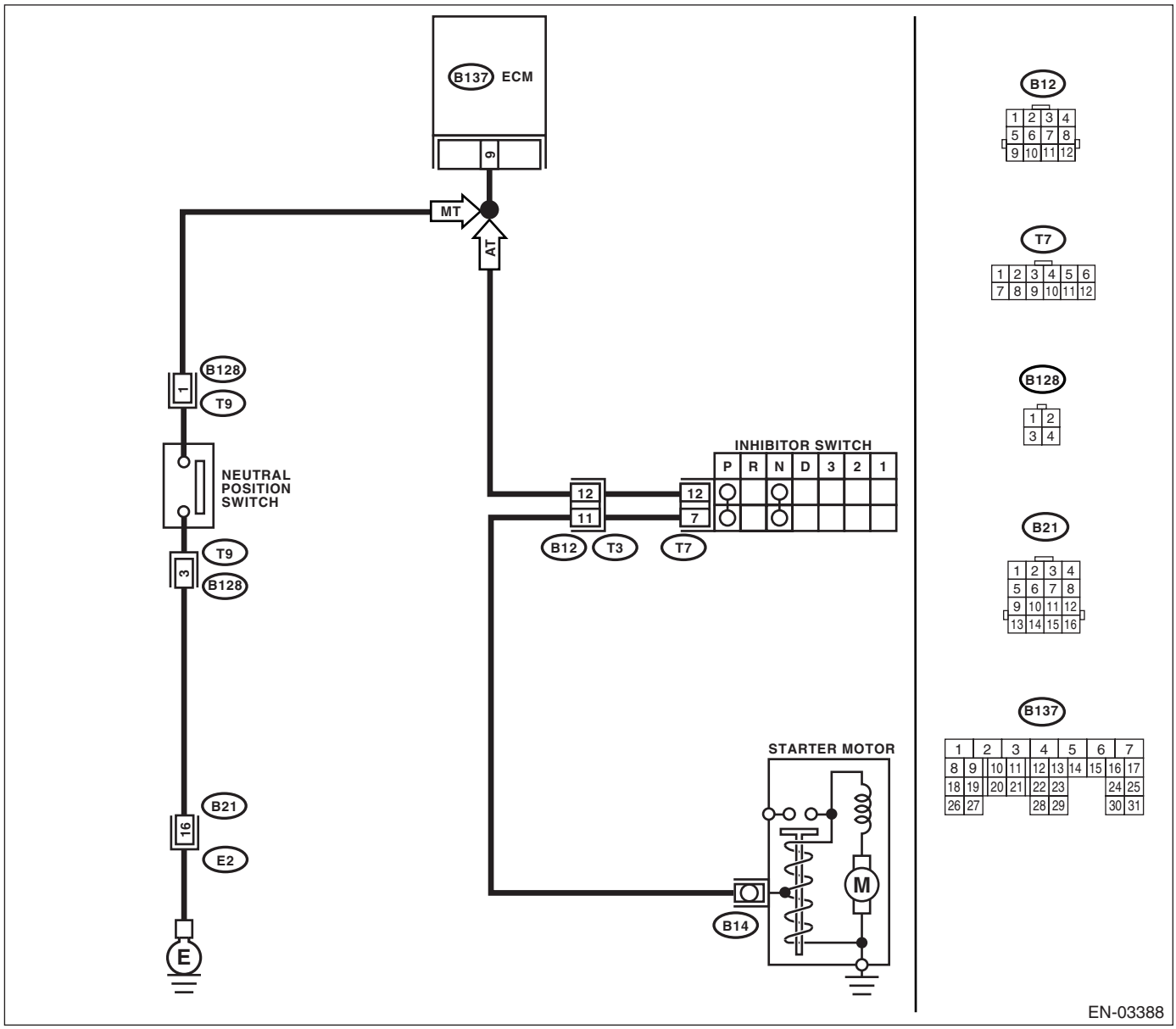
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

NOTE:

This diagnostic procedure is specified for RHD model.

WIRING DIAGRAM:

- **RHD MODEL**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Shift the select lever to other than "N" and "P" ranges. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in harness between ECM and transmission harness connector.
3	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(T3) No. 12 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
4	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" range. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>
5	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

AY:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

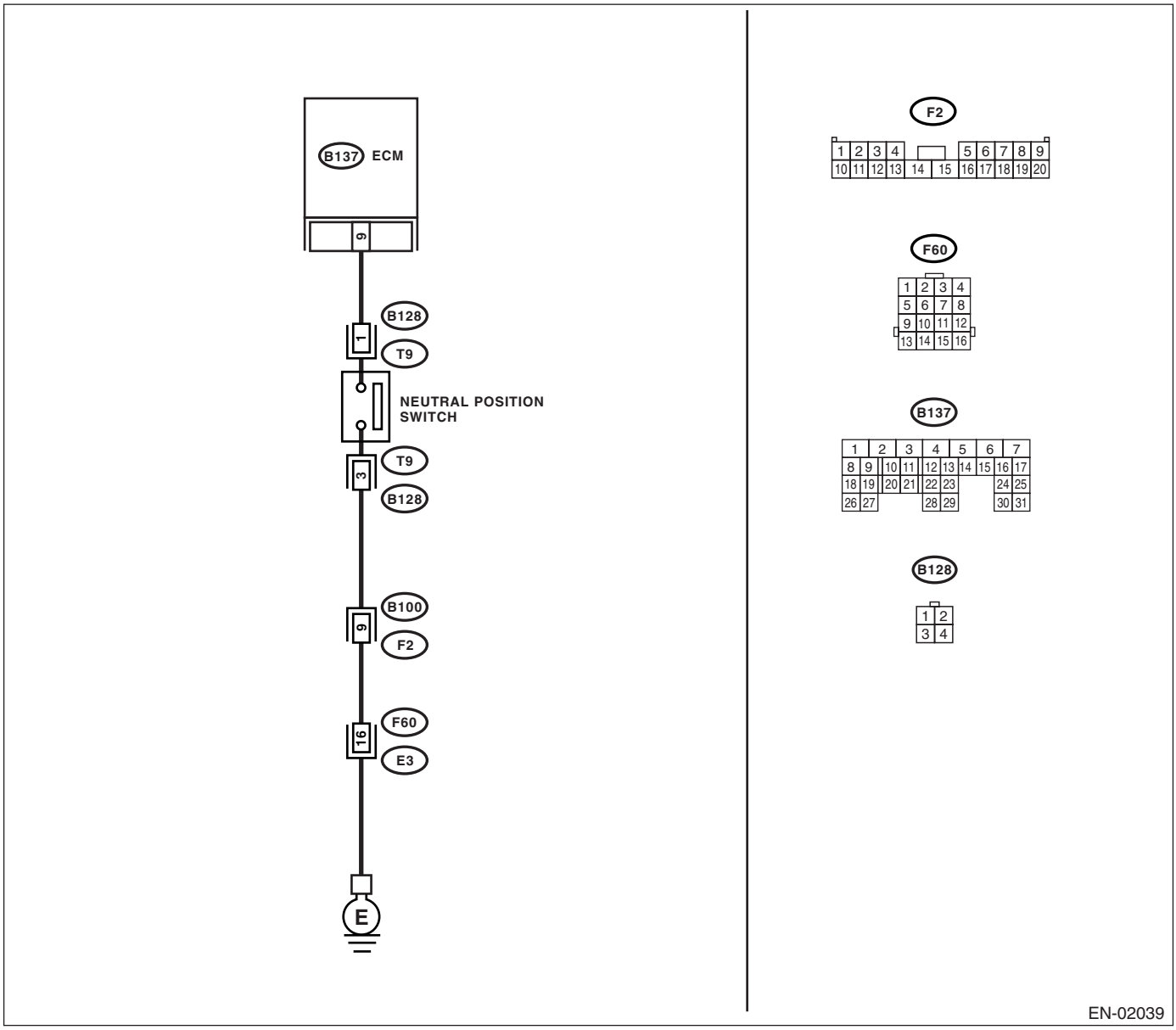
Erroneous idling.

CAUTION:

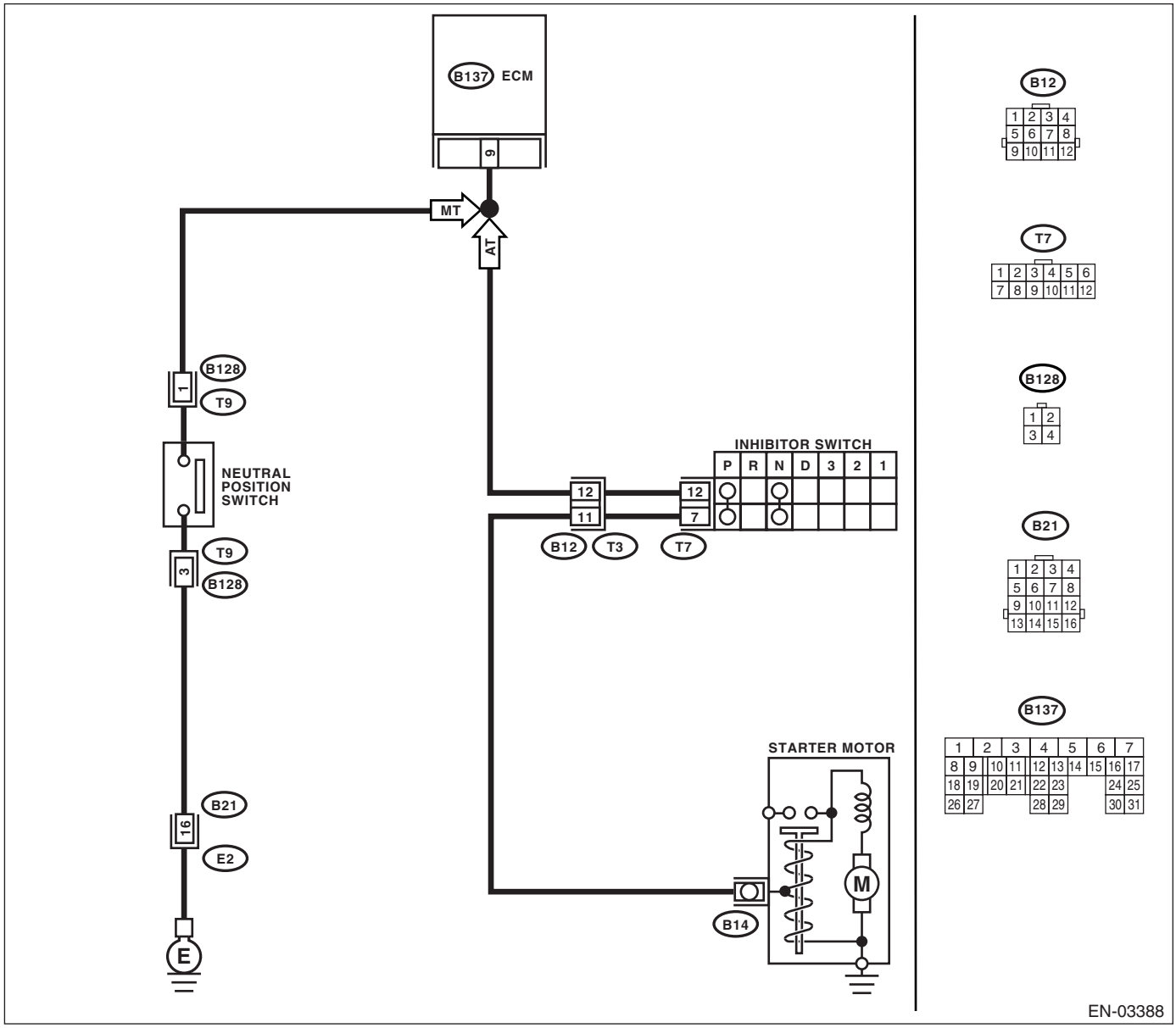
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


B137 ECM
9
MT
AT
B128
1
T9
NEUTRAL POSITION SWITCH
T9
3
B128
B21
16
E2
E
INHIBITOR SWITCH
P R N D 3 2 1
12
11
12
7
B12 T3 T7
STARTER MOTOR
M
B14
B12
1 2 3 4
5 6 7 8
9 10 11 12
T7
1 2 3 4 5 6
7 8 9 10 11 12
B128
1 2
3 4
B21
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
EN-03388

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Place the shift lever except in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T9) No. 1 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair short circuit in transmission harness or replace the neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral. 2) Measure the resistance between transmission harness connector terminals. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair short circuit in transmission harness or replace the neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair ground short circuit in harness between ECM and transmission harness connector.
7	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. ***Connector & terminal*** ***(B137) No. 9 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair open circuit in harness between ECM and transmission harness connector.
8	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact the SUBARU dealer.

AZ:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

Erroneous idling.

CAUTION:

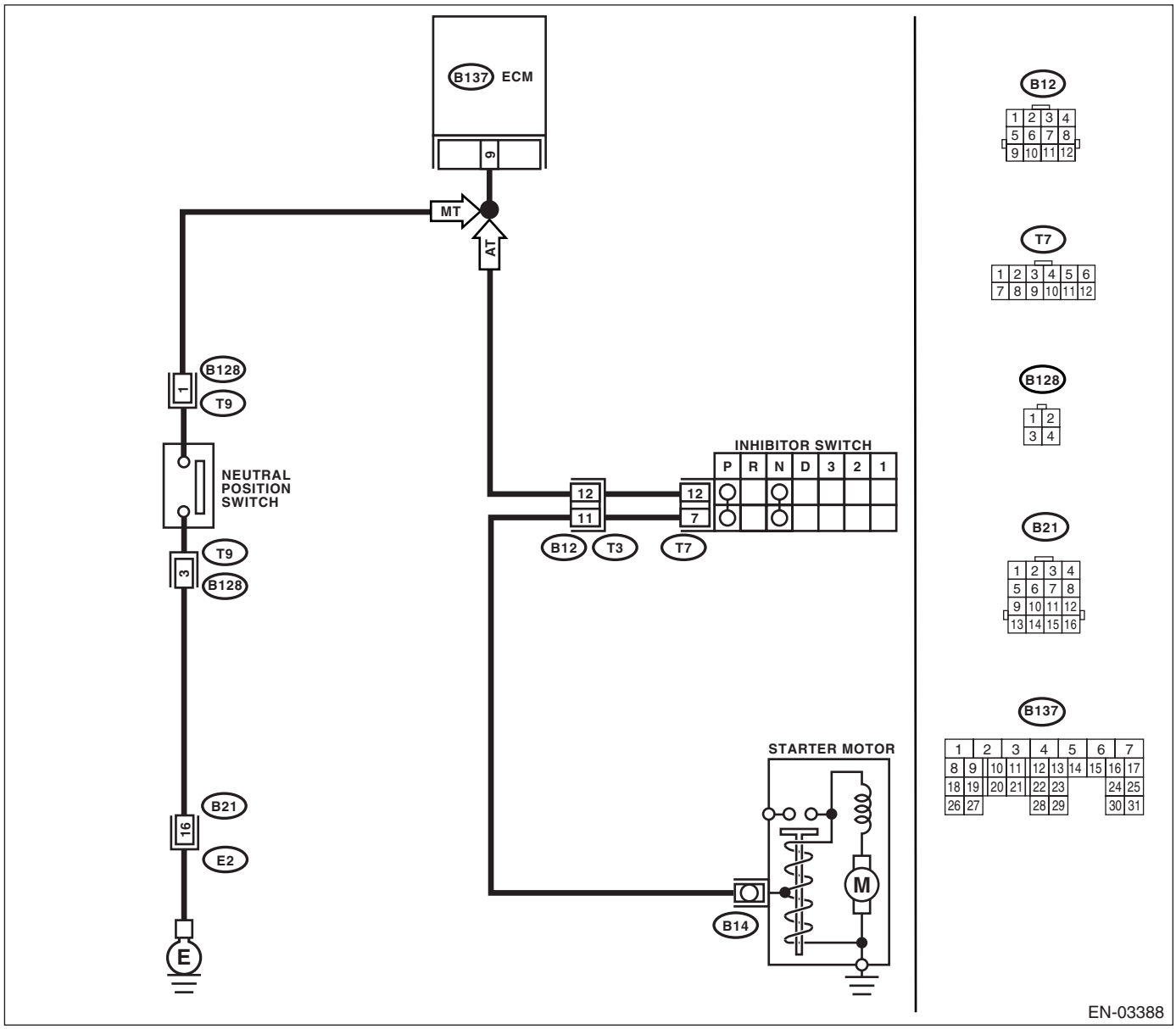
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

NOTE:

This diagnostic procedure is specified for RHD model.

WIRING DIAGRAM:

- **RHD MODEL**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground with select lever at "N" and "P" ranges. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground with select lever at except "N" and "P" ranges. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B137) No. 9 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and inhibitor switch connector. • Poor contact in coupling connector • Poor contact in inhibitor switch connector • Poor contact in ECM connector.

	Step	Check	Yes	No
6	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
7	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals with select lever at "N" and "P" ranges. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace the inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>
8	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-32, INSPECTION, Select Cable.>	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BA:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

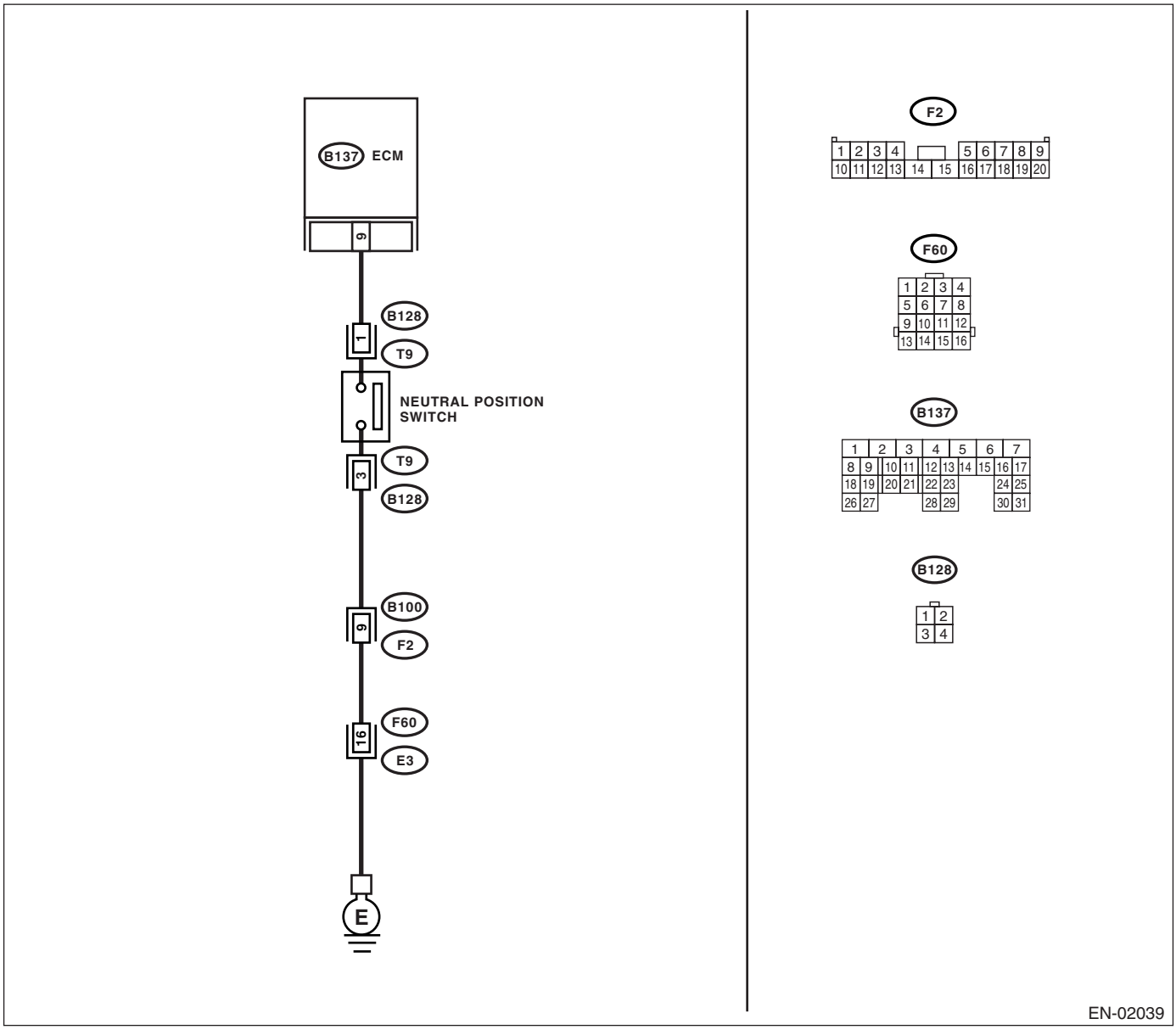
Erroneous idling.

CAUTION:

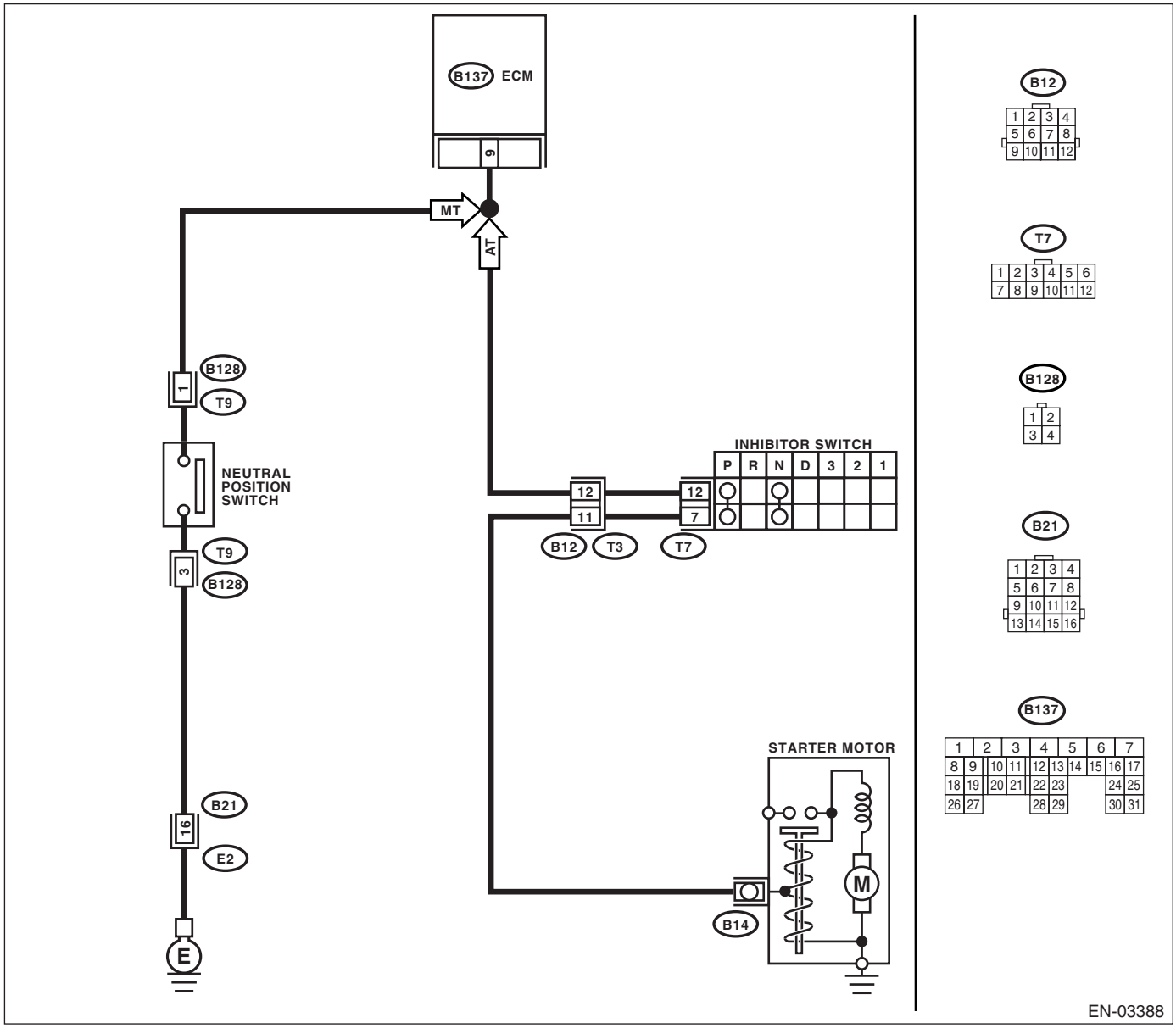
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


B137 ECM
9
MT
AT
B128
1
T9
NEUTRAL POSITION SWITCH
T9
3
B128
B21
16
E2
E
INHIBITOR SWITCH
P R N D 3 2 1
12
11
12
7
B12 T3 T7
STARTER MOTOR
M
B14
B12
1 2 3 4
5 6 7 8
9 10 11 12
T7
1 2 3 4 5 6
7 8 9 10 11 12
B128
1 2
3 4
B21
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
EN-03388

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever except in neutral position. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FROM ECM.** 1) Place the shift lever in neutral position. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer.
4	**CHECK INPUT SIGNAL FROM ECM.** 1) Disconnect the connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and transmission harness connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. ***Connector & terminal*** ***(B137) No. 9 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and transmission harness connector • Poor contact in transmission harness connector. • Poor contact in ECM connector.
6	**CHECK NEUTRAL POSITION SWITCH GROUND LINE.** Measure the resistance of harness between transmission harness connector and engine ground. ***Connector & terminal*** ***(B128) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair open circuit in the neutral position switch ground line.
7	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral position. 2) Measure the resistance between transmission harness connector socket terminals. ***Terminals*** ***No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace the neutral position switch.
8	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact the SUBARU dealer.

BB:DTC P1160 RETURN SPRING FAILURE

NOTE:
For diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC 2.5)(diag)-252, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

TROUBLE SYMPTOM:

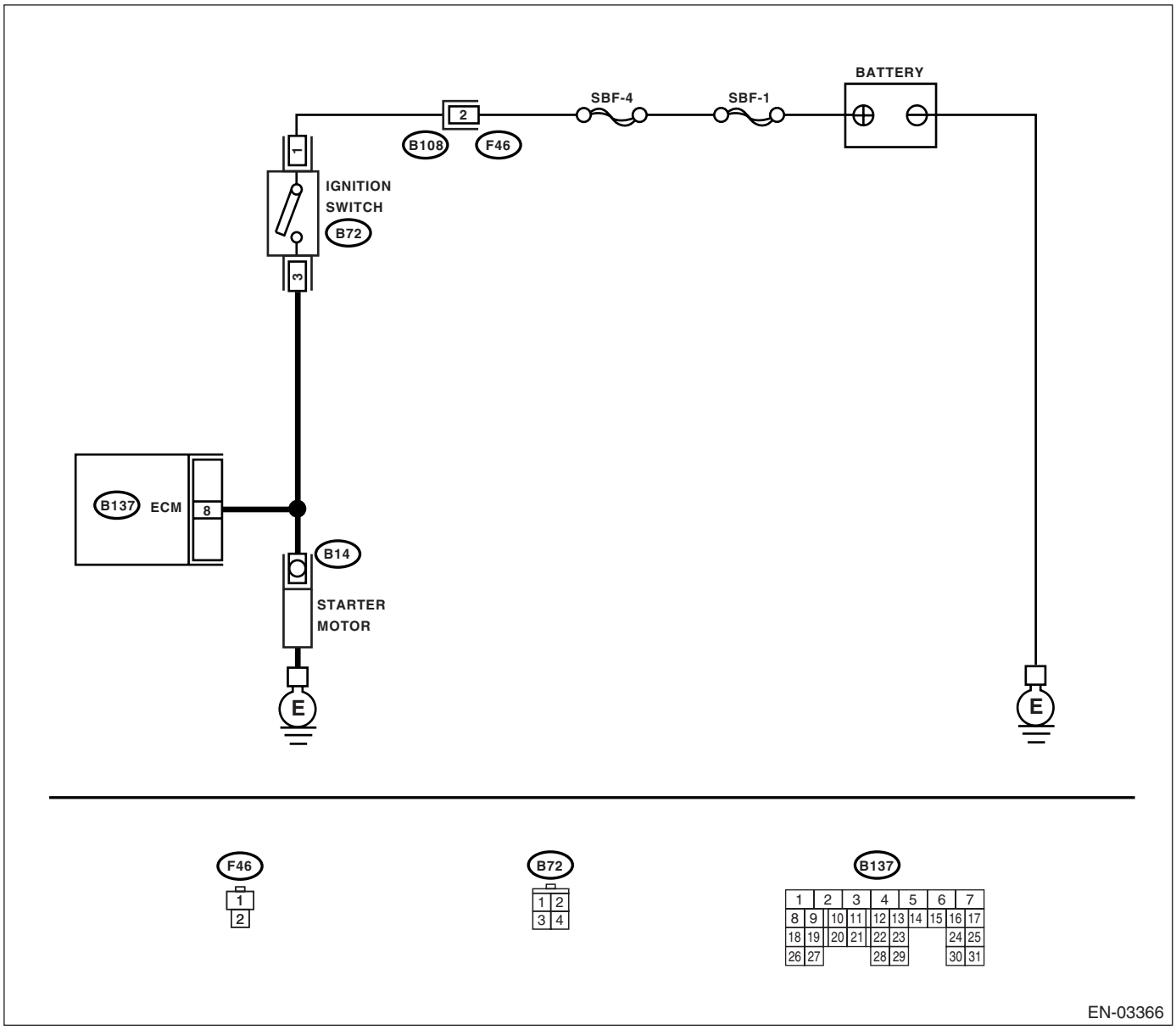
Failure of engine to start

CAUTION:

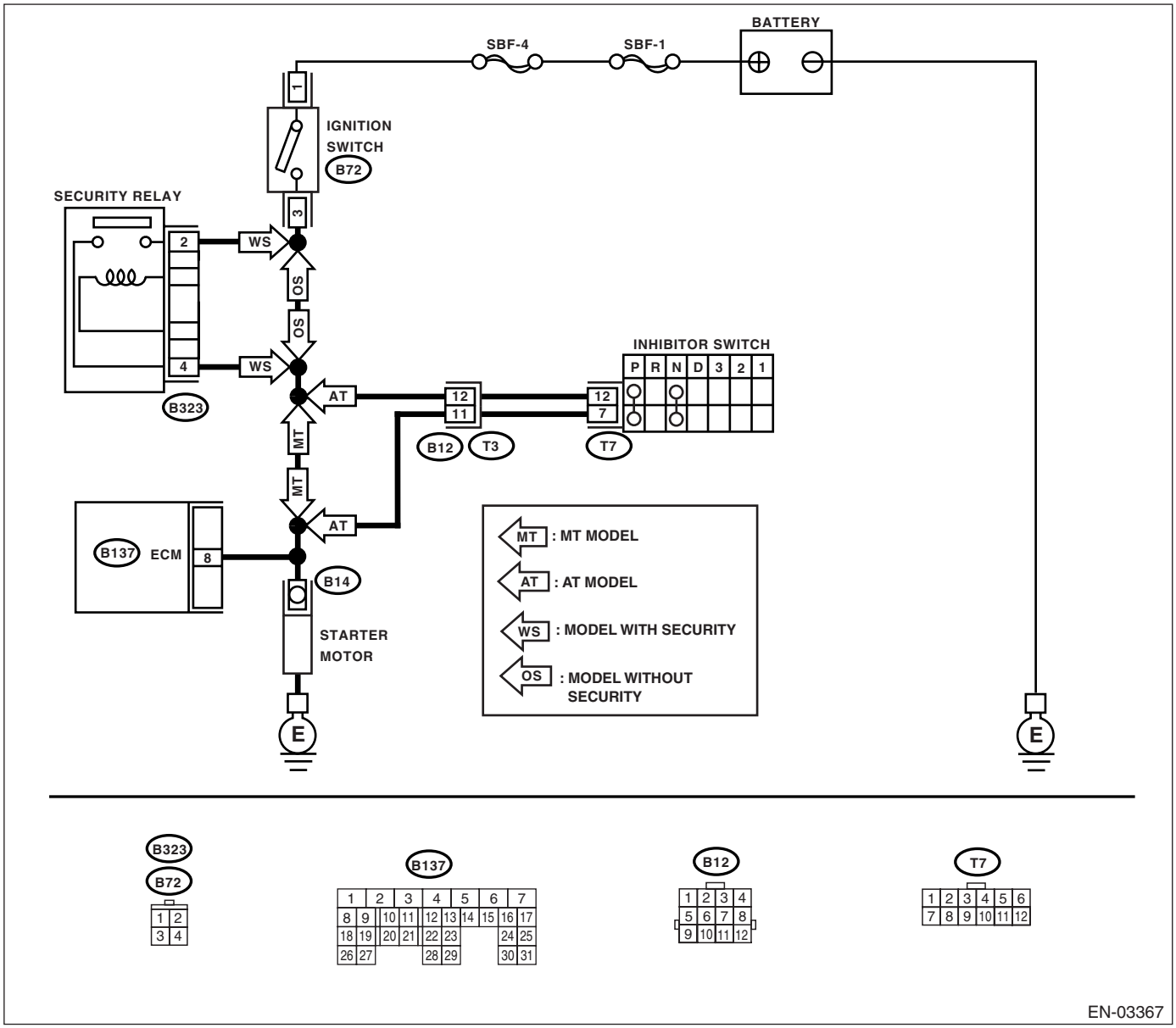
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


BATTERY
SBF-4
SBF-1
IGNITION SWITCH
B72
SECURITY RELAY
WS
OS
INHIBITOR SWITCH
P R N D 3 2 1
AT
MT
B323
B12
T3
T7
B137 ECM
B14
STARTER MOTOR
E
MT : MT MODEL
AT : AT MODEL
WS : MODEL WITH SECURITY
OS : MODEL WITHOUT SECURITY
EN-03367

Step	Check	Yes	No
1 **CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate when ignition switch to START?	Repair the harness and connector. NOTE: In this case repair the following: • Open or ground short circuit in harness between ECM and starter motor connector. • Poor contact in ECM connector.	Check starter motor circuit. <Ref. to EN(H4DOTC 2.5)(diag)-55, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

BD:DTC P1544 EXHAUST GAS TEMPERATURE TOO HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

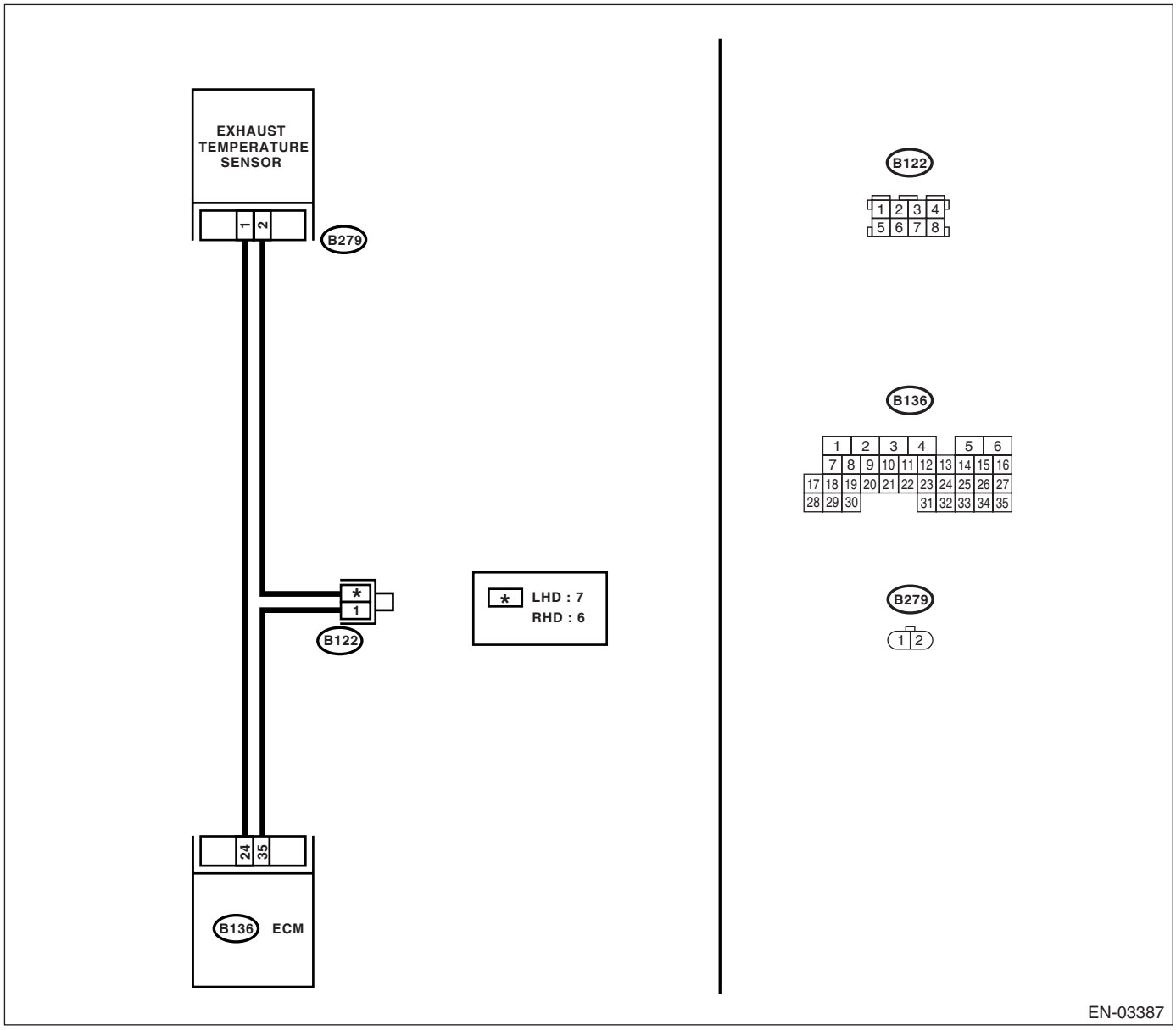
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items: • Loose installation of exhaust manifold • Cracks or hole of exhaust manifold • Loose installation of front oxygen (A/F) sensor	Is there a fault in exhaust system?	Repair or replace failure, then replace the precatalytic converter.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

BE:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

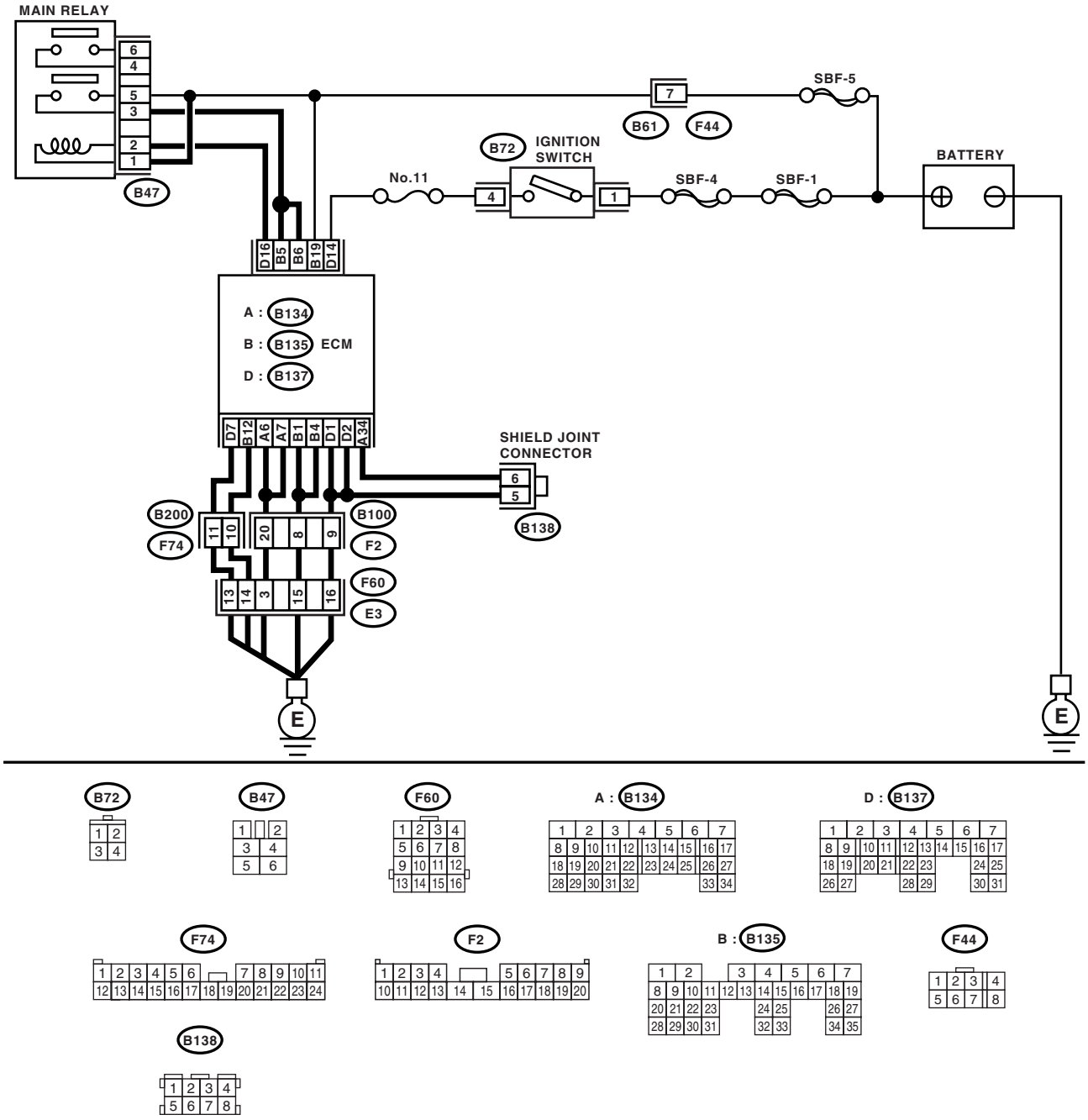
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

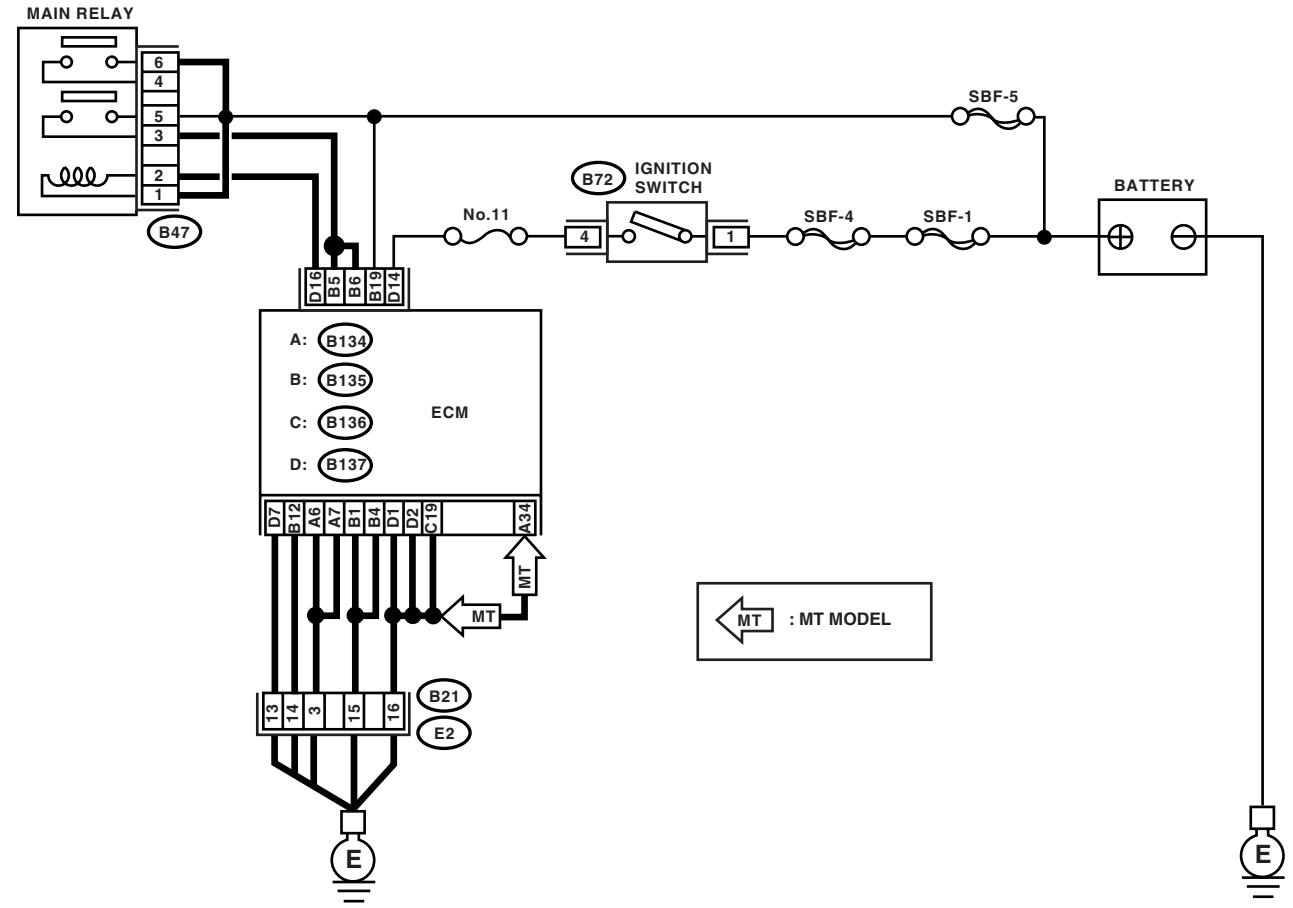
WIRING DIAGRAM:

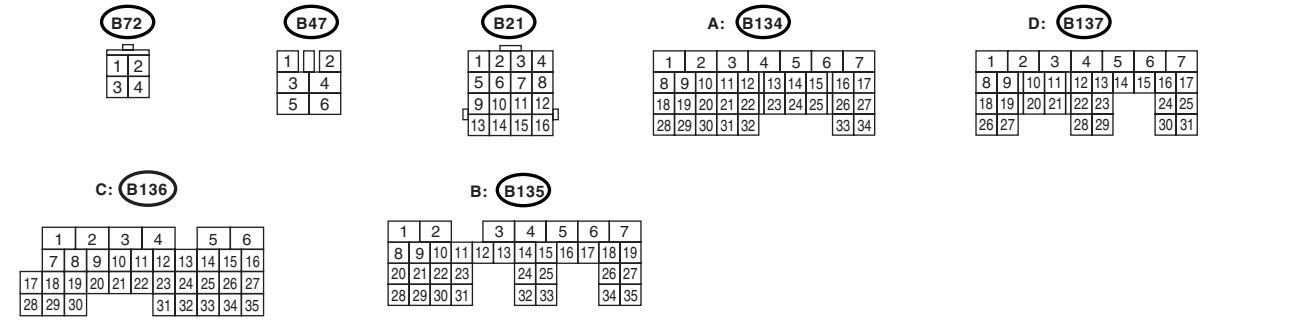
- **LHD MODEL**



EN-03368

- **RHD MODEL**





EN-03369

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair ground short circuit in harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE SBF-5.**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector. • Poor contact in battery terminal

BF:DTC P2004 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BG:DTC P2005 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BH:DTC P2006 TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BI: DTC P2007 TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE)

DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH** 1) Remove the tumble generator valve assembly. 2) Check tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>	Clean tumble generator valve.

BJ:DTC P2008 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN)

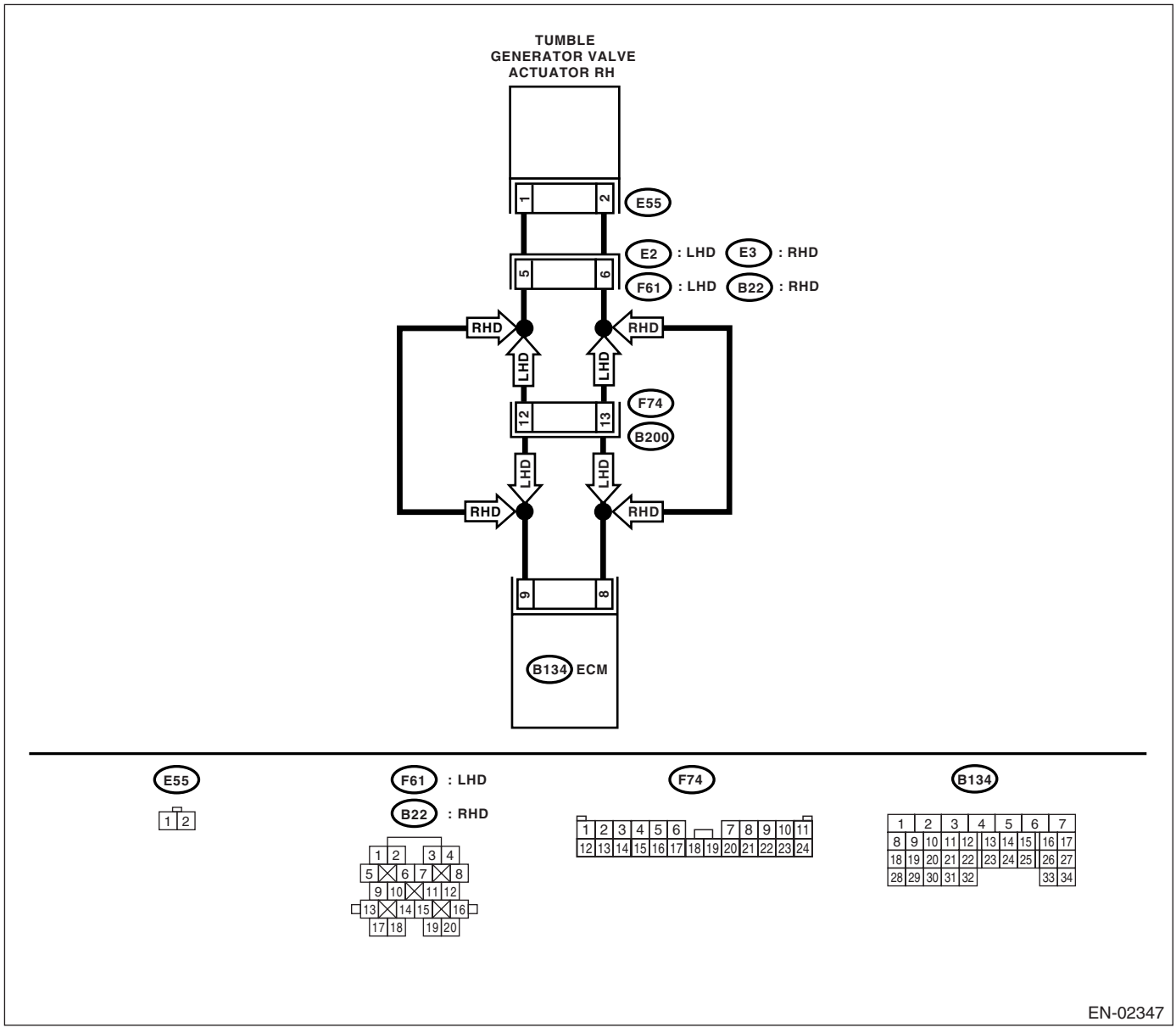
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E55) No. 1 — (B134) No. 9:*** ***(E55) No. 2 — (B134) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>

BK:DTC P2009 TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT)

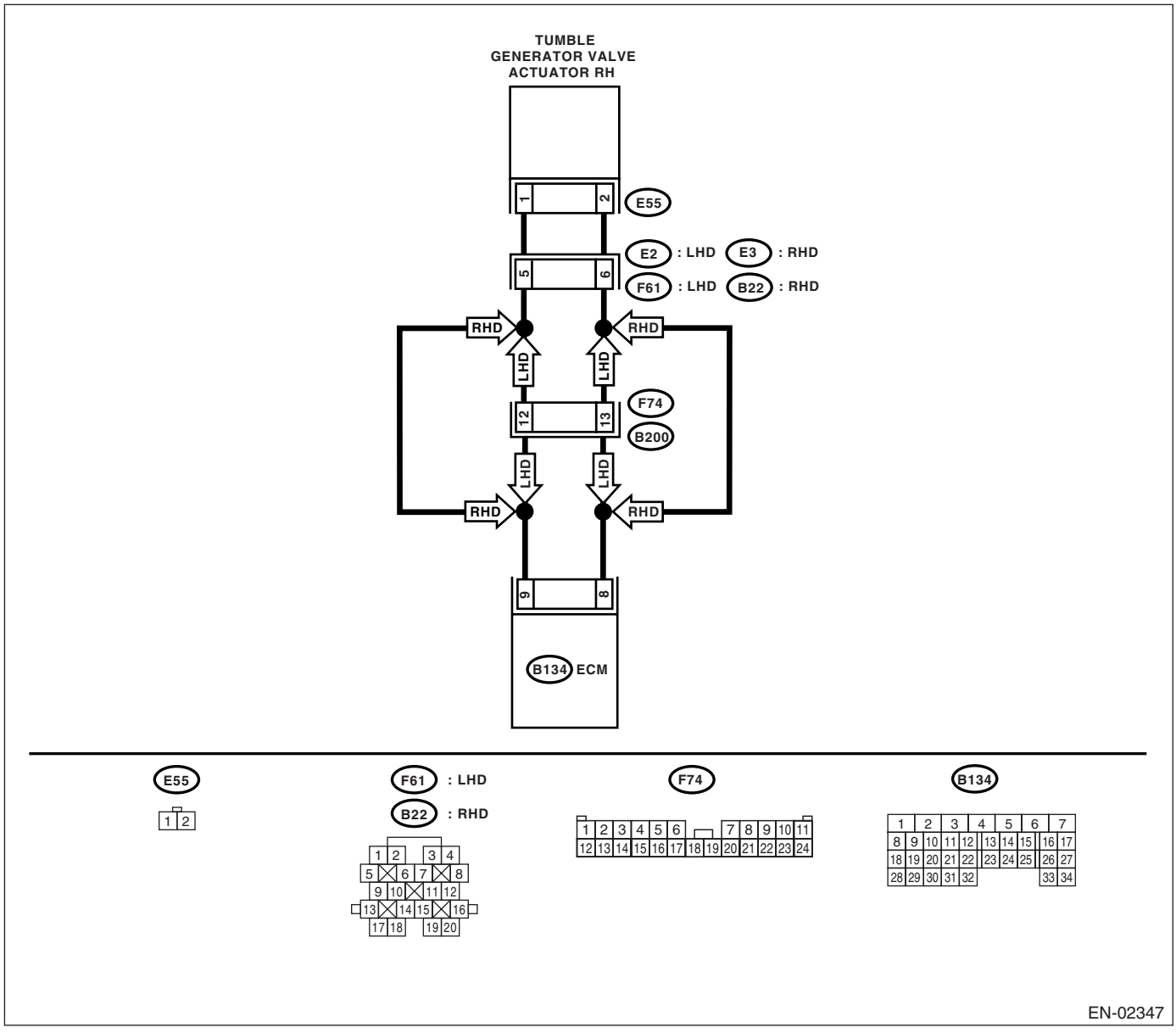
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E55) No. 1 (+) — Chassis ground (−):*** ***(E55) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 5 V?	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

BL:DTC P2011 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN)

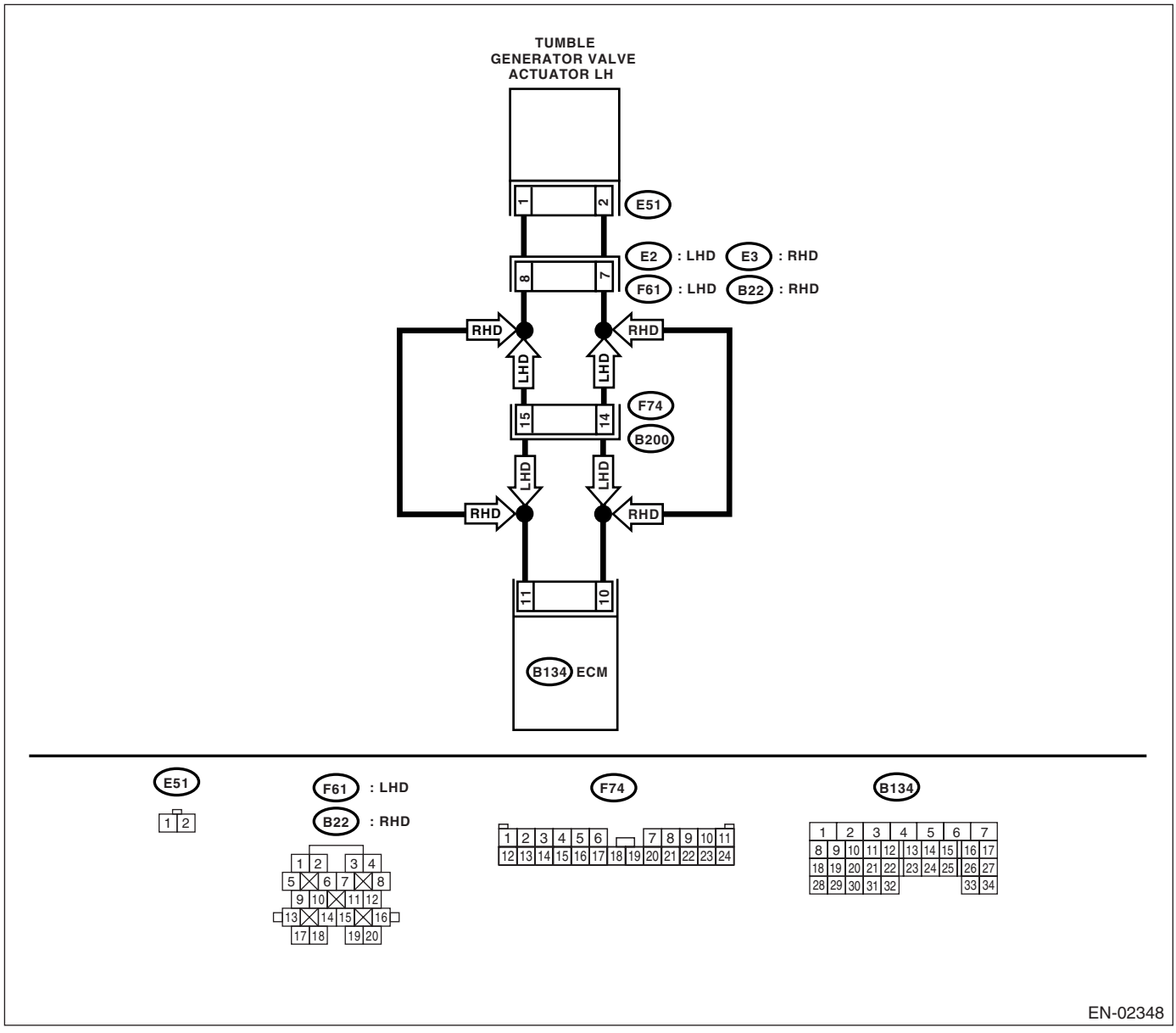
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. ***Connector & terminal*** ***(E51) No. 1 — (B134) No. 11:*** ***(E51) No. 2 — (B134) No. 10:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector
2	**CHECK POOR CONTACT.** Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>

BM:DTC P2012 TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT)

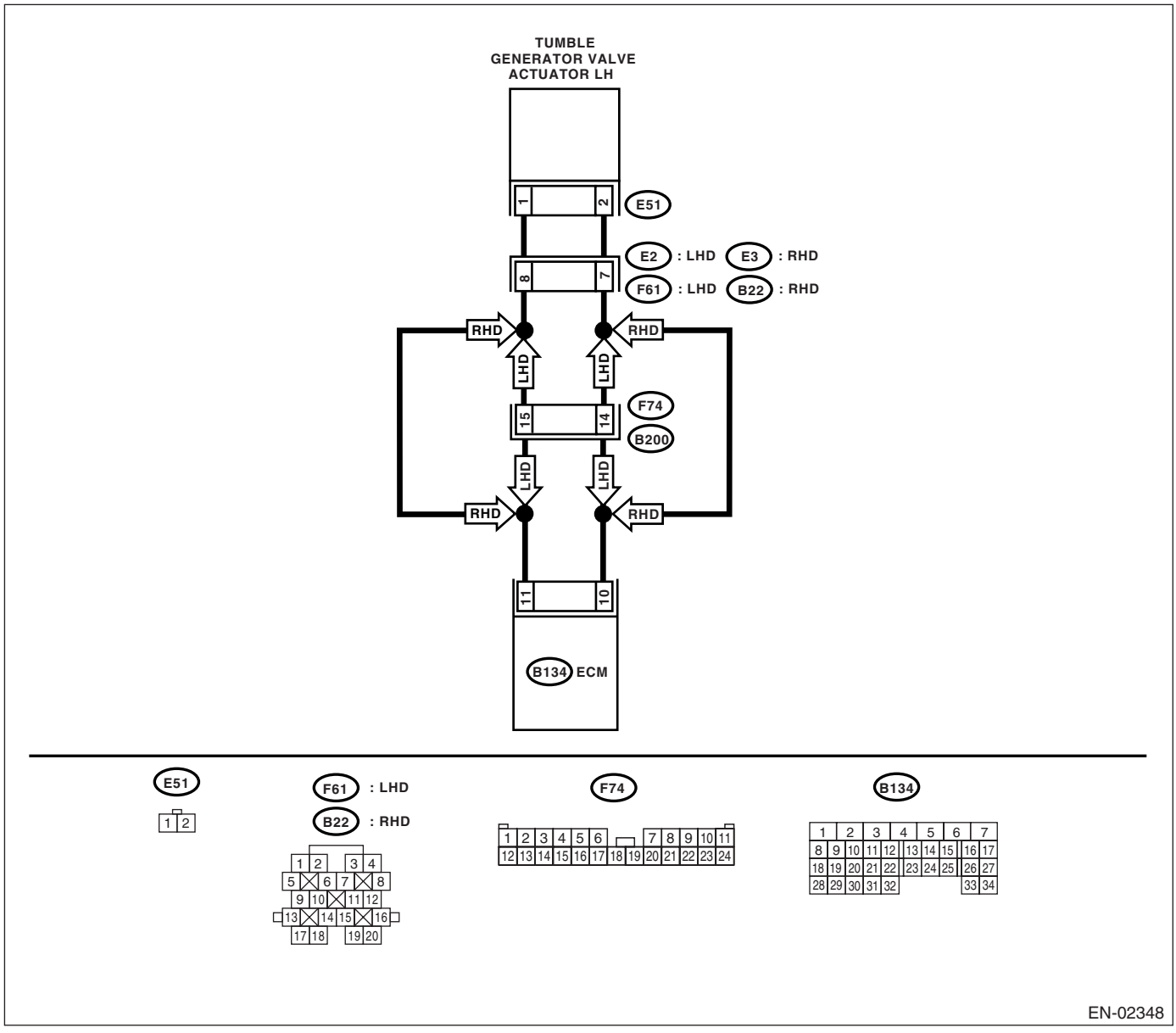
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. ***Connector & terminal*** ***(E51) No. 1 (+) — Chassis ground (−):*** ***(E51) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 5 V?	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

BN:DTC P2016 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

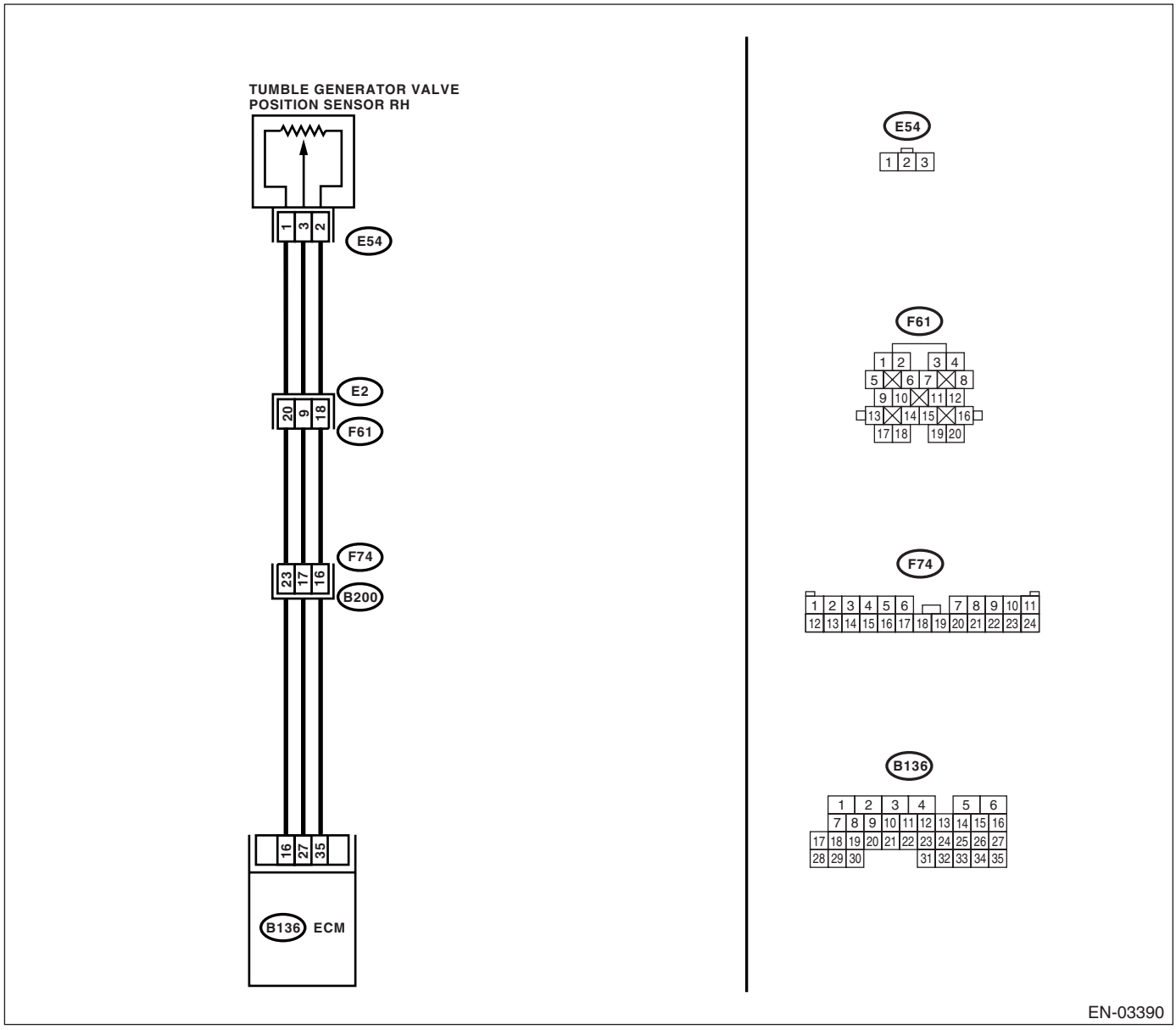
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

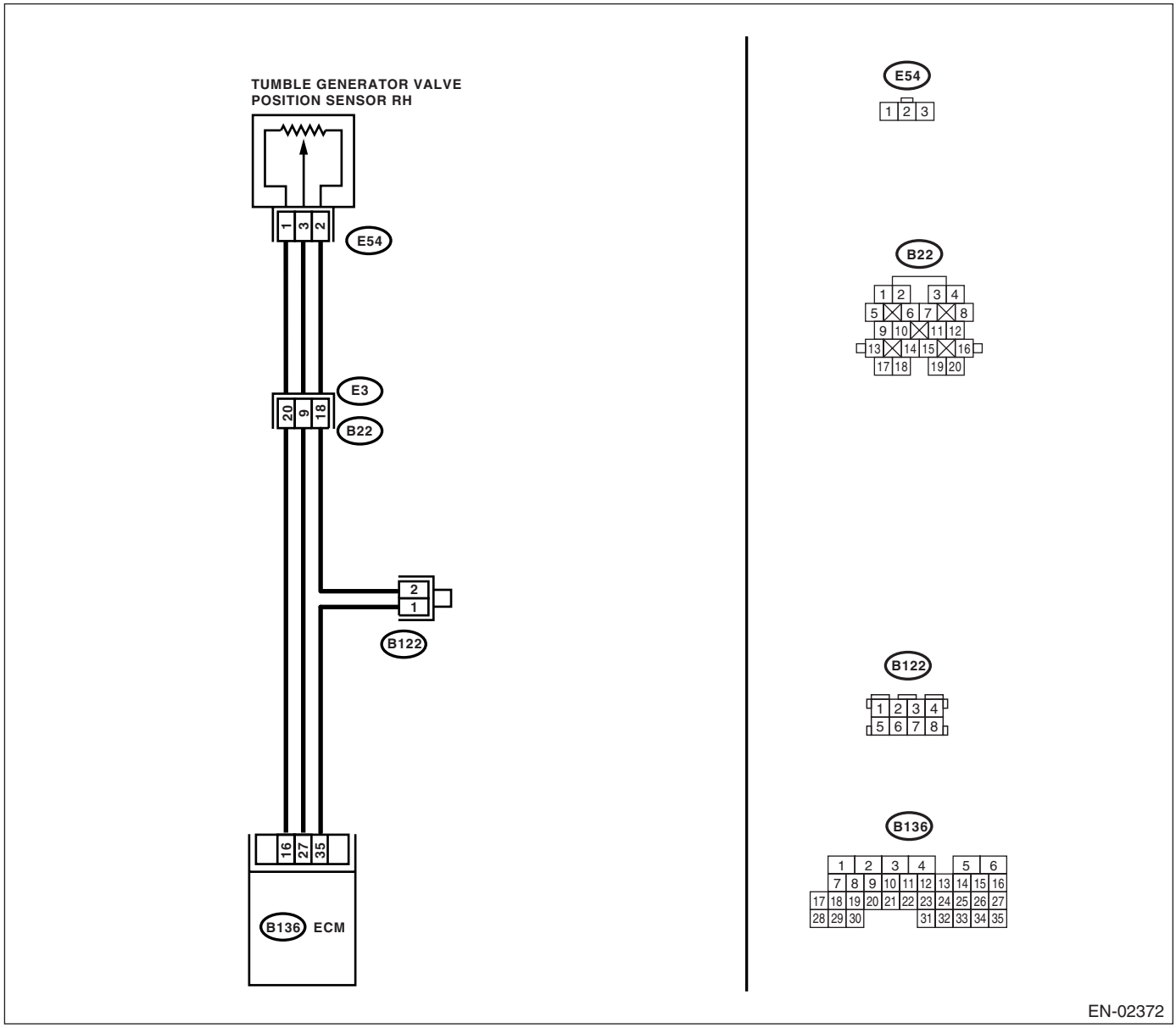
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR VALVE POSITION SENSOR RH
1 3 2
E54
E3
20 9 18
B22
2 1
B122
16 27 35
B136 ECM
E54
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02372

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (–):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 27 (+) — Chassis ground (–):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM WITH SUBARU SELECT MONITOR.** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B136) No. 27 — (E54) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Repair poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>

BO:DTC P2017 TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

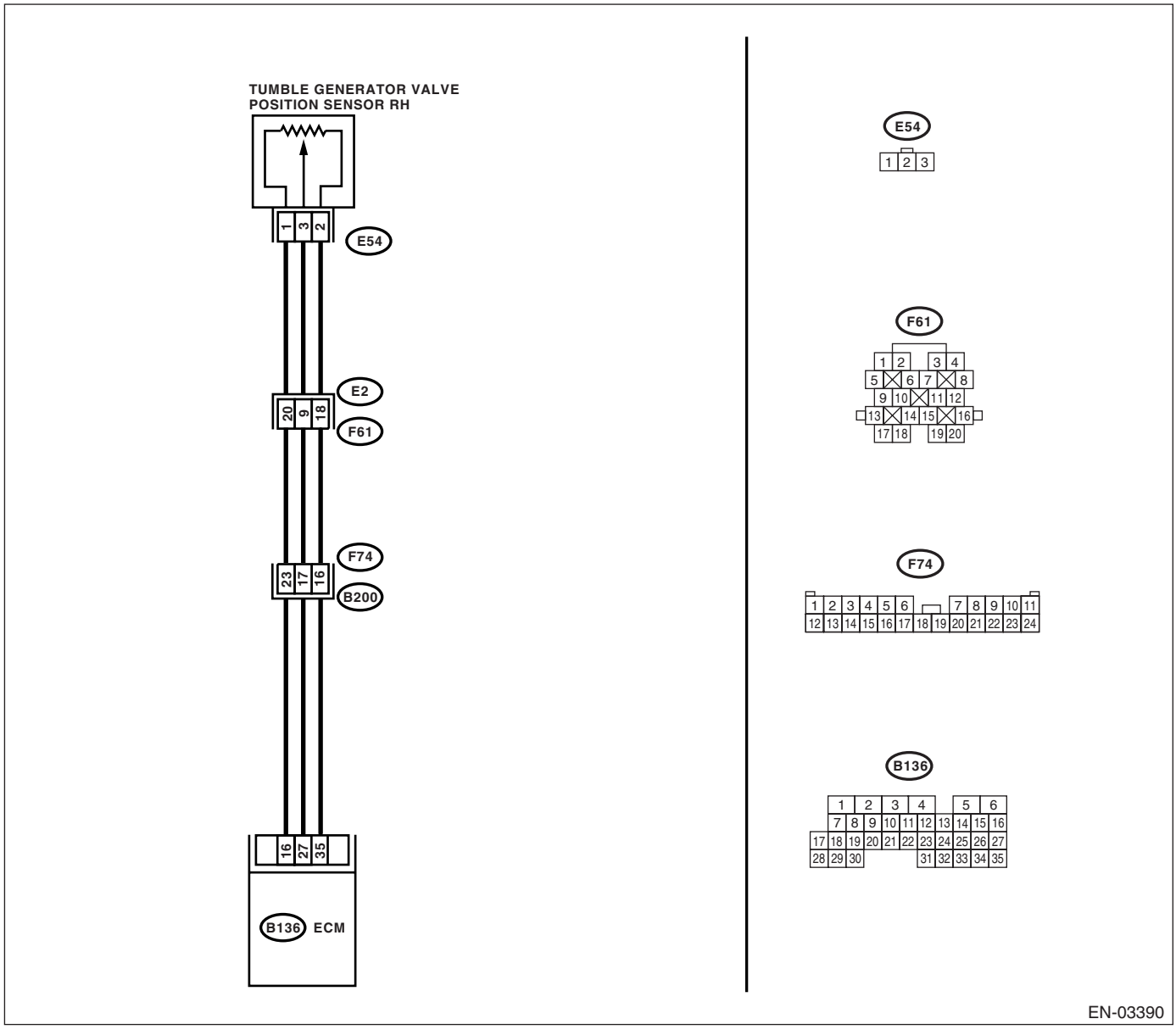
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

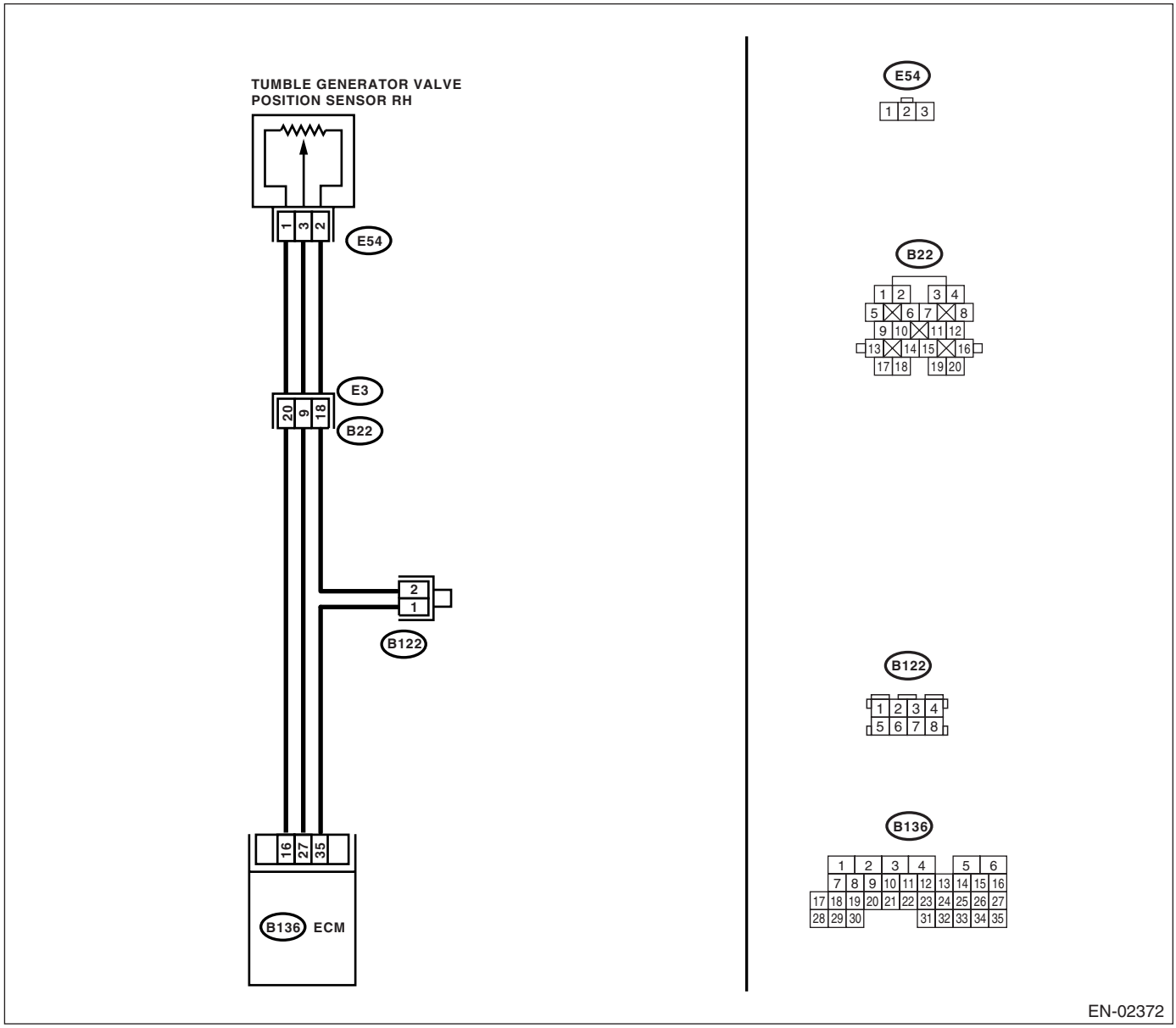
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR VALVE POSITION SENSOR RH
1 3 2
E54
E3
20 9 18
B22
2 1
B122
16 27 35
B136 ECM
E54
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02372

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E54) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>

BP:DTC P2021 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

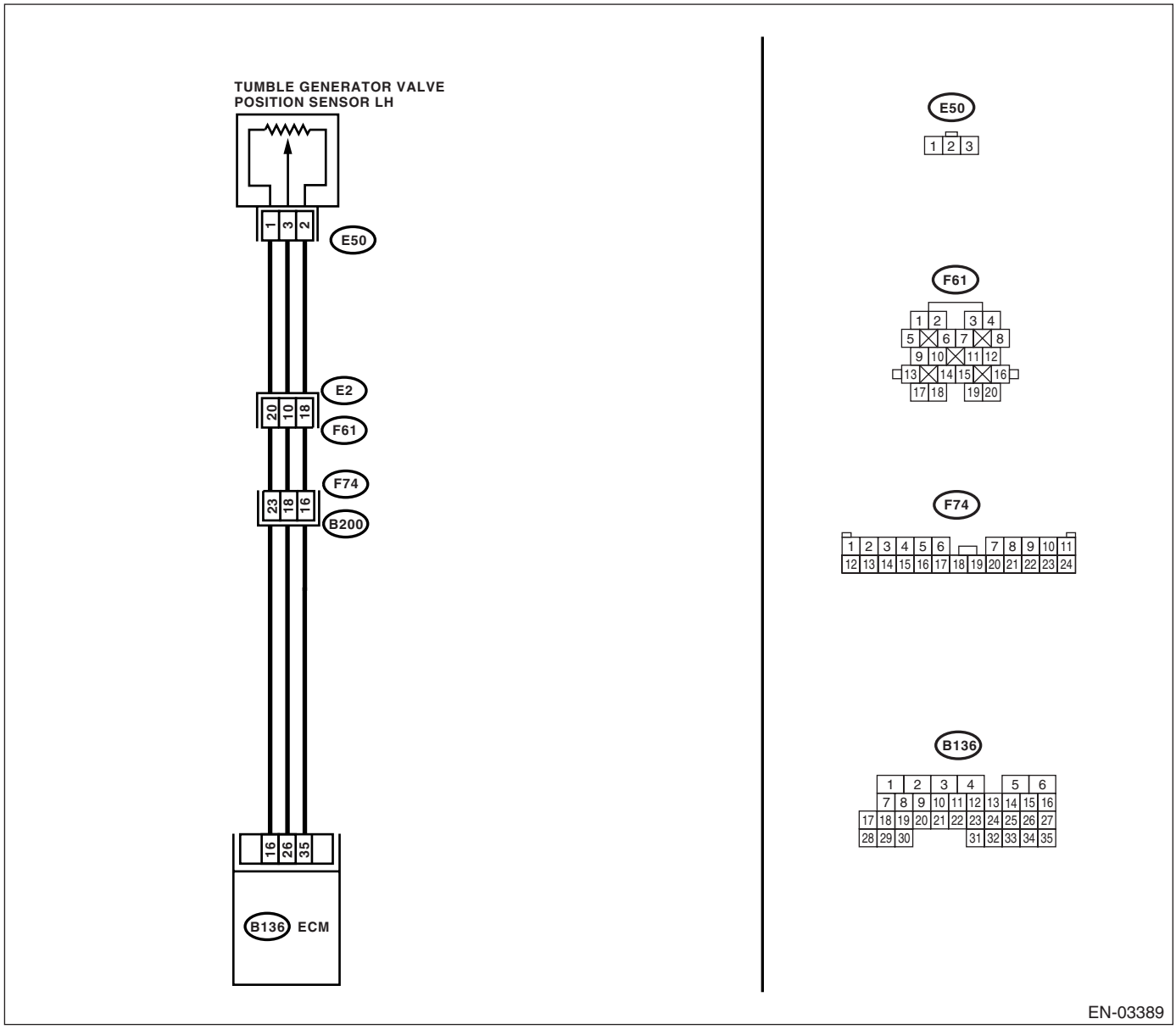
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

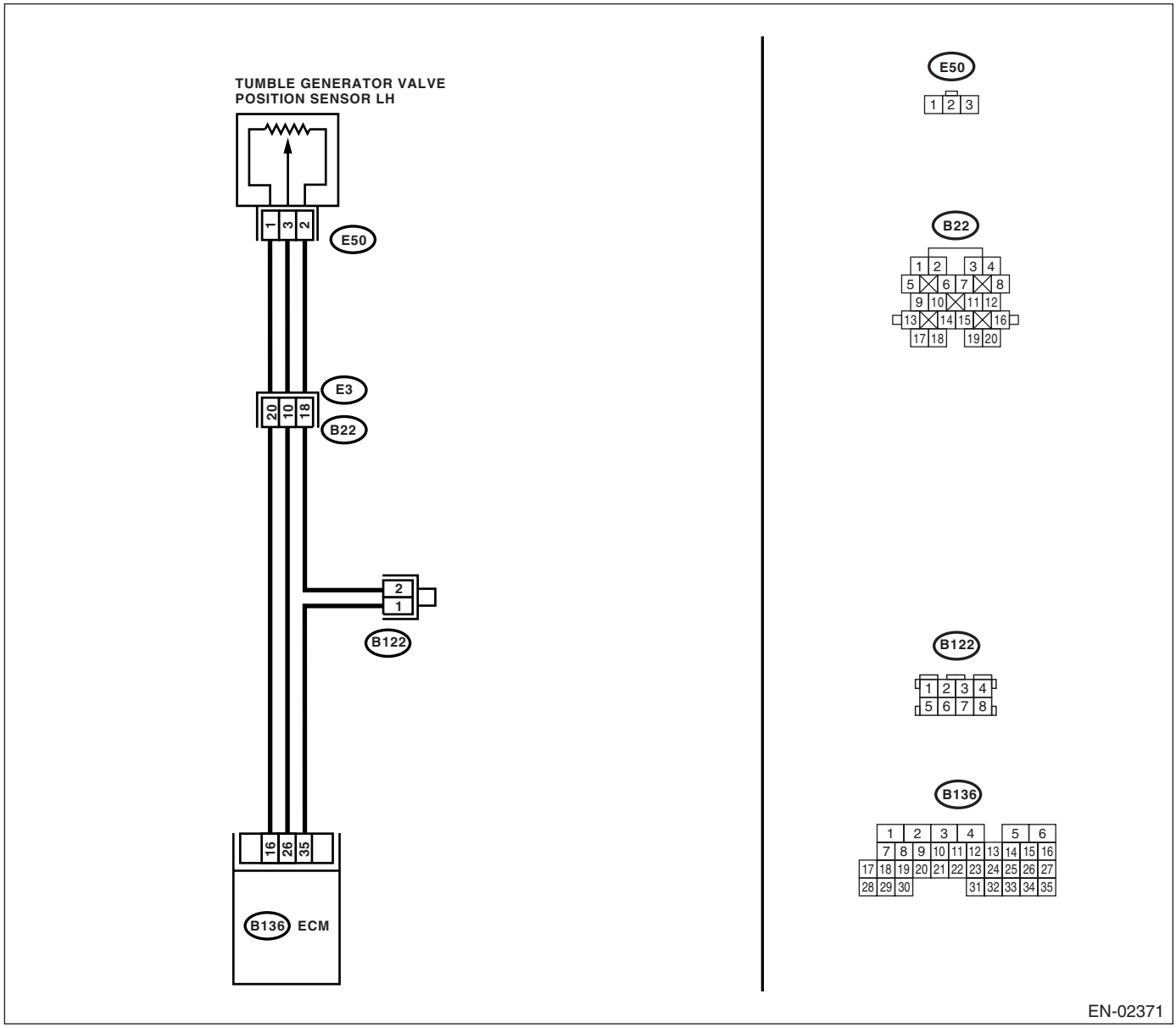
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR VALVE POSITION SENSOR LH
1
3
2
E50
E3
20
10
18
B22
2
1
B122
16
26
35
B136
ECM
E50
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02371

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground while tumble generator valve is fully closed. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Contact the SUBARU dealer. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 26 (+) — Chassis ground (−):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM WITH SUBARU SELECT MONITOR.** Measure the voltage between ECM connector and chassis ground.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **7.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. ***Connector & terminal*** ***(B136) No. 26 — (E50) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector. • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Repair poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>

BQ:DTC P2022 TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

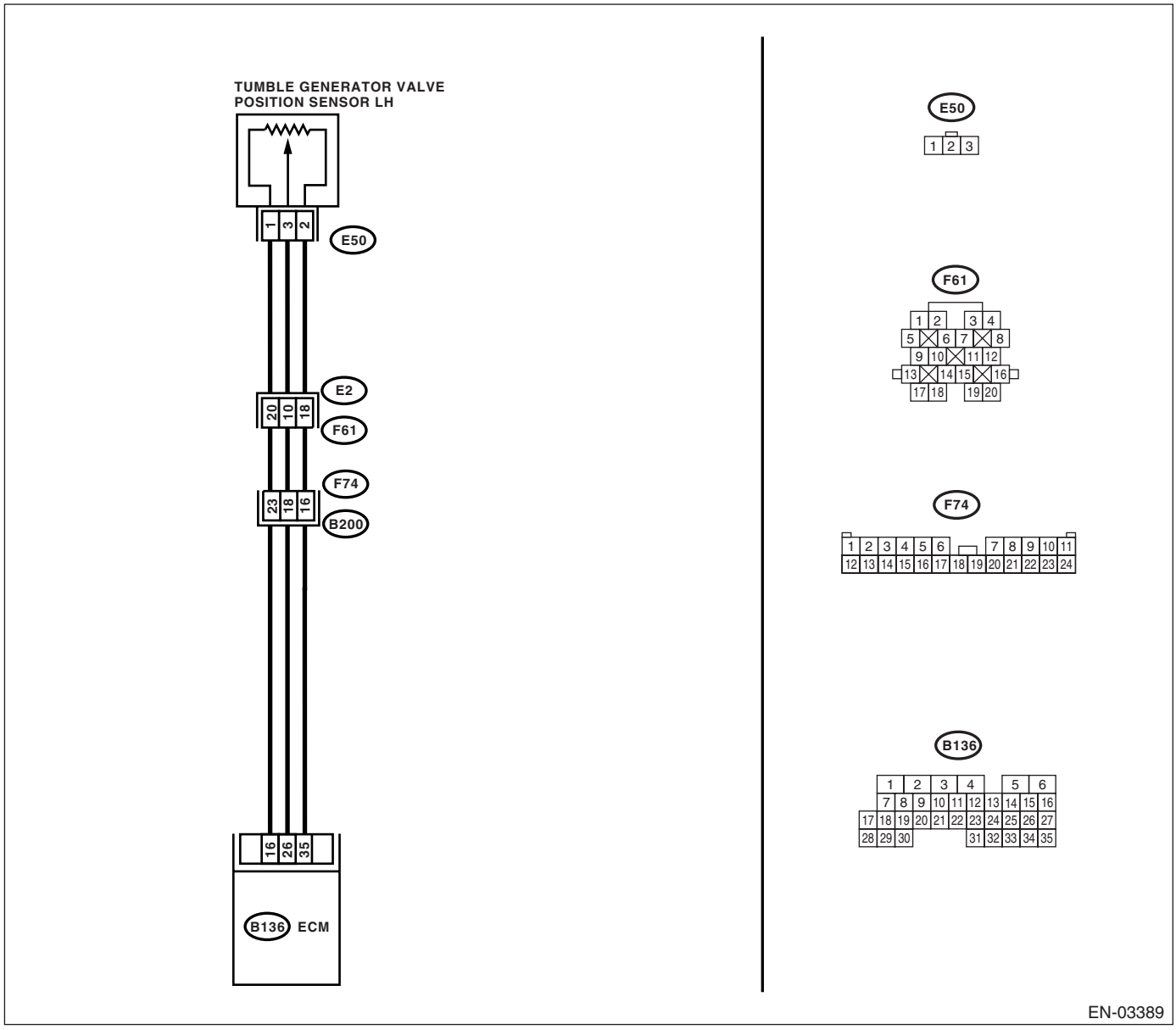
- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

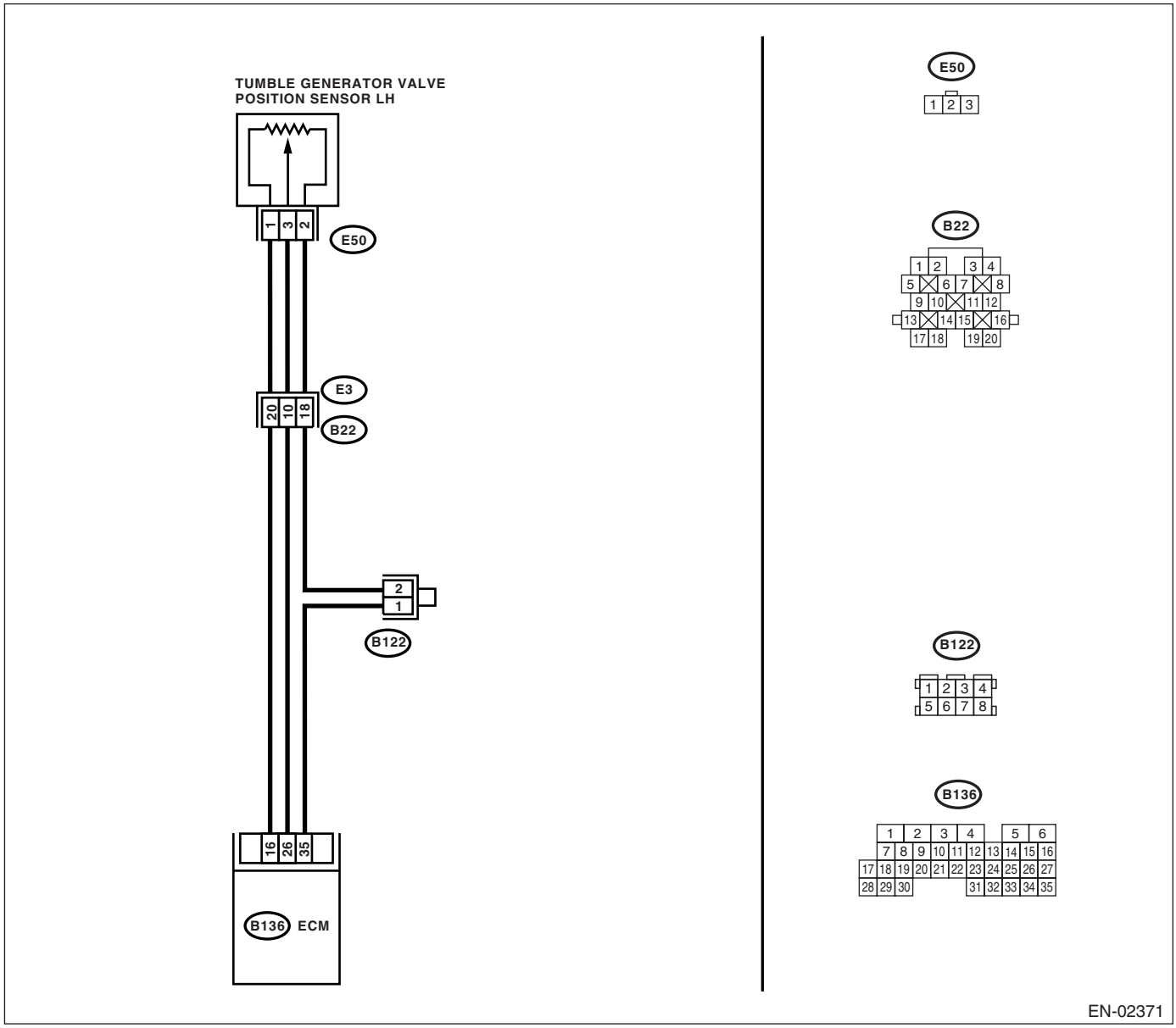
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:

- **LHD MODEL**



- **RHD MODEL**


TUMBLE GENERATOR VALVE
POSITION SENSOR LH
1
3
2
E50
E3
20
10
18
B22
2
1
B122
16
26
35
B136
ECM
E50
1 2 3
B22
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
B122
1 2 3 4
5 6 7 8
B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
EN-02371

	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC 2.5)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case repair the following: • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector. • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the harness and connector. NOTE: In this case repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E50) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.9 V?	Repair battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC 2.5)-35, Tumble Generator Valve Assembly.>

BR:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

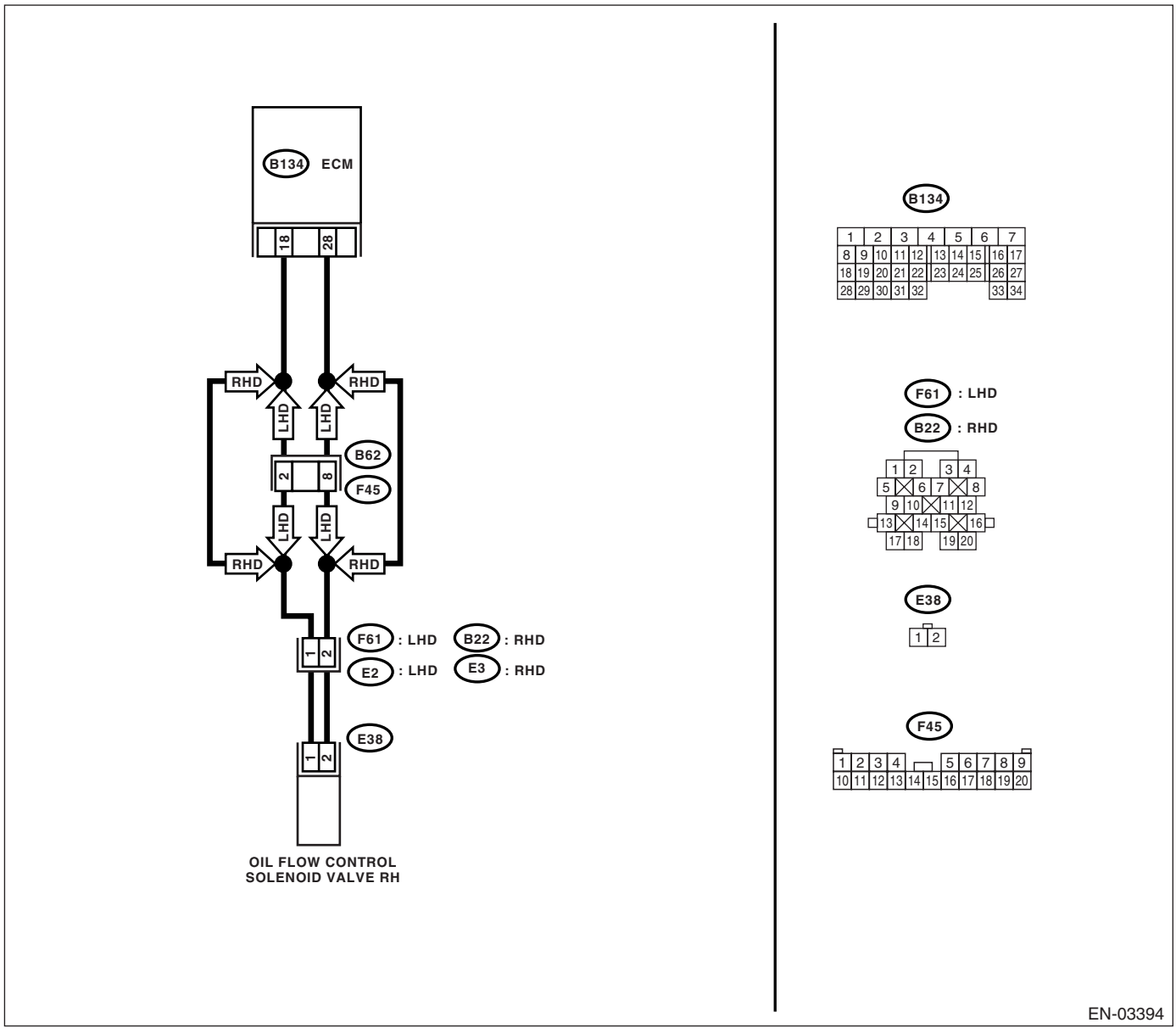
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

BS:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

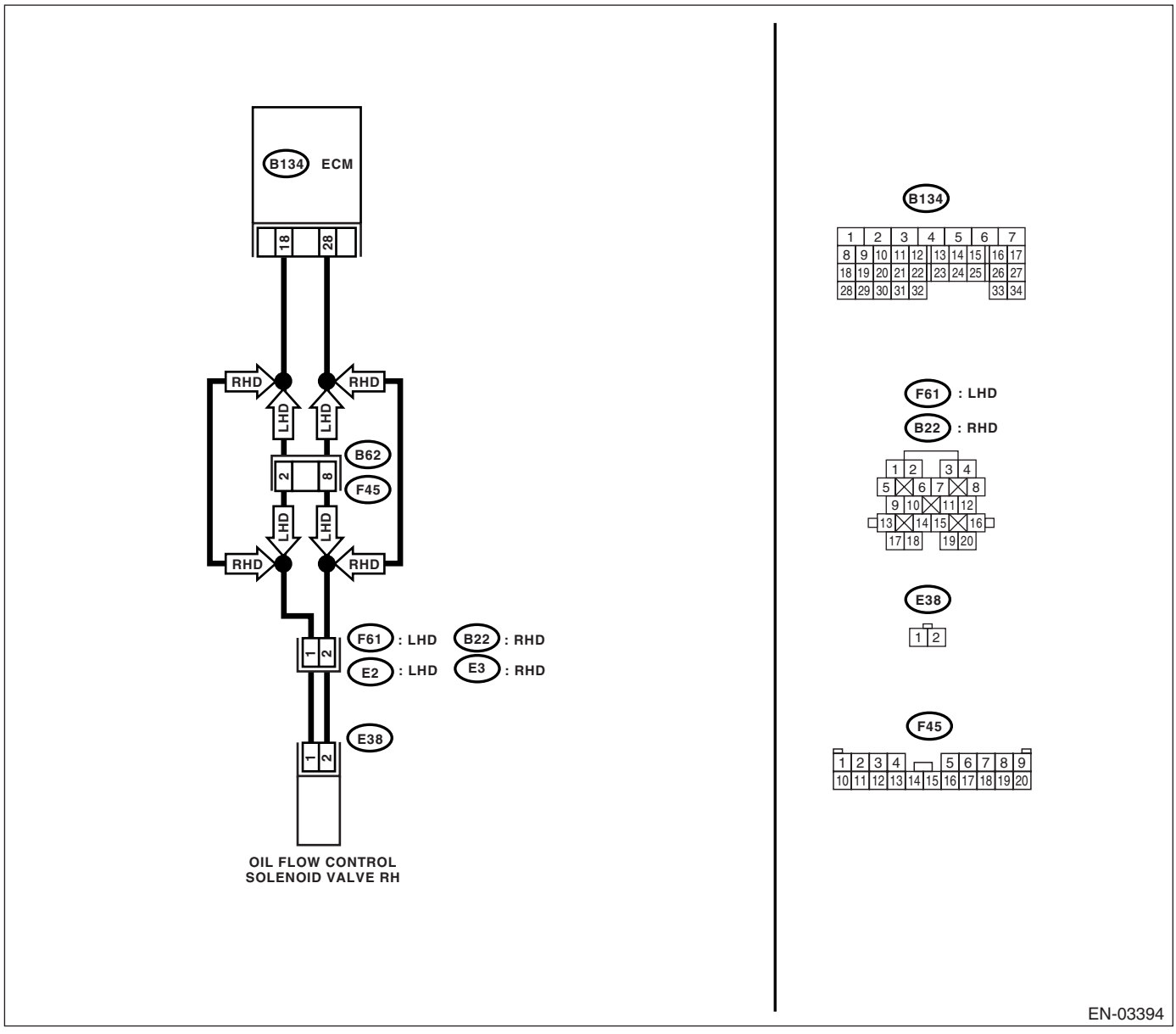
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E38) No. 1:*** ***(B134) No. 28 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

BT:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

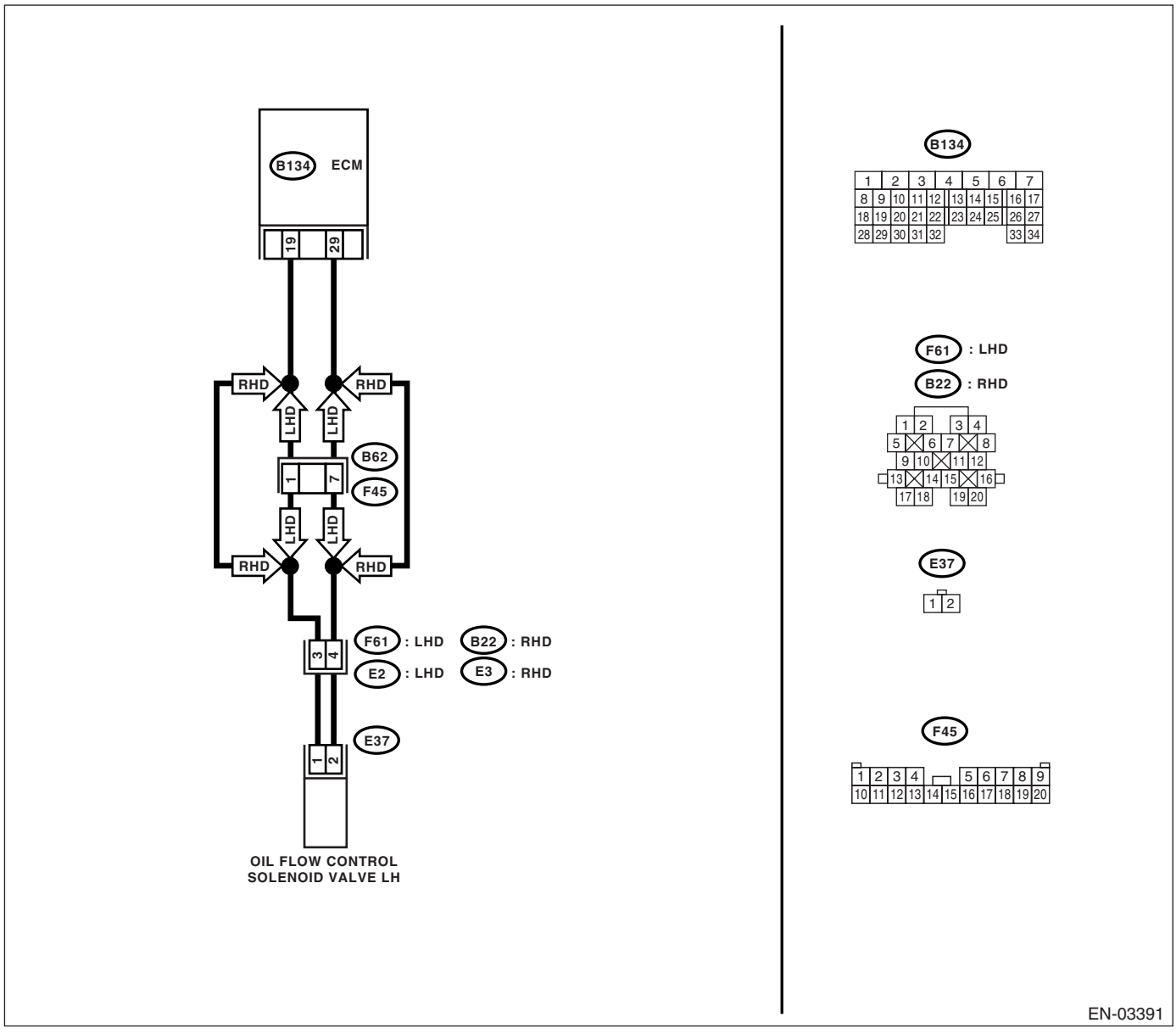
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

BU:DTC P2093 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 2)

DTC DETECTING CONDITION:

Two consecutive driving cycles with fault

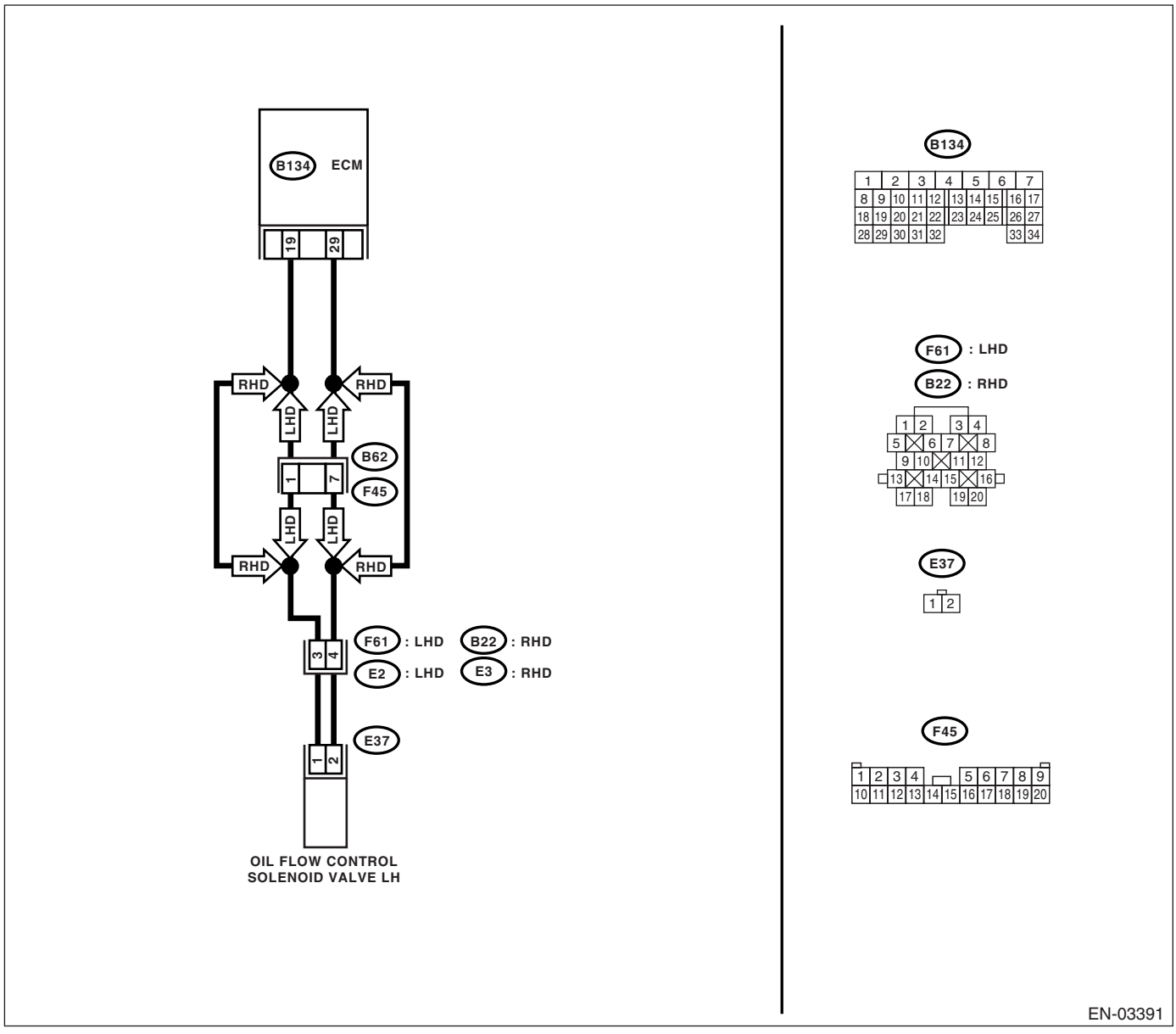
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E37) No. 1:*** ***(B134) No. 29 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair short circuit between ECM and oil flow control solenoid valve connector.
3	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC 2.0)-69, Camshaft.>

BV:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

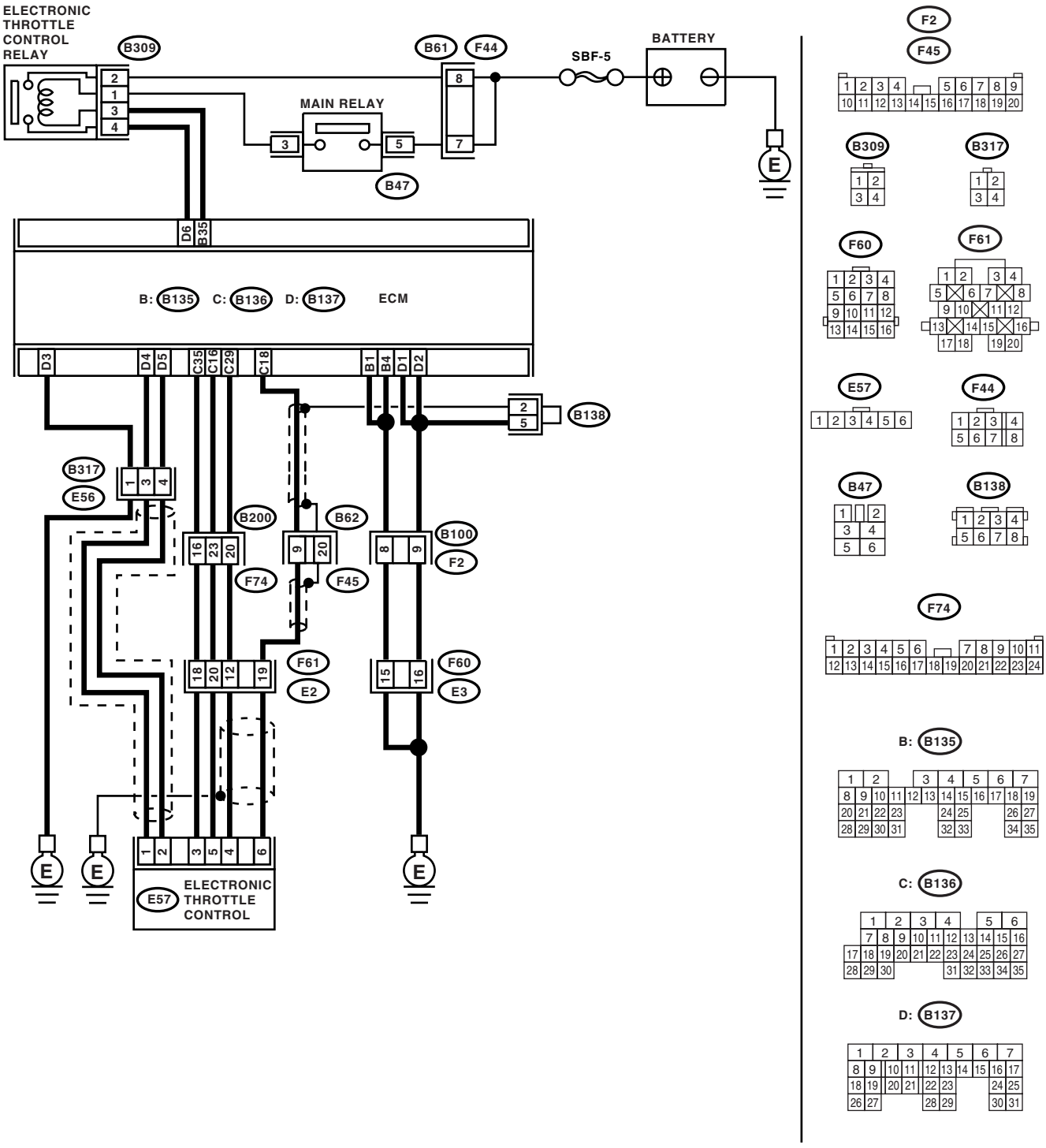
- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

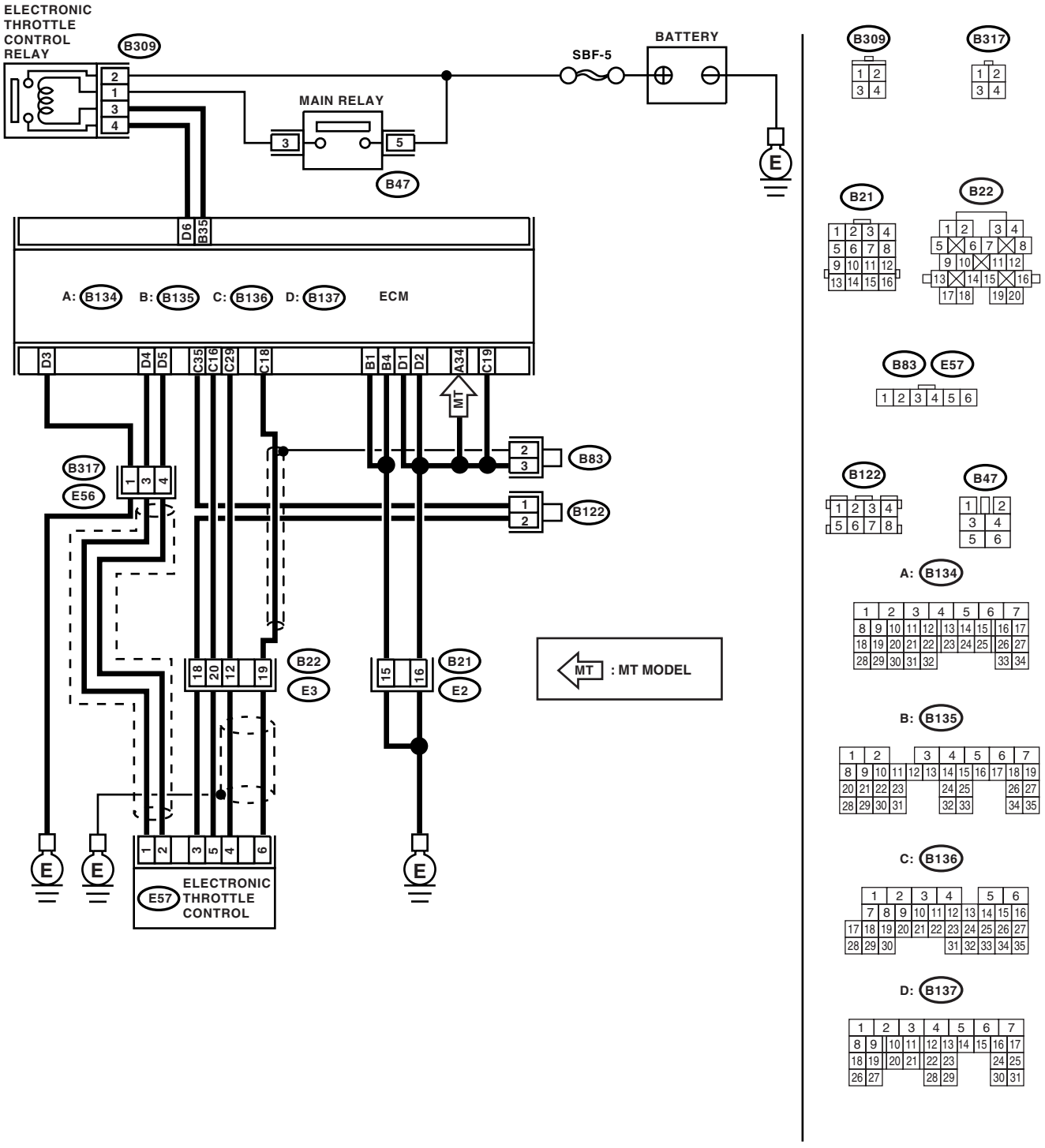
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminals No. 1 and No. 3. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (−):*** ***(B309) No. 2 (+) — Engine ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **4.**	Repair power supply short circuit in harness between ECM and electronic throttle control.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B309) No. 3:*** ***(B137) No. 6 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair open circuit in harness between ECM and electronic throttle control relay.
6	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (−):*** 4) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage more than 0.4 V?	Go to step **7.**	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (−):*** 4) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage more than 0.8 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **13.**
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit of harness connector.
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the ground short circuit of harness.
11	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **12.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
12	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
13	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. 4) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage 4.63 V?	Go to step **14.**	Go to step **16.**

	Step	Check	Yes	No
14	**CHECK SENSOR OUTPUT.** 1) Read the data of sub throttle sensor signal using Subaru Select Monitor. 2) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage 4.73 V?	Go to step **15.**	Go to step **16.**
15	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **21.**
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **17.**	Repair the open circuit of harness connector.
17	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **18.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
18	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 3) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage more than 10 V?	Go to step **19.**	Repair battery short circuit in harness between ECM connector and electronic throttle control connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (−):*** ***(E57) No. 6 (+) — Engine ground (−):*** 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **20.**	Repair short circuit in harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
20	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the resistance more than 1 MΩ?	Go to step **21.**	Repair short circuit to sensor power supply.
21	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect the connectors except of the electric control throttle relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step **22.**	Repair poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
22	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step **23.**	Repair the poor contact in ECM connector. Replace the electronic throttle control if defective.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B137) No. 4 — (E57) No. 1:*** ***(B137) No. 5 — (E57) No. 2:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit of harness connector.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 1 (+) — Engine ground (−):*** ***(E57) No. 2 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **25.**	Repair power supply short circuit in harness between ECM and electronic throttle control.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 1 — Engine ground:*** ***(E57) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Repair the short circuit of harness.
26	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance more than 1 MΩ?	Go to step **27.**	Repair the short circuit of harness.

	Step	Check	Yes	No
27	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B137) No. 3 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **28.**	Repair the open circuit of harness.
28	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 5 Ω?	Go to step **29.**	Repair the electronic throttle control.
29	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>	Repair the electronic throttle control.

BW:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

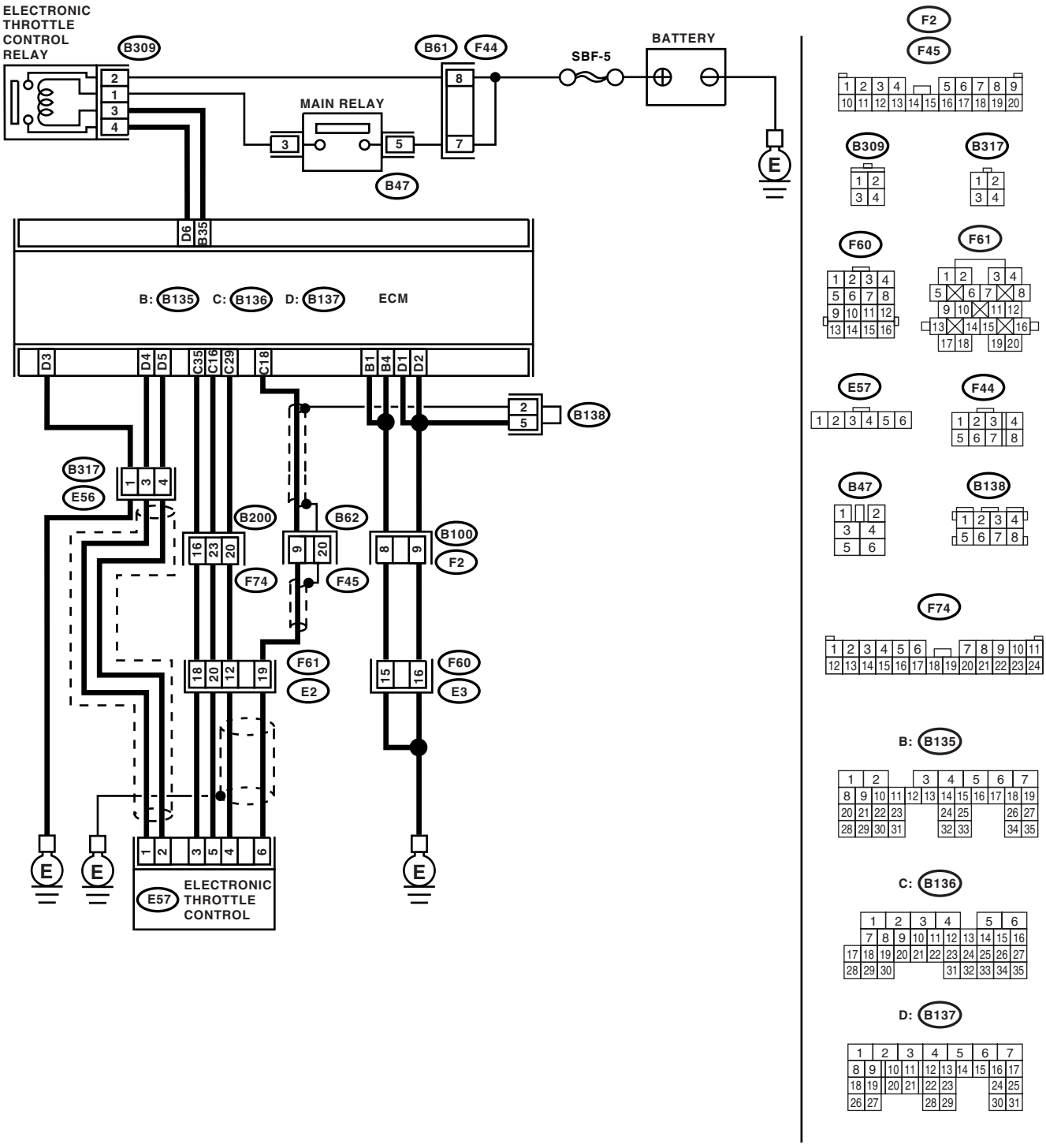
- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

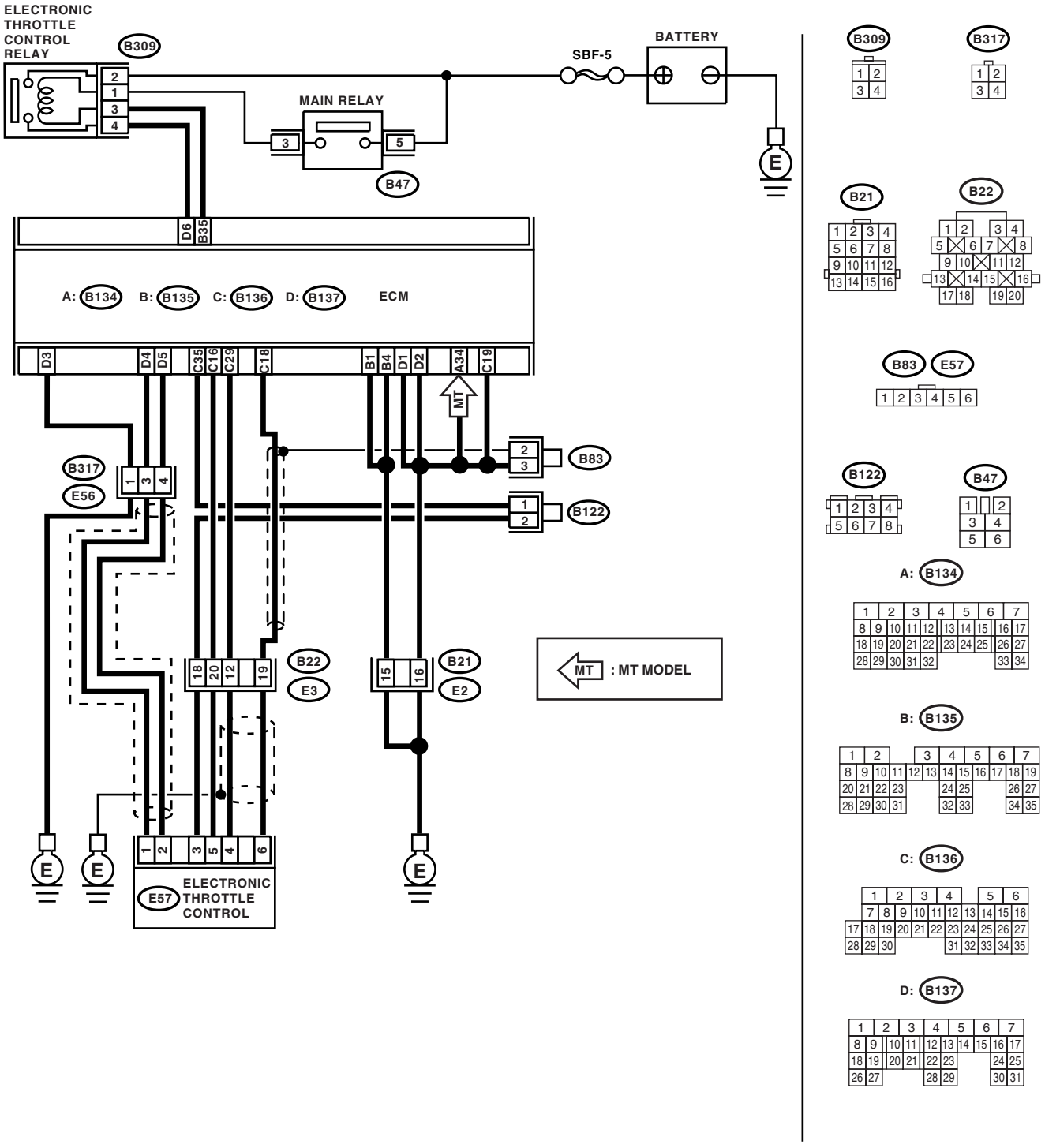
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminals No. 1 and No. 3. 4) Measure the resistance between electronic throttle control terminals. ***Terminals*** ***(B309) No. 2 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** Measure the voltage between electronic throttle control relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 1 (+) — Engine ground (−):*** ***(B309) No. 2 (+) — Engine ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Disconnect the connector from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 3 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **4.**	Repair power supply short circuit in harness between ECM and electronic throttle control relay.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B309) No. 3 — Engine ground:*** ***(B309) No. 4 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair ground short circuit in harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B309) No. 3:*** ***(B137) No. 6 — (B309) No. 4:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Repair open circuit in harness between ECM and electronic throttle control relay.

BX:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

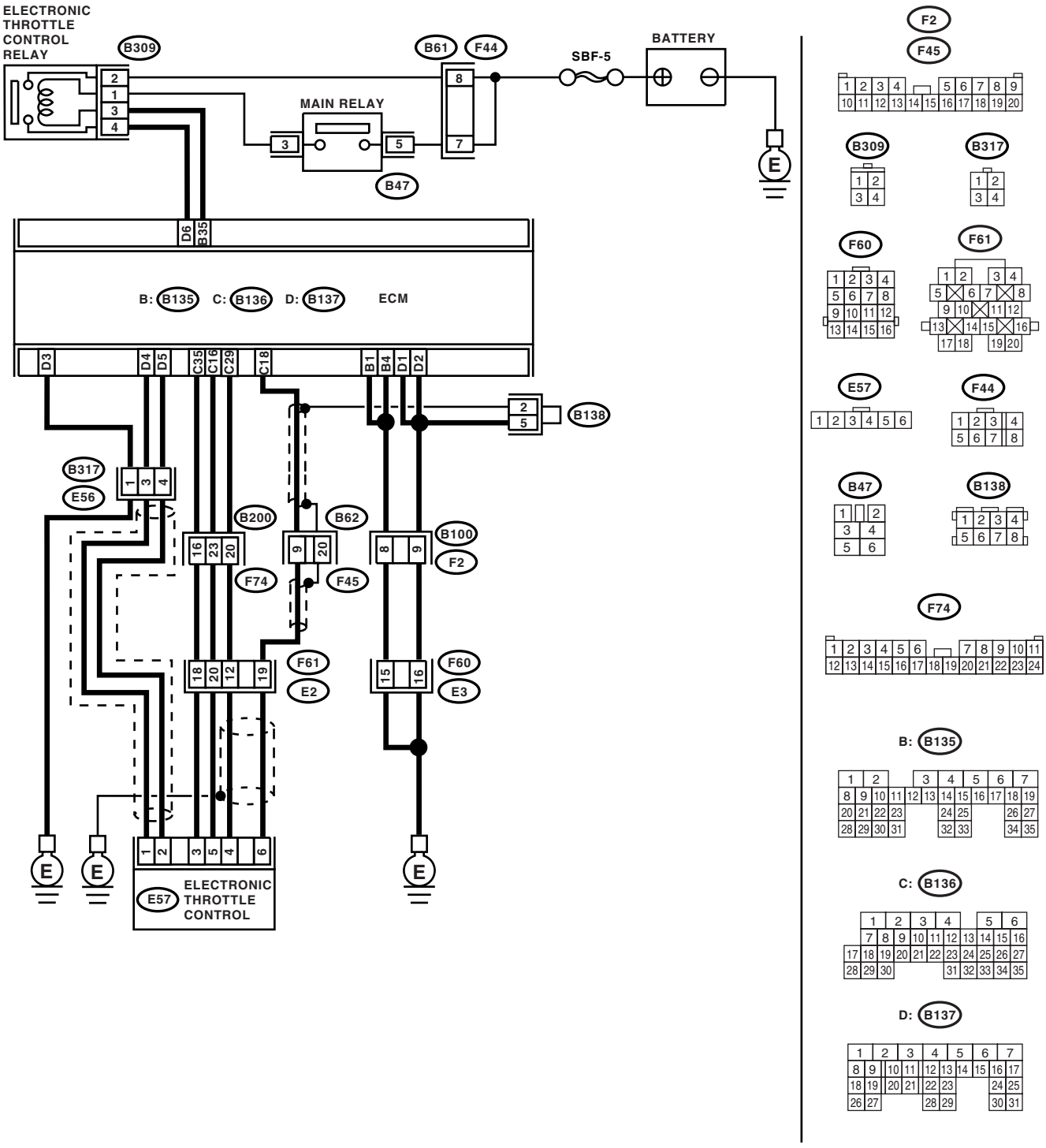
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

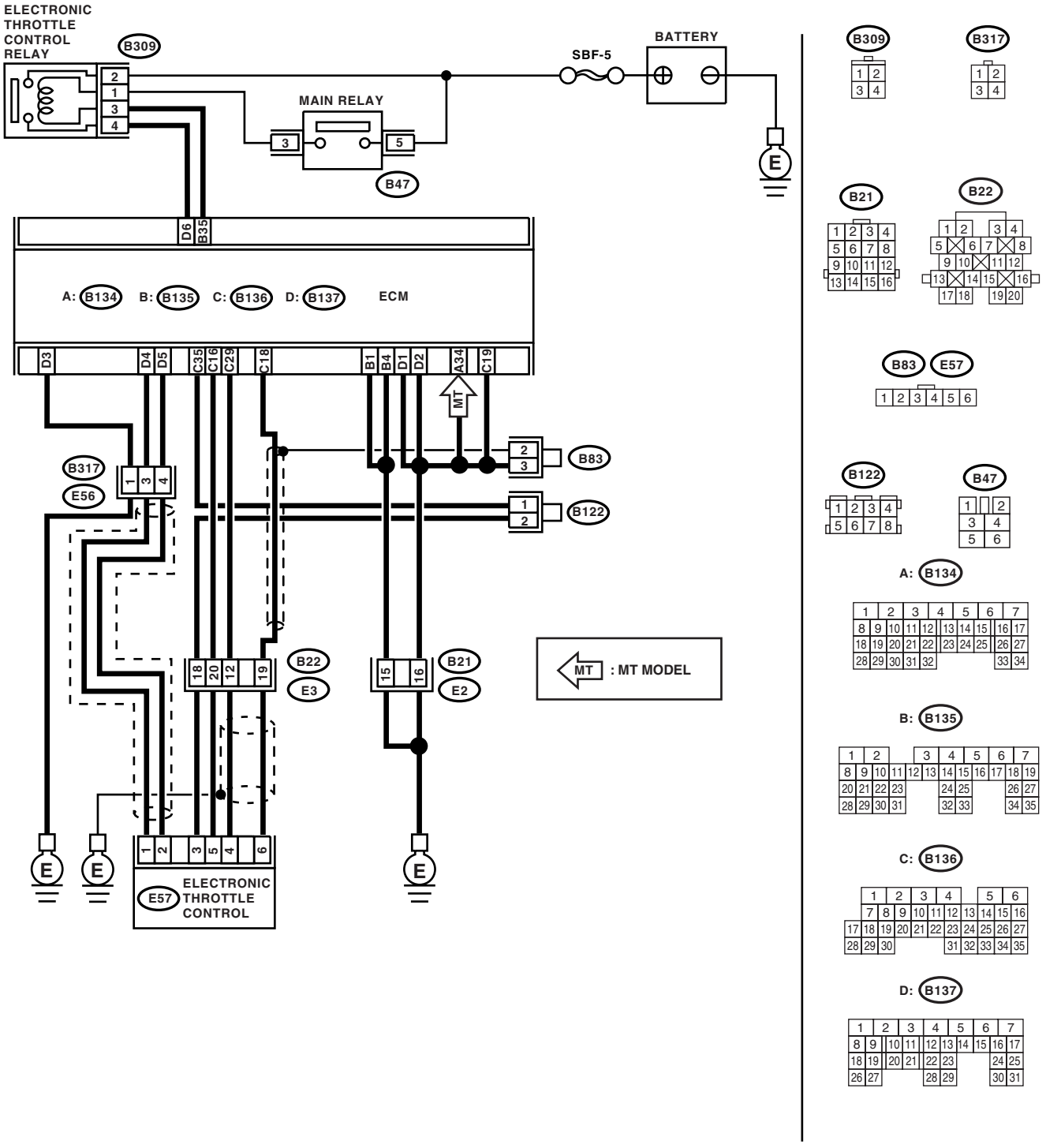
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and engine ground. ***Connector & terminal*** ***(B309) No. 4 (+) — Engine ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair power supply short circuit in harness between ECM and electronic throttle control relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and engine ground. ***Connector & terminal*** ***(B135) No. 35 — Engine ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Repair ground short circuit in harness between ECM and electronic throttle control relay.

BY:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE

NOTE:
For diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC 2.5)(diag)-252, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BZ:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

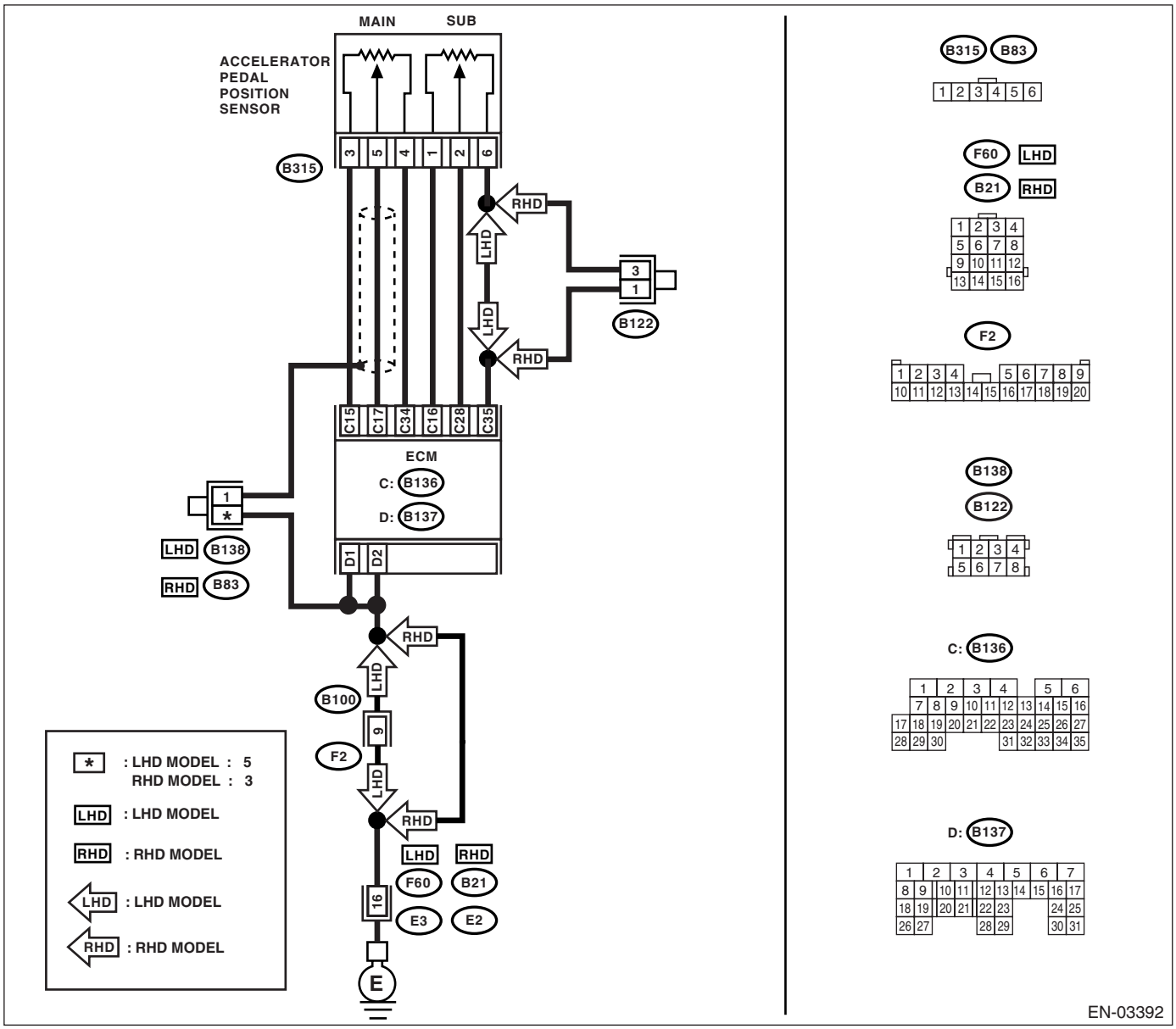
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 17 (+) — (B136) No. 34 (–):*** 3) Check the voltage change by shaking the harness and connector of ECM and accelerator pedal position sensor connector and harness.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 15 — (B315) No. 3:*** ***(B136) No. 17 — (B315) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 — Chassis ground:*** ***(B136) No. 17 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** (1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 5 — No. 4:*** (2) Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance 0.2 — 1.0 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** (1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 5 — No. 4:*** (2) Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance 0.5 — 2.5 kΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Replace the accelerator pedal position sensor.

CA:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

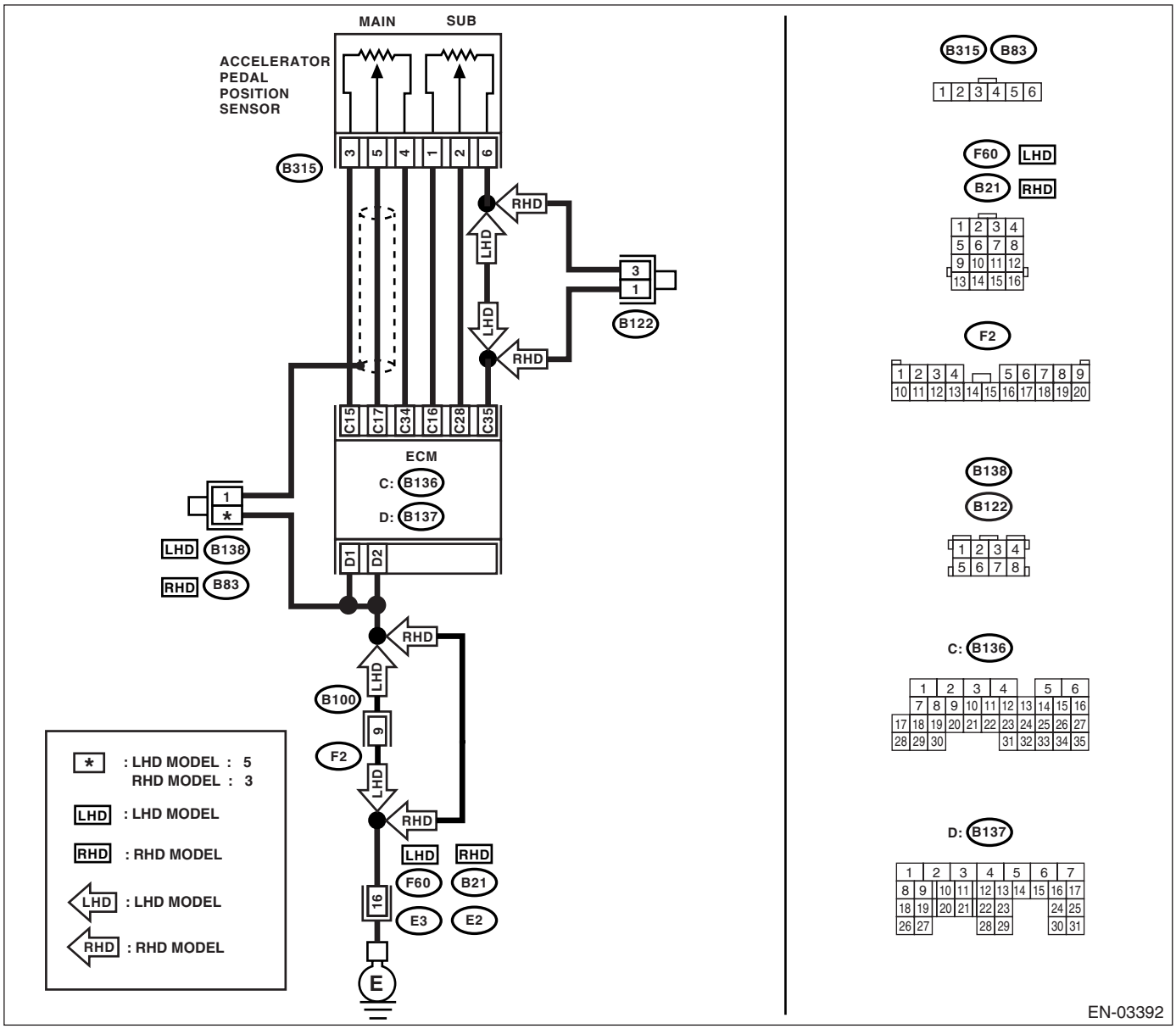
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. 3) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and accelerator pedal position sensor connector harness.	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (−):*** 4) Check the voltage is above the specified value when shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage more than 6 V?	Go to step **6.**	Repair battery short circuit in harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Engine ground (−):*** 2) Check the voltage is below the specified value when shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage less than 4.8 V?	Go to step **7.**	Repair short circuit in harness between ECM connector and accelerator pedal position sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (−):***	Is the voltage 4.8 V?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Repair poor contact in accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.

CB:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

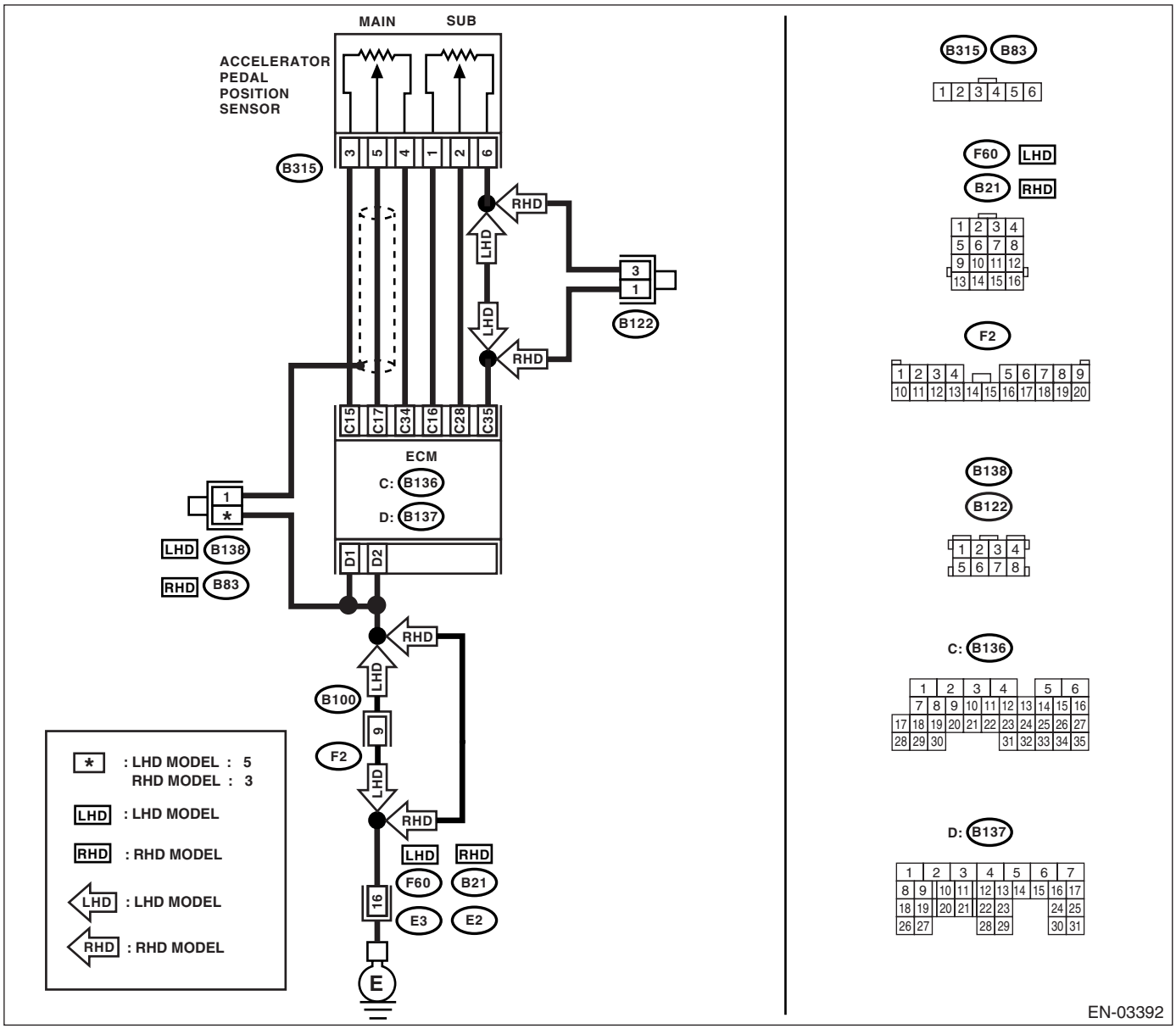
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 28 (+) — (B136) No. 35 (–):*** 3) Check the voltage exceed the standard value by shaking the harness and connector of ECM and accelerator pedal position sensor connector and harness.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 16 — (B315) No. 1:*** ***(B136) No. 28 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Check the voltage is within the specified value when shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance 0.15 — 0.63 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance 0.28 — 1.68 kΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Replace the accelerator pedal position sensor.

CC:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

Immediately at fault recognition

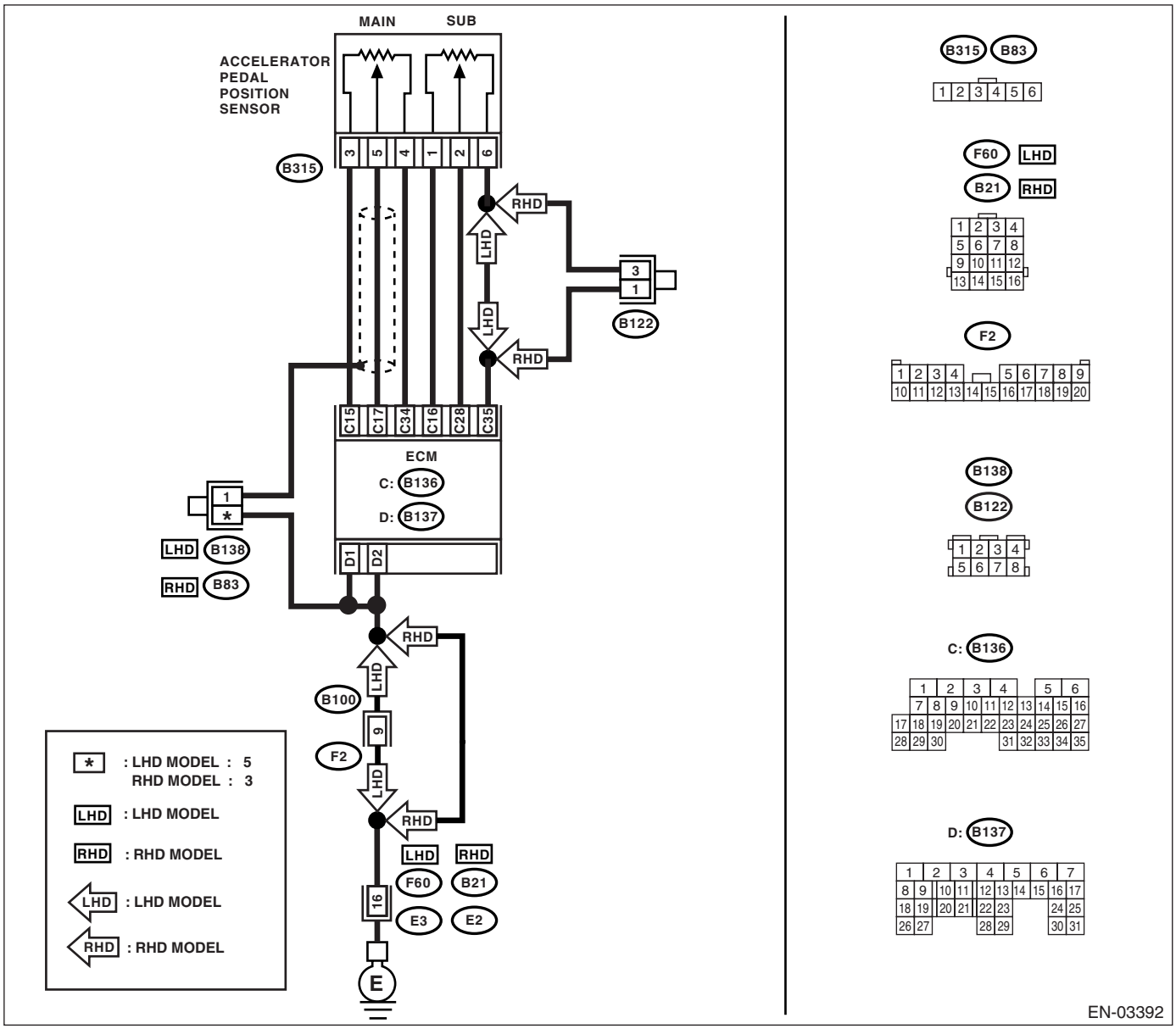
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. 3) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and accelerator pedal position sensor connector harness.	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 6 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (−):*** 4) Check the voltage is above the specified value when shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage less than 6 V?	Go to step **6.**	Repair battery short circuit in harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 2 (+) — Engine ground (−):*** 2) Check the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage less than 4.8 V?	Go to step **7.**	Repair short circuit in harness between ECM connector and accelerator pedal position sensor connector.

	Step	Check	Yes	No
7	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage 4.8 V?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Repair poor contact in accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.

CD:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE RATIONALITY

DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

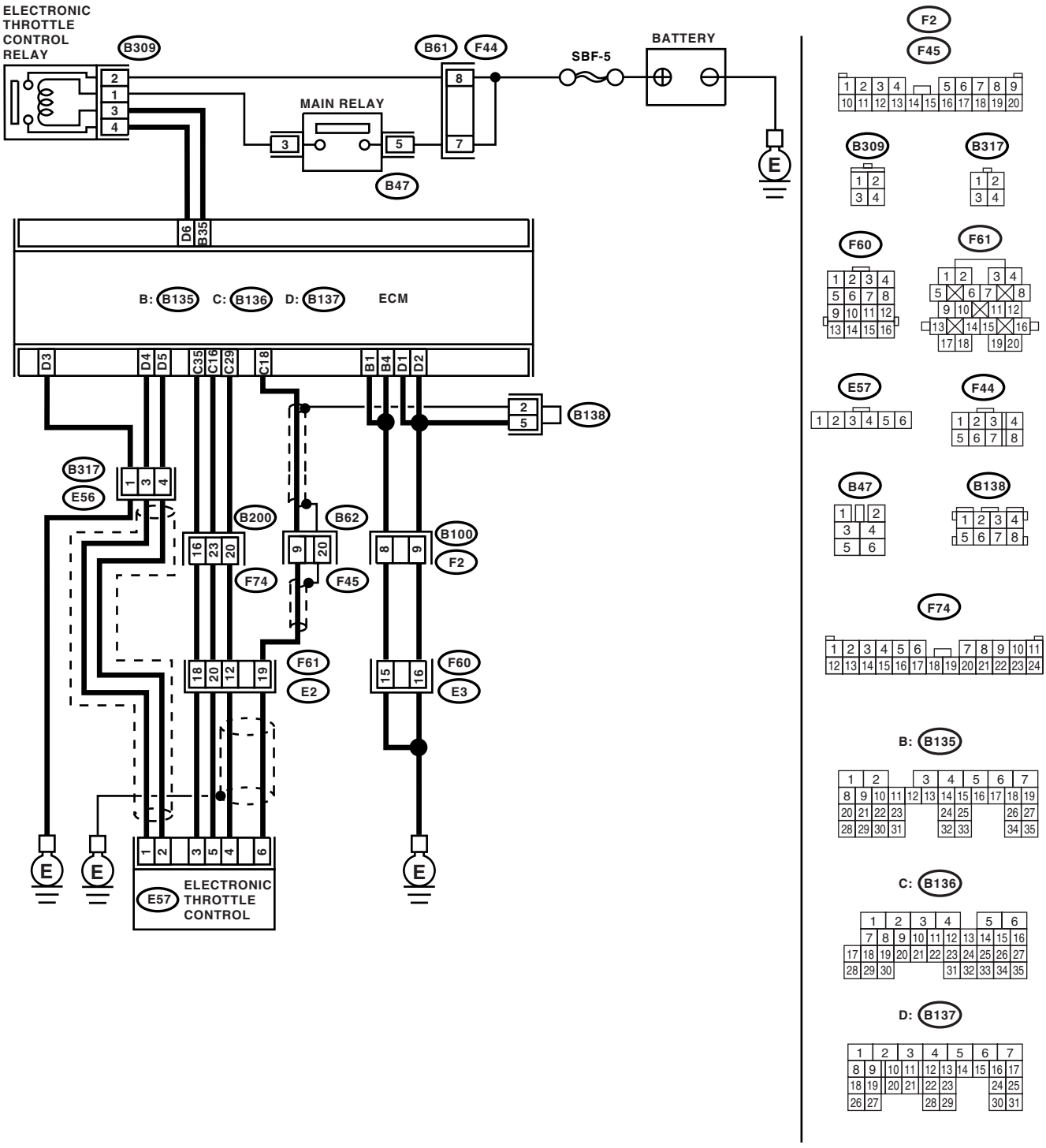
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

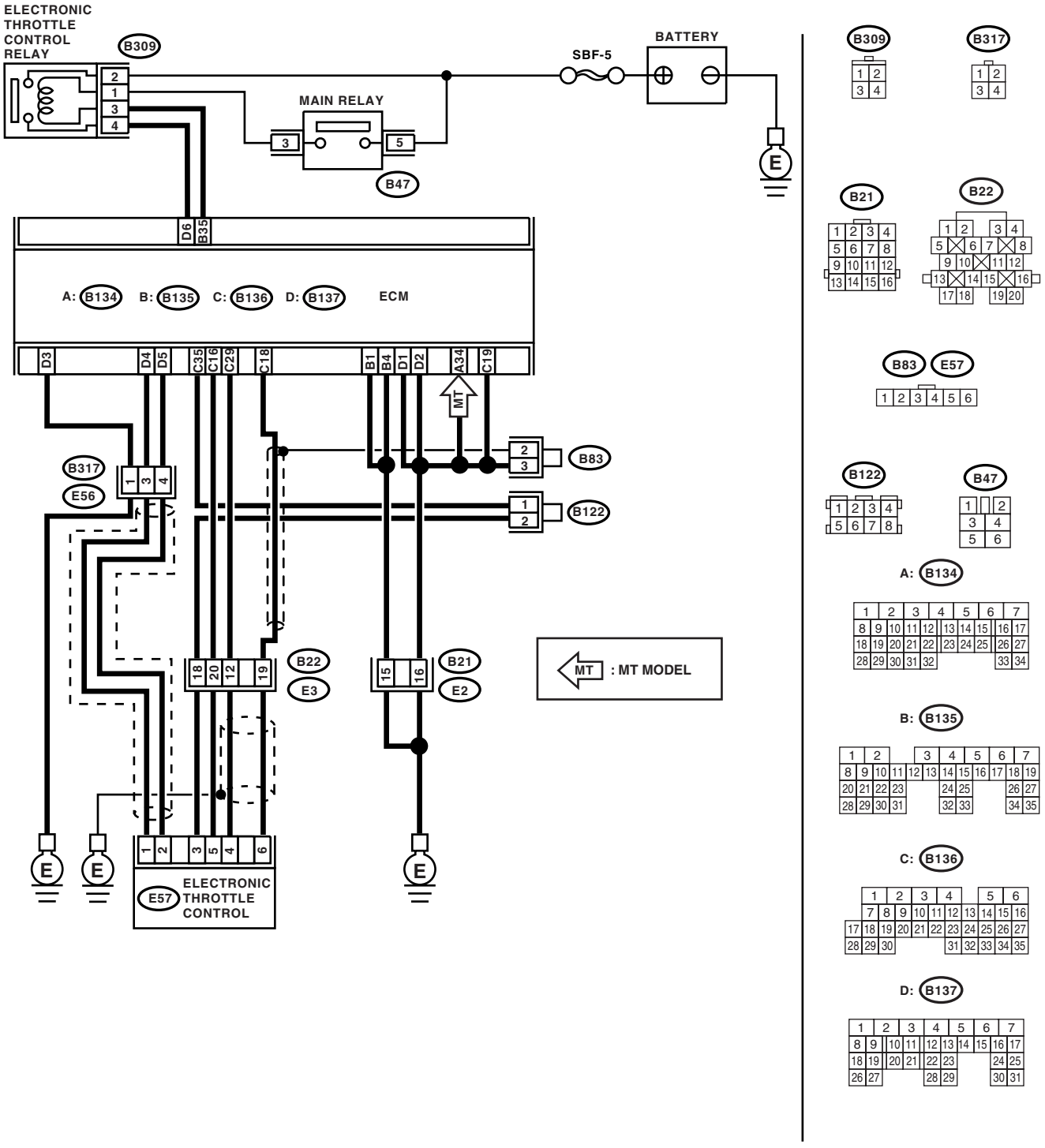
WIRING DIAGRAM:

- **LHD MODEL**



EN-03379

- **RHD MODEL**



EN-03380

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 18 (+) — (B136) No. 35 (–):*** 3) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **4.**
2	**CHECK SENSOR OUTPUT.** 1) Measure the voltage between ECM connector terminals. ***Connector & terminal*** ***(B136) No. 29 (+) — (B136) No. 35 (–):*** 2) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage more than 0.8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **14.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit of harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit of harness.
6	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **7.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
7	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **8.**	Repair the poor contact in ECM connector. Replace the ECM if defective.

	Step	Check	Yes	No
8	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. 4) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage less than 4.63 V?	Go to step **9.**	Go to step **11.**
9	**CHECK SENSOR OUTPUT.** 1) Read the data of sub throttle sensor signal using Subaru Select Monitor. 2) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and electronic throttle control connector.	Is the voltage less than 4.73 V?	Go to step **10.**	Go to step **11.**
10	**CHECK POOR CONTACT.** Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit of harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
13	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):*** 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage more than 10 V?	Go to step **14.**	Repair battery short circuit in harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (−):*** ***(E57) No. 6 (+) — Engine ground (−):*** 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step **15.**	Repair short circuit in harness between ECM connector and electronic throttle control connector.
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 35:*** ***(B136) No. 29 — (B136) No. 35:***	Is the resistance more than 1 MΩ?	Go to step **16.**	Repair short circuit to sensor power supply.
16	**CHECK ELECTRONIC THROTTLE CONTROL HARNESS.** 1) Disconnect the connector from ECM. 2) Disconnect the connectors from the electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 4:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Repair the short circuit of harness.

CE:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE RATIONALITY

DTC DETECTING CONDITION:

Immediately at fault recognition

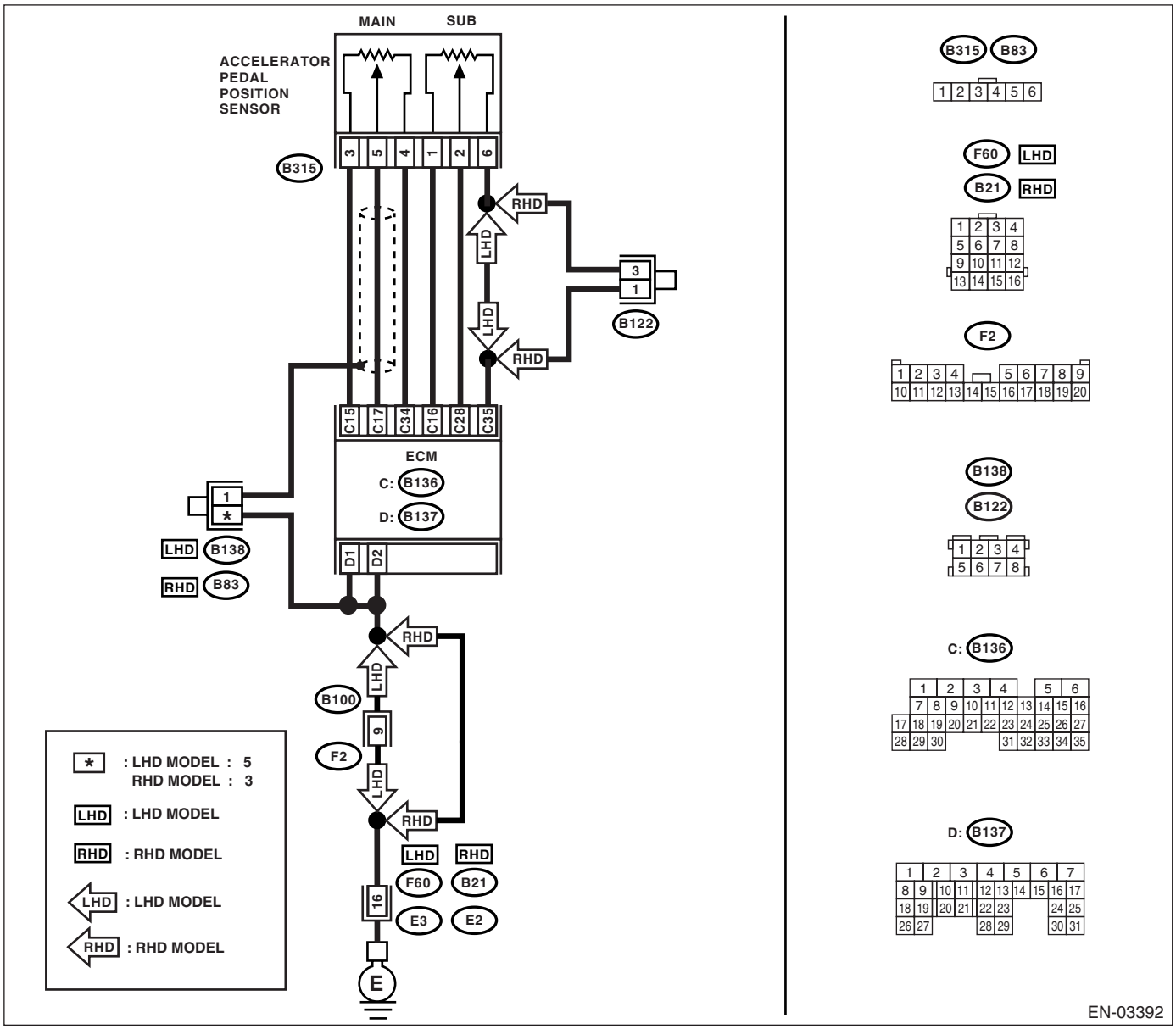
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and terminal. ***Connector & terminal*** ***(B136) No. 17 (+) — (B136) No. 34 (–):*** ***(B136) No. 28 (+) — (B136) No. 35 (–):*** 3) Check the voltage change by shaking the harness and connector of ECM and accelerator pedal position sensor connector and harness.	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **12.**
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 15 — (B315) No. 3:*** ***(B136) No. 16 — (B315) No. 1:*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 28 — (B315) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 15 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (–):*** ***(B315) No. 1 (+) — Engine ground (–):*** 4) Check the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminals*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.2 — 0.8 kΩ?	Go to step **9.**	Replace the accelerator pedal position sensor.
9	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **10.**	Replace the accelerator pedal position sensor.
10	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor with the accelerator pedal depressed. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance 0.5 — 2.5 kΩ?	Go to step **11.**	Replace the accelerator pedal position sensor.
11	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor with the accelerator pedal depressed. ***Terminals*** ***No. 2 — No. 6:***	Is the resistance 0.28 — 1.68 kΩ?	Go to step **12.**	Replace the accelerator pedal position sensor.
12	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. 5) Check the voltage change by shaking the harness and connector of ECM, engine harness connector and accelerator pedal position sensor connector harness.	Is the voltage less than 4.8 V?	Go to step **13.**	Go to step **14.**
13	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **19.**

	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit of harness connector.
15	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:*** ***(B315) No. 6 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **16.**	Repair the poor contact in ECM connector. Replace the ECM if defective.
16	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (−):*** ***(B315) No. 3 (+) — Engine ground (−):*** 4) Check the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage less than 6 V?	Go to step **17.**	Repair battery short circuit in harness between ECM connector and accelerator pedal position sensor connector.
17	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 2 (+) — Engine ground (−):*** ***(B315) No. 5 (+) — Engine ground (−):*** 2) Check the voltage change by shaking the harness and connector of ECM while monitoring the value with voltage meter.	Is the voltage less than 4.8 V?	Go to step **18.**	Repair short circuit in harness between ECM connector and accelerator pedal position sensor connector.
18	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 (+) — Chassis ground (−):*** ***(B136) No. 28 (+) — Chassis ground (−):***	Is the voltage less than 4.8 V?	Go to step **19.**	Repair poor contact in accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.

	Step	Check	Yes	No
19	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from the accelerator pedal position sensor. 4) Measure the resistance between connector terminals of accelerator pedal position sensor. ***Connector & terminal*** ***(B315) No. 5 — (B315) No. 2:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective.	Repair short circuit in harness between ECM connector and accelerator pedal position sensor connector.

CF:DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:
Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or general scan tool indicate DTC P1110?	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built in ECM.	Temporary poor contact occurs.

CG:DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:
Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC 2.5)(diag)-42, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC 2.5)(diag)-35, OPERATION, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or general scan tool indicate DTC P1111?	Replace the ECM. <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built in ECM.	Temporary poor contact occurs.

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC 2.0)-120, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Electronic throttle control 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Fuel pump and fuel pump relay
6. Surging	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After burning in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil & ignitor ASSY and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.

TRANSMISSION SECTION

CONTROL SYSTEMS	CS
AUTOMATIC TRANSMISSION	4AT
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	4AT(diag)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)	4AT(D)(diag)
MANUAL TRANSMISSION AND DIFFERENTIAL	5MT
CLUTCH SYSTEM	CL

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8090GE4

CONTROL SYSTEMS

CS

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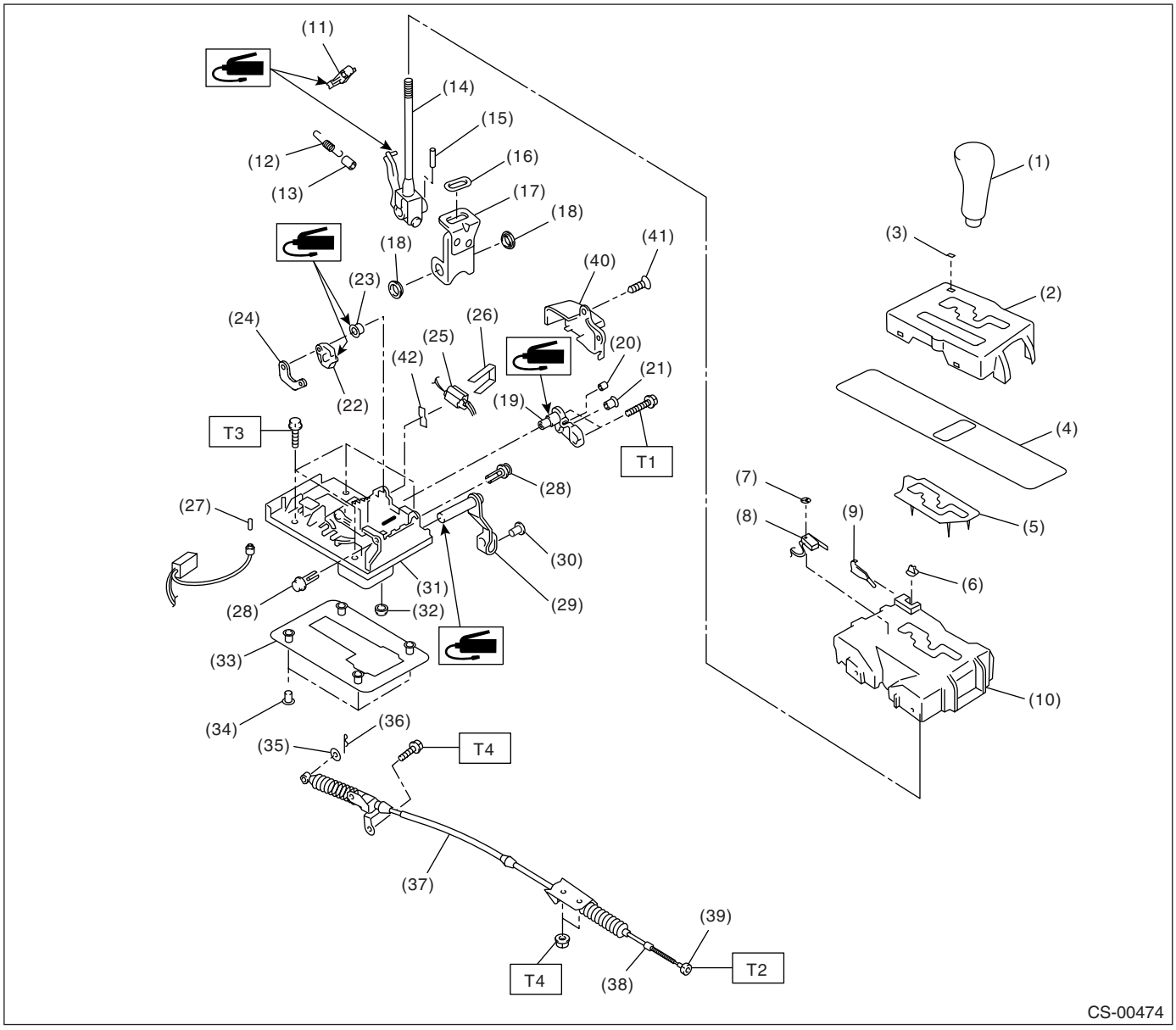
1. General Description

A: SPECIFICATION

Item		Specification
Swing torque of rod against lever	N (kgf, lbf)	3.7 (0.38, 0.83) or less

B: COMPONENT

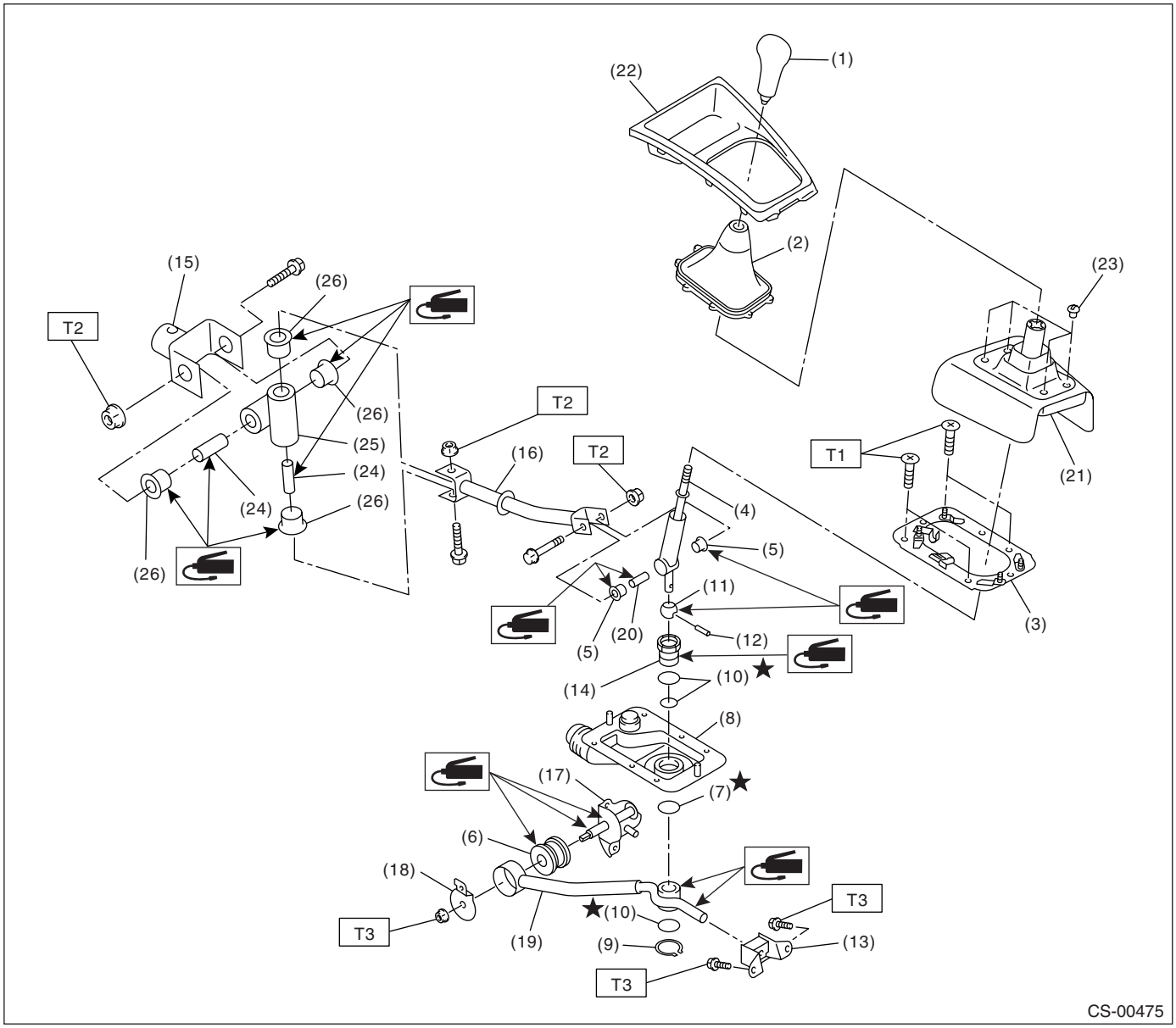
1. AT SELECT LEVER



(1) Grip
(2) Indicator cover
(3) Cover
(4) Blind
(5) Cushion
(6) Button
(7) Clip
(8) “P” range switch
(9) Spring
(10) Guide plate
(11) Detent arm
(12) Detent spring
(13) Tube
(14) Select lever COMPL
(15) Spring pin
(16) Bushing
(17) Bracket
(18) Bushing
(19) Lock plate B
(20) Bushing
(21) Bushing
(22) Lock plate A
(23) Bushing
(24) Lock plate C
(25) Shift lock solenoid
(26) Clamp
(27) Indicator light bulb
(28) Clip
(29) Select lever arm
(30) Bushing COMPL
(31) Base plate
(32) Grommet
(33) Packing
(34) Spacer
(35) Washer
(36) Snap pin
(37) Select cable
(38) Adjusting nut B
(39) Adjusting nut A
(40) Cover
(41) Clip
(42) Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T1: 2.0 (0.2, 1.4)
T2: 7.5 (0.76, 5.5)
T3: 13 (1.3, 9.4)
T4: 18 (1.8, 13)

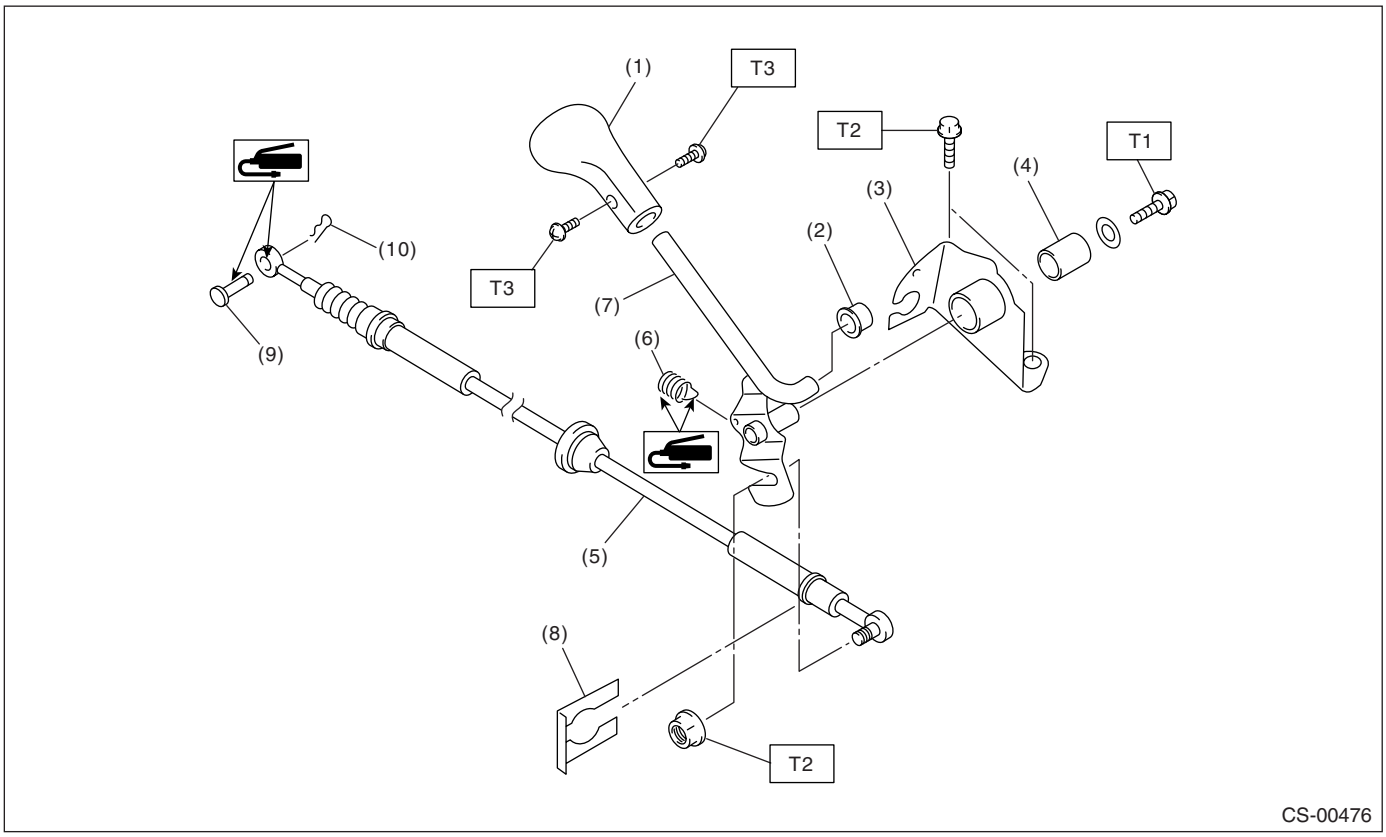
2. MT GEAR SHIFT LEVER



(1) Gear shift knob
(2) Console boot
(3) Plate COMPL
(4) Lever COMPL
(5) Bushing
(6) Stay bushing
(7) Lock wire
(8) Boot
(9) Snap ring
(10) O-ring
(11) Bushing A
(12) Spring pin
(13) Cushion rubber
(14) Bushing B
(15) Joint
(16) Rod COMPL
(17) Bracket
(18) Washer
(19) Stay COMPL
(20) Spacer
(21) Boot & insulator ASSY
(22) Front cover
(23) Clamp
(24) Spacer
(25) Boss
(26) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 12 (1.2, 9.0)
T3: 18 (1.8, 13)

3. DRIVE SELECT LEVER



(1) Knob
(2) Cushion
(3) Plate ASSY
(4) Bushing
(5) Cable
(6) Spring
(7) Lever ASSY
(8) Clip
(9) Clevis pin
(10) Snap pin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.6 (0.16, 1.2)
T2: 18 (1.8, 13)
T3: 2 (0.2, 1.5)

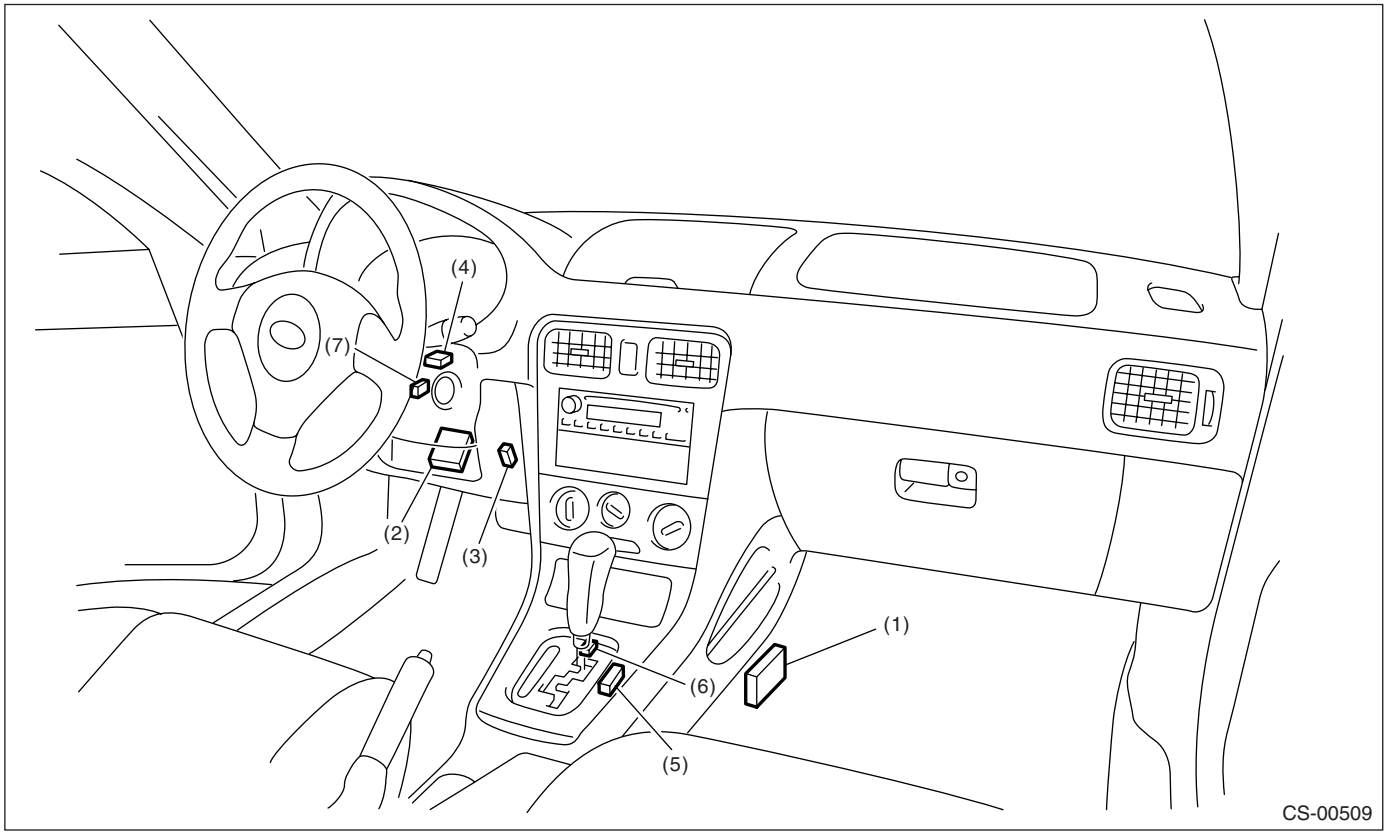
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Use SUBARU genuine fluid, grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Before disconnecting electrical connectors, be sure to disconnect the ground cable from battery.

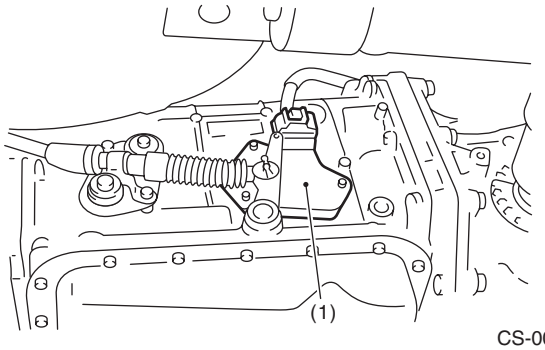
2. Electrical Component Location

A: LOCATION

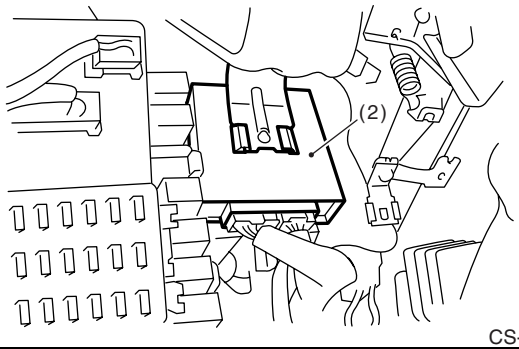
- LHD MODEL



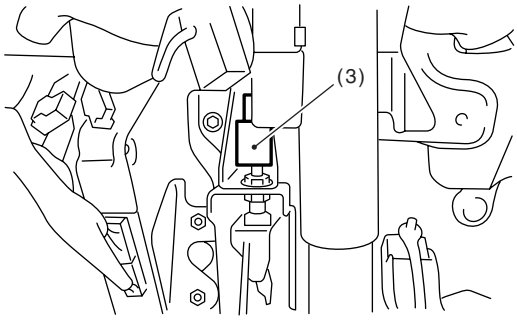
(1) Inhibitor switch
(2) Body integrated unit
(3) Stop light switch
(4) Key warning switch
(5) Shift lock solenoid
(6) “P” range switch
(7) Key lock solenoid



CS-00006



CS-00083



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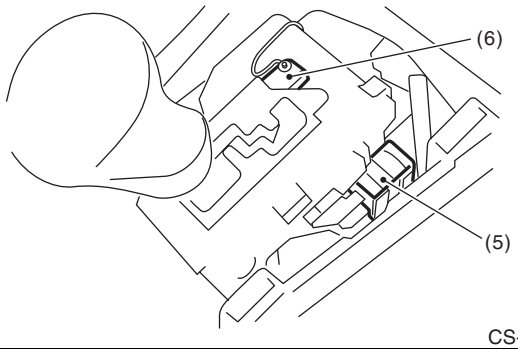

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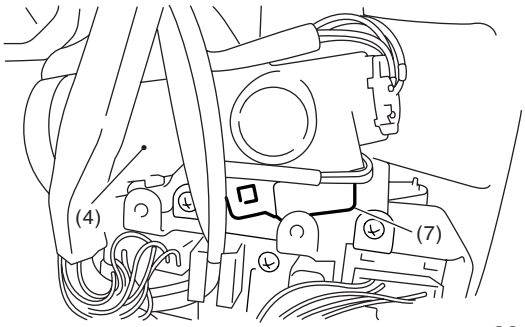
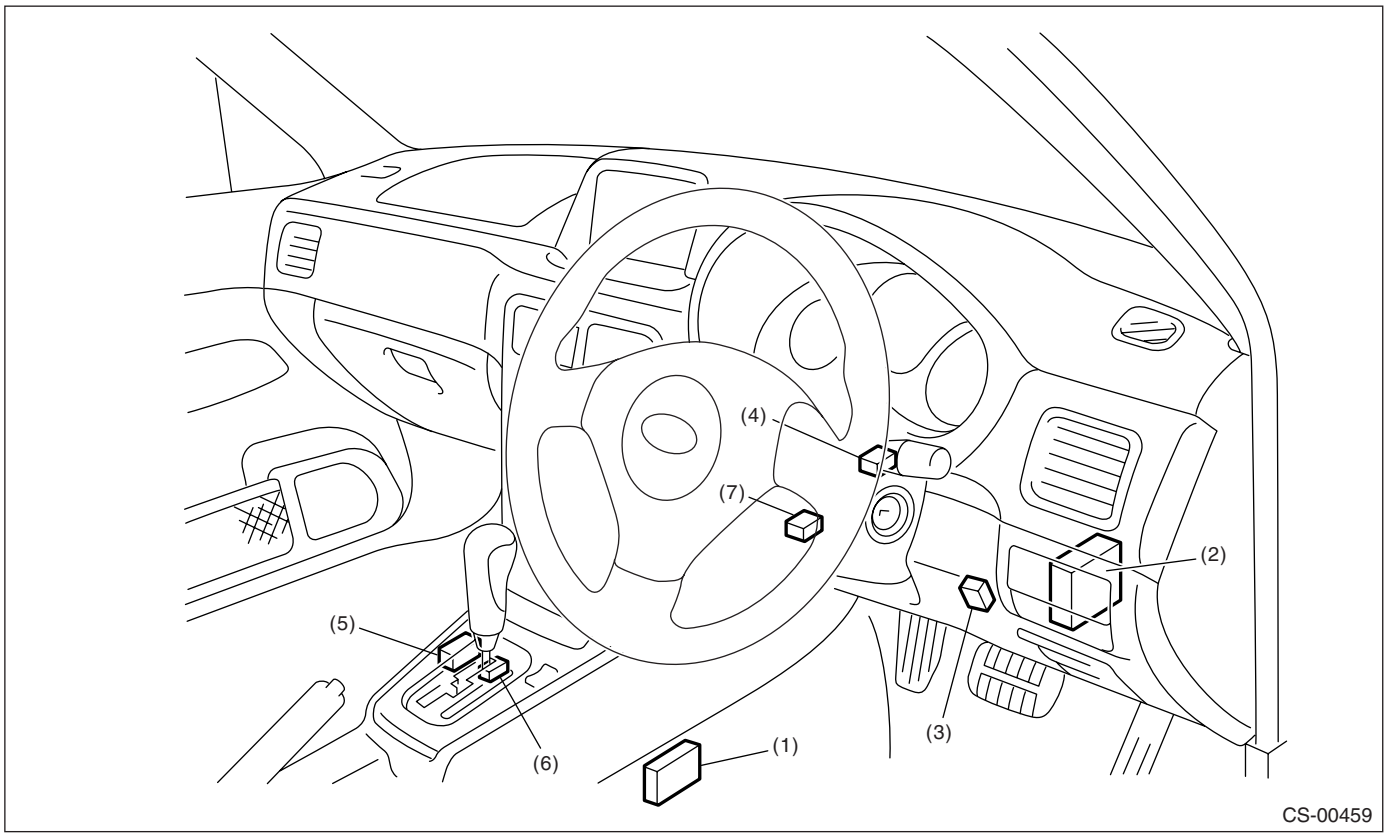


CS-00008

- RHD MODEL



(1) Inhibitor switch
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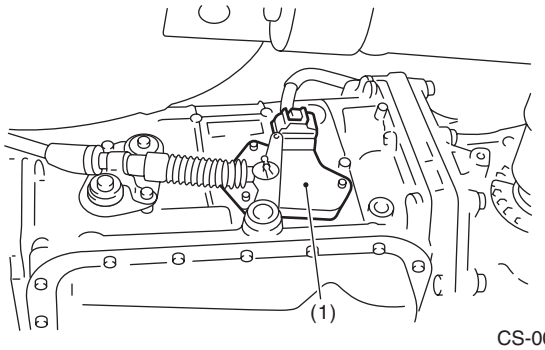
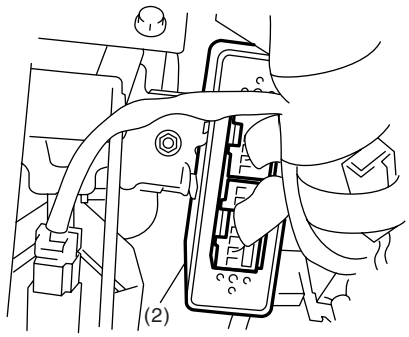
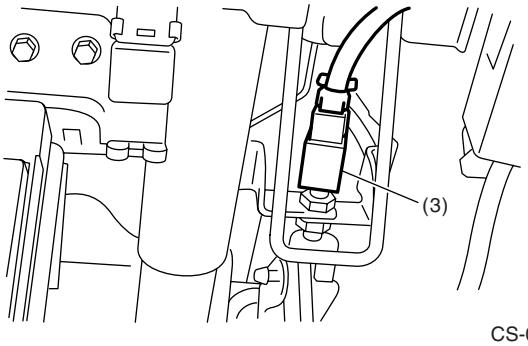
(6) “P” range switch
(7) Key lock solenoid



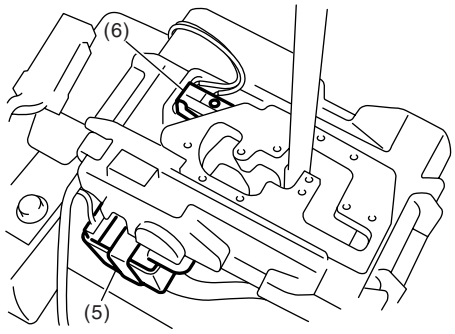
CS-00006



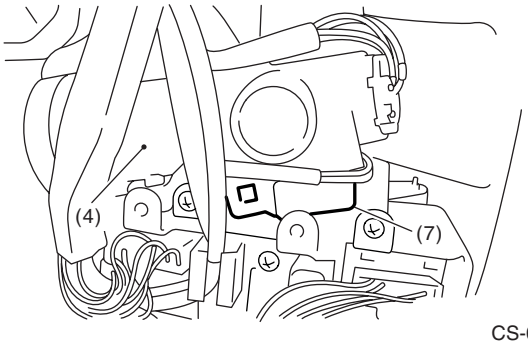
CS-00009



CS-00007



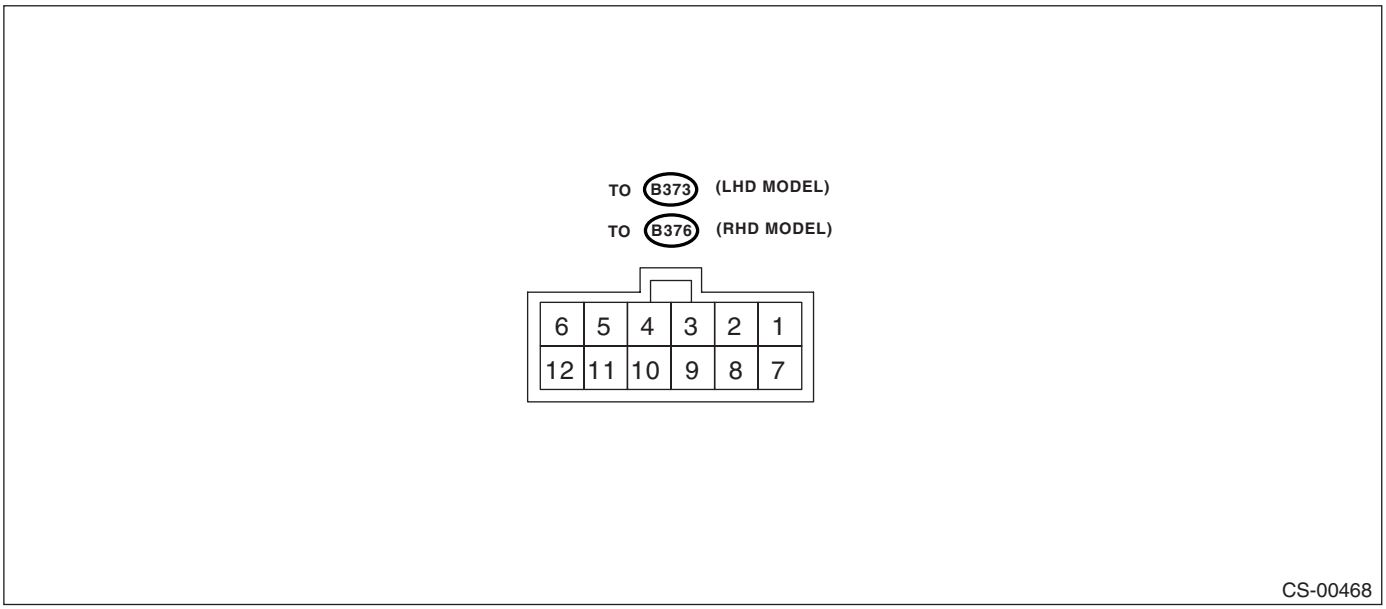
CS-00477



CS-00008

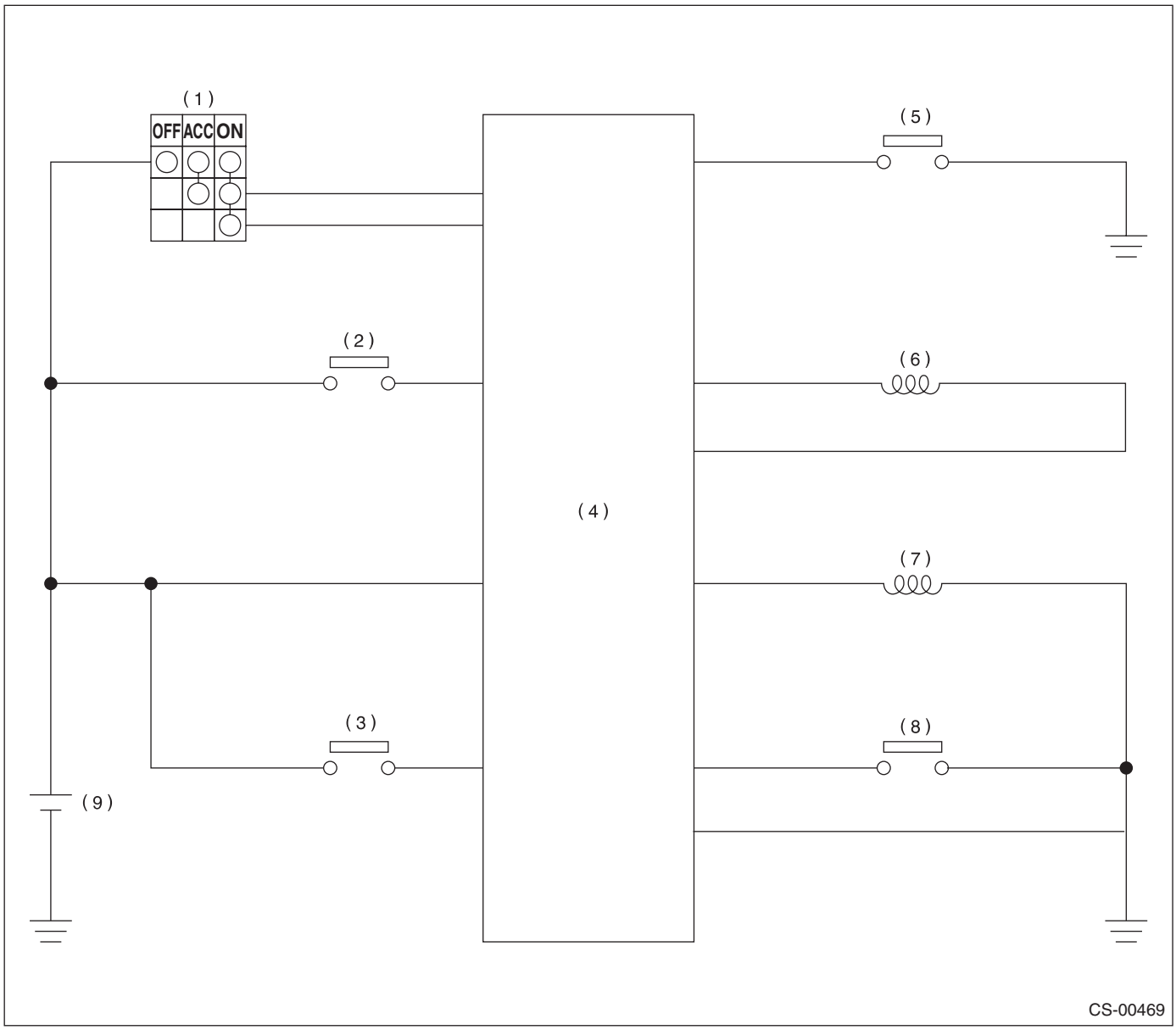
3. AT Shift Lock Control System

A: ELECTRICAL SPECIFICATION



Contents	To Connector No.	Terminal No.	Input/Output signal
			Measured value and measuring conditions
Battery power supply	LHD MODEL B373 RHD MODEL B376	3	9 — 16 V
Ignition power supply		1	10 — 15 V when ignition switch is at ON or START.
Ignition power supply		7	10 — 15 V when ignition switch is at ACC or ON.
Inhibitor Switch (“P” range)		2	0 V when select lever is in “P” range. 9 — 16 V when select lever is in other ranges than “P” range.
Stop light switch		4	9 — 16 V when stop light switch is ON. 0 V when stop light switch is OFF.
“P” range switch		5	0 V when select lever is in “P” range. 9 — 16 V when select lever is in other ranges than “P” range.
Shift lock solenoid signal		6	8.5 — 16 V when shift lock is released. 0 V when shift lock is operating.
Key warning switch signal		8	9 — 16 V when key is inserted. 0 V when key is removed.
Key lock solenoid signal		9	Pulse is output when switching key lock between locked and unlocked. 0 V at other conditions than above.
Ground		10	—

B: WIRING DIAGRAM



(1) Ignition switch
(2) Stop light switch
(3) Key warning switch
(4) Body integrated unit
(5) Inhibitor switch
(6) Key lock solenoid
(7) Shift lock solenoid
(8) “P” range switch
(9) Battery

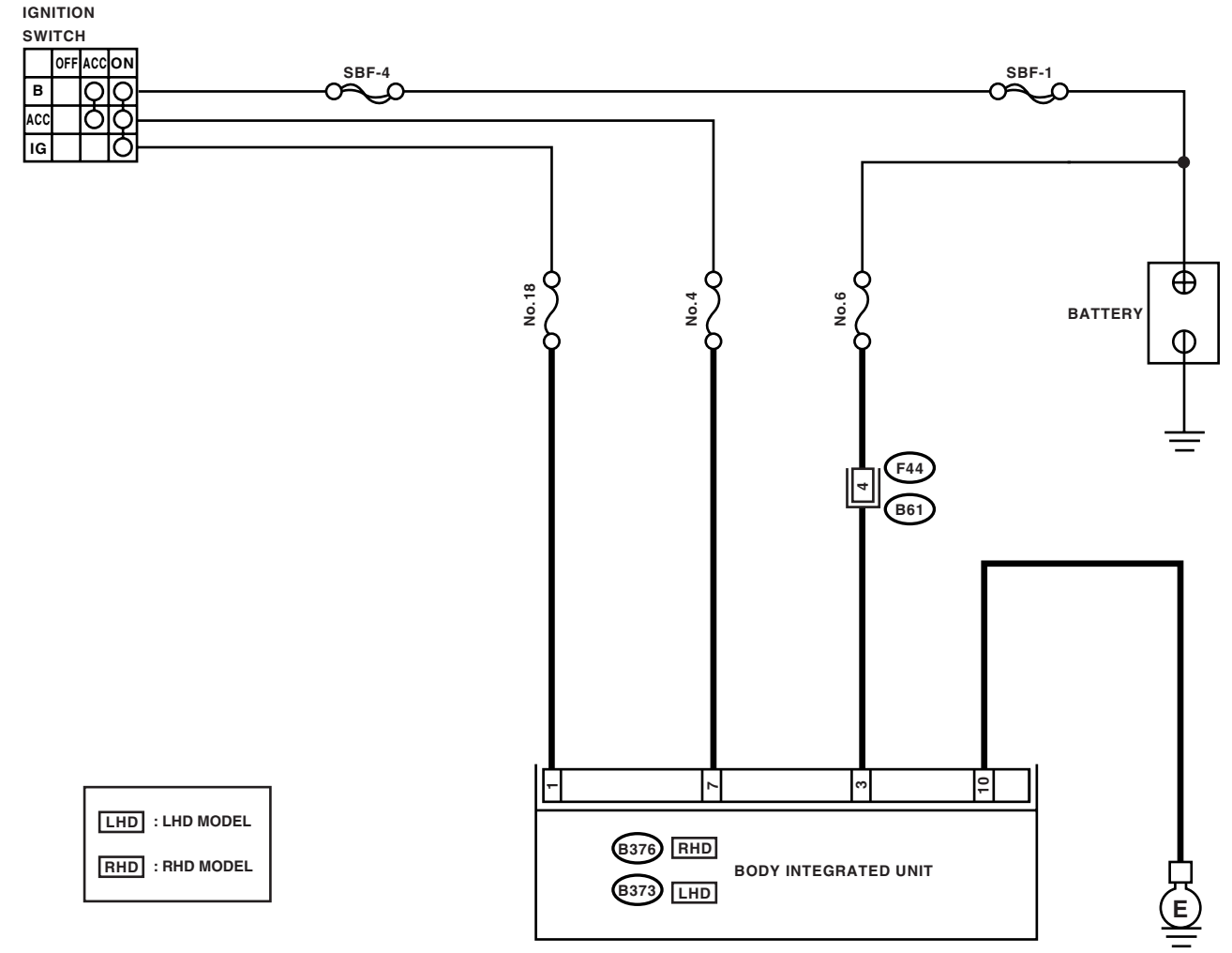
C: INSPECTION

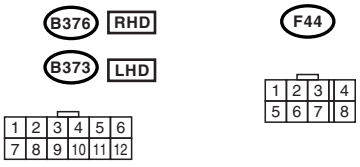
1. SHIFT LOCK OPERATION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK.** 1) Turn the ignition switch ON. 2) Move the select lever to “P” range.	While the brake pedal is not depressed, can select lever move from “P” range to other ranges?	Inspect “SELECT LEVER SHIFT LOCK CANNOT BE RELEASED”. <Ref. to CS-20, SELECT LEVER SHIFT LOCK CANNOT BE RELEASED, INSPECTION, AT Shift Lock Control System.>	Go to step **2.**
2	**CHECK SHIFT LOCK.**	While the brake pedal is depressed, can select lever move from “P” range to other ranges?	Go to step **3.**	Inspect “SELECT LEVER CANNOT BE SHIFT LOCKED”. <Ref. to CS-17, SELECT LEVER CANNOT BE SHIFT LOCKED, INSPECTION, AT Shift Lock Control System.>
3	**CHECK KEY INTERLOCK.**	When the select lever is in other than “P” range, does ignition switch turn to “LOCK” position?	Inspect “KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-24, KEY INTERLOCK DOES NOT LOCK OR RELEASE, INSPECTION, AT Shift Lock Control System.>	Go to step **4.**
4	**CHECK KEY INTERLOCK.**	When the select lever is in “P” range, does ignition switch turn to “LOCK” position?	AT shift lock control system is normal.	Inspect “KEY INTERLOCK DOES NOT BE LOCKED OR RELEASED. <Ref. to CS-24, KEY INTERLOCK DOES NOT LOCK OR RELEASE, INSPECTION, AT Shift Lock Control System.>

2. BODY INTEGRATED UNIT POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:



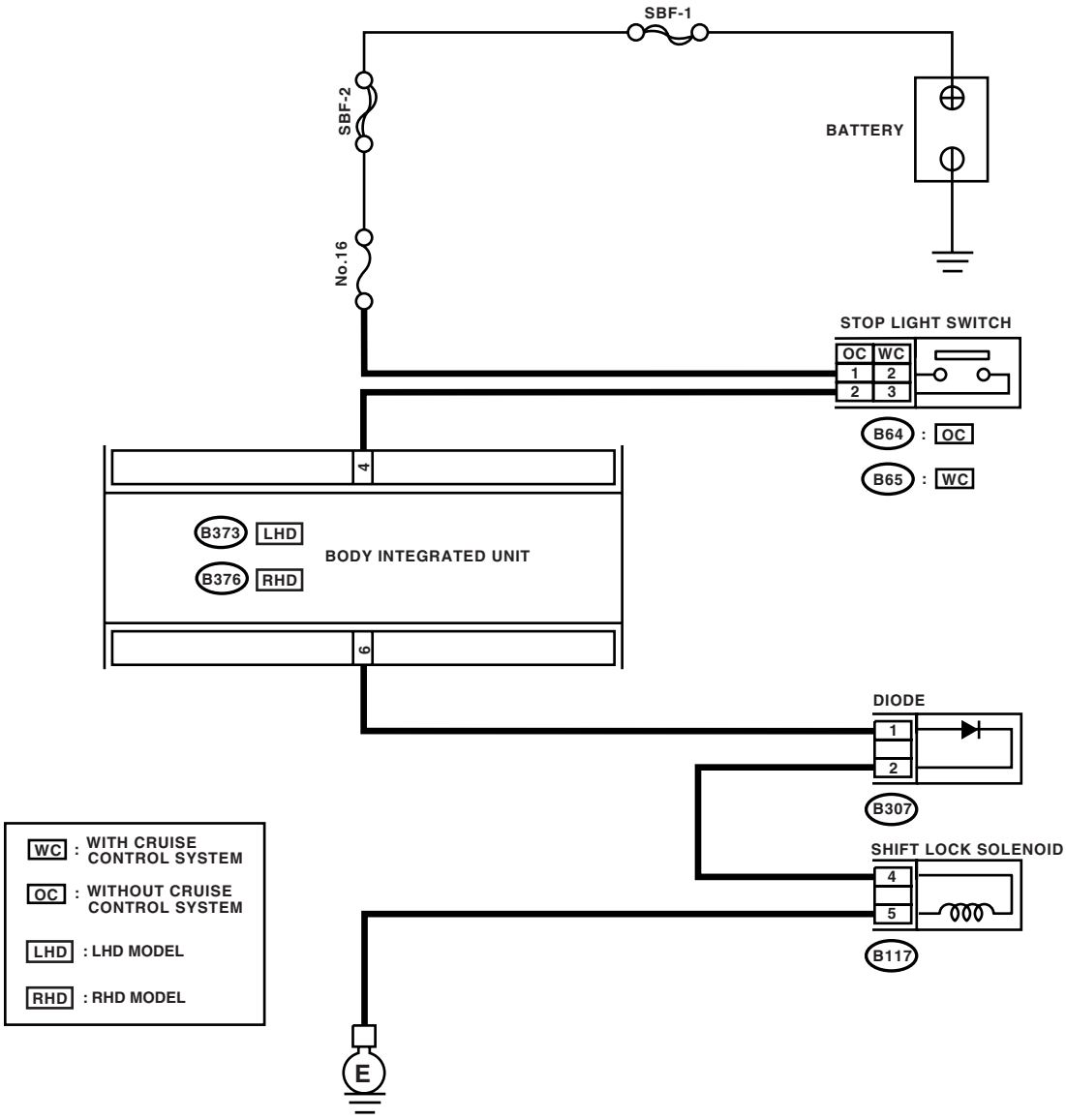


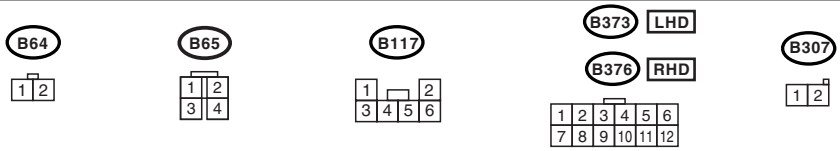
CS-00470

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove the fuse (No. 4, 6 and 18).	Is the fuse (No. 4, 6 and 18) blown out?	Replace the fuse (No. 4, 6 and 18). If the replaced fuse (No. 4, 6 and 18) has blown out easily, repair short circuit in harness between fuse and body integrated unit.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND BODY GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 10 — Chassis ground:*** ***RHD MODEL*** ***(B376) No. 10 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between body integrated unit and body ground.
3	**CHECK BATTERY POWER SUPPLY.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltages between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 3 (+) — Chassis ground (−):*** ***RHD MODEL*** ***(B376) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **4.**	Repair the open circuit harness between battery and body integrated unit, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ACC. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 7 (+) — Chassis ground (−):*** ***RHD MODEL*** ***(B376) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **5.**	Repair the open circuit harness between battery and body integrated unit, and poor contact in coupling connector.
5	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 1 (+) — Chassis ground (−):*** ***RHD MODEL*** ***(B376) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **6.**	Repair the open circuit harness between battery and body integrated unit, and poor contact in coupling connector.
6	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

3. SELECT LEVER CANNOT BE SHIFT LOCKED

WIRING DIAGRAM:





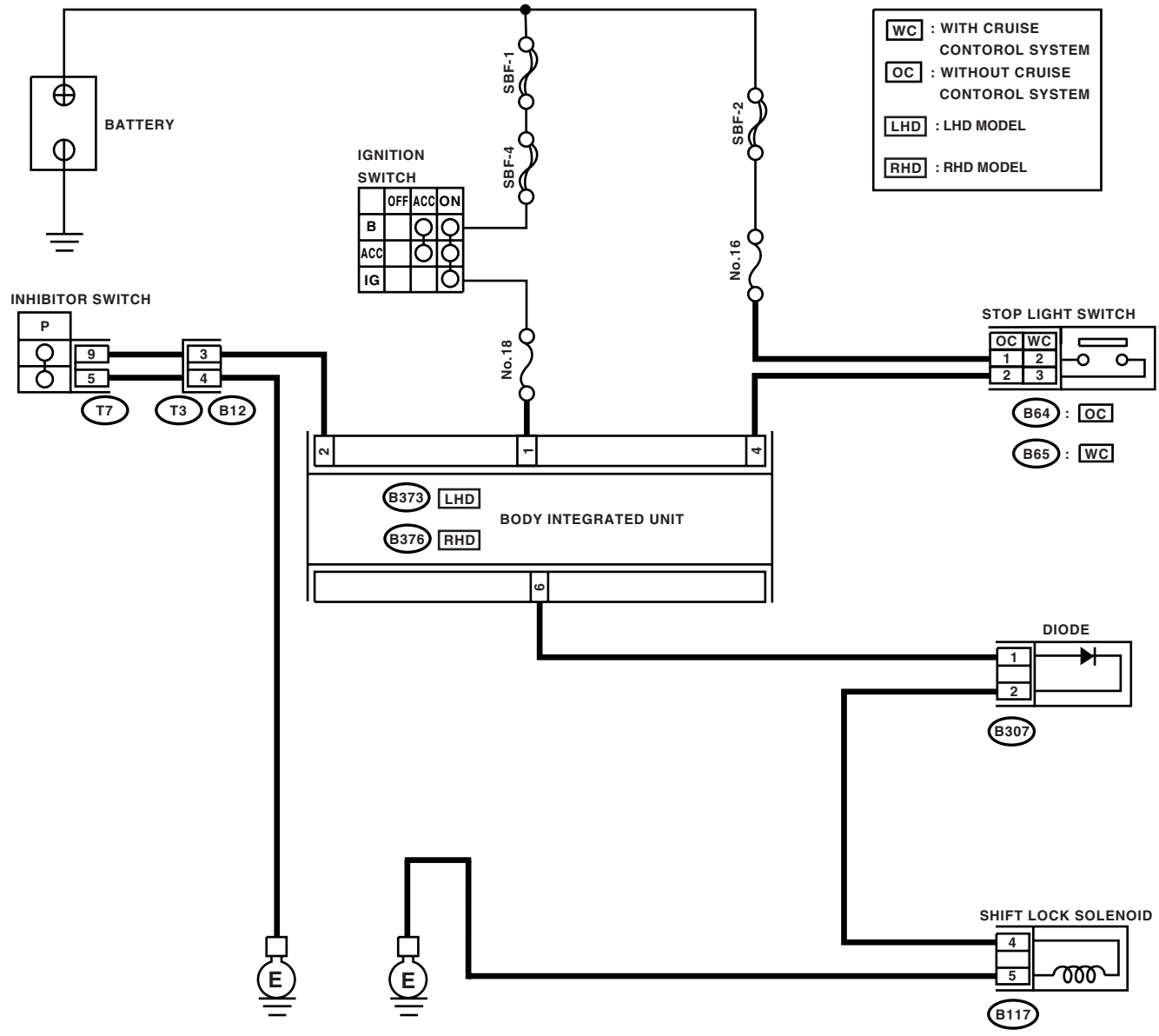
CS-00472

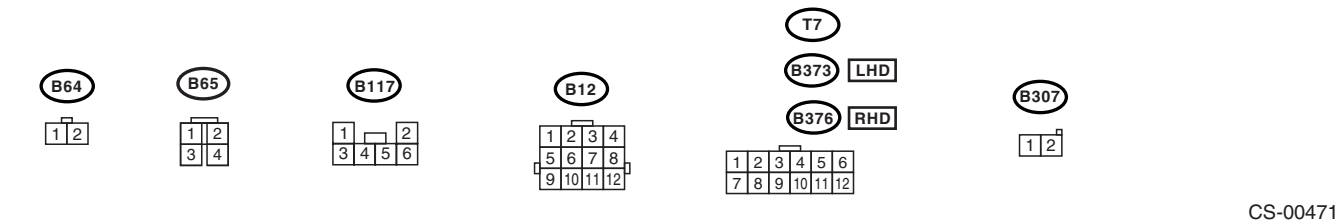
	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn on?	Go to step **2.**	Inspect the stop light system.
2	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the body integrated unit and stoplight switch connector. 3) Measure the resistance of harness between stop light switch and body integrated unit. ***Connector & terminal*** ***Without cruise control system*** ***LHD MODEL*** ***(B64) No. 2 — (B373) No. 4*** ***RHD MODEL*** ***(B64) No. 2 — (B376) No. 4*** ***With cruise control system*** ***LHD MODEL*** ***(B65) No. 3 — (B373) No. 4*** ***RHD MODEL*** ***(B65) No. 3 — (B376) No. 4***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and stop light switch.	Go to step **3.**
3	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED UNIT.** Measure the resistance of harness between stop light switch and chassis ground. ***Connector & terminal*** ***Without cruise control system*** ***(B64) No. 2 — Chassis ground:*** ***With cruise control system*** ***(B65) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the short circuit in harness between body integrated unit and stop light switch.	Go to step **4.**
4	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** 1) Disconnect the shift lock solenoid connector. 2) Measure the resistance of harness between body integrated unit and shift lock solenoid. ***Connector & terminal*** ***LHD MODEL*** ***(B117) No. 4 — (B373) No. 6*** ***RHD MODEL*** ***(B117) No. 4 — (B376) No. 6***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and shift lock solenoid.	Go to step **5.**
5	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B117) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the short circuit in harness between body integrated unit and shift lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B117) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between shift lock solenoid and body ground.	Go to step **7.**

Step		Check	Yes	No
7	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5:***	Is the resistance 20 — 40 Ω?	Go to step **8.**	Replace the shift lock solenoid.
8	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (–):***	Does the shift lock solenoid operate properly?	Go to step **9.**	Replace the shift lock solenoid.
9	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

4. SELECT LEVER SHIFT LOCK CANNOT BE RELEASED

WIRING DIAGRAM:





CS-00471

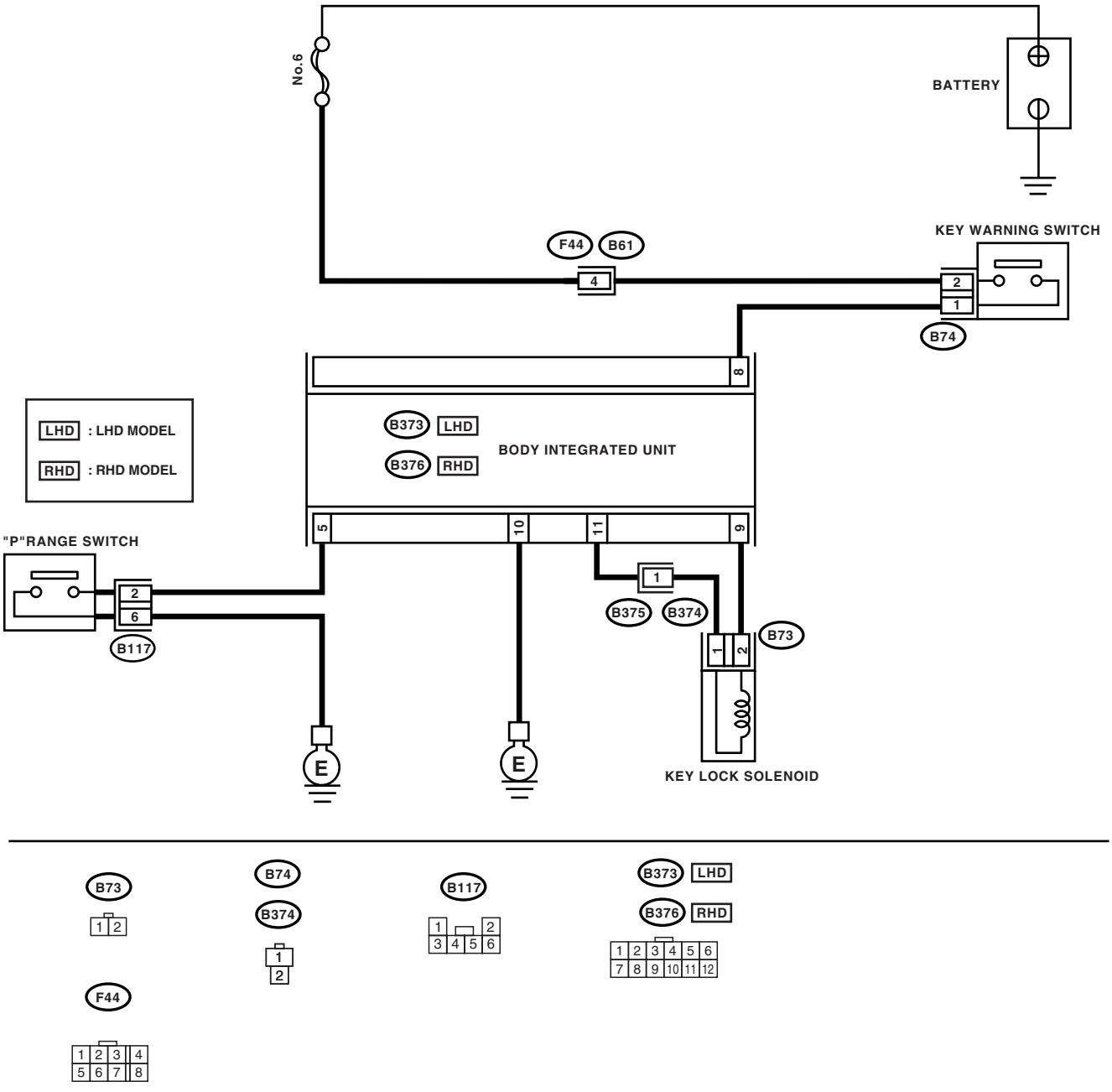
	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH.** 1) Turn the ignition switch to ON (engine OFF). 2) Move the select lever from “P” to “1” range.	Are combination meter indicator light and select lever “P”, “R”, “N”, “3”, “2” and “1” correctly matched?	Go to step **2.**	Adjust the inhibitor switch and select cable.
2	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 1 (+) — Chassis ground (−):*** ***RHD MODEL*** ***(B376) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **3.**	Repair the open circuit harness between battery and body integrated unit, and poor contact in coupling connector.
3	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND BODY INTEGRATED UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of transmission harness and body integrated unit. 3) Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 2 — Chassis ground:*** ***RHD MODEL*** ***(B376) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the short circuit in harness between body integrated unit and transmission connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND BODY INTEGRATED UNIT.** Measure the resistance of harness between body integrated unit and inhibitor switch. ***Connector & terminal*** ***LHD MODEL*** ***(B12) No. 3 — (B373) No. 2:*** ***RHD MODEL*** ***(B12) No. 3 — (B376) No. 2:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and transmission connector	Go to step **5.**
5	**CHECK HARNESS BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***(B12) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between body integrated unit and chassis ground.
6	**CHECK INHIBITOR SWITCH.** 1) Move the select lever to “P” range. 2) Measure the resistance of transmission harness connector terminals. ***Connector & terminal*** ***(T3) No. 3 — No. 4:***	Is the resistance more than 1 MΩ?	Repair or replace the inhibitor switch.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FOR BODY INTEGRATED UNIT.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 2 (+) — Chassis ground (–):*** ***RHD MODEL*** ***(B376) No. 2 (+) — Chassis ground (–):***	Is the voltage 9 — 16 V?	Go to step **8.**	Go to step **16.**
8	**CHECK STOP LIGHT SWITCH.** Depress the brake pedal.	Does the stop light turn on?	Go to step **9.**	Inspect the stop light system.
9	**CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND AT SHIFT LOCK CONTROL MODULE.** 1) Depress the brake pedal. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 4 (+) — Chassis ground (–):*** ***RHD MODEL*** ***(B376) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **10.**	Repair the open or short circuit in harness between body integrated unit and stop light switch.
10	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from shift lock solenoid and body integrated unit. 3) Measure the resistance of harness between body integrated unit and shift lock solenoid. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 6 — (B117) No. 4:*** ***RHD MODEL*** ***(B376) No. 6 — (B117) No. 4:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and shift lock solenoid.	Go to step **11.**
11	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 6 — Chassis ground:*** ***RHD MODEL*** ***(B376) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **12.**	Repair the short circuit in harness between body integrated unit and shift lock solenoid.
12	**CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B117) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between shift lock solenoid and chassis ground.

	Step	Check	Yes	No
13	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5:***	Is the resistance 20 — 40 Ω?	Go to step **14.**	Replace the shift lock solenoid.
14	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal and operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (–):***	Is the shift lock solenoid operating properly?	Go to step **15.**	Replace the shift lock solenoid.
15	**CHECK OUTPUT SIGNAL FOR AT SHIFT LOCK CONTROL MODULE.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 6 (+) — Chassis ground (–):*** ***RHD MODEL*** ***(B376) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 8.5 V?	Go to step **16.**	Replace the body integrated unit.
16	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

5. KEY INTERLOCK DOES NOT LOCK OR RELEASE

WIRING DIAGRAM:



CS-00473

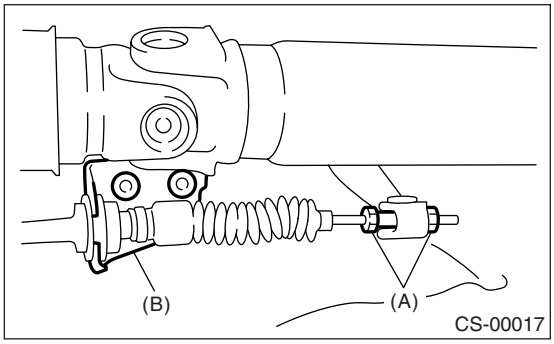
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH.** 1) Disconnect the connector key warning switch. 2) Measure the voltage of harness between key warning switch and chassis ground. ***Connector & terminal*** ***(B74) No. 2 (+) — Chassis ground (–):***	Is the voltage 9 — 16 V?	Go to step **2.**	Repair the open or short circuit in harness between battery and key warning switch.
2	**CHECK KEY WARNING SWITCH.** Measure the resistance of key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Replace the key warning switch.	Go to step **3.**
3	**CHECK KEY WARNING SWITCH.** 1) Remove the key. 2) Measure the resistance of key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the key warning switch.
4	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND KEY WARNING SWITCH.** 1) Disconnect the body integrated unit connector. 2) Measure the voltage of harness body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 8 (+) — Chassis ground (–):*** ***RHD MODEL*** ***(B376) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **5.**	Repair the open circuit in harness between body integrated unit and key warning switch.
5	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID.** 1) Disconnect the connector of key lock solenoid. 2) Measure the resistance of harness between body integrated unit and key lock solenoid. ***Connector & terminal*** ***LHD MODEL*** ***(B73) No. 2 — (B373) No. 9:*** ***RHD MODEL*** ***(B73) No. 2 — (B376) No. 9:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and key lock solenoid.	Go to step **6.**
6	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID.** Measure the resistance of harness between body integrated unit and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 9 — Chassis ground:*** ***RHD MODEL*** ***(B376) No. 9 — Chassis ground:***	Is the resistance more than 1 Ω?	Go to step **7.**	Repair the short circuit in harness between body integrated unit and key lock solenoid.
7	**CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between key lock solenoid and chassis ground. ***Connector & terminal*** ***(B73) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **8.**	Repair the open circuit in harness between key lock solenoid and chassis ground.

	Step	Check	Yes	No
8	**CHECK KEY LOCK SOLENOID.** Measure the resistance of key lock solenoid connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 4 — 8 Ω?	Go to step **9.**	Replace the key lock solenoid.
9	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" range switch and chassis ground. ***Connector & terminal*** ***(B117) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the short circuit in harness between "P" range switch and body integrated unit.
10	**CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND "P" RANGE SWITCH.** 1) Disconnect the connector from "P" range switch. 2) Measure the resistance of harness between body integrated unit and "P" range switch. ***Connector & terminal*** ***LHD MODEL*** ***(B117) No. 2 — (B373) No. 5:*** ***RHD MODEL*** ***(B117) No. 2 — (B376) No. 5:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between body integrated unit and "P" range switch.	Go to step **11.**
11	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness "P" range switch and chassis ground. ***Connector & terminal*** ***(B117) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the open circuit in harness between "P" range switch and chassis ground.	Go to step **12.**
12	**CHECK "P" RANGE SWITCH.** 1) Move the select lever to "P" range. 2) Measure resistance between "P" range switch connector terminals. ***Terminal*** ***No. 2 — No. 6:***	Is the resistance less than 1 Ω?	Go to step **13.**	Replace the "P" range switch.
13	**CHECK "P" RANGE SWITCH.** 1) Move the select lever to other than "P" range. 2) Measure resistance between "P" range switch connector terminals. ***Terminal*** ***No. 2 — No. 6:***	Is the resistance more than 1 MΩ?	Go to step **14.**	Replace the "P" range switch.
14	**CHECK OUTPUT SIGNAL FOR BODY INTEGRATED UNIT.** 1) Disconnect all connectors. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to "P" range. 4) Press the brake pedal. 5) Measure the voltage between body integrated unit connector and chassis ground. ***Connector & terminal*** ***LHD MODEL*** ***(B373) No. 9 (+) — Chassis ground (−):*** ***RHD MODEL*** ***(B376) No. 9 (+) — Chassis ground (−):***	Is the voltage 7.5 — 16 V?	Go to step **15.**	Replace the body integrated unit.
15	**CHECK POOR CONTACT.**	Is there poor contact in connector?	Repair the poor contact.	Replace the body integrated unit.

4. Select Lever

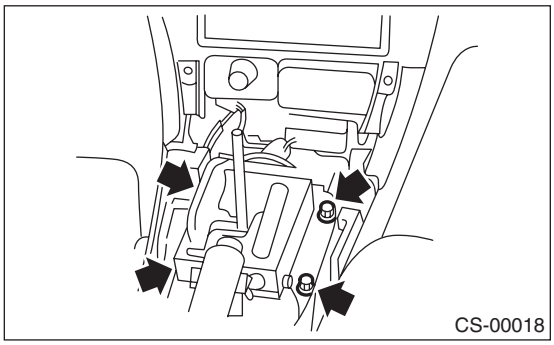
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever to “N” range.
4) Lift-up the vehicle.
5) Remove the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL, REAR EXHAUST PIPE.> <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL, REAR EXHAUST PIPE.> <Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
6) Remove the heat shield cover. (If equipped)
7) Disconnect the cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

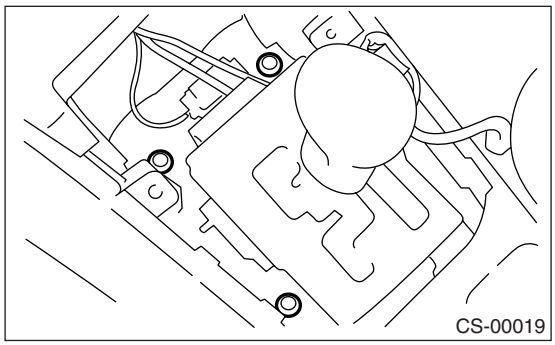
8) Lower the vehicle.
9) Remove the console box. <Ref. to EI-39, REMOVAL, Console Box.>
10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from body.



B: INSTALLATION

1) Mount the select lever onto the vehicle body.
2) Tighten the four bolts to install the select lever to vehicle body, then connect the connector.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3) Install the console box. <Ref. to EI-37, INSTALLATION, Glove Box.>
4) Set the location of select lever at “N” range.
5) Lift-up the vehicle.
6) Set the location of range select lever to “N” range.
7) Insert the thread portion of the other inner cable and into connector hole of the select lever, and fix the other outer cable end to bracket.

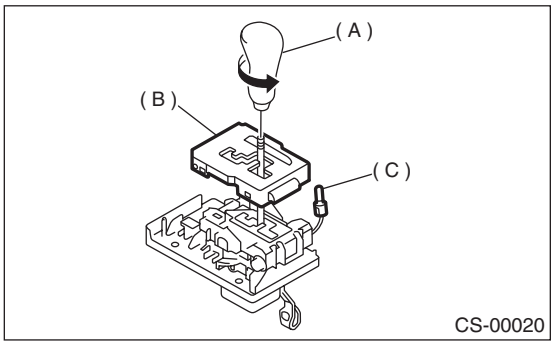
Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

8) Adjust the select cable position. <Ref. to CS-32, ADJUSTMENT, Select Cable.>
9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Install the heat shield cover. (If equipped)
11) Install the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC 2.0)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, INSTALLATION, Muffler.>
12) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-32, ADJUSTMENT, Select Cable.> <Ref. to 4AT-56, ADJUSTMENT, Inhibitor Switch.>
(1) The engine starts operating when select lever is in range “P” or “N”, but not in other ranges.
(2) The back-up light is lit when the select lever is in range “R”, but not in other ranges.
(3) Select lever and indicator ranges are matched.

C: DISASSEMBLY

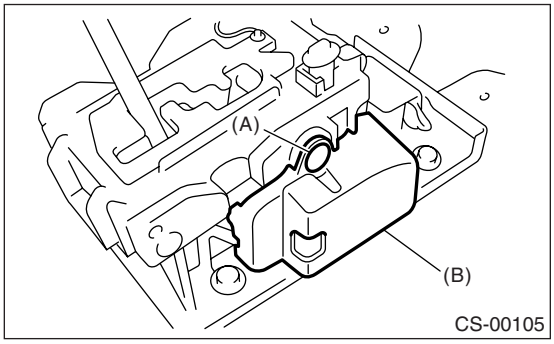
1) Remove the packing.
2) Remove the grip.
3) Remove the indicator light, and then remove the indicator cover.

NOTE:
Be careful not to break the indicator light during removal.



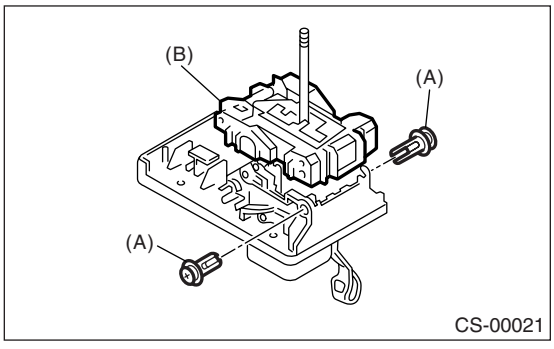
(A) Grip
(B) Indicator cover
(C) Indicator light

4) Remove the blind.
5) Remove the cover.



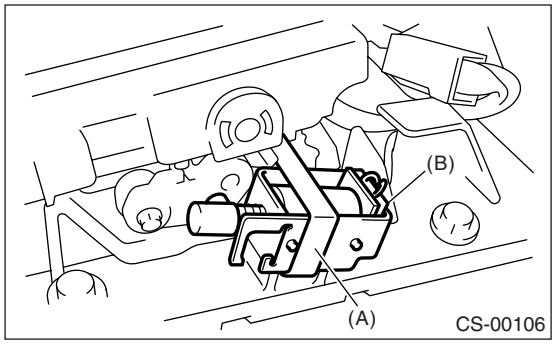
(A) Clip
(B) Cover

6) Remove the clips, and then remove the guide plate.



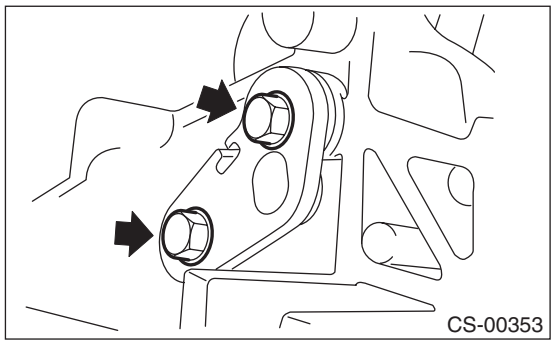
(A) Clips
(B) Guide plate

7) Remove the clamp, and the remove the shift lock solenoid.

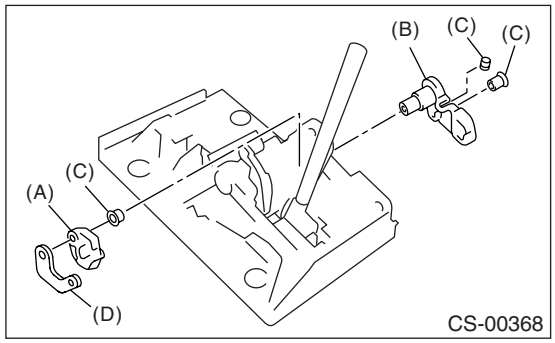


(A) Clamp
(B) Shift lock solenoid

8) Remove the bolt.

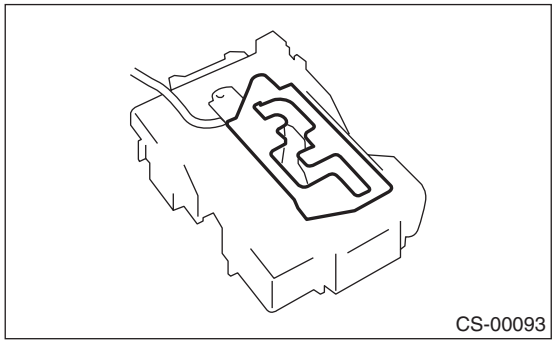


9) Remove the lock plate A, B, C and bushing.

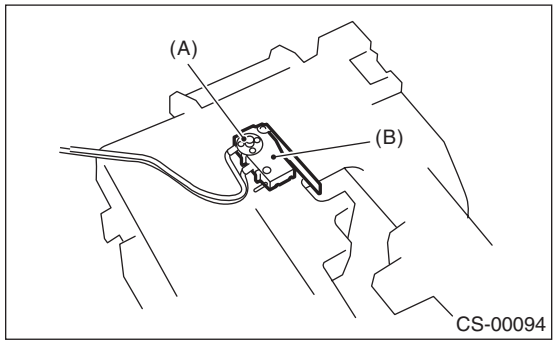


(A) Lock plate A
(B) Lock plate B
(C) Bushing
(D) Lock plate C

10) Remove the cushion plate.

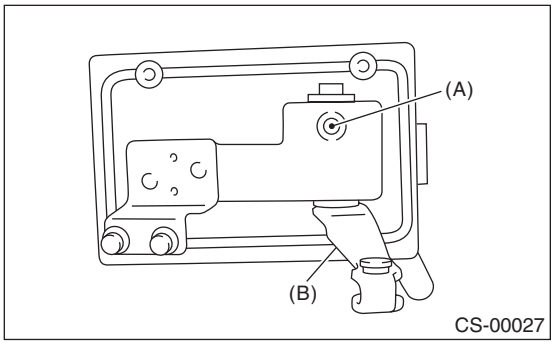


11) Remove the clip, and then remove the “P” range switch.



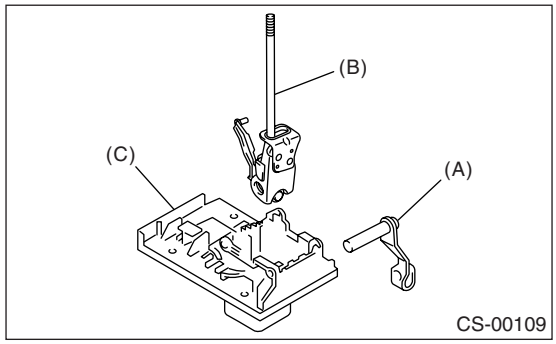
(A) Clip
(B) “P” range switch

12) Remove the grommet, and then extract spring pin.



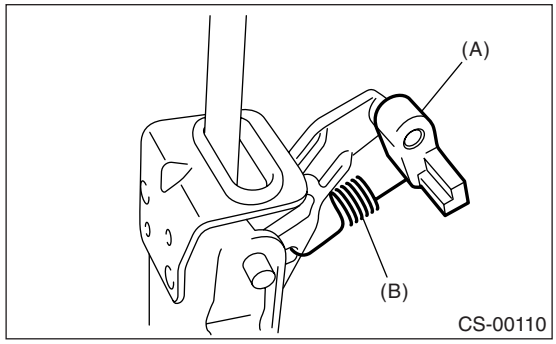
(A) Spring pin
(B) Select lever arm

13) Remove the select lever arm, and then take away the select lever COMPL from plate.



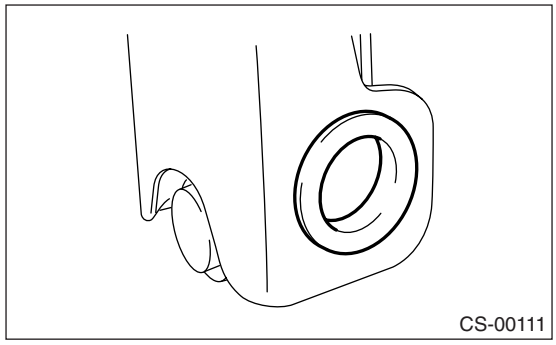
(A) Select lever arm
(B) Select lever COMPL
(C) Plate

14) Remove the detent spring, and then remove the detent arm.

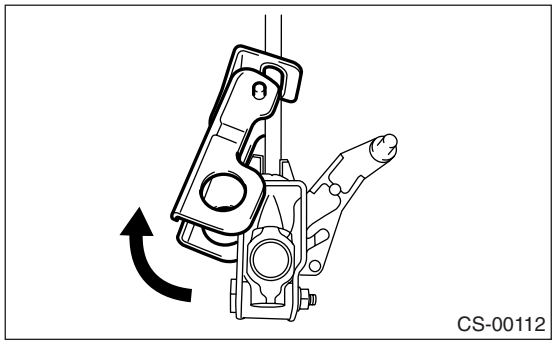


(A) Detent arm
(B) Detent spring

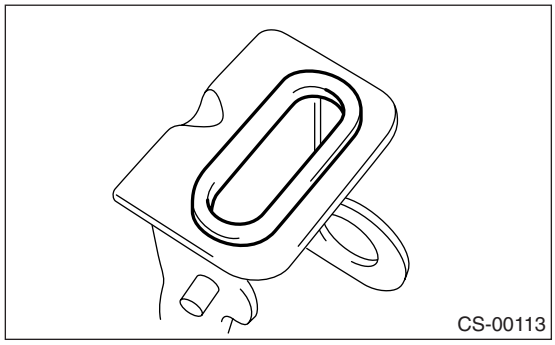
15) Remove the select lever COMPL bushing from bracket.



16) Remove the bracket from select lever COMPL.



17) Remove the bushing from bracket.



D: ASSEMBLY

1) Clean all parts before assembly.
2) Apply grease [SUNLIGHT 2 (Part No. 003602010) or equivalent] to each parts. <Ref. to CS-3, AT SELECT LEVER, COMPONENT, General Description.>

CAUTION:
Apply grease [SUNCALL] to the axle of lock plate.

3) Assembly is in the reverse order of disassembly.
4) After completion of fitting, transfer the select lever to range “P” — “1”, then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

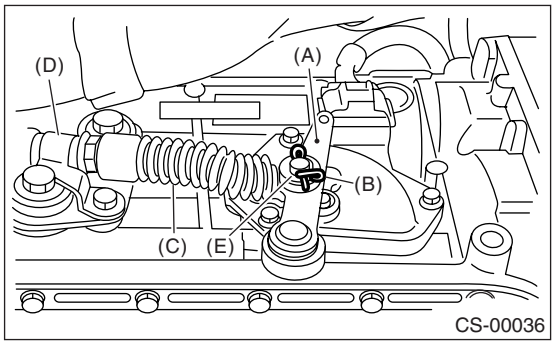
E: INSPECTION

1) Inspect the removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.
2) Confirm the following parts for operating condition before assembly. Moving condition of the select lever COMPL, it should move smoothly.

5. Select Cable

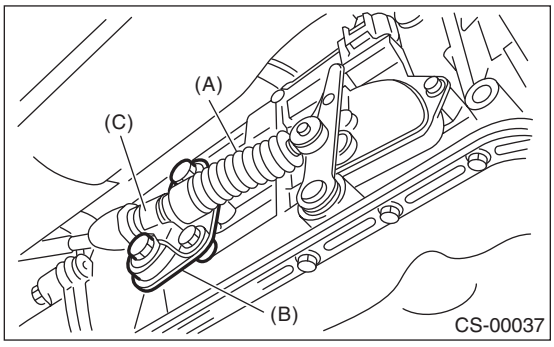
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Prior to removal, set the lever to “N” range.
4) Lift-up the vehicle.
5) Remove the front and center exhaust pipe.
• Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Front Exhaust Pipe.>
• Turbo model
<Ref. to EX(H4DOTC 2.0)-7, REMOVAL, Front Exhaust Pipe.>
6) Remove the heat shield cover. (If equipped)
7) Remove the snap pin from range select lever.



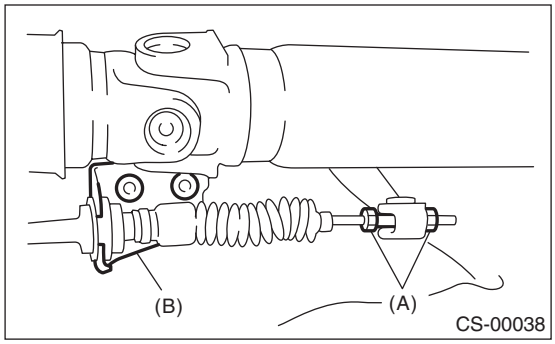
(A) Select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

8) Remove the plate assembly from transmission case.



(A) Select cable
(B) Plate ASSY
(C) Clamp

9) Disconnect the select cable from select lever, and then remove the cable bracket.



(A) Adjusting nuts
(B) Cable bracket

10) Remove the select cable from plate assembly.

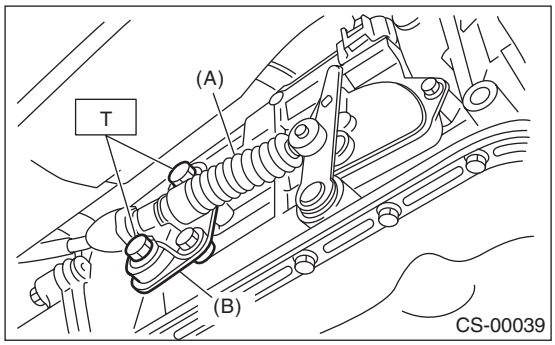
B: INSTALLATION

1) Install the select cable to plate assembly.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

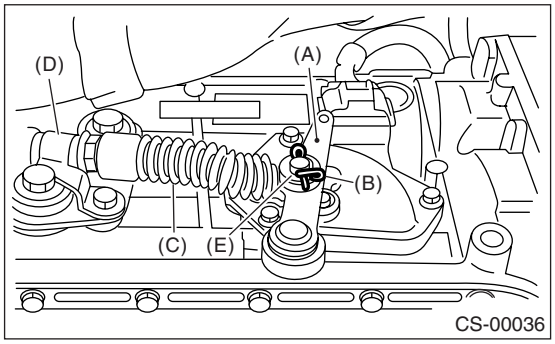
2) Install the select cable to select lever.
3) Install the plate assembly to transmission.

Tightening torque:
T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Select cable
(B) Plate ASSY

4) Install the washer and snap pin to range select lever.



(A) Select lever
(B) Snap pin
(C) Select cable
(D) Clamp
(E) Washer

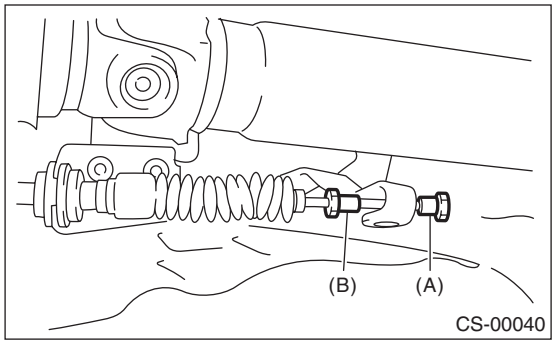
5) Move the select lever to “N” range, then adjust the select cable position. <Ref. to CS-32, ADJUSTMENT, Select Cable.>
6) Install the heat shield cover. (If equipped)
7) Install the front and center exhaust pipe.
• Non-turbo model
<Ref. to EX(H4SO)-8, INSTALLATION, Front Exhaust Pipe.>
• Turbo model
<Ref. to EX(H4DOTC 2.0)-7, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.
5) Move the select lever from “P” range to “1” range. You should be able to feel the detentes in each range. If the detentes cannot be felt or the range pointer is improperly aligned, adjust the cable.

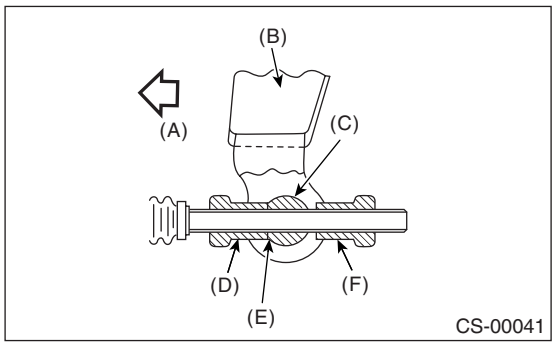
D: ADJUSTMENT

1) Set the vehicle on a lift.
2) Set the select lever to “N” range.
3) Lift-up the vehicle.
4) Remove the rear exhaust pipe and muffler.
5) Remove the heat shield cover. (If equipped)
6) Loosen the adjusting nut on each side.



(A) Adjusting nut A
(B) Adjusting nut B

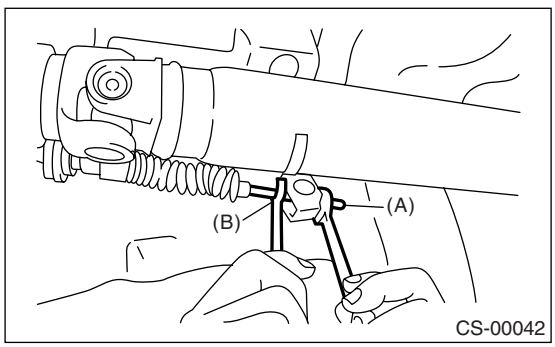
7) Turn the adjusting nut B until it lightly touches the connector.



(A) Front side
(B) Select lever
(C) Connector
(D) Adjusting nut B
(E) Contact point
(F) Adjusting nut A

8) While preventing the adjusting nut B from moving with a wrench, tighten the adjusting nut A.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



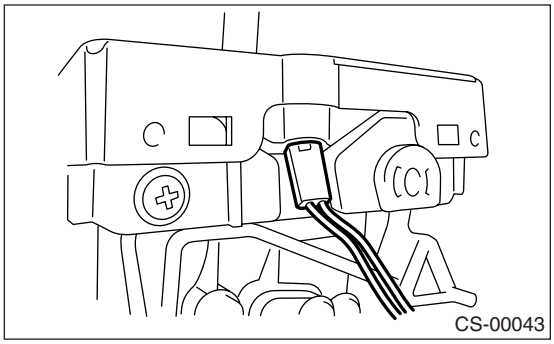
(A) Adjusting nut A
(B) Adjusting nut B

9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
10) Install in the reverse order of removal.

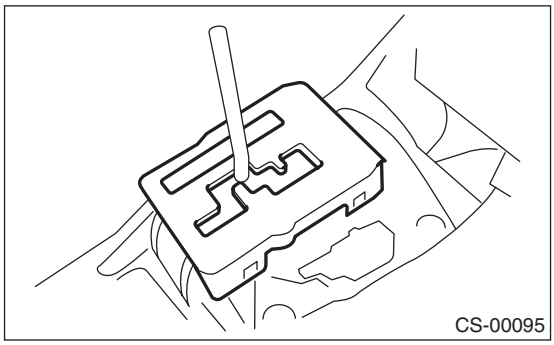
6. AT Shift Lock Solenoid and “P” Range Switch

A: REMOVAL

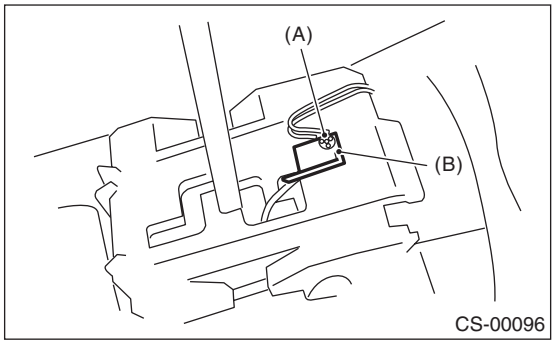
1) Disconnect the ground cable from battery.
2) Remove the console box. <Ref. to EI-39, REMOVAL, Console Box.>
3) Disconnect the connector.
4) Remove the grip.
5) Remove the indicator light from indicator cover.


CS-00043

6) Remove the indicator cover.


CS-00095

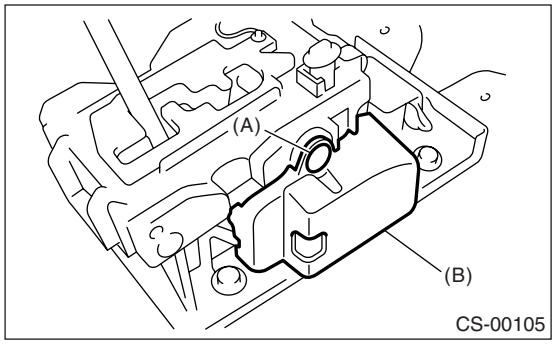
7) Remove the blind.
8) Remove the cushion.
9) Remove the clip, and then remove the “P” range switch.



CS-00096

(A) Clip
(B) “P” range switch

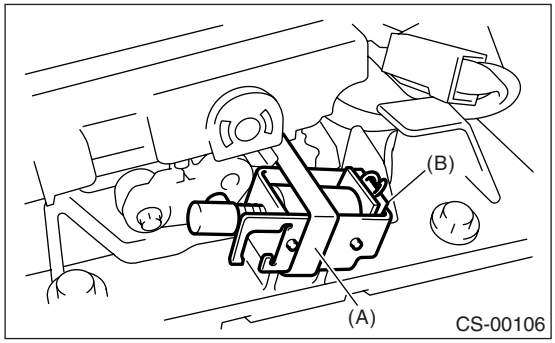
10) Remove the cover.



CS-00105

(A) Clip
(B) Cover

11) Remove the clamp and remove the shift lock solenoid.



CS-00106

(A) Clamp
(B) Shift lock solenoid

B: INSTALLATION

Install in the reverse order of removal.

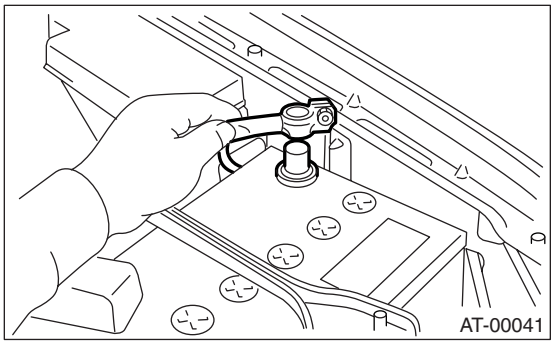
C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance of shift lock solenoid connector terminals. ***Terminal*** ***No. 4 — No. 5***	Is the resistance 20 — 40 Ω?	Go to step **2.**	Replace the shift lock solenoid and “P” range switch assembly.
2	**CHECK SHIFT LOCK SOLENOID.** Connect the battery with shift lock solenoid connector terminal, operate solenoid. ***Terminal*** ***No. 4 (+) — No. 5 (–)***	Is the shift lock solenoid operating properly?	Go to step **3.**	Replace the shift lock solenoid and “P” range switch assembly.
3	**CHECK “P” RANGE SWITCH.** 1) Move the select lever to “P” range. 2) Measure resistance between “P” range switch connector terminals.	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the “P” range switch.
4	**CHECK “P” RANGE SWITCH.** 1) Move the select lever to other than “P” range. 2) Measure resistance between “P” range switch connector terminals.	Is the resistance more than 1 M Ω?	Normal	Replace the “P” range switch.

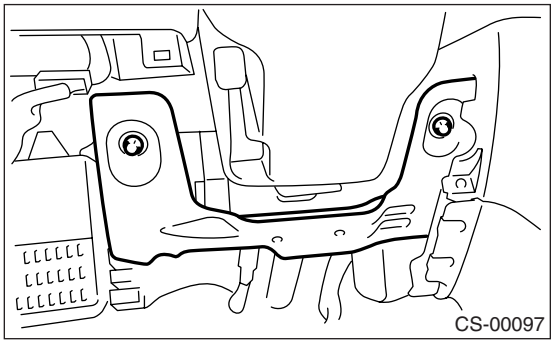
7. Body Integrated Unit

A: REMOVAL

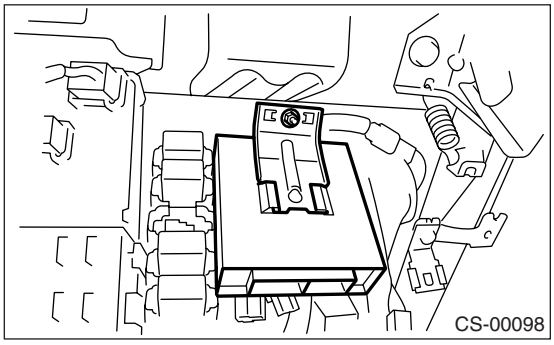
1) Disconnect the ground cable from battery.



2) Remove the lower cover.
3) Remove the knee bolster.



4) Disconnect the connector from body integrated unit.
5) Remove the body integrated unit.



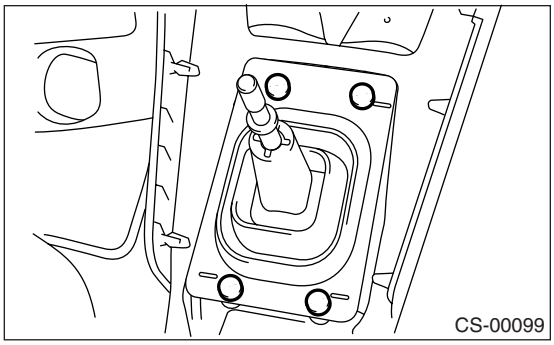
B: INSTALLATION

Install in the reverse order of removal.

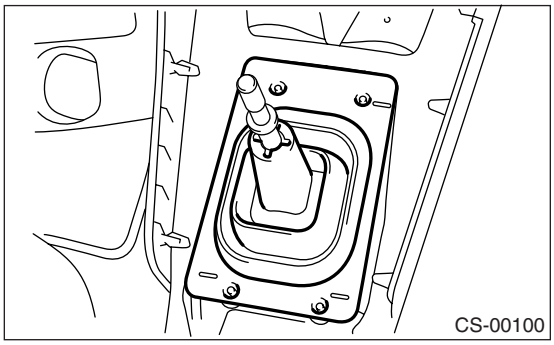
8. MT Gear Shift Lever

A: REMOVAL

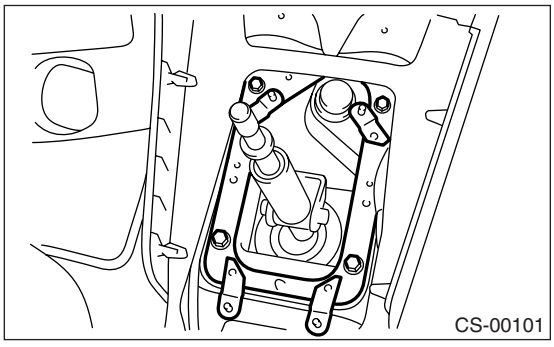
1) Set the vehicle on a lift.
2) Remove the gear shift knob.
3) Disconnect the ground cable from battery.
4) Remove the console box. <Ref. to EI-39, REMOVAL, Console Box.>
5) Remove the clamp.



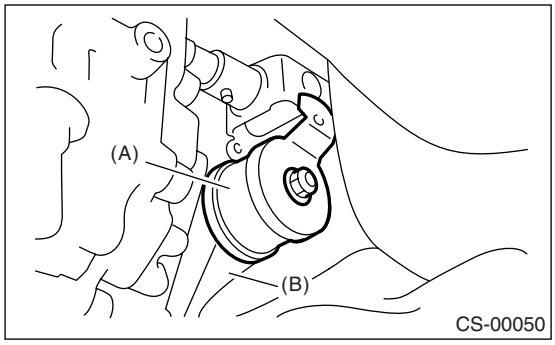
6) Remove the boot and insulator assembly.



7) Remove the plate COMPL from body.

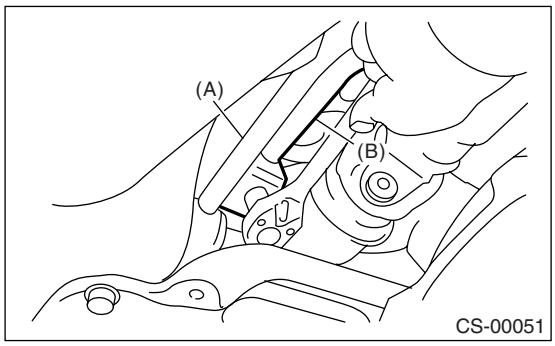


8) Lift-up the vehicle.
9) Remove the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL, REAR EXHAUST PIPE.> <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL, REAR EXHAUST PIPE.> <Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
10) Remove the heat shield cover. (If equipped)
11) Remove the stay from transmission bracket.



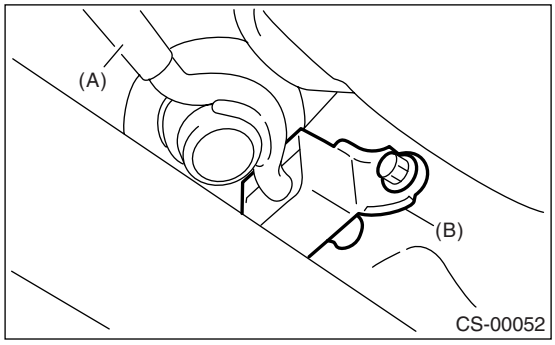
(A) Stay
(B) Transmission bracket

12) Remove the rod from joint.



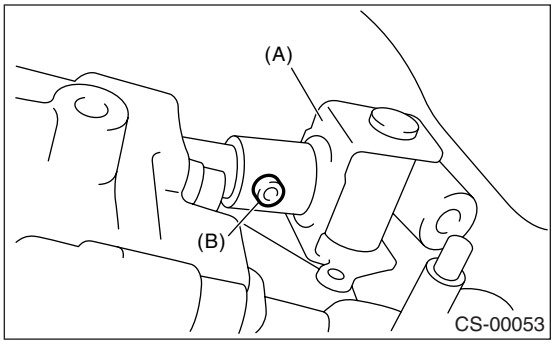
(A) Stay
(B) Rod

13) Remove the cushion rubber from body.



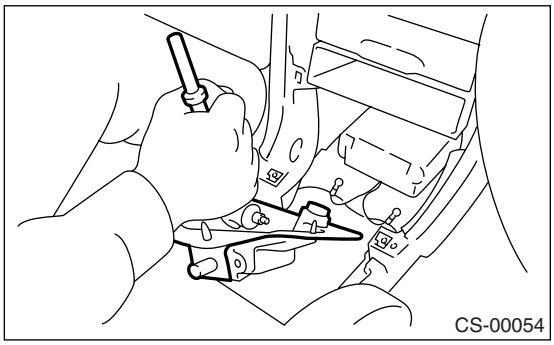
(A) Stay
(B) Cushion rubber

14) Remove the spring pin, and then extract the joint.



(A) Joint
(B) Spring pin

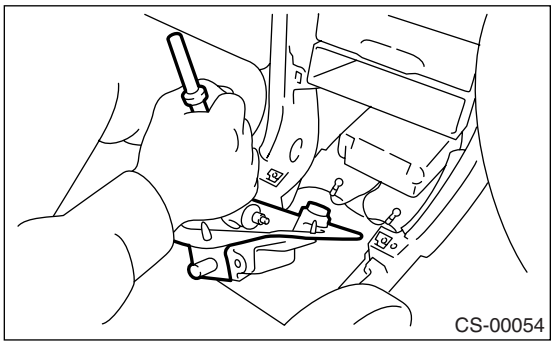
15) Lower the vehicle.
16) Remove the lever COMPL.



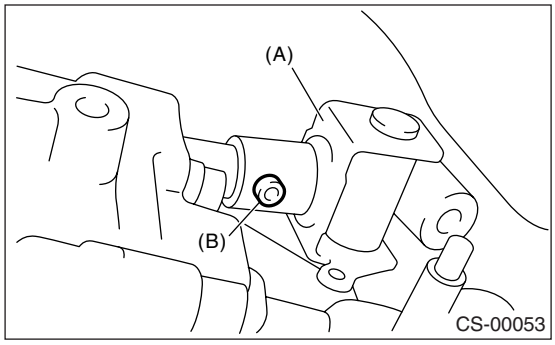
B: INSTALLATION

1) Install the joint to transmission and secure with the spring pin.
2) Insert the lever COMPL from room side.

NOTE:
After inserting the rod and stay, temporarily put them onto transmission mount.



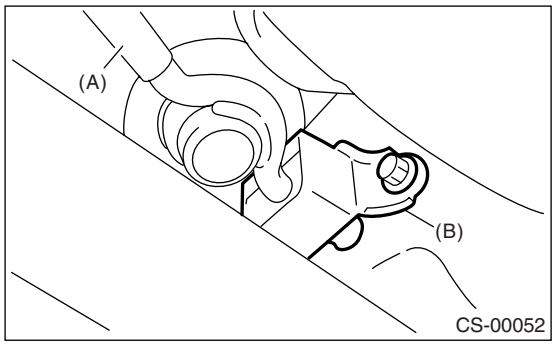
3) Lift-up the vehicle.
4) Install the joint to shifter arm.
5) Insert the spring pin.



(A) Joint
(B) Spring pin

6) Mount the cushion rubber on the body.

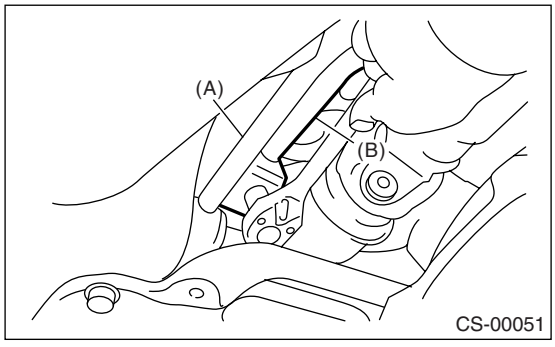
Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)



(A) Stay
(B) Cushion rubber

7) Connect the rod to the joint.

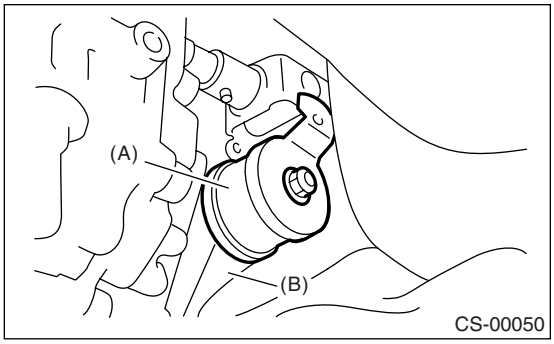
Tightening torque:
12 N·m (1.2 kgf-m, 9.0 ft-lb)



(A) Stay
(B) Rod

8) Connect the stay to transmission bracket.

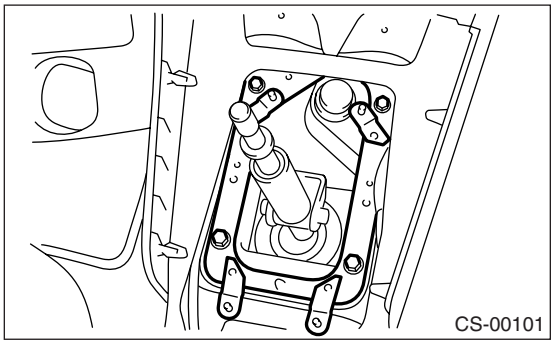
Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)



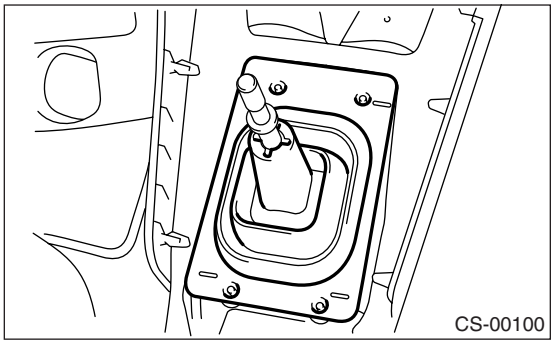
(A) Stay
(B) Transmission bracket

9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
• Non-turbo model
<Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
• Turbo model
<Ref. to EX(H4DOTC 2.0)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, INSTALLATION, Muffler.>
11) Lower the vehicle.
12) Install the plate COMPL to body.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



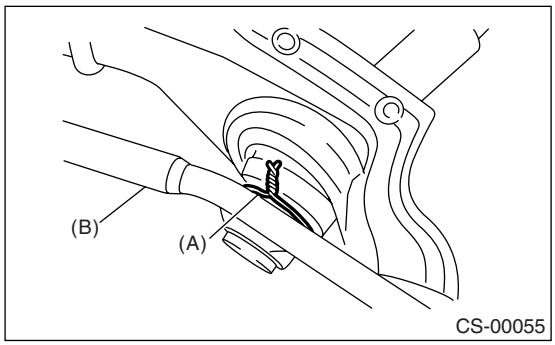
13) Install the boot and insulator assembly to vehicle in proper direction.



14) Install the clamp.
15) Install the console box. <Ref. to EI-39, INSTALLATION, Console Box.>

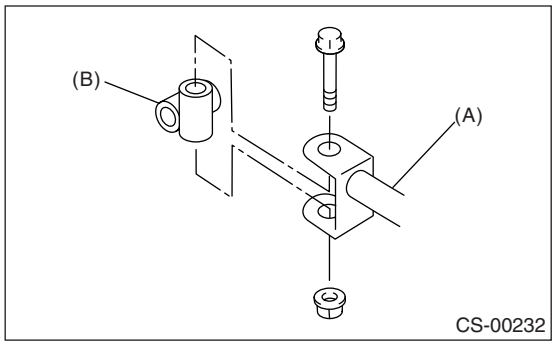
C: DISASSEMBLY

1) Disassemble the lock wire.



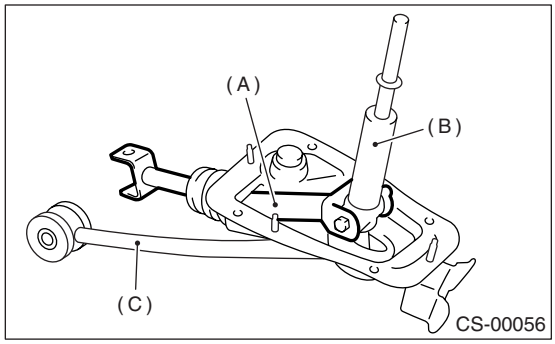
(A) Lock wire
(B) Stay COMPL

2) Remove the boss from rod COMPL.



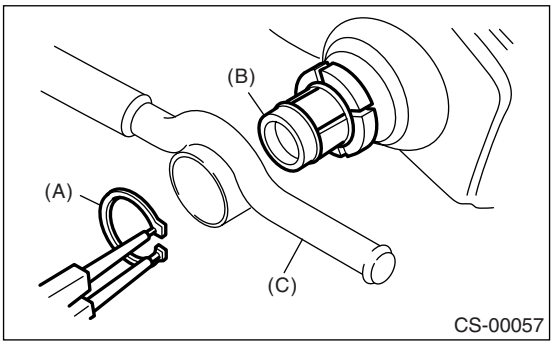
(A) Rod COMPL
(B) Boss

3) Remove the rod COMPL from lever COMPL.



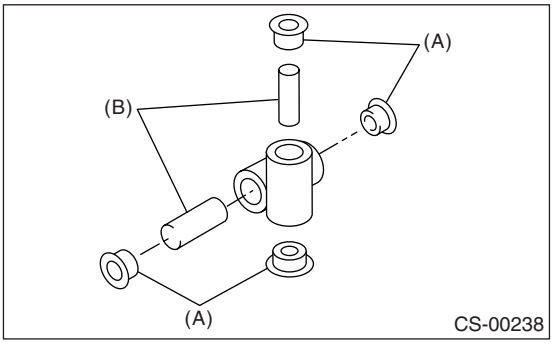
(A) Rod COMPL
(B) Lever COMPL
(C) Stay COMPL

4) Remove the snap ring from bushing B, and then disconnect the stay COMPL.



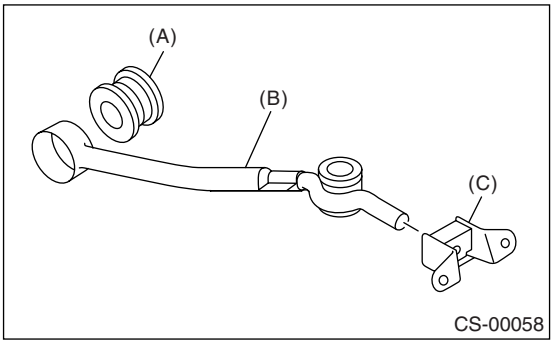
(A) Snap ring
(B) Bushing B
(C) Stay COMPL

5) Remove the boot from gear shift lever.
6) Remove the bushing and spacer from boss.



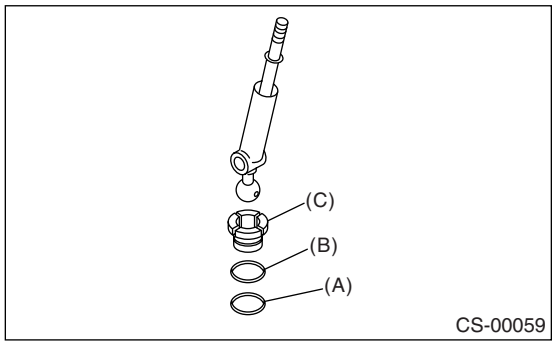
(A) Bushing
(B) Spacer

7) Remove the stay bushing and cushion rubber from stay COMPL.



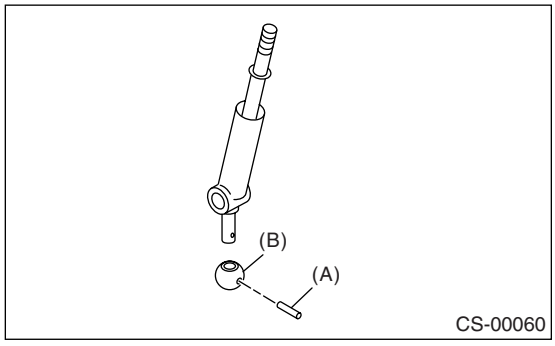
(A) Stay bushing
(B) Stay COMPL
(C) Cushion rubber

8) Remove O-ring, and then disconnect the bushing B.



(A) O-ring
(B) O-ring
(C) Bushing B

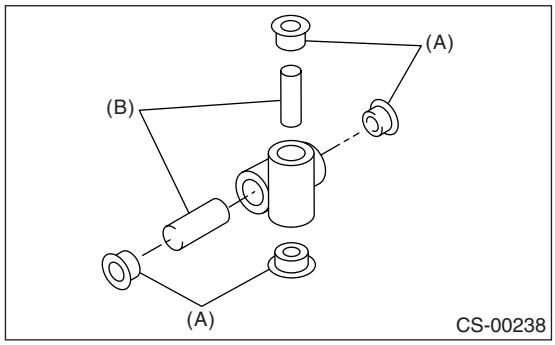
9) Draw out the spring pin, and then remove the bushing A from gear shift lever.



(A) Spring pin
(B) Bushing A

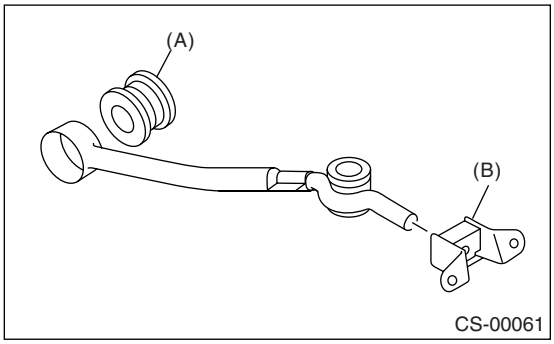
D: ASSEMBLY

1) Clean all parts before assembly.
2) Install the bushing and spacer to boss.



(A) Bushing
(B) Spacer

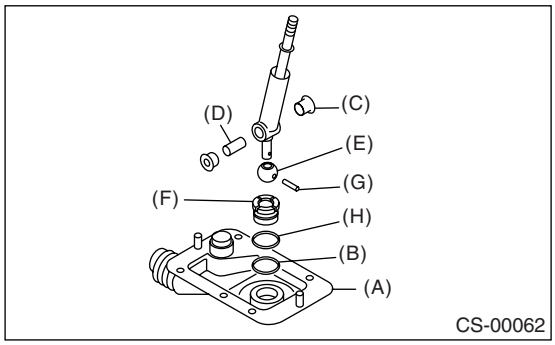
3) Mount the stay bushing and cushion rubber on the stay COMPL.



(A) Stay bushing
(B) Cushion rubber

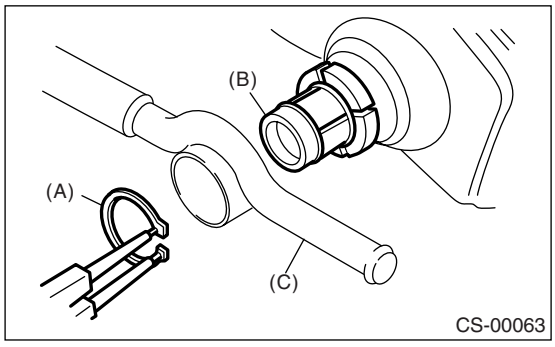
4) Mount each part; boot, O-ring, bushing A, spacer, bushing B, bushing and spring pin on the gear shift lever.

NOTE:
- Always use new O-rings.
- Apply grease [SUNLIGHT 2 (Part No.003602010) or equivalent] to the inner and side surfaces of the bush when installing the spacer.



(A) Boot
(B) O-ring
(C) Bushing
(D) Spacer
(E) Bushing A
(F) Bushing B
(G) Spring pin
(H) O-ring

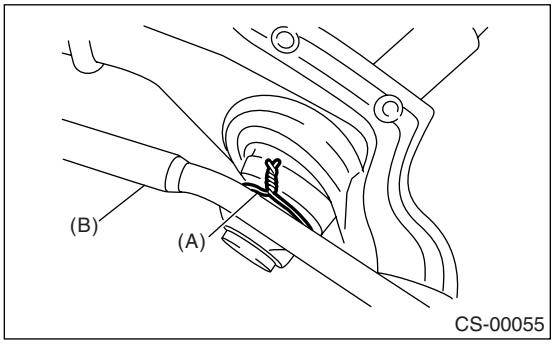
5) Insert the gear shift lever into boot hole.
6) Install the snap ring and stay COMPL to bushing B.



(A) Snap ring
(B) Bush B
(C) Stay COMPL

7) Tighten with a lock wire to the extent that the boot will not come off.

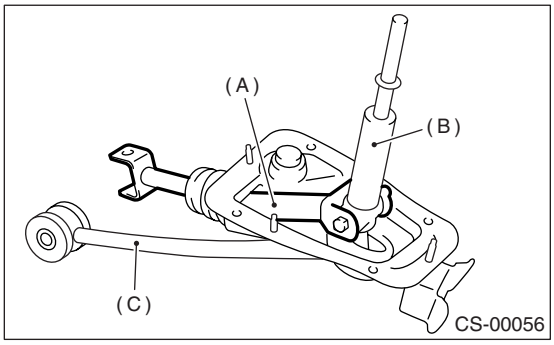
NOTE:
Always use new lock wire.



(A) Lock wire
(B) Stay COMPL

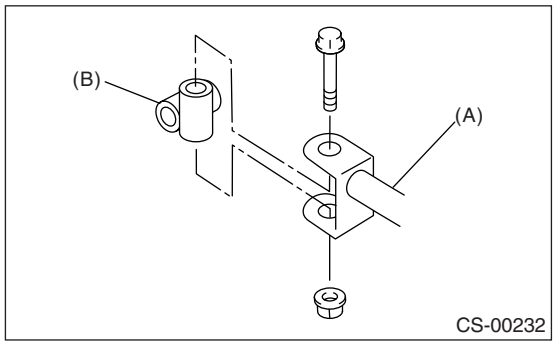
8) Insert the rod into boot hole.
9) Connect the rod COMPL to lever COMPL.

Tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)



(A) Rod COMPL
(B) Lever COMPL
(C) Stay COMPL

10) Install the boss to rod.



(A) Rod
(B) Boss

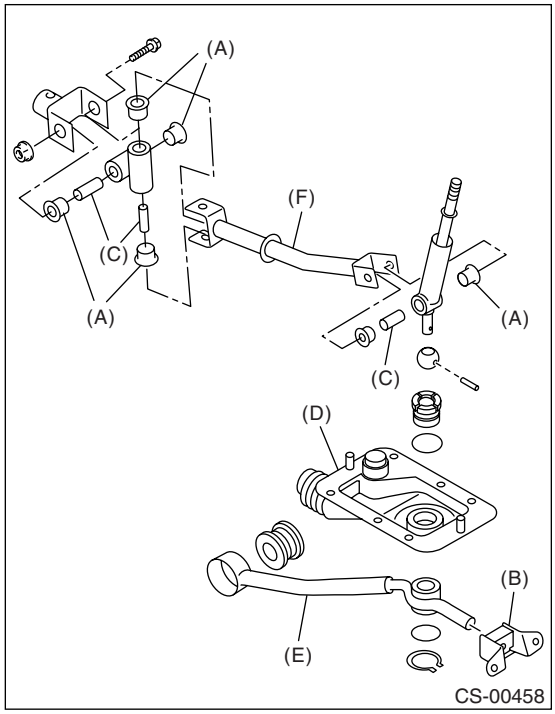
11) Check the swing torque of the rod COPML in relation to lever COMPL.

Swing torque:
3.7 N (0.38 kgf, 0.83 lbf) or less

12) Check that there is no excessive play and that parts move smoothly.

E: INSPECTION

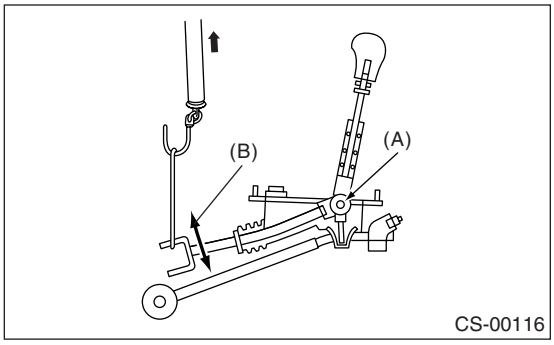
1) Check each part (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. Repair or replace any defective part. Determine defective parts by comparing with new parts.



(A) Bushing
(B) Cushion rubber
(C) Spacer
(D) Boot
(E) Stay COMPL
(F) Rod COMPL

2) Check the swing torque of the rod COMPL in relation of lever COMPL.
If the torque exceeds specification, replace the bushing or retighten nuts.

Swing torque:
3.7 N (0.38 kgf, 0.83 lbf) or less

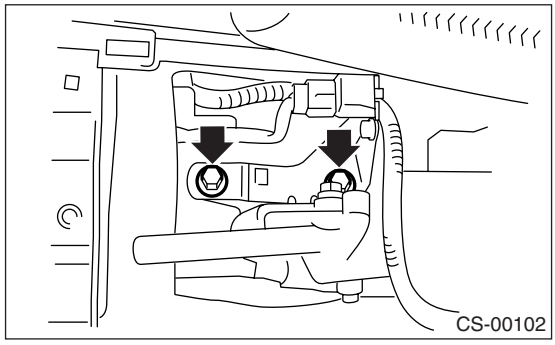


(A) Center of rotation
(B) Swing torque

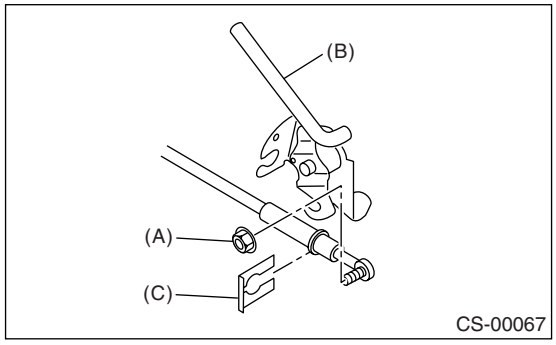
9. MT Drive Select Lever

A: REMOVAL

1) Apply parking brake and place chocks to hold wheels.
2) Disconnect the ground cable from battery.
3) Shift the drive select lever to HI position.
4) Remove the knob.
5) Remove the console box. **<Ref. to EI-39,** REMOVAL, CONSOLE BOX.>
6) Remove the bolt installing drive select lever assembly on body.



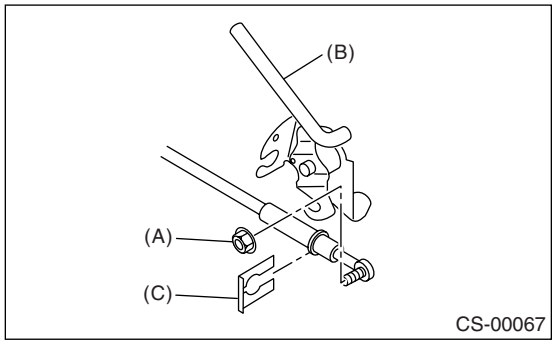
7) Remove the flange nut and clip, and then disconnect the cable from lever assembly.



(A) Flange nut
(B) Lever ASSY
(C) Clip

B: INSTALLATION

1) Install the drive select cable to lever assembly, and then fasten it with a clip.

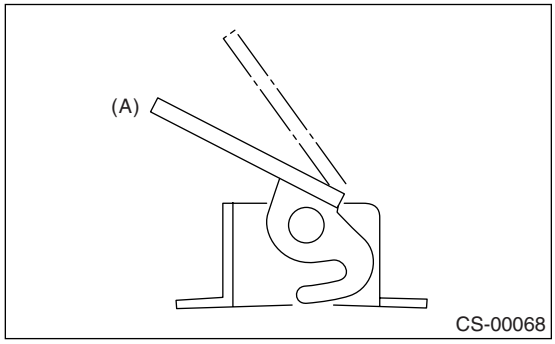


(A) Flange nut
(B) Lever ASSY
(C) Clip

2) Install the drive select lever.

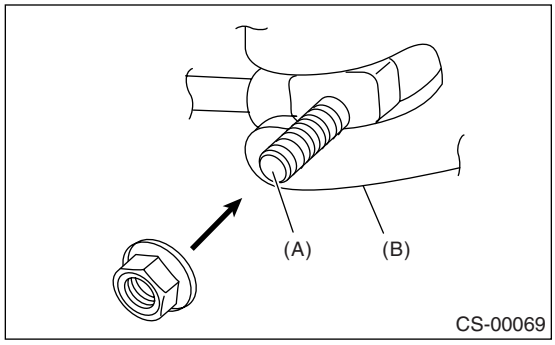
Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

3) Shift the drive select lever to HI position.



(A) HI position

4) Insert the cable eye end bolt into lever arm slit.



(A) Cable eye end bolt
(B) Lever arm

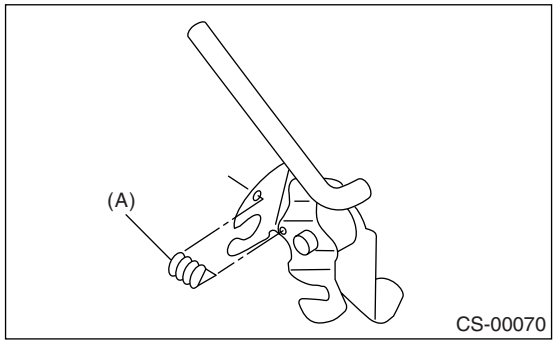
5) Tighten the nut where cable eye end bolt comes to a stop.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

6) Install in the reverse order of removal.

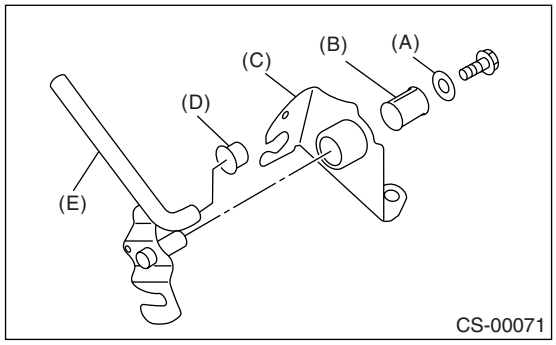
C: DISASSEMBLY

1) Remove the spring.



(A) Spring

2) Remove the lever, cushion and bushing.



(A) Washer
(B) Bushing
(C) Plate ASSY
(D) Cushion
(E) Lever ASSY

D: ASSEMBLY

1) Assemble in the reverse order of disassembly.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

2) Make sure the select lever moves smoothly.

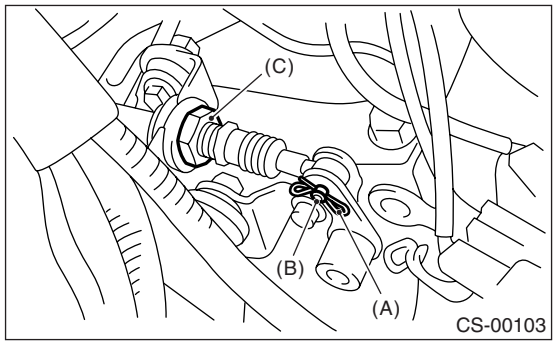
E: INSPECTION

1) Make sure the select lever moves smoothly. If it does not move smoothly, repair or replace it.
2) Make sure the drive select lever is not damaged. If it is damaged, repair or replace it.

10.Drive Select Cable

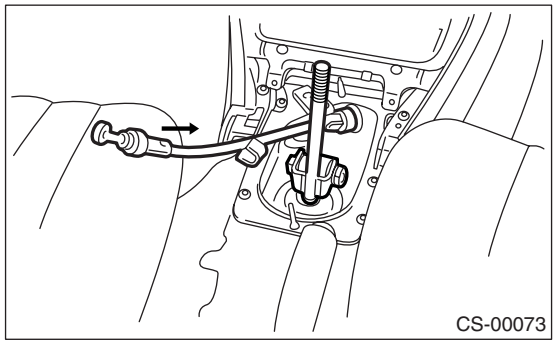
A: REMOVAL

1) Remove the drive select lever. **<Ref. to CS-44,** REMOVAL, MT DRIVE SELECT LEVER.>
2) Remove the intake duct. **<Ref. to IN(H4SO)-7,** REMOVAL, AIR INTAKE DUCT.>
3) Remove the air cleaner case. **<Ref. to IN(H4SO)-6,** REMOVAL, AIR CLEANER CASE.>
4) Remove the snap pin and clevis pin.
5) Loosen the nut and disconnect the cable from cable bracket.



(A) Snap pin
(B) Clevis pin
(C) Nut

6) Disconnect the cable from transmission clamp.
7) Remove the cable from the under side of vehicle.



B: INSTALLATION

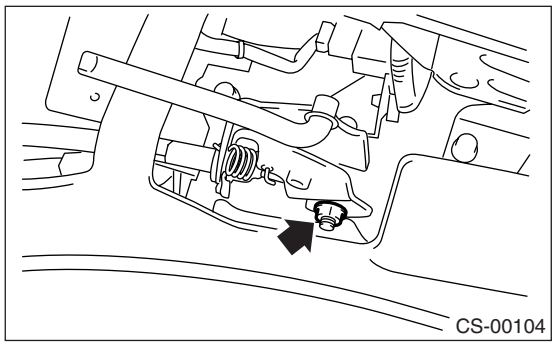
1) Install in the reverse order of removal.
2) Make sure the drive select lever operates properly.

C: INSPECTION

1) Shift the transmission to HI or LO position by moving the drive select lever. If it does not move, adjust the cable. **<Ref. to CS-46,** ADJUSTMENT, DRIVE SELECT CABLE.>
2) Make sure the cable moves smoothly. If it catches or fails to work properly, repair or replace it.
3) Check the cable for damage.

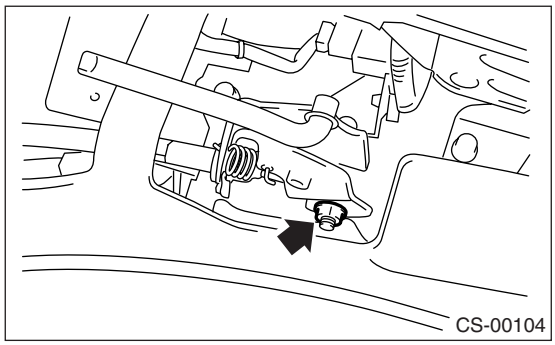
D: ADJUSTMENT

1) Shift the drive select lever to HI position.
2) Remove the drive select lever knob.
3) Remove the console box. **<Ref. to EI-39,** REMOVAL, CONSOLE BOX.>
4) Loosen the nut.



5) Make sure the transmission is in HI position. If it is not, pull the cable to put transmission in HI position.
6) Tighten the nut in the location where cable end bolt stops naturally.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)



7) Shift the transmission to HI or LO position by moving the drive select lever. If it does not move, readjust the cable.

11.General Diagnostic Table

A: INSPECTION

Symptom	Problem parts
Shift lock does not function.	• Stop light switch • Shift lock solenoid • Body integrated unit
Shift lock cannot be released.	• Stop light switch • Shift lock solenoid • Body integrated unit • Inhibitor switch
Key interlock does not function.	• Key warning switch • “P” range switch • Key lock solenoid • Body integrated unit
Key interlock cannot be released.	• Key warning switch • “P” range switch • Key lock solenoid • Body integrated unit
Starter does not run.	• Inhibitor switch • Select cable • Starter circuit
Back-up light does not light up.	• Inhibitor switch • Select cable • Back-up light circuit
Gear can be shifted from “N” range to “R” range during driving. (Turbo model)	• Shift lock solenoid • TCM

AUTOMATIC TRANSMISSION

4AT

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1. General Description

A: SPECIFICATION

1. TORQUE CONVERTER CLUTCH

Model	2.0 L Non-turbo	2.5 L Non-turbo	2.0 L Turbo	2.5 L Turbo
Type	Symmetric, 3 element, single stage, 2 phase torque converter			
Stall torque ratio	2.0 — 2.2	1.85 — 2.15	2.05 — 2.35	2.05 — 2.35
Nominal diameter	236 mm (9.29 in)	246 mm (9.69 in)		
Stall speed (at sea level)	2,000 — 2,500 rpm	2,200 — 2,700 rpm	2,500 — 3,000 rpm	2,700 — 3,200 rpm
One-way clutch	Sprague type one-way clutch			

2. OIL PUMP

Type	Pracoid constant-displacement pump	
Driving method	Driven by engine	
Number of teeth	Inner rotor	9
	Outer rotor	10

3. TRANSMISSION CONTROL ELEMENT

Type	4-forward, 1-reverse, double-row planetary gears
Multi-plate clutch	3 sets
Multi-plate brake	2 sets
One-way clutch (sprague type)	1 sets

4. TRANSMISSION GEAR RATIO

	Gear ratio
1st	2.785
2nd	1.545
3rd	1.000
4th	0.694
Rev	2.272

5. PLANETARY GEAR AND PLATE

Model	2.0 L Non-turbo	2.5 L Non-turbo	Turbo
Front sun gear number of teeth	33		
Front pinion number of teeth	21		
Front internal gear number of teeth	75		
Rear sun gear number of teeth	42		
Rear pinion number of teeth	17		
Rear internal gear number of teeth	75		
Drive & driven plate number of high clutch	4		5
Drive & driven plate number of low clutch	4	6	7
Drive & driven plate number of reverse clutch	2		
Drive & driven plate number of 2-4 brake	3		4
Drive plate number of low & reverse brake	4	6	7

6. SELECTOR POSITION

P (Park)	Transmission in neutral, output member immovable, and engine start possible
R (Reverse)	Transmission in reverse
N (Neutral)	Transmission in neutral and engine start possible
D (Drive)	Automatic gear change 1st ←→ 2nd ←→ 3rd ←→ 4th
3 (3rd)	Automatic gear change 1st ←→ 2nd ←→ 3rd ← 4th
2 (2nd)	Automatic gear change 1st ←→ 2nd ← 3rd ← 4th
1 (1st)	1st gear locked (Deceleration possible 1st ← 2nd ← 3rd ← 4th)
Control method	Wire cable type

7. HYDRAULIC CONTROL AND LUBRICATION

Type		Electronic/hydraulic control [Four forward speed changes by electrical signals of vehicle speed and accelerator (throttle) opening]
Fluid		• EC, EK, EH model SUBARU ATF (Part No. K0410Y0700) or IDEMITSU “Apoloil ATF HP”, Castrol “Transmax J”. NOTE: If it is impossible to get the ATF above, use the DEXRON III. • Except for EC, EK, EH model SUBARU ATF (Part No. K0410Y0700) or IDEMITSU “Apoloil ATF HP”, Castrol “Transmax J”, DEXRON III.
Fluid capacity	2.0 L Non-turbo model	8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)
	Except for 2.0 L Non-turbo model	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)
Lubrication system		Forced feed lubrication with oil pump
Oil		Automatic transmission fluid (above mentioned)

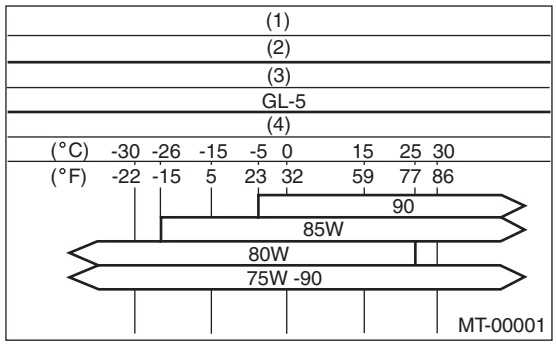
8. COOLING AND HARNESS

Cooling System	Liquid-cooled cooler
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

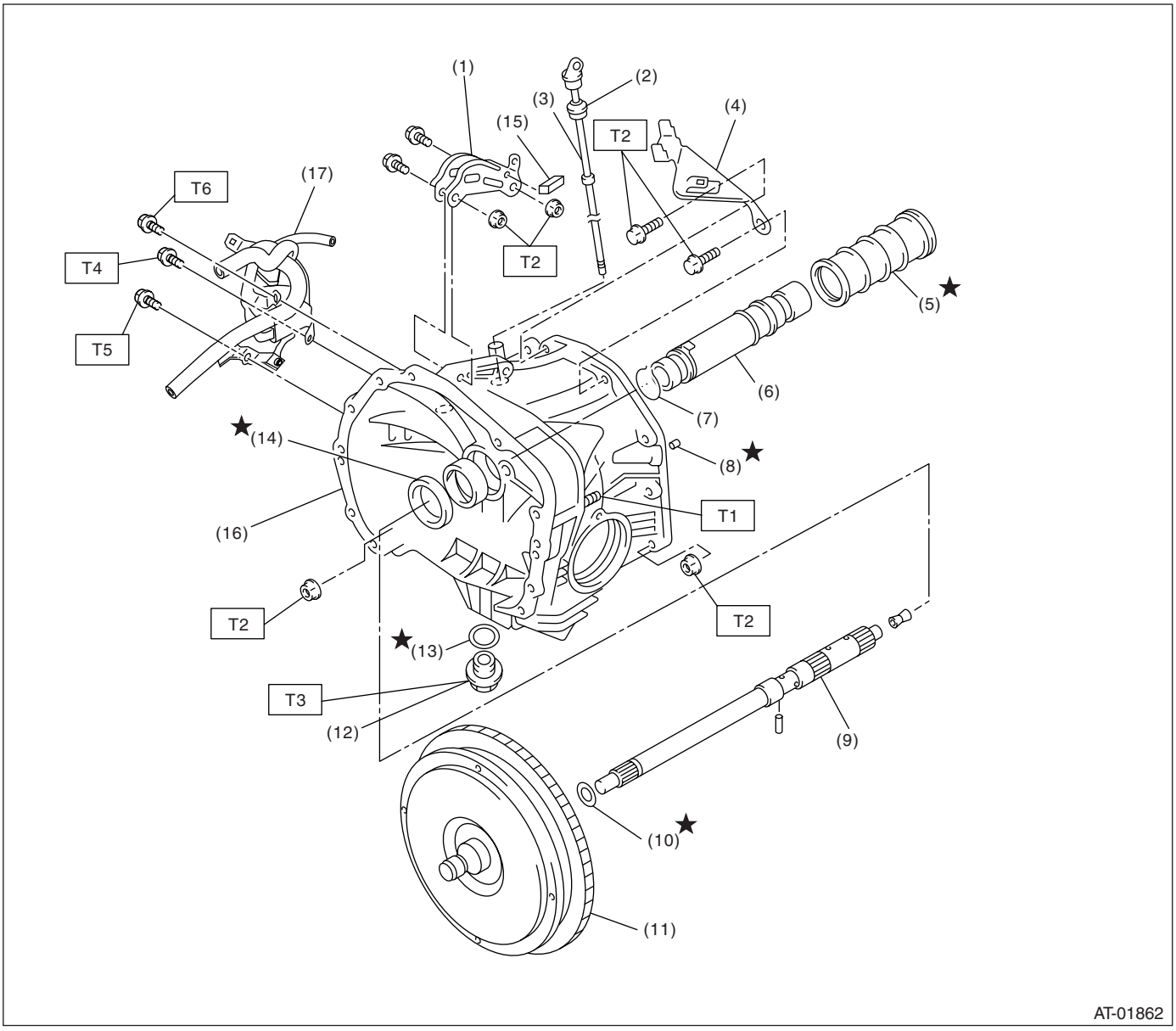
Model	Non-turbo		Turbo	
	2.0 L	2.5 L	Without vehicle dynamics control (VDC)	With vehicle dynamics control (VDC)
Transfer type	Multi-plate transfer (MPT)			Variable torque distribution (VTD)
Drive & driven plate number of transfer clutch	4	5	6	3
Control method	Electronic hydraulic type			
Lubricant	The same Automatic transmission fluid used in automatic transmission			
Reduction gear ratio	1.000 (53/53)			

10.FINAL REDUCTION

Model	2.0 L Turbo	Non-turbo, 2.5 L Turbo
Front final reduction gear ratio	4.111 (37/9)	4.444 (40/9)
Lubrication oil	 (1) Item (2) Front differential gear oil (3) API standard (4) SAE viscosity No. and applicable temperature	
Front differential oil capacity	1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)	

B: COMPONENT

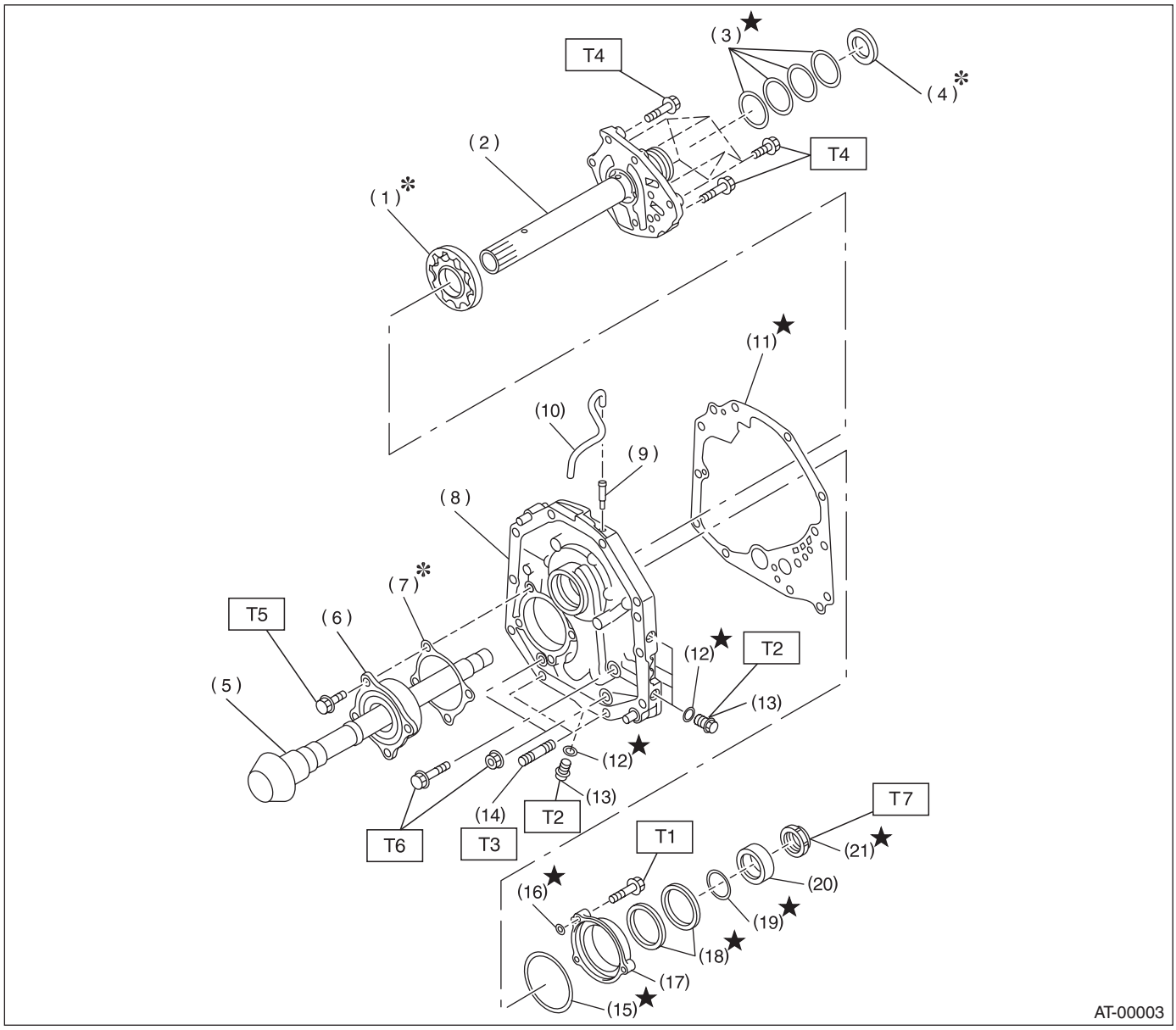
1. TORQUE CONVERTER CLUTCH AND CASE



(1) Pitching stopper bracket
(2) O-ring
(3) Differential oil level gauge
(4) Stay
(5) Seal pipe
(6) Oil pump shaft
(7) Clip
(8) Rubber seal
(9) Input shaft
(10) O-ring
(11) Torque converter clutch ASSY
(12) Differential gear oil Drain plug
(13) Gasket
(14) Oil seal
(15) Clip (Turbo model)
(16) Converter case
(17) ATF cooler (with warmer function) (if equipped)

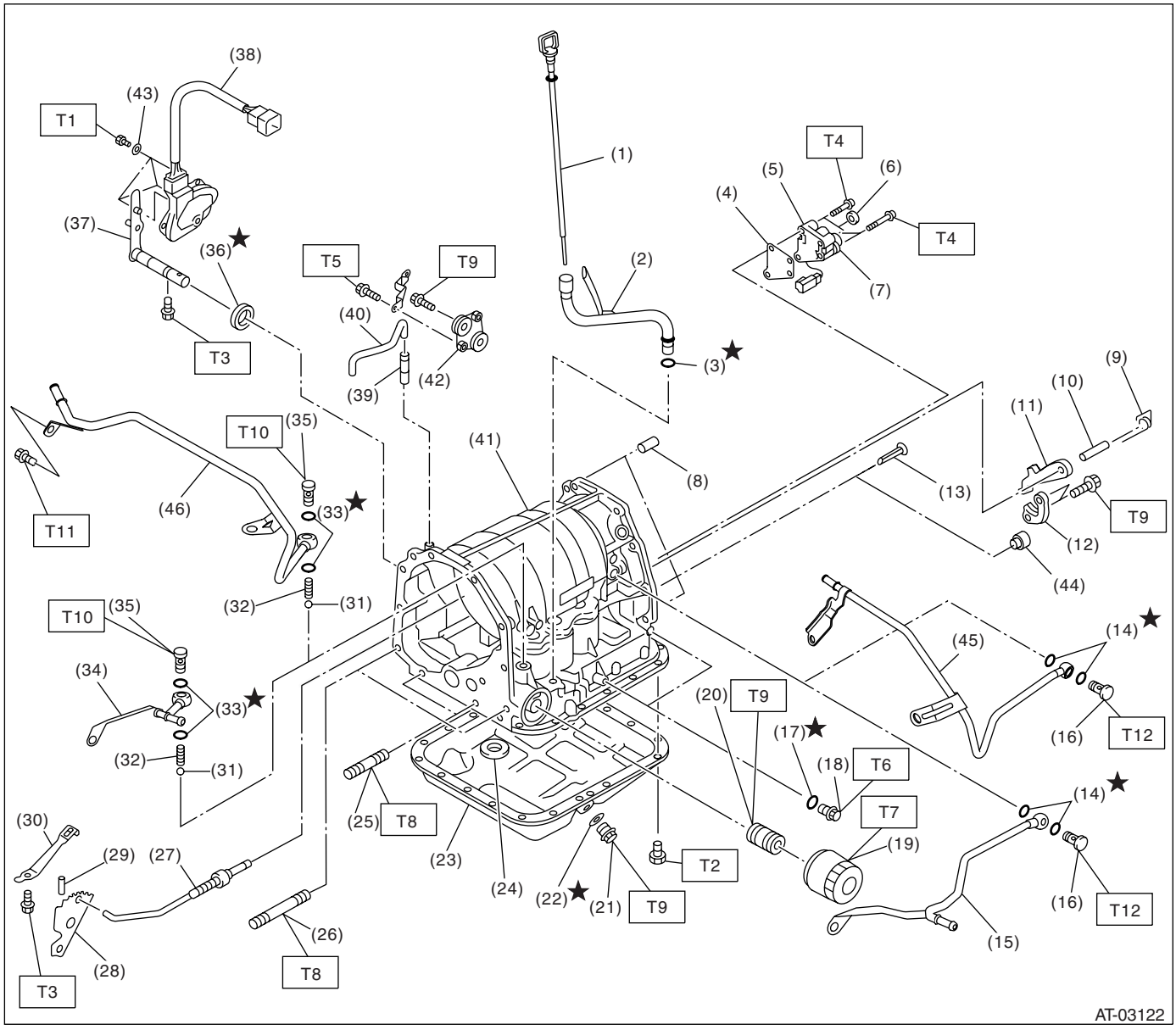
Tightening torque: N·m (kgf-m, ft-lb)
T1: 18 (1.8, 13.0)
T2: 41 (4.2, 30.4)
T3: 44 (4.5, 33) (Aluminum gasket)
70 (7.1, 52) (Copper gasket)
T4: 33 (3.4, 25)
T5: 21 (2.1, 15.5)
T6: 23 (2.3, 17.0)

2. OIL PUMP



(1)	Oil pump rotor	(11)	Gasket	(21)	Lock nuts
(2)	Oil pump cover	(12)	O-ring		
(3)	Seal ring	(13)	Test plug	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Thrust needle bearing	(14)	Stud bolt	***T1:***	***7 (0.7, 5.1)***
(5)	Drive pinion shaft	(15)	O-ring	***T2:***	***13 (1.3, 9.4)***
(6)	Roller bearing	(16)	O-ring	***T3:***	***18 (1.8, 13.0)***
(7)	Drive pinion shim	(17)	Oil seal retainer	***T4:***	***25 (2.5, 18.1)***
(8)	Oil pump housing	(18)	Oil seal	***T5:***	***40 (4.1, 30)***
(9)	Nipple	(19)	O-ring	***T6:***	***42 (4.3, 31)***
(10)	Air breather hose	(20)	Drive pinion collar	***T7:***	***116 (11.8, 85)***

3. TRANSMISSION CASE AND CONTROL DEVICE

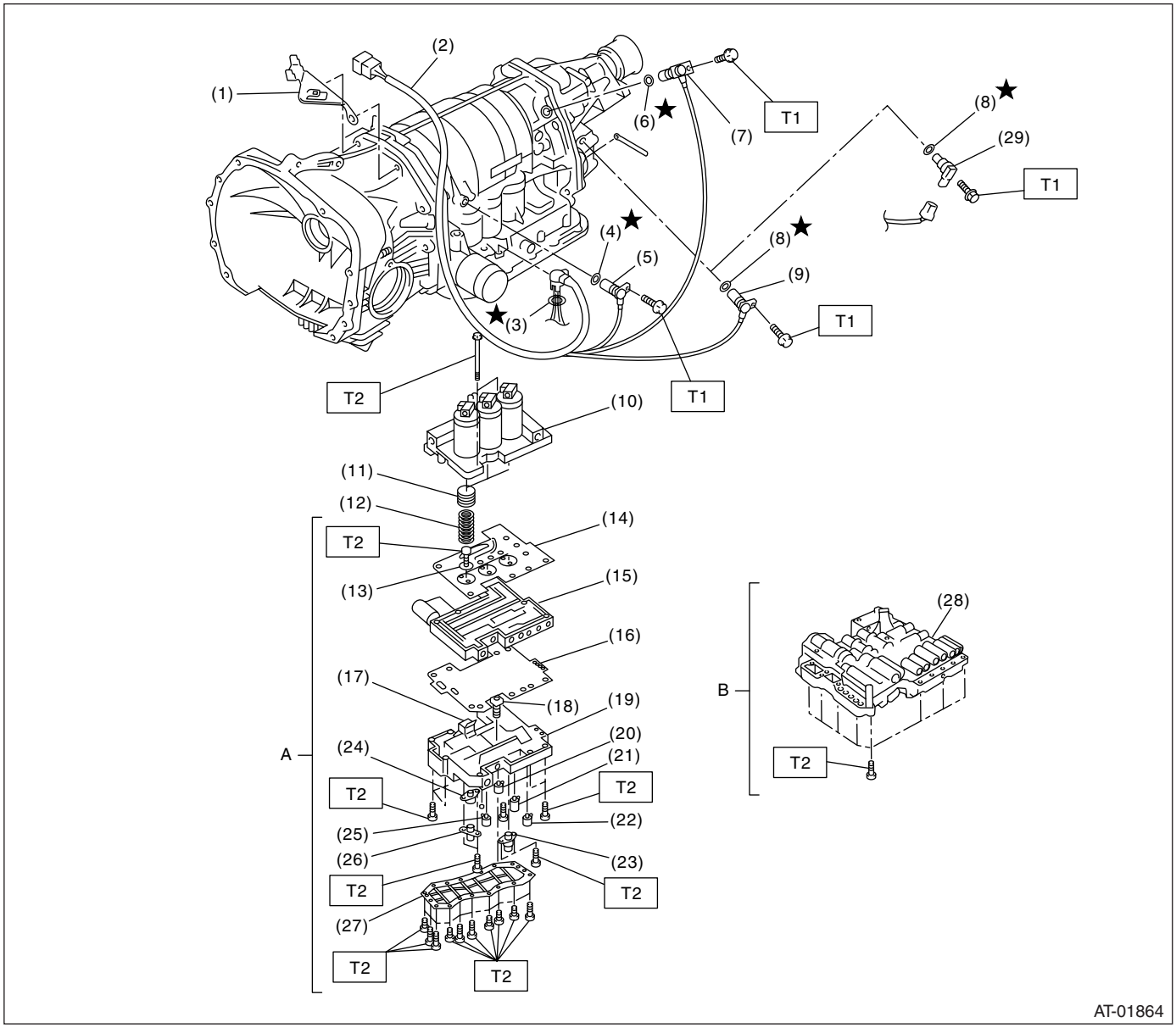


(1) ATF level gauge
(2) Oil charge pipe
(3) O-ring
(4) Transfer valve plate (Non-turbo model)
(5) Transfer valve ASSY (Non-turbo model)
(6) Transfer clutch seal (Non-turbo model)
(7) Transfer duty solenoid (Non-turbo model)
(8) Straight pin
(9) Return spring
(10) Shaft
(11) Parking pawl
(12) Parking support
(13) Inlet filter (Non-turbo model)
(14) Gasket
(15) ATF cooler inlet pipe (model without ATF cooler (with warmer function))
(16) Union screw
(17) O-ring
(18) Test plug
(19) Oil filter
(20) Oil filter stud bolt
(21) Drain plug (ATF)
(22) Gasket
(23) Oil pan
(24) Magnet
(25) Stud bolt (Short)
(26) Stud bolt (Long)
(27) Parking rod
(28) Manual plate
(29) Spring pin
(30) Detention spring
(31) Ball
(32) Spring
(33) Gasket
(34) ATF cooler outlet pipe (model without ATF cooler (with warmer function))
(35) Union screw
(36) Oil seal
(37) Range select lever
(38) Inhibitor switch ASSY
(39) Nipple
(40) Air breather hose
(41) Transmission case
(42) Plate ASSY
(43) Washer
(44) Bushing (turbo model)
(45) ATF cooler inlet pipe (model with ATF cooler (with warmer function))
(46) ATF cooler outlet pipe (model with ATF cooler (with warmer function))

Tightening torque: N·m (kgf-m, ft-lb)

T1:	***3.5 (0.36, 2.6)***
T2:	***5 (0.5, 3.6)***
T3:	***6 (0.6, 4.4)***
T4:	***8 (0.8, 5.8)***
T5:	***12 (1.2, 9.0)***
T6:	***13 (1.3, 9.4)***
T7:	***14 (1.4, 10)***
T8:	***18 (1.8, 13)***
T9:	***25 (2.5, 18.1)***
T10:	***45 (4.6, 33)***
T11:	***21 (2.1, 15.5)***
T12:	***40 (4.1, 30)***

4. CONTROL VALVE AND HARNESS ROUTING



A	Non-turbo model	B	Turbo model

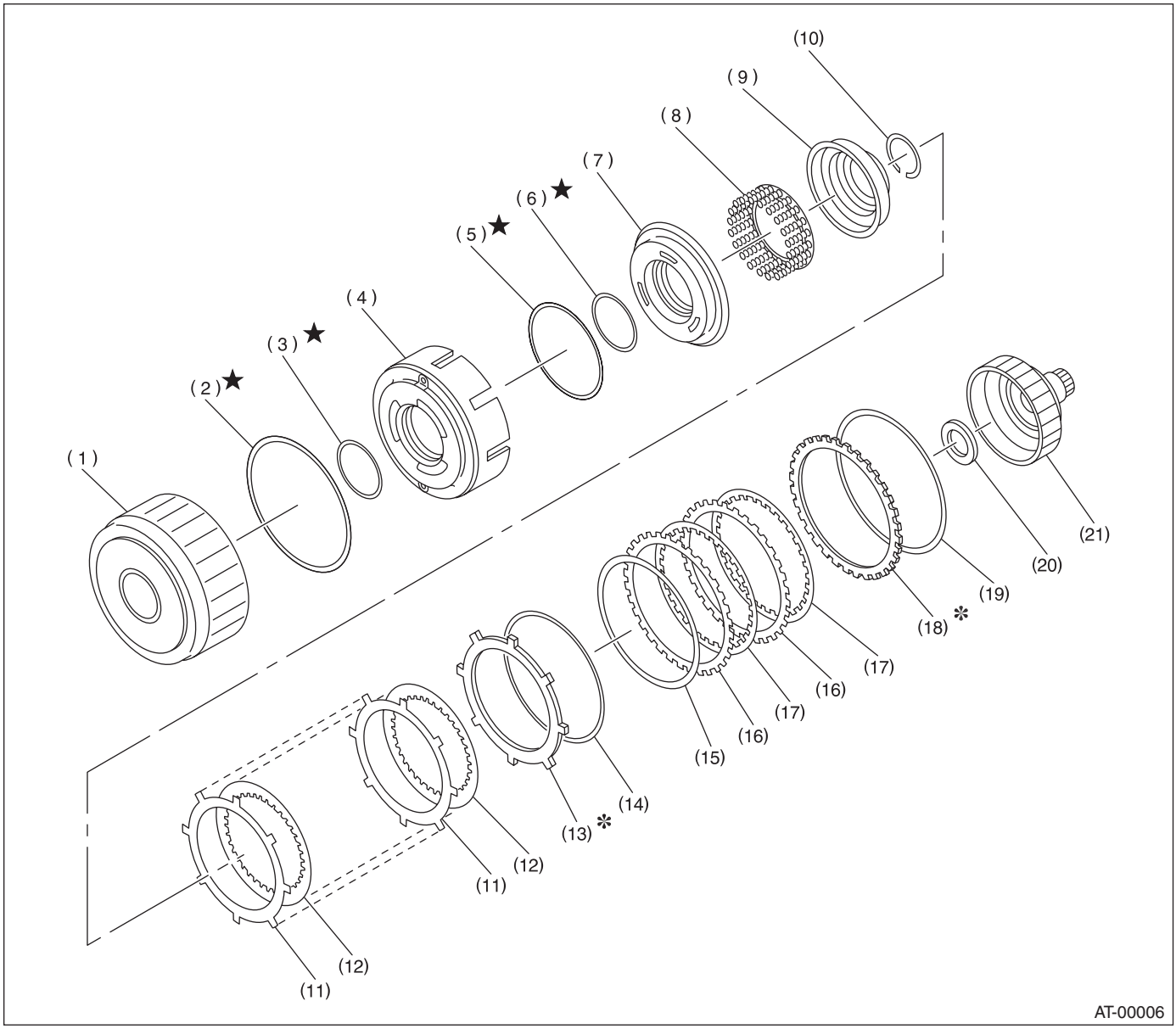
(1)	Stay	(11)	Accumulator piston	(23)	2-4 brake duty solenoid
(2)	Transmission harness ASSY	(12)	Accumulator spring	(24)	Line pressure duty solenoid
(3)	O-ring	(13)	Side plate	(25)	Low clutch timing solenoid
(4)	O-ring	(14)	Upper separate plate	(26)	Lock-up duty solenoid
(5)	Torque converter turbine speed sensor	(15)	Middle control valve body	(27)	Oil strainer
		(16)	Separate plate	(28)	Control valve ASSY
(6)	O-ring	(17)	Fluid filter	(29)	Rear vehicle speed sensor (turbo model)
(7)	Front vehicle speed sensor	(18)	Fluid filter		
(8)	O-ring	(19)	Lower control valve body		
(9)	Rear vehicle speed sensor (Non-turbo model)	(20)	Shift solenoid 2		
		(21)	Shift solenoid 1		
(10)	Upper control valve body	(22)	2-4 brake timing solenoid		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 7 (0.7, 5.1)

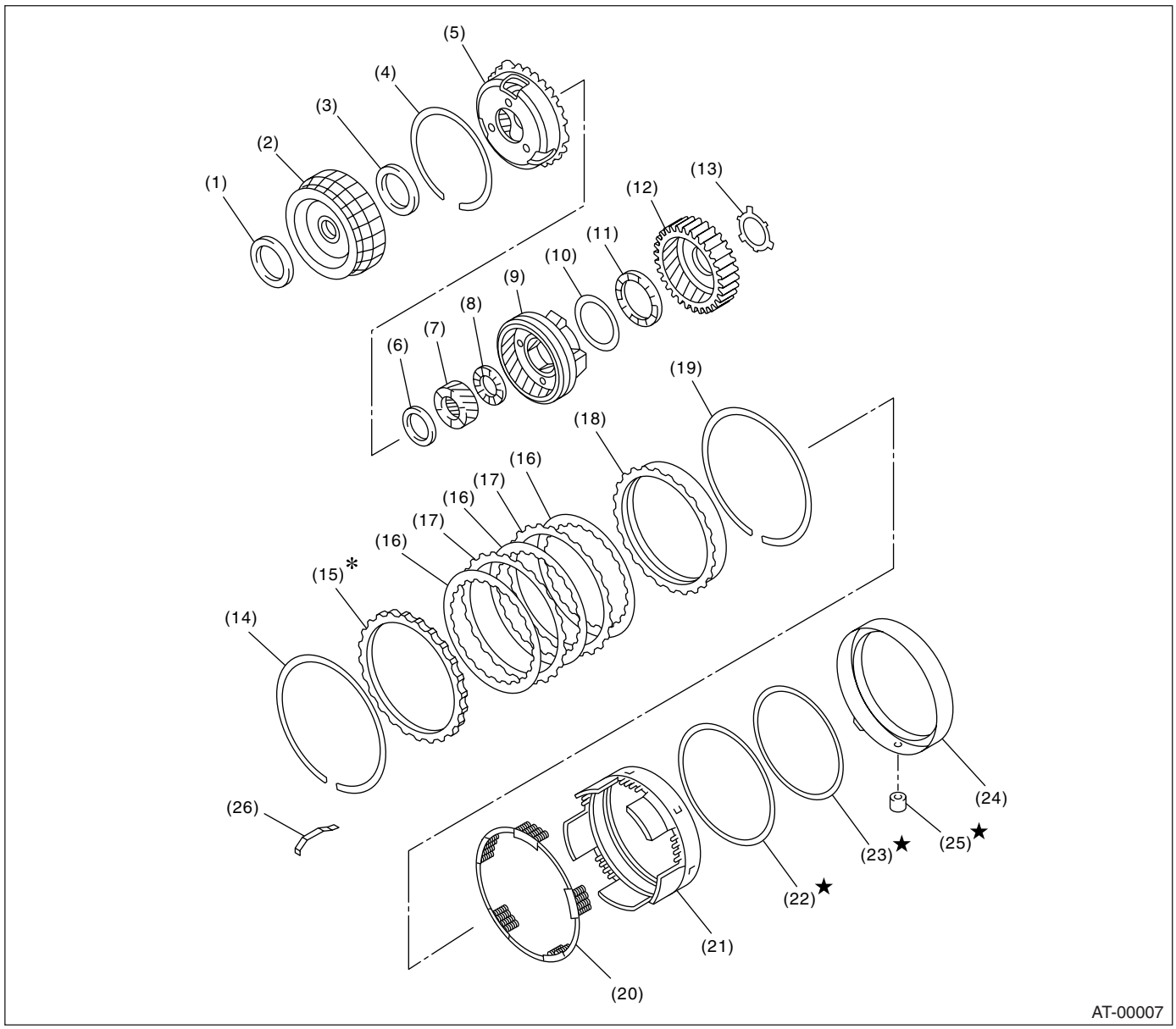
T2: 8 (0.8, 5.8)

5. HIGH CLUTCH AND REVERSE CLUTCH



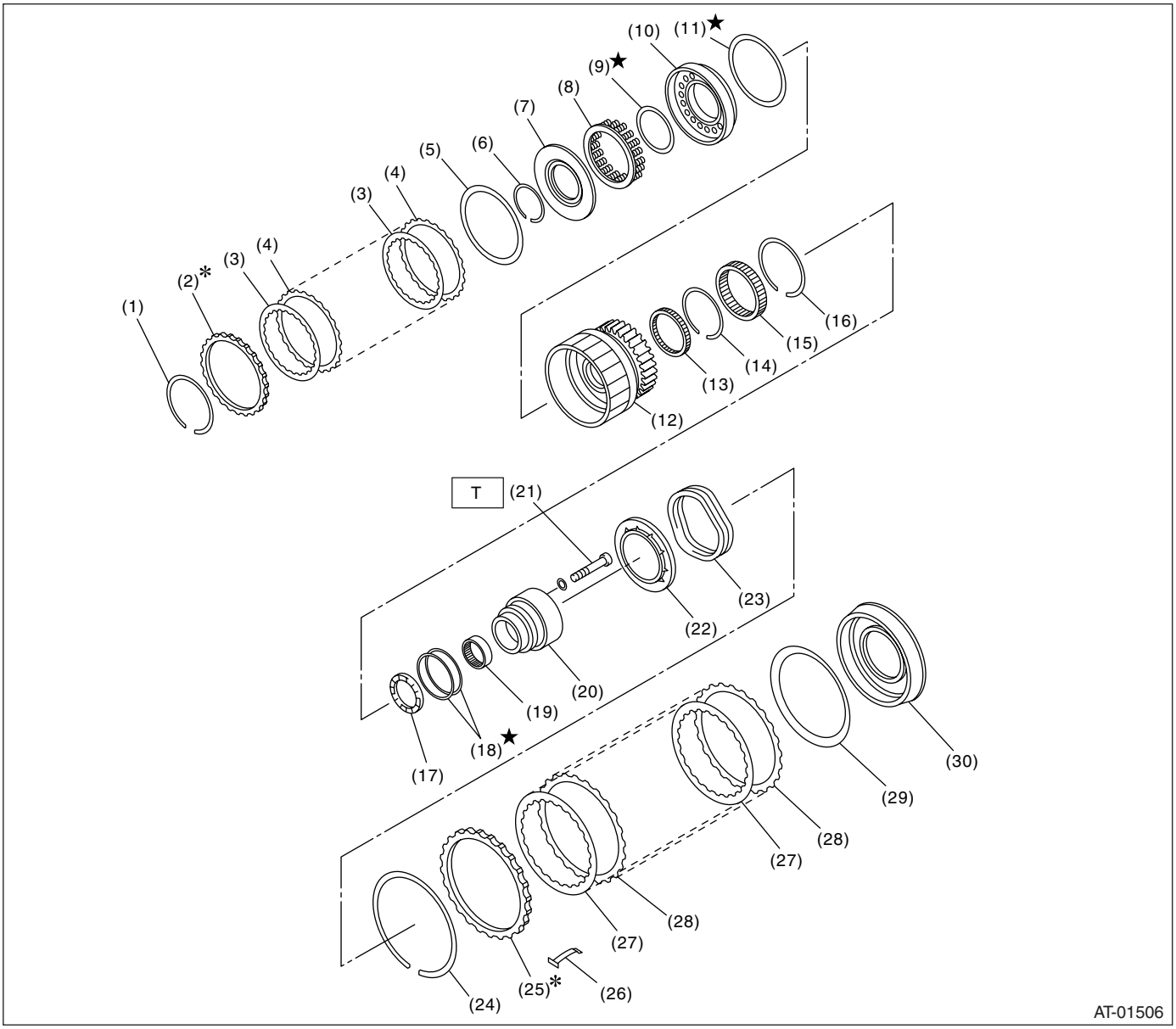
(1)	High clutch drum	(8)	Spring retainer	(15)	Dish plate
(2)	Lip seal	(9)	Clutch cover	(16)	Driven plate
(3)	D-ring	(10)	Snap ring	(17)	Drive plate
(4)	Reverse clutch piston	(11)	Driven plate	(18)	Retaining plate
(5)	D-ring	(12)	Drive plate	(19)	Snap ring
(6)	D-ring	(13)	Retaining plate	(20)	Thrust needle bearing
(7)	High clutch piston	(14)	Snap ring	(21)	High clutch hub

6. PLANETARY GEAR AND 2-4 BRAKE



(1) Thrust needle bearing
(2) Front sun gear
(3) Thrust needle bearing
(4) Snap ring
(5) Front planetary carrier
(6) Thrust needle bearing
(7) Rear sun gear
(8) Thrust needle bearing
(9) Rear planetary carrier
(10) Washer
(11) Thrust needle bearing
(12) Rear internal gear
(13) Washer
(14) Snap ring
(15) Retaining plate
(16) Drive plate
(17) Driven plate
(18) Pressure rear plate
(19) Snap ring
(20) 2-4 spring retainer
(21) 2-4 brake piston
(22) D-ring
(23) D-ring
(24) 2-4 brake piston retainer
(25) 2-4 brake seal
(26) Leaf spring

7. LOW CLUTCH AND LOW & REVERSE BRAKE

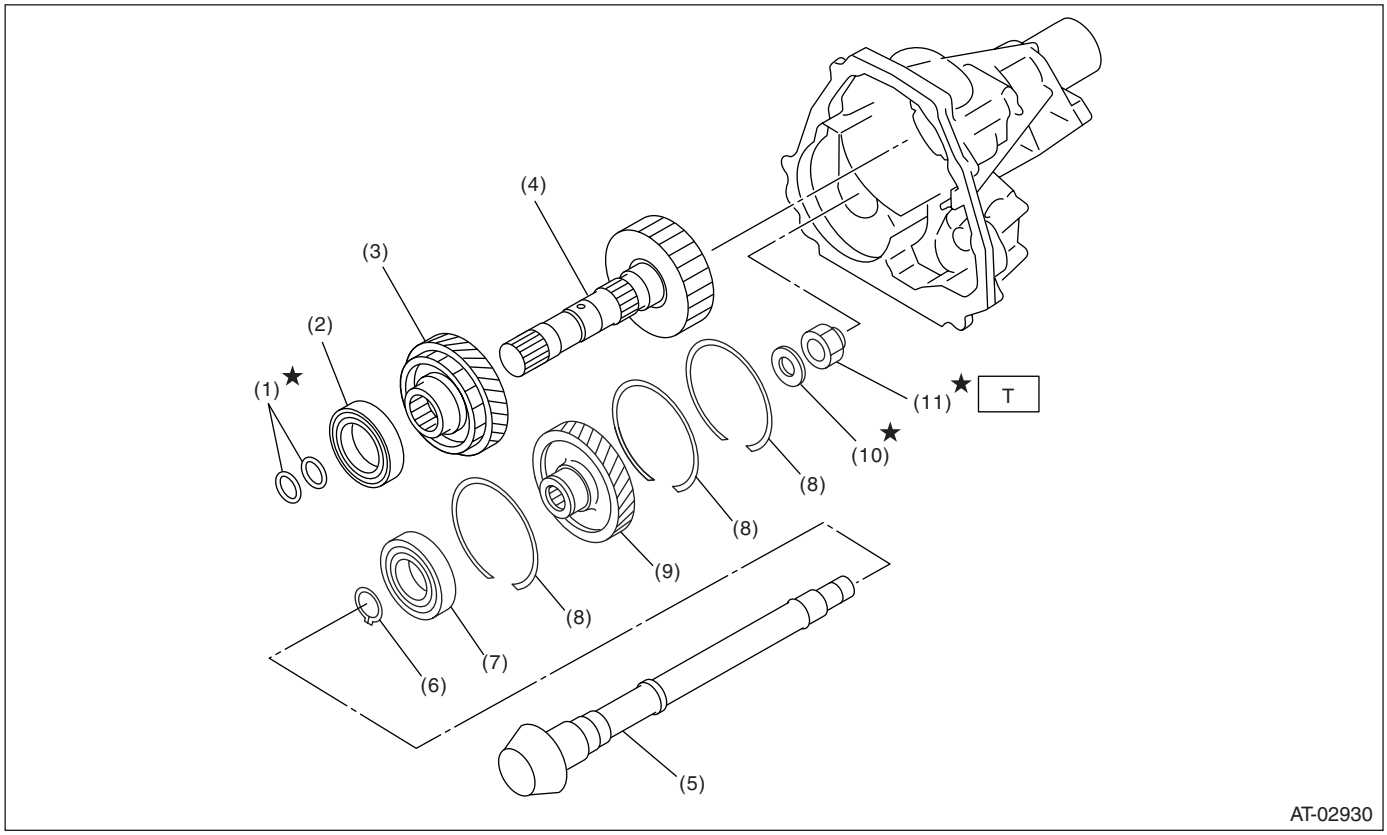


(1) Snap ring
(2) Retaining plate
(3) Drive plate
(4) Driven plate
(5) Dish plate
(6) Snap ring
(7) Cover
(8) Spring retainer
(9) D-ring
(10) Low clutch piston
(11) D-ring
(12) Low clutch drum
(13) Needle bearing
(14) Snap ring
(15) One-way clutch
(16) Snap ring
(17) Thrust needle bearing
(18) Seal ring
(19) Needle bearing
(20) One-way clutch inner race
(21) Socket bolt
(22) Spring retainer
(23) Return spring
(24) Snap ring
(25) Retaining plate
(26) Leaf spring
(27) Drive plate
(28) Driven plate
(29) Dish plate
(30) Low & reverse brake piston

Tightening torque: N·m (kgf-m, ft-lb)
T: 25 (2.5, 18.1)

8. REDUCTION GEAR

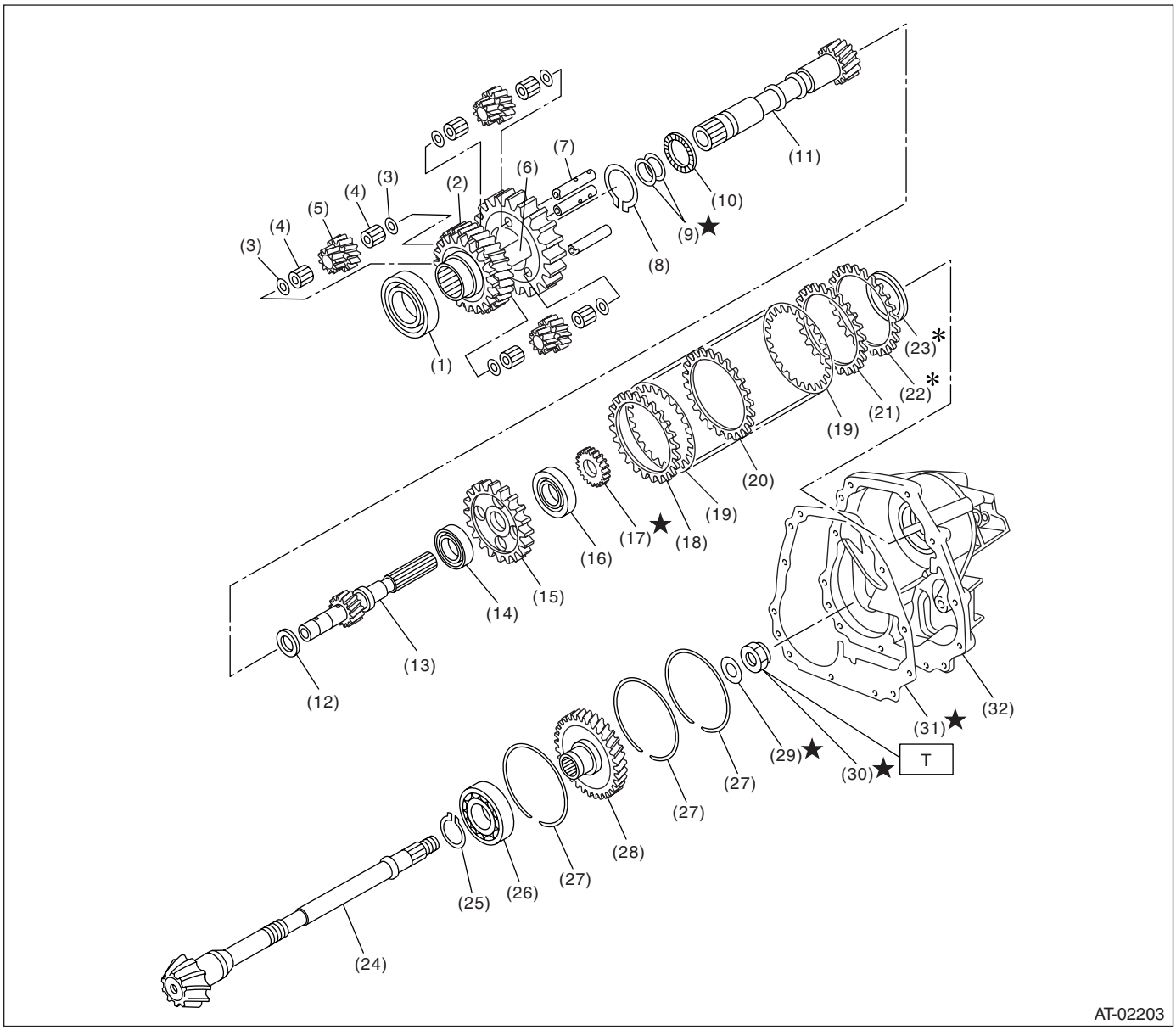
• MPT MODEL



(1) Seal ring
(2) Ball bearing
(3) Reduction drive gear
(4) Reduction drive shaft
(5) Drive pinion shaft
(6) Snap ring
(7) Ball bearing
(8) Snap ring
(9) Reduction driven gear
(10) Washer
(11) Lock nuts

Tightening torque: N·m (kgf-m, ft-lb)
T: 100 (10.2, 74)

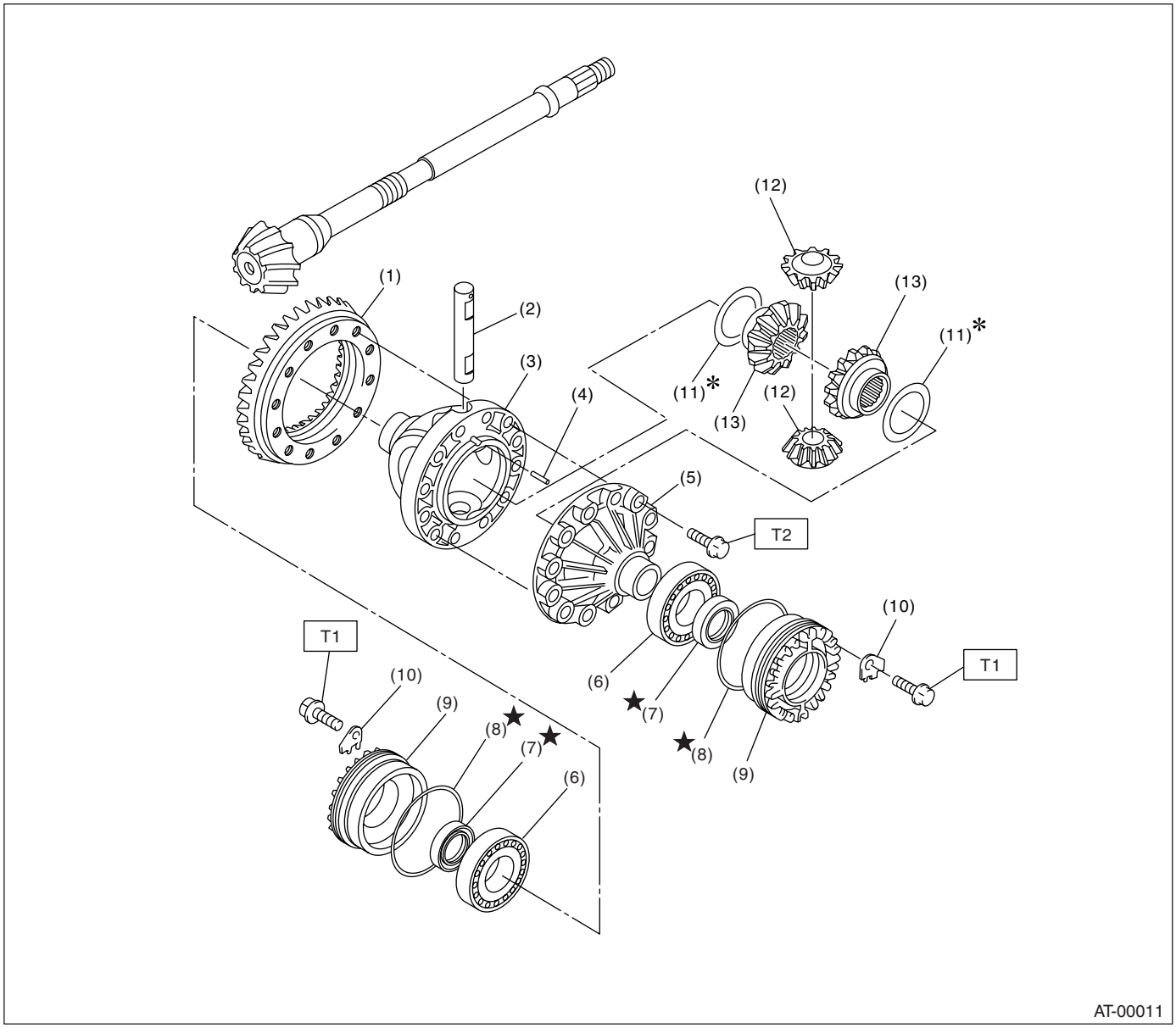
• VTD MODEL



(1) Ball bearing
(2) Reduction drive gear
(3) Washer
(4) Needle bearing
(5) Pinion gear
(6) Carrier
(7) Planetary pinion shaft
(8) Snap ring
(9) Seal ring
(10) Thrust needle bearing
(11) Intermediate shaft
(12) Thrust washer
(13) Rear drive shaft
(14) Ball bearing
(15) Multi-plate clutch (LSD) hub
(16) Ball bearing
(17) Revolution gear
(18) Driven plate (Thicker)
(19) Drive plate
(20) Driven plate (Thinner)
(21) Driven plate (Thicker)
(22) Pressure plate
(23) Rear drive shaft shim
(24) Drive pinion shaft
(25) Snap ring
(26) Ball bearing
(27) Snap ring
(28) Reduction driven gear
(29) Lock washer
(30) Lock nut
(31) Gasket
(32) Extension case

Tightening torque: N·m (kgf-m, ft-lb)
T: 100 (10.2, 74)

9. DIFFERENTIAL GEAR

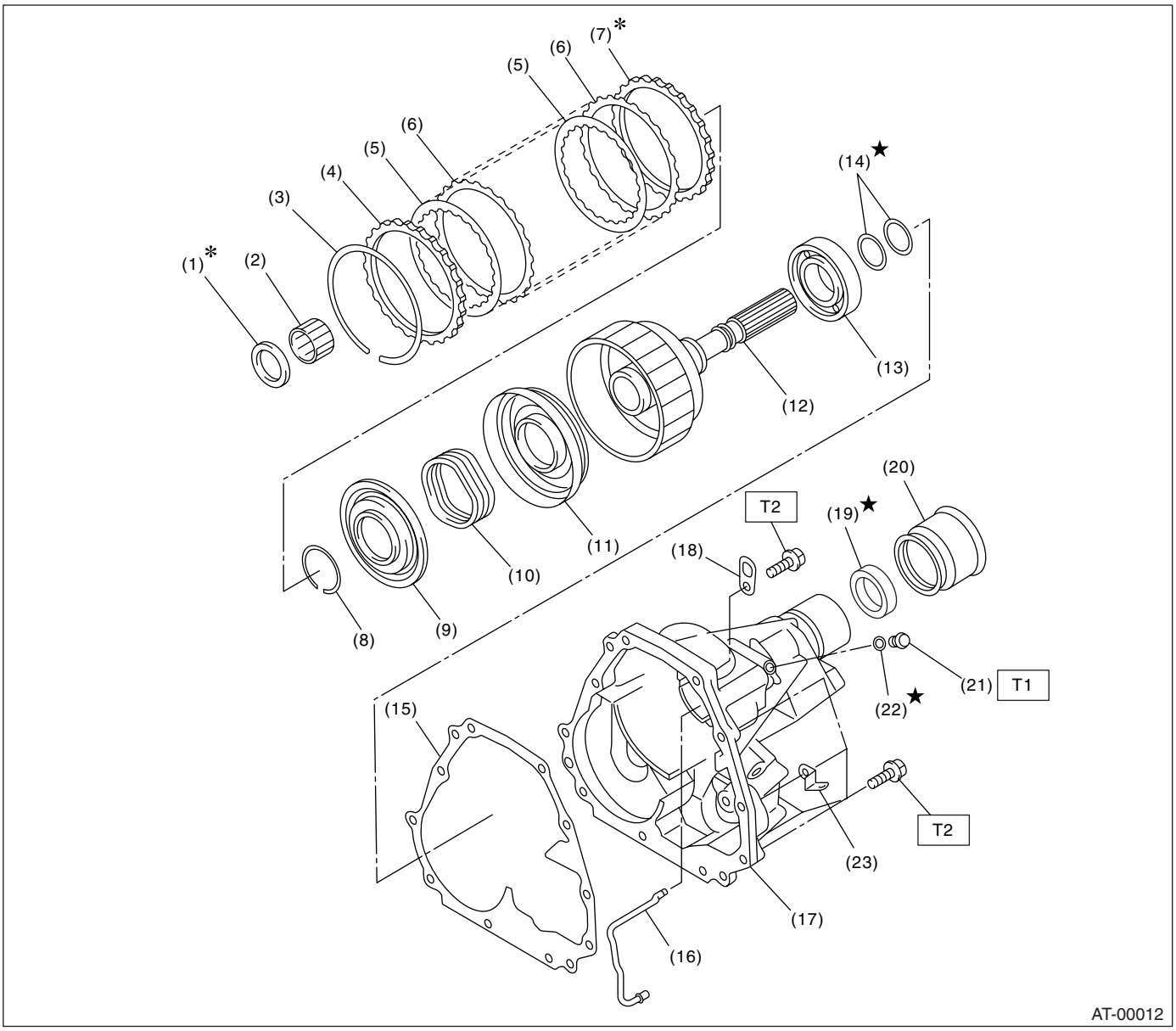


(1) Hypoid driven gear
(2) Pinion shaft
(3) Differential case (RH)
(4) Straight pin
(5) Differential case (LH)
(6) Taper roller bearing
(7) Oil seal
(8) O-ring
(9) Differential side retainer
(10) Lock plate
(11) Washer
(12) Differential bevel pinion
(13) Differential bevel gear

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

10.TRANSFER AND EXTENSION CASE

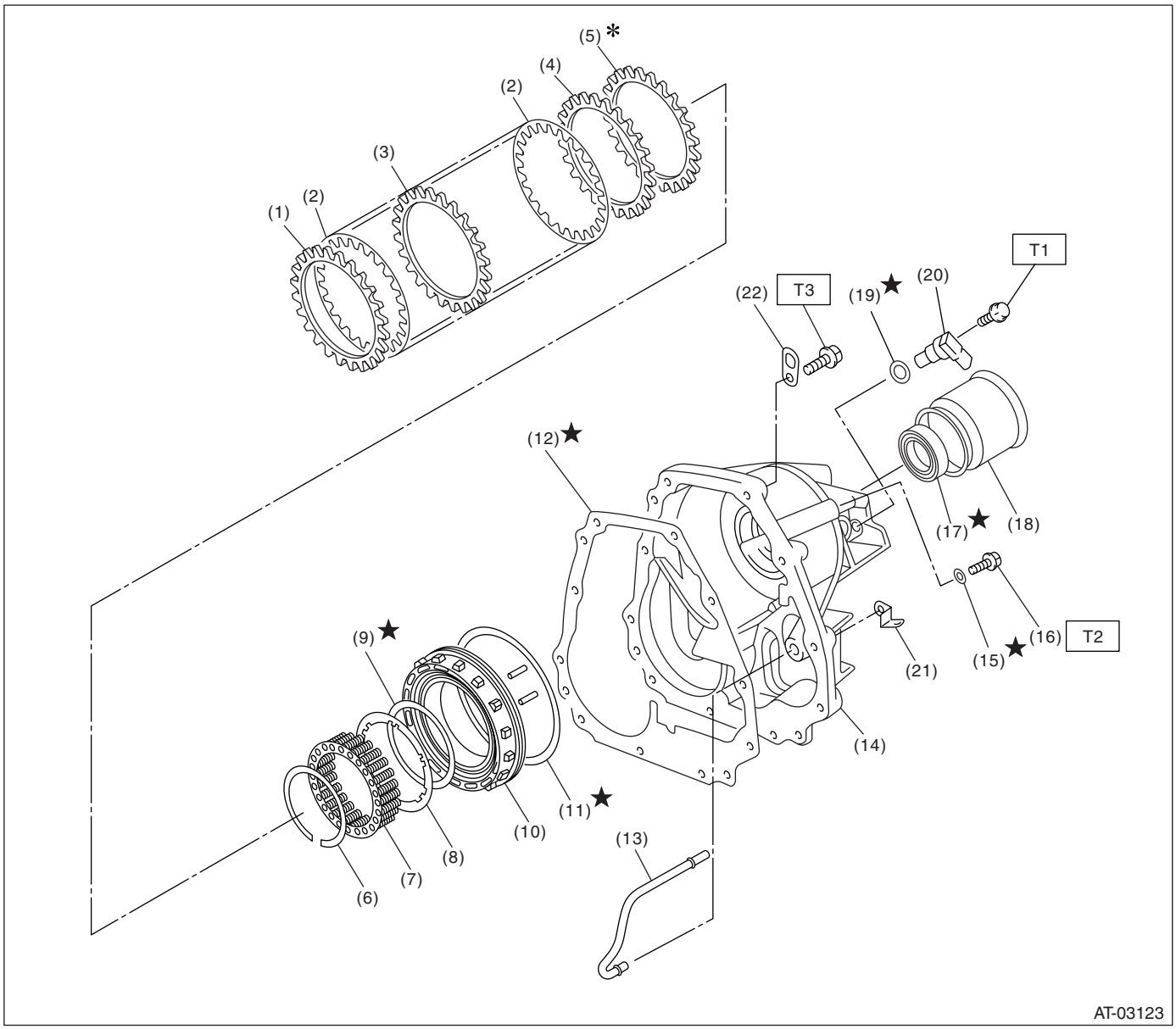
• MPT MODEL



(1) Thrust needle bearing
(2) Needle bearing
(3) Snap ring
(4) Pressure plate
(5) Drive plate
(6) Driven plate
(7) Retaining plate
(8) Snap ring
(9) Transfer clutch piston Seal
(10) Return spring
(11) Transfer clutch piston
(12) Rear drive shaft
(13) Ball bearing
(14) Seal ring
(15) Gasket
(16) Transfer clutch pipe
(17) Extension case
(18) Transmission hanger
(19) Oil seal
(20) Dust cover
(21) Test plug
(22) O-ring
(23) Clip (Turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 25 (2.5, 18.1)

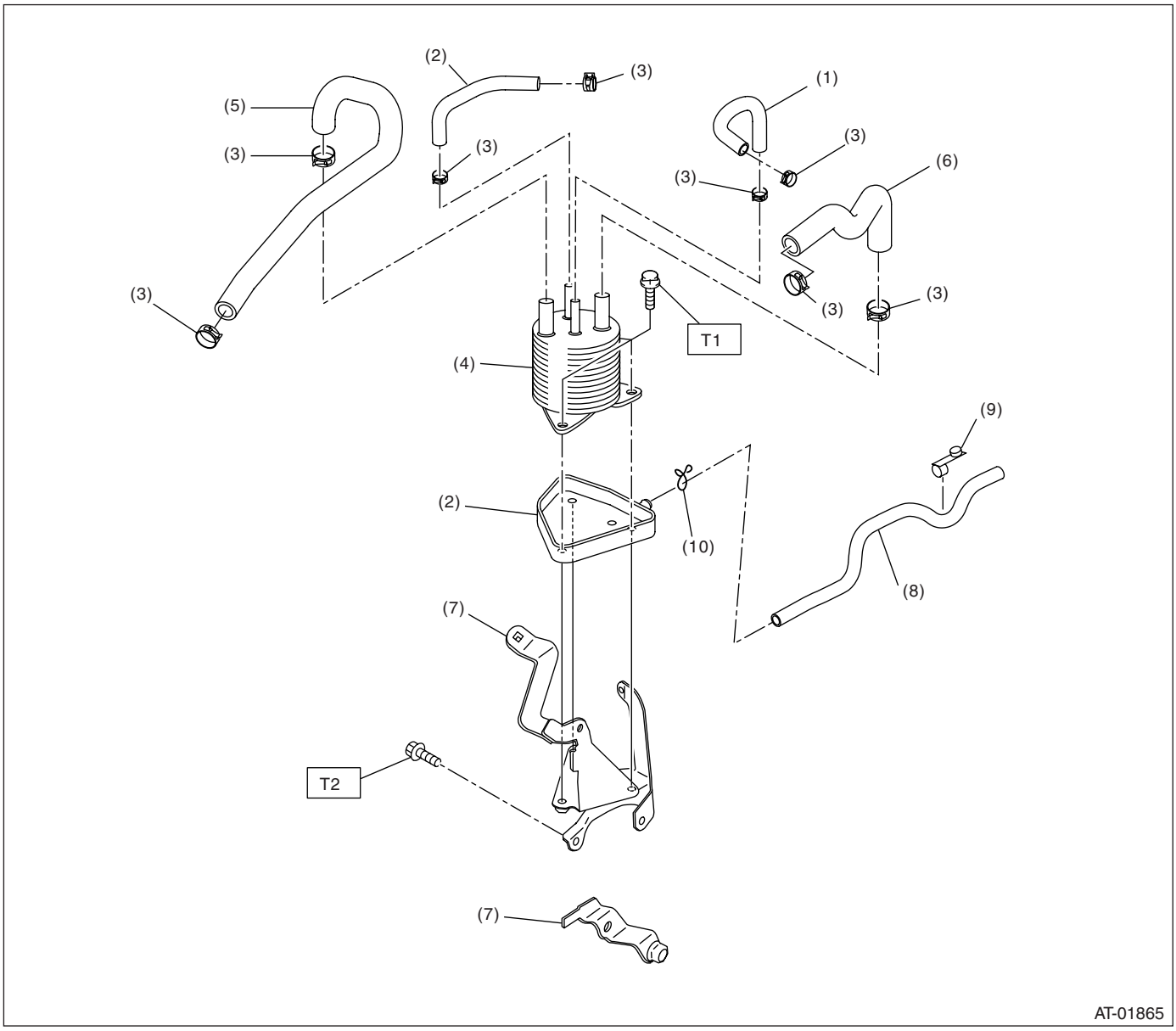
• VTD MODEL



(1) Driven plate (Thicker)
(2) Drive plate
(3) Driven plate (Thinner)
(4) Driven plate (Thicker)
(5) Adjust plate
(6) Snap ring
(7) Spring retainer
(8) Plate
(9) O-ring
(10) Multi-plate clutch (LSD) piston ASSY
(11) O-ring
(12) Gasket
(13) Multi-plate clutch (LSD) pipe
(14) Extension case
(15) O-ring
(16) Test plug
(17) Oil seal
(18) Dust cover
(19) O-ring
(20) Rear vehicle speed sensor
(21) Clip
(22) Hanger

Tightening torque: N·m (kgf-m, ft-lb)
T1: ***7 (0.7, 5.1)***
T2: ***13 (1.3, 9.4)***
T3: ***25 (2.5, 18.1)***

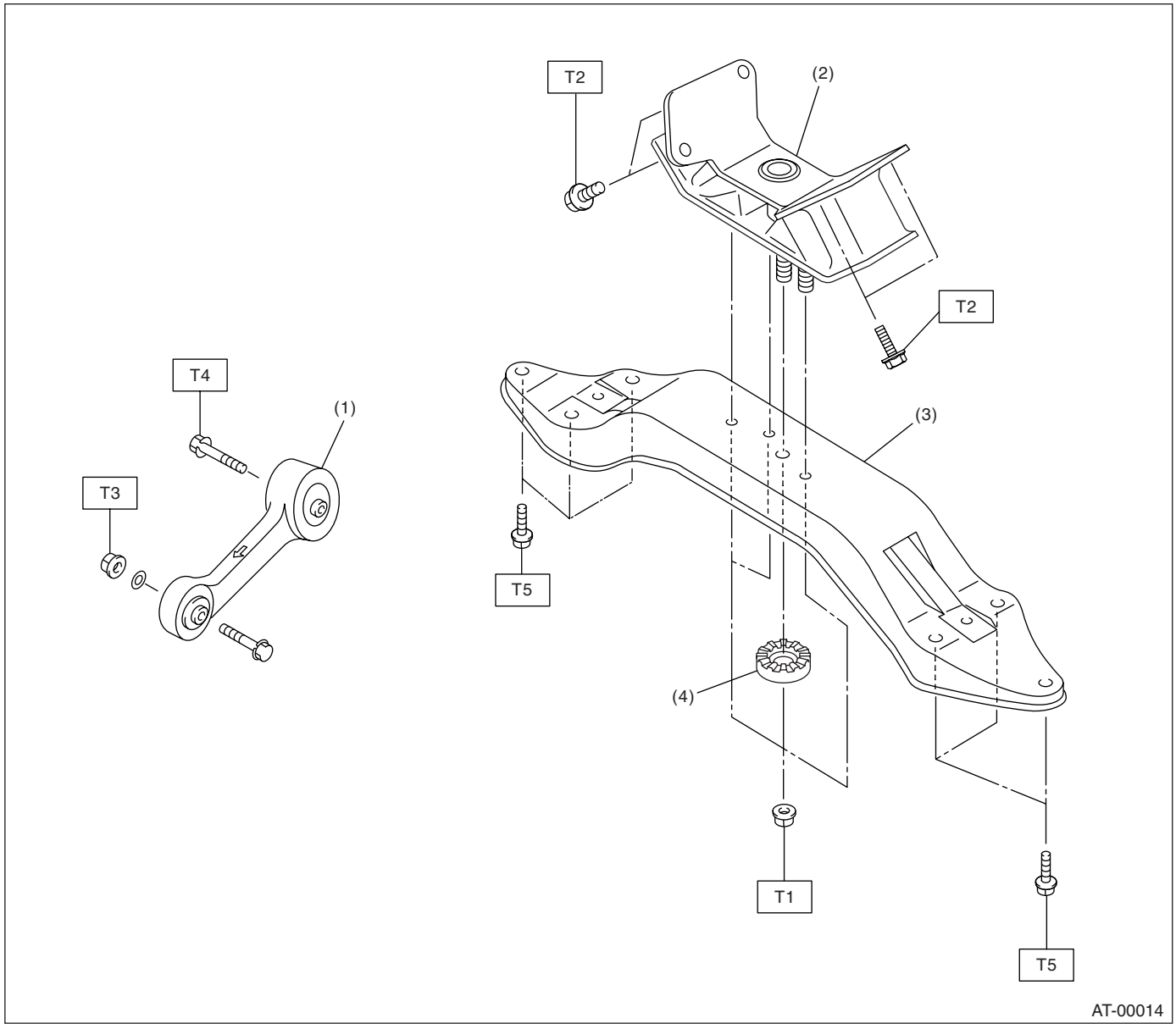
11.ATF COOLER (WITH WARMER FUNCTION)



(1) ATF cooler outlet hose
(2) ATF cooler inlet hose
(3) Hose clamp
(4) ATF cooler ASSY
(5) Engine coolant inlet hose
(6) Engine coolant outlet hose
(7) ATF cooler bracket
(8) Hose
(9) Clip
(10) Hose clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 23 (2.3, 17.0)
T2: 33 (3.4, 25)

12.TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Rear cushion rubber
(3) Transmission rear crossmember
(4) Stopper

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 26)
T2: 39 (4.0, 28.9)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 52)

C: CAUTION

• Wear work clothing, including a cap, protective goggles and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Until the oil pan is installed, do not place with the inside of oil pan facing up to prevent foreign matter from entering the valve body.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply gear oil or ATF onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of ATF to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOL

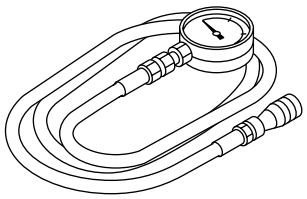
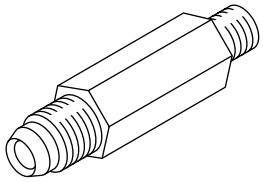
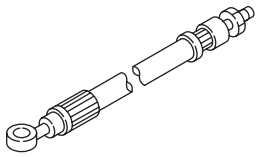
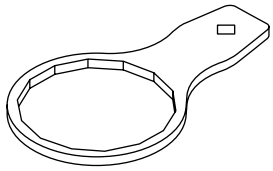
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498575400	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 ST-498897200	498897200	OIL PRESSURE GAUGE ADAPTER	Used for oil pump housing when measuring reverse clutch pressure and line pressure.
 ST-498897700	498897700	ADAPTER SET	Used for measuring transfer clutch pressure.
 ST-498545400	498545400	FILTER WRENCH	Used for removing and installing ATF filter.

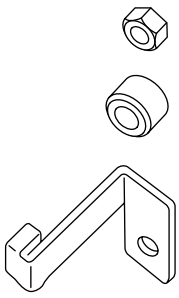
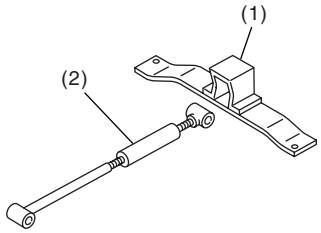
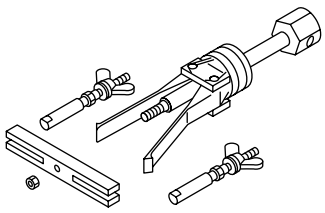
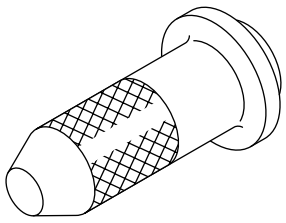
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498277200	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly.
 ST41099AC000	41099AC000	ENGINE SUPPORT ASSEMBLY	Used for supporting engine. (1) ENGINE SUPPORT BRACKET (41099AA010) (2) ENGINE SUPPORT (41099AA020)
 ST-398527700	398527700	PULLER ASSY	• Used for removing extension case roller bearing. • Used for removing extension oil seal. • Used for removing front differential side retainer bearing outer race. • Used for removing front differential side retainer oil seal.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.

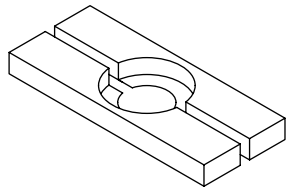
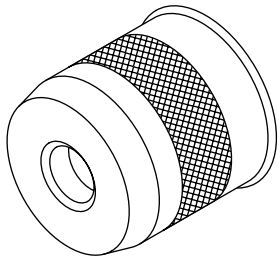
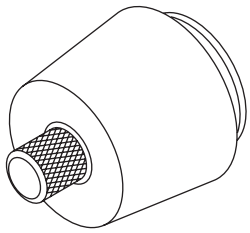
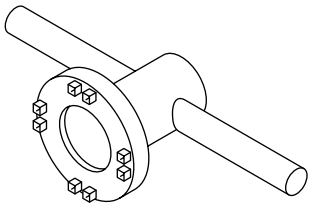
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077000	498077000	REMOVER	Used for removing differential taper roller bearing.
 ST-499247400	499247400	INSTALLER	• Used for installing transfer outer snap ring. • Used with GUIDE (499257300).
 ST-499257300	499257300	SNAP RING OUTER GUIDE	• Used for installing transfer outer snap ring. • Used with INSTALLER (499247400).
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.

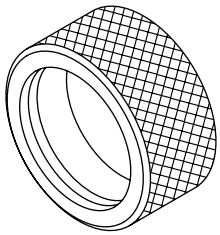
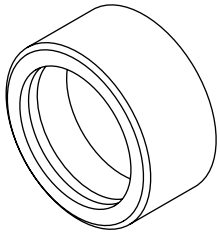
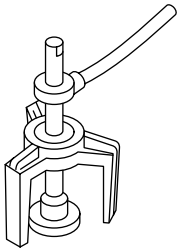
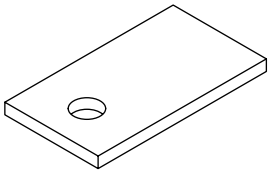
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398437700	398437700	DRIFT	Used for installing torque converter case oil seal.
 ST-398487700	398487700	INSTALLER	Used for installing front differential taper roller bearing.
 ST-398673600	398673600	COMPRESSOR	Used for removing and installing clutch spring.
 ST-498255400	498255400	PLATE	Used for measuring backlash of hypoid gear.

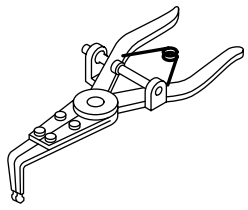
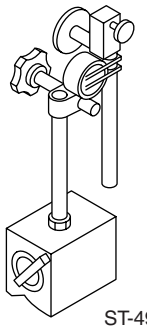
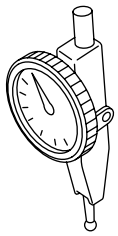
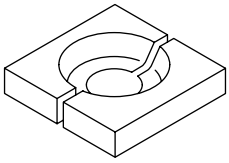
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399893600	399893600	PLIERS	Used for removing and installing clutch spring.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring gear backlash. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring gear backlash. • Used with MAGNET BASE (498247001).
 ST-498517000	498517000	REPLACER	Used for removing front roller bearing.

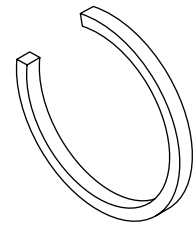
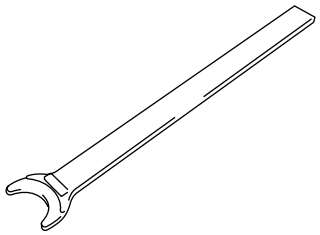
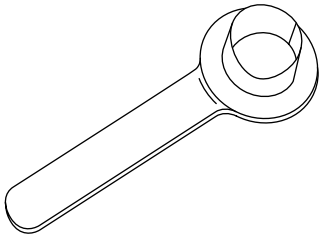
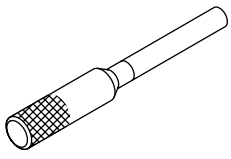
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398623600	398623600	SEAT	Used for removing spring of transfer clutch piston.
 ST28399SA000	28399SA000	DRIVE SHAFT REMOVER	Used for removing axle shaft.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	Used for installing axle shaft.
 ST-499267300	499267300	STOPPER PIN	Used for installing inhibitor switch.

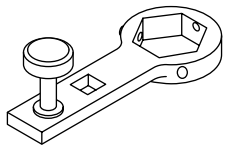
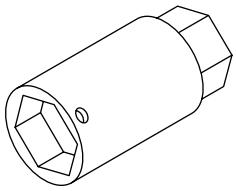
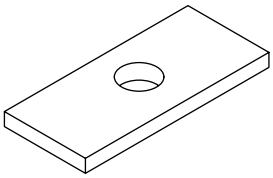
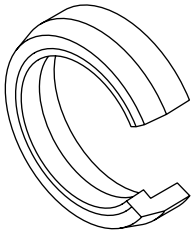
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787700	499787700	WRENCH	Used for removing and installing drive pinion lock nut.
 ST-499787500	499787500	ADAPTER	Used for removing and installing drive pinion lock nut.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-498627100	498627100	SEAT	Used for holding low clutch piston retainer spring when installing snap ring.

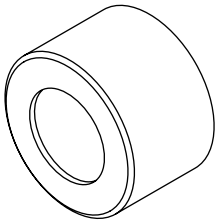
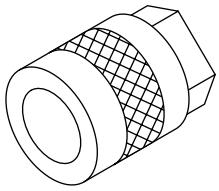
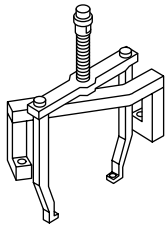
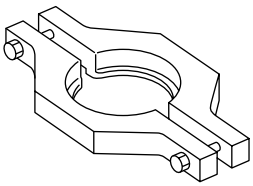
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499577000	499577000	GAUGE	Used for measuring mating surface of transmission to end of reduction gear.
 ST-499737000	499737000	PULLER	Used for removing reduction driven gear assembly.
 ST-499737100	499737100	PULLER SET	Used for removing reduction drive gear assembly.
 ST-498077600	498077600	REMOVER	Used for removing ball bearing.

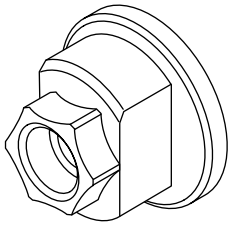
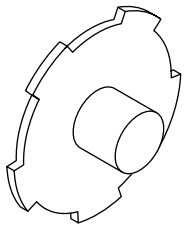
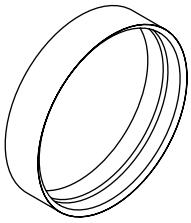
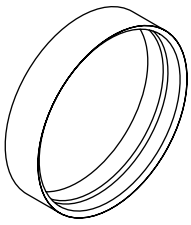
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937110	498937110	HOLDER	Used for removing and installing drive pinion lock nut.
 ST-498677100	498677100	COMPRESSOR	Used for installing 2-4 brake snap ring.
 ST-498437000	498437000	HIGH CLUTCH PISTON GUIDE	Used for installing high clutch piston.
 ST-498437100	498437100	LOW CLUTCH PISTON GUIDE	Used for installing low clutch piston.

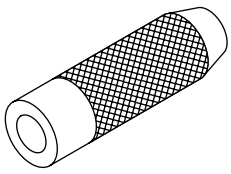
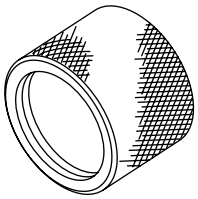
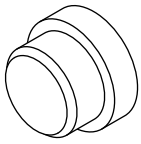
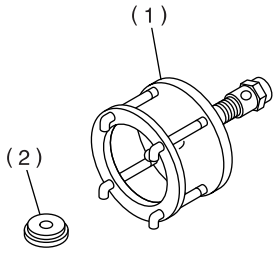
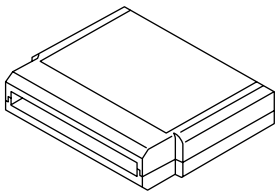
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	Used for press-fitting the ball bearing for transfer clutch.
 ST18675AA000	18675AA000	DIFFERENTIAL OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.
 ST-398497701	398497701	SEAT	Used for installing needle bearing.
 ST-899524100	899524100	PULLER SET	• Using the bolt only. (1) Bolt • Used with PULLER SET (499737100). • Used with PULLER (499737000). (1) Puller (2) Cap

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

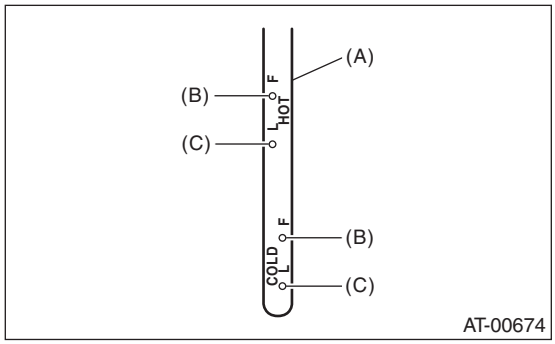
TOOL NAME	REMARKS
Depth gauge	Used for measuring transmission end play.
Thickness gauge	Used for measuring clearance of clutch, brake and oil pump.
Micro meter	Used for measuring thickness of drive pinion.
Spring balance	Used for measuring starting torque of drive pinion.
Circuit tester	Used for measuring resistance and voltage.
TORX® T70	Used for removing and installing differential gear oil drain plug.
Push/pull gauge	Used for measuring stroke of low & reverse piston.

2. Automatic Transmission Fluid

A: INSPECTION

NOTE:
The level of ATF varies with fluid temperature. Pay attention to the ATF temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on Subaru Select Monitor. <Ref. to 4AT(diag)-16, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
2) Make sure the vehicle is level.
3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in "P" range. Measure the ATF level with engine idling for one or two minutes.



(A) ATF level gauge
(B) Upper level
(C) Lower level

4) Make sure that ATF level is above the center of upper level and lower level at HOT side.
If the ATF level is below the lower level, check for leaks in the transmission. If there are leaks, it is necessary to repair or replace gasket, oil seals, plugs or other parts.
5) If the ATF level is below the center between upper level and lower level, add the recommended ATF until the fluid level is found above the center between upper level and lower level marks.

CAUTION:
• Use care not to exceed the upper level.
• Remember that the addition of ATF to the upper limit mark when the transmission is cold will overfilling of ATF, causing a transmission failure.

6) Check ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.

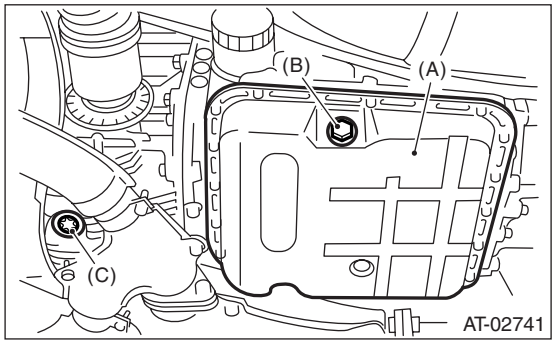
B: REPLACEMENT

1) Lift-up the vehicle.
2) Drain the ATF completely.

CAUTION:
Directly after the engine has been running, the ATF is hot. Be careful not to burn yourself.

3) Replace the gasket with new one, and then tighten the drain plug (ATF).

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

4) Lower the vehicle.
5) Pour ATF from the oil charge pipe.

Recommended fluid:
EC, EK, EH model
SUBARU ATF (Part No. K0410Y0700) or IDEMITSU "Apoloil ATF HP", Castrol "Transmax J".

NOTE:
If it is impossible to get the ATF above, use the DEXRON III.

Except for EC, EK, EH model
SUBARU ATF (Part No. K0410Y0700) or IDEMITSU "Apoloil ATF HP", Castrol "Transmax J", DEXRON III.

Capacity:
Fill the same amount of ATF drained from drain plug hole.

Capacity when transmission is overhauled:
2.0 L Non-turbo model
8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)
Except for 2.0 L Non-turbo model
9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

6) Check the level and leaks of ATF.
<Ref. to 4AT-32, INSPECTION**, Automatic Transmission Fluid.>**
7) Bleed the air of control valve.
<Ref. to 4AT-75, Air Bleeding of Control Valve.>

8) Check the level and leaks of ATF.
<Ref. to 4AT-32, INSPECTION**, Automatic Transmission Fluid.>**

C: CONDITION CHECK

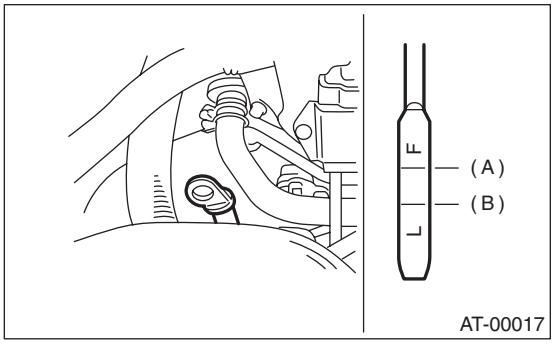
NOTE:
When replacing ATF, check the inside condition of the transmission body by inspecting the drained ATF.

Fluid condition	Trouble and possible cause	Corrective action
Large amount of metallic pieces are found.	Excessive wear of the internal of the transmission body.	Replace ATF and check if AT operates correctly.
Thick and varnish-form fluid.	Burned clutch and etc.	Replace ATF and check AT itself and vehicle for faulty.
Clouded fluid or bubbles are found in fluid.	Water mixed in fluid.	Replace ATF and check the water entering point.

3. Differential Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
4) Remove the oil level gauge again, and check the level. If the differential gear oil level is below the “L” line, add oil to bring the level up to the “F” line.
5) To prevent overfilling the differential gear oil, do not add oil above the “F” line.



(A) Upper level
(B) Lower level

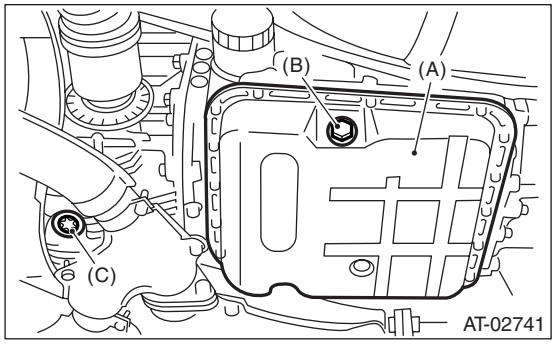
B: REPLACEMENT

1) Lift-up the vehicle.
2) Remove the differential gear oil drain plug using TORX® BIT T70, and drain the differential gear oil completely.

CAUTION:
• Directly after driving the vehicle, the differential gear oil is hot. Be careful not to burn yourself.
• Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. When the differential gear oil is spilled on exhaust pipe, wipe it away completely.

3) Replace the gasket with new ones, and then tighten the differential gear oil drain plug using TORX® BIT T70.

Tightening torque:
Copper gasket
70 N·m (7.1 kgf-m, 52 ft-lb)
Aluminum gasket
44 N·m (4.5 kgf-m, 33 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

4) Lower the vehicle.
5) Pour differential gear oil into the differential from gauge hole.

Recommended gear oil:
Use GL-5 (SAE: 75 W-90) or equivalent.

Differential gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

6) Check the level of the differential gear oil.
<Ref. to 4AT-35, INSPECTION, Differential Gear Oil.>

4. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of the automatic transmission.

NOTE:
When performing the test, do not exceed posted speed limit.

2. D RANGE SHIFT FUNCTION

Check shifting between 1st ←→ 2nd ←→ 3rd ←→ 4th while driving on normal city streets.

3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

4. KICK-DOWN FUNCTION

Check kick-down for each gear. Also check the kick-down shock level.

5. ENGINE BRAKE OPERATION

• Check the 3rd gear engine brake when shifting down from D ←→ 3rd range while driving in 4th gear of D range [50 — 60 km/h (31 — 37 MPH)].
• Check the 2nd gear engine brake when shifting between 3rd ←→ 2nd range while driving in the 3rd range of 3rd gear [40 — 50 km/h (25 — 31 MPH)].
• Check the 1st gear engine brake when shifting between 2nd ←→ 1st range while driving in the 2nd range of 2nd gear [20 — 30 km/h (12 — 19 MPH)].

6. LOCK-UP FUNCTION

• Check that rpm does not change sharply when the axle pedal is lightly depressed when driving on flat roads at 60 km/h (37 MPH).
• Check slip lock-up with following procedure. Subaru Select Monitor is needed for checking (EC, EK model).
Before start checking, check that the DTC is not existed using Subaru Select Monitor. When the DTC is existed, perform the collective action with DTC and check that the DTC is not existed again, and then start the checking.
1) The check performed on flat and straight road or free roller.

NOTE:
• Slip lock-up does not operate when the vehicle is lifted up, because of not occurring surface resistance.
• Also checking on the free roller, check with depressing foot brake lightly to make the checking easier, because the surface resistance will be deficient

2) Connect the Subaru Select Monitor.
3) Check ATF temperature using Subaru Select Monitor.

NOTE:
• ATF temperature is between 50 — 100°C (122 — 212°F).
• When the temperature is low, warm-up the ATF by running the vehicle or etc.

4) Start the engine, and make the lock-up duty be able to read on data display of Subaru Select Monitor.
5) 35 — 40 Drive the vehicle at a constant speed of 35 — 40 km/h (22 — 25 MPH).
6) Read the lock-up duty while vehicle is running.

Standard value:
25 — 45%

NOTE:
On the free roller, the value sometimes lowers.
• Slip lock-up control is not operating when the lock-up duty is less than 5%, or when the lock-up duty goes down immediately after starts rise. On these cases, improper ATF or deterioration of ATF may be the cause. Check the amount of ATF or replace them, and then recheck it.

7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to “P” range. Check that the vehicle does not move when the parking brake is released.

8. NOISE AND VIBRATION

Check for unusual sounds and vibration while driving and during shifting.

9. CLIMBING CONTROL FUNCTION

• Check that the gear remains in 3rd when going up a grade.
• Check that the gear remains in 3rd when applying the brakes while going down a grade.

10.TRANSFER CLUTCH

Check tight corner braking when the vehicle started with steering fully turned.

11.OIL LEAKS

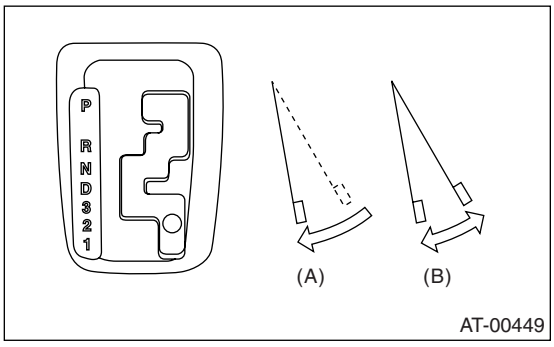
After the driving test, inspect for oil leaks.

5. Stall Test

A: INSPECTION

NOTE:
The stall test is of extreme importance in diagnosing the condition of the automatic transmission and the engine. It should be conducted to measure the engine stall speeds in “R” and “2” ranges (when HOLD switch is ON).
Purposes of the stall test:
• To check the operation of the automatic transmission clutch.
• To check the operation of the torque converter clutch.
• To check engine performance.

1) Check that the throttle valve opens fully.
2) Check that the engine oil level is correct.
3) Check that the coolant level is correct.
4) Check that the ATF level is correct.
5) Check that the differential gear oil level is correct.
6) Increase ATF temperature to 70 — 80°C (158 — 176°F) by idling the engine for approximately 30 minutes (with select lever set to “N” or “P”).
7) Place the wheel chocks at the front and rear of all wheels and engage the parking brake.
8) Shift the manual linkage to ensure it operates properly, then shift the select lever to the “2” range and turn the HOLD switch to ON.
9) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.



(A) Brake pedal
(B) Accelerator pedal

10) When the engine speed is stabilized, record that speed quickly and release the accelerator pedal.
11) Shift the select lever to “N” range, and cool down the engine by idling it for more than one minute.
12) If the stall speed in “2” range (with HOLD switch ON) is higher than specifications, low clutch slipping and “2-4 brake slipping” may occur. To identify it, conduct the same test as above in “R” range.
13) Perform the stall tests with the select lever in the “D” range.

NOTE:
• Do not continue the stall test for more than five seconds at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.
• Be sure to cool down the engine for at least one minute after each stall test with the select lever set in the “P” or “N” range and with the idle speed lower than 1,200 rpm.
• If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Stall speed (at sea level):
2.0 L NON-TURBO MODEL:
2,000 — 2,500 rpm
2.0 L TURBO MODEL:
2,500 — 3,000 rpm
2.5 L NON-TURBO MODEL:
2,200 — 2,700 rpm
2.5 L TURBO MODEL:
2,700 — 3,200 rpm

Stall Test

Stall speed (at sea level)	Range	Cause
Less than standard	2 (Hold switch ON), R	• Throttle valve not fully open • Erroneous engine operation • Torque converter clutch's one-way clutch slipping
More than standard	D	• Line pressure is too low • Low clutch slipping • One-way clutch malfunctioning
	R	• Line pressure is too low • Reverse clutch slipping • Low & reverse brake slipping
	2 (HOLD switch ON)	• Line pressure is too low • Low clutch slipping • 2-4 brake slipping

6. Time Lag Test

A: INSPECTION

NOTE:
If the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the low clutch, reverse clutch, low & reverse brake and one-way clutch.

- Perform the test at normal operation fluid temperature 70 — 80°C (158 — 176°F).
- Be sure to allow a one minute interval between tests.
- Perform measurement for three times and take the average value.

1) Fully apply the parking brake.
2) Start the engine.
Check the idling speed (A/C OFF).
3) Shift the select lever from “N” to “D” range.
Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds
If “N” → “D” time lag is longer than specified:

- Line pressure too low
- Low clutch worn
- One-way clutch not operating properly
- D-ring worn

4) In the same manner, measure the time lag for “N” → “R”.
Time lag: Less than 1.5 seconds
If “N” → “R” time lag is longer than specified:

- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn
- D-ring worn

7. Line Pressure Test

A: MEASUREMENT

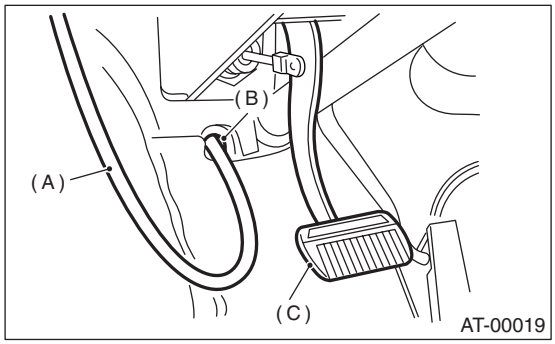
NOTE:
If the clutch or the brake shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

• Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.

• Slippage or inability to operate the vehicle may, in most cases, be due to insufficient oil pressure for the operation of the clutch, brake or control valve.

1) Line pressure measurement (under no load):
   (1) Before measuring line pressure, jack-up all wheels.
   (2) Maintain the temperature of ATF at approx. 70 — 80°C (158 — 176°F) during measurement. (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)
2) Line pressure measurement (under heavy load):
   (1) Before measuring line pressure, apply both foot and parking brakes with all wheels chocked (Same as for “stall” test conditions).
   (2) Measure the line pressure when the select lever is in “D”, “2” (HOLD switch ON) with engine under stall conditions.
   (3) Measure the line pressure within 5 seconds after shifting the select lever to each position. (If the line pressure needs to be measured again, allow the engine to idle and cool it down more than 1 minute.)
   (4) Maintain the ATF temperature at approx. 70 — 80°C (158 — 176°F) during measurement. (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)
3) Temporarily attach the ST to a suitable place in the driver’s compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to the engine compartment.

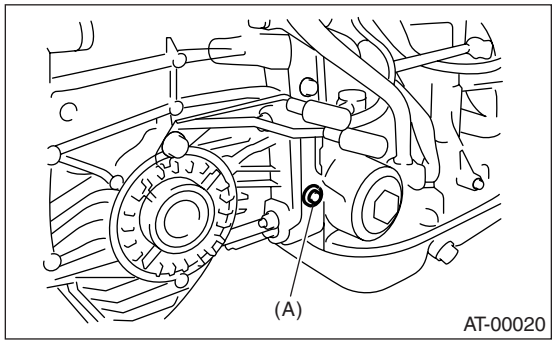
ST 498575400 OIL PRESSURE GAUGE ASSY



(A) Pressure gauge hose
(B) Hole in toe board (blank cap hole)
(C) Brake pedal

4) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



(A) Test plug

5) Connect ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER
ST2 498575400 OIL PRESSURE GAUGE ASSY

6) Check for duty ratio changes by opening and closing the throttle valve using the Subaru Select Monitor.

- Non-turbo model

Standard line pressure			
Range position	Line pressure duty ratio (%)	Acceleration opening angle (%)	Line pressure kPa (kgf/cm^2, psi)
2 (HOLD switch ON)	5	100 (Fully opens)	1,130 — 1,275 (11.5 — 13.0, 164 — 185)
R	5	100 (Fully opens)	1,520 — 1,716 (15.5 — 17.5, 220 — 249)
D	95	0 (Fully closed)	300 — 410 (3.1 — 4.2, 44 — 60)

- Turbo model

Standard line pressure			
Range position	Line pressure duty ratio (%)	Acceleration opening angle (%)	Line pressure kPa (kgf/cm^2, psi)
2 (HOLD switch ON)	(25 — 35)	100 (Fully opens)	1,000 — 1,300 (10.2 — 13.3, 145 — 189)
R	(15 — 25)	100 (Fully opens)	1,500 — 1,850 (15.3 — 18.9, 218 — 268)
D	(35 — 43)	0 (Fully closed)	500 — 800 (5.1 — 8.2, 73 — 116)

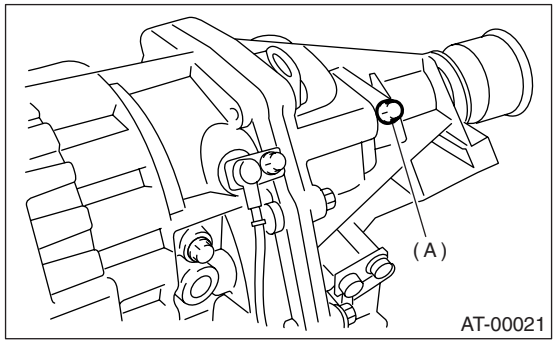
8. Transfer Clutch Pressure Test

A: INSPECTION

Check the transfer clutch pressure in accordance with the following steps in the same manner as with line pressure. <Ref. to 4AT-40, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET
ST 498575400 OIL PRESSURE GAUGE ASSY

NOTE:
• Before setting in FWD mode, install the spare fuse on FWD mode switch. (MPT model (without VDC))



(A) Test plug

• If the oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If the oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

• Turbo model

Range position	ON Duty ratio (%)	Acceleration pedal position (%)	Standard transfer clutch pressure kPa (kgf/cm^2, psi)	
			AWD mode	★FWD mode
2 range hold switch ON	95	Fully opened: 100	1,000 — 1,200 (10.2 — 12.2, 145 — 174)	—
	60	Adjust ON Duty ratio to 60%.	500 — 700 (5.1 — 7.1, 73 — 102)	—
	—	Fully closed: 0	—	0 (0, 0)
N or P	5	Fully closed: 0	0	—

★: MPT model (without VDC)

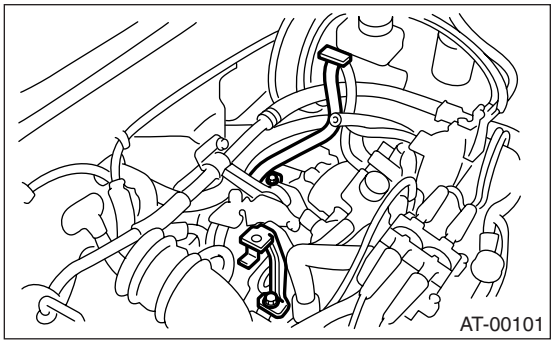
• Non-turbo model

Range position	ON Duty ratio (%)	Acceleration opening angle (%)	AWD mode Transfer clutch pressure (kPa (kgf/cm^2, psi))	FWD mode Transfer clutch pressure (kPa (kgf/cm^2, psi))
2	95	100 (Fully opens)	910 — 1,070 (9.3 — 10.9, 132 — 155)	—
2	60	Adjust ON Duty ratio to 60%.	410 — 490 (4.2 — 5.0, 59 — 71)	—
N or P	5	0 (Fully closed)	0	—
2	5	0 (Fully closed)	—	0

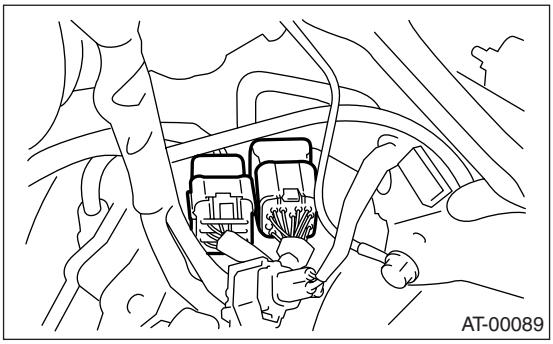
9. Automatic Transmission Assembly

A: REMOVAL

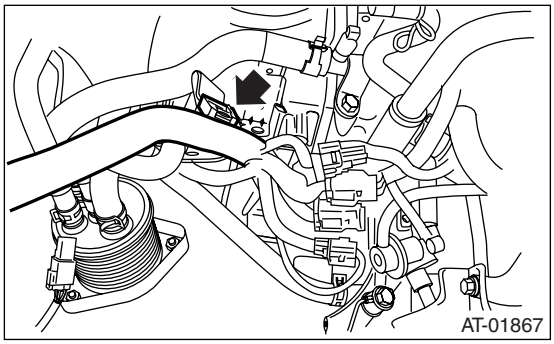
1) Set the vehicle on a lift.
2) Fully open the front hood and support with the hood stay.
3) Disconnect the ground cable from battery.
4) Remove the resonator chamber. (Non-turbo model)
<Ref. to IN(H4SO)-8, REMOVAL, Resonator Chamber.>
5) Remove the air cleaner case or air intake chamber. (Non-turbo model)
<Ref. to IN(H4SO)-6, REMOVAL**, Air Cleaner Case.>**
6) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
7) Remove the air cleaner case stay. (Non-turbo model)



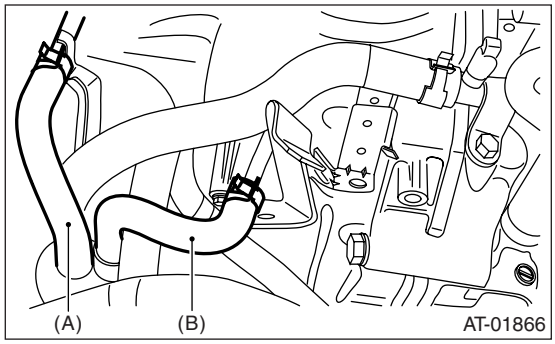
8) Disconnect the following connectors.
(1) Transmission harness connectors



(2) Transmission ground terminal
9) Remove the starter.
<Ref. to SC(H4SO)-6, REMOVAL**, Starter.>**
10) Remove the harness from bracket. (with ATF cooler (with warmer function))

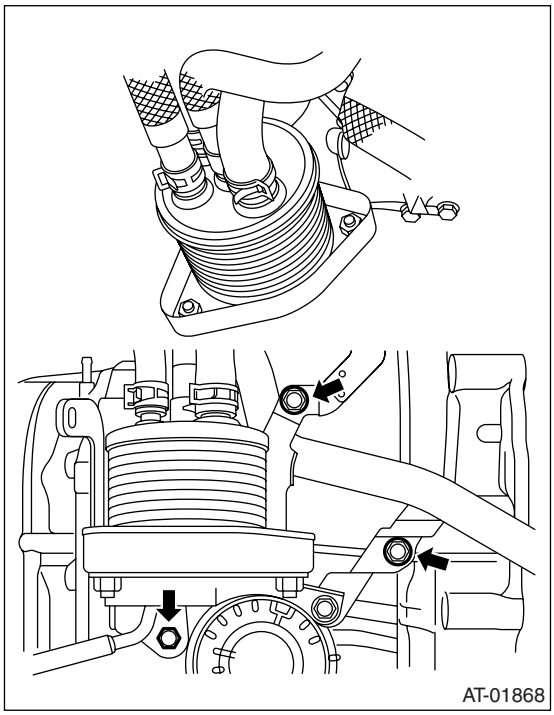


11) Disconnect the ATF cooler hoses from pipes of transmission side, and then remove the oil charge pipe. (with ATF cooler (with warmer function))

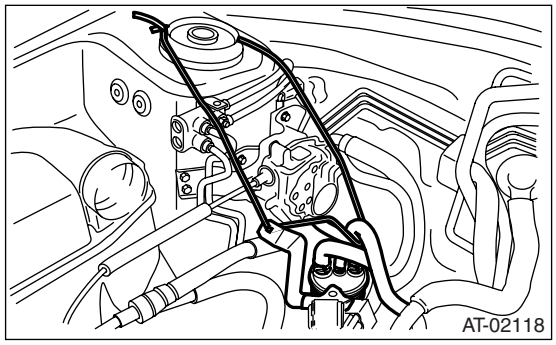


(A) Inlet hose
(B) Outlet hose

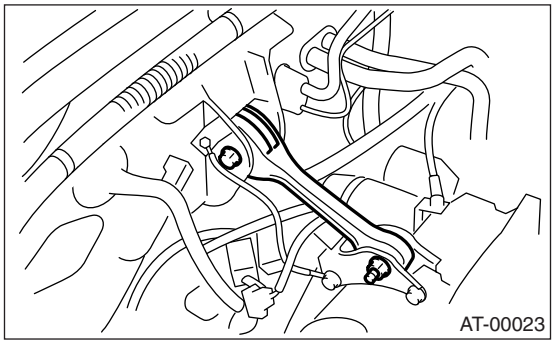
12) Remove the ATF cooler from the transmission body. (with ATF cooler (with warmer function))



13) Disconnect the hose from lower portion of ATF cooler (with warmer function), and then secure the ATF cooler to vehicle using string, etc.



14) Remove the pitching stopper.



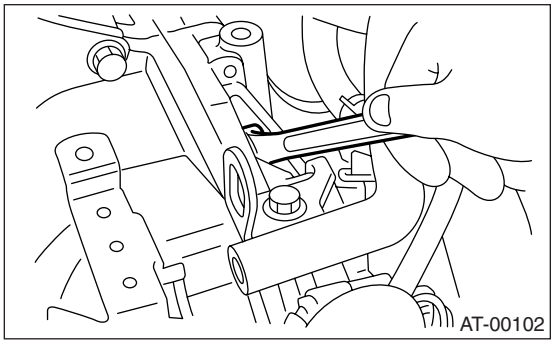
15) Separate the torque converter clutch assembly from drive plate.

(1) Remove the service hole plug.

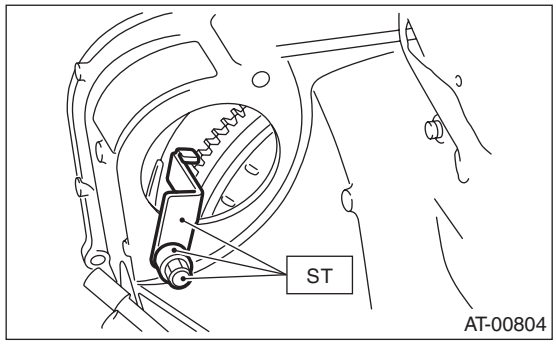
(2) Remove the bolts which hold torque converter clutch assembly to drive plate.

(3) Using ST, remove all bolts with slightly rotating crank sprocket.

CAUTION:
Be careful not to drop bolts into torque converter clutch housing.

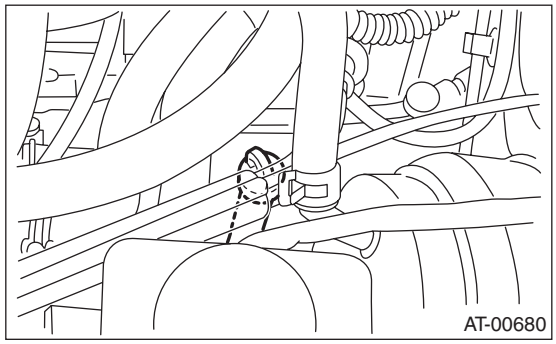


16) Install the ST to converter case.
ST 498277200 STOPPER SET

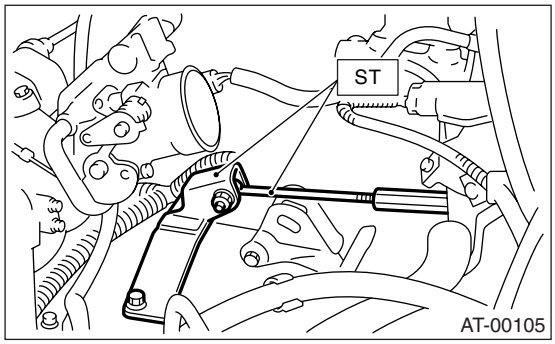


17) Remove the ATF level gauge.

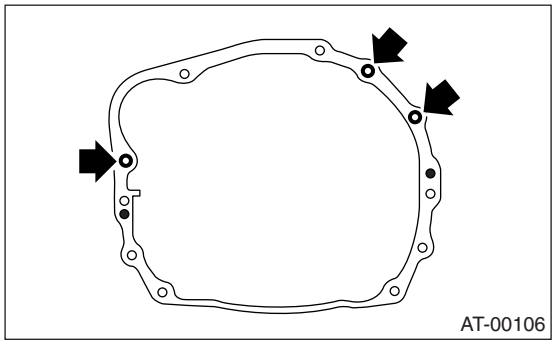
CAUTION:
Plug the opening to prevent entering foreign particles into transmission fluid.



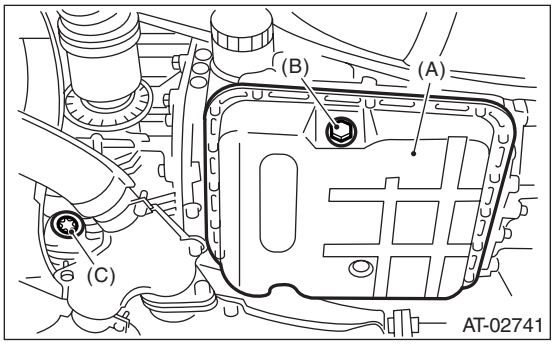
18) Set ST.
ST 41099AC000 ENGINE SUPPORT ASSEMBLY



19) Remove the bolts which hold right upper side of transmission to engine.

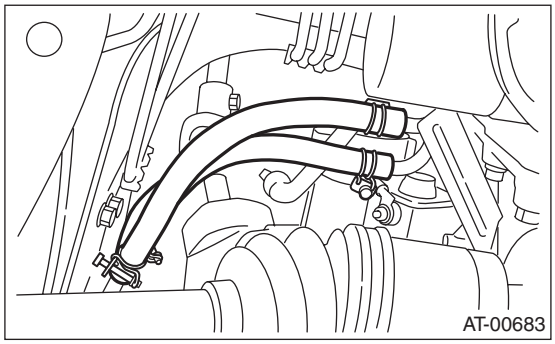


20) Lift-up the vehicle.
21) Remove the under cover.
22) Remove the front, center, rear, exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL**, Front Exhaust Pipe.>** <Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
23) Remove the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
24) Remove the heat shield cover. (If equipped)
25) Remove the drain plug (ATF) to drain ATF.

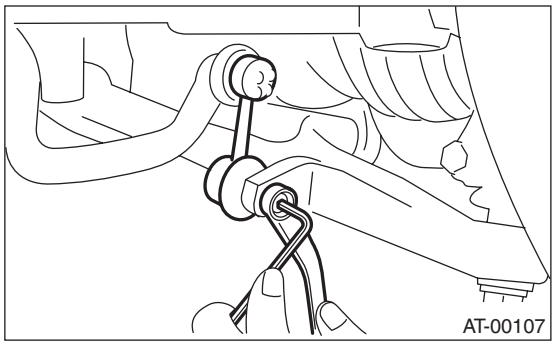


(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

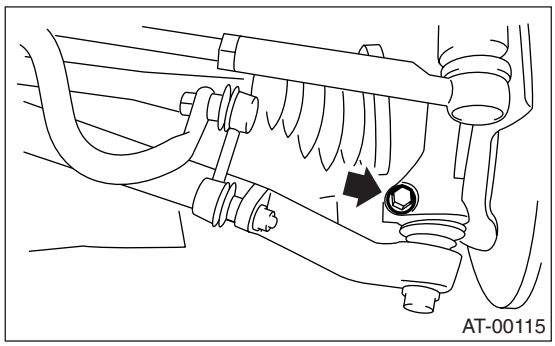
26) Disconnect the ATF cooler hoses from pipes of transmission side, and remove the ATF level gauge guide. (without ATF cooler (with warmer function))



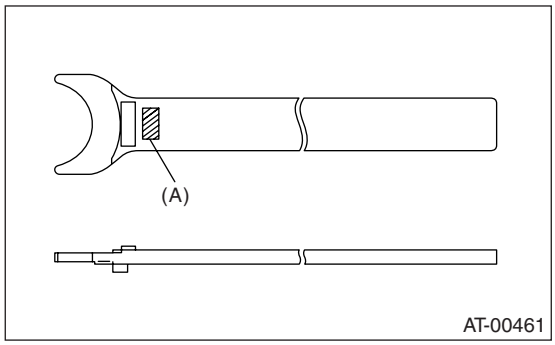
27) Remove the propeller shaft.
<Ref. to DS-15, REMOVAL, Propeller Shaft.>
28) Remove the shift select cable.
<Ref. to CS-31, REMOVAL, Select Cable.>
29) Disconnect the stabilizer link from the transverse link.



30) Remove the bolt securing ball joint of transverse link to housing.



31) Pull out the front drive shaft from transmission.
(1) Face the letter of “AT” to the transmission side.
ST 28399SA000 DRIVE SHAFT REMOVER

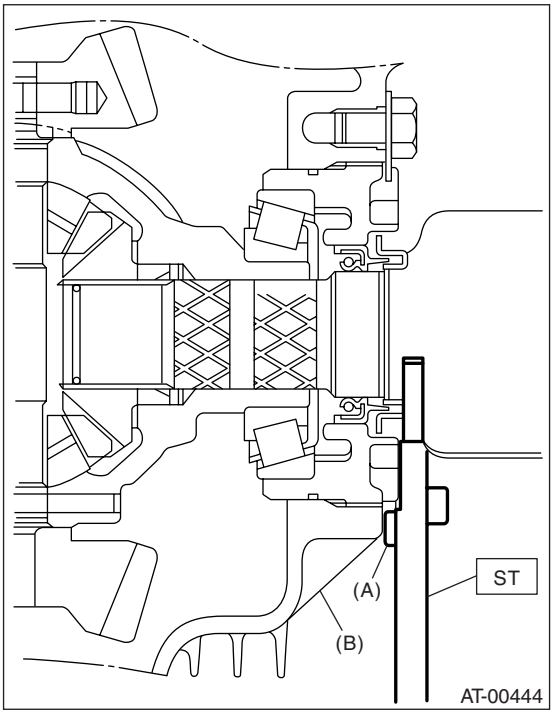


(A) Letter “AT”

(2) Insert ST between the transmission and front drive shaft.

NOTE:
Set the protrusion portion of ST to the torque converter clutch housing.

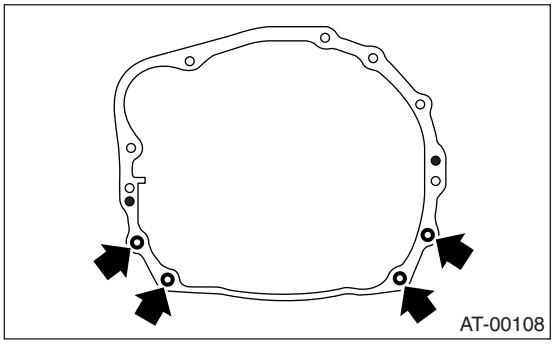
ST 28399SA000 DRIVE SHAFT REMOVER



(A) Protrusion portion of ST
(B) Converter case

(3) Hold the joint portion of front drive shaft (AARi) by hand and extract the housing from the transmission by pressing it outside.

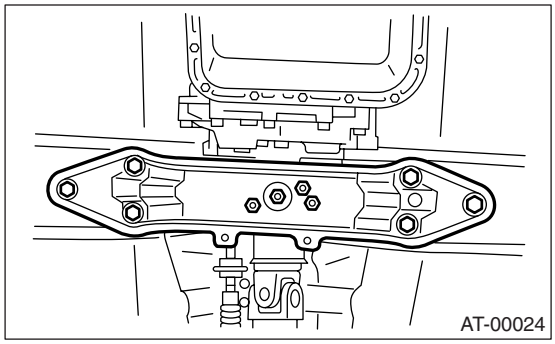
32) Remove the bolts which hold lower side of transmission to engine.



33) Place the transmission jack under transmission.

NOTE:
Make sure that the support plates of transmission jack don't touch the oil pan.

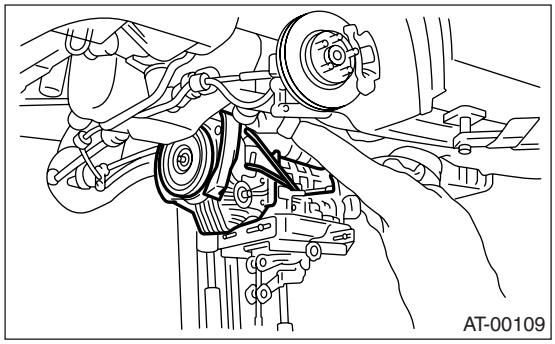
34) Remove the transmission rear crossmember from the vehicle.



35) Slightly lowering the transmission jack, fully contract the engine support and tilt the engine backward.

36) Remove the transmission.

CAUTION:
Remove the transmission and torque converter as a unit from the engine.



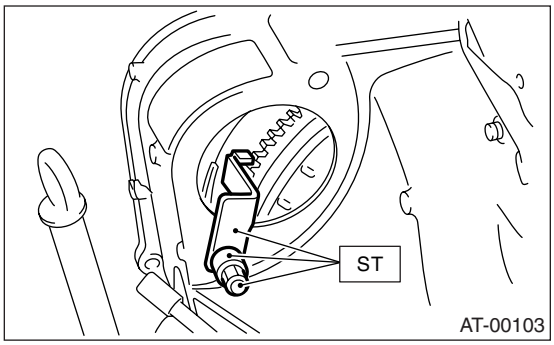
37) Remove the rear cushion rubber from transmission.

B: INSTALLATION

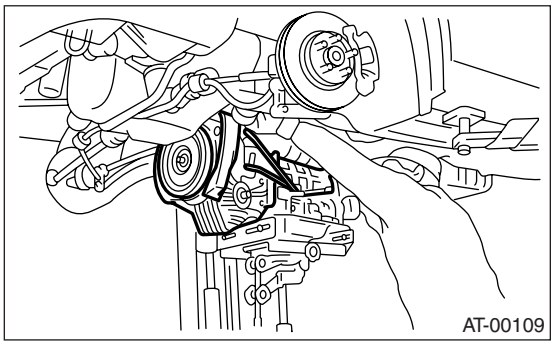
1) Replace the differential side oil seal with a new one. <Ref. to 4AT-54, REPLACEMENT, Differential Side Retainer Oil Seal.>
2) Install the rear cushion rubber to the transmission.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

3) Install the ST to converter case.
ST 498277200 STOPPER SET

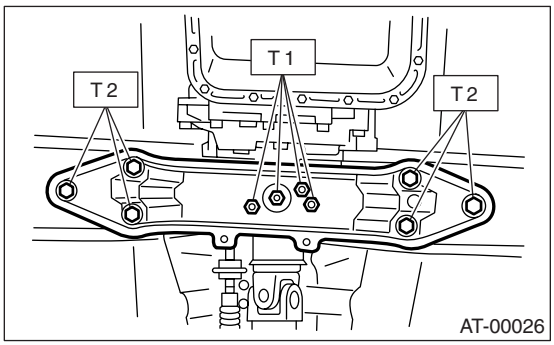


4) Install the transmission onto the engine.
(1) Lift up the transmission gradually using a transmission jack.



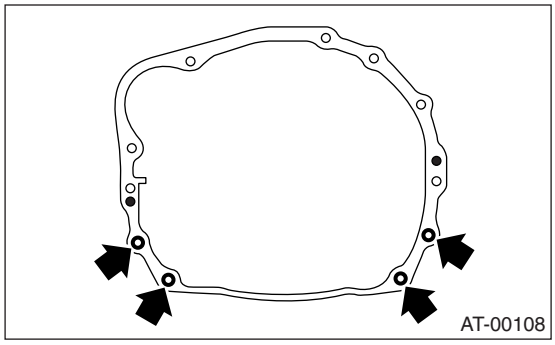
(2) Engage them at splines.
(3) Slightly raising the transmission jack, turn the screws of engine support and tilt the engine forward.
5) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 52 ft-lb)



6) Take off the transmission jack.
7) Tighten the bolts which hold lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

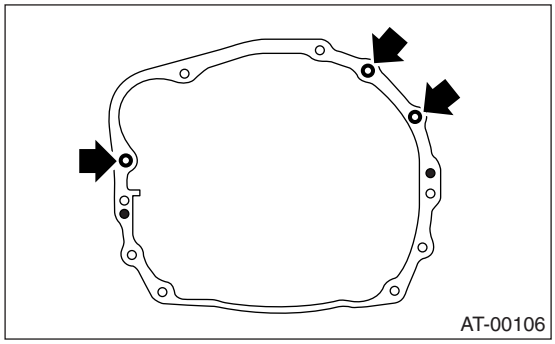


8) Lower the lift.
9) Connect the engine and transmission.
(1) Remove the ST from converter case.

NOTE:
When removing ST, be careful not to drop it into converter case.

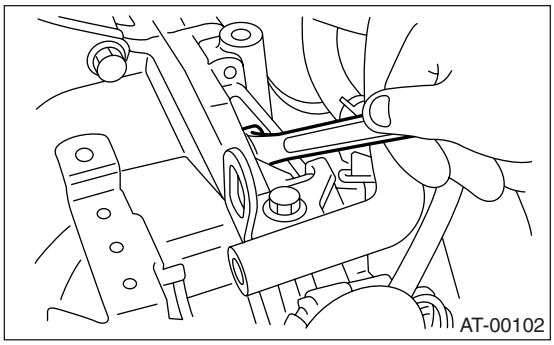
ST 498277200 STOPPER SET
(2) Install the starter.
<Ref. to SC(H4SO)-6, INSTALLATION**, Starter.>**
(3) Tighten the bolts which hold right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)



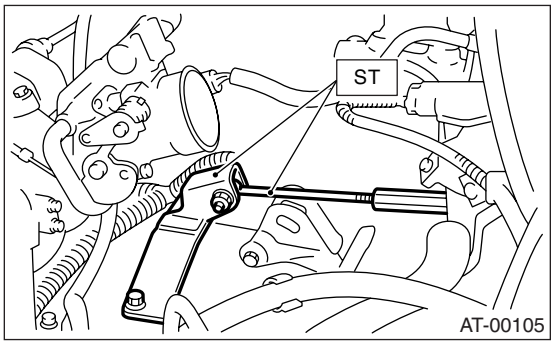
10) Install the torque converter clutch assembly to drive plate.
(1) Tighten the bolts which hold torque converter clutch assembly to drive plate.
(2) Using ST, remove all bolts with slightly rotating crank sprocket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



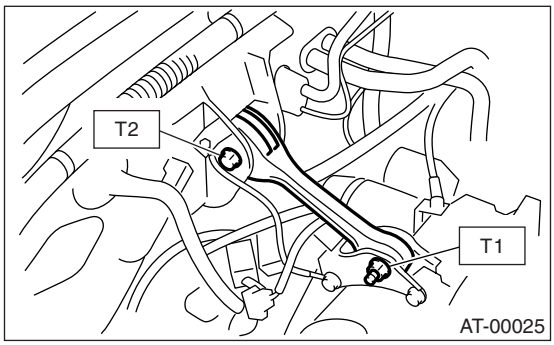
(3) Fit the plug to the service hole.

11) Remove the ST.

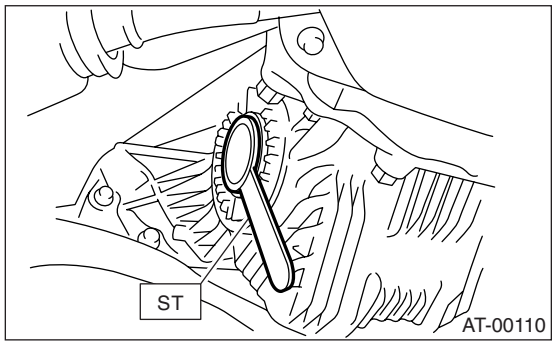


12) Install the pitching stopper.

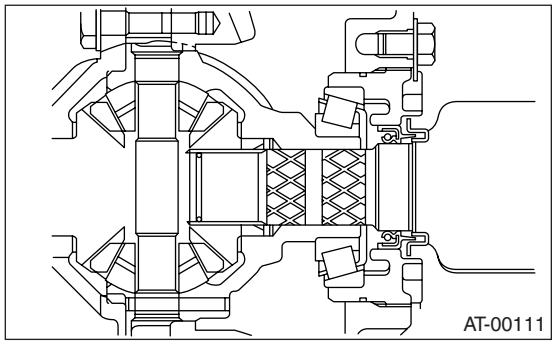
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



13) Lift-up the vehicle.
14) Replace the snap ring of front drive shaft with a new one.
15) Apply grease to the oil seal lips.
16) Install ST to side retainer.
ST 28399SA010 OIL SEAL PROTECTOR

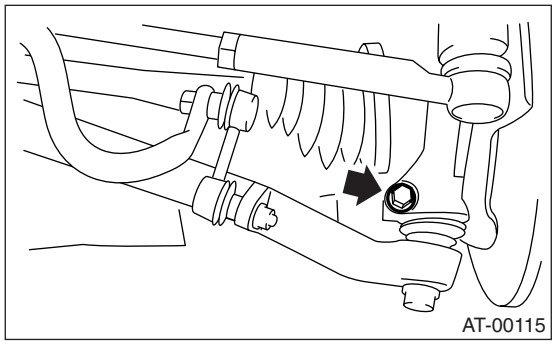


17) Align the serration of front differential shaft to that of differential bevel gear for insertion, and remove them using ST.
ST 28399SA010 OIL SEAL PROTECTOR
18) Insert the front drive shaft into transmission securely by pressing the front housing.



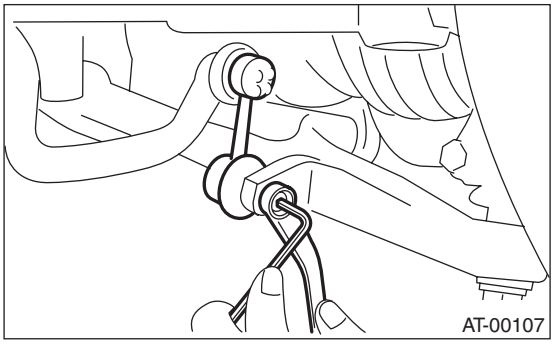
19) Install the ball joint onto front housing.
20) Tighten the attachment bolts.

Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)

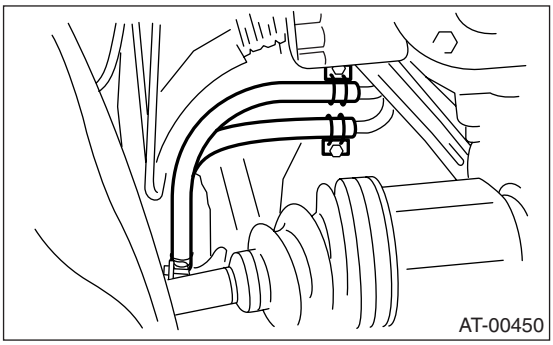


21) Install the stabilizer link from the transverse link.

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)



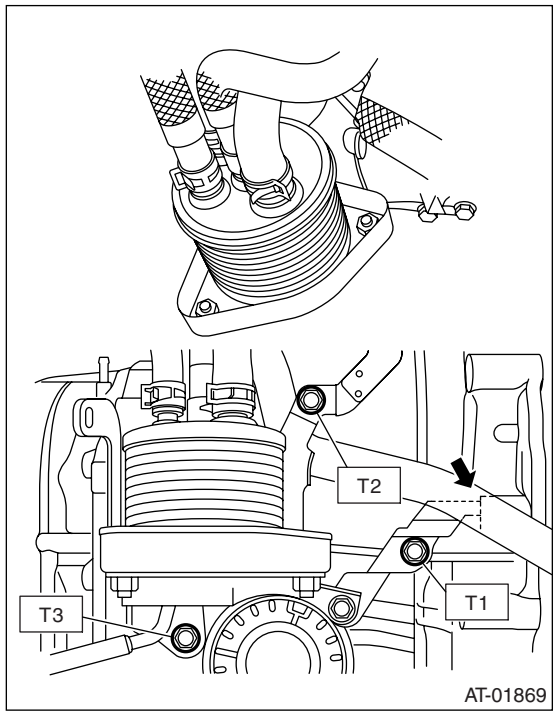
22) Install the shift select cable onto select lever.
<Ref. to CS-31, INSTALLATION, Select Cable.>
23) Connect the ATF cooler hoses to the pipe. (with ATF cooler (with warmer function))



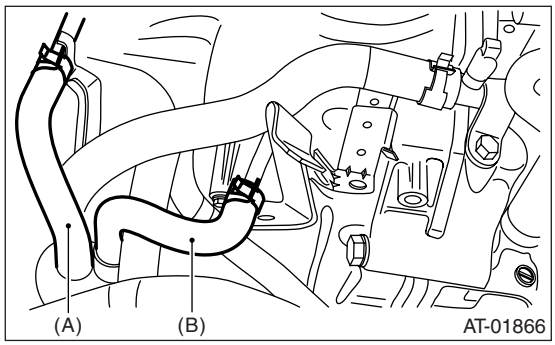
24) Install the ATF level gauge guide.
25) Install the propeller shaft.
<Ref. to DS-16, INSTALLATION, Propeller Shaft.>
26) Install the heat shield cover. (If equipped)
27) Install the rear exhaust pipe and muffler assembly.
(Non-turbo model)
<Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
(Turbo model)
<Ref. to EX(H4DOTC 2.0)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, INSTALLATION, Muffler.>
28) Install the front and center exhaust pipe. (Non-turbo model)
<Ref. to EX(H4SO)-8, INSTALLATION**, Front Exhaust Pipe.>**
29) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.>
30) Install the under cover.
31) Lower the lift.
32) Install the ATF cooler assembly bracket to transmission body. (with ATF cooler (with warmer function))

NOTE:
Insert the end of ATF cooler bracket to the hole of converter case.

Tightening torque:
T1: 21 N·m (2.1 kgf-m, 15.5 ft-lb)
T2: 23 N·m (2.3 kgf-m, 17.0 ft-lb)
T3: 33 N·m (3.4 kgf-m, 25.0 ft-lb)

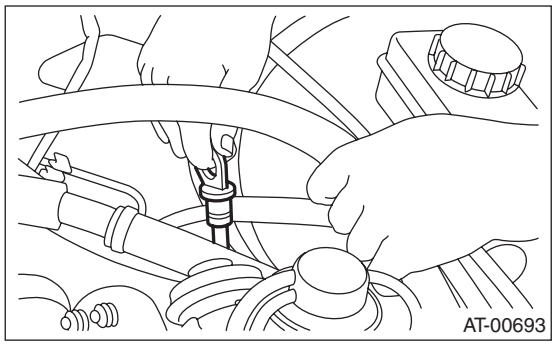


33) Connect the ATF cooler hoses to pipes on transmission side, and then install the oil charge pipe. (with ATF cooler (with warmer function))



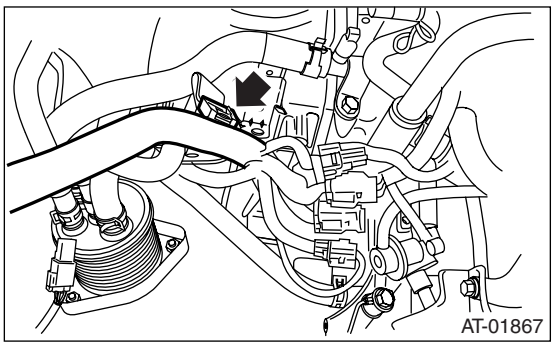
(A) Inlet hose
(B) Outlet hose

34) Install the ATF level gauge guide.



35) Connect the following connectors.
(1) Transmission harness connectors
(2) Transmission ground terminal

36) Install the harness to bracket.



37) Install the air cleaner case stay. (Non-turbo model)

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

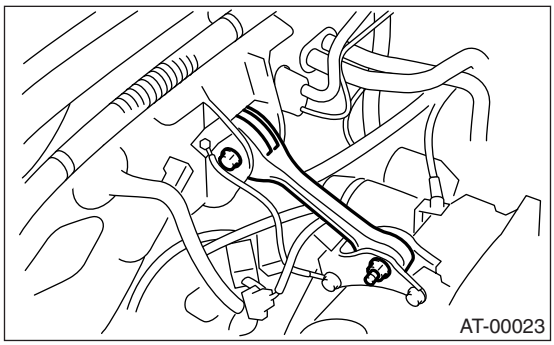
38) Install the air cleaner case and air intake duct. (Non-turbo model)
<Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H4SO)-7, INSTALLATION, Air Intake Duct.>
39) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>
40) Connect the battery ground cable to battery.
41) Pour ATF from the oil charge pipe. <Ref. to 4AT-32, Automatic Transmission Fluid.>
42) Check the ATF level. <Ref. to 4AT-32, Automatic Transmission Fluid.>
43) Take off the vehicle from a lift.
44) Check the select lever operation.
<Ref. to 4AT-55, INSPECTION, Inhibitor Switch.>
45) Execute the learning control promotion. (Turbo model) <Ref. to 4AT(D)(diag)-18, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>
46) Perform the road test.
<Ref. to 4AT-36, Road Test.>

10. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-6, REMOVAL**, Air Cleaner Case.>**
3) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
4) Remove the pitching stopper.

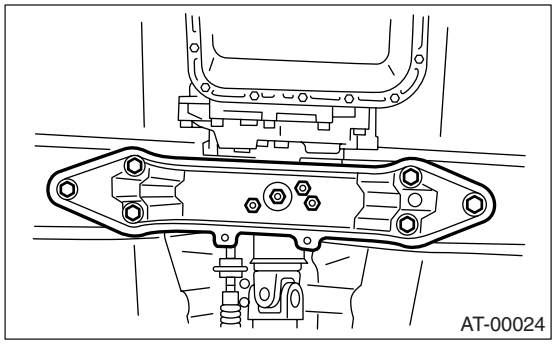


2. TRANSMISSION REAR CROSSMEMBER & REAR CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with study racks.
3) Remove the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL**, Front Exhaust Pipe.>** <Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
4) Remove the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
5) Remove the heat shield cover. (If equipped)
6) Set the transmission jack under the transmission.

NOTE:
Make sure that the support plate of transmission jack does not touch the oil pan.

7) Remove the transmission rear crossmember.



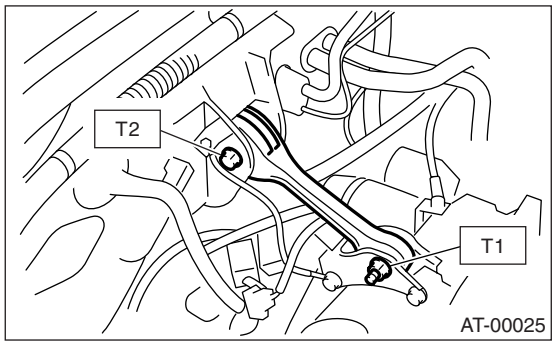
8) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



2) Install the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-6, INSTALLATION**, Air Cleaner Case.>**
3) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>

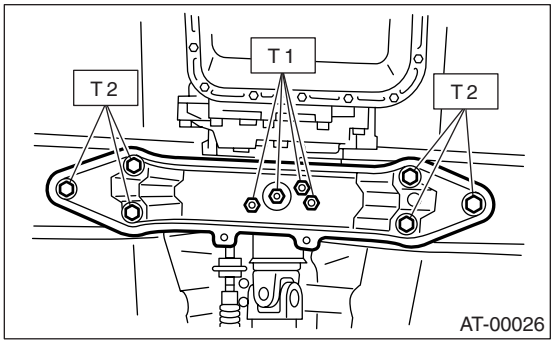
2. TRANSMISSION REAR CROSSMEMBER & REAR CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

2) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 52 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped)
5) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-8, INSTALLATION**, Front Exhaust Pipe.>** <Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
6) Install the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, INSTALLATION, Muffler.>

C: INSPECTION

Perform the following inspection procedures and repair or replace the parts if defective.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Ensure there are no cracks, hardening or damage on rubbers.

2. TRANSMISSION REAR CROSSMEMBER & REAR CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Ensure there are no cracks, breakage or damage on cushion rubbers.

11.Extension Case Oil Seal

A: INSPECTION

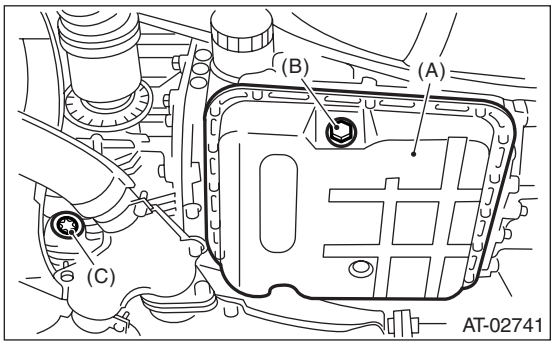
Make sure that the ATF does not leak from the joint of transmission and propeller shaft. If so, replace the oil seal. <Ref. to 4AT-53, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

1) Clean the transmission exterior.
2) Drain the ATF completely.

NOTE:
Tighten the drain plug (ATF) after draining the ATF.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

3) Remove the rear exhaust pipe and muffler.
(Non-turbo model)
<Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
(Turbo model)
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
4) Remove the heat shield cover. (If equipped)
5) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
6) Using ST, install the oil seal.
ST 398527700 PULLER ASSY
7) Using the ST, install the oil seal.
ST 498057300 INSTALLER
8) Install the propeller shaft.
<Ref. to DS-16, INSTALLATION, Propeller Shaft.>
9) Install the heat shield cover. (If equipped)
10) Install the rear exhaust pipe and muffler.
(Non-turbo model)
<Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
(Turbo model)
<Ref. to EX(H4DOTC 2.0)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, INSTALLATION, Muffler.>
11) Pour ATF and check the ATF level. <Ref. to 4AT-32, Automatic Transmission Fluid.>

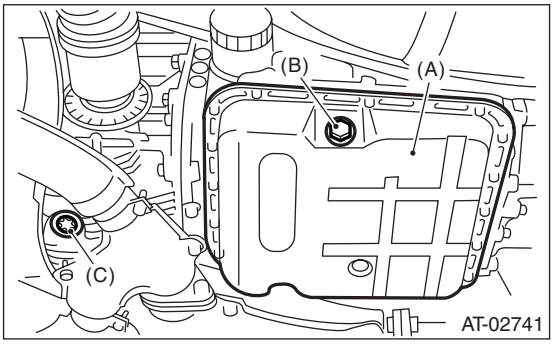
12. Differential Side Retainer Oil Seal

A: INSPECTION

Check the leakage of gear oil from differential side retainer oil seal part.
If there is oil leakage, replace the oil seal.

B: REPLACEMENT

1) Lift-up the vehicle.
2) Remove the front exhaust pipe and center exhaust pipe.
(Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL, Front Exhaust Pipe.>
(Turbo model)
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.>
3) Drain the differential gear by removing differential gear oil drain plug.

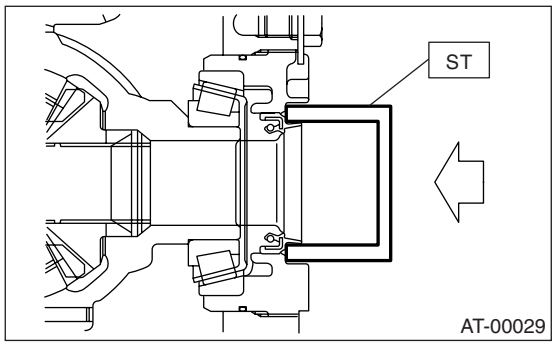


(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

4) Replace new gasket and tighten the differential oil drain plug.

Tightening torque:
Copper gasket
70 N·m (7.1 kgf-m, 52 ft-lb)
Aluminum gasket
44 N·m (4.5 kgf-m, 33 ft-lb)

5) Separate the front drive shaft from transmission.
<Ref. to DS-33, REMOVAL, Front Drive Shaft.>
6) Remove the differential side retainer oil seal using driver which wrapped with vinyl tape or etc.
7) Using ST, install the differential side retainer oil seal by slightly tapping with hammer.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



8) Apply oil to the oil seal lips.
9) Using the ST, install the front drive shaft. <Ref. to DS-34, INSTALLATION, Front Drive Shaft.>
ST 28399SA010 OIL SEAL PROTECTOR
10) Install the front exhaust pipe and center exhaust pipe.
(Non-turbo model)
<Ref. to EX(H4SO)-8, INSTALLATION, Front Exhaust Pipe.>
(Turbo model)
<Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.>
11) Lower the vehicle.
12) Pour differential gear oil into the gauge hole.

Recommended gear oil:
GL-5 (SAE: 75 W-90) or equivalent

Differential gear oil capacity:
1.1 — 1.3 ℓ (1.3 — 1.4 US qt, 1.0 — 1.1 Imp qt)

13) Check the gear oil amount. <Ref. to 4AT-35, INSPECTION, Differential Gear Oil.>

13.Inhibitor Switch

A: INSPECTION

When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

1) Disconnect the inhibitor switch connector.

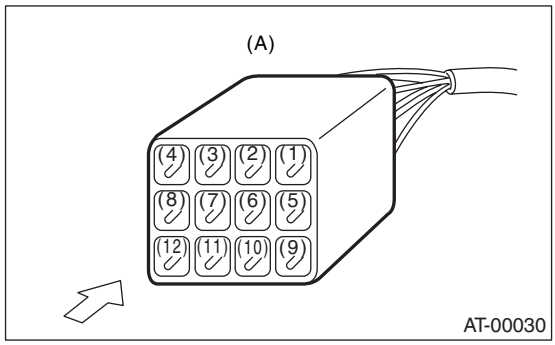
2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

NOTE:

• Also check that continuity in ignition circuit does not exist when the select lever is in “R”, “D”, “3”, “2” and “1” ranges.

• If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

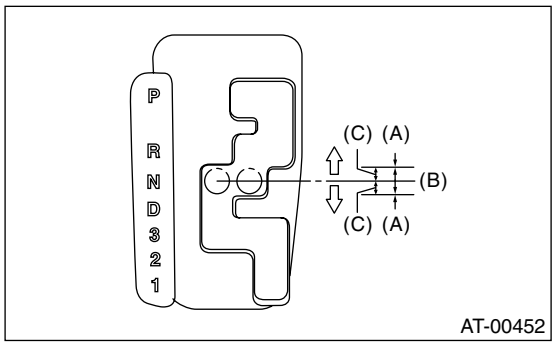
	Range	Pin No.
Signal sent to TCM	P	4 — 3
	R	4 — 2
	N	4 — 1
	D	4 — 8
	3	4 — 7
	2	4 — 6
	1	4 — 5
Ignition circuit	P/N	12 — 11
Back-up light circuit	R	10 — 9



(A) Inhibitor switch connector

3) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from the “N” range to “R” range or “D” range

If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch. <Ref. to 4AT-56, ADJUSTMENT, Inhibitor Switch.>



(A) Continuity does not exist.

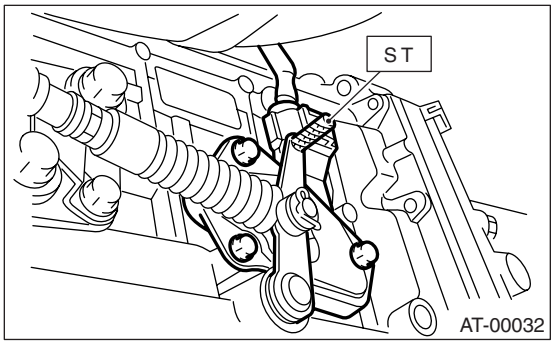
(B) Continuity exists.

(C) 1.5°

4) Repeat the above checks at other ranges. If there are abnormalities, adjust the select cable. <Ref. to CS-32, ADJUSTMENT, Select Cable.>

B: ADJUSTMENT

1) Shift the select lever to the “N” range.
2) Loosen the three inhibitor switch assembly securing bolts.
3) Insert the ST as vertical as possible into the holes in the inhibitor switch lever and switch body.
ST 499267300 STOPPER PIN



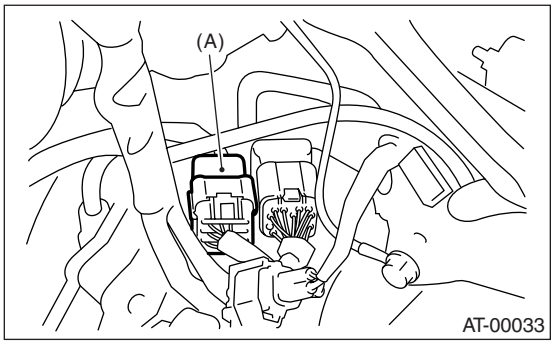
4) Tighten the three inhibitor switch assembly securing bolts.

Tightening torque:
3.5 N·m (0.36 kgf-m, 26 ft-lb)

5) Repeat the check of inhibitor switch. If the inhibitor switch is determined to be “faulty”, replace it. <Ref. to 4AT-55, INSPECTION, Inhibitor Switch.>

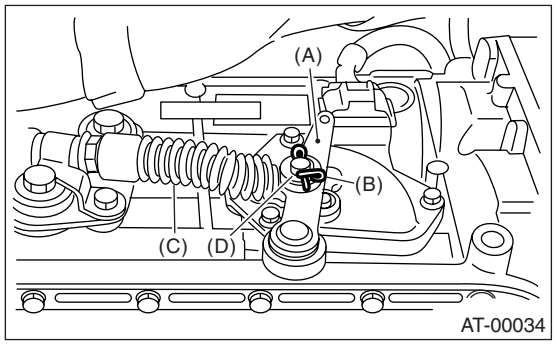
C: REMOVAL

1) Set the vehicle on a lift.
2) Shift the select lever to “N” range.
3) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-6, REMOVAL**, Air Cleaner Case.>**
4) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
5) Disconnect the inhibitor switch connector.



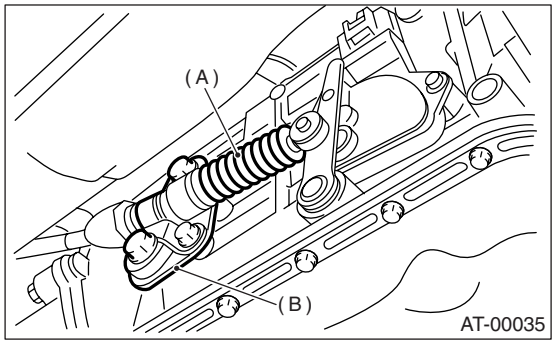
(A) Inhibitor switch connector

6) Remove the inhibitor switch connector from stay.
7) Lift-up the vehicle.
8) Remove the front and center exhaust pipe.
(Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL**, Front Exhaust Pipe.>**
(Turbo model)
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.>
9) Remove the snap pin and washers from range select lever.



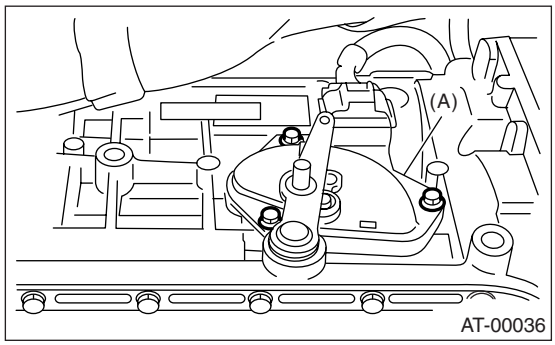
(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Washer

10) Remove the plate assembly from transmission case.



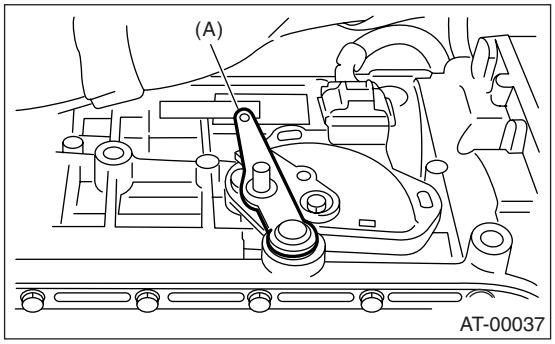
(A) Select cable
(B) Plate ASSY

11) Remove the bolt.



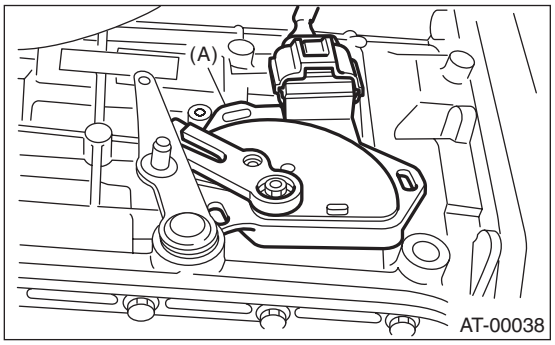
(A) Inhibitor switch ASSY

12) Shift the range select lever to parking position. (left side)



(A) Range select lever

13) Remove the inhibitor switch assembly from transmission.

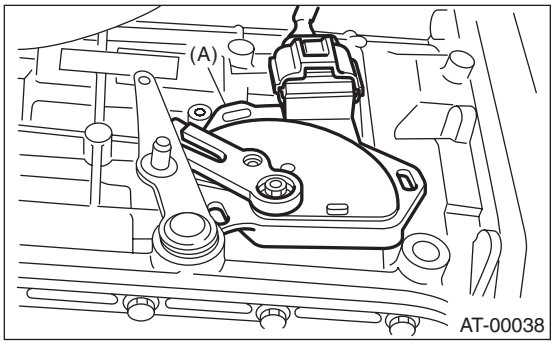


(A) Inhibitor switch ASSY

14) Disconnect the inhibitor switch harness connector from inhibitor switch.

D: INSTALLATION

1) Connect the inhibitor switch harness connector to inhibitor switch.
2) Install the inhibitor switch assembly to transmission case.

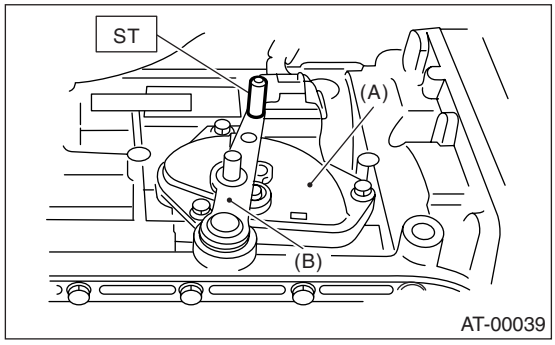


(A) Inhibitor switch ASSY

3) Move the range select lever to neutral position.

4) Using the ST, tighten bolts of inhibitor switch.
ST 499267300 STOPPER PIN

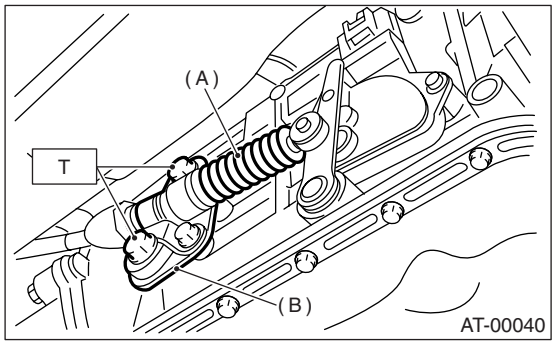
Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)



(A) Inhibitor switch ASSY
(B) Range select lever

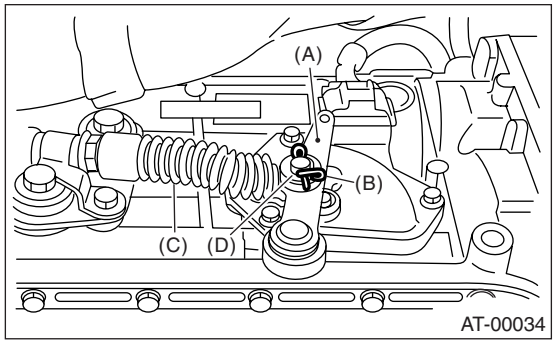
5) Install the select cable to range select lever.
6) Install the plate assembly to transmission.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



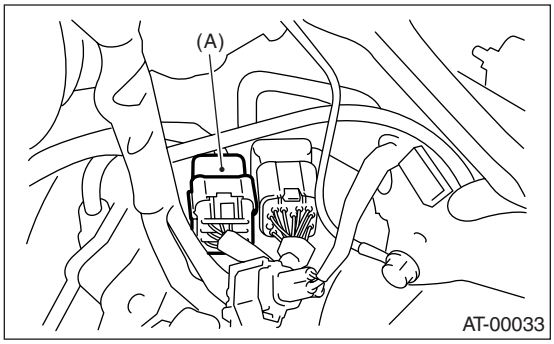
(A) Select cable
(B) Plate ASSY

7) Install the washer and snap pin to range select lever.



(A) Range select lever
(B) Snap pin
(C) Select cable
(D) Washer

8) Install the front and center exhaust pipe. (Non-turbo model)
<Ref. to EX(H4SO)-8, INSTALLATION**, Front Exhaust Pipe.>**
9) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Install the inhibitor switch connector to the stay.
12) Connect the inhibitor switch connector.



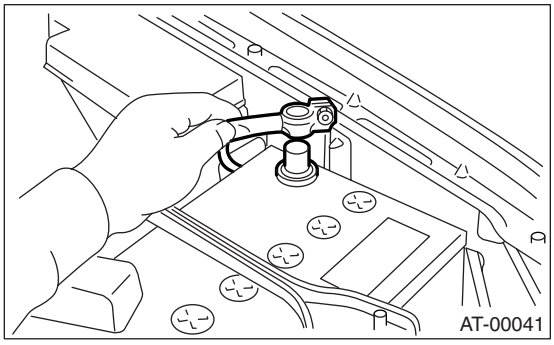
(A) Inhibitor switch connector

13) Install the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-6, INSTALLATION**, Air Cleaner Case.>**
14) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>
15) Inspect the inhibitor switch. <Ref. to 4AT-55, INSPECTION, Inhibitor Switch.>

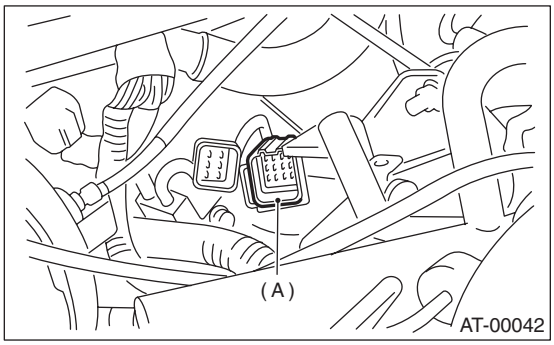
14.Front Vehicle Speed Sensor

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Remove the air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
4) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
5) Disconnect the transmission connector.

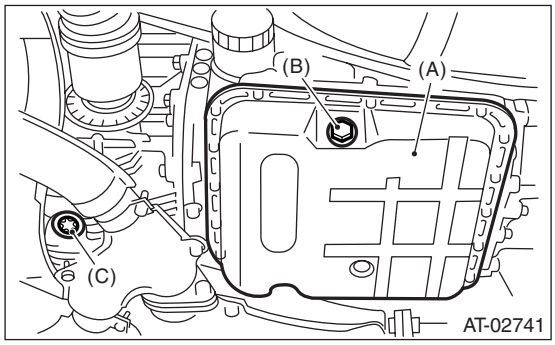


(A) Transmission connector

6) Remove the pitching stopper. <Ref. to 4AT-51, REMOVAL, Transmission Mounting System.>
7) Remove the transmission connector from the stay.
8) Lift-up the vehicle.
9) Clean the transmission exterior.
10) Drain the ATF completely.

NOTE:
Tighten the drain plug (ATF) after draining the ATF.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

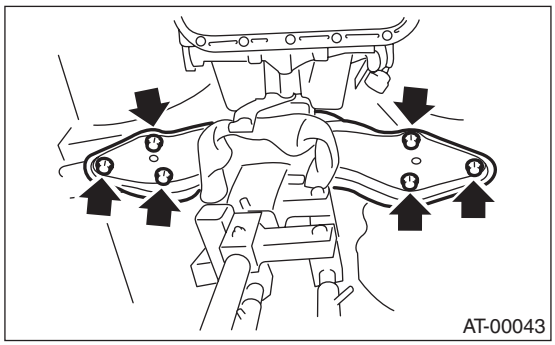


(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

11) Remove the front, center, rear, exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL**, Front Exhaust Pipe.>** <Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
12) Remove the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
13) Remove the heat shield cover. (If equipped)
14) Remove the propeller shaft.
<Ref. to DS-15, REMOVAL, Propeller Shaft.>
15) Place the transmission jack under transmission.

NOTE:
Make sure that the support plate of transmission jack does not touch the oil pan.

16) Remove the transmission rear crossmember bolt.



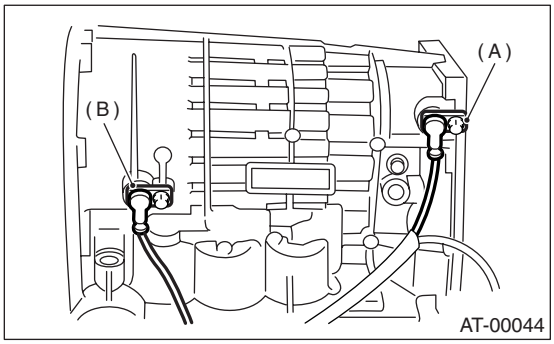
17) Lower the transmission jack.

NOTE:
Do not separate the transmission jack and transmission.

18) Remove the ATF cooler inlet and outlet pipes.

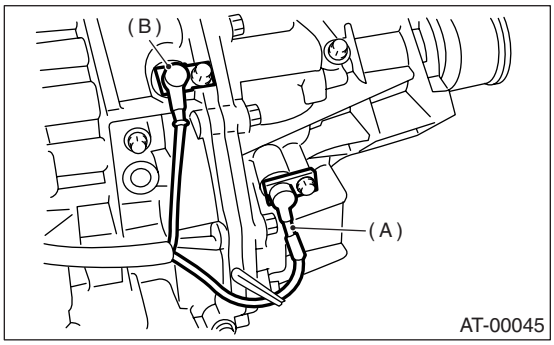
CAUTION:
When removing the outlet pipe, be careful not to lose the ball and spring used with retaining screw.

19) Remove the front vehicle speed sensor and torque converter turbine speed sensor.



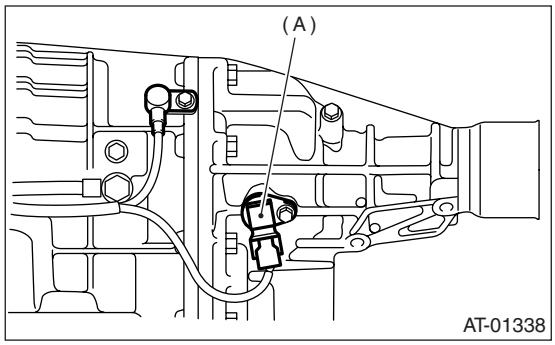
(A) Front vehicle speed sensor
(B) Torque converter turbine speed sensor

20) Remove the rear vehicle speed sensor. (Non-turbo model)



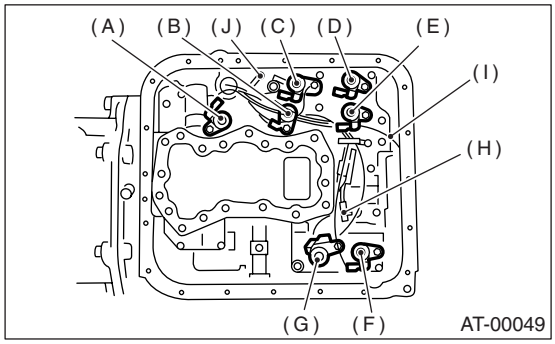
(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

21) Disconnect the connector from rear vehicle speed sensor. (Turbo model)



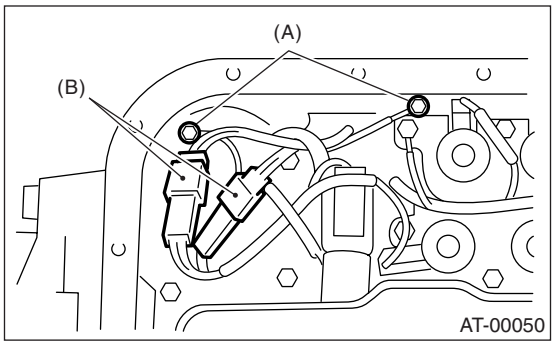
(A) Rear vehicle speed sensor

22) Remove the oil pan.
23) Remove the duty solenoid connector and ATF temperature sensor. Remove the connectors from clip and disconnect it.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

24) Disconnect the harness connector and transmission ground terminal. (Turbo model)

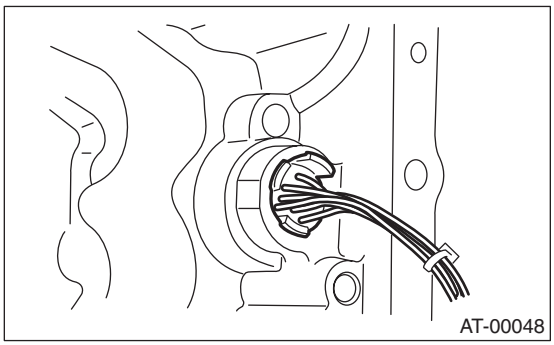


(A) Transmission ground terminal
(B) Harness connector

25) Remove the transmission harness assembly.

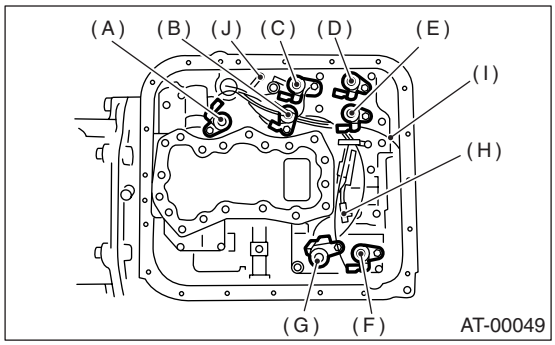
B: INSTALLATION

1) Pass the transmission harness assembly through the hole in the transmission case.



2) Connect the harness connectors.
Connect the connectors of same color, and secure the connectors to valve body using clips. (Non-turbo model)

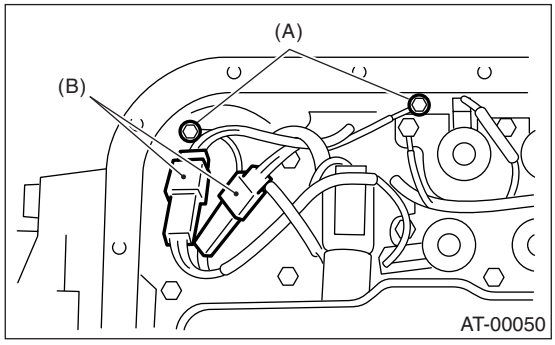
Tightening torque (Transmission ground cable):
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

3) Connect the harness connector and transmission ground terminal.

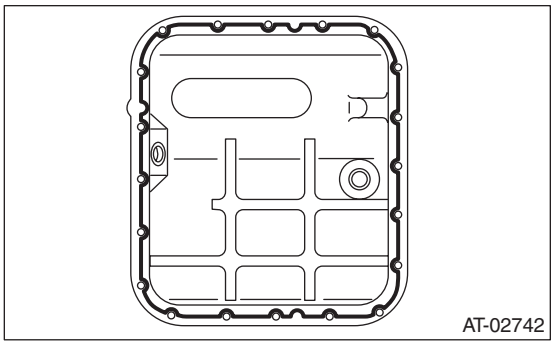
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Transmission ground terminal
(B) Harness connector

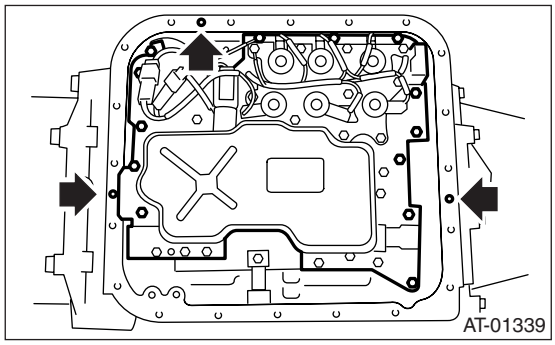
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



5) Fill liquid gasket to holes except for bolt holes (three) of transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



6) Install the oil pan with equally tighten the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

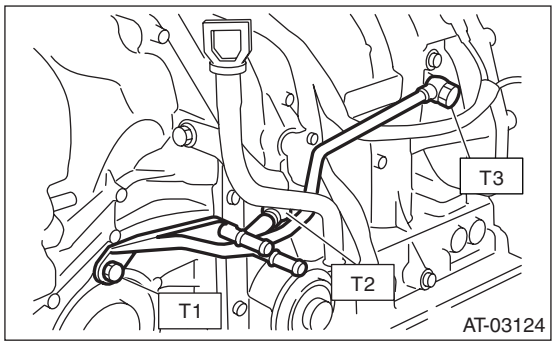
7) Install the front vehicle speed sensor, rear vehicle speed sensor and torque converter turbine speed sensor.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

8) Install the ATF cooler inlet and outlet pipes.

NOTE:
Use a new copper washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 45 N·m (4.6 kgf-m, 33 ft-lb)
T3: 40 N·m (4.1 kgf-m, 30 ft-lb)



9) Tighten the transmission rear crossmember bolt.

Tightening torque:
70 N·m (7.1 kgf-m, 52 ft-lb)

10) Install the propeller shaft.
<Ref. to DS-16, INSTALLATION, Propeller Shaft.>
11) Install the heat shield cover. (If equipped)
12) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-8, INSTALLATION**, Front Exhaust Pipe.>** <Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
13) Install the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16, INSTALLATION, Muffler.>
14) Lower the vehicle.
15) Install the transmission connector to the stay.
16) Install the pitching stopper. <Ref. to 4AT-51, INSTALLATION, Transmission Mounting System.>
17) Install the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-6, INSTALLATION**, Air Cleaner Case.>**
18) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>
19) Fill the same amount of ATF drained.
20) Bleed the air of control valve.
<Ref. to 4AT-75, Air Bleeding of Control Valve.>
21) Check the level of ATF. <Ref. to 4AT-32, Automatic Transmission Fluid.>

22) Execute the learning control promotion. <Ref. to 4AT(D)(diag)-18, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>
23) Pour ATF and check the ATF level. <Ref. to 4AT-32, Automatic Transmission Fluid.>

15.Rear Vehicle Speed Sensor

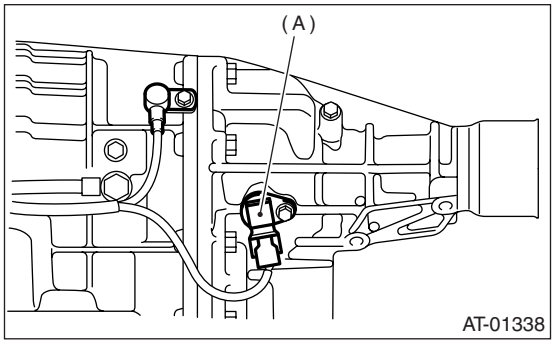
A: REMOVAL

1. NON-TURBO MODEL

When removing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-59, REMOVAL, Front Vehicle Speed Sensor.>

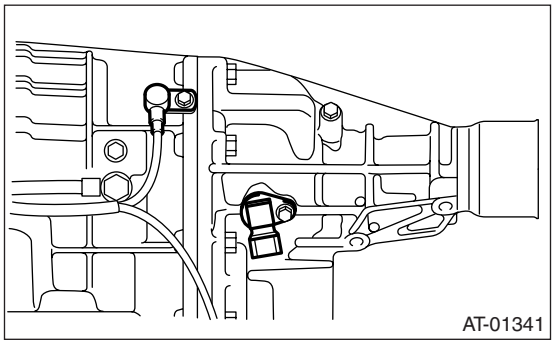
2. TURBO MODEL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Lift-up the vehicle.
4) Disconnect the connector from rear vehicle speed sensor.



(A) Rear vehicle speed sensor

5) Remove the rear vehicle speed sensor.



B: INSTALLATION

1. NON-TURBO MODEL

When installing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-61, INSTALLATION, Front Vehicle Speed Sensor.>

2. TURBO MODEL

Install in the reverse order of removal.

NOTE:
Replace O-ring with new one.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

16. Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-59, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-61, INSTALLATION, Front Vehicle Speed Sensor.>

17.Control Valve Body

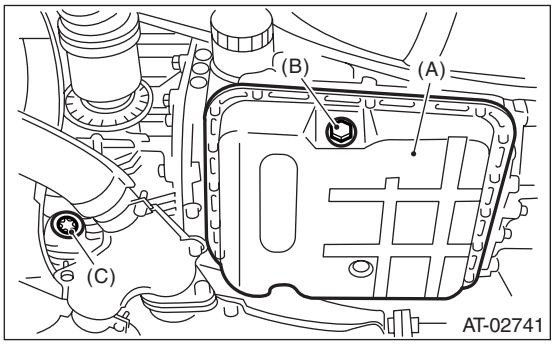
A: REMOVAL

1. NON-TURBO MODEL

1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Drain the ATF completely.

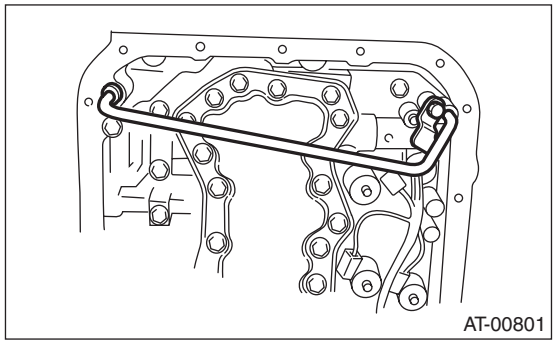
NOTE:
• Tighten the drain plug (ATF) after draining the ATF.
• Always use new gasket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

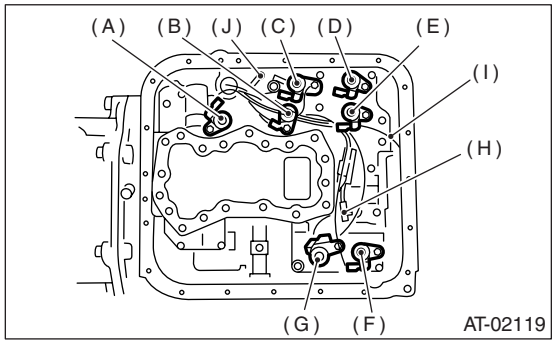


(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

4) Remove the oil pan.
5) Remove and clean the magnet.
6) Remove the old liquid gasket on the oil pan and transmission case completely.
7) Remove the pipe. (EC, EK model)



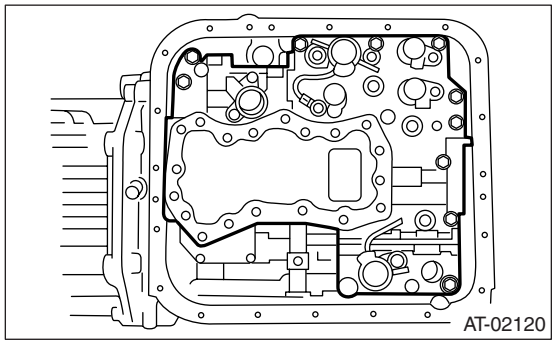
8) Disconnect the connectors of each solenoid, and then disconnect the ATF temperature sensor from control valve.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) ATF temperature sensor
(I) Transfer duty solenoid (Brown)
(J) Transmission ground

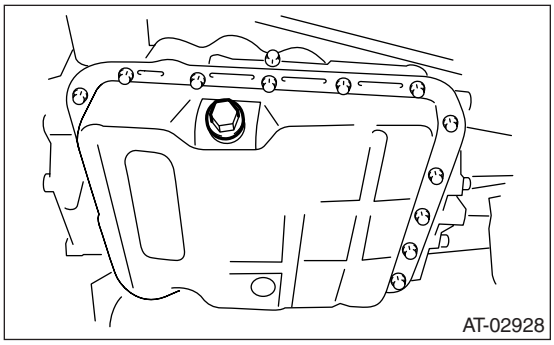
9) Remove the control valve body.

NOTE:
When removing the control valve body, be careful not to interfere with transfer duty solenoid wiring.



2. TURBO MODEL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Lift-up the vehicle.
4) Clean the transmission exterior.
5) Remove the drain plug (ATF) and gasket to drain ATF.

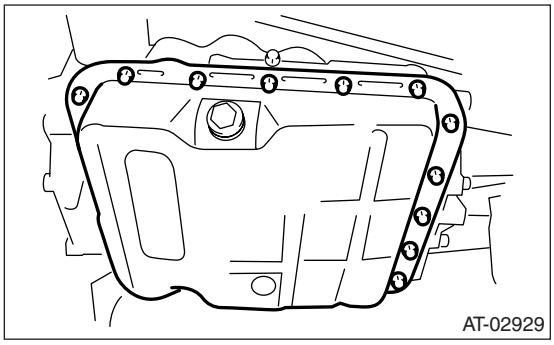


6) Replace the gasket with new one, and then tighten the drain plug (ATF).

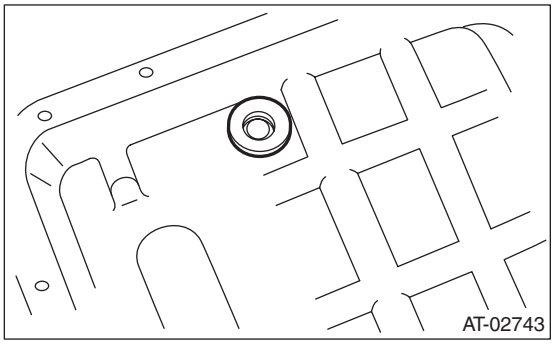
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

7) Remove the oil pan.

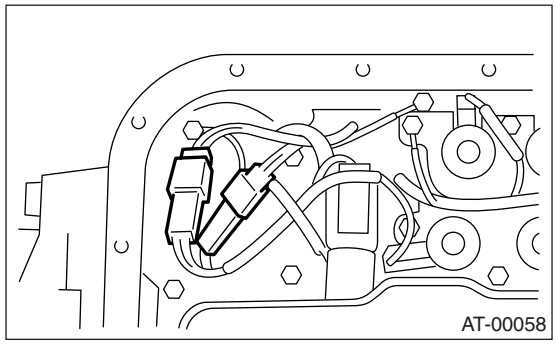
CAUTION:
Be careful not to entering foreign matter into oil pan.



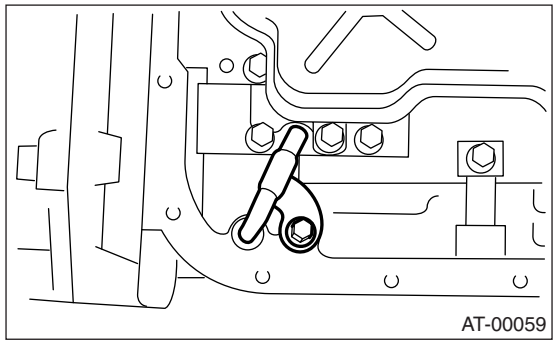
8) Remove the magnet.



9) Clean the magnet.
10) Completely remove the remaining liquid gasket on transmission case and oil pan.
11) Remove the harness connector.

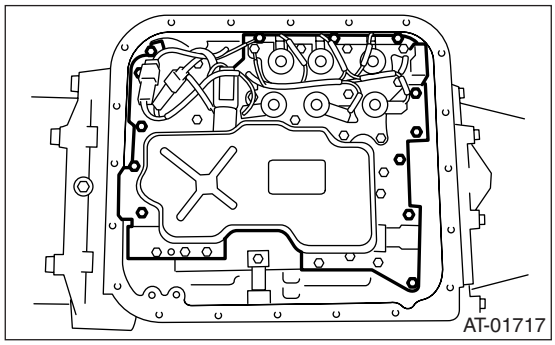


12) Remove the ATF cooler pipe.



13) Remove the control valve body.

NOTE:
Replace the control valve body as assembly, because it is non-disassemble part.

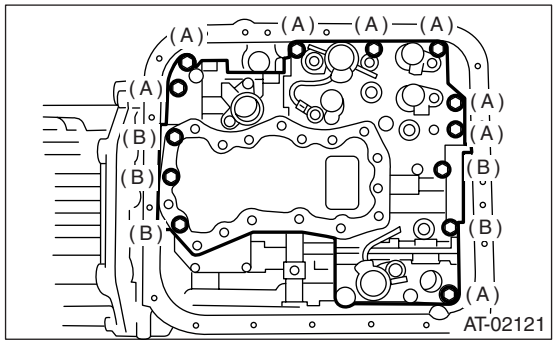


B: INSTALLATION

1. NON-TURBO MODEL

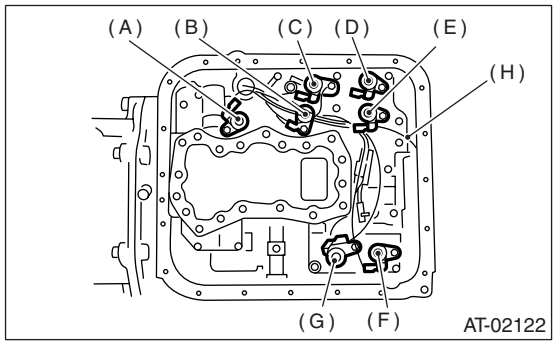
1) Set the range select lever in “N” range.
2) Install the control valve, ATF temperature sensor and ground connectors.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 30 (1.18)
(B) 55 (2.17)

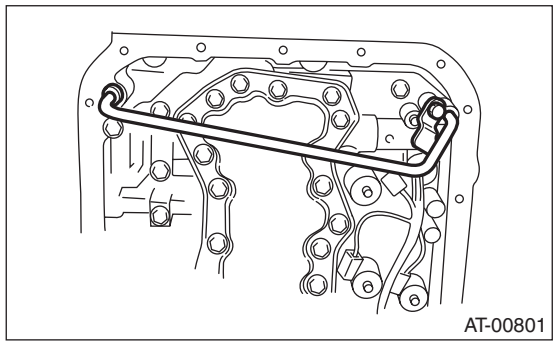
3) Connect all connectors.



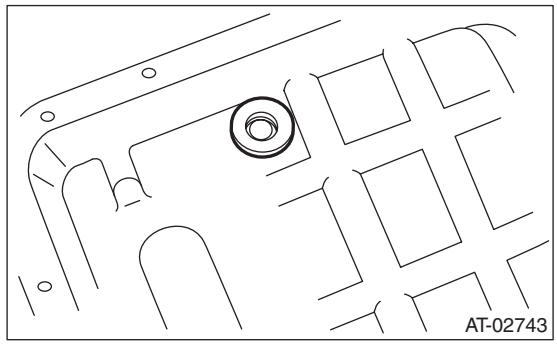
(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) Transfer duty solenoid (Brown)

4) Install the pipe. (EC, EK model)

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

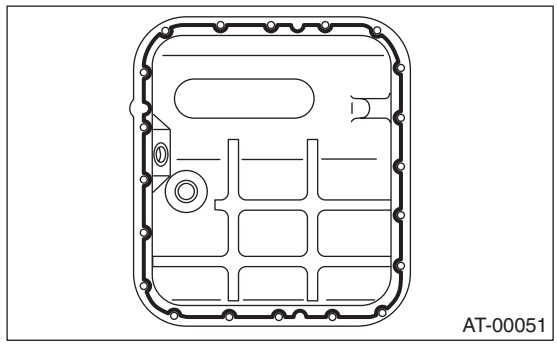


5) Attach the magnet at the specified position of oil pan.



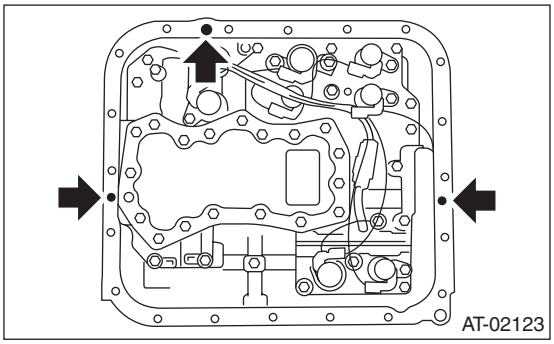
6) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



7) Fill liquid gasket to holes except for bolt holes (three) of transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



8) Install the oil pan with equally tighten the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

9) Pour ATF from the oil charge pipe.

Recommended fluid:
EC, EK, EH model
SUBARU ATF (Part No. K0410Y0700) or IDEMITSU "Apoloil ATF HP", Castrol "Transmax J".

NOTE:
If it is impossible to get the ATF above, use the DEXRON III.

Except for EC, EK, EH model
SUBARU ATF (Part No. K0410Y0700) or IDEMITSU "Apoloil ATF HP", Castrol "Transmax J", DEXRON III.

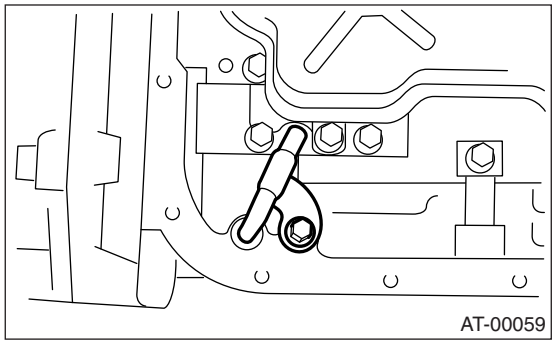
Capacity:
Pour fluid as same amount as drained fluid from drain plug hole.

10) Inspect the level of ATF.
<Ref. to 4AT-32, Automatic Transmission Fluid.>

2. TURBO MODEL

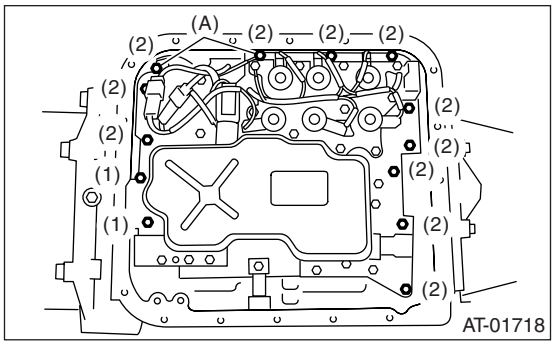
1) Check that the dust and other foreign matters are not on control valve body.

2) Temporarily assemble the control valve body and the ground cable to transmission, and install oil cooler pipe.



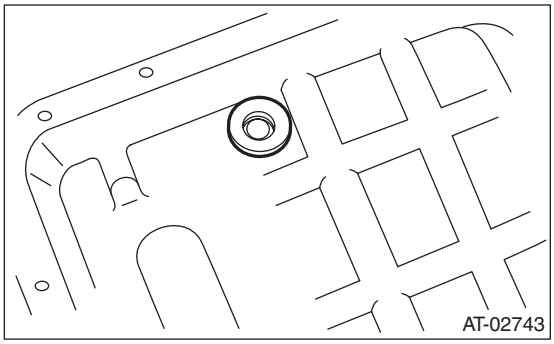
3) Equally tighten the bolts.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



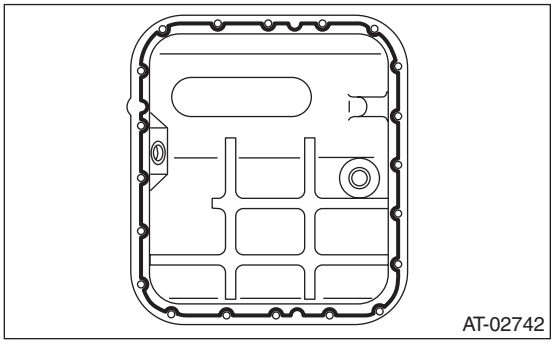
(A) Transmission ground
Bolt length mm (in)
(1) 35 (1.38)
(2) 30 (1.18)

4) Attach the magnet at the specified position of oil pan.



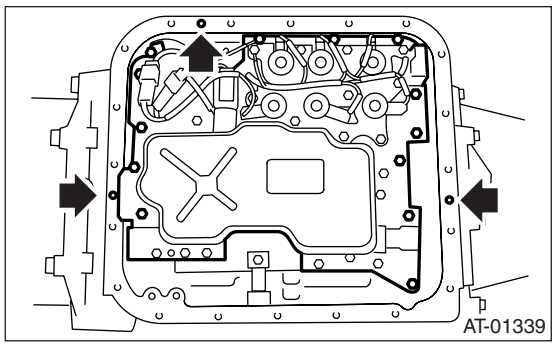
5) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



6) Fill liquid gasket to holes except for bolt holes (three) of transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



7) Install the oil pan with equally tighten the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

8) Pour ATF from the oil charge pipe.

Recommended fluid:
EC, EK, EH model
SUBARU ATF (Part No. K0410Y0700) or IDEMITSU "Apoloil ATF HP", Castrol "Transmax J".

NOTE:
If it is impossible to get the ATF above, use the DEXRON III.

Except for EC, EK, EH model
SUBARU ATF (Part No. K0410Y0700) or IDEMITSU "Apoloil ATF HP", Castrol "Transmax J", DEXRON III.

Capacity:
Pour fluid as same amount as drained fluid from drain plug hole.

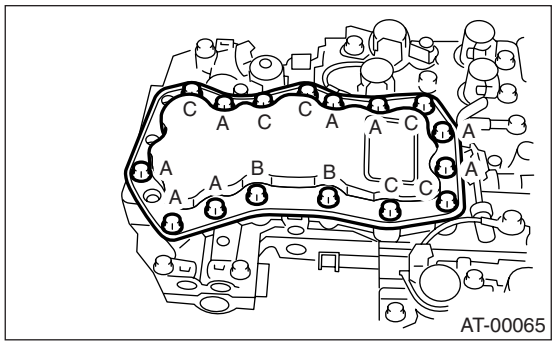
9) Bleed the air of control valve. <Ref. to 4AT-75, Air Bleeding of Control Valve.>
10) Check the ATF level. <Ref. to 4AT-32, Automatic Transmission Fluid.>
11) Execute the learning control promotion. <Ref. to 4AT(D)(diag)-18, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

C: DISASSEMBLY

Non-turbo model only

1) Remove the oil strainer from lower control valve body.

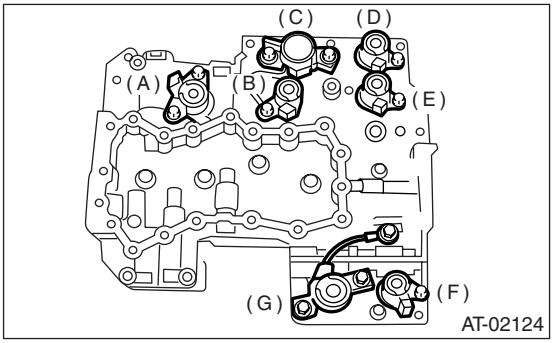
NOTE:
While assembling, safekeeping the bolt to identify bolt position, because the bolt length is different.



(A) Short bolts
(B) Middle bolts
(C) Long bolts

2) Remove the duty solenoids, solenoids and sensor from lower control valve body.

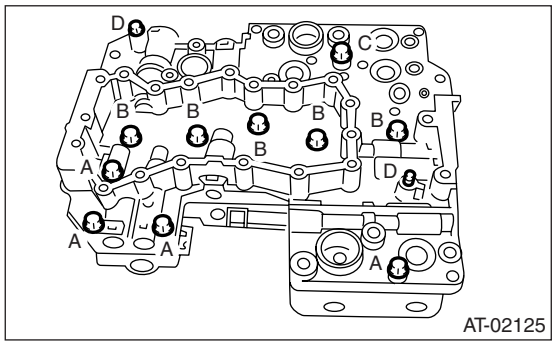
NOTE:
While assembling, safekeeping the bolt to identify bolt position, because the bolt length is different.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

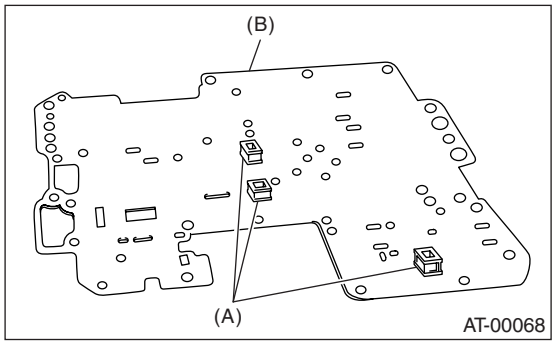
3) Remove the upper and lower control valve body installing bolt.

NOTE:
While assembling, safekeeping the bolt to identify bolt position, because the bolt length is different.



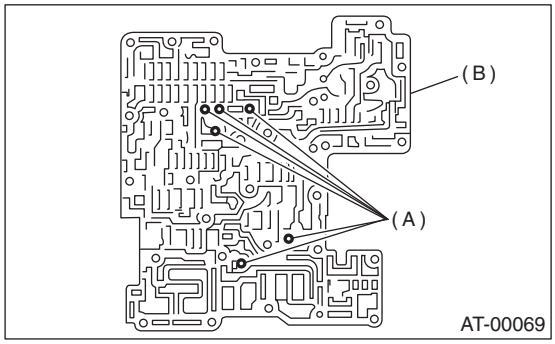
Bolt length mm (in)
(A) 40 (1.57)
(B) 62 (2.44)
(C) 73 (2.87)
(D) 79 (3.11)

4) Remove the lower control valve body.
5) Remove the oil filter and separate plate.



(A) Oil filter
(B) Separate plate

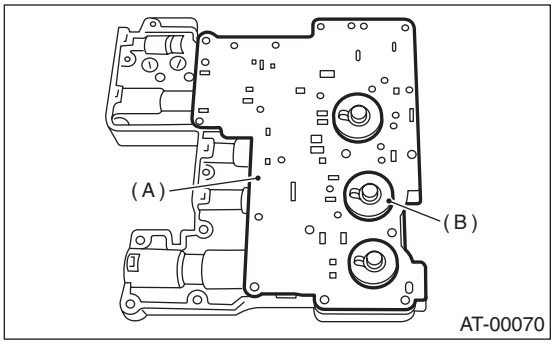
6) Remove the six steel balls from middle control valve body.



(A) Steel ball
(B) Middle control valve body

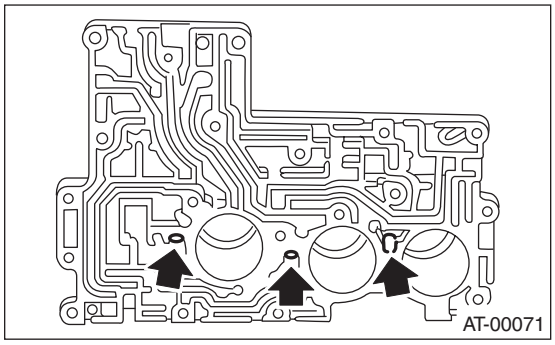
7) Remove the middle control valve body.

8) Remove the upper separator plate from middle control valve body.

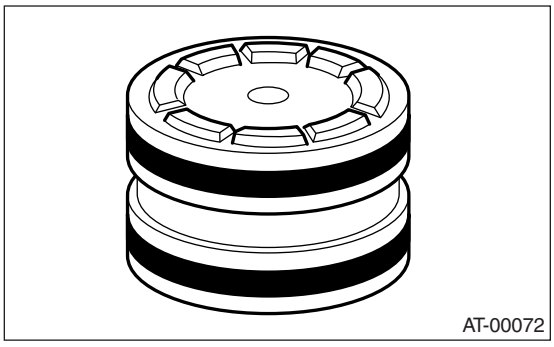


(A) Upper separate plate
(B) Side plate

9) Remove the four steel balls and accumulator spring from upper control valve body.
10) Put the cloth to removing part of piston.
11) Remove the accumulator piston with slowly apply compressed air to each hole.

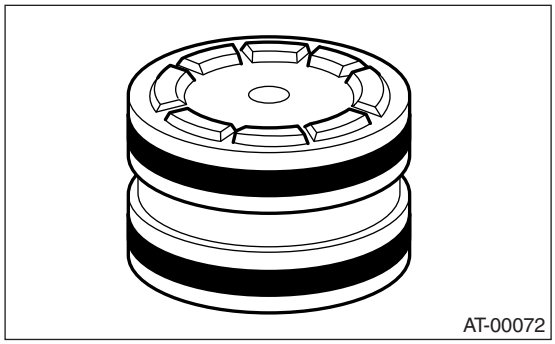


12) Remove the seal ring from accumulator piston.

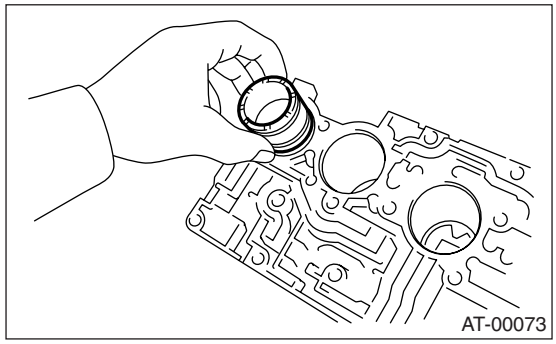


D: ASSEMBLY

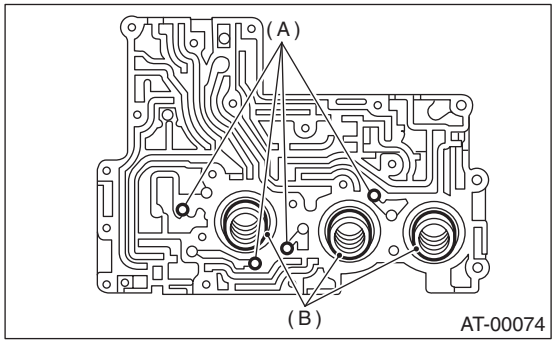
1) Install a new seal rings to accumulator piston.



2) Apply ATF to the seal ring.
3) Insert the piston into the back of upper control valve body.



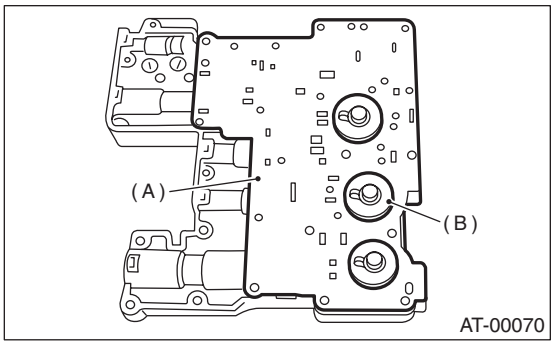
4) Install the accumulator spring and four steel balls to specified position of upper control valve body.



(A) Steel ball
(B) Accumulator spring

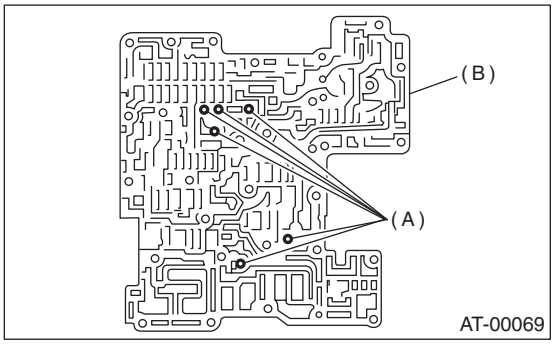
5) Align the hole of side plate and hole of upper separator plate, and then install the side plate and upper separator plate to middle control valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Upper separate plate
(B) Side plate

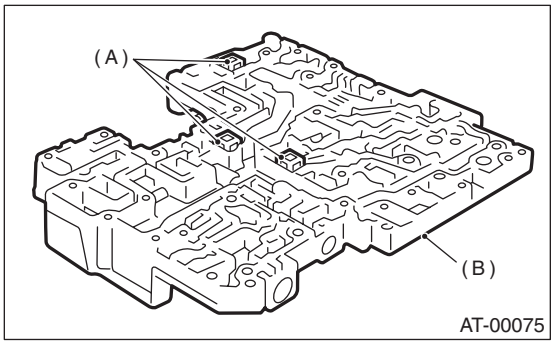
6) Insert the six steel balls to specified position of middle control valve body.



(A) Steel ball
(B) Middle control valve body

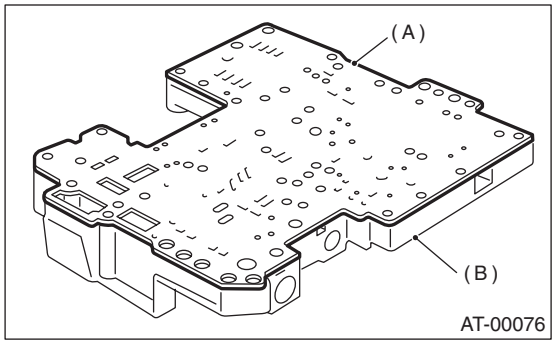
7) Install the three oil filter to lower valve body.

NOTE:
Pay attention to the oil filter position.



(A) Oil filter
(B) Lower control valve body

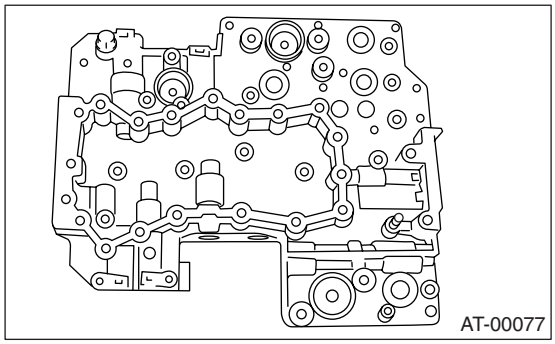
8) Install the lower separate plate to lower control valve body.



(A) Lower separator plate
(B) Lower control valve body

9) Temporarily assemble the valve body.

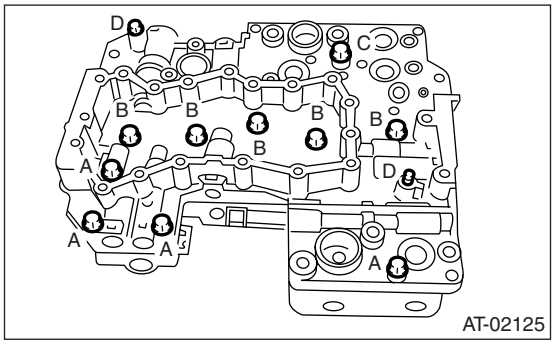
NOTE:
Be careful not to drop the oil filter of lower control valve body or steel balls in middle control valve body and upper control valve body.



10) Tighten the bolt.

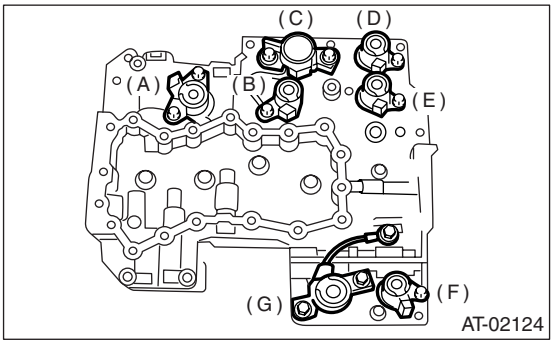
NOTE:
Tighten the bolt (D) from upper control valve body side.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 40 (1.57)
(B) 62 (2.44)
(C) 73 (2.87)
(D) 79 (3.11)

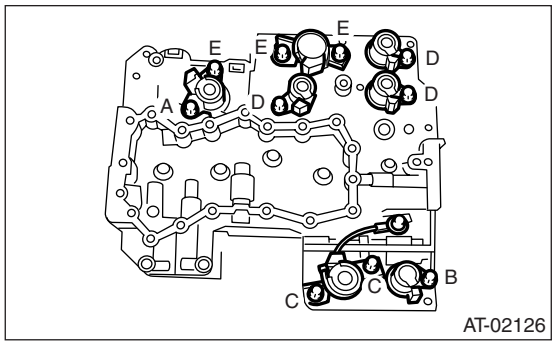
11) Insert solenoid and duty solenoid into the specified position.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

12) Tighten the bolt and nut.

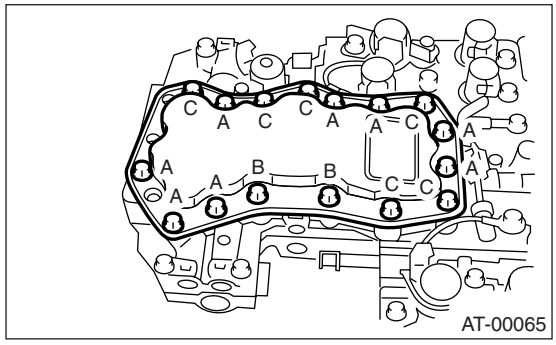
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

13) Install the oil strainer to lower control valve body.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 62 (2.44)
(C) 81 (3.19)

E: INSPECTION

Make sure that each component is free of harmful gouges, cuts or dust.

18.Air Bleeding of Control Valve

A: PROCEDURE

NOTE:
This section is specified for turbo (model).

1) Lift-up the vehicle with shifting the select lever to “P” range and applying the parking brake.
2) Connect the Subaru Select Monitor to the vehicle.
3) Make sure there is no trouble code using Subaru Select Monitor.
4) Using Subaru Select Monitor, check that the ATF temperature is in less than 60°C (140°F). <Ref. to 4AT(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
5) Power OFF the Subaru Select Monitor.
6) Turn the ignition switch to “OFF”.
7) Shift the select lever to “R” range.
8) Depress the brake pedal fully until the air bleeding is completed.
9) Turn the ignition switch to ON.
10) Shift the select lever to “P” range, and then wait for more than 3 seconds.
11) Shift the select lever to “R” range, and then wait for more than 3 seconds.
12) Shift the select lever to “N” range, and then wait for more than 3 seconds.
13) Shift the select lever to “D” range, and then wait for more than 3 seconds.
14) Shift the select lever to “N” range, and then wait for more than 3 seconds.
15) Slightly depress the accelerator pedal fully.
16) Slightly release the accelerator pedal fully.
17) Start the engine.
18) Shift the select lever to “D” range.
19) Turn the Subaru Select Monitor switch to ON.
20) Select {Each System Check} in «Main Menu» of Subaru Select Monitor.
21) On the «System Selection Menu» display screen, select the “Transmission”. Air bleeding of control valve starts on transmission. At this time, the POWER indicator light in combination meter blinks at 2 Hz. When the POWER indicator light does not blink, repeat the procedures from step 4).
22) Air bleeding of control valve is finished when blinking of POWER indicator light in combination meter changes from 2 Hz to 0.5 Hz.

NOTE:
When blinking of POWER indicator light changes from 2 Hz to 4 Hz during air bleeding, repeat the procedure from step 4).

23) Shift the select lever to “N” range, and then turn the ignition switch to OFF.
24) Shift the select lever to the “P” range, and then finish the air bleeding.

NOTE:
After air bleeding operation, and execute the leaning control promotion. <Ref. to 4AT(D)(diag)-18, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

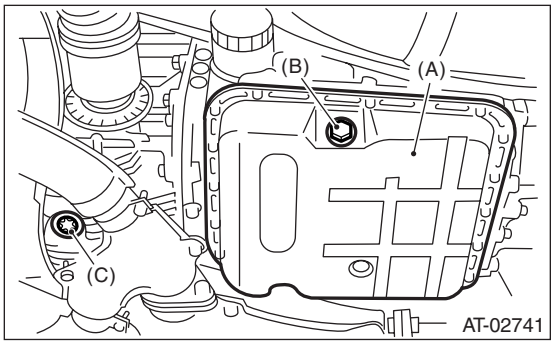
19.Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

A: REMOVAL

1. SHIFT SOLENOID AND DUTY SOLENOID

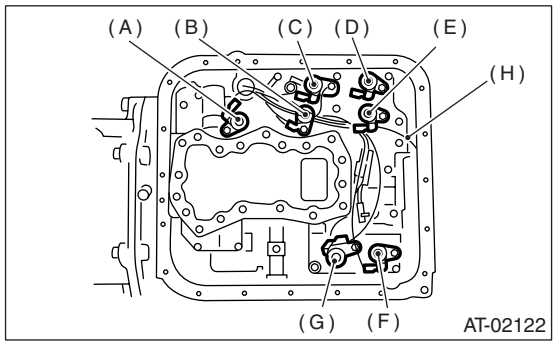
1) Lift-up the vehicle.
2) Clean the transmission exterior.
3) Drain the ATF completely.
4) Replace the gasket with new one, and then tighten the drain plug (ATF).

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



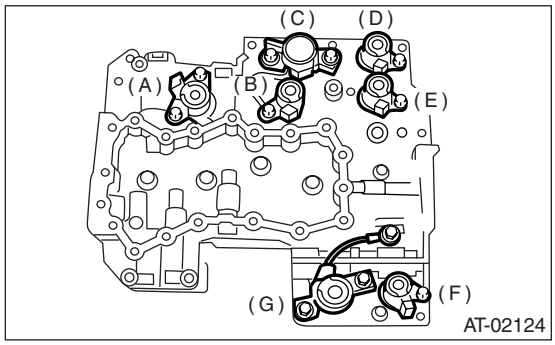
(A) Oil pan
(B) Drain plug (ATF)
(C) Differential gear oil drain plug

5) Remove the oil pan.
6) Disconnect the solenoid and duty solenoid connectors.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) Transfer duty solenoid (Brown)

7) Remove the solenoid and duty solenoid.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

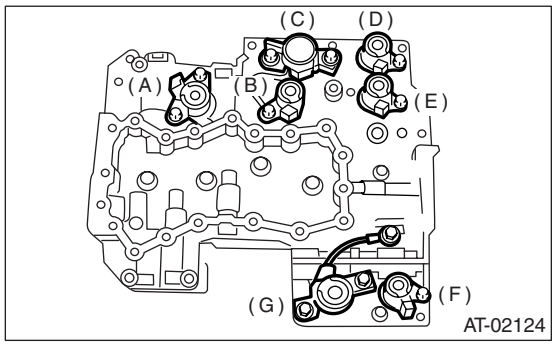
2. ATF TEMPERATURE SENSOR

For removal procedure of the ATF temperature sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-59, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

1. SHIFT SOLENOID AND DUTY SOLENOID

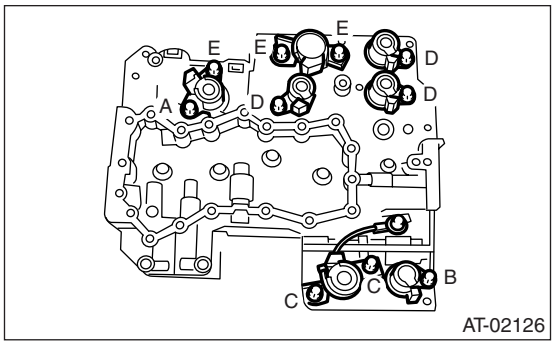
1) Insert the solenoid and duty solenoid into the specified position.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)

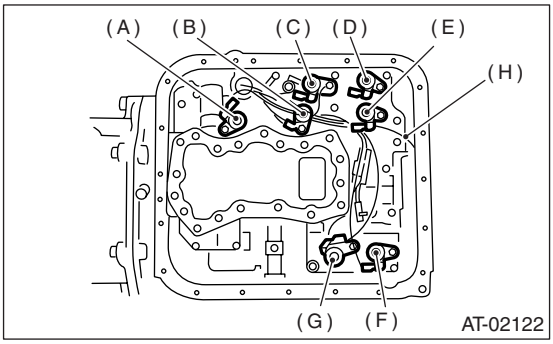
2) Tighten the bolt and nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



Bolt length mm (in)
(A) 12 (0.47)
(B) 40 (1.57)
(C) 45 (1.77)
(D) 62 (2.44)
(E) 73 (2.87)

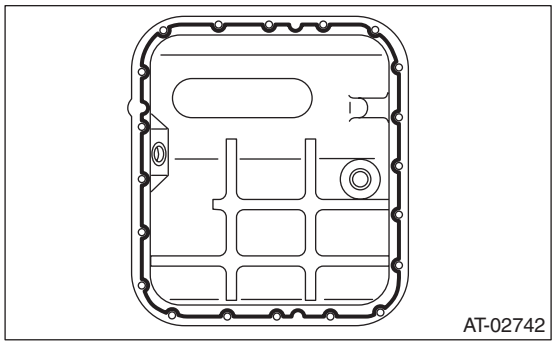
3) Connect the harness connectors.
Connect the connectors of same color, and connect the connectors to control valve body using clips.



(A) Lock-up duty solenoid (Blue)
(B) Low clutch timing solenoid (Gray)
(C) Line pressure duty solenoid (Red)
(D) Shift solenoid 2 (Yellow)
(E) Shift solenoid 1 (Green)
(F) 2-4 brake timing solenoid (Black)
(G) 2-4 brake duty solenoid (Red)
(H) Transfer duty solenoid (Brown)

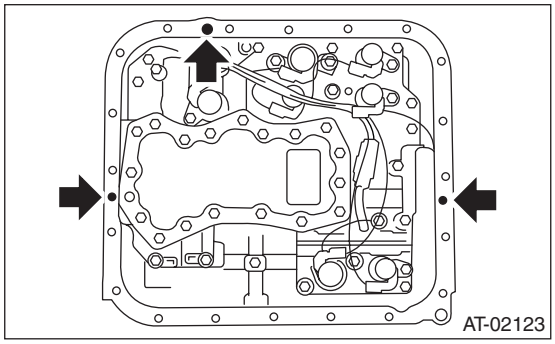
4) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



5) Fill liquid gasket to holes except for bolt holes (three) of transmission case.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020)



6) Install the oil pan with equally tighten the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

7) Pour ATF from the oil charge pipe. <Ref. to 4AT-32, Automatic Transmission Fluid.>
8) Check the ATF level. <Ref. to 4AT-32, Automatic Transmission Fluid.>

2. ATF TEMPERATURE SENSOR

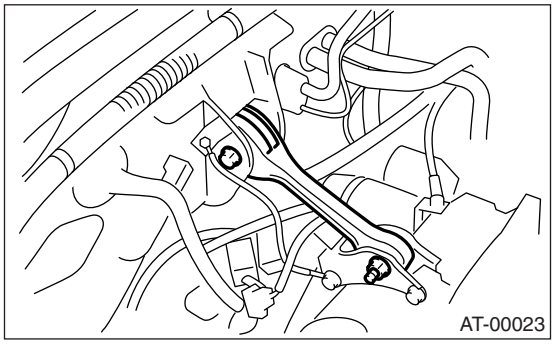
For installation procedure of the ATF temperature sensor, refer to “Front Vehicle Speed Sensor”. <Ref. to 4AT-61, INSTALLATION, Front Vehicle Speed Sensor.>

20. Transfer Duty Solenoid and Valve Body

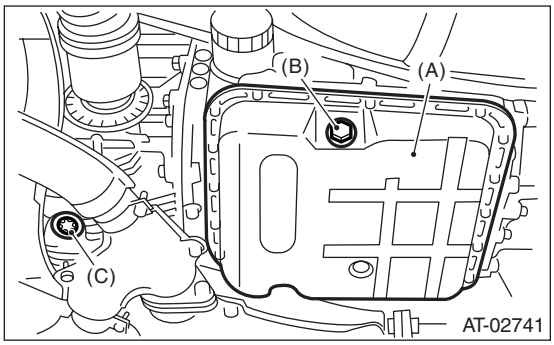
A: REMOVAL

NOTE:
This section is specified for non-turbo (model).

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-6, REMOVAL**, Air Cleaner Case.>**
4) Remove the pitching stopper.


AT-00023

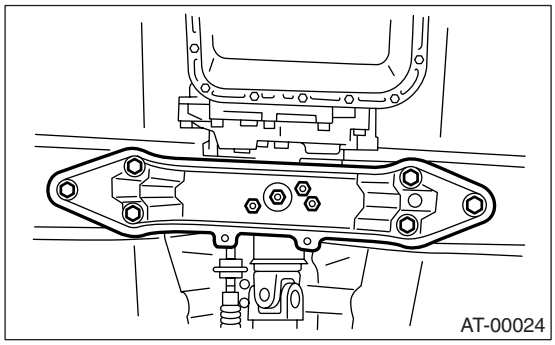
5) Remove the front exhaust pipe with center exhaust pipe. (Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL**, Front Exhaust Pipe.>**
6) Remove the rear exhaust pipe and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
7) Raise the vehicle and drain the ATF.



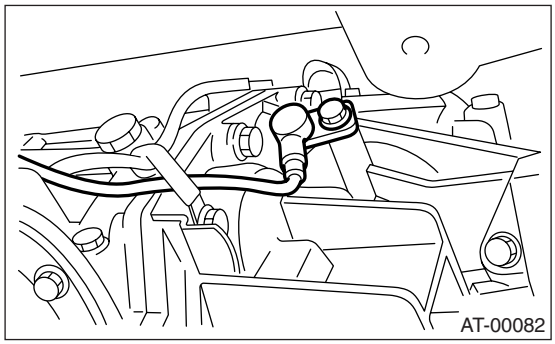
AT-02741

(A) Oil pan
(B) Drain plug (ATF)
(C) Differential oil drain plug

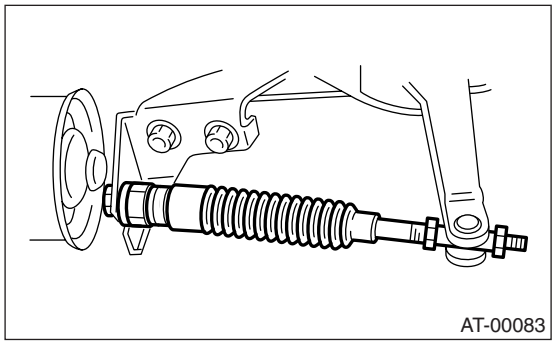
8) Remove the heat shield cover. (If equipped)
9) Remove the propeller shaft.
<Ref. to DS-15, REMOVAL, Propeller Shaft.>
10) Remove the transmission rear crossmember.
(1) Support the transmission using a transmission jack and raise slightly.
(2) Remove the bolts and nuts as shown in the figure.


AT-00024

11) Remove the rear vehicle speed sensor.

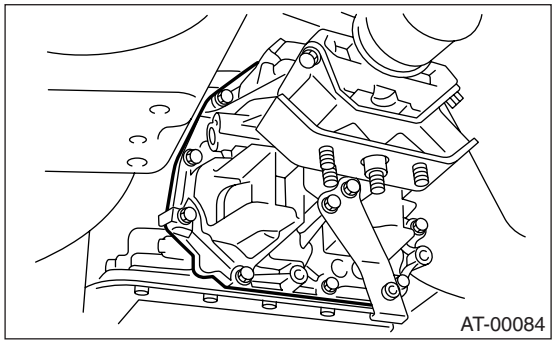

AT-00082

12) Remove the select cable nut.

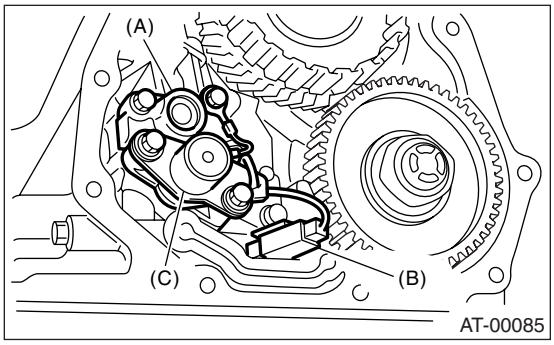

AT-00083

13) Move the gear select cable so that extension case securing bolts can be removed.
14) Remove the bolt.
15) Remove the extension case.

NOTE:
Use a container to catch oil flowing from extension.


AT-00084

16) Disconnect the transfer duty solenoid connector.
17) Remove the transfer duty solenoid and transfer valve body.



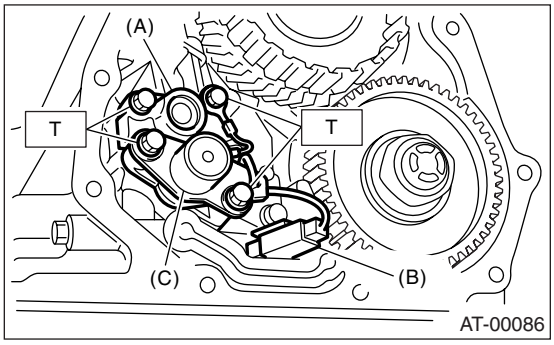
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

B: INSTALLATION

1) Install the transfer duty solenoid and transfer valve body.
(1) Install the transfer duty solenoid and transfer valve body.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

(2) Connect the transfer duty solenoid connector.



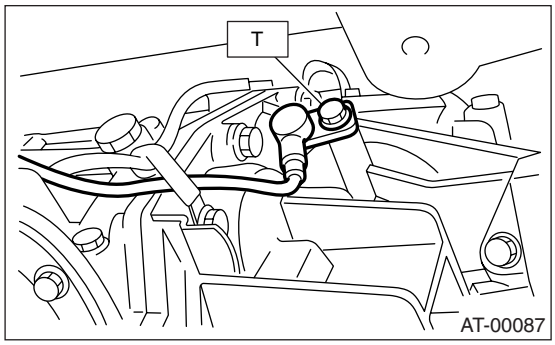
(A) Transfer valve body
(B) Transfer duty solenoid connector
(C) Transfer duty solenoid

2) Replace the gasket with a new one, and then install the extension case to transmission case.
(1) Tighten eleven bolts.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

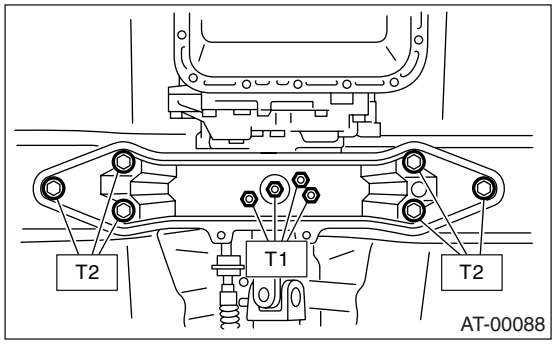
(2) Adjust the select cable. <Ref. to CS-32, ADJUSTMENT, Select Cable.>
3) Install the rear vehicle speed sensor.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

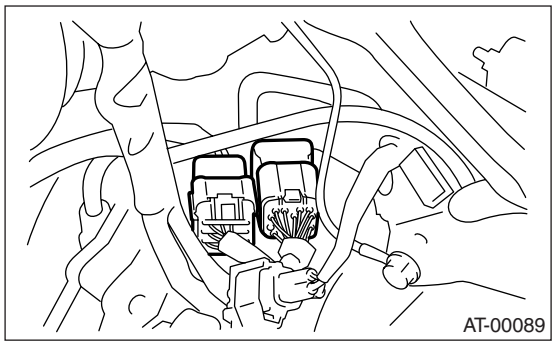


4) Install the transmission rear crossmember.
(1) Tighten the bolt.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 52 ft-lb)

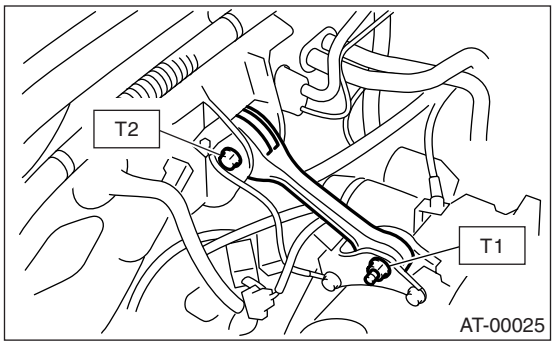


(2) Remove the transmission jack.
5) Install the propeller shaft.
<Ref. to DS-16, INSTALLATION, Propeller Shaft.>
6) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(H4SO)-8, INSTALLATION**, Front Exhaust Pipe.>** <Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
7) Connect the transmission harness connector.



8) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



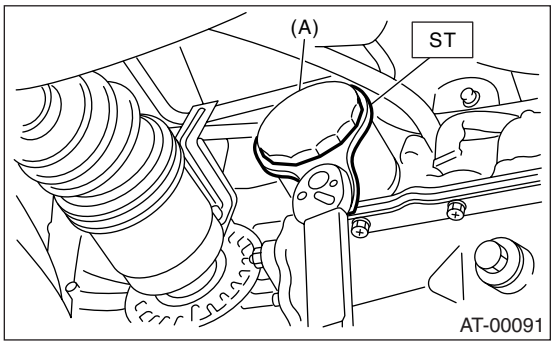
9) Install the air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-6,** INSTALLATION**, Air Cleaner Case.>**
10) Pour ATF from the oil charge pipe. <Ref. to 4AT-32, Automatic Transmission Fluid.>
11) Check the ATF level. <Ref. to 4AT-32, Automatic Transmission Fluid.>

21.ATF Filter

A: REMOVAL

NOTE:
The ATF filter is maintenance free.

1) Lift-up the vehicle.
2) Using ST, remove the ATF filter.
ST 498545400 OIL FILTER WRENCH



(A) ATF filter

B: INSTALLATION

1) Apply a thin coat of ATF to the oil seal part of new ATF filter.
2) Install the ATF filter. Turn it by hand, being careful not to damage oil seal.
3) Tighten the ATF filter using ST.
Calculate the ATF filter tightening torque using following formula.
$T2 = L2/ (L1+L2) \times T1$
T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST length 78 mm (3.07 in)
L2: Torque wrench length
Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	9.8 (1.0, 7.2)

NOTE:
Align the ST with torque wrench while tightening the ATF filter.

ST 498545400 OIL FILTER WRENCH

4) Fill ATF.
5) Check the level of the ATF. <Ref. to 4AT-32, Automatic Transmission Fluid.>

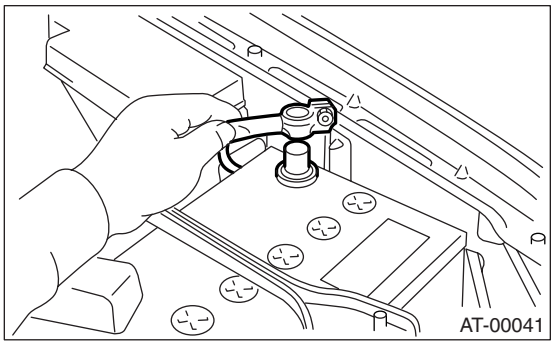
C: INSPECTION

• Replace the part if any defect is found from the inspection.
• Check for rust, hole, ATF leaks and other damage.

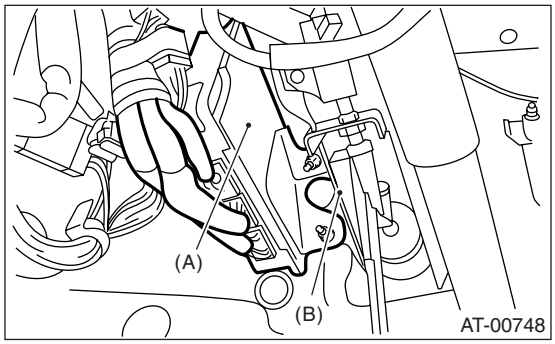
22.Transmission Control Module (TCM)

A: REMOVAL

1) Disconnect the ground cable from battery.

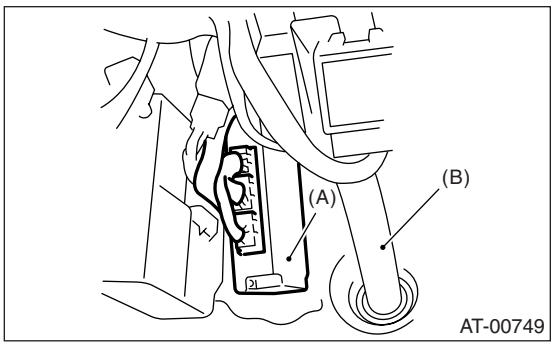


2) Remove the lower cover and then disconnect the connector.
3) Disconnect the connectors from TCM.
• LHD model



(A) Transmission control module (TCM)
(B) Brake pedal

• RHD model



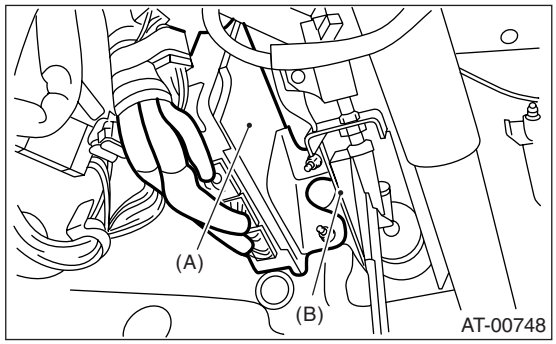
(A) Transmission control module (TCM)
(B) Steering column

4) Remove the TCM.

B: INSTALLATION

1) Install the TCM.
• LHD model

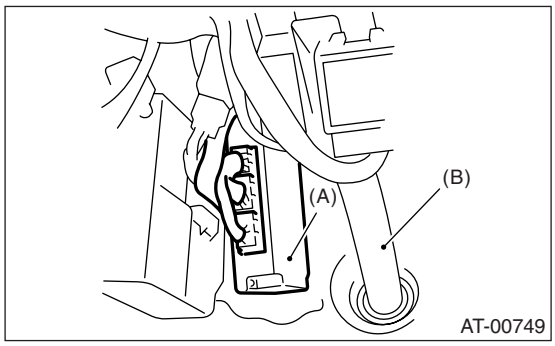
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



(A) Transmission control module (TCM)
(B) Brake pedal

• RHD model

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Transmission control module (TCM)
(B) Steering column

2) Connect the connectors to TCM.
3) Install in the reverse order of removal.

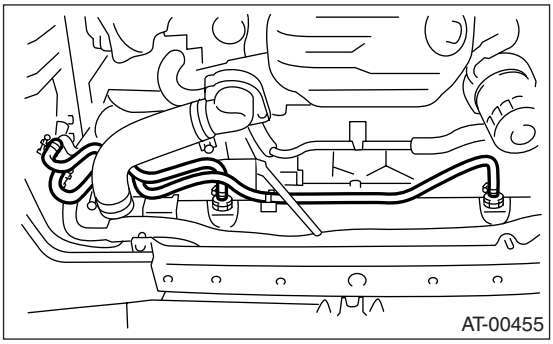
23.ATF Cooler Pipe and Hose

A: REMOVAL

1. EXCEPT WITH ATF COOLER MODEL (WITH WARMER FUNCTION)

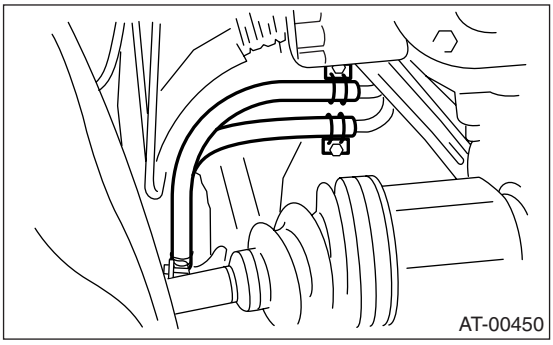
1) Set the vehicle on a lift.
2) Remove the battery and washer tank.
3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the ATF cooler hose from radiator. (Turbo model)
<Ref. to CO(H4SO)-29, TURBO MODEL, REMOVAL, Radiator.>
6) Disconnect the ATF cooler hose from radiator. (Non-turbo model)

NOTE:
• Do not use a screwdriver or other pointed tools.
• When hard to disconnect the hose, wrap the hose with cloth to prevent from damaging, and then turn with pliers and pull out with hand straightly.

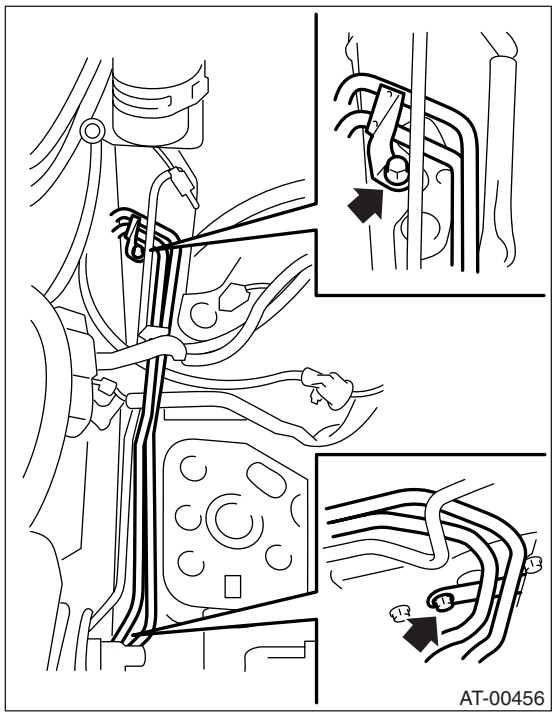


7) Disconnect the ATF cooler hoses from pipes.

NOTE:
• Do not use a screwdriver or other pointed tools.
• When hard to disconnect the hose, wrap the hose with cloth to prevent from damaging, and then turn with pliers and pull out with hand straightly.

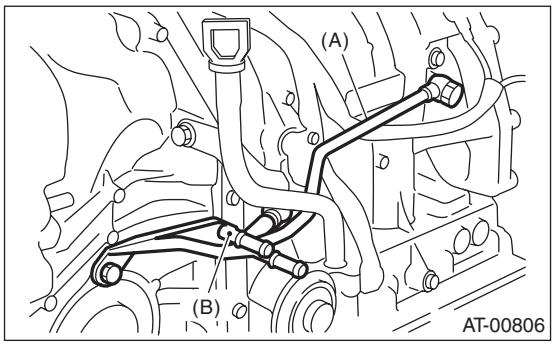


8) Disconnect the ATF cooler pipe from frame.



9) Remove the ATF cooler inlet and outlet pipes.

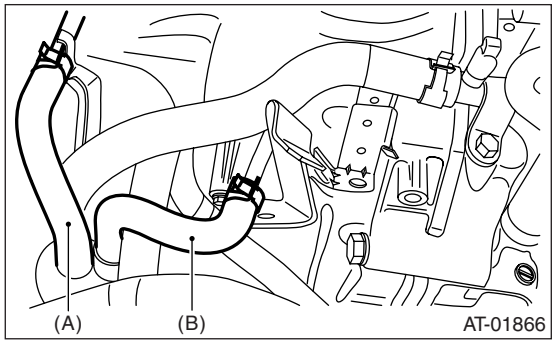
CAUTION:
When disconnecting the outlet pipe, be careful not to lose the ball and spring used with retaining screw.



(A) ATF cooler inlet pipe
(B) ATF cooler outlet pipe

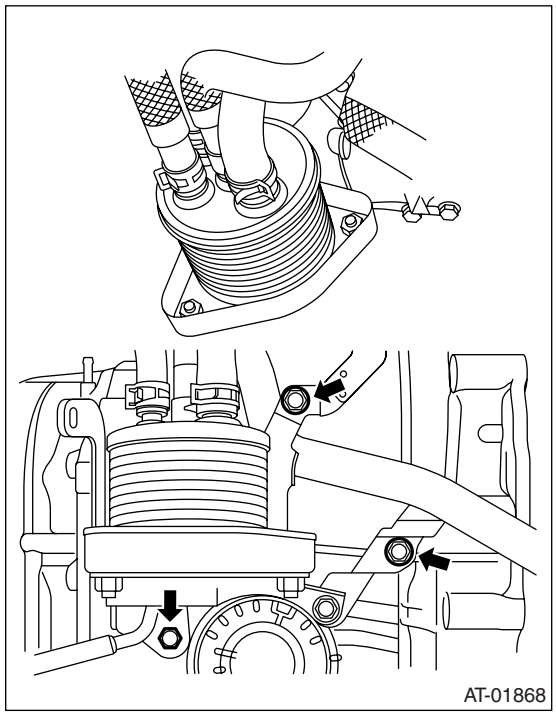
2. WITH ATF COOLER MODEL (WITH WARMER FUNCTION)

1) Set the vehicle on a lift.
2) Remove the air cleaner case. <Ref. to IN(H4SO)-6, REMOVAL, Air Cleaner Case.>
3) Disconnect the inlet and outlet hoses.



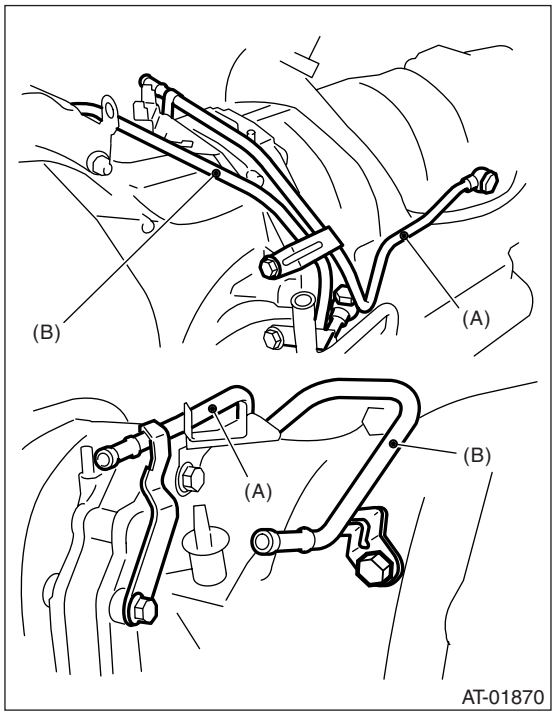
(A) Inlet hose
(B) Outlet hose

4) Disconnect the transmission harness connector and remove it from the stay.
5) Remove the oil charge pipe. <Ref. to 4AT-92, REMOVAL, Oil Charge Pipe.>
6) Remove the ATF cooler assembly and away from the transmission body.



7) Disconnect the air breather hose. <Ref. to 4AT-91, REMOVAL, Air Breather Hose.>
8) Remove the oil cooler inlet and outlet pipes.

CAUTION:
When disconnecting the outlet pipe, be careful not to lose the ball and spring used with retaining screw.



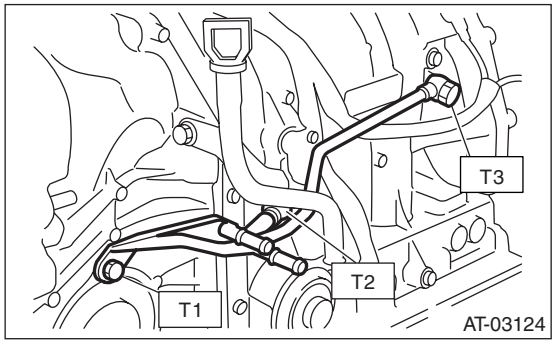
(A) ATF cooler outlet pipe
(B) ATF cooler inlet pipe

B: INSTALLATION

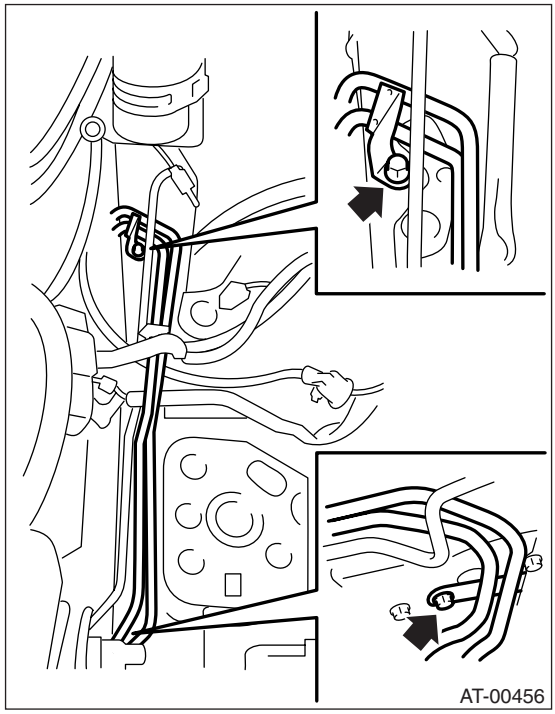
1. EXCEPT FOR MODEL WITH ATF COOLER (WITH WARMER FUNCTION)

1) Install the ATF oil cooler inlet pipe and outlet pipe with new washer.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)
T2: 45 N·m (4.6 kgf-m, 33 ft-lb)
T3: 40 N·m (4.1 kgf-m, 30 ft-lb)

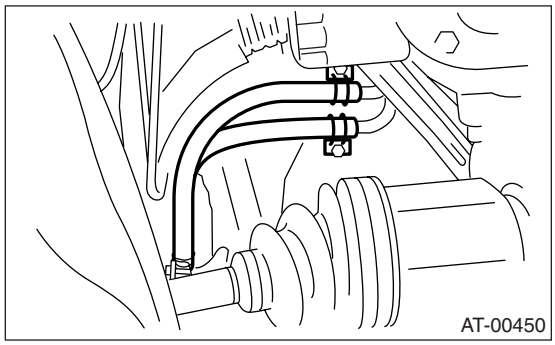


2) Install the ATF cooler pipe to frame.



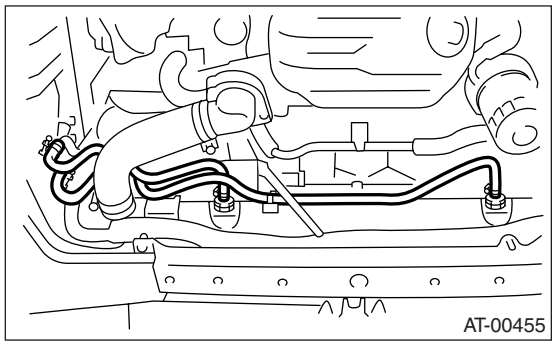
3) Connect the ATF cooler hose to pipe on transmission side.

NOTE:
• Connect so that the hose is not folded over, excessively bent, or twisted.
• Be careful to insert the hose to the specified position.



4) Connect the ATF cooler hose to pipe on radiator side. (Non-turbo model)

NOTE:
• Connect so that the hose is not folded over, excessively bent or twisted.
• Be careful to insert the hose to the specified position.



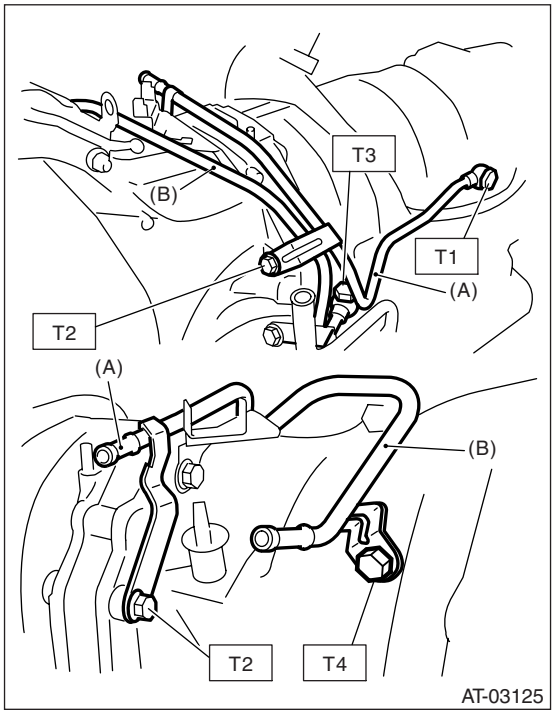
5) Connect the ATF cooler hose to pipe on radiator side. (Turbo model)
<Ref. to CO(H4SO)-32, TURBO MODEL, INSTALLATION, Radiator.>
6) Install the under cover.
7) Install the battery and washer tank.
8) Fill ATF. <Ref. to 4AT-32, Automatic Transmission Fluid.>

NOTE:
Make sure there are no ATF leaks in joints between the transmission, radiator, pipes and hoses.

2. MODEL WITH ATF COOLER (WITH WARMER FUNCTION)

1) Install the ATF cooler inlet and outlet pipe with new washer.

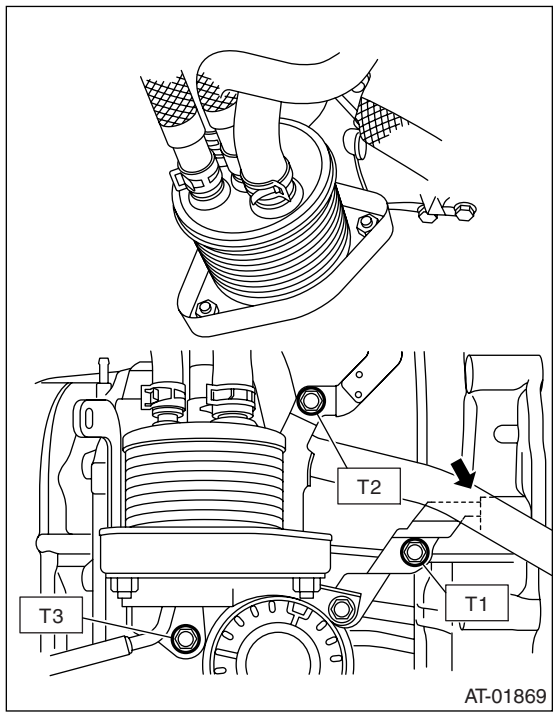
Tightening torque:
T1: 40 N·m (4.1 kgf-m, 30 ft-lb)
T2: 41 N·m (4.2 kgf-m, 30.4 ft-lb)
T3: 45 N·m (4.6 kgf-m, 33 ft-lb)
T4: 21 N·m (2.1 kgf-m, 15.5 ft-lb)



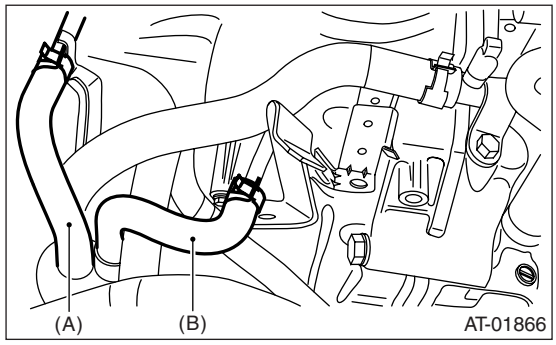
(A) ATF cooler outlet pipe
(B) ATF cooler inlet pipe

2) Install the ATF cooler assembly to transmission.

Tightening torque:
T1: 21 N·m (2.1 kgf-m, 15.5 ft-lb)
T2: 23 N·m (2.3 kgf-m, 17.0 ft-lb)
T3: 33 N·m (3.4 kgf-m, 25 ft-lb)



3) Install the oil charge pipe. <Ref. to 4AT-92, INSTALLATION, Oil Charge Pipe.>
4) Connect the inlet and outlet hoses.



(A) Inlet hose
(B) Outlet hose

5) Install the inhibitor switch and transmission harness connector to the stay, and connect the harness connector.
6) Connect the air breather hose. <Ref. to 4AT-91, INSTALLATION, Air Breather Hose.>
7) Install the air cleaner case. <Ref. to IN(H4SO)-6, INSTALLATION, Air Cleaner Case.>

C: INSPECTION

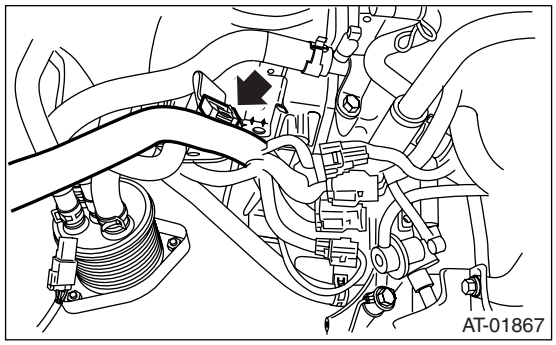
Repair or replace any defective hoses, pipes, clamps and washers found from the inspection below.

1) Check for ATF leaks in joints between the transmission, radiator, pipes, and hoses.
2) Check for deformed clamps.
3) Lightly bend the hose and check for cracks in the surface and other damage.
4) Pinch the hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was installed by pressing with your fingernail.
5) Check for peeling, cracks and deformation at the tip of the hose.

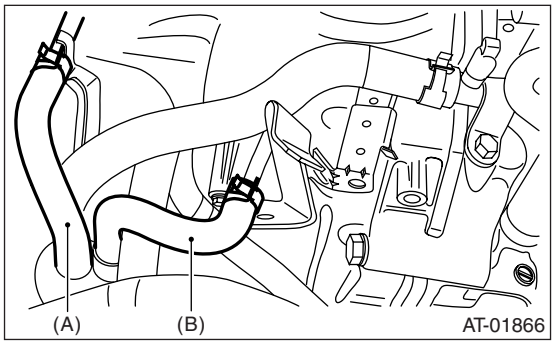
24.ATF Cooler (With Warmer Function)

A: REMOVAL

1) Drain engine coolant. <Ref. to CO(H4SO)-19, REPLACEMENT, Engine Coolant.>
2) Remove the air cleaner case. **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
3) Remove the harness from bracket.

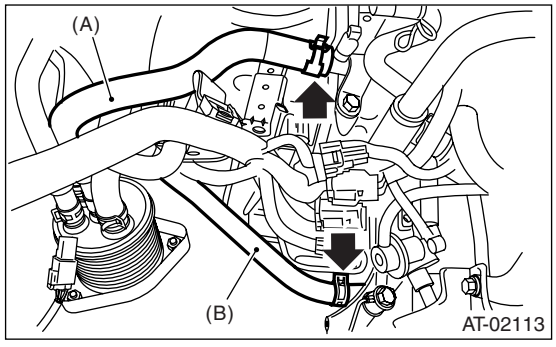


4) Disconnect the hose from pipe of transmission.



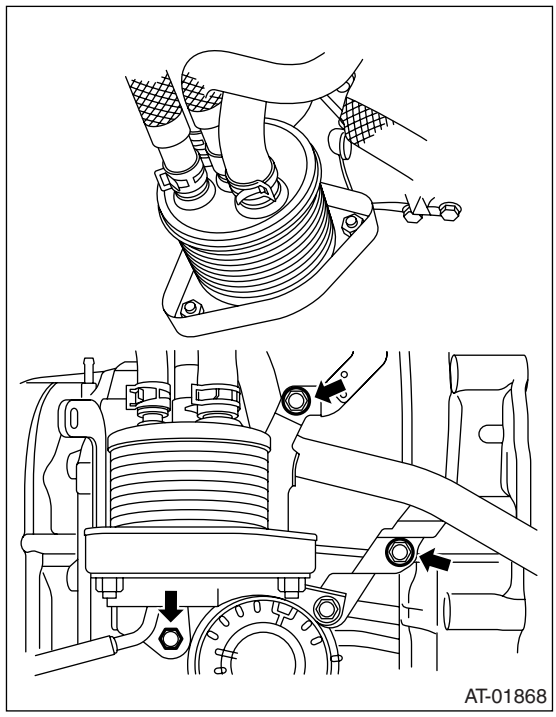
(A) Inlet pipe
(B) Outlet pipe

5) Disconnect the engine coolant inlet hose from cylinder block and the engine coolant outlet hose from upper side of engine.



(A) Outlet hose
(B) Inlet hose

6) Remove the ATF Cooler (with warmer function) from transmission body, and then disconnect the hose located lower of ATF cooler (with warmer function).

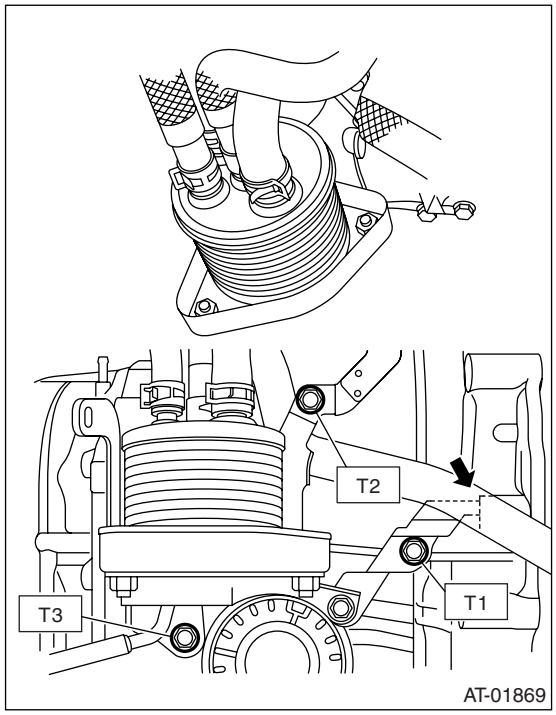


B: INSTALLATION

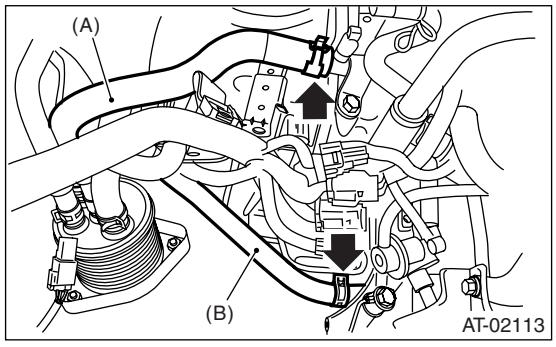
1) Connect the hose to lower side of ATF cooler (with warmer function), and then install the ATF cooler (with warmer function) to transmission body.

NOTE:
Insert the tip of ATF cooler bracket into hole of torque converter case.

Tightening torque:
T1: 21 N·m (2.1 kgf-m, 15.5 ft-lb)
T2: 23 N·m (2.3 kgf-m, 17.0 ft-lb)
T3: 33 N·m (3.4 kgf-m, 25 ft-lb)

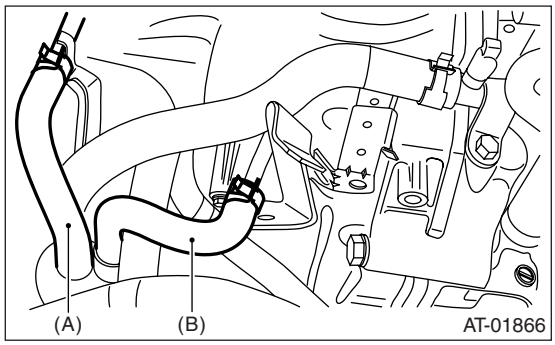


2) Connect the engine coolant inlet hose to cylinder block and the engine coolant outlet hose to upper side of engine.



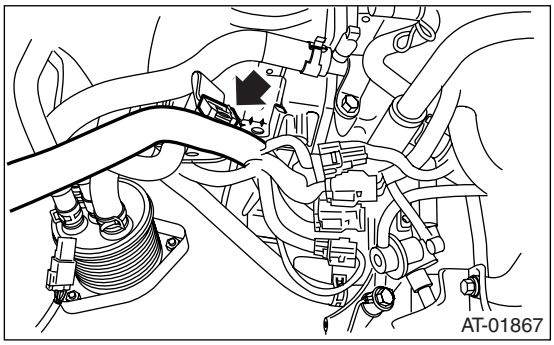
(A) Outlet hose
(B) Inlet hose

3) Connect the hose to pipe on transmission side.



(A) Inlet pipe
(B) Outlet pipe

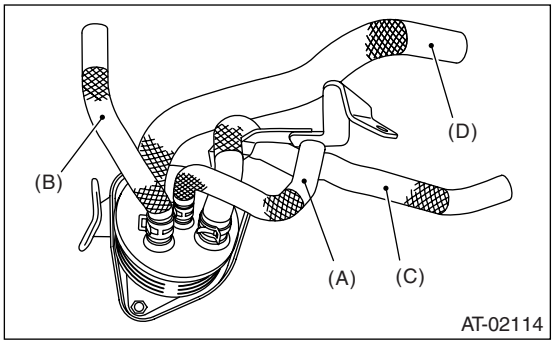
4) Install the harness to bracket.



5) Install the air cleaner case. **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
6) Fill with engine coolant. <Ref. to CO(H4SO)-19, REPLACEMENT, Engine Coolant.>

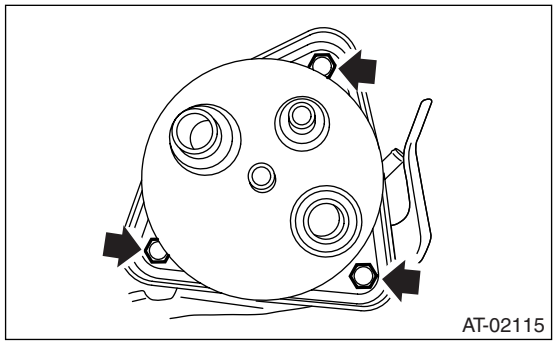
C: DISASSEMBLY

1) Disconnect each connector from ATF cooler (with warmer function).



(A) ATF Outlet hose
(B) ATF Inlet hose
(C) Engine coolant inlet hose
(D) Engine coolant outlet hose

2) Remove the ATF cooler (with warmer function) from bracket.

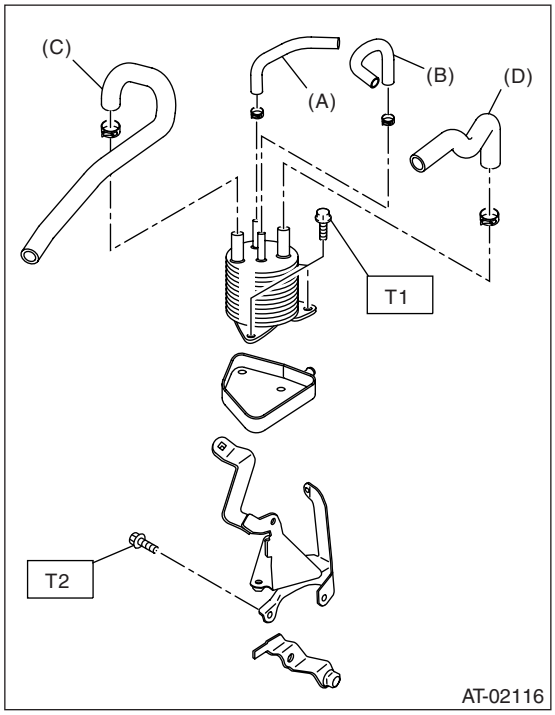


D: ASSEMBLY

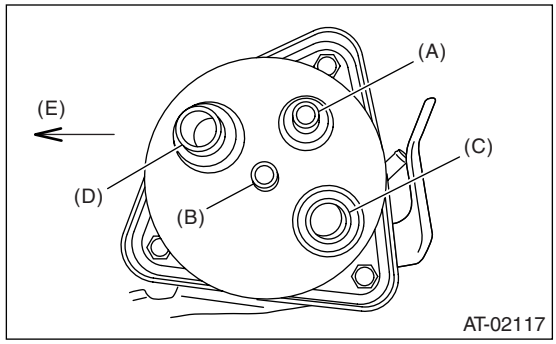
Assemble in the reverse order of disassembly.

CAUTION:
When connecting hose, be careful of its direction.

Tightening torque:
T1: 23 N·m (2.3 kgf-m, 17.0 ft-lb)
T2: 33 N·m (3.4 kgf-m, 25.0 ft-lb)



(A) ATF Inlet hose
(B) ATF Outlet hose
(C) Engine coolant outlet hose
(D) Engine coolant inlet hose



(A) ATF Inlet
(B) ATF Outlet
(C) Engine coolant outlet
(D) Engine coolant inlet
(E) Forward

E: INSPECTION

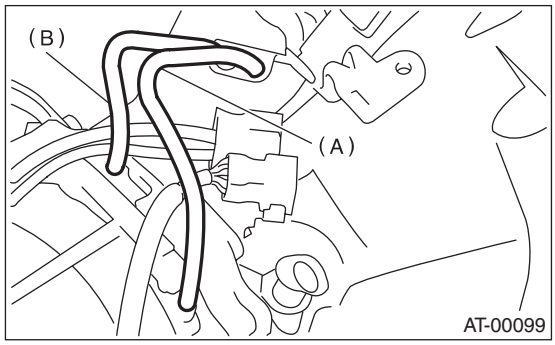
Check the ATF cooler (with warmer function) for damage.

25.Air Breather Hose

A: REMOVAL

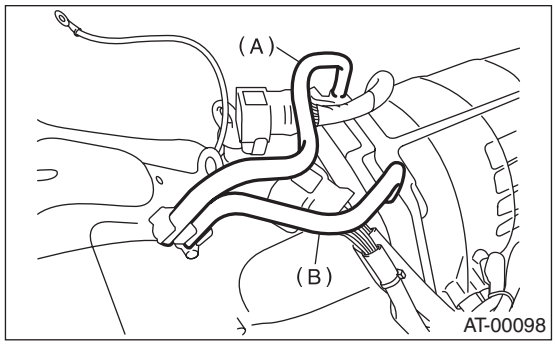
1) Remove the air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
3) Disconnect the air breather hose.

- Non-turbo model



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

- Turbo model



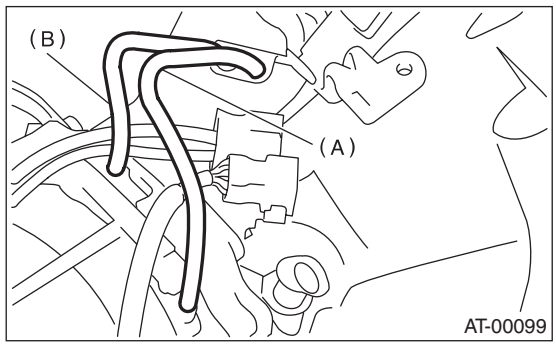
(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

B: INSTALLATION

1) Connect the air breather hose.

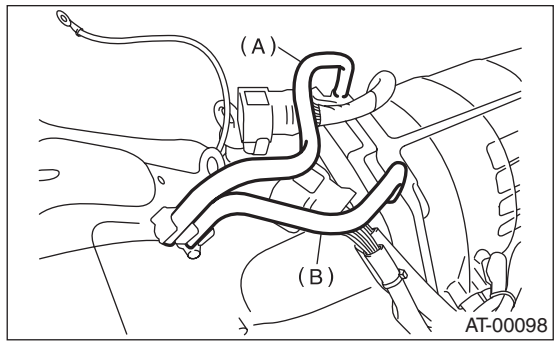
NOTE:
Connect it without no twist and bend.

- Non-turbo model



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

- Turbo model



(A) Air breather hose (Transmission case)
(B) Air breather hose (Oil pump housing)

2) Install the air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-6,** INSTALLATION**, Air Cleaner Case.>**
3) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>

C: INSPECTION

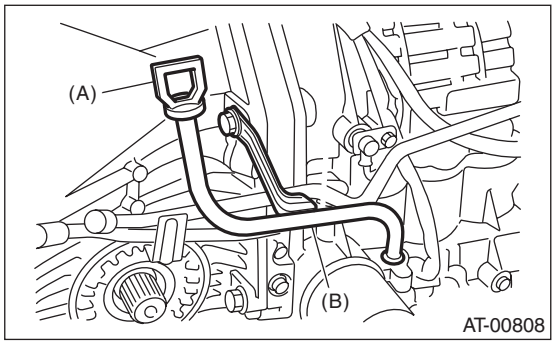
Make sure the hose is not cracked or clogged.

26.Oil Charge Pipe

A: REMOVAL

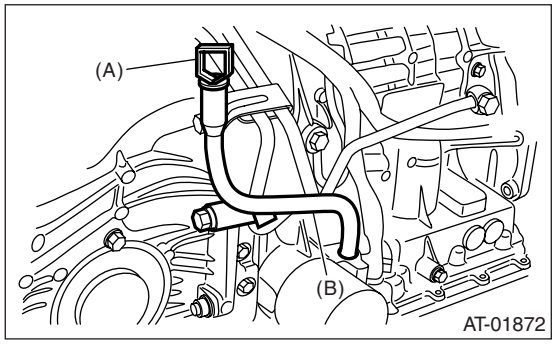
1) Remove the air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.>**
2) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
3) Remove the oil charge pipe, and then remove the O-ring from flange side.

- Model without ATF warmer



(A) ATF level gauge
(B) Oil charge pipe

- Model with ATF warmer



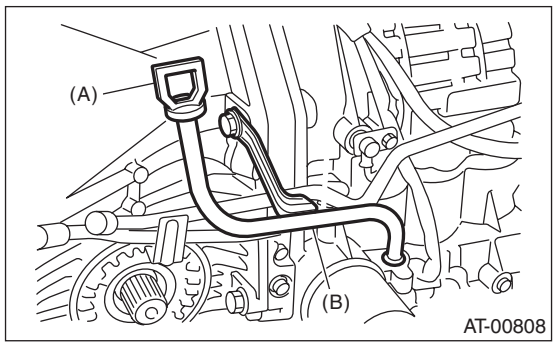
(A) ATF level gauge
(B) Oil charge pipe

B: INSTALLATION

1) Install the oil charge pipe with a new O-ring.

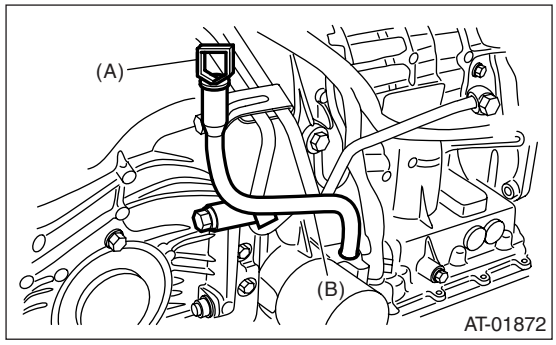
Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)

- Model without ATF warmer



(A) ATF level gauge
(B) Oil charge pipe

- Model with ATF warmer



(A) ATF level gauge
(B) Oil charge pipe

2) Install the air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-6,** INSTALLATION**, Air Cleaner Case.>**
3) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>

C: INSPECTION

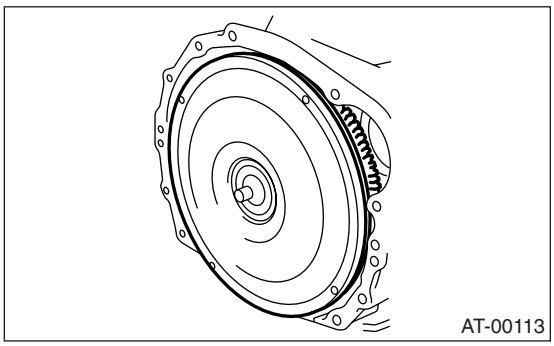
Make sure the oil charge pipe is not deformed or damaged.

27. Torque Converter Clutch Assembly

A: REMOVAL

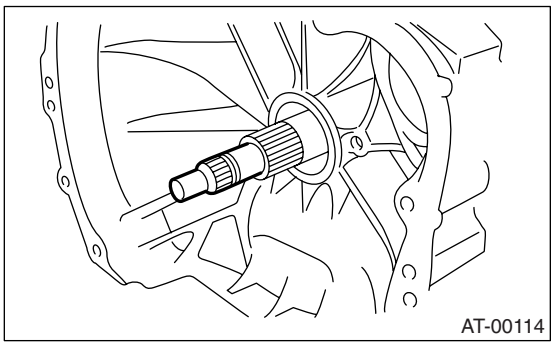
1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly and oil pump shaft horizontally.

CAUTION:
Be sure not to scratch the inside of bush in oil pump shaft.



3) Remove the input shaft.

NOTE:
When the torque converter clutch assembly is removed, the input shaft is also removed.

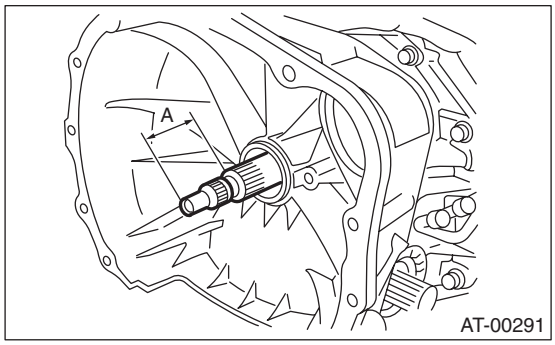


4) Remove the clips from torque converter clutch assembly.

B: INSTALLATION

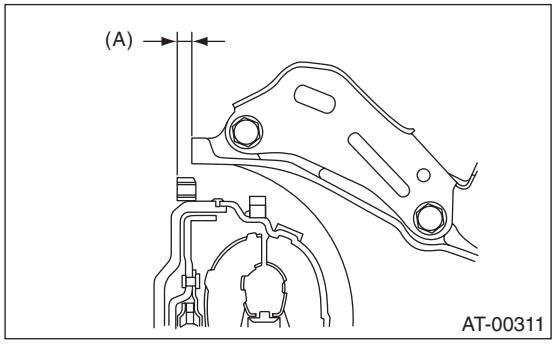
1) Install the clip to converter case.
2) Install the oil pump shaft to torque converter clutch assembly, and then make sure that the clip is secured on groove.
3) Insert the input shaft with rotating it by hand lightly, and then check the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



4) With holding the torque converter clutch assembly by hands, carefully install to the converter case. Take care not to damage the bushing. Not to contact the oil pump shaft bush and starter shaft part of oil pump cover inappropriately.
5) Lightly rotating the oil pump shaft by hands to engage the spline securely, and then check the dimension A of converter case and torque converter clutch assembly.

Dimension A:
2.0 L NON-TURBO MODEL
–1.3 — –1.1 mm (–0.015 — –0.043 in)
EXCEPT FOR 2.0 L NON-TURBO MODEL
2.7 — 2.9 mm (0.106 — 0.114 in)



(A) Dimension A

6) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

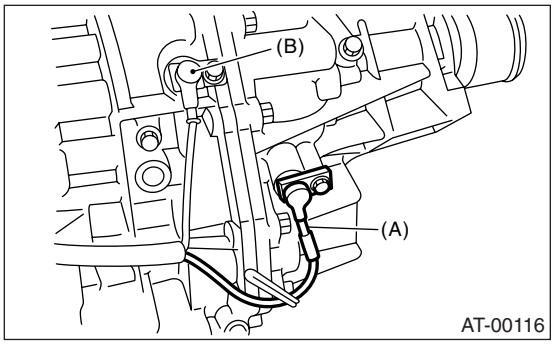
C: INSPECTION

Make sure the ring gear and protrusion of torque converter clutch end is not deformed or damaged.

28.Extension Case

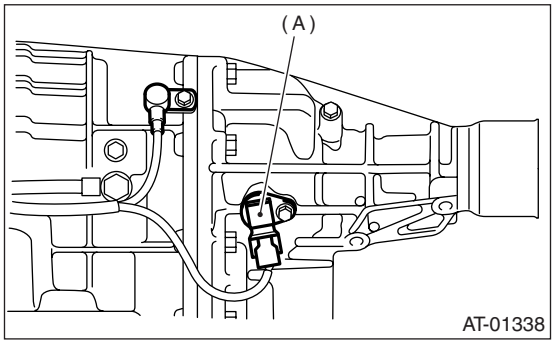
A: REMOVAL

1) Remove the transmission assembly.
<Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor.
• Non-turbo model



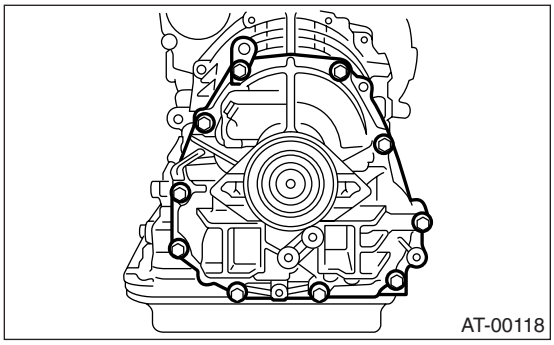
(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

• Turbo model



(A) Rear vehicle speed sensor

3) Separate the transmission case and extension case part.



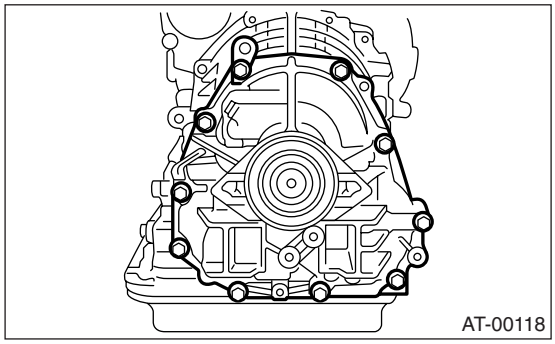
B: INSTALLATION

1) Apply the vaseline to selected thrust needle bearing and attach it to the end surface of reduction driven gear. <Ref. to 4AT-99, ADJUSTMENT, Transfer Clutch.>

NOTE:
Install the thrust needle bearing in correct direction.

2) Install a new gasket.
3) Install the extension case to transmission case.
4) Tighten bolts to secure the extension case.

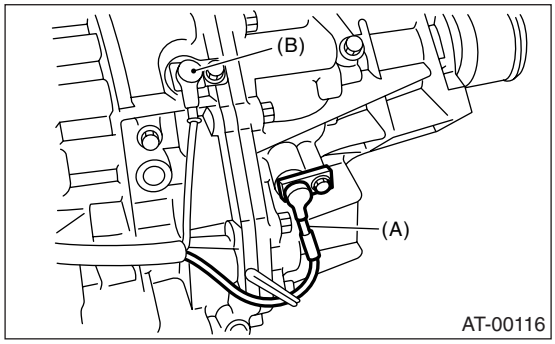
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



5) Install the rear vehicle speed sensor.

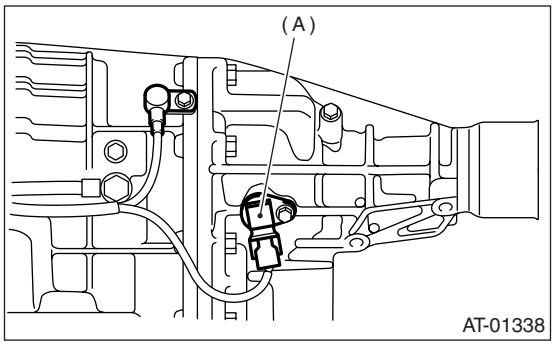
Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

• Non-turbo model



(A) Rear vehicle speed sensor
(B) Front vehicle speed sensor

• Turbo model



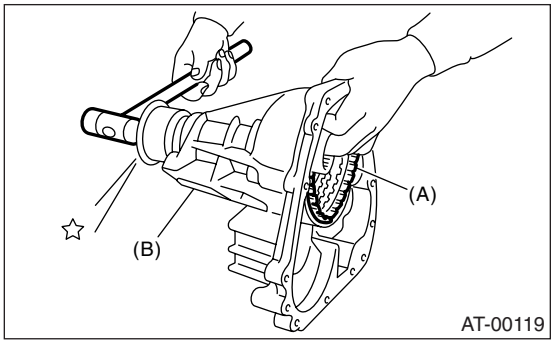
(A) Rear vehicle speed sensor

6) Install the transmission assembly.
<Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

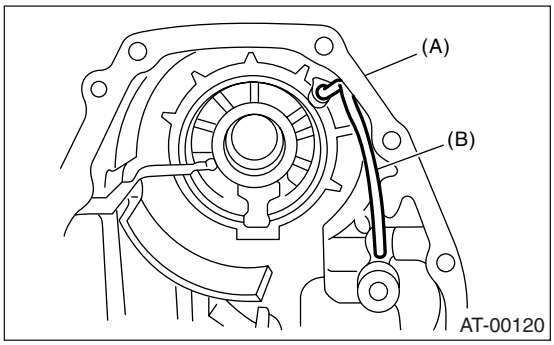
1) Take out the transfer clutch assembly by lightly tapping the end of rear drive shaft using plastic hammer and etc.

NOTE:
Be careful not to damage the oil seal of extension.



(A) Extension case
(B) Transfer clutch ASSY

2) Remove the transfer clutch pipe without bending the pipe.



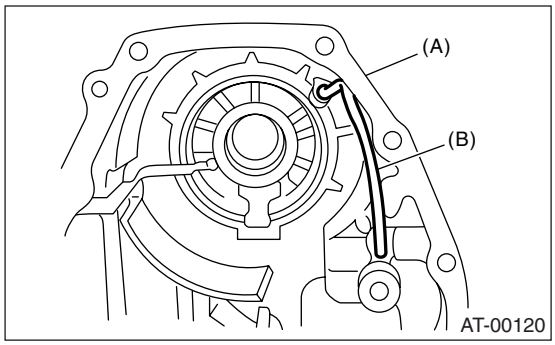
(A) Extension case
(B) Transfer clutch pipe

3) Remove the dust cover from extension case.

4) Remove the oil seal from the extension case.

D: ASSEMBLY

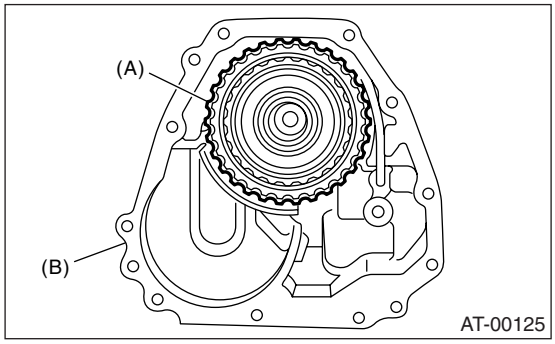
1) Press-fit new oil seal using ST and press.
ST 498057300 INSTALLER
2) Press-fit the dust cover.
3) Install the transfer clutch pipe to extension case without bending the pipe.



(A) Extension case
(B) Transfer clutch pipe

4) Install the transfer clutch assembly to the case.

NOTE:
• Be careful not to damage the seal ring.
• Press-fit the transfer clutch assembly to bottom of bearing shoulder completely.



(A) Transfer clutch ASSY
(B) Extension case

E: INSPECTION

• Use compressed air to make sure the transfer pipe and extension case routes are not clogged and not leaks.
• Measure the extension end play and adjust it to within specifications. <Ref. to 4AT-99, ADJUSTMENT, Transfer Clutch.>

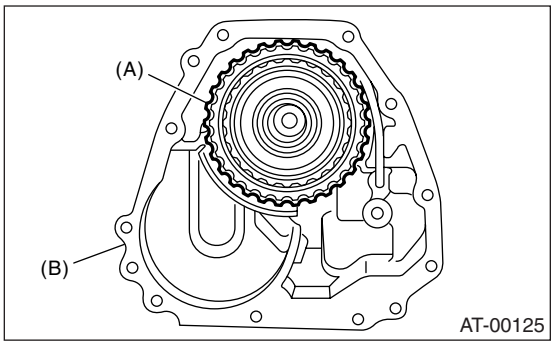
29.Transfer Clutch

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Remove the extension case, and then remove the transfer clutch assembly. <Ref. to 4AT-94, REMOVAL, Extension Case.> <Ref. to 4AT-95, DISASSEMBLY, Extension Case.>

B: INSTALLATION

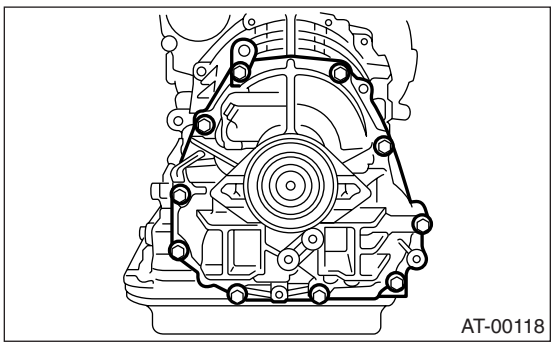
1) Select the thrust needle bearing. <Ref. to 4AT-99, ADJUSTMENT, Transfer Clutch.>
2) Install the transfer clutch assembly to the case.



(A) Transfer clutch ASSY
(B) Extension case

3) Tighten bolts to secure the case.

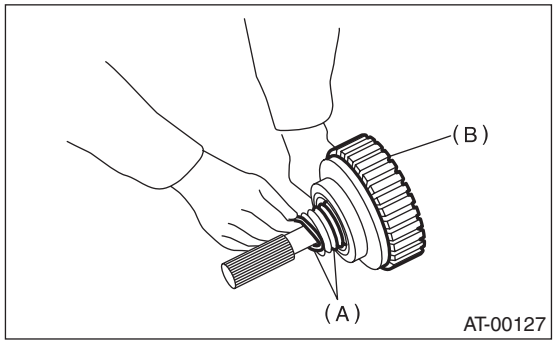
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



4) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

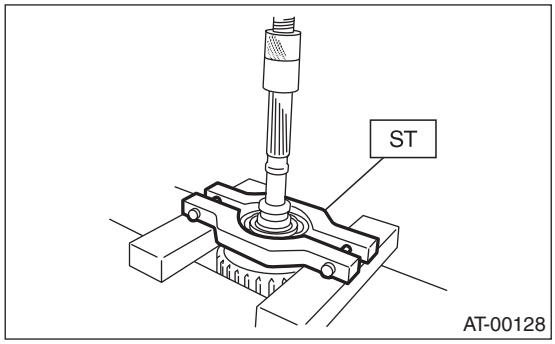
C: DISASSEMBLY

1) Remove the seal ring.

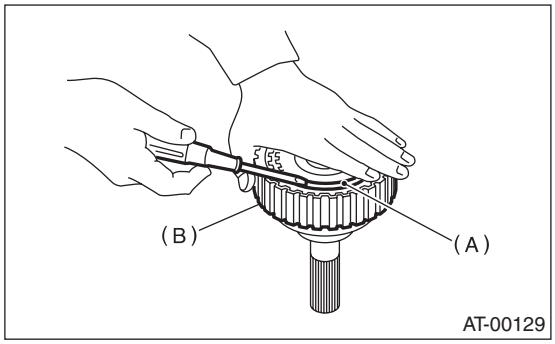


(A) Seal ring
(B) Rear drive shaft

2) Remove ball bearing using ST and press.
ST 498077600 REMOVER

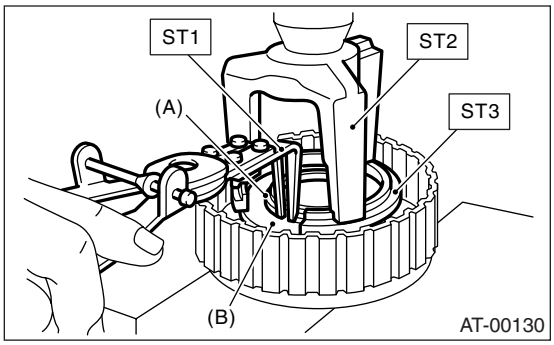


3) Remove the snap ring, and then take out the pressure plate, drive plate and driven plate using flat tip screw driver and etc.



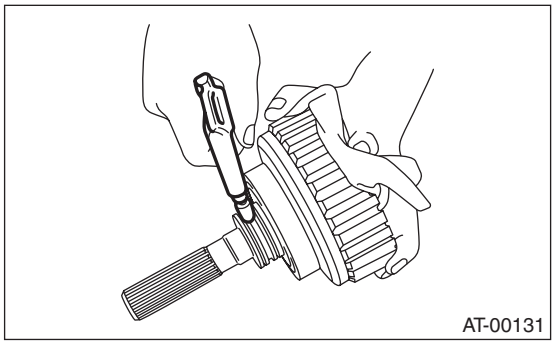
(A) Snap ring
(B) Rear drive shaft

4) Using ST1, ST2 and ST3, remove the snap ring, and then take out the return spring and transfer clutch piston seal.
ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR
ST3 398623600 SEAT



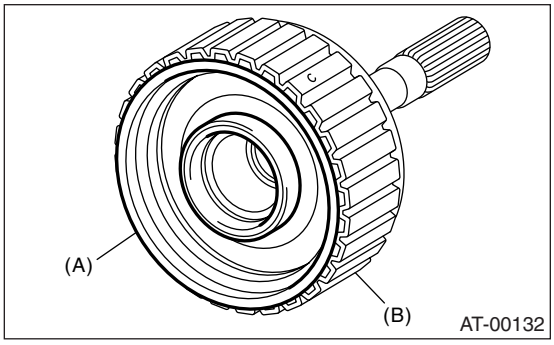
(A) Snap ring
(B) Transfer clutch piston seal

5) Apply compressed air to the rear drive shaft to remove the transfer clutch piston.



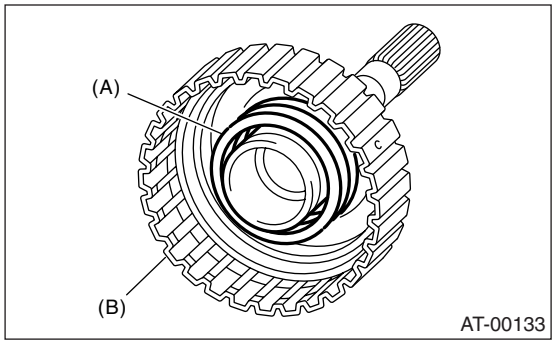
D: ASSEMBLY

1) Install the transfer clutch piston.



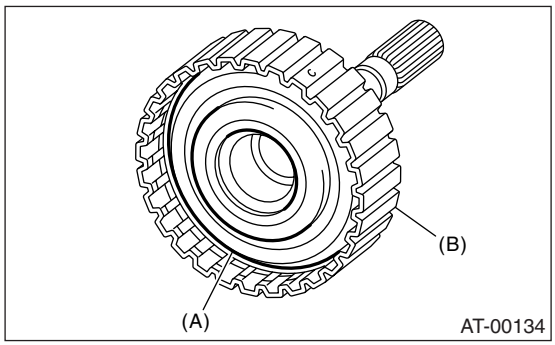
(A) Transfer clutch piston
(B) Rear drive shaft

2) Install the return spring to transfer clutch piston.



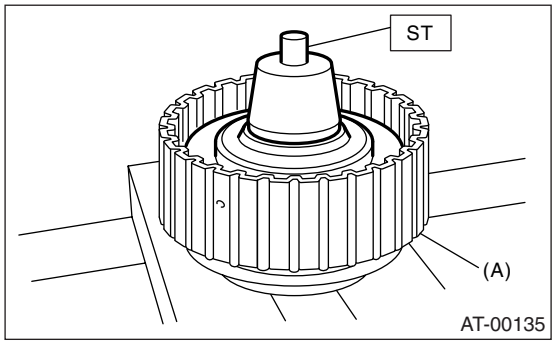
(A) Return spring
(B) Rear drive shaft

3) Install the transfer clutch piston seal.



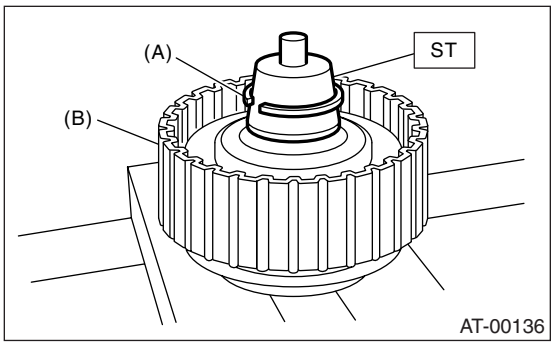
(A) Transfer clutch piston seal
(B) Rear drive shaft

4) Install ST to the rear drive shaft.
ST 499257300 SNAP RING OUTER GUIDE



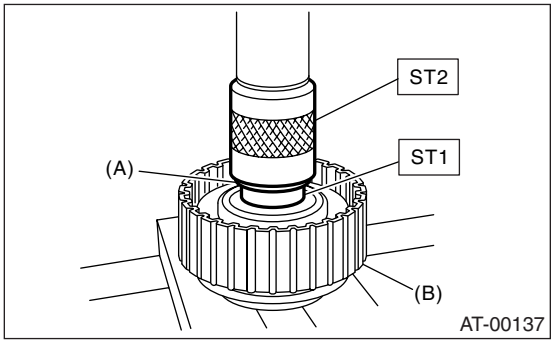
(A) Rear drive shaft

5) Install the snap ring to ST.
ST 499257300 SNAP RING OUTER GUIDE



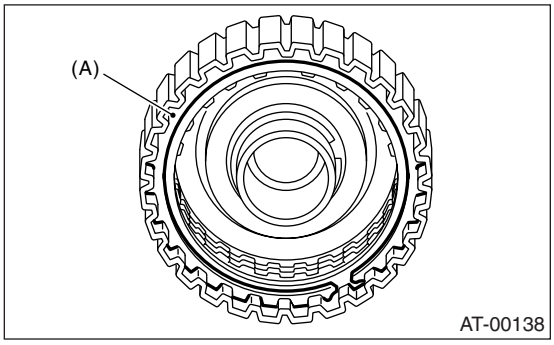
(A) Snap ring
(B) Transfer clutch

6) Install the snap ring to rear drive shaft using ST1 and ST2.
ST1 499257300 SNAP RING OUTER GUIDE
ST2 499247400 INSTALLER



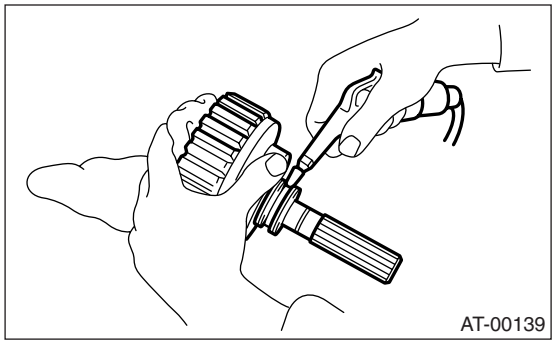
(A) Snap ring
(B) Transfer clutch

7) Install the driven plate, drive plate, pressure plate, retaining plate and snap ring.

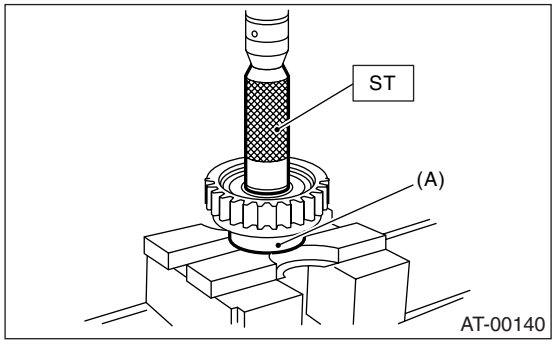


(A) Snap ring

8) Apply compressed air to see if the assembled parts move smoothly.



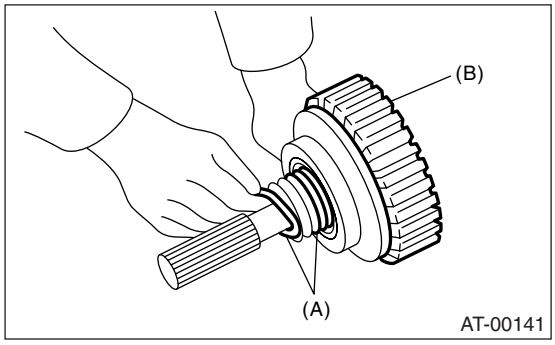
9) Check clearance between snap ring and pressure plate. <Ref. to 4AT-99, INSPECTION, Transfer Clutch.>
10) Press-fit new ball bearing using ST.
ST 899580100 INSTALLER



(A) Ball bearing

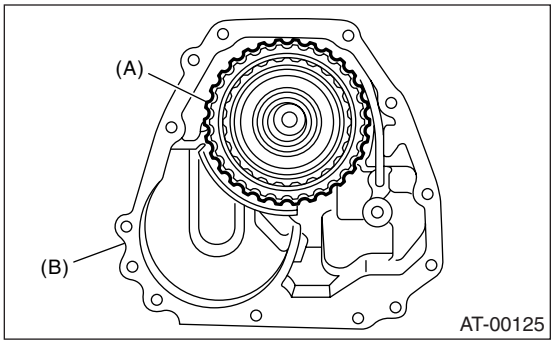
11) Apply vaseline to seal ring and attach to seal ring groove of rear drive shaft.

NOTE:
While installing the seal ring, not to expand the seal ring excessively.



(A) Seal ring
(B) Rear drive shaft

12) Install the transfer clutch assembly without damaging seal ring.



(A) Transfer clutch ASSY
(B) Extension case

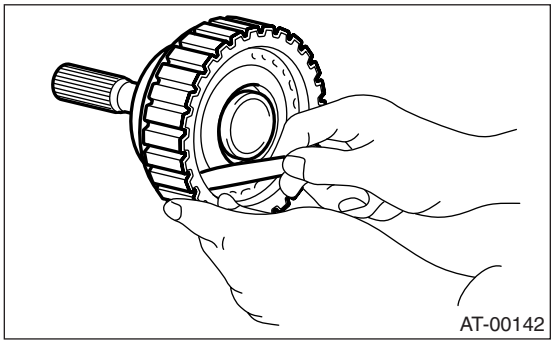
E: INSPECTION

- Inspect the drive plate facing for wear and damage.
- Inspect the snap ring for wear; return spring for permanent distortion, breakage and deformation.
- Inspect the damage for D-ring.
- Measure the extension end play and adjust it to within specifications. <Ref. to 4AT-99, ADJUSTMENT, Transfer Clutch.>

1) Check clearance between snap ring and pressure plate.
2) Before measuring clearance, place the same thickness of shim on both sides to prevent pressure plate from tilting.
3) If the clearance is out of specification, select a suitable retaining plate and adjust it.

Standard value:
0.7 — 1.1 mm (0.028 — 0.043 in)

Service limit:
1.6 mm (0.063 in)



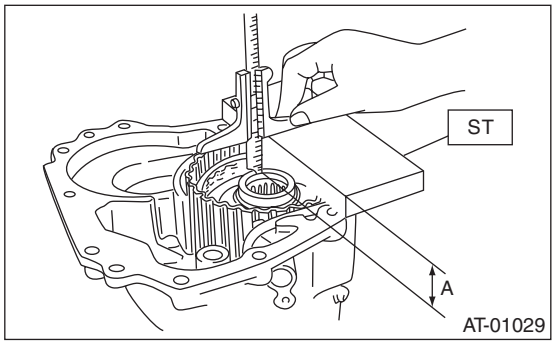
Retaining plate	
Part number	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)
31593AA171	4.1 (0.161)
31593AA181	4.5 (0.177)

4) Check that the tight corner braking does not occur when the vehicle is started with steering wheel held at fully turned position. If tight corner braking occurs, perform the following procedures.
(1) With the steering wheel held at fully turned position, drive the vehicle in “D” range and with vehicle speed at approx. 5 km/h (3 MPH) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.
(2) If the tight corner braking still persists, drive the vehicle again in a circle for several laps.

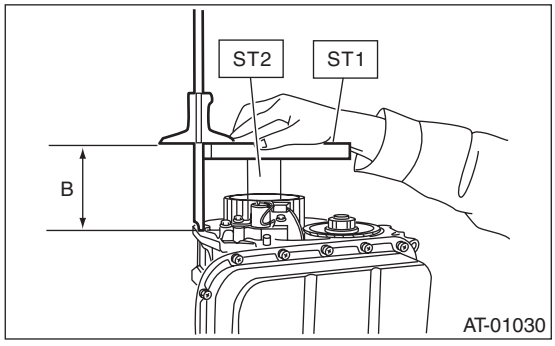
F: ADJUSTMENT

1. MPT MODEL

1) Measure distance “A” from end of extension case and rear drive shaft with ST.
ST 398643600 GAUGE



2) Measure the distance “B” from the transmission case end to reduction drive gear end surface with ST1 and ST2.
ST1 398643600 GAUGE
ST2 499577000 GAUGE



3) Calculation formula:

NOTE:
Calculation of "T":
T = A–B+35.4 mm
[T = A–B+1.3937 in]
T: Thrust needle bearing thickness
A: Distance from the end of extension case to end of rear drive shaft
B: Distance from the end of transmission case to end of reduction drive gear
Example:
When A = 33.6 mm (1.3228 in), B = 65.05 mm (2.5610 in)
T = 33.6–65.05+35.4 = 3.95
[T = 1.3228–2.5610+1.3937 = 0.1555]
After calculation, the value of "T" becomes 3.95, therefore select bearing thickness of 3.8.

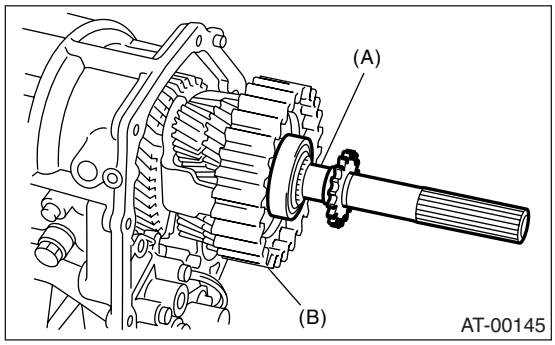
NOTE:
Calculation formula for "T" is applied when measuring using ST (398643600 GAUGE, 499577000 GAUGE). When not using ST, apply
T = (A–α+0.45 mm) – (B–β) –H
[T = (A–α+0.0177 in) – (B–β) –H]

T: Thrust needle bearing thickness
A: Distance from the end of extension case to end of reduction drive shaft
B: Distance from the end of transmission case to end of rear drive shaft
α: Collar thickness used when measuring "A"
β: Collar thickness used when measuring "B"
0.45: Gasket thickness (mm)
H: Shim clearance

Thrust needle bearing	
Part number	Thickness mm (in)
806536020	3.8 (0.150)
806535030	4.0 (0.157)
806535040	4.2 (0.165)
806535050	4.4 (0.173)
806535060	4.6 (0.181)
806535070	4.8 (0.189)
806535090	5.0 (0.197)

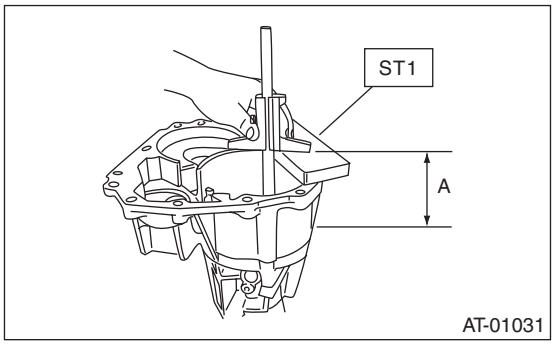
2. VTD MODEL

1) Insert the rear drive shaft into the reduction drive gear and center differential assembly.



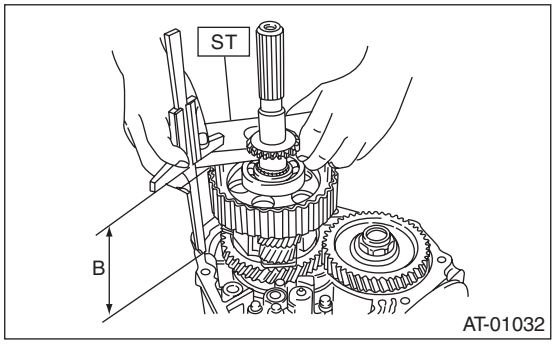
(A) Rear drive shaft
(B) Center differential carrier

2) Using the special tool, measure the distance "A" between the mating surface of extension case and multi-plate clutch (LSD) piston.
ST1 398643600 GAUGE



A: Measured value

3) Using the special tool, measure the distance "B" between the mating surface of transmission case and reduction drive gear edge.
ST 398643600 GAUGE



B: Measured value

4) Formula:

NOTE:
Calculation of “T”:
When clearances are 0.05 mm (0.0020 in), select up to four adjusting shims from the table, suitable for clearance value.
When clearances are 0.05 mm (0.0020 in)
T = A − B + 0.40 mm
[T = A − B + 0.0157 in]
When clearances are 0.25 mm (0.0098 in)
T = A − B + 0.20 mm
[T = A − B + 0.0079 in]
T: Shim clearance
A: Distance between extension case edge and rear drive shaft edge
B: Distance between transmission case edge and reduction drive gear edge
T: Shim thickness
0.05 — 0.25 mm (0.0020 — 0.0098 in)
Example:
When, A = 90.50 mm (3.5630 in), B = 90.35 mm (3.5571 in)
Calculation for 0.05 mm (0.0020 in) of clearance
T = 90.50 − 90.35 + 0.4 = 0.55
[T = 3.5630 − 3.5571 + 0.0157 = 0.0216]
Calculation when clearance is 0.25 mm (0.0098 in)
T = 90.50 − 90.35 + 0.2 = 0.35
[T = 3.5630 − 3.5571 + 0.0079 = 0.0138]

NOTE:
Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE). When not using ST, apply
T = (A − α + 0.45 mm) − (B − β) − H
[T = (A − α + 0.0177 in) − (B − β) − H]
T: Thrust needle bearing thickness
A: Distance from end of extension case to rear drive shaft ball bearing outer ring contact surface
B: Distance from end of transmission case to end of rear drive shaft ball bearing
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
T: Shim clearance
After calculation, the value of “T” becomes between 0.35 mm (0.0138 in) and 0.55 mm (0.0216 in), therefore select two shims with thickness of 0.2 mm (0.010 in) or one shim with thickness of 0.5 mm (0.020 in).

Adjusting shim	
Part No.	Thickness mm (in)
33281AA001	0.2 (0.008)
33281AA011	0.5 (0.020)

30.Multi-plate Clutch

A: REMOVAL

Remove multi-plate clutch following the same instructions as for the extension case. **<Ref. to 4AT-94,** REMOVAL, Extension Case.>

B: INSTALLATION

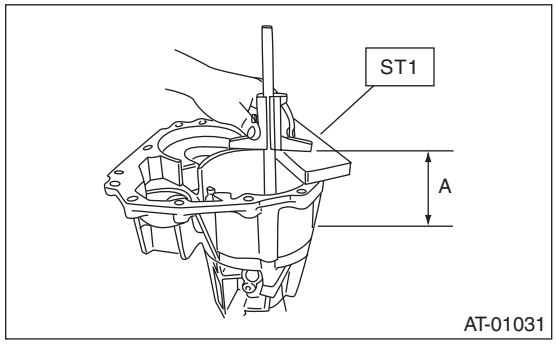
Install multi-plate clutch following the same instructions as for the extension case. **<Ref. to 4AT-94,** INSTALLATION, Extension Case.>

C: INSPECTION

- Inspect drive plate facing for wear and damage.
- Make sure snap ring is not worn and return spring has no permanent distortion, damage, or deformation.
- Inspect D-ring for damage.
- Measure multi-plate clutch clearance and adjust it to within the specification range. **<Ref. to 4AT-102,** ADJUSTMENT**, Multi-plate Clutch.>**

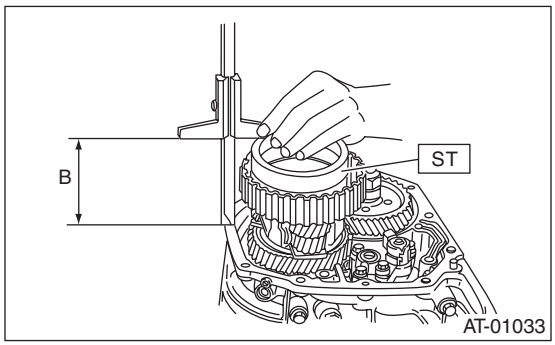
D: ADJUSTMENT

1) Remove drive plate and driven plate from center differential carrier.
2) Using the special tool, measure distance “A” from extension case joining surface to multi-plate clutch (LSD) piston.
ST1 398643600 GAUGE



A: Measured value

3) Using ST, measure height “B” from transmission case joining edge to center differential clutch drum edge.
ST 398744300 GAUGE



B: Measured value

4) Calculation formula
$T = A - B + 0.45$ mm
[$T = A - B + 0.0177$ in]

NOTE:
- Calculation formula for “T” is applied when measuring using ST (398643600 GUAGE, 398744300 GAUGE). When not using ST, apply
$T = (A - \alpha + 0.45\text{ mm}) - (B - \beta)$
[$T = (A - \alpha + 0.0177\text{ in}) - (B - \beta)$]
T: Thrust needle bearing thickness
A: Distance from end of extension case to end of reduction drive shaft
B: Distance from end of transmission case to end of rear drive shaft
α: Collar thickness used when measuring “A”
β: Collar thickness used when measuring “B”
0.45: Gasket thickness (mm)
- Measure multi-plate clutch (LSD) driven and drive plate thickness to find the clearance between measurement value and “T”.

Standard value:
0.2 — 0.6 mm (0.008 — 0.024 in)

Limit value:
1.6 mm (0.063 in)

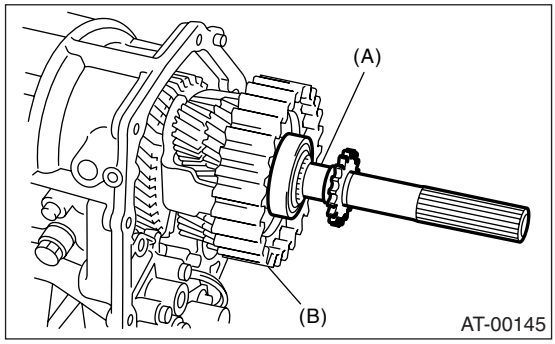
If outside the standard value, replace the plate set (drive and driven plate). Select a multi-plate clutch (LSD) piston side adjustment plate that will bring clearance within the standard value.

Obtainable driven plates	
Part No.	Thickness mm (in)
31589AA041	1.6 (0.063)
31589AA050	2.0 (0.079)
31589AA060	2.4 (0.094)
31589AA070	2.8 (0.110)

31.Rear Drive Shaft

A: REMOVAL

1) Remove the transmission assembly from the vehicle. **<Ref. to 4AT-43,** REMOVAL, Automatic Transmission Assembly.>
2) Remove rear vehicle speed sensor and separate the extension case from the transmission case. **<Ref. to 4AT-94,** REMOVAL, Extension Case.>
3) Extract the rear drive shaft from the center differential assembly.



(A) Rear drive shaft
(B) Center differential carrier

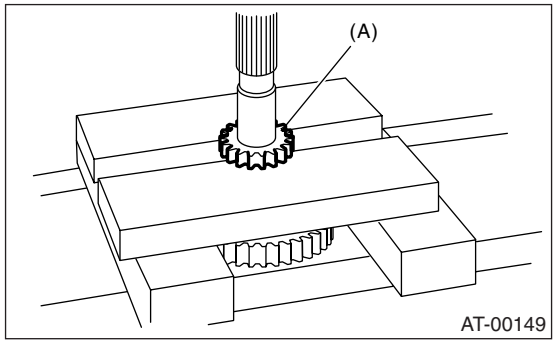
4) Remove the drive plate and driven plate.

B: INSTALLATION

1) Select the shim. **<Ref. to 4AT-100,** VTD MODEL, ADJUSTMENT**, Transfer Clutch.>**
2) Install the drive plate and driven plate.
3) Insert the rear drive shaft into the center differential assembly.
4) Combine the transmission case with the extension case, and install the rear vehicle speed sensor. **<Ref. to 4AT-94,** INSTALLATION, Extension Case.>
5) Install the transmission assembly to the vehicle. **<Ref. to 4AT-47,** INSTALLATION, Automatic Transmission Assembly.>

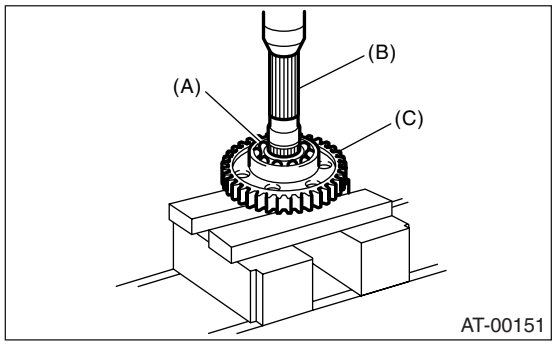
C: DISASSEMBLY

1) Using a press, remove the revolution gear.



(A) Revolution gear

2) Using a press, remove the front and rear side ball bearings and clutch hub.

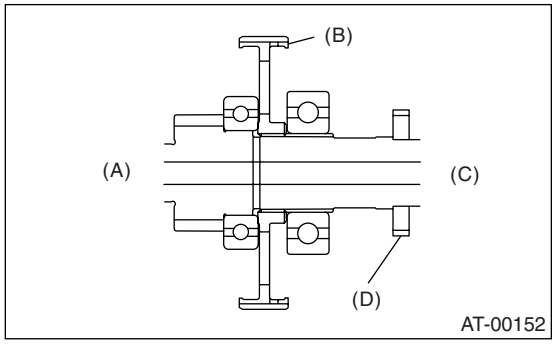


(A) Rear ball bearing
(B) Rear drive shaft
(C) Clutch hub

D: ASSEMBLY

Assembly is in the reverse order of disassembly.

NOTE:
• Be sure to use a new ball bearings and revolution gear.
• Pay attention to the direction of the clutch hub.



(A) Front side
(B) Clutch hub
(C) Rear side
(D) Revolution gear

E: INSPECTION

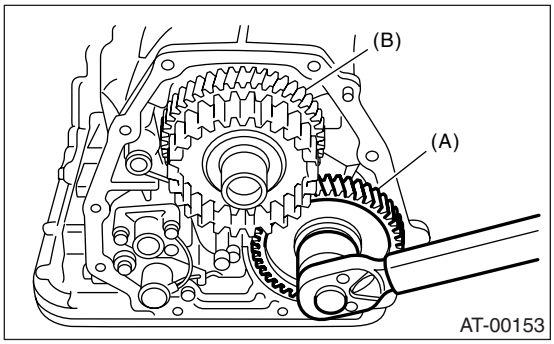
• Make sure that each component is free of harmful gouges, cuts, or dust.
• Measure the extension end play and adjust to within specifications. **<Ref. to 4AT-100,** VTD MODEL, ADJUSTMENT**, Transfer Clutch.>**

32.Reduction Driven Gear

A: REMOVAL

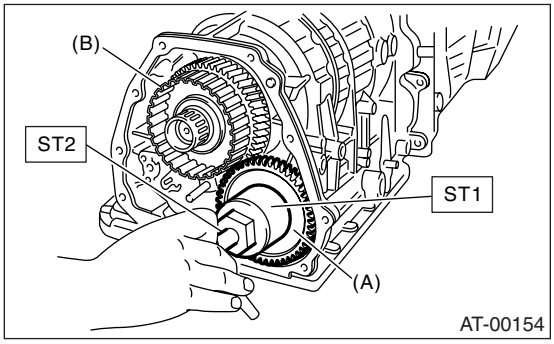
1. MPT MODEL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor, and then separate the extension case from transmission case. <Ref. to 4AT-94, REMOVAL, Extension Case.>
3) Set the range select lever to “P” range.
4) Remove the caulking part, and then remove the lock nut.



(A) Reduction driven gear
(B) Reduction drive gear

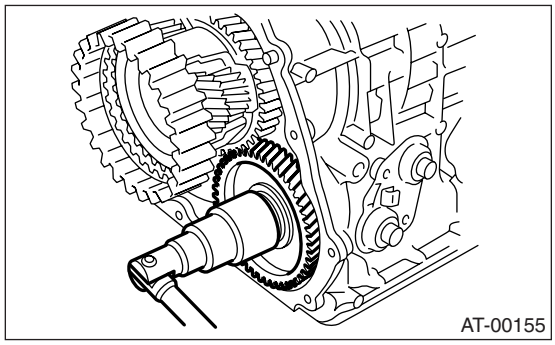
5) Using the ST1 and ST2, extract the reduction driven gear assembly.
ST1 499737000 PULLER
ST2 899524100 PULLER SET



(A) Reduction driven gear ASSY
(B) Reduction drive gear ASSY

2. VTD MODEL

1) Remove the transmission assembly from the vehicle. **<Ref. to 4AT-43,** REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor, and separate the transmission case and extension case. **<Ref. to 4AT-94,** REMOVAL, Extension Case.>
3) Remove the rear drive shaft. **<Ref. to 4AT-103,** REMOVAL**, Rear Drive Shaft.>**
4) Set the range select lever to “P”.
5) Straighten the staked portion, and remove the lock nut.



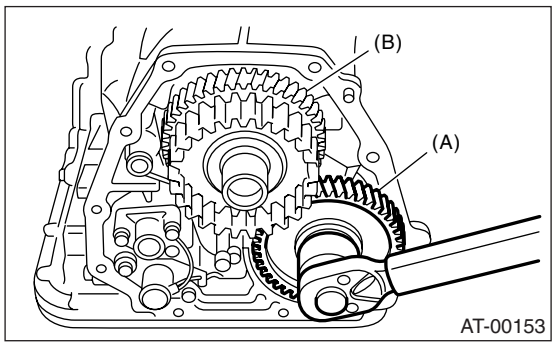
6) Using the ST1 and ST2, extract the reduction driven gear.
ST1 499737000 PULLER
ST2 899524100 PULLER SET
7) Extract center differential assembly. **<Ref. to 4AT-108,** REMOVAL**, Center Differential Carrier.>**

B: INSTALLATION

1. MPT MODEL

1) Set the range select lever to “P” range.
2) Using a plastic hammer, install the reduction driven gear assembly and new washer, and tighten new lock nut.

Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)



(A) Reduction driven gear ASSY
(B) Reduction drive gear ASSY

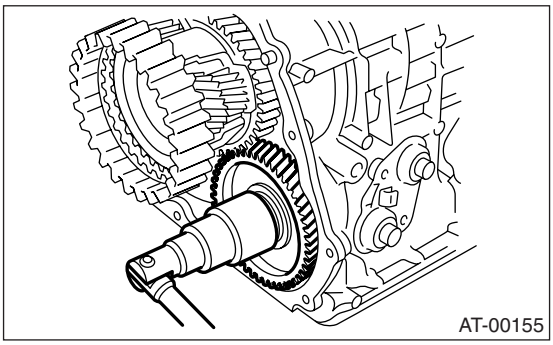
3) After tightening, stake the lock nut securely.
4) Combine the transmission case with the extension case, and then install the rear vehicle speed sensor. <Ref. to 4AT-94, INSTALLATION, Extension Case.>

5) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

2. VTD MODEL

1) Set the range select lever in the “P” range.
2) Using a plastic hammer, install reduction driven gear assembly.
3) Using a plastic hammer, install center differential.
4) Install a new lock nut and a washer.

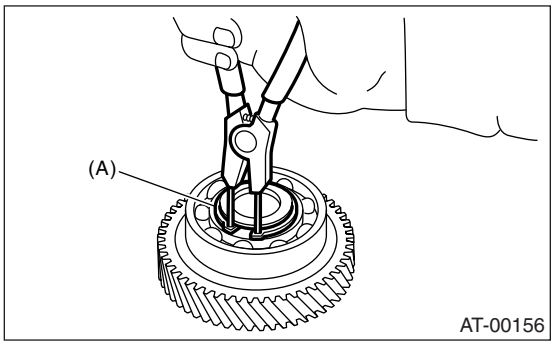
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)



5) After tightening, stake the lock nut securely.
6) Insert the rear drive shaft assembly. **<Ref. to 4AT-103,** INSTALLATION**, Rear Drive Shaft.>**
7) Combine the transmission case with the extension case, and install rear vehicle speed sensor. **<Ref. to 4AT-94,** INSTALLATION, Extension Case.>
8) Install the transmission assembly to the vehicle. **<Ref. to 4AT-47,** INSTALLATION, Automatic Transmission Assembly.>

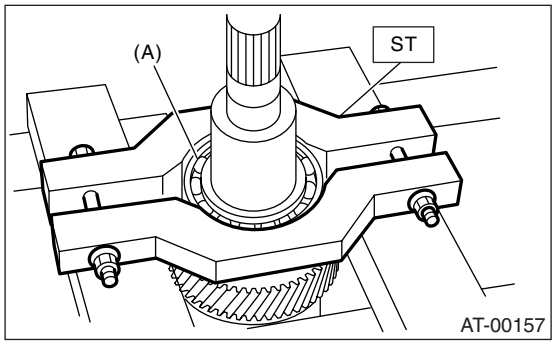
C: DISASSEMBLY

1) Remove the snap ring from reduction driven gear.



(A) Snap ring

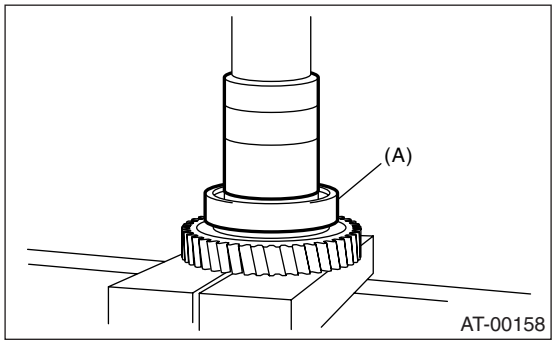
2) Remove the ball bearing from reduction driven gear using ST.
ST 498077600 REMOVER



(A) Ball bearing

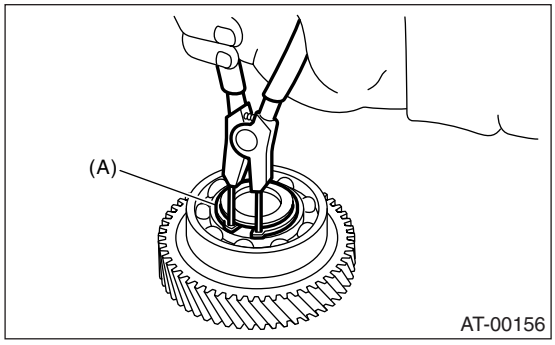
D: ASSEMBLY

1) Install the new ball bearing to reduction driven gear using press.



(A) Ball bearing

2) Install the snap ring to reduction driven gear.



(A) Snap ring

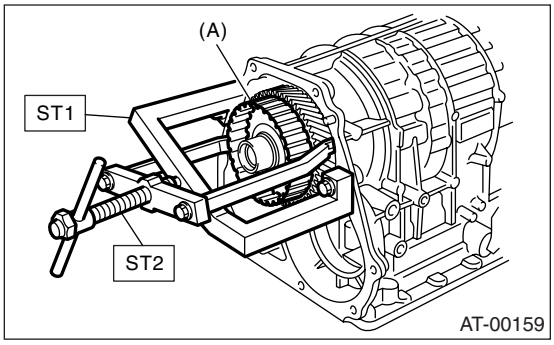
E: INSPECTION

Make sure the ball bearing and gear is not deformed or damaged.

33.Reduction Drive Gear

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor, and then separate the extension case from transmission case. <Ref. to 4AT-94, REMOVAL, Extension Case.>
3) Remove the reduction driven gear. <Ref. to 4AT-104, REMOVAL, Reduction Driven Gear.>
4) Using ST, extract the reduction drive gear assembly.
ST1 499737100 PULLER SET
ST2 899524100 PULLER SET

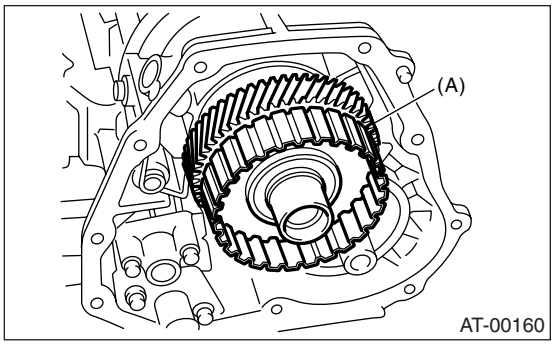


(A) Reduction drive gear ASSY

B: INSTALLATION

1) Install the reduction drive gear assembly.

NOTE:
Press-fit it to the bottom of bearing shoulder completely.

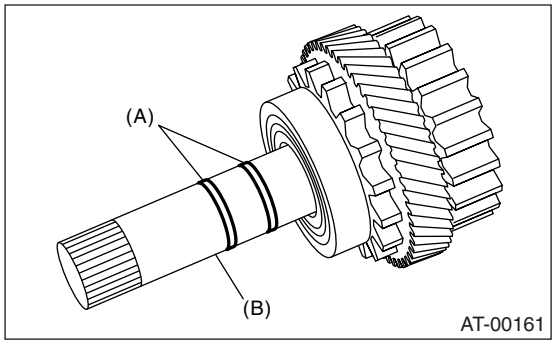


(A) Reduction drive gear ASSY

2) Install the reduction driven gear. <Ref. to 4AT-104, INSTALLATION, Reduction Driven Gear.>
3) Combine the transmission case with the extension case, and then install the rear vehicle speed sensor. <Ref. to 4AT-94, INSTALLATION, Extension Case.>
4) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

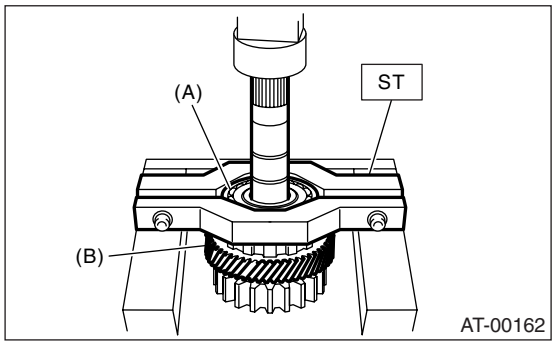
C: DISASSEMBLY

1) Take out the seal ring.



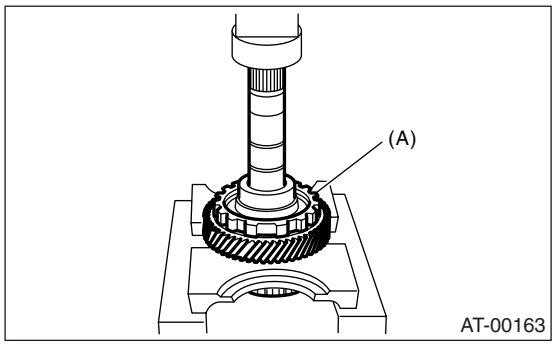
(A) Seal ring
(B) Reduction drive shaft

2) Remove ball bearing using ST.
ST 498077600 REMOVER



(A) Ball bearing
(B) Reduction drive gear

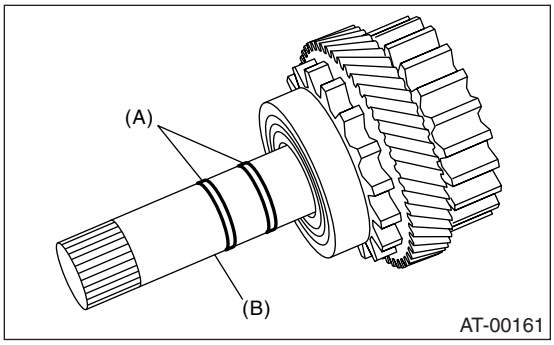
3) Using press, remove the reduction drive gear.



(A) Reduction drive gear

D: ASSEMBLY

1) Press-fit the reduction drive gear to shaft.
2) Press-fit the new ball bearing into reduction drive gear.
3) Apply vaseline to outer surface of new seal ring and shaft groove.
4) Install the seal ring.



(A) Seal ring
(B) Reduction drive shaft

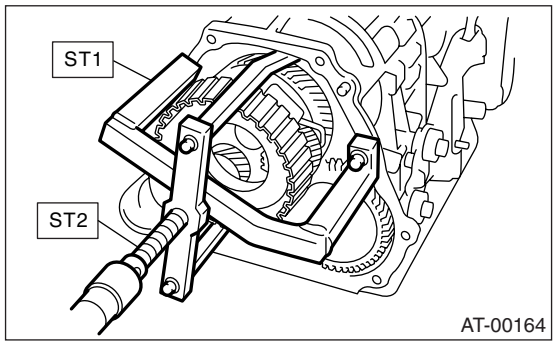
E: INSPECTION

- Rotate the bearing by hand, make sure it rotates smoothly.
- Make sure that each component is free of harmful gouges, cuts or dust.
- Measure the extension end play and adjust it to specification. <Ref. to 4AT-99, ADJUSTMENT, Transfer Clutch.>

34.Center Differential Carrier

A: REMOVAL

1) Remove the transmission assembly from the vehicle. **<Ref. to 4AT-43,** REMOVAL, Automatic Transmission Assembly.>
2) Remove rear vehicle speed sensor, and separate the extension case form the transmission case. **<Ref. to 4AT-94,** REMOVAL, Extension Case.>
3) Pull out the rear drive shaft. **<Ref. to 4AT-103,** REMOVAL**, Rear Drive Shaft.>**
4) Using ST, extract the center differential carrier assembly.
ST1 499737100 PULLER
ST2 899524100 PULLER SET

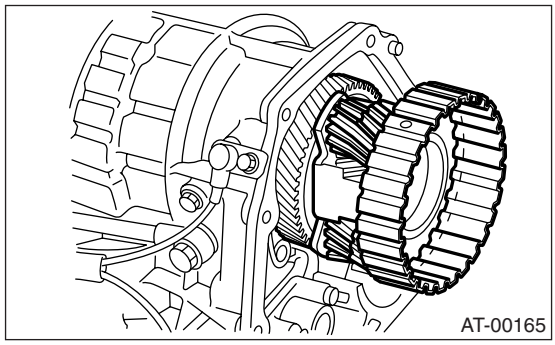


5) Extract shim from transmission case.

B: INSTALLATION

1) Install the center differential assembly with shim.

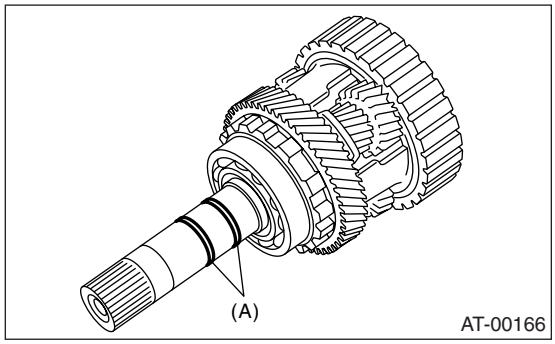
NOTE:
Insert it fully into position until the bearing shoulder bottoms.



2) Insert the rear drive shaft. **<Ref. to 4AT-103,** INSTALLATION**, Rear Drive Shaft.>**
3) Combine the transmission case with the extension case, and install rear vehicle speed sensor. **<Ref. to 4AT-94,** INSTALLATION, Extension Case.>
4) Install the transmission assembly to the vehicle. **<Ref. to 4AT-47,** INSTALLATION, Automatic Transmission Assembly.>

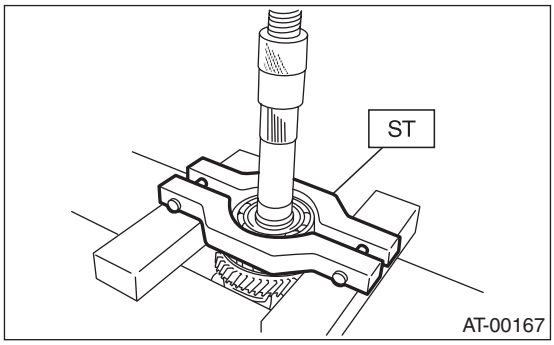
C: DISASSEMBLY

1) Remove seal ring.

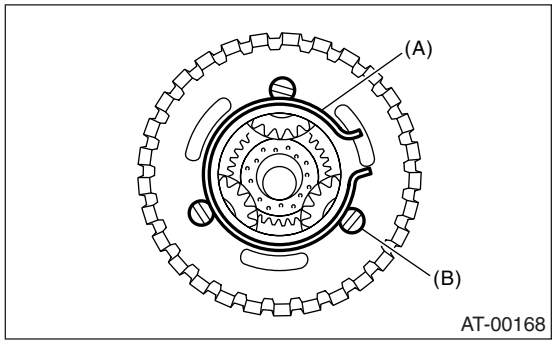


(A) Seal rings

2) Using a press and ST, remove the ball bearing.
ST 498077600 REMOVER

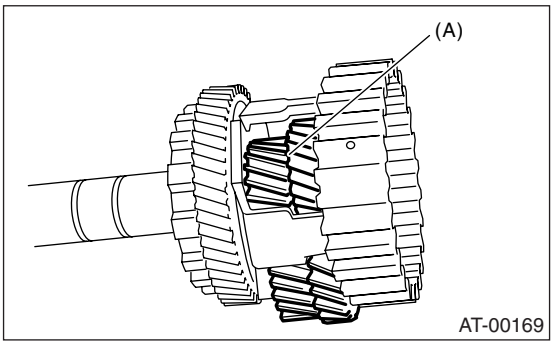


3) Remove snap ring, and pull out shafts from center differential assembly.



(A) Snap ring
(B) Shaft

4) Remove thrust washer, pinion gears and washers from center differential assembly.

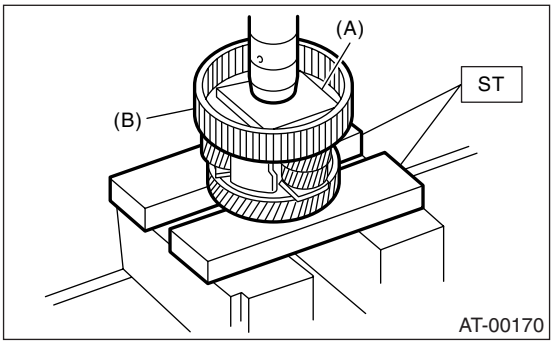


(A) Pinion gear

5) Pull out intermediate shaft and thrust bearing.

D: ASSEMBLY

1) Install thrust washer to intermediate shaft.
2) Install thrust bearing and intermediate shaft.
3) Install pinion gears and washers.
4) Put shaft in center differential assembly.
5) Install snap ring.
6) Using a press, press-fit the new ball bearing to center differential assembly.
ST 498077000 REMOVER



(A) Plate
(B) Center differential carrier

7) Apply vaseline to outer surface of seal ring and shaft groove.
8) Install a new seal ring.

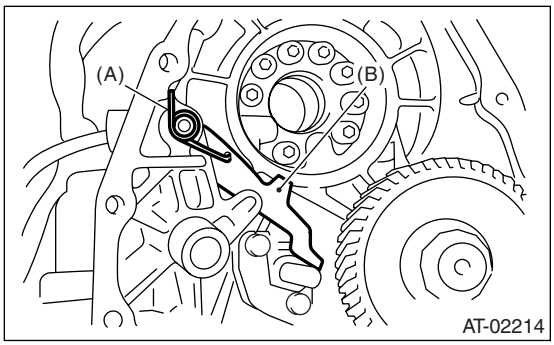
E: INSPECTION

• Make sure that each component is free of harmful gouges, cuts, or dust.
• Measure the extension end play and adjust it to within specifications. **<Ref. to 4AT-100,** VTD MODEL, ADJUSTMENT**, Transfer Clutch.>**

35.Parking Pawl

A: REMOVAL

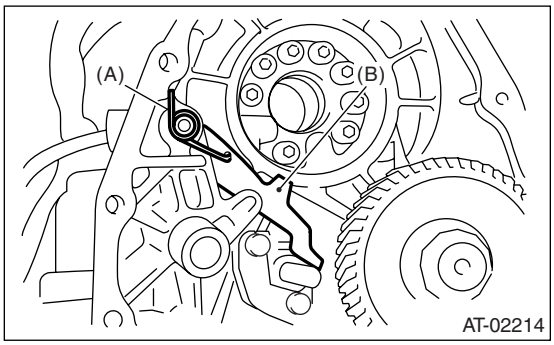
1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Remove the rear vehicle speed sensor, and then separate the extension case from transmission case. <Ref. to 4AT-94, REMOVAL, Extension Case.>
3) Remove the reduction drive gear. <Ref. to 4AT-106, REMOVAL, Reduction Drive Gear.>
4) Remove the parking pawl, return spring and shaft.



(A) Return spring
(B) Parking pawl

B: INSTALLATION

1) Install the parking pawl, return spring and shaft.



(A) Return spring
(B) Parking pawl

2) Install the reduction drive gear. <Ref. to 4AT-106, INSTALLATION, Reduction Drive Gear.>
3) Install the extension case and rear vehicle speed sensor. <Ref. to 4AT-94, INSTALLATION, Extension Case.>
4) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

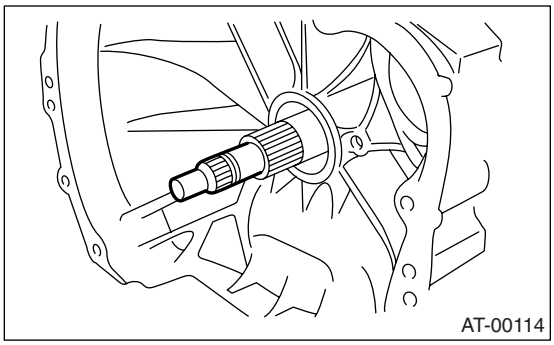
C: INSPECTION

Make sure that the tab of parking pawl on reduction gear is not worn or otherwise damaged.

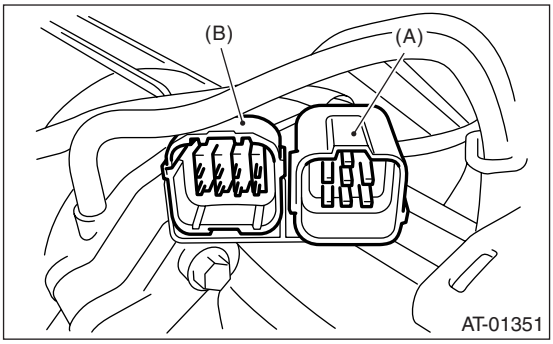
36.Converter Case

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-93, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



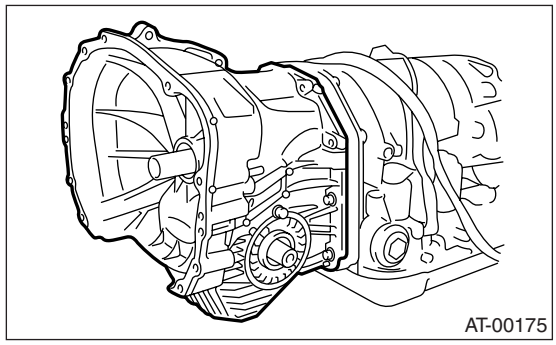
4) Lift-up the lever on rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the inhibitor switch connector from the stay.



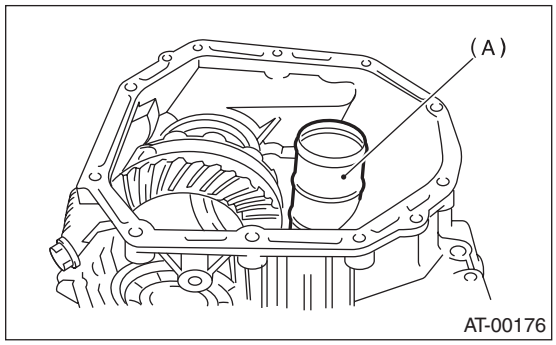
(A) Transmission harness ASSY
(B) Inhibitor switch harness

6) Disconnect the air breather hose. <Ref. to 4AT-91, REMOVAL, Air Breather Hose.>
7) Remove the oil charge pipe. <Ref. to 4AT-92, REMOVAL, Oil Charge Pipe.>
8) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-83, REMOVAL, ATF Cooler Pipe and Hose.>
9) Remove the converter case aligning bolt, and then separate the transmission case and converter case by lightly tapping with plastic hammer.

CAUTION:
• Be careful not to damage the oil seal and bush inside the converter case by the oil pump cover.
• Do not loosen the rubber seal.



10) Remove the seal pipe.

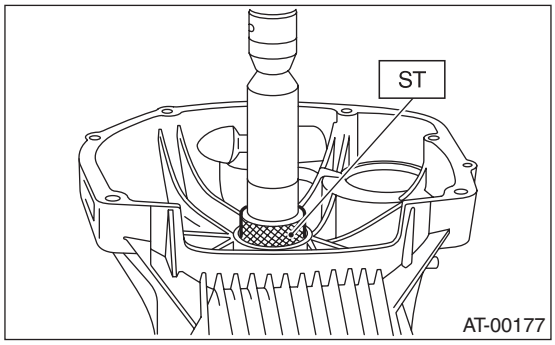


(A) Seal pipe

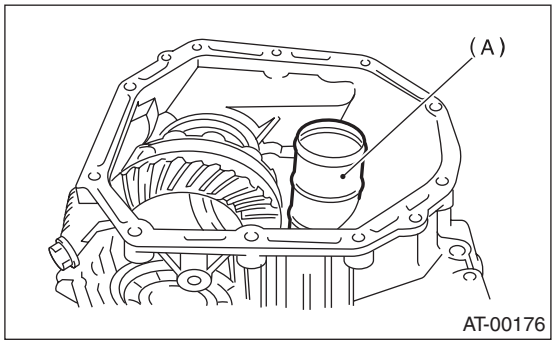
11) Remove the differential assembly. <Ref. to 4AT-126, REMOVAL, Front Differential Assembly.>
12) Remove the oil seal from converter case.

B: INSTALLATION

1) Check the appearance of each component and clean them.
2) Press-fit the new oil seal to converter case using ST.
ST 398437700 DRIFT

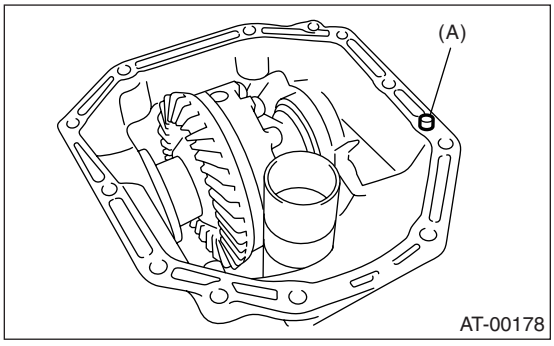


3) Install the differential assembly to case. <Ref. to 4AT-126, INSTALLATION, Front Differential Assembly.>
4) Install the left and right side retainers. <Ref. to 4AT-130, ADJUSTMENT, Front Differential Assembly.>
5) Install the new seal pipe to converter case.



(A) Seal pipe

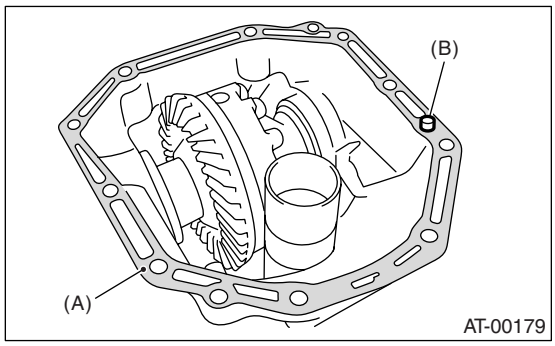
6) Install the new rubber seal to converter case.



(A) Rubber seal

7) Apply proper amount of liquid gasket to the entire matching surface of converter case.

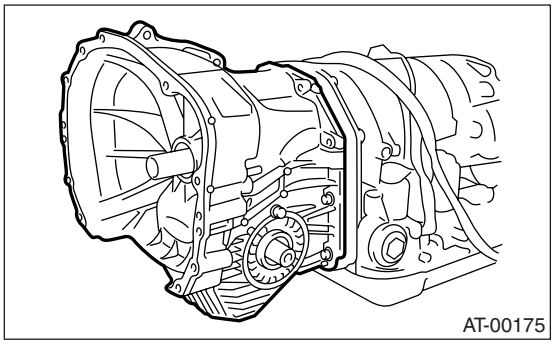
Liquid gasket:
THREE BOND 1215 (Part No. 004403007)



(A) THREE BOND 1215
(B) Rubber seal

8) Install the converter case assembly without damaging bushing and oil seal.

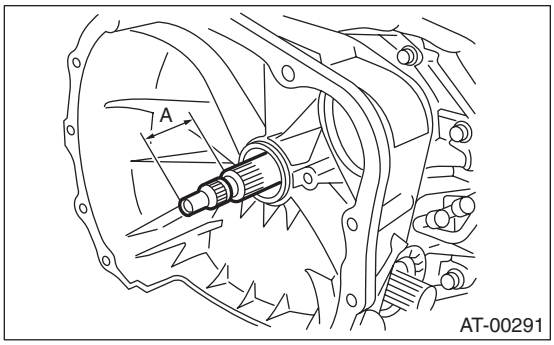
Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



9) Insert the inhibitor switch connector and transmission connector to the stay.
10) Install the air breather hose. <Ref. to 4AT-91, INSTALLATION, Air Breather Hose.>
11) Connect the ATF cooler pipe. <Ref. to 4AT-85, INSTALLATION, ATF Cooler Pipe and Hose.>
12) Install the oil charge pipe with O-ring. <Ref. to 4AT-92, INSTALLATION, Oil Charge Pipe.>

13) Insert the input shaft with rotating it by hand lightly, and then check the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



14) Install the torque converter clutch assembly. <Ref. to 4AT-93, INSTALLATION, Torque Converter Clutch Assembly.>
15) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

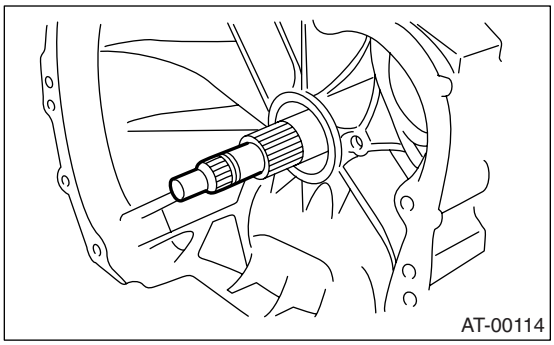
C: INSPECTION

Measure the backlash, and then adjust it within specification. <Ref. to 4AT-123, ADJUSTMENT, Drive Pinion Shaft Assembly.>

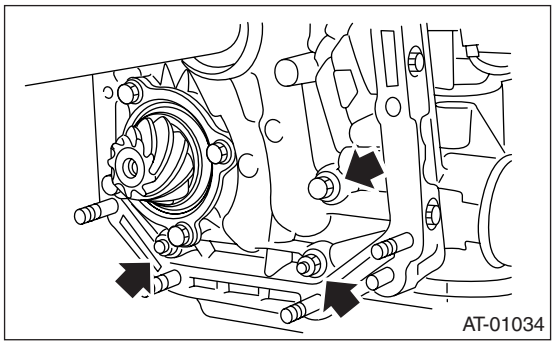
37.Oil Pump Housing

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-93, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



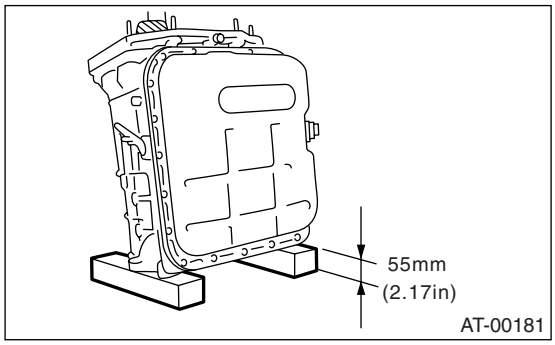
4) Lift-up the lever on rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the inhibitor switch connector from the stay.
6) Remove the oil charge pipe. <Ref. to 4AT-92, REMOVAL, Oil Charge Pipe.>
7) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-83, REMOVAL, ATF Cooler Pipe and Hose.>
8) Separate the converter case and transmission case part. <Ref. to 4AT-111, REMOVAL, Converter Case.>
9) Separate the transmission case and extension case part. <Ref. to 4AT-94, REMOVAL, Extension Case.>
10) Remove the reduction drive gear. <Ref. to 4AT-106, REMOVAL, Reduction Drive Gear.>
11) Remove the reduction driven gear. <Ref. to 4AT-104, REMOVAL, Reduction Driven Gear.>
12) Loosen the oil pump housing mounting bolts.



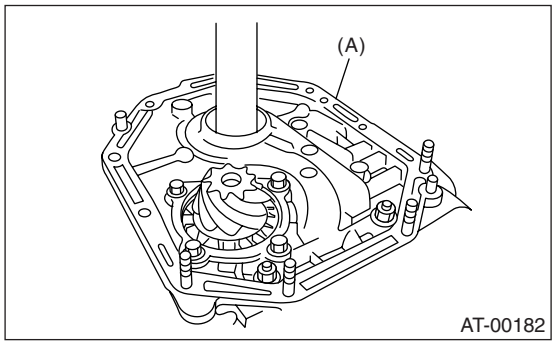
13) Place two wooden blocks on the workbench, and stand the transmission case with its rear end facing down.

CAUTION:
Be careful not to scratch the rear mating surface of transmission case.

NOTE:
Check the height of wooden blocks to avoid damaging the protrudes that on the mating surface of parking rod and drive pinion.



14) Remove the oil pump housing and adjusting thrust washer.

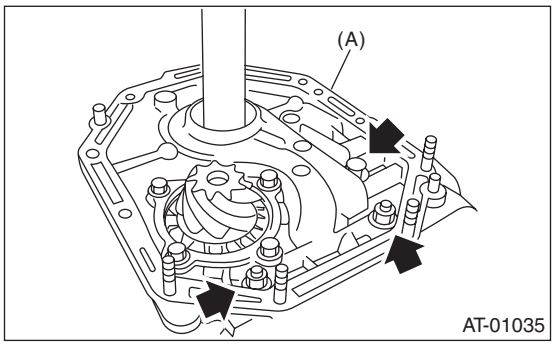


(A) Oil pump housing

B: INSTALLATION

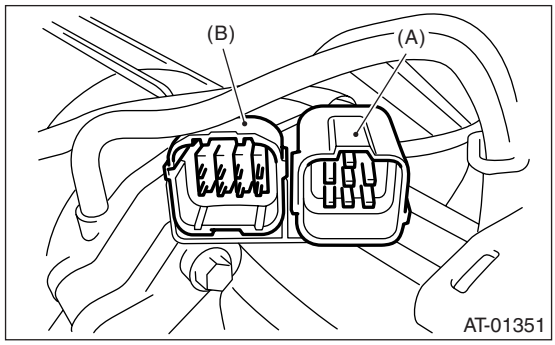
1) Secure the oil pump housing with two nuts and a bolt.

Tightening torque:
42 N·m (4.3 kgf-m, 31 ft-lb)



(A) Oil pump housing

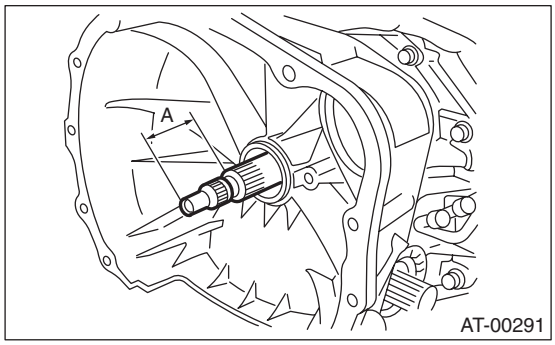
2) Install the converter case to transmission case. <Ref. to 4AT-93, INSTALLATION, Torque Converter Clutch Assembly.>
3) Install the reduction driven gear. <Ref. to 4AT-104, INSTALLATION, Reduction Driven Gear.>
4) Install the reduction drive gear. <Ref. to 4AT-106, INSTALLATION, Reduction Drive Gear.>
5) Align the transmission case and extension case. <Ref. to 4AT-94, INSTALLATION, Extension Case.>
6) Insert the inhibitor switch and transmission connector to the stay.



(A) Transmission harness ASSY
(B) Inhibitor switch harness

7) Install the ATF cooler pipe. <Ref. to 4AT-85, INSTALLATION, ATF Cooler Pipe and Hose.>
8) Install the oil charge pipe with O-ring. <Ref. to 4AT-92, INSTALLATION, Oil Charge Pipe.>
9) Insert the input shaft with rotating it by hand lightly, and then check the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

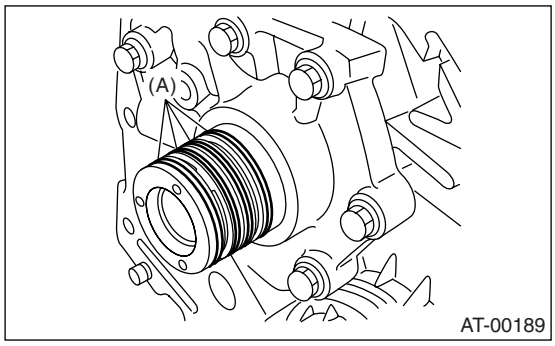


10) Install the torque converter clutch assembly. <Ref. to 4AT-93, INSTALLATION, Torque Converter Clutch Assembly.>
11) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

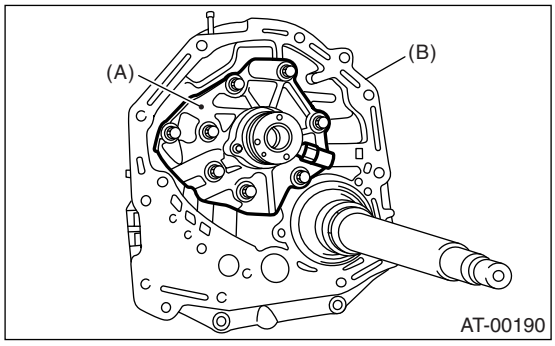
1. OIL PUMP COVER

1) Remove four seal rings.



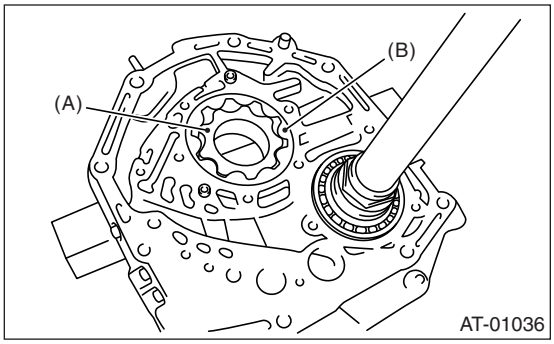
(A) Seal ring

2) Remove the installing bolt, and then remove the cover by lightly tapping the end of starter shaft.



(A) Oil pump cover
(B) Oil pump housing

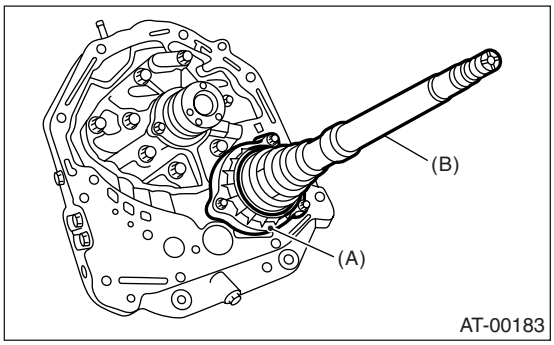
3) Remove the oil pump inner and outer rotor.



(A) Oil pump inner rotor
(B) Oil pump outer rotor

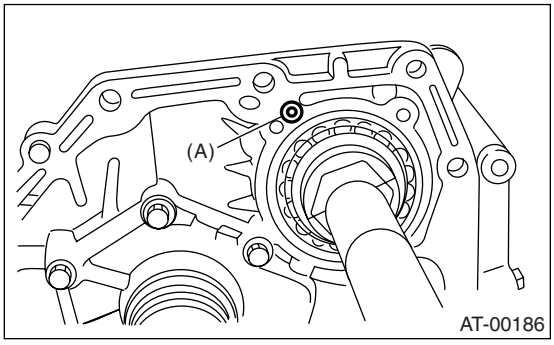
2. OIL SEAL RETAINER

1) Remove the oil seal retainer.



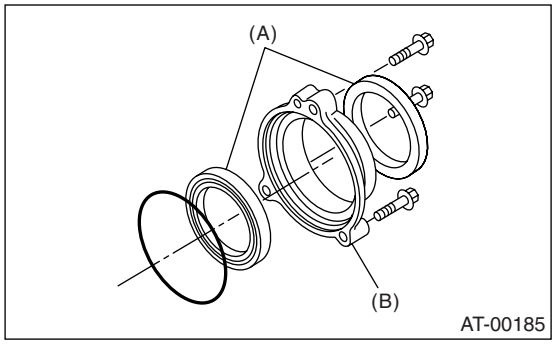
(A) Oil seal retainer
(B) Drive pinion shaft

2) Remove the O-ring.



(A) O-ring

3) Remove the oil seal from oil seal retainer.

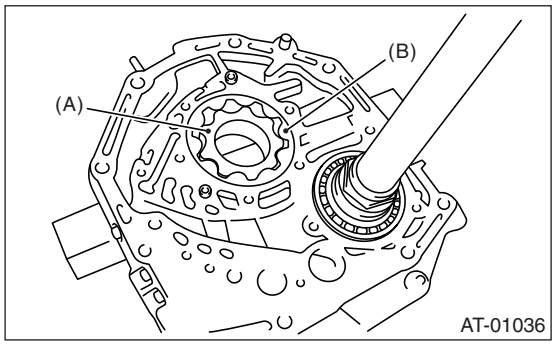


(A) Oil seal
(B) Oil seal retainer

D: ASSEMBLY

1. OIL PUMP COVER

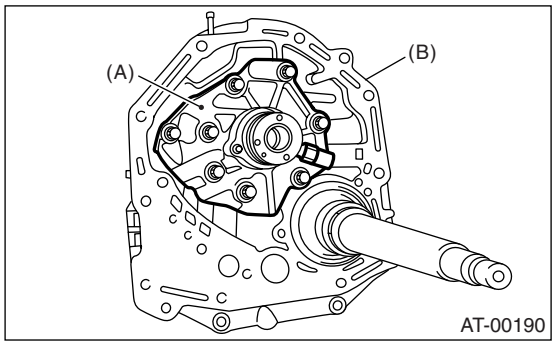
1) Install the oil pump rotor assembly to oil pump housing.



(A) Oil pump inner rotor
(B) Oil pump outer rotor

2) Align both pivots with the pivot holes of cover, and then install the oil pump cover being careful not to apply excessive force to the pivots.

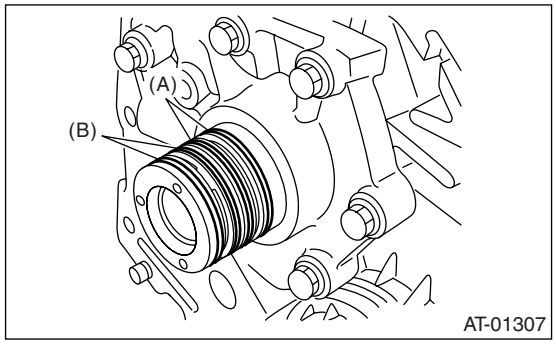
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pump cover
(B) Oil pump housing

3) After assembling, turn the oil pump shaft to check the smooth rotation of rotor.
4) Install the oil seal retainer and new seal rings. After installing, adjust the tooth contact and backlash of drive pinion. <Ref. to 4AT-118, ADJUSTMENT, Oil Pump Housing.>

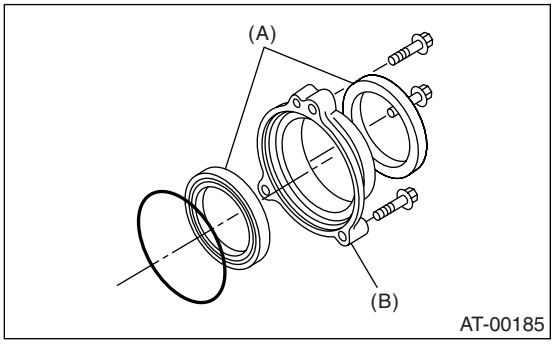
CAUTION:
There are two kinds of seal rings and those are identified by color. Be sure to install proper positions with referring figure.



(A) Seal ring (Black)
(B) Seal ring (Brown)

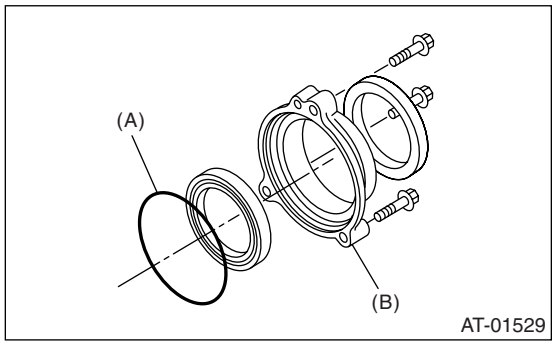
2. OIL SEAL RETAINER

1) Install two new oil seals to oil seal retainer in proper direction using ST.
ST 499247300 INSTALLER



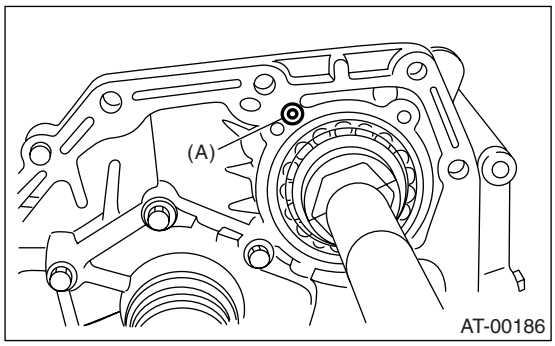
(A) Oil seal
(B) Oil seal retainer

2) Install the new O-ring to oil seal retainer.



(A) O-ring
(B) Oil seal retainer

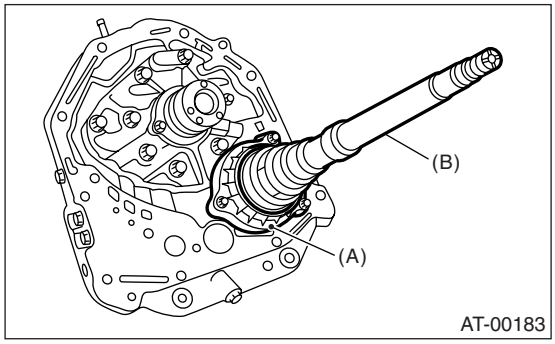
3) Install the new O-ring to oil pump housing bore.



(A) O-ring

4) Install the oil seal and secure it using three bolts being careful not to damage oil seal lip.

Tightening torque:
7 N·m (0.7 kgf-m, 5.1 ft-lb)

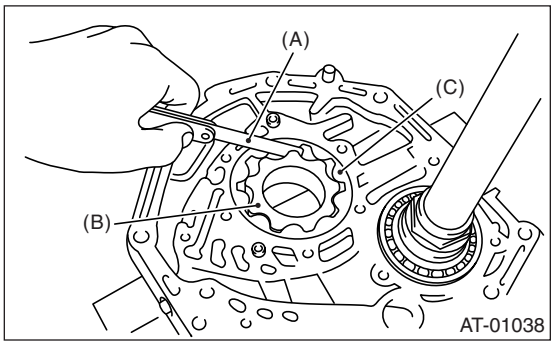


(A) Oil seal retainer
(B) Drive pinion shaft

E: INSPECTION

1) Check seal ring and oil seal for breaks or damages.
2) Check other parts for dents or abnormalities.
3) Selection of oil pump rotor assembly
   (1) Tip clearance
   Install the oil pump inner rotor and oil pump outer rotor to oil pump. With rotor gears facing each other, measure crest-to-crest clearance.

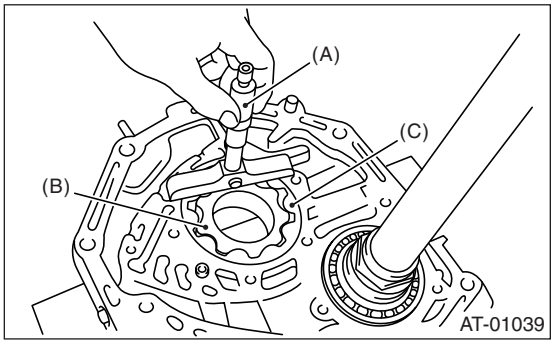
Tip clearance:
0.02 — 0.15 mm (0.0008 — 0.0059 in)



(A) Thickness gauge
(B) Oil pump inner rotor
(C) Oil pump outer rotor

(2) Side clearance
Set depth gauge to oil pump housing, then measure oil pump housing-to-oil pump rotor clearance.

Side clearance:
0.02 — 0.04 mm (0.0008 — 0.0016 in)



(A) Depth gauge
(B) Oil pump inner rotor
(C) Oil pump outer rotor

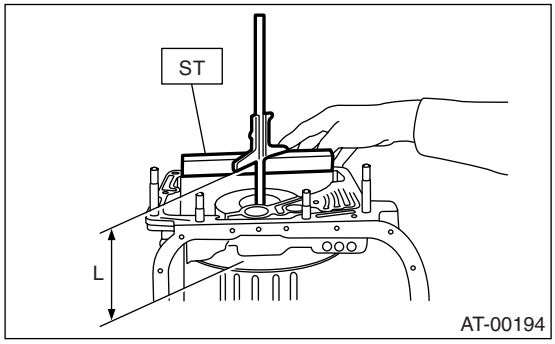
(3) If the depth and/or side clearance are not within the specifications, replace the oil pump rotor assembly.

Oil pump rotor ASSY		
Model	Part No.	Thickness mm (in)
2.0 L NA model with ATF warmer (EC, EK, EH★)	15008AA100	12.87 — 12.88 (0.5066 — 0.5070)
	15008AA110	12.88 — 12.89 (0.5070 — 0.5074)
	15008AA120	12.89 — 12.90 (0.5074 — 0.5078)
Except for 2.0 L NA model with ATF warmer (EC, EK, EH★)	15008AA060	11.37 — 11.38 (0.4476 — 0.4480)
	15008AA070	11.38 — 11.39 (0.4480 — 0.4484)
	15008AA080	11.39 — 11.40 (0.4484 — 0.4488)

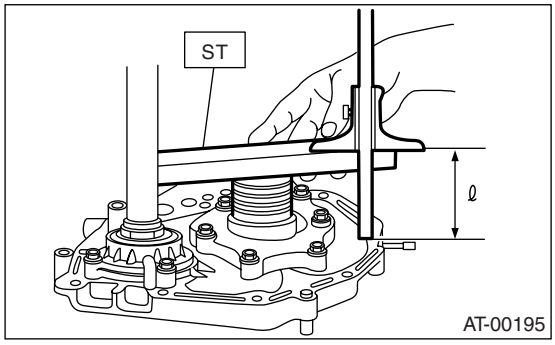
★: For the option code, refer to “ID section”.<Ref. to ID-2, Identification.>
Measure the total end play and adjust it within specifications. <Ref. to 4AT-118, ADJUSTMENT, Oil Pump Housing.>

F: ADJUSTMENT

1) Using ST, measure length “L”, which is from mating surface of transmission case to concave side of high clutch drum.
ST 398643600 GAUGE

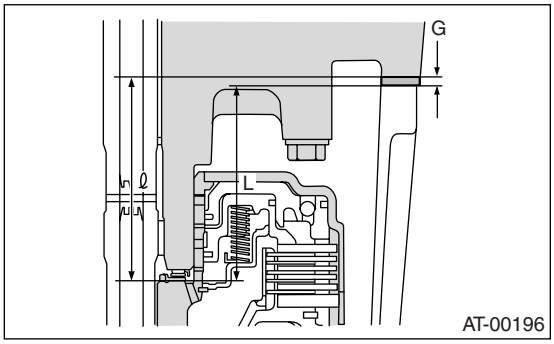


2) Using ST, measure the length from oil pump housing mating surface to top surface of oil pump cover with thrust needle bearing.
ST 398643600 GAUGE



3) Calculation of total end play
Select the suitable thrust needle bearing from among those listed in this table so that clearance C within 0.25 to 0.55 mm (0.0098 to 0.0217 in).
C = (L+G) − ℓ

C	Clearance between concave portion of high clutch and end of clutch drum support
L	Length from transmission case mating surface to concave portion of high clutch
G	Gasket thickness [0.28 mm (0.0110 in)]
ℓ	Height from oil pump housing mating surface to upper surface of oil pump cover with thrust needle bearing



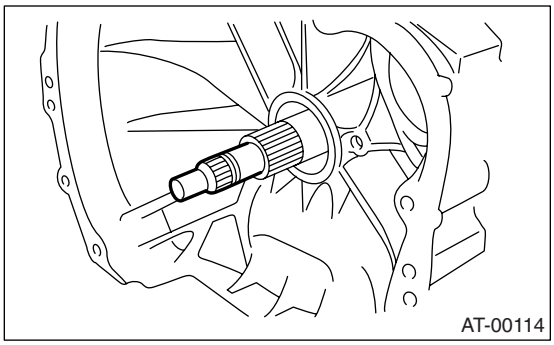
Thrust needle bearing	
Part number	Thickness mm (in)
806528050	4.1 (0.161)
806528060	4.3 (0.169)
806528070	4.5 (0.177)
806528080	4.7 (0.185)
806528090	4.9 (0.193)
806528100	5.1 (0.201)

4) After completing the end play adjustment, insert the bearing race in recess of the high clutch. Install the thrust needle bearing to oil pump cover using vaseline.
5) After correctly install the new gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of case.
6) Install both parts with dowel pins aligned. Make sure no clearance at mating surface.

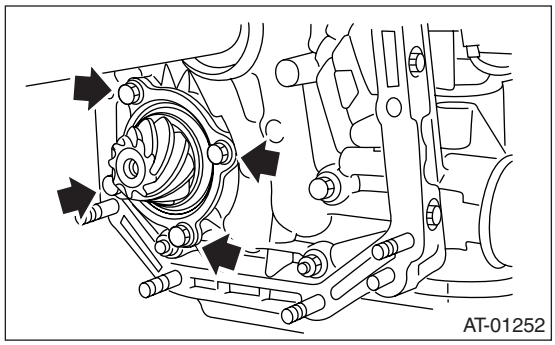
38.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-93, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.


AT-00114

4) Lift-up the lever on rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the inhibitor switch connector from the stay.
6) Disconnect the air breather hose. <Ref. to 4AT-91, REMOVAL, Air Breather Hose.>
7) Remove the oil charge pipe. <Ref. to 4AT-92, REMOVAL, Oil Charge Pipe.>
8) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-83, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the converter case and transmission case part. <Ref. to 4AT-111, REMOVAL, Converter Case.>
10) Separate the transmission case and extension case part. <Ref. to 4AT-94, REMOVAL, Extension Case.>
11) Remove the reduction drive gear. <Ref. to 4AT-106, REMOVAL, Reduction Drive Gear.>
12) Remove the reduction driven gear. <Ref. to 4AT-104, REMOVAL, Reduction Driven Gear.>
13) Remove the drive pinion shaft mounting bolt and remove the drive shaft assembly from oil pump housing.

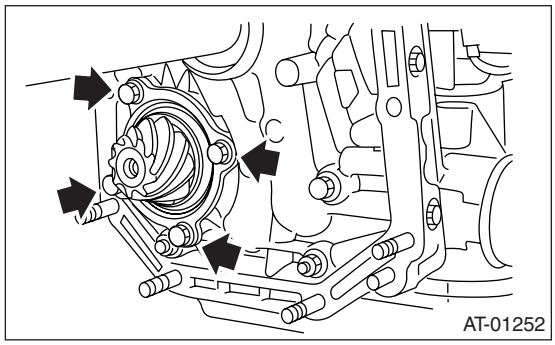

AT-01252

B: INSTALLATION

1) Assemble the drive pinion assembly to oil pump housing.

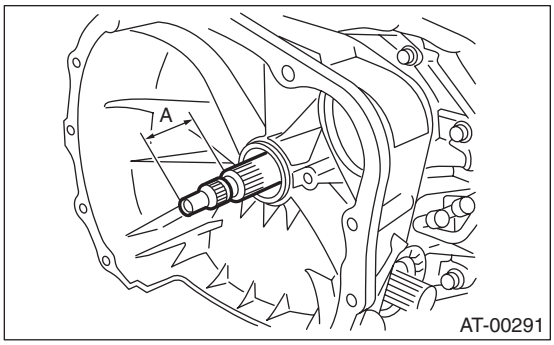
NOTE:
- Be careful not to bend the shim.
- Be careful not to press-fit the pinion into housing bore.

Tightening torque:
40 N·m (4.1 kgf-m, 30 ft-lb)


AT-01252

2) Combine the torque converter case with transmission case. <Ref. to 4AT-112, INSTALLATION, Converter Case.>
3) Install the reduction driven gear. <Ref. to 4AT-104, INSTALLATION, Reduction Driven Gear.>
4) Install the reduction drive gear. <Ref. to 4AT-106, INSTALLATION, Reduction Drive Gear.>
5) Align the transmission case and extension case. <Ref. to 4AT-94, INSTALLATION, Extension Case.>
6) Insert the inhibitor switch and transmission connector to the stay.
7) Connect the air breather hose. <Ref. to 4AT-91, INSTALLATION, Air Breather Hose.>
8) Install the ATF cooler inlet and outlet pipes. <Ref. to 4AT-85, INSTALLATION, ATF Cooler Pipe and Hose.>
9) Install the oil charge pipe with O-ring.
10) Insert the input shaft with rotating it by hand lightly, and then check the protrusion amount.

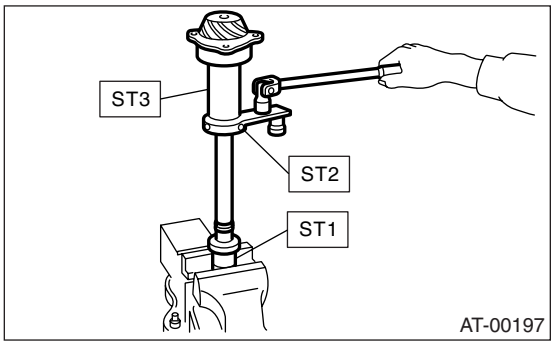
Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



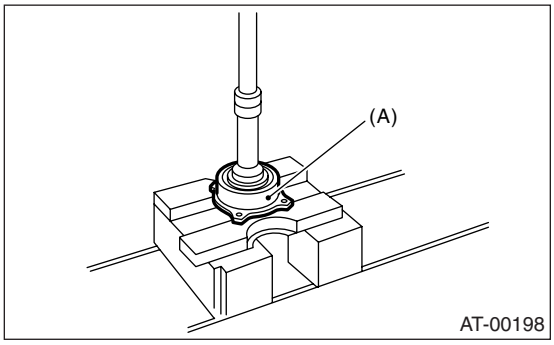
11) Install the torque converter clutch assembly. <Ref. to 4AT-93, INSTALLATION, Torque Converter Clutch Assembly.>
12) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1) Remove the caulking part of lock nut, and then remove the lock nut with holding rear spline part of drive pinion shaft using ST1 and ST2. Pull out the drive pinion collar.
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

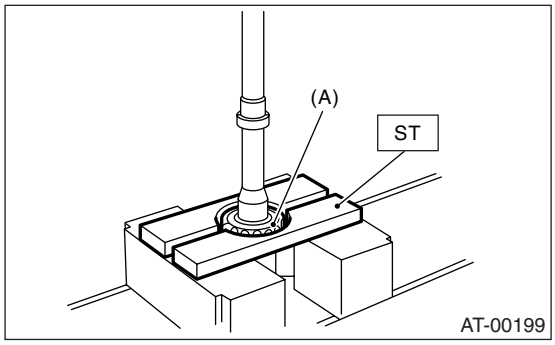


2) Remove the O-ring.
3) Separate the roller bearing and outer race from drive pinion shaft using the press.



(A) Outer race

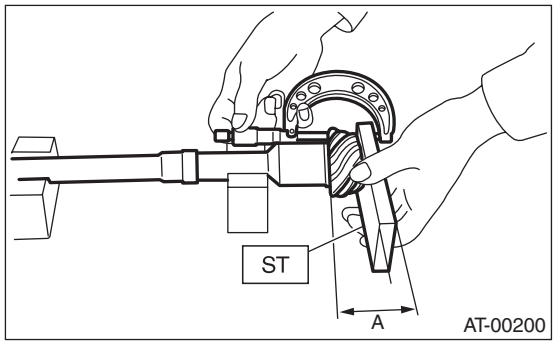
4) Separate the front roller bearing from drive pinion shaft using the press and ST.
ST 498517000 REPLACER



(A) Front roller bearing

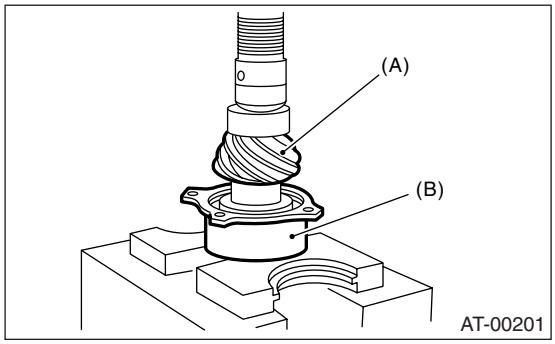
D: ASSEMBLY

1) Measure the dimension “A” of drive pinion shaft
ST 398643600 GAUGE



2) Using a press, press-fit the new roller bearing into specified position.

NOTE:
If excessive force is applied to roller bearing, the roller bearing will not turn easily.



(A) Drive pinion shaft
(B) Roller bearing

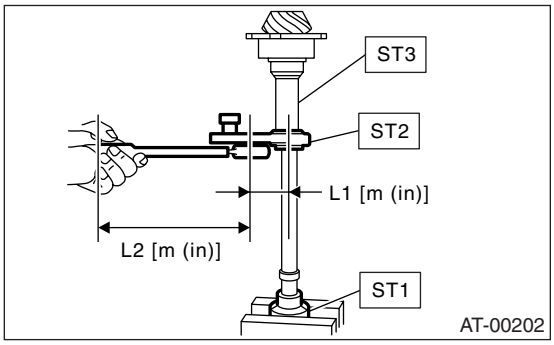
3) After fitting a new O-ring to the drive pinion shaft, attach the drive pinion collar to the drive pinion shaft.
4) Install the lock washer to drive pinion shaft in proper direction.

5) Tighten the new lock nuts using ST1, ST2 and ST3.
Calculate the lock washer and lock nut specifications using following formula.
T2 = L2/ (L1+L2) ×T1
T1: 116 N·m (11.8 kgf-m, 85.3 ft-lb)
[Required torque setting]
T2: Tightening torque
L1: ST2 length 0.072 m (2.83 in)
L2: Torque wrench length
Example:

Torque wrench length m (in)	Tightening torque N·m (kgf-m, ft-lb)
0.4 (15.75)	98 (10.0, 72.3)
0.45 (17.72)	100 (10.2, 73.5)
0.5 (19.69)	101 (10.3, 74.6)
0.55 (21.65)	102 (10.4, 75.4)

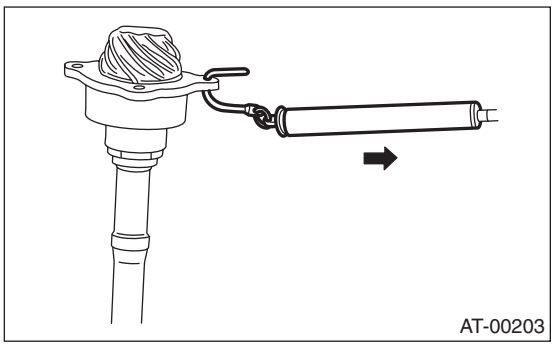
ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER

NOTE:
Install ST2 to torque wrench as straight as possible.



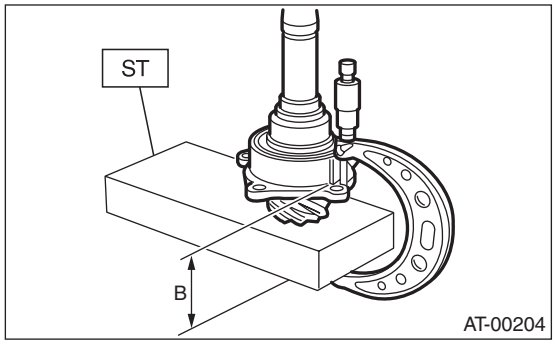
6) Measure the starting torque of bearing. Make sure the starting torque is within the specified range. If the torque is not within specified range, replace the roller bearing.

Starting torque:
7.6 — 38.1 N (0.776 — 3.88 kgf, 1.7 — 8.6 lbf)



7) Stake the lock nut at two points.
8) Measure the dimension “B” of drive pinion shaft

ST 398643600 GAUGE



9) Calculate the thickness “t” (mm) of drive pinion shim.
t = 6.5±0.0625− (B−A)

10) Select three or less shims from following table.

Drive pinion shim	
Part number	Thickness mm (in)
31451AA050	0.150 (0.0059)
31451AA060	0.175 (0.0069)
31451AA070	0.200 (0.0079)
31451AA080	0.225 (0.0089)
31451AA090	0.250 (0.0098)
31451AA100	0.275 (0.0108)

E: INSPECTION

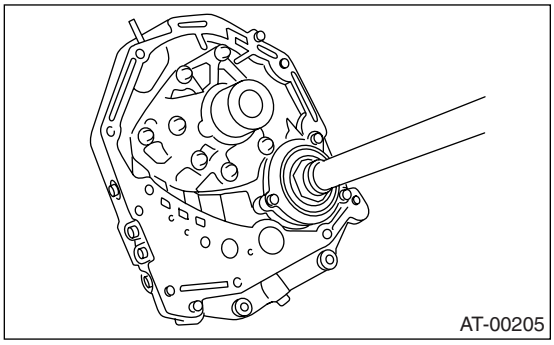
• Make sure that all component parts are free of harmful cut, gouges, and other faults.
• Adjust the teeth alignment. <Ref. to 4AT-123, ADJUSTMENT, Drive Pinion Shaft Assembly.>

F: ADJUSTMENT

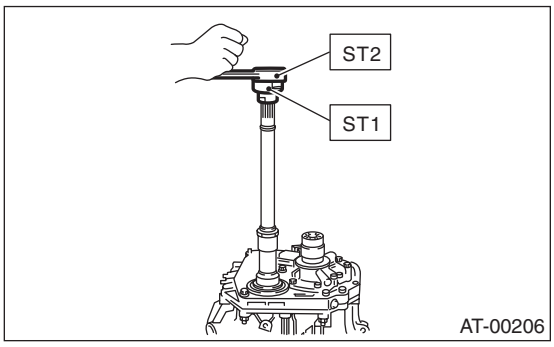
1) Remove the liquid gasket completely.
2) Install the oil pump housing assembly to converter case, and secure them with tightening four bolts evenly.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of housing.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)

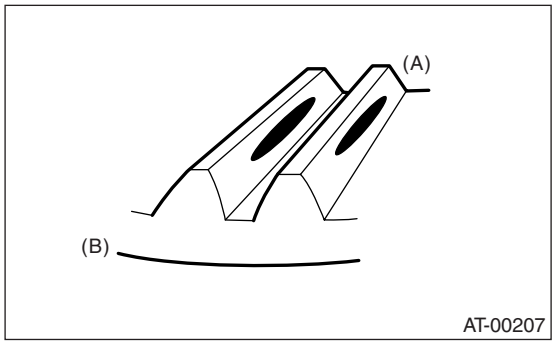

AT-00205

3) Rotate the drive pinion several times using ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH



AT-00206

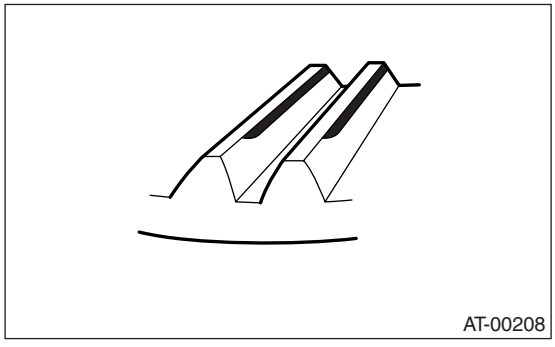
4) Adjust backlash between drive pinion and hypoid driven gear. <Ref. to 4AT-130, ADJUSTMENT, Front Differential Assembly.>
5) Apply red lead evenly to the surfaces of three or four teeth on hypoid driven gear. Rotate the drive pinion in the forward and reverse directions for several times. Remove the oil pump housing, and check the tooth contact pattern.
If the tooth contact is improper, readjust the backlash or shim thickness. <Ref. to 4AT-130, ADJUSTMENT, Front Differential Assembly.>
• Correct tooth contact
Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



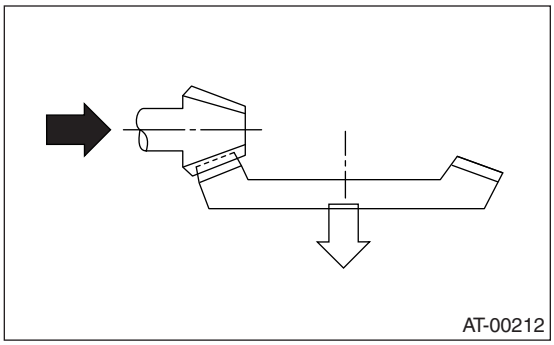
AT-00207

(A) Toe side
(B) Heel side

• Face contact
Checking item: Backlash is too large.
Contact pattern


AT-00208

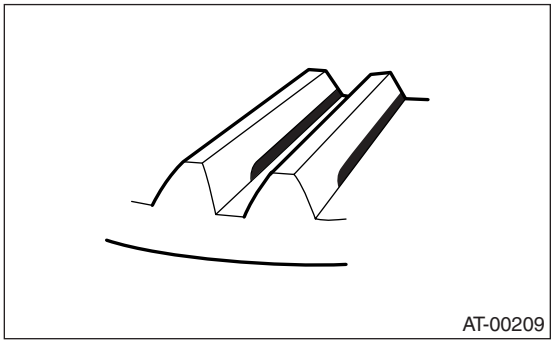
Corrective action: Increase thickness of pinion height adjusting washer in order to bring drive pinion shaft close to hypoid driven gear.



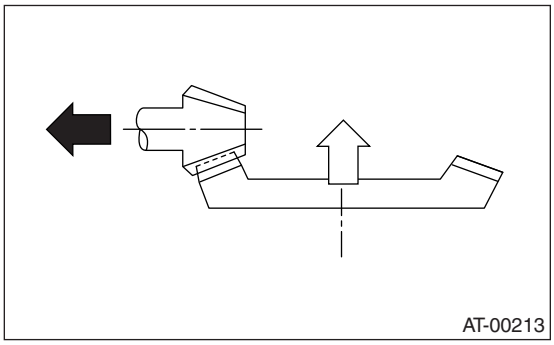
- Flank contact

Checking item: Backlash is too small.

Contact pattern



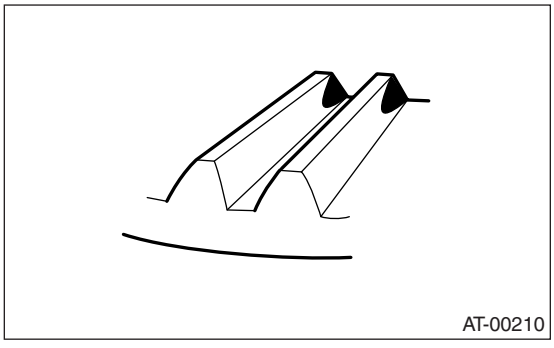
Corrective action: Reduce thickness of pinion height adjusting washer in order to bring drive pinion shaft away from hypoid driven gear.



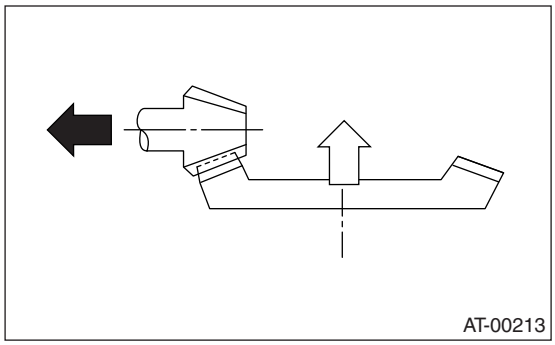
- Toe contact (inside end contact)

Checking item: Contact areas is small

Contact pattern



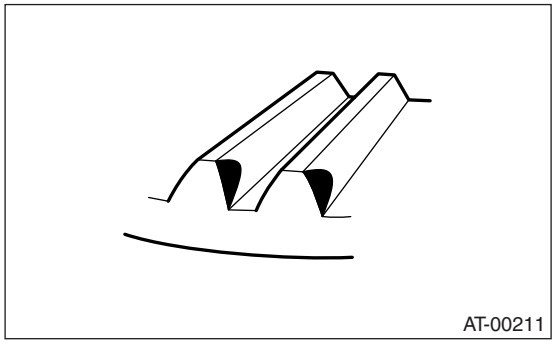
Corrective action: Reduce thickness of pinion height adjusting washer in order to bring drive pinion shaft away from hypoid driven gear.



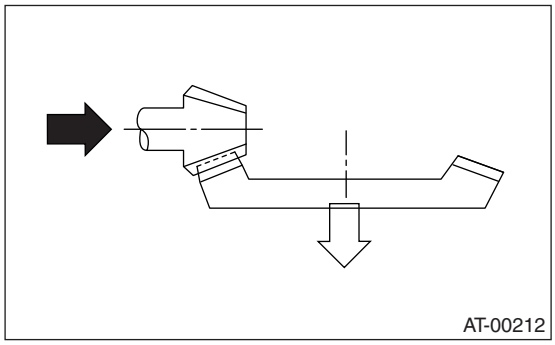
- Heel contact (outside end contact)

Checking item: Contact areas is small

Contact pattern

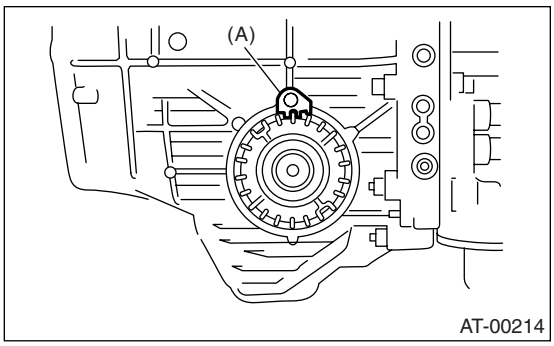


Corrective action: Increase thickness of pinion height adjusting washer in order to bring drive pinion shaft close to hypoid driven gear.



6) If tooth contact is correct, mark the differential side retainer position and loosen it. After fitting a new O-ring and oil seal, screw in the differential side retainer to the marked position. Tighten the lock plate with specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

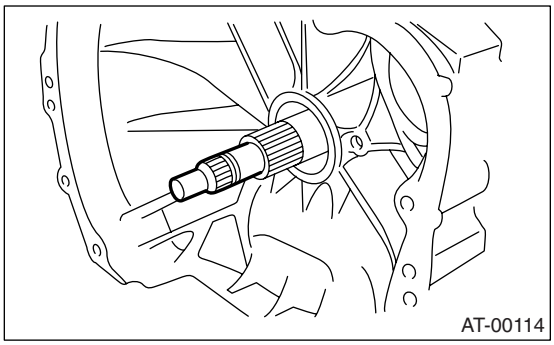


(A) Lock plate

39.Front Differential Assembly

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-93, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.



4) Lift-up the lever on rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the inhibitor switch from the stay.
6) Remove the oil charge pipe. <Ref. to 4AT-92, REMOVAL, Oil Charge Pipe.>
7) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-83, REMOVAL, ATF Cooler Pipe and Hose.>
8) Separate the converter case and transmission case. <Ref. to 4AT-111, REMOVAL, Converter Case.>
9) Remove the seal pipe.
10) Remove the differential side retainers using ST.

NOTE:
Hold the differential case assembly by hand to avoid damaging retainer mounting hole of converter case.

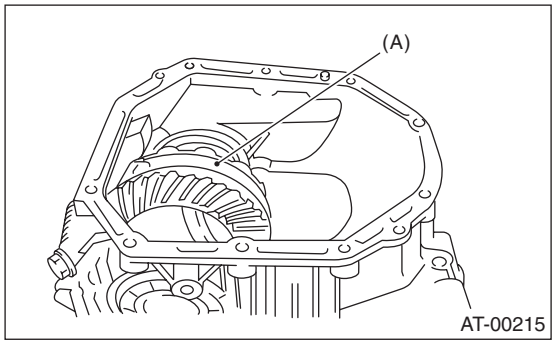
ST 499787000 WRENCH ASSY

11) Remove the differential assembly without damaging installation part of retainer.

B: INSTALLATION

1) Install the differential assembly to converter case.

CAUTION:
Do not damage the inside of converter case (especially the mating surface of differential side retainer).



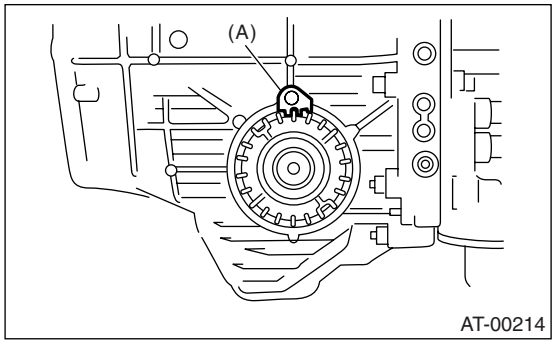
(A) Differential ASSY

2) Install the O-ring to left and right differential side retainer.
3) Install the side retainers using ST. <Ref. to 4AT-126, INSTALLATION, Front Differential Assembly.>

ST 499787000 WRENCH ASSY

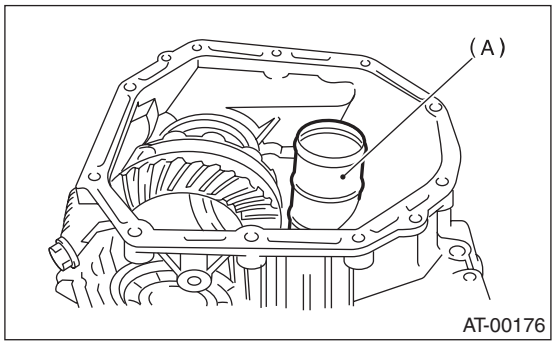
4) Adjust the front differential backlash. <Ref. to 4AT-130, ADJUSTMENT, Front Differential Assembly.>
5) Install the lock plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



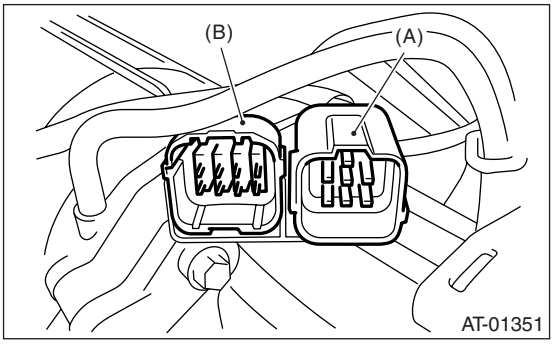
(A) Lock plate

6) Install the new seal pipe to converter case.



(A) Seal pipe

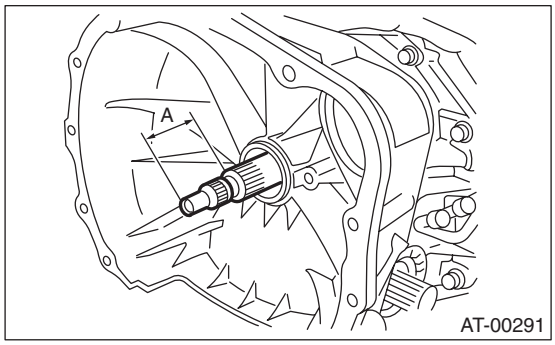
7) Install the converter case to transmission case. <Ref. to 4AT-112, INSTALLATION, Converter Case.>
8) Insert the inhibitor switch and transmission connector to the stay.



(A) Transmission harness ASSY
(B) Inhibitor switch harness

9) Install the ATF cooler pipe. <Ref. to 4AT-85, INSTALLATION, ATF Cooler Pipe and Hose.>
10) Install the oil charge pipe with O-ring. <Ref. to 4AT-92, INSTALLATION, Oil Charge Pipe.>
11) Insert the input shaft with rotating it by hand lightly, and then check the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

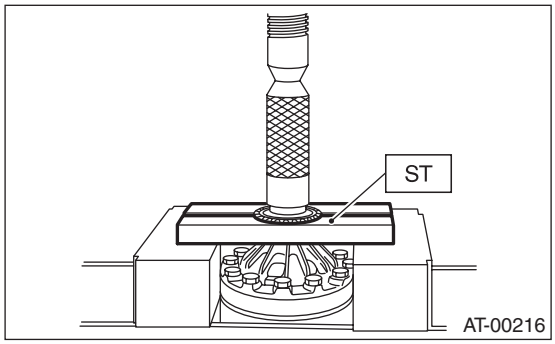


12) Install the torque converter clutch assembly. <Ref. to 4AT-93, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

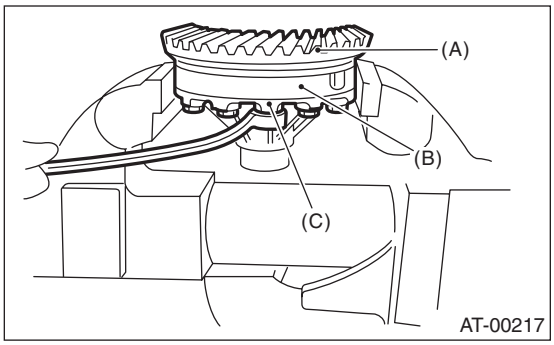
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Remove taper roller bearing using ST and press.
ST 498077000 REMOVER

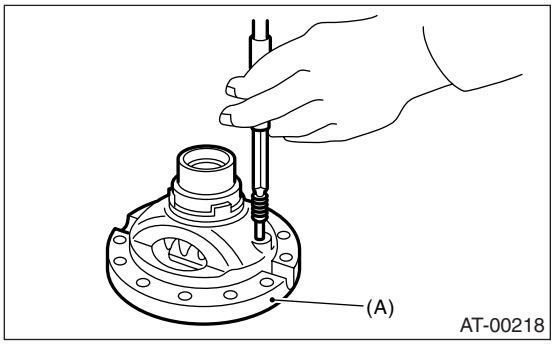


2) Secure the case in a vise and remove the hypoid driven gear tightening bolts, then separate the hypoid driven gear, differential case (RH) and differential case (LH).



(A) Hypoid driven gear
(B) Differential case (RH)
(C) Differential case (LH)

3) Pull out the straight pin and pinion shaft, and then remove the differential bevel gear, washer and differential bevel pinion.

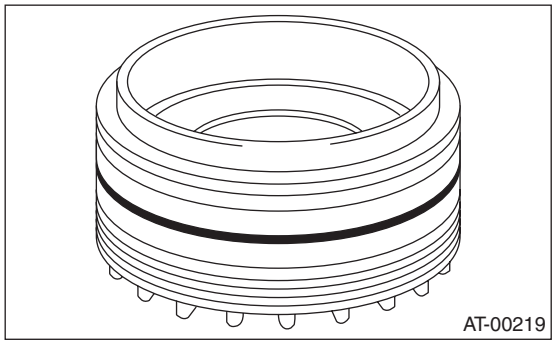


(A) Differential case (RH)

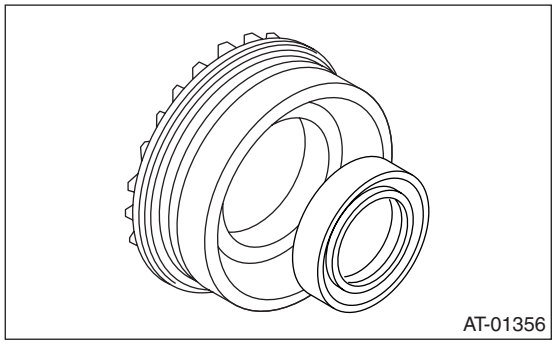
2. DIFFERENTIAL SIDE RETAINER

NOTE:
After adjusting the drive pinion backlash and tooth contact, remove and install the oil seal and O-ring.

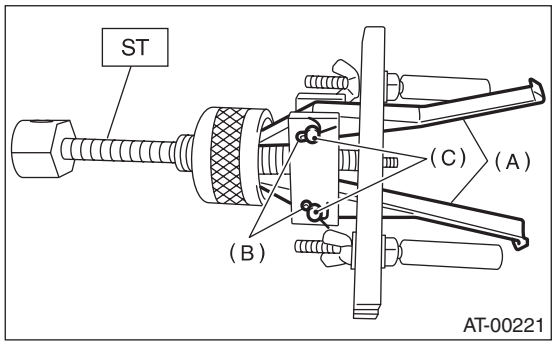
1) Remove the O-ring.



2) Remove the oil seal.

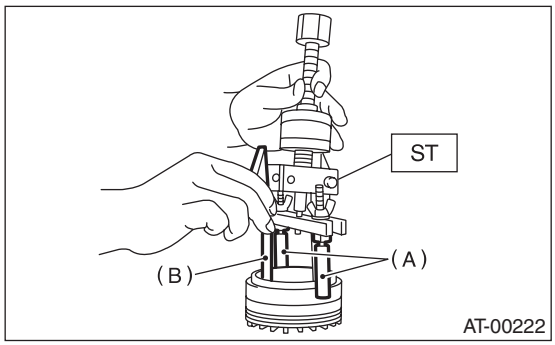


3) Remove the split pin, and then remove the claw.
ST 398527700 PULLER ASSY



(A) Claw
(B) Split pin
(C) Pin

4) Attach two claws to the outer race, and set ST to differential side retainer.
ST 398527700 PULLER ASSY

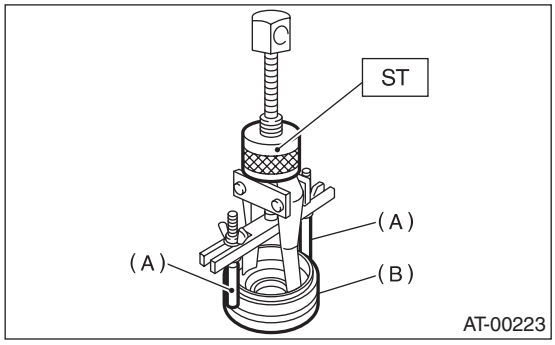


(A) Shaft
(B) Claw

5) Restore the removed claws to original position, and install the pin and split pin.

6) Hold the shaft of ST to avoid removing from differential side retainer, and then remove the bearing outer race.
ST 398527700 PULLER ASSY

NOTE:
Replace the bearing inner and outer races as a single unit.

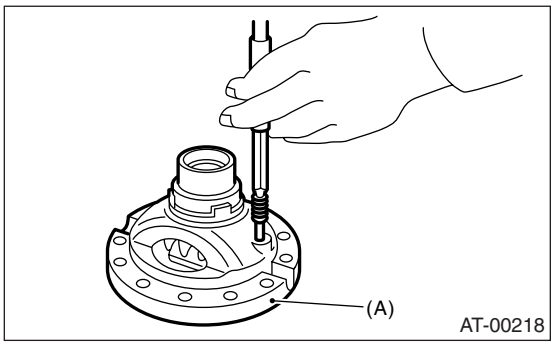


(A) Shaft
(B) Differential side retainer

D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft.
2) Install the straight pin in reverse direction.

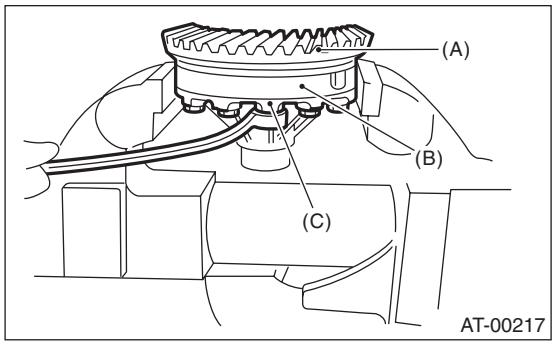


(A) Differential case (RH)

3) Install the washer and differential bevel gear to differential case (LH). Put the differential case (RH) on the case, and then combine the both cases.

4) Install the hypoid driven gear and secure by tightening the bolt.

Tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)

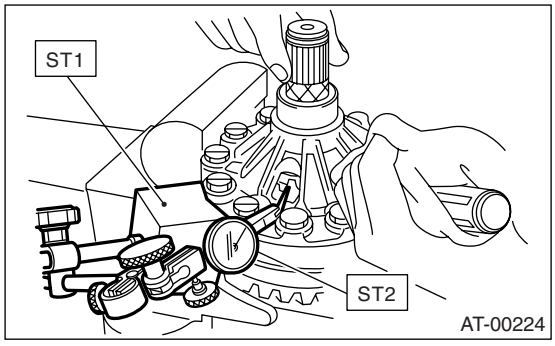


(A) Hypoid driven gear
(B) Differential case (RH)
(C) Differential case (LH)

5) Measurement of backlash (Selection of washer)
(1) Measure the gear backlash using ST1 and ST2, and then insert the ST2 from the access window of case.
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

NOTE:
• Measure the backlash by applying a differential pinion tooth between two differential bevel gear teeth.
• Fix the differential bevel pinion gear in place with a screwdriver or similar tool when measuring.

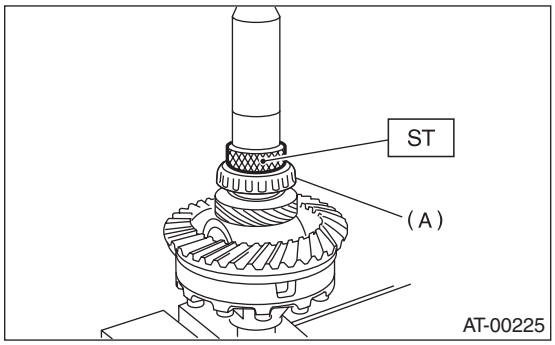
Standard value:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



(2) If the backlash is not within specifications, select a washer from the table below.

Washer	
Part number	Thickness mm (in)
803038021	0.95 (0.037)
803038022	1.00 (0.039)
803038023	1.05 (0.041)

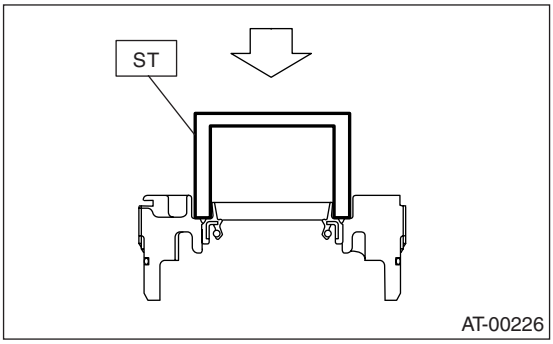
6) Using ST, install the taper roller bearing.
ST 398487700 INSTALLER



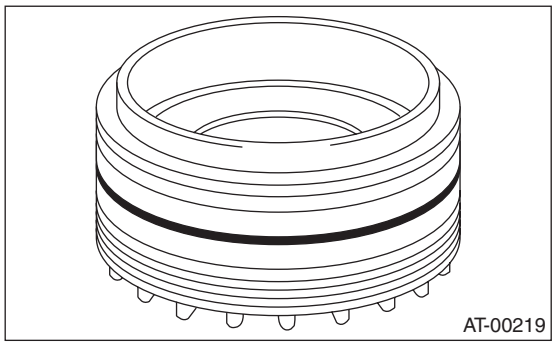
(A) Taper roller bearing

2. DIFFERENTIAL SIDE RETAINER

1) Install the bearing outer race to differential side retainer.
2) Install a new oil seal using ST and plastic hammer.
ST 18675AA000 DIFFERENTIAL OIL SEAL INSTALLER



3) Install a new O-ring.



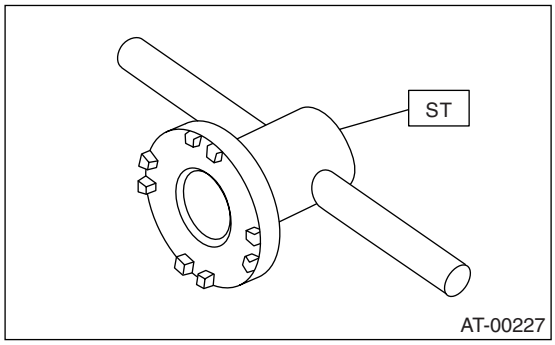
E: INSPECTION

• Check each component for harmful cuts, damage and other faults.
• Measure the backlash, and then adjust it within specification.
<Ref. to 4AT-130, ADJUSTMENT, Front Differential Assembly.>

F: ADJUSTMENT

1) Using ST, screw-in the differential side retainer until light contact is felt.

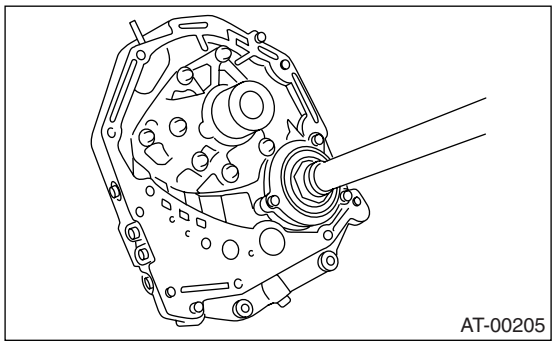
NOTE:
Screw-in the RH side slightly deeper than the LH side.
ST 499787000 WRENCH ASSY



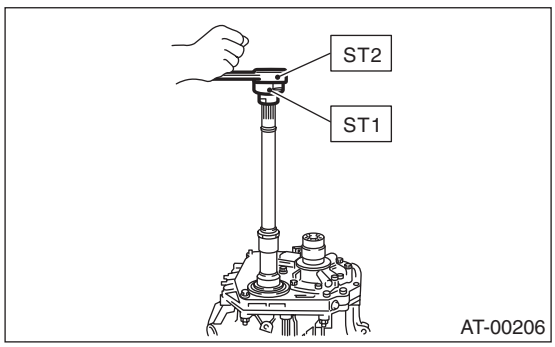
2) Remove the oil pump housing.
3) Remove the liquid gasket completely.
4) Install the oil pump housing assembly to converter case, and secure them with tightening four bolts evenly.

NOTE:
Use an old gasket or an aluminum washer so as not to damage the mating surface of housing.

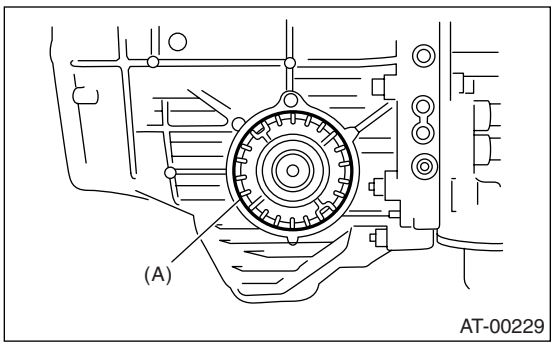
Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)



5) Rotate the drive pinion several times using ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH

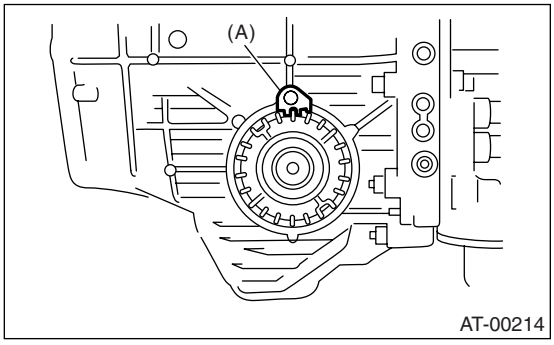


6) Tighten the LH side of differential side retainer until contact is felt while rotating the shaft. Then loosen the RH side of differential side retainer. Keep tightening the LH side of differential side retainer, and loosening the RH side until the pinion shaft not be able to turned. This is the “zero” state.



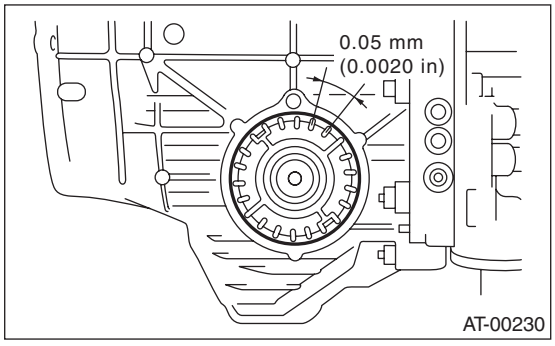
(A) Differential side retainer

7) After the “zero” state is established, back off the LH side of differential side retainer 3 notches and secure it with the lock plate. Then back off the RH side of differential side retainer and retighten until it stops. Rotate the drive pinion few times. Tighten the RH side of differential side retainer 1-3/4 notches further. This sets the preload. Finally, secure the differential side retainer with its lock plate.



(A) Lock plate

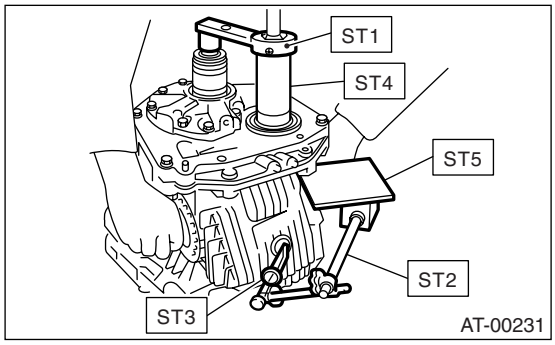
NOTE:
Turning the differential side retainer by one tooth changes the backlash about 0.05 mm (0.0020 in).



8) Turn the drive pinion several times with ST1 and check to see if the backlash is within the specified value with ST2, ST3, ST4 and ST5.

ST1	499787700	WRENCH
ST2	498247001	MAGNET BASE
ST3	498247100	DIAL GAUGE
ST4	499787500	ADAPTER
ST5	498255400	PLATE

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

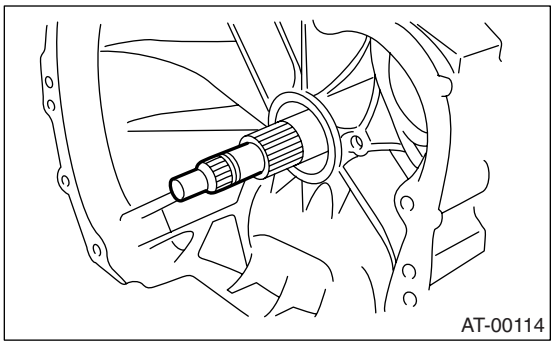


9) Adjust the tooth contact between front differential and drive shaft. <Ref. to 4AT-123, ADJUSTMENT, Drive Pinion Shaft Assembly.>

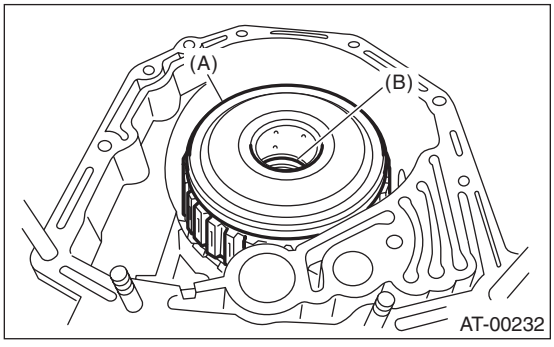
40.AT Main Case

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-93, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.

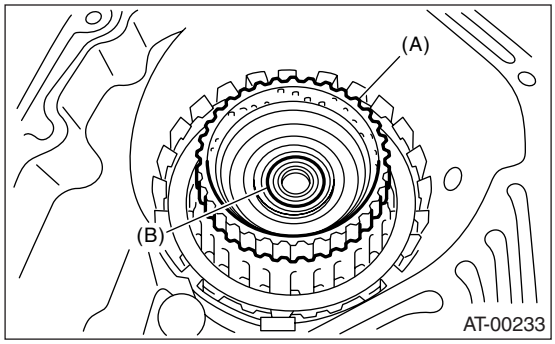


4) Lift-up the lever on rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the inhibitor switch connector from the stay.
6) Disconnect the air breather hose.
7) Remove the oil charge pipe. <Ref. to 4AT-92, REMOVAL, Oil Charge Pipe.>
8) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-83, REMOVAL, ATF Cooler Pipe and Hose.>
9) Separate the converter case and transmission case. <Ref. to 4AT-111, REMOVAL, Converter Case.>
10) Remove the oil pump housing.
<Ref. to 4AT-114, REMOVAL, Oil Pump Housing.>
11) Take out the high clutch & reverse clutch assembly and thrust needle bearing.



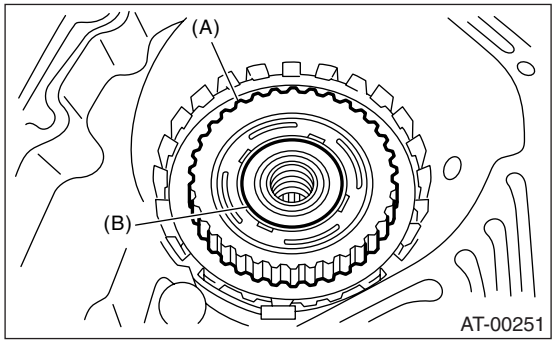
(A) High clutch & reverse clutch ASSY
(B) Thrust needle bearing

12) Take out the high clutch hub and thrust needle bearing.



(A) High clutch hub
(B) Thrust needle bearing

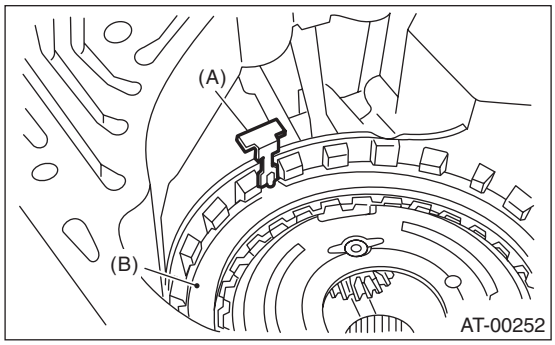
13) Take out the front sun gear and thrust needle bearing.



(A) Front sun gear
(B) Thrust needle bearing

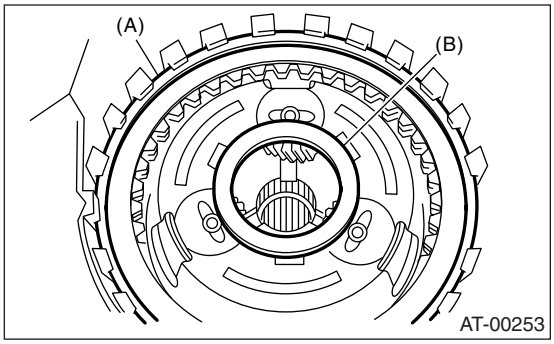
14) Pull out the leaf spring without folding.

NOTE:
Remove it while pressing down on lower leaf spring.



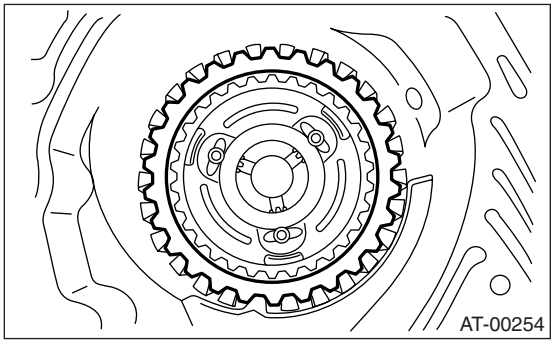
(A) Leaf spring
(B) Retaining plate

15) Remove the snap ring and thrust needle bearing.

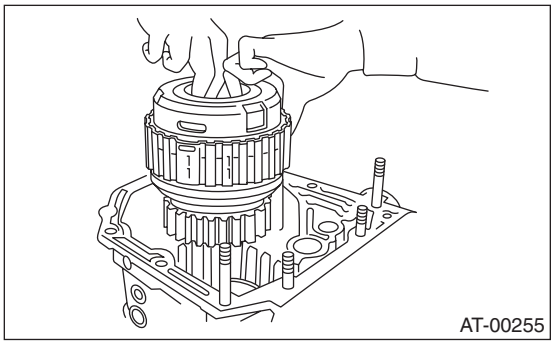


(A) Snap ring
(B) Thrust needle bearing

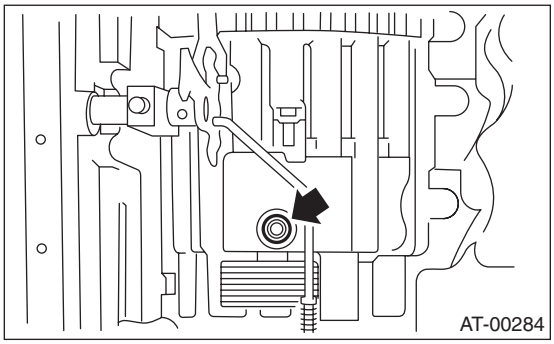
16) Take out the retaining plate, drive plate and driven plate.



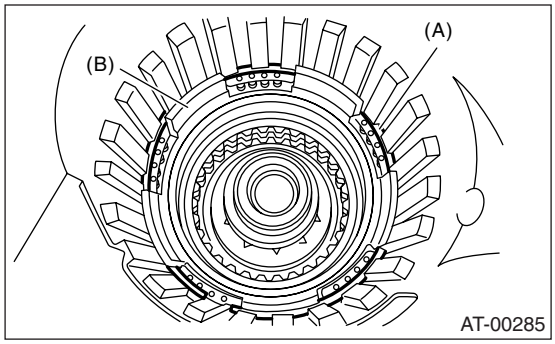
17) Take out the thrust needle bearing, planetary gear assembly and low clutch assembly.



18) Remove the 2-4 brake seal.

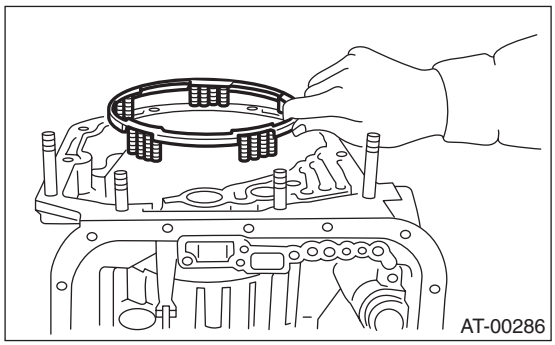


19) Remove the snap ring.

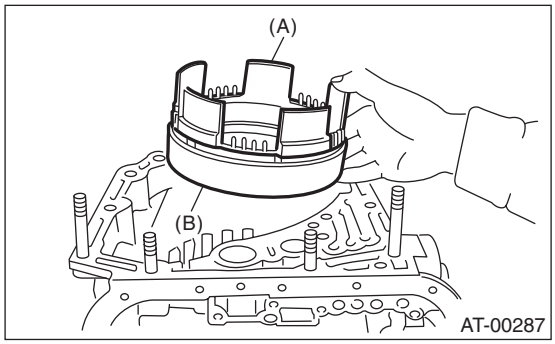


(A) Snap ring
(B) 2-4 brake piston

20) Take out the 2-4 brake spring retainer.

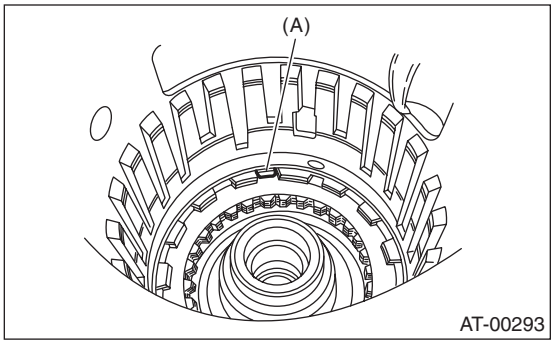


21) Remove the 2-4 brake piston and 2-4 brake piston retainer without damaging.



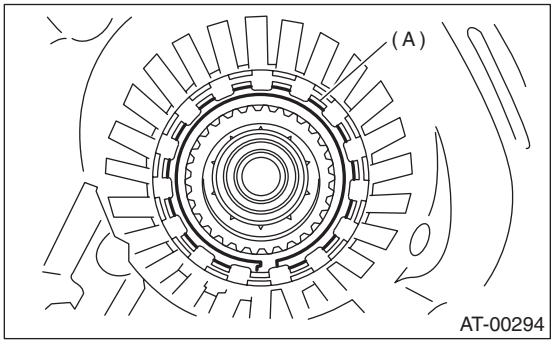
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

22) Pull out the leaf spring without folding.



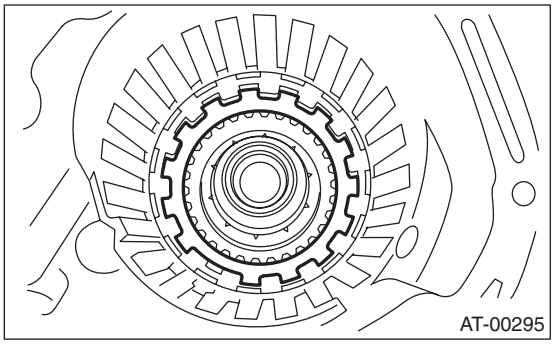
(A) Leaf spring

23) Remove the snap ring.

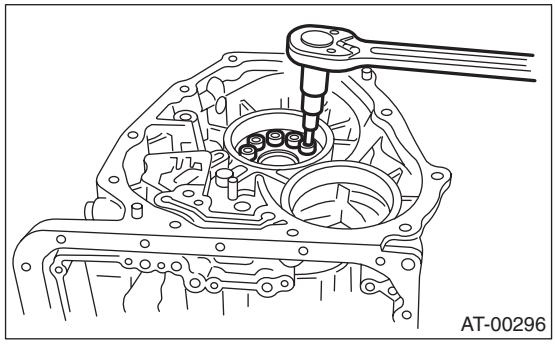


(A) Snap ring

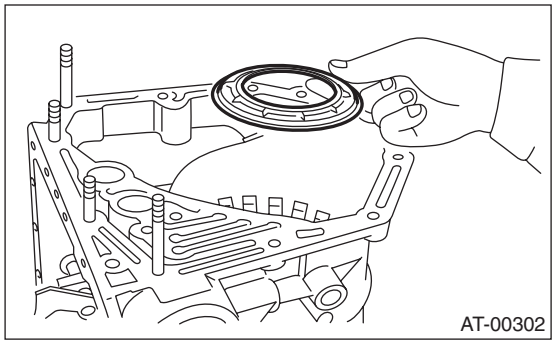
24) Take out the retaining plate, drive plate, driven plate and dish plate.



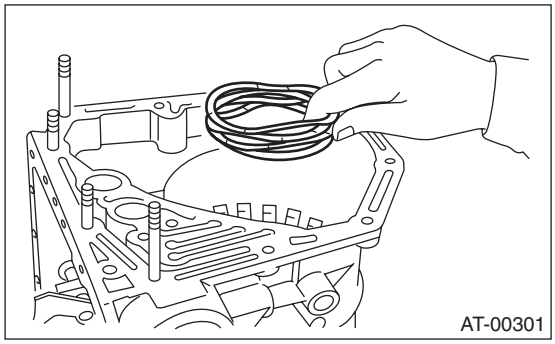
25) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race with hand.



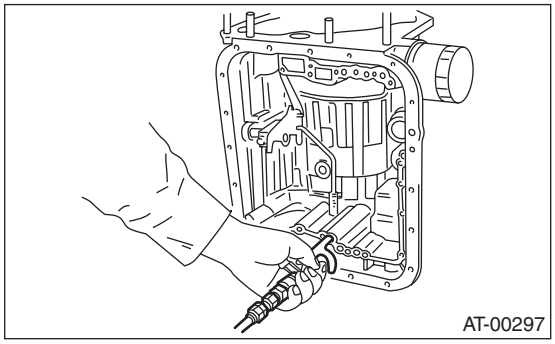
26) Remove the spring retainer.



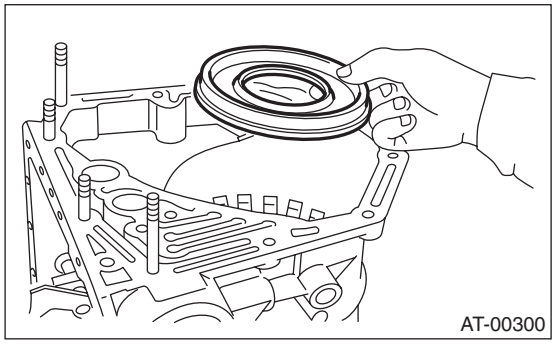
27) Take out the return spring.



28) Apply compressed air.



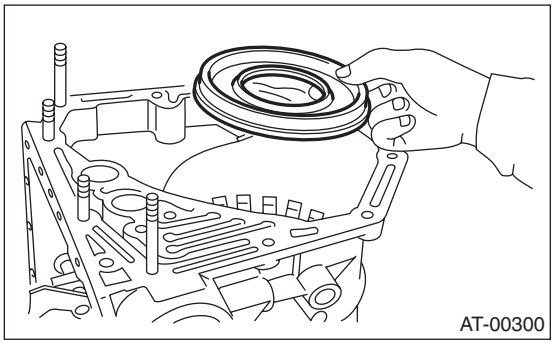
29) Take out the low & reverse brake piston.



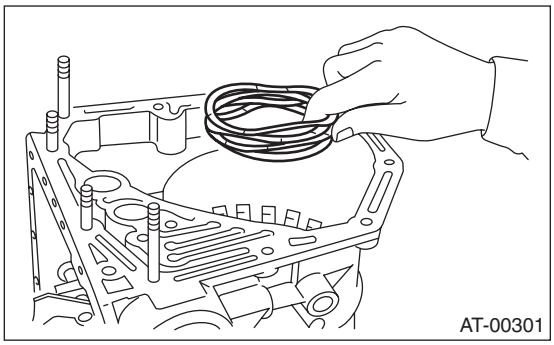
B: INSTALLATION

1) Install the low & reverse piston.

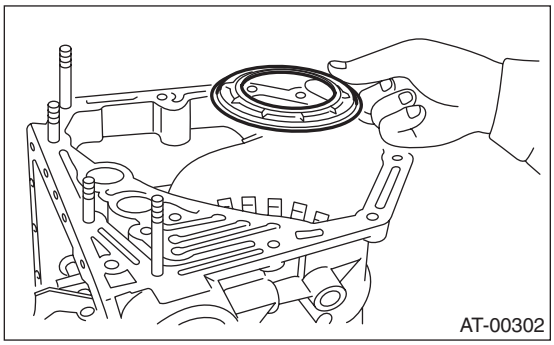
CAUTION:
Be careful not to damage the lip seal.


AT-00300

2) Install the return spring.

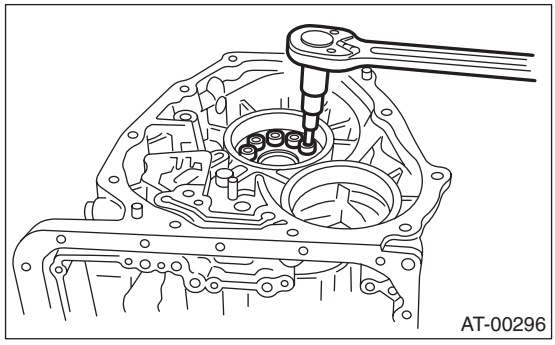

AT-00301

3) Install the spring retainer.


AT-00302

4) Install the one-way clutch inner race.
5) Tighten the socket head bolts evenly from the rear side of transmission case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)


AT-00296

6) Place the front side of transmission body up.
7) Install the thrust needle bearing.
8) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.
9) Set the micro gauge to clutch, and read its scale.

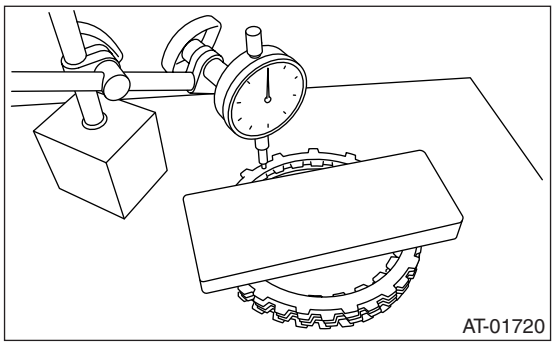
NOTE:
The value, which is read in the gauge at this time, is zero point.

10) Scale and record the weight “Z” of a flat board which will be put on plates.

NOTE:
Use a stiff flat board which does not bend against load.

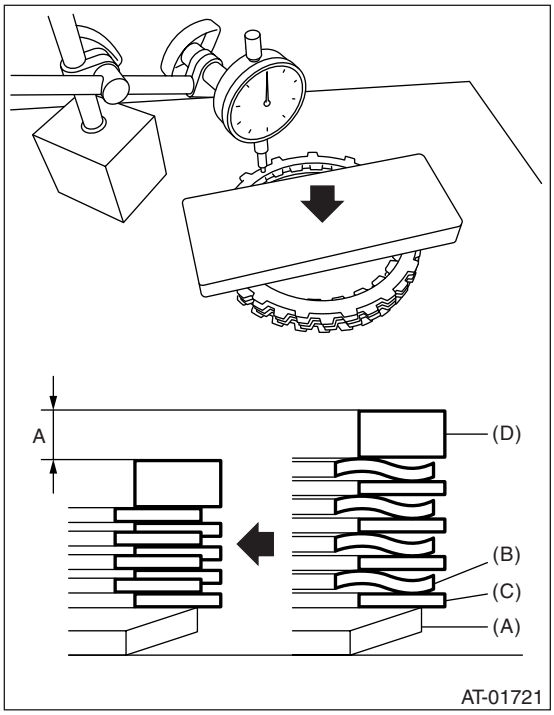
Use a flat board of its weight less than 83 N (8.5 kgf, 18.7 lbf).

11) Put the flat plate on retaining plate.


AT-01720

12) Using the following formula, calculate “N” indicated on the push/pull gauge
N = 83 N (8.5 kgf, 18.7 lbf) − Z
N: Value indicated on push/pull gauge
83 N (8.5 kgf, 18.7 lbf): Load applied to clutch plate
Z: Flat plate weight
13) Press the center of retaining plate with applying force of N, and then measure and record the height A. Make more than three measurements at even distance and take the average value.

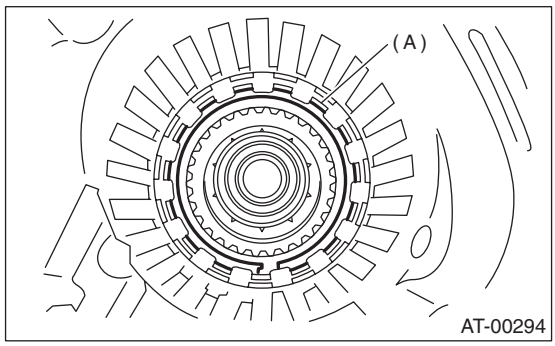
NOTE:
If three points, measure the height every 120°. If four points, measure the height every 90°.



(A) Dish plate
(B) Driven plate
(C) Drive plate
(D) Retaining plate

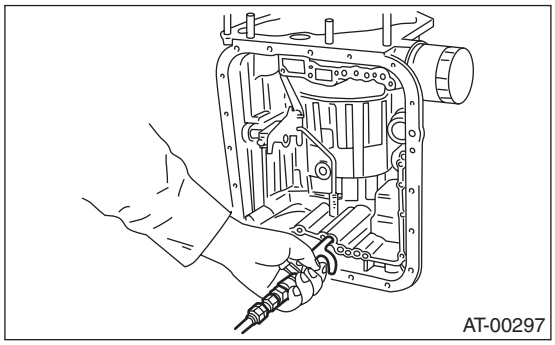
14) Installation of the low & reverse brake:
Install the dish plate, driven plate and retaining plate, and then secure them with snap ring.

NOTE:
Pay attention to the orientation of dish plate.

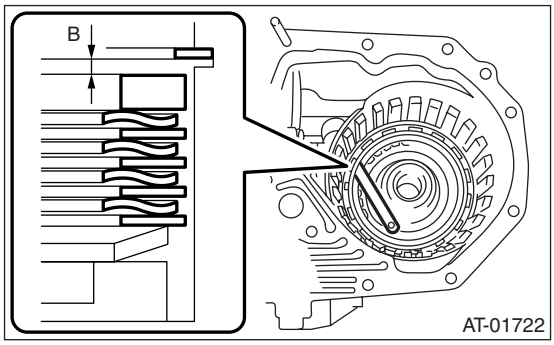


(A) Snap ring

15) Apply compressed air intermittently to check for operation.



16) Measure the clearance.
Place the same thickness of shim on both sides to prevent pressure plate from tilting, and then measure the clearance B and note it.



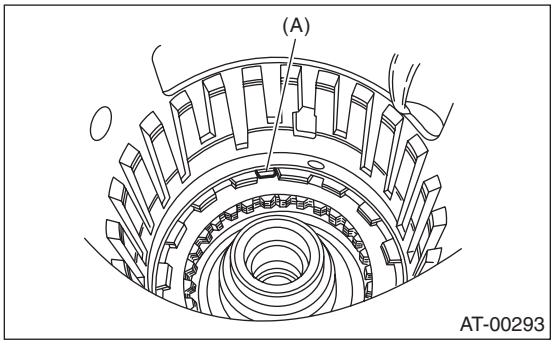
17) Calculation of piston stroke
Calculate from noted dimension A and B, and then select the retaining plate to adjust it within specification. If the calculated value exceed the limit, replace the drive plate with a new one to adjust it within specification.
T = A+B
T: Piston stroke
A: Collapsing amount of drive plate
B: Clearance between retaining plate and snap ring

Turbo model
Initial standard:
2.7 — 3.2 mm (0.106 — 0.126 in)
Limit thickness:
3.9 mm (0.154 in)

Non-turbo model
Initial standard:
2.0 L MODEL
1.85 — 2.35 mm (0.073 — 0.093 in)
2.5 L MODEL
2.40 — 2.90 mm (0.094 — 0.114 in)
Limit thickness:
2.0 L MODEL
2.65 mm (0.104 in)
2.5 L MODEL
3.60 mm (0.138 in)

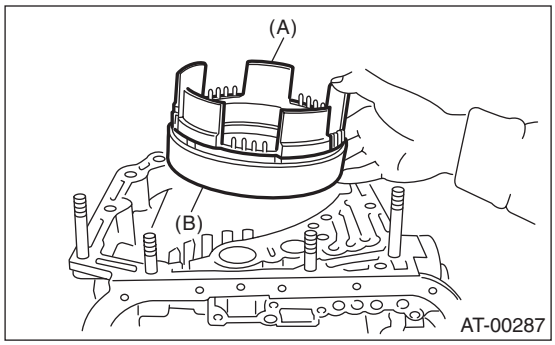
Retaining plate	
Part number	Thickness mm (in)
31667AA320	4.1 (0.161)
31667AA330	4.4 (0.173)
31667AA340	4.7 (0.185)
31667AA350	5.0 (0.197)
31667AA360	5.3 (0.209)
31667AA370	5.6 (0.220)
31667AA380	5.9 (0.232)

18) Install the leaf spring of low & reverse brake.



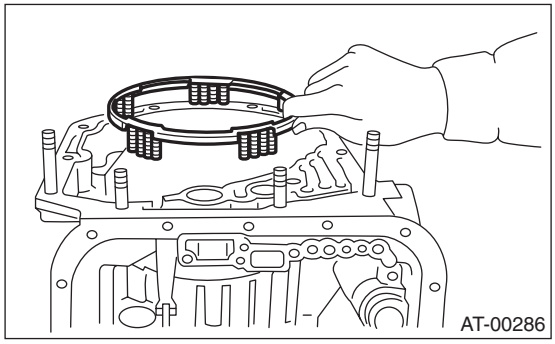
(A) Leaf spring

19) Install the 2-4 brake piston and 2-4 brake retainer by aligning hole of 2-4 brake retainer and hole of transmission case.

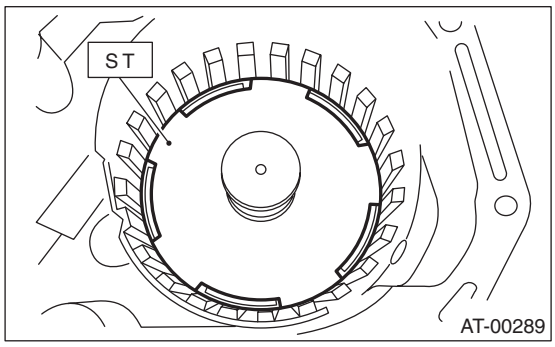


(A) 2-4 brake piston
(B) 2-4 brake piston retainer

20) Install the 2-4 brake piston spring retainer to transmission case.

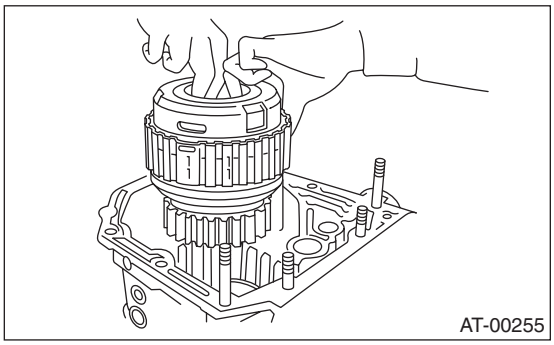


21) Position the snap ring in transmission. Using ST, press the snap ring into specified place.
ST 498677100 COMPRESSOR

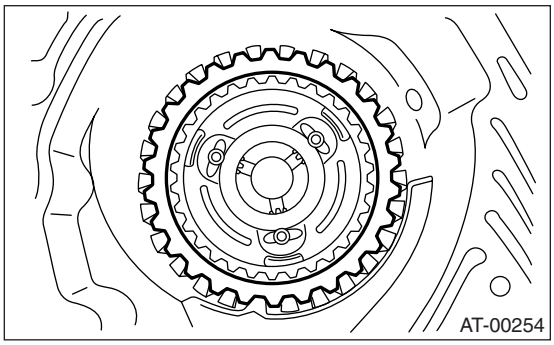


22) Install the planetary gear and low clutch assembly to transmission case.

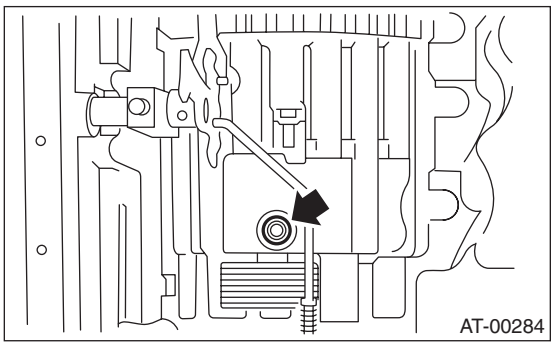
CAUTION:
When install the low clutch and planetary gear assembly with rotating them, rotate them slowly and paying attention not to damage the seal ring.



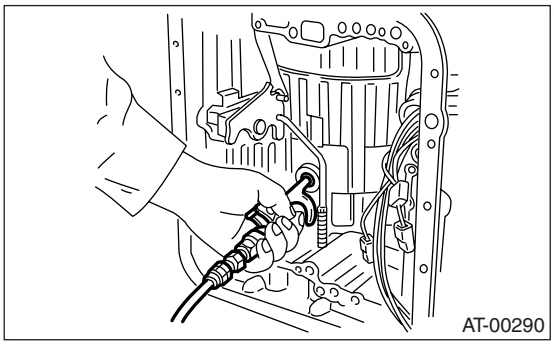
23) Install the pressure rear plate, drive plate of 2-4 brake, driven plate, retaining plate and snap ring.



24) Install a new 2-4 brake seal to transmission case.



25) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of brake.

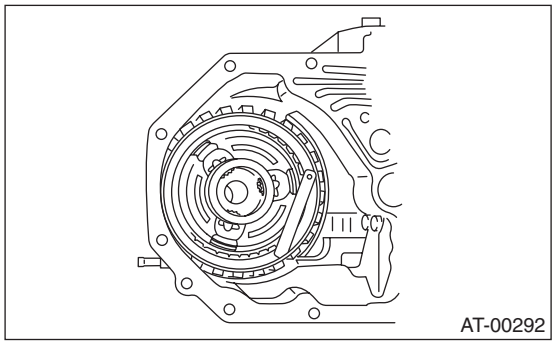


26) Check the clearance between the retaining plate and snap ring.

NOTE:
Select a retaining plate with a suitable value from following table, so that the clearance becomes within specified value.

Initial standard:
0.8 — 1.2 mm (0.031 — 0.047 in)

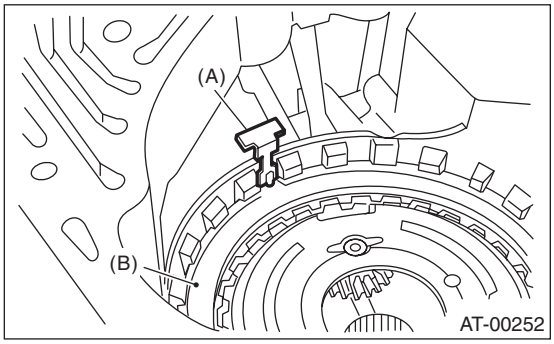
Limit thickness:
1.5 mm (0.059 in)



Retaining plate	
Part number	Thickness mm (in)
31567AA612	5.6 (0.220)
31567AA622	5.8 (0.228)
31567AA632	6.0 (0.236)
31567AA642	6.2 (0.244)
31567AA652	6.4 (0.252)
31567AA662	6.6 (0.260)

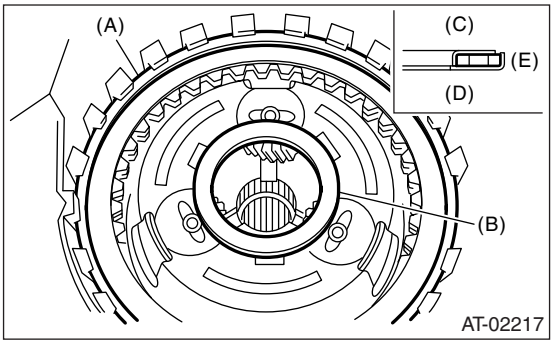
27) Install the leaf spring of 2-4 brake.

CAUTION:
Do not install in the wrong place.



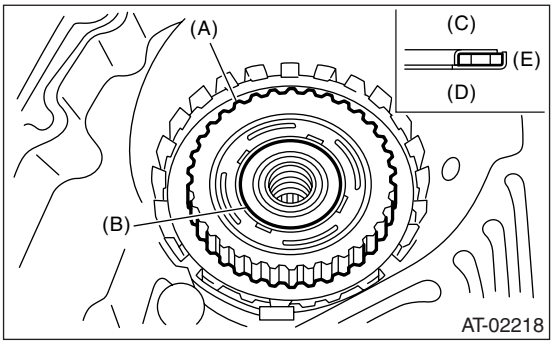
(A) Leaf spring
(B) Retaining plate

28) Install the thrust needle bearing in correct direction.



(A) Snap ring
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

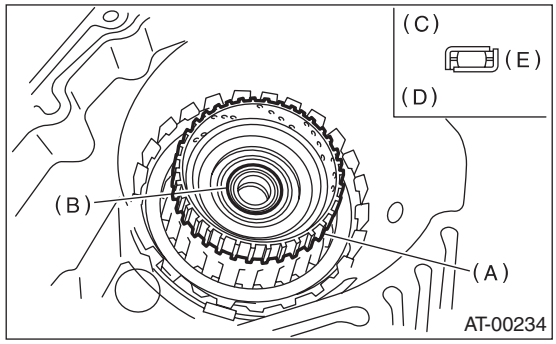
29) Install the front sun gear and thrust needle bearing.



(A) Front sun gear
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

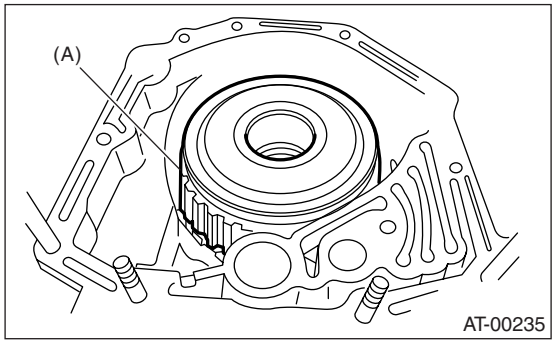
30) Attach the thrust needle bearing to high clutch hub using vaseline, and then install the high clutch hub by correctly engaging the splines of the front planetary carrier.

31) Install the thrust needle bearing in correct direction.



(A) High clutch hub
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

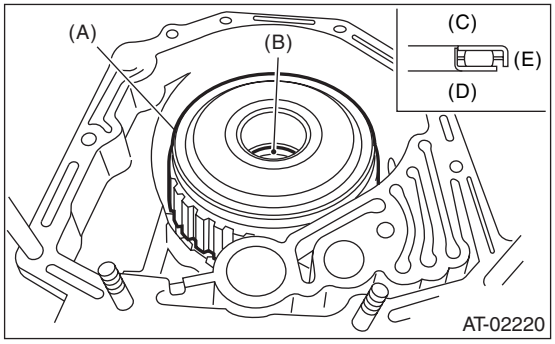
32) Install the high clutch assembly and reverse clutch assembly.



(A) High clutch and reverse clutch ASSY

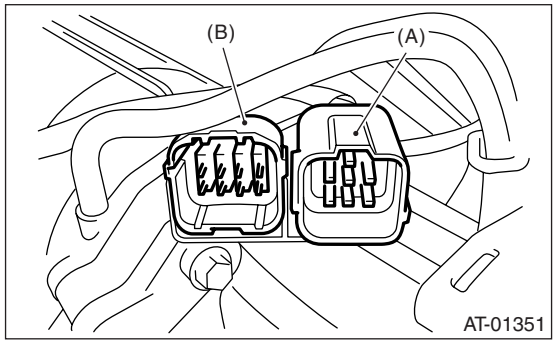
33) Adjust total end play. <Ref. to 4AT-118, ADJUSTMENT, Oil Pump Housing.>

34) Install the thrust needle bearing in correct direction.



(A) High clutch and reverse clutch ASSY
(B) Thrust needle bearing
(C) Upside
(D) Downside
(E) Outside

35) Install the oil pump housing assembly with a new gasket.
36) Install the converter case assembly into transmission case assembly. <Ref. to 4AT-112, INSTALLATION, Converter Case.>
37) Insert the inhibitor switch and transmission connector to the stay.

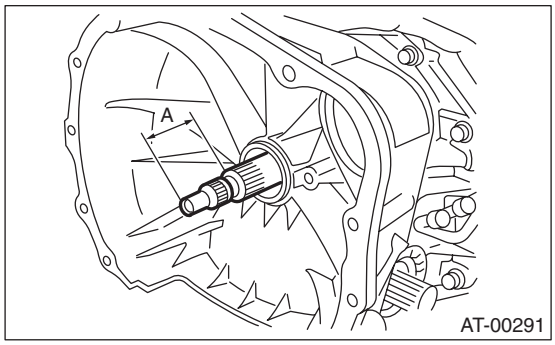


(A) Transmission harness
(B) Inhibitor switch harness

38) Connect the air breather hose. <Ref. to 4AT-91, INSTALLATION, Air Breather Hose.>
39) Install the ATF cooler pipe. <Ref. to 4AT-85, INSTALLATION, ATF Cooler Pipe and Hose.>
40) Install the oil charge pipe with O-ring. <Ref. to 4AT-92, INSTALLATION, Oil Charge Pipe.>

41) Insert the input shaft with rotating it by hand lightly, and then check the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)

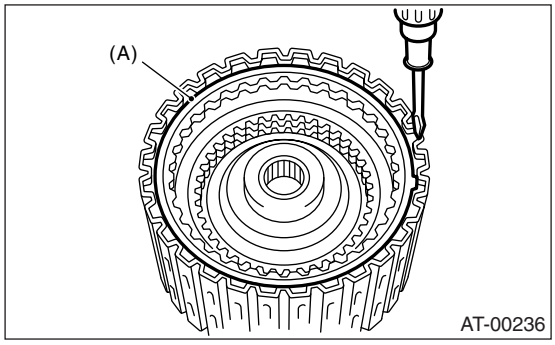


42) Install the torque converter clutch assembly. <Ref. to 4AT-93, INSTALLATION, Torque Converter Clutch Assembly.>
43) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

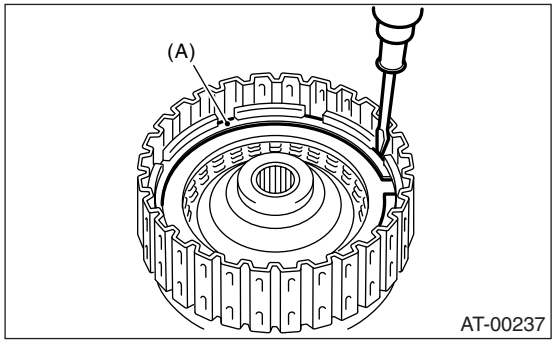
1. HIGH CLUTCH AND REVERSE CLUTCH

1) Remove the snap ring, and then take out the retaining plate, drive plate and driven plate.



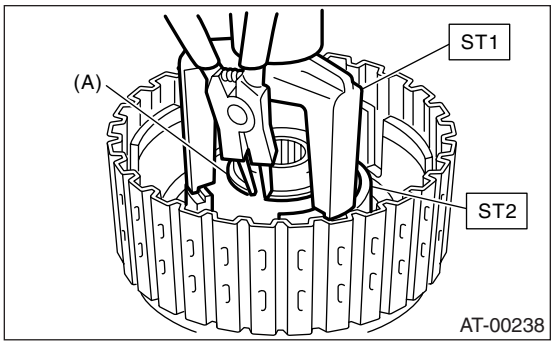
(A) Snap ring

2) Remove the snap ring, and then take out the retaining plate, drive plate and driven plate.



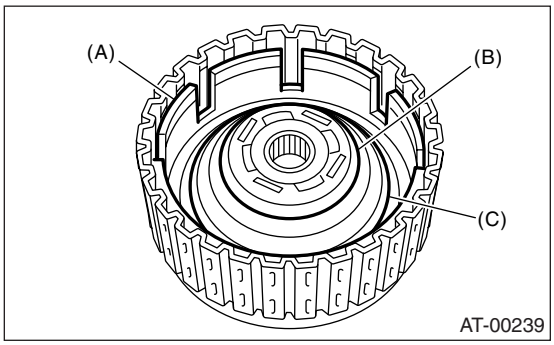
(A) Snap ring

3) Using ST1 and ST2, remove the snap ring.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT



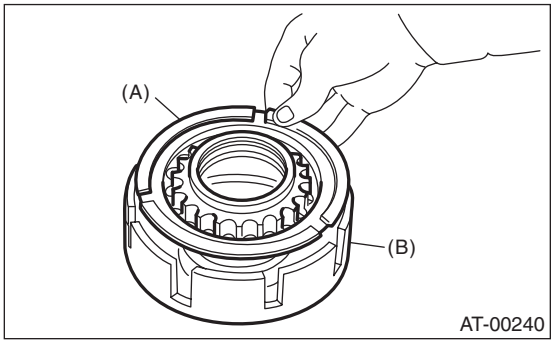
(A) Snap ring

4) Take out the clutch cover, spring retainer, high clutch piston and reverse clutch piston.



(A) Reverse clutch piston
(B) Clutch cover
(C) Return spring

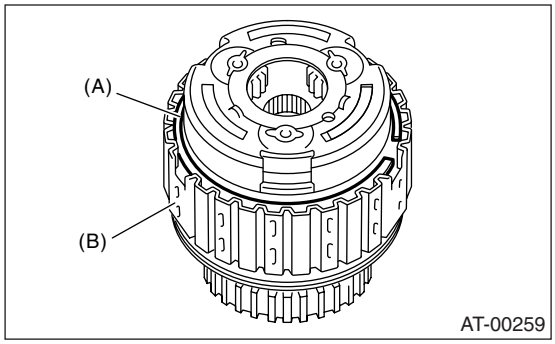
5) Remove the D-ring and lip seal from high clutch piston and reverse clutch piston.



(A) High clutch piston
(B) Reverse clutch piston

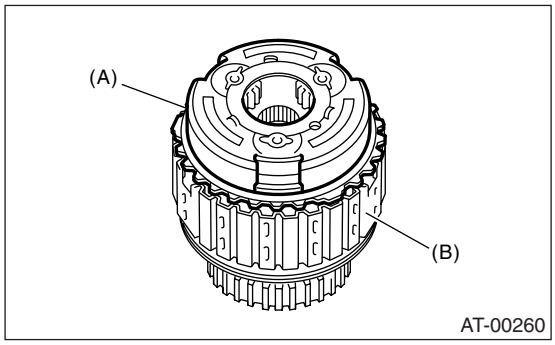
2. PLANETARY GEAR AND LOW CLUTCH

1) Remove the snap ring from low clutch drum.



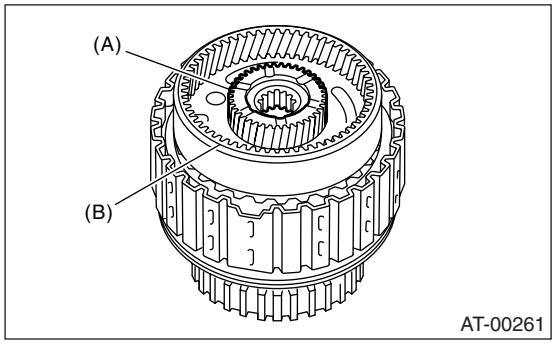
(A) Snap ring
(B) Low clutch drum

2) Take out the front planetary carrier.



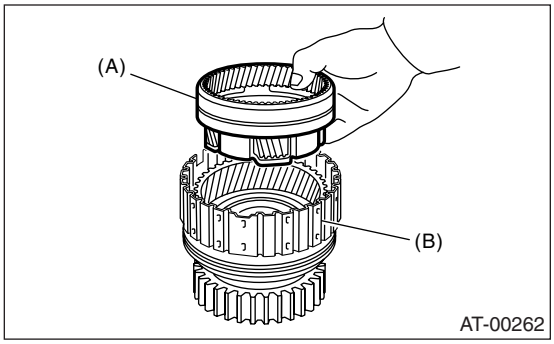
(A) Front planetary carrier
(B) Low clutch drum

3) Take out the rear sun gear.



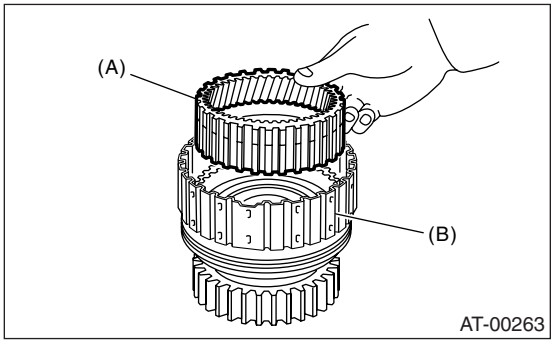
(A) Rear sun gear
(B) Rear planetary carrier

4) Take out the rear planetary carrier, washer and thrust needle bearing.



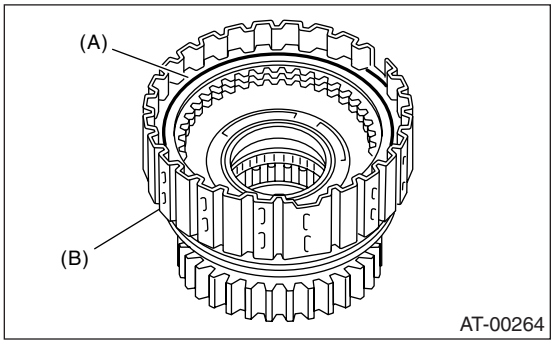
(A) Rear planetary carrier
(B) Low clutch drum

5) Take out the rear internal gear.



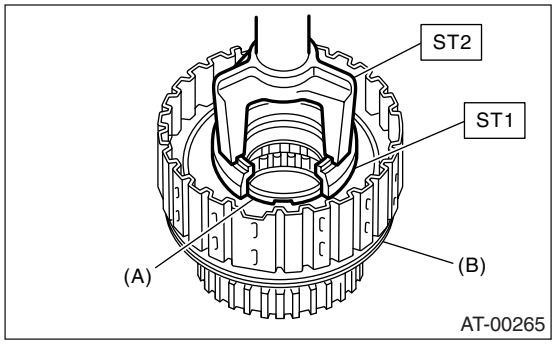
(A) Rear internal gear
(B) Low clutch drum

6) Remove the snap ring from low clutch drum.



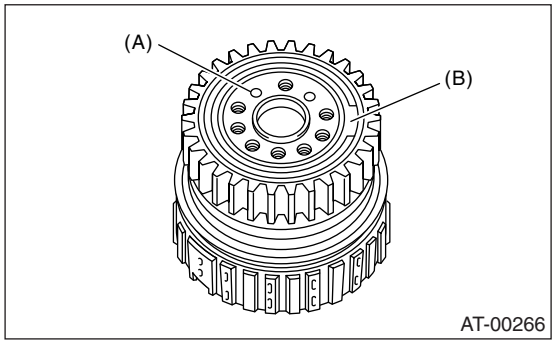
(A) Snap ring
(B) Low clutch drum

7) Compress the spring retainer of low & reverse brake, and remove the snap ring from low clutch drum using ST1 and ST2.
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



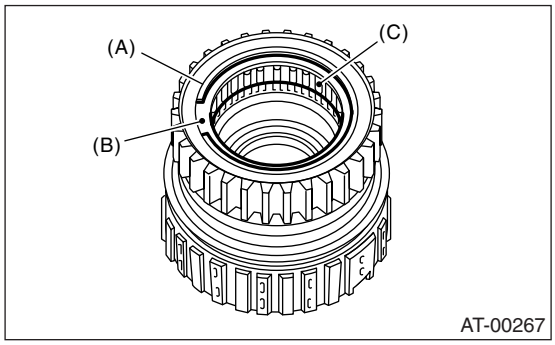
(A) Snap ring
(B) Low clutch drum

8) Remove the one-way clutch. <Ref. to 4AT-132, REMOVAL, AT Main Case.>
9) Install the one-way clutch inner race to low clutch drum, and then apply compressed air to remove the low clutch piston.



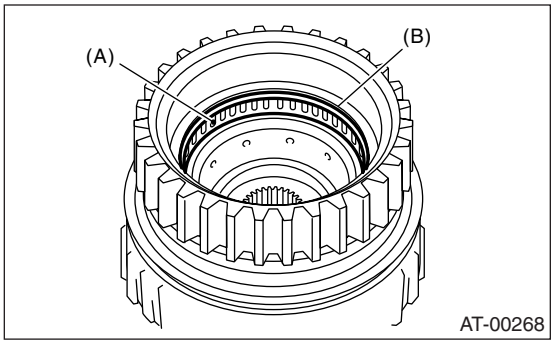
(A) Apply compressed air.
(B) One-way clutch inner race

10) Remove the one-way clutch inner race.
11) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

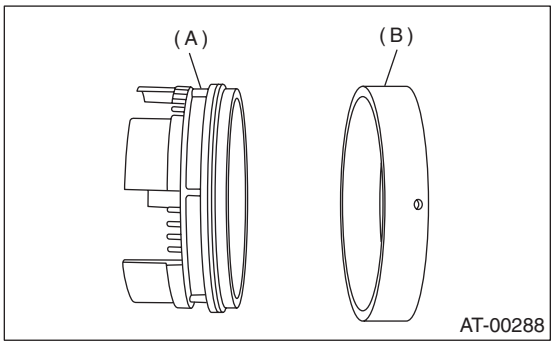
12) Remove the needle bearing after taking out the snap ring.



(A) Needle bearing
(B) Snap ring

3. 2-4 BRAKE

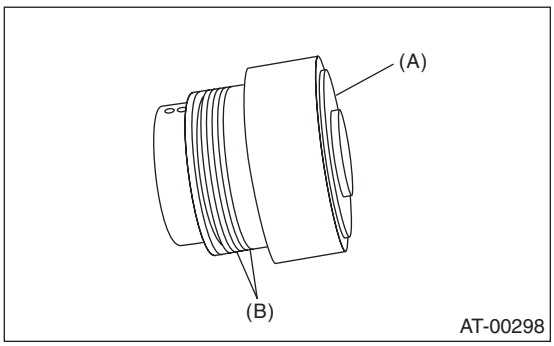
Separate the 2-4 brake piston and piston retainer.



(A) 2-4 brake piston
(B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Remove the seal ring.

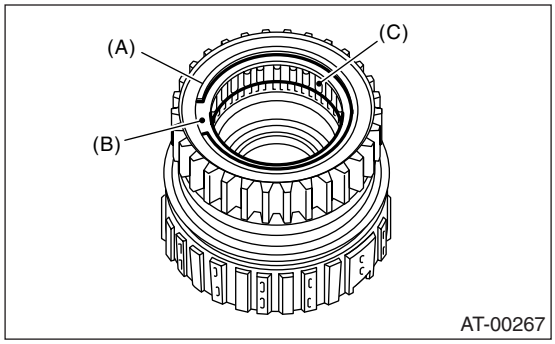


(A) One-way clutch inner race
(B) Seal ring

2) Remove the needle bearing using ST.
ST 398527700 PULLER ASSY

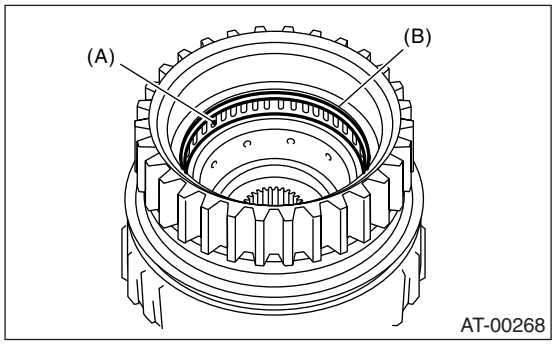
5. ONE-WAY CLUTCH OUTER RACE

1) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

2) Remove the needle bearing after taking out the snap ring.

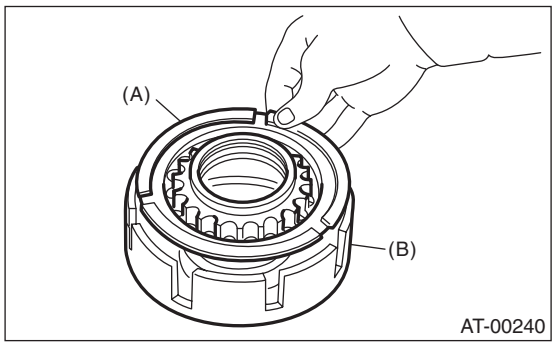


(A) Needle bearing
(B) Snap ring

D: ASSEMBLY

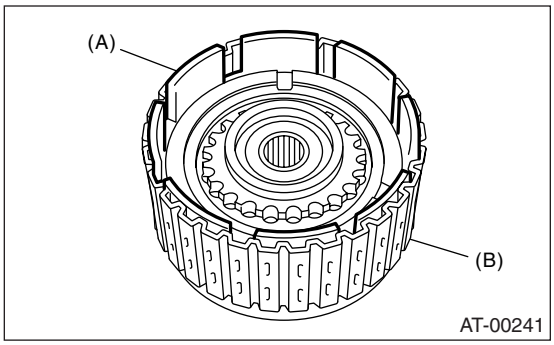
1. HIGH CLUTCH AND REVERSE CLUTCH

1) Install the new D-ring and lip seal to high clutch piston and reverse clutch piston.
2) Install the high clutch piston to reverse clutch piston.



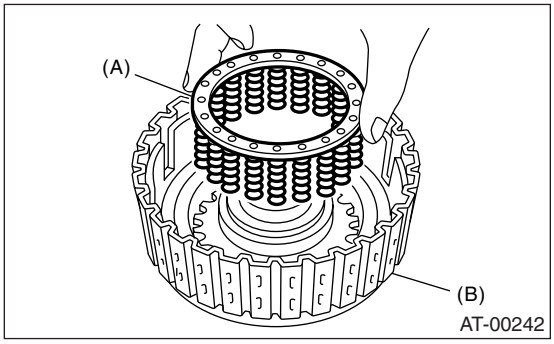
(A) High clutch piston
(B) Reverse clutch piston

3) Install the reverse clutch ASSY to high clutch drum. Align the groove on reverse clutch piston with the groove on high clutch drum during installation.



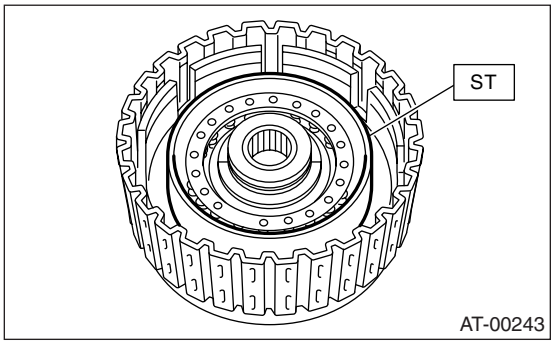
(A) Reverse clutch piston
(B) High clutch drum

4) Install the spring retainer to high clutch piston.

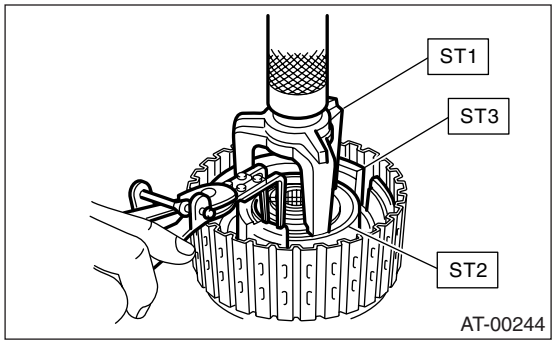


(A) Return spring
(B) High clutch drum

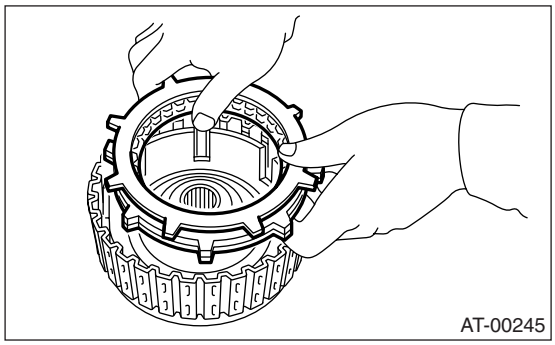
5) Install ST to high clutch piston.
ST 498437000 HIGH CLUTCH PISTON GUIDE



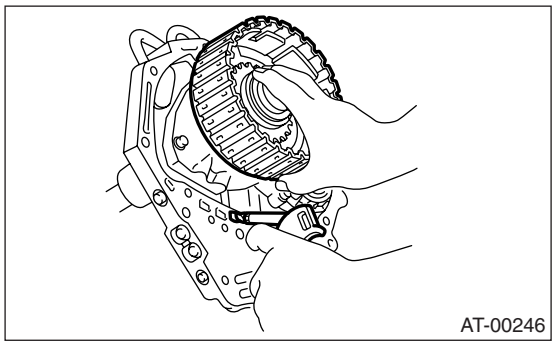
6) Install the cover to high clutch piston without folding the high clutch piston seal.
7) Install the snap ring using ST1 and ST2.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT
ST3 498437000 HIGH CLUTCH PISTON GAUGE



8) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.



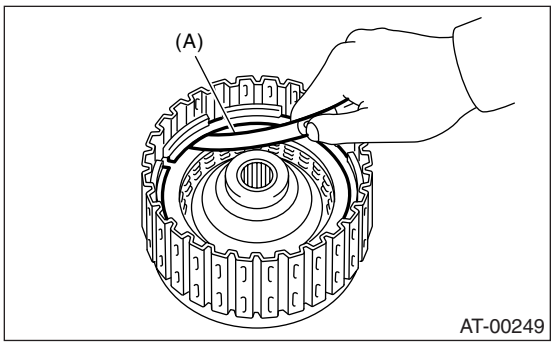
9) Install the snap ring to high clutch drum.
10) Apply compressed air intermittently to check for operation.



11) Measure the clearance between the retaining plate of high clutch and snap ring.
At this time, do not press down the retaining plate.

Initial standard:
0.8 — 1.1 mm (0.031 — 0.043 in)

Limit thickness:
1.5 mm (0.059 in)

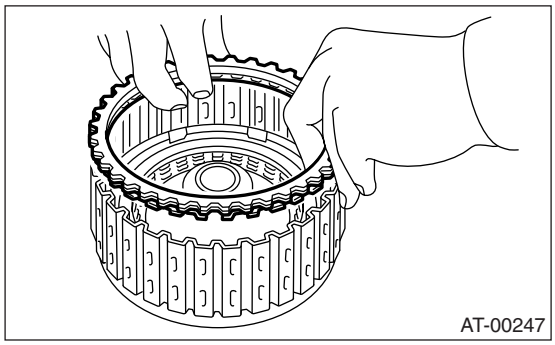


(A) Thickness gauge

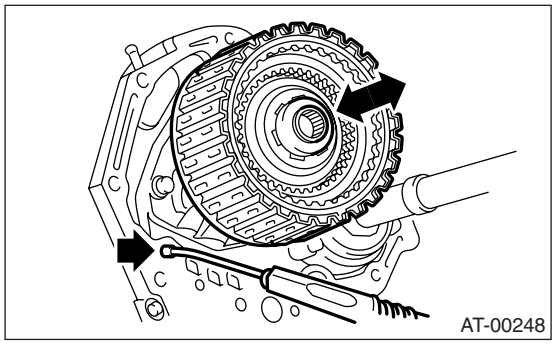
If the specified tolerance limits are exceeded, select a suitable retaining plate.

Retaining plate	
Part number	Thickness mm (in)
31567AA710	4.7 (0.185)
31567AA720	4.8 (0.189)
31567AA730	4.9 (0.193)
31567AA740	5.0 (0.197)
31567AA670	5.1 (0.201)
31567AA680	5.2 (0.205)
31567AA690	5.3 (0.209)
31567AA700	5.4 (0.213)

12) Selection of reverse clutch retaining plate (Non-turbo model)
(1) Install driven plate, drive plate, retaining plate and snap ring.



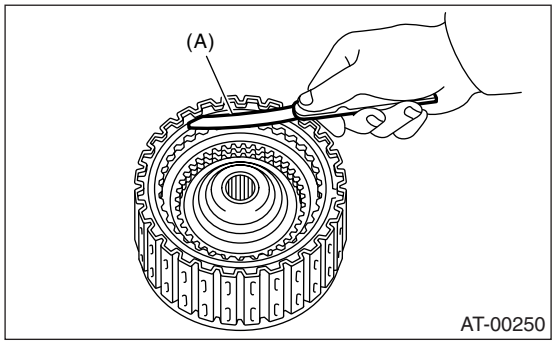
(2) Apply compressed air intermittently to check for operation.



(3) Measure the clearance between the retaining plate and snap ring. (Reverse clutch) At this time, do not press down retaining plate.

Initial standard:
0.5 — 0.8 mm (0.020 — 0.031 in)

Limit thickness:
1.2 mm (0.047 in)



(A) Thickness gauge

If specified tolerance limits are exceeded, select a suitable high clutch retaining plate.
If it exceeds the service limit, replace the drive plate with a new one and adjust it within the specification.

Reverse clutch retaining plate	
Part No.	Thickness mm (in)
31567AA910	4.0 (0.157)
31567AA920	4.2 (0.165)
31567AA930	4.4 (0.173)
31567AA940	4.6 (0.181)
31567AA950	4.8 (0.189)
31567AA960	5.0 (0.197)
31567AA970	5.2 (0.205)
31567AA980	5.4 (0.213)

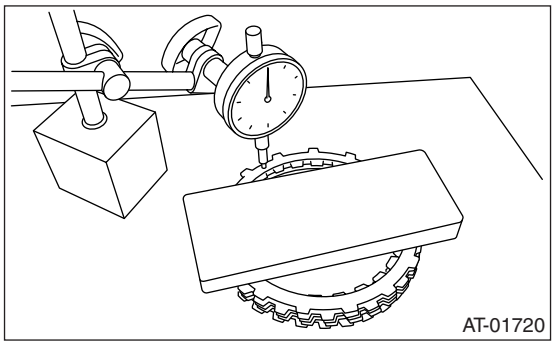
13) Selection of reverse clutch retaining plate (Turbo model)
(1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.
(2) Set the micro gauge to clutch, and read its scale.

NOTE:
The value, which is read in the gauge at this time, is zero point.

(3) Scale and record the weight Z of a flat board which will be put on plates.

NOTE:
• Use a stiff flat board which does not bend against load.
• Use a flat board of its weight less than 150 N (15.3 kgf, 33.7 lbf).

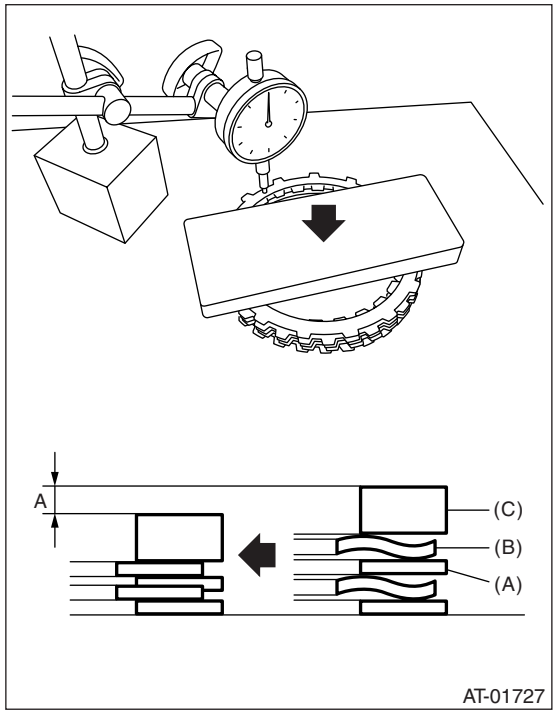
(4) Put the flat board on retaining plate.



(5) Using the following formula, calculate N indicated on the push/pull gauge.
N = 150 N (15.3 kgf, 33.7 lbf) − Z
N: Value indicated on push/pull gauge
150 N (15.3 kgf, 33.7 lbf): Load applied to clutch plate
Z: Flat board weight

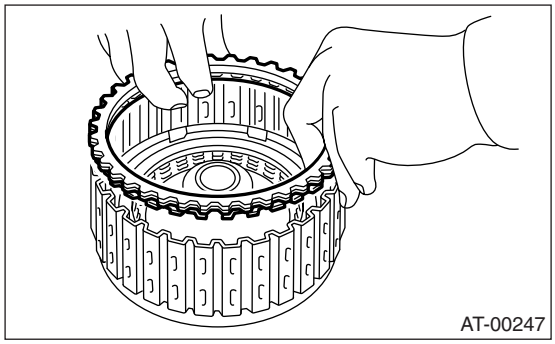
(6) Press the center of retaining plate applying force of N with push/pull gauge, and then measure and record the height “A”. Make more than three measurements at even distance and take the average value.

NOTE:
If three points, measure the height every 120°. If four points, measure the height every 90°.

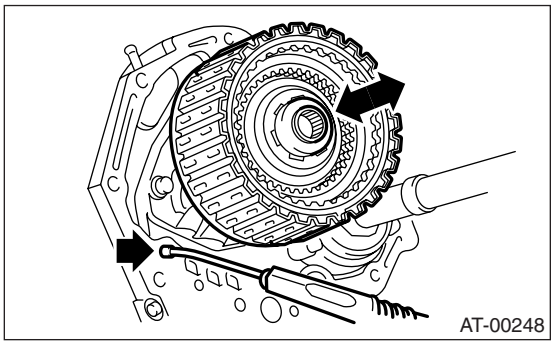


(A) Driven plate
(B) Drive plate
(C) Retaining plate

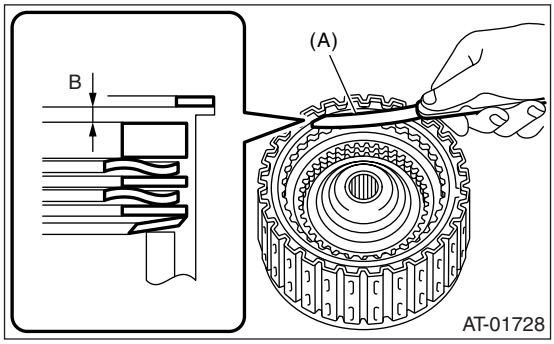
(7) Install the driven plate, drive plate, retaining plate and snap ring.



(8) Apply compressed air intermittently to check for operation.



(9) Measure and record the clearance “B” between the retaining plate and snap ring. (Reverse clutch)
At this time, do not press down the retaining plate.



(A) Thickness gauge

(10)Piston stroke calculation
Select the retaining plate within the specification by calculating with “A” and “B” dimensions which have been recorded before. If the calculated value exceeds the usage limit, replace the drive plate with a new one and adjust it within the specification.
T = A + B
T: Piston stroke
A: Collapse amount of drive plate
B: Clearance between retaining plate and snap ring

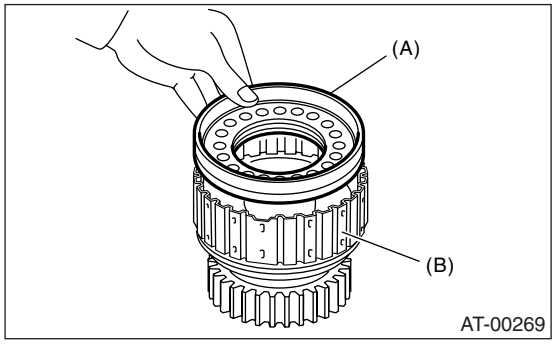
Initial standard:
1.1 — 1.4 mm (0.043 — 0.055 in)

Limit thickness:
1.6 mm (0.063 in)

Reverse clutch retaining plate	
Part number	Thickness mm (in)
31567AA910	4.0 (0.157)
31567AA920	4.2 (0.165)
31567AA930	4.4 (0.173)
31567AA940	4.6 (0.181)
31567AA950	4.8 (0.189)
31567AA960	5.0 (0.197)
31567AA970	5.2 (0.205)
31567AA980	5.4 (0.213)

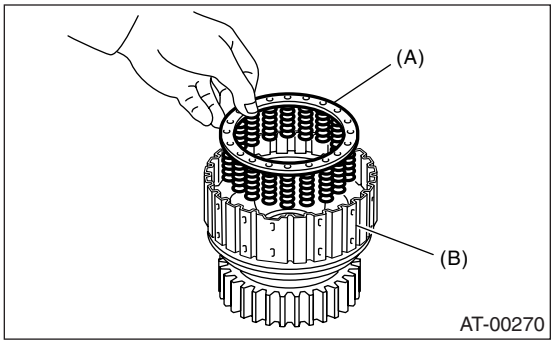
2. PLANETARY GEAR AND LOW CLUTCH

1) Install new D-ring to low clutch piston.
2) Install the low clutch piston to low clutch drum.



(A) Low clutch piston
(B) Low clutch drum

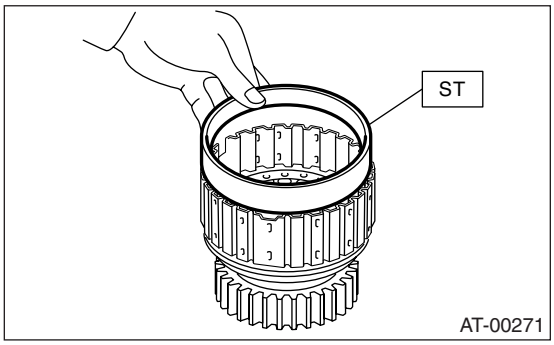
3) Install the spring retainer to low clutch piston.



(A) Spring retainer
(B) Low clutch drum

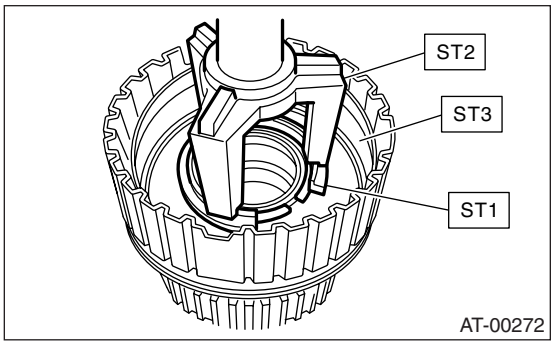
4) Install the ST to low clutch drum.

ST 498437100 LOW CLUTCH PISTON GUIDE

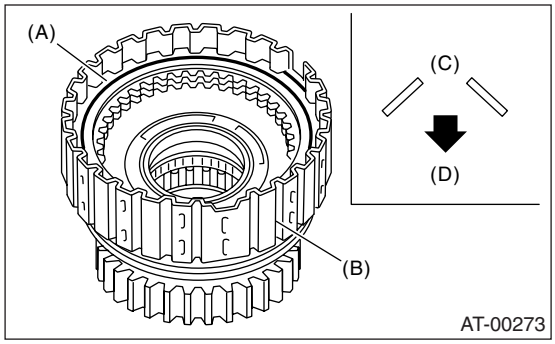


5) Set the cover on the piston with a press using ST1 and ST2, and attach the snap ring. At this time, be careful not to fold the cover seal during installation.

ST1 498627100 SEAT
ST2 398673600 COMPRESSOR
ST3 498437100 LOW CLUTCH PISTON GUIDE

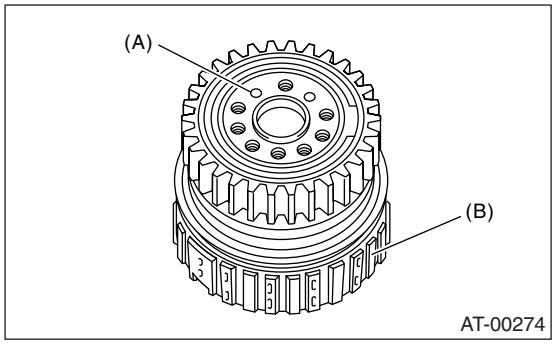


6) Install the dish plate, driven plate and retaining plate, and then secure them with snap ring.



(A) Snap ring
(B) Low clutch drum
(C) Dish plate
(D) Low clutch piston side

7) Check the low clutch for operation.
(1) Remove the one-way clutch. <Ref. to 4AT-132, REMOVAL, AT Main Case.>
(2) Set the one-way clutch inner race, and apply compressed air for checking.

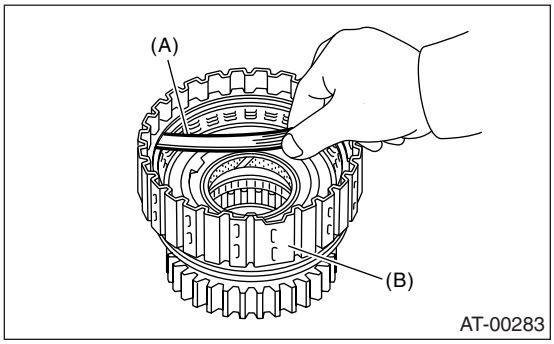


(A) Apply compressed air.
(B) Low clutch drum

8) Check the low clutch clearance.
(1) Place the same thickness of shim on both sides to prevent pressure plate from tilting.
(2) Check the clearance between retaining plate and low clutch operation.

Initial standard:
0.7 — 1.1 mm (0.028 — 0.043 in)

Limit thickness:
1.6 mm (0.063 in)

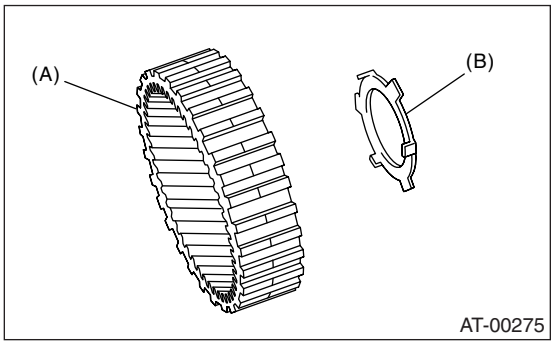


(A) Thickness gauge
(B) Low clutch drum

If the clearance is out of the specified range, select a proper retaining plate so that the standard clearance can be obtained.

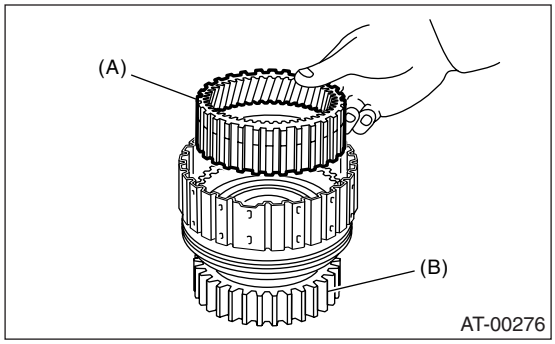
Retaining plate	
Part number	Thickness mm (in)
31567AA830	3.8 (0.150)
31567AA840	4.0 (0.157)
31567AA850	4.2 (0.165)
31567AA860	4.4 (0.173)
31567AA870	4.6 (0.181)

9) Install the washer to rear internal gear.



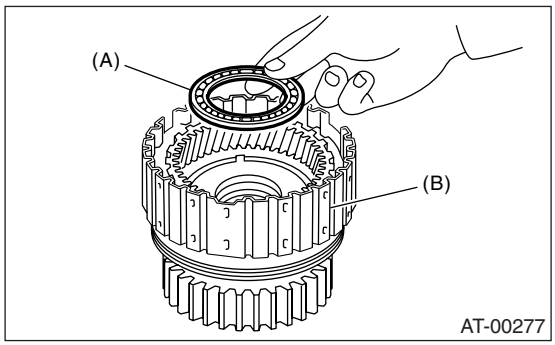
(A) Rear internal gear
(B) Washer

10) Install the rear internal gear.



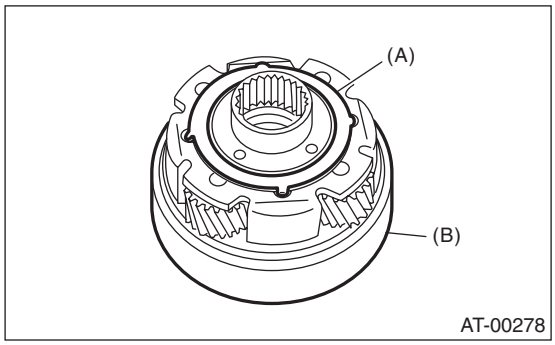
(A) Rear internal gear
(B) Low clutch drum

11) Install the thrust needle bearing in correct direction.



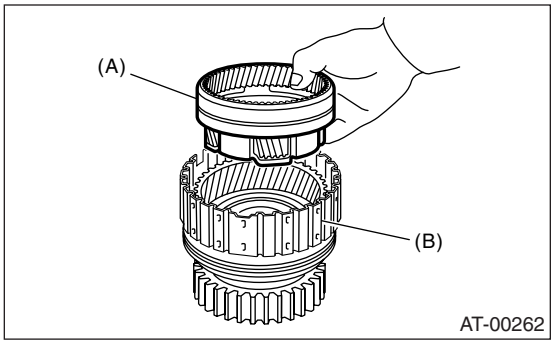
(A) Thrust needle bearing
(B) Low clutch drum

12) Install the washer by aligning protrusion of washer and hole of rear planetary carrier.



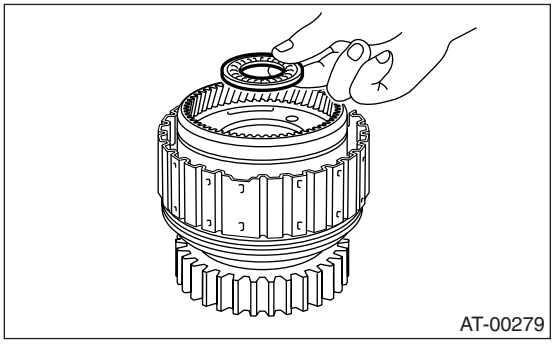
(A) Washer
(B) Rear planetary carrier

13) Install the rear planetary carrier to low clutch drum.

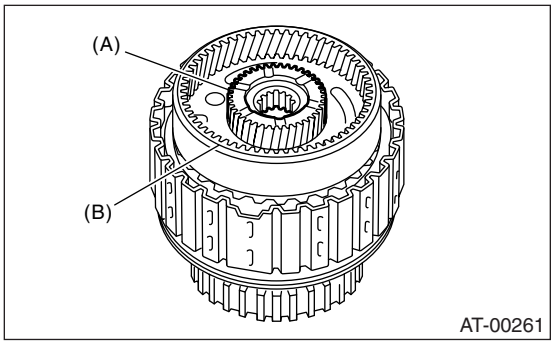


(A) Rear planetary carrier
(B) Low clutch drum

14) Install the thrust needle bearing in correct direction.

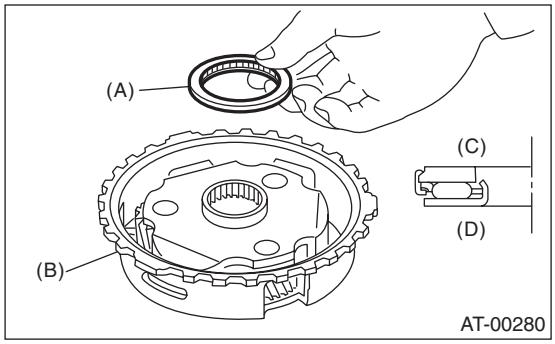


15) Install the rear sun gear in correct direction.



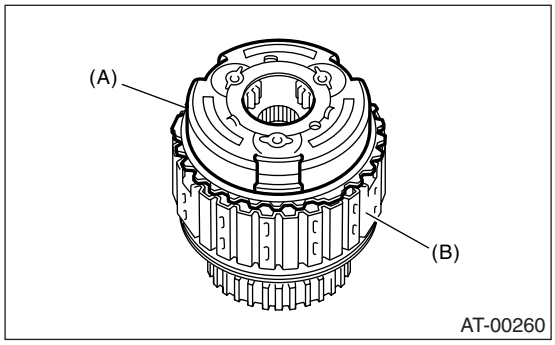
(A) Rear sun gear
(B) Rear planetary carrier

16) Install the thrust needle bearing in correct direction.



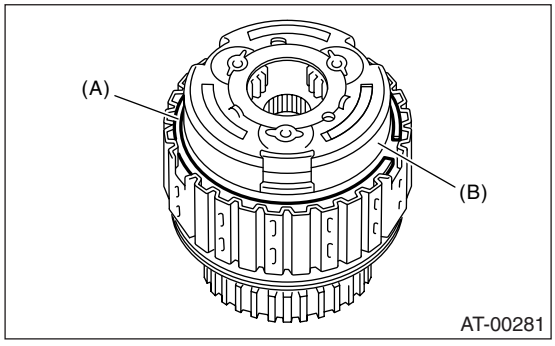
(A) Thrust needle bearing
(B) Front planetary carrier
(C) Rear sun gear side
(D) Front planetary carrier side

17) Install the front planetary carrier to low clutch drum.



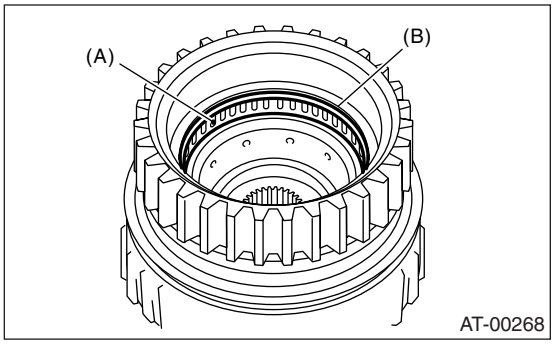
(A) Front planetary carrier
(B) Low clutch drum

18) Install the snap ring to low clutch drum.



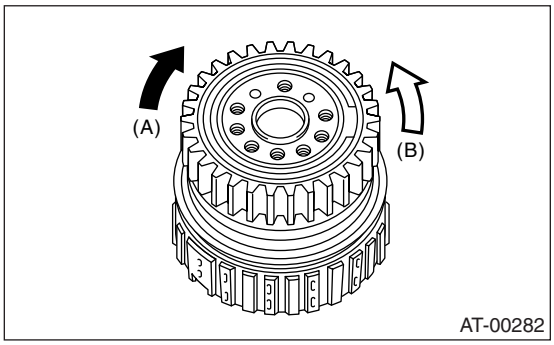
(A) Snap ring
(B) Front planetary carrier

19) Install the needle bearing, and then secure with the snap ring.



(A) Needle bearing
(B) Snap ring

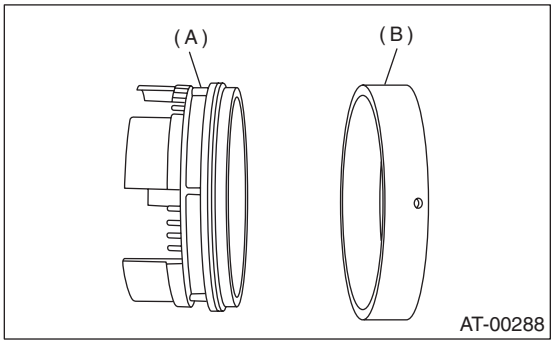
20) Install the one-way clutch and one-way clutch inner race, and then secure with the snap ring.
21) Set the one way clutch inner race to D clutch drum. Make sure that the forward clutch is free in the clockwise direction and locked in the counter clockwise direction, as viewed from the front of the vehicle.



(A) Locked
(B) Free

3. 2-4 BRAKE

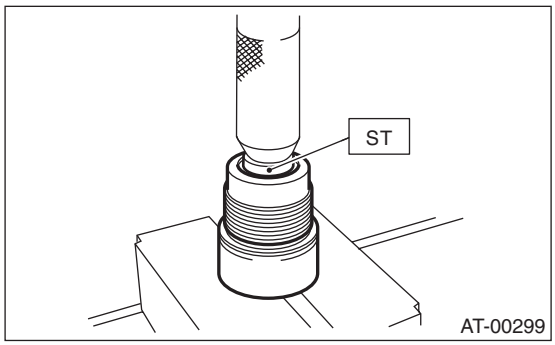
Install 2-4 brake piston to 2-4 brake piston retainer.



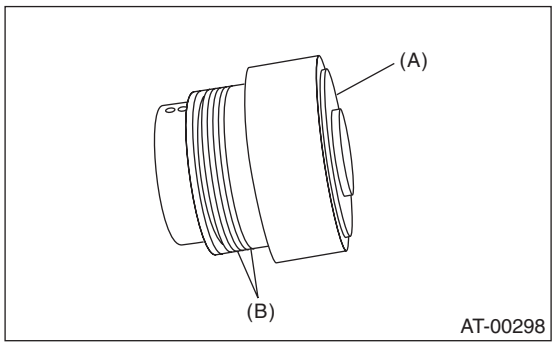
(A) 2-4 brake piston
(B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Install the needle bearing to inner race using ST and press.
ST 398497701 SEAT



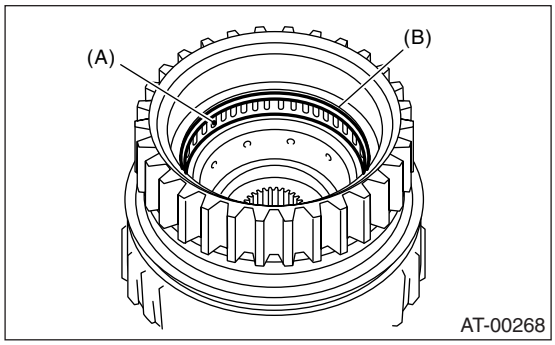
2) Apply vaseline to the groove of inner race and new seal ring.
3) Install two seal rings to one-way clutch inner race.



(A) One-way clutch inner race
(B) Seal ring

5. ONE-WAY CLUTCH OUTER RACE

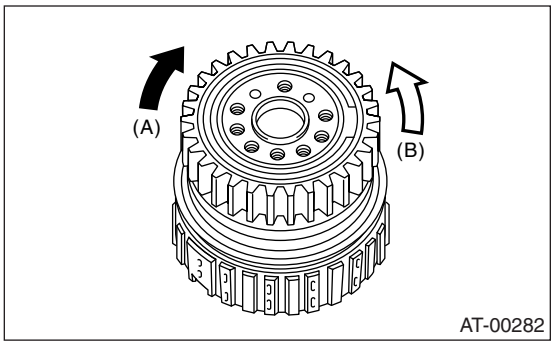
1) Install the needle bearing, and then secure with the snap ring.



(A) Needle bearing
(B) Snap ring

2) Install the one-way clutch and one-way clutch inner race, and then secure with the snap ring.

3) Set the one way clutch inner race to low clutch drum. Make sure that the forward clutch is free in the clockwise direction and locked in the counter clockwise direction, as viewed from the front of the vehicle.



(A) Locked
(B) Free

E: INSPECTION

1. HIGH CLUTCH AND REVERSE CLUTCH

Check the following items:
- Drive plate facing for wear and damage
- Snap ring for wear, return spring for setting and breakage and snap ring retainer for deformation
- Lip seal and D-ring for damage
- Piston and drum check ball for operation
- Adjust total end play. <Ref. to 4AT-118, ADJUSTMENT, Oil Pump Housing.>

2. PLANETARY GEAR AND LOW CLUTCH

Check the following items:
- Drive plate facing for wear and damage
- Snap ring for wear, return spring for setting and breakage and spring retainer for deformation
- Lip seal and D-ring for damage
- Piston check ball for operation
- Measure the total end play and adjust it within specifications. <Ref. to 4AT-118, ADJUSTMENT, Oil Pump Housing.>

3. 2-4 BRAKE

Check the following items:
- Drive plate facing for wear and damage
- Snap ring for wear and spring retainer for deformation
- Lip seal and D-ring for damage
- Measure the total end play and adjust it within specifications. <Ref. to 4AT-118, ADJUSTMENT, Oil Pump Housing.>

4. ONE-WAY CLUTCH

- Make sure the snap ring is not worn and the seal rings are not deformed.
- Measure the total end play and adjust it within specifications. <Ref. to 4AT-118, ADJUSTMENT, Oil Pump Housing.>

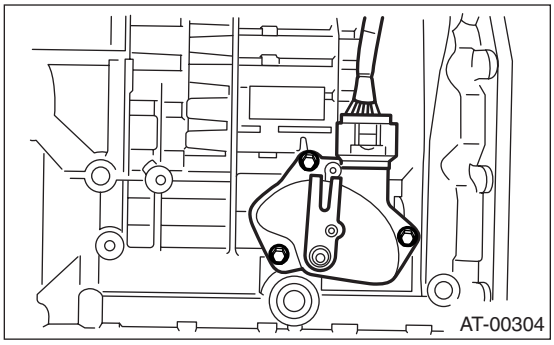
5. LOW AND REVERSE BRAKE

Check the following:
- Drive plate facing for wear and damage
- Snap ring for wear and spring retainer for deformation

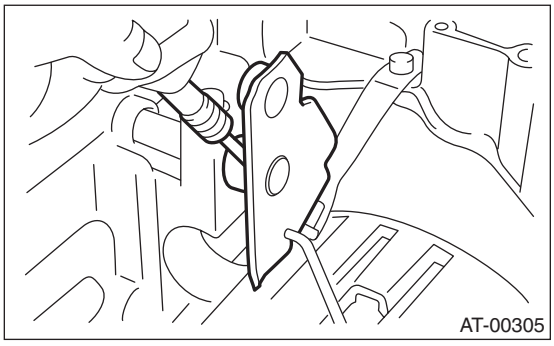
41.Transmission Control Device

A: REMOVAL

1) Remove the transmission assembly from vehicle. <Ref. to 4AT-43, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter clutch assembly. <Ref. to 4AT-93, REMOVAL, Torque Converter Clutch Assembly.>
3) Remove the input shaft.
4) Lift-up the lever on rear side of transmission harness connector, and then disconnect it from the stay.
5) Disconnect the air breather hose. <Ref. to 4AT-91, REMOVAL, Air Breather Hose.>
6) Disconnect the inhibitor switch connector from the stay.
7) Wrap vinyl tape around the nipple attached to the air breather hose.
8) Remove the pitching stopper bracket.
9) Remove the inhibitor switch.

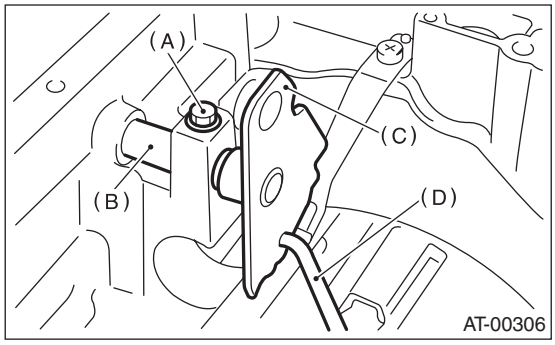

AT-00304

10) Remove the control valve body assembly. <Ref. to 4AT-66, REMOVAL, Control Valve Body.>
11) Pull out the spring pin of manual plate.


AT-00305

12) Remove the bolts which securing range select lever, and then remove the range select lever, manual plate and parking rod.

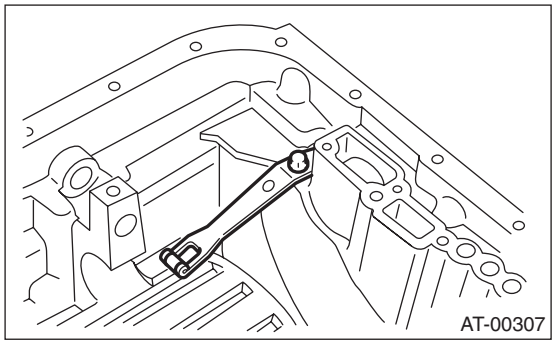
NOTE:
Be careful not to damage the lips of press-fitted oil seal in the case.



AT-00306

(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

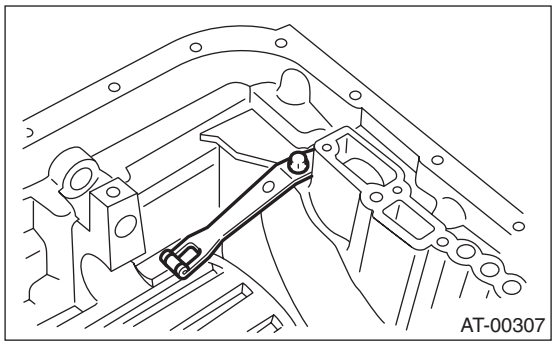
13) Remove the detention spring.


AT-00307

B: INSTALLATION

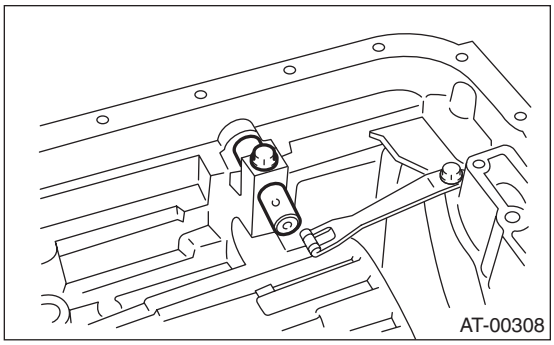
1) Install the detention spring to transmission case.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)

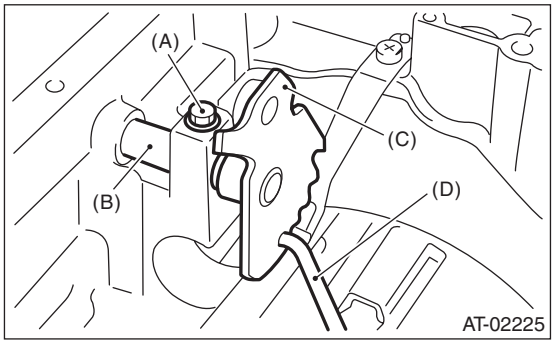

AT-00307

2) Insert the range select lever, and then tighten the bolt.

Tightening torque:
6 N·m (0.6 kgf-m, 4.4 ft-lb)

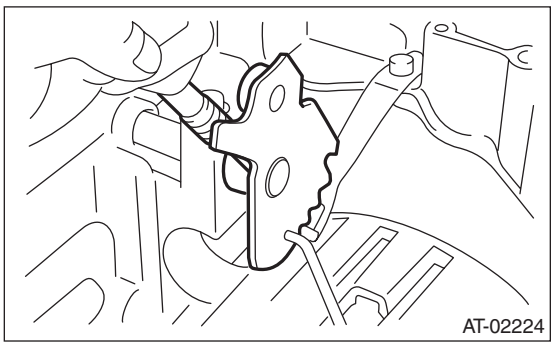


3) Insert the manual plate and parking rod.



(A) Bolt
(B) Range select lever
(C) Manual plate
(D) Parking rod

4) Insert the spring pin to manual plate.

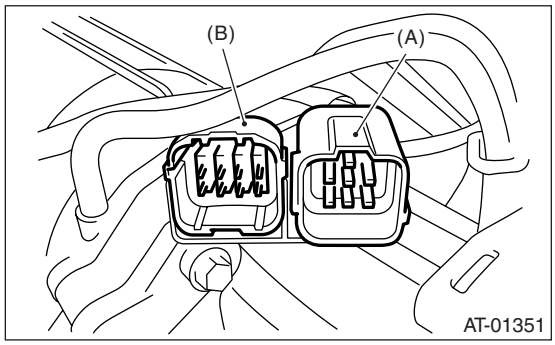


5) Install the oil pan and control valve assembly. <Ref. to 4AT-68, INSTALLATION, Control Valve Body.>
6) Turn over the transmission case to its original position.
7) Install the pitching stopper bracket.

Tightening torque:
41 N·m (4.2 kgf-m, 30.4 ft-lb)

8) Install and adjust the inhibitor switch. <Ref. to 4AT-55, Inhibitor Switch.>

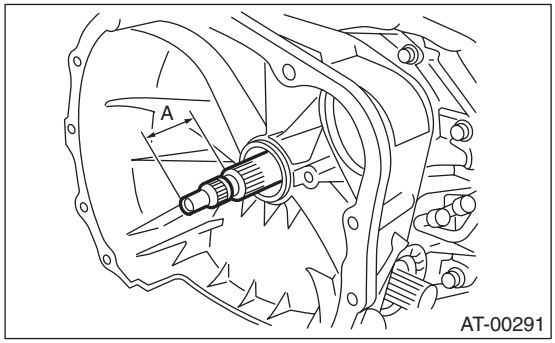
9) Insert the inhibitor switch and transmission connector to the stay.



(A) Transmission harness
(B) Inhibitor switch harness

10) Install the air breather hose. <Ref. to 4AT-91, INSTALLATION, Air Breather Hose.>
11) Insert the input shaft with rotating it by hand lightly, and then check the protrusion amount.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



12) Install the torque converter clutch assembly. <Ref. to 4AT-93, INSTALLATION, Torque Converter Clutch Assembly.>
13) Install the transmission assembly into the vehicle. <Ref. to 4AT-47, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure the manual lever and detention spring are not worn or otherwise damaged.

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4AT(diag)

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16. General Diagnostic Table 106

1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
This section is specified for H4SO engine model.

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to 4AT(diag)-4, Check List for Interview.> 2) Before performing the diagnostic, inspect following items which might influence the AT problems. • General inspection <Ref. to 4AT(diag)-5, INSPECTION, General Description.> • Disconnection of harness connector • Visually check the damage of harness • Oil leak • Stall speed test <Ref. to 4AT-37, Stall Test.> • Line pressure test <Ref. to 4AT-40, Line Pressure Test.> • Transfer clutch pressure test <Ref. to 4AT-42, Transfer Clutch Pressure Test.> • Time lag test <Ref. to 4AT-39, Time Lag Test.> • Road test <Ref. to 4AT-36, Road Test.> • Inhibitor switch <Ref. to 4AT-55, Inhibitor Switch.>	Is the unit that might influence AT problem normal?	Go to step **2.**	Repair or replace each item.
2	**CHECK POWER INDICATOR LIGHT.** Turn the ignition switch to ON.	Does the POWER indicator light illuminate?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Repair the POWER indicator light circuit or power supply and ground line circuit. <Ref. to 4AT(diag)-22, INSPECTION, Diagnostic Procedure with Power Indicator Light.> 3) Turn the ignition switch to ON.	Is the POWER indicator light illuminate?	Go to step **4.**	Go to step **5.**
4	**CHECK INDICATION OF DTC.** Calling up the DTC. With Subaru Select Monitor <Ref. to 4AT(diag)-18, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of subaru select monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(diag)-29, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.>	Is the DTC displayed?	Go to step **6.** NOTE: Record all DTC.	Go to step **5.**

	Step	Check	Yes	No
5	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “Diagnostic Procedure without DTC”. <Ref. to 4AT(diag)-81, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect using “Symptom Related Diagnostic”. <Ref. to 4AT(diag)-106, General Diagnostic Table.> 3) Perform the clear memory mode. With Subaru Select Monitor <Ref. to 4AT(diag)-20, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to 4AT(diag)-19, Inspection Mode.> 5) Calling up the DTC. With Subaru Select Monitor <Ref. to 4AT(diag)-18, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the DTC displayed?	Go to step **6.**	Complete the diagnostic.
6	**PERFORM THE DIAGNOSTIC.** 1) Inspect using “Diagnostics Chart with DTC”. <Ref. to 4AT(diag)-33, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For DTC table, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(diag)-32, List of Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the clear memory mode. With Subaru Select Monitor <Ref. to 4AT(diag)-20, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to 4AT(diag)-19, Inspection Mode.> 5) Calling up the DTC. With Subaru Select Monitor <Ref. to 4AT(diag)-18, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the DTC displayed?	Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to 4AT(diag)-33, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnostic.

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name			
Date of purchase			
Date of repair			
Trans. model	TRANSMISSION	VIN	
Odometer reading	km/h (miles)		
Frequency	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others ( )		
Place	❑ High ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Others ( )		
Outdoor temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
AT warning light (POWER indicator light)	❑ Continuously lit	❑ Not lit	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ 3 ❑ 2 ❑ 1		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH/❑ LH)	❑ While idling ❑ While cruising
POWER switch	❑ ON ❑ OFF		
HOLD switch	❑ ON ❑ OFF		
Symptoms	❑ No up-shift		
	❑ No down-shift		
	❑ No kick down		
	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Lock-up malfunction		
	❑ Noise or vibration		
	❑ Shift shock or slip		
	❑ Select lever does not move		
	❑ Others ( )		

3. General Description

A: CAUTION

• Supplemental Restraint System "Airbag"

The airbag system wiring harness is routed near the transmission control module (TCM).

CAUTION:

• All airbag system wiring harness and connectors are colored yellow. Do not use an electrical test equipment on these circuit.

• Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.

• Measurement

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.256 in).

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V or more

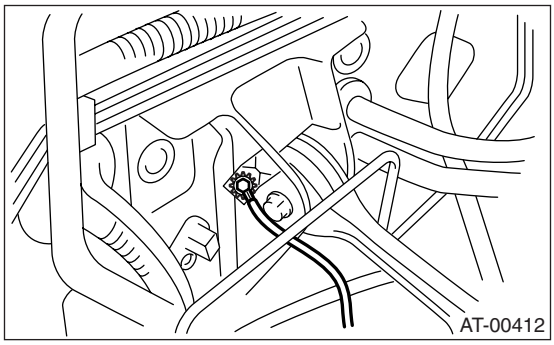
Specific gravity:
Above 1.260

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

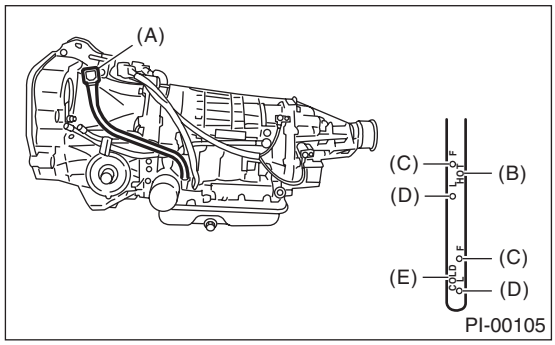
• Chassis side

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3. ATF LEVEL

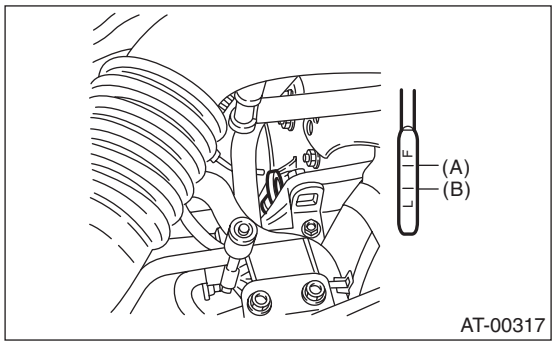
Make sure that ATF level is in the specification. **<Ref. to 4AT-32,** INSPECTION**, Automatic Transmission Fluid.>**



(A) Level gauge
(B) "HOT" side
(C) Upper level
(D) Lower level
(E) "COLD" side

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that the front differential oil level is in specification. **<Ref. to 4AT-35,** INSPECTION, Differential Gear Oil.>

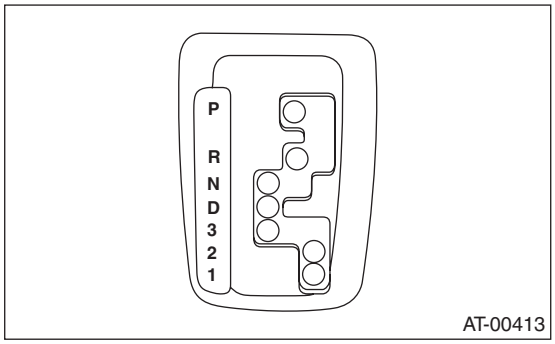


(A) Upper level
(B) Lower level

5. OPERATION OF SHIFT SELECT LEVER

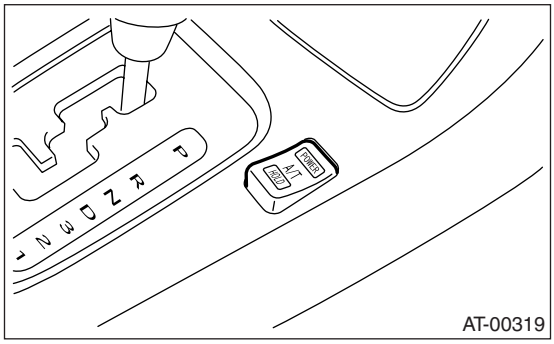
Make sure there is no noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of select lever.



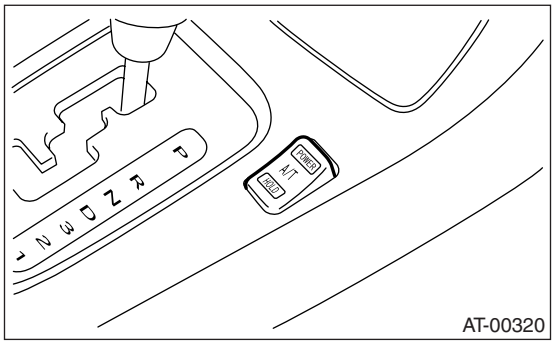
6. POWER SWITCH

Make sure that the POWER indicator light in combination meter comes ON, when turning the POWER switch to ON.



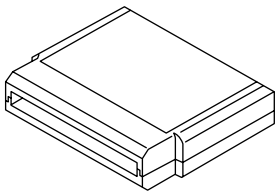
7. HOLD SWITCH

Make sure that the HOLD indicator light in combination meter comes ON, when turning the HOLD switch to ON.



C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

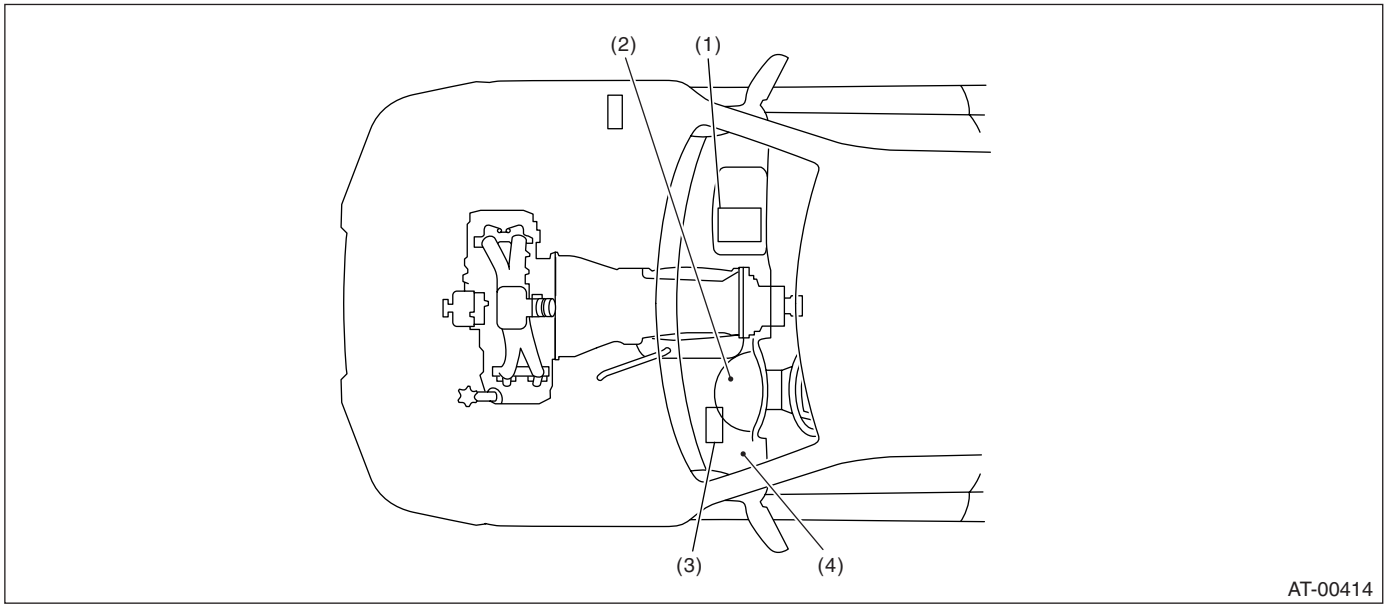
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

4. Electrical Component Location

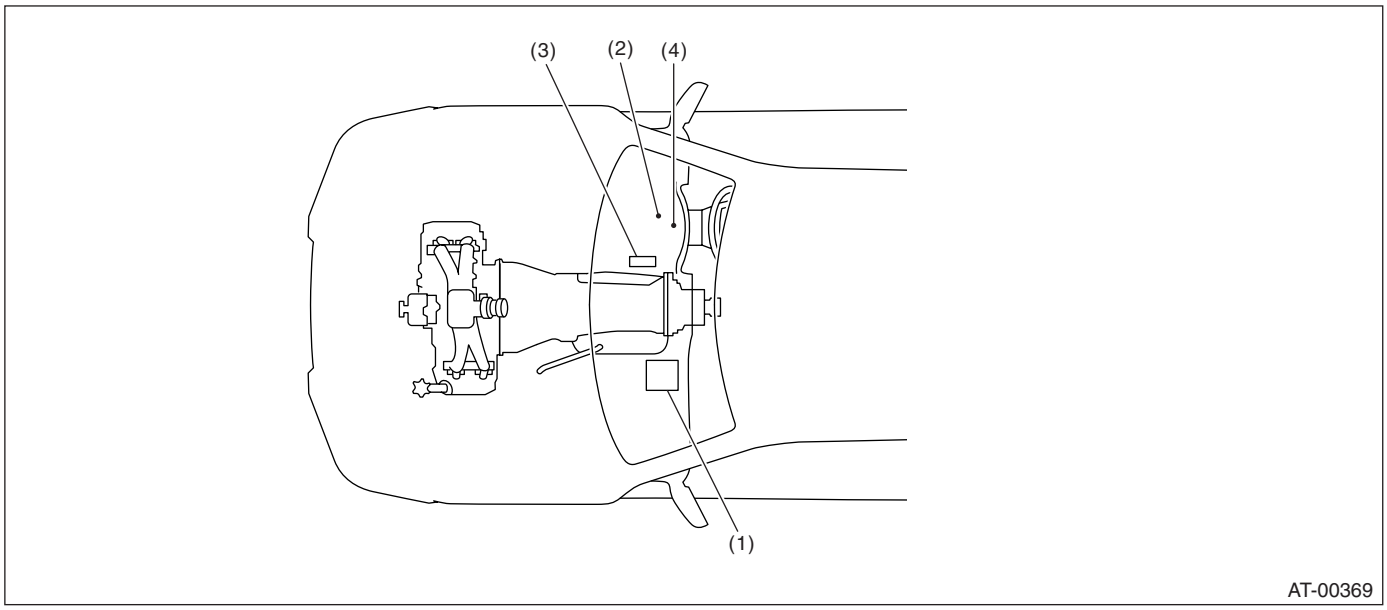
A: LOCATION

1. CONTROL MODULE

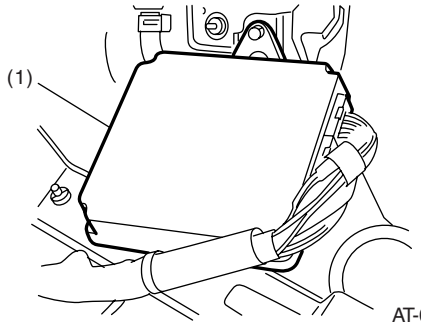
- LHD MODEL



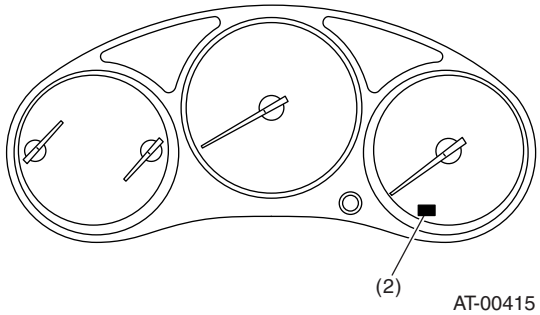
- RHD MODEL



(1) Engine control module (ECM)
(2) AT warning light (POWER indicator light)
(3) Transmission control module (TCM)
(4) Data link connector

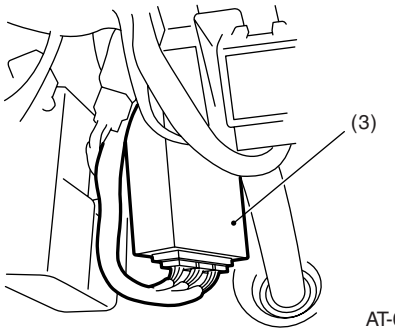


AT-00323



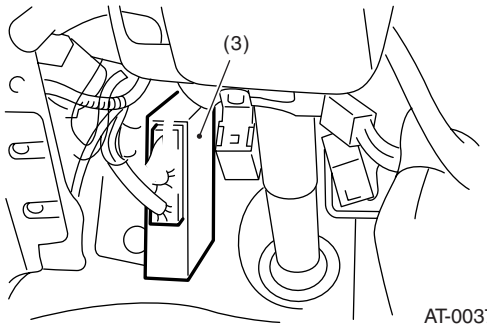
AT-00415

LHD

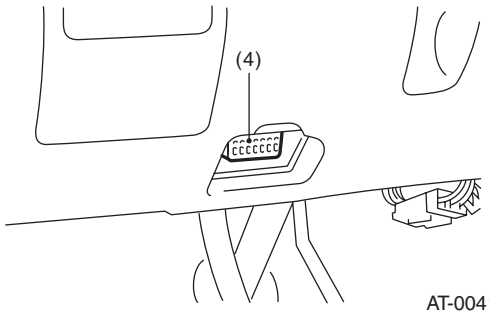


AT-01357

RHD

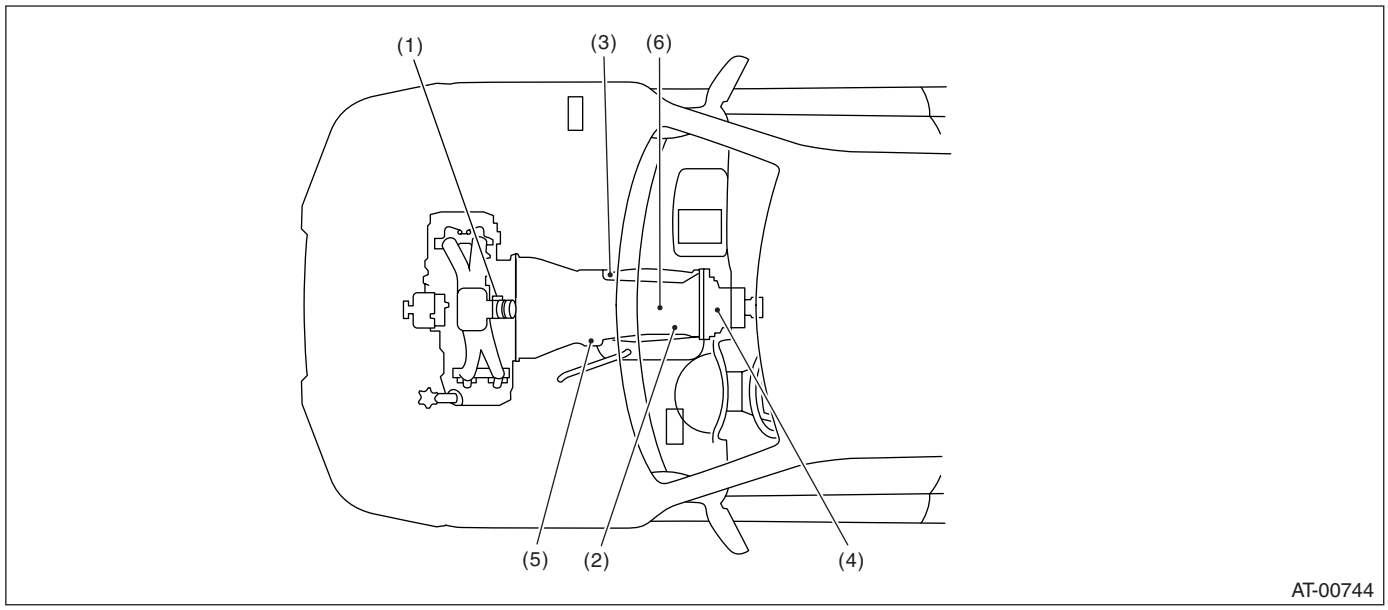


AT-00372

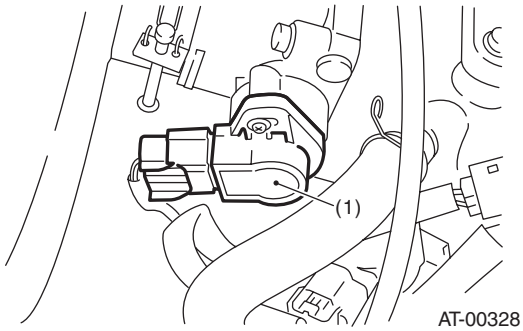


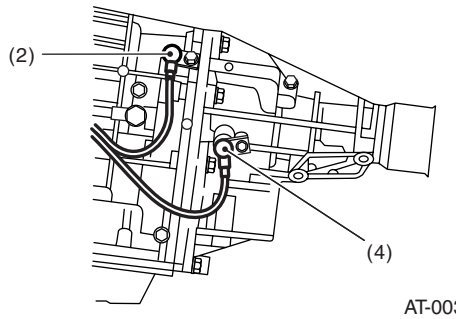
AT-00417

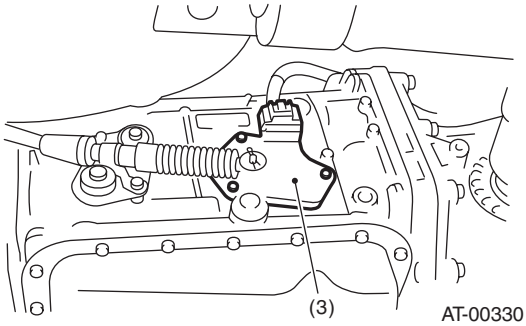
2. SENSOR

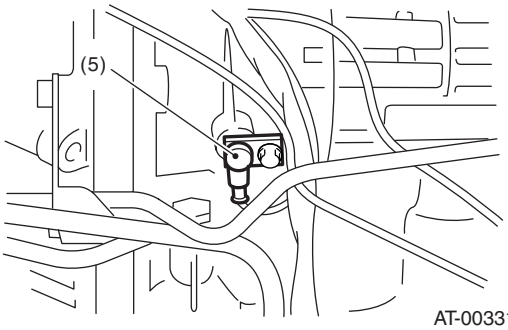


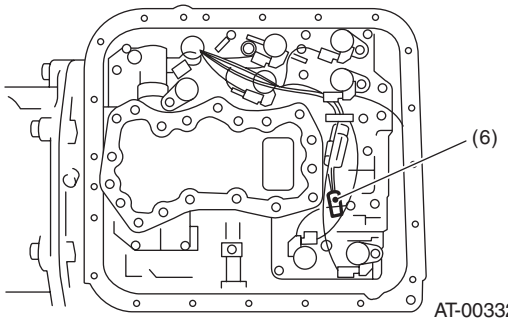
(1) Throttle position sensor
(2) Front vehicle speed sensor
(3) Inhibitor switch
(4) Rear vehicle speed sensor
(5) Torque converter turbine speed sensor
(6) ATF temperature sensor



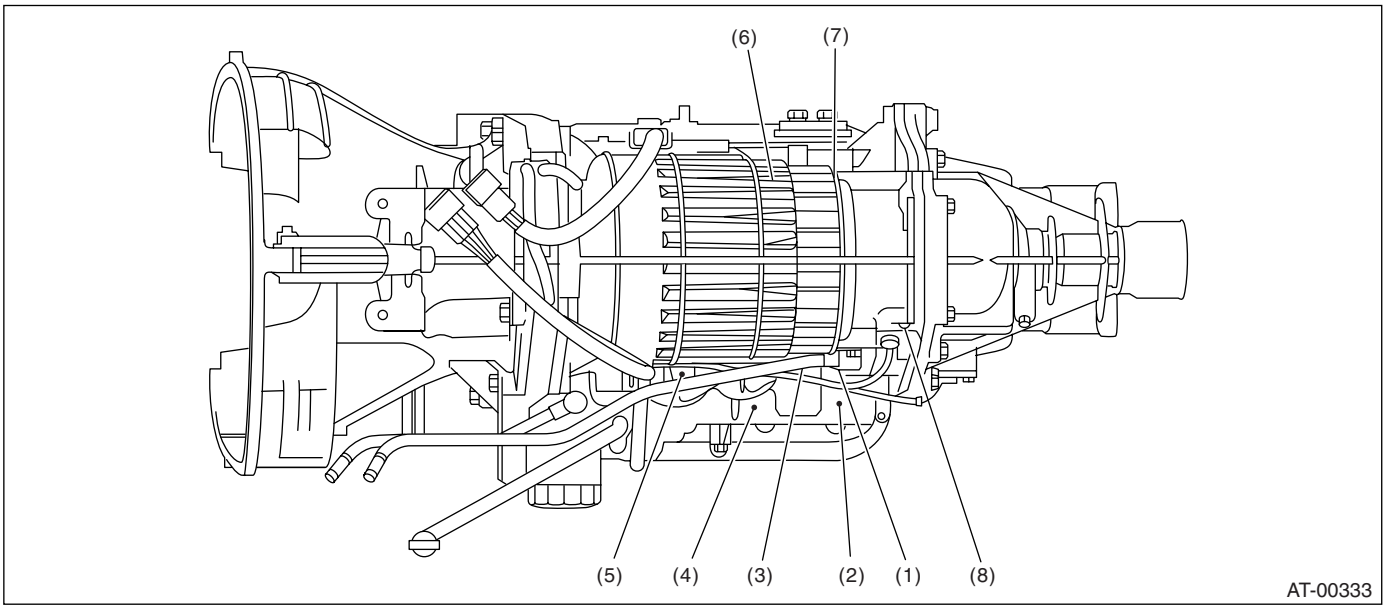




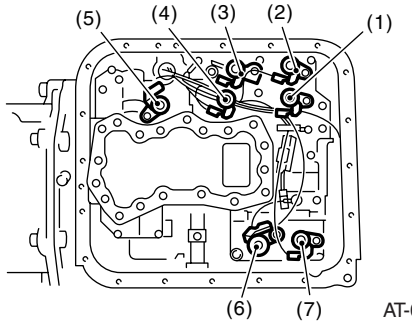


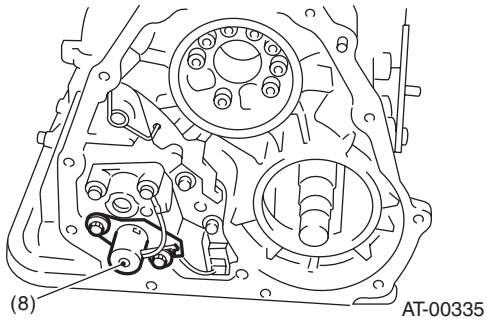


3. SOLENOID



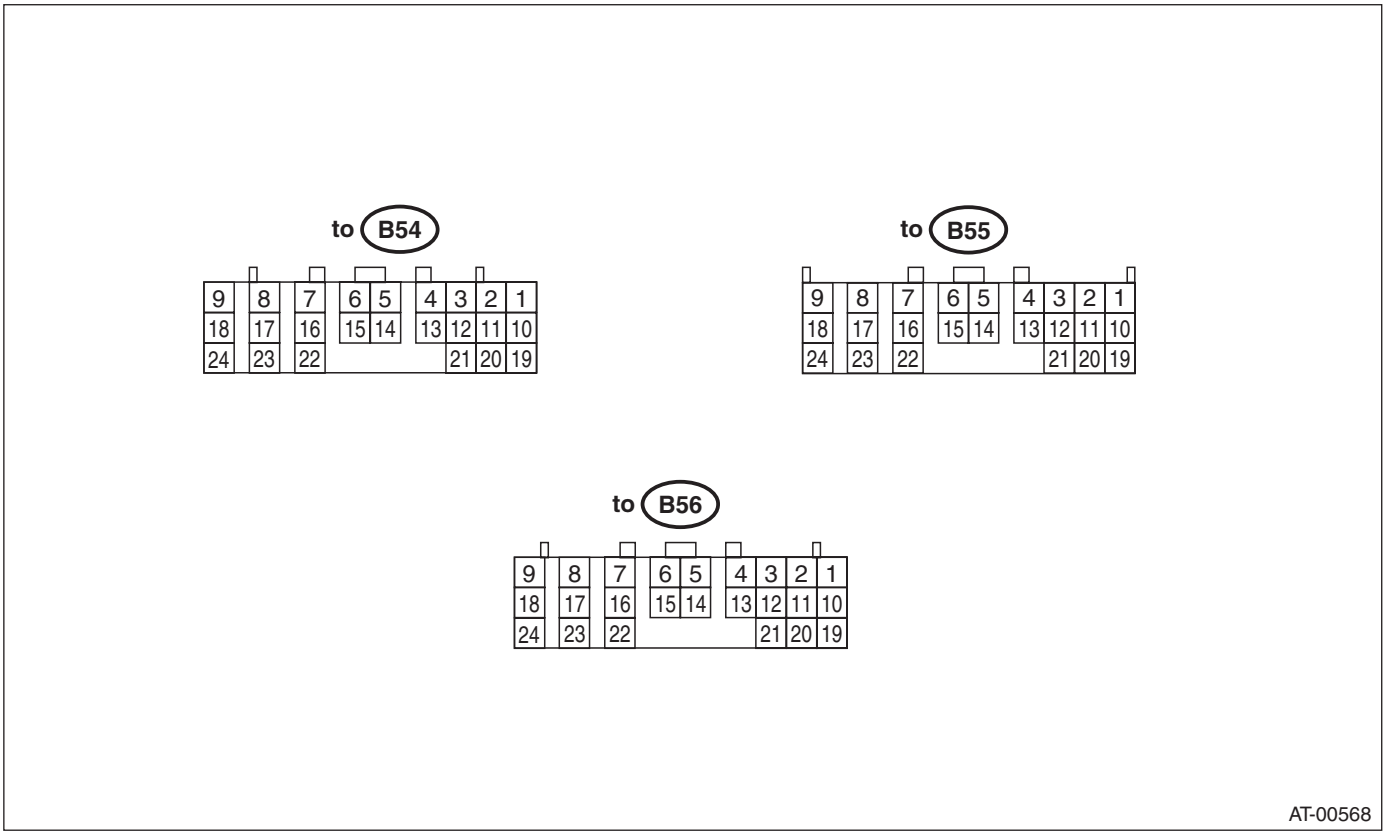
(1) Shift solenoid 1
(2) Shift solenoid 2
(3) Line pressure duty solenoid
(4) Low clutch timing solenoid
(5) Lock-up duty solenoid
(6) 2-4 brake duty solenoid
(7) 2-4 brake timing solenoid
(8) Transfer duty solenoid





5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Back-up power supply		B56	1	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	"P" range switch	B55	1	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	14	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range (except "P" range)	More than 8	
	"R" range switch	B55	3	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B55	5	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	

Check with ignition switch ON.						
Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Inhibitor switch	"2" range switch	B55	6	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B55	7	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	12	Brake pedal depressed	More than 10.5	—
				Brake pedal released	Less than 1	
Kick-down switch		B55	11	Throttle fully opened	Less than 1	—
				Throttle fully closed	More than 6.5	
AT OIL TEMP warning light		B56	10	Light ON	Less than 1	—
				Light OFF	More than 9	
Throttle position sensor		B54	3	Throttle fully closed	0.2 — 1.0	—
				Throttle fully open	4.2 — 4.7	
Throttle position sensor power supply		B54	2	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor		B54	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
				ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor		B55	24	Vehicle stopped	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor		B55	18	Vehicle stopped	0	450 — 650
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor		B55	8	Engine idling after warm-up (D range)	0	450 — 650
				Engine idling after warm-up (N range)	More than 1 (AC range)	
Vehicle speed output signal		B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal		B55	17	Ignition switch ON (with engine OFF)	More than 10.5	—
				Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal		B55	22	When cruise control is set (SET lamp ON)	Less than 1	—
				When cruise control is not set (SET lamp OFF)	More than 6.5	
Torque control signal 1		B56	5	Ignition switch ON (with engine ON)	More than 4	—
Torque control signal 2		B56	14	Ignition switch ON (with engine ON)	More than 4	—
Torque control cut signal		B55	10	Ignition switch ON (After engine is warmed-up)	8	—
Intake manifold pressure signal		B54	1	Engine idling after warm-up	0.4 — 1.6	—
Shift solenoid 1		B54	22	1st or 4th gear	More than 9	10 — 16
				2nd or 3rd gear	Less than 1	

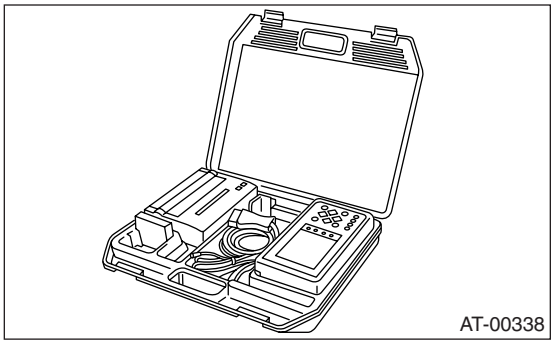
Check with ignition switch ON.					
Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Shift solenoid 2	B54	5	1st or 2nd gear	More than 9	10 — 16
			3rd or 4th gear	Less than 1	
Line pressure duty solenoid	B54	9	Ignition switch ON (with engine OFF) Throttle fully closed after warm-up	1.5 — 4.0	2.0 — 4.5
			Ignition switch ON (with engine OFF) Throttle fully open after warm-up	Less than 0.5	
Lock-up duty solenoid	B54	7	When lock up occurs	More than 8.5	10 — 17
			When lock up is released	Less than 0.5	
Transfer duty solenoid	B54	6	Fuse on FWD switch	Less than 0.5	10 — 17
			Fuse removed from FWD switch (with throttle fully open and with select lever in 1st gear)	More than 8.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up	Less than 0.5	
2-4 brake timing solenoid	B54	16	1st gear	Less than 1	10 — 16
			3rd gear	More than 9	
Low clutch timing solenoid	B54	15	2nd gear	Less than 1	10 — 16
			4th gear	More than 9	
HOLD switch	B55	16	HOLD switch ON	Less than 1	—
			HOLD switch OFF	More than 8	—
POWER switch	B55	23	POWER switch ON	Less than 1	—
			POWER switch OFF	More than 10	—
POWER indicator light	B56	11	Light ON	Less than 1	—
			Light OFF	More than 9	—
AWD switch	B55	20	Fuse removed	6 — 9.1	—
			Fuse installed	Less than 1	—
AWD indicator light	B56	2	Fused on FWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	—
Sensor ground line 1	B54	20	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground circuit	B56	19	—	0	Less than 1
	B54	21			
Sensor ground line 3	B54	10	—	0	Less than 1
Sensor ground line 4	B54	19	—	0	Less than 1
AT diagnostic signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—

6. Subaru Select Monitor

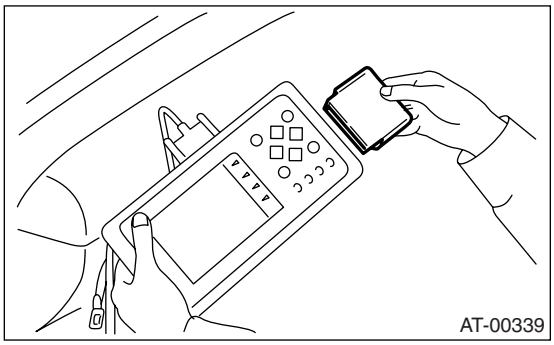
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

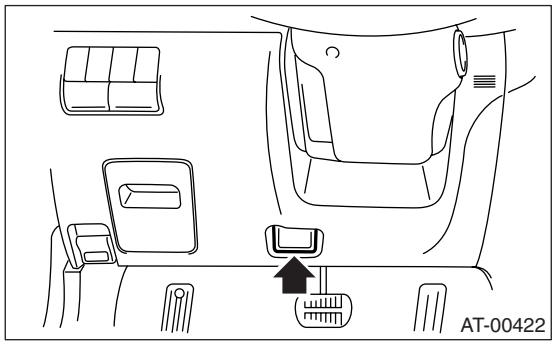
1) Prepare the Subaru Select Monitor kit.



2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. **<Ref. to 4AT(diag)-7,** PREPARATION TOOL**, General Description.>**



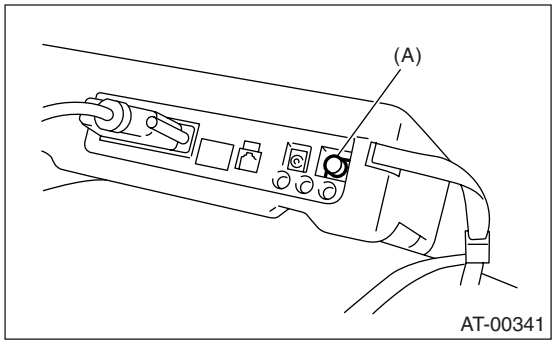
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnostic cable to data link connector.

NOTE:
Do not connect scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) POWER switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
8) Press the [YES] key after the information of transmission type is displayed.
9) On the «Transmission Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
10) On the «DTC Display» display screen, select the {Memorized DTC} and press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC). **<Ref. to 4AT(diag)-32, List of Diagnostic Trouble Code (DTC).>**

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until desired data is shown.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio (AWD model)	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Intake manifold pressure sensor voltage	Mani. Pressure Voltage	V
FWD switch signal	FWD Switch	ON or OFF
Stop light switch signal	Stop Light Switch	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal 1	ON or OFF
Torque control output signal #2	Torque Control Signal 2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnostic indicator lamp	Diagnosis Lamp	ON or OFF
Power mode switch signal	Power Mode Switch	ON or OFF
Hold mode switch signal	Hold Mode Switch	ON or OFF
Kick down switch signal	Kick Down Switch	ON or OFF
Automatic transmission fluid temperature lamp	ATF Temperature Lamp	ON or OFF

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the “Done” and “Turn Ignition Switch OFF” are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to obtain and understand DTC. **<Ref. to 4AT(diag)-15,** OPERATION**, Subaru Select Monitor.>**

8. Inspection Mode

A: OPERATION

Shift the select lever to “D” range, and drive continuously for 10 seconds or more at 60 km/h (37 MPH).

WARNING:
Observe the road traffic law.

9. Clear Memory Mode

A: OPERATION

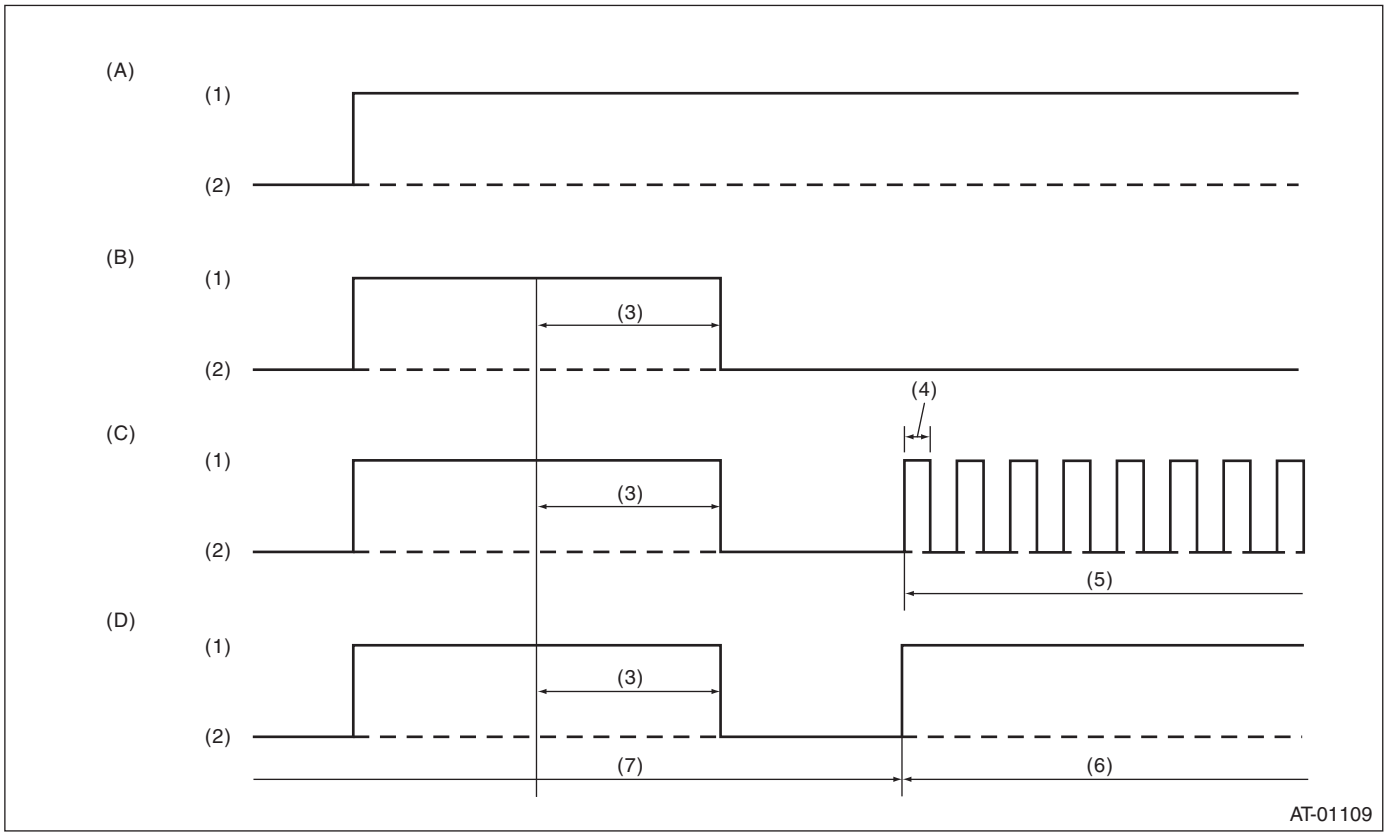
1. WITH SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information about how to clear DTC.
<Ref. to 4AT(diag)-17, CLEAR MEMORY MODE, OPERATION**, Subaru Select Monitor.>**

10.Power Indicator Light Display

A: OPERATION

When any on-board diagnostics item is malfunctioning, the display on POWER indicator light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a DTC during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the Power indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using select monitor. The indicator signal is as shown in the figure.



(A) Ignition switch (engine OFF)
(B) Normal (engine ON)
(C) Faulty (engine ON)
(D) Normal (POWER switch ON)

(1) ON
(2) OFF
(3) 2 sec.
(4) 0.25 sec.
(5) Blink
(6) POWER switch ON
(7) POWER switch OFF

Perform the inspection when the POWER indicator light does not operate correctly. <Ref. to 4AT(diag)-22, INSPECTION, Diagnostic Procedure with Power Indicator Light.>

11.Diagnostic Procedure with Power Indicator Light

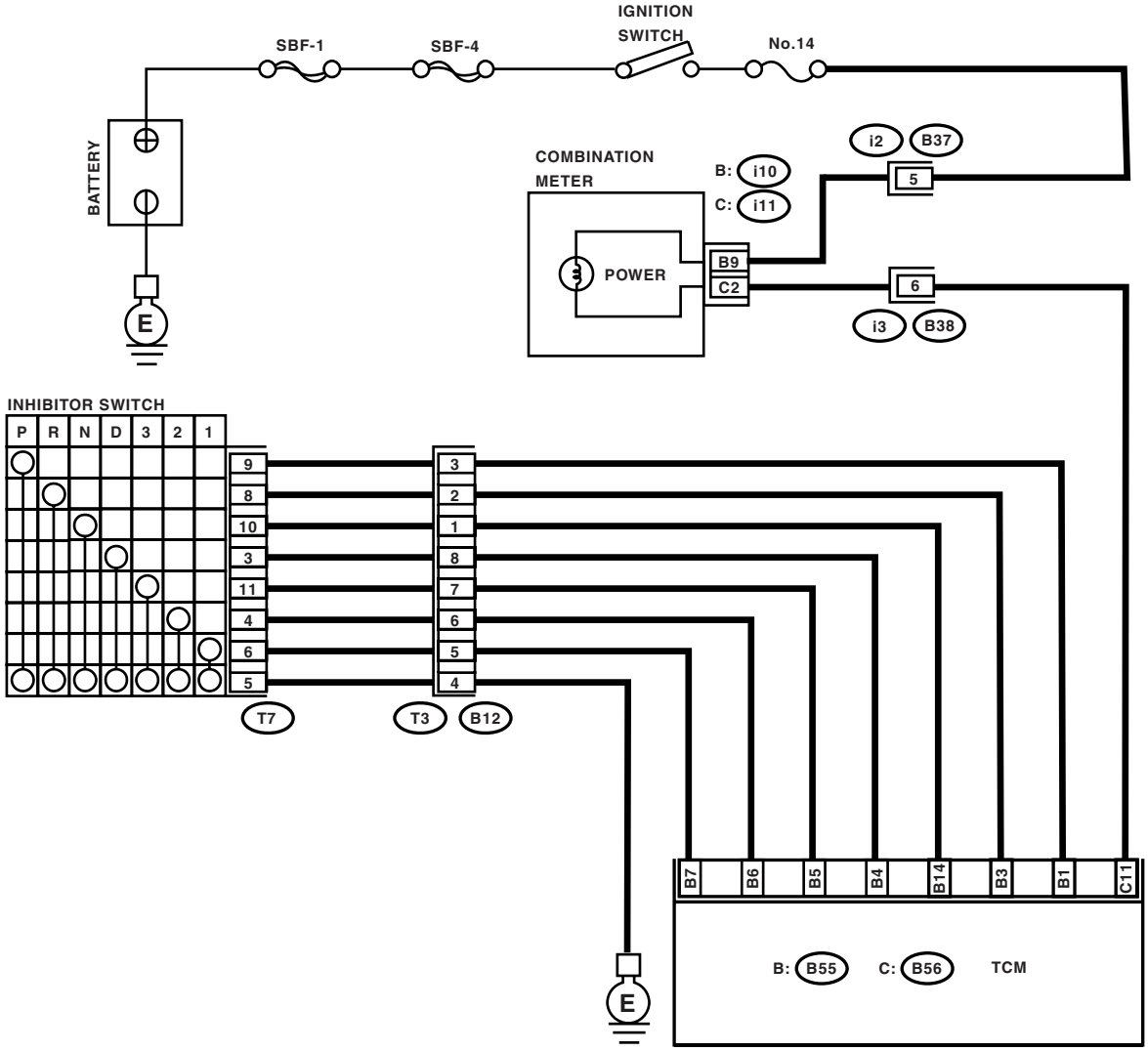
A: INSPECTION

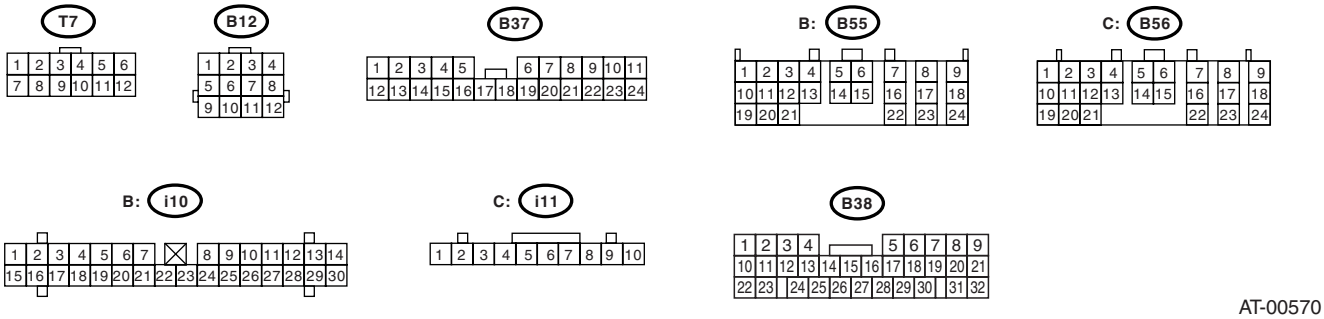
1. INSPECTION OF POWER INDICATOR LIGHT

DETECTING CONDITION:
The Power Indicator light circuit is open or shorted.
TROUBLE SYMPTOM:
- When the ignition switch is turned to ON (engine OFF), POWER indicator light does not illuminate.
- When the on-board diagnostics is performed, POWER indicator light remains illuminated.

WIRING DIAGRAM:

- LHD MODEL





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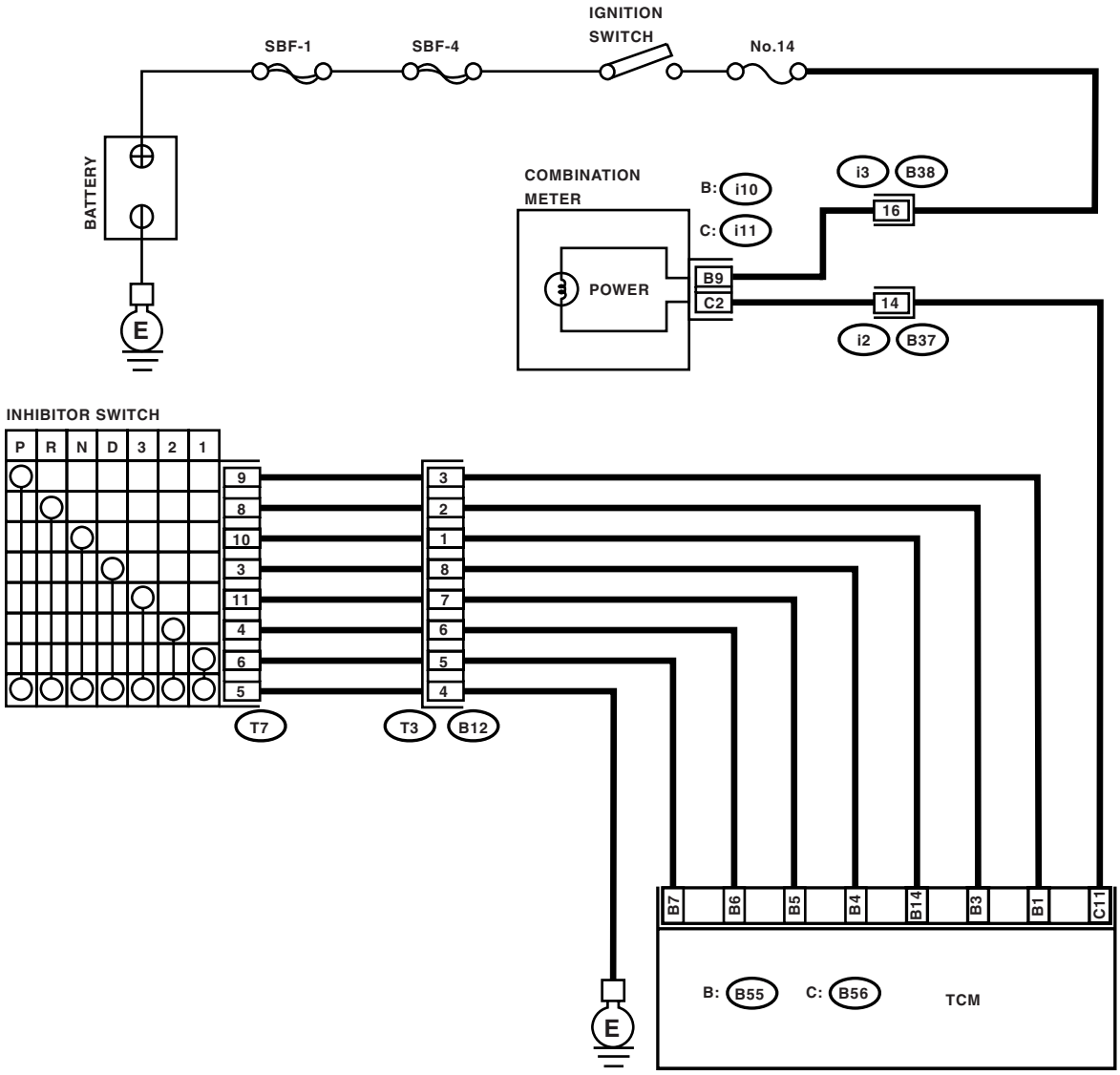
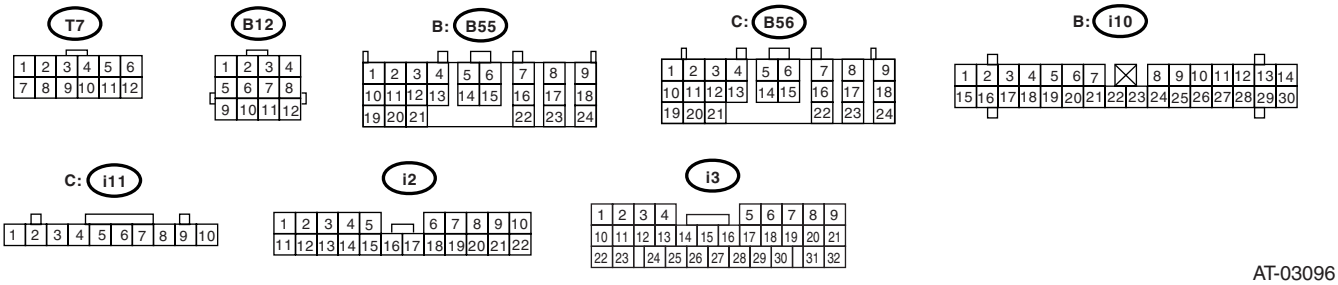
- RHD MODEL





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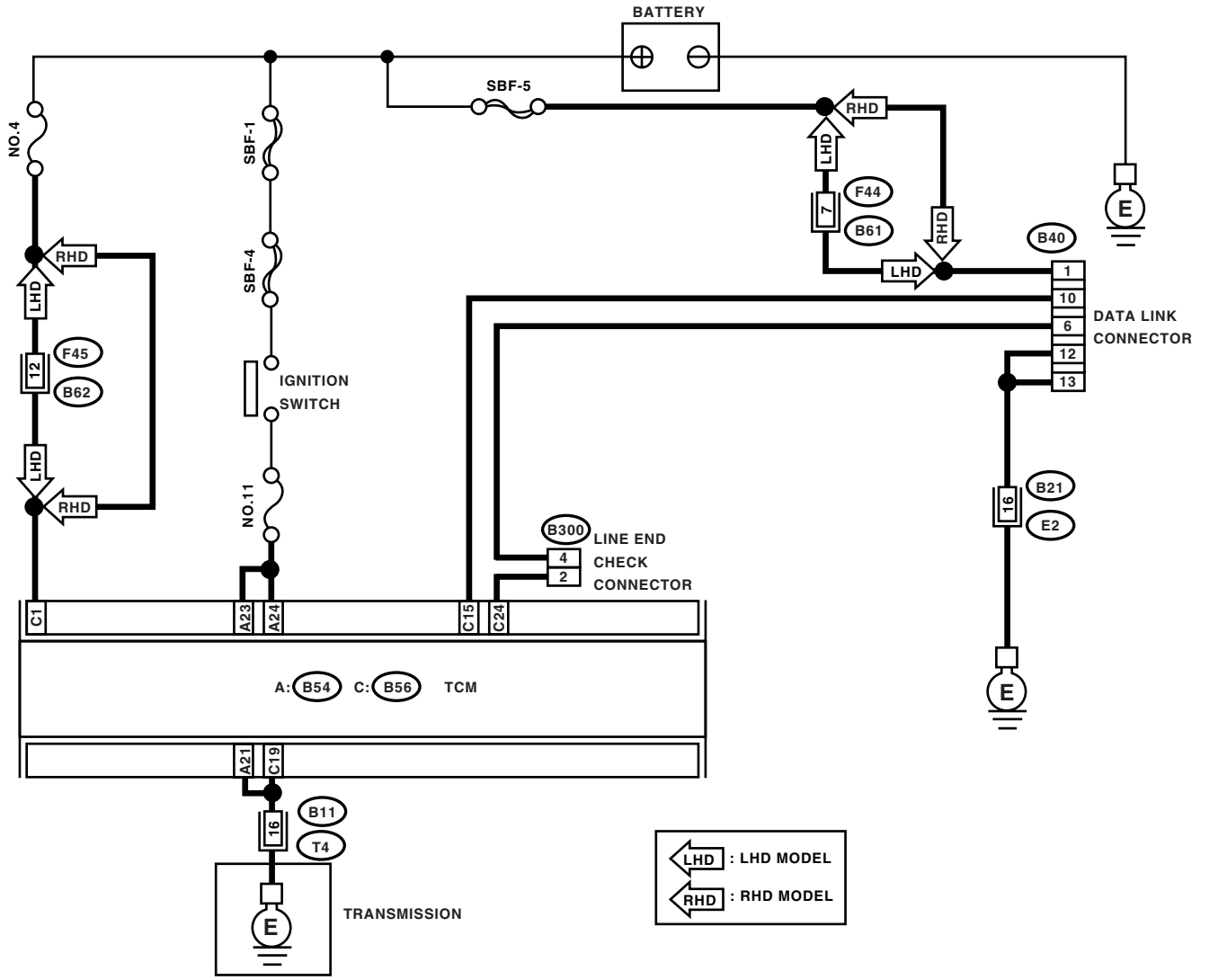
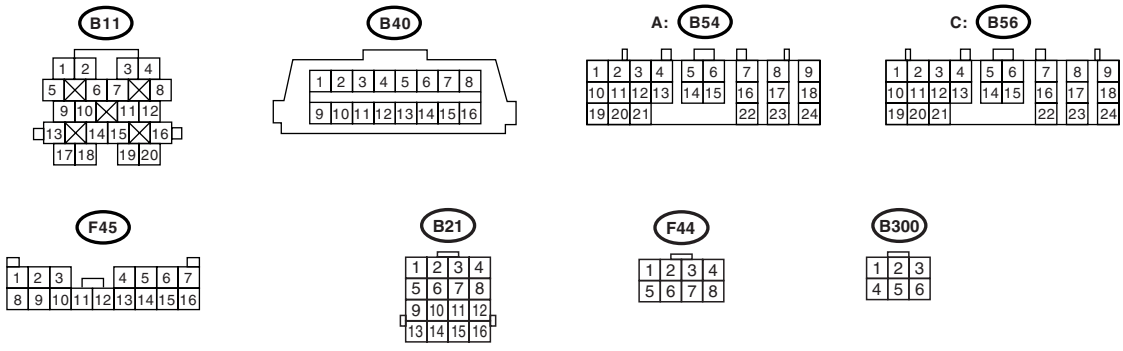
	Step	Check	Yes	No
1	**CHECK POWER INDICATOR LIGHT.** Turn the ignition switch to ON (engine OFF).	Does the POWER indicator light illuminate?	Go to step **3.**	Go to step **2.**
2	**CHECK POWER INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the POWER indicator light bulb from combination meter.	Is the POWER indicator light bulb OK?	Go to step **4.**	Replace the POWER indicator light bulb.
3	**CHECK POWER INDICATOR LIGHT.** Perform "Read Diagnostic Trouble Code (DTC)". <Ref. to 4AT(diag)-18, Read Diagnostic Trouble Code (DTC).>	Does the POWER indicator light blink?	A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM, inhibitor switch and combination meter.	Go to step **9.**
4	**CHECK FUSE (No. 14).** Remove the fuse (No. 14).	Is the fuse (No. 14) blown out?	Replace the fuse (No. 14). If replaced fuse (No. 14) is blown out easily, repair short circuit in harness between fuse (No. 14) and combination meter.	Go to step **5.**
5	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **6.**	Repair the open circuit in harness between combination meter and battery.
6	**CHECK COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 9 V?	Repair the combination meter. <Ref. to IDI-10, Combination Meter.>	Go to step **7.**
7	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter connector. 3) Measure the resistance of harness between combination meter. ***Connector & terminal*** ***(B56) No. 11 — (i11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to TCM and combination meter. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 11 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
9	**CHECK INHIBITOR SWITCH.** 1) Connect the Subaru Select Monitor to data link connector. 2) Turn the ignition switch to ON. 3) Turn the Subaru Select Monitor to ON. 4) Read the data of range switch using Subaru Select Monitor. • Range switch is indicated in ON ←→ OFF.	When each range is selected, does the LED of Subaru Select Monitor light up?	Go to step **10.**	Check the inhibitor switch circuit. <Ref. to 4AT(diag)-91, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>
10	**CHECK SHORT CIRCUIT OF HARNESS.** 1) Disconnect the connector from TCM. 2) Remove the combination meter. 3) Disconnect the connector from combination meter. 4) Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 11 — Chassis ground:***	Is the resistance less than 1 MΩ?	Check the TCM power supply and ground line. <Ref. to 4AT(diag)-27, CHECK POWER SUPPLY AND GROUND LINE, INSPECTION, Diagnostic Procedure with Power Indicator Light.>	Repair the short circuit in harness between combination meter connector and TCM connector.

2. CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:





AT-03097

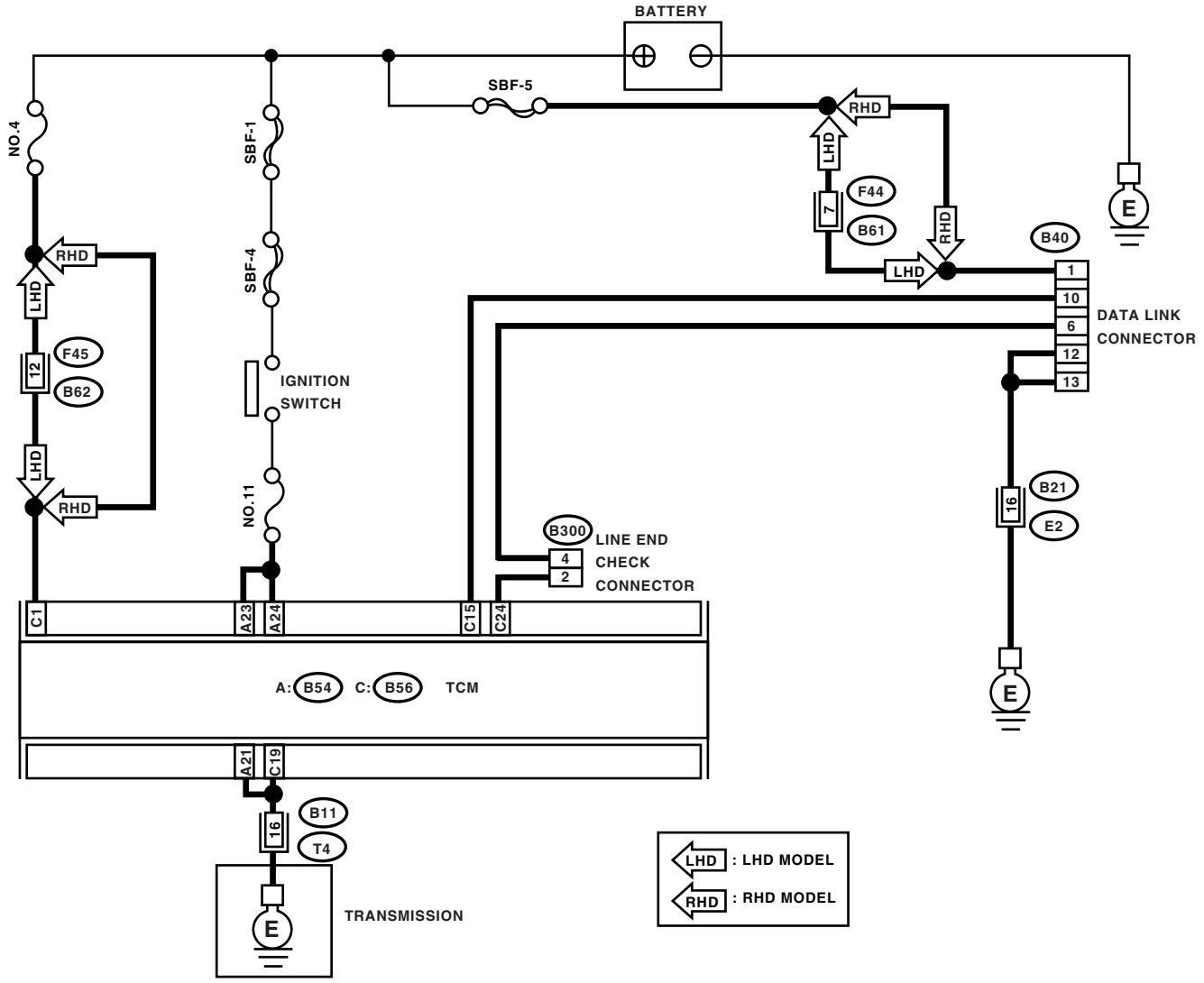
Diagnostic Procedure with Power Indicator Light

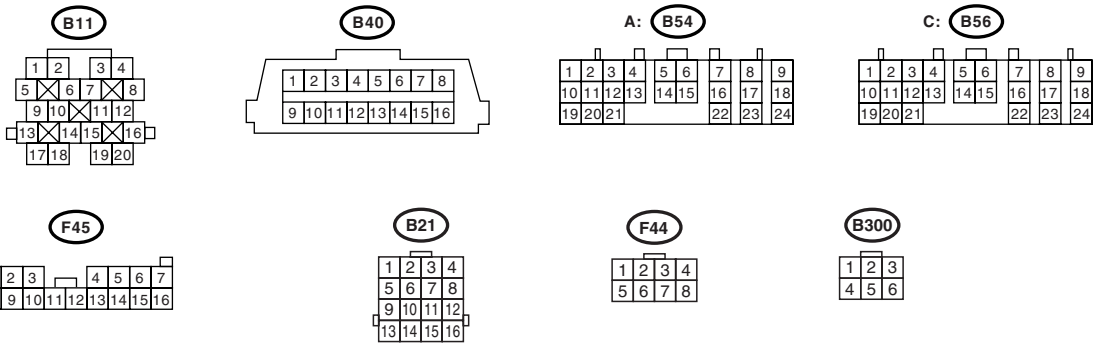
	Step	Check	Yes	No
1	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **2.**
2	**CHECK POWER SUPPLY OF TCM.** 1) Disconnect the connector from TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 1 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FUSE (No. 4).** Remove the fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 23 (+) — Chassis ground (–):*** ***(B54) No. 24 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **6.**	Go to step **5.**
5	**CHECK FUSE (No. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the open circuit in harness between fuse (No. 11) and TCM, or fuse (No. 11) and battery, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 19 — (B11) No. 16:*** ***(B54) No. 21 — (B11) No. 16:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of harness between transmission and transmission ground. ***Connector & terminal*** ***(T4) No. 16 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between transmission and transmission ground.
8	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

12.Diagnostic Procedure for Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSTIC:
Faulty harness connector
TROUBLE SYMPTOM:
Subaru select monitor communication failure
WIRING DIAGRAM:





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Diagnostic Procedure for Select Monitor Communication

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.
2	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 12 — Chassis ground:*** ***(B40) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
3	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to engine systems can be executed normally.	Are the contents of engine system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **4.**
4	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Check whether communication to engine systems can be executed normally.	Are the contents of engine system displayed on Subaru Select Monitor?	Go to step **6.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the ECM connector. 4) Check whether communication to transmission systems can be executed normally.	Are the contents of transmission displayed on Subaru Select Monitor?	Inspect the ECM.	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM, ECM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:*** ***(B40) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 1 V?	Repair the harness and connector between each control module and data link connector.	Go to step **8.**
8	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***(B56) No. 15 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between TCM and data link connector.

	Step	Check	Yes	No
9	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM and data link connector. ***Connector & terminal*** ***(B56) No. 24 — (B40) No. 6:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the harness and connector between TCM and data link connector.
10	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is the TCM connector inserted into TCM?	Go to step **11.**	Insert the TCM connector into TCM.
11	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in control module and data link connector?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

13.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Content of diagnostic	Index
11	Engine speed signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-33, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-35, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-38, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-42, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Torque converter turbine speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-46, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-49, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Intake manifold pressure signal	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-51, DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-53, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
72	Shift solenoid 2	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-56, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Low clutch timing solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-59, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	2-4 brake timing solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-62, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
75	Line pressure duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-65, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
76	2-4 brake duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-68, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
77	Lock-up duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-71, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
79	Transfer duty solenoid	Detects open or shorted output signal circuit.	<Ref. to 4AT(diag)-75, DTC 79 TRANSFER DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
93	Rear vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to 4AT(diag)-78, DTC 93 REAR VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

14.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 ENGINE SPEED SIGNAL

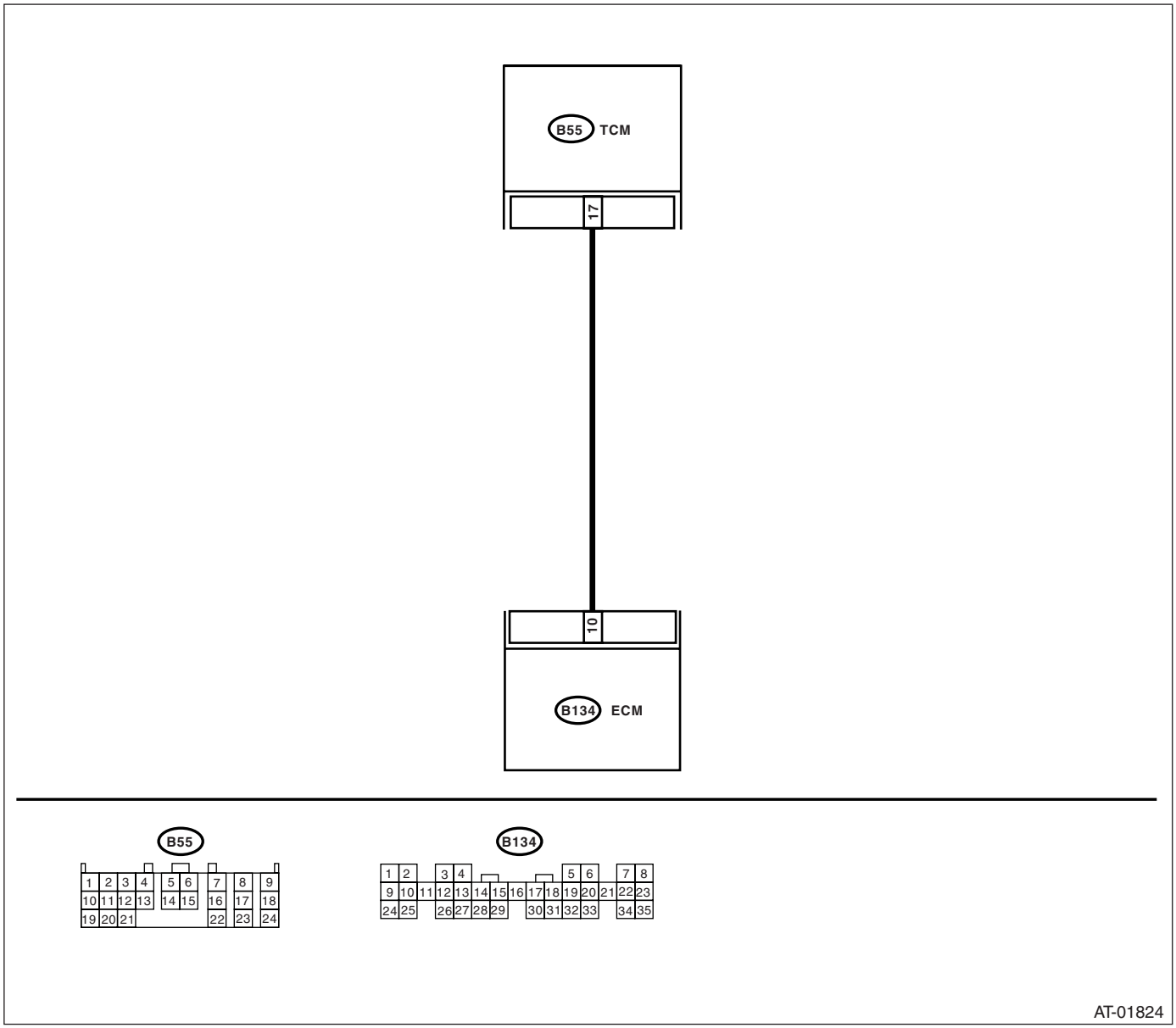
DTC DETECTING CONDITION:

The engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- The POWER indicator light remains on when vehicle speed is “0”.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B55) No. 17 — (B134) No. 10:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 17 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 10.5 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
5	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of engine speed using Subaru Select Monitor. • Display shows the engine speed signal value sent from ECM.	Is the revolution value same as tachometer reading shown on combination meter?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in engine speed signal circuit?	Repair the poor contact.	Go to step **7.**
7	**CONFIRM DTC 11.**	Replace the ECM with a new one. Does the DTC 11 appear again, after memory has been cleared?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).>

B: DTC 27 ATF TEMPERATURE SENSOR

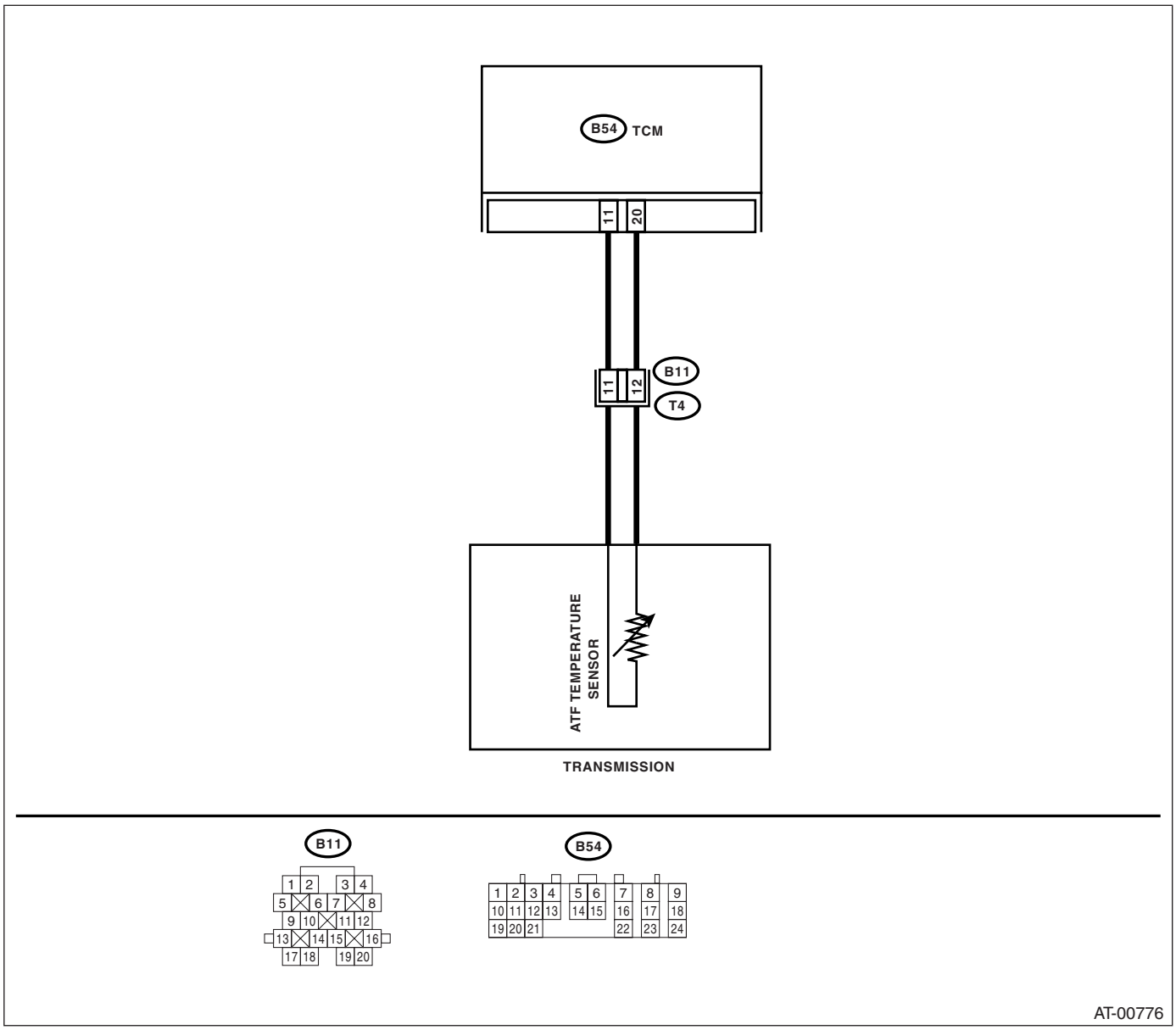
DTC DETECTING CONDITION:

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 20 — (B11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 11 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the ignition switch to ON and start engine. 4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:***	Is the resistance 275 — 375 Ω?	Go to step **6.**	Replace the ATF temperature sensor. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
6	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 12:***	Does the resistance value increase while ATF temperature decreases?	Go to step **7.**	Replace the ATF temperature sensor. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to transmission. 2) Warm-up the transmission until ATF temperature is about 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Measure the voltage between TCM connector terminal. ***Connector & terminal*** ***(B54) No. 11 (+) — No. 20 (–):***	Is the voltage 0.4 — 0.9 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connector to transmission. 2) Turn the ignition switch to ON (engine OFF).	Does the ATF temperature gradually decrease?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **10.**
10	**CHECK POOR CONTACT.**	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

C: DTC 31 THROTTLE POSITION SENSOR

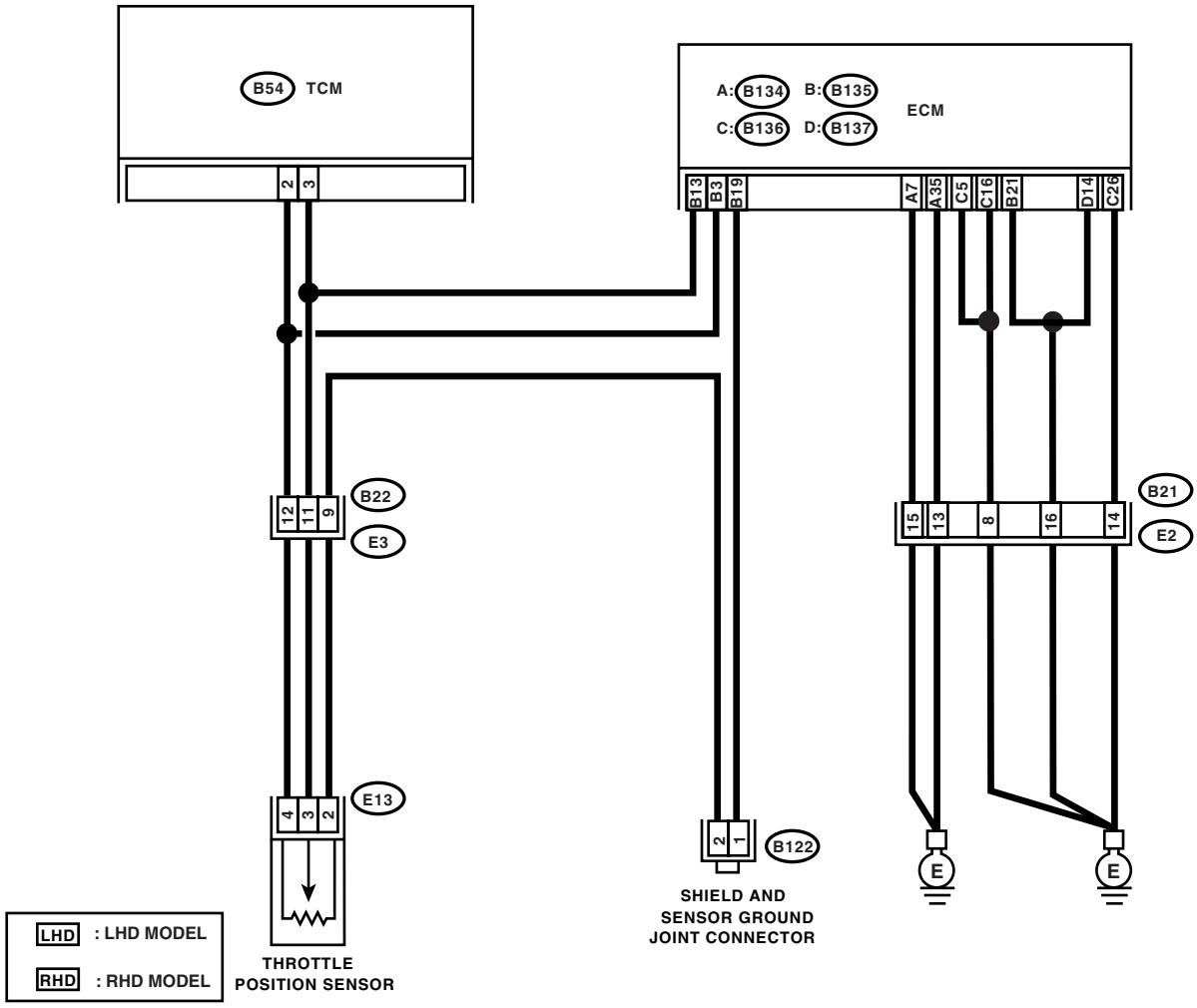
DTC DETECTING CONDITION:

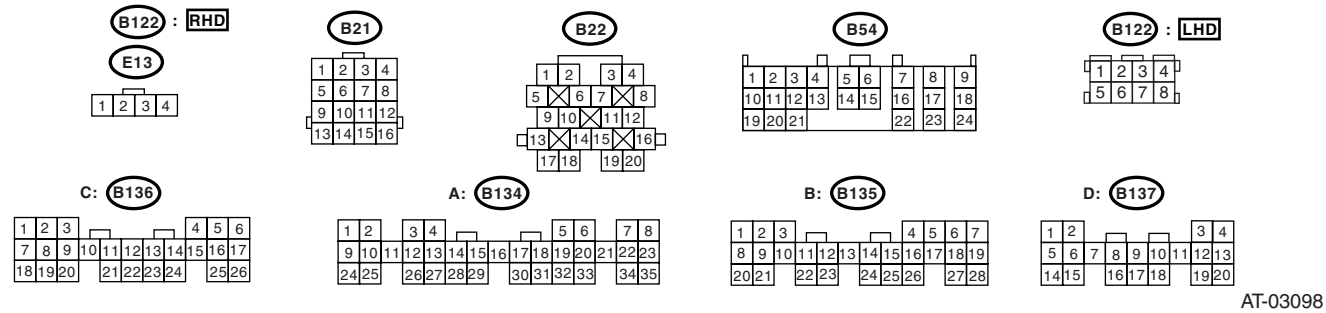
The input signal circuit of throttle position sensor is open or shorted.

TROUBLE SYMPTOM:

- Shift point too high or too low
- Excessive shift shock
- Tight corner braking phenomenon

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.**	Have engine ground terminals been tightened?	Go to step **2.**	Tighten the engine ground terminals.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 7 — Engine ground:*** ***(B134) No. 35 — Engine ground:*** ***(B135) No. 21 — Engine ground:*** ***(B136) No. 26 — Engine ground:*** ***(B136) No. 5 — Engine ground:*** ***(B136) No. 16 — Engine ground:*** ***(B137) No. 14 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CHECK THROTTLE POSITION SENSOR.** 1) Disconnect the connector from throttle position sensor. 2) Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***No. 4 — No. 2:***	Is the resistance 3.0 — 4.2 kΩ?	Go to step **4.**	Replace the throttle position sensor.
4	**CHECK THROTTLE POSITION SENSOR.** Measure the resistance between throttle position sensor connector receptacle's terminals. ***Terminals*** ***No. 2 — No. 3:***	Is the resistance 0.35 — 0.5 kΩ?	Go to step **5.**	Replace the throttle position sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***(B54) No. 3 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***(B54) No. 2 — (E13) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and throttle position sensor connector.

	Step	Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B54) No. 3 — (B135) No. 13:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit in harness between TCM and ECM connector.
10	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B54) No. 2 — (B135) No. 19:***	Is the resistance less than 1 Ω?	Go to step **11.**	Repair the open circuit in harness between TCM and ECM connector.
11	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **14.**	Go to step **12.**
12	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 3 (+) — Chassis ground (−):***	Is the voltage 0.2 — 1.0 V?	Go to step **13.**	Go to step **18.**
13	**CHECK INPUT SIGNAL FOR TCM.** 1) Open the throttle completely. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 3 (+) — Chassis ground (−):***	Is the voltage 4.2 — 4.7 V?	Go to step **16.**	Go to step **18.**
14	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Throttle fully closed. 6) Read the data of throttle position sensor using Subaru Select Monitor. • Throttle position sensor input signal is indicated.	Is the value voltage 0.2 — 1.0 V?	Go to step **15.**	Go to step **18.**
15	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** Throttle fully open. NOTE: Must be changed correspondingly with the accelerator pedal operation (from “released” to “depressed” position).	Is the value voltage 4.2 — 4.7 V?	Go to step **17.**	Go to step **18.**

	Step	Check	Yes	No
16	**CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY).** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 2 (+) — Chassis ground (−):***	Is the voltage 4.8 — 5.3 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **18.**
17	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR (THROTTLE POSITION SENSOR POWER SUPPLY).** Read the data of throttle position sensor power supply using Subaru Select Monitor. • Throttle position sensor power supply voltage is indicated.	Is the value voltage 4.8 — 5.3 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **18.**
18	**CHECK POOR CONTACT.**	Is there poor contact in throttle position sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

D: DTC 33 FRONT VEHICLE SPEED SENSOR

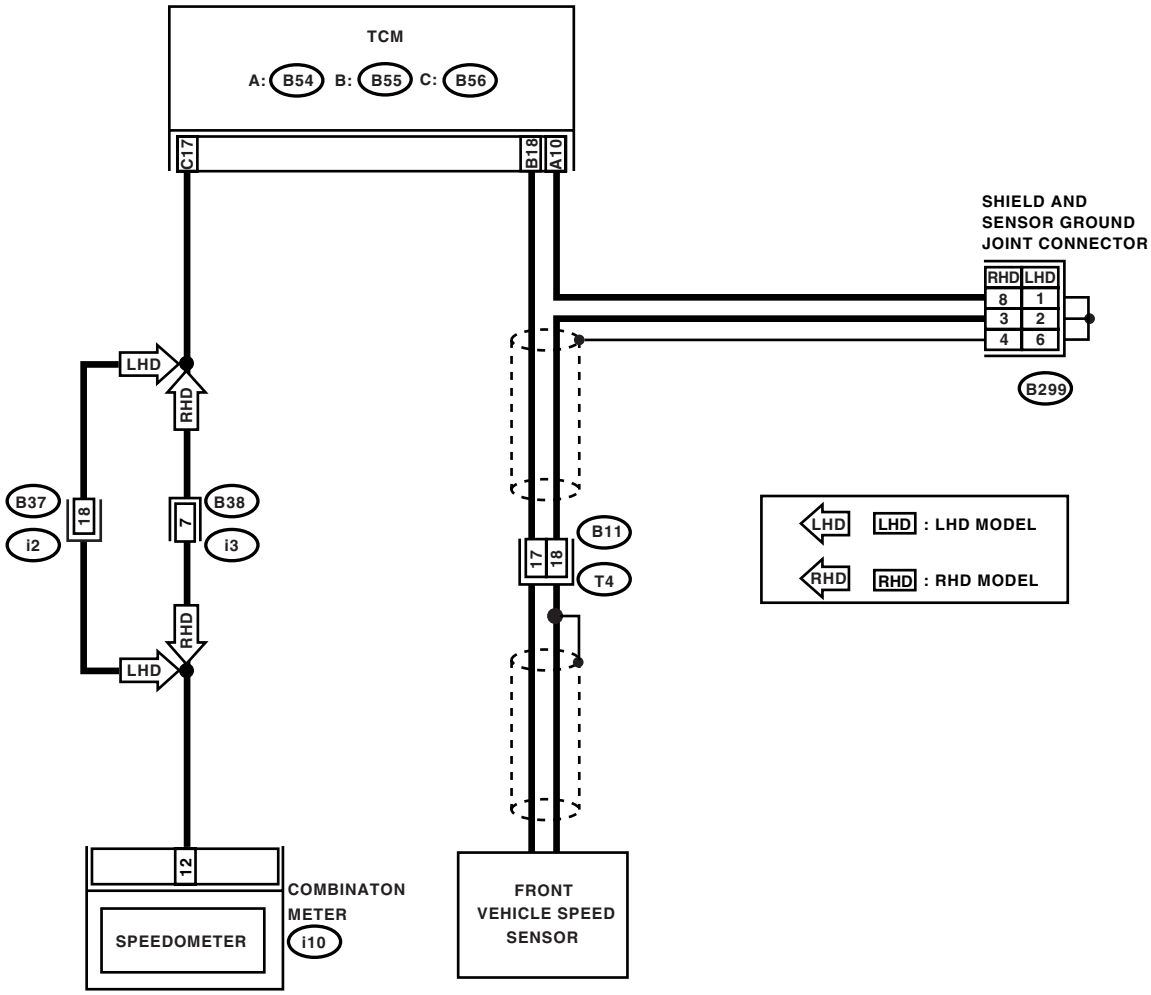
DTC DETECTING CONDITION:

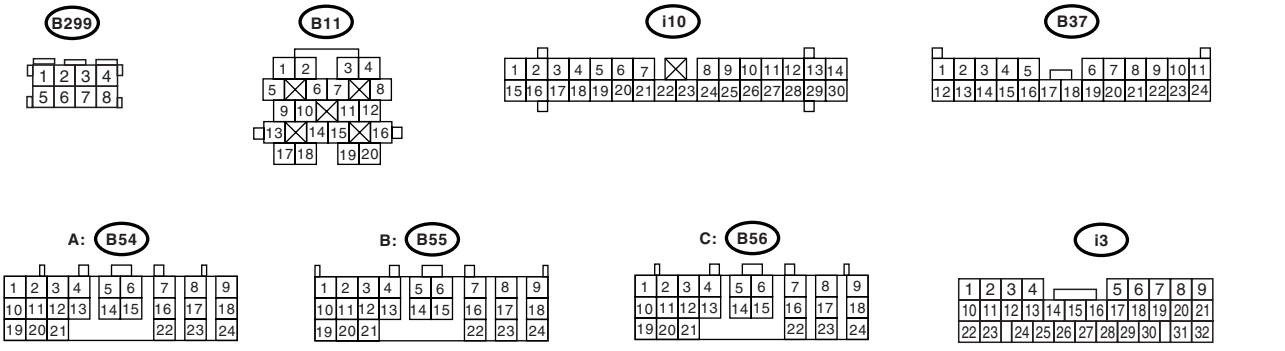
- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 18 — (B11) No. 17:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 10 — (B11) No. 18:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5	**CHECK FRONT VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 17 — No. 18:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the front vehicle speed sensor. <Ref. to 4AT-59, Front Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **9.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **10.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect all connectors. 2) Lift-up or raise the vehicle and place rigid rack. NOTE: Raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 4) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 18 (+) — (B54) No. 10 (–):***	Is the voltage more than AC 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in the front vehicle speed sensor circuit.	Go to step **11.**

	Step	Check	Yes	No
9	**CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE.** 1) Connect all connectors. 2) Lift-up the vehicle and place rigid rack. NOTE: Raise all wheels off ground. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 18*** ***Earth lead; (B54) No. 10*** 4) Start the engine, and drive the wheels slowly. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When AT control diagnostic is finished, perform the ABS memory clearance procedure of self-diagnosis function. <Ref. to ABS(diag)-27, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the voltage more than AC 4 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up or raise the vehicle and place rigid rack. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. • Compare the speedometer with Subaru Select Monitor indications. • Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h (37 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.>	Does the speedometer indication increase as Subaru Select Monitor data increases?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in front vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

E: DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR

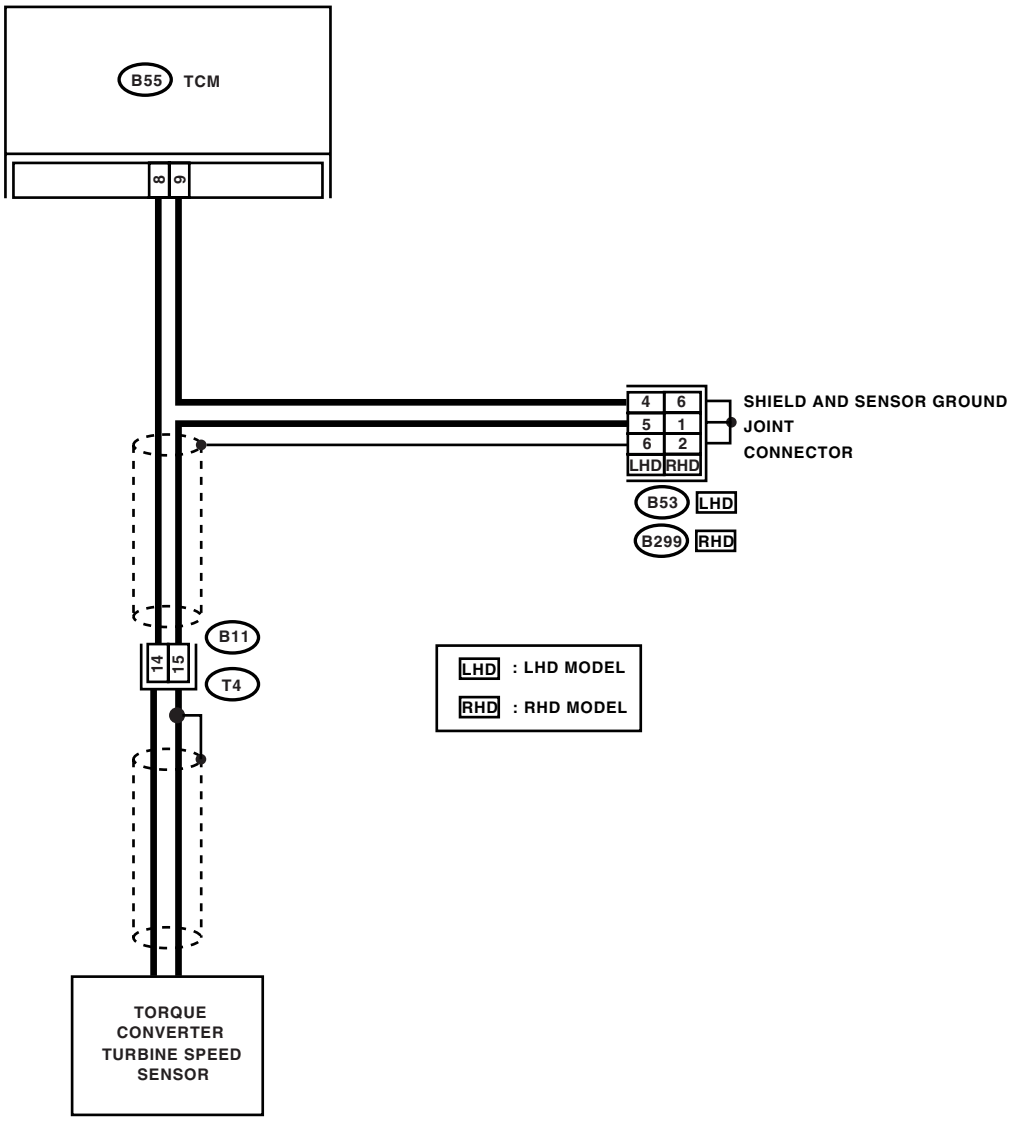
DTC DETECTING CONDITION:

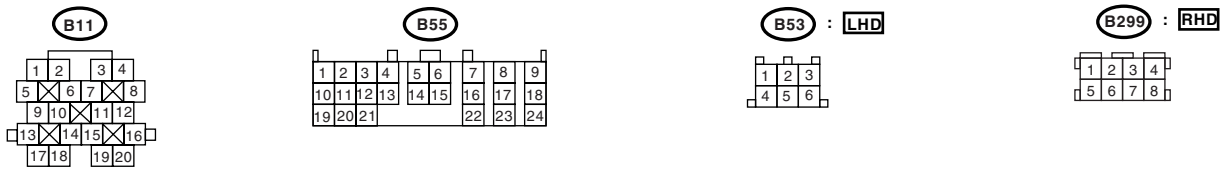
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:





AT-03099

	Step	Check	Yes	No
1	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 14 — No. 15:***	Is the resistance 450 — 650 Ω?	Go to step **2.**	Replace the turbine speed sensor. <Ref. to 4AT-65, Torque Converter Turbine Speed Sensor.>
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 8 — (B11) No. 14:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 9 — (B11) No. 15:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Start the engine and move select lever to "P" or "N" range. 3) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 8 (+) — No. 9 (−):***	Is the voltage more than AC 1 V?	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 4) Start the engine. 5) Move the select lever to “P” or “N” range. 6) Read the data of turbine speed using Subaru Select Monitor. • Compare the tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 8*** ***Earth lead; (B55) No. 9*** 3) Start the engine and move select lever to “P” or “N” range.	Is the signal voltage more than AC 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

F: DTC 38 TORQUE CONTROL SIGNAL

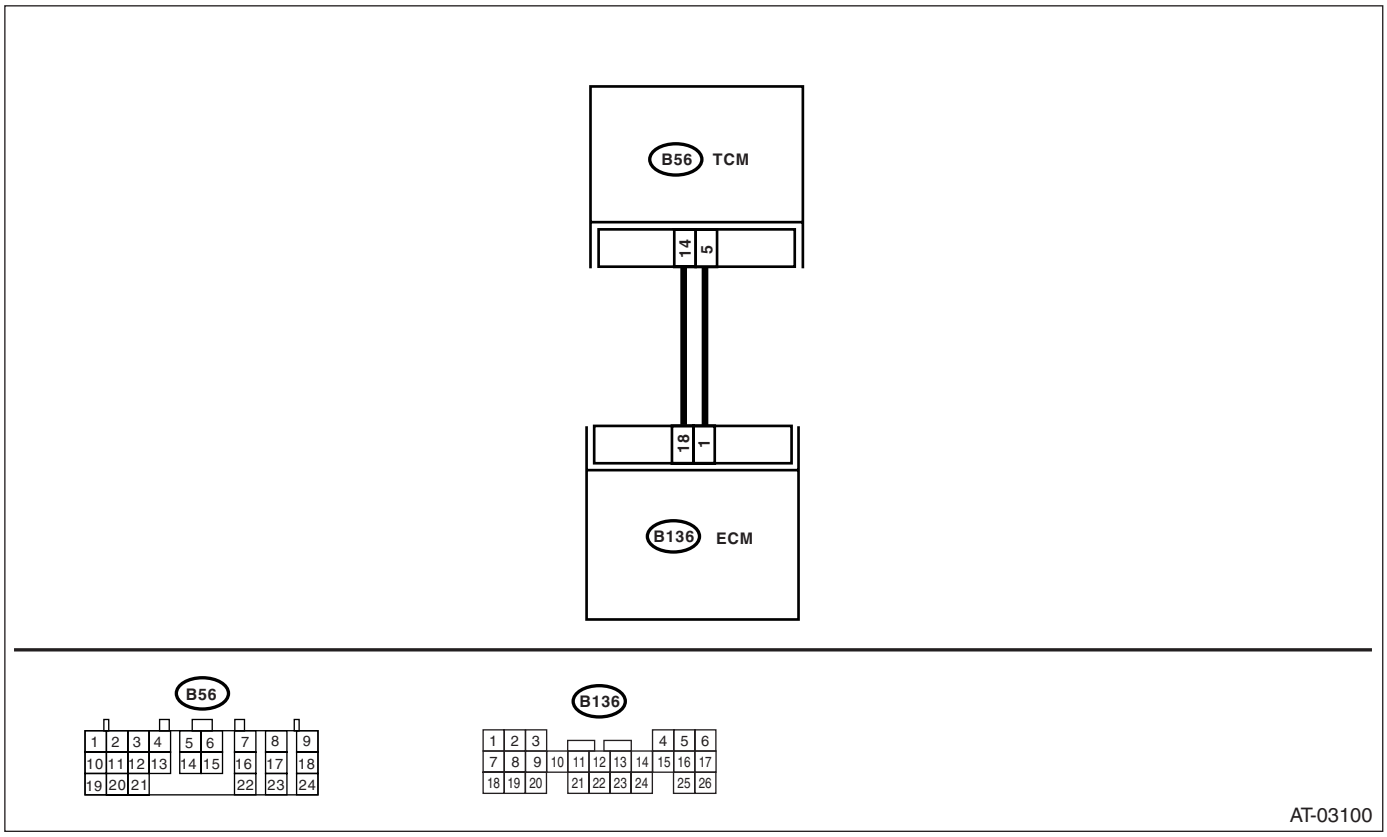
DTC DETECTING CONDITION:

The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B56) No. 14 — (B136) No. 18:*** ***(B56) No. 5 — (B136) No. 1***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 14 — Chassis ground:*** ***(B56) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.

	Step	Check	Yes	No
3	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 4.8 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **4.**
4	**CHECK POOR CONTACT.**	Is there poor contact in torque control signal circuit?	Repair the poor contact.	Go to step **5.**
5	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body.	Is there any dirt or rust at the ground line installing point?	Remove dirt and rust.	Go to step **6.**
6	**CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY.** Check installing condition of the ground line in transmission and body.	Is the tightening torque value 13 N·m (1.3 kgf-m, 9.4 ft-lb)?	Go to step **7.**	Tighten to the specified torque.
7	**CHECK GROUND LINE INSIDE TRANSMISSION.** 1) Drain the ATF and remove oil pan. 2) Check the tightening torque value of ground line installing bolt.	Is the tightening torque value 8 N·m (0.8 kgf-m, 5.8 ft-lb)?	Go to step **8.**	Tighten to the specified torque.
8	**CHECK GROUND CIRCUIT OF ECM.** <Ref. to 4AT(diag)-38, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step **9.**
9	**RECHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 14 (+) — Chassis ground (–):*** ***(B56) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 4 V?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Replace the ECM.

G: DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL

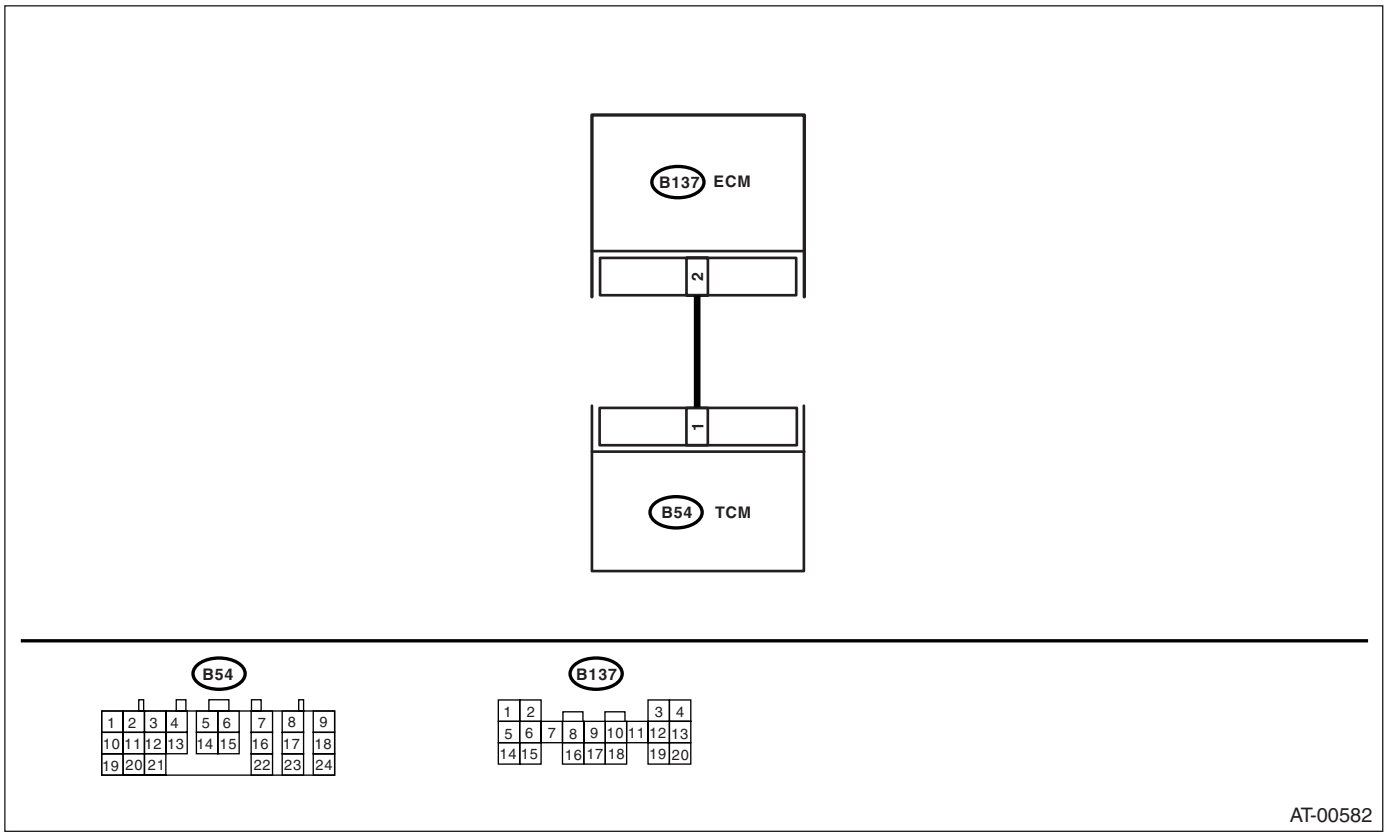
DTC DETECTING CONDITION:

The input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM** <Ref. to 4AT(diag)-38, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B54) No. 1 — (B137) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and ECM connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and ECM connector.
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **6.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and ECM. 2) Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Idle the engine. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 1 (+) — Chassis ground (−):***	Is the voltage 0.4 — 1.6 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine, and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of intake manifold pressure signal using Subaru Select Monitor. • Display shows the intake manifold pressure signal value sent from ECM.	Is the voltage 0.4 — 1.6 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in intake manifold pressure signal circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

H: DTC 71 SHIFT SOLENOID 1

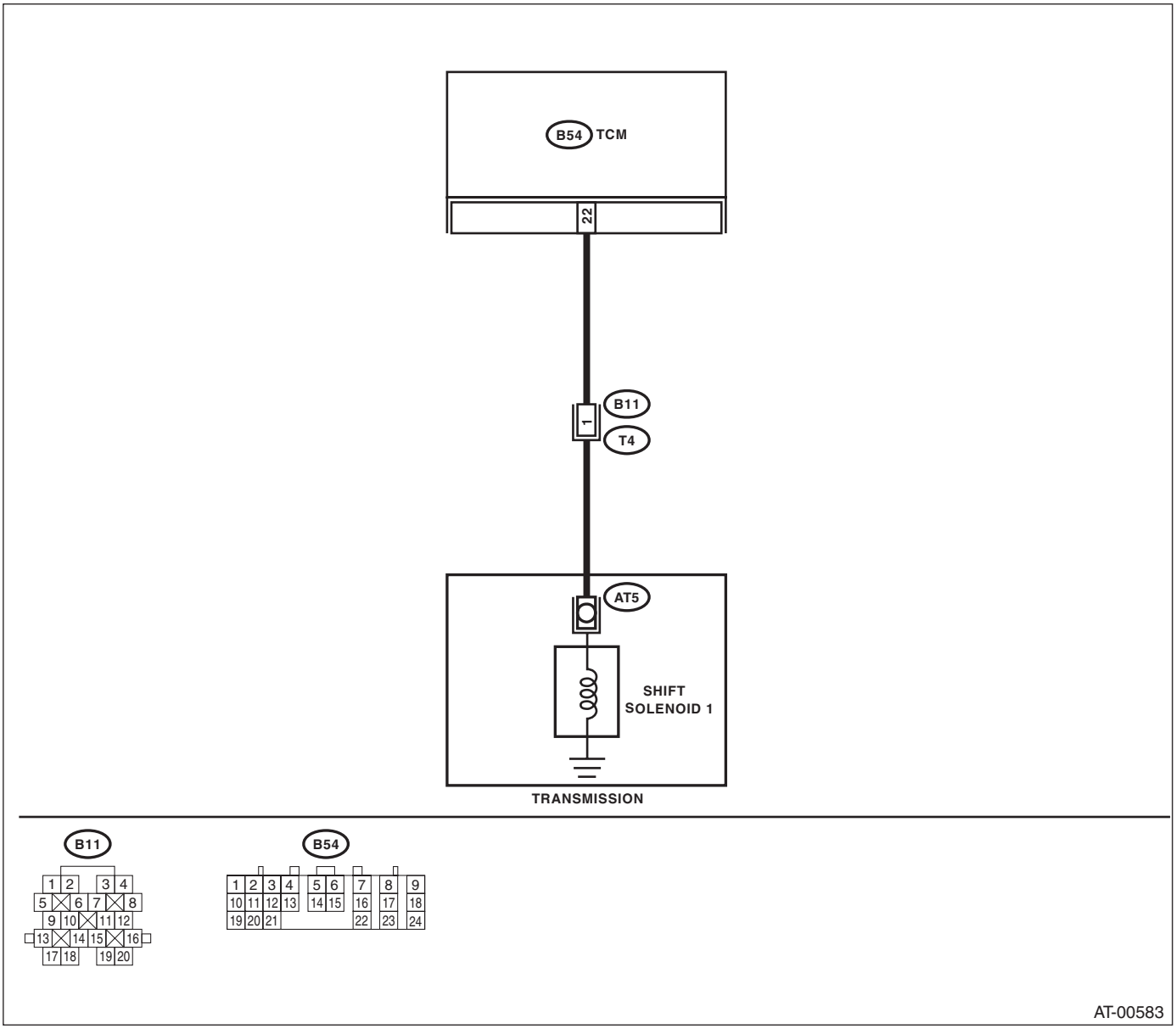
DTC DETECTING CONDITION:

The output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 1 connector. ***Connector & terminal*** ***(B54) No. 22 — (B11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 1.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 1 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to "D" range. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Turn the HOLD mode switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 1 circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
7	**CHECK SHIFT SOLENOID 1 (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with rigid rack. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from shift solenoid 1. 5) Measure the resistance between shift solenoid 1 connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the shift solenoid 1. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

	Step	Check	Yes	No
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 and transmission connector. ***Connector & terminal*** ***(T4) No. 1 — (AT5) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between shift solenoid 1 and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 1 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 1 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 1 and transmission.	Repair the short circuit harness between shift solenoid 1 and transmission connector.

I: DTC 72 SHIFT SOLENOID 2

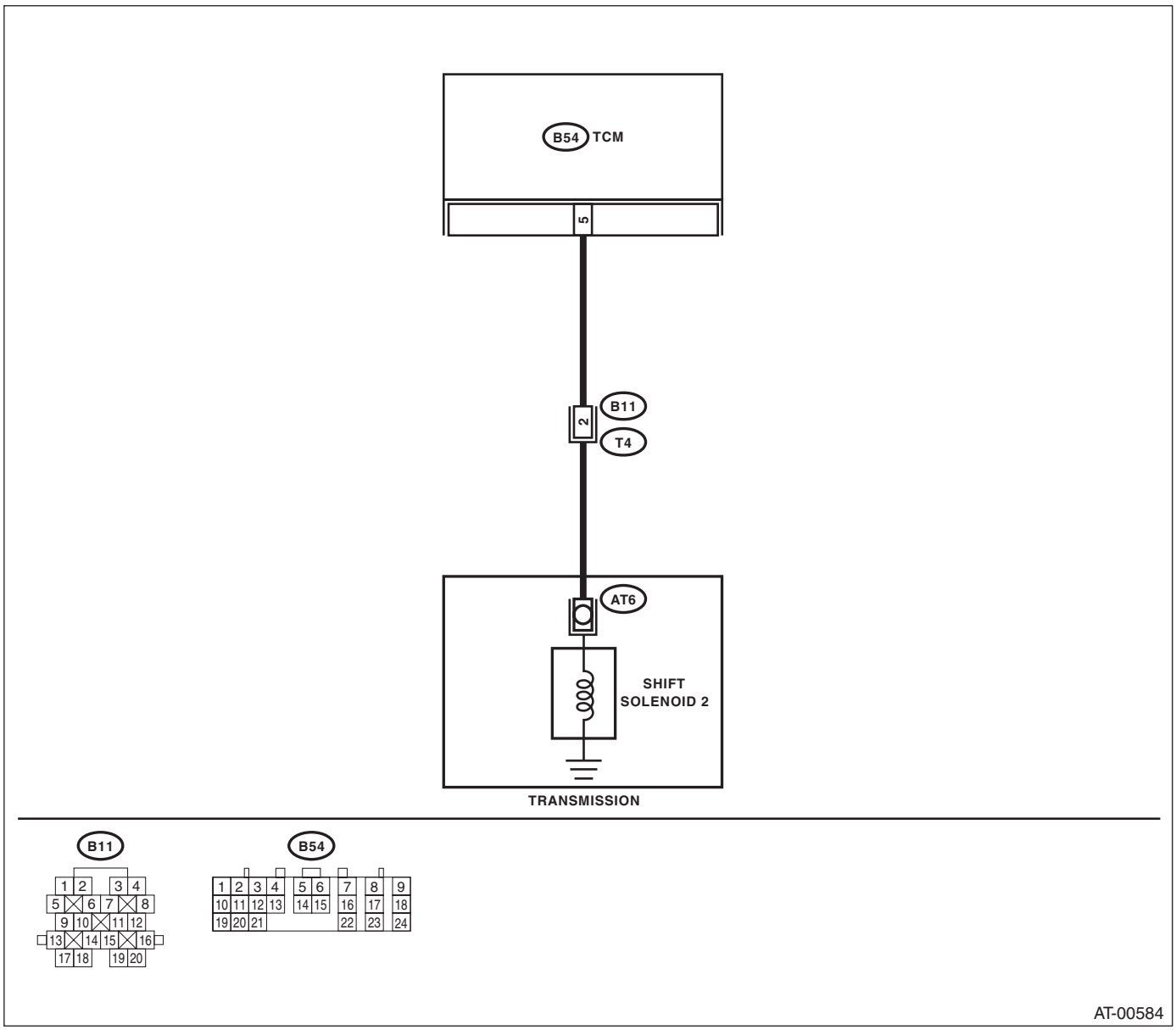
DTC DETECTING CONDITION:

The output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 2 connector. ***Connector & terminal*** ***(B54) No. 5 — (B11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and transmission ground. ***Connector & terminal*** ***(B54) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK SHIFT SOLENOID 2.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 2 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **6.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with rigid rack. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to “D” range, and slowly increase vehicle speed to 50 km/h (31 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **5.**
5	**CHECK POOR CONTACT.**	Is there poor contact in shift solenoid 2 circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
6	**CHECK SHIFT SOLENOID 2 (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from shift solenoid 2. 4) Measure the resistance between shift solenoid 2 connector and transmission ground. ***Connector & terminal*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **7.**	Replace the shift solenoid 2 assembly. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
7	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 and transmission connector. ***Connector & terminal*** ***(AT6) No. 1 — (T4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between shift solenoid 2 and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION.** Measure the resistance of harness between shift solenoid 2 connector and transmission ground. ***Connector & terminal*** ***(T4) No. 2 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in shift solenoid 2 and transmission.	Repair the short circuit harness between shift solenoid 2 and transmission connector.

J: DTC 73 LOW CLUTCH TIMING SOLENOID

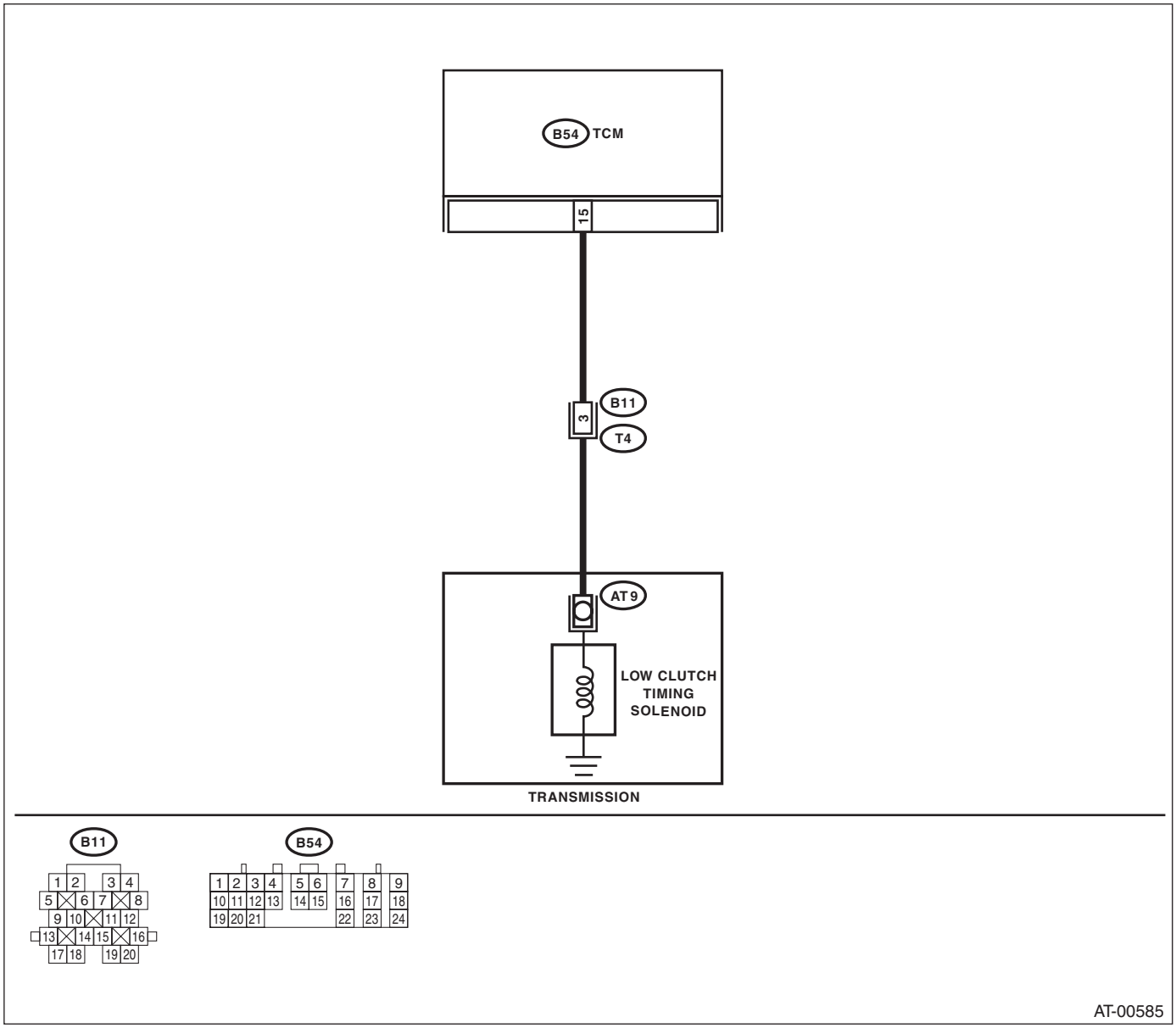
DTC DETECTING CONDITION:

The output signal circuit of low clutch timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 15 — (B11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW CLUTCH TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 3 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to “D” range. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage more than 9 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Turn the HOLD mode switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 15 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in TCM and transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in low clutch timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK LOW CLUTCH TIMING SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with rigid rack. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from low clutch timing solenoid. 5) Measure the resistance between low clutch timing solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the low clutch timing solenoid. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid and transmission connector. ***Connector & terminal*** ***(AT9) No. 1 — (T4) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between low clutch timing solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between low clutch timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 3 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low clutch timing solenoid and transmission.	Repair the short circuit harness between low clutch timing solenoid and transmission connector.

K: DTC 74 2-4 BRAKE TIMING SOLENOID

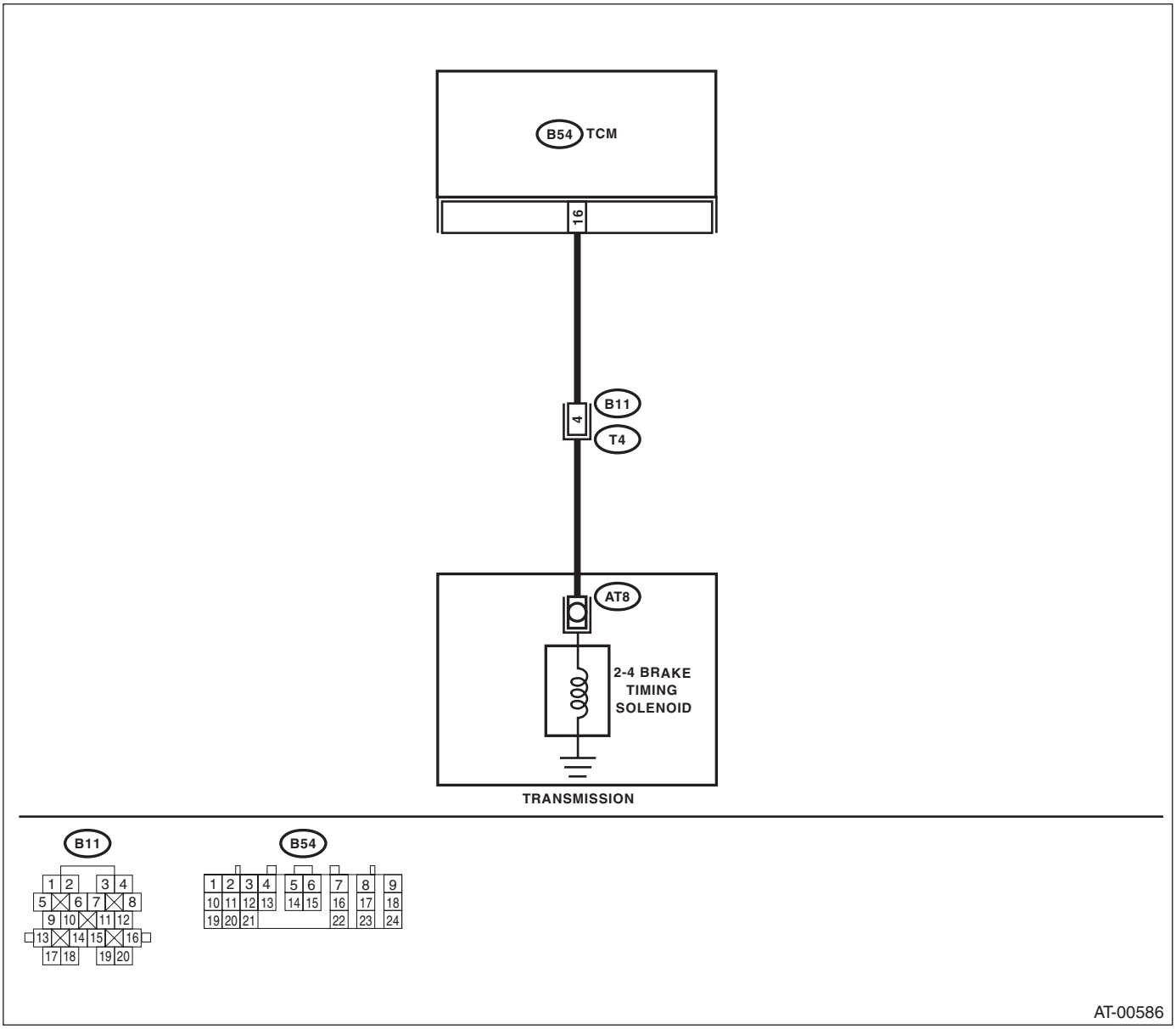
DTC DETECTING CONDITION:

The output signal circuit of 2-4 brake timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 16 — (B11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK 2-4 BRAKE TIMING SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 4 — No. 16:***	Is the resistance 10 — 16 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and support with rigid rack. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to "1" range, and slowly increase vehicle speed to 10 km/h (6 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the selector lever to "D" range, and slowly increase vehicle speed to 65 km/h (40 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transmission.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
7	**CHECK 2-4 BRAKE TIMING SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Lift-up or raise the vehicle and support with rigid rack. NOTE: Raise all wheels off ground. 3) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 4) Remove the oil pan, and disconnect connector from 2-4 brake timing solenoid. 5) Measure the resistance between 2-4 brake timing solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 16 Ω?	Go to step **8.**	Replace the 2-4 brake timing solenoid. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid and transmission connector. ***Connector & terminal*** ***(AT8) No. 1 — (T4) No. 4:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between 2-4 brake timing solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake timing solenoid connector and transmission ground. ***Connector & terminal*** ***(T4) No. 4 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in 2-4 brake timing solenoid and transmission.	Repair the short circuit harness between 2-4 brake timing solenoid and transmission connector.

L: DTC 75 LINE PRESSURE DUTY SOLENOID

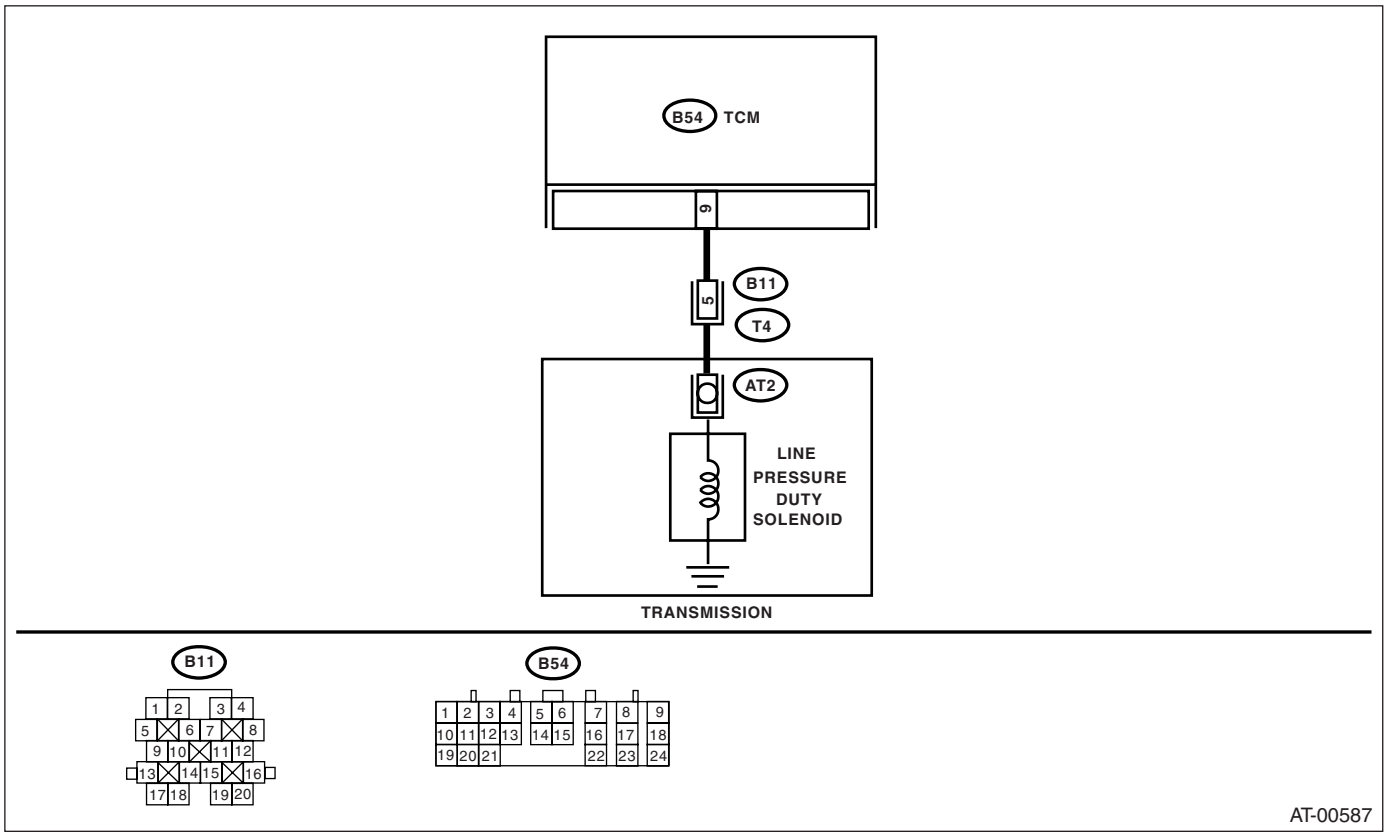
DTC DETECTING CONDITION:

The output signal circuit of line pressure duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 9 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LINE PRESSURE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminals*** ***(T4) No. 5 — No. 16:***	Is the resistance between 2.0 and 4.5 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "N" range. 5) Throttle fully closed. 6) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (−):***	Is the voltage 1.5 — 5.0 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Throttle fully open and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Throttle is fully closed. 8) Read the data of line pressure duty solenoid using Subaru Select Monitor. • Line pressure duty solenoid is indicated either in "%".	Is the value 100%?	Go to step **8.**	Go to step **9.**

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open. 3) Read the data of line pressure duty solenoid using Subaru Select Monitor.	Is the value less than 25%?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in line pressure duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
10	**CHECK LINE PRESSURE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from line pressure duty solenoid. 4) Measure the resistance between line pressure duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace the line pressure duty solenoid. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between line pressure duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 5 — (AT2) No. 1:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between line pressure duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 5 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between line pressure duty solenoid and transmission connector.

M: DTC 76 2-4 BRAKE DUTY SOLENOID

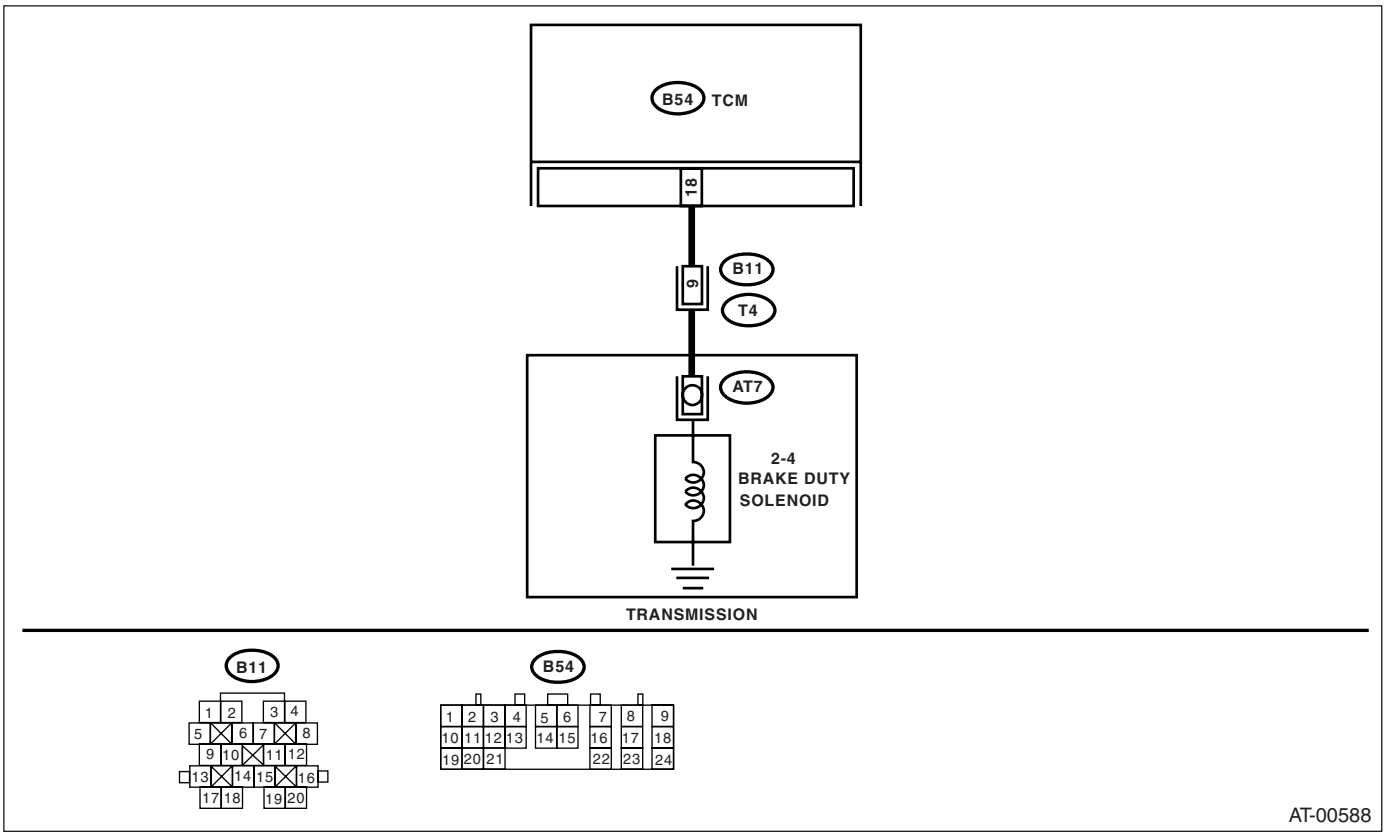
DTC DETECTING CONDITION:

The output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 18 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK 2-4 BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Terminals*** ***(T4) No. 16 — No. 9:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect all connectors. 2) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3) Turn the ignition switch to ON (engine OFF). 4) Move the select lever to "N" range. 5) Throttle fully closed. 6) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 18 (+) — Chassis ground (−):***	Is the voltage 1.5 — 5.0 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Throttle fully open and hold it. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 18 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to "N" range. 7) Throttle is fully closed. 8) Read the data of 2-4 brake duty solenoid using Subaru Select Monitor. • 2-4 brake duty solenoid is indicated in "%".	Is the value 100%?	Go to step **8.**	Go to step **9.**

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open. 3) Read the data of 2-4 brake duty solenoid using Subaru Select Monitor.	Is the value less than 25%?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
10	**CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid. 4) Measure the resistance between 2-4 brake duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **11.**	Replace the 2-4 brake duty solenoid. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 9 — (AT7) No. 1:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between 2-4 brake duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 9 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between 2-4 brake duty solenoid and transmission connector.

N: DTC 77 LOCK-UP DUTY SOLENOID

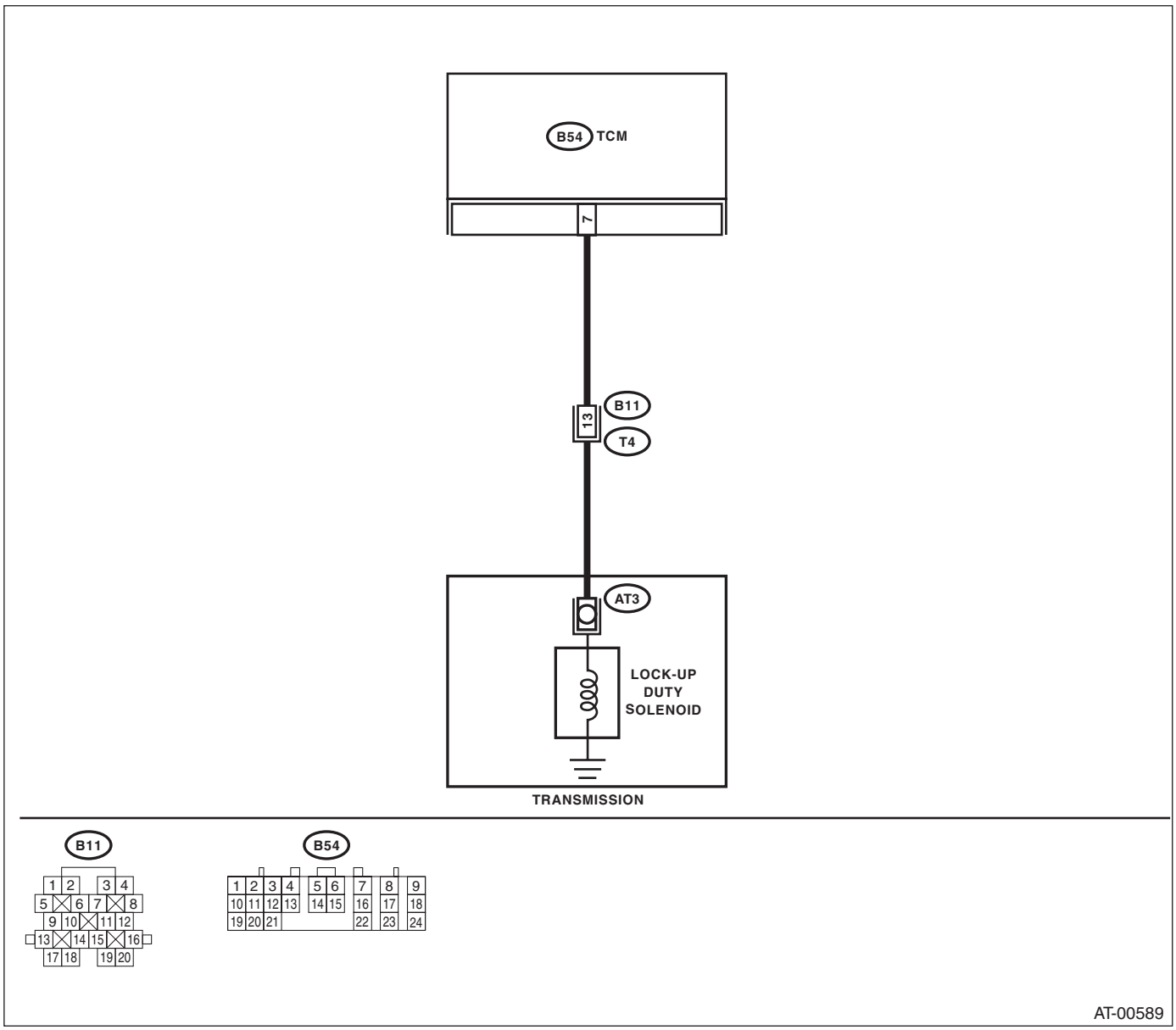
DTC DETECTING CONDITION:

The output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No “lock-up” (after engine warm-up).

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.**	Do multiple DTCs appear in the on-board diagnostics test mode?	Go to another DTC.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 7 — (B11) No. 13:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 13 — No. 16:***	Is the resistance 10 — 17 Ω?	Go to step **5.**	Go to step **11.**
5	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **8.**	Go to step **6.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place rigid rack. NOTE: Raise all wheels off ground. 3) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 4) Move the selector lever to "D" range and slowly increase vehicle speed to 60 km/h (37 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 8.5 V?	Go to step **7.**	Go to step **10.**

	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Return the engine to idling speed and move select lever to "N" range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 7 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place rigid rack. NOTE: Raise all wheels off ground. 3) Connect the Subaru Select Monitor to data link connector. 4) Start the engine and turn Subaru Select Monitor switch to ON. 5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 6) Read the data of lock-up duty solenoid using Subaru Select Monitor. • Lock-up duty solenoid is indicated in "%". 7) Move the selector lever to "D" range and slowly increase vehicle speed to 60 km/h (37 MPH). Wheels will lock-up. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.>	Is the value 95%?	Go to step **9.**	Go to step **10.**
9	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Return the engine to idling speed and move selector lever to "N" range. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 2) Read the data of lock-up duty solenoid using Subaru Select Monitor.	Is the value 5%?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK POOR CONTACT.**	Is there poor contact in lock-up duty solenoid circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
11	**CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan and disconnect connector from lock-up duty solenoid. 4) Measure the resistance between lock-up duty solenoid connector and transmission ground. ***Terminals*** ***No. 1 — Transmission ground:***	Is the resistance 10 — 17 Ω?	Go to step **12.**	Replace the lock-up duty solenoid. <Ref. to 4AT-76, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
12	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between lock-up duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 13 — (AT3) No. 1:***	Is the resistance less than 1 Ω?	Go to step **13.**	Repair the open circuit in harness between TCM and transmission connector.
13	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 13 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit in harness between lock-up duty solenoid and transmission connector.

O: DTC 79 TRANSFER DUTY SOLENOID

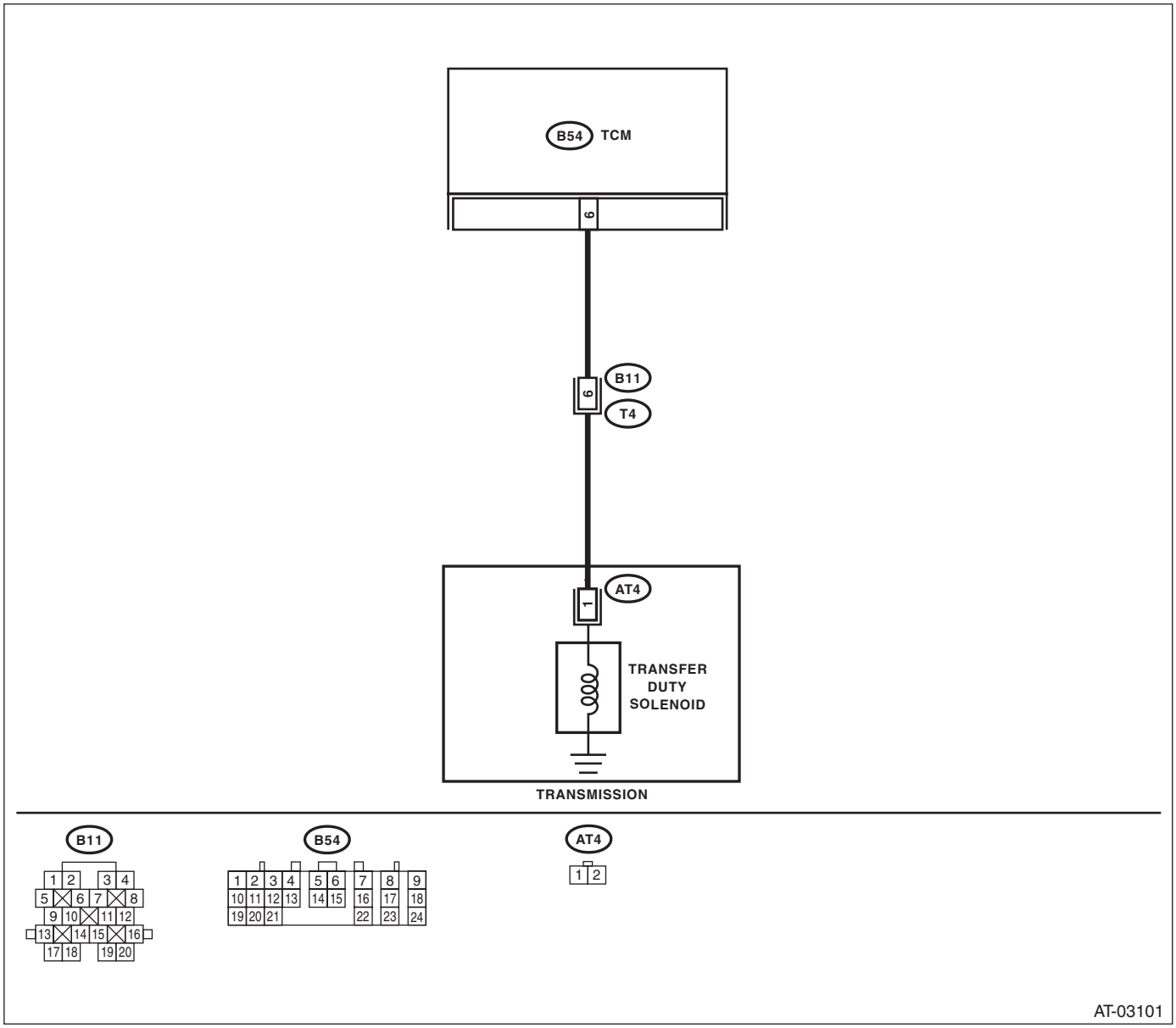
DTC DETECTING CONDITION:

The output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Tight corner braking phenomenon is occurred.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 6 — (B11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.

	Step	Check	Yes	No
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK TRANSFER DUTY SOLENOID.** Measure the resistance between transmission connector and transmission terminals. ***Connector & terminal*** ***(T4) No. 6 — No. 16:***	Is the resistance 10 — 17 Ω?	Go to step **4.**	Go to step **10.**
4	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Connect the connectors to TCM and transmission. 2) Turn the ignition switch to ON (engine OFF). 3) Move the select lever to “P” range. 4) Throttle is fully closed. 5) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 8.5 V?	Go to step **6.**	Go to step **9.**
6	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Move the select lever to “D” range. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 6 (+) — Chassis ground (−):***	Is the voltage 3.0 — 6.0 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
7	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Move the select lever to “D” range with throttle fully open (vehicle speed 0 km/h (0 MPH)). 5) Read data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in “%”.	Is the value 80 — 95%?	Go to step **8.**	Go to step **9.**

	Step	Check	Yes	No
8	**CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to "N" range with throttle fully closed (vehicle speed 0 km/h or 0 MPH). 2) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in "%".	Is the value 5 — 10%?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact in transfer duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
10	**CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).** 1) Lift-up the vehicle and place rigid rack. NOTE: Raise all wheels off ground. 2) Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3) Remove the extension case and disconnect connector from transfer duty solenoid. 4) Measure the resistance between transfer duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT4) No. 1 — Transmission ground:***	Is the resistance 10 — 17 Ω?	Go to step **11.**	Replace the transfer duty solenoid.
11	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transfer duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 6 — (AT4) No. 1:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit in harness between transfer duty solenoid and transmission connector.
12	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 6 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transfer duty solenoid and transmission.	Repair the short circuit in harness between transfer duty solenoid and transmission connector.

P: DTC 93 REAR VEHICLE SPEED SENSOR

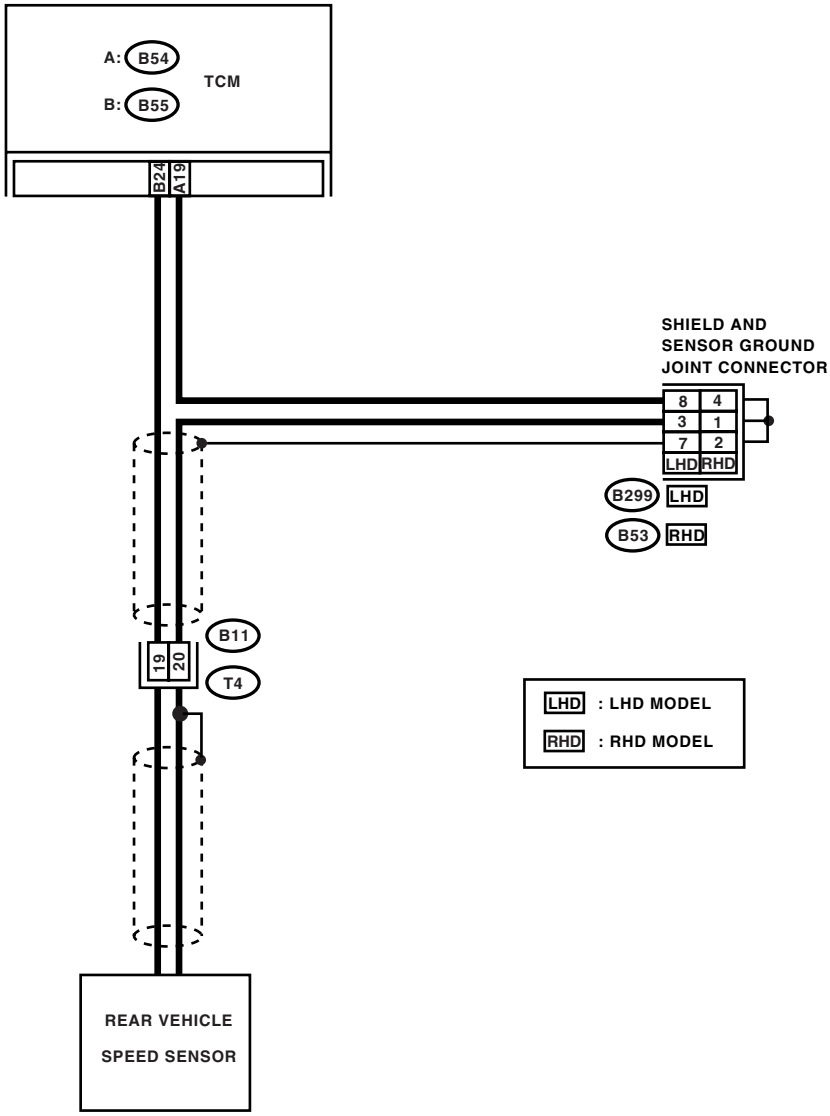
DTC DETECTING CONDITION:

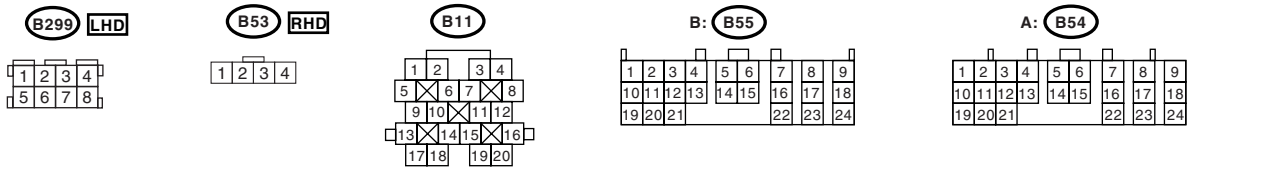
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

- No lock-up.
- Tight corner braking phenomenon is occurred.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 24 — (B11) No. 19:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 19 — (B11) No. 20:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK REAR VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 19 — No. 20:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the rear vehicle speed sensor. <Ref. to 4AT-64, Rear Vehicle Speed Sensor.>
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **10.**	Go to step **7.**
7	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **9.**	Go to step **8.**
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and place rigid rack. NOTE: Raise all wheels off floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 4) Measure the voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 24 (+) — (B54) No. 19 (–):***	Is the voltage more than AC 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up or raise the vehicle and place rigid rack. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. • Compare the speedometer with Subaru Select Monitor indications. • Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h (37 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.>	Does the speedometer indication increase as the Subaru Select Monitor data increases?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
10	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and place rigid rack. NOTE: Raise all wheels off floor. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 24*** ***Earth lead; (B54) No. 19*** 4) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the signal voltage more than AC 1 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **11.**
11	**CHECK POOR CONTACT.**	Is there poor contact in rear vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

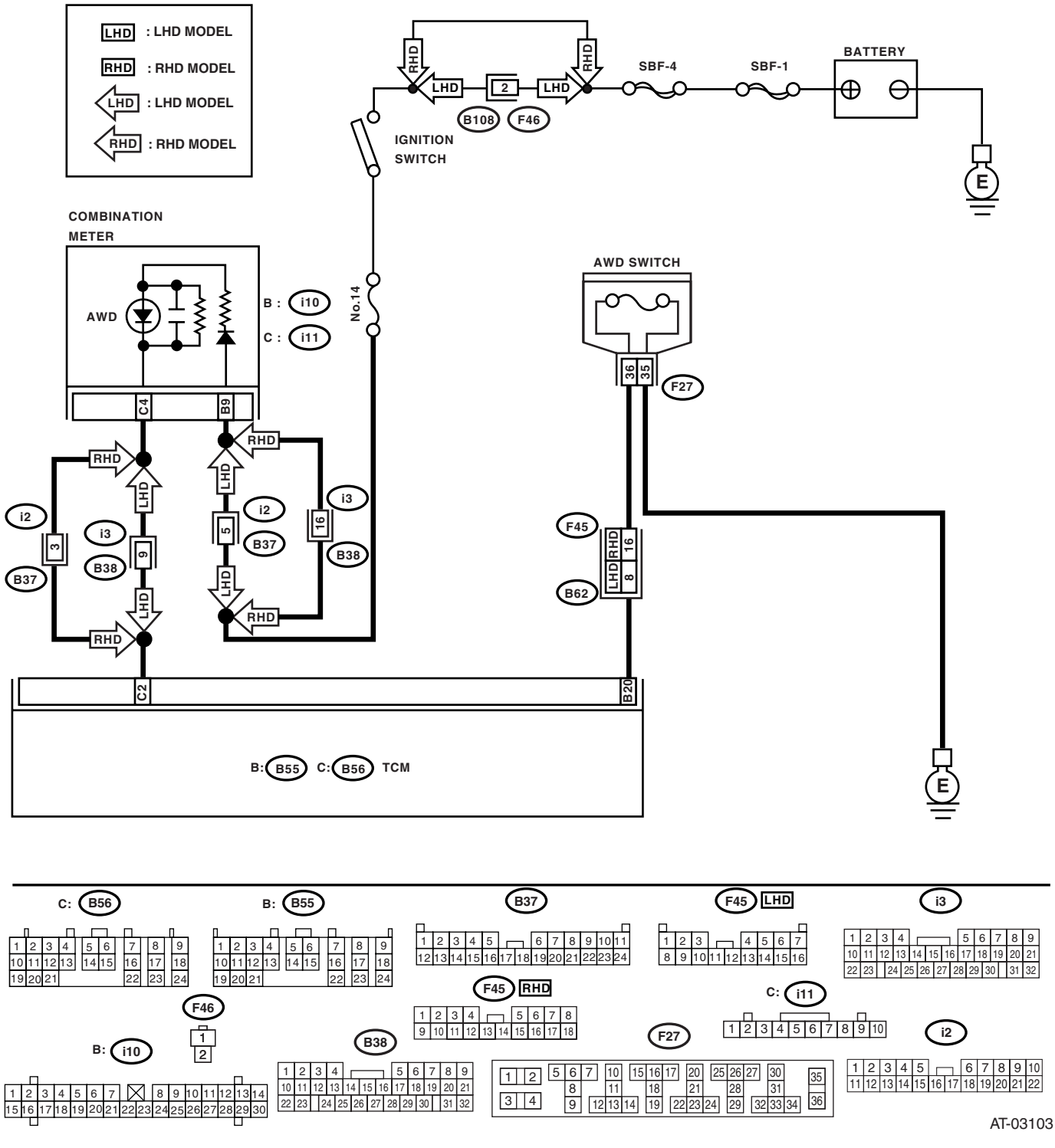
15.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

A: CHECK AWD SWITCH

DETECTING CONDITION:

- The LED does not come on even if AWD switch is ON.
- The AWD switch circuit is open or short.

WIRING DIAGRAM:



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	Step	Check	Yes	No
1	**CHECK AWD SWITCH.** Connect the Subaru Select Monitor to data link connector, and then change to LED display screen.	When the fuse is inserted to AWD switch, does LED light up?	Go to step CHECK BRAKE SWITCH. <Ref. to 4AT(diag)-84, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK AWD INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Turn the ignition switch to ON. 4) Short the combination meter connector to chassis ground. **CAUTION:** **Be sure to short through fuse.** ***Connector & terminal*** ***(i11) No. 4 — Chassis ground:***	Does the AWD indicator light illuminate?	Go to step **3.**	Inspect the combination meter. <Ref. to IDI-10, Combination Meter.>
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND AWD SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and AWD switch. 3) Measure the resistance of harness between TCM and AWD switch connector. ***Connector & terminal*** ***(B55) No. 20 — (F27) No. 36:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and AWD switch connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND AWD SWITCH.** Measure the resistance of harness connector between TCM and body to make sure that circuit does not short. ***Connector & terminal*** ***(B55) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and AWD switch connector.
5	**CHECK HARNESS CONNECTOR BETWEEN AWD SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between AWD switch and chassis ground. ***Connector & terminal*** ***(F27) No. 35 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between AWD switch connector and chassis ground.
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and AWD switch. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to AWD switch connector. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Go to step **11.**
7	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while removing the fuse from AWD switch connector. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (–):***	Is the voltage 6 — 9.1 V?	Go to step **8.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and combination meter. 3) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B56) No. 2 — (i11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between TCM and combination meter and poor contact in coupling connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the short circuit in harness between TCM and combination meter connector.
10	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and combination meter. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to AWD switch connector. ***Connector & terminal*** ***(B56) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Go to step **12.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the signal voltage for TCM while removing the fuse from AWD switch connector. ***Connector & terminal*** ***(B56) No. 2 (+) — Chassis ground (–):***	Is the voltage 6 — 9.1 V?	Go to step **12.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
12	**CHECK POOR CONTACT.**	Is there poor contact in AWD switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

B: CHECK BRAKE SWITCH

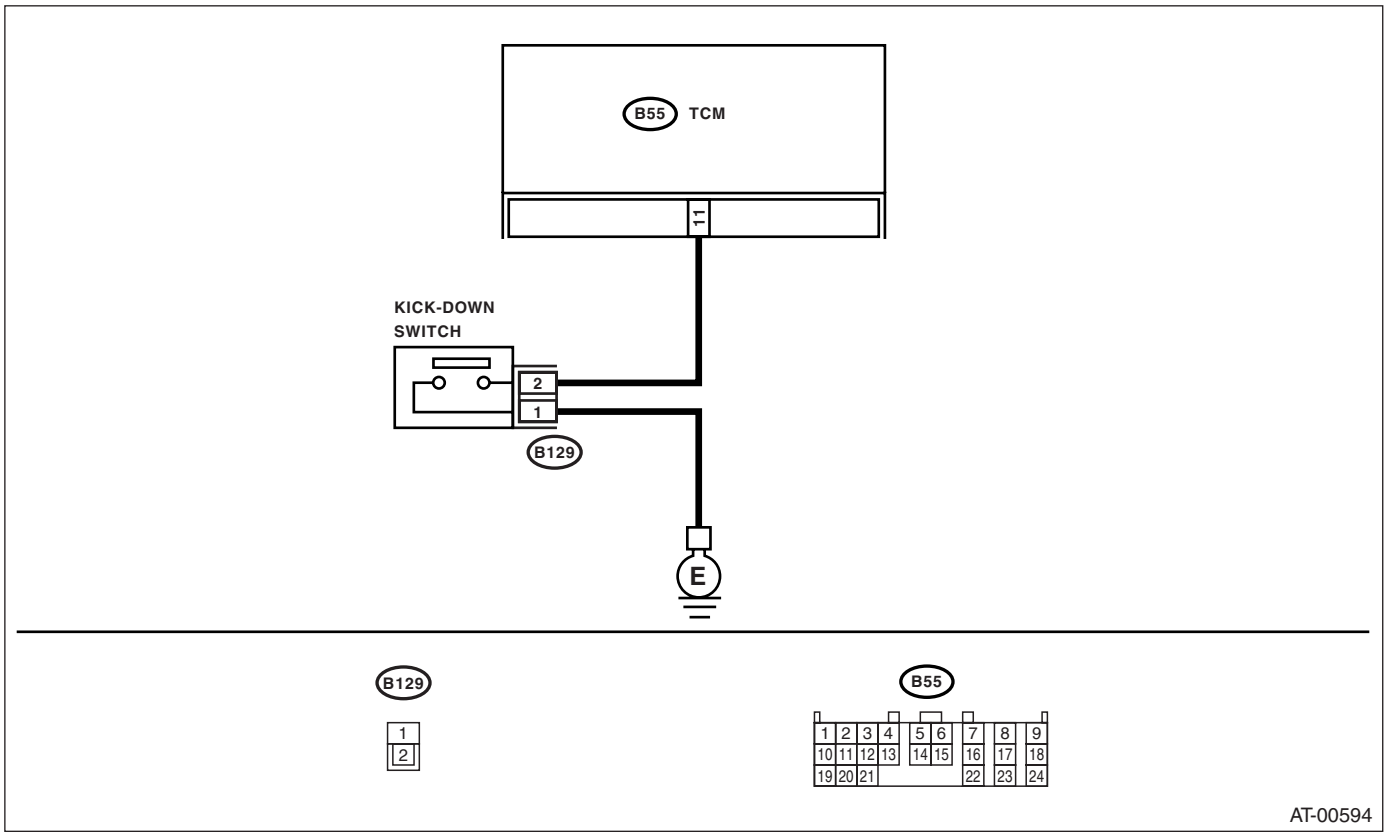
Step		Check	Yes	No
1	CHECK BRAKE SWITCH.	When the brake pedal is depressed, does LED light up?	Go to step CHECK ABS SWITCH. <Ref. to 4AT(diag)-84, CHECK CRUISE CONTROL SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Check the brake switch circuit. <Ref. to EN(H4SO)(diag)-209, DTC P0703 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: CHECK CRUISE CONTROL SWITCH

Step		Check	Yes	No
1	CHECK CRUISE CONTROL SWITCH.	When the cruise control is set, does LED light up?	Go to step CHECK KICK-DOWN SWITCH. <Ref. to 4AT(diag)-85, CHECK KICK–DOWN SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Check the cruise control. <Ref. to CC(diag)-27, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: CHECK KICK–DOWN SWITCH

DETECTING CONDITION:
The kick down switch circuit is open or shorted.
TROUBLE SYMPTOM:
No kick-down occurs (when the throttle is fully opened).
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK KICK-DOWN SWITCH OPERATION.** Select “Current Data Display” in Subaru Select Monitor.	When the accelerator pedal is fully depressed, does “ON” displayed?	Go to step CHECK POWER MODE SWITCH. <Ref. to 4AT(diag)-87, CHECK POWER MODE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK KICK-DOWN SWITCH GROUND LINE.** 1) Disconnect the connector from kick-down switch. 2) Measure the resistance of harness connector between kick-down switch and chassis ground. ***Connector & terminal*** ***(B129) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between kick-down switch and chassis ground.
3	**CHECK KICK-DOWN SWITCH.** Measure the resistance for kick-down switch when depressing the accelerator pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the kick-down switch. <Ref. to SP(H4SO)-4, Accelerator Pedal.>

	Step	Check	Yes	No
4	**CHECK KICK-DOWN SWITCH.** Measure the resistance for kick-down switch when releasing the accelerator pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the kick-down switch. <Ref. to SP(H4SO)-4, Accelerator Pedal.>
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from kick-down switch. 3) Measure the resistance of harness connector between TCM and kick-down switch. ***Connector & terminal*** ***(B55) No. 11 — (B129) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between TCM and kick-down switch.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the short circuit in harness between TCM and chassis ground.
7	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to kick-down switch. 3) Turn the ignition switch to ON (engine OFF). 4) Measure the signal voltage for TCM when depressing the accelerator pedal. ***Connector & terminal*** ***(B55) No. 11 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Go to step **9.**
8	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM when releasing the accelerator pedal. ***Connector & terminal*** ***(B55) No. 11 (+) — Chassis ground (−):***	Is the voltage more than 6.5 V?	A temporary poor contact of the connector and harness may be the cause. Repair the harness and connector in TCM.	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

E: CHECK POWER MODE SWITCH

DETECTING CONDITION:

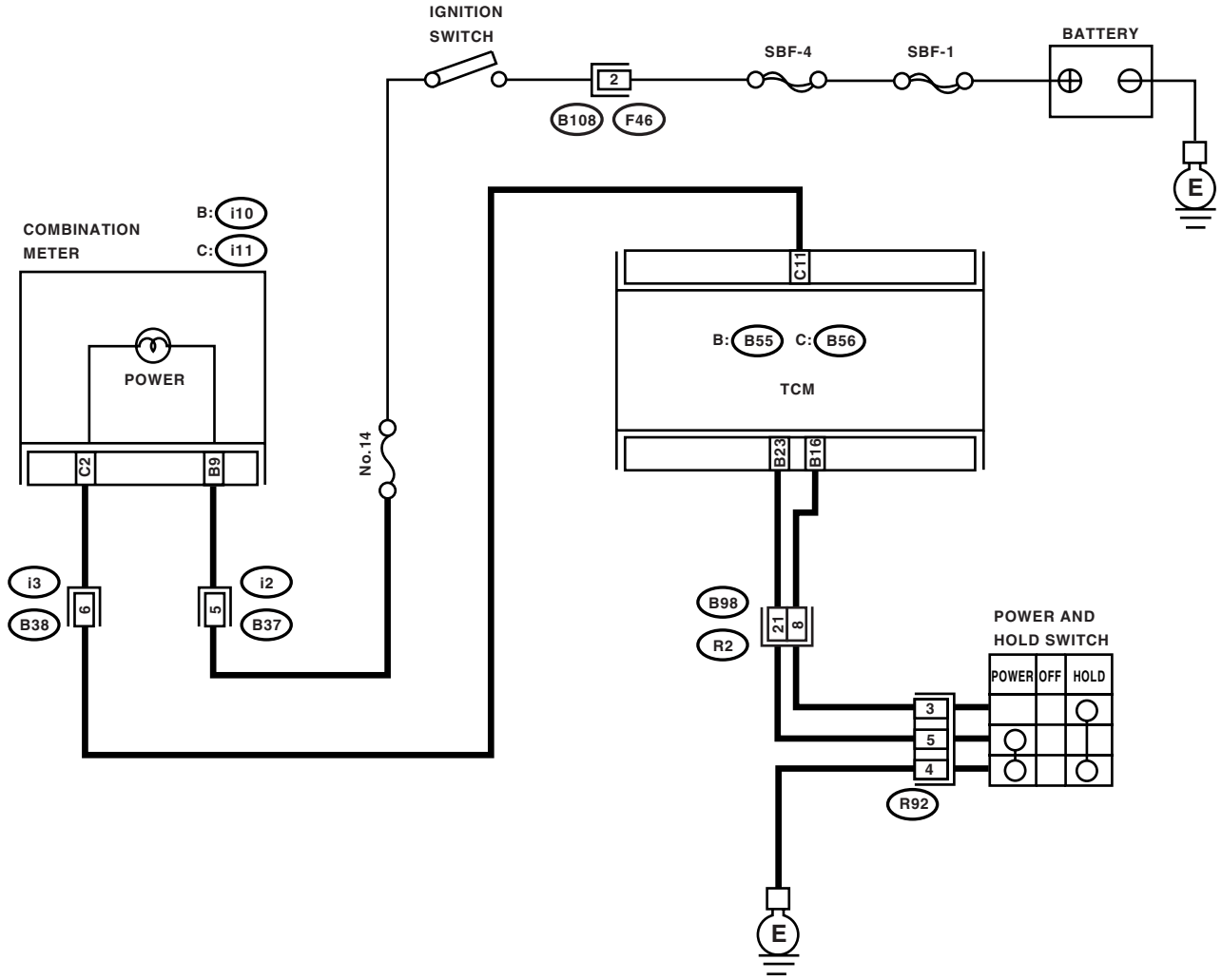
- The LED does not come on when POWER switch is ON.
- The POWER switch circuit is open or shorted.

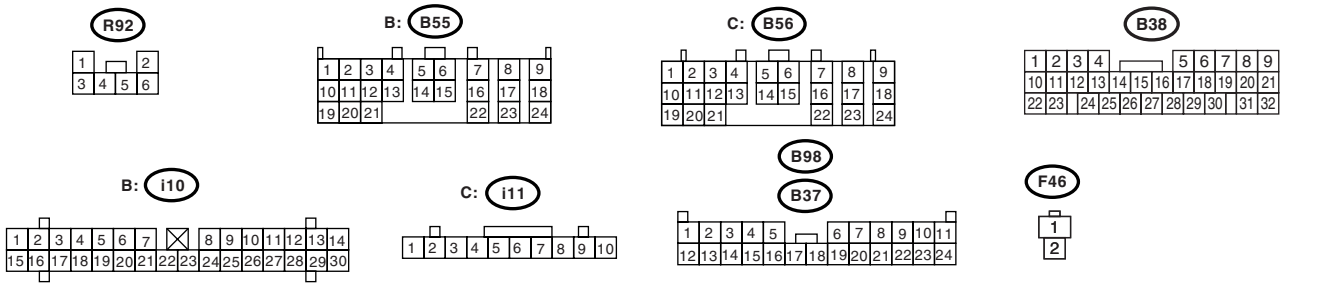
TROUBLE SYMPTOM:

No power mode occurs.

WIRING DIAGRAM:

- LHD MODEL





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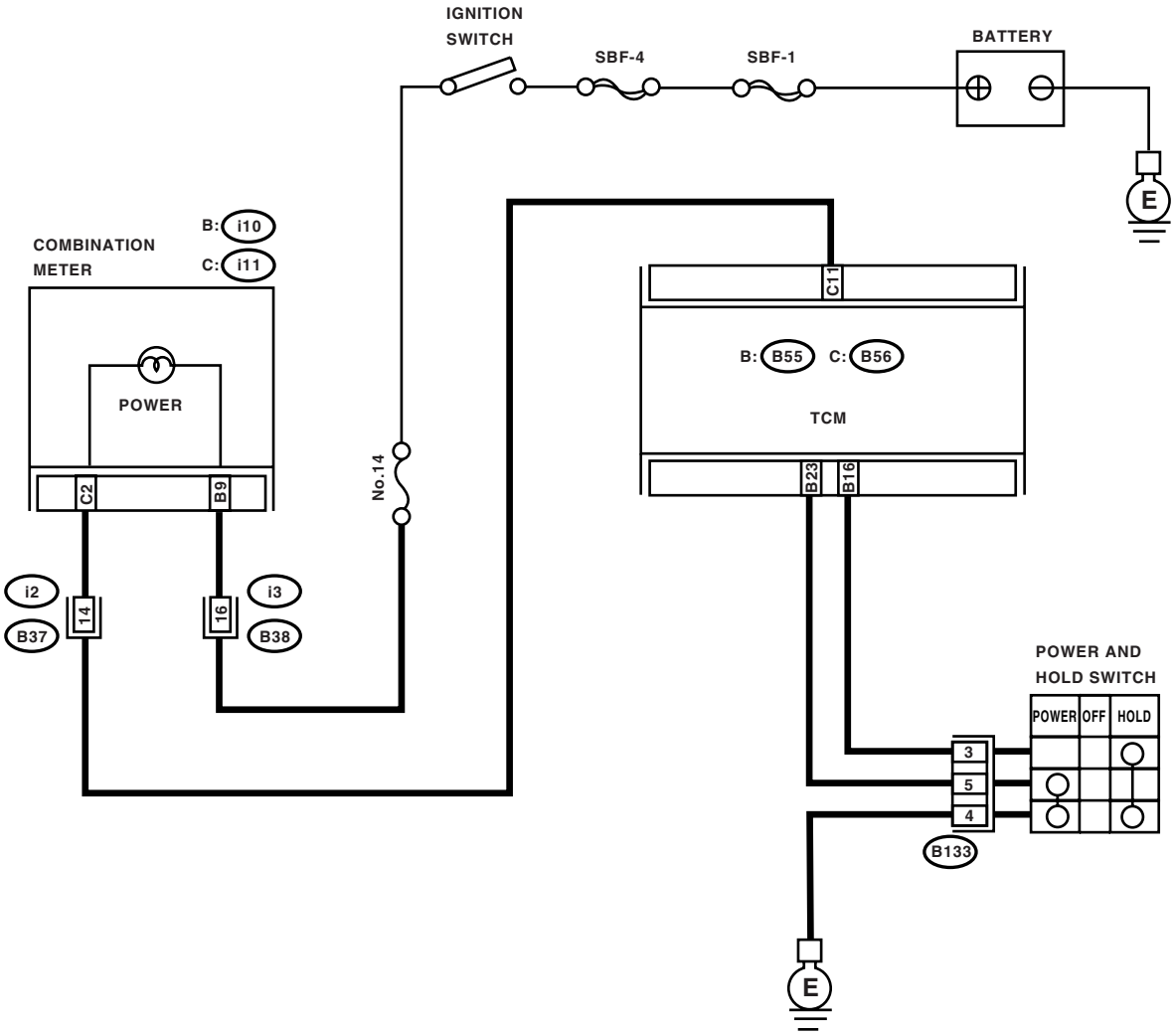
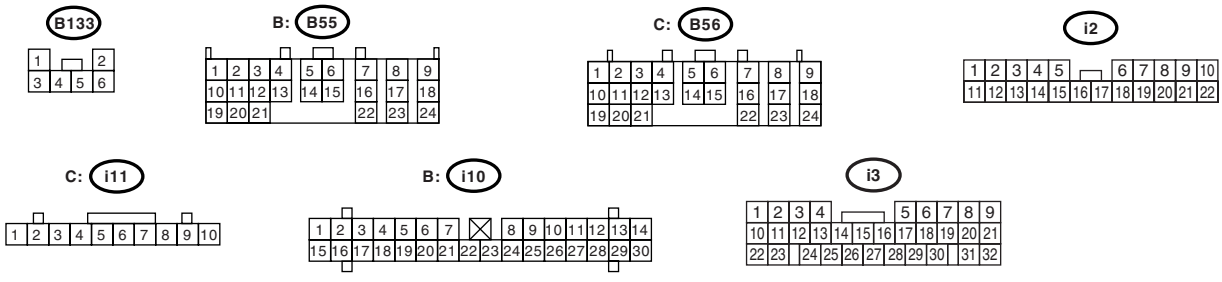
- RHD MODEL





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	Step	Check	Yes	No
1	**CHECK POWER SWITCH OPERATION.**	When the POWER switch is turned to OFF, does LED light up?	Go to step **5.**	Go to step **2.**
2	**CHECK POWER SWITCH OPERATION.**	When the POWER switch is turned to ON, does LED light up?	Go to step CHECK INHIBITOR SWITCH. <Ref. to 4AT(diag)-91, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK POWER INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the POWER indicator light bulb from combination meter.	Is the POWER indicator light bulb OK?	Go to step **4.**	Inspect the combination meter. <Ref. to IDI-10, Combination Meter.>
4	**CHECK POWER SWITCH GROUND LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from POWER switch. 3) Measure the resistance of harness connector between POWER switch and chassis ground. ***Connector & terminal*** ***LHD model*** ***(R92) No. 4 — Chassis ground:*** ***RHD model*** ***(B133) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between POWER switch and chassis ground.
5	**CHECK POWER SWITCH.** 1) Turn the POWER switch to ON. 2) Measure the resistance between terminals of POWER switch. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the POWER switch.
6	**CHECK POWER SWITCH.** 1) Turn the POWER switch to OFF. 2) Measure the resistance between terminals of POWER switch. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the POWER switch.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH.** Measure the resistance of harness connector between TCM and POWER switch. ***Connector & terminal*** ***(B55) No. 23 — (B133) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and POWER switch connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 23 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and POWER switch connector.

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and POWER switch. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the signal voltage for TCM while turning POWER switch to OFF. ***Connector & terminal*** ***(B55) No. 23 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
10	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while turning POWER switch to ON. ***Connector & terminal*** ***(B55) No. 23 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
11	**CHECK POOR CONTACT.**	Is there poor contact in POWER switch circuit?	Repair the poor contact.	A temporary poor contact of the connector or harness or connector in POWER switch circuit.

F: CHECK INHIBITOR SWITCH

DETECTING CONDITION:

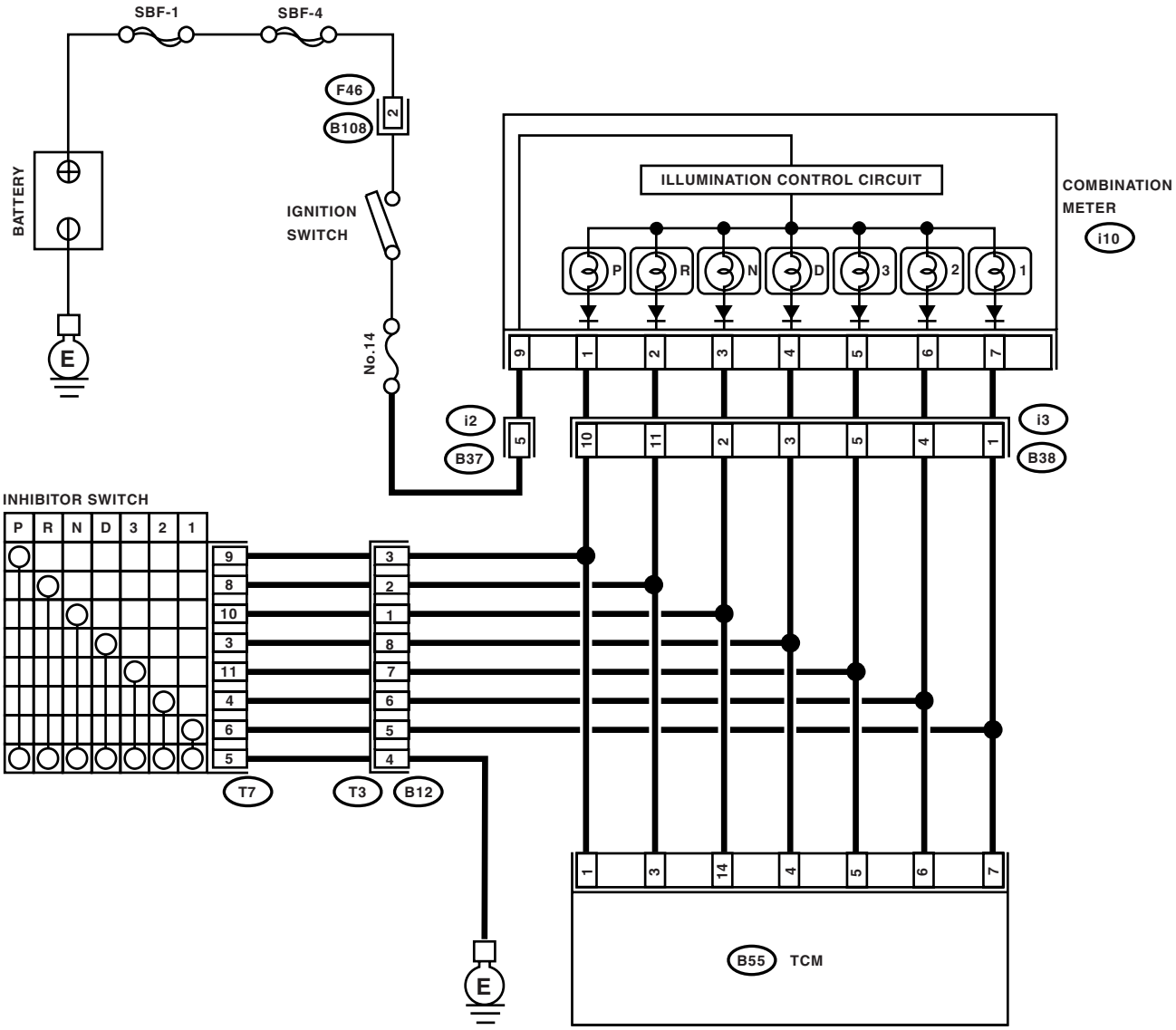
The input signal circuit of inhibitor switch is open or shorted.

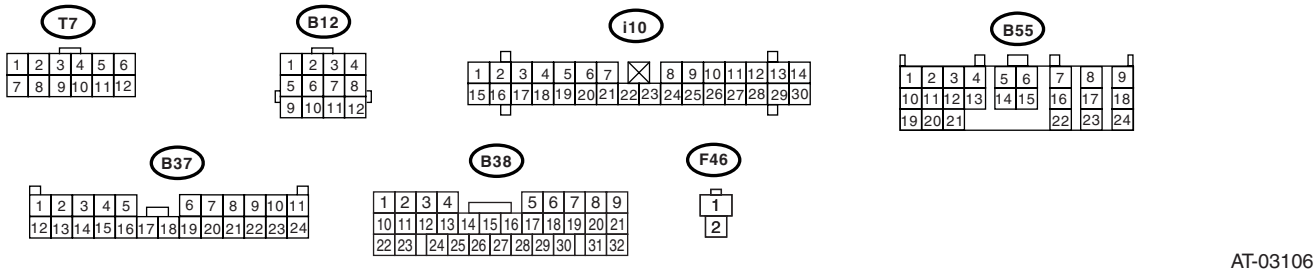
TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- Engine brake is not effected when selector lever is in “3” range.
- Engine brake is not effected when selector lever is in “2” range.
- Engine brake is not effected when selector lever is in “1” range.

WIRING DIAGRAM:

- LHD MODEL





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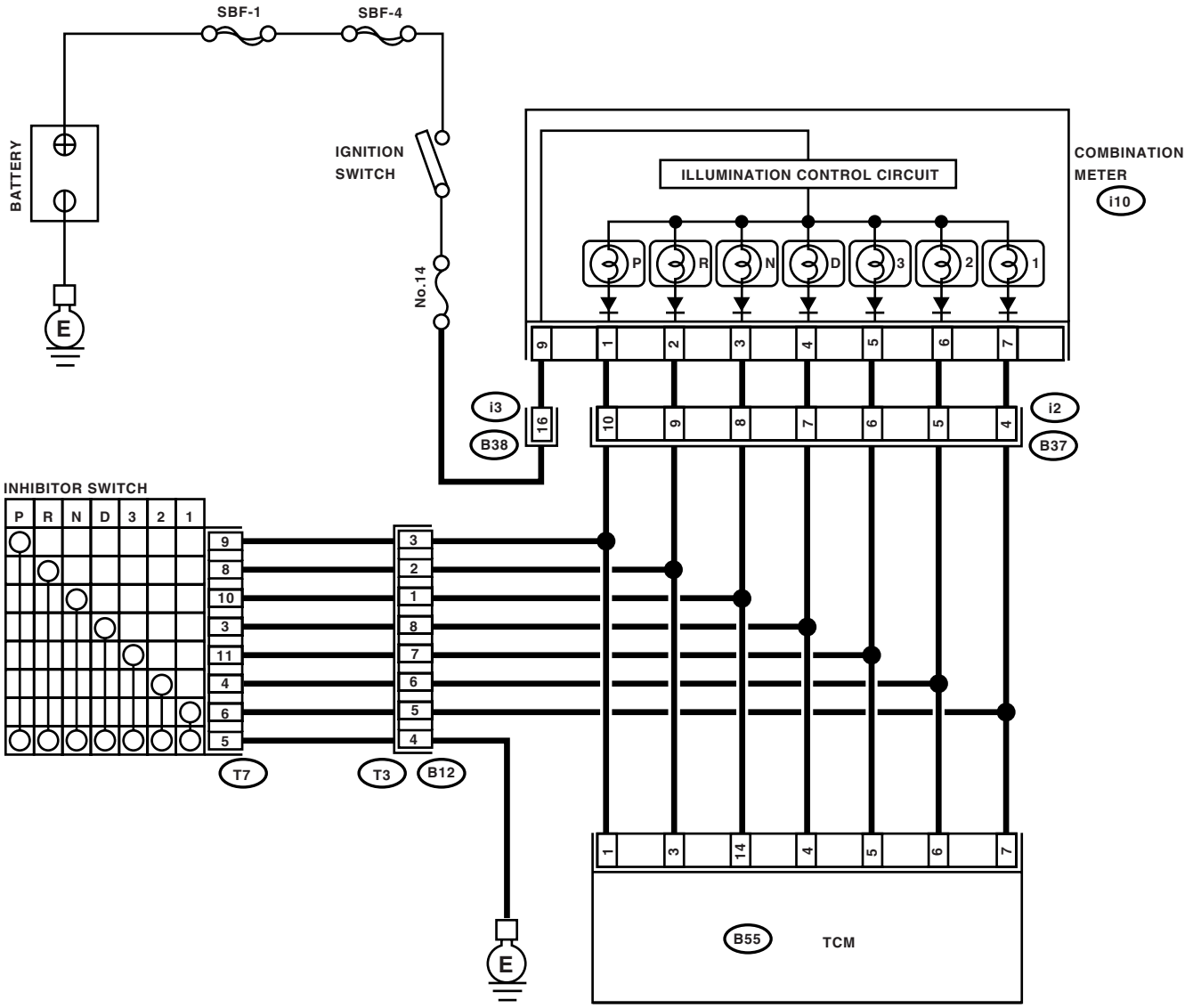
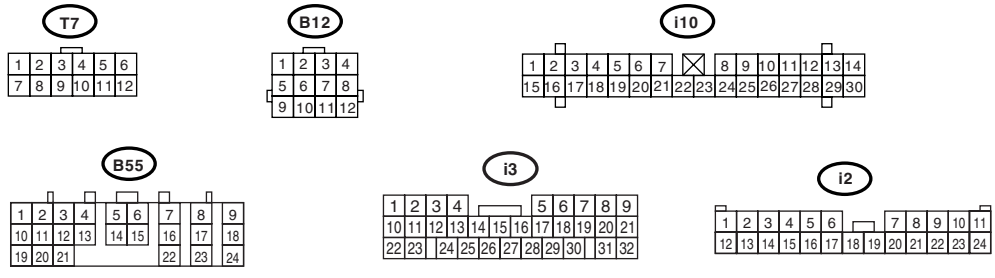
- RHD MODEL





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	Step	Check	Yes	No
1	**CHECK "P" RANGE SWITCH.**	When the "P" range is selected, does LED light up?	Go to step **2.**	Go to step **22.**
2	**CHECK INDICATOR LIGHT.**	Does the combination meter "P" range indicator illuminate?	Go to step **3.**	Go to step **26.**
3	**CHECK "P" RANGE SWITCH.**	When the "R" range is selected, does "P" range LED light up?	Go to step **28.**	Go to step **4.**
4	**CHECK "R" RANGE SWITCH.**	When the "R" range is selected, does LED light up?	Go to step **5.**	Go to step **29.**
5	**CHECK INDICATOR LIGHT.**	Does the combination meter "R" range indicator illuminate?	Go to step **6.**	Go to step **32.**
6	**CHECK "R" RANGE SWITCH.**	When the "N" range is selected, does "R" range LED light up?	Go to step **34.**	Go to step **7.**
7	**CHECK "N" RANGE SWITCH.**	When the "N" range is selected, does LED light up?	Go to step **8.**	Go to step **35.**
8	**CHECK INDICATOR LIGHT.**	Does the combination meter "N" range indicator illuminate?	Go to step **9.**	Go to step **38.**
9	**CHECK "N" RANGE SWITCH.**	When the "D" range is selected, does "N" range LED light up?	Go to step **40.**	Go to step **10.**
10	**CHECK "D" RANGE SWITCH.**	When the "D" range is selected, does LED light up?	Go to step **11.**	Go to step **41.**
11	**CHECK INDICATOR LIGHT.**	Does the combination meter "D" range indicator illuminate?	Go to step **12.**	Go to step **44.**
12	**CHECK "D" RANGE SWITCH.**	When the "3" range is selected, does "D" range LED light up?	Go to step **46.**	Go to step **13.**
13	**CHECK "3" RANGE SWITCH.**	When the "3" range is selected, does LED light up?	Go to step **14.**	Go to step **47.**
14	**CHECK INDICATOR LIGHT.**	Does the combination meter "3" range indicator illuminate?	Go to step **15.**	Go to step **50.**
15	**CHECK "3" RANGE SWITCH.**	When the "2" range is selected, does "3" range LED light up?	Go to step **52.**	Go to step **16.**
16	**CHECK "2" RANGE SWITCH.**	When the "2" range is selected, does LED light up?	Go to step **17.**	Go to step **53.**
17	**CHECK INDICATOR LIGHT.**	Does the combination meter "2" range indicator illuminate?	Go to step **18.**	Go to step **56.**
18	**CHECK "2" RANGE SWITCH.**	When the "1" range is selected, does "2" range LED light up?	Go to step **58.**	Go to step **19.**
19	**CHECK "1" RANGE SWITCH.**	When the "1" range is selected, does LED light up?	Go to step **20.**	Go to step **59.**
20	**CHECK INDICATOR LIGHT.**	Does the combination meter "1" range indicator illuminate?	Go to step **21.**	Go to step **62.**
21	**CHECK "1" RANGE SWITCH.**	When the "2" range is selected, does "1" range LED light UP?	Go to step **64.**	Go to step CHECK HOLD SWITCH. <Ref. to 4AT(diag)-102, CHECK HOLD SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>

	Step	Check	Yes	No
22	**CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between inhibitor switch and chassis ground. ***Connector & terminal*** ***(T7) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair the open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector.
23	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 1 — (T7) No. 9:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “P” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **25.**	Go to step **65.**
25	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than “P” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
26	**CHECK “P” RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “P” range indicator light bulb from combination meter.	Is the “P” range indicator light bulb OK?	Go to step **27.**	Replace the “P” range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
27	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 1 — (i10) No. 1:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in coupling connector.
28	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 1 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **29.**	Repair the ground short circuit in “P” range circuit.

	Step	Check	Yes	No
29	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 3 — (T7) No. 8:***	Is the resistance less than 1 Ω?	Go to step **30.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
30	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "R" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **31.**	Go to step **65.**
31	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "R" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
32	**CHECK "R" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "R" range indicator light bulb from combination meter.	Is "R" range indicator light bulb OK?	Go to step **33.**	Replace the "R" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
33	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 3 — (i10) No. 2:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
34	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **35.**	Repair the ground short circuit in "R" range circuit.
35	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 14 — (T7) No. 10:***	Is the resistance less than 1 Ω?	Go to step **36.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
36	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "N" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **37.**	Go to step **65.**
37	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "N" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
38	**CHECK "N" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "N" range indicator light bulb from combination meter.	Is the "N" range indicator light bulb OK?	Go to step **39.**	Replace the "N" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
39	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 14 — (i10) No. 3:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
40	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **41.**	Repair the ground short circuit in "N" range circuit.
41	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 4 — (T7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **42.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
42	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "D" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **43.**	Go to step **65.**

	Step	Check	Yes	No
43	**CHECK INPUT SIGNAL FOR TCM.** 1) Position select lever to any other than "D" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
44	**CHECK "D" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "D" range indicator light bulb from combination meter.	Is the "D" range indicator light bulb OK?	Go to step **45.**	Replace the "D" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
45	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 4 — (i10) No. 11:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and TCM connector.
46	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **47.**	Repair the ground short circuit in "D" range circuit.
47	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 5 — (T7) No. 11:***	Is the resistance less than 1 Ω?	Go to step **48.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
48	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "3" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **49.**	Go to step **65.**
49	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "3" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
50	**CHECK "3" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "3" range indicator light bulb from combination meter.	Is the "3" range indicator light bulb OK?	Go to step **51.**	Replace the "3" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
51	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 5 — (i10) No. 5:***	Is the resistance more than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.
52	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **53.**	Repair the ground short circuit in "3" range circuit.
53	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 6 — (T7) No. 4:***	Is the resistance less than 1 Ω?	Go to step **54.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "2" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 6 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **55.**	Go to step **65.**
55	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "2" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
56	**CHECK "2" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "2" range indicator light bulb from combination meter.	Is the "2" range indicator light bulb OK?	Go to step **57.**	Replace the "2" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>

	Step	Check	Yes	No
57	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 6 — (i10) No. 6:***	Is the resistance less than 1 Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in TCM connector.
58	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **59.**	Repair the ground short circuit in "2" range circuit.
59	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 7 — (T7) No. 6:***	Is the resistance less than 1 Ω?	Go to step **60.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
60	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "1" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **61.**	Go to step **65.**
61	**CHECK INPUT SIGNAL FOR TCM.** 1) Position the select lever to any other than "1" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **65.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
62	**CHECK "1" RANGE INDICATOR LIGHT BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "1" range indicator light bulb from combination meter.	Is the "1" range indicator light bulb OK?	Go to step **63.**	Replace the "1" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
63	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B55) No. 7 — (i10) No. 7:***	Is the resistance less than 1Ω?	Go to step **65.**	Repair the open circuit in harness between TCM and combination meter, poor contact in TCM connector.

	Step	Check	Yes	No
64	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **65.**	Repair the ground short circuit in "1" range circuit.
65	**CHECK POOR CONTACT.**	Is there poor contact in inhibitor switch circuit?	Repair the poor contact.	Go to step **66.**
66	**INSPECT INHIBITOR SWITCH.**	Is the inhibitor switch position in normal position?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Adjust the inhibitor switch and select cable. <Ref. to 4AT-56, ADJUSTMENT, Inhibitor Switch.> <Ref. to CS-31, Select Cable.>

G: CHECK HOLD SWITCH

DETECTING CONDITION:

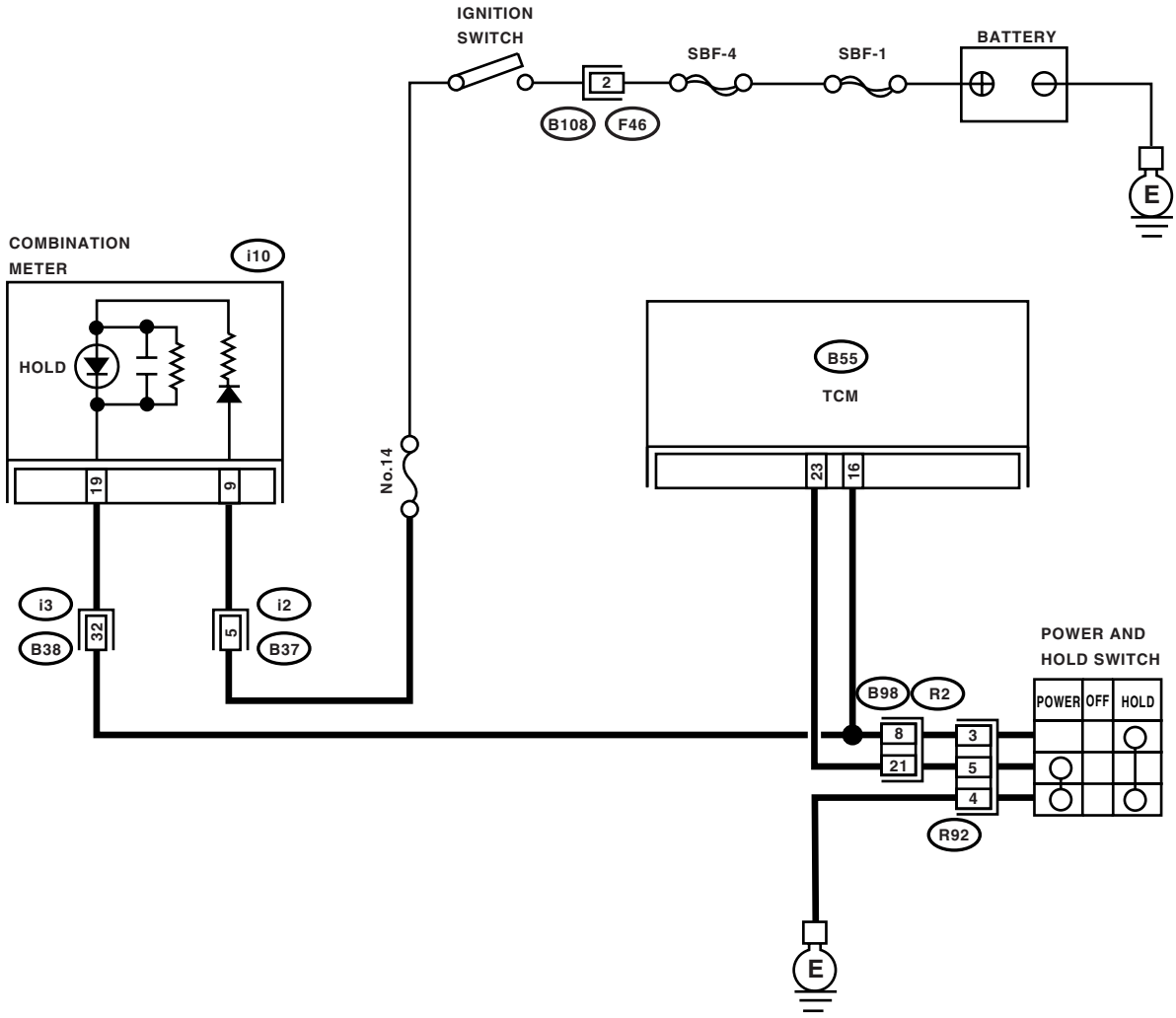
- The LED does not come on when HOLD switch is ON.
- The HOLD switch circuit is open or shorted.

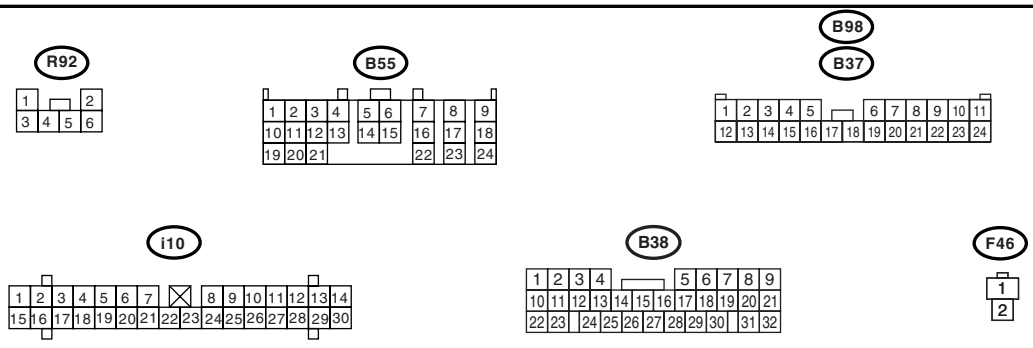
TROUBLE SYMPTOM:

- The 2nd gear is not held.
- Failure of vehicle to start in 2nd gear at “2”, “3”, “D” ranges.

WIRING DIAGRAM:

- LHD MODEL





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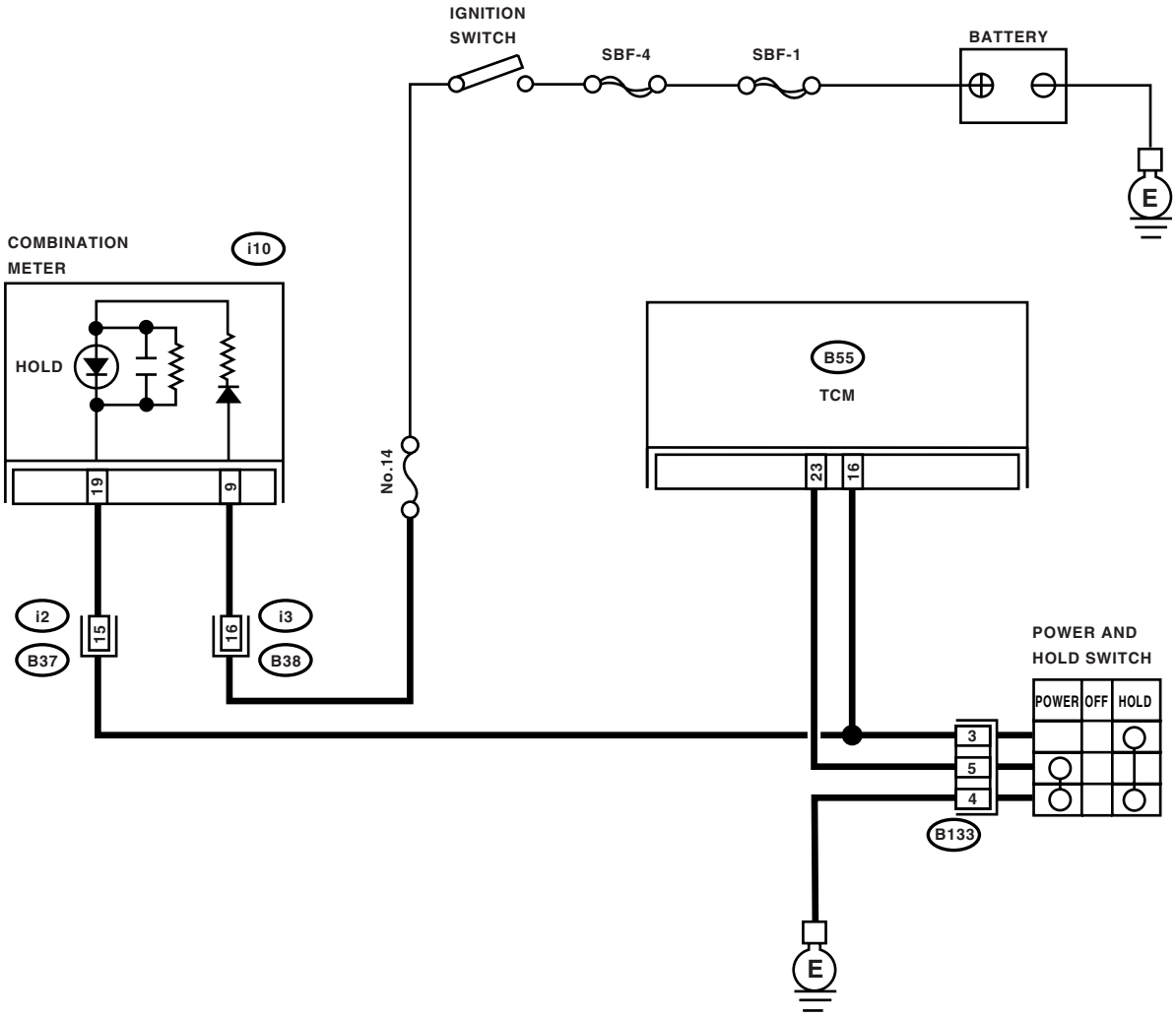
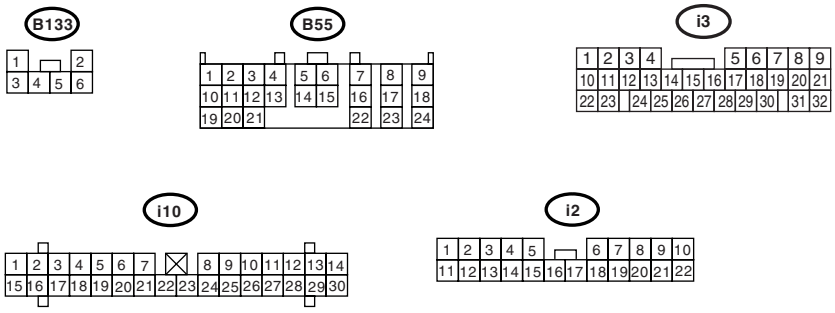
- RHD MODEL





AT-03109

	Step	Check	Yes	No
1	**CHECK HOLD SWITCH OPERATION.**	When the HOLD switch is turned to OFF, does LED light up?	Go to step **5.**	Go to step **2.**
2	**CHECK HOLD SWITCH OPERATION.**	When the HOLD switch is turned to ON, does LED light up?	Refer to "Symptom Related Diagnostic". <Ref. to 4AT(diag)-106, General Diagnostic Table.>	Go to step **3.**
3	**CHECK HOLD INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Turn the ignition switch to ON. 4) Short the combination meter connector to chassis ground. **CAUTION:** **Be sure to short through fuse.** ***Connector & terminal*** ***(i10) No. 19 — Chassis ground:***	Does the HOLD indicator light illuminate?	Go to step **4.**	Inspect the combination meter. <Ref. to IDI-10, Combination Meter.>
4	**CHECK HOLD SWITCH GROUND LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from HOLD switch. 3) Measure the resistance of harness connector between HOLD switch and chassis ground. ***Connector & terminal*** ***LHD model*** ***(R92) No. 4 — Chassis ground:*** ***RHD model*** ***(B133) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between HOLD switch and chassis ground.
5	**CHECK HOLD SWITCH.** 1) Turn the HOLD switch to ON. 2) Measure the resistance between terminals of HOLD switch. ***Terminals*** ***No. 4 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **6.**	Replace the HOLD switch.
6	**CHECK HOLD SWITCH.** 1) Turn the HOLD switch to OFF. 2) Measure the resistance between terminals of HOLD switch. ***Terminals*** ***No. 4 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Replace the HOLD switch.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH.** 1) Disconnect the connector TCM and combination meter. 2) Measure the resistance of harness connector between TCM and HOLD switch. ***Connector & terminal*** ***LHD model*** ***(B55) No. 16 — (R92) No. 2:*** ***RHD model*** ***(B55) No. 16 — (B133) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and HOLD switch connector and poor contact in coupling connector.

	Step	Check	Yes	No
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector TCM and combination meter. ***Connector & terminal*** ***(B55) No. 16 — (i10) No. 19:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***(B55) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the short circuit in harness between TCM and HOLD switch connector.
10	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and HOLD switch. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the signal voltage for TCM while turning HOLD switch to OFF. ***Connector & terminal*** ***(B55) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **11.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
11	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while turning HOLD switch to ON. ***Connector & terminal*** ***(B55) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **12.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
12	**CHECK POOR CONTACT.**	Is there poor contact in HOLD switch circuit?	Repair the poor contact.	A temporary poor contact of the connector or harness or connector in HOLD switch circuit.

16.General Diagnostic Table

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N” range; starter rotates when select lever is in “R”, “D”, “3” or “2” range.	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Noise when select lever is in “P” or “N” range.	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in “D1”.	• Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	• Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from “1” range to another.	• Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in “N” range.	• Low clutch
Shock occurs when select lever is moved from “N” to “D” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “D” range.	• Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Shock occurs when select lever is moved from “N” to “R” range.	• TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from “N” to “R” range.	• Control valve • Low & reverse clutch • Reverse clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Vehicle does not start in any shift range (engine stalls).	• Parking brake mechanism • Planetary gear

Symptom	Problem parts
Vehicle does not start in any shift range (engine revving up).	• Strainer • Line pressure duty solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket transmission case
Vehicle does not start in “R” range only (engine revving up).	• Select cable • Select lever • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in “D”, “3” range only (engine revving up).	• Low clutch • One-way clutch
Vehicle does not start in “D”, “3” or “2” range only (engine revving up).	• Low clutch
Vehicle does not start in “D”, “3” or “2” range only (engine stalls).	• Reverse clutch
Vehicle starts in “R” range only (engine revving up).	• Control valve
Acceleration during standing starts is poor (high stall rpm).	• Control valve • Low clutch • Reverse clutch • ATF level too low • Front gasket transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	• Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	• Control valve • High clutch • 2-4 brake • Planetary gear
No shift occurs from 1st to 2nd gear.	• TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Shift solenoid 1 • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	• TCM • Control valve • High clutch • Shift solenoid 2

General Diagnostic Table

Symptom	Problem parts
No shift occurs from 3rd to 4th gear.	• TCM • Shift solenoid 1 • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in “3” range.	• Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in “3” or “2” range.	• Control valve
Engine brake is not effected when select lever is in “1” range.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	• TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	• Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	• ATF level too high
Differential oil spurts out.	• Differential gear oil too high
Differential oil level changes excessively.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 1st to 2nd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid • High clutch

Symptom	Problem parts
Shock occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 2nd to 3rd gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • 2-4 brake timing solenoid
Shock occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake timing solenoid • 2-4 brake • ATF deterioration • Engine performance • Low clutch timing solenoid • Low clutch
Slippage occurs from 3rd to 4th gear.	• TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “3” to “2” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • 2-4 brake timing solenoid
Shock occurs when select lever is moved from “D” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid

Symptom	Problem parts
Shock occurs when select lever is moved from “2” to “1” range.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Shock occurs when accelerator pedal is released at medium speeds.	• TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Lock-up damper • Engine performance • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Vibration occurs during straight-forward operation.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper • HOLD switch
Vibration occurs during turns (tight corner “braking” phenomenon).	• TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness • HOLD switch
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • FWD switch • Throttle position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	• TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detente spring • Manual plate
Select lever is too hard to move (unreasonable resistance).	• Detente spring • Manual plate

Symptom	Problem parts
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detente spring • Manual plate

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4AT(D)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
This section is specified for turbo model.

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how trouble occurred using interview checklist. <Ref. to 4AT(D)(diag)-4, Check List for Interview.> 2) Before performing the diagnostic, inspect following items which might influence the AT problems. • General inspection <Ref. to 4AT(D)(diag)-5, INSPECTION, General Description.> • Disconnection of harness connector • Visually check the damage of harness • Oil leak • Stall speed test <Ref. to 4AT-37, Stall Test.> • Line pressure test <Ref. to 4AT-40, Line Pressure Test.> • Transfer clutch pressure test <Ref. to 4AT-42, Transfer Clutch Pressure Test.> • Time lag test <Ref. to 4AT-39, Time Lag Test.> • Road test <Ref. to 4AT-36, Road Test.> • Inhibitor switch <Ref. to 4AT-55, Inhibitor Switch.>	Is the unit that might influence AT problem normal?	Go to step **2.**	Repair or replace each item.
2	**CHECK POWER INDICATOR LIGHT.** Turn the ignition switch to ON.	Does the POWER indicator light illuminate?	Go to step **4.**	Go to step **3.**
3	**CHECK POWER INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Repair the POWER indicator light circuit or power supply and ground line circuit. <Ref. to 4AT(D)(diag)-23, INSPECTION, Power Indicator Light Display.> 3) Turn the ignition switch to ON.	Is the POWER indicator light flashing?	Go to step **4.**	Go to step **5.**
4	**READ OF DTC.** Calling up the DTC. NOTE: If the communication function of Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(D)(diag)-27, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.>	Is the DTC displayed?	Go to step **6.** NOTE: Record all DTC.	Go to step **5.**
5	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “Diagnostics Procedure without DTC”. <Ref. to 4AT(D)(diag)-104, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect using “Symptom Related Diagnostic”. <Ref. to 4AT(D)(diag)-118, General Diagnostic Table.> 3) Perform the clear memory mode. 4) Perform the inspection mode. <Ref. to 4AT(D)(diag)-20, Inspection Mode.> 5) Calling up the DTC.	Is the DTC displayed?	Go to step **6.**	Complete the diagnostic.

	Step	Check	Yes	No
6	**PERFORM THE DIAGNOSTIC.** 1) Inspect using “Diagnostics Procedure with DTC”. <Ref. to 4AT(D)(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For DTC table, refer to “List of DTC”. <Ref. to 4AT(D)(diag)-31, List of Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the clear memory mode. 4) Perform the inspection mode. <Ref. to 4AT(D)(diag)-20, Inspection Mode.> 5) Calling up the DTC.	Is DTC displayed?	Inspect using “Diagnostics procedure with Diagnostic Trouble code (DTC)”. <Ref. to 4AT(D)(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnostic.

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:
- Use copies of this page for interviewing customers.
- This section is specified for turbo model.

Customer's name			
Date of purchase			
Date of repair			
Trans. model	TRANSMISSION	VIN	
Odometer reading	km/h or miles		
Frequency	❑ Continuous ❑ Intermittent (times a day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others ( )		
Place	❑ High ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Rough road ❑ Others ( )		
Outdoor temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
AT warning light (POWER indicator light)	❑ Continuously blinking	❑ Not blinking	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ 3 ❑ 2 ❑ 1		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH / ❑ LH)	❑ While idling ❑ While cruising
POWER switch	❑ ON / ❑ OFF		
HOLD switch	❑ ON / ❑ OFF		
Symptoms	❑ No up-shift		
	❑ No down-shift		
	❑ No kick down		
	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Lock-up malfunction		
	❑ Noise or vibration		
	❑ Shift shock or slip		
	❑ Select lever does not move		
	❑ Others ( )		

3. General Description

A: CAUTION

• Supplemental Restraint System "Airbag"

The airbag system wiring harness is routed near the TCM.

CAUTION:

• All airbag system wiring harness and connectors are colored yellow. Do not use an electrical test equipment on these circuit.

• Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.

• Measurement

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 0.65 mm (0.026 in).

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V or more

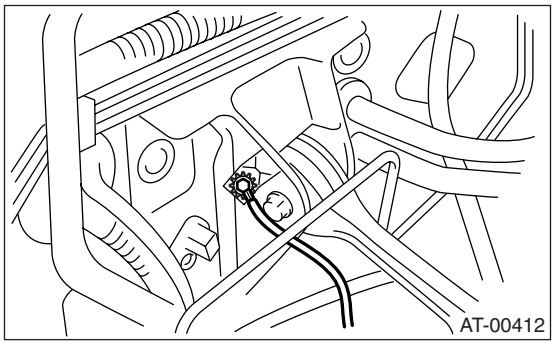
Specific gravity:
Above 1.260

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

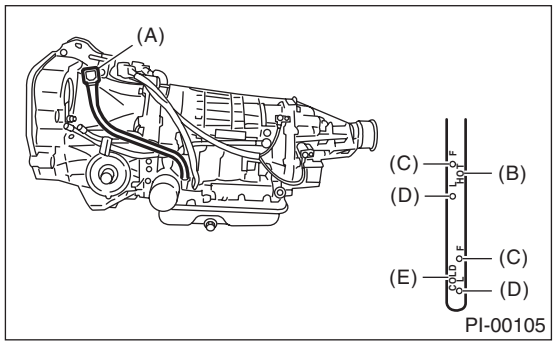
• Chassis side

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



3. ATF LEVEL

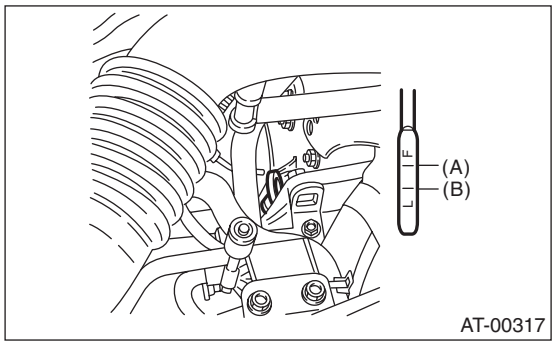
Make sure that ATF level is in the specification. **<Ref. to 4AT-32,** INSPECTION**, Automatic Transmission Fluid.>**



(A) Level gauge
(B) "HOT" side
(C) Upper level
(D) Lower level
(E) "COLD" side

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification. **<Ref. to 4AT-35,** INSPECTION, Differential Gear Oil.>

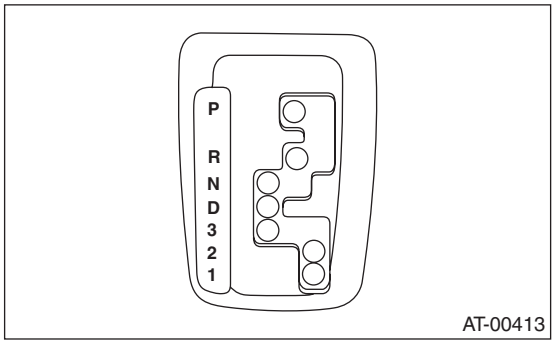


(A) Upper level
(B) Lower level

5. OPERATION OF SELECT LEVER

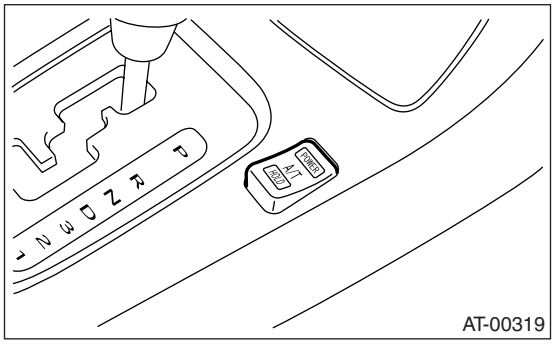
Make sure there is no noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of select lever.



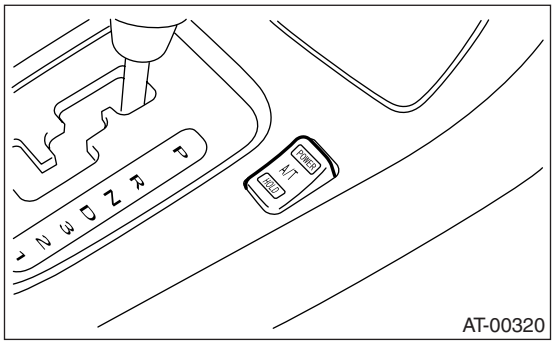
6. POWER SWITCH

Make sure that the POWER indicator light in combination meter comes on, when turning the POWER switch to ON.



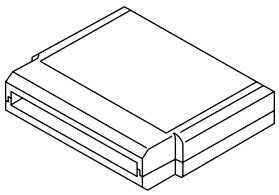
7. HOLD SWITCH

Make sure that the HOLD indicator light in combination meter comes on, when turning the HOLD switch to ON.



C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring sensor.

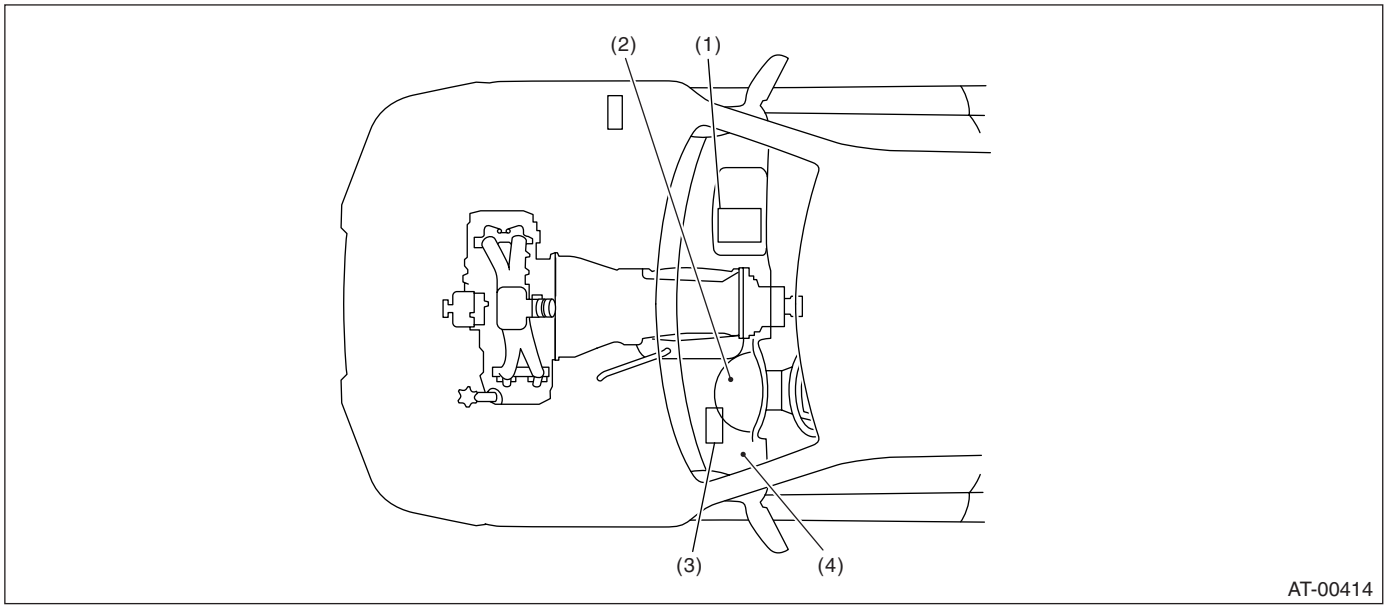
4. Electrical Component Location

A: LOCATION

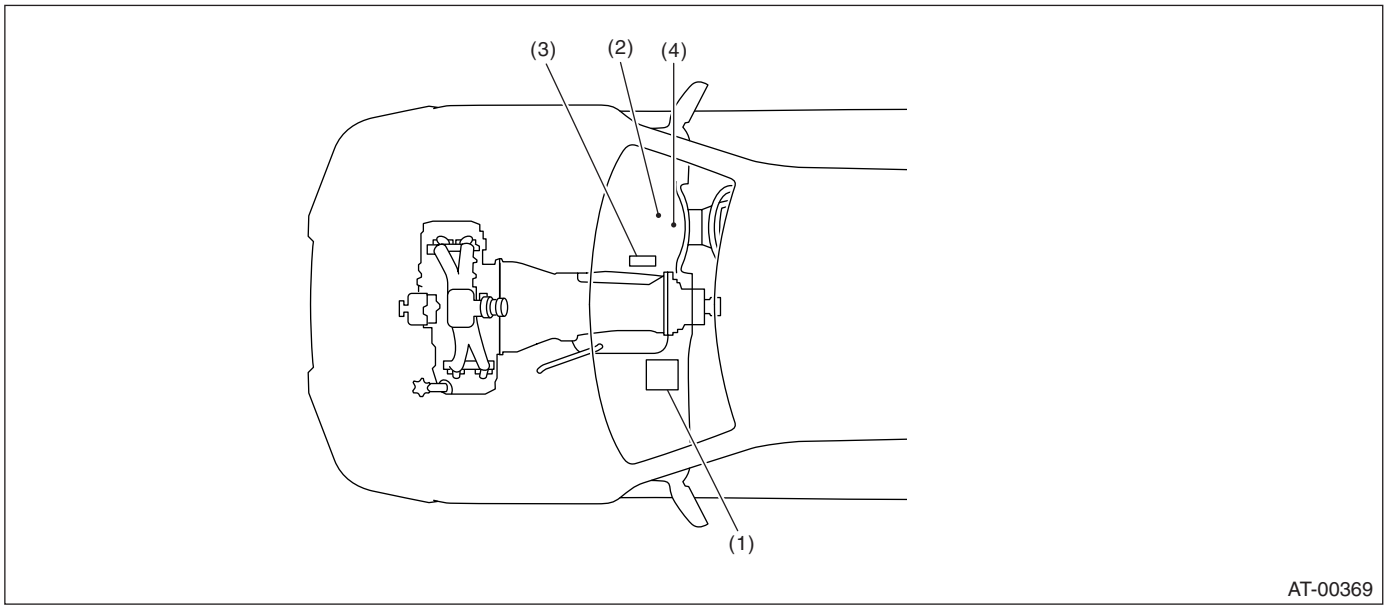
NOTE:
This section is specified for turbo model.

1. CONTROL MODULE

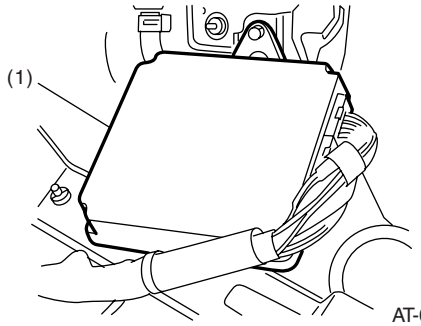
- LHD MODEL



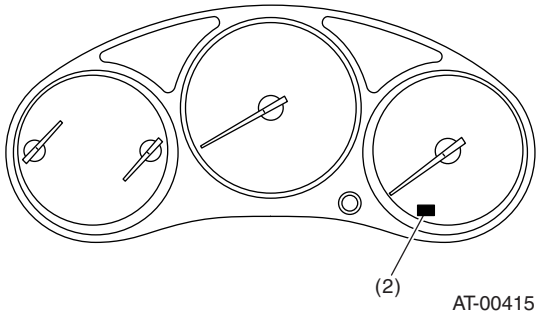
- RHD MODEL



(1) Engine control module (ECM)
(2) AT diagnostic warning light (POWER indicator light)
(3) Transmission control module (TCM)
(4) Data link connector

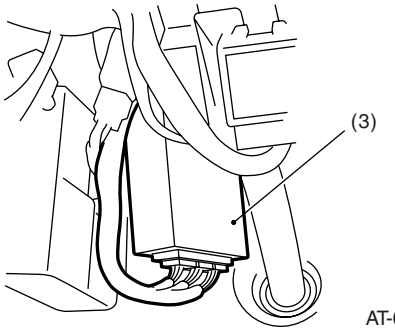


AT-00323



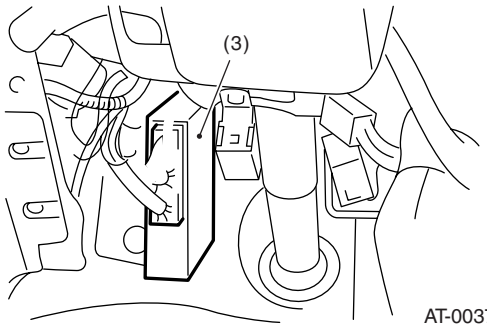
AT-00415

LHD

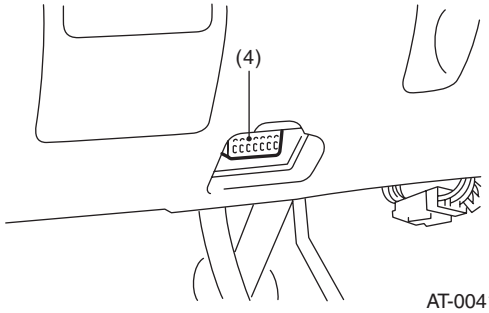


AT-01357

RHD

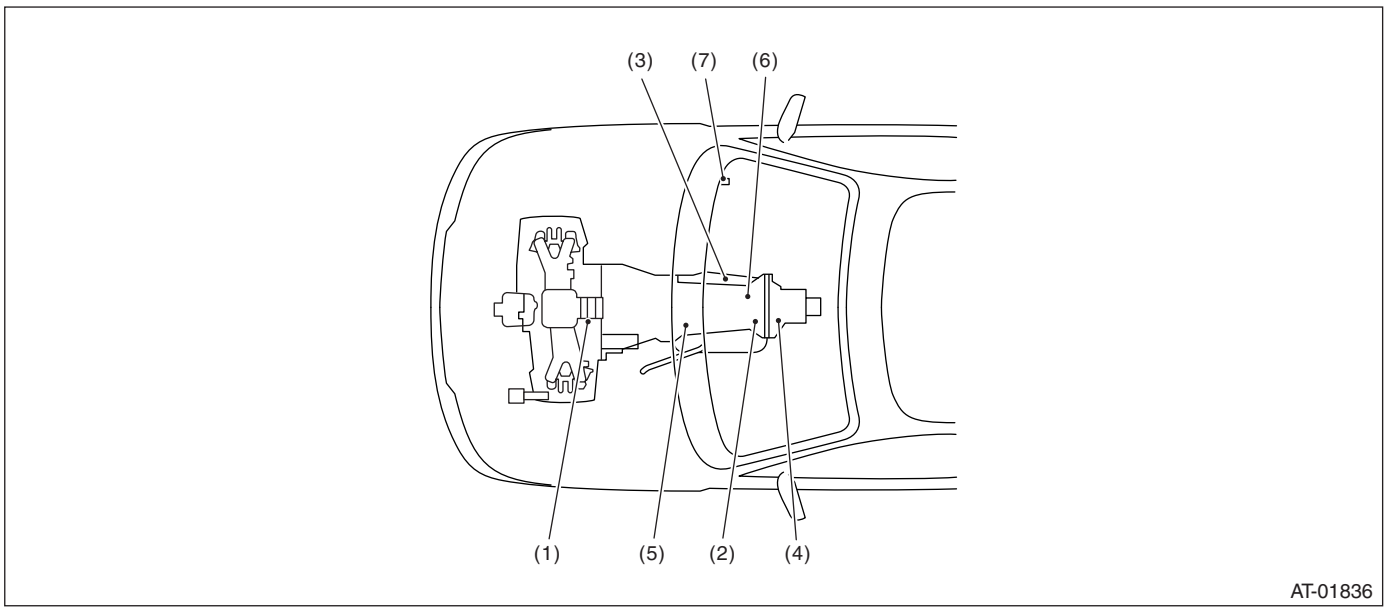


AT-00372

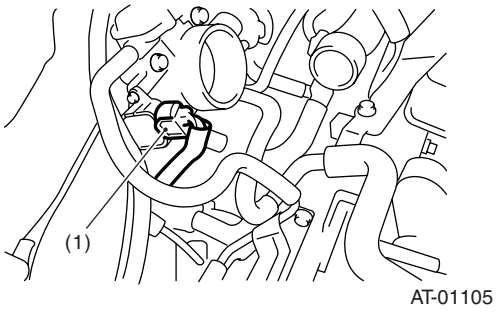


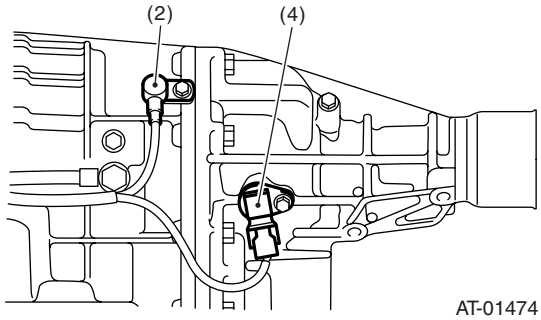
AT-00417

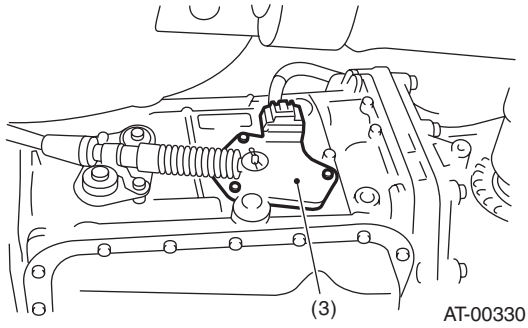
2. SENSOR

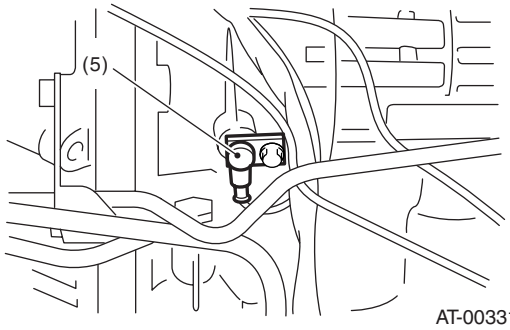


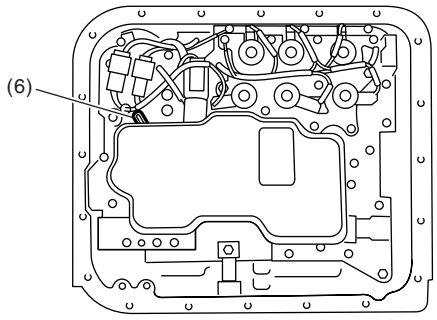
(1) Throttle position sensor (2.0 L model)
(2) Front vehicle speed sensor
(3) Inhibitor switch
(4) Rear vehicle speed sensor
(5) Torque converter turbine speed sensor
(6) ATF temperature sensor
(7) Accelerator pedal position sensor (2.5 L model)



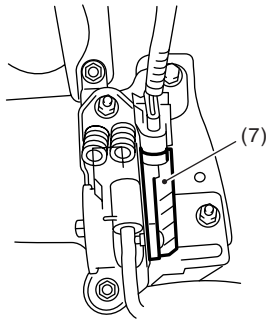






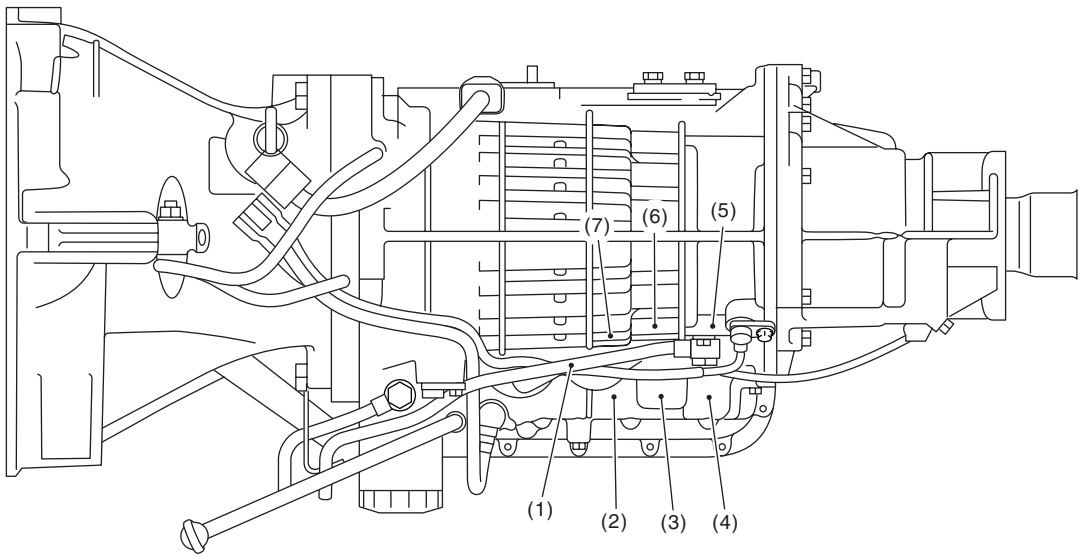


AT-00378



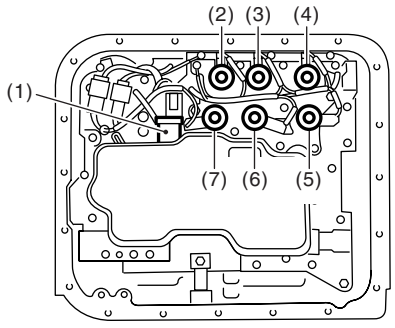
AT-01837

3. SOLENOID



AT-00379

(1) Line pressure linear solenoid
(2) High clutch duty solenoid
(3) 2-4 brake duty solenoid
(4) Low clutch duty solenoid
(5) Low & reverse duty solenoid
(6) Transfer duty solenoid
(7) Lock-up duty solenoid

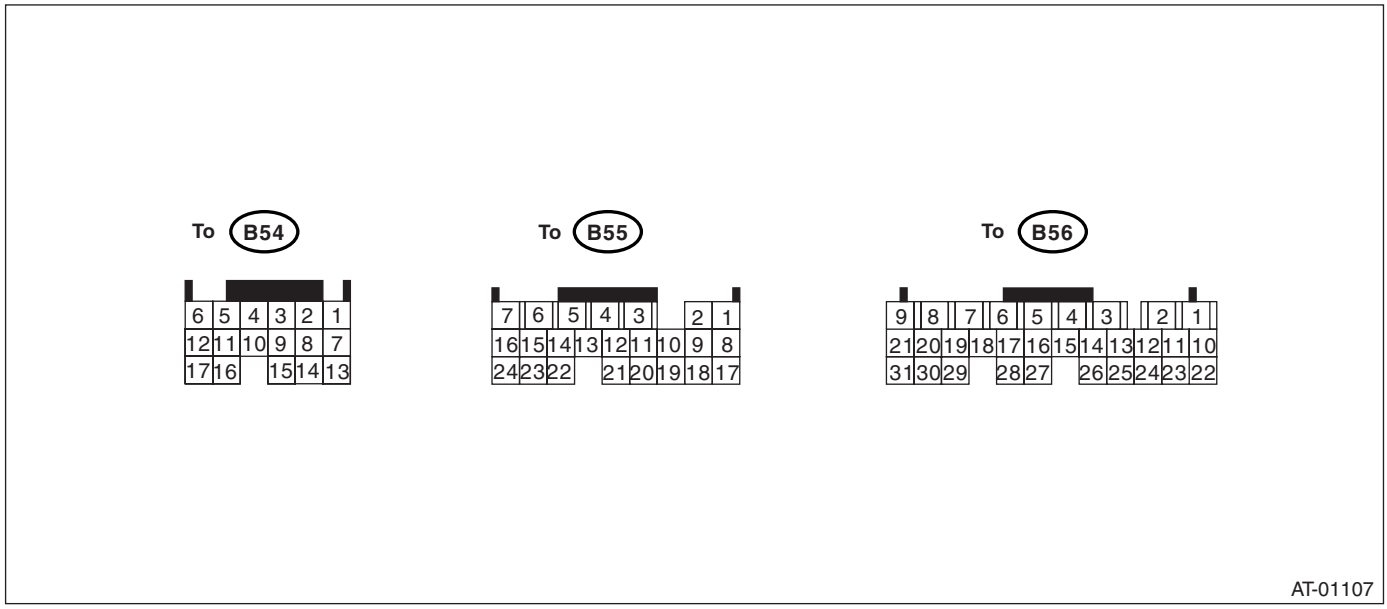


AT-00380

5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

NOTE:
This section is specified for turbo model.



Check with ignition switch ON.					
Item	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Back-up power supply	B56	27	Ignition switch OFF	10 — 13	—
		28			
		29			
ACC power supply	B56	16	Ignition switch ACC	10 — 13	—
Ignition power supply	B56	21	Ignition switch ON (with engine OFF)	10 — 13	—
	B56	31			

Check with ignition switch ON.						
Item		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Inhibitor switch	"P" range switch	B55	5	Select lever in "P" range	Less than 1	—
				Select lever in any other than "P" range (except "N" range)	More than 8	
	"N" range switch	B55	22	Select lever in "N" range	Less than 1	—
				Select lever in any other than "N" range	More than 8	
	"R" range switch	B55	14	Select lever in "R" range	Less than 1	—
				Select lever in any other than "R" range	More than 8	
	"D" range switch	B55	4	Select lever in "D" range	Less than 1	—
				Select lever in any other than "D" range	More than 8	
	"3" range switch	B54	16	Select lever in "3" range	Less than 1	—
				Select lever in any other than "3" range	More than 8	
	"2" range switch	B54	4	Select lever in "2" range	Less than 1	—
				Select lever in any other than "2" range	More than 8	
	"1" range switch	B54	10	Select lever in "1" range	Less than 1	—
				Select lever in any other than "1" range	More than 8	
Brake switch		B55	20	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	
Accelerator pedal position sensor (2.5 L model)		B55	19	Throttle fully closed.	More than 0.2	—
Throttle position sensor (2.0 L model)				Throttle fully open.	Less than 4.6	
Accelerator pedal position sensor power supply (2.5 L model)		B55	10	Ignition switch ON (with engine OFF)	Approx. 5	—
Throttle position sensor power supply (2.0 L model)						
ATF temperature sensor		B55	21	ATF temperature 20°C (68°F)	3.5 — 4.3	2.3 k — 5.3 k
				ATF temperature 80°C (176°F)	1.0 — 2.2	300 — 800
Rear vehicle speed sensor		B55	24	Vehicle speed at least 20 km/h (12 MPH)	More than 2 (AC range)	—
Front vehicle speed sensor		B55	6	Vehicle stopped.	0	450 — 750
				Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor		B55	7	Engine idling after warm-up. ("D" range)	0	450 — 650
				Engine idling after warm-up. ("N" range)	More than 1 (AC range)	
Vehicle speed output signal		B56	1	Vehicle speed at least 10 km/h (6 MPH)	Less than 1← →More than 4	—
Engine speed signal		B55	13	Ignition switch ON (with engine OFF)	Less than 1	—
				Ignition switch ON (with engine ON)	More than 5 (AC range)	

Check with ignition switch ON.					
Item	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
Line pressure linear solenoid	B56	20	Ignition switch ON (with engine OFF) “R” range and throttle fully closed after warm-up.	3.7 — 7.7	4.0 — 8.0
			Ignition switch ON (with engine OFF) “R” range and throttle fully open after warm-up.	1.1 — 5.1	
Lock-up duty solenoid	B56	5	When lock up occurs.	More than 10.5	2.0 — 4.5
			When lock up is released.	Less than 1	
Transfer duty solenoid	B56	4	“P” or “N” range	Less than 1	2.0 — 4.5
			Throttle fully open and with select lever in 1st gear.	More than 10.5	
2-4 brake duty solenoid	B56	6	“P” or “N” range	More than 10.5	2.0 — 4.5
			2nd or 4th gear	Less than 1	
High clutch duty solenoid	B56	8	3rd or 4th gear	Less than 1	2.0 — 4.5
			“P” or “N” range	More than 10.5	
Low clutch duty solenoid	B56	9	1st or 2nd gear	Less than 1	2.0 — 4.5
			“P” or “N” range	More than 10.5	
Low & reverse duty solenoid	B56	7	“P” or “N” range	More than 10.5	2.0 — 4.5
			“1” range	More than 5	
HOLD switch	B54	2	HOLD switch ON	Less than 1.5	—
			HOLD switch OFF	More than 6.0	
POWER switch	B54	8	POWER switch ON	Less than 1	—
			POWER switch OFF	More than 8	
POWER indicator light	B56	25	Light ON	Less than 1	—
			Light OFF	More than 8	
Front vehicle speed sensor ground	B55	15	—	0	Less than 1
Rear vehicle speed sensor ground	B55	23	—	0	Less than 1
Torque converter turbine speed sensor ground	B55	16	—	—	Less than 1
Combination meter	B54	6	Ignition switch ON	Pulse signal	—
System ground line	B55	17	—	0	Less than 1
	B56	2			
	B56	3			
	B55	8			
Sensor ground line 3	B55	9	—	0	Less than 1
Sensor ground line 4	B56	19	—	0	Less than 1
Range lock signal	B56	18	“D” range 0 km/h (0 MPH)	More than 10.5	20 — 40
			“D” range 20 km/h (12 MPH)	Less than 1	
Data link signal (Subaru Select Monitor)	B56	12	—	—	—
CAN communication signal (+)	B55	3	Ignition switch ON	Pulse signal	—
CAN communication signal (–)	B55	12	Ignition switch ON	Pulse signal	—
FWD switch (Except for model with VDC)	B56	17	Fuse removed	10.5 or more	—
			Fuse installed	1 or less	

Check with ignition switch ON.					
Item	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to chassis ground (Ω)
AWD indicator light	B56	14	Ignition switch ON (engine OFF)	Less than 1	—
			Ignition switch ON (engine ON, FWD fuse removed)	9 or more	
Kick down switch	B54	11	Kick down switch ON	Less than 1	—
			Kick down switch OFF	More than 8	

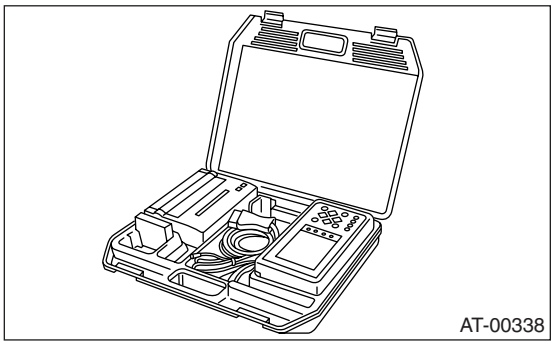
6. Subaru Select Monitor

A: OPERATION

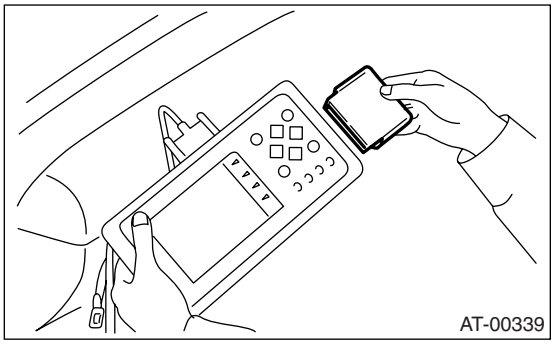
NOTE:
This section is specified for turbo model.

1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare the Subaru Select Monitor kit.

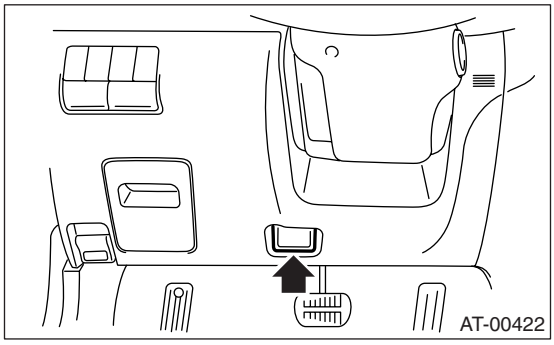


2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. **<Ref. to 4AT(D)(diag)-7,** PREPARATION TOOL**, General Description.>**



4) Connect the Subaru Select Monitor to data link connector.

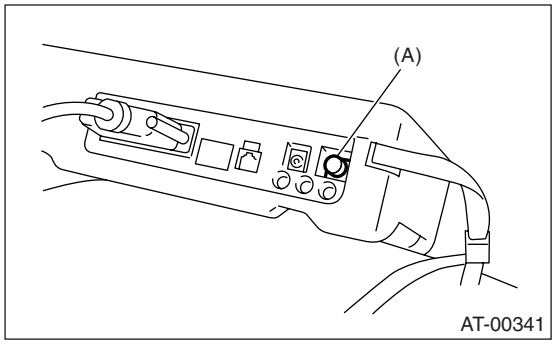
(1) Data link connector located in the lower portion of instrument panel (on driver's side).



(2) Connect the diagnostic cable to data link connector.

NOTE:
Do not connect scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) POWER switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
8) Press the [YES] key after the information of transmission type is displayed.
9) On the «Transmission Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press the [YES] key.

NOTE:
• For details concerning operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning the DTC, refer to the DTC LIST. **<Ref. to 4AT(D)(diag)-31, List of Diagnostic Trouble Code (DTC).>**

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
5) On the «Transmission Diagnosis» display screen, select the {Data Display} and press the [YES] key.

6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
ATF temperature signal	ATF Temp.	°C or °F
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Low clutch duty ratio	L/C Duty	%
High clutch duty ratio	H/C Duty	%
Low & reverse brake duty ratio	L&R/B Duty	%
Accelerator pedal position	Accel. Opening Angle	%
Cruise control system	Cruise Control Signal	ON or OFF
Automatic transmission fluid temperature light	ATF Temperature Lamp	ON or OFF
Stop light switch signal	Stop Light Switch	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
AT diagnostic indicator light	Diagnosis Lamp	ON or OFF
POWER switch signal	POWER Switch	ON or OFF
HOLD switch signal	HOLD Switch	ON or OFF
FWD switch signal	FWD SW	ON or OFF
Shift lock solenoid signal	Shift Lock solenoid	ON or OFF
Kick down switch	Kick down SW	ON or OFF

NOTE:
For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
3) Press the [YES] key after the information of transmission type is displayed.
4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the “Done” is shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
• For details concerning operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• When {Clear Memory 2} is selected and executed, DTC and learned control memory is cleared. If Clear Memory 2 is performed, execute the learning control. <Ref. to 4AT(D)(diag)-18, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

4. FACILITATION OF LEARNING CONTROL

1) Shift the select lever to “P” range, and apply parking brake.
2) Lift-up the vehicle.
3) Connect the Subaru Select Monitor to data link connector, and then turn the ignition switch to ON.
4) Perform the {Clear Memory 2} using Subaru Select Monitor. <Ref. to 4AT(D)(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>
5) Using Subaru Select Monitor, check that the DTC is not output. <Ref. to 4AT(D)(diag)-16, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>
6) Warm-up the engine until the ATF temperature which is displayed on the Subaru Select Monitor is within 60 — 90°C (140 — 194°F). <Ref. to 4AT(D)(diag)-16, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
7) Shift the select lever to “R” range.
8) Turn all switches including headlight, air conditioner, seat heater, rear defogger and etc. to OFF.
9) Turn the ignition switch to OFF.
10) Depress the brake pedal fully until the facilitation of learning control is completed when the “Communication Failed!” is displayed on Subaru Select Monitor.
11) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.
12) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
13) On the «System Selection Menu» display screen, select the {Transmission Control System} and press the [YES] key.
14) Press the [YES] key after the information of transmission type is displayed.
15) Shift the select lever to “P” range, and then wait for more than 3 seconds.
16) Shift the select lever to “R” range, and then wait for more than 3 seconds.
17) Shift the select lever to “N” range, and then wait for more than 3 seconds.
18) Shift the select lever to “D” range, and then wait for more than 3 seconds.
19) Shift the select lever to “N” range, and then wait for more than 3 seconds.
20) Slightly depress the accelerator pedal fully.
21) Slightly release the accelerator pedal fully.
22) Start the engine, and idle it.
23) Shift the select lever to “D” range.
24) Start the facilitation of learning control. At this time, the POWER indicator light in combination meter blinks at 2 Hz. When the POWER indicator light does not blink, turn the ignition switch to OFF and repeat the procedures from step 4). When the POWER indicator light which blinking at 2 Hz changes to blink at 0.5 Hz, facilitation of learning control is completed.

NOTE:
When blinking of POWER indicator light changes from 2 Hz to 4 Hz during facilitation of learning control, repeat the procedure from step 4).

25) Shift the select lever to “N” range, and then turn the ignition switch to OFF.
26) Shift the select lever to the “P” range, and then complete the facilitation of learning control.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

Refer to Subaru Select Monitor for information about how to obtain and understand DTC. **<Ref. to 4AT(D)(diag)-16,** OPERATION**, Subaru Select Monitor.>**

NOTE:
DTC can not be read through POWER indicator light.

8. Inspection Mode

A: OPERATION

WARNING:
Observe the road traffic law during actual driving.

Move the select lever to “D” range, and then drive the vehicle at 60 km/h (37 MPH) for at least 10 seconds.

9. Clear Memory Mode

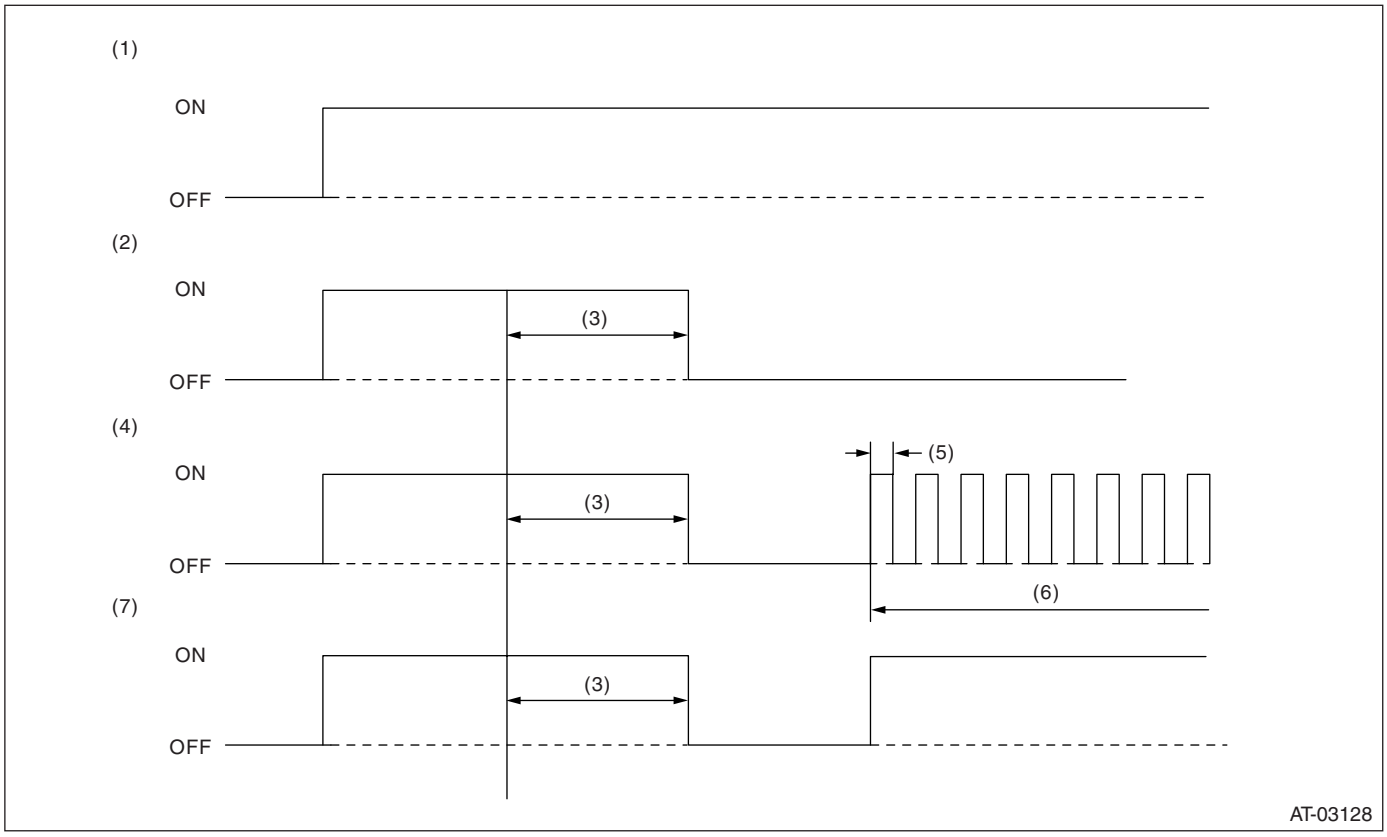
A: OPERATION

Refer to “Subaru Select Monitor” for information about how to clear DTC.
<Ref. to 4AT(D)(diag)-18, CLEAR MEMORY MODE, OPERATION**, Subaru Select Monitor.>**

10.Power Indicator Light Display

A: OPERATION

NOTE:
- This section is specified for turbo model.
- When any item is malfunctioning, the display on POWER indicator light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a DTC during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the POWER indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using select monitor. The indicator signal is as shown in the figure.



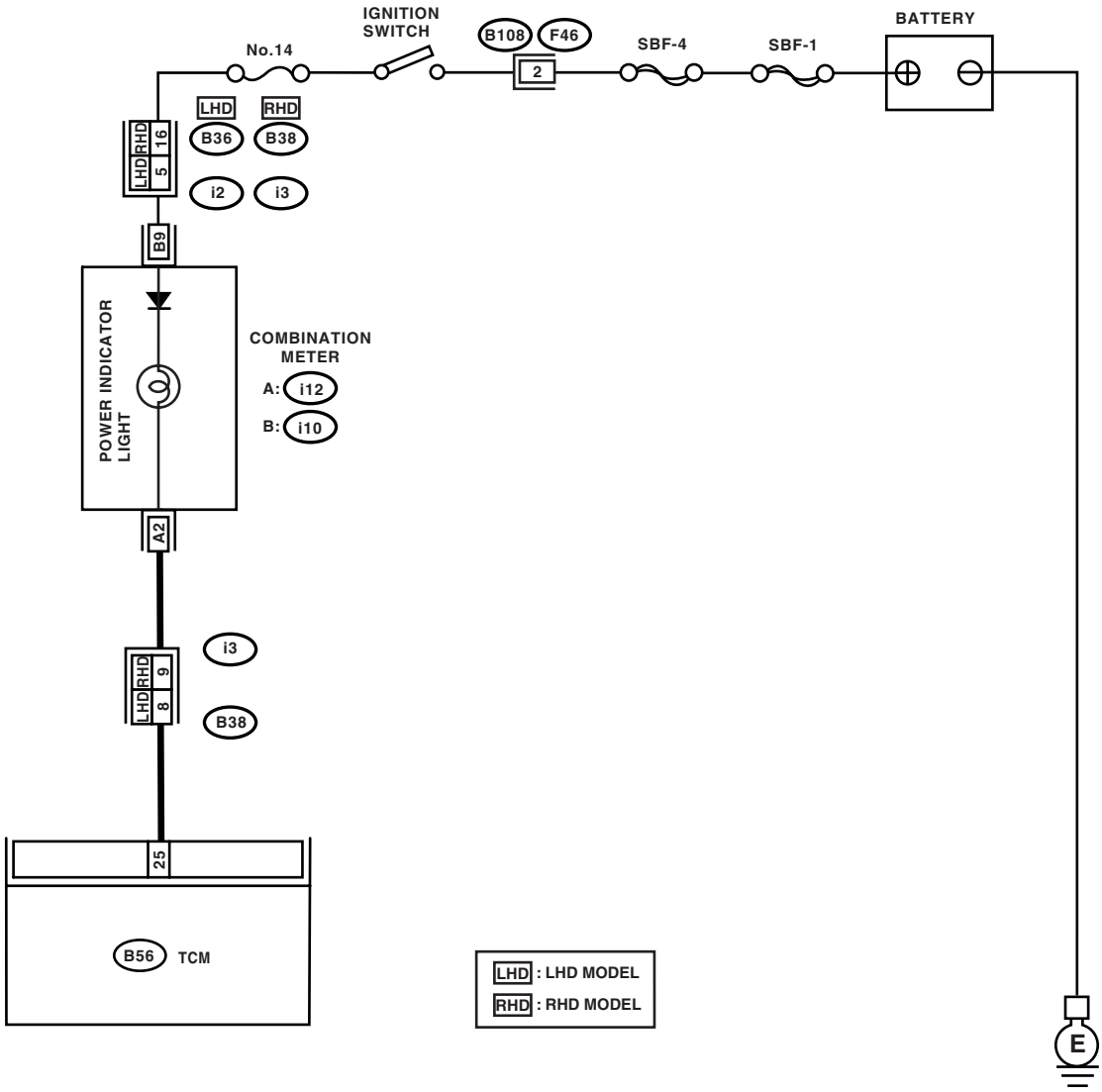
(1) Ignition switch (engine OFF)
(2) Normal
(3) 2 secs
(4) Abnormal (Trouble occurs)
(5) 0.25 secs
(6) Blink
(7) Normal (Power switch ON)

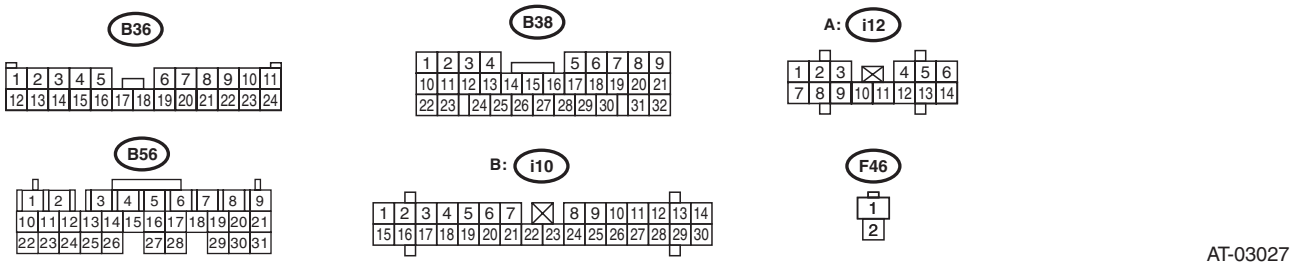
Perform the inspection when the POWER indicator light does not operate correctly. <Ref. to 4AT(D)(diag)-23, INSPECTION, Power Indicator Light Display.>

B: INSPECTION

1. CHECK POWER INDICATOR LIGHT

DIAGNOSTIC:
The POWER indicator light circuit is open or shorted.
TROUBLE SYMPTOM:
When the ignition switch is turned to ON (engine OFF), POWER indicator light does not illuminate.
WIRING DIAGRAM:



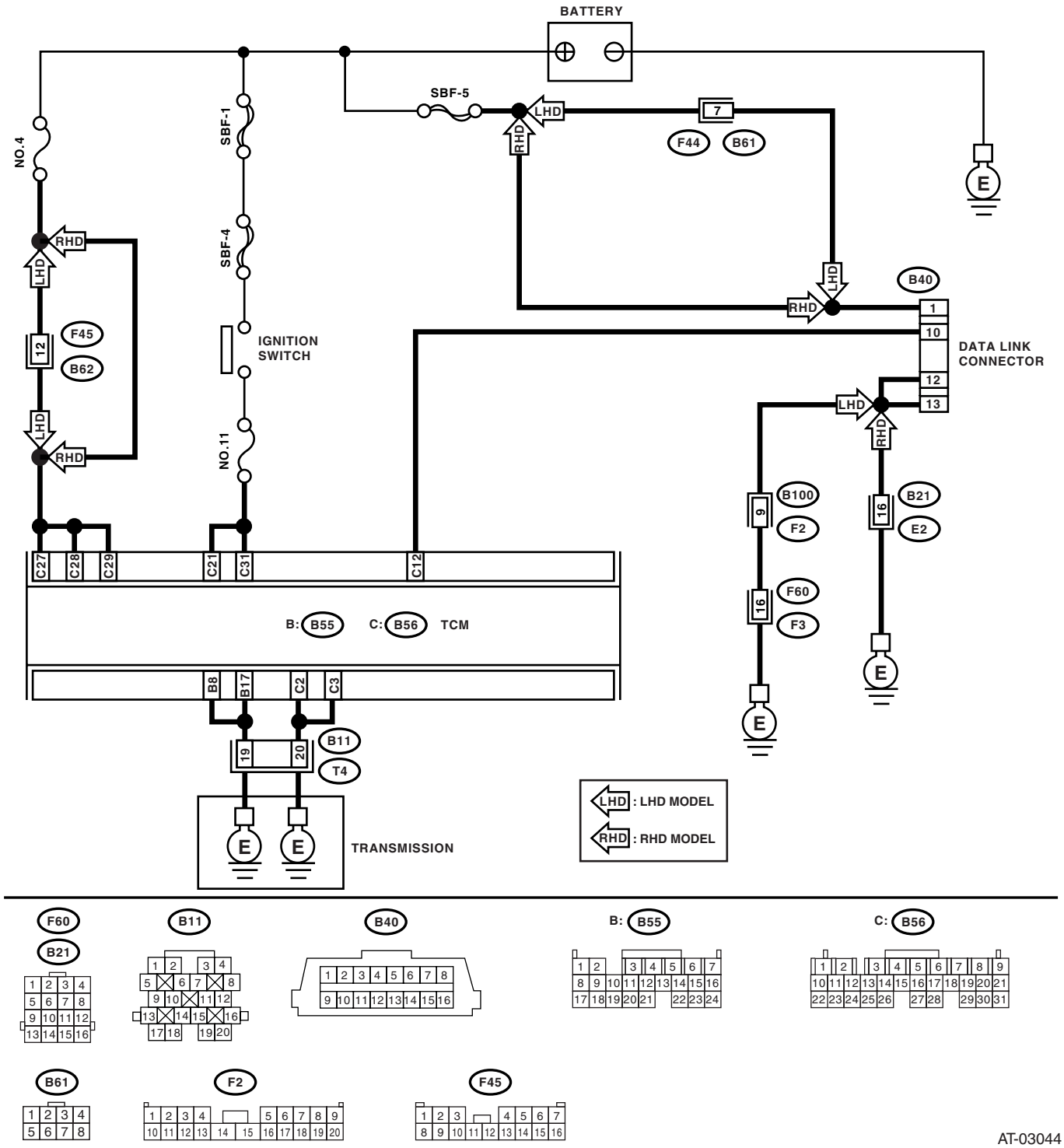


AT-03027

	Step	Check	Yes	No
1	**CHECK FUSE (No. 14).** Remove the fuse (No. 14).	Is the fuse (No. 14) blown out?	Replace the fuse (No. 14). If replaced fuse (No. 14) is blown out easily, repair short circuit in harness between fuse (No. 14) and combination meter.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Turn the ignition switch to ON (engine OFF). 4) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 9 V?	Go to step **3.**	Repair the open circuit in harness between combination meter and battery.
3	**CHECK OPEN CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM. 3) Measure the resistance of TCM connector between combination meter connector. ***Connector & terminal*** ***(B56) No. 25 — (i12) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
4	**CHECK COMBINATION METER.** Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i12) No. 2 (+) — Chassis ground (−):***	Is the resistance less than 1 MΩ?	Go to step **5.**	Repair the ground short circuit in harness between TCM and combination meter.
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to combination meter. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 25 (+) — Chassis ground (−):***	Is the voltage less than 9 V?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

2. CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:



AT-03044

Step		Check	Yes	No
1	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Is there poor contact in battery terminal?	Repair or tighten the battery terminal.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK POWER SUPPLY OF TCM.** 1) Disconnect the connector from TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 27 (+) — Chassis ground (–):*** ***(B56) No. 28 (+) — Chassis ground (–):*** ***(B56) No. 29 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **4.**	Go to step **3.**
3	**CHECK FUSE (No. 4).** 1) Turn the ignition switch to OFF. 2) Remove the fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair the open circuit in harness between fuse (No. 4) and TCM or fuse (No. 4) and battery, and poor contact in coupling connector.
4	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 21 (+) — Chassis ground (–):*** ***(B56) No. 31 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **6.**	Go to step **5.**
5	**CHECK FUSE (No. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the open circuit in harness between fuse (No. 11) and TCM, or fuse (No. 11) and battery, and poor contact in coupling connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 8 — (B11) No. 19:*** ***(B55) No. 17 — (B11) No. 19:*** ***(B56) No. 2 — (B11) No. 20:*** ***(B56) No. 3 — (B11) No. 20:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of harness between transmission and transmission ground. ***Connector & terminal*** ***(T4) No. 19 — Transmission ground:*** ***(T4) No. 20 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between transmission and transmission ground.
8	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in TCM power supply, ground line and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

11.Diagnostic Procedure for Select Monitor Communication

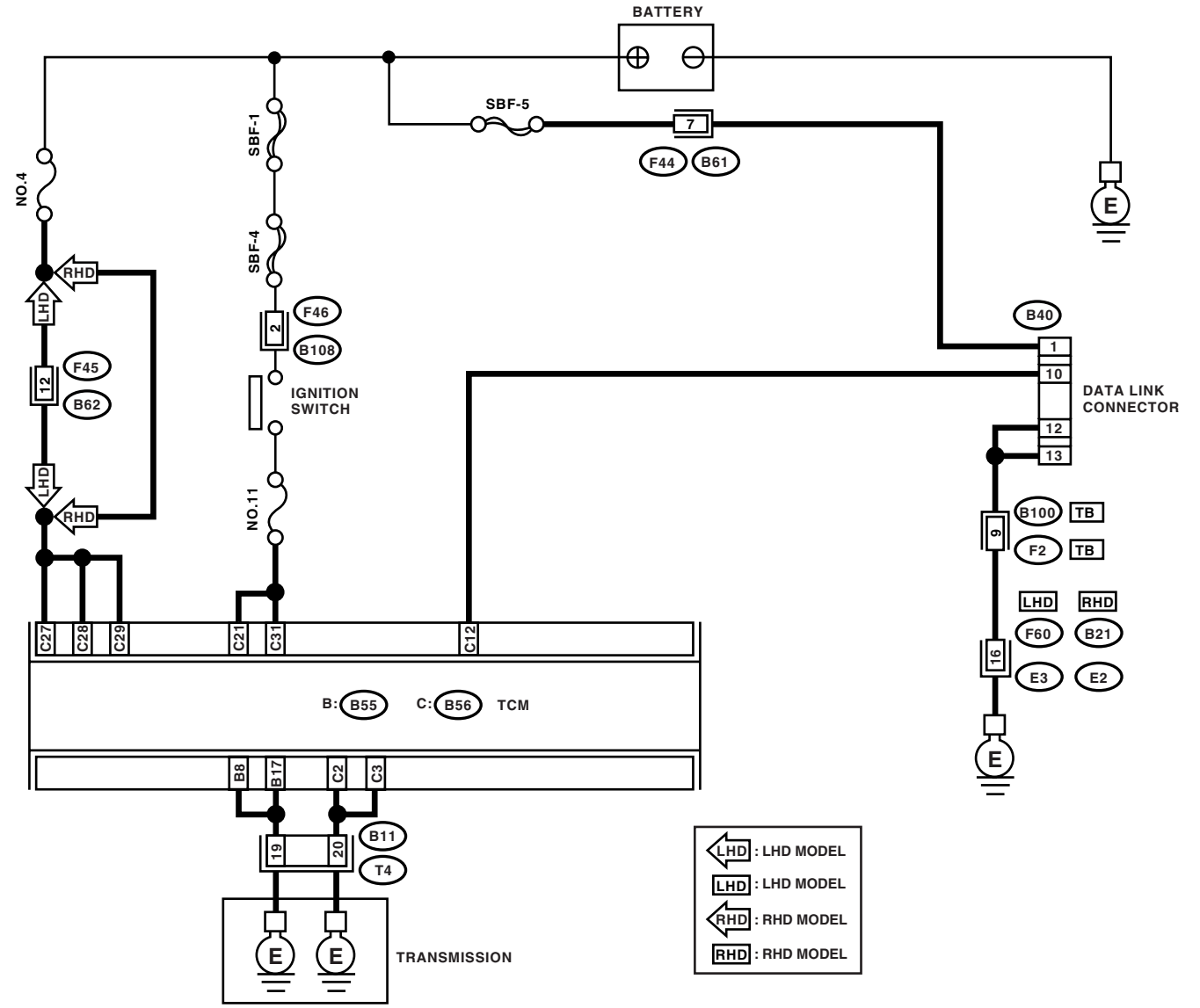
A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

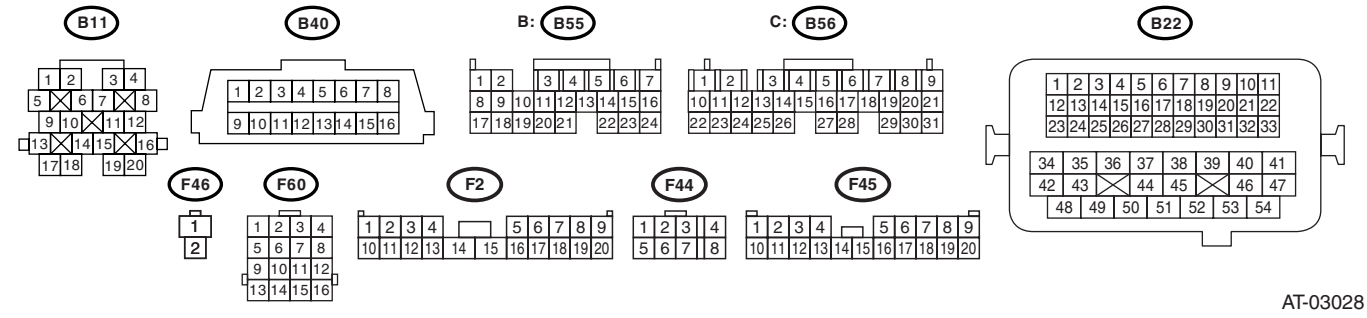
NOTE:
This section is specified for turbo model.

DIAGNOSTIC:
Faulty harness connector

TROUBLE SYMPTOM:
Subaru Select Monitor communication failure

WIRING DIAGRAM:





AT-03028

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.
2	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 12 — Chassis ground:*** ***(B40) No. 13 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between data link connector and ground terminal, and poor contact in coupling connector.
3	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to transmission systems can be executed normally.	Are the name of system displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **4.**
4	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Check whether communication to engine systems can be executed normally.	Are the name of system displayed on Subaru Select Monitor?	Go to step **6.**	Go to step **5.**
5	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the ECM connector. 4) Check whether communication to transmission systems can be executed normally.	Are the name of system displayed on Subaru Select Monitor?	Inspect the ECM.	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and ECM connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (–):***	Is the voltage more than 1 V?	Repair the harness and connector between each control module and data link connector.	Go to step **8.**
8	**CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***(B56) No. 12 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair the harness and connector between TCM and data link connector.
9	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is the TCM connector inserted into TCM?	Go to step **10.**	Insert the TCM connector into TCM.

	Step	Check	Yes	No
10	**INSPECTION OF TRANSMISSION HARNESS CONNECTOR.**	Is the transmission harness connector inserted into bulkhead harness connector?	Go to step **11.**	Connect the bulkhead harness connector to transmission harness connector.
11	**CHECK POOR CONTACT IN CONNECTORS.**	There is poor contact. Is there poor contact in control module and data link connector?	Repair the poor contact.	Go to step **12.**
12	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 27 (+) — Chassis ground (−):*** ***(B55) No. 28 (+) — Chassis ground (−):*** ***(B55) No. 29 (+) — Chassis ground (−):***	Is the voltage 10 — 13 V?	Go to step **14.**	Go to step **13.**
13	**CHECK FUSE (No. 11).** Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the open circuit in harness between fuse (No. 11) and TCM or fuse (No. 11) and battery, and poor contact in coupling connector.
14	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 8 — (B11) No. 19:*** ***(B55) No. 17 — (B11) No. 19:*** ***(B56) No. 2 — (B11) No. 20:*** ***(B56) No. 3 — (B11) No. 20:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between TCM, transmission harness connector, and poor contact in coupling connector.
15	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of harness between transmission and transmission ground. ***Connector & terminal*** ***(T4) No. 19 — Transmission ground:*** ***(T4) No. 20 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open circuit in harness between transmission and transmission ground.
16	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in TCM power supply, ground line and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

12.List of Diagnostic Trouble Code (DTC)

A: LIST

NOTE:
This section is specified for turbo model.

DTC	Item	Diagnostic content	Reference
P0705	Transmission Range Sensor Circuit (PRNDL Input)	Inhibitor switch malfunction, open or short circuit	<Ref. to 4AT(D)(diag)-34, DTC P0705 AT RANGE SWITCH SYSTEM CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0712	Transmission Fluid Temperature Sensor Circuit Low Input	ATF temperature sensor malfunction, open input signal circuit	<Ref. to 4AT(D)(diag)-42, DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0713	Transmission Fluid Temperature Sensor Circuit High Input	ATF temperature sensor malfunction, short input signal circuit	<Ref. to 4AT(D)(diag)-45, DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Input/Turbine Speed Sensor Circuit	Torque converter turbine speed sensor malfunction, open or short input signal circuit	<Ref. to 4AT(D)(diag)-48, DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0719	Torque Converter/Brake Switch “B” Circuit Low	Brake switch malfunction, open input signal circuit	<Ref. to 4AT(D)(diag)-50, DTC P0719 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	Front vehicle speed sensor malfunction, open or short input signal circuit	<Ref. to 4AT(D)(diag)-52, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0724	Torque Converter/Brake Switch “B” Circuit High	Brake switch malfunction, short input signal circuit	<Ref. to 4AT(D)(diag)-55, DTC P0724 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine Speed Input Circuit	Open or short engine speed output signal circuit	<Ref. to 4AT(D)(diag)-57, DTC P0725 ENGINE SPEED INPUT CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(D)(diag)-59, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(D)(diag)-59, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(D)(diag)-59, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(D)(diag)-59, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Diagnostic content	Reference
P0736	Reverse Incorrect Ratio	Vehicle speed sensor, torque converter turbine speed sensor, or control valve malfunction	<Ref. to 4AT(D)(diag)-60, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	Lock up clutch malfunction or locking of valve	<Ref. to 4AT(D)(diag)-61, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	Lock up solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-62, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid “A” Electrical	Line pressure linear solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-64, DTC P0748 PRESSURE CONTROL SOLENOID “A” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	Low clutch duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-67, DTC P0753 SHIFT SOLENOID “A” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	2-4 brake duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-70, DTC P0758 SHIFT SOLENOID “B” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0763	Shift Solenoid “C” Electrical	High clutch duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-73, DTC P0763 SHIFT SOLENOID “C” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0768	Shift Solenoid “D” Electrical	Low & reverse clutch duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-76, DTC P0768 SHIFT SOLENOID “D” ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0801	Reverse Inhibitor Control Circuit	N–R lock solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-79, DTC P0801 REVERSE INHIBITOR CONTROL CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1706	AT Vehicle Speed Sensor Circuit Malfunction (rear wheel)	Rear vehicle speed sensor malfunction, open or short input signal circuit	<Ref. to 4AT(D)(diag)-81, DTC P1706 AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1707	AT AWD Solenoid Valve Circuit Malfunction	Transfer duty solenoid malfunction, open or short output signal circuit	<Ref. to 4AT(D)(diag)-84, DTC P1707 AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1708	Throttle Position Sensor Circuit Low Input	Accelerator pedal position sensor or throttle position sensor malfunction, open input signal circuit	<Ref. to 4AT(D)(diag)-86, DTC P1708 THROTTLE POSITION SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1709	Throttle Position Sensor Circuit High Input	Accelerator pedal position sensor or throttle position sensor malfunction, short input signal circuit	<Ref. to 4AT(D)(diag)-92, DTC P1709 THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Diagnostic content	Reference
P1714	Throttle Position Sensor Power Supply Circuit	Accelerator pedal position sensor or throttle position sensor malfunction, open or short input signal circuit	<Ref. to 4AT(D)(diag)-98, DTC P1714 THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1718	CAN Communication Circuit	Open or short AT communication signal circuit	<Ref. to 4AT(D)(diag)-102, DTC P1718 CAN COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

13.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0705 AT RANGE SWITCH SYSTEM CIRCUIT

NOTE:
This section is specified for turbo model.

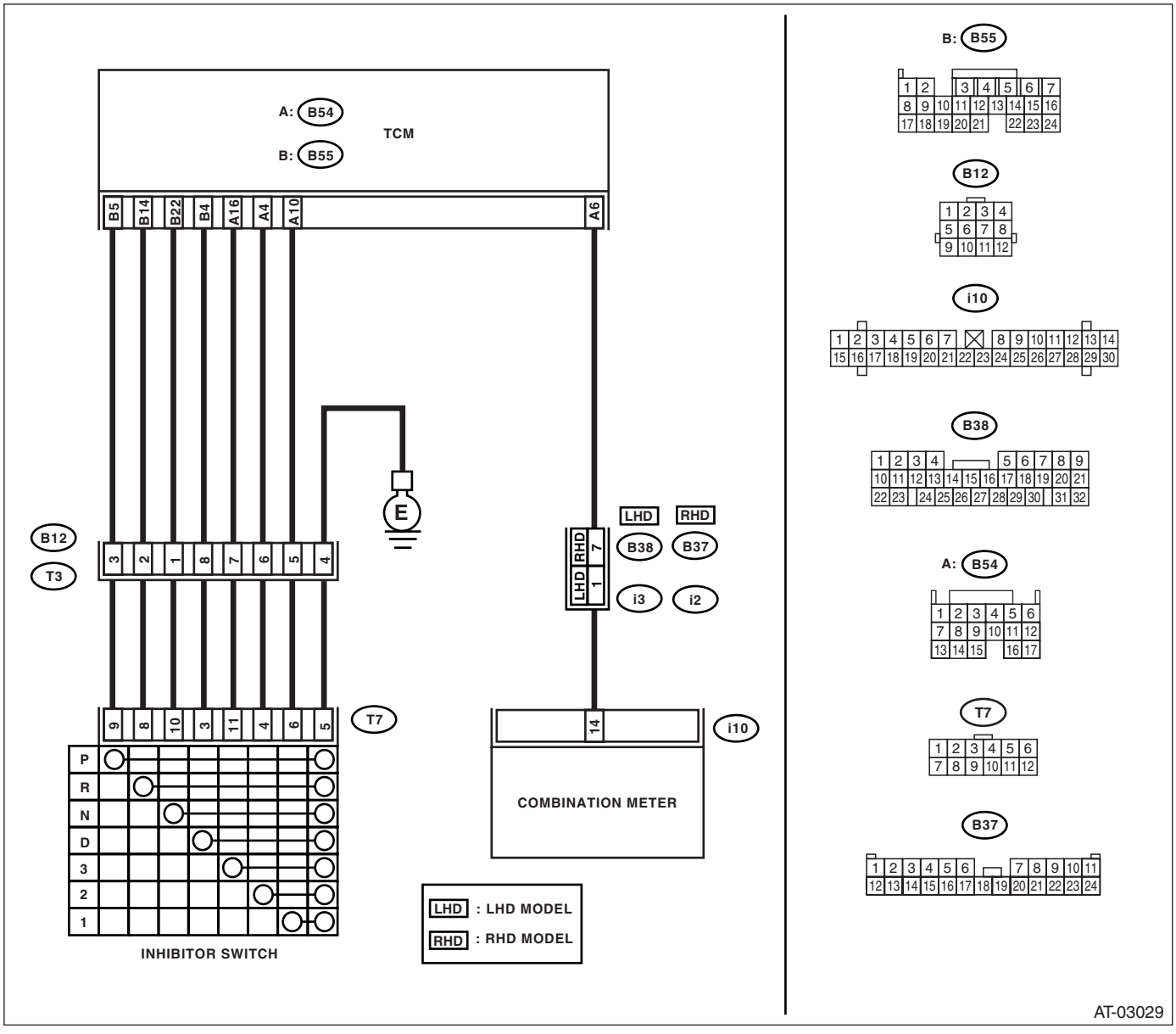
DTC DETECTING CONDITION:

- There is malfunction in inhibitor switch.
- The input signal circuit of inhibitor switch is open or shorted.

TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- Engine brake is not effected when select lever is in “3” range.
- Engine brake is not effected when select lever is in “2” range.
- Engine brake is not effected when select lever is in “1” range.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK "P" RANGE SWITCH.**	When the "P" range is selected, does LED light up?	Go to step **2.**	Go to step **22.**
2	**CHECK INDICATOR LIGHT.**	Does the combination meter "P" range indicator illuminate?	Go to step **3.**	Go to step **26.**
3	**CHECK "P" RANGE SWITCH.**	When the "R" range is selected, does "P" range LED light up?	Go to step **27.**	Go to step **4.**
4	**CHECK "R" RANGE SWITCH.**	When the "R" range is selected, does LED light up?	Go to step **5.**	Go to step **29.**
5	**CHECK INDICATOR LIGHT.**	Does the combination meter "R" range indicator illuminate?	Go to step **6.**	Go to step **31.**
6	**CHECK "R" RANGE SWITCH.**	When the "N" range is selected, does "R" range LED light up?	Go to step **34.**	Go to step **7.**
7	**CHECK "N" RANGE SWITCH.**	When the "N" range is selected, does LED light up?	Go to step **8.**	Go to step **32.**
8	**CHECK INDICATOR LIGHT.**	Does the combination meter "N" range indicator illuminate?	Go to step **9.**	Go to step **36.**
9	**CHECK "N" RANGE SWITCH.**	When the "D" range is selected, does "N" range LED light up?	Go to step **37.**	Go to step **10.**
10	**CHECK "D" RANGE SWITCH.**	When the "D" range is selected, does LED light up?	Go to step **11.**	Go to step **38.**
11	**CHECK INDICATOR LIGHT.**	Does the combination meter "D" range indicator illuminate?	Go to step **12.**	Go to step **41.**
12	**CHECK "D" RANGE SWITCH.**	When the "3" range is selected, does "D" range LED light up?	Go to step **42.**	Go to step **13.**
13	**CHECK "3" RANGE SWITCH.**	When the "3" range is selected, does LED light up?	Go to step **14.**	Go to step **43.**
14	**CHECK INDICATOR LIGHT.**	Does the combination meter "3" range indicator illuminate?	Go to step **15.**	Go to step **46.**
15	**CHECK "3" RANGE SWITCH.**	When the "2" range is selected, does "3" range LED light up?	Go to step **47.**	Go to step **16.**
16	**CHECK "2" RANGE SWITCH.**	When the "2" range is selected, does LED light up?	Go to step **17.**	Go to step **48.**
17	**CHECK INDICATOR LIGHT.**	Does the combination meter "2" range indicator illuminate?	Go to step **18.**	Go to step **51.**
18	**CHECK "2" RANGE SWITCH.**	When the "1" range is selected, does "2" range LED light up?	Go to step **52.**	Go to step **19.**
19	**CHECK "1" RANGE SWITCH.**	When the "1" range is selected, does LED light up?	Go to step **20.**	Go to step **53.**
20	**CHECK INDICATOR LIGHT.**	Does the combination meter "1" range indicator illuminate?	Go to step **21.**	Go to step **56.**
21	**CHECK "1" RANGE SWITCH.**	When the "2" range is selected, does "1" range LED light up?	Go to step **57.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
22	**CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between inhibitor switch and chassis ground. ***Connector & terminal*** ***(T7) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **23.**	Repair the open circuit in harness between inhibitor switch connector and chassis ground, and poor contact in coupling connector.
23	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 5 — (T7) No. 9:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "P" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **25.**	Go to step **60.**
25	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "P" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **60.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
26	**CHECK "P" RANGE INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the "P" range indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is the "P" range indicator light OK?	Go to step **58.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>
27	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 5 — Chassis ground:***	Is the resistance less than 1 MΩ?	Go to step **28.**	Repair the ground short circuit in "P" range circuit.
28	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 14 — (T7) No. 8:***	Is the resistance less than 1 Ω?	Go to step **29.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

	Step	Check	Yes	No
29	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “R” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **30.**	Go to step **60.**
30	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for “R” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **60.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
31	**CHECK “R” RANGE INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the “R” range indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is “R” range indicator light OK?	Go to step **58.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>
32	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **33.**	Repair the ground short circuit in “R” range circuit.
33	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 22 — (T7) No. 10:***	Is the resistance less than 1 Ω?	Go to step **34.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
34	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to “N” range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **35.**	Go to step **60.**
35	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever to except for “N” range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **60.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
36	**CHECK "N" RANGE INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the "N" range indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is the "N" range indicator light OK?	Go to step **58.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>
37	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **38.**	Repair the ground short circuit in "N" range circuit.
38	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B55) No. 4 — (T7) No. 3:***	Is the resistance less than 1 Ω?	Go to step **39.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
39	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "D" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **40.**	Go to step **60.**
40	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "D" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **60.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
41	**CHECK "D" RANGE INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the "D" range indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is the "D" range indicator light OK?	Go to step **58.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>
42	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **43.**	Repair the ground short circuit in "D" range circuit.

	Step	Check	Yes	No
43	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B54) No. 16 — (T7) No. 11:***	Is the resistance less than 1 Ω?	Go to step **44.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
44	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "3" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **45.**	Go to step **60.**
45	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "3" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 16 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **60.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
46	**CHECK "3" RANGE INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the "3" range indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is the "3" range indicator light OK?	Go to step **58.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>
47	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **48.**	Repair the ground short circuit in "3" range circuit.
48	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B54) No. 4 — (T7) No. 4:***	Is the resistance less than 1 Ω?	Go to step **49.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
49	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "2" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **50.**	Go to step **60.**

	Step	Check	Yes	No
50	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "2" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **60.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
51	**CHECK "2" RANGE INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the "2" range indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is the "2" range indicator light OK?	Go to step **58.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>
52	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **53.**	Repair the ground short circuit in "2" range circuit.
53	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. ***Connector & terminal*** ***(B54) No. 10 — (T7) No. 6:***	Is the resistance less than 1 Ω?	Go to step **54.**	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "1" range. 5) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **55.**	Go to step **60.**
55	**CHECK INPUT SIGNAL FOR TCM.** 1) Move the select lever except for "1" range. 2) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **60.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
56	**CHECK "1" RANGE INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the "1" range indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is the "1" range indicator light OK?	Go to step **58.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>

	Step	Check	Yes	No
57	**CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B54) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **60.**	Repair the ground short circuit in "1" range circuit.
58	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B54) No. 6 — (i10) No. 14:***	Is the resistance more than 1 Ω?	Go to step **59.**	Repair or replace the open circuit in harness between TCM and combination meter.
59	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness between TCM and combination meter. ***Connector & terminal*** ***(B54) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **60.**	Repair the short circuit between TCM and combination meter.
60	**CHECK POOR CONTACT.**	Is there poor contact in inhibitor switch circuit?	Repair the poor contact.	Go to step **61.**
61	**CHECK INHIBITOR SWITCH.**	Is the inhibitor switch in proper position?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Adjust the inhibitor switch and select cable. <Ref. to 4AT-55, Inhibitor Switch.> and <Ref. to CS-31, Select Cable.>

B: DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT

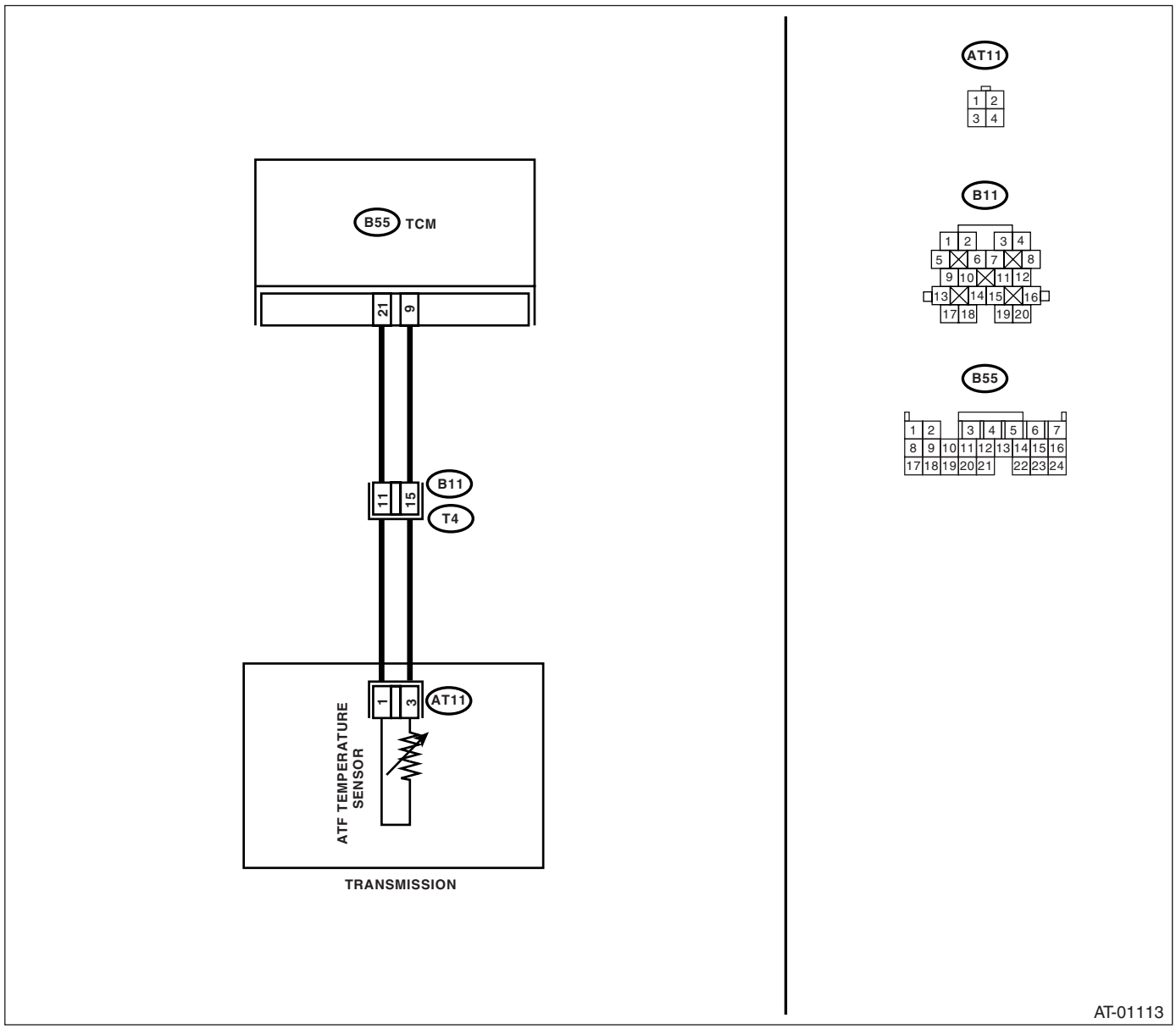
DTC DETECTING CONDITION:

Input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 21 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 9 — (B11) No. 15:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the ignition switch to ON and start engine. 4) Warm-up the transmission until ATF temperature reaches to 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Is the resistance 300 — 800 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Does the resistance value increase when ATF temperature decreases?	Go to step **5.**	Go to step **7.**
5	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connector to transmission. 2) Turn the ignition switch to ON (engine OFF).	Does the ATF temperature gradually decrease?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. Temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Remove the transmission connector from bracket. 4) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off floor. 5) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 6) Remove the oil pan, and disconnect the connector from ATF temperature sensor connector. 7) Measure the resistance of harness between ATF temperature sensor and transmission connector. ***Connector & terminal*** ***(T4) No. 11 — (AT11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between ATF temperature sensor and transmission connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between ATF temperature sensor and transmission connector. ***Connector & terminal*** ***(T4) No. 15 — (AT11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between ATF temperature sensor and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 11 — Transmission ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the short circuit in harness between ATF temperature sensor and transmission connector.
10	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 15 — Transmission ground:***	Is the resistance more than 1 MΩ?	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>	Repair the short circuit in harness between ATF temperature sensor and transmission connector.

C: DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT

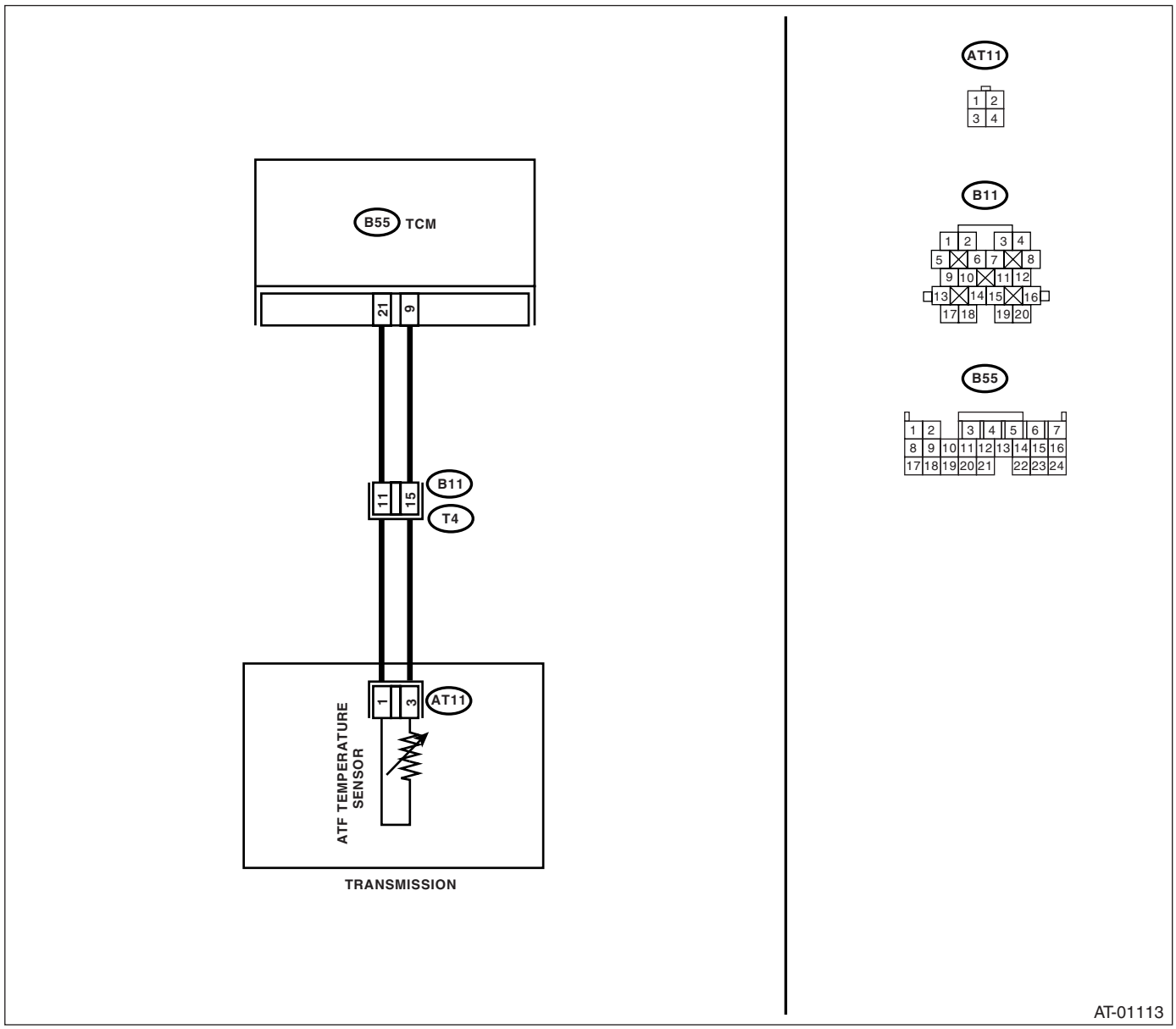
DTC DETECTING CONDITION:

Input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM. 3) Measure the resistance between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 21 — No. 9:***	Is the resistance more than 500 Ω?	Go to step **2.**	Go to step **4.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Go to step **4.**
3	**CHECK HARNESS.** Measure the resistance between TCM connector terminals while shaking the harness. ***Connector & terminal*** ***(B55) No. 21 — No. 9:***	Does the resistance change?	Go to step **4.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission harness.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between TCM and transmission harness.
6	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 11 — No. 15:***	Is the resistance more than 500 Ω?	Even if the POWER indicator light is blinking, the circuit has returned to a normal condition at this time. A temporary short circuit of connector or harness may be the cause. Repair the harness or connector.	Go to step **7.**

	Step	Check	Yes	No
7	**CHECK TRANSMISSION HARNESS.** 1) Lift-up the vehicle and place it on rigid racks. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan. 4) Disconnect the harness connector from control valve. 5) Measure the resistance between ATF temperature sensor connector terminals 6) Measure the resistance between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 11 — Transmission ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Replace the transmission harness.
8	**CHECK TRANSMISSION HARNESS.** Measure the resistance between transmission connector and transmission ground, ***Connector & terminal*** ***(T4) No. 15 — Transmission ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Replace the transmission harness.
9	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between control valve connector terminals ***Terminal*** ***No. 1 — No. 3:***	Is the resistance more than 500 Ω?	Even if the POWER indicator light is blinking, the circuit has returned to a normal condition at this time. A temporary short circuit of connector or harness may be the cause. Repair the harness or connector.	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>

D: DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT

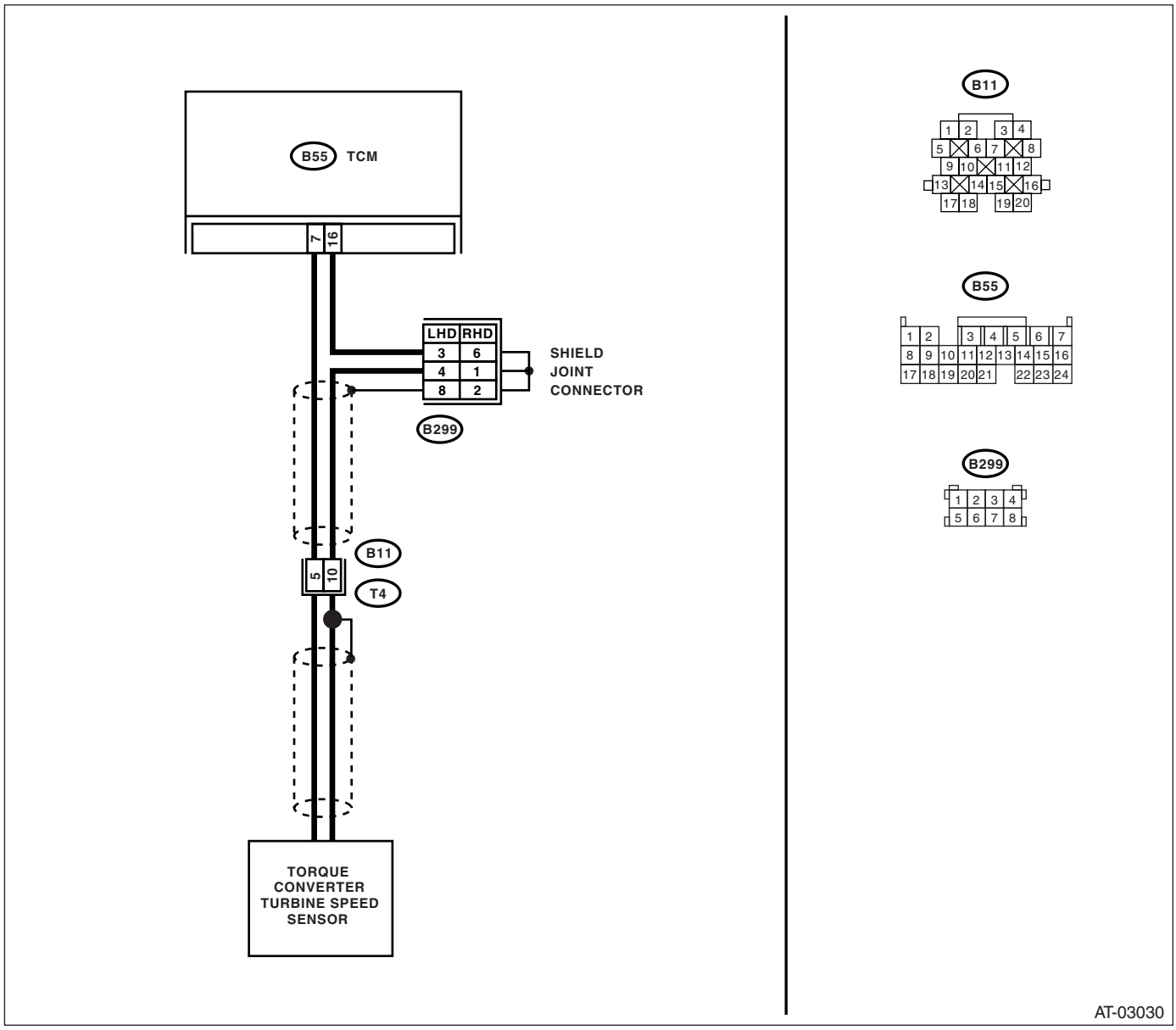
DTC DETECTING CONDITION:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 5 — No. 10:***	Is the resistance 450 — 650 Ω?	Go to step **2.**	Replace the turbine speed sensor. <Ref. to 4AT-65, Torque Converter Turbine Speed Sensor.>
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 7 — (B11) No. 5:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 16 — (B11) No. 10:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 4) Start the engine. 5) Move the select lever to "P" or "N" range. 6) Read the data of turbine speed using Subaru Select Monitor. • Compare the tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	Even if the POWER indicator light is blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

E: DTC P0719 TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT LOW

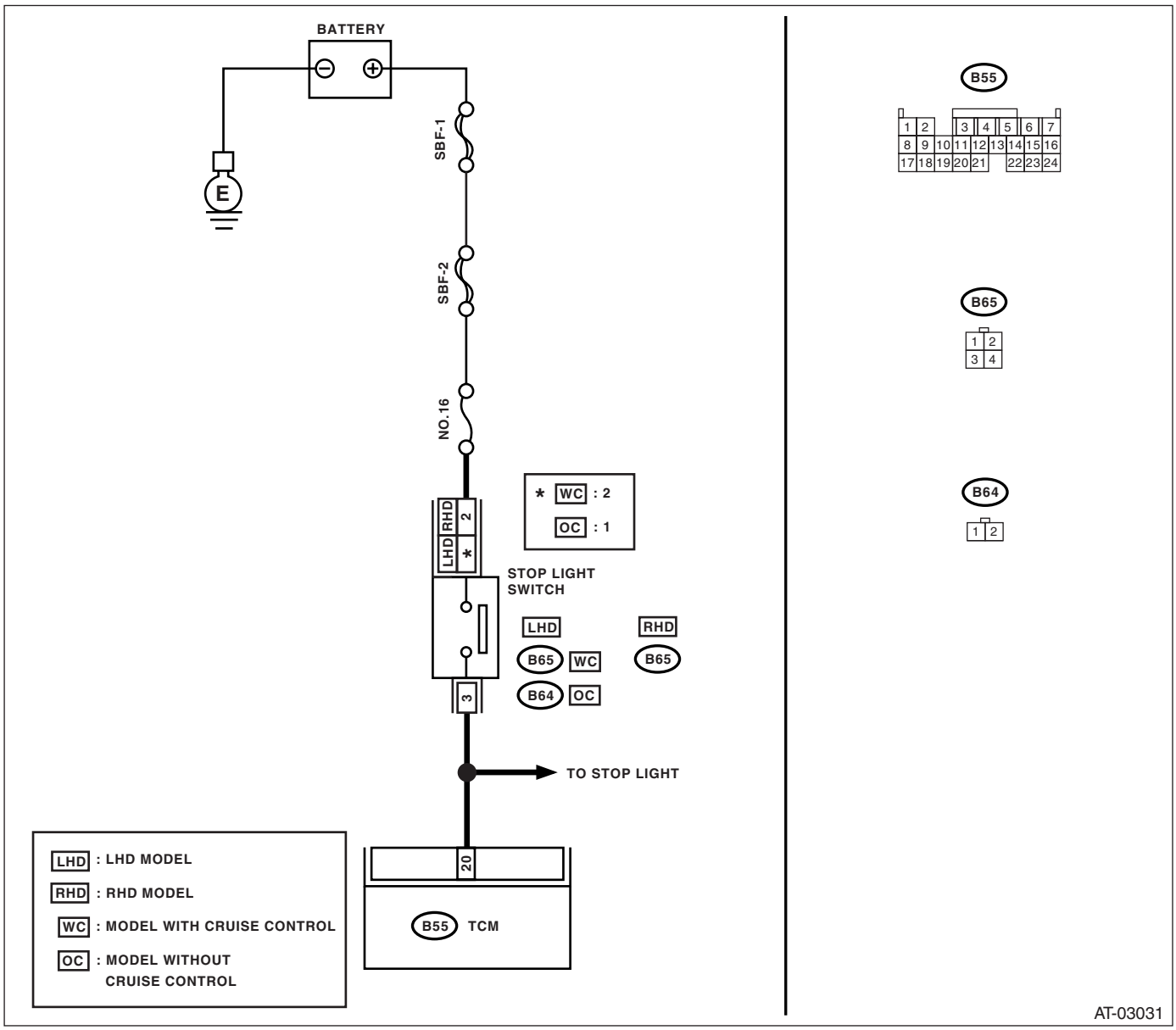
DTC DETECTING CONDITION:

Stop light switch malfunction or input signal open circuit.

TROUBLE SYMPTOM:

Gear is not shifted down when climbing hill.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUSE (No. 16).** Remove the fuse (No. 16).	Is the fuse (No. 16) blown out?	Replace the fuse (No. 16). If replaced fuse (No. 16) is blown out easily, repair short circuit in harness between fuse (No. 16) and stop light switch.	Go to step **2.**
2	**CHECK OPERATION OF BRAKE LIGHT.** Depress the brake pedal.	Does the brake light illuminate?	Go to step **3.**	Check the brake light circuit.
3	**CHECK TCM INPUT SIGNAL.** 1) Depress the brake pedal. 2) Measure the voltage of harness between TCM and stop light switch. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Go to step **4.**
4	**HECK HARNESS CONNECTOR BETWEEN TCM BRAKE LIGKT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and stop light switch. 3) Measure the resistance between TCM and stop light switch. ***Connector & terminal*** ***LHD model with cruise control and RHD model*** ***(B55) No. 20 — (B65) No. 3:*** ***LHD model without cruise control*** ***(B55) No. 20 — (B64) No. 3:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open harness between TCM and stop light switch.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM BRAKE LIGKT SWITCH.** Measure the resistance between TCM and stop light switch. ***Connector & terminal*** ***LHD model with cruise control and RHD model*** ***(B55) No. 20 — (B65) No. 3:*** ***LHD model without cruise control*** ***(B55) No. 20 — (B64) No. 3:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short harness between TCM and stop light switch.
6	**INSPECT POOR CONTACT.**	Is there poor contact in the brake switch input signal circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

F: DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

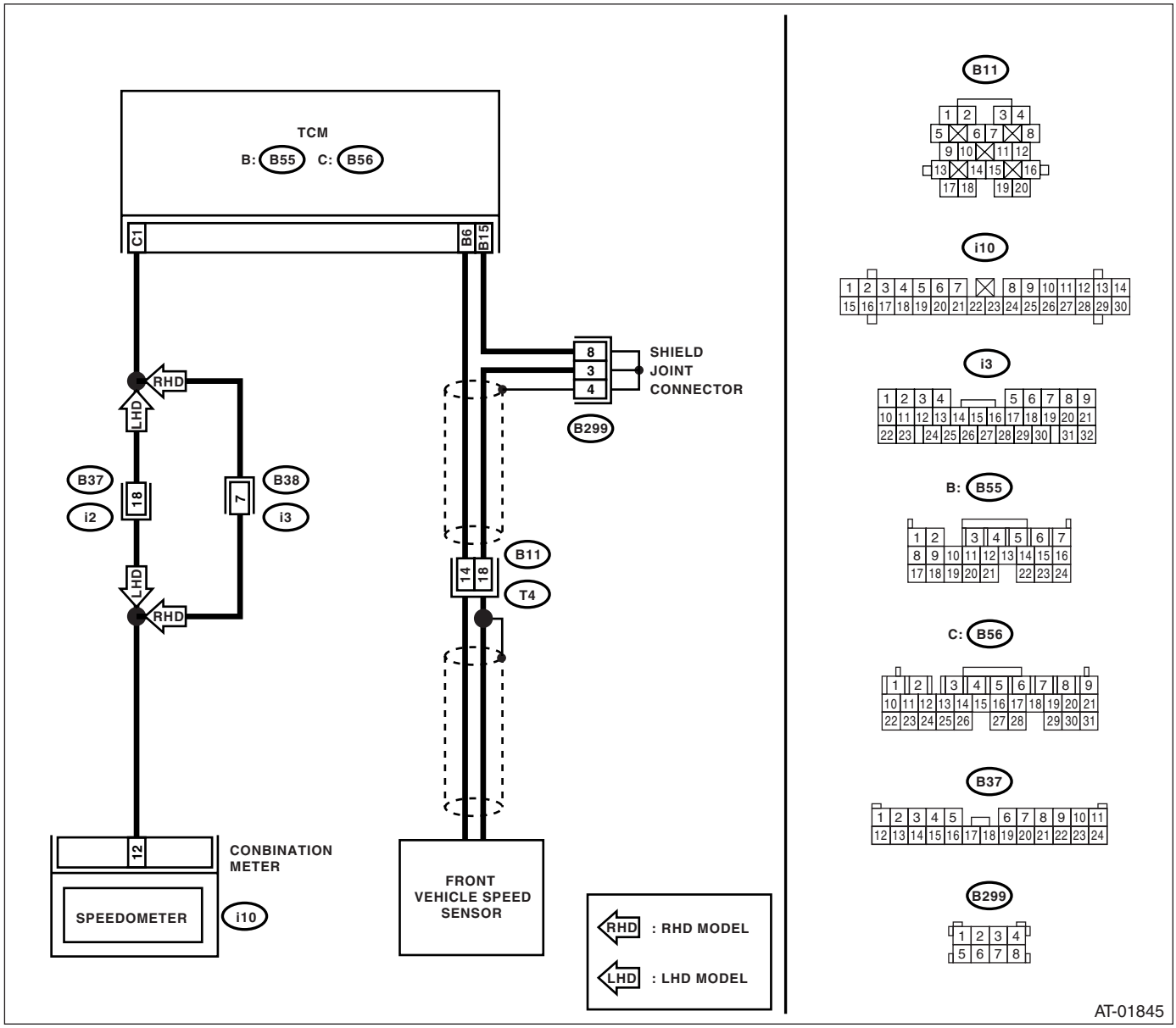
DTC DETECTING CONDITION:

- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 6 — (B11) No. 14:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 15 — (B11) No. 18:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5	**CHECK FRONT VEHICLE SPEED SENSOR.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 14 — No. 18:***	Is the resistance 450 — 650 Ω?	Go to step **6.**	Replace the front vehicle speed sensor. <Ref. to 4AT-59, Front Vehicle Speed Sensor.>

	Step	Check	Yes	No
6	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off floor. 4) Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor. • Compare the speedometer reading with Subaru Select Monitor indications. • Vehicle speed is indicated in “km/h” or “MPH”. 7) Slowly increase the vehicle speed to 60 km/h or 37 MPH. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.>	Does the speedometer indication increase as Subaru Select Monitor front speed sensor data increases?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in front vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

G: DTC P0724 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT HIGH

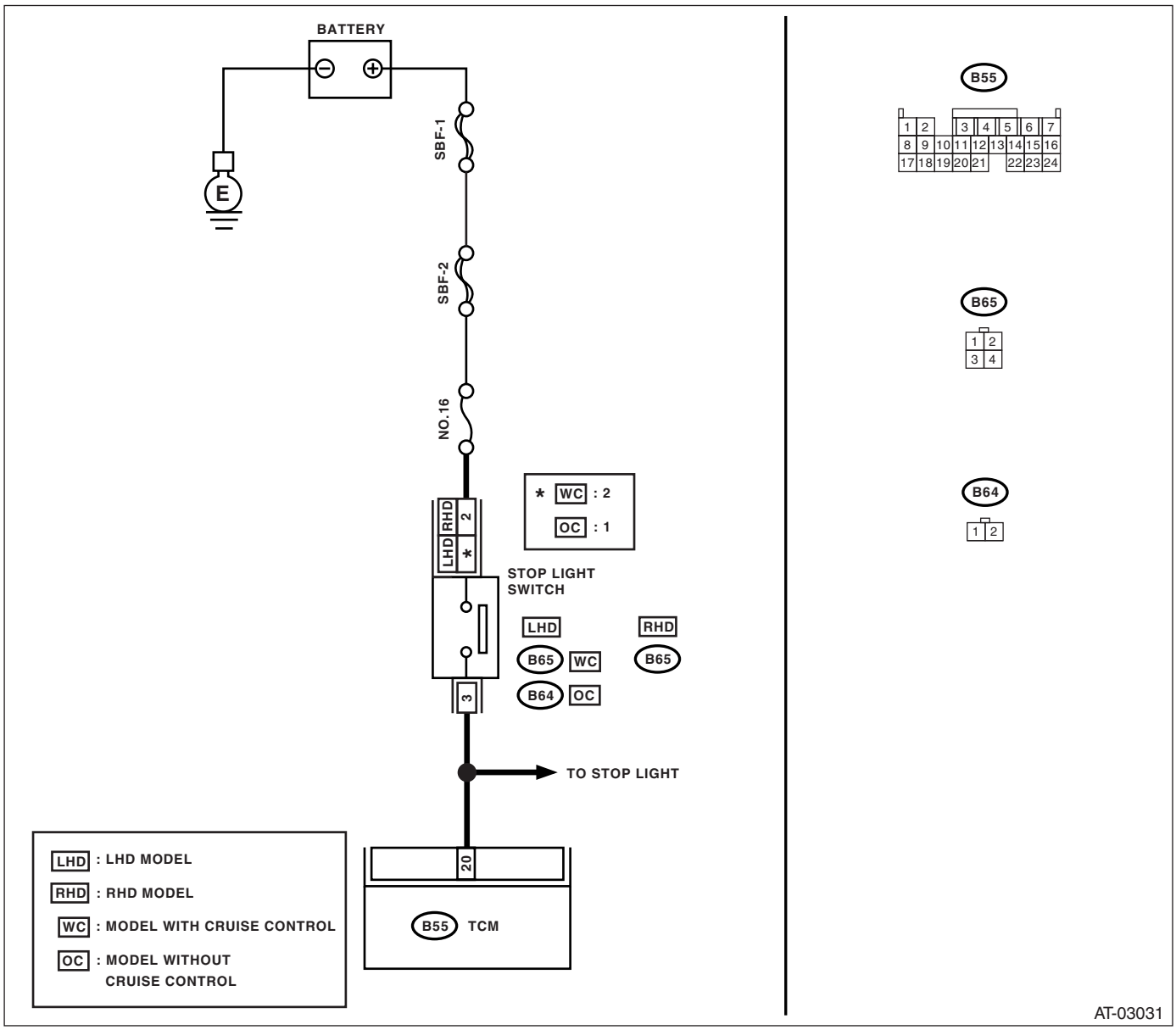
DTC DETECTING CONDITION:

Stop light switch malfunction or open input signal circuit.

TROUBLE SYMPTOM:

Gear is not shifted down when climbing hill.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TCM INPUT SIGNAL.** 1) Disconnect the harness connector from TCM. 2) Measure the voltage of harness between TCM and stop light switch. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from stop light switch. 3) Measure the resistance between stop light switch connector. ***Connector & terminal*** ***No. 2 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the stop light switch.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH.** 1) Turn the ignition switch to ON. 2) Measure the voltage of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 20 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Repair the short in power supply circuit to harness between TCM and stop light switch.
4	**INSPECT POOR CONTACT.**	Is there poor contact in the stop light switch input signal circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

H: DTC P0725 ENGINE SPEED INPUT CIRCUIT

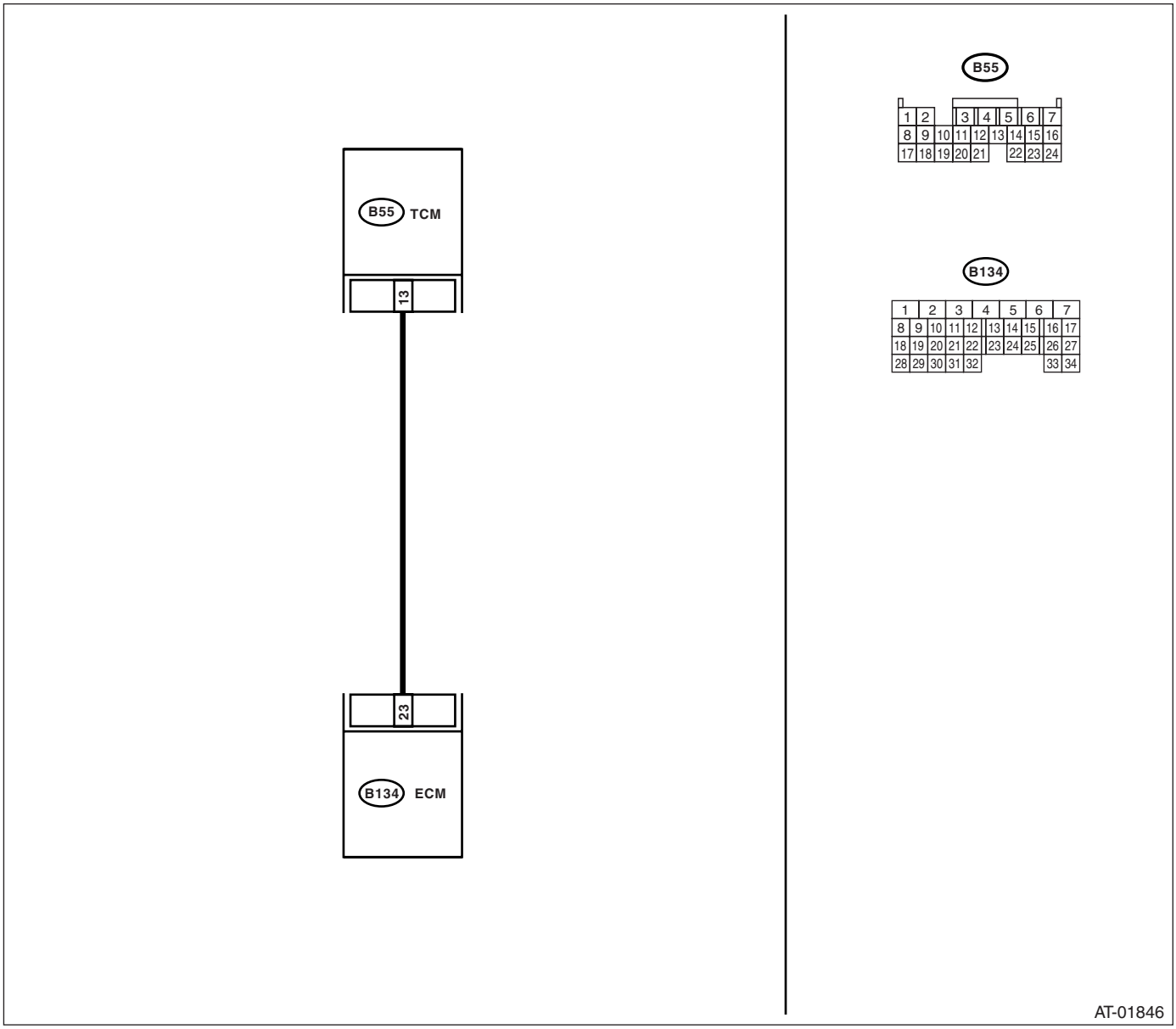
DTC DETECTING CONDITION:

Engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- POWER indicator light remains on when vehicle speed is “0”.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B55) No. 13 — (B134) No. 23:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and ECM connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and ECM connector.
3	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Idle the engine. 5) Read the data of engine speed using Subaru Select Monitor. • Display shows the engine speed signal value sent from ECM.	Is the revolution value same as tachometer reading shown on combination meter?	Even if the POWER indicator light is blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and ECM.	Go to step **4.**
4	**CHECK POOR CONTACT.**	Is there poor contact in engine speed signal circuit?	Repair the poor contact.	Go to step **5.**
5	**CONFIRM DTC P0725.** Replace the ECM with a new one.	Does the DTC appear again, after memory has been cleared?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Replace the ECM.

I: DTC P0731 GEAR 1 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. **<Ref. to 4AT(D)(diag)-60,** DTC P0736 REVERSE INCORRECT RATIO**, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>**

J: DTC P0732 GEAR 2 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. **<Ref. to 4AT(D)(diag)-60,** DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC P0733 GEAR 3 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. **<Ref. to 4AT(D)(diag)-60,** DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC P0734 GEAR 4 INCORRECT RATIO

NOTE:
Refer to DTC P0736 for diagnostic procedure. **<Ref. to 4AT(D)(diag)-60,** DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC P0736 REVERSE INCORRECT RATIO

DTC DETECTING CONDITION:

Vehicle speed sensor malfunction and torque converter turbine speed sensor malfunction, etc. or control valve malfunction.

TROUBLE SYMPTOM:

- Shift point is too high or too low.
- Excessive shift shock.
- Tight corner “braking” phenomenon is occurred.
- Gear is not shifted to reverse.
- Gear position is held by fail safe function.

	Step	Check	Yes	No
1	**CHECK THROTTLE POSITION SENSOR.** 1) Connect the Subaru Select Monitor to data link connector. 2) Turn the ignition switch to ON. 3) Read the value of throttle sensor voltage at the Subaru Select Monitor.	Does the value of throttle sensor voltage change from 0.2 V to 4.6 V smoothly when throttle position sensor was operated from fully closing to fully opening?	Go to step **2.**	Check throttle position sensor. <Ref. to 4AT(D)(diag)-86, DTC P1708 THROTTLE POSITION SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2	**FRONT VEHICLE SPEED SENSOR.** 1) Lift-up the vehicle and place rigid racks. 2) Start the engine. 3) Move the select lever “D” range and slowly increase vehicle speed. NOTE: The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system.	Does the vehicle speed displayed by Subaru Select Monitor almost correspond with vehicle speed indicated by combination meter?	Go to step **3.**	Check the front vehicle speed sensor.
3	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Move the select lever to “P” or “N” range. 2) Idle the engine.	Does the turbine speed sensor revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?	There are malfunctions in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.	Check the torque converter turbine speed sensor circuit.

N: DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

DTC DETECTING CONDITION:

- Lock up clutch malfunction
- Locking of valve

TROUBLE SYMPTOM:

Lock up is not operated.

	Step	Check	Yes	No
1	**CHECK LOCK UP DUTY SOLENOID CIRCUIT.** Check according as DTC P0743 procedure.	Is there malfunction?	Repair or replace the lock up duty solenoid circuit.	Go to step **2.**
2	**CHECK INHIBITOR SWITCH CIRCUIT.** Check according as DTC P0705 procedure.	Is there malfunction?	Repair or replace the inhibitor switch circuit.	Go to step **3.**
3	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check according as DTC P0719 and DTC P0724 procedure.	Is there malfunction?	Repair or replace the stop light switch circuit.	Go to step **4.**
4	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check according to DTC P0712 and DTC P0713 procedure.	Is there malfunction?	Repair or replace the ATF temperature circuit.	Go to step **5.**
5	**CHECK THROTTLE POSITION SENSOR.** 1) Connect the Subaru Select Monitor to data link connector. 2) Turn the ignition switch to ON. 3) Read the value of throttle sensor voltage at the Subaru Select Monitor.	Does the value of throttle sensor voltage change from 0.2 V to 4.6 V smoothly when throttle position sensor was operated from fully closing to fully opening?	Go to step **6.**	Check the throttle position sensor circuit.
6	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR.** 1) Move the select lever to “P” or “N” range. 2) Idle the engine.	Does the engine revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?	Go to step **7.**	Check the torque converter turbine speed sensor circuit.
7	**CHECK ENGINE SPEED SIGNAL.** Idle the engine.	Does the engine revolution displayed by Subaru Select Monitor almost correspond with engine revolution indicated by tachometer?	There is malfunction in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.	Check the engine speed signal circuit.

O: DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

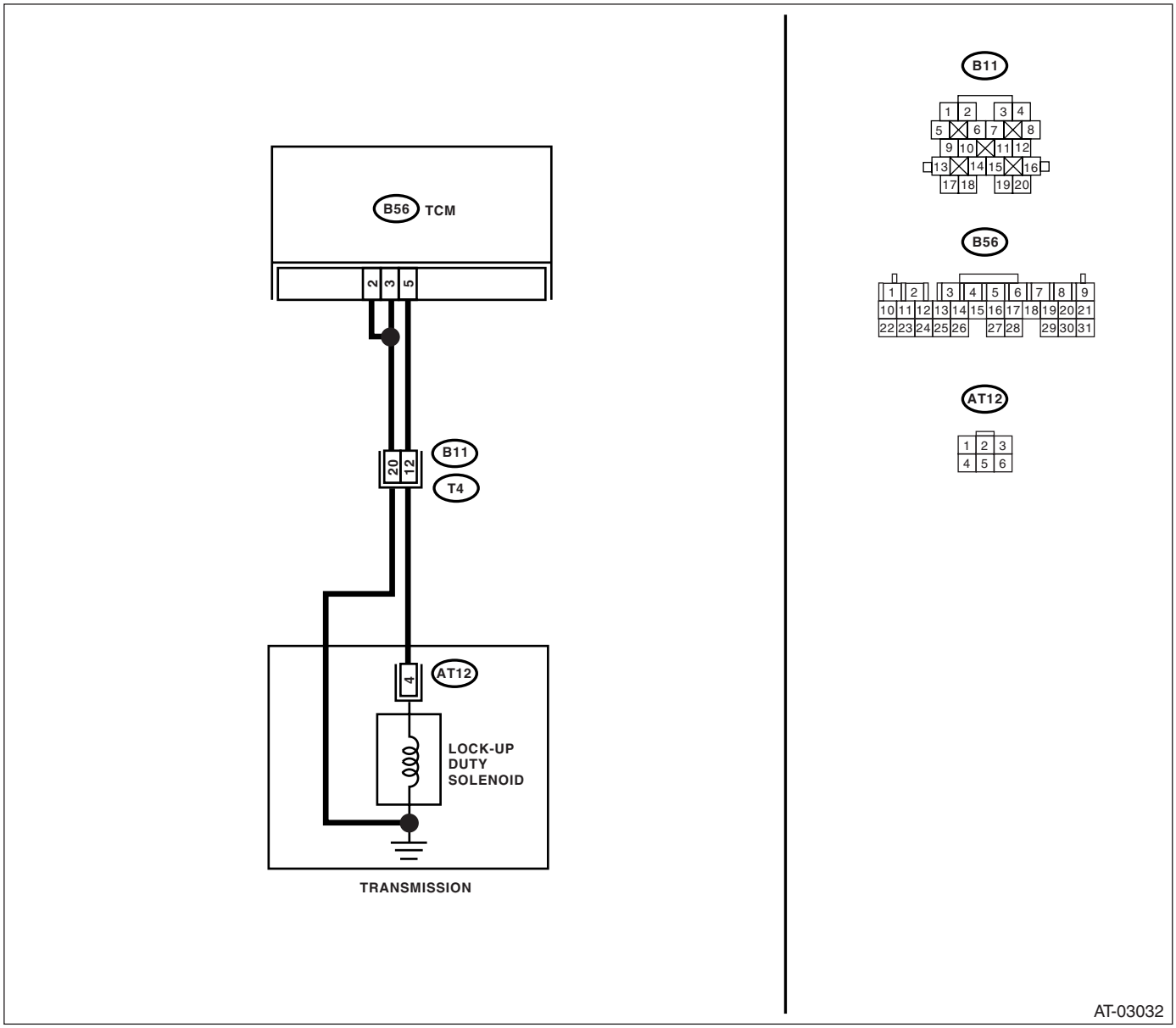
DTC DETECTING CONDITION:

Output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No “lock-up” (after engine warm-up).

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DTC.**	Do multiple DTCs appear in the on-board diagnostics test mode?	Go to another DTC.	Go to step **2.**
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 5 — (B11) No. 12:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit in harness between TCM and transmission connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the short circuit in harness between TCM and transmission connector.
4	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 12 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **6.**	Go to step **5.**
5	**CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION).** 1) Disconnect the transmission connector. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan and disconnect connector from lock-up duty solenoid. 4) Measure the resistance between lock-up duty solenoid and transmission ground. ***Connector & terminal*** ***(AT12) No. 4 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **6.**	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>
6	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between lock-up duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 12 — (AT12) No. 4:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM and transmission connector.
7	**CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 12 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit in harness between lock-up duty solenoid and transmission connector.

P: DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL

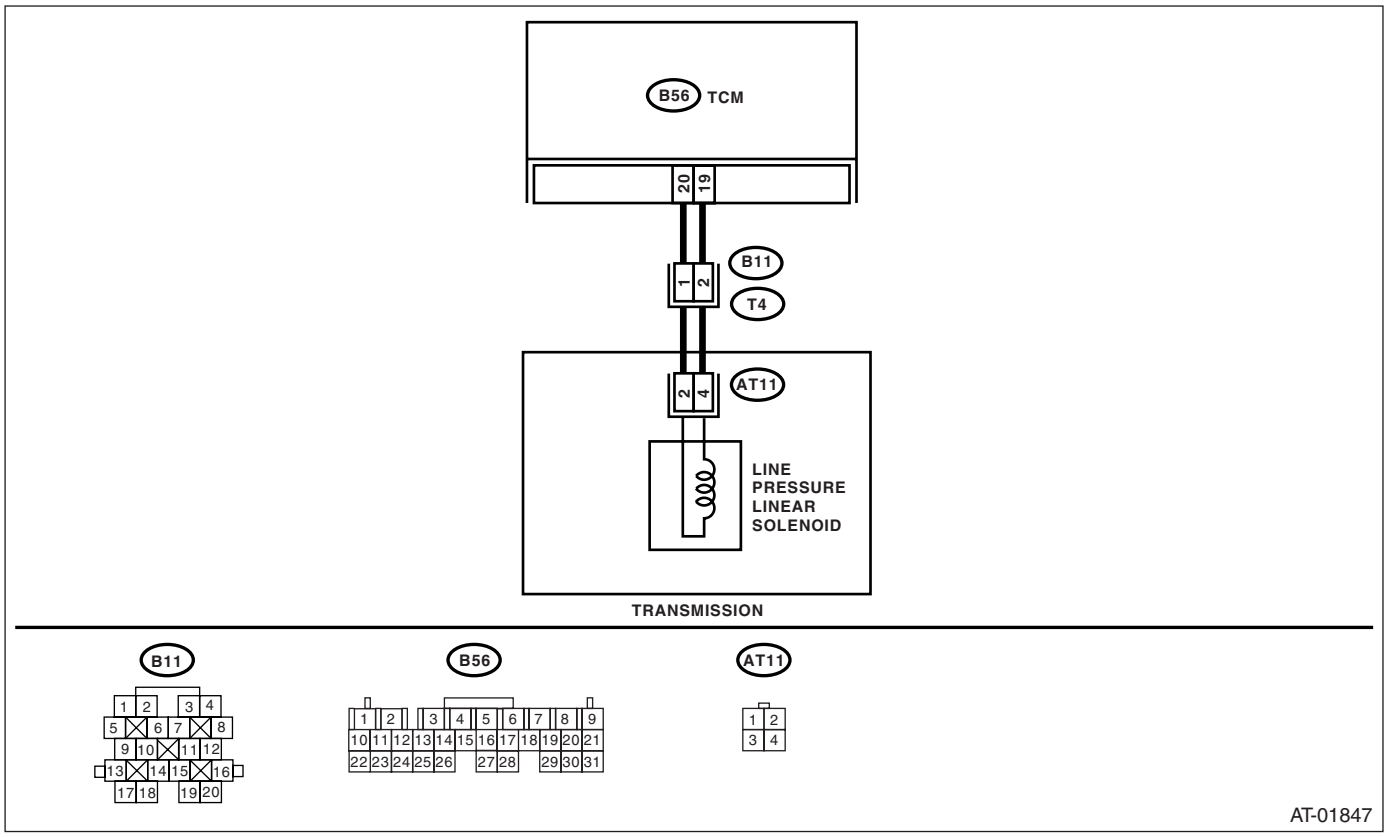
DTC DETECTING CONDITION:

Output signal circuit of line pressure linear solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 19 — (B11) No. 2:*** ***(B56) No. 20 — (B11) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 19 — Chassis ground:*** ***(B56) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LINE PRESSURE LINEAR SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 1 — No. 2:***	Is the resistance 4 — 8 Ω?	Go to step **5.**	Go to step **4.**
4	**CHECK LINE PRESSURE LINEAR SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from line pressure linear solenoid. 4) Measure the resistance between line pressure linear solenoid connector and transmission ground. ***Connector & terminal*** ***(AT11) No. 2 — No. 4:***	Is the resistance 4 — 8 Ω?	Go to step **5.**	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID.** Measure the resistance of harness between line pressure linear solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 2 — (AT11) No. 4:*** ***(T4) No. 1 — (AT11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between line pressure linear solenoid and transmission connector.

Step		Check	Yes	No
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 1 — Transmission ground:*** ***(T4) No. 2 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in line pressure linear solenoid and transmission.	Repair the short circuit in harness between line pressure linear solenoid and transmission connector.

Q: DTC P0753 SHIFT SOLENOID “A” ELECTRICAL

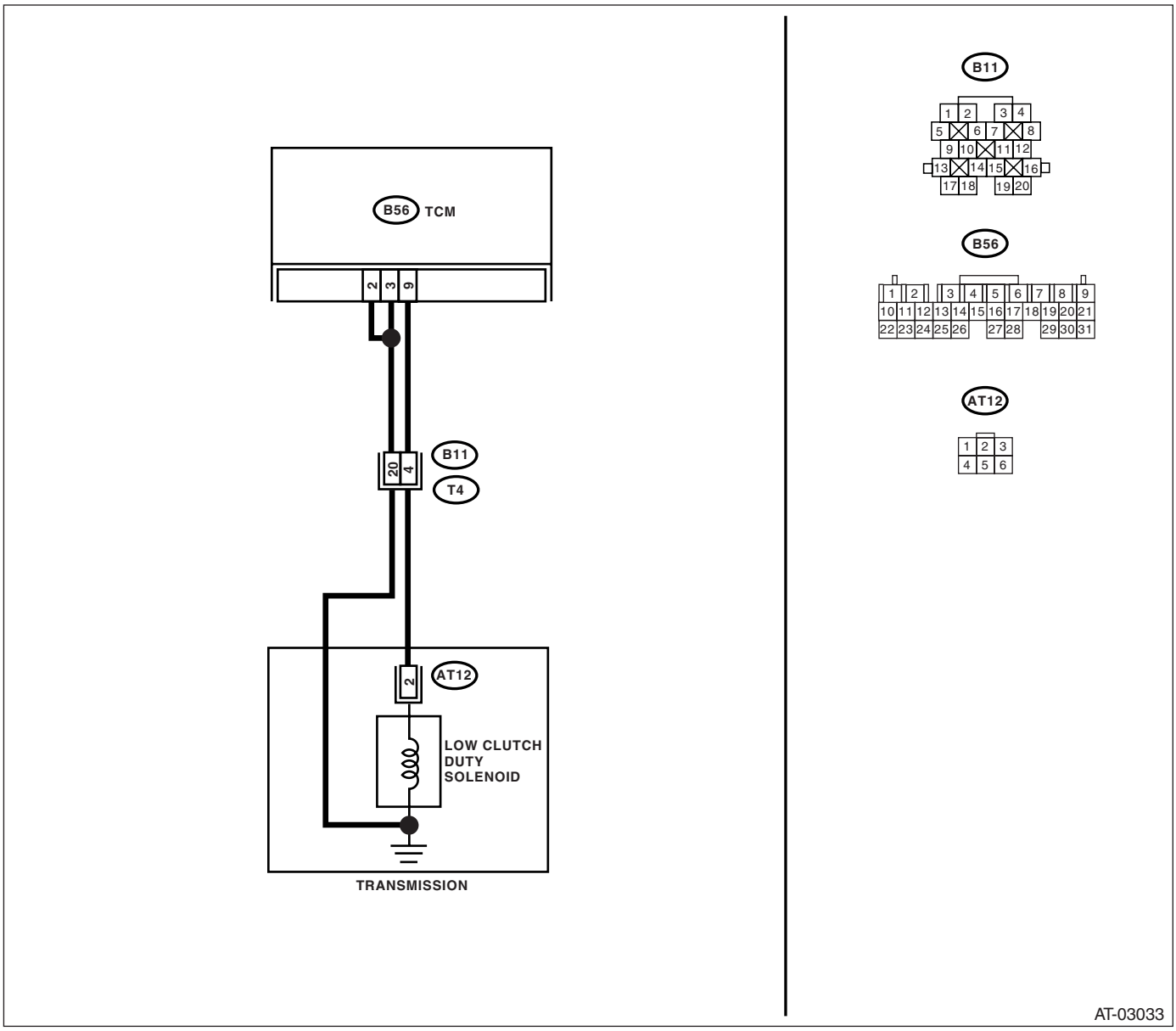
DTC DETECTING CONDITION:

Output signal circuit of low clutch duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift solenoid 1 connector. ***Connector & terminal*** ***(B56) No. 9 — (B11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW CLUTCH DUTY.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 4 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Shift the select lever to “P” or “N” range, and depress the accelerator pedal. 7) Read the data of low clutch duty solenoid using Subaru Select Monitor. • Low clutch duty solenoid is indicated in “%”.	Is the value 100%?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON (engine OFF). 2) Move the select lever to “D” range. 3) Read the data of low clutch duty solenoid.	Is the value 0%?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in low clutch duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK LOW CLUTCH DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from low clutch duty solenoid. 4) Measure the resistance between low clutch duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 2 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8.**	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>
8	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.** Measure the resistance of harness between low clutch duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 4 — (AT12) No. 2:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between low clutch duty solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 4 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low clutch duty solenoid and transmission.	Repair the short circuit in harness between low clutch duty solenoid and transmission connector.

R: DTC P0758 SHIFT SOLENOID "B" ELECTRICAL

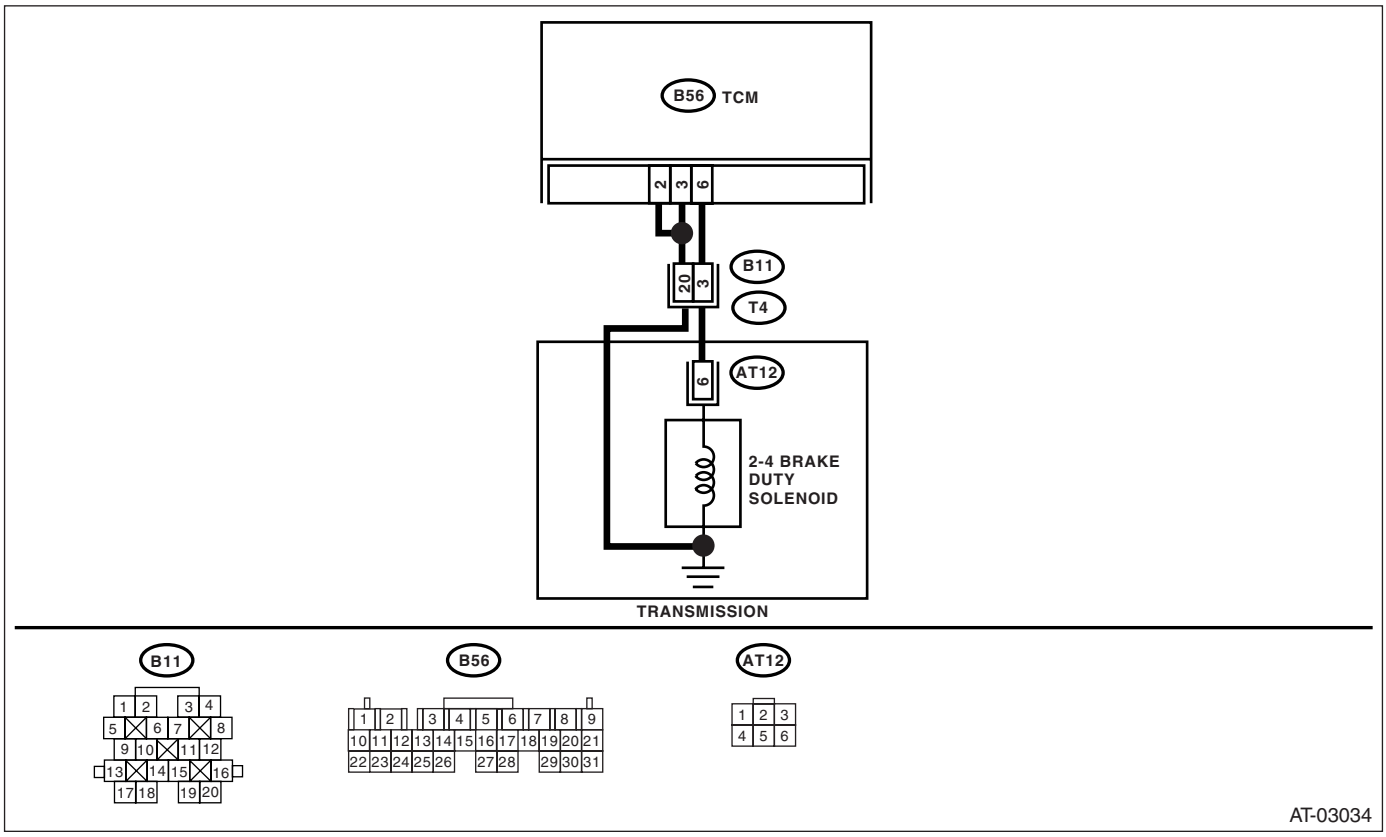
DTC DETECTING CONDITION:

Output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and shift transmission connector. ***Connector & terminal*** ***(B56) No. 6 — (B11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK 2-4 BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 3 — No. 20:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Move the select lever to “N” range. 7) Read the data of 2-4 brake duty solenoid using Subaru Select Monitor while depressing the accelerator pedal. • 2-4 brake duty solenoid is indicated in “%”.	Is the value 100%?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to “2” range. 2) Turn the HOLD switch to ON.	Is the value 0%?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

	Step	Check	Yes	No
7	**CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid. 4) Measure the resistance between 2-4 brake duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 6 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8.**	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>
8	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 3 — (AT12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between 2-4 brake duty solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 3 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in high clutch duty solenoid and transmission.	Repair the short circuit harness between 2-4 brake duty solenoid and transmission connector.

S: DTC P0763 SHIFT SOLENOID “C” ELECTRICAL

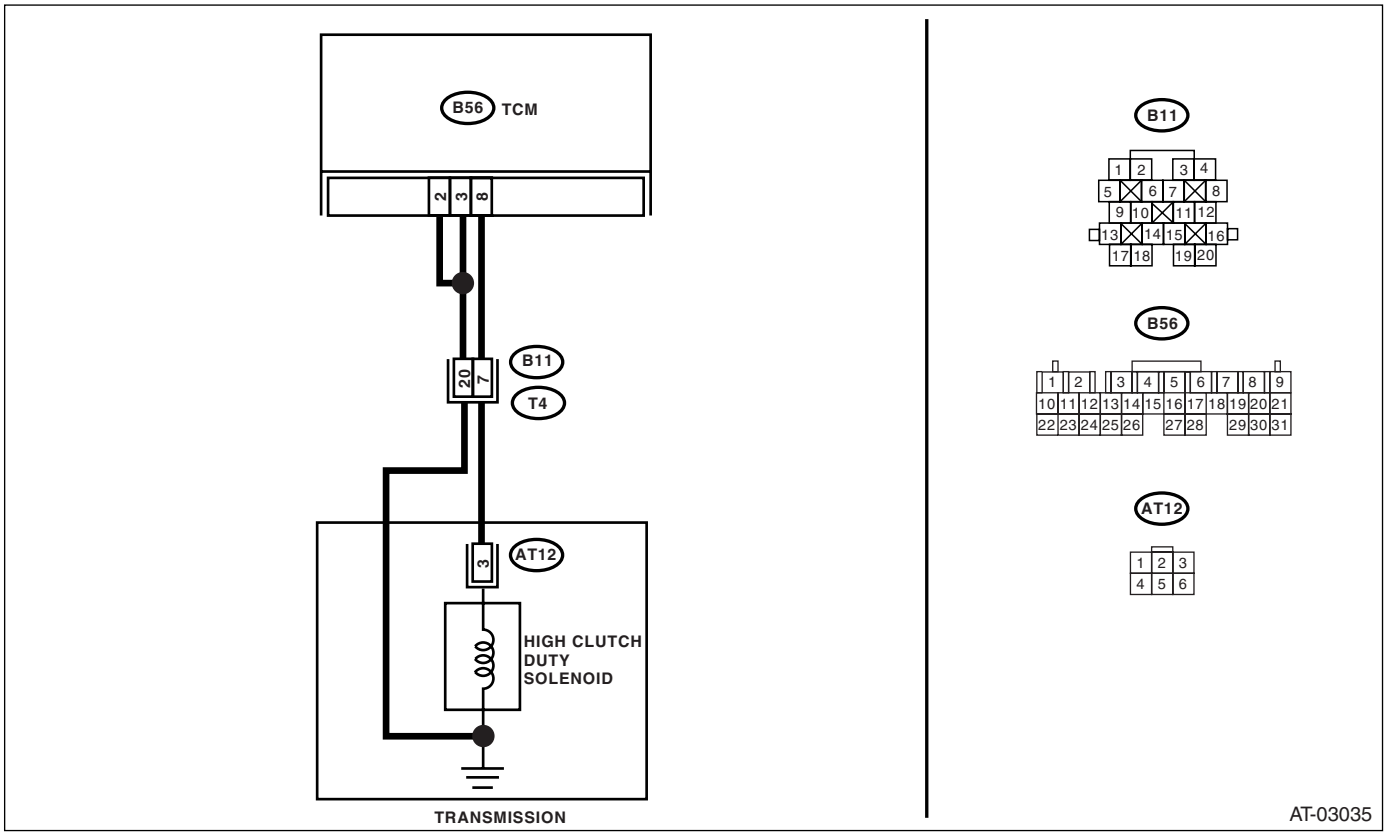
DTC DETECTING CONDITION:

Output signal circuit of high clutch duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 8 — (B11) No. 7:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK HIGH CLUTCH DUTY SOLENOID.** Measure the resistance between transmission connector receptacle's terminals. ***Connector & terminal*** ***(T4) No. 7 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off ground. 3) Connect the Subaru Select Monitor to data link connector. 4) Start the engine and turn Subaru Select Monitor switch to ON. 5) Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 6) Read the data of high clutch duty solenoid using Subaru Select Monitor. • High clutch duty solenoid is indicated in "%". 7) Move the select lever to "D" range and slowly increase vehicle speed and measure at 3rd or 4th gear. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>	Is the value 0%?	Go to step **5.**	Go to step **6.**

	Step	Check	Yes	No
5	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** Return the engine to idling speed and move select lever to "N" range. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>	Is the value 100%?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **6.**
6	**CHECK POOR CONTACT.**	Is there poor contact in high clutch duty circuit?	Repair poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
7	**CHECK HIGH CLUTCH DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan and disconnect connector from high clutch duty solenoid. 4) Measure the resistance between high clutch duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 3 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8.**	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>
8	**CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between high clutch duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 7 — (AT12) No. 3:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between TCM and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 7 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in high clutch duty solenoid and transmission.	Repair the short circuit in harness between high clutch duty solenoid and transmission connector.

T: DTC P0768 SHIFT SOLENOID "D" ELECTRICAL

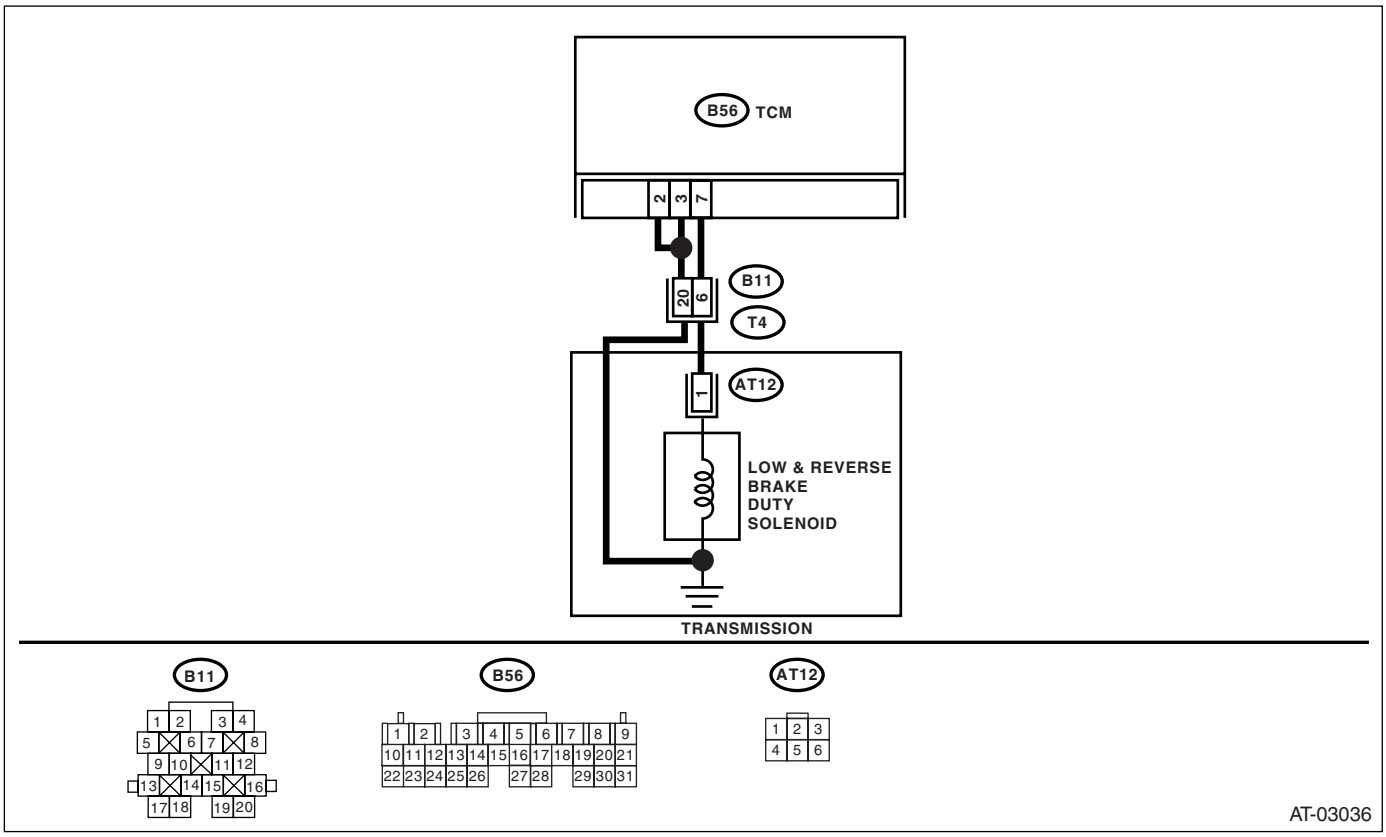
DTC DETECTING CONDITION:

Output signal circuit of low & reverse duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Gear is not changed.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 7 — (B11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK LOW & REVERSE BRAKE DUTY SOLENOID.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 6 — No. 20:***	Is the resistance 2.0 — 4.5 Ω?	Go to step **4.**	Go to step **7.**
4	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Connect all connectors. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 5) Stop the engine and turn ignition switch to ON (engine OFF). 6) Shift the select lever to “P” or “N” range, and depress the accelerator pedal. 7) Read the data of low & reverse duty solenoid using Subaru Select Monitor. • Low & reverse duty solenoid is indicated in “%”.	Is the value 100%?	Go to step **5.**	Go to step **6.**
5	**CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.** 1) Move the select lever to “1” range. 2) Read the data of low & reverse duty solenoid.	Is the value 55%?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK POOR CONTACT.**	Is there poor contact in low & reverse duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
7	**CHECK LOW & REVERSE BRAKE DUTY SOLENOID (IN TRANSMISSION).** 1) Remove the transmission connector from bracket. 2) Drain the ATF. **CAUTION:** **Do not drain the ATF until it cools down.** 3) Remove the oil pan, and disconnect connector from low & reverse duty solenoid. 4) Measure the resistance between low & reverse duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 1 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **8.**	Replace the low & reverse brake duty solenoid. <Ref. to 4AT-66, Control Valve Body.>
8	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW & REVERSE DUTY SOLENOID.** Measure the resistance of harness between low & reverse duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 6 — (AT12) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between low & reverse brake duty solenoid and transmission connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW & REVERSE BRAKE DUTY SOLENOID.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 6 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in low & reverse brake duty solenoid and transmission.	Repair the short circuit in harness between low & reverse brake duty solenoid and transmission connector.

U: DTC P0801 REVERSE INHIBITOR CONTROL CIRCUIT

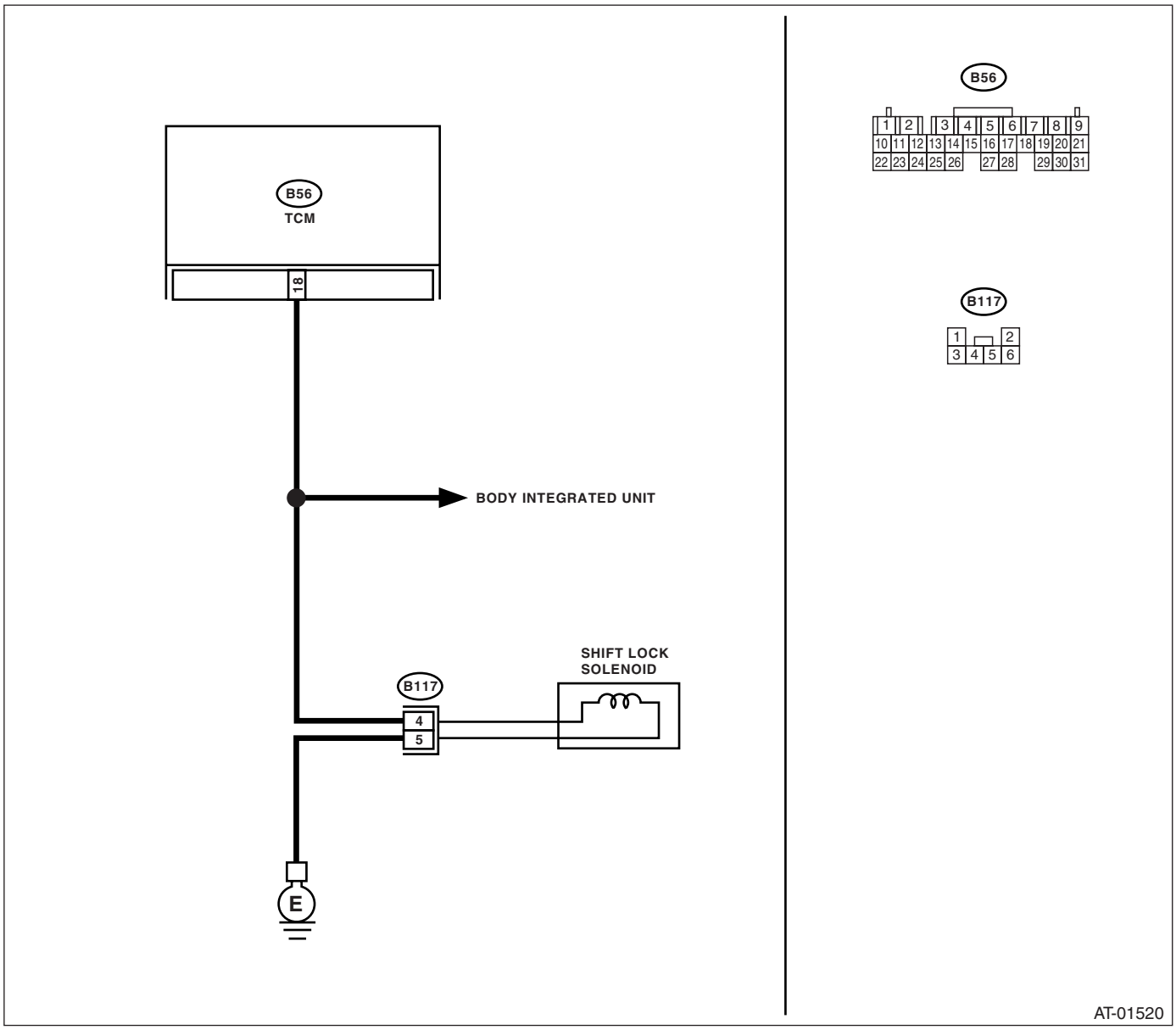
DTC DETECTING CONDITION:

Shift lock solenoid malfunction, open or short reverse inhibitor control circuit.

TROUBLE SYMPTOM:

- Gear is shifted from “N” range to “P” range during driving at 20 km/h (12 MPH) or more.
- Gear can not be shifted from “N” range to “R” range.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and shift lock solenoid. 3) Measure the resistance harness between TCM and shift lock solenoid connector. ***Connector & terminal*** ***(B56) No. 18 — (B117) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and shift lock solenoid connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and shift lock solenoid connector.
3	**CHECK HARNESS CONNECTOR BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between shift lock solenoid and chassis ground. ***Connector & terminal*** ***(B117) No. 5 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between chassis ground terminal and shift lock solenoid connector.
4	**CHECK SHIFT LOCK SOLENOID.** Measure the resistance between shift lock solenoid. ***Connector & terminal*** ***(B117) No. 5 — No. 4:***	Is the resistance 20 — 40 Ω?	Go to step **5.**	Replace the shift lock solenoid.
5	**CHECK TCM OUTPUT SIGNAL.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Move the select lever to “D” range. 4) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 10.5 V?	Go to step **6.**	Go to step **7.**
6	**CHECK OUTPUT SIGNAL FROM TCM.** 1) Lift-up the vehicle and place rigid rack. NOTE: Raise all wheels off ground. 2) Start the engine. 3) Move the select lever “D” range and slowly increase vehicle speed to 20 km/h (12 MPH). NOTE: The speed difference between front and rear wheels may light ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 4) Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 18 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Even if the POWER indicator light is blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be cause. Repair the harness or connector in reverse inhibitor control circuit.	Go to step **7.**
7	**CHECK POOR CONTACT.**	Is there poor contact in the reverse inhibitor control circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

V: DTC P1706 AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL)

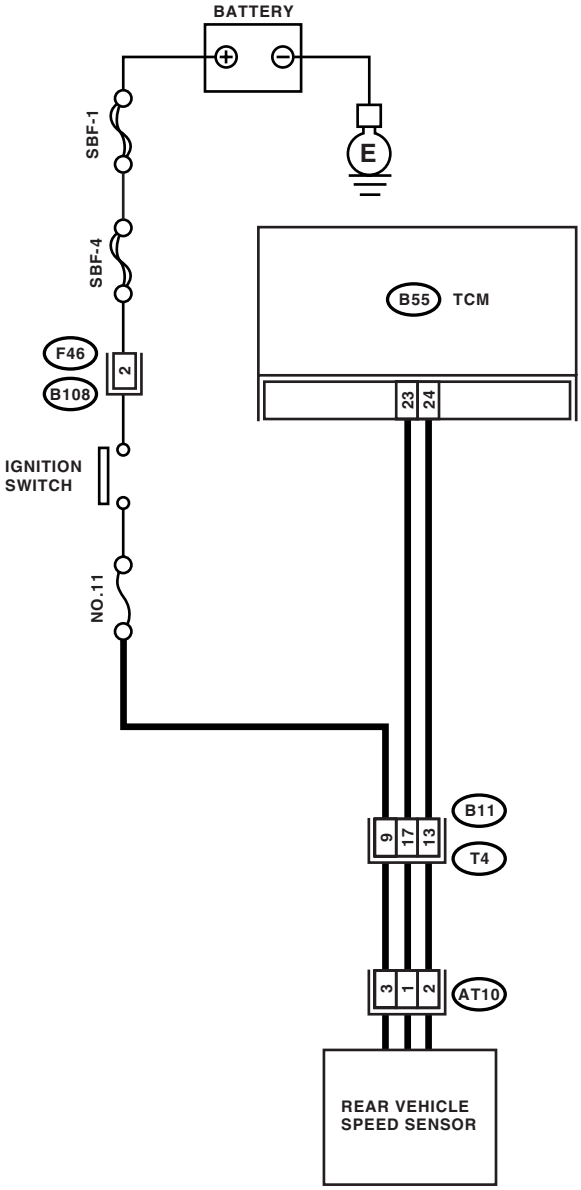
DTC DETECTING CONDITION:

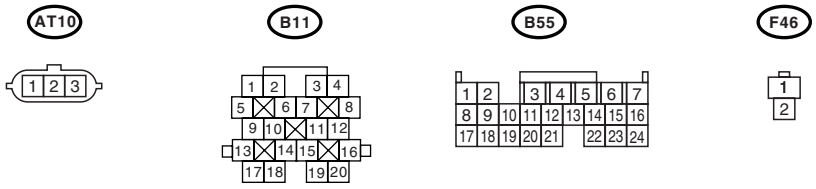
The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or occurring tight corner “braking” phenomenon.

WIRING DIAGRAM:





AT-02899

	Step	Check	Yes	No
1	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear vehicle speed sensor. 3) Measure the ignition power supply between rear vehicle speed sensor connector and transmission ground. ***Connector & terminal*** ***(AT10) No. 3 (+) — Transmission ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check harness between rear vehicle speed sensor and battery for open circuit, short or poor contact. Repair the harness if required.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 23 — (AT10) No. 1:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit or poor contact of connector in harness between TCM and rear vehicle speed sensor connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B55) No. 24 — (AT10) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit or poor contact of connector in harness between TCM and rear vehicle speed sensor connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 23 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the short circuit in harness between TCM and rear vehicle speed sensor connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 24 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the short circuit in harness between TCM and rear vehicle speed sensor connector.
6	**PREPARE OSCILLOSCOPE.**	Do you have an oscilloscope?	Go to step **8.**	Go to step **7.**
7	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off ground. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 4) Measure the AC voltage between TCM connector terminals. ***Connector & terminal*** ***(B55) No. 24 (+) — No. 23 (−):***	Is the voltage more than 2 V?	Go to step **9.**	Replace the rear vehicle speed sensor.

	Step	Check	Yes	No
8	**CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.** 1) Connect the connectors to TCM and transmission. 2) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off ground. 3) Set the oscilloscope to TCM connector terminals. ***Connector & terminal*** ***Positive probe; (B55) No. 24:*** ***Earth lead; (B55) No. 23:*** 4) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnostic is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS(diag)-27, Clear Memory Mode.> 5) Measure the signal voltage indicated on oscilloscope.	Is the pulse voltage approx. 5 V?	Go to step **9.**	Replace the rear vehicle speed sensor.
9	**CHECK POOR CONTACT.**	Is there poor contact in rear vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

W: DTC P1707 AT AWD SOLENOID VALVE CIRCUIT MALFUNCTION

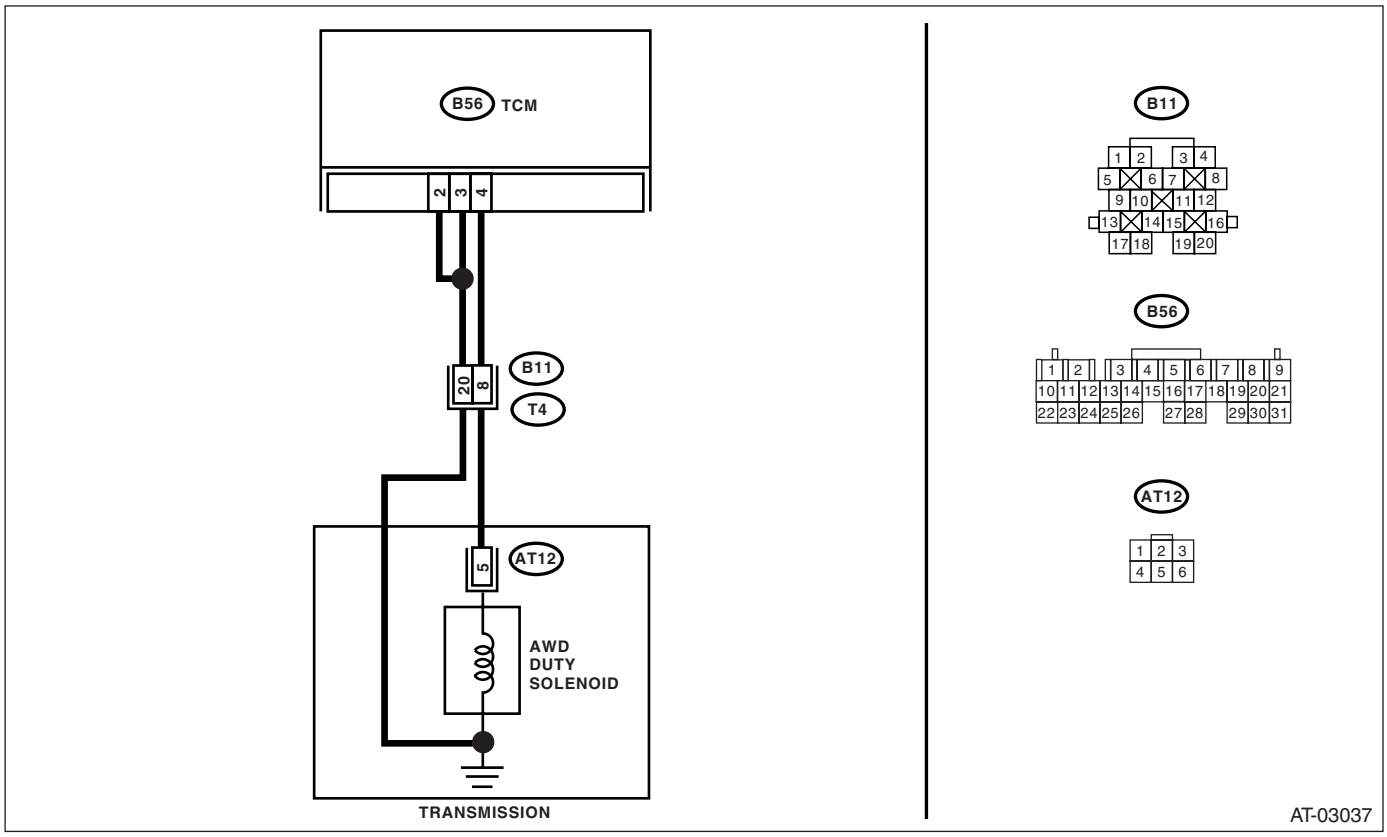
DTC DETECTING CONDITION:

The output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

- Tight corner “braking” phenomenon is occurred.
- Front wheels slip on the slippery road.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B56) No. 4 — (B11) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and transmission connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** Measure the resistance harness connector between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and transmission connector.
3	**CHECK TRANSFER DUTY SOLENOID.** Measure the resistance between transmission connector and transmission terminals. ***Connector & terminal*** ***(T4) No. 8 — No. 20:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **5.**	Go to step **4.**
4	**CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION).** 1) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off ground. 2) Drain the automatic transmission fluid. **CAUTION:** **Do not drain the automatic transmission fluid until it cools down.** 3) Remove the extension case and disconnect connector from transfer duty solenoid. 4) Measure the resistance between transfer duty solenoid connector and transmission ground. ***Connector & terminal*** ***(AT12) No. 5 — Transmission ground:***	Is the resistance 2.0 — 6.0 Ω?	Go to step **5.**	Replace the control valve body. <Ref. to 4AT-66, Control Valve Body.>
5	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transfer duty solenoid and transmission connector. ***Connector & terminal*** ***(T4) No. 8 — (AT12) No. 5:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between transfer duty solenoid and transmission connector.
6	**CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION.** Measure the resistance of harness between transmission connector and transmission ground. ***Connector & terminal*** ***(T4) No. 8 — Transmission ground:***	Is the resistance more than 1 MΩ?	Even if the POWER indicator light blinks, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or contact in transfer duty solenoid and transmission.	Repair the short circuit in harness between transfer duty solenoid and transmission connector.

X: DTC P1708 THROTTLE POSITION SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

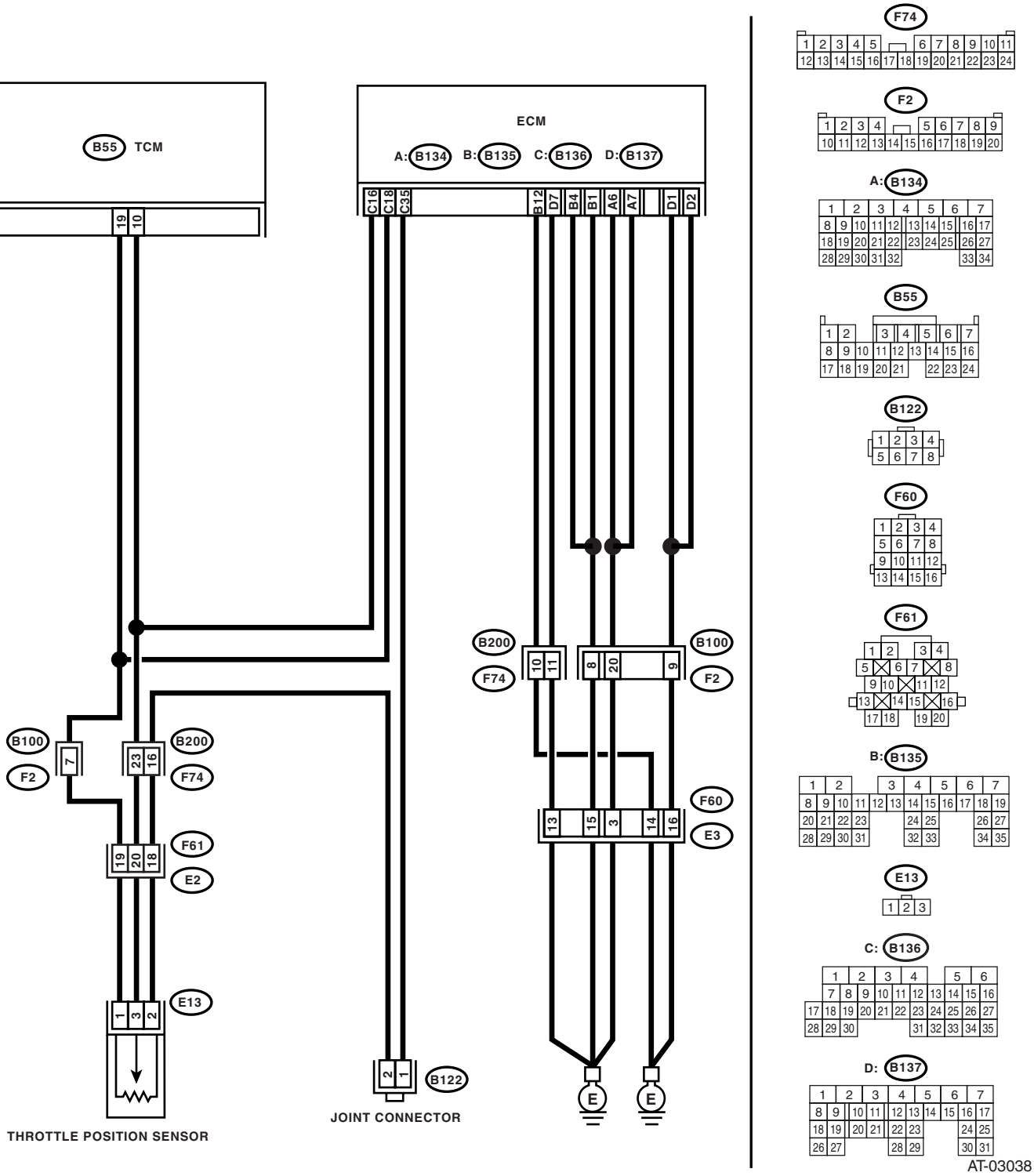
- Input signal circuit of throttle position sensor is open or shorted. (2.0 L model)
- Input signal circuit of accelerator pedal position sensor is open or shorted. (2.5 L model)

TROUBLE SYMPTOM:

- Shift point too high or too low.
- Excessive shift shock.
- Tight corner “braking” phenomenon.

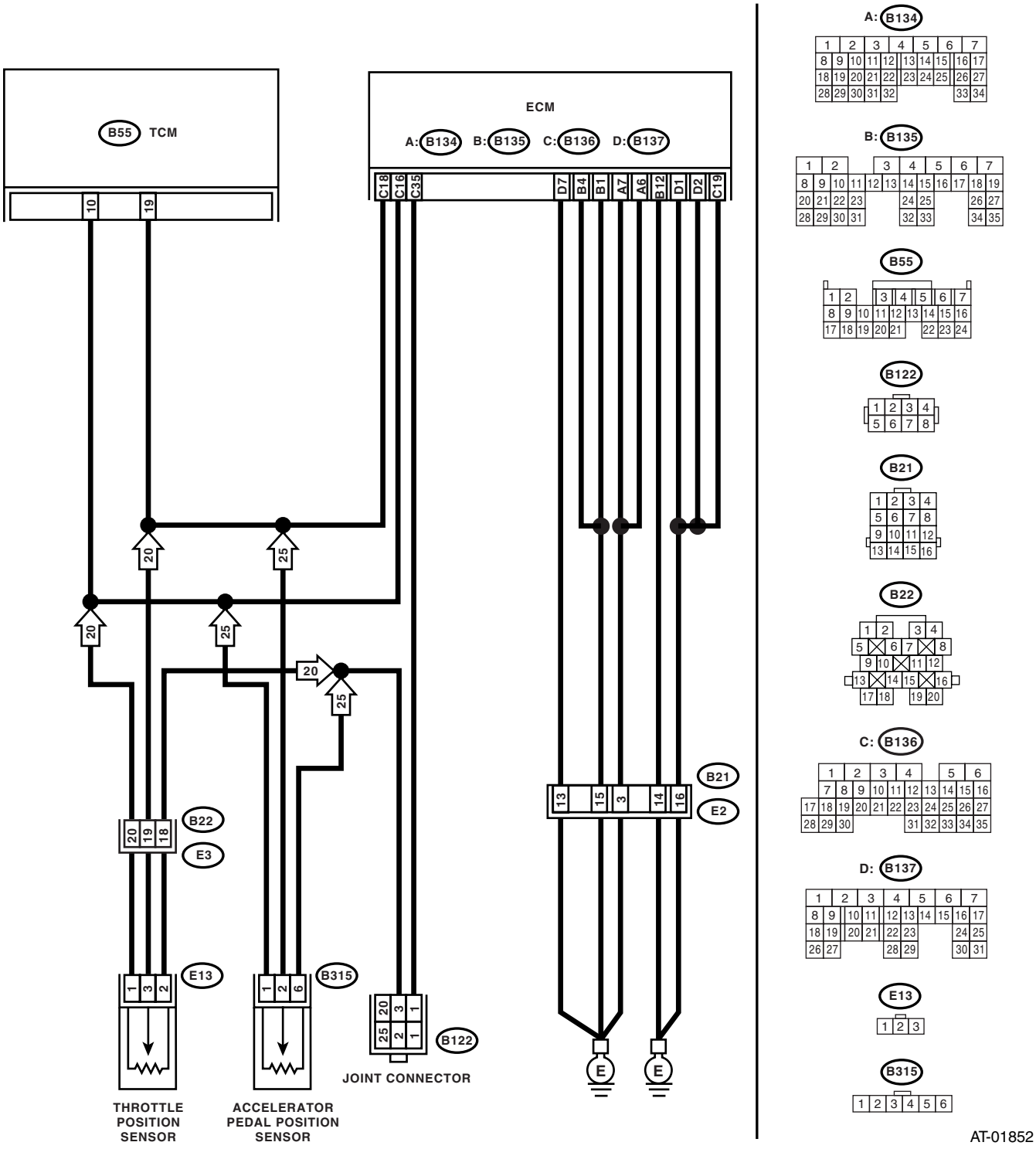
WIRING DIAGRAM:

- LHD model



AT-03038

- RHD model



AT-01852

	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.**	Have engine ground terminals been tightened securely?	Go to step **2.**	Tighten the engine ground terminals.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 6 — Engine ground:*** ***(B134) No. 7 — Engine ground:*** ***(B135) No. 1 — Engine ground:*** ***(B135) No. 4 — Engine ground:*** ***(B135) No. 12 — Engine ground:*** ***(B136) No. 19 — Engine ground:*** ***(B137) No. 1 — Engine ground:*** ***(B137) No. 2 — Engine ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	**CONFIRM MODEL.**	Is the vehicle 2.0 L model?	Go to step **4.**	Go to step **12.**
4	**CHECK THROTTLE POSITION SENSOR.** 1) Disconnect the connector from throttle position sensor. 2) Measure the resistance between throttle position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 1 — No. 2:***	Is the resistance 2.5 — 6 kΩ?	Go to step **5.**	Replace the throttle position sensor.
5	**CHECK THROTTLE POSITION SENSOR.** Measure the resistance between throttle position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 3 — No. 2:***	Is the resistance 0.5 — 4.5 kΩ?	Go to step **6.**	Replace the throttle position sensor.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and throttle position sensor connector. ***Connector & terminal*** ***(B55) No. 10 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
8	**CHECK HARNESS CONNECTOR BETWEEN ECM AND THROTTLE POSITION SENSOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between throttle position sensor and chassis ground. ***Connector & terminal*** ***(E13) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between ECM and throttle position sensor.
9	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **11.**	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **20.**
11	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Close the throttle completely. 6) Read the data of throttle position sensor using Subaru Select Monitor. • Throttle position sensor input signal is indicated.	Is the voltage more than 0.2 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.	Go to step **20.**
12	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from accelerator pedal position sensor. 2) Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 1 — No. 2:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **13.**	Replace the accelerator pedal position sensor.
13	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 3 — No. 2:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **14.**	Replace the accelerator pedal position sensor.
14	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B55) No. 10 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between TCM and accelerator pedal position sensor connector, and poor contact in coupling connector.

	Step	Check	Yes	No
15	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **16.**	Repair the short circuit in harness between TCM and accelerator pedal position sensor connector.
16	**CHECK HARNESS CONNECTOR BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between accelerator pedal position sensor connector and chassis ground. ***Connector & terminal*** ***(E13) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **17.**	Repair the short circuit in harness between ECM and accelerator pedal position sensor.
17	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **19.**	Go to step **18.**
18	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Close the throttle completely. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 0.4 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.	Go to step **20.**
19	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Close the throttle completely. 6) Read the data of accelerator pedal position sensor using Subaru Select Monitor. • Accelerator pedal position sensor input signal is indicated.	Is the voltage more than 0.4 V?	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.	Go to step **20.**
20	**CHECK POOR CONTACT.**	Is there poor contact in sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

Y: DTC P1709 THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

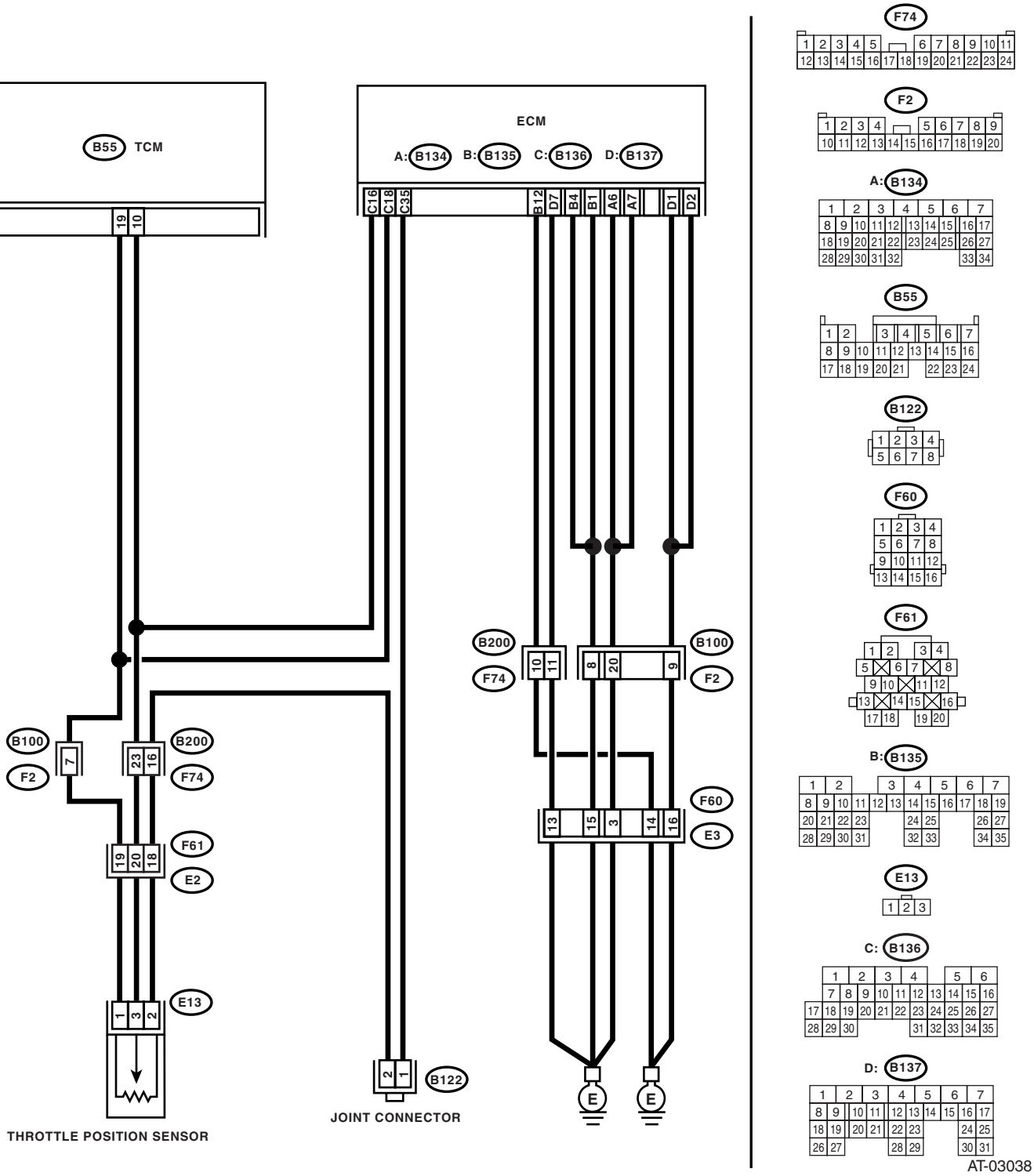
- Input signal circuit of throttle position sensor is shorted. (2.0 L model)
- Input signal circuit of accelerator pedal position sensor is shorted. (2.5 L model)

TROUBLE SYMPTOM:

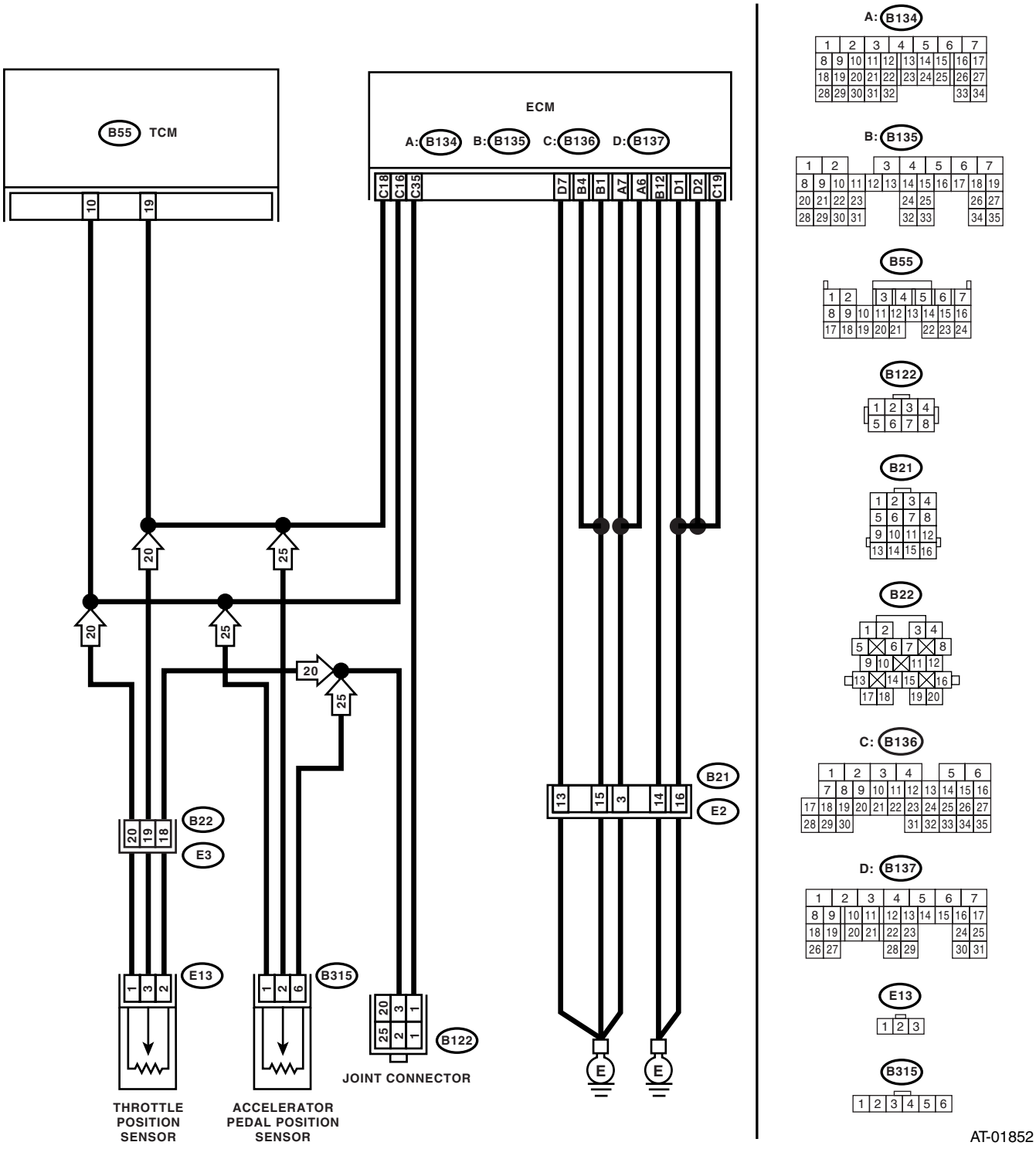
- Shift point too high or too low.
- Excessive shift shock.
- Tight corner braking phenomenon.

WIRING DIAGRAM:

- LHD model



- RHD model



AT-01852

	Step	Check	Yes	No
1	**CHECK ENGINE GROUND TERMINALS.**	Have the engine ground terminals been tightened securely?	Go to step **2.**	Tighten the engine ground terminals.
2	**CHECK GROUND CIRCUIT OF ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. ***Connector & terminal*** ***(B134) No. 6 — Engine ground:*** ***(B134) No. 7 — Engine ground:*** ***(B135) No. 1 — Engine ground:*** ***(B135) No. 4 — Engine ground:*** ***(B135) No. 12 — Engine ground:*** ***(B136) No. 19 — Engine ground:*** ***(B137) No. 1 — Engine ground:*** ***(B137) No. 2 — Engine ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit in harness between ECM connector and engine ground terminal.
3	**CONFIRM MODEL.**	Is the vehicle 2.0 L model?	Go to step **4.**	Go to step **11.**
4	**CHECK THROTTLE POSITION SENSOR.** 1) Disconnect the connector from throttle position sensor. 2) Measure the resistance between throttle position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 1 — No. 2:***	Is the resistance 2.5 — 6 kΩ?	Go to step **5.**	Replace the throttle position sensor.
5	**CHECK THROTTLE POSITION SENSOR.** Measure the resistance between throttle position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 2 — No. 3:***	Is the resistance 0.5 — 4.5 kΩ?	Go to step **6.**	Replace the throttle position sensor.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the short circuit in harness between TCM and throttle position sensor connector.
7	**CHECK HARNESS CONNECTOR BETWEEN ECM AND THROTTLE POSITION SENSOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(E13) No. 2 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the short circuit in harness between ECM and throttle position sensor.
8	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **10.**	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Open the throttle fully. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 4.6 V?	Go to step **18.**	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.
10	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, throttle position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Open the throttle fully. 6) Read the data of throttle position sensor using Subaru Select Monitor. • Throttle position sensor input signal is indicated.	Is the voltage more than 4.6 V?	Go to step **11.**	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor circuit.
11	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from accelerator pedal position sensor. 2) Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 1 — No. 2:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **12.**	Replace the accelerator pedal position sensor.
12	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between accelerator pedal position sensor connector receptacle's terminals. ***Connector & terminal*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **13.**	Replace the accelerator pedal position sensor.
13	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **14.**	Repair the short circuit in harness between TCM and accelerator pedal position sensor connector.
14	**CHECK HARNESS CONNECTOR BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(E315) No. 2 — (B136) No. 18:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the short circuit in harness between ECM and accelerator pedal position sensor.

	Step	Check	Yes	No
15	**PREPARE SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **17.**	Go to step **16.**
16	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Open the throttle fully. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 4.6 V?	Go to step **18.**	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.
17	**CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.** 1) Connect the connectors to TCM, accelerator pedal position sensor and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF). 4) Turn the Subaru Select Monitor switch to ON. 5) Open the throttle fully. 6) Read the data of accelerator pedal position sensor using Subaru Select Monitor. • Accelerator pedal position sensor input signal is indicated.	Is the voltage more than 4.6 V?	Go to step **18.**	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in accelerator pedal position sensor circuit.
18	**CHECK POOR CONTACT.**	Is there poor contact in sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

Z: DTC P1714 THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

DTC DETECTING CONDITION:

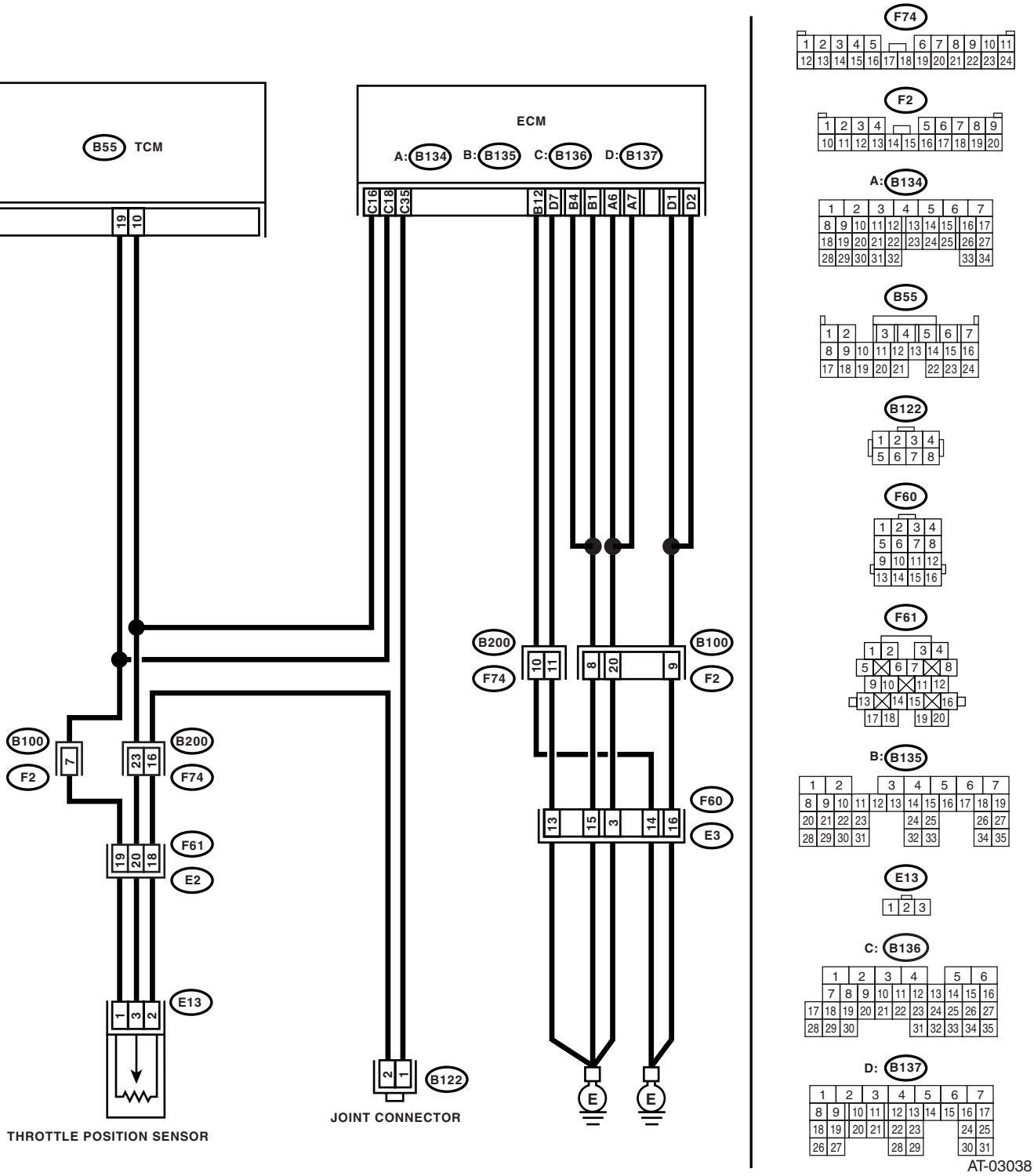
- Power supply circuit of throttle position sensor is open or shorted. (2.0 L model)
- Power supply circuit of accelerator pedal position sensor is open or shorted. (2.5 L model)

TROUBLE SYMPTOM:

- Shift point too high or too low.
- Excessive shift shock.
- Tight corner “braking” phenomenon.

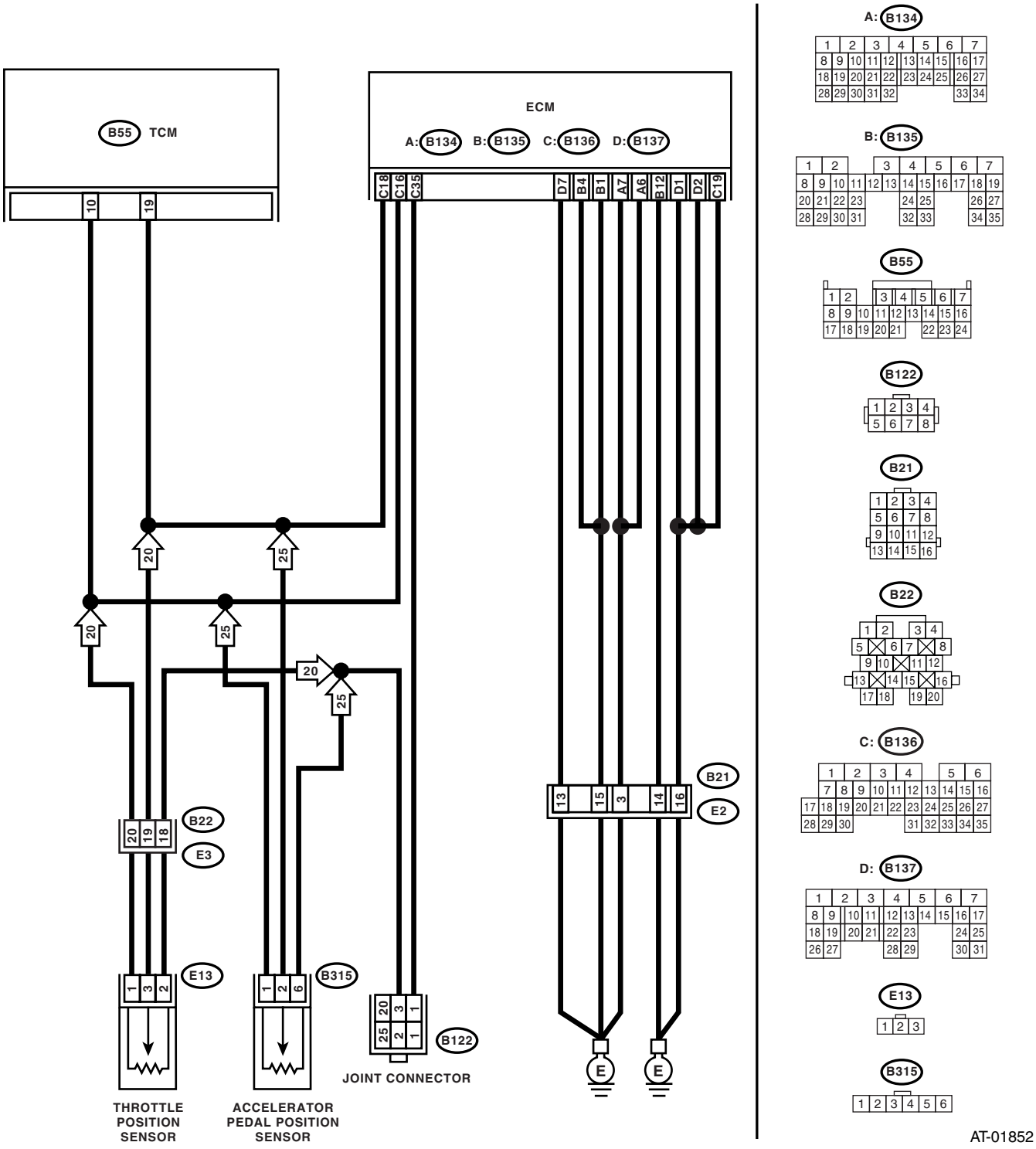
WIRING DIAGRAM:

- LHD model



AT-03038

- RHD model



AT-01852

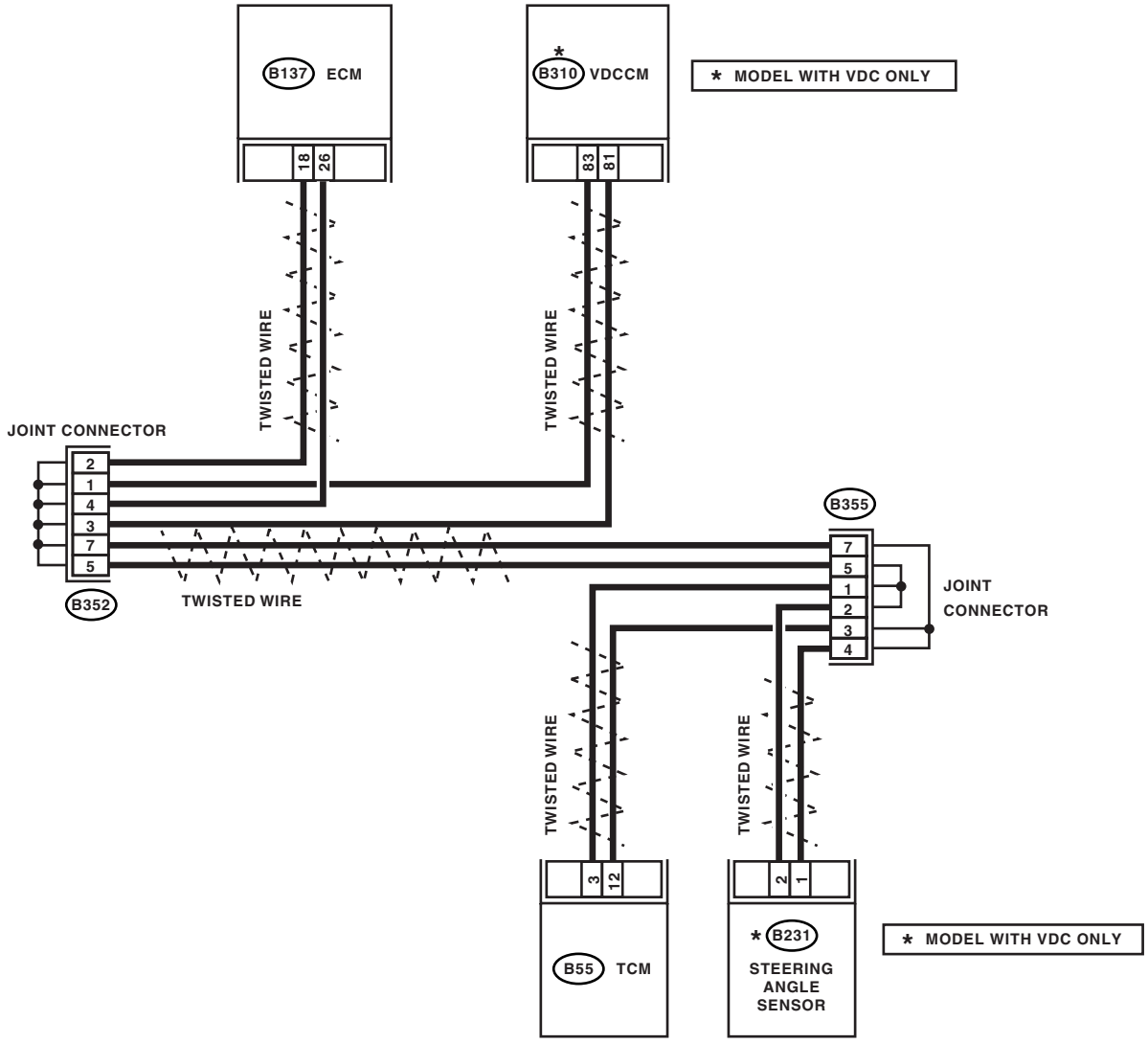
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR OR ACCELERATOR PEDAL POSITION SENSOR.** 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and throttle position sensor or accelerator pedal position sensor connector. ***Connector & terminal*** ***2.0 L model*** ***(B55) No. 19 — (E13) No. 1:*** ***2.5 L model*** ***(B55) No. 10 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and throttle position sensor or accelerator pedal position sensor connector, and poor contact in coupling connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR OR ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and throttle position sensor or accelerator pedal position sensor connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 10 (+) — Chassis ground (−):***	Is the voltage approx. 5 V?	Go to step **4.**	Even if the POWER indicator light was blinking, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in throttle position sensor or accelerator pedal position sensor circuit.
4	**CHECK POOR CONTACT.**	Is there poor contact in sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

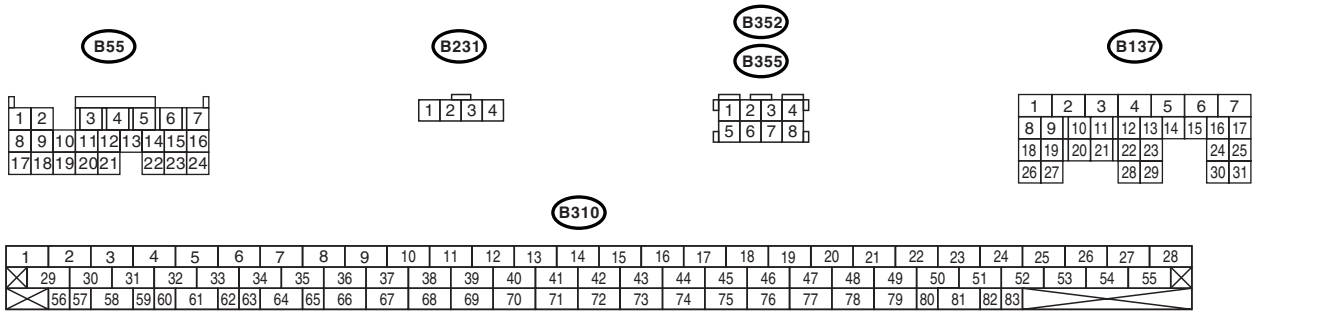
AA:DTC P1718 CAN COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

Input signal circuit of TCM is open or shorted.

WIRING DIAGRAM:





AT-02932

	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM, ECM and VDCCM. 3) Measure the resistance of harness between TCM and VDCCM connector. ***Connector & terminal*** ***(B55) No. 12 — (B310) No. 81:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair open circuit in harness between TCM and VDCCM and poor contact in coupling connector.
2	**CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM.** Measure the resistance of harness between TCM and VDCCM connector. ***Connector & terminal*** ***(B55) No. 3 — (B310) No. 83:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between TCM and VDCCM and poor contact in coupling connector.
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B55) No. 12 — (B137) No. 26:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair open circuit in harness between TCM and ECM and poor contact in coupling connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM.** Measure the resistance of harness between TCM and ECM connector. ***Connector & terminal*** ***(B55) No. 3 — (B137) No. 18:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair open circuit in harness between TCM and ECM and poor contact in coupling connector.
5	**CHECK HARNESS CONNECTOR BETWEEN TCM, ECM AND VDCCM.** Measure the voltage of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 3 — Chassis ground:*** ***(B55) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace and check it again because of TCM, ECM and VDCCM malfunction possibility.	Repair short circuit in harness between TCM, ECM and VDCCM connector.

14.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

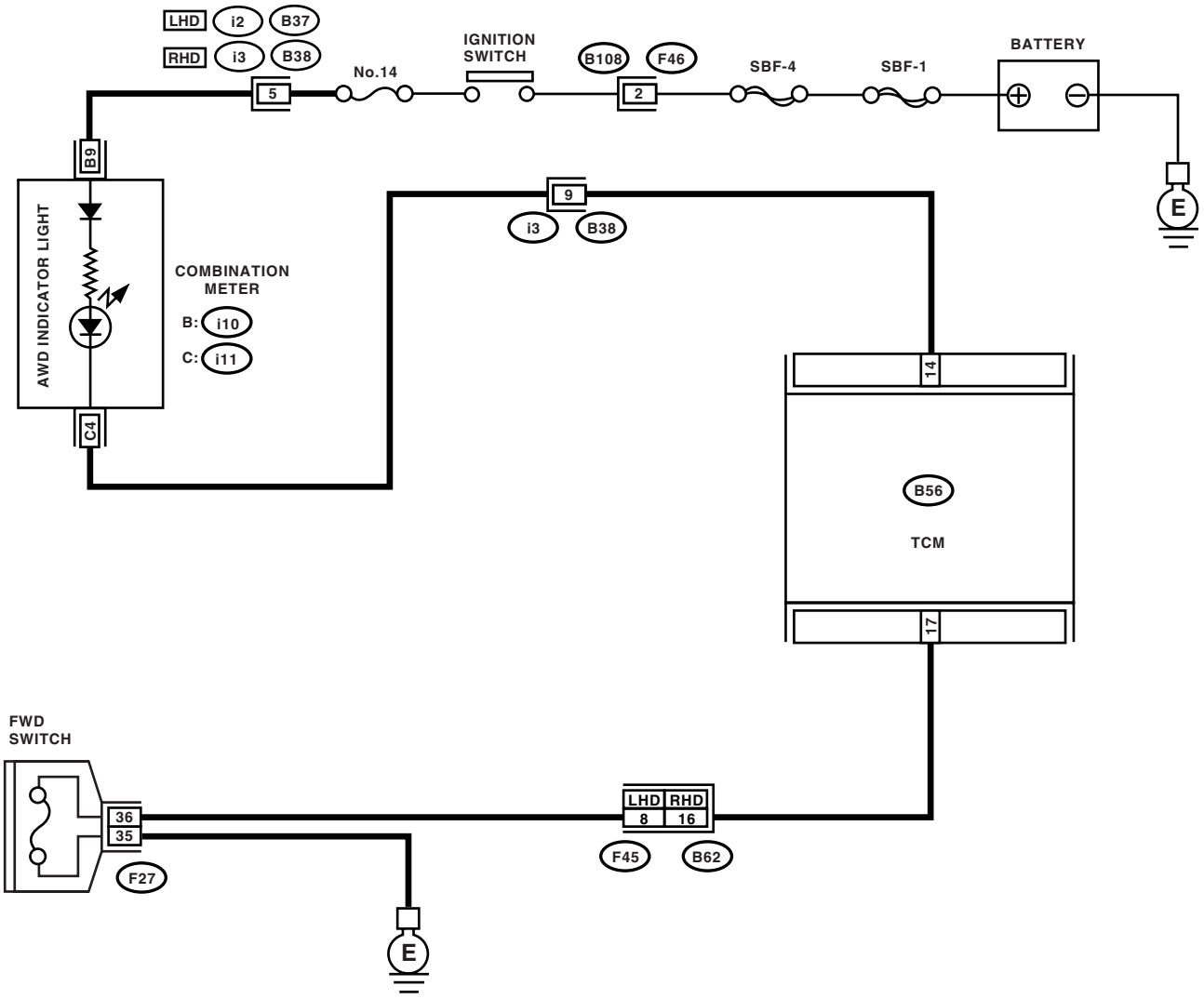
A: CHECK FWD SWITCH.

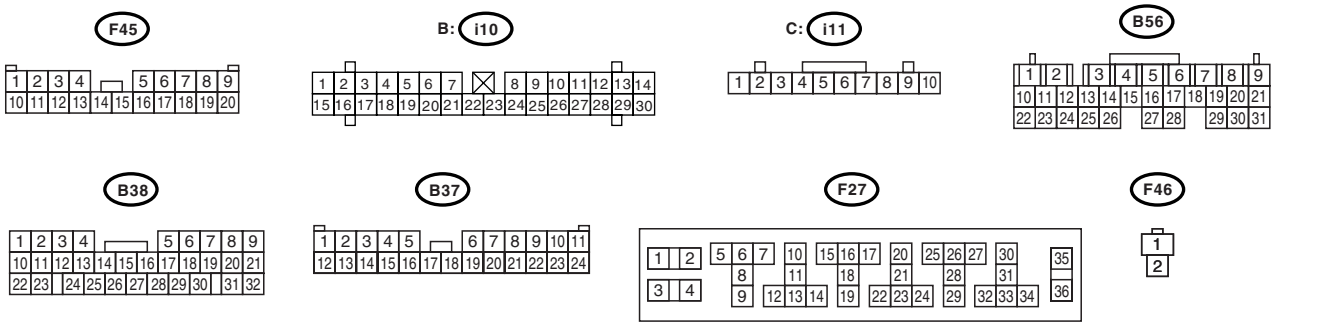
NOTE:
This section is specified for turbo model.

1. EXCEPT FOR MODEL WITH VDC

DIAGNOSTIC:
- The LED does not come on even if FWD switch is ON.
- The FWD switch circuit is open or short.

WIRING DIAGRAM:





AT-03039

	Step	Check	Yes	No
1	**CHECK SPARE FUSE.**	Is the spare fuse OK?	Go to step **2.**	Replace the spare fuse.
2	**CHECK FWD SWITCH.**	When the fuse is inserted to FWD switch, does LED illuminate?	Go to step check cruise control switch.	Go to step **3.**
3	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and FWD switch. 3) Measure the resistance of harness between TCM and FWD switch connector. ***Connector & terminal*** ***(B56) No. 17 — (F27) No. 36:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between TCM and FWD switch connector.
4	**CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH.** Measure the resistance of harness connector between TCM and body to make sure that circuit does not short. ***Connector & terminal*** ***(B56) No. 17 — Chassis ground:***	Is the resistance more than 1 M Ω?	Go to step **5.**	Repair the short circuit in harness between TCM and FWD switch connector.
5	**CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between FWD switch and chassis ground. ***Connector & terminal*** ***(F27) No. 35 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between FWD switch connector and chassis ground.
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and FWD switch. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector. ***Connector & terminal*** ***(B56) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **7.**	Go to step **11.**
7	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***(B56) No. 17 (+) — Chassis ground (−):***	Is the voltage more than 10.5 V?	Go to step **8.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and combination meter. 3) Measure the resistance of harness between TCM and diagnostic connector. ***Connector & terminal*** ***(B56) No. 14 — (i11) No. 4:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between TCM and combination meter and poor contact in coupling connector.
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***(B56) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the short circuit in harness between TCM and combination meter connector.

	Step	Check	Yes	No
10	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and combination meter. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing and removing the fuse to FWD switch connector. ***Connector & terminal*** ***(B56) No. 14 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Go to step **12.**
11	**CHECK OUTPUT SIGNAL EMITTED FROM TCM.** Measure the signal voltage for TCM while removing the fuse from FWD switch connector. ***Connector & terminal*** ***(B56) No. 14 (+) — Chassis ground (–):***	Is the voltage more than 10.5 V?	Go to step **12.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
12	**CHECK POOR CONTACT.**	Is there poor contact in FWD switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

B: CHECK CRUISE CONTROL SWITCH.

	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL SWITCH.**	When the cruise control is set, does LED illuminate?	Go to step CHECK SYMPTOM RELATED DIAGNOSTIC. <Ref. to 4AT(D)(diag)-118, INSPECTION, General Diagnostic Table.>	Check the cruise control switch. <Ref. to CC(ETC)(diag)-10, Diagnostic with Phenomenon.>

C: CHECK POWER SWITCH

DIAGNOSTIC:

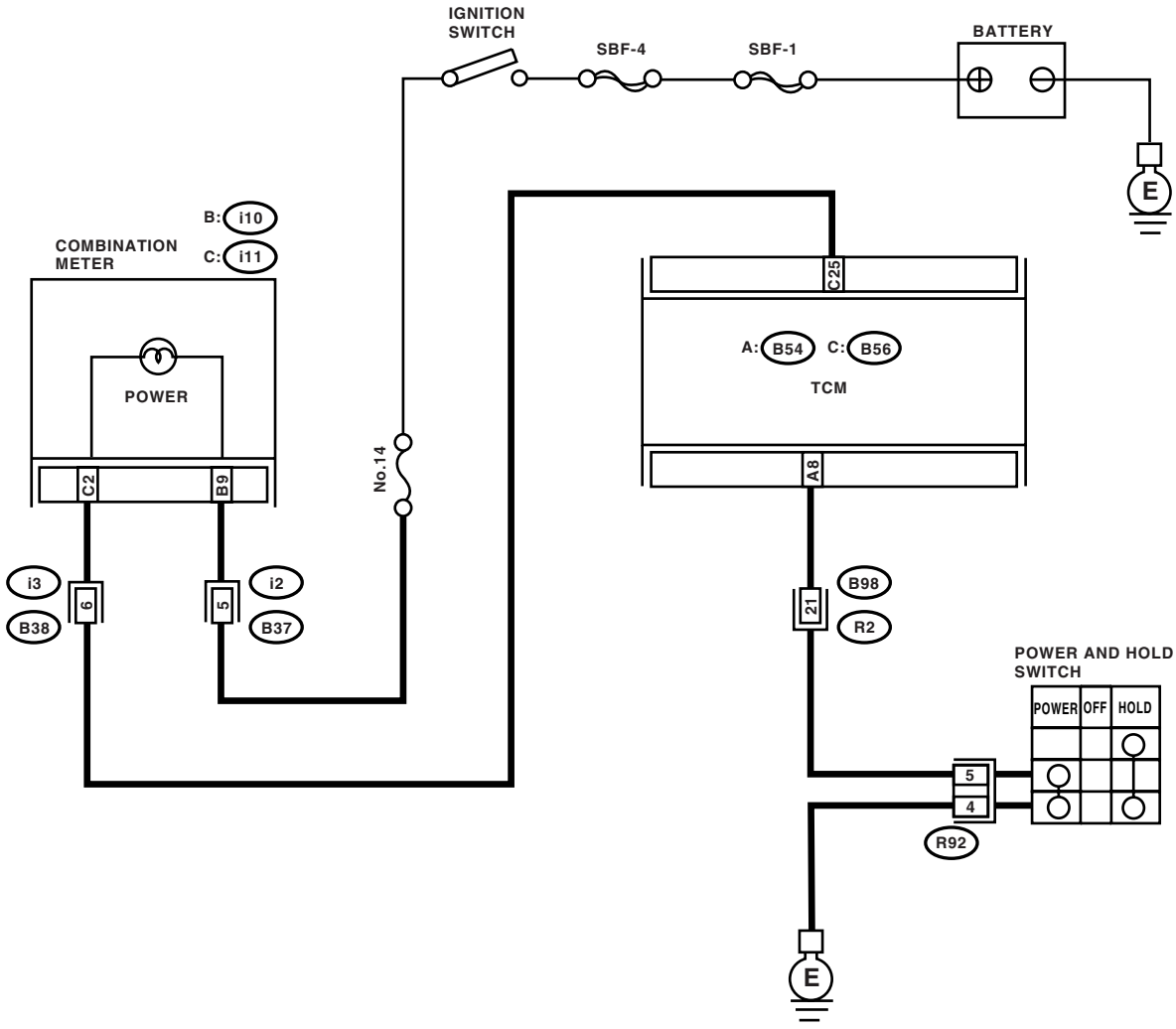
- The light does not come on when POWER switch is ON.
- The POWER switch circuit is open or shorted.

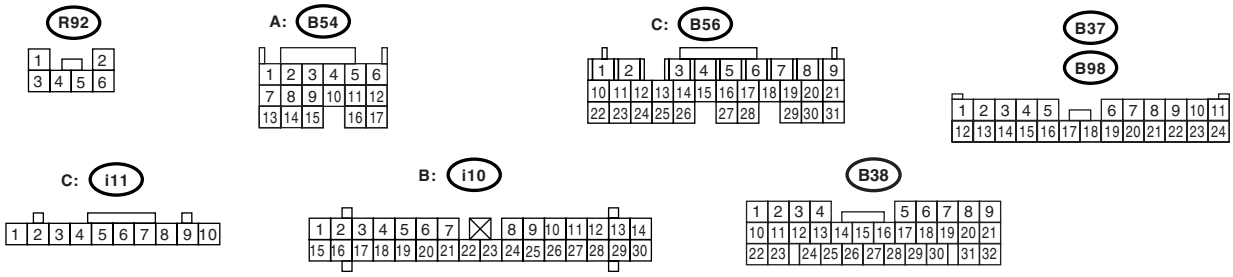
TROUBLE SYMPTOM:

No POWER mode occurs.

WIRING DIAGRAM:

- LHD MODEL





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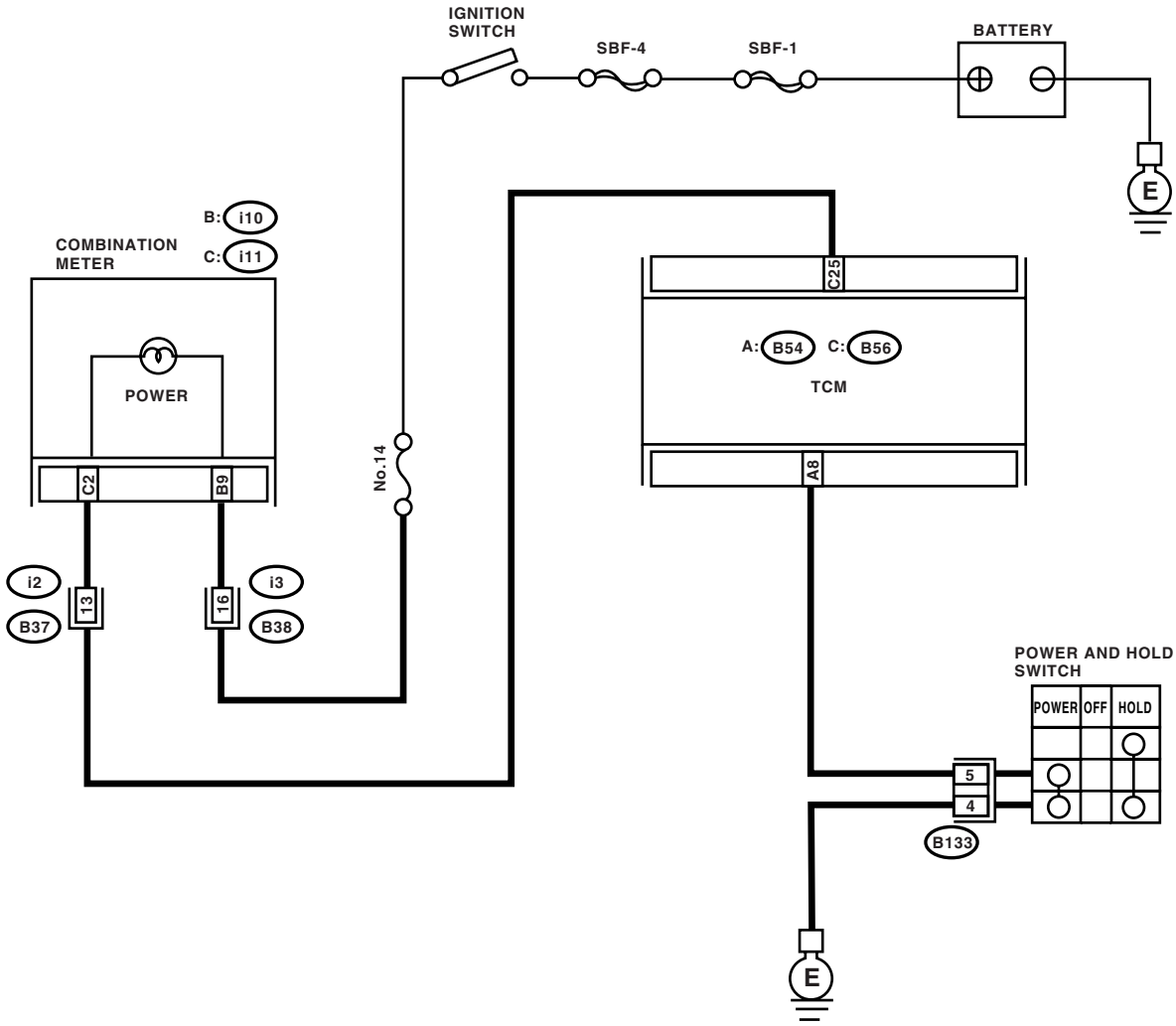
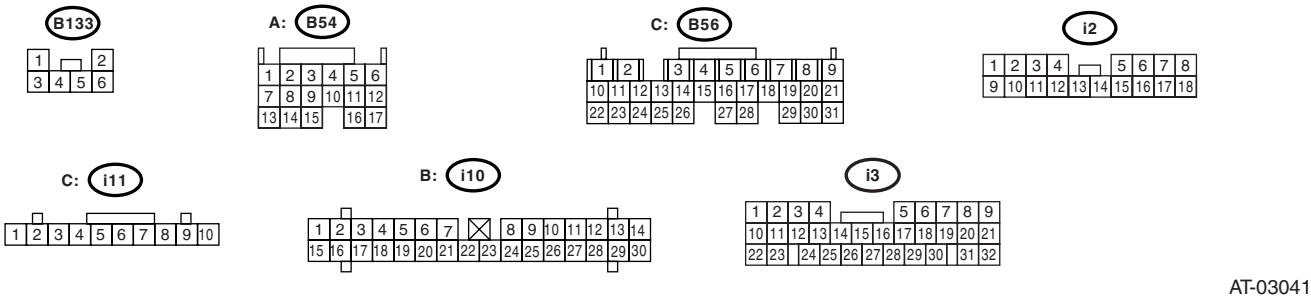
- RHD MODEL





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	Step	Check	Yes	No
1	**CHECK POWER SWITCH OPERATION.**	When the POWER switch is turned to OFF, does light up?	Go to step **5.**	Go to step **2.**
2	**CHECK POWER SWITCH OPERATION.**	When the POWER switch is turned to ON, does light up?	Go to step CHECK HOLD SWITCH. <Ref. to 4AT(D)(diag)-112, CHECK HOLD SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK POWER INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the POWER indicator light bulb from combination meter.	Is the POWER indicator light bulb OK?	Go to step **4.**	Replace the POWER indicator light bulb. <Ref. to IDI-10, Combination Meter.>
4	**CHECK POWER SWITCH GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from POWER switch. 3) Measure the resistance of harness connector between POWER switch and chassis ground. ***Connector & terminal*** ***LHD model*** ***(R92) No. 4 — Chassis ground:*** ***RHD model*** ***(B133) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between POWER switch and chassis ground.
5	**CHECK POWER SWITCH.** 1) Turn the POWER switch to ON. 2) Measure the resistance between terminals of POWER switch. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **6.**	Replace the POWER switch.
6	**CHECK POWER SWITCH.** 1) Turn the POWER switch to OFF. 2) Measure the resistance between terminals of POWER switch. ***Terminals*** ***No. 5 — No. 4:***	Is the resistance more than1 MΩ?	Go to step **7.**	Replace the POWER switch.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH.** Measure the resistance of harness connector between TCM and POWER switch. ***Connector & terminal*** ***(B54) No. 8 — (B133) No. 5:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and POWER switch connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH.** Measure the resistance of harness connector between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the short circuit in harness between TCM and POWER switch connector.

	Step	Check	Yes	No
9	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors to TCM and POWER switch. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the signal voltage for TCM while turning POWER switch to OFF. ***Connector & terminal*** ***(B54) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **10.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
10	**CHECK INPUT SIGNAL FOR TCM.** Measure the signal voltage for TCM while turning POWER switch to ON. ***Connector & terminal*** ***(B54) No. 8 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
11	**CHECK POOR CONTACT.**	Is there poor contact?	Repair the poor contact.	A temporary poor contact of the connector or harness in POWER switch circuit.

D: CHECK HOLD SWITCH

DIAGNOSTIC:

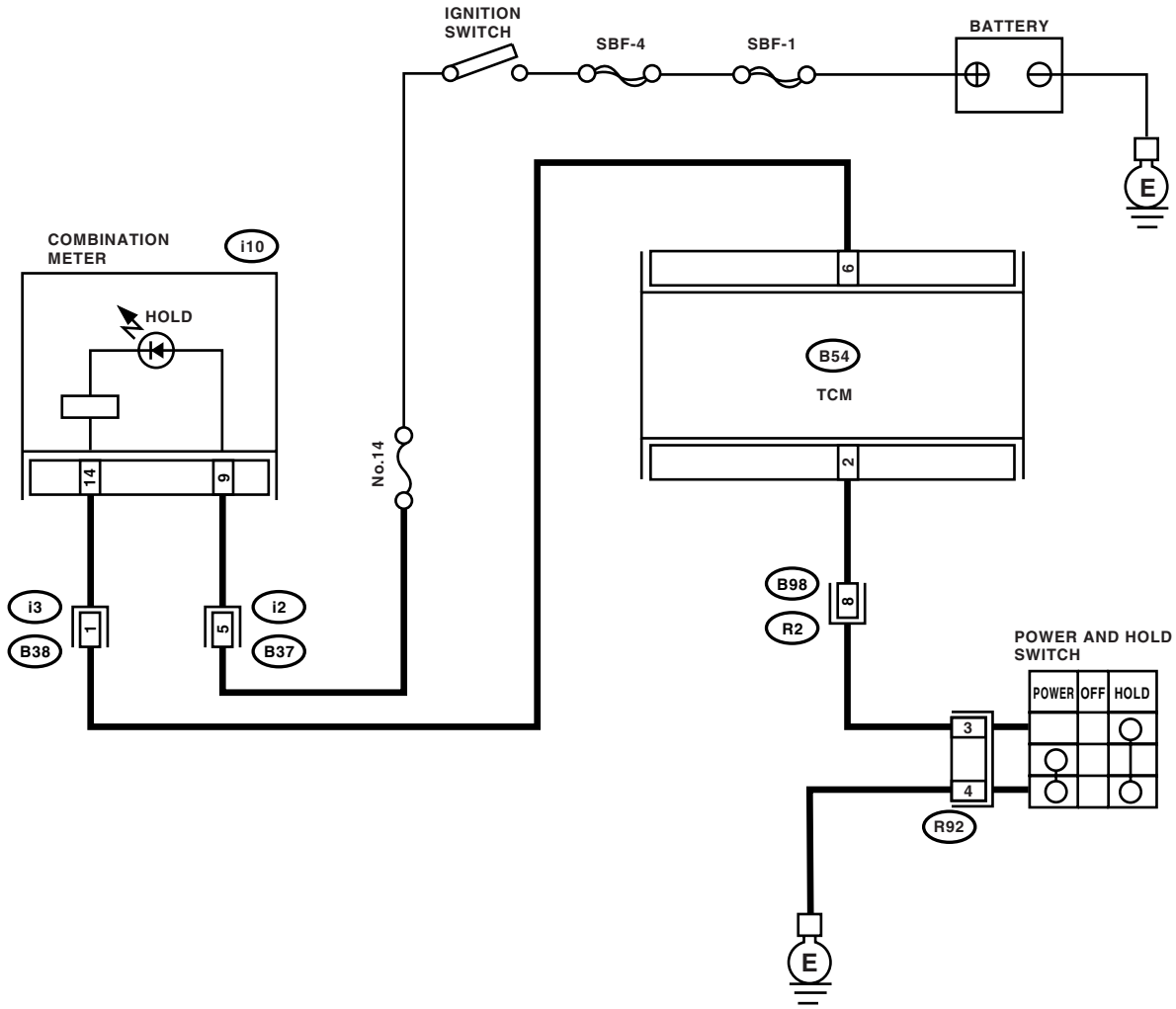
- The LED does not come on when HOLD switch is ON.
- The HOLD switch circuit is open or shorted.

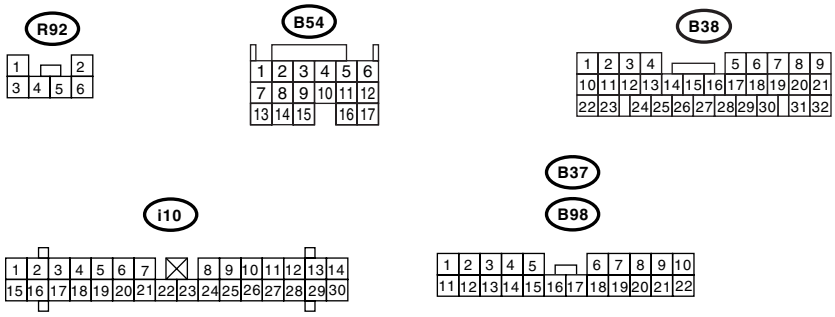
TROUBLE SYMPTOM:

- The 2nd gear is not held.
- Failure of vehicle to start in 2nd gear except 1st range.

WIRING DIAGRAM:

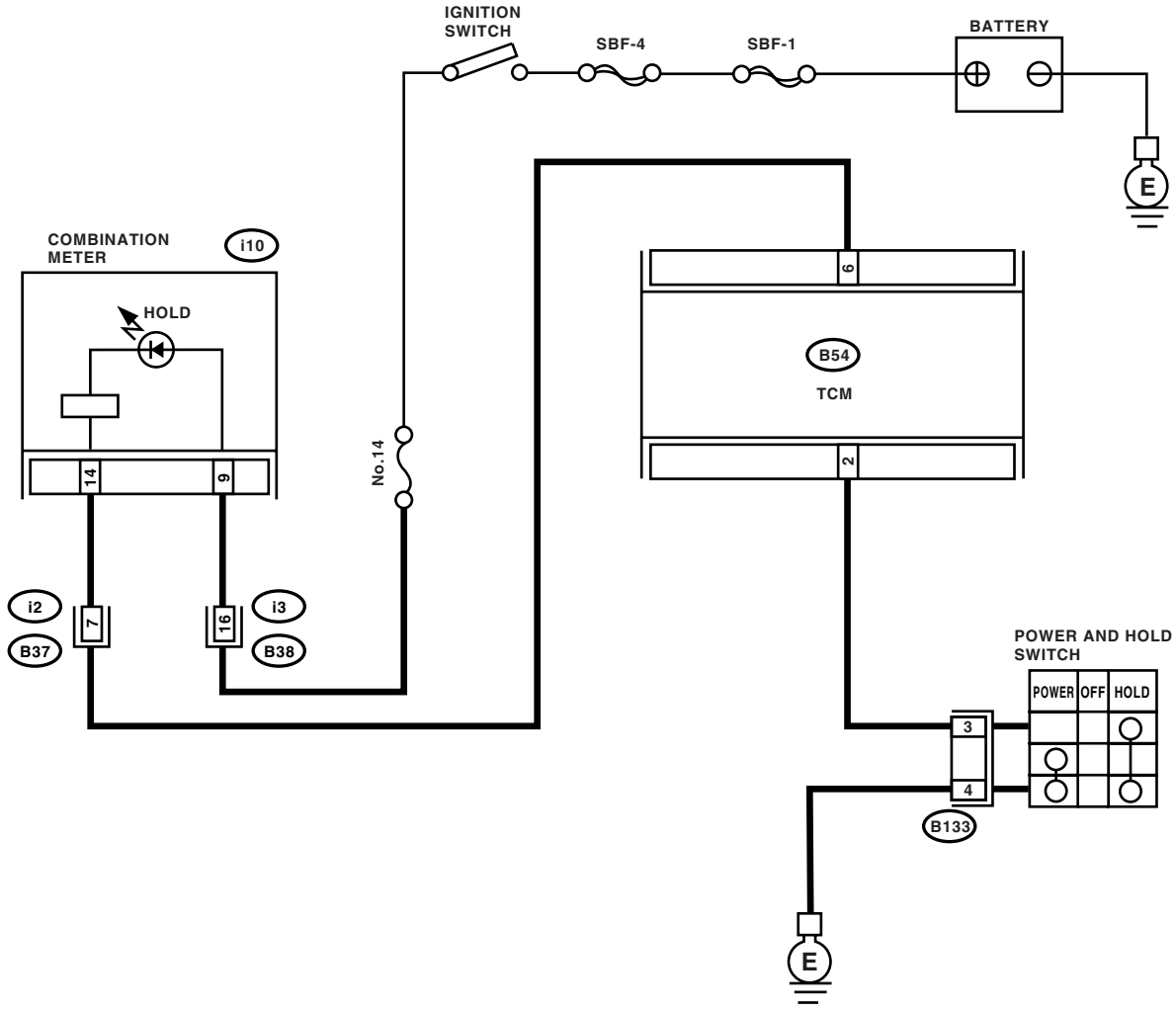
- LHD MODEL

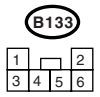


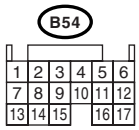


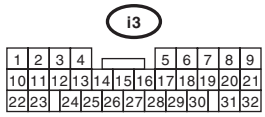
AT-03042

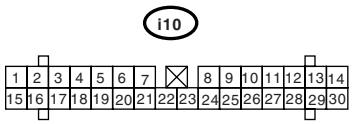
- RHD MODEL

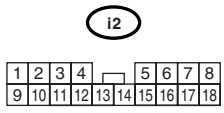












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	Step	Check	Yes	No
1	**CHECK HOLD SWITCH OPERATION.**	When the HOLD switch is turned to OFF, does LED light up?	Go to step **5.**	Go to step **2.**
2	**CHECK HOLD SWITCH OPERATION.**	When the HOLD switch is turned to ON, does LED light up?	Go to step Check Kick-Down Switch. <Ref. to 4AT(D)(diag)-116, CHECK KICK–DOWN SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK HOLD INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the HOLD indicator light. <Ref. to IDI-4, INSPECTION, Combination Meter System.>	Is the HOLD indicator light OK?	Go to step **4.**	Replace the combination meter assembly. <Ref. to IDI-10, Combination Meter.>
4	**CHECK HOLD SWITCH GROUND LINE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from HOLD switch. 3) Measure the resistance of harness connector between HOLD switch and chassis ground. ***Connector & terminal*** ***LHD model*** ***(R92) No. 4 — Chassis ground:*** ***RHD model*** ***(B133) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between HOLD switch and chassis ground.
5	**CHECK HOLD SWITCH.** 1) Turn the HOLD switch to ON. 2) Measure the resistance between terminals of HOLD switch. ***Terminals*** ***No. 4 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **6.**	Replace the HOLD switch.
6	**CHECK HOLD SWITCH.** 1) Turn the HOLD switch to OFF. 2) Measure the resistance between terminals of HOLD switch. ***Terminals*** ***No. 4 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Replace the HOLD switch.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH.** 1) Disconnect the connector TCM and combination meter. 2) Measure the resistance of harness connector between TCM and HOLD switch. ***Connector & terminal*** ***LHD model*** ***(B54) No. 2 — (R92) No. 3:*** ***RHD model*** ***(B54) No. 2 — (B133) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit in harness between TCM and HOLD switch connector and poor contact in coupling connector.
8	**CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER.** Measure the resistance of harness connector between TCM and combination meter. ***Connector & terminal*** ***(B54) No. 6 — (i10) No. 14:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.

Step		Check	Yes	No
9	**CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH.** Measure the resistance of harness connector between TCM and chassis ground to make sure that circuit does not short. ***Connector & terminal*** ***(B56) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **10.**	Repair the short circuit in harness between TCM and HOLD switch connector.
10	**CHECK POOR CONTACT.**	Is there poor contact in HOLD switch circuit?	Repair the poor contact.	A temporary poor contact of the connector or harness or connector in HOLD switch circuit.

E: CHECK KICK–DOWN SWITCH

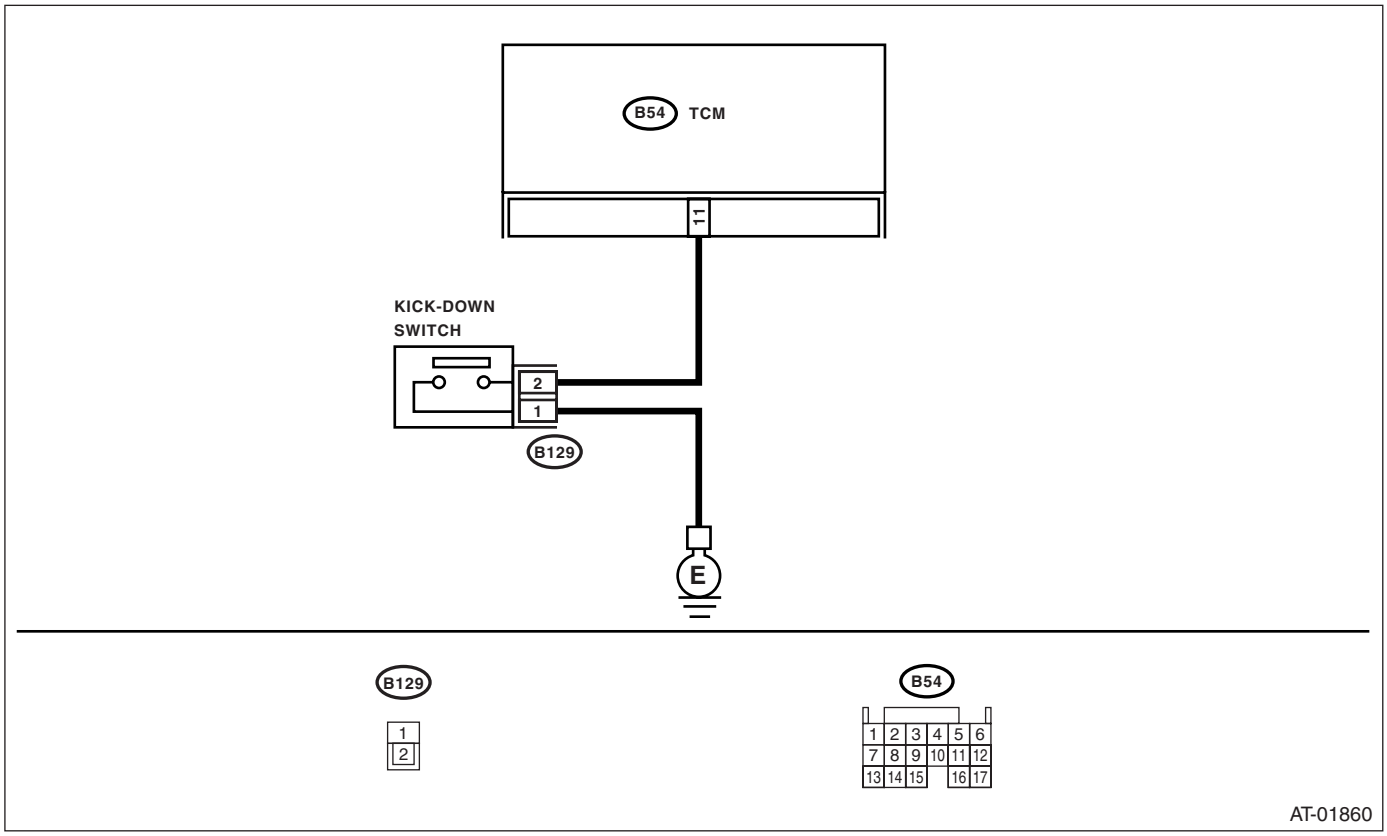
DIAGNOSTIC:

- The kick-down switch is OFF when the throttle is partially open or fully closed, but it is not ON when the throttle is fully opened.
- The kick-down switch circuit is open or shorted.

TROUBLE SYMPTOM:

No kick-down occurs (when the throttle is fully opened).

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CONFIRM MODEL.**	Is the vehicle 2.0 L model?	Go to step **2.**	Go to Symptom Related Diagnostic. <Ref. to 4AT(D)(diag)-118, General Diagnostic Table.>
2	**CHECK KICK-DOWN SWITCH OPERATION.**	When the accelerator pedal is depressed, does “ON” displayed?	Go to Symptom Related Diagnostic. <Ref. to 4AT(D)(diag)-118, General Diagnostic Table.>	Go to step **3.**
3	**CHECK KICK-DOWN SWITCH GROUND LINE.** 1) Disconnect the connector from kick-down switch. 2) Measure the resistance of harness connector between kick-down switch and chassis ground. ***Connector & terminal*** ***(B129) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit in harness between kick-down switch and TCM.

	Step	Check	Yes	No
4	**CHECK KICK-DOWN SWITCH.** Measure the resistance for kick-down switch when depressing the accelerator pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Replace the kick-down switch. <Ref. to SP(H4SO)-4, Accelerator Pedal.>
5	**CHECK KICK-DOWN SWITCH.** Measure the resistance for kick-down switch when not pressing the accelerator pedal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the kick-down switch.
6	**CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from kick-down switch. 3) Measure the resistance of harness connector between TCM and kick-down switch. ***Connector & terminal*** ***(B54) No. 11 — (B129) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit in harness between TCM and kick-down switch.
7	**CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH.** Measure the resistance of harness connector between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit in harness between TCM and chassis ground.
8	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to kick-down switch. 3) Turn the ignition switch to ON (engine OFF). 4) Measure the signal voltage for TCM when depressing the accelerator pedal. ***Connector & terminal*** ***(B55) No. 11 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Go to step **9.**
9	**CHECK POOR CONTACT.**	Is there poor contact?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

15.General Diagnostic Table

A: INSPECTION

NOTE:
This section is specified for turbo model.

Symptom	Problem parts
Starter does not rotate when select lever is in “P” or “N” range, starter rotates when select lever is in “R”, “D”, “3” or “2” range.	• Inhibitor switch • Select cable • Select lever • Starter motor and harness
Noise when select lever is in “P” or “N” range.	• Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	• Strainer • ATF level too high or too low
Noise occurs while driving in “D1”.	• Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D2”.	
Noise occurs while driving in “D3”.	• Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in “D4”.	• Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from “1” range to another.	• Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in “N” range.	• Select cable • Inhibitor switch • TCM • Low clutch
Shock occurs when select lever is shifted from “N” to “D” range.	• Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Low clutch duty solenoid • Low clutch • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is shifted from “N” to “D” range.	• Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket of transmission case
Shock occurs when select lever is shifted from “N” to “R” range.	• Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • TCM • Harness • Control valve • ATF deterioration

Symptom	Problem parts
Excessive time lag occurs when select lever is shifted from “N” to “R” range.	• Control valve • Low & reverse clutch • Reverse clutch • Line pressure linear solenoid • Seal ring • Front gasket of transmission case
Vehicle does not start in any shift range (engine stalls).	• Parking brake mechanism • Planetary gear
Vehicle does not start in any shift range (engine running up).	• Strainer • Line pressure linear solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket of transmission case
Vehicle does not start in “R” range only (engine running up).	• Select cable • Select lever • Line pressure linear solenoid • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in “R” range only (engine stalls).	• Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in “D”, “3” range only (engine running up).	• Low clutch • One-way clutch
Vehicle does not start in “D”, “3” or “2” range only (engine running up).	Low clutch
Vehicle does not start in “D”, “3” or “2” range only (engine stalls).	Reverse clutch
Vehicle starts in “R” range only (engine running up).	• Control valve
Acceleration during standing starts is poor (high stall rpm).	• Control valve • Low clutch • Reverse clutch • ATF level too low • ATF deterioration • Front gasket of transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	• Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in “D”, “3” or “2” range (normal stall rpm).	• TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in “R” (normal stall rpm).	• Control valve • High clutch • 2-4 brake • Planetary gear

General Diagnostic Table

Symptom	Problem parts
No shift occurs from 1st to 2nd gear.	• TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	• TCM • Control valve • High clutch
No shift occurs from 3rd to 4th gear.	• TCM • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in “3” range.	• Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in “3” or “2” range.	Control valve
Engine brake is not effected when select lever is in “1” range.	• Control valve • Low & reverse brake
Shift characteristics are erroneous.	• Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	• TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	• Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from “P” range.	
ATF spurts out.	ATF level too high
Differential oil spurts out.	Differential gear oil too high
Differential oil level changes excessively.	• Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	• High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • Low & reverse duty solenoid

Symptom	Problem parts
Slippage occurs from 1st to 2nd gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake
Shock occurs from 2nd to 3rd gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Low & reverse duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • High clutch duty solenoid
Slippage occurs from 2nd to 3rd gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • High clutch • 2-4 brake • Low & reverse duty solenoid
Shock occurs from 3rd to 4th gear.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • Low clutch duty solenoid • 2-4 brake • ATF deterioration • Engine performance
Slippage occurs from 3rd to 4th gear.	• TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake
Shock occurs when select lever is shifted from “3” to “2” range.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • High clutch duty solenoid

Symptom	Problem parts
Shock occurs when select lever is shifted from “D” to “1” range.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • ATF deterioration • Low & reverse brake duty solenoid • Low & reverse clutch solenoid
Shock occurs when select lever is shifted from “2” to “1” range.	• TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • Low & reverse brake duty solenoid
Shock occurs when accelerator pedal is released at medium speeds.	• TCM • Accelerator pedal position sensor • ATF temperature sensor • Line pressure linear solenoid • Control valve • Lock-up damper • Engine performance
Vibration occurs during straight-forward operation.	• TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper • HOLD switch
Vibration occurs during turns (tight corner “braking” phenomenon).	• TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness • HOLD switch
Front wheel slippage occurs during standing starts.	• TCM • Front vehicle speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	• TCM • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	• Select cable • Select lever • Detente spring • Manual plate

Symptom	Problem parts
Select lever is too high to move (unreasonable resistance).	• Detente spring • Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	• Select cable • Select lever • Detente spring • Manual plate

MANUAL TRANSMISSION AND DIFFERENTIAL

5MT

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1. General Description

A: SPECIFICATION

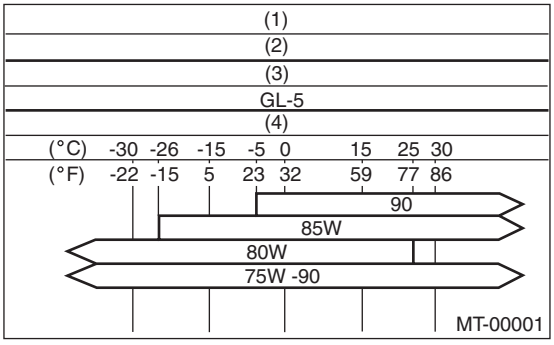
1. MANUAL TRANSMISSION AND DIFFERENTIAL

Model			2.0 L Non-turbo	2.5 L Non-turbo	2.0 L Turbo		2.5 L Turbo	
					Except for EC, EH, EK★	EC, EH, EK★	KA★	EC, EH, EK★
Type			5 × 2-forward speeds with synchromesh and 2-reverse		5-forward speeds with synchromesh and 1-reverse			
Transmission gear ratio		1st	3.454					
		2nd	2.062		1.947			
		3rd	1.448		1.366			
		4th	1.088		0.972			
		5th	0.871	0.780	0.738			
		Reverse	3.333					
Auxiliary transmission gear ratio		High	1.000		—			
		Low	1.447	1.196	—			
Front reduction gear	Final	Type of gear	Hypoid					
		Gear ratio	4.111		4.444			
Rear reduction gear	Transfer	Type of gear	Helical					
		Gear ratio	1.000		1.000	1.081	1.000	1.081
	Final	Type of gear	Hypoid					
		Gear ratio	4.111		4.444	4.111	4.444	4.111
Front differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)					
Center differential	Type and number of gear		Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)					
Transmission gear oil			GL-5					
Transmission oil capacity			4.0 ℓ (4.2 US qt, 3.5 Imp qt)		3.5 ℓ (3.7 US qt, 3.1 Imp qt)	3.9 ℓ (4.1 US qt, 3.4 Imp qt)	3.5 ℓ (3.7 US qt, 3.1 Imp qt)	

★: Refer to “ID section” for option code. <Ref. to ID-2, Identification.>

2. TRANSMISSION GEAR OIL

Recommended oil



(1) Item
(2) Transmission gear oil
(3) API Standard
(4) SAE viscosity No. and applicable temperature

3. TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment

Hypoid gear backlash :
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Selection of main shaft rear plate

Main shaft rear plate		
Dimension “A” mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

Snap ring to counter washer clearance :
0.05 — 0.35 mm (0.0020 — 0.0138 in)

Snap ring (Outer-19)	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

Input shaft holder adjustment

Dimension “D” mm (in)	Number of shim
52.50 — 53.11 (2.0669 — 2.0909)	—
52.00 — 52.49 (2.0472 — 2.0665)	1
51.26 — 51.99 (2.0181 — 2.0468)	2

4. DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing

Starting torque :
0.3 — 0.8 N·m
(0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

5. INPUT SHAFT ASSEMBLY

Snap ring (Outer-28) to ball bearing clearance :
0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Outer-28)	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

Snap ring (Inner-68) to bearing clearance :
0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Inner-68)	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

6. MAIN SHAFT

Snap ring (Outer-25) to synchronizer hub clearance :
0.060 — 0.100 mm (0.0024 — 0.0039 in)

Snap ring (Outer-25)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
805025051	2.42 (0.0953)	805025055	2.62 (0.1031)
805025052	2.47 (0.0972)	805025056	2.67 (0.1051)
805025053	2.52 (0.0992)	805025057	2.72 (0.1071)
805025054	2.57 (0.1012)	805025058	2.37 (0.0933)

7. REVERSE IDLER GEAR

Adjustment of reverse idler gear position

Reverse idler gear to transmission case (LH) wall clearance :
6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to the case wall

After installing a suitable reverse shifter lever, adjust the clearance using washers.

Reverse idler gear to transmission case wall clearance:
0 — 0.5 mm (0 — 0.020 in)

Washer (20.5 × 26 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)	—	—

8. SHIFTER FORK AND ROD

Select the suitable shifter forks so that both coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.

Rod end clearance :
A: 1st-2nd — 3rd-4th
0.4 — 1.4 mm (0.016 — 0.055 in)
B: 3rd-4th — 5th
0.5 — 1.3 mm (0.020 — 0.051 in)

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in)
32810AA071	No mark	Standard
32810AA101	3	Approach to 3rd gear by 0.2 mm (0.008 in)

5th shifter fork (Non-turbo)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA211	No mark	Standard
32812AA221	9	Become distant from 5th gear by 0.2 mm (0.008 in)

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in)
32812AA241	No mark	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in)

9. TRANSFER CASE AND REAR CASE

Neutral position adjustment

Adjustment shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA130	S	Neutral position is closer to 1st.
32188AA140	T	Standard
32188AA150	U	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

10.EXTENSION ASSEMBLY

Standard protrusion amount of taper roller bearing outer race:
0.2 — 0.3 mm (0.0008 — 0.012 in)

NOTE:
Be sure to set within the standard protrusion amount.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

Thrust washer to center differential side clearance :
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

11.FRONT DIFFERENTIAL

Bevel gear to pinion backlash :
0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 × 50 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)	—	—

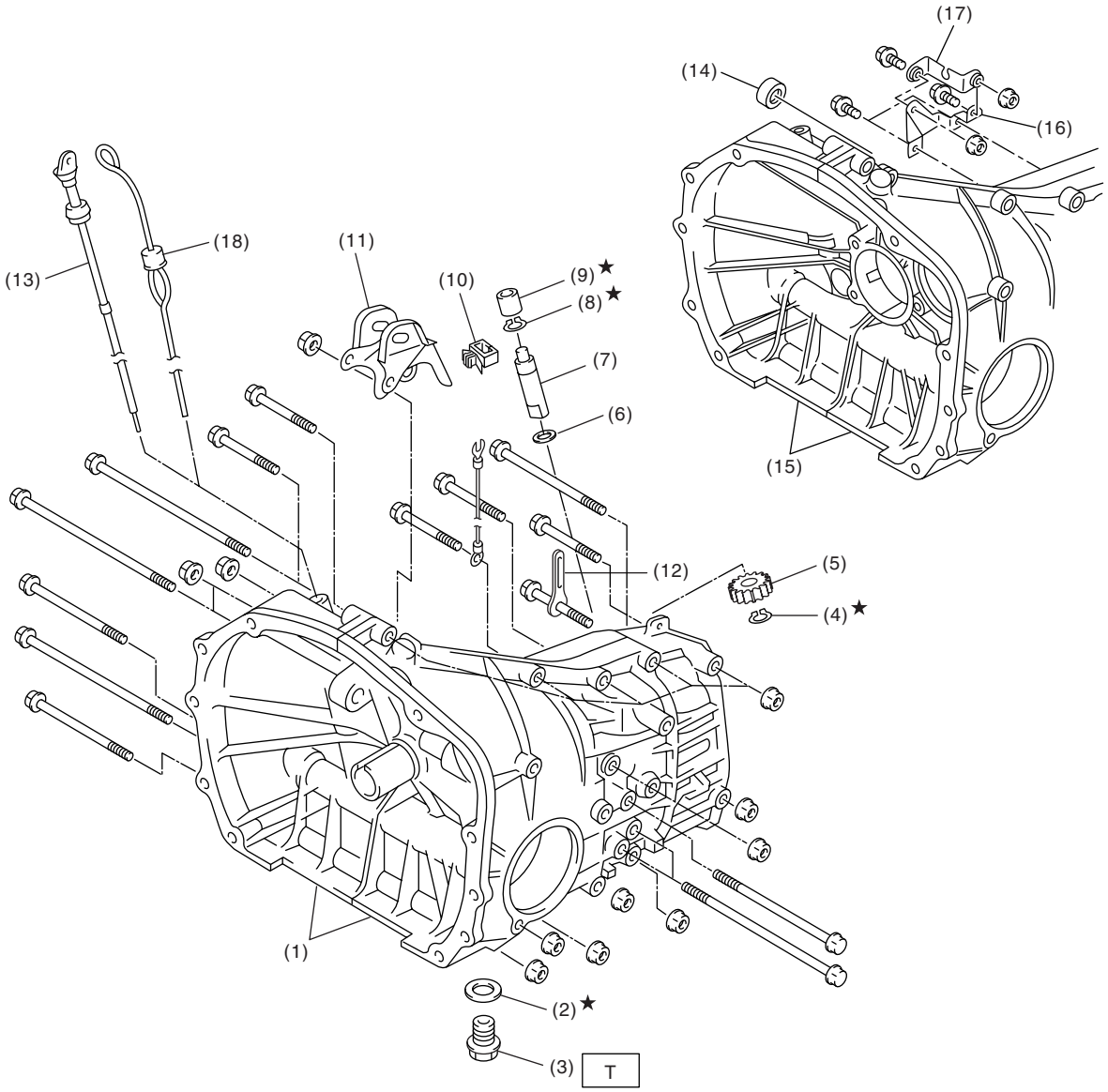
12.TRANSFER DRIVE GEAR

Snap ring (Outer-30) to ball bearing clearance :
0.01 — 0.15 mm (0.0004 — 0.0059 in)

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

B: COMPONENT

1. TRANSMISSION CASE

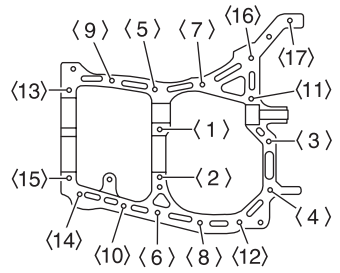


MT-00002

(1) Transmission case ASSY (Single-range)
(2) Gasket
(3) Drain plug
(4) Snap ring (Outer)
(5) Speedometer driven gear
(6) Washer
(7) Speedometer shaft
(8) Snap ring (Outer)
(9) Oil seal
(10) Clamp
(11) Pitching stopper bracket
(12) Clip
(13) Oil level gauge (Non-turbo model)
(14) Oil seal (Dual-range)
(15) Transmission case ASSY (Dual-range)
(16) High-low cable bracket A (Dual-range)
(17) High-low cable bracket B (Dual-range)
(18) Oil level gauge (Turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T: 44 (4.5, 33) (Aluminum gasket)
70 (7.1, 52) (Copper gasket)

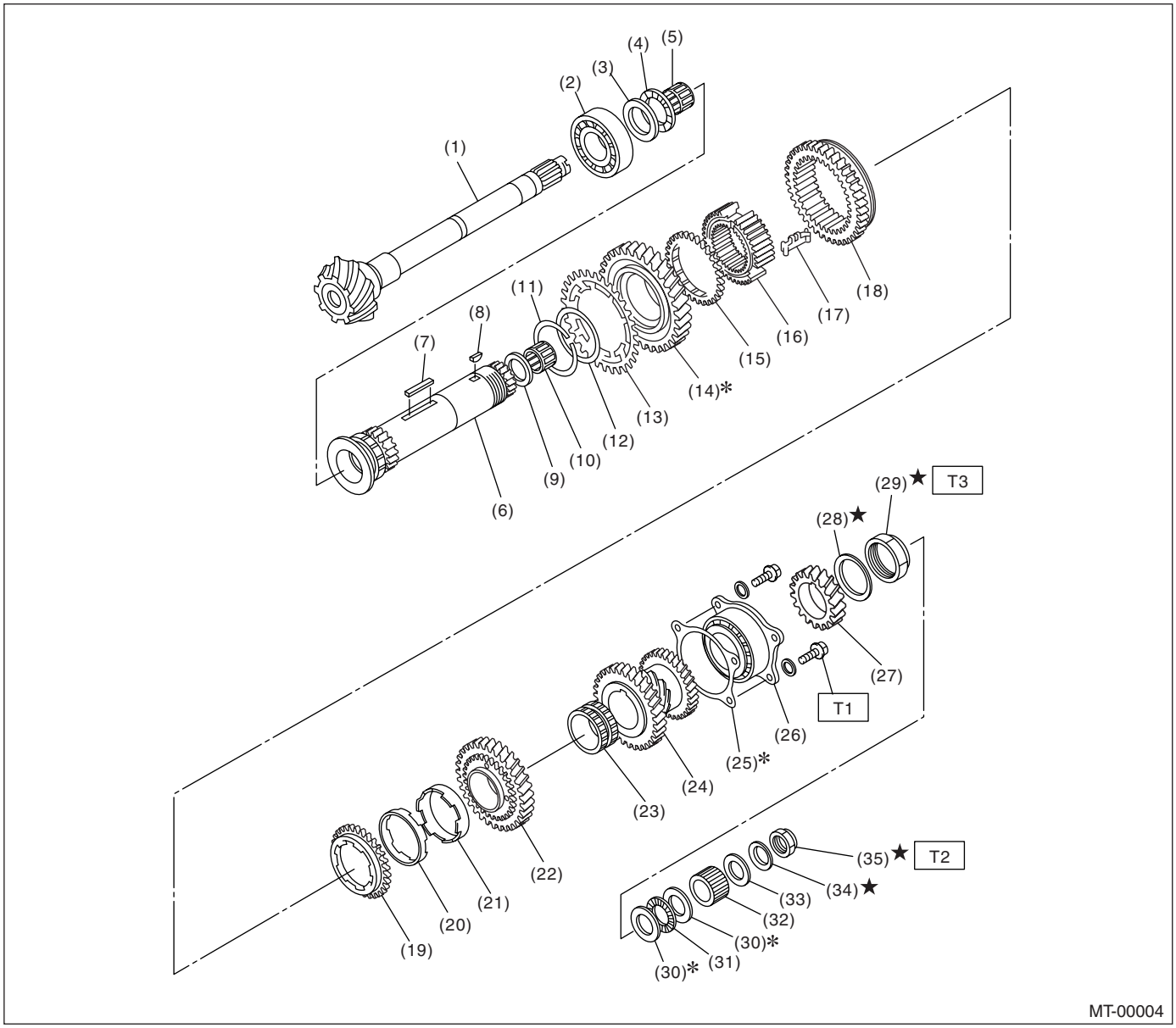
• TRANSMISSION CASE TIGHTENING TORQUE



MT-00003

Bolt No.	Bolt size	Tightening torque: N·m (kgf-m, ft-lb)
<5> to <15>	8 mm	25 (2.5, 18.1)
<1> to <4> <16>, <17>	10 mm	39 (4.0, 28.9)

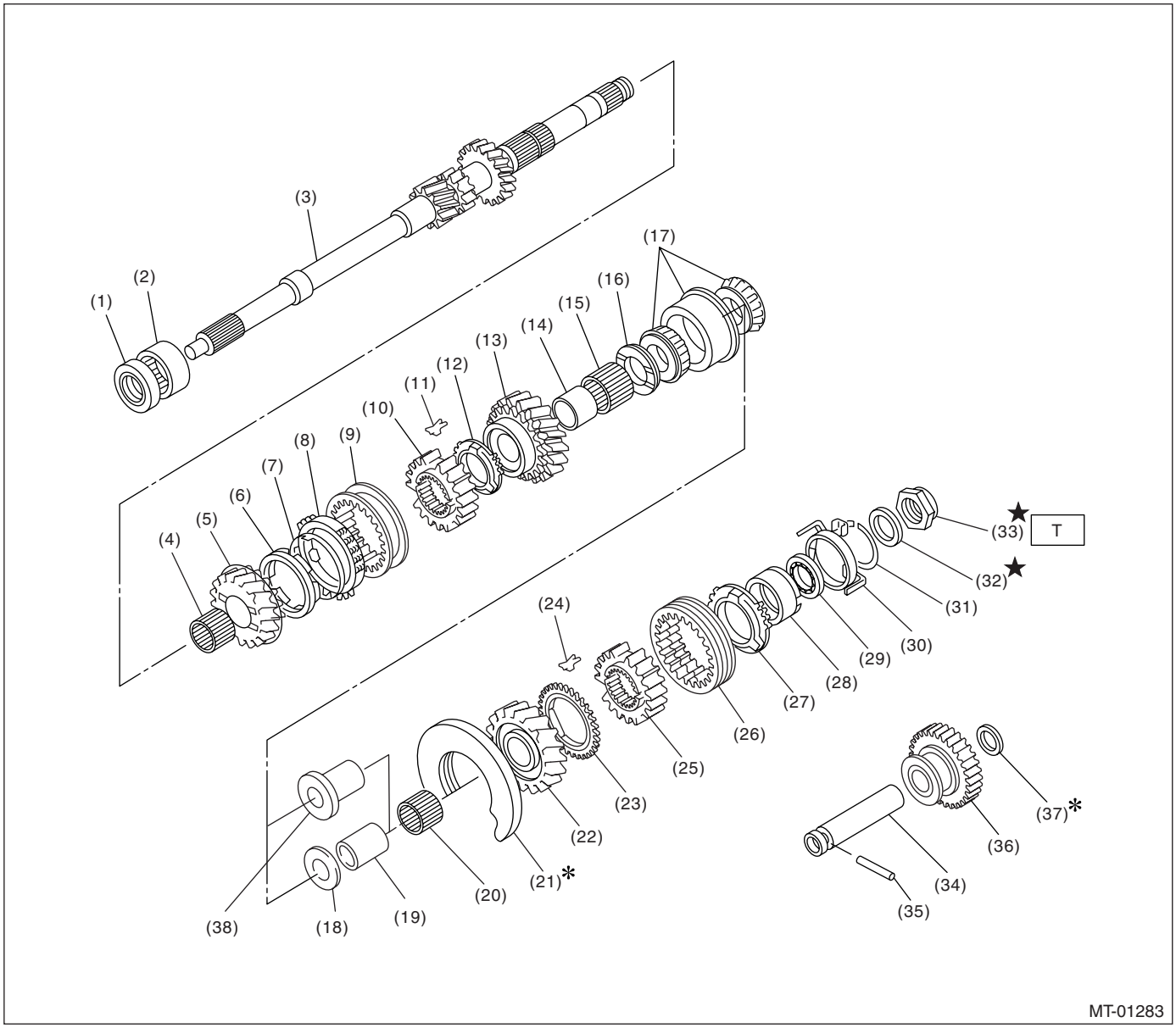
2. DRIVE PINION ASSEMBLY



(1) Drive pinion shaft
(2) Roller bearing
(3) Washer
(4) Thrust bearing
(5) Needle bearing
(6) Driven shaft
(7) Key
(8) Woodruff key
(9) Drive pinion collar
(10) Needle bearing
(11) Snap ring (Outer) (Non-turbo model)
(12) Washer (Non-turbo model)
(13) Sub gear (Non-turbo model)
(14) 1st driven gear
(15) Baulk ring
(16) 1st-2nd synchronizer hub
(17) Insert key
(18) Reverse driven gear
(19) Outer baulk ring
(20) Synchro cone
(21) Inner baulk ring
(22) 2nd driven gear
(23) 2nd driven gear bush
(24) 3rd-4th driven gear
(25) Driven pinion shim
(26) Roller bearing
(27) 5th driven gear
(28) Lock washer
(29) Lock nut
(30) Washer
(31) Thrust bearing
(32) Differential bevel gear sleeve
(33) Washer
(34) Lock washer
(35) Lock nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.1)
T2: 120 (12.2, 88.5)
T3: 260 (26.5, 192)

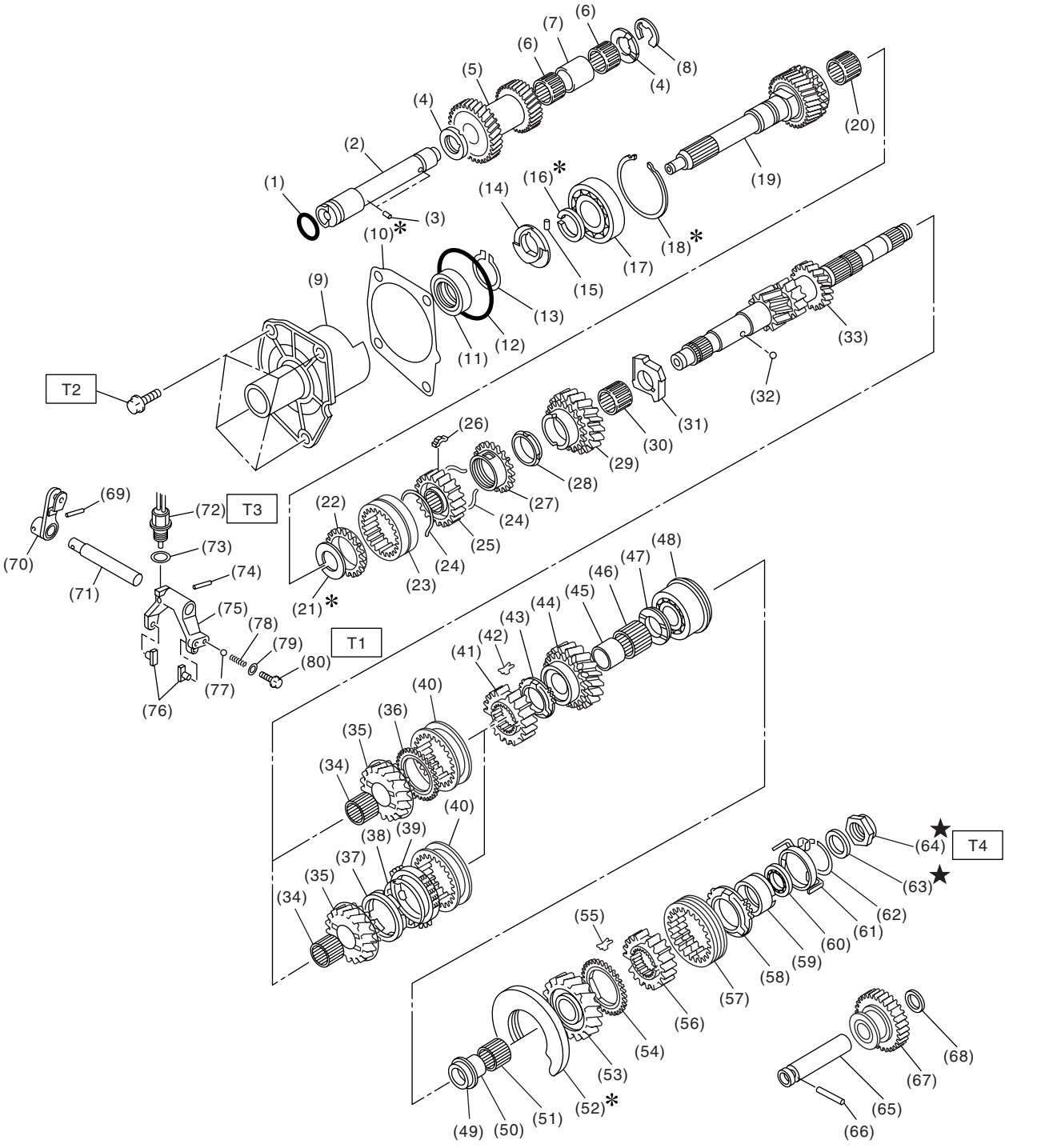
3. MAIN SHAFT ASSEMBLY (SINGLE RANGE)



(1) Oil seal
(2) Needle bearing
(3) Transmission main shaft
(4) Needle bearing
(5) 3rd drive gear
(6) Inner baulk ring
(7) 3rd synchro cone
(8) Outer baulk ring
(9) 3rd-4th coupling sleeve
(10) 3rd-4th synchronizer hub
(11) 3rd-4th shifting insert key
(12) 4th baulk ring
(13) 4th drive gear
(14) 4th needle bearing race
(15) Needle bearing
(16) 4th gear thrust washer
(17) Double taper roller bearing
(18) 5th gear thrust washer (Non-turbo model)
(19) 5th needle bearing race (Non-turbo model)
(20) Needle bearing
(21) Main shaft rear plate
(22) 5th drive gear
(23) 5th baulk ring
(24) 5th-Rev shifting insert key
(25) 5th-Rev synchronizer hub
(26) 5th-Rev coupling sleeve
(27) Rev baulk ring
(28) Rev synchro cone
(29) Ball bearing
(30) Synchro cone stopper
(31) Snap ring
(32) Lock washer
(33) Lock nut
(34) Reverse idler gear shaft
(35) Straight pin
(36) Reverse idler gear
(37) Washer
(38) 5th needle bearing race (Turbo model)

Tightening torque: N·m (kgf-m, ft-lb)
T: 120 (12.2, 88.5)

4. MAIN SHAFT ASSEMBLY (DUAL RANGE)

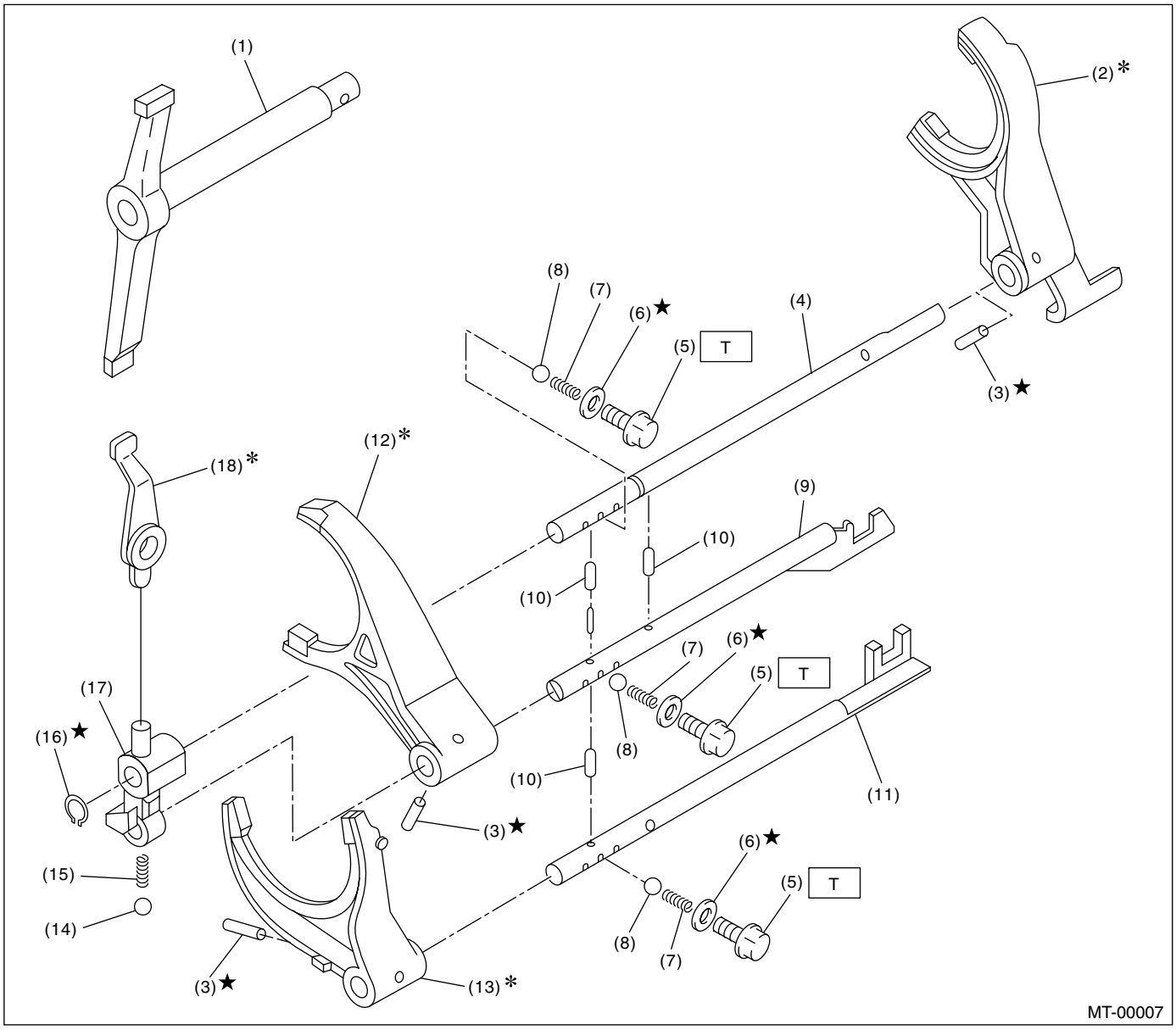


MT-01014

(1) O-ring
(2) High-low counter shaft
(3) Knock pin
(4) High-low counter washer
(5) Counter gear
(6) Needle bearing
(7) Counter gear collar
(8) Snap ring (Outer-19)
(9) Input shaft holder
(10) Input shaft shim
(11) Oil seal
(12) O-ring
(13) Snap ring (Outer-28)
(14) Oil squeeze
(15) Straight pin
(16) Snap ring (Outer-28)
(17) Ball bearing
(18) Snap ring (Inner-68)
(19) Input shaft
(20) Needle bearing
(21) Snap ring (Outer-25)
(22) High-low baulk ring
(23) High-low coupling sleeve
(24) High-low synchronizer spring
(25) High-low synchronizer hub
(26) Shifting insert key
(27) High-low baulk ring
(28) Friction damper
(29) Input low gear
(30) Needle bearing
(31) Input low gear spacer
(32) Ball
(33) Main shaft
(34) Needle bearing
(35) 3rd drive gear
(36) 3rd baulk ring (2.0 L model)
(37) Inner baulk ring (2.5 L model)
(38) 3rd synchro cone (2.5 L model)
(39) Outer baulk ring (2.5 L model)
(40) 3rd-4th coupling sleeve
(41) 3rd-4th synchronizer hub
(42) 3rd-4th shifting insert key
(43) 4th baulk ring
(44) 4th drive gear
(45) 4th needle bearing race
(46) Needle bearing
(47) 4th gear thrust washer
(48) Ball bearing
(49) 5th gear thrust washer
(50) 5th needle bearing race
(51) Needle bearing
(52) Main shaft rear plate
(53) 5th drive gear
(54) 5th baulk ring
(55) 5th-Rev shifting insert key
(56) 5th-Rev synchronizer hub
(57) 5th-Rev coupling sleeve
(58) Rev baulk ring
(59) Rev synchro cone
(60) Ball bearing
(61) Synchro cone stopper
(62) Snap ring
(63) Lock washer
(64) Lock nut
(65) Reverse idler gear shaft
(66) Straight pin
(67) Reverse idler gear
(68) Washer
(69) Straight pin
(70) High-low shifter lever
(71) High-low shifter shaft
(72) Low switch
(73) Gasket
(74) Straight pin
(75) High-low shifter fork
(76) High-low shifter piece
(77) Ball
(78) Spring
(79) Gasket
(80) Plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 9.75 (1.0, 7.2)
T2: 20 (2.0, 14.5)
T3: 25 (2.5, 18.1)
T4: 120 (12.2, 88.5)

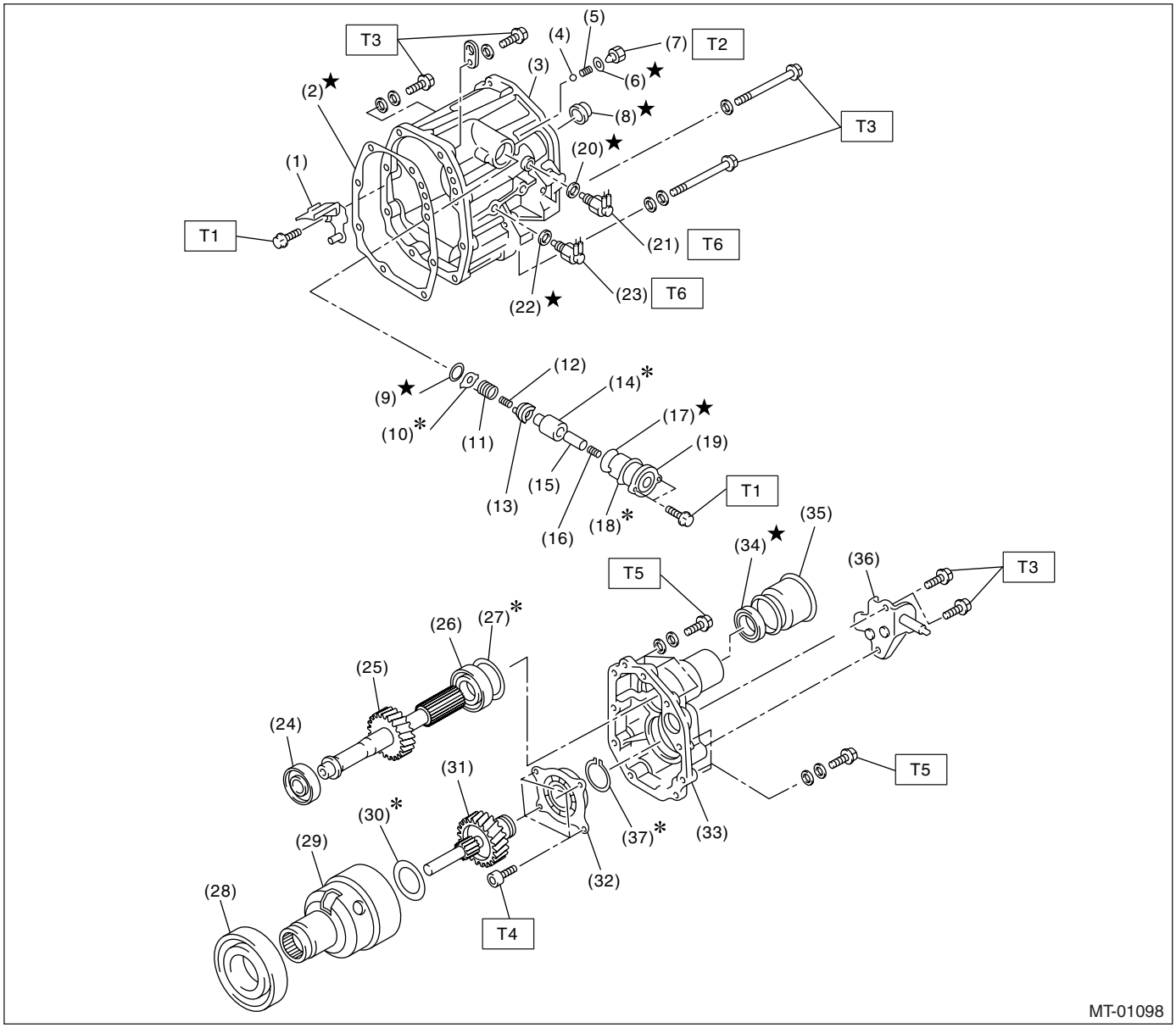
5. SHIFTER FORK AND SHIFTER ROD



(1) Shifter arm
(2) 5th shifter fork
(3) Straight pin
(4) Reverse fork rod
(5) Checking ball plug
(6) Gasket
(7) Checking ball spring
(8) Ball
(9) 3rd-4th fork rod
(10) Interlock plunger
(11) 1st-2nd fork rod
(12) 3rd-4th shifter fork
(13) 1st-2nd shifter fork
(14) Ball
(15) Spring
(16) Snap ring (Outer)
(17) Reverse fork rod arm
(18) Reverse shifter lever

Tightening torque: N·m (kgf-m, ft-lb)
T: 20 (2.0, 14.5)

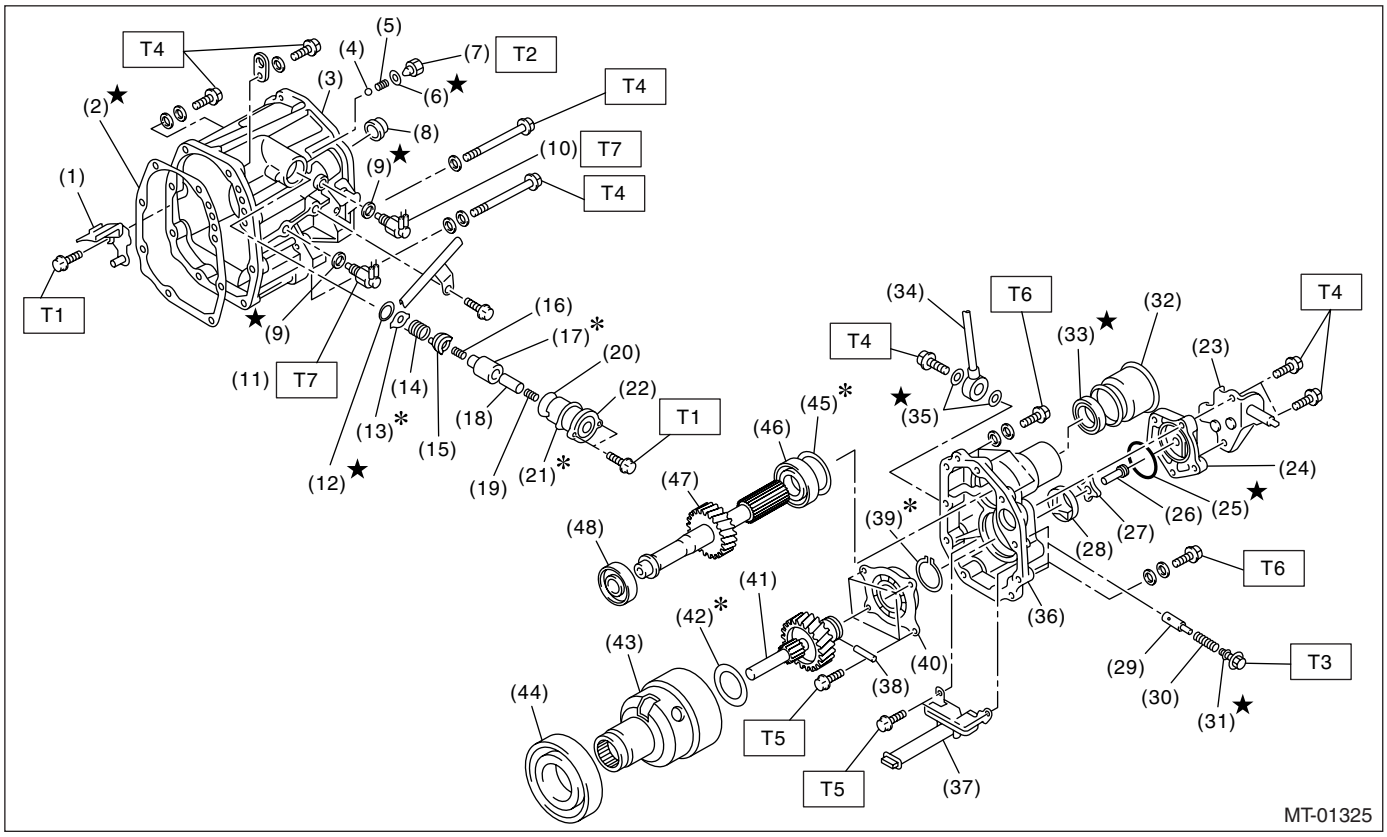
6. TRANSFER CASE AND EXTENSION (WITHOUT OIL PUMP MODEL)



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Snap ring (Inner)
(10) Reverse check plate
(11) Reverse check spring
(12) Reverse return spring
(13) Reverse check cam
(14) Reverse accent shaft
(15) Return spring cap
(16) Return spring
(17) O-ring
(18) Adjusting select shim
(19) Reverse check sleeve
(20) Gasket
(21) Neutral switch
(22) Gasket
(23) Back-up light switch
(24) Roller bearing
(25) Transfer driven gear
(26) Roller bearing
(27) Adjusting washer
(28) Ball bearing
(29) Center differential
(30) Adjusting washer
(31) Transfer drive gear
(32) Ball bearing
(33) Extension case
(34) Oil seal
(35) Dust cover
(36) Shift bracket
(37) Snap ring

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.49, 18.07)
T4: 26 (2.7, 20)
T5: 40 (4.1, 30)
T6: 32.3 (3.3, 23.8)

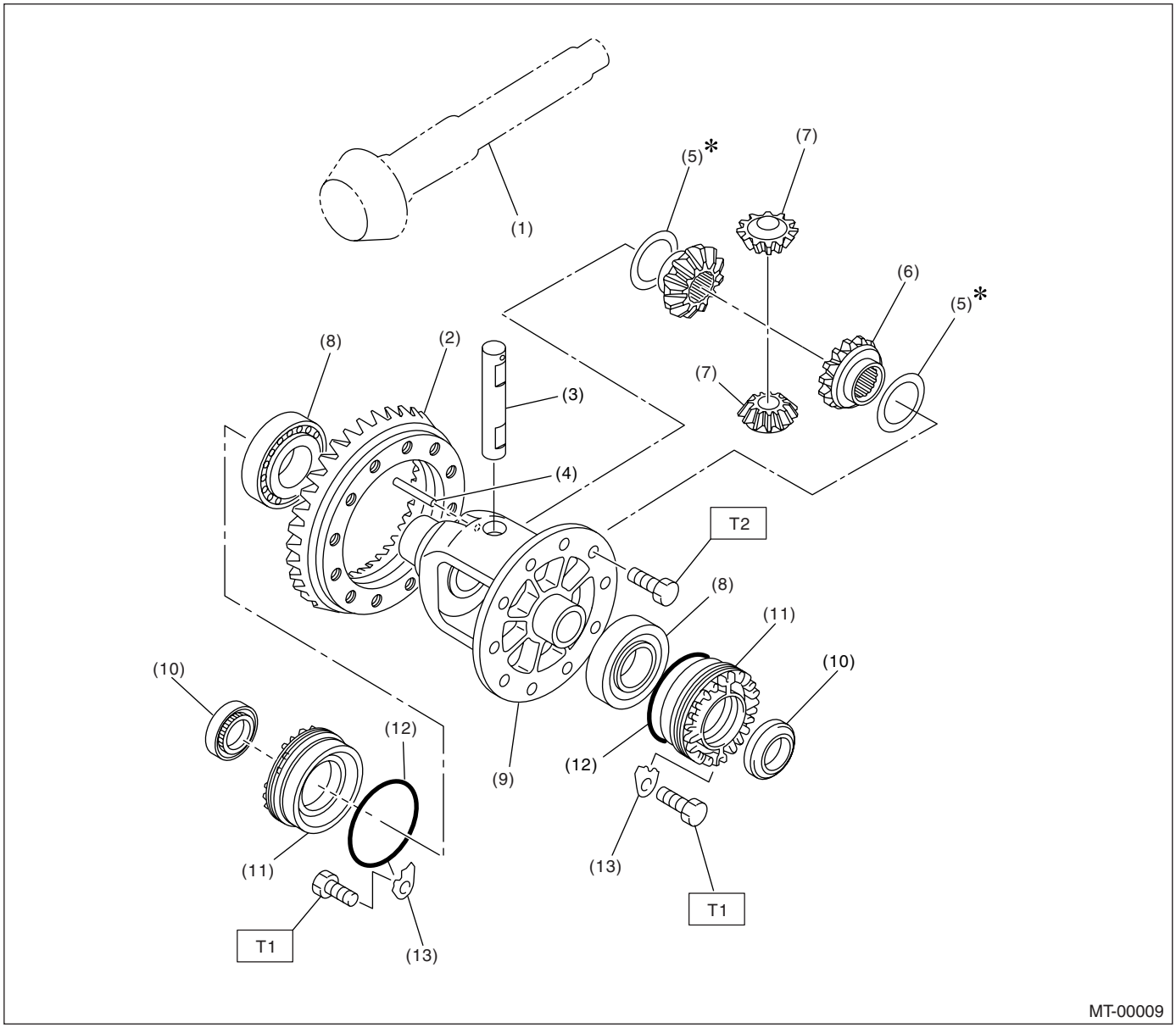
7. TRANSFER CASE AND EXTENSION (WITH OIL PUMP MODEL)



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Gasket
(10) Neutral switch
(11) Back-up light switch
(12) Snap ring (Inner)
(13) Reverse check spring
(14) Reverse check spring
(15) Reverse check cam
(16) Return spring
(17) Reverse accent shaft
(18) Return spring cap
(19) Return spring
(20) O-ring
(21) Adjusting select shim
(22) Reverse check sleeve
(23) Shift bracket
(24) Oil pump cover
(25) O-ring
(26) Oil pump shaft
(27) Inner rotor
(28) Outer rotor
(29) Relief valve
(30) Return spring
(31) O-ring
(32) Dust cover
(33) Oil seal
(34) Outlet pipe
(35) Gasket
(36) Extension case
(37) Oil strainer
(38) Straight pin
(39) Snap ring
(40) Ball bearing
(41) Transfer drive gear
(42) Washer
(43) Center differential
(44) Ball bearing
(45) Adjusting washer
(46) Roller bearing
(47) Transfer driven gear
(48) Roller bearing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 12.75 (1.3, 9.4)
T4: 24.5 (2.5, 18.1)
T5: 26 (2.7, 19)
T6: 40 (4.1, 30)
T7: 32.3 (3.3, 23.8)

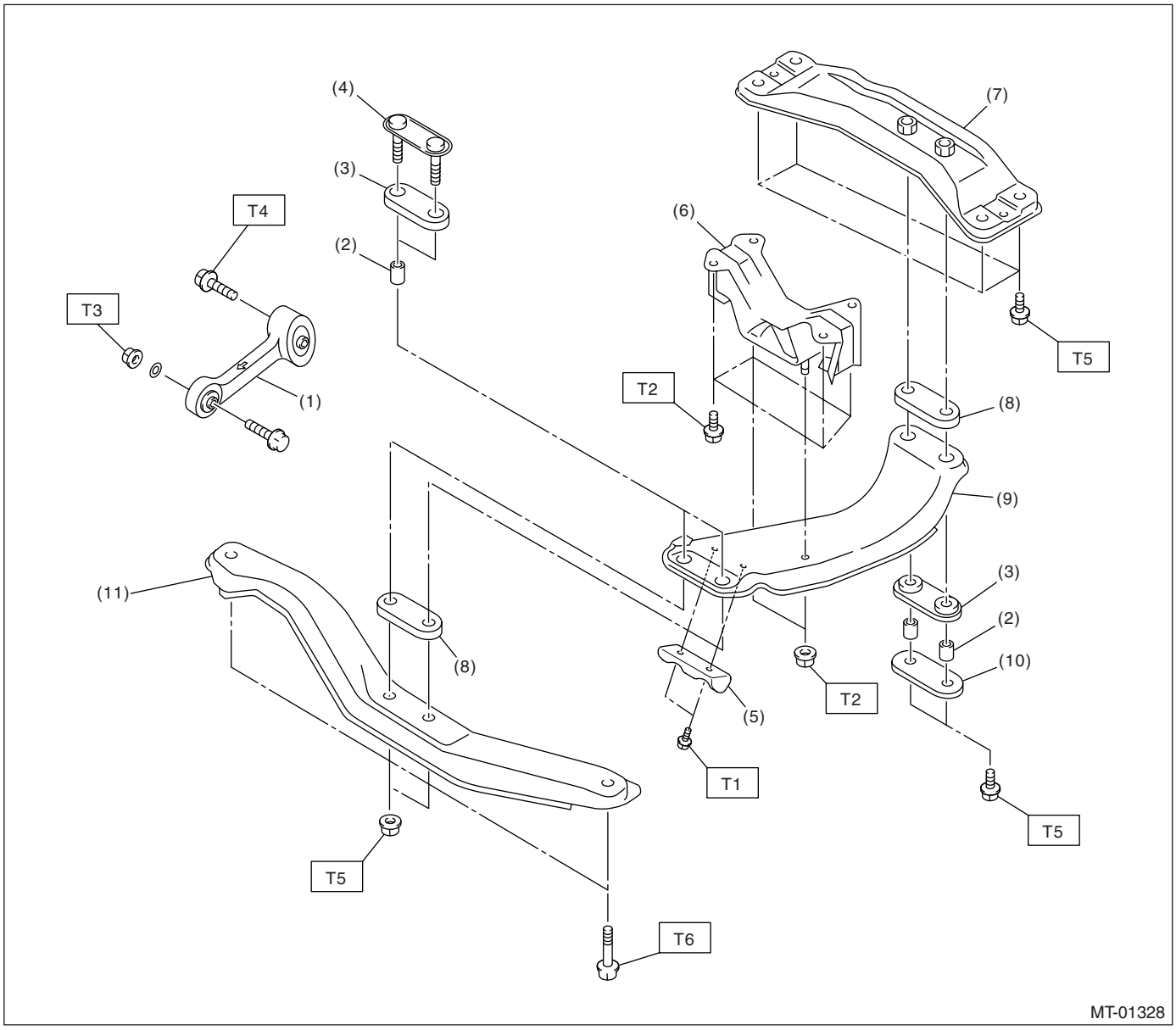
8. FRONT DIFFERENTIAL



(1) Drive pinion shaft
(2) Hypoid drive gear
(3) Pinion shaft
(4) Straight pin
(5) Washer
(6) Differential bevel gear
(7) Differential bevel pinion
(8) Roller bearing
(9) Differential case
(10) Oil seal
(11) Differential side retainer
(12) O-ring
(13) Retainer lock plate

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 62 (6.3, 45.6)

9. TRANSMISSION MOUNTING



(1)	Pitching stopper	(8)	Cushion D
(2)	Spacer	(9)	Center crossmember
(3)	Cushion C	(10)	Rear plate
(4)	Front plate	(11)	Front crossmember
(5)	Dynamic damper		
(6)	Rear cushion rubber		
(7)	Rear crossmember		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)
T2: 35 (3.6, 26)
T3: 50 (5.1, 37)
T4: 58 (5.9, 43)
T5: 70 (7.1, 52)
T6: 140 (14.3, 103)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation, and disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply gear oil onto sliding or revolution surfaces before installation.
• Replace deformed or otherwise damaged snap rings with new ones.
• Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vis e.
• Avoid damaging the mating surface of the case.
• Before applying sealant, completely remove the old seal.

D: PREPARATION TOOL

1. SPECIAL TOOL

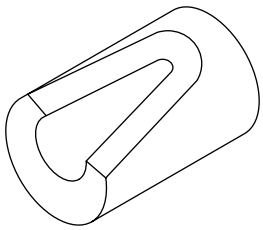
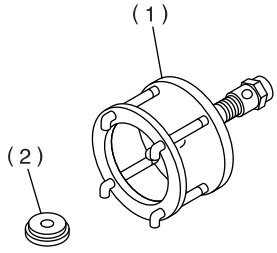
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399411700	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.
 ST-899524100	899524100	PULLER SET	Used for removing and installing roller bearing (Differential). (1) PULLER (2) CAP

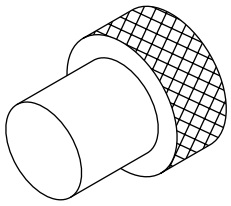
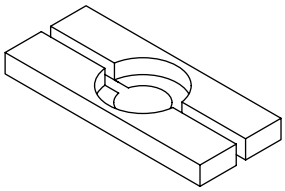
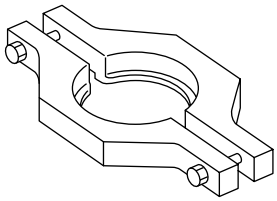
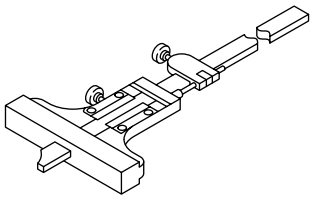
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399780104	399780104	WEIGHT	Used for measuring preload on roller bearing.
 ST-498077000	498077000	REMOVER	Used for removing roller bearing of drive pinion shaft.
 ST-498077300	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.
 ST-498147000	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.

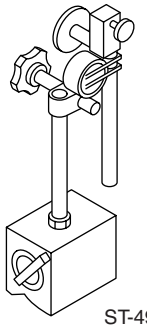
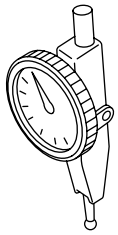
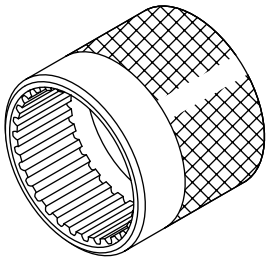
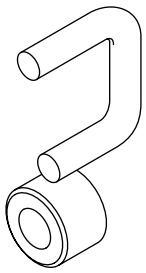
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 ST-498247400	498427400	STOPPER	Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.
 ST-498787100	498787100	MAIN SHAFT STOPPER	Used for removing and installing transmission main shaft lock nut.

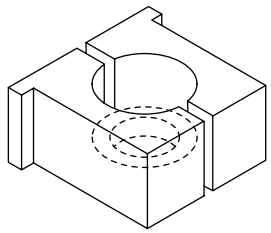
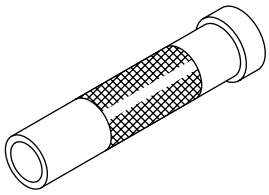
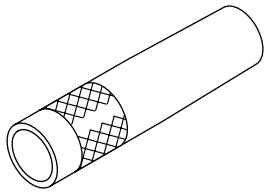
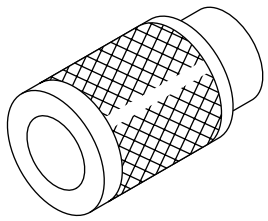
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937000	498937000	TRANSMISSION HOLDER	Used for removing and installing transmission main shaft lock nut.
 ST-499277100	499277100	BUSH 1-2 INSTALLER	• Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bush. • Used for installing roller bearing outer races to differential case.
 ST-499277200	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings, and 5th driven gear onto the driven shaft.
 ST-499757002	499757002	INSTALLER	• Used for installing snap ring (OUT 25), and ball bearing (25 × 26 × 17). • Used for installing bearing cone of transfer driven gear (extension core side).

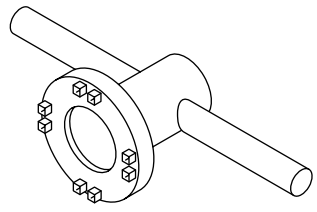
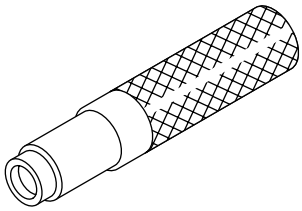
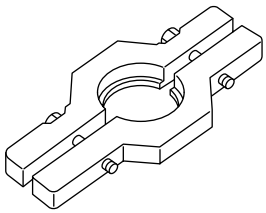
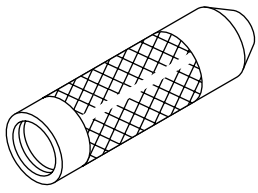
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787000	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 ST-499827000	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.
 ST-499857000	499857000	5TH DRIVEN GEAR REMOVER	Used for removing 5th driven gear.
 ST-499877000	499877000	RACE 4-5 INSTALLER	• Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).

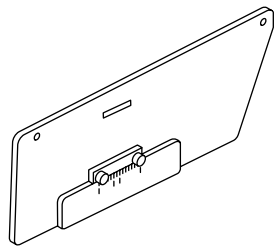
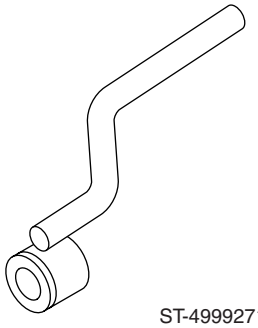
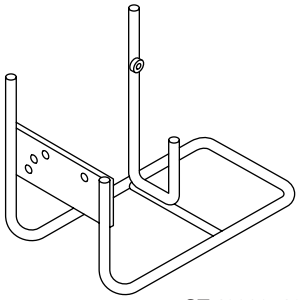
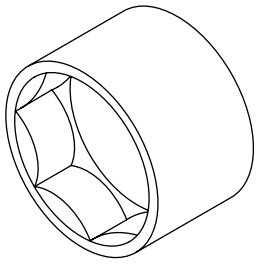
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499917500	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting drive pinion shim.
 ST-499927100	499927100	HANDLE	Used for fitting transmission main shaft.
 ST-499937100	499937100	TRANSMISSION STAND SET	Stand used for transmission disassembly and assembly.
 ST-499987003	499987003	SOCKET WRENCH (35)	Used for removing and installing driven pinion lock nut and main shaft lock nut.

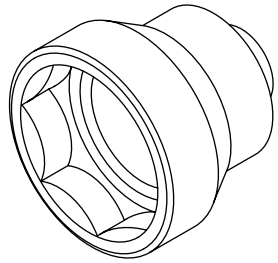
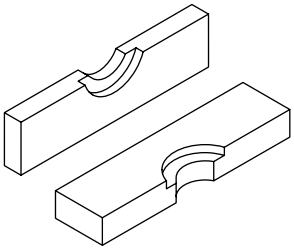
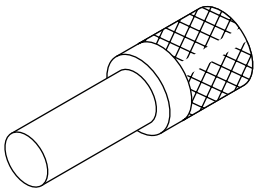
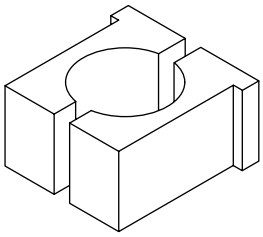
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987300	499987300	SOCKET WRENCH (50)	Used for removing and installing driven gear assembly lock nut.
 ST-899714110	899714110	REMOVER	Used for fixing transmission main shaft, drive pinion and rear drive shaft.
 ST-899864100	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.
 ST-899884100	899884100	HOLDER	Used for tightening lock nut on sleeve.

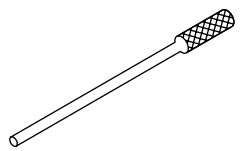
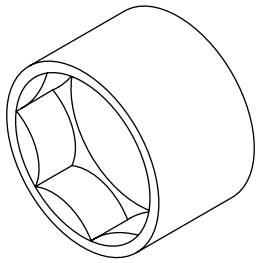
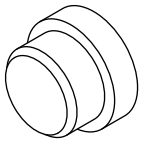
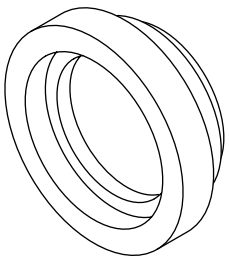
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	REMOVER	Used for removing and installing straight pin.
 ST-899988608	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.
 ST-398497701	398497701	ADAPTER	• Used for installing roller bearing onto differential case. • Used with INSTALLER (499277100).
 ST-499587000	499587000	INSTALLER	Used for installing driven gears to driven shaft.

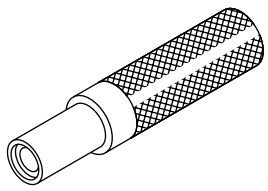
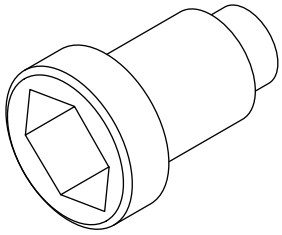
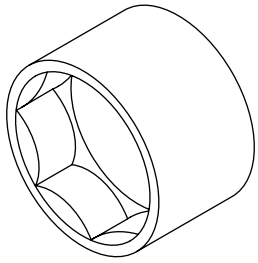
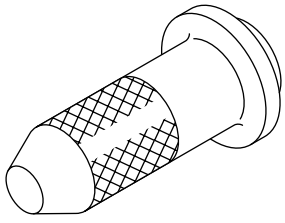
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899824100	899824100	PRESS	Used for installing speedometer shaft oil seal.
 ST-499987100	499987100	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-899984103	899984103	SOCKET WRENCH (35)	Used for removing and installing drive pinion lock nut.
 ST-498057300	498057300	INSTALLER	Used for installing extension oil seal.

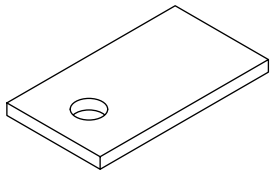
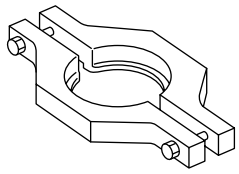
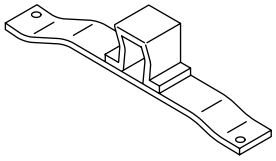
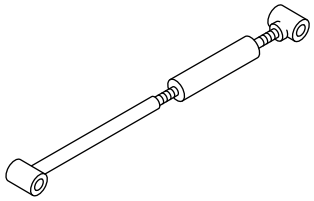
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498255400	498255400	PLATE	Used for measuring backlash.
 ST-498077400	498077400	SYNCHRONIZER CONE REMOVER	• Used for removing synchronizer cone of main shaft. • Used for removing 5th driven gear of drive pinion shaft.
 ST41099AA010	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.
 ST41099AA020	41099AA020	ENGINE SUPPORT	Used for supporting engine.

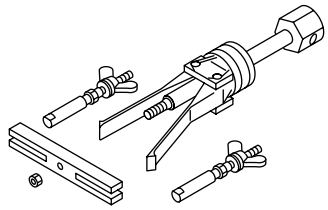
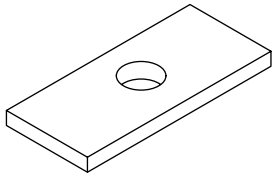
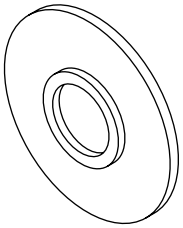
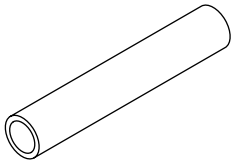
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398527700	398527700	PULLER ASSY	• Used for removing extension case roller bearing. • Used for removing front differential side retainer bearing outer race. • Used for removing front differential side retainer oil seal.
 ST-398643600	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 ST-398177700	398177700	INSTALLER	• Used for installing bearing cone of transfer driven gear (transfer case side). • Used for installing ball bearing of transfer drive gear.
 ST-398507703	398507703	DUMMY COLLAR	• Used for installing input shaft holder oil seal. • For dual-range model.

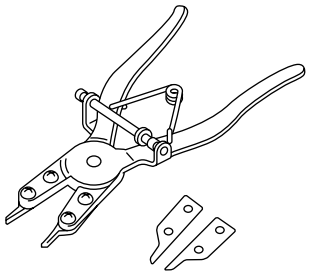
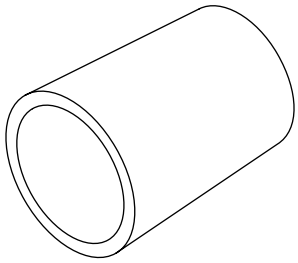
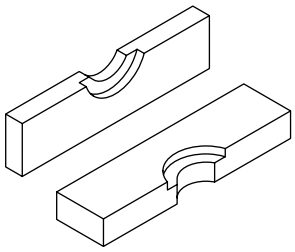
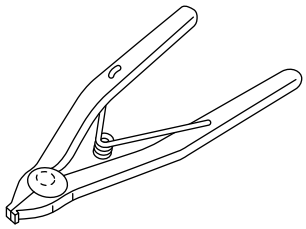
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398663600	398663600	PLIERS	• Used for removing and installing input shaft snap ring. • For dual-range model.
 ST-499757001	499757001	SNAP RING GUIDE	• Used for installing snap ring (OUT 25). • For dual-range model.
 ST-899858600	899858600	RETAINER	• Used for removing ball bearing. • For dual-range model.
 ST-899474100	899474100	EXPANDER	• Used for removing and installing snap ring. • For dual-range model.

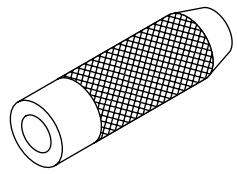
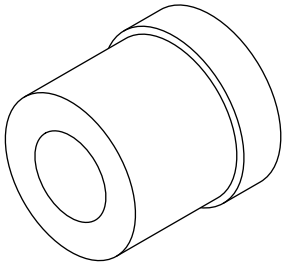
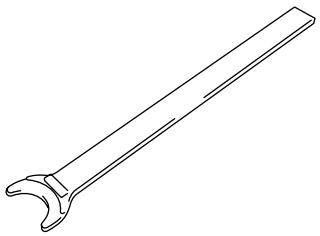
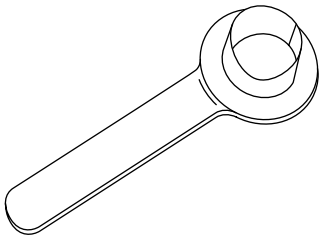
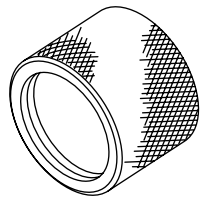
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899580100	899580100	INSTALLER	• Used when pressing ball bearings into input shaft. • For dual-range model.
 ST-399513600	399513600	INSTALLER	• Used when pressing ball bearings into input shaft. • For dual-range model.
 ST28399SA000	28399SA000	FRONT DRIVE SHAFT REMOVER	Used for removing front drive shaft. (Commonly used for MT model and AT model)
 ST28399SA010	28399SA010	FRONT DRIVE SHAFT OIL SEAL PROTECTOR	Used for protecting oil seal when installing front drive shaft.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.

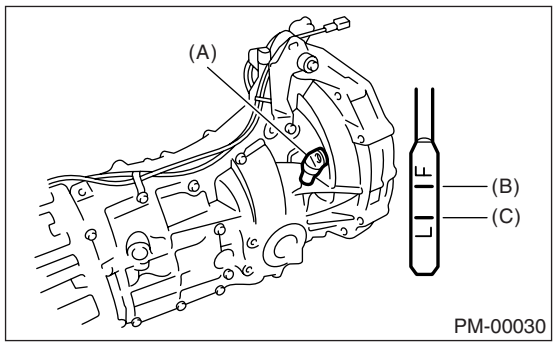
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.

2. Transmission Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Turn the ignition switch to OFF, and wait until the engine cools.
3) Remove the oil level gauge and wipe it clean.
4) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper direction.
5) Pull out the oil level gauge again and check the oil level on it. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



(A) Oil level gauge
(B) Upper level
(C) Lower level

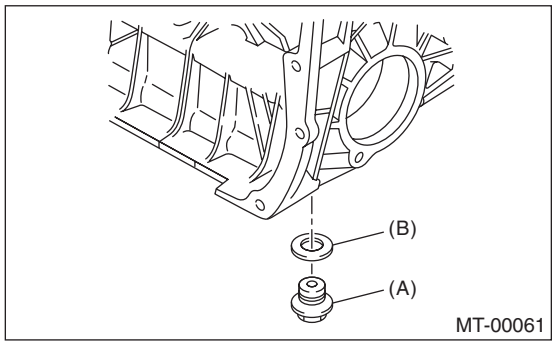
B: REPLACEMENT

1) Pull out the oil level gauge.
2) Lift-up the vehicle.
3) Drain the transmission gear oil completely.

CAUTION:
• Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.
• Be sure not to spill the transmission gear oil on exhaust pipe to prevent it from emitting smoke or firing. When the transmission gear oil is split on exhaust pipe, wipe it away completely.

4) Tighten the transmission gear oil drain plug using a new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb) (Aluminum gasket)
70 N·m (7.1 kgf-m, 52 ft-lb) (Copper gasket)



(A) Drain plug
(B) Gasket

5) Lower the vehicle.
6) Pour gear oil into the gauge hole.

Recommended gear oil:
Use GL-5 (75 W — 90) or equivalent.

Gear oil capacity:

Single-range model
Model without oil pump
3.5 ℓ (3.7 US qt, 3.1 Imp qt)
Model with oil pump
3.9 ℓ (4.1 US qt, 3.4 Imp qt)

Dual-range model
4.0 ℓ (4.2 US qt, 3.5 Imp qt)

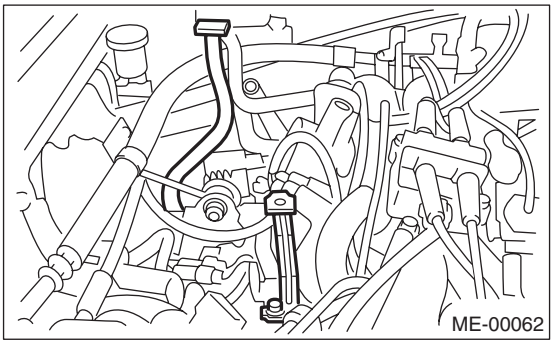
7) Measure the level of transmission gear oil, and then check the level within the specified range.

CAUTION:
When inserting the level gauge into transmission gear, align the protrusion on the side of the top part of level gauge with the notch in the gauge hole.

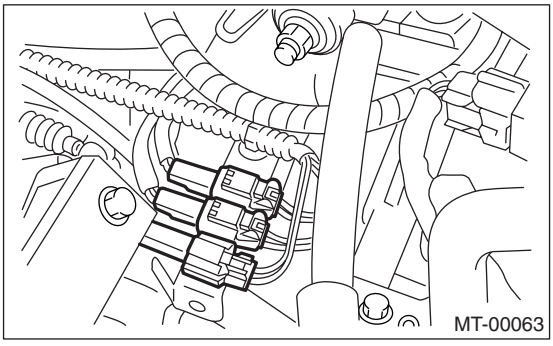
3. Manual Transmission Assembly

A: REMOVAL

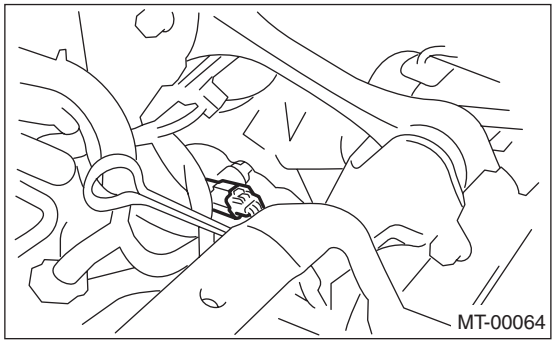
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Drain the transmission gear oil completely. **<Ref. to 5MT-31,** REPLACEMENT, TRANSMISSION GEAR OIL.>
4) Open the front hood fully, and support with stay.
5) Remove the air intake duct and air cleaner case. (Non-turbo model) **<Ref. to IN(H4SO)-7,** REMOVAL, AIR INTAKE DUCT.> **<Ref. to IN(H4SO)-6,** REMOVAL, AIR CLEANER CASE.>
6) Remove the air cleaner case stay. (Non-turbo model)



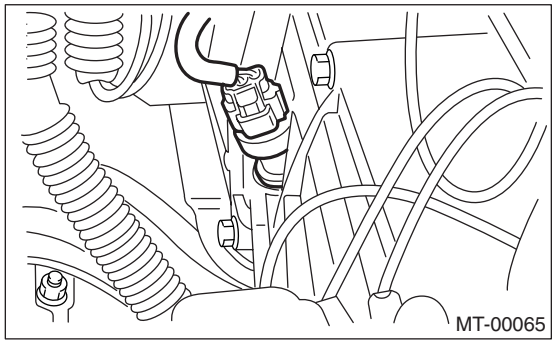
7) Remove the intercooler. (Turbo model) **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>
8) Disconnect the following connectors and transmission cable.
(1) Neutral position switch connector
(2) Back-up light switch connector
(3) High-low switch connector (Dual-range model)
• Non-turbo model



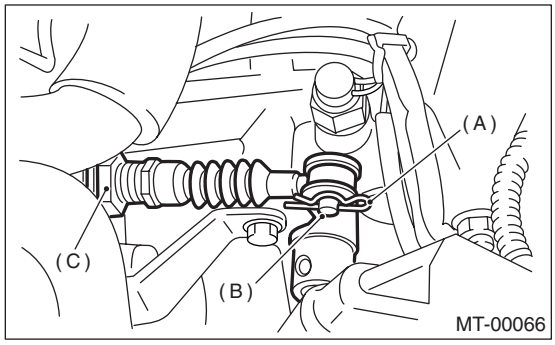
• Turbo model



(4) Vehicle speed sensor



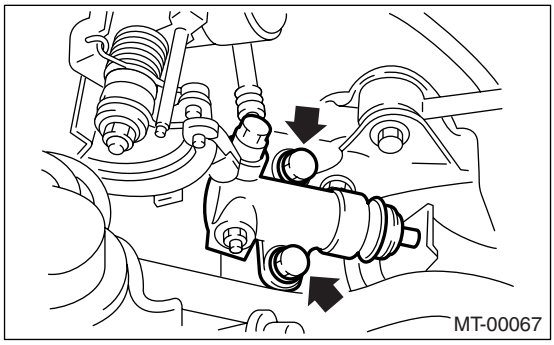
9) Remove the snap pin and pin from drive select cable.
10) Remove the drive select cable on transmission. (Dual-range model)



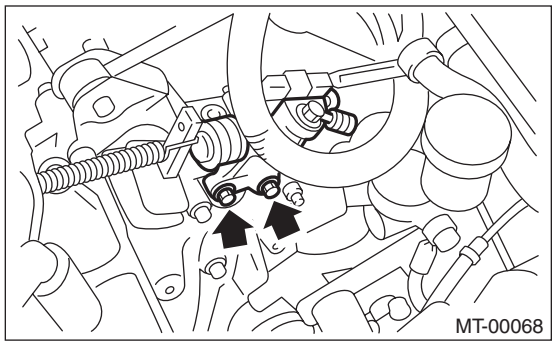
(A) Snap pin
(B) Clevis pin
(C) Drive select cable

11) Remove the starter. **<Ref. to SC(H4SO)-6,** REMOVAL, STARTER.>
12) Remove the operating cylinder from transmission, and then hang it with wires.

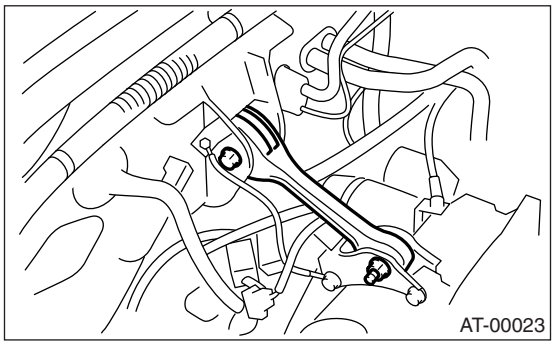
- Non-turbo model



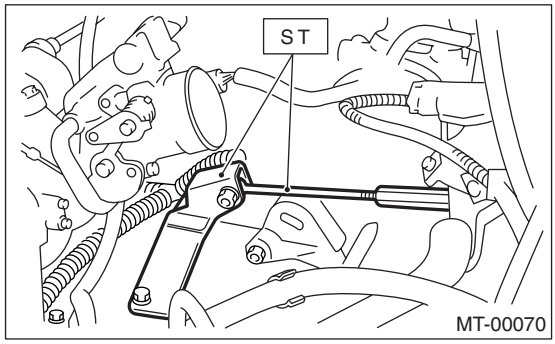
- Turbo model



13) Remove the pitching stopper.



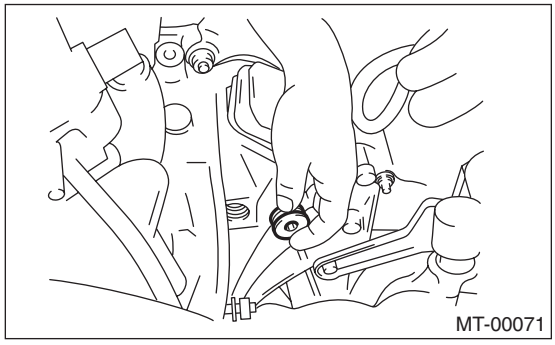
14) Set the ST.
ST 41099AA020 ENGINE SUPPORT ASSY



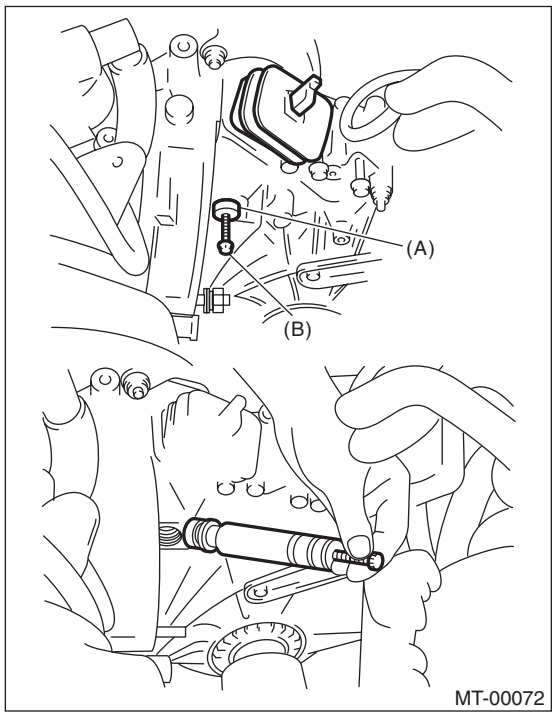
15) Separate the clutch release fork from release bearing. (Turbo model)

(1) Remove the clutch operating cylinder from transmission.

(2) Remove the plug using 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.

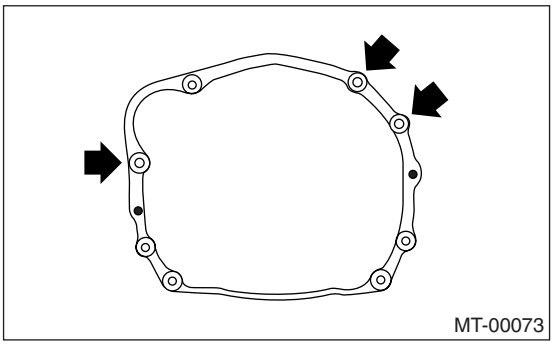


(A) Release fork shaft
(B) Bolt (6 mm)

(4) Raise the release fork and unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

16) Remove the bolts which holds right upper side of transmission to engine.



17) Remove the front and center exhaust pipes. (Non-turbo model) **<Ref. to EX(H4SO)-7,** REMOVAL, Front Exhaust Pipe.>

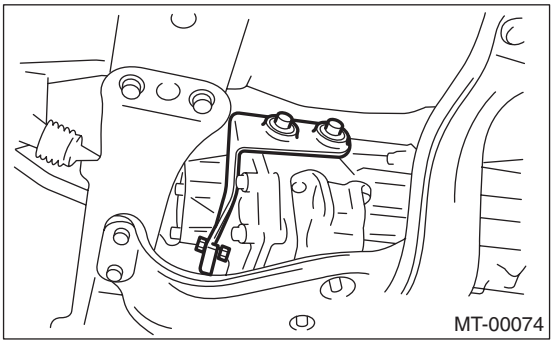
18) Remove the center exhaust pipe. (Turbo model). **<Ref. to EX(H4DOTC 2.0)-9,** REMOVAL, CENTER EXHAUST PIPE.>

19) Remove the rear exhaust pipe and muffler.

CAUTION:
When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

20) Remove the heat shield cover. (Non-turbo model)

21) Remove the hanger bracket from right side of transmission.

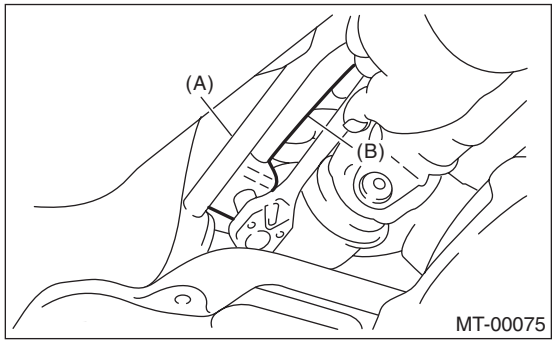


22) Remove the propeller shaft. **<Ref. to DS-15,** REMOVAL, PROPELLER SHAFT.>

23) Remove the gear shift rod and stay from transmission.

(1) Disconnect the stay from transmission.

(2) Disconnect the gear shift rod from transmission.

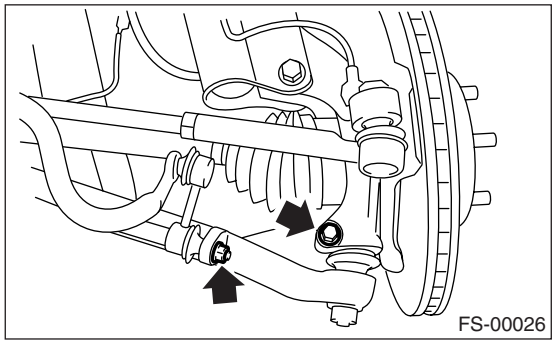


(A) Stay
(B) Gear shift rod

24) Disconnect the ATF cooler hose from transmission side oil cooler pipe. (Model with oil pump)

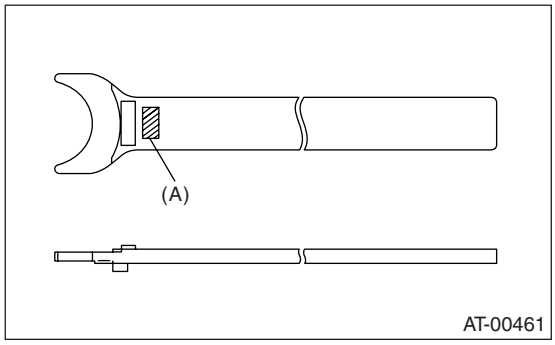
25) Disconnect the stabilizer link from transverse link.

26) Remove the bolts securing ball joint of transverse link to housing, and then separate the transverse link and housing.



27) Using the ST, remove the front drive shaft from side of transmission case.

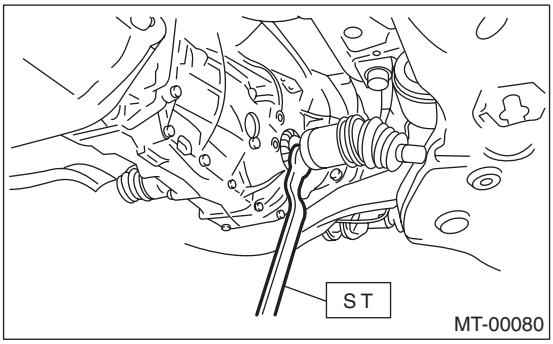
NOTE:
• Face the “MT” letter stamped on handle of ST to transmission.



(A) “MT” letter stamped

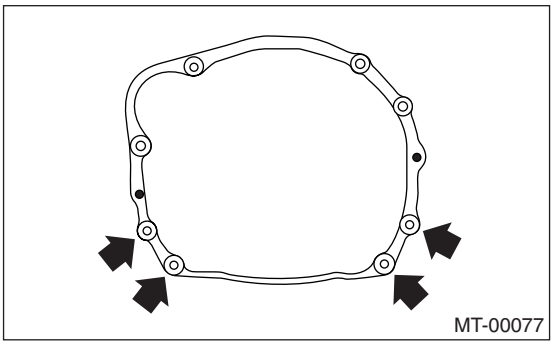
• Contact the portion of ST to transmission case.

ST 28399SA000 FRONT DRIVE SHAFT REMOVER



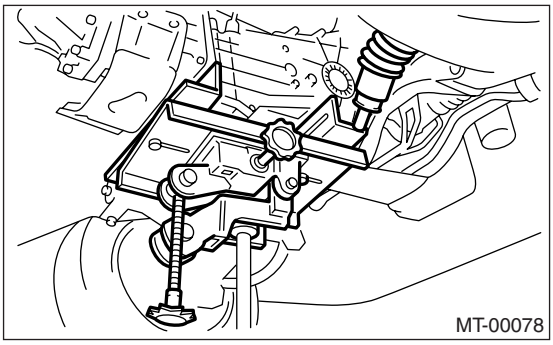
28) While holding the joint portion (AARi) of front drive shaft with your hand, push the housing outside to remove from transmission without stretching AARi side of boot.

29) Remove the nuts which hold lower side of transmission to engine.

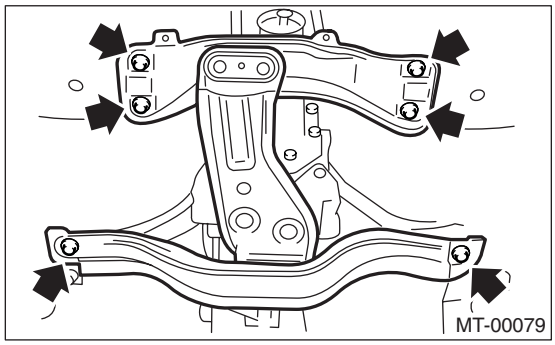


30) Place the transmission jack under transmission.

CAUTION:
Always support the transmission case with a transmission jack.



31) Remove the transmission rear crossmember from vehicle.



32) Remove the transmission.

NOTE:
Move the transmission jack toward rear until main shaft is withdrawn from clutch cover.

33) Separate the transmission assembly and rear cushion rubber.

B: INSTALLATION

1) Replace the differential side retainer oil seal with a new one. **<Ref. to 5MT-42,** REPLACEMENT, DIFFERENTIAL SIDE RETAINER OIL SEAL.>

NOTE:
When pulling out the front drive shaft, always replace the differential side retainer oil seal.

2) Install the rear cushion rubber to transmission assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26 ft-lb)

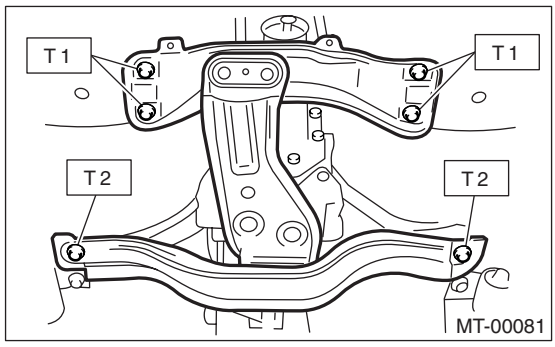
3) Install the clutch release lever and bearing onto transmission. (Turbo model) **<Ref. to CL-19,** INSTALLATION, RELEASE BEARING AND LEVER.>

4) Install the transmission onto engine.
   (1) Gradually raise the transmission with transmission jack.
   (2) Engage them at splines.

NOTE:
Be careful not to strike the main shaft against clutch cover.

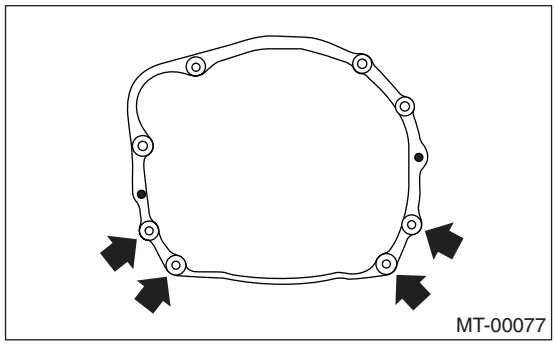
5) Install the transmission rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 52 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



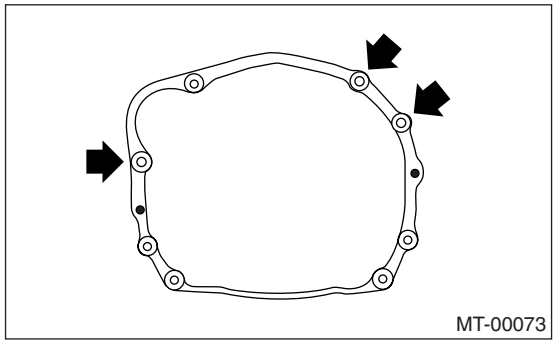
6) Take off the transmission jack.
7) Tighten the nuts which hold lower side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

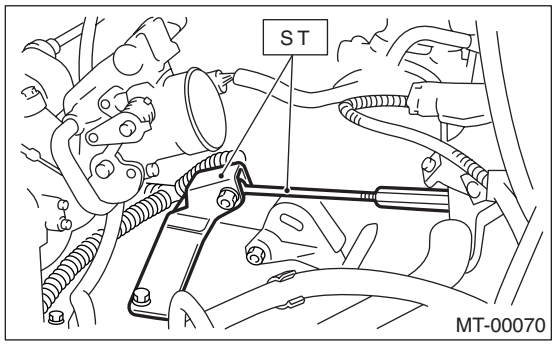


8) Connect the engine and transmission.
(1) Install the starter.
<Ref. to SC(H4SO)-6, INSTALLATION, STARTER.>
(2) Tighten the bolts which holds right upper side of transmission to engine.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

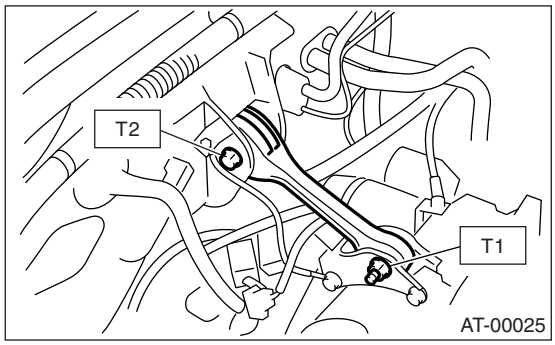


9) Remove the ST.



10) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)

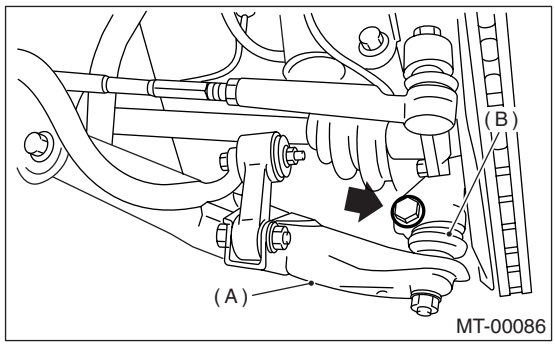


11) Lift-up the vehicle.
12) Install the front drive shaft into transmission. <Ref. to DS-34, INSTALLATION, Front Drive Shaft.>

ST 28399SA010 FRONT DRIVE SHAFT OIL SEAL PROTECTOR

13) Insert the ball joints of lower arm in lower part of housing, and tighten the installing bolt.

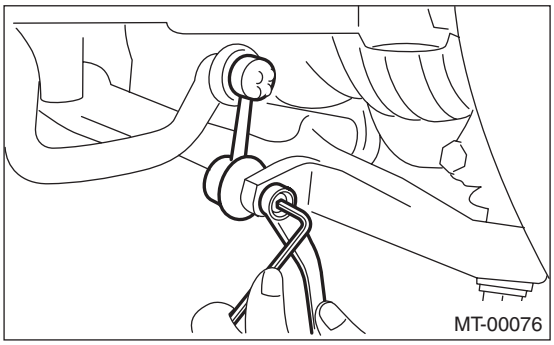
Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)



(A) Transverse link
(B) Ball joint

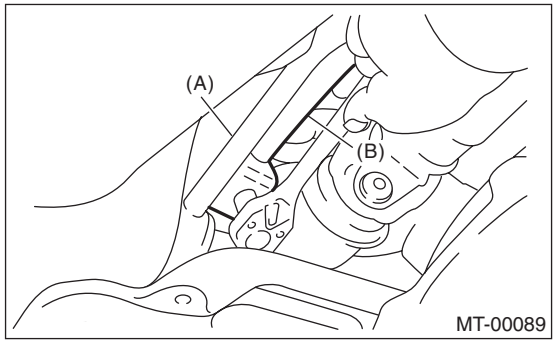
14) Install the stabilizer link from transverse link.

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)



15) Install the gear shift rod and stay.
(1) Install the gear shift rod onto transmission.

Tightening torque:
12 N·m (1.2 kgf-m, 9 ft-lb)

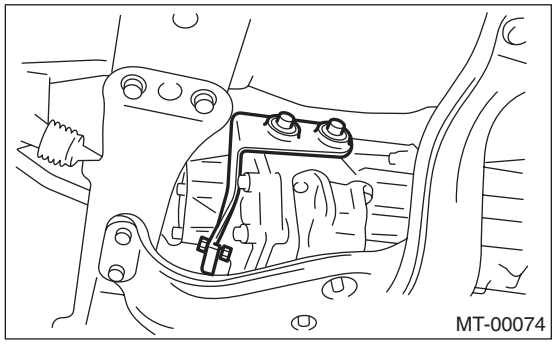


(A) Stay
(B) Gear shift rod

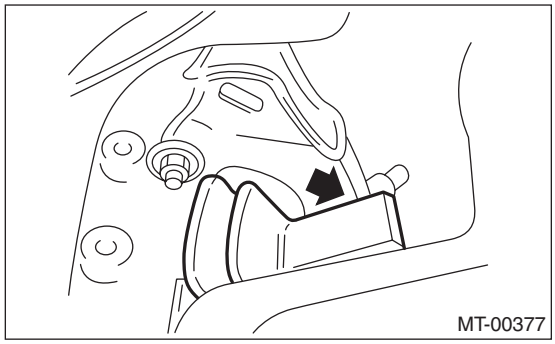
(2) Install the stay onto transmission.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

16) Install the propeller shaft. **<Ref. to DS-16,** INSTALLATION, PROPELLER SHAFT.>
17) Connect the cooler hose to oil pipe. (Model with oil pump)
18) Install the heat shield cover. (If equipped model)
19) Install the hanger bracket on right side of transmission.



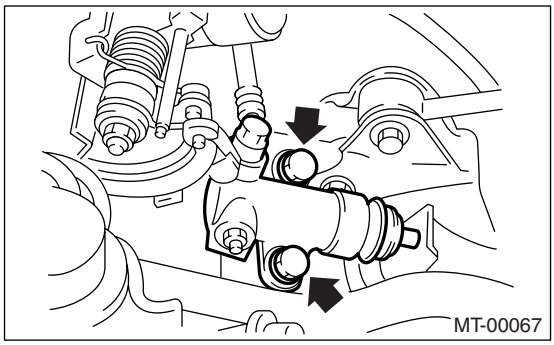
20) Install the rear exhaust pipe and muffler.
21) Install the front exhaust pipe and center exhaust pipe. (Non-turbo model) **<Ref. to EX(H4SO)-8,** INSTALLATION, Front Exhaust Pipe.>
22) Install the center exhaust pipe. (Turbo model) **<Ref. to EX(H4DOTC 2.0)-10,** INSTALLATION, Center Exhaust Pipe.>
23) Install the under cover.
24) Push clutch release lever to fit bearing into clutch cover.



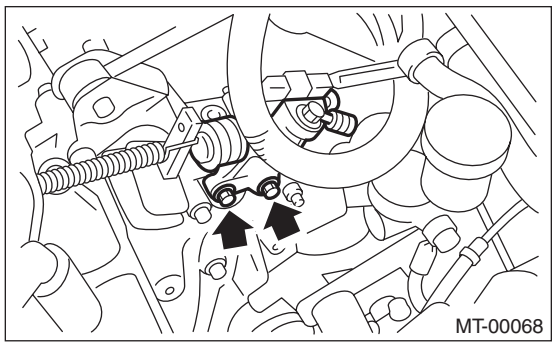
25) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf-m, 27.5 ft-lb)

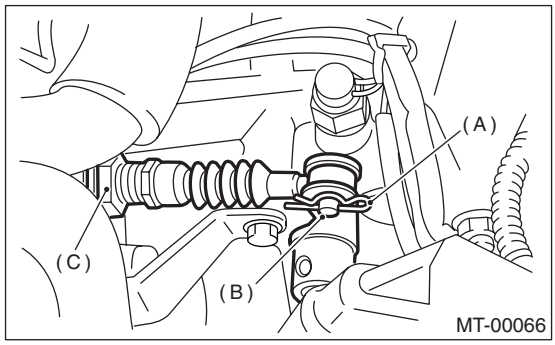
- Non-turbo model



- Turbo model



26) Install the drive select cable on transmission. (Dual-range model)



(A) Snap pin
(B) Clevis pin
(C) Drive select cable

27) Connect the following connectors:
(1) Transmission ground cable

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Vehicle speed sensor connector
(3) Neutral position switch connector
(4) Back-up light switch connector
(5) High-low switch connector (Dual-range model)

28) Install the air cleaner case stay.

29) Install the air cleaner case and duct. **<Ref. to IN(H4SO)-6,** INSTALLATION, AIR CLEANER CASE.> **<Ref. to IN(H4SO)-7,** INSTALLATION, AIR INTAKE DUCT.>

30) Install the intercooler.(TURBO MODEL) **<Ref. to IN(H4DOTC 2.0)-11,** INSTALLATION, Intercooler.>

31) Fill gear oil into the gauge hole.
<Ref. to 5MT-31, REPLACEMENT, TRANSMISSION GEAR OIL.>

32) Connect the battery ground cable to battery.

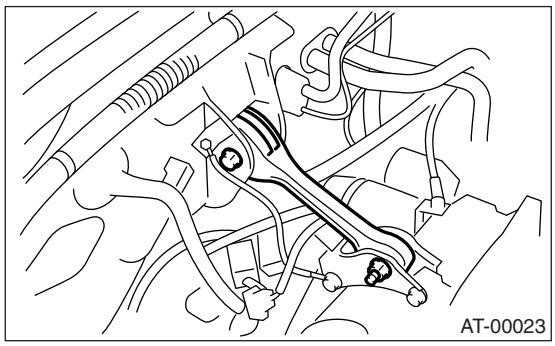
33) Take off the vehicle from lift arms.

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air intake duct and cleaner case.
3) Remove the air intake duct. (Non-turbo model) <Ref. to IN(H4SO)-7, REMOVAL, AIR INTAKE DUCT.>
4) Remove the air cleaner case. (Non-turbo model) <Ref. to IN(H4SO)-6, REMOVAL, AIR CLEANER CASE.>
5) Remove the intercooler (Turbo model). <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
6) Remove the pitching stopper.

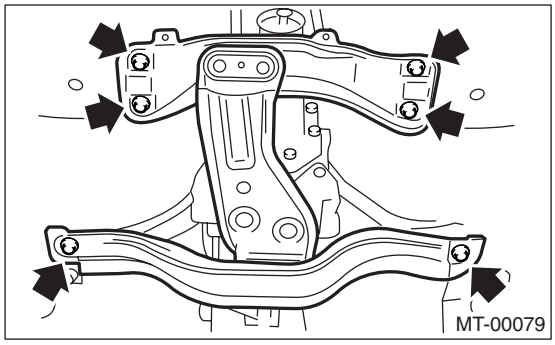


2. CROSSMEMBER AND CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Jack-up the vehicle and support it with rigid racks.
3) Remove the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL, Front Exhaust Pipe.>
<Ref. to EX(H4SO)-10, REMOVAL, Center Exhaust Pipe.>
4) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC 2.0)-9, REMOVAL, CENTER EXHAUST PIPE.>
5) Remove the rear exhaust pipe and muffler.
6) Remove the heat shield cover. (If equipped model)
7) Set the transmission jack under the transmission body.

CAUTION:
Always support the transmission case with a transmission jack.

8) Remove the rear crossmember.



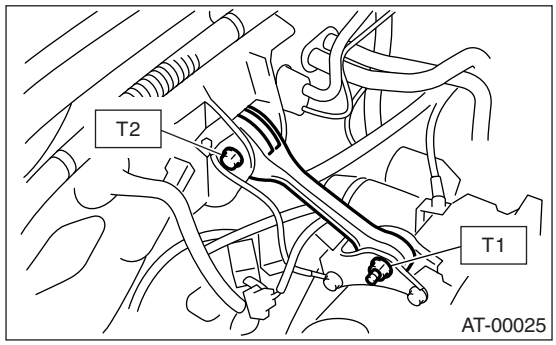
9) Remove the rear cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 37 ft-lb)
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



2) Install the air intake duct and cleaner case. (Non-turbo model)
<Ref. to IN(H4SO)-6, INSTALLATION, AIR CLEANER CASE.> <Ref. to IN(H4SO)-7, INSTALLATION, AIR INTAKE DUCT.>
3) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.

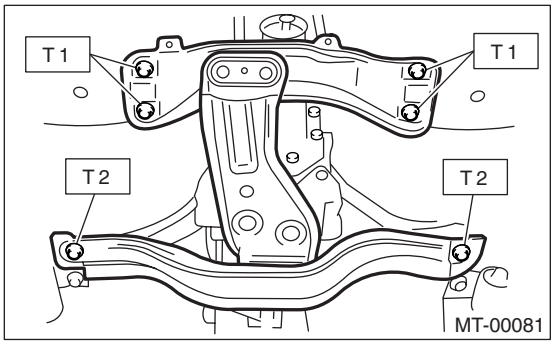
2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:
35 N·m (3.6 kgf-m, 26 ft-lb)

2) Install the rear crossmember.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 52 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



3) Remove the transmission jack.
4) Install the heat shield cover. (If equipped model)
5) Install the front and center exhaust pipes. (Non-turbo model)
<Ref. to EX(H4SO)-8, INSTALLATION, Front Exhaust Pipe.>
6) Install the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.>
7) Install the rear exhaust pipe and muffler.

C: INSPECTION

Repair or replace parts if the results of the inspection below are not satisfactory.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Make sure that the rubber is not stiff, cracked or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Make sure that the cushion rubber is not stiff, cracked or otherwise damaged.

5. Oil Seal

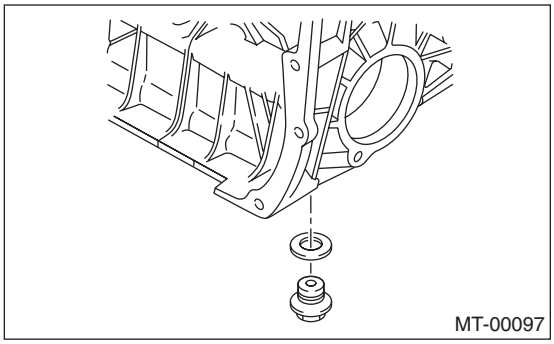
A: INSPECTION

Check the oil seal portion for leakage. If leakage is found, replace the oil seal with a new one.

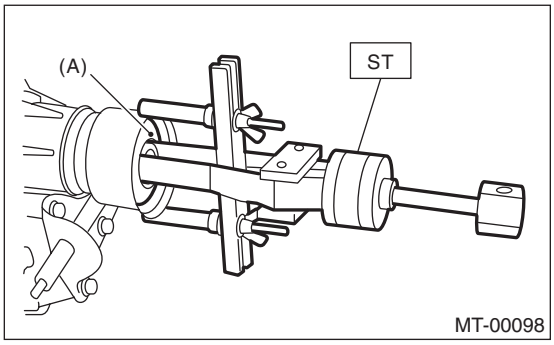
B: REPLACEMENT

1) Clean the transmission exterior.
2) Drain the gear oil completely.
3) Replace the gasket with a new one, and then tighten the drain plug after draining gear oil.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb) (Aluminum gasket)
70 N·m (7.1 kgf-m, 52 ft-lb) (Copper gasket)

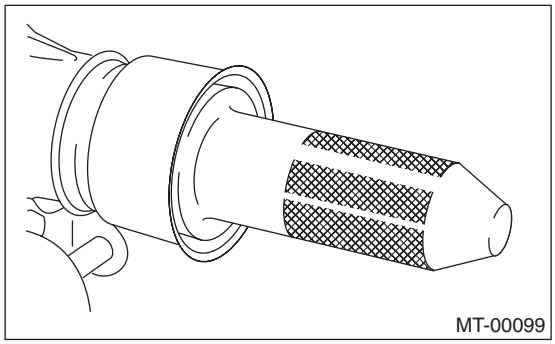


4) Remove the rear exhaust pipe and muffler.
5) Remove the heat shield cover. (If equipped model)
6) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, PROPELLER SHAFT.>
7) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY



(A) Oil seal

8) Using the ST, install the oil seal.
ST 498057300 INSTALLER



9) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, PROPELLER SHAFT.>
10) Install the heat shield cover. (If equipped model)
11) Install the rear exhaust pipe and muffler.
12) Pour gear oil and check the oil level. <Ref. to 5MT-31, REPLACEMENT, TRANSMISSION GEAR OIL.>

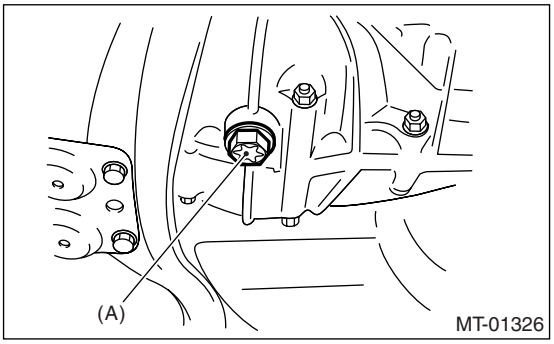
6. Differential Side Retainer Oil Seal

A: INSPECTION

Check the differential side retainer oil seal for leakage of gear oil. If oil leaks, replace the oil seal.

B: REPLACEMENT

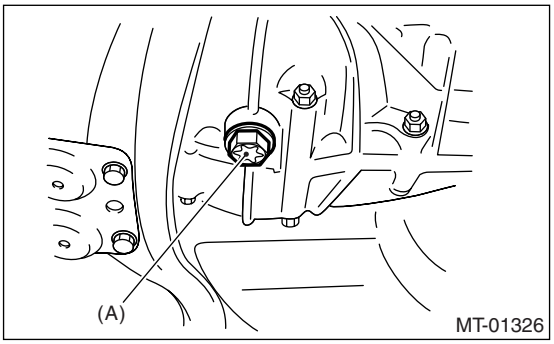
1) Lift-up the vehicle.
2) Drain the gear oil from oil drain plug.



(A) Drain plug

3) Replace the gasket with new one, and then tighten the differential oil drain plug.

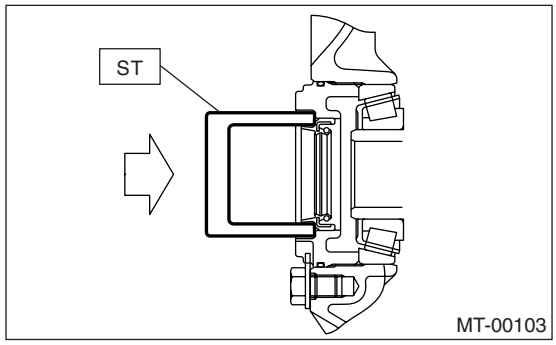
Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb) (Aluminum gasket)
70 N·m (7.1 kgf-m, 52 ft-lb) (Copper gasket)



(A) Drain plug

4) Remove the front exhaust pipe and center exhaust pipe. (Non-turbo model) <Ref. to EX(H4SO)-7, REMOVAL, Front Exhaust Pipe.>
5) Separate the front drive shaft from transmission. <Ref. to DS-33, REMOVAL, Front Drive Shaft.>
6) Using a vinyl tape, etc. wrapped flat tip screwdriver, remove the differential side retainer oil seal.
7) Using the ST, install the differential side retainer oil seal tapping ST lightly with a hammer.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

NOTE:
Be sure to apply oil to oil seal lip surface.



8) Install the front drive shaft. <Ref. to DS-34, INSTALLATION, Front Drive Shaft.>
9) Install the front exhaust pipe and center exhaust pipe. (Non-turbo model) <Ref. to EX(H4SO)-8, INSTALLATION, Front Exhaust Pipe.>
10) Lower the vehicle.
11) Fill gear oil into the gauge hole. <Ref. to 5MT-31, REPLACEMENT, TRANSMISSION GEAR OIL.>

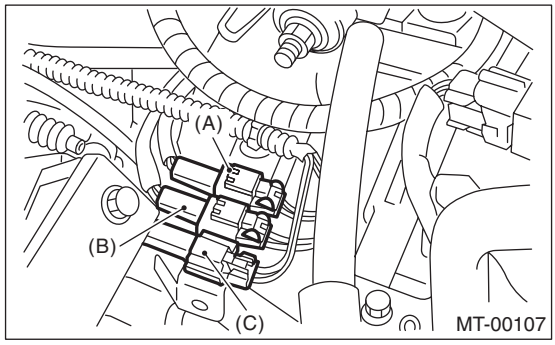
7. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

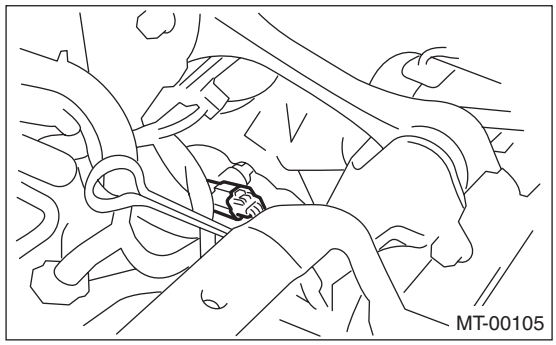
1) Disconnect the ground cable from battery.
2) Remove the air intake duct and cleaner case. <Ref. to IN(H4SO)-7, REMOVAL, AIR INTAKE DUCT.> <Ref. to IN(H4SO)-6, REMOVAL, AIR CLEANER CASE.>
3) Remove the intercooler (Turbo model). <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
4) Disconnect the connector of back-up light switch and neutral position switch.

- Non-turbo model

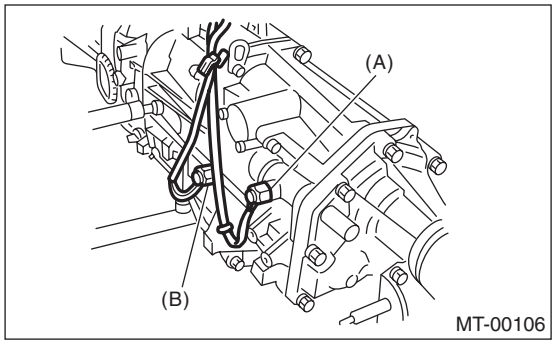


(A) Neutral switch (Brown)
(B) Back-up light switch (Gray)
(C) High-low switch (Black)

- Turbo model



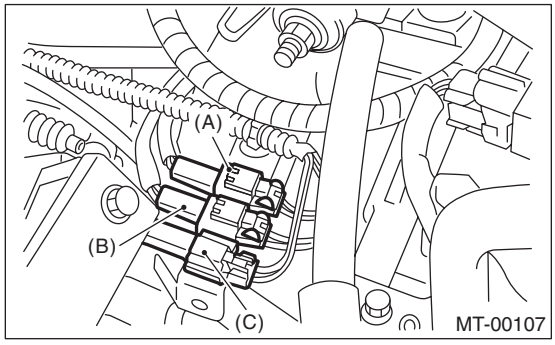
5) Lift-up the vehicle.
6) Remove the back-up light switch and neutral position switch with harness.



(A) Neutral position switch (Brown)
(B) Back-up light switch (Gray)

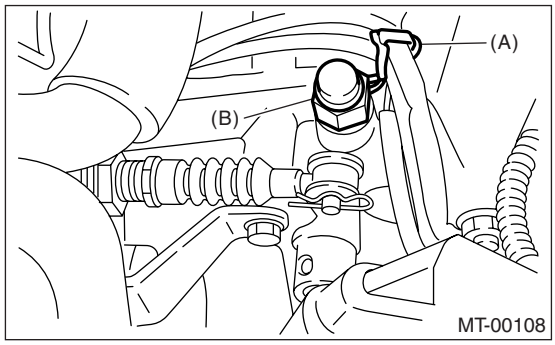
2. HIGH-LOW SWITCH

1) Disconnect the ground cable from battery.
2) Remove the air intake duct and cleaner case. **<Ref. to IN(H4SO)-7,** REMOVAL, AIR INTAKE DUCT.> **<Ref. to IN(H4SO)-6,** REMOVAL, AIR CLEANER CASE.>
3) Disconnect the connector of high-low switch.



(A) Neutral position switch (Brown)
(B) Back-up light switch (Gray)
(C) High-low switch (Black)

4) Remove the high-low switch cable from clamp.
5) Remove the high-low switch.



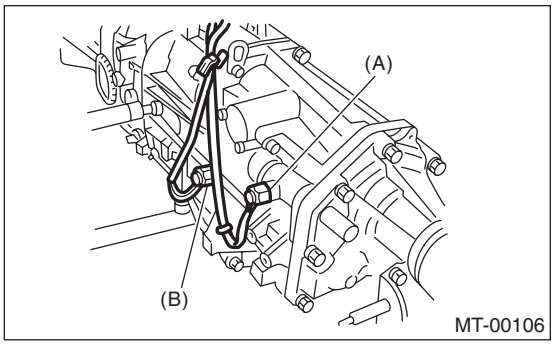
(A) Clamp
(B) High-low switch

B: INSTALLATION

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

1) Install the back-up light switch and neutral position switch with harness.

Tightening torque:
32.3 N·m (3.3 kgf-m, 23.8 ft-lb)



(A) Neutral position switch (Brown)
(B) Back-up light switch (Gray)

2) Connect the connector of back-up light switch and neutral position switch.
3) Install the air intake duct and cleaner case. <Ref. to IN(H4SO)-7, INSTALLATION, AIR INTAKE DUCT.> <Ref. to IN(H4SO)-6, INSTALLATION, AIR CLEANER CASE.>
4) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>
5) Connect the battery ground cable to battery.

2. HIGH-LOW SWITCH

1) Install the high-low switch.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

2) Install the high-low switch cable to clamp.
3) Connect the connector of high-low switch.
4) Install the air intake duct and cleaner case. **<Ref. to IN(H4SO)-7,** INSTALLATION, AIR INTAKE DUCT.> **<Ref. to IN(H4SO)-6,** INSTALLATION, AIR CLEANER CASE.>
5) Connect the battery ground cable to battery.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-7, INSPECTION, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

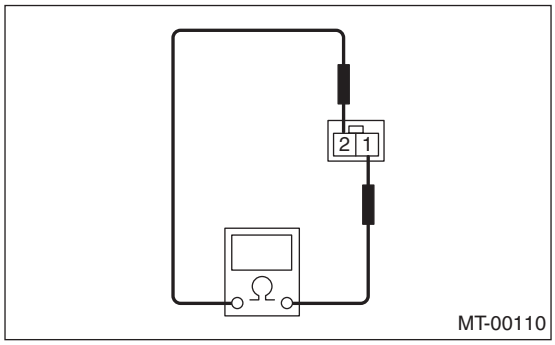
1) Turn the ignition switch to OFF.
2) Disconnect the connector of neutral position switch.
3) Measure the resistance between neutral position switch terminals.
Non-turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

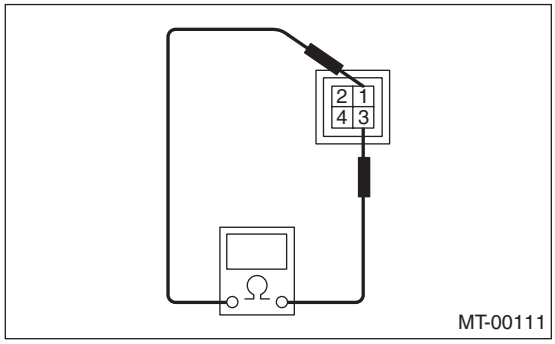
Turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1 Ω
Other positions		More than 1 MΩ

- Non-turbo model



- Turbo model

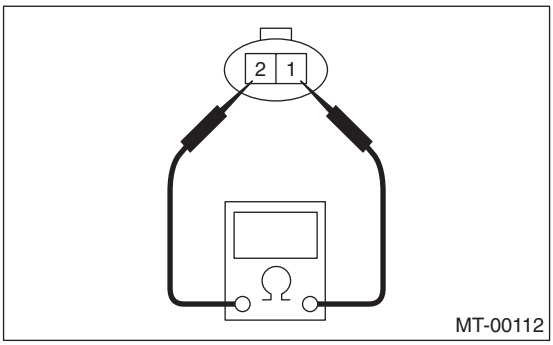


4) Replace defective parts.

3. HIGH-LOW SWITCH

1) Turn the ignition switch to OFF.
2) Disconnect the connector high-low switch.
3) Measure the resistance between high-low switch terminals.

Gear shift position	Terminal No.	Specified resistance
LO position	1 and 2	Less than 1 Ω
HIGH position		More than 1 MΩ

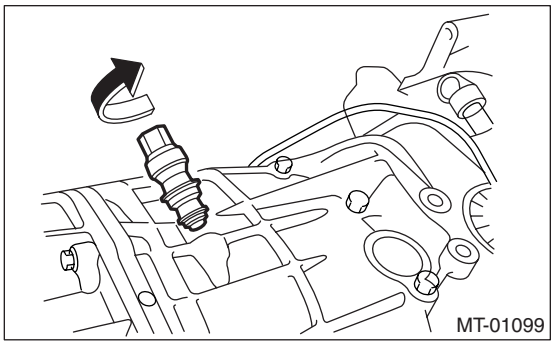


4) Replace the defective parts.

8. Vehicle Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Remove the front, center and rear exhaust pipe and muffler.
4) Disconnect the connector from vehicle speed sensor.
5) Turn and remove the vehicle speed sensor.



B: INSTALLATION

NOTE:
• Discard the vehicle speed sensor and after removal, replace with a new one.
• Ensure the sensor mounting hole is clean and free of foreign matter.
• Align the tip end of key with key groove on end of speedometer shaft during installation.

1) Hand tighten the vehicle speed sensor.
2) Tighten the vehicle speed sensor using suitable tool.

Tightening torque:
5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

3) Connect the connector to vehicle speed sensor.
4) Install the front and center exhaust pipe.
5) Lower the vehicle.
6) Connect the battery ground cable to battery.

C: INSPECTION

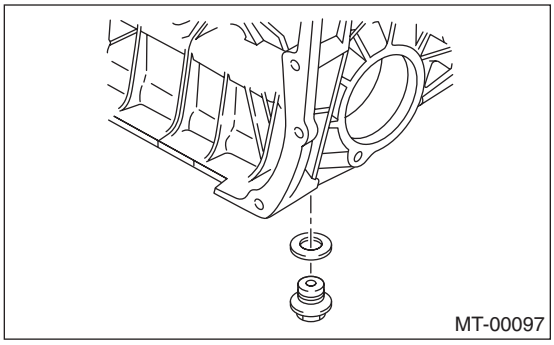
Inspect the vehicle speed sensor.
<Ref. to EN(H4SO)(diag)-183, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to EN(H4SO)(diag)-184, DTC P0503 VEHICLE SPEED SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

9. Preparation for Overhaul

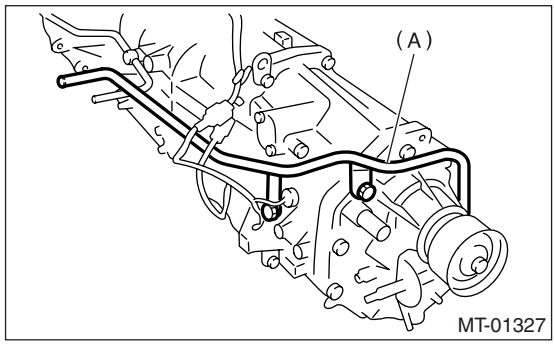
A: PROCEDURE

1) Clean oil, grease, dirt and dust from transmission.
2) Remove the drain plug to drain oil.
3) Tighten the drain plug using new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb) (Aluminum gasket)
70 N·m (7.1 kgf-m, 52 ft-lb) (Copper gasket)

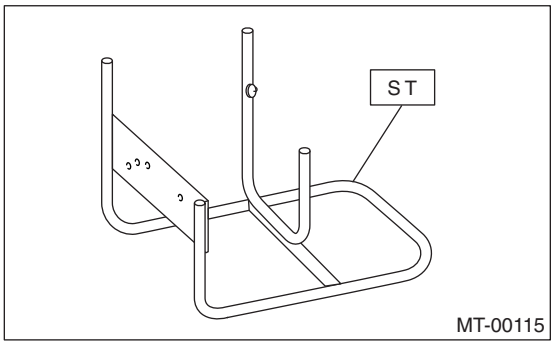


4) Remove the outlet pipe. (model with oil pump)



(A) Outlet pipe

5) Attach the transmission to ST.
ST 499937100 TRANSMISSION STAND



6) Rotating parts should be coated with oil prior to assembly.
7) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
8) Gaskets, lock washers and lock nut must be replaced with new ones.
9) Liquid gasket should be used where specified to prevent leakage.

10.Oil Pump

A: REMOVAL

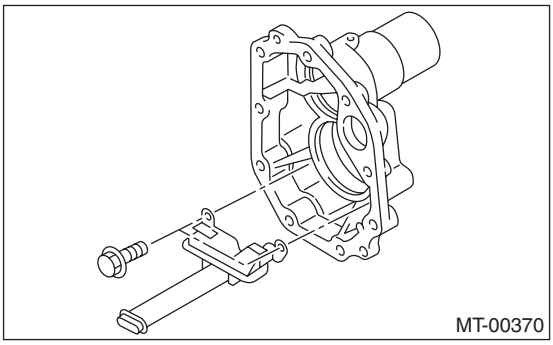
For extension case removal procedure, refer to “Transfer Case and Extension Case Assembly”. **<Ref. to 5MT-50,** REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>

B: INSTALLATION

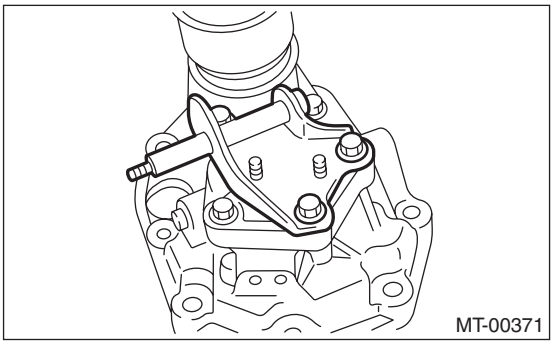
For extension case installation procedure, refer to “Transfer Case Pump and Extension Case Assembly”. **<Ref. to 5MT-50,** INSTALLATION, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>

C: DISASSEMBLY

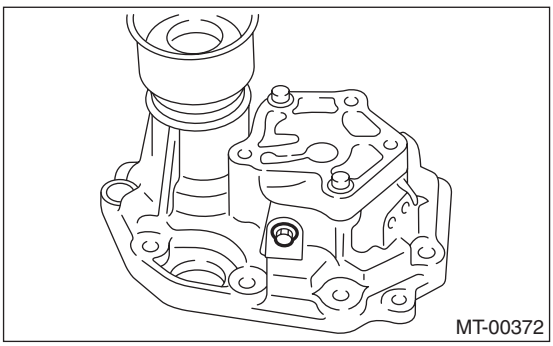
1) Remove the transfer drive gear assembly. **<Ref. to 5MT-54,** REMOVAL, TRANSFER DRIVE GEAR.>
2) Remove the oil strainer from extension case.



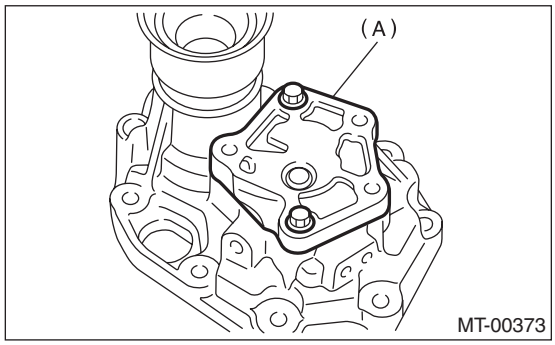
3) Remove the shift bracket.



4) Remove the relief valve from extension case.

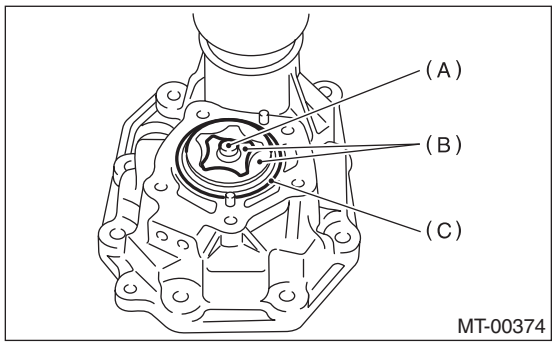


5) Remove the oil pump cover from extension.



(A) Oil pump cover

6) Remove the rotor assembly, oil pump shaft and O-ring.



(A) Oil pump shaft
(B) Rotor ASSY
(C) O-ring

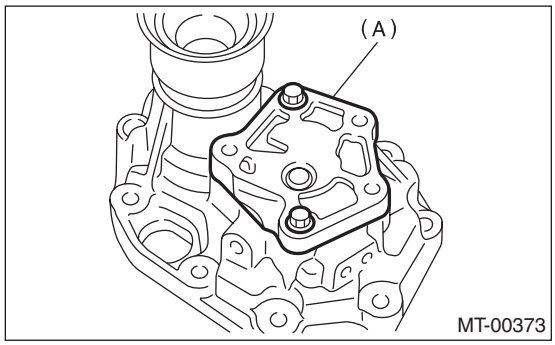
D: ASSEMBLY

1) Install the rotor assembly and oil pomp shaft to extension case.
2) Install a new O-ring to oil pump cover.

NOTE:
Apply a coat of gear oil to the O-ring.

3) Install the oil pump cover to extension case.

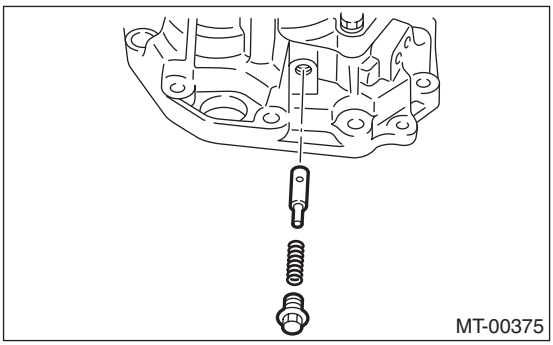
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Oil pump cover

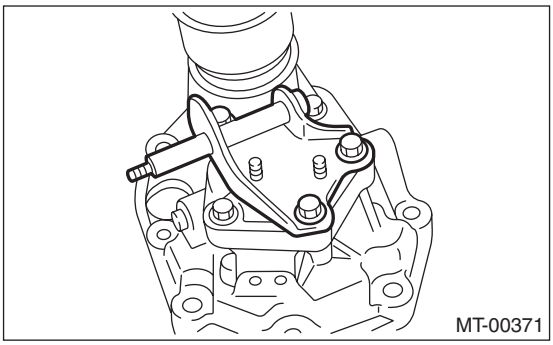
4) Install a new O-ring, relief valve and return spring to extension case.

Tightening torque:
12.75 N·m (1.3 kgf-m, 9.4 ft-lb)



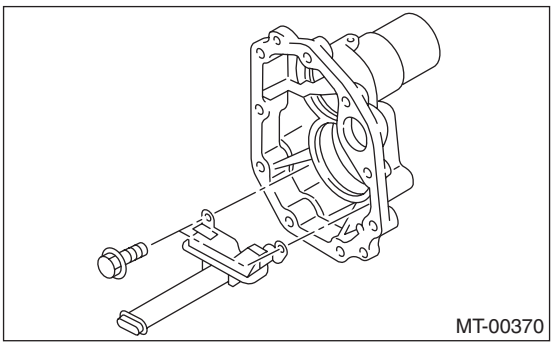
5) Install the shift bracket to extension case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



6) Install the oil strainer to extension case.

Tightening torque:
26 N·m (2.7 kgf-m, 19 ft-lb)

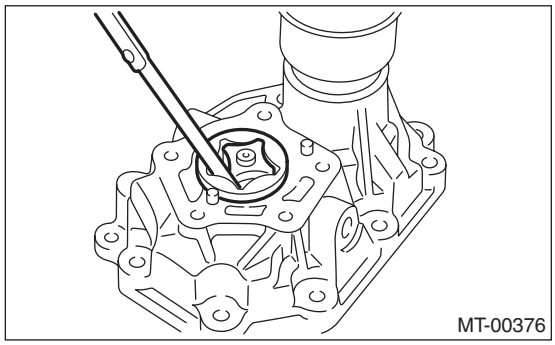


7) Install the transfer drive gear. **<Ref. to 5MT-54,** INSTALLATION, TRANSFER DRIVE GEAR.>

E: INSPECTION

Use a thickness gauge to measure the chip clearance of the rotor assembly. If the value exceeds standard, replace the rotor as an assembly.

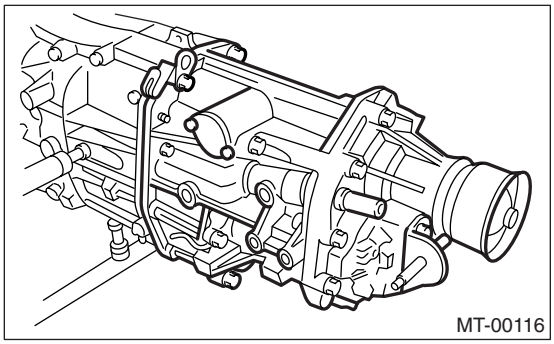
Chip clearance:
Less than 0.15 mm (0.0059 in)



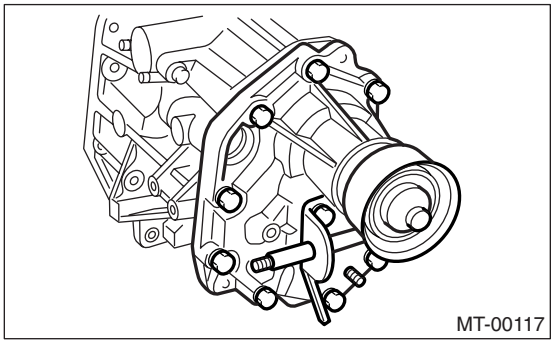
11. Transfer Case and Extension Case Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly.

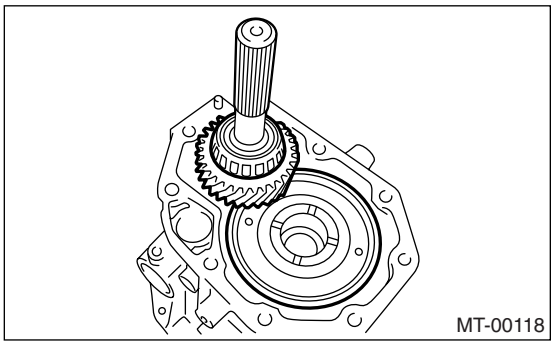

MT-00116

4) Remove the shifter arm.
5) Remove the extension case assembly.

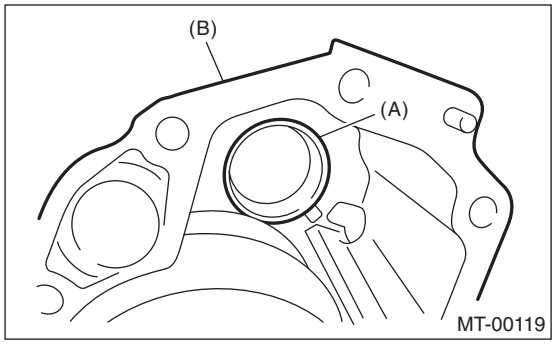

MT-00117

B: INSTALLATION

1) Install the center differential and transfer driven gear into transfer case.


MT-00118

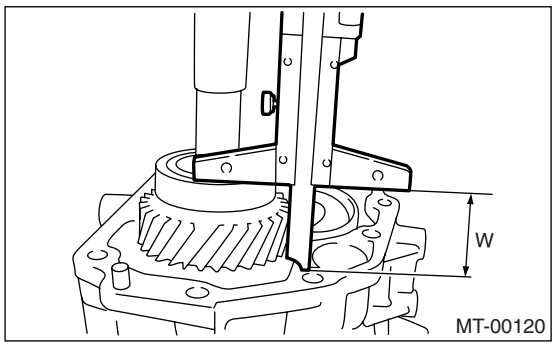
2) Remove the bearing outer race from extension case.



MT-00119

(A) Bearing outer race
(B) Extension case

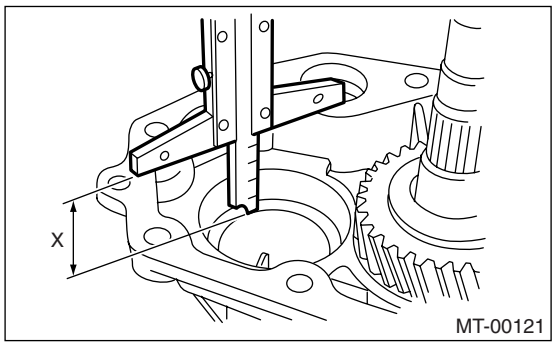
3) While pressing the bearing outer race horizontally, turn the driven shaft ten rotations.
4) Measure the height “W” between transfer case and taper roller bearing on the transfer driven gear.



MT-00120

5) Measure the depth “X”.

NOTE:
Measure with bearing cone and thrust washer removed.



MT-00121

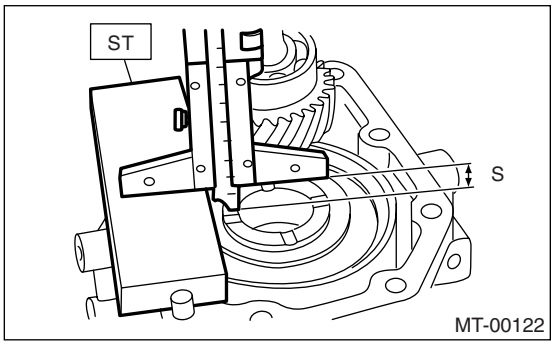
6) Calculate the thrust washer thickness “t” using the following equation: t = X − W + (0.2 to 0.3 mm) (0.008 to 0.012 in)
7) Select the nearest washer in the following table:

Standard protrusion amount of taper roller bearing outer race:
0.2 — 0.3 mm (0.008 — 0.012 in)

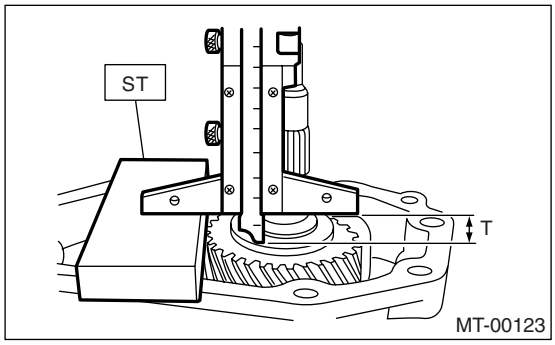
NOTE:
Be sure to set within the standard protrusion amount.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

8) Fit the thrust washers on transfer drive shaft.
9) Install the bearing outer race into extension case.
10) Measure the depth “S” between transfer case and center differential.
ST 398643600 GAUGE



11) Measure the depth “T” between extension case and transfer drive gear.
ST 398643600 GAUGE



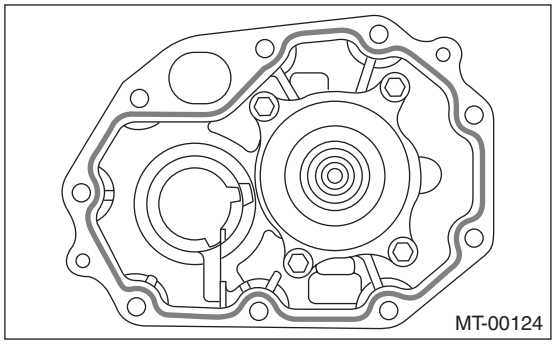
12) Calculate the space “U” using the following equation: U = S+T−30 mm (1.18 in) [Thickness of ST]
13) Select the suitable washer in the following table:

Standard clearance:
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

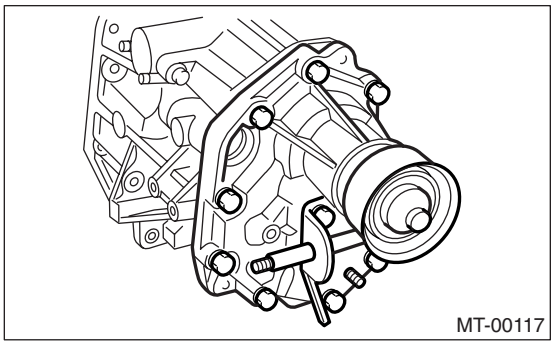
14) Fit the thrust washer on center differential.
15) Apply proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:
THREE BOND 1215 (Part No. : 004403007)

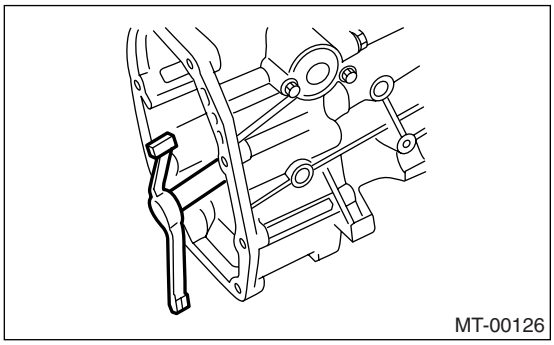


16) Install the extension assembly into transfer case.

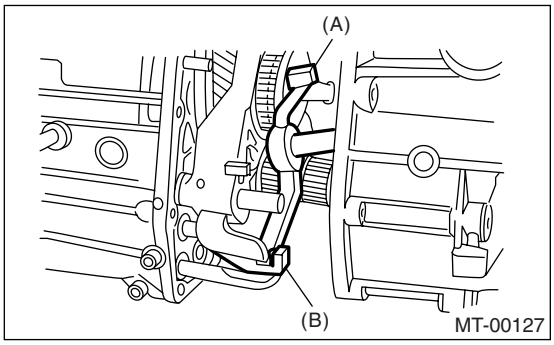
Tightening torque:
40 N·m (4.1 kgf-m, 30 ft-lb)


MT-00117

17) Install the shifter arm to transfer case.


MT-00126

18) Hang the shifter arm on 3rd-4th fork rod.

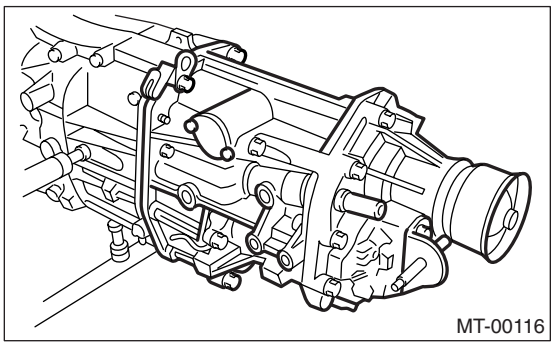


MT-00127

(A) Shifter arm
(B) 3rd-4th fork rod

19) Install the transfer case with extension case assembly to transmission case.

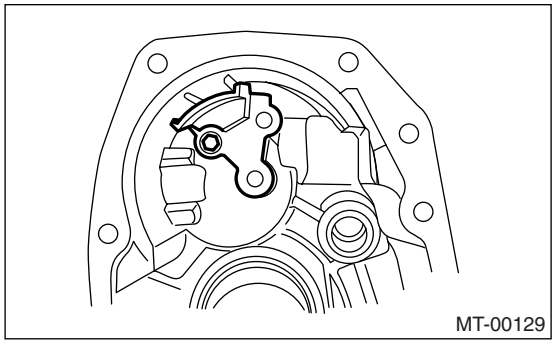
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)


MT-00116

C: DISASSEMBLY

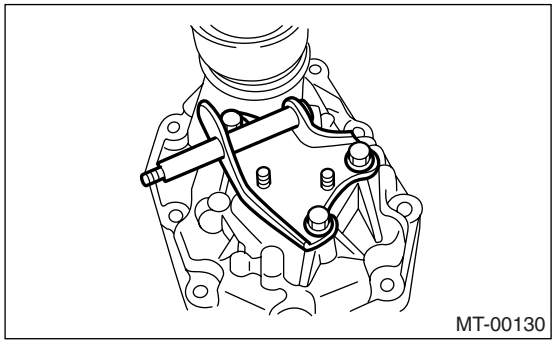
1. TRANSFER CASE

1) Remove the reverse check assembly. <Ref. to 5MT-59, REMOVAL, Reverse Check Sleeve.>
2) Remove the oil guide.


MT-00129

2. EXTENSION CASE

1) Remove the transfer drive gear assembly. <Ref. to 5MT-54, REMOVAL, TRANSFER DRIVE GEAR.>
2) Remove the shift bracket.


MT-00130

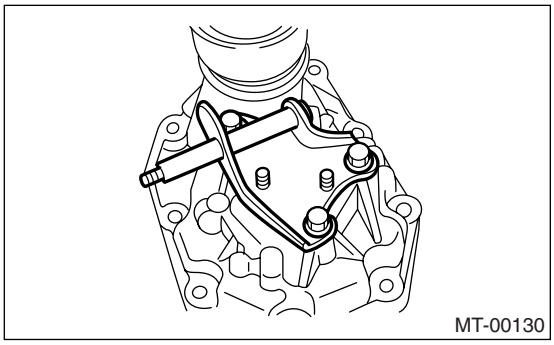
3) Remove the oil seal from extension case. <Ref. to 5MT-41, REPLACEMENT, Oil Seal.>

D: ASSEMBLY

1. EXTENSION CASE

1) Using the ST, insert the new oil seal to extension case. <Ref. to 5MT-41, REPLACEMENT, Oil Seal.>
2) Install the shift bracket to extension case.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

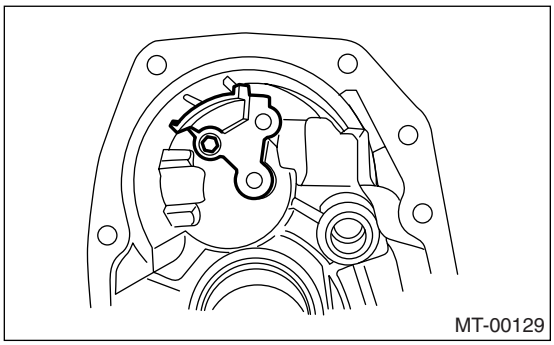


3) Install the transfer drive gear to extension case. <Ref. to 5MT-54, INSTALLATION, TRANSFER DRIVE GEAR.>

2. TRANSFER CASE

1) Install the oil guide to transfer case.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

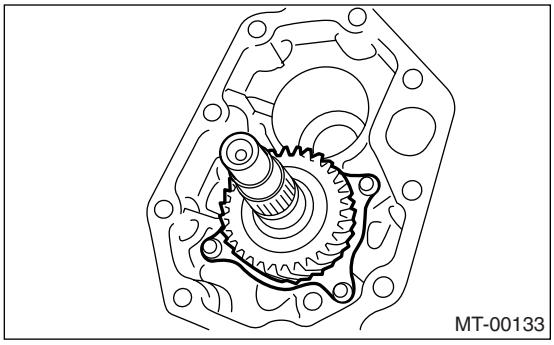


2) Install the reverse check sleeve assembly to transfer case. <Ref. to 5MT-59, INSTALLATION, Reverse Check Sleeve.>

12.Transfer Drive Gear

A: REMOVAL

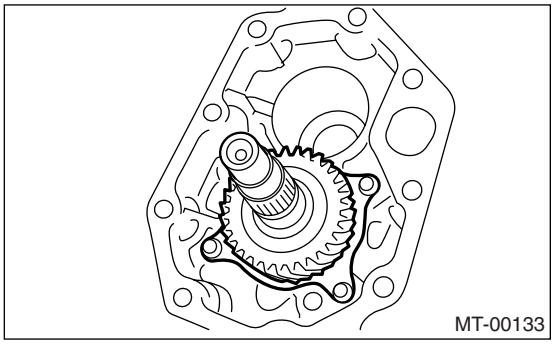
1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.
6) Remove the transfer drive gear.



B: INSTALLATION

1) Install the transfer drive gear.

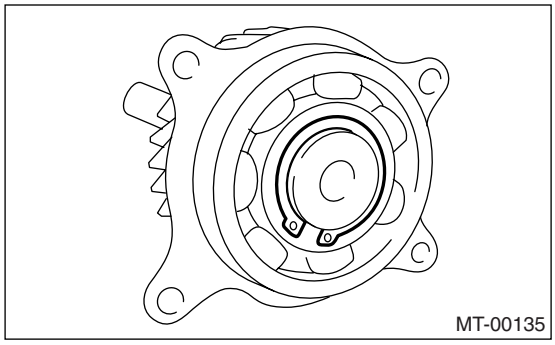
Tightening torque:
26 N·m (2.7 kgf-m, 19 ft-lb)



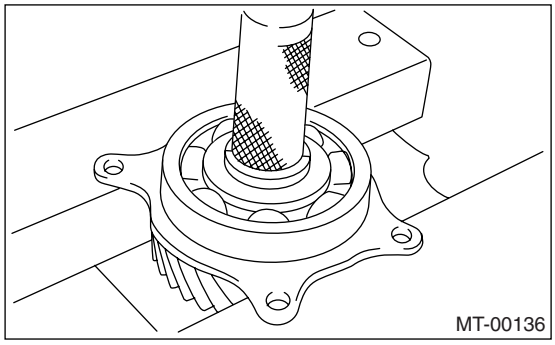
2) Install the transfer driven gear.
3) Install the extension case assembly.
4) Install the transfer case and extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-44, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the snap ring.



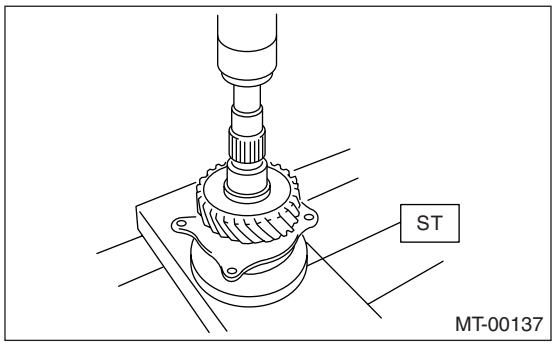
2) Remove the ball bearing.



D: ASSEMBLY

1) Set the ST applying to inner race of bearing and install to drive shaft.
ST 398177700 INSTALLER

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



2) Install the snap ring on transfer drive shaft.
3) Check the clearance between snap ring and ball bearing. <Ref. to 5MT-55, INSPECTION, Transfer Drive Gear.>

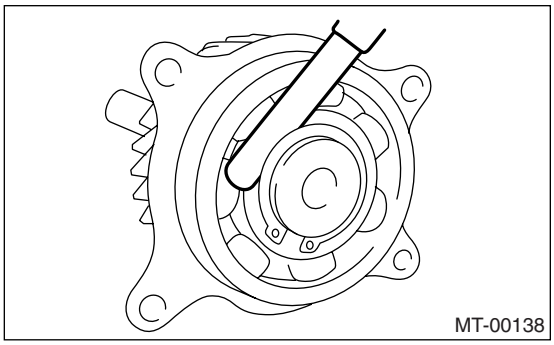
E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.

2) Drive gear
Replace the drive gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:
0.01 — 0.15 mm (0.0004 — 0.0059 in)



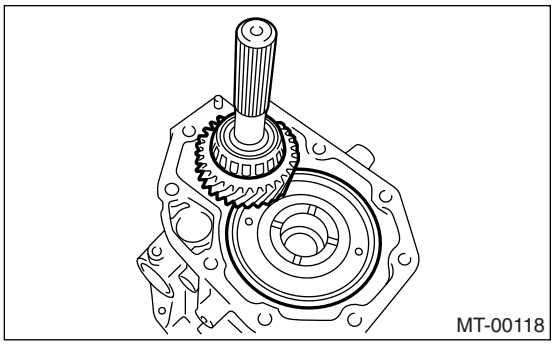
If the measurement is not within specification, select a suitable snap ring.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

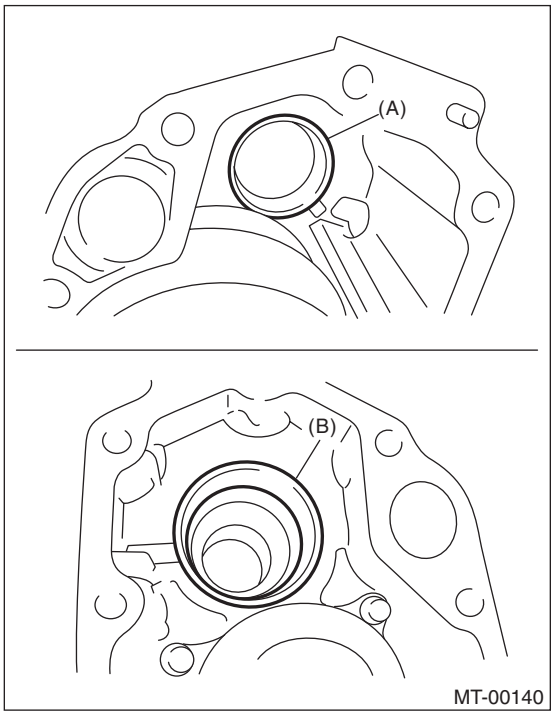
13.Transfer Driven Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.



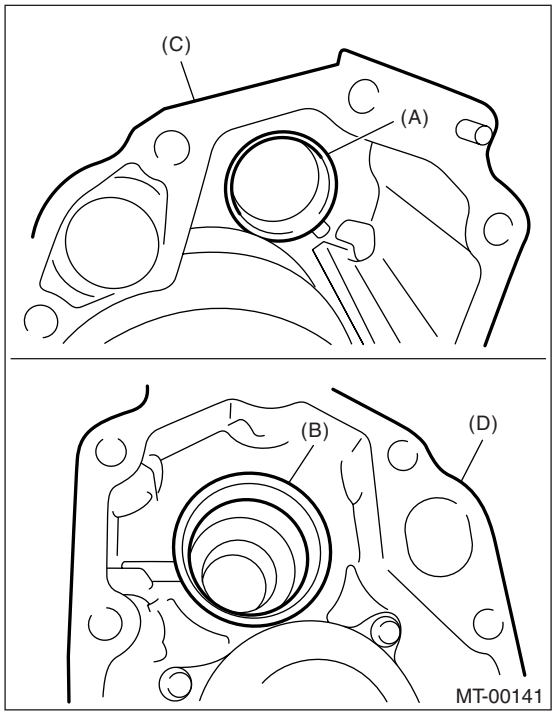
6) Remove the bearing outer race from extension case and transfer case.



(A) Bearing outer race (extension case side)
(B) Bearing outer race (transfer case side)

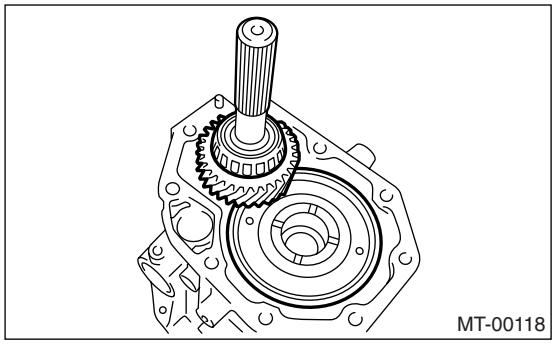
B: INSTALLATION

1) Install the bearing outer race to extension case and transfer case.



(A) Bearing outer race (extension case side)
(B) Bearing outer race (transfer case side)
(C) Extension case
(D) Transfer case

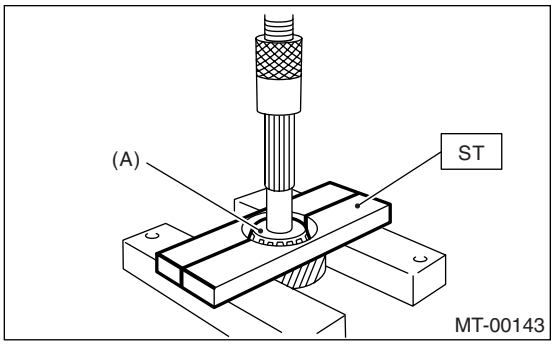
2) Install the transfer driven gear.



3) Install the transfer case and extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the back-up light switch and neutral position switch. <Ref. to 5MT-44, INSTALLATION, Switches and Harness.>
5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

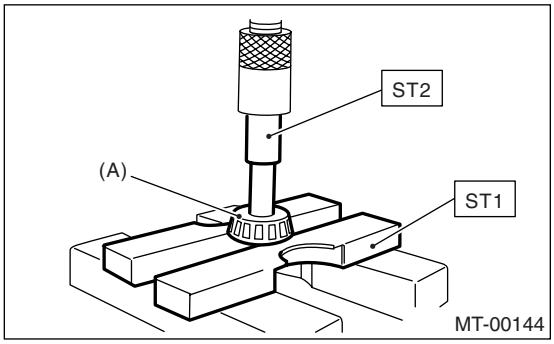
C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).
ST 498077000 REMOVER



(A) Roller bearing

2) Using the ST1 and ST2, remove the roller bearing (transfer case side).
ST1 498077000 REMOVER
ST2 899864100 REMOVER

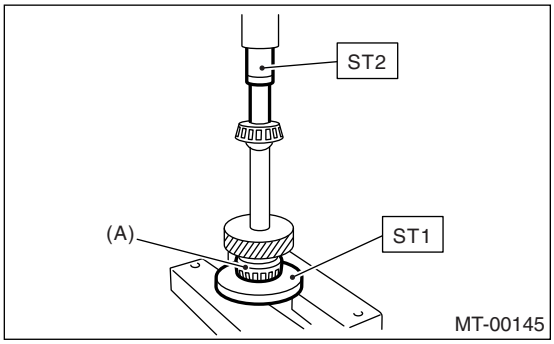


(A) Roller bearing

D: ASSEMBLY

1) Using the ST, install the roller bearing (extension case side).
ST1 398177700 INSTALLER
ST2 899864100 REMOVER

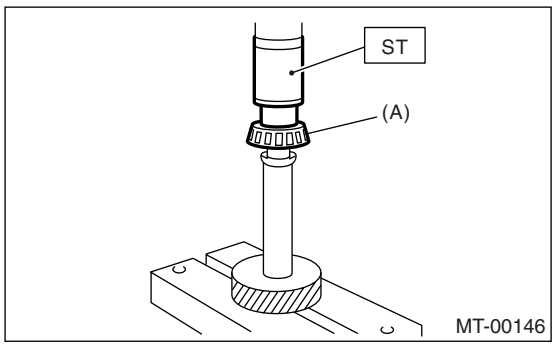
CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

2) Using the ST, install the roller bearing (transfer case side).
ST 499757002 INSTALLER

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)



(A) Roller bearing

E: INSPECTION

1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.

2) Driven gear
Replace the drive gear in the following cases:
- If their tooth surfaces and shaft are excessively broken or damaged.

14.Center Differential

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
4) Remove the transfer driven gear. <Ref. to 5MT-56, REMOVAL, Transfer Driven Gear.>
5) Remove the center differential.

B: INSTALLATION

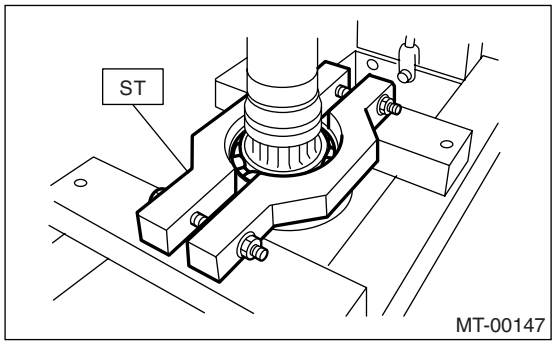
1) Install the center differential into transfer case.
2) Install the transfer driven gear. <Ref. to 5MT-56, INSTALLATION, Transfer Driven Gear.>
3) Install the extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-44, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the ball bearing using ST.

NOTE:
Do not reuse the ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

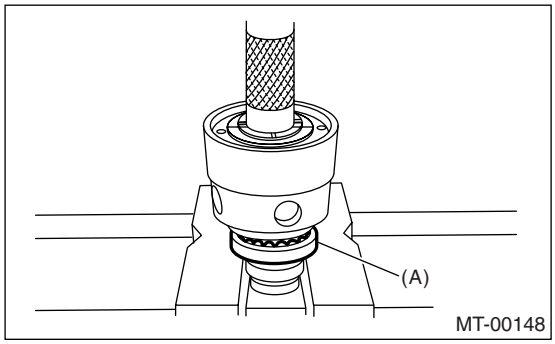


2) Do not disassemble the center differential except ball bearing part because it is a non-disassemble part.

D: ASSEMBLY

Install the ball bearing to center differential assembly.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ball bearing

E: INSPECTION

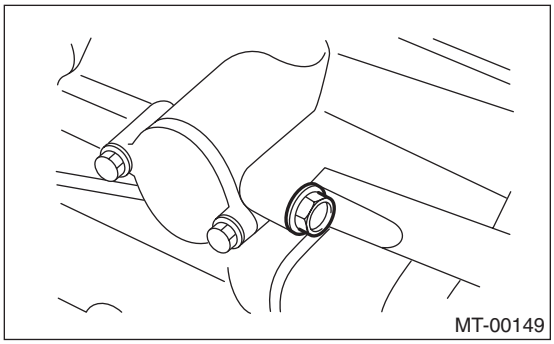
1) Bearings
Replace the bearings in the following cases:
- Broken or rusty bearings
- Worn or damaged
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.
- Bearings having other defects

2) Center differential
Replace the center differential assembly in the following case:
- Worn or damaged

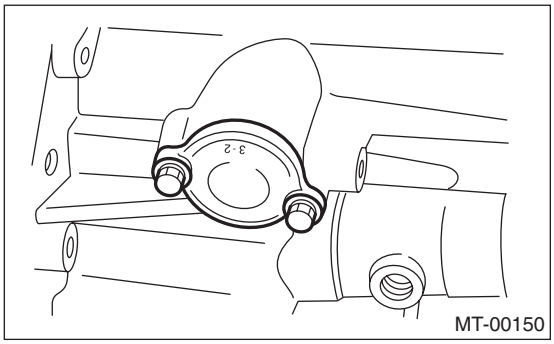
15.Reverse Check Sleeve

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
3) Remove the shifter arm.
4) Remove the plug, gasket, reverse accent spring and reverse check ball.


MT-00149

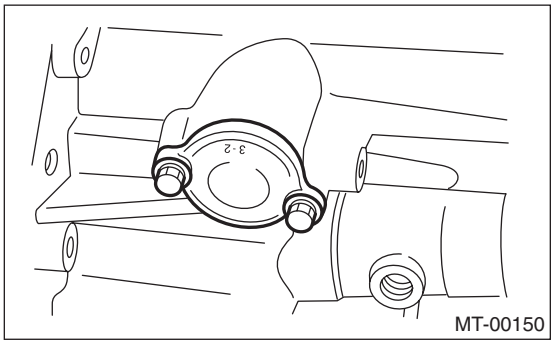
5) Remove the reverse check sleeve.


MT-00150

B: INSTALLATION

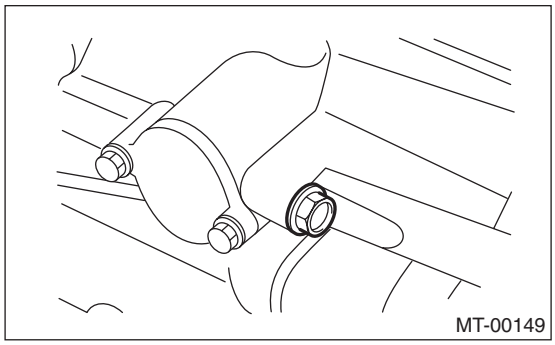
1) Install the reverse check sleeve.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


MT-00150

2) Install the reverse check ball, reverse accent spring, gasket and plug to transfer case.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

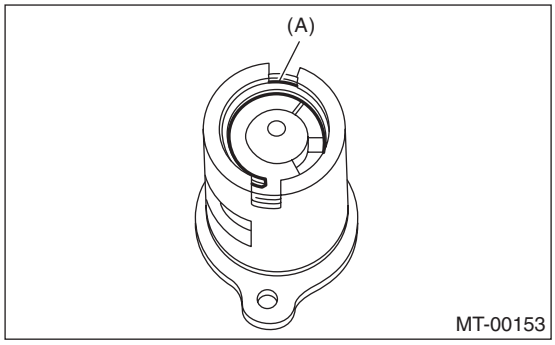

MT-00149

3) Install the shifter arm to transfer case assembly.
4) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Cover the reverse check sleeve with a rag, and remove the snap ring using a screwdriver.

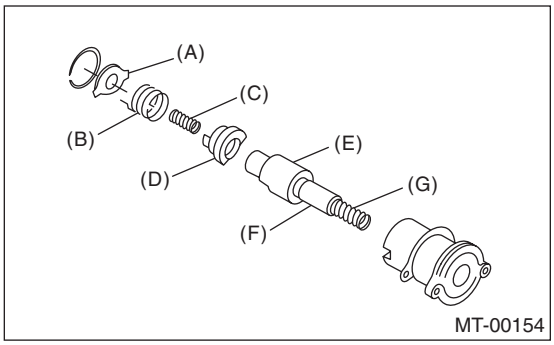
NOTE:
Replace the snap ring with a new one if deformed or reactive force is weakened.



MT-00153

(A) Snap ring

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Rev), reverse accent shaft, return spring cap and return spring (1st-2nd).



(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

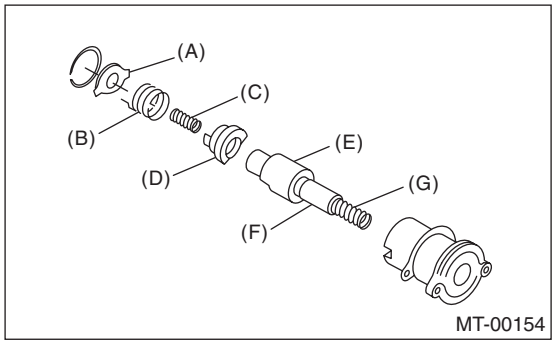
3) Remove the O-ring.

NOTE:
• Reverse check sleeve assembly uses an O-ring which should not be scratched.
• Be careful not to break the adjustment shim placed between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, check cam, return spring and check spring onto reverse check sleeve.

NOTE:
Be sure the bent section of reverse check spring is positioned in the groove in check cam.

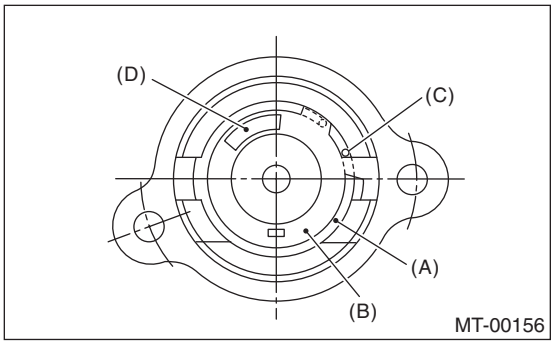


(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Rev)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

2) Hook the bent section of reverse check spring over reverse check plate.
3) Rotate the cam so that the protrusion of reverse check cam is at the opening in plate.
4) With the cam held in that position, install the plate onto reverse check sleeve and hold with snap ring.
5) Position a new O-ring in groove in sleeve.

E: INSPECTION

• Make sure the cutout section of reverse accent shaft is aligned with the opening in reverse check sleeve.
• Spin the cam by hand for smooth rotation.
• Move the cam and shaft all the way toward plate and release.
If the cam does not return properly, replace the reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace the spring.



(A) Snap ring
(B) Reverse check plate
(C) Check spring
(D) Check cam

• Select a suitable reverse accent shaft and reverse check plate. <Ref. to 5MT-61, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

1) Shift the gear into 3rd gear position.
2) Shifter arm turns lightly toward the 1st/2nd gear side but heavily toward the reverse gear side because of the function of return spring, until arm contacts the stopper.
3) Make adjustment so that the heavy stroke (reverse side) is a little more than the light stroke (1st/2nd side).
4) To adjust, remove the bolts holding reverse check sleeve assembly to the case, move the sleeve assembly outward, and place adjusting shim (0 to 1 ea.) between sleeve assembly and case to adjust the clearance.
5) Be careful not to break the O-ring when placing shim(s).

NOTE:
• When the shim is removed, the neutral position will move closer to reverse; when shim is added, the neutral position will move closer to 1st gear.
• If the shims alone cannot adjust clearance, replace the reverse accent shaft and re-adjust.

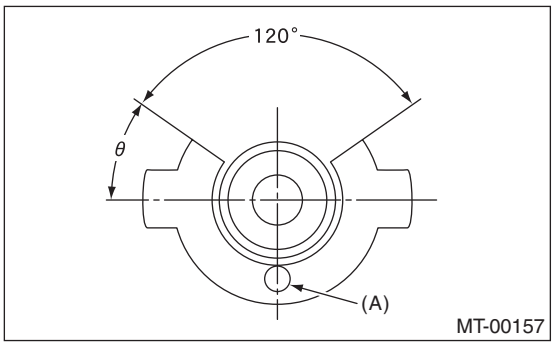
Adjusting shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA130	S	Neutral position is closer to 1st gear.
32188AA140	T	Standard
32188AA150	U	Neutral position is closer to reverse gear.

2. REVERSE CHECK PLATE ADJUSTMENT

1) Shift the shifter arm to “5th” and then to reverse to see if reverse check mechanism operates properly.
2) Also check to see if the arm returns to neutral when released from reverse position. If the arm does not return properly, replace the reverse check plate.

Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

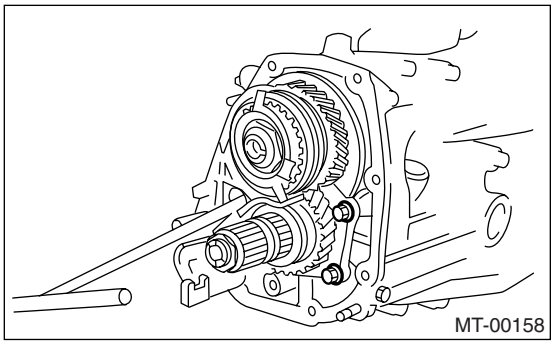


16.Transmission Case

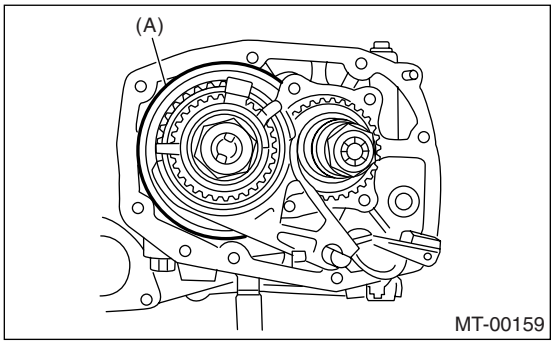
A: REMOVAL

1. SINGLE-RANGE

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-19, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
4) Remove the bearing mounting bolts.


MT-00158

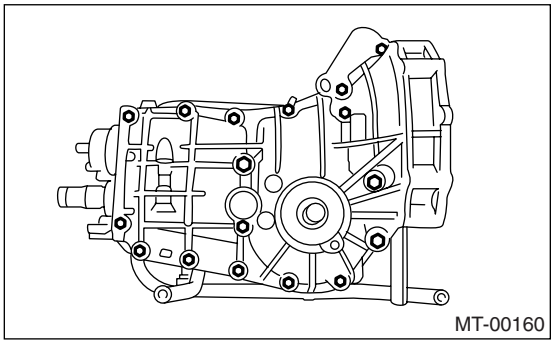
5) Remove the main shaft rear plate.



MT-00159

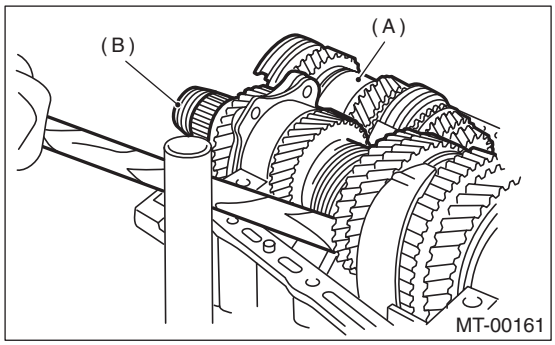
(A) Main shaft rear plate

6) Separate the transmission case into right and left cases by loosening the coupling bolts and nuts.


MT-00160

7) Remove the drive pinion shaft assembly from left side transmission case.

NOTE:
Use a hammer handle, etc. to remove if too tight.

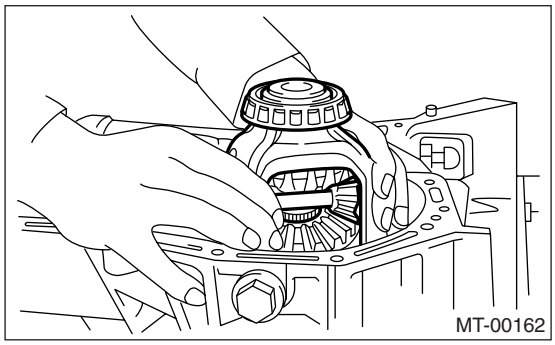


MT-00161

(A) Main shaft assembly
(B) Drive pinion shaft assembly

8) Remove the differential assembly.

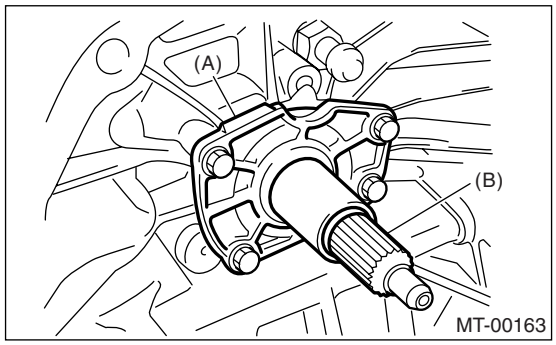
NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.


MT-00162

2. DUAL-RANGE

1) Remove the manual transmission assembly from vehicle. **<Ref. to 5MT-32,** REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. **<Ref. to CL-19,** REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case with extension case assembly. **<Ref. to 5MT-50,** REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>

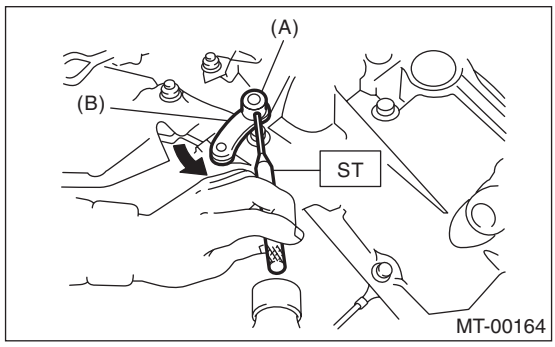
4) Remove the input shaft holder.



(A) Input shaft holder
(B) Input shaft

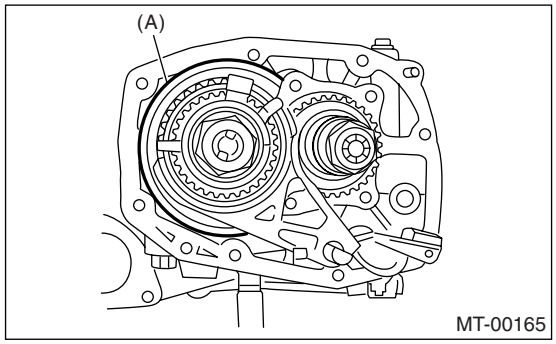
5) Remove the high-low switch. **<Ref. to 5MT-43,** REMOVAL, Switches and Harness.>
6) Using the ST, drive out the straight pin, and remove high-low shifter lever.
ST 398791700 STRAIGHT PIN REMOVER 2

NOTE:
When driving out the straight pin, remove it in the direction that it does not butt against transmission case.



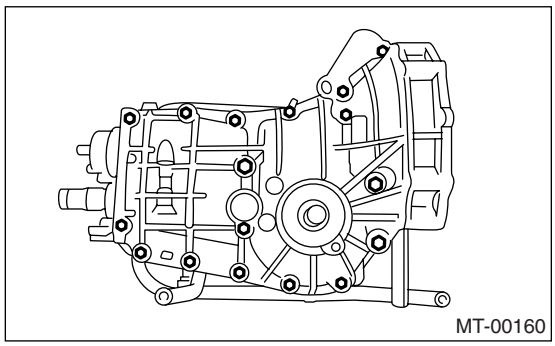
(A) Straight pin
(B) High-low shifter lever

7) Remove the main shaft rear plate.

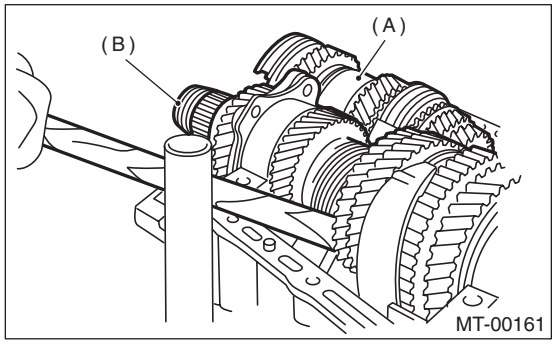


(A) Main shaft rear plate

8) Separate the transmission case into right and left cases by loosening the seventeen coupling bolts and nuts.



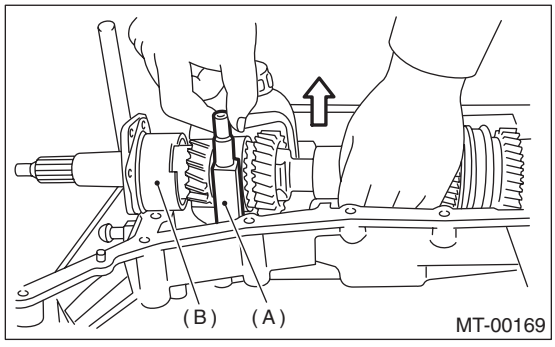
9) Using a hammer handle, etc. remove the drive pinion shaft assembly from left side transmission case, and then remove the main shaft assembly.



(A) Main shaft ASSY
(B) Drive pinion shaft ASSY

10) Removing high-low shifter fork:
Remove the high-low shifter fork together with high-low shifter shaft and washer.

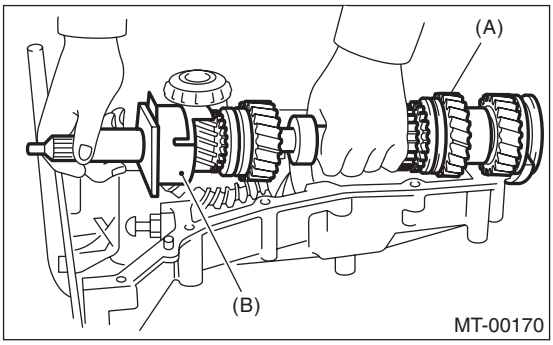
NOTE:
Be careful not to drop the two high-low shifter pieces.



(A) High-low shifter fork
(B) Input shaft ASSY

11) Remove the main shaft assembly and input shaft assembly.

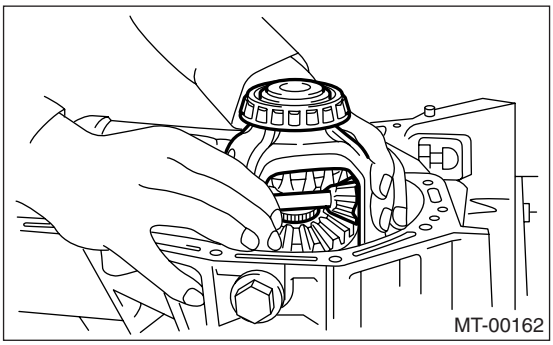
NOTE:
Be careful not to drop the input shaft and main shaft as they are separable.



(A) Main shaft ASSY
(B) Input shaft ASSY

12) Remove the differential assembly.

NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.



B: INSTALLATION

1. SINGLE-RANGE

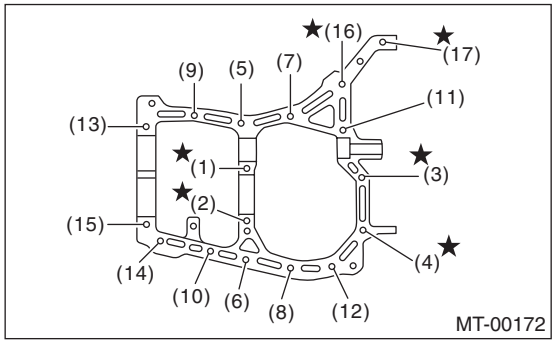
1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
2) Install the front differential assembly.
3) Install the main shaft assembly.
Install the needle bearing knock pin hole into transmission case knock pin.
4) Install the drive pinion shaft assembly.
Install the roller bearing knock pin hole into transmission case knock pin.
5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:
THREE BOND 1215B (Part No. : 004403007) or equivalent

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

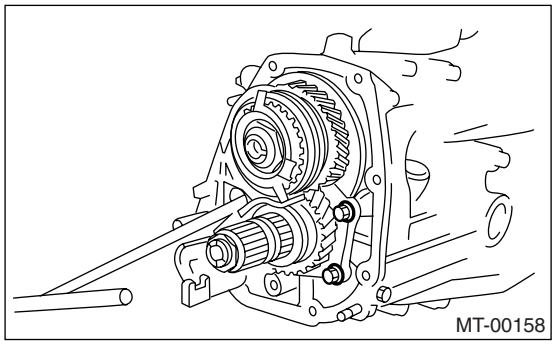
NOTE:
• Insert the 10 mm bolts from bottom and tighten the nuts at top.
• Put the cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
• Confirm that the speedometer gear is meshed.

Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.1 ft-lb)
★ 10 mm bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)



7) Tighten the bearing attachment bolts.

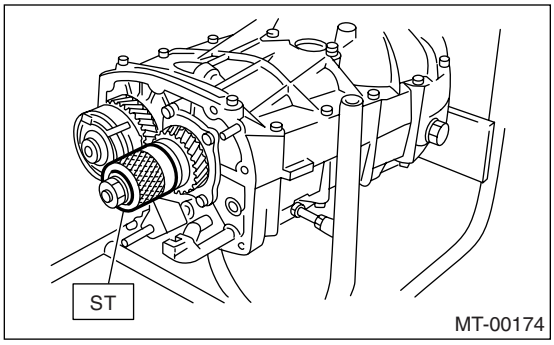
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing:

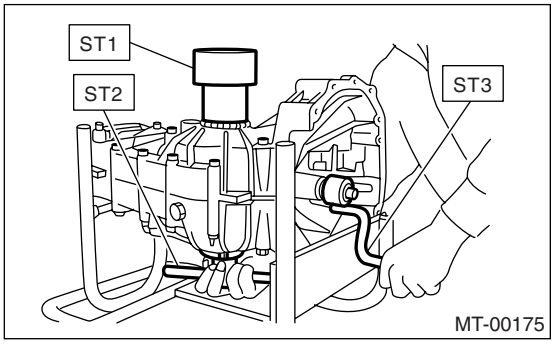
NOTE:
Support the drive pinion assembly with ST.

ST 498427100 STOPPER



9) Place the transmission with case left side facing downward and put ST1 on bearing outer race.
10) Screw the retainer assembly into left case from the bottom with ST2 Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2. This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

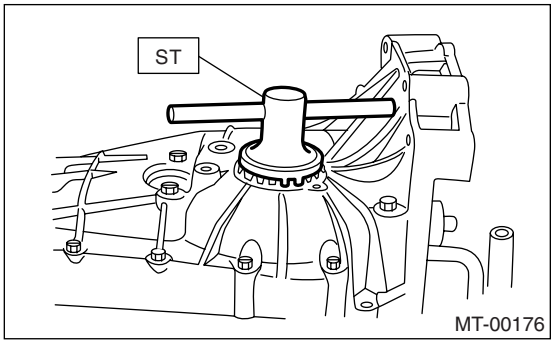
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



11) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



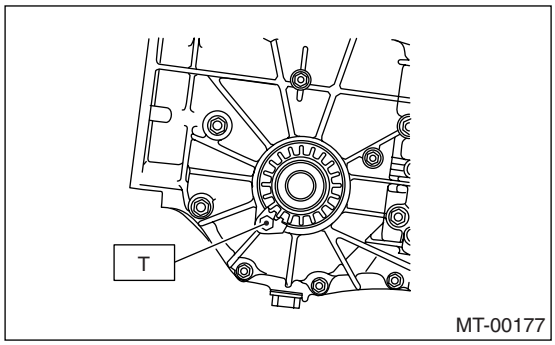
12) Fit the lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on upper side by the same amount in order to obtain the backlash.

NOTE:
The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

13) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
14) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
15) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.
16) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to 5MT-98, INSPECTION, Front Differential Assembly.>
17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into groove and tighten the retainer into the position where retainer has been tightened in.
Tighten the lock plate.

NOTE:
Carry out this job on both upper and lower retainers.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



18) Selecting of main shaft rear plate. <Ref. to 5MT-75, ADJUSTMENT, Main Shaft Assembly for Single-Range.>
19) Install the clutch release lever and bearing. <Ref. to CL-19, INSTALLATION, RELEASE BEARING AND LEVER.>
20) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the manual transmission assembly into the vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

2. DUAL-RANGE

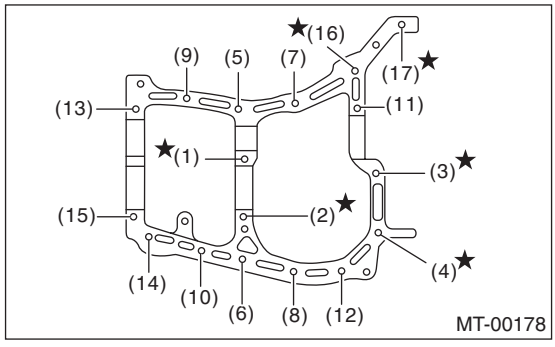
1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
2) Install the front differential assembly.
3) Install the main shaft assembly and input shaft assembly.
Connect the main shaft assembly and input the shaft assembly, and install needle bearing knock pin hole into transmission case knock pin.
4) Install the drive pinion shaft assembly.
Install the roller bearing knock pin hole into transmission case knock pin.
5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:
THREE BOND 1215B (Parts No. 004403007) or equivalent

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

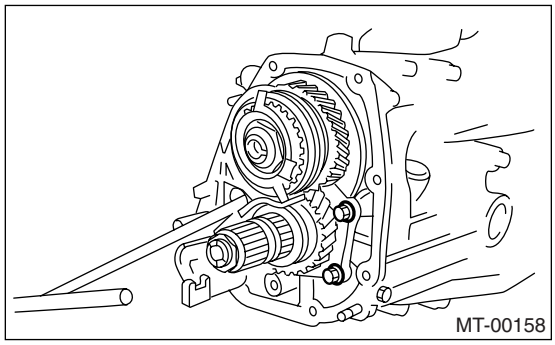
NOTE:
• Insert the bolts from bottom and tighten the nuts at top.
• Put the cases together so that the drive pinion shim and input shaft holder shim are not caught up in between.
• Confirm that the speedometer gear is meshed.

Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.1 ft-lb)
★ 10 mm bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)



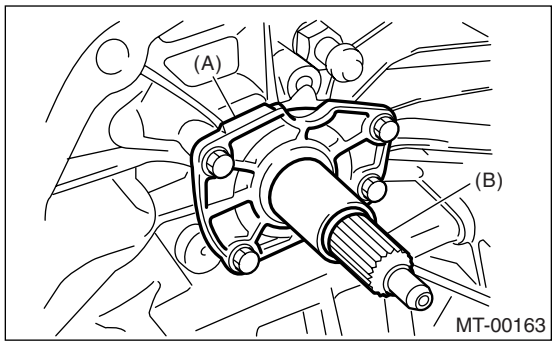
7) Tighten the bearing attachment bolts.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



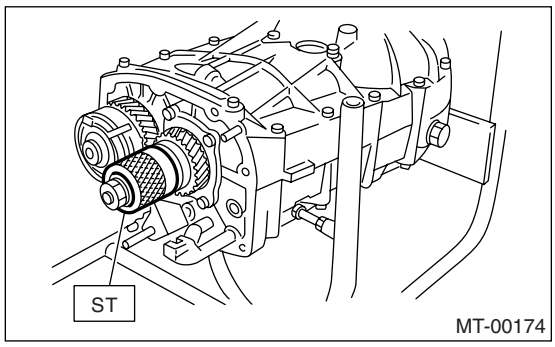
8) Tighten the input shaft holder attaching bolts.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)



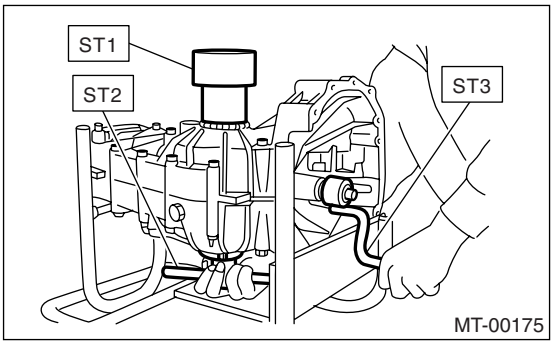
(A) Input shaft holder
(B) Input shaft

9) Using the ST, support the drive pinion assembly, and then adjust the backlash of hypoid gear and measure preload of roller bearing.
ST 498427100 STOPPER



10) Place the transmission with case left side facing downward and put ST1 on bearing cup.
11) Screw the retainer assembly into left case from the bottom with ST2. Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th and turn the shaft several times. Screw in the retainer while turning ST3 until a slight resistance is felt on ST2. This is the contact point of hypoid gear and drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

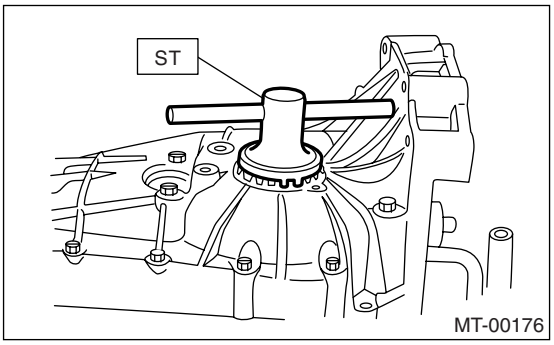
ST1 399780104 WEIGHT
ST2 499787000 WRENCH ASSY
ST3 499927100 HANDLE



12) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:
At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



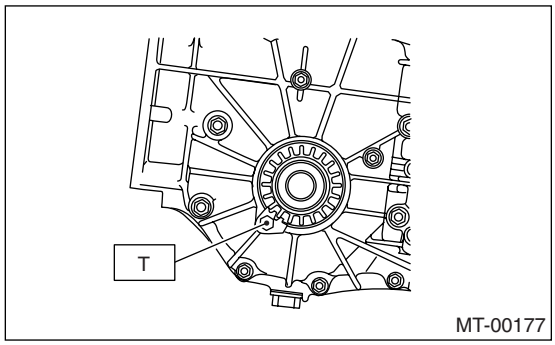
13) Fit the lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on upper side by the same amount in order to obtain the backlash.

NOTE:
The notch on the lock plate moves by 1/2 notch if the plate is turned upside down.

14) Turn in the retainer on the upper side additionally by 1 notch in order to apply preload on taper roller bearing.
15) Tighten temporarily both the upper and lower lock plates and mark both holder and lock plate for later readjustment.
16) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.
17) Inspect and adjust the backlash and tooth contact of hypoid gear. **<Ref. to 5MT-98,** INSPECTION, Front Differential Assembly.>
18) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into groove and tighten the retainer into the position where retainer has been tightened in.
Tighten the lock plate.

NOTE:
Carry out this job on both upper and lower retainers.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



19) Selection of main shaft rear plate **<Ref. to 5MT-75,** ADJUSTMENT, Main Shaft Assembly for Single-Range.>
20) Install the transfer case with extension case assembly. **<Ref. to 5MT-50,** INSTALLATION, Transfer Case and Extension Case Assembly.>
21) Install the clutch release lever and bearing. **<Ref. to CL-19,** INSTALLATION, RELEASE BEARING AND LEVER.>
22) Install the manual transmission assembly into the vehicle. **<Ref. to 5MT-35,** INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, and oil leaks.

17.Main Shaft Assembly for Single-Range

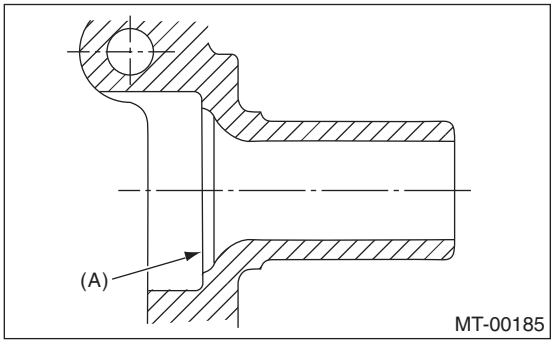
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-50, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.

B: INSTALLATION

1) Wrap the clutch splined section with vinyl tape to prevent damage to oil seal.
2) Apply grease Unilube #2 (or equivalent) to the sealing lip of oil seal.
3) Install the needle bearing and new oil seal onto the front of transmission main shaft assembly.
4) Install the needle bearing outer race knock pin hole into transmission case knock pin.

NOTE:
Align the end face of seal with surface (A) when installing oil seal.



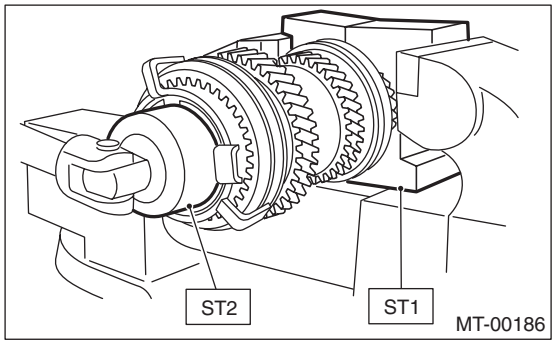
5) Install the drive pinion assembly. <Ref. to 5MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to 5MT-64, INSTALLATION, Transmission Case.>
7) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

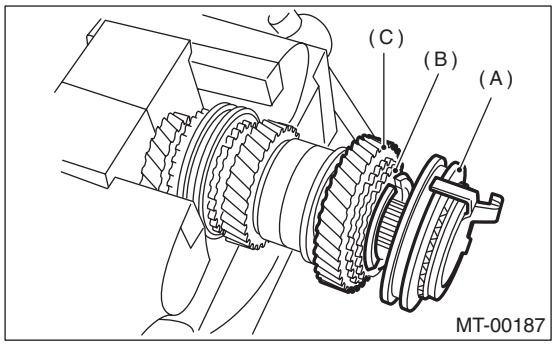
1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove the lock nut from transmission main shaft assembly.

NOTE:
Unlock the caulking before removing lock nut.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

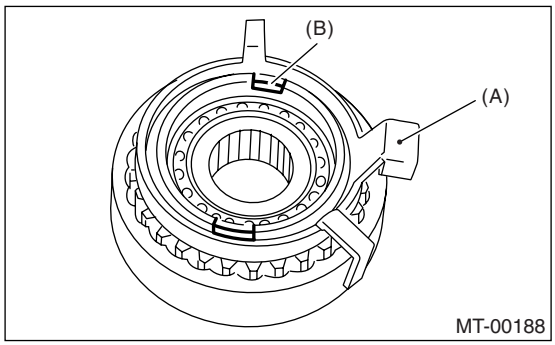


3) Remove the 5th-Rev sleeve & hub assembly assembly, 5th baulk ring, 5th drive gear & needle bearing.



(A) 5th-Rev sleeve & hub Assembly
(B) 5th baulk ring
(C) 5th drive gear

4) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve & hub assembly.

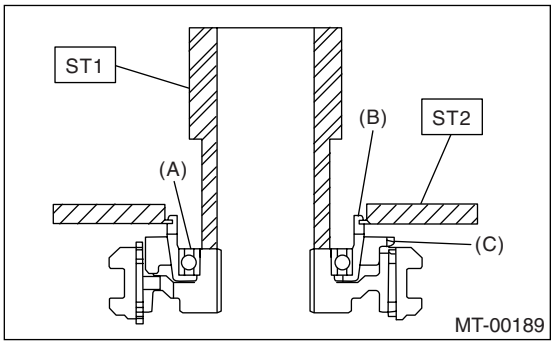


(A) Synchro cone stopper
(B) Snap ring

5) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:
If replace the sleeve or hub assembly as necessary, use the new sleeve & hub assembly as a unit. Do not disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER

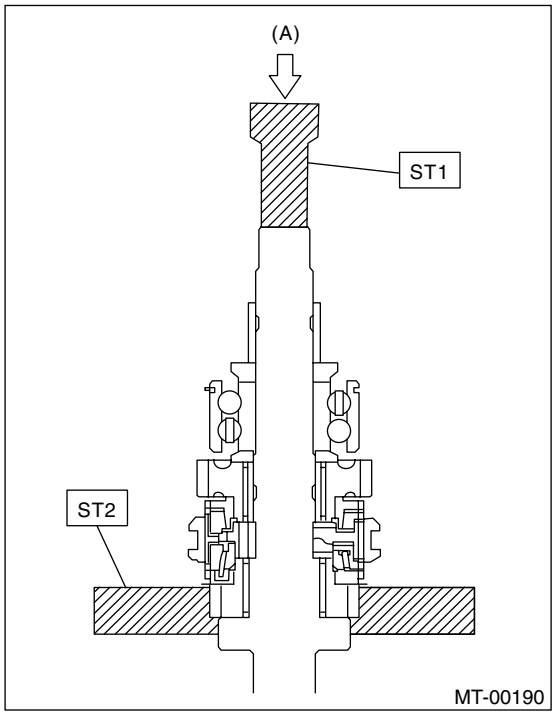


(A) Ball bearing
(B) Revers synchro cone
(C) Revers baulk ring

6) Using the ST1 and ST2, remove rest of the parts.

NOTE:
If replace the sleeve or hub assembly as necessary, use the new sleeve & hub assembly as a unit. Do not disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.

ST1 899864100 REMOVER
ST2 899714110 REMOVER

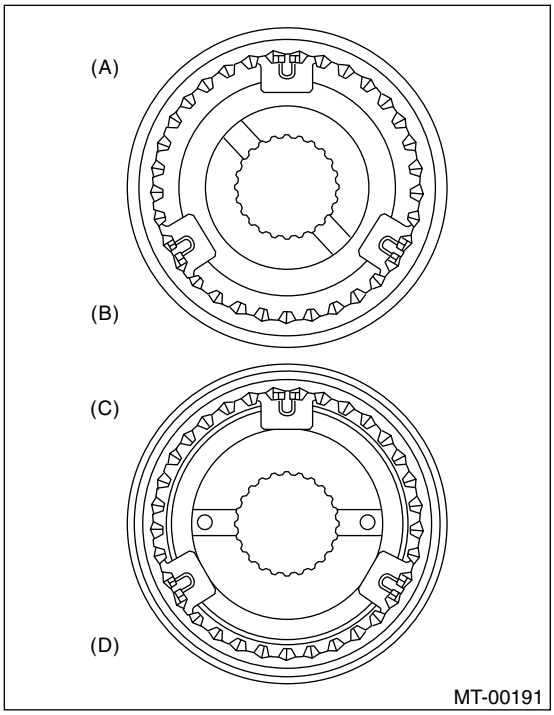


(A) Press

D: ASSEMBLY

1. NON-TURBO MODEL

1) Assemble each sleeve & hub assembly.



(A) 3rd-4th hub ASSY
(B) 3rd gear side
(C) 5th-Rev hub ASSY
(D) 5th gear side

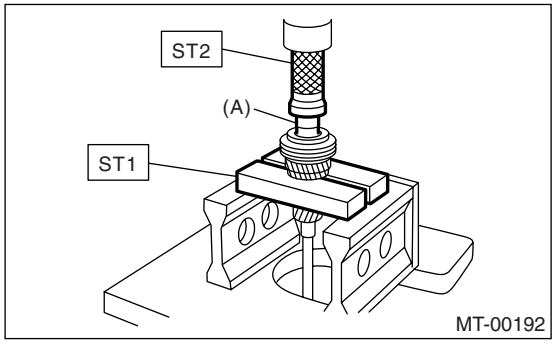
2) Install the 3rd drive gear, outer baulk ring, 3rd synchro cone, inner baulk ring, 3rd-4th sleeve & hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:
Align the convex part in baulk ring with shifting insert.

3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

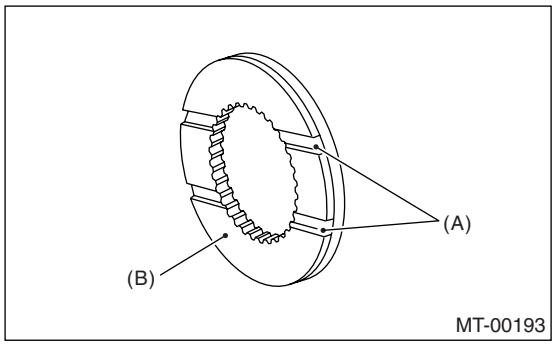
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

4) Install the 4th baulk ring, 4th needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
• Align the baulk ring and gear & hub assembly with key convex part.
• Pay attention to the orientation of thrust washer.

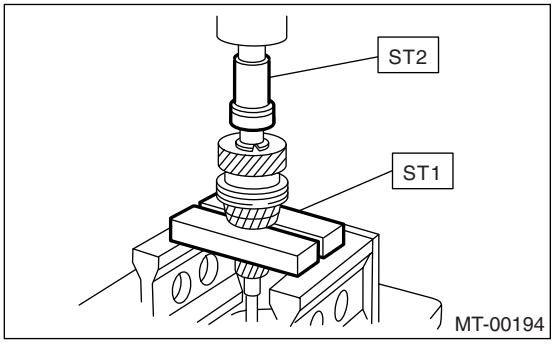


(A) Groove
(B) Face this surface to 4th gear side

5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

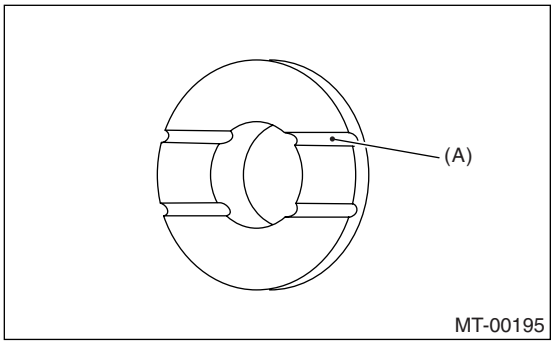


6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Pay attention to the orientation of thrust washer.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



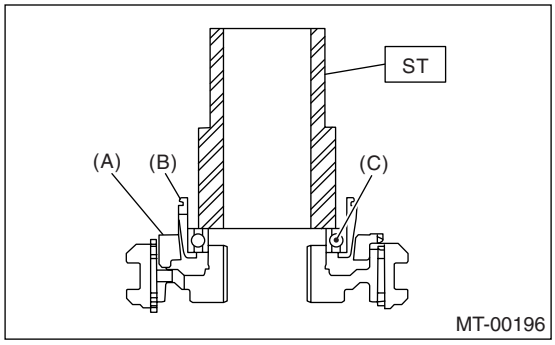
(A) Face this surface to 5th gear side.

7) Install the bearing onto synchro cone.
8) Install the Rev baulk ring, Rev synchro cone and new ball bearing. onto 5th-Rev sleeve & hub assembly using ST and a press.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

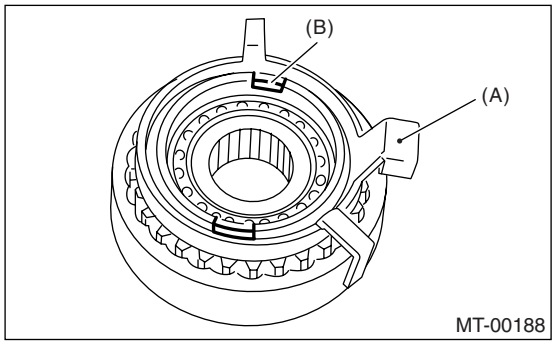
9) After press fitting, make sure the synchro cone rotates freely.

ST 499757002 INSTALLER



(A) Rev Baulk ring
(B) Rev Synchro cone
(C) Ball bearing

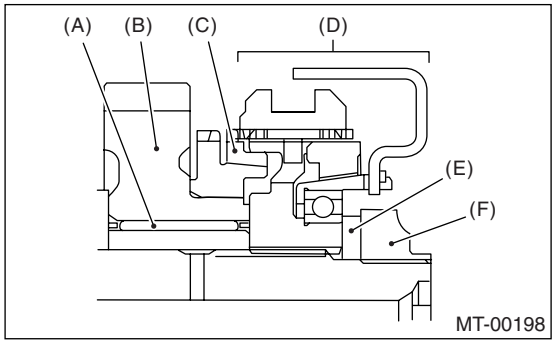
10) Install the synchro cone stopper and snap ring to 5th-Rev sleeve & hub assembly.



(A) Synchro cone stopper
(B) Snap ring

11) Install the rest parts to the rear section of transmission main shaft.

NOTE:
Align the convex part in baulk ring with shifting insert.



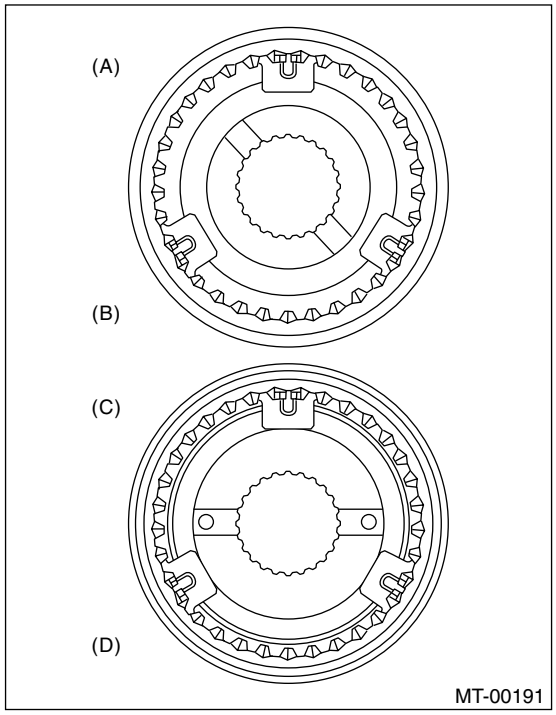
(A) 5th needle bearing
(B) 5th drive gear
(C) 5th baulk ring
(D) 5th-Rev sleeve & hub ASSY
(E) Lock washer
(F) Lock nuts

12) Tighten the lock nuts to the specified torque using ST1 and ST2.
13) Secure the lock nuts in two places after tightening.
ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

2. TURBO MODEL

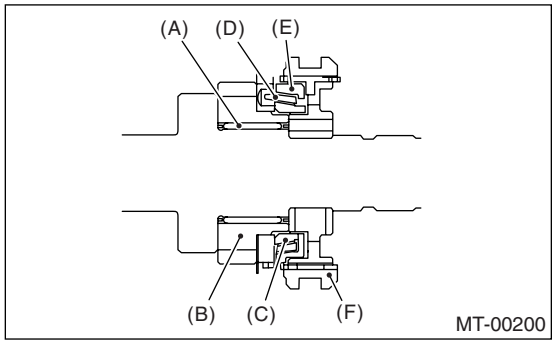
1) Assemble each sleeve & hub assembly.



(A) 3rd-4th hub ASSY
(B) 3rd gear side
(C) 5th-Rev hub ASSY
(D) 5th gear side

2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve & hub assembly for 3rd needle bearing on transmission main shaft.

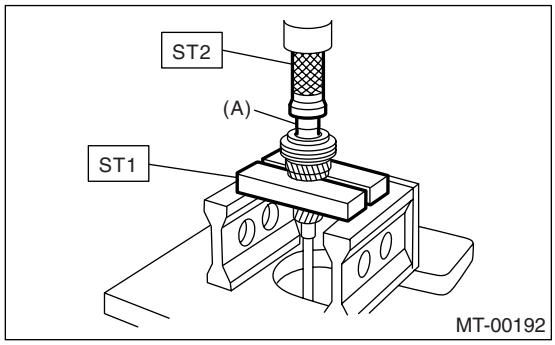
NOTE:
Align the convex part in baulk ring with shifting insert.



(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) sleeve & hub ASSY

3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

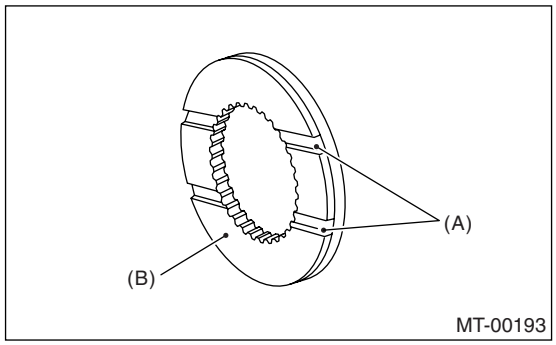
CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
• Align the baulk ring and gear & hub assembly with key convex part.
• Pay attention to the orientation of thrust washer.

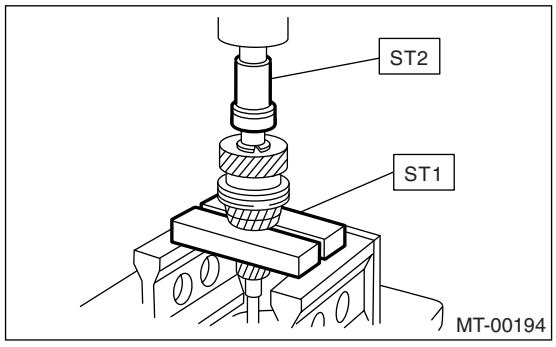


(A) Groove
(B) Face this surface to 4th gear side

5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

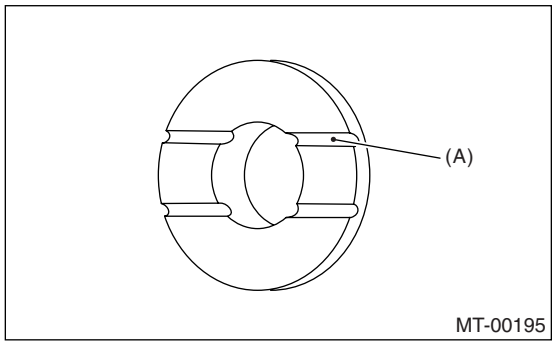


6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Pay attention to the orientation of thrust washer.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



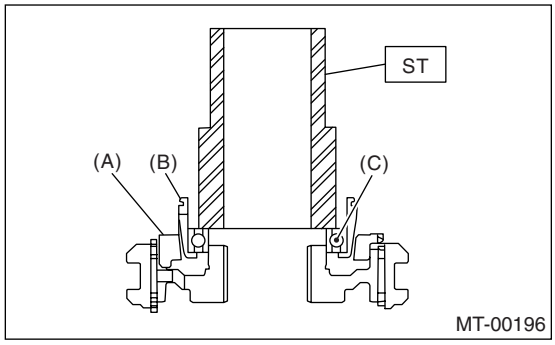
(A) Face this surface to 5th gear side.

7) Install the bearing onto synchro cone.
8) Install the baulk ring, synchro cone and new ball bearing. onto 5th-Rev sleeve & hub assembly using ST and a press.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

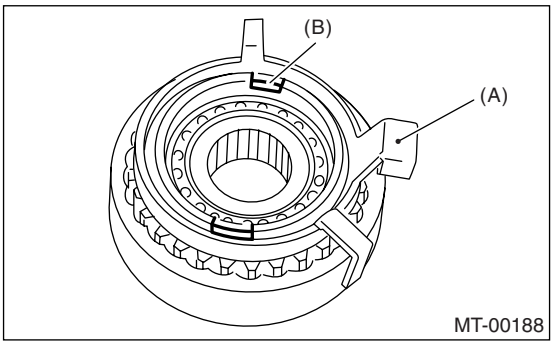
9) Make sure the synchro cone rotates smoothly after press-fitting.

ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

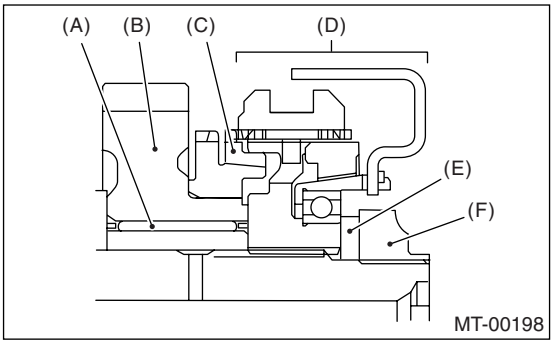
10) Install the synchro cone stopper and snap ring to 5th-Rev sleeve & hub assembly.



(A) Synchro cone stopper
(B) Snap ring

11) Install the rest parts to the rear section of transmission main shaft.

NOTE:
Align the convex part in baulk ring with shifting insert.



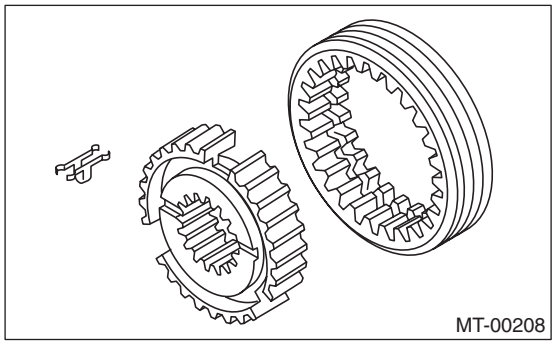
(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve & hub Assembly
(E) Lock washer
(F) Lock nuts

12) Tighten the lock nuts to the specified torque using ST1 and ST2.
13) Secure the lock nuts in two places after tightening.
ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.
1) Bearings
Replace the bearings in the following cases:
• Bearings whose balls, outer races and inner races are broken or rusty.
• Worn bearings
• Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.
• Bearings having other defects
2) Bushing (each gear)
Replace the bushing in the following cases:
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.
3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Correct or replace if the cone that contacts the baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.
4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is abnormally or partially worn down.
• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.
5) Shifting insert key
Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.
7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.
8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

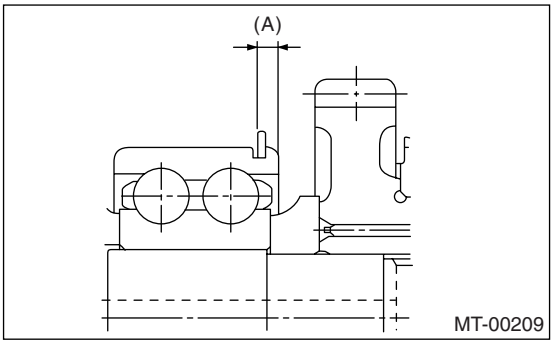
F: ADJUSTMENT

Selection of main shaft rear plate:
Using the ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

NOTE:
Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

ST 498147000 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2



18.Main Shaft Assembly for Dual-Range

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. **<Ref. to 5MT-32,** REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. **<Ref. to 5MT-50,** REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. **<Ref. to 5MT-62,** REMOVAL, TRANSMISSION CASE.>
4) Remove the drive pinion shaft assembly. **<Ref. to 5MT-86,** REMOVAL, DRIVE PINION SHAFT ASSEMBLY.>
5) Remove the main shaft assembly and input shaft assembly.

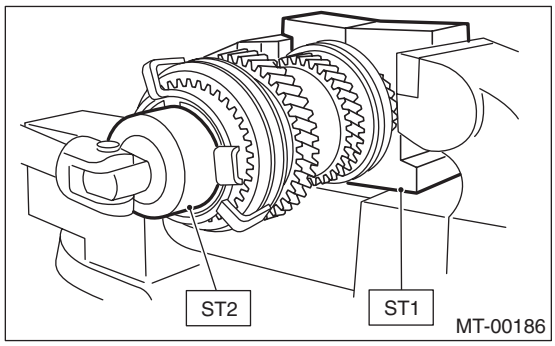
B: INSTALLATION

1) Install the needle bearing onto the front of transmission main shaft assembly.
2) Select the input shaft adjusting shim and install it to the input shaft assembly. **<Ref. to 5MT-85,** ADJUSTMENT, INPUT SHAFT ASSEMBLY.>
3) Connect the main shaft assembly and input shaft assembly.
4) Install the needle bearing outer race knock pin hole into transmission case knock pin.
5) Install the drive pinion assembly. **<Ref. to 5MT-86,** INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. **<Ref. to 5MT-64,** INSTALLATION, TRANSMISSION CASE.>
7) Install the transfer case with extension case assembly. **<Ref. to 5MT-50,** INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to vehicle. **<Ref. to 5MT-35,** INSTALLATION, Manual Transmission Assembly.>

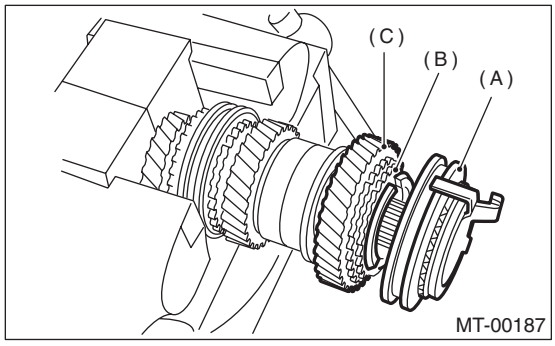
C: DISASSEMBLY

1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove caulking of the lock nut.
3) Remove the lock nut from transmission main shaft assembly.

ST1	498937000	TRANSMISSION HOLDER
ST2	499987003	SOCKET WRENCH (35)

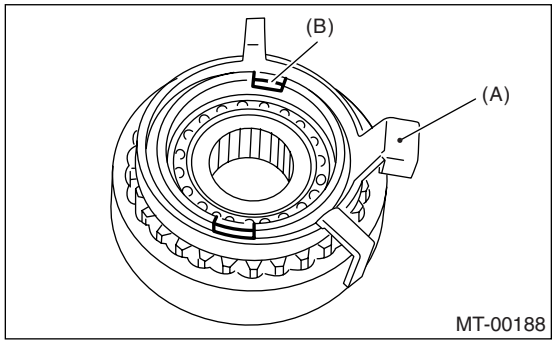


4) Remove the 5th-Rev sleeve & hub assembly, baulk ring, 5th drive gear and needle bearing.



(A) 5th-Rev sleeve & hub Assembly
(B) Baulk ring
(C) 5th drive gear

5) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve & hub assembly.

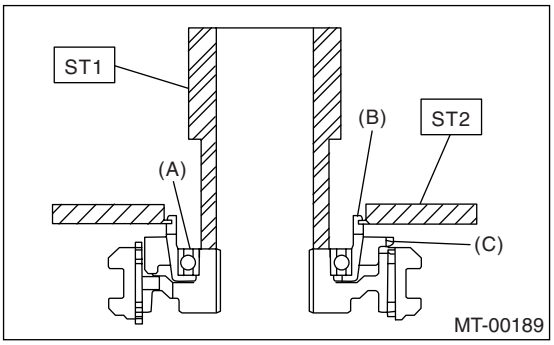


(A) Synchro cone stopper
(B) Snap ring

6) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:
• If replace the sleeve or hub assembly as necessary, use the new sleeve & hub assembly as a unit. Do not disassemble because they must engage at a specified point. If they should be disassembled, mark engagement point on splines beforehand.
• Do not reuse the ball bearing.

ST1 499757002 INSTALLER
ST2 498077400 SYNCHRO CONE REMOVER

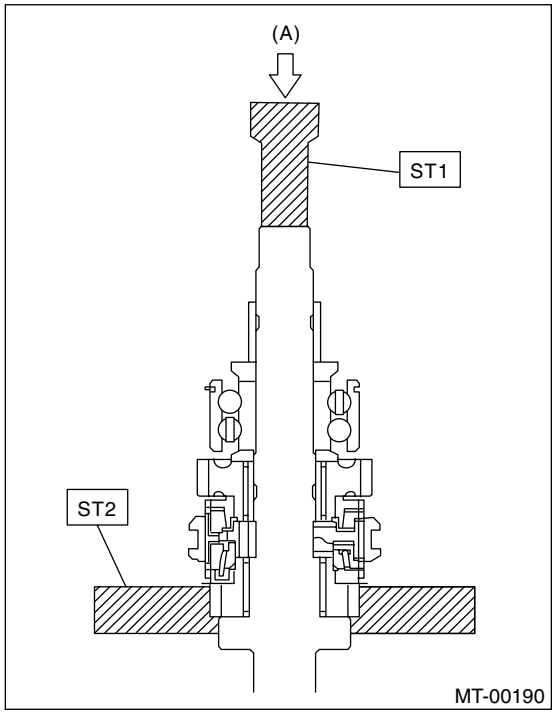


(A) Ball bearing
(B) Synchro cone
(C) Baulk ring

7) Using the ST1 and ST2, remove rest of the parts.

NOTE:
If replace the sleeve or hub assembly as necessary, use the new sleeve & hub assembly as a unit. Do not disassemble because they must engage at a specified point. If they should be disassembled, marking engagement point on splines beforehand.

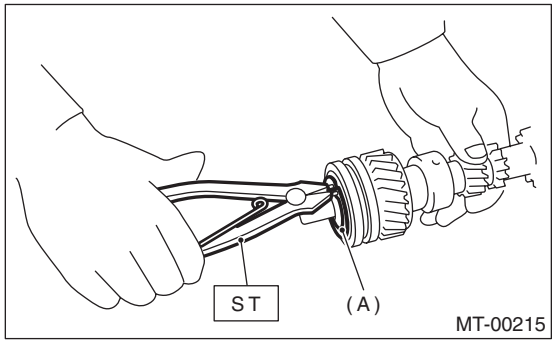
ST1 899864100 REMOVER
ST2 899714110 REMOVER



(A) Press

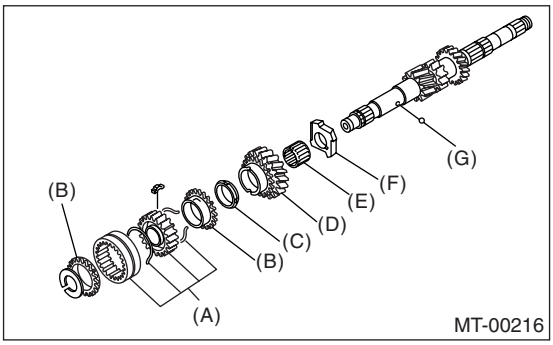
8) Remove the snap ring from main shaft.

ST 899474100 EXPANDER



(A) Snap ring

9) Remove rest of the parts.

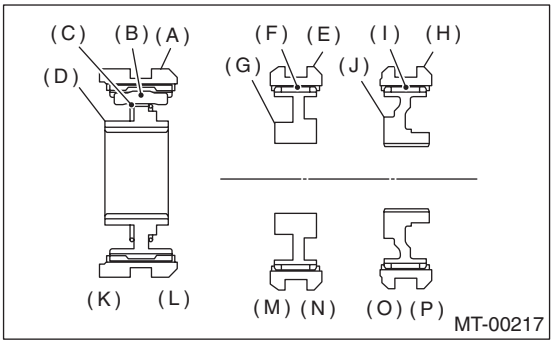


(A) Sleeve & hub ASSY
(B) High-low baulk ring
(C) Friction damper
(D) Low input gear
(E) Needle bearing
(F) Input low gear spacer
(G) Ball

D: ASSEMBLY

1) Assemble when each sleeve & hub assembly are disassembled.

NOTE:
Position the open ends of spring for high-low sleeve & hub assembly 120° apart.



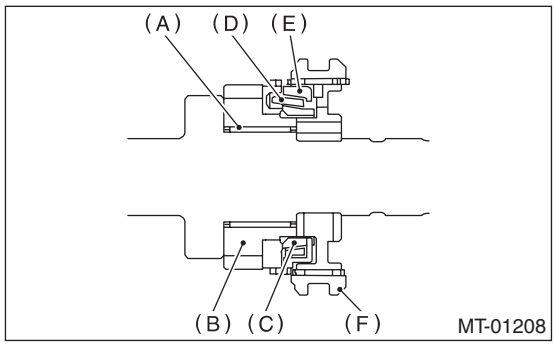
(A) High-low coupling sleeve
(B) Shifting insert
(C) High-low synchronizer spring
(D) High-low synchronizer hub
(E) Sleeve
(F) Insert key
(G) 3rd-4th synchronizer hub
(H) Sleeve
(I) Insert key
(J) 5th-Rev synchronizer hub
(K) High side
(L) Low side
(M) 3rd side
(N) 4th side
(O) 5th side
(P) Rev side

2) Install the 3rd drive gear, baulk ring, sleeve & hub assembly for 3rd-4th needle bearing on transmission main shaft. (2.0 L model)

NOTE:
Align the convex part in baulk ring with shifting insert.

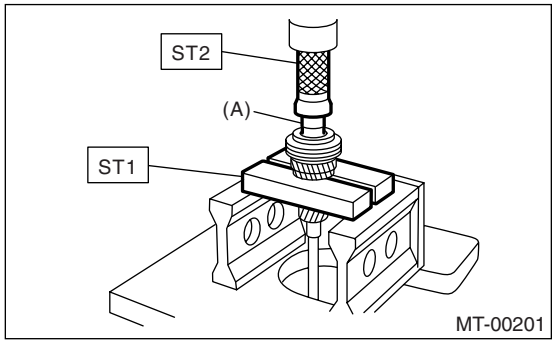
3) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve & hub assembly for 3rd needle bearing on transmission main shaft. (2.5 L model)

NOTE:
Align the convex part in baulk ring with shifting insert.



(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) Sleeve & hub ASSY

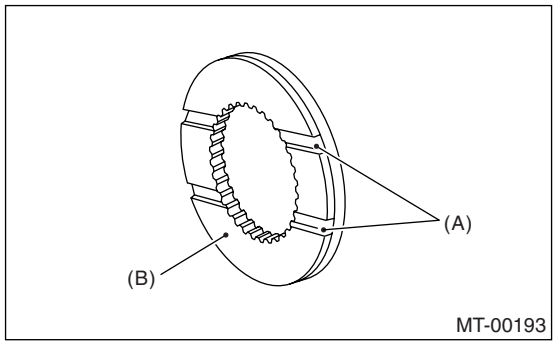
4) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

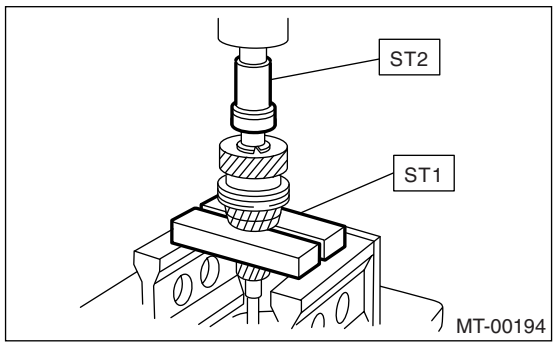
5) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:
Pay attention to the orientation of thrust washer.



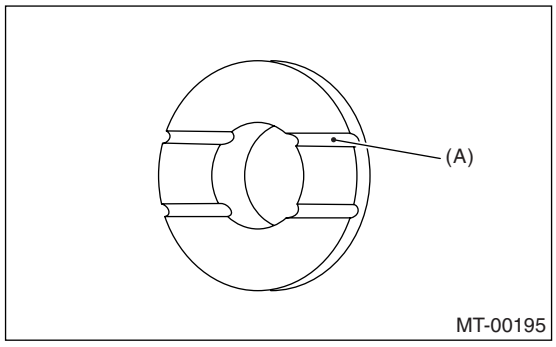
(A) Groove
(B) Face this surface to 4th gear side

6) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



7) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

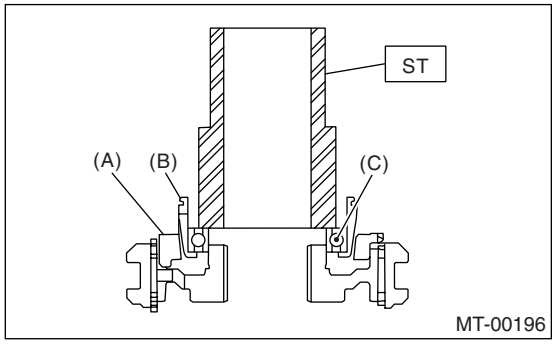
NOTE:
Pay attention to the orientation of thrust washer.
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

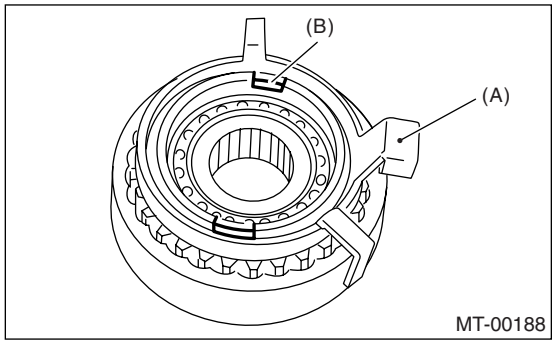
8) Install the bearing onto synchro cone.
9) Install the baulk ring and synchro cone onto 5th-Rev sleeve & hub assembly using ST and a press.

NOTE:
• Use a new ball bearing.
• After press fitting, make sure the synchro cone rotates freely.
ST 499757002 INSTALLER



(A) Baulk ring
(B) Synchro cone
(C) Ball bearing

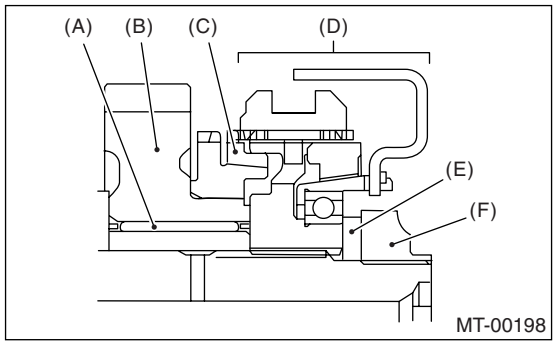
10) Install the synchro cone stopper and snap ring to 5th-Rev sleeve & hub assembly.



(A) Synchro cone stopper
(B) Snap ring

11) Install rest of the parts to the rear section of transmission main shaft.

NOTE:
Align the convex part in baulk ring with shifting insert.



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th-Rev sleeve & hub Assembly
(E) Lock washer
(F) Lock nuts

12) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE:
Secure the lock nuts in two places after tightening.

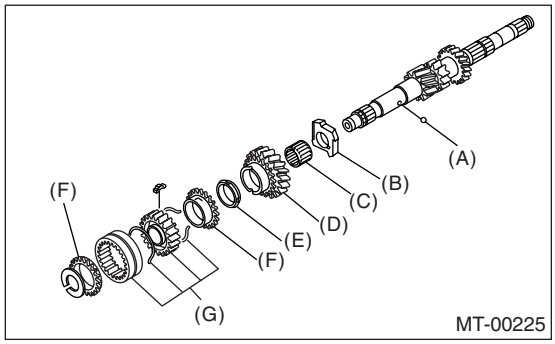
ST1 499987003 SOCKET WRENCH
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)

13) Install the needle bearing on main shaft.

14) Install the rest of parts to the front section of transmission main shaft.

NOTE:
- Be careful not to damage the graded section of transmission main shaft when installing the needle bearing.
- Face the grooved side toward input gear.
- Align the high-low baulk ring's groove with shifting insert.



(A) Ball
(B) Input low gear spacer
(C) Needle bearing
(D) Low input gear
(E) Friction damper
(F) High-low baulk ring
(G) Sleeve & hub Assembly

15) Install a new snap ring to the rod section of transmission main shaft using ST1 and ST2.

NOTE:
Select a suitable outer snap ring so that axial clearance between snap ring and hub is held within 0.060 to 0.100 mm (0.0024 to 0.0039 in).

ST1 499757002 INSTALLER
ST2 499757001 SNAP RING GUIDE

Snap ring	
Part No.	Thickness mm (in)
805025058	2.37 (0.0933)
805025051	2.42 (0.0953)
805025052	2.47 (0.0972)
805025053	2.52 (0.0992)
805025054	2.57 (0.1012)
805025055	2.62 (0.1031)
805025056	2.67 (0.1051)
805025057	2.72 (0.1071)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.
- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

4) Baulk ring

Replace the ring in the following cases:

- When the inner surface and end face are damaged.
- When the ring inner surface is abnormally or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.

6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

F: ADJUSTMENT

Choose the main shaft rear plate. **<Ref. to 5MT-75,** ADJUSTMENT, Main Shaft Assembly for Single-Range.>

19.Input Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. **<Ref. to 5MT-32,** REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. **<Ref. to 5MT-50,** REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
3) Remove the transmission case. **<Ref. to 5MT-62,** REMOVAL, TRANSMISSION CASE.>
4) Remove the drive pinion shaft assembly. **<Ref. to 5MT-86,** REMOVAL, DRIVE PINION SHAFT ASSEMBLY.>
5) Remove the main shaft assembly and input shaft assembly.

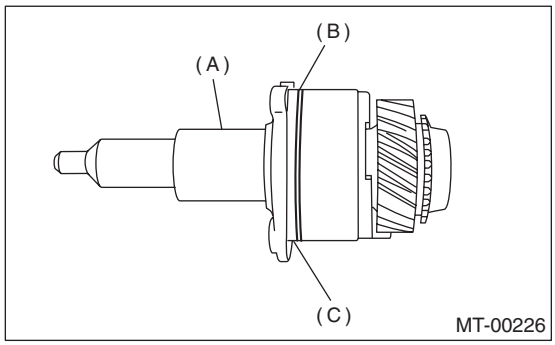
B: INSTALLATION

1) Install the needle bearing onto the front of transmission main shaft assembly.
2) Connect the main shaft assembly and input shaft assembly.
3) Install the needle bearing outer race knock pin hole into transmission case knock pin.
4) Install the drive pinion assembly. **<Ref. to 5MT-86,** INSTALLATION, Drive Pinion Shaft Assembly.>
5) Install the transmission case. **<Ref. to 5MT-64,** INSTALLATION, TRANSMISSION CASE.>
6) Install the transfer case with extension case assembly. **<Ref. to 5MT-50,** INSTALLATION, Transfer Case and Extension Case Assembly.>
7) Install the manual transmission assembly on vehicle. **<Ref. to 5MT-35,** INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

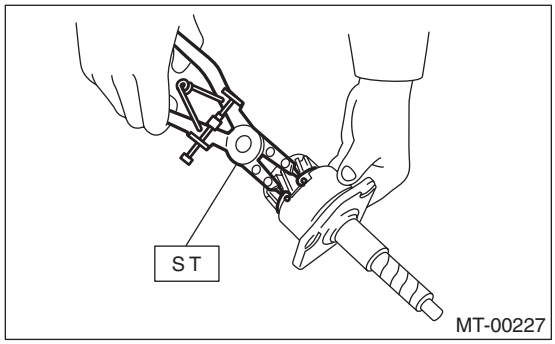
1) Remove the O-ring from input shaft holder. Also, remove the input shaft holder shim.

NOTE:
- Use a new O-ring.
- Number of shims used varies from none to two.

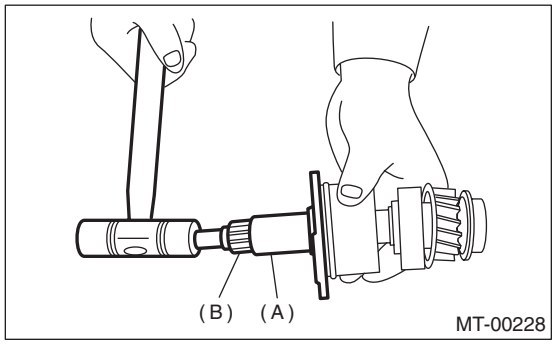


(A) Input shaft holder
(B) O-ring
(C) Input shaft holder shim

2) Put vinyl tape around the input shaft splines to protect oil seal from damage.
3) Remove the inner snap ring.
ST 398663600 PLIERS

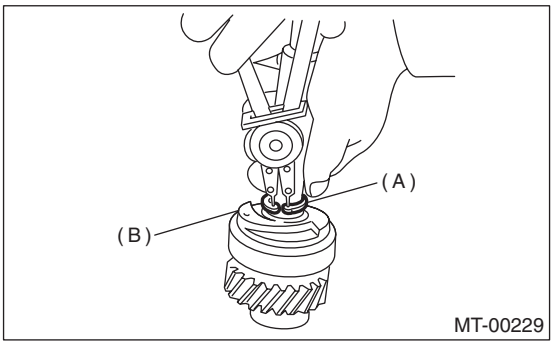


4) Hold the input shaft holder stationary and remove the input shaft by tapping its end with a plastic hammer.



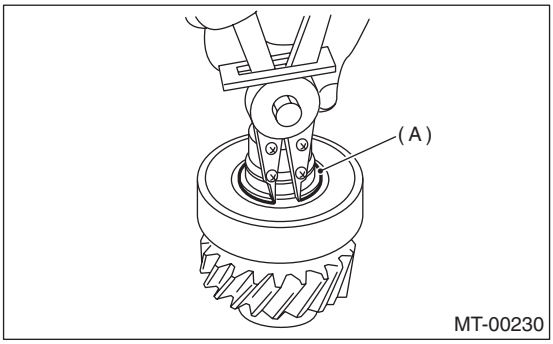
(A) Input shaft holder
(B) Input shaft

5) Remove the outer snap ring. Then remove the oil squeeze plate and straight pin.



(A) Snap ring
(B) Oil squeeze plate

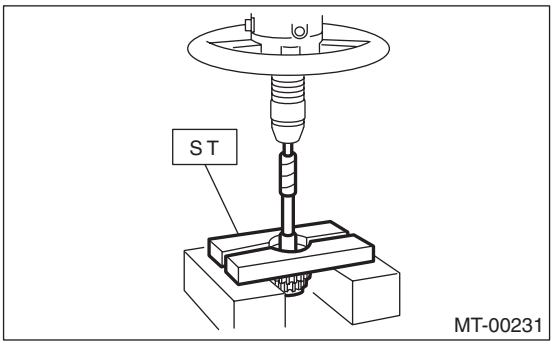
6) Remove the snap ring.



(A) Snap ring

7) Using a press and ST, remove the ball bearing.

NOTE:
Remove the inner snap ring before pressing.
ST 498077000 REMOVER

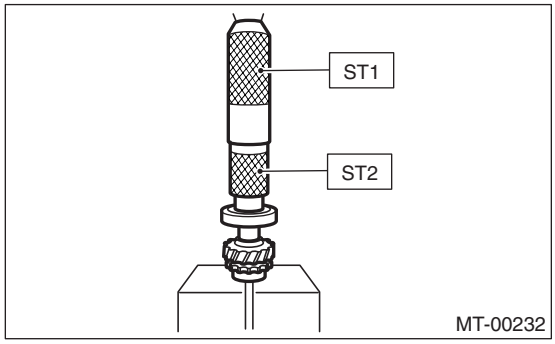


8) Remove the oil seal from input shaft holder.

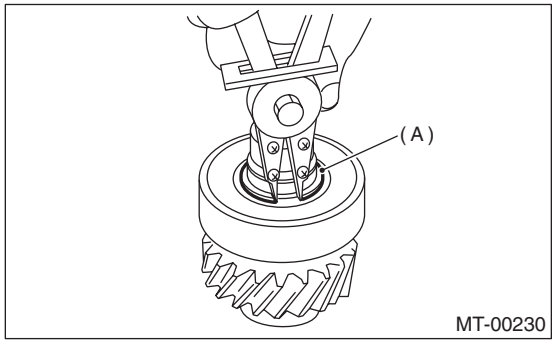
D: ASSEMBLY

1) Install the ball bearing onto input shaft.

NOTE:
Place the snap ring between input shaft gear and ball bearing beforehand. Use the table at 8) as a guide in selecting a suitable snap ring.
ST1 899580100 INSTALLER
ST2 399513600 INSTALLER

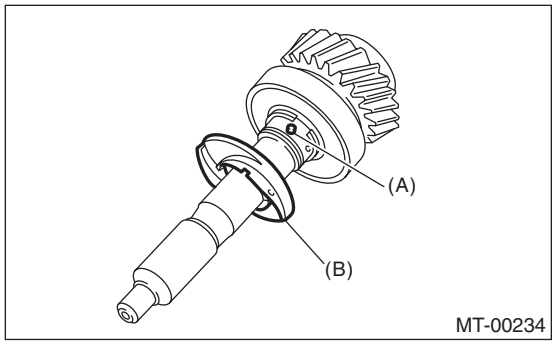


2) Install the snap ring on input shaft.



(A) Snap ring

3) Inspect the clearance between ball bearing and snap ring. **<Ref. to 5MT-84,** INSPECTION, INPUT SHAFT ASSEMBLY.>
4) Install the straight pin and oil squeeze plate to input shaft.



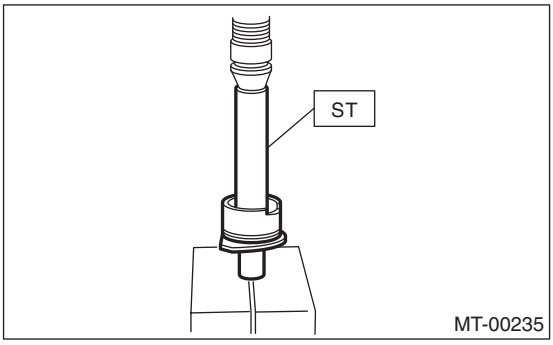
(A) Straight pin
(B) Oil squeeze plate

5) Install the snap ring.

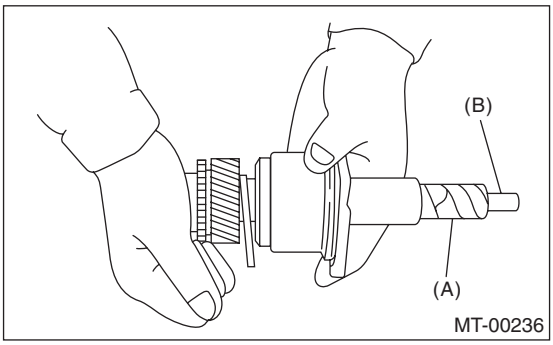
6) Drive the oil seal into input shaft holder.

NOTE:
Apply a coat of grease to sealing lips before installing oil seal.

ST 398507703 DUMMY COLLAR



7) Wind vinyl tape around the shaft splines and insert input shaft into holder by lightly tapping it by hand.

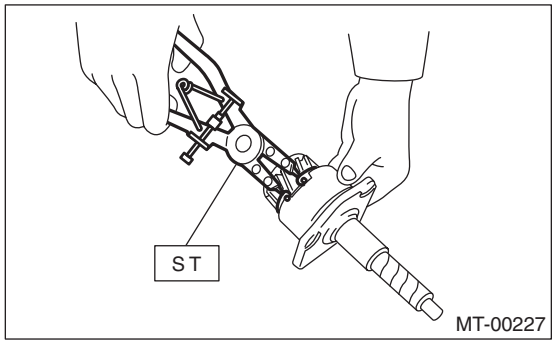


(A) Vinyl tape
(B) Input shaft

8) Install the snap ring to input shaft holder.

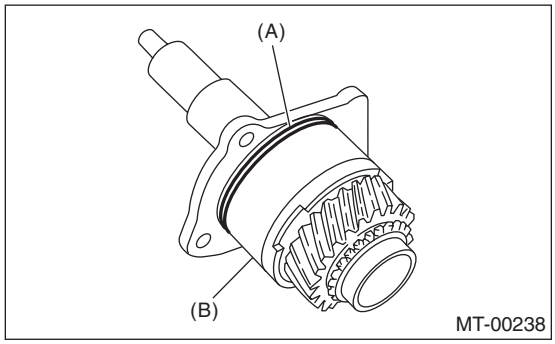
NOTE:
Select a suitable snap ring so that clearance between snap ring and bearing is held within 0 to 0.12 mm (0 to 0.0047 in).

ST 398663600 PLIERS



Snap ring	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

9) Install the O-ring to input shaft holder.



(A) O-ring
(B) Input shaft holder

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.
- Bearings having other defects

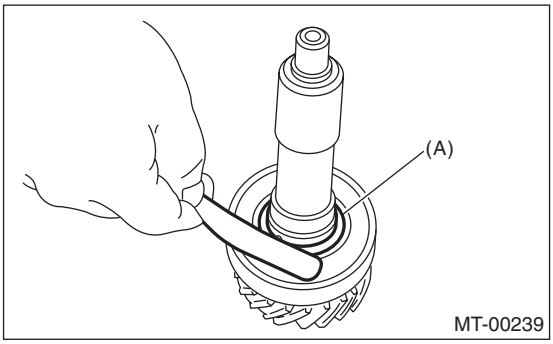
2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears
• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.
• Correct or replace if the cone that contacts the baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.
4) Baulk ring
Replace the ring in the following cases:
• When the inner surface and end face are damaged.
• When the ring inner surface is excessively or partially worn down.
• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.
5) Shifting insert key
Replace the insert if deformed, excessively worn, or defective in any way.
6) Oil seal
Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.
7) O-ring
Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.
8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.
9) Measure the clearance between snap ring and ball bearing using thickness gauge.

Clearance:
0 — 0.12 mm (0 — 0.0047 in)



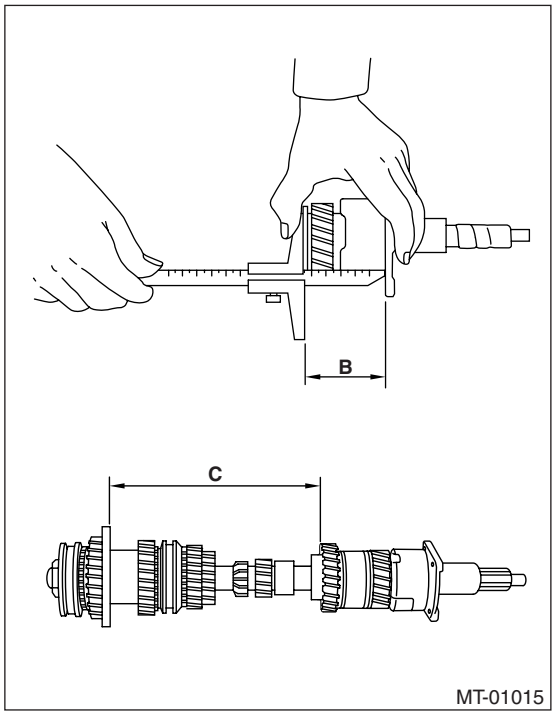
(A) Snap ring

If the measurement is not within specification, select a suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

F: ADJUSTMENT

1) Place transmission main shaft assembly and input shaft on transmission main case without shim.
2) The proper number of shim can be determined as follows:
D = A−(B+C)
A: Main case length (353 mm (13.90 in)
B: Input shaft complete length
C: Main shaft assembly length



NOTE:
The thickness of shim is 0.45 to 0.55 mm (0.0177 to 0.0217 in).

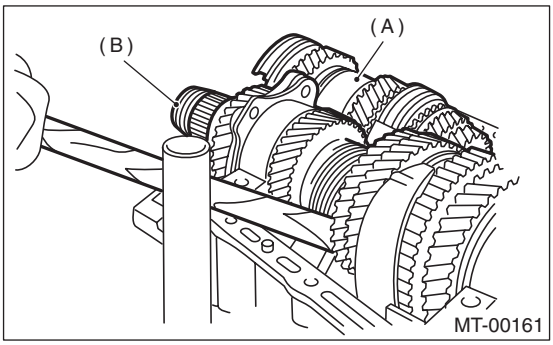
Dimension “D” mm (in)	Number of shims
52.50 — 53.11 (2.0669 — 2.0909)	—
52.00 — 52.49 (2.0472 — 2.0665)	1
51.26 — 51.99 (2.0181 — 2.0468)	2

20.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
3) Remove the transmission case. <Ref. to 5MT-62, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly.

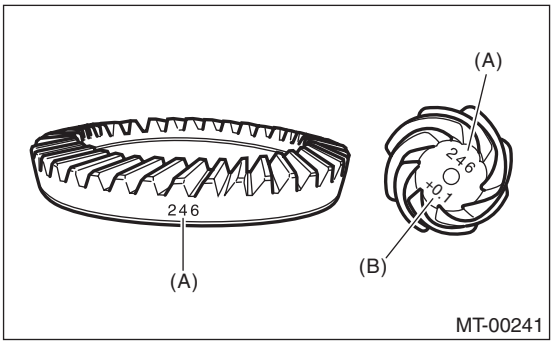
NOTE:
Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly
(B) Drive pinion shaft assembly

B: INSTALLATION

1) Remove the differential assembly.
2) Alignment marks/numbers on hypoid gear set:
The upper number on driven pinion is the match number for combining it with hypoid driven gear. The lower number is for shim adjustment. If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for combination with drive pinion.

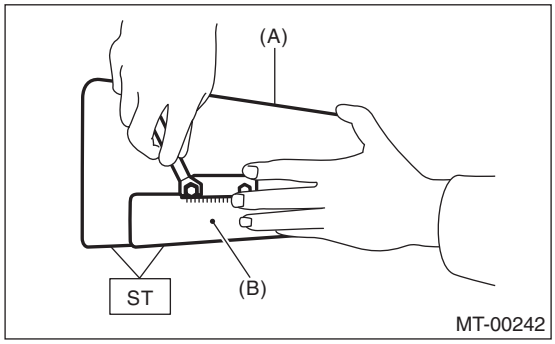


(A) Match number
(B) Shim adjust number

3) Place the drive pinion shaft assembly on right hand transmission main case without shim and tighten the bearing mounting bolts.
4) Inspection and adjustment of ST:

NOTE:
• Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
• Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY



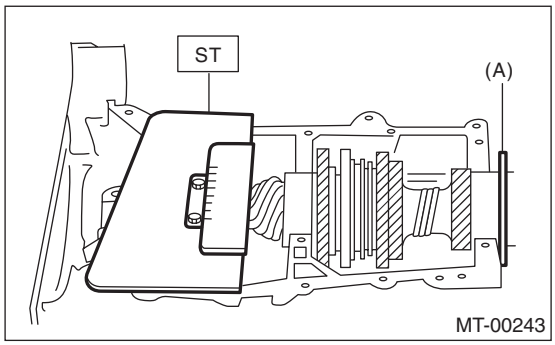
(A) Plate
(B) Scale

5) Position the ST by inserting the knock pin of ST into the knock hole in transmission case.

ST 499917500 DRIVE PINION GAUGE ASSY

6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

ST 499917500 DRIVE PINION GAUGE ASSY



(A) Adjust clearance to zero without shim.

7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on ST. (Add if the number on drive pinion is prefixed by + and subtract if the number is prefixed by−.)

ST 499917500 DRIVE PINION GAUGE ASSY

8) Select one to three shims from the next table for the value determined as described above and take a shim thickness which is closest to the indicated value.

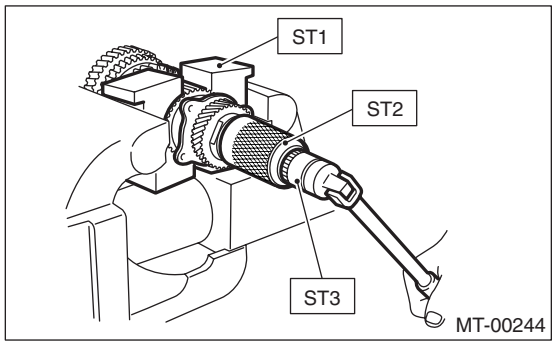
Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install the differential assembly. <Ref. to 5MT-95, INSTALLATION, Front Differential Assembly.>
10) Set the transmission main shaft assembly and drive pinion assembly in position. (So there is no clearance between the two when moved all the way to the front). Inspect the suitable 1st-2nd, 3rd-4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to 5MT-92, INSPECTION, Drive Pinion Shaft Assembly.>
11) Install the transmission case. <Ref. to 5MT-64, INSTALLATION, Transmission Case.>
12) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
13) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

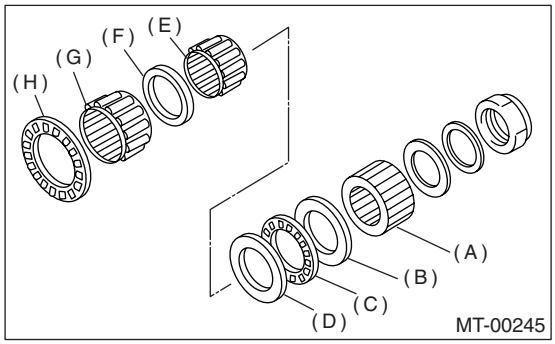
C: DISASSEMBLY

NOTE:
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) during disassembly or reassembly to prevent damage.

1) Straighten the lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)



2) Withdraw the drive pinion from driven shaft.
Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing, drive pinion collar, needle bearing and thrust bearing.

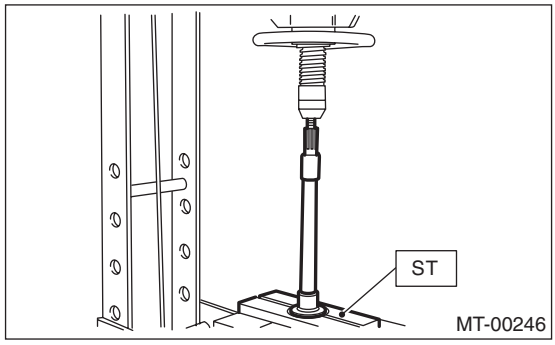


(A) Differential bevel gear sleeve
(B) Adjusting washer No. 1 (25 × 37.5 × t)
(C) Thrust bearing (25 × 37.5 × 3)
(D) Adjusting washer No. 2 (25 × 37.5 × 4)
(E) Needle bearing (25 × 30 × 20)
(F) Drive pinion collar
(G) Needle bearing (30 × 37 × 23)
(H) Thrust bearing (33 × 50 × 3)

3) Remove the roller bearing and washer using ST and press.

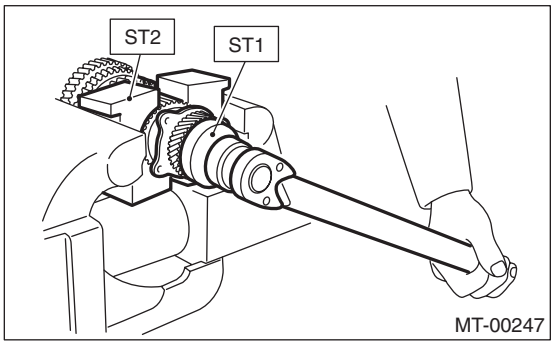
NOTE:
Do not reuse the roller bearing.

ST 498077000 REMOVER



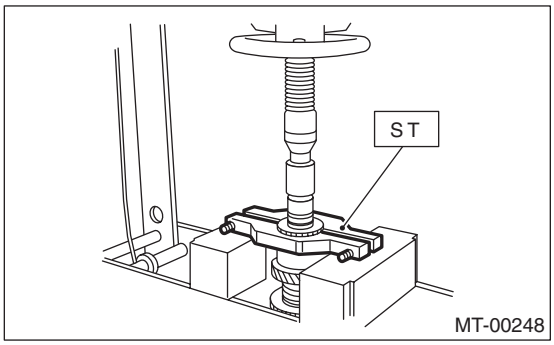
4) Straighten the lock nut at staked portion. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



5) Remove the 5th driven gear using ST.

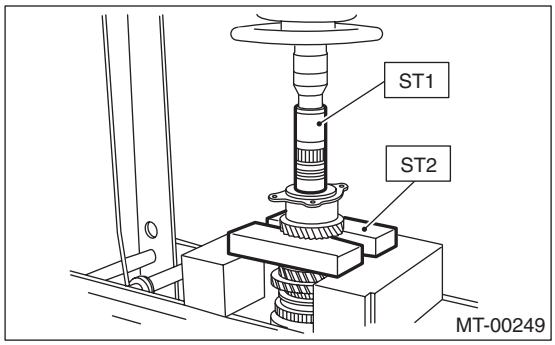
ST 499857000 5TH DRIVEN GEAR REMOVER



6) Remove the woodruff key.

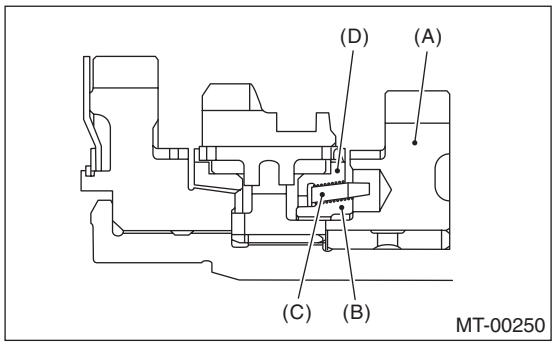
7) Remove the roller bearing, 3rd-4th driven gear using ST1 and ST2.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER



8) Remove the key.

9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.

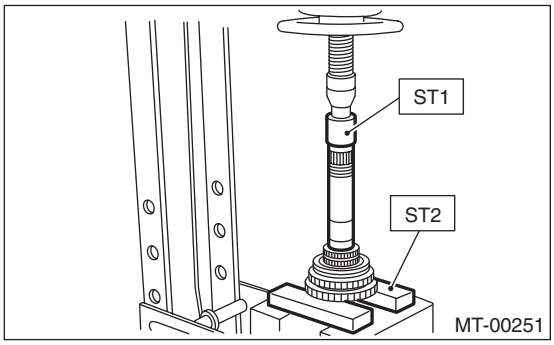


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

10) Remove the 1st driven gear, 2nd driven gear bushing, gear and hub using ST1 and ST2.

NOTE:
If replace the gear or hub assembly as necessary, use the new gear & hub assembly as a unit. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they should be disassembled, mark engagement point beforehand.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER

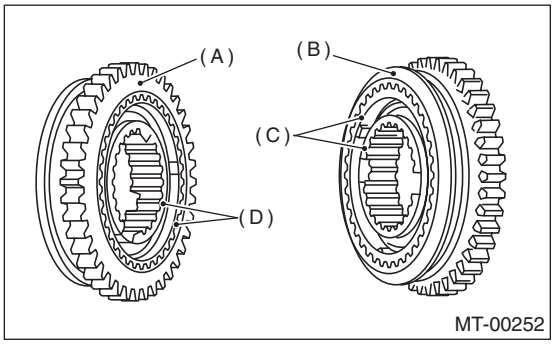


11) Remove the sub gear for 1st driven gear. (Non-turbo model)

D: ASSEMBLY

1) Install the sleeve and gear and hub assembly by matching alignment marks.

NOTE:
If replace the gear or hub assembly as necessary, use the new gear & hub assembly as a unit.



(A) 1st gear side
(B) 2nd gear side
(C) Flush surface
(D) Stepped surface

2) Install the washer, snap ring and sub gear to 1st driven gear.

3) Install the 1st driven gear, 1st baulk ring, gear and hub assembly onto driven shaft.

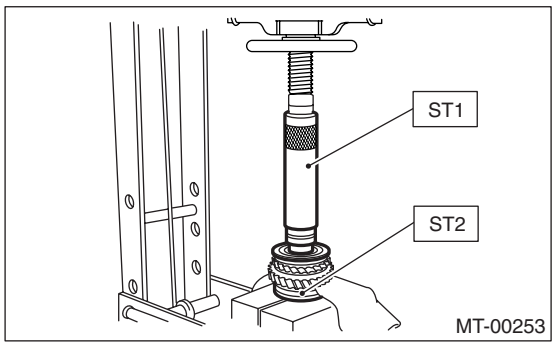
NOTE:
• Take care to install the gear and hub assembly in proper direction.
• Align the baulk ring and gear & hub assembly with key convex part.

4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

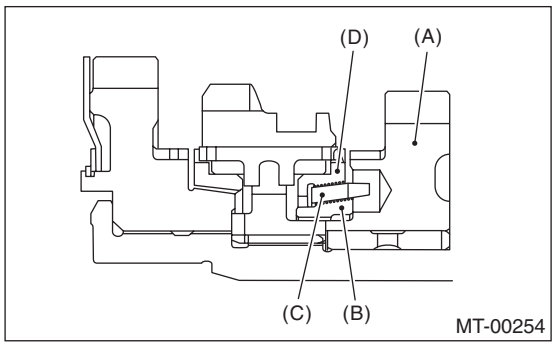
CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
• Attach a cloth to the end of driven shaft to prevent damage.
• When press fitting, align the oil holes of shaft and bush.

ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



5) Install the 2nd driven gear, inner baulk ring, synchro cone, outer baulk ring and insert onto driven shaft.

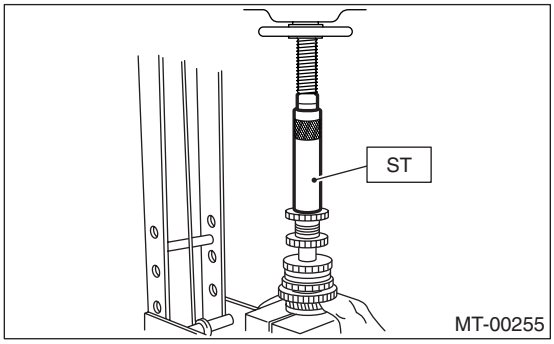


(A) 2nd driven gear
(B) Inner baulk ring
(C) Synchro cone
(D) Outer baulk ring

6) After installing the key on driven shaft, install the 3rd-4th driven gear using ST and press.

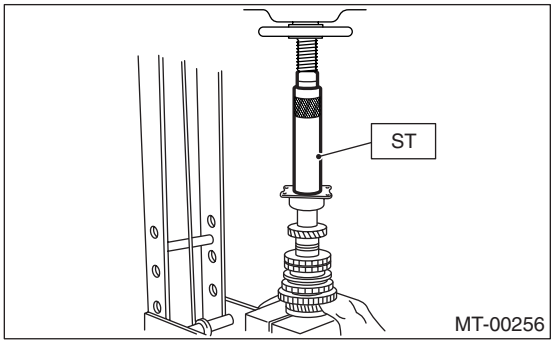
CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Align the convex part in baulk ring with insert.
ST 499277200 INSTALLER



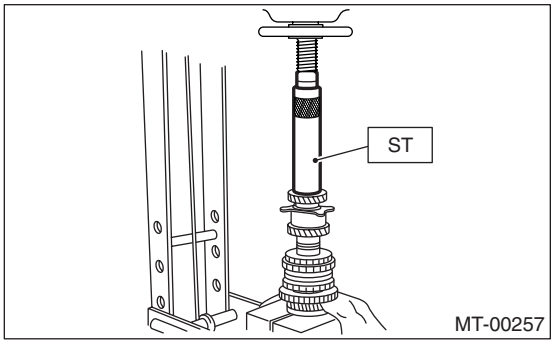
7) Install a set of roller bearings onto the driven shaft using ST and press.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 499277200 INSTALLER



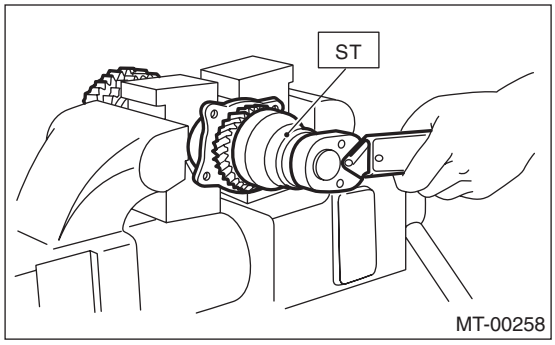
8) Position the woodruff key in groove on the rear of driven shaft. Install the 5th driven gear onto driven shaft using ST and press.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST 499277200 INSTALLER

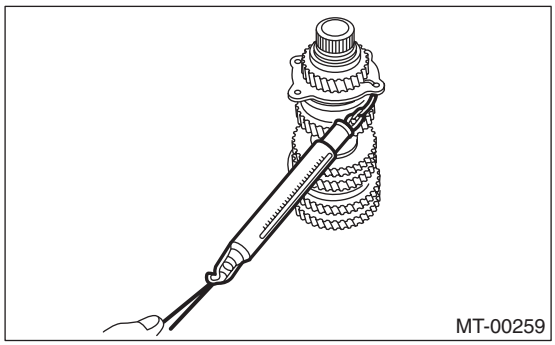


9) Install the lock washer. Install the lock nut and tighten to the specified torque using ST.
ST 499987300 SOCKET WRENCH (50)

Tightening torque:
260 N·m (26.5 kgf-m, 192 ft-lb)

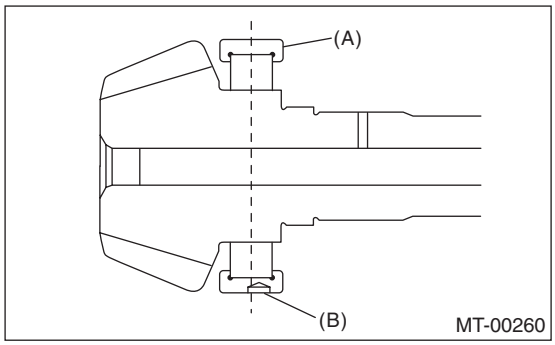


NOTE:
- Stake the lock nut at two points.
- Using the spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33 lbf).



10) Install the roller bearing onto drive pinion.

NOTE:
When installing the roller bearing, note its directions (front and rear) because the knock pin hole in outer race is offset.

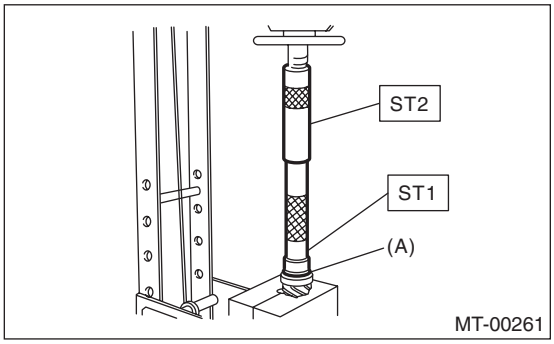


(A) Roller bearing
(B) Knock pin hole

11) Install the washer using ST1, ST2 and press.

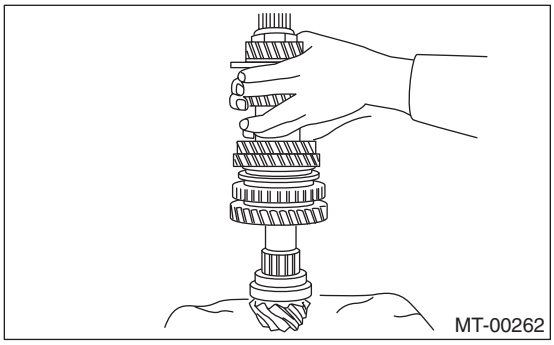
NOTE:
- Discard the old lock nuts, replace with new ones.
- Secure the lock nut in four places.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 499277200 INSTALLER



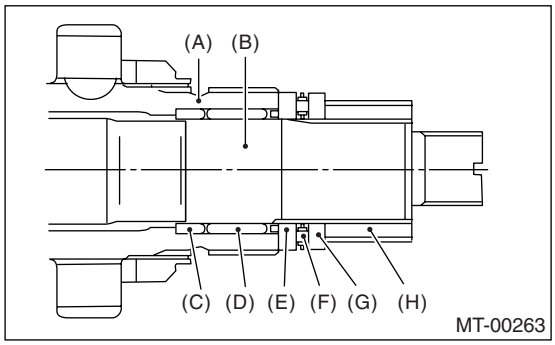
(A) Washer

12) Install the thrust bearing and needle bearing. Install the driven shaft assembly.



13) Install the drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in that order.

NOTE:
Be careful because the spacer must be installed in proper direction.



(A) Driven shaft
(B) Drive pinion shaft
(C) Drive pinion collar
(D) Needle bearing (25 × 30 × 20)
(E) Adjusting washer No. 2 (25 × 36 × 4)
(F) Thrust bearing (25 × 37.5 × 3)
(G) Adjusting washer No. 1 (25 × 36 × t)
(H) Differential bevel gear sleeve

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

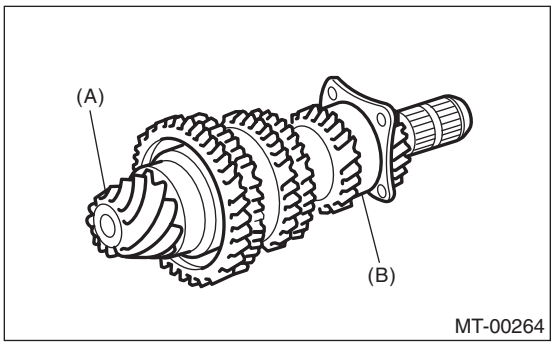
Replace the bearings in the following cases:

• Bearings whose balls, outer races and inner races are broken or rusty.

• Worn bearings

• Bearings that fail to turn smoothly or make noise when turned after gear oil lubrication.

• The roller bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike the other bearings.



(A) Drive pinion shaft
(B) Roller bearing

• Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

• When the sliding surface is damaged or abnormally worn.

• When the inner wall is abnormally worn.

3) Gears

• Replace the gears with new ones if their tooth surfaces are broken, damaged, or excessively worn.

• Correct or replace if the cone that contacts the baulk ring is rough or damaged.

• Correct or replace if the inner surface or end face is damaged.

4) Baulk ring

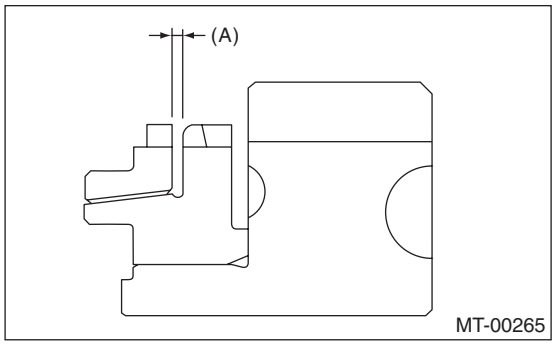
Replace the ring in the following cases:

• When the inner surface and end face are damaged.

• When the ring inner surface is abnormally or partially worn down.

• If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.

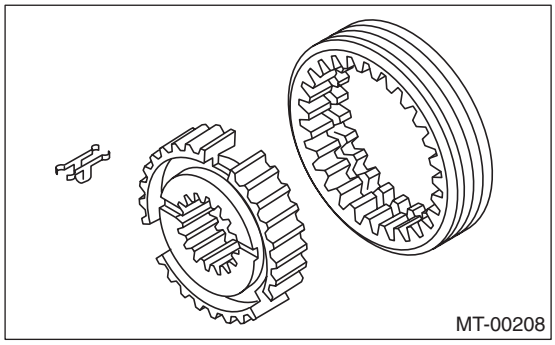
Clearance (A):
0.5 — 1.0 mm (0.020 — 0.040 in)



• When the contact surface of the synchronizer ring insert is scored or abnormally worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn, or defective in any way.



6) Oil seal

Replace the oil seal if the lip is deformed, hardened, damaged, worn, or defective in any way.

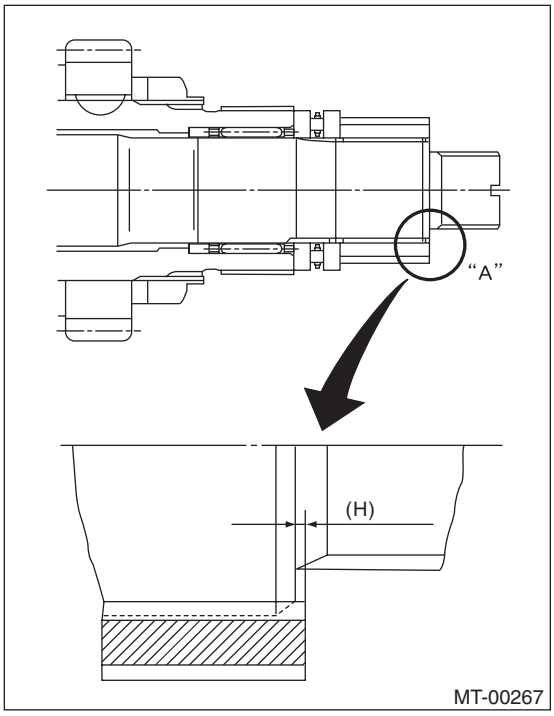
7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn, or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

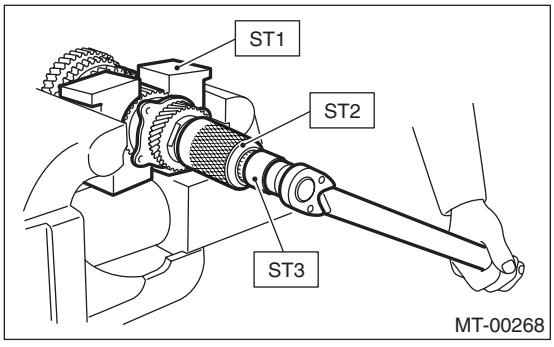
1) Select the adjusting washer No. 1 so that dimension (H) is zero through visual check. Position the washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install the lock nut (18 × 13.5).



2) Using the ST1, ST2 and ST3, tighten the lock nut to specified torque.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

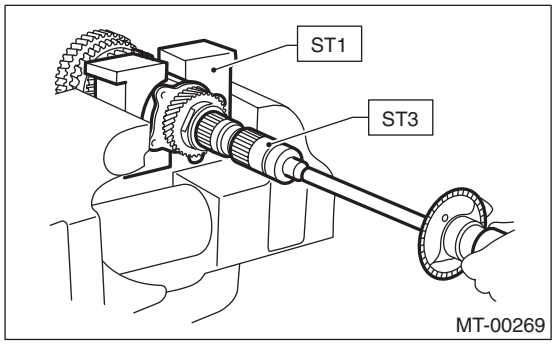
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)



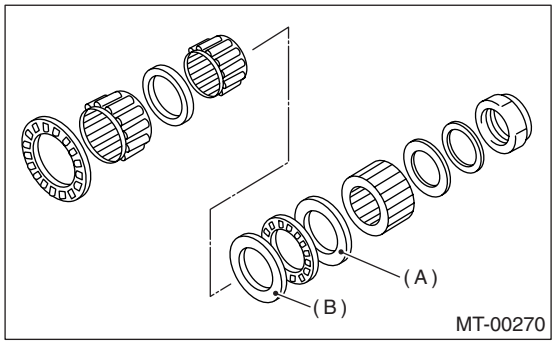
3) After removing the ST2, measure the starting torque using torque driver.

ST1 899884100 HOLDER
ST3 899988608 SOCKET WRENCH (27)

Starting torque:
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)



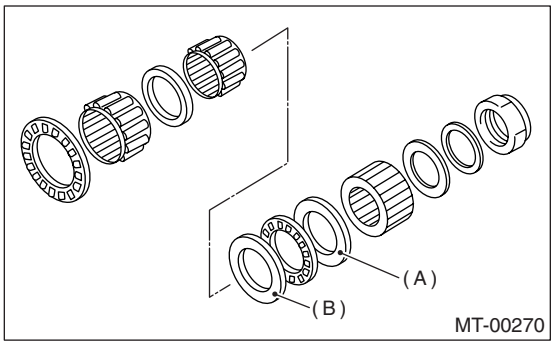
4) If the starting torque is not within specified limit, select a new adjusting washer No. 1 and recheck starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

5) If the specified starting torque range cannot be obtained when a No. 1 adjusting washer is used, then select a suitable No. 2 adjusting washer from those listed in the following table. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Starting torque	Dimension H	Washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

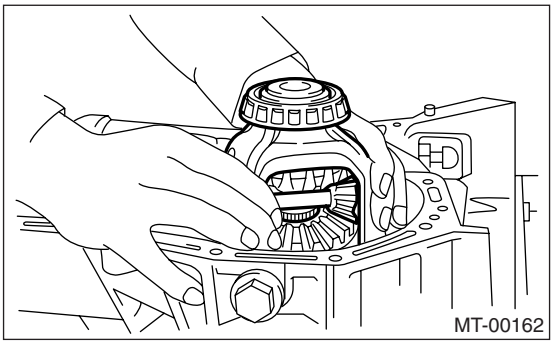
6) Recheck that the starting torque is within specified range, then clinch the lock nut at four positions.

21.Front Differential Assembly

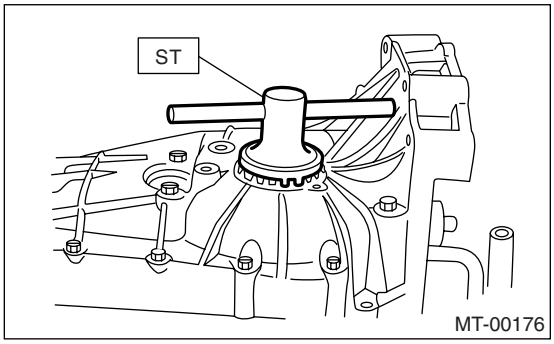
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
3) Remove the transmission case. <Ref. to 5MT-62, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-86, REMOVAL, DRIVE PINION SHAFT ASSEMBLY.>
5) Remove the main shaft assembly.
Single-range model
<Ref. to 5MT-68, REMOVAL, Main Shaft Assembly for Single-Range.>
Dual-range model
<Ref. to 5MT-76, REMOVAL, Main Shaft Assembly for Dual-Range.>
6) Remove the differential assembly.

NOTE:
• Be careful not to confuse the right and left roller bearing outer races.
• Be careful not to damage the retainer oil seal.



7) Remove the differential side retainers using ST.
ST 499787000 WRENCH ASSY



8) Remove the bearing outer race from transmission case.
ST 398527700 PULLER ASSY

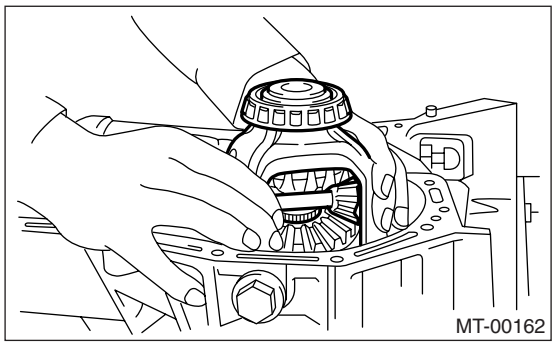
B: INSTALLATION

1) Insert the bearing outer race to transmission case.

NOTE:
Apply the transmission gear oil to outer surface of bearing outer race.

2) Install the differential side retainers using ST.
ST 499787000 WRENCH ASSY
3) Install the differential assembly.

NOTE:
• Be careful not to fold the sealing lip of oil seal.
• Wrap the right and left spline sections of axle shaft with vinyl tape to prevent scratches.

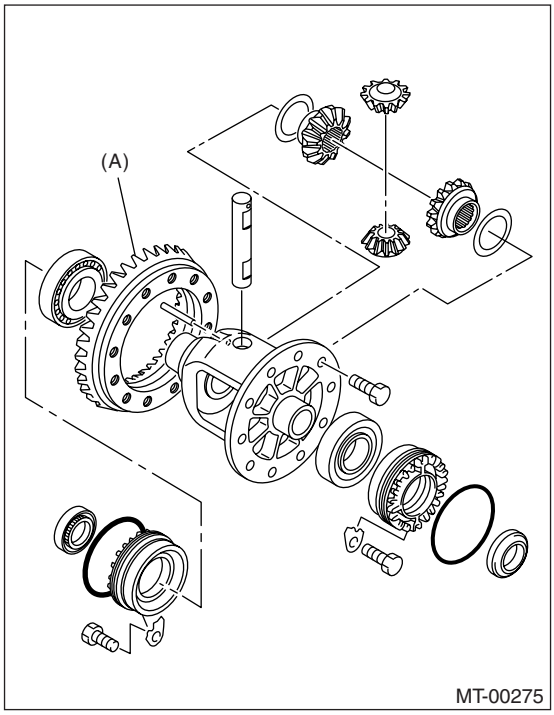


4) Install the main shaft assembly.
Single-range model
<Ref. to 5MT-68, INSTALLATION, Main Shaft Assembly for Single-Range.>
Dual-range model
<Ref. to 5MT-76, INSTALLATION, Main Shaft Assembly for Dual-Range.>
5) Install the drive pinion assembly. <Ref. to 5MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to 5MT-64, INSTALLATION, Transmission Case.>
7) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

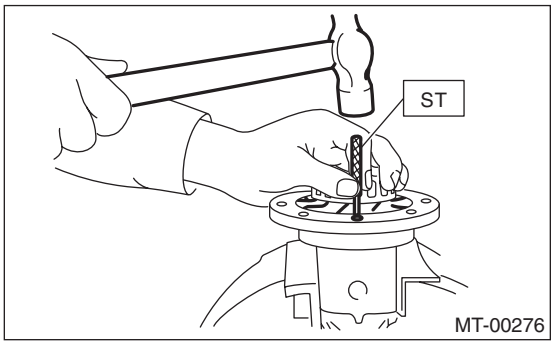
1. DIFFERENTIAL CASE ASSEMBLY

1) Loosen the twelve bolts and remove the hypoid driven gear.

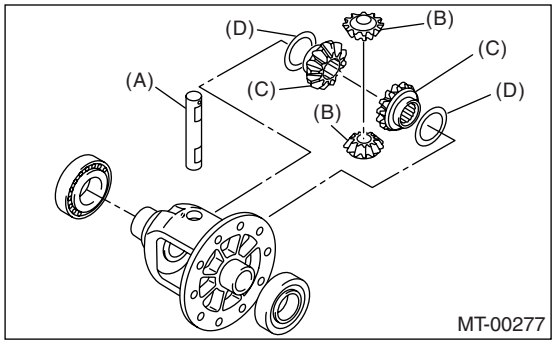


(A) Hypoid driven gear

2) Drive out the straight pin from differential assembly toward hypoid driven gear.
ST 899904100 REMOVER

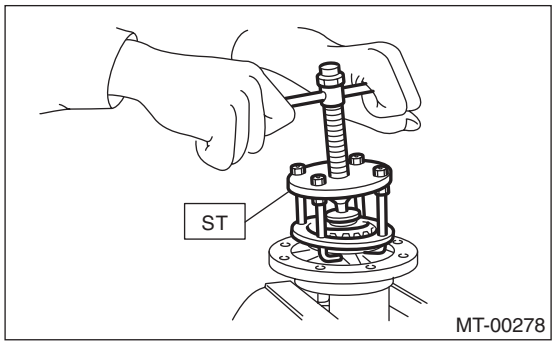


3) Pull out the pinion shaft, and remove the differential bevel pinion and gear and washer.



(A) Pinion shaft
(B) Differential bevel pinion
(C) Differential bevel gear
(D) Washer

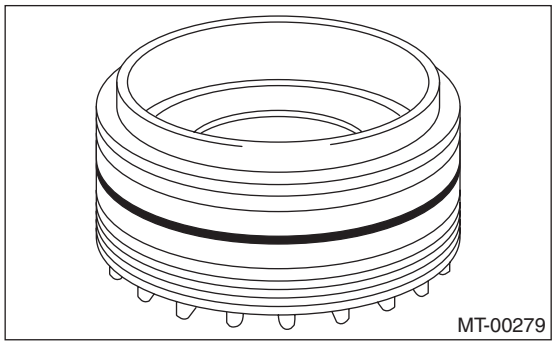
4) Remove the roller bearing using ST.
ST 899524100 PULLER SET



2. SIDE RETAINER

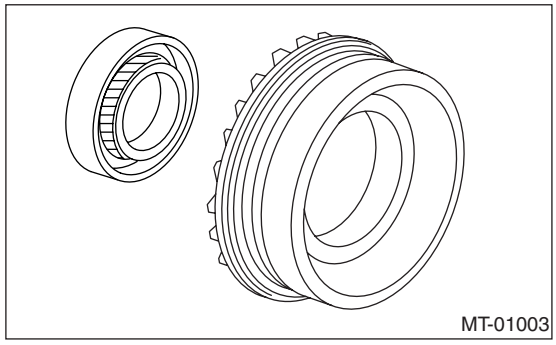
NOTE:
Replace the oil seal and O-ring after adjustment of drive pinion gear backlash and tooth contact.

1) Remove the O-ring.



2) Remove the oil seal.

NOTE:
- Remove the oil seal using a flat tip screwdriver
- Do not reuse the oil seal. Prepare a new oil seal.

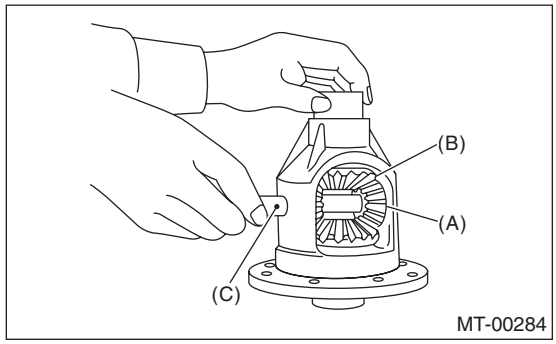


D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the differential bevel gear and bevel pinion together with washers, and insert pinion shaft.

NOTE:
Face the chamfered side of washer toward gear.



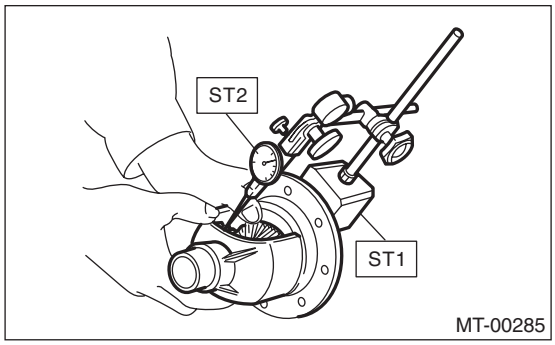
(A) Differential bevel pinion
(B) Differential bevel gear
(C) Pinion shaft

2) Measure the backlash between differential bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to 5MT-99, ADJUSTMENT, Front Differential Assembly.>

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

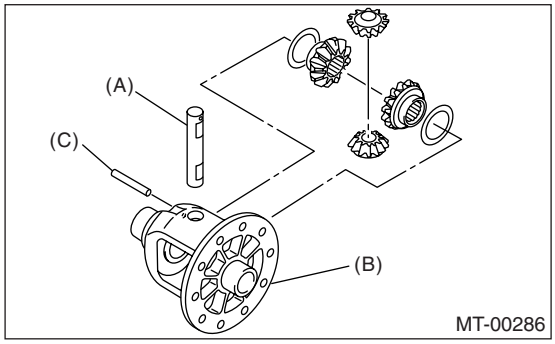
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



3) Align the pinion shaft and differential case at their holes, and drive the straight pin into holes from the hypoid driven gear side, using ST.

NOTE:
Lock the straight pin after installing.

ST 899904100 REMOVER



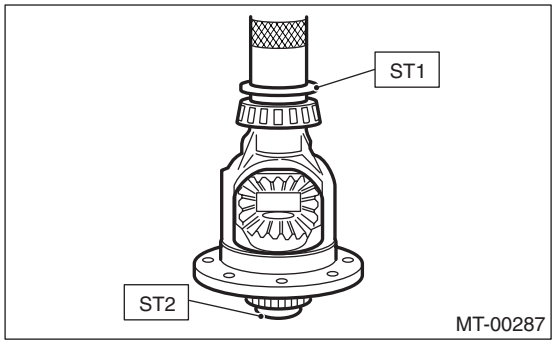
(A) Pinion shaft
(B) Differential case
(C) Straight pin

4) Install the roller bearing to differential case.

CAUTION:
Do not apply load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

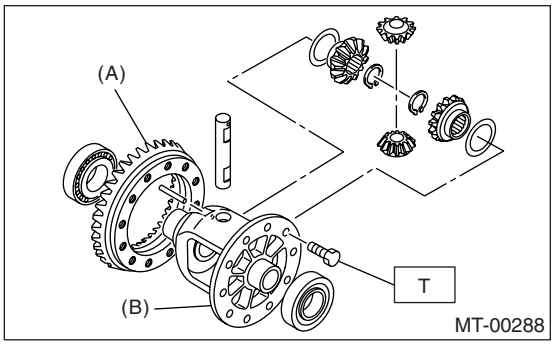
NOTE:
Be careful because the roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install the hypoid driven gear to differential case using twelve bolts.

Tightening torque:
T: 62 N·m (6.3 kgf-m, 45.6 ft-lb)

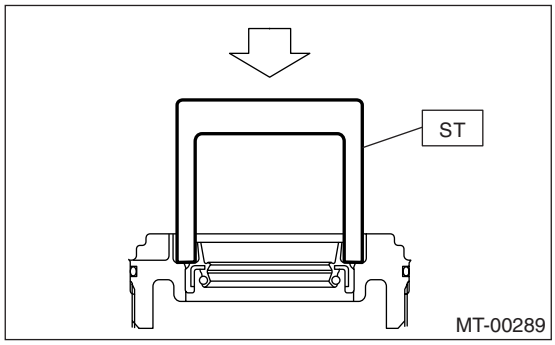


(A) Hypoid driven gear
(B) Differential case

2. SIDE RETAINER

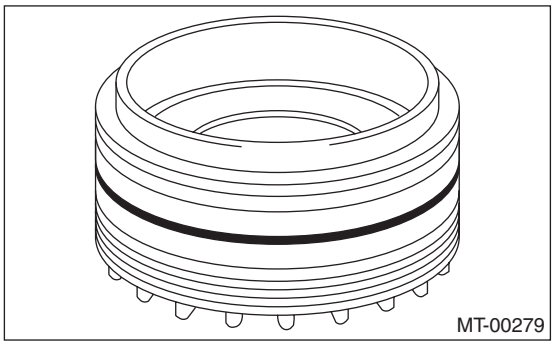
1) Install a new oil seal.
ST 18675AA000 DIFFERENTIAL OIL SEAL INSTALLER

CAUTION:
• When pressing fit the oil seal to side retainer, tap it to press fit using a plastic hammer.
• Do not use the press.



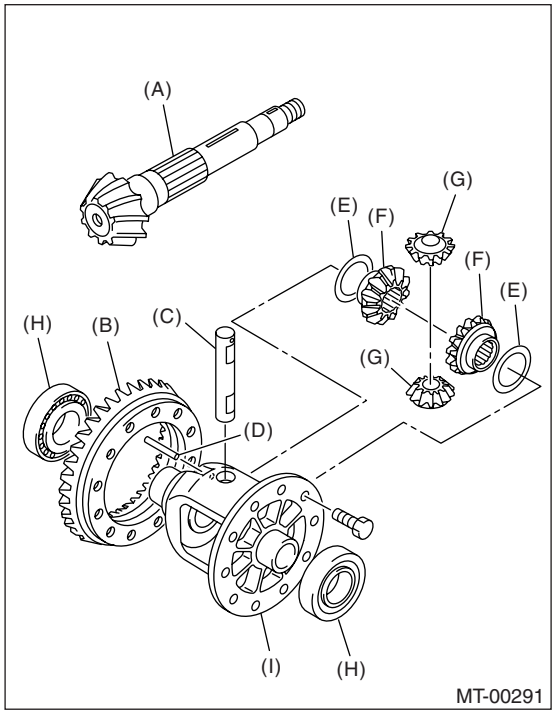
2) Install a new O-ring.

NOTE:
Do not stretch or damage the O-ring.



E: INSPECTION

Repair or replace the differential gear in the following cases:
• The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
• The roller bearing on the drive pinion shaft has a worn or damaged roller path.
• There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.
• The differential case has worn or damaged sliding surfaces.



(A) Drive pinion shaft
(B) Hypoid drive gear
(C) Pinion shaft
(D) Straight pin
(E) Washer
(F) Differential bevel gear
(G) Differential bevel pinion
(H) Roller bearing
(I) Differential case

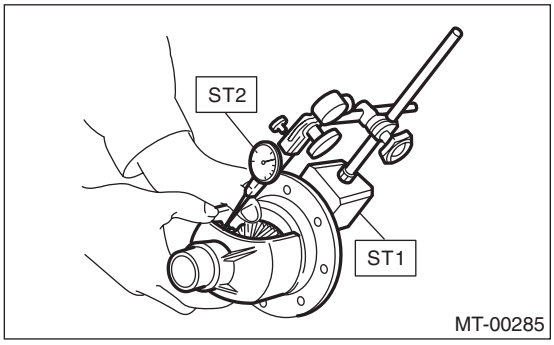
1. DIFFERENTIAL BEVEL PINION GEAR BACKLASH

Measure the backlash between differential bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

NOTE:
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



2. HYPOID GEAR BACKLASH

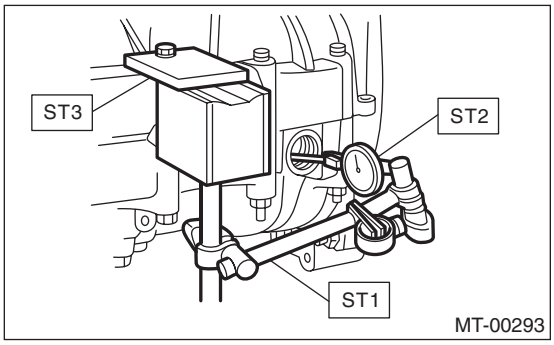
1) Set the ST1, ST2 and ST3. Insert the needle through transmission oil drain plug hole so that the needle comes in contact with the tooth surface at a right angle.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE

2) Install the axle shaft (SUBARU Genuine Parts) to both sides, move it clockwise and counter clockwise to contact tooth, and then read the value of dial gauge runout.

Part No. 38415AA100 AXEL SHAFT

Backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

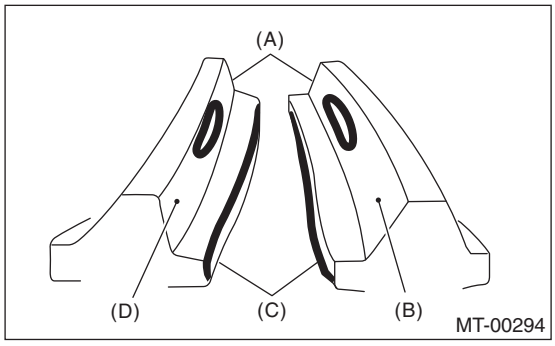


3) If the backlash is outside specified range, adjust it by turning the holder in right side case.

3. TOOTH CONTACT OF HYPOID GEAR

Check the tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is inaccurate, make adjustment. <Ref. to 5MT-99, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact is correct.



(A) Toe
(B) Coast side
(C) Heel
(D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

1) Disassemble the front differential. <Ref. to 5MT-95, REMOVAL, Front Differential Assembly.>
2) Select a different washer from the table and install.

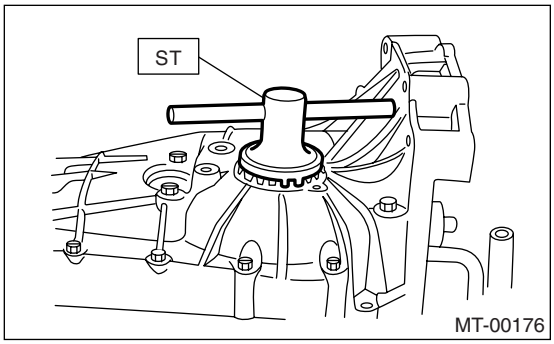
Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

3) Adjust until the specified value is obtained.

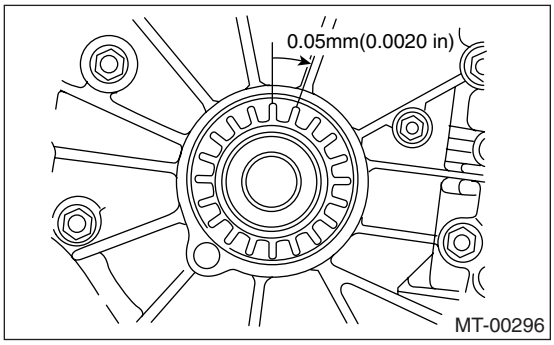
Standard backlash:
0.13 — 0.18 mm (0.0051 — 0.0071 in)

2. HYPOID GEAR BACKLASH

Adjust backlash by turning the holder in right side case.
ST 499787000 WRENCH ASSY



NOTE:
Each time holder rotates one tooth, backlash changes by 0.05 mm (0.0020 in).

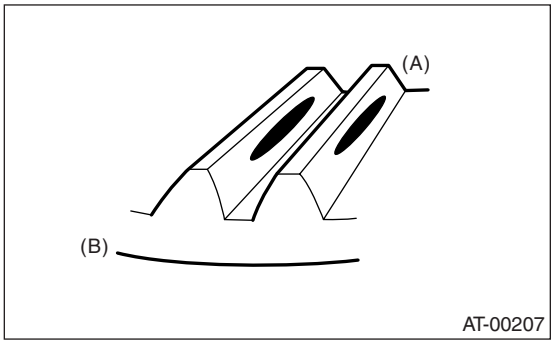


3. TOOTH CONTACT OF HYPOID GEAR

1) Adjust until the teeth contact is correct.
2) Check and adjust the teeth contact with following table.

- Tooth contact

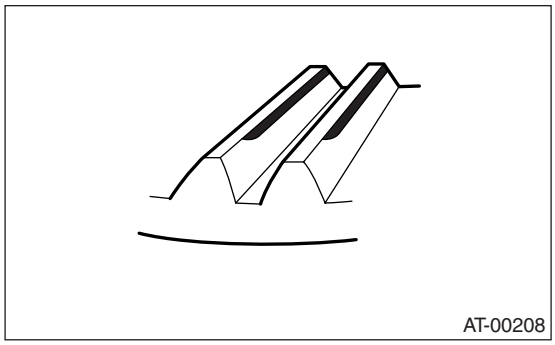
Checking item:Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



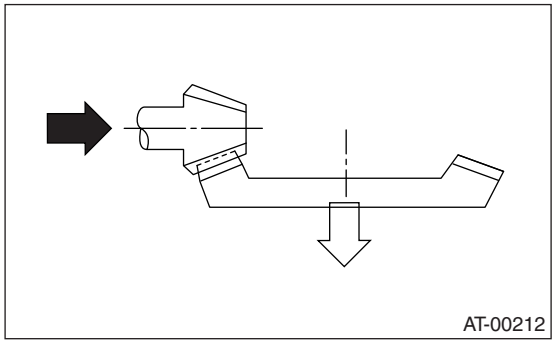
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

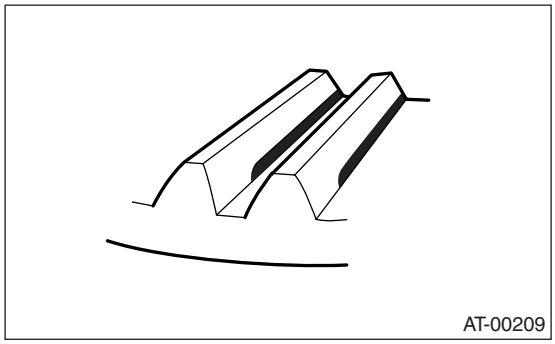


Corrective action: Reduce thickness of drive pinion height adjusting shim in order to bring drive pinion close to Hypoid driven gear.

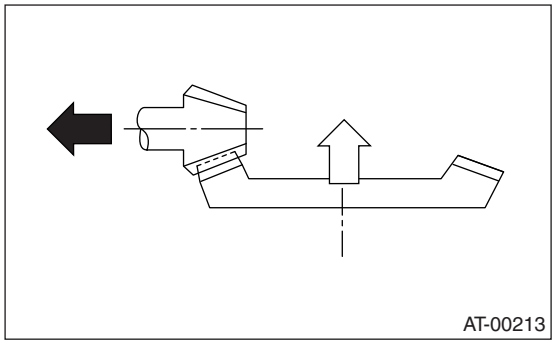


- Flank contact

Checking item: Backlash is too small.
Contact pattern

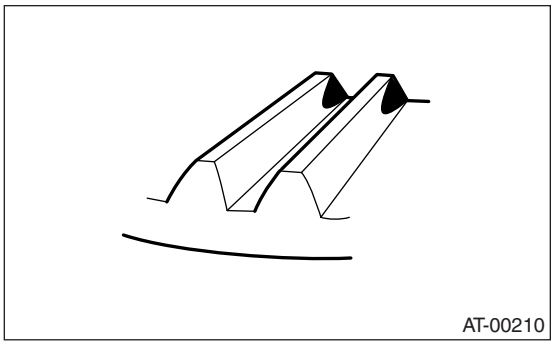


Corrective action: Increase thickness of drive pinion height adjusting shim in order to move drive pinion away from Hypoid driven gear.

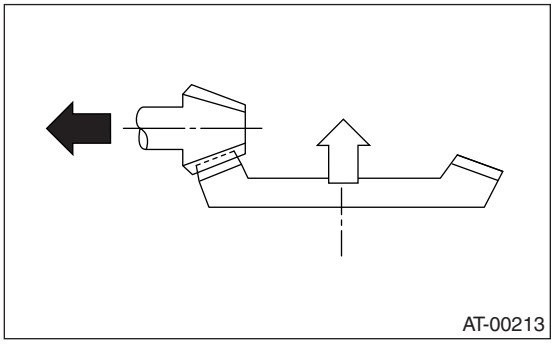


- Toe contact (Inside end contact)

Checking item: Contact areas is small.
Contact pattern

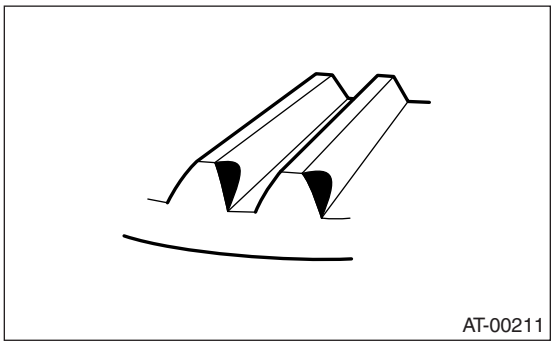


Corrective action: Increase thickness of drive pinion height adjusting shim in order to bring drive pinion close to Hypoid driven gear.

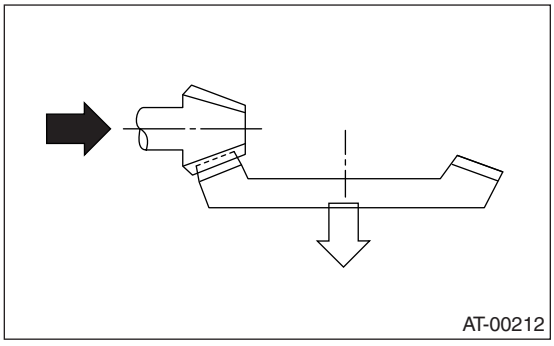


- Heel contact (Outside end contact)

Checking item: Contact areas is small.
Contact pattern



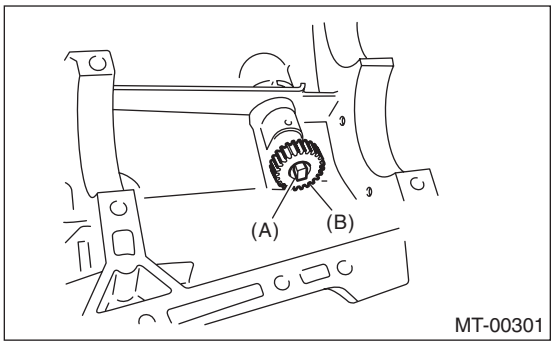
Corrective action: Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from Hypoid driven gear.



22.Speedometer Gear

A: REMOVAL

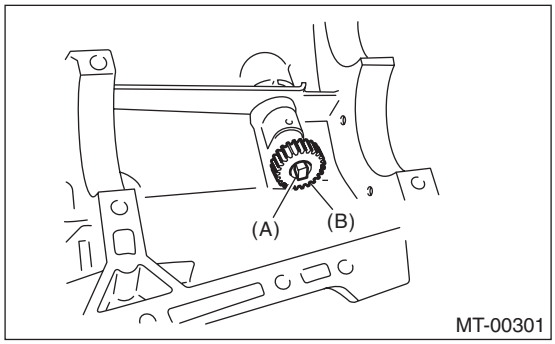
1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
4) Remove the transmission case. <Ref. to 5MT-62, REMOVAL, Transmission Case.>
5) Remove the vehicle speed sensor. <Ref. to 5MT-46, REMOVAL, Vehicle Speed Sensor.>
6) Remove the outer snap ring and pull out speedometer driven gear. Next, remove the oil seal, speedometer shaft and washer.



(A) Outer snap ring
(B) Speedometer driven gear

B: INSTALLATION

1) Install the washer and speedometer shaft, and press fit the new oil seal with ST.
ST 899824100 or 499827000 PRESS
2) Install the vehicle speed sensor. <Ref. to 5MT-46, INSTALLATION, Vehicle Speed Sensor.>
3) Install the speedometer driven gear and new snap ring.



(A) Outer snap ring
(B) Speedometer driven gear

4) Install the transmission case. <Ref. to 5MT-64, INSTALLATION, Transmission Case.>
5) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the back-up light switch and neutral position switch. <Ref. to 5MT-44, INSTALLATION, Switches and Harness.>
7) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

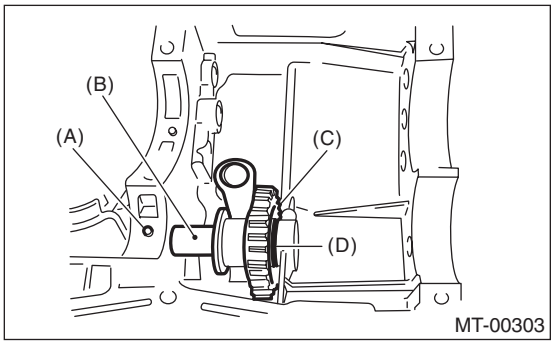
C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

23.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
4) Remove the transmission case. <Ref. to 5MT-62, REMOVAL, Transmission Case.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-86, REMOVAL, DRIVE PINION SHAFT ASSEMBLY.>
6) Remove the main shaft assembly.
Single-Range model
<Ref. to 5MT-68, REMOVAL, Main Shaft Assembly for Single-Range.>
Dual-Range model
<Ref. to 5MT-76, REMOVAL, Main Shaft Assembly for Dual-Range.>
7) Remove the differential assembly. <Ref. to 5MT-95, REMOVAL, Front Differential Assembly.>
8) Remove the shifter forks and rods. <Ref. to 5MT-105, REMOVAL, Shifter Fork and Rod.>
9) Pull out the straight pin, and remove the Rev idler gear shaft, reverse idler gear and washer.



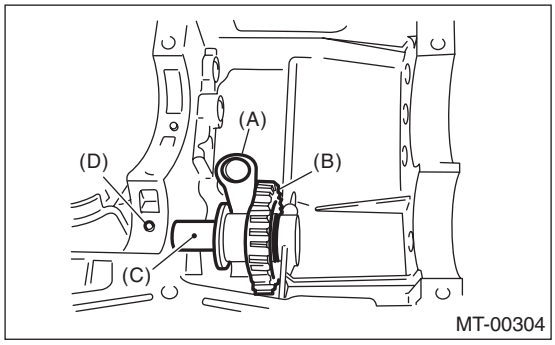
(A) Straight pin
(B) Rev idler gear shaft
(C) Rev idler gear
(D) Washer

10) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

NOTE:
Be sure to install the reverse idler shaft from rear side.



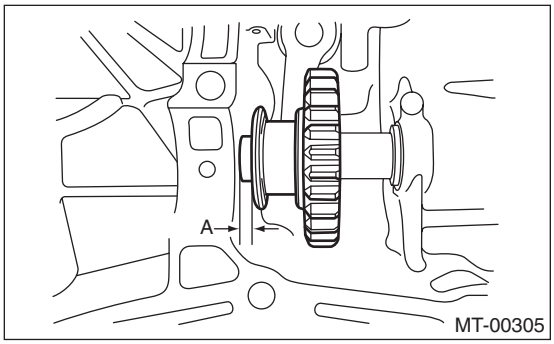
(A) Reverse shifter lever
(B) Reverse idler gear
(C) Reverse idler gear shaft
(D) Straight pin

2) Inspect and adjust the clearance between reverse idler gear and transmission case wall. <Ref. to 5MT-104, INSPECTION, Reverse Idler Gear.> <Ref. to 5MT-104, ADJUSTMENT, Reverse Idler Gear.>
3) Install the shifter forks and rods. <Ref. to 5MT-105, INSTALLATION, Shifter Fork and Rod.>
4) Install the differential assembly. <Ref. to 5MT-95, INSTALLATION, Front Differential Assembly.>
5) Install the main shaft assembly.
Single-Range model
<Ref. to 5MT-68, INSTALLATION, Main Shaft Assembly for Single-Range.>
Dual-Range model
<Ref. to 5MT-76, INSTALLATION, Main Shaft Assembly for Dual-Range.>
6) Install the drive pinion shaft assembly. <Ref. to 5MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>
7) Install the transmission case. <Ref. to 5MT-64, INSTALLATION, Transmission Case.>
8) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
9) Install the back-up light switch and neutral position switch. <Ref. to 5MT-44, INSTALLATION, Switches and Harness.>
10) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

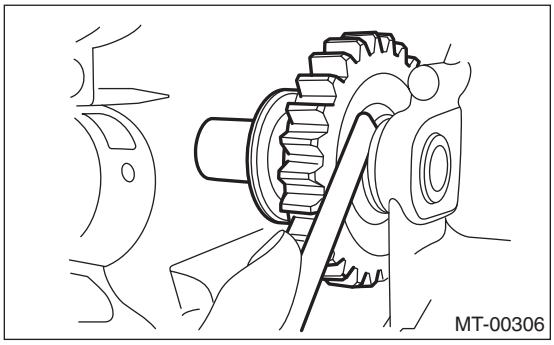
1) Move the reverse shifter rod toward the reverse side. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



2) After installing a suitable reverse shifter lever, shift into neutral. Inspect the clearance between reverse idler gear and transmission case wall.
If out of specification, select the appropriate washer and adjust.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

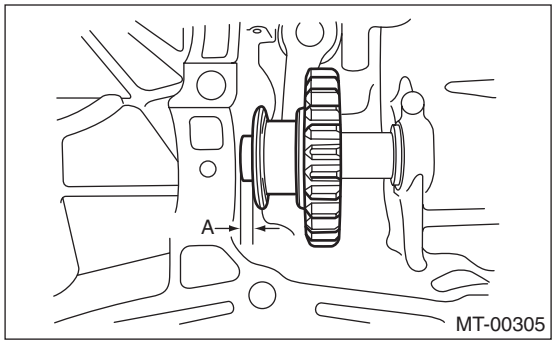


3) Check the reverse idler gear and shaft for damage. Replace if damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

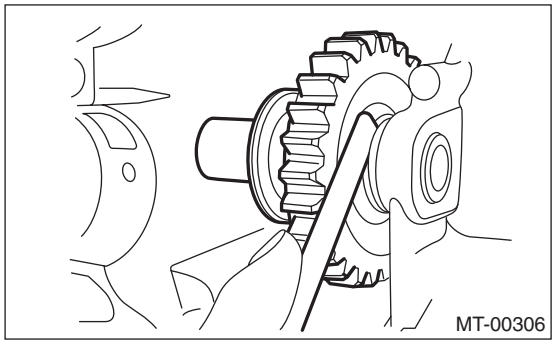
Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

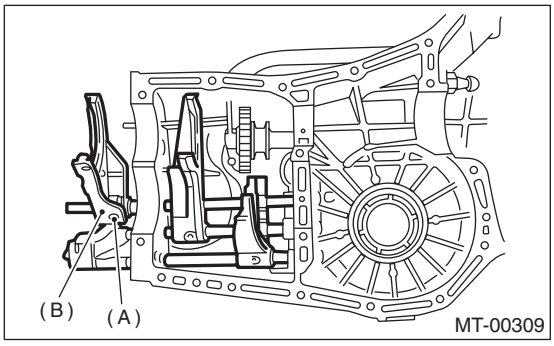


Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

24.Shifter Fork and Rod

A: REMOVAL

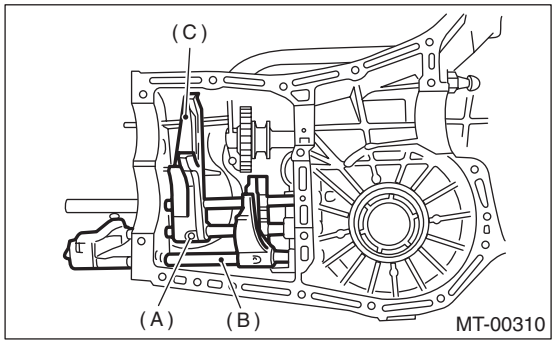
1) Remove the manual transmission assembly from vehicle. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-43, REMOVAL, Switches and Harness.>
3) Remove the transfer case with extension case assembly. <Ref. to 5MT-50, REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
4) Remove the transmission case. <Ref. to 5MT-62, REMOVAL, Transmission Case.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-86, REMOVAL, DRIVE PINION SHAFT ASSEMBLY.>
6) Remove the main shaft assembly.
Single-Range model
<Ref. to 5MT-68, REMOVAL, Main Shaft Assembly for Single-Range.>
Dual-Range model
<Ref. to 5MT-76, REMOVAL, Main Shaft Assembly for Dual-Range.>
7) Remove the differential assembly. <Ref. to 5MT-95, REMOVAL, Front Differential Assembly.>
8) Drive out the straight pin with ST, and 5th shifter fork.
ST 398791700 STRAIGHT PIN REMOVER



(A) Straight pin
(B) 5th shifter fork

9) Remove the plugs, springs and checking balls.
10) Drive out the straight pin, and pull out 3-4 fork rod and shifter fork.

NOTE:
When removing the rod, keep other rods in neutral.



(A) Straight pin
(B) 3rd-4th fork rod
(C) Shifter fork

11) Drive out the straight pin, and pull out 1st-2nd fork rod and shifter fork.
12) Remove the outer snap ring, and pull out the reverse shifter rod arm from reverse fork rod. Then take out the ball, spring and interlock plunger from rod.
And then remove the rod.

NOTE:
When pulling out the reverse shifter rod arm, be careful not to let the ball pop out of arm.

13) Remove the reverse shifter lever.

B: INSTALLATION

1) Apply grease to plunger.
ST 399411700 ACCENT BALL INSTALLER
2) Install the reverse arm fork spring, ball and interlock plunger to reverse fork rod arm. Insert the reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using ST.
3) Position the ball, spring and new gasket in reverse shifter rod hole, on left side transmission case, and tighten the checking ball plug.
4) Install the 1st-2nd fork rod into 1st-2nd shifter fork via the hole on the rear of transmission case.
5) Align the holes in rod and fork, and new drive straight pin into these holes using ST.

NOTE:
- Set other rods to neutral.
- Make sure the interlock plunger is on the 3rd-4th fork rod side.

ST 398791700 STRAIGHT PIN REMOVER
6) Apply a coat of grease to plunger.
7) Install the interlock plunger onto 3rd-4th fork rod.
8) Install the 3rd-4th fork rod into 3rd-4th shifter fork via the hole on the rear of transmission case.

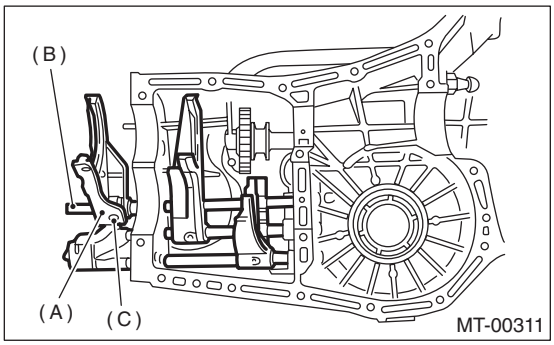
9) Align the holes in rod and fork, and new drive straight pin into these holes.

NOTE:
- Set the reverse fork rod to neutral.
- Make sure the interlock plunger (installing before) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

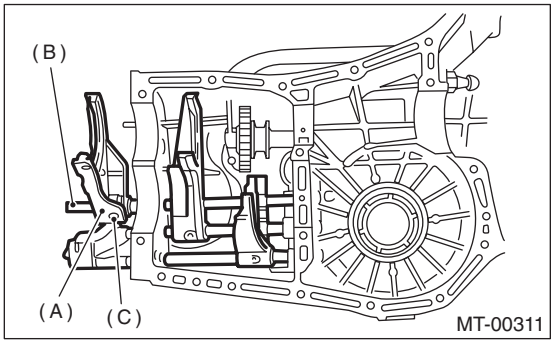
10) Install the 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and new drive straight pin into place.

ST 398791700 STRAIGHT PIN REMOVER



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

11) Position the balls, checking ball springs and new gaskets into 3rd-4th and 1st-2nd fork rod holes, and install plugs.



(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

12) Install the differential assembly. <Ref. to 5MT-95, INSTALLATION, Front Differential Assembly.>

13) Install the main shaft assembly.

Single-Range model
<Ref. to 5MT-68, INSTALLATION, Main Shaft Assembly for Single-Range.>

Dual-Range model
<Ref. to 5MT-76, INSTALLATION, Main Shaft Assembly for Dual-Range.>

14) Install the drive pinion shaft assembly. <Ref. to 5MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>

15) Install the transmission case. <Ref. to 5MT-64, INSTALLATION, Transmission Case.>

16) Install the transfer case with extension case assembly. <Ref. to 5MT-50, INSTALLATION, Transfer Case and Extension Case Assembly.>

17) Install the back-up light switch and neutral position switch. <Ref. to 5MT-44, INSTALLATION, Switches and Harness.>

18) Install the manual transmission assembly to vehicle. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

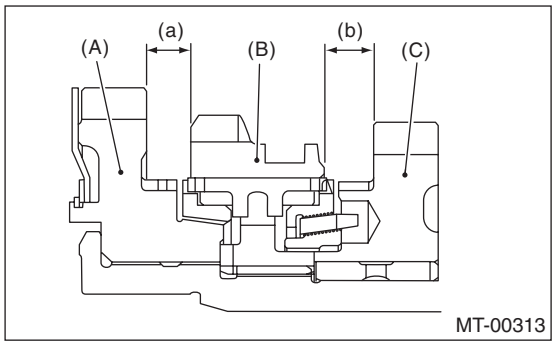
C: INSPECTION

1) Check the shift shaft and shift rod for damage. Replace if damaged.

2) Gearshift mechanism:
Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.5 mm (0.374 in)

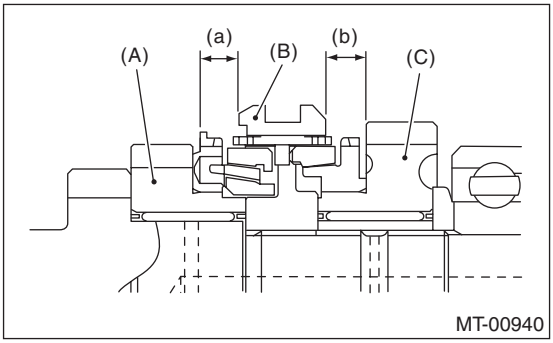


(A) 1st driven gear
(B) Reverse driven gear
(C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approach to 1st gear by 0.2 mm (0.008 in).
32804AA070	—	Standard
32804AA080	3	Approach to 2nd gear by 0.2 mm (0.008 in).

4) Inspect the clearance between 3rd, 4th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.3 mm (0.366 in)

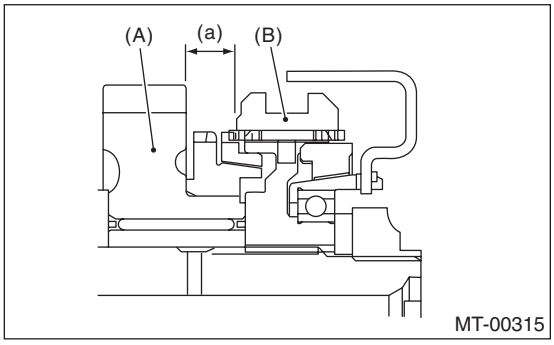


(A) 3rd drive gear
(B) Coupling sleeve
(C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in).
32810AA071	—	Standard
32810AA101	3	Approach to 3rd gear by 0.2 mm (0.008 in).

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



(A) 5th drive gear
(B) Coupling sleeve

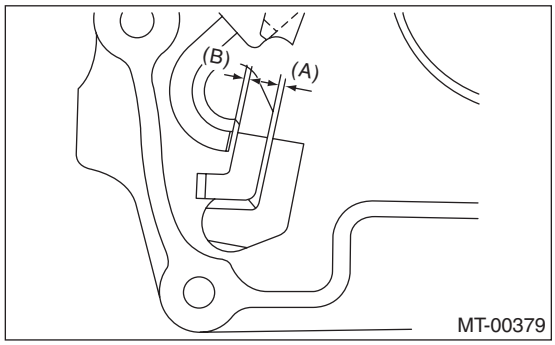
5th shifter fork (Non-turbo)		
Part No.	Mark	Remarks
32812AA201	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA211	—	Standard
32812AA221	9	Approach to 5th gear by 0.2 mm (0.008 in).

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approach to 5th gear by 0.2 mm (0.008 in).
32812AA241	—	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in).

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (A):
1st-2nd to 3rd-4th:
0.4 — 1.4 mm (0.016 — 0.055 in)

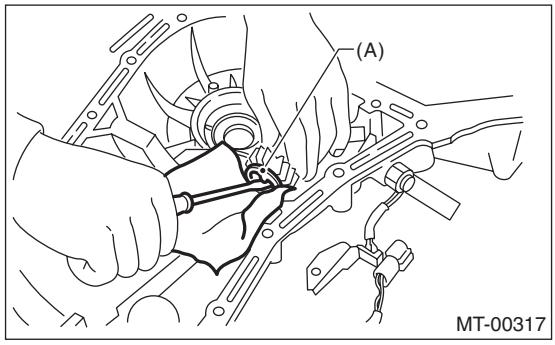
Clearance (B):
3rd-4th to 5th:
0.5 — 1.3 mm (0.020 — 0.051 in)



25.Counter Gear

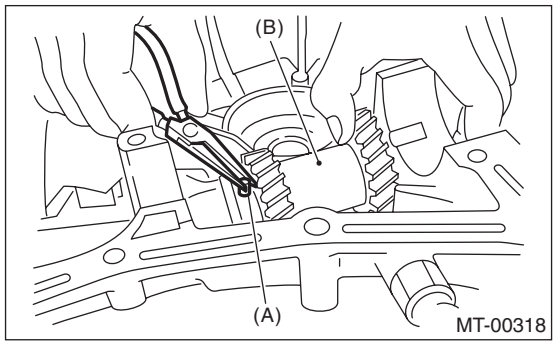
A: REMOVAL

1) Remove the manual transmission assembly from vehicle. **<Ref. to 5MT-32,** REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case with extension case assembly. **<Ref. to 5MT-50,** REMOVAL, TRANSFER CASE AND EXTENSION CASE ASSEMBLY.>
3) Remove the transmission case. **<Ref. to 5MT-62,** REMOVAL, TRANSMISSION CASE.>
4) Move the counter gear shaft until it touches transmission case, and remove the snap ring with a suitable tool.



(A) Snap ring

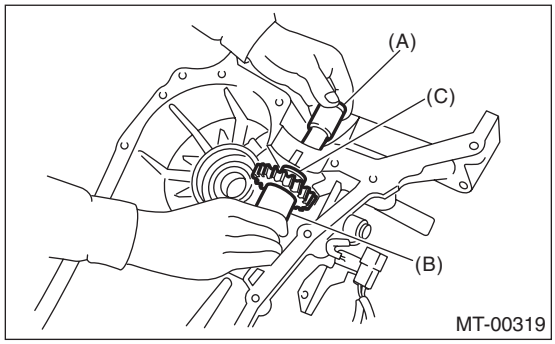
5) Slide the washer at rear of high-low counter shaft, and remove the straight pin from counter shaft.



(A) Straight pin
(B) Counter gear

6) Remove the counter shaft from transmission case, taking care not to drop the counter gear and two washers.

NOTE:
• Be careful not to damage the O-ring.
• Be careful not to drop the straight pin on front side.
• Be careful not to drop the two needle bearings and collar contained in counter gear.



(A) Counter shaft
(B) Counter gear
(C) Washers

B: INSTALLATION

1) Install the O-ring and straight pin onto counter gear shaft.
2) Install the following parts in main case (Right-side), and push the shaft perfectly into case.
• Counter gear shaft
• Two counter gear washers
• Two needle bearings
• Counter gear collar
• Counter gear
• Straight pin
• Snap ring
3) Install the transmission case. **<Ref. to 5MT-64,** INSTALLATION, TRANSMISSION CASE.>
4) Install the transfer case with extension case assembly. **<Ref. to 5MT-50,** INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the manual transmission assembly on vehicle. **<Ref. to 5MT-35,** INSTALLATION, Manual Transmission Assembly.>

NOTE:
• Make sure that the cut-out end surface of counter gear shaft does not protrude above the end surface of the case.
• Position the cut-out portion of counter gear shaft as shown in the figure.

C: INSPECTION

1) After installing the snap ring, measure the clearance between snap ring and counter washer.

Clearance:
0.05 — 0.35 mm (0.0020 — 0.0138 in)

2) If the clearance is out of measured value, select a snap ring and install to put clearance within measured value. **<Ref. to 5MT-109,** ADJUSTMENT, COUNTER GEAR.>

D: ADJUSTMENT

Selection of snap ring:
If the measurement is not within specification, select suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

26.General Diagnostic Table

A: INSPECTION

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of spline of gears	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper adjustment	Adjust.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter, broken shifter fork rail spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Worn tooth step of synchronizer hub	Replace.
	(g) Worn 1st driven gear and driven shaft	Replace.
	(h) Worn 2nd driven gear and 2nd bush	Replace.
	(i) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings NOTE: If the trouble is only wear of the tooth surfaces, merely a high roaring noise will occur at high speeds, but if any part is broken, rhythmical knocking sound will be heard even at low speeds.	Replace.

2. DIFFERENTIAL

Symptom	Possible cause	Remedy
1. Broken differential (case, gear, bearing, etc.) NOTE: Noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.	(a) Insufficient or improper oil	Disassemble the differential and replace broken components and at the same time check other components for any trouble, and replace if necessary.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of clutch	Readjust the bearing preload and backlash and face contact of gears.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of drive pinion and hypoid driven gear	Adjust.
	(e) Excessive backlash due to worn differential side gear, washer or differential pinion vehicle under severe operating conditions.	Add recommended oil to specified level. Do not use the vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
2. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. • Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment • Bearing noise when driving or when coasting: Cracked, broken or damaged bearings • Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc.	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust the bearing preload.
	(d) Loose roller bearing	Readjust the hypoid driven gear to drive pinion backlash and check tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

CLUTCH SYSTEM

CL

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9. Clutch Fluid Air Bleeding 30
10. Clutch Pedal 32
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1. General Description

A: SPECIFICATION

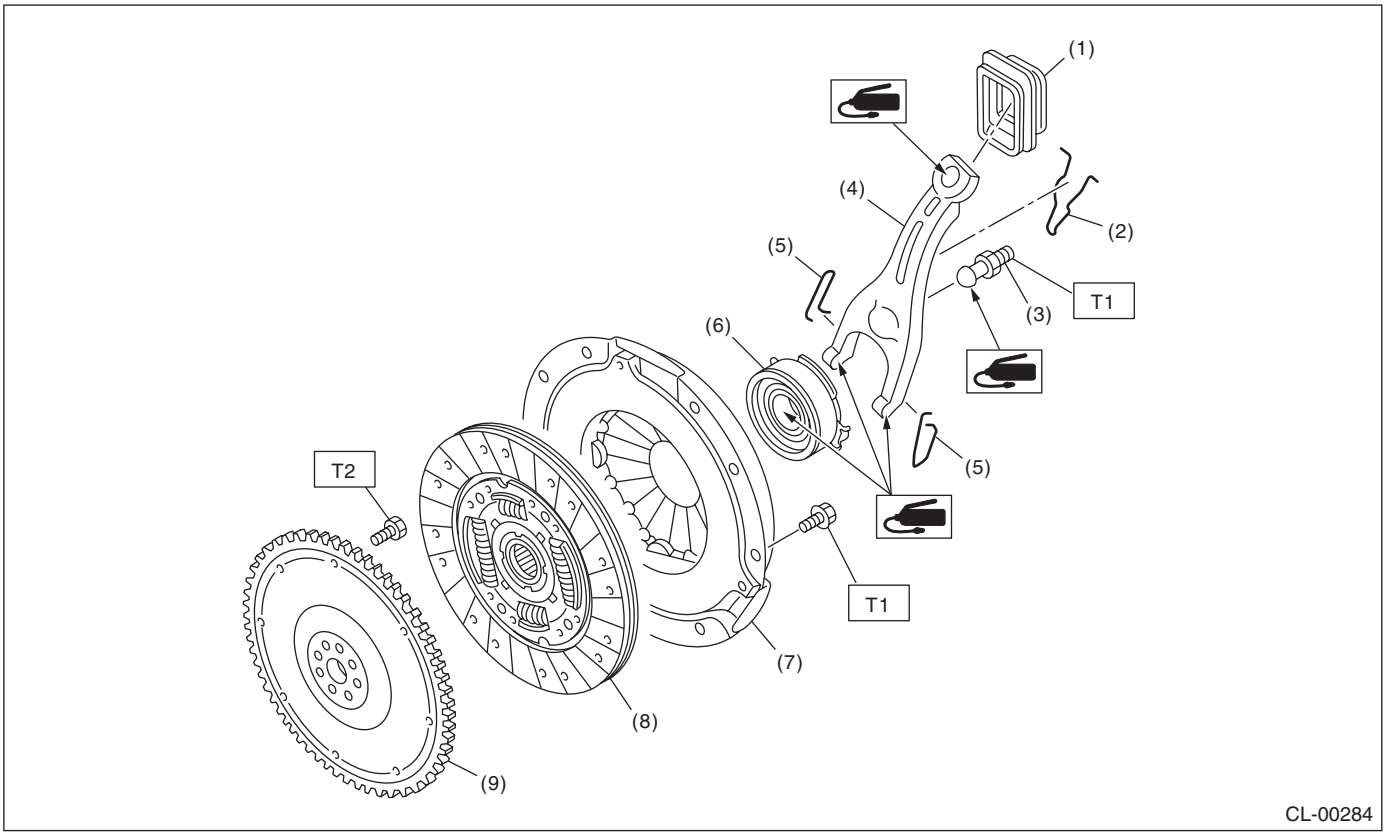
Model				2.0 L Non-turbo, 2.5 L LHD	2.0 L Turbo	2.5 L RHD	2.5 L Turbo
Clutch cover	Type			Push type	Pull type	Push type	Pull type
	Diaphragm set load		kgf (lbf)	580 (1,279)	800 (1,764)	580 (1,279)	800 (1,764)
Clutch disc	Facing material			Woven (Non asbestos)			
	O.D. × I.D. × Thickness	mm (in)	Flywheel side	225 × 150 × 3.5 (8.86 × 5.91 × 0.138)	230 × 155 × 3.5 (9.06 × 6.10 × 0.138)		
			Pressure plate side				
	Spline O.D.		mm (in)	25.2 (0.992), (No. of teeth: 24)			
Clutch release lever ratio				1.6	1.7	1.6	1.7
Release bearing				Grease-packed self-aligning			
Clutch pedal	Full stroke		mm (in)	130 — 135 (5.12 — 5.31)			
	Free play		mm (in)	4 — 12 (0.16 — 0.47)	3 — 13 (0.12 — 0.51)	4 — 12 (0.16 — 0.47)	
Clutch disc	Depth of rivet head mm (in)	Clutch cover side		1.65 — 2.25 (0.065 — 0.089)	1.65 — 2.25 (0.065 — 0.089)	1.65 — 2.25 (0.065 — 0.089)	1.65 — 2.25 (0.065 — 0.089)
		Flywheel side			1.35 — 1.95 (0.053 — 0.076)		1.35 — 1.95 (0.053 — 0.076)
		Limit of sinking		0.3 (0.012)			
	Limit for run out		mm (in)	0.8 (0.031) at R = 110 (4.33)	1.0 (0.039) at R = 110 (4.33)		

I.D.: Inner diameter
O.D.: Outer diameter

B: COMPONENT

1. CLUTCH ASSEMBLY

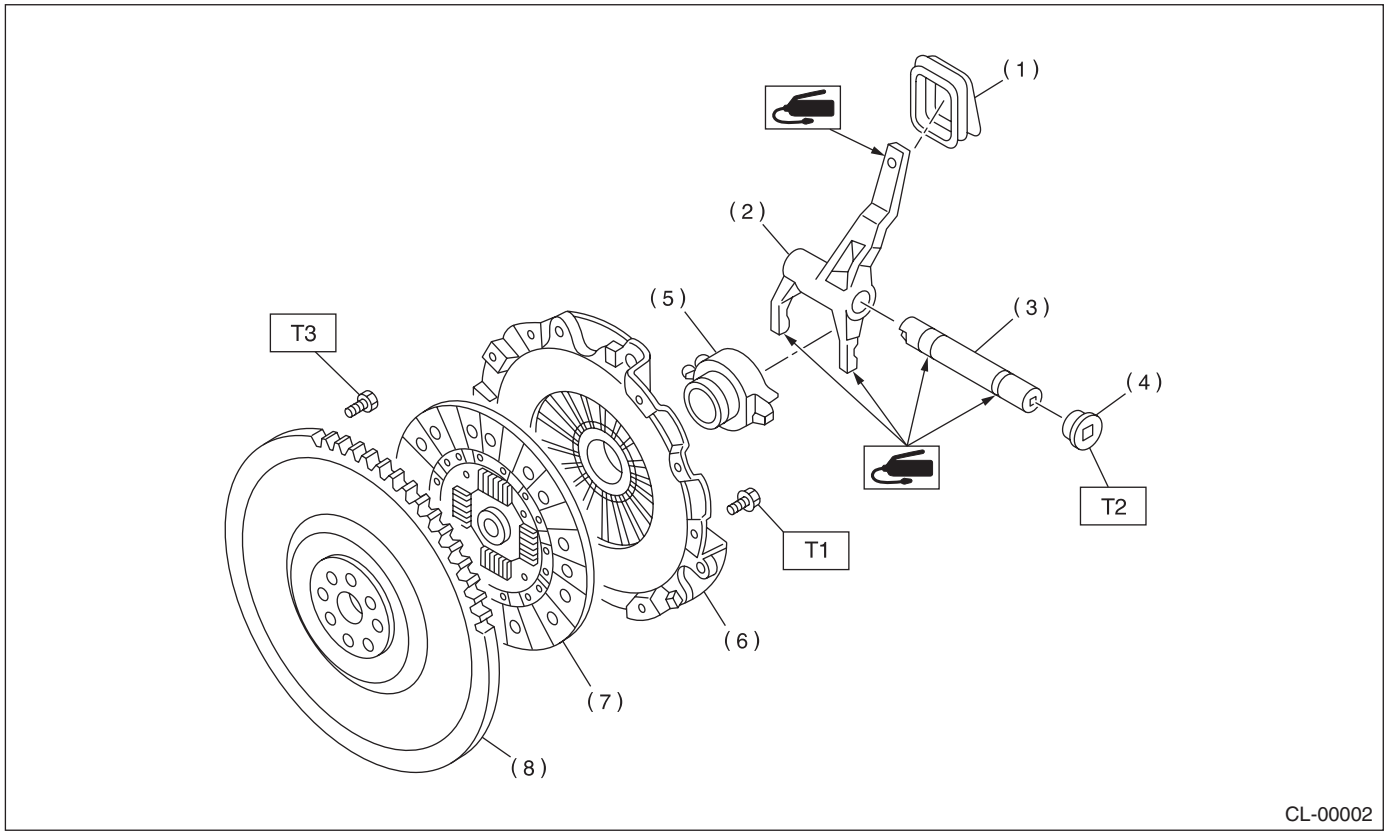
• NON-TURBO MODEL



(1)	Clutch release lever dust cover	(6)	Clutch release bearing
(2)	Retainer spring	(7)	Clutch cover
(3)	Pivot	(8)	Clutch disc
(4)	Clutch release lever	(9)	Flywheel
(5)	Clip		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 72 (7.3, 53.1)

• TURBO MODEL

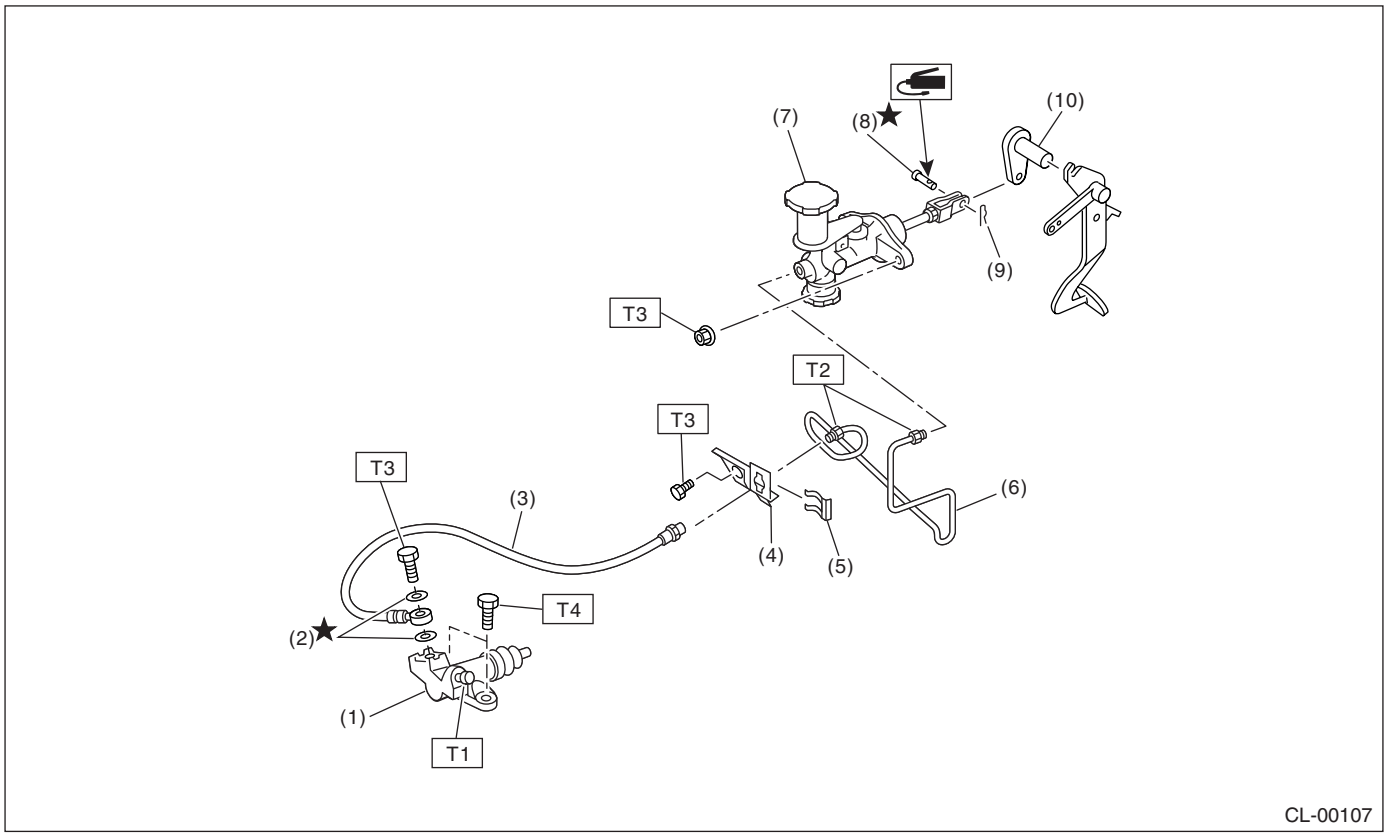


(1)	Clutch release lever dust cover	(5)	Clutch release bearing
(2)	Clutch release lever	(6)	Clutch cover
(3)	Clutch release lever shaft	(7)	Clutch disc
(4)	Plug	(8)	Flywheel

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 44 (4.5, 33)
T3: 72 (7.3, 53.1)

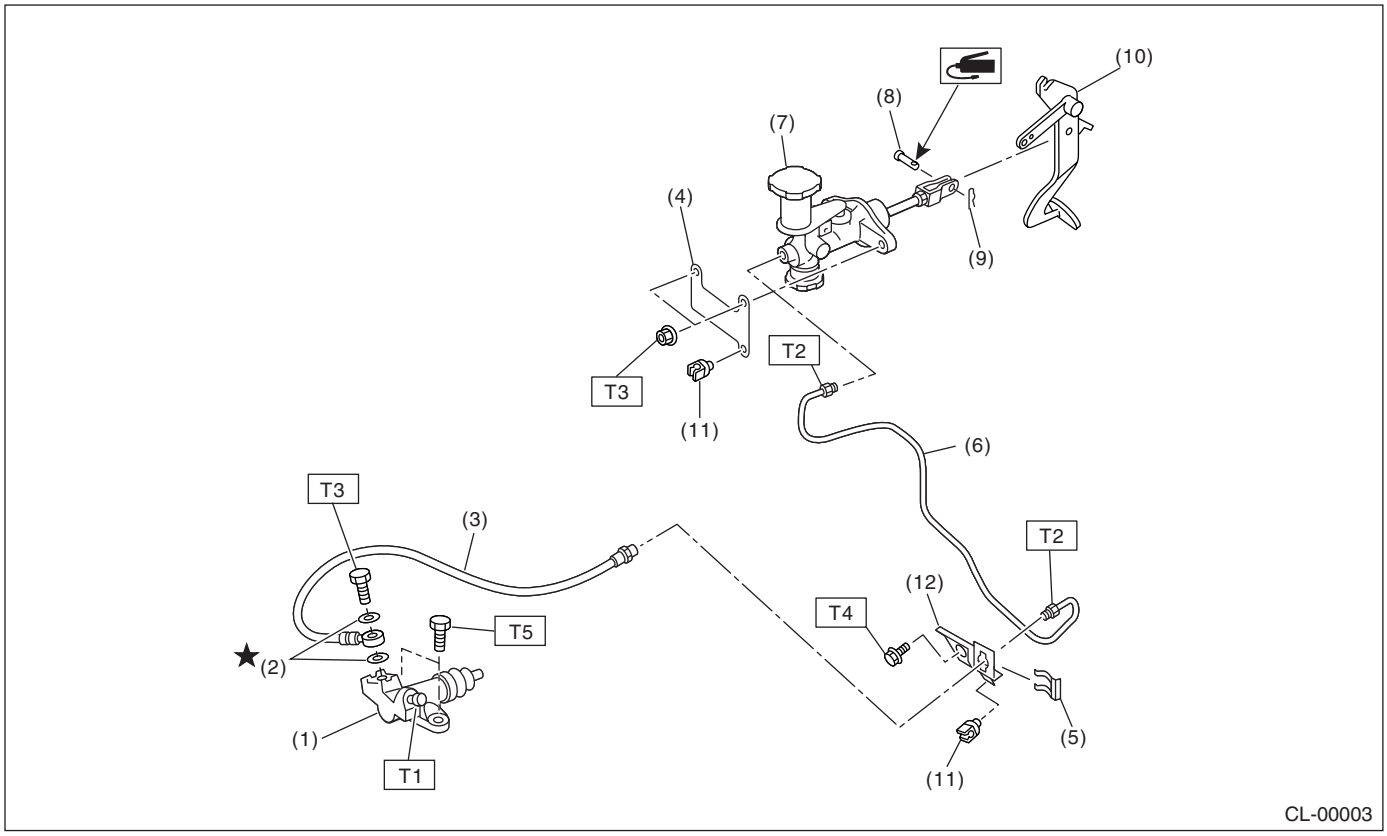
2. CLUTCH PIPE AND HOSE (NON-TURBO MODEL)

• LHD MODEL



(1)	Operating cylinder	(6)	Clutch pipe	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Washer	(7)	Master cylinder ASSY	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(8)	Clevis pin	***T2: 15 (1.5, 10.8)***
(4)	Bracket	(9)	Snap pin	***T3: 18 (1.8, 13.0)***
(5)	Clip	(10)	Lever	***T4: 37 (3.8, 27.5)***

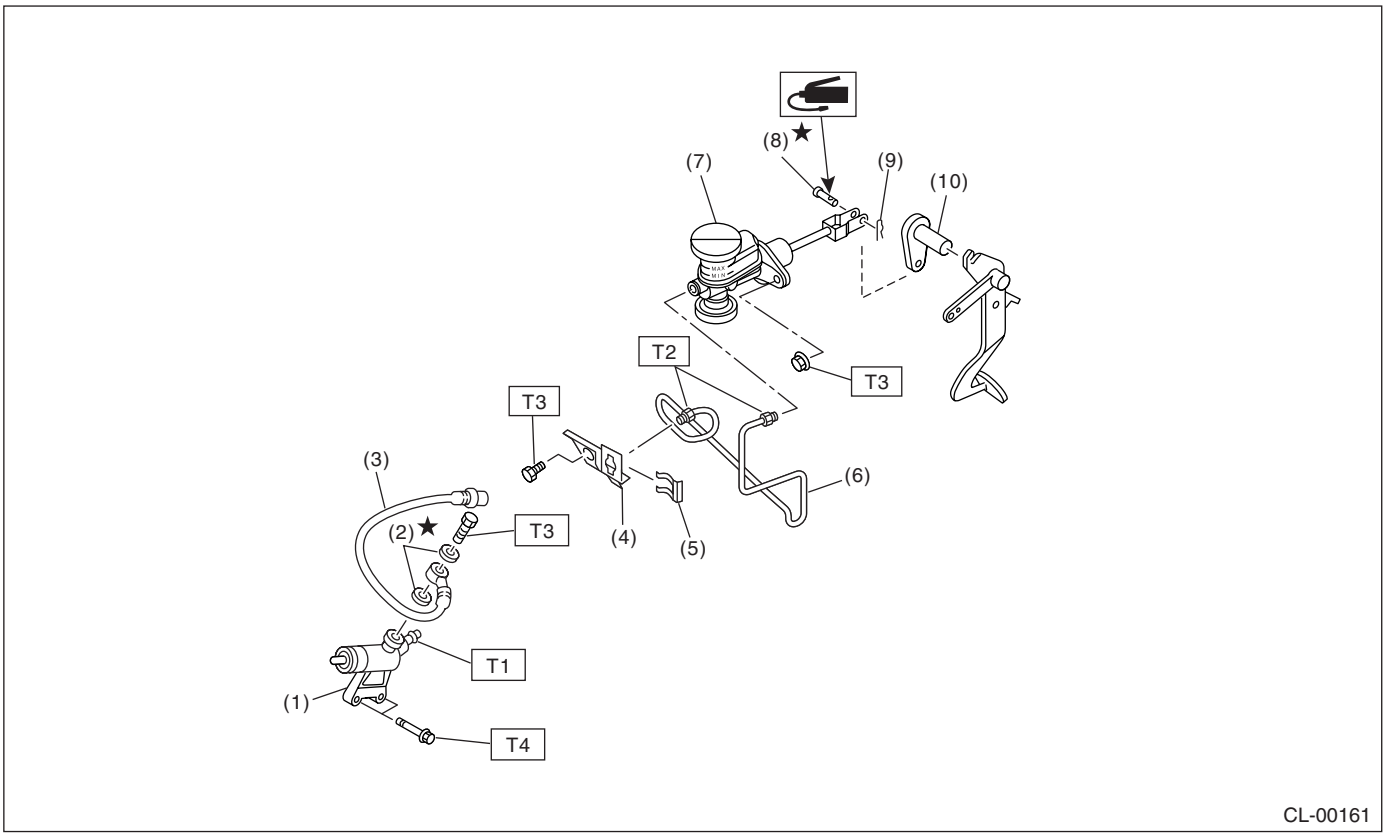
• RHD MODEL



(1)	Operating cylinder	(7)	Master cylinder ASSY	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Washer	(8)	Clevis pin	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(9)	Snap pin	***T2: 15 (1.5, 10.8)***
(4)	Bracket	(10)	Pedal	***T3: 18 (1.8, 13.0)***
(5)	Clamp	(11)	Clip	***T4: 25 (2.5, 18.1)***
(6)	Clutch pipe	(12)	Bracket	***T5: 37 (3.8, 27.5)***

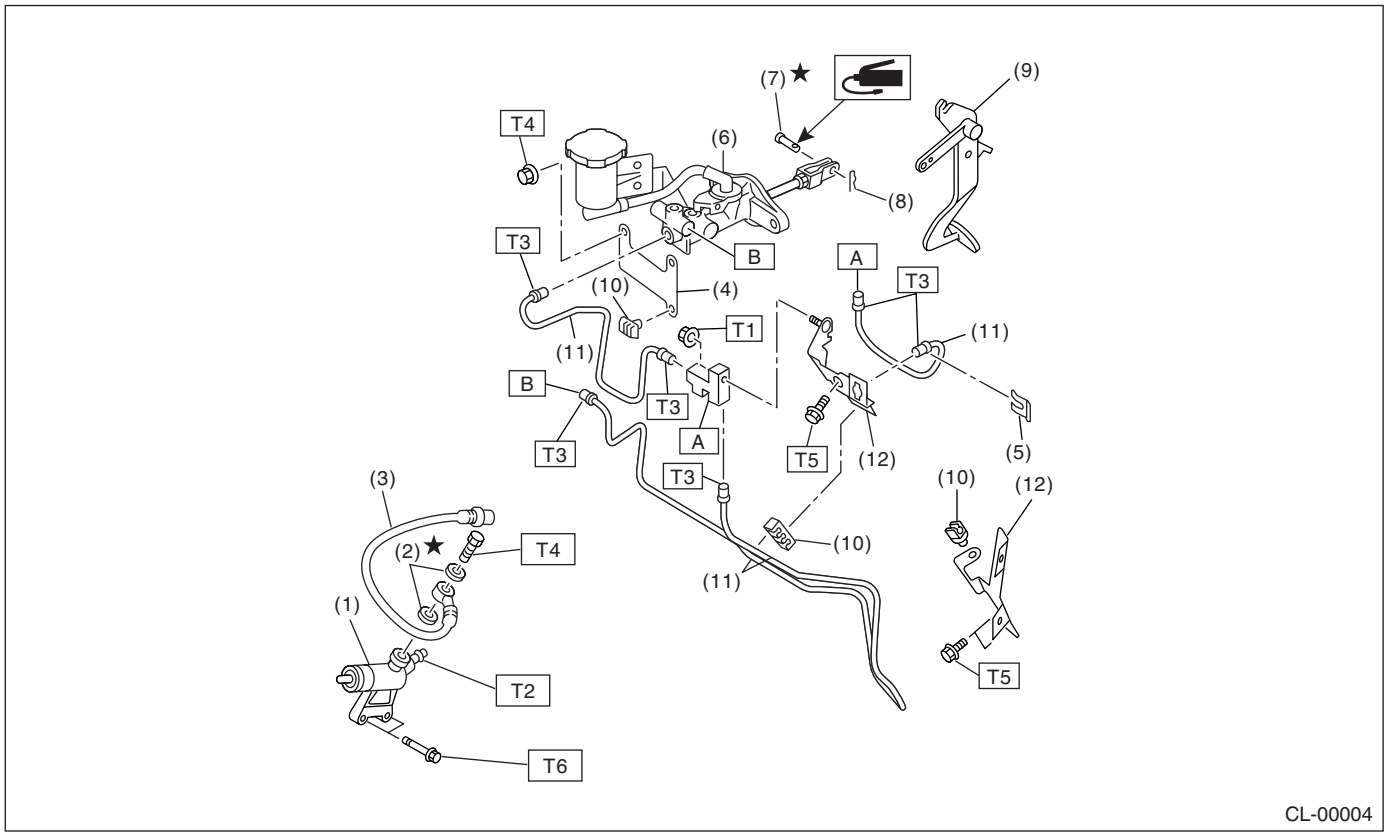
3. CLUTCH PIPE AND HOSE (TURBO MODEL)

• LHD MODEL



(1)	Operating cylinder	(6)	Clutch pipe	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Washer	(7)	Master cylinder ASSY	***T1: 8 (0.8, 5.8)***
(3)	Clutch hose	(8)	Clevis pin	***T2: 15 (1.5, 10.8)***
(4)	Bracket	(9)	Snap pin	***T3: 18 (1.8, 13.0)***
(5)	Clip	(10)	Lever	***T4: 37 (3.8, 27.5)***

• RHD MODEL

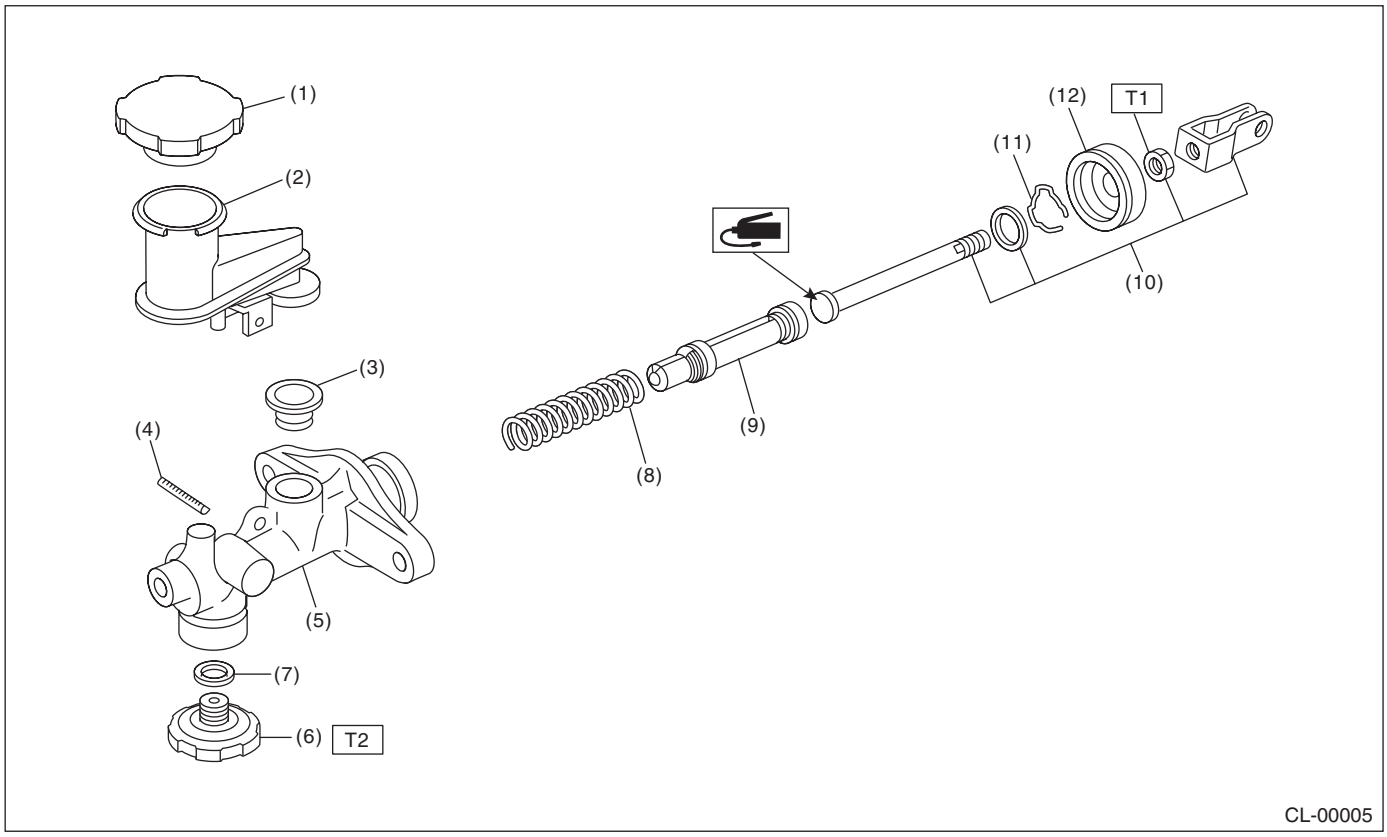


(1)	Operating cylinder	(7)	Clevis pin
(2)	Washer	(8)	Snap pin
(3)	Clutch hose	(9)	Pedal
(4)	Bracket	(10)	Clip
(5)	Clamp	(11)	Clutch pipe
(6)	Master cylinder ASSY	(12)	Bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 8 (0.8, 5.8)
T3: 15 (1.5, 10.8)
T4: 18 (1.8, 13.0)
T5: 25 (2.5, 18.1)
T6: 37 (3.8, 27.5)

4. MASTER CYLINDER

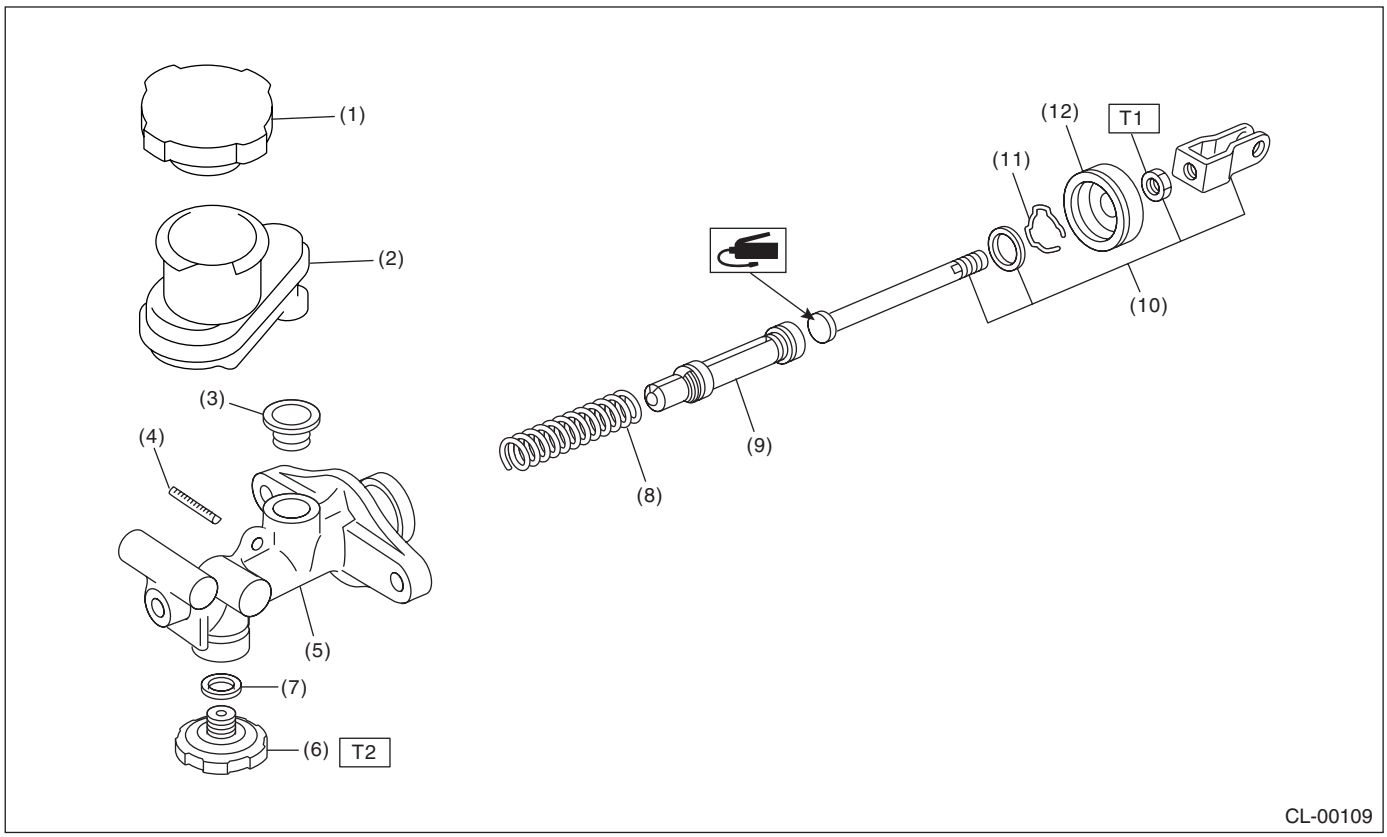
• NON-TURBO MODEL



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Clutch damper
(7) Gasket
(8) Return spring
(9) Piston
(10) Push rod
(11) Piston stop ring
(12) Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7.2)
T2: 46.6 (4.75, 34.4)

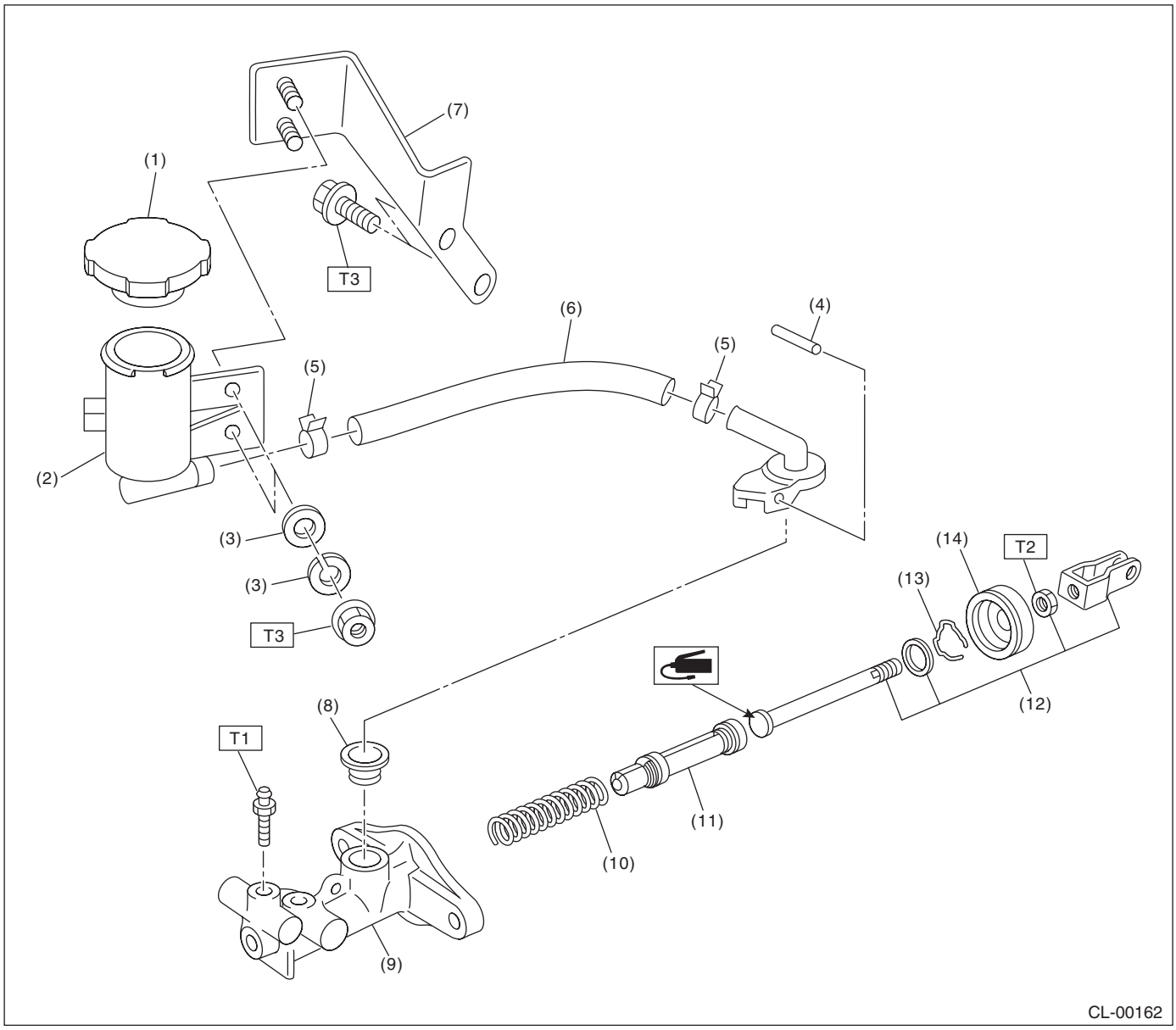
• LHD TURBO MODEL



(1)	Reservoir cap	(7)	Gasket
(2)	Reservoir tank	(8)	Return spring
(3)	Oil seal	(9)	Piston
(4)	Straight pin	(10)	Push rod
(5)	Master cylinder	(11)	Piston stop ring
(6)	Clutch damper	(12)	Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10 (1.0, 7.2)
T2: 46.6 (4.75, 34.4)

• RHD TURBO MODEL

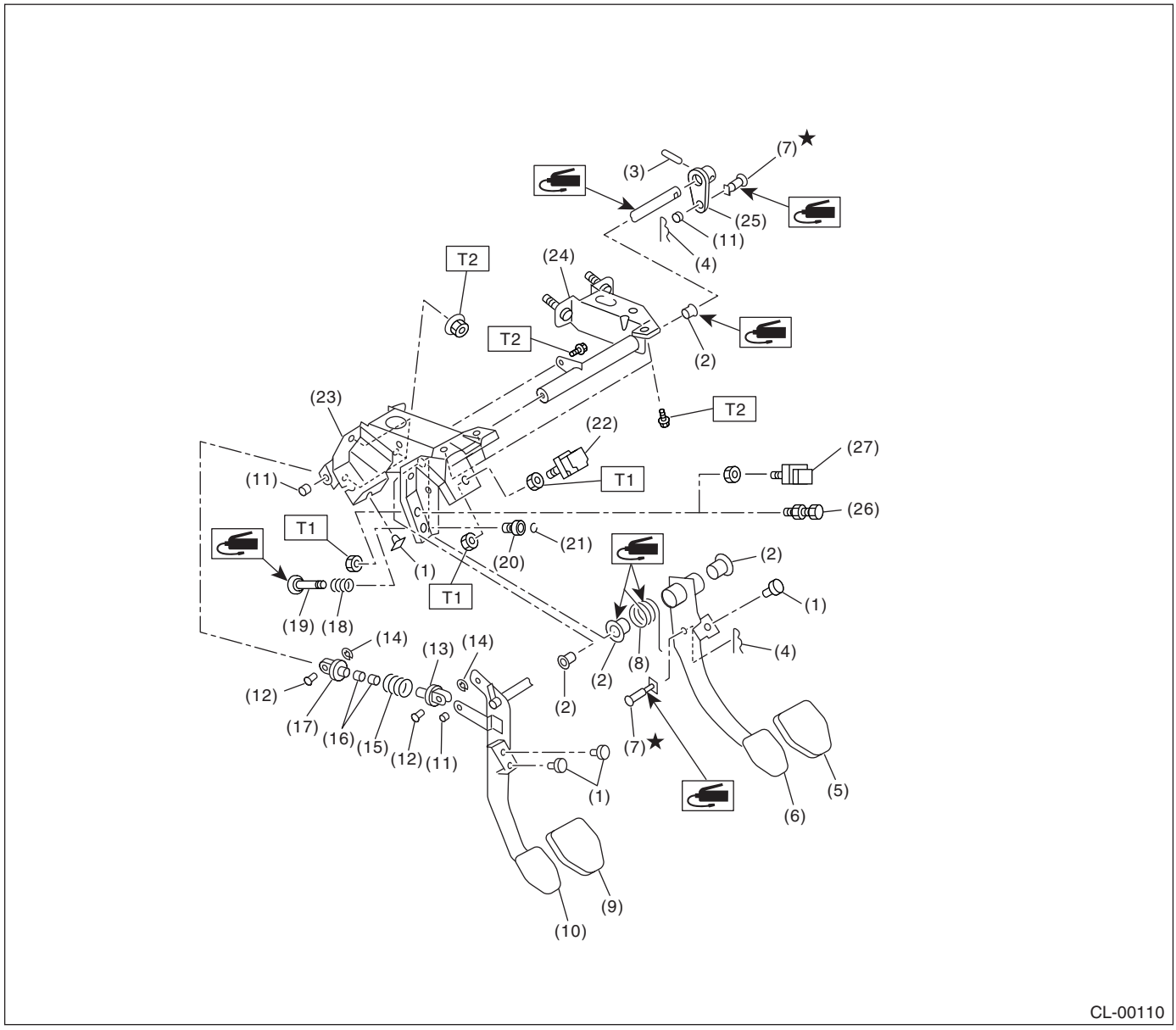


(1)	Reservoir cap	(8)	Oil seal
(2)	Reservoir tank	(9)	Master cylinder
(3)	Washer	(10)	Return spring
(4)	Straight pin	(11)	Piston
(5)	Clip	(12)	Push rod
(6)	Hose	(13)	Piston stop ring
(7)	Reservoir tank bracket	(14)	Cylinder boot

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7.2)
T3: 18 (1.8, 13.0)

5. CLUTCH PEDAL

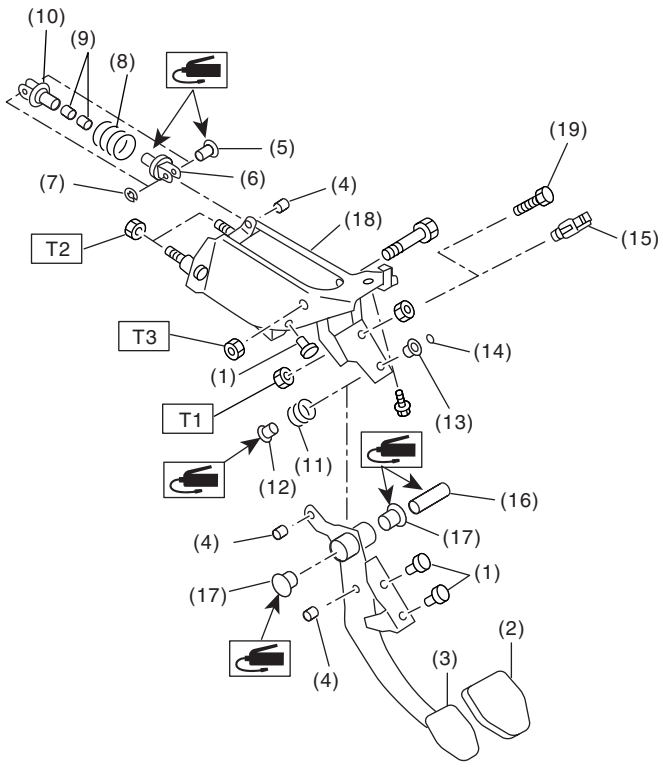
• LHD MODEL



(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring A
(19) Rod
(20) Bushing B
(21) Clip
(22) Stop light switch
(23) Pedal bracket
(24) Clutch master cylinder bracket
(25) Lever
(26) Adjusting bolt
(27) Clutch switch (Model with cruise control system)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)

• RHD MODEL



CL-00111

(1) Stopper
(2) Clutch pedal pad
(3) Clutch pedal
(4) Bushing
(5) Clutch clevis pin
(6) Assist rod A
(7) Clip
(8) Assist spring
(9) Assist bushing
(10) Assist rod B
(11) Spring A
(12) Rod S
(13) Bushing B
(14) Clip
(15) Clutch switch (Model with cruise control system)
(16) Spacer
(17) Bushing
(18) Pedal bracket
(19) Adjusting bolt

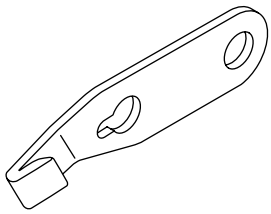
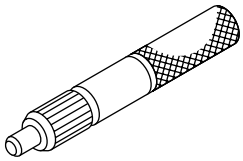
Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*8 (0.8, 5.8)*
T2:	*18 (1.8, 13.0)*
T3:	*30 (3.1, 22.1)*

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening tightening bolt, etc.
 ST-499747100	499747100	CLUTCH DISC GUIDE	Used when installing clutch disc to flywheel.

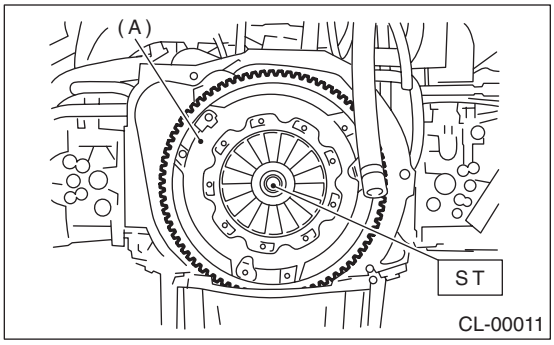
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Dial gauge	Used for measuring clutch disk run-out.

2. Clutch Disc and Cover

A: REMOVAL

1) Remove the transmission assembly from vehicle body. **<Ref. to 5MT-32,** REMOVAL, Manual Transmission Assembly.>
2) Install the ST on flywheel.
ST 499747100 CRANKSHAFT STOPPER



(A) Clutch cover

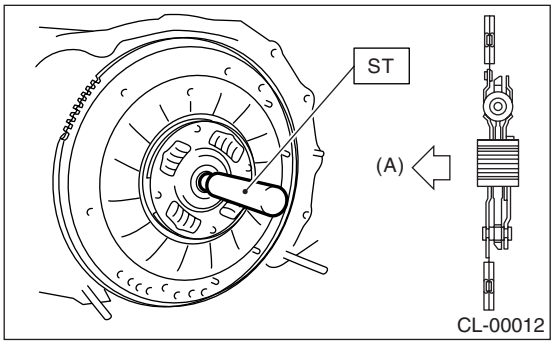
3) Remove the clutch cover and clutch disc.

NOTE:
• Take care not to allow oil on the clutch disc facing.
• Do not disassemble either the clutch cover or clutch disc.

B: INSTALLATION

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:
When installing the clutch disc, be careful to its direction.
ST 499747100 CLUTCH DISC GUIDE

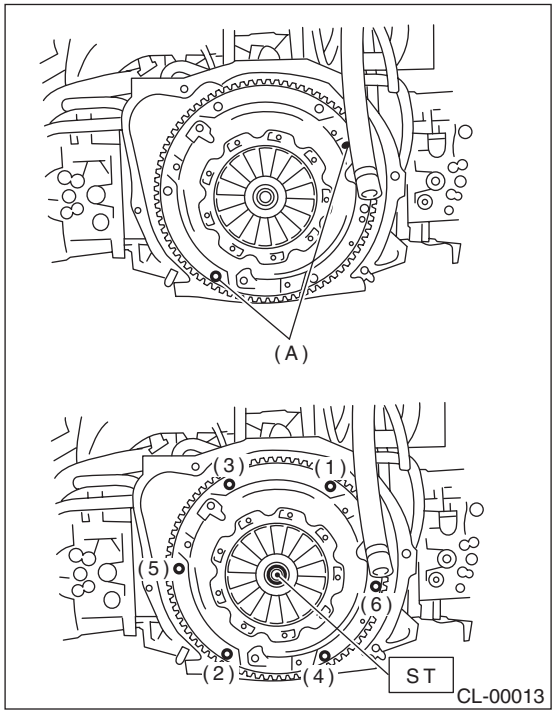


(A) Flywheel side

2) Position "0" marks on clutch cover and flywheel 120° apart, and then tighten the clutch cover installation bolts diagonally.

NOTE:
• "0" marks indicate the directions of residual unbalance.
• Temporarily tighten the bolts by hand. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



(A) "0" marks

3) Remove the ST.
ST 499747100 CLUTCH DISC GUIDE
4) Install the transmission assembly. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

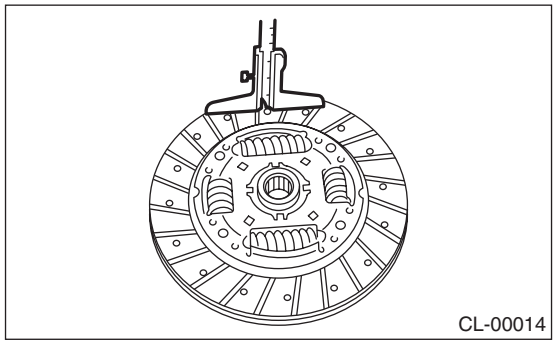
C: INSPECTION

1. CLUTCH DISC

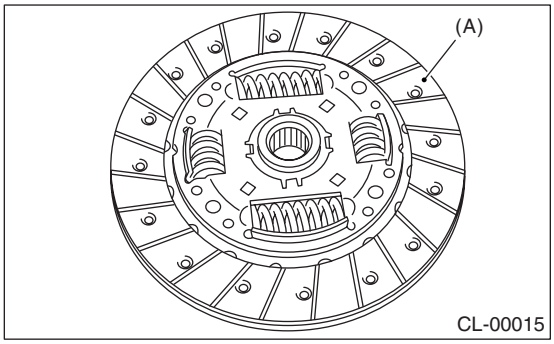
1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

Depth of rivet head:
Limit of sinking
0.3 mm (0.012 in)

NOTE:
Do not wash the clutch disc with any cleaning fluid.



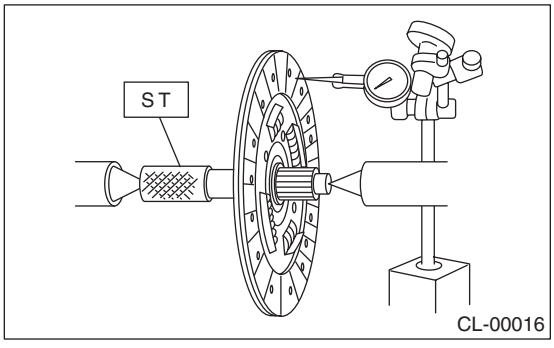
2) Hardened facing
Correct by using emery paper or replace.
3) Oil soakage on facing
Replace the clutch disc and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.



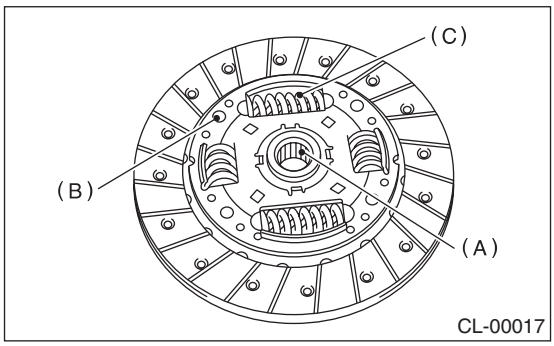
(A) Clutch facing

4) Run out on facing
If run out exceeds the specified value at the outer circumference of facing, repair or replace.
ST 499747100 CLUTCH DISC GUIDE

Limit for run out:
2.0 L Non-Turbo model and LHD 2.5 L Non-Turbo model:
0.8 (0.031 in) mm at R = 110 mm (4.33 in)
Turbo model and RHD 2.5 L Non-Turbo model:
1.0 (0.039 in) mm at R = 110 mm (4.33 in)



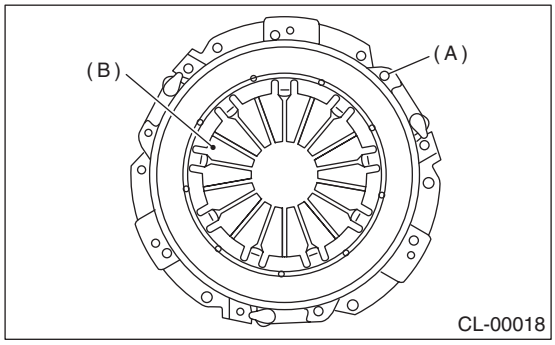
5) Worn spline, loose rivets and torsion spring failure.
Replace defective parts.



(A) Spline
(B) Rivet
(C) Torsion spring

2. CLUTCH COVER

NOTE:
Visually check for the following items without disassembling, and replace or repair if defective.
1) Loose thrust rivet.
2) Damaged or worn bearing contact area at center of diaphragm spring.

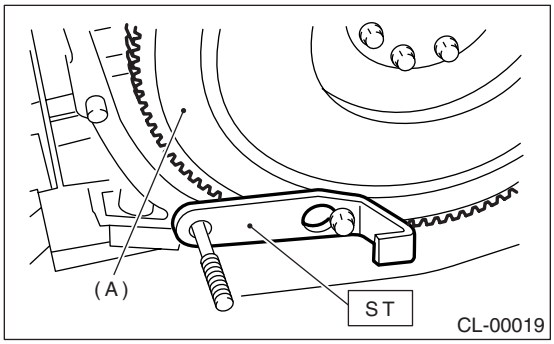


(A) Thrust rivet
(B) Diaphragm spring

3. Flywheel

A: REMOVAL

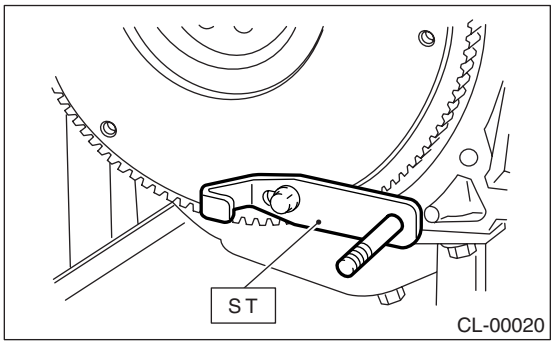
1) Remove the transmission assembly. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. **<Ref. to CL-16,** REMOVAL**, Clutch Disc and Cover.>**
3) Using the ST, remove the flywheel.
ST 498497100 CRANKSHAFT STOPPER



(A) Flywheel

B: INSTALLATION

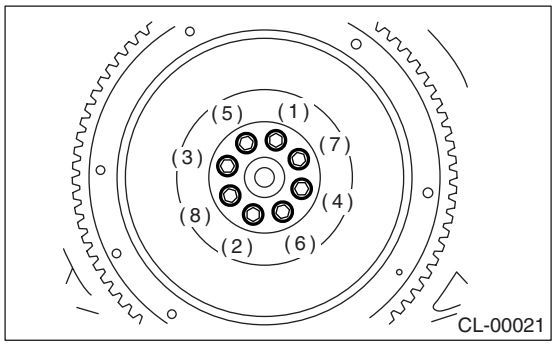
1) Install the flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:
Tighten the flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
72 N·m (7.3 kgf-m, 53.1 ft-lb)

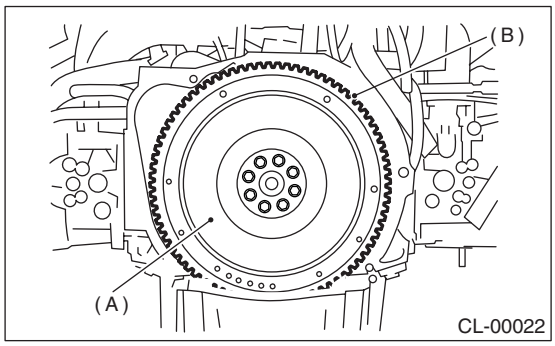


3) Install the clutch disc and cover. **<Ref. to CL-16,** INSTALLATION**, Clutch Disc and Cover.>**
4) Install the transmission assembly. **<Ref. to 5MT-35,** INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

CAUTION:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent.

1) Damage of facing and ring gear
If defective, replace the flywheel.



(A) Flywheel
(B) Ring gear

2) Smoothness of rotation
Rotate the ball bearing applying pressure in thrust direction.
3) If noise or excessive play is noted, replace the flywheel.

4. Release Bearing and Lever

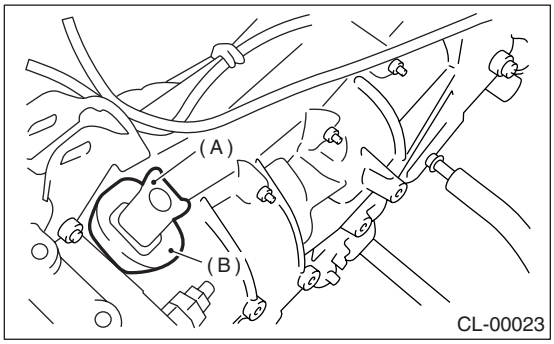
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the transmission assembly from vehicle body.
<Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the two clips from clutch release lever and remove the release bearing.

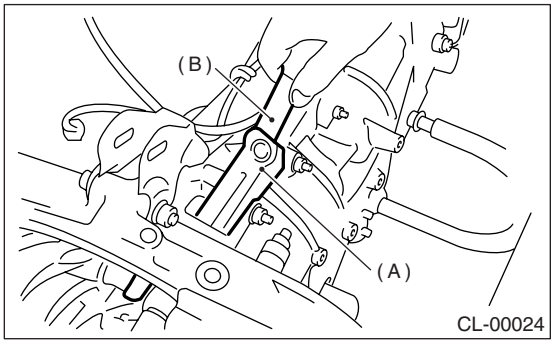
CAUTION:
Be careful not to deform clips.

3) Remove the release lever dust cover.



(A) Clutch release lever
(B) Release lever dust cover

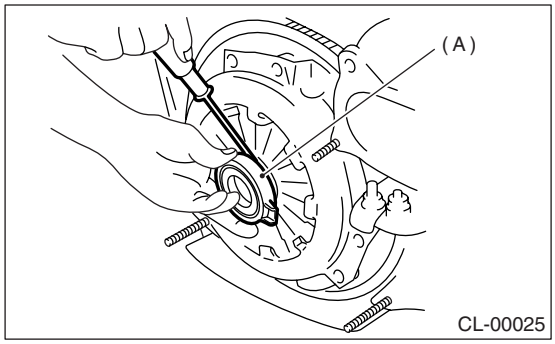
4) Remove the release lever retainer spring from release lever pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove the release lever.



(A) Clutch release lever
(B) Screwdriver

2. TURBO MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to 5MT-32, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever from transmission.
3) Put the clutch release bearing in engine side.
4) Remove the clutch release bearing from the clutch cover using flat tip screwdriver.



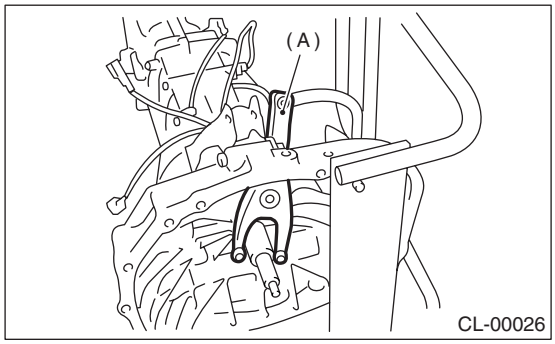
(A) Clutch release bearing

B: INSTALLATION

1. NON-TURBO MODEL

1) Before assembly, lubricate the following points with a coat of grease.
- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline (Use grease containing molybdenum disulfide.)
- Contact surface of lever and operating cylinder

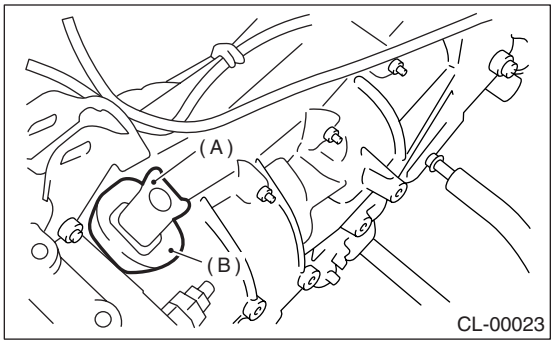
2) While pushing the fork to pivot and twisting it to both sides, fit the retainer spring onto the constricted portion of pivot.
Apply grease (SUNLIGHT 2: Part No. 003602010) to the contact point of release lever and operating cylinder.
3) Confirm that the retainer spring is securely fitted by observing it through the main case hole.



(A) Release lever

4) Install the release bearing and fasten it with two clips.

5) Install the release lever dust cover.

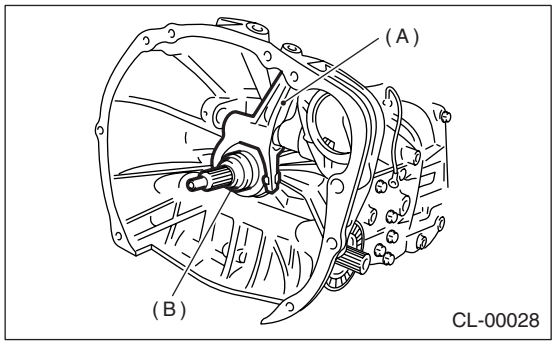


(A) Release lever
(B) Release lever dust cover

6) Verify that the bearing moves smoothly with operating release fork.
7) Install the transmission assembly.
<Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

2. TURBO MODEL

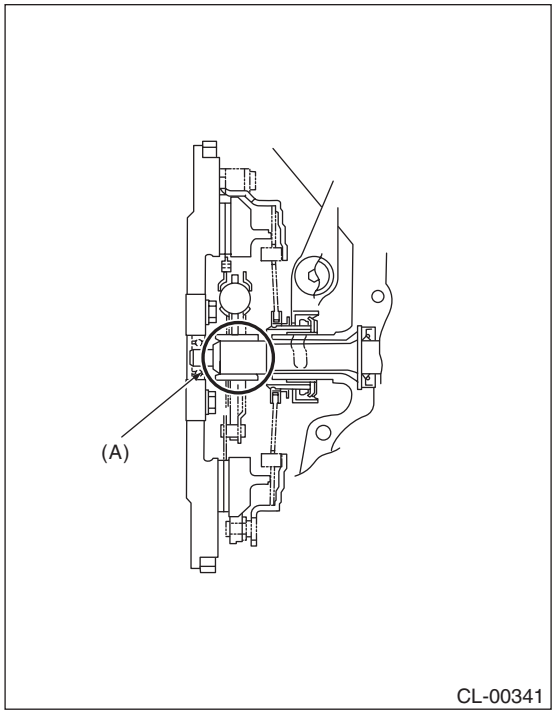
1) Install the release bearing on transmission.
2) Insert the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

3) Apply grease to the specified points:

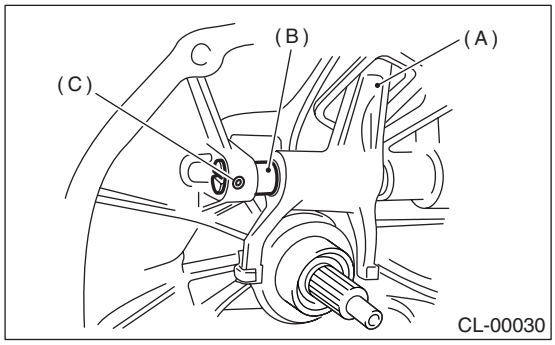
Grease:
FX2200 (Part No. 000040901)



(A) Spline

4) Insert the release fork shaft into release fork.

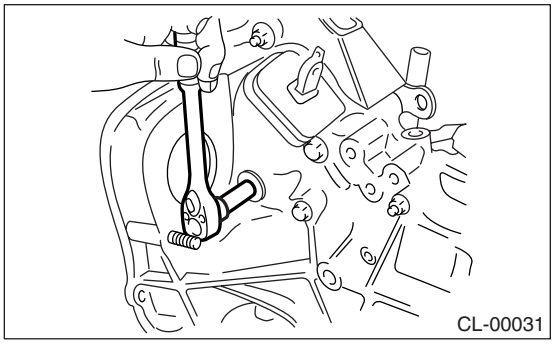
NOTE:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

5) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)



6) Move the release fork to ensure that release bearing and release fork move smoothly.
7) Install the transmission assembly. <Ref. to 5MT-35, INSTALLATION, Manual Transmission Assembly.>

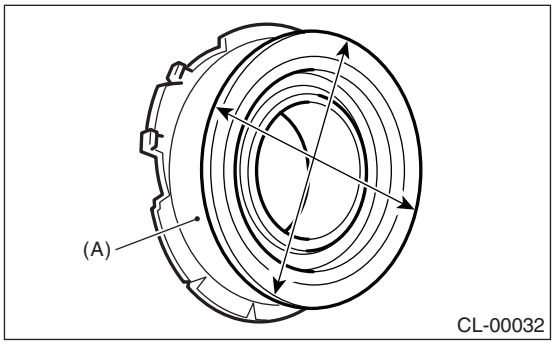
C: INSPECTION

1. RELEASE BEARING

CAUTION:
Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent when servicing the clutch.

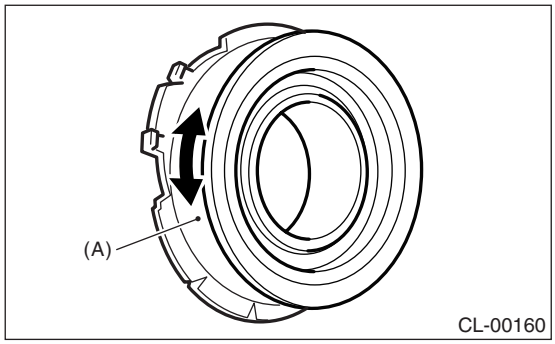
1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
1.6 mm (0.063 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

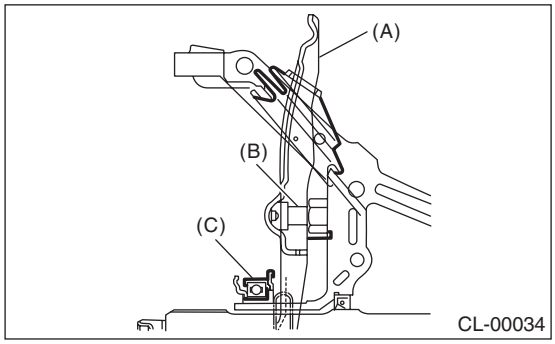


(A) Bearing case

3) Check wear and damage of the bearing case surface contacting with lever.

2. RELEASE LEVER

Check the lever pivot portion and the point of contact with release bearing case for wear.



(A) Clutch release lever
(B) Pivot
(C) Clutch release bearing

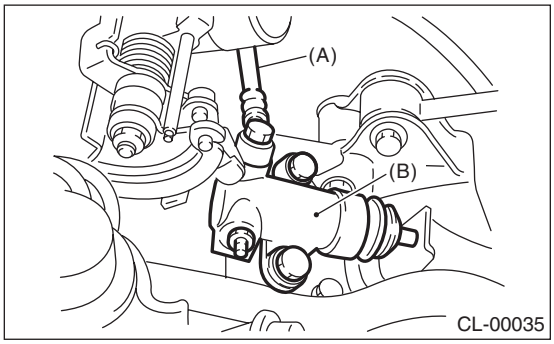
5. Operating Cylinder

A: REMOVAL

1) Remove the air cleaner case and air intake duct (Non-turbo model). **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.> <Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.>**
2) Remove the intercooler (Turbo model). <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
3) Remove the clutch hose from operating cylinder.

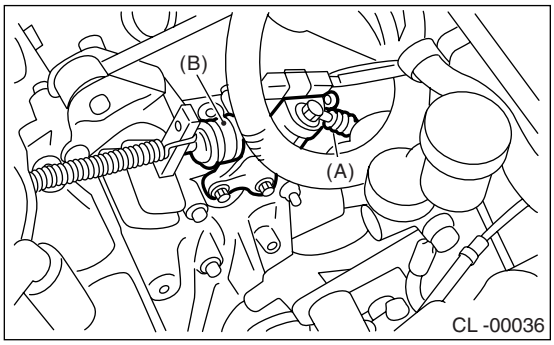
NOTE:
Cover the hose joint to prevent clutch fluid from flowing out.

- NON-TURBO model



(A) Clutch hose
(B) Operating cylinder

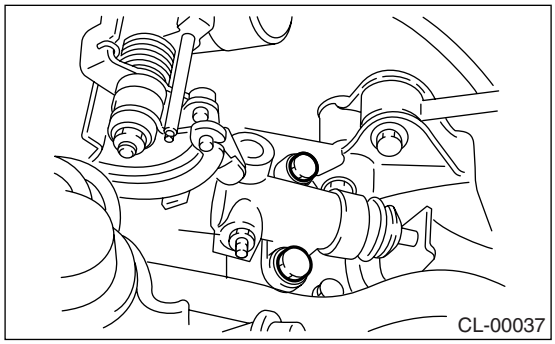
- TURBO model



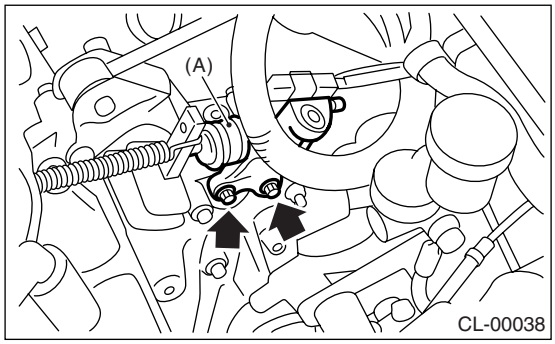
(A) Clutch hose
(B) Operating cylinder

4) Remove the operating cylinder from transmission.

- NON-TURBO model



- TURBO model



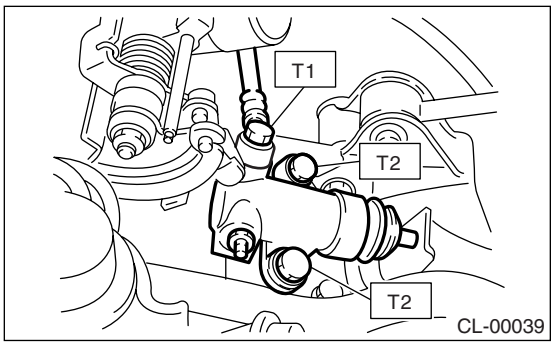
(A) Operating cylinder

B: INSTALLATION

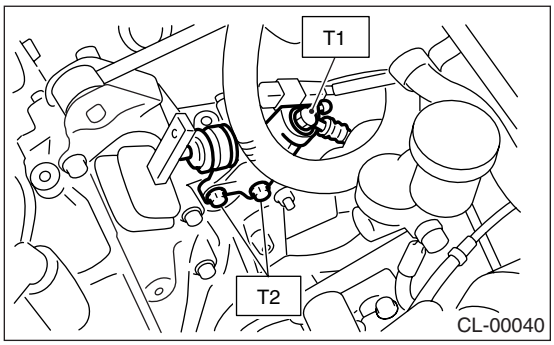
1) Apply grease (SUNLIGHT 2: Part No. 003602010) to the contact point of the release lever and operating cylinder.
2) Install in the reverse order of removal.
Before installing the operating cylinder, apply grease (SUNLIGHT 2: Part No. 003602010) to contact point of the release lever and operating cylinder.

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

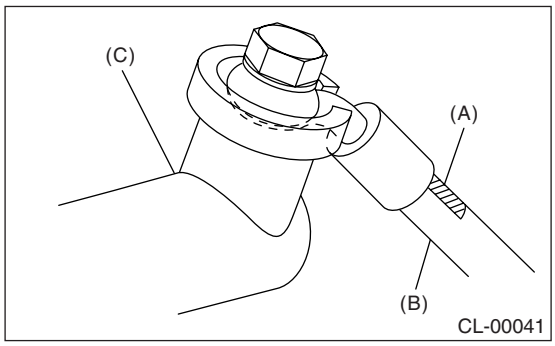
- NON-TURBO model



- TURBO model



NOTE:
- Be sure to install the clutch hose with the mark side facing upward.
- Be careful not to twist the clutch hose during installation.



(A) Marking
(B) Clutch hose
(C) Operating cylinder

3) After bleeding air from the operating cylinder, ensure that clutch operates properly.
<Ref. to CL-30, Clutch Fluid Air Bleeding.>

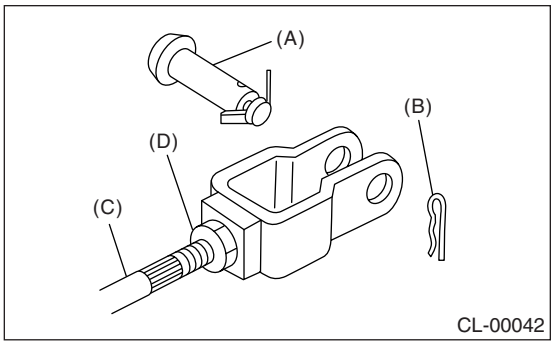
C: INSPECTION

1) Check the operating cylinder for damage. If operating cylinder is damaged, replace it.
2) Check the operating cylinder for fluid leakage or damage on boot. If any leakage or damage is found, replace the operating cylinder.

6. Master Cylinder

A: REMOVAL

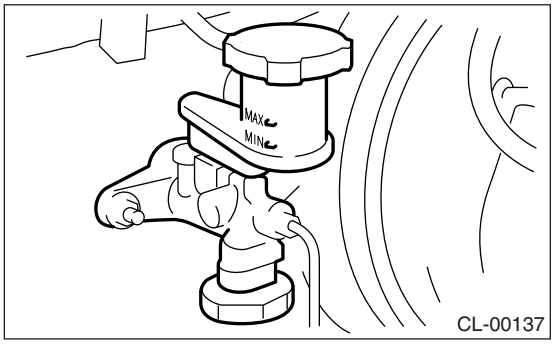
1) Thoroughly drain the brake fluid from reservoir tank.
2) Remove the snap pin, clevis pin and separate the push rod of master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Push rod lock nut

3) Remove the air cleaner case and air intake duct (Non-turbo model). **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.> <Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.>**
4) Remove the intercooler (Turbo model). <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
5) Remove the clutch pipe from master cylinder.
6) Remove the master cylinder with reservoir tank.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.

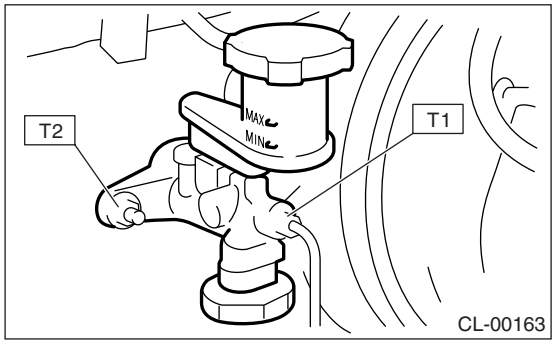


B: INSTALLATION

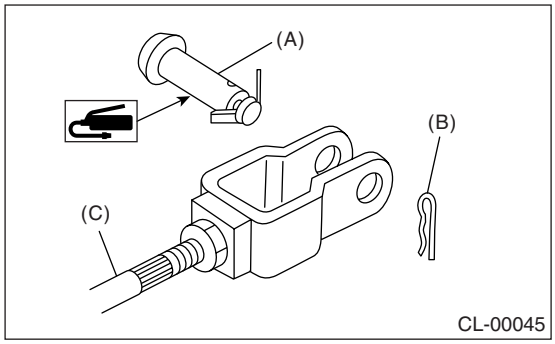
1) Install the master cylinder to body, and install the clutch pipe to master cylinder.

NOTE:
Check that the pipe is routed properly.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



2) Apply a coat of grease to the clevis pin.
3) Connect the push rod of master cylinder to clutch pedal, and install the new clevis pin and snap pin.



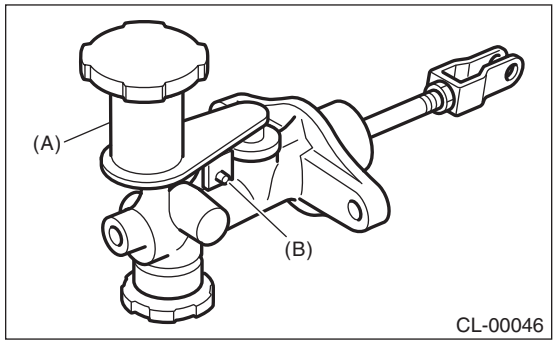
(A) Clevis pin
(B) Snap pin
(C) Push rod

4) After bleeding air from the system, ensure that clutch operates properly.
<Ref. to CL-30, Clutch Fluid Air Bleeding.>
5) Install the air cleaner case and air intake duct (Non-turbo model). **<Ref. to IN(H4SO)-6,** INSTALLATION**, Air Cleaner Case.> <Ref. to IN(H4SO)-7,** INSTALLATION**, Air Intake Duct.>**
6) Install the intercooler (Turbo model). <Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>

C: DISASSEMBLY

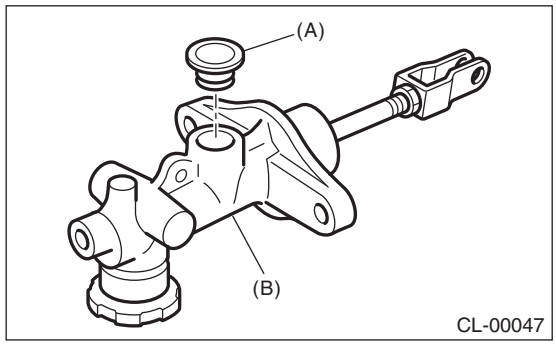
1. EXCEPT RHD TURBO MODEL

1) Remove the straight pin and reservoir tank.



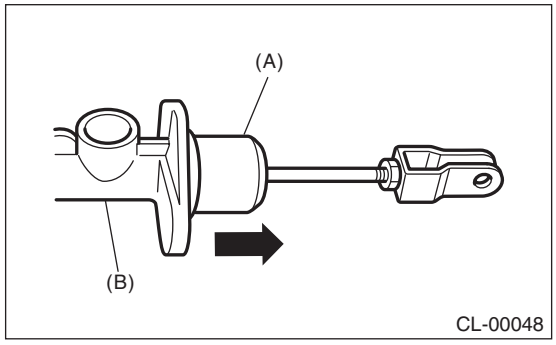
(A) Reservoir tank
(B) Straight pin

2) Remove the oil seal.



(A) Oil seal
(B) Master cylinder

3) Move the cylinder boot backward.



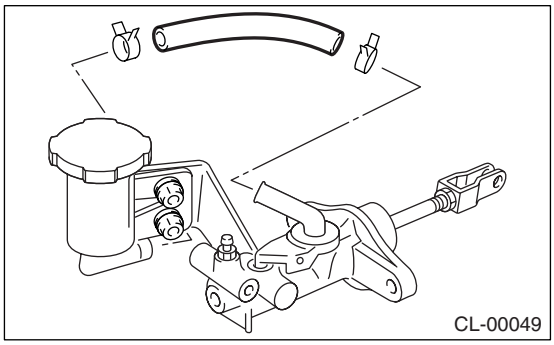
(A) Cylinder boot
(B) Master cylinder

4) Remove the stop ring.

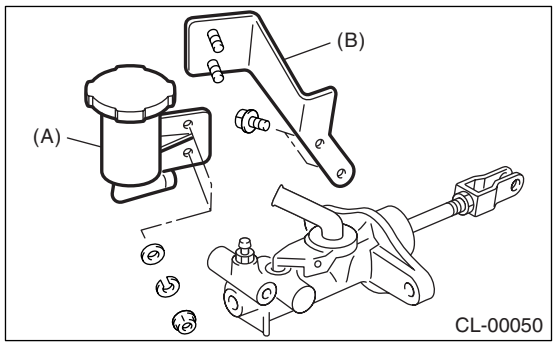
CAUTION:
Be careful when removing the stop ring to prevent the rod, washer, piston and return spring from flying out.

2. RHD TURBO MODEL

1) Remove the hose.

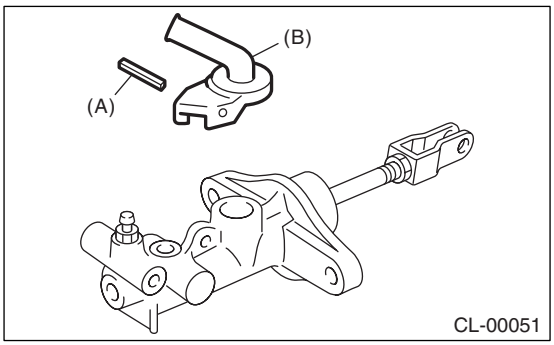


2) Remove the reservoir tank and bracket.



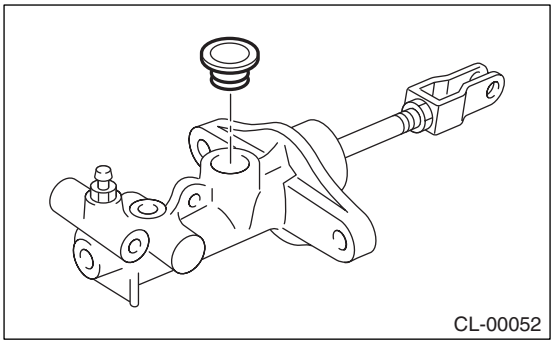
(A) Reservoir tank
(B) Bracket

3) Remove the straight pin and adapter.

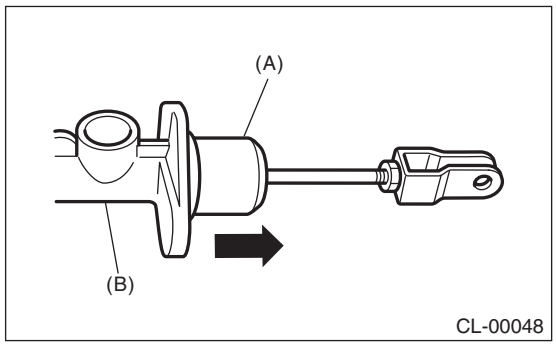


(A) Straight pin
(B) Adapter

4) Remove the oil seal.



5) Move the cylinder boot backward.



(A) Cylinder boot
(B) Master cylinder

6) Remove the stop ring.

CAUTION:
Be careful when removing the stop ring to prevent the rod, washer, piston and return spring from flying out.

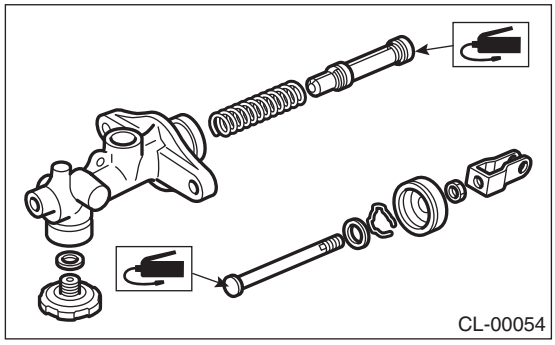
7) Remove the air bleeder.

D: ASSEMBLY

1. EXCEPT RHD TURBO MODEL

1) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.
2) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:
SILICONE GREASE G40M (Part No. 004404003)



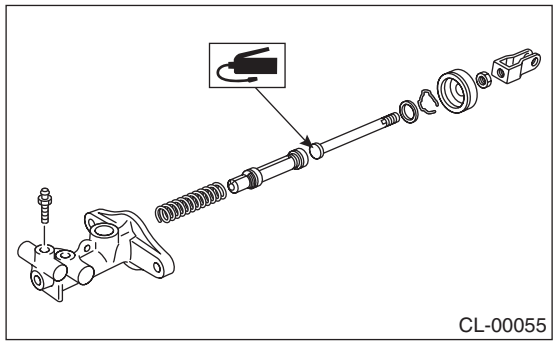
3) To assemble the master cylinder, reverse the sequence of disassembly procedure.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)

2. RHD TURBO MODEL

1) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

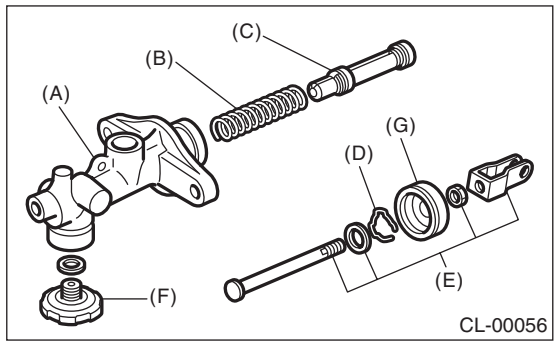
Grease:
SILICONE GREASE G40M (Part No. 004404003)



2) Assemble in the reverse order of disassemble.

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring, gasket, cylinder boot and hose replace the faulty part.



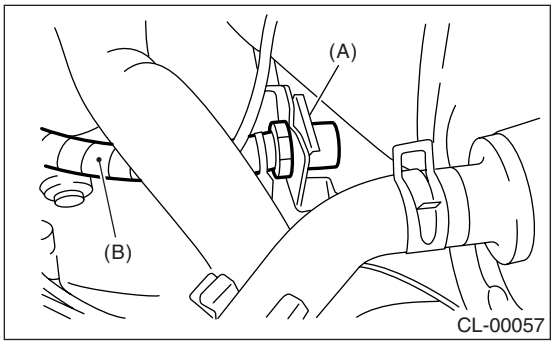
(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Stop ring
(E) Rod ASSY
(F) Clutch damper
(G) Cylinder boot

7. Clutch Pipe and Hose

A: REMOVAL

1. EXCEPT RHD TURBO MODEL

1) Remove the air cleaner case and air intake chamber.
2) Drain the clutch fluid. **<Ref. to CL-29, Clutch Fluid.>**
3) Remove the clutch pipe from the clutch hose and master cylinder.
4) Pull out the clamp, then remove the clutch hose from bracket.

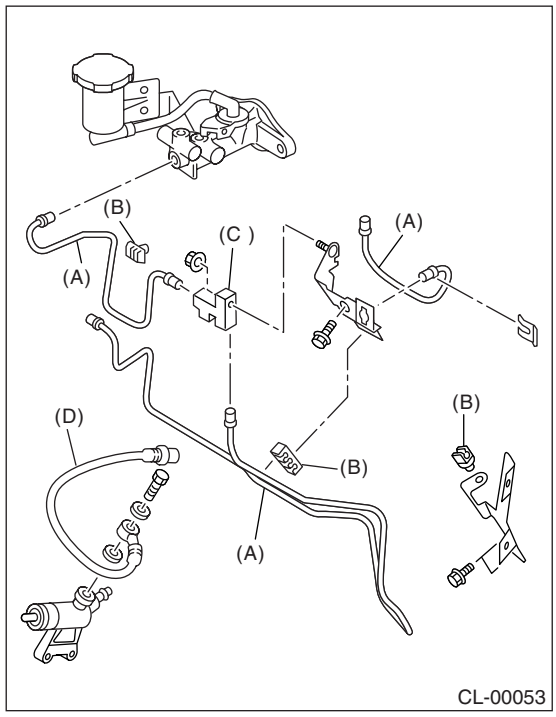


(A) Clamp
(B) Clutch hose

5) Remove the hose from operating cylinder.
6) Remove the bracket.

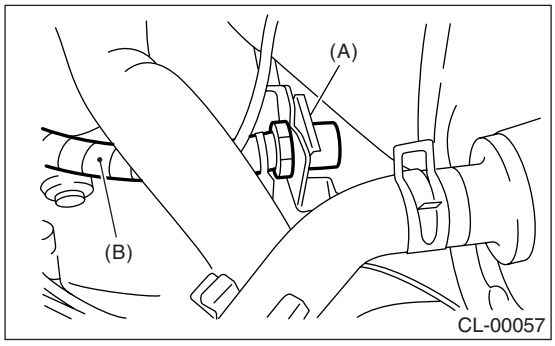
2. RHD TURBO MODEL

1) Remove the intercooler. **<Ref. to IN(H4DOTC 2.0)-10,** REMOVAL, Intercooler.>
2) Drain the clutch fluid. **<Ref. to CL-29, Clutch Fluid.>**
3) Remove the clutch pipe from the master cylinder, connector and clutch hose.



(A) Clutch pipe
(B) Clip
(C) Connector
(D) Clutch hose

4) Pull out the clamp, then remove the clutch hose from bracket.



(A) Clamp
(B) Clutch hose

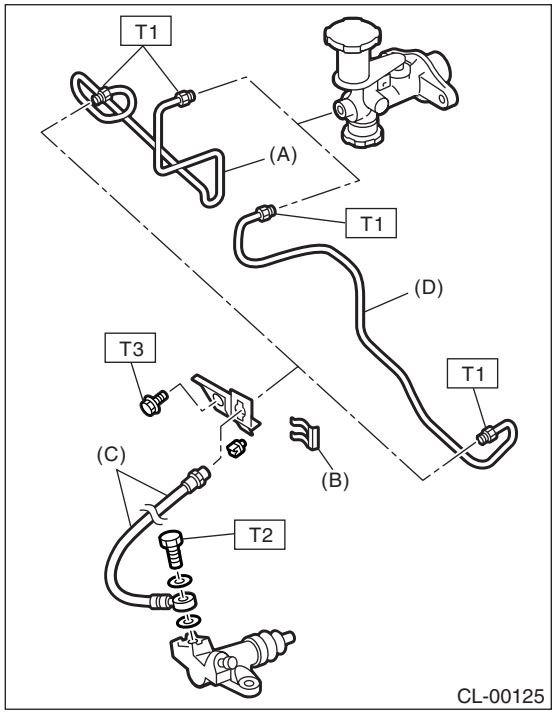
5) Remove the hose from operating cylinder.
6) Remove the bracket.

B: INSTALLATION

1. EXCEPT RHD TURBO MODEL

Install in the reverse order of removal.

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T3: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

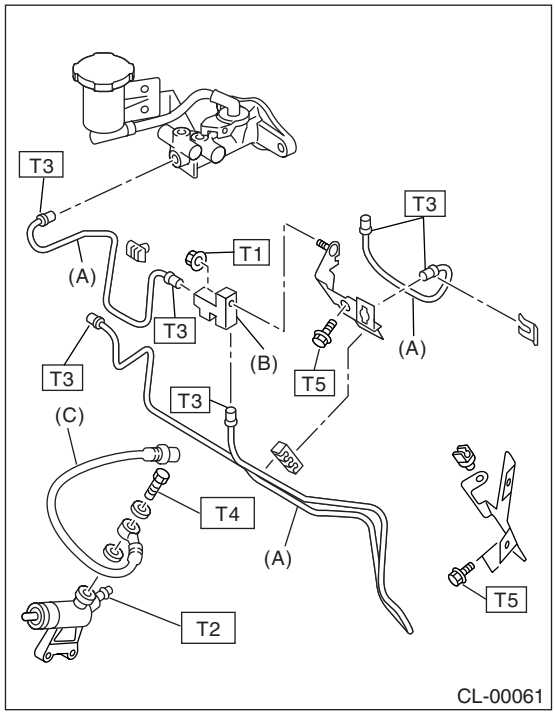


(A) Clutch pipe (LHD model)
(B) Clip
(C) Clutch hose
(D) Clutch pipe (RHD model)

2. RHD TURBO MODEL

Install in the reverse order of removal.

Tightening torque:
T1: 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
T2: 8 N·m (0.8 kgf-m, 5.8 ft-lb)
T3: 15 N·m (1.5 kgf-m, 10.8 ft-lb)
T4: 18 N·m (1.8 kgf-m, 13.0 ft-lb)
T5: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Clutch pipe
(B) Connector
(C) Clutch hose

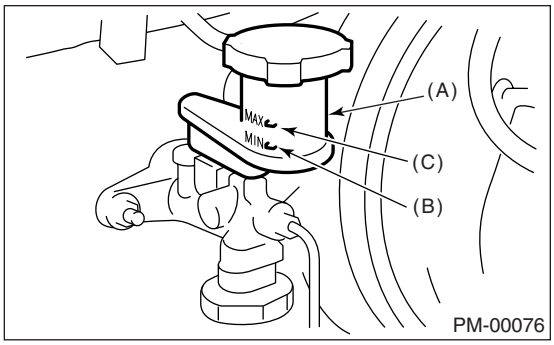
C: INSPECTION

Check the pipes and hoses for cracks, breakage, or damage. Check the joints for fluid leakage. If any cracks, breakage, damage, or leakage is found, repair or replace the applicable pipe or hose.

8. Clutch Fluid

A: INSPECTION

1) Park the vehicle on a level surface.
2) Inspect the fluid level using scale on the outside of the reservoir tank. If the level is below “MIN”, add fluid to bring it up to “MAX”, and also inspect for leakage.



(A) Reservoir tank
(B) MIN level
(C) MAX level

B: REPLACEMENT

CAUTION:
• The FMVSS No. 116, fresh DOT3 or DOT4 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
For convenience and safety, it is advisable to have two men working.

1) Remove the air cleaner case and air chamber.
2) Either jack-up the vehicle and place a rigid rack under it, or lift-up the vehicle.
3) Draw out the brake fluid from reservoir tank with syringe.
4) Refill the reservoir tank with new recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

5) Drain fluid in the same method as air bleeding.
6) Refill the brake fluid before reservoir tank becomes empty, and drain contaminated fluid again.
7) Repeat the above procedure until the contaminated fluid is completely drained.

9. Clutch Fluid Air Bleeding

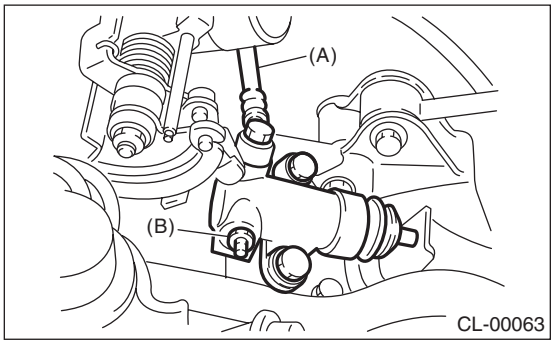
A: PROCEDURE

1. NON-TURBO MODEL

NOTE:
Bleed air from the oil line with help of co-worker.

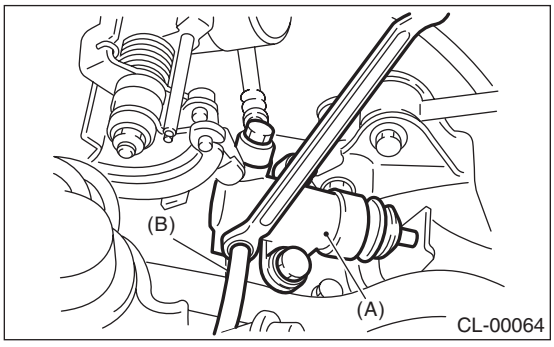
1) Remove the air cleaner case and air intake duct. **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.> <Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.>**

2) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



(A) Clutch hose
(B) Air bleeder

3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid. Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.



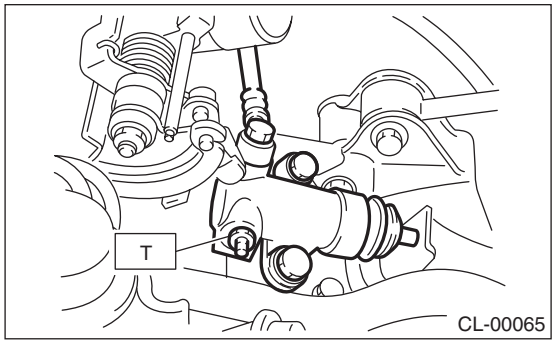
(A) Operating cylinder
(B) Vinyl tube

4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

5) Tighten the air bleeder.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



6) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
7) After bleeding air from the system, ensure that clutch operates properly.

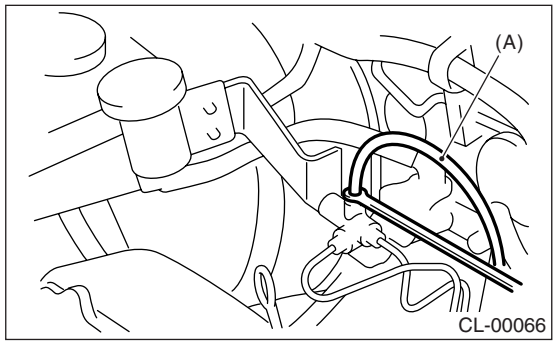
2. TURBO MODEL

NOTE:
Bleed air from the oil line with help of co-worker.

1) Remove the intercooler. <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>

2) Fit one end of a vinyl tube into the air bleeder of master cylinder and put the air bleeder of other end into a brake fluid container. (RHD turbo model)

3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid. Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal. (RHD turbo model)



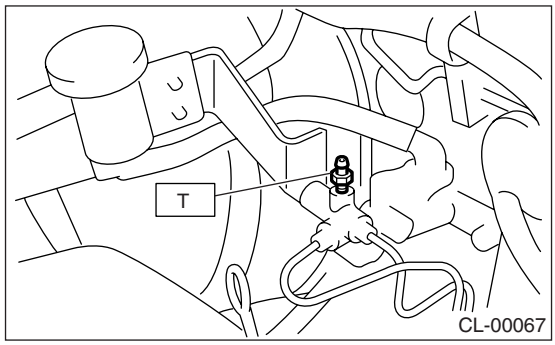
(A) Vinyl tube

4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover the bleeder with waste cloth when loosening to prevent brake fluid from being splashed over surrounding parts.

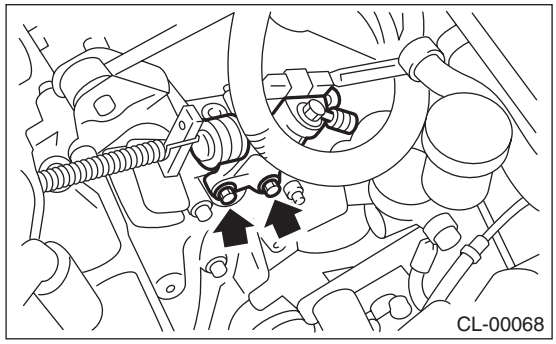
5) Tighten the air bleeder. (RHD turbo model)

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

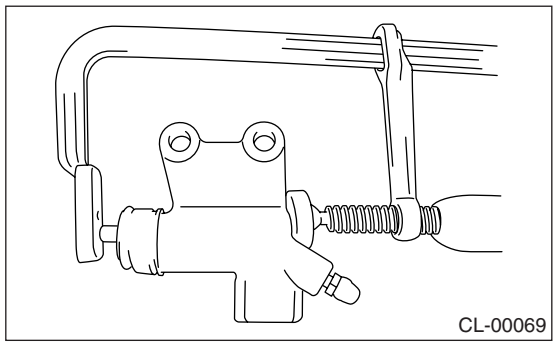


6) Remove the operating cylinder.

NOTE:
Do not remove the clutch hose.



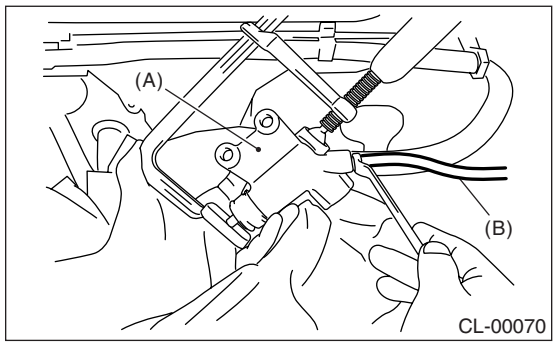
7) Fix the piston with clamp to avoid the piston from jumping out.



8) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.

9) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

NOTE:
Set the air breather screw part higher than tip of operating cylinder when performing this procedure.



(A) Operating cylinder
(B) Vinyl tube

10) Repeat these steps until there are no more air bubbles in the vinyl tube.

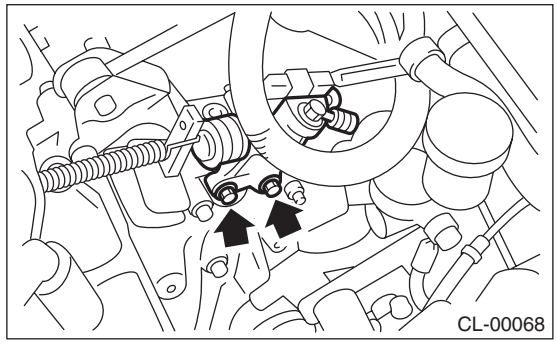
CAUTION:
Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

11) Tighten the air bleeder.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

12) Install the operating cylinder.

Tightening torque:
T: 37 N·m (3.8 kgf-m, 27.5 ft-lb)



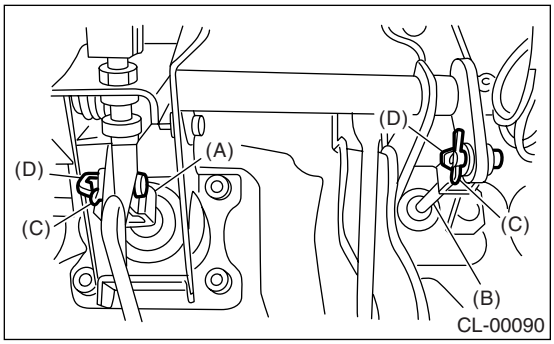
13) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
14) After bleeding air from the system, ensure that clutch operates properly.
15) Install the intercooler. <Ref. to IN(H4DOTC 2.0)-11, INSTALLATION, Intercooler.>

10.Clutch Pedal

A: REMOVAL

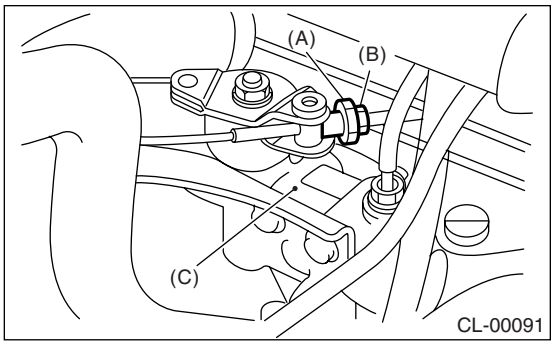
1. LHD MODEL

1) Remove the steering column. <Ref. to PS-21, REMOVAL, Tilt Steering Column.>
2) Disconnect the connectors from stop light switch and clutch switch.
3) Remove the snap pins which secure lever to push rod and operating rod.
4) Remove the clevis pins which secure lever to push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

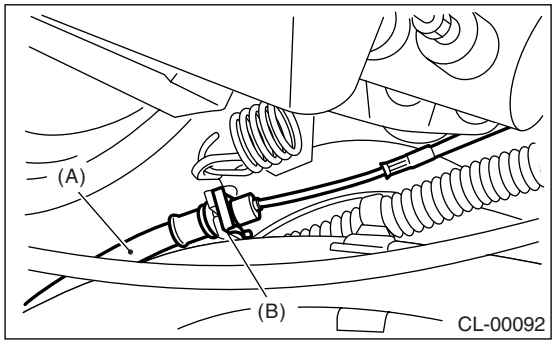
5) Remove the accelerator pedal. <Ref. to SP(H4SO)-4, REMOVAL, Accelerator Pedal.>
6) Remove the air cleaner case and intake duct. (Non-turbo model) **<Ref. to IN(H4SO)-6,** REMOVAL**, Air Cleaner Case.> <Ref. to IN(H4SO)-7,** REMOVAL**, Air Intake Duct.>**
7) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC 2.0)-10, REMOVAL, Intercooler.>
8) Remove the PHV adjusting nut and lock nut. (Model with hill holder)



(A) Adjusting nut
(B) Lock nut
(C) PHV

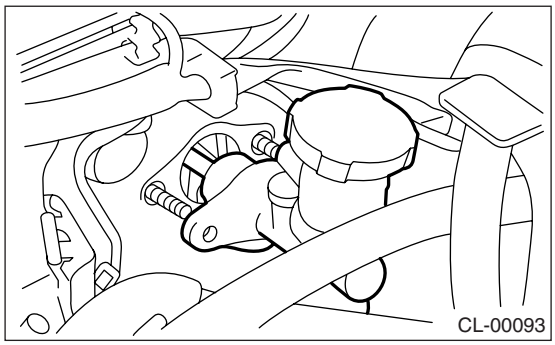
9) Remove the cable clamp, and disconnect the PHV cable from PHV. (Model with hill holder)

CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting the PHV cable.



(A) PHV cable
(B) Clamp

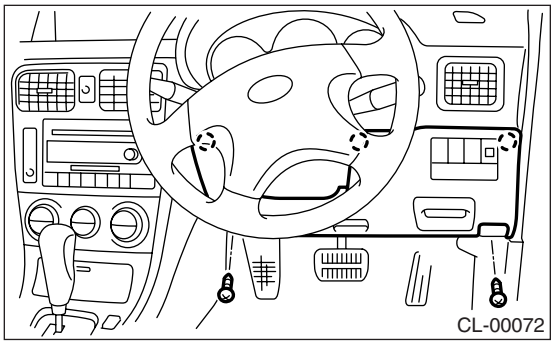
10) Remove the nut which secures clutch master cylinder.



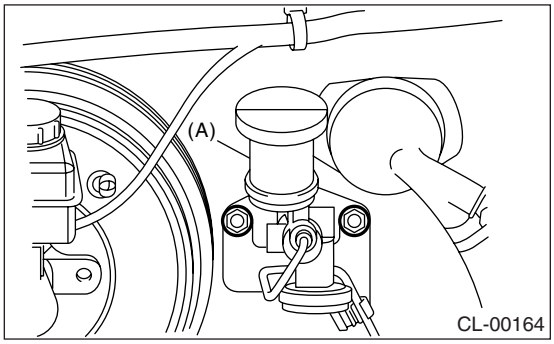
11) Remove the bolts and nuts which secure brake and clutch pedals, and remove the pedal assembly.

2. RHD MODEL

1) Disconnect the ground cable from battery.
2) Loosen the screws and clips, and then remove the lower cover.

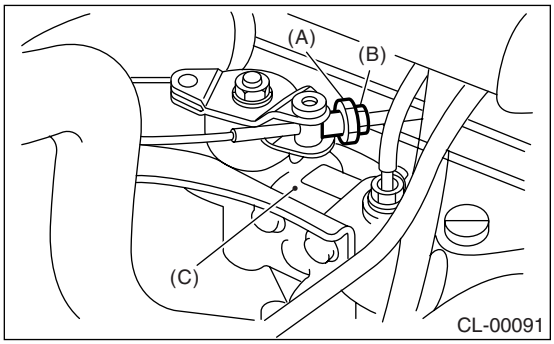


3) Disconnect the clutch switch connector. (Model with cruise control system)
4) Remove the snap pin connecting clutch pedal and clutch master cylinder rod, and then pull the clevis pin out.
5) Remove the clutch master cylinder mounting nut.



(A) Master cylinder

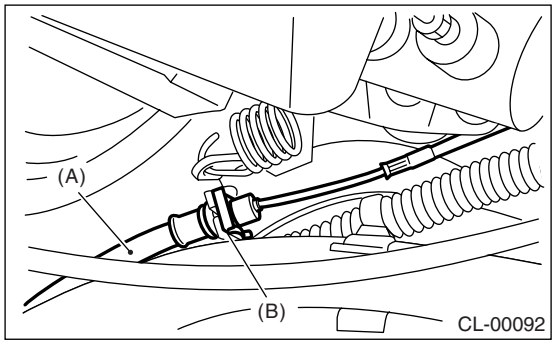
6) Remove the PHV adjusting nut and the lock nut. (Model with hill holder)



(A) Adjusting nut
(B) Lock nut
(C) PHV

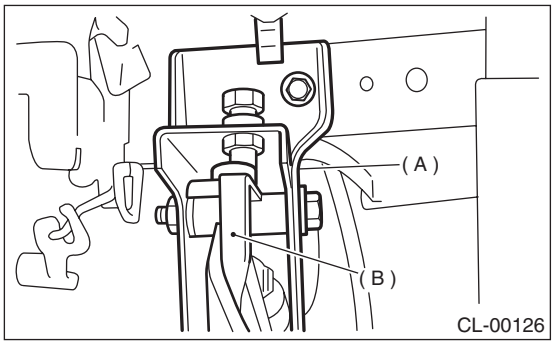
7) Remove the cable clamp, and disconnect the PHV cable from PHV. (Model with hill holder)

CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting the PHV cable.



(A) PHV cable
(B) Clamp

8) Remove the clutch pedal bracket.



(A) Clutch pedal bracket
(B) Clutch pedal

B: INSTALLATION

1) Install the clutch pedal bracket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Install the clutch master cylinder mounting nut.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

3) Insert the new clevis pin to assist rod A, and then install the snap pin.

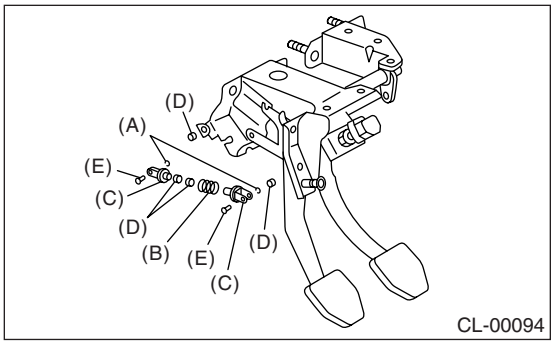
NOTE:
Apply a coat of grease to the clevis pin.

4) Adjust the stroke amount of clutch pedal. **<Ref. to CL-35,** ADJUSTMENT**, Clutch Pedal.>**
5) Adjust the hill holder (Model with hill holder). **<Ref. to BR-55,** ADJUSTMENT**, Hill Holder.>**
6) Connect the clutch switch connector. (Model with cruise control system)
7) Install the instrument panel lower cover.

C: DISASSEMBLY

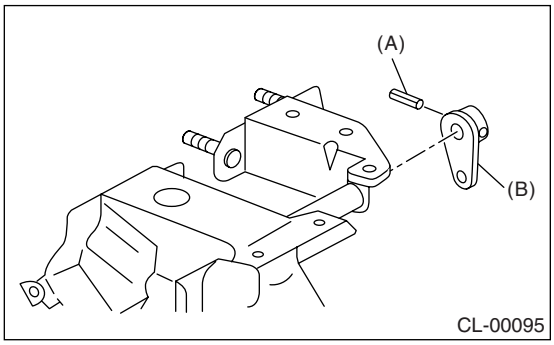
1. LHD MODEL

1) Remove the clips, assist spring, rod and bushing.



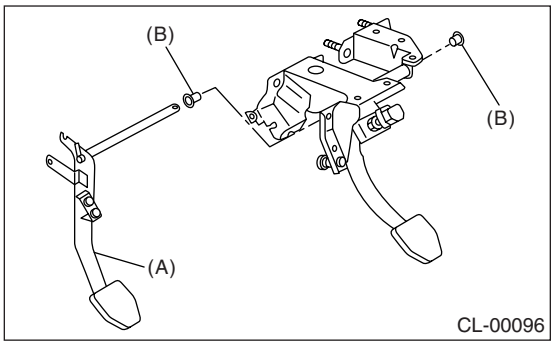
(A) Clip
(B) Assist spring
(C) Assist rod
(D) Bushing
(E) Clevis pin

2) Remove the spring pin and lever.



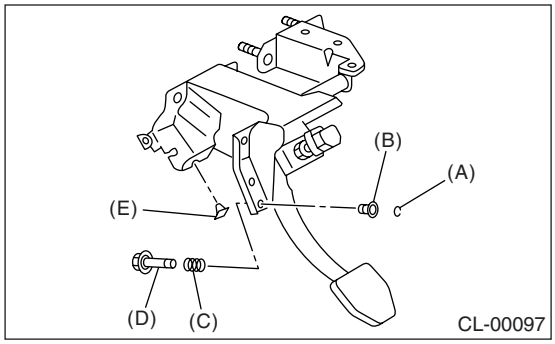
(A) Pin
(B) Lever

3) Remove the clutch pedal and bushings.



(A) Clutch pedal
(B) Bushing

4) Remove the stopper, clip, rod S, and then remove the spring and bushing S.

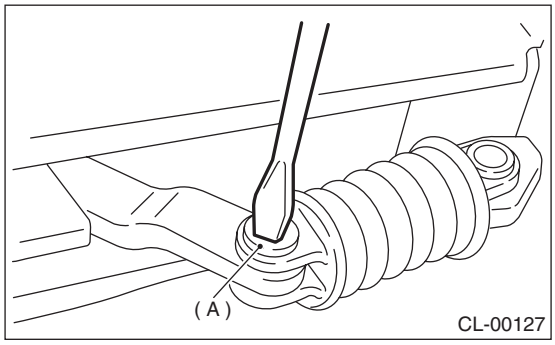


(A) Clip
(B) Bushing S
(C) Spring S
(D) Rod S
(E) Stopper

5) Remove the stoppers from clutch pedal.
6) Remove the clutch pedal pad.

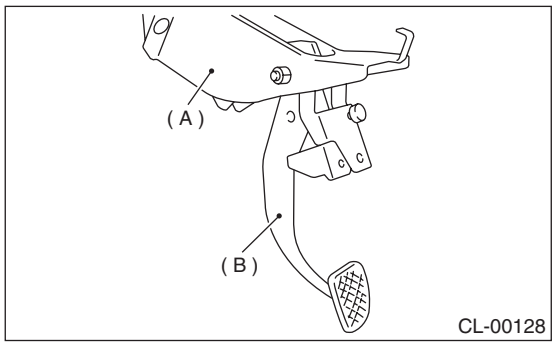
2. RHD MODEL

1) Remove the clutch switch. (Model with cruise control)
2) Remove the clip, then pull out the clevis pin.



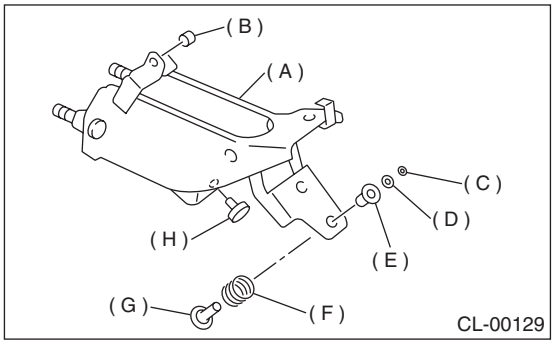
(A) Clevis pin

3) Remove the assist rod, spring and bushing.
4) Remove the clutch pedal from clutch pedal bracket.



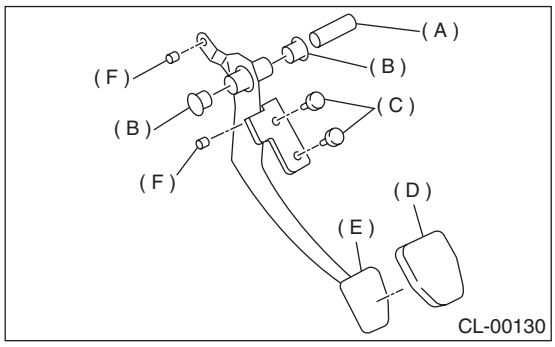
(A) Clutch pedal bracket
(B) Clutch pedal

5) Remove the following parts (B to H) from clutch pedal bracket (A) as shown in the figure.



(A) Clutch pedal bracket
(B) Bushing C
(C) Clip
(D) O-ring
(E) Bushing S
(F) Spring S
(G) Rod S
(H) Bushing

6) Remove the spacer, bushing and pedal pad from clutch pedal.



(A) Spacer
(B) Bushing
(C) Bushing
(D) Pedal pad
(E) Clutch pedal
(F) Bushing C

D: ASSEMBLY

1) Attach the stopper, etc. to pedal bracket temporarily.
2) Clean inside of bores of clutch pedal and brake pedal, apply grease, and set bushings into bores.
3) Align bores of pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring, assist rods, spring, and bushing.

NOTE:
Clean up inside of bushings and apply grease before installing the spacer.

4) Install the hill holder cable to clutch pedal.

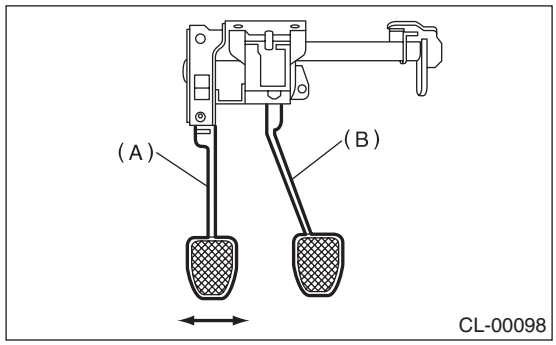
E: INSPECTION

1. CLUTCH PEDAL

Move the clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lbf) to ensure pedal deflection is in specified range.

NOTE:
If excessive deflection is noted, replace the bushings with new ones.

Deflection of clutch pedal:
Service limit
2.0 mm (0.079 in) or less



(A) Clutch pedal
(B) Brake pedal

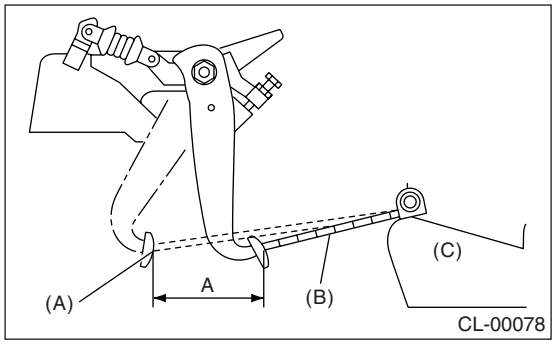
F: ADJUSTMENT

1. LHD MODEL

1) Measure the full stroke amount of clutch pedal.

NOTE:
• Measure the length between seat cushion front end and center portion of clutch pedal.
• Slide the seat at seventh notch from first notch.

Specified clutch pedal full stroke A:
130 — 135 mm (5.12 — 5.31 in)

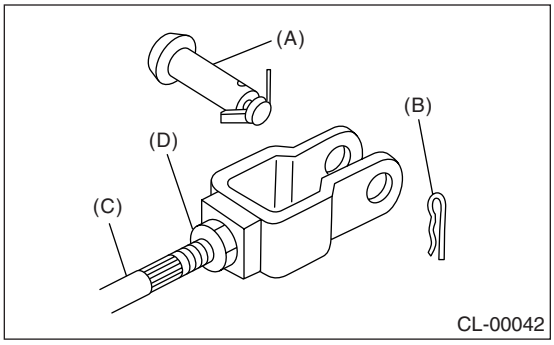


(A) Clutch (Full stroke condition)
(B) Scale
(C) Seat

2) If not as specified, loosen the clutch stopper nut to adjust it.

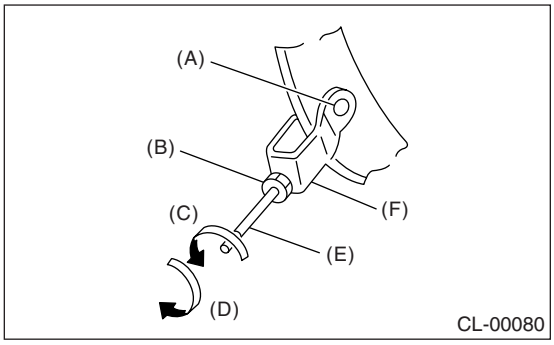
Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

3) Loosen the push rod lock nut.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Push rod lock nut

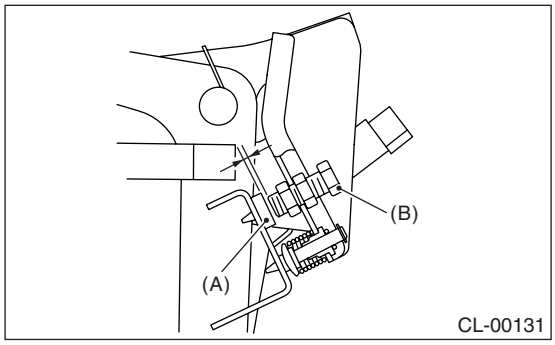
4) Turn the push rod to adjust.
(1) Ensure that the clutch pedal contacts stopper bolt, when releasing the clutch pedal.
(2) Ensure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



(A) Clevis hole
(B) Push rod lock nut
(C) Lengthening direction
(D) Shortening direction
(E) Push rod
(F) U shaped bracket

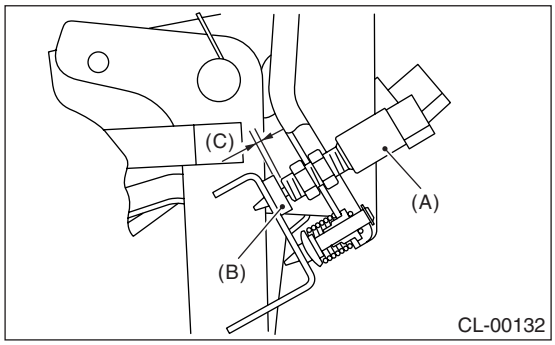
5) Turn the push rod clockwise to shorten until clearance is made at stopper bolt or clutch switch.

- Model without cruise control



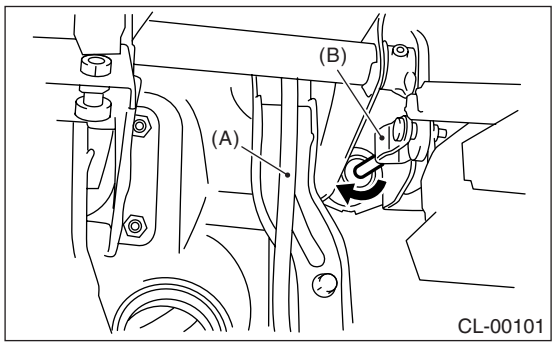
(A) Stopper
(B) Stopper bolt

- Model with cruise control



(A) Clutch switch
(B) Stopper
(C) Clearance

6) Turn the push rod counter clockwise to lengthen until clutch pedal contacts to stopper bolt.
7) Turn the push rod further 270° counterclockwise to lengthen (arrow direction as shown in the figure).



(A) Accelerator pedal
(B) Clevis

8) Move the clevis pin in lateral direction to ensure it moves smoothly.

9) Tighten the push rod lock nut.

Tightening torque :
10 N·m (1.0 kgf-m, 7.2 ft-lb)

10) Measure the full stroke amount of clutch pedal again.

Specified clutch pedal full stroke A:
130 — 135 mm (5.12 — 5.31 in)

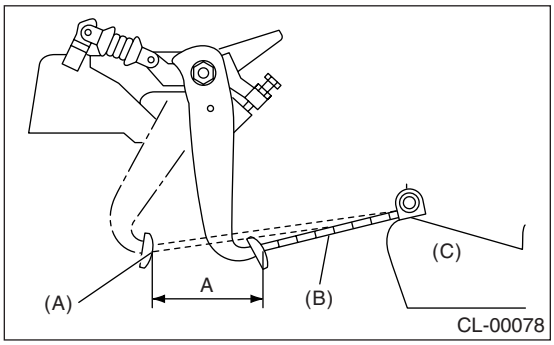
11) Install the clutch switch. **<Ref. to CL-39,** INSTALLATION**, Clutch Switch.>**

2. RHD MODEL

1) Measure the full stroke amount of clutch pedal.

NOTE:
• Measure the length between seat cushion front end and center portion of clutch pedal.
• Slide the seat at seventh notch from first notch.

Specified clutch pedal full stroke A:
125 — 130 mm (4.92 — 5.12 in)



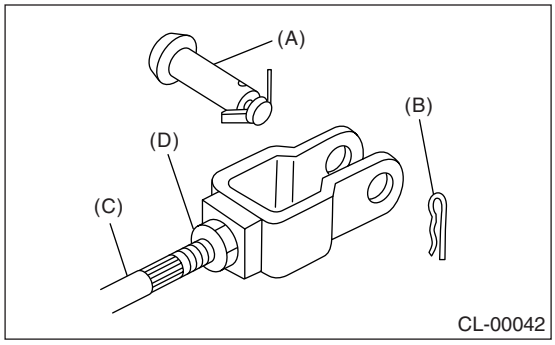
(A) Clutch (Full stroke condition)
(B) Scale
(C) Seat

2) If not as specified, loosen the clutch stopper nut to adjust it.

Tightening torque (Clutch stopper nut):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

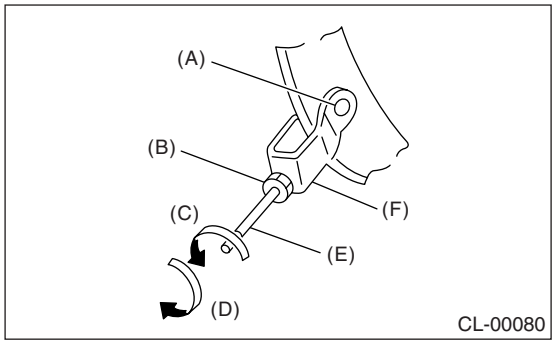
3) If the stroke amount can not be adjusted by stopper nut, remove the clutch switch. **<Ref. to CL-39,** REMOVAL**, Clutch Switch.>**

4) Loosen the push rod lock nut.



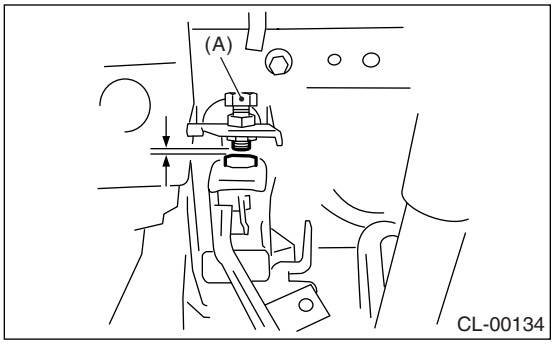
(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Push rod lock nut

5) Turn the push rod to adjust.
(1) Ensure that the clutch pedal contacts stopper bolt, when releasing the clutch pedal.
(2) Ensure that the clutch pedal contacts clutch pedal bracket stopper, when fully depressing the clutch pedal.



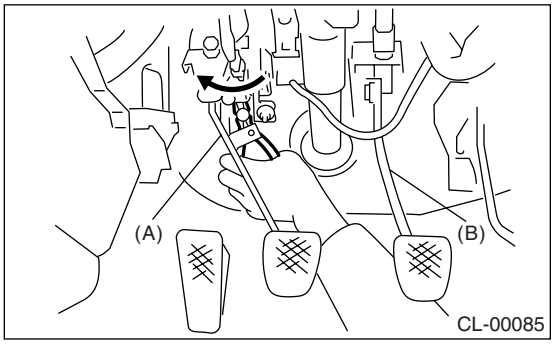
(A) Clevis hole
(B) Push rod lock nut
(C) Lengthening direction
(D) Shortening direction
(E) Push rod
(F) U shaped bracket

6) Turn the push rod clockwise to shorten until clearance is made at stopper bolt or clutch switch.



(A) Stopper bolt

7) Turn the push rod counter clockwise to lengthen until clutch pedal contacts to stopper bolt.
8) Turn the push rod further 270° counterclockwise to lengthen (arrow direction as shown in the figure).



(A) Clutch pedal
(B) Brake pedal

9) Move the clevis pin in lateral direction to ensure it moves smoothly.
10) Tighten the push rod lock nut.

Tightening torque :
10 N·m (1.0 kgf-m, 7.2 ft-lb)

11) Measure the full stroke amount of clutch pedal again.

Specified clutch pedal full stroke A:
125 — 130 mm (4.92 — 5.12 in)

12) Install the clutch switch. **<Ref. to CL-39,** INSTALLATION**, Clutch Switch.>**

11.Clutch Switch

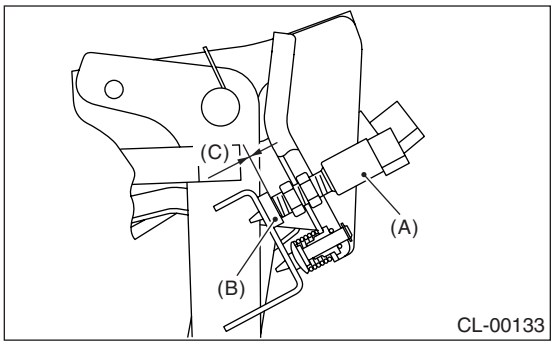
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover.
3) Disconnect the connector from clutch switch.
4) Remove the clutch switch.

B: INSTALLATION

1) Install the clutch switch and clutch pedal stopper so that the gap between them is 0 mm (0 in).

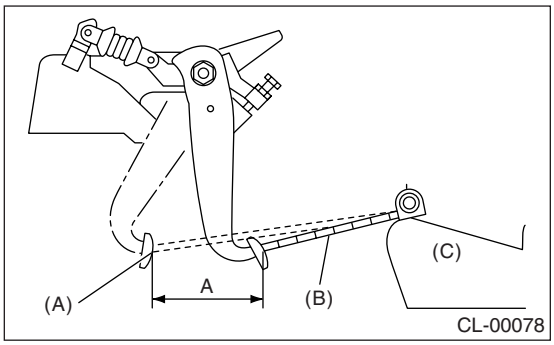
Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(A) Clutch switch
(B) Stopper
(C) 0 mm (0 in)

2) Measure stroke of clutch pedal.

Specified clutch pedal full stroke A:
130 — 135 mm (5.12 — 5.31 in)



(A) Clutch (Full stroke condition)
(B) Scale
(C) Seat

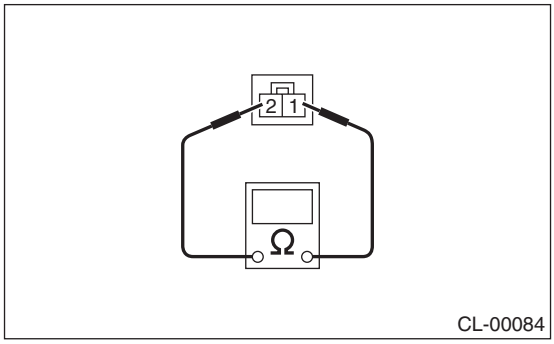
3) If the clutch pedal stroke is out of specification, adjust the stroke. **<Ref. to CL-35,** ADJUSTMENT**, Clutch Pedal.>**
4) Connect clutch switch connector.

C: INSPECTION

Check the clutch switch continuity. If continuity is not as specified, replace the switch.
(1) Disconnect the clutch switch connector.
(2) Measure the resistance between 1 and 2 of switch terminal.

Terminals/Specified resistance
When clutch pedal depressed:
Terminal No. 1 — 2/Less than 1 Ω

Terminals/Specified resistance
When clutch pedal not depressed:
Terminal No. 1 — 2/More than 1 MΩ



D: ADJUSTMENT

Refer to “ADJUSTMENT” for clutch pedal. **<Ref. to CL-35,** ADJUSTMENT**, Clutch Pedal.>**

12.General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptom	Possible cause	Corrective
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms • Engine speed up when shifting. • High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. • Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. • Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall.	(a) Clutch facing smeared by oil	Replace.
	(b) Worn clutch facing	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Distorted pressure plate or flywheel	Replace.
	(e) Defective release bearing holder	Replace.
2. Clutch drags. As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after. • Method of testing: <Ref. to CL-41, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc facing	Replace.
	(c) Malfunction of crankshaft pilot bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) Stuck clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.	(a) Adhesion of oil on the facing	Replace the clutch disc.
	(b) Weak or broken torsion spring	Replace the clutch disc.
	(c) Defective facing contact or excessive disc worn	Replace the clutch disc defection.
	(d) Warped pressure plate or flywheel	Replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace the mounting.
	(g) Improper adjustment of pitching stopper	Adjustment.

Symptom	Possible cause	Corrective
4. Noisy clutch Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	(a) Broken, worn or unlubricated release bearing	Replace the release bearing.
	(b) Insufficient lubrication of pilot bearing	Replace.
	(c) Loose clutch disc hub	Replace the clutch disc.
	(d) Loose torsion spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken torsion spring	Replace the clutch disc.
5. Clutch grabs. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace the clutch disc.
	(b) Deteriorated cushioning spring	Replace the clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace the clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace the clutch disc.
	(e) Loose engine mounting	Retighten or replace the mounting.
	(f) Deteriorated diaphragm spring	Replace.

2. CLUTCH PEDAL

Trouble	Corrective action
Insufficient pedal play	Adjust pedal play.
Clutch pedal free play insufficient	Adjust pedal free play.
Excessively worn and damaged pedal shaft and/or bushing	Replace the bushing or shaft with a new one.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

	Step	Check	Yes	No
1	**CHECK GEAR NOISE.** 1) Start the engine. 2) Disengage the clutch and shift quickly from neutral to reverse in idling condition.	Is there any noise from the transmission gear?	Go to step **2.**	Clutch is normal.
2	**CHECK GEAR NOISE.** Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.	Is there any noise from the transmission gear?	Go to step **3.**	Defective transmission or excessive clutch drag torque. Inspect the pilot bearing, clutch disc, transmission and clutch disc hub spline.
3	**CHECK GEAR NOISE.** 1) Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. 2) With the clutch disengaged, shift from N to R, R to N several times.	Is there any noise from the transmission gear?	Defect in clutch disengaging. Inspect the clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and flywheel seizure. Inspect the clutch disc, spline of clutch disc hub.

CHASSIS SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
ABS	ABS
ABS (DIAGNOSTICS)	ABS(diag)
VEHICLE DYNAMICS CONTROL (VDC)	VDC
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)	VDC(diag)
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS

FRONT SUSPENSION

FS

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5.	Front Strut	18
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8.	Sub Frame	24
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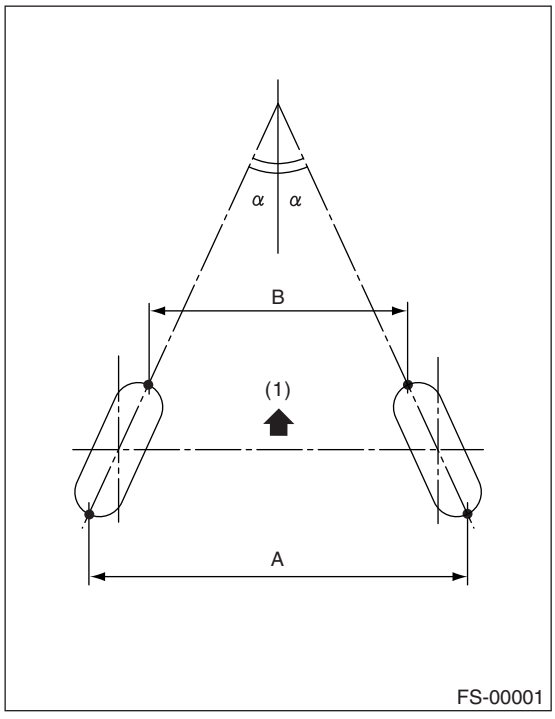
1. General Description

A: SPECIFICATION

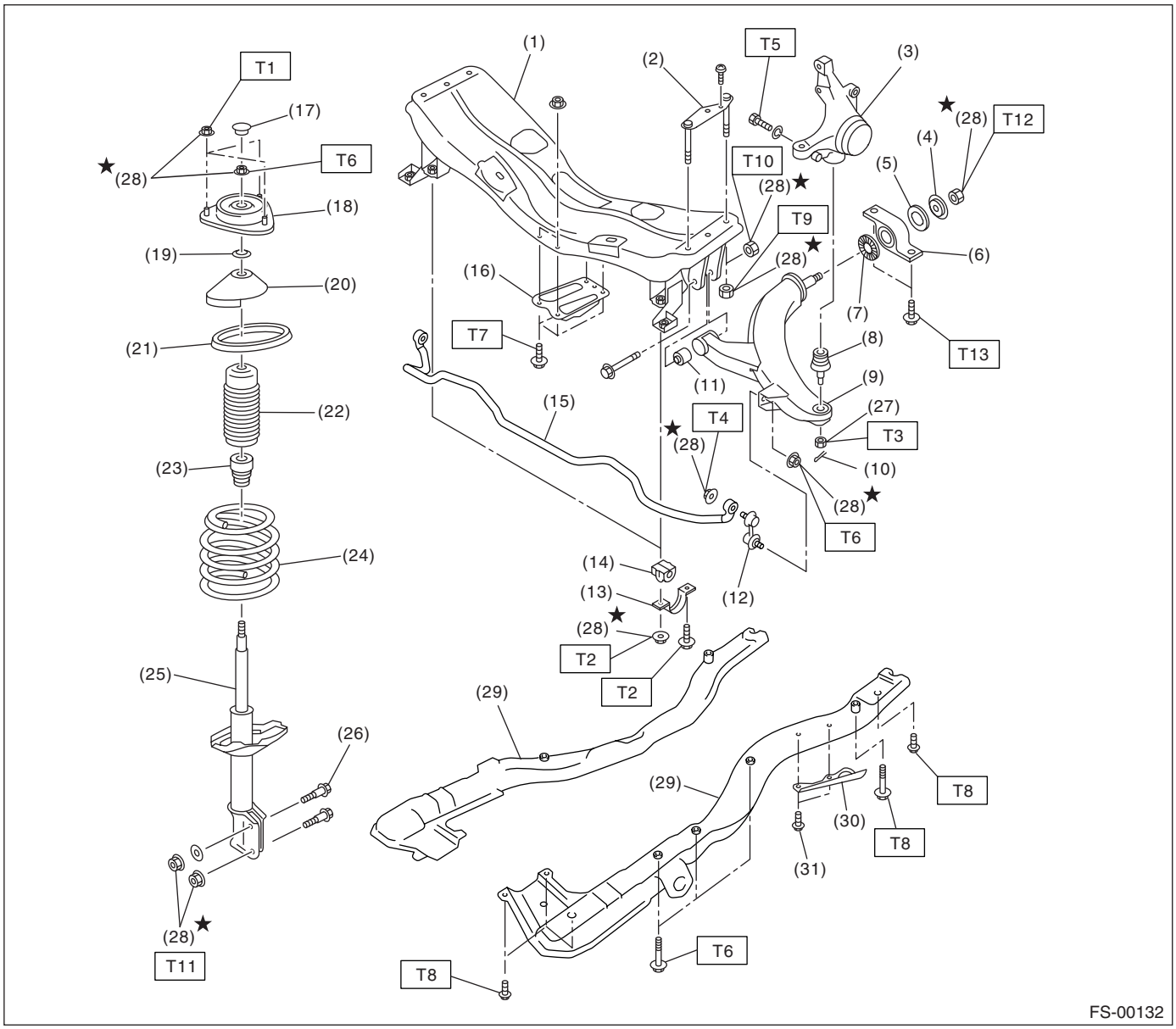
Model		Non-turbo	Turbo
Front	Camber (Permissible value: ±0°45′ differences between RH and LH: 45′ or less)	−0°25′	
	Caster (Reference)	3°03′	
	Toe-in	0±3 mm (0±0.12 in) Toe angle (sum of both wheels): 0°±0°15′	
	Kingpin angle (Reference)	13°12′	
	Wheel arch height (tolerance: $^{+12}/_{-24}$ mm ($^{+0.47}/_{-0.94}$ in)	437 mm (17.20 in)	
	Diameter of stabilizer	21 mm (0.83 in)	
Rear	Camber (Permissible value: ±0°45′ differences between RH and LH: 45′ or less)	−0°50′	−0°55′
	Toe-in	2±3 mm (0.079±0.118 in) Toe angle (sum of both wheels): 0°10′±0°15′	
	Thrust angle (Permissible value: ±0°30′)	0°	
	Wheel arch height (tolerance: $^{+12}/_{-24}$ mm ($^{+0.47}/_{-0.94}$ in)	440 mm (17.32 in)	435 mm (17.13 in)
	Diameter of stabilizer	17 mm (0.67 in)	

NOTE:
• Front and rear toe-ins and front camber can be adjusted. If toe-in or camber permissible value exceeds specifications, adjust toe-in and camber to specified value at adjustment.
• Another items do not equipped with adjusting mechanism. If the other items exceeds specifications, check suspension parts and connections for deformities; replace with new ones as required.



(1) Front
A−B = Positive: Toe-in, Negative: Toe-out
α = Each toe angle

B: COMPONENT



(1) Front crossmember
(2) Bolt ASSY
(3) Housing
(4) Washer
(5) Stopper rubber (Rear)
(6) Rear bushing
(7) Stopper rubber (Front)
(8) Ball joint
(9) Transverse link
(10) Cotter pin
(11) Front bushing
(12) Stabilizer link
(13) Clamp
(14) Bushing
(15) Stabilizer
(16) Jack-up plate
(17) Dust seal
(18) Strut mount
(19) Spacer
(20) Upper spring seat
(21) Rubber seat
(22) Dust cover
(23) Helper
(24) Coil spring
(25) Damper strut
(26) Adjusting bolt
(27) Castle nut
(28) Self-locking nut
(29) Sub frame
(30) Cover
(31) Clip

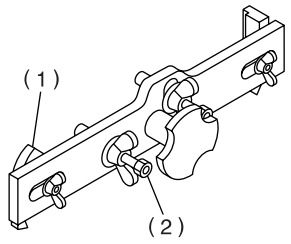
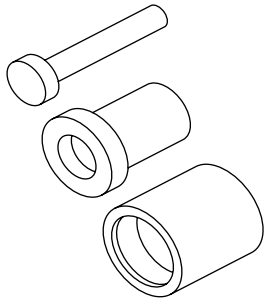
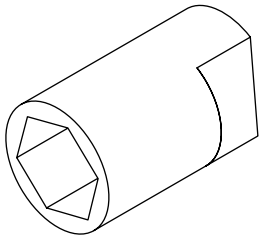
Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 25 (2.5, 18.1)
T3: 40 (4.1, 30) (Further tighten 60° or less)
T4: 45 (4.6, 33)
T5: 50 (5.1, 37)
T6: 55 (5.6, 41)
T7: 70 (7.1, 52)
T8: 71 (7.2, 52)
T9: 100 (10.2, 74)
T10: 125 (12.7, 92.3)
T11: 175 (17.8, 129)
T12: 190 (19.4, 140)
T13: 250 (25.5, 184)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380001	927380001	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927680000	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 ST-927760000	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.
Coil spring compressor	Used for strut disassembly assembly.

2. Wheel Alignment

A: INSPECTION

Check the following items before taking wheel alignment measurement.
Check items before taking wheel alignment measurement:

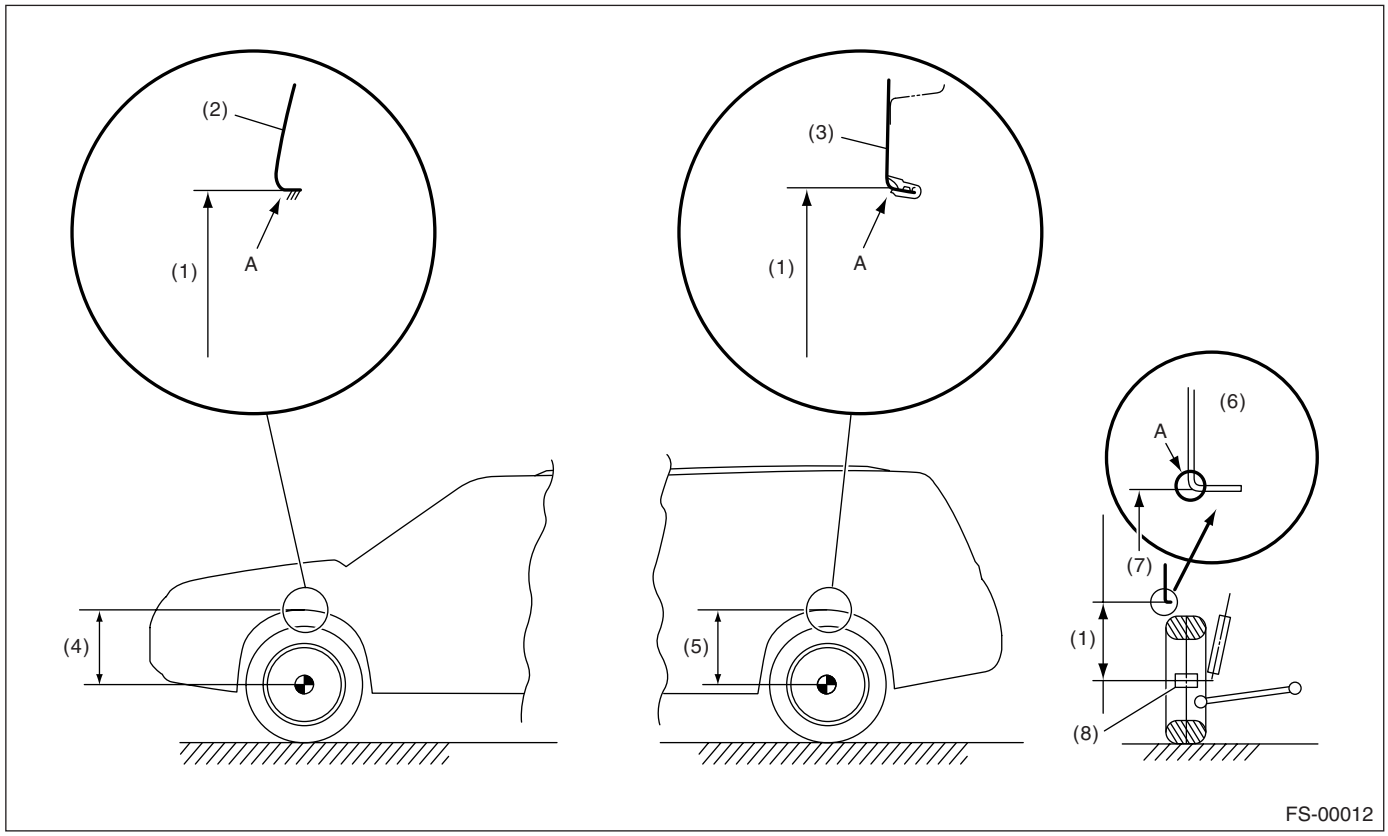
- Tire air pressure
- Unbalanced right and left tire wear, size difference
- Tire run-out
- Ball joint excessive play, wear
- Tie rod end excessive play, wear
- Wheel bearing excessive play
- Right and left wheel base imbalance
- Steering link part deformed, excessive play
- Suspension part deformed, excessive play

Check, adjust and measure the wheel alignment in accordance with procedures indicated in the figure:

Wheel arch height (Front and rear) <Ref. to FS-7, WHEEL ARCH HEIGHT, INSPECTION, Wheel Alignment.>
↓
Camber (Front and rear) <Ref. to FS-8, CAMBER, INSPECTION, Wheel Alignment.>
↓
Caster (Front) <Ref. to FS-9, CASTER, INSPECTION, Wheel Alignment.>
↓
Steering angle <Ref. to FS-10, STEERING ANGLE, INSPECTION, Wheel Alignment.>
↓
Front wheel toe-in <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Rear wheel toe-in <Ref. to FS-11, REAR WHEEL TOE-IN, INSPECTION, Wheel Alignment.>
↓
Thrust angle <Ref. to FS-13, THRUST ANGLE, INSPECTION, Wheel Alignment.>

1. WHEEL ARCH HEIGHT

1) Set the vehicle on a level surface.
2) Set the vehicle to “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
3) Set the steering wheel in a straight line, then remove the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
4) Suspend the thread from wheel arch (point “A” in figure below) to determine a point directly above center of wheel.
5) Measure the distance between measuring point “A” and center of wheel.



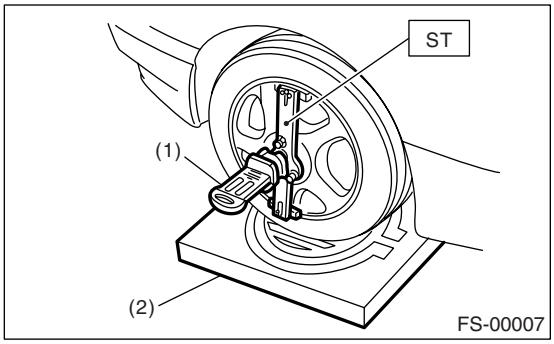
(1) Wheel arch height
(2) Front fender
(3) Rear quarter
(4) Front wheel arch height
(5) Rear wheel arch height
(6) Flange bend line
(7) Measuring point
(8) End of spindle

Model	Specified wheel arch height	
	Front	Rear
Non-turbo	437 $^{+12}/_{-24}$ mm (17.20 $^{+0.47}/_{-0.94}$ in)	440 $^{+12}/_{-24}$ mm (17.32 $^{+0.47}/_{-0.94}$ in)
Turbo		435 $^{+12}/_{-24}$ mm (17.13 $^{+0.47}/_{-0.94}$ in)

2. CAMBER

• INSPECTION

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of wheel, and then install the wheel alignment gauge.
ST 927380001 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure camber angle.

NOTE:
Refer to the “SPECIFICATIONS” for camber values. <Ref. to FS-2, SPECIFICATION, General Description.>

• FRONT CAMBER ADJUSTMENT

1) When adjusting the camber, adjust it to following value.

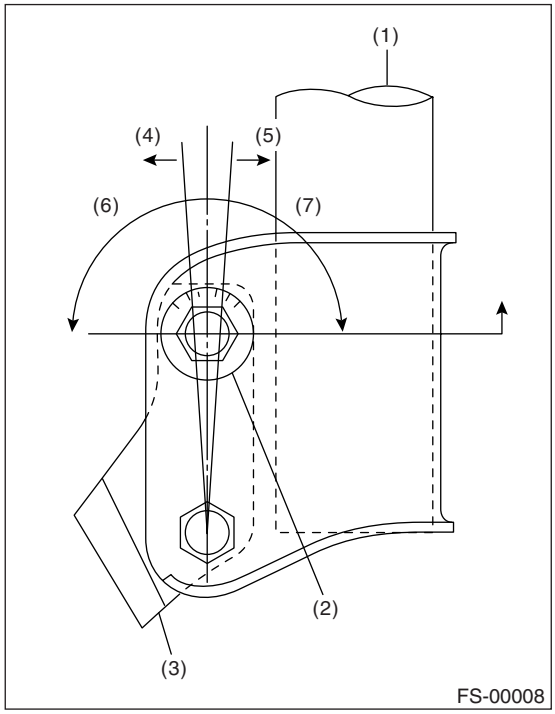
Front camber (Specified value at adjustment) : −0°25′±0°30′ (Differences between RH and LH:45′or less)

2) Loosen the two self-locking nuts located at lower front portion of strut.

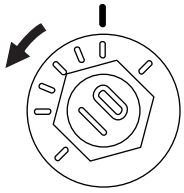
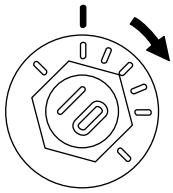
NOTE:
When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.

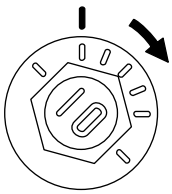
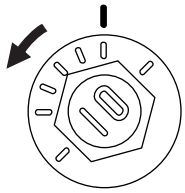
3) Turn the camber adjusting bolt so that camber is set at the specification.

NOTE:
Moving the adjusting bolt by one scale graduation changes camber by approx. 0°10′.



(1) Strut
(2) Adjusting bolt
(3) Housing
(4) Outer
(5) Inner
(6) Camber is increased.
(7) Camber is decreased.

Camber is increased.	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00009	 FS-00010

Camber is decreased	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00010	 FS-00009

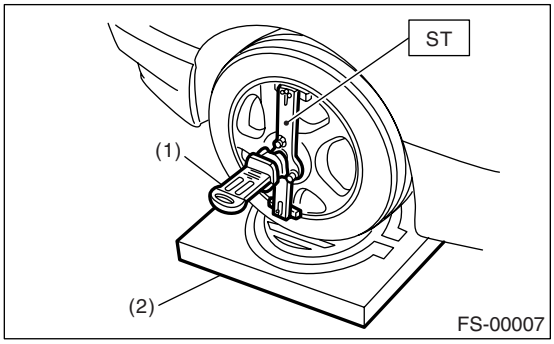
4) Tighten new two self-locking nuts.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3. CASTER

• INSPECTION

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.
2) Set the ST into the center of wheel, and then install the wheel alignment gauge.
ST 927380001 ADAPTER



(1) Alignment gauge
(2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure caster angle.

Model	Caster
All models	3°03′

4. STEERING ANGLE

• INSPECTION

1) Place the vehicle on a turning radius gauge.
2) While depressing the brake pedal, turn the steering wheel fully to the right and left. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

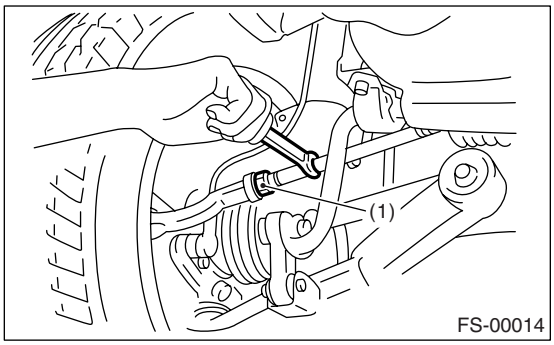
Steering angle:

Inner wheel	**36°24′±1°30′**
Outer wheel	**32°±1°30′**

• ADJUSTMENT

1) Turn the tie-rod to adjust steering angle of both inner and outer wheels.
2) Check the toe-in.

NOTE:
Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• INSPECTION

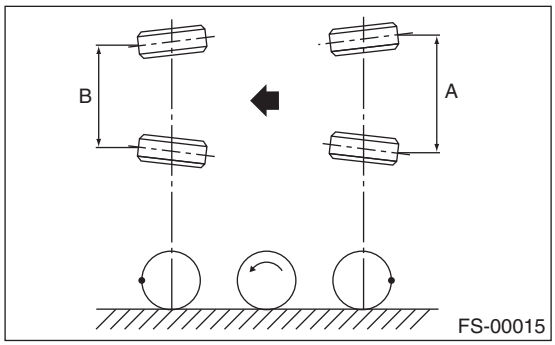
Toe-in (Permissible value):
0±3 mm (0±0.12 in)

1) Set the toe-in gauge to rear sides of right and left front tires at height corresponding to center of spindle.
2) Mark each right and left tires at height corresponding to center of spindle and measure the distance “A” between marks.
3) Move the vehicle forward to rotate wheels 180°.

NOTE:
Whenever rotating the wheels, drive the vehicle forward.

4) Measure the distance “B” between right and left marks. Toe-in can then be obtained by the following equation:

A−B = Toe-in

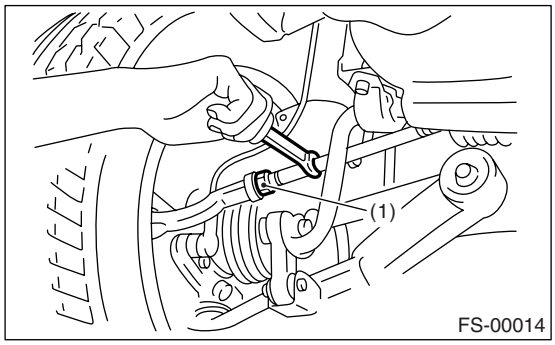


• ADJUSTMENT

When adjusting the toe-in, adjust it to following value.

Toe-in (Specified value at adjustment):
0±2 mm (0±0.08 in)

1) Make sure that the right and left steering angles are within specified value.
2) Loosen the right and left side steering tie-rods lock nuts.
3) Turn the right and left tie rods equal amounts until the toe-in is at the specification.
Both the right and left tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from inside of the vehicle).



(1) Lock nut

4) Tighten the tie-rod lock nut.

Tightening torque:
85 N·m (8.7 kgf-m, 63 ft-lb)

NOTE:
Correct the tie-rod boot, if it is twisted.

6. REAR WHEEL TOE-IN

• INSPECTION

Toe-in: (Permissible value)
2±3 mm (0.079±0.118 in)

For rear toe-in inspection procedure, refer to FRONT WHEEL TOE-IN procedure.
<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

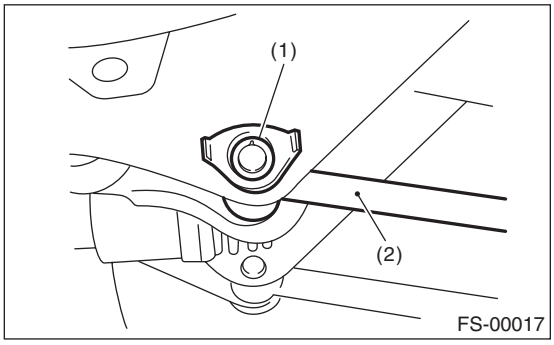
• ADJUSTMENT

When adjusting the toe-in, adjust it to following value.

Toe-in: (Specified value at adjustment)
2±2 mm (0.079±0.079 in)

1) Loosen the self-locking nut on inner side of link rear.

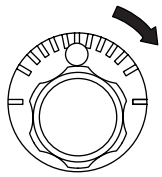
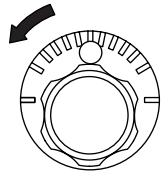
NOTE:
When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.

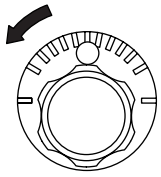
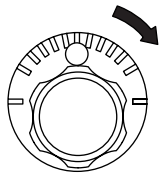


(1) Adjusting bolt
(2) Link rear

2) Turn the adjusting bolt head until toe-in is at the specification.

NOTE:
When right and left wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

Toe-in is increased.	
Rotate camber adjusting bolt LH clockwise.	Rotate camber adjusting bolt RH counterclockwise.
 FS-00018	 FS-00019

Toe-in is decreased	
Rotate camber adjusting bolt LH counterclockwise.	Rotate camber adjusting bolt RH clockwise.
 FS-00019	 FS-00018

3) Tighten a new self-locking nut.

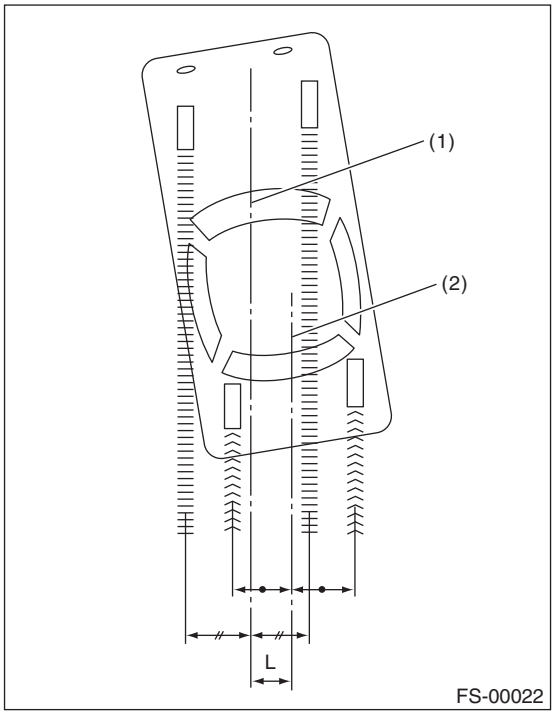
Tightening torque:
100 N·m (10.2 kgf-m, 74 ft-lb)

7. THRUST ANGLE

• INSPECTION

1) Position the vehicle on a level surface.
2) Move the vehicle 3 to 4 m (10 to 13 ft) directly forward.
3) Determine the center lines of front axle loci and rear axle loci.
4) Measure the distance “L” between center line of loci of the axles.

Thrust angle:
0°±30′
(Less than 30′ when “L” is less than 23 mm (0.9 in).)



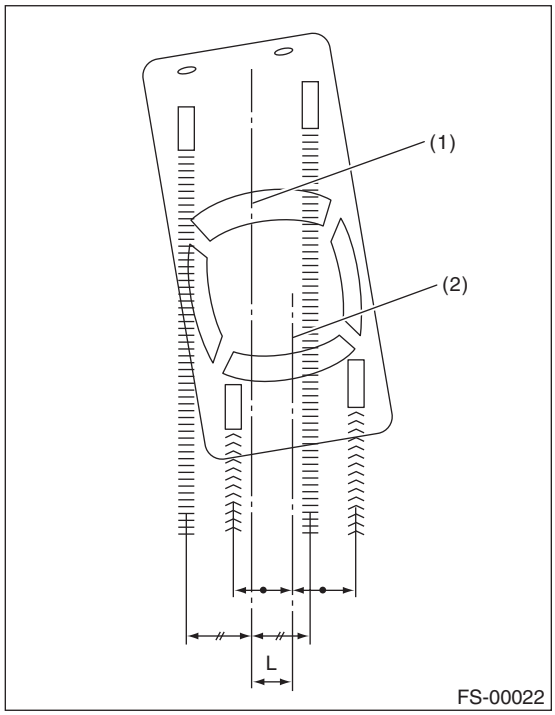
(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

• ADJUSTMENT

When adjusting, adjust it to following value.

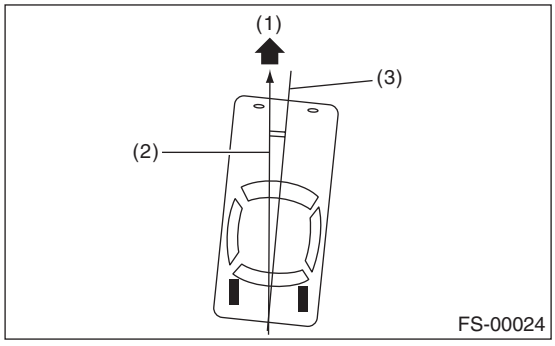
Thrust angle:
0°±20′
(Less than 20′ when “L” is less than 15 mm (0.6 in).)

1) Make the thrust angle adjustments by turning toe-in adjusting bolts of rear suspension equally in the same direction.
2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make thrust angle adjustment.
3) When the right and left adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approx. 20′ [“L” is almost equal to 15 mm (0.591 in)].



(1) Center line of loci (front axle)
(2) Center line of loci (rear axle)

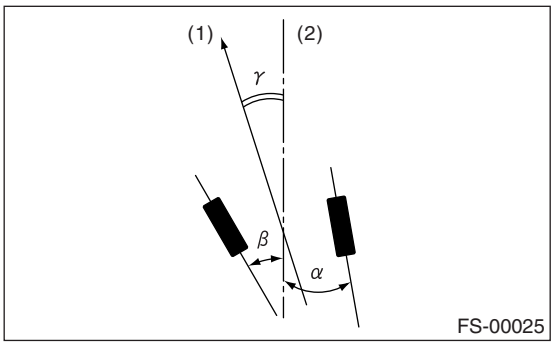
NOTE:
Thrust angle means the average of left and right wheel toe angle to body center line. Vehicle goes straight to the direction of thrust angle while rolling obliquely.



(1) Front
(2) Thrust angle
(3) Body center line

Thrust angle: $\gamma = (\alpha - \beta)/2$

α: Right rear wheel toe-in angle
β: Left rear wheel toe-in angle
Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.

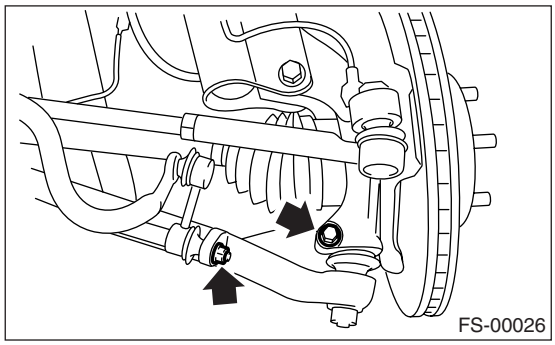


(1) Front
(2) Body center line

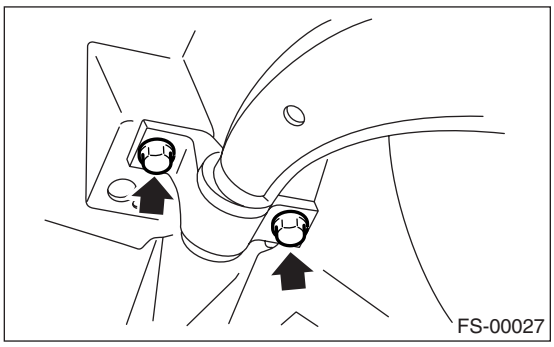
3. Front Transverse Link

A: REMOVAL

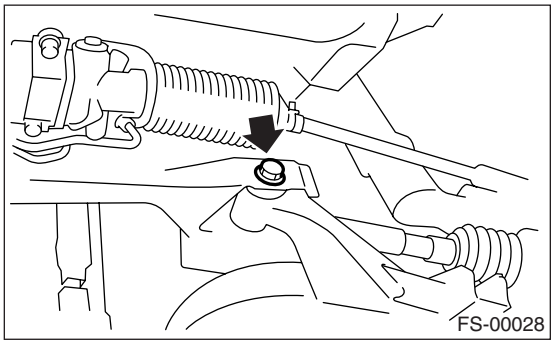
1) Set the vehicle on the lift.
2) Lift-up the vehicle and remove the wheel.
3) Remove the sub frame.
4) Disconnect the stabilizer link from transverse link.
5) Remove the bolt securing ball joint of transverse link to housing.



6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



8) Extract the ball joint from housing.
9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.

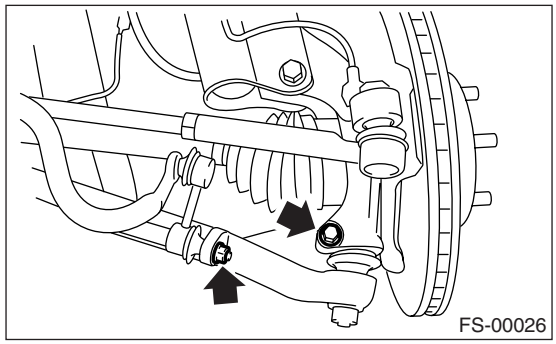


B: INSTALLATION

1) Temporarily tighten the two bolts used to secure rear bushing of transverse link to body.

NOTE:
These bolts should be tightened to such an extent that they can still move back and forth in the oblong shaped hole in the bracket (which holds the bushing).

2) Install the bolts used to connect transverse link to crossmember and temporarily tighten with a new self-locking nut.
3) Insert the ball joint into housing.
4) Connect the stabilizer link to transverse link, and temporarily tighten a new self-locking nut.



5) Tighten the following points in the order shown below when wheels are in full contact with the ground and vehicle is curb weight.
(1) Transverse link and stabilizer

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)

(2) Transverse link and crossmember

Tightening torque:
125 N·m (12.7 kgf-m, 92.3 ft-lb)

(3) Transverse link rear bushing and body

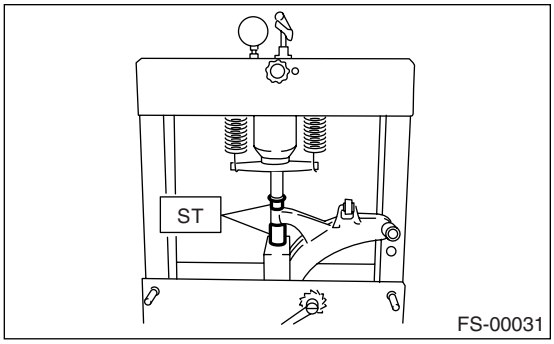
Tightening torque:
250 N·m (25.5 kgf-m, 184 ft-lb)

6) Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

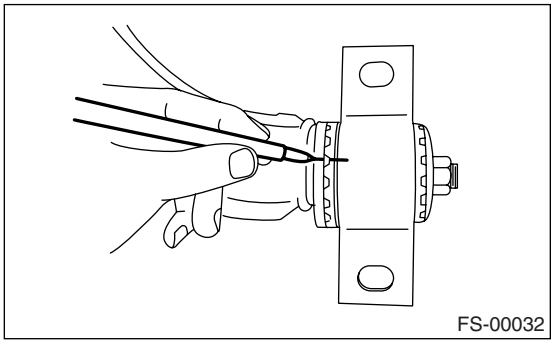
1. FRONT BUSHING

Using the ST, press the front bushing out of place.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

1) Scribe an aligning mark on the transverse link and rear bushing.
2) Loosen the nut and remove rear bushing.

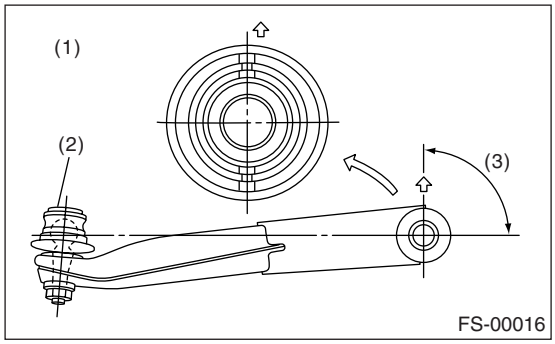


D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

CAUTION:
Install the front bushing in correct direction, as shown in the figure.



(1) Face bushing toward center of ball joint
(2) Ball joint
(3) 90°±3°

2. REAR BUSHING

1) Install the rear bushing to transverse link and align aligning marks scribed on the two.
2) Tighten a new self-locking nut.

NOTE:
While holding the rear bushing so as not to change position of aligning marks, tighten the self-locking nut.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

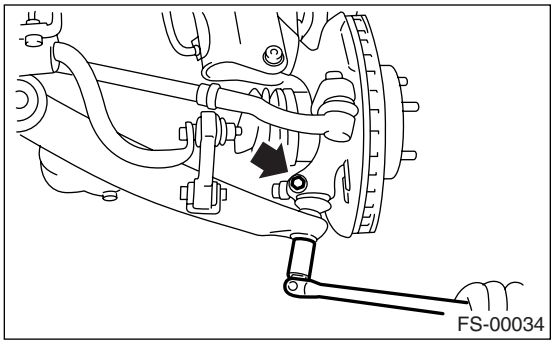
E: INSPECTION

1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
2) Check the bushings for cracks, fatigue or damage.
3) Check the rear bushing for oil leaks.

4. Front Ball Joint

A: REMOVAL

1) Remove the wheel.
2) Pull out the cotter pin from ball stud, remove the castle nut, and extract the ball stud from transverse link.
3) Remove the bolt securing ball joint to housing.



4) Extract the ball joint from housing.

B: INSTALLATION

1) Install the ball joint onto housing.

Tightening torque (Bolt):
50 N·m (5.1 kgf-m, 37 ft-lb)

CAUTION:
Do not apply grease to tapered portion of ball stud.

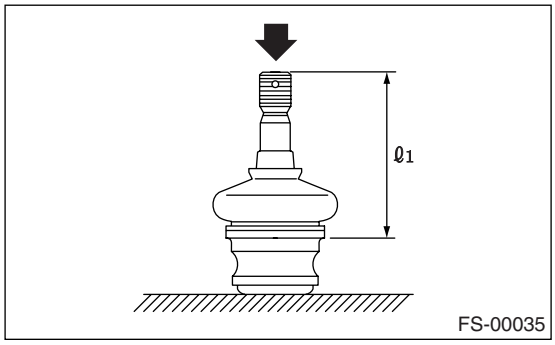
2) Connect the ball joint to transverse link.

Tightening torque (Castle nut):
40 N·m (4.1 kgf-m, 30 ft-lb)

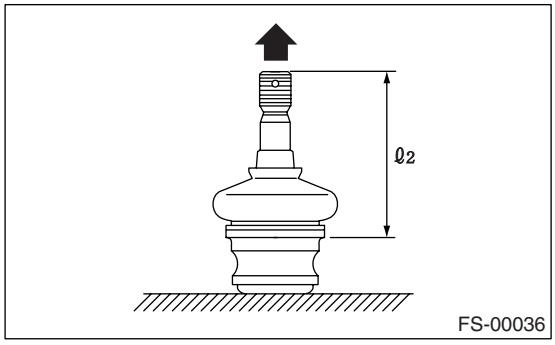
3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert a new cotter pin and bend it around castle nut.
4) Install the front wheel.

C: INSPECTION

1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.
(1) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the dimension ℓ_1.



(2) With 686 N (70 kgf, 154 lbf) loaded in direction shown in the figure, measure the dimension ℓ_2.



(3) Calculate plays from the following formula.
$S = \ell_2 - \ell_1$
(4) When plays are larger than the specified value, replace with a new one.

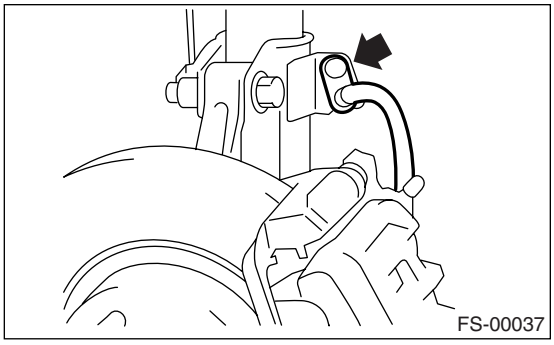
FRONT BALL JOINT
Specified play for replacement S:
Less than 0.3 mm (0.012 in)

2) When the play is smaller than specified value, visually inspect the dust cover.
3) The ball joint and cover that have been removed must be checked for wear, damage or cracks, and any defective part must be replaced.
4) If the dust cover is damaged, replace with a new ball joint.

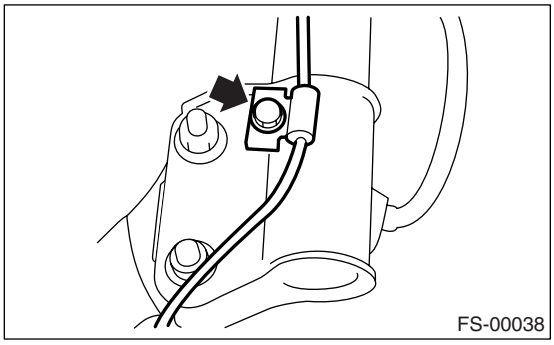
5. Front Strut

A: REMOVAL

1) Remove the wheel.
2) Remove the bolt securing brake hose from strut.



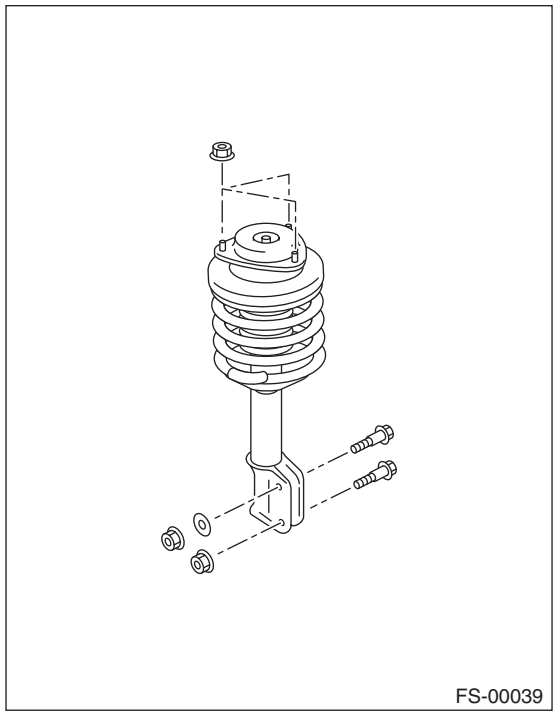
3) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
4) Remove the bolt securing ABS wheel speed sensor harness.



5) Remove the two bolts securing housing to strut.

NOTE:
While holding the head of adjusting bolt, loosen self-locking nut.

6) Remove the three nuts securing strut mount to body.



B: INSTALLATION

1) Install the strut mount at upper side of strut to body, and then tighten with nuts.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Position the aligning mark on camber adjustment bolt with aligning mark on lower side of strut. Install the strut to housing with a new self-locking nut.

NOTE:
While holding the head of adjusting bolt, tighten self-locking nut.

Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

3) Install the ABS wheel speed sensor harness to strut.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

4) Install the bolts which secure brake hose to strut.

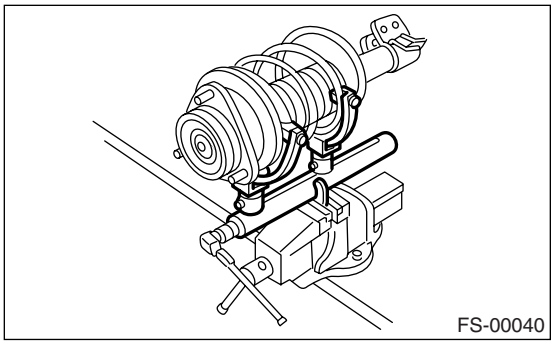
Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

5) Install the wheels.

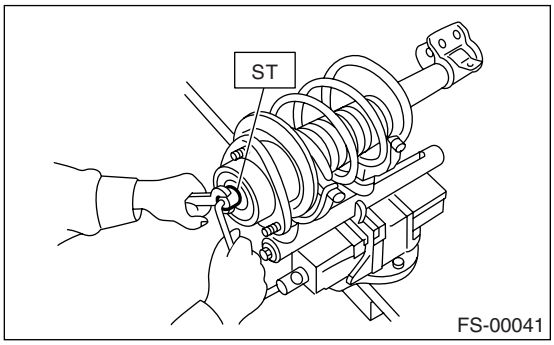
NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1) Using a coil spring compressor, compress the coil spring.



2) Using the ST, remove the self-locking nut.
ST 927760000 STRUT MOUNT SOCKET



3) Remove the strut mount, upper spring seat and rubber seat from strut.
4) Gradually decreasing the compression force of compressor, and then remove the coil spring.
5) Remove the dust cover and helper spring.

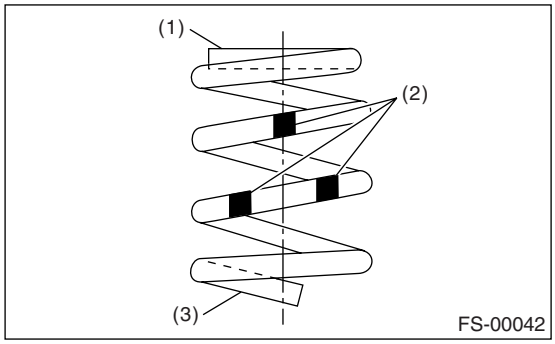
D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc., on the strut, check for the presence of air in the damping force generating mechanism of the strut since air prevents proper damping force from being produced.
2) Checking for the presence of air
   (1) Place the strut vertically with piston rod facing up.
   (2) Move the piston rod to center of its entire stroke.
   (3) While holding the piston rod end with fingertips, move the rod up and down.
   (4) If the piston rod moves at least 10 mm (0.39 in) in the former step, purge air from the strut.
3) Air purging procedure
   (1) Place the strut vertically with piston rod facing up.
   (2) Fully extend the piston rod.
   (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
   (4) Fully contract the piston rod.
   (5) Repeat three or four times from the first step.

NOTE:
After completely purging air from the strut, be sure to place the strut with piston rod facing up. If it is laid down, check for entry of air in the strut as outlined under “Checking for the presence of air”.

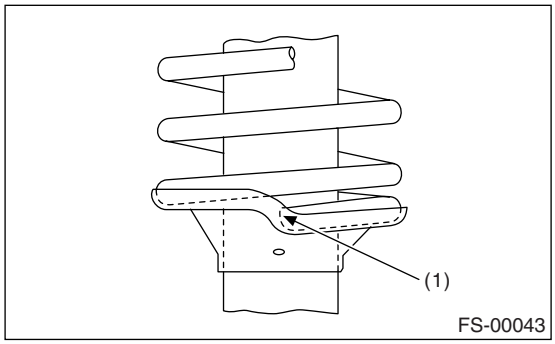
4) Using a coil spring compressor, compress the coil spring.

NOTE:
Make sure that the installing direction of coil spring is as shown in the figure.



(1) Flat (top side)
(2) Identification paint
(3) Inclined (bottom side)

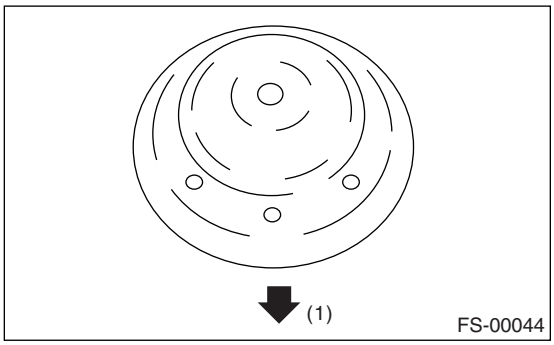
5) Set the coil spring correctly so that its end face fits well into the spring seat as shown in the figure.



(1) Coil spring end face

6) Install the helper and dust cover to the piston rod.
7) Pull the piston rod fully upward, and install the rubber seat and spring seat.

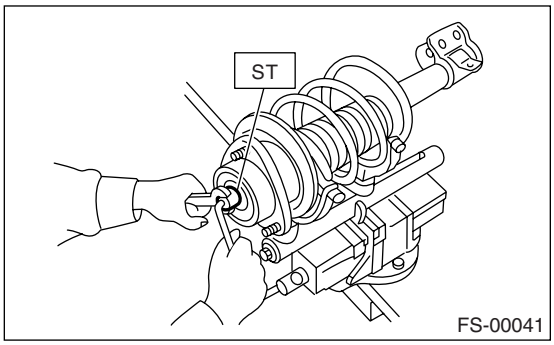
NOTE:
Ensure that upper spring seat is positioned as shown in the figure.



(1) Outside of body

8) Install the strut mount to the piston rod, and then tighten a new self-locking nut temporarily.
9) Using a hexagon wrench to prevent strut rod from turning, tighten the self-locking nut with ST.
ST 927760000 STRUT MOUNT SOCKET

Tightening torque:
55 N·m (5.6 kgf-m, 41 ft-lb)



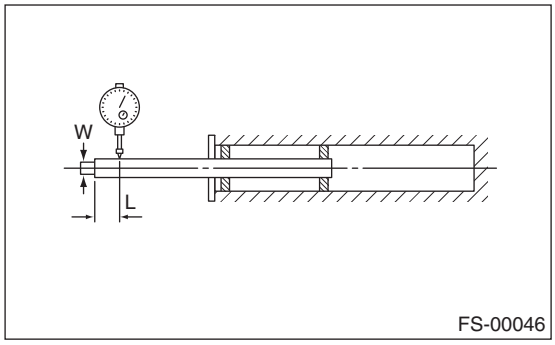
10) Loosen the coil spring carefully.

E: INSPECTION

Check the disassembled parts for cracks, damage and wear, and replace with new parts if defective.

1. DAMPER STRUT

1) Check for oil leakage.
2) Move the piston rod up and down to check that it operates smoothly without any binding.
3) Play of piston rod
Measure the play as follows:
Fix outer shell and fully extend the rod. Set a dial gauge at the end of rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lbf)] to threaded portion. With the force of 20 N (2 kgf, 4 lbf) applied, read dial gauge indication: P_1. Apply a force of 20 N (2 kgf, 4 lbf) in the opposite direction of “W”, then read dial gauge indication: P_2.



Limit of play (P_1+P_2):
0.8 mm (0.031 in)

If the play is greater than limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for creep, cracks and deterioration, and replace it with a new one if defective.

3. DUST COVER

If any cracks or damage are found, replace it with a new one.

4. COIL SPRING

Coil spring having permanent strain should be replaced with a new one. When the vehicle posture is uneven, although there is no considerable reasons like tire puncture, uneven loading, etc., check the wheel arch height referring to specifications and replace the coil spring with a new one if the measured value is out of specification.

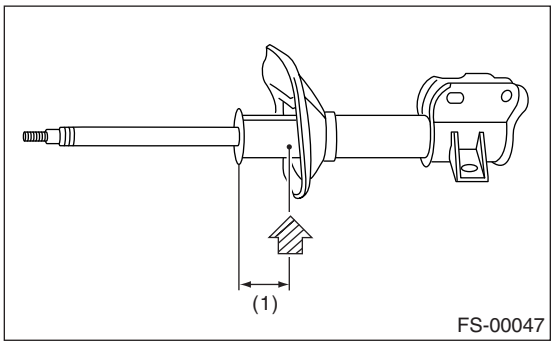
5. HELPER

Replace it with a new one if cracked or damaged.

F: DISPOSAL

CAUTION:
• Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and/or filings.
• Do not disassemble the strut damper or place into a fire.
• Drill holes before disposing of gas filled struts.

1) Place the gas filled strut on a flat and level surface with piston rod fully extended.
2) Using a 2 to 3 mm (0.079 to 0.12 in) dia. drill, make holes in areas shown in the figure.

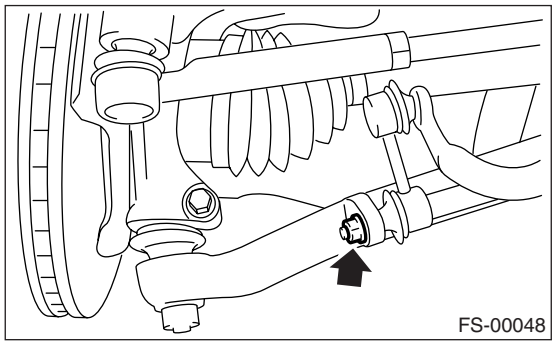


(1) 40 mm (1.57 in)

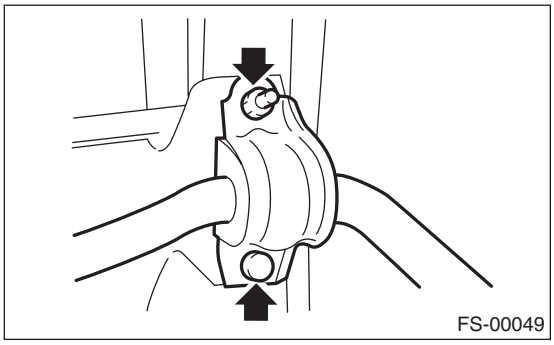
6. Front Stabilizer

A: REMOVAL

1) Jack-up the front part of the vehicle and support it with rigid racks.
2) Remove the jack-up plate from lower part of crossmember.
3) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
4) Remove the nuts which secures stabilizer link to front transverse link.



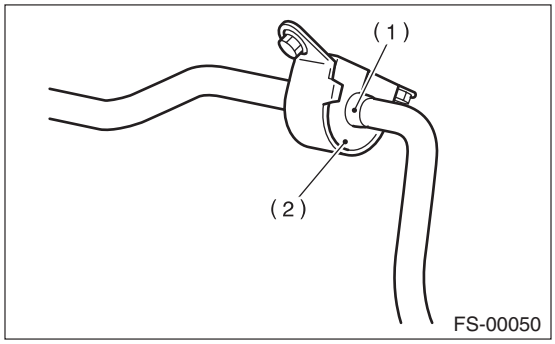
5) Remove the bolt and nut which secure stabilizer to crossmember.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Install the bushing (on front crossmember side) while aligning it with paint mark on stabilizer.
• Ensure that bushing and stabilizer have the same identification colors when installing.



(1) Mark stamped on stabilizer
(2) Bushing identification color

2) Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Jack-up plate to crossmember:
70 N·m (7.1 kgf-m, 52 ft-lb)
Stabilizer link to front transverse link:
55 N·m (5.6 kgf-m, 41 ft-lb)
Stabilizer to crossmember:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

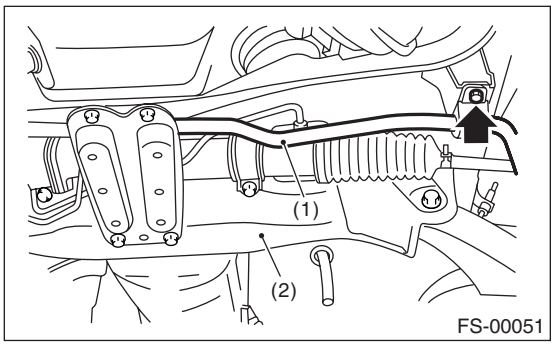
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer link for deformities, cracks or damage.
3) Check the bushing for protrusions from the hole of stabilizer link.

7. Front Crossmember

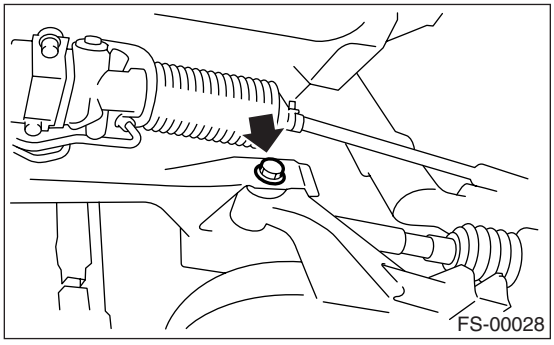
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the front wheels.
3) Remove the sub frame.
4) Remove both the stabilizer and jack-up plate.



(1) Front stabilizer
(2) Front crossmember

5) Disconnect the tie-rod end from housing.
6) Remove the front exhaust pipe.
7) Remove the front transverse link from front crossmember and body.



8) Remove the bolts attaching engine mount cushion rubber to crossmember.
9) Remove the steering universal joint.
10) Disconnect the power steering pipe from steering gear box.
11) Lift the engine by approx. 10 mm (0.39 in) by using chain block.
12) Support the crossmember with a jack, remove nuts securing crossmember to body and lower the crossmember gradually along with steering gearbox.

CAUTION:
When removing the crossmember downward, be careful that tie-rod end does not interfere with SFJ boot.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Always tighten the rubber bushing when tires are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Transverse link bushing to crossmember:
125 N·m (12.7 kgf-m, 92.3 ft-lb)
Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Tie-rod end to housing:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)
Front cushion rubber to crossmember:
85 N·m (8.7 kgf-m, 63 ft-lb)
Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)
Crossmember to body:
100 N·m (10.2 kgf-m, 74 ft-lb)

2) Purge air from the power steering system.
<Ref. to PS-80, Power Steering Fluid.>
3) Check the wheel alignment and adjust if necessary.

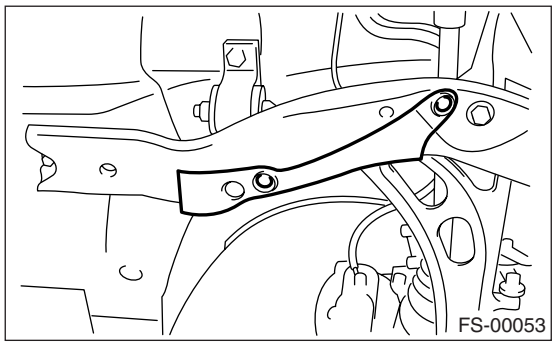
C: INSPECTION

Check the crossmember for wear, damage and cracks and correct or replace if defective.

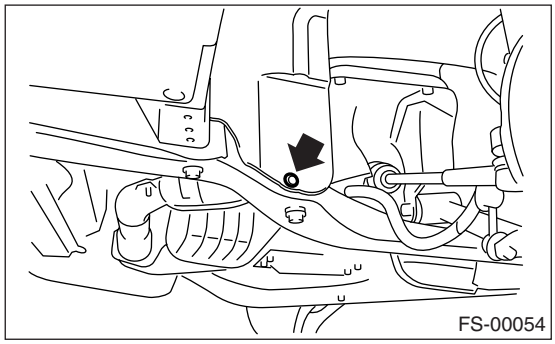
8. Sub Frame

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the bolt cover.

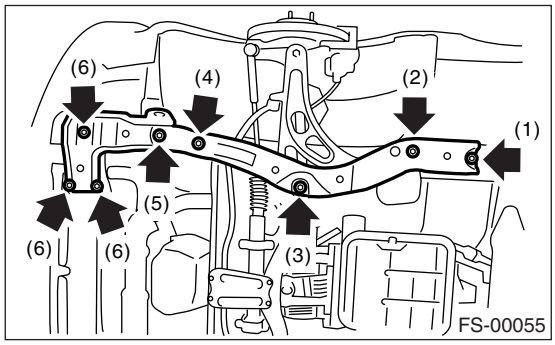


4) Remove the clip.



5) Remove the sub frame.

NOTE:
Loosen bolt (1) and leave a few threads caught, then remove the bolts in the order of (2), (3), (4), (5), and (6).

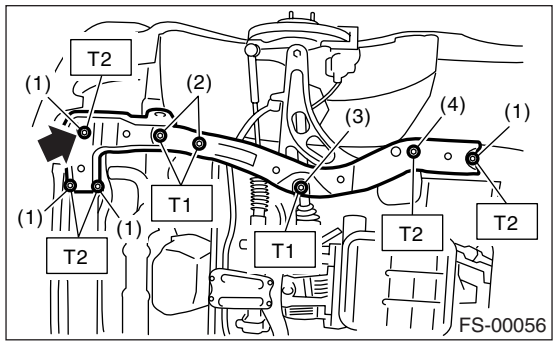


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the M12 bolt with a new one.

Tightening torque:
T1: 55 N·m (5.6 kgf-m, 41 ft-lb)
T2: 71 N·m (7.2 kgf-m, 52 ft-lb)

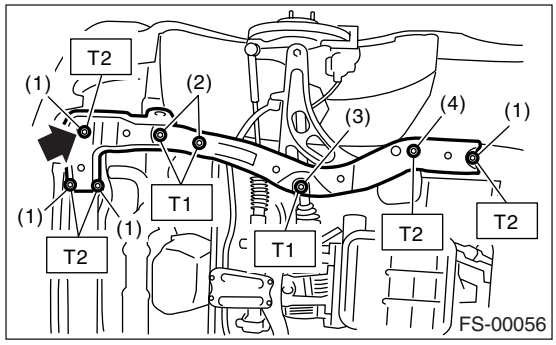


(1) M10 × 30 bolt
(2) M12 × 87 bolt (with wax)
(3) M12 × 65 bolt (with wax)
(4) M10 × 90 bolt

C: INSPECTION

1) Check that there is no damage and distortion at the sub frame.
2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

Tightening torque:
T1: 55 N·m (5.6 kgf-m, 41 ft-lb)
T2: 71 N·m (7.2 kgf-m, 52 ft-lb)



(1) M10 × 30 bolt
(2) M12 × 87 bolt (with wax)
(3) M12 × 65 bolt (with wax)
(4) M10 × 90 bolt

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut or shock absorber	Replace.
(3) Installation of wrong strut or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and/or hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitable installation (maximum or minimum length) of damper strut or shock absorber.	Replace with proper parts.
(7) Deformation or damage of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut	Replace.
(2) Wear or damage of shock absorber component parts	Replace.
(3) Loosening of suspension link installing bolt	Retighten to the specified torque.
(4) Deformation or loss of bushing	Replace.
(5) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(6) Breakage of coil spring	Replace.
(7) Wear or damage of ball joint	Replace.
(8) Deformation of stabilizer clamp	Replace.

REAR SUSPENSION

RS

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1. General Description 2
2. Wheel Alignment 8
3. Rear Stabilizer 9
4. Rear Trailing Link 10
5. Rear Strut 14
6. Lateral Link 15
7. Rear Crossmember 18
8. General Diagnostic Table 19

1. General Description

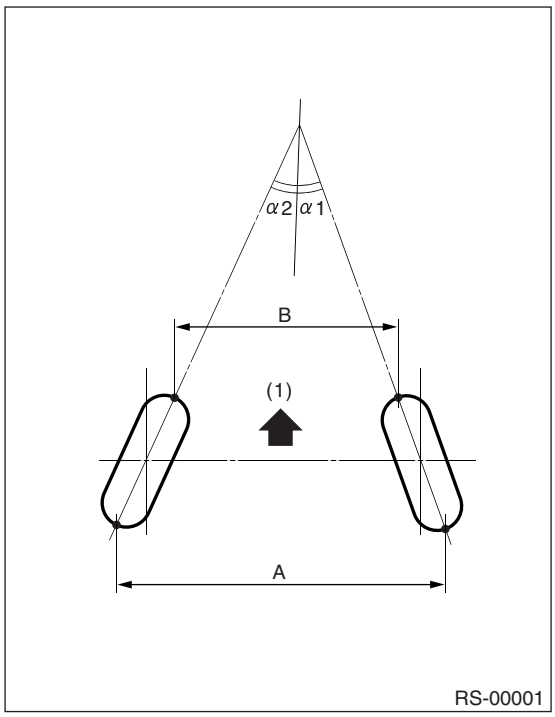
A: SPECIFICATION

Refer to “FS” section for rear suspension specifications. <Ref. to FS-2, SPECIFICATION, General Description.>

NOTE:

• Front and rear toe-ins and front camber can be adjusted. If toe-in or camber permissible value exceeds specifications, adjust them so that they conform to specified value at adjustment.

• Another items do not equipped with adjusting mechanism. If the other items exceeds specifications, check suspension parts and connections for deformities; replace with new ones as required.



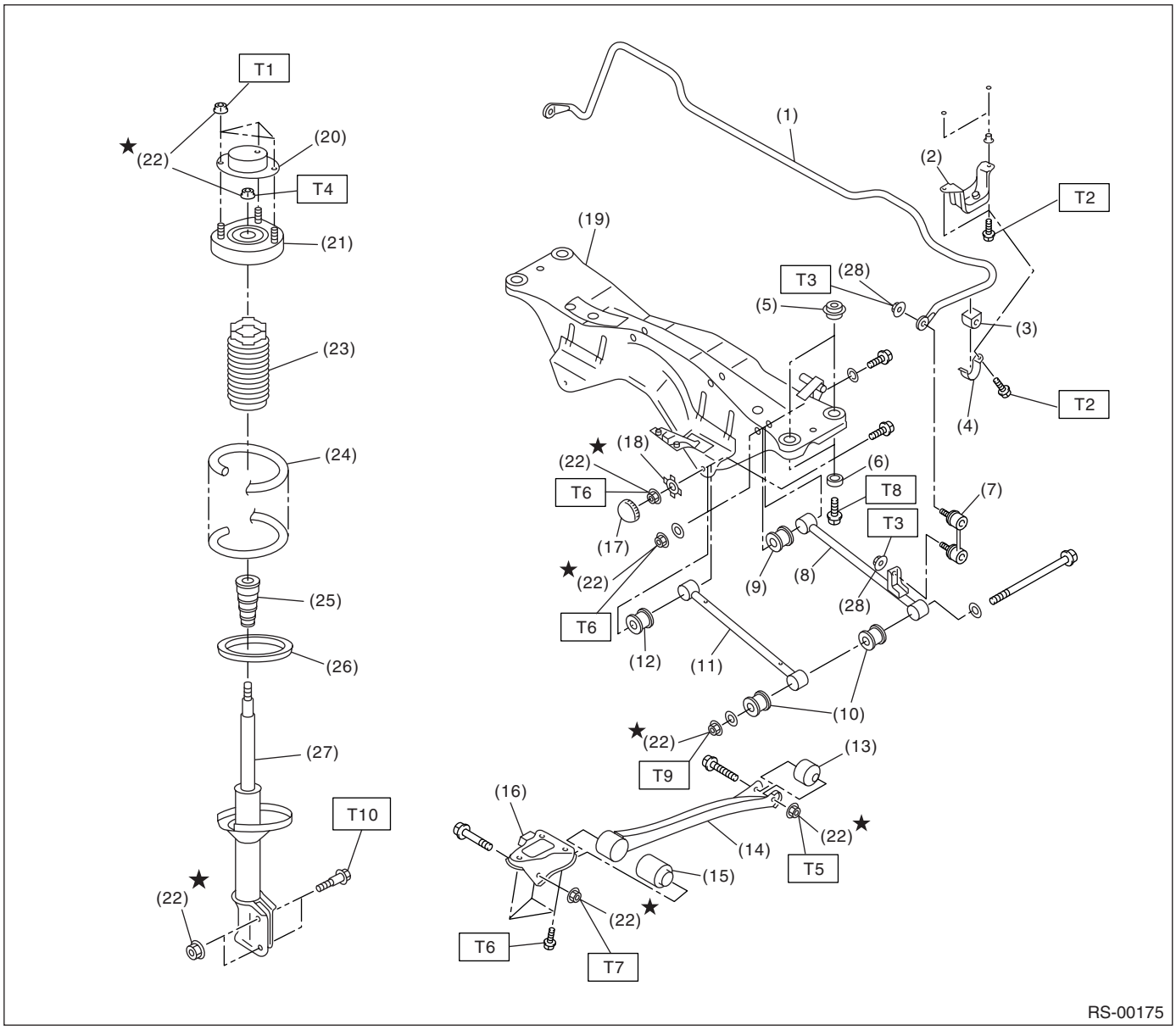
(1) Front

A–B = Positive: Toe-in, Negative: Toe-out

α1, α2: Each toe-in angle

B: COMPONENT

1. REAR SUSPENSION



(1)	Stabilizer	(14)	Trailing link	(27)	Damper strut
(2)	Stabilizer bracket	(15)	Trailing link front bushing	(28)	Flange nut
(3)	Stabilizer bushing	(16)	Trailing link bracket	***Tightening torque: N·m (kgf-m, ft-lb)***	
(4)	Clamp	(17)	Cap (Protection)	***T1:***	***20 (2.0, 14.5)***
(5)	Floating bushing	(18)	Washer	***T2:***	***25 (2.5, 18.1)***
(6)	Stopper	(19)	Rear crossmember	***T3:***	***45 (4.6, 33)***
(7)	Stabilizer link	(20)	Strut mount cap	***T4:***	***60 (6.1, 44)***
(8)	Rear lateral link	(21)	Strut mount	***T5:***	***90 (9.2, 66)***
(9)	Bushing (C)	(22)	Self-locking nut	***T6:***	***100 (10.2, 74)***
(10)	Bushing (A)	(23)	Dust cover	***T7:***	***115 (11.7, 85)***
(11)	Front lateral link	(24)	Coil spring	***T8:***	***130 (13.3, 96)***
(12)	Bushing (B)	(25)	Helper	***T9:***	***140 (14.3, 103)***
(13)	Trailing link rear bushing	(26)	Rubber seat lower	***T10:***	***200 (20.4, 148)***

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Use SUBARU genuine grease or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

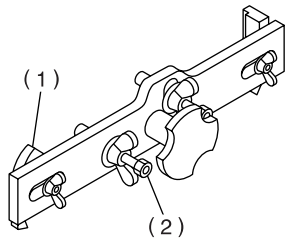
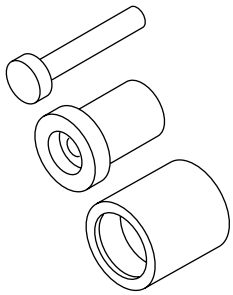
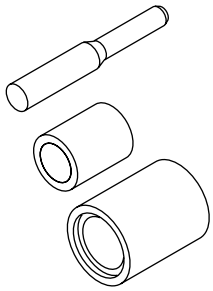
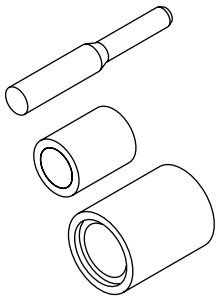
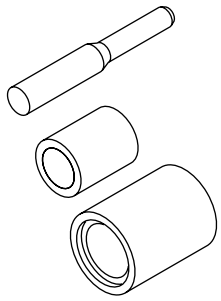
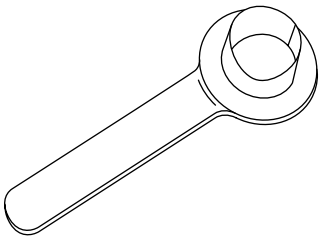
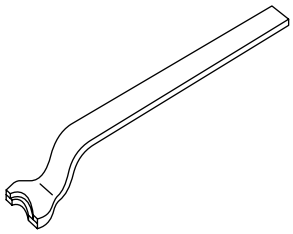
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927380001	927380001	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 ST-927720000	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 ST-927730000	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.
 ST-927700000	927700000	INSTALLER & REMOVER	Used for replacing lateral link bushing.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927690000	927690000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for suspension removal/installation.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for strut disassembly/assembly.

2. Wheel Alignment

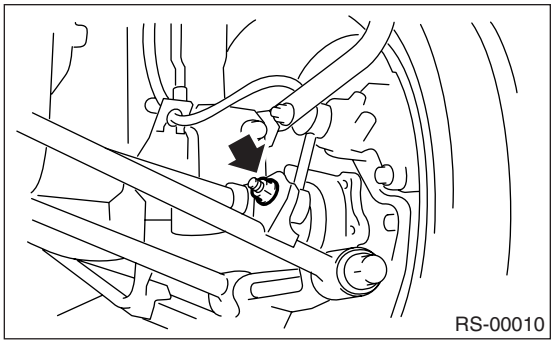
A: INSPECTION

NOTE:
Measure and adjust the front and rear wheel alignment together. Follow the procedure in “FS” section “Wheel Alignment” for measurement or adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

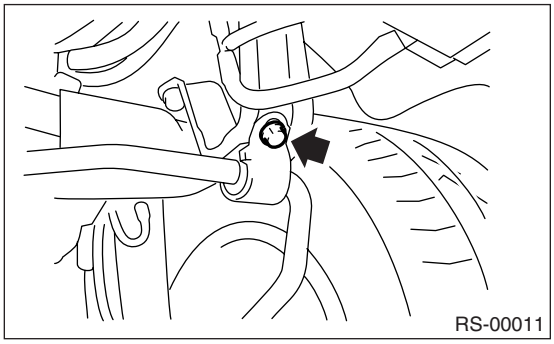
3. Rear Stabilizer

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the stabilizer link.



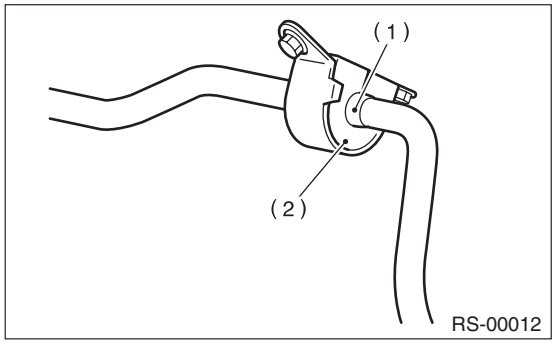
3) Remove the bolt which secure stabilizer to stabilizer bracket.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Use a new nut.
• Install the bushing while aligning it with paint mark on stabilizer.
• Ensure that bushing and stabilizer have the same identification colors when installing.



(1) Mark stamped on stabilizer
(2) Bushing identification color

2) Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.

Tightening torque:
Stabilizer link to rear lateral link
45 N·m (4.6 kgf-m, 33 ft-lb)
Stabilizer to stabilizer bracket
25 N·m (2.5 kgf-m, 18.1 ft-lb)

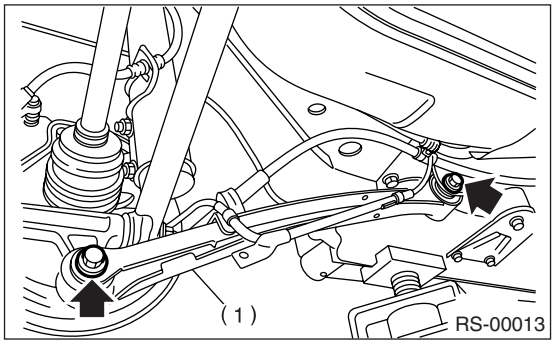
C: INSPECTION

1) Check the bushing for cracks, fatigue or damage.
2) Check the stabilizer link for deformities, cracks or damage.

4. Rear Trailing Link

A: REMOVAL

1) Loosen the rear wheel nuts.
2) Lift-up the vehicle, and then remove the rear wheels.
3) Remove both the rear parking brake clamp and ABS wheel speed sensor harness.
4) Remove the bolt which secures trailing link to trailing link bracket.



(1) Trailing link

5) Remove the bolt which secures trailing link to rear housing.

B: INSTALLATION

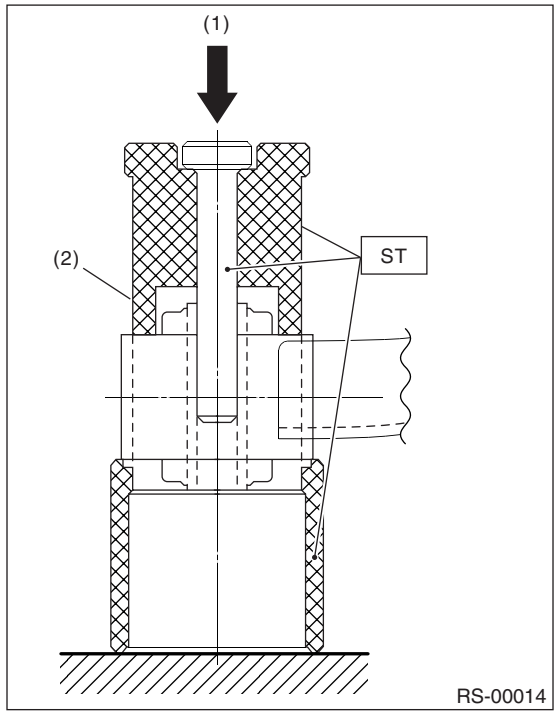
1) Install in the reverse order of removal.
2) Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight condition.

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

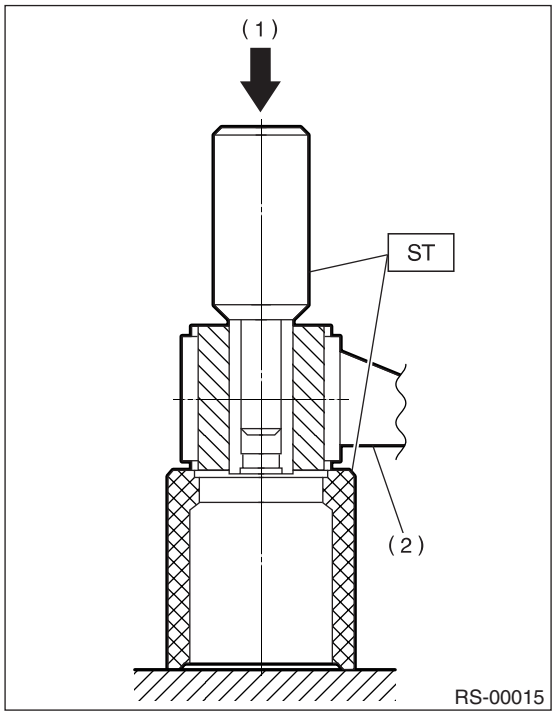
Using the ST, press the front bushing out of place.
ST 927720000 INSTALLER & REMOVER SET



(1) Press
(2) Trailing link

2. REAR BUSHING

1) Remove the housing. <Ref. to DS-25, REMOVAL, Rear Axle.>
2) Using the ST, press the rear bushing out of place.
ST 927730000 INSTALLER & REMOVER SET



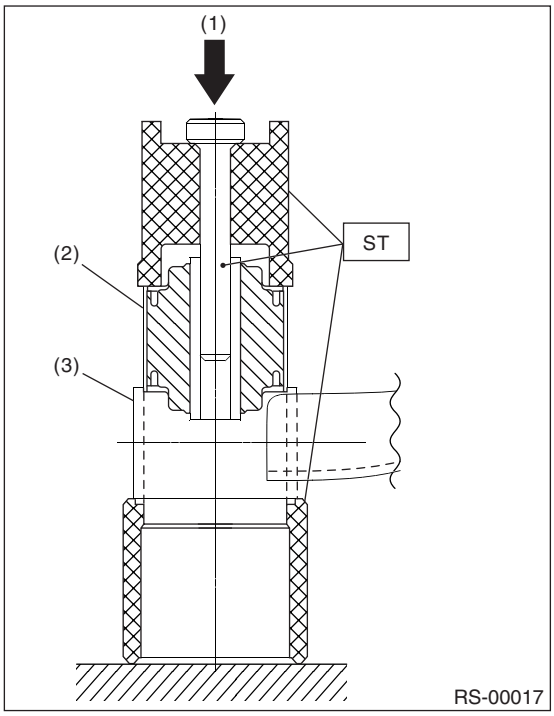
(1) Press
(2) Housing

D: ASSEMBLY

1. FRONT BUSHING

Using the ST, press the bushing into trailing link.
ST 927720000 INSTALLER & REMOVER SET

CAUTION:
Turn the ST plunger upside down and press it until the plunger end surface contacts trailing link end surface.



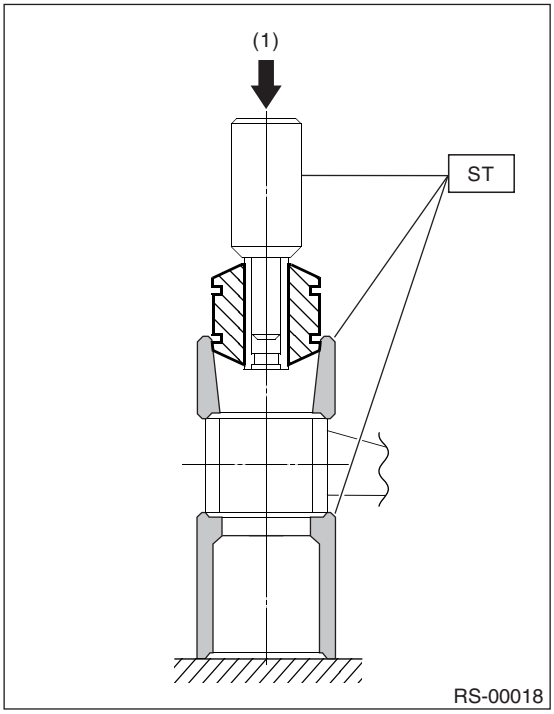
(1) Press
(2) Front bushing
(3) Trailing link

2. REAR BUSHING

1) Using the ST, press the bushing into trailing link.
ST 927730000 INSTALLER & REMOVER SET

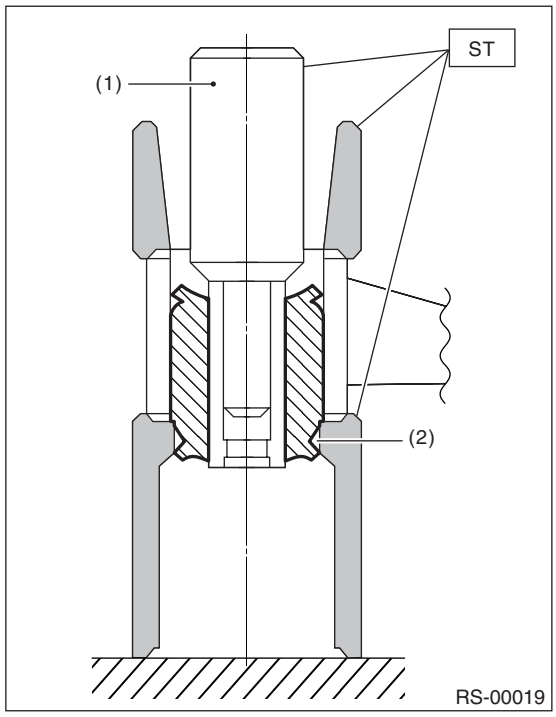
NOTE:
If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

Specified lubricant:
TIRE LUBE: water = 1: 3



(1) Press

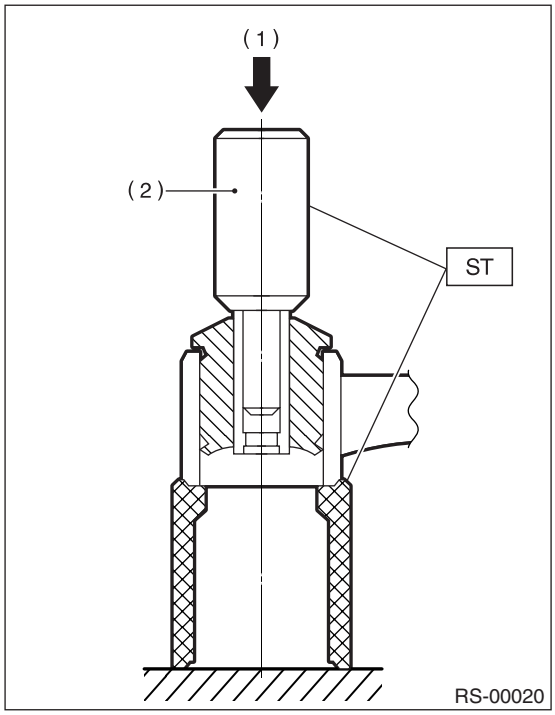
2) Press the ST plunger until bushing flange protrudes beyond trailing link.
ST 927730000 INSTALLER & REMOVER SET



(1) Plunger
(2) Flange

3) Turn the trailing link upside down. Press the ST plunger in the opposite direction that outlines in the former procedure until bushing is correctly positioned in trailing link.

ST 927730000 INSTALLER & REMOVER SET



(1) Press
(2) Plunger

4) Install the housing. <Ref. to DS-28, INSTALLATION, Rear Axle.>

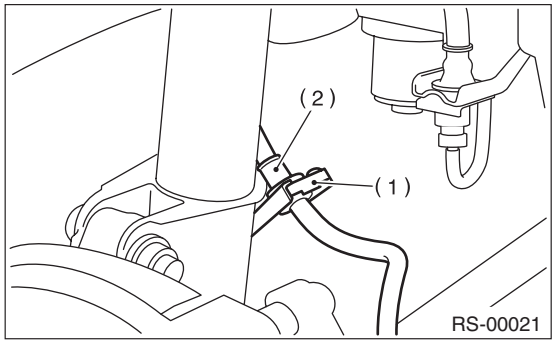
E: INSPECTION

Check the trailing links for bends, corrosion or damage.

5. Rear Strut

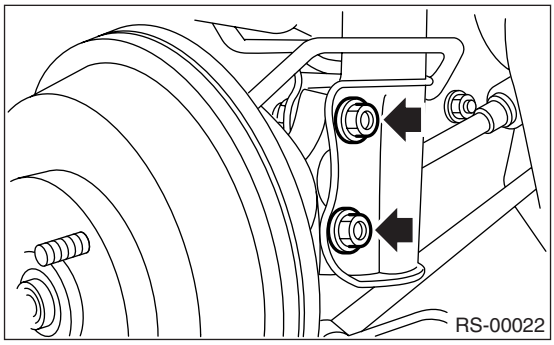
A: REMOVAL

1) Remove the strut cap of quarter trim.
2) Loosen the rear wheel nuts.
3) Lift-up the vehicle, and remove rear wheels.
4) Remove the brake hose clip, and then remove the brake hose from rear strut.



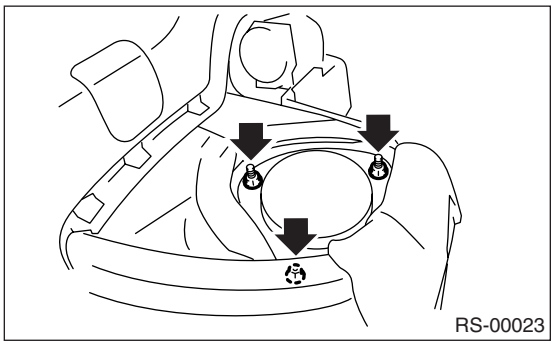
(1) Brake hose clip
(2) Brake hose

5) Remove the bolts which secure rear strut to housing.



CAUTION:
Do not subject the brake hose and ABS wheel speed sensor harness to excessive tension.

6) Remove the nuts securing strut mount to body.



B: INSTALLATION

1) Secure the strut mount to body with a new self-locking nut.

Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Secure the rear strut to housing with a new self-locking nut.

Tightening torque:
200 N·m (20.4 kgf-m, 148 ft-lb)

3) Install the brake hose to lower side of strut, then insert brake hose clip.
4) Lower the vehicle and tighten wheel nut.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

5) Install the strut cap to rear quarter trim.
6) Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

For disassembly of rear strut, refer to procedures outlined under front strut as a guide. <Ref. to FS-19, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut as a guide for assembly procedures.
<Ref. to FS-19, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut as a guide for inspection procedures.
<Ref. to FS-20, INSPECTION, Front Strut.>

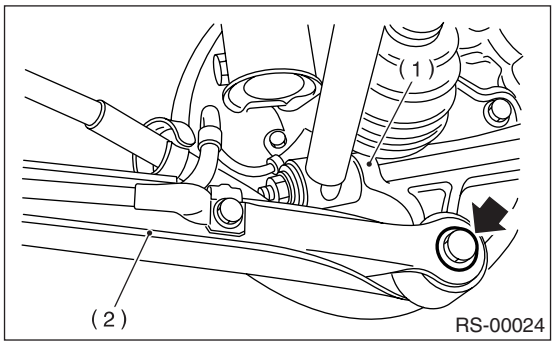
F: DISPOSAL

Refer to Front Strut as a guide for disposal procedures. <Ref. to FS-21, DISPOSAL, Front Strut.>

6. Lateral Link

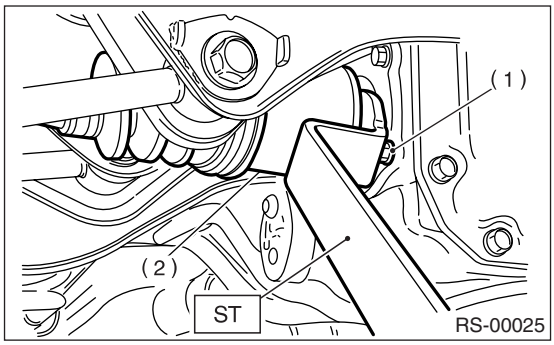
A: REMOVAL

1) Loosen the wheel nuts. Lift-up the vehicle and remove wheel.
2) Remove the stabilizers.
3) Remove the ABS wheel speed sensor harness from trailing link.
4) Remove the bolt securing trailing link to housing.



(1) Rear housing
(2) Trailing link

5) Remove the bolts which secure lateral link assembly to rear housing.
6) Remove the DOJ from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER



(1) Bolt
(2) DOJ

CAUTION:
Be careful not to damage the side bearing retainer. Always use bolt shown in the figure, as supporting point for ST during removal.

7) Scribe an alignment mark on the rear lateral link adjusting bolt and crossmember.
8) Remove the bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:
To loosen the adjusting bolt, always loosen the nut while holding head of adjusting bolt.

B: INSTALLATION

Install in the reverse order of removal. Observe the following instructions.
• Installation of DOJ to differential <Ref. to DS-41, INSTALLATION, Rear Drive Shaft.>
• Always tighten the bushing location when tires are in full contact with the ground and vehicle is curb weight.
• Secure the bolt head and tighten the nut when installing the adjusting bolt.

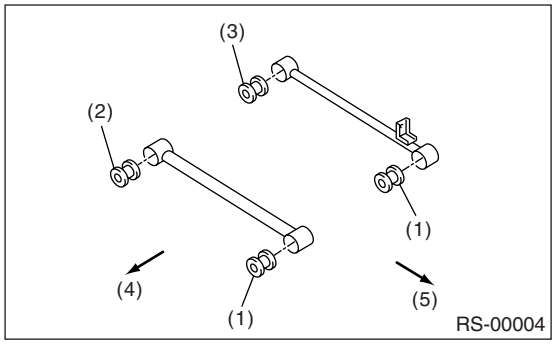
CAUTION:
• Replace the self-locking nut and DOJ circlip with new ones.
• Always use the special tool not to allow the DOJ splines to damage the side oil seal.
ST 28099PA090 OIL SEAL PROTECTOR

NOTE:
Check the wheel alignment and adjust if necessary.

C: DISASSEMBLY

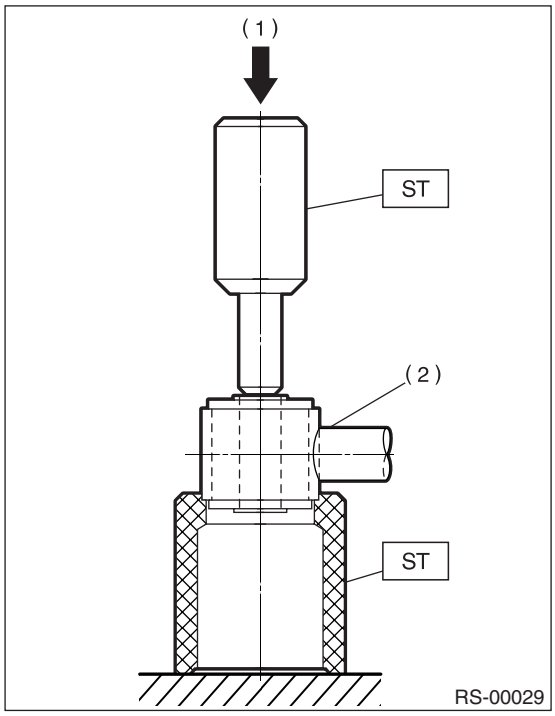
1) Using the following table as a guide, verify the type of bushings.
2) Select the ST according to type of bushings used.

Bushing	ST: INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000



(1) Bushing A
(2) Bushing B
(3) Bushing C
(4) Front
(5) Outside of body

3) Using the ST, press the bushing out of place.



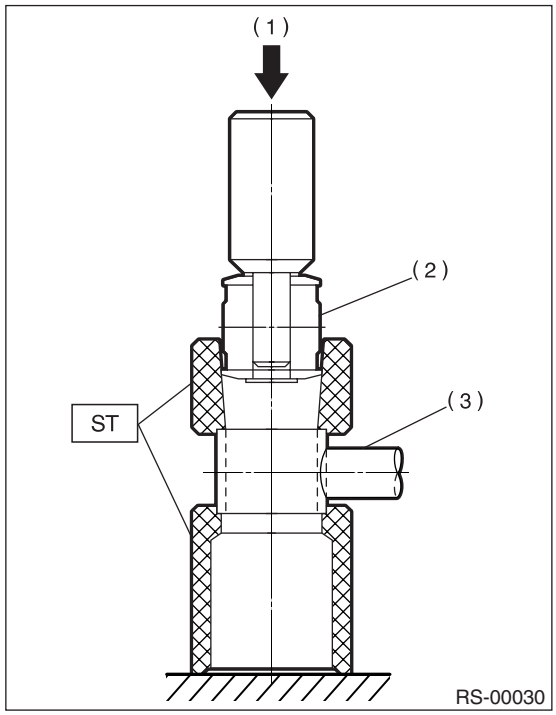
(1) Press
(2) Lateral link

D: ASSEMBLY

1) Using the same ST as that used during disassembly.
2) If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

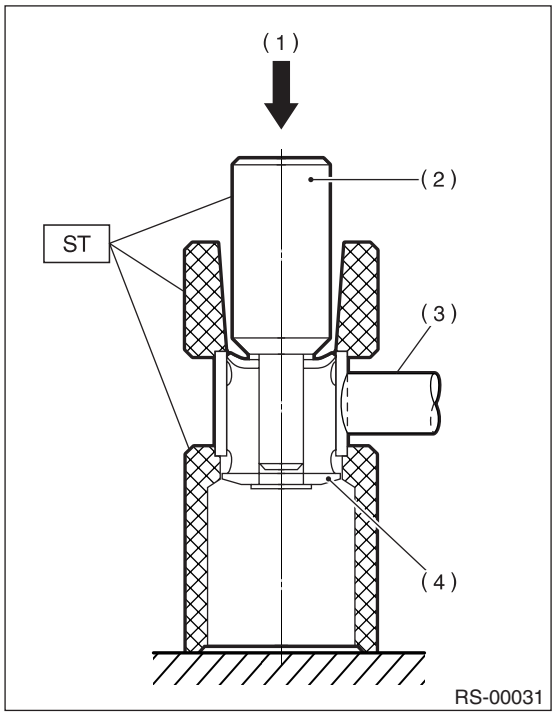
Specified lubricant:
TIRE LUBE : water = 1: 3

3) Using the ST, press the bushing into place.



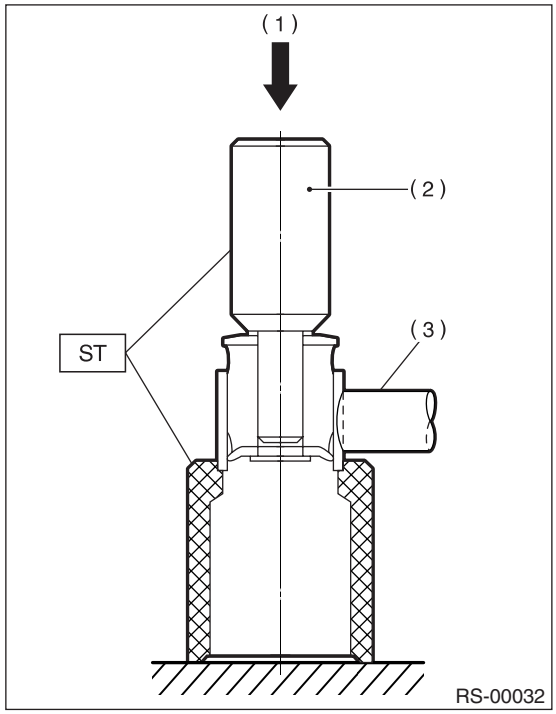
(1) Press
(2) Bushing
(3) Lateral link

4) Press the ST plunger until bushing flange protrudes beyond lateral link.



(1) Press
(2) Plunger
(3) Lateral link
(4) Flange

5) Turn the lateral link upside down. Press the ST plunger in opposite direction that outlined in the former procedure until bushing is correctly positioned in trailing link.



(1) Press
(2) Plunger
(3) Lateral link

E: INSPECTION

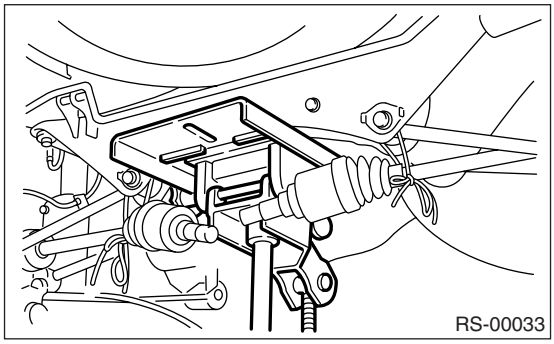
Visually check the lateral links for damage or bends.

7. Rear Crossmember

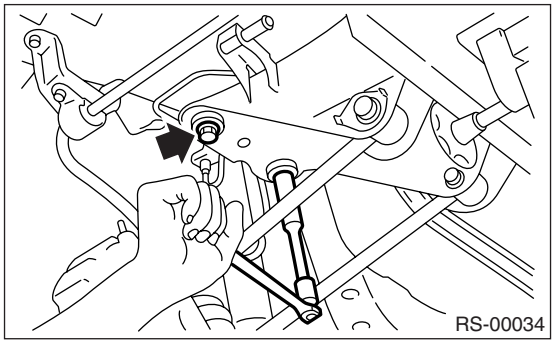
A: REMOVAL

CAUTION:
Do not subject the ABS wheel speed sensor harness to excessive tension.

1) Separate the front exhaust pipe and rear exhaust pipe.
2) Remove the rear exhaust pipe and muffler.
3) Remove the rear differential. <Ref. to DI-24, REMOVAL, Rear Differential (T-type).> or <Ref. to DI-39, REMOVAL, Rear Differential (VA-type).>
4) Place the transmission jack under rear crossmember.



5) Remove the bolts securing crossmember to vehicle body, and then remove the crossmember.



6) Scribe an alignment mark on the rear lateral link cam bolt and crossmember.
7) Remove the front and rear lateral links by loosening nuts.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
• Discard the loosened self-locking nut and replace it with a new one.
• Always tighten the nut (not adjusting bolt), when tightening adjusting bolt.

2) For installation and tightening torque of rear differential;
<Ref. to DI-26, INSTALLATION, Rear Differential (T-type).> or <Ref. to DI-39, REMOVAL, Rear Differential (VA-type).>
3) Always tighten the rubber bushing when wheels are in full contact with the ground and vehicle is curb weight.
4) Check the wheel alignment and adjust if necessary.

C: INSPECTION

Check the removed parts for wear, damage and cracks, and correct or replace if defective.

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut or shock absorber	Replace.
(3) Installation of wrong strut or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

1) Large rebound shock
2) Rocking of the vehicle continues too long after running over bump and hump.
3) Large shock in bumping

Possible causes	Countermeasures
(1) Breakage of coil spring	Replace.
(2) Overinflation pressure of tire	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new ones.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Unsuitable installation (maximum or minimum length) of damper strut or shock absorber	Replace with proper parts.
(7) Deformation or damage of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage of damper strut or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut	Replace.
(2) Wear or damage of shock absorber component parts	Replace.
(3) Loosening of suspension link installing bolt	Retighten to the specified torque.
(4) Deformation or loss of bushing	Replace.
(5) Unsuitability of maximum or minimum length of damper strut or shock absorber	Replace with proper parts.
(6) Breakage of coil spring	Replace.
(7) Wear or damage of ball joint	Replace.
(8) Deformation of stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

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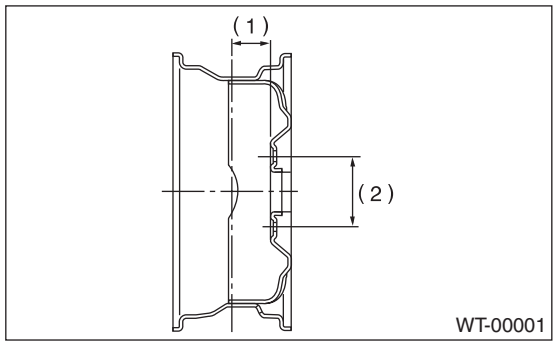
1. General Description

A: SPECIFICATION



(1) Offset
(2) P.C.D.

Model	Tire size	Wheel size	Offset mm (in)	P.C.D. mm (in)	Tire inflation pressure kPa (kgf/cm^2, psi)	
					Light load	Full load
HUNTER VER.	205/70R15 95H	15 × 6J (Steel)	48 (1.89)	100 (3.94)	Front:200 (2.0, 29) Rear:190 (1.9, 28)	Front:200 (2.0, 29) Rear:250 (2.5, 36)
2.0X						
2.0XT	215/60R16 95V	16 × 6 1/2JJ (Aluminum)				
2.5X (LHD)	215/60R16 95V	16 × 6 1/2J (Steel)				
2.5X (RHD)	P215/60R16 94H	16 × 6 1/2J (Steel)				
2.5XS	P215/60R16 94H	16 × 6 1/2JJ (Aluminum)				
2.5XT (LHD)	215/60R16 95V	16 × 6 1/2JJ (Aluminum)				
2.5XT (RHD)	P215/60R16 94H	16 × 6 1/2JJ (Aluminum)				

1. SERVICE DATA

Item	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

2. ADJUSTING PARTS

Wheel balancing	Standard	Service limit
Dynamic unbalance	Less than 5 g (0.18 oz)	

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge	Used for measuring wheel runout.

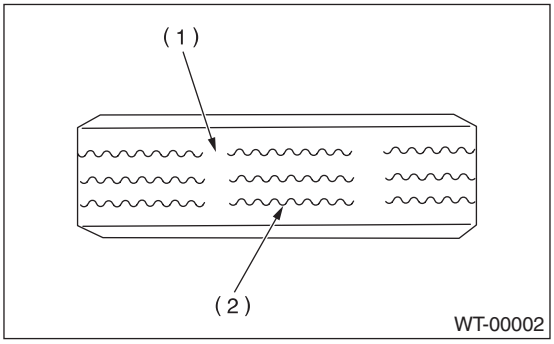
2. Tire

A: INSPECTION

1) Take stone, glass, nail etc. off the tread groove.
2) Replace the tire:

CAUTION:
When replacing a tire, make sure to use only the same size, construction and load range as originally installed.

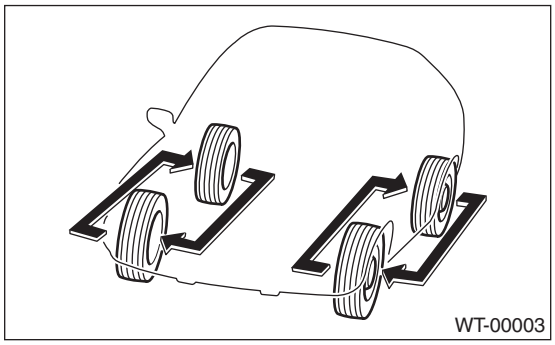
(1) When large crack on the side wall, damage or crack on tread is found.
(2) When the “tread wear indicator” appears as a solid band across the tread.
(3) If a crack is found on the tire valve, replace the tire valve.



(1) Tread wear indicator
(2) Tire tread

1. TIRE ROTATION

Rotate the tire positions periodically (10,000 km (6,200 miles)) as shown in the figure to prevent tires from wearing unevenly or the lengthen their service lives.



3. Steel Wheel

A: REMOVAL

1) Apply parking brake, and position the select lever to “P” or “LOW”.
2) Set jacks or a lift to the specified point, and support the vehicle with its tires slightly contacting the floor.
3) Loosen the wheel nuts.
4) Raise the vehicle until its wheels take off the ground using a jack or a lift.
5) Remove the wheel nuts and wheels.

NOTE:
• While removing the wheels, prevent hub bolts from damage.
• Place the wheels with their outer sides facing upward to prevent wheels from damage.

B: INSTALLATION

1) Remove dirt on the mating surface of wheels and brake rotors.
2) Attach the wheel to hub by aligning the wheel bolt hole with hub bolt.
3) Temporarily attach the wheel nuts to hub bolts. (In the case of aluminum wheel, use SUBARU genuine wheel nut for aluminum wheel.)
4) Manually tighten the nuts making sure the wheel hub hole is aligned correctly to guide portion of hub.
5) Tighten the wheel nuts in a diagonal selection to specified torque. Use a wheel nut wrench.

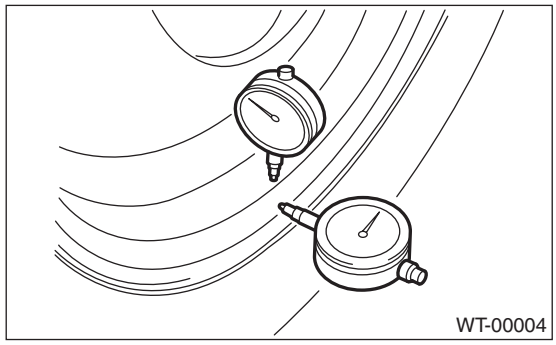
Wheel nut tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

CAUTION:
• Tighten the wheel nuts in two or three steps by gradually increasing the torque and working diagonally, until the specified torque is reached. For drum brake models, excess tightening of wheel nuts may cause wheels to “judder”.
• Do not depress the wrench with foot. Always use both hands when tightening.
• Make sure the bolt, nut and nut seating surface of the wheel are free from oils.

6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (620 miles).

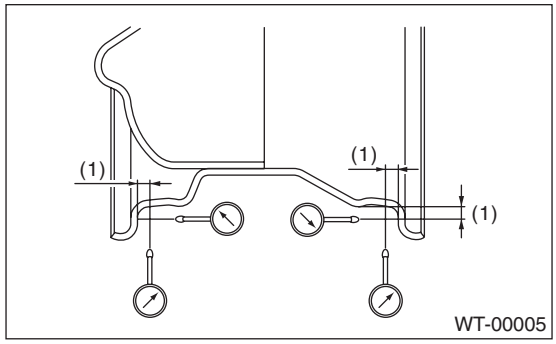
C: INSPECTION

1) Deformation or damage on the rim can cause air leakage. Check the rim flange for deformation, crack, or damage, and repair or replace as necessary.
2) Jack-up the vehicle until tires clear the floor.
3) Slowly rotate the wheel to check rim “runout” using a dial gauge.



Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	

4) If the rim runout exceeds specifications, remove the tire from rim and check runout while attaching dial gauge to positions shown in the figure.



(1) Approx. 7 mm (0.28 in)

5) If measured runout still exceeds specifications, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

Refer to Steel Wheel for removal procedure of aluminum wheels. <Ref. to WT-5, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to Steel Wheel for installation procedure of aluminum wheels. <Ref. to WT-5, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to Steel Wheel for inspection procedure of aluminum wheels. <Ref. to WT-5, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout limit	Radial runout limit
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, do the following:
1) Do not damage the aluminum wheels during removal, installation, wheel balancing, etc. After removing the aluminum wheels, place them on a rubber mat, etc.
2) While the vehicle is being driven, be careful not to ride over sharp obstacles or allow the aluminum wheels to contact the shoulder of the road.
3) When installing a tire chain, be sure to install it properly not to have slack; otherwise it may hit the wheel while driving.
4) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleanser including abrasive, hard brushes or an automatic car washer.

5. Wheel Balancing

A: ADJUSTMENT

1) Remove the balance weights.
2) Using wheel balancer, measure the wheel balance.
3) Select a weight close to the value measured by wheel balancer.

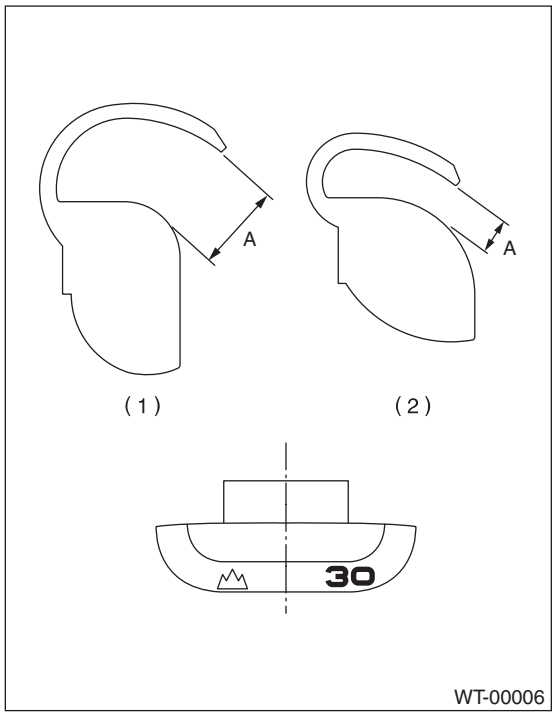
Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
723141340	30 g (1.06 oz)
723141350	35 g (1.23 oz)
723141360	40 g (1.41 oz)
723141370	45 g (1.59 oz)
723241380	50 g (1.76 oz)
723241580	55 g (1.94 oz)
723241590	60 g (2.12 oz)

Balance weight part number (For aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
23141GA512	30 g (1.06 oz)
23141GA522	35 g (1.23 oz)
23141GA532	40 g (1.41 oz)
23141GA542	45 g (1.59 oz)
23141GA552	50 g (1.76 oz)
—	55 g (1.94 oz)
23141GA572	60 g (2.12 oz)

4) Install the selected weight to the point designated by wheel balancer.
5) Using wheel balancer, measure the wheel balance again. Check that the wheel balance is correctly adjusted.
6) Use genuine balance weights.

NOTE:
• 55 g (1.94 oz) weight used with the aluminum wheel is not available.

• Balance weights are available for use with any of 15 to 16-inch wheels.



(1) Weight for aluminum wheel
(2) Weight for steel wheel

Service limit A:
Weight for steel wheel:
5 g (0.18 oz) — 25 g (0.88 oz) 2.0 mm (0.079 in)
More than 30 g (1.06 oz) 1.8 mm (0.071 in)
Weight for aluminum wheel:
5 g (0.18 oz) — 25 g (0.88 oz) 5.0 mm (0.197 in)
More than 30 g (1.06 oz) 4.5 mm (0.177 in)

6. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Vehicle sways.	Improperly inflated tire	Adjust inflation pressure.
	Abnormal tire wear	Inspect tires according “Abnormal tire wear” in this table, and then replace tires if required.
	Front wheel alignment	Inspect front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Inspect rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
	Front strut	Inspect front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Inspect rear strut. <Ref. to RS-14, INSPECTION, Rear Strut.>
	Front axle	Inspect front axle. <Ref. to DS-24, INSPECTION, Front Axle.>
	Rear axle	Inspect rear axle. <Ref. to DS-32, INSPECTION, Rear Axle.>
Abnormal vehicle pitching	Improperly inflated tire	Adjust inflation pressure.
	Abnormal tire wear	Inspect tires according “Abnormal tire wear” in this table, and then replace tires if required.
	Front stabilizer	Inspect front stabilizer. <Ref. to FS-22, INSPECTION, Front Stabilizer.>
	Front wheel alignment	Inspect front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Inspect rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>
Abnormal wheel vibration	Improperly inflated tire	Adjust inflation pressure.
	Abnormal tire wear	Inspect tires according “Abnormal tire wear” in this table, and then replace tires if required.
	Wheel is out of balance.	Inspect wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front axle	Inspect front axle. <Ref. to DS-24, INSPECTION, Front Axle.>
	Rear axle	Inspect rear axle. <Ref. to DS-32, INSPECTION, Rear Axle.>
Abnormal tire wear	Improperly inflated tire	Adjust inflation pressure.
	Wheel is out of balance.	Inspect wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Inspect front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Inspect rear wheel alignment. <Ref. to RS-8, INSPECTION, Wheel Alignment.>

DIFFERENTIALS

DI

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7. Rear Differential Side Oil Seal 55
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1. General Description

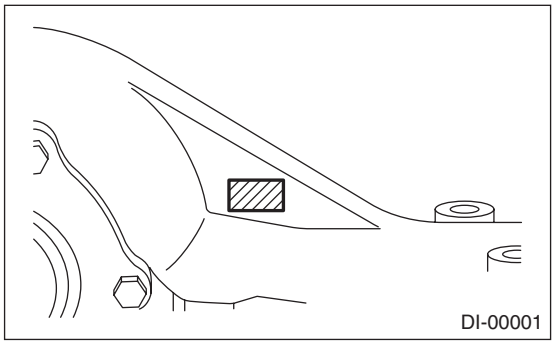
A: SPECIFICATION

When replacing a rear differential assembly, select the correct one according to the following table.

NOTE:
Using the different rear differential assembly causes the drive line and tires to “drag” or emit noise.

Model	2.0 L Non-turbo		2.0 L Turbo				2.5 L Non-turbo		2.5 L Turbo		
			MT		AT				MT		
	MT	AT	For Europe	Except For Europe	For Europe	Except For Europe	MT	AT	For Europe	Except For Europe	AT
Rear differential type	VA-type with LSD		T-type with LSD								
LSD type	Viscous coupling										
Identification	XR	XS	FF	CF	FF	JP	CF		FF	CF	
Type of gear	Hypoid gear										
Gear ratio (Number of gear teeth)	4.111 (37/9)	4.444 (40/9)	4.111 (37/9)	4.444 (40/9)	4.111 (37/9)		4.444 (40/9)		4.111 (37/9)	4.444 (40/9)	
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)										
Rear differential gear oil	GL-5										

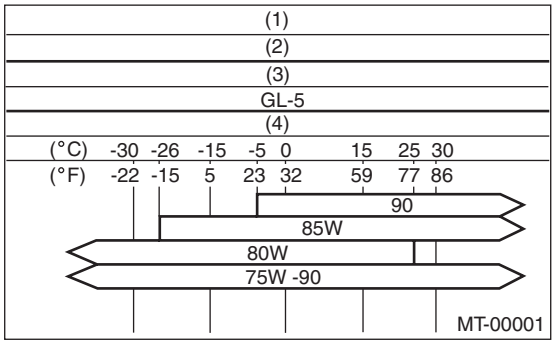
• Identification



• Rear differential gear oil

Recommended oil

CAUTION:
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



(1) Item
(2) Differential gear oil
(3) API standard
(4) SAE Viscosity No. and Application Temperature

1. SERVICE DATA

Front and rear bearing preload at companion flange bolt hole N (kgf, lbf)	New bearing	T-type	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
		VA-type	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
Side bearing standard width mm (in)			20.00 (0.7874)
Hypoid driven gear to drive pinion backlash mm (in)		T-type	0.10 — 0.20 (0.0039 — 0.0079)
		VA-type	0.10 — 0.15 (0.0039 — 0.0059)
Hypoid driven gear runout on its back surface mm (in)			Less than 0.05 (0.0020)

2. ADJUSTING PARTS

- **T-type**

Front and rear bearing preload at companion flange bolt hole N (kgf, lbf)	New bearing	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
Preload adjusting collar	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)
Preload adjusting washer	Part No.	Length mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)

Pinion height adjusting shim	Part No.	Thickness mm (in)
	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
	383655200	3.57 (0.1406)
	383665200	3.60 (0.1417)
	383675200	3.63 (0.1429)
	383685200	3.66 (0.1441)
Side bearing standard width mm (in)	—	20.00 (0.7874)
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
	383475205	0.50 (0.0197)
Hypoid driven gear to drive pinion backlash	Limit mm (in)	0.10 — 0.20 (0.0039 — 0.0079)
Hypoid driven gear runout on its back surface		0.05 (0.0020)

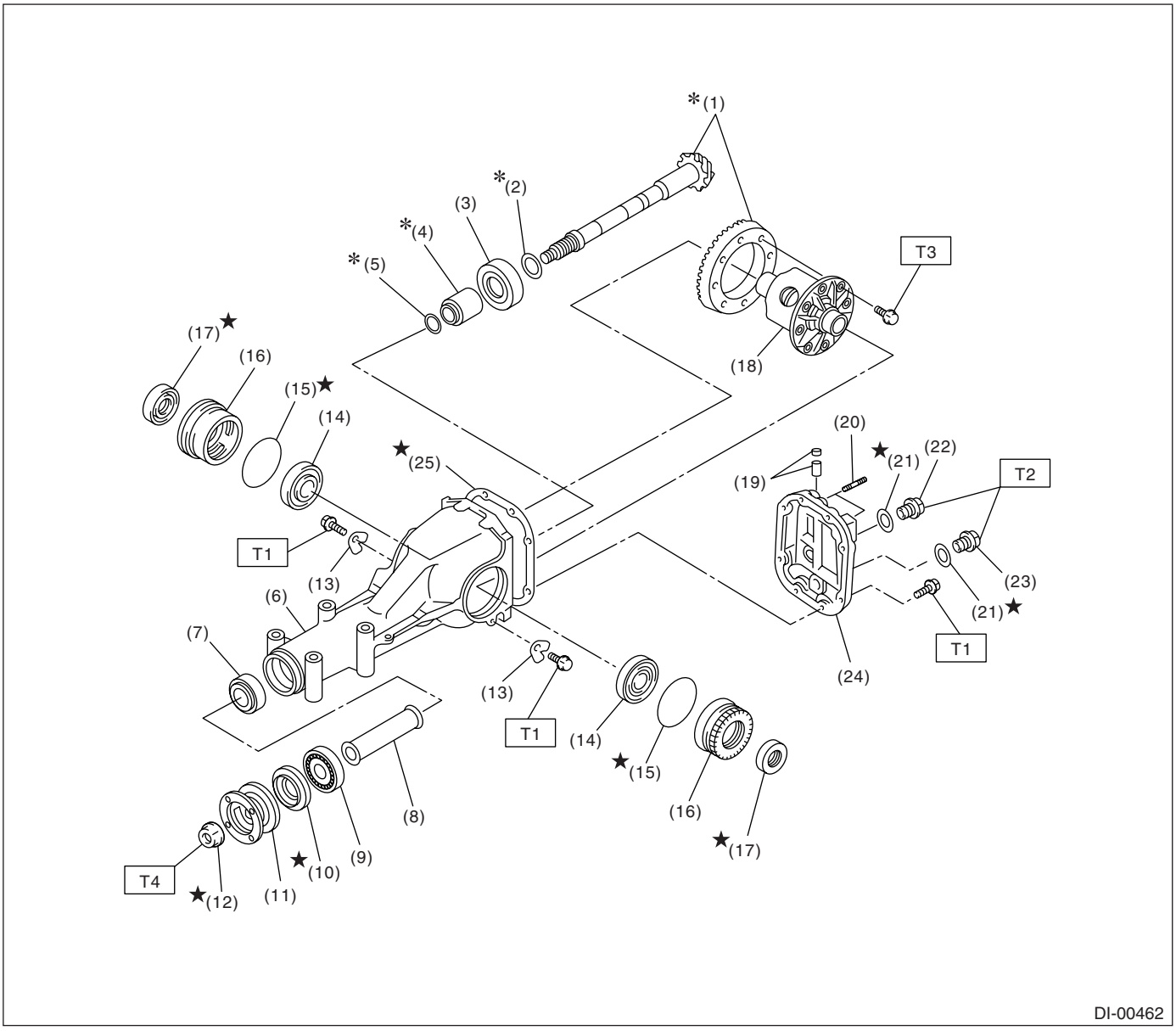
- **VA-type**

Front and rear bearing preload at companion flange bolt hole	New bearing	12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lbf)
Preload adjusting collar	Part No.	Length mm (in)
	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)

Preload adjusting washer	Part No.	Thickness mm (in)
	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
Pinion height adjusting shim	Part No.	Thickness mm (in)
	32295AA200	0.150 (0.0059)
	32295AA210	0.175 (0.0069)
	32295AA220	0.200 (0.0079)
	32295AA230	0.225 (0.0089)
	32295AA240	0.250 (0.0098)
	32295AA250	0.275 (0.0108)
Side gear thrust washer	Part No.	Thickness mm (in)
	803135011	0.925 — 0.950 (0.0364 — 0.0374)
	803135012	0.950 — 0.975 (0.0374 — 0.0384)
	803135013	0.975 — 1.000 (0.0384 — 0.0394)
	803135014	1.000 — 1.025 (0.0394 — 0.0404)
	803135015	1.025 — 1.050 (0.0404 — 0.0413)
Hypoid driven gear to drive pinion backlash	Limit mm (in)	0.10 — 0.15 (0.0039 — 0.0059)

B: COMPONENT

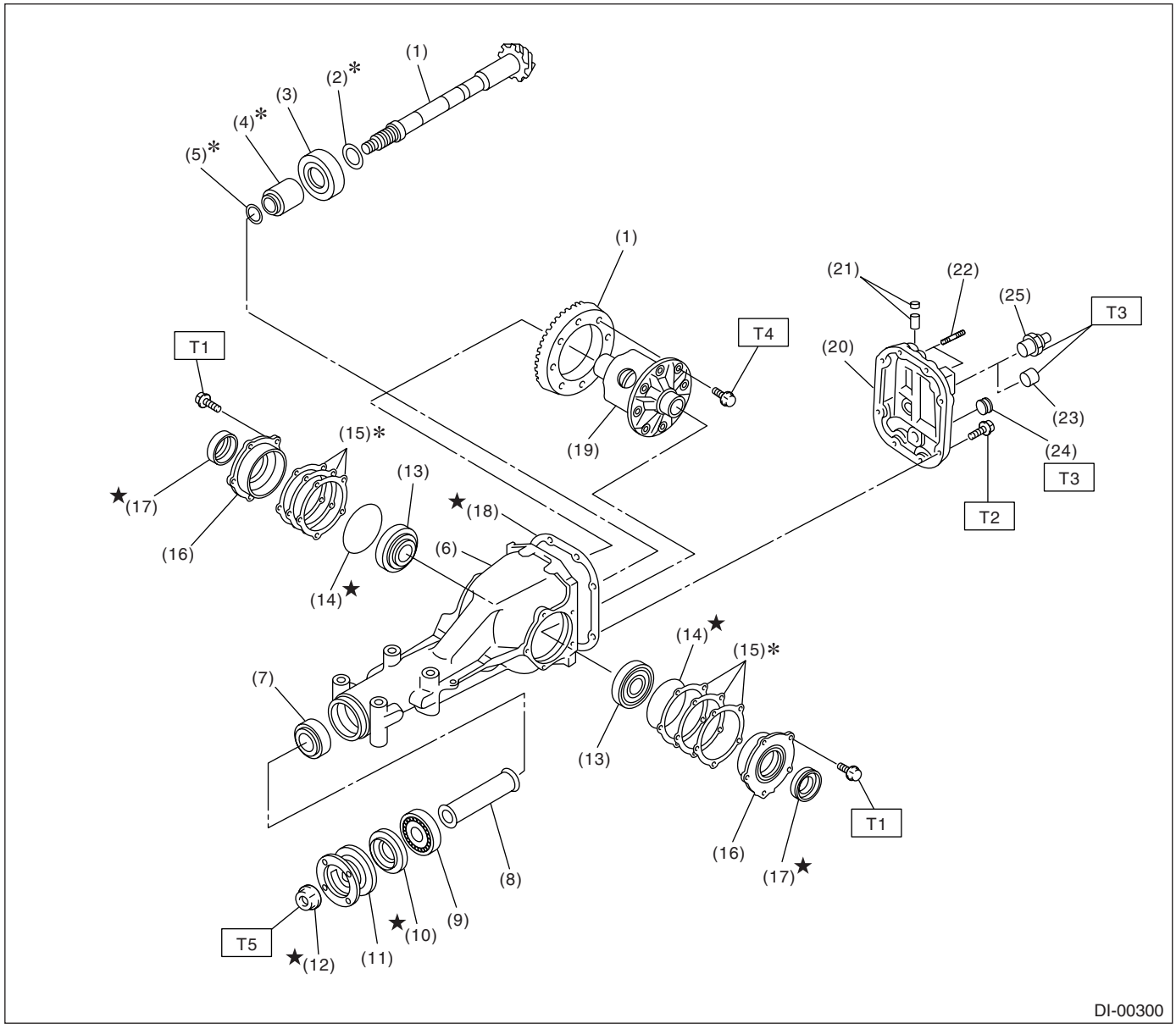
1. REAR DIFFERENTIAL FOR VA-TYPE



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Lock plate
(14) Side bearing
(15) O-ring
(16) Axle shaft holder
(17) Side oil seal
(18) Differential case
(19) Air breather cap
(20) Stud bolt
(21) Gasket
(22) Oil filler plug
(23) Oil drain plug
(24) Rear cover
(25) Gasket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)
T2: 34 (3.5, 25.3)
T3: 62 (6.3, 45.6)
T4: 191 (19.5, 141)

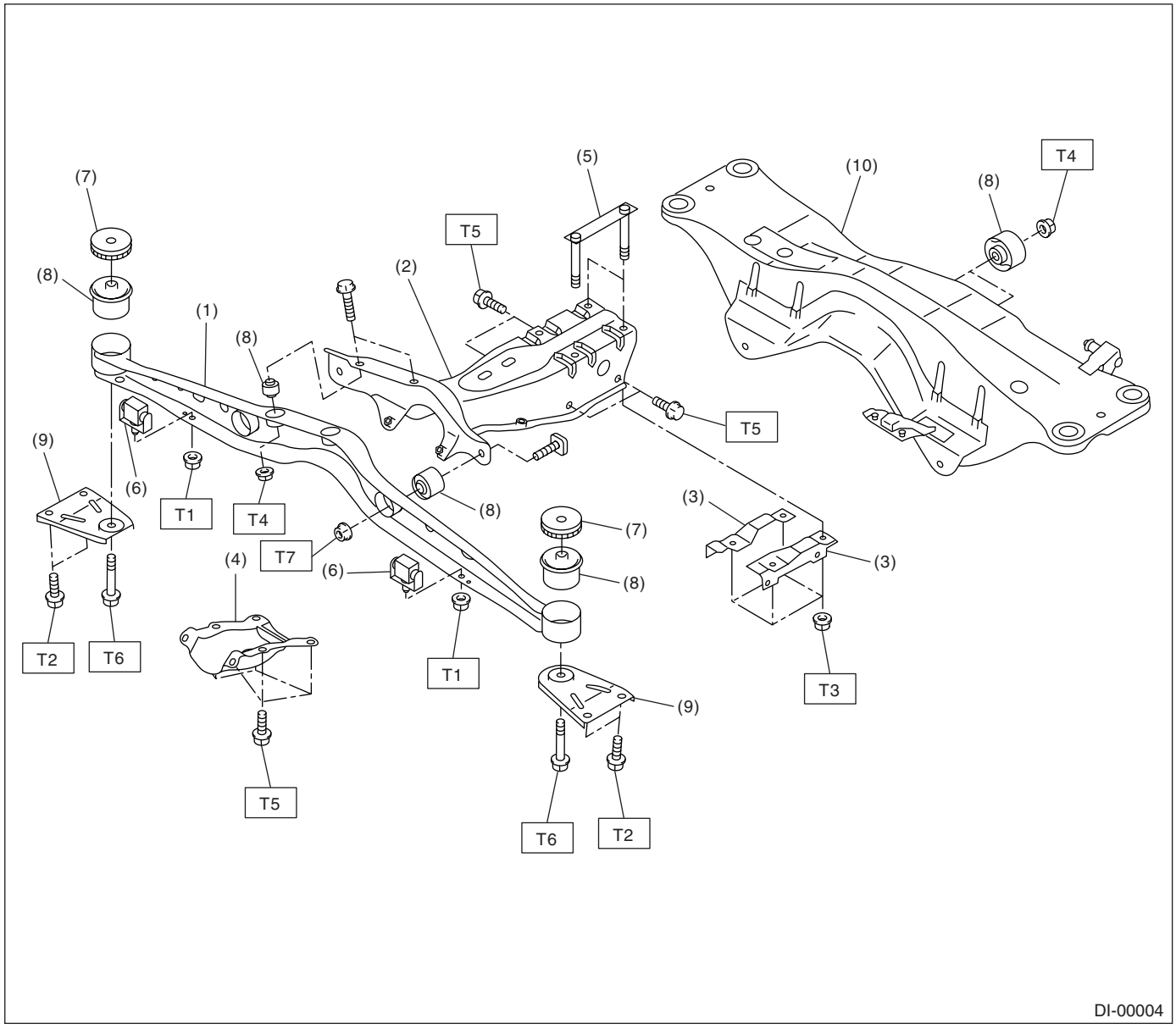
2. REAR DIFFERENTIAL FOR T-TYPE



(1) Hypoid driven gear and drive pinion set
(2) Pinion height adjusting washer
(3) Rear bearing
(4) Bearing preload adjusting collar
(5) Bearing preload adjusting washer
(6) Differential carrier
(7) Front bearing
(8) Collar
(9) Pilot bearing
(10) Front oil seal
(11) Companion flange
(12) Self-locking nut
(13) Side bearing
(14) O-ring
(15) Side bearing retainer shim
(16) Side bearing retainer
(17) Side oil seal
(18) Gasket
(19) Differential case (Viscous coupling type)
(20) Rear cover
(21) Air breather cap
(22) Stud bolt
(23) Oil filler plug (model without oil temperature switch)
(24) Oil drain plug
(25) Oil filler plug (model with oil temperature switch)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 10.3 (1.05, 7.6)
T2: 29 (3.0, 22)
T3: 49 (5.0, 36.2)
T4: 105 (10.7, 77.4)
T5: 181 (18.5, 134)

3. REAR DIFFERENTIAL MOUNTING SYSTEM



(1) Differential front member
(2) Differential bracket
(3) Differential mount lower bracket
(4) Differential mounting front cover
(5) Plate
(6) Dynamic damper (Non-turbo model)
(7) Stopper
(8) Bushing
(9) Differential mount bracket
(10) Cross member

Tightening torque: N·m (kgf-m, ft-lb)
T1: 20 (2.0, 14.5)
T2: 33 (3.4, 25)
T3: 50 (5.1, 37)
T4: 70 (7.1, 52)
T5: 90 (9.2, 66)
T6: 100 (10.2, 73.8)
T7: 128 (13.1, 95)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating face of the case.

D: PREPARATION TOOL

1. SPECIAL TOOL

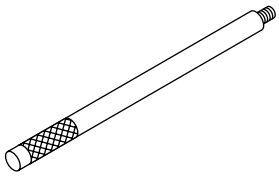
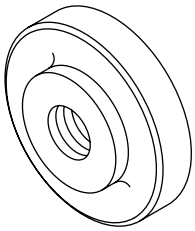
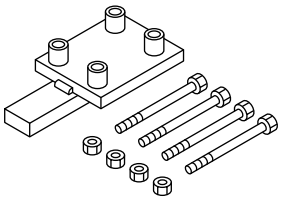
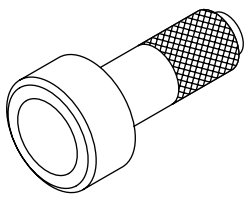
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	Used for installing front and rear bearing cone.
 ST-398477702	398477702	DRIFT	• Used press-fitting the bearing cone of differential carrier (front). • For T-type.
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 ST-498447120	498447120	INSTALLER	Used for installing front oil seal.

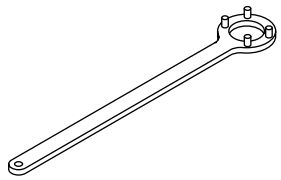
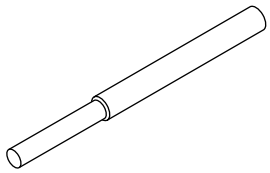
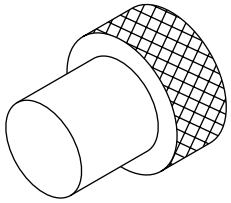
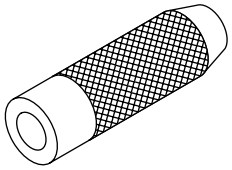
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498427200	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when loosening and tightening self-locking nut.
 ST-398467700	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 ST-399780104	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 ST-899580100	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.

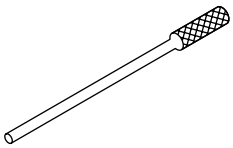
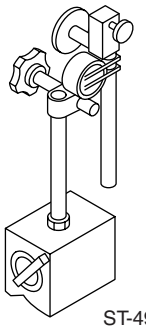
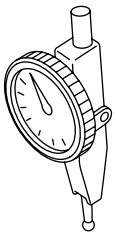
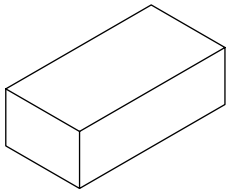
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.

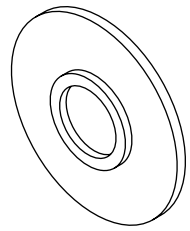
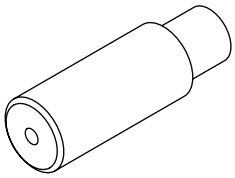
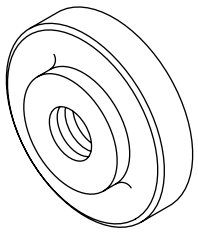
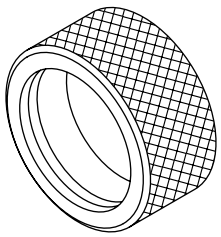
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398177700	398177700	INSTALLER	• Used for installing rear bearing cone. • For T-type.
 ST-398457700	398457700	ATTACHMENT	• Used for removing side bearing retainer. • For T-type.
 ST-398477703	398477703	DRIFT2	• Used for press-fitting the bearing race (rear) of differential carrier. • For T-type.
 ST-398437700	398437700	DRIFT	• Used for installing side oil seal. • For T-type.

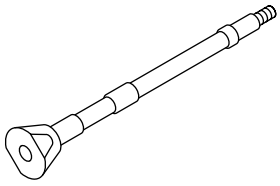
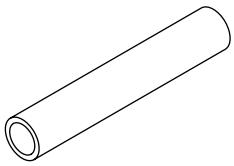
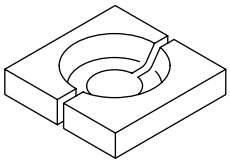
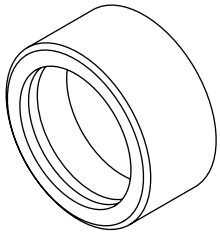
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507702	398507702	DUMMY SHAFT	• Used for adjusting pinion height and preload. • For T-type.
 ST-398507703	398507703	DUMMY COLLAR	• Used for adjusting pinion height and preload. • For T-type.
 ST-398517700	398517700	REPLACER	• Used for removing rear bearing cone. • For T-type.
 ST-398487700	398487700	DRIFT	• Used for press-fitting the side bearing cone. • For T-type.

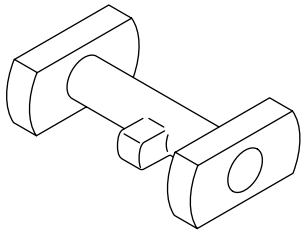
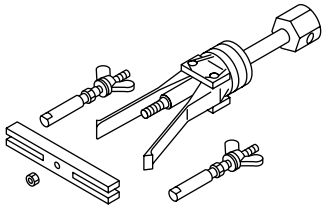
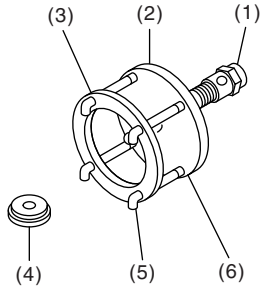
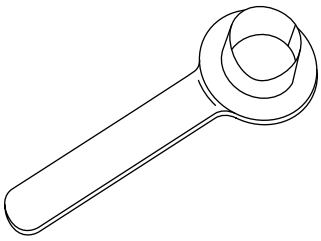
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For T-type.
 ST-398527700	398527700	PULLEY ASSY	• Used for removing front oil seal. • Used for removing side bearing cup. (T-type)
 ST-399527700	399527700	PULLER SET	• Used for extracting side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000) • For T-type.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.

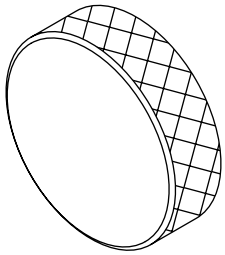
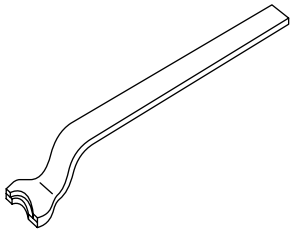
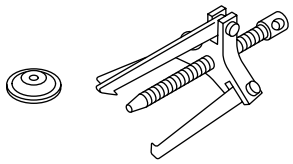
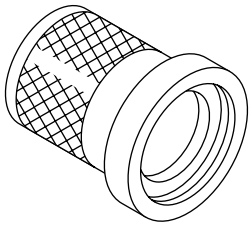
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398237700	398237700	DRIFT	• Used for installing side bearing. • For T-type.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	• Used for removing rear drive shaft from rear differential. • For T-type.
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange
 ST-899874100	899874100	INSTALLER	Used for installing companion flange.

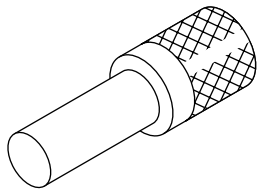
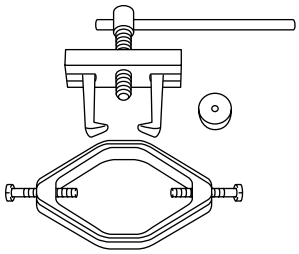
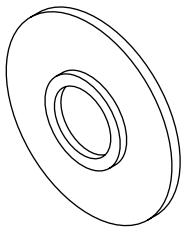
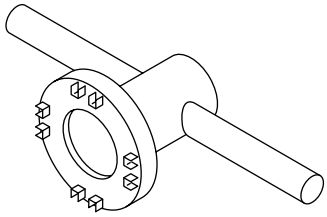
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899864100	899864100	REMOVER	Used for removing differential side bearing.
 ST18759AA000	18759AA000 (Newly adopted tool)	PULLER ASSY	Used for removing differential from side bearing cone.
 ST-498175500	498175500	INSTALLER	• Used for installing rear bearing cone. • For VA-type.
 ST-499785500	499785500	OIL SEAL HOLDER WRENCH	• Used for removing and installing side oil seal holder. • For VA-type.

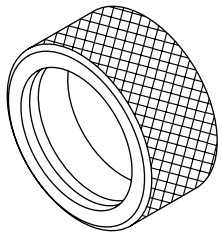
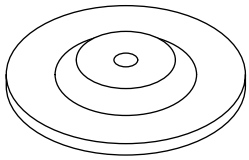
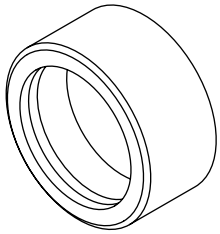
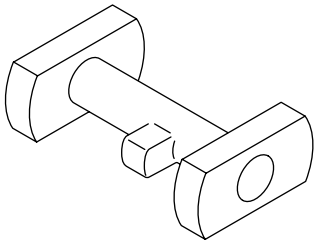
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447100	498447100	INSTALLER	• Used for installing oil seal. • For VA-type.
 ST-399520105	399520105	SEAT	• Used for removing side bearing cone. • Used with PULLER SET (899524100). • For VA-type.
 ST-498485400	498485400	DRIFT	• Used for installing side bearing cone. • For VA-type.
 ST-498505501	498505501	DIFFERENTIAL CARRIER GAUGE	• Used for adjusting pinion height. • For VA-type.

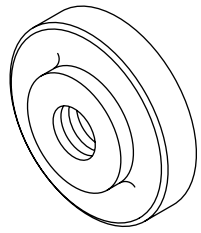
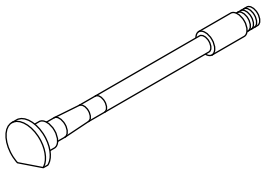
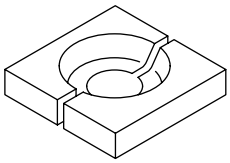
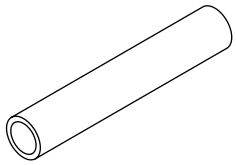
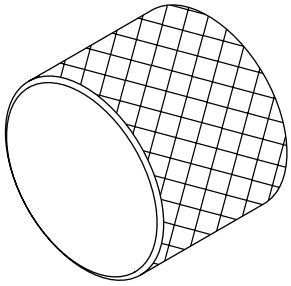
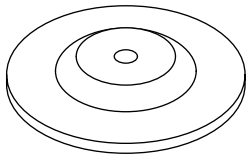
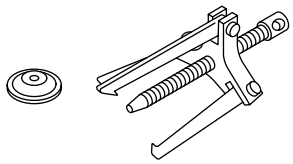
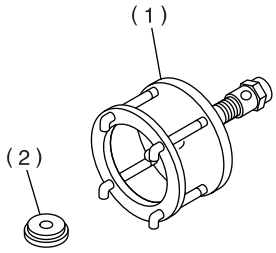
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447110	498447110	DRIFT	• Used for press-fitting the bearing race (front) of differential carrier. • For VA-type.
 ST-498447150	498447150	DUMMY SHAFT	• Used for adjusting pinion height and pre-load. • For VA-type.
 ST-498515500	498515500	REPLACER	• Used for removing rear bearing cone. • For VA-type.
 ST32285AA000	32285AA000	DUMMY COLLAR	• Used for adjusting pinion height and pre-load. • For VA-type.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398227700	398227700	DRIFT	Used for installing side bearing.
 ST-499705404	499705404	SEAT	• Used for removing side bearing race. • Used with PULLER ASSY (499705401). • For VA-type.
 ST-499705401	499705401	PULLER ASSY	• Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type.
 ST-899524100	899524100	PULLER SET	• Used for removing side bearing cone of differential. • For VA-type. (1) Puller (2) Cap

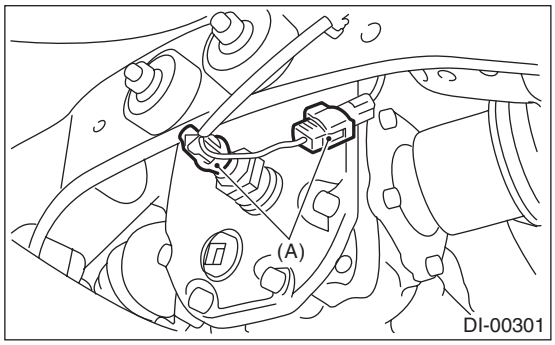
2. GENERAL TOOL

TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer. (T-type)
Thickness gauge	Used for measuring clearance.
Tire lever	Used for removal of rear drive shaft. (VA-type)

2. Differential Gear Oil

A: INSPECTION

1) Disconnect the oil temperature switch connector (For Europe model with turbo).

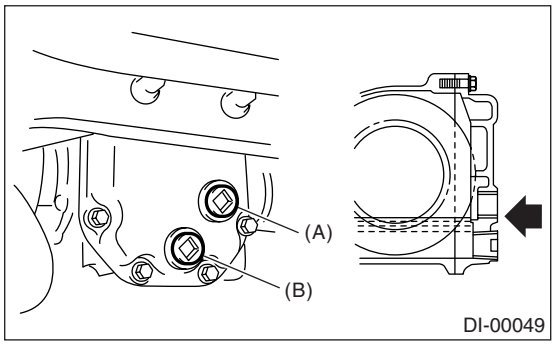


(A) Connector

2) Remove the filler plug or oil temperature switch, and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. **<Ref. to DI-21,** REPLACEMENT**, Differential Gear Oil.>**

NOTE:
Remove the oil temperature switch (for Europe model with turbo) and filler plug as a unit.

3) Check the gear oil level is up to the bottom part of filler bolt or oil temperature switch. If the level is low, refill up to the bottom of filler bolt.



(A) Filler plug
(B) Drain plug

4) After the inspection, tighten the filler plug or oil temperature switch.

NOTE:
• Install the oil temperature switch (for Europe model with turbo) and filler plug as a unit.
• Apply liquid gasket to the drain plug for T-type.
• Use a new aluminum gasket for VA-type.

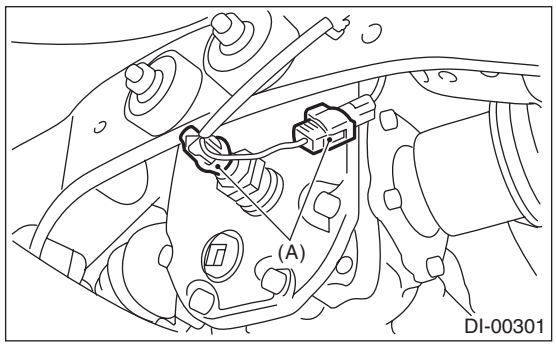
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

5) Connect the connector to oil temperature switch. (For Europe model with turbo)

B: REPLACEMENT

1) Jack-up the vehicle and support it with rigid racks.
2) Disconnect the oil temperature switch connector (For Europe model with turbo).

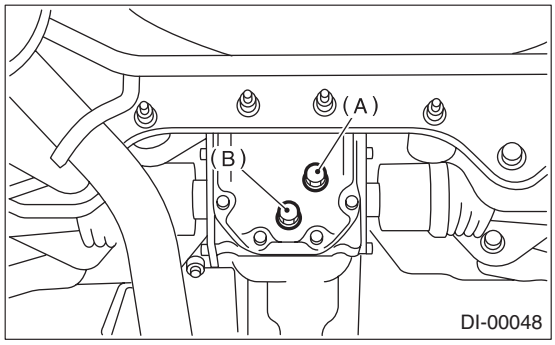


(A) Connector

3) Remove the oil drain plug and filler plug or oil temperature switch, and drain the gear oil.

NOTE:
Remove the oil temperature switch (for Europe model with turbo) and filler plug as a unit.

CAUTION:
Be careful not to burn yourself, because gear oil becomes extremely hot after running.



(A) Filler plug
(B) Drain plug

4) Tighten the oil drain plug.

NOTE:
- Apply liquid gasket to the drain plug for T-type.
- Use a new aluminum gasket for VA-type.

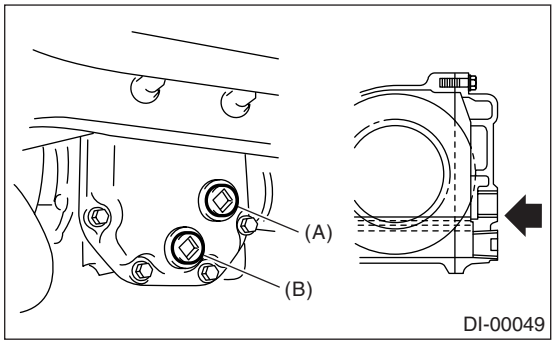
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

5) Fill the differential carrier with gear oil to the upper plug level.

NOTE:
Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.

Oil capacity:
0.8 ℓ (0.8 US qt, 0.7 Imp qt)



(A) Filler plug
(B) Drain plug

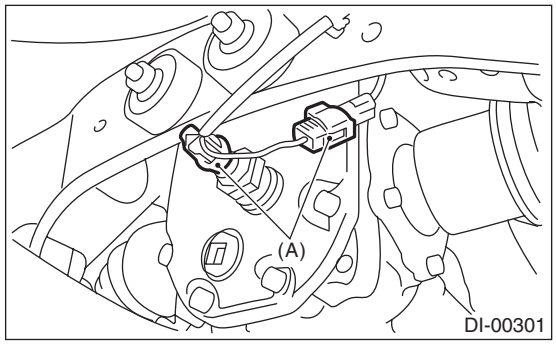
6) Install the filler plug or oil temperature switch.

NOTE:
- Install the oil temperature switch (for Europe model with turbo) and filler plug as a unit.
- Apply liquid gasket to the filler plug or oil temperature switch for T-type.
- Use a new aluminum gasket for VA-type.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

7) Connect the oil temperature switch connector (For Europe model with turbo).



(A) Connector

3. Front Differential Assembly

A: NOTE

1. AT MODEL

For front differential of AUTOMATIC TRANSMISSION, refer to “AT” section. **<Ref. to 4AT-126, Front Differential Assembly.>**

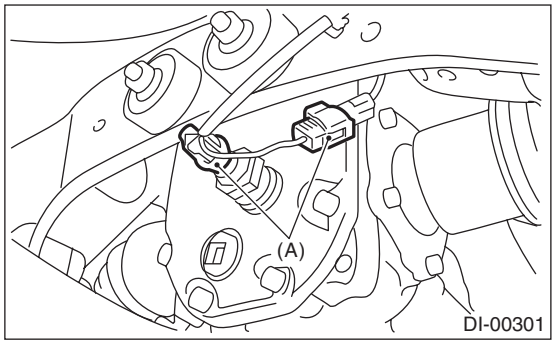
2. MT MODEL

For front differential of manual transmission, refer to “MT” section. **<Ref. to 5MT-95, Front Differential Assembly.>**

4. Rear Differential (T-type)

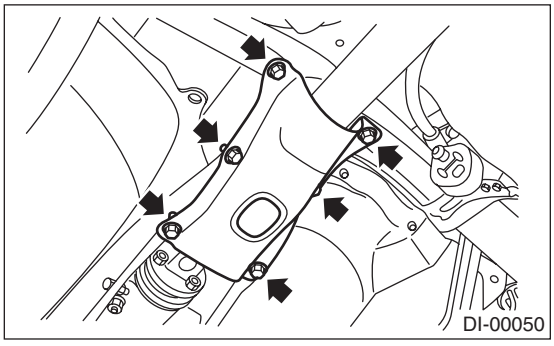
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with rigid racks.
7) Remove the wheels.
8) Disconnect the connector from oil temperature switch. (For Europe model with turbo)

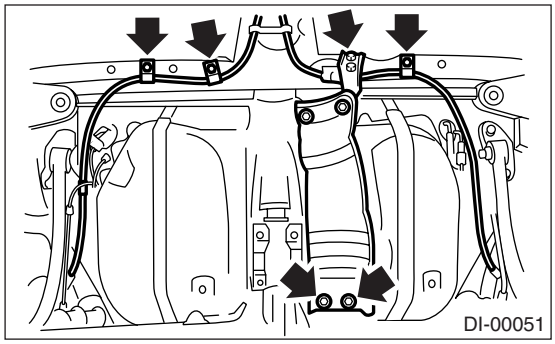


(A) Connector

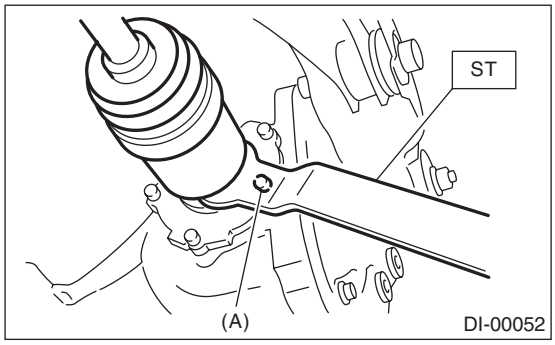
9) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL**, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13,** REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL**, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16,** REMOVAL, Muffler.>
10) Remove the front cover of rear differential mount.



11) Remove the propeller shaft. **<Ref. to DS-15,** REMOVAL**, Propeller Shaft.>**
12) Remove the clamps and bracket of parking brake cable.

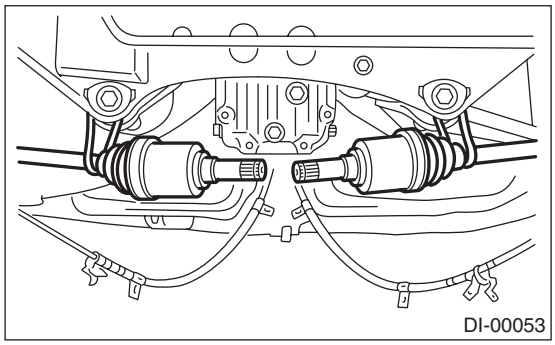


13) Remove the DOJ of rear drive shaft from rear differential using ST. **<Ref. to DI-55,** REPLACEMENT**, Rear Differential Side Oil Seal.>**
ST 28099PA100 DRIVE SHAFT REMOVER

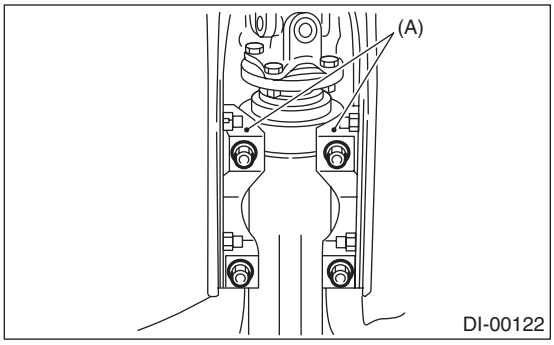


(A) Bolt

14) Suspend the rear drive shaft to rear crossmember using wire.

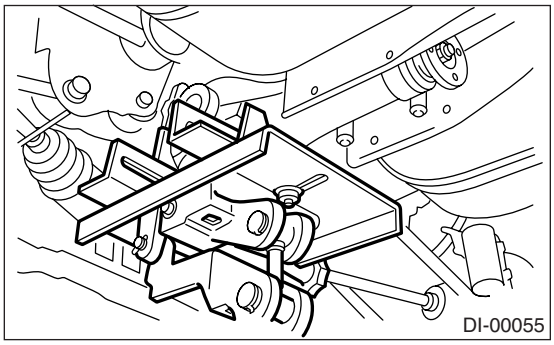


15) Remove the lower differential bracket.

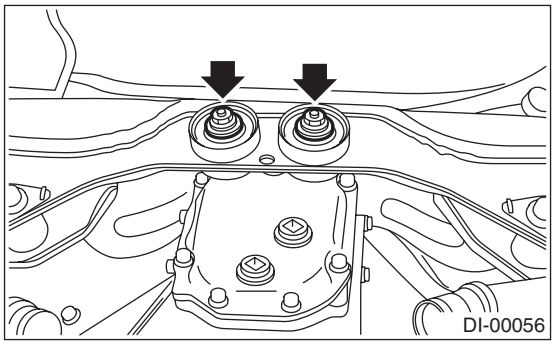


(A) Lower differential bracket

16) Support the rear differential with transmission jack.

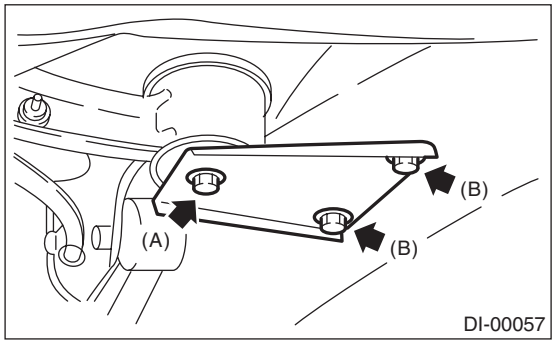


17) Remove the self-locking nuts and bolts.



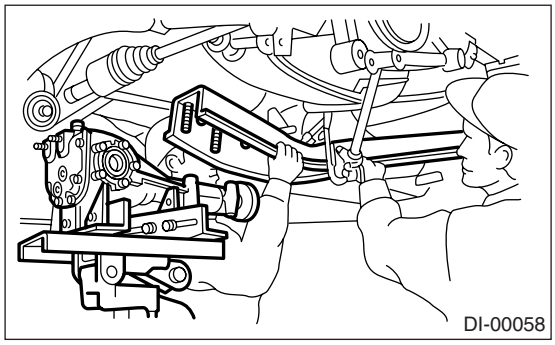
18) Remove the bolts which secure differential front member to vehicle.
Loosen the bolt A first, then remove the bolts B.

NOTE:
Support the differential front member with use of a helper to prevent it from dropping.

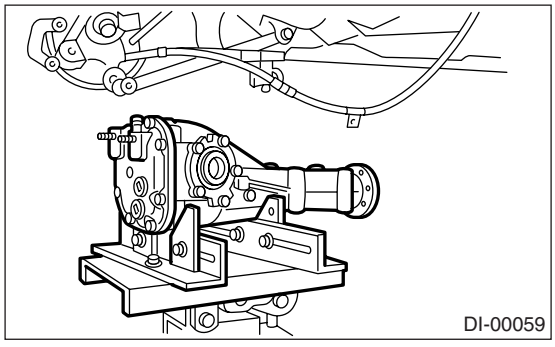


(A) Bolt A
(B) Bolt B

19) Remove the bolt A.
20) While slowly lowering the transmission jack, move the rear differential forward and remove differential front member and rear differential from vehicle.



21) Remove the rear differential from differential front member.



B: INSTALLATION

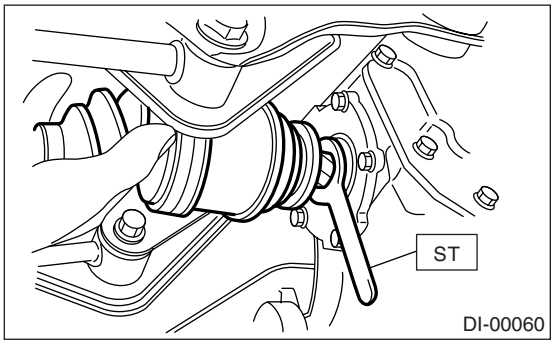
Install in the reverse order of removal.

1) Position the differential front member on vehicle by passing it under the parking brake cable and securing to rear differential.

NOTE:
When installing the rear differential front member, pay attention the installation sequence of the upper and lower stoppers.

2) Install the DOJ of drive shaft into rear differential. **<Ref. to DI-55,** REPLACEMENT**, Rear Differential Side Oil Seal.>**

ST 28099PA090 SIDE OIL SEAL PROTECTOR



3) Installing procedure hereafter is in the reverse order of removal.

4) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-21, Differential Gear Oil.>

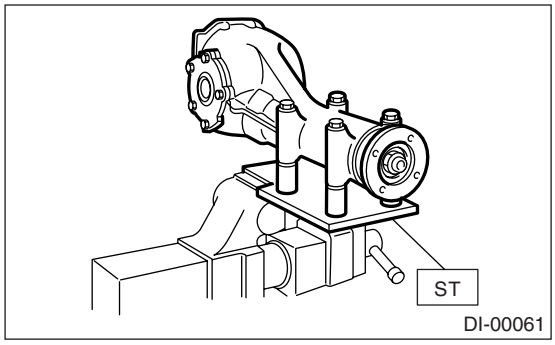
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of hypoid driven gear and drive pinion and backlash
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

1) Set the ST on vise and install the differential assembly to ST.

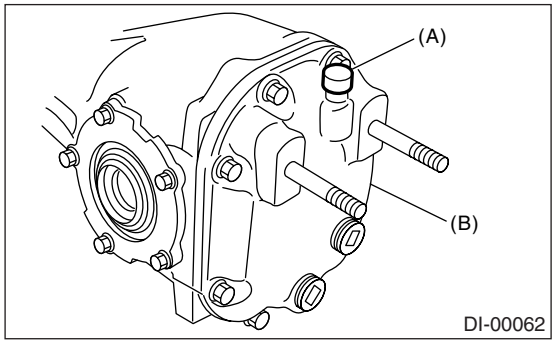
ST 398217700 ATTACHMENT



2) Drain the gear oil by removing plug.

3) Remove the air breather cap.

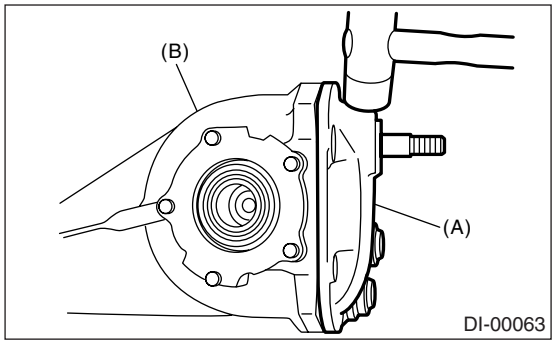
NOTE:
- Do not remove the air breather cap unless necessary.
- Replace the air breather cap with a new one when removing it.



(A) Air breather cap
(B) Rear cover

4) Remove the bolts, and then remove the rear cover.

NOTE:
Remove it by tapping with plastic hammer.

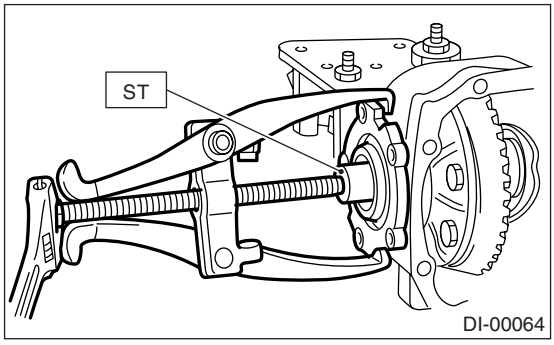


(A) Rear cover
(B) Differential carrier

5) Keep the side bearing retainers RH and LH separately for easier reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract the bearing retainers RH and LH with a puller.

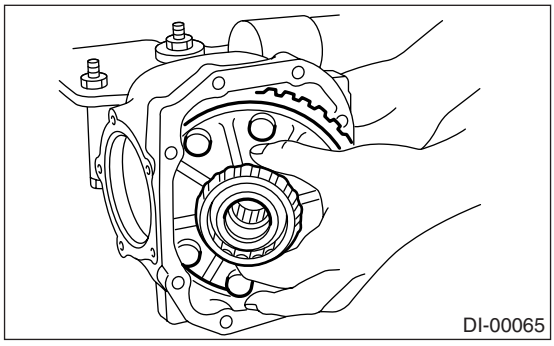
NOTE:
Each shim, which is installed to adjusted the side bearing preload, should be kept together with its mating retainer.

ST 398457700 ATTACHMENT



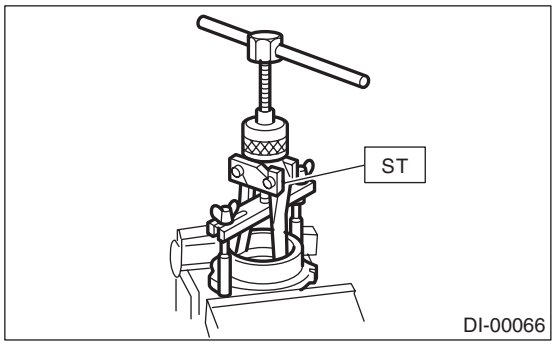
6) Pull out the differential case assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.



7) When replacing the side bearing, remove the bearing cup from side bearing retainer using ST.

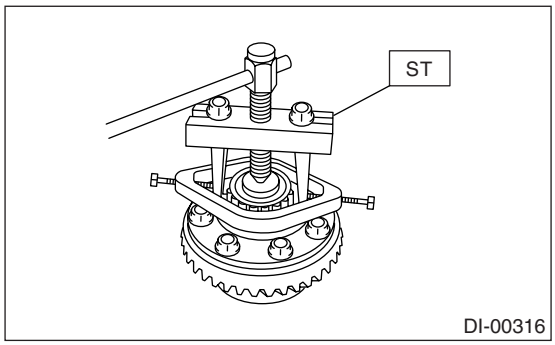
ST 398527700 PULLER ASSY



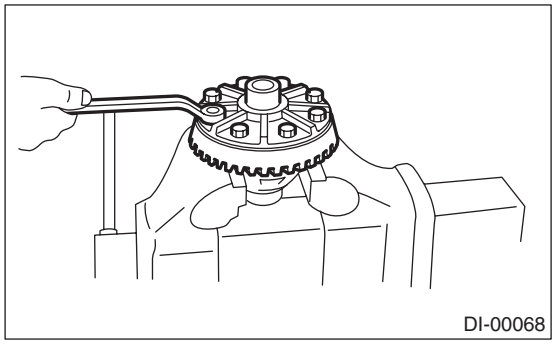
8) Extract the bearing cone with ST.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Never mix up the bearing races RH and LH and cones.

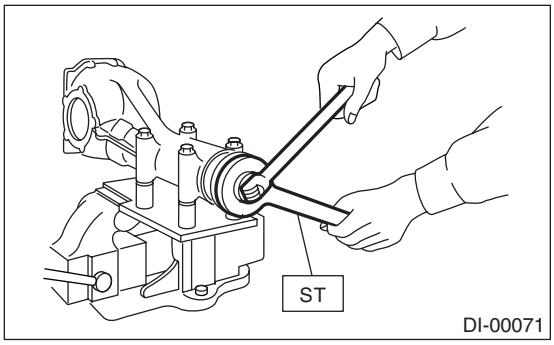
ST 18759AA000 PULLER ASSY



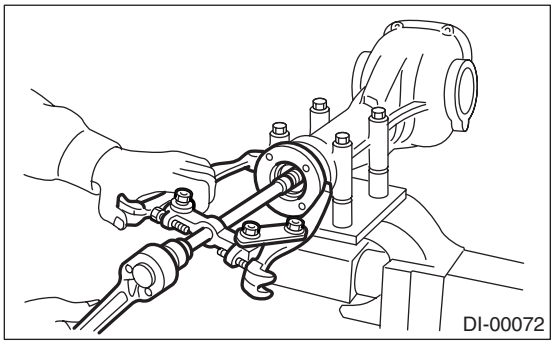
9) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



10) Hold the companion flange with ST and remove the self-locking nut.
ST 498427200 FLANGE WRENCH

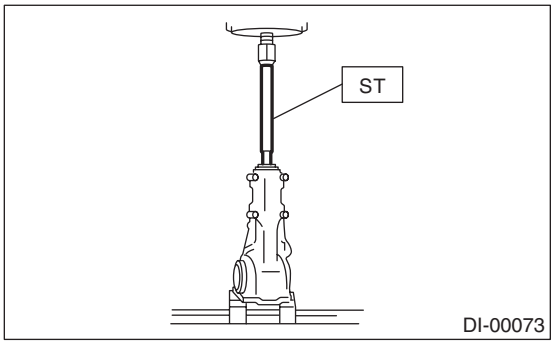


11) Extract the companion flange with a puller.



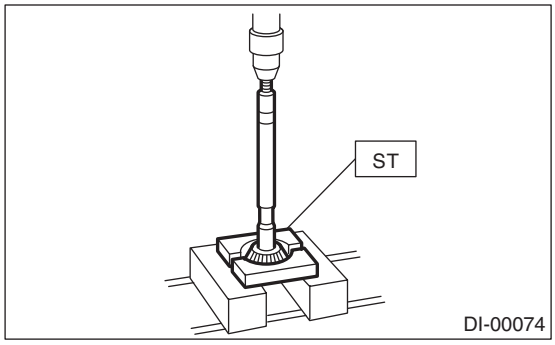
12) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height Adjusting washer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

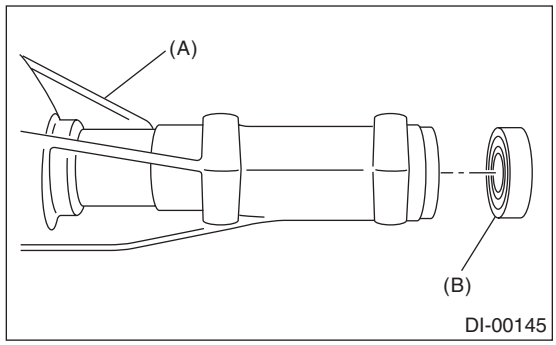


13) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 398517700 REPLACER

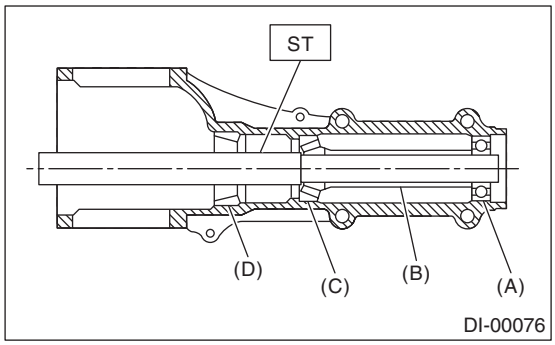


14) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER ASSY



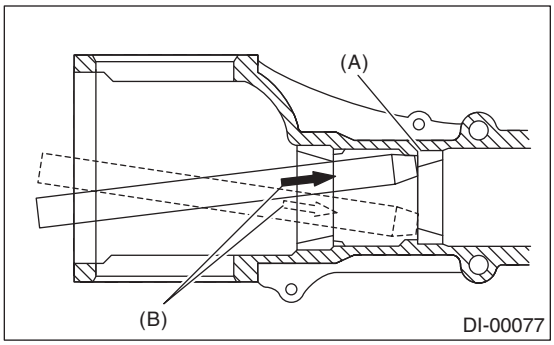
(A) Differential carrier
(B) Front oil seal

15) Remove the pilot bearing together with front bearing cone and collar using ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Collar
(C) Front bearing
(D) Rear bearing cup

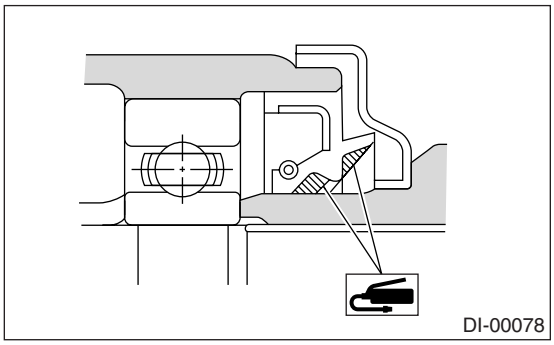
16) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar

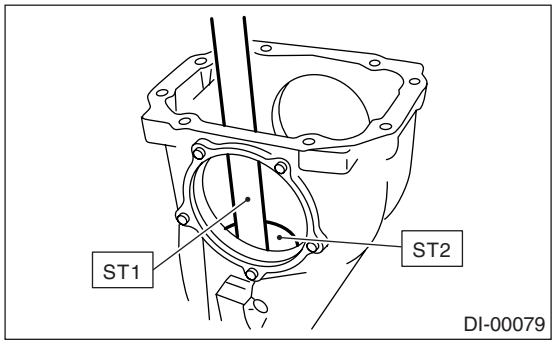
D: ASSEMBLY

NOTE:
• Assemble in the reverse order of disassembly.
• Check and adjust each part during assembly.
• Keep the shims and washers in order, so that they are not improperly installed.
• Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
• Apply gear oil to the bearings and thrust washers when installing them.
• Be careful not to mix up the bearing races RH and LH.
• Use new O-rings and gasket.
• Replace the oil seals with new ones at every disassembly. Apply grease to the lips when installing the oil seals.
• Be careful not to mix up the differential oil seal RH and LH.



1) Adjusting preload for front and rear bearings:
Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press the rear bearing race into differential carrier with ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Install the front bearing race to differential carrier using ST1 and ST2.
ST1 398477701 HANDLE
ST2 398477702 DRIFT

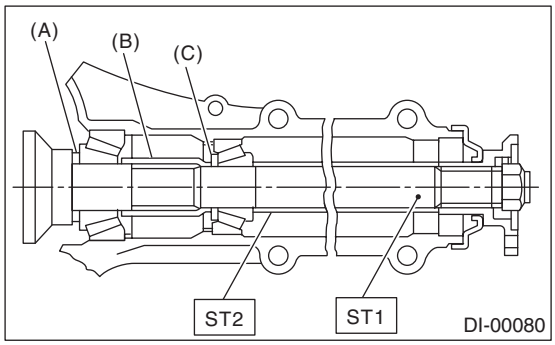
(3) Measure and record the thickness of pinion height Adjusting washer.

NOTE:
If tooth contact (drive pinion, hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

(4) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

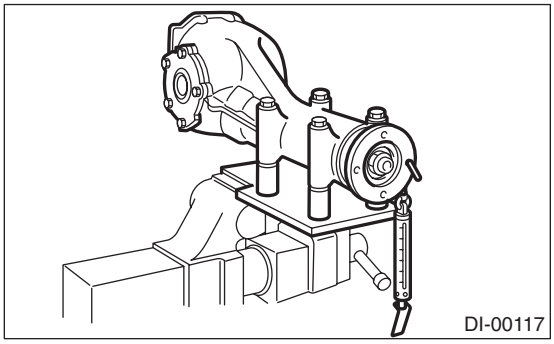
NOTE:
Use new rear bearing cone.

(5) Install the preload adjusting collar and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.
ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



(A) Pinion height adjusting washer
(B) Preload adjusting collar
(C) Preload adjusting washer

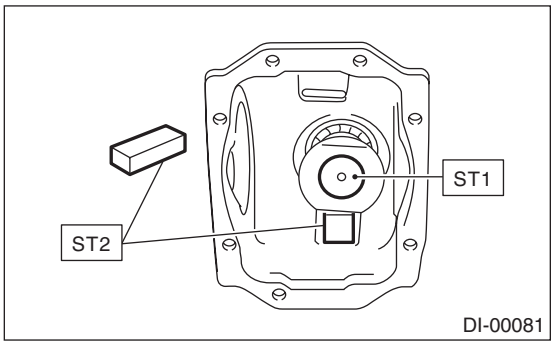
(6) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.



NOTE:
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT
ST2 398507704 BLOCK

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



Drive pinion bearing preload
18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lbf) at companion flange bolt hole

	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
	383845200	2.31 (0.0909)
	Part No.	Length mm (in)
Preload adjusting collar	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

2) Adjusting drive pinion height:
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

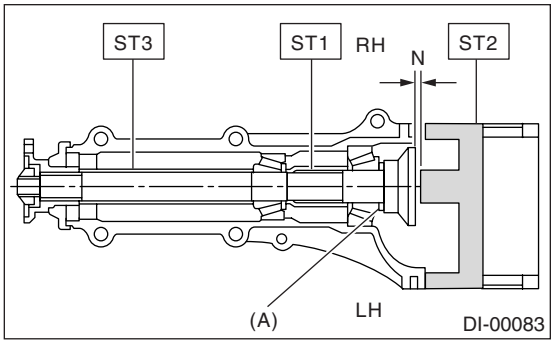
(1) Do not remove the ST1, ST2 and ST3 out of position after adjusting pinion bearing preload in previous step.

Front and rear bearing preload
For new bearing: 18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lbf) at companion flange bolt hole

Adjusting preload for front and rear bearings

NOTE:
At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE
ST3 398507703 DUMMY COLLAR

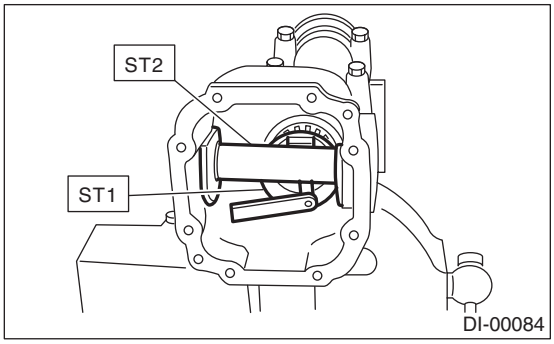


(A) Pinion height adjusting washer

(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

$T = To + N - (H \times 0.01) - 0.20$ mm

NOTE:
Use copies of this page.

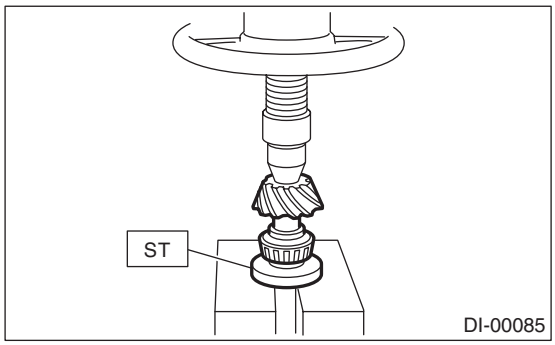
T	Thickness of pinion height adjusting washer mm (in)	
To	Thickness of washer temporally inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
H	Figure marked on drive pinion head	
Memo:		

(Example of calculation)
To = 2.20 + 1.20 = 3.40 mm
N = 0.23 mm
H = + 1
T = 3.40 + 0.23 − 0.01 − 0.20 = 3.42
Result: Thickness = 3.42 mm
Therefore use the pinion height adjusting washer of part number 383605200.

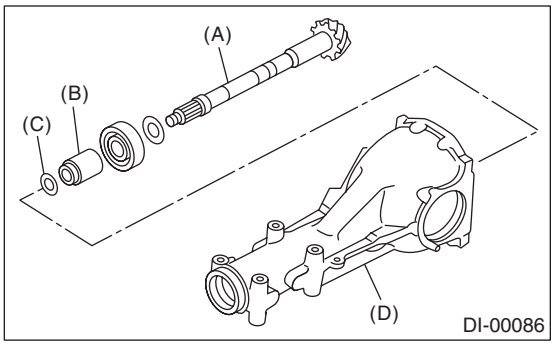
Pinion height adjusting washer	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER

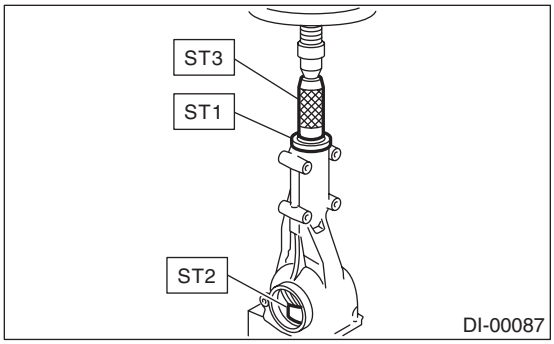


4) Insert the drive pinion into differential carrier, install the selected bearing preload adjusting collar and washer.

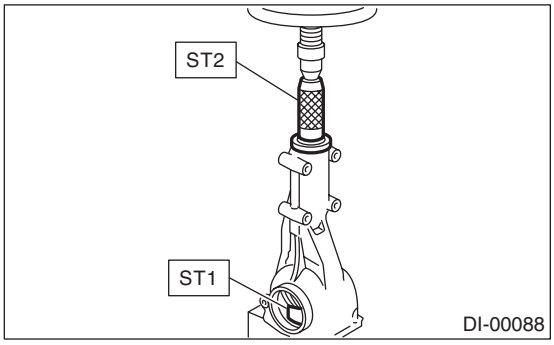


(A) Drive pinion
(B) Bearing preload adjusting collar
(C) Bearing preload adjusting washer
(D) Differential carrier

5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.
ST1 398507703 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER

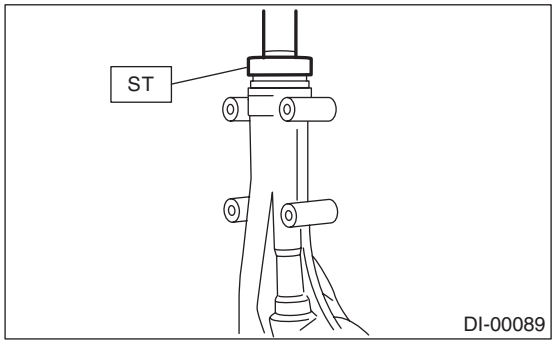


6) Insert the collar, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



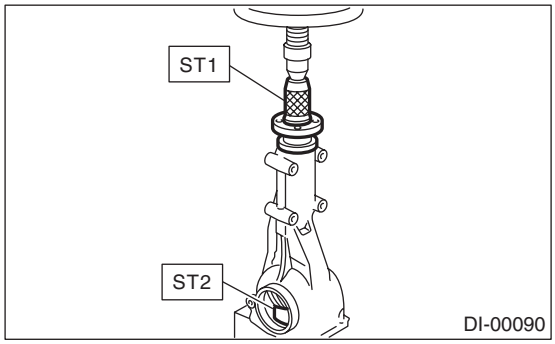
7) Fit a new oil seal with ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease to the oil seal lips.
ST 498447120 INSTALLER



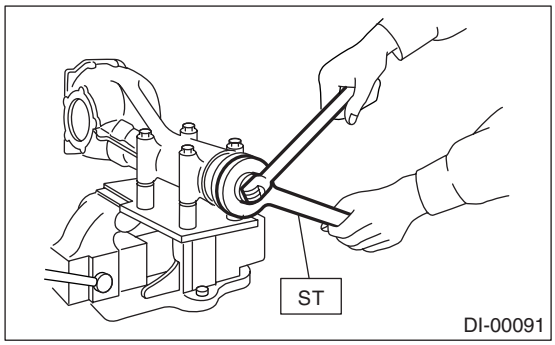
8) Press-fit the companion flange with ST1 and ST2.

NOTE:
Be careful not to damage the bearing.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install a new self-locking nut and secure the companion flange using ST and tighten the nut.
ST 498427200 FLANGE WRENCH

Tightening torque:
181 N·m (18.5 kgf-m, 134 ft-lb)



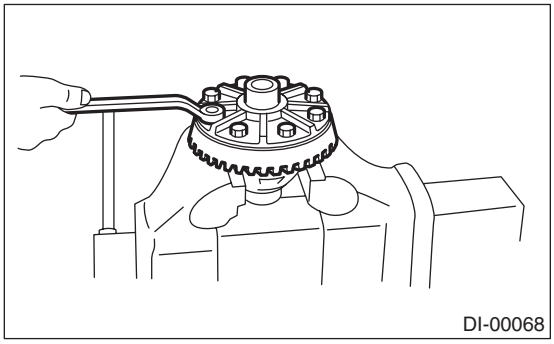
10) Install the hypoid driven gear to differential case.

NOTE:
• Before installing bolts, apply Lock Tite to bolt threads.

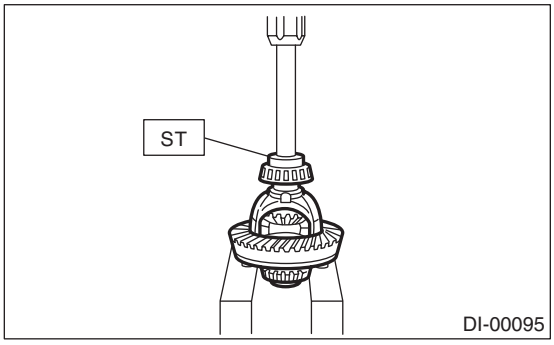
Lock Tite:
THREE BOND 1324 (Part No. 004403042)

• Tighten diagonally while tapping the bolt heads.

Tightening torque:
105 N·m (10.7 kgf-m, 77.4 ft-lb)

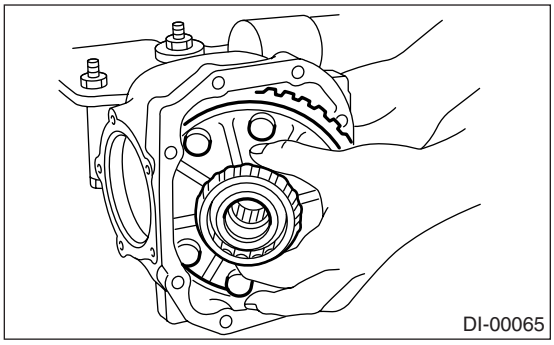


11) Press the side bearing into differential case using ST.
ST 398227700 DRIFT



12) Press-fit the side bearing cone to the side bearing retainer using ST.
ST 398487700 DRIFT

13) Adjusting the side bearing retainer shims
(1) The hypoid driven gear backlash and side bearing preload can be adjusted by the side bearing retainer shim thickness.
(2) Install the differential assembly into differential carrier in the reverse order of disassembly.



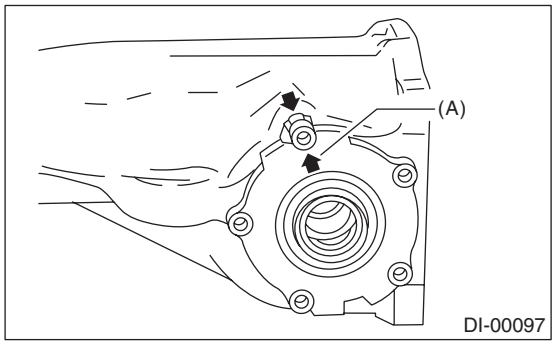
(3) Install the side bearing retainer shims to retainers RH and LH from which they were removed.

NOTE:
Replace the broken or corroded side retainer shim with a new one of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align the arrow mark on differential carrier with the mark on side retainer during installation.

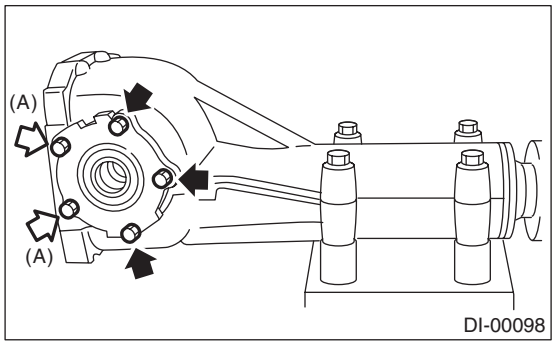
NOTE:
• Replace the broken or cracked O-ring with new one.
• Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

(5) Tighten the side bearing retainer bolts (A).

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



(A) Side bearing retainer bolt

(6) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move the hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge. If the backlash is not within specification, adjust the side bearing retainer shim as follows.

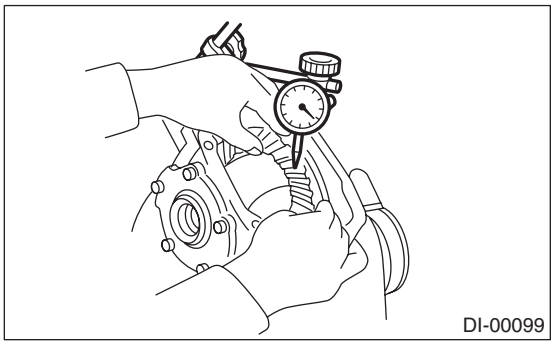
- **When backlash is more than 0.2 mm (0.0079 in):**

Reduce shim thickness of behind hypoid driven gear, and increase shim thickness of hypoid driven gear side.

- **When backlash is less than 0.1 mm (0.0039 in):**

Increase shim thickness of behind hypoid driven gear, and reduce shim thickness of hypoid driven gear side.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)

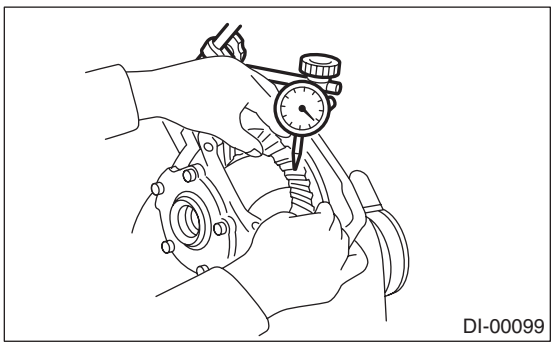


(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing by an even amount at a time.

Total preload:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

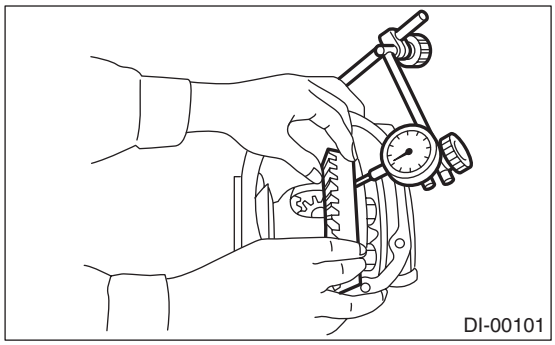
14) Recheck the hypoid driven gear to drive pinion backlash.

Backlash:
0.10 — 0.20 mm (0.0039 — 0.0079 in)



15) Check the hypoid driven gear runout on its back surface, and make sure that pinion and hypoid driven gear rotates smoothly.
If the hypoid driven gear runout on its back surface exceed the specification, verify that there is any foreign material between hypoid driven gear and differential case, and they are not deformed.

Hypoid driven gear runout on its back surface:
0.05 mm (0.0020 in)



16) Checking and adjusting the tooth contact of hypoid driven gear

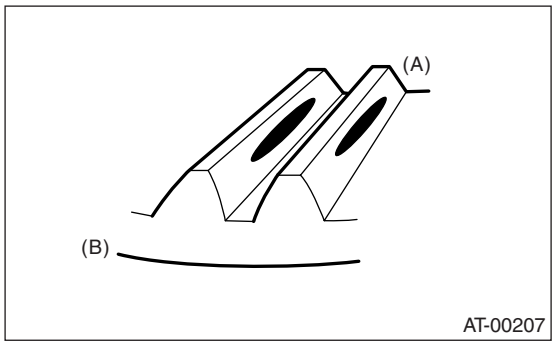
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.

(2) When the contact pattern is incorrect, readjust.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

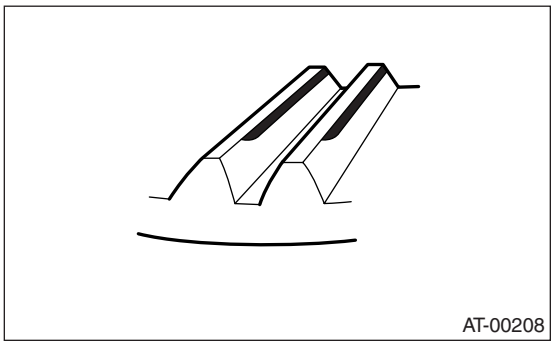
Checking item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



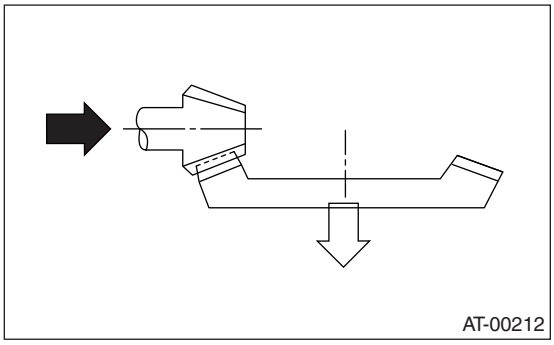
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

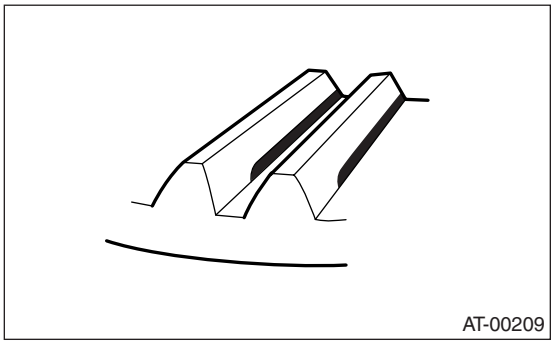


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

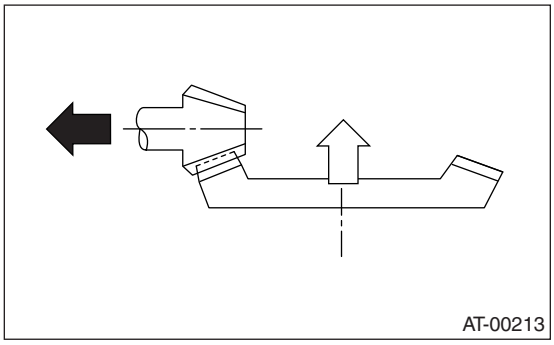


- Flank contact

Checking item: Backlash is too small.
Contact pattern

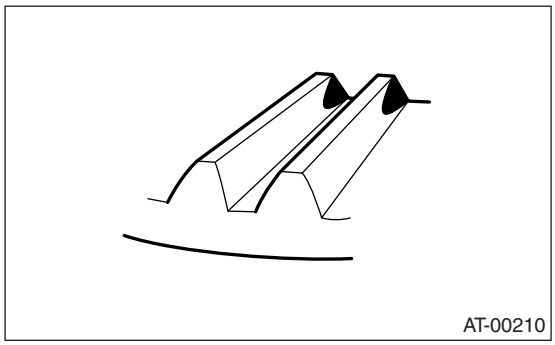


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.

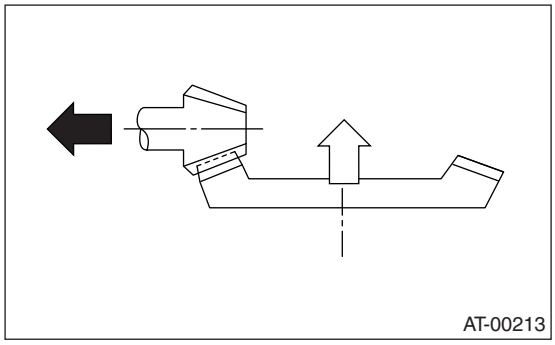


- Toe contact (inside end contact)

Checking item: Contact areas is small
Contact pattern

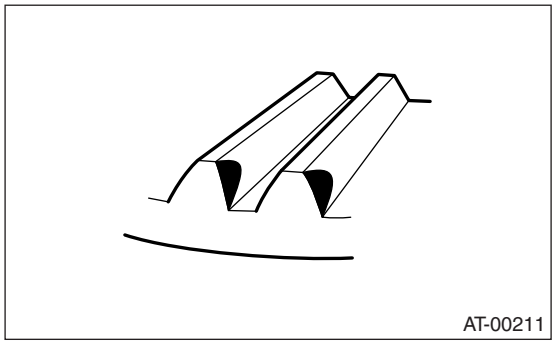


Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.

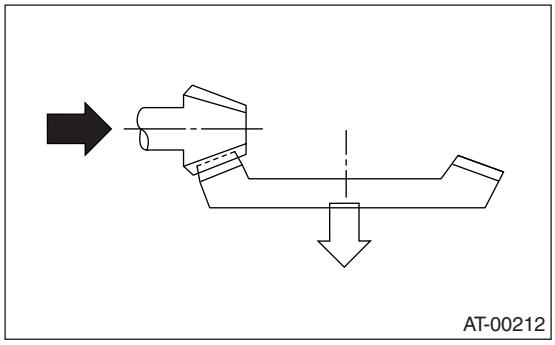


- Heel contact (outside end contact)

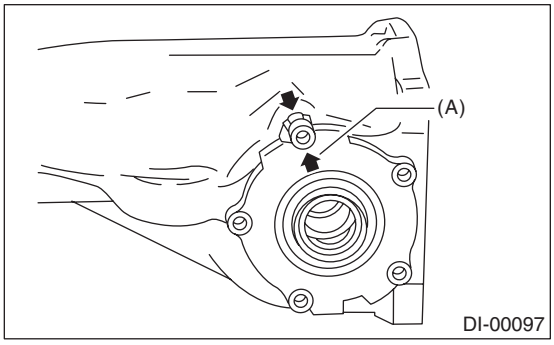
Checking item: Contact areas is small
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



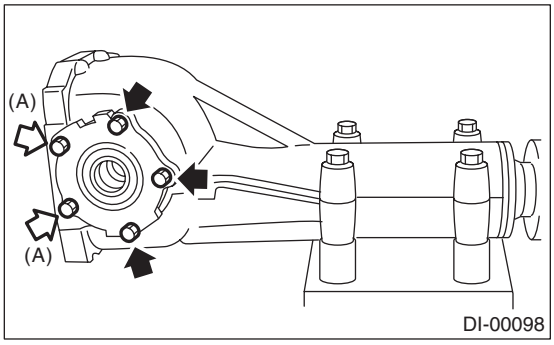
17) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.
18) Remove the RH and LH side bearing retainer.
19) Install a new O-ring to side bearing retainer of both side.
20) Using the ST, install the oil seal to the side bearing retainer of both side.
ST 398437700 DRIFT
21) Align the arrow mark on differential carrier with the mark on side retainer during installation.



(A) Arrow mark

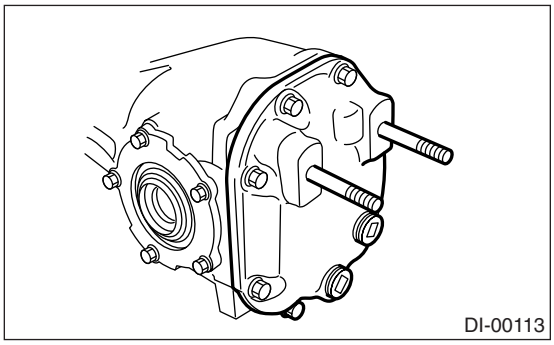
22) Tighten the side bearing retainer bolts.

Tightening torque:
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)

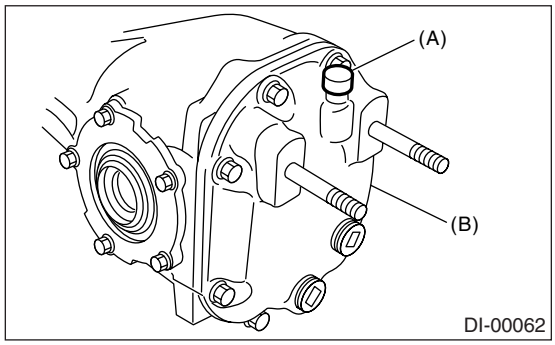


23) Install the new gasket and rear cover to the differential carrier, and tighten the bolts to specified torque.

Tightening torque:
29 N·m (3.0 kgf-m, 22 ft-lb)



24) Install the breather cap.



(A) Air breather cap
(B) Rear cover

25) Install the drain plug and filler plug.

Tightening torque:
49 N·m (5.0 kgf-m, 36.2 ft-lb)

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.
1) Hypoid driven gear and drive pinion
• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact. Replace the gear if excessively worn or incapable of adjustment.
• If crack, score or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.
2) Bearings
Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.
3) Oil seal
Replace if deformed or damaged, and at every disassembling.
4) Differential carrier
Replace if the bearing bores are worn or damaged.
5) Differential case
Replace if its sliding surfaces are worn or cracked.
6) Companion flange
Replace if the oil seal lip contacting surfaces have flaws.
7) Rear differential oil temperature switch (Turbo model for Europe).
If the results of the following inspections are not satisfactory, replace rear differential temperature switch.
(1) At room temperature, check for continuity between the sensor terminal and body.

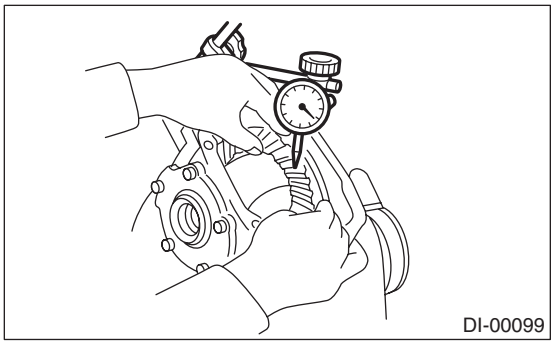
(2) Soak the sensor in oil, then raise the oil temperature. Check that the continuity is cut off when the oil temperature is between 144°C (291°F) and 156°C (313°F). Then, check that the continuity resumes by the time the oil temperature drops to 135°C (275°F).

1. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:
0.1 — 0.2 mm (0.0039 — 0.0079 in)

If the hypoid driven gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.

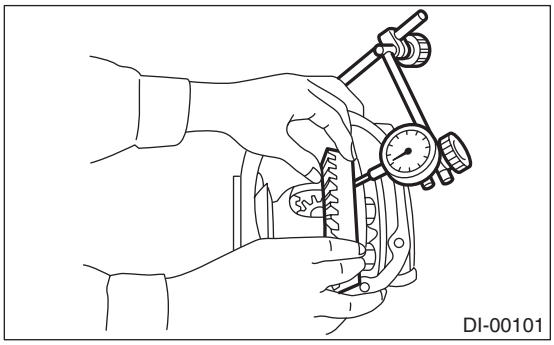

DI-00099

2. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

Using a dial gauge, check the hypoid driven gear runout on its back surface.

Hypoid driven gear runout on its back surface:
0.05 mm (0.0020 in)

If the hypoid driven gear runout exceeds 0.05 mm (0.0020 in), replace the hypoid driven gear.


DI-00101

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

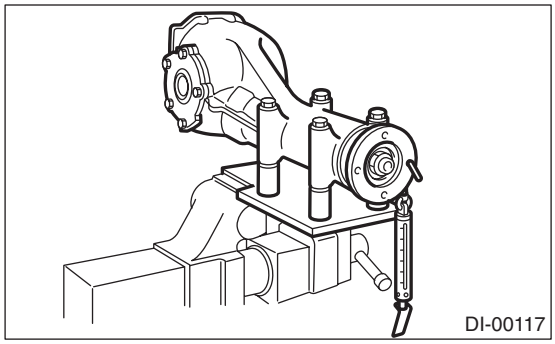
Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

4. TOTAL PRELOAD

Using a spring balance, check the total preload.

Total preload:
20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

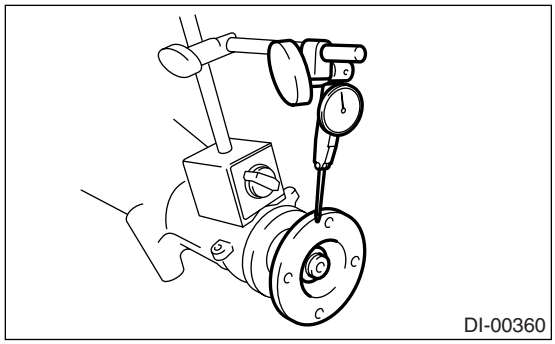
If the total preload is not within the specification, adjust the side bearing retainer shims.


DI-00117

5. COMPANION FLANGE

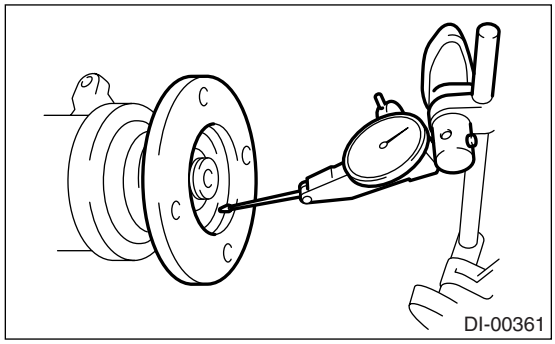
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.0031 in)


DI-00360

3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:
0.08 mm (0.0031 in)


DI-00361

4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point where the runout is within the limit.

5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.
6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash.
<Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

2. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear.
<Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

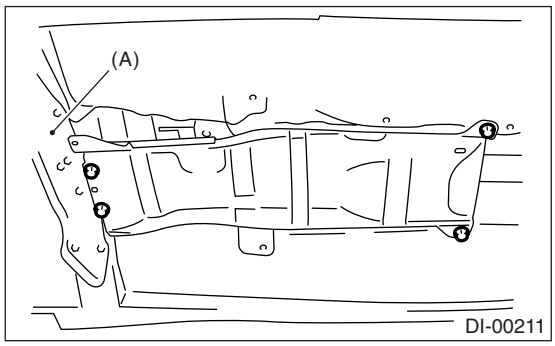
3. TOTAL PRELOAD

Adjust the side bearing shim.
<Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

5. Rear Differential (VA-type)

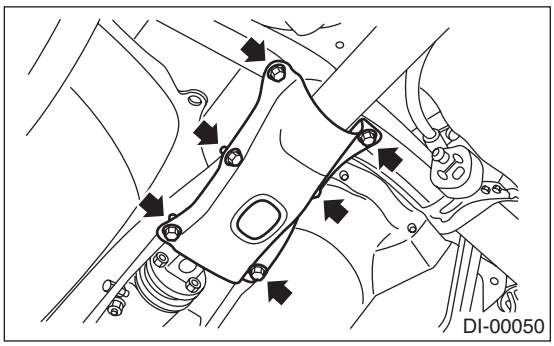
A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with rigid racks.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler. **<Ref. to EX(H4SO)-11,** REMOVAL, Rear Exhaust Pipe.> **<Ref. to EX(H4SO)-13,** REMOVAL, Muffler.>
9) Remove the heat shield cover. (if equipped)

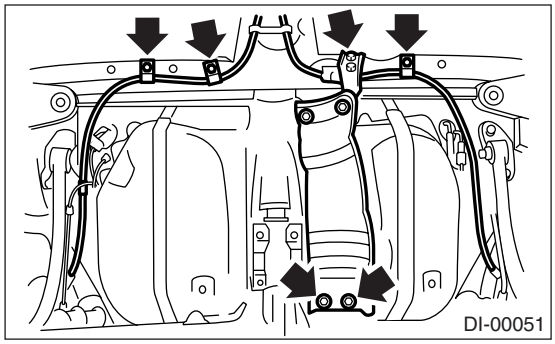


(A) Transmission mounting

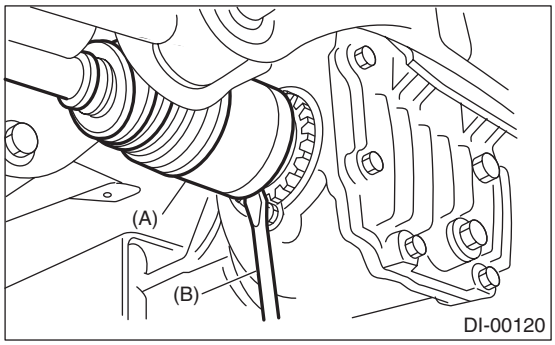
10) Remove the front cover of rear differential mount.



11) Remove the propeller shaft. **<Ref. to DS-15,** REMOVAL**, Propeller Shaft.>**
12) Remove the clamps and bracket of parking brake cable.

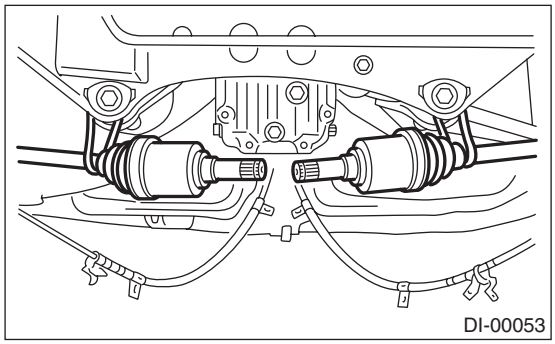


13) Remove the DOJ of rear drive shaft from rear differential. **<Ref. to DI-55,** REPLACEMENT**, Rear Differential Side Oil Seal.>**

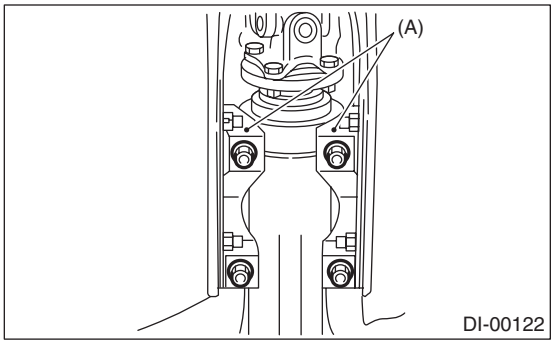


(A) DOJ
(B) Tire lever

14) Suspend the rear drive shaft to rear crossmember using wire.

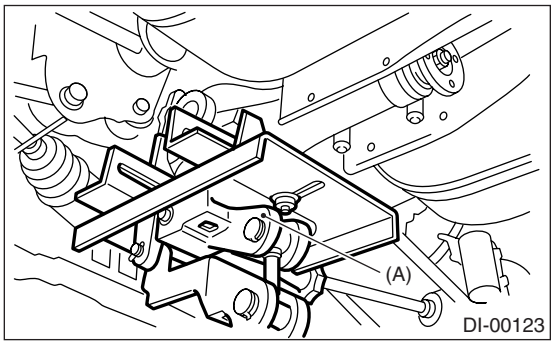


15) Remove the lower differential bracket.



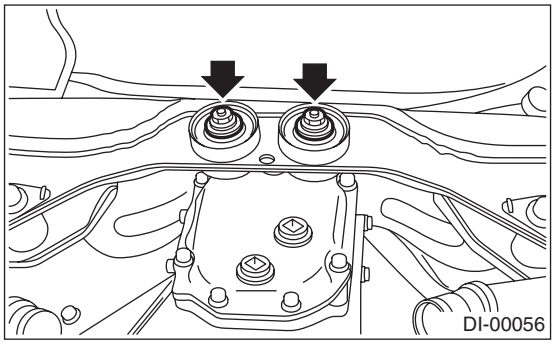
(A) Lower differential bracket

16) Support the rear differential with transmission jack.



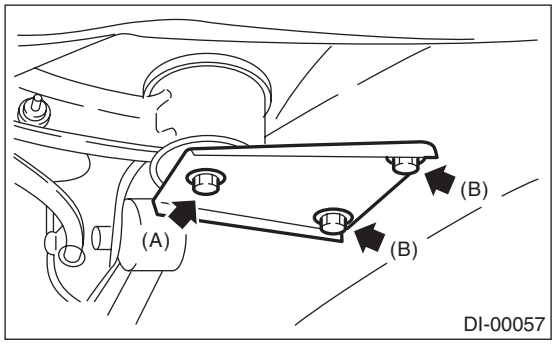
(A) Transmission jack

17) Remove the self-locking nuts and bolts.



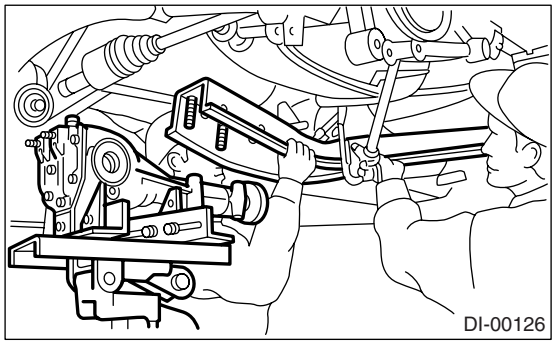
18) Remove the bolts which secure rear differential front member to vehicle.
Loosen the bolt A, and remove the bolt B.

NOTE:
Support the front member with use of a helper to prevent it from dropping.

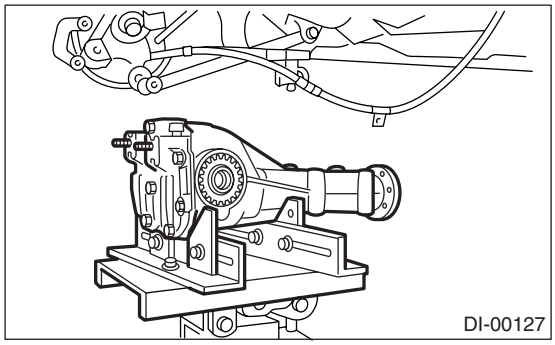


(A) Bolt A
(B) Bolt B

19) Remove the bolt A.
20) While slowly lowering the transmission jack, move the rear differential forward and remove bolts from front member.
21) Remove the front member from vehicle.



22) Remove the rear differential from front member.



B: INSTALLATION

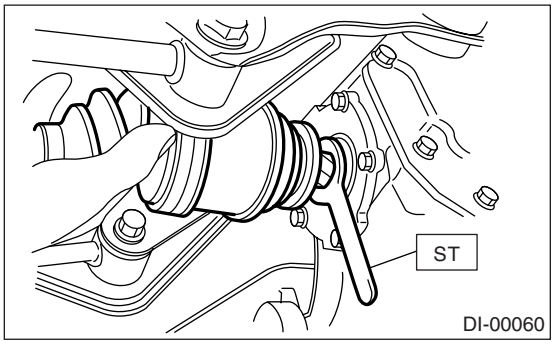
Install in the reverse order of removal.

1) Position the front member on vehicle by passing it under the parking brake cable and securing to rear differential.

NOTE:
When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

2) Install the DOJ of rear drive shaft into rear differential. **<Ref. to DI-55,** REPLACEMENT**, Rear Differential Side Oil Seal.>**

ST 28099PA090 SIDE OIL SEAL PROTECTOR



3) Install in the reverse order of removal.

4) After installation, fill the differential carrier with gear oil to the upper plug level. **<Ref. to DI-23, Front Differential Assembly.>**

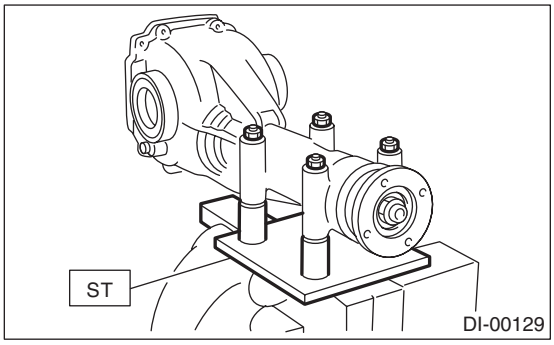
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact and backlash between hypoid driven gear and drive pinion
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

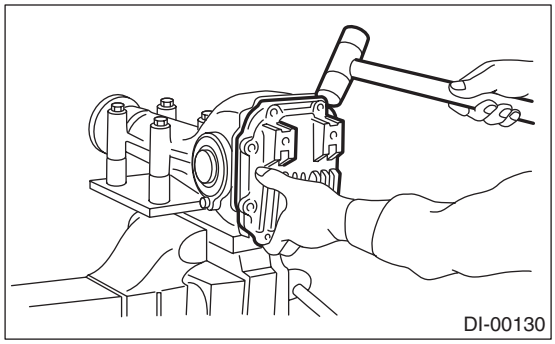
1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT



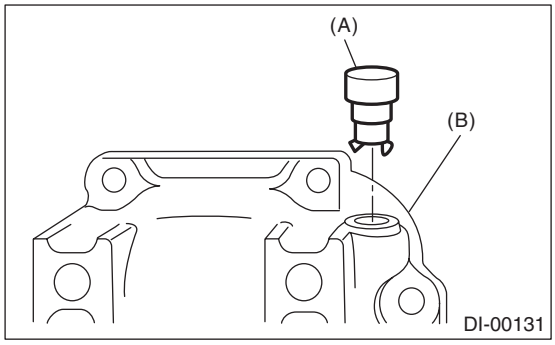
2) Drain the gear oil by removing plug.

3) Remove the rear cover by loosening retaining bolts.



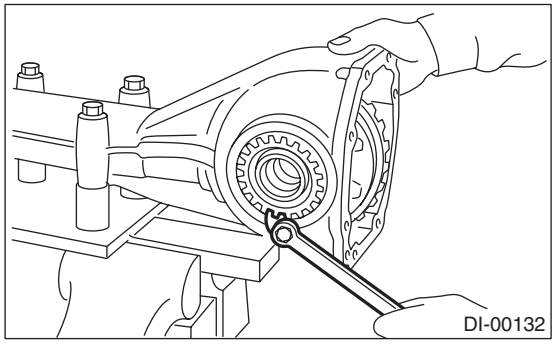
4) Remove the air breather cap.

NOTE:
- Do not remove the air breather cap unless necessary.
- When removing the air breather cap, replace it with a new one.

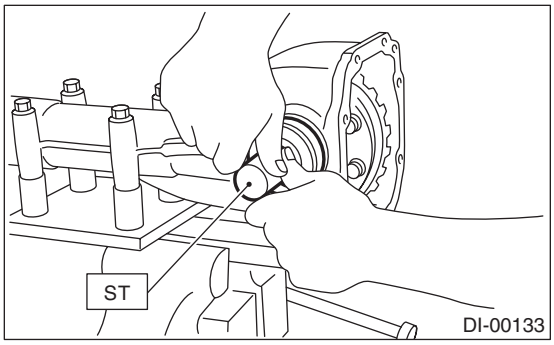


(A) Air breather cap
(B) Rear cover

5) Remove the lock plate RH and LH.

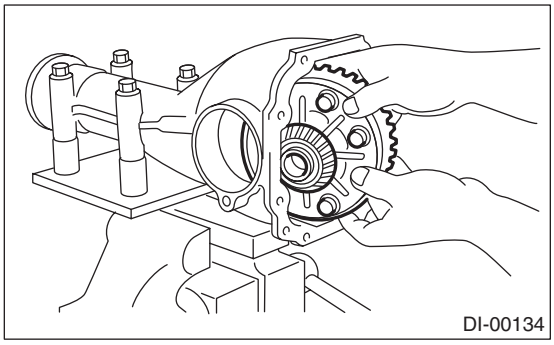


6) Remove the holder RH and LH with ST.
ST 499785500 OIL SEAL HOLDER WRENCH

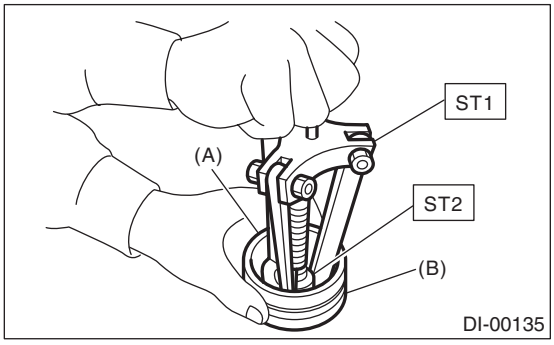


7) Pull out the differential case assembly from differential carrier.

NOTE:
Be careful not to hit the teeth against the case.



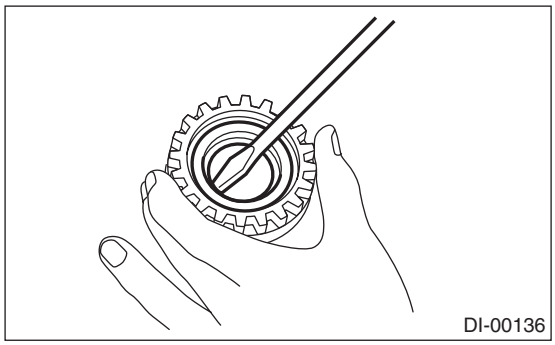
8) Remove the bearing race from holder RH and LH with ST1 and ST2.
ST1 499705401 PULLER ASSY
ST2 499705404 SEAT



(A) Bearing race
(B) Holder

9) Remove the oil seal from holder RH and LH using screwdriver.

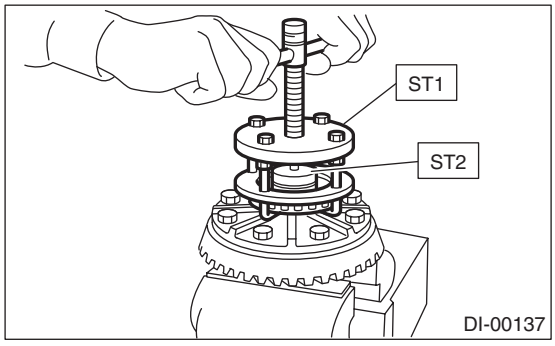
NOTE:
Perform this operation only when changing oil seal.



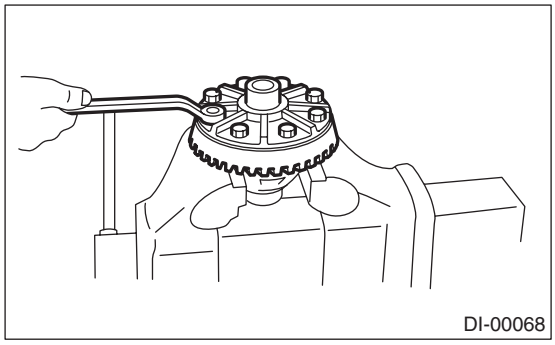
10) Extract the bearing cone with ST1 and ST2.

NOTE:
• Do not attempt to disassemble the parts unless necessary.
• Set the puller so that its claws catch the edge of the bearing cone.
• Never mix up the bearing races RH and LH and cones.

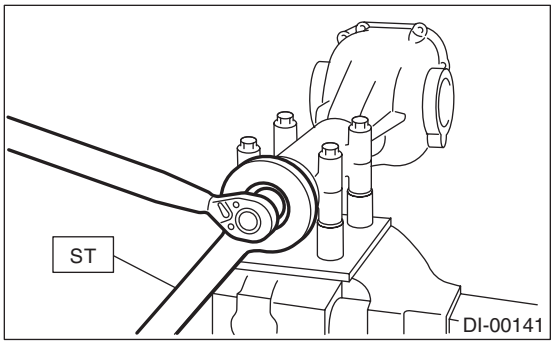
ST1 899524100 PULLER SET
ST2 399520105 SEAT



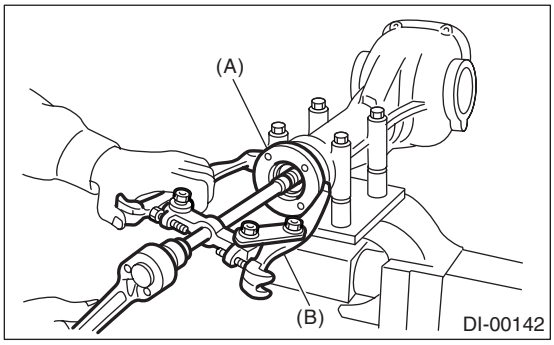
11) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



12) Support the companion flange with ST and remove self-locking nut.
ST 498427200 FLANGE WRENCH



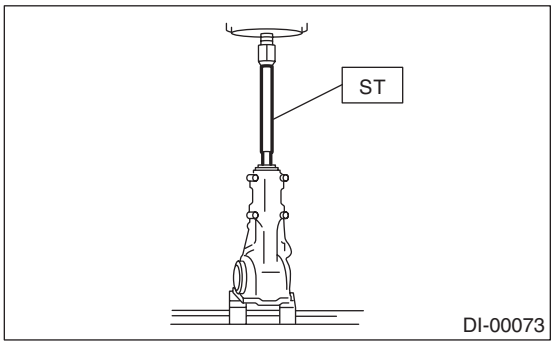
13) Extract the companion flange with a puller.



(A) Companion flange
(B) Puller

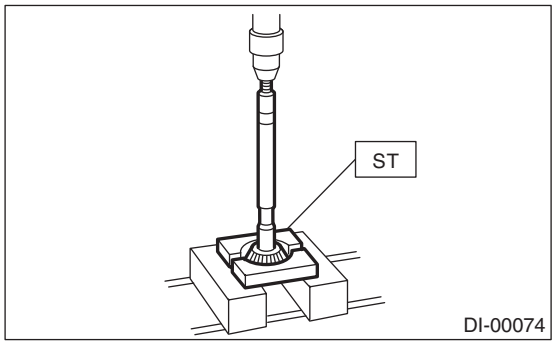
14) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjusting washer and washer.

NOTE:
Hold the drive pinion so as not to drop it.
ST 398467700 DRIFT

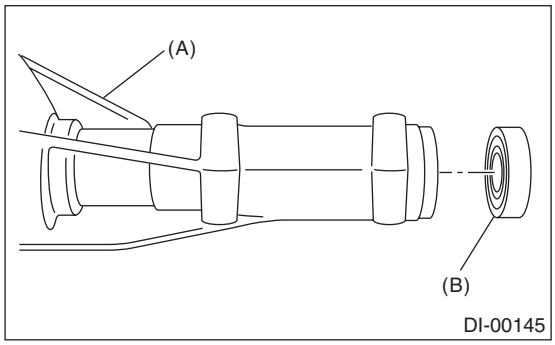


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:
Place the replacer so that its center-recessed side faces the pinion gear.
ST 498515500 REPLACER

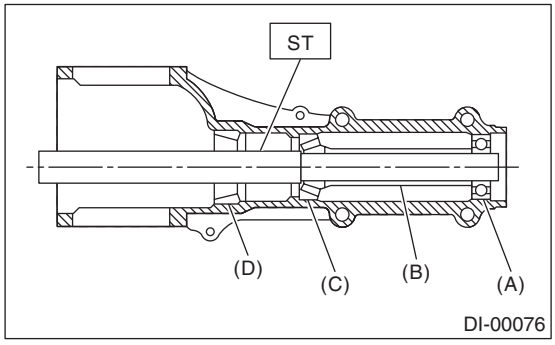


16) Remove the front oil seal from differential carrier using ST.
ST 398527700 PULLER SET



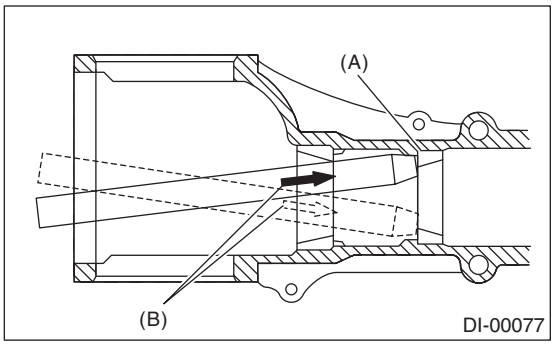
(A) Differential carrier
(B) Front oil seal

17) Remove the pilot bearing together with front bearing cone and collar using ST.
ST 398467700 DRIFT



(A) Pilot bearing
(B) Collar
(C) Front bearing
(D) Rear bearing cup

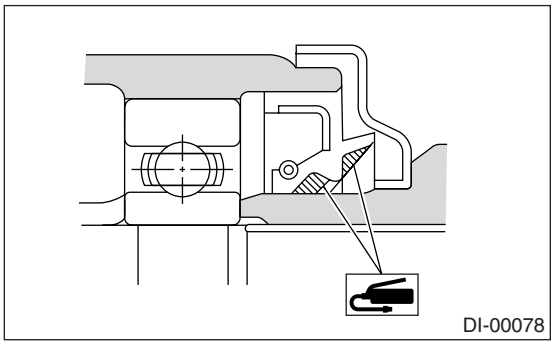
18) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines
(B) Hit out alternately with brass bar

D: ASSEMBLY

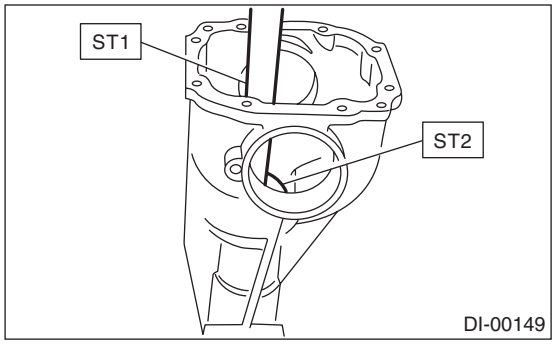
NOTE:
- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use a new gasket.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the bearing races RH and LH.
- Replace the oil seal with a new one at every disassembly. Apply grease to the lips when installing the oil seal.
- Be careful not to mix up the differential oil seal RH and LH.



1) Adjusting preload for front and rear bearings:
Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Install the rear bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477702 DRIFT



(2) Install the front bearing race to differential carrier using ST1 and ST2.

ST1 398477701 HANDLE
ST2 498447110 DRIFT

(3) Measure and record the thickness of pinion height adjusting washer.

NOTE:
If tooth contact (drive pinion, hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

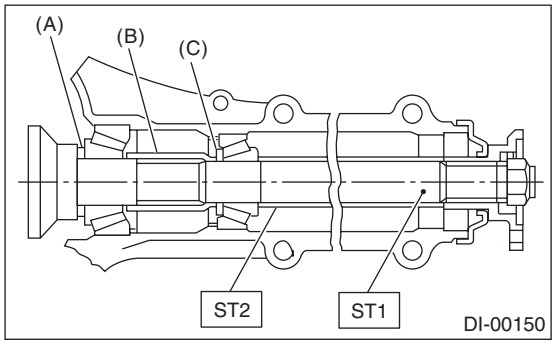
(4) Insert the ST1 into the case with pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:
Use new rear bearing cone.

(5) Install the preload adjusting collar and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.

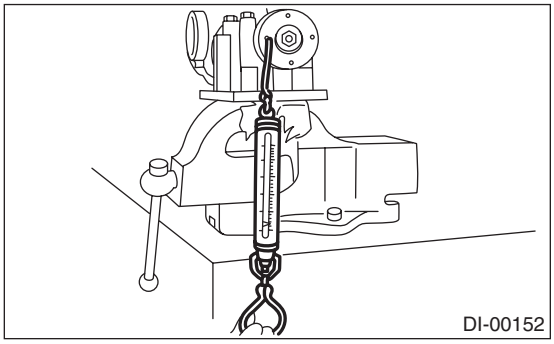
NOTE:
Use new front bearing cone.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR



(A) Pinion height adjusting washer
(B) Preload adjusting collar
(C) Preload adjusting washer

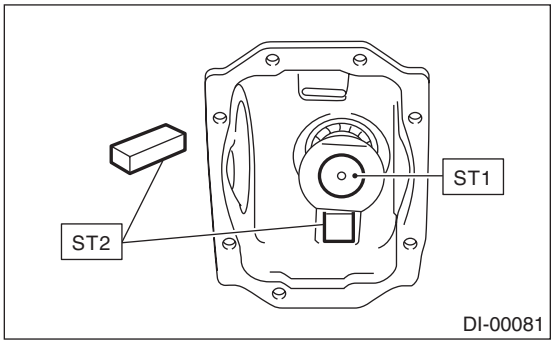
(6) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.



NOTE:
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 498447150 DUMMY SHAFT
ST2 398507704 BLOCK

Tightening torque:
191 N·m (19.5 kgf-m, 141 ft-lb)



Drive pinion bearing preload
For new bearing: 12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.3 lbf) Measure at companion flange bolt hole

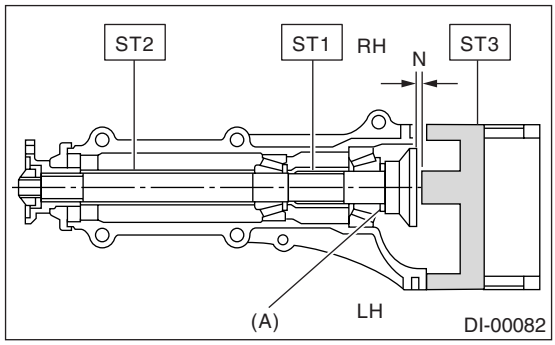
	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
	38336AA100	1.750 (0.0689)
	38336AA220	1.763 (0.0694)
	38336AA110	1.775 (0.0699)
	Part No.	Length mm (in)
Preload adjusting collar	32288AA040	52.3 (2.059)
	32288AA050	52.5 (2.067)
	31454AA100	52.6 (2.071)
	32288AA060	52.7 (2.075)
	31454AA110	52.8 (2.079)
	32288AA070	52.9 (2.083)
	31454AA120	53.0 (2.087)
	32288AA080	53.1 (2.091)
	32288AA090	53.3 (2.098)

2) Adjusting drive pinion height:
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

(1) Do not remove the ST1, ST2 and ST3 out of position after adjusting pinion bearing preload in previous step.

NOTE:
At this time, install the pinion height adjusting shim which is temporarily selected or same as that used before.

ST1 498447150 DUMMY SHAFT
ST2 32285AA000 DUMMY COLLAR
ST3 498505501 DIFFERENTIAL CARRIER GAUGE

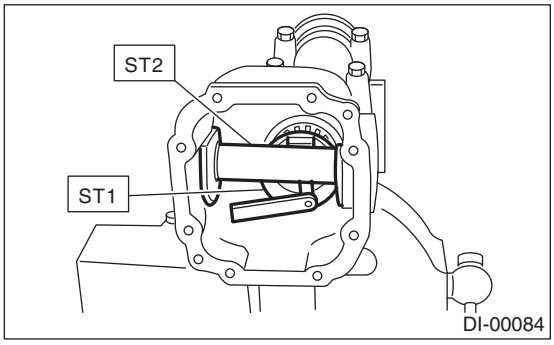


(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:
Make sure there is no clearance between the case and ST2.

ST1 498447150 DUMMY SHAFT
ST2 498505501 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

NOTE:
Adjust it using the 1 — 3 washers.
T = To + N − 0.05 (mm)

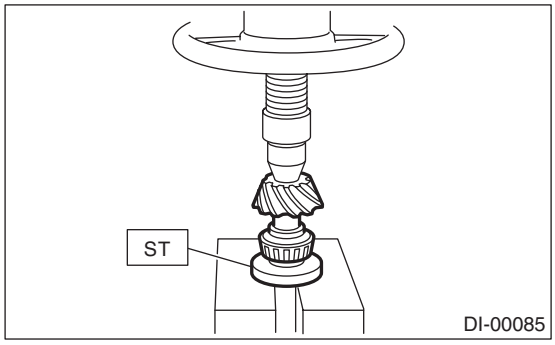
T	Thickness of pinion height adjusting washer mm (in)	
To	Thickness of washer temporally inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
Memo:		

(Example of calculation)
To = 0.15 mm
N = 0.1 mm
T = 0.15 + 0.1 − 0.05 = 0.2 mm
Result: Thickness = 0.2 mm
Therefore use the pinion height adjusting washer of part number 32295AA220.

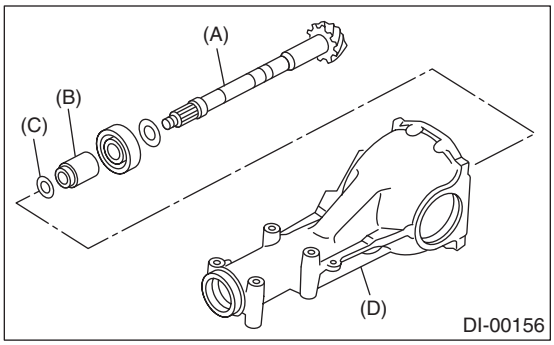
Pinion height adjusting washer	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER

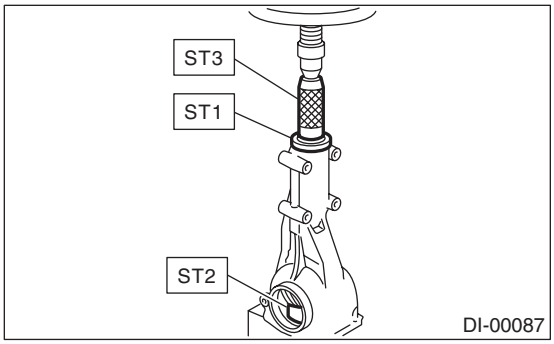


4) Insert the drive pinion into differential carrier, install the selected bearing preload adjusting collar and washer.

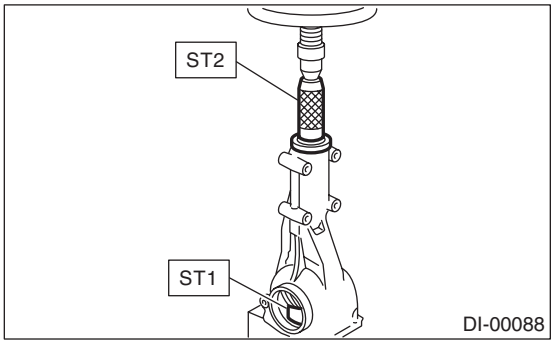


(A) Drive pinion
(B) Bearing preload adjusting collar
(C) Bearing preload adjusting washer
(D) Differential carrier

5) Press-fit the front bearing cone into carrier with ST1, ST2 and ST3.
ST1 32285AA000 DUMMY COLLAR
ST2 399780104 WEIGHT
ST3 899580100 INSTALLER

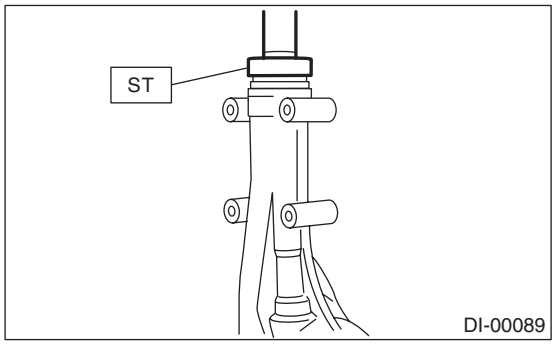


6) Insert the collar, then press-fit the pilot bearing with ST1 and ST2.
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



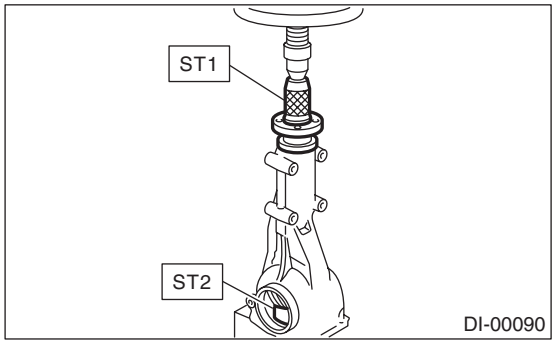
7) Fit a new oil seal with ST.

NOTE:
• Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
• Apply grease to the oil seal lips.
ST 498447120 INSTALLER



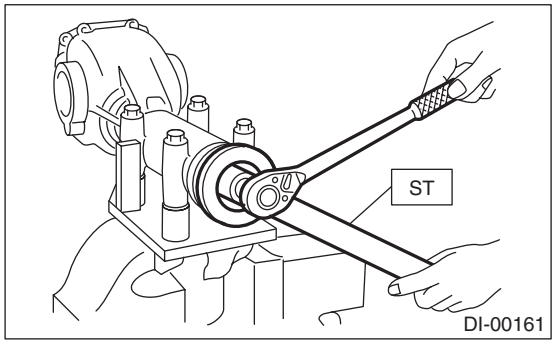
8) Press-fit the companion flange with ST1 and ST2.

NOTE:
Be careful not to damage the bearing.
ST1 899874100 INSTALLER
ST2 399780104 WEIGHT



9) Install a new self-locking nut, and secure the companion flange using ST, and tighten the nut.
ST 498427200 FLANGE WRENCH

Tightening torque:
191 N·m (19.1 kgf-m, 141 ft-lb)

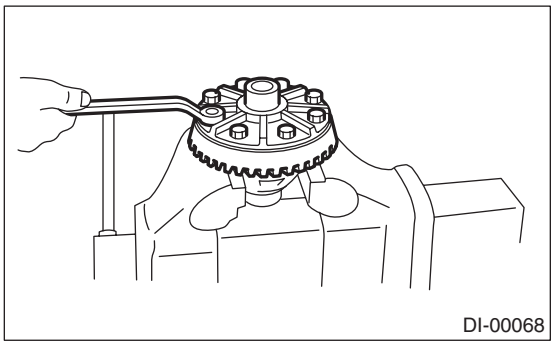


10) Install the hypoid driven gear on differential case.

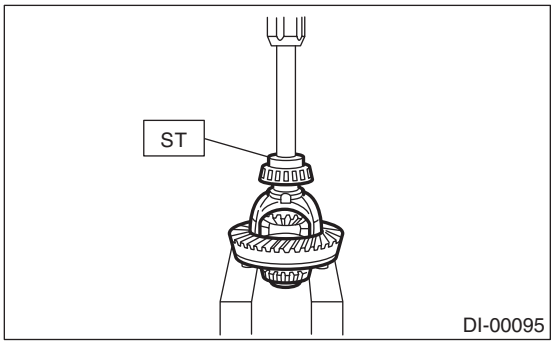
NOTE:
• Before installing bolts, apply Lock Tite to bolt threads.
• Tighten diagonally while tapping the bolt heads.

Lock Tite:
THREE BOND 1324 (Part No. 004403042)

Tightening torque:
62 N·m (6.3 kgf-m, 45.6 ft-lb)

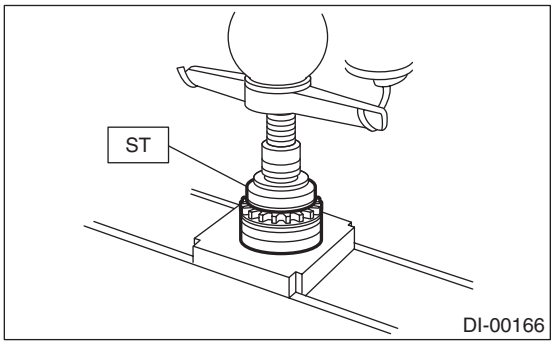

DI-00068

11) Press the side bearing cone into differential case using ST.
ST 498485400 DRIFT



DI-00095

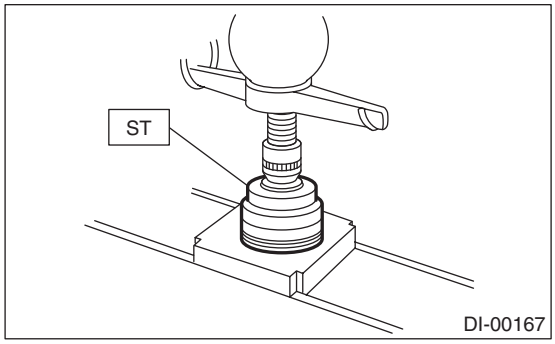
12) Assemble holders.
(1) Install the oil seal into holder RH and LH.
ST 498447100 INSTALLER



DI-00166

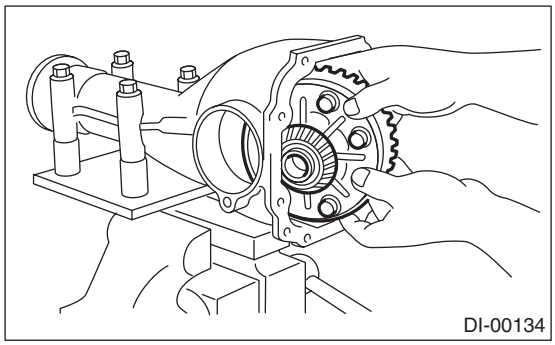
(2) Install the bearing race into holder RH and LH.
ST 398477702 DRIFT

CAUTION:
Make sure that the oil seal, bearing outer race and cone are properly assembled.



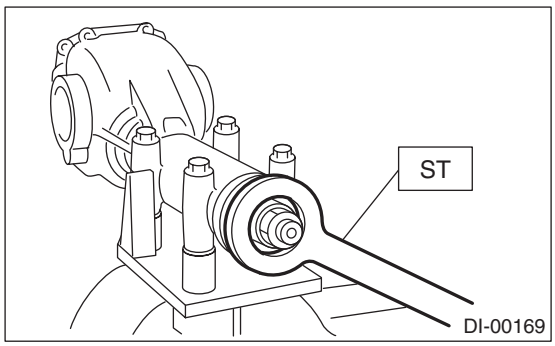
DI-00167

(3) Install the differential assembly into differential carrier in the reverse order of disassembly.


DI-00134

(4) Temporally tighten the side holder RH and LH in differential carrier to install.

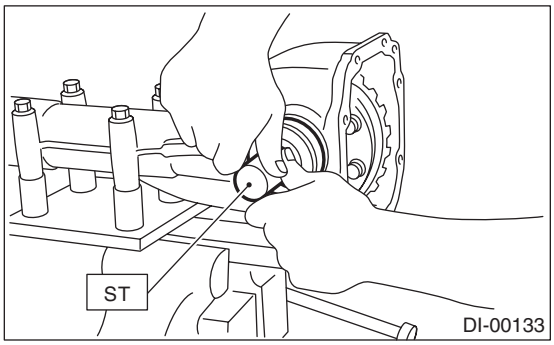
13) Perform the backlash adjustment between the hypoid driven gear and drive pinion, and preload adjustment of differential side bearing.
(1) Turn the drive pinion with ST for better fitting of differential side bearing.
ST 498427200 FLANGE WRENCH



DI-00169

(2) Screw in the side holder LH until light contact is made with ST.

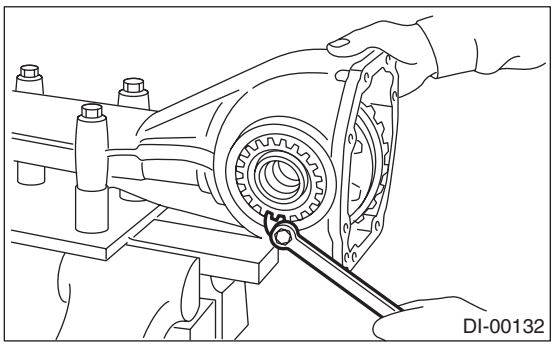
ST 499785500 OIL SEAL HOLDER WRENCH



(3) Back off the side (hypoid driven gear side) holder approx. 1 1/2 teeth of holder, and tighten the other side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of side (hypoid driven gear side) holder + 1/2 tooth.]
This + 1/2 tooth gives preload.

(4) Temporarily tighten the lock plate.

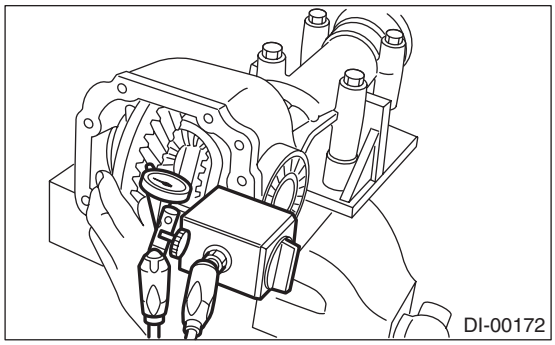
NOTE:
Turn over the lock plate to displace the holder 1/2 tooth.



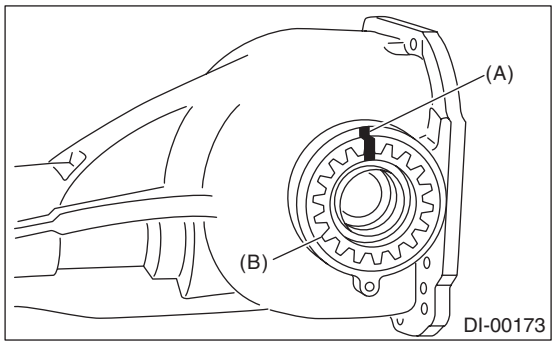
(5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

NOTE:
If measured backlash is not within specified range, repeat the procedures for pinion driven gear set backlash adjustment and differential side bearing preload adjustment.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)



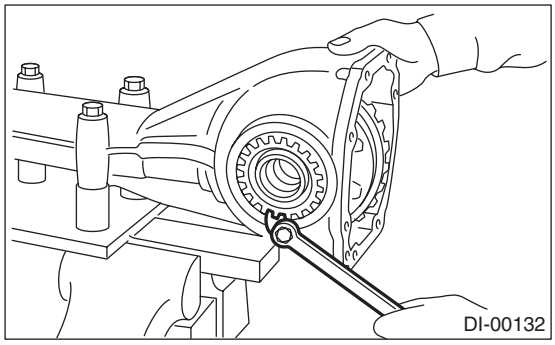
14) Draw a matching mark on both differential carrier and holder. Remove the holder side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.



(A) Alignment mark
(B) Holder

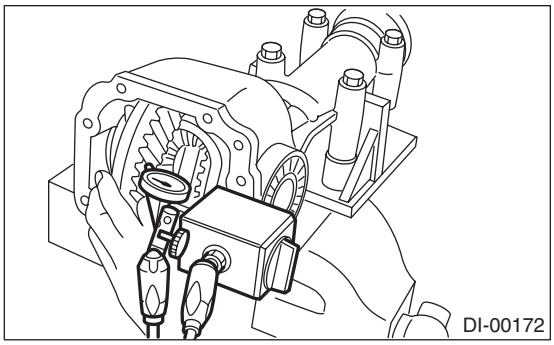
15) Tighten the bolt of lock plate to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



16) Recheck the hypoid driven gear to pinion backlash.

Backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

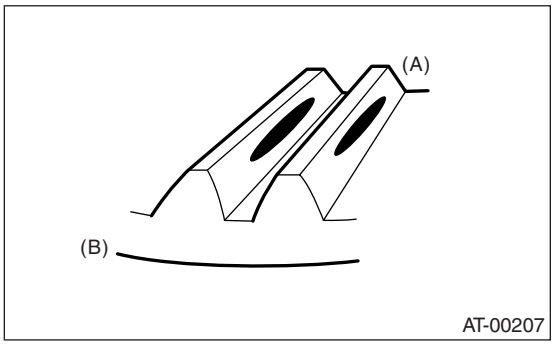


17) Checking and adjusting the tooth contact of hypoid driven gear:
(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
(2) When the contact pattern is incorrect, readjust.

NOTE:
Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

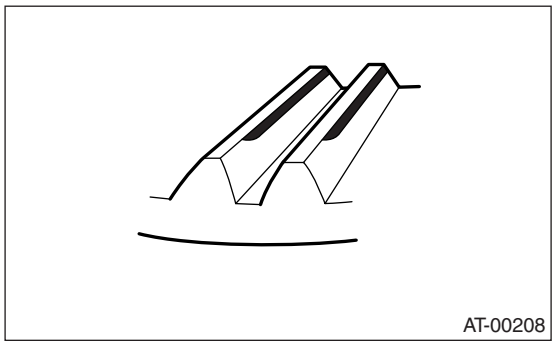
Checking item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]



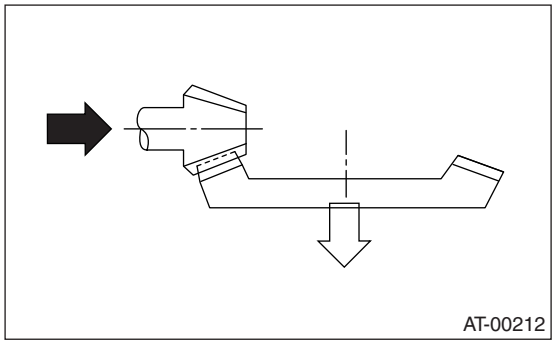
(A) Toe side
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern

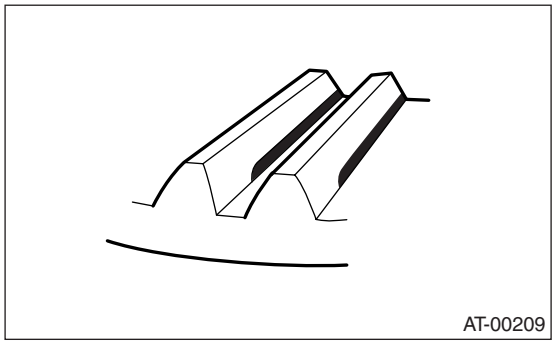


Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

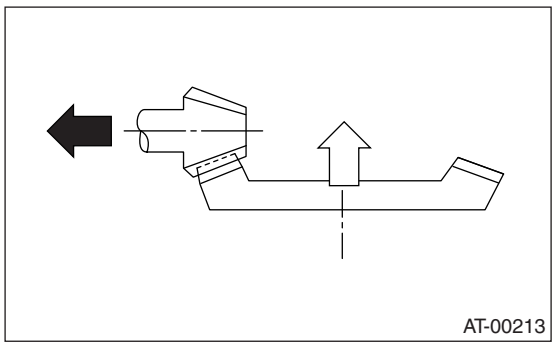


- Flank contact

Checking item: Backlash is too small.
Contact pattern



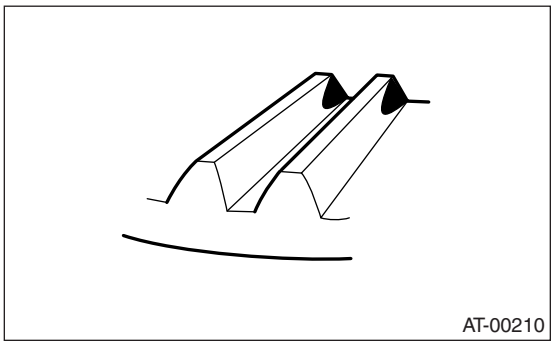
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



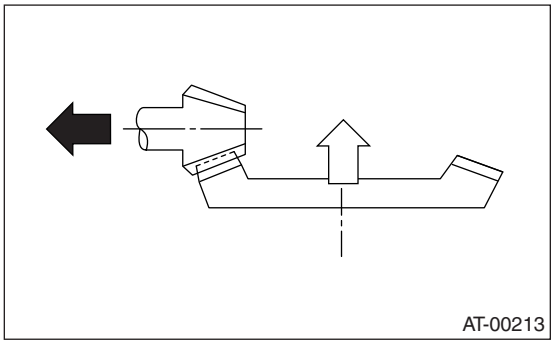
• Toe contact (inside end contact)

Checking item: Contact areas is small

Contact pattern



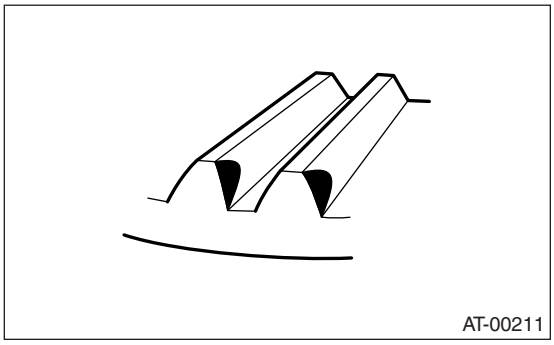
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



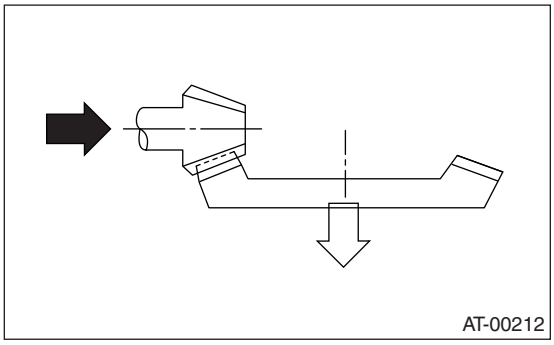
• Heel contact (outside end contact)

Checking item: Contact areas is small

Contact pattern



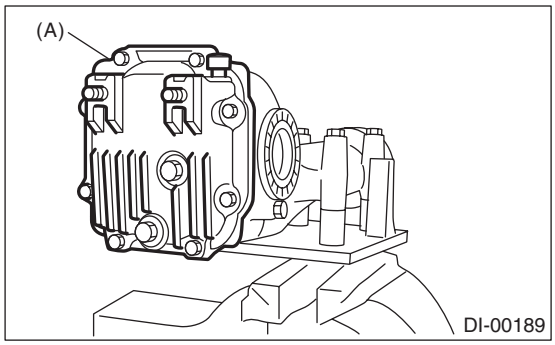
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



18) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

19) Install the new gasket and rear cover to differential carrier and tighten the bolts to specified torque.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Rear cover

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.

1) Hypoid driven gear and drive pinion

• If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact. Replace the gear if excessively worn or incapable of adjustment.

• If crack, score or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Bearings

Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.

3) Oil seal

Replace if deformed or damaged, and at every disassembling.

4) Differential carrier

Replace if the bearing bores are worn or damaged.

5) Differential case

Replace if its sliding surfaces are worn or cracked.

6) Companion flange

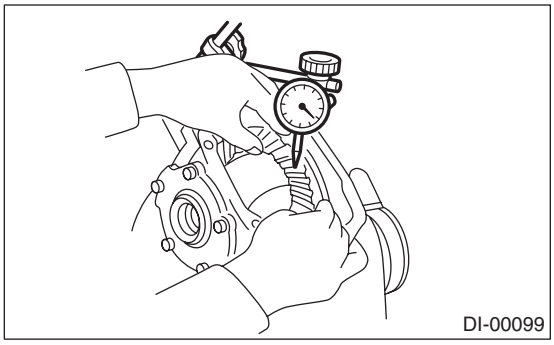
Replace if the oil seal lip contacting surfaces have flaws.

1. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:
0.10 — 0.15 mm (0.0039 — 0.0059 in)

If the hypoid driven gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.


DI-00099

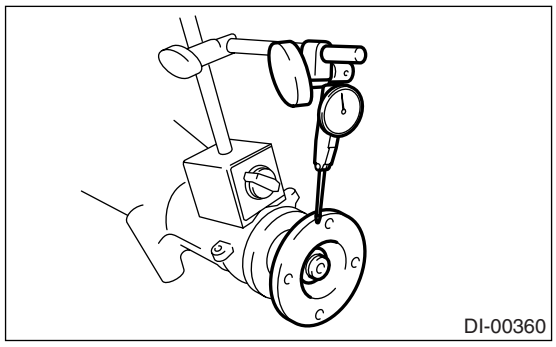
2. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-44, ASSEMBLY, Rear Differential (VA-type).>

3. COMPANION FLANGE

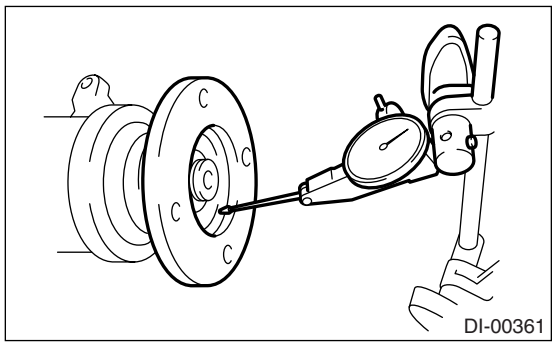
1) If rust or dirt is attached to the companion flange, remove them.
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:
0.08 mm (0.003 in)


DI-00360

3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:
0.08 mm (0.003 in)


DI-00361

4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point that the runout is within the limit.
5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.
6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash.
<Ref. to DI-44, ASSEMBLY, Rear Differential (VA-type).>

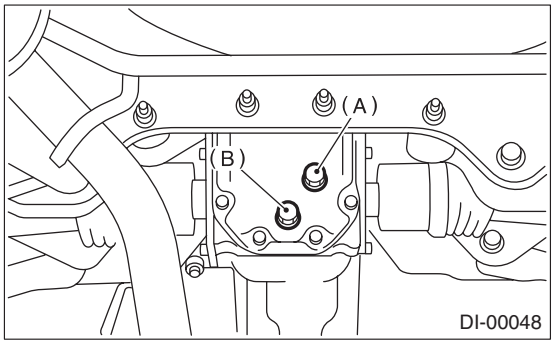
2. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear.
<Ref. to DI-44, ASSEMBLY, Rear Differential (VA-type).>

6. Rear Differential Front Oil Seal

A: REPLACEMENT

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the select lever or gear shift lever to “N”.
4) Release the parking brake.
5) Remove the oil drain plug, and drain the gear oil.



(A) Filler plug
(B) Drain plug

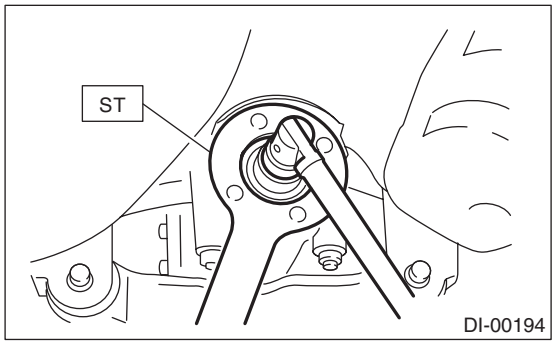
6) Install the oil drain plug.

NOTE:
- Apply liquid gasket to the drain plug for T-type.
- Use a new aluminum gasket for VA-type.

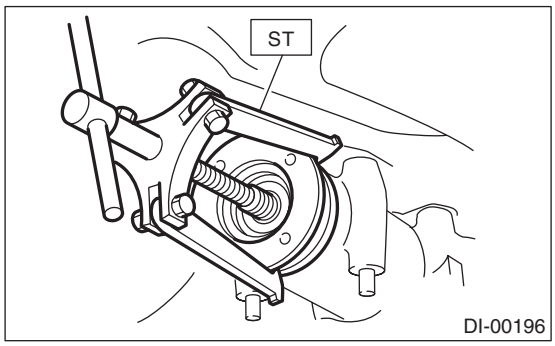
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:
T-type
49 N·m (5.0 kgf-m, 36.2 ft-lb)
VA-type
34 N·m (3.5 kgf-m, 25.3 ft-lb)

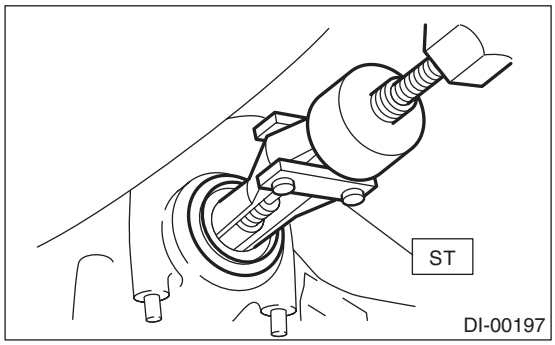
7) Jack-up the rear wheels and support the vehicle body with rigid racks.
8) Remove the rear exhaust pipe and muffler.
9) Remove the propeller shaft from body. **<Ref. to DS-15,** REMOVAL**, Propeller Shaft.>**
10) Remove the self-locking nut while holding the companion flange with ST.
ST 498427200 FLANGE WRENCH



11) Remove the companion flange using ST.
ST 399703600 PULLER ASSY

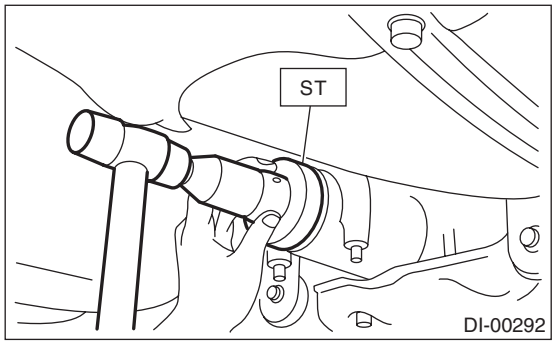


12) Remove the oil seal using ST or screw-driver.
ST 398527700 PULLER ASSY



13) Fit a new oil seal using ST.

NOTE:
Apply oil to the outer surface of oil seal.
ST 498447120 INSTALLER



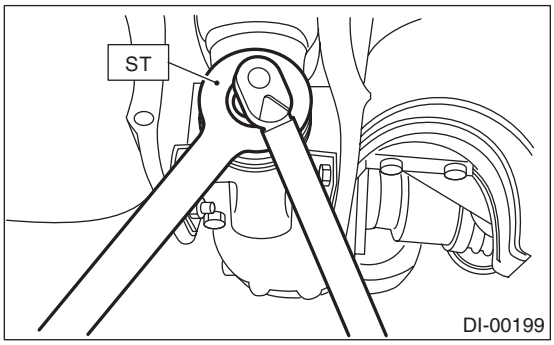
14) Install the companion flange.

NOTE:
Use a plastic hammer to install the companion flange.

15) Tighten the self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that before replacing oil seal.
ST 498427200 FLANGE WRENCH

NOTE:
Use a new self-locking nut.

Tightening torque:
T-type
181 N·m (18.5 kgf-m, 134 ft-lb)
VA-type
191 N·m (19.5 kgf-m, 141 ft-lb)



16) Hereafter, reassemble in the reverse order of disassembly.

7. Rear Differential Side Oil Seal

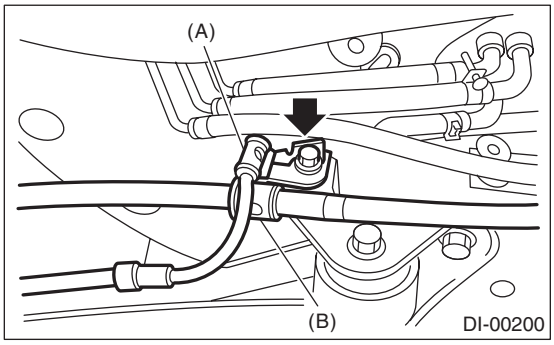
A: INSPECTION

Make sure that there is no oil leakage from side oil seal.
If there is any oil leakage, replace the oil seal.

B: REPLACEMENT

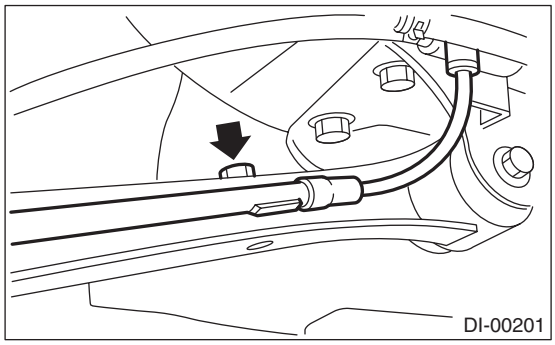
1. T-TYPE

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen both wheel nuts.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL**, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13,** REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL**, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16,** REMOVAL, Muffler.>
8) Remove the DOJ of rear drive shaft from rear differential.
(1) Remove the ABS wheel speed sensor cable clamp and parking brake cable clamp from bracket.

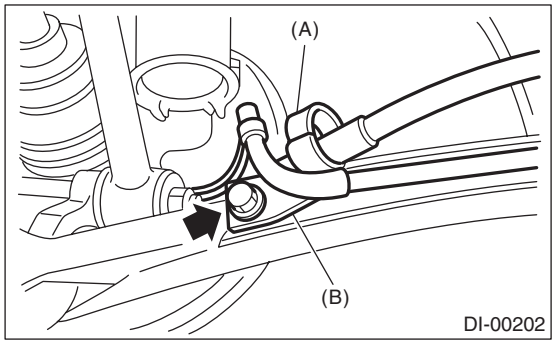


(A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

(2) Remove the ABS wheel speed sensor cable clamp from trailing link.

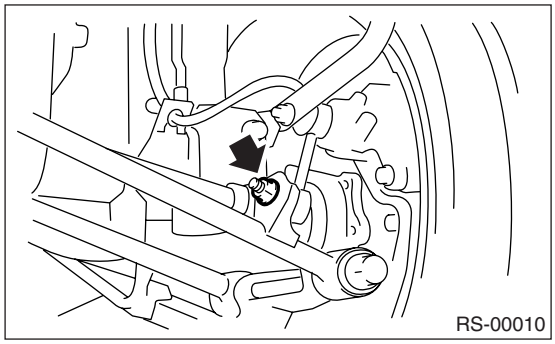


(3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

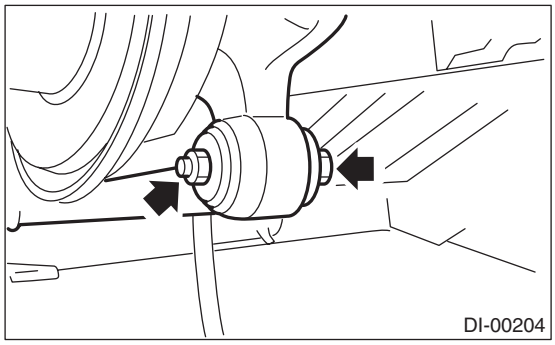


(A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

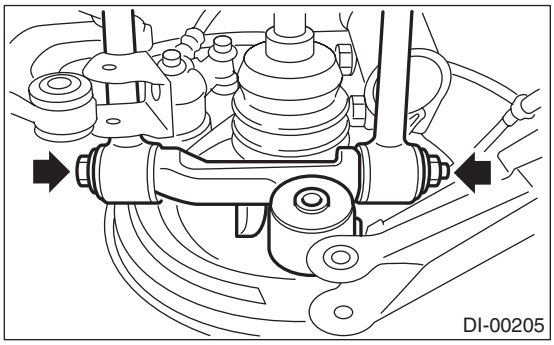
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure trailing link to housing.



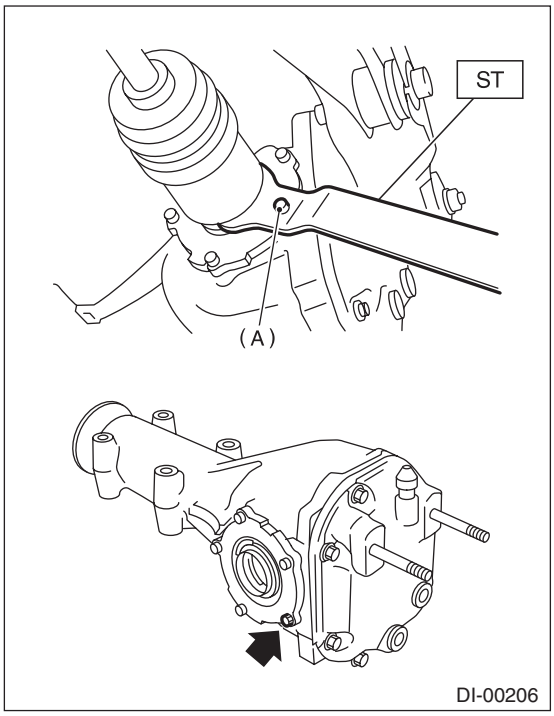
(6) Remove the bolts which secure front and rear lateral link to rear housing.



(7) Remove the DOJ from the rear differential by using ST.

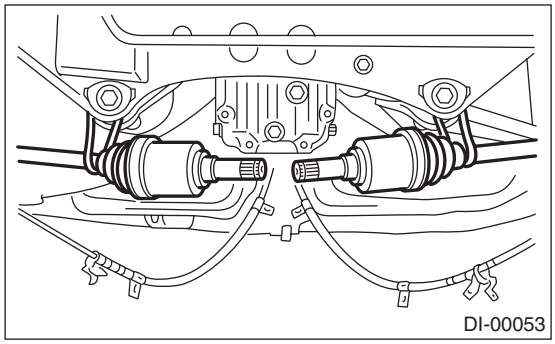
NOTE:
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 28099PA100 DRIVE SHAFT REMOVER



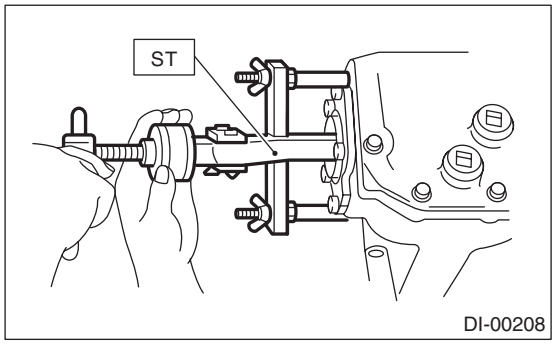
(A) Bolt

9) Suspend the rear drive shaft to the rear cross-member using wire.



10) Using the ST, remove the oil seal.

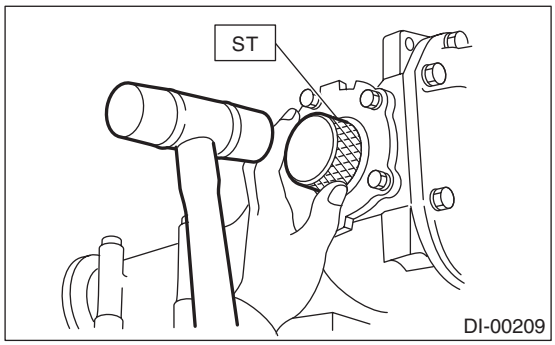
ST 398527700 PULLER ASSY



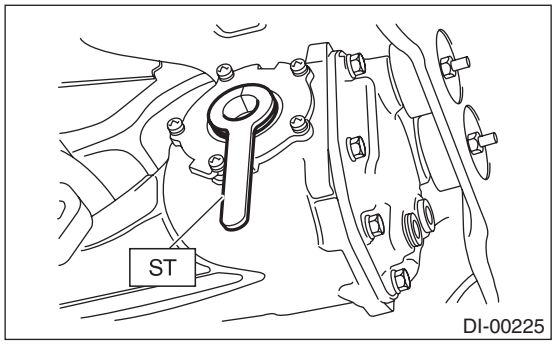
11) Install the new side oil seal using ST.

NOTE:
Apply chassis grease between the oil seal lips.

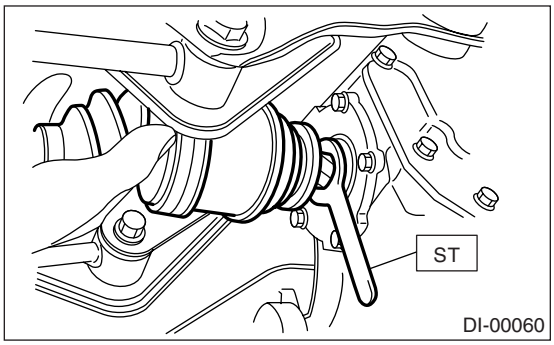
ST 398437700 DRIFT



12) Insert the DOJ into rear differential.
(1) Install the ST to rear differential.
ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.
ST 28099PA090 SIDE OIL SEAL PROTECTOR



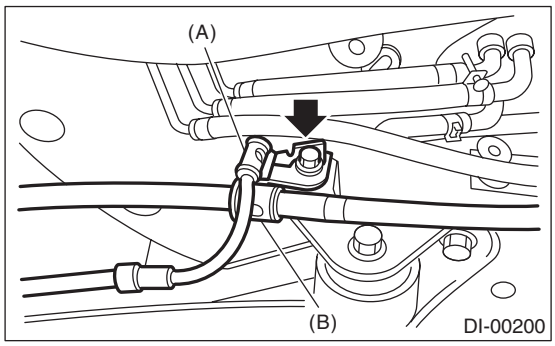
(3) Remove the ST.
ST 28099PA090 SIDE OIL SEAL PROTECTOR

13) Hereafter, reassemble in the reverse order of disassembly.

2. VA-TYPE

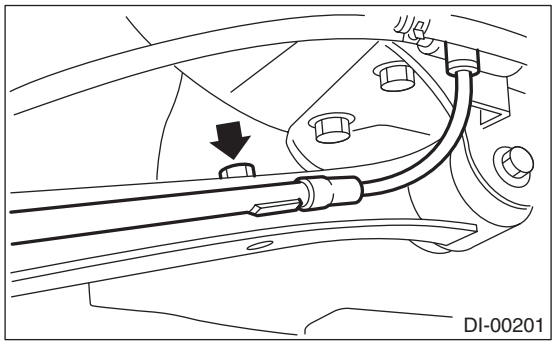
1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Loosen both wheel nuts.
5) Jack-up the vehicle and support it with rigid racks.
6) Remove the wheels.
7) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL**, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13,** REMOVAL, Muffler.> **<Ref. to EX(H4SO)-13,** REMOVAL, Muffler.>
8) Remove the DOJ of rear drive shaft from rear differential.

(1) Remove the ABS wheel speed sensor cable clamp and parking brake cable clamp from bracket.

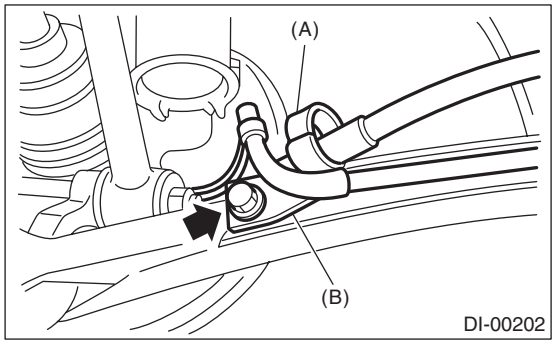


(A) ABS wheel speed sensor cable clamp
(B) Parking brake cable clamp

(2) Remove the ABS wheel speed sensor cable clamp from trailing link.

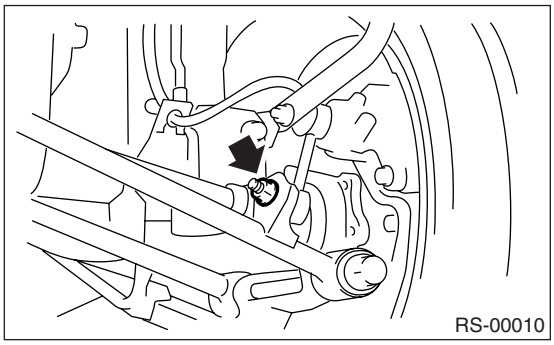


(3) Remove the ABS wheel speed sensor cable clamp and parking brake cable guide from trailing link.

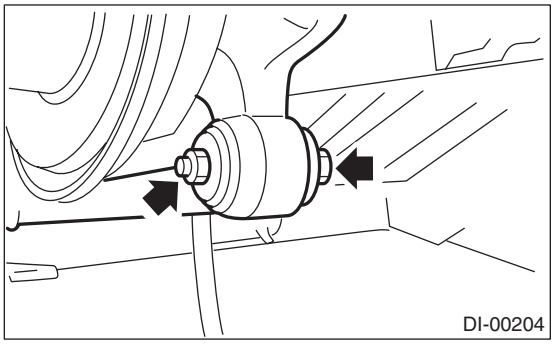


(A) Parking brake cable guide
(B) ABS wheel speed sensor cable clamp

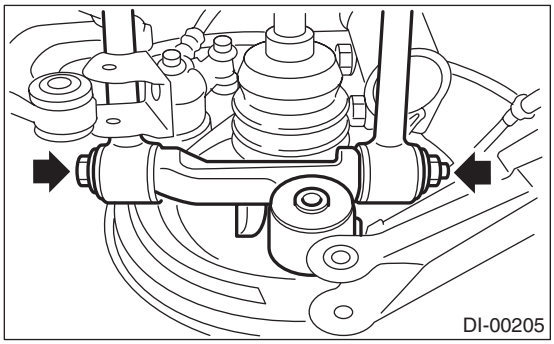
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure trailing link to housing.



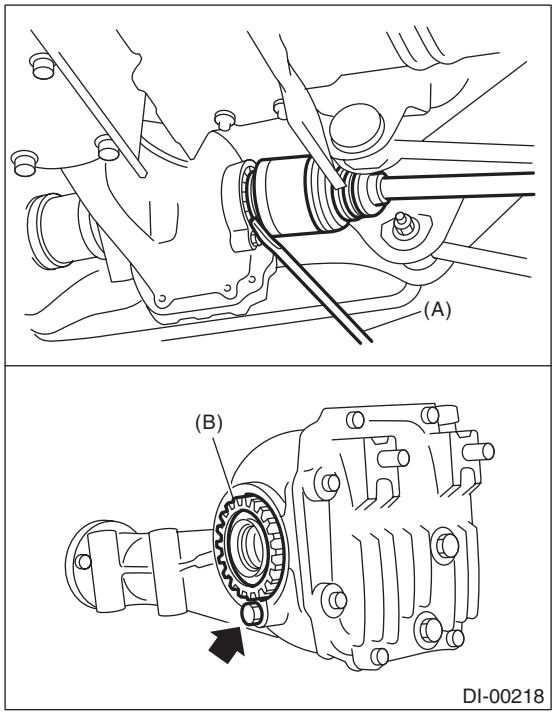
(6) Remove the bolts which secure front and rear lateral link to rear housing.



(7) Remove the DOJ from the rear differential using tire lever.

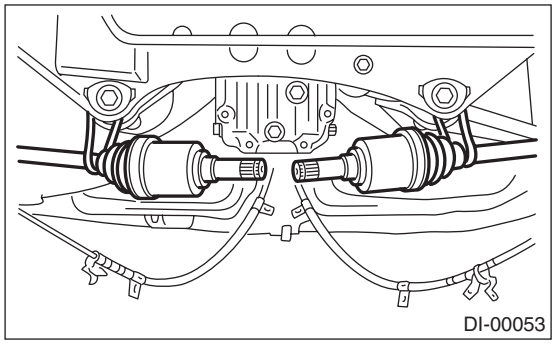
NOTE:
When removing the DOJ from rear differential, fit tire lever to the bolt as shown in the figure so as not to damage the axle shaft holder.

NOTE:
The side spline shaft circlip comes out together with the shaft.

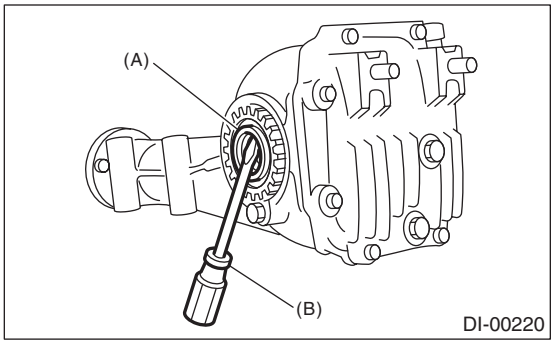


(A) Tire lever
(B) Axle shaft holder

9) Suspend the rear drive shaft to rear crossmember using wire.



10) Remove the oil seal with screwdriver.

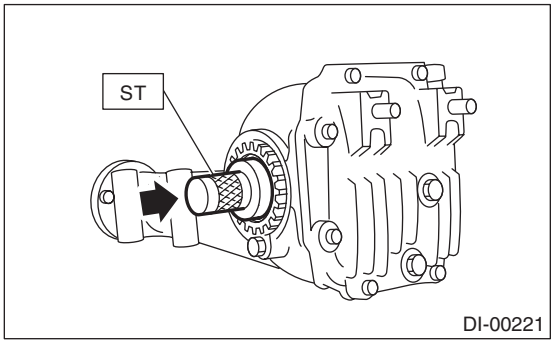


(A) Side oil seal
(B) Screwdriver

11) Drive in a new side oil seal using ST.

NOTE:
Apply chassis grease between the oil seal lips.

ST 498447100 OIL SEAL INSTALLER

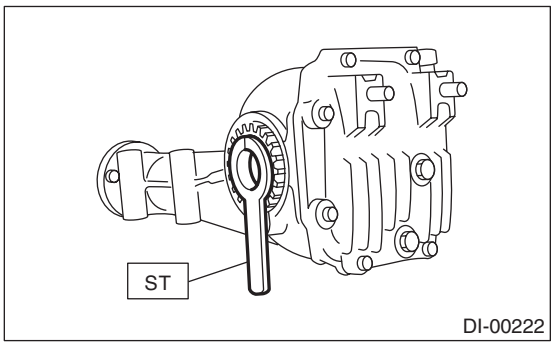


12) Insert the DOJ into rear differential.

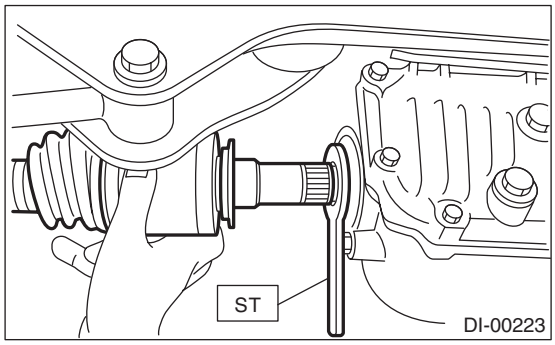
NOTE:
Before inserting, replace the circlip at the end of spline shaft with a new one.

(1) Install the ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal.

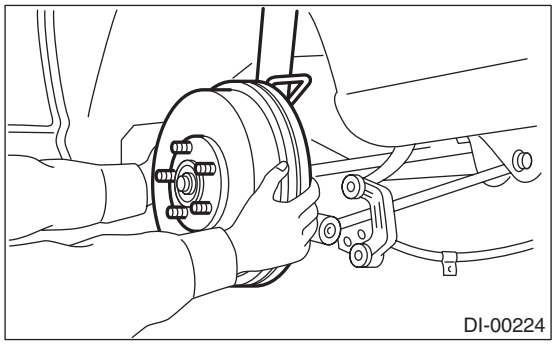


(3) Remove the ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

(4) Completely insert the DOJ into rear differential by pressing rear housing.

NOTE:
Make sure that the oil seal lip is not folded over inward.



13) Hereafter, reassemble in the reverse order of disassembly.

8. Rear Differential Member

A: REMOVAL

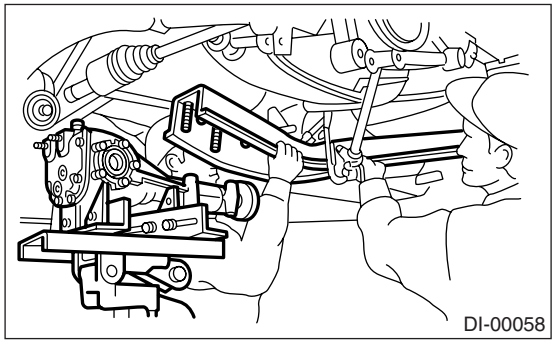
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Move the selector lever or gear shift lever to “N”.
4) Release the parking brake.
5) Loosen the wheel nuts.
6) Jack-up the vehicle and support it with rigid racks.
7) Remove the wheels.
8) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL**, Rear Exhaust Pipe.> <Ref. to EX(H4SO)-13,** REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL**, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC 2.0)-16,** REMOVAL, Muffler.>
9) Remove the rear differential front member.

NOTE:
When removing the rear differential front member, work the removal procedure as rear differential.
T-type
<Ref. to DI-24, REMOVAL, Rear Differential (T-type).>
VA-type
<Ref. to DI-39, REMOVAL**, Rear Differential (VA-type).>**
10) Remove the differential rear member.

B: INSTALLATION

Install in the reverse order of removal.
1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

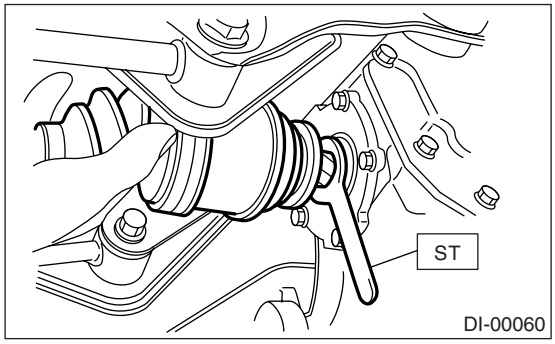
NOTE:
When installing the rear differential front member, pay attention the installation sequence of the stopper.



2) Insert the DOJ of rear drive shaft into rear differential.

NOTE:
Before inserting, replace the side oil seal with a new one.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

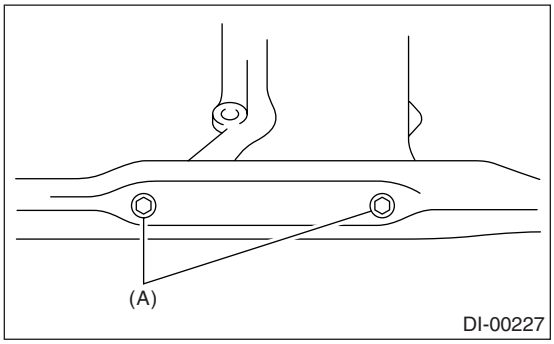


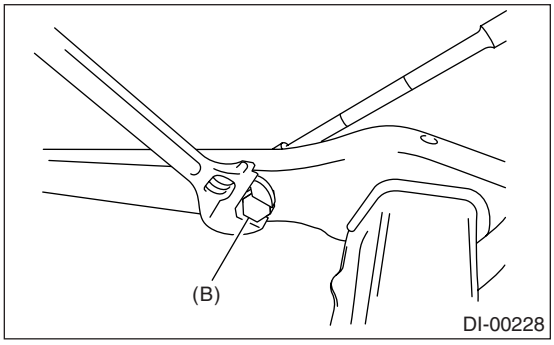
3) Hereafter, install in the reverse order of removal.

C: DISASSEMBLY

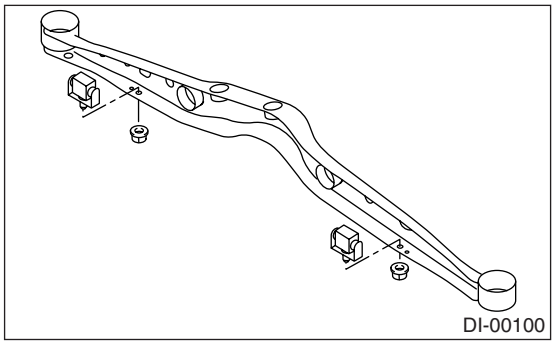
NOTE:
Clean the rear differential member before disassembly.

1) Remove the bolt (A) and (B) which connect front differential member and differential mounting bracket.





2) Remove the dynamic damper from front differential member. (Non-turbo model)

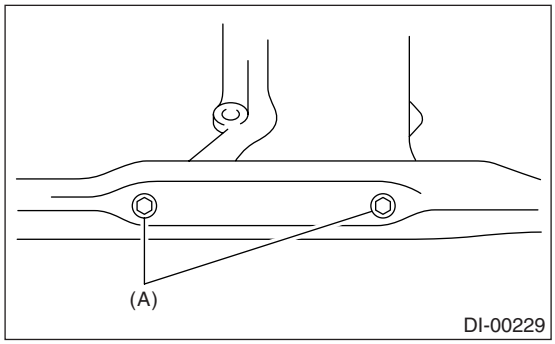


D: ASSEMBLY

1) Install the dynamic damper to front differential member. (Non-turbo model)

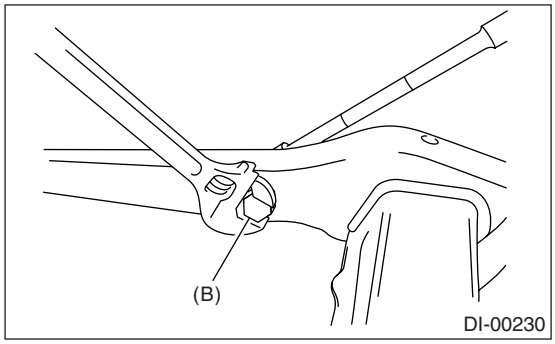
Tightening torque:
20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Temporarily tighten the connecting bolt (A) which secures front differential to differential mount.



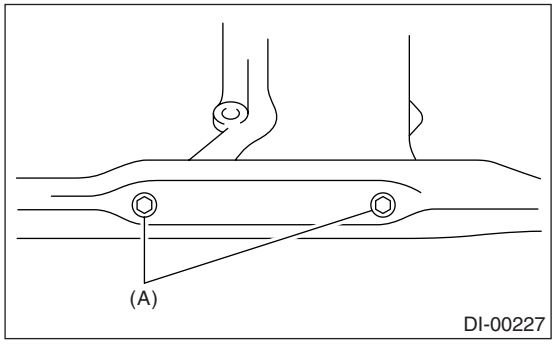
3) Tighten the nut of connecting bolt (B).

Tightening torque:
128 N·m (13.1 kgf-m, 95 ft-lb)



4) Tighten the nut of connecting bolt (A).

Tightening torque:
70 N·m (7.1 kgf-m, 52 ft-lb)



E: INSPECTION

1) Check the rear differential member for damage, bend, or corrosion.
If damage, bend, or corrosion is excessive, replace the rear differential member.
2) Check the bushings of rear differential member for cracking, hardening, or damage.
If cracking, hardening, or damage is excessive, replace the rear differential member.

9. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched or incorrectly seated front or side oil seal. Scored, battered or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on side retainer or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten the bolts to specified torque. Replace the gasket and apply liquid gasket.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid gasket.
	(6) Wear, damage or incorrectly fitting for side retainer and oil seal.	Repair or replace.
2. Seizure NOTE: Improper or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Insufficient backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Replace the improper part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear, or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(4) Loose bolts and nuts such as hypoid driven gear bolt.	Retighten.
	(5) Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembly.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace the gear or thrust washer.
	(3) Insufficient preload for front or rear bearing.	Readjust.
	(4) Loose drive pinion nut.	Tighten to specified torque.
	(5) Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

General Diagnostic Table

Symptom or trouble	Possible cause	Remedy
6. Gear noises NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise.	(1) Improper tooth contact of hypoid gear.	Readjust or replace the hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace the hypoid gear set.
	(4) Seized hypoid gear.	Replace the hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Seized, scored, or chipped front or rear bearing.	Replace.
	(7) Seized, scored, or chipped side bearing.	Replace.
	(8) Vibrating differential carrier.	Replace.

TRANSFER CASE

TC

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1. General Description

A: NOTE

For general description, refer to “4AT” or “5MT” section.
AT model:
<Ref. to 4AT-2, General Description.>
MT model:
<Ref. to 5MT-2, General Description.>

2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection work, refer to “5MT” section. <Ref. to 5MT-50, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-96, Transfer Clutch.>

4. Oil Seal

A: NOTE

For removal, installation and inspection work, refer to “4AT” or “5MT” section.
AT model:
<Ref. to 4AT-53, Extension Case Oil Seal.>
MT model:
<Ref. to 5MT-41, Oil Seal.>

5. Transfer Drive Gear

A: NOTE

For removal, installation and inspection work, refer to “5MT” section. <Ref. to 5MT-54, Transfer Drive Gear.>

6. Transfer Driven Gear

A: NOTE

For removal, installation and inspection work, refer to “5MT” section. <Ref. to 5MT-56, Transfer Driven Gear.>

7. Reduction Drive Gear

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-106, Reduction Drive Gear.>

8. Reduction Driven Gear

A: NOTE

For removal, installation and inspection work, refer to “4AT” section. <Ref. to 4AT-104, Reduction Driven Gear.>

9. Center Differential

A: NOTE

For removal, installation and inspection work, refer to “5MT” section. <Ref. to 5MT-58, Center Differential.>

10. Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to “4AT” section. <Ref. to 4AT-42, Transfer Clutch Pressure Test.>

DRIVE SHAFT SYSTEM

DS

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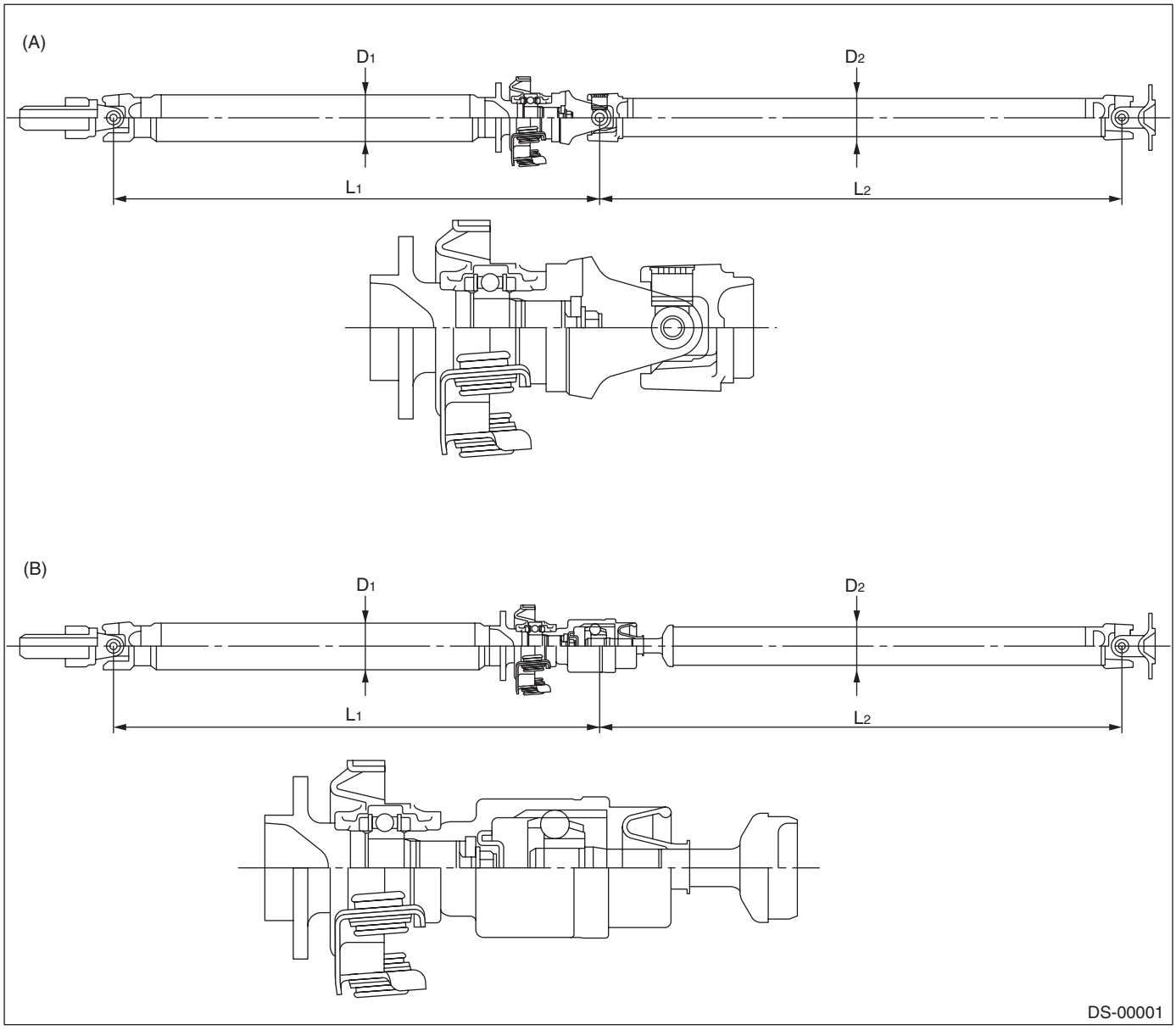
1. General Description

A: SPECIFICATION

1. PROPELLER SHAFT

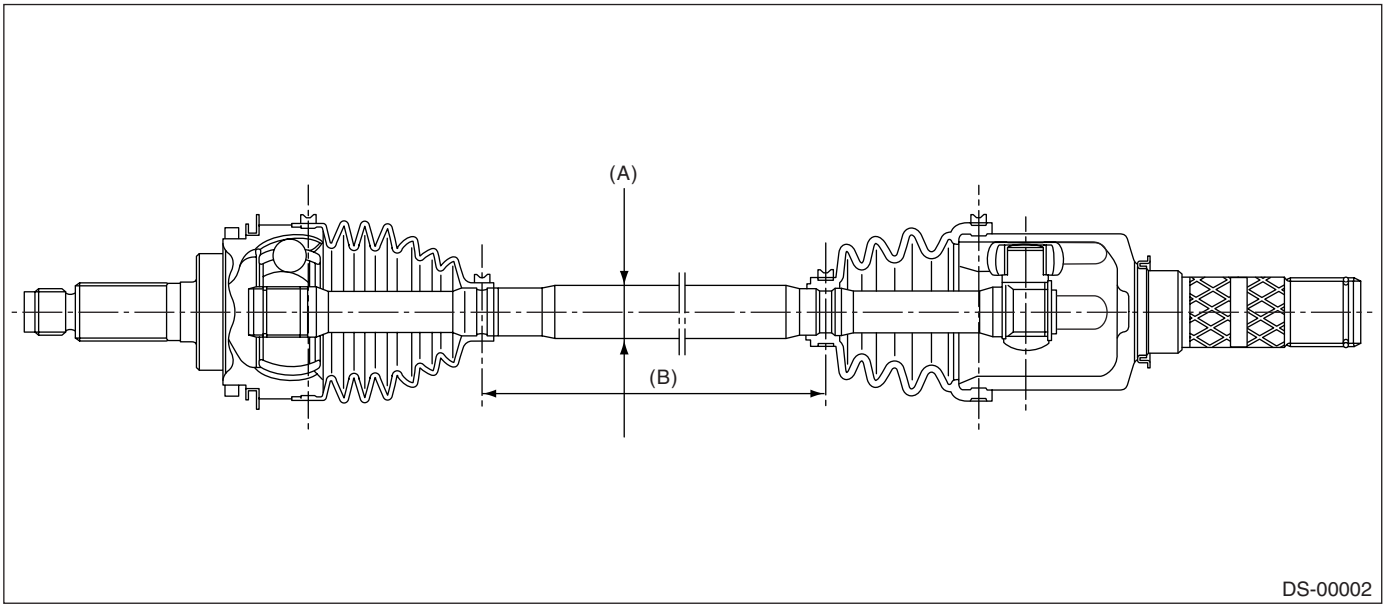
Model			AT		MT	
Propeller shaft type			DOJ	3UJ	DOJ	3UJ
Front propeller shaft Joint-to-joint length: L_1		mm (in)	580 (22.83)	585 (23.03)	639 (25.16)	644 (25.35)
Rear propeller shaft Joint-to-joint length: L_2		mm (in)	712 (28.03)	707 (27.83)	712 (28.03)	707 (27.83)
Outside diameter of tube:	mm (in)	D_1	63.5 (2.500)			
		D_2	57.0 (2.244)			



(A) 3UJ type (2.0 L non-turbo model) (B) DOJ type (Except for 2.0 L non-turbo model)

2. FRONT DRIVE SHAFT ASSEMBLY

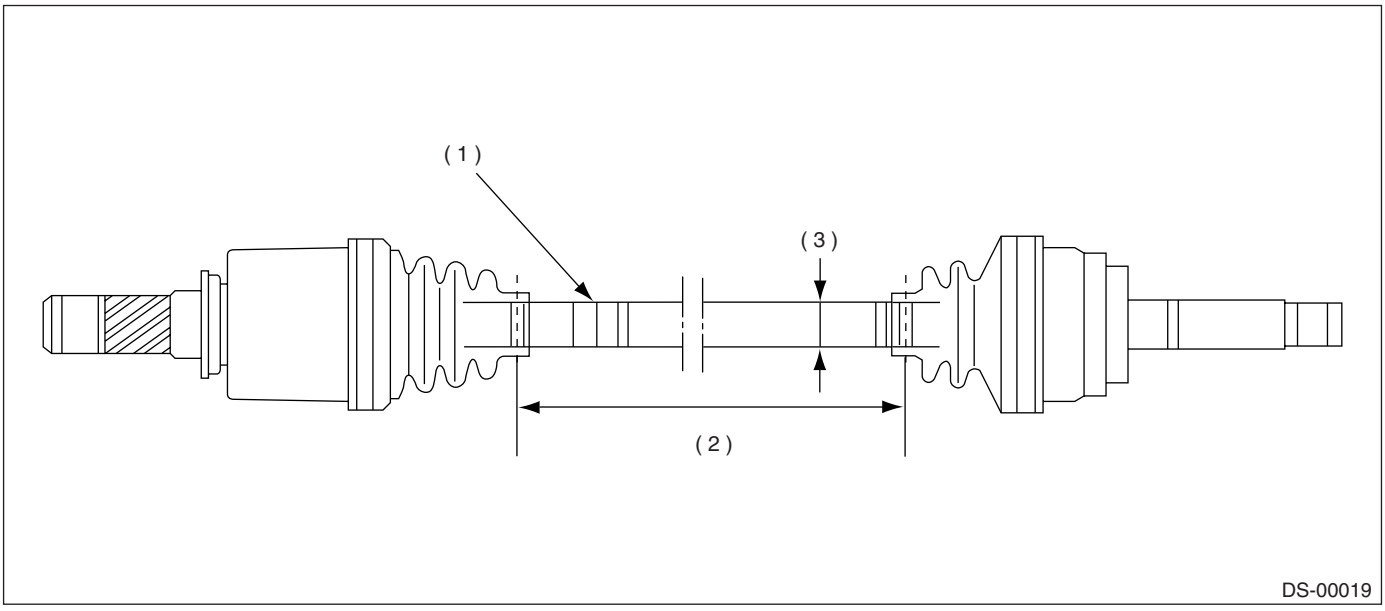
Specification	Model	Identification color of shaft	L_1 mm (in)	ϕ D mm (in)
AC+AARi	Non-turbo AT, Turbo AT	—	513 (20.2)	24.9 (0.98)
	Non-turbo MT	Yellow	513 (20.2)	28 (1.10)
	Turbo MT	Pink	511.4 (20.13)	24.9 (0.98)



(A) ϕ D mm (in) (B) L_1 mm (in)

3. REAR DRIVE SHAFT ASSEMBLY

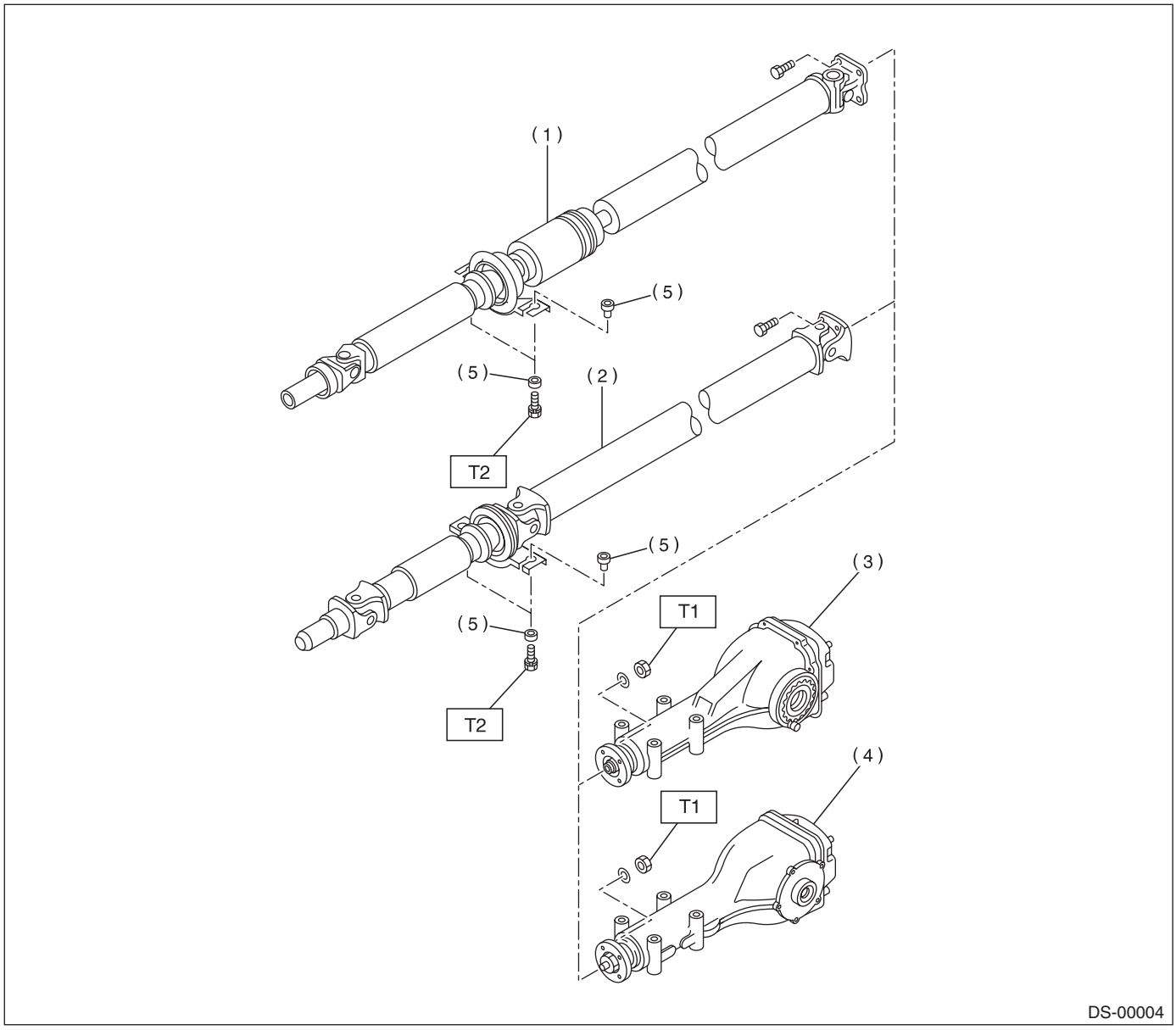
Specification	Model	No. of identification groove on shaft	L_1 mm (in)	ϕ D mm (in)
EBJ+DOJ RH	Turbo MT&AT	2	363 (14.2)	24 (0.9)
BJ+DOJ	Non-turbo MT&AT	3	363 (14.2)	24 (0.9)
EBJ+DOJ LH	Turbo MT&AT	1	353 (13.9)	24 (0.9)



(1) Identification groove (2) L_1 mm (in) (3) ϕ D mm (in)

B: COMPONENT

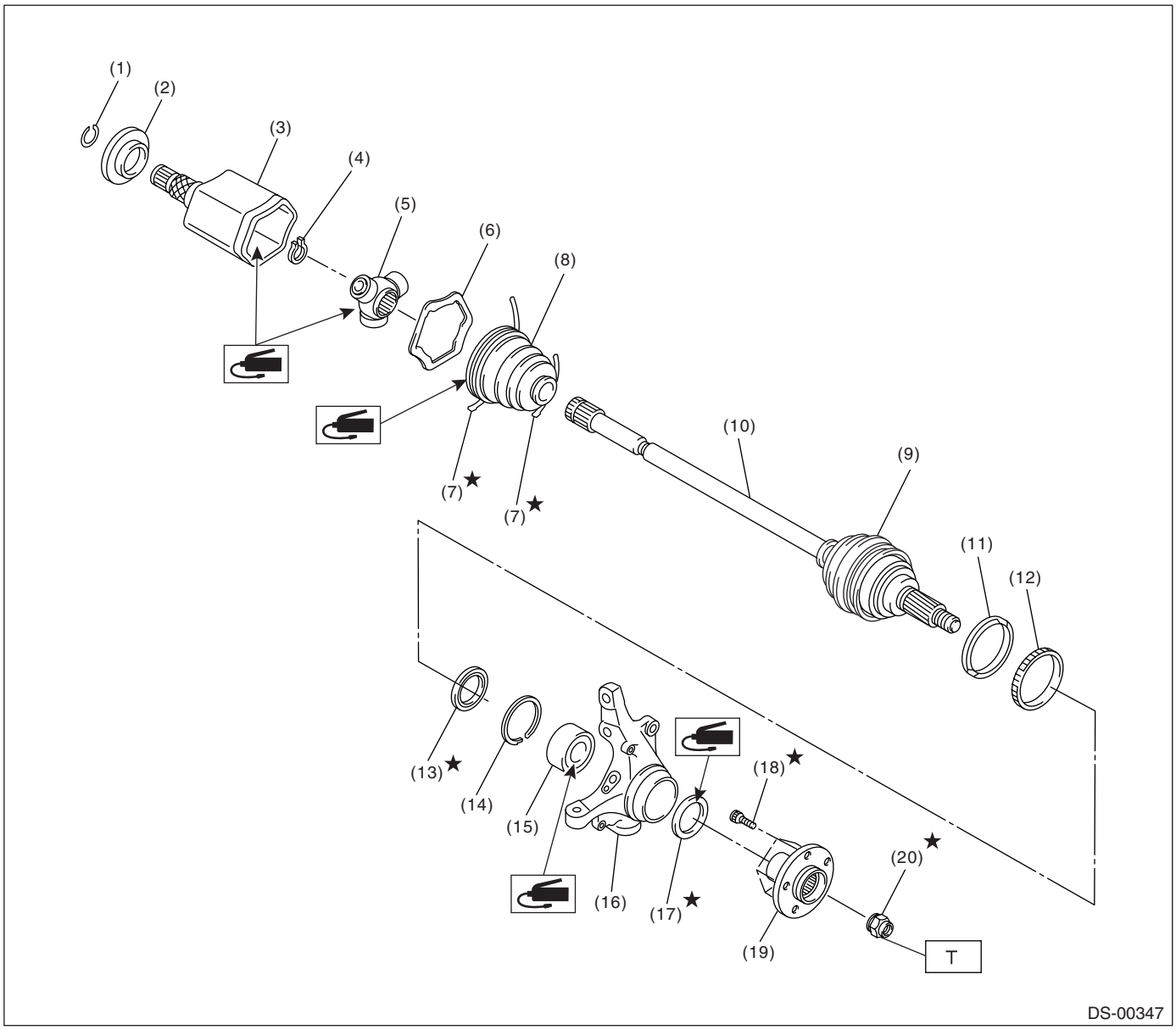
1. PROPELLER SHAFT



(1) Propeller shaft (DOJ type)
(2) Propeller shaft (3UJ type)
(3) Rear differential (VA-type)
(4) Rear differential (T-type)
(5) Bush

Tightening torque: N·m (kgf-m, ft-lb)
T1: 31 (3.2, 23.1)
T2: 52 (5.3, 38.3)

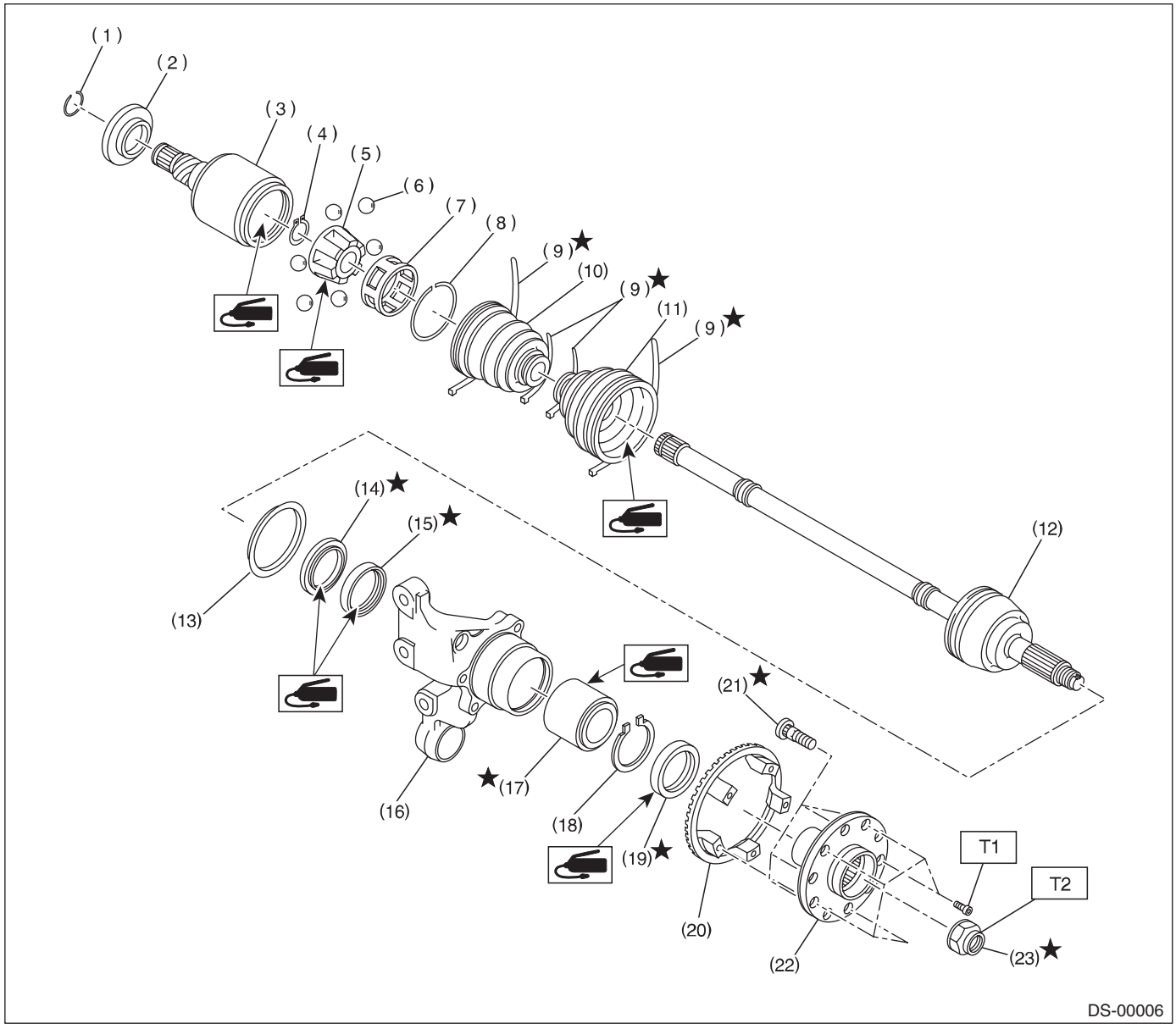
2. FRONT AXLE



(1) Spring pin
(2) Baffle plate (SFJ)
(3) Outer race (SFJ)
(4) Snap ring
(5) Trunnion
(6) Retainer
(7) Boot band
(8) Boot (AARi)
(9) Boot (AC)
(10) AC ASSY
(11) Tone wheel
(12) Baffle plate
(13) Oil seal (IN)
(14) Snap ring
(15) Bearing
(16) Housing
(17) Oil seal (OUT)
(18) Hub bolt
(19) Hub
(20) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T: 220 (22.4, 162)

3. REAR AXLE



(1) Circlip
(2) Baffle plate (DOJ)
(3) Outer race (DOJ)
(4) Snap ring
(5) Inner race
(6) Ball
(7) Cage
(8) Circlip
(9) Boot band
(10) Boot (DOJ)
(11) Boot
(12) BJ ASSY
(13) Baffle plate
(14) Oil seal (IN. No. 2)
(15) Oil seal (IN. No. 3)
(16) Housing
(17) Bearing
(18) Snap ring
(19) Oil seal (OUT)
(20) Tone wheel
(21) Hub bolt
(22) Hub
(23) Axle nut

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 190 (19.4, 140)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply grease onto sliding or revolution surfaces before installation.
• Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

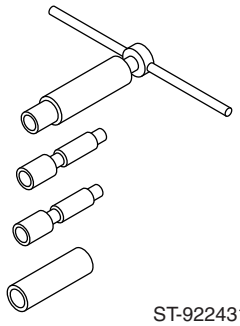
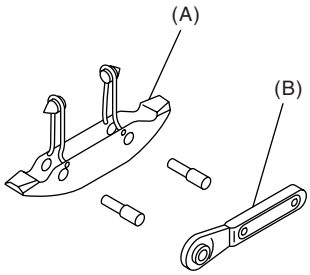
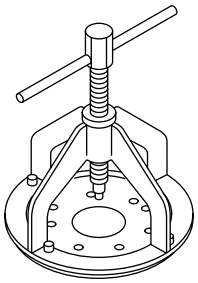
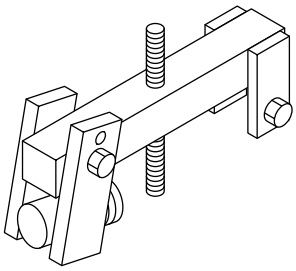
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-922431000	922431000	AXLE SHAFT INSTALLER	• Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 ST-925091000	925091000	BAND TIGHTENING TOOL	Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 ST-926470000	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 ST-927060000	927060000	HUB REMOVER	• Used for removing front hub. • Used with HUB STAND (927080000).

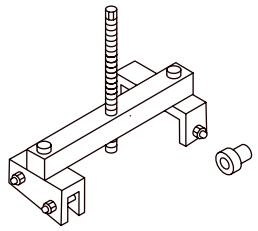
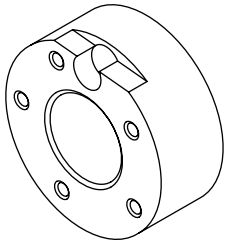
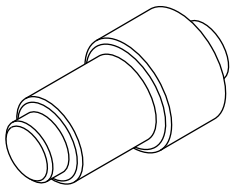
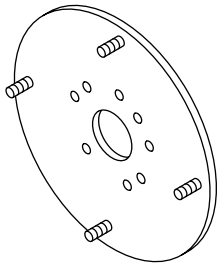
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927420000	927420000	HUB REMOVER	• Used for removing rear hub. • Used with HUB STAND (927080000).
 ST-927080000	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 ST-927100000	927100000	BEARING PULLER	• Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 ST-927140000	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).

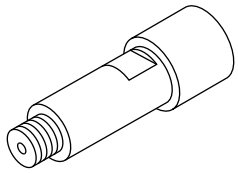
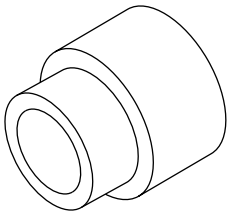
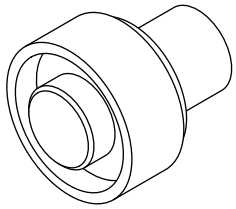
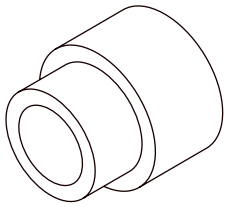
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927390000	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 ST-927400000	927400000	HOUSING STAND	• Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).
 ST-927410000	927410000	OIL SEAL INSTALLER	• Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 ST-927430000	927430000	HOUSING STAND	• Used for disassembling and assembling rear housing bearing. • Used with BEARING PULLER (927440000).

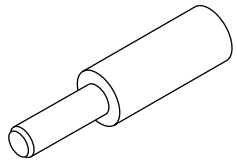
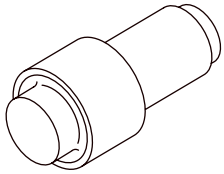
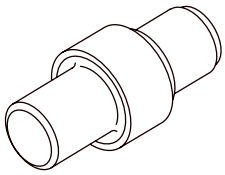
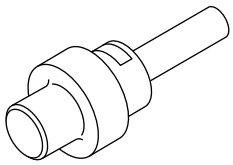
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-927120000	927120000	HUB INSTALLER	Used for installing hub.
 ST-927440000	927440000	BEARING REMOVER	• Used for disassembling and assembling rear wheel bearing. • Used with HOUSING STAND (927430000).
 ST-927460000	927460000	OIL SEAL INSTALLER	• Used for installing outer oil seal. • Used with HOUSING STAND (927430000).
 ST-927450000	927450000	HUB INSTALLER	• Used for pressing hub bearing into hub. • Used with HUB STAND (927080000).

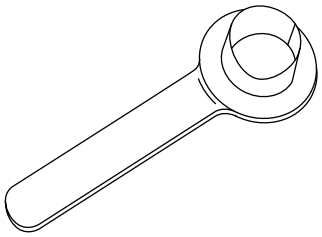
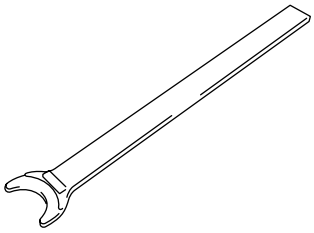
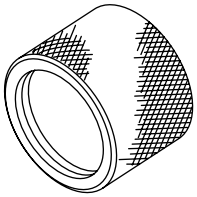
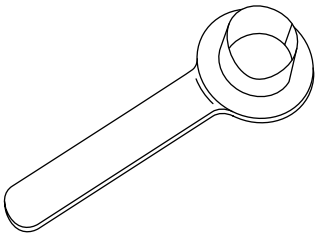
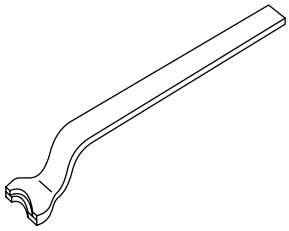
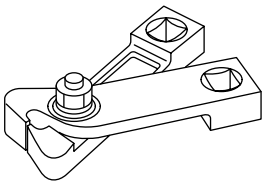
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	• Used for installing front drive shaft into front differential. • For protecting oil seal.
 ST28399SA000	28399SA000	DRIVE SHAFT REMOVER	Used for removing front drive shaft from front differential.
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing differential side retainer oil seal.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	• Used for installing rear drive shaft into rear differential. • For protecting oil seal.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing rear drive shaft from rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLIERS	Used for tightening front AC boot band.

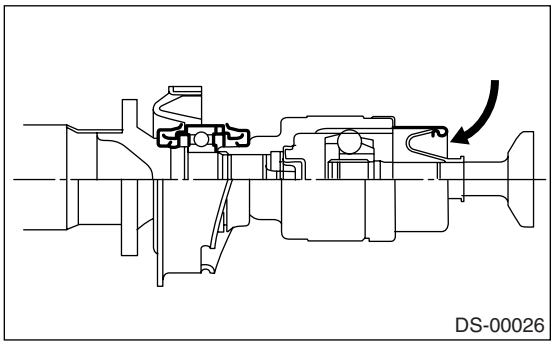
2. GENERAL TOOL

TOOL NAME	REMERKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.
Extension cap	Used for preventing leak of gear oil or ATF.

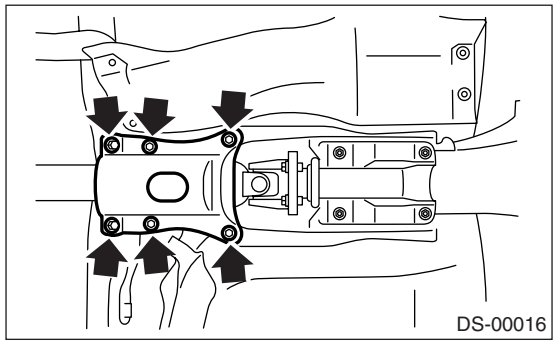
2. Propeller Shaft

A: REMOVAL

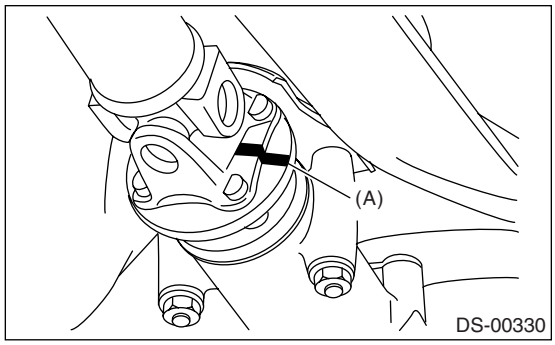
NOTE:
• Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
• In case of DOJ type, before removing the propeller shaft, wrap the metal parts (installed at the rubber boot of center DOJ) with a cloth or rubber material, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the DOJ during removal.


DS-00026

1) Disconnect the ground cable from battery.
2) Move the select lever or gear shift lever to “N”.
3) Release the parking brake.
4) Jack-up the vehicle and support it with rigid racks.
5) Remove the center exhaust pipes.
Non-turbo model
<Ref. to EX(H4SO)-10, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.>
6) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
7) Remove the differential mount front cover.


DS-00016

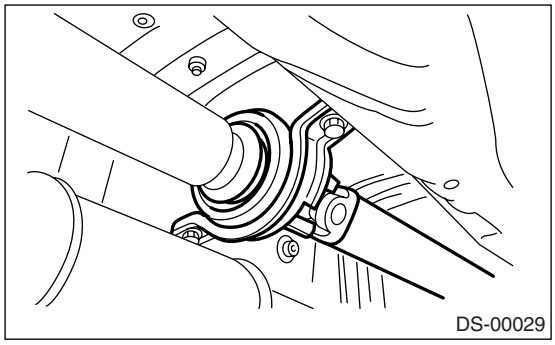
8) Make matching marks on affected parts before removal.



DS-00330

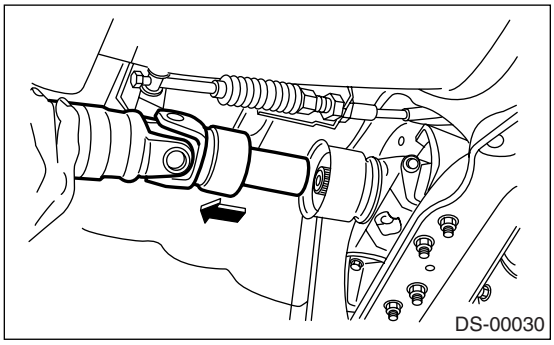
(A) Matching mark

9) Remove the three bolts which hold propeller shaft to rear differential.
10) Remove the remaining bolt.
11) Remove the two bolts which hold center bearing to vehicle body.


DS-00029

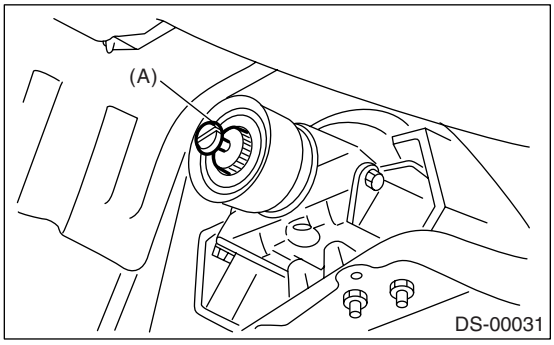
12) Remove the propeller shaft from transmission.

CAUTION:
• Be careful not to damage the oil seals and frictional surface of sleeve yoke.
• Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.


DS-00030

13) Install the extension cap to transmission.

NOTE:
If the extension cap is not available, place a vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.



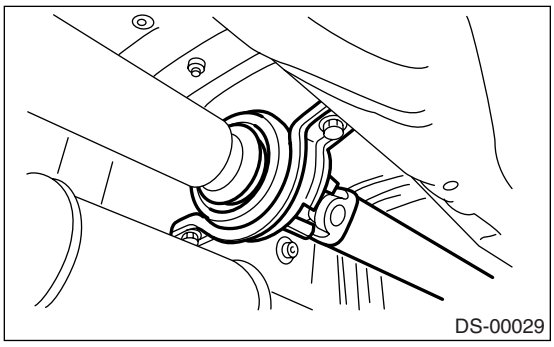
DS-00031

(A) Extension cap

B: INSTALLATION

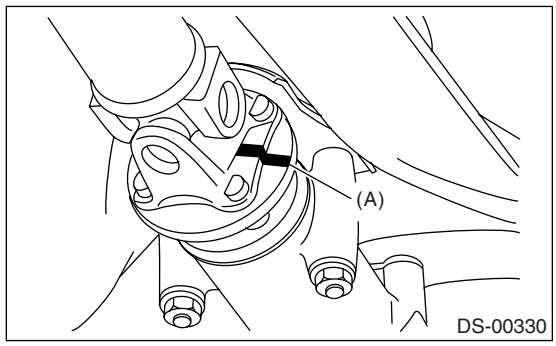
1) Insert the sleeve yoke into transmission, and then attach the center bearing to body.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)


DS-00029

2) Align the matching marks, and then connect the flange yoke and rear differential.

Tightening torque:
31 N·m (3.2 kgf-m, 23.1 ft-lb)

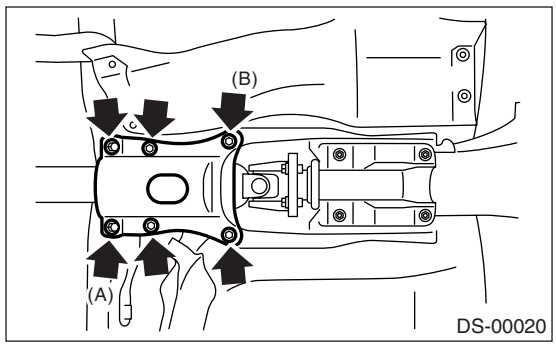


DS-00330

(A) Matching mark

3) Using new bolts, install the differential mount front cover.
(1) Temporarily tighten the bolt (A) while pushing cover forward.
(2) Tighten the bolt (B) to specified torque.
(3) Tighten the bolt (A) to specified torque.
(4) Tighten the remaining bolts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)



DS-00020

4) Install the center exhaust pipes.
Non-turbo model
<Ref. to EX(H4SO)-10, INSTALLATION, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-10, INSTALLATION, Center Exhaust Pipe.>
5) Install the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, INSTALLATION, Rear Exhaust Pipe.>
<Ref. to EX(H4SO)-13, INSTALLATION, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, INSTALLATION, Rear Exhaust Pipe.>
<Ref. to EX(H4DOTC 2.0)-16, INSTALLATION, Muffler.>

C: INSPECTION

NOTE:
Do not disassemble the propeller shaft. Check the following and replace if necessary.

1) Tube surfaces for dents or cracks
2) Splines for deformation or abnormal wear
3) Joints for non-smooth operation or noise
4) Center bearing for free play, noise or non-smooth operation
5) Oil seals for abnormal wear or damage
6) Center bearing for breakage

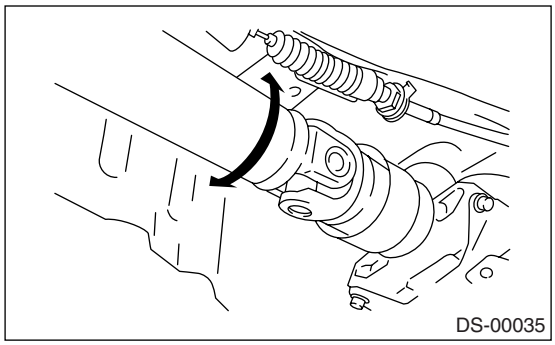
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

1) Remove the center exhaust pipes.
Non-turbo model
<Ref. to EX(H4SO)-10, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.>
2) Remove the heat shield cover. (If equipped)
3) Check for any looseness of the yoke flange mounting bolts which connect to rear differential and center bearing bracket mounting bolts.

2. SPLINES AND BEARING LOCATIONS

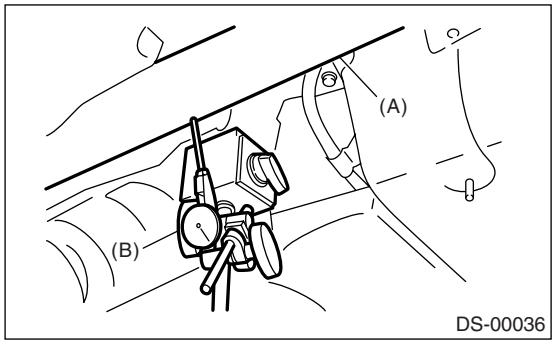
1) Remove the center exhaust pipes.
Non-turbo model
<Ref. to EX(H4SO)-10, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.>
2) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
3) Remove the heat shield cover. (If equipped)
4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move the yokes to see if abnormal free play exists at spiders and bearings.


DS-00035

3. RUNOUT OF PROPELLER SHAFT

1) Remove the center exhaust pipes.
Non-turbo model
<Ref. to EX(H4SO)-10, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.>
2) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
3) Remove the heat shield cover. (If equipped)
4) Set the dial gauge with its indicator stem at center of propeller shaft tube.
5) Turn the propeller shaft slowly by hands to check for “runout” of propeller shaft.

Runout:
Limit 0.6 mm (0.024 in)

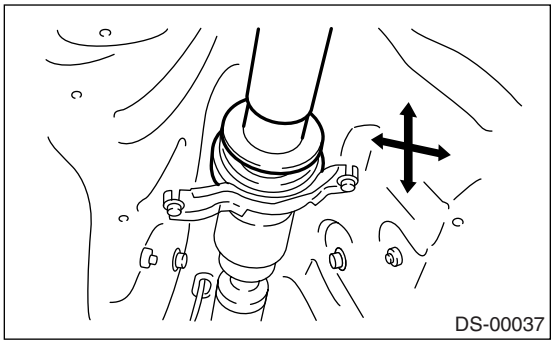


DS-00036

(A) Propeller shaft
(B) Dial gauge

4. CENTER BEARING FREE PLAY

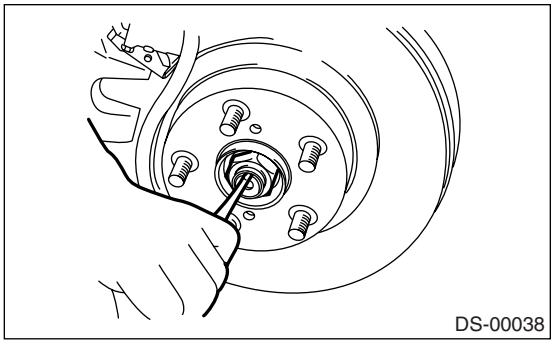
1) Remove the front and center exhaust pipes.
Non-turbo model
<Ref. to EX(H4SO)-7, REMOVAL, Front Exhaust Pipe.>
<Ref. to EX(H4SO)-10, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-7, REMOVAL, Front Exhaust Pipe.>
<Ref. to EX(H4DOTC 2.0)-9, REMOVAL, Center Exhaust Pipe.>
2) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX(H4SO)-11, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC 2.0)-14, REMOVAL, Rear Exhaust Pipe.>
<Ref. to EX(H4DOTC 2.0)-16, REMOVAL, Muffler.>
3) Remove the heat shield cover. (If equipped)
4) Move the propeller shaft near center bearing up and down, and left and right with your hand to check for any abnormal bearing free play.



3. Front Axle

A: REMOVAL

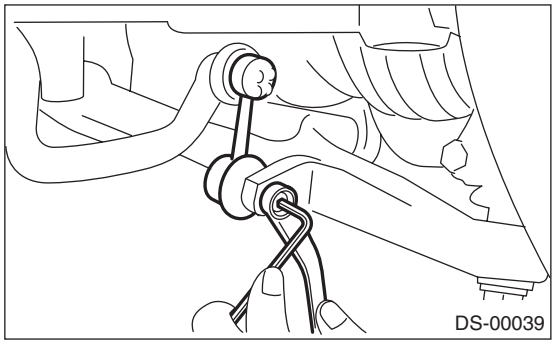
1) Lift-up the vehicle and remove the front wheels.
2) Unlock the axle nut.



3) Remove the axle nut using a socket wrench while depressing the brake pedal.

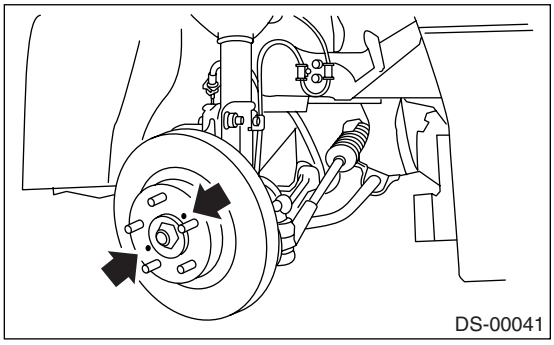
CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

4) Remove the stabilizer link.

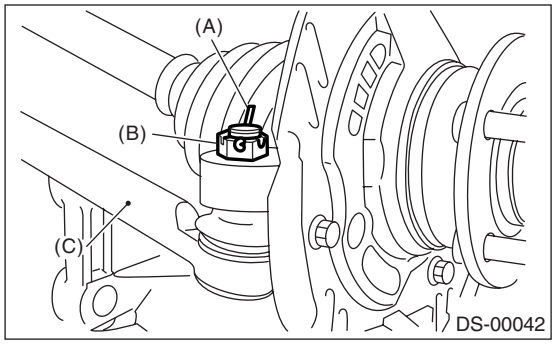


5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.
6) Remove the disc rotor from hub.

NOTE:
If the disc rotor seizes up within hub, drive disc rotor out by installing an 8 mm (0.31 in) bolt in screw hole on the rotor.

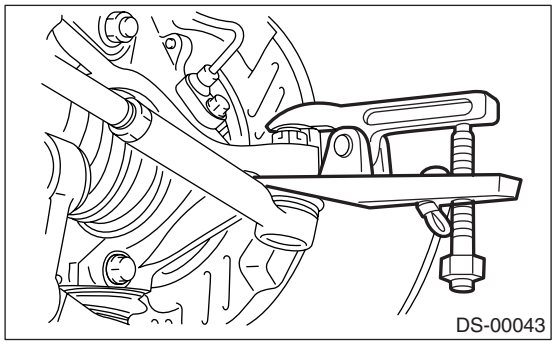


7) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

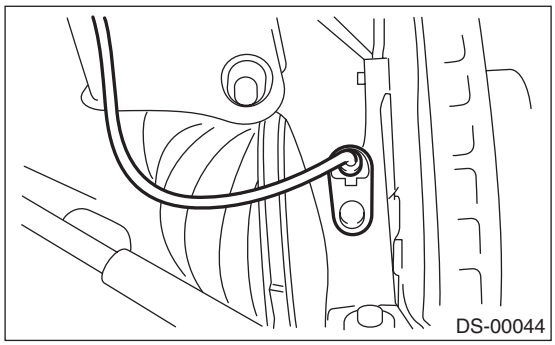


(A) Cotter pin
(B) Castle nut
(C) Tie-rod

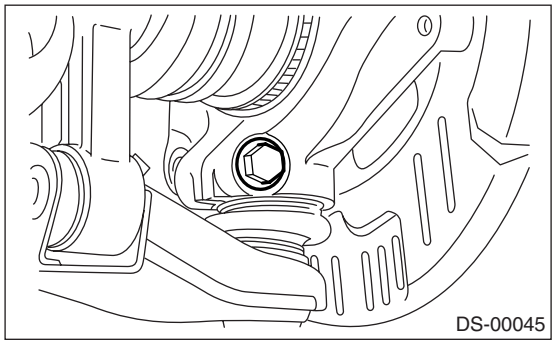
8) Using a puller, remove the tie-rod ball joint from knuckle arm.



9) Remove the ABS wheel speed sensor assembly and harness.



10) Remove the transverse link ball joint from housing.

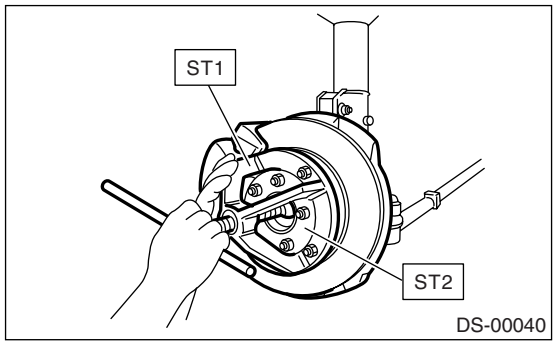


11) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

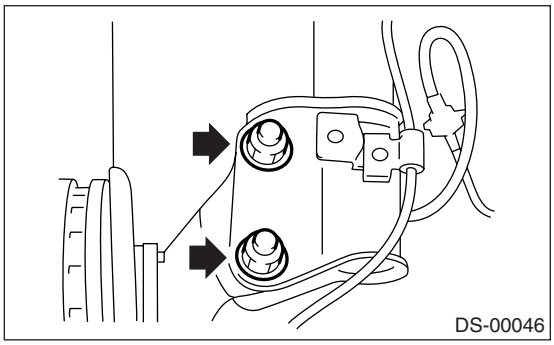
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
Be sure to replace the differential side retainer oil seal at transmission side with a new one when removing front drive shaft.

12) Suspend the front drive shaft to vehicle body using a wire.



13) After scribing an alignment mark on the camber adjusting bolt head, remove the bolts which connect housing and strut, and disconnect housing from strut.



B: INSTALLATION

1) Temporarily tighten the front axle to front strut.
2) Insert the front drive shaft into front axle.
3) Temporarily tighten the axle nut.
4) Install the transverse link ball joint to housing.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

5) While aligning the alignment mark on the camber adjusting bolt head, tighten the housing and strut using a new self-locking nut.

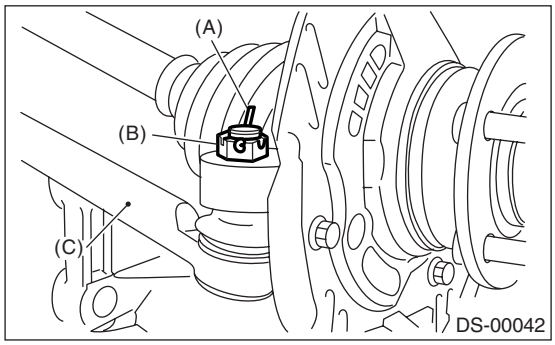
Tightening torque:
175 N·m (17.8 kgf-m, 129 ft-lb)

6) Connect the tie-rod end ball joint to the knuckle arm with a castle nut.

Tightening torque:
27.0 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at bottom of tie-rod with hammer.

7) Tighten the castle nut to the specified torque and tighten further within 60° until pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



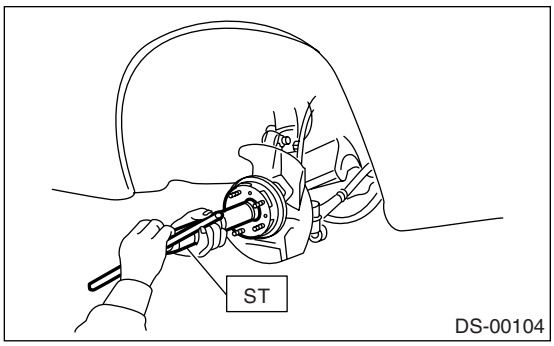
(A) Cotter pin
(B) Castle nut
(C) Tie-rod

8) Install the disc rotor on hub.
9) Install the disc brake caliper on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

10) Connect the stabilizer link.

11) Using the ST1 and ST2, pull the front drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

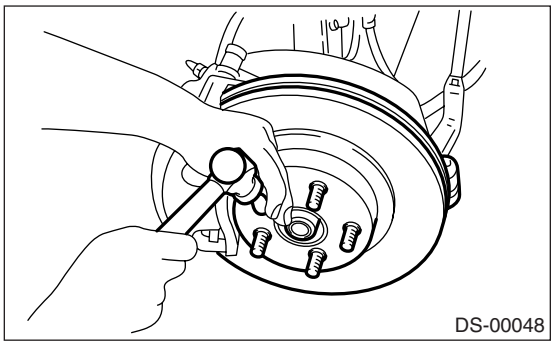


12) While depressing the brake pedal, tighten a new axle nut to the specified torque and lock it securely.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

13) After tightening the axle nut, lock it securely.



14) Install the ABS wheel speed sensor on housing.

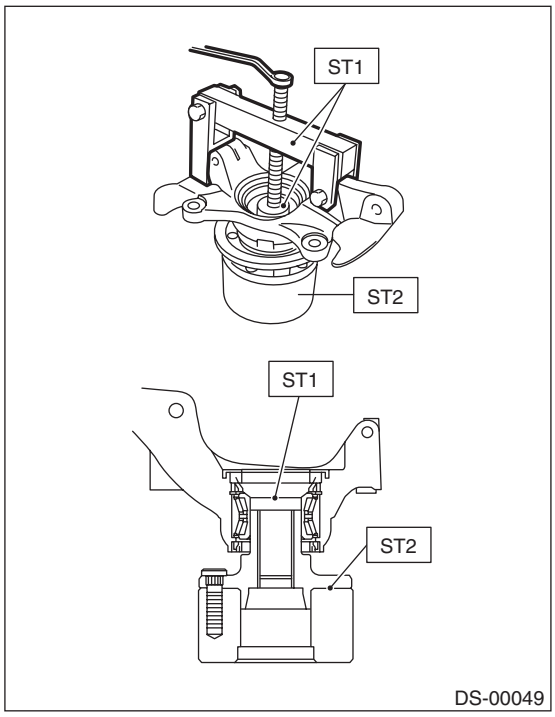
Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

15) Install the wheel and tighten wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

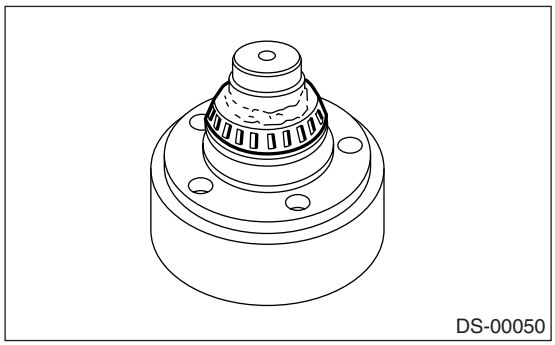
C: DISASSEMBLY

1) Using the ST1, support the housing and hub securely.
2) Attach the ST2 to housing and drive hub out.
ST1 927060000 HUB REMOVER
ST2 927080000 HUB STAND

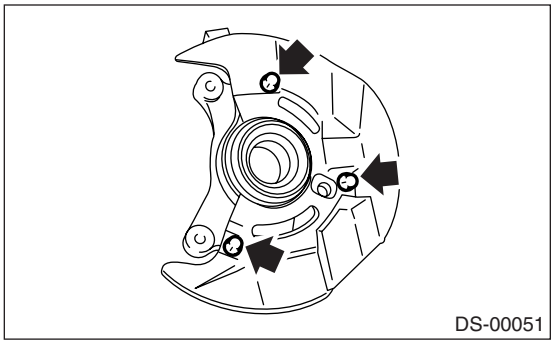


If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

CAUTION:
Be careful not to scratch the polished area of hub.

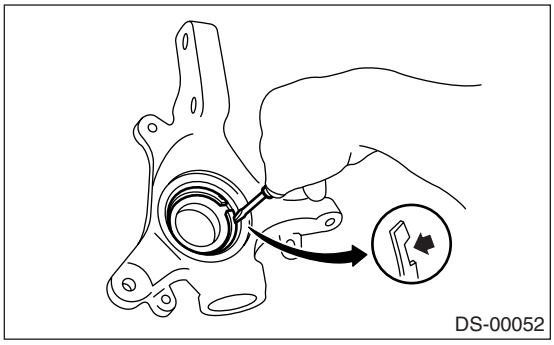


3) Remove the disc cover from housing.

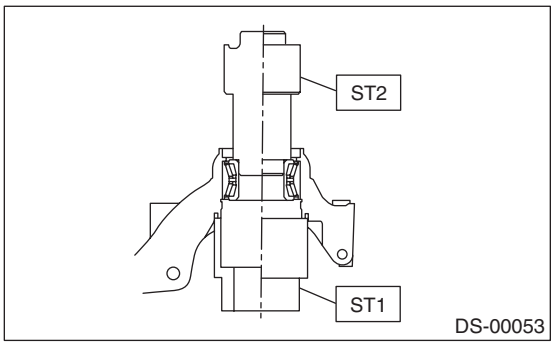


4) Using a standard screwdriver, remove the outer and inner oil seals.
5) Using a flat tip screwdriver, remove the snap ring.

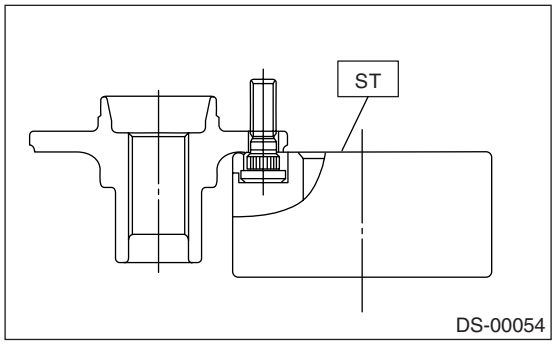
CAUTION:
Be careful not to damage the housing at removal.



6) Using the ST1, support the housing securely.
7) Using the ST2, hold the inner race to drive out outer race of bearing.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER



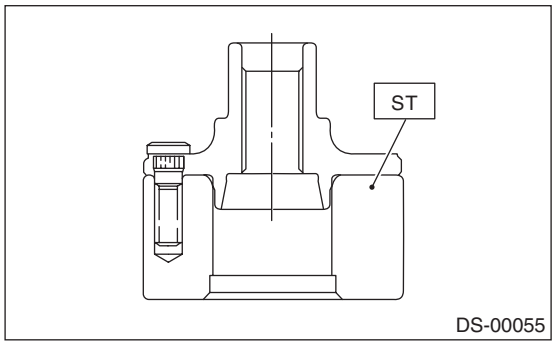
8) Using the ST and a hydraulic press, drive the hub bolts out.
ST 927080000 HUB STAND



D: ASSEMBLY

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Attach the hub to ST securely.
ST 927080000 HUB STAND



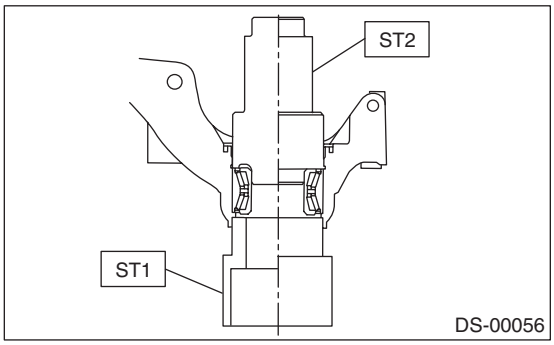
2) Using a hydraulic press, press new hub bolts until their seating surfaces contact hub.

NOTE:
Use 12 mm (0.47 in) dia. holes in HUB STAND to prevent bolts from tilting.

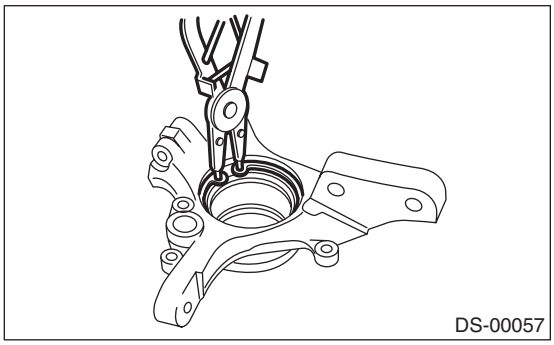
3) Clean dust or foreign particles from inside the housing.

4) Using the ST1 and ST2, press a new bearing into place.
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

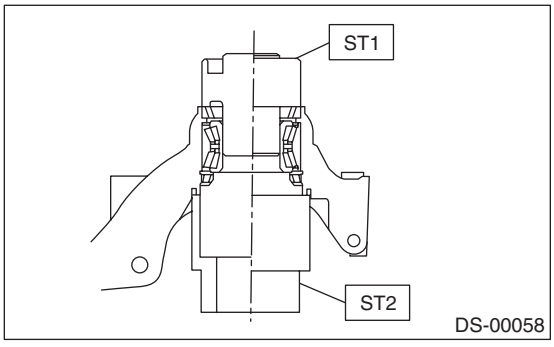
CAUTION:
• Always press the outer race when installing bearing.
• Be careful not to remove the plastic lock from inner race when installing bearing.



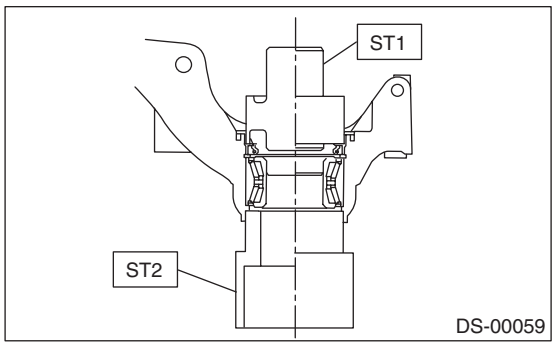
5) Using pliers, install the snap ring firmly.



6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Using the ST1 and ST2, press the inner oil seal until it contacts circlip.
ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Invert the ST and housing.
ST 927400000 HOUSING STAND
9) Apply sufficient grease to the oil seal lip.

Grease:
SHELL 6459N

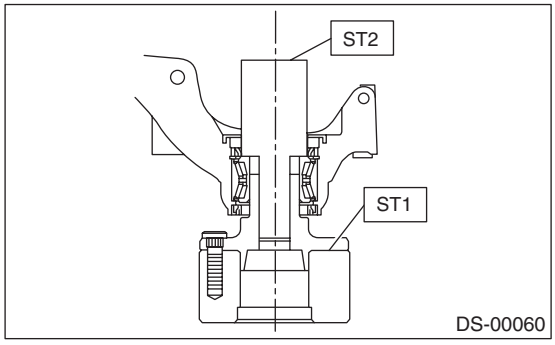
NOTE:
If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.

CAUTION:
Do not mix different types of grease.

10) Install the disc cover to housing the three bolts.

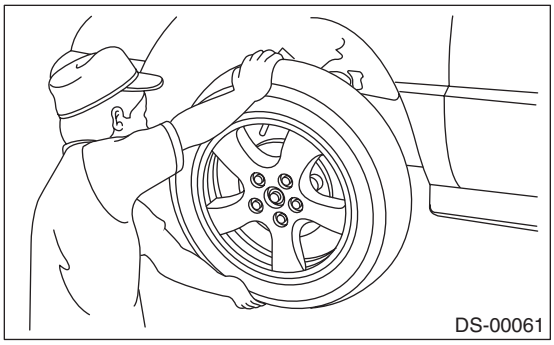
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

11) Attach the hub to ST1 securely.
12) Clean dust or foreign particles from the polished surface of hub.
13) Using the ST2, press the bearing into hub by driving inner race.
ST1 927080000 HUB STAND
ST2 927120000 HUB INSTALLER



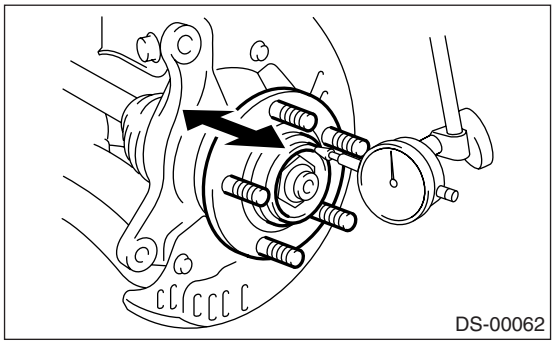
E: INSPECTION

1) Moving the front tire up and down by hand, check that there is no backlash in the bearing, and check that the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceed the limitation.

Limit:
Maximum 0.05 mm (0.0020 in)



4. Rear Axle

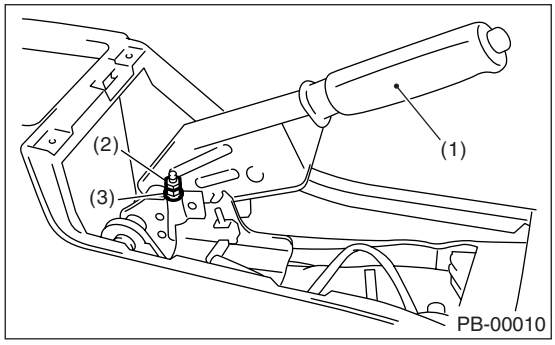
A: REMOVAL

1. DISC BRAKE

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel.
3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench with brake pedal depressed.

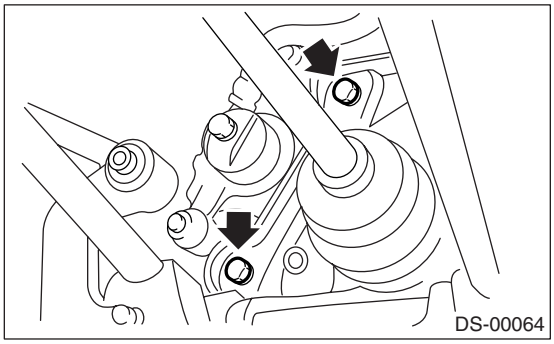
CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

5) Return the parking brake lever and loosen adjusting nut.



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

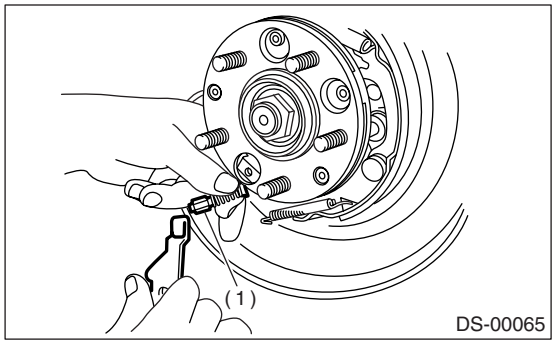
6) Remove the disc brake caliper from back plate, and suspend it from strut using a piece of wire.



7) Remove the disc rotor from hub.

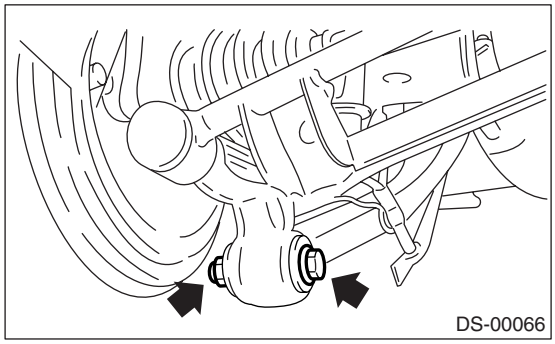
NOTE:
If the disc rotor seizes up within hub, drive it out by installing an 8 mm (0.31 in) bolt into bolt hole in disc rotor.

8) Disconnect the parking brake cable end from the parking lever.

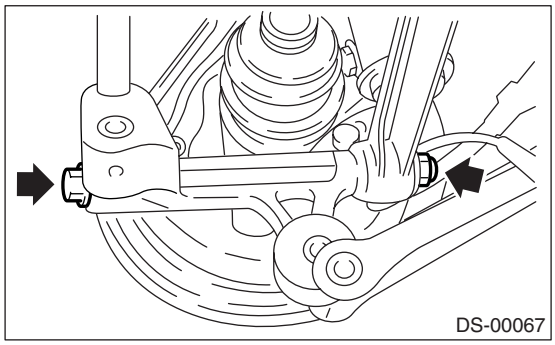


(1) Cable end

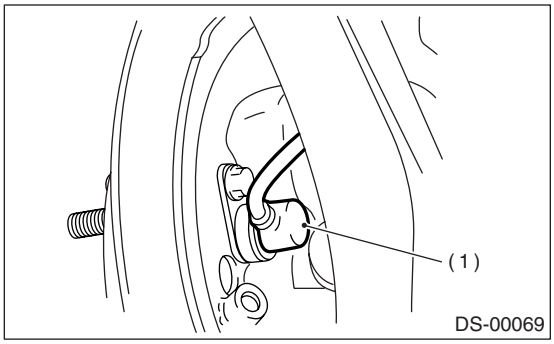
9) Disconnect the rear stabilizer from rear lateral link.
10) Remove the bolts which secure trailing link assembly to rear housing.



11) Remove the bolts which secure lateral assembly to rear housing.



12) Remove the rear ABS wheel speed sensor from back plate.

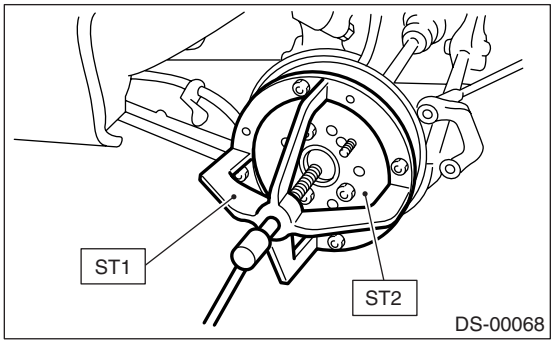


(1) ABS wheel speed sensor

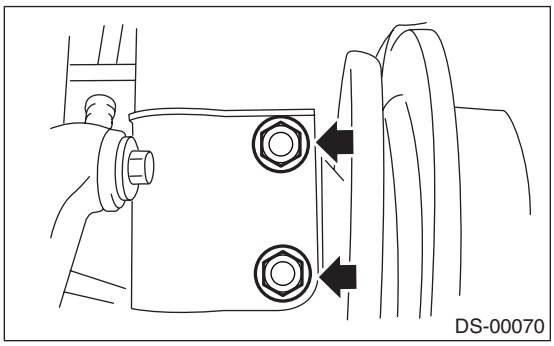
13) Disengage the BJ assembly from housing splines, and then remove the rear drive shaft assembly.
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be careful not to damage the oil seal lip when removing rear drive shaft.
• When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



14) Remove the bolts which secure rear housing to strut, and separate the two.

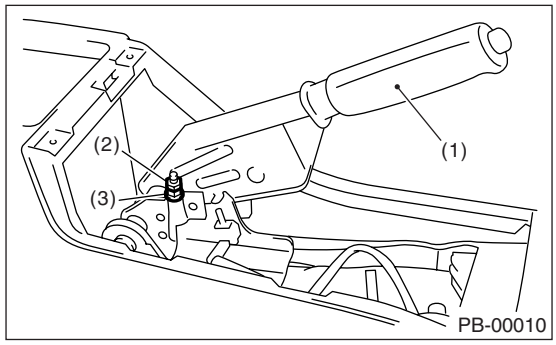


2. DRUM BRAKE

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove rear wheel.
3) Unlock the axle nut.
4) Remove the axle nut using a socket wrench with parking brake applied.

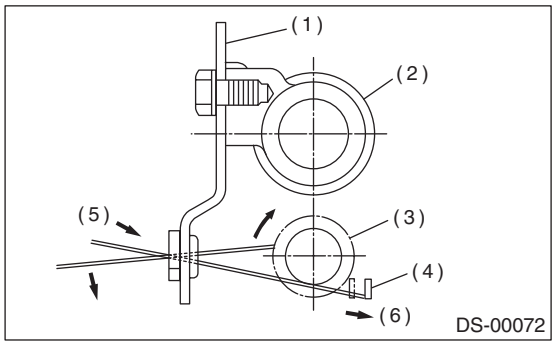
CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

5) Return the parking brake lever and loosen adjusting nut.



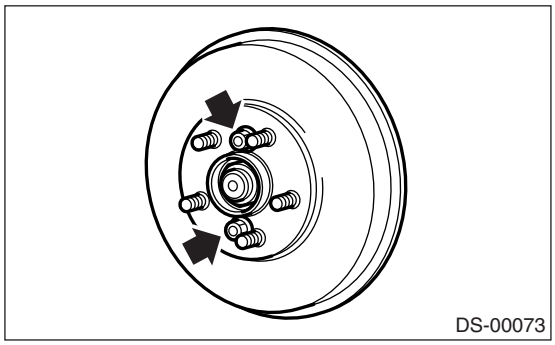
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

6) Remove the brake drum from hub.
7) If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjusting screw using a flat tip screwdriver until brake shoe separates from the drum.

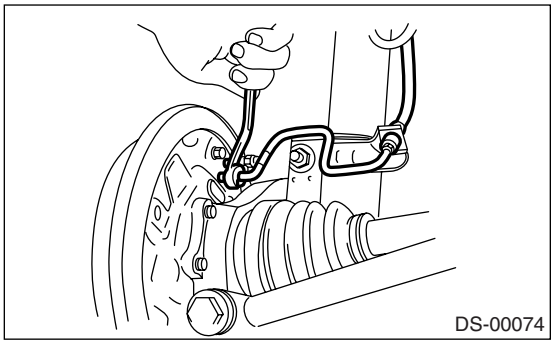


(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push

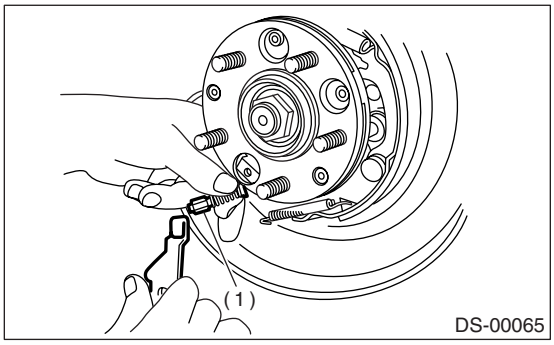
NOTE:
If the brake drum is difficult to remove, drive it out by installing two 8 mm bolts into bolt hole in brake drum.



8) Using a flare-nut wrench, disconnect the brake hose from wheel cylinder. Cover the open end of wheel cylinder to prevent entry of foreign particles.

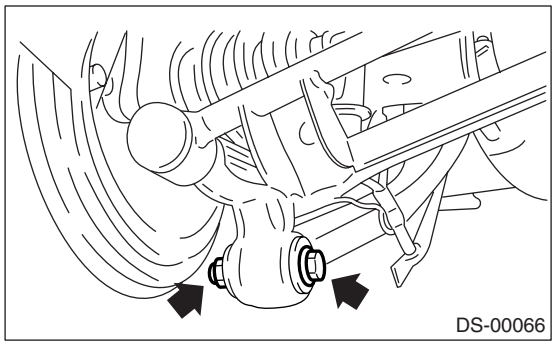


9) Cover the open end of brake pipe with vinyl sheet or equivalent to prevent brake fluid from spilling.
10) Disconnect the parking brake cable end from the parking brake lever.

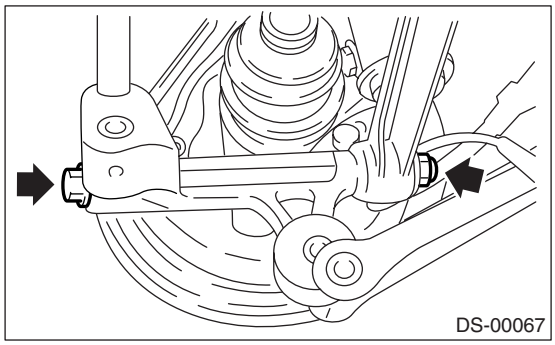


(1) Cable end

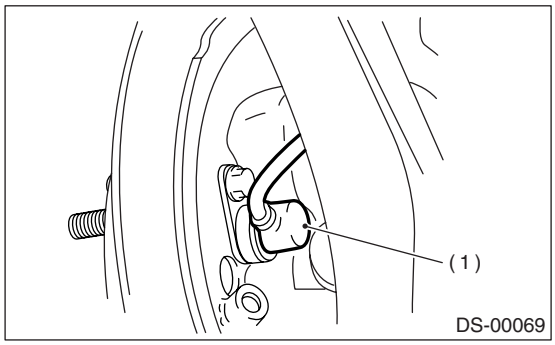
11) Disconnect the rear stabilizer from rear lateral link. Remove the bolts which secure trailing link assembly to rear housing.



12) Remove the bolts which secure lateral link assembly to rear housing.



13) Remove the rear ABS wheel speed sensor from back plate.



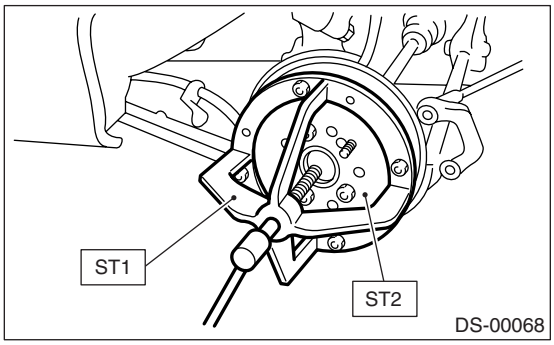
(1) ABS wheel speed sensor

14) Disengage the BJ assembly from housing splines, and remove the rear drive shaft assembly.

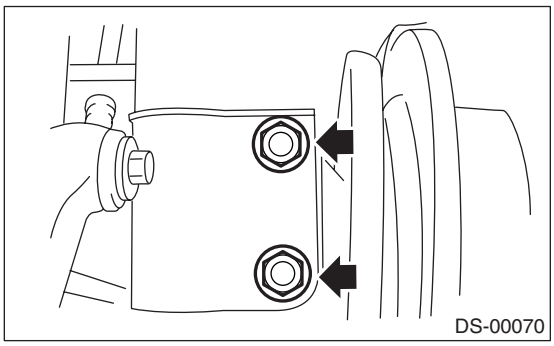
NOTE:
If it is hard to remove, use the STs.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
• Be careful not to damage the oil seal lip when removing rear drive shaft.
• When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.



15) Remove the bolts which secure rear housing to strut, and separate the two.



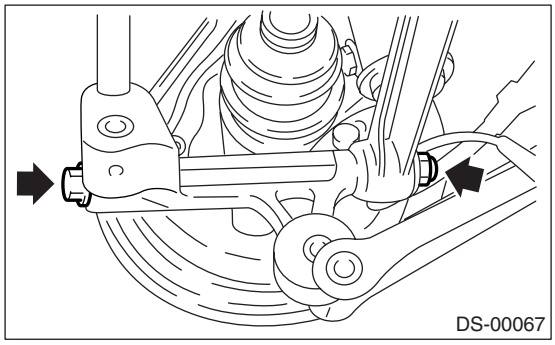
B: INSTALLATION

1. DISC BRAKE

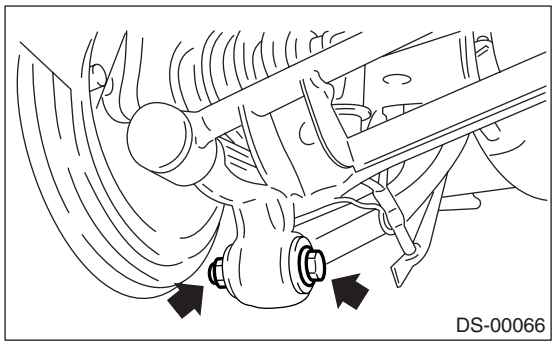
1) Temporarily tighten the rear axle to strut.
2) Insert the rear drive shaft into rear axle.

CAUTION:
Be careful not to damage the inner oil seal lip.

3) Temporarily tighten the axle nut.
4) Using a new self-locking nut, install the rear housing assembly and rear lateral link assembly.



5) Using a new self-locking nut, temporarily install the rear housing assembly and trailing link assembly.



6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

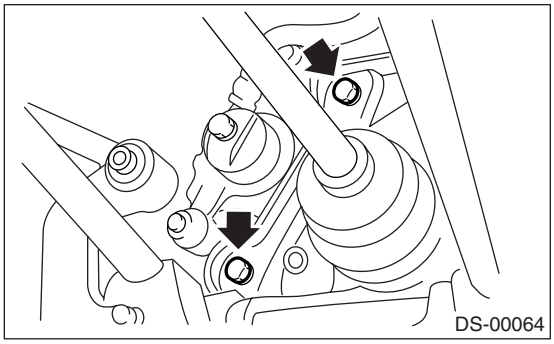
7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

8) Connect the parking brake cable to parking brake lever.
9) Install the disc rotor on rear housing assembly.

10) Install the disc brake caliper on back plate.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

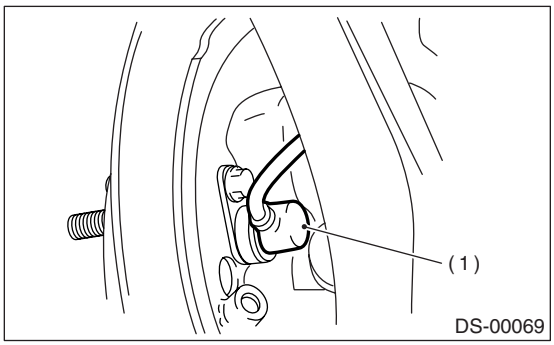


11) Adjust the parking brake lever stroke by turning adjuster.
12) While applying the parking brake, tighten a new axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.

13) Install rear ABS wheel speed sensor.



(1) ABS wheel speed sensor

14) Install the wheel, and then tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

15) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

16) Tighten the installation bolt of rear housing assembly and lateral link assembly.

Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

17) Tighten the installation bolt of rear housing assembly and trailing link assembly.

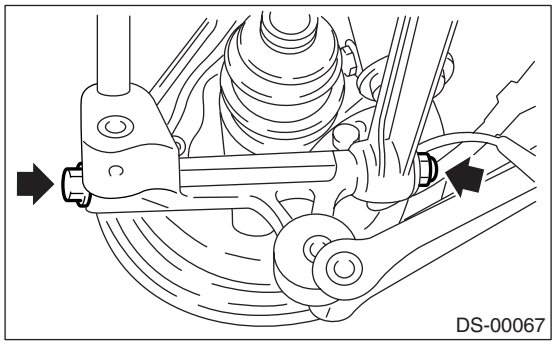
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

2. DRUM BRAKE

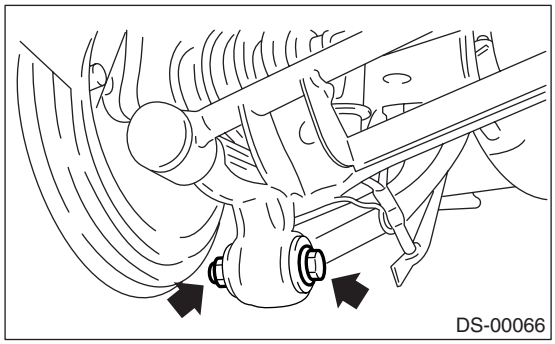
1) Temporarily tighten the rear axle to strut.
2) Insert the rear drive shaft to rear axle.

CAUTION:
Be careful not to damage the inner oil seal lip.

3) Temporarily tighten the axle nut.
4) Using a new self-locking nut, temporarily install the rear housing assembly and rear lateral link assembly.



5) Using a new self-locking nut, temporarily install the rear housing assembly and trailing link assembly.



6) Tighten the rear housing assembly and strut assembly using a new self-locking nut.

Tightening torque:
196 N·m (20 kgf-m, 145 ft-lb)

7) Using a new self-locking nut, install the rear stabilizer and rear lateral link.

Tightening torque:
44 N·m (4.5 kgf-m, 33 ft-lb)

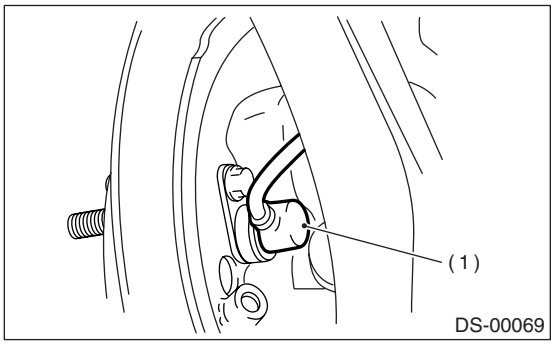
8) Connect the parking brake cable to parking brake lever.
9) Clean the brake pipe connection. Using a flare-nut wrench, connect the brake pipe to wheel cylinder.
10) Connect the parking brake cable to lever.

11) Install the brake drum on rear housing assembly.
12) Bleed the air from brake system. <Ref. to BR-42, REPLACEMENT, Brake Fluid.>
13) Adjust the parking brake lever stroke by turning adjuster.
14) While applying the parking brake, tighten axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Do not overtighten it as this may damage the wheel bearing.

15) Connect the rear ABS wheel speed sensor to back plate.



(1) ABS wheel speed sensor

16) Install the wheel, and then tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

17) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

18) Tighten the installation bolt of rear housing assembly and lateral link assembly.

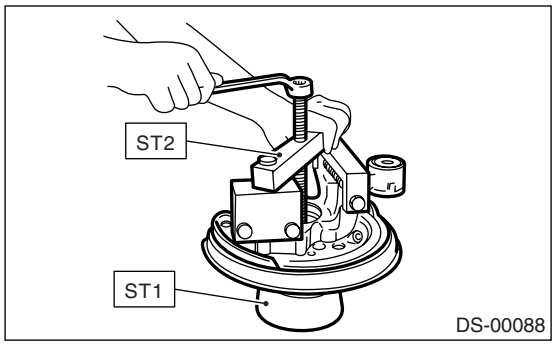
Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

19) Tighten the installation bolt of rear housing assembly and trailing link assembly.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

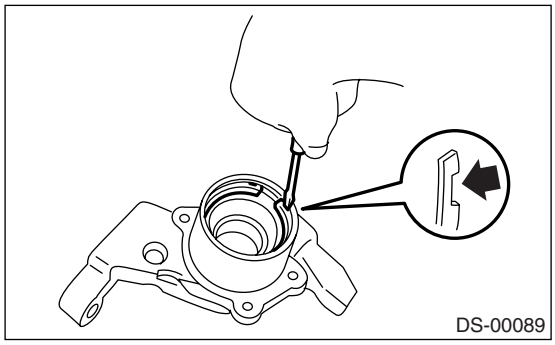
C: DISASSEMBLY

1) Using the ST1 and ST2, remove the hub from rear housing.
ST1 927080000 HUB STAND
ST2 927420000 HUB REMOVER

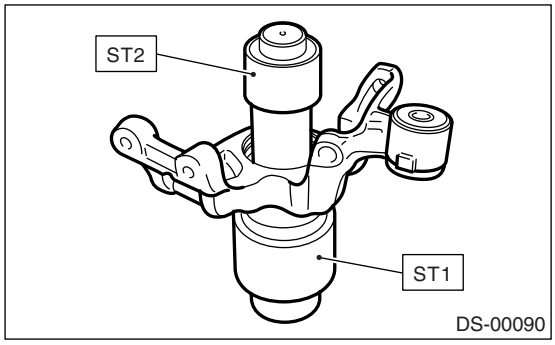


2) Remove the back plate from rear housing
3) Using a flat tip screwdriver, remove the outer and inner oil seals.
4) Using a flat tip screwdriver, remove the snap ring.

CAUTION:
Be careful not to damage the housing at removal.



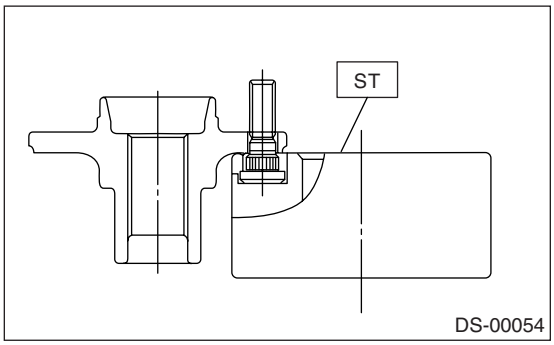
5) Using the ST1 and ST2, remove the bearing by pressing inner race.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER



6) Remove the tone wheel bolts, and then remove the tone wheel from hub (model equipped with ABS).

7) Using the ST, press the hub bolt out.
ST 927080000 HUB STAND

CAUTION:
Be careful not to hammer the hub bolts. This may deform the hub.



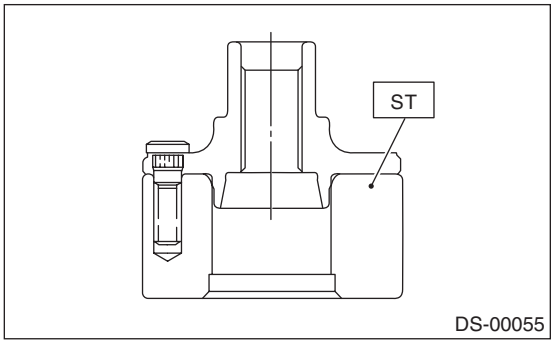
D: ASSEMBLY

NOTE:
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Using the ST, press the new hub bolt into place.

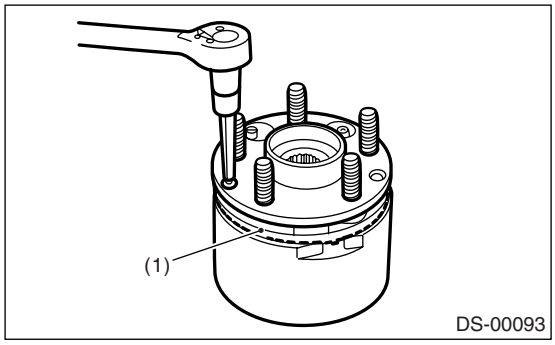
NOTE:
- Ensure the hub bolt closely contacts hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

ST 927080000 HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub (model equipped with ABS).

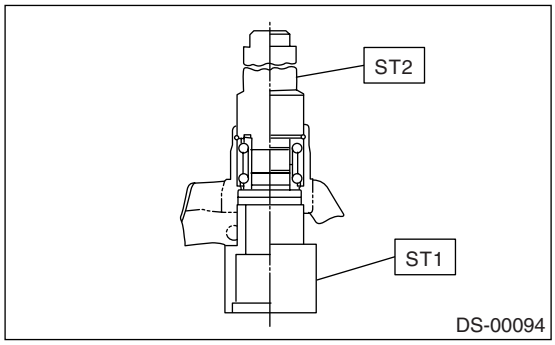
NOTE:
- Ensure the tone wheel closely contacts hub.
- Be careful not to damage the tone wheel teeth.



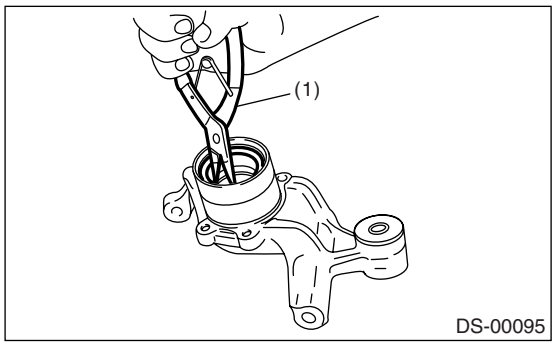
(1) Tone wheel

3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:
- **Always press the outer race when installing bearing.**
- **Be careful not to remove the plastic lock from inner race when installing bearing.**

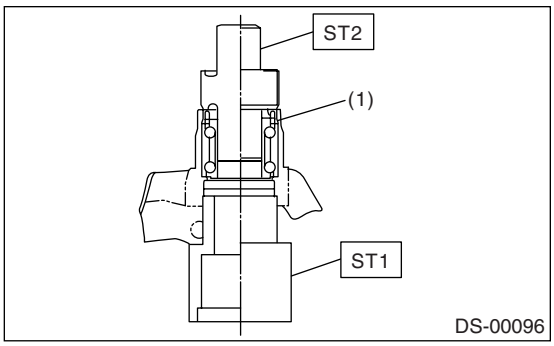


4) Using pliers, install the snap ring firmly.



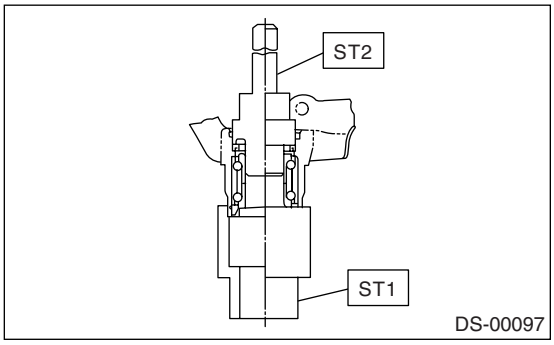
(1) Pliers

5) Using the ST1 and ST2, press the outer oil seal unit it comes in contact with snap ring.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER

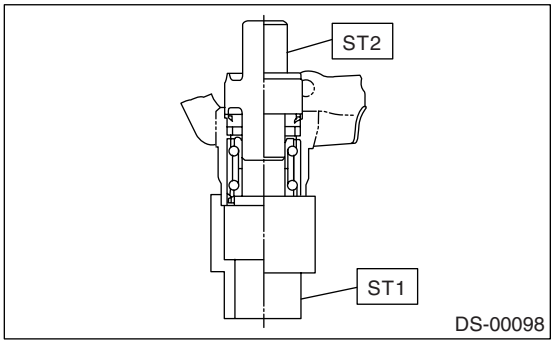


(1) Snap ring

6) Invert both ST1 and housing.
7) Using the ST2, press the inner oil seal into housing until it touches bottom.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



8) Using the ST1 and ST2, press the sub seal into place.
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



9) Apply sufficient grease to oil seal lip.

Grease:
SHELL 6459N

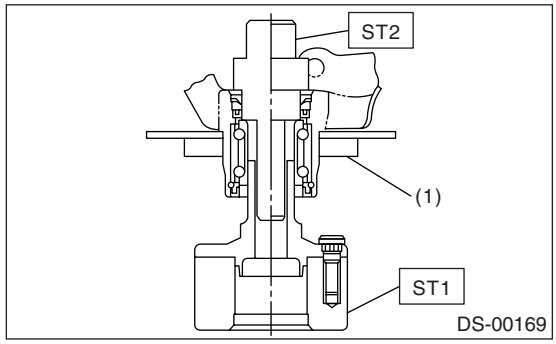
NOTE:
If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.

CAUTION:
Do not mix different types of grease.

10) Install the back plate to rear housing.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

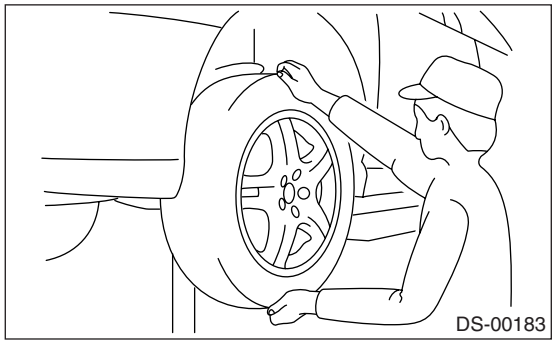
11) Using the ST1 and ST2, press the baring into hub.
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER



(1) Back plate

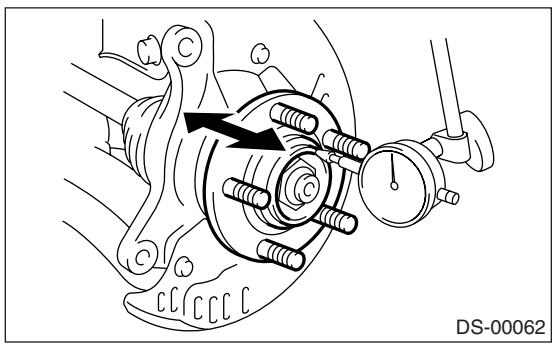
E: INSPECTION

1) Moving the rear tire up and down by hand, check that there is no shakiness in the bearing, and check that the wheel rotates smoothly.



2) Inspect the lean of axis direction using a dial gauge. Replace the hub bearing if the load range exceed the limitation.

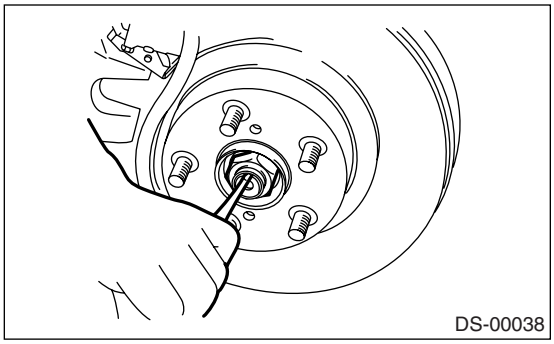
Limit:
Maximum 0.05 mm (0.0020 in)



5. Front Drive Shaft

A: REMOVAL

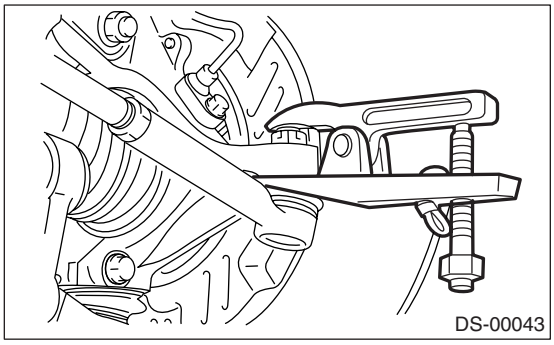
1) Lift-up the vehicle, and then remove the front wheels.
2) Drain the transmission oil.
3) Unlock the axle nut.



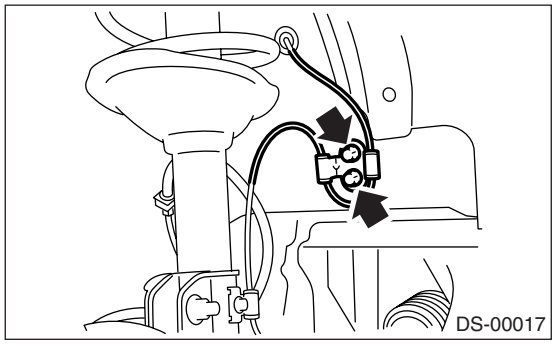
4) Remove the axle nut using a socket wrench with brake pedal depressed.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

5) Remove the cotter pin and castle nut. Remove the tie-rod end using a puller.

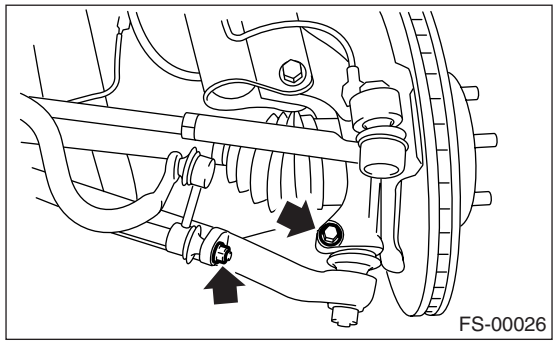


6) Remove the ABS wheel speed sensor bracket.



7) Remove the front stabilizer link from transverse link.

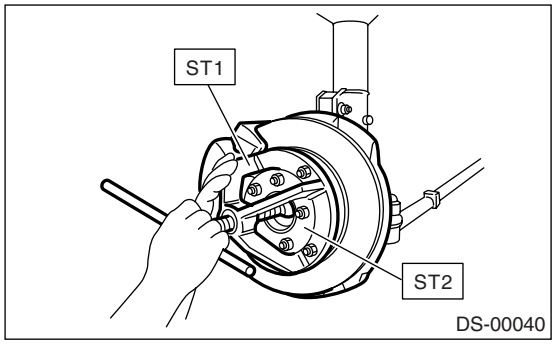
8) Remove the bolt securing ball joint, and then remove the transverse link from front housing.



9) Remove the front drive shaft from front axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

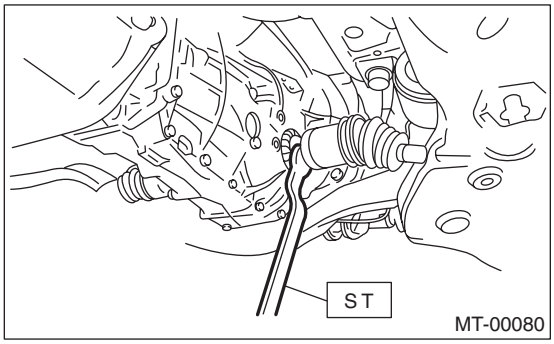
CAUTION:
• Do not hammer the drive shaft when removing.
• Do not damage the oil seal and tone wheel.
• When the front drive shaft is to be replaced, also replace the inner oil seal.



10) Remove the front drive shaft from transmission using ST.
ST 28399SA000 DRIVE SHAFT REMOVER

NOTE:
• ST usage is different depending on type of transmission equipped.
• For AT model, face the “AT” letter stamped on ST to transmission side. For MT model, face the “MT” letter stamped on ST to transmission side.

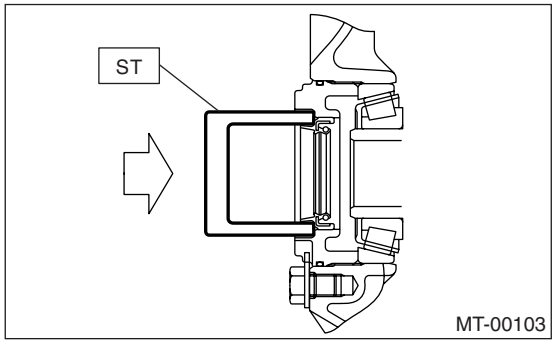
CAUTION:
Do not contact the ST to holder area.



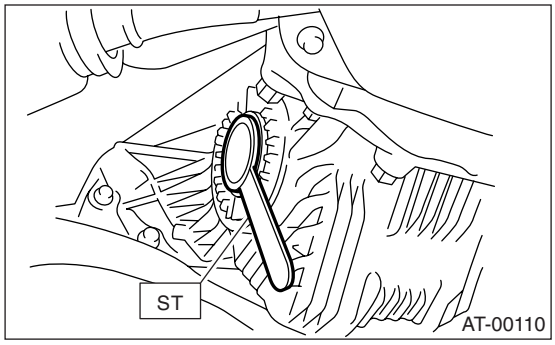
B: INSTALLATION

1) Using the ST, replace the differential side retainer oil seal with a new one.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

CAUTION:
Be sure to replace the differential side retainer oil seal with a new one when removing drive shaft.



2) Insert the front drive shaft into front axle.
3) Temporarily tighten the axle nut.
4) Using ST, protect the differential side retainer oil seal and install the front drive shaft to transmission.
ST 28399SA010 OIL SEAL PROTECTOR

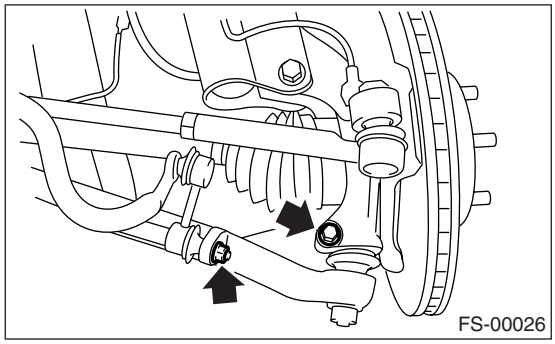


5) Install the ball joint to front axle.

Tightening torque:
50 N·m (5.1 kgf-m, 37 ft-lb)

6) Install the stabilizer link.

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)

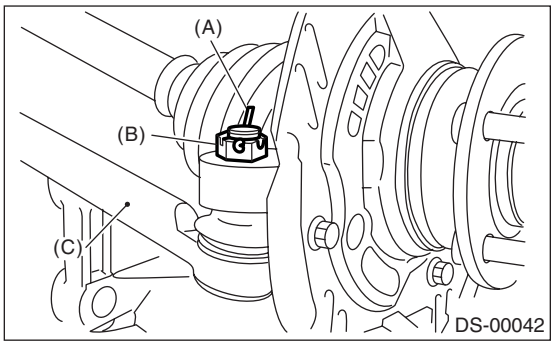


7) Install the tie-rod end.

Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

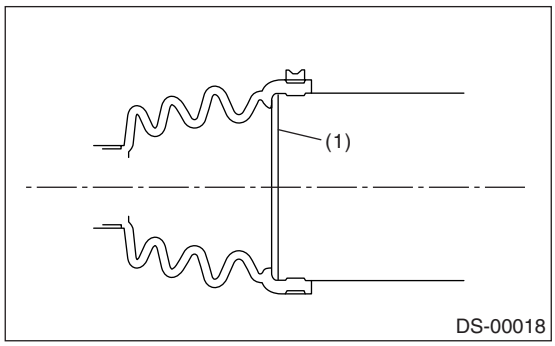
CAUTION:
When connecting, do not hit the cap at bottom of tie-rod with hammer.

8) Tighten the castle nut to the specified torque and tighten further within 60° until pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



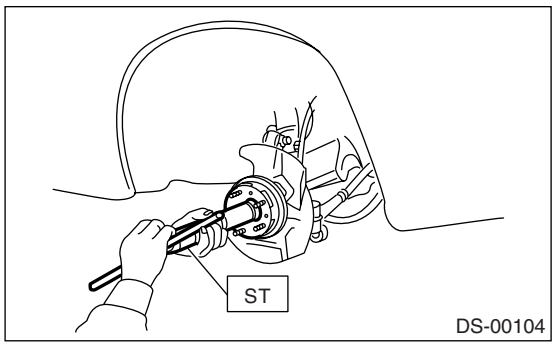
(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

9) Make sure to recognize the position of AARi retainer.



(1) Retainer

10) Using the ST1 and ST2, pull the front drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

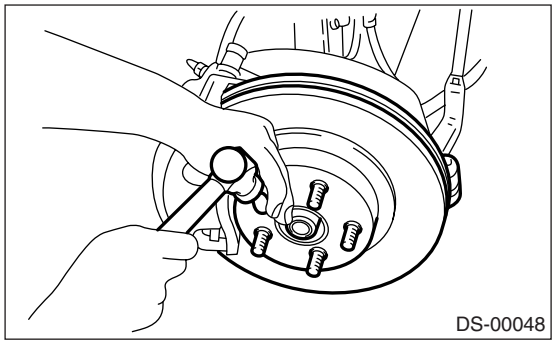


11) Tighten a new axle nut to the specified torque with brake pedal depressed.

Tightening torque:
220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:
Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

12) Lock the axle nut.



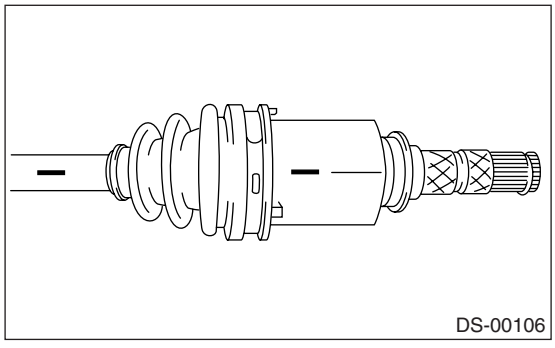
13) Install the ABS wheel speed sensor bracket.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

14) Add the transmission oil.
15) Install the wheel.

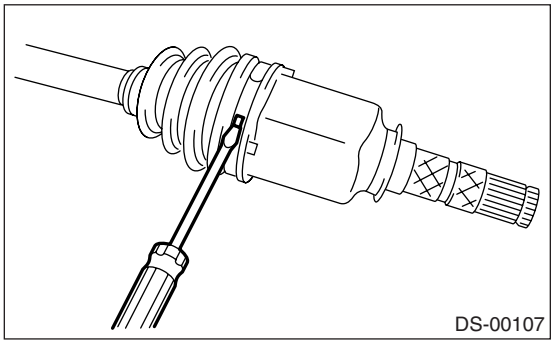
C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.

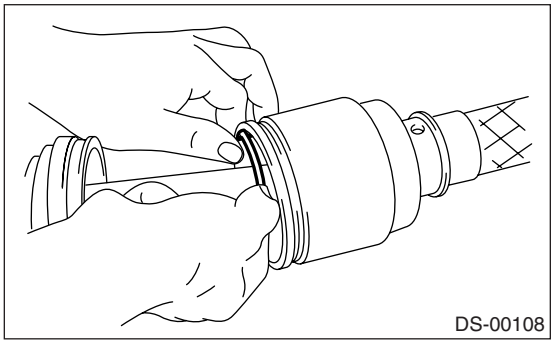


2) Remove the AARi boot band and boot.

CAUTION:
Be careful not to damage the boot.


DS-00107

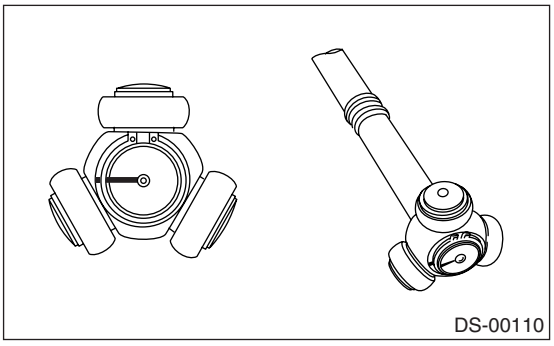
3) Remove the retainer from AARi outer race.


DS-00108

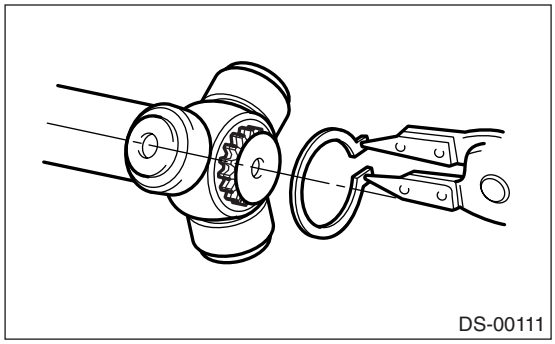
4) Remove the AARi outer race from shaft assembly.
5) Wipe off the grease.

CAUTION:
The grease is a special grease. Do not confuse with other greases.

6) Place an alignment mark on the trunnion and shaft.


DS-00110

7) Remove the snap ring and trunnion.


DS-00111

8) Remove the spider.

CAUTION:
Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

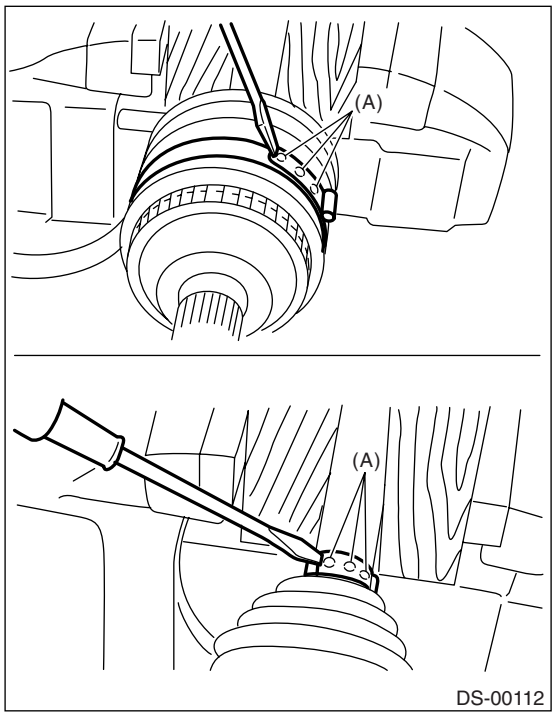
9) Remove the AARi boot.

CAUTION:
For non-turbo MT model, further disassembly of AC boots is impossible because the AC boots cannot be removal.

10) Place the drive shaft in a vise between wooden blocks.

CAUTION:
Do not place the drive shaft directly in the vise. Use wooden blocks.

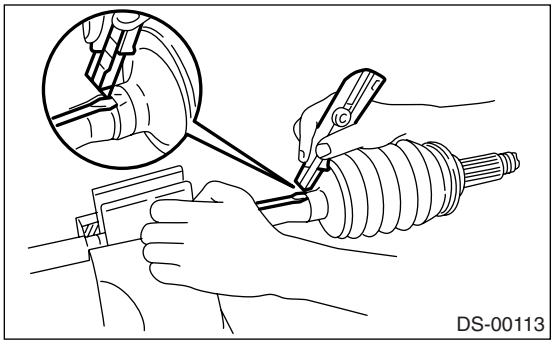
11) Raise the boot band claws by means of screwdriver and hammer.



DS-00112

(A) Boot band claws

12) Cut and remove the boot.



13) Hit the AC joint inner race with hammer to remove AC joint from shaft.

D: ASSEMBLY

NOTE:
Use specified grease.

AC side:
HTBJ (Part No. 28395SA010)

AARi side:
One Luber C (Part No. 28395SA000)

1) Place the AC boot and small boot band on AC side of shaft.

CAUTION:
Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

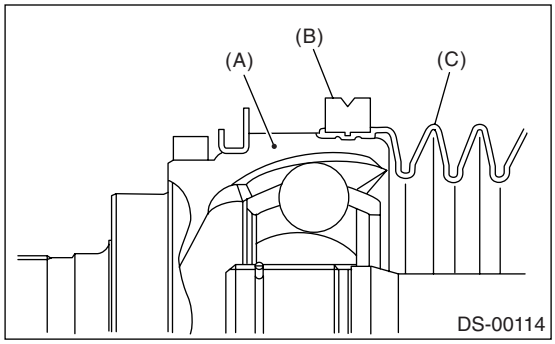
2) Place the drive shaft in a vise between wooden blocks.

CAUTION:
Do not place the drive shaft directly in the vise. Use wooden blocks.

3) Apply a coat of specified grease [80 to 85 g (2.82 to 3.0 oz)] to AC.
4) Apply an even coat of specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to the shaft.

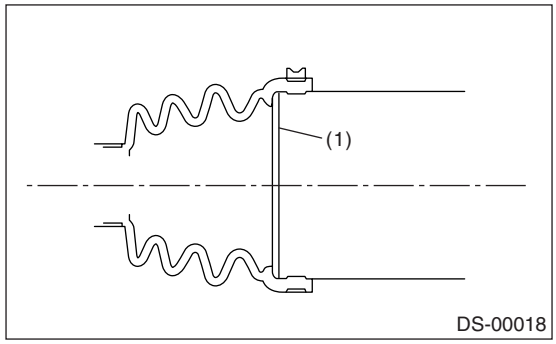
NOTE:
The inside of the larger end of AC boot and boot groove shall be cleaned so as to be free from grease and other substances.

5) Install the boot projecting portion to AC boot groove.



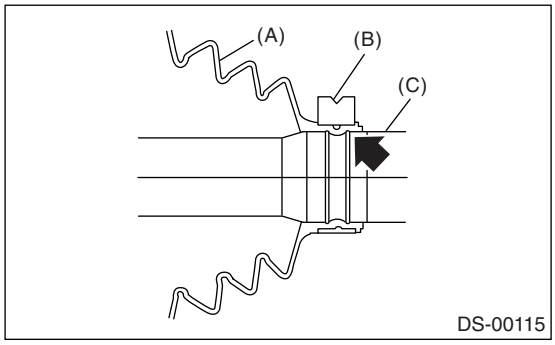
(A) AC
(B) Large boot band
(C) Boot

6) Temporarily set the large boot band in the AC boot groove.
7) Make sure to recognize the position of retainer.



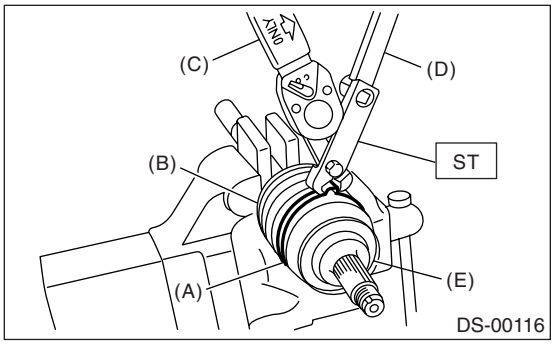
(1) Retainer

8) Install the boot projecting portion to shaft groove.



(A) Boot
(B) Small boot band
(C) Shaft

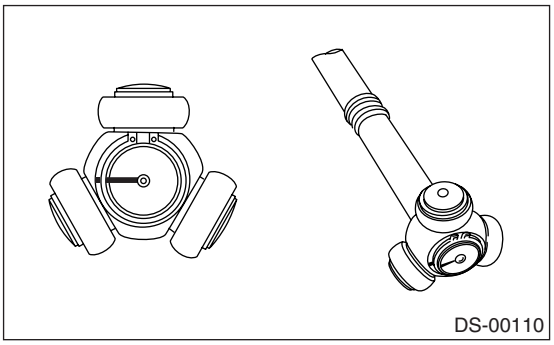
9) Tighten the boot bands using ST, torque wrench and socket flex handle.
ST 28099AC000 BOOT BAND PLIER



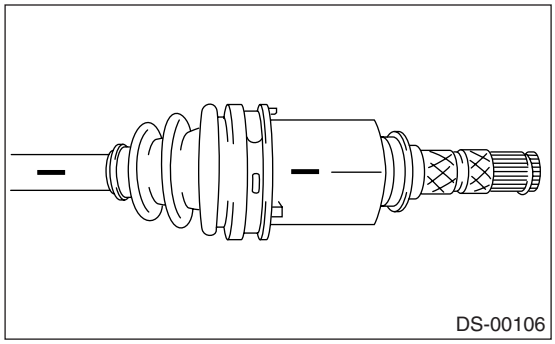
(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) AC

Caulked portion clearance of boot band:
Large boot band
1.3 mm (0.051 in) or more
Small boot band
1.3 mm (0.051 in) or more

10) Fit the AARi boot and retainer to shaft, and then position to center of shaft.
11) Align the alignment marks, and then install the trunnion on shaft.



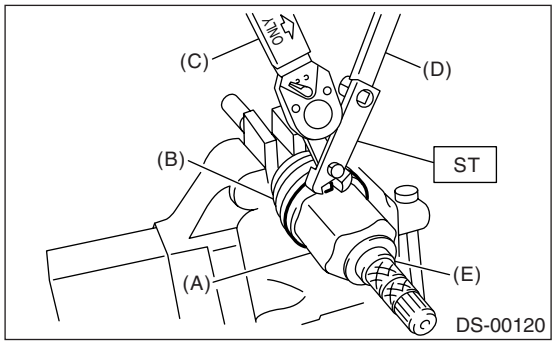
12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of AARi outer race.
13) Apply a coat of specified grease to the free ring and trunnion.
14) Align the alignment marks on shaft and outer race, and then install the outer race.



15) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.
16) Install the AARi boot taking care not to twist it.

CAUTION:
• The inside of the larger end of AARi boot and boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the AARi boot, position the outer race of AARi at center of its travel.

17) Install a new large boot band and small boot band in specified position.
18) Using the ST, torque wrench and socket flex handle, tighten the boot band.
ST 28099AC000 BOOT BAND PLIERS



(A) Large boot band
(B) Boot
(C) Torque wrench
(D) Socket flex handle
(E) AARi

Caulked portion clearance of boot band:
Large boot band
1 mm (0.04 in) or less
Small boot band
1 mm (0.04 in) or less

19) Extend and retract repeatedly the AARi to provide equal grease coating.

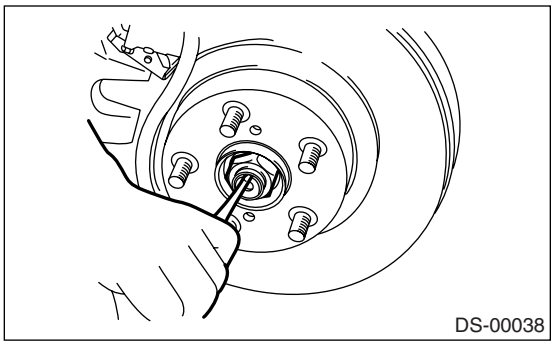
E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) AARi
Check seizure, corrosion, damage and excessive play.
2) Shaft
Check excessive bending, twisting, damage and wear.
3) AC
Check seizure, corrosion, damage and excessive play.
4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or fluidity.

6. Rear Drive Shaft

A: REMOVAL

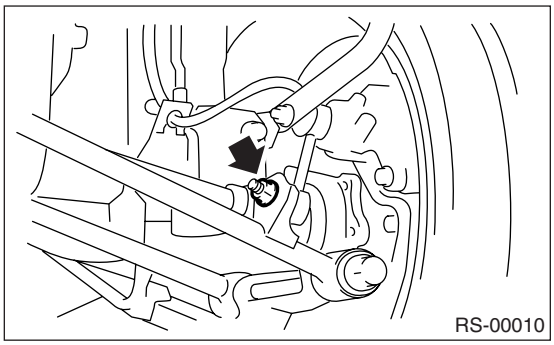
1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and remove the rear wheel.
3) Unlock the axle nut.



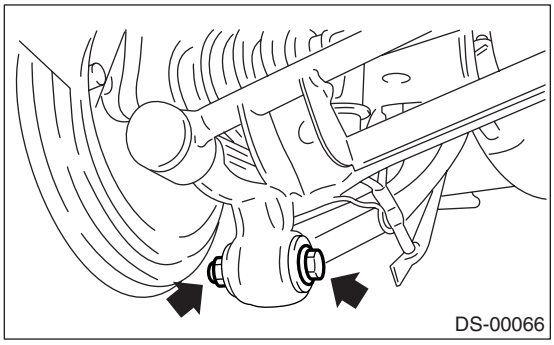
4) Remove the axle nut using a socket wrench with brake pedal depressed.

CAUTION:
Remove the axle nut with vehicle weight not applied on axle. Failure to follow this rule may damage the wheel bearings.

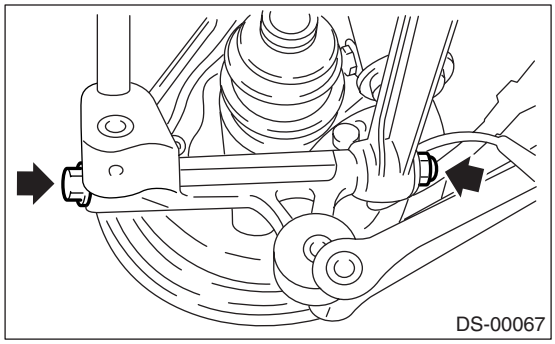
5) Disconnect the stabilizer link.



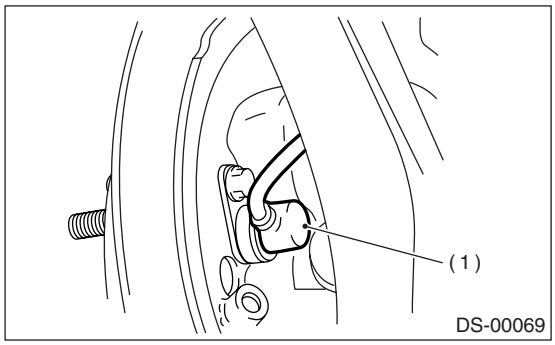
6) Remove the bolt which secures trailing link to housing.



7) Remove the bolts which secure front lateral link and rear lateral link to housing.



8) Remove the rear ABS wheel speed sensor from back plate.

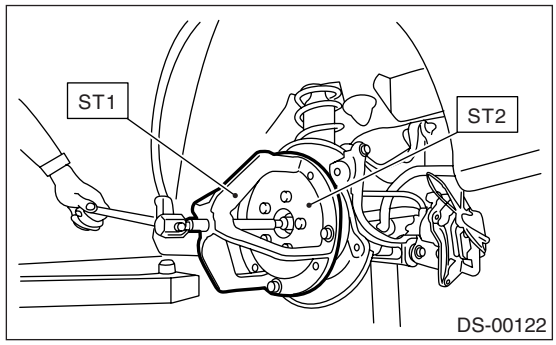


(1) ABS wheel speed sensor

9) Remove the rear drive shaft from rear axle. If it is hard to remove, remove the brake disk rotor using the ST1 and ST2.

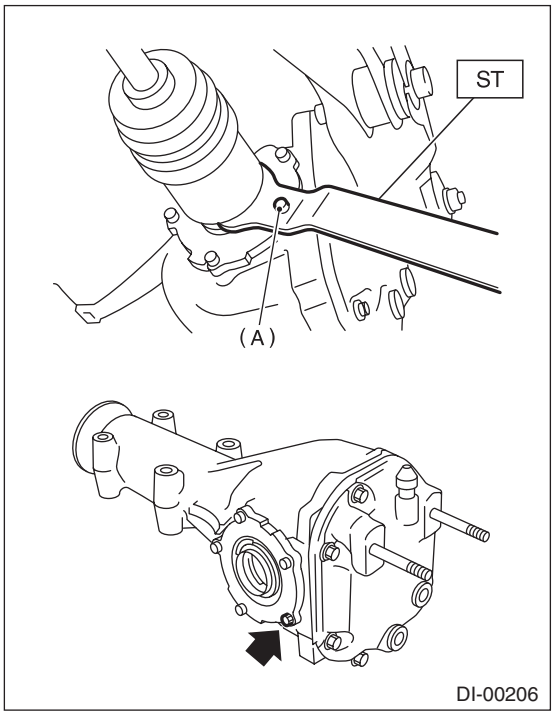
ST1	926470000	AXLE SHAFT PULLER
ST2	927140000	AXLE SHAFT PULLER PLATE

CAUTION:
- **Do not hammer the drive shaft when removing.**
- **Do not damage the oil seal and tone wheel.**



10) Remove the rear drive shaft from rear differential using ST.
ST 28099PA100 DRIVE SHAFT REMOVER

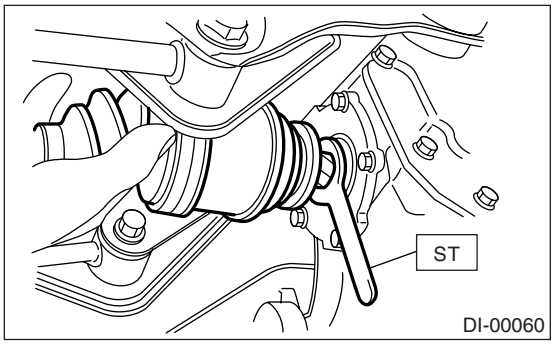
CAUTION:
Fit ST to the bolt (A) as shown in the figure to avoid damage on the side bearing retainer.



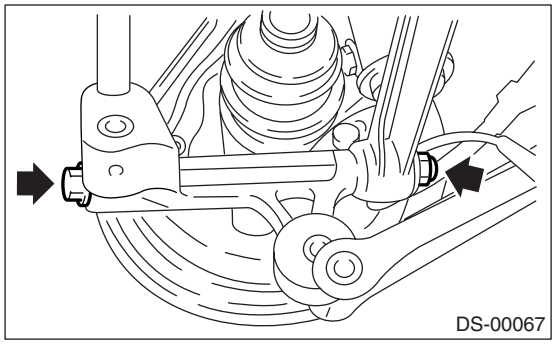
(A) Bolt

B: INSTALLATION

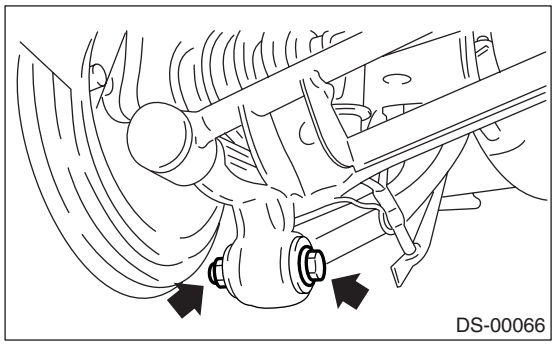
1) Insert the rear drive shaft into rear axle.
2) Temporarily tighten the axle nut.
3) Using ST, protect the oil seal and install the rear drive shaft to rear differential.
ST 28099PA090 OIL SEAL PROTECTOR



4) Attach the front lateral link and rear lateral link to housing using a new self-locking nuts.

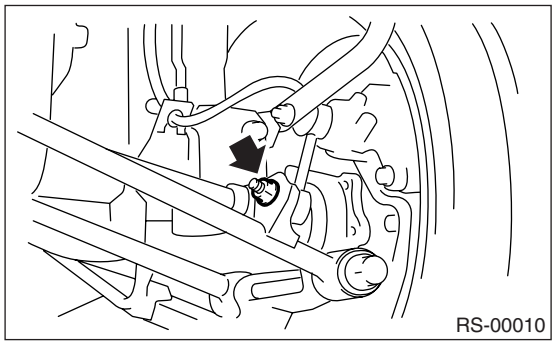


5) Attach the trailing link to housing using a new self-locking nut.



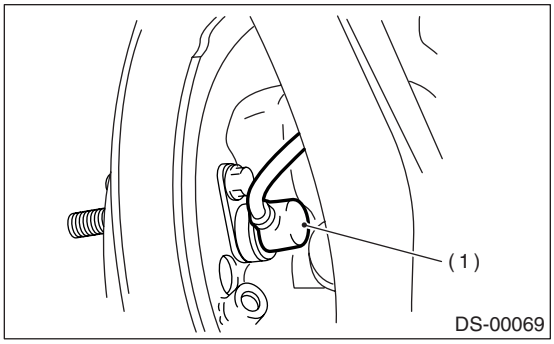
6) Install the stabilizer link.

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)



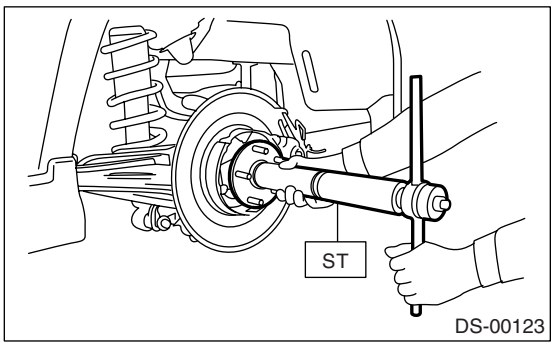
7) Install the ABS wheel speed sensor.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)



(A) ABS vehicle speed sensor

8) Using the ST1 and ST2, pull the rear drive shaft into place.
ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER

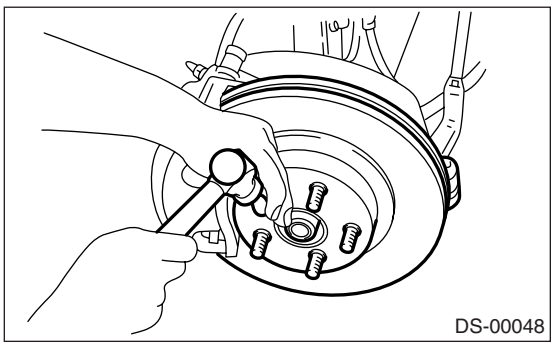


9) Tighten a new axle nut to the specified torque with brake pedal depressed.

Tightening torque:
190 N·m (19.4 kgf-m, 140 ft-lb)

CAUTION:
Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

10) Lock the axle nut.



11) Install the wheel.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

12) Make the tires contact the ground fully.

CAUTION:
Make the tires contact the ground fully and the vehicle be in curb weight whenever carrying out the tightening of bush portions.

13) Tighten the installation bolt of rear housing assembly and lateral link assembly.

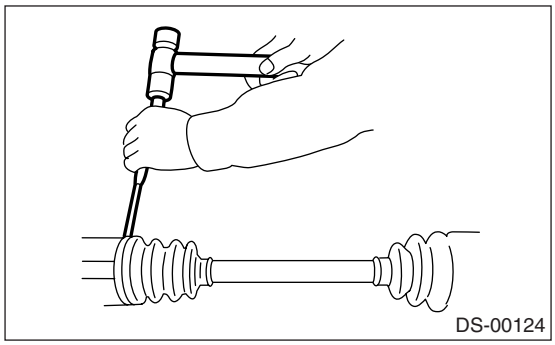
Tightening torque:
140 N·m (14.3 kgf-m, 103 ft-lb)

14) Tighten the installation bolt of rear housing assembly and trailing link assembly.

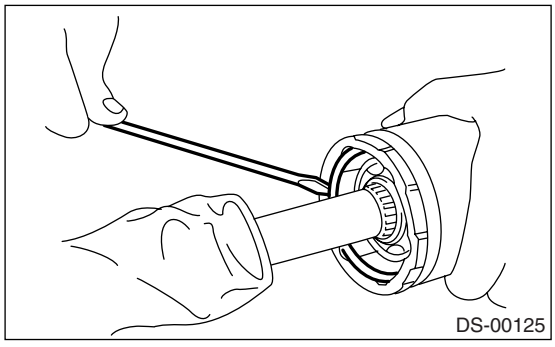
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

C: DISASSEMBLY

1) Straighten the bent claw of larger end of DOJ boot.
2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



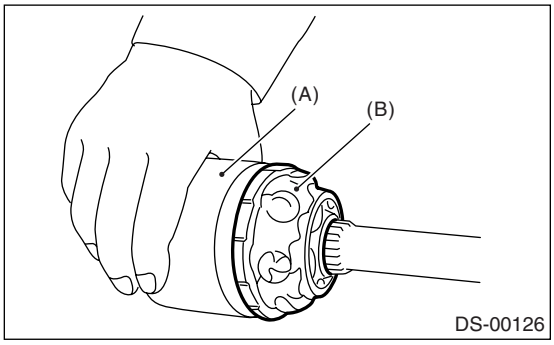
3) Remove the boot band on the small end of DOJ boot in the same manner.
4) Remove the larger end of DOJ boot from DOJ outer race.
5) Pry and remove the round circlip located at neck of DOJ outer race with a screwdriver.



6) Take out the DOJ outer race from shaft assembly.

7) Wipe off the grease, and then take out the balls.

CAUTION:
• The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.
• Disassemble with exercising care not to lose balls (6 pcs).



(A) Outer race
(B) Grease

8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race and shift the cage.
9) Remove the snap ring, which fixes inner race to shaft, by using pliers.
10) Take out the DOJ inner race.
11) Take off the DOJ cage from shaft and remove DOJ boot.
12) Wrap the shaft splines with vinyl tape.
13) Remove the BJ boot in same procedure as DOJ boot.

NOTE:
Thus, disassembly of axle is completed, but the BJ is unable to be disassembled.

D: ASSEMBLY

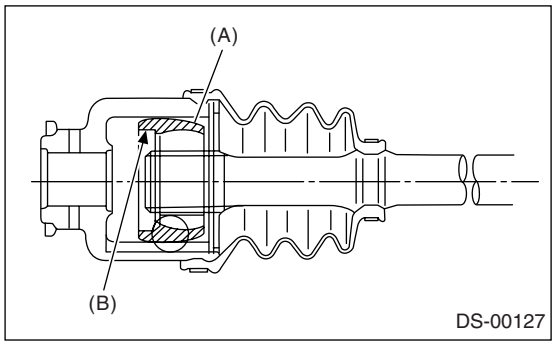
NOTE:
Use specified grease.

BJ side:
NTG2218-M (Part No. 28395AG010)

DOJ side:
NKG205 (Yellow) (Part No. 28495AG010)

1) Install the BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
2) Place the DOJ boot at the center of shaft.
3) Wrap the shaft splines with vinyl tape.
4) Insert the DOJ cage onto shaft.

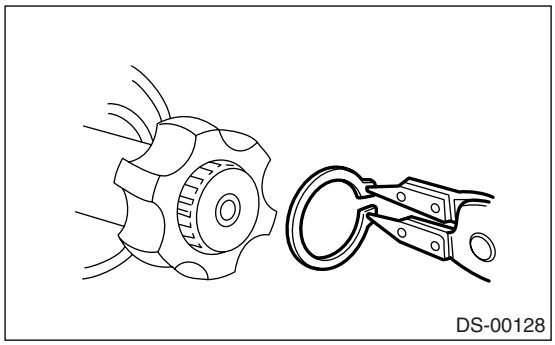
CAUTION:
Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.



(A) Cage
(B) Cut-out portion

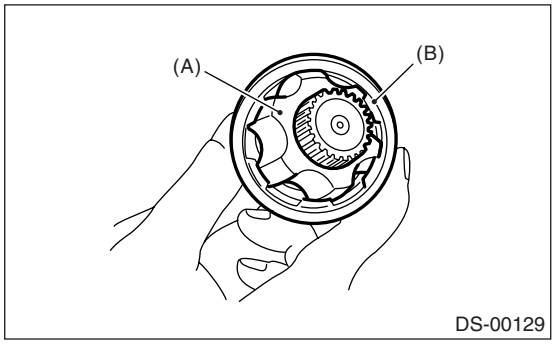
5) Install the DOJ inner race on shaft and fit snap ring with pliers.

CAUTION:
Confirm that the snap ring is completely fitted in shaft groove.



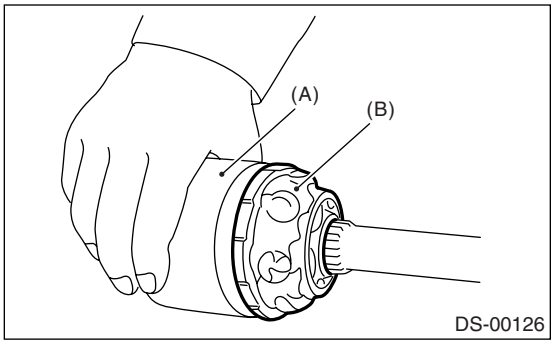
6) Install the cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:
Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.



(A) Inner race
(B) Cage

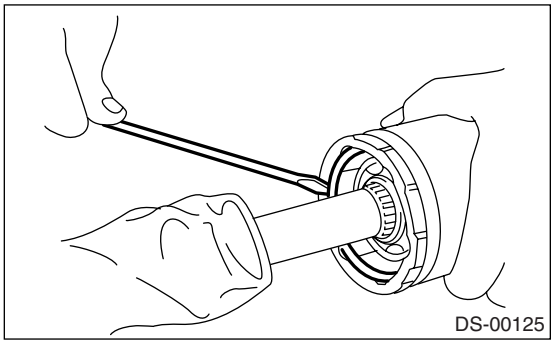
7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the interior of DOJ outer race.
8) Apply a coat of specified grease to the cage pocket and six balls.
9) Insert six balls into the cage pocket.
10) Align the outer race track and ball positions and place in the part where shaft, inner race, cage and balls are previously installed, and then fit outer race.



(A) Outer race
(B) Grease

11) Install the circlip in the groove on DOJ outer race.

CAUTION:
• Assure that the balls, cage and inner race are completely fitted in the outer race of DOJ.
• Exercise care not to place the matched position of circlip in the ball groove of outer race.
• Pull the shaft lightly and assure that the circlip is completely fitted in the groove.



12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to shaft.
13) Install the DOJ boot taking care not to twist it.

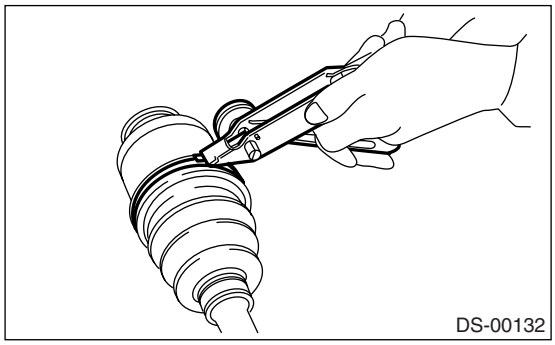
NOTE:
• The inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
• When installing the DOJ boot, position the outer race of DOJ at center of its travel.

14) Put a new band through the clip and wind twice in alignment with band groove of boot.
15) Pinch the end of band with pliers. Hold the clip and tighten securely.

CAUTION:
When tightening the boot, exercise care so that air within the boot is appropriate.

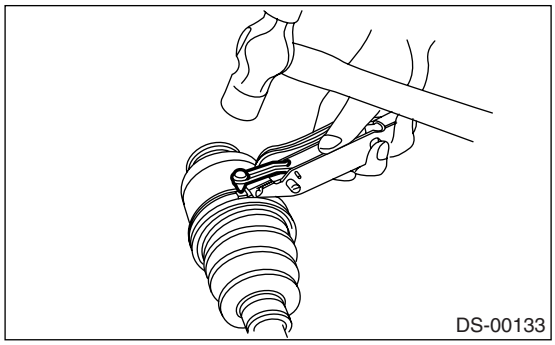
16) Tighten the band by using ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tighten the band until it cannot be moved by hand.



17) Tap on the clip with the punch provided at the end of ST.
ST 925091000 BAND TIGHTENING TOOL

CAUTION:
Tap to an extent that the boot underneath is not damaged.



18) Cut off the band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:
Be careful so that the end of the band is in close contact with clip.

19) Fix up the boot on BJ in the same manner.
20) Extend and retract repeatedly the DOJ to provide equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. If faulty, repair or replace.
1) DOJ (Double Offset Joint)
Check seizure, corrosion, damage, wear or excessive play.
2) Shaft
Check excessive bending, twisting, damage or wear.
3) BJ (Bell Joint)
Check seizure, corrosion, damage or excessive play.
4) Boot
Check for wear, warping, breakage or scratches.
5) Grease
Check for discoloration or fluidity.

7. General Diagnostic Table

A: INSPECTION

NOTE:
Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-18, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check the vibration of propeller shaft. <Ref. to DS-17, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or free play of connection	Check joint and connector. <Ref. to DS-17, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.>
		Check splines and bearing. <Ref. to DS-17, SPLINES AND BEARING LOCATIONS, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut absorber	Check the rear strut. <Ref. to RS-14, INSPECTION, Rear Strut.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-39, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-45, INSPECTION, Rear Drive Shaft.>
	Front axle	Check the front axle. <Ref. to DS-24, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-32, INSPECTION, Rear Axle.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-14, INSPECTION, Rear Strut.>

ABS

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4. Front ABS Wheel Speed Sensor 14
5. Rear ABS Wheel Speed Sensor 17
6. Front Tone Wheel 20
7. Rear Tone Wheel 21
8. G Sensor 22

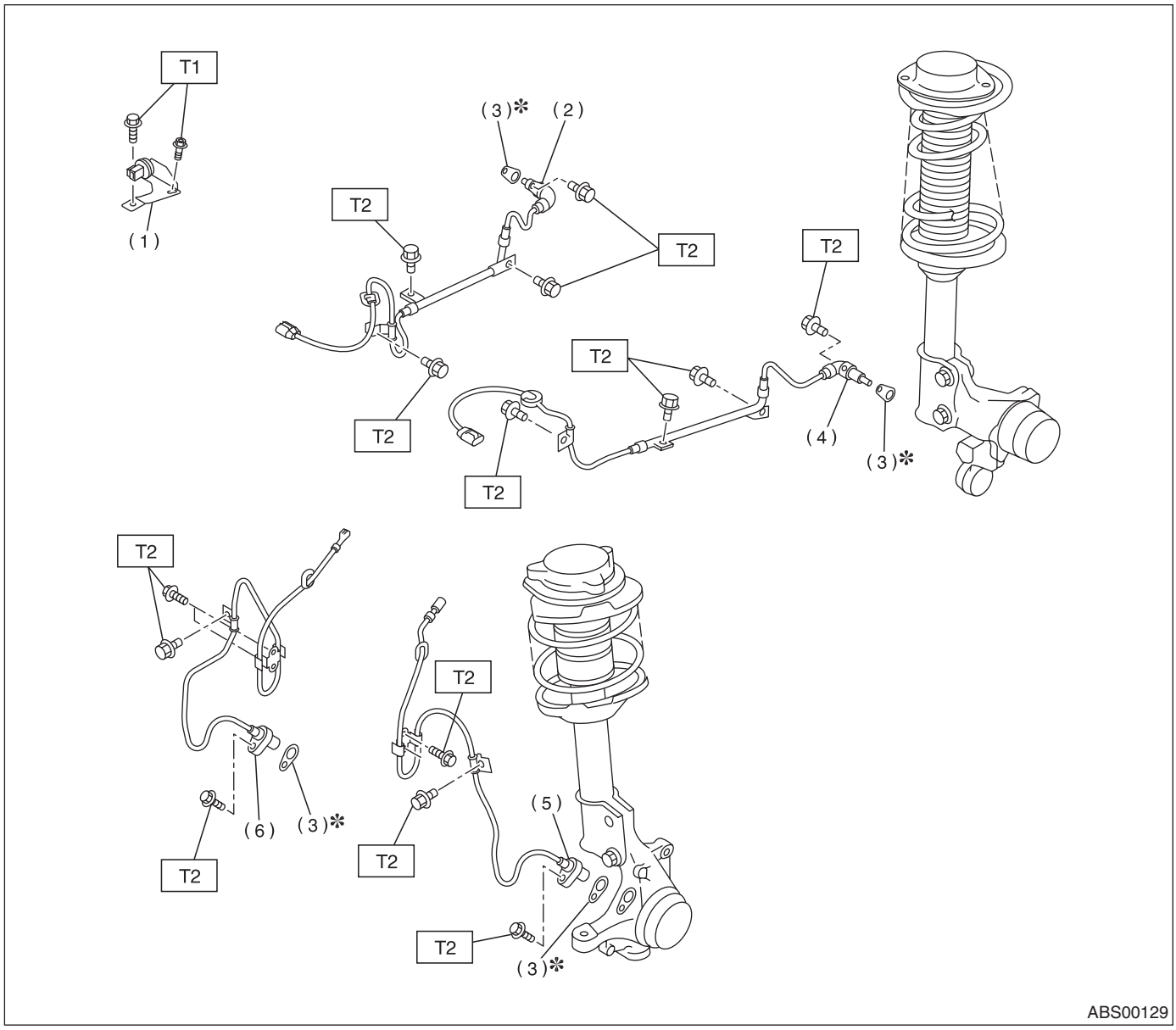
1. General Description

A: SPECIFICATION

Item				Standard or remarks
ABS wheel speed sensor	ABS wheel speed sensor gap		Front	0.3 — 0.8 mm (0.012 — 0.031 in)
			Rear	0.7 — 1.2 mm (0.028 — 0.047 in)
	ABS wheel speed sensor resistance		Front	1.25±0.25 kΩ
			Rear	1.15±0.115 kΩ
	Marks of the harness (color)	Front	RH	Light blue
			LH	Brown
		Rear	RH	White
			LH	Yellow
G sensor	G sensor voltage			2.3±0.2 V
ABSCM&H/U identification			AT	L1
			MT	L2

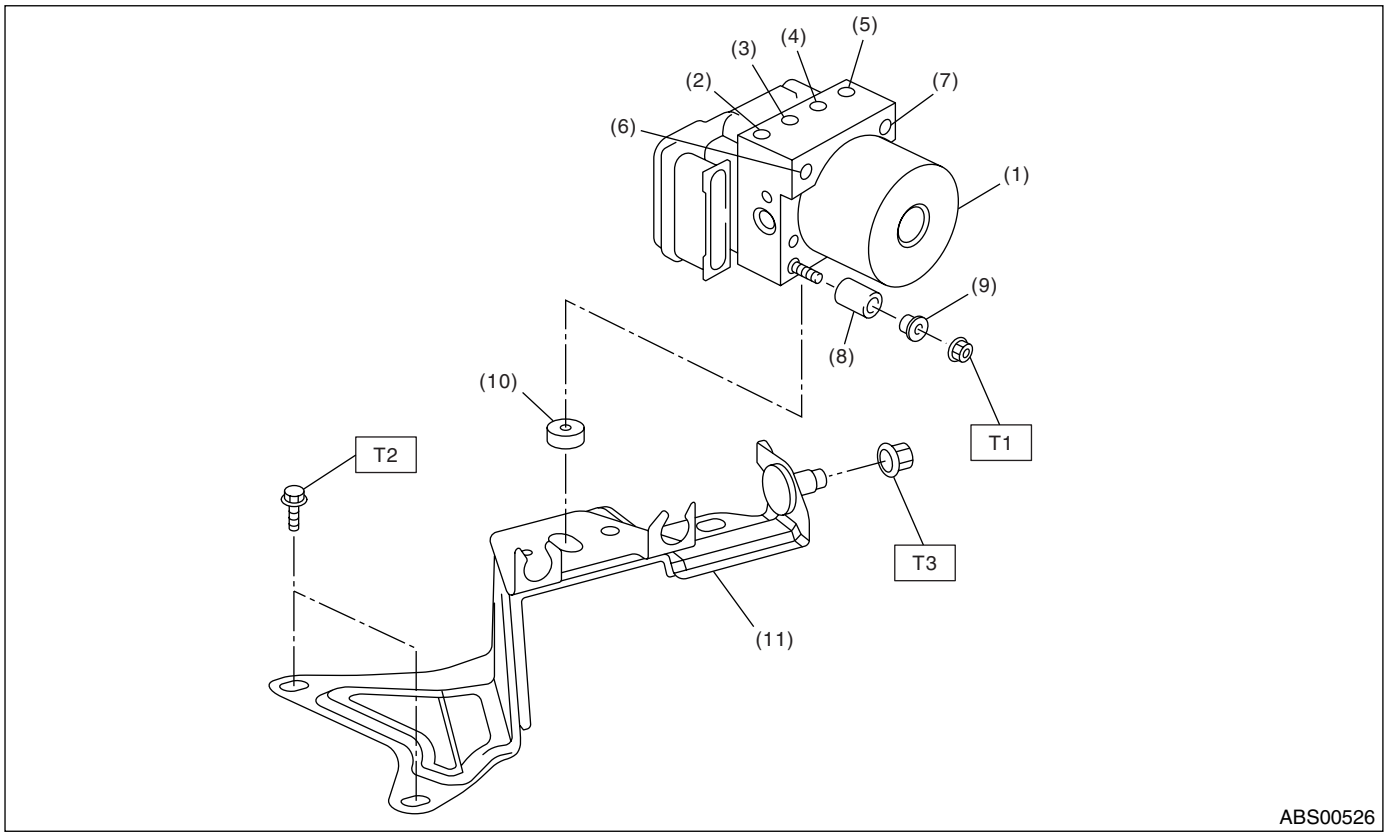
B: COMPONENT

1. SENSOR



(1)	G sensor	(4)	Rear ABS wheel speed sensor LH	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Rear ABS wheel speed sensor RH	(5)	Front ABS wheel speed sensor LH	***T1: 18 (1.8, 13.0)***
(3)	Adjusting spacer	(6)	Front ABS wheel speed sensor RH	***T2: 33 (3.4, 25)***

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



(1)	ABS control module and hydraulic control unit (ABSCM&H/U)	(6)	Primary inlet
(2)	Front outlet RH	(7)	Secondary inlet
(3)	Rear outlet LH	(8)	Damper
(4)	Rear outlet RH	(9)	Spacer
(5)	Front outlet LH	(10)	Damper
		(11)	Bracket

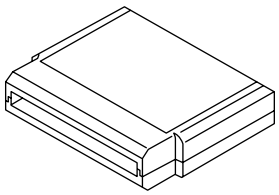
Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 25)
T3: 38 (3.8, 27.5)

C: CAUTION

• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.
TORX® BIT E5	Used for replacing ABSCM.

2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

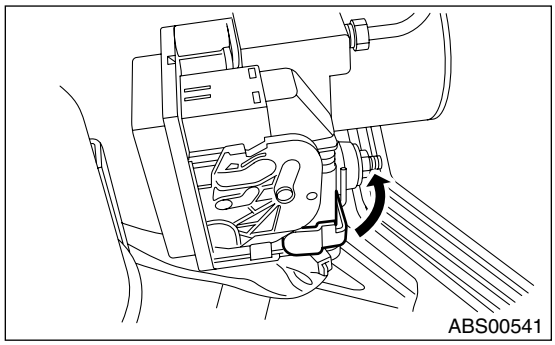
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air cleaner case to facilitate removal of ABSCM&H/U. <Ref. to IN(H4SO)-6, REMOVAL, AIR CLEANER CASE.> or <Ref. to IN(H4DOTC 2.0)-7, REMOVAL, AIR CLEANER CASE.>
3) Use an air gun to get rid of water around the ABSCM&H/U.

NOTE:
Contact will be insufficient if the terminal gets wet.

4) Disconnect the ABSCM&H/U connector pulling up the lock lever.

CAUTION:
Do not pull the harness when disconnecting connector.

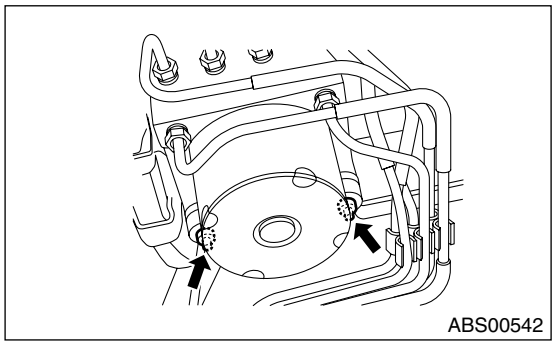

ABS00541

5) Remove the harness clip.
6) Disconnect the brake pipes from ABSCM&H/U.
7) Wrap the brake pipe using a vinyl bag not to spill the brake fluid on the vehicle body.

CAUTION:
When brake fluid is attached to the vehicle body, wash it off with water and wipe the water.

8) Remove the nuts and remove the ABSCM&H/U.

CAUTION:
• Do not drop or bump the ABSCM&H/U.
• Do not turn ABSCM&H/U upside down or place it sideways for storage.
• Be careful that no foreign objects are mixed in ABSCM&H/U.
• Be careful that no water enters inside the connectors.


ABS00542

9) Remove the ABSCM&H/U bracket.

B: INSTALLATION

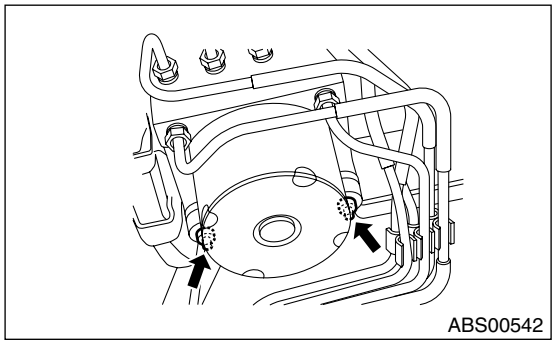
1) Install the ABSCM&H/U bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

2) Install the ABSCM&H/U aligning the groove of damper on ABSCM&H/U side with the pawl of bracket.

NOTE:
Check the identification mark of ABSCM&H/U.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)


ABS00542

3) Connect the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

4) Using the cable clip, secure the ABSCM&H/U harness to bracket.

5) Connect the connector to ABSCM&H/U.

NOTE:
• Be sure to remove all foreign matter from inside of the connector before connecting.
• Ensure that the ABSCM&H/U connector is securely locked.

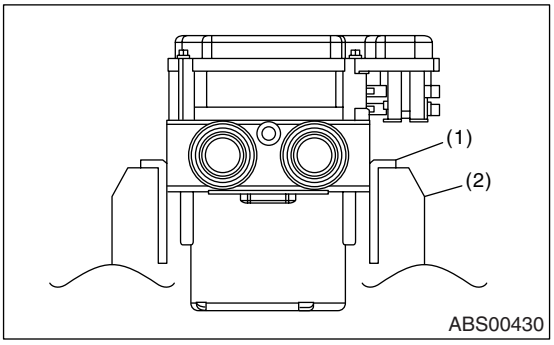
6) Connect the ground cable to ABSCM&H/U, and then apply anti-corrosive wax.
7) Install the air cleaner case. <Ref. to IN(H4SO)-6, INSTALLATION, AIR CLEANER CASE.> or <Ref. to IN(H4DOTC 2.0)-7, INSTALLATION, AIR CLEANER CASE.>
8) Bleed air from the brake system.

C: REPLACEMENT

CAUTION:
• Because the seal of ABSCM cannot be replaced, do not pull or peel it with lifting up.
• Because the screw part of H/U deteriorates in every replacement procedure, do not perform the replacement more than five times on it. When the malfunction is found though the replacement that performed is less than five times, replace the H/U body.
• Use new screws for installation of ABSCM.
• When the sealing surface of ABSCM or H/U is dirty or damaged and it cannot be removed or repaired, replace it with new one.

1) Remove the ABSCM&H/U. <Ref. to ABS-7, REMOVAL, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
2) To prevent entering foreign matter and brake fluid leakage, plug the oil pressure port of ABSCM&H/U using screw plug and etc.
3) Set the pump motor part of removed ABSCM&H/U faces down in the vise.

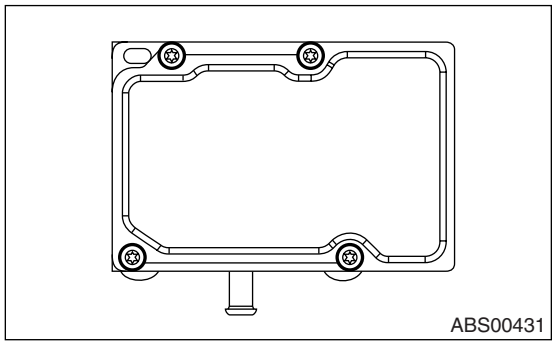
NOTE:
Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate or cloth between the part and vice.



(1) Aluminum plate or etc.
(2) Vise

4) Using TORX® bit E5, remove the four screws of ABSCM.

NOTE:
Always use new screws.



5) Slowly remove the ABSCM upward from H/U.

NOTE:
To prevent damaging of coil part, remove the ABSCM straightly from H/U.

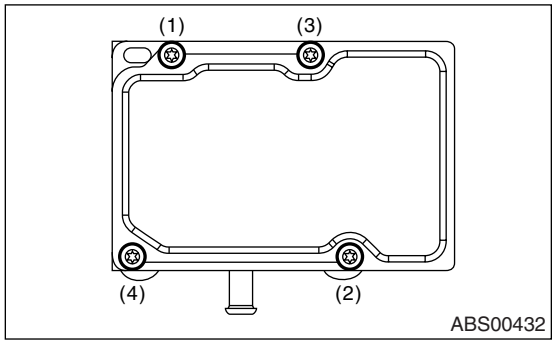
6) Ensure there are no dirt or damage on sealing surface of H/U.

CAUTION:
• Do not clean the ABSCM & H/U with applying compressed air.
• Do not repair the damages of H/U sealing surface using file or metal scraper. To remove the sealing, use resin scraper. Do not use the chemical materials (thinner and etc.).

7) Position the coil of new ABSCM to align H/U valve.
8) To prevent deforming of ABSCM housing cover, hold the corner of ABSCM and install it to the H/U without tilting.
9) Using TORX® bit E5, tighten the screws stepwise in the order of (1) through (4).

CAUTION:
Always use new screws.

Tightening torque:
1.5 N·m (0.15 kgf-m, 1.1 ft-lb)



10) Check that there is no foreign matter in aligning part between ABSCM and H/U.

11) Using TORX® bit E5, tighten the screws stepwise in the order of (1) through (4) again.

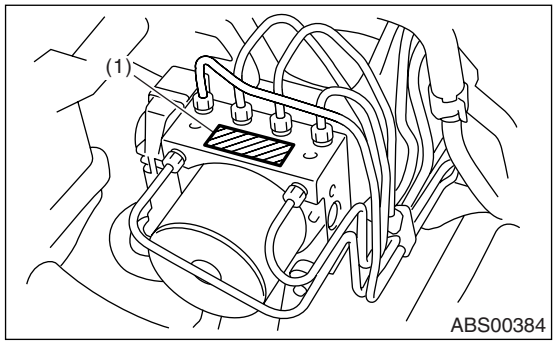
Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)

12) Check that there is no clearance in aligning part between ABSCM and H/U.
13) Install the ABSCM&H/U to vehicle. <Ref. to ABS-7, INSTALLATION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
L1	AT
L2	MT



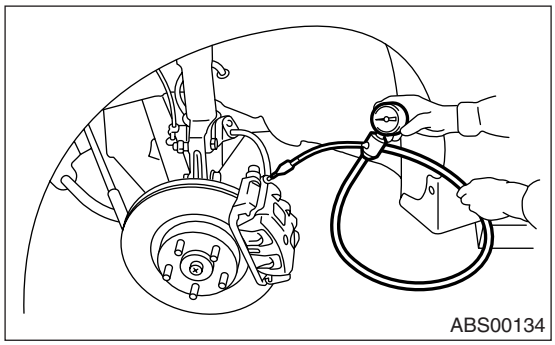
(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheels.
2) Disconnect the air bleeder screws from the FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ pressure gauge previously used for transmission oil pressure since the piston seal is expanded which may lead to malfunction of the brake.

NOTE:
Wrap sealing tape around the pressure gauge.



4) Bleed air from the pressure gauges.
5) Perform the ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
6) When the hydraulic unit begins to work and first the FL side performs decompression, holding and compression, and then the FR side performs decompression, holding and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

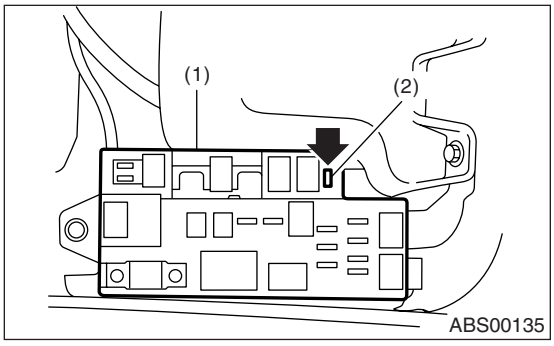
	Front wheel	Rear wheel
Initial value	3,500 kPa (35 kgf/cm^2, 498 psi)	3,500 kPa (35 kgf/cm^2, 498 psi)
Decompressed	500 kPa (5 kgf/cm^2, 71 psi) or less	500 kPa (5 kgf/cm^2, 71 psi) or less
Compressed	3,500 kPa (35 kgf/cm^2, 498 psi) or more	3,500 kPa (35 kgf/cm^2, 498 psi) or more

8) Remove the pressure gauges from FL and FR caliper bodies.
9) Remove the air bleeder screws from the RL and RR caliper bodies.
10) Connect the air bleeder screws to the FL and FR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the FL and FR caliper bodies.
13) Perform the ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
14) When the hydraulic unit begins to work, at first the RR side performs decompression, holding and compression, and then the RL side performs decompression, holding and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.

17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from the brake system.

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

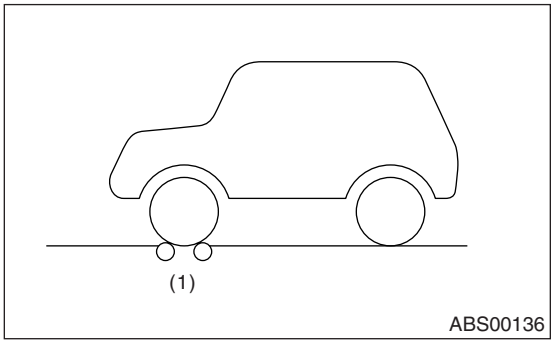
1) In the case of AWD AT model, install a spare fuse with the FWD connector in the main fuse box to simulate FWD model.

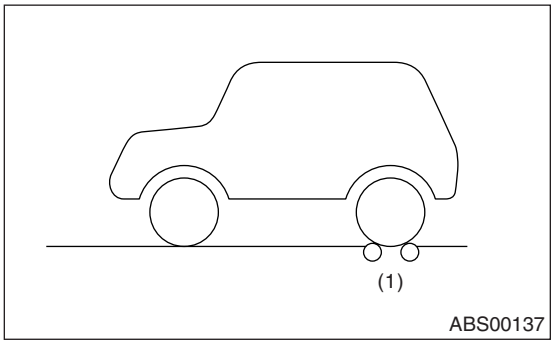


(1) Main fuse box
(2) FWD connector

NOTE:
The AWD circuit of MT model can not be disabled because viscous coupling is used inside center differential.

2) Prepare for operating the ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
3) Set the front wheels or rear wheels on the brake tester and set the select lever's position at "N" range.





(1) Brake tester

4) Operate the brake tester.
5) Perform the ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
6) Hydraulic unit begins to work; and check the following working sequence.
   (1) The FL side performs decompression, holding and compression in sequence, and subsequently the FR side repeats the cycle.
   (2) The RR side performs decompression, holding and compression in sequence, and subsequently the RL side repeats the cycle.
7) Read values indicated on the brake tester and check if the fluctuation of values, while decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (100 kgf, 221 lbf)	1,000 N (100 kgf, 221 lbf)
Decompressed	500 N (50 kgf, 110 lbf) or less	500 N (50 kgf, 110 lbf) or less
Compressed	1,000 N (100 kgf, 221 lbf) or more	1,000 N (100 kgf, 221 lbf) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

3. ABS Sequence Control

A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by diagnostic connector or Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

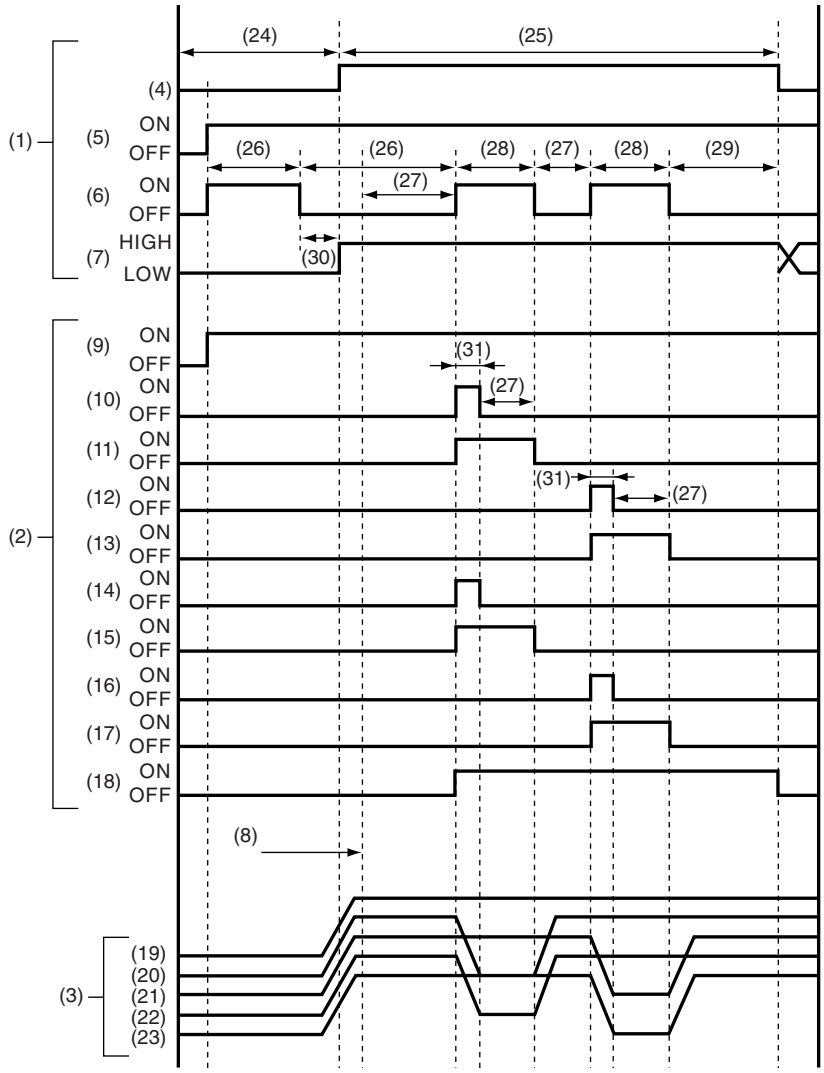
NOTE:
In the event of any trouble, the sequence control may not be operative. In such a case, perform the diagnostic. <Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

1) Connect the Subaru Select Monitor to data link connector under driver's seat instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) Put the Subaru Select Monitor to "BRAKE CONTROL" mode.
5) When "Function check sequence" is selected, 'ABS sequence control' will start.
6) When the message "Press Brake Pedal with braking force of 100 to 150 kgf" is displayed, perform the followings.
   (1) When using the brake tester, depress the brake pedal with braking force of 981 N (100 kgf, 221 lbf).
   (2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,432 kPa (35 kgf/cm^2, 498 psi).

CAUTION:
Do not depress the clutch pedal in case of model with hill holder.

7) When the message "Press YES" is displayed, press the YES key.
8) The braking system in operation is displayed on Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00611

(1) Operational guide line of sequence control
(2) Operational pattern of sequence control
(3) Operational pressure of sequence control
(4) Speed of all wheels
(5) Ignition key switch
(6) ABS warning light
(7) Stop light switch
(8) Point A
(9) Valve relay
(10) FL outlet valve
(11) FL inlet valve
(12) FR outlet valve
(13) FR inlet valve
(14) RR outlet valve
(15) RR inlet valve
(16) RL outlet valve
(17) RL inlet valve
(18) Pump motor
(19) Pressure of master cylinder
(20) Pressure of FL wheel cylinder
(21) Pressure of FR wheel cylinder
(22) Pressure of RR wheel cylinder
(23) Pressure of RL wheel cylinder
(24) 4 km/h (2 MPH) or less
(25) 10 km/h (6 MPH) or less
(26) Approx. 2 seconds
(27) 1.0 second
(28) 1.4 seconds
(29) 0.6 seconds
(30) Within 0.5 seconds
(31) 0.4 seconds

NOTE:
Sequence control operation starts at point A.

B: SPECIFICATION

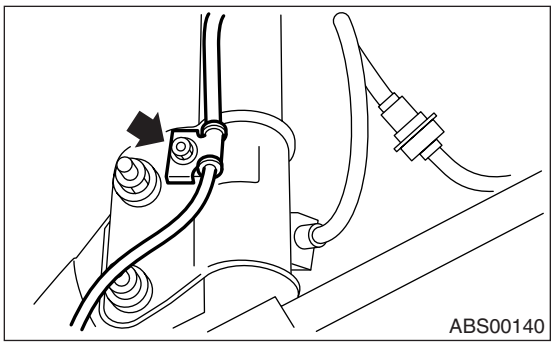
1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during sequence control and the stop light switch is set to off.
3) After completion of the sequence control.
4) When malfunction is detected.

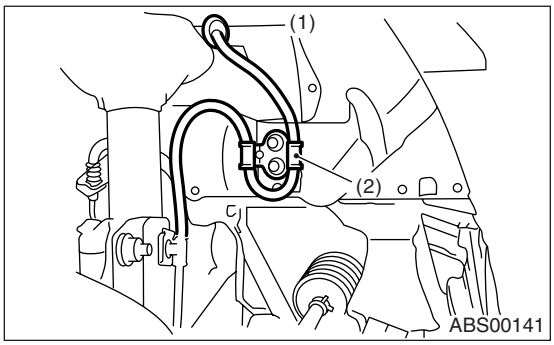
4. Front ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the front ABS wheel speed sensor connector located next to the front strut mounting house in engine compartment.
3) Remove the bolts which secure sensor harness to strut.



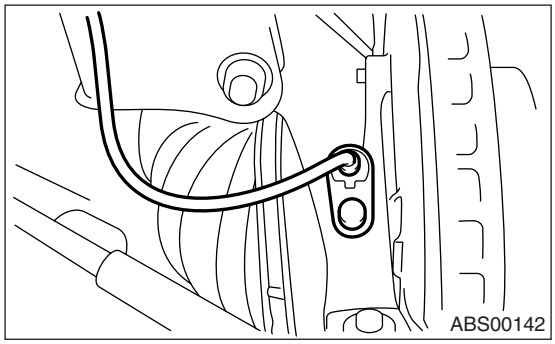
4) Remove the bolts which secure sensor harness to body.



(1) To front ABS wheel speed sensor connector
(2) Bracket

5) Remove the bolts which secure front ABS wheel speed sensor to housing, and remove the front ABS wheel speed sensor.

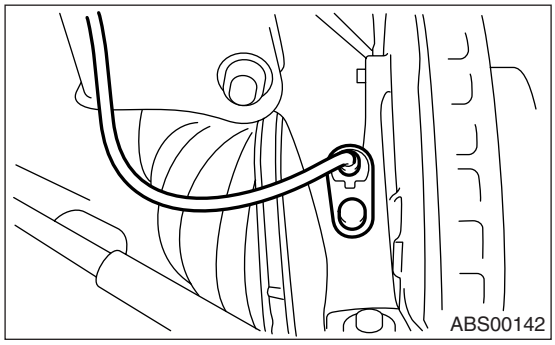
CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



B: INSTALLATION

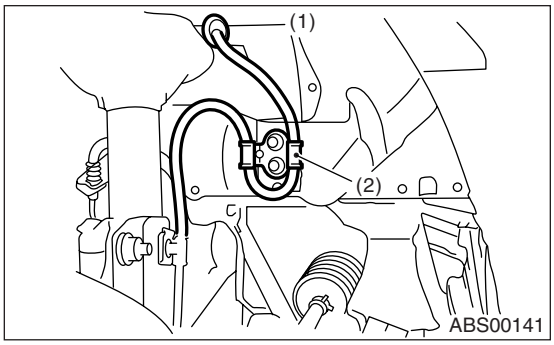
1) Temporarily install the front ABS wheel speed sensor on housing.

CAUTION:
Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



2) Install the front ABS wheel speed sensor on strut and wheel apron bracket.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

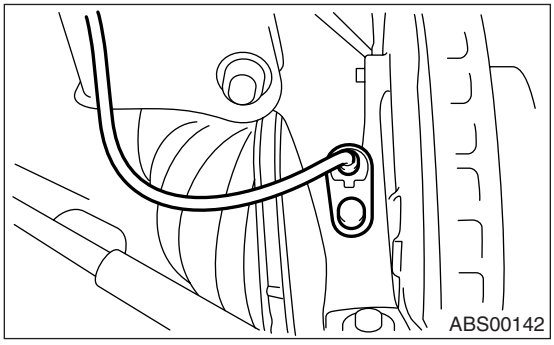


(1) To front ABS wheel speed sensor connector
(2) Bracket

3) Check the ABS wheel speed sensor gap. <Ref. to ABS-15, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on housing to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS wheel speed sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



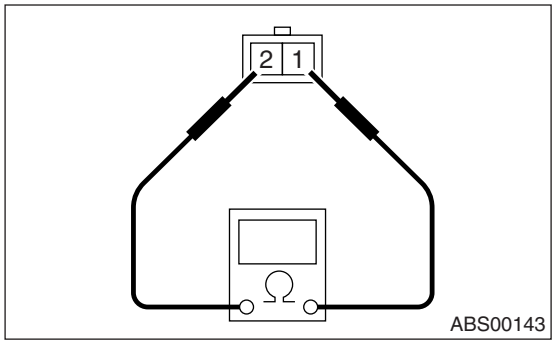
NOTE:
Check the marks on the harness and make sure that no kink exists. (RH: Light blue, LH: Brown)

4) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.
5) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance.
If the resistance is outside standard value, replace the ABS wheel speed sensor with a new one.

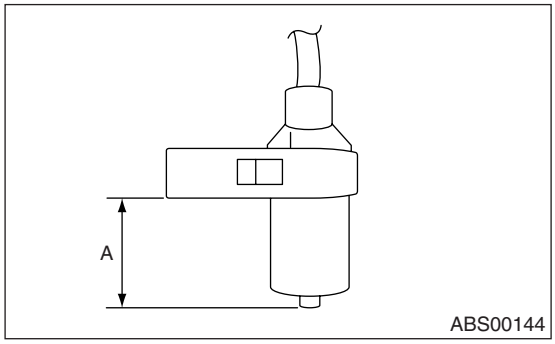


Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

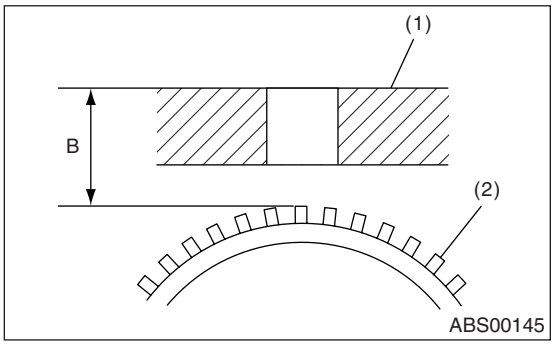
2. SENSOR GAP

1) Measure the distance “A” between ABS wheel speed sensor surface and sensor pole face.



2) Measure the distance “B” between surface where the front axle housing meets the ABS wheel speed sensor and the tone wheel.

NOTE:
Measure so that the gauge touches the tone wheel teeth top.



(1) Axle housing
(2) Tone wheel

3) Find the gap between the ABS wheel speed sensor pole piece and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

ABS wheel speed sensor clearance = B − A

ABS wheel speed sensor standard clearance:
0.3 — 0.8 mm (0.012 — 0.031 in)

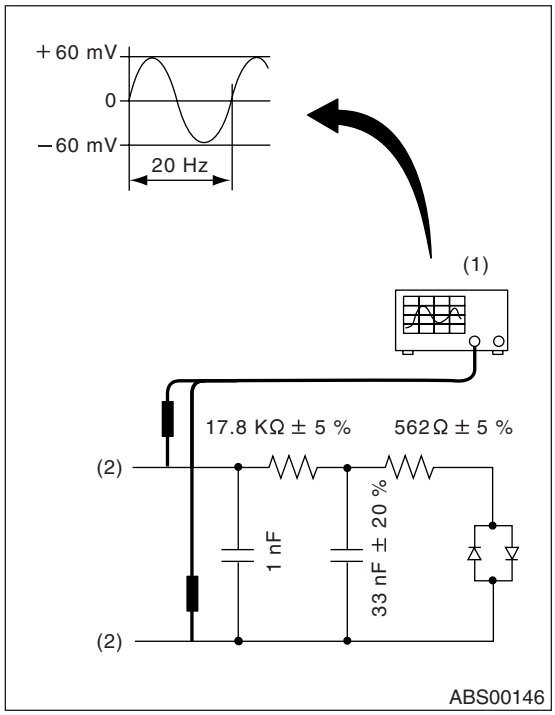
NOTE:
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 — 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-15, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

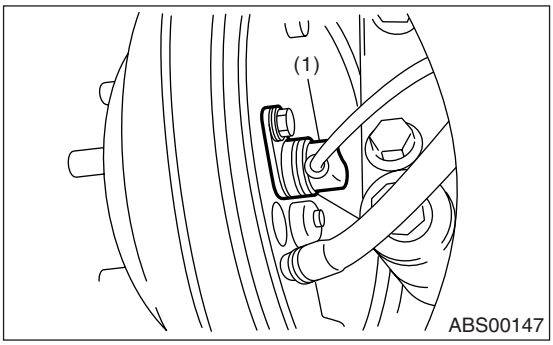
Adjust the gap using spacer (Part No. 26755A000).

5. Rear ABS Wheel Speed Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle.
3) Remove the rear seat and disconnect the rear ABS wheel speed sensor connector.
4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
5) Remove the rear ABS wheel speed sensor from back plate.

CAUTION:
• Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
• Do not pull the sensor harness during removal.



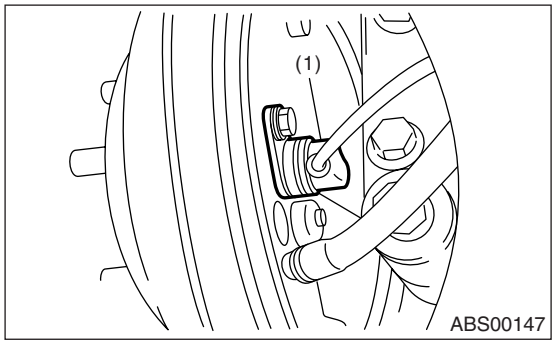
(1) Rear ABS wheel speed sensor

6) Remove the rear tone wheel while removing the hub from housing and hub assembly. <Ref. to DS-25, REMOVAL, Rear Axle.>

B: INSTALLATION

1) Install the rear tone wheel on hub, then rear housing. <Ref. to DS-31, ASSEMBLY, Rear Axle.>
2) Temporarily install the rear ABS wheel speed sensor on back plate.

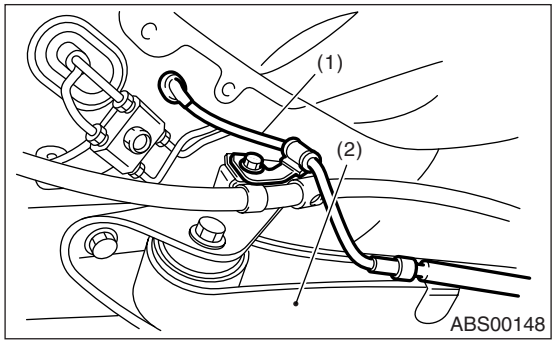
CAUTION:
Be careful not to strike the ABS wheel speed sensor's pole piece against tone wheel and adjacent metal parts during installation.



(1) Rear ABS wheel speed sensor

3) Install the rear drive shaft to rear housing and rear differential spindle. <Ref. to DS-28, INSTALLATION, Rear Axle.>
4) Install the rear sensor harness on rear trailing link.

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)



(1) Rear sensor harness
(2) Trailing link

5) Check the ABS wheel speed sensor gap. <Ref. to ABS-18, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.> After standard clearance is obtained, tighten the ABS wheel speed sensor on back plate to specified torque.
If the clearance is outside specification, readjust using spacer (Part No. 26755AA000).

ABS wheel speed sensor standard clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

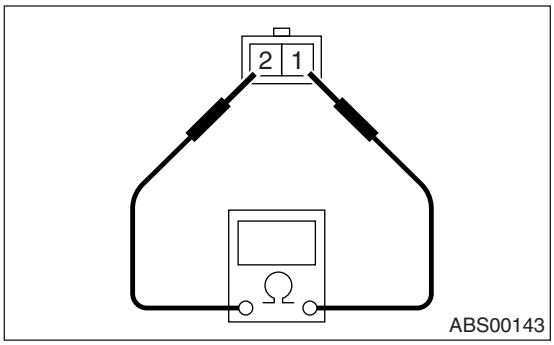
NOTE:
Check the marks on the harness and make sure that no kink exists. (RH: white, LH: yellow)

6) After confirmation of the ABS wheel speed sensor clearance, connect the connector to ABS wheel speed sensor.
7) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS wheel speed sensor.
2) Measure the ABS wheel speed sensor resistance.
If resistance is outside the standard value, replace the ABS wheel speed sensor with a new one.



Terminal No.	Standard
1 and 2	1.15±0.115 kΩ

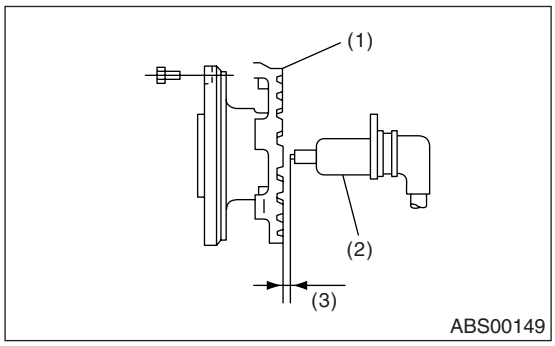
NOTE:
Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new one.

2. SENSOR GAP

Measure clearance between tone wheel and ABS wheel speed sensor at whole periphery.

NOTE:
If clearance is narrow, adjust by using spacer (Part No. 26755AA000).
If clearance is wide, check the outputted voltage then replace the ABS wheel speed sensor or tone wheel if the outputted voltage is outside specification.

ABS wheel speed sensor clearance:
0.7 — 1.2 mm (0.028 — 0.047 in)



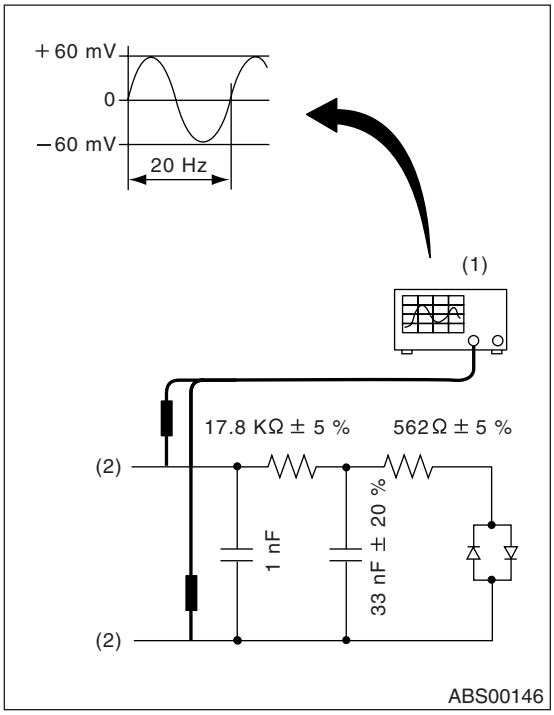
(1) Tone wheel
(2) ABS wheel speed sensor
(3) Sensor gap

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Output voltage specification:
0.12 — 1 V (at 20 Hz)

NOTE:
Regarding terminal No., please refer to item 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-18, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>



(1) Oscilloscope
(2) Terminal

D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755AA000).

6. Front Tone Wheel

A: REMOVAL

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-33, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.
<Ref. to DS-34, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

NOTE:
Replace the BJ assembly with a new one as a single unit if there are any defects found on tone wheel is unitized with BJ assembly of drive shaft.

7. Rear Tone Wheel

A: REMOVAL

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.
<Ref. to DS-25, REMOVAL, Rear Axle.>

B: INSTALLATION

Refer to Rear Axle, because the rear tone wheel is installed to rear hub.
<Ref. to DS-28, INSTALLATION, Rear Axle.>

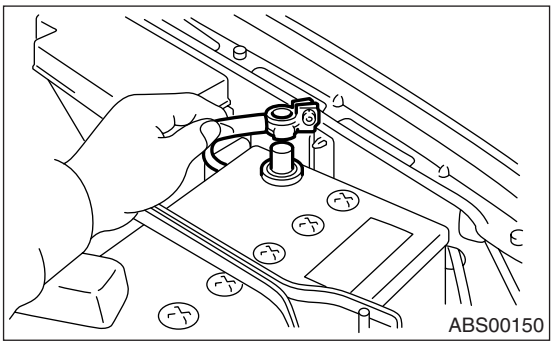
C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

8. G Sensor

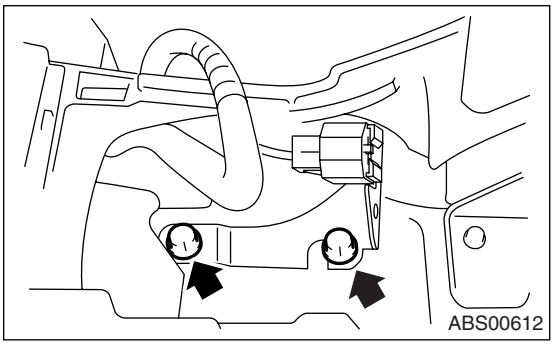
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the console cover.
<Ref. to EI-39, REMOVAL, Console Box.>
3) Disconnect the connector from G sensor.
4) Remove the G sensor from body.

CAUTION:
• Do not drop or bump the G sensor.
• G sensor and the bracket are integrated into one unit. Therefore, do not disassemble it.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
Do not drop or bump the G sensor.

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Do you have a Subaru Select Monitor?	Go to step **5.**	Go to step **2.**
2	**CHECK G SENSOR.** 1)Turn the ignition switch to OFF. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Turn the ignition switch to ON. 5)Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.3±0.2 V when G sensor is horizontal?	Go to step **3.**	Replace the G sensor.
3	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.9±0.2 V when G sensor is inclined forwards to 90°?	Go to step **4.**	Replace the G sensor.
4	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.7±0.2 V when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.
5	**CHECK G SENSOR.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the Subaru Select Monitor into {BRAKE CONTROL} mode. 4)Set the display in the {Current Data Display & Save} mode. 5)Read the G sensor output value.	Is the indicated reading –1.2 — +1.2 m/s^2 when the vehicle is in horizontal position?	Go to step **6.**	Replace the G sensor.
6	**CHECK G SENSOR.** 1)Remove the console box. 2)Remove the G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the indicated reading 8.1 — 11.2 m/s^2 when G sensor is inclined forwards to 90°?	Go to step **7.**	Replace the G sensor.
7	**CHECK G SENSOR.** Read the Subaru Select Monitor display.	Is the indicated reading –8.1 — –11.2 m/s^2 when G sensor is inclined backwards to 90°?	G sensor is normal.	Replace the G sensor.

ABS (DIAGNOSTICS)

ABS(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:
Remove foreign matters (dust, water, oil, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:
- To check harness for broken wires or short circuits, shake trouble spot or connector.
- Refer to “Check List for Interview”. <Ref. to ABS(diag)-4, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to ABS(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the component which might affect ABS problems. <Ref. to ABS(diag)-8, INSPECTION, General Description.>	Is the component that might influence the ABS problem normal?	Go to step **2.**	Repair or replace each unit.
2	**CHECK INDICATION OF DTC ON SCREEN.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor to ON. NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 4) Read the DTC. <Ref. to ABS(diag)-25, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all DTCs and Freeze Frame Data.	Is DTC displayed?	Go to step **4.**	Go to step **3.**
3	**PERFORM THE GENERAL DIAGNOSTICS.** 1) Inspect using “General Diagnostic Table”. <Ref. to ABS(diag)-89, General Diagnostic Table.> 2) Perform clear memory mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 3) Perform the inspection mode. <Ref. to ABS(diag)-26, Inspection Mode.> 4) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> Check the DTC does not displayed.	Does the ABS warning light go off after turning the ignition switch to ON?	Finish the diagnostic.	Check in accordance with “Diagnostic Procedure for ABS”. <Ref. to ABS(diag)-22, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Step		Check	Yes	No
4	**PERFORM THE DIAGNOSTICS.** 1) Refer to the “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, LIST, List of Diagnostic Trouble Code (DTC).> 2) Fix the wrong part. 3) Perform clear memory mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the inspection mode. <Ref. to ABS(diag)-26, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Repeat step 1 to 4 until DTC is not shown.	Finish the diagnostic.

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When / how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after Engine starting, engine is running) ❑ ON (after Engine starting, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Parts name: • Operating condition:		

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on ❑ When pulling the parking brake lever up. ❑ When releasing the parking brake lever down. • When / how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON (after Engine starting, engine is running) ❑ ON (after Engine starting, engine is at a standstill)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Parts name: • Operating condition:		

3. SYMPTOMS

ABS operating condition	❑ Does not move.		
	❑ Operates only when applying an abrupt brake.	Vehicle speed:	km/h
			MPH
	• How to step on brake pedal:		
	a) Operating time:		Sec.
	b) Operating noise: ❑ Occurs. / ❑ Does not occur.		
	• What kind of noise?	❑ Knocking ❑ Gong gong ❑ Bong ❑ Buzz ❑ Gong gong buzz ❑ Others:	
	c) Reaction force of brake pedal		
		❑ Stick ❑ Weak pedal resistance ❑ Strong pedal resistance ❑ Others:	
Behavior of vehicle	a) Directional stability cannot be obtained or the steering refuses to work when applying brakes: ❑ Yes / ❑ No		
	• When:	❑ When turning to the right ❑ When turning to the left ❑ When spinning ❑ Others:	
	b) Directional stability cannot be obtained or the steering refuses to work when accelerating: ❑ Yes / ❑ No		
	• When:	❑ When turning to the right ❑ When turning to the left ❑ When spinning ❑ Others:	
	c) Poor brake performance: ❑ Yes / ❑ No		
	• What kind:	❑ Long braking/stopping distance ❑ Brakes lock or drag ❑ Long pedal stroke ❑ Pedal sticks. ❑ Others:	
	d) Poor acceleration: ❑ Yes / ❑ No		
	• What kind:	❑ Not accelerate ❑ Engine stalls. ❑ Others:	
	e) Occurrence of vibration: ❑ Yes / ❑ No		
	• Where • What kind:		
	f) Occurrence of noise: ❑ Yes / ❑ No		
	• Where • What kind:		
	g) Other troubles occurred: ❑ Yes / ❑ No		
	• What kind:		

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Others:
	d) Road surface	❑ Dried ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others:
Condition	a) Brakes	Deceleration: G
		❑ Intermittent / ❑ Temporary
	b) Accelerator	Acceleration: G
		❑ Intermittent / ❑ Temporary
	c) Vehicle speed	km/h | MPH
		❑ Advancing ❑ When accelerating ❑ When decelerating ❑ At low speed ❑ When turning ❑ Others:
	d) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
	e) Degree of wear	Front RH tire:
		Front LH tire:
		Rear RH tire:
		Rear LH tire:
	f) Genuine parts are used.: ❑ Yes / ❑ No	
	g) Tire chain is attached.: ❑ Yes / ❑ No	
	h) T-type tire is used.: ❑ Yes / ❑ No	
	i) Condition of suspension alignment:	
	j) Loading state:	
	k) Repair parts are used.: ❑ Yes / ❑ No	
	• Contents:	
	l) Others:	

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor and ABSCM&H/U.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and ABSCM&H/U.

B: INSPECTION

Before performing diagnostic, check the following items which might affect ABS problems.

1. BATTERY

Measure battery voltage and check electrolyte.

Standard voltage:
12 V or more

Specific gravity:
More than 1.260

2. GROUND

Check the tightening torque of ABS ground (LHD: B302, RHD: F64) bolt.

Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

3. BRAKE FLUID

1) Check the brake fluid level.
2) Check the brake fluid for leaks.

4. HYDRAULIC UNIT

Check the hydraulic unit.
• With brake tester <Ref. to ABS-10, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
• Without brake tester <Ref. to ABS-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

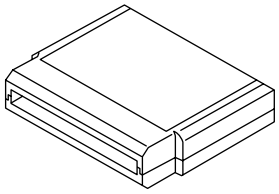
Check the brake pad and rotor.
• FRONT <Ref. to BR-18, INSPECTION, Front Brake Pad.> <Ref. to BR-19, INSPECTION, Front Disc Rotor.>
• REAR <Ref. to BR-23, INSPECTION, Rear Brake Pad.> <Ref. to BR-24, INSPECTION, Rear Disc Rotor.>

7. TIRE

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOL

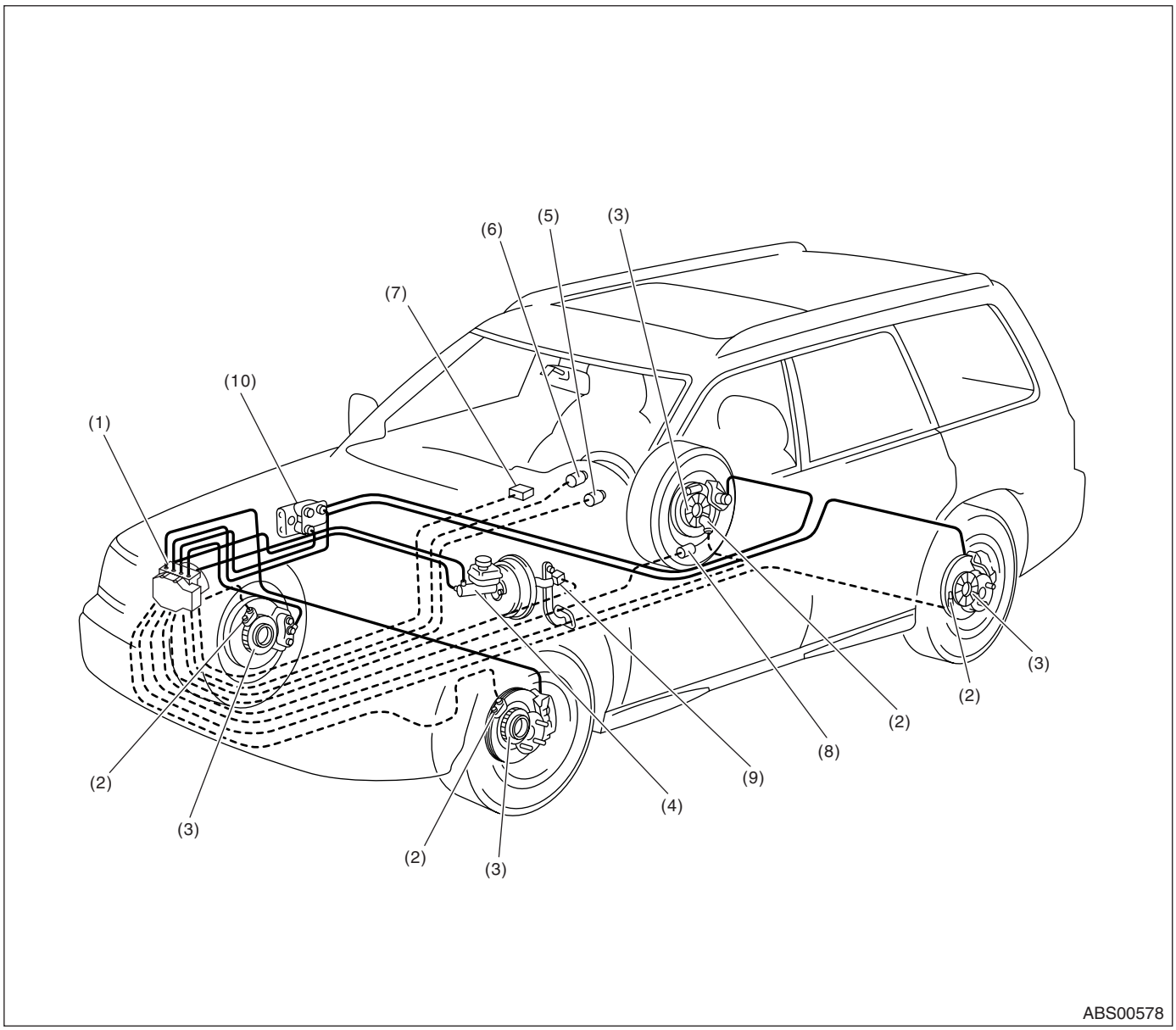
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

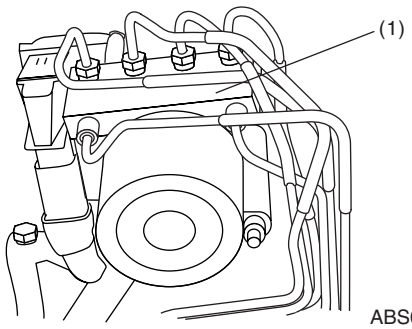
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

4. Electrical Component Location

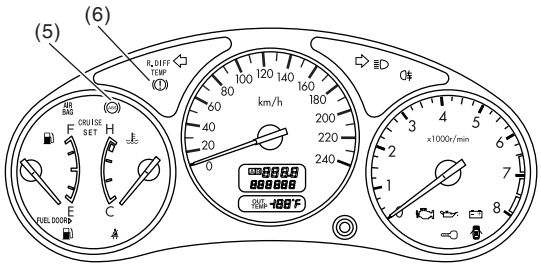
A: LOCATION



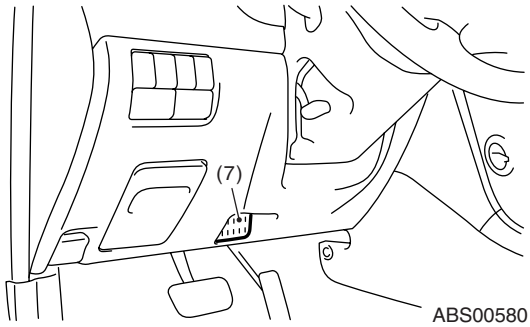
(1) ABS control module and hydraulic control unit (ABSCM&H/U)
(2) ABS wheel speed sensor
(3) Tone wheel
(4) Master cylinder
(5) ABS warning light
(6) Brake (EBD) warning light
(7) Data link connector
(8) G sensor
(9) Stop light switch
(10) Proportioning valve (Model without EBD)



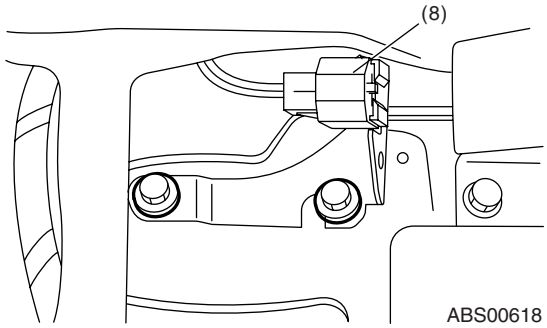
ABS00551



ABS00661

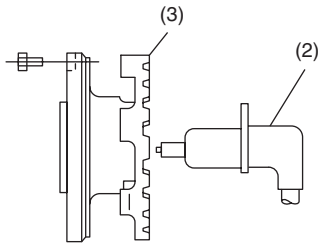


ABS00580



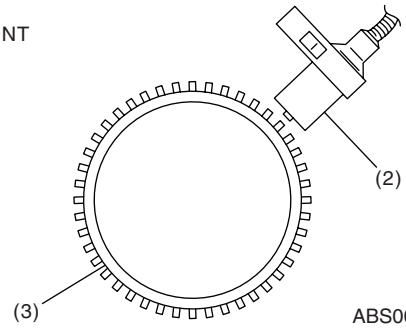
ABS00618

REAR



ABS00019

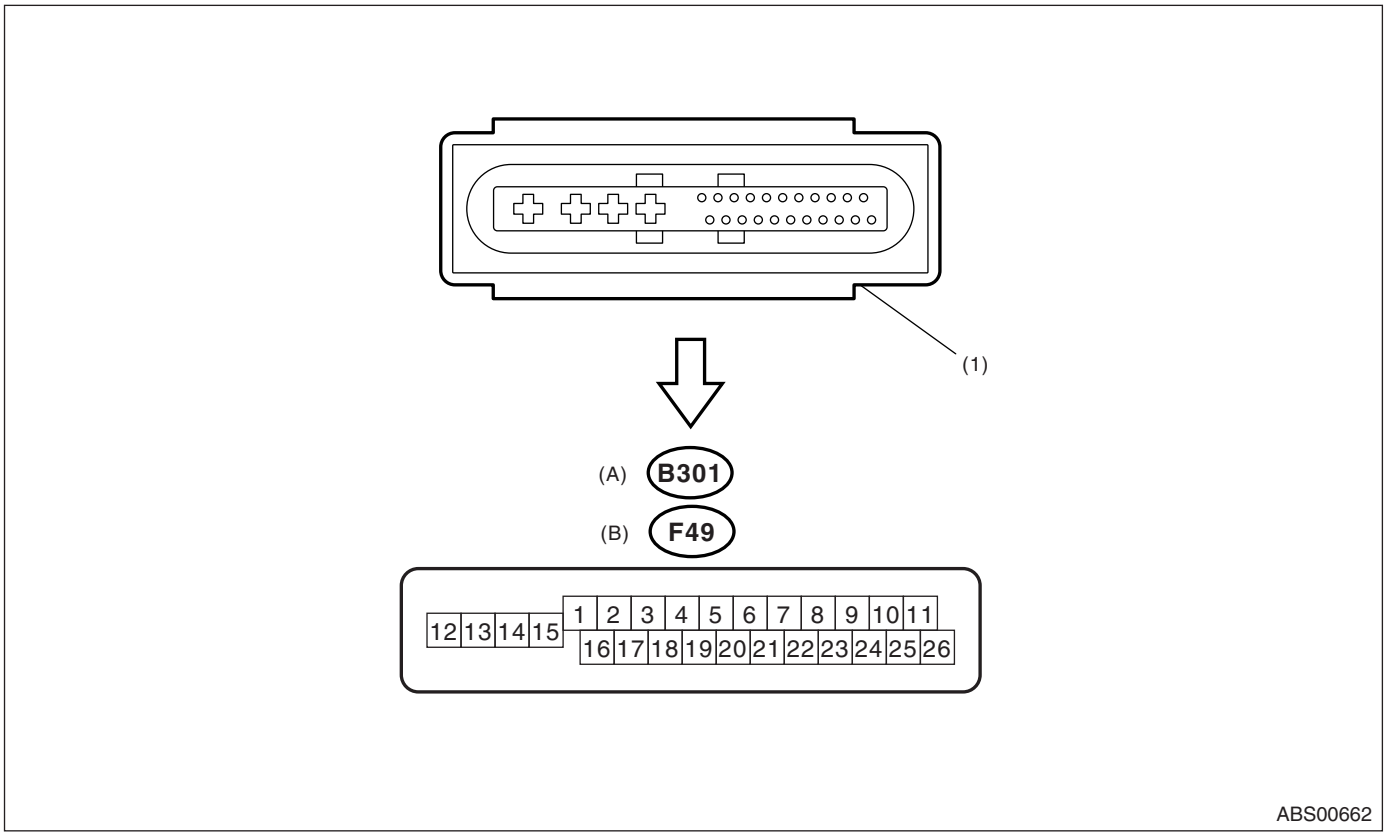
FRONT



ABS00028

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



(A) LHD model

(B) RHD model

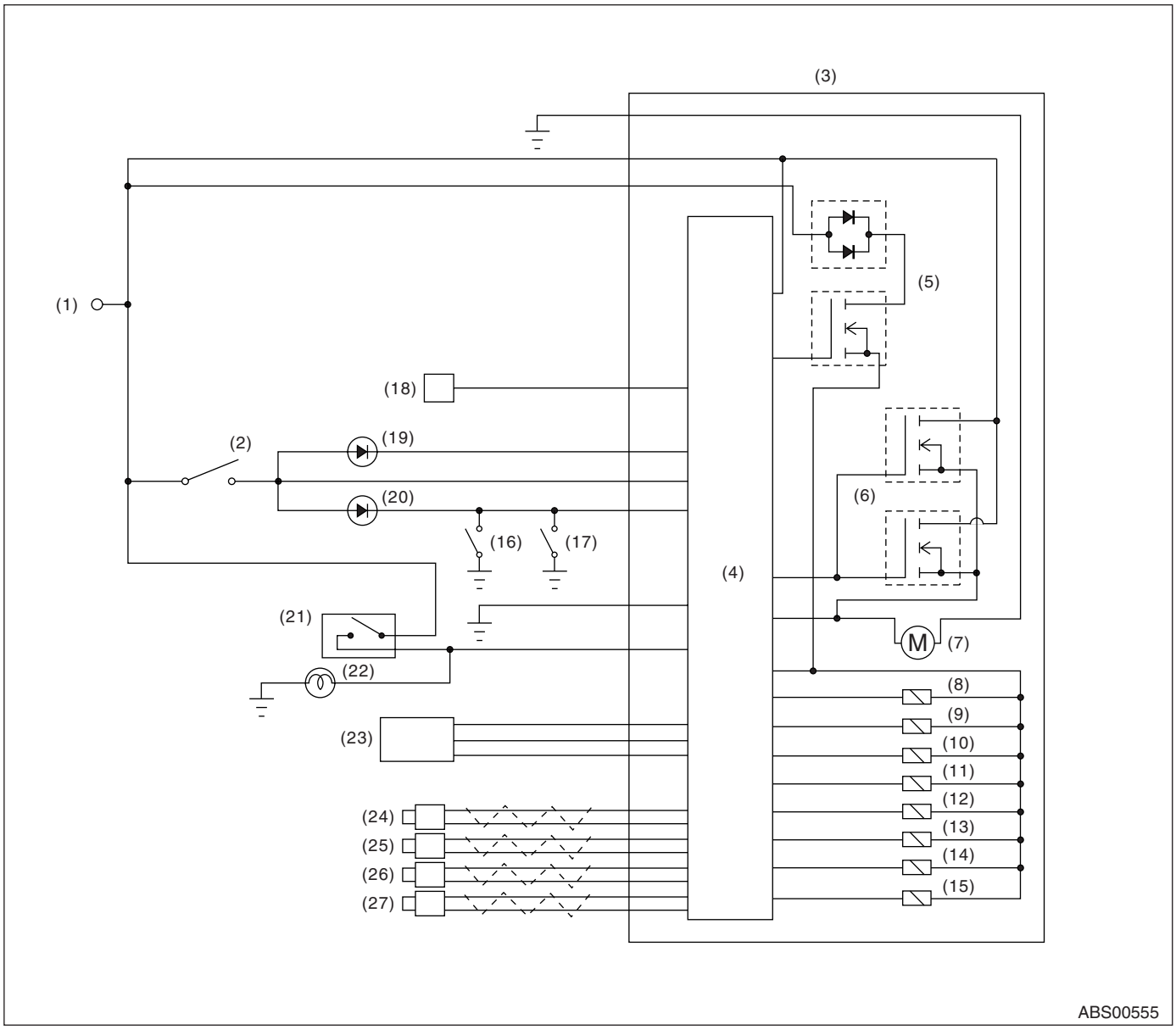
(1) ABS control module and hydraulic control unit (ABSCM&H/U) connector

NOTE:
- Terminal numbers in ABSCM&H/U connector are as shown in the figure.
- ABS warning light is illuminates when the connector is removed from ABSCM&H/U.

Description		Terminal No. (+) — (–)	Input/Output signal
ABS wheel speed sensor (Wheel speed sensor)	Front LH wheel	1 — 16	0.12 — 1 V (at 20 Hz)
	Front RH wheel	6 — 5	
	Rear LH wheel	3 — 2	
	Rear RH wheel	19 — 4	
Valve relay power supply *1		14 — 15	10 — 15 V
Motor relay power supply *1		13 — 15	10 — 15 V
G sensor	Power supply	24 — 10	4.75 — 5.25 V
	Ground	10	—
	Output	21 — 10	2.1 — 2.5 V when the vehicle is on a level surface
Stop light switch *1		20 — 15	Less than 1.5 V when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
ABS warning light		22 — 15	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Brake warning light (EBD warning light)		8 — 15	After turning the ignition switch to ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Subaru Select Monitor		7 — 15	Less than 1.5 V when no data is received. 0 ←→ 12 V pulse (in communication)
Power supply *1		18 — 15	When the ignition switch is ON, 10 — 15 V.
Grounding line		15	—

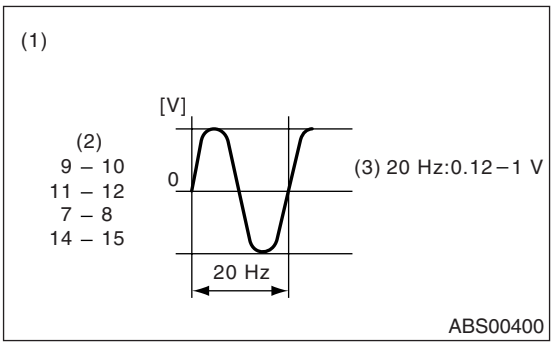
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.

B: WIRING DIAGRAM



(1) Battery
(2) Ignition switch
(3) ABS control module and hydraulic control unit (ABSCM&H/U)
(4) ABS control module
(5) Valve relay
(6) Motor relay
(7) Motor
(8) Front inlet solenoid valve LH
(9) Front outlet solenoid valve LH
(10) Front inlet solenoid valve RH
(11) Front outlet solenoid valve RH
(12) Rear inlet solenoid valve LH
(13) Rear outlet solenoid valve LH
(14) Rear inlet solenoid valve RH
(15) Rear outlet solenoid valve RH
(16) Parking brake switch
(17) Brake fluid level switch
(18) Data link connector
(19) ABS warning light
(20) Brake warning light
(21) Stop light switch
(22) Stop light
(23) G sensor
(24) Front ABS wheel speed sensor LH
(25) Front ABS wheel speed sensor RH
(26) Rear ABS wheel speed sensor LH
(27) Rear ABS wheel speed sensor RH

C: WAVEFORM



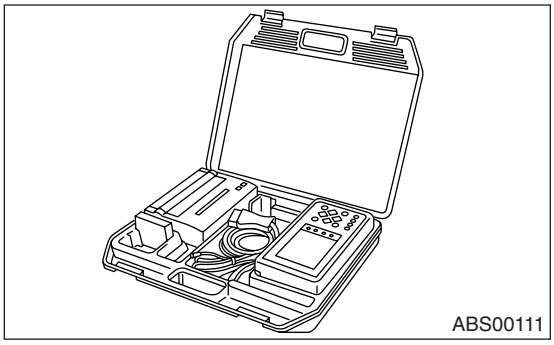
(1) ABS wheel speed sensor
(2) Terminal No.
(3) Standard output voltage

6. Subaru Select Monitor

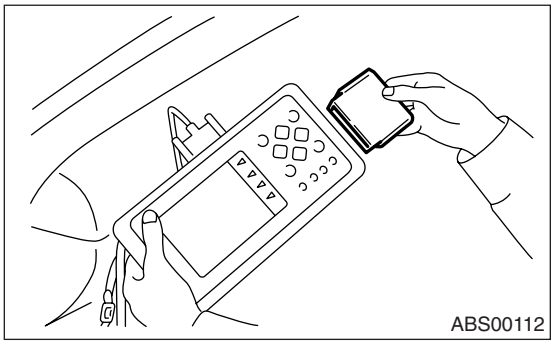
A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>

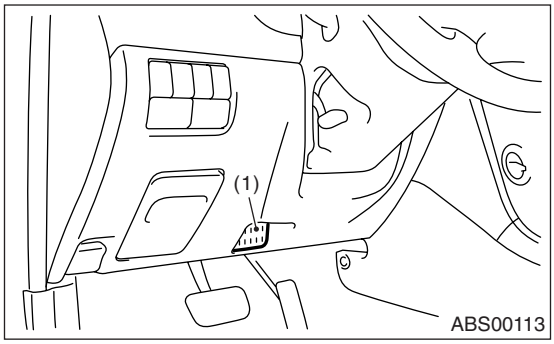


2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).

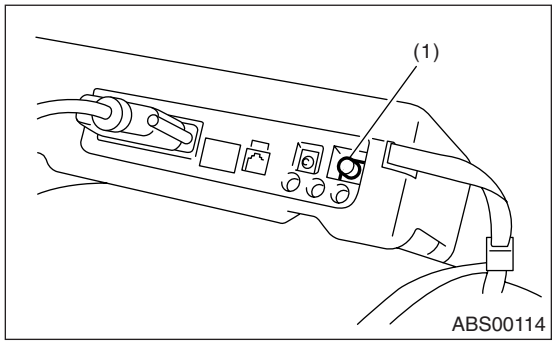


(1) Data link connector

(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF) and turn the Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
8) Press the [YES] key after the {ABS} is displayed.
9) On the «ABS Diagnosis» display screen, select the {DTC Display} and press the [YES] key.

NOTE:
• For details concerning operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTCs, refer to the "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>
• DTCs are displayed up to three in detected order.
• If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) on the occurrence of a problem, the DTC which is suffixed with a question mark "?" appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

10) If ABS and Subaru Select Monitor cannot communicate, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

11) When DTC is not displayed, check the meter circuit or CAN communication circuit. <Ref. to ABS(diag)-22, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Display	Contents to be monitored
Current	Indicate the latest DTC on the Subaru Select Monitor display.
Old	Indicate the latest DTC in previous trouble on the Subaru Select Monitor display.
Older	Indicate the latest DTC in second previous trouble on the Subaru Select Monitor display.
Before 3	Indicate the latest DTC in third previous trouble on the Subaru Select Monitor display.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the {ABS} is displayed.
4) On the «Brake Control Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select the data display style and press the [YES] key.
6) Using a scroll key, move the display screen up or down until necessary data is shown.
• A list of the support data is shown in the following table.

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
BLS Signal	Brake ON/OFF is displayed.	ON or OFF
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.	m/s (m/s^2)
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Motor relay monitor voltage is displayed.	V
IG power supply voltage	Voltage supplied to ABSCM&H/U is displayed.	V
ABS Control Flag	ABS control condition is displayed.	ON or OFF
ABS OK B Signal	ABS system normal/abnormal is displayed.	OK or NG

NOTE:
For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the {ABS} is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.

Display	Contents to be monitored
Clear memory?	Function of clearing DTC.

5) When “Done” and “Turn ignition switch OFF” are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:
For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

4. ABS SEQUENCE CONTROL

Display	Contents to be monitored	Index No.
ABS sequence control	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to ABS-11, ABS Sequence Control.>

5. FREEZE FRAME DATA

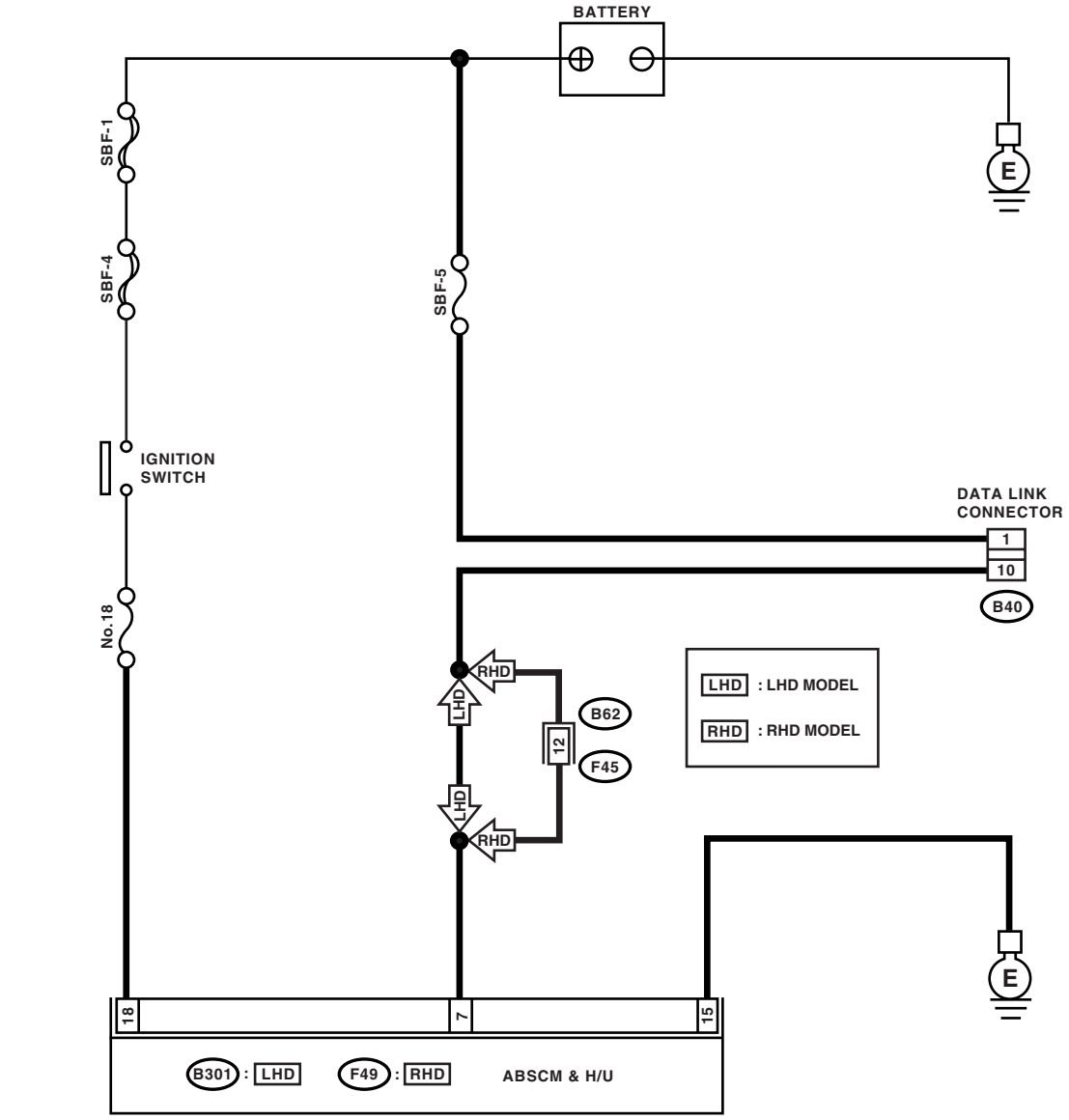
NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
• Freeze frame data will be memorized up to three.
• If a Freeze Frame Data is not properly stored in memory (due to a drop in ABS control module power supply, etc.), the DTC which is suffixed with a question mark “?” appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

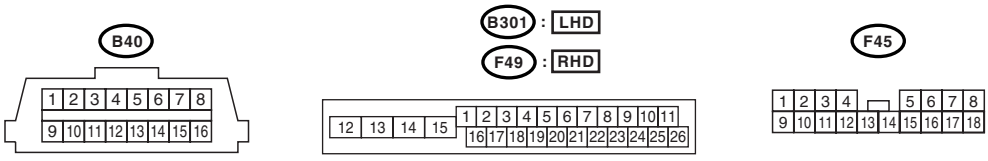
Display	Contents to be monitored
FR Wheel Speed	Wheel speed detected by the Front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel Speed	Wheel speed detected by the Front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel Speed	Wheel speed detected by the Rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel Speed	Wheel speed detected by the Rear ABS wheel speed sensor LH is displayed in km/h or MPH.
IG power supply voltage	Voltage supplied (V) to ABSCM&H/U is displayed.
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.
Motor relay monitor	Motor relay condition is displayed.
BLS Signal	Brake ON/OFF is displayed.
Vehicle speed	Vehicle speed calculated by ABS control module is displayed.
ABS Control Flag	ABS control condition is displayed.
Power Supply Failure	Whether abnormal voltage occurred or not is displayed during malfunction.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:
Defective harness connector
TROUBLE SYMPTOM:
Communication is impossible between ABS and Subaru Select Monitor.
WIRING DIAGRAM:





ABS00663

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Does the ignition switch turn to ON?	Go to step **2.**	Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage more than 11 V?	Go to step **3.**	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step **4.**
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using Subaru Select Monitor, check whether communication to other system can be executed normally.	Is the system name and model year displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connector. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Is the system name and model year displayed on Subaru Select Monitor?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect ABSCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL FOR ABSCM&H/U.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Repair harness and connector between each control module and data link connector.
8	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR.** Measure the resistance between ABSCM&H/U connector and data link connector. ***Connector & terminal*** ***LHD model*** ***(B301) No. 7 — (B40) No. 10:*** ***RHD model*** ***(F49) No. 7 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Repair harness and connector between ABSCM&H/U and data link connector.
9	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM&H/U until it is locked by clamps?	Go to step **10.**	Insert ABSCM&H/U connector into ABSCM&H/U.

	Step	Check	Yes	No
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 18 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **11.**	Repair open circuit in harness between ABSCM&H/U and battery.
11	**CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance of harness between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 15 — Chassis ground:*** ***RHD model*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **12.**	Repair open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2. WITHOUT DTC

DETECTING CONDITION:

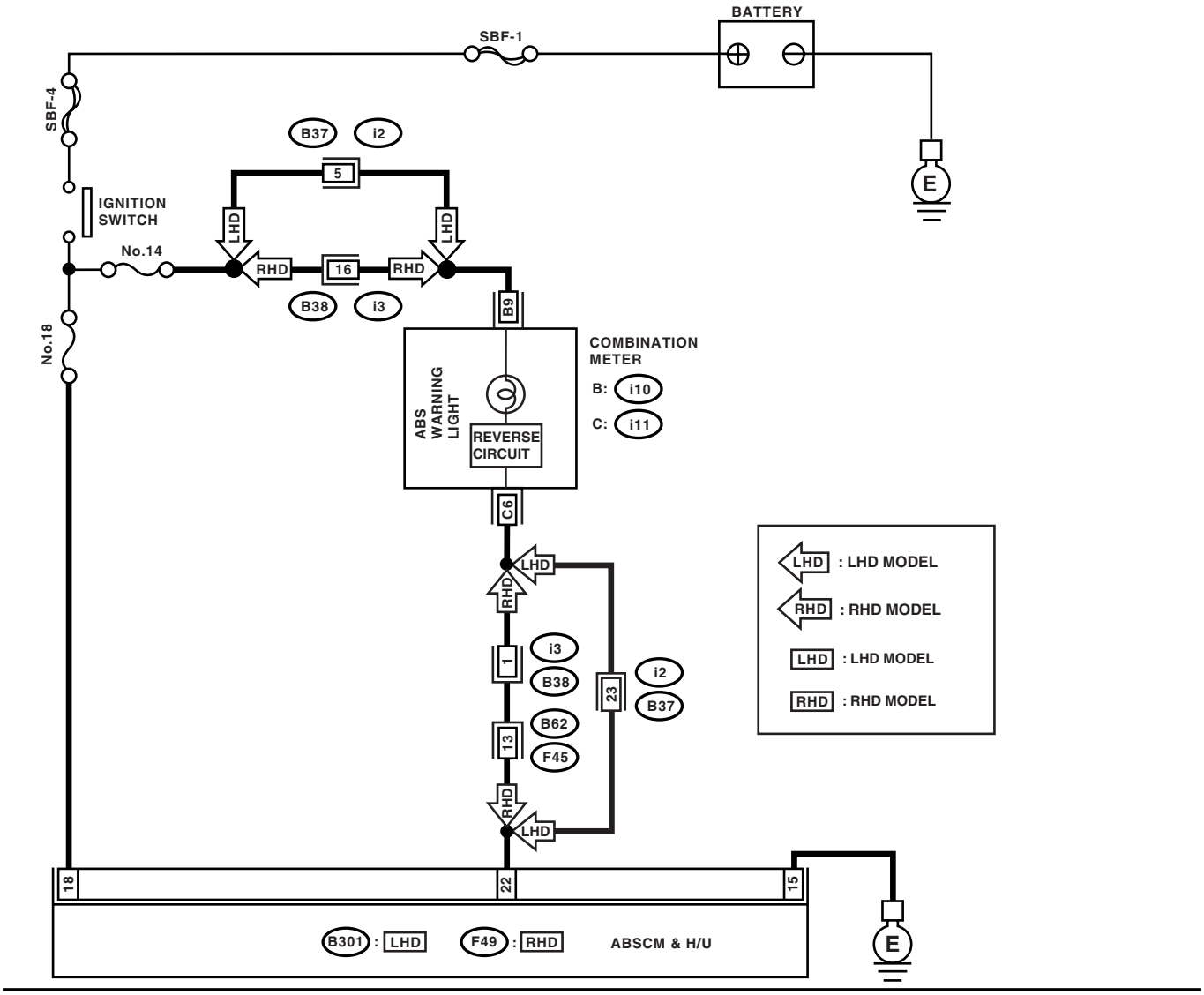
- Defective combination meter
- Open in harness

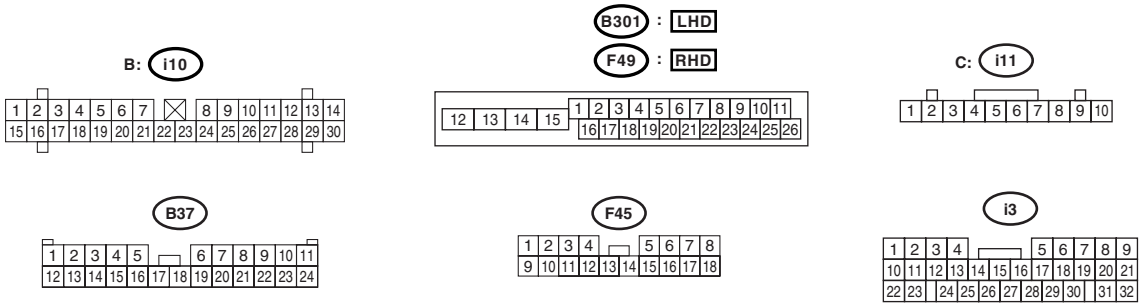
TROUBLE SYMPTOM:

- ABS warning light does not go off.
- “NO TROUBLE CODE” will be displayed on the Subaru Select Monitor.

NOTE:
When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is in normal condition.

WIRING DIAGRAM:





ABS00664

	Step	Check	Yes	No
1	**DATA CHECK SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the condition of “ABS warning light”.	Is “ON” indicated?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **2.**
2	**CHECK WIRING HARNESS.** Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***LHD model*** ***(i11) No. 6 — (B301) No. 22:*** ***RHD model*** ***(i11) No. 6 — (F49) No. 22:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair harness and connector between ABSCM&H/U and combination meter connector.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in ABSCM connector and combination meter connector?	Repair the connector.	Check the combination meter.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as possible.
Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

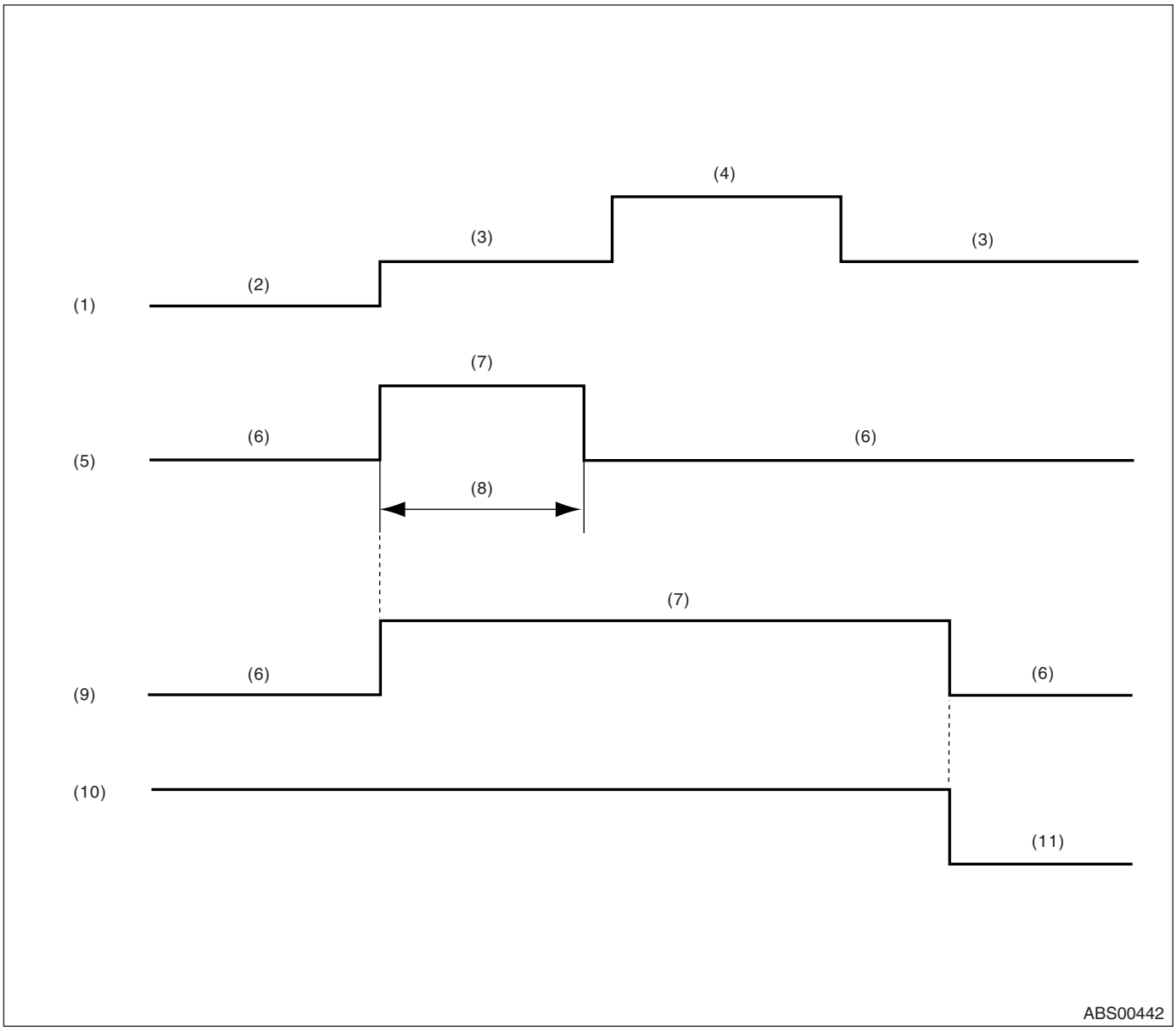
9. Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to “Subaru Select Monitor”. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

10.ABS Warning Light / Brake Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Start
(5) ABS warning light
(6) Light OFF
(7) Light ON
(8) Approx. 2 seconds
(9) Brake warning light (EBD warning light)
(10) Parking brake
(11) Released

ABS Warning Light / Brake Warning Light Illumination Pattern

1) When the ABS warning light and brake warning light do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) When ABS warning light remains constantly OFF, check the combination meter circuit. <Ref. to ABS(diag)-30, ABS WARNING LIGHT DOES NOT COME ON, ABS Warning Light / Brake Warning Light Illumination Pattern.>
3) When ABS warning light does not go off, check the combination meter circuit. <Ref. to ABS(diag)-32, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>
4) When brake warning light does not go off, check the brake warning light circuit, combination meter circuit. <Ref. to ABS(diag)-34, BRAKE WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

NOTE:
Even though the ABS warning light does not go off after approx. 2 seconds from ABS warning light illumination, the ABS function operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS function does not operate while the ABS warning light is illuminated.

B: ABS WARNING LIGHT DOES NOT COME ON

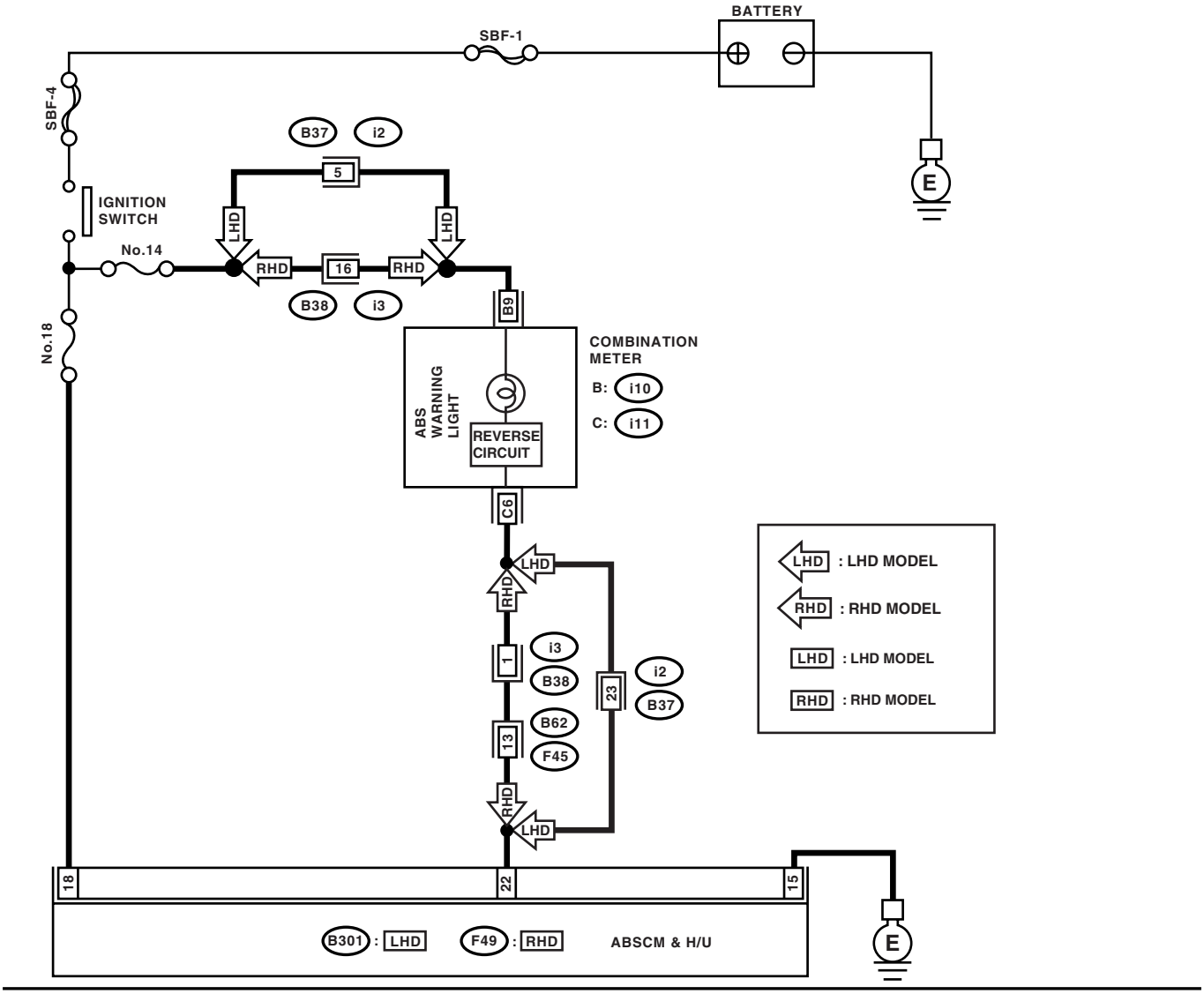
DETECTING CONDITION:

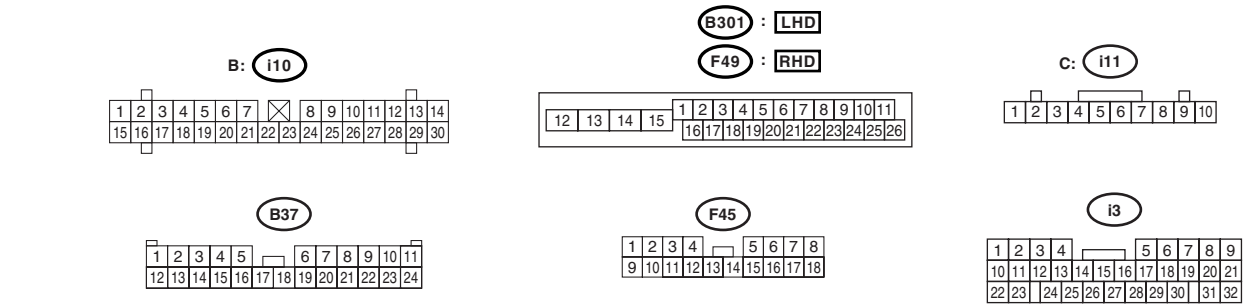
- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:





ABS00664

ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK ILLUMINATION OF OTHER LIGHTS.** Turn the ignition switch to ON. (engine OFF)	Do other warning lights illuminate?	Go to step **2.**	Check the combination meter.
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-25, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnostic according to DTC.	Go to step **3.**
3	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B301) (LHD model), (F49) (RHD model) from ABSCM&H/U. 3) Disconnect the connector (i11) from the combination meter. 4) Measure the resistance between ABSCM connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 22 — Chassis ground:*** ***RHD model*** ***(F49) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair harness and connector between ABSCM&H/U and combination meter connector.
4	**CHECK ABSCM.** 1) Connect the connector (B301) (LHD model), (F49) (RHD model) to the ABSCM&H/U. 2) Turn the ignition to ON. 3) Immediately after turning ignition switch to ON (within approx. 2 seconds), measure the resistance of harness between the combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

C: ABS WARNING LIGHT DOES NOT GO OFF

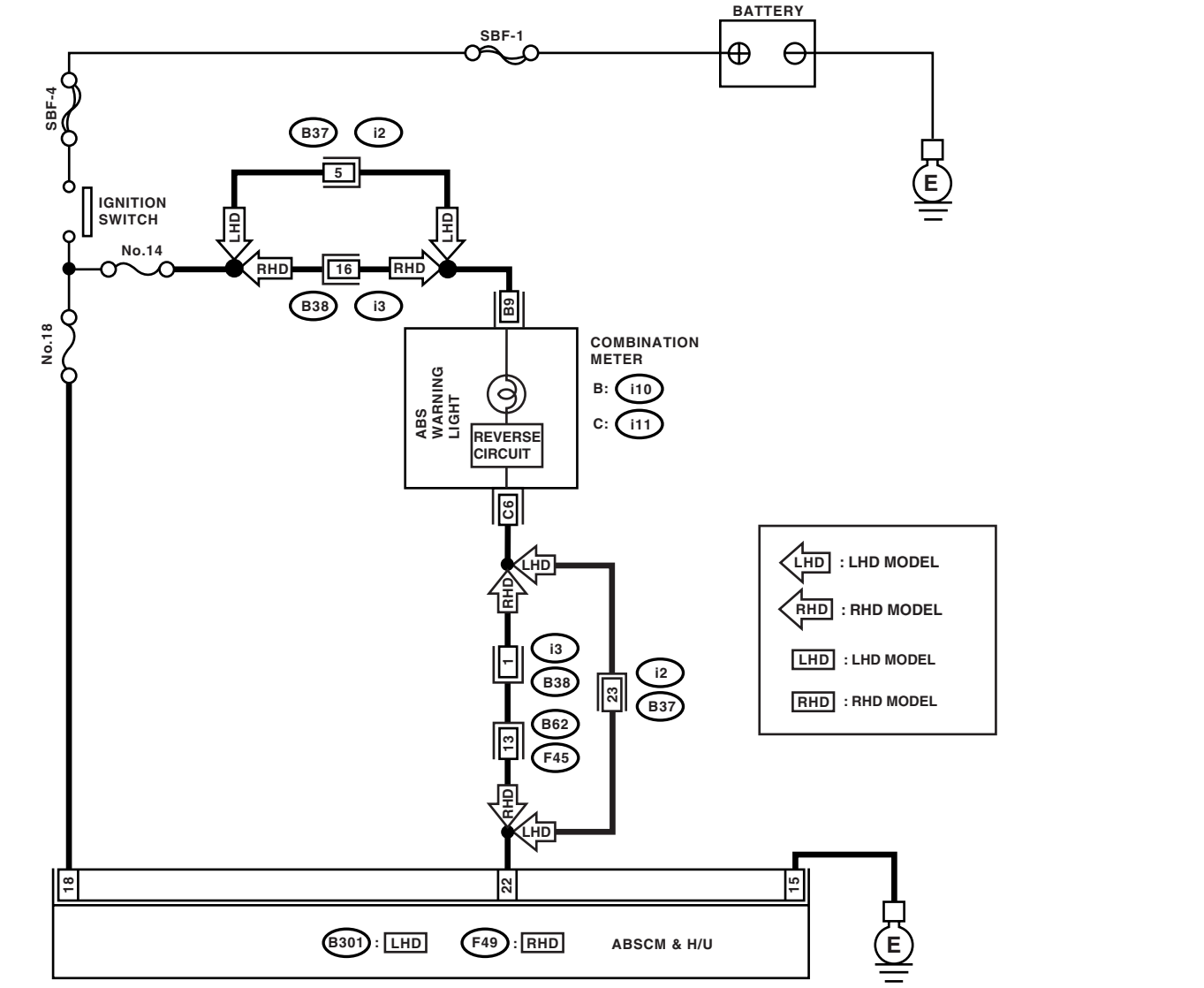
DETECTING CONDITION:

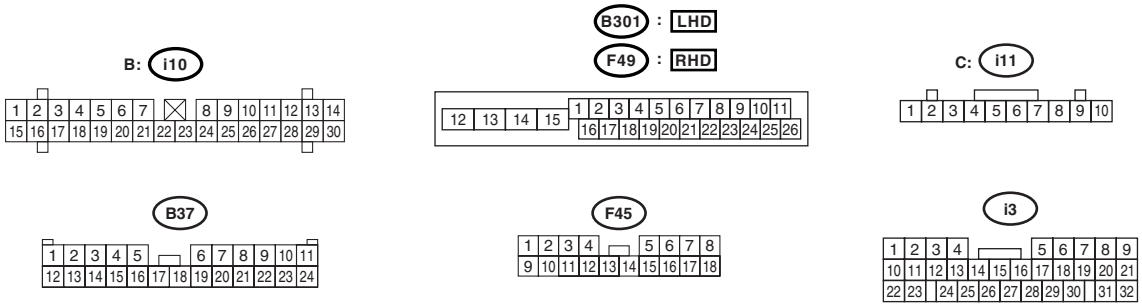
- Defective combination meter
- Open in harness

TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept on.

WIRING DIAGRAM:





ABS00664

	Step	Check	Yes	No
1	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-25, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnostic according to DTC.	Go to step **2.**
2	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (B301) (LHD model), (F49) (RHD model) from ABSCM&H/U. 3) Disconnect the connector (i11) from the combination meter. 4) Measure the resistance between ABSCM connector and combination meter connector. ***Connector & terminal*** ***LHD model*** ***(B301) No. 22 — (i11) No. 6:*** ***RHD model*** ***(F49) No. 22 — (i11) No. 6:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair harness and connector between ABSCM&H/U and combination meter connector.
3	**CHECK POOR CONTACT IN CONNECTOR.** Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM.** 1) Connect the connector (B301) (LHD model), (F49) (RHD model) to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: BRAKE WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Brake warning light circuit is shorted.
- Defective sensor/connector

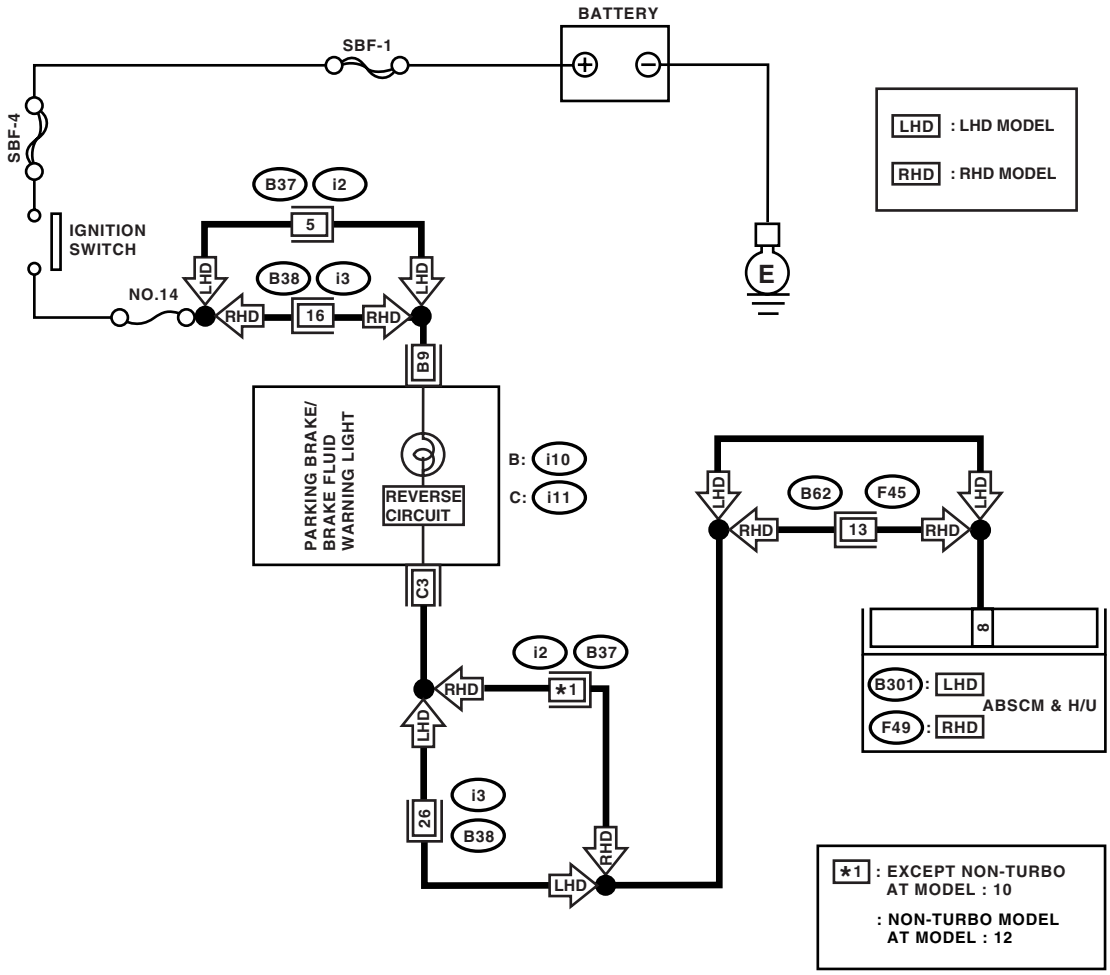
TROUBLE SYMPTOM:

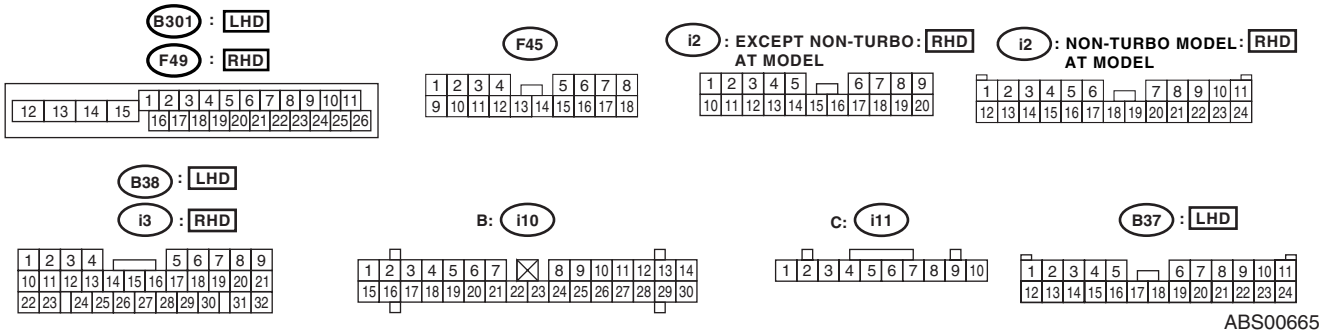
After starting the engine, the brake warning light is kept on though the parking lever is released.

NOTE:
When ABS warning light dose not go off too, perform the diagnostics of ABS warning light dose not go off. After repairing the ABS warning light, perform the diagnostics of brake warning light dose not go off. <Ref. to ABS(diag)-32, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

ABS Warning Light / Brake Warning Light Illumination Pattern

WIRING DIAGRAM:





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ABS Warning Light / Brake Warning Light Illumination Pattern

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF ABSCM&H/U CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Check that the ABSCM&H/U connector is inserted to ABSCM&H/U until the clamp locks onto it.	Is the connector correctly inserted?	Go to step **2.**	Insert the ABSCM&H/U connector until the clamp locks onto it.
2	**READ DTC.** Read the DTC. <Ref. to ABS(diag)-25, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnostic according to DTC.	Go to step **3.**
3	**CHECK THE BRAKE FLUID AMOUNT.** Check the amount of brake fluid in the reservoir tank of master cylinder.	Is the amount of brake fluid between the lines of MAX and MIN?	Go to step **4.**	Replenish brake fluid to the specified value.
4	**CHECK BRAKE FLUID LEVEL SWITCH.** 1) Disconnect the level switch connector (B16) from master cylinder. 2) Measure the resistance of master cylinder terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the master cylinder.
5	**CHECK PARKING BRAKE SWITCH.** 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the parking brake switch.
6	**CHECK GROUND SHORT OF HARNESS.** 1) Disconnect the connector (i11) from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness connector between combination meter and parking brake switch.
7	**CHECK HARNESS.** 1) Disconnect the connector (F49) from ABSCM&H/U. 2) Disconnect the connector (i11) from the combination meter. 3) Measure the resistance between ABSCM&H/U connector and combination meter connector. ***Connector & terminal*** ***LHD model*** ***(B301) No. 8 — (i11) No. 3:*** ***RHD model*** ***(F49) No. 8 — (i11) No. 3:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Repair harness between ABSCM&H/U and combination meter connector.
8	**CHECK POOR CONTACT IN CONNECTOR.** Check poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step **9.**
9	**CHECK ABSCM.** 1) Connect the connector to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. ***Connector & terminal*** ***(i11) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

11.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Content of diagnostic		Display	Reference target
21	ABS wheel speed sensor malfunction (Broken wire, short)	Front ABS wheel speed sensor RH	Front Right ABS wheel speed sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-40, DTC 21 ABS WHEEL SPEED SENSOR FR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of front ABS wheel speed sensor RH	Front Right ABS wheel speed sensor Signal	<Ref. to ABS(diag)-40, DTC 22 ABS WHEEL SPEED SENSOR FR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	ABS wheel speed sensor malfunction (Broken wire, short)	Front ABS wheel speed sensor LH	Front Left ABS wheel speed sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-41, DTC 23 ABS WHEEL SPEED SENSOR FL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of front ABS wheel speed sensor LH	Front Left ABS wheel speed sensor Signal	<Ref. to ABS(diag)-50, DTC 24 ABS WHEEL SPEED SENSOR FL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor RH	Rear Right ABS wheel speed sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-58, DTC 25 ABS WHEEL SPEED SENSOR RR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor RH	Rear Right ABS wheel speed sensor Signal	<Ref. to ABS(diag)-58, DTC 26 ABS WHEEL SPEED SENSOR RR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor LH	Rear Left ABS wheel speed sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-58, DTC 27 ABS WHEEL SPEED SENSOR RL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor LH	Rear Left ABS wheel speed sensor Signal	<Ref. to ABS(diag)-58, DTC 28 ABS WHEEL SPEED SENSOR RL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29		Abnormal ABS wheel speed sensor on any one of four sensors	Any One of Four ABS wheel speed sensors Signal	<Ref. to ABS(diag)-59, DTC 29 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Inlet valve malfunction in hydraulic unit	Front inlet valve RH	FR Hold Valve malfunction	<Ref. to ABS(diag)-65, DTC 31 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Content of diagnostic		Display	Reference target
32	Outlet valve malfunction in hydraulic unit	Front outlet valve RH	FR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-65, DTC 32 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Inlet valve malfunction in hydraulic unit	Front inlet valve LH	FL Hold Valve malfunction	<Ref. to ABS(diag)-65, DTC 33 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Outlet valve malfunction in hydraulic unit	Front outlet valve LH	FL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-65, DTC 34 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Inlet valve malfunction in hydraulic unit	Rear inlet valve RH	RR Hold Valve malfunction	<Ref. to ABS(diag)-66, DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Outlet valve malfunction in hydraulic unit	Rear outlet valve RH	RR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-69, DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Inlet valve malfunction in hydraulic unit	Rear inlet valve LH	RL Hold Valve malfunction	<Ref. to ABS(diag)-71, DTC 37 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Outlet valve malfunction in hydraulic unit	Rear outlet valve LH	RL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-71, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	ABS control module malfunction		ECM	<Ref. to ABS(diag)-72, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Power voltage malfunction		Power Supply Voltage Failure	<Ref. to ABS(diag)-74, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Valve relay on failure		Valve Relay	<Ref. to ABS(diag)-77, DTC 51 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	Motor/motor relay on failure		Motor and Motor Relay	<Ref. to ABS(diag)-80, DTC 52 MOTOR/MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Content of diagnostic	Display	Reference target
54	Stop light switch signal circuit malfunction	Brake Light Switch	<Ref. to ABS(diag)-83, DTC 54 FAULTY STOP LIGHT SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
56	Faulty G sensor output voltage or output signal	G Sensor Failure	<Ref. to ABS(diag)-85, DTC 56 G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

12.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 21 ABS WHEEL SPEED SENSOR FR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
For the diagnostic procedure, refer to DTC 23 <Ref. to ABS(diag)-41, DTC 23 ABS WHEEL SPEED SENSOR FL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 22 ABS WHEEL SPEED SENSOR FR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
For the diagnostic procedure, refer to DTC 24. <Ref. to ABS(diag)-50, DTC 24 ABS WHEEL SPEED SENSOR FL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 23 ABS WHEEL SPEED SENSOR FL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

DTC DETECTING CONDITION:

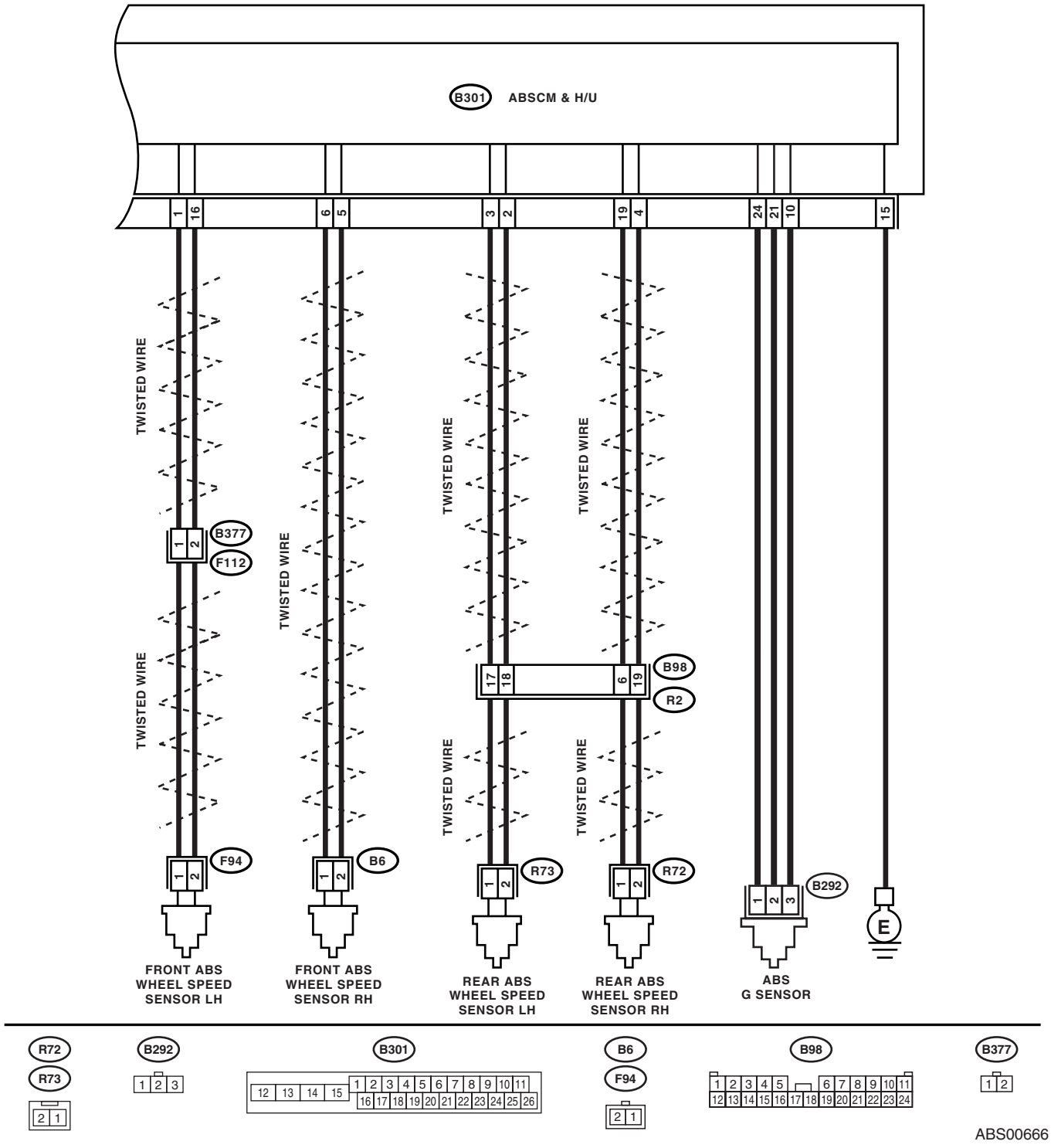
- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

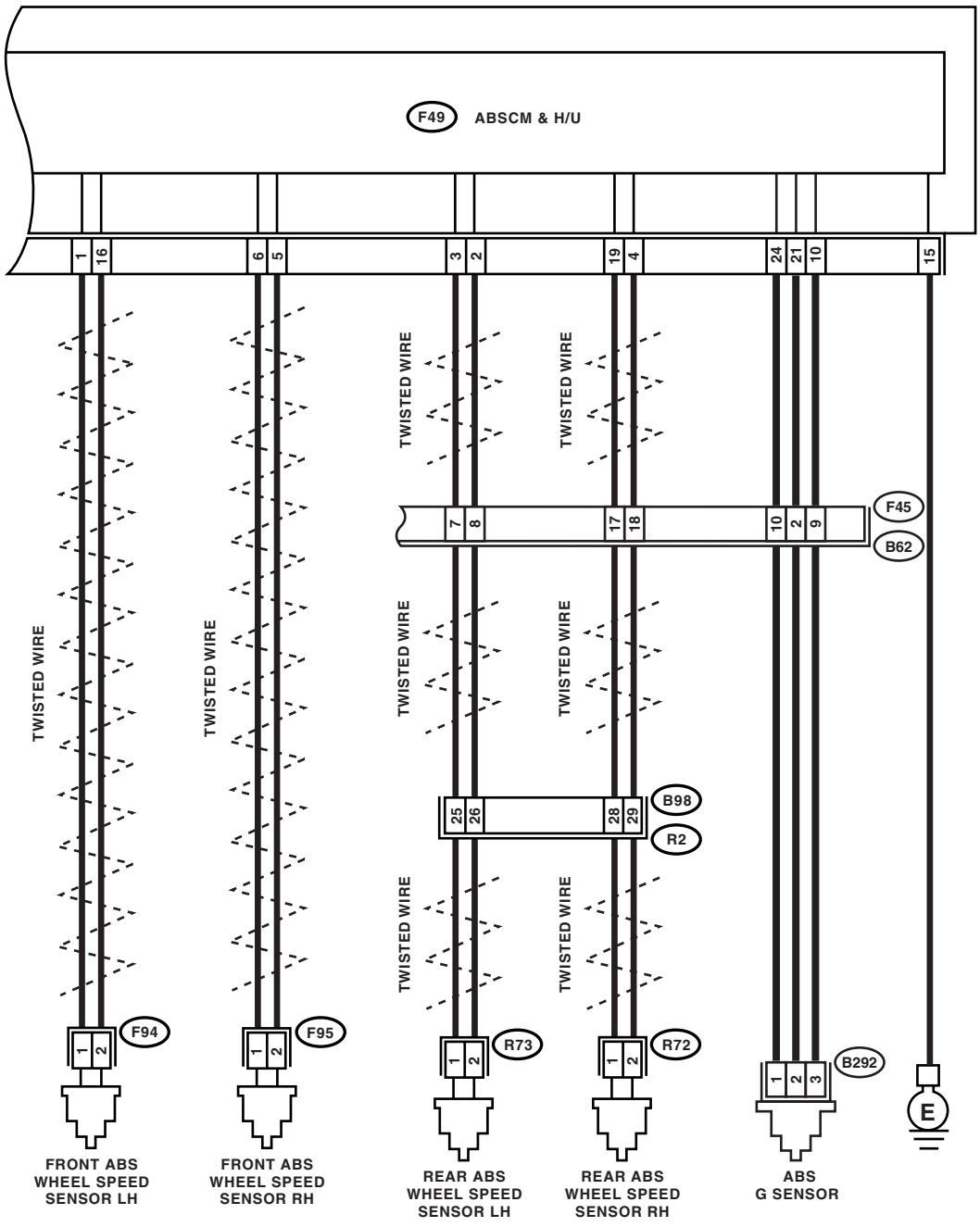
ABS does not operate.

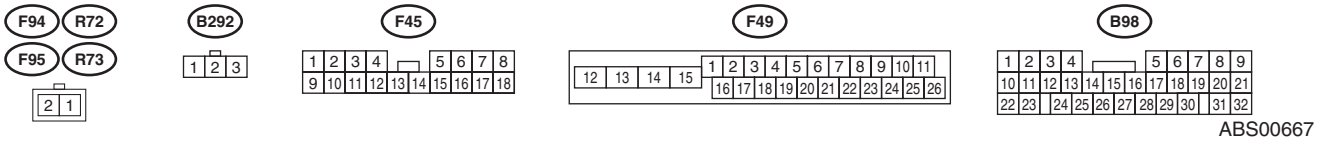
WIRING DIAGRAM:

- LHD MODEL



- RHD MODEL





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read the ABS wheel speed sensor output corresponding to faulty system in the select monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 25 ft-lb)?	Go to step **3.**	Tighten the ABS wheel speed sensor installation bolts securely.
3	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **4.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **5.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnostic still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnostic corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
8	**CHECK ABS WHEEL SPEED SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABS wheel speed sensor. 3)Measure the resistance of ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminals*** ***Front RH*** ***No. 1 — No. 2:*** ***Front LH*** ***No. 1 — No. 2:*** ***Rear RH*** ***No. 1 — No. 2:*** ***Rear LH*** ***No. 1 — No. 2:***	Is the resistance as following value? Front: 1— 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
9	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1)Disconnect the connector from ABSCM&H/U. 2)Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH*** ***No. 1 (+) — Chassis ground (−):*** ***Front LH*** ***No. 1 (+) — Chassis ground (−):*** ***Rear RH*** ***No. 1 (+) — Chassis ground (−):*** ***Rear LH*** ***No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **10.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
10	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH*** ***No. 1 (+) — Chassis ground (−):*** ***Front LH*** ***No. 1 (+) — Chassis ground (−):*** ***Rear RH*** ***No. 1 (+) — Chassis ground (−):*** ***Rear LH*** ***No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>

	Step	Check	Yes	No
11	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1)Turn the ignition switch to OFF. 2)Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 21*** ***LHD model*** ***(B301) No. 6 — No. 5:*** ***RHD model*** ***(F49) No. 6 — No. 5:*** ***DTC 23*** ***LHD model*** ***(B301) No. 1 — No. 16:*** ***RHD model*** ***(F49) No. 1 — No. 16:*** ***DTC 25*** ***LHD model*** ***(B301) No. 19 — No. 4:*** ***RHD model*** ***(F49) No. 19 — No. 4:*** ***DTC 27*** ***LHD model*** ***(B301) No. 3 — No. 2:*** ***RHD model*** ***(F49) No. 3 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **12.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD model*** ***(B301) No. 6 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 6 (+) — Chassis ground (–):*** ***DTC 23*** ***LHD model*** ***(B301) No. 1 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***DTC 25*** ***LHD model*** ***(B301) No. 19 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 19 (+) — Chassis ground (–):*** ***DTC 27*** ***LHD model*** ***(B301) No. 3 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
13	**CHECK BATTERY SHORT OF HARNESS.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD model*** ***(B301) No. 6 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 6 (+) — Chassis ground (–):*** ***DTC 23*** ***LHD model*** ***(B301) No. 1 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 1 (+) — Chassis ground (–):*** ***DTC 25*** ***LHD model*** ***(B301) No. 19 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 19 (+) — Chassis ground (–):*** ***DTC 27*** ***LHD model*** ***(B301) No. 3 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 3 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
14	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 25 ft-lb)?	Go to step **15.**	Tighten the ABS wheel speed sensor installation bolts securely.
15	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.Is the gap as following value?	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **16.**	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
16	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>

	Step	Check	Yes	No
17	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** 1)Turn the ignition switch to ON. 2)Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminals*** ***Front RH*** ***No. 1 — Chassis ground:*** ***Front LH*** ***No. 1 — Chassis ground:*** ***Rear RH*** ***No. 1 — Chassis ground:*** ***Rear LH*** ***No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Replace the ABS wheel speed sensor and ABSCM&H/U. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.> <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	**CHECK GROUND SHORT OF HARNESS.** 1)Turn the ignition switch to OFF. 2)Connect the connector to ABS wheel speed sensor. 3)Measure the resistance between ABSCM&H/U connector terminal and chassis ground. ***Connector & terminal*** ***DTC 21*** ***LHD model*** ***(B301) No. 6 — Chassis ground:*** ***RHD model*** ***(F49) No. 6 — Chassis ground:*** ***DTC 23*** ***LHD model*** ***(B301) No. 1 — Chassis ground:*** ***RHD model*** ***(F49) No. 1 — Chassis ground:*** ***DTC 25*** ***LHD model*** ***(B301) No. 19 — Chassis ground:*** ***RHD model*** ***(F49) No. 19 — Chassis ground:*** ***DTC 27*** ***LHD model*** ***(B301) No. 3 — Chassis ground:*** ***RHD model*** ***(F49) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. And replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20.**
20	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnostic still being output?	Replace the ABSCM only.	Go to step **21.**

Step		Check	Yes	No
21	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnostic corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS wheel speed sensor.

D: DTC 24 ABS WHEEL SPEED SENSOR FL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

DTC DETECTING CONDITION:

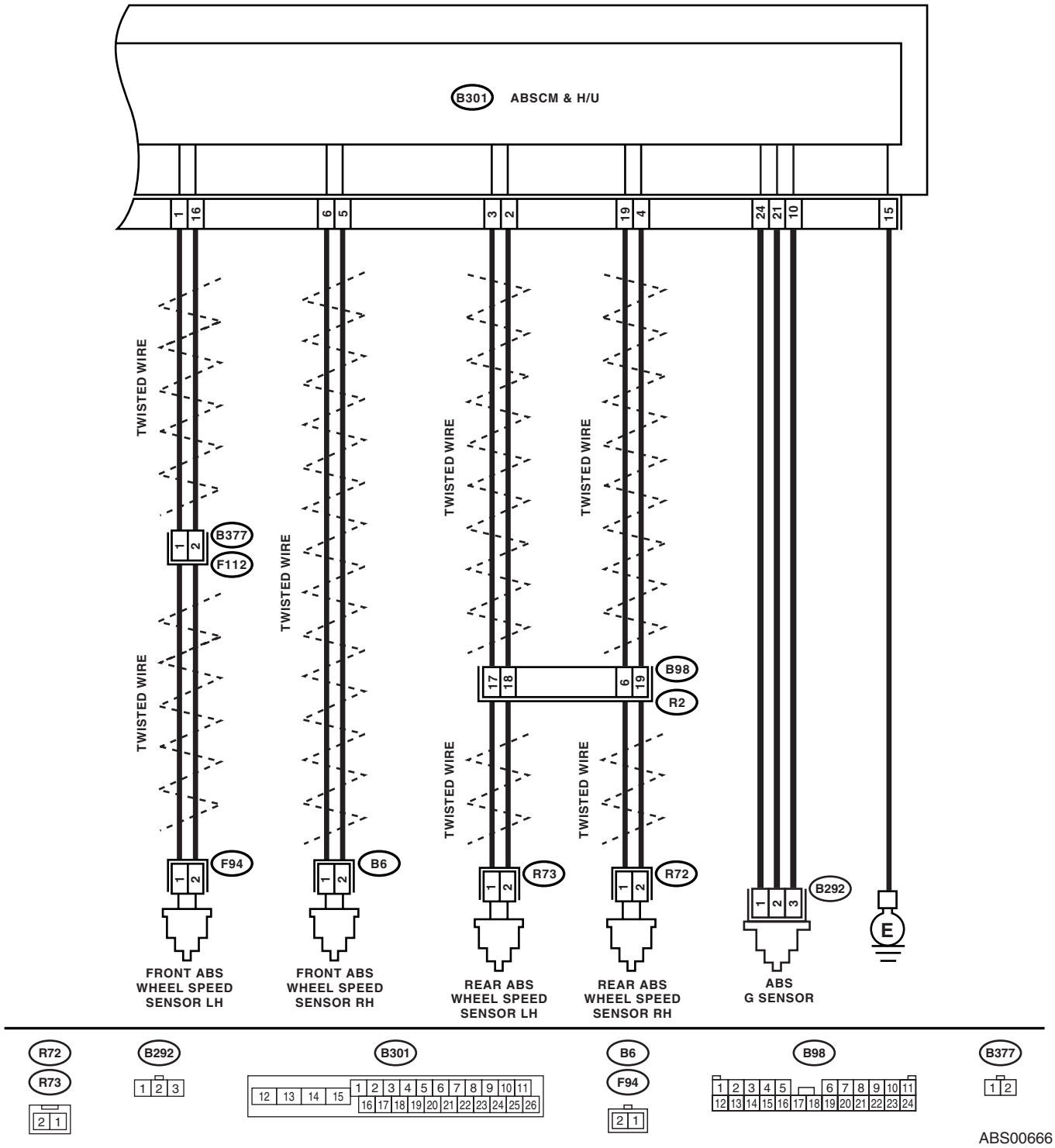
- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:

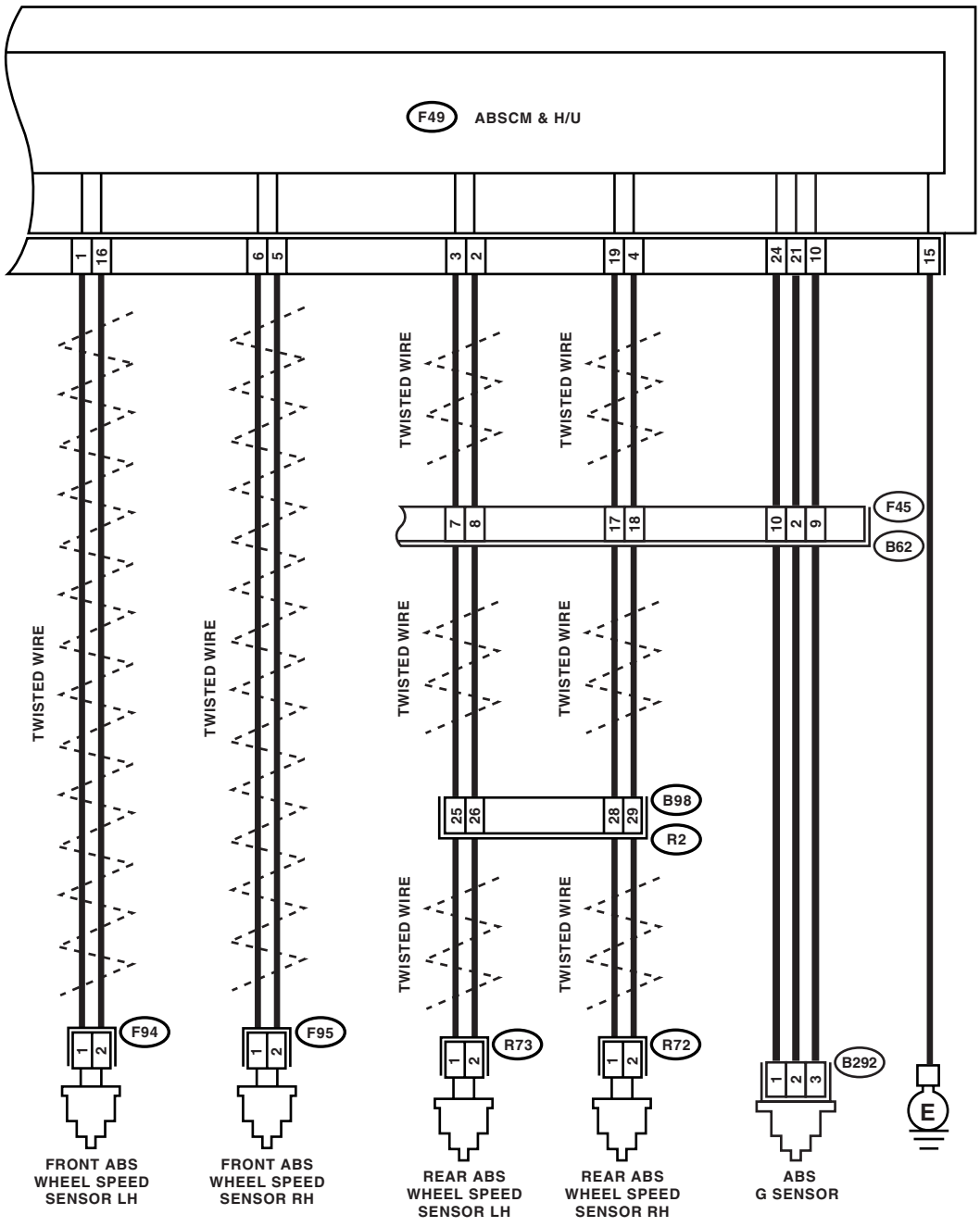
ABS does not operate.

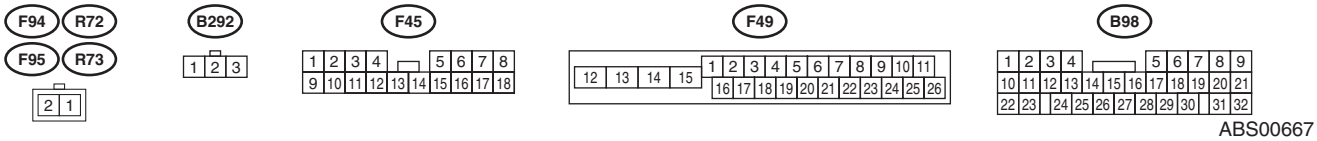
WIRING DIAGRAM:

- LHD MODEL



- RHD MODEL





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	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SELECT MONITOR.** 1)Select “Current data display & Save” on the select monitor. 2)Read the ABS wheel speed sensor output corresponding to faulty system in the select monitor data display mode.	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step **2.**	Go to step **7.**
2	**CHECK POOR CONTACT IN CONNECTORS.** Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or keyless transmitter properly installed?	Go to step **4.**	Properly install the car telephone or keyless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnostic still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnostic corresponding to DTC.	A temporary noise interference.
7	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 25 ft-lb)?	Go to step **8.**	Tighten the ABS wheel speed sensor installation bolts securely.
8	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **9.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
9	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **10.**	Go to step **11.**

	Step	Check	Yes	No
10	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5)Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.> NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores DTC 29 or DTC 56. ***Connector & terminal*** ***DTC 22*** ***LHD model*** ***(B6) No. 1 (+) — No. 2 (–):*** ***RHD model*** ***(F95) No. 1 (+) — No. 2 (–):*** ***DTC 24*** ***(F94) No. 1 (+) — No. 2 (–):*** ***DTC 26*** ***LHD model*** ***(B98) No. 6 (+) — No. 19 (–):*** ***RHD model*** ***(B98) No. 28 (+) — No. 29 (–):*** ***DTC 28*** ***LHD model*** ***(B98) No. 18 (+) — No. 17 (–):*** ***RHD model*** ***(B98) No. 26 (+) — No. 25 (–):***	Is an oscilloscope pattern the voltage, as shown in the table? <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Go to step **14.**	Go to step **11.**
11	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub in accordance with DTC.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **12.**
12	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged in the ABS wheel speed sensor piece or tone wheel?	Go to step **13.**	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
13	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **14.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>

	Step	Check	Yes	No
14	**CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABS wheel speed sensor. 3)Measure the resistance between ABS wheel speed sensor connector terminals while shaking the harness lightly. ***Terminal*** ***Front RH*** ***No. 1 — No. 2:*** ***Front LH*** ***No. 1 — No. 2:*** ***Rear RH*** ***No. 1 — No. 2:*** ***Rear LH*** ***No. 1 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **15.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
15	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminal*** ***Front RH*** ***No. 1 — Chassis ground:*** ***Front LH*** ***No. 1 — Chassis ground:*** ***Rear RH*** ***No. 1 — Chassis ground:*** ***Rear LH*** ***No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **16.**	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
16	**CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR.** 1)Connect the connector to ABS wheel speed sensor. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance at ABSCM&H/U connector terminals. ***Connector & terminal*** ***DTC 22*** ***LHD model*** ***(B301) No. 6 — No. 5:*** ***RHD model*** ***(F49) No. 6 — No. 5:*** ***DTC 24*** ***LHD model*** ***(B301) No. 1 — No. 16:*** ***RHD model*** ***(F49) No. 1 — No. 16:*** ***DTC 26*** ***LHD model*** ***(B301) No. 19 — No. 4:*** ***RHD model*** ***(F49) No. 19 — No. 4:*** ***DTC 28*** ***LHD model*** ***(B301) No. 3 — No. 2:*** ***RHD model*** ***(F49) No. 3 — No. 2:***	Is the resistance as following value? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step **17.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.

	Step	Check	Yes	No
17	**CHECK GROUND SHORT OF HARNESS.** Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***LHD model*** ***(B301) No. 6 — Chassis ground:*** ***RHD model*** ***(F49) No. 6 — Chassis ground:*** ***DTC 24*** ***LHD model*** ***(B301) No. 1 — Chassis ground:*** ***RHD model*** ***(F49) No. 1 — Chassis ground:*** ***DTC 26*** ***LHD model*** ***(B301) No. 19 — Chassis ground:*** ***RHD model*** ***(F49) No. 19 — Chassis ground:*** ***DTC 28*** ***LHD model*** ***(B301) No. 3 — Chassis ground:*** ***RHD model*** ***(F49) No. 3 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Repair the harness/connector between ABSCM&H/U and ABS wheel speed sensor.
18	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 15 — Chassis ground:*** ***RHD model*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **19.**	Repair the ABSCM&H/U ground harness.
19	**CHECK POOR CONTACT IN CONNECTORS.**	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step **20.**
20	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the keyless transmitter properly installed?	Go to step **21.**	Properly install the car telephone or keyless transmitter.
21	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from sensor harness.	Go to step **22.**
22	**CHECK ABSCM&H/U.** 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnostic still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **23.**

Step		Check	Yes	No
23	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnostic corresponding to DTC.	A temporary noise interference. NOTE: Although the ABS warning light remains illuminating at this point, this is a normal condition. Vehicle must be driven at approx. 12 km/h (7.46 MPH) or faster to turn off ABS warning light. Make sure that the ABS warning light goes off after driving vehicle.

E: DTC 25 ABS WHEEL SPEED SENSOR RR MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
For the diagnostic procedure, refer to DTC 23. <Ref. to ABS(diag)-41, DTC 23 ABS WHEEL SPEED SENSOR FL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 26 ABS WHEEL SPEED SENSOR RR MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
For the diagnostic procedure, refer to DTC 24. <Ref. to ABS(diag)-50, DTC 24 ABS WHEEL SPEED SENSOR FL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 27 ABS WHEEL SPEED SENSOR RL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:
For the diagnostic procedure, refer to DTC 23. <Ref. to ABS(diag)-41, DTC 23 ABS WHEEL SPEED SENSOR FL MALFUNCTION (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 28 ABS WHEEL SPEED SENSOR RL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:
For the diagnostic procedure, refer to DTC 24. <Ref. to ABS(diag)-50, DTC 24 ABS WHEEL SPEED SENSOR FL MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

I: DTC 29 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS

DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

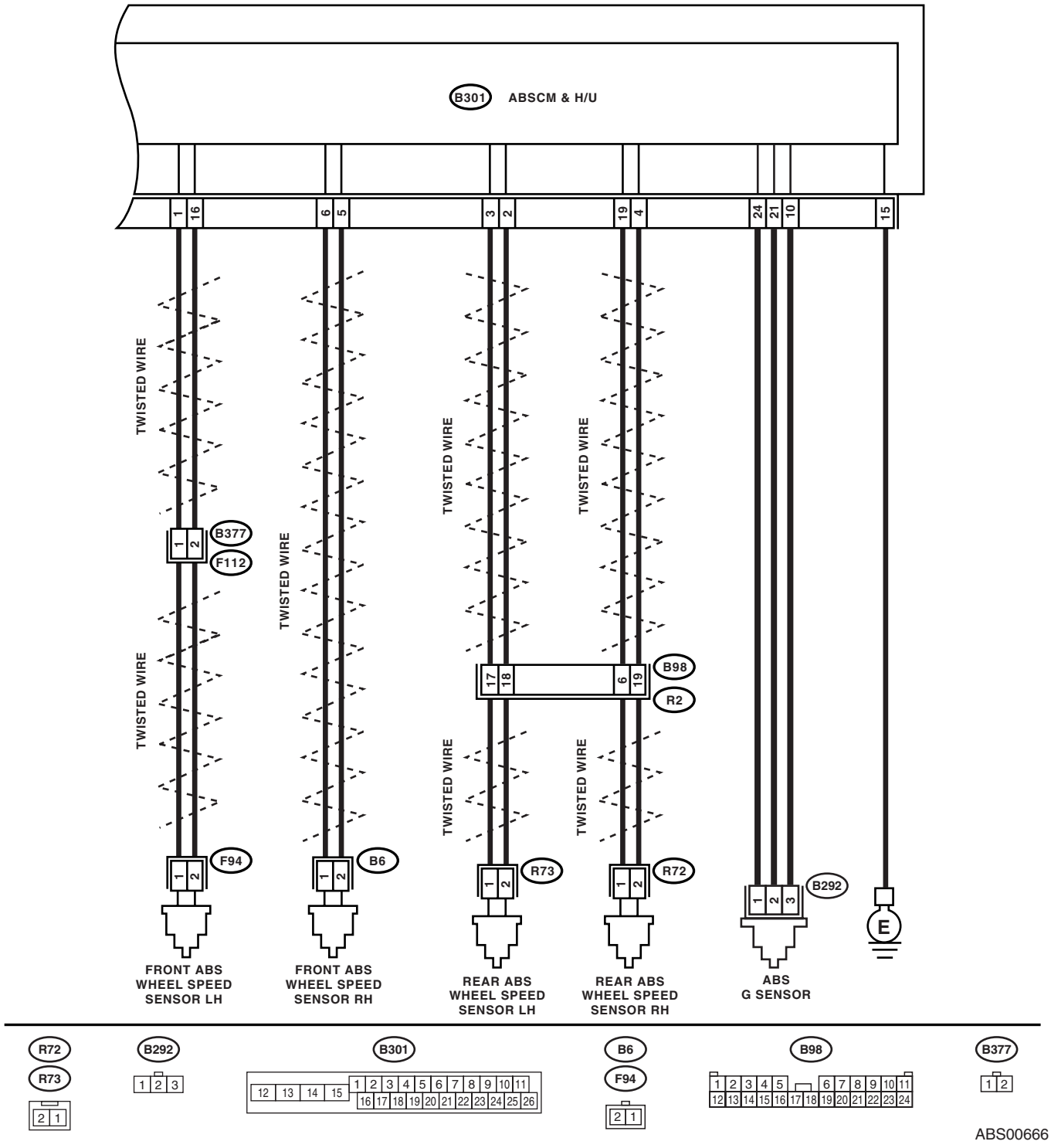
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

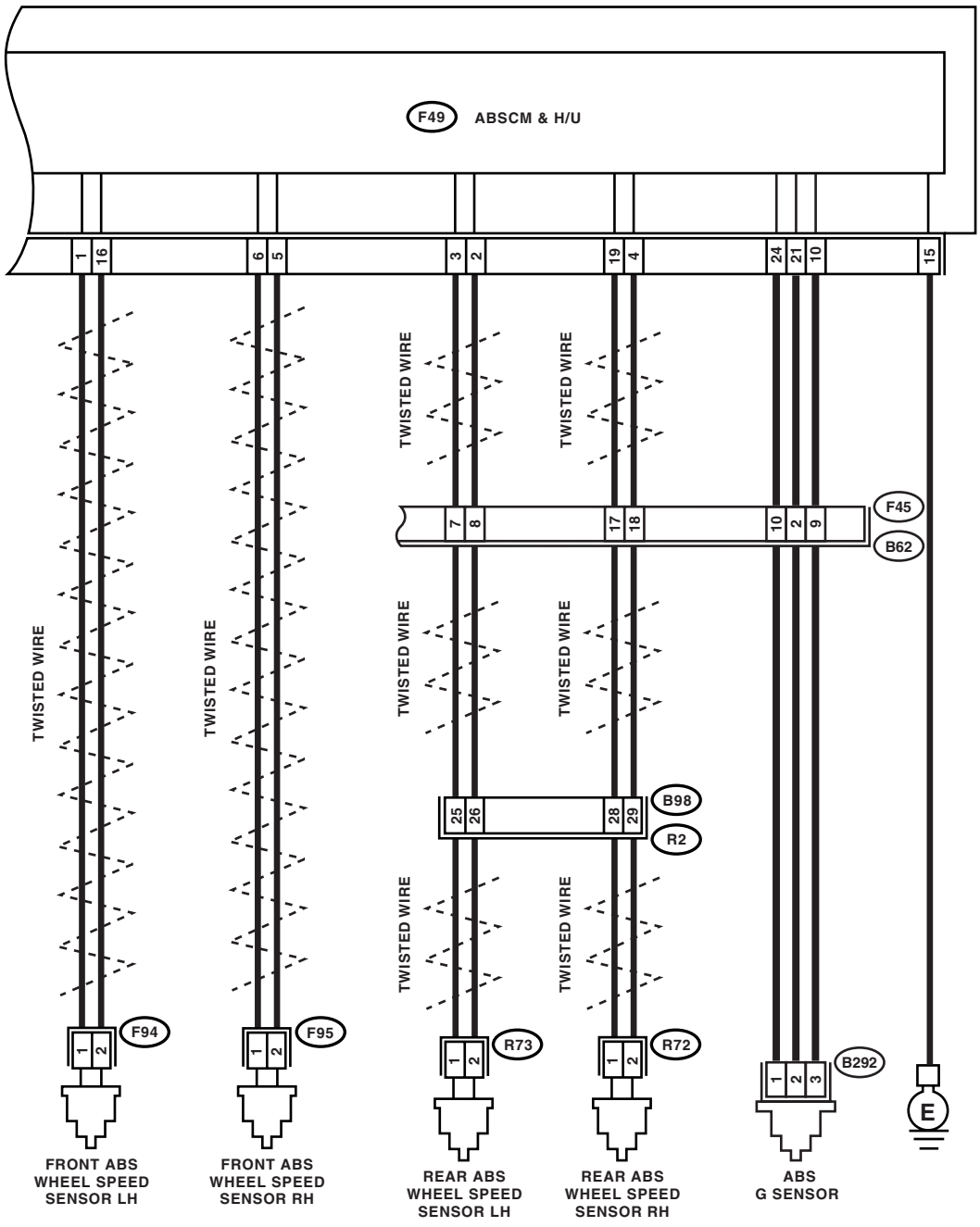
NOTE:
Brake warning light comes on as well as ABS warning light.

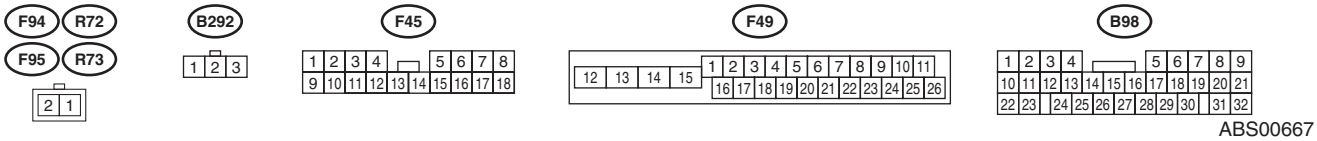
WIRING DIAGRAM:

- LHD MODEL



- RHD MODEL





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	Step	Check	Yes	No
1	**CHECK IF THE WHEELS HAVE TURNED FREELY FOR A LONG TIME.**	Have the wheels been turned freely for more than one minute, such as when vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface?	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TIRE SPECIFICATIONS.** Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step **3.**	Replace the tire.
3	**CHECK WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4.**
4	**CHECK TIRE PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Are the ABS wheel speed sensor installation bolts tightened 33 N·m (3.3 kgf-m, 25 ft-lb)?	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts securely.
6	**CHECK ABS WHEEL SPEED SENSOR GAP.** Measure the tone wheel to ABS wheel speed sensor piece gap over entire perimeter of the wheel.	Is the gap as following value? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step **7.**	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
7	**PREPARE OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**

	Step	Check	Yes	No
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1)Raise all four wheels off ground. 2)Turn the ignition switch to OFF. 3)Connect the oscilloscope to the connector. 4)Turn the ignition switch to ON. 5) rotate the wheels and measure voltage at specified frequency. <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM&H/U sometimes stores the DTC 29. ***Connector & terminal*** ***Front RH*** ***LHD model*** ***(B6) No. 1 (+) — No. 2 (–):*** ***RHD model*** ***(F95) No. 1 (+) — No. 2 (–):*** ***Front LH*** ***(F94) No. 1 (+) — No. 2 (–):*** ***Rear RH*** ***LHD model*** ***(B98) No. 6 (+) — No. 19 (–):*** ***RHD model*** ***(B98) No. 28 (+) — No. 29 (–):*** ***Rear LH*** ***LHD model*** ***(B98) No. 18 (+) — No. 17 (–):*** ***RHD model*** ***(B98) No. 25 (+) — No. 26 (–):***	Is an oscilloscope pattern the voltage, as shown in the table? <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor or drum from hub.	Is the ABS wheel speed sensor piece or tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Are there broken or damaged teeth in the ABS wheel speed sensor piece or tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.> and Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>

	Step	Check	Yes	No
12	**CHECK ABSCM&H/U.** 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in the current diagnostic still being output?	Replace the ABSCM only. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **13.**
13	**CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.**	Are other DTCs being output?	Proceed with the diagnostic corresponding to DTC.	A temporary poor contact.

J: DTC 31 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC 35. <Ref. to ABS(diag)-66, DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 32 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC 36. <Ref. to ABS(diag)-69, DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 33 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC 35. <Ref. to ABS(diag)-66, DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 34 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC 36. <Ref. to ABS(diag)-69, DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

DTC DETECTING CONDITION:

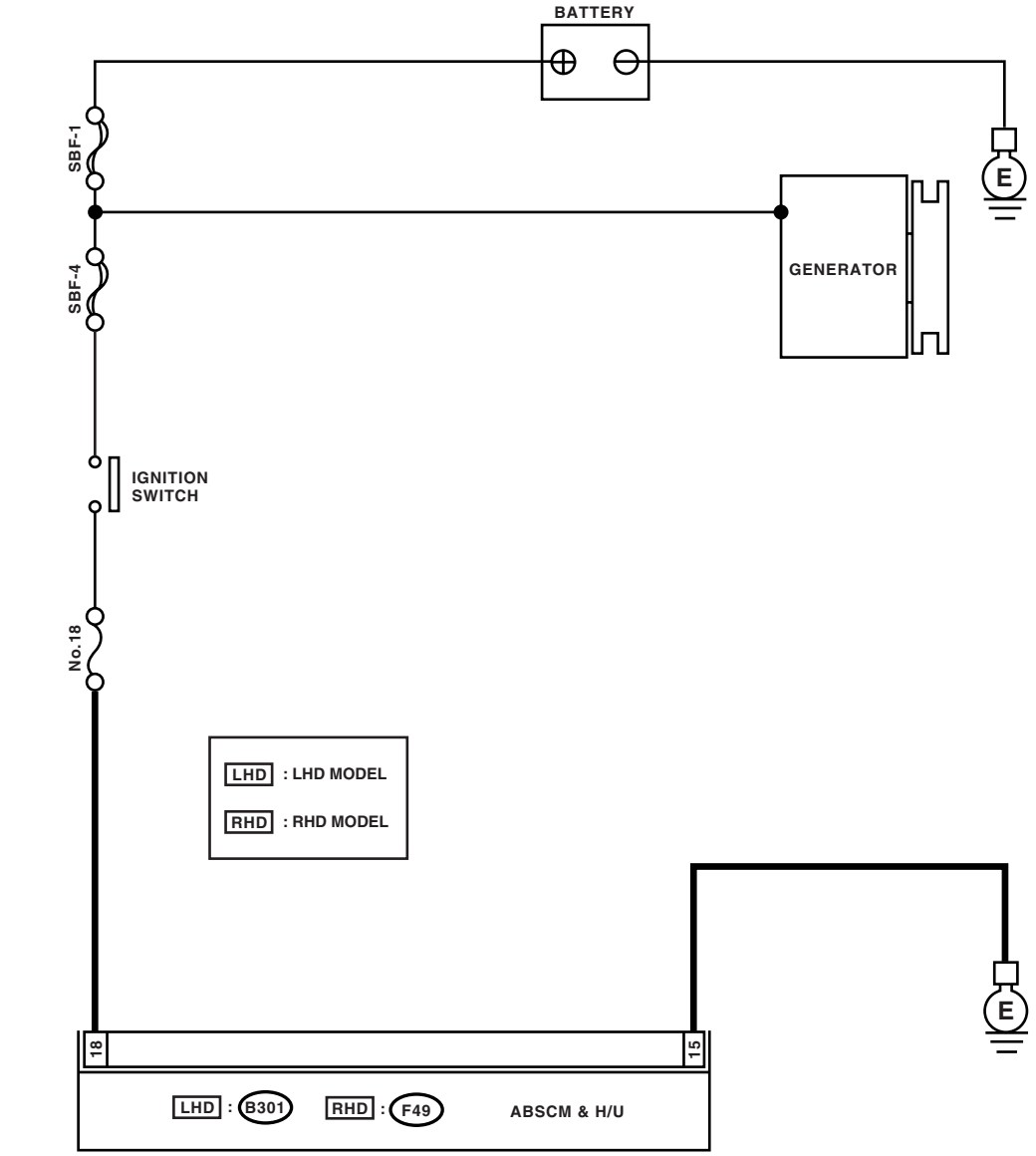
- Defective harness connector
- Defective inlet solenoid valve in ABSCM&H/U

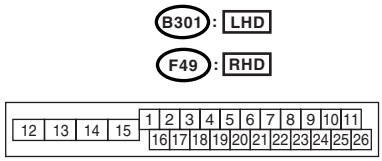
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD model*** ***(F49) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the ABSCM&H/U power circuit.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 15 — Chassis ground:*** ***RHD model*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

O: DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

DTC DETECTING CONDITION:

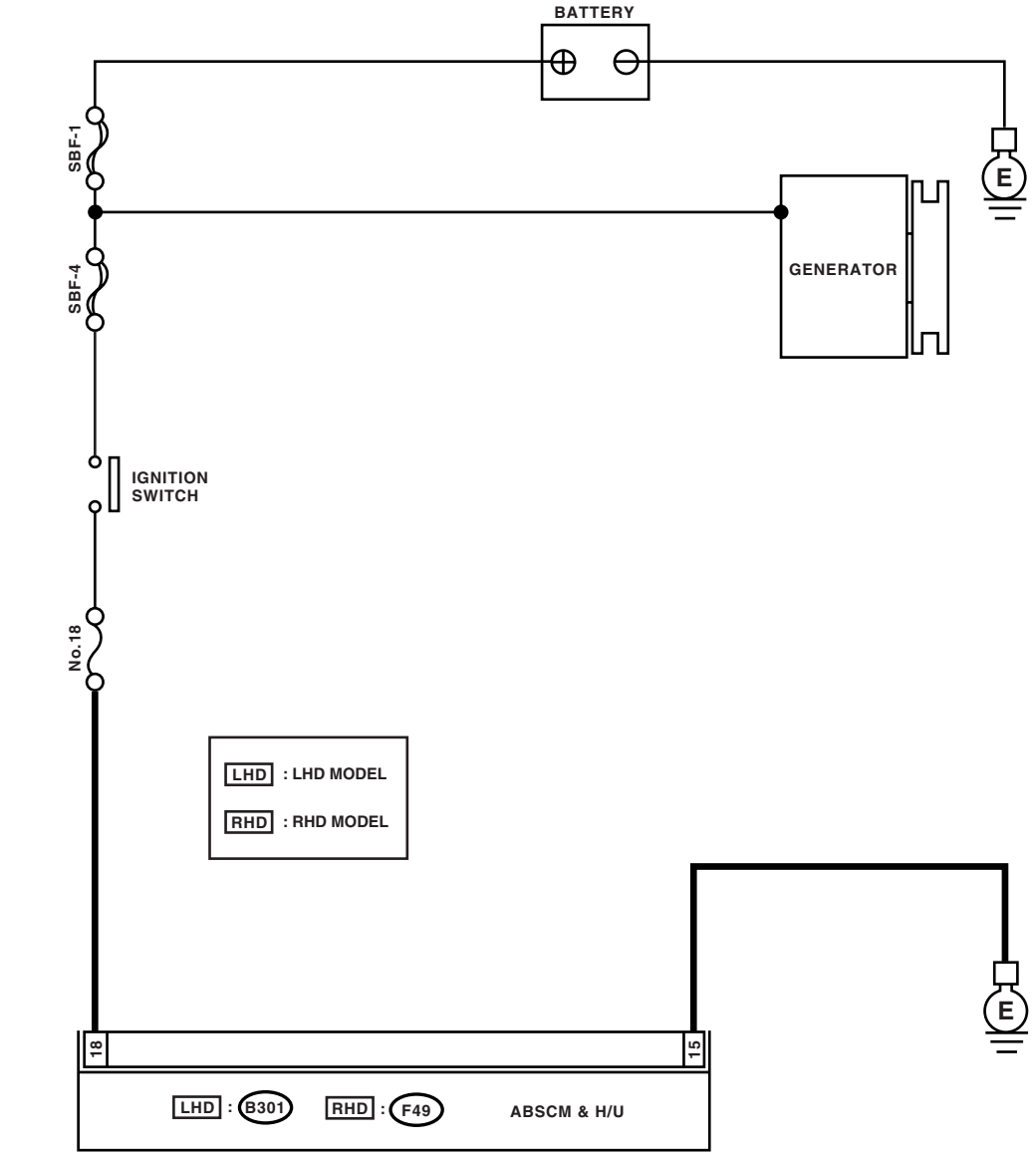
- Defective harness connector
- Defective outlet solenoid valve in ABSCM&H/U

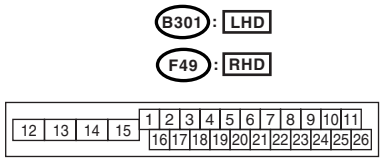
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:
Brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD model*** ***(F49) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the ABSCM&H/U power circuit.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 15 — Chassis ground:*** ***RHD model*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

P: DTC 37 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC 35. <Ref. to ABS(diag)-66, DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:
For the diagnostic procedure, refer to DTC 36. <Ref. to ABS(diag)-69, DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC 41 ABS CONTROL MODULE MALFUNCTION

DTC DETECTING CONDITION:

Defective ABSCM&H/U

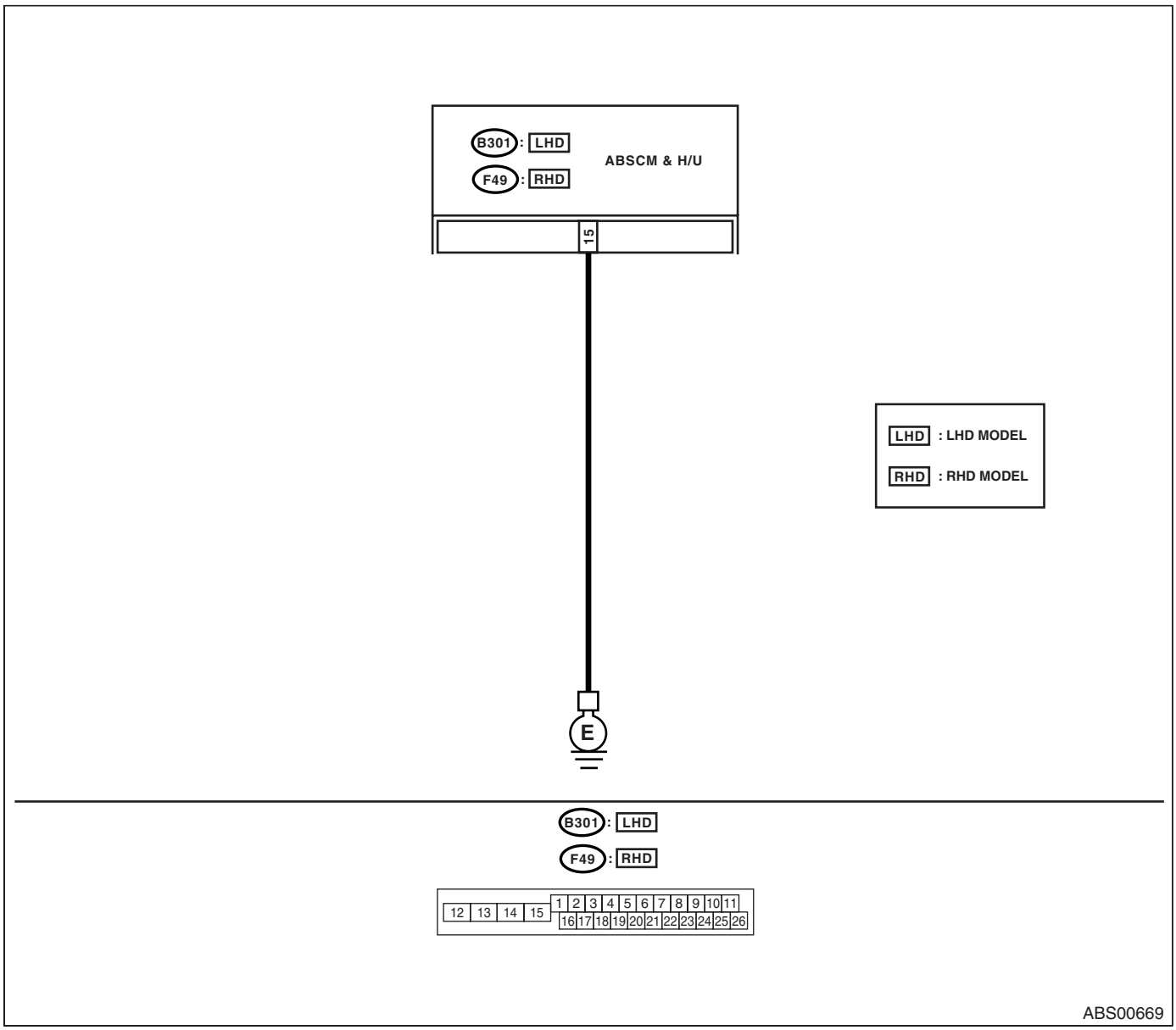
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

Brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 15 — Chassis ground:*** ***RHD model*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair the ABSCM&H/U ground harness.
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car telephone or the radio properly installed?	Go to step **4.**	Properly install the car telephone or the keyless transmitter.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

S: DTC 42 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:

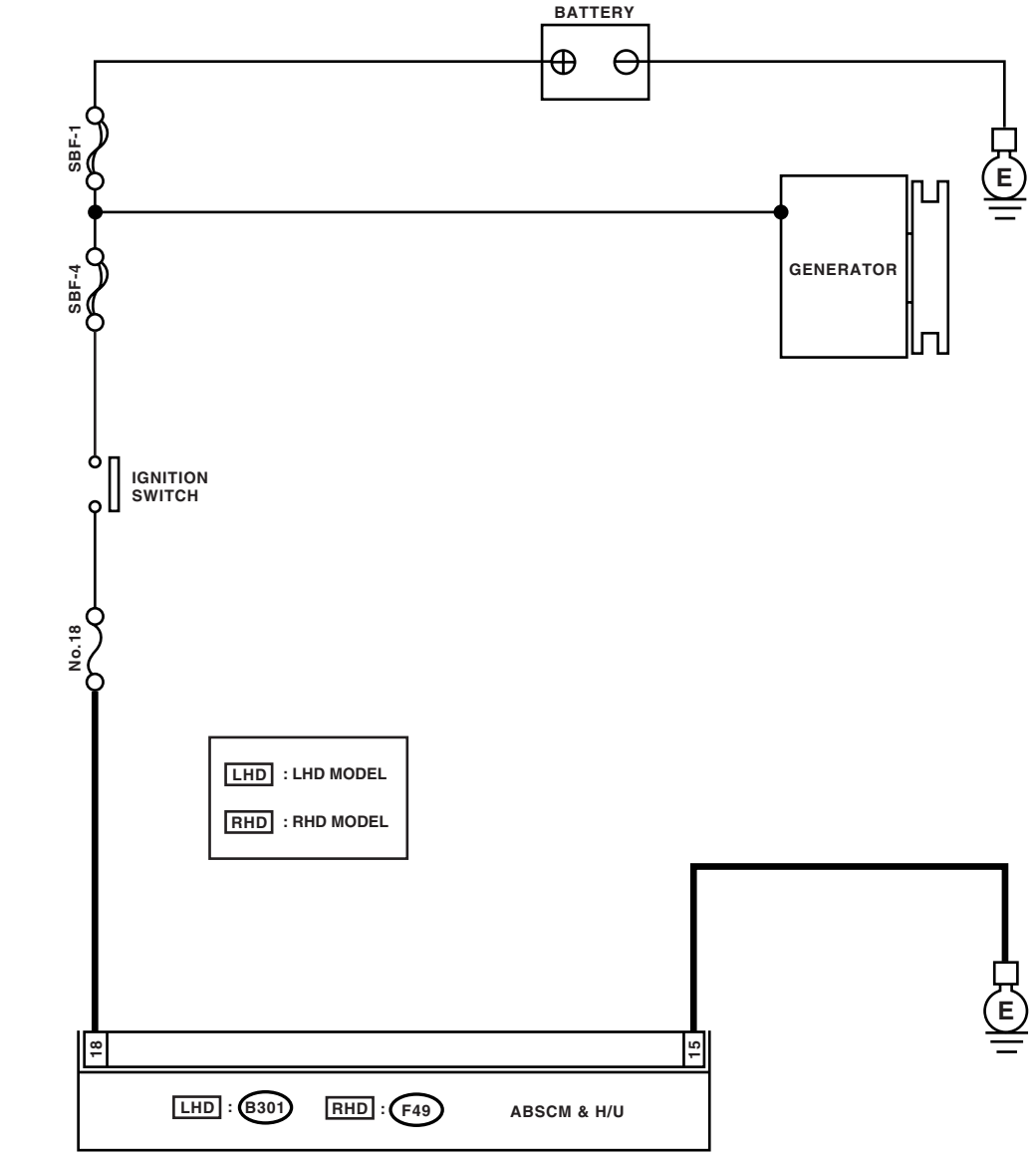
Power voltage of the ABSCM&H/U is too low or too high.

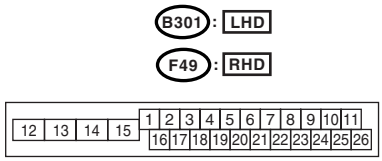
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD may not operate.

NOTE:
If EBD does not operate, brake warning light comes on as well as ABS warning light. Both warning lights go off if voltage returns.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator B terminal and chassis ground. ***Terminals*** ***Generator B terminal (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the generator.
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step **3.**	Tighten the terminal.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Disconnect the connector from ABSCM&H/U. 2) Run the engine at idle. 3) Operate the devices such as headlights, air conditioner, defogger, etc. which produce much electrical loading. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***RHD model*** ***(F49) No. 18 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the ABSCM&H/U power circuit.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

T: DTC 51 VALVE RELAY MALFUNCTION

DTC DETECTING CONDITION:

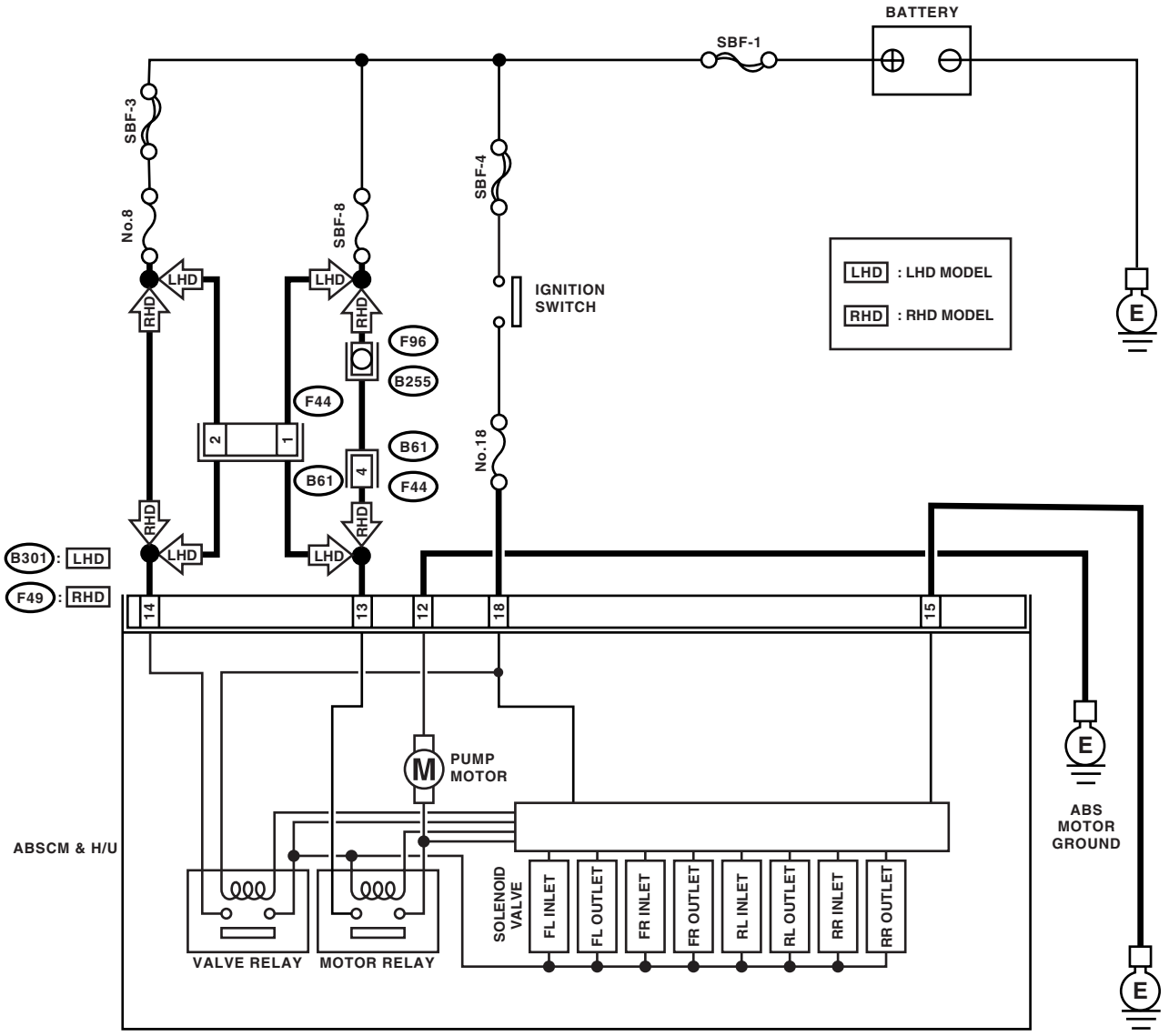
Defective valve relay

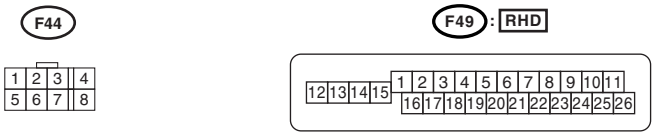
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate depending on the trouble contents.

NOTE:
Brake warning light comes on as well as ABS warning light when EBD does not operate.

WIRING DIAGRAM:





ABS00670

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 18 (+) — Chassis ground (−):*** ***(B301) No. 14 (+) — Chassis ground (−):*** ***RHD model*** ***(F49) No. 18 (+) — Chassis ground (−):*** ***(F49) No. 14 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 15 — Chassis ground:*** ***RHD model*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK VALVE RELAY IN ABSCM&H/U.** Measure the resistance between ABSCM&H/U terminals. ***Terminals*** ***No. 14 — No. 15:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **5.**
5	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **6.**
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

U: DTC 52 MOTOR/MOTOR RELAY MALFUNCTION

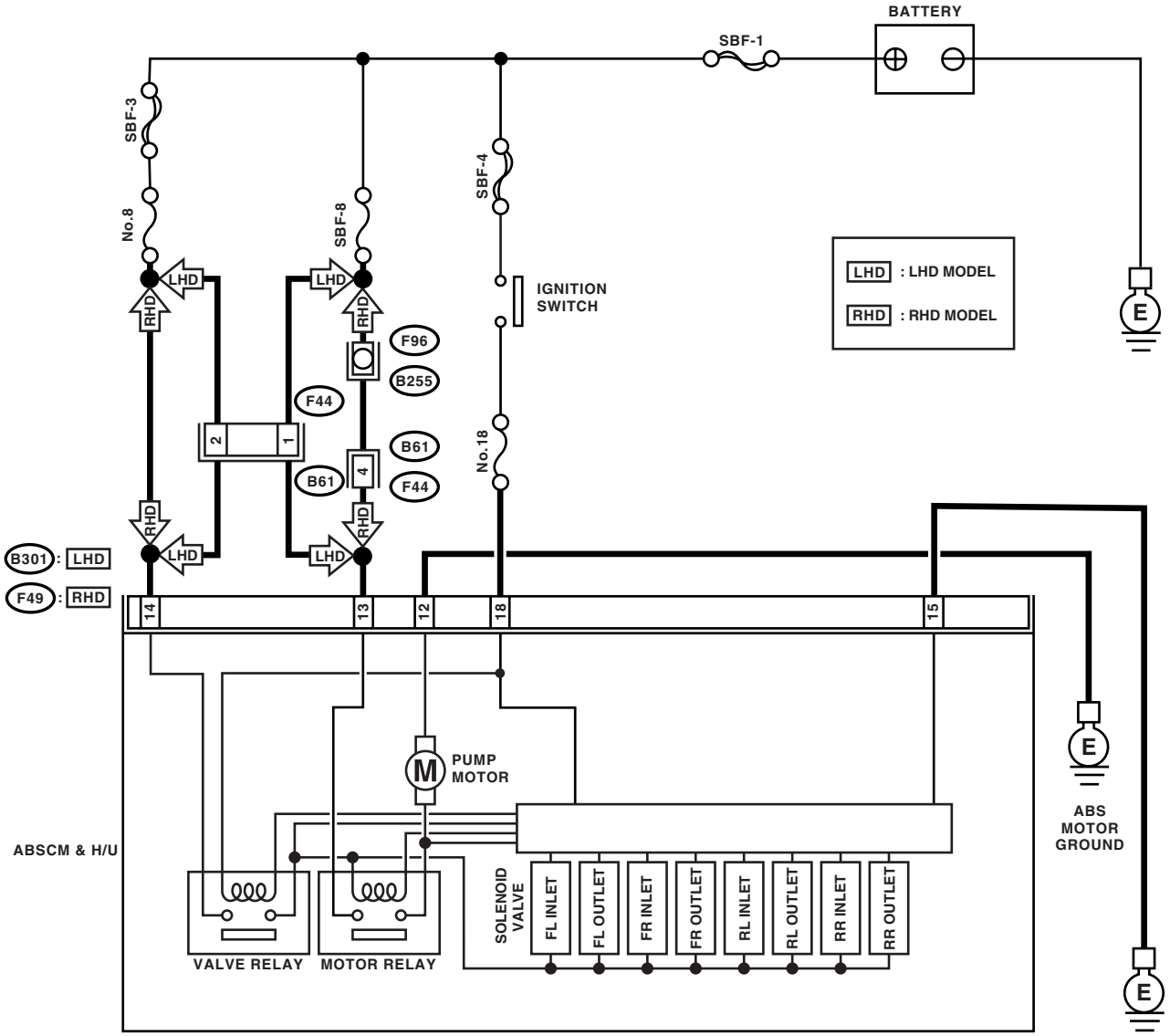
DTC DETECTING CONDITION:

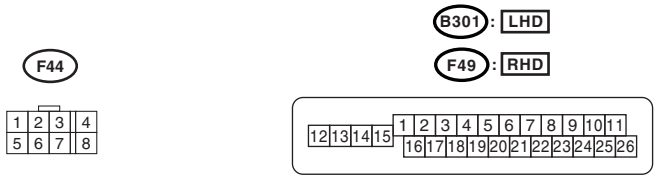
- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:





ABS00670

	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 13 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the harness connector between battery and ABSCM&H/U.
2	**CHECK GROUND CIRCUIT OF MOTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 12 — Chassis ground:*** ***RHD model*** ***(F49) No. 12 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair the ABSCM&H/U ground harness.
3	**CHECK INPUT VOLTAGE OF ABSCM&H/U.** 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 18 (+) — Chassis ground (–):*** ***RHD model*** ***(F49) No. 18 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4	**CHECK GROUND CIRCUIT OF ABSCM&H/U.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 15 — Chassis ground:*** ***RHD model*** ***(F49) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the ABSCM&H/U ground harness.
5	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step **6.**
6	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**

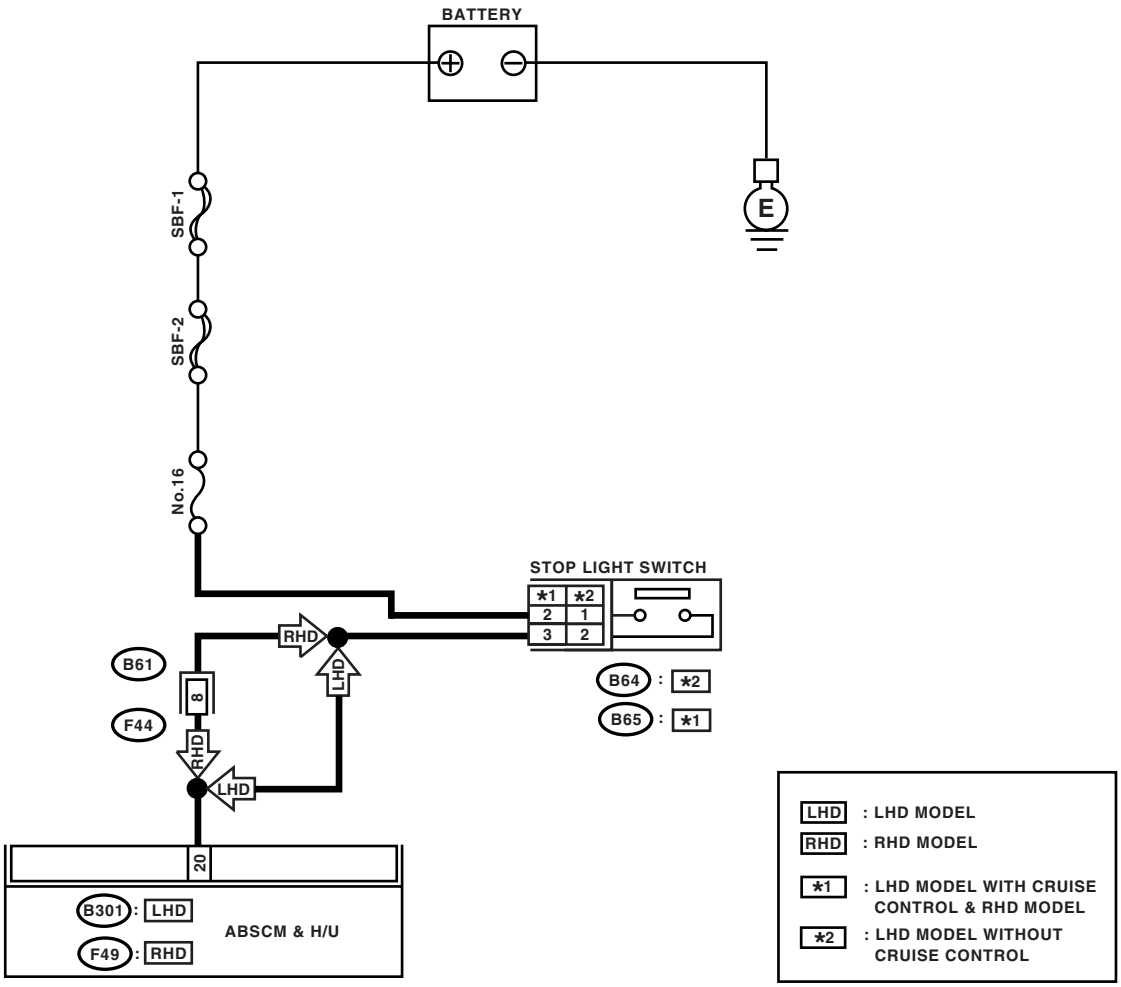
Step		Check	Yes	No
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though ABS warning light remains to illuminate at this time, it is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to make ABS warning light go off. Be sure to drive the vehicle and check the warning light goes off.

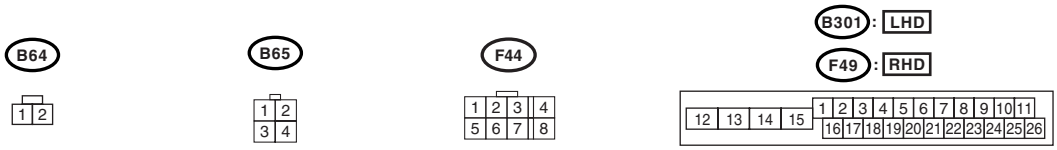
V: DTC 54 FAULTY STOP LIGHT SWITCH

DTC DETECTING CONDITION:

Defective stop light switch

WIRING DIAGRAM:



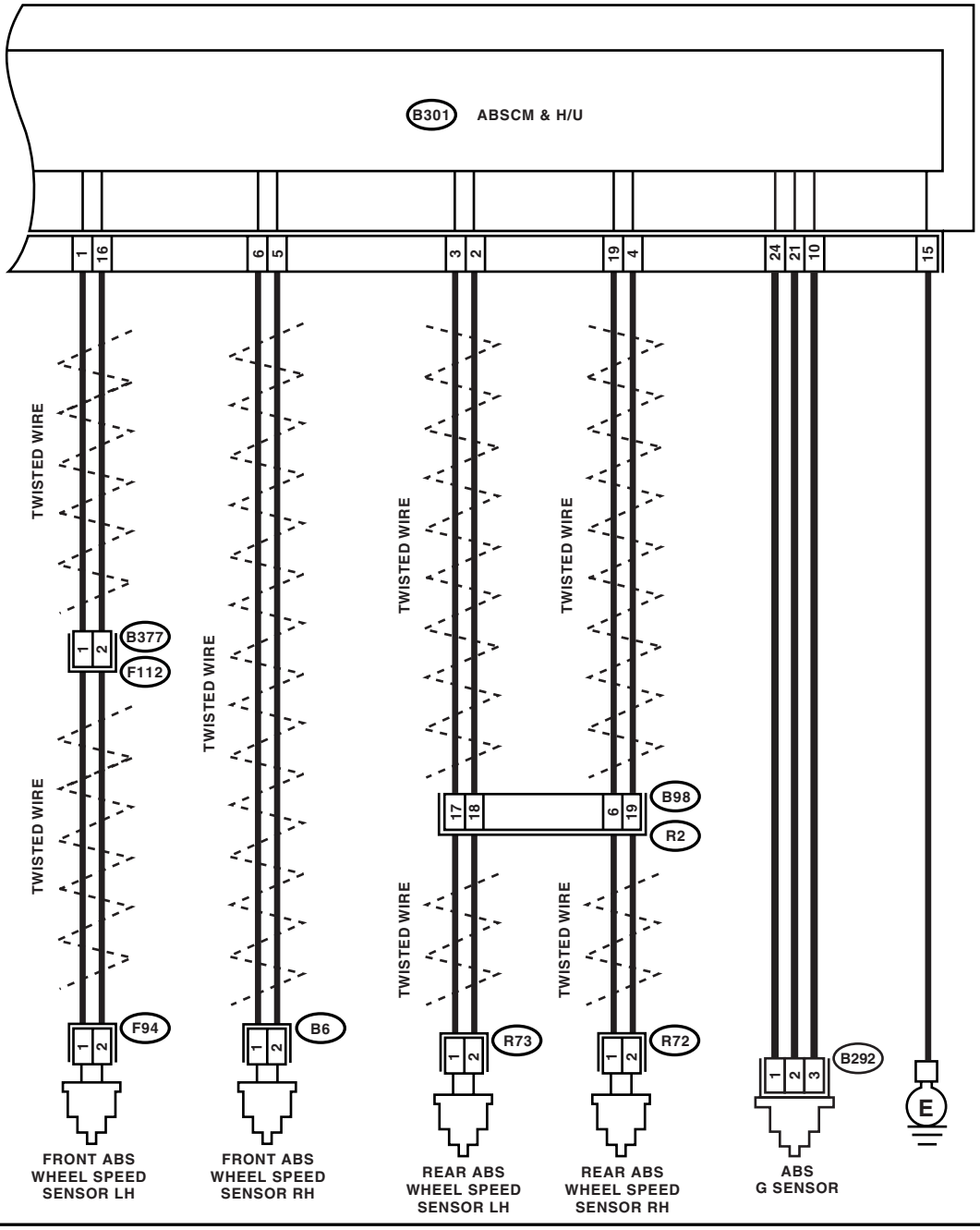


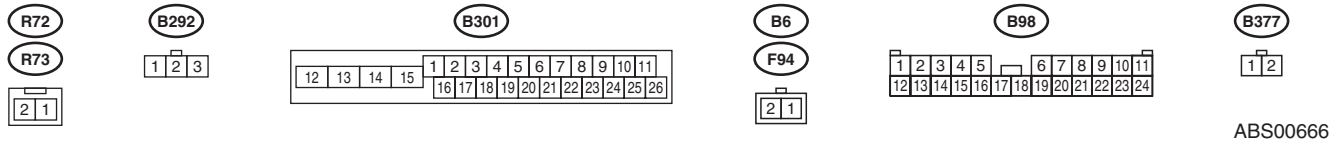
ABS00671

	Step	Check	Yes	No
1	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch signal in Subaru Select Monitor.	Is "OFF" displayed on the display?	Go to step **2.**	Go to step **3.**
2	**CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR.** 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is "ON" displayed on the display?	Go to step **5.**	Go to step **3.**
3	**CHECK IF STOP LIGHTS COME ON.** Depress the brake pedal.	Does the stop light illuminate?	Go to step **4.**	Repair the stop lights circuit.
4	**CHECK OPEN CIRCUIT IN HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 20 (+) — Chassis ground (−):*** ***RHD model*** ***(F49) No. 20 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair harness between stop light switch and ABSCM&H/U connector.
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between stop light switch and ABSCM&H/U?	Go to step **6.**	Repair the connector.
6	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

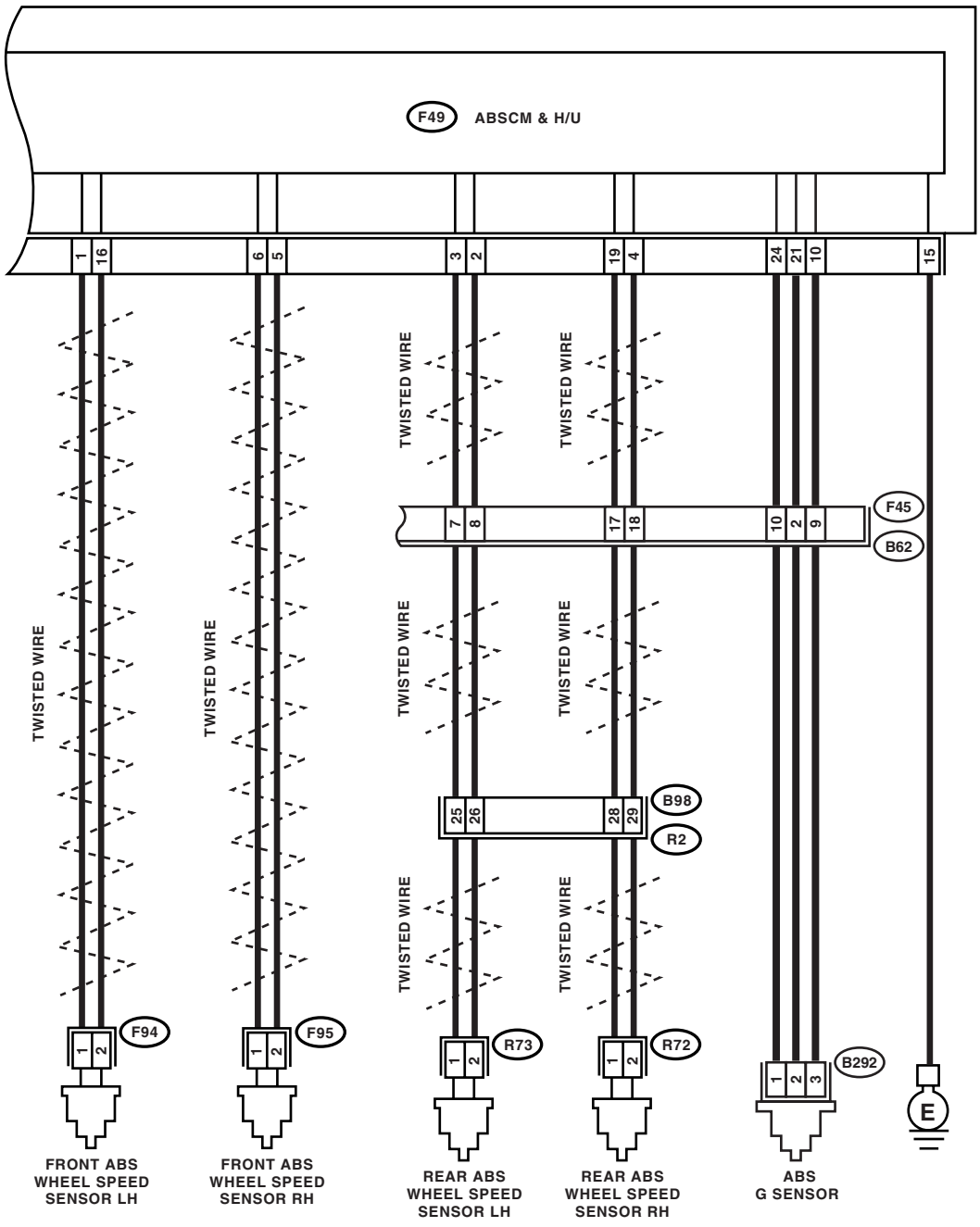
W: DTC 56 G SENSOR OUTPUT VOLTAGE OR OUTPUT SIGNAL MALFUNCTION

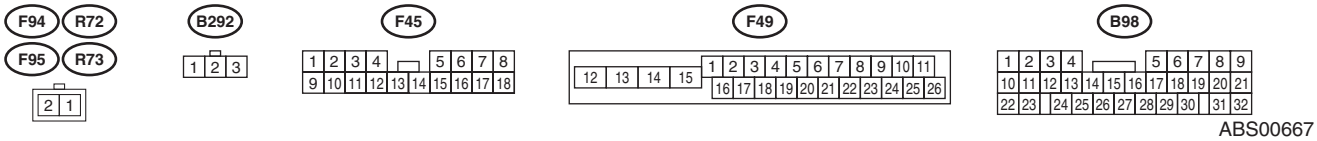
DTC DETECTING CONDITION:
Defective G sensor
TROUBLE SYMPTOM:
ABS does not operate.
WIRING DIAGRAM:
- LHD MODEL





- RHD MODEL





ABS00667

	Step	Check	Yes	No
1	**WHETHER A WHEEL TURNED FREELY OR NOT.**	Have the wheels been turned freely when the vehicle is lifted up or drove on a rolling road?	ABS is normal. Erase the memory.	Go to step **2.**
2	**CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the G sensor output on Subaru Select Monitor.	Is the reading indicated on display −1.2 — 1.2 m/s when G sensor is horizontal?	Go to step **3.**	Go to step **6.**
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **4.**
4	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **5.**
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.
6	**CHECK INPUT VOLTAGE OF G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 1 (+) — No. 3 (−):***	Is the voltage 4.75 — 5.25 V?	Go to step **7.**	Repair the harness connector between G sensor and ABSCM&H/U.
7	**CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. ***Connector & terminal*** ***LHD model*** ***(B301) No. 21 — No. 10:*** ***RHD model*** ***(F49) No. 21 — No. 10:***	Is the resistance 1.8 — 2.4 kΩ?	Go to step **8.**	Repair the harness connector between G sensor and ABSCM&H/U.
8	**CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS.** 1) Disconnect the connector from G sensor. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. ***Connector & terminal*** ***LHD model*** ***(B301) No. 21 — Chassis ground:*** ***RHD model*** ***(F49) No. 21 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the harness between G sensor and ABSCM&H/U.

	Step	Check	Yes	No
9	**CHECK G SENSOR.** 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 2.1 — 2.5 V when G sensor is on a level?	Go to step **10.**	Replace G sensor. <Ref. to ABS-22, G Sensor.>
10	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 3.6 — 4.1 V when G sensor is inclined forwards to 90°?	Go to step **11.**	Replace G sensor. <Ref. to ABS-22, G Sensor.>
11	**CHECK G SENSOR.** Measure the voltage between G sensor connector terminals. ***Connector & terminal*** ***(B292) No. 2 (+) — No. 3 (–):***	Is the voltage 0.5 — 1.0 V when G sensor is inclined backward to 90°?	Go to step **12.**	Replace G sensor. <Ref. to ABS-22, G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step **13.**
13	**CHECK ABSCM&H/U.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-8, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step **14.**
14	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-37, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

13.General Diagnostic Table

A: INSPECTION

Symptom		Problem parts
Vehicle instability during braking	Vehicle is pulled to either right or left side.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pads) • Wheel Alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor brake performance	Long braking/stopping distance	• ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	• ABSCM&H/U (solenoid valve, motor) • ABS wheel speed sensor • Incorrect wiring or piping connections
	Brake drag	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Master cylinder • Brake (caliper and piston) • Parking Brake • Axle and wheels • Brake pedal play
	Long brake pedal stroke	• Air in brake line • Brake pedal play
	Vehicle vertical pitching	• Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	• ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Excessive pedal vibration	• Incorrect wiring or piping connections • Road surface (uneven)
	Noise from ABSCM&H/U	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Brake line
	Noise from front of vehicle	• ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper, piston, pads and rotor) • Brake line • Brake booster and check valve • Suspension play or fatigue
	Noise from rear of vehicle	• ABS wheel speed sensor • Brake (caliper, piston, pads and rotor) • Parking Brake • Brake line • Suspension play or fatigue

VEHICLE DYNAMICS CONTROL (VDC)

VDC

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10. Front Tone Wheel 30
11. Rear Tone Wheel 31
12. VDC OFF Switch 32

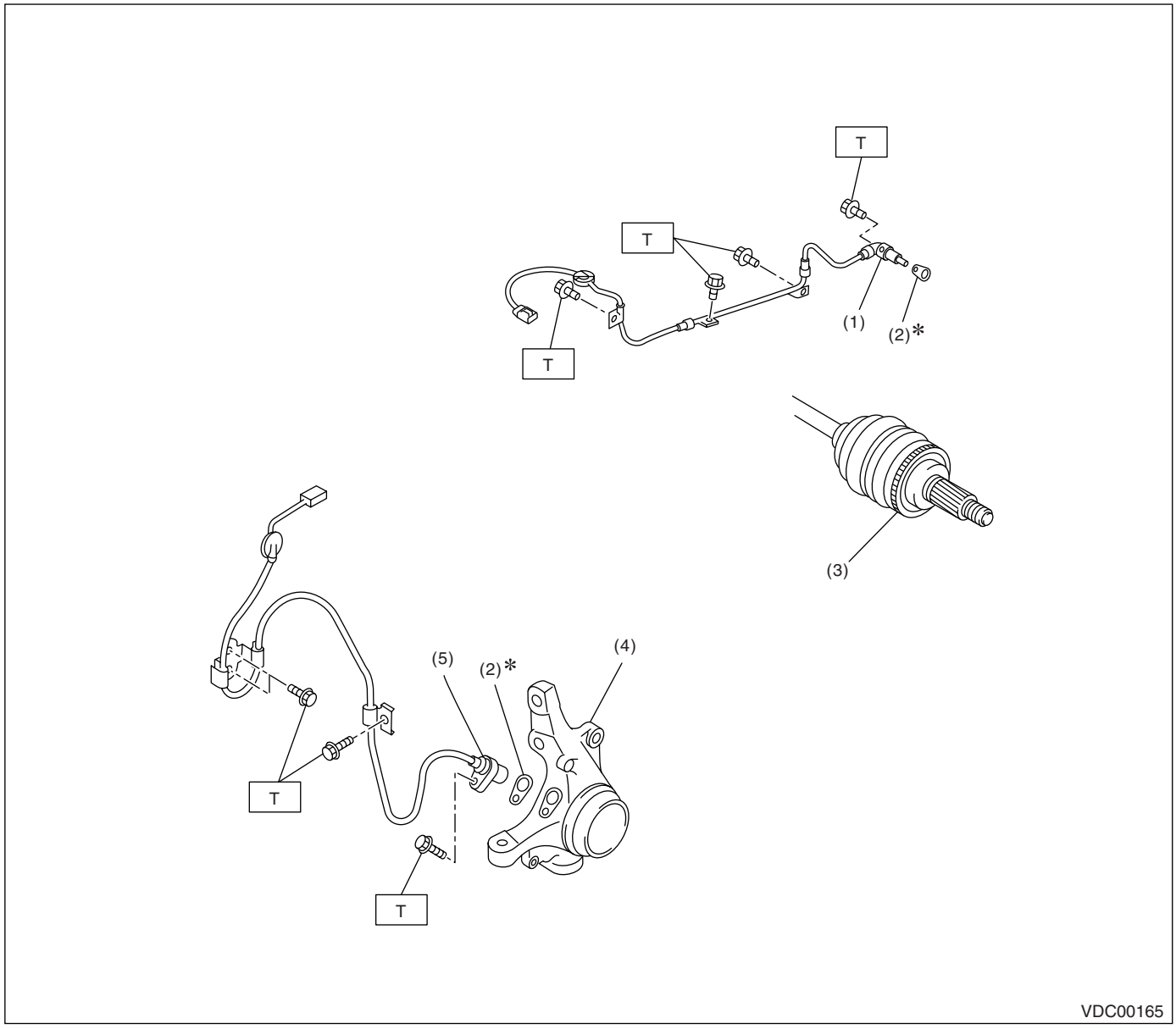
1. General Description

A: SPECIFICATION

Item			Standard or identification
ABS wheel speed sensor	ABS wheel speed sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)
		Rear	0.7 — 1.2 mm (0.0276 — 0.0472 in)
	ABS wheel speed sensor resistance	Front/Rear	1.25±0.25 kΩ/1.15±0.115 kΩ
	Marks of harness (Color)	Front LH	Brown
		Front RH	Light blue
		Rear LH	Yellow
		Rear RH	White
Yaw rate & lateral G sensor	Lateral G sensor voltage		2.5±0.2 V
Mark of VDCH/U			D3
Mark of VDCCM			N2

B: COMPONENT

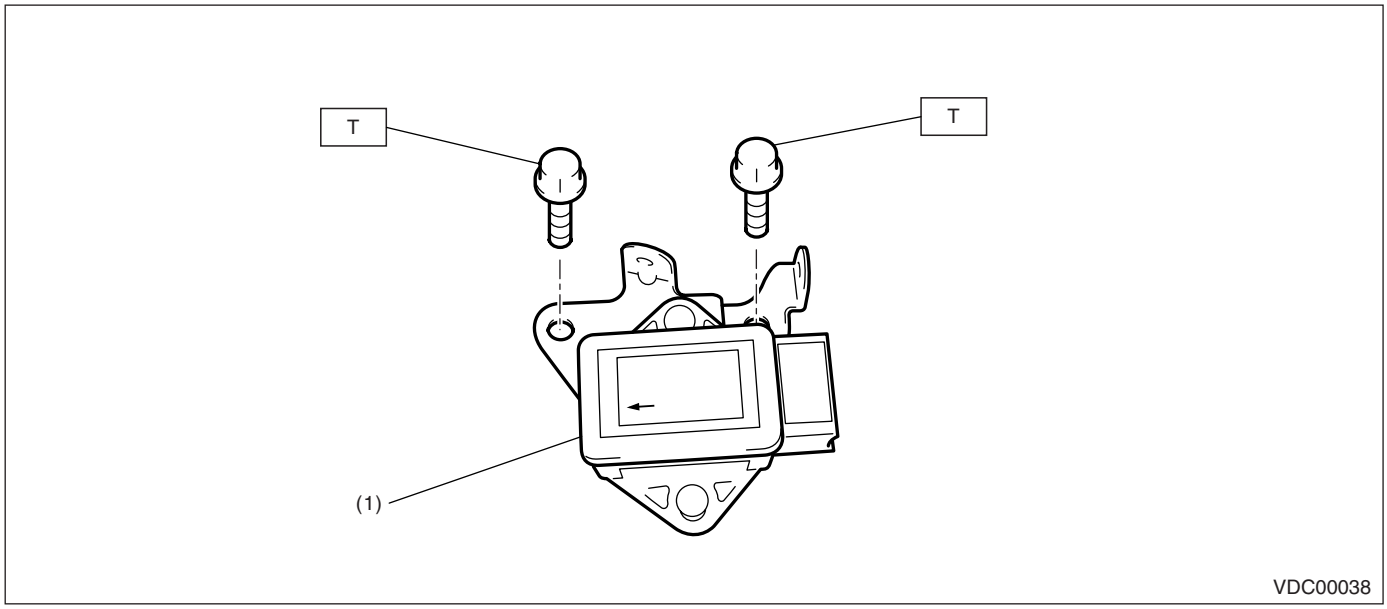
1. ABS WHEEL SPEED SENSOR



(1) Rear ABS wheel speed sensor
(2) Adjusting spacer
(3) Tone wheel (Rear)
(4) Housing
(5) Front ABS wheel speed sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 33 (3.4, 25)

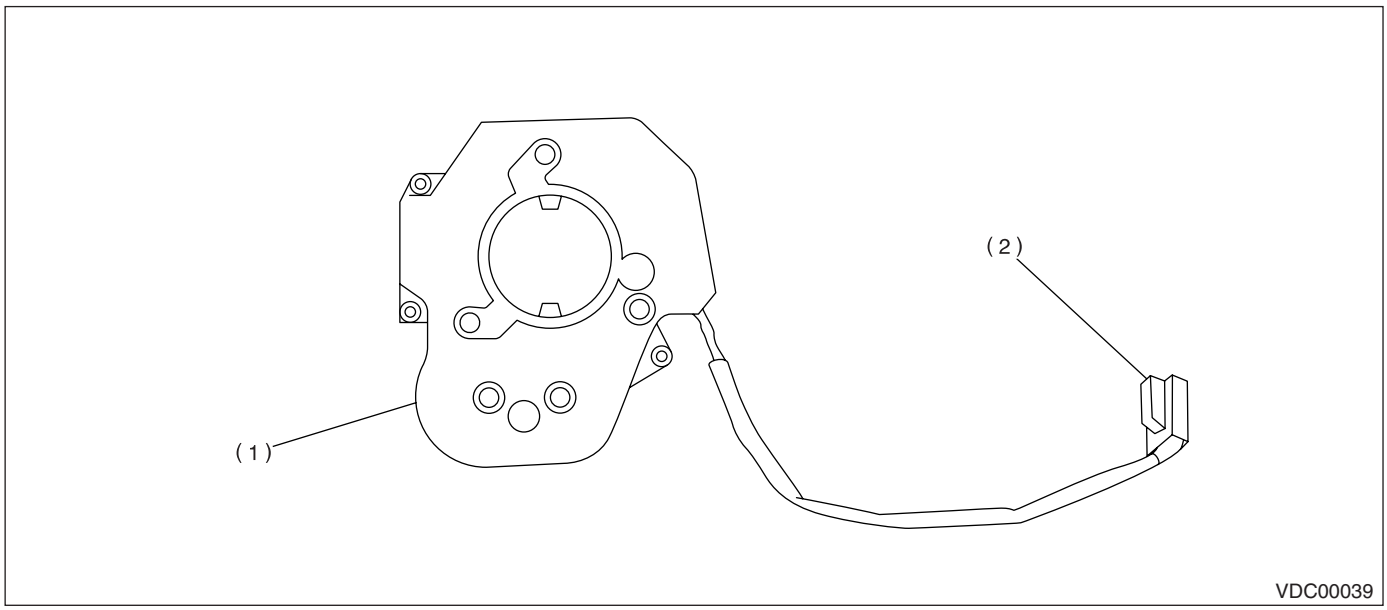
2. YAW RATE & LATERAL G SENSOR



(1) Yaw rate & lateral G sensor

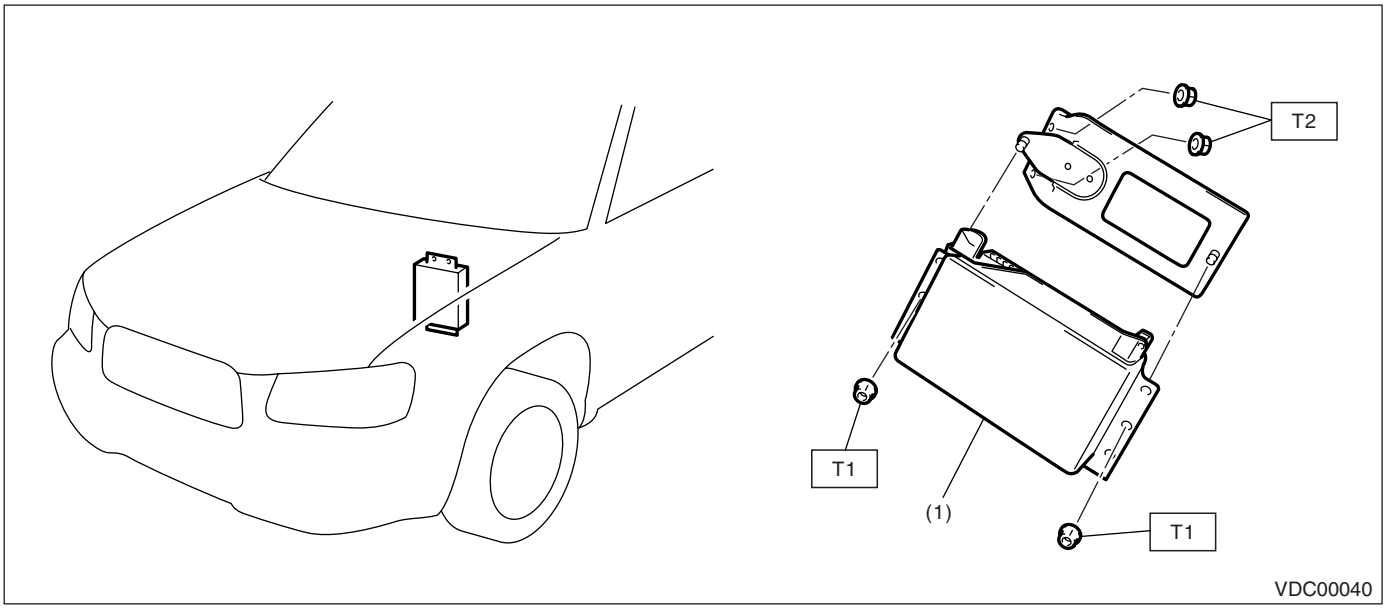
Tightening torque: N·m (kgf-m, ft-lb)
T: 18 (1.8, 13.0)

3. STEERING ANGLE SENSOR



(1) Steering angle sensor (2) Connector

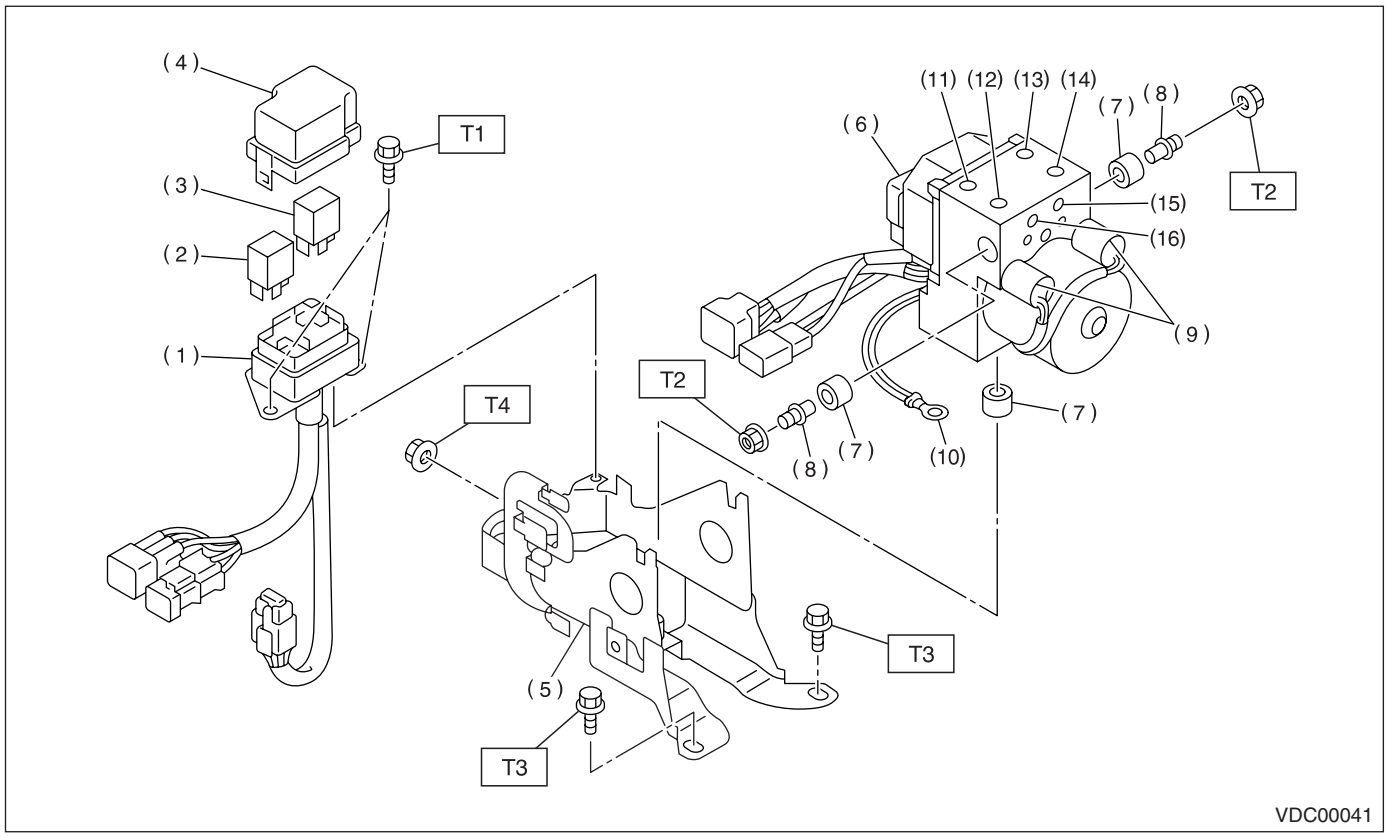
4. VDC CONTROL MODULE (VDCCM)



(1) VDC control module (VDCCM)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 18 (1.8, 13.0)

5. VDC HYDRAULIC CONTROL UNIT (VDCH/U)



(1) Relay box
(2) Motor relay
(3) Valve relay
(4) Cap
(5) Bracket
(6) VDC hydraulic control unit (VDCH/U)
(7) Damper
(8) Stud bolt
(9) Pressure sensor
(10) Ground terminal
(11) Front-LH outlet
(12) Secondary inlet
(13) Front-RH outlet
(14) Primary inlet
(15) Rear-LH outlet
(16) Rear-RH outlet

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.4)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)
T4: 38 (3.8, 27.5)

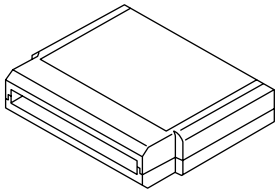
CAUTION:
Do not disassemble except valve relay and motor relay.

C: CAUTION

• Wear working clothing, including, a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

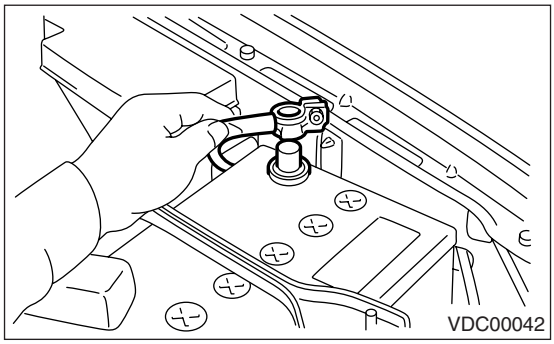
2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Pressure Gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.
Steering puller	Used for removing a steering wheel.

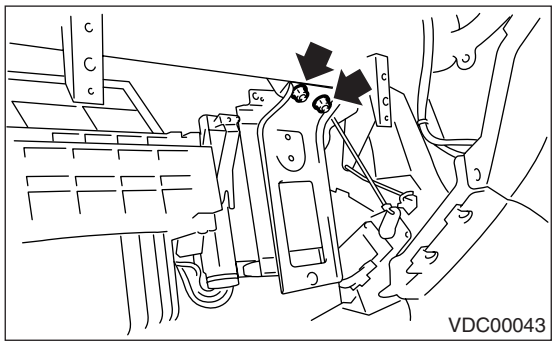
2. VDC Control Module (VDC-CM)

A: REMOVAL

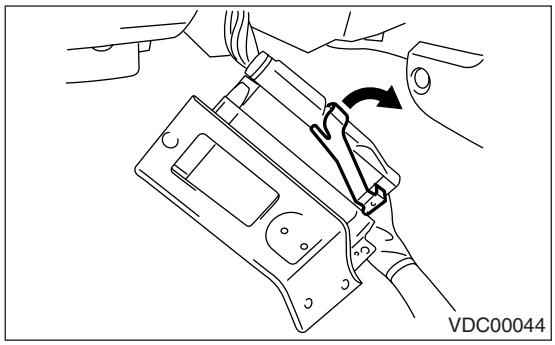
1) Disconnect the ground cable from battery.



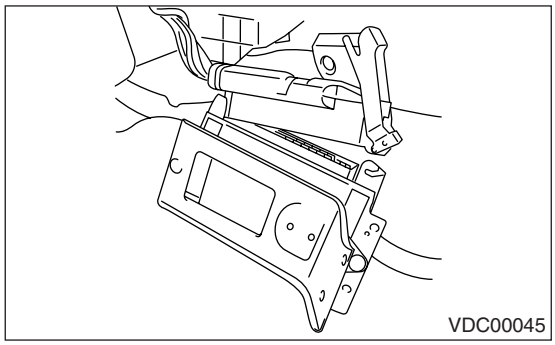
2) Remove the glove box.
3) Remove the two nuts which secure bracket.



4) Disconnect the connector from VDCCM by pulling up the securing holder.



5) Remove the VDCCM.



B: INSTALLATION

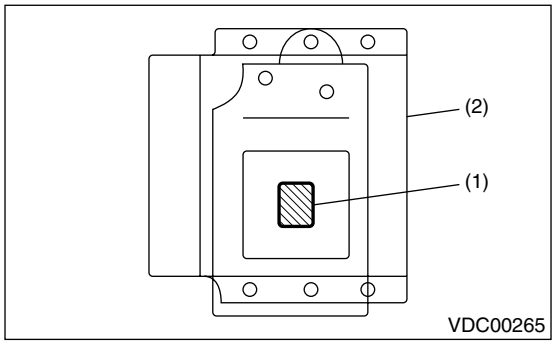
Install in the reverse order of removal.

CAUTION:
After completion of installation procedure, the following two position settings must be made.
- **Center positioning of SRS role connector and steering angle sensor.**
- **Yaw rate & lateral G sensor 0 positioning**

These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, referring to "ADJUSTMENT". <Ref. to VDC-8, ADJUSTMENT, VDC Control Module (VDCCM).>

C: INSPECTION

Check the mark used for VDCCM identification. Refer to "SPECIFICATION" for mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Mark
(2) VDCCM

D: ADJUSTMENT

Always conduct the steering angle sensor center positioning and yaw rate & lateral G sensor 0 positioning whenever you have replaced, removed or installed the following items.
- VDCCM
- Steering angle sensor
- Yaw rate & lateral G sensor
- Steering wheel parts (including airbag)
- Suspension parts
- Adjustment of wheel alignment

1. WITH SUBARU SELECT MONITOR

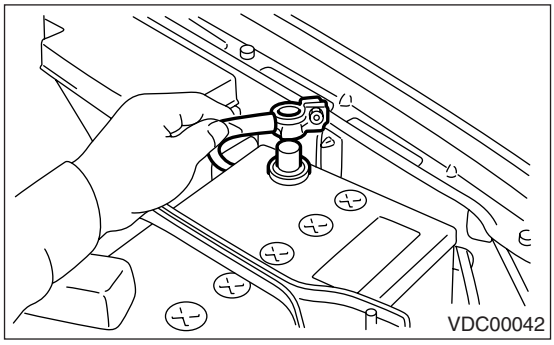
1) Park the vehicle in a straight ahead position on a horizontal surface. (Engine running in gear position of P or N)
2) Confirm the steering wheel center position. (If the center position is not accurate, adjust wheel alignment.)
3) Set the Subaru Select Monitor on the vehicle and select “Set Mode Str.A.Sen.N & Lat.Gsen.0p” in “Function Check Sequence” display menu. (Follow the instructions in the display.)
4) Select “Current Data display & Save” in {Brake control} display menu and confirm if the steering angle sensor is indicated as “0 deg”.
5) If the display does not indicate “0 deg”, conduct the procedure over again and make sure it indicates “0 deg”.
6) Drive the vehicle approx. 10 minutes and confirm that ABS and VDC warning lights do not go ON.
7) If there are any abnormalities in VDC function (VDC operation and buzzer) or wander found while vehicle is being driven, conduct the procedure all over again.

3. VDC Hydraulic Control Unit (VDCH/U)

A: REMOVAL

1. VDC HYDRAULIC CONTROL UNIT (VDCH/U)

1) Disconnect the ground cable from battery.



2) Remove the air intake duct from engine compartment to facilitate removal of VDCH/U.
3) Disconnect the connector from VDCH/U.

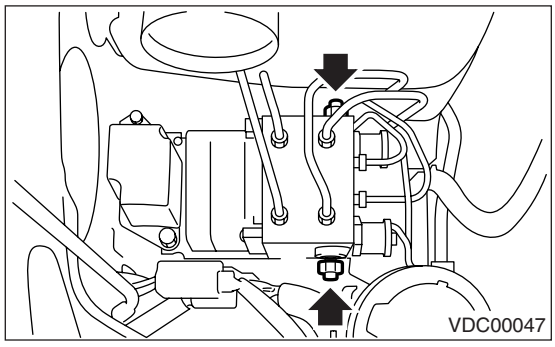
CAUTION:
Be careful not to let water or other foreign matter contact the VDCH/U terminal.

4) Unlock the cable clip.
5) Disconnect the brake pipes from VDCH/U.

CAUTION:
Wrap the brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

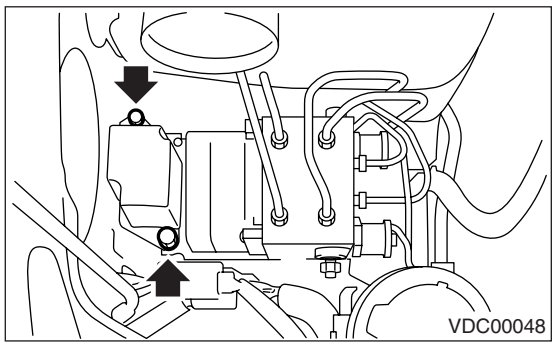
6) Disconnect the VDCH/U ground cable.
7) Remove the two nuts which secure VDCH/U, and remove the VDCH/U from engine compartment.

CAUTION:
• VDCH/U cannot be disassembled. Do not attempt to loosen the bolts and nuts.
• Do not drop or bump the VDCH/U.
• Do not turn the VDCH/U upside down or place it on its side.
• Be careful to prevent foreign particles from getting into the VDCH/U.
• When a new VDCH/U is installed, apply a coat of rust-preventive wax (Nippeco LT or GB) to the bracket attaching bolt after tightening.
• Do not pull the harness when disconnecting harness connector.



2. RELAY BOX

1) Disconnect the ground cable from battery.
2) Remove the air intake duct from engine compartment to facilitate removal of relay box.
3) Disconnect the connector from relay box.
4) Unlock the cable clip.
5) Remove the bolts which secure relay box, and remove the relay box and connector bracket.

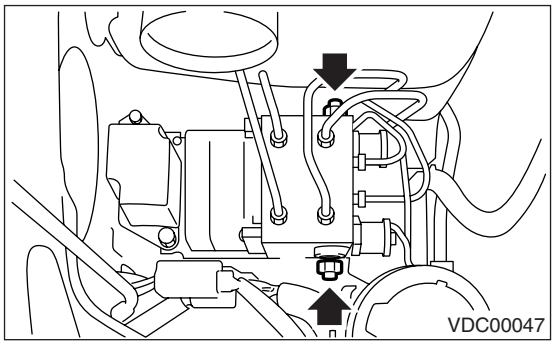


CAUTION:
Do not drop or bump the relay box.

B: INSTALLATION

1. VDC HYDRAULIC CONTROL UNIT (VDCH/U)

1) Install the VDCH/U.



Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Connect the VDCH/U ground cable, and then apply the specified grease to ground cable end.

Specified grease:
Nippeco LT or GB

Tightening torque:
33 N·m (3.4 kgf-m, 25 ft-lb)

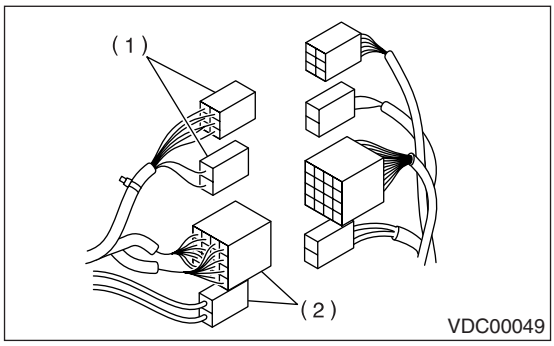
3) Connect the brake pipes to their correct VDCH/U connections.

Tightening torque:
15 N·m (1.5 kgf-m, 10.6 ft-lb)

4) Secure the VDCH/U connector to connector bracket.

CAUTION:
Align the connector with mating receptacle.

5) Connect the connector to VDCH/U.



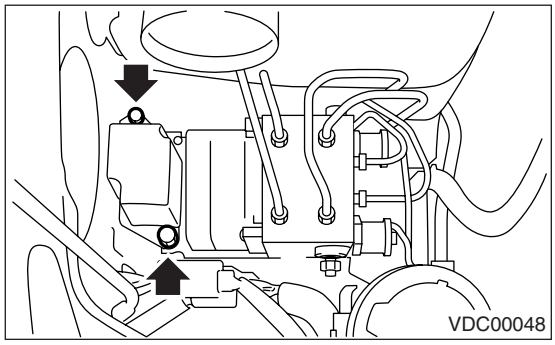
(1) Relay box connector
(2) VDCH/U connector

6) Install the air intake duct.
7) Connect the battery ground cable to battery.
8) Bleed air from the brake system.

2. RELAY BOX

1) Install the relay box and connector bracket.

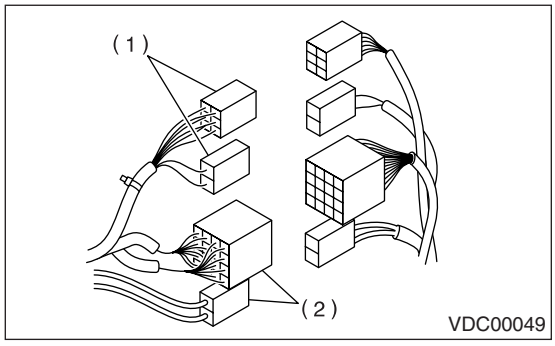
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)



2) Secure the relay box connector to connector bracket.

CAUTION:
Align the connector with mating receptacle.

3) Connect the connector to relay box.

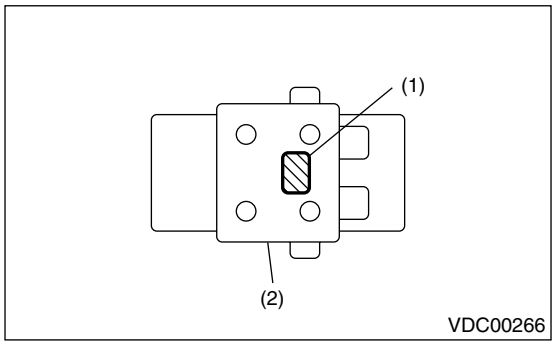


(1) Relay box connector
(2) VDCH/U connector

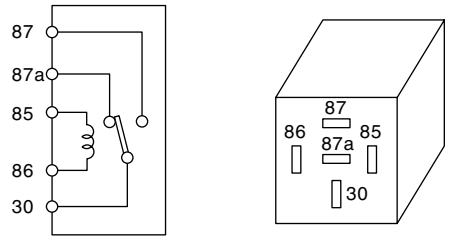
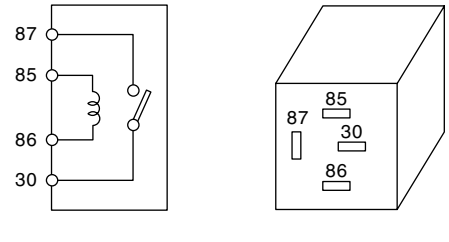
4) Install the air intake duct.
5) Connect the battery ground cable to battery.

C: INSPECTION

1) Check the connected and fixed condition of connector.
2) Check the valve relay and motor relay for discontinuity or short circuits.
3) Check the mark used for VDCH/U identification. Refer to “SPECIFICATION” for mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



(1) Mark
(2) VDCH/U

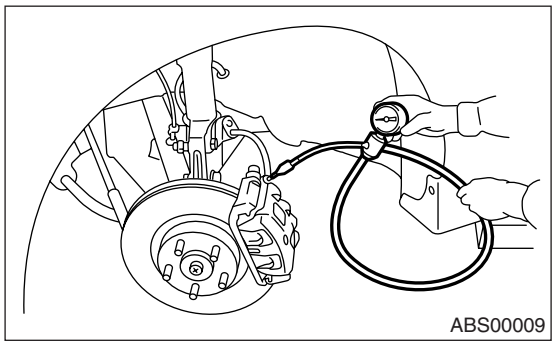
	Condition	Terminal number	Standard	
Valve relay	Turning off electricity.	85 — 86	103±10 Ω	
		30 — 87a	Less than 0.5 Ω	
		30 — 87	More than 1 MΩ	
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87a	More than 1 MΩ	
		30 — 87	Less than 0.5 Ω	
Motor relay	Turning off electricity.	85 — 86	80±10 Ω	
		30 — 87	More than 1 MΩ	
	Turning on electricity between 85 and 86. (DC 12 V)	30 — 87	Less than 0.5 Ω	

1. CHECKING THE VDC HYDRAULIC CONTROL UNIT (VDCH/U) ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheels.
2) Disconnect the air bleeder screws from FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ a pressure gauge previously used for transmission; the piston seal is expanded and may lead to malfunction of the brake.

NOTE:
Wrap a sealing tape around pressure gauge.



4) Bleed air from the pressure gauges.
5) Perform the ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>

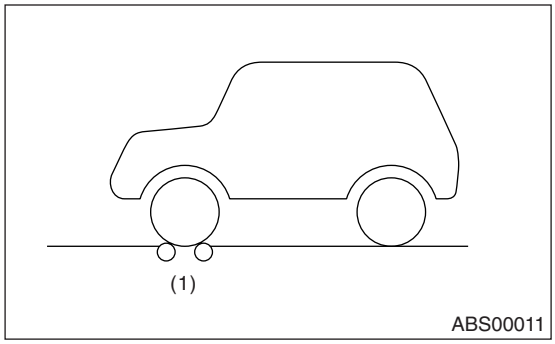
6) When the VDCH/U begins to work, and first FL side performs decompression, holding, and compression, and then FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

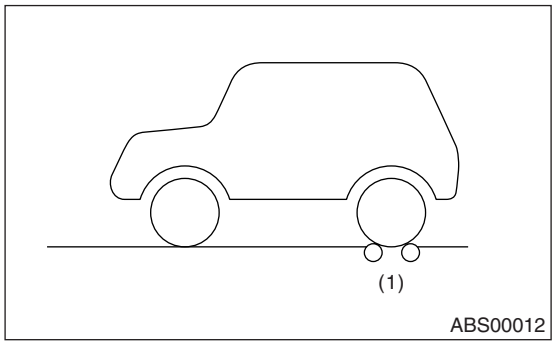
	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm^2, 512 psi)	3,500 kPa (36 kgf/cm^2, 512 psi)
Decompressed	500 kPa (5 kgf/cm^2, 71 psi) or less	500 kPa (5 kgf/cm^2, 71 psi) or less
Compressed	3,500 kPa (36 kgf/cm^2, 512 psi) or more	3,500 kPa (36 kgf/cm^2, 512 psi) or more

8) Remove the pressure gauges from FL and FR caliper bodies.
9) Connect the air bleeder screws to FL and FR caliper bodies.
10) Remove the air bleeder screws from RL and RR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and RL, RR caliper bodies.
13) Perform the ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
14) When the VDCH/U begins to work, at first RR side performs decompression, holding, and compression, and then RL side performs decompression, holding, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from the brake line.

2. CHECKING THE VDC HYDRAULIC CONTROL UNIT (VDCH/U) ABS OPERATION WITH BRAKE TESTER

1) Prepare for operating the ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
2) Set the front wheels or rear wheels on brake tester and set the select lever position to “N” range.





(1) Brake tester

3) Operate the brake tester.
4) Perform the ABS sequence control.
<Ref. to VDC-16, ABS Sequence Control.>
5) When the VDCH/U begins to work, check the following working sequence.
(1) FL wheel performs decompression, holding, and compression in sequence, and subsequently FR wheel repeats the cycle.
(2) RR wheel performs decompression, holding, and compression in sequence, and subsequently RL wheel repeats the cycle.

6) Read values indicated on the brake tester and check if fluctuation of values meet the standard values when decompressed and compressed.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 224 lbf)	1,000 N (102 kgf, 224 lbf)
Decompressed	500 N (51 kgf, 112 lbf) or less	500 N (51 kgf, 112 lbf) or less
Compressed	1,000 N (102 kgf, 224 lbf) or more	1,000 N (102 kgf, 224 lbf) or more

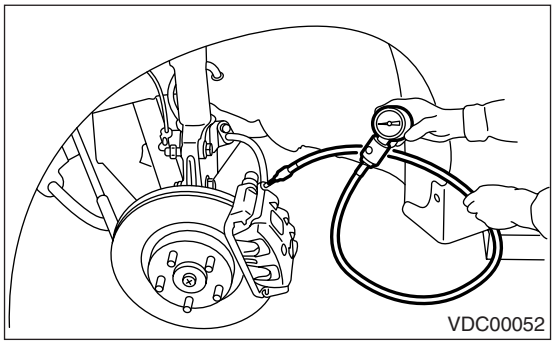
7) After checking, also check if any irregular brake pedal tightness is felt.

3. CHECKING THE VDC HYDRAULIC CONTROL UNIT (VDCH/U) VDC OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheels.
2) Disconnect the air bleeder screws from FL and FR caliper bodies.
3) Connect two pressure gauges to the FL and FR caliper bodies.

CAUTION:
• Pressure gauges used exclusively for brake fluid must be used.
• Do not employ a pressure gauge previously used for transmission; the piston seal is expanded and may lead to malfunction of the brake.

NOTE:
Wrap a sealing tape around pressure gauge.



4) Bleed air from the pressure gauges.
5) Perform the VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
6) When the VDCH/U begins to work, and first FL side performs holding, decompression, and compression, and then FR side performs decompression, holding, and compression.
7) Read values indicated on the pressure gauge and check if the fluctuation of values between decompression and compression meets the standard values. Also check if any irregular brake pedal tightness is felt.

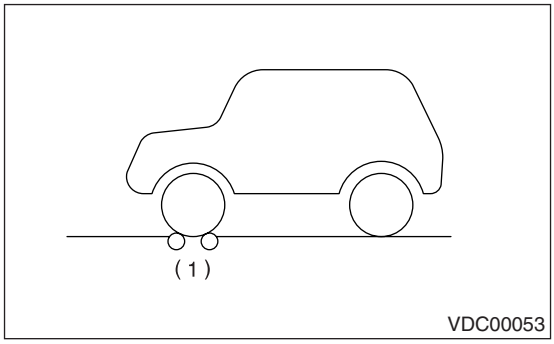
	Front wheel	Rear wheel
When compressed	3,000 kPa (31 kgf/cm^2, 441 psi) or more	2,000 kPa (20 kgf/cm^2, 284 psi) or more
When decompressed	500 kPa (5 kgf/cm^2, 71 psi) or less	500 kPa (5 kgf/cm^2, 71 psi) or less

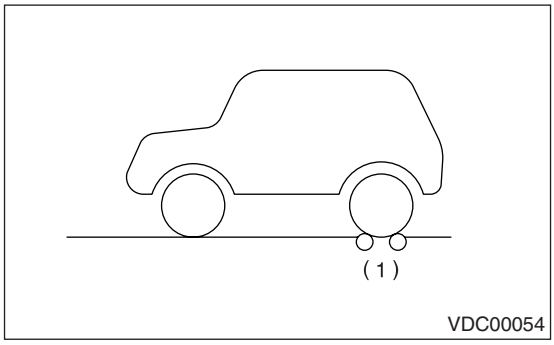
8) Remove the pressure gauges from FL and FR caliper bodies.
9) Install the air bleeder screws to FL and FR caliper bodies.
10) Remove the air bleeder screws from RL and RR caliper bodies.
11) Connect two pressure gauges to the RL and RR caliper bodies.
12) Bleed air from the pressure gauges and RL, RR caliper bodies.
13) Perform the VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
14) When the hydraulic unit begins to work, at first RR side performs holding, decompression, and compression, and then RL side performs holding, decompression, and compression.
15) Read values indicated on the pressure gauges and check if they meet the standard value.
16) After checking, remove the pressure gauges from caliper bodies.
17) Connect the air bleeder screws to RL and RR caliper bodies.
18) Bleed air from the brake line.

4. CHECKING THE VDC HYDRAULIC CONTROL UNIT (VDCH/U) VDC OPERATION WITH BRAKE TESTER

1) Prepare for operating the VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>

2) Set the front wheels or rear wheels on brake tester and set the select lever position to “neutral”.





(1) Brake tester

3) Operate the brake tester.
4) Perform the ABS sequence control. **<Ref. to VDC-16, ABS Sequence Control.>**
5) When the VDCH/U begins to work, check the following working sequence.
(1) FL wheel performs decompression, holding, and compression in sequence, and subsequently FR wheel repeats the cycle.
(2) RR wheel performs decompression, holding, and compression in sequence, and subsequently RL wheel repeats the cycle.
6) Read values indicated on the brake tester and check if fluctuation of values meet the standard values when decompressed and compressed.

	Front wheel	Rear wheel
When compressed	2,000 N (203 kgf, 447 lbf) or more	1,000 N (102 kgf, 224 lbf) or more
When decompressed	500 N (51 kgf, 112 lbf) or less	500 N (51 kgf, 112 lbf) or less

7) After checking, also check if any irregular brake pedal tightness is felt.

4. ABS Sequence Control

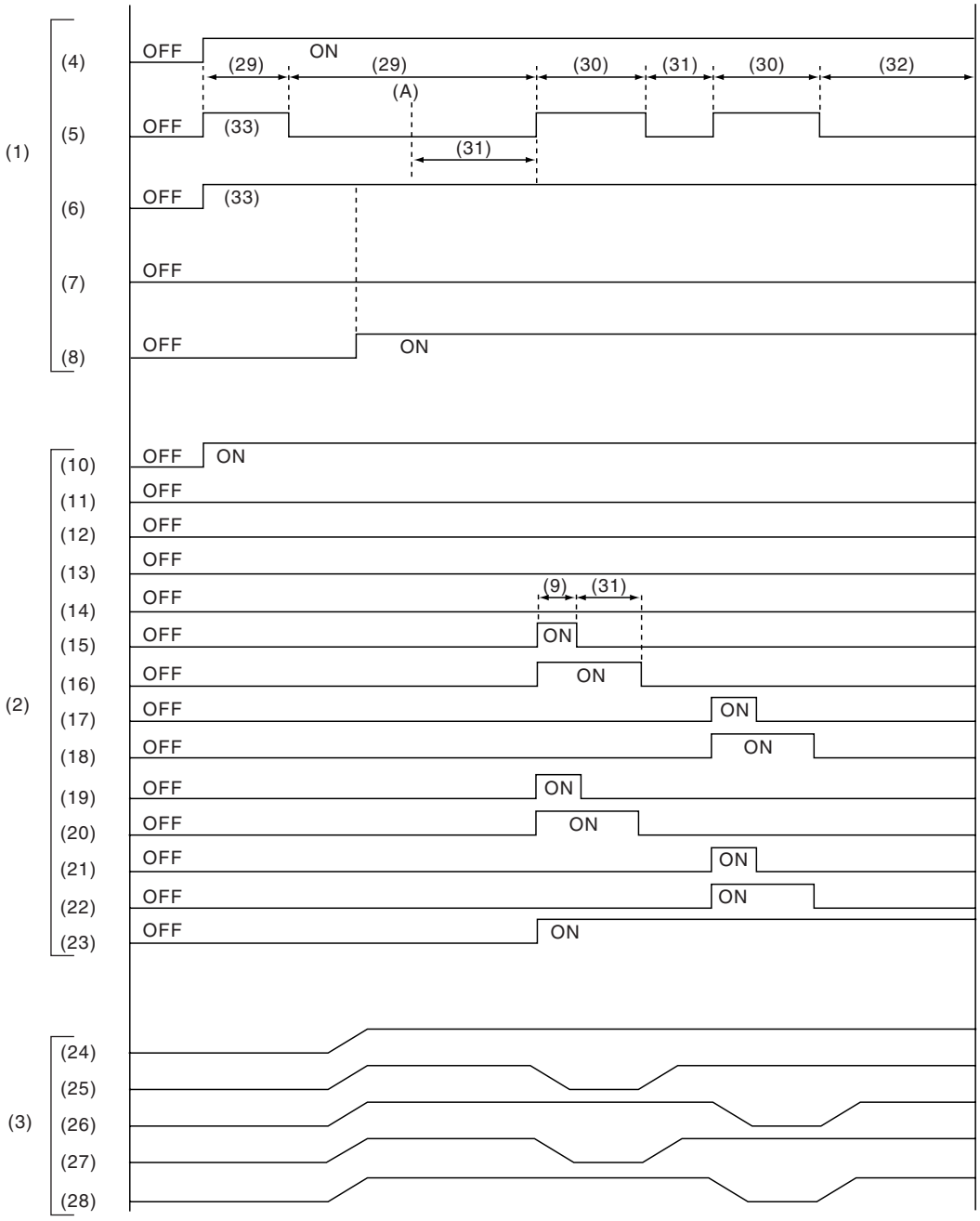
A: OPERATION

1) Under the ABS sequence control, after VDCH/U solenoid valve is driven, operation of the VDCH/U can be checked by means of the brake tester or pressure gauge.
2) ABS sequence control can be started by the Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

1) Connect the Subaru Select Monitor to data link connector under driver's seat instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) Put the Subaru Select Monitor to "BRAKE CONTROL" mode.
5) When the "Function check sequence" is selected, 'ABS sequence control' will start.
6) When the message "Press Brake Pedal with braking force of 100 to 150 kgf" is displayed, perform the followings.
   (1) When using the brake tester, depress the brake pedal with braking force of 1,000 N (102 kgf, 224 lbf).
   (2) When using the pressure gauge, depress the brake pedal so as to make the pressure gauge indicate 3,500 kPa (36 kgf/cm^2, 511 psi).
7) When the message "Press YES" is displayed, press the «YES» key.
8) Operation points will be displayed on the Subaru Select Monitor.

2. CONDITIONS FOR ABS SEQUENCE CONTROL



VDC00324

(1) Operational guide line of sequence control
(2) Operational pattern of sequence control
(3) Operational pressure of sequence control
(4) Ignition key switch
(5) ABS warning light
(6) VDC warning light
(7) VDC operation indicator light
(8) Pressure sensor signal
(9) 0.4 s
(10) Valve relay
(11) Secondary cut valve
(12) Primary cut valve
(13) Secondary suction valve
(14) Primary suction valve
(15) FL outlet valve
(16) FL inlet valve
(17) FR outlet valve
(18) FR inlet valve
(19) RR outlet valve
(20) RR inlet valve
(21) RL outlet valve
(22) RL inlet valve
(23) Pump motor
(24) Pressure of master cylinder
(25) Pressure of FL wheel cylinder
(26) Pressure of FR wheel cylinder
(27) Pressure of RR wheel cylinder
(28) Pressure of RL wheel cylinder
(29) Approx. 2 s
(30) 1.4 s
(31) 1.0 s
(32) 0.6 s
(33) LIGHT

NOTE:
Sequence control operation starts at point (A)

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, ABS sequence control stops and ABS operation is returned to normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during sequence control and braking lamp switch is set to off.
3) When malfunction is detected.

5. VDC Sequence Control

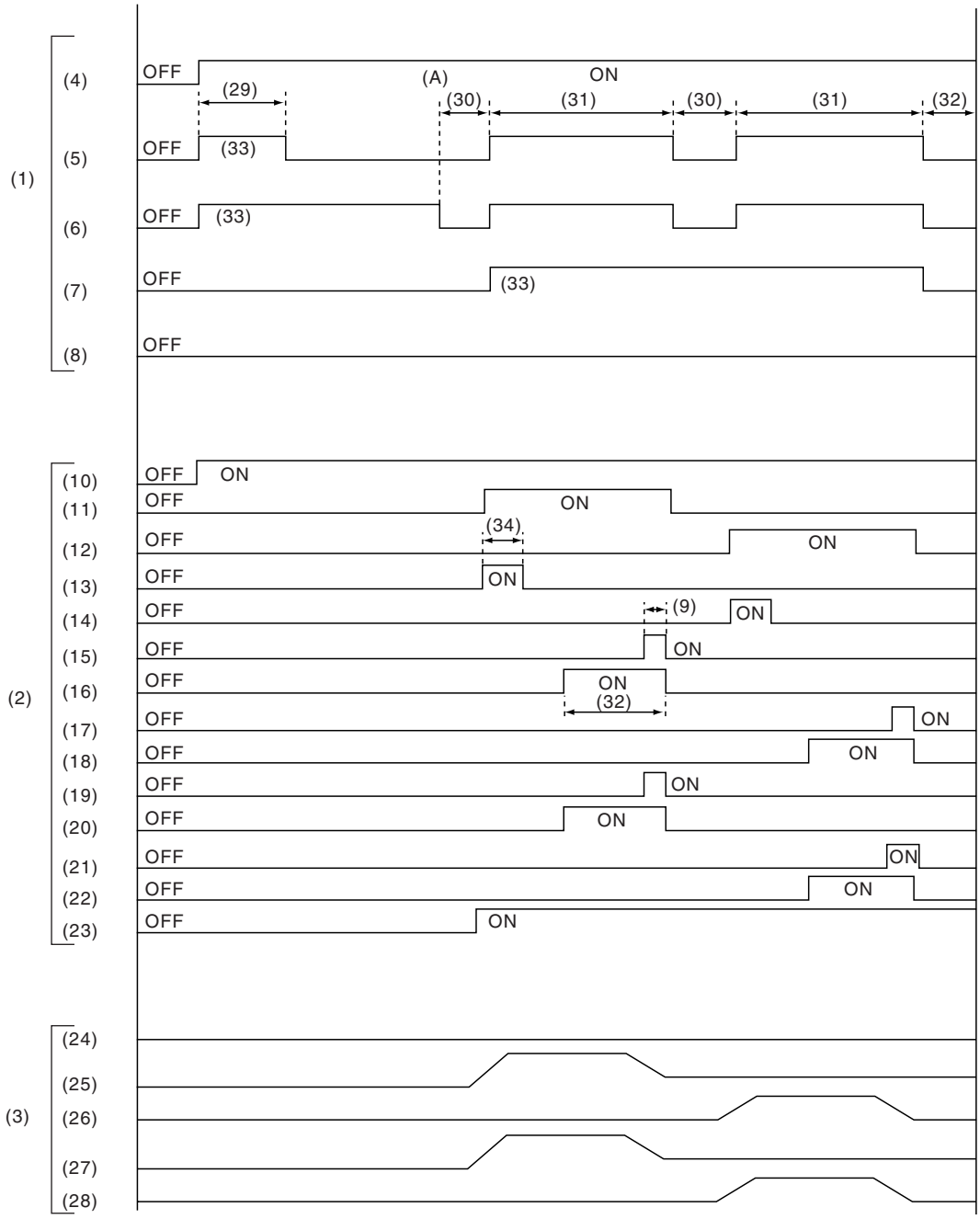
A: OPERATION

1) Under the VDC sequence control, after VDCH/U solenoid valve is driven, operation of the VDCH/U can be checked by means of the brake tester or pressure gauge.
2) VDC sequence control can be started by the Subaru Select Monitor.

1. VDC SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

1) Connect the Subaru Select Monitor to data link connector beside driver's seat instrument panel lower cover.
2) Turn the ignition switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) Put the Subaru Select Monitor to "BRAKE CONTROL" mode.
5) Select the "VDC Check Mode" in {Function check sequence} menu to start "VDC sequence control".
6) When the message "Press YES" is displayed, press «YES» key.
7) Operation points will be displayed on the Subaru Select Monitor.

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00325

(1) Operational guide line of sequence control
(2) Operational pattern of sequence control
(3) Operational pressure of sequence control
(4) Ignition key switch
(5) ABS warning light
(6) VDC warning light
(7) VDC operation indicator light
(8) Pressure sensor signal
(9) 0.4 s
(10) Valve relay
(11) Secondary cut valve
(12) Primary cut valve
(13) Secondary suction valve
(14) Primary suction valve
(15) FL outlet valve
(16) FL inlet valve
(17) FR outlet valve
(18) FR inlet valve
(19) RR outlet valve
(20) RR inlet valve
(21) RL outlet valve
(22) RL inlet valve
(23) Pump motor
(24) Pressure of master cylinder
(25) Pressure of FR wheel cylinder
(26) Pressure of FL wheel cylinder
(27) Pressure of RL wheel cylinder
(28) Pressure of RR wheel cylinder
(29) Approx. 2 s
(30) 1.0 s
(31) 3.4 s
(32) 1.6 s
(33) LIGHT
(34) 0.8 s

NOTE:
Sequence control operation starts point (A)

B: SPECIFICATION

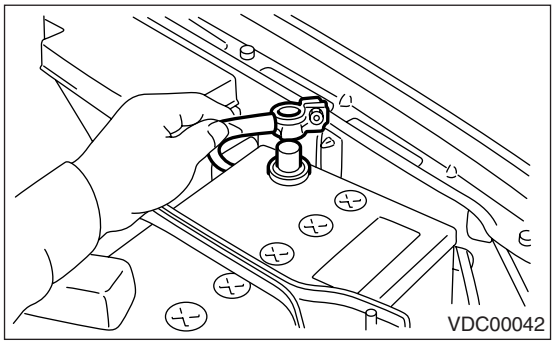
1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

When the following conditions develop, VDC sequence control stops and VDC operation is returned to normal control mode.
1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
2) When the brake pedal is released during sequence control and braking lamp switch is set to off.
3) When malfunction is detected.

6. Yaw Rate and Lateral G Sensor

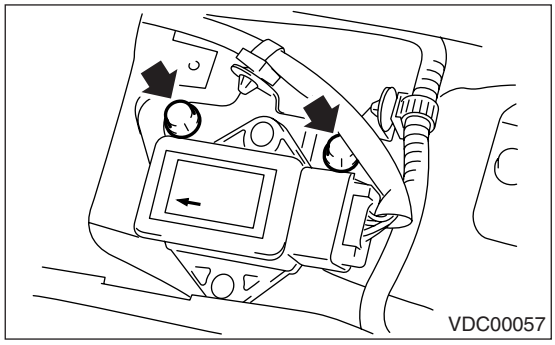
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the console cover.
<Ref. to EI-39, Console Box.>
3) Disconnect the connector from yaw rate & lateral G sensor.
4) Remove the yaw rate & lateral G sensor.

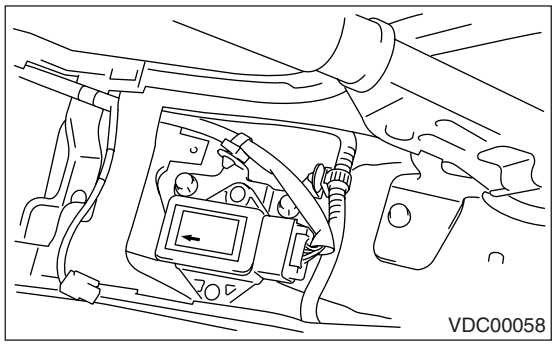
CAUTION:
• Do not drop or bump the yaw rate & lateral G sensor.
• The sensor and bracket are integrated as a unit. Do not attempt to separate them.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Do not install the yaw rate & lateral G sensor in wrong direction. There is an arrow on the sensor showing which side faces the front of vehicle.



Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
After completion of installation procedure, the following two position settings must be made.
• Steering angle sensor center positioning
• Yaw rate & lateral G sensor 0 positioning
These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, refer to the section describing VDCCM adjustment. <Ref. to VDC-8, ADJUSTMENT, VDC Control Module (VDCCM).>.

C: INSPECTION

1. LATERAL G SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK SUBARU SELECT MONITOR.**	Is the Subaru Select Monitor available?	Go to step **5.**	Go to step **2.**
2	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Move the vehicle to a flat location. 2) Turn the ignition switch to OFF. 3) Connect the connector to yaw rate & lateral G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between yaw rate & lateral G sensor connector terminals when it is horizontal. ***Connector & terminal*** ***(R257) No. 5 (+) — No. 6 (–)***	Is the voltage 2.3 — 2.7 V?	Go to step **3.**	Replace the yaw rate & lateral G sensor.
3	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Remove the yaw rate & lateral G sensor from vehicle. 2) Measure the voltage between yaw rate & lateral G sensor connector terminals when it is inclined right to 90°. ***Connector & terminal*** ***(R257) No. 5 (+) — No. 6 (–)*** NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 3.3 — 3.7 V?	Go to step **4.**	Replace the yaw rate & lateral G sensor.
4	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between yaw rate & lateral G sensor connector terminals when it is inclined left to 90°. ***Connector & terminal*** ***(R257) No. 5 (+) — No. 6 (–)*** NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 1.3 — 1.7 V?	Yaw rate & lateral G sensor is normal.	Replace the yaw rate & lateral G sensor.
5	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor connector to data link connector. 3) Turn the ignition switch to ON. 4) Turn the Subaru Select Monitor into {Current Data Display & Save} mode. 5) Set the display in {Current Data Display & Save} mode. 6) Read the yaw rate & lateral G sensor output voltage when vehicle is in horizontal position. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 2.3 — 2.7 V?	Go to step **6.**	Replace the yaw rate & lateral G sensor.

	Step	Check	Yes	No
6	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Remove the console box. 2) Remove the yaw rate & lateral G sensor from vehicle. (Do not disconnect connector.) 3) Read the Subaru Select Monitor display when yaw rate & lateral G sensor is inclined right to 90°. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 3.3 — 3.7 V?	Go to step **7.**	Replace the yaw rate & lateral G sensor.
7	**CHECK YAW RATE & LATERAL G SENSOR.** Read the Subaru Select Monitor display when yaw rate & lateral G sensor is inclined left to 90°. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 1.3 — 1.7 V?	Yaw rate & lateral G sensor is normal.	Replace the yaw rate & lateral G sensor.

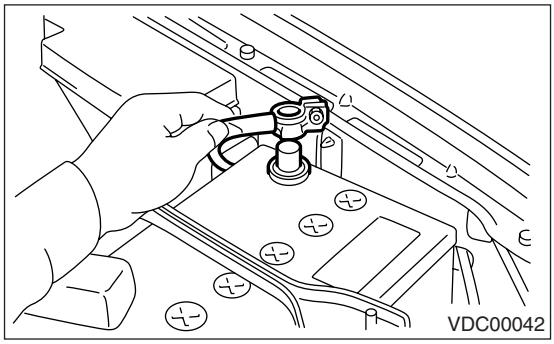
2. YAW RATE SENSOR SIGNAL

	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR USING OSCILLOSCOPE.** 1) Connect all connectors. 2) Set the oscilloscope to TCM connector terminals. Positive probe; (B257) No. 4 Ground lead; (B257) No. 6 3) Start the engine. 4) Measure the signal voltage indicated on oscilloscope.<Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the voltage 2.1 — 2.9 V?	Go to step **2.**	Replace the yaw rate & lateral G sensor.
2	**CHECK YAW USING OSCILLOSCOPE.** 1) Turn the ignition switch to OFF. 2) Set the oscilloscope to TCM connector terminals. Positive probe; (B257) No. 2 Ground lead; (B257) No. 6 3) Start the engine. 4) Measure the signal voltage indicated on oscilloscope. <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the voltage 5 V?	Yaw rate & lateral G sensor is normal.	Replace the yaw rate & lateral G sensor.

7. Steering Angle Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.

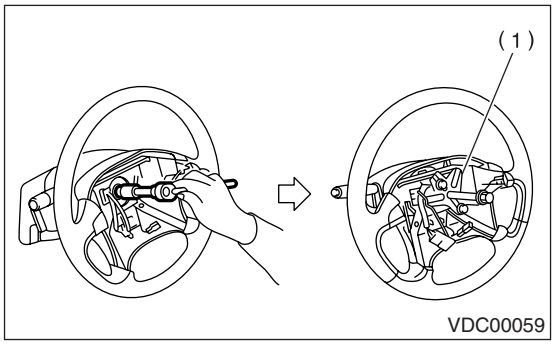


2) Remove the airbag module. **<Ref. to AB-14,** REMOVAL**, Driver's Airbag Module.>**

WARNING:
Always refer to "Airbag System" before performing the airbag module service.
<Ref. to AB-3, CAUTION, General Description.>

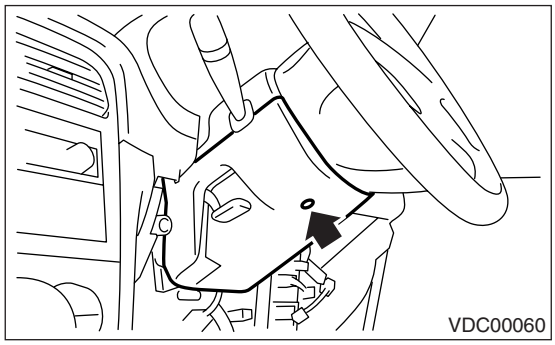
3) Remove the steering wheel nut, then draw out the steering wheel from shaft using steering puller.

NOTE:
Steering wheel must be removed at the straight ahead position.



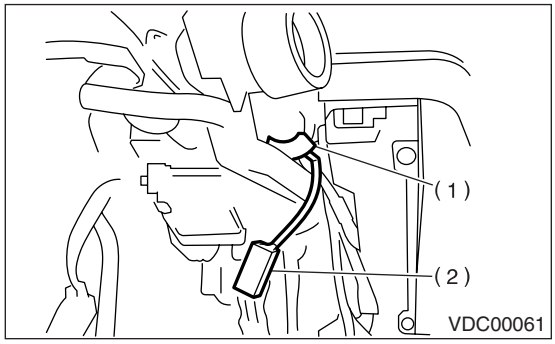
(1) Steering puller

4) Remove the screw securing steering column lower cover.



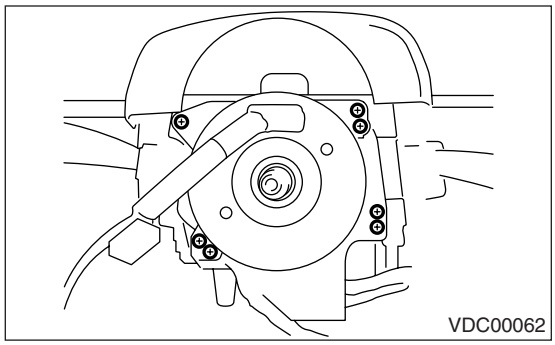
5) Remove the two screws securing steering column upper cover.

6) Release the lock of harness band and disconnect the connector of steering angle sensor.

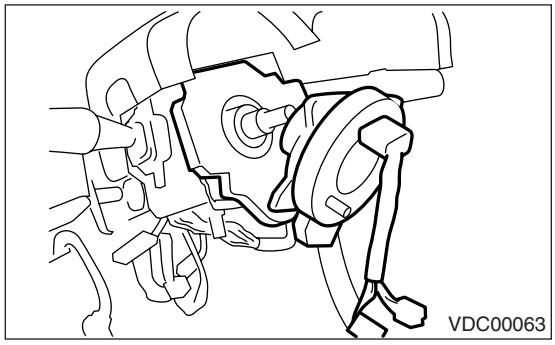


(1) Harness band
(2) Connector

7) Remove the bolts which hold roll connector and steering angle sensor onto steering column.



8) Remove the roll connector and steering angle sensor.

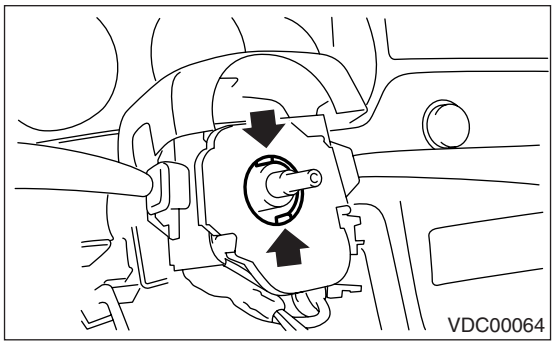


NOTE:
Do not turn the steering angle sensor as it's center position has been recognized by VDCCM.

B: INSTALLATION

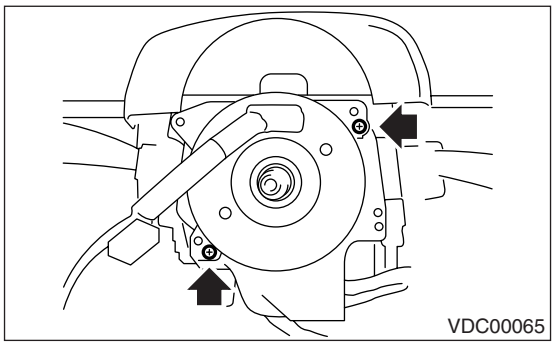
CAUTION:
Ensure that the front wheels are set in straight ahead direction.

1) Place the steering angle sensor on steering column, confirming that the sensor is positioned as in the figure.

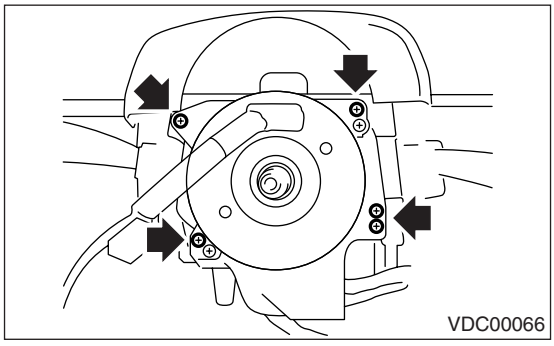


2) Conduct centering of the roll connector.
<Ref. to AB-20, INSTALLATION**, Roll Connector.>**

3) Place the roll connector over steering angle sensor and tighten the bolts which secure roll connector and steering angle sensor.



4) Tighten the bolts which install roll connector and steering angle sensor onto steering column.



5) Set the steering wheel to neutral and install it onto steering shaft.

Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)

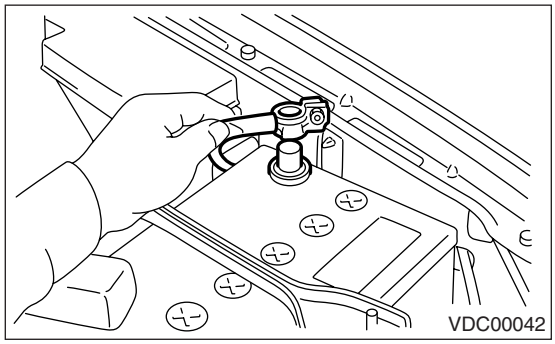
Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out the airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

6) Install the airbag module to steering wheel.
<Ref. to AB-14, INSTALLATION**, Driver's Airbag Module.>**

WARNING:
Always refer to "Airbag System" before performing the service operation.
<Ref. to AB-3, CAUTION, General Description.>

7) Connect the battery ground cable to battery.



CAUTION:
After completion of installation procedure, the following two position settings must be made.
• SRS roll connector and steering angle sensor center positioning.
• Yaw rate & lateral G sensor 0 positioning.
These procedures are necessary for VDCCM to later recognize what position the vehicle is in. For procedures for the above two settings, refer to the section describing VDCCM adjustment. <Ref. to VDC-8, ADJUSTMENT, VDC Control Module (VDCCM).>

C: INSPECTION

Refer to “VDC (diag) section” for inspection procedures of steering angle sensor. <Ref. to VDC(diag)-110, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-112, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-114, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-116, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

8. Front ABS Wheel Speed Sensor

A: NOTE

For the vehicle equipped with VDC, it has the same ABS wheel speed sensor as installed to the vehicle equipped with ABS. For removal, installation and inspection procedure, refer to ABS section.
<Ref. to ABS-14, Front ABS Wheel Speed Sensor.>

9. Rear ABS Wheel Speed Sensor

A: NOTE

For the vehicle equipped with VDC, it has the same ABS wheel speed sensor as installed to the vehicle equipped with ABS. For removal, installation and inspection procedure, refer to ABS section.
<Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>

10.Front Tone Wheel

A: NOTE

As front tone wheel is integrated with front drive shaft, refer to “DS section” for removal, installation, and inspection procedures.
<Ref. to DS-33, Front Drive Shaft.>

11.Rear Tone Wheel

A: REMOVAL

Remove the bolts, and then remove the tone wheel from hub.
<Ref. to DS-25, REMOVAL**, Rear Axle.>**

B: INSTALLATION

Remove the dirt from mating surface of hub and tone wheel, and then install the tone wheel to hub with bolt.
<Ref. to DS-28, INSTALLATION**, Rear Axle.>**

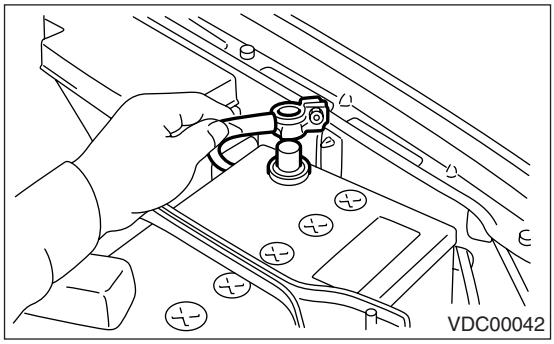
C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

12.VDC OFF Switch

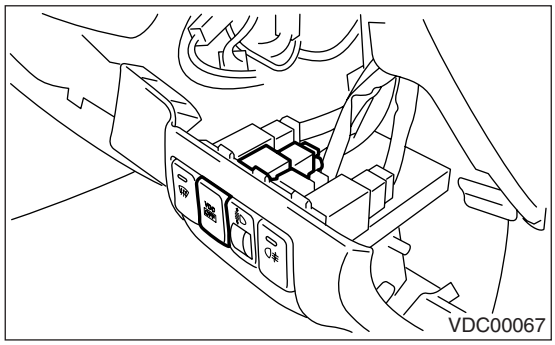
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the instrument panel lower cover. **<Ref. to EI-40,** REMOVAL**, Instrument Panel Assembly.>**

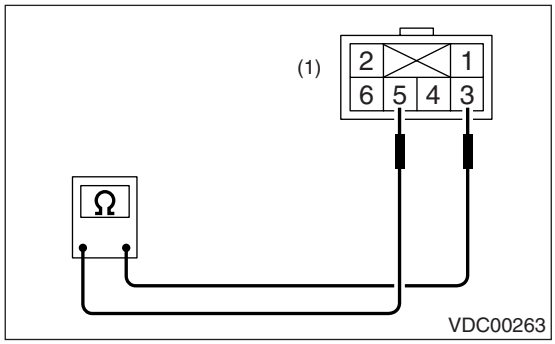
3) Remove the VDC OFF switch by pushing it outward.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



(1) VDC OFF switch side

Measure the resistance between VDC OFF switch terminals.

Switch position	Tester connection	Standard
OFF	3 — 5	More than 1 MΩ
ON	3 — 5	Less than 1 Ω

If NG, replace the VDC OFF switch.

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS) VDC(diag)

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13.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	34
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1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- Check List for Interview <Ref. to VDC(diag)-3, Check List for Interview.>

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using interview checklist. <Ref. to VDC(diag)-3, Check List for Interview.> 2) Before performing diagnostic, inspect the unit which might influence the VDC problem. <Ref. to VDC(diag)-7, INSPECTION, General Description.>	Is the component that might influence the VDC problem normal?	Go to step **2.**	Repair or replace each component.
2	**CHECK INDICATION OF DTC ON SCREEN.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor to ON. 4) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Record all DTCs and Freeze Frame Data.	Is DTC displayed?	Go to step **4.**	Go to step **3.**
3	**PERFORM GENERAL DIAGNOSTICS.** 1) Inspect using a “General Diagnostic Table”. <Ref. to VDC(diag)-147, INSPECTION, General Diagnostic Table.> 2) Perform the clear memory mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 3) Perform the inspection mode. <Ref. to VDC(diag)-24, OPERATION, Inspection Mode.> 4) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).> 5) Check the DTC does not displayed.	Is the warning light illumination pattern OK? <Ref. to VDC(diag)-26, Warning Light Illumination Pattern.>	Finish the diagnostic.	Check the warning light. Refer to “LIST OF DIAGNOSTIC TROUBLE CODE (DTC)”. <Ref. to VDC(diag)-28, List of Diagnostic Trouble Code (DTC).>
4	**PERFORM DIAGNOSTICS.** 1) Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For the DTC list, refer to the “List of Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-28, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the wrong part. 3) Perform the clear memory mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.> 4) Perform the inspection mode. <Ref. to VDC(diag)-24, OPERATION, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to VDC(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnostic.

2. Check List for Interview

A: CHECK

Inspect the following items about the vehicle's state.

1. STATE OF ABS/VDC WARNING LIGHT

ABS/VDC warning light come on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When/how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON after starting (Engine running.)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Part name: • State of operation:		

2. STATE OF VDC WARNING LIGHT/VDC OFF INDICTOR LIGHT

VDC warning light/ VDC OFF indicator light come on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When/how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON after starting (Engine is running.) ❑ ON after starting (Engine is at a standstill.)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Part name: • State of operation:		

3. STATE OF VDC OPERATION INDICTOR LIGHT

VDC operation indicator light comes on.	❑ Always ❑ Sometimes ❑ Only once ❑ Not come on • When/how long does it come on?		
Ignition key position	❑ LOCK ❑ ACC ❑ ON (before starting engine) ❑ START ❑ ON after starting (Engine is running.) ❑ ON after starting (Engine is at a standstill.)		
Timing	❑ Immediately after turning the ignition to ON ❑ Immediately after turning the ignition to START		
	❑ When accelerating	—	km/h
		—	MPH
	❑ When driving at a constant speed	km/h	MPH
	❑ When decelerating	—	km/h
		—	MPH
	❑ When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	❑ When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	❑ When operating other electrical parts		
	• Part name: • State of operation:		

4. CONDITIONS UNDER TROUBLE OCCURRENCE

Environment	a) Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Others:
	b) Ambient temperature	°C (°F)
	c) Road	❑ Inner city ❑ Suburbs ❑ Highway ❑ Local street ❑ Uphill ❑ Downhill ❑ Paved road ❑ Gravel road ❑ Muddy road ❑ Sandy place ❑ Straight road ❑ Sharp curve ❑ Gentle curve ❑ S-curve ❑ Curved road on both edge ❑ Others:
	d) Road surface	❑ Dried ❑ Wet ❑ Covered with fresh snow ❑ Covered with hardened snow ❑ Frozen slope ❑ Others:

Check List for Interview

Condition	a) Brakes	Deceleration:	G
		❑ Intermittent / ❑ Temporary	
	b) Accelerator	Acceleration:	G
		❑ Intermittent / ❑ Temporary	
	c) Vehicle speed	km/h	MPH
		❑ Advancing ❑ When accelerating ❑ When decelerating ❑ When low speed ❑ When turning ❑ Others:	
	d) Tire inflation pressure	Front RH tire:	kPa
		Front LH tire:	kPa
		Rear RH tire:	kPa
		Rear LH tire:	kPa
	e) Degree of wear	Front RH tire:	
		Front LH tire:	
		Rear RH tire:	
		Rear LH tire:	
	f) Steering wheel	❑ Sharp turning ❑ Gentle turning ❑ Straight ❑ Gentle returning ❑ Sharp returning	
	g) Tire/Wheel size	❑ Within specification ❑ Except specification ( )	
	h) Tire type	❑ Summer tire ❑ Studless tire (Manufacture:)	
	i) Chain is passed around tires: ❑ Yes / ❑ No		
	j) T-type tire is used: ❑ Yes / ❑ No		
	k) Condition of wheel alignment:		
	l) Loading state:		
	m) Repair parts are used: ❑ Yes / ❑ No		
	• Part name:		
	n) Others:		

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the ABS wheel speed sensor, VDCCM and VDCH/U.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor, VDCCM and VDCH/U.

B: INSPECTION

Before performing diagnostic, check the following items which might affect VDC problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:
12 V or more

Specific gravity:
More than 1.260

2. BRAKE FLUID

1) Check the brake fluid level. <Ref. to BR-42, INSPECTION, Brake Fluid.>
2) Check for brake fluid leaks. <Ref. to BR-42, INSPECTION, Brake Fluid.>

3. HYDRAULIC UNIT

Inspect the VDCH/U.
• With brake tester <Ref. to VDC-14, CHECKING THE VDC HYDRAULIC CONTROL UNIT (VDCH/U) VDC OPERATION WITH BRAKE TESTER, INSPECTION, VDC Hydraulic Control Unit (VDCH/U).>
• Without brake tester <Ref. to VDC-14, CHECKING THE VDC HYDRAULIC CONTROL UNIT (VDCH/U) VDC OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Hydraulic Control Unit (VDCH/U).>

4. BRAKE DRAG

Check for brake drag.

5. BRAKE PAD AND ROTOR

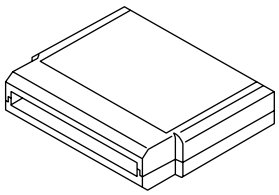
Check the brake pad and rotor.
• Front <Ref. to BR-18, INSPECTION, Front Brake Pad.> <Ref. to BR-19, INSPECTION, Front Disc Rotor.>
• Rear <Ref. to BR-23, INSPECTION, Rear Brake Pad.> <Ref. to BR-24, Rear Disc Rotor.>

6. TIRE

Check the tire specifications, tire wear and air pressure.<Ref. to WT-2, SPECIFICATION, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOL

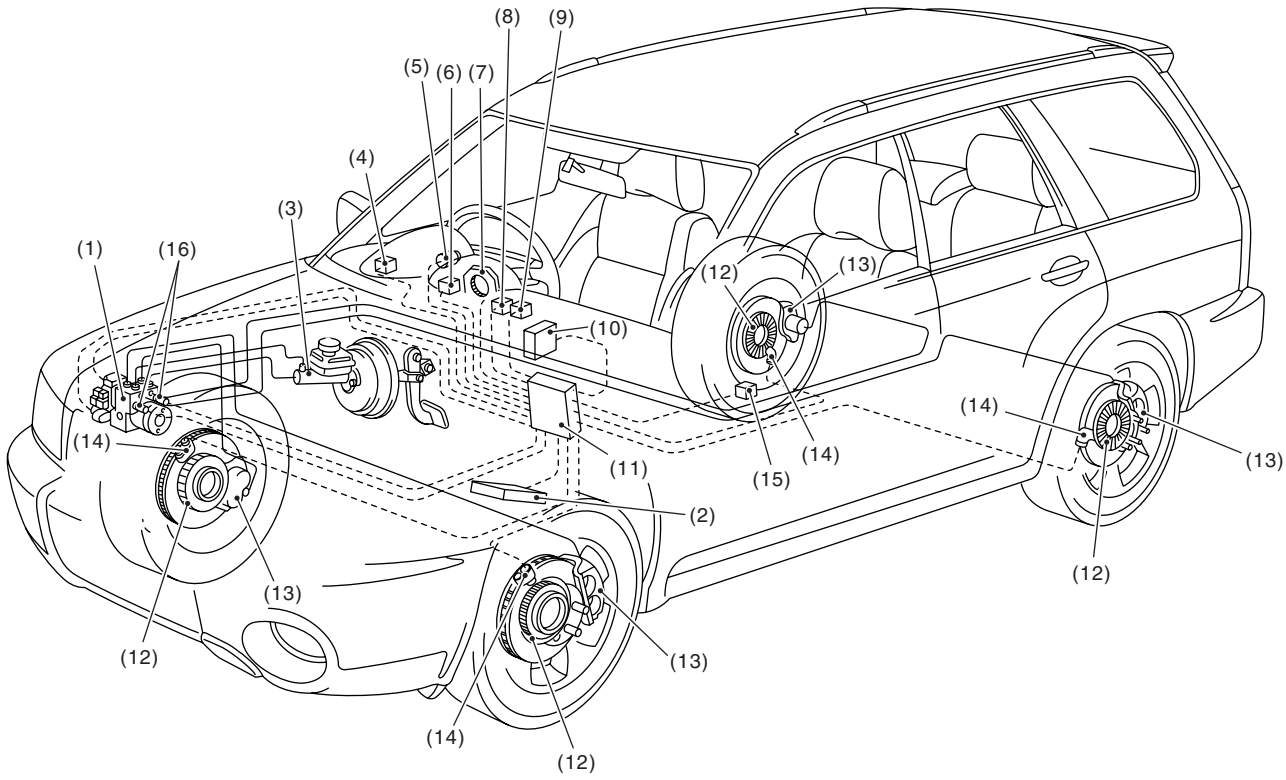
ILLUSTRATION	TOOL NUMBER	Description	Remarks
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	Remarks
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring sensor.

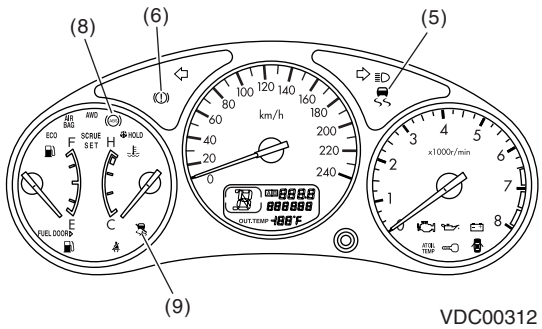
4. Electrical Component Location

A: LOCATION

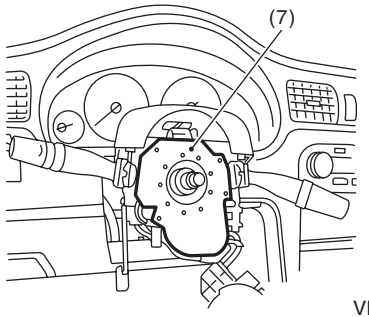


VDC00001

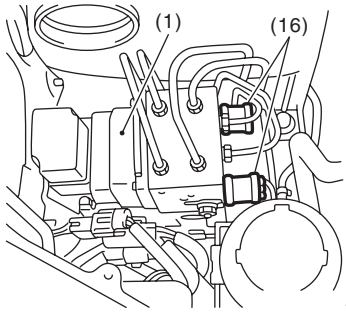
(1) VDC hydraulic control unit (VDCH/U)
(2) Engine Control Module (ECM)
(3) Master Cylinder
(4) VDC OFF Switch
(5) VDC indicator light
(6) Brake warning light (EBD warning light)
(7) Steering Angle Sensor
(8) ABS warning light
(9) VDC warning light/VDC OFF indicator light
(10) Transmission Control Module (TCM)
(11) VDC control module (VDCCM)
(12) Tone wheel
(13) Wheel cylinder
(14) ABS wheel speed sensor
(15) Yaw rate & lateral G sensor
(16) Pressure sensor



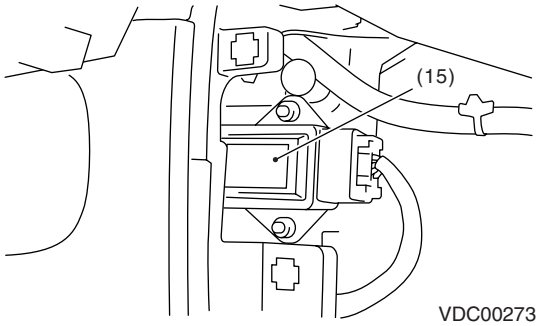
VDC00312



VDC00009

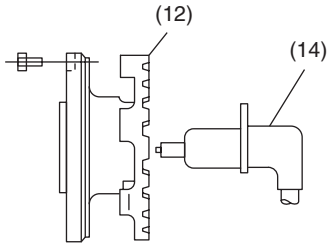


VDC00004



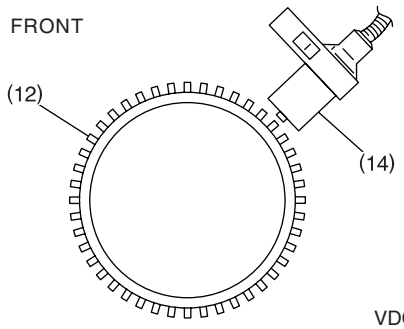
VDC00273

REAR



VDC00167

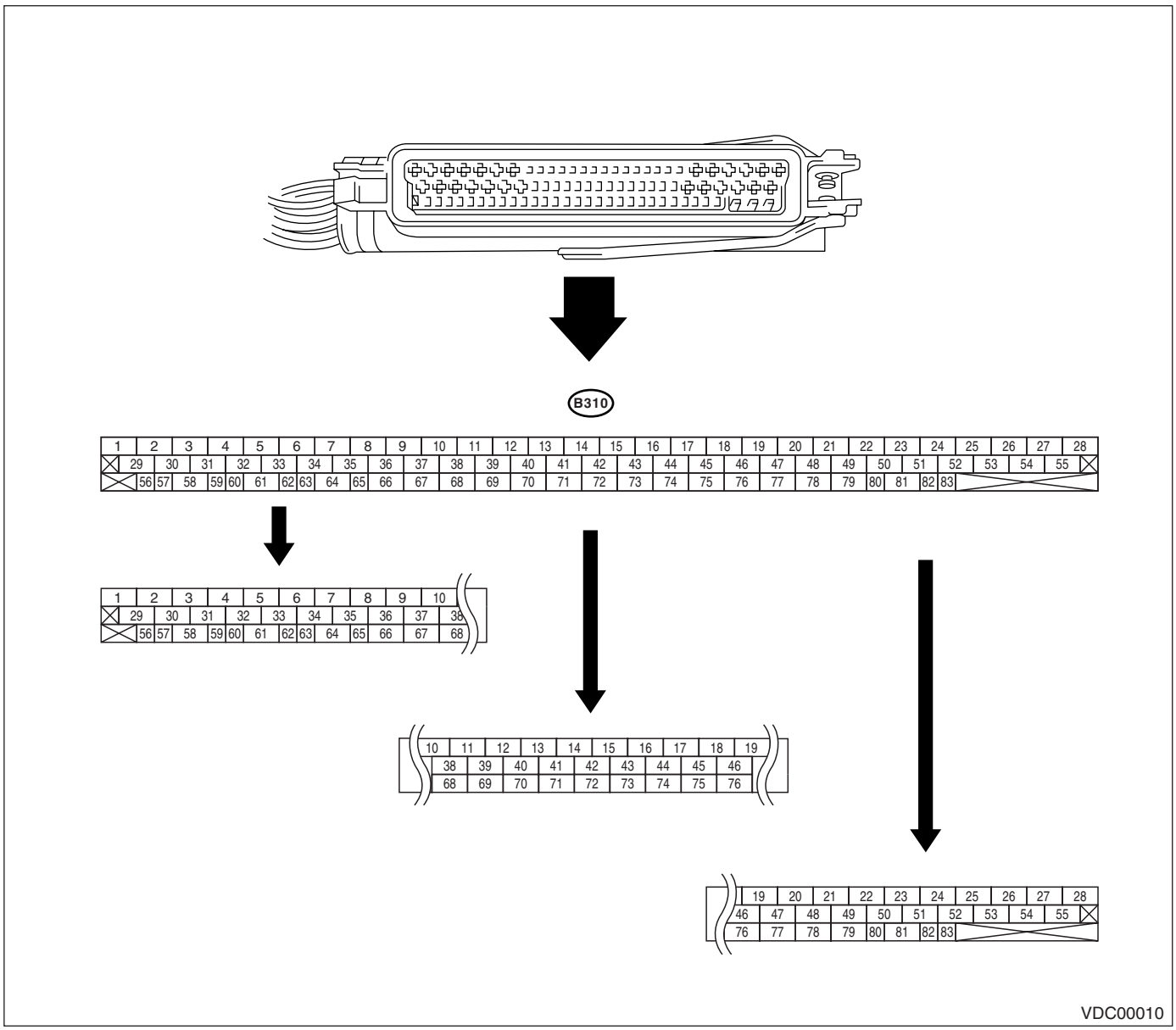
FRONT



VDC00008

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

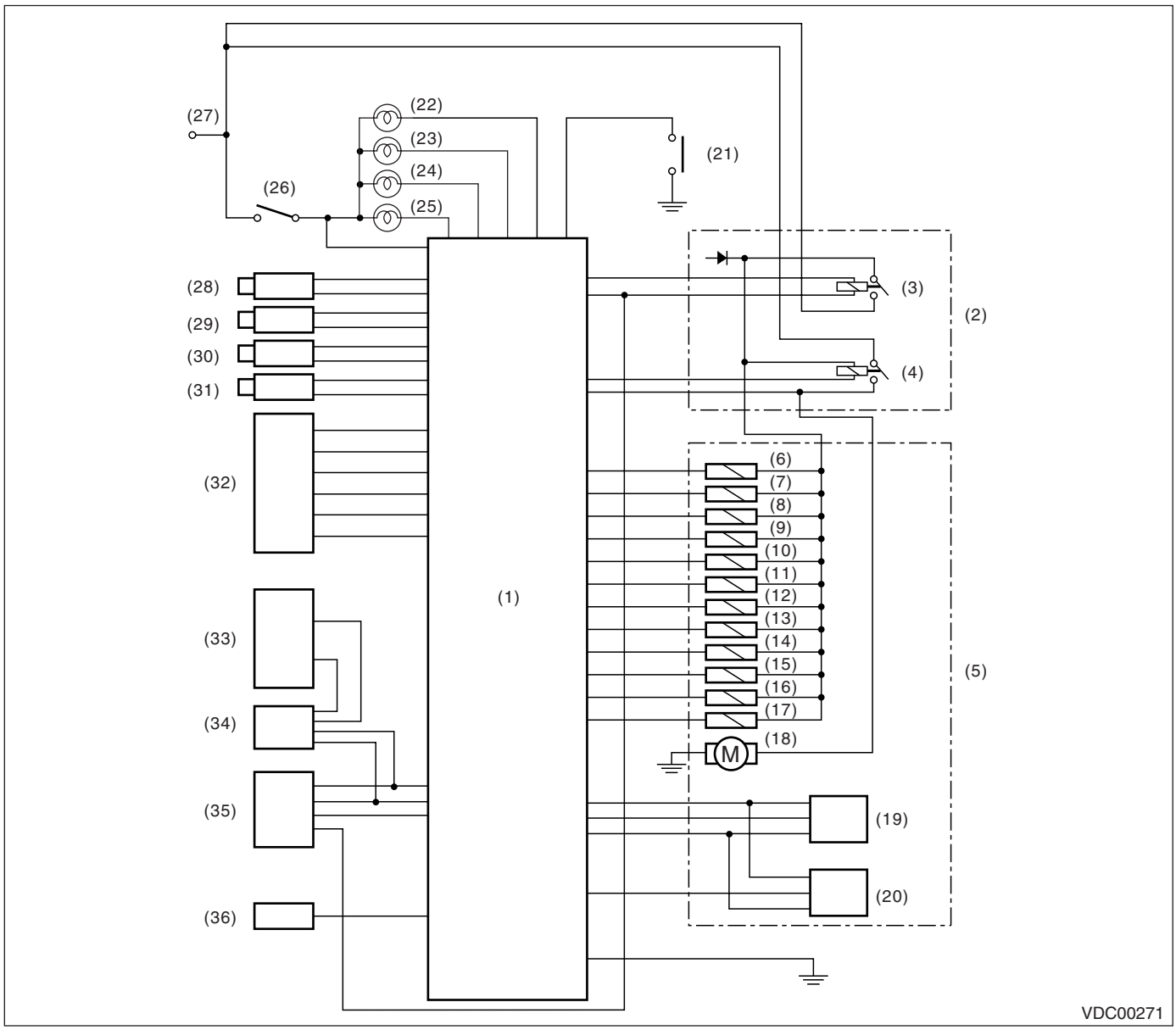


NOTE:
- Terminal numbers of VDCCM connectors are as shown in the figure.
- When the connector is removed from VDCCM, the connector switch closes the circuit between terminal No. 53 and 54. At this time, ABS warning light and brake warning light (EBD warning light) illuminate.

Description		Terminal No. (+) — (–)	Input/Output signal Measured value and measuring conditions
Ignition switch		28 — 1	When the ignition switch is ON, 10 — 15 V.
ABS wheel speed sensor (Wheel speed sensor)	Front left wheel	19 — 21	0.12 — 1 V (at 20 Hz)
	Front right wheel	13 — 14	
	Rear left wheel	15 — 16	
	Rear right wheel	17 — 18	
Yaw rate & lateral G sensor	Output (Lateral G sensor)	11 — 64	2.2 — 2.8 V, when the vehicle is in horizontal
	Power supply	50 — 64	When the ignition switch is ON, 10 — 15 V.
	Output (Yaw rate sensor)	65 — 64	Waveform <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Reference (Yaw rate sensor)	66 — 64	2.1 — 2.9 V
	Test	67 — 64	5 cycle — 1 V of 40 ms pulse signal. <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Ground	64	—
CAN Communication Line (+)		83 — 1	2.5 — 1.5 V pulse signal <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
CAN Communication Line (–)		81 — 1	3.5 — 2.5 V pulse signal <Ref. to VDC(diag)-15, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
Relay box	Valve relay power supply	27 — 1	When the ignition switch is ON, 10 — 15 V.
	Valve relay driving	48 — 1	When the ignition switch ON, less than 15 V.
	Motor relay driving	22 — 1	Less than 1.5 V (ABS/TCS/VDC operation): More than 10 V (ABS/TCS/VDC not operated)
	Motor monitoring	9 — 1	Less than 1.5 V (ABS/TCS/VDC operation): More than 10 V (ABS/TCS/VDC not operated)
VDCH/U	Front inlet (maintain) solenoid valve LH	24 — 1	When the valve OFF: 10 — 15 V, when the valve ON: less than 1.5 V
	Front inlet (maintain) solenoid valve RH	3 — 1	
	Rear inlet (maintain) solenoid valve LH	31 — 1	
	Rear inlet (maintain) solenoid valve RH	23 — 1	
	Front outlet (reducing pressure) solenoid valve LH	26 — 1	
	Front outlet (reducing pressure) solenoid valve RH	29 — 1	
	Rear outlet (reducing pressure) solenoid valve LH	4 — 1	
	Rear outlet (reducing pressure) solenoid valve RH	25 — 1	
	Primary cut solenoid valve	34 — 1	
	Secondary cut solenoid valve	35 — 1	
	Primary suction solenoid valve	32 — 1	
	Secondary suction solenoid valve	30 — 1	
Pressure sensor	Power supply	77 — 75	When the ignition switch is ON, 4.75 — 5.25 V.
	Primary output	76 — 75	0.48 — 0.72 V (when the brake pedal is released)
	Ground	75	—
	Secondary output	44 — 75	0.48 — 0.72 V (when the brake pedal is released)
VDC indicator light		72 — 1	After turning the ignition switch to ON, less than 1.5 V during 1.5 seconds and 10 — 15 V after 1.5 seconds passed.

Description	Terminal No. (+) — (–)	Input/Output signal
		Measured value and measuring conditions
VDC warning light/VDC OFF indicator light	61 — 1	When the ignition switch is ON and light is ON, less than 1.5 V, and when the ignition switch is ON and light is OFF, 10 — 15 V.
ABS warning light	53 — 1	After turning the ignition switch to ON, less than 1.5 V during 2.6 seconds and 10 — 15 V after 1.5 seconds passed.
Subaru Select Monitor	38 — 1	0 — 12 V pulse signal (in communication)
VDC OFF Switch	40 — 1	When the ignition switch is ON, 10 — 15 V. 0 V (when depressing the switch)
Ground	1	—
Ground	55	—
Brake warning light (EBD warning light)	54 — 1	After turning the ignition switch to ON, less than 1.5 V during 3.6 seconds and 10 — 15 V after 1.5 seconds passed.

B: WIRING DIAGRAM



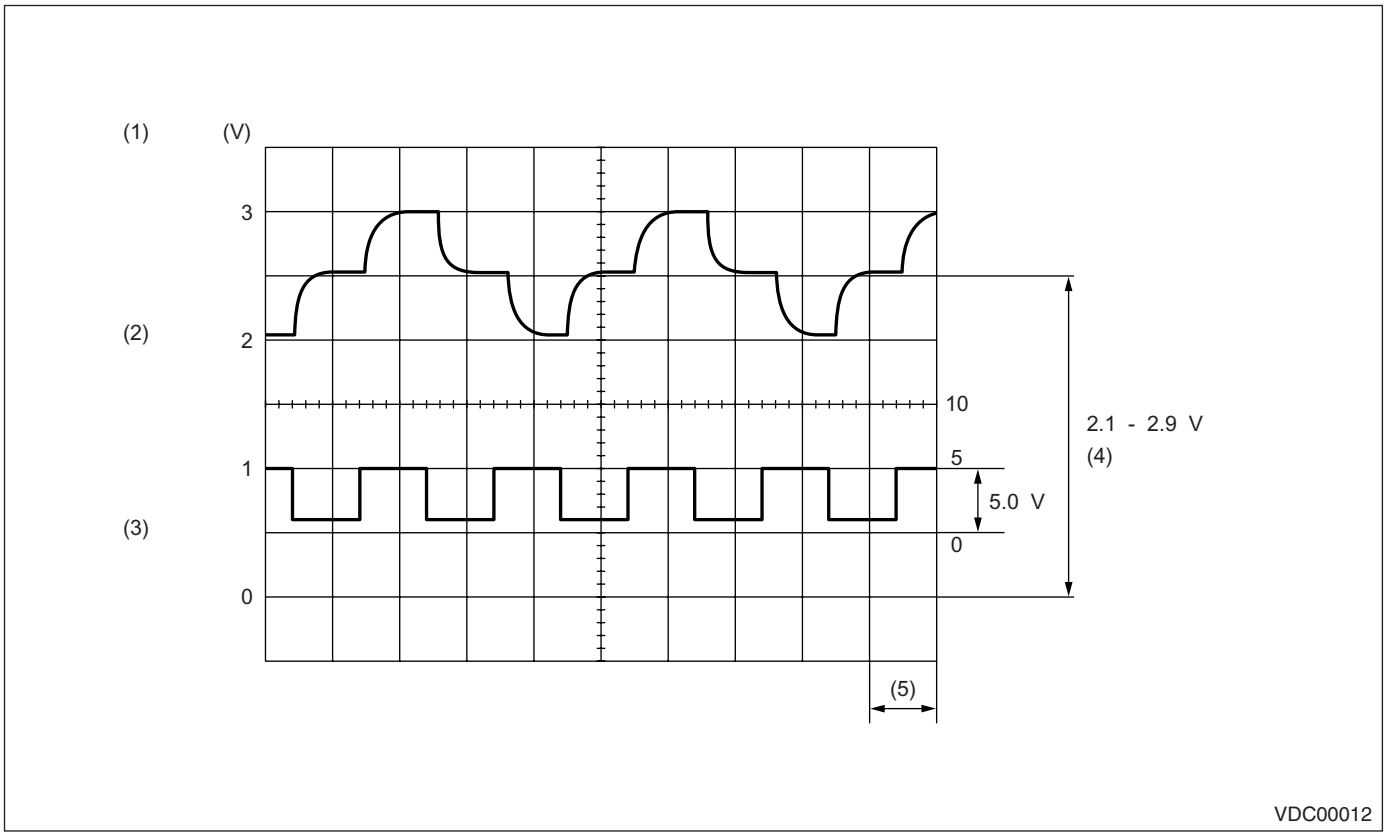
(1) VDC control module (VDCCM)
(2) Relay box
(3) Valve Relay
(4) Motor relay
(5) VDC hydraulic control unit (VDCH/U)
(6) Front maintain valve LH
(7) Front reducing pressure valve LH
(8) Front maintain valve RH
(9) Front reducing pressure valve RH
(10) Rear maintain valve LH
(11) Rear reducing pressure valve LH
(12) Rear maintain valve RH
(13) Rear reducing pressure valve RH
(14) Primary suction solenoid valve
(15) Primary cut solenoid valve
(16) Secondary suction solenoid valve
(17) Secondary cut solenoid valve
(18) Motor
(19) Primary pressure sensor
(20) Secondary pressure sensor
(21) VDC OFF Switch
(22) ABS warning light
(23) VDC warning light/VDC OFF indicator light
(24) VDC indicator light
(25) Brake warning light (EBD warning light)
(26) Ignition relay
(27) Battery
(28) Front ABS wheel speed sensor LH
(29) Front ABS wheel speed sensor RH
(30) Rear ABS wheel speed sensor LH
(31) Rear ABS wheel speed sensor RH
(32) Yaw rate & lateral G sensor
(33) Engine Control Module (ECM)
(34) Transmission Control Module (TCM)
(35) Steering Angle Sensor
(36) Data Link Connector

C: MEASUREMENT

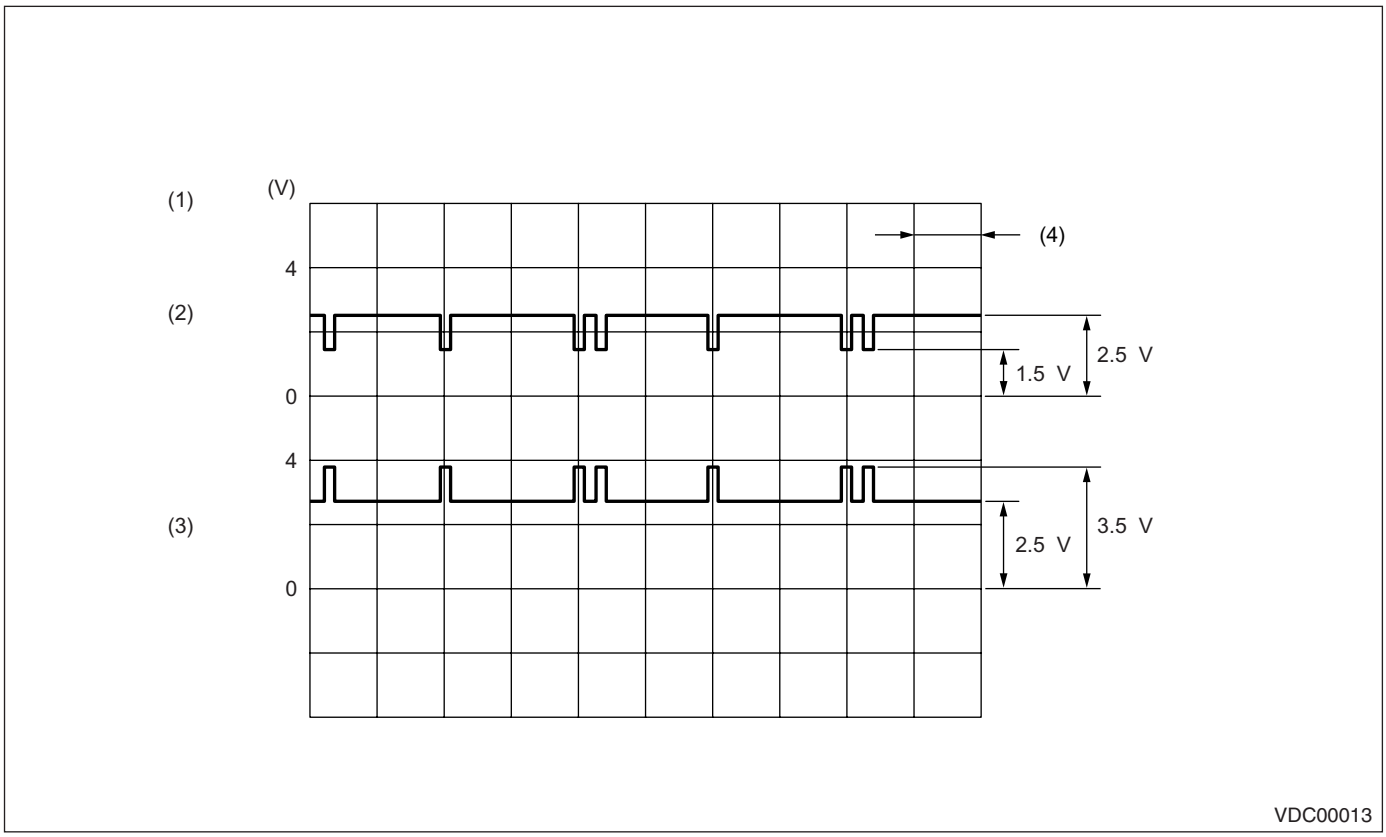
Measure input/output signal voltage.

NOTE:
Measure it with VDCCM connector cover removed. <Ref. to VDC(diag)-17, VDCCM Connector Cover.>

1. WAVEFORM



(1) Yaw rate sensor
(2) Terminal No. 65 — 64
(3) Terminal No. 67 — 64
(4) Vehicle is at a standstill.
(5) 20 ms

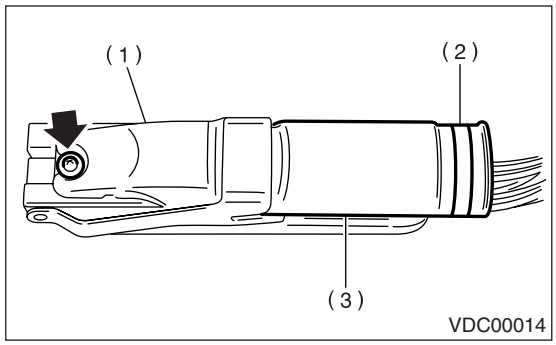


(1) CAN communication line
(2) Terminal No. 83 — 1
(3) Terminal No. 81 — 1
(4) 5 ms

6. VDCCM Connector Cover

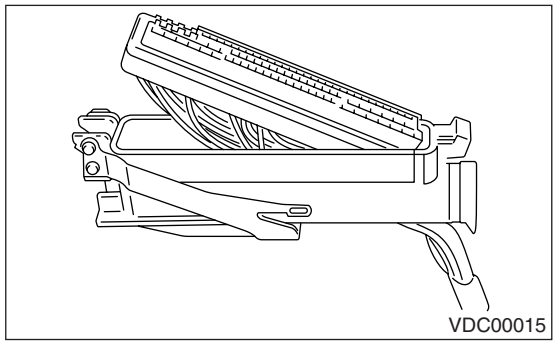
A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the connector from VDCCM.
3) Remove the band.
4) Remove the cable clamp cover.
5) Remove the screw securing connector cover.



(1) Connector cover
(2) Band
(3) Cable clamp cover

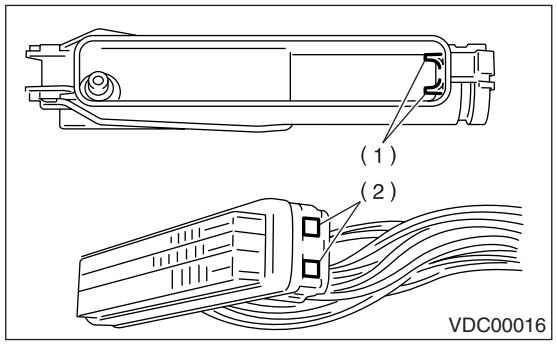
6) Remove the connector cover.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Align the rib of connector cover to connector hole correctly before installation.



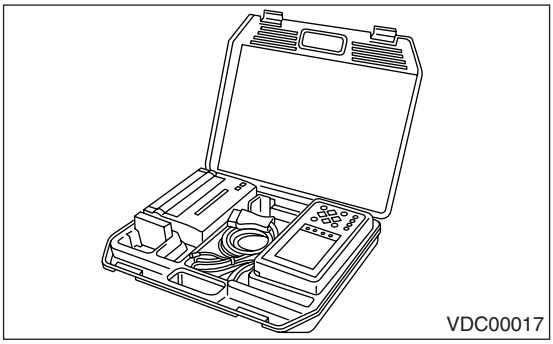
(1) Rib
(2) Hole

7. Subaru Select Monitor

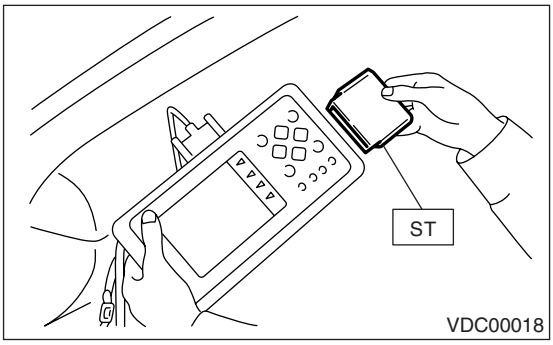
A: OPERATION

1. READ DTC

1) Prepare the Subaru Select Monitor kit.

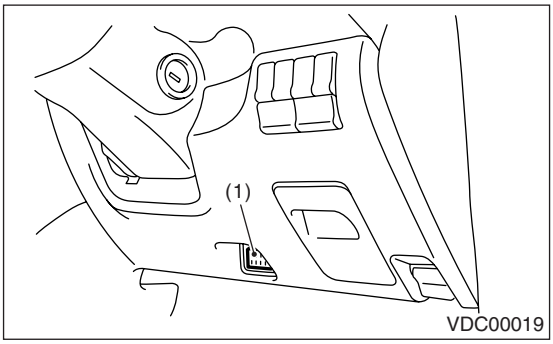


2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to VDC(diag)-8, SPECIAL TOOL, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

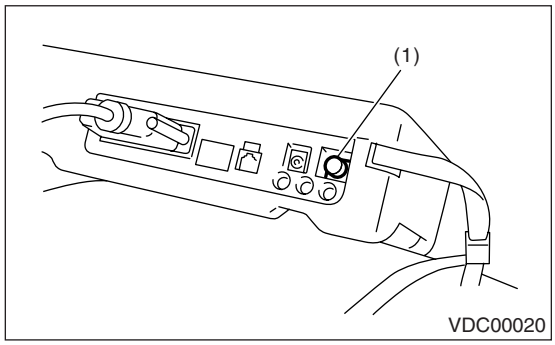
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(1) Data Link Connector

(2) Connect the diagnostic cable to data link connector.

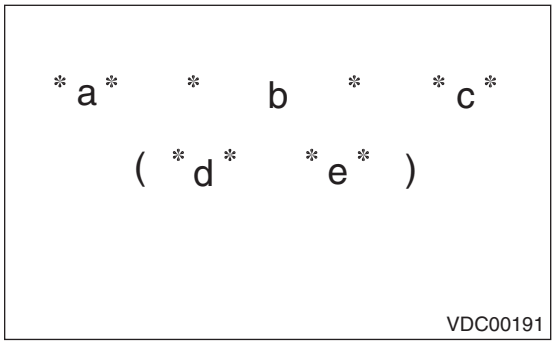
5) Turn the ignition switch to ON (engine OFF), and the Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
7) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
8) Press the [YES] key after the information of engine type is displayed.
9) On the «brake Control Diagnosis» display screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.

NOTE:
• For details concerning operation procedure, refer to "SUBARU SELECT MONITOR OPERATION MANUAL".
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to VDC(diag)-28, List of Diagnostic Trouble Code (DTC).>
• Maximum 3 DTCs displayed in chronological order.



a: DTC (2 digit)
b: Trouble contents
c: Chronological order that trouble occur. (Present, Previous, Second previous, Third previous)
d: Detail DTC (4 digit)
e: IG/ON number after malfunction occurred (maximum 254)

Display	Display contents
Previous	Latest DTC in previous trouble is displayed in Subaru Select Monitor.
Second previous	Previous DTC in previous trouble is displayed in Subaru Select Monitor.
Third previous	Before 3 DTC in previous trouble is displayed in Subaru Select Monitor.

*If the vehicle in trouble, “Current” is displayed.

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the VDC type is displayed.
4) On the «Brake Control Diagnosis» screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, scroll the display screen up or down until the desired data is shown.

- Following table are shown the list of support data.

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h
Steering Angle Sensor	Steering wheel angle that detected by steering angle sensor is displayed.	deg
Yaw Rate Sensor	Vehicle angular speed detected by yaw rate sensor is displayed.	deg/s
Pressure Sensor (P)	Brake fluid pressure detected by primary pressure sensor is displayed.	bar
Pressure Sensor (S)	Brake fluid pressure detected by secondary pressure sensor is displayed.	bar
Lateral G Sensor	Acceleration in lateral direction detected by lateral G sensor is displayed.	m/s^2
IG Power Supply Voltage	Voltage supplied to VDCCM is displayed.	V
Valve Relay	Valve relay operating condition is displayed.	ON or OFF
Motor Relay	Motor relay operating condition is displayed.	ON or OFF
Motor Relay Monitor	Motor relay operating condition is displayed.	ON or OFF
VDC ON	VDC operation condition is displayed.	ON or OFF
VDC Warning Light	ON/OFF state of VDC warning light/VDC OFF indicator light is displayed. (ON displayed when VDC is faulty.)	ON or OFF
ABS Warning Light	ON/OFF state of ABS warning light is displayed.	ON or OFF
VDC OFF Light	ON/OFF state of VDC warning light/VDC OFF indicator light is displayed. (ON/OFF displayed by operating VDC OFF switch and EAM signal.)	ON or OFF
EBD Warning Light	ON/OFF state of EBD warning light is displayed.	ON or OFF
EAM Signal	Engine control command signal is displayed.	1 or 0
PATA Signal	ON/OFF state of VDC OFF switch is displayed.	ON or OFF
Gear Position	Gear position is displayed in number. 0: N or P, 1: 1st, 2: 2nd, 3: 3rd, 4: 4th, 7: R	—
Engine Speed	Engine speed is displayed.	rpm
PW Signal	Acceleration opening is displayed.	%
Car Line	Type of vehicle is displayed in number. “1” for normal.	—

NOTE:
For details concerning operation procedure, refer to “SUBARU SELECT MONITOR OPERATION MANUAL”.

3. CLEAR MEMORY MODE

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Brake Control} and press the [YES] key.
3) Press the [YES] key after the engine type is displayed.
4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
5) When the “Done” are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

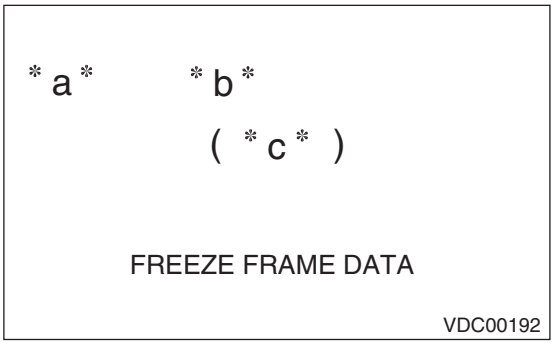
NOTE:
For details concerning operation procedure, refer to “SUBARU SELECT MONITOR OPERATION MANUAL”.

4. FUNCTION CHECK

Display	Display contents	Index No.
ABS check mode	Operate the valve and pump motor sequentially to perform the ABS sequence control.	**<Ref. to VDC-16, ABS Sequence Control.>**
VDC check mode	Operate the valve and pump motor sequentially to perform the VDC sequence control.	**<Ref. to VDC-19, VDC Sequence Control.>**
Steering angle sensor neutral & lateral G sensor 0 pt mode	Set the both of steering angle sensor neutral position and lateral G sensor “0” pt.	<Ref. to VDC-25, Steering Angle Sensor.>

5. FREEZE FRAME DATA

NOTE:
• Data stored at the time of trouble occurrence is shown on display.
• Each time trouble occurs, the latest information is stored in the freeze frame data in memory.
• Freeze Frame Data recorded one.
• If a freeze frame data is not properly stored in memory (Due to a drop in VDCCM power supply, etc.), the DTC which is suffixed with a question mark “?” appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.



a: DTC (2 digit)
b: Trouble contents
c: Detail DTC (4 digit)

FREEZE FRAME DATA LIST

Display	Contents to be monitored
FR Wheel Speed	Wheel speed detected by the Front ABS wheel speed sensor RH is displayed in km/h.
FL Wheel Speed	Wheel speed detected by the Front ABS wheel speed sensor LH is displayed in km/h.
RR Wheel Speed	Wheel speed detected by the Rear ABS wheel speed sensor RH is displayed in km/h.
RL Wheel Speed	Wheel speed detected by the Rear ABS wheel speed sensor LH is displayed in km/h.
Steering Angle Sensor	Steering wheel angle that detected by steering angle sensor is displayed.
Yaw Rate Sensor	Vehicle angular speed detected by yaw rate sensor is transformed and displayed as voltage.
Lateral G Sensor	Acceleration in lateral direction detected by lateral G sensor is transformed and displayed as voltage.
Primary Pressure Sensor	Brake fluid pressure detected by primary pressure sensor is transformed and displayed as voltage.
Secondary Pressure Sensor	Brake fluid pressure detected by secondary pressure sensor is transformed and displayed as voltage.
Vehicle Speed	Vehicle speed is displayed.
Required Torque	Engine torque that driver required is displayed.
Current Torque	Current engine torque is displayed.
Target Torque	Target torque is displayed.
Acceleration Opening Angle	Acceleration opening is displayed.
Engine Speed	Engine speed is displayed.
Gear Position	Gear position is displayed.
IG Power Supply Voltage	Voltage supplied to VDC control module is displayed.
ABS Warning Light	ON/OFF state of ABS warning light is displayed.
EBD Warning Light	ON/OFF state of EBD warning light is displayed.
VDC Warning Light	ON/OFF state of VDC warning light/VDC OFF indicator light is displayed. (ON displayed when VDC is faulty.)
VDC OFF Light	ON/OFF state of VDC warning light/VDC OFF indicator light is displayed. (ON/OFF displayed by operating VDC OFF switch and EAM signal.)
VDC Operation Light	ON/OFF condition of VDC operation indicator light is displayed.
Valve Relay Signal	Valve relay operating condition is displayed.
Motor Relay Driving Vibration	Motor relay operating condition is displayed.
Motor Relay Monitor	Motor relay operating condition is displayed.
Decreasing Required Torque	Requirement of reducing engine torque is displayed.
EAM Signal	Engine control command signal is displayed.
VDC O Control Flag	VDC operating condition (oversteer) is displayed.
VDC U Control Flag	VDC operating condition (understeer) is displayed.
ABS Control Flag	ABS operation condition is displayed.
VDC OK B Flag	VDC sensor normal flag

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details of DTCs, refer to the “SUBARU SELECT MONITOR”. <Ref. to VDC(diag)-18, Subaru Select Monitor.> At this time, be sure to read the detail code that displayed under the DTC.

9. Inspection Mode

A: OPERATION

Reproduce the condition that trouble occur as possible.
Drive the vehicle for more than 10 minutes.

NOTE:
Be sure to check that the vehicle goes right or left from straight position in normal driving.

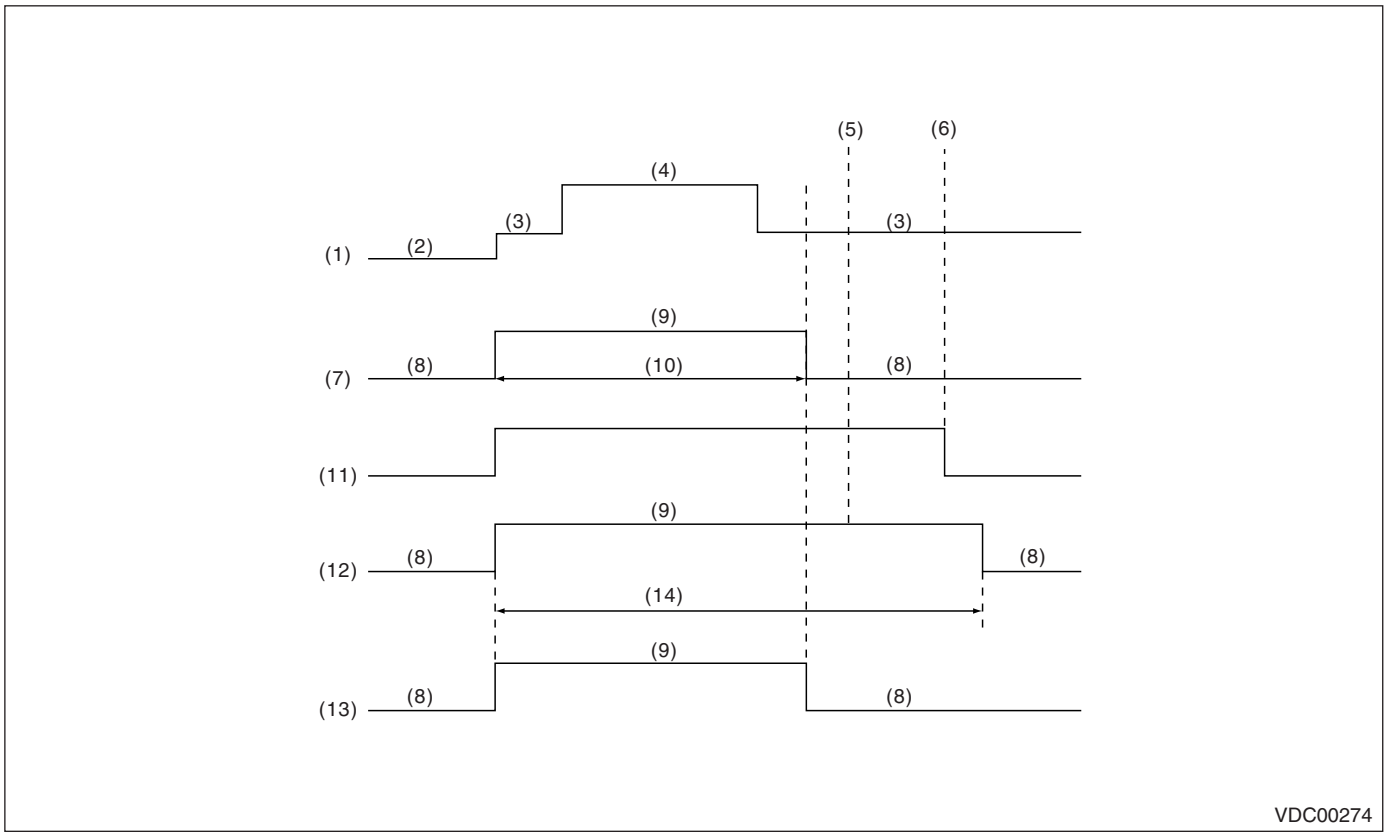
10.Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to “Subaru Select Monitor”. <Ref. to VDC(diag)-18, Subaru Select Monitor.>

11.Warning Light Illumination Pattern

A: INSPECTION



(1) Ignition switch
(2) OFF
(3) ON
(4) Engine start
(5) Engine start
(6) Parking brake released
(7) ABS warning light
(8) Light OFF
(9) Light ON
(10) Approx. 2 sec.
(11) Brake warning light (EBD warning light)
(12) VDC warning light/VDC OFF indicator light
(13) VDC indicator light
(14) Few seconds (depend on water temperature)

1) When warning lights or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.
2) Repair or diagnose the warning light or indicator light circuit when the warning light and indicator light remains off. <Ref. to VDC(diag)-37, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC OPERATION INDICATOR LIGHT DOES NOT COME ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-41, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF., Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-44, VDC INDICATOR LIGHT DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

NOTE:
• Even though the ABS warning light does not go out after 1.5 seconds from ABS warning light illumination, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7.46 MPH). However, the ABS does not work while the ABS warning light is illuminated.
• When the vehicle is parked in a lower temperature place for long time, VDC warning light/VDC OFF indicator light may takes few minutes to go off. This is not defective because it is resulted from low engine coolant temperature.
• One of the wheels is locked or slipped, power train to the other wheel may changes. Changing of power train may difference in occurring normal operation. This situation detect by ABS wheel speed sensor. ABS warning light and VDC warning light come on. When the vehicle is driven in all four wheels off from ground, or all four wheels on the free roller, VDCCM detect the malfunction of speed sensor and ABS warning light and VDC warning light may illuminate. In this case, this is not a malfunction. Erase the DTC from memory.

12.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detail code No.	Display	Content of diagnostic	Reference target
—		Communication for initializing impossible	Subaru Select Monitor communication failure	<Ref. to VDC(diag)-34, COMMUNICATION FOR INITIALIZING IS IMPOSSIBLE (SUBARU SELECT MONITOR COMMUNICATION MALFUNCTION), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	ABS warning light and VDC warning light/VDC OFF indicator light, VDC operation indicator light comes on though the DTC is not displayed on Subaru Select Monitor display.	<Ref. to VDC(diag)-37, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC OPERATION INDICATOR LIGHT DOES NOT COME ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	ABS warning light and VDC warning light/VDC OFF indicator light, brake warning light (EBD warning light) comes on though the DTC is not displayed on Subaru Select Monitor display.	<Ref. to VDC(diag)-41, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	VDC operation indicator light does not come on though the DTC is not displayed on Subaru Select Monitor display.	<Ref. to VDC(diag)-44, VDC INDICATOR LIGHT DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	6A0XH	Front Right ABS Sensor Circuit Open or Shorted Battery	Open or Short Circuit in Front Right ABS Wheel Speed Sensor Circuit	<Ref. to VDC(diag)-45, DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	68CXH 68EXH 690XH 694XH	Front Right ABS Wheel Speed Sensor Signal Malfunction	Front ABS Wheel Speed Sensor RH Signal Malfunction	<Ref. to VDC(diag)-50, DTC 22 FR WHEEL SPEED SENSOR SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	620XH	FL Wheel Speed Sensor Circuit Open / High Input	Open or Short Circuit in Front Left ABS Wheel Speed Sensor Circuit	<Ref. to VDC(diag)-45, DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	60CXH 60EXH 610XH 614XH	Front Left ABS Wheel Speed Sensor Signal Malfunction	Front ABS Wheel Speed Sensor LH Signal Malfunction	<Ref. to VDC(diag)-50, DTC 24 FL WHEEL SPEED SENSOR SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	660XH	Rear Right ABS Sensor Circuit Open or Shorted Battery	Open or Short Circuit in Rear Right ABS Wheel Speed Sensor Circuit	<Ref. to VDC(diag)-45, DTC 25 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	64CXH 64EXH 650XH 654XH	Rear Right ABS Wheel Speed Sensor Signal Malfunction	Rear ABS Wheel Speed Sensor RH Signal Malfunction	<Ref. to VDC(diag)-50, DTC 26 RR WHEEL SPEED SENSOR SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnostic	Reference target
27	6E0XH	RL Wheel Speed Sensor Circuit Open / High Input	Open or Short Circuit in Rear Left ABS Wheel Speed Sensor Circuit	<Ref. to VDC(diag)-46, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	6CCXH 6CEXH 6D0XH 6D4XH	Rear Left ABS Wheel Speed Sensor Signal Malfunction	Rear ABS Wheel Speed Sensor LH Signal Malfunction	<Ref. to VDC(diag)-51, DTC 28 RL WHEEL SPEED SENSOR SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29	604XH 606XH 608XH 644XH 646XH 648XH 684XH 686XH 688XH 6C4XH 6C6XH 6C8XH 702XH 704XH 720XH 70CXH	Any One of Four ABS Sensors Signal	Signal malfunction any one of four ABS wheel speed sensor	<Ref. to VDC(diag)-57, DTC 29 ANY ONE OF FOUR ABS SENSORS SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	320XH	FR maintain valve	Front maintain valve RH malfunction	<Ref. to VDC(diag)-61, DTC 31 FR MAINTAIN VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	360XH	FR decompression valve	Front decompression valve RH malfunction	<Ref. to VDC(diag)-67, DTC 32 FR DECOMPRESSION VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	220XH	FL maintain valve	Front maintain valve LH malfunction	<Ref. to VDC(diag)-61, DTC 33 FL MAINTAIN VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	260XH	FL decompression valve	Front decompression valve LH malfunction	<Ref. to VDC(diag)-67, DTC 34 FL DECOMPRESSION VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	2A0XH	RR maintain valve	Rear maintain valve RH malfunction	<Ref. to VDC(diag)-61, DTC 35 RR MAINTAIN VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	2E0XH	RR decompression valve	Rear decompression valve RH malfunction	<Ref. to VDC(diag)-67, DTC 36 RR DECOMPRESSION VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	3A0XH	RL maintain valve	Rear maintain valve LH malfunction	<Ref. to VDC(diag)-61, DTC 37 RL MAINTAIN VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	3E0XH	RL decompression valve	Rear decompression valve LH malfunction	<Ref. to VDC(diag)-67, DTC 38 RL DECOMPRESSION VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnostic	Reference target
41	000XH 002XH 004XH 006XH 014XH 016XH 018XH 024XH 026XH 028XH 02CXH 02EXH 030XH 03AXH 03EXH 034XH 036XH 038XH 9D4XH 9E0XH	ECM	VDCCM malfunction	<Ref. to VDC(diag)-73, DTC 41 ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	7CEXH 7D0XH	Lower power supply voltage	Power supply voltage is too low	<Ref. to VDC(diag)-75, DTC 42 POWER SUPPLY TOO LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44	9A0XH	TCM communication circuit	Defective TCM communication line	<Ref. to VDC(diag)-77, DTC 44 AT COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	970XH	Incorrect VDC Control Module specifications	Incorrect VDCCM	<Ref. to VDC(diag)-78, DTC C0045 DIFFERENT CONTROL MODULE SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	972XH	TCM malfunction	TCM specification malfunction	<Ref. to VDC(diag)-79, DTC 45 AT ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
46	9CEXH	5 V power supply voltage	5 V power supply voltage malfunction	<Ref. to VDC(diag)-80, DTC 46 5 V POWER SUPPLY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
47	788XH 78CXH 7A0XH 7A4XH	CAN communication link	Defective CAN communication line	<Ref. to VDC(diag)-83, DTC 47 CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	048XH	Valve relay OFF malfunction	Defective valve relay	<Ref. to VDC(diag)-86, DTC 51 VALVE RELAY OFF MALFUNCTION/VALVE RELAY TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	064XH	Valve relay ON failure		<Ref. to VDC(diag)-92, DTC 51 VALVE RELAY ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	06AXH	Valve relay test failure		<Ref. to VDC(diag)-86, DTC 51 VALVE RELAY OFF MALFUNCTION/VALVE RELAY TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
52	5A0XH	Motor and motor relay OFF failure	Defective motor and motor relay OFF	<Ref. to VDC(diag)-97, DTC 52 MOTOR/MOTOR RELAY OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58EXH	Motor and motor relay ON failure	Defective motor and motor relay ON	<Ref. to VDC(diag)-100, DTC 52 MOTOR/MOTOR RELAY ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58CXH	Motor malfunction	Defective motor	<Ref. to VDC(diag)-104, DTC 52 MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnostic	Reference target
57	820XH	EGI ECM signal	ECM communication malfunction	<Ref. to VDC(diag)-108, DTC 57 EGI COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	4A0XH	VDC switching valve 1 (P)	Primary cut valve malfunction	<Ref. to VDC(diag)-61, DTC 61 VDC SWITCHING VALVE 1 (P), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
62	4E0XH	VDC switching valve 1 (S)	Secondary cut valve malfunction	<Ref. to VDC(diag)-62, DTC 62 VDC SWITCHING VALVE 1 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
63	520XH	VDC switching valve 2 (P)	Primary suction valve malfunction	<Ref. to VDC(diag)-67, DTC 63 VDC SWITCHING VALVE 2 (P), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
64	560XH	VDC switching valve 2 (S)	Secondary suction valve malfunction	<Ref. to VDC(diag)-68, DTC 64 VDC SWITCHING VALVE 2 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	148XH	Steering angle sensor offset is too big	Steering angle sensor offset too large	<Ref. to VDC(diag)-110, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	14AXH	Change range of steering angle sensor is too big	Steering sensor range too large	<Ref. to VDC(diag)-112, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	142XH 144XH 146XH 158XH 15AXH 15CXH 15EXH	Steering angle sensor malfunction	Defective steering angle sensor	<Ref. to VDC(diag)-114, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	14CXH 14EXH 150XH 152XH 160XH	No signal from steering angle sensor	Signal not sent from steering angle sensor	<Ref. to VDC(diag)-116, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
72	180XH 182XH 184XH 186XH 188XH 18BXH 18EXH 190XH 192XH 194XH 196XH 198XH 19AXH	Yaw rate sensor output	Abnormal yaw rate sensor output	<Ref. to VDC(diag)-119, DTC 72 YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1A0XH	Voltage inputted to yaw rate sensor exceeds specification	Yaw rate sensor input voltage exceed the specification.	<Ref. to VDC(diag)-121, DTC 72 YAW RATE SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	19CXH	Abnormal yaw rate sensor reference voltage	Yaw rate sensor reference voltage malfunction	<Ref. to VDC(diag)-123, DTC 72 YAW RATE SENSOR REFERENCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	18CXH	Change range of yaw rate sensor signal is too big	Yaw rate sensor signal range too large	<Ref. to VDC(diag)-126, DTC 72 EXCESSIVE VARIATION AMOUNT OF YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Detail code No.	Display	Content of diagnostic	Reference target
73	1C8XH 1CAXH	Lateral G sensor offset is too big	Lateral G sensor offset too large	<Ref. to VDC(diag)-129, DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1C0XH 1C6XH 1D8XH	Abnormal lateral G sensor output	Lateral G sensor output malfunction	<Ref. to VDC(diag)-129, DTC 73 LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1CCXH	Change range of lateral G sensor is too big	Lateral G sensor range too large.	<Ref. to VDC(diag)-129, DTC 73 EXCESSIVE VARIATION AMOUNT OF LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D2XH	Excessive lateral G sensor output	Excessive lateral G sensor signal	<Ref. to VDC(diag)-130, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E0XH	Lateral G sensor power/output	Lateral G sensor input voltage exceed the specification.	<Ref. to VDC(diag)-132, DTC 73 VOLTAGE INPUT TO LATERAL G SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	120XH	Primary pressure sensor power/output	Primary pressure sensor input voltage exceed the specification.	<Ref. to VDC(diag)-135, DTC 74 PRIMARY PRESSURE SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	122XH	Secondary pressure sensor power/output	Secondary pressure sensor input voltage exceed the specification.	<Ref. to VDC(diag)-138, DTC 74 SECONDARY PRESSURE SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	110XH	Primary pressure sensor offset is too big	Primary pressure sensor offset too large	<Ref. to VDC(diag)-141, DTC 74 PRIMARY PRESSURE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	112XH	Secondary pressure sensor offset is too big	Secondary pressure sensor offset too large	<Ref. to VDC(diag)-142, DTC 74 SECONDARY PRESSURE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	10AXH	Pressure sensor differential pressure too large	Differential pressure of pressure sensor too large.	<Ref. to VDC(diag)-144, DTC 74 PRESSURE SENSOR DIFFERENTIAL PRESSURE TOO LARGE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

One of following DTCs are in the memory, perform the inspection according first DTC. Malfunction is not detected, perform the inspection according DTC in chronological order.

Combination of DTC	Faulty part	Reference target
46 5 V power supply voltage malfunction 74 Pressure sensor 2 input voltage exceed the specification.	(F87) — Read circuit of No.78, 68 or 69 is shorted to ground or battery.	<Ref. to VDC(diag)-80, DTC 46 5 V POWER SUPPLY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44 TCM communication circuit 71 Signal is not sent from steering angle sensor	(F87) — Read circuit of No. 83 or 81 is open.	<Ref. to VDC(diag)-116, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51 Valve relay 71 Signal is not sent from steering angle sensor	(F87) — Read circuit of No. 27 is open.	<Ref. to VDC(diag)-116, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71 Signal is not sent from steering angle sensor 51 Valve relay 44 TCM communication circuit	(F87) — Read circuit of No. 27 is open.	<Ref. to VDC(diag)-116, DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73 Lateral G sensor input voltage exceed the specification. 72 Yaw rate sensor input voltage exceed the specification.	(F87) — Read circuit of No. 23 is open.	<Ref. to VDC(diag)-130, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

13.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: COMMUNICATION FOR INITIALIZING IS IMPOSSIBLE (SUBARU SELECT MONITOR COMMUNICATION MALFUNCTION)

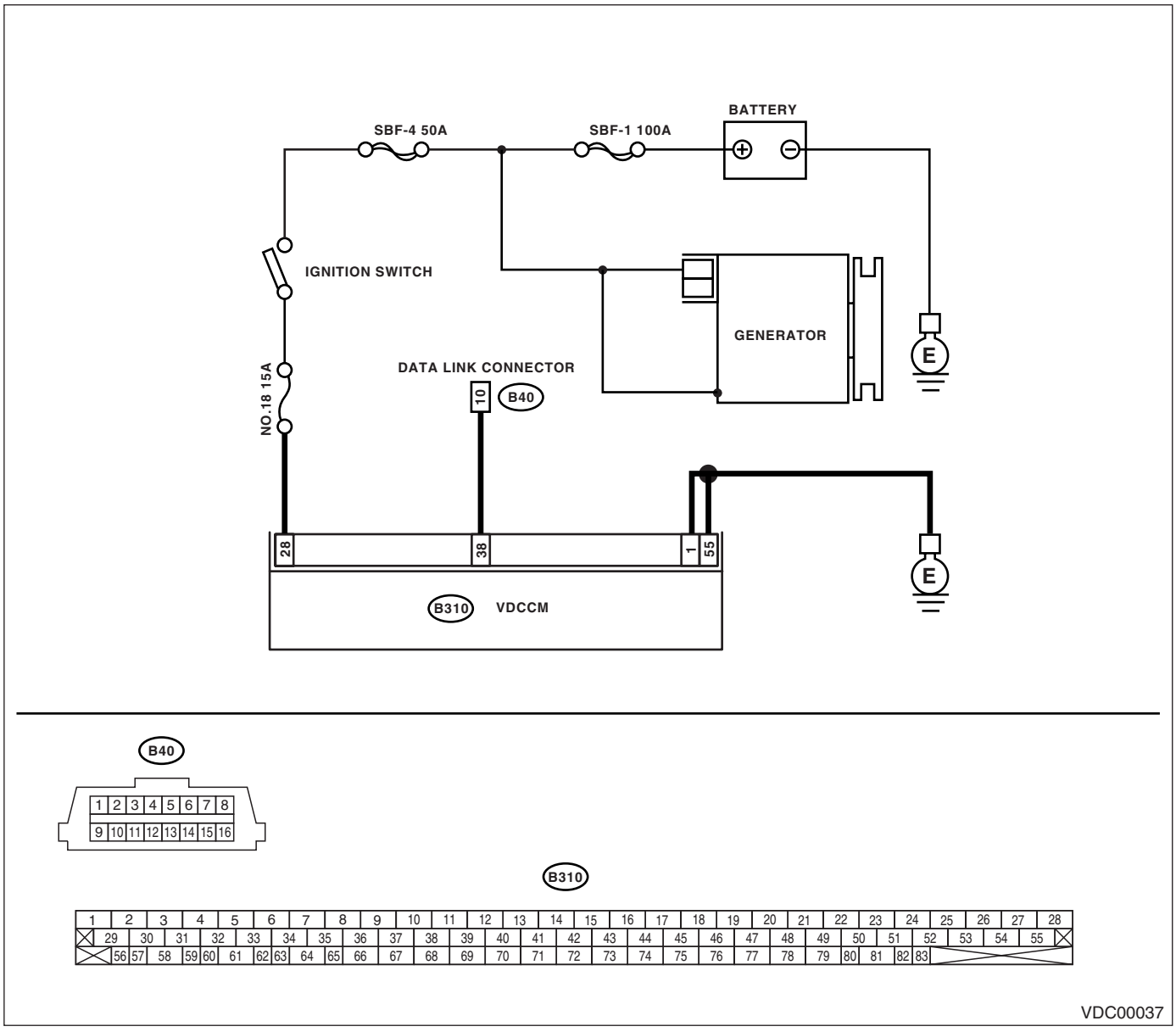
DTC DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

ABS warning light is remains on.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH.**	Is the ignition switch turned to ON?	Go to step **2.**	Turn the ignition switch to ON, and select VDCCM mode using Subaru Select Monitor.
2	**CHECK BATTERY.** 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage more than 11 V?	Go to step **3.**	Charge or replace the battery.
3	**CHECK BATTERY TERMINAL.**	Is there poor contact at battery terminal?	Retighten or repair the battery terminal.	Go to step **4.**
4	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Is the system name and year displayed on Subaru Select Monitor?	Go to step **8.**	Go to step **5.**
5	**CHECK SUBARU SELECT MONITOR COMMUNICATION.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Check whether communication to other systems can be executed normally.	Is the system name and model year displayed on Subaru Select Monitor?	Go to step **9.**	Go to step **6.**
6	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL UNIT AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the harness and connector between each control module and data link connector.
7	**CHECK OUTPUT SIGNAL OF VDCCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 1 V?	Repair the harness and connector between each control module and data link connector.	Go to step **8.**
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND DATA LINK CONNECTOR.** Measure the resistance between VDCCM connector and data link connector. ***Connector & terminal*** ***(B310) No. 38 — (B40) No. 10:***	Is the resistance less than 0.5 Ω?	Repair the harness and connector between VDCCM and data link connector.	Go to step **9.**
9	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn the ignition switch to OFF.	Is the VDCCM connector inserted into VDCCM until the clamp is locked?	Go to step **10.**	Insert the VDCCM connector into VDCCM until the clamp is locked.
10	**CHECK POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **11.**	Repair open circuit in harness between VDCCM and battery.

	Step	Check	Yes	No
11	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM and transmission. 3) Measure the voltage of harness between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the poor contact in connector and open circuit in harness between VDCCM and inhibitor connector.
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

B: ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC OPERATION INDICATOR LIGHT DOES NOT COME ON

DTC DETECTING CONDITION:

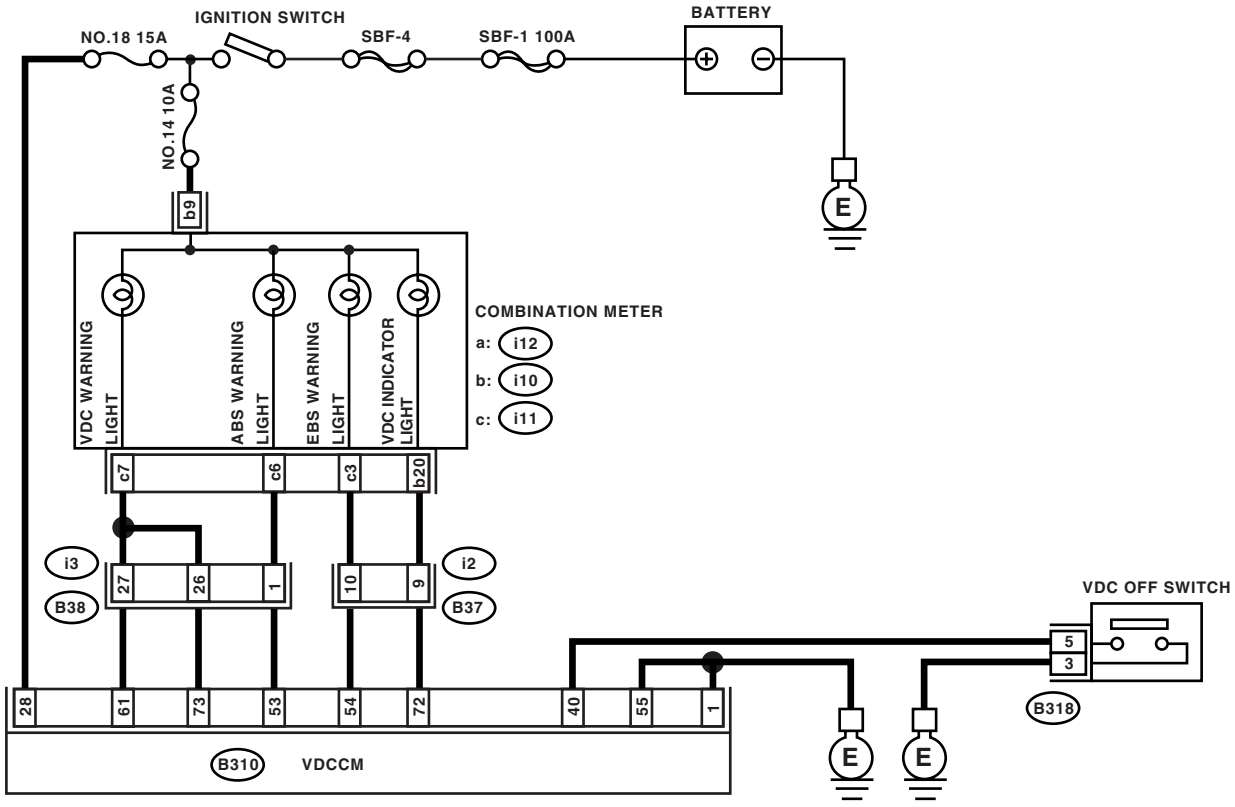
- ABS warning light circuit is open or shorted.
- VDC warning light/VDC OFF indicator light circuit is open or shorted.
- VDC operation indicator light circuit is open or shorted.
- Brake warning light (EBD warning light) circuit is open or shorted.

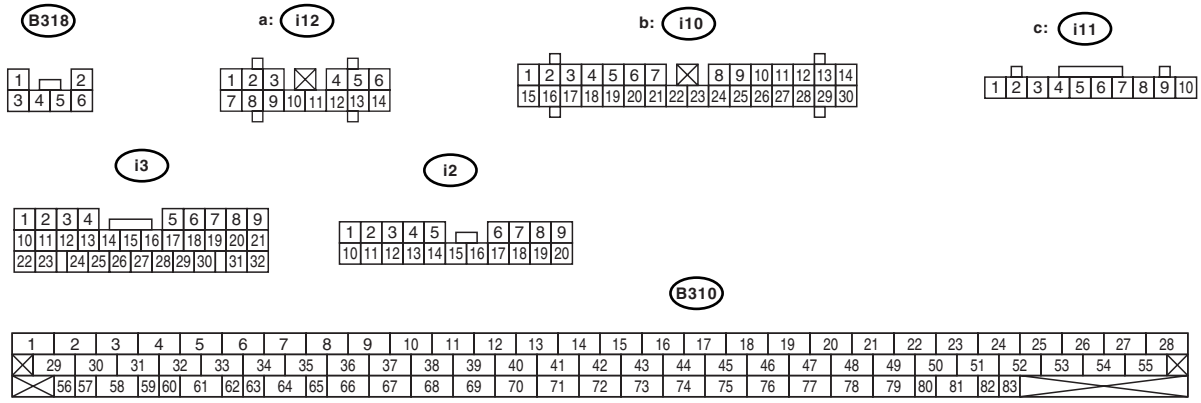
TROUBLE SYMPTOM:

When the ignition switch is ON (engine OFF), ABS warning light, VDC warning light/VDC OFF indicator light, VDC operation indicator light or brake warning light (EBD warning light) does not come on.

NOTE:
When keep depressing the VDC OFF switch for more than 10 seconds while engine running, VDC warning light/VDC OFF indicator light go off and block the later switch operation. To return VDC operation, turn the ignition switch from OFF to ON.

WIRING DIAGRAM:





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	Step	Check	Yes	No
1	**CHECK ILLUMINATION OF OTHER WARNING LIGHT.** Turn the ignition switch to ON (engine OFF).	Do other warning lights illuminate?	Go to step **2.**	Repair the combination meter. <Ref. to IDI-10, Combination Meter.>
2	**CHECK BULB.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the bulb of ABS warning light, VDC warning light, VDC operation indicator light, brake warning light and VDC OFF indicator light.	Is the bulb normal?	Go to step **3.**	Replace the faulty bulb. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>
3	**CHECK BATTERY SHORT OF LIGHT HARNESS.** 1) Disconnect the VDCCM connector from VDCCM. 2) Insert the thick paper (thickness: 1.5 mm (0.059 in)) into the switch of VDCCM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDC connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(B310) No. 53 (+) — Chassis ground (–):*** ***VDC warning light*** ***(B310) No. 61 (+) — Chassis ground (–):*** ***Brake warning light*** ***(B310) No. 54 (+) — Chassis ground (–):*** ***VDC indicator light*** ***(B310) No. 72 (+) — Chassis ground (–):*** ***VDC OFF indicator light*** ***(B310) No. 73 (+) — Chassis ground (–):***	Is the voltage less than 3 V?	Go to step **4.**	Repair the light harness.
4	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Install the bulb of ABS warning light to combination meter. 3) Install the combination meter. 4) Insert the thick paper (thickness: 1.5 mm (0.059 in)) into the switch of VDCCM connector. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***ABS warning light*** ***(B310) No. 53 (+) — Chassis ground (–):*** ***VDC warning light*** ***(B310) No. 61 (+) — Chassis ground (–):*** ***Brake warning light*** ***(B310) No. 54 (+) — Chassis ground (–):*** ***VDC indicator light*** ***(B310) No. 72 (+) — Chassis ground (–):*** ***VDC OFF indicator light*** ***(B310) No. 73 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair the wiring harness.
5	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between combination meter and VDCCM?	Repair the connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK WARNING LIGHT AND INDICATOR LIGHT.** 1) Connect the connector to VDCCM. 2) Turn the ignition switch to ON.	Does the ABS warning light, VDC warning light, brake warning light, VDC operation indicator light and VDC OFF indicator light illuminate?	Temporary poor contact occurs.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

C: ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF.

DTC DETECTING CONDITION:

- ABS warning light circuit is open or shorted.
- VDC warning light/VDC OFF indicator light circuit is open or shorted.
- Brake warning light (EBD warning light) circuit is open or shorted.
- diagnostic circuit is open.
- VDC OFF switch is shorted.

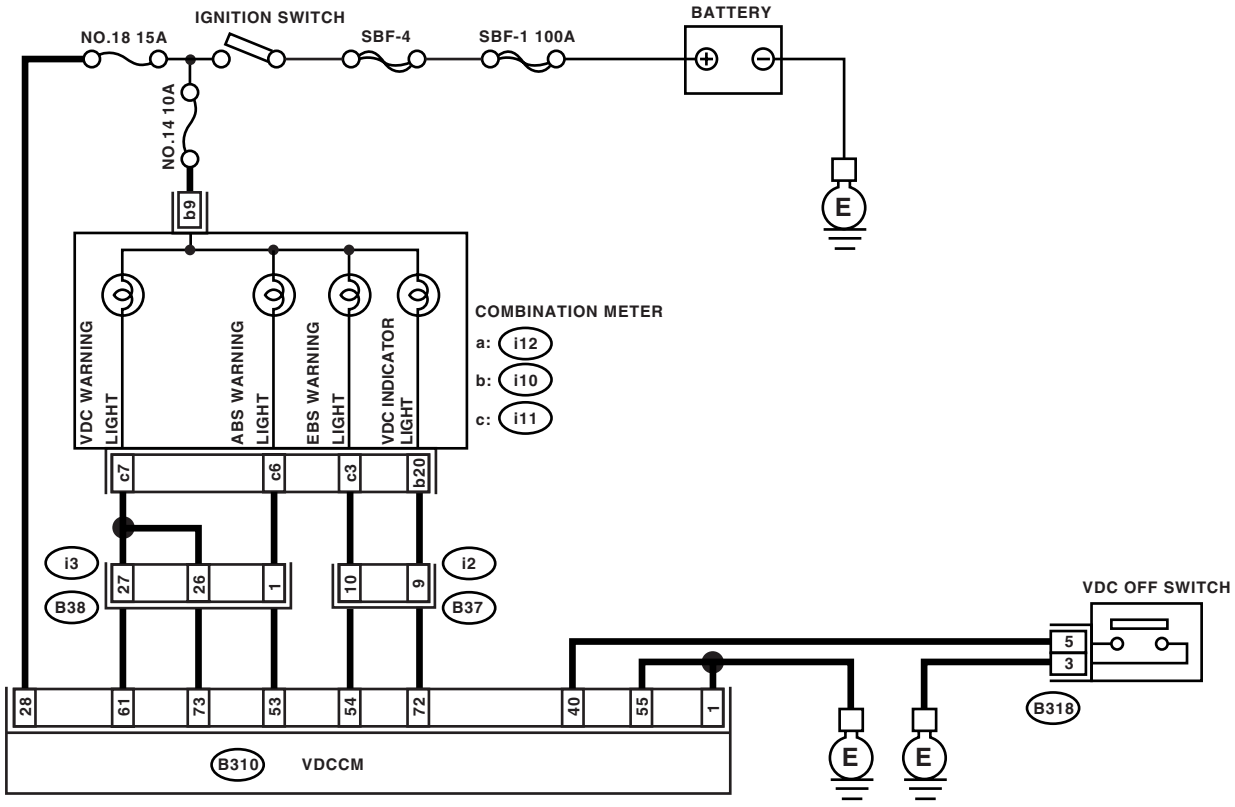
TROUBLE SYMPTOM:

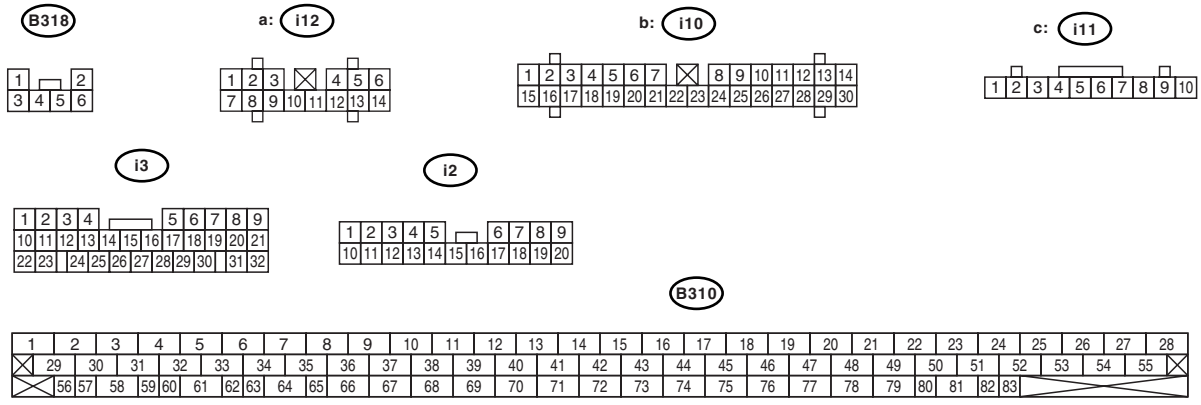
- ABS warning light and VDC warning light/VDC OFF indicator light remains on at the engine start.
- At the engine start, brake warning light (EBD warning light) remains on though the parking brake is released.

NOTE:

- When keep depressing the VDC OFF switch for more than 10 seconds while engine running, VDC OFF indicator light go off and block the later switch operation. To return VDC operation, turn the ignition switch from OFF to ON.
- When the engine coolant temperature is too low, VDC OFF indicator light illuminate. It goes off when the engine warmed-up.

WIRING DIAGRAM:





VDC00313

	Step	Check	Yes	No
1	**CHECK INSTALLATION OF VDCCM CONNECTOR.** Turn the ignition switch to OFF.	Is the VDCCM connector inserted into VDCCM until the clamp is locked?	Go to step **2.**	Insert the VDCCM connector into VDCCM until the clamp is locked.
2	**CHECK FAILURE LIGHT.** Check the light that does not go off.	The light that does not go off is VDC warning light/VDC OFF indicator light?	Go to step **7.**	Go to step **3.**
3	**CHECK WIRING HARNESS.** 1) Insert the thick paper (thickness: 1.5 mm (0.059 in)) into the switch of VDCCM connector. 2) Turn the ignition switch to ON.	ABS warning light and brake warning light (EBD warning light) remains off?	Go to step **4.**	Repair the front wiring harness.
4	**CHECK PROTRUSION OF VDCCM.** 1) Turn the ignition switch to OFF. 2) Check the damage on protrusion of VDCCM terminal.	Is the protruding part damaged?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK VDCCM POWER SUPPLY.** 1) Disconnect the connector from VDCCM. 2) Start the engine. 3) Run the engine at idle. 4) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Repair the power supply circuit of VDCCM.
6	**CHECK POOR CONTACT IN VDCCM CONNECTOR.**	Is there poor contact in VDCCM connector?	Repair the connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**OPERATION OF VDC OFF SWITCH.** 1) Operate the VDC OFF switch. 2) Turn the ignition switch to OFF once and turn to ON again.	Does the VDC warning light/VDC OFF indicator light go off?	VDC is normal.	Go to step **8.**
8	**CHECK ENGINE COOLANT.**	Does the illuminating state of VDC warning light/VDC OFF indicator light changes after warning-up the engine?	VDC is normal.	Go to step **9.**
9	**CHECK VDC OFF SWITCH.** Remove and check VDC OFF switch. <Ref. to VDC-32, VDC OFF Switch.>	Is VDC OFF switch normal?	Go to step **10.**	Replace the VDC OFF switch.
10	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector from VDCCM. 3) Turn the ignition switch to ON.	Does the VDC warning light/VDC OFF indicator light remain off?	Go to step **11.**	Repair the wiring harness.
11	**CHECK VDC OFF SWITCH HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) CHECK ISOLATION BETWEEN ECM CONNECTOR TERMINAL AND CHASSIS GROUND. ***Connector & terminal*** ***(B310) No. 40 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair the VDC OFF switch circuit.

D: VDC INDICATOR LIGHT DOES NOT GO OFF

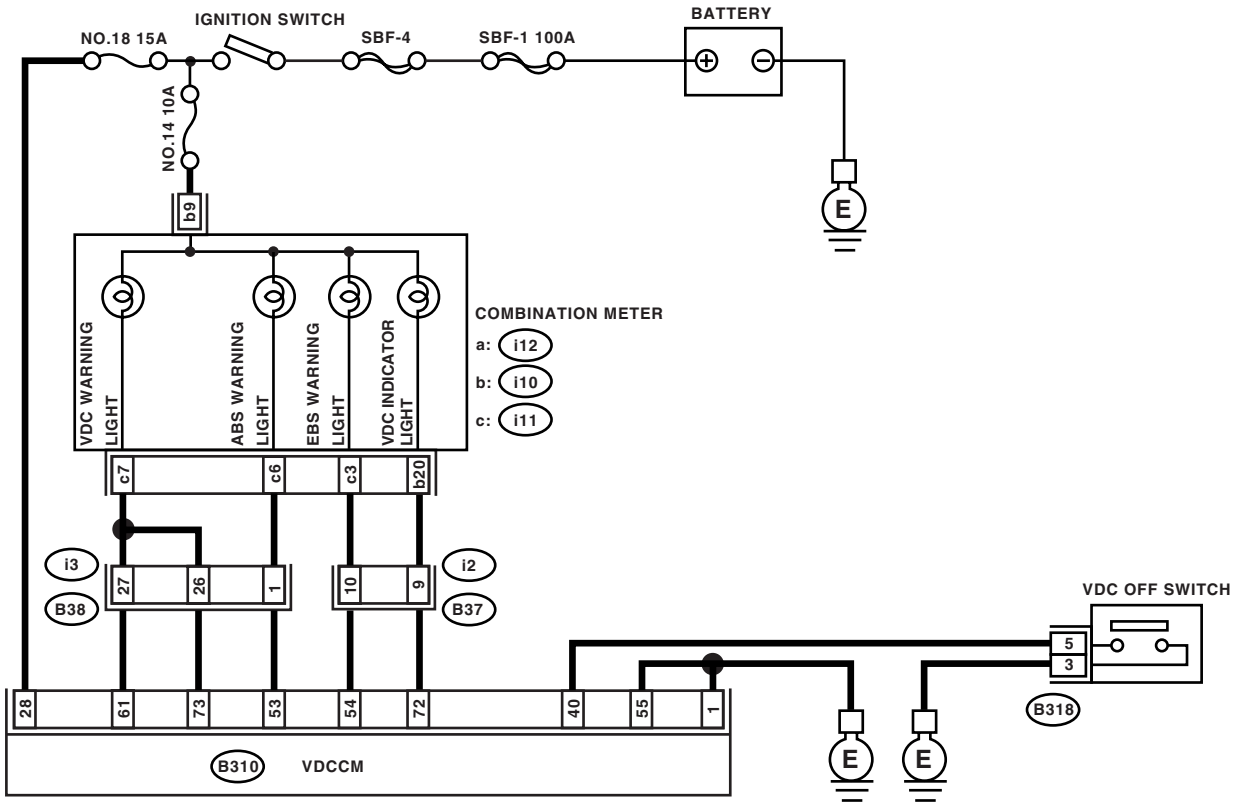
DTC DETECTING CONDITION:

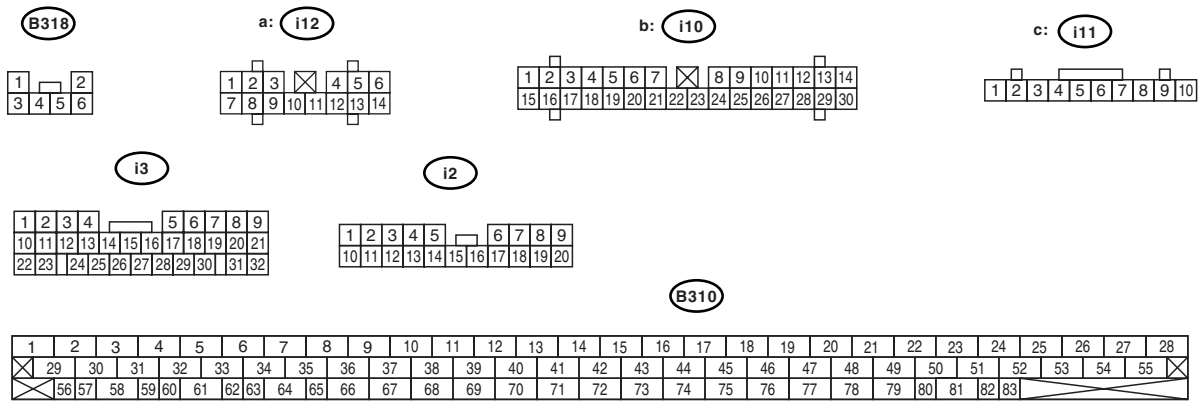
VDC operation indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When starting the engine, VDC indicator light is remains ON.

WIRING DIAGRAM:





VDC00313

	Step	Check	Yes	No
1	**CHECK WIRING HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector from VDCCM. 3) Turn the ignition switch to ON.	Does the VDC operating indicator light go off?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair the wiring harness.

E: DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
Refer to DTC 27 for diagnostic procedure. <Ref. to VDC(diag)-46, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
Refer to DTC 27 for diagnostic procedure. <Ref. to VDC(diag)-46, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 25 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

NOTE:
Refer to DTC 27 for diagnostic procedure. <Ref. to VDC(diag)-46, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORTED BATTERY

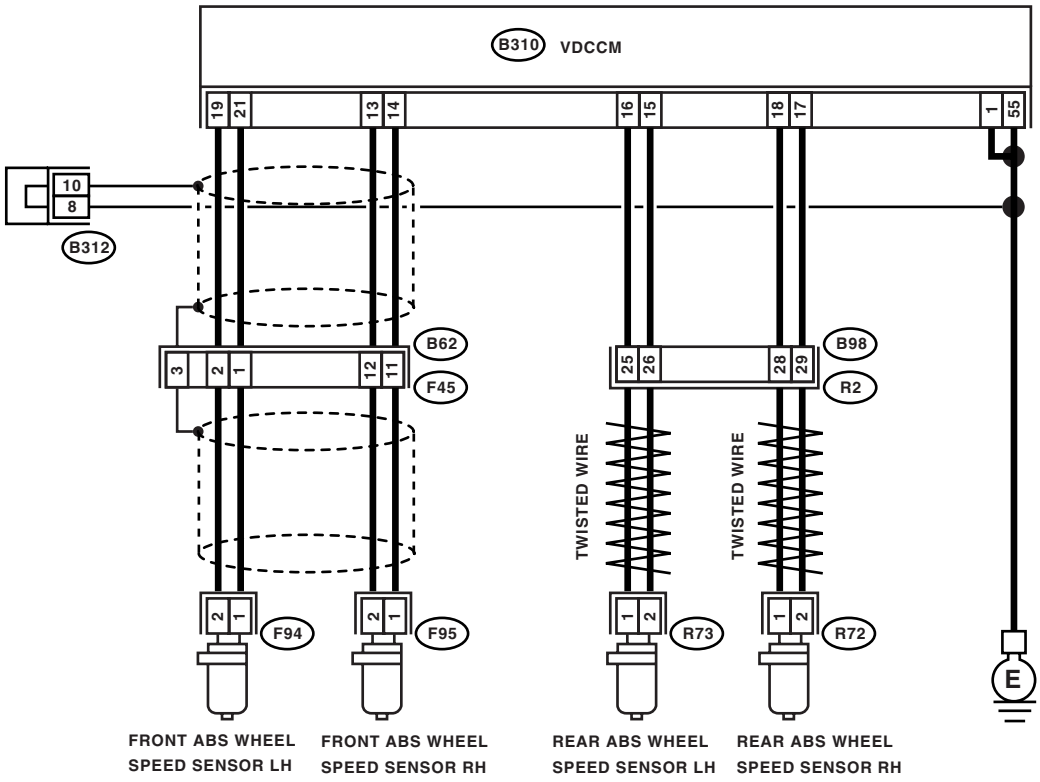
DTC DETECTING CONDITION:

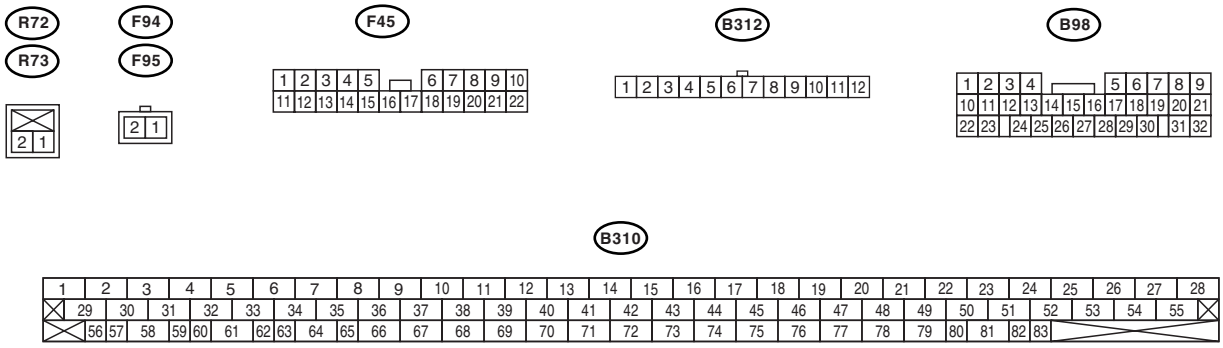
- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00314

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the faulty ABS wheel speed sensor output using the display mode of Subaru Select Monitor.	When the steering wheel is in straight direction and vehicle is accelerating or decelerating, indicated speed on display changes according to speedometer indication?	Go to step **2.**	Go to step **8.**
2	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the ABS wheel speed sensor installation bolt tightened 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step **3.**	Tighten the ABS wheel speed sensor installation bolts.
3	**CHECK CLEARANCE OF ABS WHEEL SPEED SENSOR.** Measure the clearance between tone wheel and protrusion entire the wheel.	Is the clearance as following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in), Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **4.**	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
4	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **5.**	Repair the tone wheel. Front: <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-31, Rear Tone Wheel.>
5	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between VDCCM and ABS wheel speed sensor.
8	**CHECK ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals. ***Terminal*** ***Front RH No.1 — No. 2:*** ***Front LH No.1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **9.**	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>

	Step	Check	Yes	No
9	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Disconnect the connector from VDCCM. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10.**	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
10	**CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. ***Terminal*** ***Front RH No. 1 (+) — Chassis ground (–):*** ***Front LH No. 1 (+) — Chassis ground (–):*** ***Rear RH No. 1 (+) — Chassis ground (–):*** ***Rear LH No. 1 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
11	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS wheel speed sensor. 3) Measure the resistance between VDCCM connector. ***Connector & terminal*** ***DTC 21 / (B310) No. 14 — No. 13:*** ***DTC 23 / (B310) No. 21 — No. 19:*** ***DTC 25 / (B310) No. 18 — No. 17:*** ***DTC 27 / (B310) No. 16 — No. 15:***	Is the resistance as following? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **12.**	Repair the harness connector between VDCCM and ABS wheel speed sensor.
12	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B310) No. 14 (+) — Chassis ground (–):*** ***DTC 23*** ***(B310) No. 21 (+) — Chassis ground (–):*** ***DTC 25*** ***(B310) No. 18 (+) — Chassis ground (–):*** ***DTC 27*** ***(B310) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13.**	Repair the harness between VDCCM and ABS wheel speed sensor.
13	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 21*** ***(B310) No. 14 (+) — Chassis ground (–):*** ***DTC 23*** ***(B310) No. 21 (+) — Chassis ground (–):*** ***DTC 25*** ***(B310) No. 18 (+) — Chassis ground (–):*** ***DTC 27*** ***(B310) No. 16 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14.**	Repair the harness between VDCCM and ABS wheel speed sensor.

	Step	Check	Yes	No
14	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the mounting bolt of ABS wheel speed sensor tightened with 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step **15.**	Tighten the ABS wheel speed sensor installation bolts.
15	**CHECK ABS WHEEL SPEED SENSOR CLEARANCE.** Measure the clearance between tone wheel and protrusion entire the wheel.	Is the clearance as following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.787 in), Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **16.**	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
16	**CHECK RUNOUT OF HUB AND TONE WHEEL.** Measure the runout of hub and tone wheel.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **17.**	Repair the hub and tone wheel. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
17	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Go to step **18.**	Repair the connector.
18	**CHECK THE VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19.**
19	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between VDCCM and ABS wheel speed sensor.

I: DTC 22 FR WHEEL SPEED SENSOR SIGNAL MALFUNCTION

NOTE:
Refer to DTC 28 for diagnostic procedure. <Ref. to VDC(diag)-51, DTC 28 RL WHEEL SPEED SENSOR SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC 24 FL WHEEL SPEED SENSOR SIGNAL MALFUNCTION

NOTE:
Refer to DTC 28 for diagnostic procedure. <Ref. to VDC(diag)-51, DTC 28 RL WHEEL SPEED SENSOR SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 26 RR WHEEL SPEED SENSOR SIGNAL MALFUNCTION

NOTE:
Refer to DTC 28 for diagnostic procedure. <Ref. to VDC(diag)-51, DTC 28 RL WHEEL SPEED SENSOR SIGNAL MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 28 RL WHEEL SPEED SENSOR SIGNAL MALFUNCTION

DTC DETECTING CONDITION:

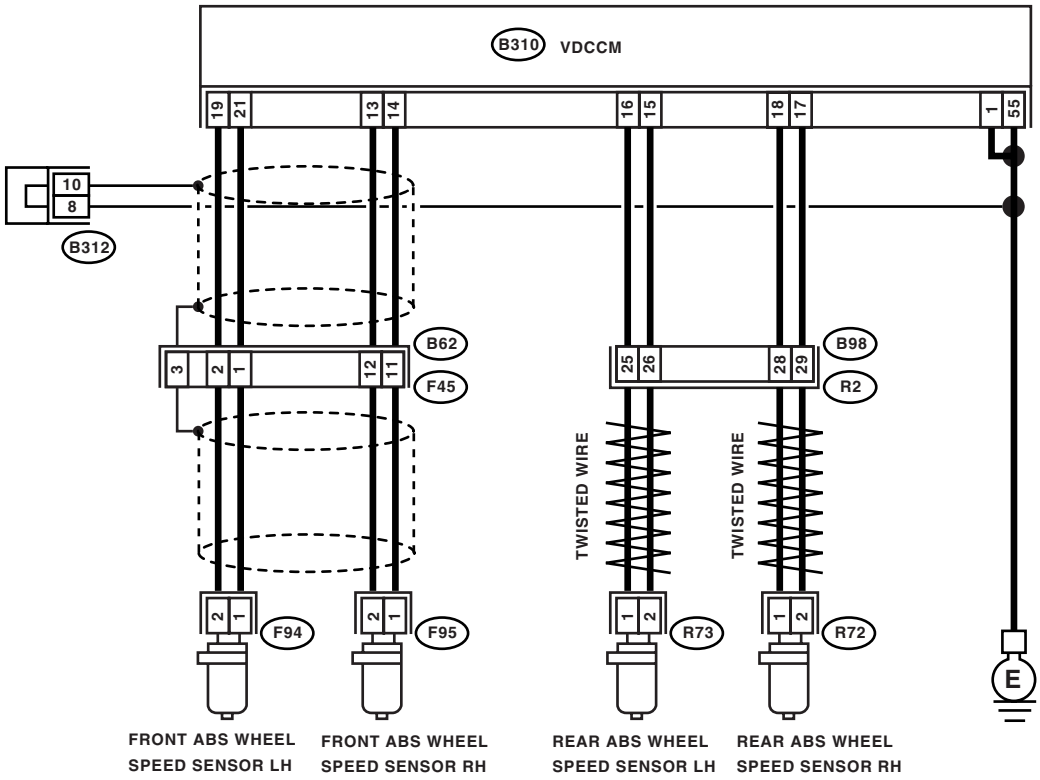
- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective harness connector

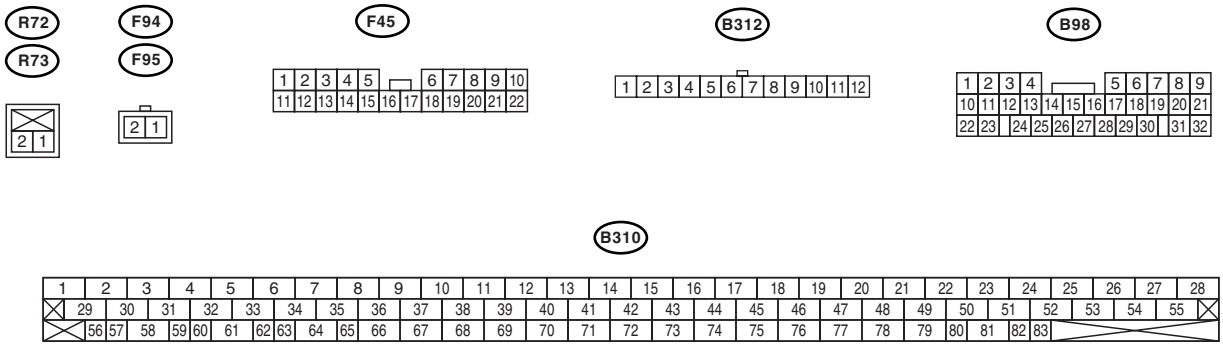
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:
At this time, brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:





VDC00314

	Step	Check	Yes	No
1	**CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the faulty ABS wheel speed sensor output using the display mode of Subaru Select Monitor.	When the steering wheel is in straight direction and vehicle is accelerating or decelerating, indicated speed on display changes according to speedometer indication?	Go to step **2.**	Go to step **8.**
2	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car phone, radio wave device like radio and etc., electric components installed correctly?	Go to step **4.**	Install the radio wave device and electric device properly.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK THE SHIELD CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(F45) No. 13 — Chassis ground:*** ***DTC 24*** ***(F45) No. 3 — Chassis ground:*** NOTE: For DTC 26 and 28 Go to step **6.**	Is the resistance less than 0.5 Ω?	Go to step **6.**	Repair the shield harness.
6	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Temporary noise occurs.	Proceed with the diagnostic corresponding to the DTC.
8	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the mounting bolt of ABS wheel speed sensor tightened with 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step **9.**	Tighten the ABS wheel speed sensor installation bolts.
9	**CHECK ABS WHEEL SPEED SENSOR CLEARANCE.** Measure the clearance between tone wheel and protrusion entire the wheel.	Is the clearance as following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.787 in), Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **10.**	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
10	**INSPECTION USING OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **11.**	Go to step **12.**

	Step	Check	Yes	No
11	**CHECK ABS WHEEL SPEED SENSOR SIGNALÅD** 1) Jack up the vehicle until four wheels are off ground. 2) Turn the ignition switch to OFF. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn the ignition switch to ON. 6) Rotate the wheels and measure voltage at specified frequency. NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***DTC 22*** ***(B310) No. 14 (+) — No. 13 (–):*** ***DTC 24*** ***(B310) No. 21 (+) — No. 19 (–):*** ***DTC 26*** ***(B310) No. 18 (+) — No. 17 (–):*** ***DTC 28*** ***(B310) No. 16 (+) — No. 15 (–):***	Is the oscilloscope pattern the same waveform as shown in the figure?	Go to step **15.**	Go to step **12.**
12	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor from hub according DTC.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **13.**
13	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Is there breakage or damage in the protrusion of ABS wheel speed sensor or tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.> <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **14.**
14	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **15.**	Repair the tone wheel. Front: <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-31, Rear Tone Wheel.>

	Step	Check	Yes	No
15	**CHECK RESISTANCE OF ABS WHEEL SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals. ***Terminal*** ***Front RH No.1 — No. 2:*** ***Front LH No.1 — No. 2:*** ***Rear RH No. 1 — No. 2:*** ***Rear LH No. 1 — No. 2:***	Is the resistance as following? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **16.**	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
16	**CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR.** Measure the resistance between ABS wheel speed sensor and chassis ground. ***Terminal*** ***Front RH No. 1 — Chassis ground:*** ***Front LH No. 1 — Chassis ground:*** ***Rear RH No. 1 — Chassis ground:*** ***Rear LH No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **17.**	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
17	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND ABS WHEEL SPEED SENSOR.** 1) Connect the connector to ABS wheel speed sensor. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM connector terminals. ***Connector & terminal*** ***DTC 22*** ***(B310) No. 14 — No. 13:*** ***DTC 24*** ***(B310) No. 21 — No. 19:*** ***DTC 26*** ***(B310) No. 18 — No. 17:*** ***DTC 28*** ***(B310) No. 16 — No. 15:***	Is the resistance as following? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step **18.**	Repair the harness connector between VDCCM and ABS wheel speed sensor.
18	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(B310) No. 14 — Chassis ground:*** ***DTC 24*** ***(B310) No. 21 — Chassis ground:*** ***DTC 26*** ***(B310) No. 18 — Chassis ground:*** ***DTC 28*** ***(B310) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness connector between VDCCM and ABS wheel speed sensor.
19	**CHECK GROUND CIRCUIT OF VDCCM.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **20.**	Repair the VDCCM ground harness.
20	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step **21.**

	Step	Check	Yes	No
21	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car phone, radio wave device like radio and etc., electric components installed correctly?	Go to step **22.**	Install the radio wave device and electric device properly.
22	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **23.**
23	**CHECK SHIELD CIRCUIT.** 1) Connect all the connectors. 2) Measure the resistance between shield connector and chassis ground. ***Connector & terminal*** ***DTC 22*** ***(F45) No. 13 — Chassis ground:*** ***DTC 24*** ***(F45) No. 3 — Chassis ground:*** NOTE: For DTC 26 and 28 Go to step **25.**	Is the resistance less than 0.5 Ω?	Go to step **24.**	Repair the shield harness.
24	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **25.**
25	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary noise occurs.

M: DTC 29 ANY ONE OF FOUR ABS SENSORS SIGNAL

DTC DETECTING CONDITION:

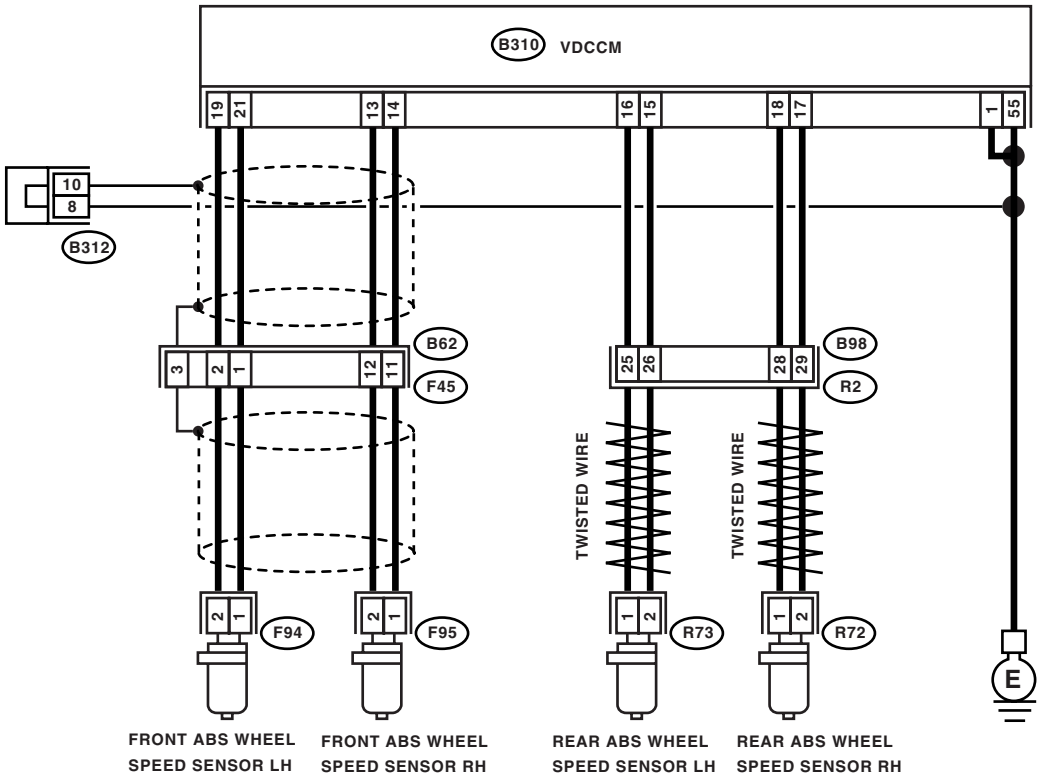
- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- When a wheel is turned freely for a long time

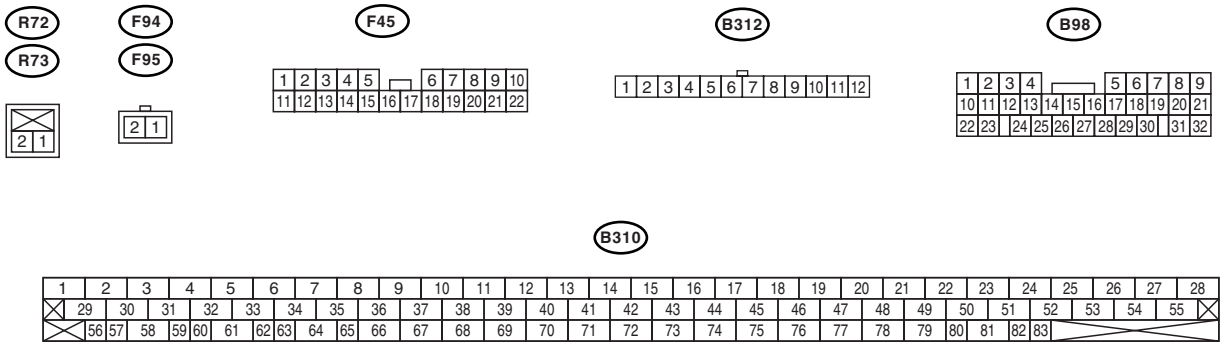
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (cause of malfunction)

NOTE:
At this time, brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:





VDC00314

	Step	Check	Yes	No
1	**CHECK WHETHER A WHEEL TURNED FREELY OR NOT.**	Did the wheel rotate freely more than 1 minutes with the situation when the vehicle lifted-up with jack, turned the corner with full lock condition or tire is not contact to ground?	VDC is normal. Clear the DTC. NOTE: When the wheels turn freely for a long time, such as when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way, this diagnostic trouble code may sometimes occur.	Go to step **2.**
2	**CHECK TYRE TYPE.**	Is the tire specification correct?	Go to step **3.**	Replace the tire.
3	**CHECK THE WEAR OF TIRE.**	Is the tire worn excessively?	Replace the tire.	Go to step **4.**
4	**CHECK TIRE AIR PRESSURE.**	Is the tire pressure correct?	Go to step **5.**	Adjust the tire pressure.
5	**CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.**	Is the mounting bolt of ABS wheel speed sensor tightened with 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step **6.**	Tighten the ABS wheel speed sensor installation bolts.
6	**CHECK ABS WHEEL SPEED SENSOR CLEARANCE.** Measure the clearance between tone wheel and protrusion entire the wheel.	Is the clearance as following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.787 in), Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step **7.**	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
7	**CHECK BY OSCILLOSCOPE.**	Is an oscilloscope available?	Go to step **8.**	Go to step **9.**
8	**CHECK ABS WHEEL SPEED SENSOR SIGNAL.** 1) Jack up the vehicle until four wheels are off ground. 2) Turn the ignition switch to OFF. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn the ignition switch to ON. 6) Rotate the wheels and measure voltage at specified frequency. NOTE: When this inspection is completed, the VDCCM sometimes stores the DTC 29. ***Connector & terminal*** ***(B310) No. 14 (+) — No. 13 (–) (Front RH):*** ***(B310) No. 21 (+) — No. 19 (–) (Front LH):*** ***(B310) No. 18 (+) — No. 17 (–) (Rear RH):*** ***(B310) No. 16 (+) — No. 15 (–) (Rear LH):***	Is the oscilloscope pattern the same waveform as shown in the figure?	Go to step **12.**	Go to step **9.**
9	**CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.** Remove the disc rotor from hub.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step **10.**

	Step	Check	Yes	No
10	**CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.**	Is there breakage or damage in the protrusion of ABS wheel speed sensor or tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.> <Ref. to VDC-31, Rear Tone Wheel.>	Go to step **11.**
11	**CHECK TONE WHEEL RUNOUT.** Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step **12.**	Repair the tone wheel. Front: <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-31, Rear Tone Wheel.>
12	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs. NOTE: ABS warning light remains on until the vehicle speed reaches approx. 12 km/h (7.46 MPH) though the memory is cleared. This is normal operation.

N: DTC 31 FR MAINTAIN VALVE

NOTE:
Refer to DTC 62 for diagnostic procedure. <Ref. to VDC(diag)-62, DTC 62 VDC SWITCHING VALVE 1 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 33 FL MAINTAIN VALVE

NOTE:
Refer to DTC 62 for diagnostic procedure. <Ref. to VDC(diag)-62, DTC 62 VDC SWITCHING VALVE 1 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 35 RR MAINTAIN VALVE

NOTE:
Refer to DTC 62 for diagnostic procedure. <Ref. to VDC(diag)-62, DTC 62 VDC SWITCHING VALVE 1 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 37 RL MAINTAIN VALVE

NOTE:
Refer to DTC 62 for diagnostic procedure. <Ref. to VDC(diag)-62, DTC 62 VDC SWITCHING VALVE 1 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC 61 VDC SWITCHING VALVE 1 (P)

NOTE:
Refer to DTC 62 for diagnostic procedure. <Ref. to VDC(diag)-62, DTC 62 VDC SWITCHING VALVE 1 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC 62 VDC SWITCHING VALVE 1 (S)

DTC DETECTING CONDITION:

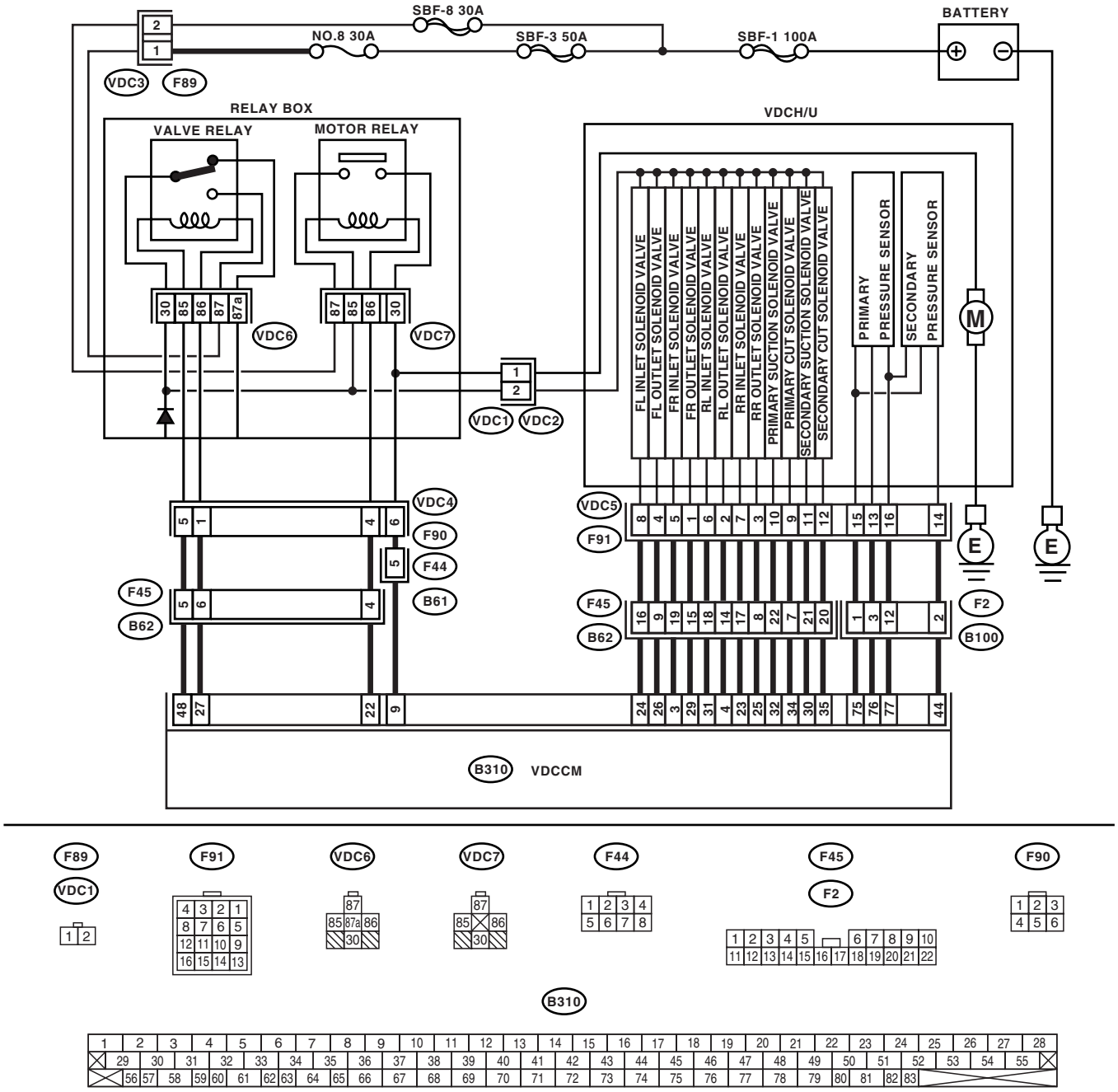
- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:
At this time, brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:



VDC00268

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (VDC1, F91) from VDCH/U. 3) Measure the resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 31*** ***(VDC5) No. 5 — (VDC2) No. 2:*** ***DTC 33*** ***(VDC5) No. 8 — (VDC2) No. 2:*** ***DTC 35*** ***(VDC5) No. 7 — (VDC2) No. 2:*** ***DTC 37*** ***(VDC5) No. 6 — (VDC2) No. 2:*** ***DTC 61*** ***(VDC5) No. 9 — (VDC2) No. 2:*** ***DTC 62*** ***(VDC5) No. 12 — (VDC2) No. 2:***	Is the resistance 8.04 — 9.04 Ω?	Go to step **2.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(VDC5) No. 5 — Chassis ground:*** ***DTC 33*** ***(VDC5) No. 8 — Chassis ground:*** ***DTC 35*** ***(VDC5) No. 7 — Chassis ground:*** ***DTC 37*** ***(VDC5) No. 6 — Chassis ground:*** ***DTC 61*** ***(VDC5) No. 9 — Chassis ground:*** ***DTC 62*** ***(VDC5) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect the connector from VDCCM. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(VDC5) No. 5 (+) — Chassis ground (−):*** ***DTC 33*** ***(VDC5) No. 8 (+) — Chassis ground (−):*** ***DTC 35*** ***(VDC5) No. 7 (+) — Chassis ground (−):*** ***DTC 37*** ***(VDC5) No. 6 (+) — Chassis ground (−):*** ***DTC 61*** ***(VDC5) No. 9 (+) — Chassis ground (−):*** ***DTC 62*** ***(VDC5) No. 12 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>

	Step	Check	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(VDC5) No. 5 (+) — Chassis ground (–):*** ***DTC 33*** ***(VDC5) No. 8 (+) — Chassis ground (–):*** ***DTC 35*** ***(VDC5) No. 7 (+) — Chassis ground (–):*** ***DTC 37*** ***(VDC5) No. 6 (+) — Chassis ground (–):*** ***DTC 61*** ***(VDC5) No. 9 (+) — Chassis ground (–):*** ***DTC 62*** ***(VDC5) No. 12 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 33 (+) — Chassis ground (–):*** ***DTC 33*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***DTC 35*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***DTC 37*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***DTC 61*** ***(B310) No. 34 (+) — Chassis ground (–):*** ***DTC 62*** ***(B310) No. 35 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Repair the harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 3 (+) — Chassis ground (–):*** ***DTC 33*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***DTC 35*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***DTC 37*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***DTC 61*** ***(B310) No. 34 (+) — Chassis ground (–):*** ***DTC 62*** ***(B310) No. 35 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair the harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 3 — Chassis ground:*** ***DTC 33*** ***(B310) No. 24 — Chassis ground:*** ***DTC 35*** ***(B310) No. 23 — Chassis ground:*** ***DTC 37*** ***(B310) No. 31 — Chassis ground:*** ***DTC 61*** ***(B310) No. 34 — Chassis ground:*** ***DTC 62*** ***(B310) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between VDCCM and VDCH/U.
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect the connector (F91) to the VDCH/U. 2) Measure the resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 31*** ***(B310) No. 3 — (VDC2) No. 2:*** ***DTC 33*** ***(B310) No. 24 — (VDC2) No. 2:*** ***DTC 35*** ***(B310) No. 23 — (VDC2) No. 2:*** ***DTC 37*** ***(B310) No. 31 — (VDC2) No. 2:*** ***DTC 61*** ***(B310) No. 34 — (VDC2) No. 2:*** ***DTC 62*** ***(B310) No. 35 — (VDC2) No. 2:***	Is the resistance 7 — 10 Ω?	Go to step **9.**	Repair the harness and connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair the connector.	Go to step **10.**
10	**CHECK THE VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Repair the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

T: DTC 32 FR DECOMPRESSION VALVE

NOTE:
Refer to DTC 64 for diagnostic procedure. <Ref. to VDC(diag)-68, DTC 64 VDC SWITCHING VALVE 2 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC 34 FL DECOMPRESSION VALVE

NOTE:
Refer to DTC 64 for diagnostic procedure. <Ref. to VDC(diag)-68, DTC 64 VDC SWITCHING VALVE 2 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC 36 RR DECOMPRESSION VALVE

NOTE:
Refer to DTC 64 for diagnostic procedure. <Ref. to VDC(diag)-68, DTC 64 VDC SWITCHING VALVE 2 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

W: DTC 38 RL DECOMPRESSION VALVE

NOTE:
Refer to DTC 64 for diagnostic procedure. <Ref. to VDC(diag)-68, DTC 64 VDC SWITCHING VALVE 2 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

X: DTC 63 VDC SWITCHING VALVE 2 (P)

NOTE:
Refer to DTC 64 for diagnostic procedure. <Ref. to VDC(diag)-68, DTC 64 VDC SWITCHING VALVE 2 (S), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Y: DTC 64 VDC SWITCHING VALVE 2 (S)

DTC DETECTING CONDITION:

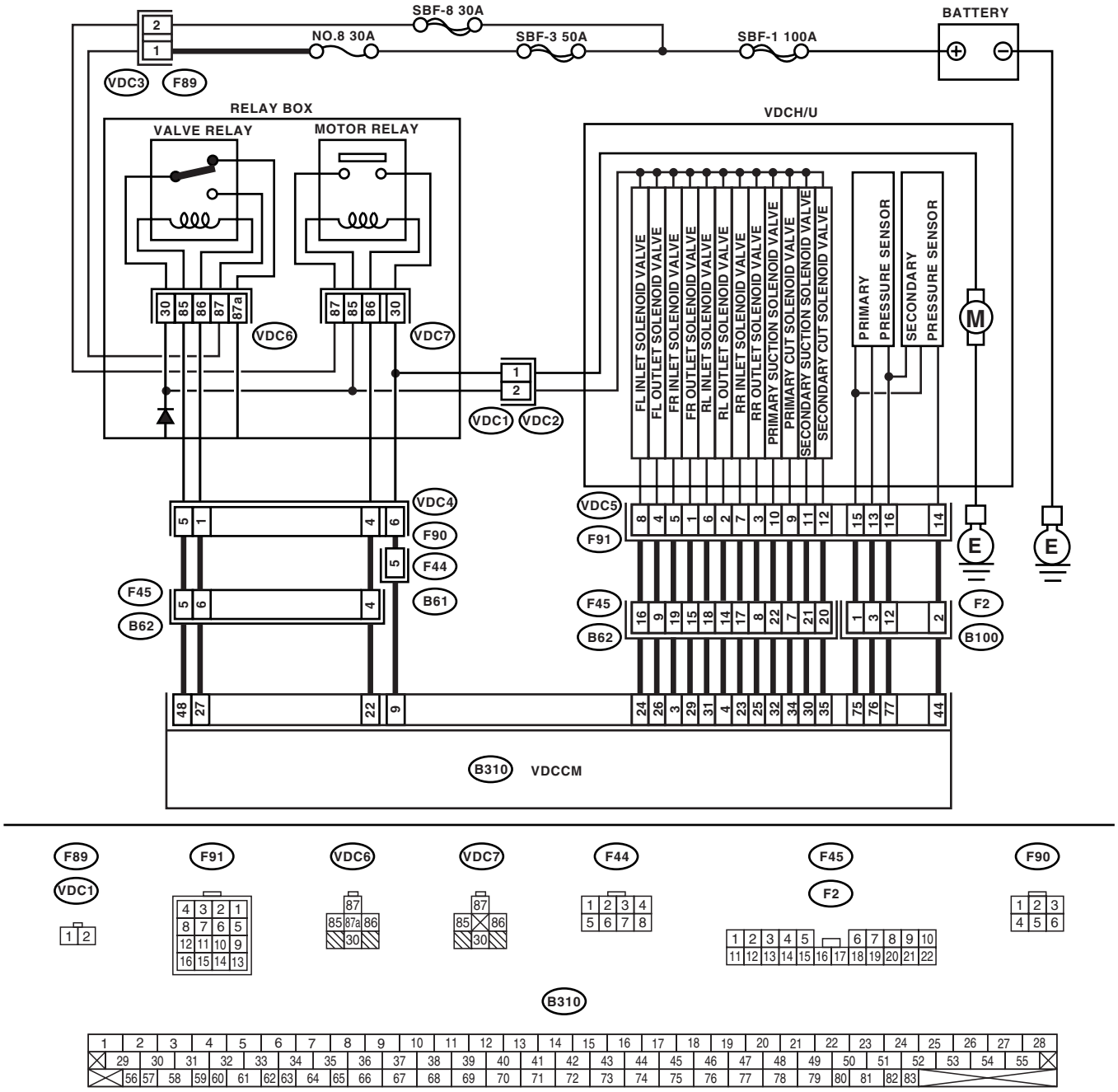
- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:
At this time, brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:



VDC00268

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (VDC1, F91) from VDCH/U. 3) Measure the resistance between VDCH/U connector terminals. ***Connector & terminal*** ***DTC 32*** ***(VDC5) No. 1 — (VDC2) No. 2:*** ***DTC 34*** ***(VDC5) No. 4 — (VDC2) No. 2:*** ***DTC 36*** ***(VDC5) No. 3 — (VDC2) No. 2:*** ***DTC 38*** ***(VDC5) No. 2 — (VDC2) No. 2:*** ***DTC 63*** ***(VDC5) No. 10 — (VDC2) No. 2:*** ***DTC 64*** ***(VDC5) No. 11 — (VDC2) No. 2:***	Is the resistance 3.8 — 4.8 Ω?	Go to step **2.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
2	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(VDC5) No. 1 — Chassis ground:*** ***DTC 34*** ***(VDC5) No. 4 — Chassis ground:*** ***DTC 36*** ***(VDC5) No. 3 — Chassis ground:*** ***DTC 38*** ***(VDC5) No. 2 — Chassis ground:*** ***DTC 63*** ***(VDC5) No. 10 — Chassis ground:*** ***DTC 64*** ***(VDC5) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
3	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Disconnect the connector from VDCCM. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(VDC5) No. 1 (+) — Chassis ground (−):*** ***DTC 34*** ***(VDC5) No. 4 (+) — Chassis ground (−):*** ***DTC 36*** ***(VDC5) No. 3 (+) — Chassis ground (−):*** ***DTC 38*** ***(VDC5) No. 2 (+) — Chassis ground (−):*** ***DTC 63*** ***(VDC5) No. 10 (+) — Chassis ground (−):*** ***DTC 64*** ***(VDC5) No. 11 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>

	Step	Check	Yes	No
4	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(VDC5) No. 1 (+) — Chassis ground (–):*** ***DTC 34*** ***(VDC5) No. 4 (+) — Chassis ground (–):*** ***DTC 36*** ***(VDC5) No. 3 (+) — Chassis ground (–):*** ***DTC 38*** ***(VDC5) No. 2 (+) — Chassis ground (–):*** ***DTC 63*** ***(VDC5) No. 10 (+) — Chassis ground (–):*** ***DTC 64*** ***(VDC5) No. 11 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **5.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***DTC 34*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***DTC 36*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***DTC 38*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***DTC 63*** ***(B310) No. 32 (+) — Chassis ground (–):*** ***DTC 64*** ***(B310) No. 30 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **6.**	Repair the harness between VDCCM and VDCH/U.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***DTC 34*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***DTC 36*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***DTC 38*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***DTC 63*** ***(B310) No. 32 (+) — Chassis ground (–):*** ***DTC 64*** ***(B310) No. 30 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **7.**	Repair the harness between VDCCM and VDCH/U.

	Step	Check	Yes	No
7	**CHECK GROUND SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 — Chassis ground:*** ***DTC 34*** ***(B310) No. 26 — Chassis ground:*** ***DTC 36*** ***(B310) No. 25 — Chassis ground:*** ***DTC 38*** ***(B310) No. 4 — Chassis ground:*** ***DTC 63*** ***(B310) No. 32 — Chassis ground:*** ***DTC 64*** ***(B310) No. 30 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between VDCCM and VDCH/U.
8	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect the connector (F91) to the VDCH/U. 2) Measure the resistance between VDCCM connector and VDCH/U connector. ***Connector & terminal*** ***DTC 32*** ***(B310) No. 29 — (VDC2) No. 1:*** ***DTC 34*** ***(B310) No. 26 — (VDC2) No. 1:*** ***DTC 36*** ***(B310) No. 25 — (VDC2) No. 1:*** ***DTC 38*** ***(B310) No. 4 — (VDC2) No. 1:*** ***DTC 63*** ***(B310) No. 32 — (VDC2) No. 1:*** ***DTC 64*** ***(B310) No. 30 — (VDC2) No. 1:***	Is the resistance 4 — 6 Ω?	Go to step **9.**	Repair the harness connector between VDCCM and VDCH/U.
9	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair the connector.	Go to step **10.**
10	**CHECK THE VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

Z: DTC 41 ECM

DTC DETECTING CONDITION:

VDCCM malfunction

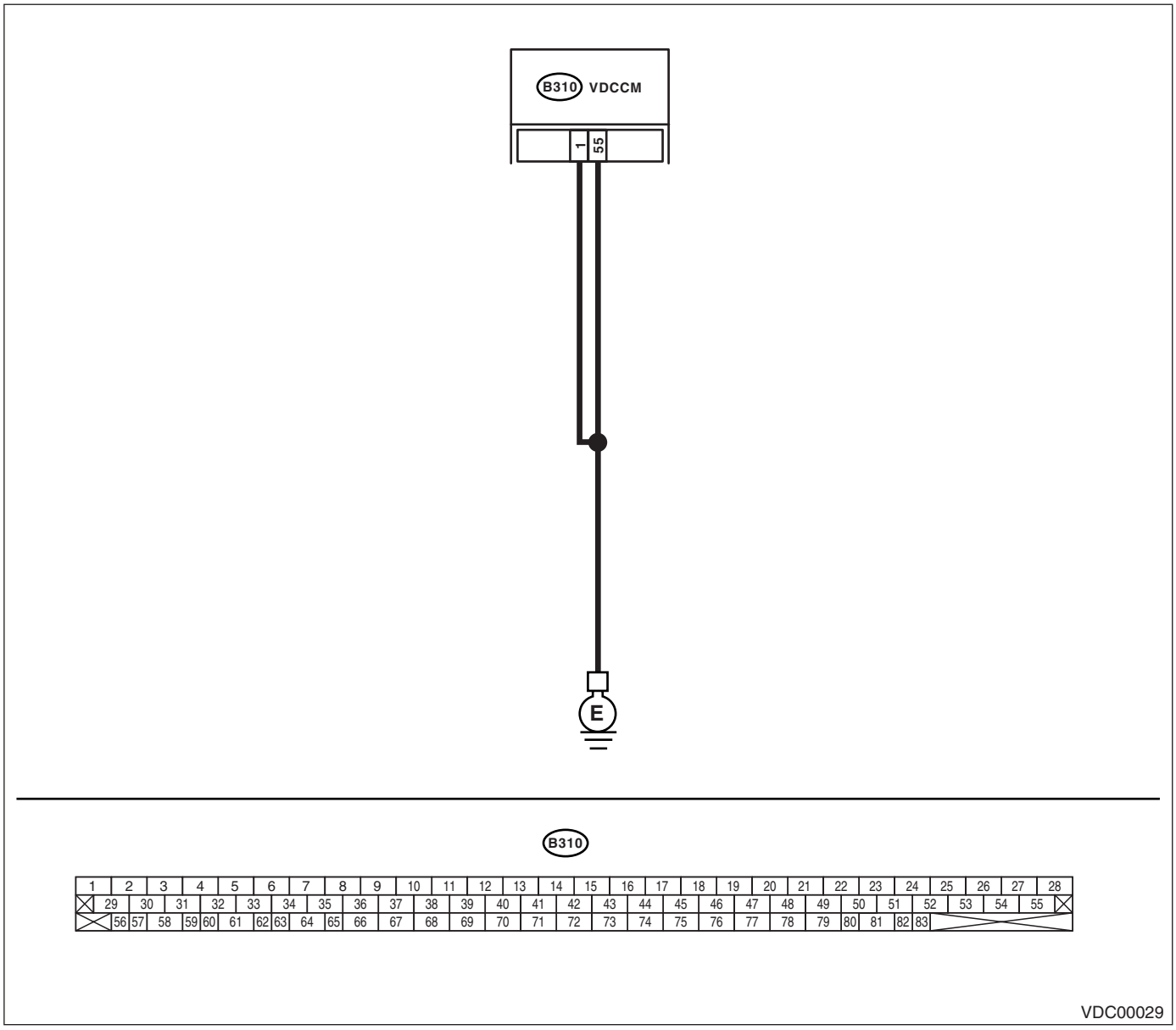
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:

At this time, brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Repair the VDCCM ground harness.
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between battery, ignition switch and VDCCM?	Repair the connector.	Go to step **3.**
3	**CHECK SOURCES OF SIGNAL NOISE.**	Is the car phone, radio wave device like radio and etc., electric components installed correctly?	Go to step **4.**	Install the radio wave device and electric device properly.
4	**CHECK SOURCES OF SIGNAL NOISE.**	Are noise sources (such as an antenna) installed near the sensor harness?	Install the noise sources apart from the sensor harness.	Go to step **5.**
5	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **6.**
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AA:DTC 42 POWER SUPPLY TOO LOW

DTC DETECTING CONDITION:

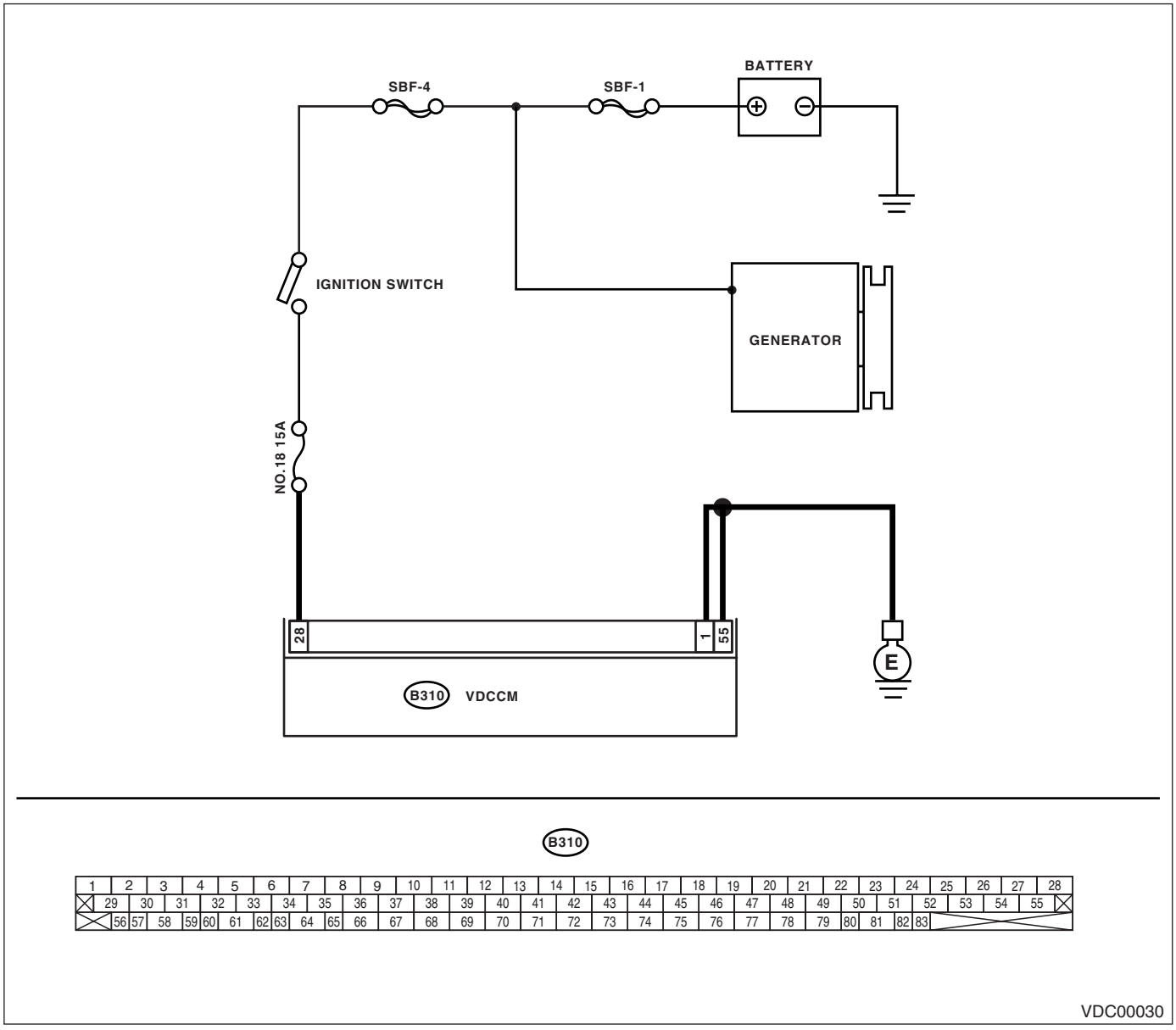
- Power supply voltage of VDCCM is too low.
- Voltage of VDCCM too high. (Warning lights go off if voltage returns.)

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (When the voltage extremely low or high.)

NOTE:
At this time, brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GENERATOR.** 1) Start the engine. 2) Idle after warm-up. 3) Measure the voltage between generator terminal B and chassis ground. ***Terminal*** ***Generator terminal B — Chassis ground:***	Is the voltage 10 — 15 V?	Go to step **2.**	Repair the generator.
2	**CHECK BATTERY TERMINAL.** Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step **3.**	Tighten the clamp of terminal.
3	**CHECK VDCCM INPUT VOLTAGE.** 1) Disconnect the connector from VDCCM. 2) Run the engine at idle. 3) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 28 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the harness connectors between battery, ignition switch and VDCCM.
4	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 1 — Chassis ground:*** ***(B310) No. 55 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the VDCCM ground harness.
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between generator, battery and VDCCM?	Repair the connector.	Go to step **6.**
6	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AB:DTC 44 AT COMMUNICATION

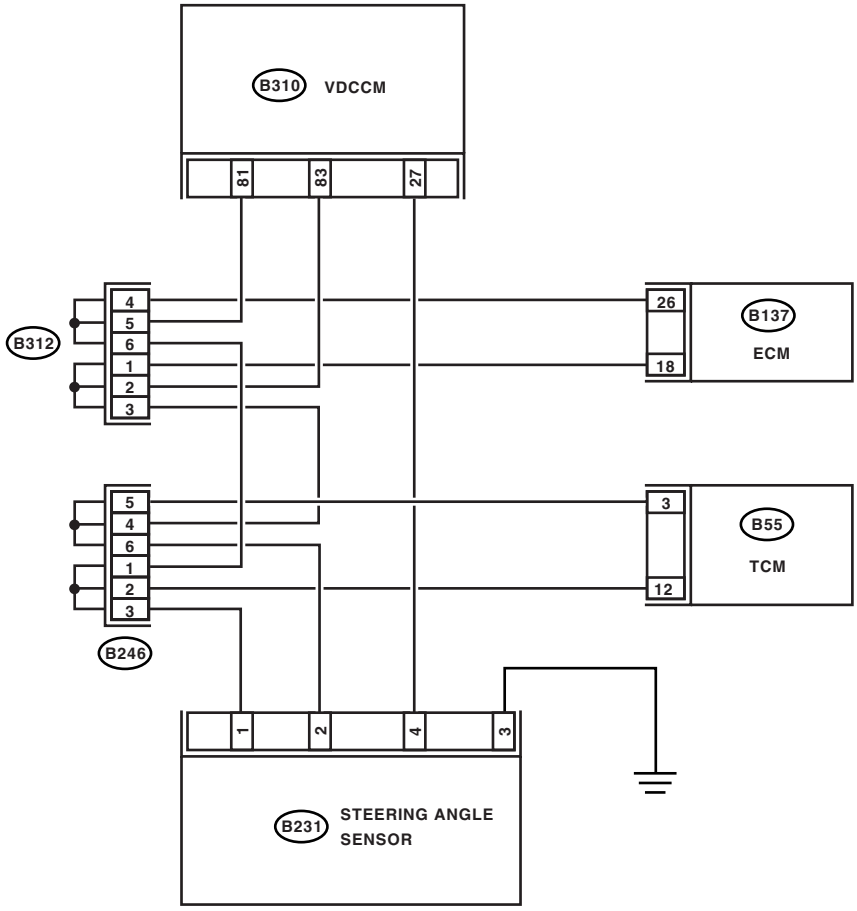
DTC DETECTING CONDITION:

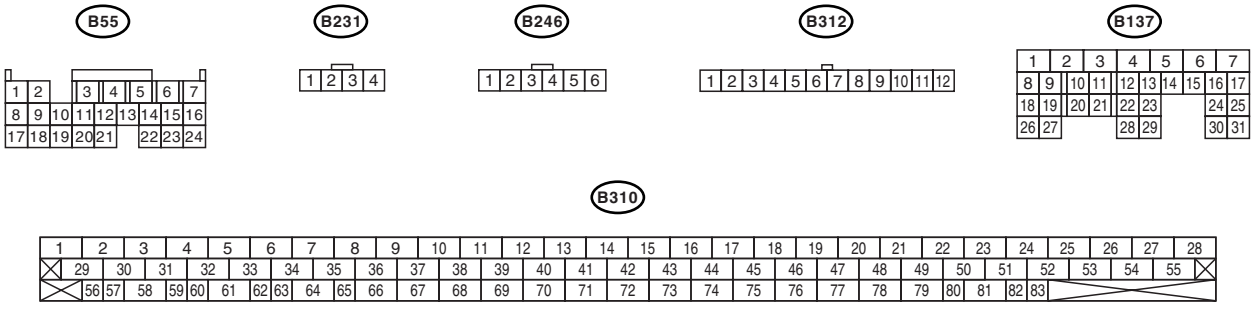
TCM communication malfunction

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00315

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the two connectors from TCM. 3) Measure the resistance between TCM connector terminals. ***Connector & terminal (B55) No. 3 — No. 12:***	Is the resistance 60±3 Ω?	Go to step **2.**	Repair the harness between TCM and VDCCM.
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in TCM connector?	Repair the connector.	Go to step **3.**
3	**CHECK TCM.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Go to step **4.**
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AC:DTC C0045 DIFFERENT CONTROL MODULE SPECIFICATION

DTC DETECTING CONDITION:

Different control module specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

	Step	Check	Yes	No
1	**CHECK VDCCM SPECIFICATION.** Check VDCCM identification mark.	Does the vehicle specification and the VDCCM specification match?	Go to step **2.**	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	**CHECK TCM SPECIFICATION.** Check TCM identification mark.	Does the vehicle specification and the TCM specification match?	Go to step **3.**	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>
3	**CHECK TCM.** 1) Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Go to step **4.**	Malfunction is found in original TCM.
4	**CHECK TCM.**	Is the same DTC displayed again?	Proceed with the diagnostic corresponding to the DTC.	Go to step **5.**
5	**CHECK VDCCM.** 1) Install the original TCM. 2) Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Go to step **6.**	Malfunction is found in original VDCCM.

Step		Check	Yes	No
6	**CHECK VDCCM.**	Is the same DTC as current diagnostic still displayed?	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>	Proceed with the diagnostic corresponding to the DTC.

AD:DTC 45 AT ECM

DTC DETECTING CONDITION:

TCM or VDCCM malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step		Check	Yes	No
1	**CHECK AT SYSTEM.** 1) Start the engine. 2) Check the DTC in AT system.	Is DTC of AT system recorded on memory?	Repair the AT system.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

AE:DTC 46 5 V POWER SUPPLY

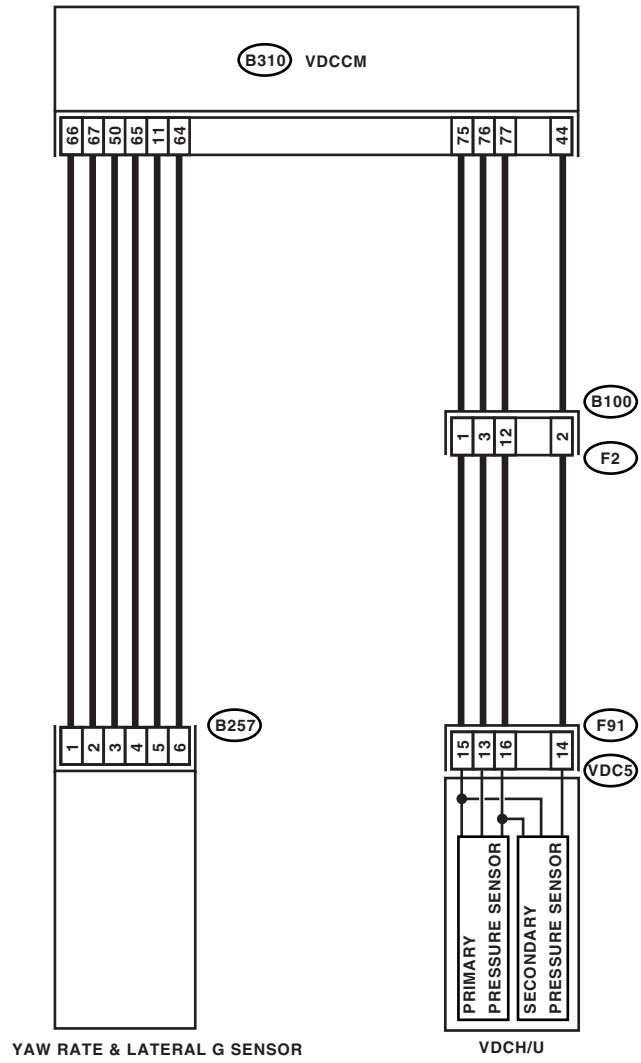
DTC DETECTING CONDITION:

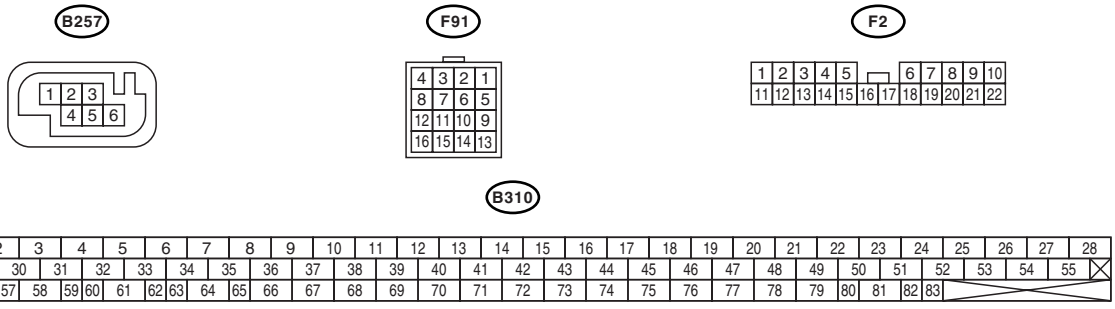
5 V power supply voltage malfunction.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00270

	Step	Check	Yes	No
1	**CHECK GROUND SHORT OF SENSOR AND HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 50 — Chassis ground (Lateral G sensor):*** ***(B310) No. 77 — Chassis ground (Pressure sensor):***	Is the resistance more than 1 MΩ?	Go to step **3.**	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Disconnect the connector from faulty sensor. 2) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 — Chassis ground (Lateral G sensor):*** ***(B310) No. 77 — Chassis ground (Pressure sensor):***	Is the resistance more than 1 MΩ?	Replace the faulty sensor.	Repair or replace the harness connector between VDCCM and faulty sensor.
3	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–) (Lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (–) (Pressure sensor):***	Is the voltage less than 0.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK BATTERY SHORT OF SENSOR AND HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–) (Lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (–) (Pressure sensor):***	Is the voltage less than 0.5 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from faulty sensor. 3) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–) (Lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (–) (Pressure sensor):***	Is the voltage less than 0.5 V?	Go to step **6.**	Repair or replace the harness connector between VDCCM and faulty sensor.

	Step	Check	Yes	No
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (−)*** ***(Lateral G sensor):*** ***(B310) No. 77 (+) — Chassis ground (−)*** ***(Pressure sensor):***	Is the voltage less than 0.5 V?	Replace the faulty sensor.	Repair or replace the harness connector between VDCCM and faulty sensor.

AF:DTC 47 CAN COMMUNICATION

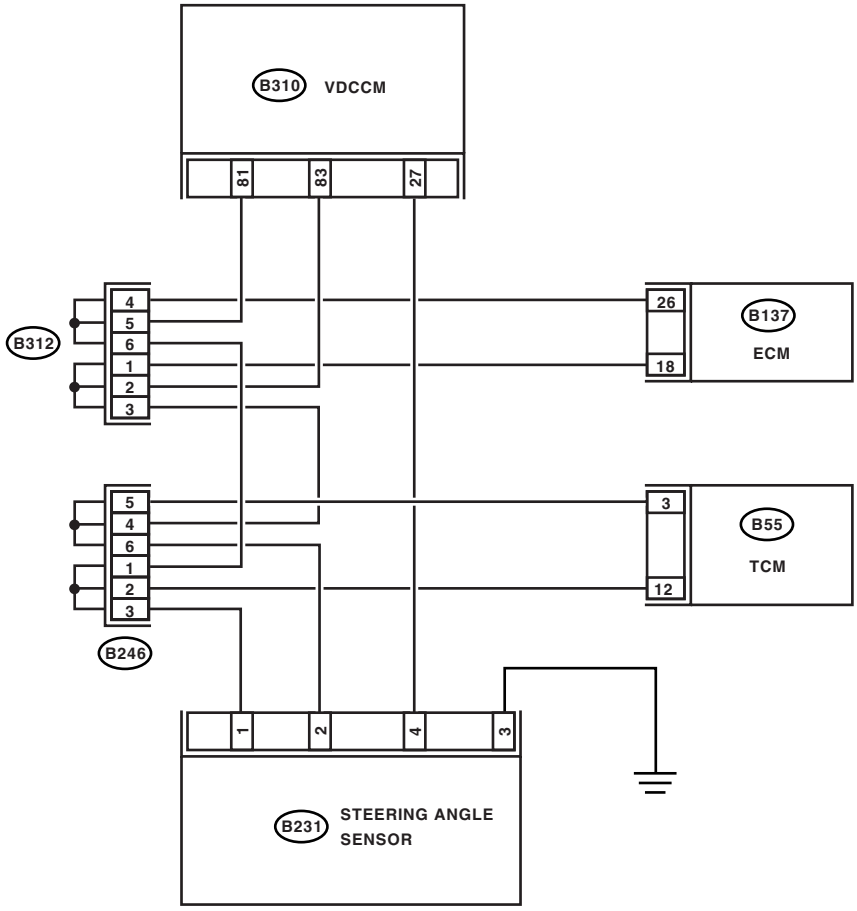
DTC DETECTING CONDITION:

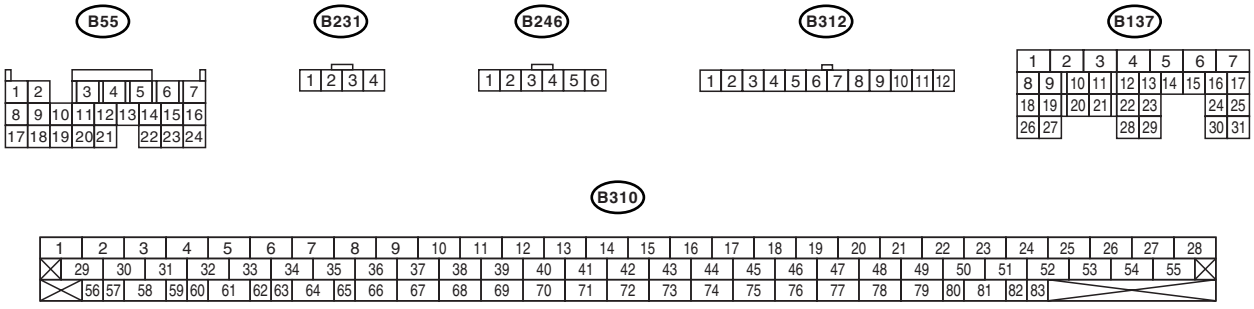
CAN communication line is damaged or circuit is shorted.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00315

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM, TCM, ECM and steering angle sensor. 3) Check resistance between VDCCM, TCM, ECM and steering angle sensor. ***Connector & terminal*** ***(B310) No. 83 — (B55) No. 3:*** ***(B310) No. 81 — (B55) No. 12:*** ***(B310) No. 83 — (B231) No. 2:*** ***(B310) No. 81 — (B231) No. 1:*** ***(B310) No. 83 — (B134) No. 3:*** ***(B310) No. 81 — (B134) No. 10:***	Is the resistance less than 0.5 Ω?	Go to step **4.**	Go to step **2.**
2	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM.** Measure the resistance between TCM and steering angle sensor. ***Connector & terminal*** ***(B55) No. 3 — (B231) No. 2:*** ***(B55) No. 12 — (B231) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Repair or replace the harness connector between TCM and steering angle sensor.
3	**CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND ECM.** Measure the resistance between ECM and steering angle sensor. ***Connector & terminal*** ***(B231) No. 2 — (B134) No. 3:*** ***(B231) No. 1 — (B134) No. 10:***	Is the resistance less than 0.5 Ω?	Repair or replace the harness connector between VDCCM and ECM.	Repair or replace the harness connector between steering angle sensor and ECM.
4	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 83 — Chassis ground:*** ***(B310) No. 81 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair or replace the harness connector between VDCCM, TCM, ECM and steering angle sensor.
5	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 83 (+) — Chassis ground (−):*** ***(B310) No. 81 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **6.**	Repair or replace the harness connector between VDCCM, TCM, ECM and steering angle sensor.
6	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 83 (+) — Chassis ground (−):*** ***(B310) No. 81 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **7.**	Repair or replace the harness connector between VDCCM, TCM, ECM and steering angle sensor.
7	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connector to steering angle sensor. 3) Measure the resistance between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 83 — No. 81:***	Is the resistance 120±6 Ω?	Go to step **9.**	Go to step **8.**
8	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in steering angle sensor connector?	Repair or replace the steering angle sensor connector.	Replace the steering angle sensor.

	Step	Check	Yes	No
9	**CHECK VDCCM.** 1) Connect the connector to VDCCM. 2) Disconnect the connector from steering angle sensor. 3) Measure the resistance between steering angle sensor connector terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Go to step **10.**
10	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in VDCCM?	Correct or replace the VDCCM connector.	Replace the VDCCM.
11	**CHECK TCM.** 1) Connect the connector to TCM. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between the steering angle sensor terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **13.**	Go to step **12.**
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in TCM?	Correct or replace the TCM connector.	Replace the TCM.
13	**CHECK ECM.** 1) Connect the connector to ECM. 2) Disconnect the connector from TCM. 3) Measure the resistance between the steering angle sensor terminals. ***Connector & terminal*** ***(B231) No. 1 — No. 2:***	Is the resistance 120±6 Ω?	Go to step **15.**	Go to step **14.**
14	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in ECM?	Correct or replace the ECM connector.	Replace the ECM.
15	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is any other DTC displayed?	Go to step **16.**	Temporary poor contact occurs.
16	**CHECK ANY OTHER DTC ON DISPLAY.**	Is the same DTC displayed again?	Go to step **17.**	Proceed with the diagnostic corresponding to the DTC.
17	**CHECK INDICATION OF AT SYSTEM DTC.**	Is AT system DTC P1718 displayed?	Replace the steering angle sensor.	Replace the VDCCM.

AG:DTC 51 VALVE RELAY OFF MALFUNCTION/VALVE RELAY TEST MALFUNCTION

DTC DETECTING CONDITION:

Defective valve relay

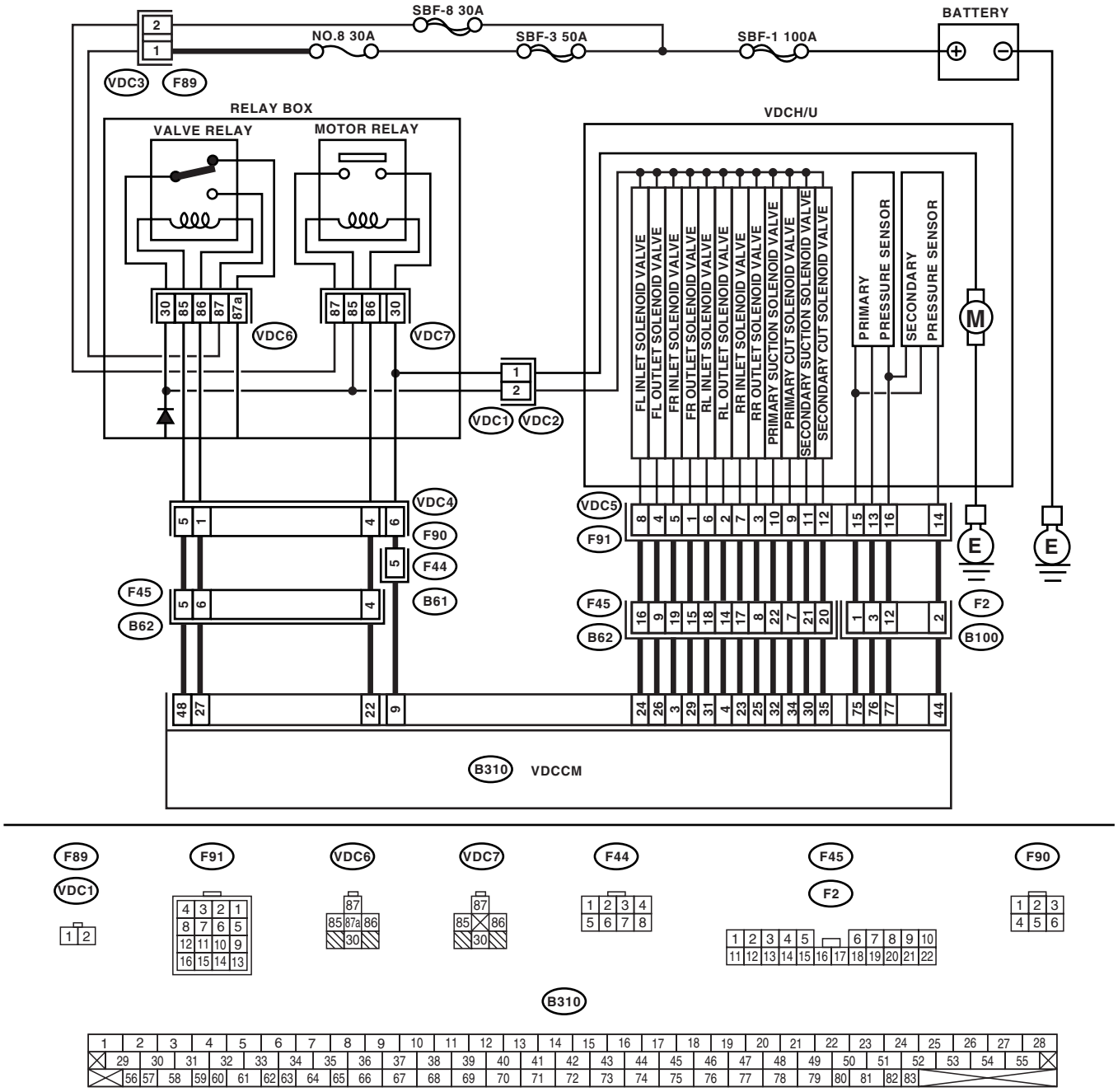
NOTE:
When performing this inspection of DTC 74, DTC 51 is saved; however, this does not mean the malfunction of valve relay operation.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (cause of malfunction)

NOTE:
At this time, brake warning light comes on as well as ABS warning light.

WIRING DIAGRAM:



VDC00268

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the valve relay from relay box. 3) Measure the resistance between valve relay terminals. ***Terminal*** ***No. 85 — No. 86***	Is the resistance 93 — 113 Ω?	Go to step **2.**	Replace the valve relay.
2	**CHECK CONTACT OF VALVE RELAY.** 1) Connect the battery to valve relay terminals No. 85 and No. 86. 2) Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Replace the valve relay.
3	**CHECK CONTACT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87a:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the valve relay.
4	**CHECK CONTACT OF VALVE RELAY.** 1) Disconnect the battery from the valve relay terminals. 2) Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the valve relay.
5	**CHECK CONTACT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87a:***	Is the resistance less than 0.5 Ω?	Go to step **6.**	Replace the valve relay.
6	**CHECK SHORT CIRCUIT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminal*** ***No. 86 — No. 87*** ***No. 86 — No. 87a:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Replace the valve relay.
7	**CHECK POWER SUPPLY OF VALVE RELAY.** 1) Disconnect the connector (F89) from relay box. 2) Turn the ignition switch to ON. 3) Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 1 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **8.**	Repair the harness between battery and relay box connector. Replace the fuse No. 8.
8	**CHECK GROUND SHORT AND OPEN CIRCUIT ON POWER SUPPLY CIRCUIT OF RELAY BOX.** 1) Disconnect the connector (VDC1) from VDCH/U. 2) Connect the connector (F89) to relay box. 3) Turn the ignition switch to ON. 4) Measure the voltage of relay box. ***Connector & terminal*** ***Valve relay mounting point No. 87 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **9.**	Replace the relay box, and then check fuse No. 8.

	Step	Check	Yes	No
9	**CHECK OPEN CIRCUIT ON CONTROL CIRCUIT OF RELAY BOX.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (F90) from relay box. 3) Measure the resistance between relay box connector and valve relay mounting point. ***Connector & terminal*** ***(VDC4) No. 5 — Valve relay mounting point No. 85:*** ***(VDC4) No. 1 — Valve relay mounting point No. 86:***	Is the resistance less than 0.5 Ω?	Go to step **10.**	Replace the relay box.
10	**CHECK GROUND SHORT CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** Measure the resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 — Chassis ground:*** ***(VDC4) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Replace the relay box, and then check fuse SBF6.
11	**CHECK OPEN CIRCUIT ON CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(B310) No. 48 — (F90) No. 5:*** ***(B310) No. 27 — (F90) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **12.**	Repair the harness between VDCCM and relay box.
12	**CHECK GROUND SHORT CIRCUIT ON CONTROL SYSTEM HARNESS OF VALVE RELAY.** Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 48 — Chassis ground:*** ***(B310) No. 27 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **13.**	Repair the harness between VDCCM and relay box.
13	**CHECK OPEN CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** Measure the resistance between VDCH/U connector and valve relay mounting point. ***Connector & terminal*** ***(VDC1) No. 2 — Valve relay mounting point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **14.**	Replace the relay box.
14	**CHECK GROUND SHORT CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **15.**	Replace the relay box, and then check fuse No. 8.

	Step	Check	Yes	No
15	**CHECK RESISTANCE OF MAINTAIN VALVE AND CUT SOLENOID VALVE.** 1) Disconnect the connector from VDCH/U. 2) Measure the resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 8 — (VDC2) No. 2:*** ***(VDC5) No. 5 — (VDC2) No. 2:*** ***(VDC5) No. 6 — (VDC2) No. 2:*** ***(VDC5) No. 7 — (VDC2) No. 2:*** ***(VDC5) No. 9 — (VDC2) No. 2:*** ***(VDC5) No. 12 — (VDC2) No. 2:***	Is the resistance 8.04 — 9.04 Ω?	Go to step **16.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
16	**CHECK RESISTANCE OF DECOMPRESSION VALVE.** Measure the resistance between VDCH/U connector terminals. ***Connector & terminal*** ***(VDC5) No. 4 — (VDC2) No. 2:*** ***(VDC5) No. 1 — (VDC2) No. 2:*** ***(VDC5) No. 2 — (VDC2) No. 2:*** ***(VDC5) No. 3 — (VDC2) No. 2:*** ***(VDC5) No. 10 — (VDC2) No. 2:*** ***(VDC5) No. 11 — (VDC2) No. 2:***	Is the resistance 4.04 — 4.54 Ω?	Go to step **17.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
17	**CHECK GROUND SHORT OF SOLENOID VALVE.** Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Replace the VDCH/U and check all fuse. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
18	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 3 — Chassis ground:*** ***(B310) No. 24 — Chassis ground:*** ***(B310) No. 23 — Chassis ground:*** ***(B310) No. 31 — Chassis ground:*** ***(B310) No. 35 — Chassis ground:*** ***(B310) No. 34 — Chassis ground:*** ***(B310) No. 29 — Chassis ground:*** ***(B310) No. 26 — Chassis ground:*** ***(B310) No. 25 — Chassis ground:*** ***(B310) No. 4 — Chassis ground:*** ***(B310) No. 30 — Chassis ground:*** ***(B310) No. 32 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **19.**	Repair the harness between VDCCM and VDCH/U.
19	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** 1) Connect the connector (F91) to the VDCH/U. 2) Measure the resistance between VDCCM connector and VDCH/U. ***Connector & terminal*** ***(B310) No. 3 — (VDC2) No. 2:*** ***(B310) No. 24 — (VDC2) No. 2:*** ***(B310) No. 23 — (VDC2) No. 2:*** ***(B310) No. 31 — (VDC2) No. 2:*** ***(B310) No. 35 — (VDC2) No. 2:*** ***(B310) No. 34 — (VDC2) No. 2:***	Is the resistance 8.0 — 10.0 Ω?	Go to step **20.**	Repair the harness and connector between VDCCM and VDCH/U.

	Step	Check	Yes	No
20	**CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.** Measure the resistance between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 29 — (VDC2) No. 2:*** ***(B310) No. 26 — (VDC2) No. 2:*** ***(B310) No. 25 — (VDC2) No. 2:*** ***(B310) No. 4 — (VDC2) No. 2:*** ***(B310) No. 30 — (VDC2) No. 2:*** ***(B310) No. 32 — (VDC2) No. 2:***	Is the resistance 4.0 — 6.0 Ω?	Go to step **21.**	Repair the harness connector between VDCCM and VDCH/U.
21	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair the connector.	Go to step **22.**
22	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **23.**
23	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AH:DTC 51 VALVE RELAY ON MALFUNCTION

DTC DETECTING CONDITION:

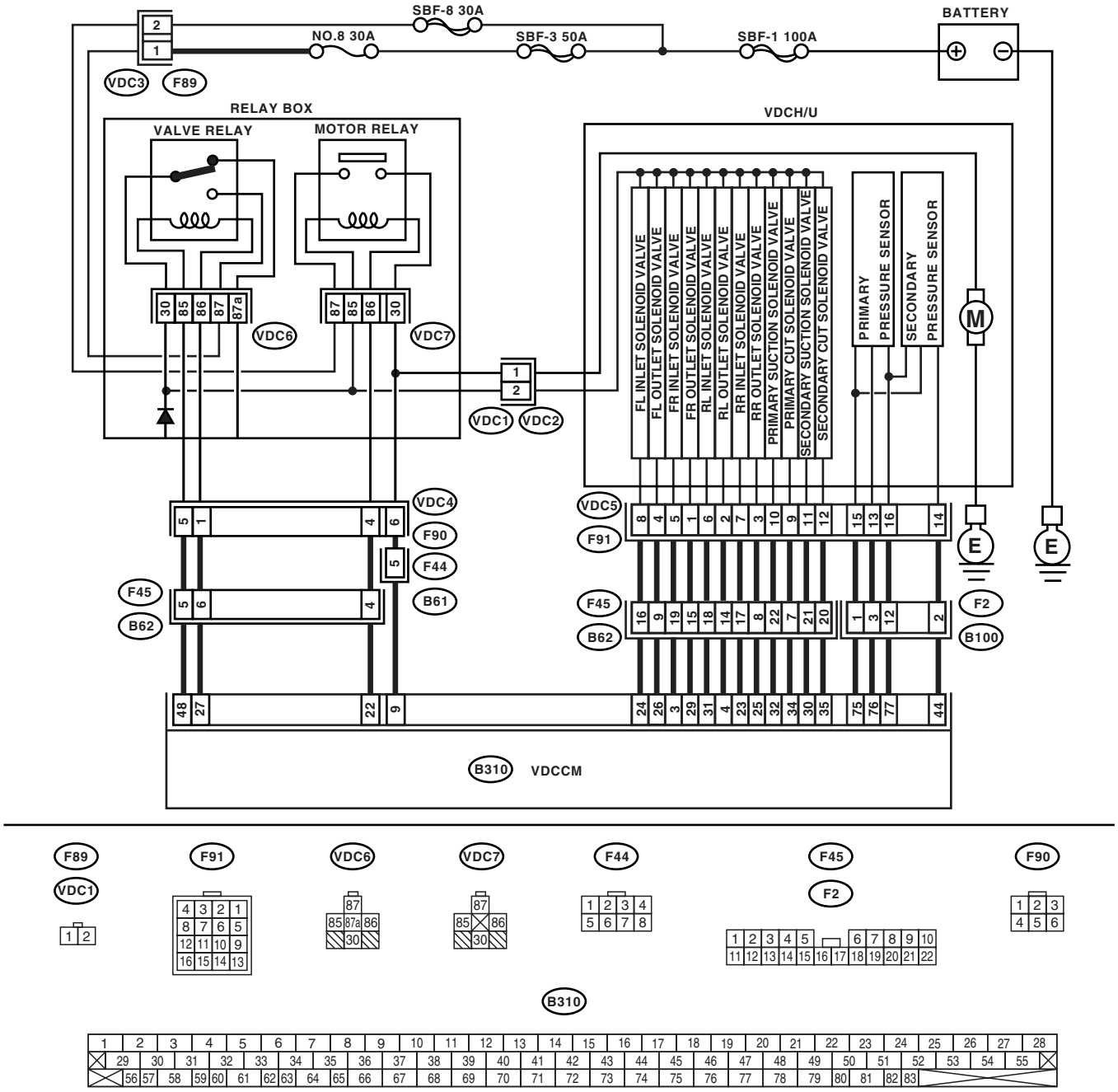
Defective valve relay

NOTE:
When performing this inspection of DTC 74, DTC 51 is saved; however, this does not mean the malfunction of valve relay operation.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00268

	Step	Check	Yes	No
1	**CHECK CONTACT OF VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the valve relay from relay box. 3) Connect the battery to valve relay terminals No. 85 and No. 86. 4) Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Replace the valve relay.
2	**CHECK CONTACT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87a:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the valve relay.
3	**CHECK CONTACT OF VALVE RELAY.** 1) Disconnect the battery from the valve relay terminals. 2) Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the valve relay.
4	**CHECK CONTACT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminal*** ***No. 30 — No. 87a:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Replace the valve relay.
5	**CHECK SHORT CIRCUIT OF VALVE RELAY.** Measure the resistance between valve relay terminals. ***Terminal*** ***No. 86 — No. 87*** ***No. 86 — No. 87a:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Replace the valve relay.
6	**CHECK BATTERY SHORT CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** 1) Disconnect the connector (F90) from relay box. 2) Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (−):*** ***(VDC4) No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **7.**	Replace the relay box. Check the fuse No. 8 and SBF3.
7	**CHECK BATTERY SHORT CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 5 (+) — Chassis ground (−):*** ***(VDC4) No. 1 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Replace the relay box. Check the fuse No. 8 and SBF3.
8	**CHECK BATTERY SHORT CIRCUIT ON CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Disconnect the connector from VDCH/U. 4) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (−):*** ***(B310) No. 48 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **9.**	Repair the harness between VDCCM and relay box, and then check all the fuse.

	Step	Check	Yes	No
9	**CHECK BATTERY SHORT CIRCUIT ON CONTROL SYSTEM HARNESS OF VALVE RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (–):*** ***(B310) No. 48 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **10.**	Repair the harness between VDCCM and relay box, and then check all the fuse.
10	**CHECK BATTERY SHORT CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** 1) Disconnect the (VDC1) connector from relay box. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **11.**	Replace the relay box.
11	**CHECK BATTERY SHORT CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC1) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **12.**	Replace the relay box.
12	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **13.**	Replace the VDCH/U and check all fuse. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
13	**CHECK BATTERY SHORT OF SOLENOID VALVE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(VDC2) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **14.**	Replace the VDCH/U and check all fuse. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
14	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 3 (+) — Chassis ground (–):*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***(B310) No. 35 (+) — Chassis ground (–):*** ***(B310) No. 34 (+) — Chassis ground (–):*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***(B310) No. 30 (+) — Chassis ground (–):*** ***(B310) No. 32 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **15.**	Repair the harness between VDCH/U and VDCCM, and then check all the fuse.

	Step	Check	Yes	No
15	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 3 (+) — Chassis ground (–):*** ***(B310) No. 24 (+) — Chassis ground (–):*** ***(B310) No. 23 (+) — Chassis ground (–):*** ***(B310) No. 31 (+) — Chassis ground (–):*** ***(B310) No. 35 (+) — Chassis ground (–):*** ***(B310) No. 34 (+) — Chassis ground (–):*** ***(B310) No. 29 (+) — Chassis ground (–):*** ***(B310) No. 26 (+) — Chassis ground (–):*** ***(B310) No. 25 (+) — Chassis ground (–):*** ***(B310) No. 4 (+) — Chassis ground (–):*** ***(B310) No. 30 (+) — Chassis ground (–):*** ***(B310) No. 32 (+) — Chassis ground (–):***	Is the voltage less than 1 V?	Go to step **16.**	Repair the harness between VDCH/U and VDCCM, and then check all the fuse.
16	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM and VDCH/U?	Repair the connector.	Go to step **17.**
17	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **18.**
18	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AI: DTC 52 MOTOR/MOTOR RELAY OFF MALFUNCTION

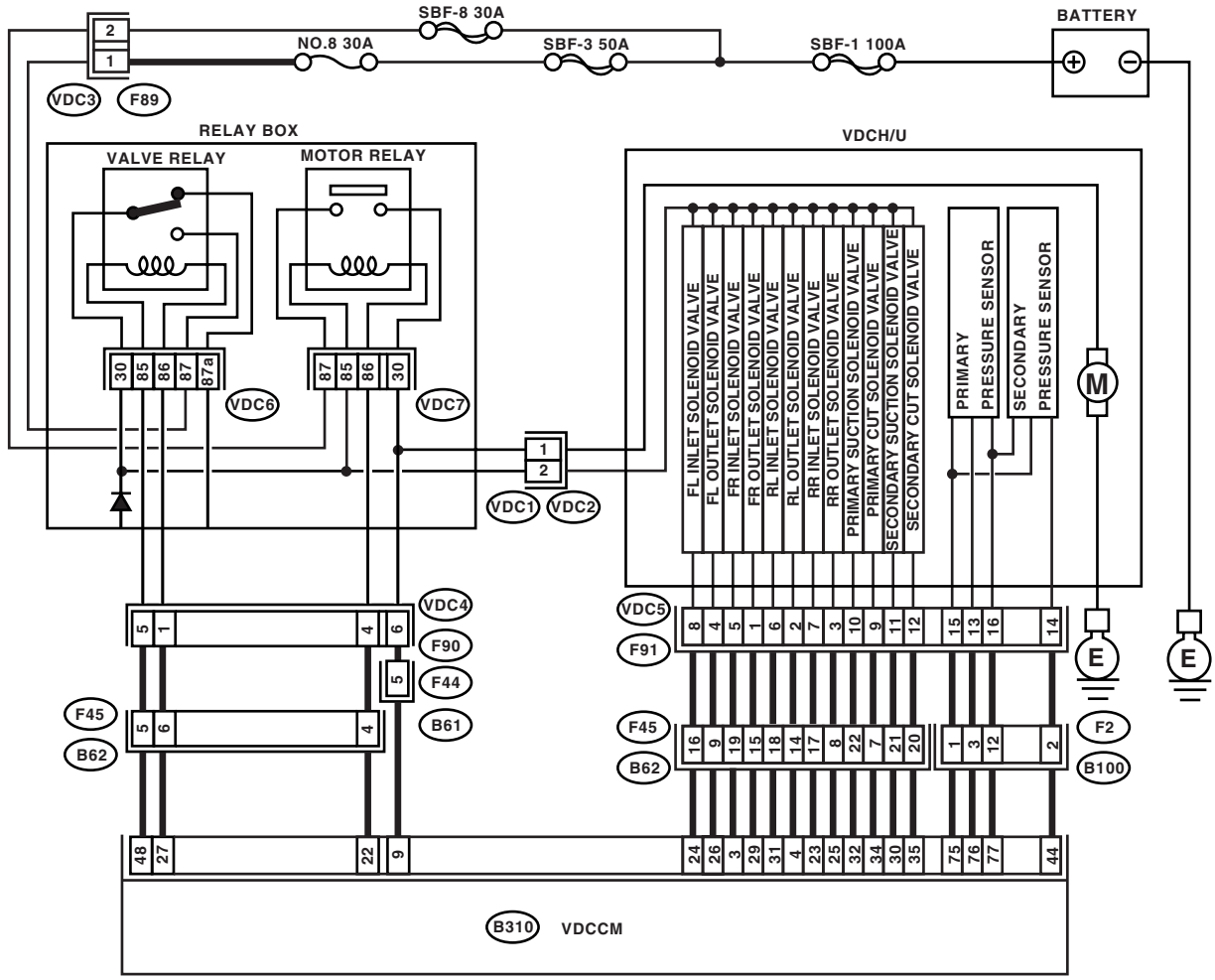
DTC DETECTING CONDITION:

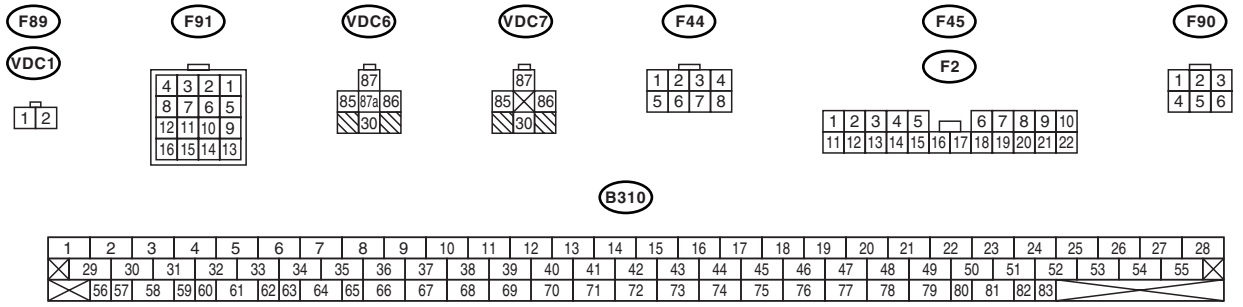
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00268

	Step	Check	Yes	No
1	**CHECK MOTOR GROUND.**	Is the mounting bolt of motor ground terminal tightened with 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step **2.**	Tighten the clamp of motor ground terminal.
2	**CHECK CONTACT OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the motor relay from relay box. 3) Measure the resistance between motor relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the motor relay.
3	**CHECK SHORT CIRCUIT OF MOTOR RELAY.** Measure the resistance between motor relay terminals. ***Terminal*** ***No. 85 — No. 30*** ***No. 85 — No. 87***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the motor relay.
4	**CHECK GROUND SHORT CIRCUIT ON CIRCUIT OF RELAY BOX.** 1) Disconnect the connector (F90) from relay box. 2) Measure the resistance between relay box connector unit and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Replace the relay box.
5	**CHECK BATTERY SHORT CIRCUIT ON CIRCUIT OF RELAY BOX.** Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **6.**	Replace the relay box.
6	**CHECK BATTERY SHORT CIRCUIT ON CIRCUIT OF RELAY BOX.** 1) Turn the ignition switch to ON. 2) Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **7.**	Replace the relay box.
7	**CHECK HARNESS BETWEEN RELAY BOX AND VDCCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
8	**CHECK BATTERY SHORT CIRCUIT BETWEEN RELAY BOX AND VDCCM.** Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **9.**	Repair the harness between VDCCM and relay box.

	Step	Check	Yes	No
9	**CHECK BATTERY SHORT CIRCUIT BETWEEN RELAY BOX AND VDCCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **10.**	Repair the harness between VDCCM and relay box.
10	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step **11.**
11	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **12.**
12	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs. NOTE: ABS warning light remains on until the vehicle speed reaches approx. 12 km/h (7.46 MPH) though the memory is cleared. This is normal operation.

AJ:DTC 52 MOTOR/MOTOR RELAY ON MALFUNCTION

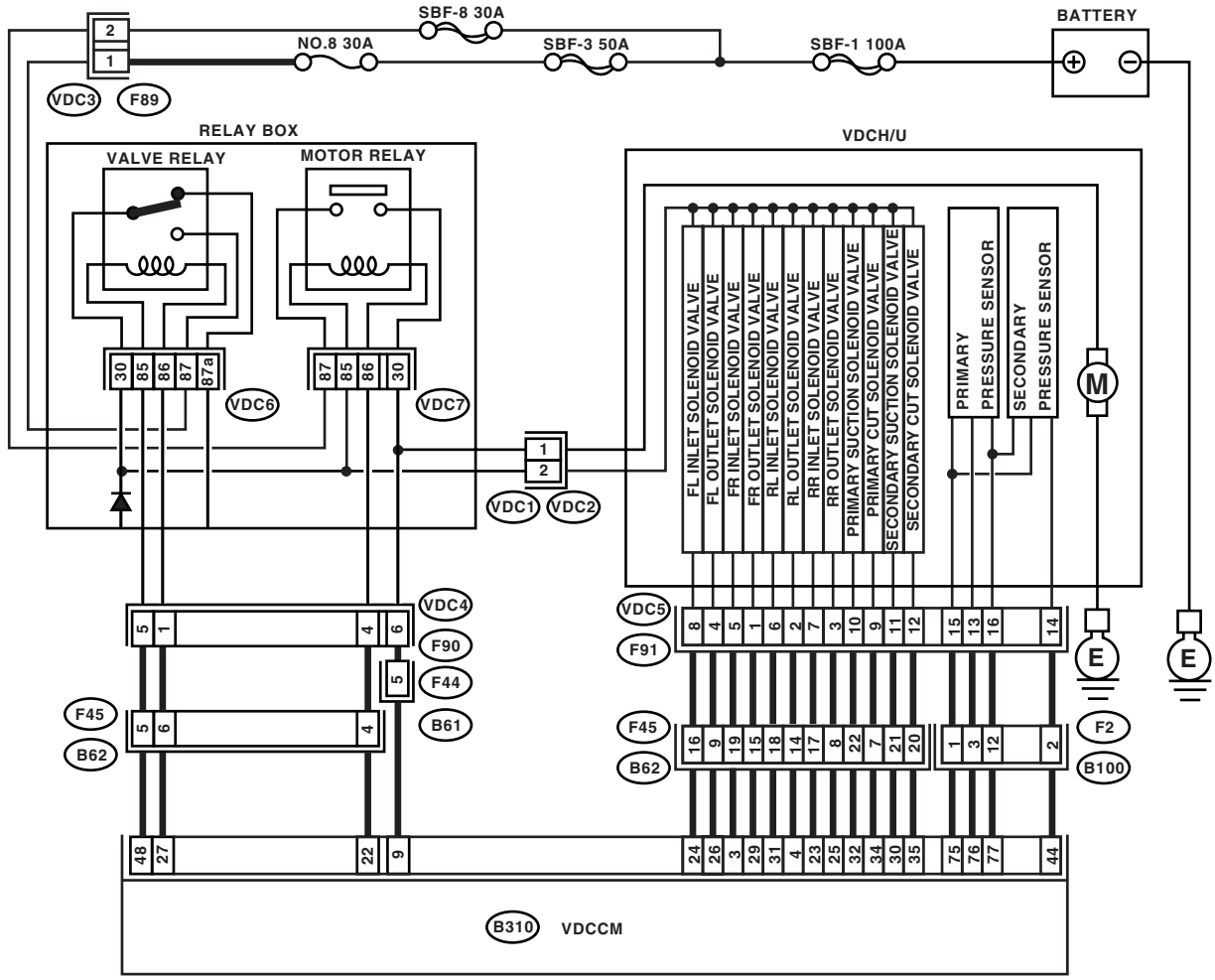
DTC DETECTING CONDITION:

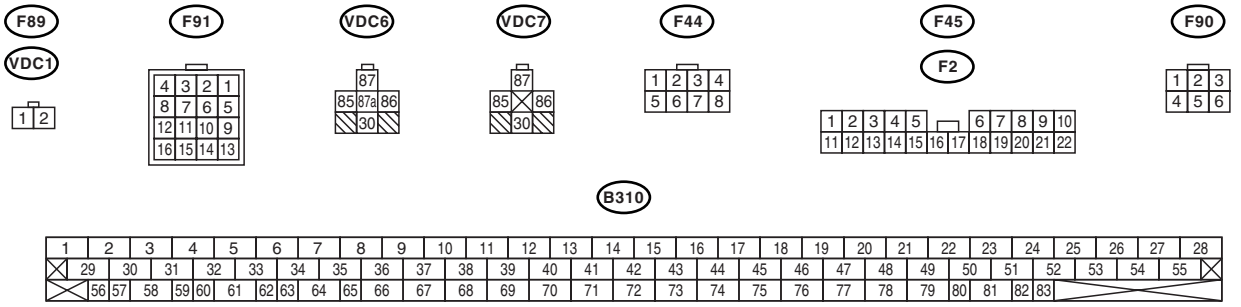
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00268

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the motor relay from relay box. 3) Measure the resistance between motor relay terminals. ***Terminal*** ***No. 85 — No. 86***	Is the resistance 70 — 90 Ω?	Go to step **2.**	Replace the motor relay.
2	**CHECK CONTACT OF MOTOR RELAY.** 1) Connect the battery to motor relay terminals No. 85 and No. 86. 2) Measure the resistance between motor relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance less than 0.5 Ω?	Go to step **3.**	Replace the motor relay.
3	**CHECK SHORT CIRCUIT OF MOTOR RELAY.** Measure the resistance between motor relay terminals. ***Terminal*** ***No. 85 — No. 30*** ***No. 85 — No. 87***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the motor relay.
4	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect the connector (F89) from relay box. 2) Disconnect the connector from VDCCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(F89) No. 2 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **5.**	Repair the harness connector between battery and relay box and check fuse SBF-holder.
5	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Connect the connector (F89) to relay box. 3) Turn the ignition switch to ON. 4) Measure the voltage between relay box and chassis ground. ***Connector & terminal*** ***Motor relay mounting point No. 87 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Replace the relay box.
6	**CHECK OPEN CIRCUIT ON CONTACT CIRCUIT OF RELAY BOX.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (VDC2, F90) from relay box. 3) Measure the resistance between relay box connector unit and motor relay mounting point. ***Connector & terminal*** ***(VDC1) No. 1 — Motor relay mounting point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **7.**	Replace the relay box.
7	**CHECK OPEN CIRCUIT ON MONITOR SYSTEM CIRCUIT OF RELAY BOX.** Measure the resistance between relay box connector and motor relay mounting point. ***Connector & terminal*** ***(VDC4) No. 6 — Motor relay mounting point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **8.**	Replace the relay box.

	Step	Check	Yes	No
8	**CHECK OPEN CIRCUIT ON CONTROL CIRCUIT OF RELAY BOX.** Measure the resistance between relay box connector and motor relay mounting point. ***Connector & terminal*** ***(VDC4) No. 4 — Motor relay mounting point No. 86:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Replace the relay box.
9	**CHECK OPEN CIRCUIT ON CONTROL CIRCUIT OF RELAY BOX.** 1) Remove the valve relay from relay box. 2) Measure the resistance between motor relay mounting point and valve relay mounting point. ***Connector & terminal*** ***Motor relay mounting point No. 86 — Valve relay mounting point No. 30:***	Is the resistance less than 0.5 Ω?	Go to step **10.**	Replace the relay box.
10	**CHECK GROUND SHORT CIRCUIT ON CIRCUIT OF RELAY BOX.** Measure the resistance between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 4 — Chassis ground:*** ***(VDC4) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Replace the relay box.
11	**CHECK BATTERY SHORT CIRCUIT ON CIRCUIT OF RELAY BOX.** Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **12.**	Replace the relay box.
12	**CHECK BATTERY SHORT CIRCUIT ON CIRCUIT OF RELAY BOX.** 1) Turn the ignition switch to ON. 2) Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(VDC4) No. 6 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **13.**	Replace the relay box.
13	**CHECK OPEN CIRCUIT ON RELAY CONTROL SYSTEM HARNESS.** Measure the resistance between VDCCM connector and relay box connector. ***Connector & terminal*** ***(B310) No. 22 — (F90) No. 4:*** ***(B310) No. 9 — (F90) No. 6:***	Is the resistance less than 0.5 Ω?	Go to step **14.**	Repair the harness connector between VDCCM and relay box.
14	**CHECK HARNESS BETWEEN RELAY BOX AND VDCCM.** Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 22 — Chassis ground:*** ***(B310) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **15.**	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
15	**CHECK BATTERY SHORT CIRCUIT BETWEEN RELAY BOX AND VDCCM.** Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **16.**	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.

	Step	Check	Yes	No
16	**CHECK BATTERY SHORT CIRCUIT BETWEEN RELAY BOX AND VDCCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **17.**	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
17	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step **18.**
18	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **19.**
19	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs. NOTE: ABS warning light remains on until the vehicle speed reaches approx. 12 km/h (7.46 MPH) though the memory is cleared. This is normal operation.

AK:DTC 52 MOTOR

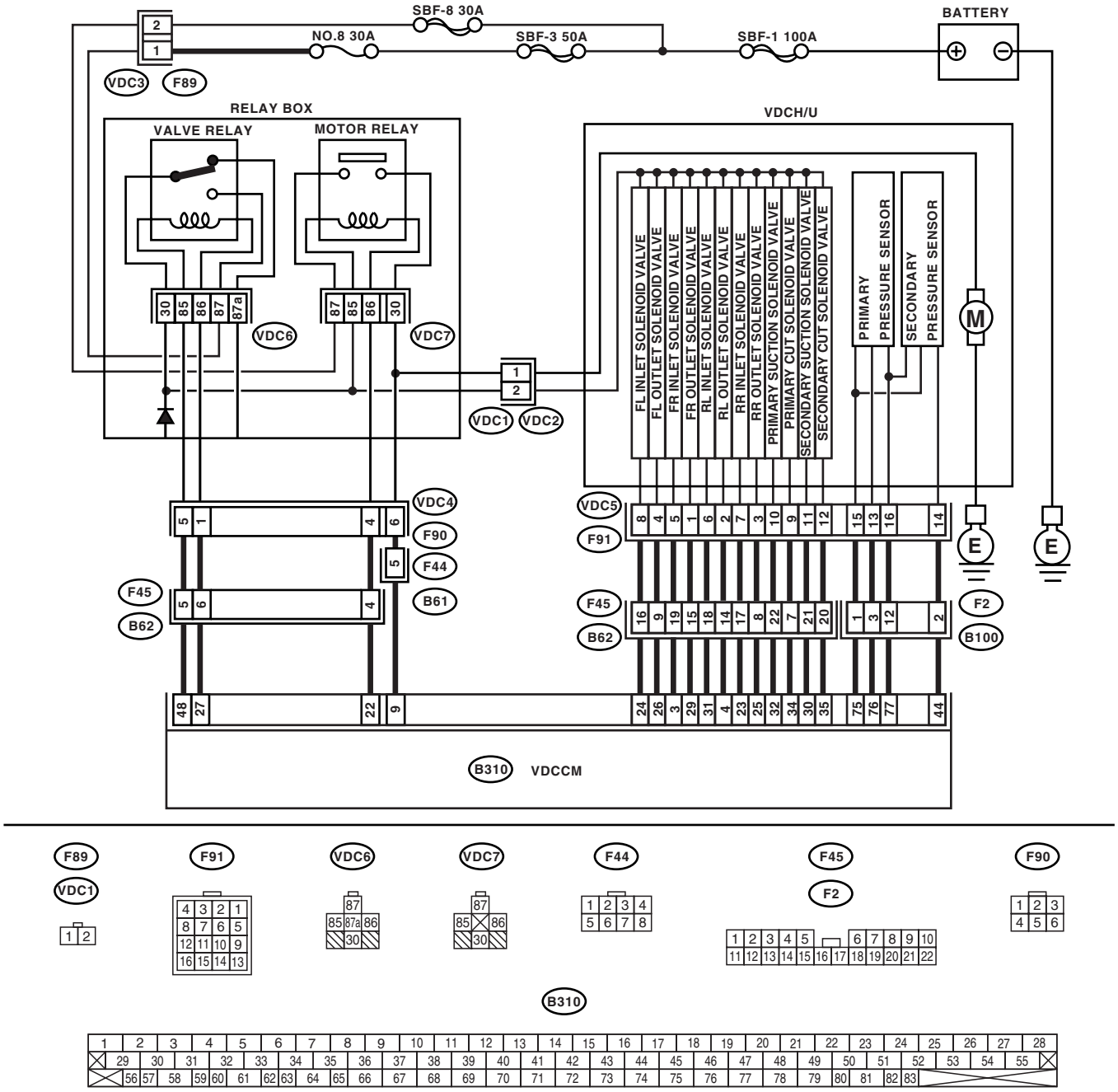
DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00268

	Step	Check	Yes	No
1	**CHECK CONTACT OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the motor relay from relay box. 3) Connect the battery to motor relay terminals No. 85 and No. 86. 4) Measure the resistance between motor relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance less than 0.5 Ω?	Go to step **2.**	Replace the motor relay.
2	**CHECK CONTACT OF MOTOR RELAY.** 1) Disconnect the battery from the motor relay terminals. 2) Measure the resistance between motor relay terminals. ***Terminal*** ***No. 30 — No. 87***	Is the resistance more than 1 MΩ?	Go to step **3.**	Replace the motor relay.
3	**CHECK INPUT VOLTAGE OF RELAY BOX.** 1) Disconnect the connector (F89) from relay box. 2) Disconnect the connector from VDCCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between relay box connector and chassis ground. ***Connector & terminal*** ***(B310) No. 2 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4.**	Repair the harness connector between battery and relay box and check fuse SBF-holder.
4	**CHECK INPUT VOLTAGE OF MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Connect the connector (F89) to relay box. 3) Turn the ignition switch to ON. 4) Measure the voltage between relay box and chassis ground. ***Connector & terminal*** ***Motor relay mounting point No. 87 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **5.**	Replace the relay box.
5	**CHECK MOTOR GROUND.**	Is the mounting bolt of motor ground terminal tightened with 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step **6.**	Tighten the clamp of motor ground terminal.
6	**CHECK VDCCM MOTOR DRIVE TERMINAL.** 1) Turn the ignition switch to OFF. 2) Remove the VDC connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 3) Connect all the connectors. 4) Install the motor relay. 5) Perform ABS sequence control check. **<Ref. to VDC-16, ABS Sequence Control.>** 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 22 (+) — No. 1 (–):***	When the ABS sequence control check is performed, does the voltage go down from 10 V — 13 V to less than 1.5 V, and later the voltage returns to 10 V — 13 V?	Go to step **7.**	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	**CHECK MOTOR OPERATION.** Perform ABS sequence control check. **<Ref. to VDC-19, VDC Sequence Control.>**	Can the motor revolution noise (buzz) be heard when carrying out the ABS sequence control?	Go to step **8.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
8	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step **9.**

	Step	Check	Yes	No
9	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **10.**
10	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs. NOTE: ABS warning light remains on until the vehicle speed reaches approx. 12 km/h (7.46 MPH) though the memory is cleared. This is normal operation.

AL:DTC 57 EGI COMMUNICATION

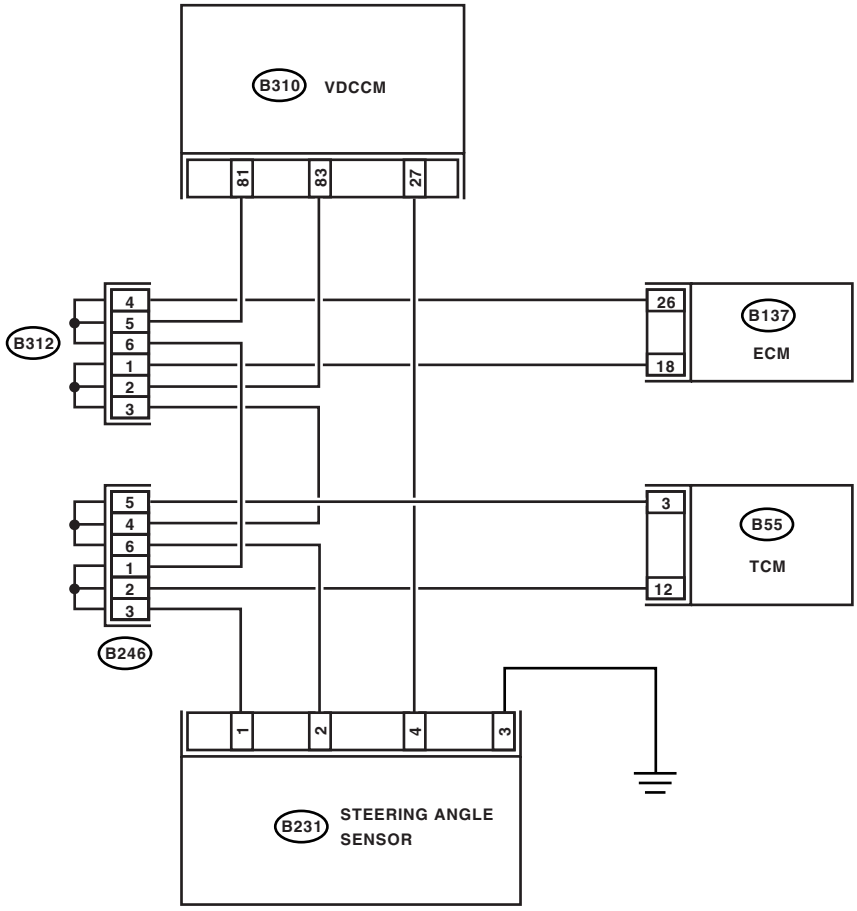
DTC DETECTING CONDITION:

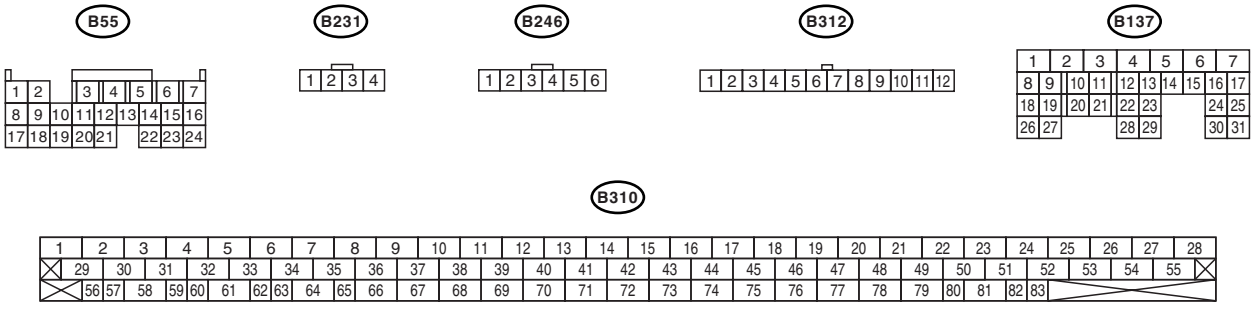
Communication malfunction between engine control module

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00315

	Step	Check	Yes	No
1	**CHECK RESISTANCE OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector terminals. ***Connector & terminal (B137) No. 18 — No. 26:***	Is the resistance 60±3 Ω?	Go to step **2.**	Repair the harness between ECM and VDCCM.
2	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in ECM connector?	Repair the connector.	Go to step **3.**
3	**CHECK ECM.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the ECM.	Go to step **4.**
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AM:DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG

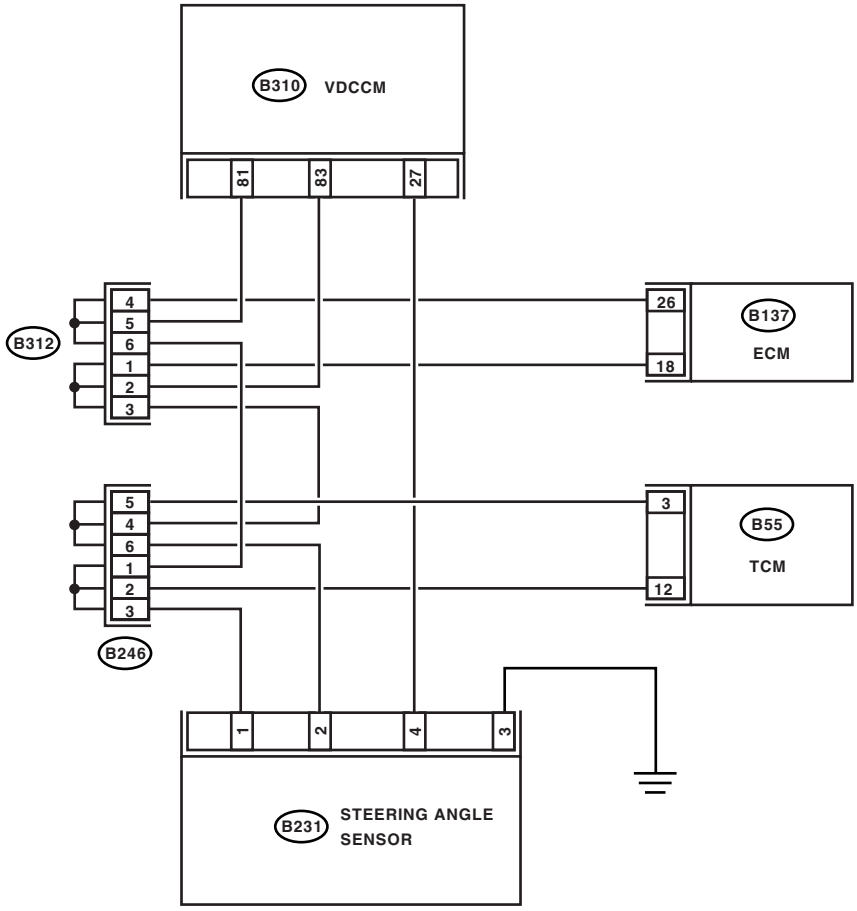
DTC DETECTING CONDITION:

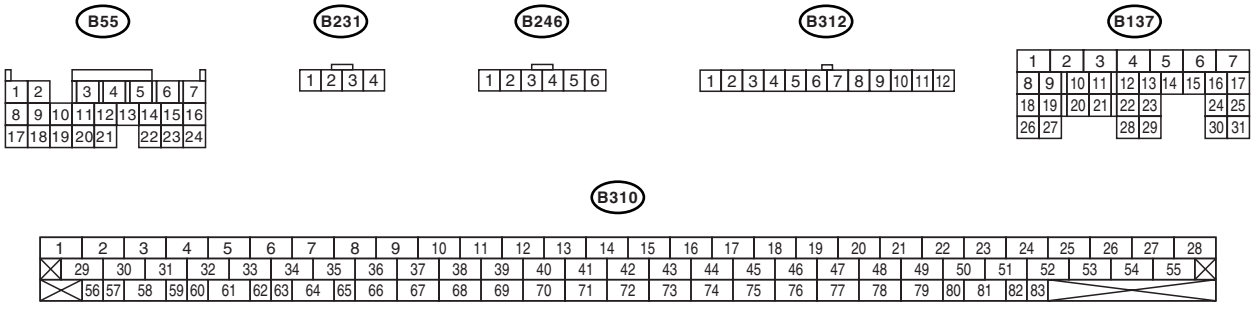
Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00315

	Step	Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in straighten position. 3) Check the steering wheel angle.	Is the deviation from the center of steering wheel less than 5°?	Go to step **2.**	Perform the centering adjustment of steering wheel.
2	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **3.**
3	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AN:DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG

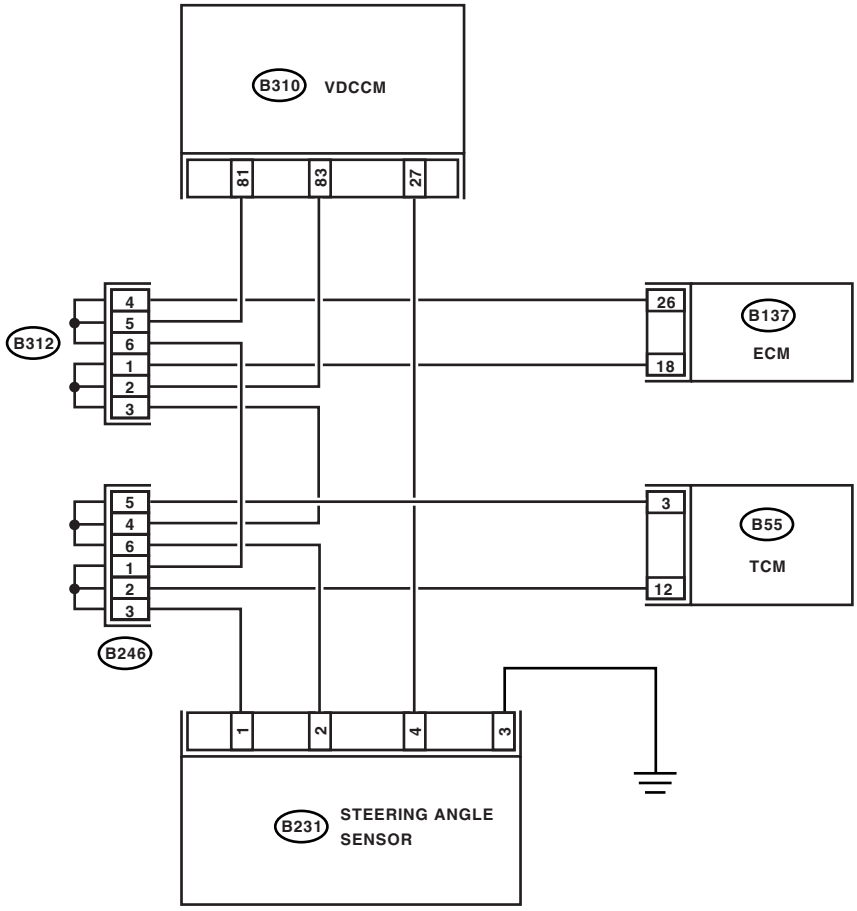
DTC DETECTING CONDITION:

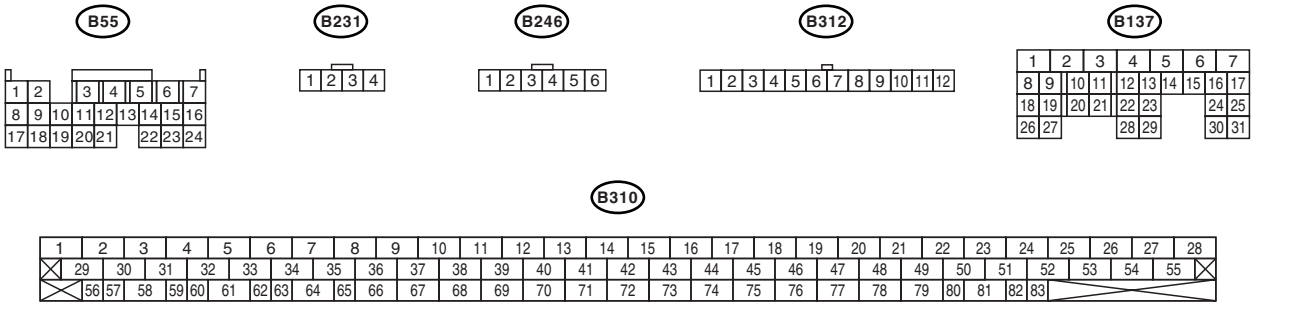
Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00315

	Step	Check	Yes	No
1	**CHECK THE VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC as current diagnostic still displayed?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **2.**
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AO:DTC 71 STEERING ANGLE SENSOR MALFUNCTION

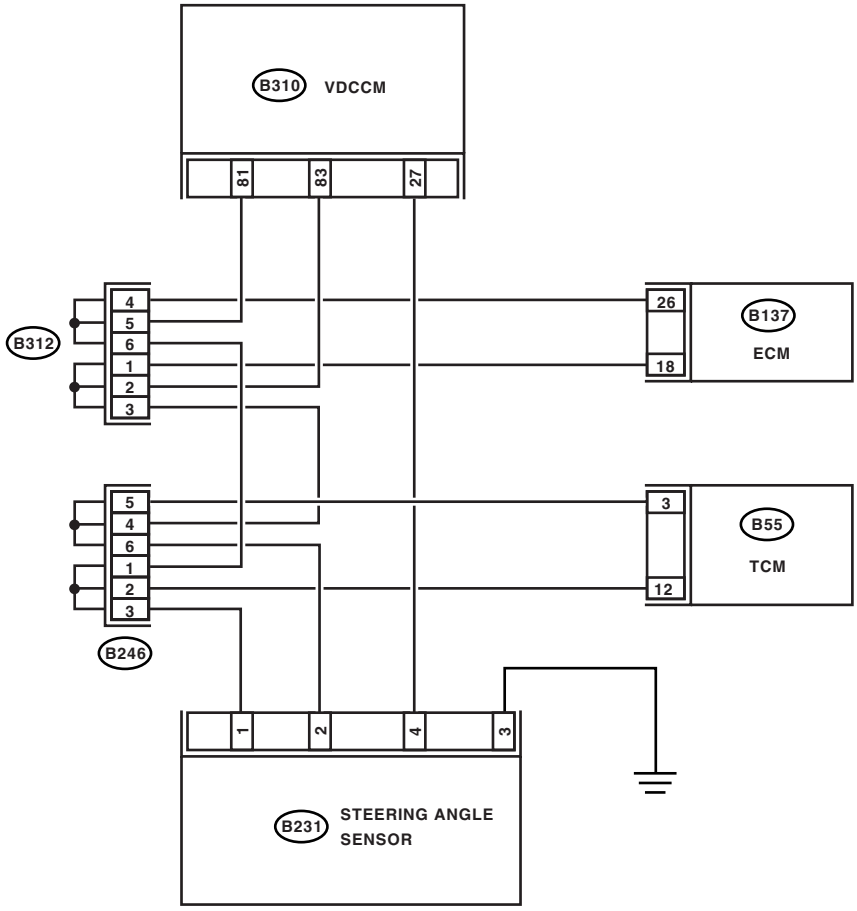
DTC DETECTING CONDITION:

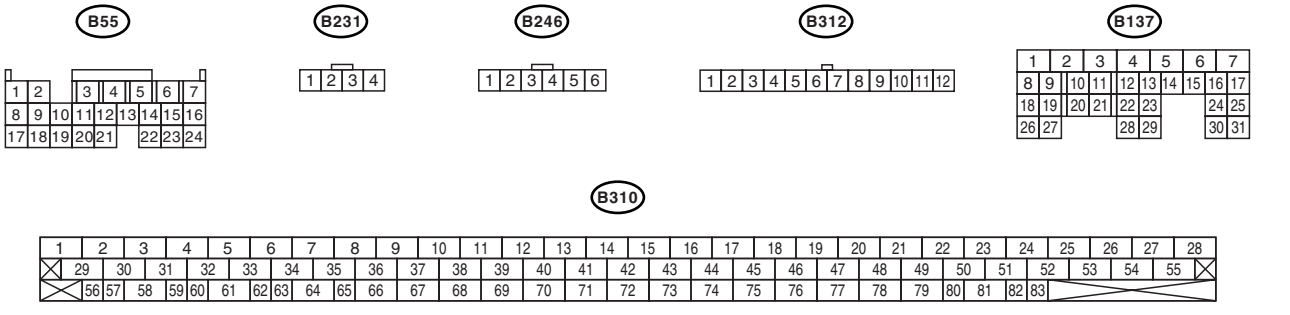
Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:





VDC00315

	Step	Check	Yes	No
1	**CHECK STEERING WHEEL.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in straighten position. 3) Check the steering wheel angle.	Is the angle from the center of steering wheel less than 5°?	Go to step **2.**	Perform the centering of steering wheel.
2	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the steering angle sensor output on Subaru Select Monitor.	Does the sensor output on monitor display change when the steering wheel turned to either direction?	Go to step **3.**	Replace the steering angle sensor.
3	**CHECK DIVING ROAD.** Interview the owner that the vehicle have driven bank or sand road.	Vehicle have driven bank or sand road?	VDCCM may records DTC when the vehicle drive on bank or sand road.	Go to step **4.**
4	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AP:DTC 71 NO SIGNAL FROM STEERING ANGLE SENSOR

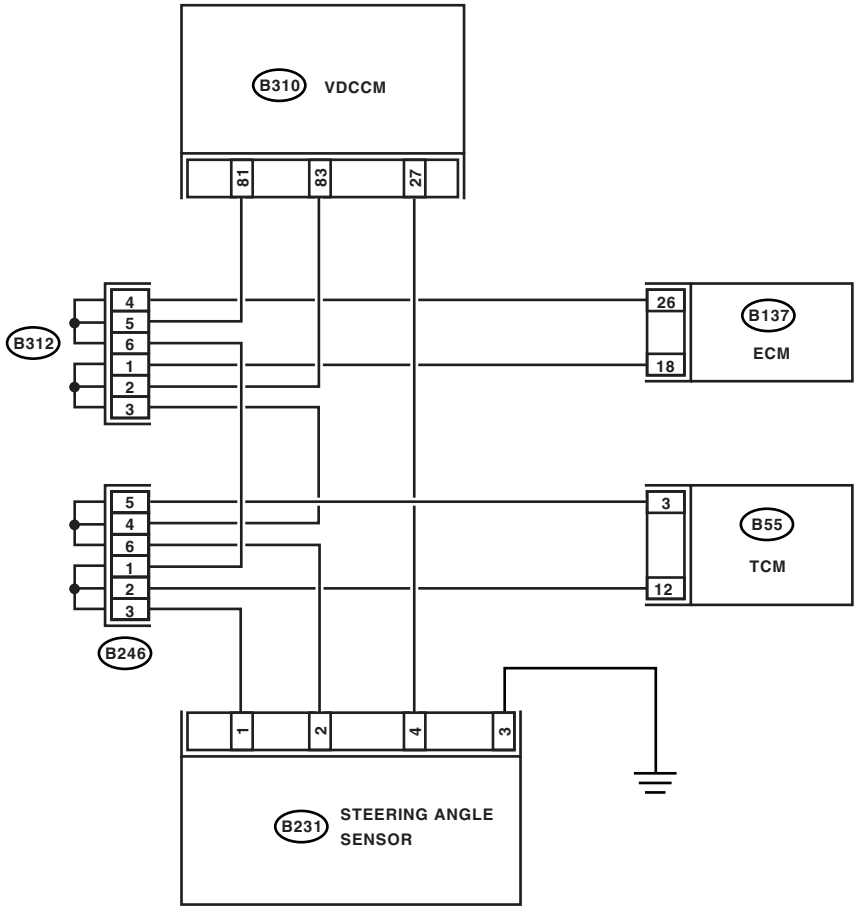
DTC DETECTING CONDITION:

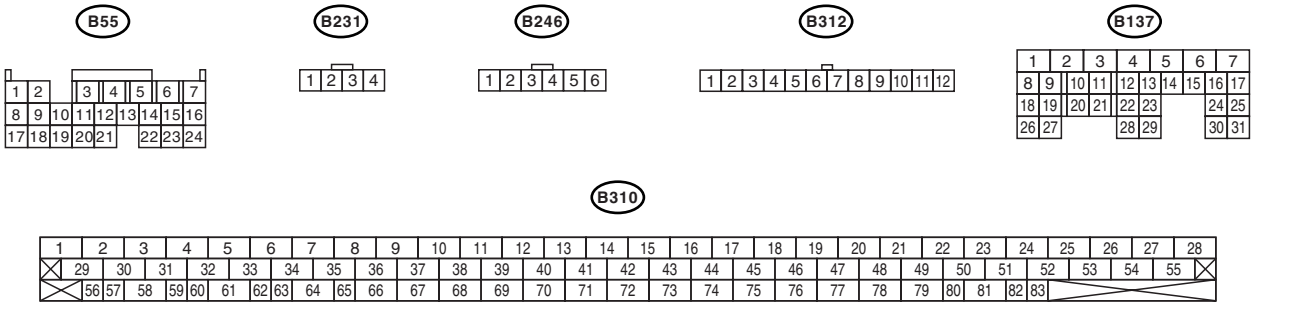
Defective steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:





VDC00315

	Step	Check	Yes	No
1	**CHECK STEERING ANGLE SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 4 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 27 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in yaw rate sensor connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK GROUND CIRCUTI OF STEERING ANGLE SENSOR.** Measure the resistance between steering angle sensor and chassis ground. ***Connector & terminal*** ***(B231) No. 3 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the steering angle sensor ground harness.
5	**CHECK STEERING ANGLE SENSOR HARNESS.** 1) Connect the connector to steering angle sensor. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 81 — No. 83:***	Is the resistance 120±6 Ω?	Repair the harness between steering angle sensor and VDCCM.	Go to step **6.**
6	**CHECK STEERING ANGLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Go to step **8.**	Go to step **7.**
7	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.
8	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **9.**

Step		Check	Yes	No
9	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Original steering sensor is faulty.

AQ:DTC 72 YAW RATE SENSOR OUTPUT

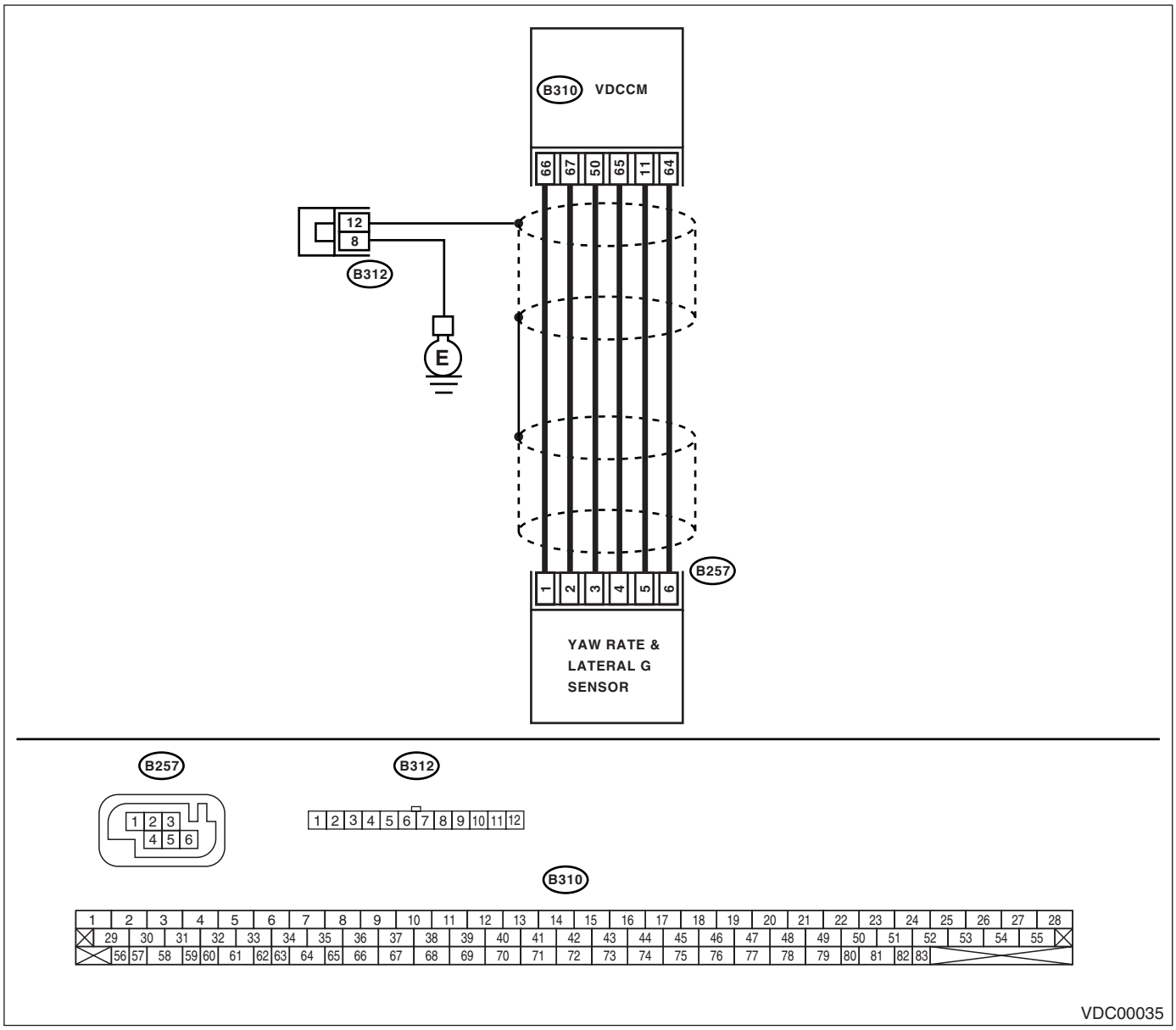
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DIVING ROAD.** Interview the owner that the vehicle have driven bank or sand road.	Vehicle have driven bank or sand road?	VDCCM may records DTC when the vehicle drive on bank or sand road.	Go to step **2.**
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.** Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step **3.**	Tighten the yaw rate & lateral G sensor securely.
3	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in straighten position. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the yaw rate & lateral G sensor output on Subaru Select Monitor display.	Is the output value 0±5.25 deg/s?	Go to step **4.**	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
4	**CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR.** 1) Drive the vehicle on a flat road. 2) Stop the vehicle in straighten position. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the steering angle sensor output on Subaru Select Monitor.	Is the output value 0±2.5 deg?	Go to step **5.**	Perform the centering adjustment of steering wheel.
5	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Go to step **7.**	Go to step **6.**
6	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.
7	**CHECK VDCCM.** 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Erase the memory. 4) Perform the inspection mode. 5) Read the DTC.	Is the same DTC displayed again?	Go to step **8.**	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
8	**CHECK INDICATION POINT OF DTC.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Original yaw rate & lateral G sensor is faulty.

AR:DTC 72 YAW RATE SENSOR POWER/OUTPUT

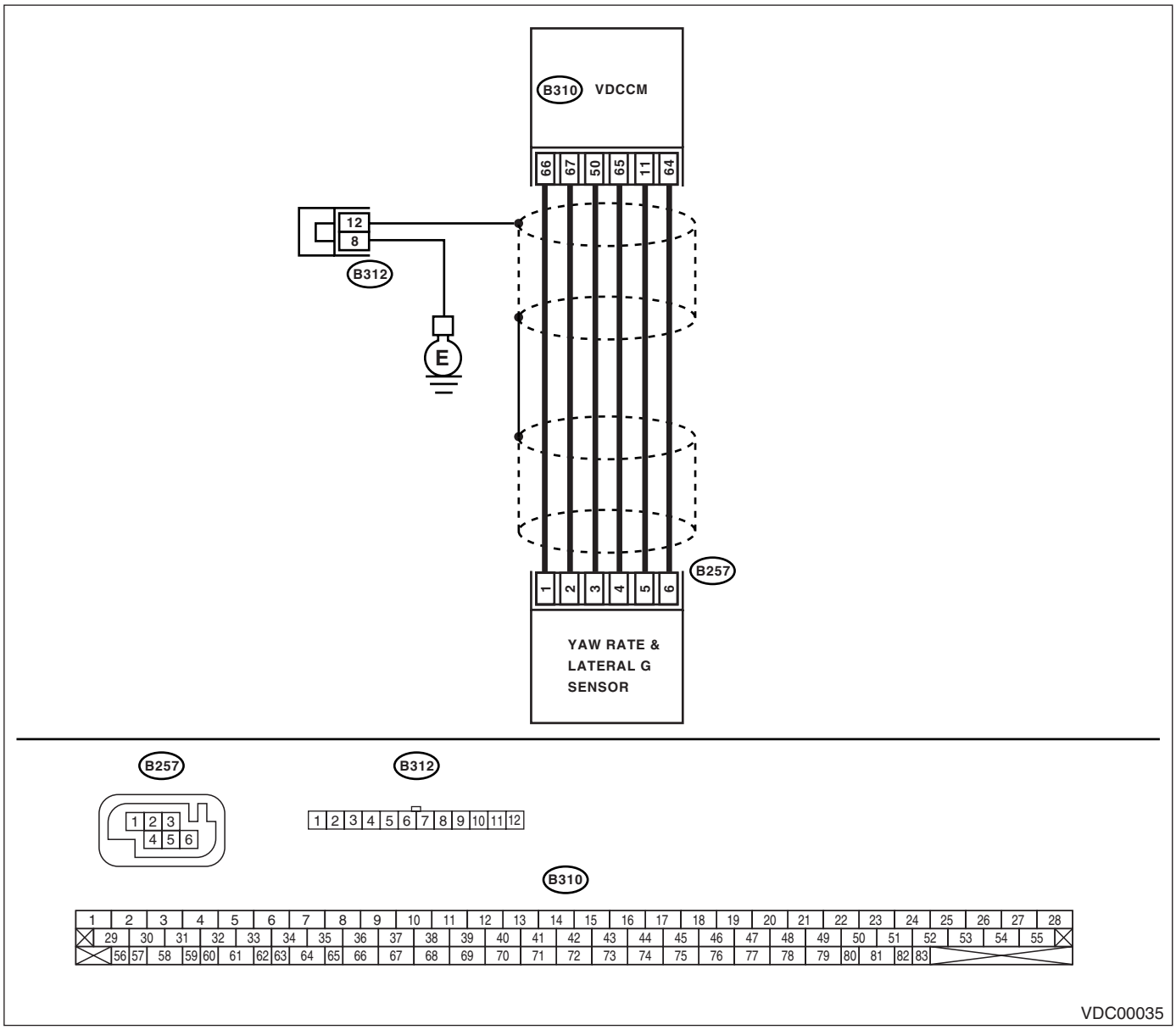
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B257) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in the yaw rate & lateral G sensor connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 65 — (B257) No. 4:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **7.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>	Repair the harness between yaw rate & lateral G sensor and VDCCM.

AS:DTC 72 YAW RATE SENSOR REFERENCE

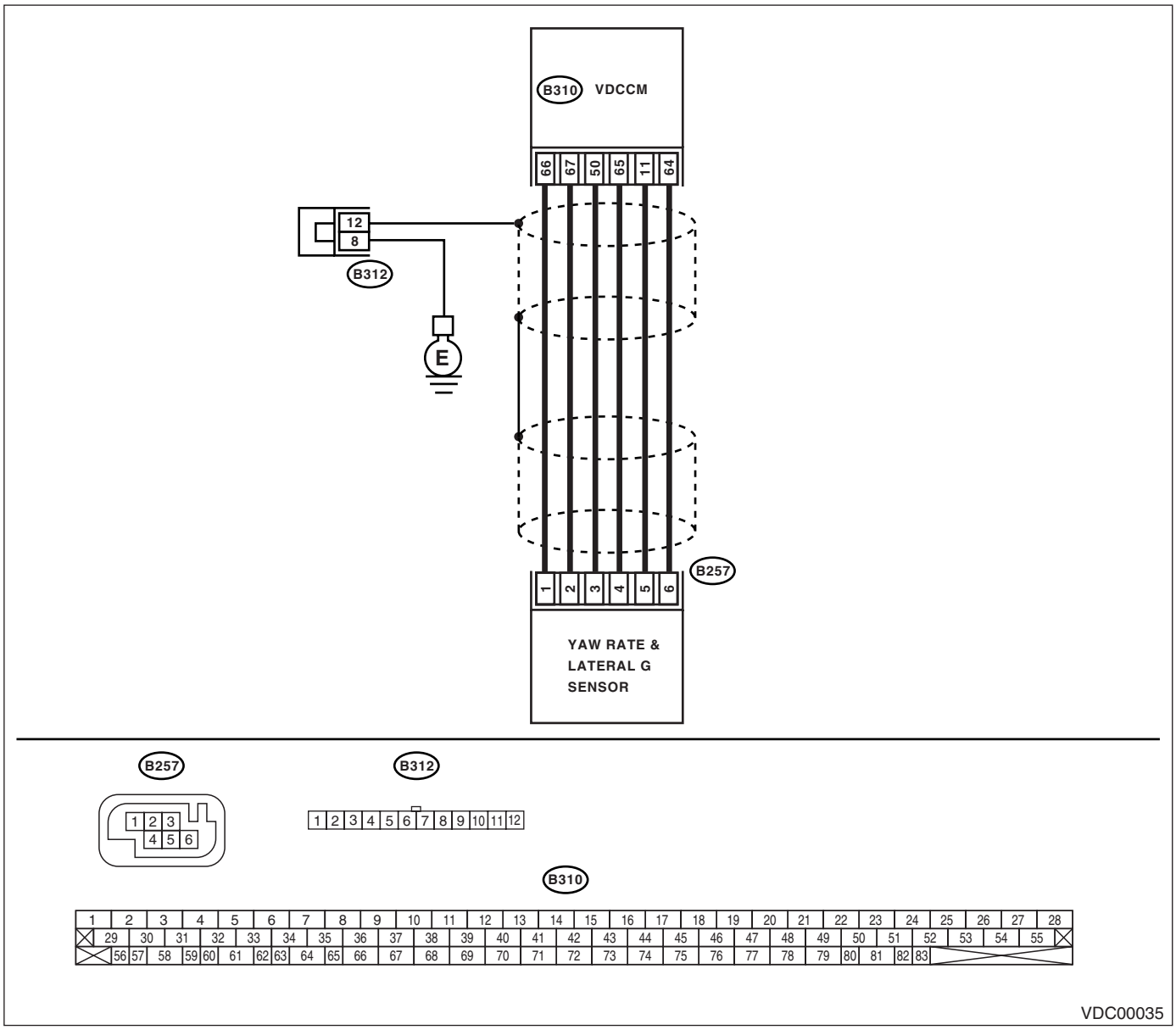
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B257) No. 3 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **4.**	Go to step **2.**
2	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (–):***	Is the voltage 10 — 15 V?	Go to step **3.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in the yaw rate & lateral G sensor connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connector from VDCCM. 2) Measure the resistance between VDCCM and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 66 — (B257) No. 1:***	Is the resistance less than 0.5 Ω?	Go to step **5.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
5	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 66 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
6	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 66 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **7.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
7	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 66 (+) — Chassis ground (–):***	Is the voltage less than 0.5 V?	Go to step **8.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.

	Step	Check	Yes	No
8	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Install the yaw rate & lateral G sensor to body. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, VDCCM Connector Cover.> 4) Connect all the connectors. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 66 (+) — No. 64 (−):***	Is the voltage 2.1 — 2.9 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

AT:DTC 72 EXCESSIVE VARIATION AMOUNT OF YAW RATE SENSOR OUTPUT

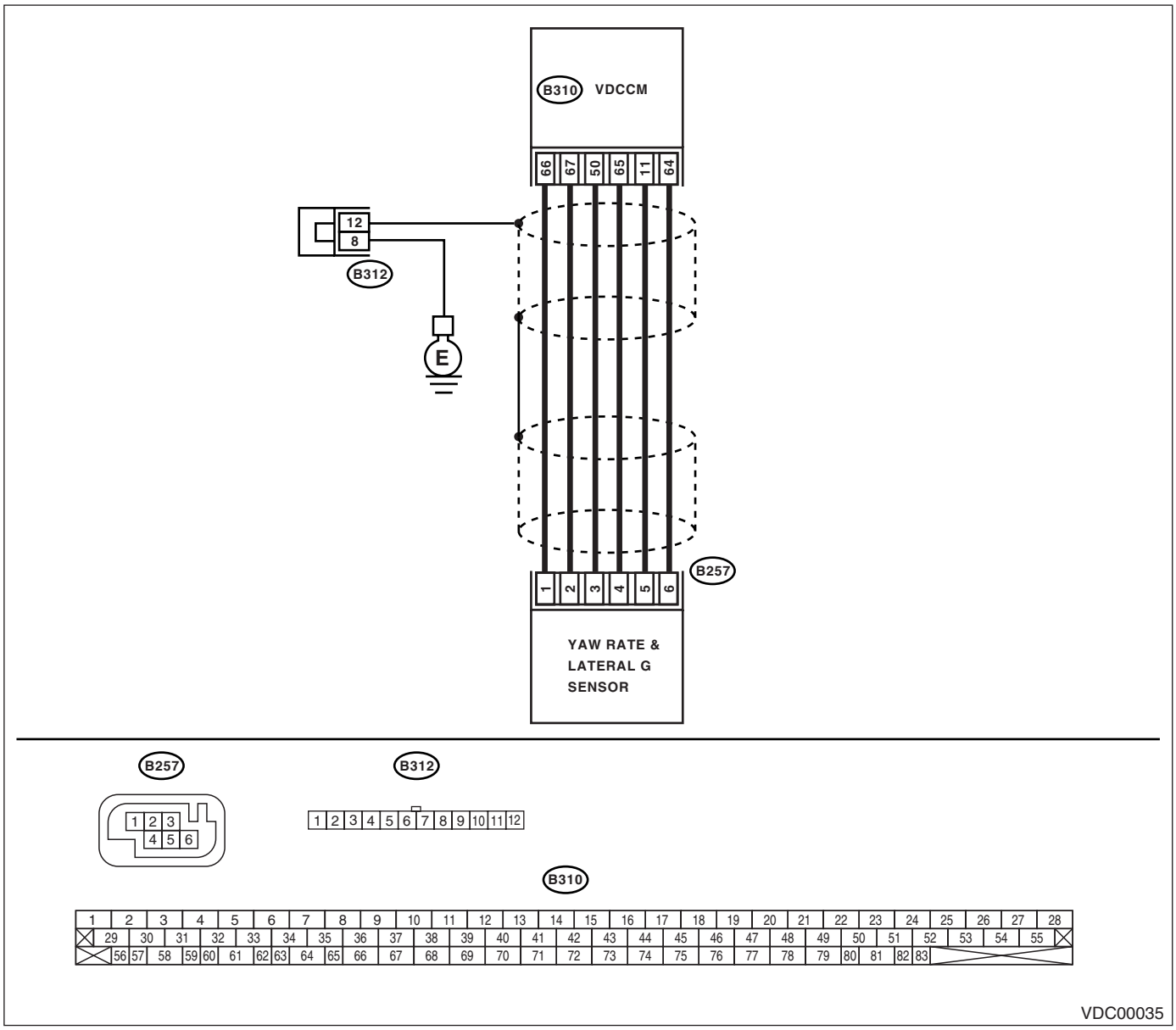
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DIVING ROAD.** Interview the owner that the vehicle have driven bank or sand road.	Vehicle have driven bank or sand road?	VDCCM may records DTC when the vehicle drive on bank or sand road.	Go to step **2.**
2	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.** Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step **3.**	Tighten the yaw rate & lateral G sensor securely.
3	**CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B257) No. 3 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Go to step **4.**
4	**CHECK VDCCM OUTPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 50 (+) — Chassis ground (−):***	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step **5.**
5	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in the yaw rate & lateral G sensor connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	**CHECK YAW RATE & LATERAL G SENSOR GROUND.** Measure the resistance between yaw rate & lateral G sensor and chassis ground. ***Connector & terminal*** ***(B257) No. 6 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **9.**	Go to step **7.**
7	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect the connector from VDCCM. 2) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, VDCCM Connector Cover.> 3) Connect the connector to VDCCM. 4) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 64 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step **8.**
8	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in VDCCM connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
9	**CHECK YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connector from VDCCM. 2) Measure the resistance between VDCCM and yaw rate & lateral G sensor. ***Connector & terminal*** ***(B310) No. 65 — (B257) No. 4:*** ***(B310) No. 66 — (B257) No. 1:*** ***(B310) No. 67 — (B257) No. 2:***	Is the resistance less than 0.5 Ω?	Go to step **10.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
10	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 — Chassis ground:*** ***(B310) No. 66 — Chassis ground:*** ***(B310) No. 67 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
11	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (−):*** ***(B310) No. 66 (+) — Chassis ground (−):*** ***(B310) No. 67 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **12.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
12	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 65 (+) — Chassis ground (−):*** ***(B310) No. 66 (+) — Chassis ground (−):*** ***(B310) No. 67 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **13.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.
13	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Install the yaw rate & lateral G sensor to body. 3) Connect all the connectors. 4) Turn the ignition switch to ON. 5) Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B310) No. 66 (+) — No. 64 (−):***	Is the voltage 2.1 — 2.9 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>

AU:DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG

NOTE:
Refer to DTC 73 for diagnostic procedure. <Ref. to VDC(diag)-130, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC 73 LATERAL G SENSOR OUTPUT

NOTE:
Refer to DTC 73 for diagnostic procedure. <Ref. to VDC(diag)-130, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AW:DTC 73 EXCESSIVE VARIATION AMOUNT OF LATERAL G SENSOR OUTPUT

NOTE:
Refer to DTC 73 for diagnostic procedure. <Ref. to VDC(diag)-130, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AX:DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL

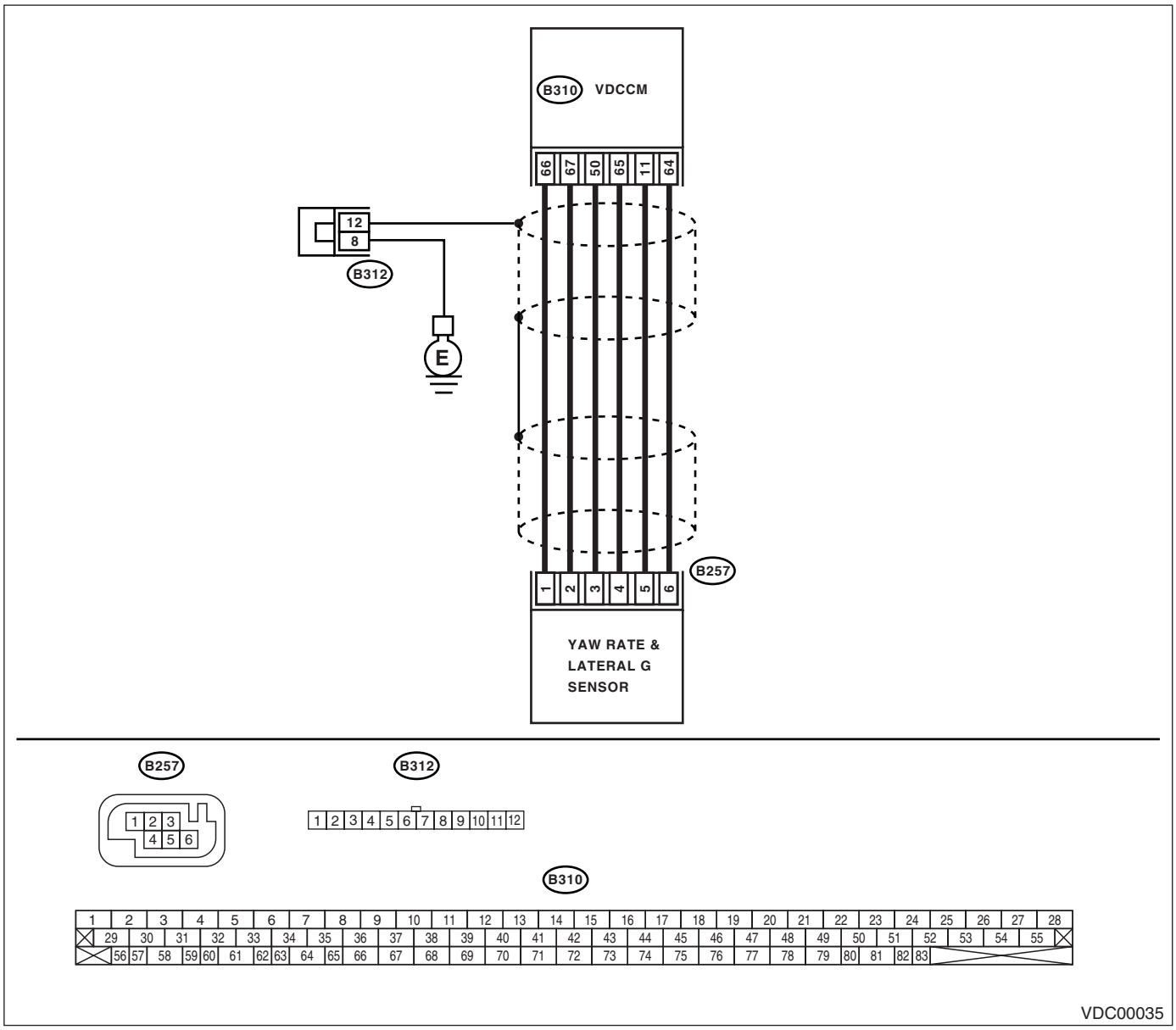
DTC DETECTING CONDITION:

Lateral G sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK YAW RATE & LATERAL G SENSOR INSTALLATION.** Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step **2.**	Tighten the yaw rate & lateral G sensor securely.
2	**CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Park the vehicle on a flat road. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the yaw rate & lateral G sensor output on Subaru Select Monitor display.	Is the output value 2.5±0.2 V?	Go to step **3.**	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
3	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step **4.**
4	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **5.**
5	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AY:DTC 73 VOLTAGE INPUT TO LATERAL G SENSOR EXCEEDS SPECIFICATION

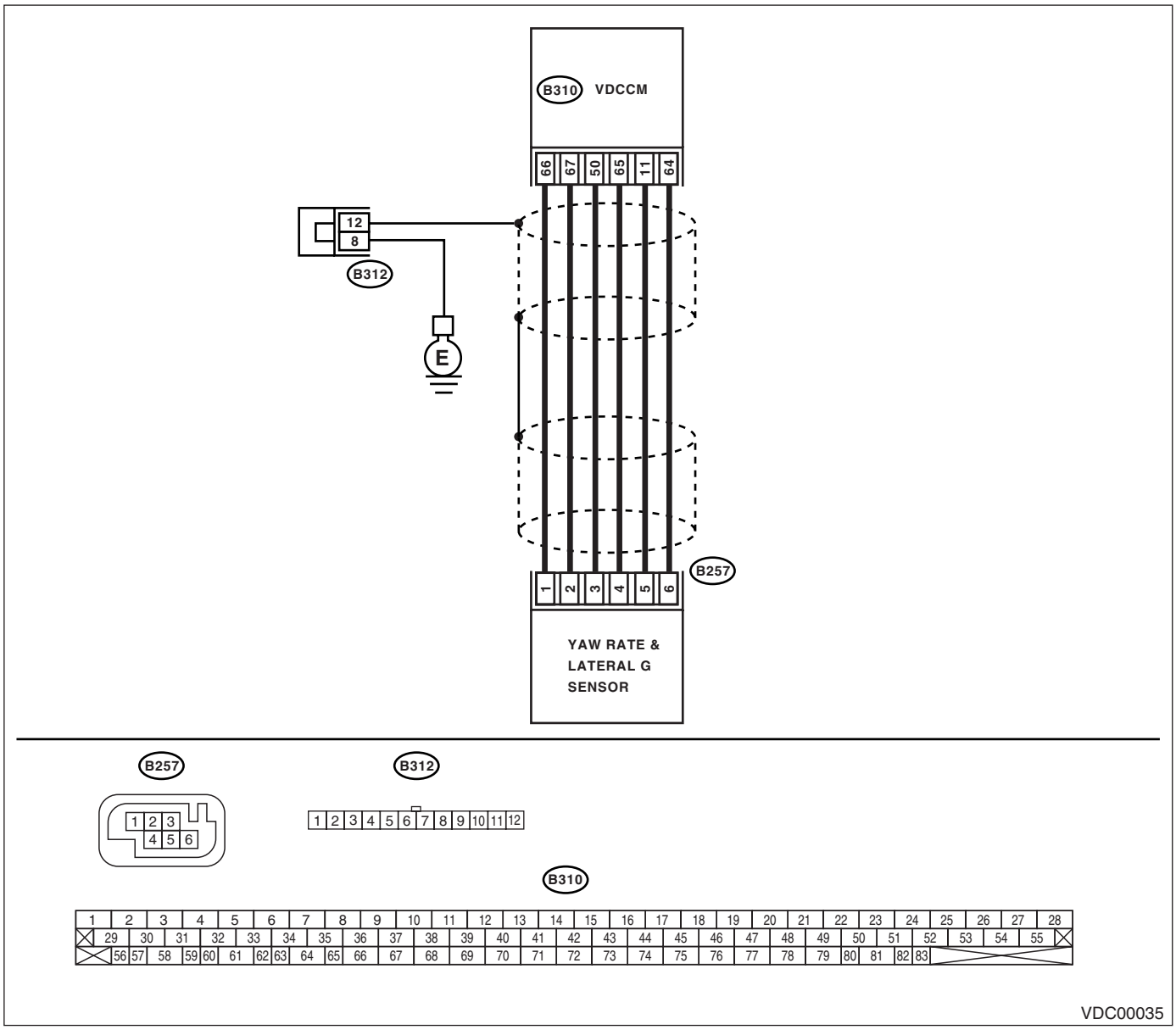
DTC DETECTING CONDITION:

Lateral G sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR.** 1) Park the vehicle on a flat road. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the yaw rate & lateral G sensor output on Subaru Select Monitor display.	Is the output value 2.5±0.2 V?	Go to step **2.**	Go to step **5.**
2	**CHECK POOR CONTACT IN CONNECTOR.** Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step **3.**
3	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4.**
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.
5	**CHECK YAW RATE & LATERAL G SENSOR INPUT VOLTAGE.** 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from yaw rate & lateral G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 3 (+) — No. 6 (−):***	Is the voltage 10 — 15 V?	Go to step **6.**	Repair the harness or connector between yaw rate & lateral G sensor and VDCCM.
6	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between yaw rate & lateral G sensor connector terminals. ***Terminal*** ***No. 3 — No. 5***	Is the resistance 4.3 — 4.9 kΩ?	Go to step **7.**	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
7	**CHECK OPEN CIRCUIT FOR OUTPUT HARNESS AND GROUND HARNESS OF YAW RATE & LATERAL G SENSOR.** 1) Connect the connector to the yaw rate & lateral G sensor. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 11 — No. 64:***	Is the resistance 4.3 — 4.9 kΩ?	Go to step **8.**	Repair the harness connector between yaw rate & lateral G sensor and VDCCM.
8	**CHECK GROUND SHORT CIRCUIT OF YAW RATE & LATERAL G SENSOR HARNESS.** 1) Disconnect the connector from yaw rate & lateral G sensor. 2) Measure the resistance between VDCCM connector and chassis ground. ***Connector & terminal*** ***(B310) No. 63 — Chassis ground:*** ***(B310) No. 11 — Chassis ground:*** ***(B310) No. 64 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the harness between yaw rate & lateral G sensor and VDCCM.

	Step	Check	Yes	No
9	**CHECK YAW RATE & LATERAL G SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & lateral G sensor from vehicle. 3) Connect the connector to the yaw rate & lateral G sensor. 4) Connect the connector to VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 5 (+) — No. 6 (−):***	Is the voltage 2.3 — 2.7 V when yaw rate & lateral G sensor is on level?	Go to step **10.**	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
10	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 5 (+) — No. 6 (−):***	Is the voltage 3.3 — 3.7 V when yaw rate & lateral G sensor is inclined 90° to the left?	Go to step **11.**	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
11	**CHECK YAW RATE & LATERAL G SENSOR.** Measure the voltage between yaw rate & lateral G sensor connector terminals. ***Connector & terminal*** ***(B257) No. 5 (+) — No. 6 (−):***	Is the voltage 1.3 — 1.7 V when yaw rate & lateral G sensor is inclined 90° to the right?	Go to step **12.**	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate and Lateral G Sensor.>
12	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step **13.**
13	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **14.**
14	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

AZ:DTC 74 PRIMARY PRESSURE SENSOR POWER/OUTPUT

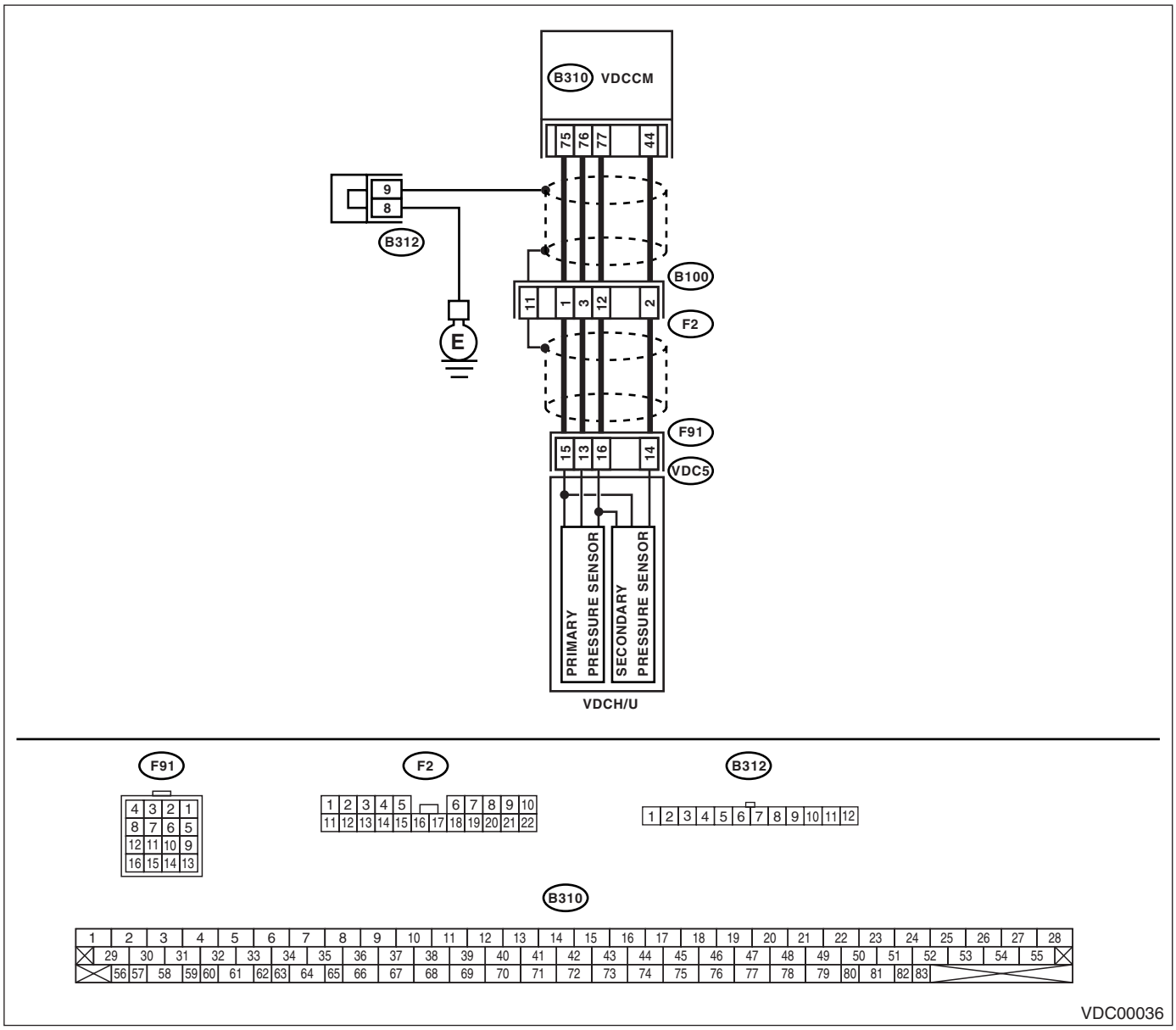
DTC DETECTING CONDITION:

Primary pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (F91) from VDCH/U. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect the connector from VDCCM. 2) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, VDCCM Connector Cover.> 3) Connect the connector to VDCCM. 4) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 75 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Replace the harness between VDCCM and VDCH/U.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in VDCCM connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY FOR PRESSURE SENSOR.** NOTE: When performing this inspection, DTC 51 VALVE RELAY MALFUNCTION is saved; however, this does not mean the malfunction of valve relay operation. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **7.**	Go to step **5.**
5	**CHECK VDCCM POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 77 (+) — No. 75 (–):***	Is the voltage 4.75 — 5.25 V?	Repair the harness between VDCCM and VDCH/U.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in VDCCM connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
7	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between VDCCM and VDCH/U.
8	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **9.**	Repair the harness between VDCCM and VDCH/U.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **10.**	Repair the harness between VDCCM and VDCH/U.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Connect all the connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 76 (+) — No. 75 (−):***	Is the voltage 0.48 — 0.72 V?	Go to step **11.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
11	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

BA:DTC 74 SECONDARY PRESSURE SENSOR POWER/OUTPUT

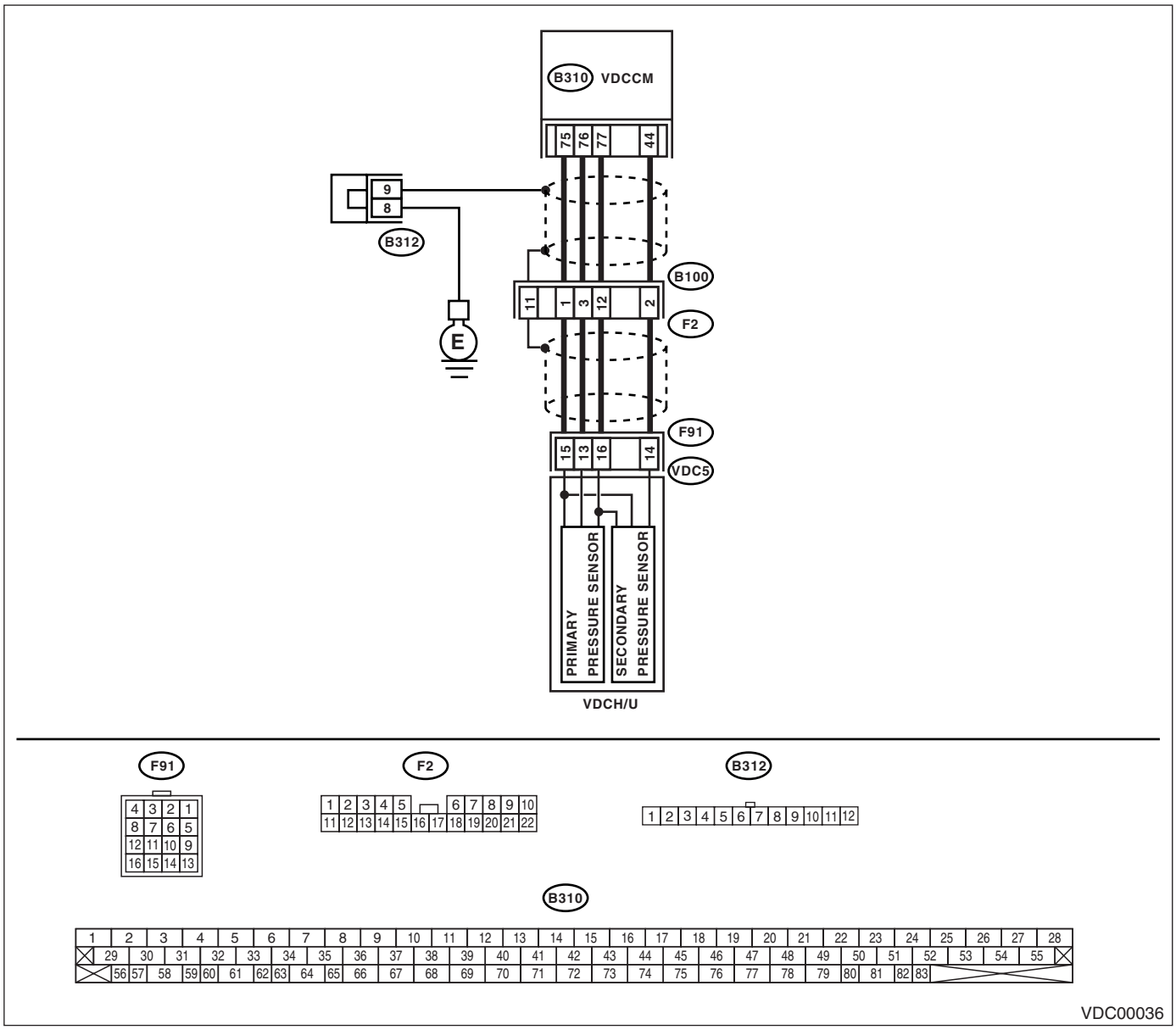
DTC DETECTING CONDITION:

Secondary pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND CIRCUIT OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector (F91) from VDCH/U. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 15 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Go to step **4.**	Go to step **2.**
2	**CHECK GROUND CIRCUIT OF VDCCM.** 1) Disconnect the connector from VDCCM. 2) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 3) Connect the connector to VDCCM. 4) Measure the resistance between VDCCM and chassis ground. ***Connector & terminal*** ***(B310) No. 75 — Chassis ground:***	Is the resistance less than 0.5 Ω?	Replace the harness between VDCCM and VDCH/U.	Go to step **3.**
3	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in VDCCM connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	**CHECK POWER SUPPLY FOR PRESSURE SENSOR.** NOTE: When performing this inspection, DTC 51 VALVE RELAY MALFUNCTION is saved; however, this does not mean the malfunction of valve relay operation. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector terminals. ***Connector & terminal*** ***(F91) No. 16 (+) — No. 15 (–):***	Is the voltage 4.75 — 5.25 V?	Go to step **7.**	Go to step **5.**
5	**CHECK VDCCM POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 77 (+) — No. 75 (–):***	Is the voltage 4.75 — 5.25 V?	Repair the harness between VDCCM and VDCH/U.	Go to step **6.**
6	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in VDCCM connector?	Correct or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

	Step	Check	Yes	No
7	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the harness between VDCCM and VDCH/U.
8	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 14 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **9.**	Repair the harness between VDCCM and VDCH/U.
9	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (−):*** ***(F91) No. 14 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **10.**	Repair the harness between VDCCM and VDCH/U.
10	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Connect all the connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 44 (+) — No. 75 (−):***	Is the voltage 0.48 — 0.72 V?	Go to step **11.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
11	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step **12.**
12	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **13.**
13	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

BB:DTC 74 PRIMARY PRESSURE SENSOR OFFSET IS TOO BIG

NOTE:
Refer to DTC 74 for diagnostic procedure. <Ref. to VDC(diag)-142, DTC 74 SECONDARY PRESSURE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC 74 SECONDARY PRESSURE SENSOR OFFSET IS TOO BIG

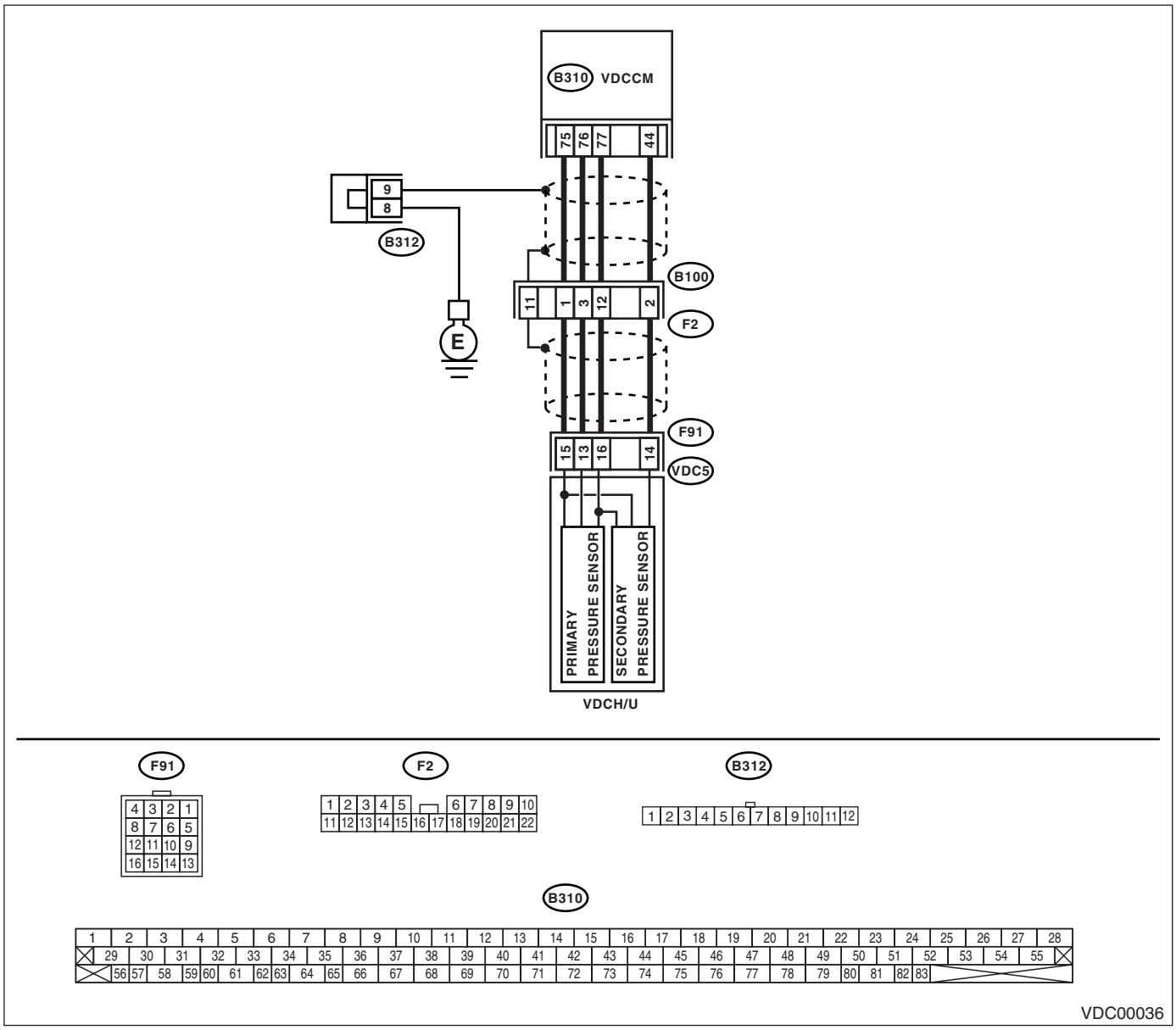
DTC DETECTING CONDITION:

Pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVING OF OWNER.** Interview the driving style to owner.	Are the acceleration pedal and brake pedal depressed simultaneously during driving?	VDC is normal, clear the DTC. NOTE: DTC record may be conducted as a result of driving the vehicle with depressing the both of accelerator pedal and brake pedal.	Go to step **2.**
2	**CHECK OUTPUT OF PRESSURE SENSOR USING SUBARU SELECT MONITOR.** 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the pressure sensor output on Subaru Select Monitor.	Is the reading indicated on monitor display 0.6±0.12 V when releasing the brake pedal?	Go to step **3.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
3	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **4.**
4	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

BD:DTC 74 PRESSURE SENSOR DIFFERENTIAL PRESSURE TOO LARGE

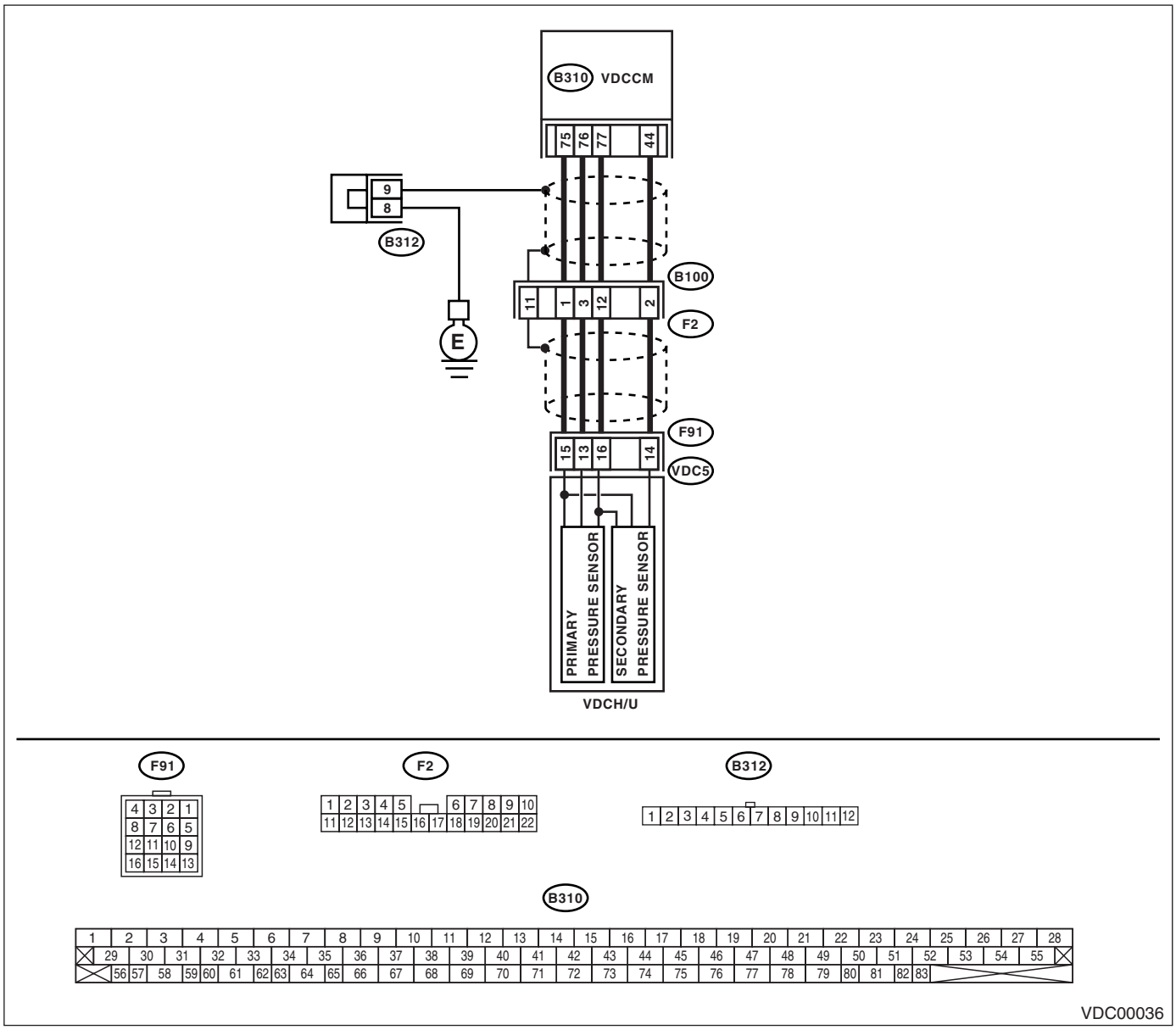
DTC DETECTING CONDITION:

Pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK GROUND SHORT CIRCUIT OF HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Disconnect the connector (F91) from VDCH/U. 4) Measure the resistance between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 — Chassis ground:*** ***(F91) No. 14 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the harness between VDCCM and VDCH/U.
2	**CHECK BATTERY SHORT OF HARNESS.** Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (−):*** ***(F91) No. 14 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **3.**	Repair the harness between VDCCM and VDCH/U.
3	**CHECK BATTERY SHORT OF HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. ***Connector & terminal*** ***(F91) No. 13 (+) — Chassis ground (−):*** ***(F91) No. 14 (+) — Chassis ground (−):***	Is the voltage less than 0.5 V?	Go to step **4.**	Repair the harness between VDCCM and VDCH/U.
4	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-17, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to VDCCM. 5) Connect all the connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 76 (+) — No. 75 (−):*** ***(B310) No. 44 (+) — No. 75 (−):***	Is the voltage 0.48 — 0.72 V?	Go to step **5.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>
5	**CHECK FOR BRAKE FLUID LEAKS.** Check fluid leaks between brake master cylinder and VDCH/U.	Does brake fluid leak?	Retighten or replace.	Go to step **6.**
6	**CHECK BRAKE MASTER CYLINDER.** Check the oil pressure of brake master cylinder. <Ref. to BR-39, OPERATION CHECK (WITH GAUGES), INSPECTION, Brake Booster.>	Is oil pressure normal?	Go to step **7.**	Replace the master cylinder.
7	**CHECK BRAKE PEDAL STROKE** Measure the brake pedal stroke in the force of 50 kg (110 lb).	Is the stroke less than 105 mm (4.13 in)?	Go to step **8.**	Bleed air from brake system.
8	**CHECK INPUT VOLTAGE OF PRESSURE SENSOR.** 1) Depress brake pedal pad with a force of 50 kg (110 lb). 2) Measure the voltage between VDCCM connector terminals. ***Connector & terminal*** ***(B310) No. 76 (+) — No. 75 (−):*** ***(B310) No. 44 (+) — No. 75 (−):***	Is the voltage less than 0.2 V?	Go to step **9.**	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Unit (VDCH/U).>

	Step	Check	Yes	No
9	**CHECK POOR CONTACT IN CONNECTOR.**	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step **10.**
10	**CHECK VDCCM.** 1) Connect all the connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step **11.**
11	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Proceed with the diagnostic corresponding to the DTC.	Temporary poor contact occurs.

14.General Diagnostic Table

A: INSPECTION

Symptom		Main probable cause	Other probable cause
Poor brake performance	Long braking/ stopping distance	VDCH/U VDCCM Brake pads Air in brake line Tire specifications, tire wear and air pressures Incorrect wiring or piping	ABS wheel speed sensor or clearance of sensor malfunction Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Master cylinder Brake caliper Disc rotor Brake pipe Brake booster
	Wheels will lock-up.	VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Incorrect wiring or piping	Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Brake caliper Brake pipe
	Brake drag	VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Master cylinder Brake caliper Parking brake Axle & wheels Brake pedal play	Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Brake pads Brake pipe
	Excessive brake pedal stroke	Air in brake line Brake pedal play	VDCH/U Master cylinder Brake caliper Brake pads Brake pipe Brake booster
	Vehicle pitching	VDCH/U VDCCM Uneven road Suspension play or fatigue (poor damping) Incorrect wiring or piping	ABS wheel speed sensor or clearance of sensor malfunction Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction
Poor brake performance	Unbalance braking or unbalanced brake effect	VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Brake caliper Brake pads Uneven road Tire specifications, tire wear and air pressures Incorrect wiring or piping	ABS wheel speed sensor or clearance of sensor malfunction Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Master cylinder Disc rotor Brake pipe Axle & wheels Coronal road/ road with bank Suspension play or fatigue (poor damping)

General Diagnostic Table

Symptom		Main probable cause	Other probable cause
Vibration and/or noise • When braking suddenly • When accelerating suddenly • While driving on slippery roads	Excessive brake pedal vibration	Uneven road Incorrect wiring or piping	VDCH/U Brake booster Suspension play or fatigue (poor damping)
	Noise from VDCH/U	VDCH/U (mount bushing) ABS wheel speed sensor or clearance of sensor malfunction Brake pipe	VDCCM Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction
	Noise from the front side of vehicle	VDCH/U (mount bushing) ABS wheel speed sensor or clearance of sensor malfunction Master cylinder Brake caliper Brake pads Disc rotor Brake pipe Brake booster Suspension play or fatigue (poor damping)	Axle & wheels Tire specifications, tire wear and air pressures
	Noise in compartment		VDCCM Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction
	Noise from the rear side of vehicle	ABS wheel speed sensor or clearance of sensor malfunction Brake caliper Brake pads Disc rotor Parking brake Brake pipe Suspension play or fatigue (poor damping)	Axle & wheels Tire specifications, tire wear and air pressures
Engine does not accelerate or goes into a stall when accelerating suddenly or driving on a slippery surface.		VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Master cylinder Brake caliper Parking brake Incorrect wiring or piping	Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Brake pads Brake pipe

Symptom		Main probable cause	Other probable cause
Poor straight stability of TCS	Vehicle goes either left or right from straighten direction.	VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Brake caliper Brake pads Wheel alignment Uneven road Coronal road/ road with bank Tire specifications, tire wear and air pressures Incorrect wiring or piping	Disc rotor Brake pipe Axle & wheels Suspension play or fatigue (poor damping)
	Vehicle spin	VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Brake pads Tire specifications, tire wear and air pressures Incorrect wiring or piping	Brake caliper Brake pipe
Steering wheel drag while driving		VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Incorrect wiring or piping joint Power steering system	Brake caliper Brake pads Disc rotor Wheel alignment Uneven road Coronal road/ road with bank Suspension play or fatigue (poor damping) Tire specifications, tire wear and air pressures
VDC operates while driving normally.		VDCH/U VDCCM ABS wheel speed sensor or clearance of sensor malfunction Defective steering angle sensor or improper neutral position Yaw rate & lateral G sensor installation malfunction Wheel alignment Uneven road Coronal road/ road with bank Suspension play or fatigue (poor damping) Tire specifications, tire wear and air pressures Incorrect wiring or piping Power steering system	—

Symptom	Main probable cause	Other probable cause
VDC warning light/VDC OFF indicator light does not come on when the VDC OFF switch is depressed. NOTE: When keep depressing the VDC OFF switch for more than 10 seconds while engine running, VDC OFF indicator light go off and block the later switch operation. To return VDC operation, turn the ignition switch from OFF to ON.	Harness VDC warning light/VDC OFF indicator light bulb VDC OFF Switch	—

BRAKE

BR

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1. General Description

A: SPECIFICATION

Model		2.0 X, Hunter Ver.	2.5 X (LHD)	2.0 XT, 2.5 XT (RHD)	2.5 X (RHD), 2.5 XS, 2.5 XT (KA)	2.5 XT (LHD)
Front disc brake	Type	Disc (Floating type, ventilated)				
	Effective disc diameter	228 mm (8.98 in)	244 mm (9.61 in)			
	Disc thickness × Outer diameter	24 × 277 mm (0.94 × 10.91 in)	24 × 294 mm (0.94 × 11.57 in)			
	Effective cylinder diameter	42.8 mm (1.685 in) × 2				
	Pad dimensions (length × width × thickness)	117.8 × 50.5 × 11.0 mm (4.638 × 1.988 × 0.433 in)				
	Clearance adjustment	Automatic adjustment				
Rear disc brake	Type	—		Disc (Floating type)		
	Effective disc diameter	—		230 mm (9.06 in)		
	Disc thickness × Outer diameter	—		10 × 266 mm (0.39 × 10.47 in)		
	Effective cylinder diameter	—		38.1 mm (1.500 in)		
	Pad dimensions (length × width × thickness)	—		89.4 × 33.7 × 9.0 mm (3.520 × 1.327 × 0.354 in)		
	Clearance adjustment	—		Automatic adjustment		
Rear drum brake	Type	Drum (Leading-Trailing type)		—		
	Effective drum diameter	228.6 mm (9 in)		—		
	Effective cylinder diameter	19 mm (0.748 in)		—		
	Lining dimensions (length × width × thickness)	219.4 × 35.0 × 4.1 mm (8.64 × 1.378 × 0.161 in)		—		
	Clearance adjustment	Automatic adjustment		—		
Master cylinder	Type	Tandem				
	Effective diameter	26.99 mm (1-$^1/_{16}$ in)			25.4 mm (1 in)	26.99 mm (1-$^1/_{16}$ in)
	Reservoir type	Sealed type				
	Brake fluid reservoir capacity	205 cm^3 (12.51 cu in)				
Brake booster	Type	Vacuum suspended				
	Effective diameter	“8+9” tandem type				
Proportioning valve	Split point	3.628 kPa (37 kgf/cm^2, 526 psi)		—		3.628 kPa (37 kgf/cm^2, 526 psi)
	Reducing ratio	0.3		—		0.3
Brake line		Dual circuit system				

Model	2.0 X, Hunter Ver.	2.5 X (LHD)	2.0 XT, 2.5 XT (RHD)	2.5 X (RHD), 2.5 XS, 2.5 XT (KA)	2.5 XT (LHD)
Brake fluid **CAUTION:** **• Avoid mixing brake fluid of different brands to prevent the fluid performance from degrading.** **• When brake fluid is supplemented, be careful not to allow any dust into the reservoir.** **• Use fresh brake fluid when replacing or refilling the fluid.**	FMVSS No. 116, DOT3 or DOT4				

NOTE:
Refer to “PB section” for parking brake SPECIFICATIONS. <Ref. to PB-2, SPECIFICATION, General Description.>

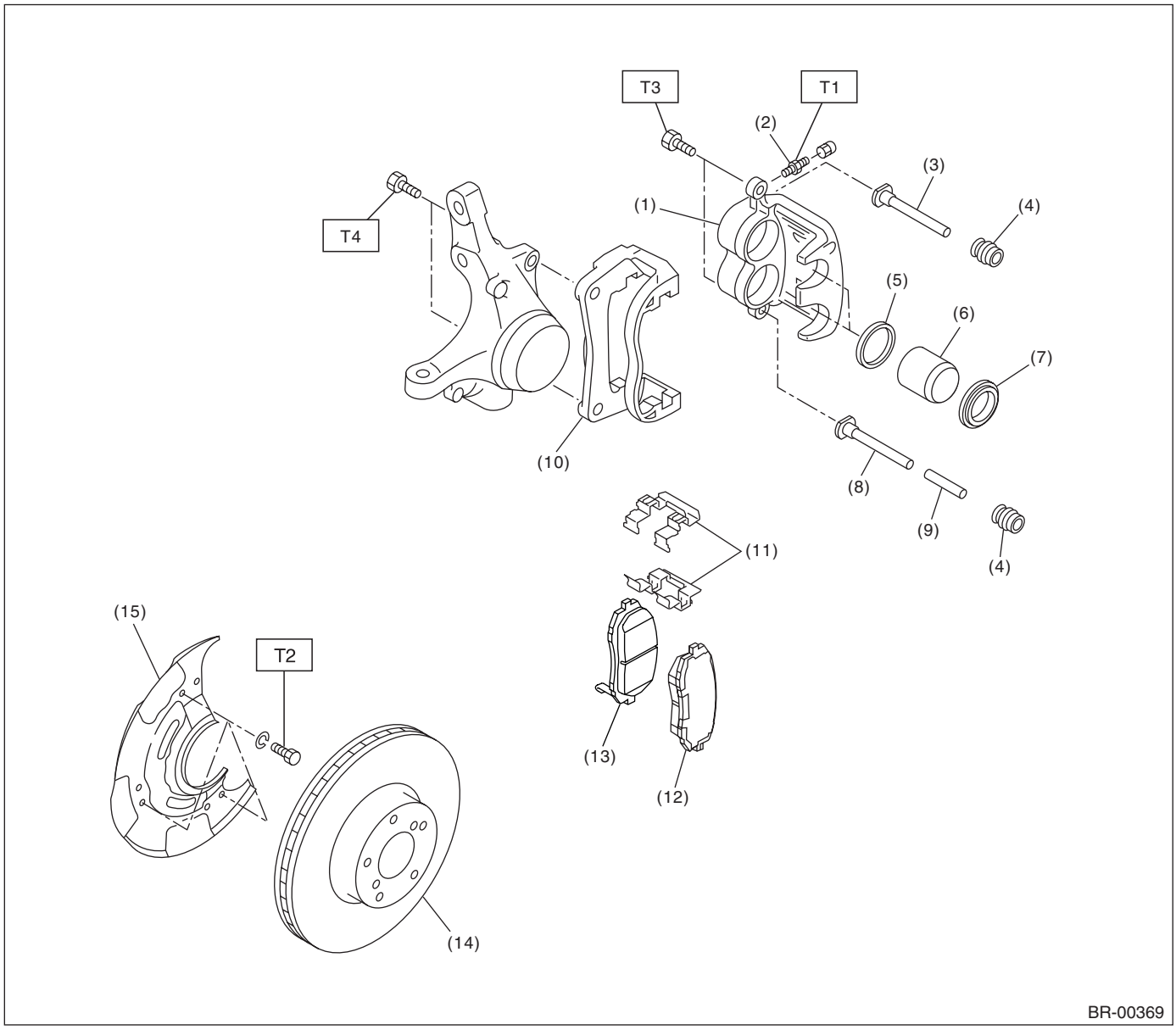
ITEM		STANDARD	SERVICE LIMIT
Front brake	Pad thickness	11 mm (0.43 in)	1.5 mm (0.059 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout	—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	9 mm (0.35 in)	1.5 mm (0.059 in)
	Disc thickness	10 mm (0.39 in)	8.5 mm (0.335 in)
	Disc runout	—	0.07 mm (0.0028 in)
Rear brake (Drum type)	Inside diameter	228.6 mm (9 in)	230.6 mm (9.08 in)
	Lining thickness	4.1 mm (0.161 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking)	Inside diameter	170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness	3.2 mm (0.126 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke	7 to 8 notches/196 N (20 kgf, 44 lbf)	

		Brake pedal force	Fluid pressure	
			Europe · General	Australia
Brake booster	Brake fluid pressure without engine running	147 N (15 kgf, 33 lbf)	588 kPa (6 kgf/cm^2, 85 psi)	588 kPa (6 kgf/cm^2, 85 psi)
		294 N (30 kgf, 66 lbf)	1,471 kPa (15 kgf/cm^2, 213 psi)	1,667 kPa (17 kgf/cm^2, 242 psi)
	Brake fluid pressure with engine running and vacuum at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lbf)	5,688 kPa (58 kgf/cm^2, 825 psi)	6,374 kPa (65 kgf/cm^2, 925 psi)
		294 N (30 kgf, 66 lbf)	9,121 kPa (93 kgf/cm^2, 1,322 psi)	10,199 kPa (104 kgf/cm^2, 1,479 psi)

Brake pedal	Free play	1 — 3 mm (0.039 — 0.118 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf).]

B: COMPONENT

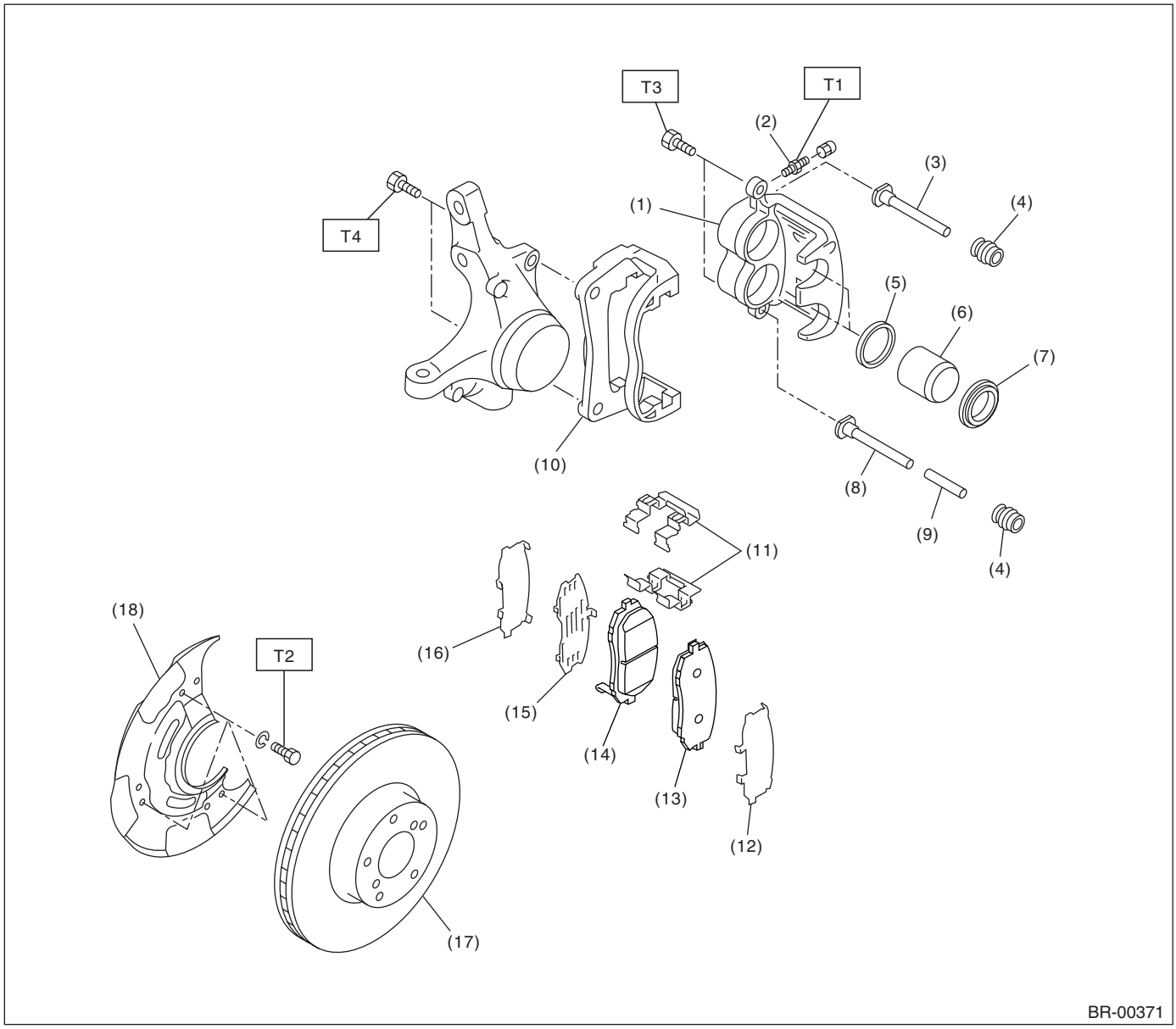
1. FRONT DISC BRAKE (EUROPE · GENERAL MODEL)



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Bushing
(10) Support
(11) Pad clip
(12) Pad (Outside)
(13) Pad (Inside)
(14) Disc rotor
(15) Disc cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 26.5 (2.7, 19.5)
T4: 80 (8.2, 59)

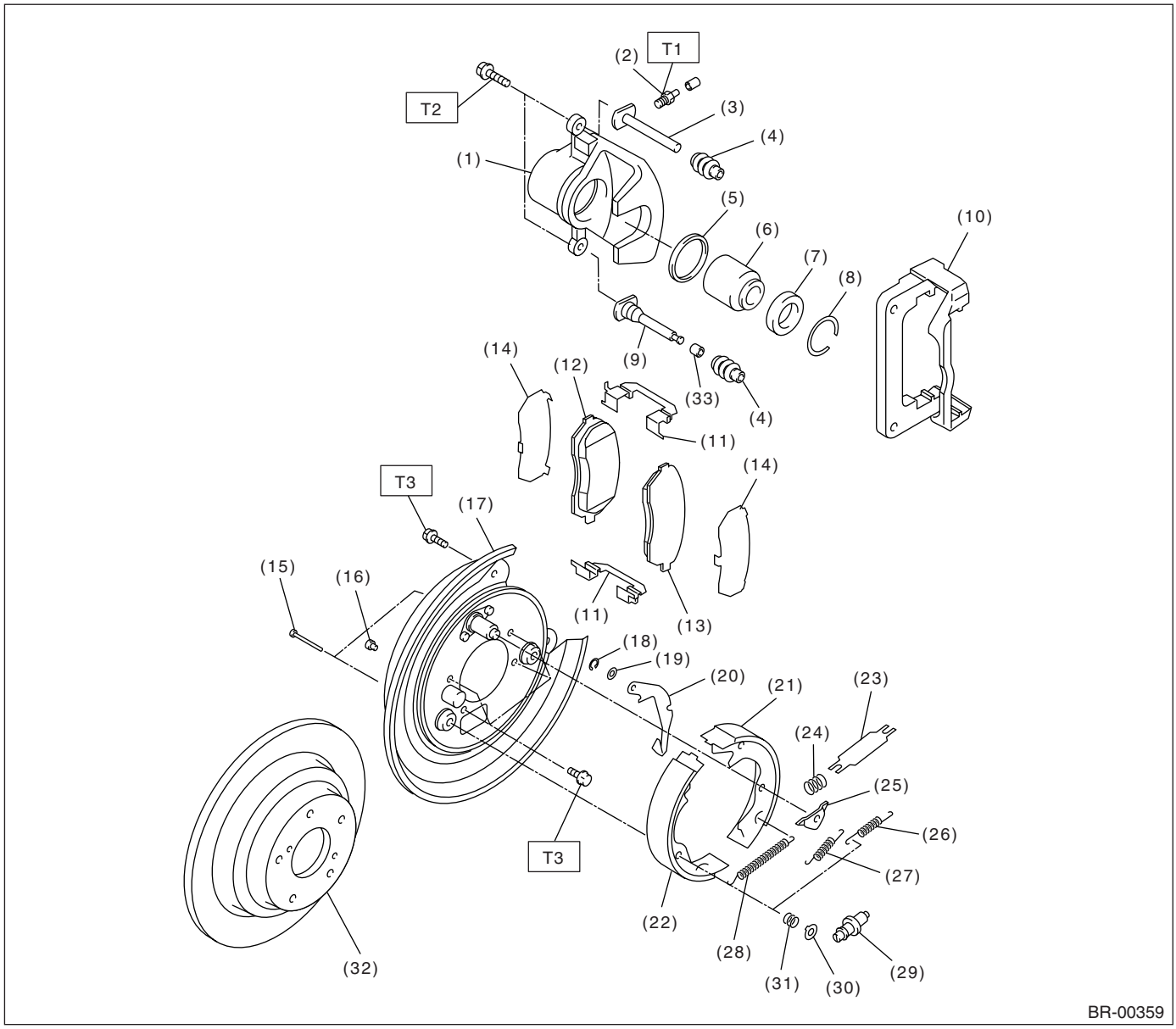
2. FRONT DISC BRAKE (AUSTRALIA MODEL)



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Lock pin (Yellow)
(9) Bushing
(10) Support
(11) Pad clip
(12) Outer shim
(13) Pad (Outside)
(14) Pad (Inside)
(15) Rubber coated shim
(16) Inner shim
(17) Disc rotor
(18) Disc cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 26.5 (2.7, 19.5)
T4: 80 (8.2, 59)

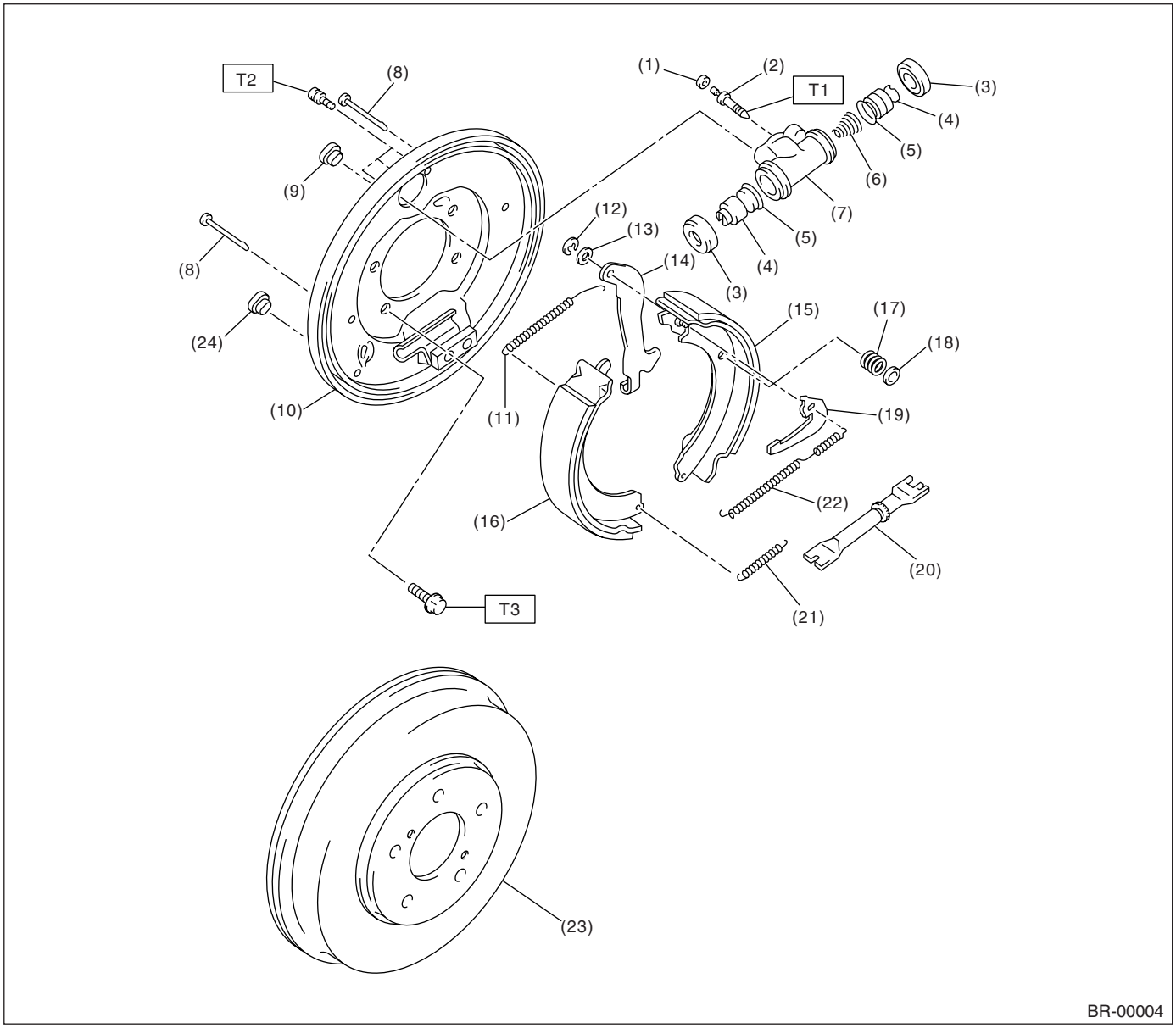
3. REAR DISC BRAKE



(1) Caliper body
(2) Air bleeder screw
(3) Guide pin (Green)
(4) Pin boot
(5) Piston seal
(6) Piston
(7) Piston boot
(8) Boot ring
(9) Lock pin (Yellow)
(10) Support
(11) Pad clip
(12) Pad (outside)
(13) Pad (inside)
(14) Shim
(15) Shoe hold-down pin
(16) Cover
(17) Back plate
(18) Retainer
(19) Spring washer
(20) Parking brake lever
(21) Parking brake shoe (Secondary)
(22) Parking brake shoe (Primary)
(23) Strut
(24) Strut shoe spring
(25) Shoe guide plate
(26) Secondary shoe return spring
(27) Primary shoe return spring
(28) Adjusting spring
(29) Adjuster
(30) Shoe hold-down cup
(31) Shoe hold-down spring
(32) Disc rotor
(33) Bushing

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 37 (3.8, 27.3)
T3: 53 (5.4, 39)

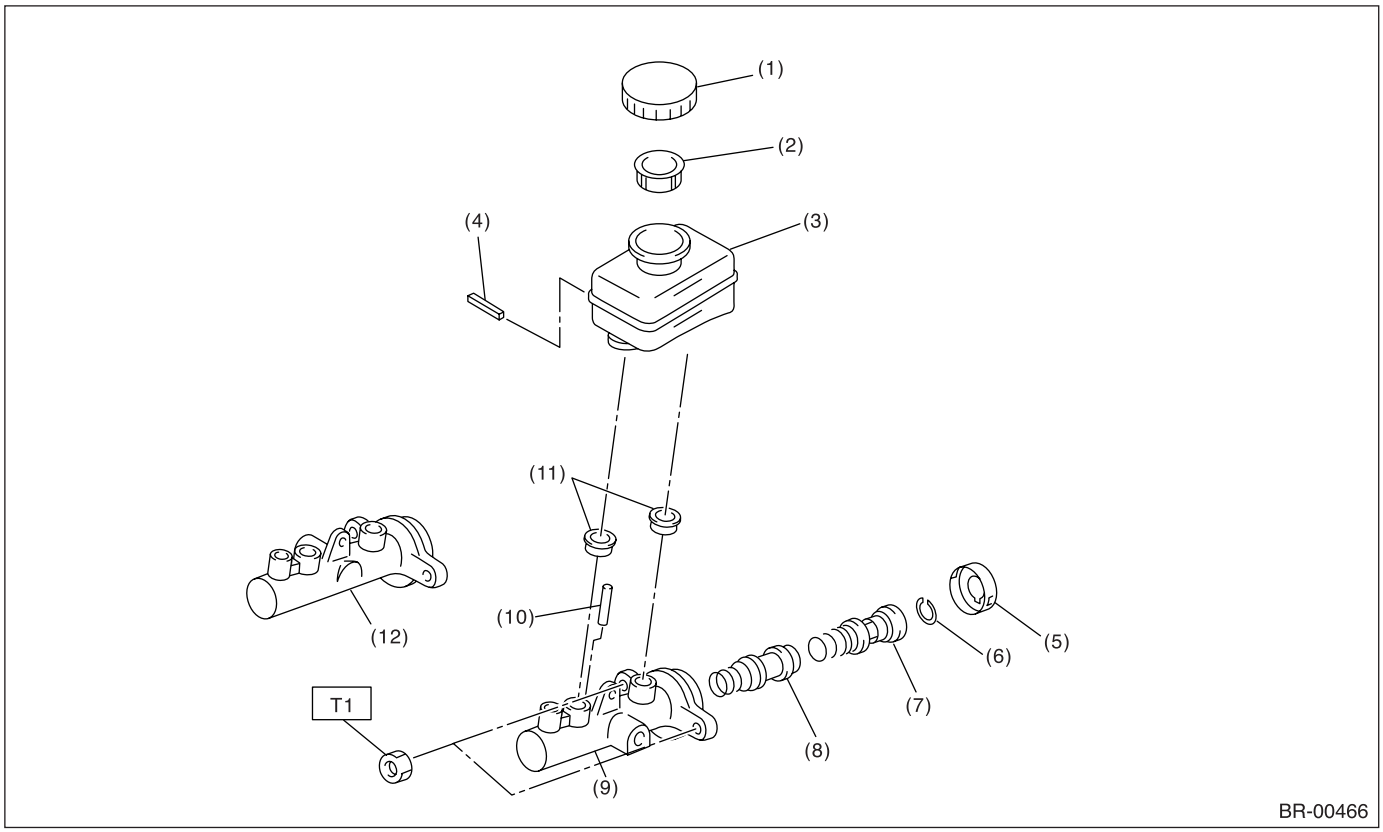
4. REAR DRUM BRAKE



(1) Air bleeder cap
(2) Air bleeder screw
(3) Dust Boot
(4) Piston
(5) Cup
(6) Spring
(7) Wheel cylinder body
(8) Hold-down Pin
(9) Plug
(10) Back plate
(11) Upper shoe return spring
(12) Retainer
(13) Washer
(14) Parking brake lever
(15) Brake shoe (Trailing)
(16) Brake shoe (Leading)
(17) Shoe hold-down spring
(18) Hold-down Cup
(19) Adjusting lever
(20) Adjuster assembly
(21) Lower shoe return spring
(22) Adjusting spring
(23) Brake Drum
(24) Plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 10 (1.0, 7.2)
T3: 53 (5.4, 39)

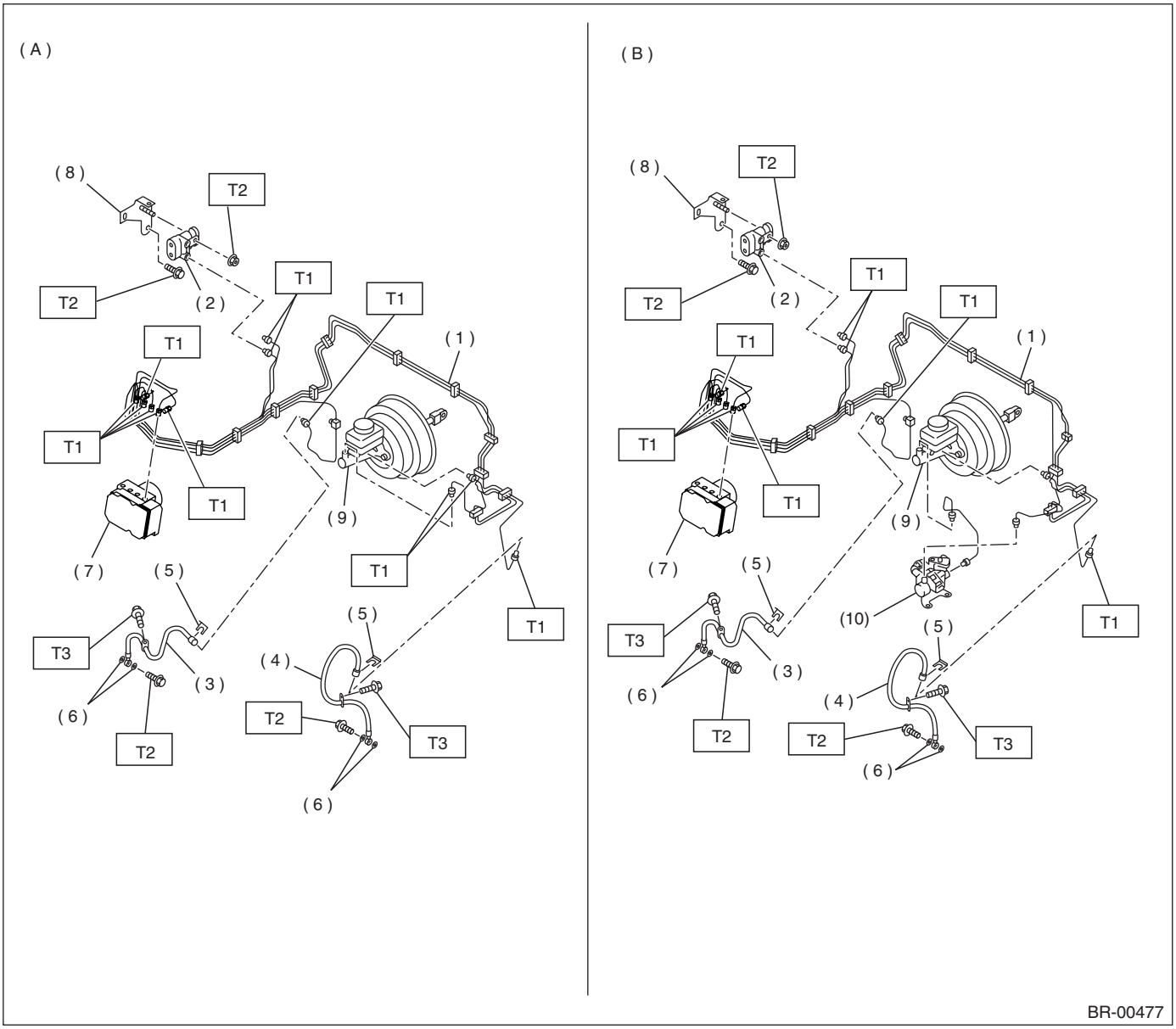
5. MASTER CYLINDER



(1) Cap
(2) Filter
(3) Reservoir tank
(4) Pin
(5) Piston retainer
(6) C-ring (model with VDC)
(7) Primary piston
(8) Secondary piston
(9) Cylinder body (LHD model)
(10) Cylinder pin (model with ABS)
(11) Seal
(12) Cylinder body (RHD model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 14 (1.4, 10.3)

6. FRONT BRAKE PIPES AND HOSE FOR LHD MODEL

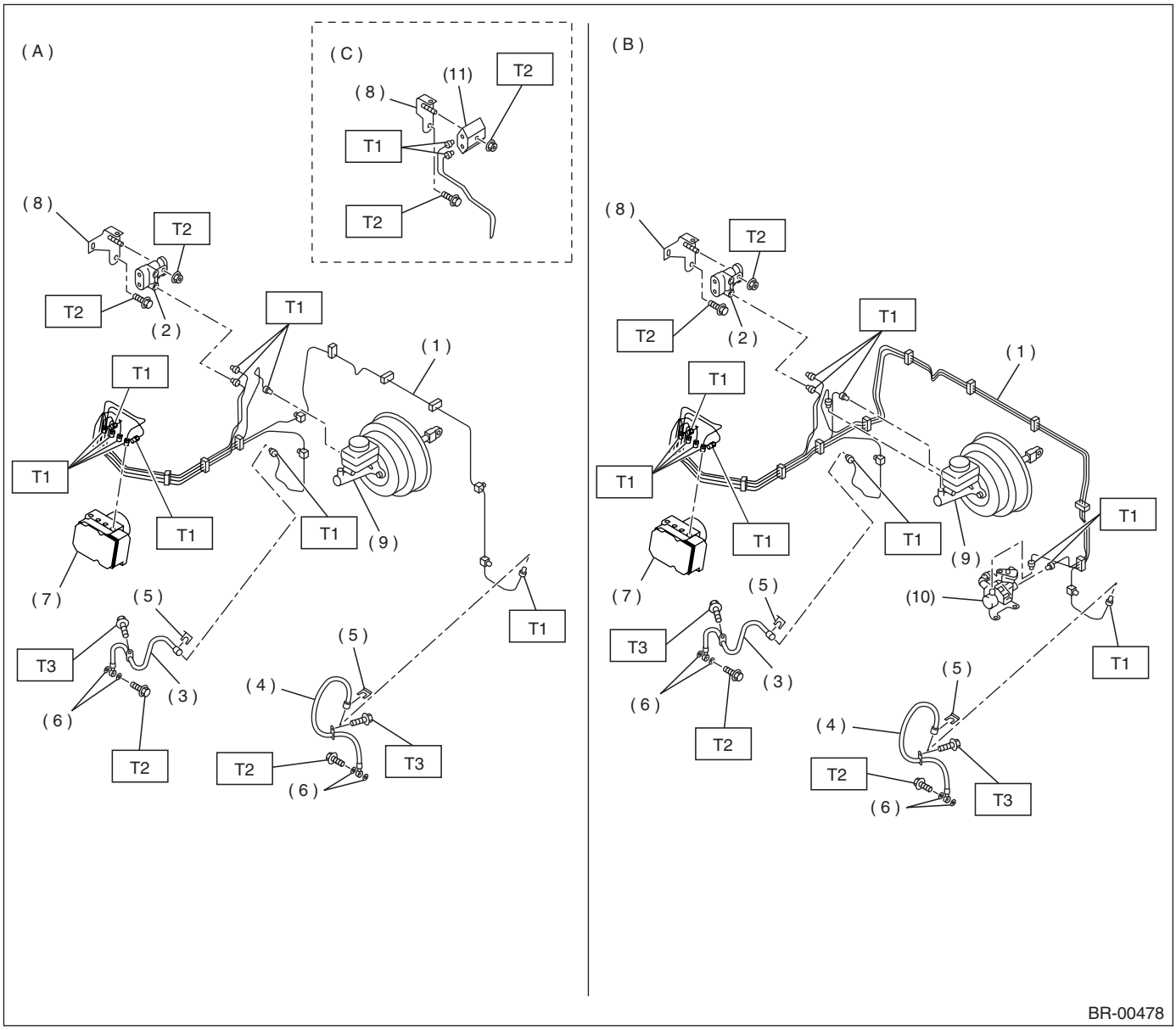


(A) Without hill holder model
(B) With hill holder model

(1) Front brake pipe assembly
(2) Proportioning valve assembly
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(8) Bracket
(9) Master cylinder
(10) Hill holder

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 11.1)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)

7. FRONT BRAKE PIPES AND HOSE FOR RHD MODEL

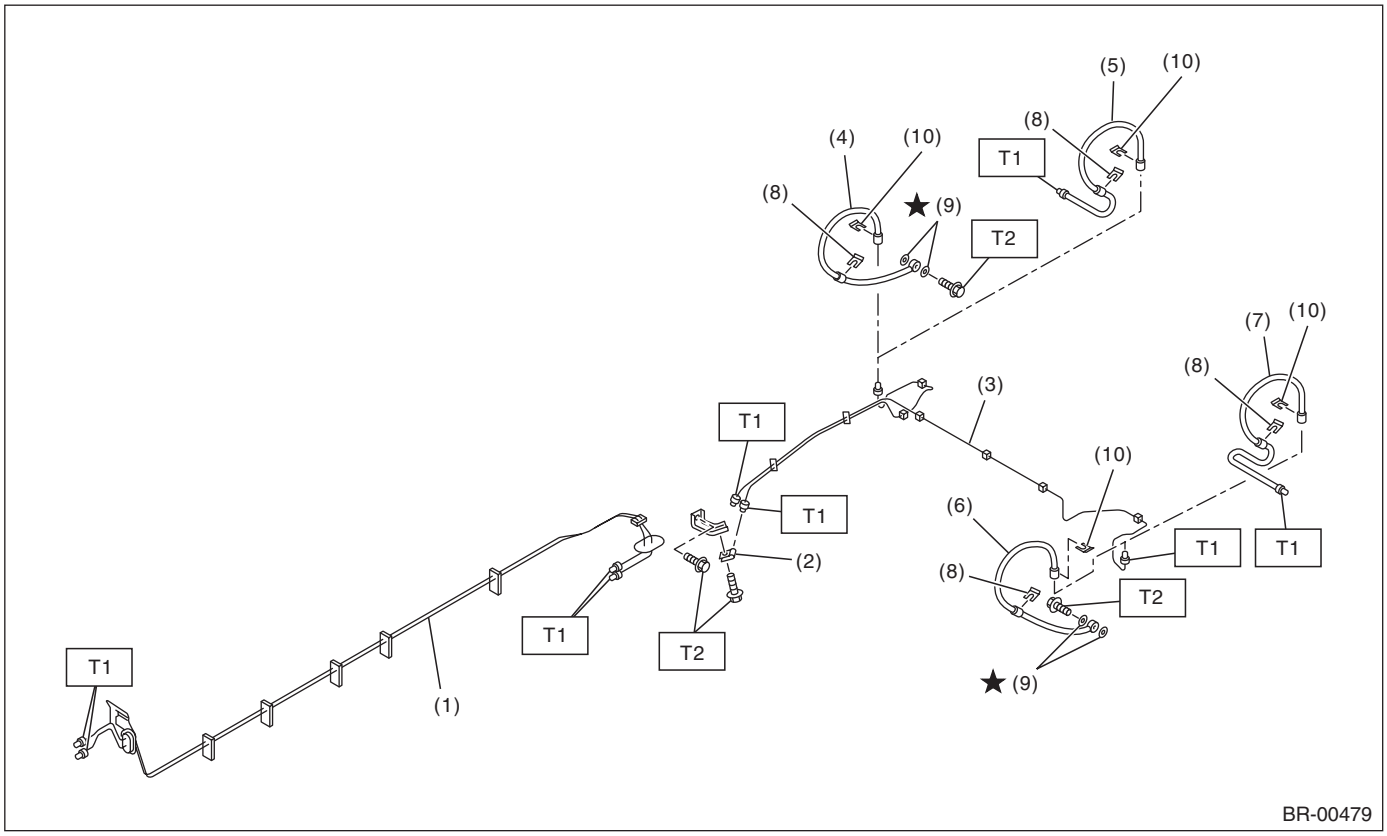


(A) Without hill holder model
(B) With hill holder model
(C) VDC model

(1) Front brake pipe assembly
(2) Proportioning valve assembly
(3) Front brake hose RH
(4) Front brake hose LH
(5) Clamp
(6) Gasket
(7) ABS control module and hydraulic control unit (ABSCM&H/U)
(8) Bracket
(9) Master cylinder
(10) Hill holder
(11) Two-way connector (VDC model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 11.1)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)

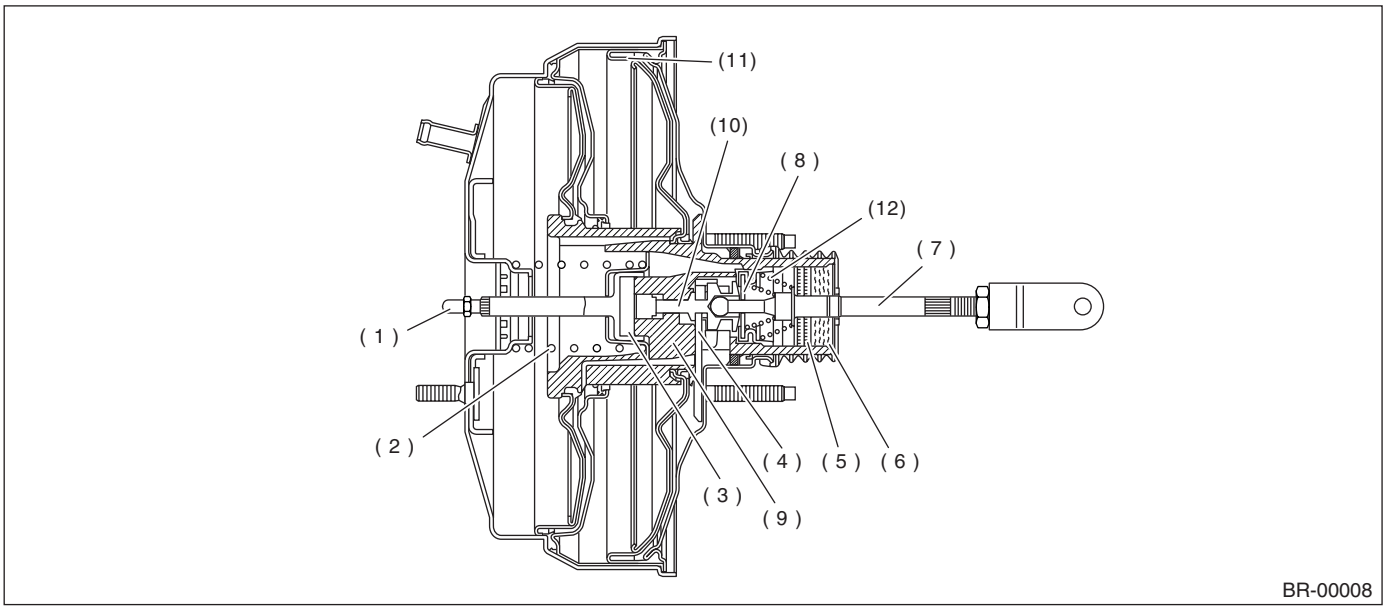
8. CENTER AND REAR BRAKE PIPES AND HOSES



(1) Center brake pipe assembly
(2) Two-way connector
(3) Rear brake pipe assembly
(4) Rear brake hose RH (Disc brake model)
(5) Rear brake hose RH (Drum brake model)
(6) Rear brake hose LH (Disc brake model)
(7) Rear brake hose LH (Drum brake model)
(8) Brake hose Clamp
(9) Gasket
(10) Brake hose clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 15 (1.5, 11.1)
T2: 18 (1.8, 13.0)

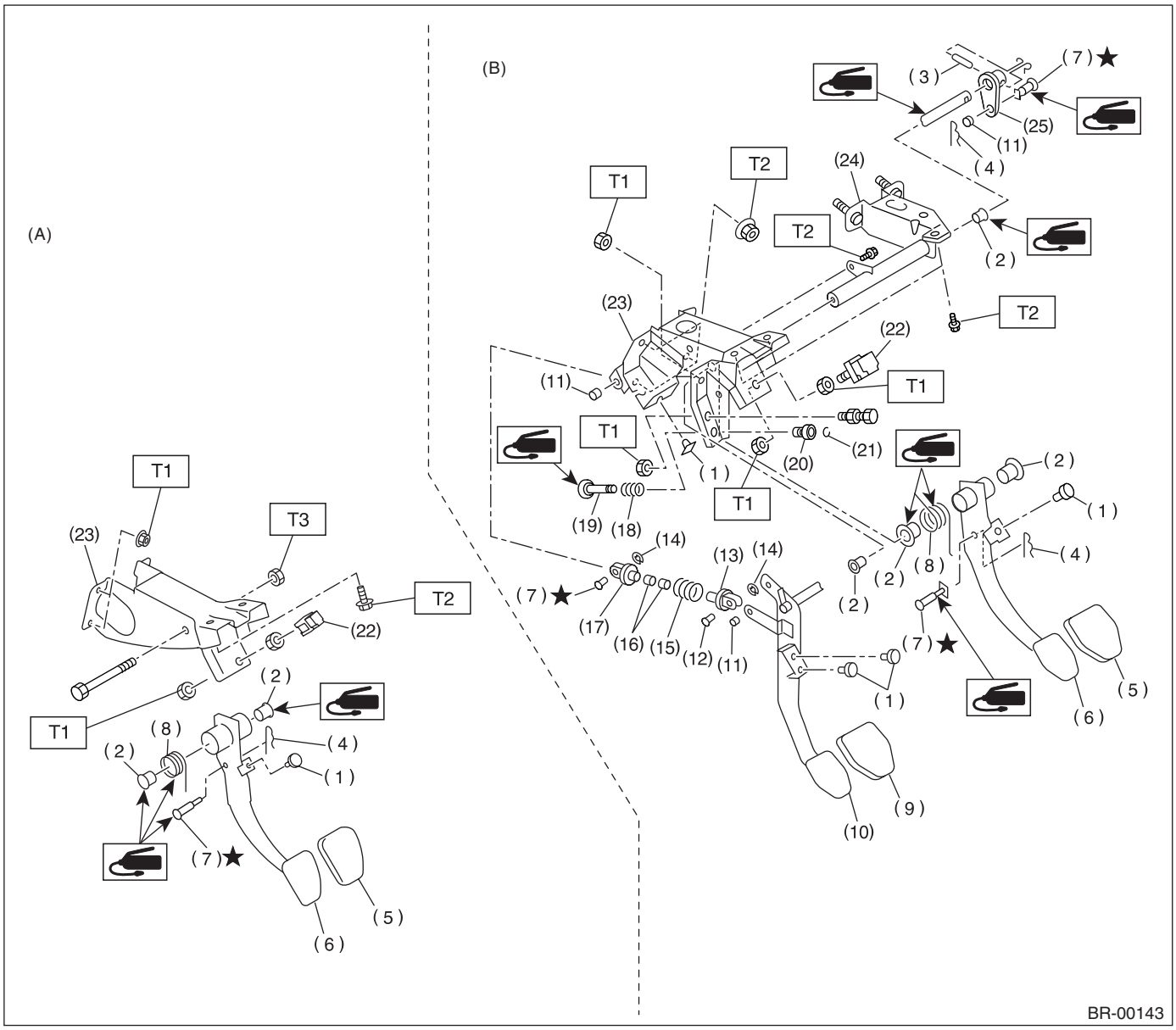
9. BRAKE BOOSTER



(1) Push rod
(2) Return spring
(3) Reaction disc
(4) Key
(5) Filter
(6) Silencer
(7) Operating rod
(8) Poppet valve assembly
(9) Valve body
(10) Plunger valve
(11) Diaphragm plate
(12) Valve return spring

10.BRAKE PEDAL

• LHD MODEL

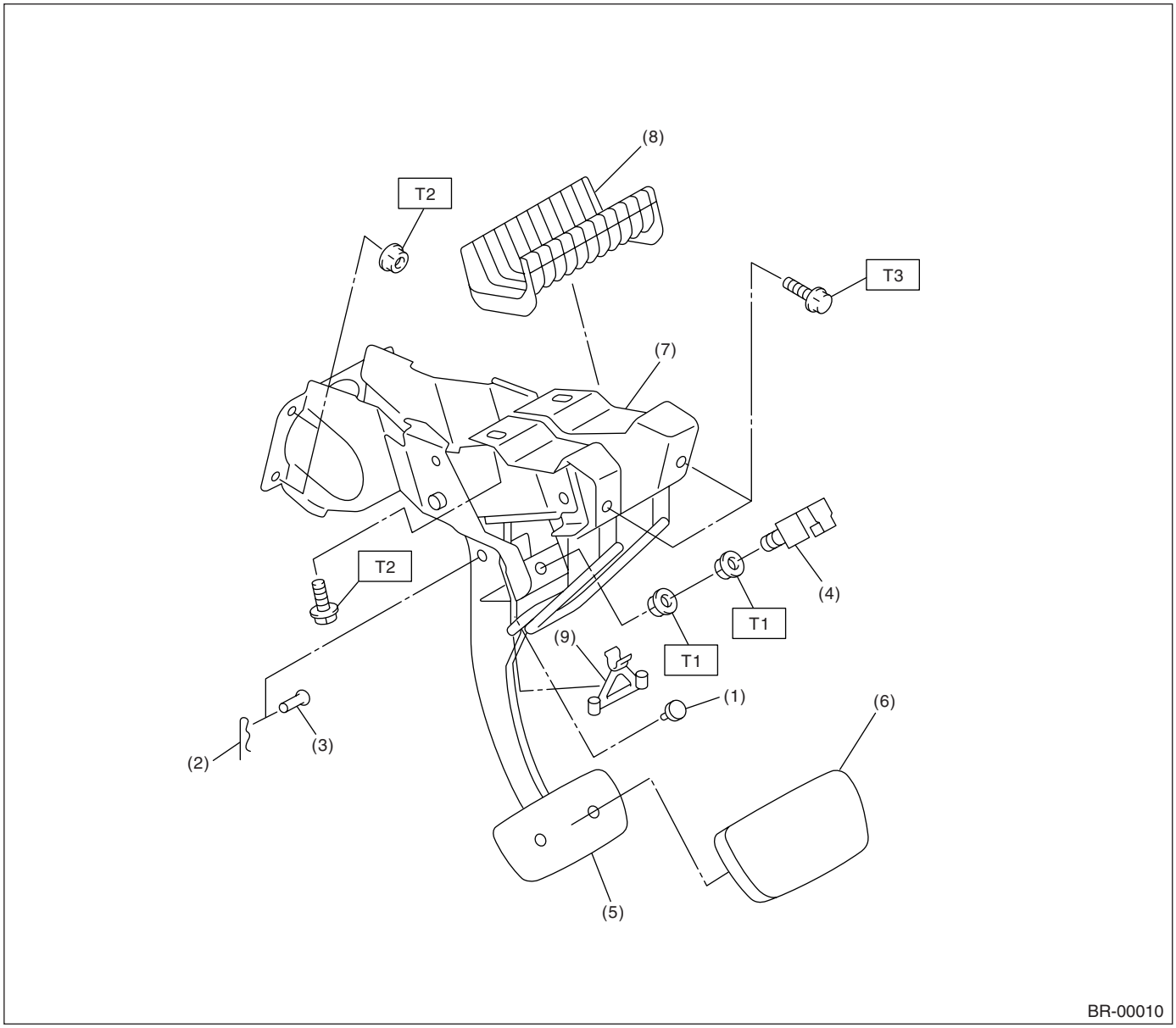


(A) AT model
(B) MT model

(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Brake pedal spring
(9) Clutch pedal pad
(10) Clutch pedal
(11) Bushing C
(12) Clutch clevis pin
(13) Assist rod A
(14) Clip
(15) Assist spring
(16) Assist bushing
(17) Assist rod B
(18) Spring S
(19) Rod S
(20) Bushing S
(21) Clip
(22) Stop light switch
(23) Pedal bracket
(24) Clutch master cylinder bracket
(25) Lever

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.1)

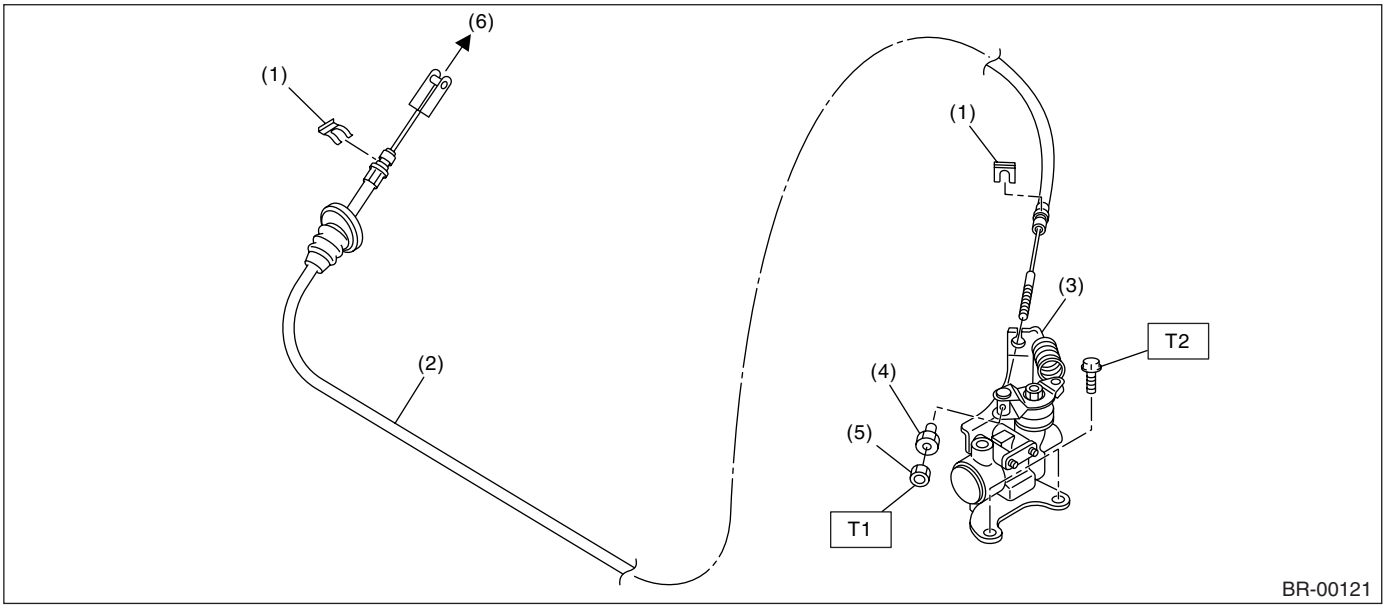
• RHD MODEL



(1) Stopper
(2) Snap pin
(3) Clevis pin
(4) Stop light switch
(5) Brake pedal
(6) Brake pedal pad
(7) Brake pedal bracket Assembly
(8) Cover
(9) Protector

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.8)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)

11.HILL HOLDER



(1)	Clamp	(4)	Adjusting nut
(2)	PHV cable	(5)	Lock nut
(3)	PHV (Pressure hold valve)	(6)	To clutch pedal

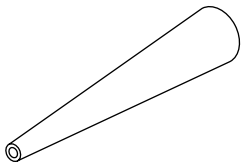
Tightening torque: N·m (kgf-m, ft-lb)
T1: 3.5 (0.36, 2.6)
T2: 18 (1.8, 13.0)

C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, because each part in the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Do not put fluid on body. If the body is tainted, wash away with water.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926460000	926460000	WHEEL CYLINDER 3/4″ ADAPTER	Used for installing cup onto wheel cylinder piston (Size 3/4 in).

2. GENERAL TOOL

TOOL NAME	REMARKS
Snap ring pliers	Used for removing and installing snap ring.

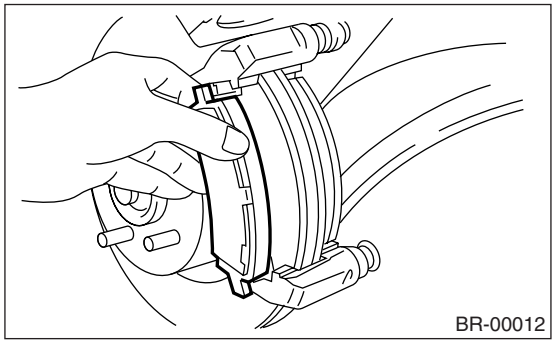
2. Front Brake Pad

A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the front wheel.
4) Remove the lower caliper bolt.
5) Raise the caliper body upward and support it.

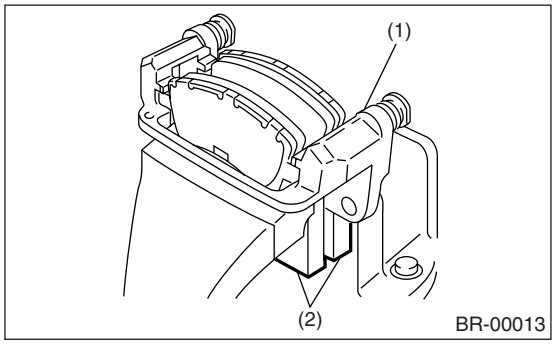
NOTE:
Do not disconnect the brake hose from caliper body.

6) Remove the pad.



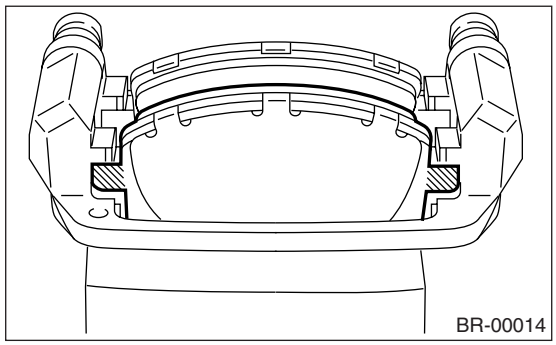
NOTE:
If the brake pad is difficult to remove, proceed as follows:

(1) Remove the caliper body from support.
(2) Remove the support.
(3) Place a support in a vise between wooden blocks.



(1) Support
(2) Wooden blocks

(4) Attach a rod of less than 12 mm (0.47 in) dia. to the shaded area of brake pad, and strike the rod with a hammer to drive brake pad out of place.

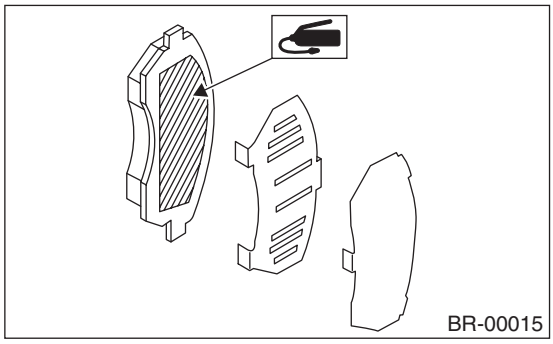


B: INSTALLATION

1) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between inner pad and rubber coated shim. (For Australia model)

NOTE:
• Do not apply grease between outer pad and outer shim. (For Australia model)
• Do not confuse the inner shim with outer shim. (For Australia model)

CAUTION:
Replace the pad if there is oil or grease on it.



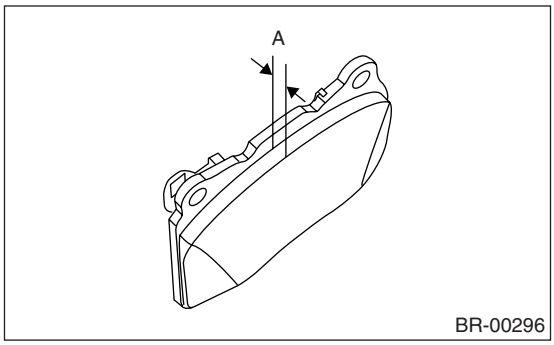
3) Install the pads on support.
4) Install the caliper body on support.

Tightening torque:
26.5 N·m (2.7 kgf-m, 19.5 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

C: INSPECTION

Check the pad thickness A.



Pad thickness	Standard value	11 mm (0.43 in)
	Wear limit	1.5 mm (0.059 in)

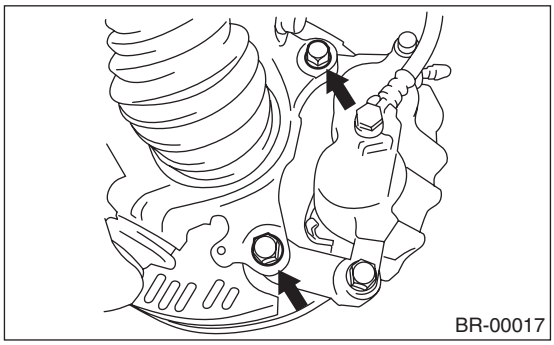
NOTE:

- Always replace the pads for both right and left wheels at the same time.
- Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad (RH). If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

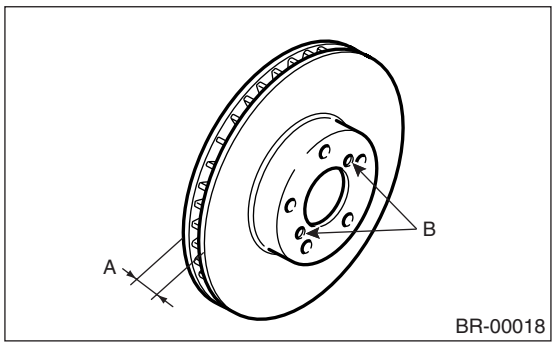
A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the front wheel.
4) Remove the caliper body and support from housing, and suspend it from strut using a wire.



5) Remove the disc rotor.

NOTE:
If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8 mm bolt in holes B on rotor.



6) Clean mud and foreign particles from the caliper body assembly and support.

B: INSTALLATION

1) Install the disc rotor.
2) Install the caliper body and support to housing.

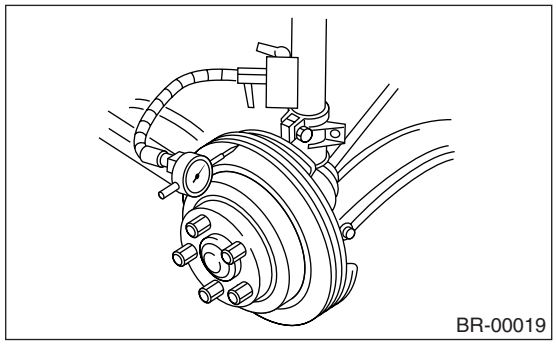
Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

3) Install the wheel.

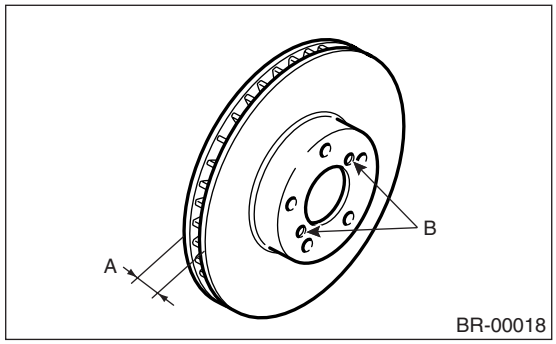
C: INSPECTION

1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-24, INSPECTION, Front Axle.>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.

Disc rotor runout limit:
0.075 mm (0.0030 in)



4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness A. If the thickness of disc rotor is outside the service limit, replace the disc rotor.



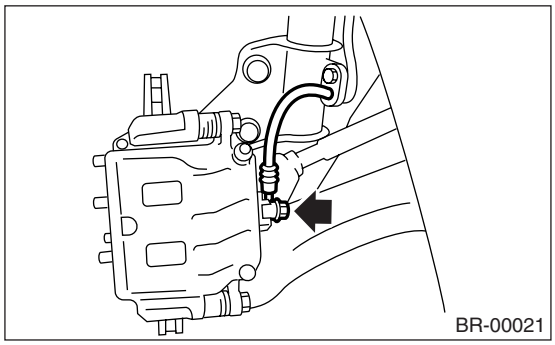
		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	15″	24 mm (0.94 in)	22 mm (0.87 in)	277 mm (10.91 in)
	16″	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)

4. Front Disc Brake Assembly

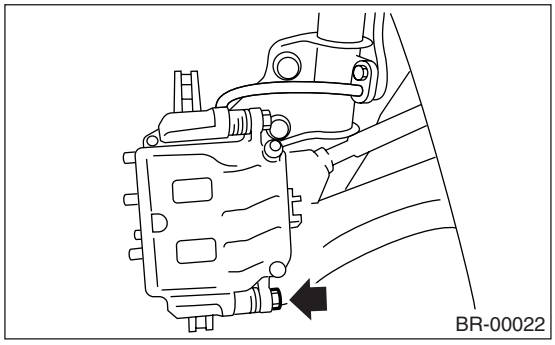
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the front wheel.
4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.

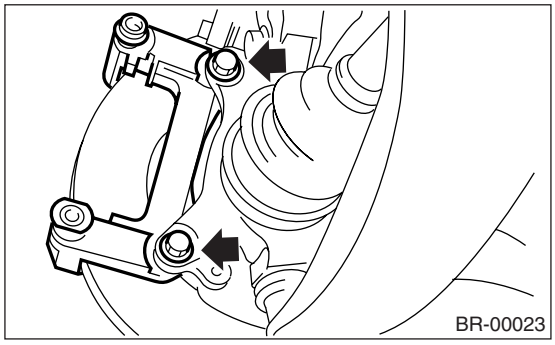


5) Remove the bolt securing lock pin to caliper body.



6) Raise the caliper body and move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.



8) Clean mud and foreign particles from the caliper body assembly and support.

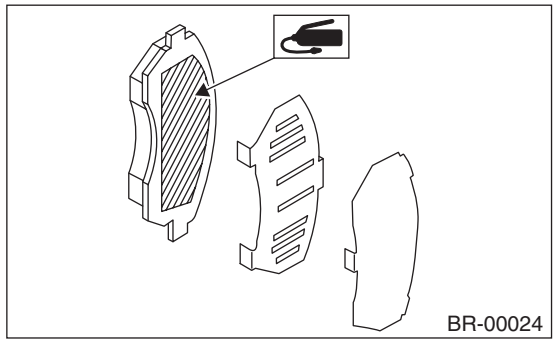
B: INSTALLATION

1) Install the support on housing.

Tightening torque:
80 N·m (8.2 kgf-m, 59 ft-lb)

2) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
3) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between inner pad and rubber coated shim. (For Australia model)

NOTE:
• Do not apply grease between outer pad and outer shim. (For Australia model)
• Do not confuse the inner shim with outer shim. (For Australia model)



4) Install the pads on support.
5) Install the caliper body on support.

Tightening torque:
26.5 N·m (2.7 kgf-m, 19.5 ft-lb)

6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

7) Bleed air from the brake system.

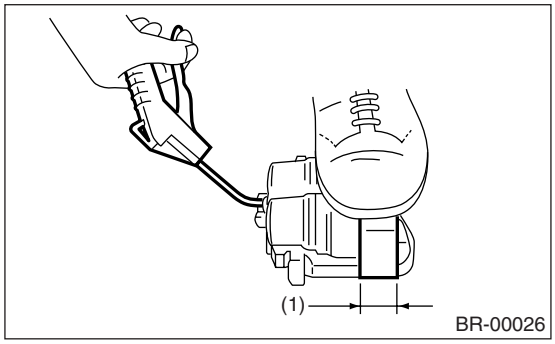
C: DISASSEMBLY

1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

2) Remove the boot from piston end.
3) Place a wooden block as shown in the figure to prevent damage to the piston. Gradually supply

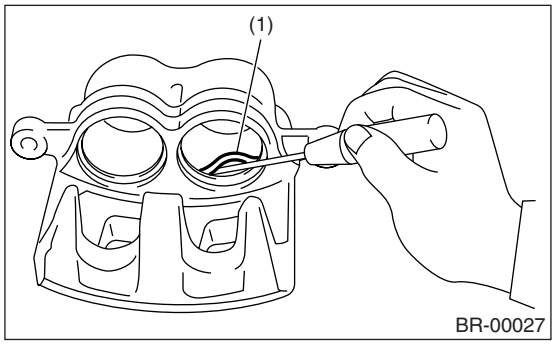
compressed air via inlet of the brake hose to force piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Be careful not to scratch the inner surface of cylinder and piston seal groove.



(1) Piston seal

5) Remove the lock pin boot and guide pin boot.

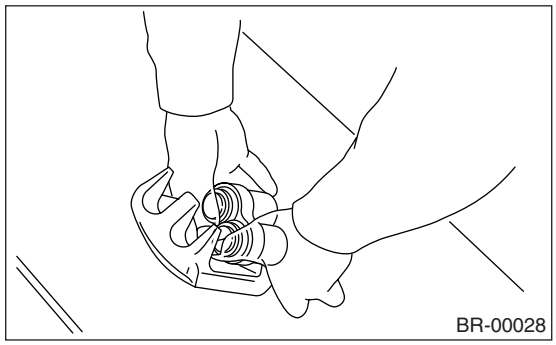
D: ASSEMBLY

1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

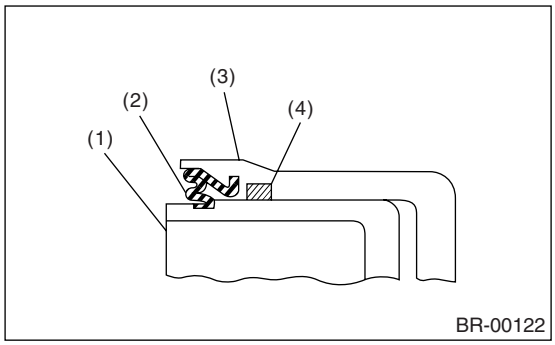
Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force the piston into cylinder.



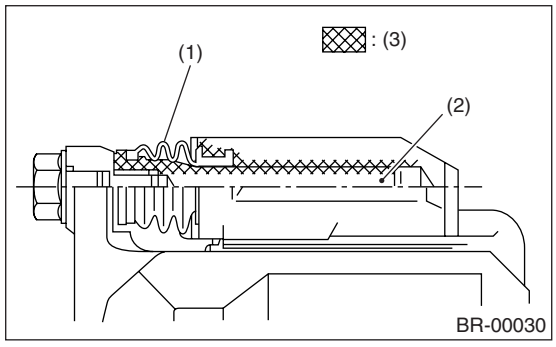
6) Position the boot in grooves on cylinder and piston.



(1) Piston
(2) Piston boot
(3) Caliper body
(4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin, outer surface, cylinder inner surface, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin or guide pin
(3) Apply grease.

8) Install the lock pin boot and guide pin boot on support.

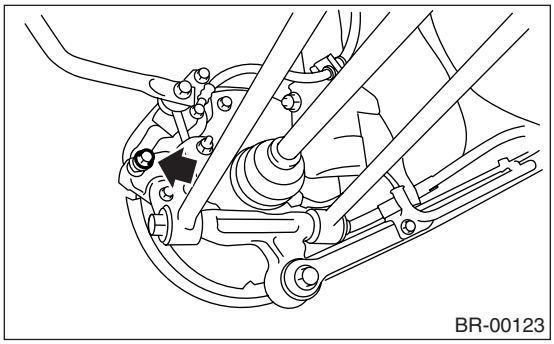
E: INSPECTION

1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Jack-up the vehicle, and then remove the rear wheel.
4) Remove the lower caliper bolt.

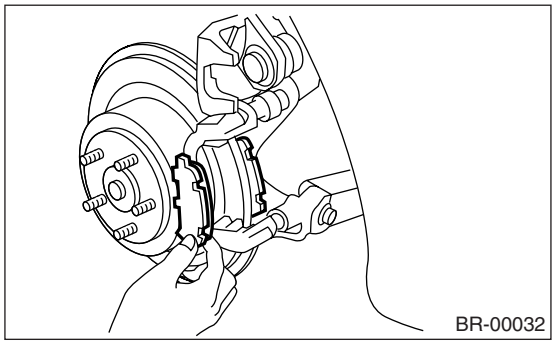


5) Raise the caliper body upward and support it.

NOTE:
Do not disconnect the brake hose from caliper body.

6) Remove the pad.

NOTE:
If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.
<Ref. to BR-17, REMOVAL, Front Brake Pad.>



B: INSTALLATION

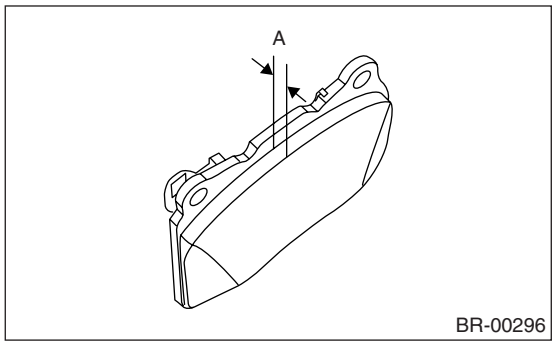
1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
2) Install the pad on support.
3) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)

NOTE:
If it is difficult to push the piston during pad replacement, loosen air bleeder to facilitate work.

C: INSPECTION

Check pad thickness A.



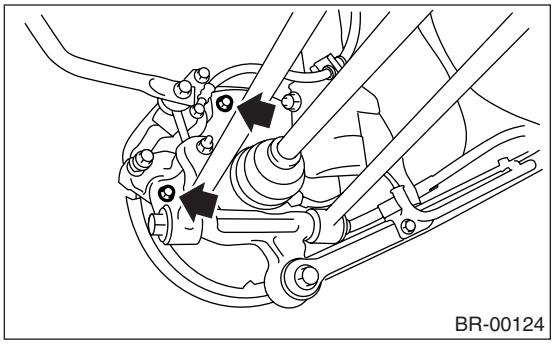
Pad thickness	Standard value	9 mm (0.35 in)
	Wear limit	1.5 mm (0.059 in)

NOTE:
• Always replace the pads for both right and left wheels at the same time.
• Also replace the pad clips if they are twisted or worn.
• A wear indicator is provided on the inner disc brake pad (RH). If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
• Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

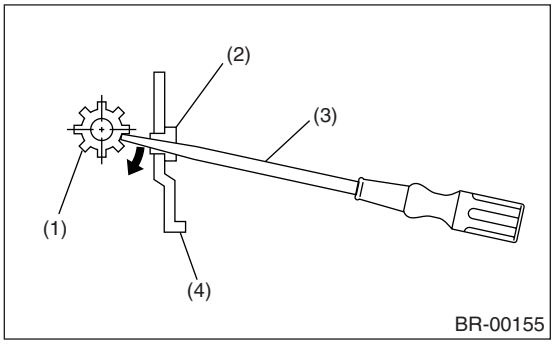
1) Lift-up the vehicle, and then remove the wheels.
2) Pull down and release the parking brake.
3) Remove the two mounting bolts, and then remove the disc brake assembly.


BR-00124

4) Suspend the disc brake assembly so that hose is not stretched.
5) Remove the disc rotor.

NOTE:
If the disc rotor is difficult to remove try following two methods in order.

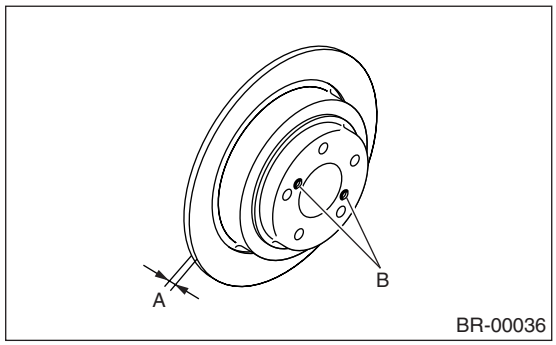
(1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.



BR-00155

(1) Adjusting screw
(2) Cover
(3) Flat tip screwdriver
(4) Back plate

(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing an 8 mm bolt in holes B on rotor.



BR-00036

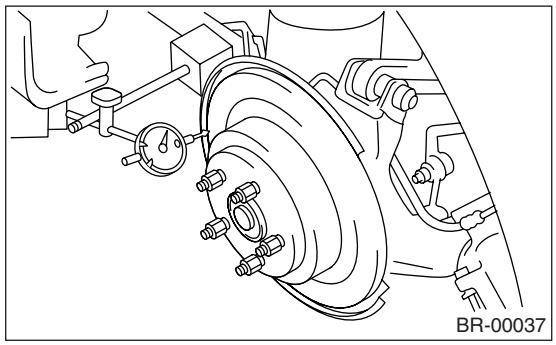
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

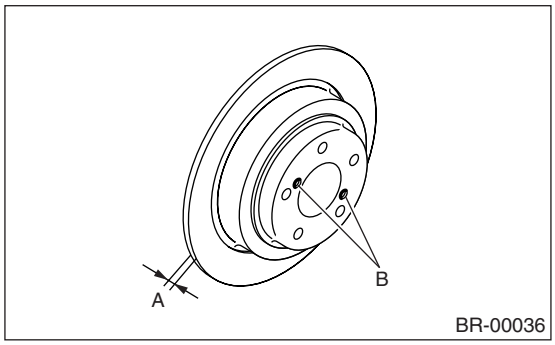
C: INSPECTION

1) Check bearing axial end play and hub runout before disc rotor runout limit inspection. <Ref. to DS-32, INSPECTION, Rear Axle.>
2) Secure the disc rotor by tightening five wheel nuts.
3) Set a dial gauge 10 mm (0.39 in) inward of rotor outer perimeter. Turn the disc rotor to check runout. If the disc rotor runout is above specified value, replace the disc rotor.

Disc rotor runout limit:
0.070 mm (0.0028 in)


BR-00037

4) Set a micrometer 10 mm (0.39 in) inward of the rotor outer perimeter, and then measure the disc rotor thickness A. If the thickness of disc rotor is outside the service limit, replace the disc rotor.



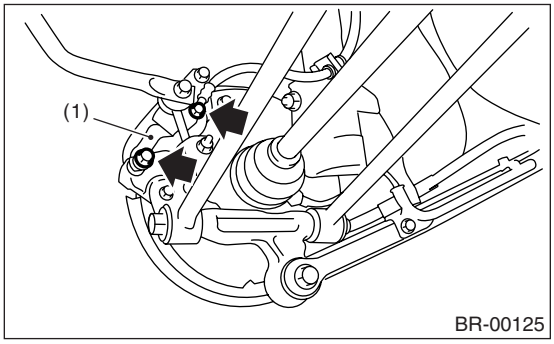
	Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	10 mm (0.39 in)	8.5 mm (0.335 in)	266 mm (10.47 in)

7. Rear Disc Brake Assembly

A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Disconnect the brake hose from caliper body assembly.
5) Remove the bolt securing lock pin to caliper body.



(1) Caliper body

6) Raise the caliper body and move it toward vehicle center to separate it from support.
7) Remove the support from housing.

NOTE:
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.

8) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

B: INSTALLATION

1) Install the disc rotor on hub.
2) Install the support on housing.

Tightening torque:
53 N·m (5.4 kgf-m, 39 ft-lb)

3) Apply thin coat of Molykote AS880N (Part No. K0777YA010) to the frictional portion between pad and pad clip.
4) Install the pads on support.
5) Install the caliper body on support.

Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)

6) Replace the brake hose gaskets with new ones, and then connect the brake hose.

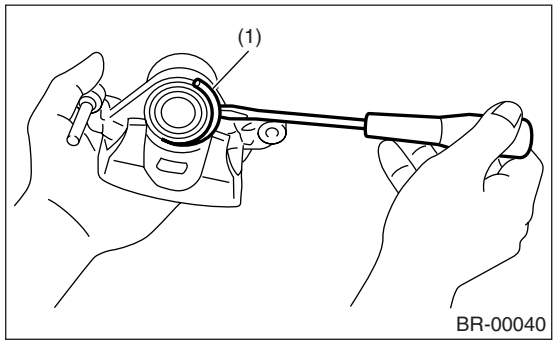
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:
The brake hose must be connected without any twist.

7) Bleed air from the brake system. <Ref. to BR-44, Air Bleeding.>

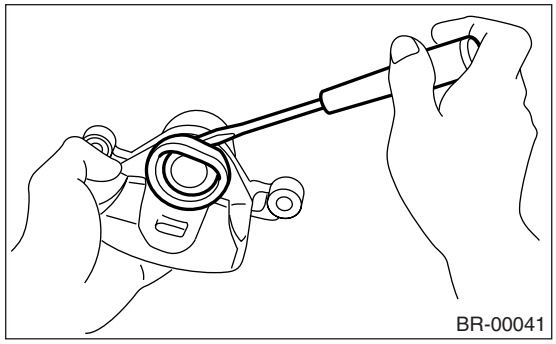
C: DISASSEMBLY

1) Remove the boot ring.

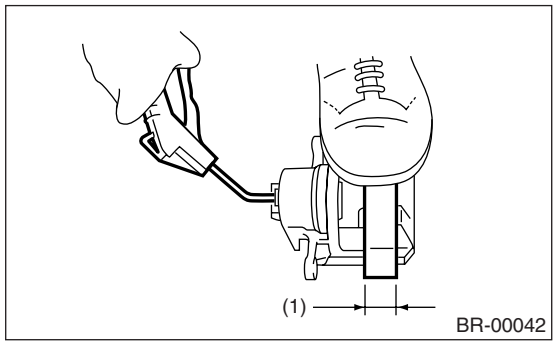


(1) Boot ring

2) Remove the piston boot.



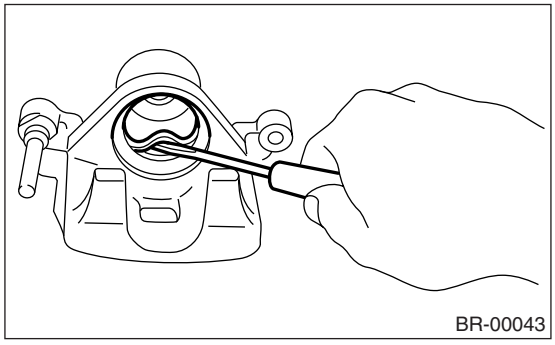
3) Place a wooden block as shown in the figure to prevent damage to the piston. Gradually supply compressed air via inlet of the brake hose to force piston out.



(1) Place a 30 mm (1.18 in) wide wooden block here.

4) Remove the piston seal from caliper body cylinder.

CAUTION:
Be careful not to scratch the inner surface of cylinder and piston seal groove.



5) Remove the lock pin sleeve and boot from caliper body.
6) Remove the guide pin (green) and boot.

D: ASSEMBLY

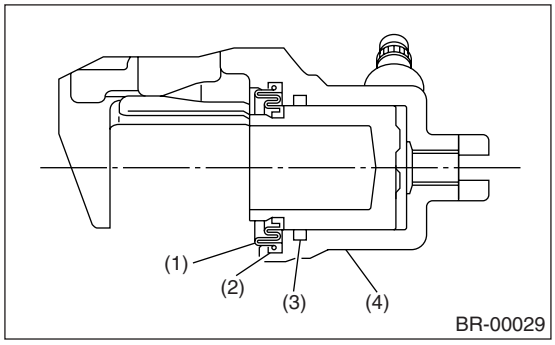
1) Clean the caliper body interior using brake fluid.
2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)

5) Insert the piston into cylinder.

CAUTION:
Do not force piston into cylinder.

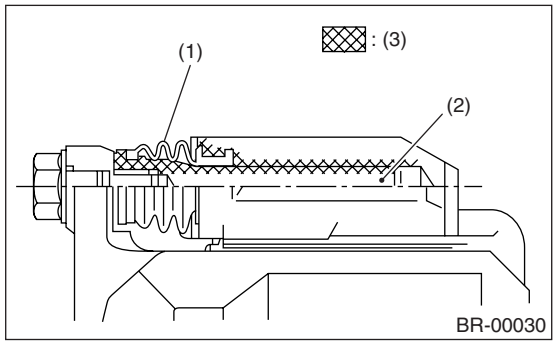
6) Install the piston boot to caliper body, and attach boot ring.



(1) Piston boot
(2) Boot ring
(3) Piston seal
(4) Caliper body

7) Apply a coat of specified grease to the outer surface of the lock pin (yellow) and guide pin (green), sleeve outer surface of the lock pin, inner surface of the cylinder, and boot grooves.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



(1) Pin boot
(2) Lock pin (yellow) or guide pin (green)
(3) Apply grease.

8) Install the guide pin boot on support.
9) Install the lock pin boot on support and insert lock pin sleeve into place.

E: INSPECTION

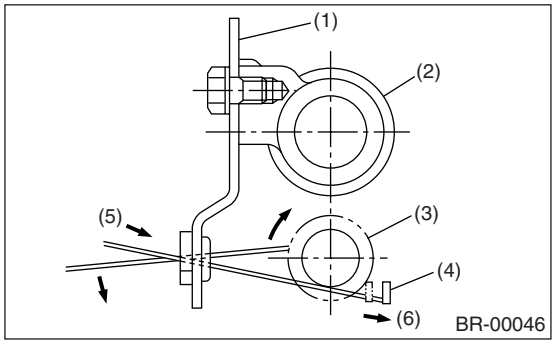
1) Repair or replace the faulty parts.
2) Check the caliper body and piston for uneven wear, damage or rust.
3) Check the rubber parts for damage or deterioration.

8. Rear Drum Brake Shoe

A: REMOVAL

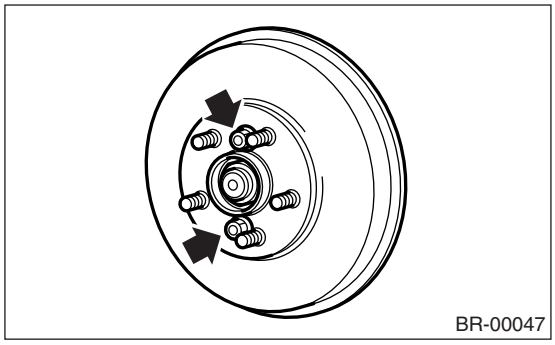
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn adjuster assembly pawls using a flat tip screwdriver until brake shoe separates from the drum.

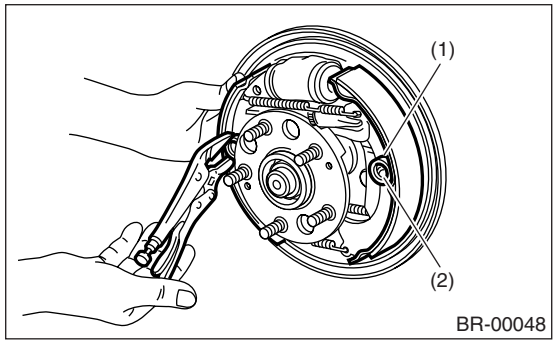


(1) Back plate
(2) Wheel cylinder assembly
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push direction

• If the brake drum is difficult to remove, drive it out by installing an 8 mm bolt into bolt hole in brake drum.

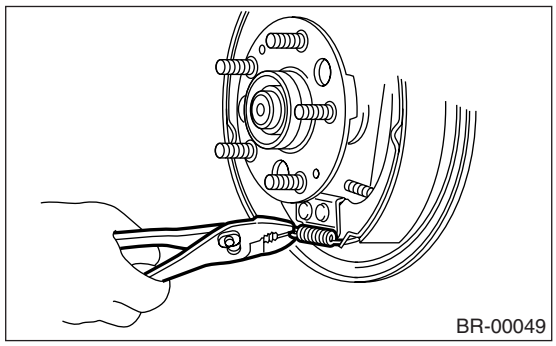


6) Hold the hold-down pin by securing rear of back plate with your hand.



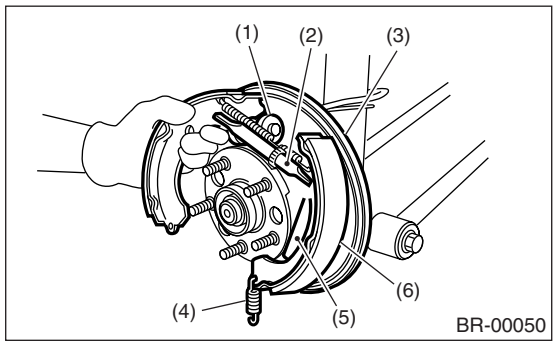
(1) Hold-down cup
(2) Hold-down pin

7) Disconnect the hold-down cup from hold-down pin by rotating hold-down cup.
8) Disconnect the lower shoe return spring from shoes.



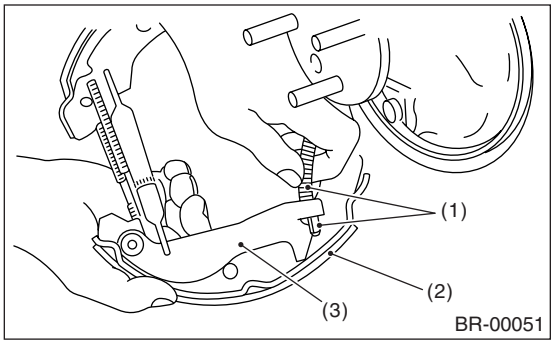
9) Remove the shoes one by one from back plate with adjuster.

CAUTION:
Be careful not to bend the parking brake cable excessively when removing brake shoes.



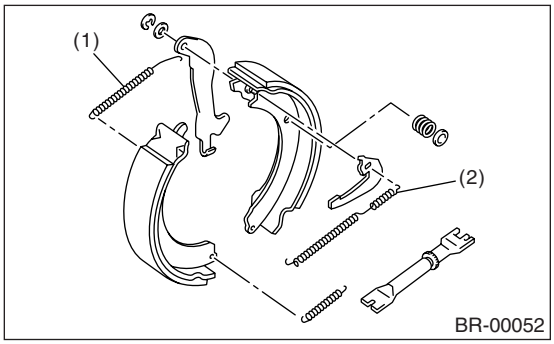
(1) Wheel cylinder assembly
(2) Adjuster assembly
(3) Back plate
(4) Lower shoe return spring
(5) Parking lever
(6) Brake shoe (Trailing)

10) Disconnect the parking brake cable from parking lever.



(1) Parking brake cable
(2) Brake shoe (Trailing)
(3) Parking brake lever

11) Remove the upper shoe return spring and adjusting spring from brake shoe.

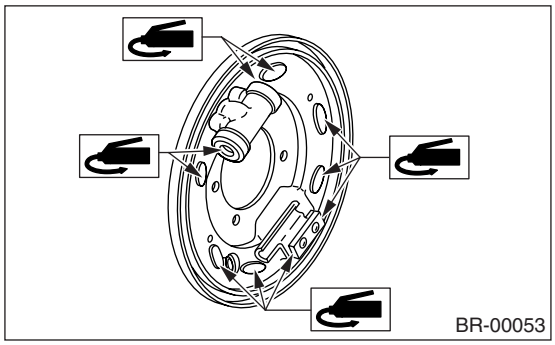


(1) Upper shoe return spring
(2) Adjusting spring

B: INSTALLATION

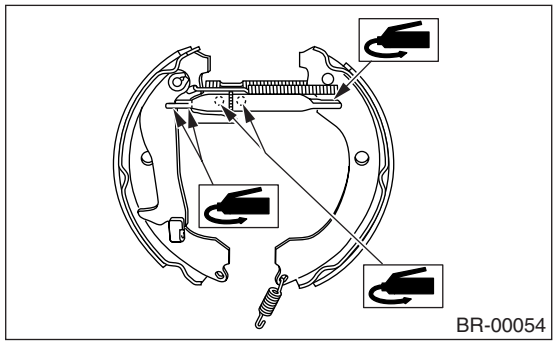
1) Clean the back plate and wheel cylinder.
2) Apply grease to portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)

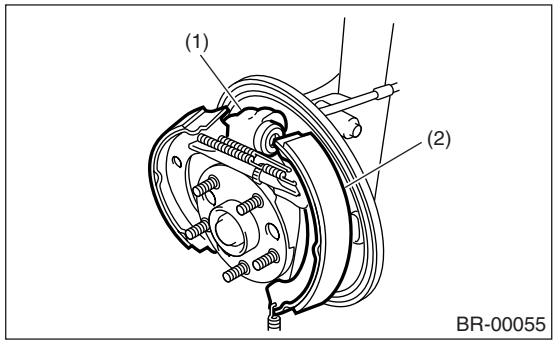


3) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)



4) Connect the upper shoe return spring to shoes.
5) Connect the parking brake cable to parking lever.
6) While positioning the shoes (one at a time) in groove on wheel cylinder, secure the shoes.



(1) Wheel cylinder
(2) Brake shoe (Trailing)

7) Fix the shoes by connecting hold-down cup to hold-down pin.
8) Connect the lower shoe return spring.
9) Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with inside diameter of brake drum.

C: INSPECTION

1) Measure the lining thickness. If the thickness of lining is outside the service limit, replace the shoes.

Lining thickness:
Standard 4.1 mm (0.161 in)
Service limit 1.5 mm (0.059 in)

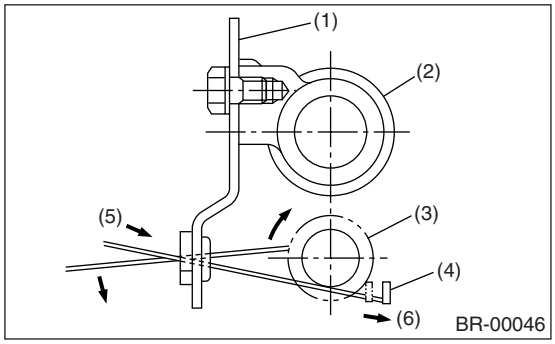
2) If the deformation or wear of back plate, shoe, etc. are notable, replace them.
3) When the shoe return spring tension is excessively weakened, replace it, taking care to identify the upper and lower springs.

9. Rear Drum Brake Drum

A: REMOVAL

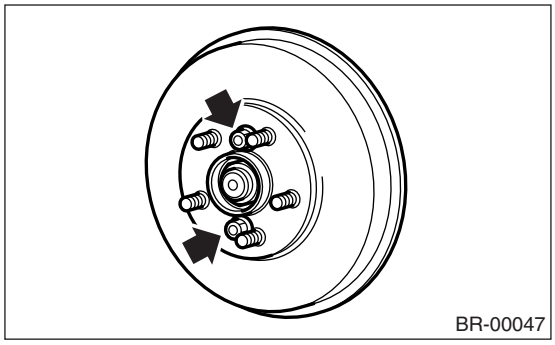
1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly.

NOTE:
• If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjuster assembly pawls using a flat tip screwdriver until brake shoe separates from drum.



(1) Back plate assembly
(2) Wheel cylinder assembly
(3) Adjuster ASSY pawls
(4) Adjusting lever
(5) Tightening direction
(6) Push direction

• If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in the brake drum.



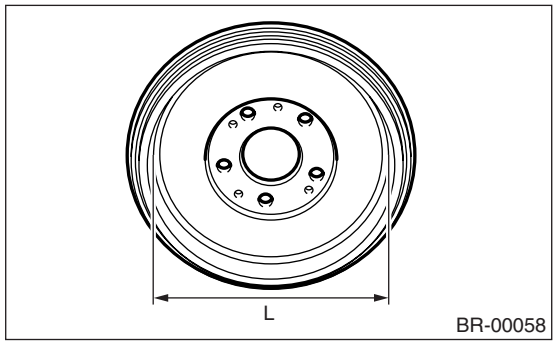
B: INSTALLATION

Set the outside diameter of brake shoes less than 0.5 to 0.8 mm (0.020 to 0.031 in) in comparison with inside diameter of brake drum.

C: INSPECTION

1) If the inside surface of brake drum is streaked, correct the surface. And, if it is unevenly worn, taperingly streaked, or the outside surface of brake drum is damaged, correct or replace it.
2) Measure the drum inner diameter. If the inner diameter of drum is outside the service limit, replace the drum.

Drum inner diameter L:
Standard 228.6 mm (9 in)
Service limit 230.6 mm (9.08 in)

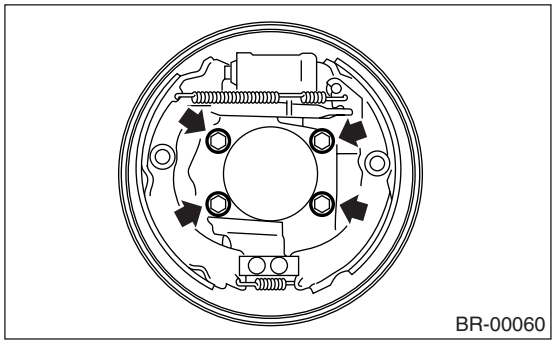


10.Rear Drum Brake Assembly

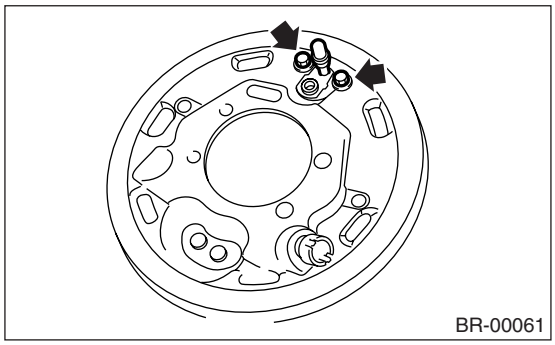
A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Set the vehicle on a lift.
2) Loosen the wheel nuts.
3) Lift-up the vehicle, and then remove the wheels.
4) Release the parking brake.
5) Remove the brake drum from brake assembly. <Ref. to BR-30, REMOVAL, Rear Drum Brake Drum.>
6) Remove the brake shoe. <Ref. to BR-28, REMOVAL, Rear Drum Brake Shoe.>
7) Disconnect the brake hose. <Ref. to BR-46, REAR BRAKE HOSE (DRUM BRAKE), REMOVAL, Brake Hose.>
8) Remove the hub. <Ref. to DS-25, REMOVAL, Rear Axle.>
9) Disconnect the ABS wheel speed sensor from back plate.
10) Remove the brake assembly.


BR-00060

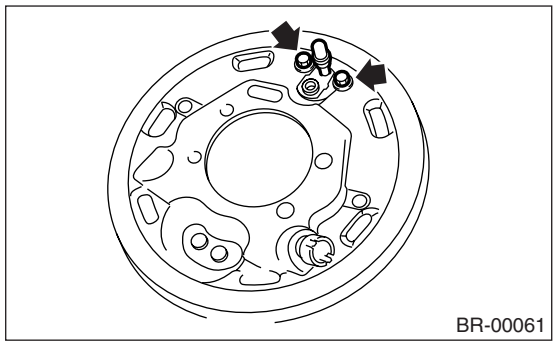
11) Remove the bolts installing wheel cylinder on back plate, and remove it.


BR-00061

B: INSTALLATION

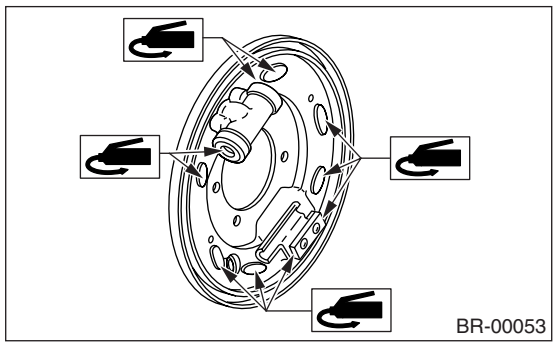
1) Clean the back plate and wheel cylinder.
2) Install the wheel cylinder on back plate, and tighten bolts.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


BR-00061

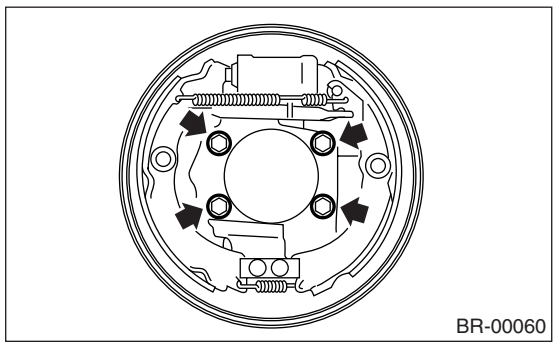
3) Apply grease to the portions indicated by arrows in the figure.

Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)


BR-00053

4) Install the brake assembly on housing, and tighten the bolts to install back plate.

Tightening torque:
53 N·m (5.4 kgf-m, 39.1 ft-lb)


BR-00060

5) Install the hub. <Ref. to DS-28, INSTALLATION, Rear Axle.>

6) Connect the brake hose, and tighten the brake hose flange nut.

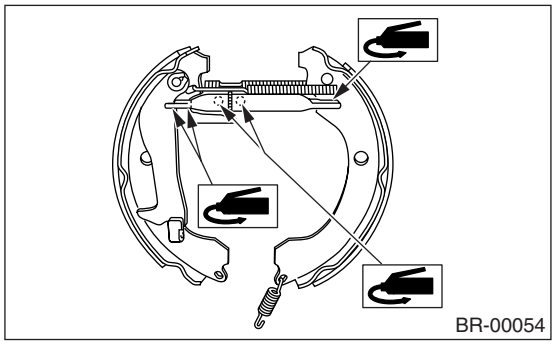
Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

7) Connect the ABS wheel speed sensor to back plate.

Tightening torque:
32 N·m (3.3 kgf-m, 24 ft-lb)

8) Apply grease to the adjusting screw and both ends of adjuster.

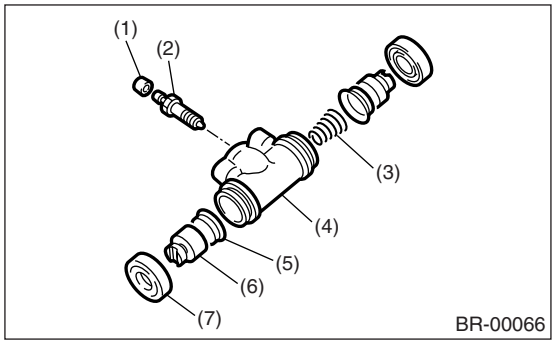
Brake grease:
Dow Corning Molykote No. 7439 (Part No. 003602001)



9) Install the brake shoe. <Ref. to BR-29, INSTALLATION, Rear Drum Brake Shoe.>
10) Install the brake drum. <Ref. to BR-30, INSTALLATION, Rear Drum Brake Drum.>
11) After installing the brake assembly, bleed air from the brake line. <Ref. to BR-44, Air Bleeding.>

C: DISASSEMBLY

1) Remove the right and left dust boots from wheel cylinder.



(1) Air Bleeder cap
(2) Air Bleeder screw
(3) Spring
(4) Wheel Cylinder body
(5) Cup
(6) Piston
(7) Dust Boot

2) Remove the piston, cup, spring and air bleeder screw and cap.

D: ASSEMBLY

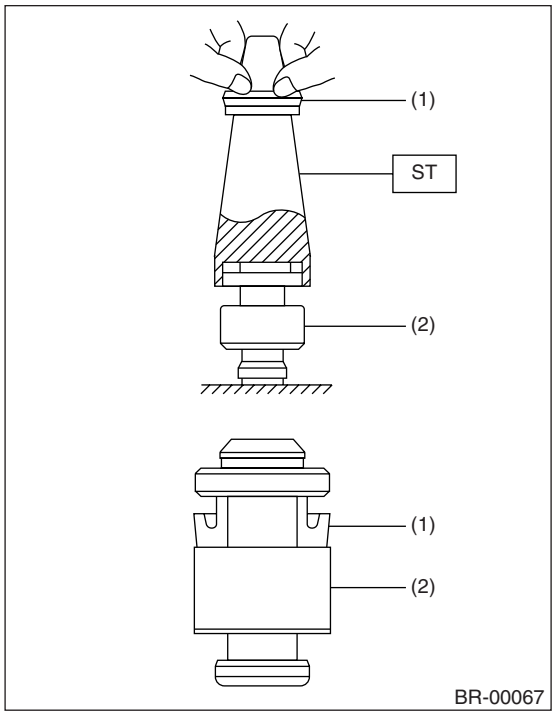
1) Clean all parts in brake fluid. Check and replace the faulty parts.
- Cup and boot for damage or fatigue
- Cylinder, piston and spring or damage or rust formation

2) Assemble in the reverse order of disassembly.
(1) When installing the cup, use ST, apply brake fluid to the frictional surface for smooth installation and pay attention to cup direction.
(2) STs are available in different sizes.

CAUTION:
When replacing the repair kit, make sure that the sizes of cylinder and cup are the same as those which were replaced.

ST: ADAPTER	
Applicable size	Part No.
19 mm (3/4 in)	926460000

CAUTION:
While assembling, be careful to prevent any metal chip, dust or dirt from entering the wheel cylinder.

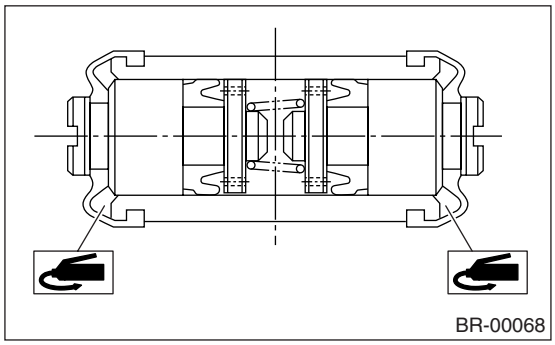


(1) Cup
(2) Piston

3) Apply rubber grease to the boot inside as shown in the figure.

CAUTION:
Never use brake grease.

Grease:
NIGLUBE RX-2 (Part No. K0779GA102)



E: INSPECTION

If the deformation or wear of back plate, shoe, etc. are notable, replace them.

11.Master Cylinder

A: REMOVAL

CAUTION:
Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.

1) Thoroughly drain brake fluid from reservoir tank.
2) Disconnect the fluid level indicator harness connector.
3) Remove the brake pipes from master cylinder.
4) Remove the master cylinder mounting nuts, and take out master cylinder from brake booster.

B: INSTALLATION

1) To install the master cylinder to body, reverse the sequence of removal procedure.

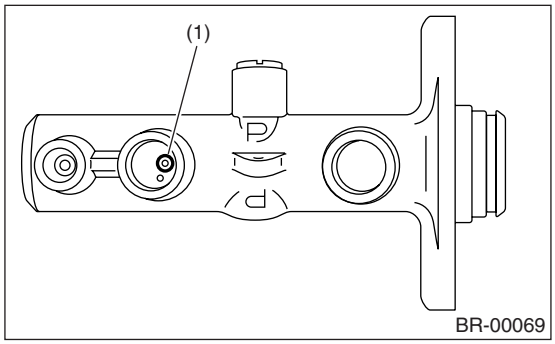
Tightening torque:
Master cylinder mounting nut
14 N·m (1.4 kgf-m, 10.3 ft-lb)
Piping flare nut
15 N·m (1.5 kgf-m, 11.1 ft-lb)

CAUTION:
Be sure to use recommended brake fluid.

2) Bleed air from the brake system. <Ref. to BR-44, PROCEDURE, Air Bleeding.>

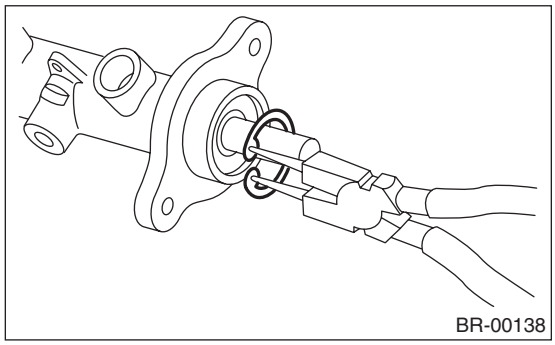
C: DISASSEMBLY

1) Remove mud and dirt from the surface of brake master cylinder.
2) Secure the master cylinder on a vise.
3) Remove the pin which secures reservoir tank to master cylinder, and then remove the reservoir tank and grommet.
4) Remove the cylinder pin with magnetic pick-up tool while pushing in primary piston by screwdriver which wrapped with tape.

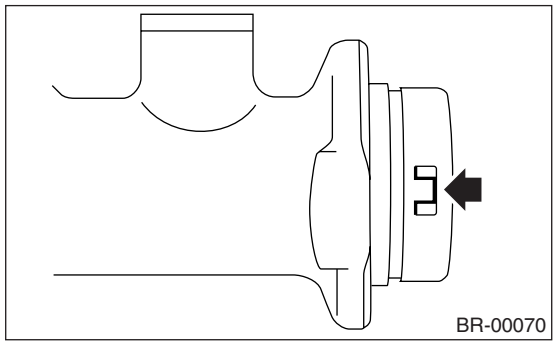


(1) Cylinder pin (straight pin)

5) Remove the C-ring. (model with VDC)



6) Pry up the pawl and remove piston retainer. Hold piston retainer tight, because the piston may jump out from master cylinder.

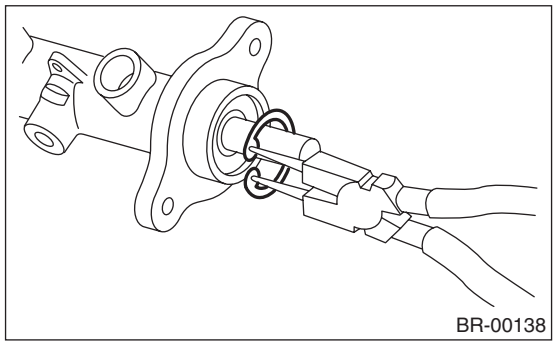


7) Extract the primary piston assembly and secondary piston assembly straight out, while taking care not to scratch the inner surface of cylinder.
8) Use brake fluid to wash the inside wall of cylinder, and piston assembly. If any damage, deformation, wear, rust, and other faults are found, replace the faulty part.

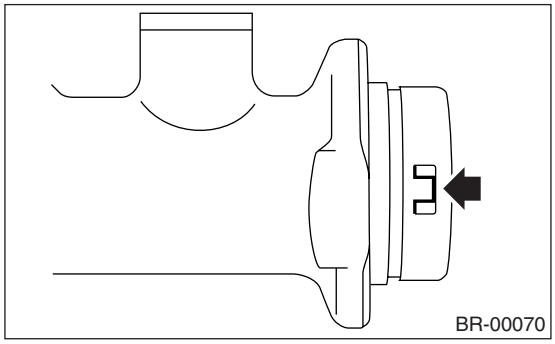
D: ASSEMBLY

1) Apply recommended brake fluid to the inside wall of cylinder, and to outer surface of the piston assembly.
2) Ensure that the inside wall of cylinder, and piston assembly are free from dirt when assembling. Install the primary piston assembly and secondary piston assembly, while taking care not to damage, scratch, or dent the cylinder inside wall, and piston assembly.
3) Install the cylinder pin while pushing in primary piston by screwdriver which wrapped with tape.

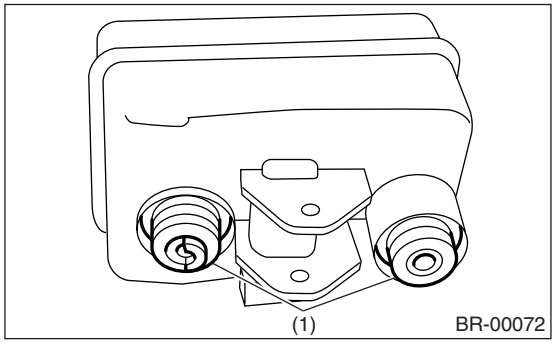
4) Install the C-ring. (model with VDC)



5) Install the piston retainer, and then secure it by pressing the pawl.



6) Install the seal to reservoir tank.



(1) Seal

7) Install the reservoir tank to master cylinder and secure with pin.

E: INSPECTION

If any damage, deformation, wear, swelling, rust, and other faults are found on the primary piston assembly, secondary piston assembly, supply the valve stopper, or gasket, replace the faulty part.

Service limit :

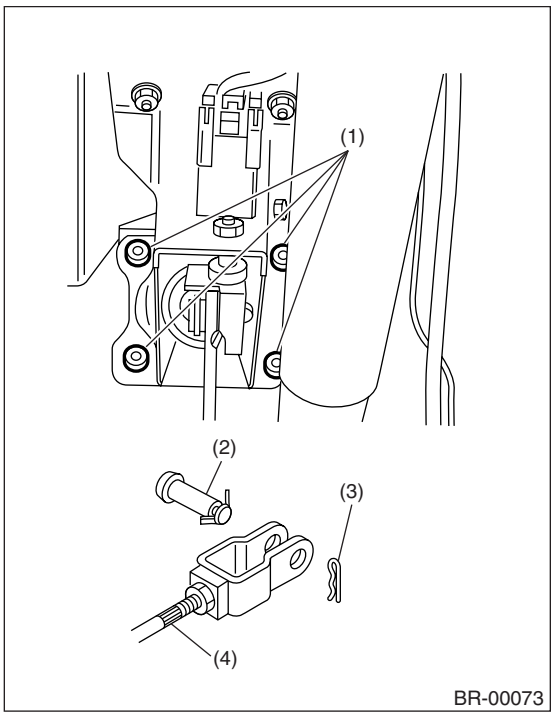
The clearance between each piston and the master cylinder inner dia. 0.11 mm (0.0043 in)

NOTE:
The primary and secondary pistons must be replaced as complete assemblies.

12.Brake Booster

A: REMOVAL

1) Remove or disconnect the following parts at engine compartment.
   (1) Disconnect the connector for brake fluid level indicator.
   (2) Remove the brake pipes from master cylinder.
   (3) Remove the master cylinder installing nuts.
   (4) Disconnect the vacuum hose from brake booster.
2) Remove the following parts from pedal bracket.
   (1) Snap pin and clevis pin
   (2) Four brake booster installing nuts

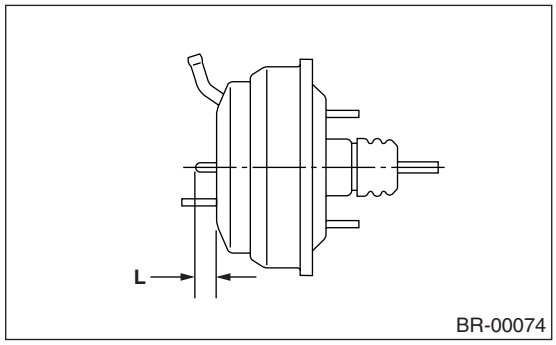


(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

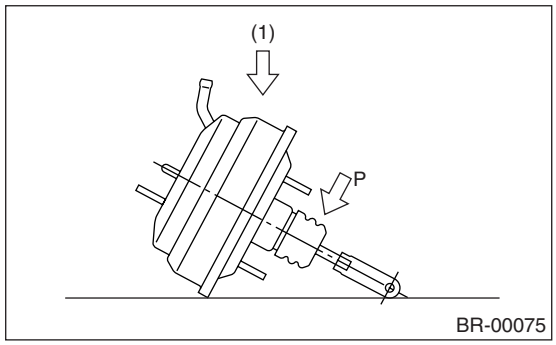
3) Remove the brake booster while shunning brake pipes.

NOTE:
• Be careful not to drop the brake booster. The brake booster should be discarded if it has been dropped.
• Use special care when handling the operating rod.
If excessive force is applied to the operating rod, sufficient to cause a change in the angle in excess of ±3°, it may result in damage to the master cylinder.
• Use care when placing the brake booster on floor.
• Do not change the push rod length. If it has been changed, reset the projected length “L” to standard length.

Standard L:
LHD model : 10.05 mm (0.4 in)
RHD model (Model with ABS) : 10.4 mm (0.41 in)
RHD model (Model with VDC) : 1.8 mm (0.07 in)



CAUTION:
If external force is applied from above when the brake booster is placed in this position, the resin portion as indicated by “P”, may be damaged.



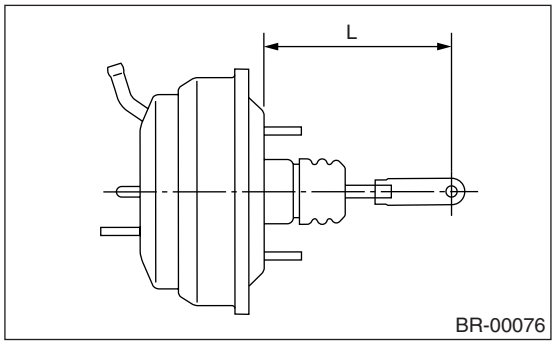
(1) Force

B: INSTALLATION

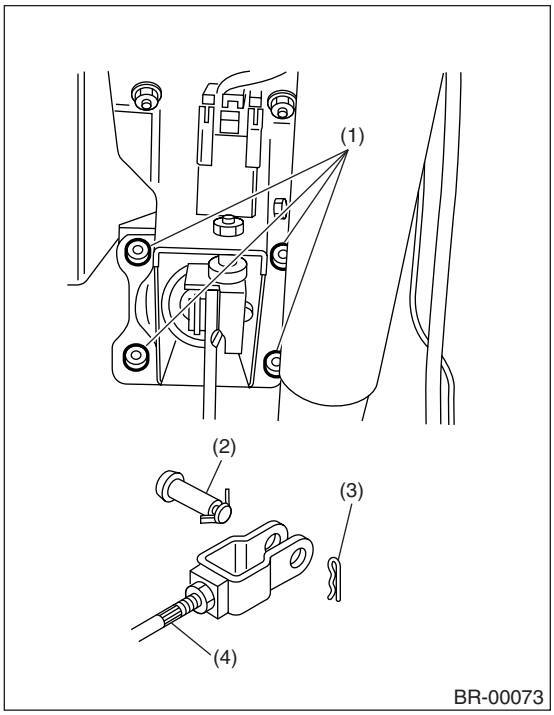
1) Adjust the operating rod of brake booster.

Standard L:
LHD model : 144.6 mm (5.69 in)
RHD model : 173.2 mm (6.82 in)

If it is not within specified value, adjust it by adjusting the brake booster operating rod.

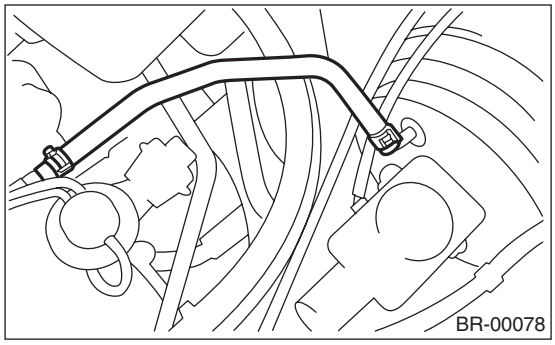


2) Mount the brake booster in position.
3) Connect the operating rod to brake pedal with clevis pin and snap pin.



(1) Nuts
(2) Clevis pin
(3) Snap pin
(4) Operating rod

4) Connect the vacuum hose to brake booster.



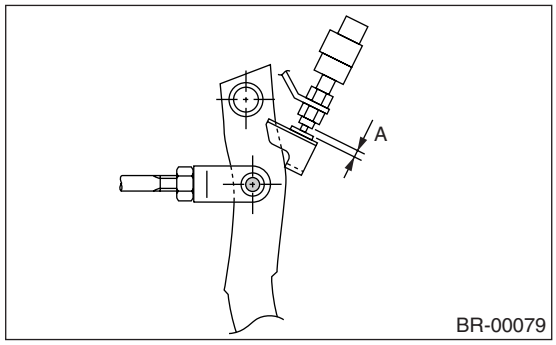
5) Mount the master cylinder onto brake booster.
6) Connect the brake pipes to master cylinder.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

7) Connect the electric connector for brake fluid level indicator.
8) Measure the clearance between threaded end of stop light switch and stopper.If it is not within specified value, adjust it by adjusting the position of stop light switch. <Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>

CAUTION:
Be careful not to rotate the stop light switch.

Stop light switch clearance A:
0.3 mm (0.012 in)



9) Apply grease to operating rod connecting pin to prevent it from wearing.
10) Bleed air from the brake system. <Ref. to BR-44, Air Bleeding.>

Tightening torque (Air bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

11) Conduct road tests to ensure brakes do not drag.

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

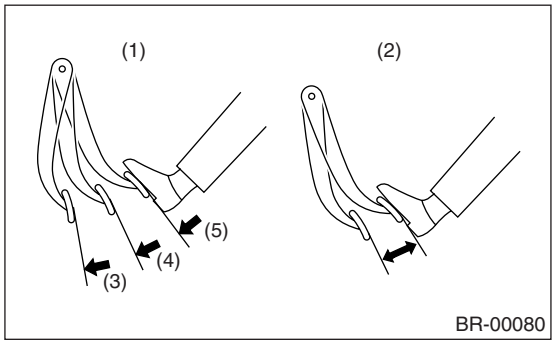
CAUTION:
When checking operation, be sure to securely apply the parking brake.

• CHECKING WITHOUT GAUGES

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of failure if checking is conducted in accordance with the following procedures.

• AIR TIGHTNESS CHECK

Start the engine, and run it for 1 to 2 minutes, then turn it off. Depress the brake pedal several times applying same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, the brake booster is faulty.

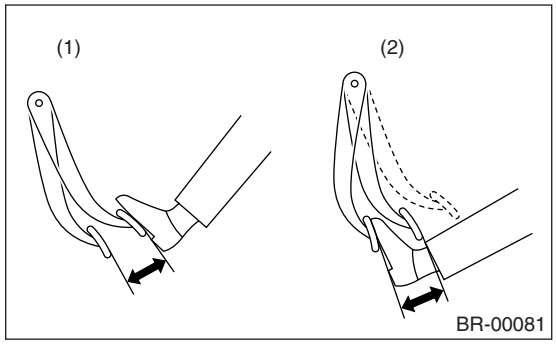


(1) OK
(2) NOT OK
(3) 1st
(4) 2nd
(5) 3rd

NOTE:
• In the event of defective operation, inspect the condition of check valve and vacuum hose.
• Replace them if faulty and conduct the test again.
• If no improvement is observed, check precisely with gauges.

• OPERATION CHECK

1) With the engine off, depress the brake pedal several times applying same pedal force and make sure that pedal height does not vary with each depression of pedal.



(1) When engine is stopped
(2) When engine is started

2) With the brake pedal depressed, start the engine.
3) As the engine starts, the brake pedal should move slightly toward the floor. If no change occurs in the pedal height, the brake booster is faulty.

NOTE:
If faulty, check precisely with gauges.

• LOADED AIR TIGHTNESS CHECK

Depress the brake pedal while engine is running, and turn off the engine while pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, the brake booster is functioning normally; if the pedal height increases, it is faulty.

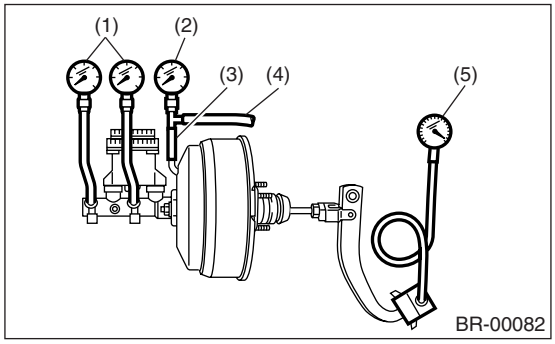
NOTE:
If faulty, check precisely with gauges.

2. OPERATION CHECK (WITH GAUGES)

CAUTION:
When checking operation, be sure to securely apply the parking brake.

• CHECKING WITH GAUGES

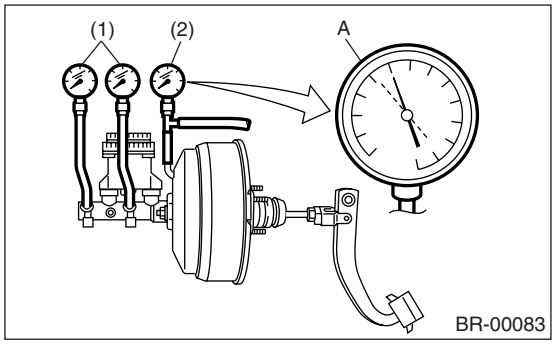
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



(1) Pressure gauge
(2) Vacuum gauge
(3) Adapter hose
(4) Vacuum hose
(5) Pedal force gauge

• AIR TIGHTNESS CHECK

1) Start the engine and keep it running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point A is indicated on vacuum gauge. Do not depress the brake pedal.



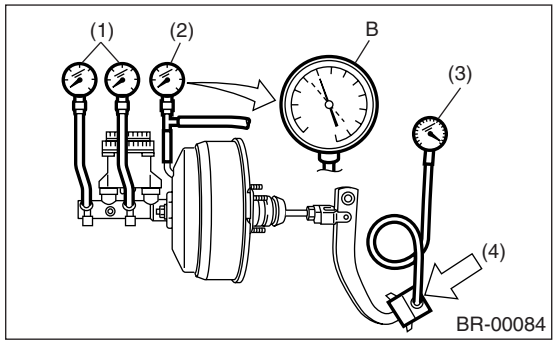
(1) Pressure gauge
(2) Vacuum gauge

2) Stop the engine and watch the gauge. If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly.
If defective, the cause may be one of those listed below.

- Check valve malfunction
- Leak from vacuum hose
- Leak from the shell jointed portion or stud bolt welded portion
- Damaged diaphragm
- Leak from valve body seal and bearing portion
- Leak from plate and seal assembly portion
- Leak from poppet valve assembly portion

• LOADED AIR TIGHTNESS CHECK

1) Start the engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lbf). Keep the engine running until a vacuum of 66.7 kPa (500 mmHg, 19.69 inHg) = point B is indicated on vacuum gauge while the pedal is still depressed.



(1) Pressure gauge
(2) Vacuum gauge
(3) Pedal force gauge
(4) Depress

2) Stop the engine and watch vacuum gauge.
If the vacuum drop range is less than 3.3 kPa (25 mmHg, 0.98 inHg) within 15 seconds after stopping engine, the brake booster is functioning properly.
If defective, refer to “AIR TIGHTNESS CHECK”.
<Ref. to BR-38, INSPECTION, Brake Booster.>

3) If any fault is found on brake booster, replace the brake booster with a new one.

• LACK OF BOOSTING ACTION CHECK

Turn off the engine, and set the vacuum gauge reading at "0". Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

	Brake pedal force	147 N (15 kgf, 33 lbf)	294 N (30 kgf, 66 lbf)
Europe · General	Fluid pressure	588 kPa (6 kgf/cm^2, 85 psi)	1,471 kPa (15 kgf/cm^2, 213 psi)
Australia		588 kPa (6 kgf/cm^2, 85 psi)	1,667 kPa (17 kgf/cm^2, 242 psi)

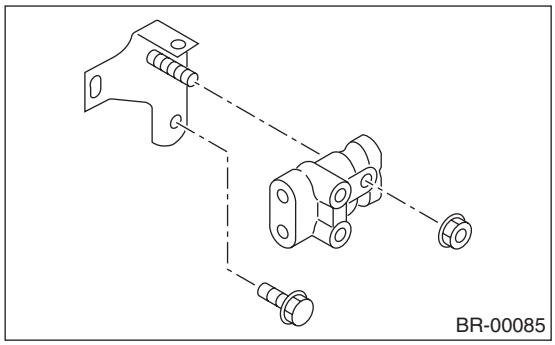
• BOOSTING ACTION CHECK

Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

	Brake pedal force	147 N (15 kgf, 33 lbf)	294 N (30 kgf, 66 lbf)
Europe · General	Fluid pressure	5,688 kPa (58 kgf/cm^2, 825 psi)	9,121 kPa (93 kgf/cm^2, 1,322 psi)
Australia		6,374 kPa (65 kgf/cm^2, 925 psi)	10,199 kPa (104 kgf/cm^2, 1,479 psi)

13.Proportioning Valve

A: REMOVAL



1) Remove the brake pipe from proportioning valve at four places.
2) Remove the proportioning valve from its bracket.

NOTE:
Do not disassemble or adjust the proportioning valve. (The proportioning valve must be replaced as an assembly.)

B: INSTALLATION

1) Install the proportioning valve to bracket.
2) Connect the brake pipes correctly to proportioning valve.

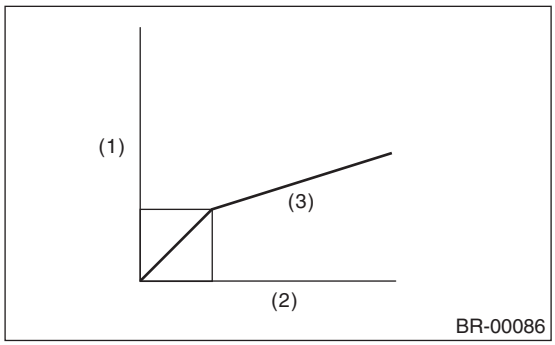
Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

3) Bleed air, then check each joint of the brake pipe for oil leaks. <Ref. to BR-44, Air Bleeding.>

Tightening torque:
Proportioning valve to brake pipe flare nut:
15 N·m (1.5 kgf-m, 11.1 ft-lb)
Proportioning valve to bracket:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: INSPECTION

1) Install the oil pressure gauges to measure the master cylinder fluid pressure (front wheel brake fluid pressure) and rear wheel cylinder fluid pressure.
2) Bleed air from the oil pressure gauges.
3) Check the master cylinder fluid pressure and rear wheel cylinder fluid pressure.
The standard values are shown in the figure.



(1) Rear wheel cylinder fluid pressure
(2) Master cylinder fluid pressure
(3) When both circuits are normal

4) For the oil pressure in case of split point, refer to “SPECIFICATIONS”.
<Ref. to BR-2, SPECIFICATION, General Description.>

14.Brake Fluid

A: INSPECTION

1) Check that the brake fluid level remains between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If the fluid level becomes close to “MIN”, refill the fluid.
2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

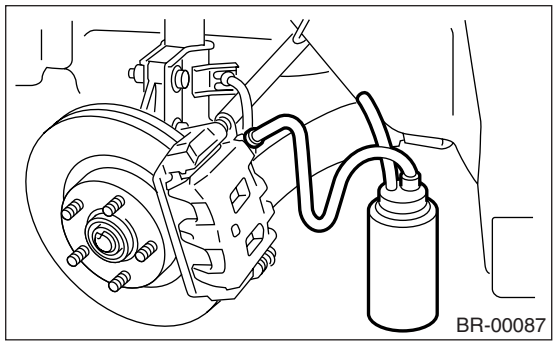
CAUTION:
• To always maintain the brake fluid characteristics, replace the brake fluid according to maintenance schedule or earlier than that when used in severe condition.
• The FMVSS No. 116, fresh DOT3 or DOT4 brake fluid must be used.
• Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

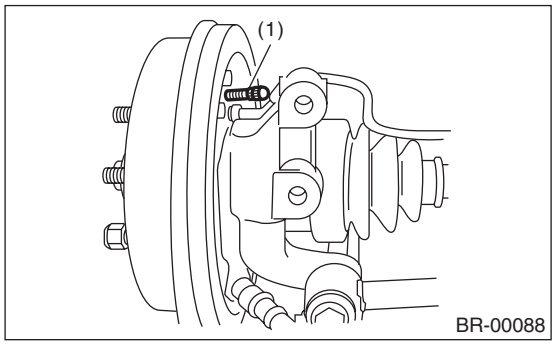
NOTE:
• During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.
• The amount of brake fluid required is approx. 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

1) Either jack-up the vehicle and place a rigid rack under it, or left up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from master cylinder with syringe.
4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

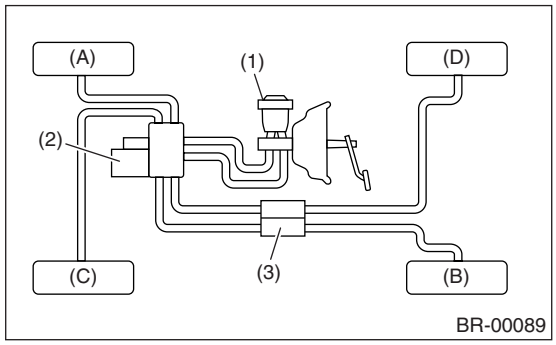
5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.





(1) Air bleeder screw

CAUTION:
Brake fluid replacement sequence; (A) Front RH → (B) Rear LH → (C) Front LH → (D) Rear RH



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

6) Instruct your co-worker to depress the brake pedal slowly two or three times and then hold it depressed.
7) Loosen the bleeder screws to drain the brake fluid. And then quickly tighten the screw.

8) Release the brake pedal slowly. Repeat steps 6) through 8) until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:
Add brake fluid as necessary while performing air bleed operation, in order to prevent the tank from running short of brake fluid.

9) After completing the bleeding operation, hold brake pedal depressed and tighten screw and install bleeder cap.

Tightening torque (Bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

10) Bleed air from each wheel cylinder using the same procedures as described in steps 6) through 8) above.

11) Depress the brake pedal with a force of approx. 294 N (30 kgf, 66 lbf) and hold it there for approx. 20 seconds. At this time check for mix in air and pedal height change. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.

12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

15.Air Bleeding

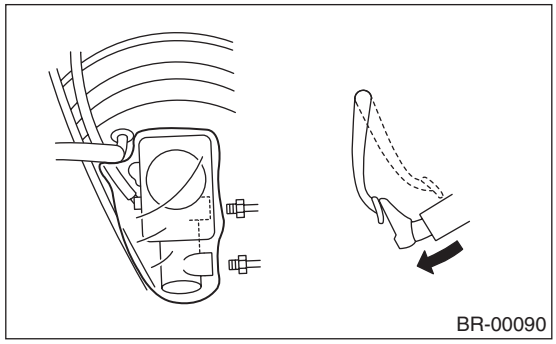
A: PROCEDURE

CAUTION:
• The FMVSS No. 116, fresh DOT3 or DOT4 brake fluid must be used.
• Cover the bleeder with waste cloth when loosening it to prevent brake fluid from being splashed over surrounding parts.
• Do not allow brake fluid to come in contact with vehicle body; wash away with water and wipe off completely if spilled.
• Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
• Be careful not to allow dirt or dust to get into the reservoir tank.

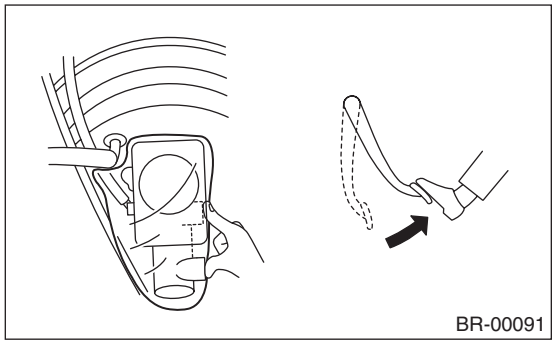
1. MASTER CYLINDER

NOTE:
• If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

1) Loosen the wheel nuts, jack-up the vehicle, support it with rigid racks and remove the wheel.
2) Disconnect the brake line at primary and secondary sides.
3) Put a plastic bag cover on master cylinder.
4) Carefully depress and hold the brake pedal.


BR-00090

5) Close the outlet plug with your finger, and release the brake pedal.


BR-00091

6) Repeat step 4) and 5) until the brake fluid is completely bled from outlet plug.
7) Remove the plastic bag.
8) Install the brake pipes to master cylinder.

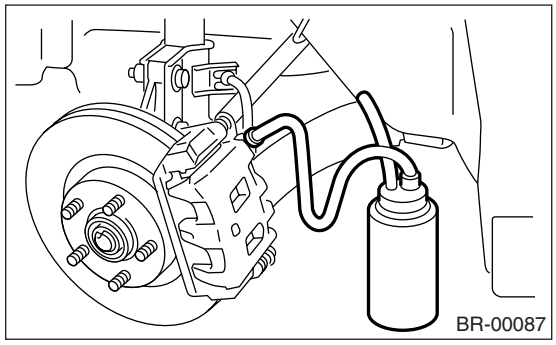
Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-44, BRAKE LINE, PROCEDURE, Air Bleeding.>

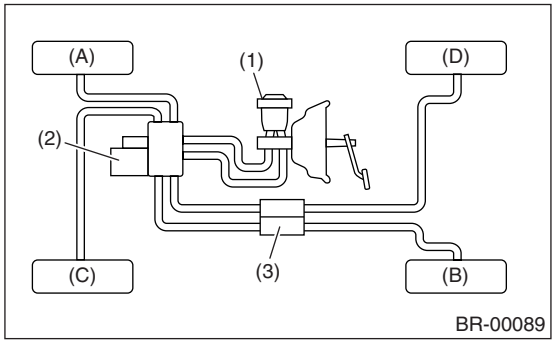
2. BRAKE LINE

NOTE:
• During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
• The brake pedal operating must be very slow.
• For convenience and safety, two people should do the work.

1) Make sure that there is no leak from the joints and connections of brake system.
2) Fit one end of vinyl tube into the air bleeder and put the other end into a brake fluid container.


BR-00087

CAUTION:
Brake fluid replacement sequence; (A) Front RH → (B) Rear LH → (C) Front LH → (D) Rear RH



(1) Master cylinder
(2) Hydraulic unit
(3) Proportioning valve

3) Slowly depress the brake pedal and keep it depressed. Then, open the air bleeder to discharge air together with the fluid.
Release the air bleeder for 1 to 2 seconds.
Next, with the bleeder closed, slowly release the brake pedal.
Repeat these steps until there are no more air bubbles in the vinyl tube.
Allow 3 to 4 seconds between two brake pedal operations.

CAUTION:
Cover the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

NOTE:
The brake pedal operating must be very slow.

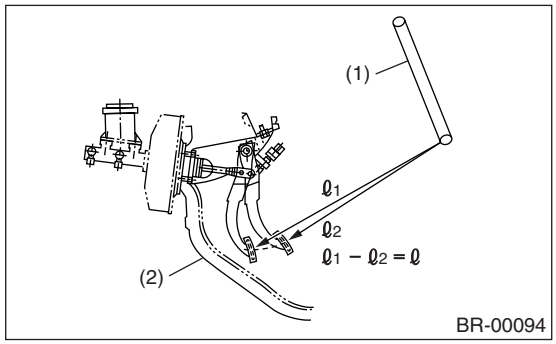
4) Tighten the air bleeder securely when no air bubbles are visible.

Air bleeder tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

5) Perform these steps for the brakes connecting to secondary chamber of master cylinder, first, and then for the ones connecting to primary chamber. With all procedures completed, fully depress the brake pedal and keep it in that position for approx. 20 seconds to make sure that there is no leak evident in the entire system.

6) Check the pedal stroke.
While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lbf) load and measure the distance between brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measurements must not be more than specified.

Specified pedal stroke ℓ :
Europe General model:
90 mm (3.54 in)
Australia model:
105 mm (4.13 in)
When depressing brake pedal with a 490 N (50 kgf, 110 lbf) load.



(1) Steering wheel
(2) Toe board

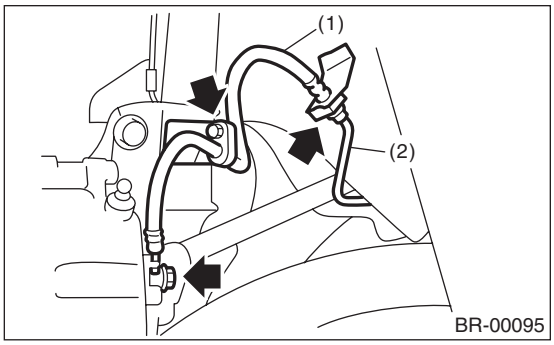
7) If the distance is more than the specifications, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.
8) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-11, ABS Sequence Control.>
9) Recheck the brake stroke.
10) If the distance is more than specifications, there is a possibility air is in the inside of hydraulic unit. Repeat above steps 2) to 9) above until pedal stroke meets the specification.
11) Add brake fluid to the required level (MAX. level) of reservoir tank.
12) As a final step, test run the vehicle at low speed and ensure that brakes provide normal braking action.

16.Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

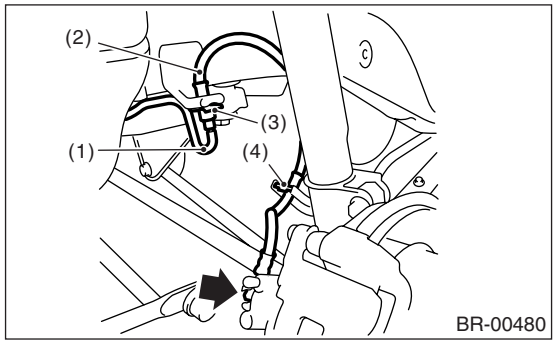
1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove the clamp, bolt at strut mount, and union bolt.



(1) Brake hose
(2) Brake pipe

2. REAR BRAKE HOSE (DISC BRAKE)

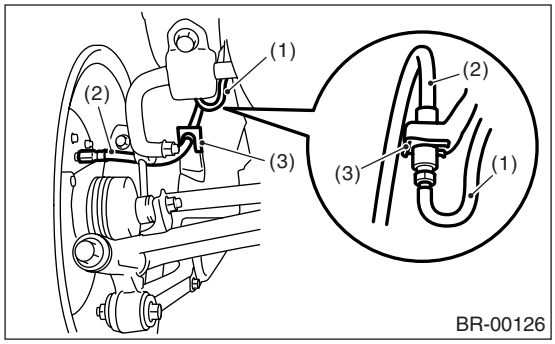
1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove the clamp and union bolt.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp
(4) Brake hose clamp

3. REAR BRAKE HOSE (DRUM BRAKE)

1) Separate the brake pipe from brake hose using a flare nut wrench.
2) Remove two clamps.
3) Separate the brake hose from wheel cylinder.



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

B: INSTALLATION

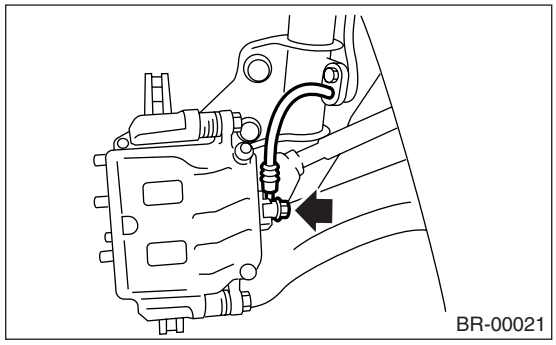
1. FRONT BRAKE HOSE

1) Secure the brake hose to strut mount.

Tightening torque (Union bolt):
33 N·m (3.4 kgf-m, 25 ft-lb)

2) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Position the disc in straight-forward direction and route brake hose through hole in bracket on wheel apron side.

CAUTION:
Be sure brake hose is not twisted.

4) Temporarily tighten the flare nut to connect brake pipe and hose.
5) Fix the brake hose with clamp at wheel apron bracket.
6) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 11.1 ft-lb)

7) Bleed air from the brake system.

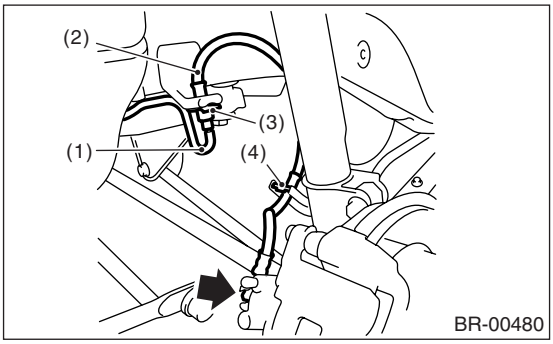
2. REAR BRAKE HOSE (DISC BRAKE)

1) Pass the brake hose through hole of bracket, and lightly tighten the flare nut to connect brake pipe.
2) Insert the clamp upward to fix brake hose.
3) Install the brake hose to caliper using a new gasket.

Tightening torque (Union bolt):
18 N·m (1.8 kgf-m, 13.0 ft-lb)

4) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (Brake pipe flare nut):
15 N·m (1.5 kgf-m, 11.1 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp
(4) Brake hose clamp

5) Bleed air from the brake system.

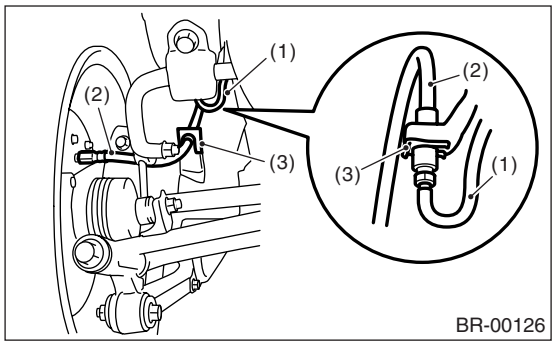
3. REAR BRAKE HOSE (DRUM BRAKE)

1) Install the brake hose to wheel cylinder.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

2) Secure the brake hose to bracket on strut using a clamp.
3) Connect the brake hose through hole in bracket on body.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)



(1) Brake pipe
(2) Brake hose
(3) Brake hose clamp

4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on the hoses. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the hose.

17.Brake Pipe

A: REMOVAL

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When removing the brake pipe, make sure that it is not bent.

B: INSTALLATION

NOTE:
Airbag system wiring harness is routed near the center brake pipe.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
• When installing the brake pipe, make sure that it is not bent.
• After installing the brake pipe and hose, bleed the air.
• After installing the brake hose, make sure that it does not touch the tire or suspension assembly, etc.

Brake pipe tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

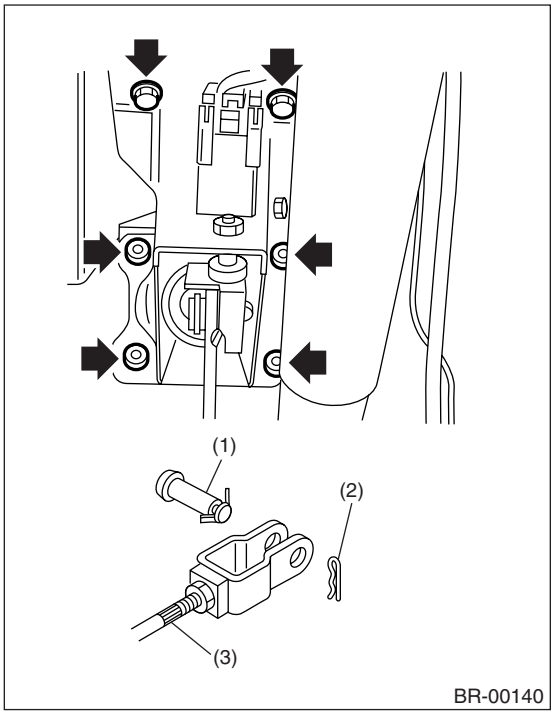
NOTE:
Use a mirror when inspecting low-visible part or back side.

18.Brake Pedal

A: REMOVAL

1. LHD AT MODEL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Remove the clevis pin which secures brake pedal to brake booster operating rod. Also disconnect the stop light switch connector.
4) Remove the two bolts and four nuts which secure the brake pedal to pedal.

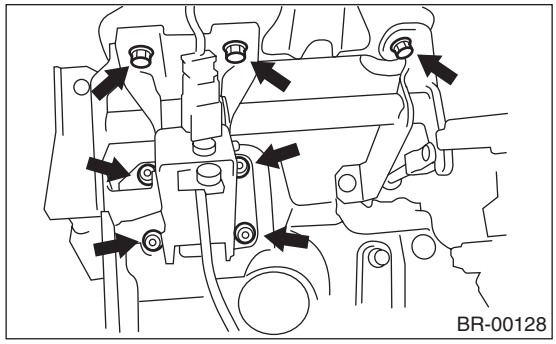


(1) Clevis pin
(2) Snap pin
(3) Operating rod

2. LHD MT MODEL

1) Remove the steering bolts.
2) Raise the vehicle on hoist and remove the two bolts which secure steering unit to underside of body.
3) Lower the vehicle to floor.
4) Remove the instrument panel lower cover from instrument panel.
5) Disconnect the following parts from pedal bracket.
- Operating rod of brake booster
- Electrical connectors (for stop light switch, etc.)

6) Remove the clevis pin which secures lever to push rod.
7) Remove the nut which secures clutch master cylinder.
8) Remove the steering assembly.
9) Remove the accelerator pedal.
10) Remove the bolts and nuts which secure pedal bracket.

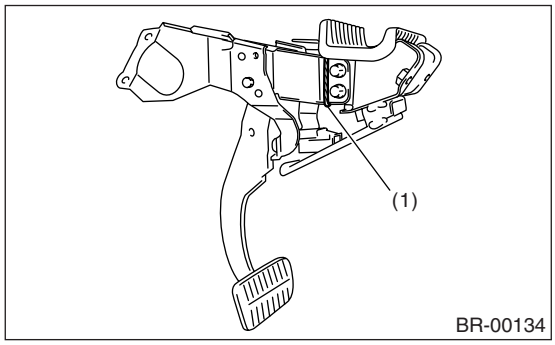


3. RHD MODEL

NOTE:
Brake pedal bracket is non-disassemble part. However the removal is necessary for replacement, refer to the following.

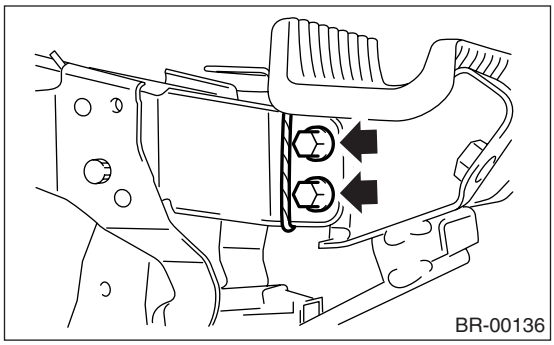
1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover from instrument panel.
3) Hold the brake pedal bracket (front side) using wires.

NOTE:
- To avoid the dislocation of brake pedal axis when the bracket opens, hold the bracket with using wires.
- Be sure not to over tighten the wires.

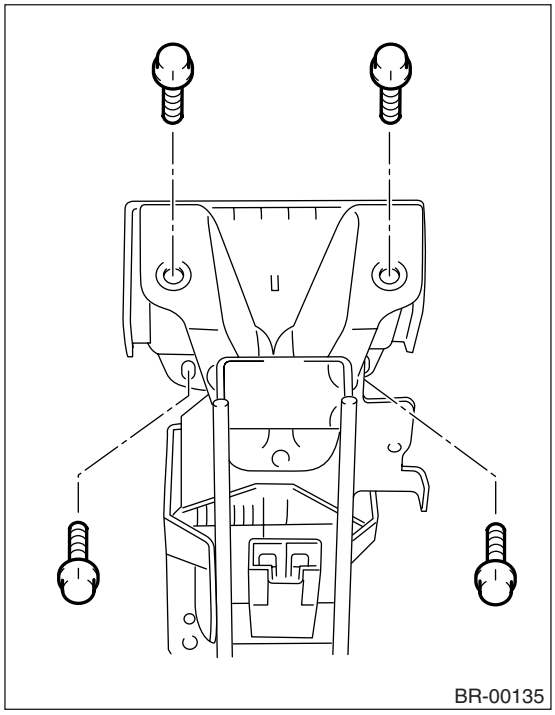


(1) Wires

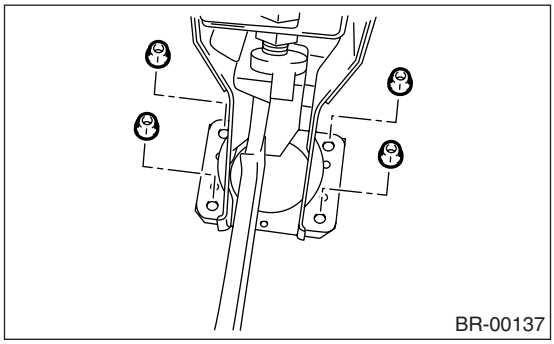
4) Remove the bolts which securing RH and LH side of brake pedal bracket (front side).



5) Remove the four bolts which securing brake pedal bracket (rear side).



6) Remove the nuts which securing brake pedal bracket (front side).



7) Remove the brake pedal.

NOTE:
During the removal of pedal, do not pry the bracket.

B: INSTALLATION

1) Install in the reverse order of removal.

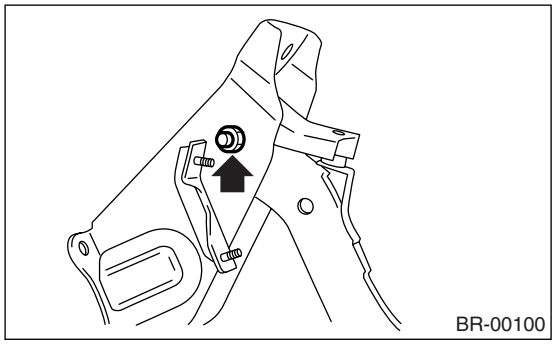
CAUTION:
• If the cable clamp is damaged, replace it with a new one.
• Never fail to cover the outer cable end with boot.
• Be careful not to kink the accelerator cable.
• Always use new clevis pins.

2) Adjust the clutch pedal. <Ref. to CL-35, ADJUSTMENT, Clutch Pedal.>
3) Inspect the brake pedal after installation. <Ref. to BR-51, INSPECTION, Brake Pedal.>

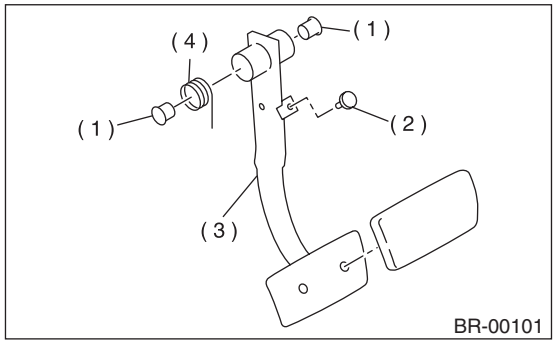
C: DISASSEMBLY

1. LHD AT MODEL

1) Remove the brake switch. <Ref. to BR-53, REMOVAL, Stop Light Switch.>
2) Unbolt, and then remove the brake pedal.



3) Remove the bushing, spacer and spring.



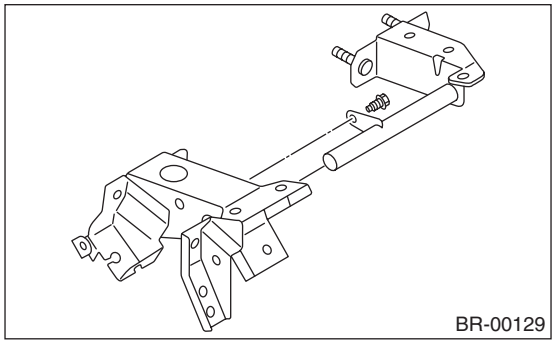
(1) Bushing
(2) Stopper
(3) Brake pedal
(4) Brake pedal spring

4) Remove the brake pedal pad.

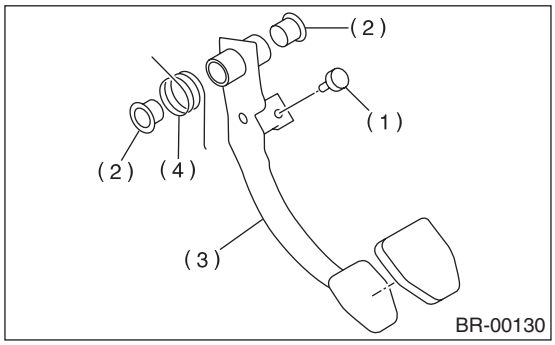
2. LHD MT MODEL

1) Remove the brake switch. <Ref. to BR-53, REMOVAL, Stop Light Switch.>
2) Remove the clutch pedal. <Ref. to CL-34, DISASSEMBLY, Clutch Pedal.>

3) Remove the clutch master cylinder bracket.



4) Remove the bushing, spring and stopper.



(1) Stopper
(2) Bushing
(3) Brake pedal
(4) Brake pedal spring

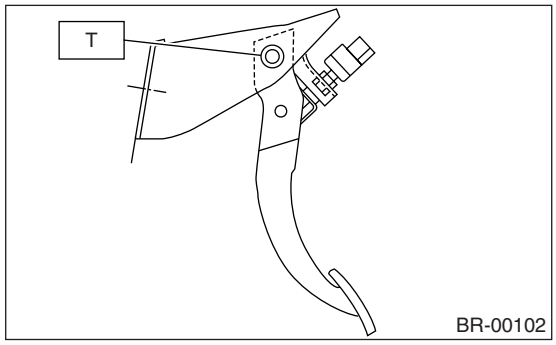
5) Remove the brake pedal pad.

D: ASSEMBLY

1) Attach the stop light switch, etc. to pedal bracket temporarily.
2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring and clutch pedal effort reducing spring (vehicle with hill holder), and then install the pedal bolt.

NOTE:
Clean up the inside of bushings and apply grease before installing spacer.

Tightening torque:
T: 29 N·m (3.0 kgf-m, 22 ft-lb)



4) After installing the brake pedal to vehicle, adjust the stop light position. <Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>

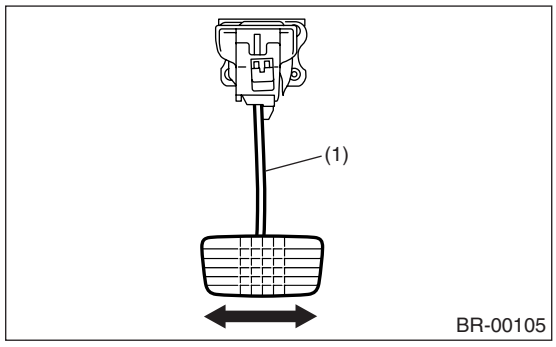
E: INSPECTION

1) Move the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lbf) to ensure pedal deflection is in specified range.

CAUTION:
If excessive deflection is noted, replace the bushings with new ones.

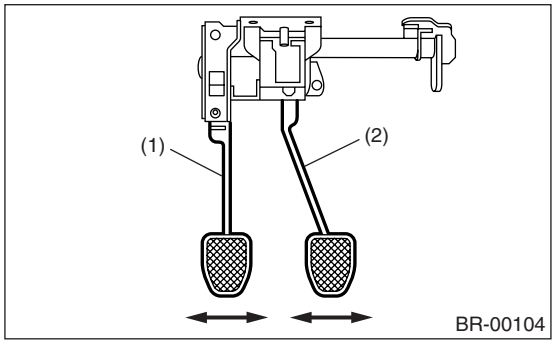
Deflection of brake and clutch pedal:
Service limit
5.0 mm (0.197 in) or less

- AT model



(1) Brake pedal

- MT model

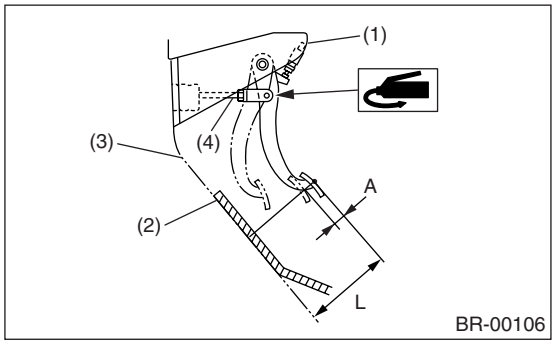


(1) Clutch pedal
(2) Brake pedal

2) Check the position of pedal pad.

Pedal height L:
148 mm (5.83 in)

Brake pedal free play A:
1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lbf).]



(1) Stop light switch
(2) Mat
(3) Toe board
(4) Brake booster operating rod

3) If it is not within specified value, adjust it by adjusting the brake booster operating rod length.

19.Stop Light Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the stop light switch connector.
3) Loosen nuts, and unscrew stop light switch to remove.

B: INSTALLATION

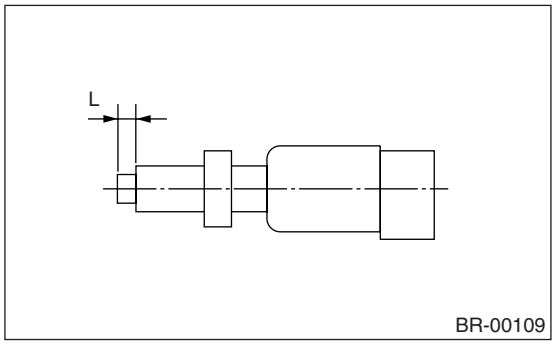
1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
2) Adjust the stop light switch position, and then tighten the nut.
<Ref. to BR-53, ADJUSTMENT, Stop Light Switch.>

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

C: INSPECTION

1) If the stop light switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

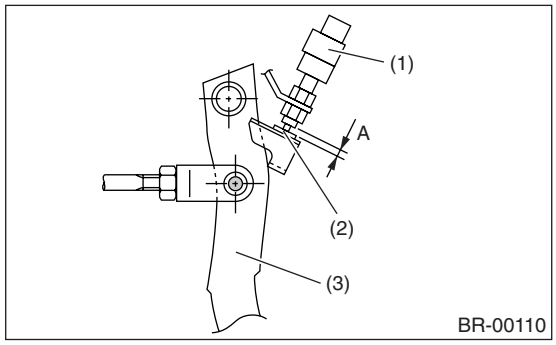
Specified position: L
2 mm (0.08 in)



2) Measure the clearance between threaded end of stop light switch and stopper.

CAUTION:
Be careful not to rotate stop light switch.

Stop light switch clearance A:
0.3 mm (0.012 in)



(1) Stop light switch
(2) Stopper
(3) Brake pedal

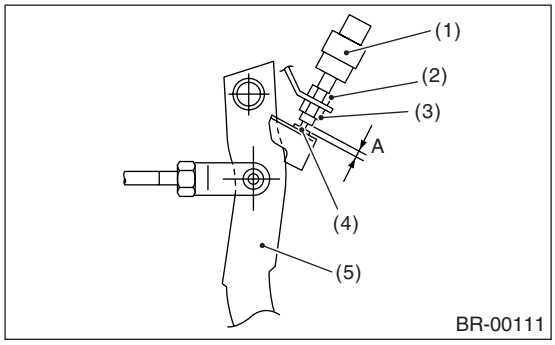
3) If it is not within specified value, adjust it by adjusting position of stop light switch.

CAUTION:
Be careful not to rotate the stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance A between threaded end of stop light switch and stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)



(1) Stop light switch
(2) Lock nut A
(3) Lock nut B
(4) Stopper
(5) Brake pedal

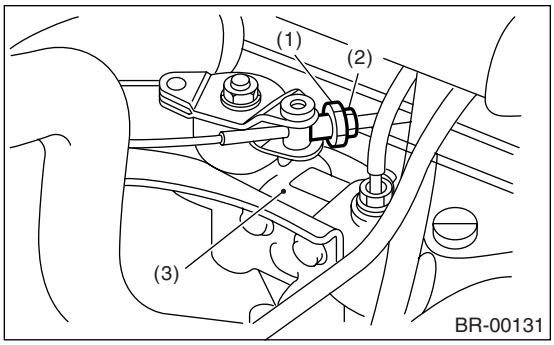
NOTE:
Tighten the lock nut B until the clearance between threaded end of stop light switch and stopper becomes 0 mm (0 in). Hold the stop light switch to prevent turning, and then loosen the lock nut B approx. 60 degrees. The clearance will become 0.3 mm (0.012 in).

20.Hill Holder

A: REMOVAL

1. PHV (PRESSURE HOLD VALVE)

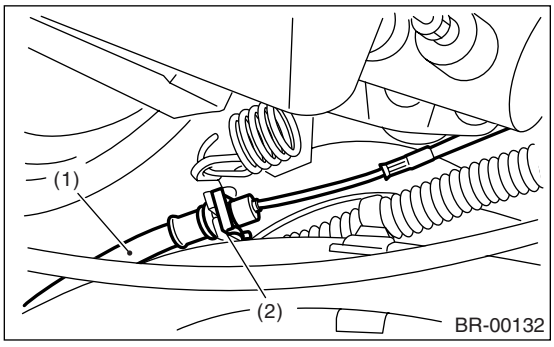
1) Drain the brake fluid from reservoir of master cylinder.
2) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Remove the cable clamp, and disconnect the PHV cable from PHV.

CAUTION:
Carefully protect the boots and inner cable from damage when disconnecting PHV cable.



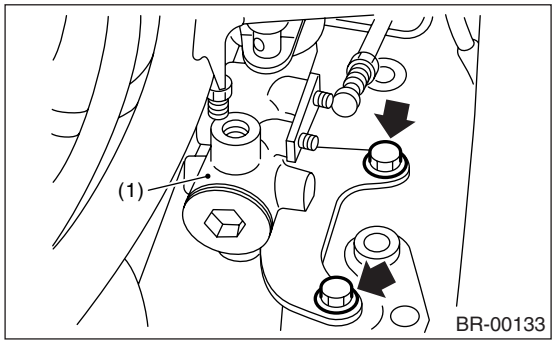
(1) PHV cable
(2) Clamp

4) Disconnect the brake pipes from PHV.

CAUTION:
• Pay attention not to drop the brake fluid onto body painting since it may dissolve paint.
• Pay attention not to damage hexagonal head of the flare nut by using pipe wrench without fail.

5) Detach the PHV along with support from side frame.

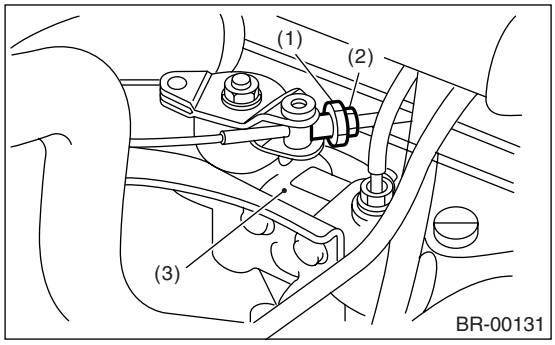
CAUTION:
Exercise utmost care to prevent foreign matter from entering into the PHV when removing it.



(1) PHV

2. PHV CABLE

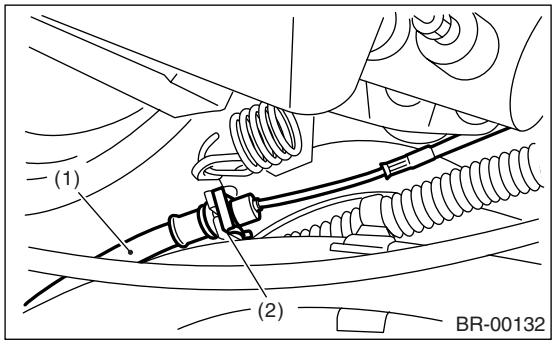
1) Remove the adjusting nut and lock nut.



(1) Adjusting nut
(2) Lock nut
(3) PHV

2) Remove the cable clamp, and disconnect PHV cable from PHV.

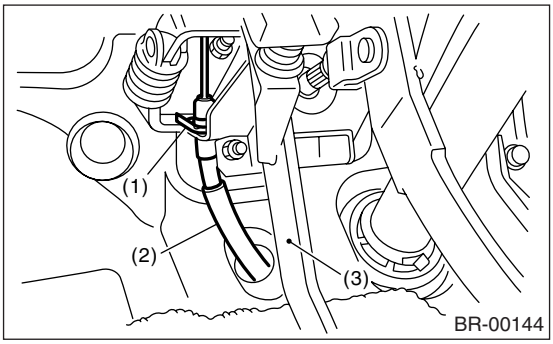
CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting PHV cable.



(1) PHV cable
(2) Clamp

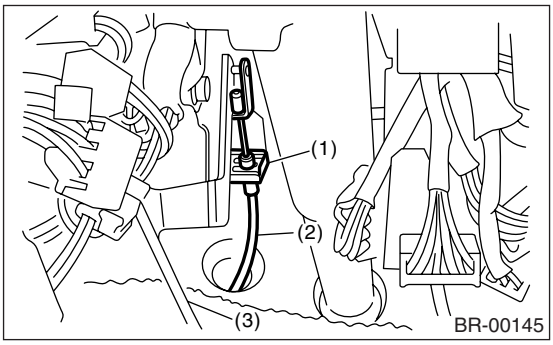
3) Remove the cable clamp from clutch pedal bracket.

• LHD model



(1) Clamp
(2) PHV cable
(3) Clutch pedal

• RHD model



(1) Clamp
(2) PHV cable
(3) Clutch pedal

4) Remove the PHV cable.

B: INSPECTION

Check up removed parts as follows, and replace defective ones.
1) Check if the boots of PHV cable are damaged or degraded, the inner cable is damaged or corroded.
2) Check if the return spring is worn out, damaged or corroded.
3) Confirm that rolling sound of the ball is heard with PHV inclined and lever rotates smoothly.

CAUTION:
Never disassemble the PHV. Replace entire PHV assembly if necessary.

C: INSTALLATION

1. PHV (PRESSURE HOLD VALVE)

1) Install the PHV onto side frame.

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Connect the brake pipes to PHV.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

CAUTION:
Confirm that the brake pipes are not deformed and/or damaged. Replace them with new ones if necessary.

3) Install the PHV cable to PHV.

CAUTION:
• If the cable clamp (and clips) is damaged, replace it with a new one.
• Avoid sharp bending of PHV cable as it may cause breakage.

4) Connect the PHV cable with clips.
5) Apply grease to the following points.
• Hook portion of return spring
• Cable end portion of lever

Grease:
SUNLIGHT 2 (Part No. 003602010)

6) Be sure to bleed air from the brake system. <Ref. to BR-44, Air Bleeding.>
7) Adjust the PHV cable. <Ref. to BR-55, PHV CABLE, INSTALLATION, Hill Holder.>

CAUTION:
After replacing the PHV cable with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

2. PHV CABLE

1) Install the PHV cable in the reverse order of removal.

CAUTION:
• If the cable clamp is damaged, replace it with a new one.
• Avoid sharp bending of PHV cable as it may cause breakage.

2) Apply grease to the following points.
• Hook portion of return spring
• Cable end portion of lever

Grease:
SUNLIGHT 2 (Part No. 003602010)

3) Adjust the PHV cable. <Ref. to BR-55, ADJUSTMENT, HILL HOLDER.>

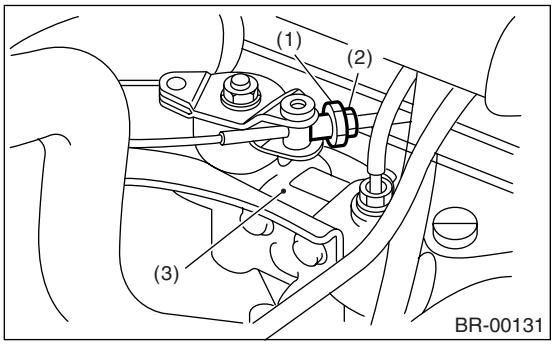
CAUTION:
After replacing the PHV cable with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

D: ADJUSTMENT

Confirm stopping and starting performances by activating the hill holder on an uphill road of 3° or higher inclination.
1) If the vehicle does not stop;

Tighten the adjusting nut of PHV cable.
2) If the vehicle does not start properly;
• Case A — When the hill holder is released later than engagement of clutch pedal (Engine tends to stall.):
Loosen adjusting nut gradually until smooth starting is enabled.
• Case B — When the hill holder is released earlier than engagement of clutch pedal (Vehicle slips down slightly.):
Tighten the adjusting nut so that hill holder is released later than engagement of clutch pedal (status in Case A). Then make adjustment the same as in Case A.

CAUTION:
Whenever turning the adjusting nut, prevent the PHV cable from revolving.



(1) Adjusting nut
(2) Lock nut
(3) PHV

3) Tighten the lock nut.

Tightening torque:
3.5 N·m (0.36 kgf-m, 2.6 ft-lb)

21.General Diagnostics Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(2) Entry of air into the hydraulic mechanism	Bleed the air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, adhering water or fluid on the lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining, drum or rotor	Eliminate cause of fluid leakage, clean, or replace.
	(2) Drum or rotor eccentricity	Correct or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by sand	Correct by grinding, or replace.
	(4) Improper lining contact, deteriorated surface material, improper inferior material, or wear	Correct by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Improper tire inflation	Inflate to correct pressure.
	(7) Disordered wheel alignment	Adjust alignment.
	(8) Loosened back plate or the support installing bolts	Retighten to specified torque.
	(9) Loosened wheel bearing	Retighten.
	(10) Trouble in the hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) Uneven effect of the parking brake	Check, adjust, or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed the air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Repair or replace (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose).
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic system	Replace.
	(4) Improper return or adjustment of parking brake	Correct or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Wheel bearing faulty	Replace.
5. Brake noise (1) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten to specified torque.
	(4) Loose wheel bearing	Retighten to specified torque.
	(5) Dirty drum or rotor	Clean the drum or rotor, or clean and replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improper installed shoe or pad	Correct or replace the shoe assembly or pad.
	(3) Loose or bent drum or rotor	Retighten or replace.

	Trouble and possible cause	Corrective action
7. Brake noise (3) (click sound)	In the case of the disc brake:	
	(1) Excessively worn pad or the support	Replace the pad or the support.
	In the case of the drum brake:	
	(1) Excessively worn shoe ridge	Replace the back plate.
	(2) Lack of oil on the shoe ridge surface and anchor	Add more grease.

PARKING BRAKE

PB

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2. Parking Brake Lever....6
3. Parking Brake Cable 7
4. Parking Brake Assembly (Rear Disc Brake) 8
5. General Diagnostic Table....11

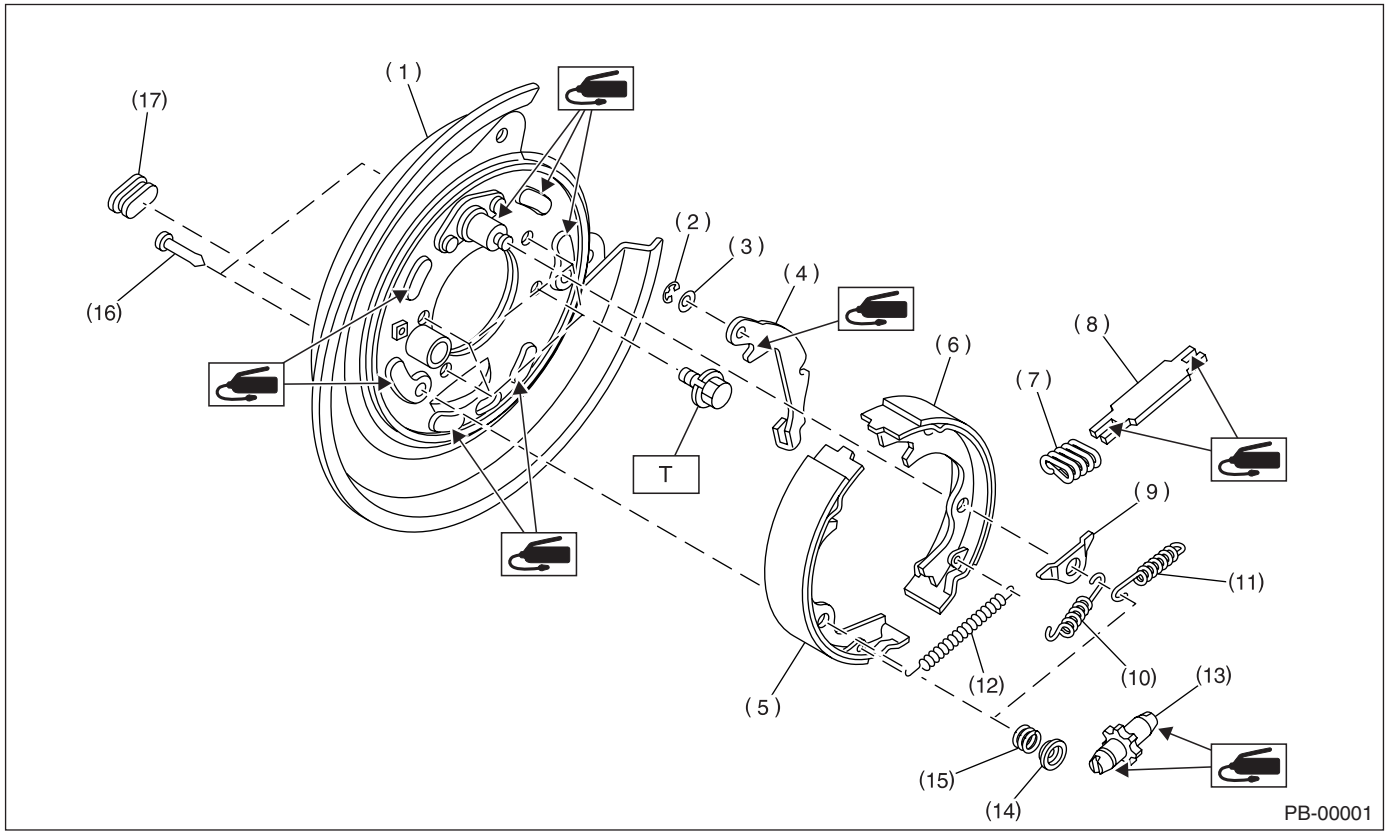
1. General Description

A: SPECIFICATION

Model		Rear drum brake	Rear disc brake
Type		Mechanical on rear brakes	Mechanical on rear brakes, drum in disc
Effective drum diameter	mm (in)	228.6 (9)	170 (6.69)
Lining dimensions (length × width × thickness)	mm (in)	219.4 × 35.0 × 4.1 (8.64 × 1.378 × 0.161)	163.1 × 30.0 × 3.2 (6.42 × 1.181 × 0.126)
Clearance adjustment		Automatic adjustment	Manual adjustment
Lever stroke	notches/N (kgf, lbf)	7 to 8/196 (20, 44)	

B: COMPONENT

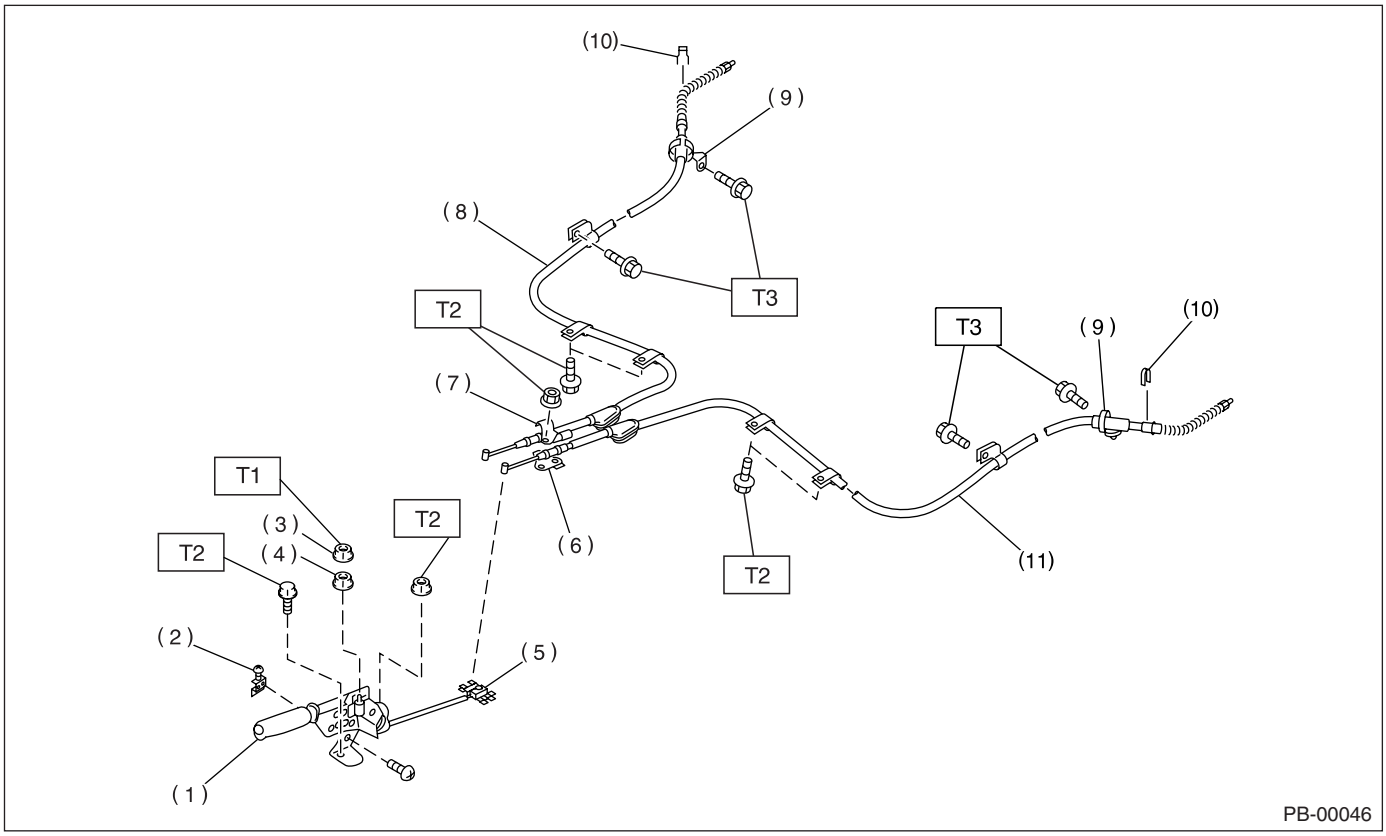
1. PARKING BRAKE (REAR DISC BRAKE)



(1) Back plate
(2) Retainer
(3) Spring washer
(4) Lever
(5) Parking brake shoe (Primary)
(6) Parking brake shoe (Secondary)
(7) Strut spring
(8) Strut
(9) Shoe guide plate
(10) Primary return spring
(11) Secondary return spring
(12) Adjusting spring
(13) Adjuster
(14) Shoe hold-down cup
(15) Shoe hold-down spring
(16) Shoe hold-down pin
(17) Adjusting hole cover

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39.1)

2. PARKING BRAKE CABLE



(1) Parking brake lever
(2) Parking brake switch
(3) Lock nut
(4) Adjusting nut
(5) Equalizer
(6) Bracket
(7) Clamp
(8) Parking brake cable RH
(9) Cable guide
(10) Clamp (Rear disc brake model only)
(11) Parking brake cable LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6 (0.6, 4.3)
T2: 18 (1.8, 13.0)
T3: 33 (3.4, 25)

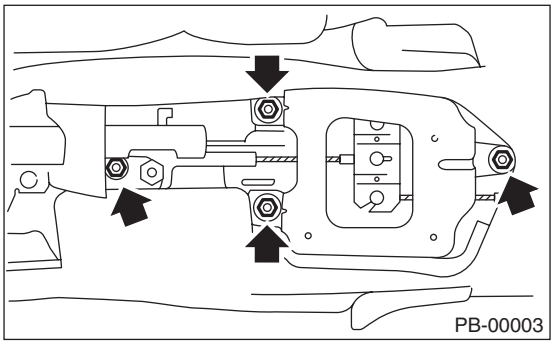
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
• Keep grease etc. away from parking brake shoes.

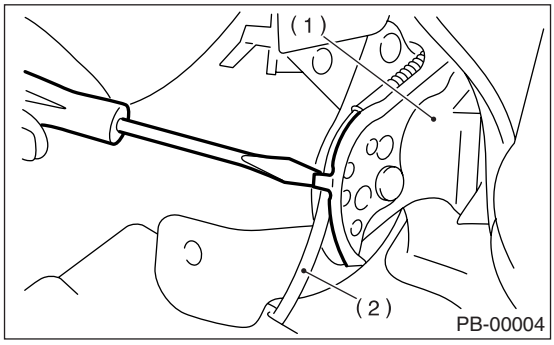
2. Parking Brake Lever

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the rear tire and wheel.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable adjusting nut and console bracket.
6) Disconnect the connector of parking brake switch.
7) Remove the parking brake lever.



8) Unbend the parking brake lever pawls and remove cable.



(1) Parking brake lever
(2) Cable

B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
Parking brake lever;
18 N·m (1.8 kgf-m, 13.0 ft-lb)
Adjusting nut;
6 N·m (0.6 kgf-m, 4.3 ft-lb)

2) Be sure to adjust the lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

• While pulling the parking brake lever upward, count the notches.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

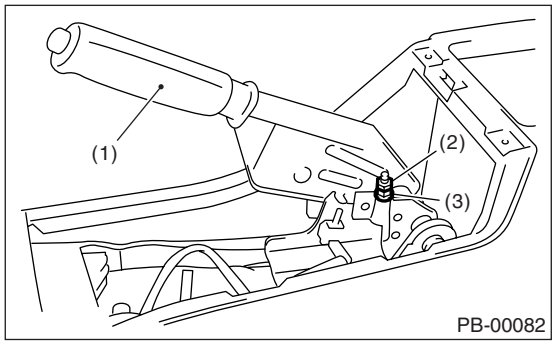
• If not as specified, adjust the parking brake. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

1) Remove the console cover.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lbf).
4) Tighten the lock nut.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

Tightening torque (Lock nut):
6 N·m (0.6 kgf-m, 4.3 ft-lb)



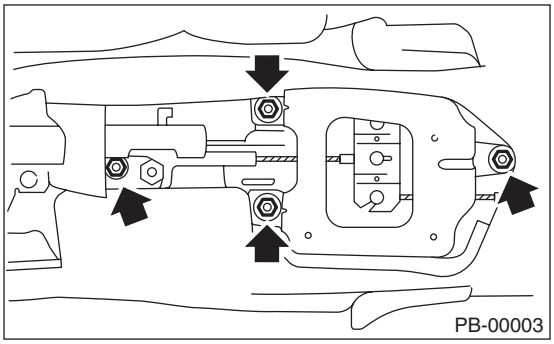
(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

5) Install the console cover.

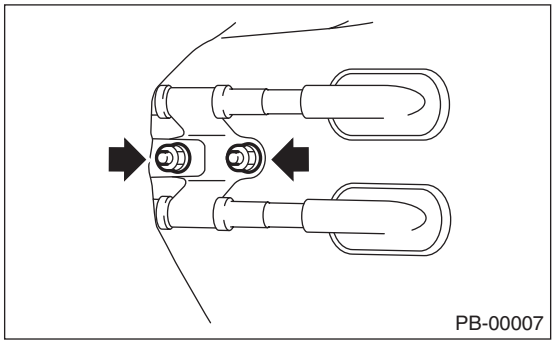
3. Parking Brake Cable

A: REMOVAL

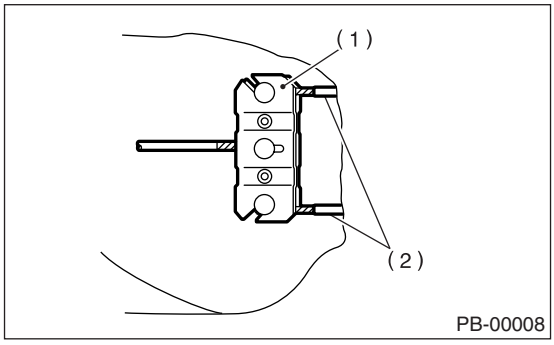
1) Lift-up the vehicle.
2) Remove the rear tires and wheels.
3) Remove the rear seat cushion.
4) Remove the console box.
5) Loosen the parking cable adjusting nut and console bracket.
6) Remove the parking brake lever.



7) Roll up the floor mat and remove clamps.

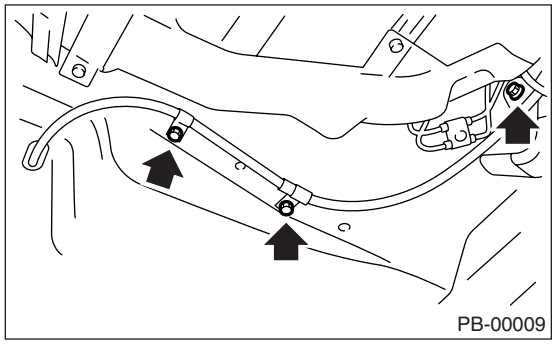


8) Remove the equalizer cover.
9) Remove the inner cable end from equalizer.



(1) Equalizer
(2) Inner cable end

10) Remove the parking brake cable from rear brake.
• Disc brake
<Ref. to PB-8, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
• Drum brake
<Ref. to BR-31, Rear Drum Brake Assembly.>
11) Remove the clamp from rear brake.
12) Remove the bolt and bracket from trailing link bracket.
13) Remove the bolt and clamp from rear floor.



14) Detach the grommet from rear floor.
15) Remove the cable assembly from cabin by forcibly pulling it backward.
16) Detach the parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

1) Install the (new) parking brake assembly in the reverse order of removal.

NOTE:
Be sure to pass the cable through cable guide inside the tunnel.

2) Be sure to adjust the lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

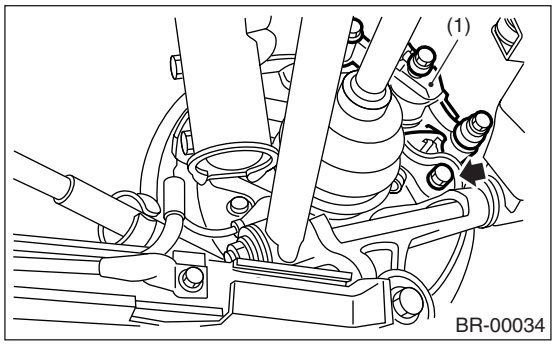
C: INSPECTION

Check the removed cable and replace if damaged, rusty, or malfunctioning.
1) Check for smooth operation of the cable.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends, and cracks.
4) Check the boot for damage, cracks, and deterioration.

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

1) Pull down and release the parking brake.
2) Remove the two mounting bolts and remove the brake caliper assembly.

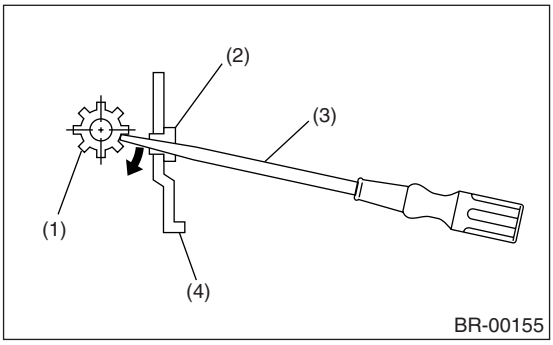


(1) Brake caliper assembly

3) Suspend the disc brake assembly so that the hose is not stretched.
4) Remove the disc rotor.

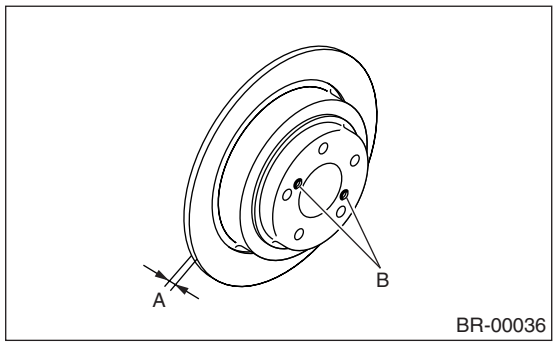
NOTE:
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn the adjusting screw using a flat tip screwdriver until brake shoe gets away enough from the disc rotor.

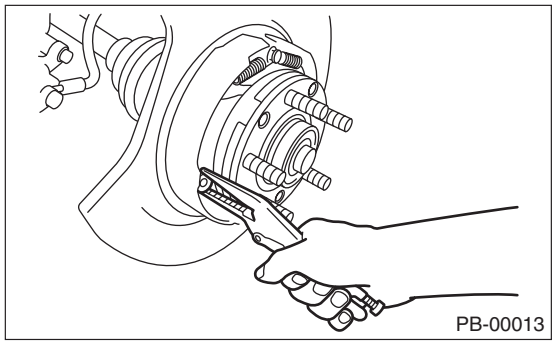


(1) Adjusting screw
(2) Adjusting hole cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

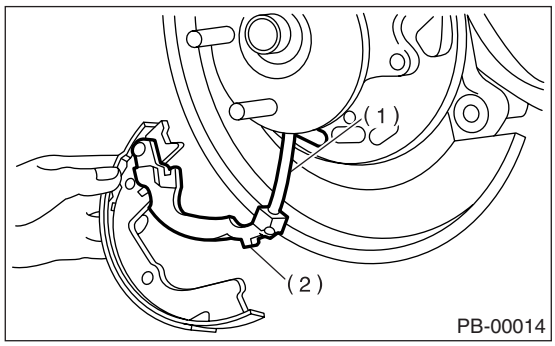
(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing two 8-mm (0.31-in) bolt in holes B on rotor.



5) Remove the shoe return spring from parking brake assembly.
6) Remove the front shoe hold down spring and pin with pliers.



7) Remove the strut and strut spring.
8) Remove the adjuster assembly from parking brake assembly.
9) Remove the brake shoe.
10) Remove the rear shoe hold-down spring and pin with pliers.
11) Remove the parking brake cable from parking brake lever.



(1) Parking brake cable
(2) Parking brake lever

12) Using a standard screwdriver, raise the retainer. Remove the parking brake lever and washer from brake shoe.

B: INSTALLATION

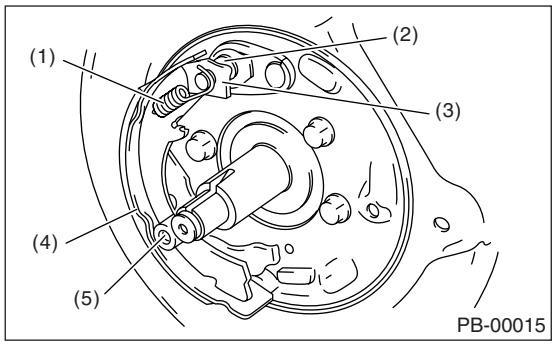
CAUTION:
Be sure the lining surface is free from oil and grease contamination.

1) Apply brake grease to the following places.

Brake grease:
Brake Grease (Part No. 003602002)

- Six contact surfaces of shoe rim and back plate packing
- Contact surface of shoe wave and anchor pin
- Contact surface of lever and strut
- Contact surface of shoe wave and adjuster assembly
- Contact surface of shoe wave and strut
- Contact surface of lever and shoe wave

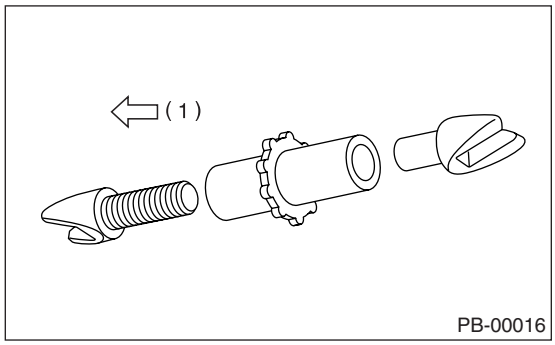
2) Insert the primary side brake shoe into anchor pin groove.
3) Secure the brake shoe with shoe hold-down pin and cup.
4) Install the plate to anchor pin, and then assemble the primary return spring to anchor pin.



(1) Primary return spring
(2) Anchor pin
(3) Plate
(4) Primary shoe
(5) Shoe hold-down pin & cup

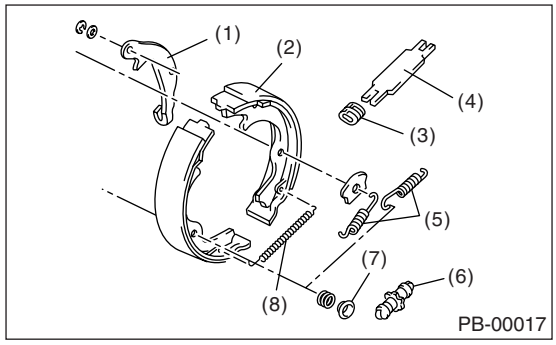
5) Install the parking brake cable to parking brake lever.
6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with shoe hold-down pin & cup.

NOTE:
- Install the strut spring of both right and left wheel facing vehicle front.
- Install the adjuster assembly with screw on left side.



(1) Left

7) Install the secondary return spring and adjusting spring.



(1) Lever
(2) Secondary brake shoe
(3) Strut spring
(4) Strut
(5) Secondary return spring
(6) Adjuster
(7) Hold-down cup
(8) Adjusting spring

8) Adjust the parking brakes. <Ref. to PB-10, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>
9) Drive the vehicle for parking brake lining “break-in”.
(1) Drive the vehicle at about 35 km/h (22 MPH).
(2) With the parking brake release button pushed in, pull the parking brake lever gently.
(3) Drive the vehicle for about 200 meter (0.12 mile) in this condition.
(4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
(5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:
Standard:
170 mm (6.69 in)
Service limit:
171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace the shoe assembly.

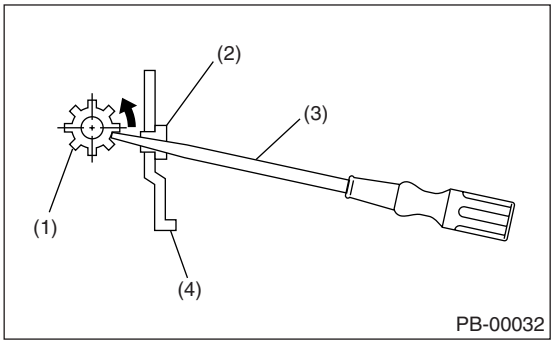
Lining thickness:
Standard:
3.2 mm (0.126 in)
Service limit:
1.5 mm (0.059 in)

NOTE:
Replace the right and left brake shoe at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove the adjusting hole cover from back plate.
2) Turn the adjusting screw using a flat tip screwdriver until brake shoe is in close contact with disc rotor.

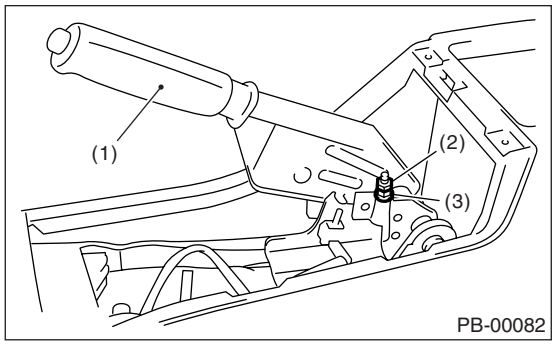


(1) Adjusting screw
(2) Adjusting hold cover (rubber)
(3) Flat tip screwdriver
(4) Back plate

3) Turn back (downward) the adjusting screw 3 or 4 notches.
4) Install the adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove the console box lid.
2) Forcibly pull the parking brake lever 3 to 5 times.
3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lbf).



(1) Parking brake lever
(2) Lock nut
(3) Adjusting nut

4) Tighten the lock nut.
5) Install the console box lid.

Lever stroke:
7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lbf)

Tightening torque (Lock nut):
6 N·m (0.6 kgf-m, 4.3 ft-lb)

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	Parking brake lever is maladjusted.	Adjustment.
	Parking brake cable does not move.	Repair or replace.
	Parking brake shoe clearance is maladjusted.	Adjustment.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring is faulty.	Replace.

POWER ASSISTED SYSTEM (POWER STEERING)

PS

		Page
1.	General Description	2
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6.	Steering Gearbox [RHD Model]	42
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1. General Description

A: SPECIFICATION

Item			Designation
Whole system	Minimum turning diameter m (ft)		10.6 (34.8)
	Steering angle (Inside-Outside)		36°25′ — 32°00′
	Steering wheel diameter mm (in)		385 (15.16)
	Maximum rotation		3.0
Gearbox	Type		Rack and pinion, Integral
	Backlash		0 (Automatically adjustable)
	Valve (Power steering system)		Rotary valve
Pump (Power steering system)	Type		Vane pump
	Oil tank		Installed on body
	Output cm^3 (cu in)/rev.		7.2 (0.439)
	Relief pressure kPa (kgf/cm^2, psi)		7,360 — 8,050 (75 — 82, 1,067 — 1,168)
	Hydraulic fluid control		Dropping in response to increased engine revolutions
	Hydraulic fluid ℓ (US qt, Imp qt)/min		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)
	Range of revolution rpm		595 — 8,925
	Revolving direction		Clockwise (Viewed from pulley side)
Working fluid (Power steering system)	Name		ATF DEXRON III or equivalent
	Capacity ℓ (US qt, Imp qt)	Oil tank	0.3 (0.3, 0.3)
		Whole system	0.7 (0.7, 0.6)

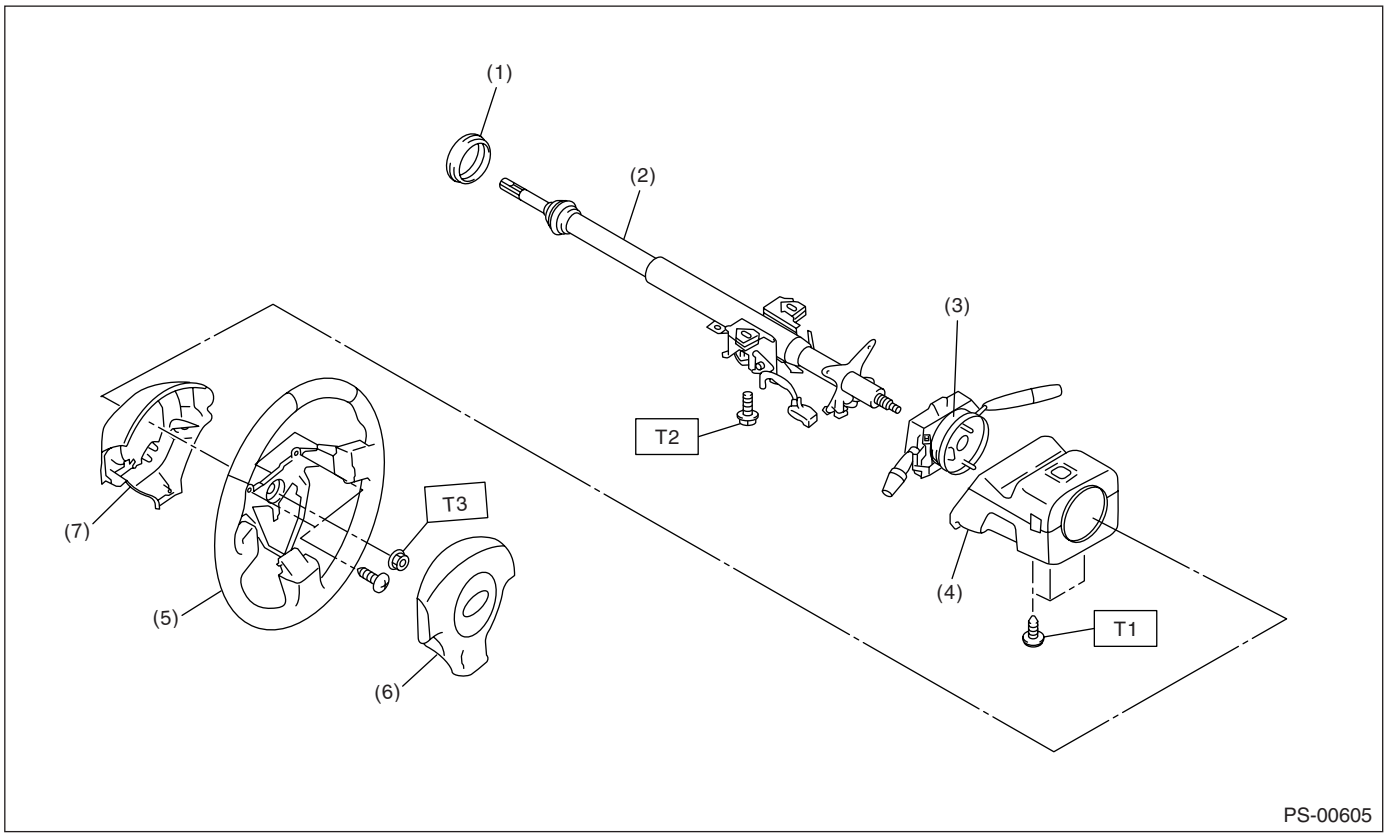
Model				LHD	RHD
Steering wheel	Free play mm (in)			17 (0.67)	
Turning angle	Inner tire & wheel			36°25′±1°30′	
	Outer tire & wheel			32°00′±1°30′	
Steering shaft	Clearance between steering wheel and column cover mm (in)			3.0 (0.118)	
Steering gearbox (Power steering system)	Sliding resistance N (kgf, lbf)			400 (41, 90) or less	
	Rack shaft play in radial direction	Right-turn steering mm (in)		0.19 (0.0075) or less	Horizontal movement: 0.19 (0.0075) or less Vertical movement: 0.3 (0.012) or less
		Left-turn steering mm (in)		Horizontal movement: 0.15 (0.0059) or less Vertical movement: 0.3 (0.012) or less	0.19 (0.0075) or less
	Input shaft play	In radial direction mm (in)		0.18 (0.0071) or less	
		In axial direction mm (in)		0.5 (0.020) or less	
	Turning resistance N (kgf, lbf)			Maximum allowable value: Less than 10.5 (1.1, 2.4) Difference between right and left sliding resistance: Less than 20%	
Oil pump (Power steering system)	Pulley shaft	Radial play mm (in)		0.4 (0.016) or less	
		Axial play mm (in)		0.9 (0.035) or less	
	Pulley	Ditch deflection mm (in)		1.0 (0.039) or less	
		Resistance to rotation N (kgf, lbf)		9.22 (0.94, 2.07) or less	
	Regular pressure kPa (kgf/cm^2, psi)			981 (10, 142) or less	
Steering wheel effort (Power steering system)	At standstill with engine idling on a concrete road N (kgf, lbf)			31.4 (3.2, 7.1) or less	
	At standstill with engine stalled on a concrete road N (kgf, lbf)			294.2 (30, 66.1) or less	

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

NOTE:
General diagnostic table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults. <Ref. to PS-86, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

B: COMPONENT

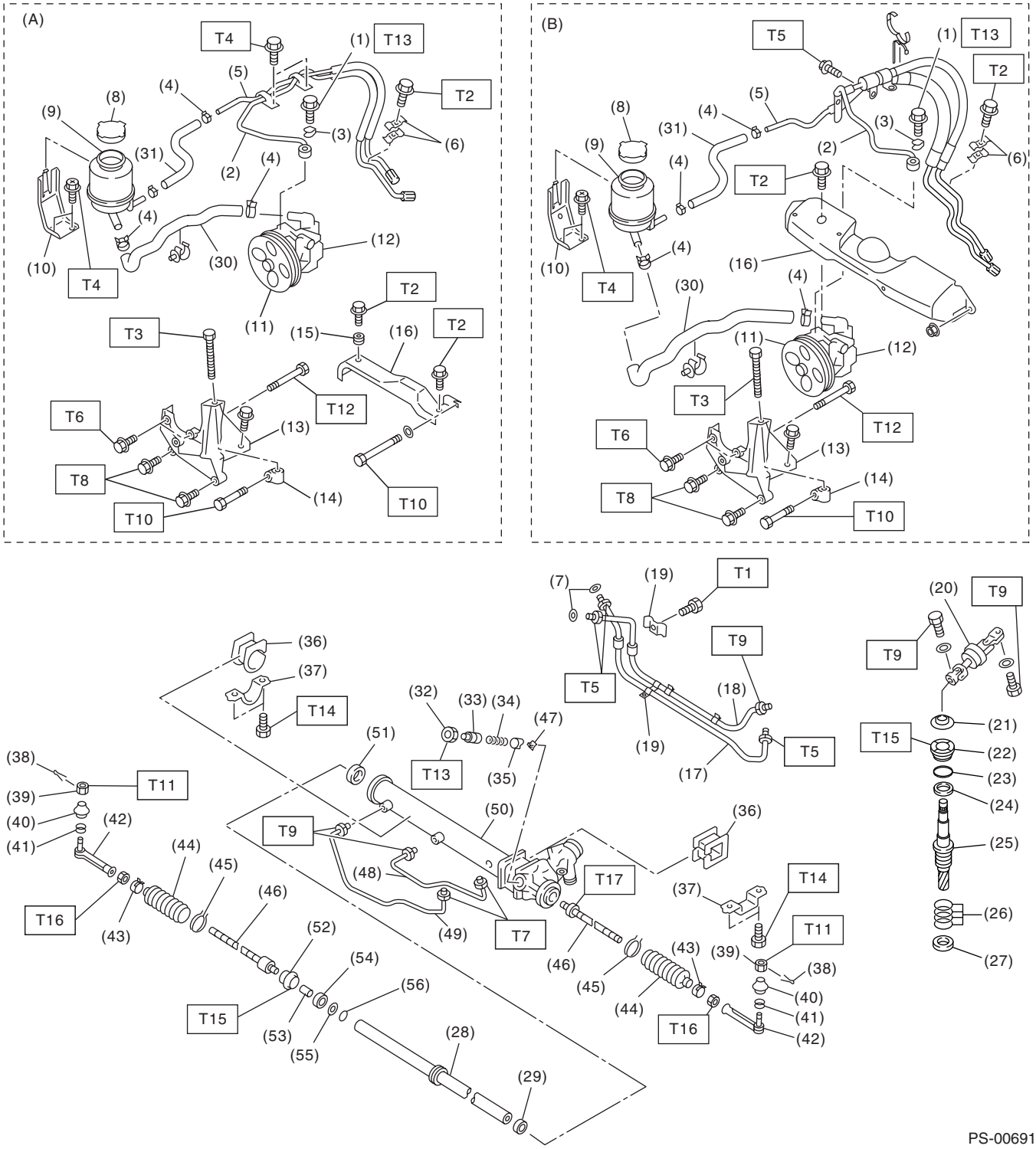
1. STEERING WHEEL AND COLUMN



(1)	Bushing	(5)	Steering wheel	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Steering shaft	(6)	Airbag module	***T1: 1.2 (0.12, 0.9)***
(3)	Steering roll connector	(7)	Steering wheel lower cover	***T2: 25 (2.5, 18.1)***
(4)	Column cover			***T3: 45 (4.6, 33)***

2. POWER ASSISTED SYSTEM

- LHD model



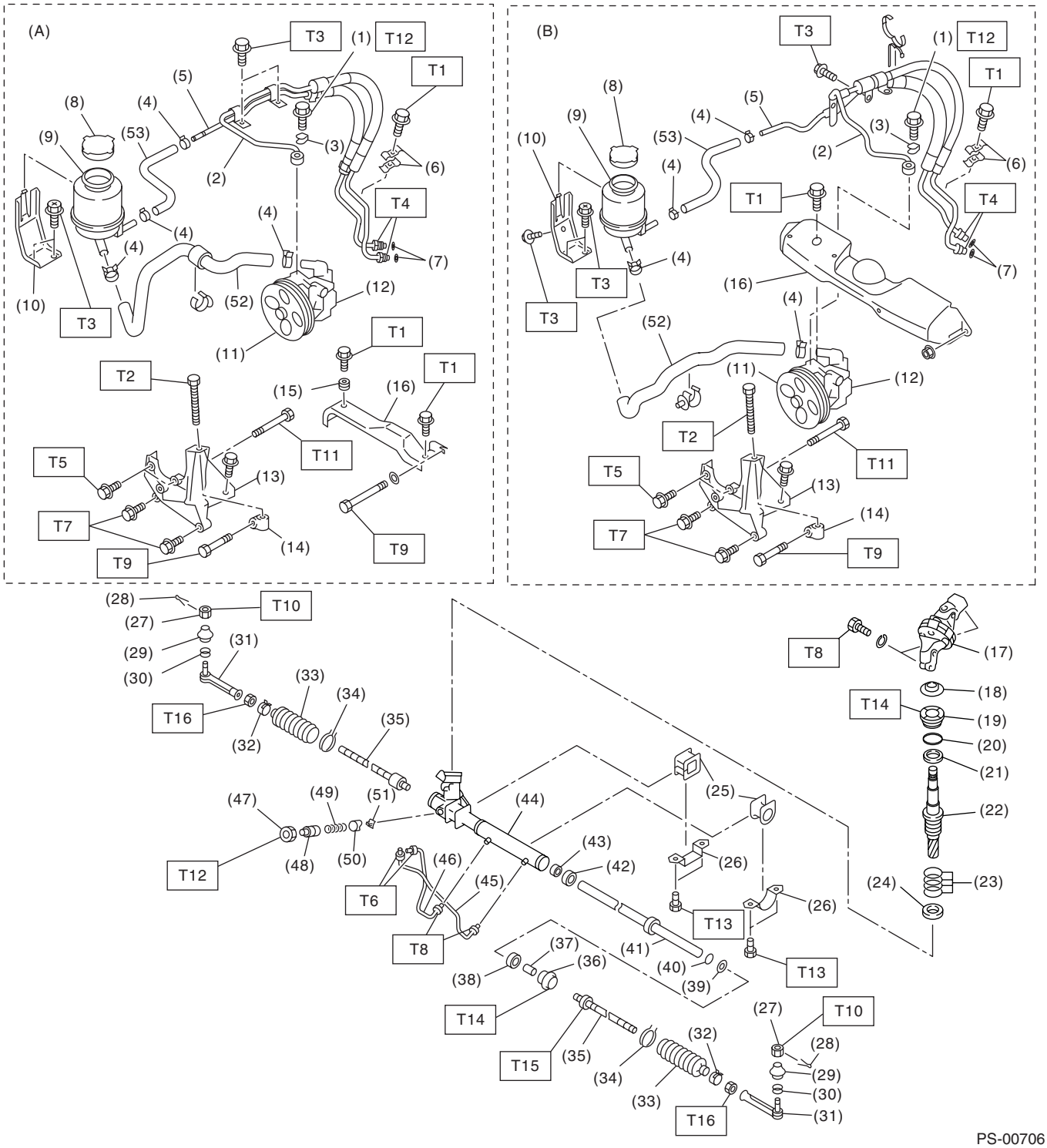
(A) Non-turbo model
(B) Turbo model

(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bush
(16) Belt cover
(17) Pipe E
(18) Pipe F
(19) Clamp plate
(20) Universal joint
(21) Dust cover
(22) Plug
(23) O-ring
(24) Oil seal
(25) Pinion and valve ASSY
(26) Seal ring
(27) Oil seal
(28) Rack
(29) Back-up washer
(30) Suction hose
(31) Return hose
(32) Lock nut
(33) Adjusting screw
(34) Spring
(35) Sleeve
(36) Adapter
(37) Clamp
(38) Cotter pin
(39) Castle nut
(40) Dust cover
(41) Clip
(42) Tie-rod end
(43) Clip
(44) Boot
(45) Boot band
(46) Tie-rod
(47) Seat pad
(48) Pipe B
(49) Pipe A
(50) Steering body
(51) Oil seal
(52) Holder
(53) Bush
(54) Oil seal
(55) Oil seal
(56) O-ring

Tightening torque: N·m ***(kgf-m, ft-lb)***

T1:	***6 (0.6, 4.4)***
T2:	***7.4 (0.75, 5.4)***
T3:	***8 (0.8, 5.8)***
T4:	***13 (1.3, 9.4)***
T5:	***15 (1.5, 11.1)***
T6:	***15.7 (1.6, 11.6)***
T7:	***20 (2.0, 14.5)***
T8:	***22 (2.2, 15.9)***
T9:	***24 (2.4, 17.7)***
T10:	***25 (2.5, 18.1)***
T11:	***27 (2.75, 19.9)***
T12:	***37.3 (3.8, 27.5)***
T13:	***39 (4.0, 28.9)***
T14:	***59 (6.0, 43.5)***
T15:	***64 (6.5, 47.2)***
T16:	***83 (8.5, 61.2)***
T17:	***90 (9.2, 66)***

- RHD model



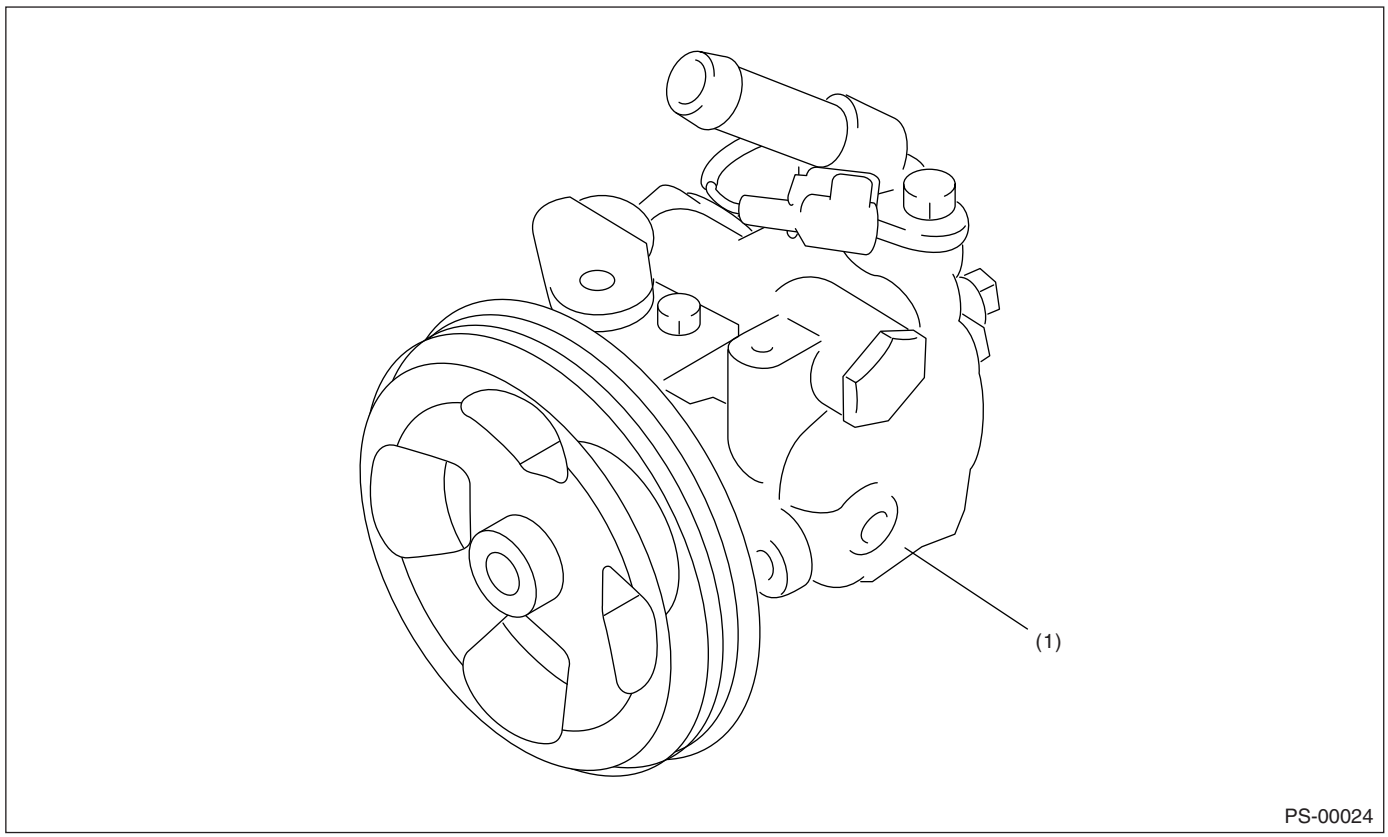
(A) Non-turbo model
(B) Turbo model

(1) Eye bolt
(2) Pipe C
(3) Gasket
(4) Clip
(5) Pipe D
(6) Clamp E
(7) O-ring
(8) Cap
(9) Reservoir tank
(10) Reservoir tank bracket
(11) Pulley
(12) Oil pump
(13) Bracket
(14) Belt tension nut
(15) Bushing
(16) Belt cover
(17) Universal joint
(18) Dust cover
(19) Plug
(20) O-ring
(21) Oil seal
(22) Pinion
(23) Seal ring
(24) Oil seal
(25) Adapter
(26) Clamp
(27) Castle nut
(28) Cotter pin
(29) Dust seal
(30) Clip
(31) Tie-rod end
(32) Clip
(33) Boot
(34) Wire
(35) Tie-rod
(36) Holder
(37) Bushing
(38) Oil seal
(39) Oil seal
(40) O-ring
(41) Rack
(42) Oil seal
(43) Back-up washer
(44) Steering body
(45) Pipe A
(46) Pipe B
(47) Lock nut
(48) Adjusting screw
(49) Spring
(50) Sleeve
(51) Seat pad
(52) Suction hose
(53) Return hose

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***7.4 (0.75, 5.4)***
T2:	***8 (0.8, 5.8)***
T3:	***13 (1.3, 9.4)***
T4:	***15 (1.5, 11.1)***
T5:	***15.7 (1.6, 11.6)***
T6:	***20 (2.0, 14.5)***
T7:	***22 (2.2, 15.9)***
T8:	***24 (2.4, 17.7)***
T9:	***25 (2.5, 18.1)***
T10:	***27 (2.75, 19.9)***
T11:	***37.3 (3.8, 27.5)***
T12:	***39 (4.0, 28.9)***
T13:	***60 (6.1, 44.3)***
T14:	***64 (6.5, 47.2)***
T15:	***78 (8.0, 57.5)***
T16:	***85 (8.7, 63)***

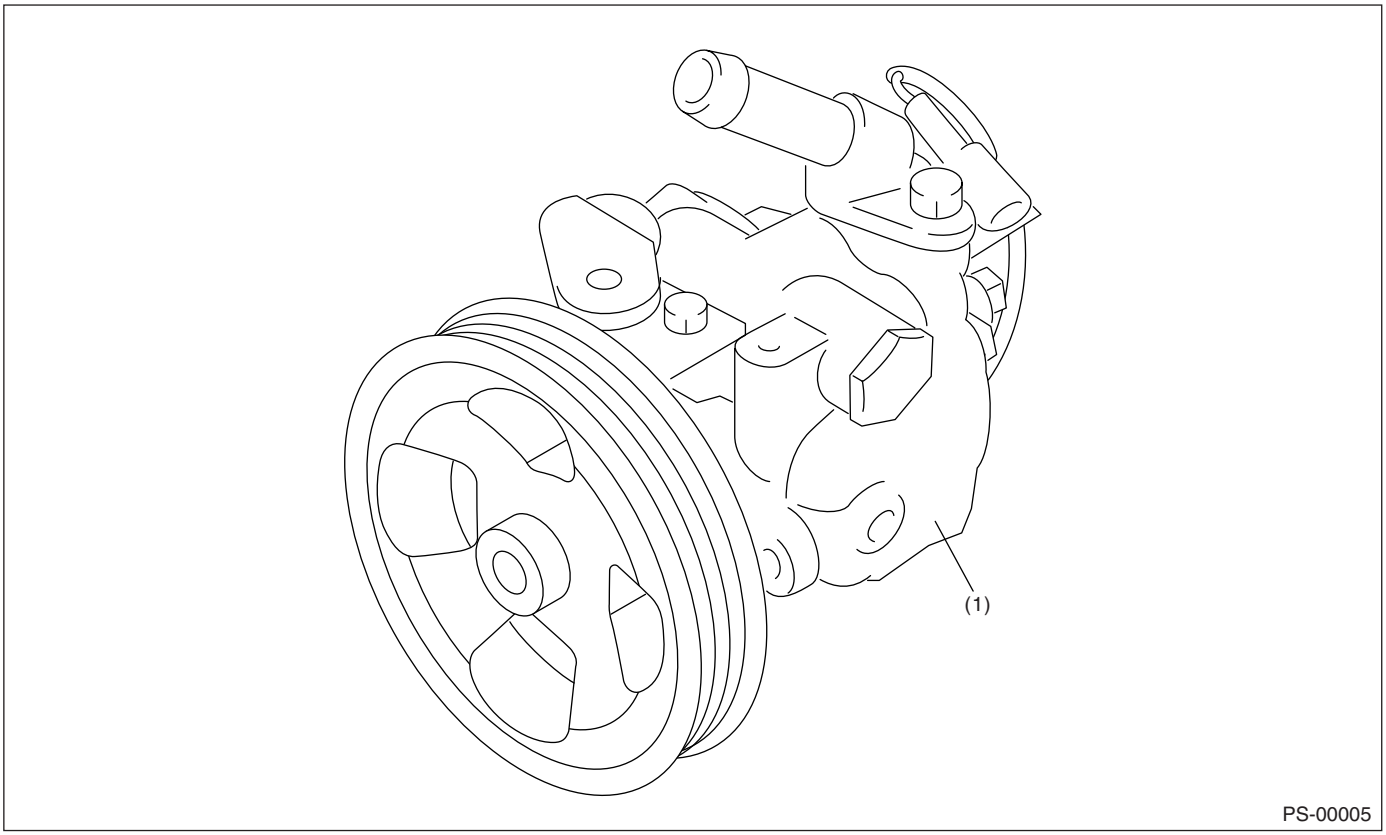
3. OIL PUMP

- Non-turbo model



(1) Oil pump ASSY

- Turbo model



(1) Oil pump ASSY

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. with that of another grade or from other manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply power steering fluid onto sliding or revolution surfaces before installation.
• Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.

D: PREPARATION TOOL

1. SPECIAL TOOL

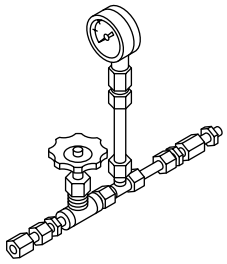
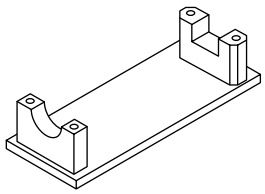
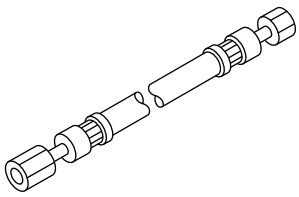
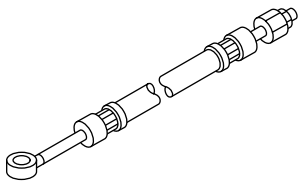
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925711000	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 ST-926200000	926200000	STAND	Used for disassembling gearbox assembly and inspecting characteristic of it.
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).

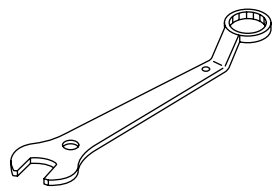
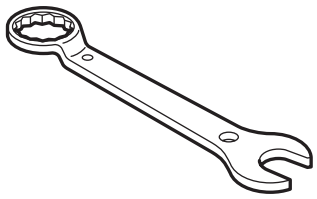
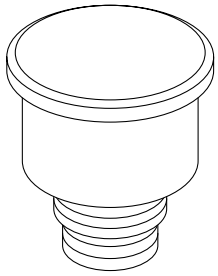
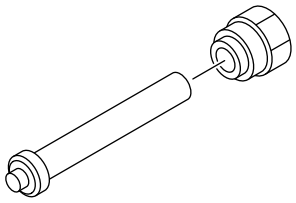
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926230000	926230000	SPANNER	For the lock nut when adjusting backlash of gearbox.
 ST34099PA100	34099PA100	SPANNER	Used for measurement of rotating resistance of gearbox assembly.
 ST34199AE040	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.
 ST-926420000	926420000	PLUG	When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.

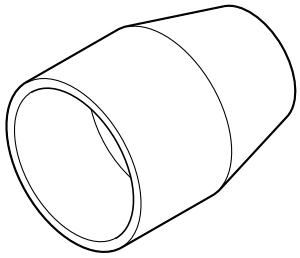
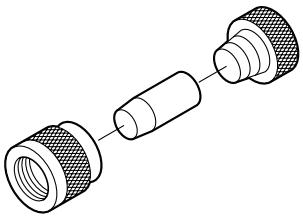
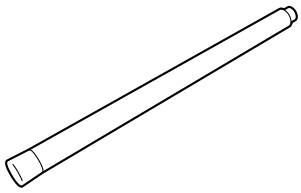
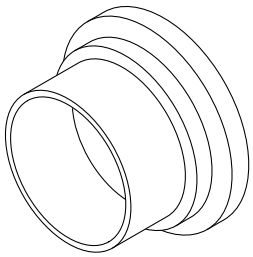
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-926250000	926250000	GUIDE	Used for installing holder ASSY into rack housing.
 ST-927490000	927490000	INSTALLER A, B, C	Used for installing oil seal into rack assembly.
 ST-927580000	927580000	REMOVER	Used for removing back-up ring and oil seal.
 ST34199AE000	34199AE000	GUIDE	Used for installing rack and seal into housing assembly.

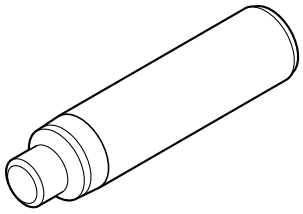
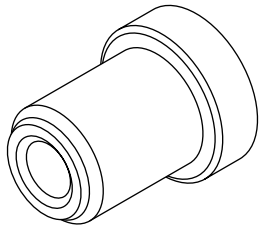
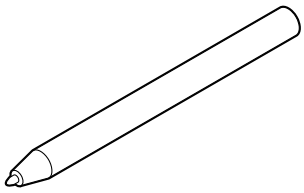
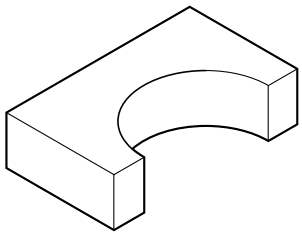
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA030	34099FA030	INSTALLER & REMOVER	Used for removing and installing rack oil seal (outer & inner).
 ST34199AE010	34199AE010	INSTALLER	Used for installing rack oil seal (outer).
 ST34099FA060	34099FA060	PUNCH HOLDER	Used for caulking.
 ST34099FA070	34099FA070	BASE	Used for supporting housing assembly.

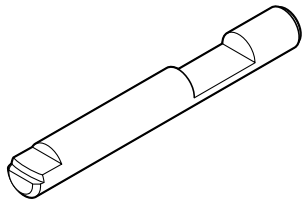
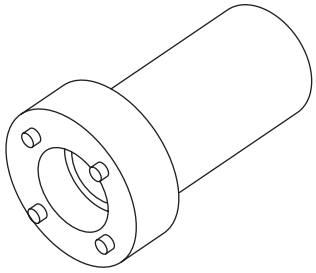
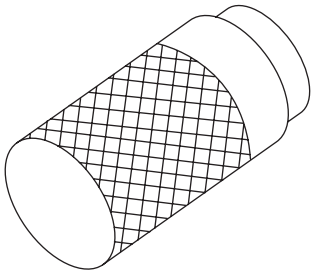
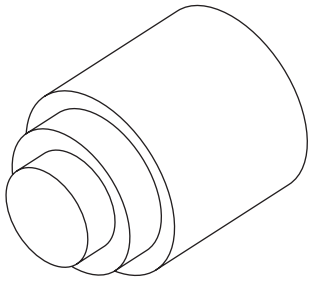
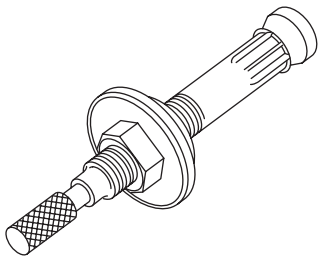
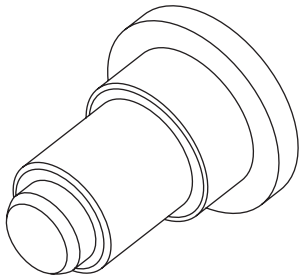
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34099FA080	34099FA080	PUNCH	Used for removing caulking.
 ST34199AE090	34199AE090	PLUG WRENCH	Used for removing plug.
 ST34199AE100	34199AE100	PLUG OIL SEAL REMOVER	Used for removing oil seal plug.
 ST34199AE110	34199AE110	OIL SEAL PLUG INSTALLER	Used for installing oil seal plug.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST34199AE120	34199AE120	GEARBOX OIL SEAL REMOVER	Used for removing gearbox oil seal.
 ST34199AE130	34199AE130	GEARBOX OIL SEAL INSTALLER	Used for installing gearbox oil seal.

2. GENERAL TOOL

TOOL NAME	REMARKS
Spring scale	Used for measurement of rotating resistance of pulley.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring steering gearbox.
Band clamp pliers	Used for caulking boot band.
Steering wheel puller	Used for removing steering wheel.

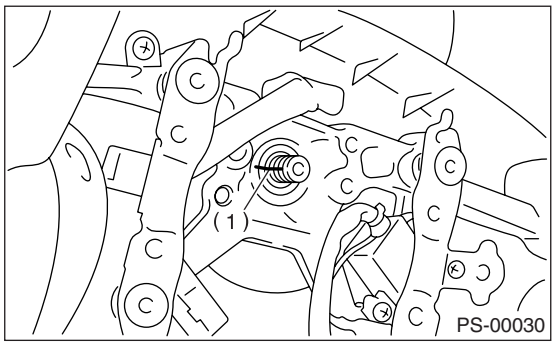
2. Steering Wheel

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tires to straight-ahead position.
3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Make matching marks on the steering wheel and steering shaft.



(1) Matching mark

5) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

B: INSTALLATION

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

1) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
2) Install in the reverse order of removal.

NOTE:
Align matching marks on the steering wheel and steering shaft.

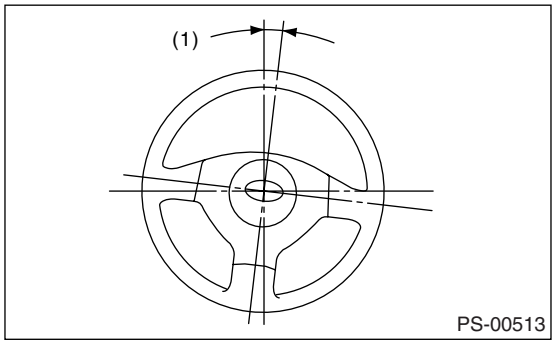
Tightening torque:
45 N·m (4.6 kgf-m, 33 ft-lb)

Column cover-to-steering wheel clearance:
2 — 4 mm (0.08 — 0.16 in)

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of the steering wheel surface to prevent damage.

C: INSPECTION

1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
2) Check the splines on steering wheel for damage. If the damage is excessive, replace the steering wheel.
3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.

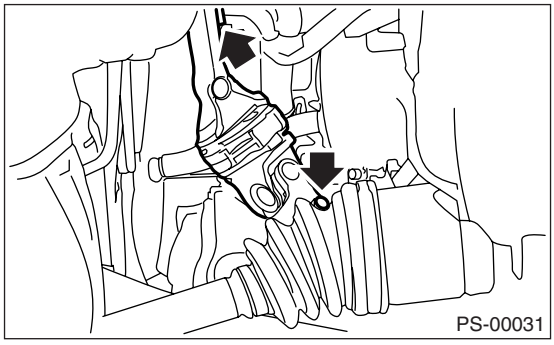


(1) Within 5°

3. Universal Joint

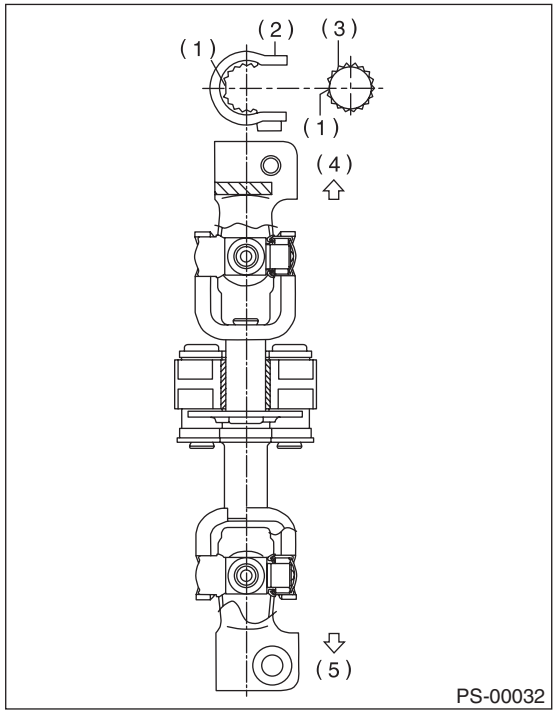
A: REMOVAL

1) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
2) Make matching mark on the universal joint.
3) Remove the universal joint bolts, and then remove the universal joint.



B: INSTALLATION

1) Align the cutout at serrated section of the steering shaft and yoke, and then insert the universal joint into steering shaft.



(1) Cutout
(2) Yoke
(3) Steering shaft
(4) Steering shaft side
(5) Gearbox side

2) Align the matching marks, and then insert the universal joint to serrated section of gearbox assembly.
3) Tighten the bolt.

Tightening torque:
24 N·m (2.4 kgf-m, 17.7 ft-lb)

CAUTION:
Excessively large tightening torque of the universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
Over 14 mm (0.55 in)

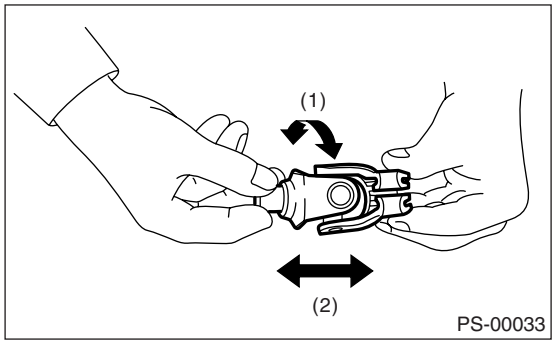
4) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
5) Install the steering wheel and airbag module. <Ref. to PS-18, INSTALLATION, Steering Wheel.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

C: INSPECTION

Check for wear, damage, or any other faults. If necessary, replace.

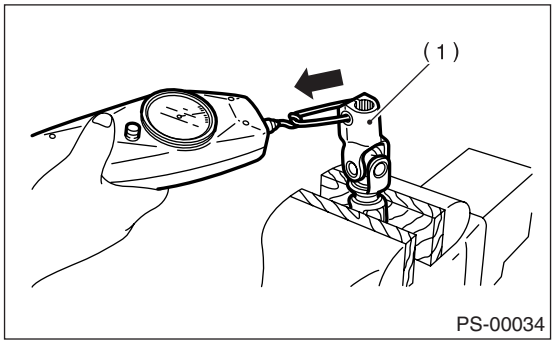
Service limit:
Universal joint play;
0 mm (0 in)
Maximum swing torque;
0.3 N (0.03 kgf, 0.07 lbf)



(1) Swing torque
(2) Play

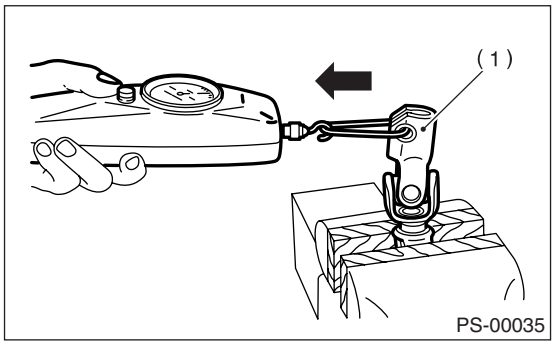
Measure the folding torque of universal joint.

Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lbf) or less



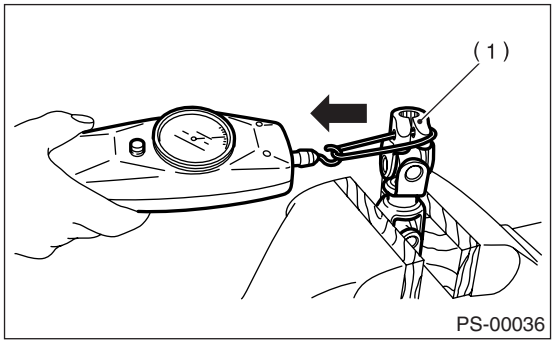
(1) Yoke (gearbox side)

Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lbf) or less



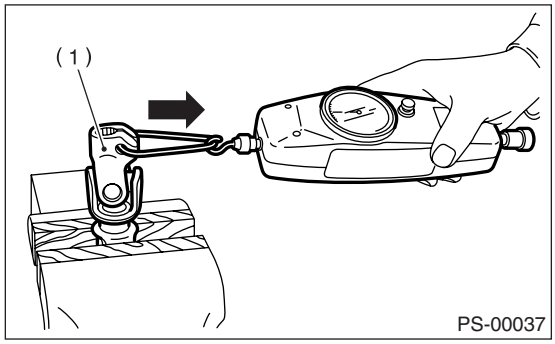
(1) Yoke (gearbox side)

Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

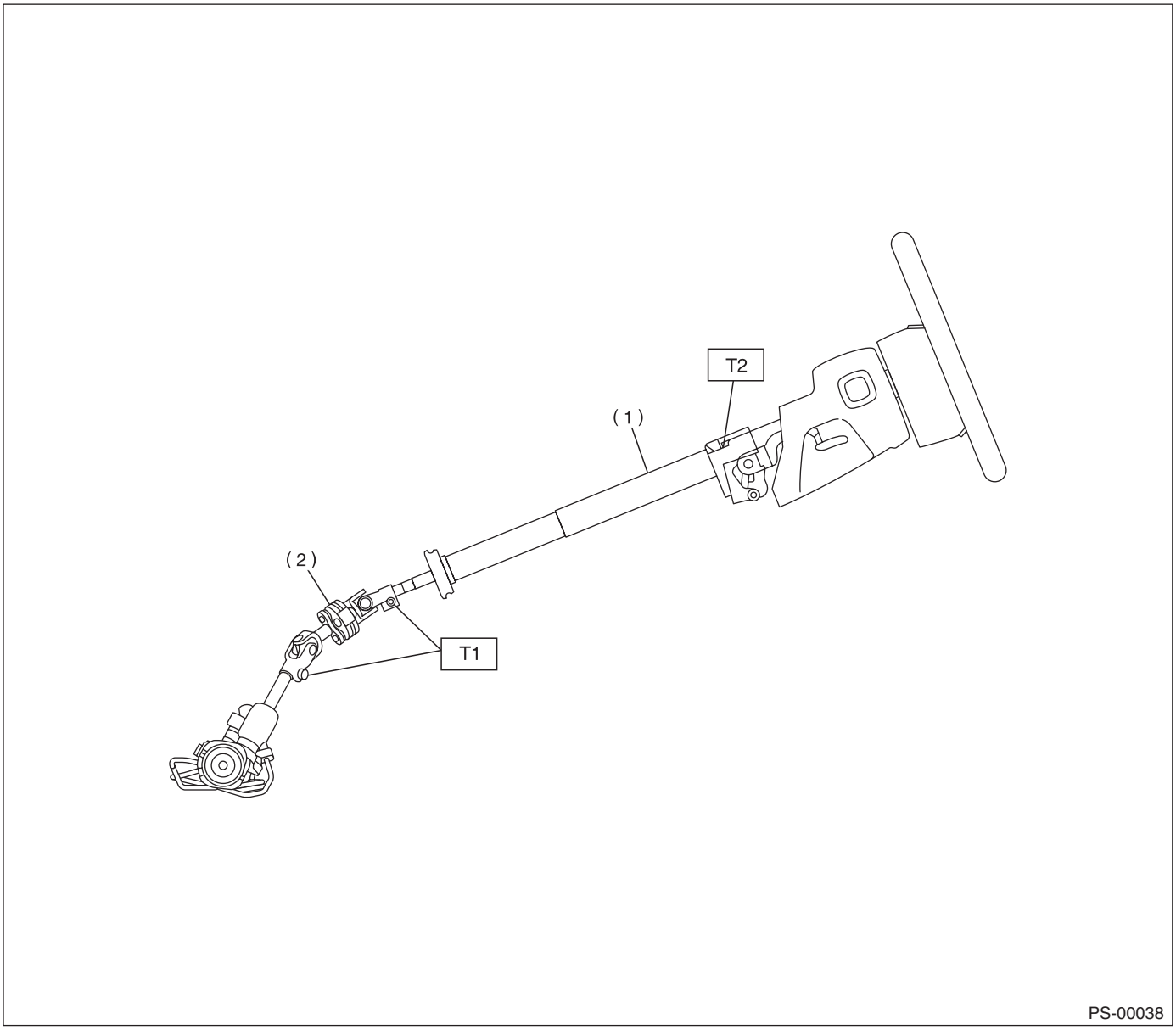
Service limit:
Maximum load; 7.3 N (0.74 kgf, 1.64 lbf) or less



(1) Yoke (Steering column side)

4. Tilt Steering Column

A: REMOVAL



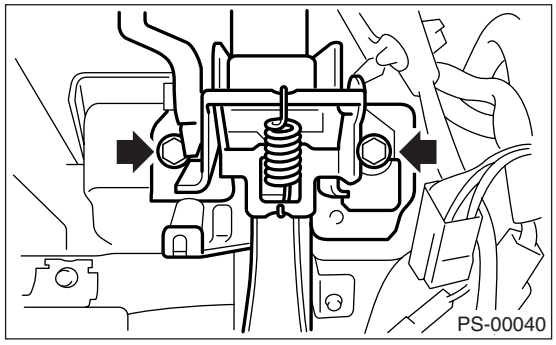
(1) Tilt steering column
(2) Universal joint

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24 (2.4, 17.7)
T2: 25 (2.5, 18.1)

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:
Always refer to "Airbag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

4) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
5) Remove the universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
6) Remove the trim panel under instrument panel.
7) Remove the steering column lower cover.
8) Remove all connectors from steering column.
9) Remove the two bolts under instrument panel securing steering column.

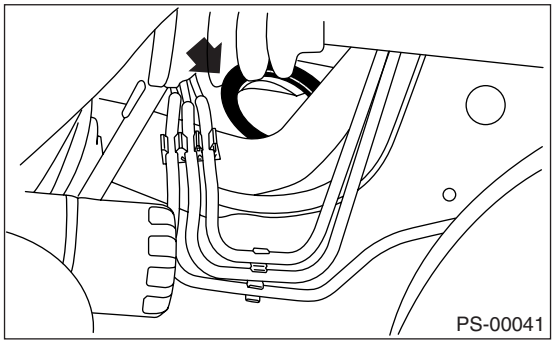

PS-00040

10) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:
• Be sure to remove the universal joint before removing steering shaft assembly installing bolts when removing steering shaft assembly or when lowering it for servicing of other parts.
• Do not loosen tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Set the grommet to toe board.


PS-00041

2) Insert the end of steering shaft into toe board grommet.
3) With the tilt lever secured, tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

4) Connect all connectors under instrument panel.
5) Connect the airbag system connector at harness spool.

NOTE:
Make sure to apply double lock.

6) Install the lower column cover with tilt lever held in the lowered position.
7) Install the universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
8) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
9) Install the steering wheel. <Ref. to PS-18, INSTALLATION, Steering Wheel.>

CAUTION:
Insert the roll connector guide pin into guide hole on lower end of the steering wheel surface to prevent damage.

10) Install the airbag module to steering wheel.

WARNING:
Always refer to "Airbag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

D: ASSEMBLY

Insert the combination switch to upper column shaft, and then install the upper column cover. Then route the ignition key harness and combination switch harness between column cover mounting bosses.

Tightening torque:
1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

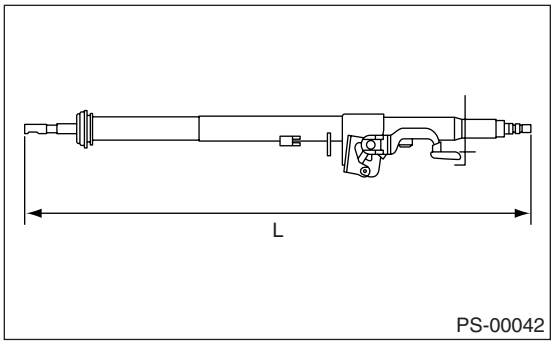
CAUTION:
Do not overtorque the screw.

E: INSPECTION

1. BASIC INSPECTION

Measure overall length of the steering column. If not as specified, replace.

Standard value:
Overall length L
808.6±1.5 mm (31.83±0.059 in)



2. AIRBAG MODEL INSPECTION

WARNING:
For airbag model inspection procedures, refer to "Airbag System". <Ref. to AB-3, CAUTION, General Description.>

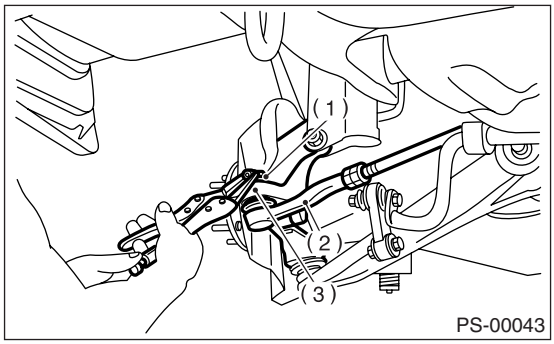
5. Steering Gearbox [LHD Model]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nut.
4) Lift-up the vehicle, and then remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL, Front Exhaust Pipe.>

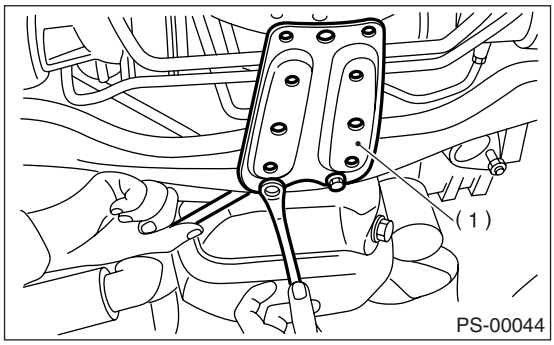
WARNING:
Be careful, the exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



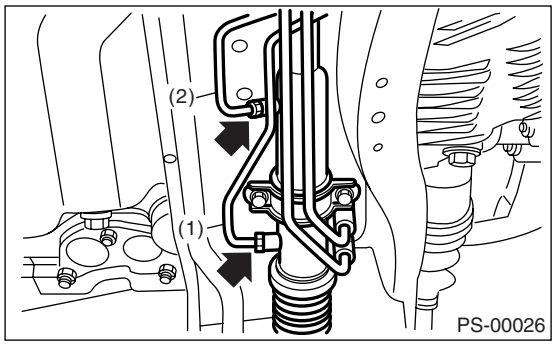
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.



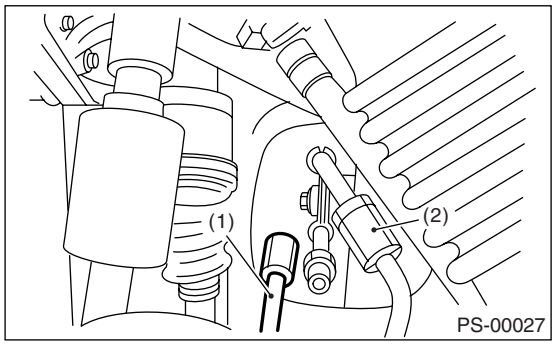
(1) Jack-up plate

10) Remove the one pipe joint at center of gearbox assembly, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



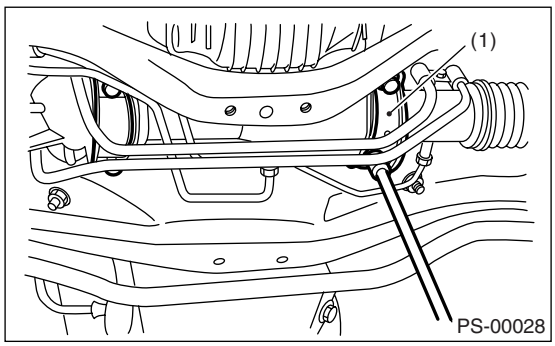
(1) Pipe A
(2) Pipe B

11) Remove the universal joint. <Ref. to PS-19, REMOVAL, Universal Joint.>
12) Disconnect the lower pipe C from gearbox assembly first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

13) Remove the clamp bolts securing gearbox assembly to crossmember, and then remove the gearbox.

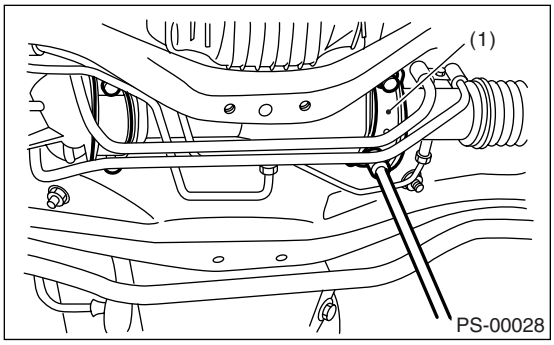


(1) Clamp

B: INSTALLATION

1) Insert the gearbox assembly into crossmember, being careful not to damage the gearbox assembly boot.
2) Tighten the gearbox assembly to crossmember bracket via clamp with bolt to specified torque.

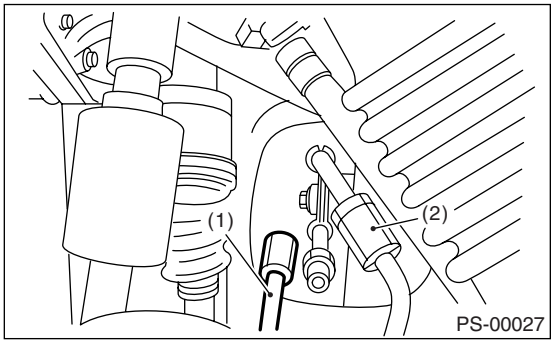
Tightening torque:
59 N·m (6.0 kgf-m, 43.5 ft-lb)



(1) Clamp

3) Connect the pipe D first to gearbox, and pipe C second.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)



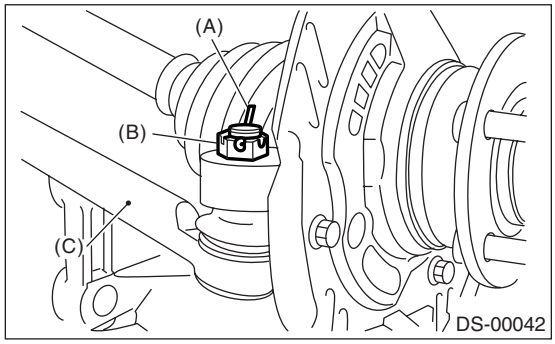
(1) Pipe C
(2) Pipe D

4) Install the universal joint. <Ref. to PS-19, INSTALLATION, Universal Joint.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
When connecting, do not hit the cap at bottom of tie-rod end with hammer.

6) After tightening the castle nut to specified torque, tighten it further within 60° until cotter pin hole is aligned with the slot in nut, and then bend the cotter pin to lock.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod end

7) Install the front stabilizer to vehicle. <Ref. to FS-22, INSTALLATION, Front Stabilizer.>
8) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-8, INSTALLATION, Front Exhaust Pipe.>
9) Install the sub frame. <Ref. to FS-24, INSTALLATION, Sub Frame.>
10) Install the under cover. <Ref. to EI-22, INSTALLATION, Front Under Cover.>
11) Align the center of roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
12) Install the steering wheel. <Ref. to PS-18, INSTALLATION, Steering Wheel.>
13) Install the front wheel.
14) Tighten the wheel nuts to specified torque.

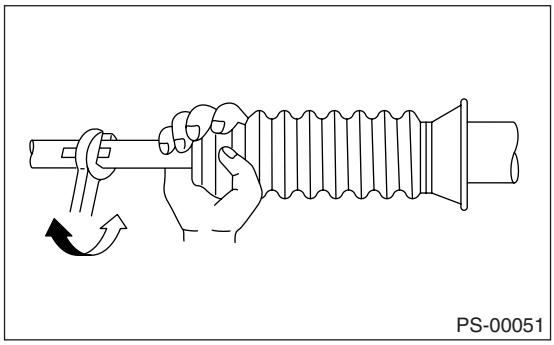
Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

15) Connect the battery ground cable to battery.
16) Pour fluid into the oil tank, and bleed air.
<Ref. to PS-80, Power Steering Fluid.>
17) Check for fluid leaks.
18) Install the jack-up plate.
19) Lower the vehicle.
20) Check the fluid level in reservoir tank.

21) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:
83 N·m (8.5 kgf-m, 61.2 ft-lb)

NOTE:
When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.


PS-00051

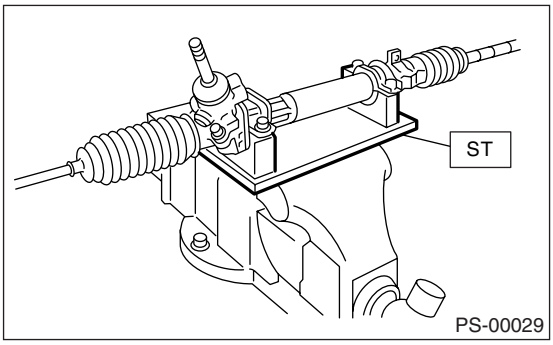
C: DISASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox assembly removed from vehicle in vise using the ST.
ST 926200000 STAND

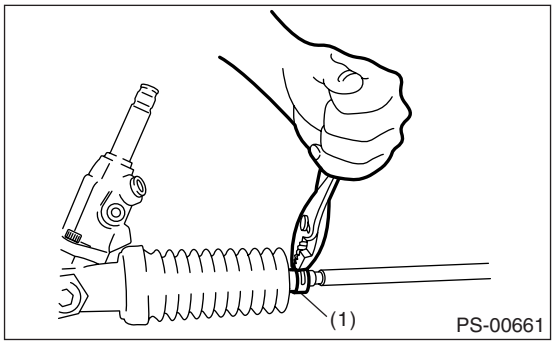
CAUTION:
Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.



PS-00029

3) Remove the tie-rod end and lock nut from gearbox assembly.

4) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.

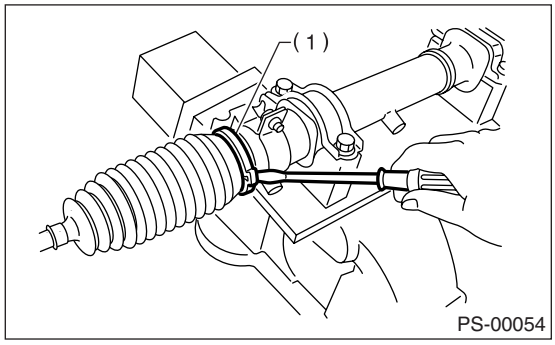


PS-00661

(1) Clip

5) Using flat tip screwdriver, remove the band from boot.

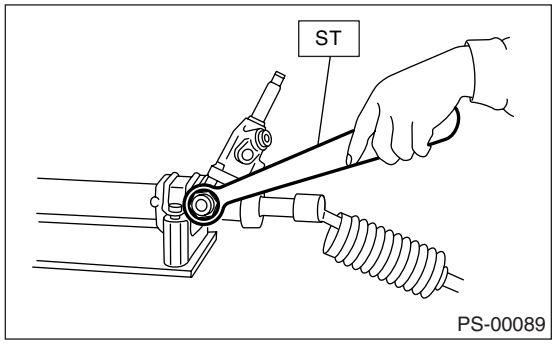
NOTE:
Check the boot for crack, damage or deterioration. Replace the boot with a new one if necessary.



PS-00054

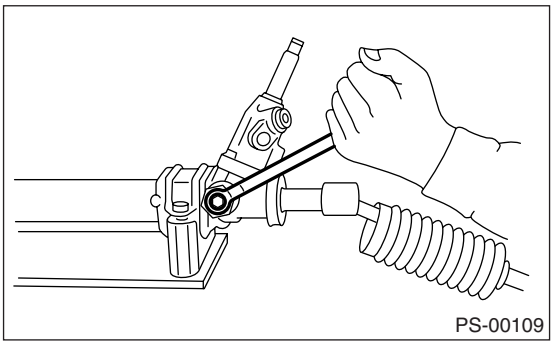
(1) Band

6) Using the ST, loosen lock nut.
ST 926230000 SPANNER

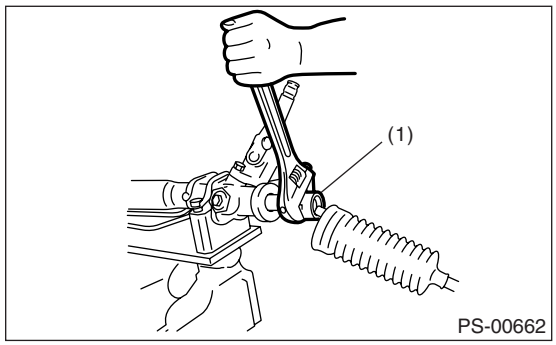


PS-00089

7) Tighten the adjusting screw until it no longer tightens.

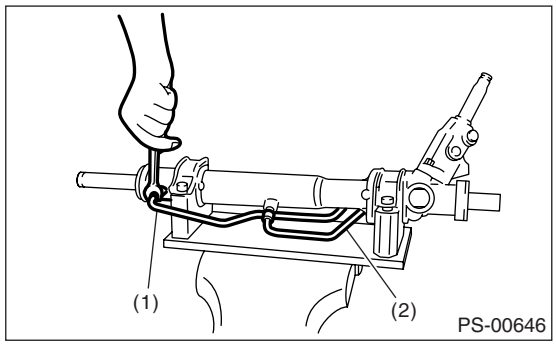


8) Using a 32 mm spanner or adjustable wrench with clinching boot, remove the tie-rod.



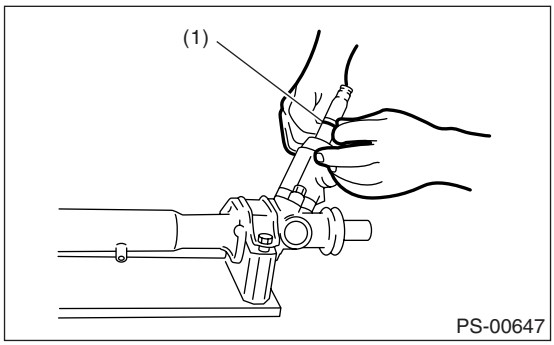
(1) Tie-rod

9) Loosen the adjusting screw, and then remove the spring and sleeve.
10) Disconnect the pipes A and B from steering body and control valve housing.



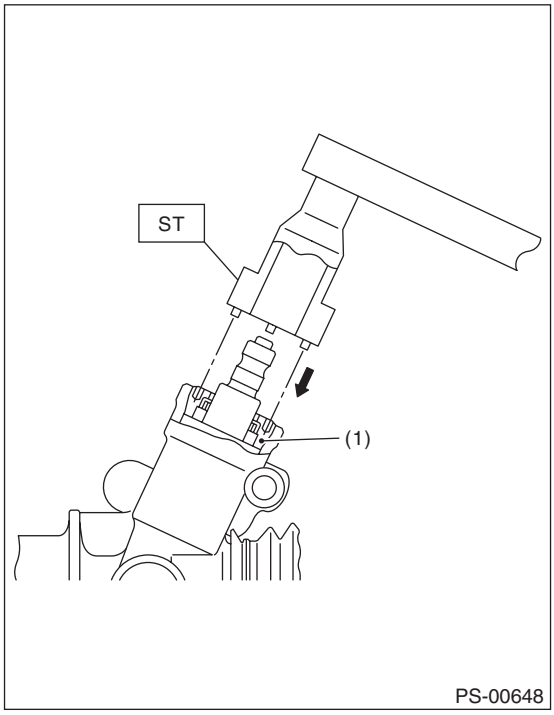
(1) Pipe A
(2) Pipe B

11) Clean the dirt of input shaft. Remove the dust cover taking care not to scratch the housing or input shaft and allow foreign matter to enter gearbox interior.



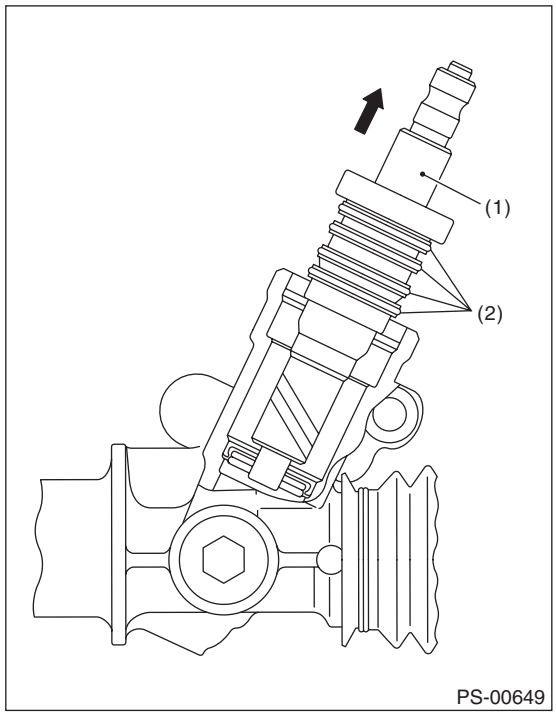
(1) Dust cover

12) Align the ST pin to plug hole to install. Rotate the ST counterclockwise to remove plug.
ST 34199AE090 PLUG WRENCH



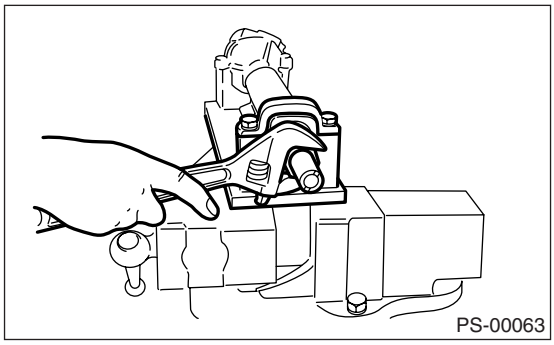
(1) Plug

13) Remove the valve assembly taking care not to scratch seal ring and valve housing inner surface.



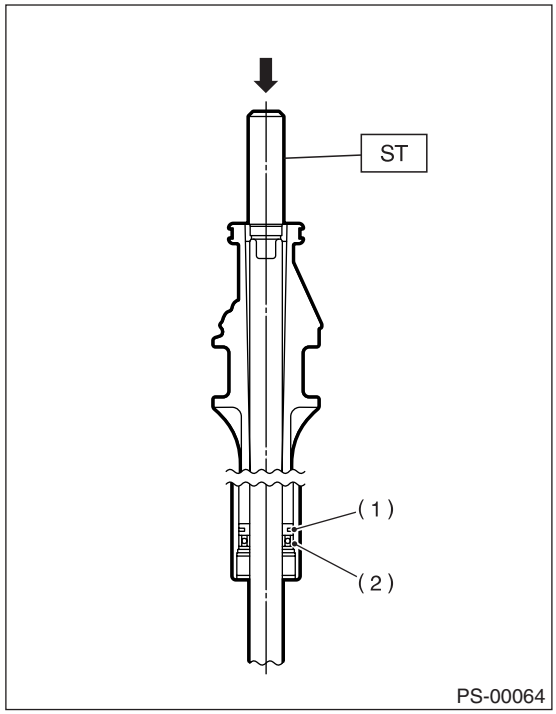
(1) Valve ASSY
(2) Seal ring

14) Remove the holder using a 32 mm spanner or adjustable wrench.



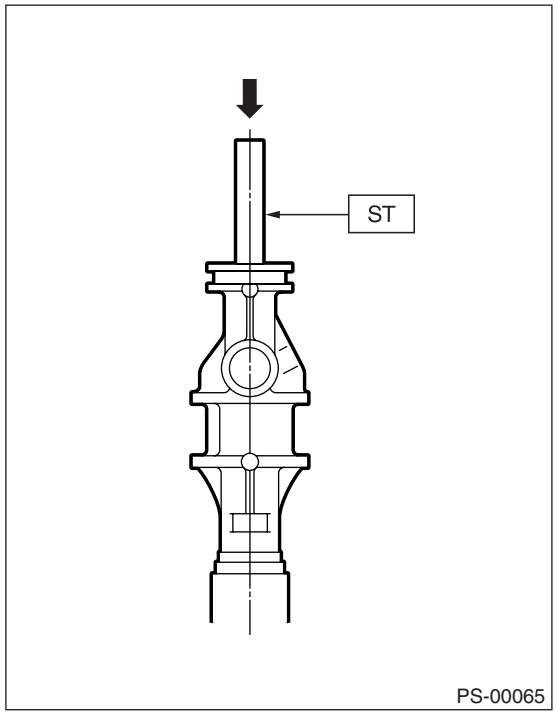
15) Install the ST on valve side of rack and press outer side oil seal out taking care not to contact rack with steering body inner surface.
ST 34099FA030 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.

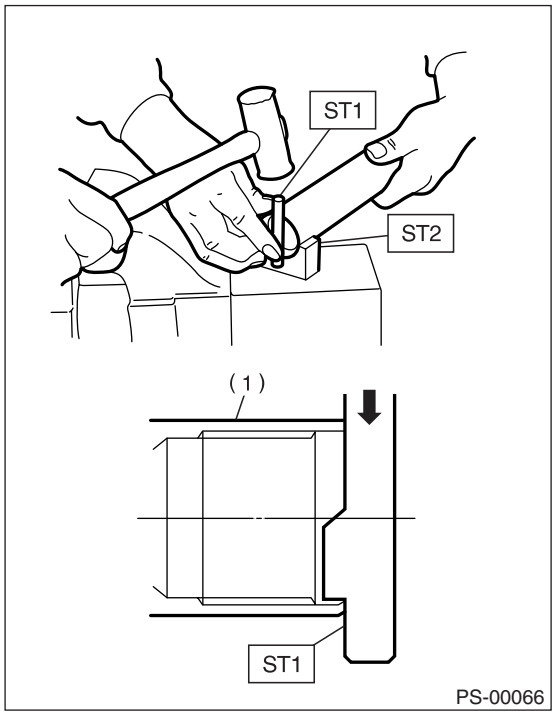


(1) Rack piston
(2) Outer side oil seal

16) Insert the ST from valve side and press back-up ring and oil seal out.
ST 927580000 REMOVER

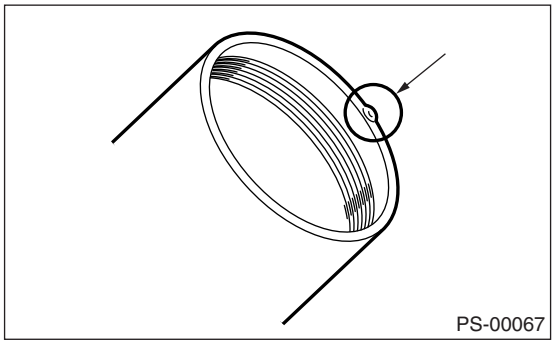


17) Using the ST1 and ST2, repair the cylinder's clinched sections.
ST1 34099FA080 PUNCH
ST2 34099FA070 BASE



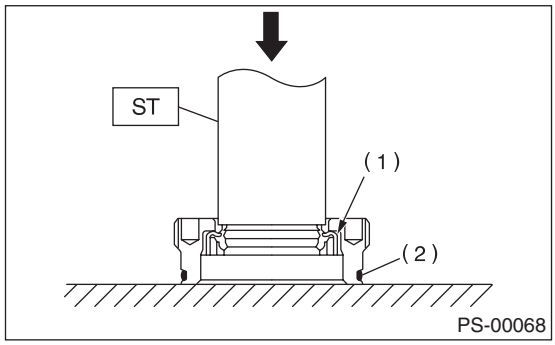
(1) Cylinder

18) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



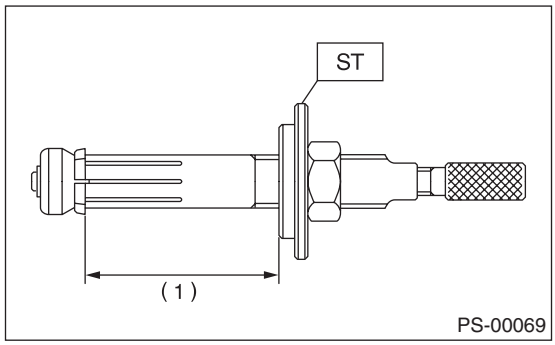
19) Remove the oil seal using ST and press from plug.
ST 34199AE100 PLUG OIL SEAL REMOVER

NOTE:
Do not apply force on the plug edge surface.



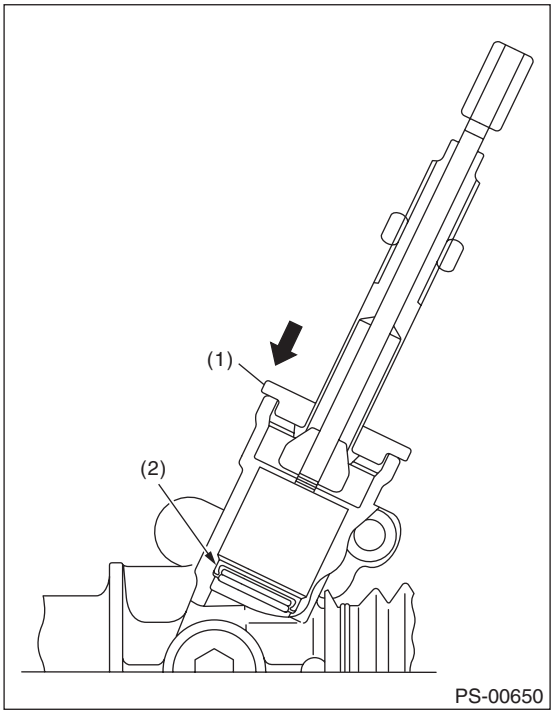
(1) Oil seal
(2) O-ring

20) Set the ST on drawing dimension.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



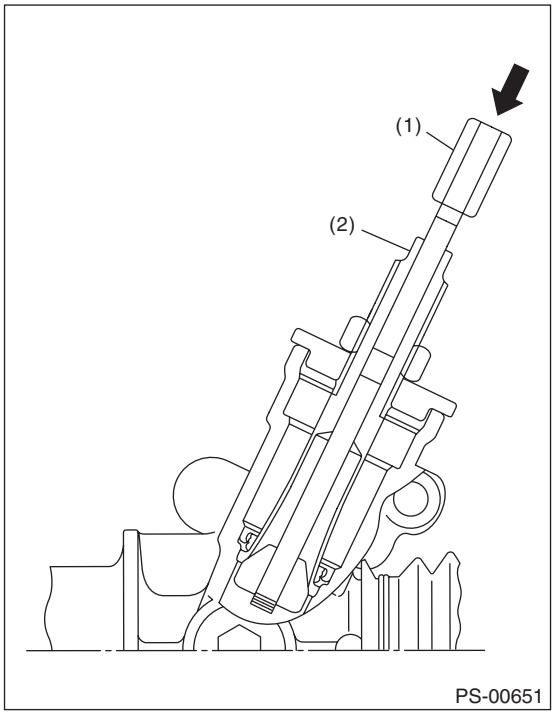
(1) 70 mm (2.76 in)

21) Set the stopper to gearbox, and then insert the tip of ST to gearbox.



(1) Stopper
(2) Oil seal

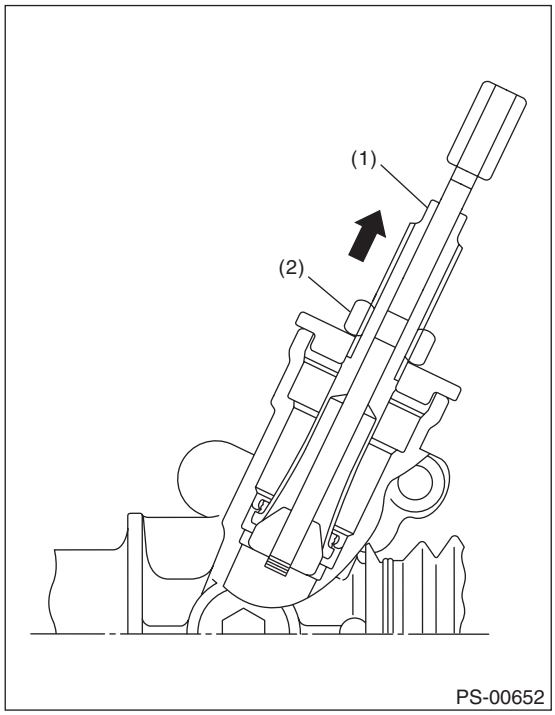
22) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.



(1) Rod
(2) 2-surface width

23) While fixing the 2-surface width, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gearbox inner surface.



(1) 2-surface width
(2) Nut

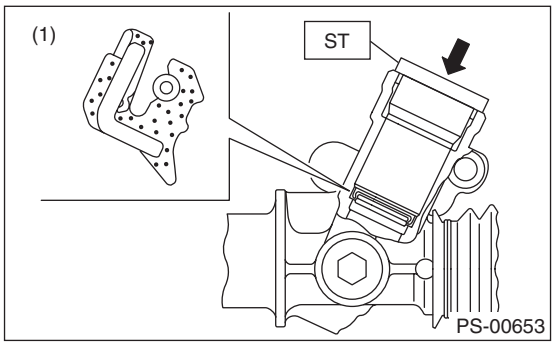
D: ASSEMBLY

1) Apply a coat of grease to inside and outside of new oil seal.

Specified steering grease:
One Luber MO (Part No. 003608001)

2) Verify the oil seal direction and installation position. Using the ST and press, press fit the oil seal to gearbox.

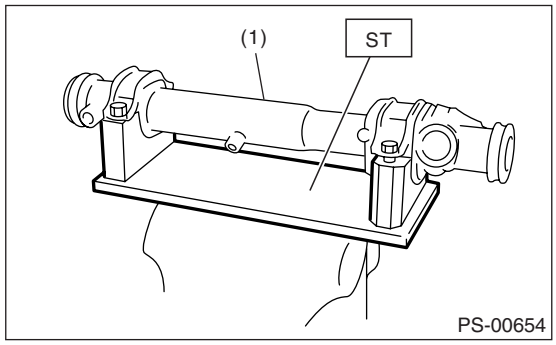
ST 34199AE130 GEARBOX OIL SEAL INSTALLER



(1) Oil seal

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.
ST 926200000 STAND

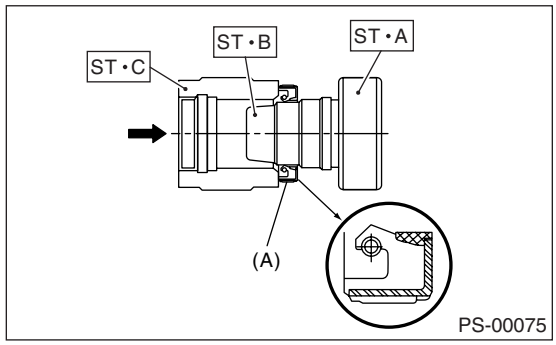
CAUTION:
Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.



(1) Steering body

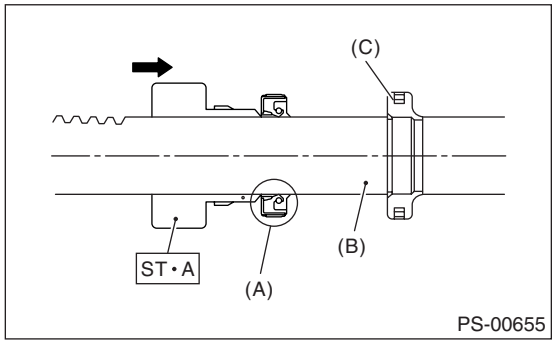
4) Using the ST·B and ST·C, attach the oil seal to ST·A.
ST 927490000 INSTALLER A, B, C

NOTE:
Face the oil seal in direction shown in the figure.



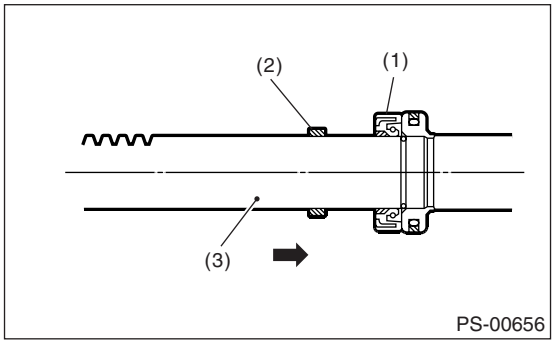
(A) Oil seal

5) Insert the ST·A with oil seal assembled, through gear side of rack. Remove the oil seal from ST·A near piston, and then remove the ST·A from rack.



(A) Oil seal
(B) Rack
(C) Piston

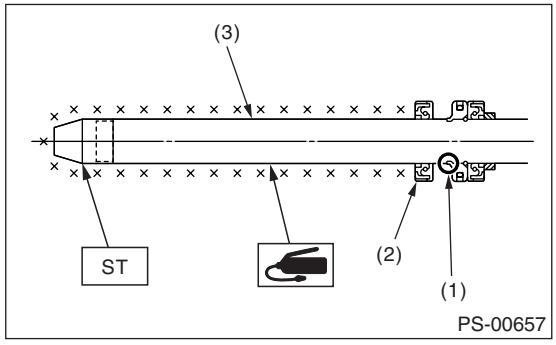
6) Install the back-up washer from gear side of rack.



(1) Oil seal
(2) Back-up washer
(3) Rack

7) Install the ST on rack and equally apply a thin coat of grease to the rack and ST, then install the oil seal.
ST 926250000 GUIDE

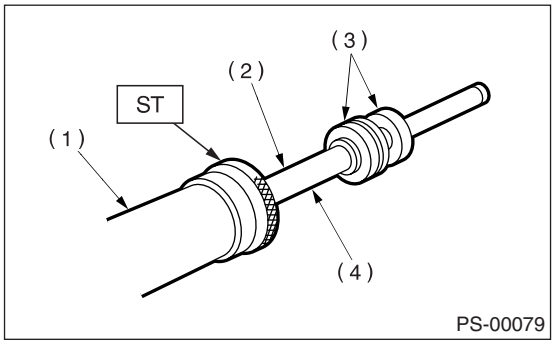
CAUTION:
Be careful not to scratch the oil seal lips with piston's inner ring section.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

8) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install the ST on end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199AE000 GUIDE (Oil seal)

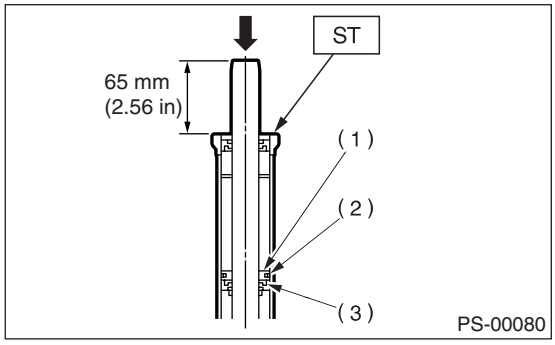
CAUTION:
Do not allow grease to block the air vent hole on rack.



(1) Cylinder side of steering body
(2) Air vent hole
(3) Oil seal
(4) Rack

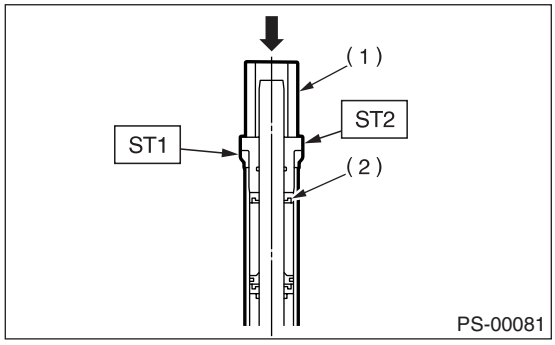
9) Using the press, slowly press the inner side oil seal until distance between the ST and end of rack becomes 65 mm (2.56 in).
ST 34199AE000 GUIDE (Oil seal)

CAUTION:
Ensure the ST's inner wall is free of scratches. Otherwise, it may damage the oil seal during installation.



(1) Rack piston
(2) Inner side oil seal
(3) Back-up ring

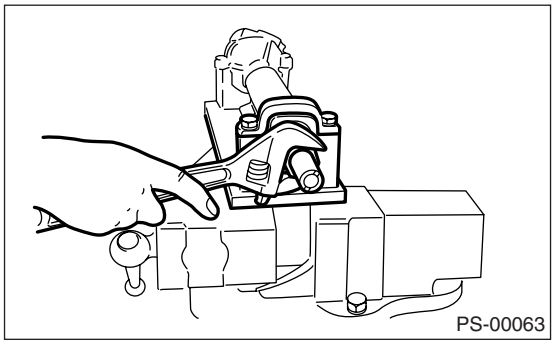
10) Pass the ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2 using press.
ST1 34199AE000 GUIDE (Oil seal)
ST2 34199AE010 INSTALLER (Oil seal)



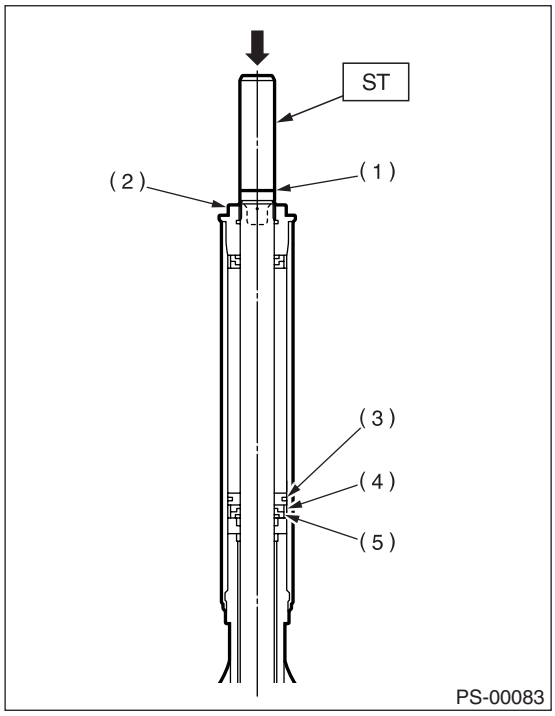
(1) Pipe
(2) Outer side oil seal

11) Install a new holder to cylinder side of steering body.

Tightening torque:
64 N·m (6.5 kgf-m, 47.2 ft-lb)



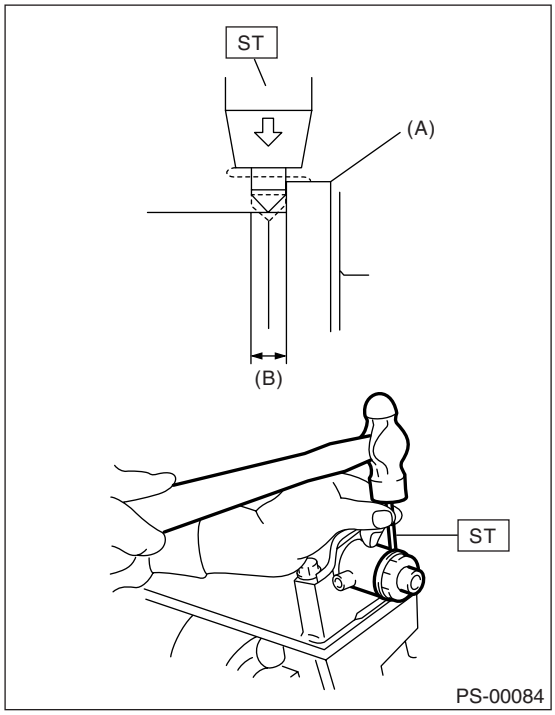
12) Using a press, press the ST until its groove is aligned with end of holder.
ST 34099FA030 INSTALLER & REMOVER



(1) Installer guide
(2) Holder
(3) Rack piston
(4) Oil seal
(5) Back-up ring

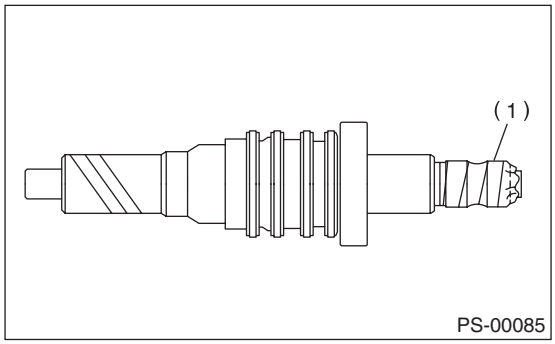
13) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

CAUTION:
Be careful not to deform the holder.
ST 34099FA060 PUNCH HOLDER



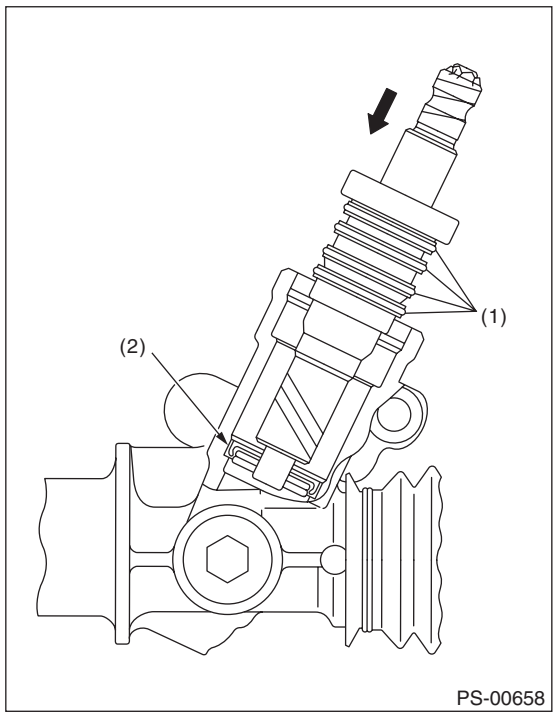
(A) Holder
(B) 3 mm (0.12 in)

14) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

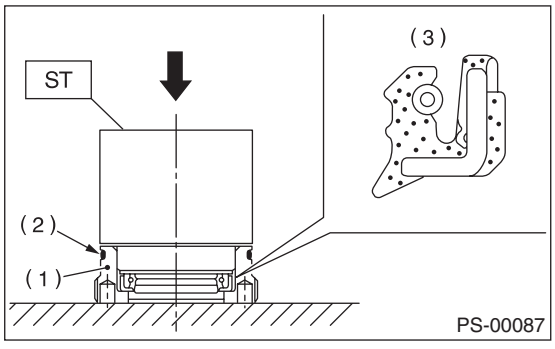
15) Apply a coat of grease on the gear teeth of valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



(1) Seal ring
(2) Oil seal

16) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.
ST 34199AE110 OIL SEAL PLUG INSTALLER

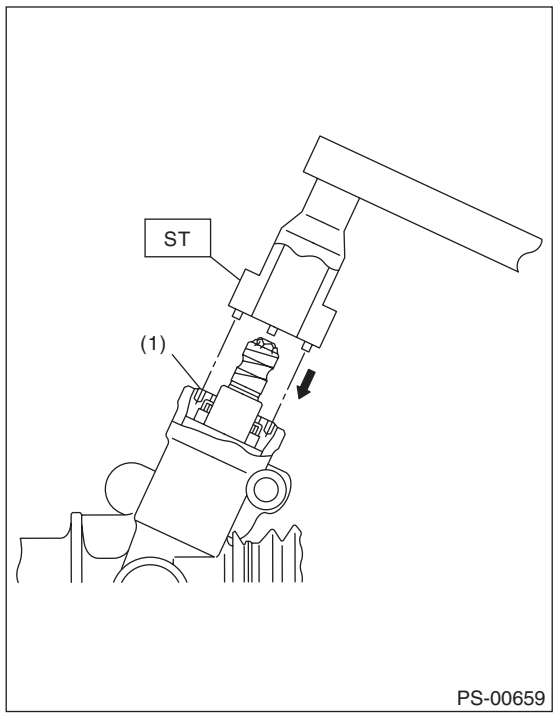
CAUTION:
Pay attention to the oil seal direction.



(1) Plug
(2) O-ring
(3) Oil seal

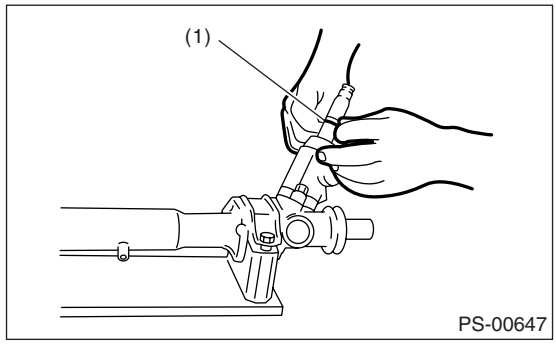
17) Using the ST, install the plug.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.2 ft-lb)



(1) Plug

18) Install the dust cover. Remove the vinyl tape.

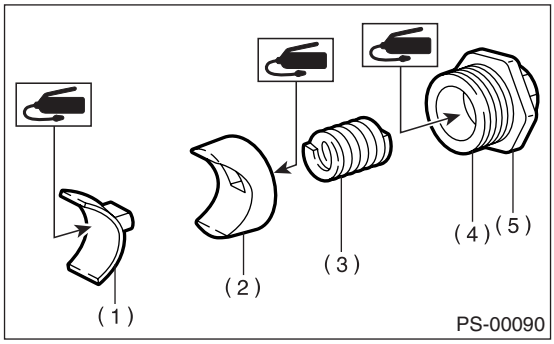


(1) Dust cover

19) Temporarily install the tie-rod to rack end, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

20) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



(1) Seat pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

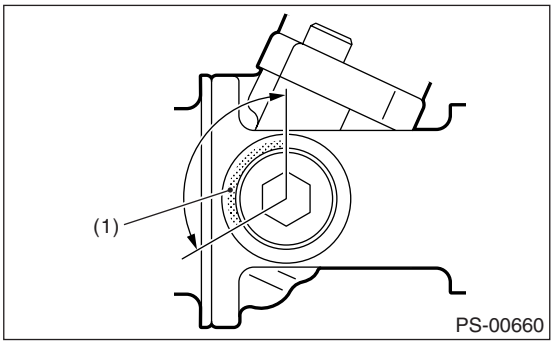
21) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

NOTE:
Tighten to the specified tightening torque, and then loosen by 25°.

22) Remove the tie-rod.
23) Verify that play is within specified value. **<Ref. to PS-38,** SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].>
24) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

25) Tighten the adjusting screw.
(1) Tighten the adjusting screw to specified torque, and then loosen.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

(2) Tighten the adjusting screw to specified torque, and then loosen.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

(3) Tighten the adjusting screw to specified torque, and then loosen by 26°.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

26) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

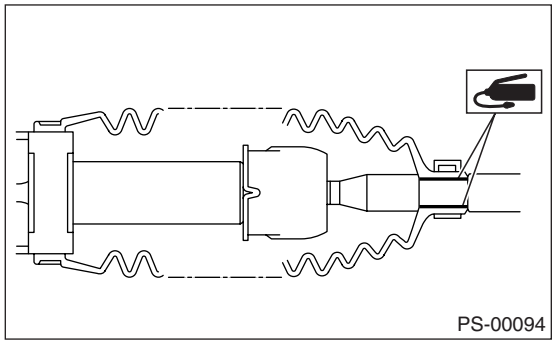
27) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

NOTE:
Check the mating face of rack and tie-rod for foreign material, dirt, dust, etc.
If required, clean the mating face.

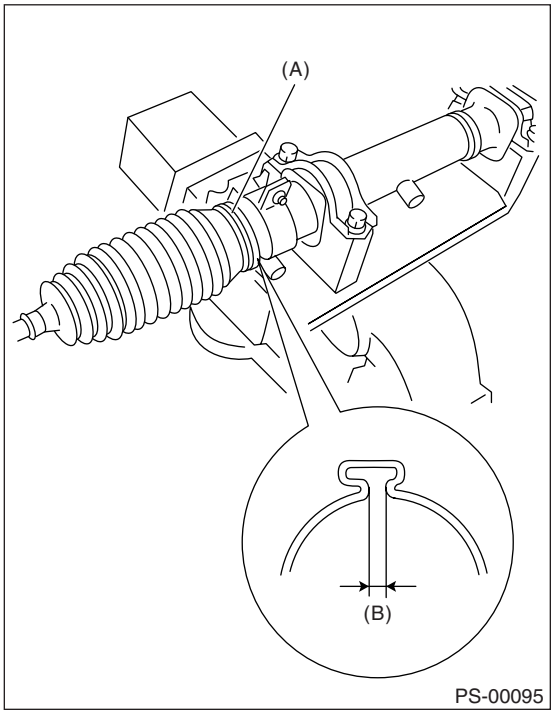
28) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



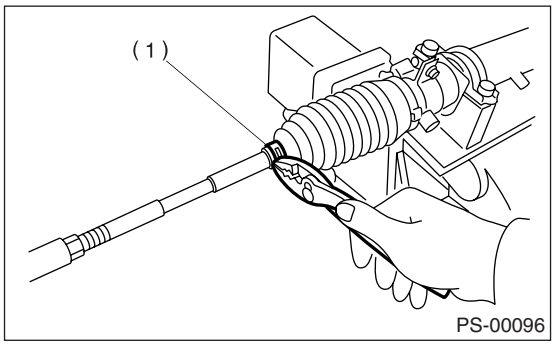
29) Caulk the boot so the space inside boot band caulking portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new boot band.



(A) Boot band
(B) Less than 2 mm (0.08 in)

30) Fix the boot end with clip (small).

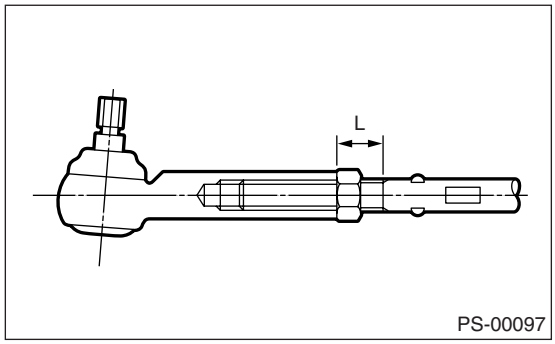


(1) Clip

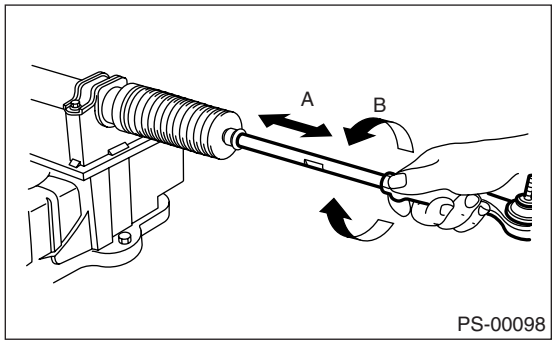
31) After installing, check the boot end is positioned into groove on tie-rod.

32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
31.2 mm (1.23 in)



33) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in specified position without deflation.



34) Remove the gearbox from ST.
ST 926200000 STAND

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox assembly for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox assembly.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping the rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox assembly.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox assembly with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox assembly with a new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox assembly with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

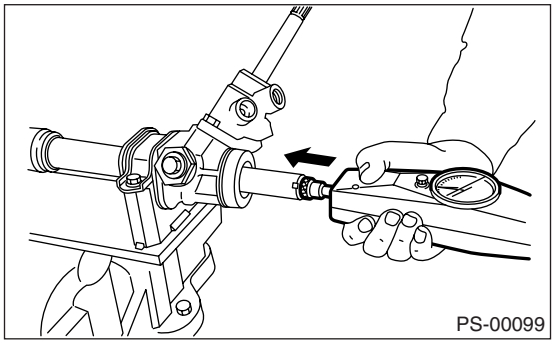
2. SERVICE LIMIT

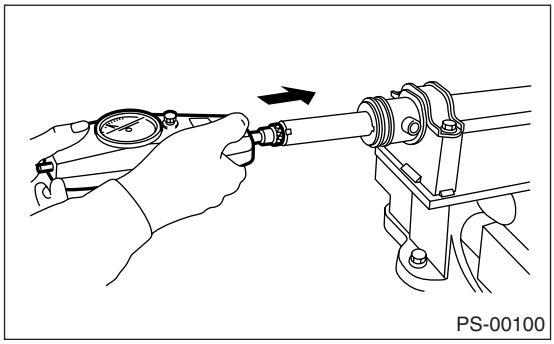
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

NOTE:
When making a measurement, vise the gearbox assembly by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox assembly.

ST 926200000 STAND

Sliding resistance of rack shaft:
Service limit:
400 N (41 kgf, 90 lbf) or less


PS-00099

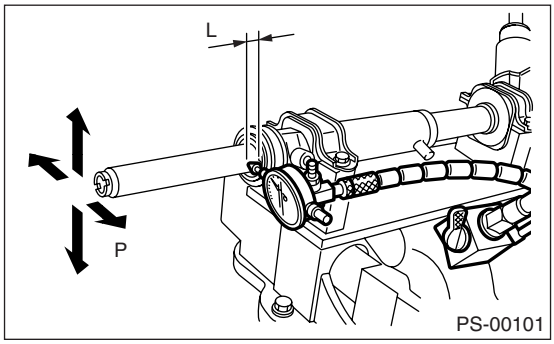

PS-00100

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering

Service limit:
0.19 mm (0.0075 in) or less

On condition
L: 5 mm (0.20 in)
P: 122.6 N (12.5 kgf, 27.6 lbf)

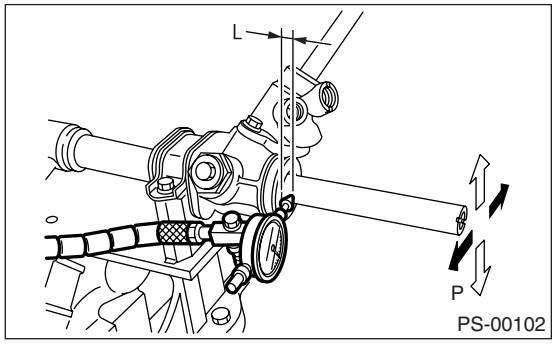


PS-00101

Left-turn steering

Service limit:
Direction ⇦⇨
0.3 mm (0.012 in) or less
Direction ⬅➡
0.15 mm (0.0059 in) or less

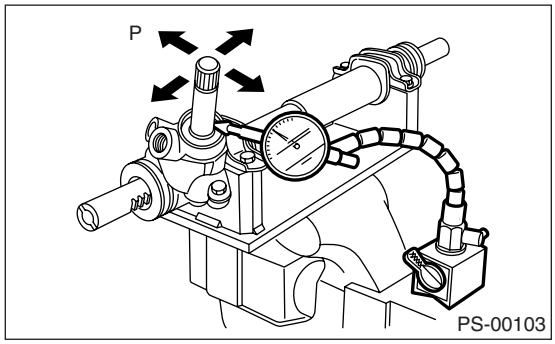
On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)



PS-00102

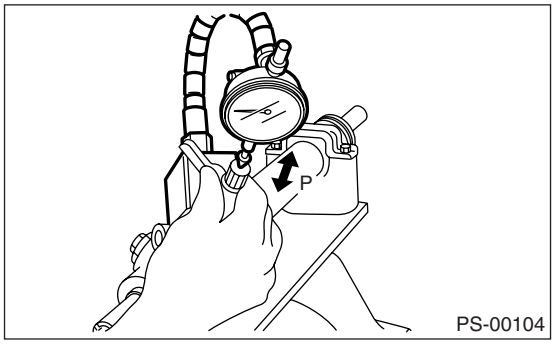
4. INPUT SHAFT PLAY

In radial direction
Service limit:
0.18 mm (0.0071 in) or less
On condition
P: 98 N (10 kgf, 22 lbf)



PS-00103

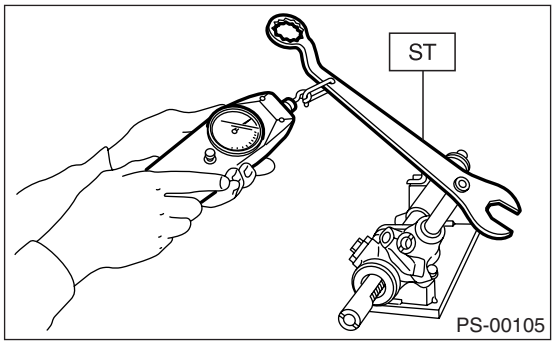
In axial direction
Service limit:
0.5 mm (0.020 in) or less
On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)



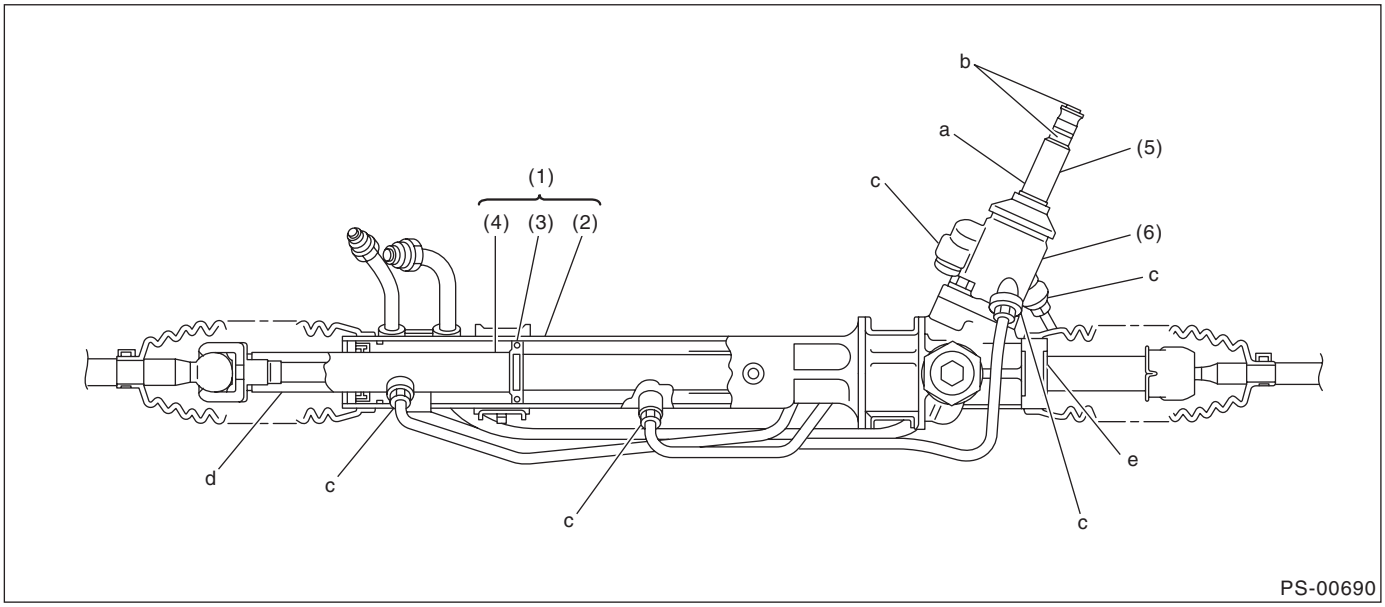
5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure the gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit:
Maximum allowable resistance:
Less than 9.33 N (0.95 kgf, 2.10 lbf)
Difference between right and left sliding resistance:
Less than 20%



6. OIL LEAKING



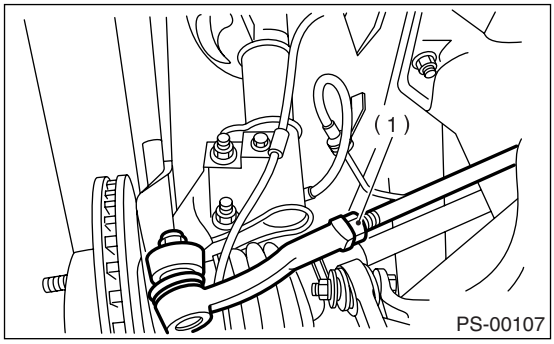
(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack shaft
(5) Input shaft
(6) Valve housing

1) If the leak is found, it is necessary to thoroughly remove the fluid from the suspected portion and turn the steering wheel from lock to lock about thirty to forty times with engine running, then make comparison of the portion immediately after and several hours after this operation.
2) Inspect leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new one.
3) Inspect leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
4) Inspect leakage from “c”
The pipe is damaged. Replace the faulty pipe or O-ring.
5) If leak is other than a, b, c and if oil is leaking from the gearbox assembly, move the right and left boots toward tie-rod end side, respectively, with the gearbox assembly mounted to the vehicle, and remove fluid from the surrounding portions. Then, turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion immediately after and several hours after this operation.
(1) Leakage from “d”
The cylinder seal is damaged. Replace the rack bush with a new one.
(2) Leakage from “e”
There are two possible causes. Take the following step first. Remove the pipe B assembly from the valve housing, and close the circuit with ST.
ST 926420000 PLUG
Turn the steering wheel from lock to lock thirty to forty times with the engine running, then make comparison of the leaked portion between immediately after and several hours after this operation.
• If leakage from “e” is noted again:
The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new one. Or replace the oil seal and parts that are damaged during disassembly with new ones.
• If oil stops leaking from “e”:
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:
IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)

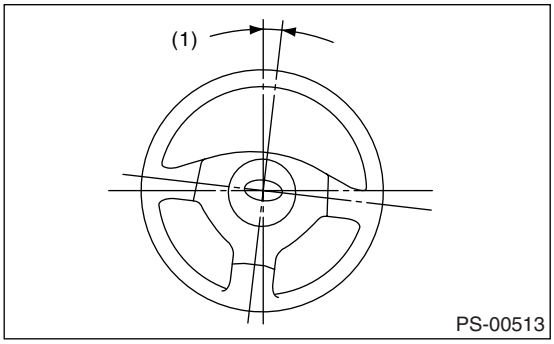


(1) Lock nut

2) Adjust the steering angle of steering wheels.

Standard of steering angle:
Inner wheel
36°25'±1°30'
Outer wheel
32°00'±1°30'

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



(1) Within 5°

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in opposite direction by same angle.

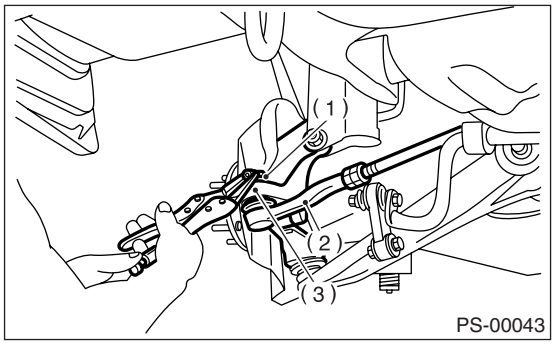
6. Steering Gearbox [RHD Model]

A: REMOVAL

1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.
3) Loosen the front wheel nut.
4) Lift-up the vehicle, and then remove the front wheels.
5) Remove the under cover.
6) Remove the sub frame. <Ref. to FS-24, REMOVAL, Sub Frame.>
7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX(H4SO)-7, REMOVAL, FRONT EXHAUST PIPE.>

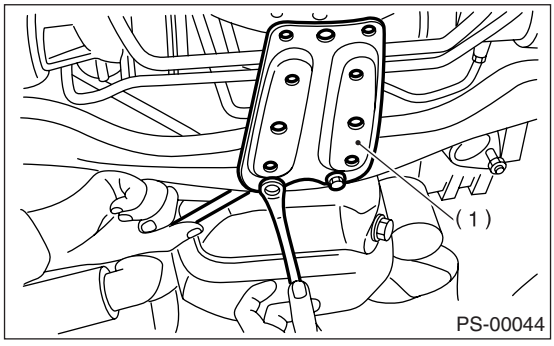
WARNING:
Be careful, the exhaust pipe is hot.

8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



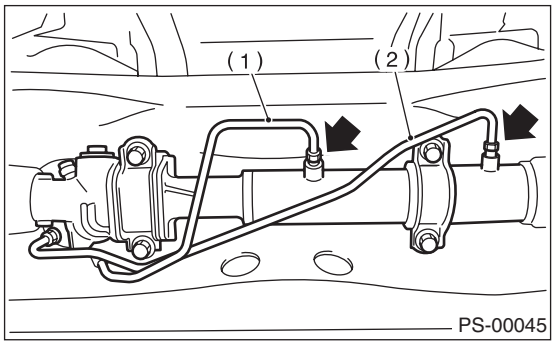
(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

9) Remove the jack-up plate and front stabilizer.



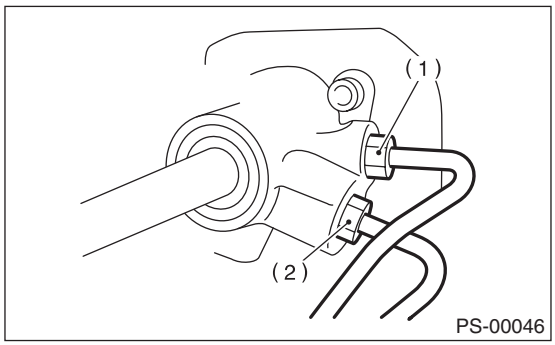
(1) Jack-up plate

10) Remove the one pipe joint at center of gearbox assembly, and connect vinyl hose to the pipe and the joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from other pipes.



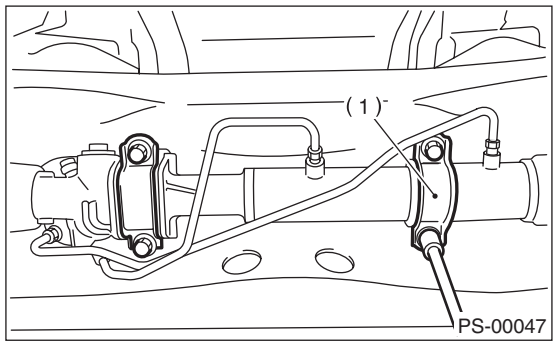
(1) Pipe A
(2) Pipe B

11) Remove the universal joint. **<Ref. to PS-19,** REMOVAL, UNIVERSAL JOINT.>
12) Disconnect the lower pipe C from gearbox assembly first, and upper pipe D second.



(1) Pipe C
(2) Pipe D

13) Remove the clamp bolts securing gearbox assembly to crossmember, and then remove the gearbox.

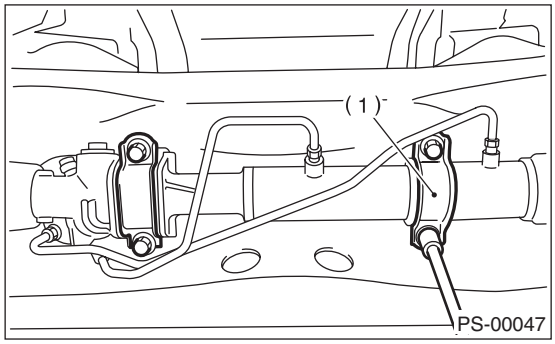


(1) Clamp

B: INSTALLATION

1) Insert the gearbox assembly into crossmember, being careful not to damage the gearbox boot.
2) Tighten the gearbox assembly to crossmember bracket via clamp with bolt to specified torque.

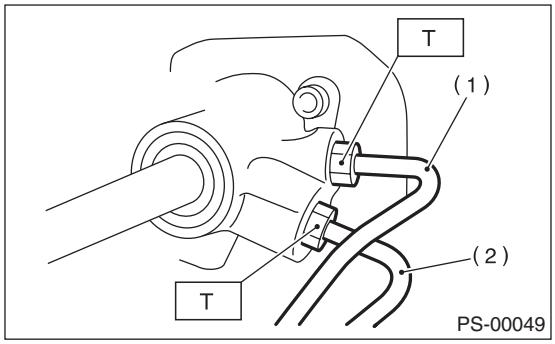
Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)



(1) Clamp

3) Connect the pipe D first to gearbox, and pipe C second.

Tightening torque:
T: 15 N·m (1.5 kgf-m, 11.1 ft-lb)

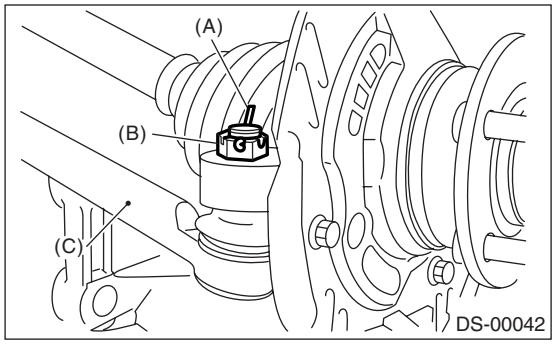


(1) Pipe C
(2) Pipe D

4) Install the universal joint. **<Ref. to PS-19,** INSTALLATION, UNIVERSAL JOINT.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut. Fit the cotter pin into nut, and then bend the pin to lock.

Castle nut tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:
• Tighten to the specified tightening torque, and tighten further within 60° until cotter pin hole is aligned with slot in the nut.
• When connecting, do not hit the cap at bottom of tie-rod end with hammer.



(A) Cotter pin
(B) Castle nut
(C) Tie-rod

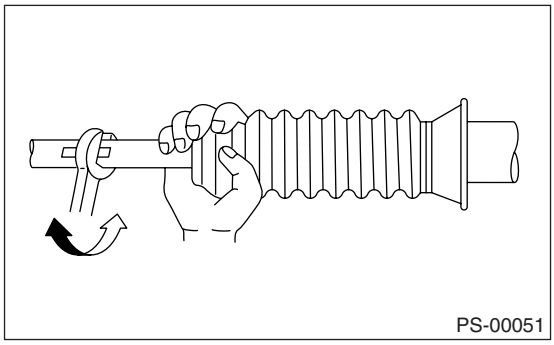
6) Install the front stabilizer to vehicle. <Ref. to FS-22, INSTALLATION, Front Stabilizer.>
7) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX(H4SO)-8, INSTALLATION, Front Exhaust Pipe.>
8) Install the sub frame. <Ref. to FS-24, INSTALLATION, Sub Frame.>
9) Install the under cover. <Ref. to EI-22, INSTALLATION, Front Under Cover.>
10) Align the center of roll connector. **<Ref. to AB-20,** ADJUSTMENT, ROLL CONNECTOR.>
11) Install the steering wheel. **<Ref. to PS-18,** INSTALLATION, Steering Wheel.>
12) Install the front wheels.
13) Tighten the wheel nuts to specified torque.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

14) Connect the battery ground cable to battery.
15) Pour fluid into the reservoir tank, and bleed air. **<Ref. to PS-80, Power Steering Fluid.>**
16) Check for fluid leaks.
17) Install the jack-up plate.
18) Lower the vehicle.
19) Check the fluid level in reservoir tank.
20) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:
83 N·m (8.5 kgf-m, 61.2 ft-lb)

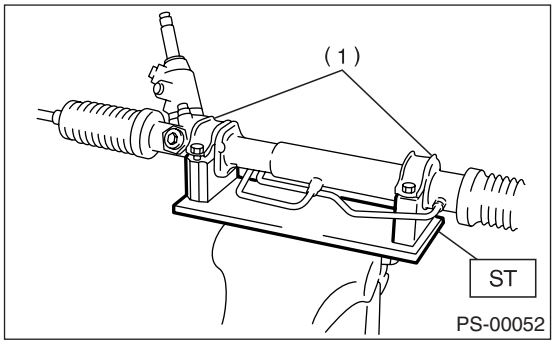
NOTE:
When adjusting the toe-in, hold the boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

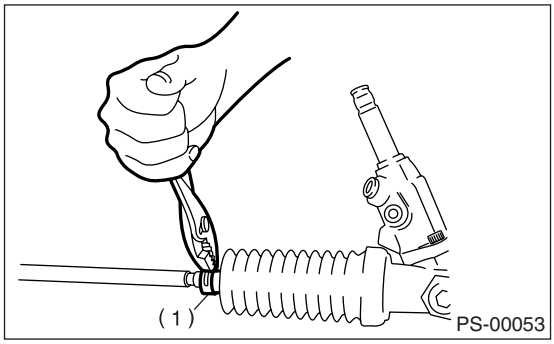
1) Secure the gearbox assembly removed from vehicle in vise using the ST.
ST 926200000 STAND

CAUTION:
Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.



(1) Clamp

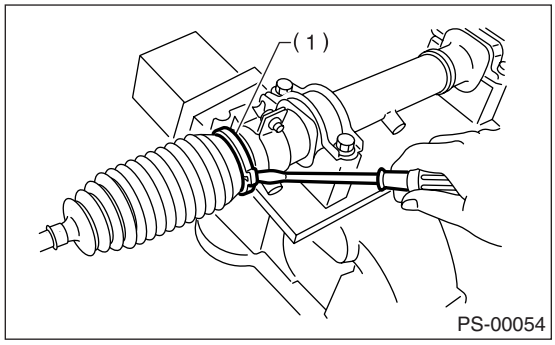
2) Remove the tie-rod end and lock nut from gearbox assembly.
3) Remove the clip on outside of boot using pliers, and then slide the boot to tie-rod end side.



(1) Clip

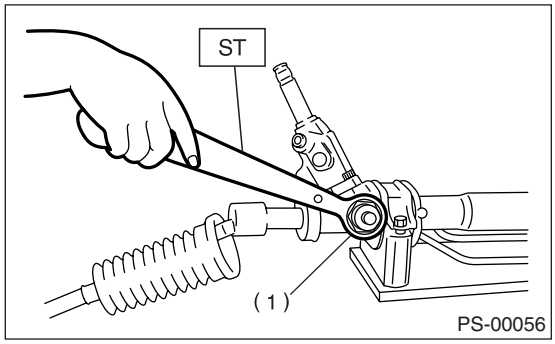
4) Using flat tip screwdriver, remove the band from boot.

NOTE:
Check the boot for crack, damage or deterioration. Replace the boot with a new one if necessary.



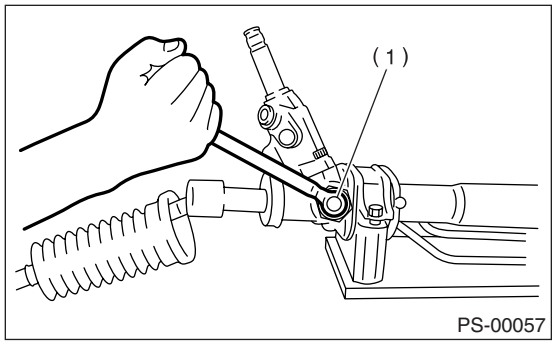
(1) Band

5) Using the ST, loosen lock nut.
ST 926230000 SPANNER



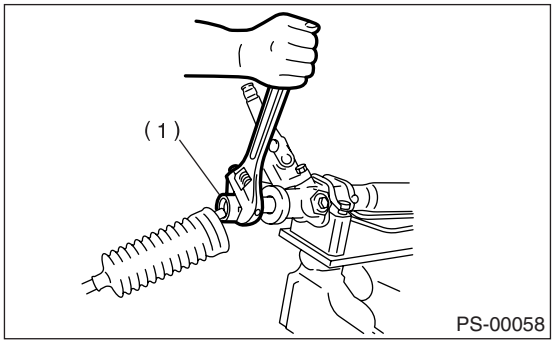
(1) Lock nut

6) Tighten the adjusting screw until it no longer tightens.



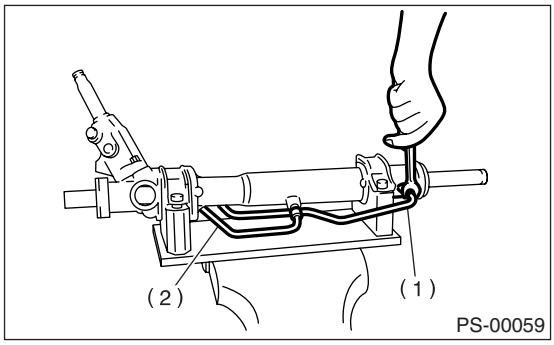
(1) Adjusting screw

7) Using a 32 mm spanner or adjustable wrench with clinching boot, remove the tie-rod.



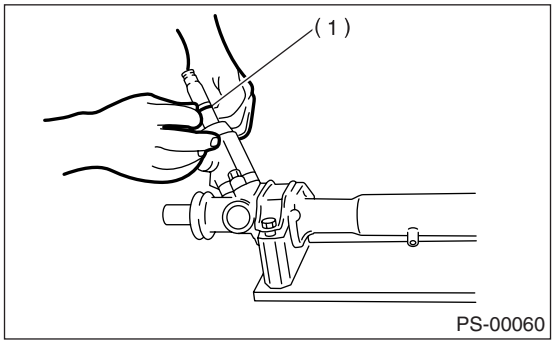
(1) Tie-rod

8) Loosen the adjusting screw, and then remove the spring and sleeve.
9) Disconnect the pipes A and B from steering body and control valve housing.



(1) Pipe A
(2) Pipe B

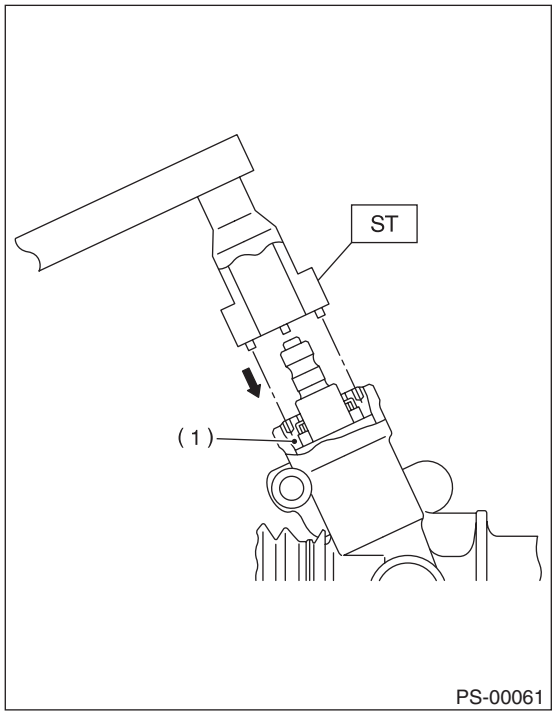
10) Clean the dirt of input shaft. Remove the dust cover taking care not to scratch the housing or input shaft and allow foreign matter to enter gearbox interior.



(1) Dust cover

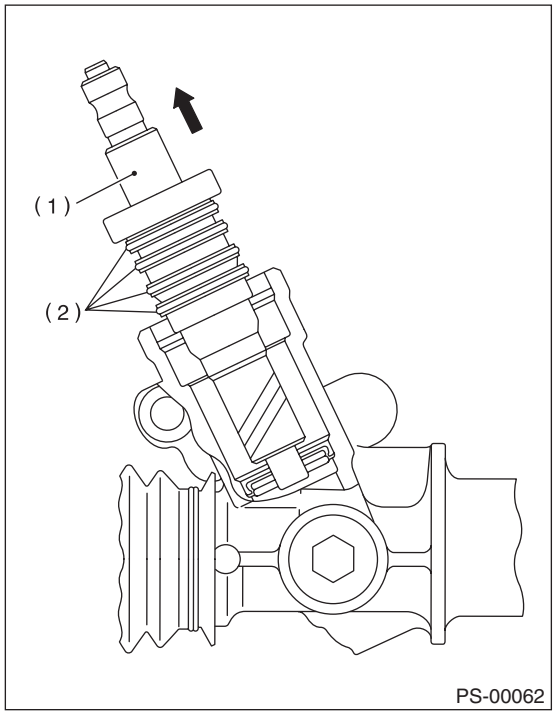
11) Align the ST pin to plug hole to install. Rotate the ST counterclockwise to remove plug.

ST 34199AE090 PLUG WRENCH



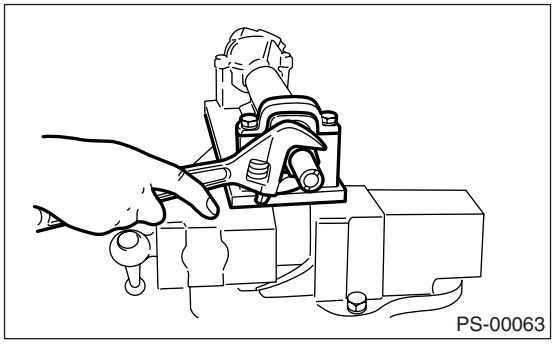
(1) Plug

12) Remove the valve assembly taking care not to scratch seal ring and valve housing inner surface.



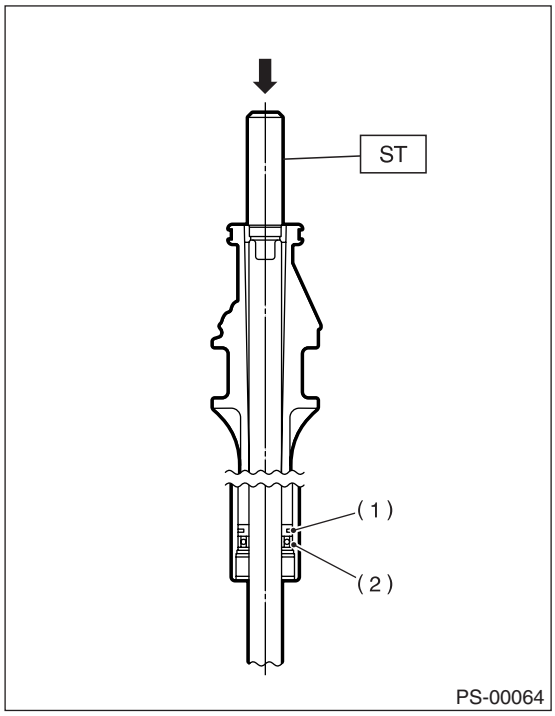
(1) Valve ASSY
(2) Seal ring

13) Remove the holder using a 32 mm (1.26 in) spanner or adjustable wrench.



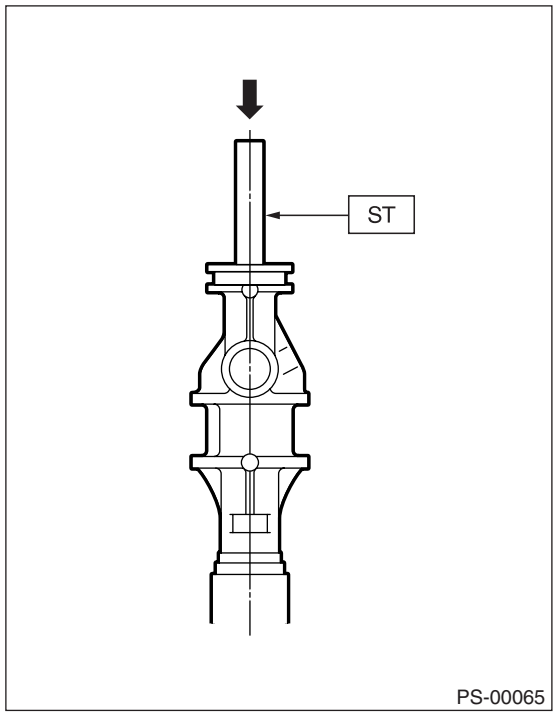
14) Install the ST on valve side of rack and press outer side oil seal out taking care not to contact rack with steering body inner surface.
ST 34099FA030 INSTALLER & REMOVER

NOTE:
Block the pipe connection of steering body to prevent fluid from flowing out.

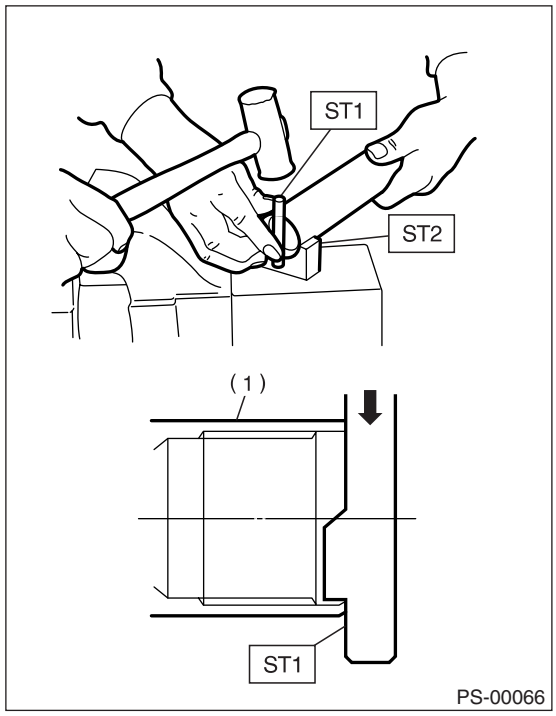


(1) Rack piston
(2) Outer side oil seal

15) Insert the ST from valve side and press back-up ring and oil seal out.
ST 927580000 REMOVER

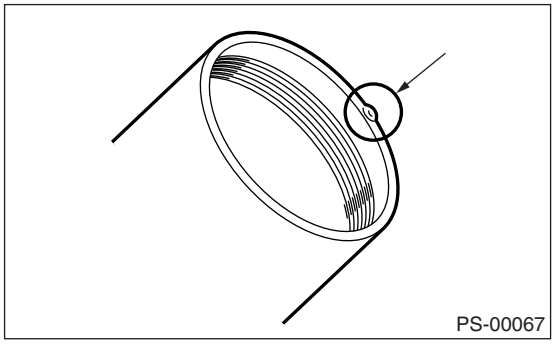


16) Using the ST1 and ST2, repair the cylinder's clinched sections.
ST1 34099FA080 PUNCH
ST2 34099FA070 BASE



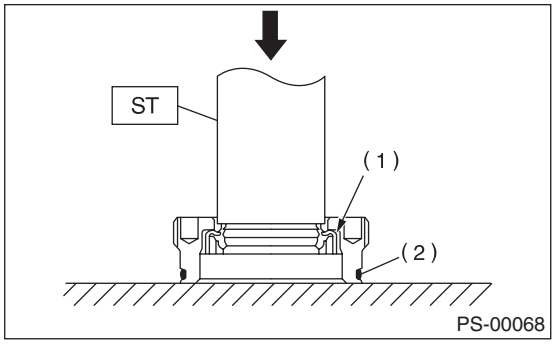
(1) Cylinder

17) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



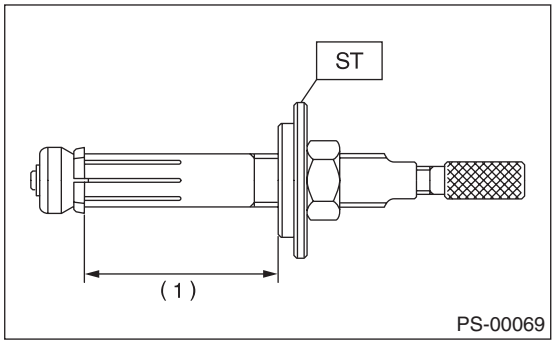
18) Remove the oil seal using ST and press from plug.
ST 34199AE100 PLUG OIL SEAL REMOVER

NOTE:
Do not apply force on the plug edge surface.



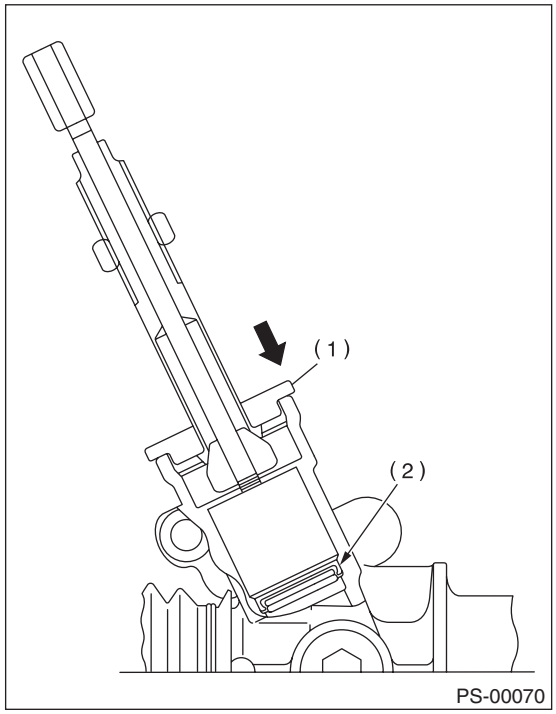
(1) Oil seal
(2) O-ring

19) Set the ST on drawing dimension.
ST 34199AE120 GEARBOX OIL SEAL REMOVER



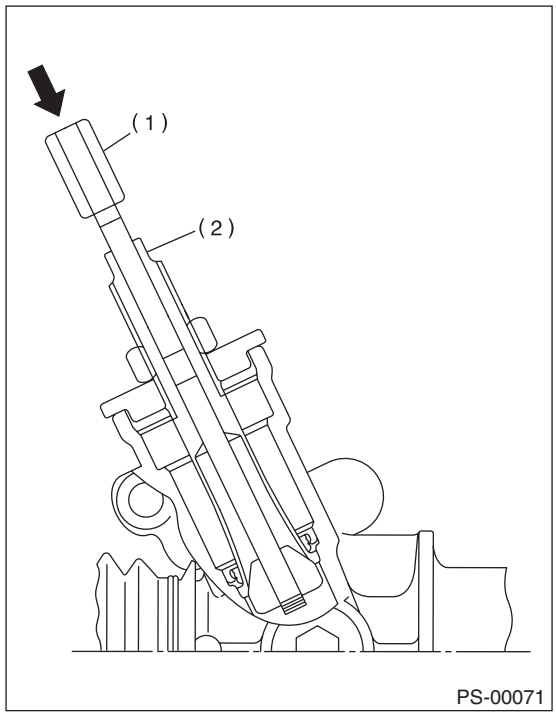
(1) 70 mm (2.76 in)

20) Set the stopper to gearbox, and then insert the tip of ST to gearbox.



(1) Stopper
(2) Oil seal

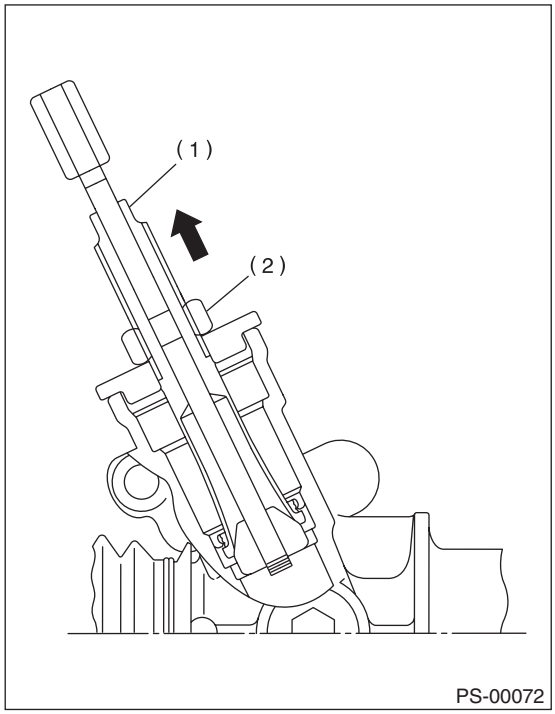
21) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.



(1) Rod
(2) 2-surface width

22) While fixing the 2-surface width, pull out the oil seal by rotating nut.

CAUTION:
Take care not to scratch the gearbox inner surface.



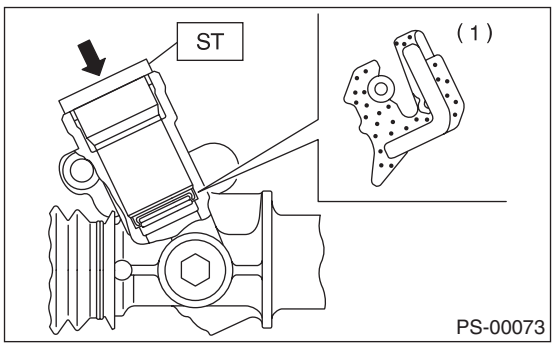
(1) 2-surface width
(2) Nut

D: ASSEMBLY

1) Apply a coat of grease to inside and outside of new oil seal.

Specified steering grease:
ONE LUBER MO (Part No. 003608001)

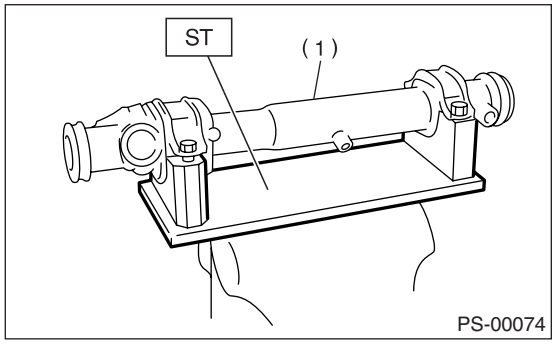
2) Verify the oil seal direction and installation position. Using the ST and press, press fit the oil seal to gearbox.
ST 34199AE130 GEARBOX OIL SEAL INSTALLER



(1) Oil seal

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.
ST 926200000 STAND

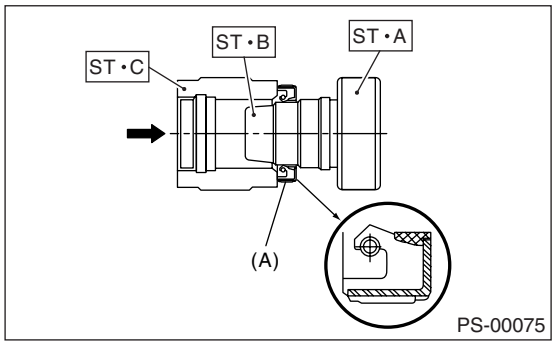
CAUTION:
Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.



(1) Steering body

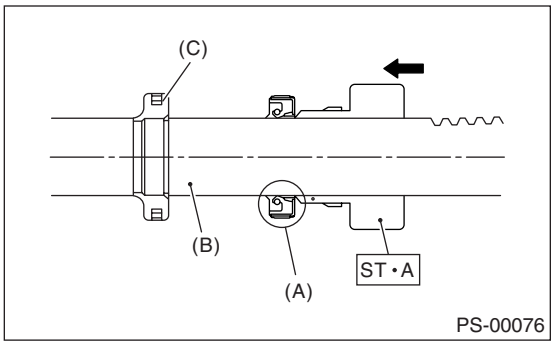
4) Using the ST·B and ST·C, attach the oil seal to ST·A.
ST 927490000 INSTALLER A, B, C

NOTE:
Face the oil seal in direction shown in the figure.



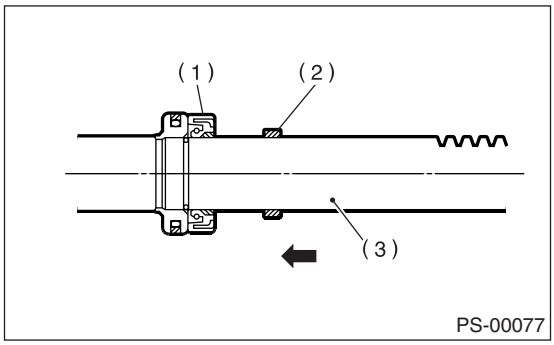
(A) Oil seal

5) Insert the ST·A with oil seal assembled, through gear side of rack. Remove the oil seal from ST·A near piston, and then remove the ST·A from rack.



(A) Oil seal
(B) Rack
(C) Piston

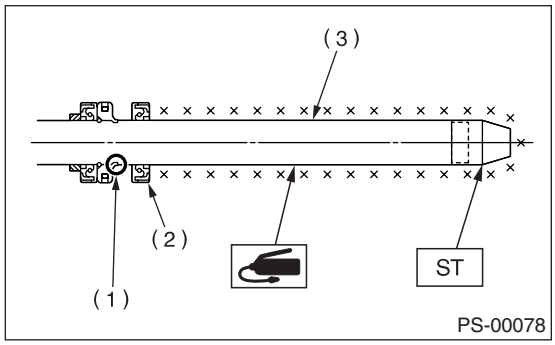
6) Install the back-up washer from gear side of rack.



(1) Oil seal
(2) Back-up washer
(3) Rack

7) Install the ST on rack and equally apply a thin coat of grease to the rack and ST, then install the oil seal.
ST 926250000 GUIDE

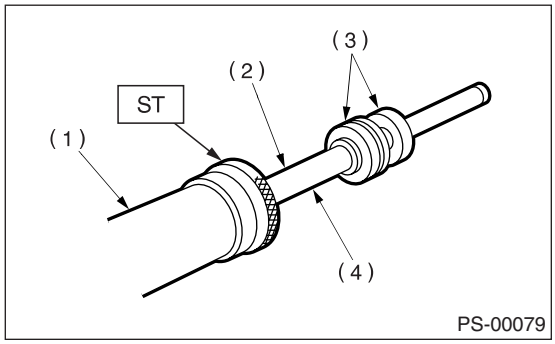
CAUTION:
Be careful not to scratch the oil seal lips with piston's inner ring section.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

8) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install the ST on end of steering body cylinder. Then insert the rack into steering body from cylinder side.
ST 34199AE000 GUIDE (Oil seal)

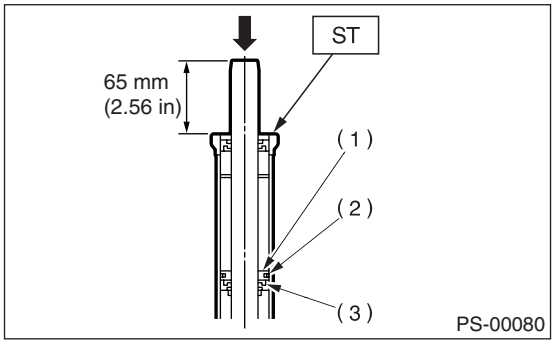
CAUTION:
Do not allow grease to block the air vent hole on rack.



(1) Cylinder side of steering body
(2) Air vent hole
(3) Oil seal
(4) Rack

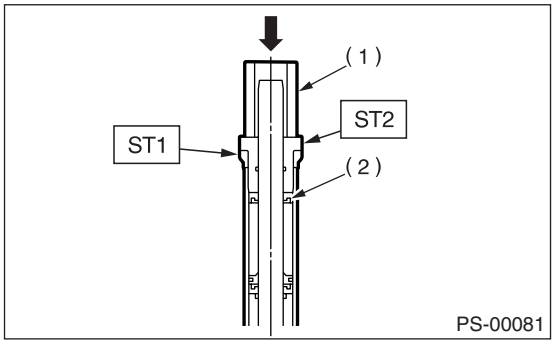
9) Using the press, slowly press the inner side oil seal until distance between the ST and end of rack becomes 65 mm (2.56 in).
ST 34199AE000 GUIDE (Oil seal)

CAUTION:
Ensure the ST's inner wall is free of scratches. Otherwise, it may damage the oil seal during installation.



(1) Rack piston
(2) Inner side oil seal
(3) Back-up ring

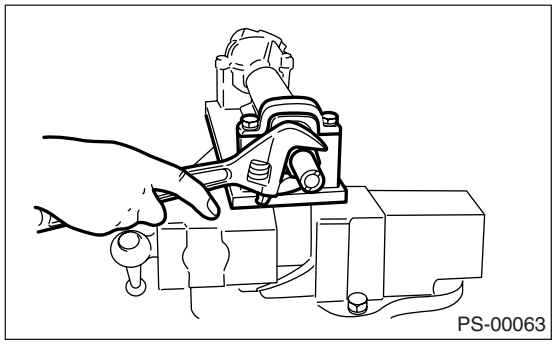
10) Pass the ST2 and pipe through rack and press outer side oil seal until ST1 is in contact with ST2 using press.
ST1 34199AE000 GUIDE (Oil seal)
ST2 34199AE010 INSTALLER (Oil seal)



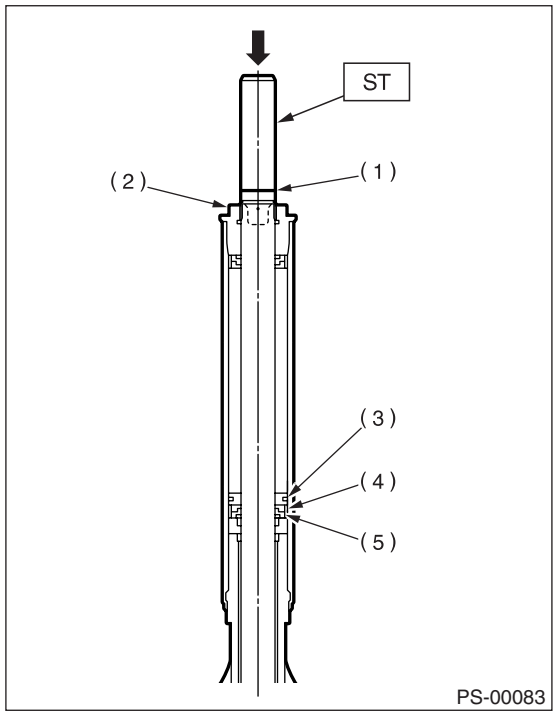
(1) Pipe
(2) Outer side oil seal

11) Install a new holder to cylinder side of steering body.

Tightening torque:
64 N·m (6.5 kgf-m, 47.2 ft-lb)



12) Using a press, press the ST until its groove is aligned with end of holder.
ST 34099FA030 INSTALLER & REMOVER

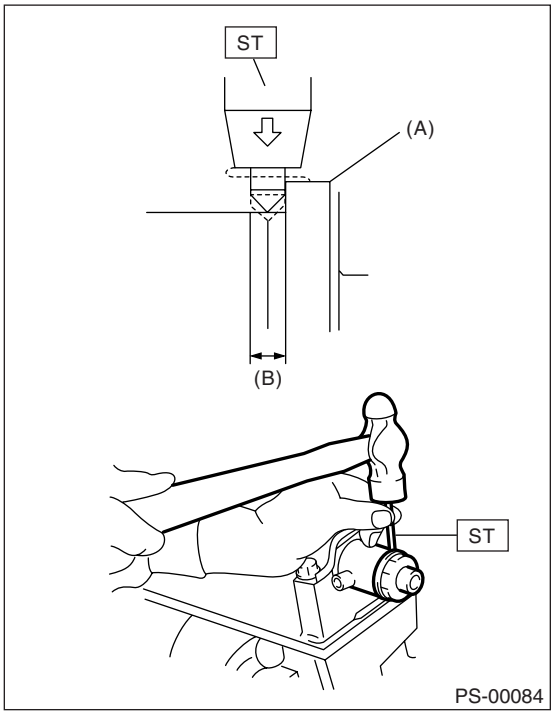


(1) Installer guide
(2) Holder
(3) Rack piston
(4) Oil seal
(5) Back-up ring

13) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

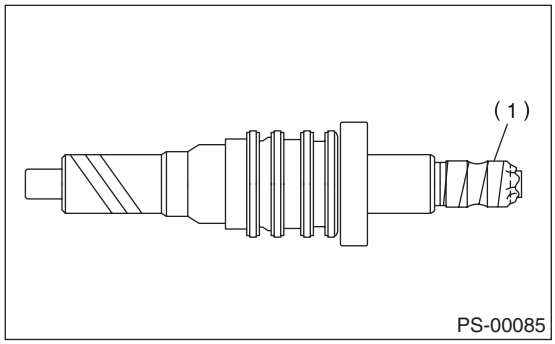
CAUTION:
Be careful not to deform the holder.

ST 34099FA060 PUNCH HOLDER



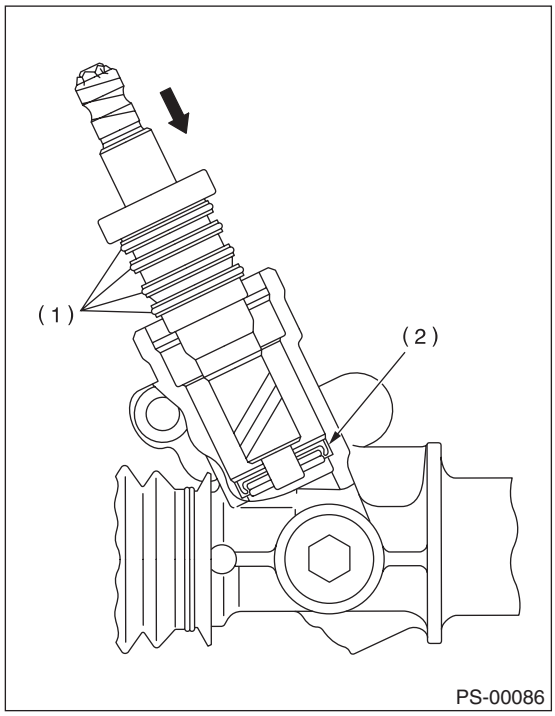
(A) Holder
(B) 3 mm (0.12 in)

14) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.



(1) Vinyl tape

15) Apply a coat of grease on the gear teeth of valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.

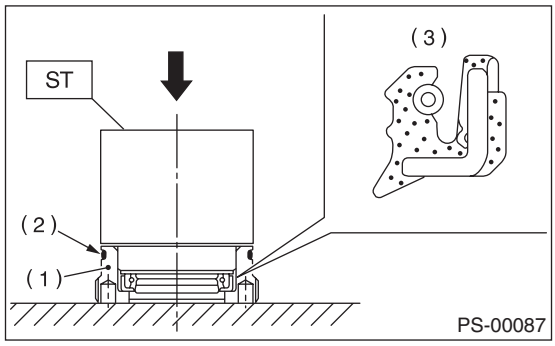


(1) Seal ring
(2) Oil seal

16) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.

ST 34199AE110 PLUG OIL SEAL INSTALLER

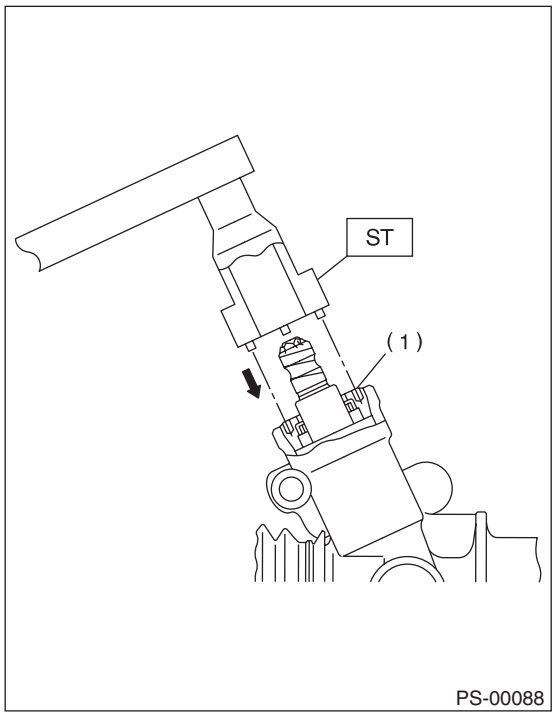
CAUTION:
Pay attention to the oil seal direction.



(1) Plug
(2) O-ring
(3) Oil seal

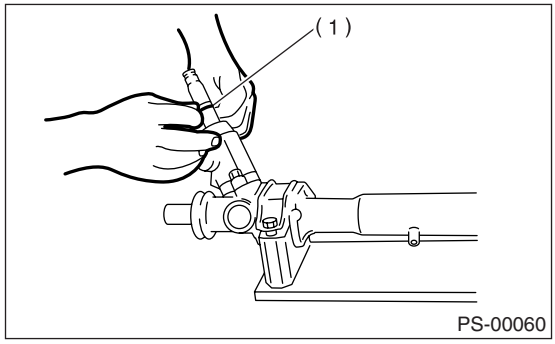
17) Using the ST, install the plug.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf-m, 47.2 ft-lb)



(1) Plug

18) Install the dust cover. Remove the vinyl tape.

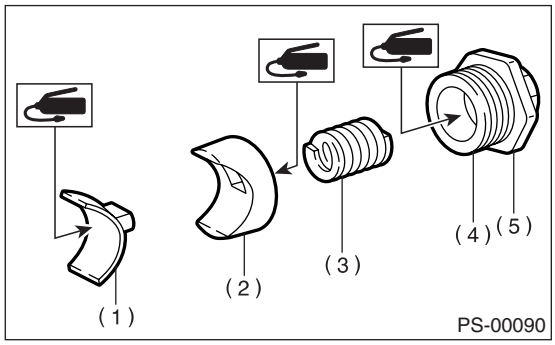


(1) Dust cover

19) Temporarily install the tie-rod to rack end, and then operate it from lock to lock two or three times to make it fit in. Remove the grease blocking air vent hole.

CAUTION:
If operating the rack from lock to lock without installing tie-rod, it may damage the oil seal. Always install the tie-rods LH and RH.

20) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.
Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



(1) Seat pad
(2) Sleeve
(3) Spring
(4) Adjusting screw
(5) Lock nut

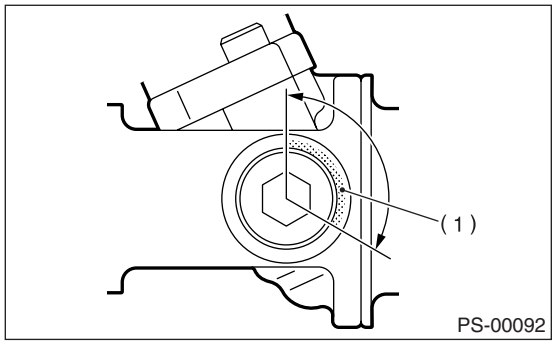
21) Tighten the adjusting screw to specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

NOTE:
Tighten to the specified tightening torque, and then loosen by 25°.

22) Remove the tie-rod.
23) Verify that play is within specified value. **<Ref. to PS-56,** SERVICE LIMIT, INSPECTION, STEERING GEARBOX [RHD MODEL].>
24) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



(1) Apply liquid gasket to at least 1/3 of entire perimeter.

25) Tighten the adjusting screw.
(1) Tighten the adjusting screw to specified torque, and then loosen.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

(2) Tighten the adjusting screw to specified torque, and then loosen.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

(3) Tighten the adjusting screw to specified torque, and then loosen by 26°.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

26) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST.
ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.

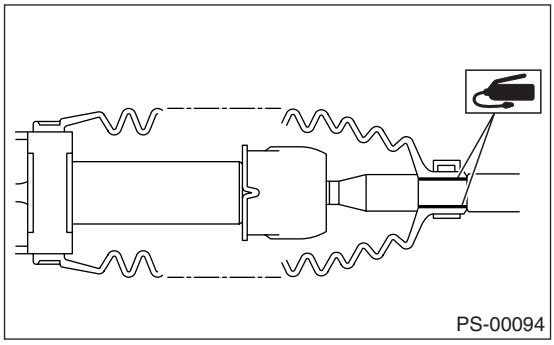
27) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.2 kgf-m, 66 ft-lb)

NOTE:
Check the mating face of rack and tie-rod for foreign material, dirt, dust, etc.
If required, clean the mating face.

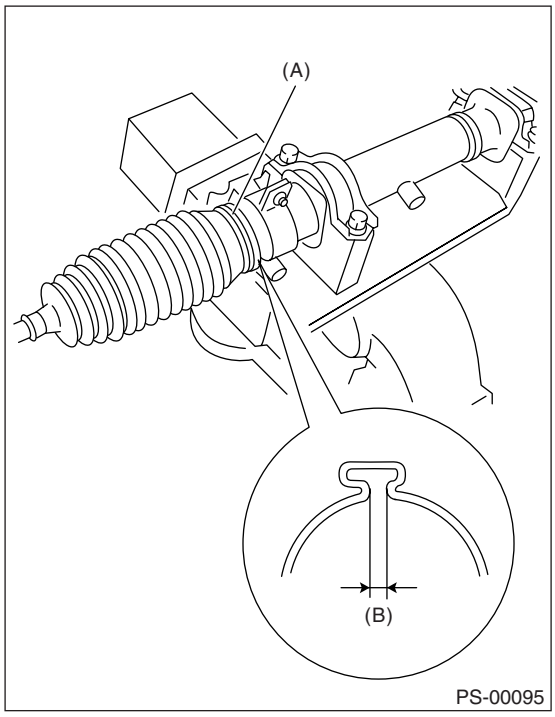
28) Apply a coat of grease to the tie-rod groove, and then install the boot to housing.

NOTE:
Make sure that the boot is installed without unusual inflation or deflation.



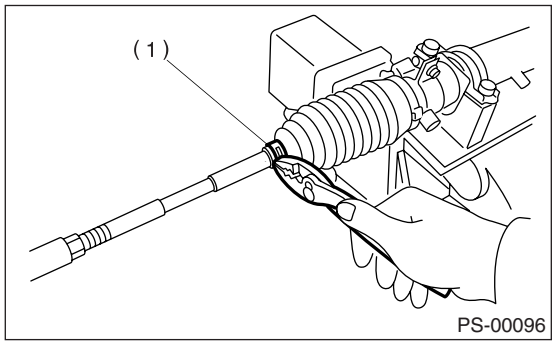
29) Caulk the boot so the space inside boot band caulking portion becomes 2 mm (0.08 in) or less.

NOTE:
Use a new boot band.



(A) Boot band
(B) Less than 2 mm (0.08 in)

30) Fix the boot end with clip (small).

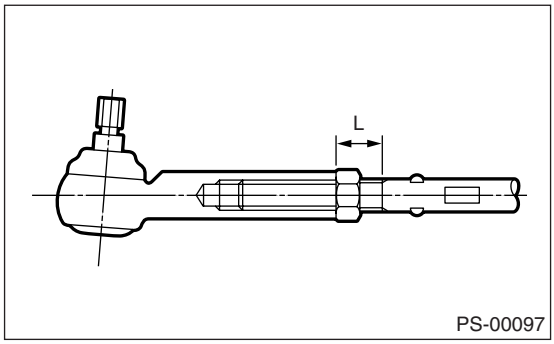


(1) Clip

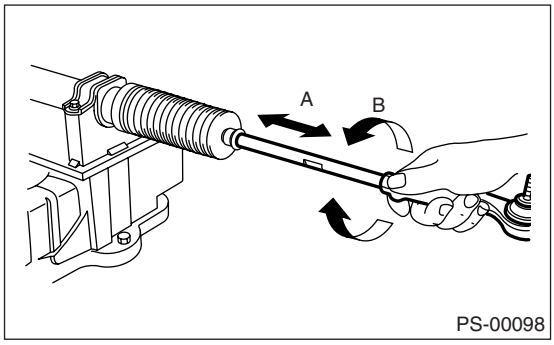
31) After installing, check the boot end is positioned into groove on tie-rod.

32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length L:
31.2 mm (1.23 in)



33) Inspect the gearbox as follows:
"A" Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.
"B" Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.
After all, make sure that the boot is installed in specified position without deflation.



34) Remove the gearbox from ST.
ST 926200000 STAND

E: INSPECTION

1. BASIC INSPECTION

1) Clean all disassembled parts, and check for wear, damage, or any other faults, then repair or replace as necessary.
2) When disassembling, check the inside of gearbox assembly for water. If any water is found, carefully check the boot for damage, input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bend of input shaft (2) Damage on serration	If the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of gearbox and sliding resistance of rack, check if rack and pinion engage uniformly and smoothly with each other. (Refer to “Service limit”.) (2) Keeping the rack pulled out all the way so that all teeth emerge, check teeth for damage. Even if abnormality is found in either (1) or (2), replace the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to “Service limit”.)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a new one. (Refer to “Service limit”.)
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration on dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipes	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

2. SERVICE LIMIT

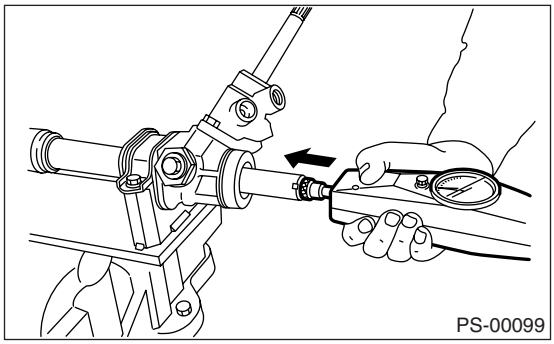
Make a measurement as follows. If it exceeds the specified service limit, adjust or replace.

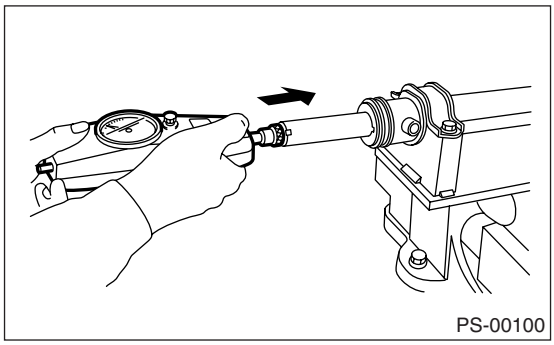
NOTE:
When making a measurement, vise gearbox assembly by using ST. Never vise the gearbox assembly by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit
304 N (31 kgf, 68 lbf) or less



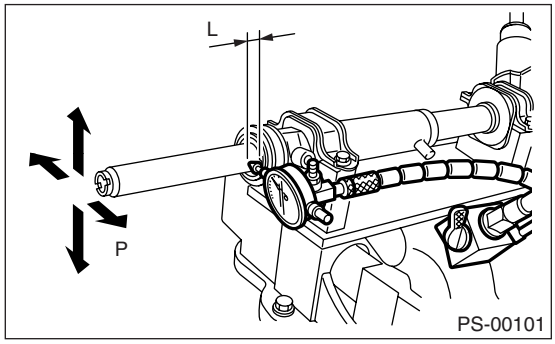


3. RACK SHAFT PLAY IN RADIAL DIRECTION

Left-turn steering:

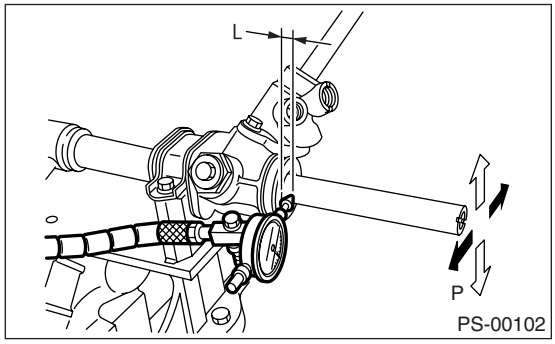
Service limit
0.19 mm (0.0075 in) or less

On condition
L: 5 mm (0.20 in)
P: 98 N (10 kgf, 22 lbf)



Right-turn steering:

Service limit
Direction ⇦⇨
0.3 mm (0.012 in) or less
Direction ⬅➡
0.19 mm (0.0075 in) or less

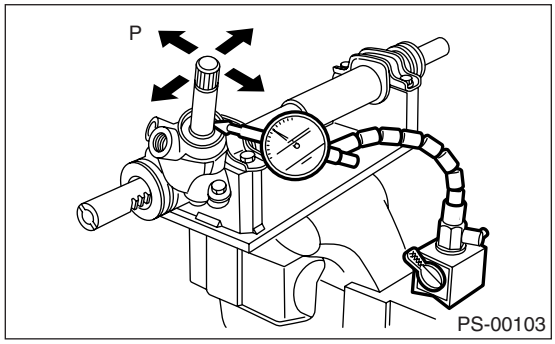


4. INPUT SHAFT PLAY

In radial direction:

Service limit
0.18 mm (0.0071 in) or less

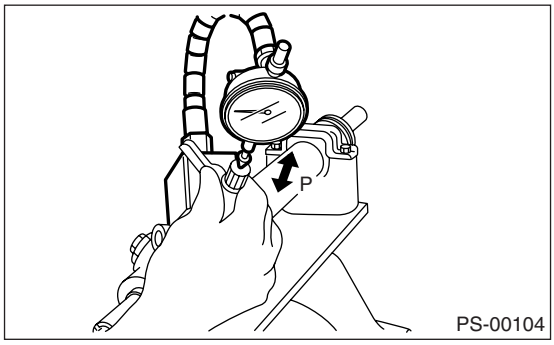
On condition
P: 98 N (10 kgf, 22 lbf)



In axial direction:

Service limit
0.5 mm (0.020 in) or less

On condition
P: 20 — 49 N (2 — 5 kgf, 4 — 11 lbf)

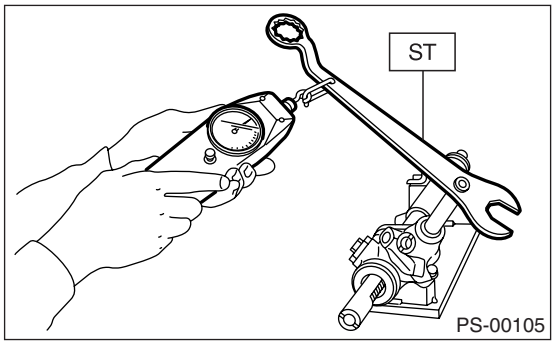


5. TURNING RESISTANCE OF GEARBOX

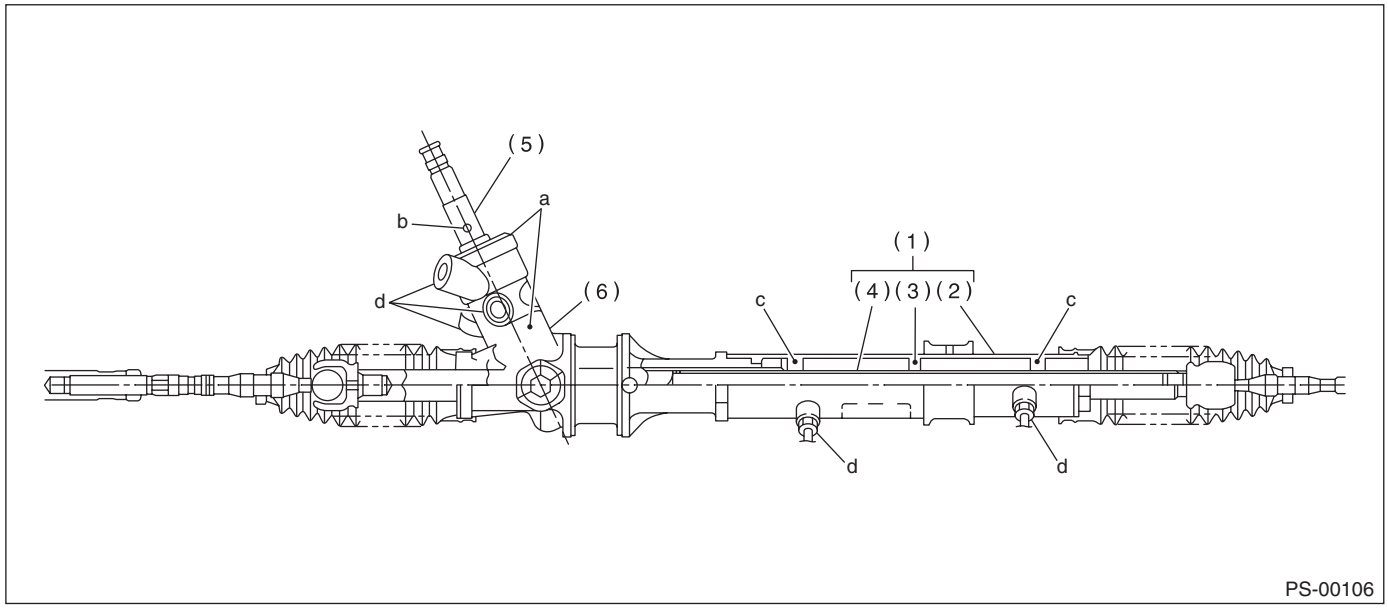
Using the ST, measure gearbox turning resistance.
ST 34099PA100 SPANNER

Service limit
Maximum allowable resistance
9.33 N (0.95 kgf, 2.1 lbf) or less

Difference between right and left turning resistance:
Less than 20%



6. OIL LEAKING



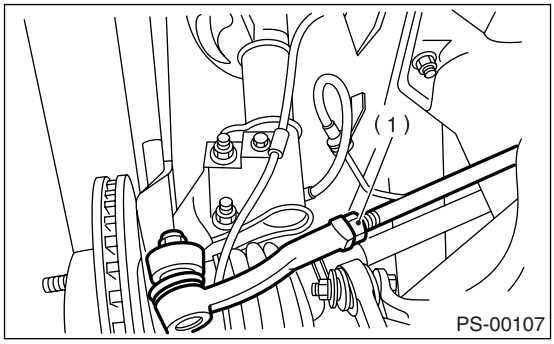
(1) Power cylinder
(2) Cylinder
(3) Rack piston
(4) Rack
(5) Input shaft
(6) Valve housing

1) If the leakage is found, it is necessary to thoroughly remove the fluid from suspected portion and turn steering wheel from lock to lock about thirty to forty times with engine running, then make comparison of the portion immediately after and several hours after this operation.
2) Possible causes and measures for leakage from "a"
The oil seal is damaged. Replace the valve assembly with a new one.
3) Possible causes and measures for leakage from "b"
The torsion bar O-ring is damaged. Replace the valve assembly with a new one.
4) Possible causes and measures for leakage from "c"
The oil seal is damaged. Replace the oil seal with a new one.
5) Possible causes and measures for leakage from "d"
The pipe is damaged. Replace the faulty pipe and O-ring with a new one.

F: ADJUSTMENT

1) Adjust the front toe. **<Ref. to FS-10,** FRONT WHEEL TOE-IN, INSPECTION, WHEEL ALIGNMENT.>

Standard of front toe:
IN 3 — OUT 1 mm (IN 0.12 — OUT 0.039 in)

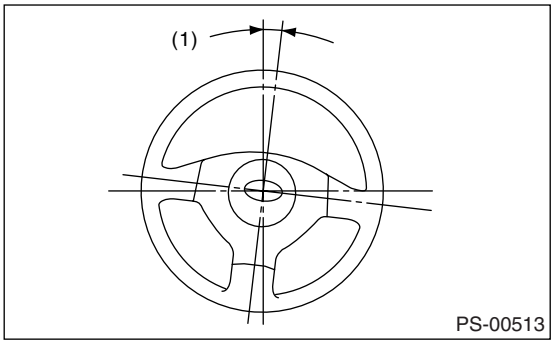


(1) Lock nut

2) Adjust the steering angle of wheels. **<Ref. to FS-10,** STEERING ANGLE, INSPECTION, WHEEL ALIGNMENT.>

Standard of steering angle:
Inner wheel: 36°25′ ±1°30′
Outer wheel: 32°00′ ±1°30′

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of steering wheel, correctly re-install the steering wheel.



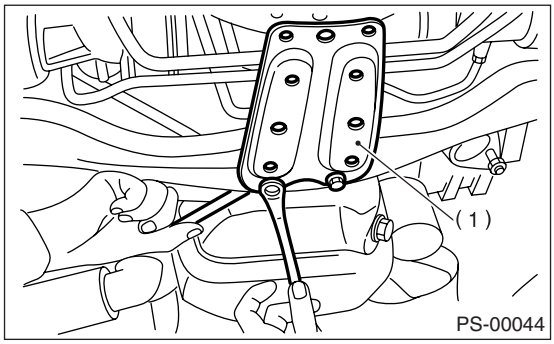
(1) Within 5°

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction each other by the same angle.

7. Pipe Assembly [LHD Model]

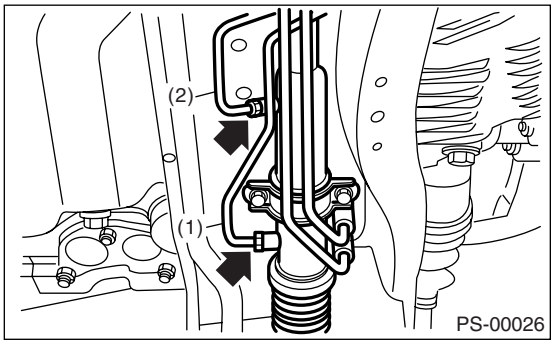
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the jack-up plate.



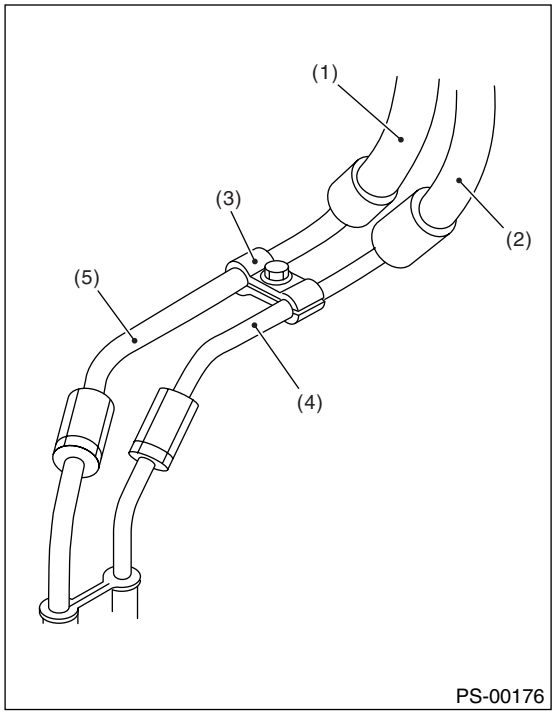
(1) Jack-up plate

3) Remove the one pipe joint at the center of gearbox assembly, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



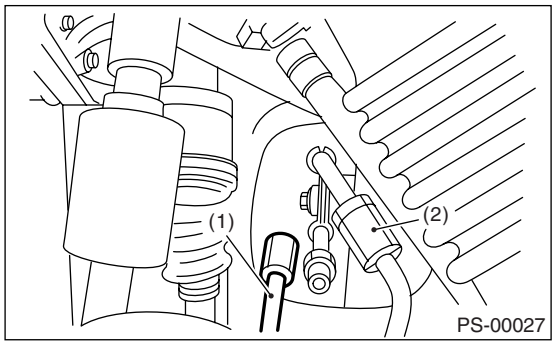
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

5) Disconnect the pipe C and D from gearbox.

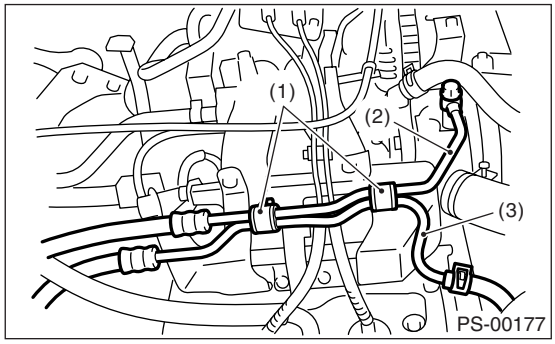


(1) Pipe C
(2) Pipe D

6) Non-turbo model:
(1) Remove the air intake duct. <Ref. to IN(H4SO)-7, REMOVAL, AIR INTAKE DUCT.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

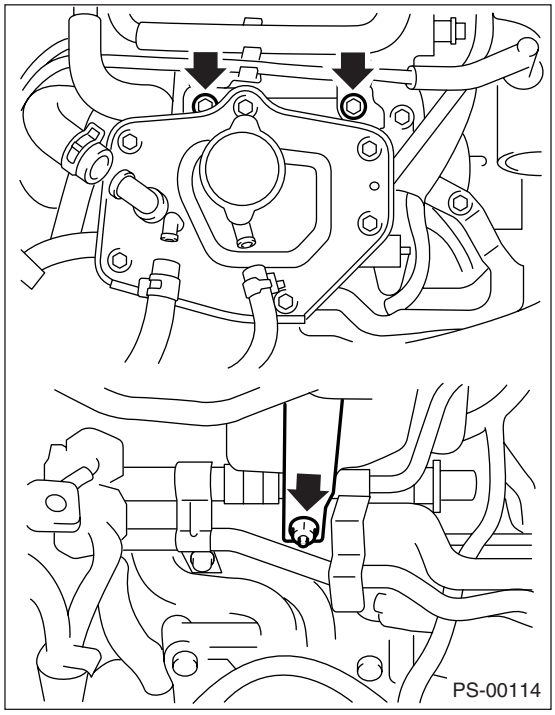
CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



(1) Bolt A
(2) Pipe C
(3) Pipe D

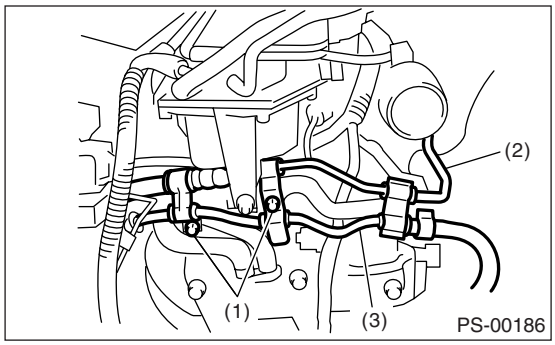
7) Turbo model:
(1) Remove the air cleaner.
<Ref. to IN(H4DOTC 2.0)-7, REMOVAL, AIR CLEANER CASE.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts fixing pipe C and D. (bolt A)
(4) Disconnect the pipe C from oil pump. Disconnect pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



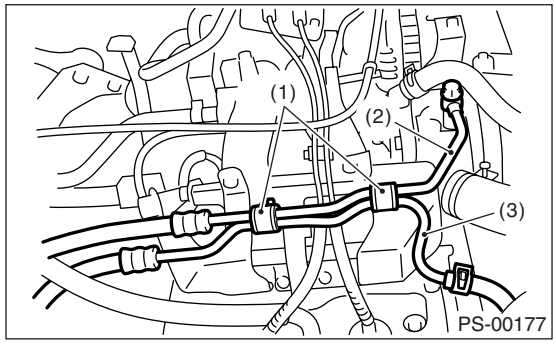
(1) Bolt A
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A)

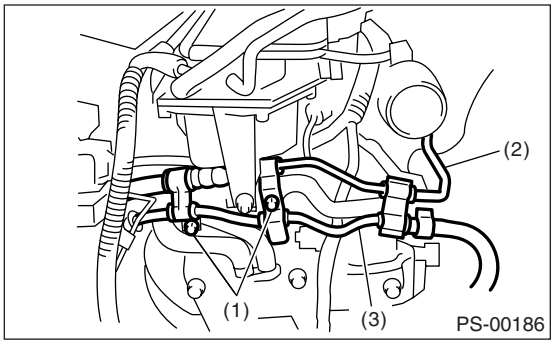
NOTE:
Visually check that the hose between tank and pipe D is free from bending or twisting.

• Non-turbo model



(1) Bolt A
(2) Pipe C
(3) Pipe D

• Turbo model



(1) Bolt A
(2) Pipe C
(3) Pipe D

(1) Connect the pipe D to reservoir tank.
(2) Using a new gasket, connect the pipe C to oil pump.

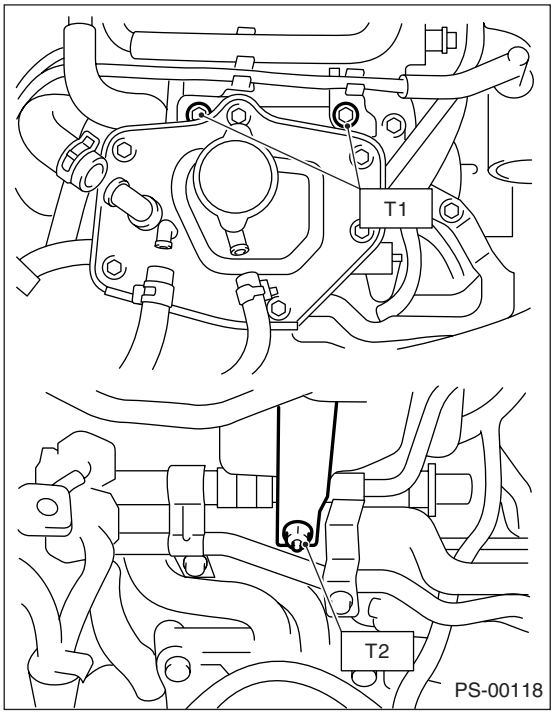
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts fixing pipe C and D. (bolt A)

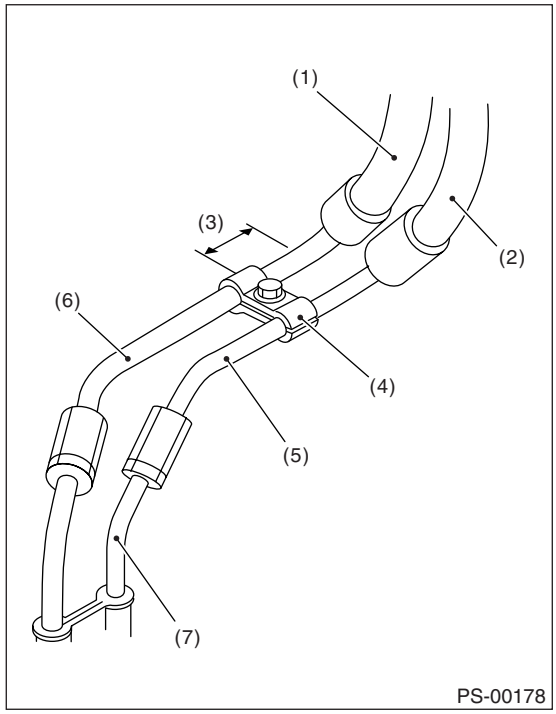
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 14.0 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.5 ft-lb)



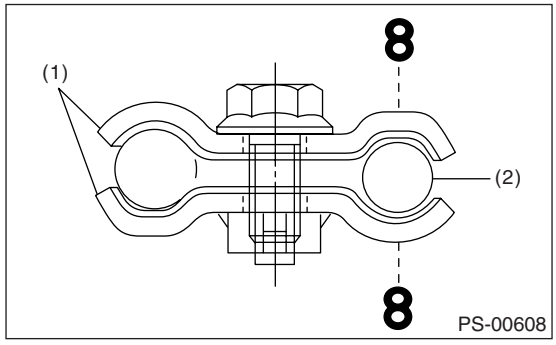
3) Temporarily connect the pipe C and D to gearbox assembly.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E
(5) Pipe C
(6) Pipe D
(7) Pipe (Gearbox assembly side)

4) Temporarily install the clamp E on pipes C and D.

NOTE:
Ensure the letter “8” on each clamp are same side as shown in the figure.



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

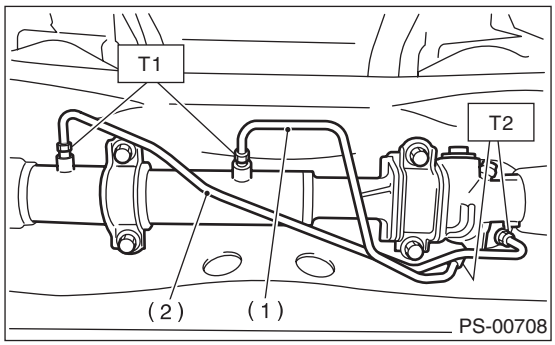
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox assembly. Connect the upper pipe B first, and lower pipe A second.

Tightening torque:
T1: 24 N·m (2.4 kgf-m, 17.7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(1) Pipe A
(2) Pipe B

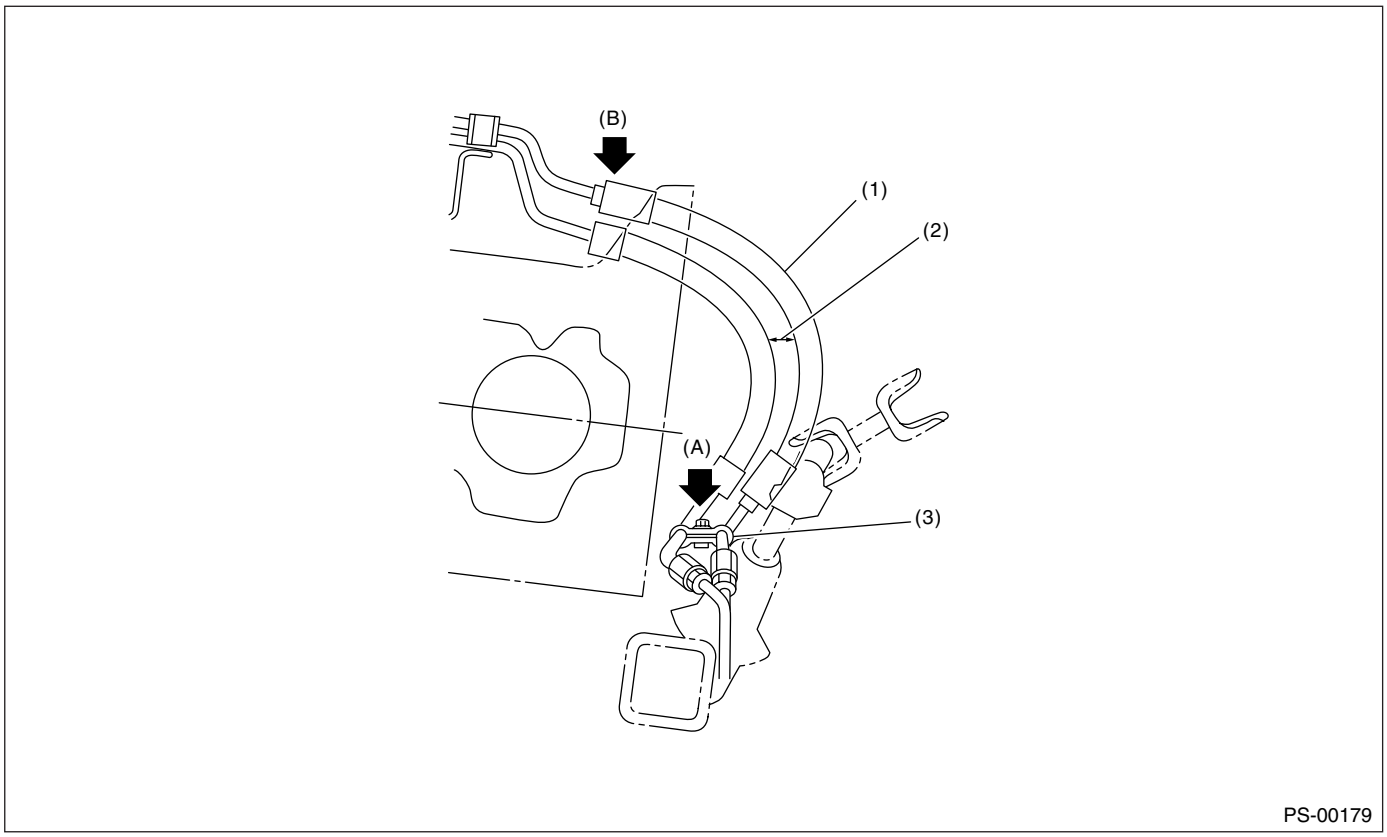
8) Install the jack-up plate.
9) Install the air intake duct, air cleaner upper cover and air intake boot. <Ref. to IN(H4SO)-7, INSTALLATION, AIR INTAKE DUCT.> <Ref. to IN(H4DOTC 2.0)-7, INSTALLATION, AIR CLEANER CASE.>
10) Connect the battery ground cable to battery.
11) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

12) Finally check clearance between pipes or hoses, as shown in the figure.

Clearance:
10 mm (0.39 in) or more.

If cruise control actuator-to-power steering hose clearance is less than 10 mm (0.39 in), move the portion (A) secured by clamp to other portion, or bend portion (B) to adjust.



(1) High pressure hose
(2) No interference is allowed between hoses.
(3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

C: INSPECTION

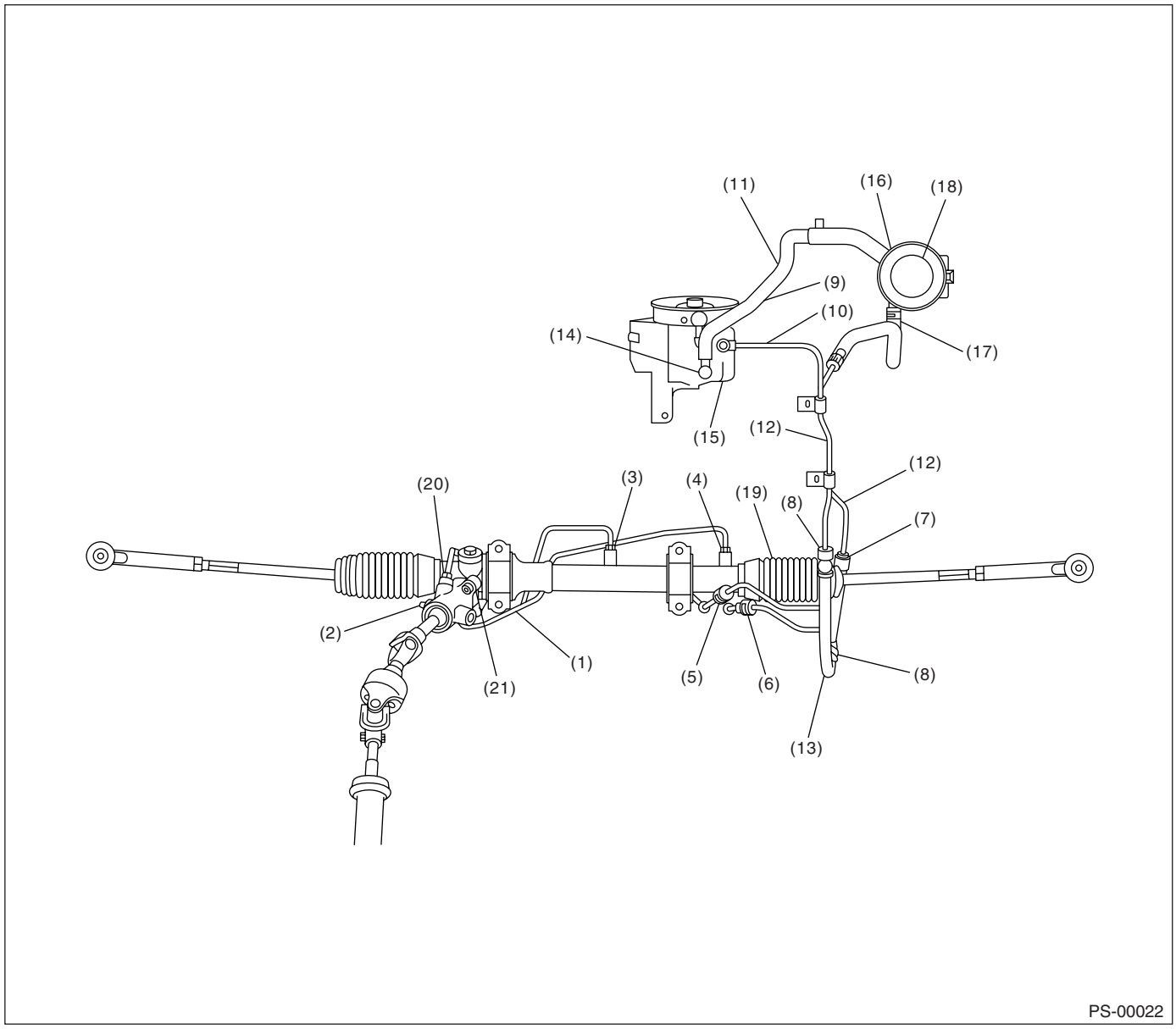
Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with a new one.
Clamp	• Clamps for weak clamping force	Replace with a new one.
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with a new one.

CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid by which their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since the resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform the careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and a driving condition in which many steering operations are required in short time.
Particularly, continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct the customers.

NOTE:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.


(11)
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(5)
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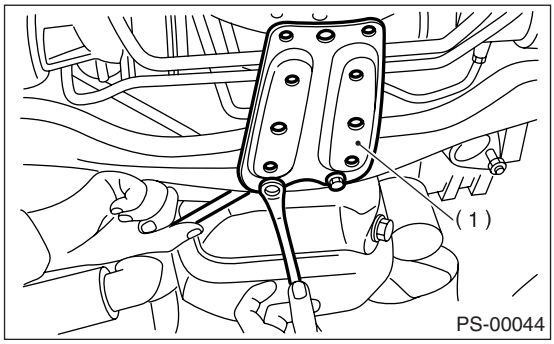
(8)
(13)
PS-00022

Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one. If ineffective, replace gearbox assembly also.
Leakage from hose (11), (12) and (13) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from reservoir tank (16) and (17) in figure	Crack in reservoir tank	Replace the reservoir tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the reservoir tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

8. Pipe Assembly [RHD Model]

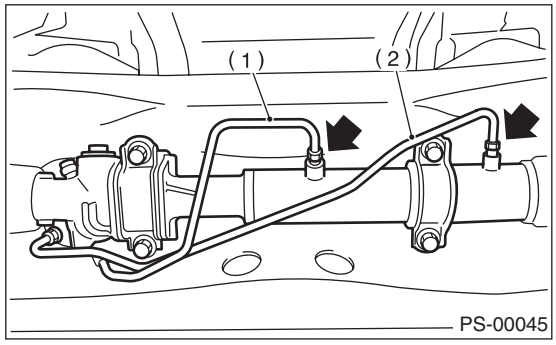
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Lift-up the vehicle, and then remove the jack-up plate.



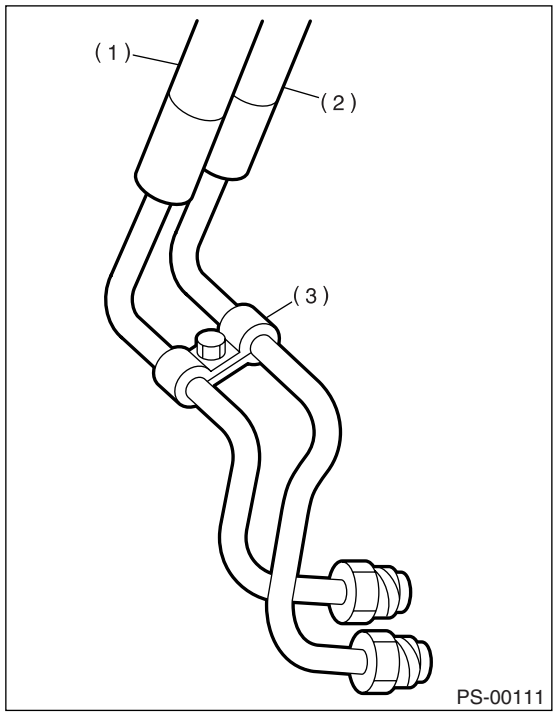
(1) Jack-up plate

3) Remove the one pipe joint at the center of gearbox, and then connect the vinyl hose to the pipe and the joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from other pipes.



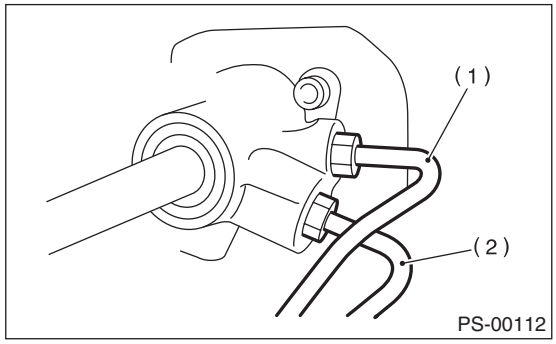
(1) Pipe A
(2) Pipe B

4) Remove the clamp E from pipes C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E

5) Disconnect the pipe C and D from gearbox.

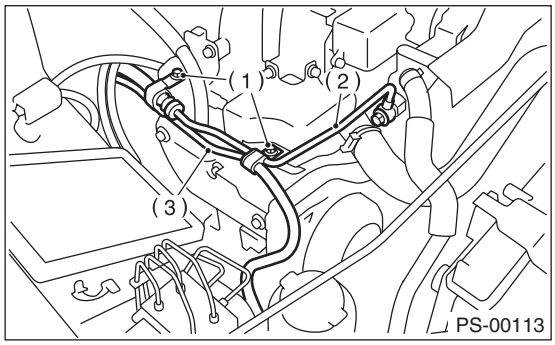


(1) Pipe C
(2) Pipe D

6) Non-turbo model:
(1) Remove the air cleaner.
<Ref. to IN(H4DOTC 2.0)-7, REMOVAL, AIR CLEANER CASE.>
(2) Remove the bolt A.
(3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

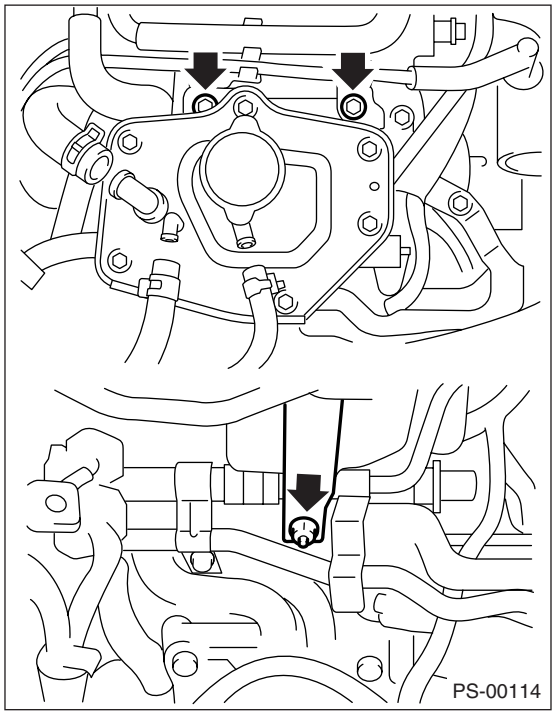
CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



(1) Bolt A
(2) Pipe C
(3) Pipe D

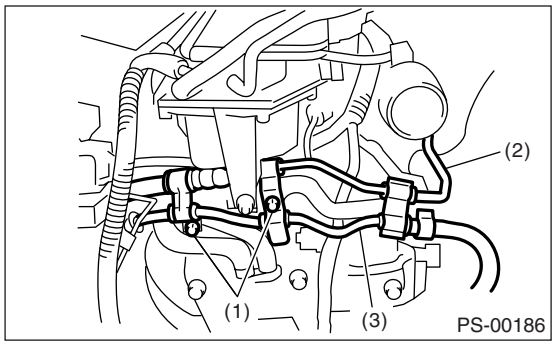
7) Turbo model:
(1) Remove the air cleaner.
<Ref. to IN(H4DOTC 2.0)-7, REMOVAL, AIR CLEANER CASE.>
(2) Remove the coolant filler tank.



(3) Remove the two bolts (bolt A) fixing pipe C and D.
(4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.

• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



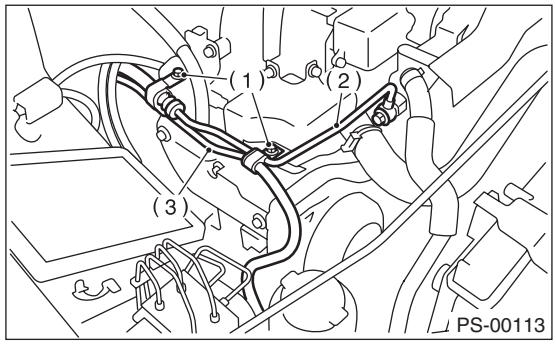
(1) Bolt A
(2) Pipe C
(3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts (bolt A) fixing pipe C and D.

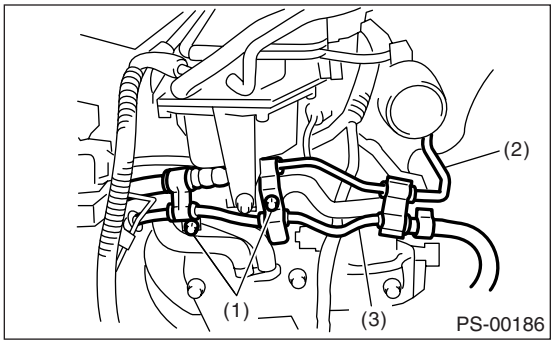
NOTE:
Visually check that the hose between tank and pipe D is free from bending or twisting.

• Non-turbo model



(1) Bolt A
(2) Pipe C
(3) Pipe D

• Turbo model



(1) Bolt A
(2) Pipe C
(3) Pipe D

(1) Connect the pipe D to reservoir tank.
(2) Using a new gasket, connect the pipe C to oil pump.

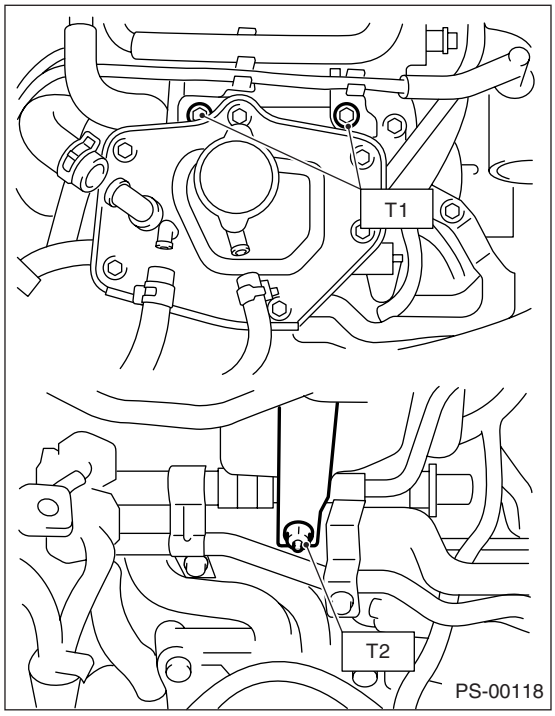
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

(3) Tighten the two bolts (bolt A) fixing pipe C and D.

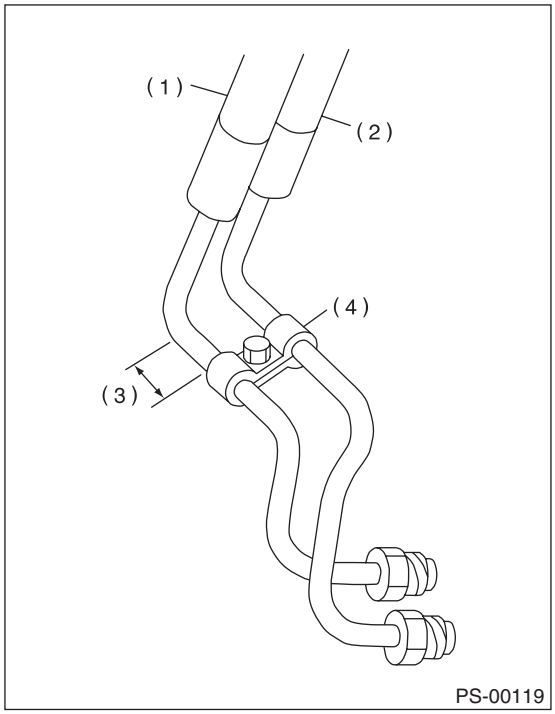
Tightening torque:
13 N·m (1.3 kgf-m, 9.4 ft-lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:
T1: 19 N·m (1.9 kgf-m, 14.0 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.5 ft-lb)



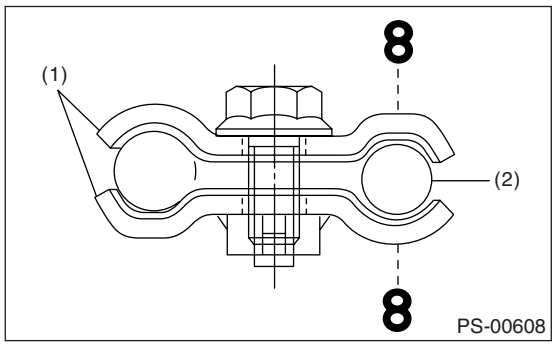
3) Temporarily connect the pipe C and D to gearbox assembly.



(1) Return hose
(2) Pressure hose
(3) Approx. 30 mm (1.18 in)
(4) Clamp E

4) Temporarily install the clamp E on pipes C and D.

NOTE:
Ensure the letter “8” on each clamp are same side as shown in the figure.



(1) Clamp E
(2) Pipe C

5) Tighten the clamp E firmly.

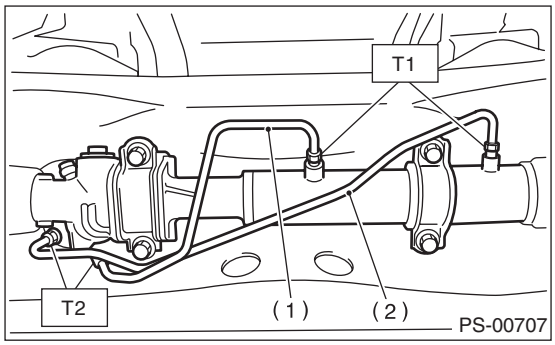
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

Tightening torque:
15 N·m (1.5 kgf-m, 11.1 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A second.

Tightening torque:
T1: 24 N·m (2.4 kgf-m, 17.7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



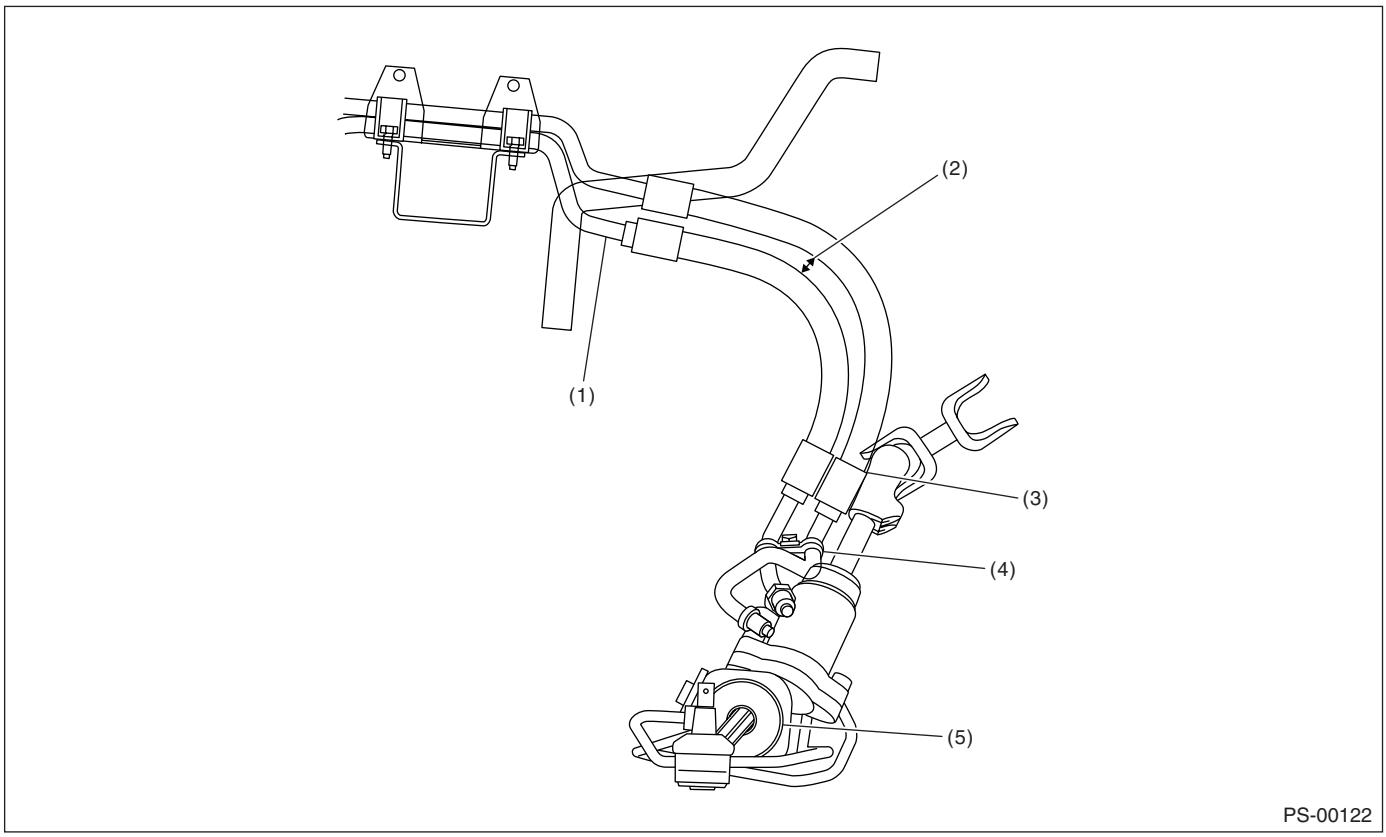
(1) Pipe A
(2) Pipe B

8) Install the jack-up plate.
9) Install the air intake duct, air cleaner upper cover and air intake boot.
<Ref. to IN(H4DOTC 2.0)-7, INSTALLATION, AIR CLEANER CASE.> **<Ref. to IN(H4SO)-7,** REMOVAL, AIR INTAKE DUCT.>
10) Connect the battery ground cable to battery.
11) Feed the specified fluid.

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

12) Finally check clearance between pipes or hoses, as shown in the figure.

Pipe-to-crossmember clearance:
10 mm (0.39 in) or more.



(1) Clearance between blow-by hose and pipe: 3 — 5 mm (0.12 — 0.20 in)
(2) No interference is allowed between hoses.
(3) Clearance between side frame and hose: 15 mm (0.59 in) or more
(4) Clearance between crossmember and pipe: 5 — 13 mm (0.20 — 0.51 in)
(5) Steering gearbox

C: INSPECTION

Check all disassembled parts for wear, damage or other abnormalities. Repair or replace faulty parts as required.

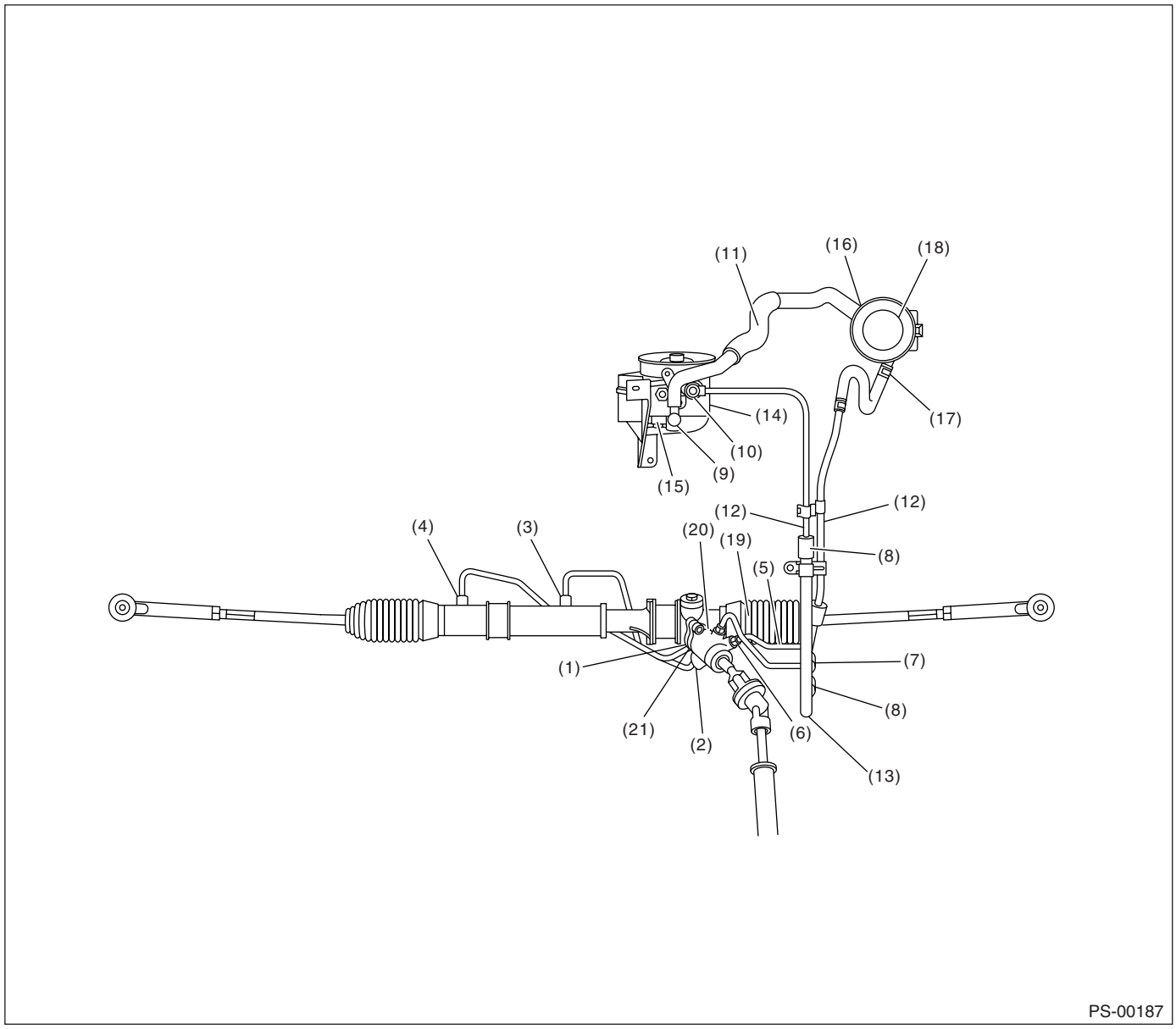
Part name	Inspection	Remedy
Pipe	• O-ring fitting surface for damage • Nut for damage • Pipe for damage	Replace with a new one.
Clamp	Clamps for weak clamping force	Replace with a new one.
Hose	• Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation	Replace with a new one.

CAUTION:
Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they are likely to be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid by which their service lives are to be very shortened. It is very important to keep the hoses free from before mentioned fluids and to wipe out immediately when the hoses are adhered with the fluids.
Since the resistances for heat or low temperature brittleness are gradually declining according to time accumulation of hot or cold conditions for the hoses and their service lives are shortening accordingly, it is necessary to perform the careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and a driving condition in which many steering operations are required in short time.
Particularly, continuous work of relief valve over 5 seconds causes to reduce service lives of the hoses, the oil pump, the fluid, etc. due to over heat.

Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace.
	Power steering fluid, brake fluid, engine oil, electrolyte adhere on the hose surface	Replace. Pay attention on service work.
	Too many times use in extremely cold weather	Replace. Instruct the customers.

Pipe Assembly [RHD Model]

NOTE:
It is likely that although one judges fluid leakage, there is actually no leakage. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.

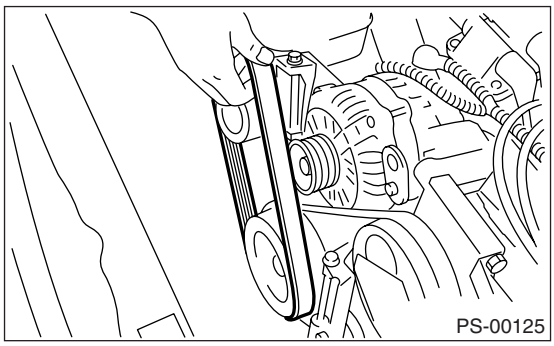


Fluid leaking area	Possible cause	Corrective action
Leakage from connecting portions of pipes and hoses, numbered with (1) through (10) in figure	Insufficient tightening of flare nut, catching dirt or the like, damage to flare or flare nut or eye bolt	Loosen and retighten, if ineffective, replace.
	Poor insertion of hose, poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox also.
Leakage from hose (11), (12) and (13) in figure	Crack or damage in hose	Replace with a new one.
	Crack or damage in hose hardware	Replace with a new one.
Leakage from surrounding of cast iron portion of oil pump (14) and (15) in figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from reservoir tank (16) and (17) in figure	Crack in reservoir tank	Replace the reservoir tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the reservoir tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gear-box (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

9. Oil Pump

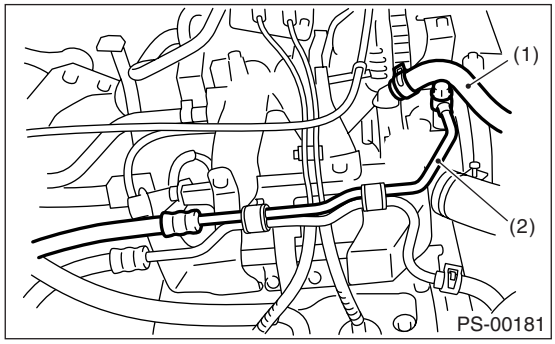
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the pulley belt cover.
3) Loosen the lock bolt and slider bolt, and then remove the power steering pump drive V-belt.



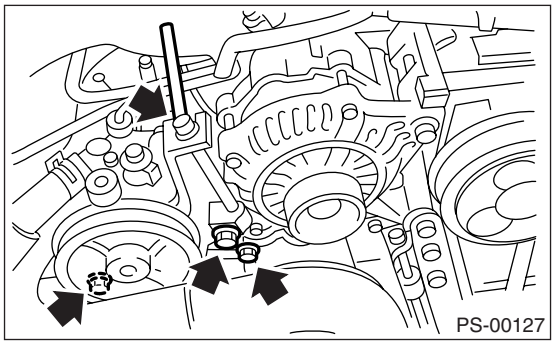
4) Disconnect the connector from power steering pump switch.
5) Disconnect the pipe C and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose, cover the open ends of them with a clean cloth.



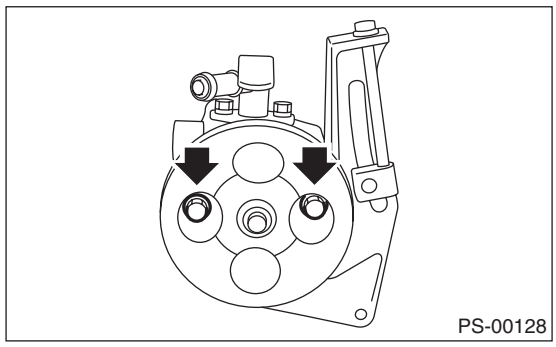
(1) Suction hose
(2) Pipe C

6) Remove the bolts which install power steering pump bracket.

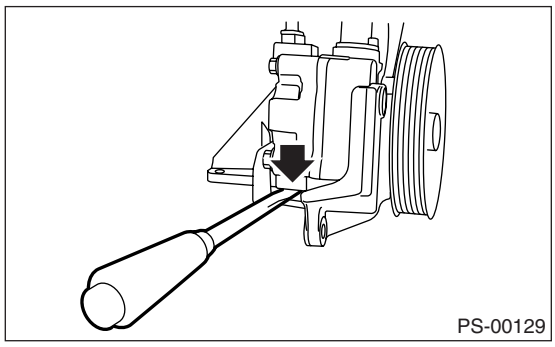


7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

CAUTION:
Do not place the oil pump bracket directly in the vise; hold the oil pump with least possible force between two wood pieces.



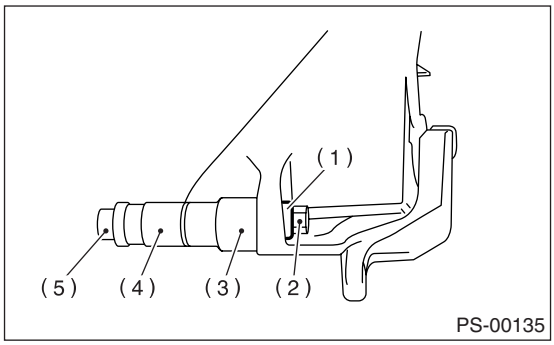
8) Remove the bolt from the rear side of oil pump.
9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.



B: INSTALLATION

1) Install the oil pump to bracket.
(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2″) type 14 and 21 mm box wrench until it is in contact with the oil pump mounting surface.

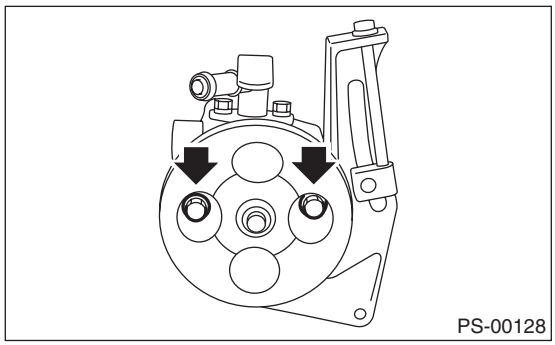
CAUTION:
Do not place the oil pump bracket directly in the vise; hold the oil pump with least possible force between two wood pieces.



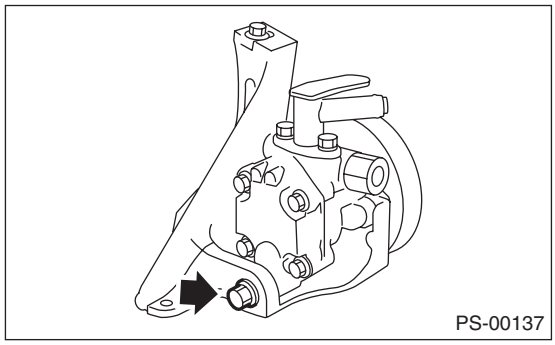
(1) Bushing
(2) Nut
(3) 21 mm
(4) 14 mm
(5) Bolt

(2) Tighten the bolts which install oil pump to bracket.

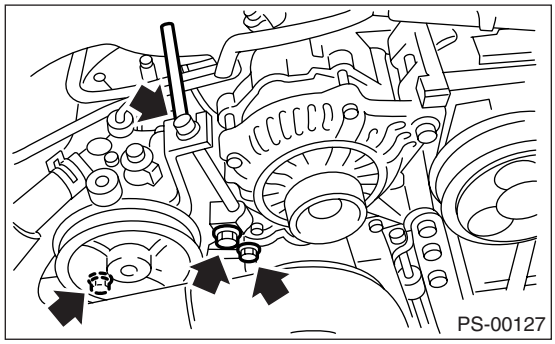
Tightening torque:
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



Tightening torque:
37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



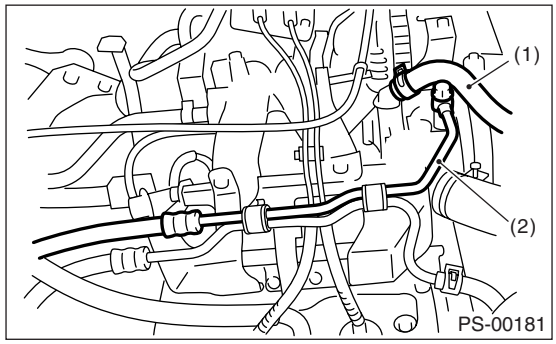
2) Tighten the bolt which installs power steering pump bracket.



3) Connect the pipe C and suction hose to oil pump.

Tightening torque:
Eye bolt
39 N·m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:
If a hose is twisted, the hose may come into contact with some other parts.



(1) Suction hose
(2) Pipe C

4) Connect the connector to power steering pump switch.
5) Install the V-belts to oil pump.

6) Tighten the oil pump pulley nut to the specified torque.

Tightening torque:
52 N·m (5.3 kgf-m, 38.3 ft-lb)

7) Check the V-belt tension. <Ref. to ME(H4SO)-44, INSPECTION, V-belt.>
8) Tighten the belt tension bolt.

Tightening torque:
8 N·m (0.8 kgf-m, 5.8 ft-lb)

9) Install the belt cover.
10) Connect the battery ground cable to battery.
11) Feed the specified power steering fluid. <Ref. to PS-80, Power Steering Fluid.>

CAUTION:
Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new one.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check the resistance to rotation of pulley. If it is past the service limit, replace the oil pump with a new one.
		(2) Bend in the shaft or damage to bearing	Oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump when turning with a string put around its pulley, replace the oil pump with a new one.
4	O-ring	Crack or deterioration	Replace it with a new one.
5	Bracket	Crack	Replace it with a new one.

2. SERVICE LIMIT

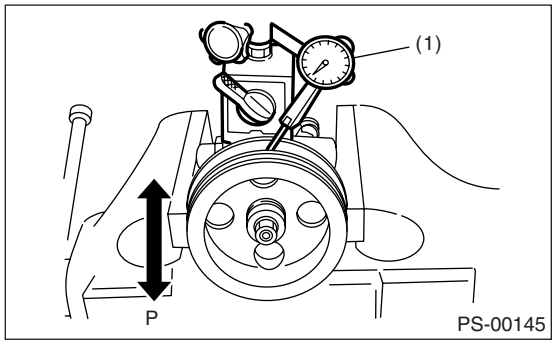
Make a measurement as follows. If it exceeds the specified service limit, replace the parts with new ones.

CAUTION:
• Fix the oil pump on a vise to make a measurement. At this time, hold the oil pump with least possible force between two wood pieces.
• Do not set outside of flow control valve or pulley on a vise; otherwise outside or pulley might be deformed. Select properly sized wood pieces.

1) Play of the pulley shaft

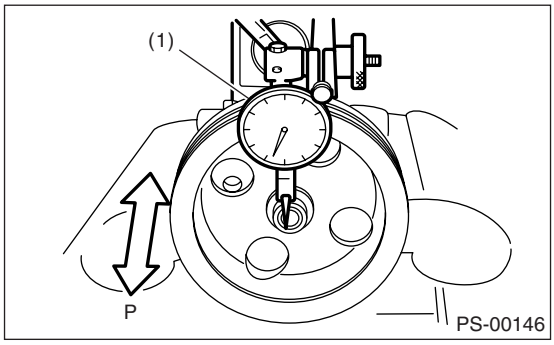
Condition:
When applying the force of 9.8 N (1.0 kgf, 2.2 lbf)

Service limit:
Radial play (Direction ⬅ ➡)
0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ⇦ ⇨)
1.0 mm (0.039 in) or less

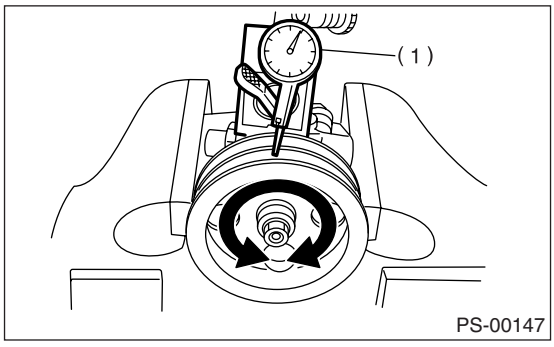


(1) Dial gauge

2) Ditch deflection of pulley

Service limit:
1.0 mm (0.039 in) or less

NOTE:
Read the value for one surface of V ditch, and then the value for another off the dial.

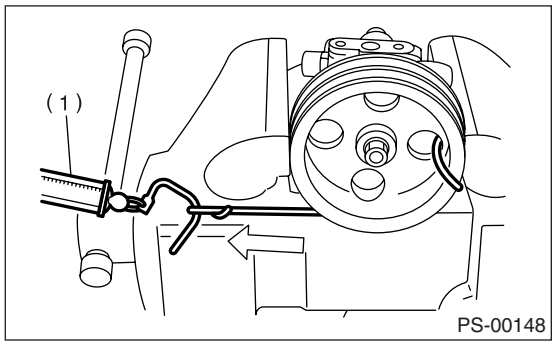


(1) Dial gauge

3) Resistance to rotation of pulley

Service limit:
Maximum load;
9.22 N (0.94 kgf, 2.07 lbf) or less

NOTE:
• A rather higher value may be indicated when pulley starts turning.
• Measure the load during rotation and make a judgment.



(1) Spring scale

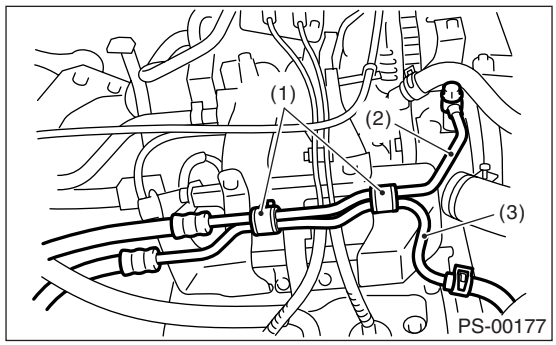
3. HYDRAULIC PRESSURE

NOTE:
• Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-81, INSPECTION, General Diagnostic Table.>
• Do not leave the valve of pressure gauge closed or hold the steering wheel at stop end for 5 seconds or more in any case, as the oil pump may be damaged.
• Put a cloth at a place where fluid may drops before the pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

1) Regular pressure measurement
(1) Connect the ST1, ST2 and ST3.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A

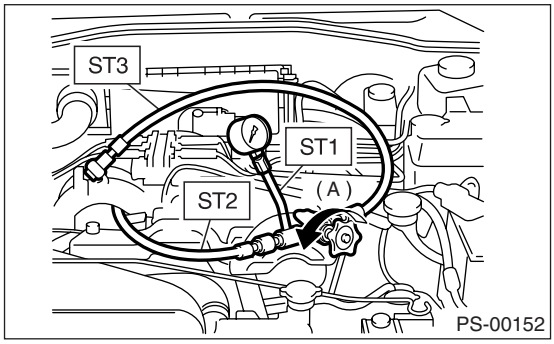
(2) Remove the air intake duct.
(3) Disconnect the pipe C from pump.
(4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.



(1) Bolt A
(2) Pipe C
(3) Pipe D

(5) Install the ST3 to end of pipe C removed from pump.
(6) Replenish power steering fluid up to the specified level.
(7) Open the valve, and start the engine.
(8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



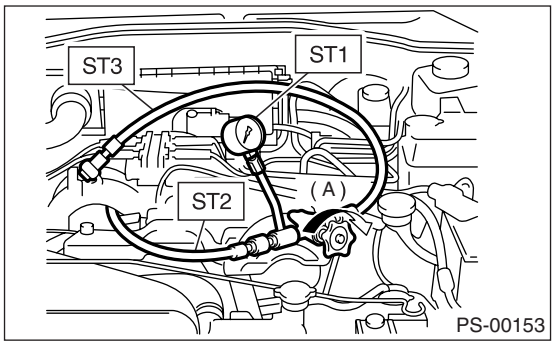
(A) Open

Service limit:
981 kPa (10 kgf/cm^2, 142 psi) or less

(9) If it is not within the specified value, replace the troubled part caused by following symptoms; pipe or hose clogged, leaks from fluid line, and mix of foreign objects in fluid line.

2) Measure the relief pressure.
(1) Using the STs, measure the relief pressure.
(2) Close the valve.
(3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



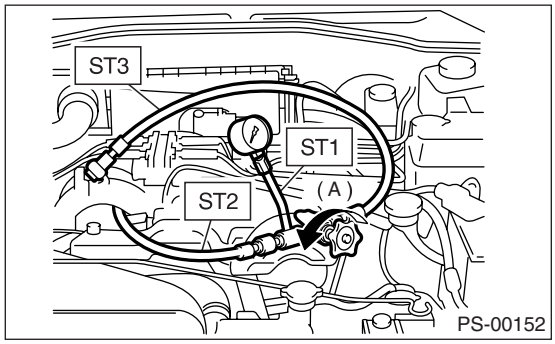
(A) Close

Service limit:
7,650 — 8,340 kPa
(78 — 85 kgf/cm^2, 1,109 — 1,209 psi)

(4) If it is not within the specified value, replace the oil pump.

3) Measure the working pressure.
(1) Using the STs, measure the working pressure.
(2) Open the valve.
(3) Measure the working pressure of control valve by turning wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
ST2 34099AC020 ADAPTER HOSE B
ST3 34099AC010 ADAPTER HOSE A



(A) Open

Service limit:
7,650 — 8,340 kPa
(78 — 85 kgf/cm^2, 1,109 — 1,209 psi)

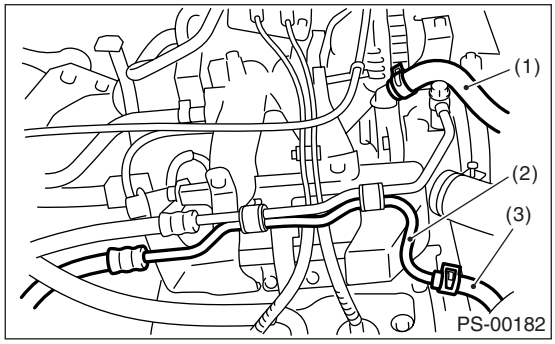
(4) If it is within the specified value, measure the steering effort. <Ref. to PS-85, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.

10.Reservoir Tank

A: REMOVAL

1) Remove the air intake duct.
<Ref. to IN(H4SO)-7, REMOVAL, AIR INTAKE DUCT.>
2) Drain fluid from the reservoir tank.
3) Disconnect the pipe D from return hose and suction hose from oil pump.

CAUTION:
• Do not allow fluid from the hose end to come into contact with pulley belt.
• To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.

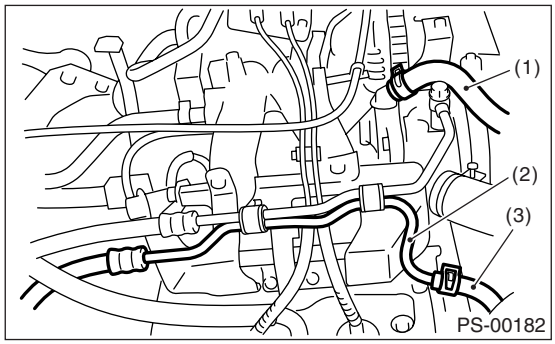


(1) Suction hose
(2) Pipe D
(3) Return hose

4) Remove the reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

1) Install the reservoir tank to bracket.
2) Connect the pipes D to return hose and suction hose to oil pump.



(1) Suction hose
(2) Pipe D
(3) Return hose

3) Feed the specified power steering fluid up to the specified level. <Ref. to PS-2, SPECIFICATION, General Description.>

C: INSPECTION

Check the reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace the reservoir tank.

11.Power Steering Fluid

A: SPECIFICATION

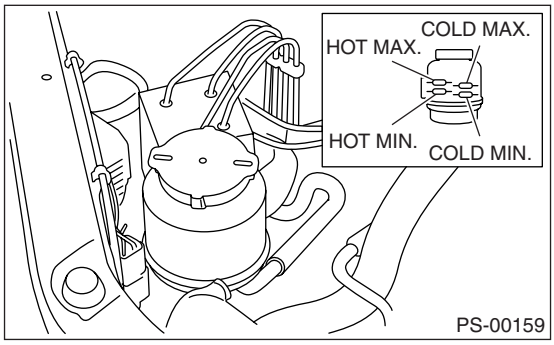
Recommended power steering fluid <Ref. to PS-2, SPECIFICATION, General Description.>

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.
3) Inspect the fluid level on flat and level surface with engine "OFF" by indicator of reservoir tank.
If the level is at MIN. point or below, add fluid to keep the level in the specified range of indicator. If at MAX. point or above, drain fluid by using a syringe or the like.

(1) Check at power steering fluid temperature less than 20°C (68°F); read the fluid level on "COLD" side.

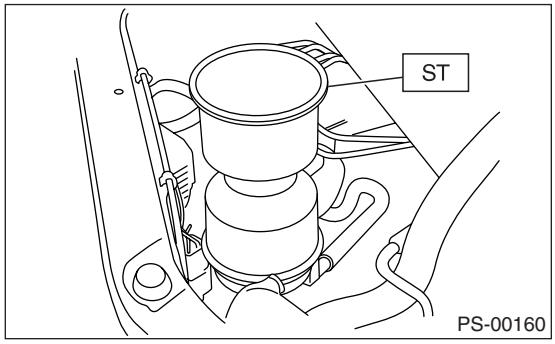
(2) Check at power steering fluid temperature more than 80°C (176°F); read the fluid level on "HOT" side.



C: REPLACEMENT

1) Lift up the vehicle.
2) Remove the jack up plate.
3) Remove the pipe joint in center of gearbox assembly, and then install the vinyl hose to the pipe and the joint. Drain the fluid while turning steering wheel.
4) Set the ST on top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE GUIDE



5) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing on oil surface while keeping the fluid at that level.
6) If turning the steering wheel in low fluid level condition, air will be sucked in pipe. In this case, leave it about half an hour and then do the step 5) again.
7) Lift up the vehicle, start the engine and let it idle.
8) Continue to turn the steering wheel slowly from lock to lock again until bubbles stop appearing on oil surface while keeping the fluid at that level.
It is normal that bubbles stop appearing after three times turning of steering wheel from lock to lock.
9) In case the bubbles do not stop appearing in the tank, leave it about half an hour and then do the step 4) all over again.
10) Lower the vehicle, and then idle the engine.
11) Continue to turn the steering wheel from lock to lock until bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).
12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Grinding noise is generated from oil pump.

13) Check the fluid leakage after turning steering wheel from lock to lock with engine running.

12.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning.	1. Pulley belt • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom. • Poor revolution of pulleys (except oil pump pulley) • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel • Improper tires out of specification • Improper wheels out of specification • Tires not properly inflated*1	Replace or reinflate.
	3. Fluid • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2	Refill, bleed air, replace or instruct the customer.
	4. Idling speed • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3	Adjust or instruct the customer.
	5. Measure hydraulic pressure. <Ref. to PS-76, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort. <Ref. to PS-81, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning.	1. Fluid line • Folded hose • Flattened pipe	Reform or replace.
	2. Tire and wheel • Flat tire • Mix use of different tires • Mix use of different wheels • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure	Fix or replace.
	3. Front alignment • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • One-sided weight	Replace, adjust or instruct the customer.
	5. Measure steering effort. <Ref. to PS-81, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or wheels are wider, the load to power steering system is heavier. In a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.
*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

1. NOISE AND VIBRATION

CAUTION:
Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
• Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
• When turning the steering wheel with service brake and/or parking brake applied, the noise is generated by creaking between disk and pads. However this does not indicate abnormal function in system.
• There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts have no defects.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
This phenomena does not indicate there is some abnormal function in the system.
The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission model.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means the relief valve is faulty.	Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-64, INSPECTION, Pipe Assembly [LHD Model].>
	Loosened installation of oil pump, reservoir tank, pump bracket, gearbox or crossmember	Retighten.
	Loosened installation of oil pump pulley or other pulley(s)	Retighten.
	Loosened linkage or play of steering or suspension Loosened tightening of joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace the faulty parts of gearbox or oil pump.
Knocking When turning steering wheel in both direction with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for backlash adjustment	Adjust and retighten.
	Loosened tightening or play of tie-rod or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Vane pump aeration	Inspect and retighten the fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Pulley bearing seizing of oil pump	Replace the oil pump.
	Folded hose, flat pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Maladjustment of pulley belt Damaged or charged pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Run out or soilage of V-groove surface of oil pump pulley	Clean or replace.
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the wrong part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Abnormal inside of hose or pipe Flat hose or pipe	Correct or replace.
	Abnormal inside of reservoir tank	Replace.
	Removed reservoir tank cap	Install the cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the faulty parts of gearbox or hose.
Whine or growl (continuous or intermittent) While engine is running with/ without steering turned.	Loosened installation of oil pump, oil pump bracket	Retighten.
	Abnormal inside of oil pump, hose	Replace the oil pump or hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and inspect.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace the faulty parts of gearbox.
	Abnormal bearing for steering shaft	Apply grease or replace.
	Generates when turning steering wheel with brake (service or parking) applied.	If the noise goes off when brake is released, it is normal.

Trouble	Possible cause	Corrective action
Vibration While engine is running with/ without steering turned.	Too low engine speed	Adjust and instruct customers.
	Vane pump aeration	Fix the wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace the oil pump, faulty parts of gearbox.
	Play of steering, looseness of suspension parts	Retighten.

2. MEASUREMENT OF STEERING EFFORT

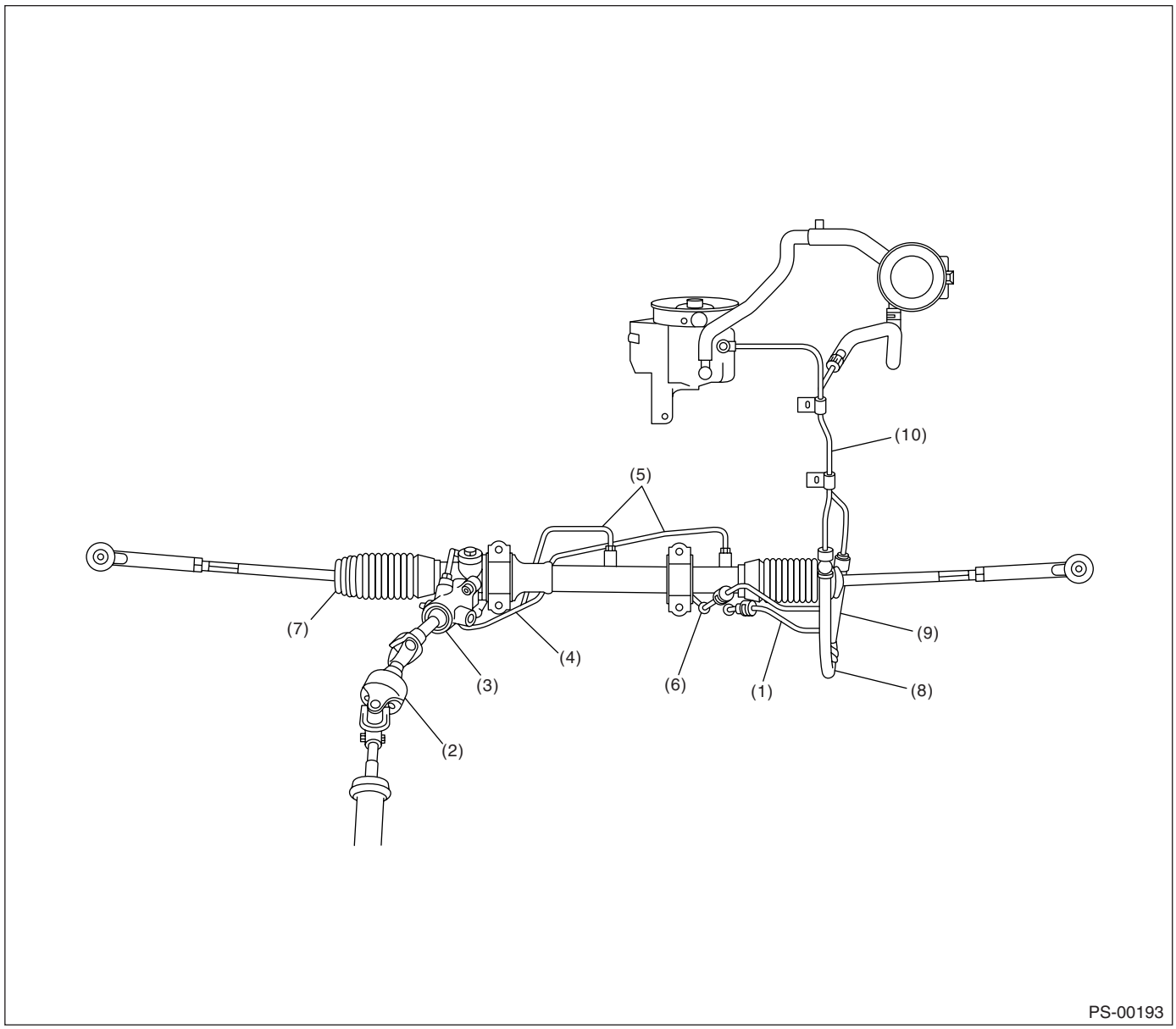
	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on a concrete road. 2) Start the engine. 3) Idle the engine. 4) Install the spring scale on steering wheel. 5) Pull the spring scale at an right angle to steering wheel, and measure both right and left steering wheel effort. NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of oil pump and is not a problem.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lbf)?	Go to step **2.**	Adjust the backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull the spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort less than 314 N (32 kgf, 71 lbf)?	Go to step **3.**	Perform adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is the steering effort less than 2.26 N (0.23 kgf, 0.51 lbf)?	Go to step **4.**	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the difference of steering effort between clockwise and counterclockwise less than 1.08 N (0.11 kgf, 0.24 lbf)?	Go to step **5.**	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure the folding torque of the joint (yoke of steering column side). <Ref. to PS-19, INSPECTION, Universal Joint.>	Is the folding torque less than 7.3 N (0.74 kgf, 1.64 lbf)?	Go to step **6.**	Replace with new one.
6	**CHECK UNIVERSAL JOINT.** Measure the folding torque of the joint (yoke of gearbox side). <Ref. to PS-19, INSPECTION, Universal Joint.>	Is the folding torque less than 7.3 N (0.74 kgf, 1.64 lbf)?	Go to step **7.**	Replace with new one.
7	**CHECK FRONT WHEELS.** Check the front wheels.	Are there unsteady revolution or rattling for front wheels? Is brake dragging?	Inspect, readjust and replace if necessary.	Go to step **8.**
8	**CHECK TIE-ROD ENDS.** Remove the tie-rod ends.	Are there unsteady revolution or rattling for the tie-rod ends of suspension?	Inspect and replace if necessary.	Go to step **9.**
9	**CHECK BALL JOINT.** Remove the ball joint.	Are there unsteady revolution or rattling for the ball joints of suspension?	Inspect and replace if necessary.	Go to step **10.**
10	**CHECK GEARBOX.** Measure the rotating resistance of gearbox. <Ref. to PS-39, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [LHD Model].> or <Ref. to PS-57, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [RHD Model].>	Is the rotating resistance of gearbox less than 9.33 N (0.95 kgf, 2.09 lbf)? Is the difference between clockwise and counterclockwise less than 20%?	Go to step **11.**	Readjust the backlash. If ineffective, replace the faulty parts.
11	**CHECK GEARBOX.** Measure the sliding resistance of gearbox. <Ref. to PS-38, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD Model].> or <Ref. to PS-56, SERVICE LIMIT, INSPECTION, Steering Gearbox [RHD Model].>	Is the sliding resistance of gearbox less than 400 N (41 kgf, 90 lbf)? Is the difference between right and left less than 20%?	Steering effort is normal.	Readjust the backlash. If ineffective, replace the faulty parts.

3. INSPECTION OF CLEARANCE

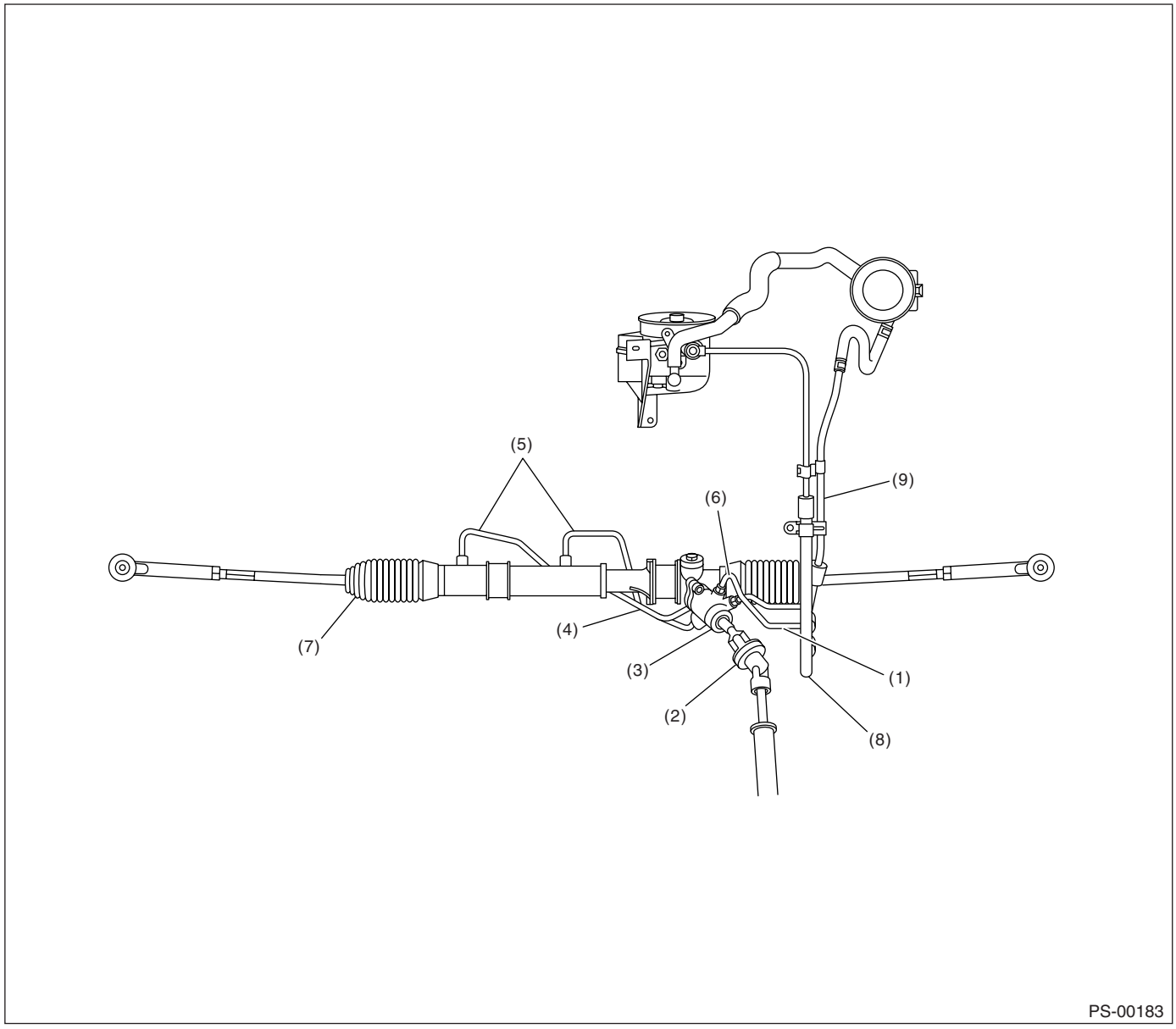
This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Location	Minimum allowance mm (in)
(1) Crossmember — Pipe	5 (0.20)
(2) DOJ — Shaft or joint	14 (0.55)
(3) DOJ — Valve housing	11 (0.43)
(4) Pipe — Pipe	2 (0.08)
(5) Stabilizer — Pipe	5 (0.20)
(6) Exhaust pipe — Pipe	11 (0.43)
(7) Exhaust pipe — Gearbox bolt	15 (0.59)
(8) Side frame — Hose A and B	10 (0.39)
(9) Cruise control pump — Hose A and B	15 (0.59)
(10) Pipe portion of hose A — Pipe portion of hose B	1.5 (0.059)

- LHD model



- RHD model



BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)	AC
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)	AC(diag)
AIRBAG SYSTEM	AB
AIRBAG SYSTEM (DIAGNOSTICS)	AB(diag)
SEAT BELT SYSTEM	SB
LIGHTING SYSTEM	LI
WIPER AND WASHER SYSTEM	WW
ENTERTAINMENT	ET
COMMUNICATION SYSTEM	COM
GLASS/WINDOWS/MIRRORS	GW
BODY STRUCTURE	BS
INSTRUMENTATION/DRIVER INFO	IDI
SEATS	SE
SECURITY AND LOCKS	SL
SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)	SR
EXTERIOR/INTERIOR TRIM	EI
EXTERIOR BODY PANELS	EB

FUJI HEAVY INDUSTRIES LTD.

G8090GE6

BODY SECTION

CRUISE CONTROL SYSTEM	CC
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC(diag)
CRUISE CONTROL SYSTEM (DIAGNOSTICS)	CC(ETC)(diag)
IMMOBILIZER (DIAGNOSTICS)	IM(diag)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

AC

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1. General Description

A: SPECIFICATION

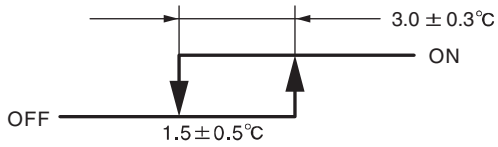
1. HEATER SYSTEM

Item		Specifications	Condition
Heating capacity		5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	• Mode selector switch: HEAT • Temperature control switch: FULL HOT • Temperature difference between hot water and inlet air: 65°C (149°F) • Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
Air flow rate		280 m^3 (9,890 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		480 m^3 (16,954 cu ft)/h	• Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector lever: RECIRC
Heater core size (height × length × width)		134.1 × 224.3 × 32 mm (5.28 × 8.83 × 1.26 in)	—
Blower motor	Type	Auto A/C (Brushless motor) 230 W or less	12.5 V
		Manual A/C (Cylinder motor) 260 W or less	12.5 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

2. A/C SYSTEM

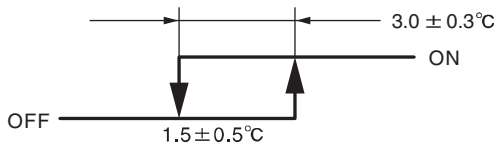
• AUTO A/C MODEL

Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.1 kW (4,386 kcal/h, 17,403 BTU/h)
Refrigerant		HFC-134a (CH_2FCF_3) [600±50 g (1.32±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (DKV-14G)
	Discharge	140 cm^3 (8.54 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	38 W (DC 12 V-25°C)
	Type of belt	V-belt 4 PK
	Pulley dia. (effective dia.)	125 mm (4.92 in)
	Pulley ratio	1.064
Condenser	Type	Corrugated fin (Sub cool type)
	Core face area	0.234 m^2 (2.52 sq ft)
	Core thickness	16 mm (0.63 in)
	Radiation area	5.6 m^2 (60.28 sq ft)
Receiver drier	Effective inner capacity	220 cm^3 (13.42 cu in)
Expansion valve	Type	External equalizing
Evaporator	Type	Single tank
	Dimensions (W × H × T)	176.5 × 266 × 60 mm (6.95 × 10.47 × 2.36 in)
Blower fan	Fan type	Sirocco fan
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
	Power consumption	230 W or less at 12.5 V

Item			Specifications
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	2.5 L turbo model and turbo AT model for EC and EK: 120 W at 12 V Other model than above: 70 W at 12 V
		Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	2.5 L turbo model and turbo AT model for EC and EK: 120 W at 12 V Other model than above: 70 W at 12 V
		Fan outer diameter	320 mm (12.6 in)
Idling speed (A/C ON)		MPFI model	800±100 rpm
Triple switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	177±25 kPa (1.80±0.25 kgf/cm^2, 25.60±3.56 psi)
		OFF → ON	206±30 kPa (2.10±0.31 kgf/cm^2, 29.86±4.41 psi)
	High-pressure switch operating pressure	ON → OFF	2,940±200 kPa (29.98±2.03 kgf/cm^2, 426.32±28.87 psi)
		OFF → ON	590±200 kPa (6.02±2.03 kgf/cm^2, 85.6±28.87 psi)
	Middle pressure switch operating pressure	ON → OFF	1370±120 kPa (13.97±1.22 kgf/cm^2, 198.65±17.35 psi)
		OFF → ON	1,770±100 kPa (18.05±1.02 kgf/cm^2, 256.67±14.50 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			 AC-00082

• MANUAL A/C MODEL

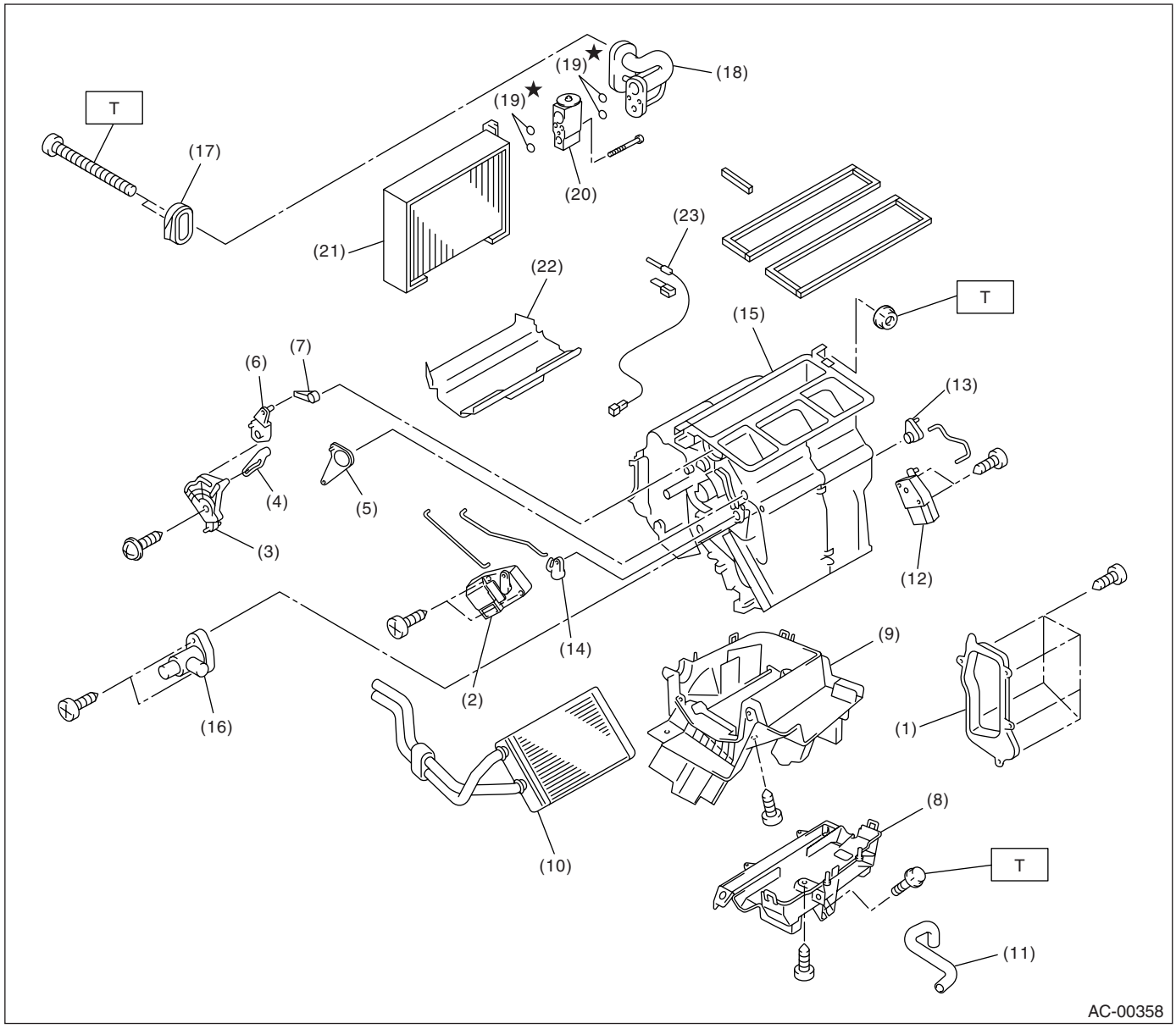
Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.1 kW (4,386 kcal/h, 17,403 BTU/h)
Refrigerant		HFC-134a (CH_2FCF_3) [600±50 g (1.32±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (DKV-14G)
	Discharge	140 cm^3 (8.54 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	38 W (DC12 V — 25°C)
	Type of belt	V-belt 4 PK
	Pulley dia. (effective dia.)	125 mm (4.92 in)
	Pulley ratio	1.064

Item			Specifications
Condenser		Type	Corrugated fin (Sub cool type)
		Core face area	0.234 m^2 (2.52 sq ft)
		Core thickness	16 mm (0.63 in)
		Radiation area	5.6 m^2 (60.28 sq ft)
Receiver drier		Effective inner capacity	220 cm^3 (13.42 cu in)
Expansion valve		Type	External equalizing
Evaporator		Type	Single tank
		Dimensions (W × H × T)	176.5 × 266 × 60 mm (6.95 × 10.47 × 2.36 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	260 W or less at 12.5 V
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	2.5 L turbo model and turbo AT model for EC and EK: 120 W at 12 V Other model than above: 70 W at 12 V
		Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	2.5 L turbo model and turbo AT model for EC and EK: 120 W at 12 V Other model than above: 70 W at 12 V
		Fan outer diameter	320 mm (12.6 in)
Idling speed (A/C ON)		MPFI model	800±100 rpm
Triple switch (Pressure switch)	Low-pressure switch operating pressure	ON → OFF	177±25 kPa (1.80±0.25 kgf/cm^2, 25.60±3.56 psi)
		OFF → ON	206±30 kPa (2.10±0.31 kgf/cm^2, 29.86±4.41 psi)
	High-pressure switch operating pressure	ON → OFF	2,940±200 kPa (29.98±2.03 kgf/cm^2, 426.32±28.87 psi)
		OFF → ON	590±200 kPa (6.02±2.03 kgf/cm^2, 85.6±28.87 psi)
	Middle pressure switch operating pressure	ON → OFF	1,370±120 kPa (13.97±1.22 kgf/cm^2, 198.65±17.35 psi)
		OFF → ON	1,770±100 kPa (18.05±1.02 kgf/cm^2, 256.67±14.50 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			 AC-00082

B: COMPONENT

1. HEATER COOLING UNIT

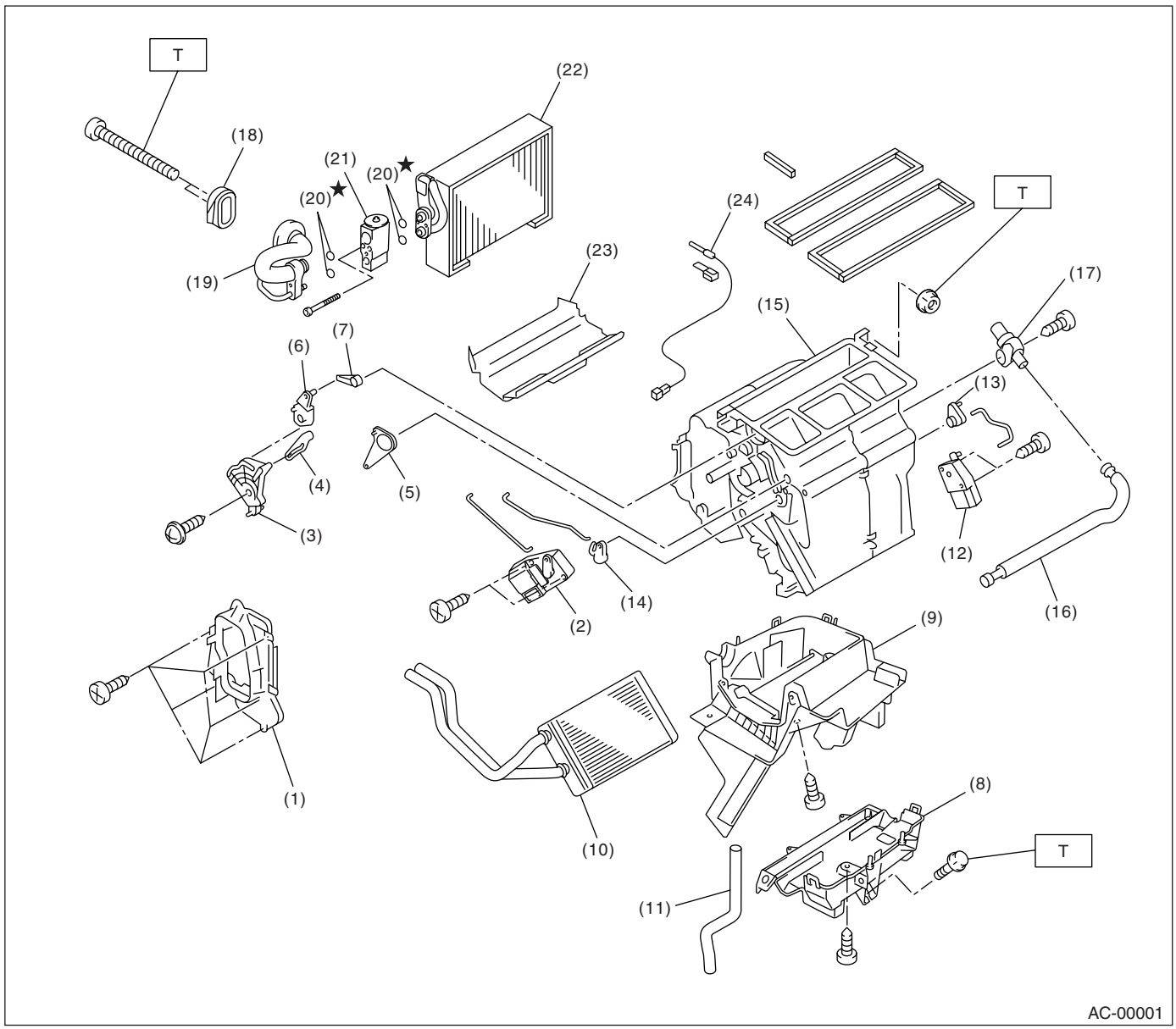
• LHD MODEL WITH AUTO A/C



(1) Evaporator cover
(2) Mode door actuator
(3) Mode main lever
(4) Vent door lever
(5) Foot door lever (A)
(6) Mode door actuator link
(7) Defroster lever
(8) Foot duct
(9) Lower case
(10) Heater core
(11) Drain hose
(12) Mix door actuator
(13) Mix door lever
(14) Foot door lever (B)
(15) Upper case
(16) Aspirator
(17) Packing
(18) Cooling unit pipe
(19) O-ring
(20) Expansion valve
(21) Evaporator
(22) Evaporator lining
(23) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

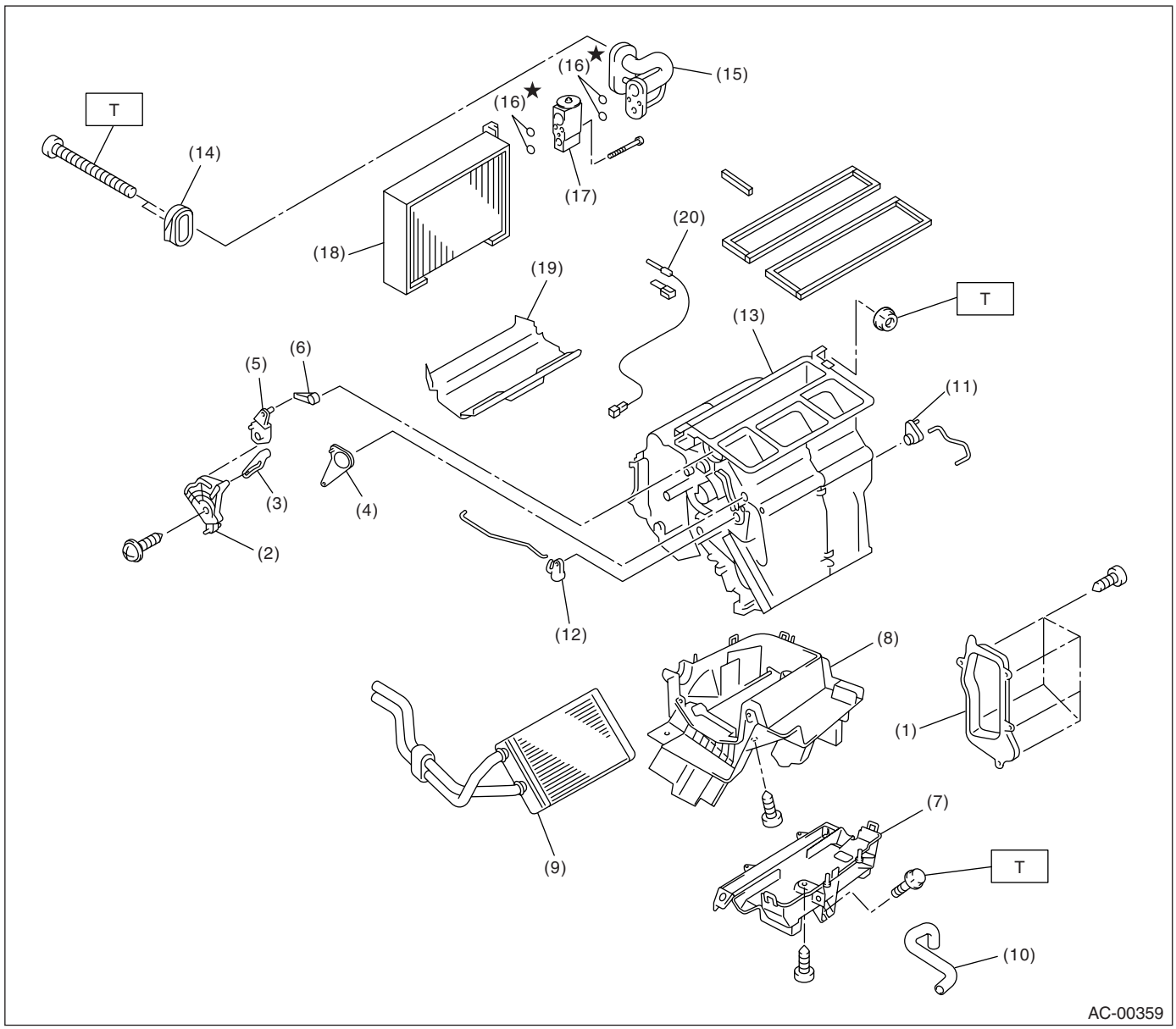
• RHD MODEL WITH AUTO A/C



(1) Evaporator cover
(2) Mode door actuator
(3) Mode main lever
(4) Vent door lever
(5) Foot door lever (A)
(6) Mode door actuator link
(7) Defroster lever
(8) Foot duct
(9) Lower case
(10) Heater core
(11) Drain hose
(12) Mix door actuator
(13) Mix door lever
(14) Foot door lever (B)
(15) Upper case
(16) Aspirator hose
(17) Aspirator
(18) Packing
(19) Cooling unit pipe
(20) O-ring
(21) Expansion valve
(22) Evaporator
(23) Evaporator lining
(24) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

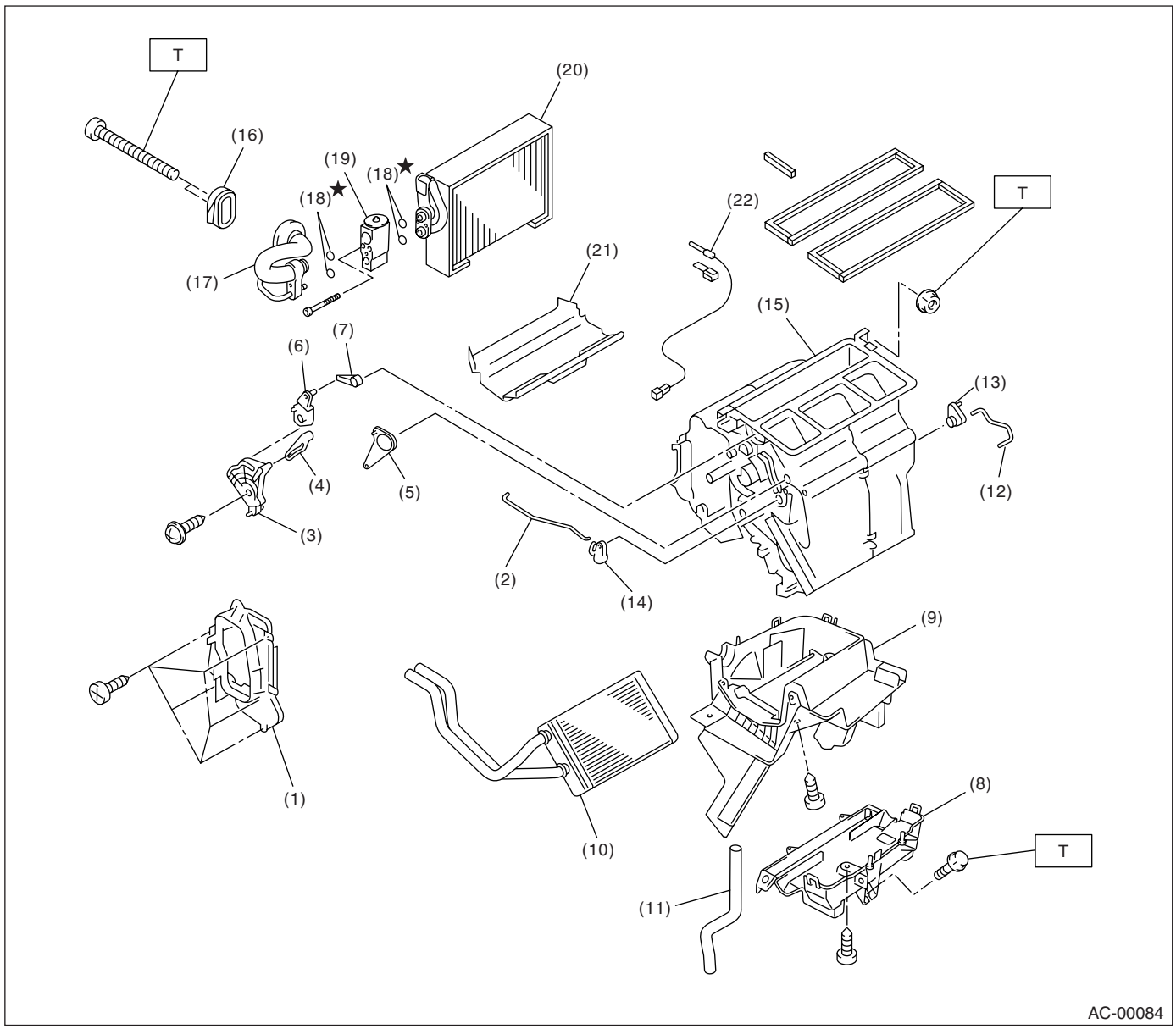
• LHD MODEL WITH MANUAL A/C



(1) Evaporator cover
(2) Mode main lever
(3) Vent door lever
(4) Foot door lever
(5) Mode door actuator link
(6) Defroster lever
(7) Foot duct
(8) Lower case
(9) Heater core
(10) Drain hose
(11) Mix door actuator lever
(12) Foot door lever (B)
(13) Upper case
(14) Packing
(15) Cooling unit pipe
(16) O-ring
(17) Expansion valve
(18) Evaporator
(19) Evaporator lining
(20) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

• RHD MODEL WITH MANUAL A/C

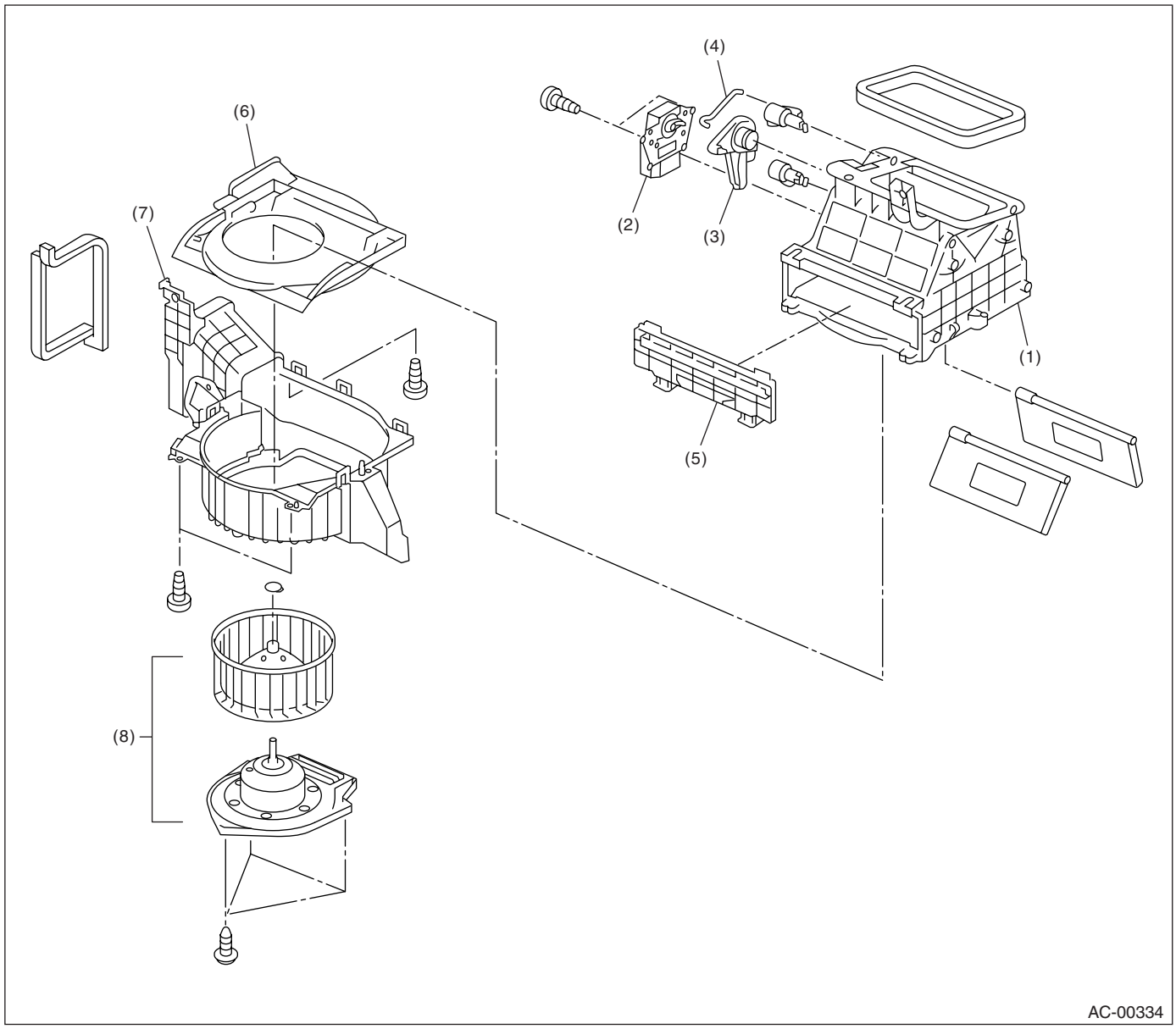


(1) Evaporator cover
(2) Side rod
(3) Mode door actuator lever
(4) Vent door lever
(5) Foot door lever (A)
(6) Mode door actuator link
(7) Defroster lever
(8) Foot duct
(9) Lower case
(10) Heater core
(11) Drain hose
(12) Mix door actuator rod
(13) Mix door actuator lever
(14) Foot door lever (B)
(15) Upper case
(16) Packing
(17) Cooling unit pipe
(18) O-ring
(19) Expansion valve
(20) Evaporator
(21) Evaporator lining
(22) Evaporator sensor

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

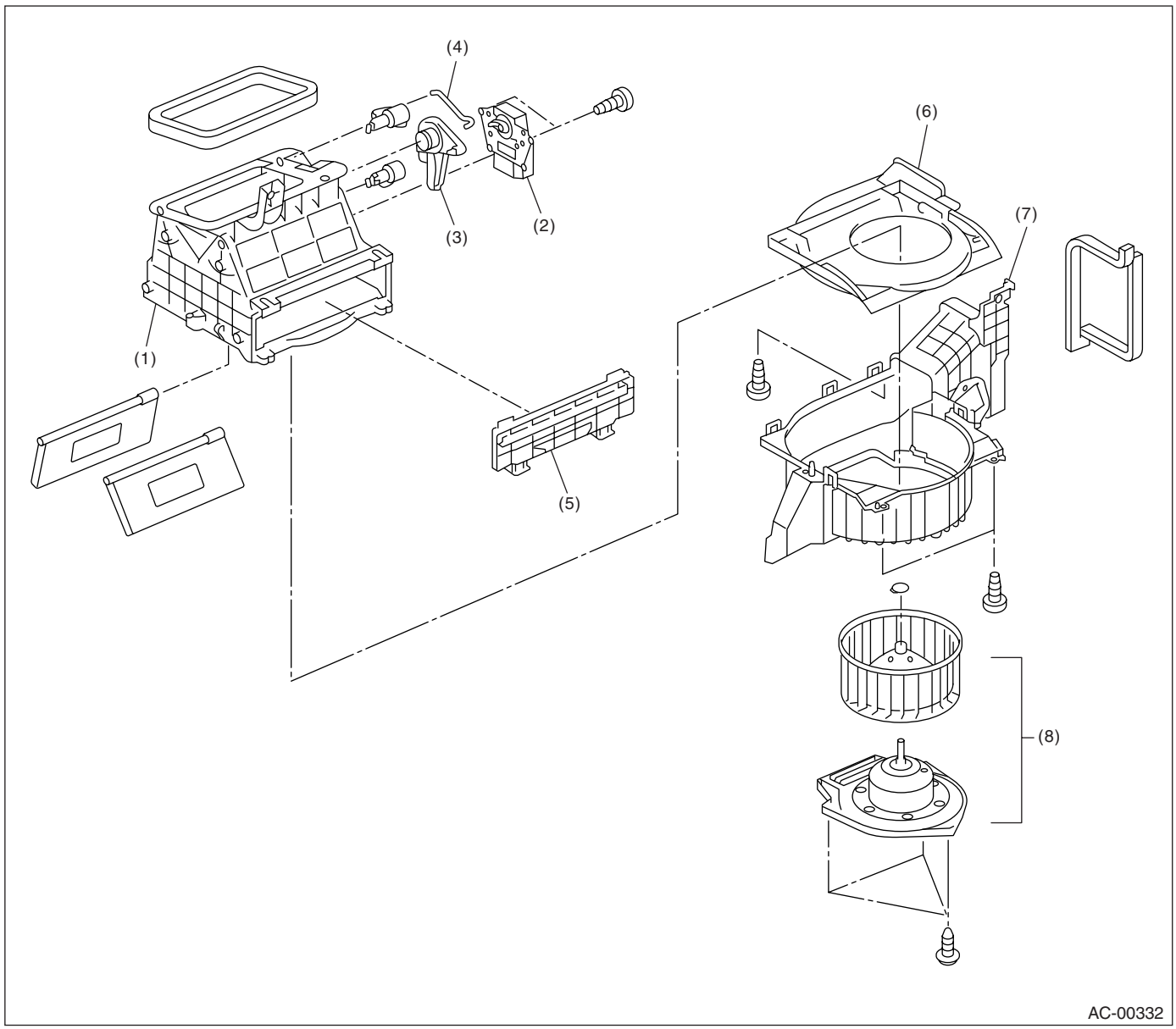
2. BLOWER MOTOR UNIT

• LHD MODEL WITH AUTO A/C



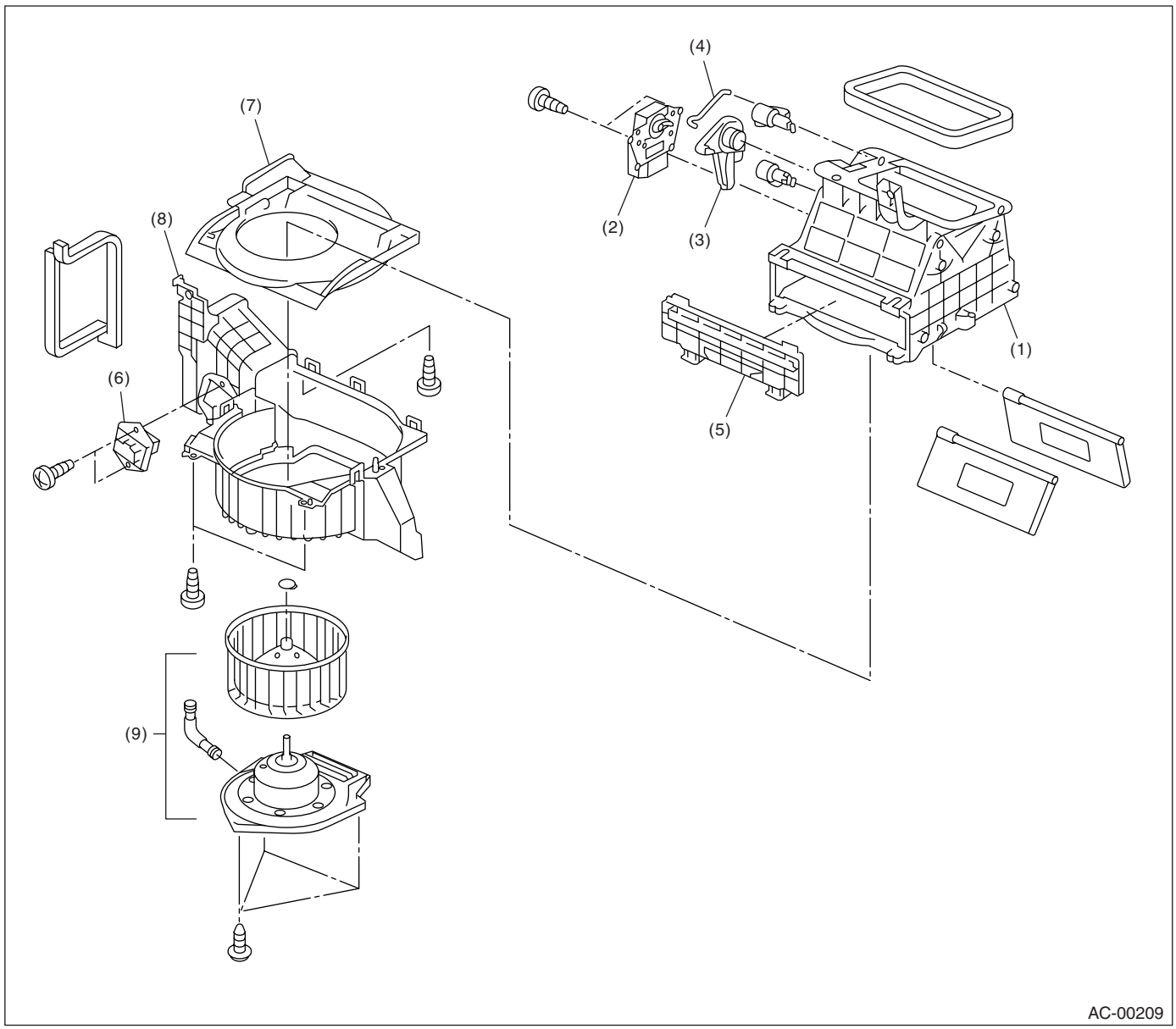
(1) Upper case
(2) Air inlet select actuator
(3) Air inlet select link
(4) Link lever
(5) Filter cover
(6) Cover
(7) Lower case
(8) Blower motor ASSY

• RHD MODEL WITH AUTO A/C



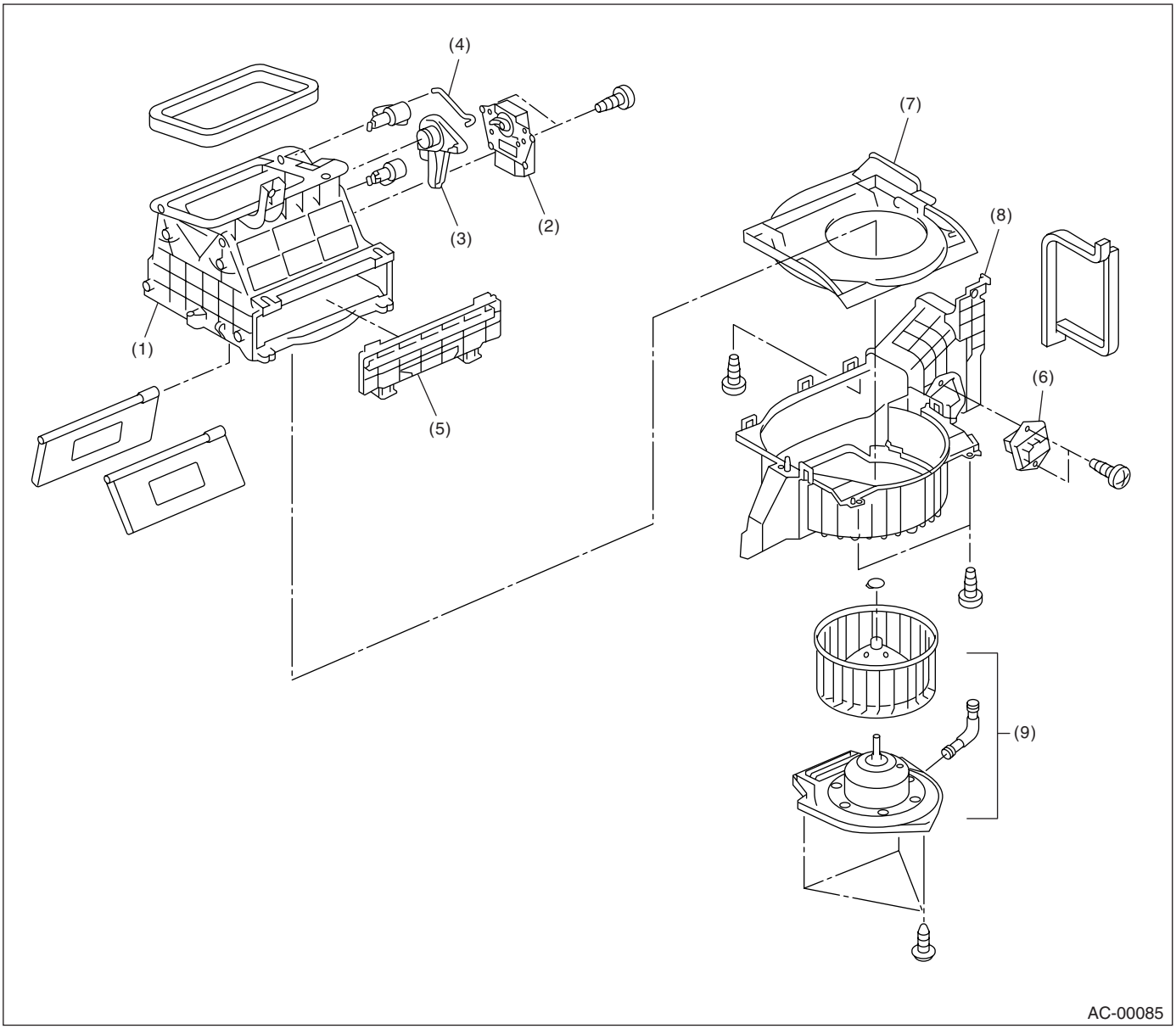
(1) Upper case
(2) Air inlet select door actuator
(3) Air inlet select link
(4) Link lever
(5) Filter cover
(6) Cover
(7) Lower case
(8) Blower motor ASSY

• LHD MODEL WITH MANUAL A/C



(1)	Upper case	(4)	Link rod	(7)	Cover
(2)	Air inlet select door actuator	(5)	Filter cover	(8)	Lower case
(3)	Air inlet select link	(6)	Blower resistor	(9)	Blower motor ASSY

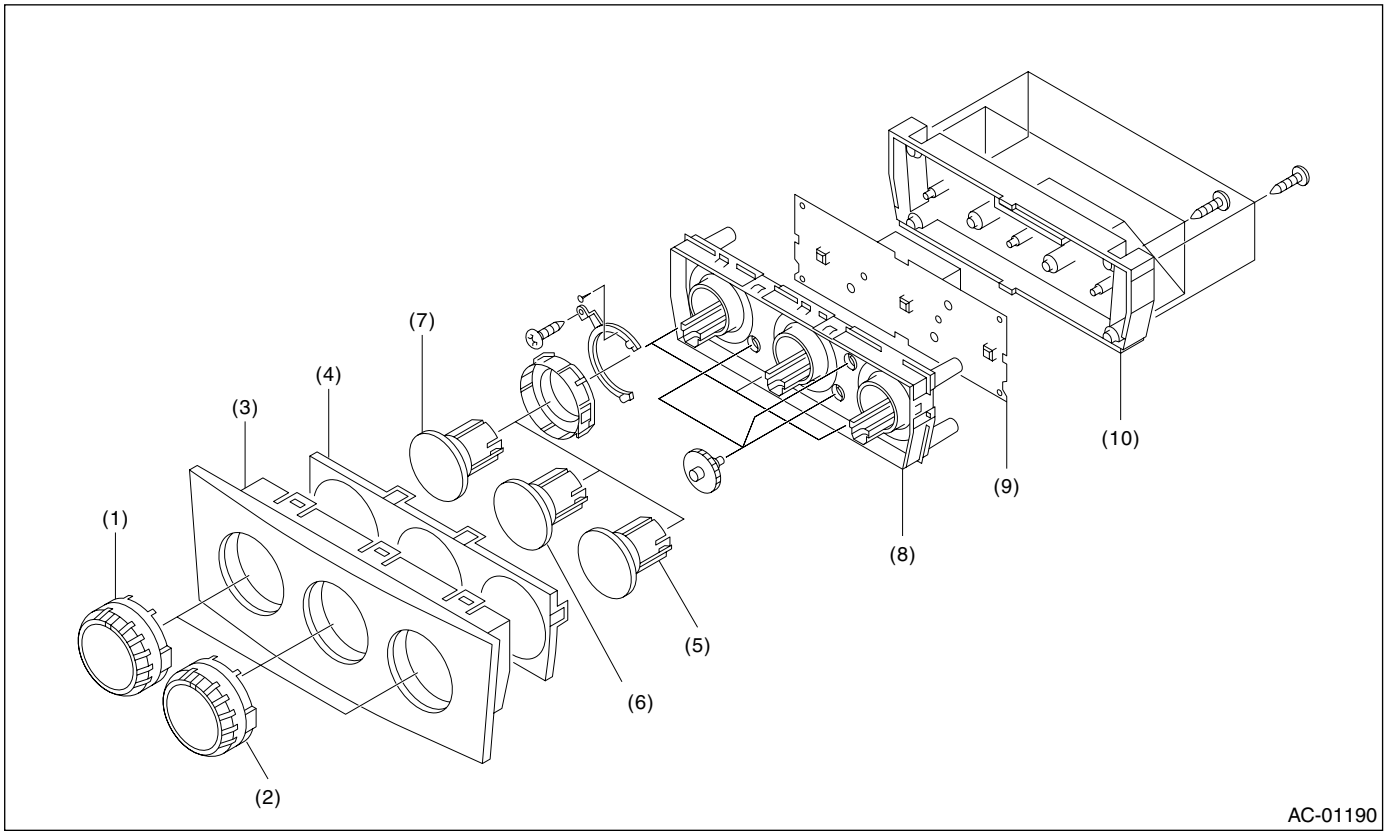
• RHD MODEL WITH MANUAL A/C



(1) Upper case
(2) Air inlet select door actuator
(3) Air inlet select lever
(4) Air inlet select link
(5) Filter cover
(6) Blower resister
(7) Cover
(8) Lower case
(9) Blower motor ASSY

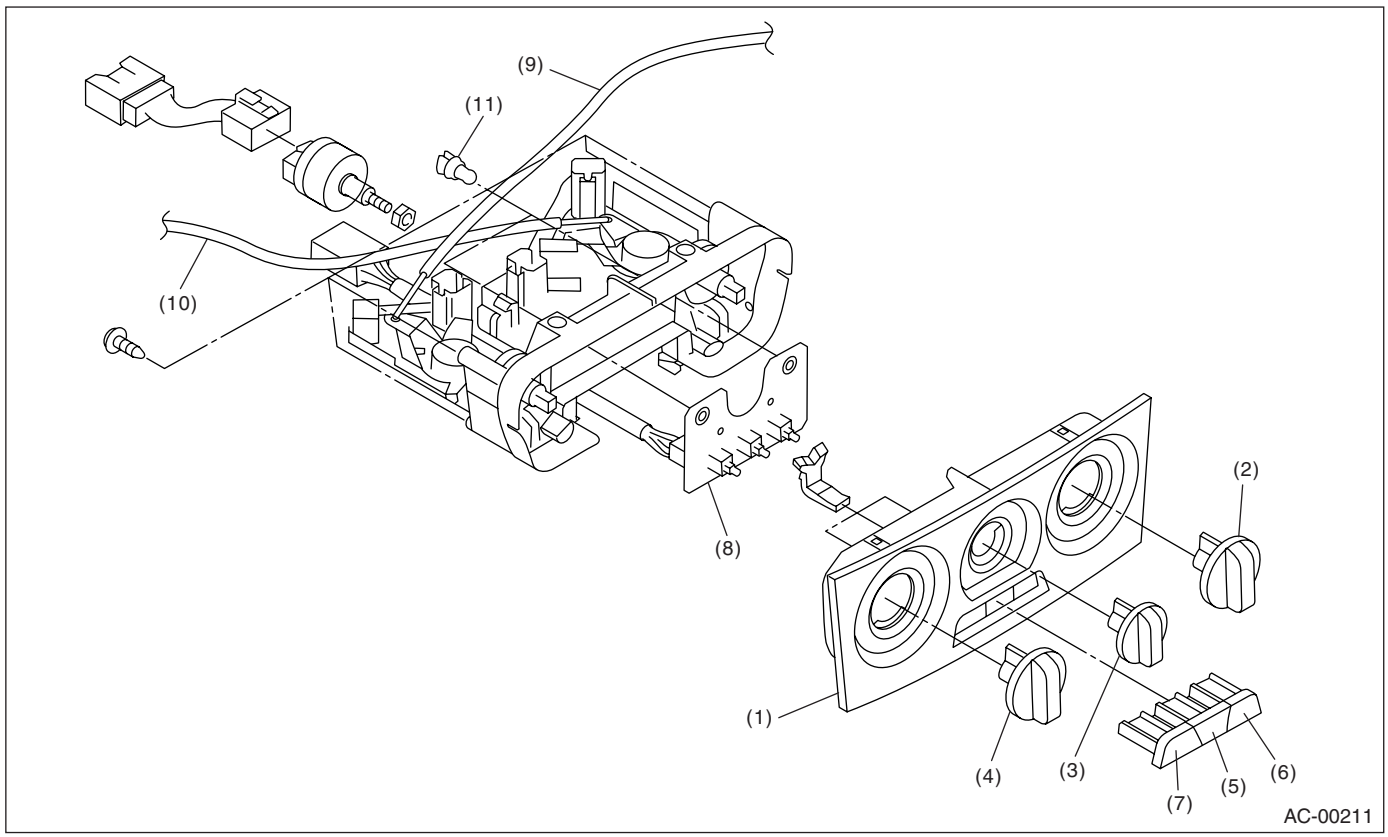
3. CONTROL UNIT

• AUTO A/C MODEL



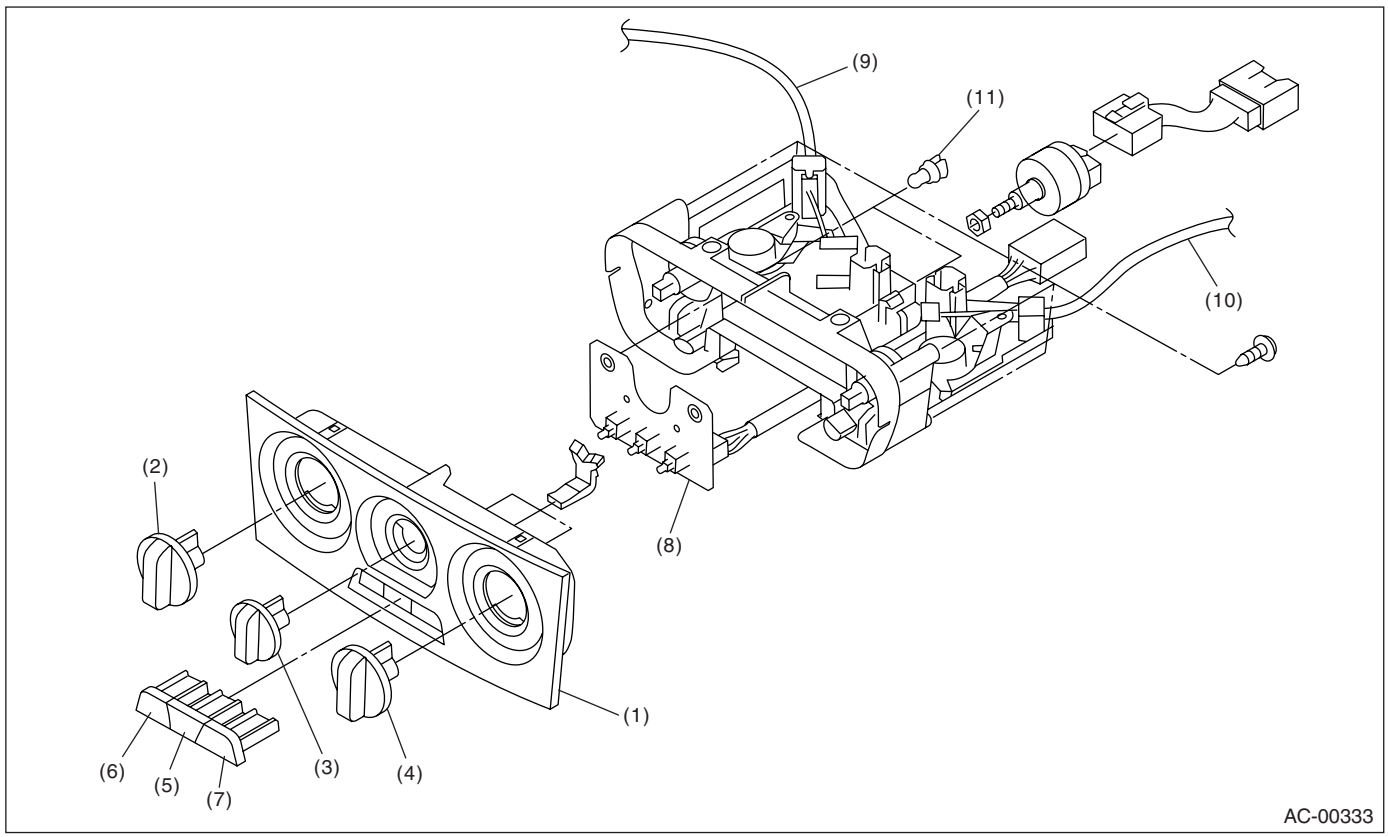
(1) Control dial (small)
(2) Control dial (large)
(3) Heater control panel
(4) Control case (front)
(5) Rear defogger button
(6) Air inlet select button
(7) A/C button
(8) Control case (base)
(9) Control unit circuit
(10) Control case (rear)

• LHD MODEL WITH MANUAL A/C



(1) Panel
(2) Temperature control dial
(3) Fan speed control dial
(4) Mode control dial
(5) A/C switch
(6) Air inlet select switch
(7) Rear defogger switch
(8) Switch circuit board
(9) Mode control cable
(10) Temperature control cable
(11) Bulb

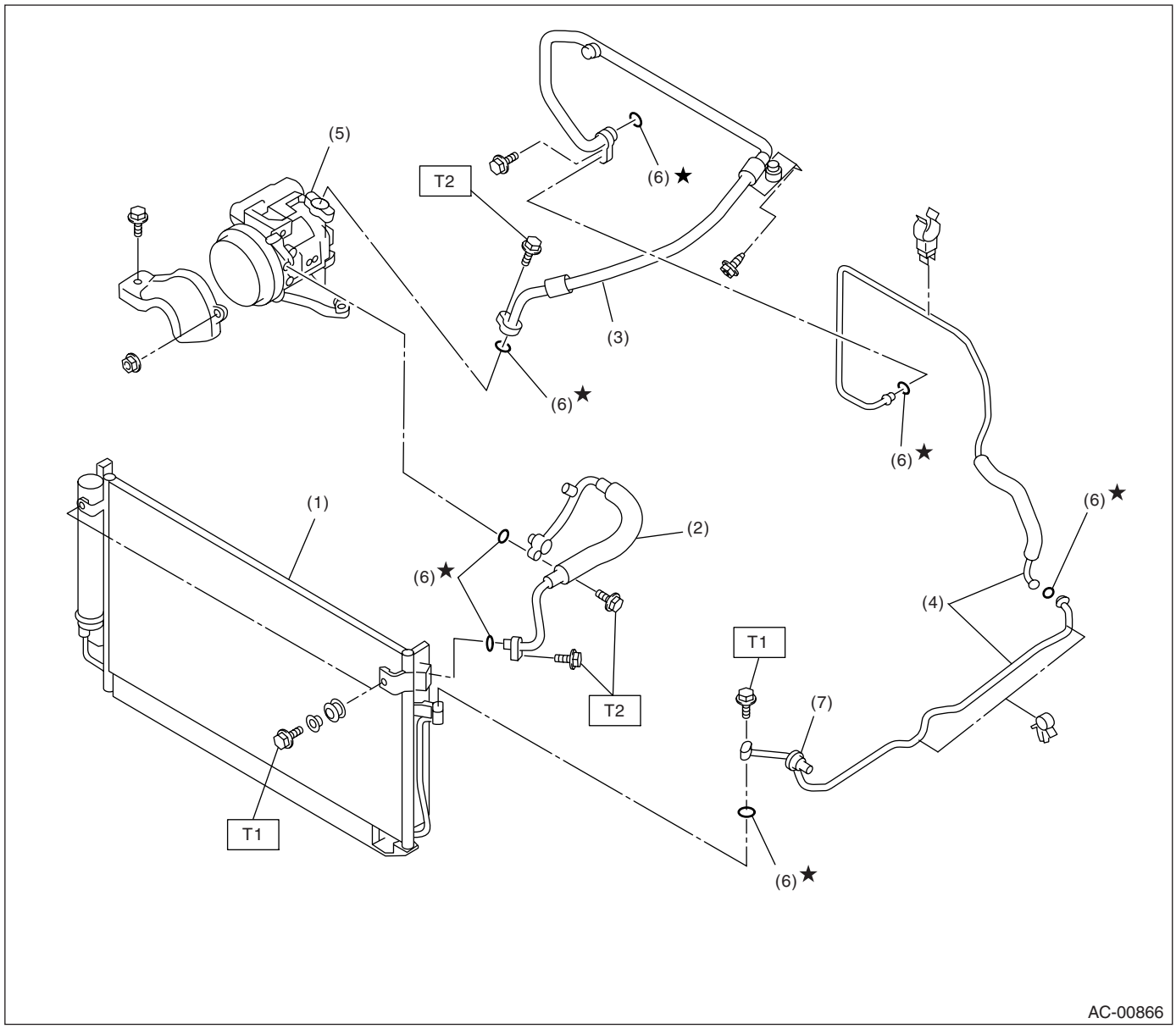
• RHD MODEL WITH MANUAL A/C



(1) Panel
(2) Mode control dial
(3) Fan speed control dial
(4) Temperature control dial
(5) A/C switch
(6) Rear defogger switch
(7) Air inlet select switch
(8) Switch circuit board
(9) Mode control cable
(10) Temperature control cable
(11) Bulb

4. AIR CONDITIONING UNIT

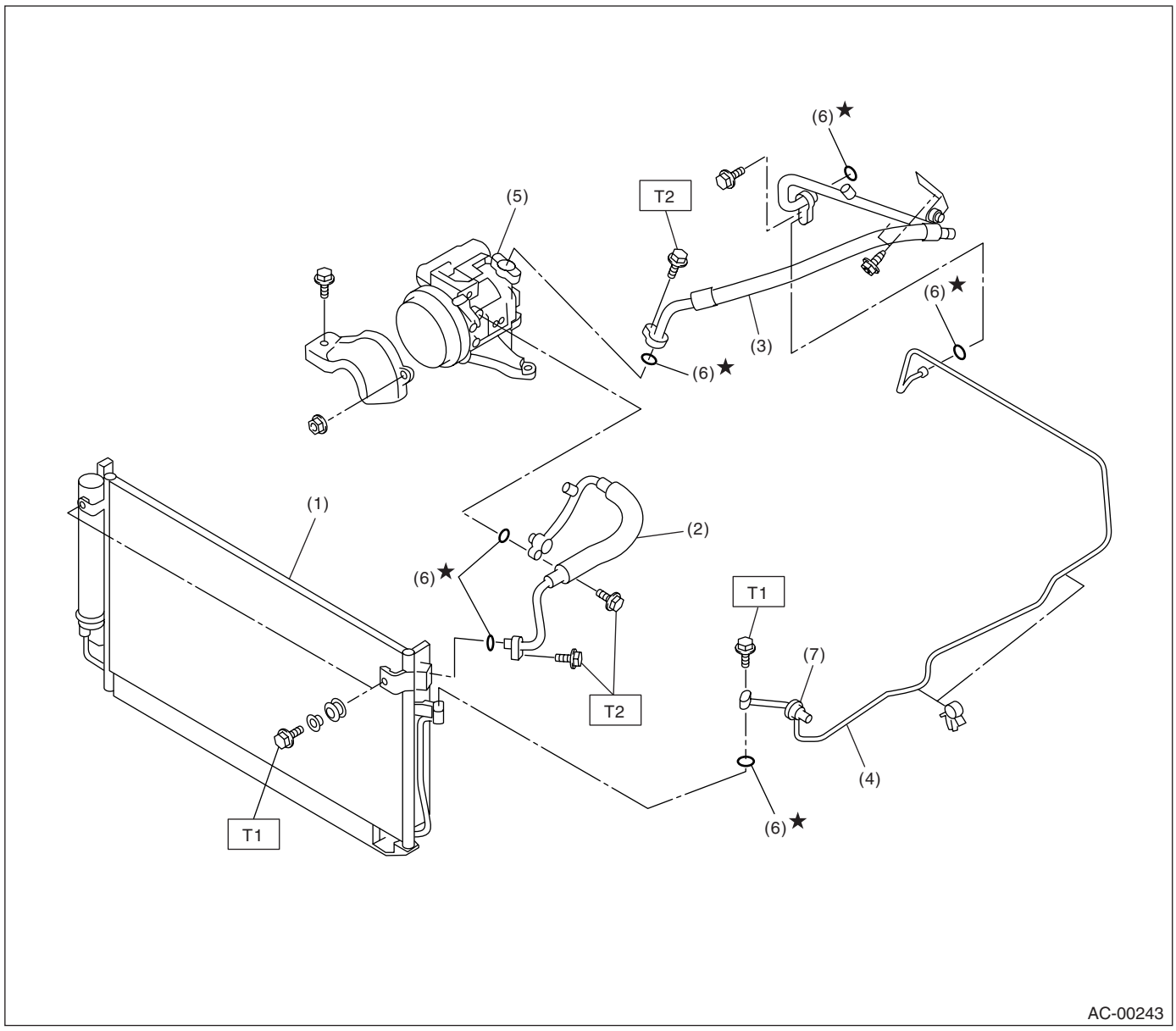
• LHD MODEL



(1) Condenser
(2) High-pressure hose
(3) Low-pressure hose
(4) Pipe
(5) Compressor
(6) O-ring
(7) Triple pressure switch

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 15 (1.5, 10.8)

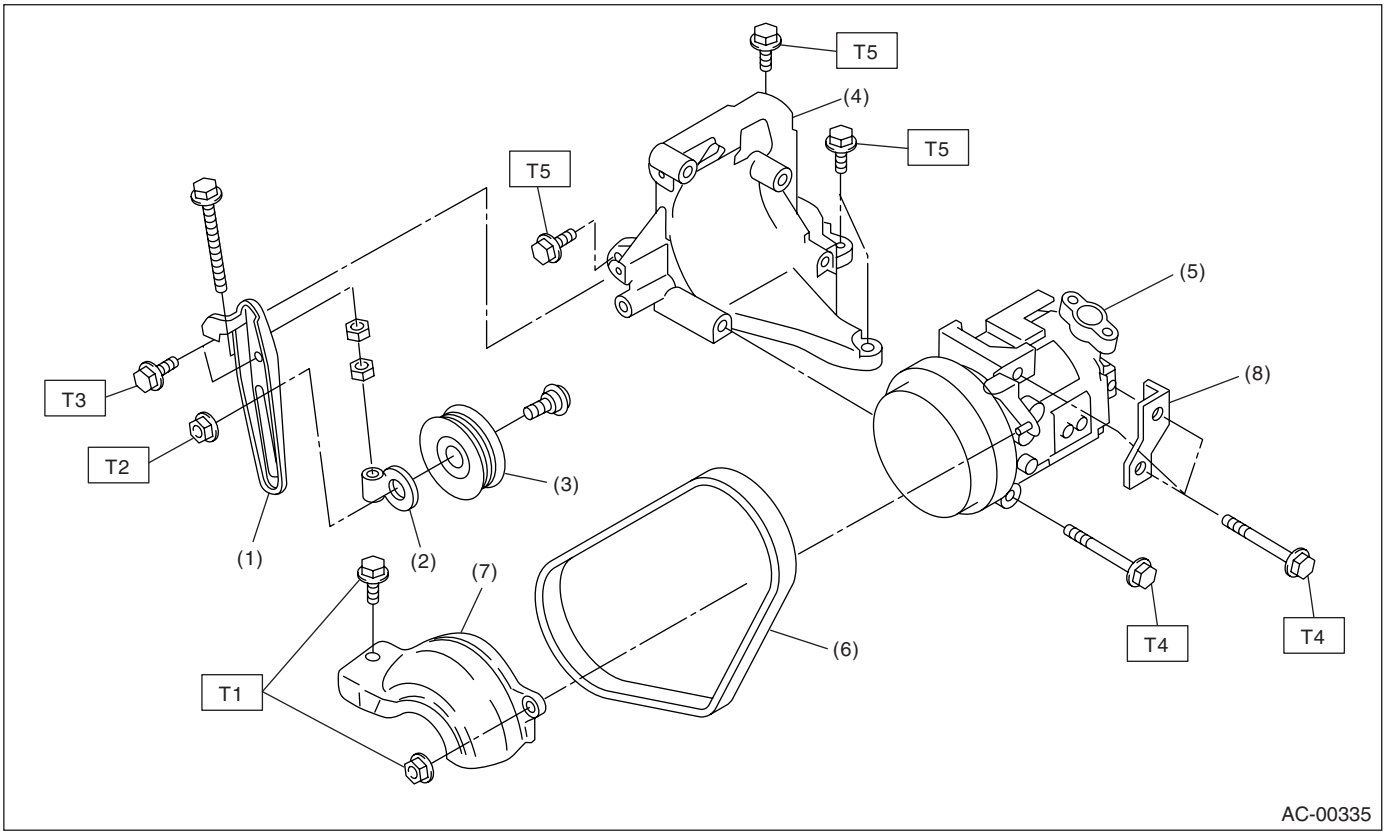
• RHD MODEL



(1) Condenser
(2) High-pressure hose
(3) Low-pressure hose
(4) Pipe
(5) Compressor
(6) O-ring
(7) Triple pressure switch

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.4 (0.75, 5.4)
T2: 15 (1.5, 10.8)

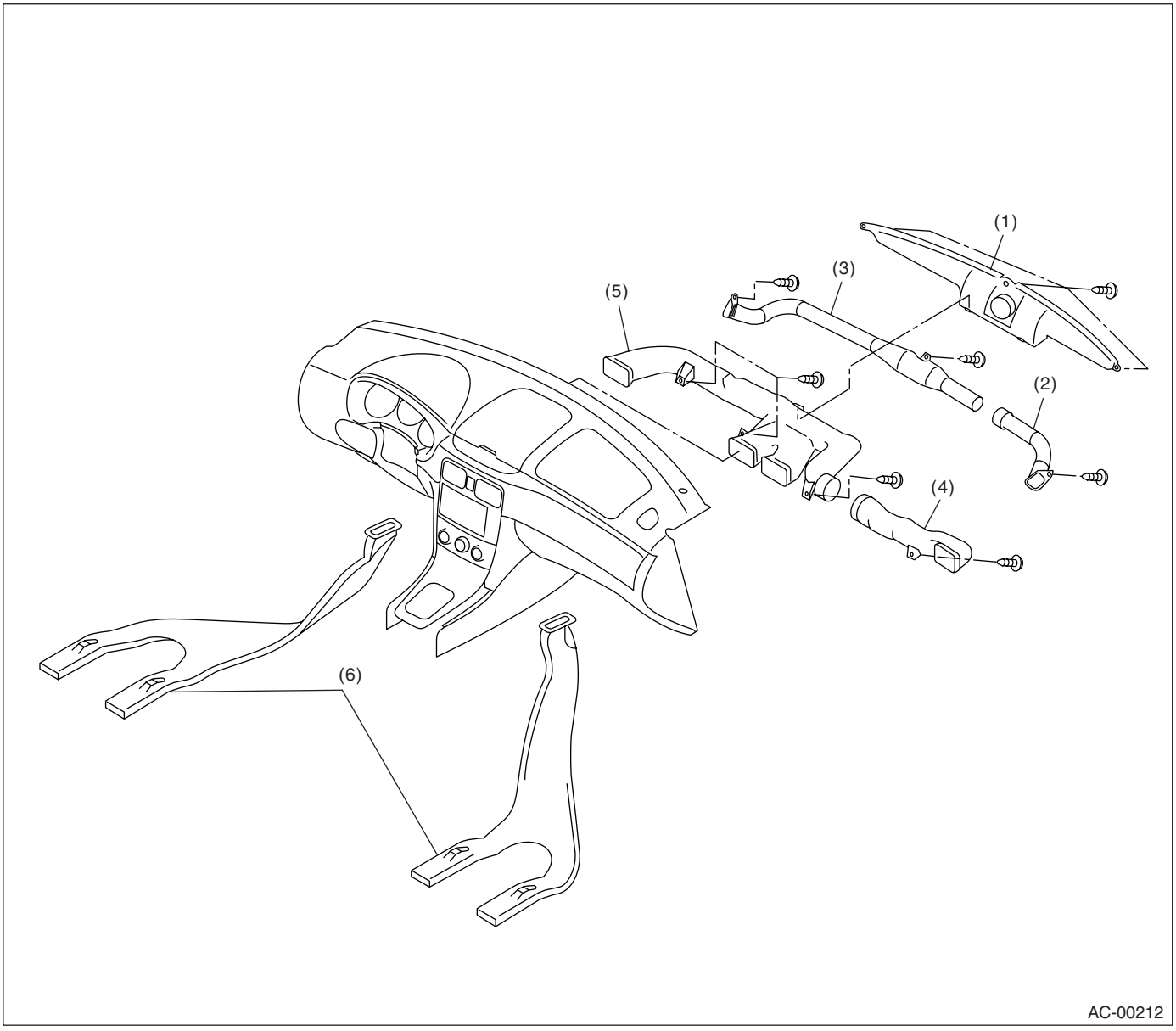
5. COMPRESSOR



(1) Idler pulley bracket
(2) Idler pulley adjuster
(3) Idler pulley
(4) Compressor bracket
(5) Compressor
(6) V-belt
(7) Compressor belt cover (Non-turbo model)
(8) Compressor stay

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.0 (0.40, 2.95)
T2: 22.6 (2.3, 16.7)
T3: 23.0 (2.35, 17.0)
T4: 28.9 (2.95, 21.3)
T5: 35 (3.6, 26)

6. HEATER DUCT

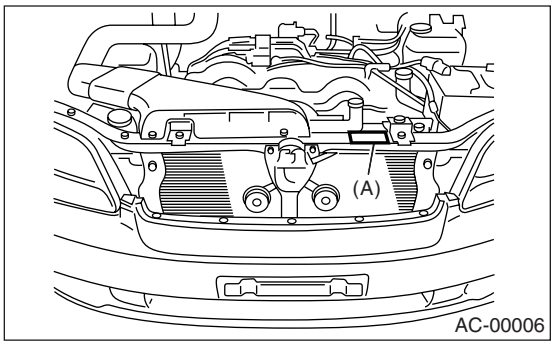


(1) Front defroster nozzle
(2) Side defroster duct (LH)
(3) Side defroster duct (RH)
(4) Side ventilation duct (LH)
(5) Side ventilation duct (RH)
(6) Rear heater duct

C: CAUTION

1. HFC-134a A/C SYSTEM

• The cooling system components for the HFC-134a system such as the refrigerant and compressor oil are different from the old conventional HFC-12 system components and they are incompatible with each other.
• Vehicles with the HFC-134a system can be identified by the label (A) attached to the vehicle.
Before maintenance, check which A/C system is installed in the vehicle.



2. COMPRESSOR OIL

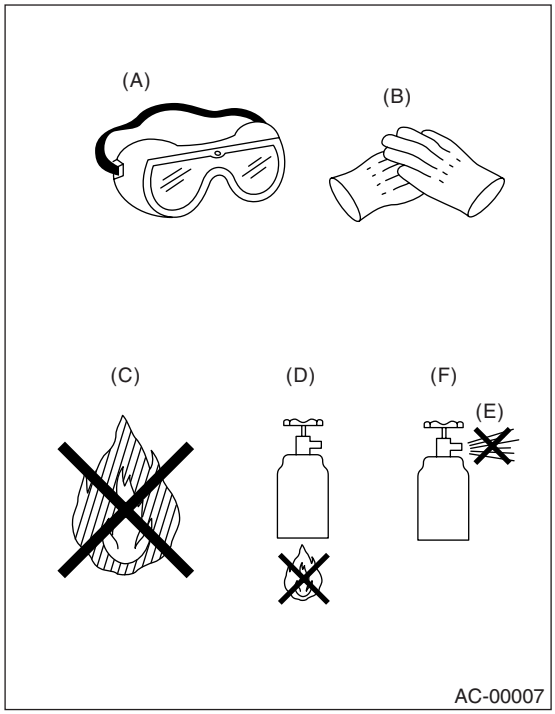
• HFC-134a compressor oil has no compatibility with that for R12 system.
• Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use ZXL200PG.
• Do not mix multiple compressor oils.
If HFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.
On the other hand, if HFC-134a compressor oil is used in a HFC-12 A/C system, the durability of the A/C system will be lowered.
• HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from the atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap securely closed.

3. REFRIGERANT

• The HFC-12 refrigerant cannot be used in the HFC-134a A/C system. The HFC-134a refrigerant, also, cannot be used in the HFC-12 A/C system.
• If an incorrect or no refrigerant is used, poor lubrication will result and the compressor itself may be damaged.

4. HANDLING OF REFRIGERANT

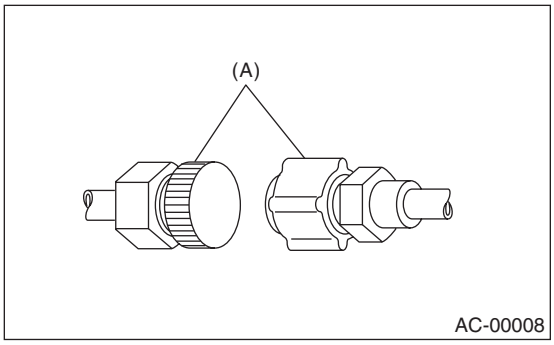
• The refrigerant boils at approx. −30°C (−22°F). When handling it, be sure to wear safety goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite.
If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.
• Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use hot water in 40°C (104°F) max.
• Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
• When the engine is running, do not open the high-pressure valve of the manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
• Provide good ventilation and do not work in a closed area.
• In order to prevent global warming, avoid releasing HFC-134a into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



(A) Goggles
(B) Gloves
(C) Avoid open flame
(D) No direct heat on container
(E) Do not discharge
(F) Loosen

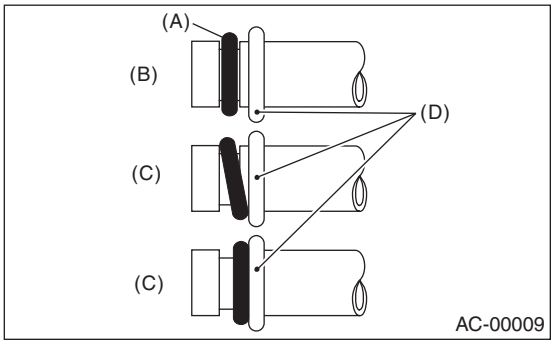
5. O-RING CONNECTIONS

- Use new O-rings.
- In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and shop cloths.
- Apply the compressor oil to the O-rings to avoid sticking, then install them.
- Use a torque wrench to tighten the O-ring fittings: Over-tightening will damage the O-ring and tube end distortion.
- If the operation is interrupted before completing a pipe connection, recap the tubes, components, and fittings with a plug or tape to prevent foreign matters from entering.



(A) Seal

- Visually check the surfaces and mating surfaces of O-rings, threads, and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings at right angle to the tube beards.

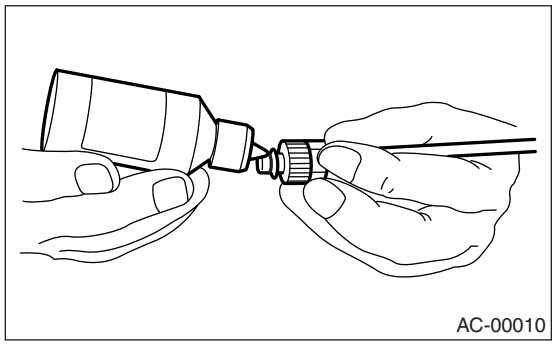


(A) O-ring
(B) OK
(C) NG
(D) Bead

- Use compressor oil specified in the service manual to lubricate the O-rings.

Apply the oil to the top and sides of the O-rings before installation.

Apply compressor oil to the bead of tube.



- After tightening, use a clean cloth to remove excess compressor oil from the connections and any oil which may have run on the vehicle body or other parts.
- If any leakage is suspected after tightening, do not retighten the connections, disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

D: PREPARATION TOOL

CAUTION:

- **When working on vehicles with the HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with CFC-12 tools and parts. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.**
- **In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.**

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

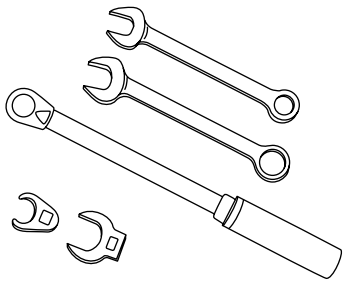
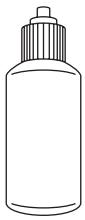
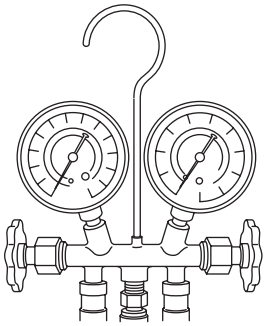
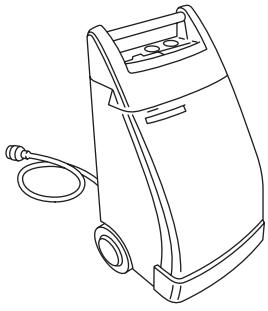
Illustration	Tools and Equipment
 AC-00213	Wrench Various **WRENCHES** will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kgf-m, 5 to 30 ft-lb) torque wrench and various crow-foot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.
 AC-00012	Applicator bottle A small **APPLICATOR BOTTLE** is recommended to apply refrigerant oil to the various parts. They can be available at a hardware or drug store.
 AC-00013	Manifold gauge set A **MANIFOLD GAUGE SET** (with hoses) can be available at from either a refrigerant supplier or an automotive equipment supplier.
 AC-00014	Refrigerant recovery system A **REFRIGERANT RECOVERY SYSTEM** is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.

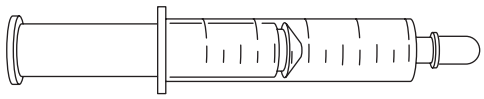
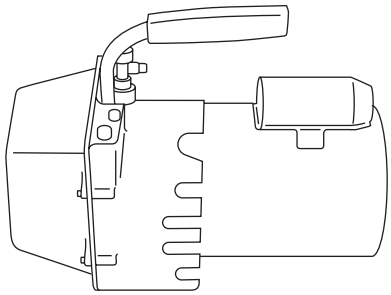
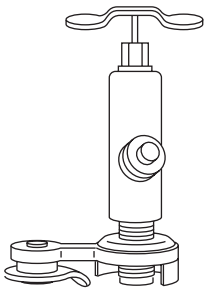
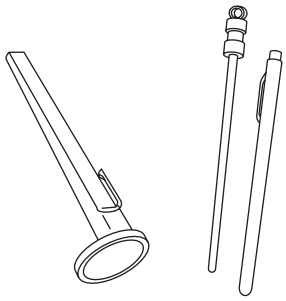
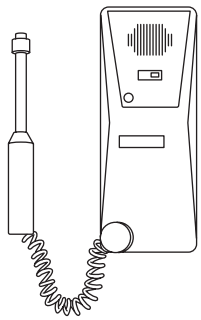
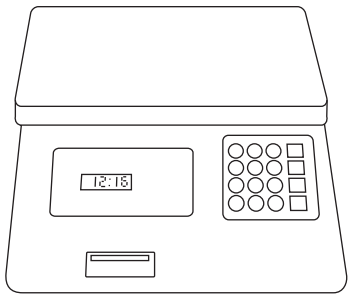
Illustration	Tools and Equipment
 AC-00015	Syringe A graduated plastic **SYRINGE** will be needed to add oil back into the system. The syringe can be available at a pharmacy or a drug store.
 AC-00016	Vacuum pump A **VACUUM PUMP** (in good working condition) is necessary, and can be available at either a refrigerant supplier or an automotive equipment supplier.
 AC-00017	Can tap A **CAN TAP** for the 397 g (14 oz) can is available at an automotive equipment supplier.
 AC-00018	Thermometer Pocket **THERMOMETERS** are available at either a industrial hardware store or a refrigerant suppliers.

Illustration	Tools and Equipment
 AC-00019	Electronic leak detector An **ELECTRONIC LEAK DETECTOR** can be available at either a specialty tool supplier or an A/C equipment supplier.
 AC-00020	Weight scale A **WEIGHT SCALE** such as an electronic charging scale or a bathroom scale with digital display will be needed, if a 13.6 kg (30 lb) refrigerant container is used.

2. Refrigerant Pressure with Manifold Gauge Set

A: OPERATION

1) Place the vehicle in the shade and draftless condition.
2) Connect the manifold gauge set.
3) Open the front windows and close all doors.
4) Open the hood.
5) Increase the engine speed to 1,500 rpm.
6) Turn ON the A/C switch.
7) Turn the temperature control dial to MAX COOL.
8) Set the air inlet select switch to RECIRC position.
9) Turn the fan speed control dial to HI.
10) Read the gauge.

Standard:
Low pressure: 127 — 196 kPa (1.3 — 2.0 kgf/cm^2, 18 — 28 psi)
High pressure: 1,471 — 1, 667 kPa (15 — 17 kgf/cm^2, 213 — 242 psi)
Ambient temperature: 30 — 35°C (86 — 95°F)

B: INSPECTION

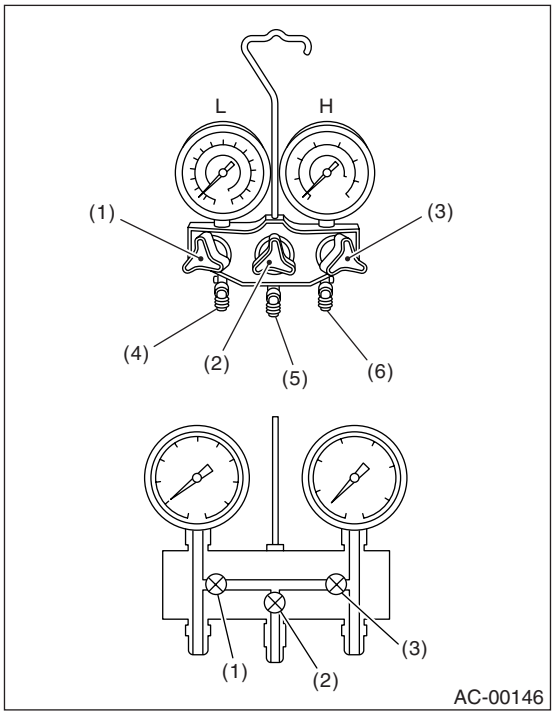
Symptom	Probable cause	Repair order
High-pressure side is unusually high.	• Defective condenser fan motor • Clogged condenser fin • Too much refrigerant • Air inside the system • Defective receiver dryer	• Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the receiver dryer. • After reevacuating the receiver dryer, charge appropriate amount of refrigerant.
High-pressure side is unusually low.	• Defective compressor • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture	• Replace the compressor. • Check for leaks. • Replace the expansion valve. • Fully evacuate the expansion valve.
Low-pressure side is unusually high.	• Defective compressor • Defective expansion valve • Too much refrigerant	• Replace the compressor. • Replace the expansion valve. • Discharge refrigerant.
Low-pressure side is unusually low.	• Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture • Saturated receiver dryer	• Check for leaks. • Replace the expansion valve. • Replace the receiver dryer.

3. Refrigerant Recovery Procedure

A: OPERATION

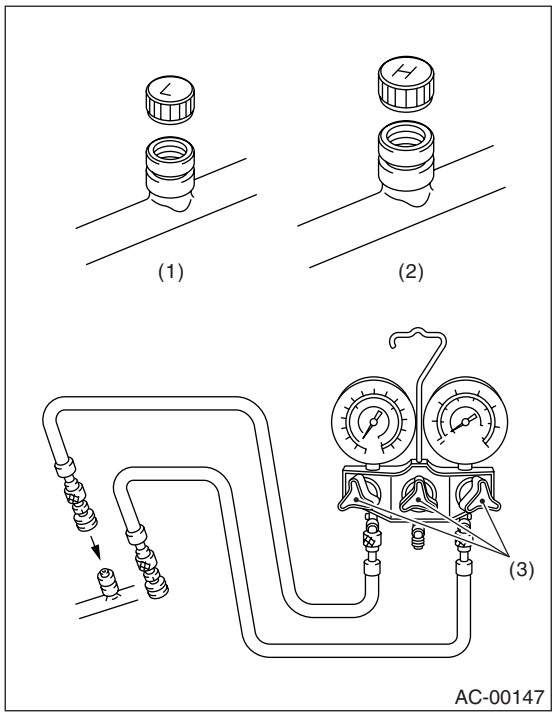
CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
• When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
• Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

1) Perform the compressor oil return operation. <Ref. to AC-31, OPERATION, Compressor Oil.>
2) Stop the engine.
3) Make sure the valves on low-/high-pressure sides of manifold gauge set are fully closed.



L: Low-pressure gauge
H: High-pressure gauge
(1) Low-pressure valve
(2) Vacuum pump valve
(3) High-pressure valve
(4) For low-pressure
(5) For vacuum pump
(6) For high-pressure

4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



(1) Low-pressure service port
(2) High-pressure service port
(3) Close

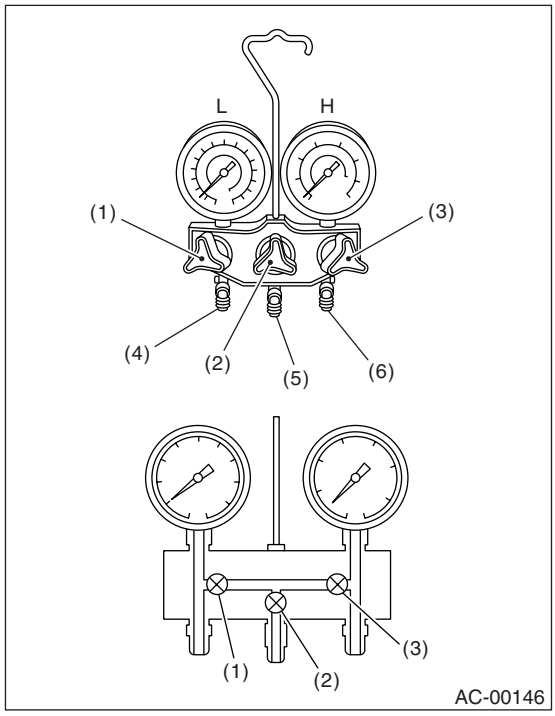
5) Connect the center hose to the refrigerant recovery system.
6) Follow the operation manual to activate the refrigerant recovery system.

4. Refrigerant Charging Procedure

A: OPERATION

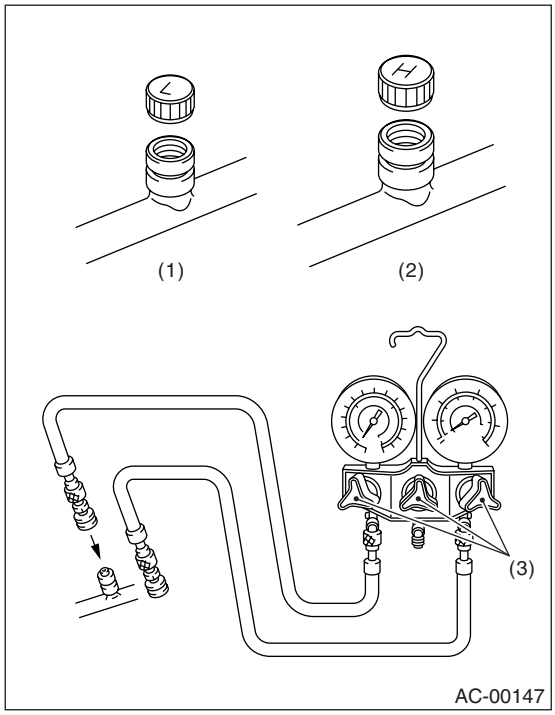
CAUTION:
• During operation, be sure to wear safety goggles and protective gloves.
• If air is mixed in refrigeration cycle, poor cooling may result, and also if moisture is mixed in refrigeration cycle, clogging (freezing) or rust may result.
Before charging the refrigerant, evacuate the system using vacuum pump to remove air and moisture in the system. Moisture can be evaporated and removed easily even at normal temperature, if the system is evacuated using vacuum pump.

1) Close all valves of manifold gauge.



L: Low-pressure gauge
H: High-pressure gauge
(1) Low-pressure valve
(2) Vacuum pump valve
(3) High-pressure valve
(4) For low-pressure
(5) For vacuum pump
(6) For high-pressure

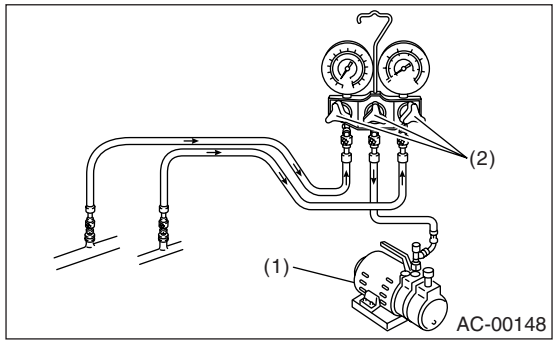
2) Install the low-/high-pressure hoses to corresponding service ports on vehicle.



(1) Low-pressure service port
(2) High-pressure service port
(3) Close

CAUTION:
Be sure that the hoses are securely connected.

3) Connect the center hose of manifold gauge with vacuum pump.
4) Activate the vacuum pump and then open the valves on low-/high-pressure sides.

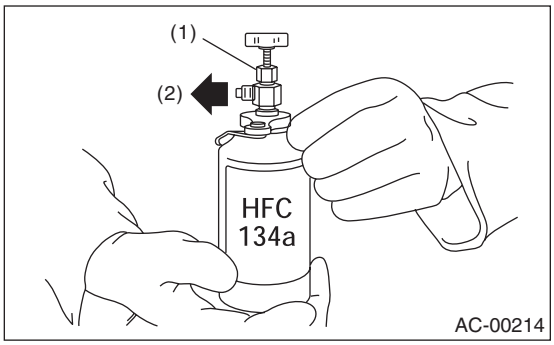


(1) Vacuum pump
(2) Open

CAUTION:
Be sure to evacuate the system using vacuum pump.

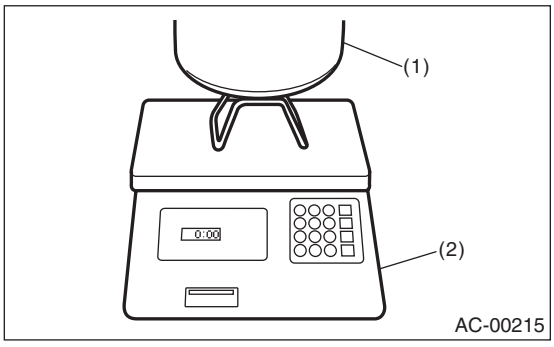
5) After at least 5 minutes of evacuation, if the low-pressure gauge reading shows 100.0 kPa (750 mmHg, 29.5 inHg) or higher, close the valves on center hose to stop the vacuum pump.

6) Leave it at least 5 to 10 minutes after closing the valves on low-/high-pressure sides, and then check the low-pressure gauge reading for any changes. When the gauge reading changes, this is a sign of leakage. Check the pipe or hose connector points, and repair if necessary. Repeat the procedure from 1) after repairing the faulty part.
7) If there are no leaks, further evacuate the system 20 to 30 minutes.
8) Close all valves and stop the vacuum pump.
9) Following the can tap operation manual instructions, install it to refrigerant can.



(1) Tap valve
(2) To center manifold hose

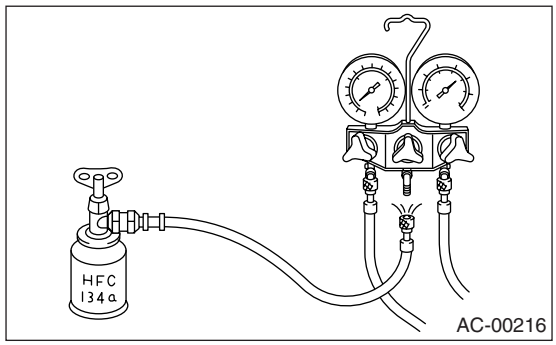
10) Disconnect the vacuum pump from center hose, and connect the hose to tap valve.
11) When a 13.6 kg (30 lb) refrigerant container is used, measure the refrigerant amount in use using a weighting scale before connecting to center hose.



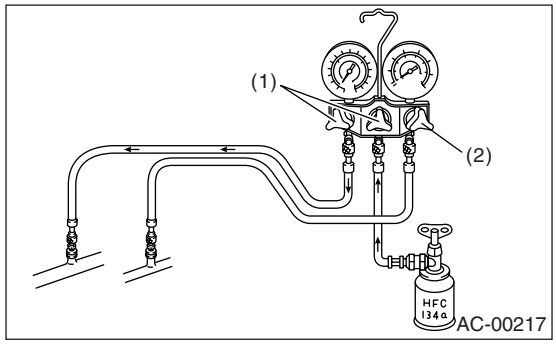
(1) Refrigerant container (HFC-134a)
(2) Weighting scale

12) Open the valve on HFC-134a source.

13) Loosen the center hose connection on manifold gauge (if applicable, press a purge valve on manifold gauge) only for a couple of seconds to allow the air in the center hose to escape by the refrigerant.



14) Make sure that the high-pressure valve of manifold gauge is closed, and then open the low-pressure side valve only to charge the refrigerant.



(1) Open
(2) Close

CAUTION:
Do not open the high-pressure valve. Be sure to open the low-pressure valve.

15) Close the low-pressure valve when the low-pressure gauge reading reaches 200 kPa (1,500 mmHg, 59.1 inHg).
16) Using a leak tester, check the system for refrigerant leaks.
17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.
18) If the HFC-134a source is empty, close the low-pressure valve and then close the valve on can tap before replacing the empty source. Restart charging operation after replacing the HFC-134a source with a new one and purging.
19) Close the low-pressure valve if the charge rate of refrigerant becomes worse.
20) Confirm that both the low-/high-pressure valves are closed. Start the engine with A/C switch OFF.
21) Quickly repeat A/C switch ON-OFF cycles a few times to prevent initial compressor damage.

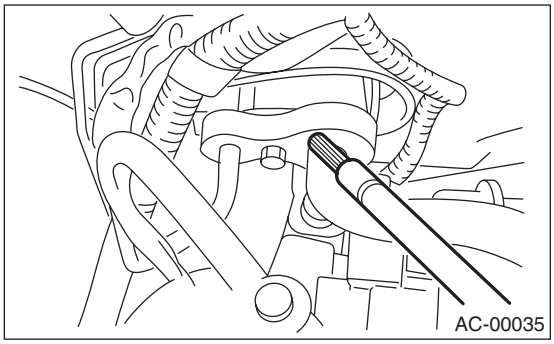
22) Set up the vehicle to the following status:
- A/C switch ON
- Engine running at 1,500 rpm
- Blower speed setting to “HI”
- Temperature setting to “MAX COOL”
- Air inlet setting to “RECIRC”
- Window open

23) Open the low-pressure valve and charge the specified amount of refrigerant.
24) Close all valves and disconnect the hoses from service port after charging the refrigerant.
25) Install the cap to service port.

5. Refrigerant Leak Check

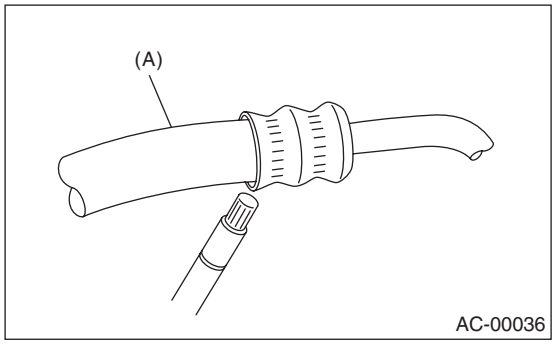
A: INSPECTION

1) Operate the A/C system for approx. 10 minutes, and confirm that the high-pressure side shows at least 690 kPa (7.03 kgf/cm^2, 100 psi). Then stop the engine to start the leak test.
2) Starting from the connection between the high-pressure pipe and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.
3) Check the joint and seam between the pressure switch (triple pressure switch) and high-pressure pipe.
4) Check the connections between the condenser and pipes, and welded joints on the condenser.
The leak tester may detect the oil on the condenser fins as a leak.
5) Check the joint between the compressor and hoses.
6) Check the machined area of compressor and other joints on the compressor.
7) Check the compressor shaft seal at the area near the center of compressor clutch pulley.
Some shaft seals show a slight amount of leakage about 28 g (1.0 oz) per year. This is not a problem.
8) Starting from the connection between the low-pressure pipe and evaporator, check the system for leakage along the low-pressure side through the compressor. The following items must be checked thoroughly.
- Connection between two parts
- Connection between the pipe and plate



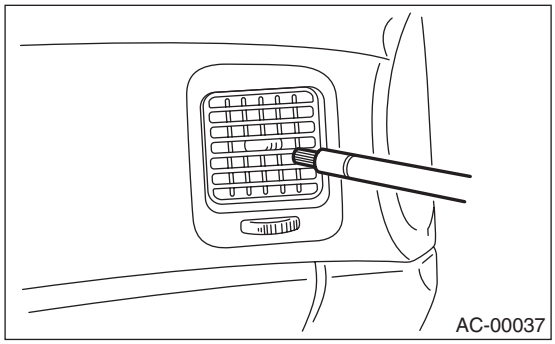
9) Visually check the rubber area of the flexible hose for cracks.
Check the entire length of the flexible hose, especially the connection with the metal hose end.

CAUTION:
Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.

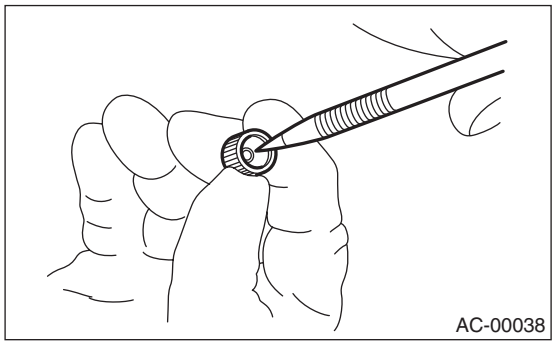


(A) Flexible hose

10) Disconnect the drain hose from the heater case, and check the hose end for at least 10 seconds.
After the test is finished, reconnect the drain hose.
11) Turn the ignition switch to ON, and run the blower at high speed for 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



12) Check the valve in the service port.
13) Visually check the rubber seal in the service port cap.



6. Compressor Oil

A: OPERATION

NOTE:
Before making repairs, conduct the oil return operation to return the compressor oil in circulation with the refrigerant to the compressor.

1) Increase the engine speed to 1,500 rpm.
2) Turn ON the A/C switch.
3) Turn the temperature control dial to MAX COOL.
4) Set the air inlet select switch to RECIRC position.
5) Turn the fan speed control dial to HI.
6) Leave in this condition for 10 minutes.

B: REPLACEMENT

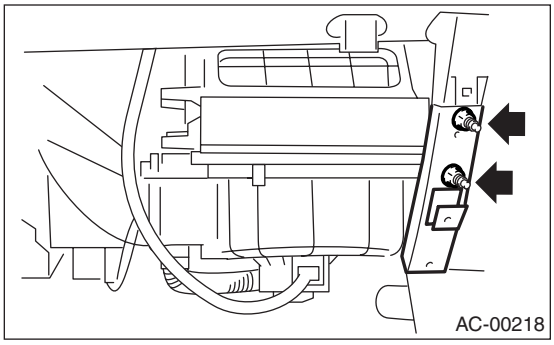
NOTE:
• If a component is replaced, add an appropriate amount of compressor oil (same as the amount of remaining oil in removed component).
• When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	Approx. 50 cm^3 (1.7 US fl oz, 1.8 Imp fl oz)
Condenser	Approx. 30 cm^3 (1.0 US fl oz, 1.1 Imp fl oz)
Hose	Approx. 10 cm^3 (0.3 US fl oz, 0.4 Imp fl oz)
Receiver dryer	Approx. 10 cm^3 (0.3 US fl oz, 0.4 Imp fl oz)

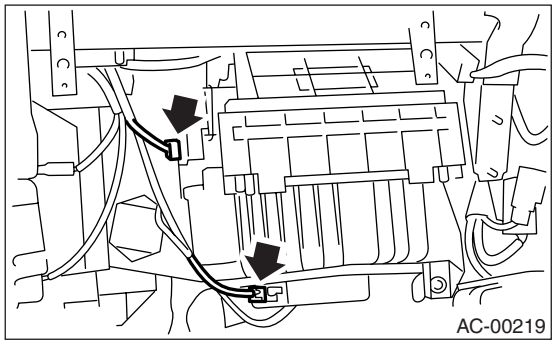
7. Blower Motor Unit Assembly

A: REMOVAL

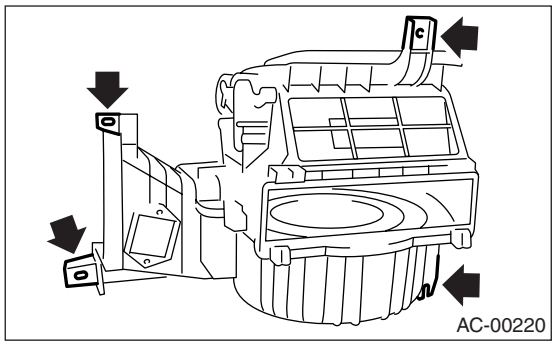
1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
3) Loosen the nut to remove the support beam stay.



4) Disconnect the connectors of blower motor and intake actuator resistor.



5) Loosen the bolt and nut to remove blower motor unit assembly.



B: INSTALLATION

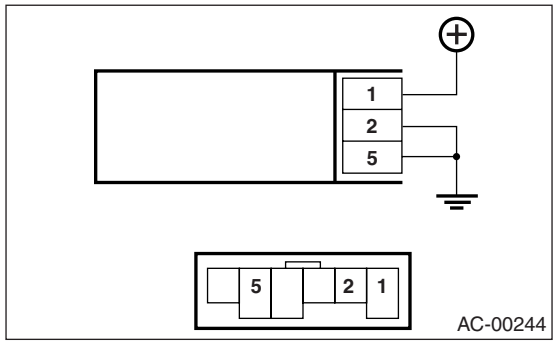
Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.> <Ref. to AC-9, BLOWER MOTOR UNIT, COMPONENT, General Description.>

C: INSPECTION

Inspection of Auto A/C Brush-less Motor Operation

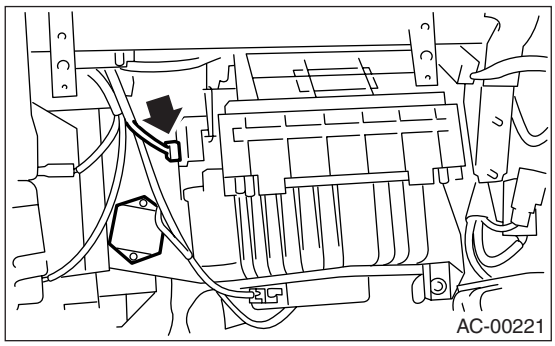
Connect the motor connector terminal 1 from the battery to the positive (+) lead and terminal 2 and 5 at the same time to the negative (−) lead. Make sure the motor runs smoothly.



8. Blower Resistor (Manual A/C Model)

A: REMOVAL

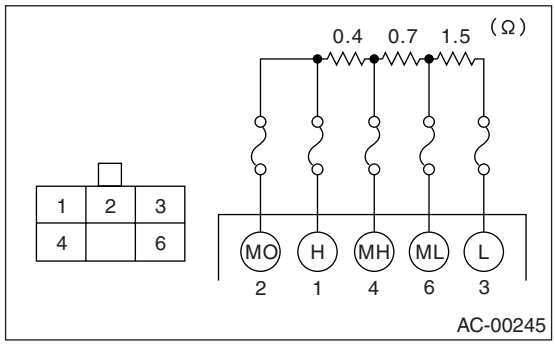
1) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
2) Disconnect the blower resistor connector.
3) Remove the two screws to remove blower resistor.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Measure the blower resistor resistance.

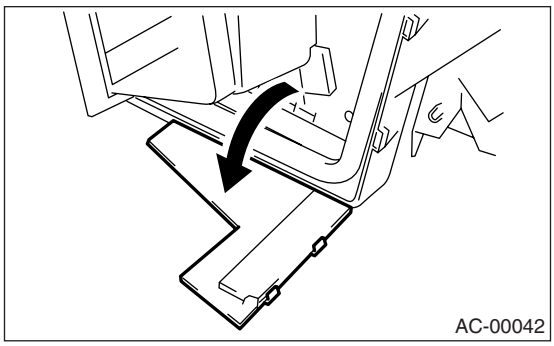
Terminal No.	Standard
3 and 6	Approx. 0.4 Ω
3 and 4	Approx. 1.1 Ω
2 and 1	Approx. 2.6 Ω

If NG, replace the blower resistor.

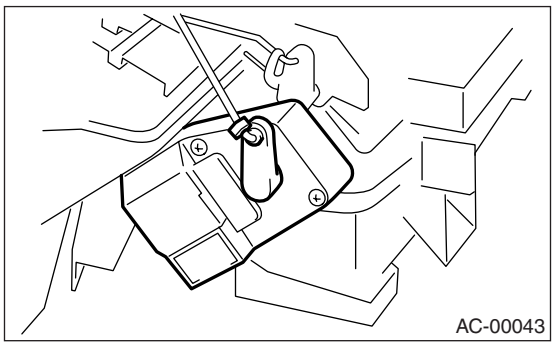
9. Heater Core

A: REMOVAL

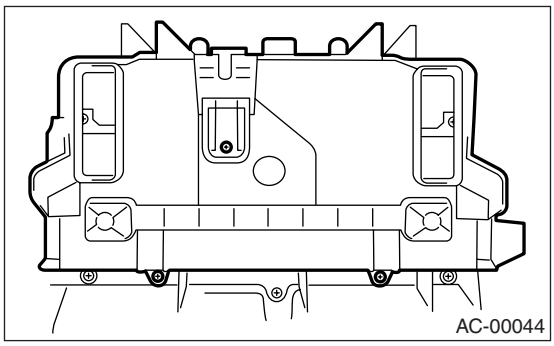
1) Remove the heater cooling unit. <Ref. to AC-39, REMOVAL, Heater and Cooling Unit.>
2) Remove the screws to remove the heater core pipe cover (RHD model).


AC-00042

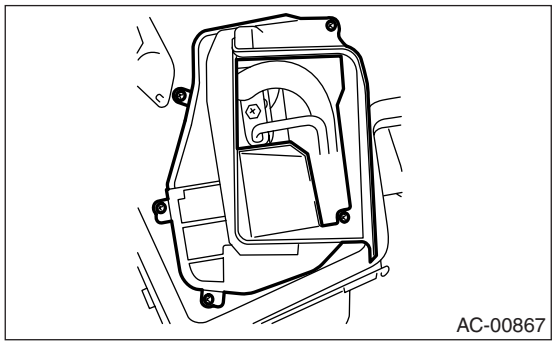
3) Remove the screws to remove mode actuator.


AC-00043

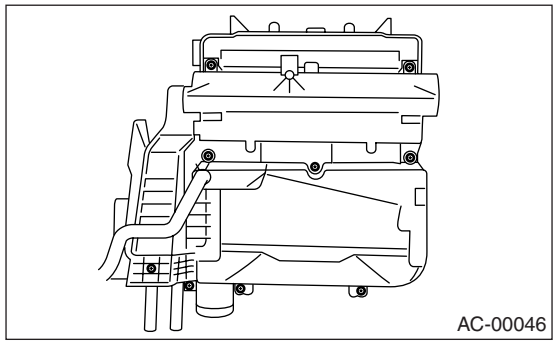
4) Remove the screws to remove foot duct.


AC-00044

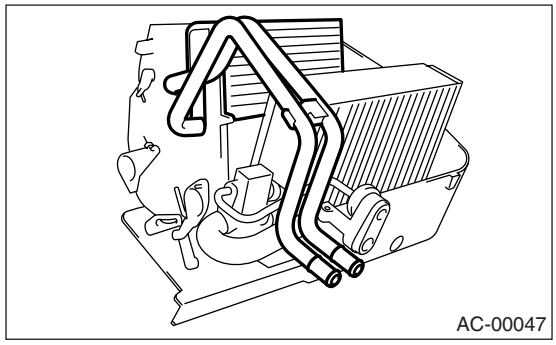
5) Remove the screws to remove evaporator cover.


AC-00867

6) Remove the screws to remove lower case.


AC-00046

7) Remove the heater core.


AC-00047

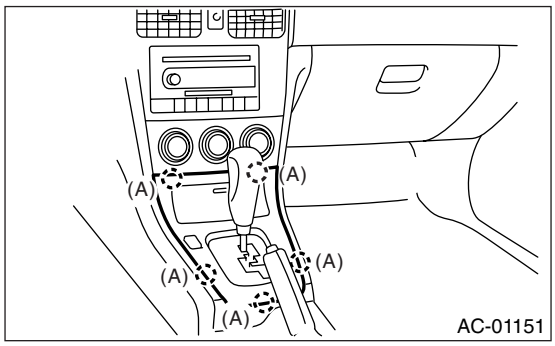
B: INSTALLATION

Install in the reverse order of removal.

10.Control Unit

A: REMOVAL

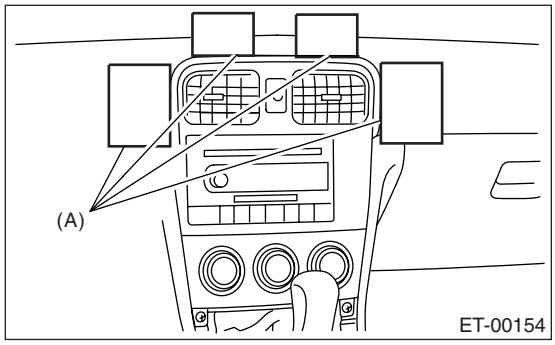
1) Disconnect the ground cable from battery.
2) In case of manual A/C, remove the mode cable and air-mix cable from links of heater unit.
3) Remove the console front cover.



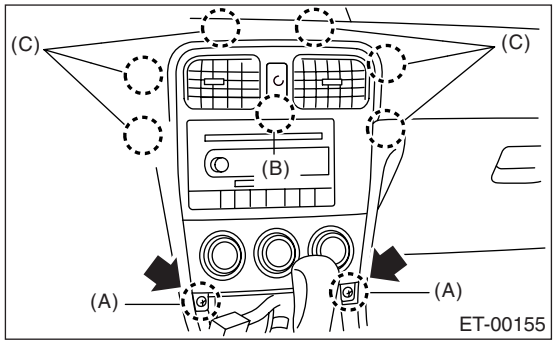
(A) Hook

4) Apply the thick protective tape (A) to instrument panel pad to protect the surface of it.

NOTE:
Also apply the protective tape to the deep inside portion between center console panel and instrument panel pad.



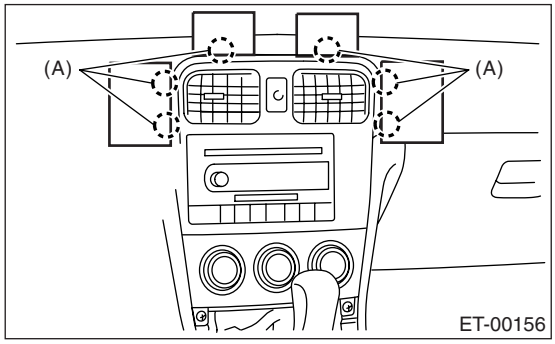
5) Loosen the screws.



(A) Screw
(B) Clip
(C) Claw

6) Insert the flat tip screwdriver to the position (A) and release the claw with pulling out the lower portion of center console panel.

CAUTION:
Do not insert the flat tip screwdriver into any portion except for indicated in the figure. The instrument panel may be damaged.



(A) Inserting position of flat tip screwdriver

7) Remove the four screws on rear side of center console panel, and then remove the control unit.

B: INSTALLATION

Install in the reverse order of removal.

11.Compressor

A: INSPECTION

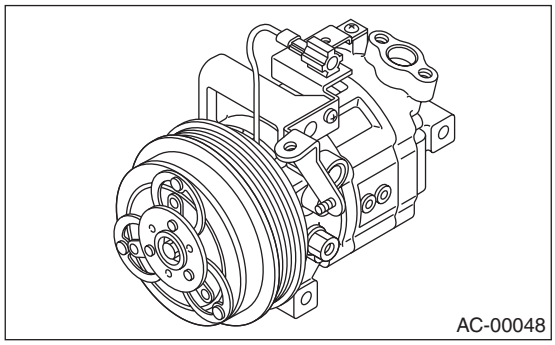
1. MAGNETIC CLUTCH CLEARANCE

Check the clearance of the entire circumference around the drive plate and pulley.

Standard:
0.3 — 0.6 mm (0.0118 — 0.0236 in)

2. MAGNETIC CLUTCH OPERATION

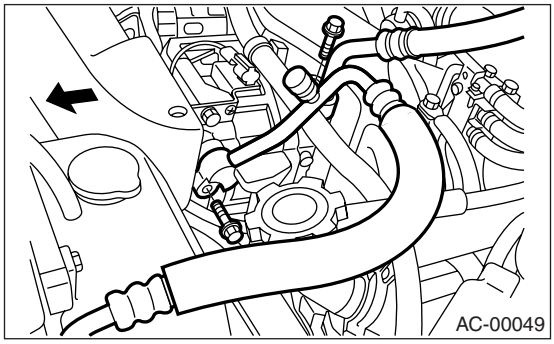
1) Disconnect the compressor connector.
2) Connect the battery positive (+) terminal to the No. 3 terminal of the compressor connector.


AC-00048

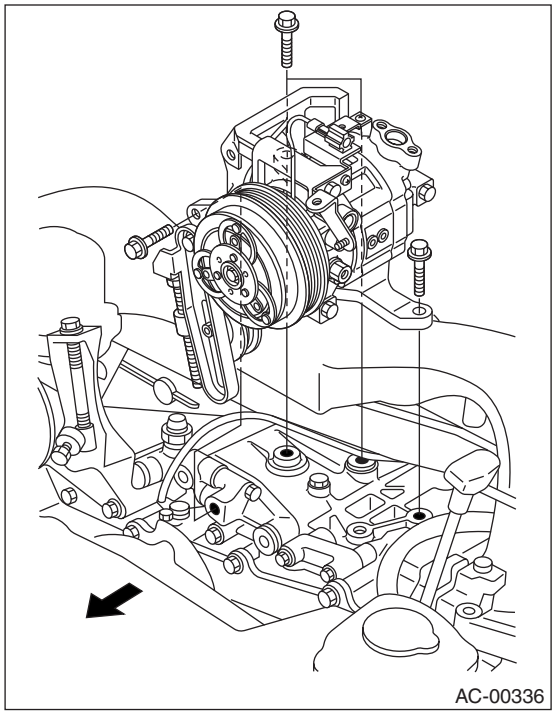
3) Make sure the magnet clutch engages.
If NG, replace the compressor.

B: REMOVAL

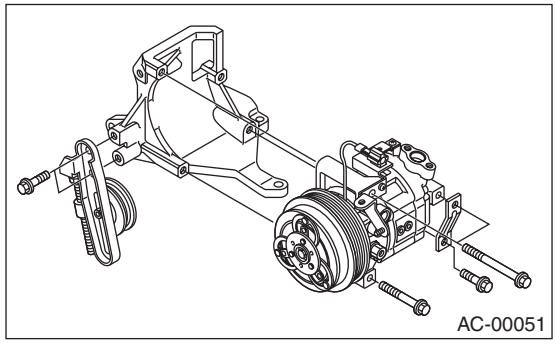
1) Perform the compressor oil return operation. <Ref. to AC-31, OPERATION, Compressor Oil.>
2) Turn the A/C switch OFF and stop the engine.
3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
4) Disconnect the ground cable from battery.
5) Remove the V-belt. <Ref. to ME(H4SO)-43, REMOVAL, V-BELT.> <Ref. to ME(H4DOTC 2.0)-53, REMOVAL, V-belt.>
6) Remove the generator. <Ref. to SC(H4SO)-15, REMOVAL, GENERATOR.>
7) Remove the low-pressure hose and high-pressure hose.


AC-00049

8) Disconnect the compressor harness from body harness.
9) Remove the bolts to remove compressor bracket.


AC-00336

10) Remove the bolts and then separate compressor and bracket.


AC-00051

C: INSTALLATION

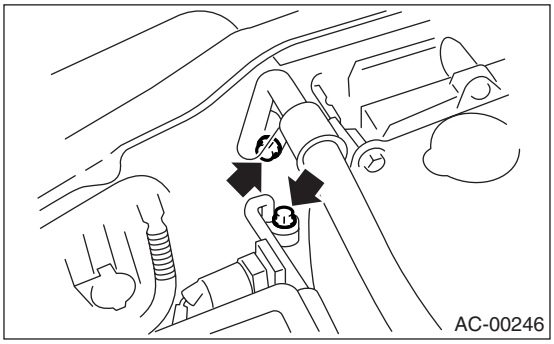
1) Install in the reverse order of removal.
2) Replace the O-rings on low-/high-pressure hoses with new ones, then apply compressor oil.
3) When replacing compressor, adjust amount of compressor oil. <Ref. to AC-31, OPERATION, Compressor Oil.>
4) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-16, AIR CONDITIONING UNIT, COMPONENT, General Description.> <Ref. to AC-18, COMPRESSOR, COMPONENT, General Description.>

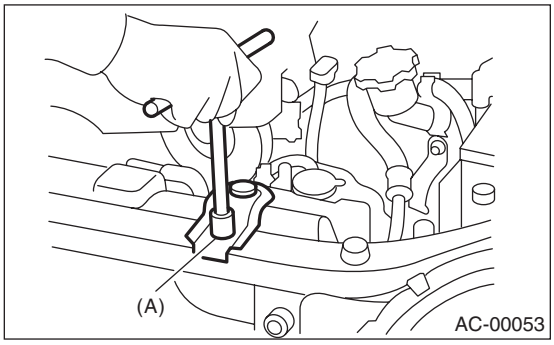
12.Condenser

A: REMOVAL

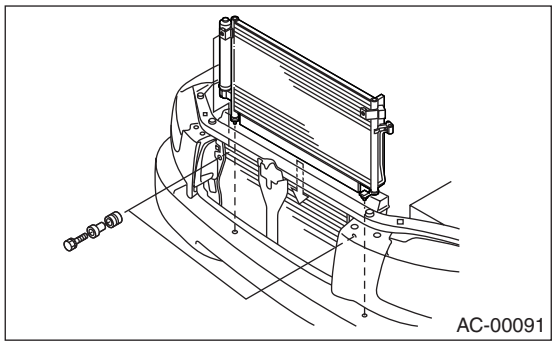
1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
2) Disconnect the ground cable from battery.
3) Disconnect the pressure hose and pipe from condenser.



4) Remove the radiator bracket (A).



5) Remove the two bolts. While lifting the condenser, pull it out through the space between radiator and radiator panel.

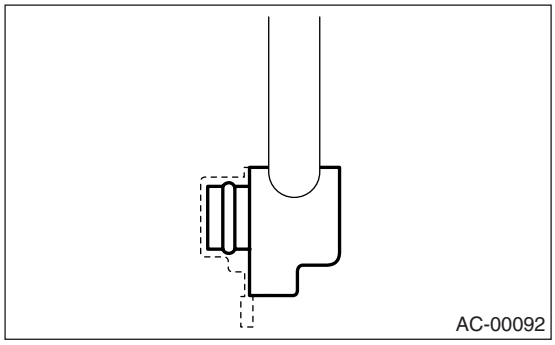


CAUTION:
Be careful not to damage the radiator fins and condenser fins. If a damaged fin is found, repair it using a thin screwdriver.
If the condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-31, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Replace the O-rings on hoses or pipes with new ones, and then apply compressor oil. Confirm that lower guide of condenser has been fitted into holes on radiator panel.



2) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to AC-16, AIR CONDITIONING UNIT, COMPONENT, General Description.>
<Ref. to CO(H4SO)-7, RADIATOR AND RADIATOR FAN, COMPONENT, General Description.>

C: INSPECTION

1) Check that no dust or insects are found on the condenser fins. Air-blow or flush fins with water as needed.
2) Check that no oil leaks from condenser. If a failure is found, replace the condenser with a new one.

13.Condenser (Sub Fan)

A: REMOVAL

<Ref. to CO(H4SO)-35, REMOVAL, Radiator Main Fan and Fan Motor.>

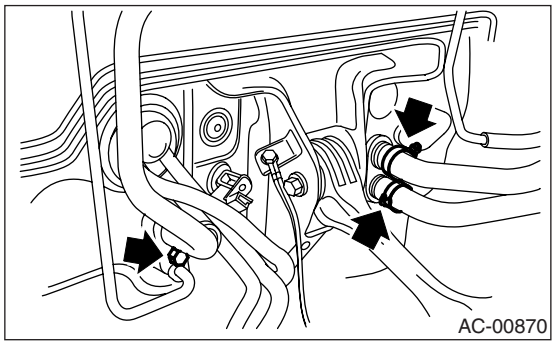
B: INSTALLATION

<Ref. to CO(H4SO)-37, INSTALLATION, Radiator Main Fan and Fan Motor.>

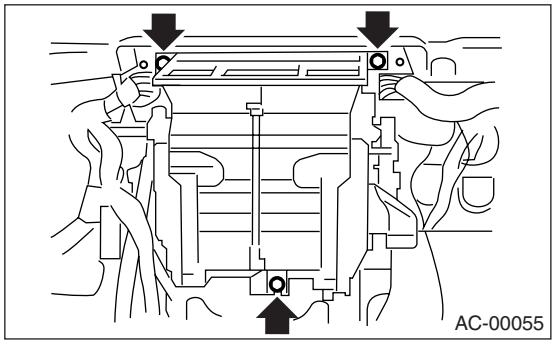
14.Heater and Cooling Unit

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
3) Drain the engine coolant from radiator.
4) Remove the bolt securing expansion valve and pipe in engine compartment. Release the heater hose clamps in engine compartment to remove the hoses.


AC-00870

5) Remove the instrument panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
6) Remove the support beam.
7) Remove the blower motor unit assembly. <Ref. to AC-32, REMOVAL, Blower Motor Unit Assembly.>
8) Disconnect the servo motor connectors.
9) Remove the bolt and nuts to remove the heater and cooling unit.


AC-00055

B: INSTALLATION

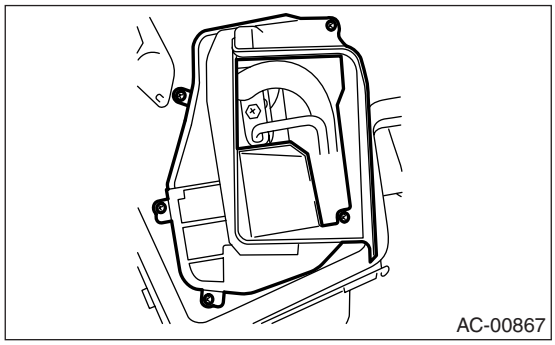
1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.>

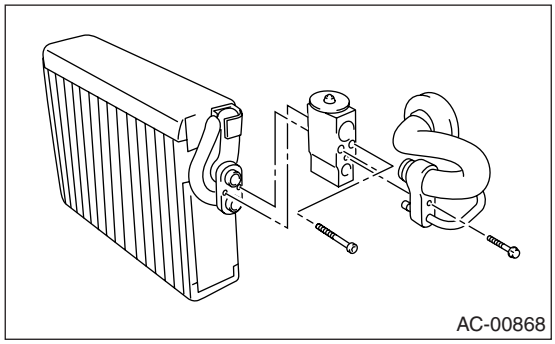
15.Evaporator

A: REMOVAL

1) Perform the refrigerant recovery operation, and then disconnect the toe board area A/C pipe. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
2) Remove the glove box.
3) Remove blower motor unit assembly. <Ref. to AC-32, REMOVAL, Blower Motor Unit Assembly.>
4) Loosen the screws and remove evaporator cover.


AC-00867

5) Remove the A/C pipes in unit.
6) Rotate the upper part of evaporator tilt toward the front vehicle and the lower part tilt toward the interior, respectively. Then pull out the heater case to the left side.
7) Remove the two bolts to remove expansion valve.


AC-00868

CAUTION:
If the evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-31, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

Install in the reverse order of removal.

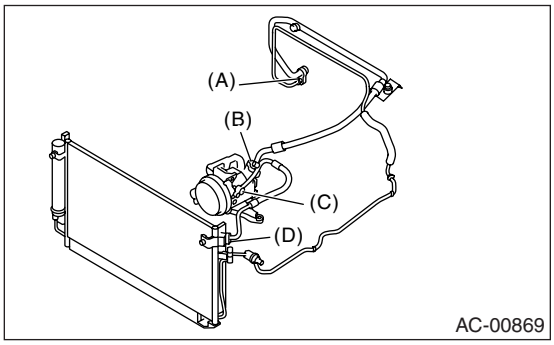
NOTE:
Replace the O-ring for A/C pipe with a new one, and then apply compressor oil.

16.Hose and Tube

A: REMOVAL

CAUTION:
• When disconnecting/connecting hoses, do not apply excessive force to them. Confirm that no torsion and excessive tension exists after installing.
• Seal the disconnected hose with a plug or vinyl tape to prevent foreign matters from entering.

1) Disconnect the ground cable from battery.
2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-26, OPERATION, Refrigerant Recovery Procedure.>
3) Remove the evaporator unit mounting bolt (A).
4) Remove the low-pressure hose attaching bolts (B).
5) Disconnect the low-pressure hose from evaporator unit.
6) Disconnect the low-pressure hose from compressor.
7) Remove the low-pressure hose from vehicle.
8) Remove the high-pressure hose attaching bolts (C).
9) Disconnect the high-pressure hose from compressor.
10) Disconnect the high-pressure hose from condenser.
11) Remove the high-pressure hose from vehicle.
12) Remove the high-pressure tube attaching bolt (D).
13) Remove the high-pressure tube from vehicle.



B: INSTALLATION

CAUTION:
• When disconnecting/connecting hoses, do not apply an excessive force to them. Confirm that no torsion and excessive tension exists after installing.
• Seal the disconnected hose with a plug or vinyl tape to prevent foreign matters from entering.
• Replace the o-rings for hoses and pipes with new ones, and then apply compressor oil.

1) Install in the reverse order of removal.
2) Charge refrigerant. <Ref. to AC-27, OPERATION, Refrigerant Charging Procedure.>

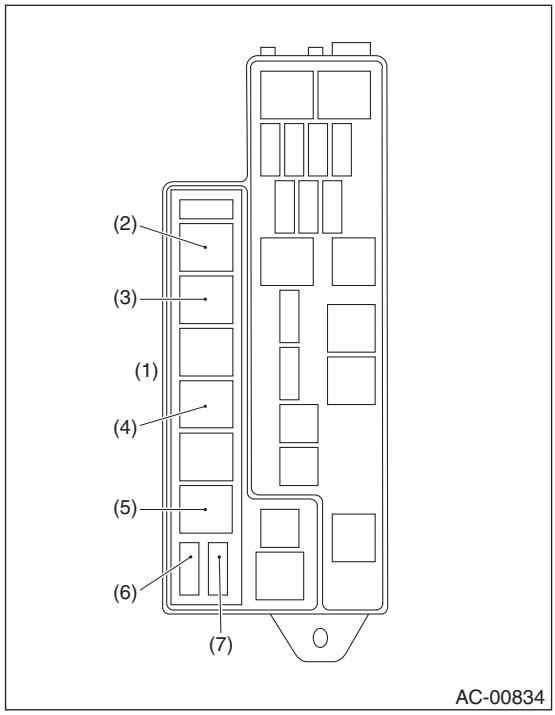
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to AC-16, AIR CONDITIONING UNIT, COMPONENT, General Description.>

C: INSPECTION

NOTE:
Check the hoses for cracks, damage and expansion. If any failure is found, replace them with new ones.

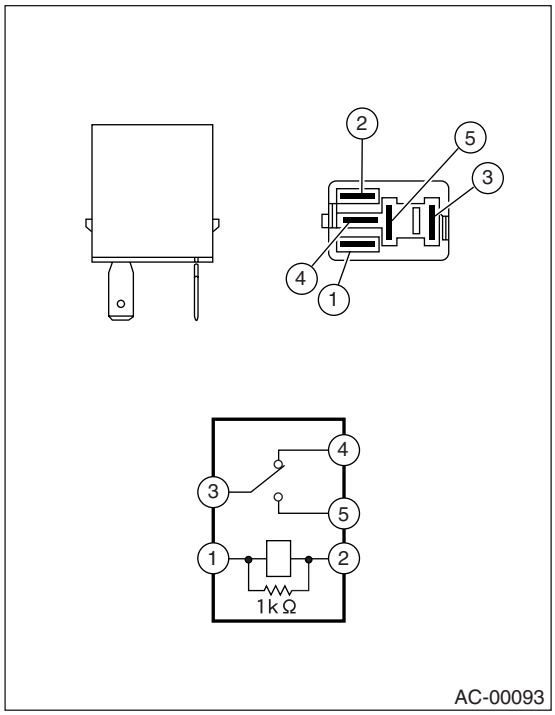
17.Relay and Fuse

A: LOCATION



(1) Main fuse box (M/B)
(2) Main fan relay
(3) Sub fan relay
(4) A/C relay
(5) Fan mode relay
(6) Main fan fuse
(7) Sub fan fuse

B: INSPECTION



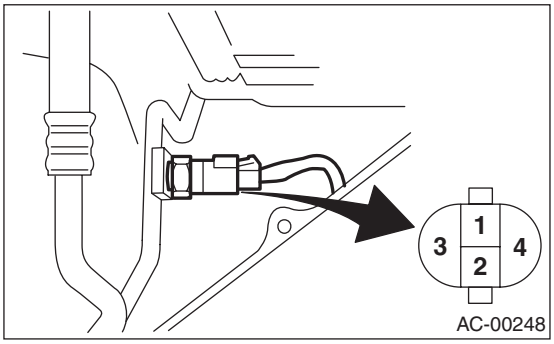
(1) — (2) Continuity exists.
(3) — (4) Continuity exists.
(3) — (5) No continuity.

While applying battery voltage between the terminals (1) and (2), check continuity between the terminals (3) and (5).
If no continuity exists, replace the relay with a new one.

18.Pressure Switch (Triple Pressure Switch)

A: INSPECTION

1) Connect the manifold gauge to the service valve on the high-pressure side.
2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of the pressure switch.

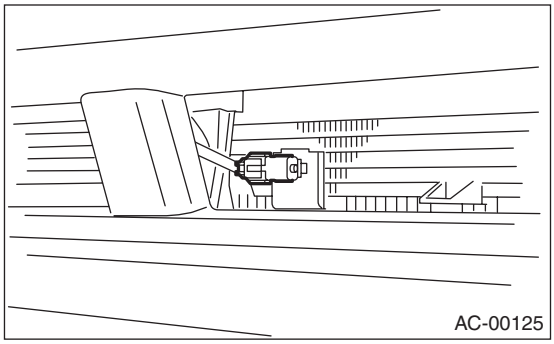


	Terminal No.	Operation	Standard kPa (kgf/cm^2, psi)
High and low pressure switch	1 and 2	Turns OFF.	Pressure increases up to 2,940±200 (29.98±2.03, 426.32±28.87).
			Pressure decreases down to 177±25 (1.80±0.25, 25.60±3.56).
		Turns ON.	Pressure increases up to 206±30 (2.10±0.31, 29.86±4.41).
			Pressure decreases down to 2,350±200 (24±2, 341.28±28.44).
Middle pressure switch	3 and 4	Turns OFF.	Pressure decreases down to 1,370±120 (13.97±1.22, 198.65±17.35).
		Turns ON.	Pressure increases up to 1,770±100 (18.05±1.02, 256.67±14.50).

19.Ambient Sensor (Auto A/C Model)

A: REMOVAL

1) Open the front hood.
2) Disconnect the ground cable from battery.
3) Disconnect the ambient sensor connector.
4) Remove the ambient sensor from radiator lower panel.



B: INSTALLATION

Install in the reverse order of removal.

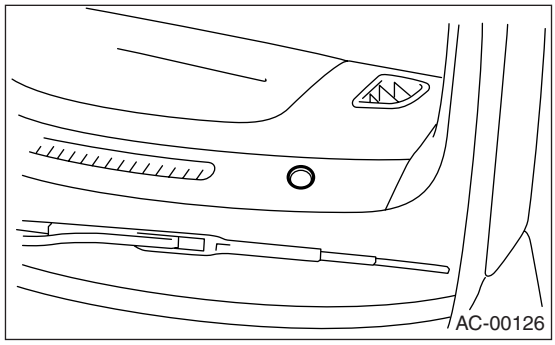
C: INSPECTION

<Ref. to AC(diag)-32, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

20.Sunload Sensor (Auto A/C Model)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the sunload sensor connector.



CAUTION:
Be careful not to damage the sensors and interior trims when removing them.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

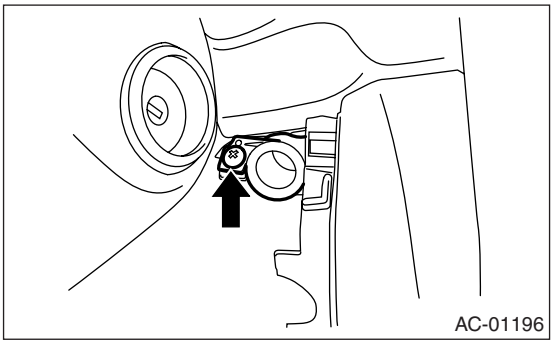
<Ref. to AC(diag)-39, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

21.In-Vehicle Sensor (Auto A/C Model)

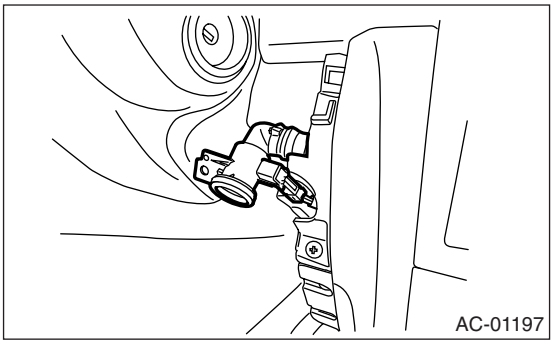
A: REMOVAL

1. LHD MODEL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Remove the in-vehicle sensor from instrument panel.



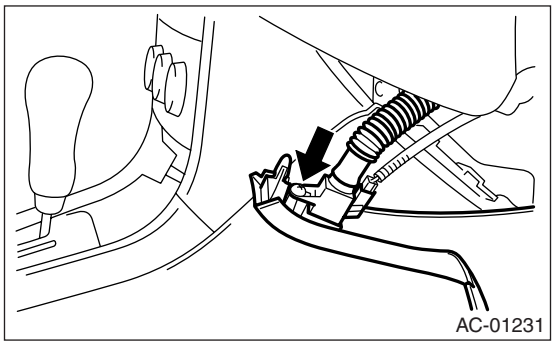
4) Disconnect the connector and aspirator hose from in-vehicle sensor.



CAUTION:
Be careful not to damage the sensors and interior trims when removing.

2. RHD MODEL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Remove the in-vehicle sensor from instrument panel lower cover.



4) Disconnect the connector and aspirator hose from in-vehicle sensor.

CAUTION:
Be careful not to damage the sensors and interior trims when removing.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

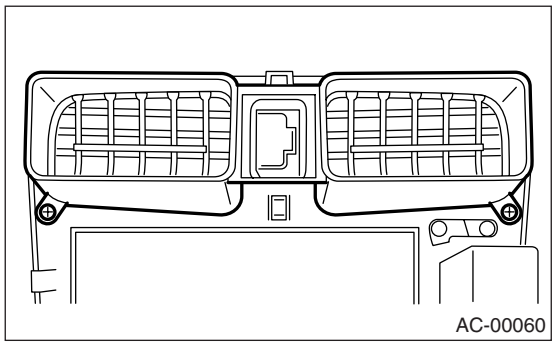
<Ref. to AC(diag)-35, IN-VEHICLE SENSOR, Diagnostic Procedure for Sensors.>

22.Air Vent Grille

A: REMOVAL

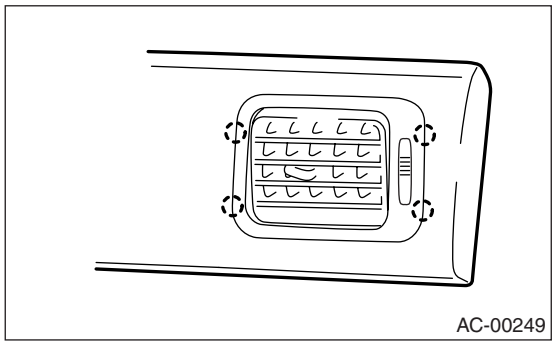
1. CENTER GRILLE

1) Disconnect the ground cable from battery.
2) Remove the center console panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Loosen the two screws to remove the center air vent grille.



2. SIDE GRILLE

Remove the side vent grille by prying four points.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check that the direction and amount of air can be adjusted smoothly.
2) Check that the adjustment can be kept in each position.

23.Heater Duct

A: REMOVAL

1) Remove the front seat. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the front side sill cover.
3) Pull off the floor mat, remove the cover, and then remove the heater duct.

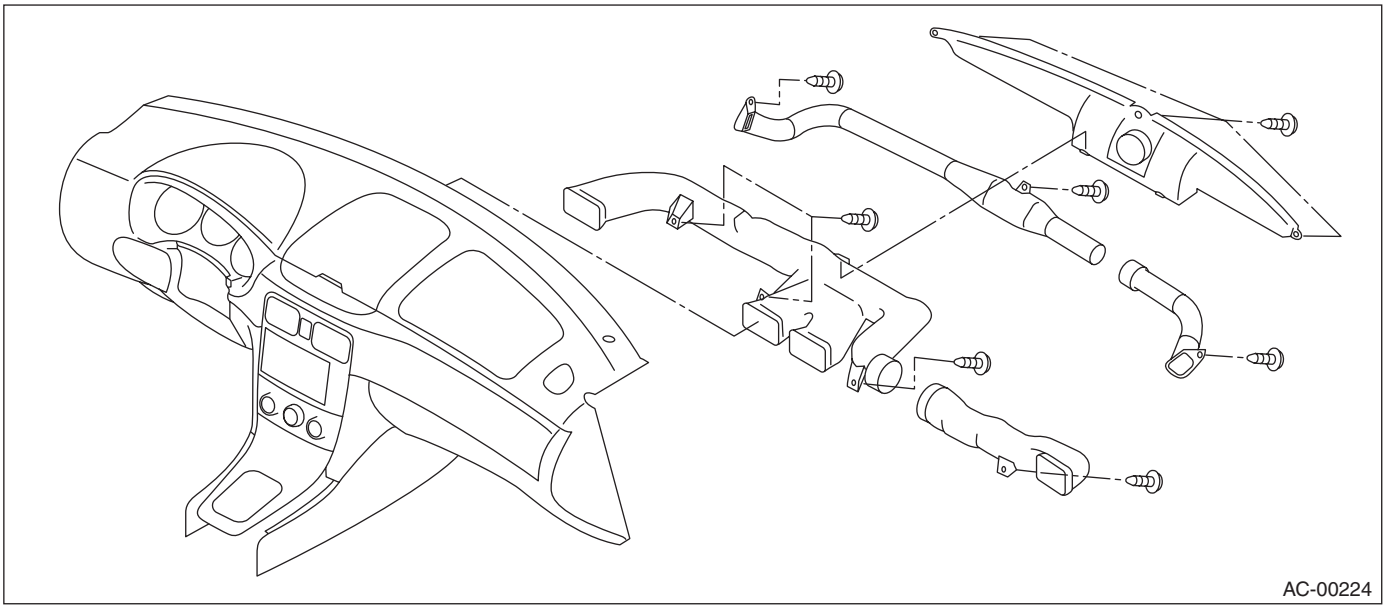
B: INSTALLATION

Install in the reverse order of removal.

24.Heater Vent Duct

A: REMOVAL

1) Remove the instrument panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
2) Remove the screws.
3) Remove the heater vent duct.



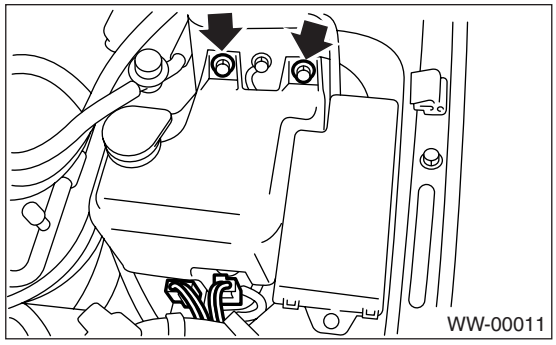
B: INSTALLATION

Install in the reverse order of removal.

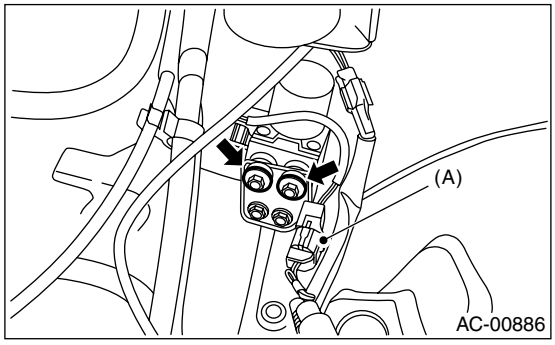
25.Heater Cock Solenoid Valve

A: REMOVAL

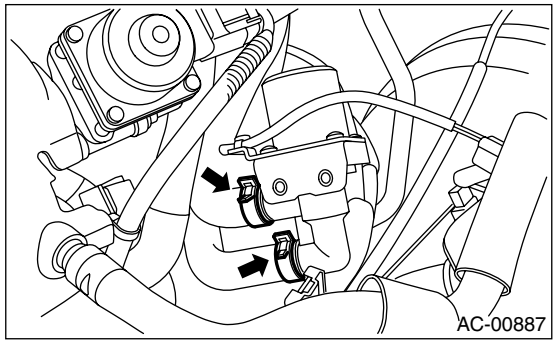
1) Drain the engine coolant.
<Ref. to CO(H4SO)-19, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
2) Remove the battery.
3) Remove the two bolts and disconnect harness connector, and move the washer tank forward.



4) Disconnect the harness connector (A) of the heater cock solenoid valve.
5) Remove the two bolts to remove the heater cock solenoid from the bracket.



6) Pull out the heater cock solenoid. Loosen the hose clamp and disconnect the two heater hoses.

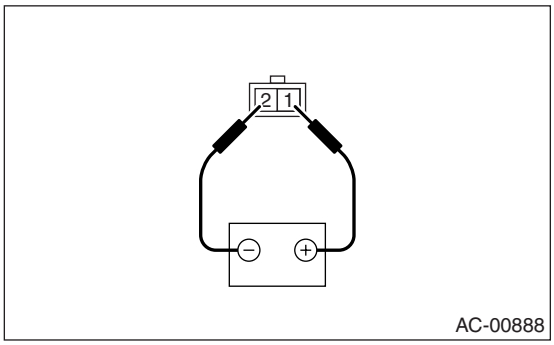


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Remove the heater cock solenoid valve. <Ref. to AC-50, REMOVAL, Heater Cock Solenoid Valve.>
2) Connect the positive terminal of battery to No. 1 terminal of heater cock solenoid valve, and the ground terminal to No. 2 terminal. Check that the heater cock solenoid valve opens and closes normally.



If any failure is found, replace the heater cock solenoid valve.

26.General Diagnostic Table

A: INSPECTION

Symptom		Repair order
Blower motor	Does not run.	Fuse
		Blower motor relay
		Wiring harness
		Blower motor
		Blower motor resistor (Manual A/C model)
		Blower switch
	Noise	Blower motor
Compressor	Does not run.	Refrigerant
		Fuse
		A/C relay
		Wiring harness
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
	Noise	V-Belt
		Magnet clutch
		Compressor
Condenser fan	Does not run.	Fuse
		Sub fan relay
		Wiring harness
	Noise	Condenser fan motor
Cold air not emitted.		Refrigerant
		V-Belt
		Magnet clutch
		Compressor
		Pressure switch
		Blower fan relay, Blower motor
		A/C switch
		Blower switch
		Wiring harness
		Heater duct
		Heater vent duct
		Control unit
		Expansion valve
		Evaporator
		Air mix actuator (Auto A/C), Temperature control cable (Manual A/C)
Warm air not emitted.		Engine coolant
		Aspirator hose
		Blower switch
		Air mix actuator (Auto A/C), Temperature control cable (Manual A/C)
		Heater core
		Heater cock solenoid valve (Non-turbo model for EC/EK)

Symptom	Repair order
Temperature of air from vents does not change.	Wiring harness
	Air mix actuator (Auto A/C), Temperature control cable (Manual A/C)
	Temperature adjustment switch
Unable to switch blow vents.	Wiring harness
	Mode actuator (Auto A/C), Mode control cable (Manual A/C)
	Mode switch
Unable to switch suction vents.	Wiring harness
	FRESH/RECIRC actuator
	Air inlet select switch

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**START INSPECTIONS.** 1) Perform the pre-inspection. <Ref. to AC(diag)-3, INSPECTION, General Description.> 2) Perform the self-diagnosis. <Ref. to AC(diag)-9, OPERATION, Diagnostic Chart for Self-Diagnosis.>	Does the self-diagnosis operate?	Go to step **2.**	<Ref. to AC(diag)-12, A/C OR SELF DIAGNOSIS FUNCTIONS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2	**IDENTIFY MALFUNCTION PART.** Identify the malfunction part with self-diagnosis.	Can the malfunction part be identified?	Repair the malfunction part in accordance with each diagnostic chart.	Go to step **3.**
3	**CHECK COMPARTMENT TEMPERATURE.** 1) Turn ON the A/C switch. 2) Turn the temperature control dial at maximum cool position. 3) Check the compartment temperature change.	Does the compartment temperature change?	Go to step **4.**	<Ref. to AC(diag)-16, COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY., Diagnostics for A/C System Malfunction.>
4	**CHECK A/C SYSTEM RESPONSE.** Change the temperature setting, and check the response of A/C system.	Does the A/C system respond quickly?	A/C system is normal.	<Ref. to AC(diag)-16, COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY., Diagnostics for A/C System Malfunction.>

2. General Description

A: CAUTION

1) Never connect the battery in reverse polarity.
Auto A/C control module may be destroyed instantly.
2) Do not disconnect the battery terminals while the engine is running.
A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as auto A/C control module, etc.
3) Before disconnecting the connectors of each sensor and the auto A/C control module, be sure to turn off the ignition switch.
Auto A/C control module may be damaged.
4) Every A/C-related part is a precision part. Do not drop them.
5) Airbag system wiring harness is routed near the A/C control panel (auto A/C control module) and junction box.

CAUTION:
• For airbag system, yellow-colored wiring harness and connectors are all used. Do not use the electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the A/C control panel (auto A/C control module) and junction box.

B: INSPECTION

Before performing the diagnostic, check the following items which might affect A/C system problems.

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V

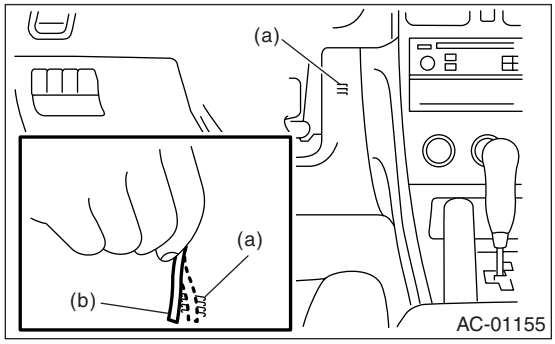
Specific gravity:
More than 1.260

2) Check the condition of the fuses for A/C system power supply and other fuses.
3) Check the condition of harness and harness connector connections.

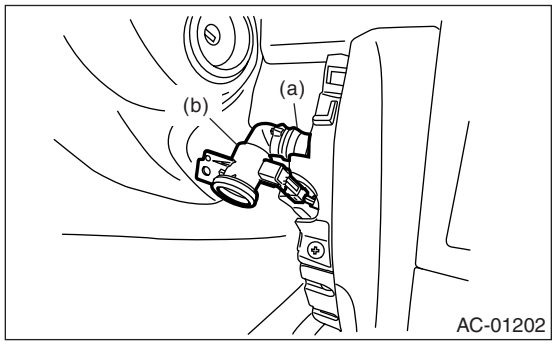
2. ASPIRATOR HOSE

1) Turn the ignition switch to ON, and press the A/C switch.
2) Turn the temperature control dial at maximum hot position.
3) Press the defroster switch.
4) Turn the fan speed control dial to 4th position.
5) Approach a strip of paper (b) in front of the in-vehicle sensor suction port (a) located in the instrument lower cover, and check that air is being sucked into the port by seeing the paper moving towards port.

NOTE:
Be careful not to let the paper get sucked into port.

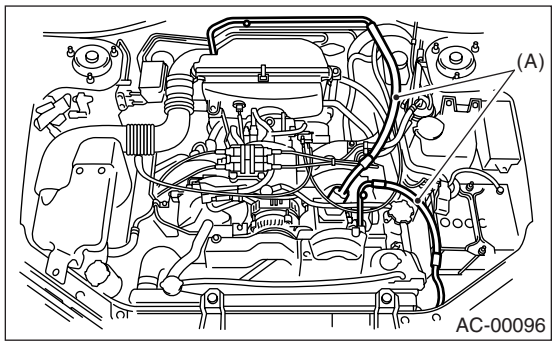


6) If the paper does not move at all, remove the instrument panel lower cover <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.> and check for improper connection of the aspirator hose (a), in-vehicle sensor (b) and heater unit, and repair them if necessary.



3. A/C LINE

Check the connection for A/C line (A) and lower side high-pressure pipe.



4. CONTROL LINKAGE

1) Check the state of mode door linkage.
2) Check the state of air mix door linkage.
3) Check the state of intake door linkage.

5. CONTROL SWITCHES

Start and warm-up the engine completely.
1) Inspection using switches

No.	Item to be checked	Switch position	Judgment standard
1	Air flow control dial	Turn the dial to the right.	Outlet opening (mode) switches AUTO → VENT → BILEVEL → HEAT → DEF/HEAT → DEF each time turning the dial.
2	Fan speed control dial	Turn the dial to the right	Fan speed switches OFF → AUTO → 1st → 2nd → 3rd → 4th → 5th → 6th → 7th each time turning the dial.
3	FRESH/RECIRC switch	Press the FRESH/RECIRC switch.	Inlet opening switches RECIRC → FRESH → RECIRC each time pressing the switch. (LED illuminates at RECIRC)
		Press the FRESH/RECIRC switch longer (more than 1 second).	LED blinks twice, and switches to AUTO.
4	A/C switch	Turn the A/C switch to ON with the fan speed control dial position other than OFF.	LED comes on, and the compressor will be operated.
		Press the FRESH/RECIRC switch longer (more than 1 second).	LED blinks twice, and switches to AUTO.
5	Auto function Operate from 1) in order.	1) Set the following dials and switch to AUTO. • Air flow control dial • Fan speed control dial • FRESH/RECIRC switch • A/C switch 2) Turn the temperature control dial to the left fully, to set to the maximum cool position.	• Outlet air temperature: COOL • Fan speed: MAX • Outlet opening: VENT • Inlet opening: Internal air • Compressor: AUTO
		3)Turn the temperature control dial to the right slowly, to change the setting gradually to the maximum hot position.	• Outlet air temperature: COOL → HOT • Fan speed: AUTO • Outlet opening: AUTO • Inlet opening: AUTO • Compressor: AUTO
		4) Turn the temperature control dial to the right fully, to set to the maximum hot position.	• Outlet air temperature: HOT • Fan speed: MAX • Outlet opening: HEAT • Inlet opening: External air • Compressor: AUTO
6	Defroster interlock	Turn the air flow control dial to DEF or DEF/HEAT position.	• Outlet air temperature: AUTO • Fan speed: AUTO • Outlet opening: DEF or DEF/HEAT • Inlet opening: External air • Compressor: ON
7	Rear window defogger switch	Press the rear window defogger switch.	LED comes on.

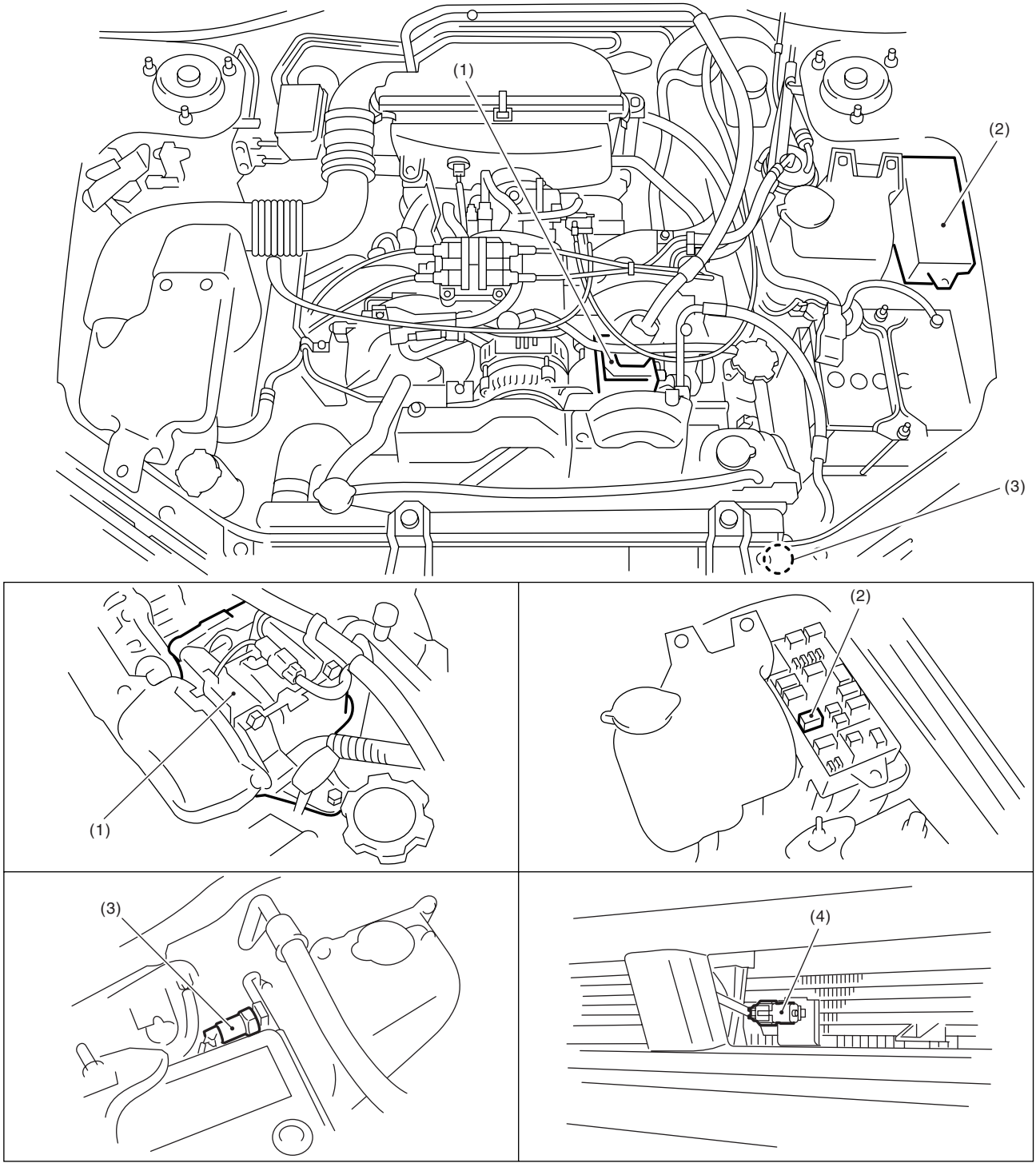
2) Inspection of illumination control

No.	Item to be checked	Switch operation	Judgment standard
1	Illumination	Turn the lighting switch to ON.	Illumination comes on. LED goes dim if it has been illuminated.

3. Electrical Component Location

A: LOCATION

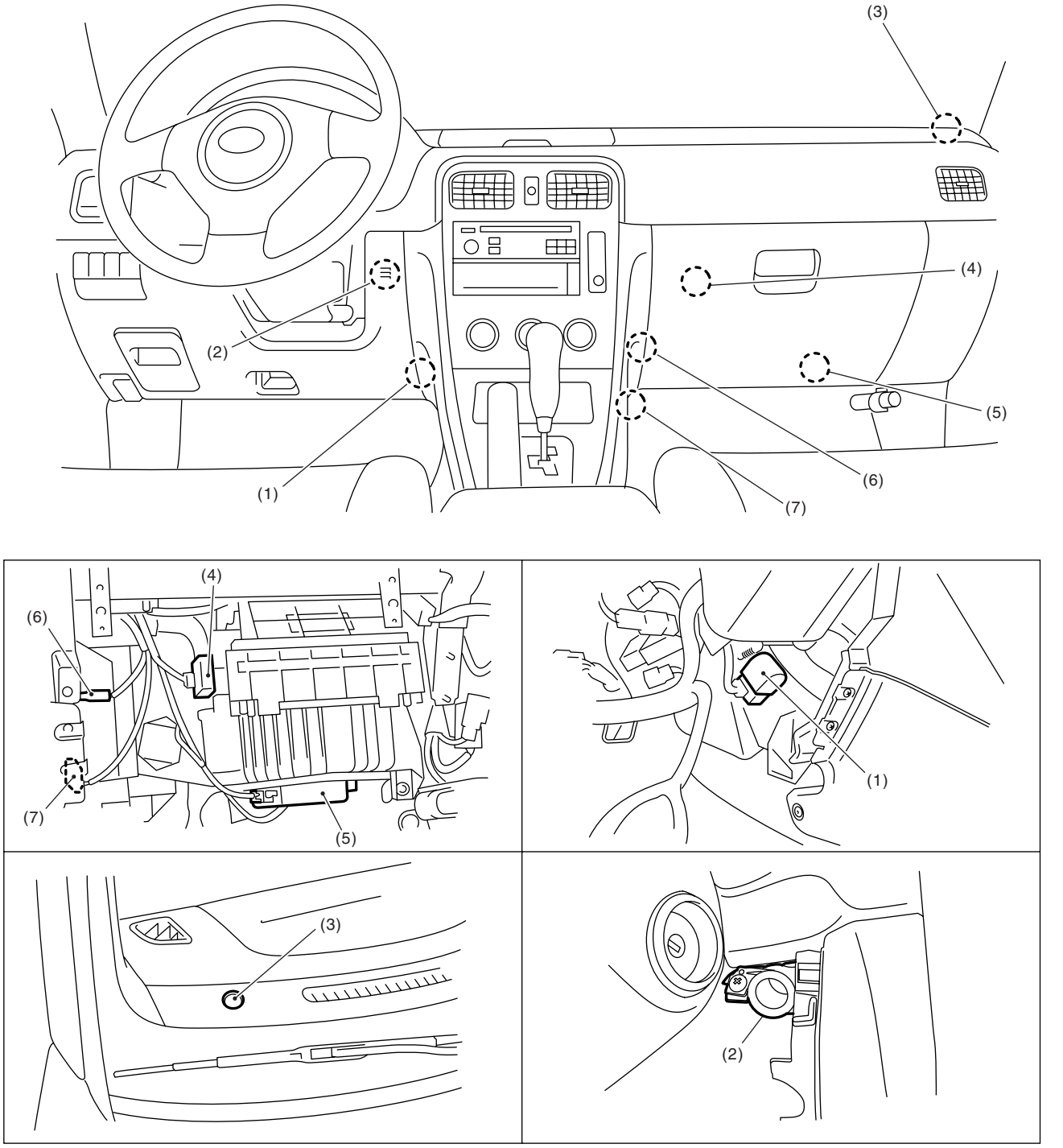
1. ENGINE COMPARTMENT



AC-00097

(1) A/C compressor
(2) A/C relay
(3) Pressure switch
(4) Ambient sensor

2. PASSENGER COMPARTMENT

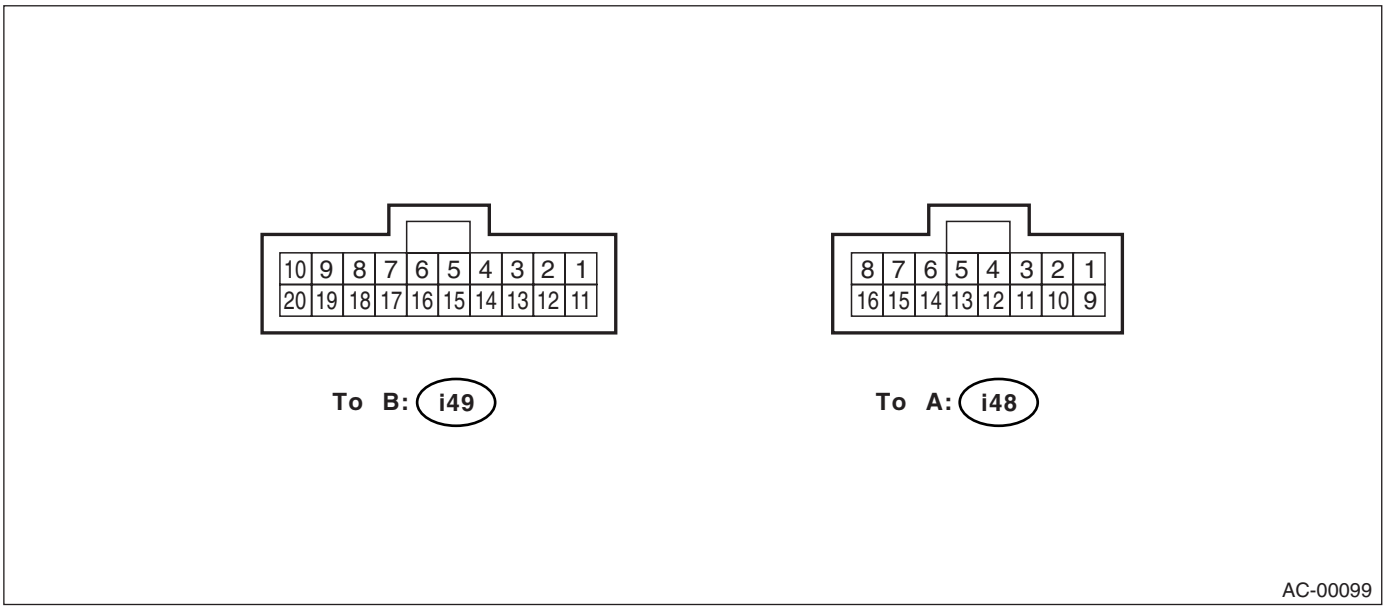


AC-01198

(1) Mode door actuator
(2) In-vehicle sensor
(3) Sunload sensor
(4) Intake door actuator
(5) Blower motor
(6) Evaporator sensor
(7) Air mix door actuator

4. Auto A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Terminal No.	Content	Measuring condition		Specified value
B9	Mode door actuator power supply	Changes outlet from VENT to DEF.		*2
B8		Changes outlet from DEF to VENT.		
B7	Air mix door actuator power supply	Changes air mix door from COOL to HOT.		*1
B6		Changes air mix door from HOT to COOL.		
B5	IGN power supply	Ignition switch: ON		Battery voltage
B4	Battery power supply	Ignition switch: OFF, ACC, ON		Battery voltage
B3	Sunload sensor	Ignition switch: ON and under normal sunload (without sunload: 5 V)		3 V
B2	Evaporator sensor	Ignition switch: ON		5 V or less
B1	Air mix door actuator P.B.R. signal	Air mix door: COOL position		0.5 V
		Air mix door: HOT position		4.5 V
B20	Intake door actuator signal	Air inlet: FRESH (other positions: 12 V)		0 V
B19		Air inlet: MIX (other positions: 12 V)		0 V
B18		Air inlet: RECIRC (other positions: 12 V)		0 V
B17	A/C ON signal	A/C: ON (A/C OFF: 0 V)		8 — 10 V
B16	Blower motor control	*3		*3
B15	Blower fan ON signal	When blower fan running (when blower fan not running: 12 V)		0 V
B13	Engine coolant temperature sensor	When the engine coolant is at 49°C (120°F)		8.9 V
B12	In-vehicle sensor	—		—
B11	Ground	When there is continuity to chassis ground		0 Ω
A7	Air mix door actuator P.B.R. reference voltage	Ignition switch: ON		5 V
A5	Mode door actuator position detection signal	Outlet	BI-LEVEL, DEF	5 V
			VENT, HEAT, DEF/HEAT	0 V
A4	Mode door actuator position detection signal	Outlet	HEAT, DEF/HEAT, DEF	5 V
			VENT, BI-LEVEL	0 V
A1	Illumination power supply	Ignition switch: ON, light switch: ON		Battery voltage
		Ignition switch: ON, light switch: OFF		0 V
A16	Sensor ground	When there is continuity to chassis ground		0 Ω

Terminal No.	Content	Measuring condition		Specified value
A14	Combination meter (ambient temperature signal)	*3		*3
A13	Mode door actuator position detection signal	Outlet	VENT, BI-LEVEL, HEAT	5 V
			DEF/HEAT, DEF	0 V
A12	Mode door actuator position detection signal	Outlet	VENT, DEF/HEAT	5 V
			BI-LEVEL, HEAT, DEF	0 V
A10	A/C cutout signal	A/C: ON		Battery voltage
		Pressure switch operated		0 V
A9	Illumination ground	When there is continuity to chassis ground		0 Ω

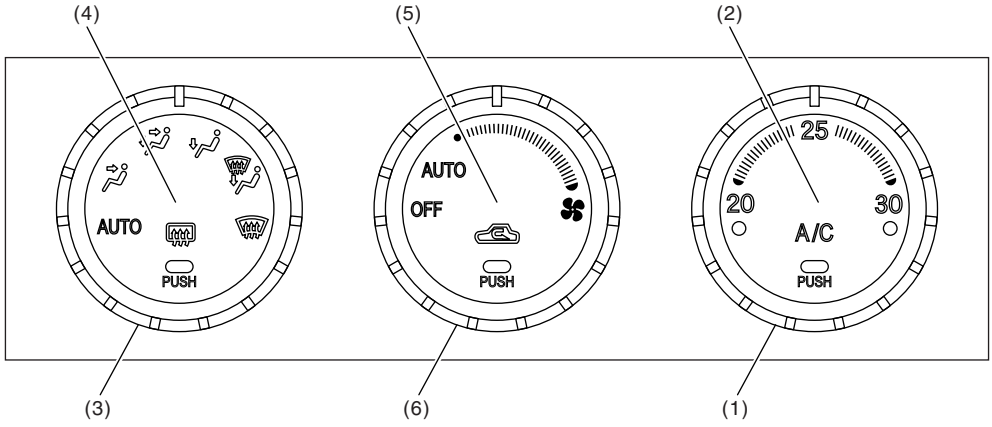
*1: Battery voltage is indicated when motor running, 0 V or battery voltage pulse signal is output when motor stops.
*2: Battery voltage is indicated when motor running, 0 V is indicated when motor stops.
*3: Voltage can not be measured because of pulse signal.

B: WIRING DIAGRAM:

<Ref. to WI-173, WIRING DIAGRAM, Air Conditioning System.>

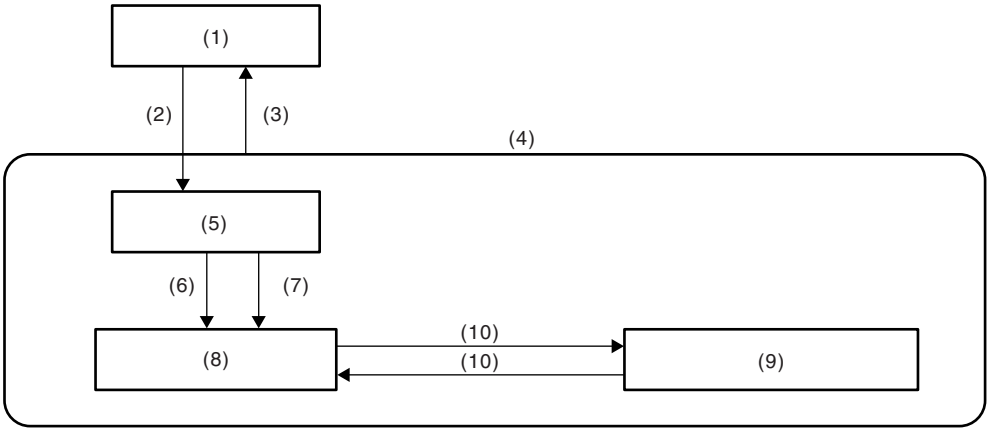
5. Diagnostic Chart for Self-Diagnosis

A: OPERATION



AC-01071

(1) Temperature control dial
(2) A/C switch
(3) Air flow control dial
(4) Rear window defogger switch
(5) FRESH/RECIRC switch
(6) Fan speed control dial



AC-01072

(1) Normal Operation
(2) Turn the air flow control dial and fan speed control dial to AUTO position. And then turn the ignition switch to ON (from OFF) with the FRESH/RECIRC switch and A/C switch pressed.
(3) Turn the fan speed control dial switch to OFF position, or turn the ignition switch to ON (from OFF).
(4) Self-Diagnosis Function
(5) Indication Check
(6) After the indication check (Approx. 8 sec.)
(7) Press the rear window defogger switch.
(8) Sensor Check (Phased Operation)
(9) Output Equipment Operation (Phased Operation)
(10) Press the A/C switch.

Diagnostic Chart for Self-Diagnosis

	Step	Check	Yes	No
1	**SET SELF-DIAGNOSIS MODE BY OPERATING CONTROL PANEL.** 1) Turn the ignition switch to OFF. 2) Turn the air flow control dial to AUTO position. 3) Turn the fan speed control dial to AUTO position. 4) Turn the ignition switch to ON with the FRESH/RECIRC switch and A/C switch pressed. 5) LED in the A/C control panel will blink.	Does the self-diagnosis mode operate?	Go to step **2.**	<Ref. to AC(diag)-12, A/C OR SELF DIAGNOSIS FUNCTIONS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2	**LED ILLUMINATION CHECK.** Check if LED in the A/C control panel blinks (illuminates then goes off 8 times).	Do all LEDs blink?	Go to step **3.**	Go to step **5.**
3	**SENSOR MALFUNCTION CHECK.** 1) A/C switch LED will go off and the sensor check will start after completing LED check or when rear defogger switch is pressed. 2) Switch the air flow control dial and check the sensor. 3) If the sensor is normal, FRESH/RECIRC switch LED will illuminate regardless of air flow control dial position. NOTE: At this time, rear defogger LED will illuminate if past malfunction, and go off if present malfunction. Open or short circuit can be determined with illuminating pattern of FRESH/RECIRC switch.	Does the LED of FRESH/RECIRC switch illuminate?	Go to step **4.**	Check and repair the faulty sensor by checking the relationship between air flow control dial position and sensor with the sensor check table. <Ref. to AC(diag)-11, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.>
4	**CHECK OPERATION OF EACH ACTUATOR, COMPRESSOR AND FAN MOTOR.** 1) Press the A/C switch. (A/C switch LED illuminates at this time.) 2) Operate the fan speed control dial to check operation of each actuator, compressor and fan motor. <Ref. to AC(diag)-11, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.> NOTE: Switching the fan speed control dial position enable the individual check of each step.	Do each actuator, compressor and fan motor operate according to the operating mode table? <Ref. to AC(diag)-11, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-Diagnosis.>	Turn the fan control dial or ignition switch to OFF to finish the self-diagnosis.	Repair the faulty part by referring to the diagnostic of each actuator, compressor and fan motor. <Ref. to AC(diag)-12, Diagnostics for A/C System Malfunction.> <Ref. to AC(diag)-21, Diagnostic Procedure for Actuators.>
5	**CHECK POOR CONTACT.** Check poor contact in the auto A/C control module connector.	Is there poor contact in auto A/C control module connector?	Repair the poor contact in connector.	Replace the auto A/C control module.

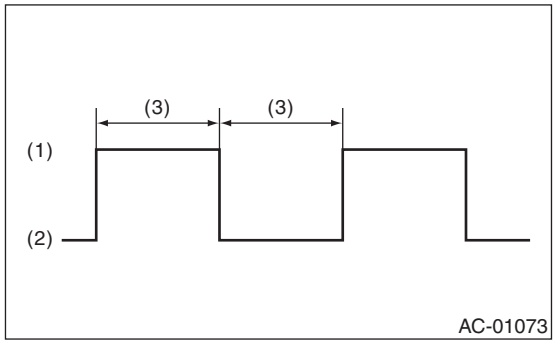
1. SENSOR CHECK TABLE

NOTE:
When the sunload sensor is checked indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at a place where sun shines directly on it.

No.	Item to be checked	Air flow control dial position
1	In-vehicle sensor	AUTO
2	Ambient sensor	VENT
3	Evaporator sensor	B/L
4	Sunlord sensor *1	HEAT
5	Air mix door actuator P.B.R	D/H
6	Meter communication (Ambient sensor)	DEF

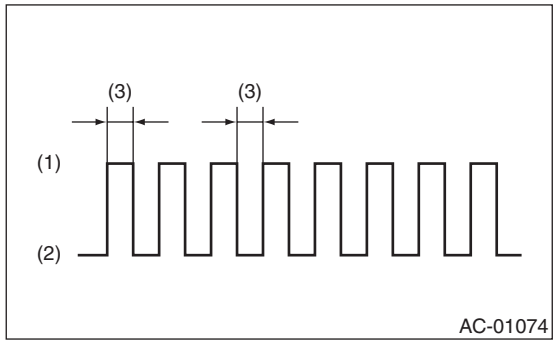
*1: Only present malfunction is indicated for open circuit of sunload sensor. (However, stored malfunction can be indicated for short circuit of sunload sensor.)

- Illuminating pattern when the circuit is open



(1) ON
(2) OFF
(3) Approx. 1 sec

- Illuminating pattern when the circuit is shorted



(1) ON
(2) OFF
(3) Approx. 0.2 sec

2. OPERATING MODE TABLE

Step	1	2	3	4	5	6	7	8
Fun control dial position	AUTO	1st	2nd	3rd	4th	5th	6th	7th
Fun speed (%)	24.0	24.0	34.0	45.0	42.0	59.0	71.0	100.0
Mode door actuator	VENT	VENT	VENT	B/L	HEAT	HEAT	D/H	DEF
FRESH/RECIRC door actuator	FRE	REC	REC	FRE	FRE	FRE	FRE	FRE
Air mix door actuator	Maximum cool (0%)	Maximum cool (0%)	Maximum cool (0%)	Medium (50%)	Medium (50%)	Maximum hot (100%)	Maximum hot (100%)	Maximum hot (100%)
Compressor (Magnet clutch)	OFF	ON	ON	ON	ON	ON	ON	ON

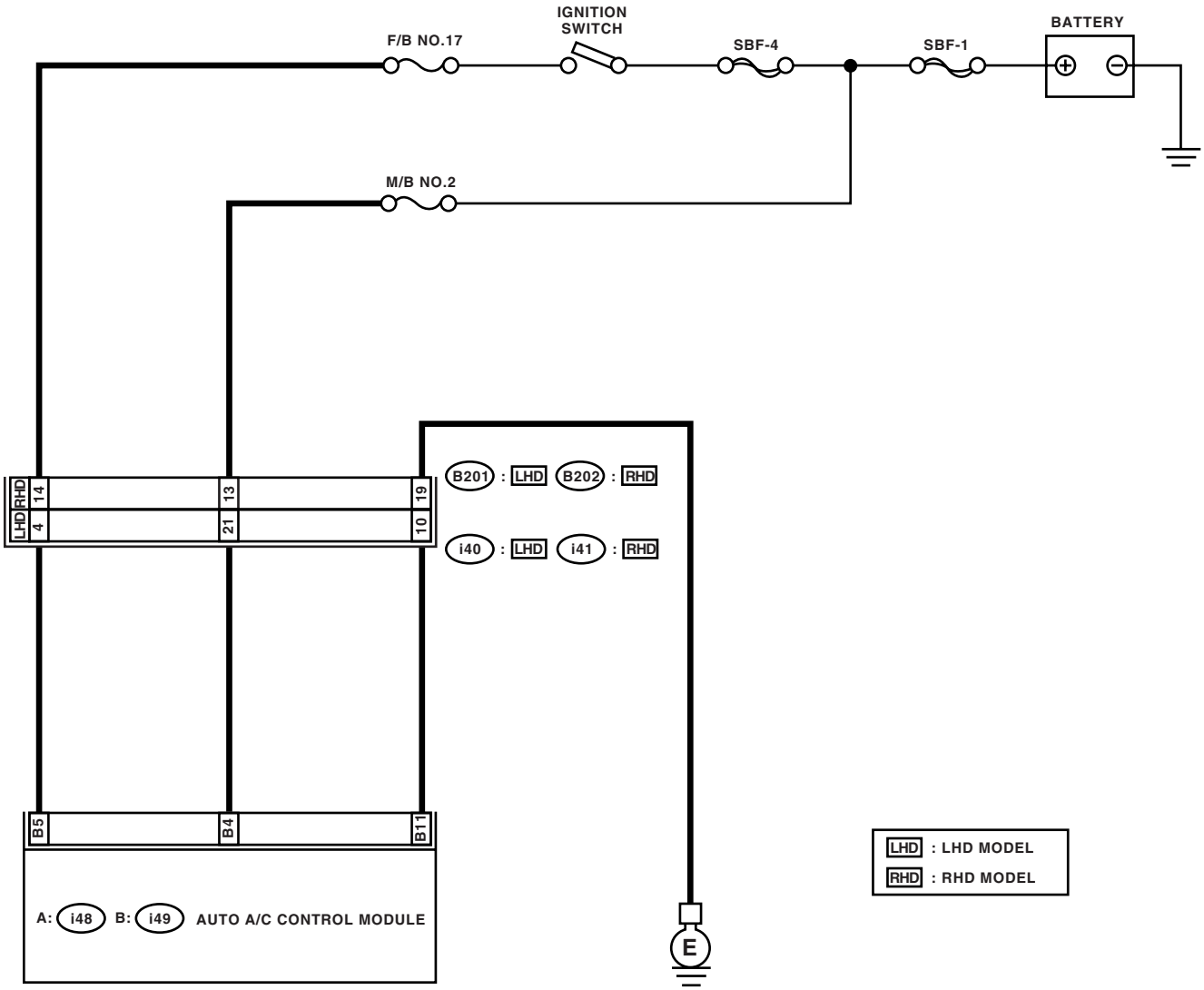
6. Diagnostics for A/C System Malfunction

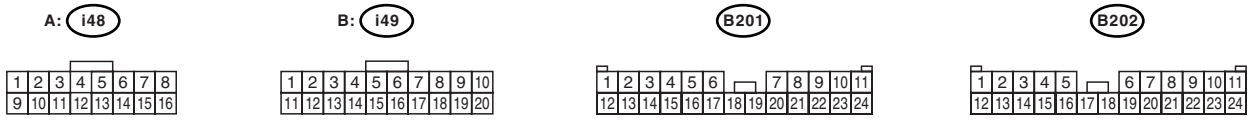
A: A/C OR SELF DIAGNOSIS FUNCTIONS DO NOT OPERATE

TROUBLE SYMPTOM:

- Switch LEDs are faulty or switches do not operate.
- self-diagnosis function does not operate.

WIRING DIAGRAM:





AC-00149

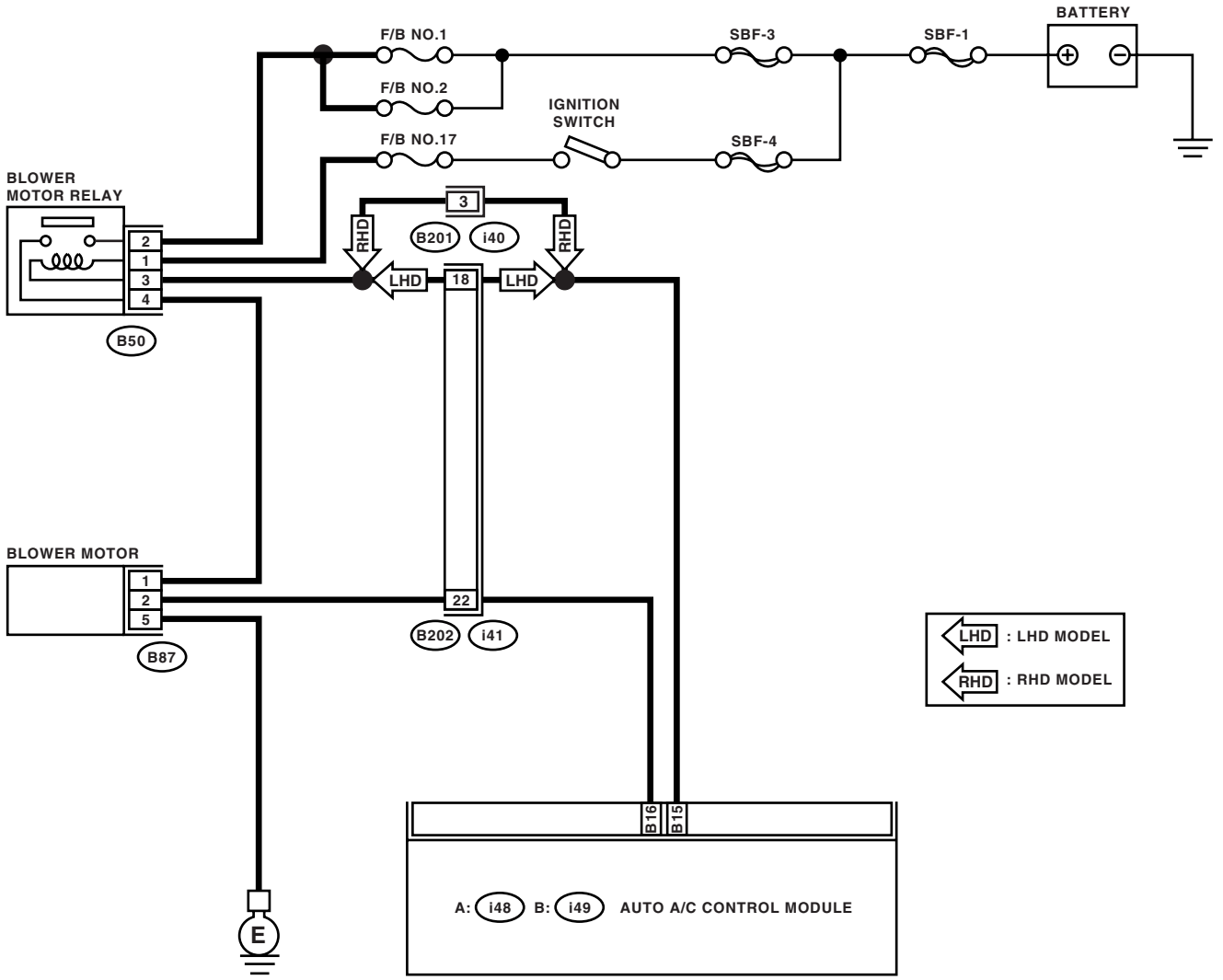
	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 2 from main fuse box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **2.**
2	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from fuse & relay box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step **3.**
3	**CHECK AUTO A/C CONTROL MODULE POWER CIRCUIT.** 1) Pull out the auto A/C control module connector. 2) Measure the voltage between auto A/C control module connector terminal and chassis ground after turning the ignition switch to OFF position. ***Connector & terminal*** ***(i49) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Check open or short circuit in harness between auto A/C control module and fuse.
4	**CHECK AUTO A/C CONTROL MODULE POWER CIRCUIT.** Measure the voltage between auto A/C control module connector terminal and chassis ground after turning the ignition switch to ON position. ***Connector & terminal*** ***(i49) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Check open or short circuit in harness between auto A/C control module and fuse.
5	**CHECK AUTO A/C CONTROL MODULE GROUND CIRCUIT.** Measure the resistance in harness between auto A/C control module and chassis ground. ***Connector & terminal*** ***(i49) No. 11 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness for ground line.
6	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the auto A/C control module.

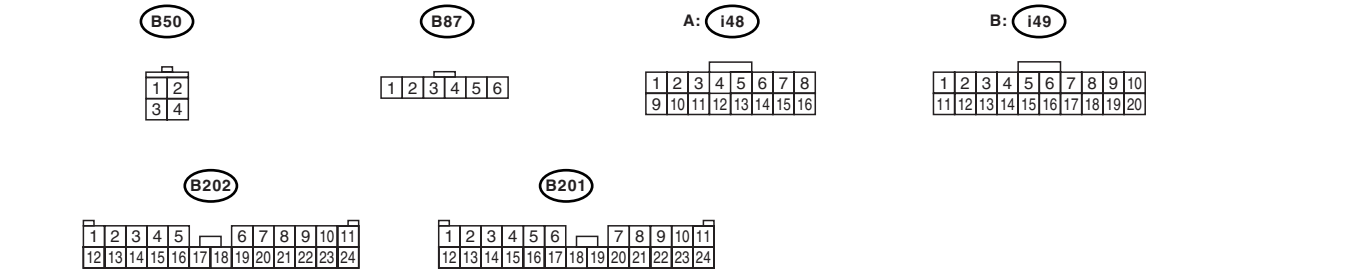
B: BLOWER FAN DOES NOT ROTATE.

TROUBLE SYMPTOM:

- Blower motor does not rotate.
- Blower motor does not change.

WIRING DIAGRAM:





AC-01232

	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Remove the fuse No. 1, 2 and 17 from fuse & relay box. 2) Check the condition of fuse.	Is any fuse blown-out?	Replace the fuse.	Go to step **2.**
2	**CHECK POWER SUPPLY FOR BLOWER MOTOR.** 1) Turn the ignition switch to ON. 2) Turn the fan speed control dial clockwise. 3) Measure the voltage between blower motor and chassis ground. ***Connector & terminal*** ***(B87) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 8 V (at normal temperature)?	Go to step **3.**	Repair the open circuit of blower motor power supply line harness.
3	**CHECK BLOWER MOTOR RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the blower motor relay. 3) Connect the battery positive (+) terminal to terminal No. 1 of blower motor relay, and negative (–) terminal to terminal No. 3. 4) Measure the resistance between terminals No. 2 and 4. ***Terminals*** ***No. 2 — No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the blower motor relay.
4	**CHECK BLOWER MOTOR.** 1) Disconnect the connector from blower motor. 2) Connect the battery positive (+) terminal to terminal No. 1 of blower motor connector, and negative (–) terminal to terminal No. 2 and No. 5. 3) Make sure the blower motor runs.	Does the blower motor run?	Go to step **5.**	Replace the blower motor.
5	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the auto A/C control module.

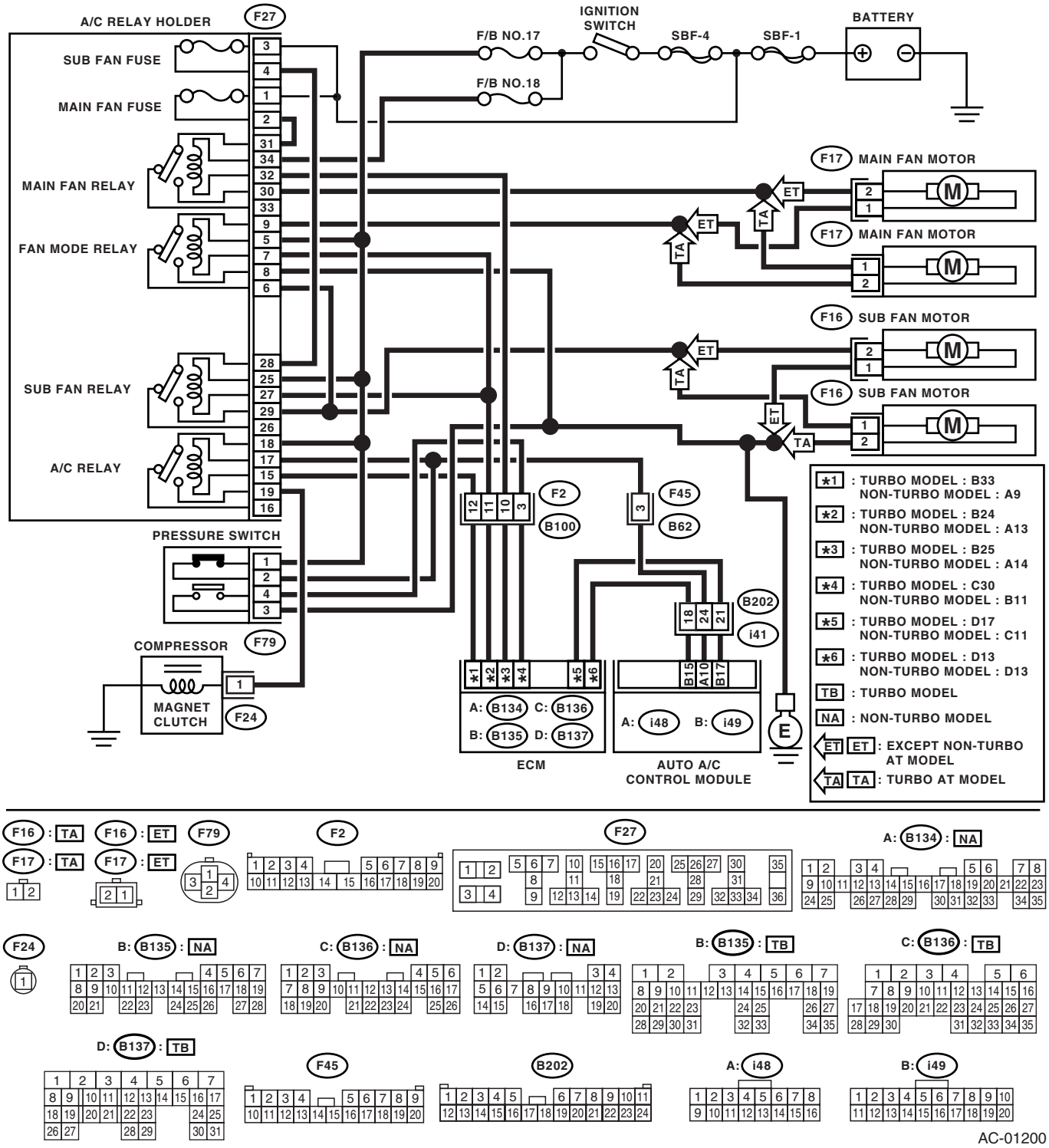
C: COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY.

TROUBLE SYMPTOM:

- Compartment temperature is not changed. (No cool air is discharged.)
- A/C system does not respond quickly.

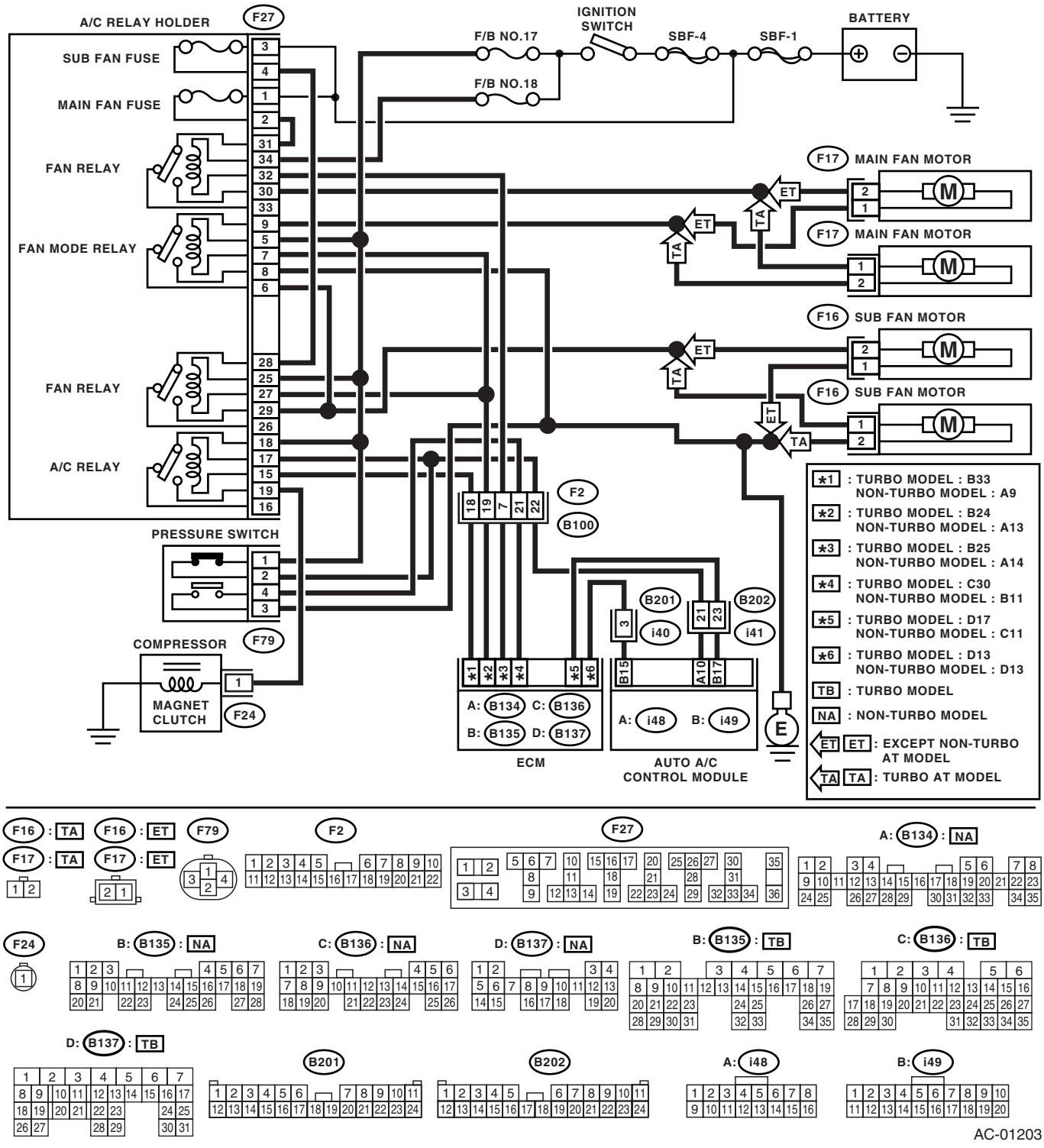
WIRING DIAGRAM:

- LHD MODEL



AC-01200

- RHD MODEL



AC-01203

	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the main fan fuse and sub fan fuse in main fuse box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **2.**
2	**CHECK THE POWER SUPPLY TO PRESSURE SWITCH.** 1) Disconnect the connector from pressure switch. 2) Turn the ignition switch to ON. 3) Measure the voltage between harness connector and chassis ground. ***Connector & terminal*** ***(F79) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness for pressure switch power supply circuit.
3	**CHECK THE HARNESS BETWEEN PRESSURE SWITCH AND A/C RELAY HARNESS.** 1) Turn the ignition switch to OFF. 2) Remove the A/C relay in the main fuse box. 3) Measure the resistance between A/C relay and pressure switch connector. ***Connector & terminal*** ***(F27) No. 17 — (F79) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness between A/C relay and pressure switch.
4	**CHECK THE PRESSURE SWITCH.** Measure the resistance between pressure switch terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Replace the pressure switch.
5	**CHECK THE A/C CUT SIGNAL CIRCUIT.** 1) Disconnect the connector from auto A/C control module. 2) Measure the resistance between auto A/C control module and pressure switch connector. ***Connector & terminal*** ***(i48) No. 10 — (F79) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness between auto A/C control module and pressure switch.
6	**CHECK THE A/C ON SIGNAL CIRCUIT.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM and auto A/C control module connector. ***Connector & terminal*** ***Turbo model*** ***(B137) No. 17 — (i49) No. 17:*** ***Non-turbo model*** ***(B136) No. 11 — (i49) No. 17:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the harness between auto A/C control module and ECM.
7	**CHECK A/C RELAY.** 1) Remove the A/C relay in main fuse box. 2) Check the A/C relay. <Ref. to AC-42, INSPECTION, Relay and Fuse.>	Is the operation of the relay OK?	Go to step **8.**	Replace the A/C relay.
8	**CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR.** 1) Turn the ignition switch to OFF, and then connect the A/C relay connector and all removed connectors. 2) Start the engine, and turn A/C switch to ON. 3) Set the temperature control dial to maximum cold position. 4) Measure the voltage between magnet clutch harness connector and chassis ground. ***Connector & terminal*** ***(F24) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10.5 V (at normal temperature)?	Go to step **9.**	Repair the harness for power supply line of A/C compressor.

	Step	Check	Yes	No
9	**CHECK OPERATION OF MAIN FAN MOTOR.** 1) Start the engine and turn the A/C switch to ON. 2) Check the operation of main fan motor.	Does the main fan motor operate normally?	Go to step **14.**	Go to step **10.**
10	**CHECK POWER SUPPLY TO MAIN FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between main fan motor harness connector and chassis ground. ***Connector & terminal*** ***Except turbo AT model:*** ***(F17) No. 2 (+) — Chassis ground (–):*** ***Turbo AT model:*** ***(F17) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **11.**	Repair the harness for main fan motor power supply circuit.
11	**CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.** Measure the resistance between main fan motor harness connector and chassis ground. ***Connector & terminal*** ***Except turbo AT model:*** ***(F17) No. 1 — Chassis ground:*** ***Turbo AT model:*** ***(F17) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the harness for main fan motor ground circuit.
12	**CHECK MAIN FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (–) terminal to terminal No. 1 of main fan motor connector to make sure that main fan motor rotate.	Does the main fan rotate?	Go to step **13.**	Replace the main fan motor.
13	**CHECK POOR CONTACT IN MAIN FAN MOTOR CONNECTOR.** Check poor contact in main fan motor harness connector.	Is there poor contact in connector?	Go to step **14.**	Repair the poor contact in main fan motor connector.
14	**CHECK OPERATION OF SUB FAN MOTOR.** 1) Start the engine and turn the A/C switch to ON. 2) Check the operation of sub fan motor.	Does the sub fan motor operate normally?	Go to step **19.**	Go to step **15.**

	Step	Check	Yes	No
15	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn ignition switch to ON. 5) Measure the voltage between sub fan motor harness connector and chassis ground. ***Connector & terminal*** ***Except turbo AT model:*** ***(F16) No. 2 (+) — Chassis ground (–):*** ***Turbo AT model:*** ***(F16) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **16.**	Repair the harness for sub fan motor power supply circuit.
16	**CHECK GROUND CIRCUIT OF SUB FAN MOTOR.** Measure the resistance between sub fan motor harness connector and chassis ground. ***Connector & terminal*** ***Except turbo AT model:*** ***(F16) No. 1 — Chassis ground:*** ***Turbo AT model:*** ***(F16) No. 2 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **17.**	Repair the harness for sub fan motor ground circuit.
17	**CHECK SUB FAN MOTOR.** Connect the battery positive (+) terminal to terminal No. 2, and ground (–) terminal to terminal No. 1 of sub fan motor connector to make sure that sub fan motor rotate.	Does the sub fan motor rotate?	Go to step **18.**	Replace the sub fan motor.
18	**CHECK POOR CONTACT IN SUB FAN MOTOR CONNECTOR.** Check poor contact in sub fan motor connector.	Is there poor contact in connector?	Go to step **19.**	Repair the poor contact in sub fan motor connector.
19	**CHECK POOR CONTACT IN AUTO A/C CONTROL MODULE CONNECTOR.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Replace the auto A/C control module.	Repair the connector.

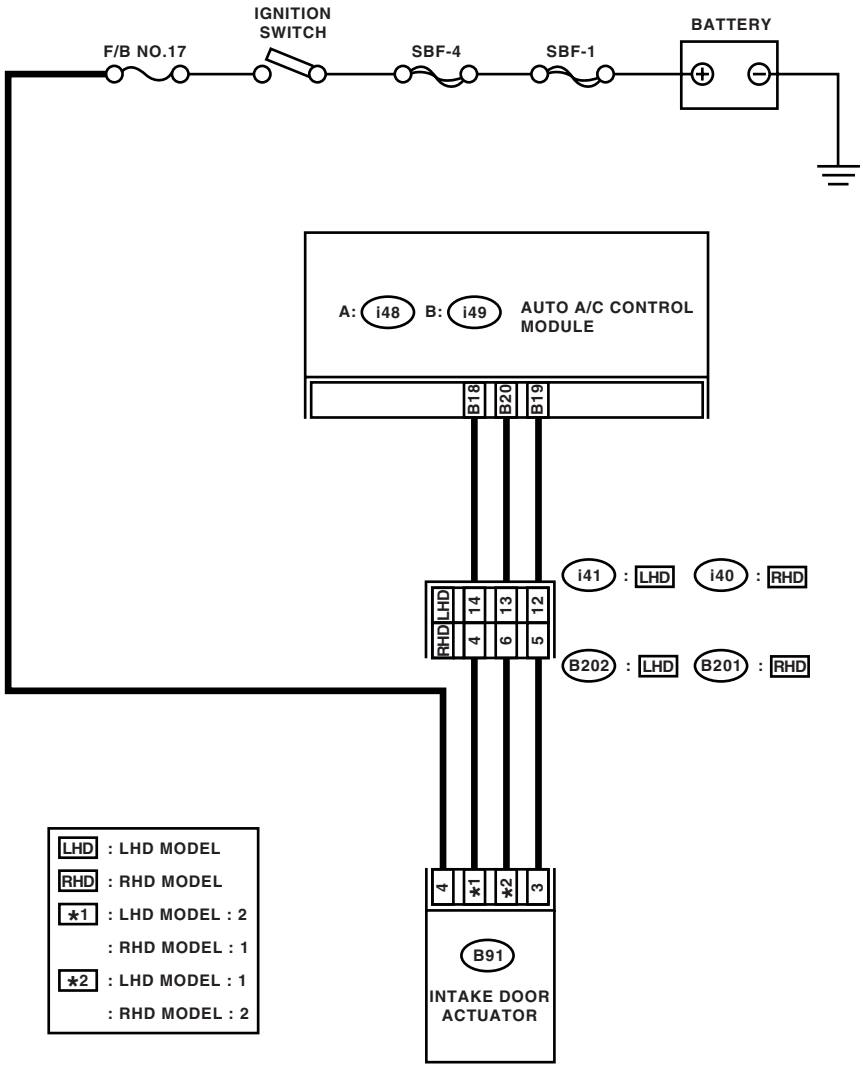
7. Diagnostic Procedure for Actuators

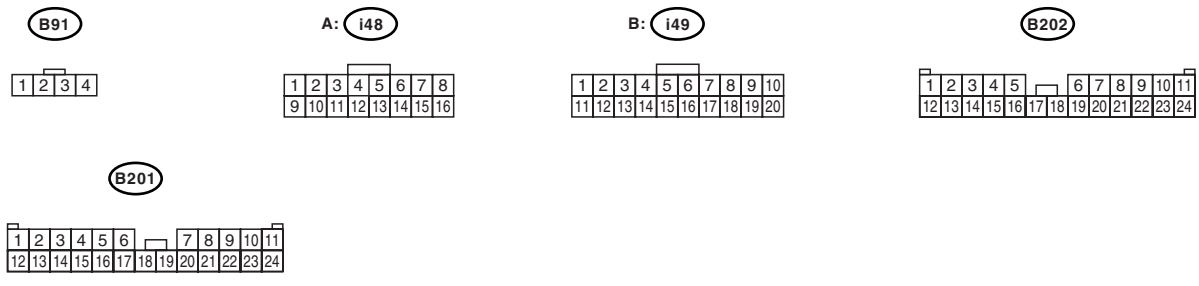
A: INTAKE DOOR ACTUATOR

TROUBLE SYMPTOM:

FRESH/RECIRC mode is not changed.

WIRING DIAGRAM:





AC-00153

Diagnostic Procedure for Actuators

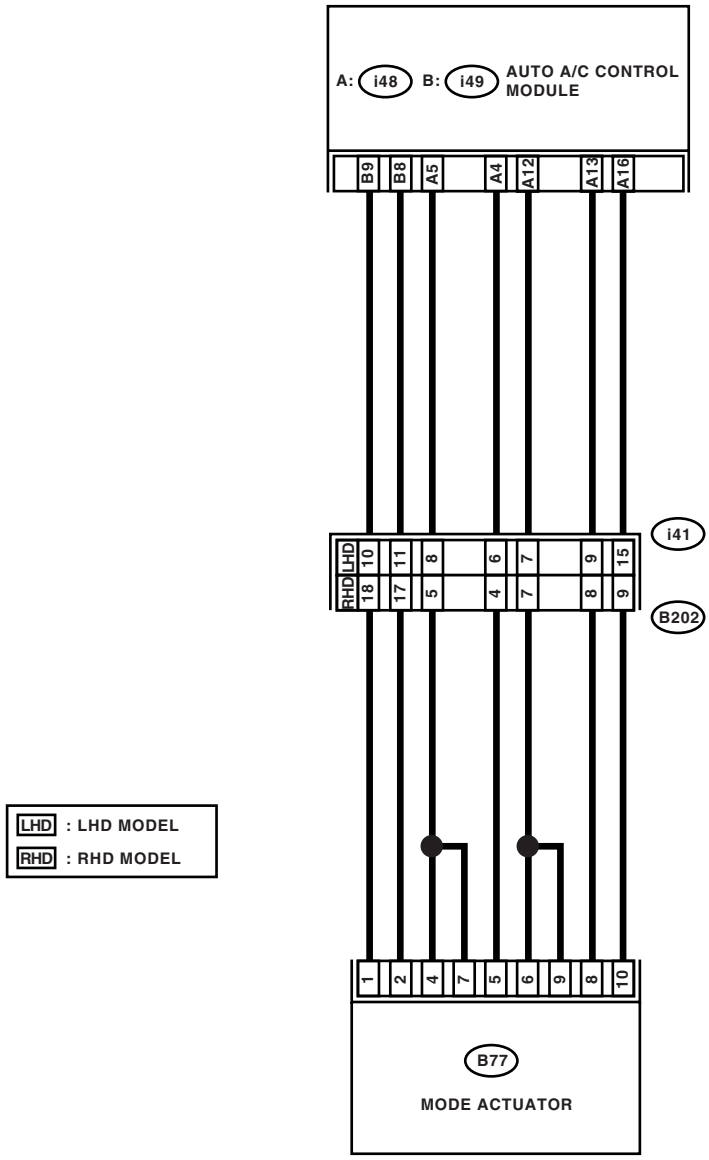
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR INTAKE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the intake door actuator connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between intake door actuator connector and chassis ground. ***Connector & terminal*** ***(B91) No. 4 (+) — Chassis ground (–):***	Is the voltage 7 V (at normal temperature)?	Go to step **2.**	Check open or short circuit in harness between intake door actuator and fuse.
2	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND INTAKE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the auto A/C control module connector. 3) Measure the resistance between intake door actuator connector and auto A/C control module connector. ***Connector & terminal*** ***LHD model:*** ***(i49) No. 18 — (B91) No. 2:*** ***(i49) No. 19 — (B91) No. 3:*** ***(i49) No. 20 — (B91) No. 1:*** ***RHD model:*** ***(i49) No. 18 — (B91) No. 1:*** ***(i49) No. 19 — (B91) No. 3:*** ***(i49) No. 20 — (B91) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the harness between auto A/C control module and intake door actuator.
3	**CHECK OPERATION OF INTAKE DOOR ACTUATOR.** 1) Connect the intake door actuator connector. 2) Ground the auto A/C control module connector with a suitable wire. 3) Turn the ignition switch to ON, and check the operation of intake door actuator. ***Connector & terminal*** ***(i49) No. 20 — Chassis ground:***	Does the actuator move to FRESH side?	Go to step **4.**	Replace the intake door actuator.
4	**CHECK OPERATION OF INTAKE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Ground the auto A/C control module connector with a suitable wire. 3) Turn the ignition switch to ON, and check the operation of intake door actuator. ***Connector & terminal:*** ***(i49) No. 18 — Chassis ground:***	Does the actuator move to RECIRC side?	Replace the auto A/C control module.	Replace the intake door actuator.

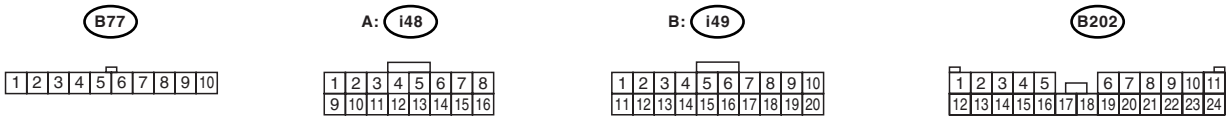
B: MODE DOOR ACTUATOR

TROUBLE SYMPTOM:

Air flow outlet is not changed.

WIRING DIAGRAM:





AC-00154

Diagnostic Procedure for Actuators

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1) Turn the ignition switch to ON. 2) Turn the mode control dial to VENT position. 3) Press the defroster switch and measure the voltage between auto A/C control module and chassis ground when VENT is changed to DEF position. ***Connector & terminal*** ***(i49) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 12 V?	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** 1) Turn the mode control dial to VENT position. 2) Press the defroster switch and measure the voltage between mode door actuator harness connector and chassis ground when VENT is changed to DEF position. ***Connector & terminal*** ***(B77) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 7 V (at normal temperature)?	Go to step **3.**	Repair the harness between auto A/C control module and mode door actuator.
3	**CHECK POWER SUPPLY FOR AUTO A/C CONTROL MODULE SIDE.** 1) Press the defroster switch. 2) Turn the mode control dial to VENT position and measure the voltage between auto A/C control module and chassis ground when DEF is changed to VENT position. ***Connector & terminal*** ***(i49) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 12 V?	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK POWER SUPPLY FOR ACTUATOR SIDE.** 1) Press the defroster switch. 2) Turn the mode control dial to VENT position and measure the voltage between mode door actuator harness connector and chassis ground when DEF is changed to VENT position. ***Connector & terminal*** ***(B77) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 7 V (at normal temperature)?	Go to step **5.**	Repair the harness between auto A/C control module and mode door actuator.
5	**CHECK ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Connect the battery positive (+) terminal to terminal No. 1 and ground (–) terminal to terminal No. 2 of mode door actuator to make sure that actuator operates. 4) Connect the battery positive (+) terminal to terminal No. 2 and ground (–) terminal to terminal No. 1 of mode door actuator to make sure that actuator operates.	Does the motor operate normally?	Go to step **6.**	Replace the mode door actuator.

	Step	Check	Yes	No
6	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn the ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 4 (+) — Chassis ground (–):***	Is the voltage 5 V when HEAT, D/H, DEF position and 0 V when VENT, BI-LEVEL position?	Go to step **9.**	Go to step **7.**
7	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 5 (+) — Chassis ground (–):***	Is the voltage 5 V?	Go to step **9.**	Go to step **8.**
8	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 4 — (B77) No. 5:***	Is the resistance less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
9	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 12 (+) — Chassis ground (–):***	Is the voltage 5 V when VENT, D/H position and 0 V when BI-LEVEL, HEAT, DEF position?	Go to step **12.**	Go to step **10.**
10	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 6, 9 (+) — Chassis ground (–):***	Is the voltage 5 V?	Go to step **12.**	Go to step **11.**

	Step	Check	Yes	No
11	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 12 — (B77) No. 6, 9:***	Is the resistance less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
12	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 5 (+) — Chassis ground (−):***	Is the voltage 5 V when BI-LEVEL, DEF position and 0 V when VENT, HEAT, D/H position?	Go to step **15.**	Go to step **13.**
13	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator harness connector and chassis ground. ***Connector & terminal*** ***(B77) No. 4, 7 (+) — Chassis ground (−):***	Is the voltage 5 V?	Go to step **15.**	Go to step **14.**
14	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 5 — (B77) No. 4, 7:***	Is the resistance less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
15	**CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.** 1) Turn ignition switch to ON. 2) Turn the mode control dial and measure voltage between auto A/C control module harness connector and chassis ground for each mode. ***Connector & terminal*** ***(i48) No. 13 (+) — Chassis ground (−):***	Is the voltage 5 V when VENT, BI-LEVEL, HEAT position and 0 V when D/H, DEF position?	Go to step **19.**	Go to step **16.**

	Step	Check	Yes	No
16	**CHECK AUTO A/C CONTROL MODULE SIGNAL POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator and chassis ground. ***Connector & terminal*** ***(B77) No. 8 (+) — Chassis ground (−):***	Is the voltage 5 V?	Go to step **18.**	Go to step **17.**
17	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from auto A/C control module and mode door actuator. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 13 — (B77) No. 8:***	Is the resistance less than 1 Ω?	Replace the auto A/C control module.	Repair the harness between auto A/C control module and mode door actuator.
18	**CHECK ACTUATOR GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module. 3) Measure the resistance of harness between auto A/C control module and mode door actuator. ***Connector & terminal*** ***(i48) No. 16 — (B77) No. 10:***	Is the resistance less than 1 Ω?	Replace the mode door actuator.	Repair the harness between auto A/C control module and mode door actuator.
19	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the poor contact in auto A/C control module.	Repair the connector.

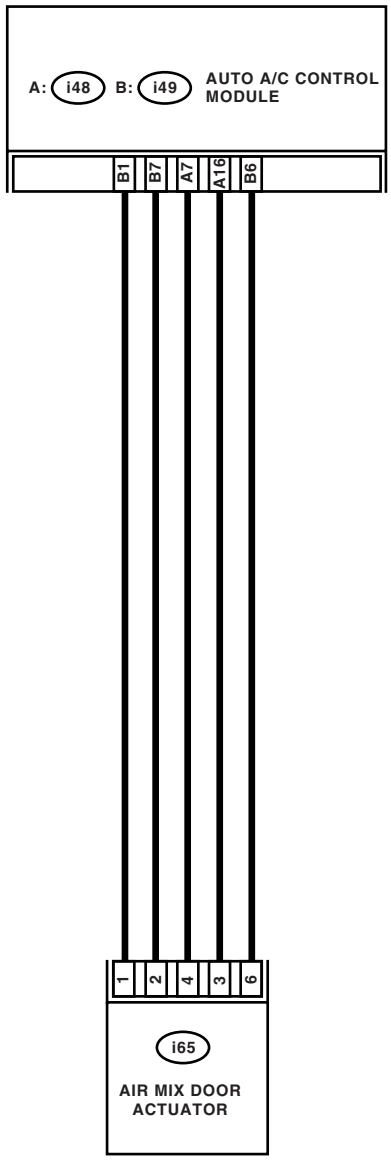
C: AIR MIX DOOR ACTUATOR

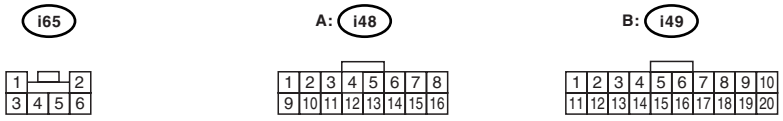
TROUBLE SYMPTOM:

Outlet air temperature does not change.

WIRING DIAGRAM:

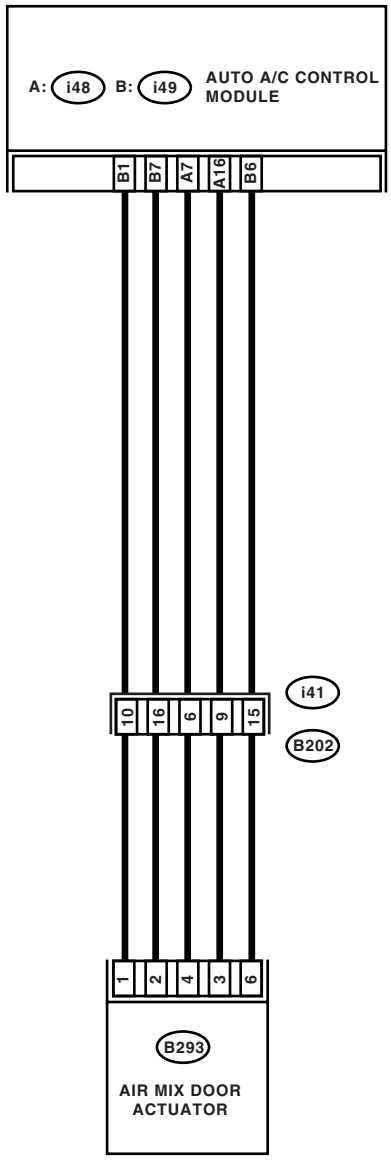
- LHD MODEL

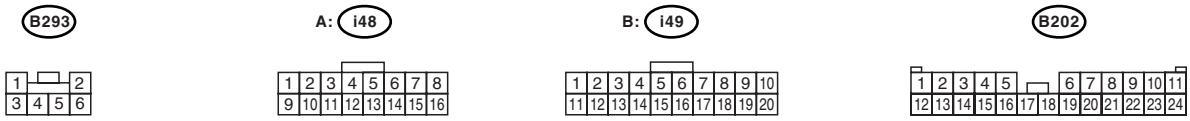




AC-00106

- RHD MODEL





AC-00155

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AIR MIX DOOR ACTUATOR POSITION SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the air mix door actuator connector. 3) Turn the ignition switch and AUTO switch to ON. 4) Measure the voltage between auto A/C control module connector terminals. ***Connector & terminal*** ***(i48) No. 7 (+) — (i48) No. 16 (–):***	Is the voltage approx. 5 V?	Go to step **2.**	Replace the auto A/C control module.
2	**CHECK POWER SUPPLY FOR AIR MIX DOOR ACTUATOR.** Measure the voltage between auto A/C control module connector and chassis ground after turning the temperature control dial to maximum COOL position. ***Connector & terminal*** ***(i49) No. 6 (+) — Chassis ground (–):***	Is the voltage 7 V (at normal temperature)?	Go to step **3.**	Replace the auto A/C control module.
3	**CHECK POWER SUPPLY FOR AIR MIX DOOR ACTUATOR.** Measure the voltage between auto A/C control module connector and chassis ground after turning the temperature control dial to maximum HOT position. ***Connector & terminal*** ***(i49) No. 7 (+) — Chassis ground (–):***	Is the voltage 7 V (at normal temperature)?	Go to step **4.**	Replace the auto A/C control module.
4	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR.** 1) Turn the A/C and ignition switch to OFF. 2) Disconnect the auto A/C control module connector. 3) Measure the resistance between auto A/C control module and air mix door actuator connector. ***Connector & terminal*** ***LHD model:*** ***(i65) No. 1 — (i49) No. 1:*** ***(i65) No. 2 — (i49) No. 7:*** ***(i65) No. 3 — (i48) No. 16:*** ***(i65) No. 4 — (i48) No. 7:*** ***(i65) No. 6 — (i49) No. 6:*** ***RHD model:*** ***(B293) No. 1 — (i49) No. 1:*** ***(B293) No. 2 — (i49) No. 7:*** ***(B293) No. 3 — (i48) No. 16:*** ***(B293) No. 4 — (i48) No. 7:*** ***(B293) No. 6 — (i49) No. 6:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness between auto A/C control module and air mix door actuator.

	Step	Check	Yes	No
5	**CHECK AIR MIX DOOR ACTUATOR POSITION SWITCH SIGNAL.** 1) Connect the connector of auto A/C control module and air mix door actuator. 2) Turn the ignition switch and AUTO switch to ON. 3) Check the voltage between auto A/C control module connector terminals while changing the setting temperature between maximum COOL and maximum HOT. ***Connector & terminal*** ***(i49) No. 1 (+) — (i48) No. 16 (−):***	Does the voltage change between 0.5 (Max. HOT) — 4.5 (Max. COOL) V?	Go to step **6.**	Replace the air mix door actuator.
6	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module and connector.	Is there poor contact in connector?	Repair the connector.	Replace the auto A/C control module.

8. Diagnostic Procedure for Sensors

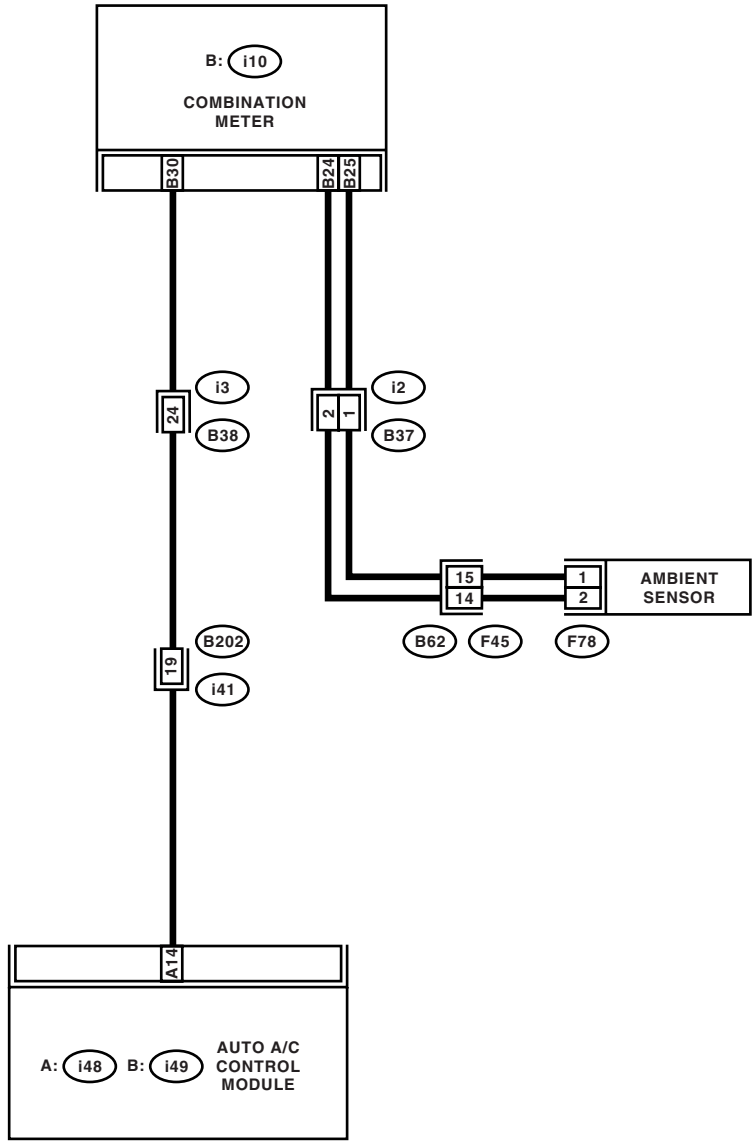
A: AMBIENT SENSOR

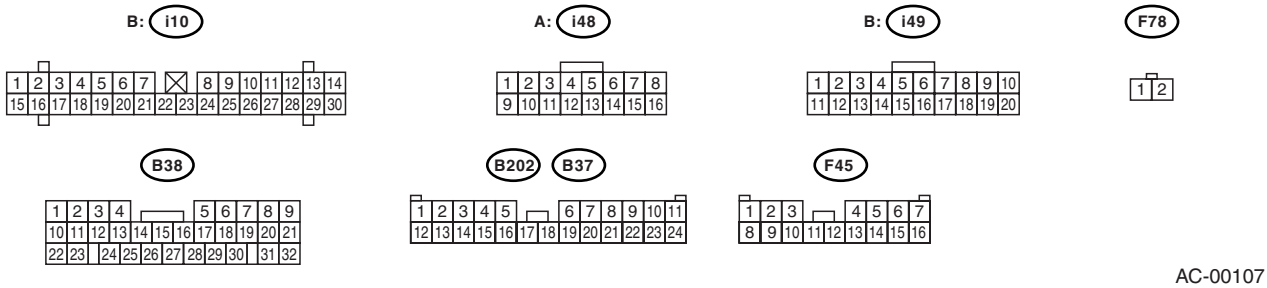
TROUBLE SYMPTOM:

- Fan speed is not switched when the fan speed control dial is in AUTO position.
- Malfunction related to ambient sensor is indicated in self diagnosis.

WIRING DIAGRAM:

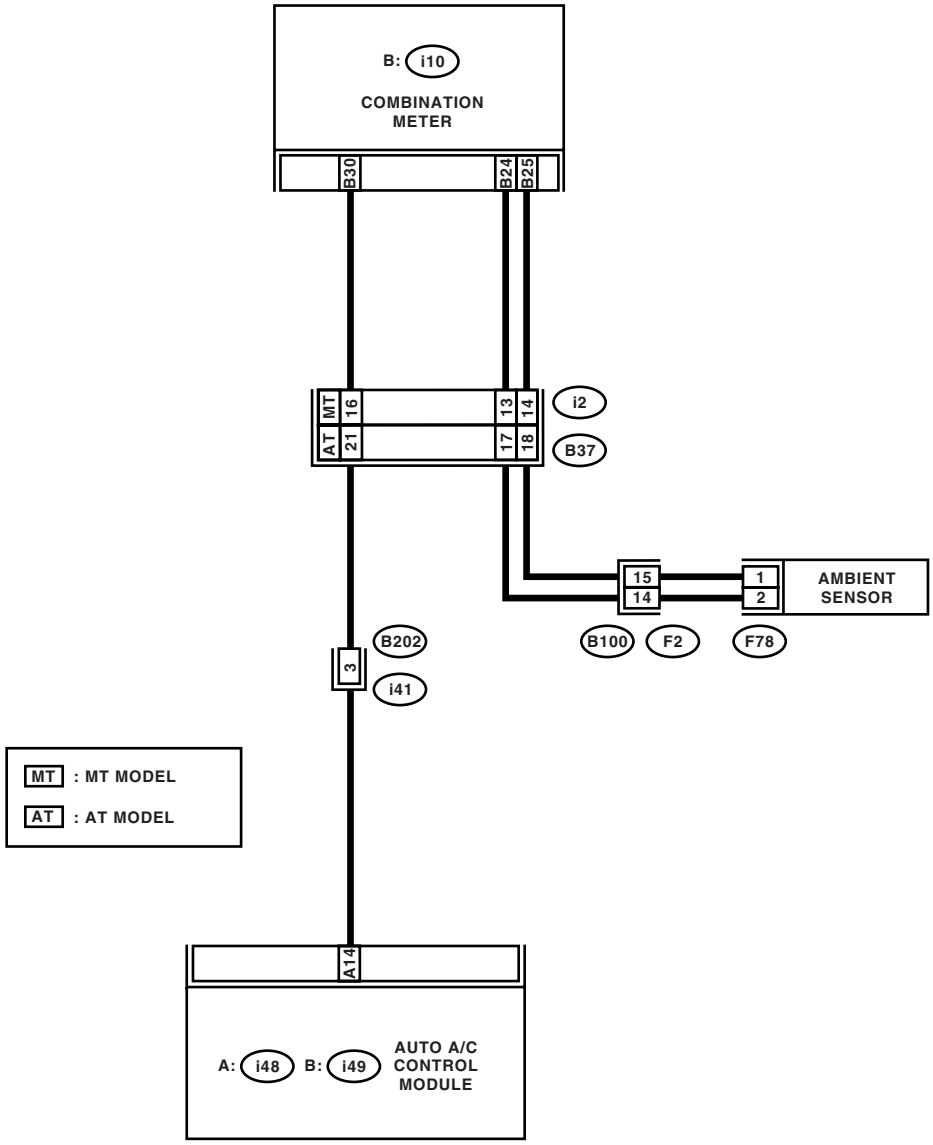
- LHD MODEL

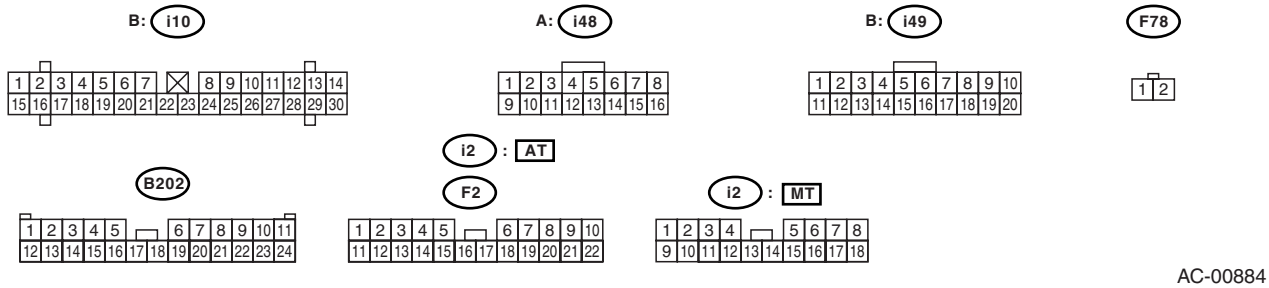




AC-00107

- RHD MODEL





AC-00884

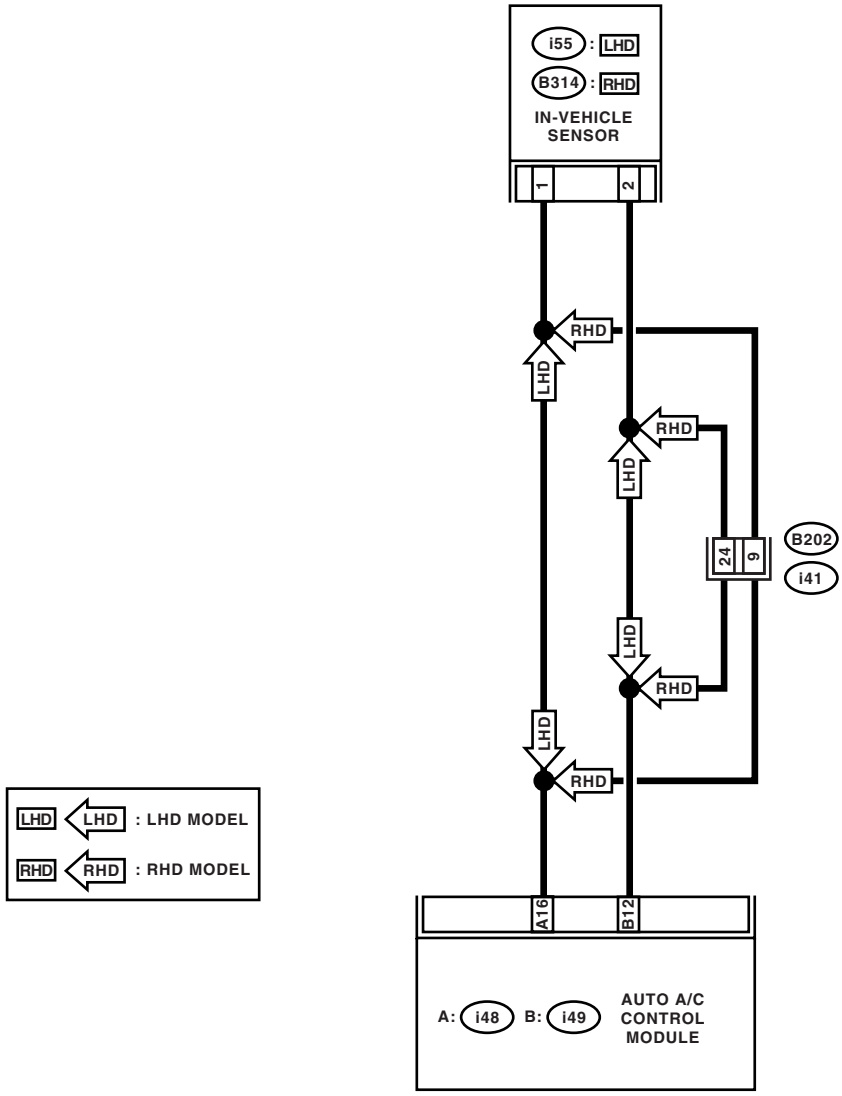
	Step	Check	Yes	No
1	**CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module and combination meter. 3) Measure the resistance in harness between auto A/C control module and combination meter. ***Connector & terminal*** ***(i10) No. 30 — (i48) No. 14:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the harness between auto A/C control module and combination meter.
2	**CHECK AMBIENT SENSOR CIRCUIT.** Check the ambient sensor circuit. <Ref. to IDI-8, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>	Is the ambient sensor circuit normal?	Go to step **3.**	Repair the ambient sensor circuit.
3	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the A/C control module.

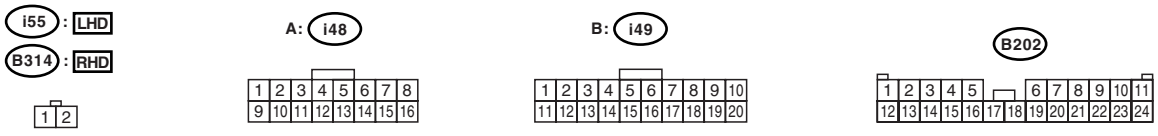
B: IN-VEHICLE SENSOR

TROUBLE SYMPTOM:

- Blower fan speed, outlet port and inlet port do not change after turning the AUTO switch to ON.
- Malfunction related to ambient sensor is indicated in self diagnosis.

WIRING DIAGRAM:





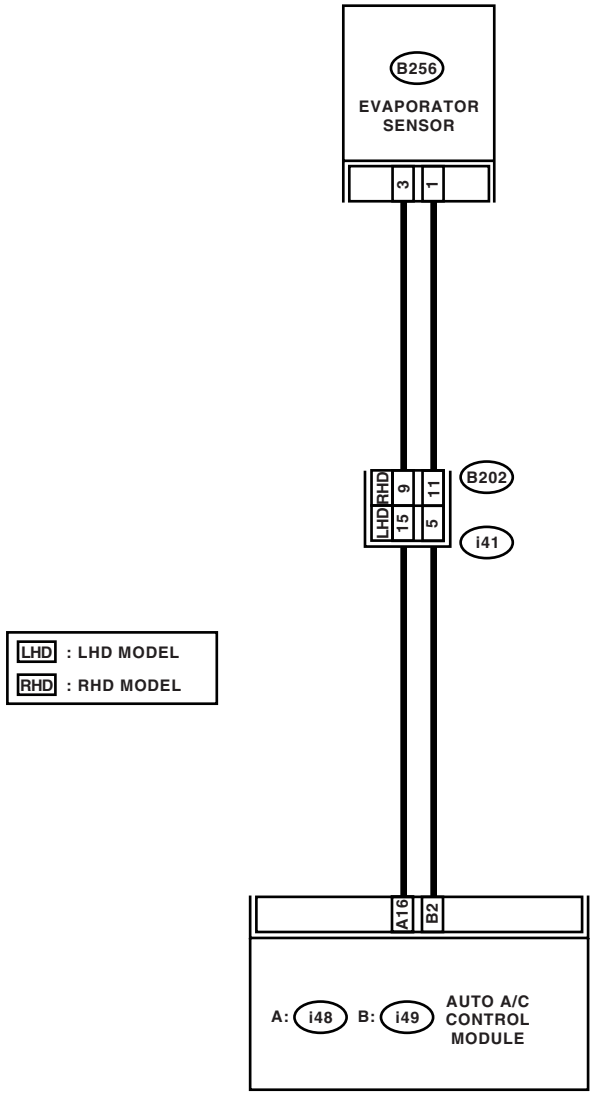
AC-01204

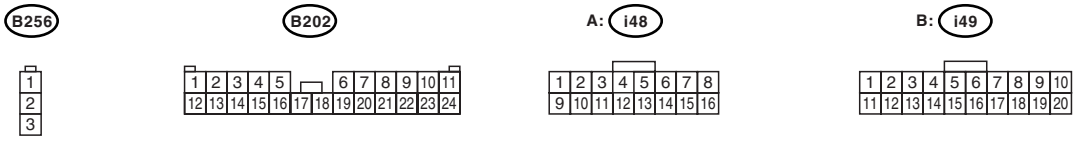
Diagnostic Procedure for Sensors

	Step	Check	Yes	No
1	**CHECK IN-VEHICLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the instrument panel lower cover. 3) Disconnect the connector from in-vehicle sensor. 4) Measure the resistance between connector terminals of in-vehicle sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance approx. 2.7 kΩ at 20°C (68°F)?	Go to step **2.**	Replace the in-vehicle sensor.
2	**CHECK INPUT SIGNAL FOR IN-VEHICLE SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between in-vehicle sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***LHD model:*** ***(i55) No. 2 (+) — Chassis ground (–):*** ***RHD model:*** ***(B314) No. 2 (+) — Chassis ground (–):***	Is the voltage approx. 5 V?	Go to step **6.**	Go to step **3.**
3	**CHECK AUTO A/C CONTROL MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to OFF. 2) Remove the auto A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between connector terminals of auto A/C control module. ***Connector & terminal*** ***(i49) No. 12 (+) — (i48) No. 16:***	Is the voltage approx. 5 V?	Go to step **4.**	Go to step **6.**
4	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND IN-VEHICLE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module. 3) Measure the resistance in harness between auto A/C control module and in-vehicle sensor. ***Connector & terminal*** ***LHD model:*** ***(i55) No. 2 — (i49) No. 12:*** ***RHD model:*** ***(B314) No. 2 — (i49) No. 12:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness between auto A/C control module and in-vehicle sensor.
5	**CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND IN-VEHICLE SENSOR.** Measure the resistance in harness between auto A/C control module and in-vehicle sensor. ***Connector & terminal*** ***LHD model:*** ***(i55) No. 1 — (i48) No. 16:*** ***RHD model:*** ***(B314) No. 1 — (i48) No. 16:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the harness between auto A/C control module and in-vehicle sensor.
6	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the auto A/C control module.

C: EVAPORATOR SENSOR

WIRING DIAGRAM:





AC-00158

	Step	Check	Yes	No
1	**CHECK EVAPORATOR SENSOR.** 1) Turn the ignition switch to OFF. 2) Remove the glove box. 3) Disconnect the connector from evaporator sensor. 4) Measure the resistance between connector terminals of evaporator sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance approx. 2.7 kΩ at 20°C (68°F)?	Go to step **2.**	Replace the evaporator sensor.
2	**CHECK INPUT SIGNAL FOR EVAPORATOR SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (B256) terminal and chassis ground. ***Connector & terminal*** ***(B256) No. 1 (+) — Chassis ground (−):***	Is the voltage approx. 5 V?	Go to step **5.**	Go to step **3.**
3	**CHECK AUTO A/C CONTROL MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to OFF. 2) Remove the auto A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between connector terminals of auto A/C control module. ***Connector & terminal*** ***(i49) No. 2 (+) — (i48) No. 16 (−):***	Is the voltage approx. 5 V?	Go to step **4.**	Go to step **6.**
4	**CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND EVAPORATOR SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module. 3) Measure the resistance in harness between auto A/C control module and evaporator sensor. ***Connector & terminal*** ***(B256) No. 1 — (i49) No. 2:***	Is the resistance less than 1Ω?	Go to step **5.**	Repair the open circuit in harness between auto A/C control module and evaporator sensor.
5	**CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND EVAPORATOR SENSOR.** Measure the resistance in harness between auto A/C control module and evaporator sensor. ***Connector & terminal*** ***(B256) No. 3 — (i48) No. 16:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between auto A/C control module and evaporator sensor.
6	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the auto A/C control module.

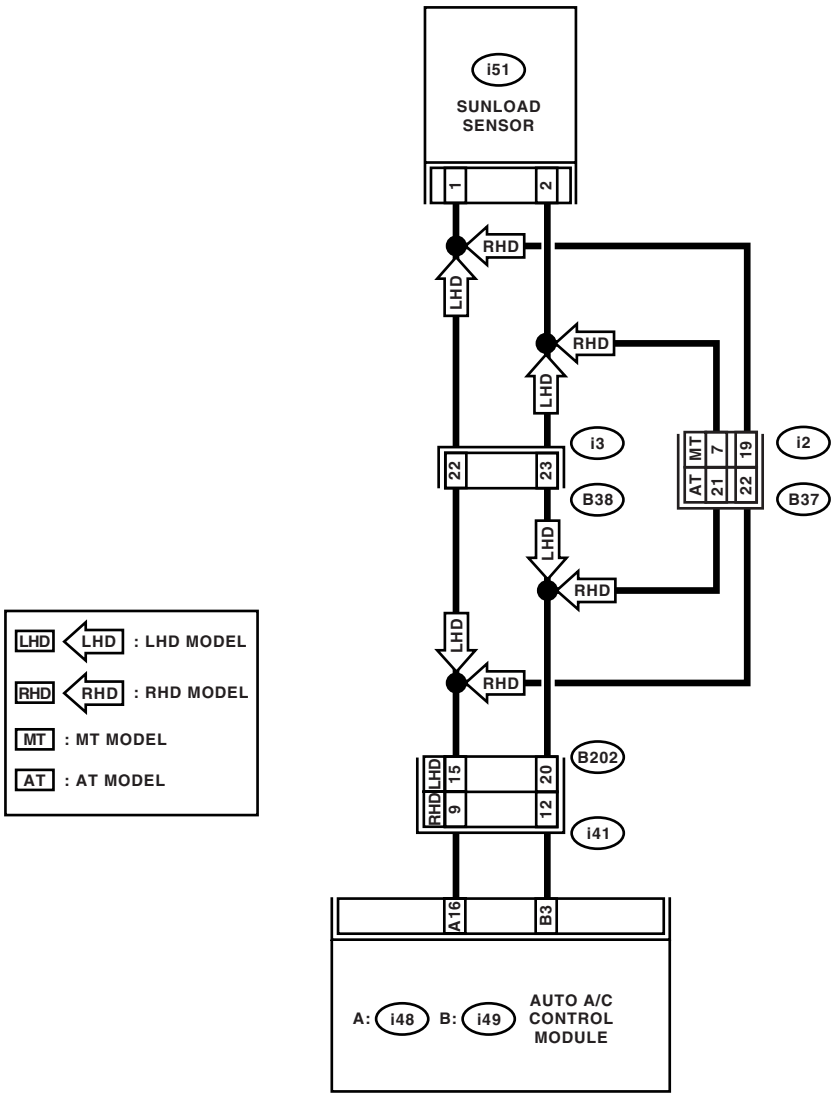
D: SUNLOAD SENSOR

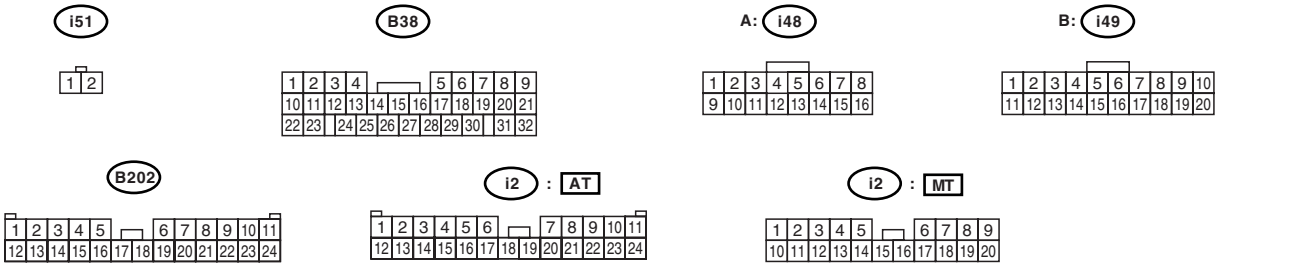
TROUBLE SYMPTOM:

- Sensor identifies that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identifies that sunlight is at minimum. Then, A/C system is controlled to HOT side.

NOTE:
When the sunload sensor check is conducted indoors or in the shade, open circuit might be indicated. Always check the sunload sensor at the place where the sun shines directly on it.

WIRING DIAGRAM:





AC-01201

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY VOLTAGE FOR SUNLOAD SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sunload sensor. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage for sunload sensor. ***Connector & terminal*** ***(i51) No. 2 (+) — Chassis ground (−):***	Is the voltage approx. 5 V?	Go to step **4.**	Go to step **2.**
2	**CHECK AUTO A/C CONTROL MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to OFF. 2) Remove the auto A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between connector terminals of auto A/C control module. ***Connector & terminal*** ***(i49) No. 3 (+) — (i48) No. 16 (−):***	Is the voltage approx. 5 V?	Go to step **3.**	Go to step **6.**
3	**CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND SUNLOAD SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module. 3) Measure the resistance in harness between auto A/C control module and sunload sensor. ***Connector & terminal*** ***(i51) No. 2 — (i49) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness between auto A/C control module and sunload sensor.
4	**CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND SUNLOAD SENSOR.** Measure the resistance in harness between auto A/C control module and sunload sensor. ***Connector & terminal*** ***(i51) No. 1 — (i48) No. 16:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness between auto A/C control module and sunload sensor.
5	**CHECK INPUT VOLTAGE FOR AUTO A/C CONTROL MODULE.** 1) Connect the connector of auto A/C control module. 2) Turn the ignition switch to ON. 3) Measure the voltage between connector terminals of auto A/C control module. ***Connector & terminal*** ***(i49) No. 3 (+) — (i48) No. 16 (−):***	Is the voltage approx. 2.5 V?	Go to step **6.**	Replace the sunload sensor.
6	**CHECK POOR CONTACT.** Check poor contact in auto A/C control module connector.	Is there poor contact in connector?	Repair the connector.	Replace the auto A/C control module.

9. General Diagnostic Table

A: INSPECTION

Symptom	Problem parts
A/C system fails to operate.	• Fuse • Connector (Poor contact) • Ground • Auto A/C control module • Blower fan motor • Blower fan relay • A/C Relay • Compressor (Magnet clutch) • Evaporator sensor
Fuse is blown out.	• Fuse • Connector (Poor contact)
Illumination cannot dim.	• Fuse • Connector (Poor contact) • Auto A/C control module
Blower fan does not rotate or fan speed cannot be controlled.	• Fuse • Connector (Poor contact) • Ground • Auto A/C control module • Blower fan motor • Blower fan relay
Unable to switch suction vents.	• Connector (Poor contact) • Auto A/C control module • Intake door actuator
Unable to switch blow vents.	• Connector (Poor contact) • Auto A/C control module • Mode door actuator
Compartment temperature does not increase. (No hot air is discharged.)	• Connector (Poor contact) • Auto A/C control module • Air mix door actuator • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
Compartment temperature does not decrease. (No cool air is discharged.)	• Connector (Poor contact) • Auto A/C control module • Air mix door actuator • A/C Relay • Compressor (Magnet clutch) • Radiator fan motor • Radiator fan relay • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
Compartment temperature is higher or lower than setting temperature.	• Auto A/C control module • Air mix door actuator • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
Compartment temperature does not quickly respond to setting temperature.	• Air mix door actuator • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
Radiator fan does not rotate during A/C operation.	• Radiator fan motor • Radiator fan relay

AIRBAG SYSTEM

AB

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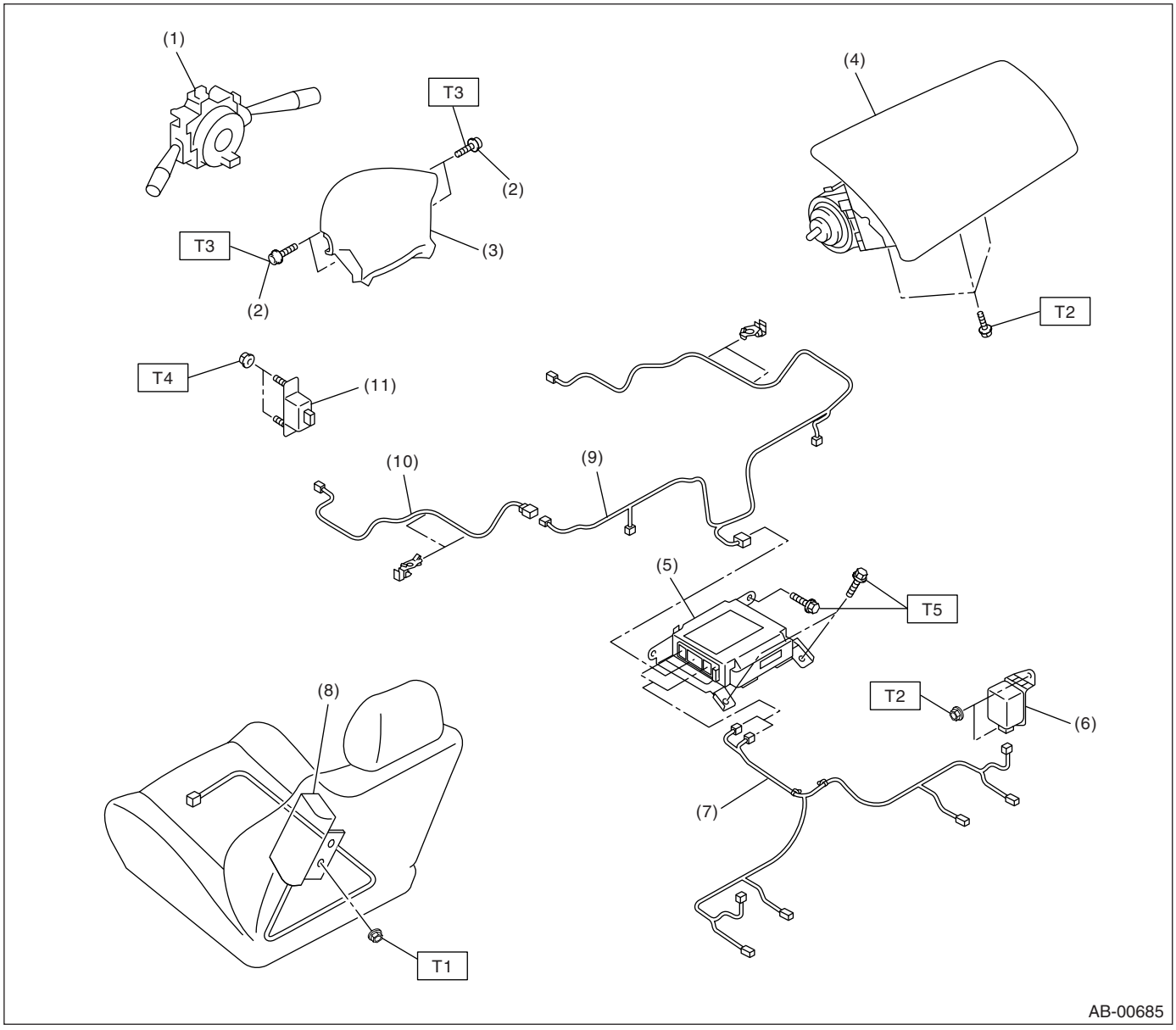
1. General Description

A: COMPONENT

1. SRS AIRBAG



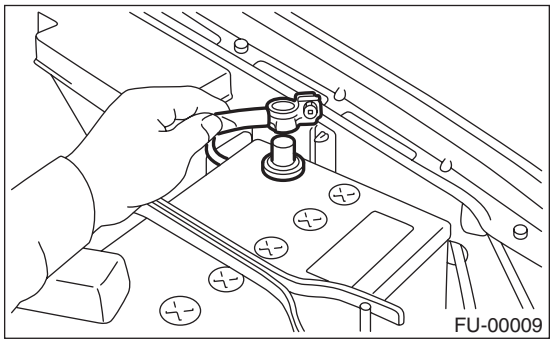
(1)	Combination switch ASSY with roll connector	(5)	Airbag control module
(2)	TORX® bolt T30	(6)	Side airbag sensor
(3)	Airbag module ASSY (Driver's side)	(7)	Wiring harness rear
(4)	Airbag module ASSY (Passenger's side)	(8)	Side airbag module
		(9)	Wiring harness CTR
		(10)	Wiring harness front
		(11)	Front sub sensor

Tightening torque: N·m (kgf-m, ft-lb)

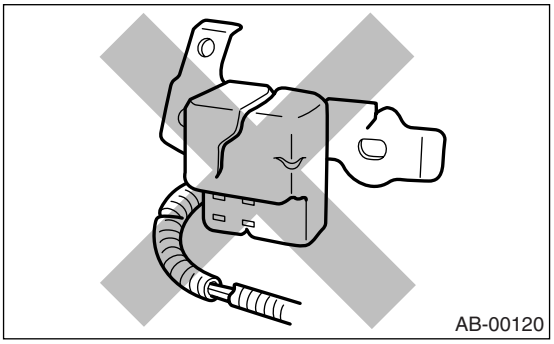
T1: 5.9 (0.59, 4.4)
T2: 7.4 (0.75, 5.4)
T3: 10 (1.0, 7.2)
T4: 20 (2.0, 14.5)
T5: 25 (2.5, 18.1)

B: CAUTION

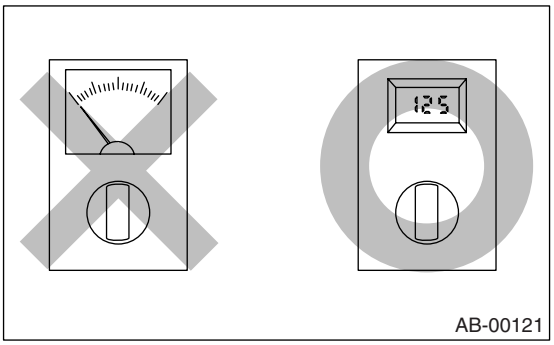
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



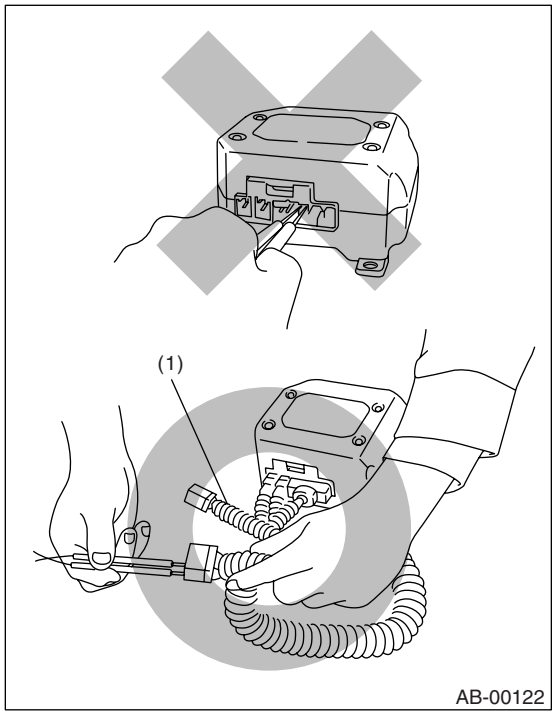
• If the airbag warning light illuminates, repair the vehicle immediately. Airbag or pretensioner may inflate incorrectly, or not inflate in collision.
• If sensors, airbag module, airbag control module, pretensioner or harness are deformed or damaged, replace them with new parts.



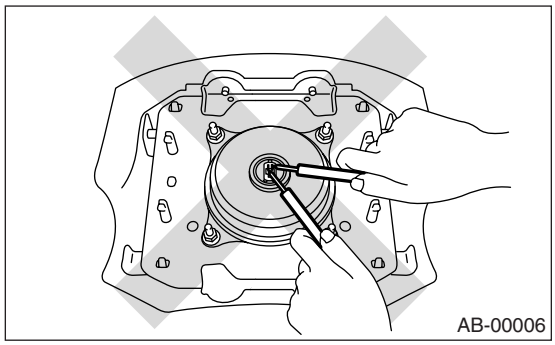
• When checking the airbag system, be sure to use a digital circuit tester.
Infinitesimal electric current in an analog circuit tester may cause the airbag to activate erroneously.



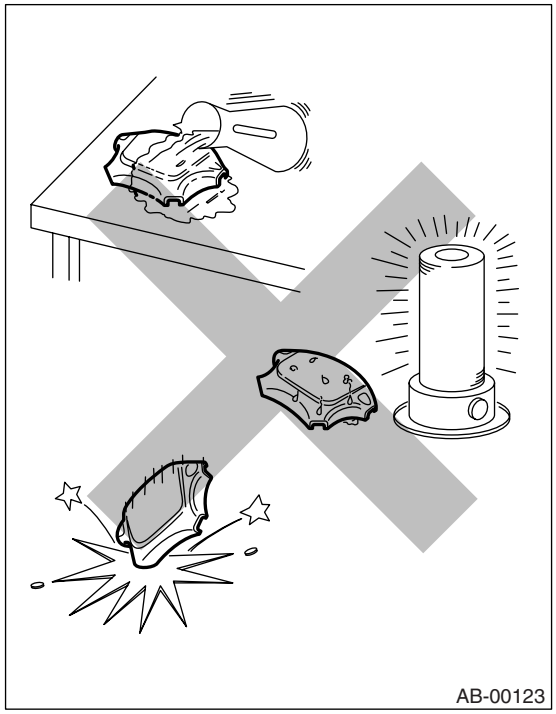
• When checking, use a test harness (1). Do not directly apply the tester probe to any connector terminal of the airbag. Damage to the connector terminal may cause the airbag to activate erroneously.



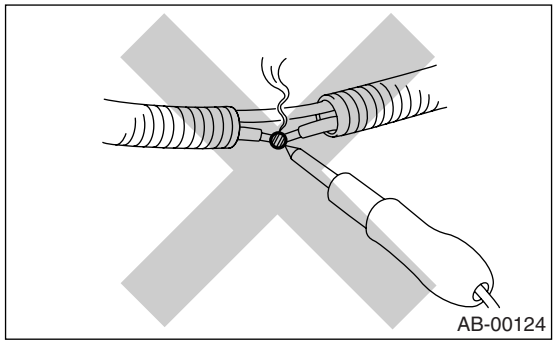
• Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.



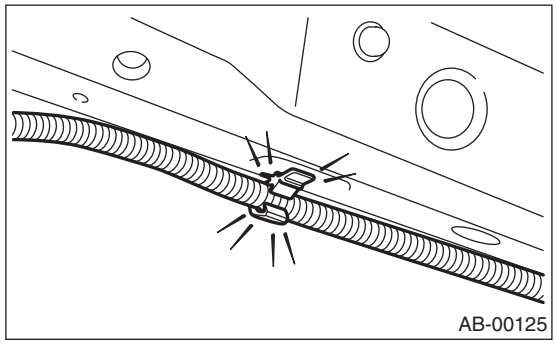
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



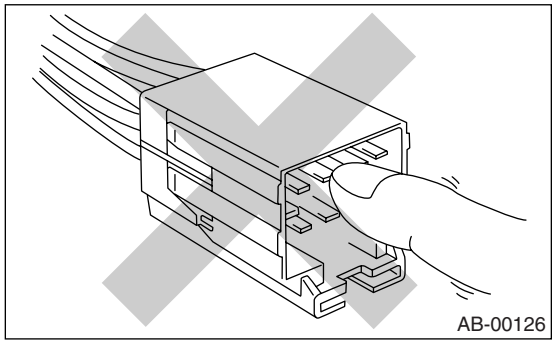
• If any damage, opening, or rust is found on the airbag system wiring harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



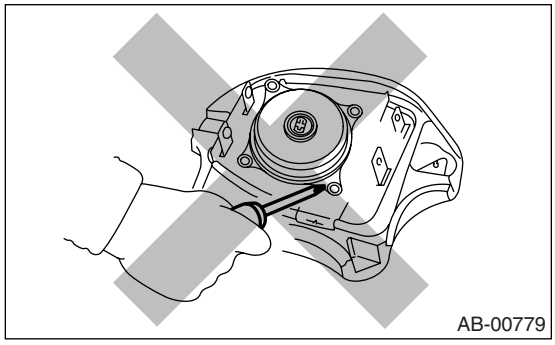
• Install the wiring harness securely with the specified clips to avoid interference or tangled up with other parts.



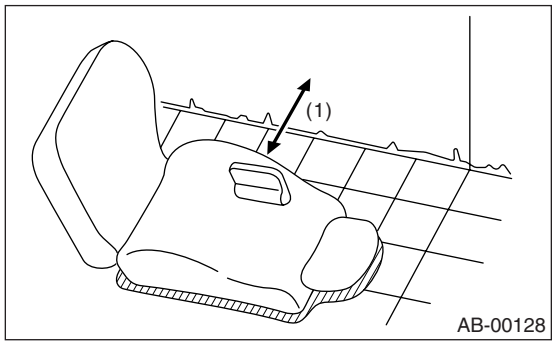
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



• Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.



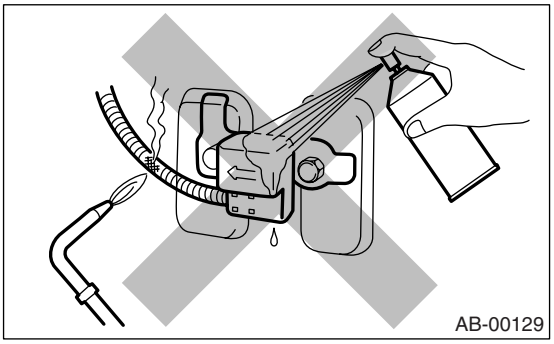
• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



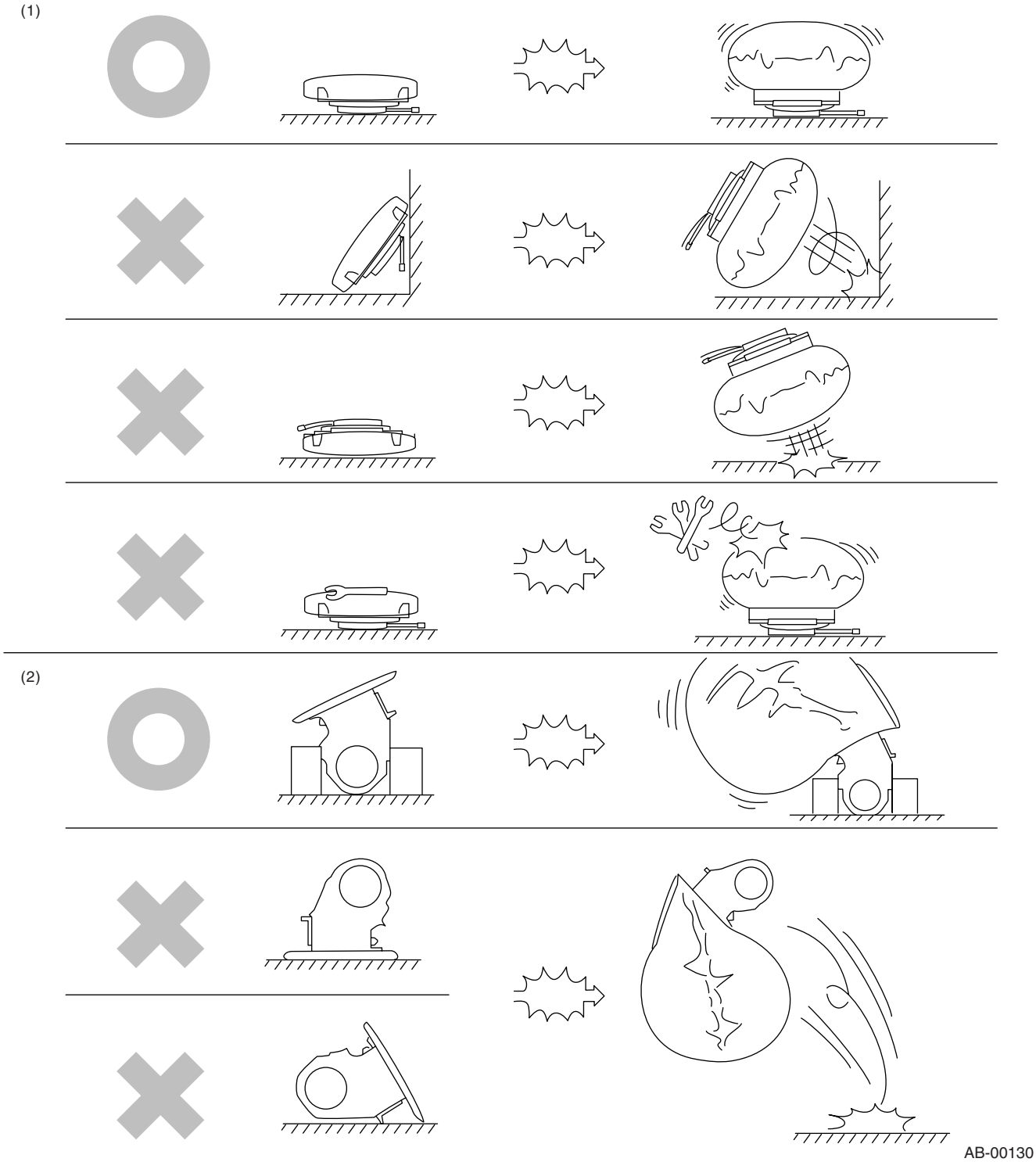
(1) More than 200 mm (8 in)

• Do not use the airbag or pretensioner parts from other vehicles. Always replace defective parts with new ones.
• Never reuse a deployed airbag or pretensioner.
• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wiring harness of the airbag system.

• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar, and front and rear doors, remove the side airbag sensors and wiring harness of the airbag system.



• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



(1) Driver's airbag module (2) Passenger's airbag module

C: PREPARATION TOOL

1. SPECIAL TOOL

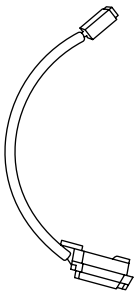
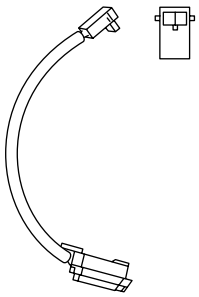
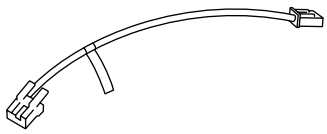
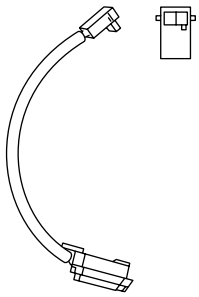
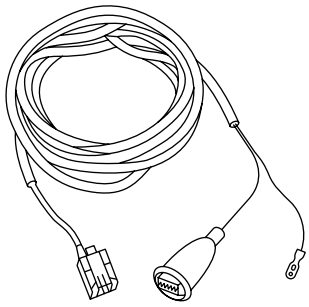
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FC030	98299FC030	DEPLOYMENT ADAPTER A	• Used for deploying the side airbag module. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299SA010	98299SA010	TEST HARNESS ADAPTER D	• Used for deploying the driver's airbag module and seat belt pretensioner. • Used with DEPLOYMENT TOOL (98299PA030). • Can not reuse.
 ST98299SA030	98299SA030	TEST HARNESS ADAPTER E	• Used for deploying the passenger's airbag module. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299SA050	98299SA050	TEST HARNESS ADAPTER F	• Used for deploying lap seat belt pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299PA030	98299PA030	DEPLOYMENT TOOL	• Used for deploying the airbag module. • Used with DEPLOYMENT ADAPTER A (98299FC030).

2. GENERAL TOOL

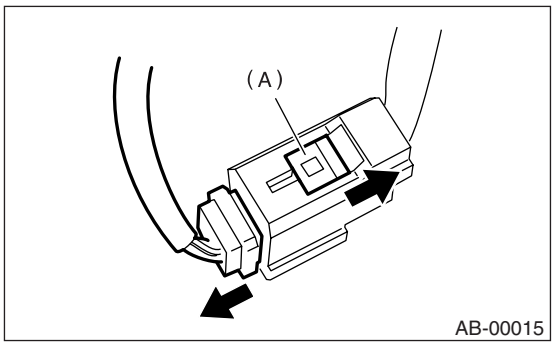
TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of driver's airbag module.

2. Airbag Connector

A: OPERATION

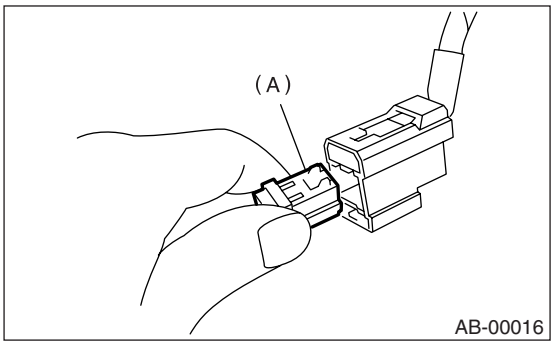
1. POWER SUPPLY

1) How to disconnect:
(1) Move the slide lock (A) in the direction of arrow.
(2) Pull the female connector in the direction of arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

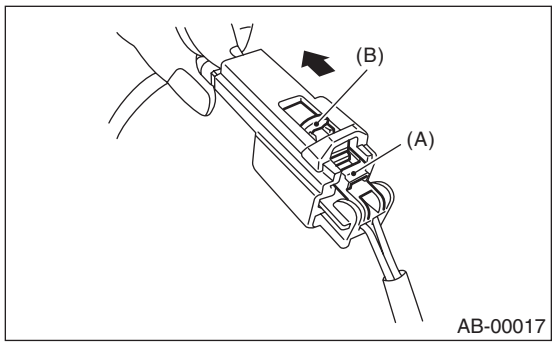
2) How to connect:
Holding the connector (A), push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

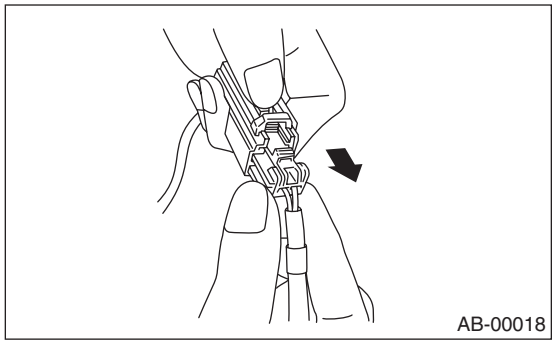
2. DRIVER'S AIRBAG (BETWEEN AIRBAG HARNESS AND ROLL CONNECTOR), PASSENGER'S AIRBAG AND SIDE AIRBAG

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of arrow.



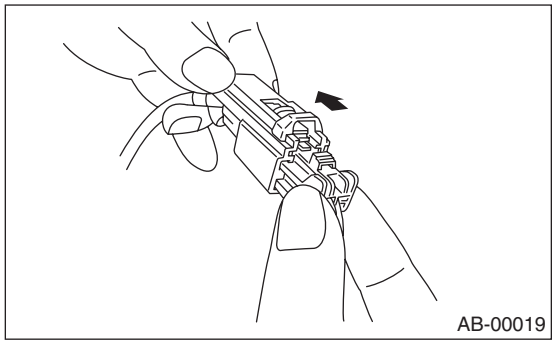
(3) With the slide lock pulled, remove the lock arm to its original position, and then pull in the direction of arrow to separate connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



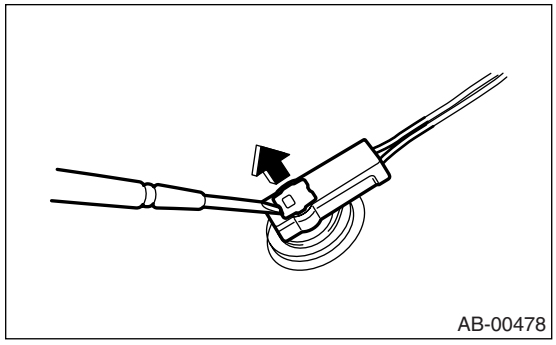
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

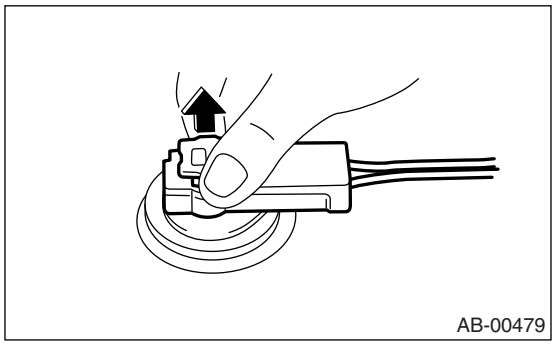


3. DRIVER'S AIRBAG MODULE AND PRETENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock upward to unlock.

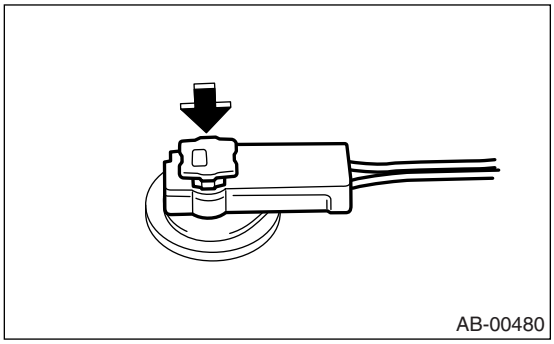

AB-00478

(2) Pull the connector to disconnect from driver's side airbag module assembly or retractor assembly.


AB-00479

2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until a connecting sound is heard.

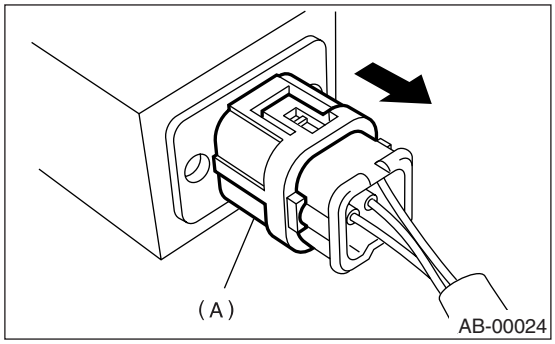
CAUTION:
• Be sure to insert the connector in until it locks. Then pull it gently to make sure that it is locked.
• Be sure to insert the push lock in.


AB-00480

4. FRONT SUB-SENSOR AND SIDE AIRBAG SENSOR

1) How to disconnect:
Holding outer part (A), pull it in the direction of arrow.

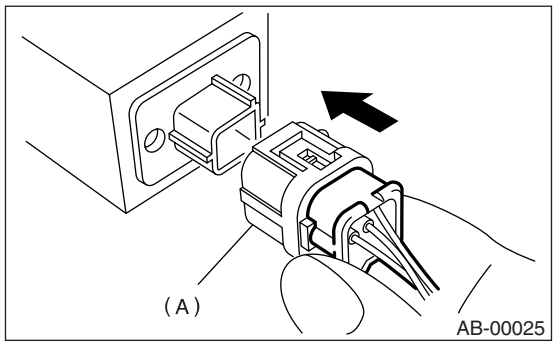
CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



AB-00024

2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

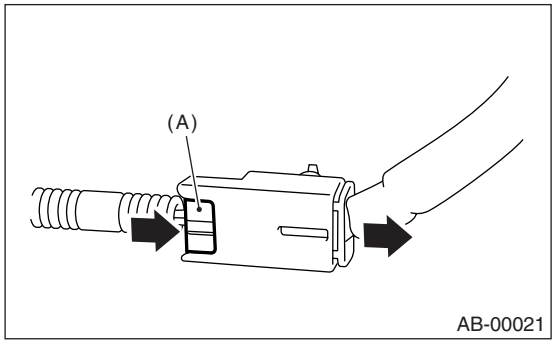
CAUTION:
• Do not put your hand on the outer part, since outer (A) moves back.
• Be sure to insert the connector in until it locks. Then pull it gently to make sure that it is locked.



AB-00025

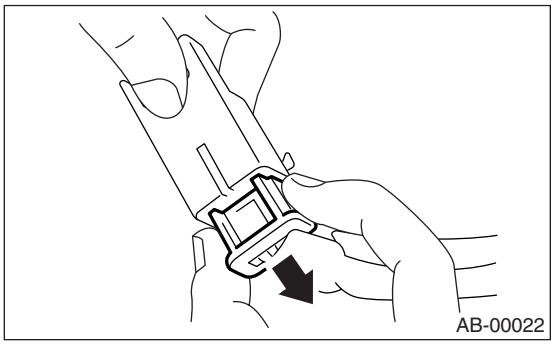
5. PASSENGER'S AIRBAG

1) How to disconnect:
(1) Move the slide lock (A) in the direction of arrow.



AB-00021

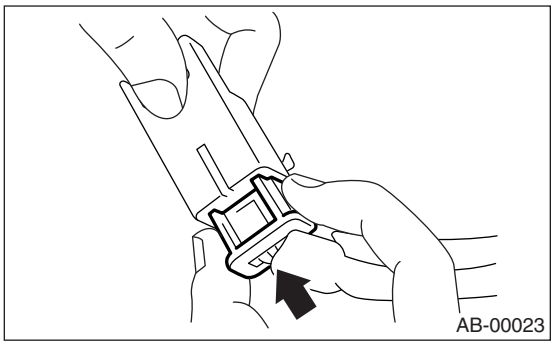
(2) With the slide lock pushed, pull the connector in the direction of arrow and disconnect it.


AB-00022

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

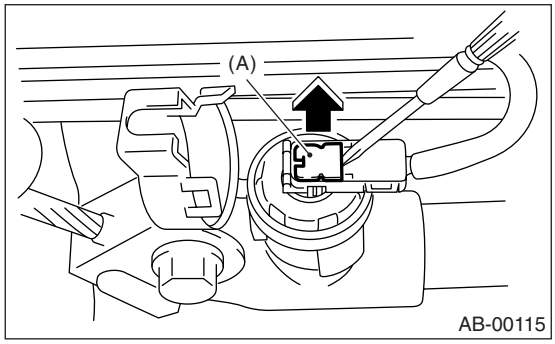
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.


AB-00023

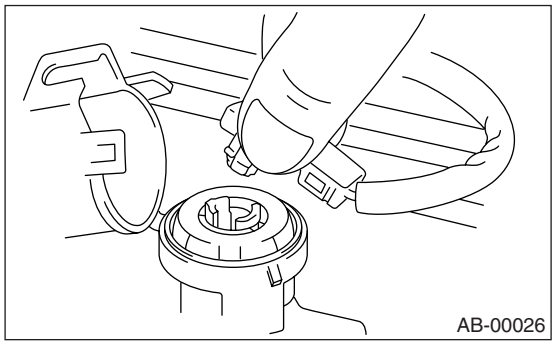
6. LAP SEAT BELT PRETENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock (A) upward to unlock.



AB-00115

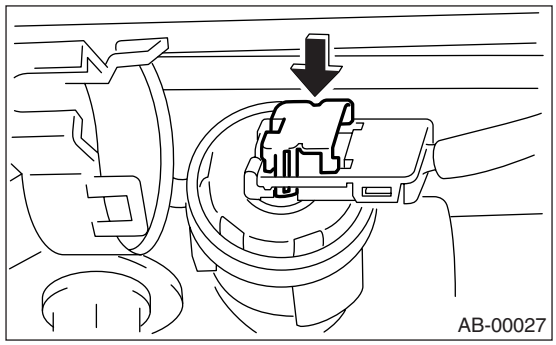
(2) Pull the connector to disconnect from lap seat belt pretensioner.


AB-00026

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until a connecting sound is heard.

CAUTION:
• Be sure to insert the connector in until it locks.
Then pull it gently to make sure that it is locked.
• Be sure to lock the push lock securely.


AB-00027

3. Inspection Locations After a Collision

A: REPLACEMENT

When airbag system is deployed, replace the following parts.

1. FRONT COLLISION

1) Driver's airbag module
2) Passenger's airbag module
3) Driver's seat belt (pretensioner, lap seat belt pretensioner)
4) Passenger's seat belt (pretensioner)
5) Airbag control module
6) Front sub-sensor
7) Roll connector

2. SIDE COLLISION

1) Airbag control module
2) Side airbag module (operating side seat bag)
3) Side airbag sensor (operating side)

3. INSPECTION OF OTHER PARTS

Check for the following parts, replace the damaged parts with new ones.
1) Steering wheel and steering shaft
Check the steering wheel and steering shaft for mounting condition and deflection of axial and radial direction. Check the steering shaft for deflection of axial direction with tilt lever released. (After a collision, absorbing part of steering shaft may inflate.)
2) Check the direct type connector of driver's airbag module, pretensioner, etc. for damage, and also check each harness for pinch and connector damage. If damage is found, replace the harness as a unit.

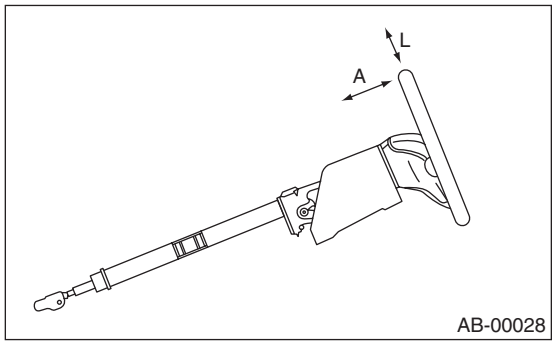
B: INSPECTION

If the vehicle is involved in a collision on any side, even if it is a slight collision, be sure to check the following system parts.

1. DRIVER'S AIRBAG MODULE

1) Check for the following, and replace damaged parts with new ones.
• Airbag module is cracked or deformed.
• Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
• The module surface is fouled with grease, oil, water or cleaning solvent.
2) When installing a new driver's airbag module, check the following. If necessary, install a new airbag module and steering wheel.
• The steering wheel is in the way, making it difficult to install the airbag module.
• The clearance between the driver's airbag module and steering wheel is not constant.
• The steering wheel deformation in axial and radial directions exceed limits.

Specifications:
Height deflection A
Less than 6 mm (0.24 in)
O.D. deflection L
Less than 17 mm (0.67 in)



2. PASSENGER'S AIRBAG MODULE

Check for the following, and replace damaged parts with new ones.
• Airbag module is cracked or deformed.
• Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
• Mounting bracket is cracked or deformed.

3. SIDE AIRBAG MODULE

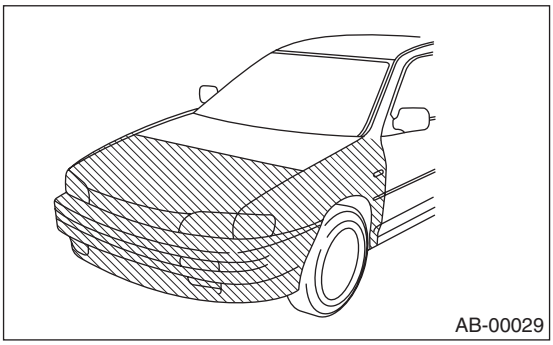
Check for the following, and replace damaged parts with new ones.
• Front seat is damaged or deformed.
• Harness and/or connector is cracked, deformed or open.
• Lead wire is exposed.

4. AIRBAG CONTROL MODULE

Check for the following, and replace damaged parts with new ones.
• Control module is cracked or deformed.
• Mounting bracket is cracked or deformed.
• Connector is scratched or deformed.
• Airbag is deployed.
• Side airbag is deployed.

5. FRONT SUB SENSOR

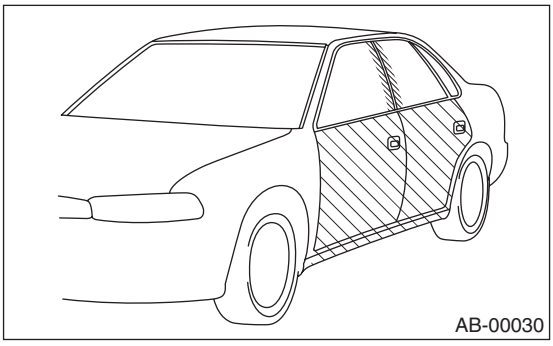
If the front section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new ones.
- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Airbag is deployed.

6. SIDE AIRBAG SENSOR

If the side section of vehicle as shown in the figure is damaged:



Check for the following, and replace damaged parts with new ones.
- Side airbag sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Side airbag is deployed. (operating side)

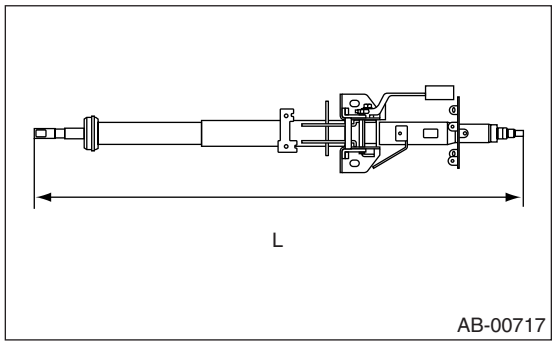
7. ROLL CONNECTOR

Check for the following, and replace damaged parts with new ones.
- Combination switch or steering roll connector is cracked or deformed.

8. STEERING SHAFT

Check for the following, and replace damaged parts with new ones.
- Overall length of steering column should be within specifications.

Specifications:
Overall length L
808.6±1.5 mm (31.83±0.06 in)



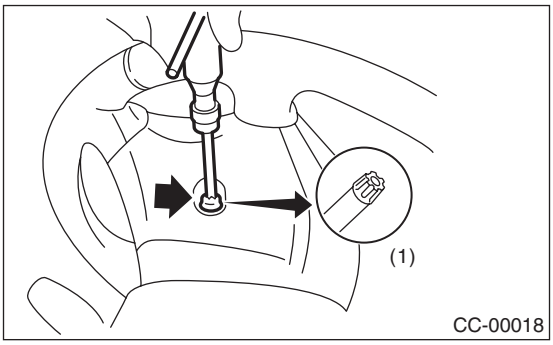
If necessary, replace it with a new part.

4. Driver's Airbag Module

A: REMOVAL

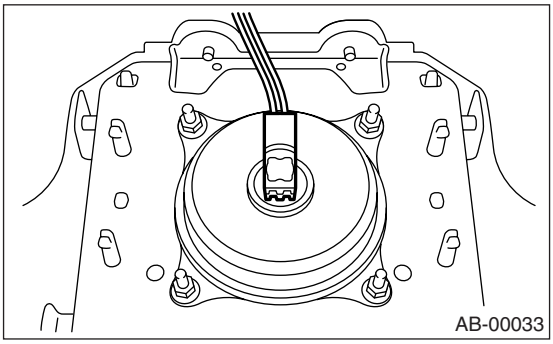
CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Position the front wheels straight ahead. (After moving the vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead).
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
4) Using the TORX® BIT T30, remove the two TORX® bolts on side of steering wheel.



(1) TORX® BIT T30

5) Disconnect the airbag connector on the back of airbag module, and then remove the airbag module.



6) Refer to "CAUTION" for handling of removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

Tightening torque:
Refer to "COMPONENT" in "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new ones.

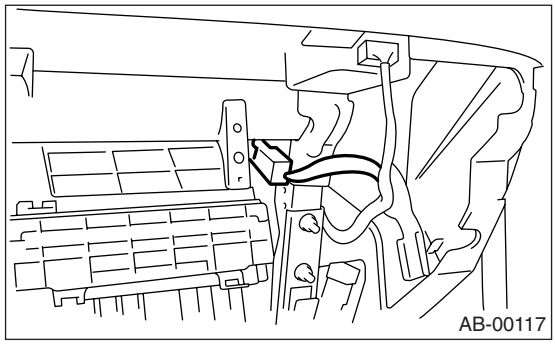
- Airbag module, harness, connector, and mounting bracket are damaged. <Ref. to AB-12, DRIVER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

5. Passenger's Airbag Module

A: REMOVAL

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the glove box. <Ref. to EI-37, REMOVAL, Glove Box.>
4) Detach the airbag connector from support beam bracket, and then disconnect the airbag connector.



5) Remove the three bolts, and then carefully remove the airbag module.
6) Refer to "CAUTION" for handling of removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Do not allow harness and connectors to interfere or get tangled up with other parts.

Tightening torque:
Refer to "COMPONENT" in "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

CAUTION:
Refer to "CAUTION" in General Description before handing the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new ones.

- Airbag module, harness, connector, and mounting bracket are damaged. <Ref. to AB-12, PASSENGER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

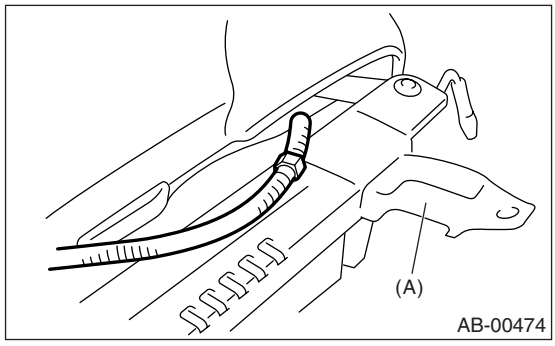
6. Side Airbag Module

A: REMOVAL

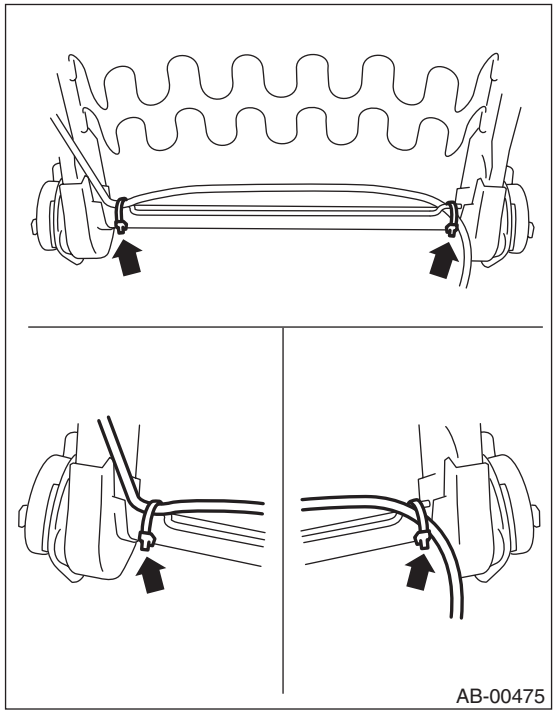
CAUTION:
Before working on the airbag module, refer to the "CAUTION" in General Description. <Ref. to AB-3, CAUTION, General Description.>

NOTE:
Remove the passenger's side by referring to driver's side.

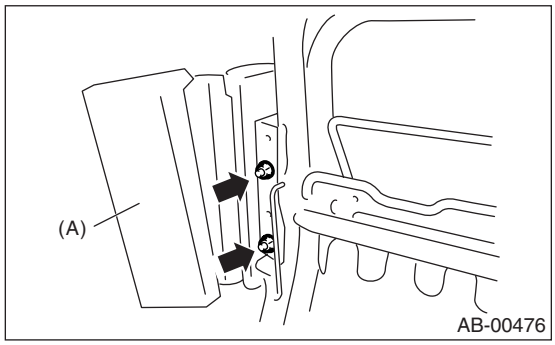
1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the front seat from the vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
4) Remove the clip from slide rail IN (A) and reverse side of seat cushion assembly, and then remove the side airbag harness.



5) Remove the backrest cover. <Ref. to SE-6, DISASSEMBLY, Front Seat.>
6) Remove the side airbag harness from backrest frame assembly.



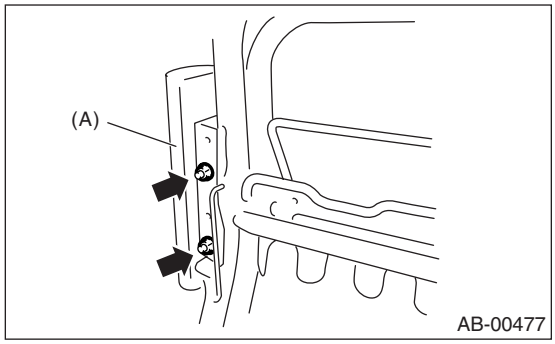
7) Remove the side airbag module (A) from backrest frame assembly.



B: INSTALLATION

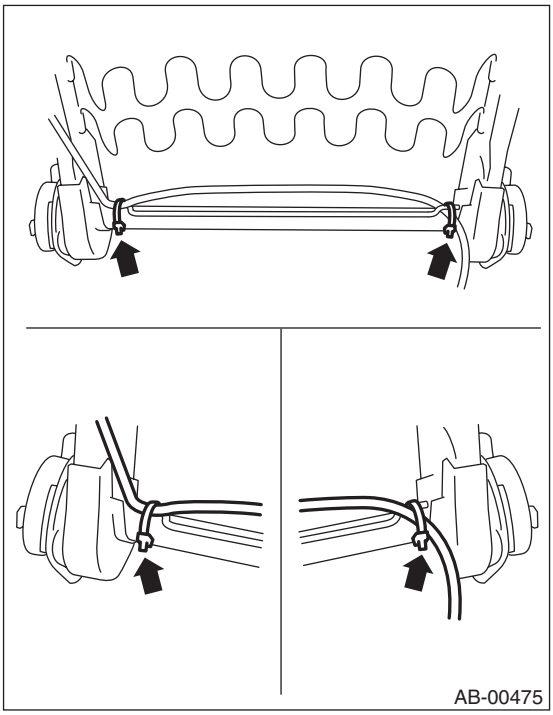
1) Ensure there are no foreign particles on side airbag module.
2) Install the side airbag module (A) to backrest frame assembly.

Tightening torque:
5.9 N·m (0.59 kgf-m, 4.4 ft-lb)



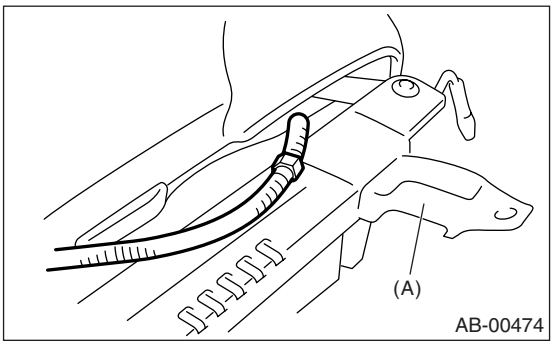
3) Install the side airbag harness to backrest frame assembly.

NOTE:
Secure the harness to its original position of seat.



4) Install the backrest cover. <Ref. to SE-11, ASSEMBLY, Front Seat.>

5) Install the side airbag harness to slide rail IN (A).



6) Recline the seat or slide it backward and forward. Check there is no contact between seat backrest assembly, cushion cover assembly and side airbag harness.

C: INSPECTION

CAUTION:
Before working on the airbag module, refer to the "CAUTION" in General Description. <Ref. to AB-3, CAUTION, General Description.>

Perform the inspection of following items, and replace the damaged parts with new ones. <Ref. to AB-12, SIDE AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

1) With side clash (when side airbag is deployed)

<Replacement parts>

- Side airbag module assembly
- Backrest pad assembly
- Backrest frame assembly
- Backrest cover assembly

<Other replacement parts, which found to be damaged by visual check>

- Headrest assembly
- Bushing
- Slide rail OUT
- Slide rail IN
- Seat hinge cover
- Seat lifter lever
- Reclining lever
- Side airbag harness and connector (body side)

2) With side clash (when side airbag is not deployed)

Check the seat and airbag module visually, and then replace them with new ones if damaged or cracked.

Specially inspect the damage of airbag module body, installing bracket, harness connector.

3) Without side clash (dirt and damage of cover)

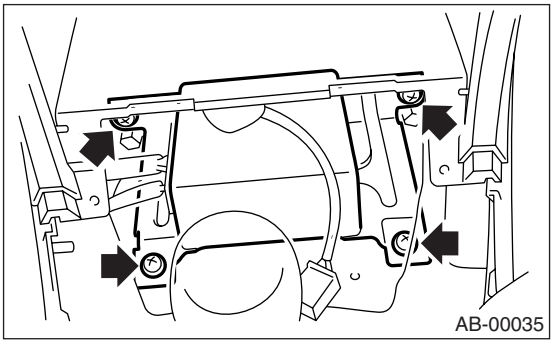
Replace the corresponding part with a new one.

7. Airbag Control Module

A: REMOVAL

CAUTION:
• Do not disassemble the airbag control module.
• If the airbag control module is deformed or if water damage is suspected, replace the airbag control module with a new part.
• Do not drop the airbag control module.
• After removal, keep the airbag control module on a dry, clean surface away from moisture, heat, and dust.

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the console cover. <Ref. to EI-39, REMOVAL, Console Box.>
4) Remove the center console panel. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
5) Disconnect the connector from airbag control module.
6) Remove the four bolts, and then remove the airbag control module.



B: INSTALLATION

CAUTION:
Use new bolts (for airbag control module only) during reassembly.

Install in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" in "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

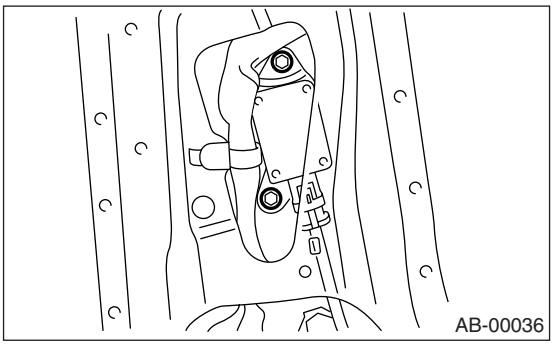
C: INSPECTION

Check for the following, and replace damaged parts with new ones.
• Control module, connector, and mounting bracket are damaged.
• Airbag is deployed.
• Side airbag is deployed.

8. Side Airbag Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the outer belt (FRONT). <Ref. to SB-10, FRONT OUTER BELT, REMOVAL, Front Seat Belt.>
4) Detach the side airbag sensor, and then disconnect the airbag connector.



B: INSTALLATION

CAUTION:
Use new M6 nuts when reassembling.

Install in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" in "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

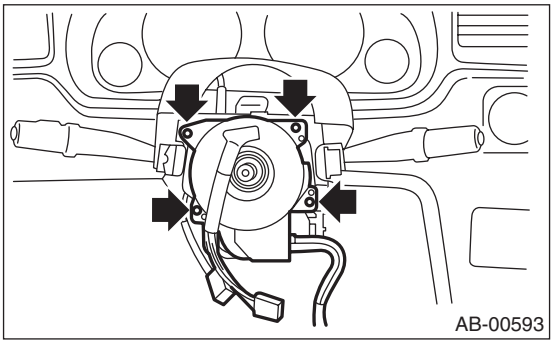
Check for the following, and replace damaged parts with new parts.

- Bracket connector for side airbag sensor is damaged.
- Side airbag is deployed.

9. Roll Connector

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>
4) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
5) Remove the steering column cover.
6) Remove the screws, and then remove the roll connector.



B: INSTALLATION

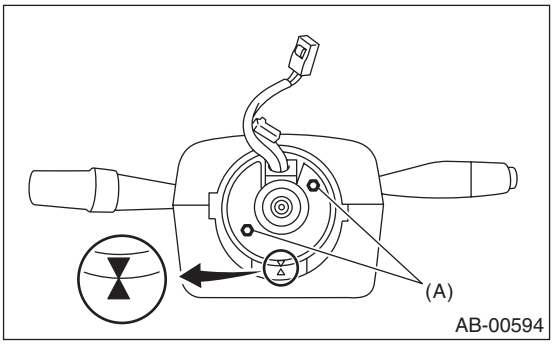
1) Install in the reverse order of removal.
2) Before installing the steering wheel, be sure the direction of roll connector is adjusted with steering. <Ref. to AB-20, ADJUSTMENT, ROLL CONNECTOR.>

C: INSPECTION

Check for the following, and replace damaged parts with new parts.
• Combination switch and roll connector are cracked or deformed.

D: ADJUSTMENT

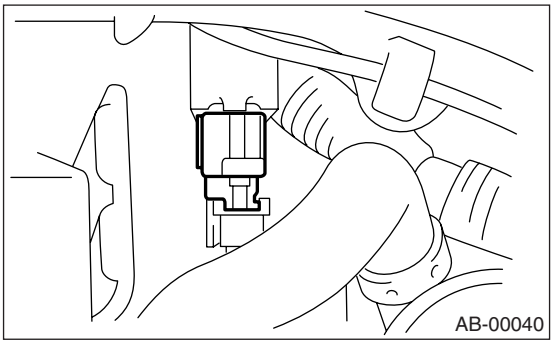
1) Check that the front wheels are positioned in straight ahead direction.
2) Turn the roll connector pin (A) clockwise until it stops.
3) Turn the roll connector pin (A) counterclockwise approx. 3.25 turns until "▲" marks are aligned.



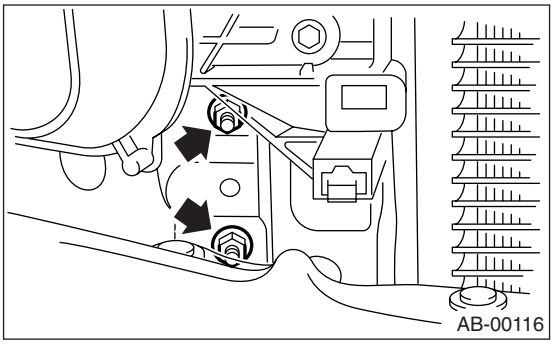
10.Front Sub Sensor

A: REMOVAL

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
3) Remove the front grille and front grille side. <Ref. to EI-18, REMOVAL, Front Grille.>
4) Disconnect the connector from front sub sensor.



5) Loosen the nut, and then detach the front sub sensor.



B: INSTALLATION

CAUTION:
Use new nuts when reassembling.

Install in the reverse order of removal.

Tightening torque:
Refer to "COMPONENT" in "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Front sub sensor, mounting bracket, and connector are damaged.
- Airbag is deployed.

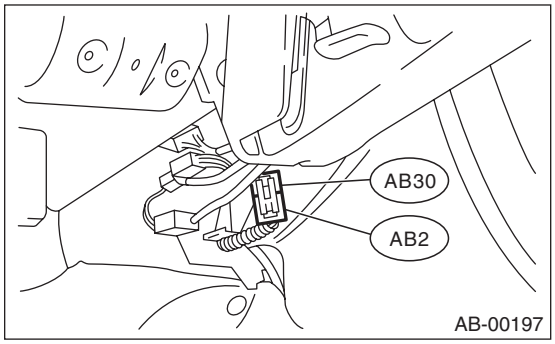
11. Airbag Module Disposal (Deployment Processing On Vehicle)

A: OPERATION

CAUTION:
• Do not discard an undeployed airbag modules because it may cause a serious personal injury when accidentally deployed.
• As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove the airbag modules unless necessary.
• Deployment of the airbag module should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
• Deploying the airbag module causes a high explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
• Some smoke will be emitted from deployment of the airbag module. Therefore, it must be deployed in a well-ventilated place with no smoke detector nearby.
• Wear protective gloves, safety goggles and earplugs during this operation. Wash your hands afterwards.
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.
• Wrap the deployed airbag module in an airtight vinyl bag, and discard it.
• If circumstances do not permit the airbag module deployment, contact the SUBARU dealer.

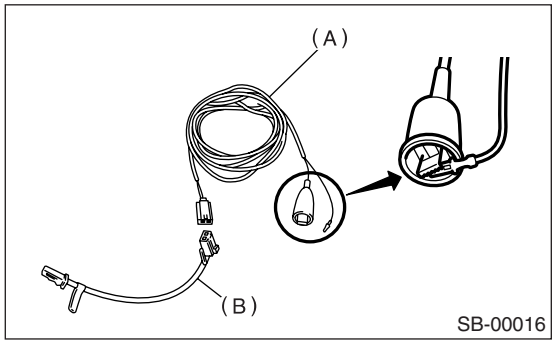
1. DRIVER'S AIRBAG MODULE

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
3) Remove the lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
4) Disconnect the airbag connector (AB30) and (AB2) below steering column.



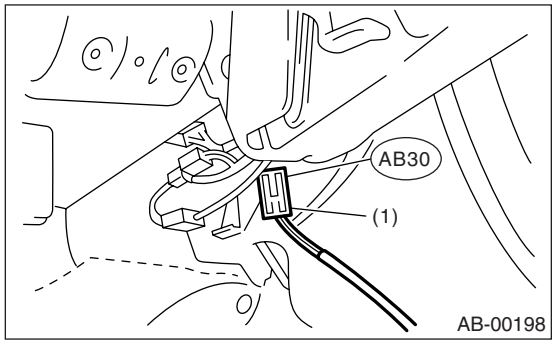
5) Short the terminal to alligator clip furnished as deployment tool (A).
6) Connect the deployment tool and deployment adapter A (B).

CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of airbag module.



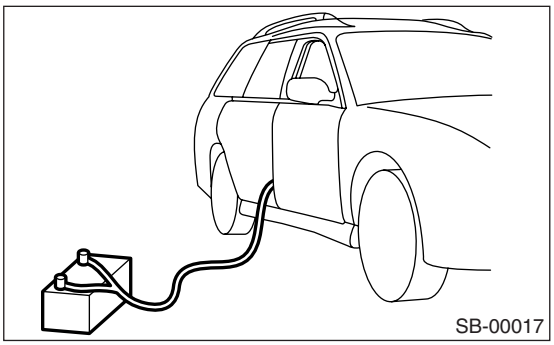
(A) Deployment tool:
(Tool number 98299PA030)
(B) Deployment adapter A:
(Tool number 98299SA030)

7) Connect the deployment adapter A to airbag connector (AB30).

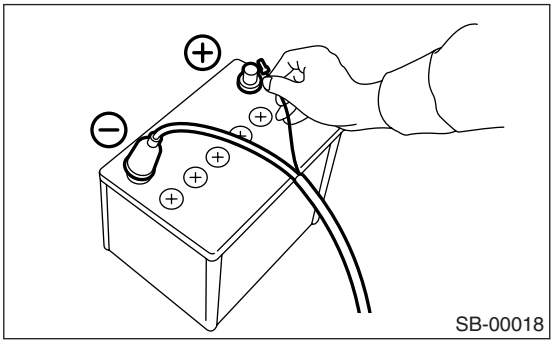


(1) Deployment adapter A:
(Tool number 98299SA030)

8) Extend the wiring of deployment tool to the limit, and make sure that the vehicle is empty. Close all the windows, sunroof and rear gate completely.

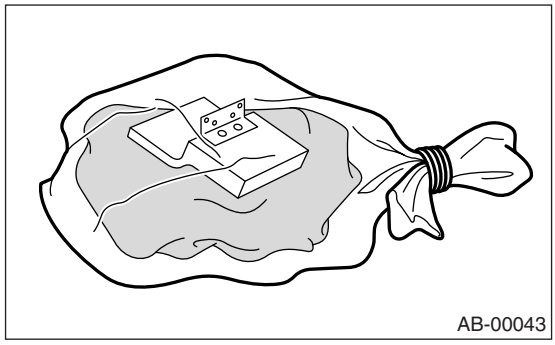

SB-00017

9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.
10) Connect the other cable of deployment tool to the battery positive (+) terminal, and deploy the airbag module.


SB-00018

CAUTION:
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

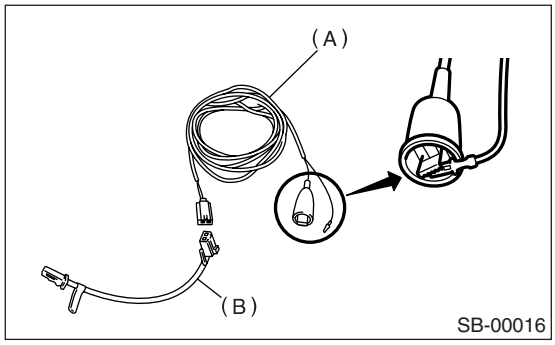
11) Remove the airbag module. <Ref. to AB-14, Driver's Airbag Module.>
12) Wrap the deployed airbag module in airtight vinyl bag, and discard it.


AB-00043

2. PASSENGER'S AIRBAG MODULE

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
3) Remove the glove box.
4) Disconnect the airbag connectors (AB4) and (AB27).
5) Short the terminal to alligator clip furnished as deployment tool (A)
6) Connect the deployment tool (A) and deployment adapter E (B).

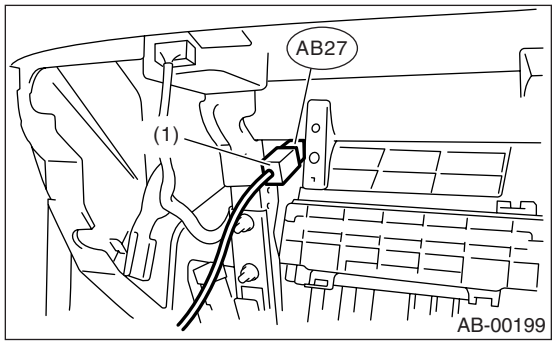
CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of airbag module.



SB-00016

(A) Deployment tool:
(Tool number 98299PA030)
(B) Deployment adapter E:
(Tool number 98299SA030)

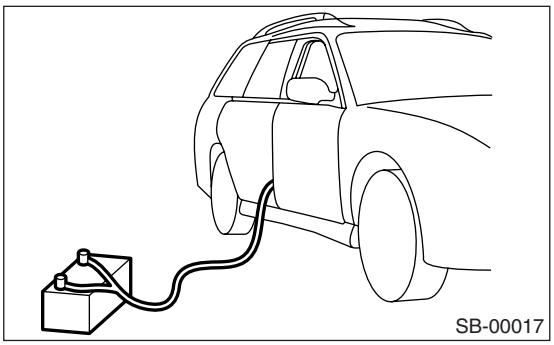
7) Connect the deployment adapter E to the airbag connector (AB27).



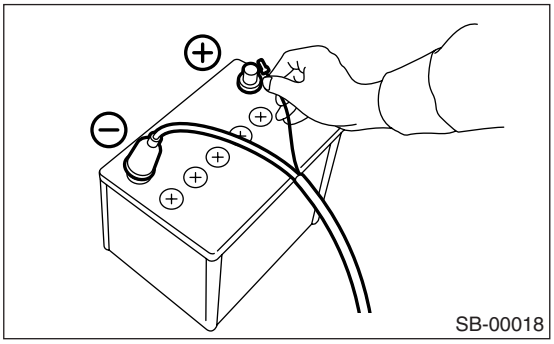
AB-00199

(1) Deployment adapter E:
(Tool number 98299SA030)

8) Extend the wiring of deployment tool to the limit, and make sure that the vehicle is empty. Close all the windows, sunroof and rear gate completely.

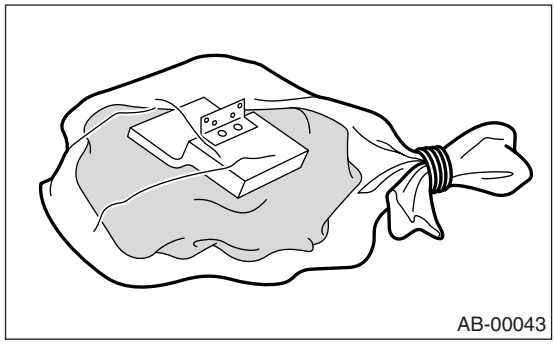

SB-00017

9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.
10) Connect the other cable of deployment tool to the battery positive (+) terminal, and deploy the airbag module.


SB-00018

CAUTION:
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

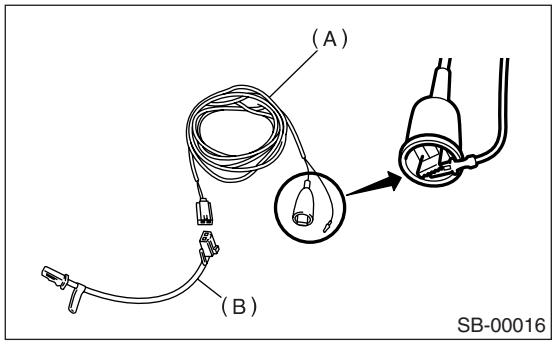
11) Remove the airbag module. <Ref. to AB-15, Passenger's Airbag Module.>
12) Wrap the airbag module in an airtight vinyl bag, and discard it.


AB-00043

3. SIDE AIRBAG MODULE

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
3) Disconnect the side airbag module connector (yellow) under the front seat cushion.
4) Set the backrest at most standing position, and then set the seat position at center of slide rail.
5) Short the terminal to alligator clip furnished as deployment tool (A)
6) Connect the deployment tool and deployment adapter A (B).

CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of airbag module.

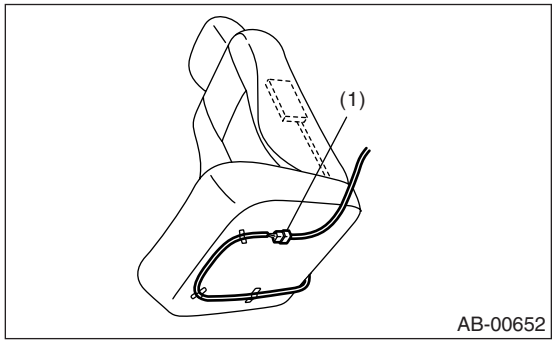


SB-00016

(A) Deployment tool:
(Tool number 98299PA030)
(B) Deployment adapter A:
(Tool number 98299FC030)

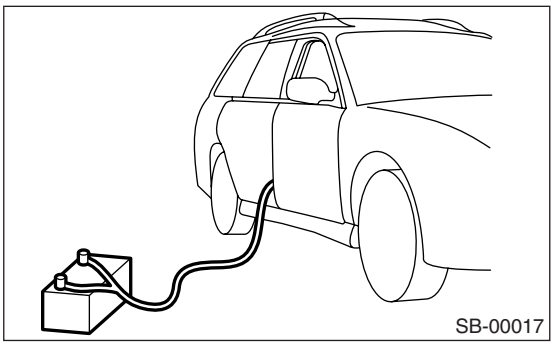
7) Connect the deployment adapter A (1) to the side airbag module connector (yellow).

CAUTION:
• Do not place any object on front seat.
• Deploy the side airbag one by one to discard it.

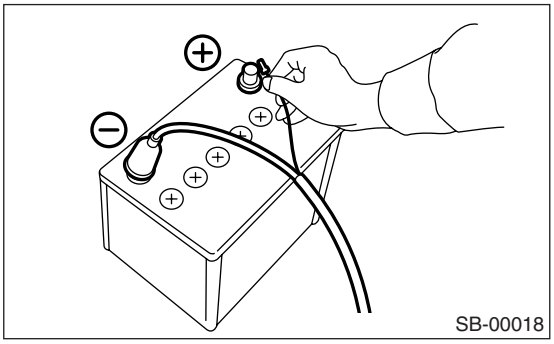


AB-00652

8) Extend the wiring of deployment tool to the limit, and make sure that the vehicle is empty. Close all the windows, sunroof and rear gate completely.

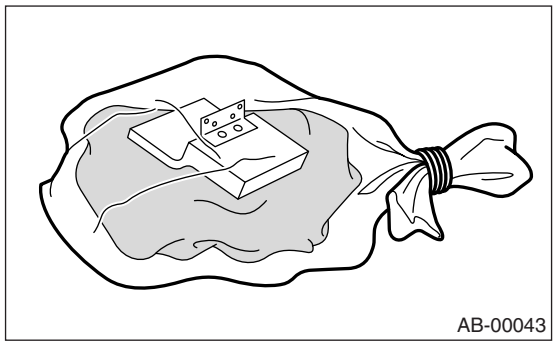

SB-00017

9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.
10) Connect the other cable of deployment tool to the battery positive (+) terminal, and deploy the airbag module.


SB-00018

CAUTION:
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

11) Remove the side airbag module. <Ref. to AB-16, REMOVAL, Side Airbag Module.>
12) Wrap the deployed airbag module in airtight vinyl bag, and discard it.


AB-00043

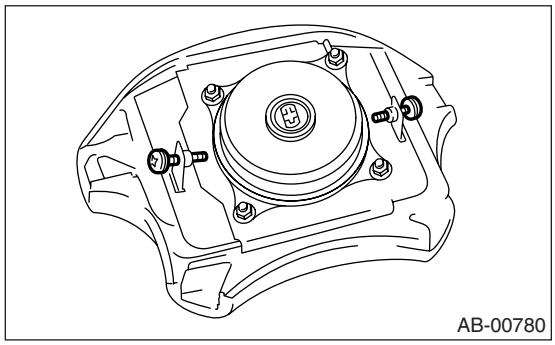
12. Airbag Module Disposal (Deployment Processing After Removal from Vehicle)

A: OPERATION

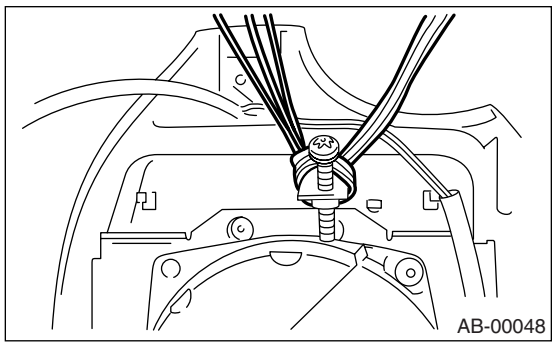
CAUTION:
• Do not discard an undeployed airbag module because it may cause serious personal injury when accidentally deployed.
• As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove the airbag modules unless necessary.
• Deployment of the airbag module should be done on a flat place free from any possible danger. Avoid deploying outdoors during rainy or windy weather.
• Do not damage the airbag module or drop it.
• Deploying the airbag module causes a high explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
• Some smoke will be emitted from deployment of the airbag module. Therefore, it must be deployed in a well ventilated place with no smoke detector nearby.
• Wear protective gloves, safety goggles and earplugs during this operation. Wash your hands afterwards.
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.
• Wrap the deployed airbag module in an airtight vinyl bag, and discard it.
• If circumstances do not permit the airbag module deployment, contact the SUBARU dealer.

1. DRIVER'S AIRBAG MODULE

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
3) Remove the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>
4) Install the removed bolts to airbag module.

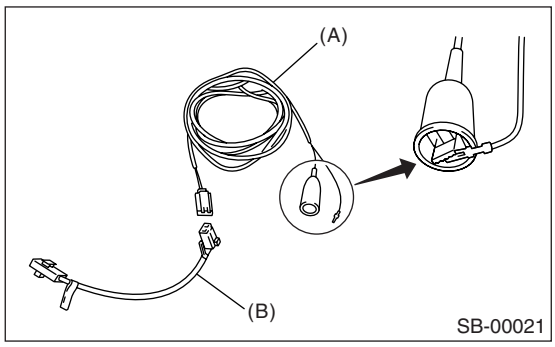

AB-00780

5) Bundle three automotive wiring harnesses [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and bind them twofold around airbag module stay.


AB-00048

6) Short the terminal to alligator clip furnished as deployment tool (A).
7) Connect the deployment tool and deployment adapter D (B).

CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of airbag module.

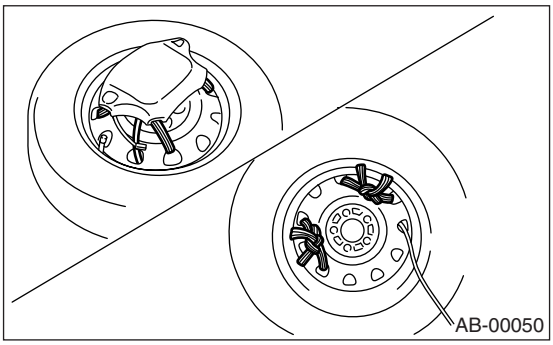


SB-00021

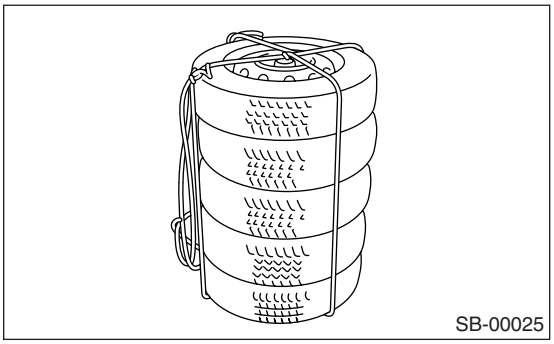
(A) Deployment tool:
(Tool number 98299PA030)
(B) Deployment adapter D:
(Tool number 98299SA010)

8) Connect the deployment adapter D connector to airbag module.

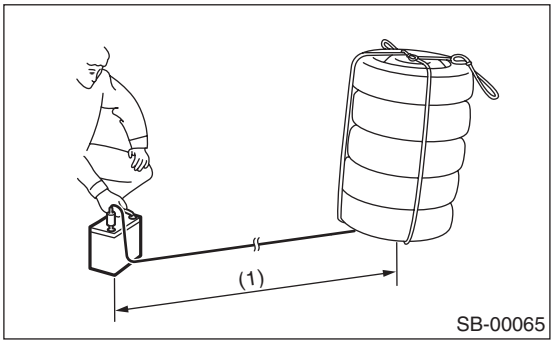
9) Install the airbag module with pad side facing upward on a wheel with tire.



10) Put three tires without wheels on the tire installed with the airbag module. Put on an additional tire with a wheel, and then fasten them tight with a rope.

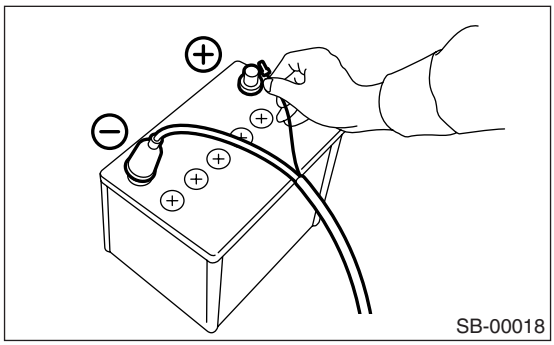


11) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



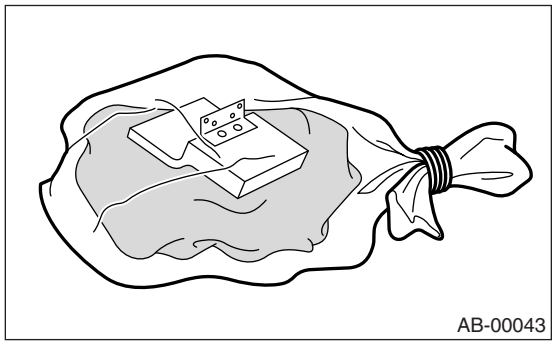
(1) 5 m (16 ft) or more

12) Connect the other cable of deployment tool to the battery positive (+) terminal, and deploy the airbag module.



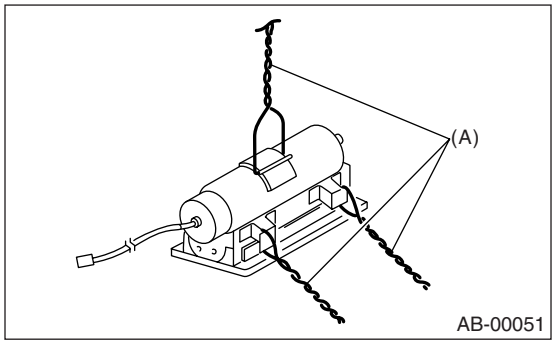
CAUTION:
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

13) Wrap the deployed airbag module in airtight vinyl bag, and discard it.



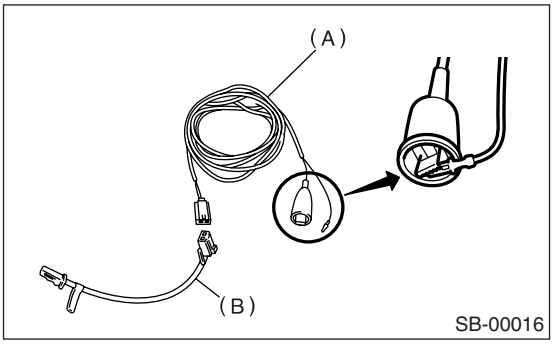
2. PASSENGER'S AIRBAG MODULE

1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
3) Remove the passenger airbag module. <Ref. to AB-15, Passenger's Airbag Module.>
4) Bundle three automotive wiring harnesses [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], route them through airbag module bracket (A). Then, twist them to add strength.



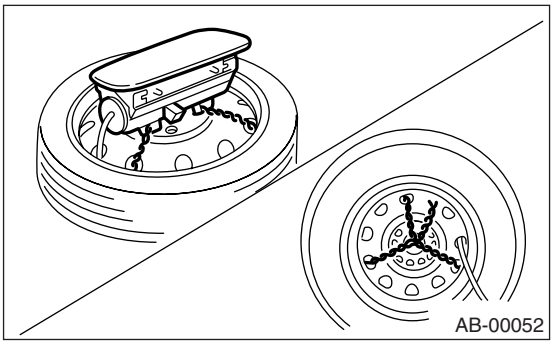
5) Short the terminal to alligator clip furnished as deployment tool (A)
6) Connect the deployment tool and deployment adapter E (B).

CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of airbag module.

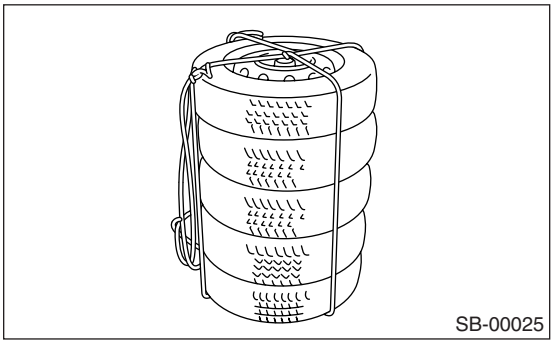


(A) Deployment tool:
(Tool number 98299PA030)
(B) Deployment adapter E:
(Tool number 98299SA030)

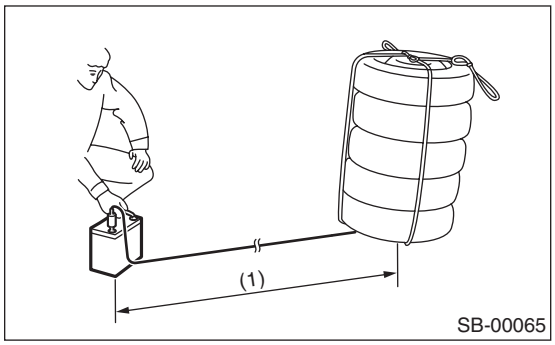
7) Connect the deployment adapter E connector to the airbag module.
8) Install the airbag module with opening side facing upward on 14-inch or greater size wheel with tire.



9) Put three tires without wheels on the tire installed with the airbag module. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.

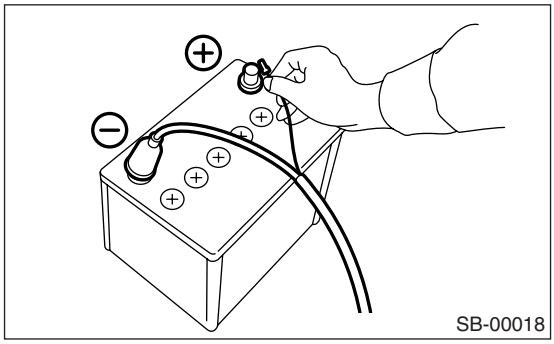


10) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



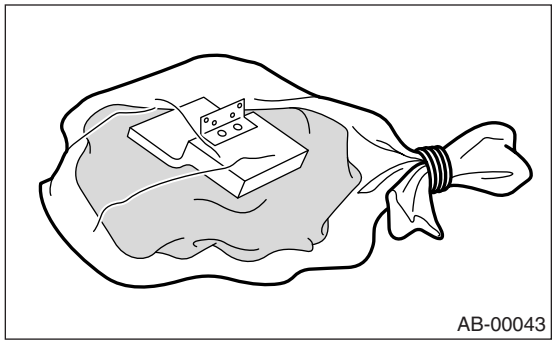
(1) 5 m (16 ft) or more

11) Connect the other cable of deployment tool to the battery positive (+) terminal, and deploy the airbag module.



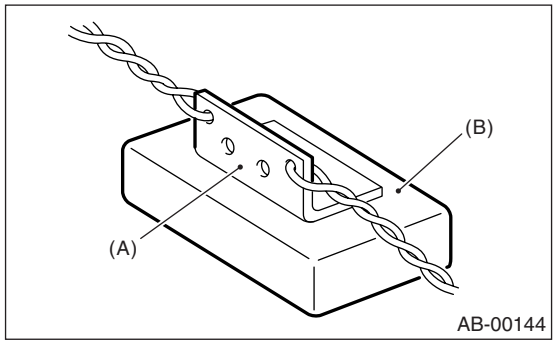
CAUTION:
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and then discard it.
• Do not let water get on the deployed airbag module.

12) Wrap the deployed airbag module in airtight vinyl bag, and discard it.



3. SIDE AIRBAG MODULE

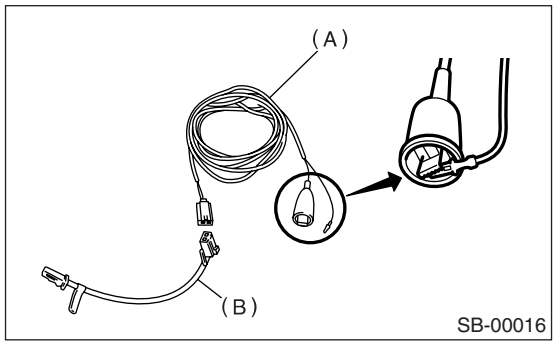
1) Turn the ignition switch to OFF.
2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
3) Remove the front seats. <Ref. to SE-6, REMOVAL, Front Seat.>
4) Remove the side airbag module. <Ref. to AB-16, REMOVAL, Side Airbag Module.>
5) Bundle three automotive wiring harnesses [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and then bind them through the holes in airbag module bracket.



(A) Airbag module bracket
(B) Side airbag module

6) Short the terminal to alligator clip furnished as deployment tool (A)
7) Connect the deployment tool and deployment adapter A (B).

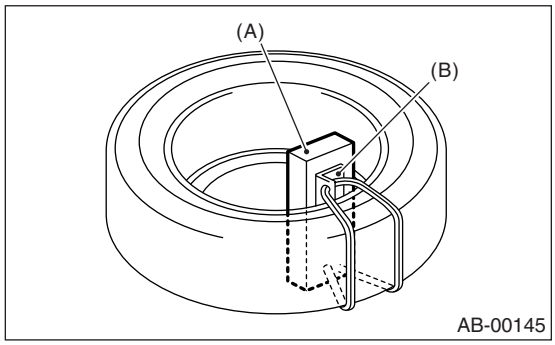
CAUTION:
The deployment tool should be kept shorted terminals until just before deployment of airbag module.



(A) Deployment tool:
(Tool number 98299PA030)
(B) Deployment adapter A:
(Tool number 98299FC030)

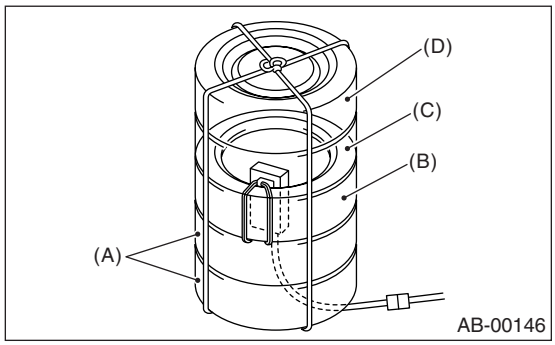
8) Connect the deployment adapter A connector to the airbag module.

9) Install the airbag module on 14-inch or greater size tire without wheel.

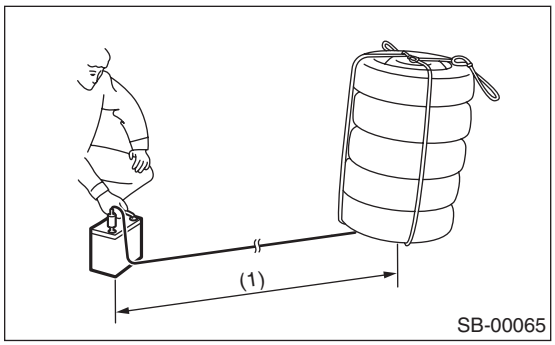


(A) Pad
(B) Airbag module bracket

10) Put two tires without wheels (A) under the tire installed with the side airbag module (B). Put on an additional tire without a wheel (C), and then put a tire with a wheel (D) on top. Fasten them tight with a rope.

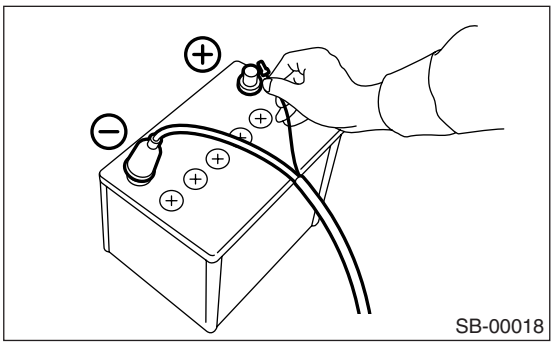


11) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (–) terminal.



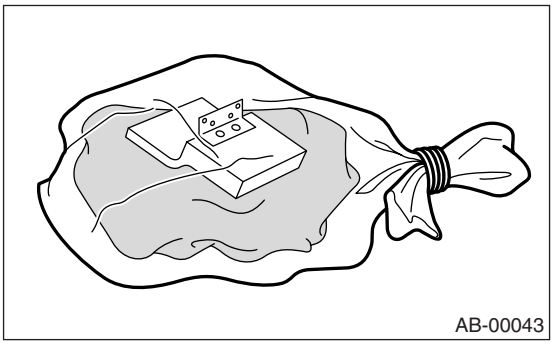
(1) 5 m (16 ft) or more

12) Connect the other cable of deployment tool to the battery positive (+) terminal, and deploy the airbag module.



CAUTION:
• After deployment, the airbag module will be especially hot, leave it unattended for 40 minutes, and discard it.
• Do not let water get on the deployed airbag module.

13) Wrap the deployed airbag module in airtight vinyl bag, and discard it.



AIRBAG SYSTEM (DIAGNOSTICS)

AB(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**READ DTC.** <Ref. to AB(diag)-26, Read Diagnostic Trouble Code (DTC).>	Is the normal code detected?	Finish the diagnostic.	Go to step **2.**
2	**READ DTC.** <Ref. to AB(diag)-26, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Go to step **3.**	Replace the airbag warning light. <Ref. to AB(diag)-29, Airbag Warning Light Failure.>
3	**PERFORM THE DIAGNOSTIC.** 1) Judge the possible cause from “List of Diagnostic Trouble Code (DCT)” <Ref. to AB(diag)-39, List of Diagnostic Trouble Code (DTC).> 2) Inspect using “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. 3) Repair the cause of the trouble. 4) Perform the clear memory mode. <Ref. to AB(diag)-28, Clear Memory Mode.> 5) Perform the inspection mode. <Ref. to AB(diag)-27, Inspection Mode.> 6) Read any DTC again.	Is DTC displayed?	Perform the procedure 1) to 5) in step 3.	Finish the diagnostic.

2. Check List for Interview

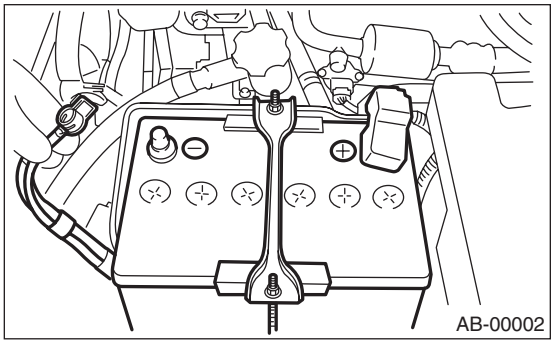
A: CHECK

Customer's Name		Inspector's Name	
Date Vehicle Brought In	/ /	Registration No.	
Odometer Reading	km miles	VIN	
Date Problem Occurred	/ /	Registration Year	/ /
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Other:		
Temperature	°C (°F)		
Road Condition	❑ Level road ❑ Uphill ❑ Downhill ❑ Rough road ❑ Others:		
Vehicle Operation	❑ Starting ❑ Idling ❑ Driving (❑ Constant speed ❑ Acceleration ❑ Deceleration ❑ Steering wheel turn ❑ Others:)		
Details of Problem			
Check Airbag Warning Light	❑ Normal (After turning the ignition switch to ON, lit for 7 seconds and goes off.) ❑ Remains ON ❑ Remains OFF		
Check DTC	❑ Normal Code ❑ DTC: (Code:)		

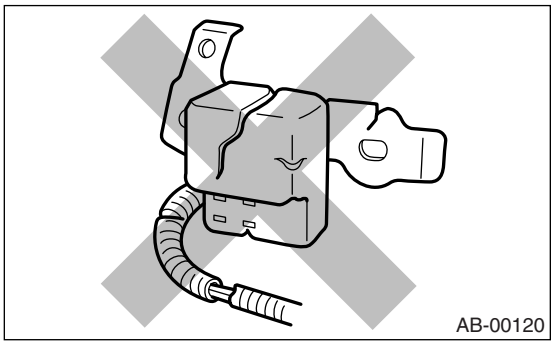
3. General Description

A: CAUTION

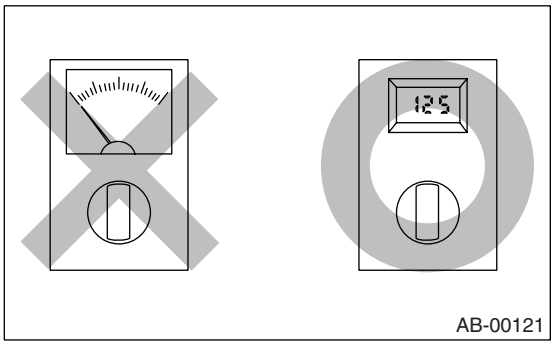
• When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
• The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.



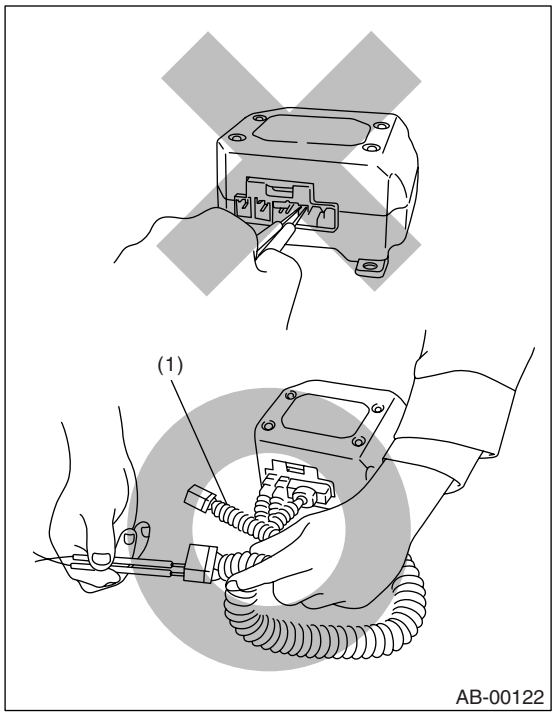
• If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.



• Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.
• When checking the system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously.

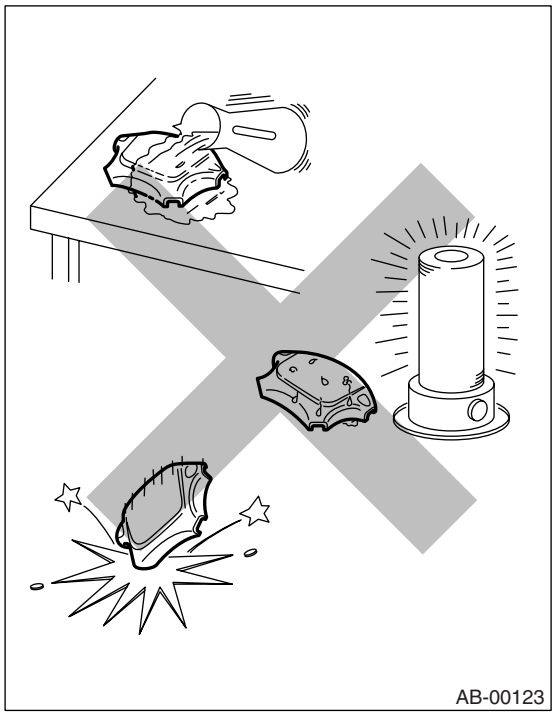


• When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.

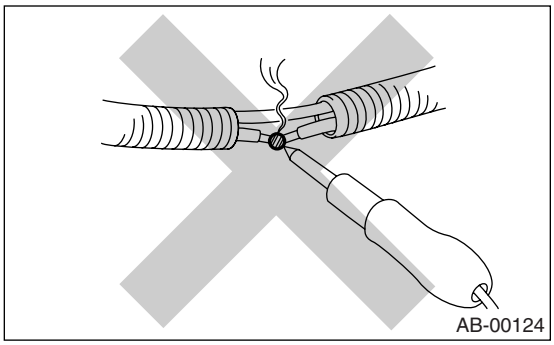


(1) Test harness

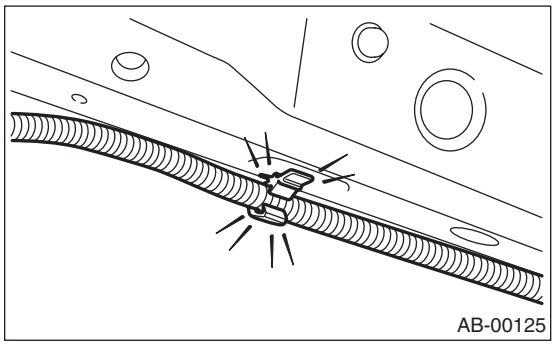
• Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



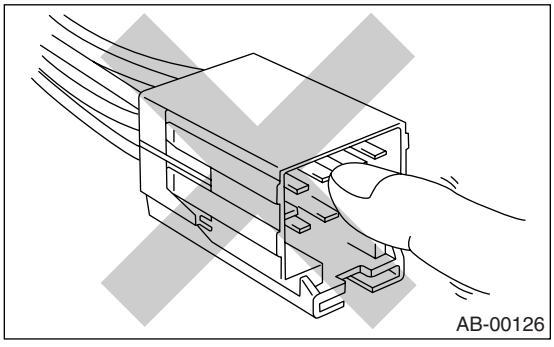
• If any damage, opening or rust is found on the airbag system wiring harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



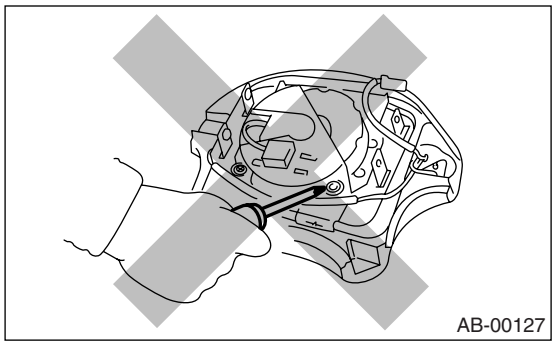
• Install the wiring harness securely with the specified clips to avoid interference or tangled up with other parts.



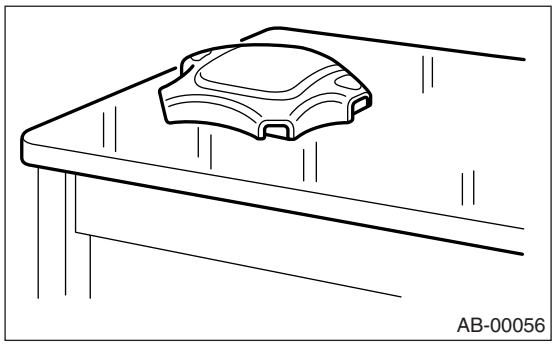
• Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



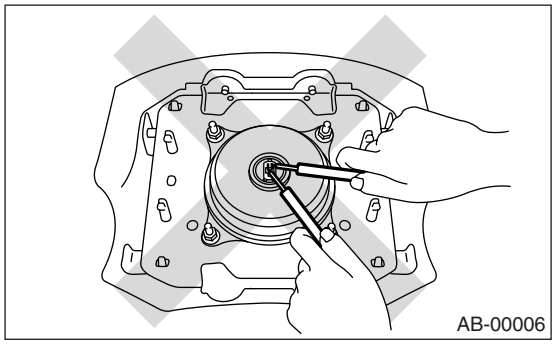
• Either of the airbag modules for driver, passenger or side or pretensioner must not be disassembled.



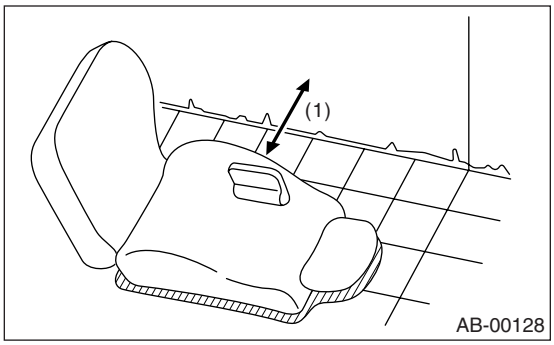
• The airbag module cannot be used again once inflated.
• After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.



• Do not check continuity of either of the airbag modules for driver, passenger or side or pretensioner.

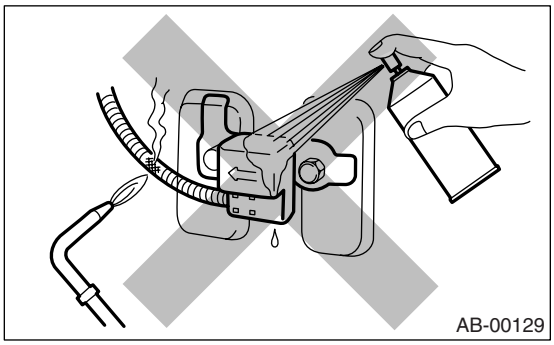


• The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



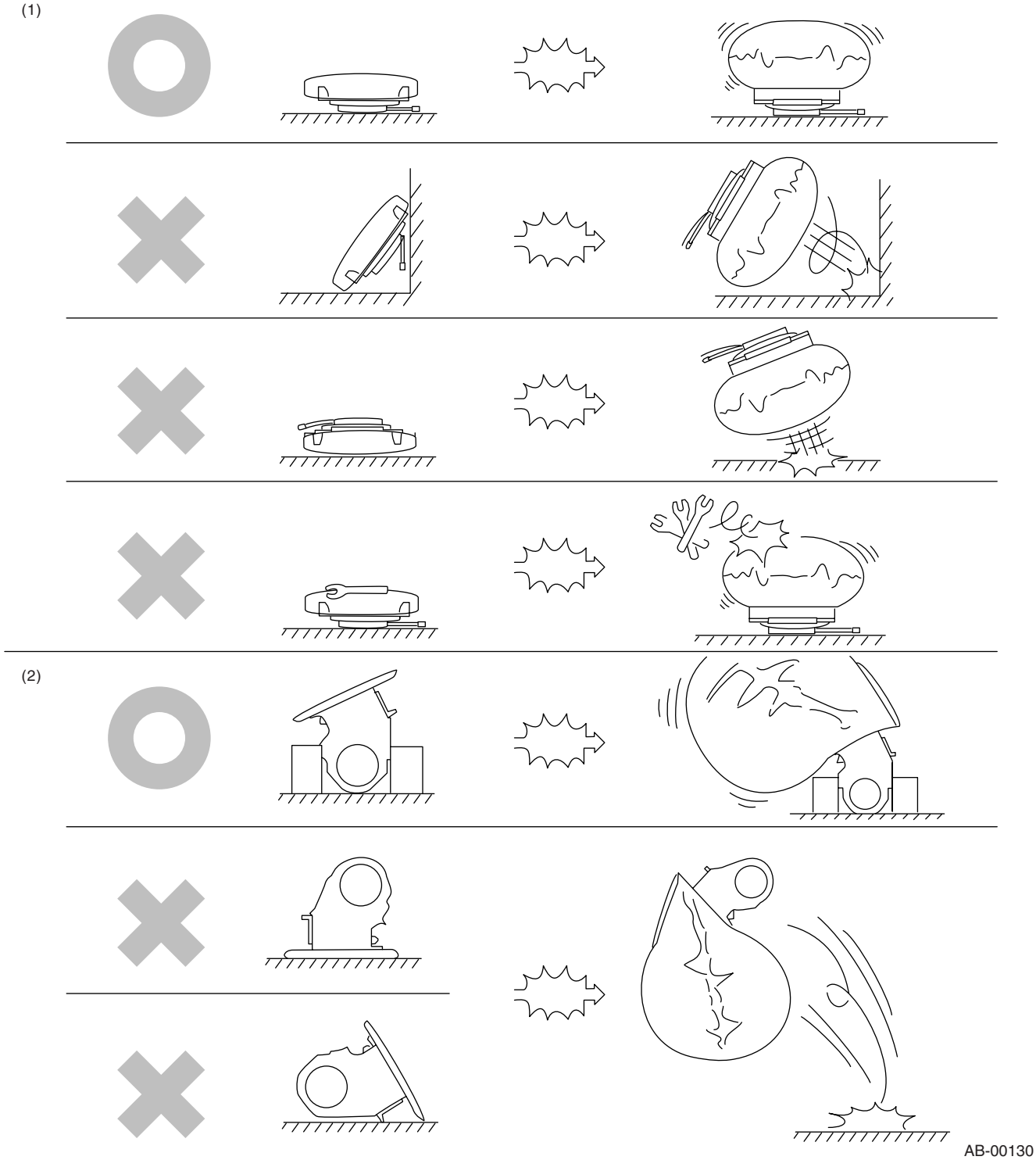
(1) More than 200 mm (8 in)

• When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.
• When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar and front and rear doors, remove the side airbag sensors and wiring harness of the airbag system.



• Do not discard undeployed airbag modules. They could easily cause a serious accident if accidentally deployed.

• When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.



(1) Driver side airbag module (2) Passenger side airbag module

B: INSPECTION

Before diagnosing, check the following items that might be related to the engine problem:

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:

12 V

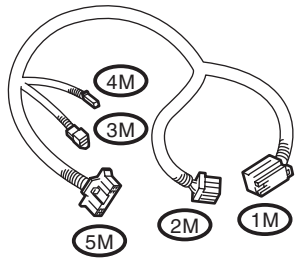
Specific gravity:

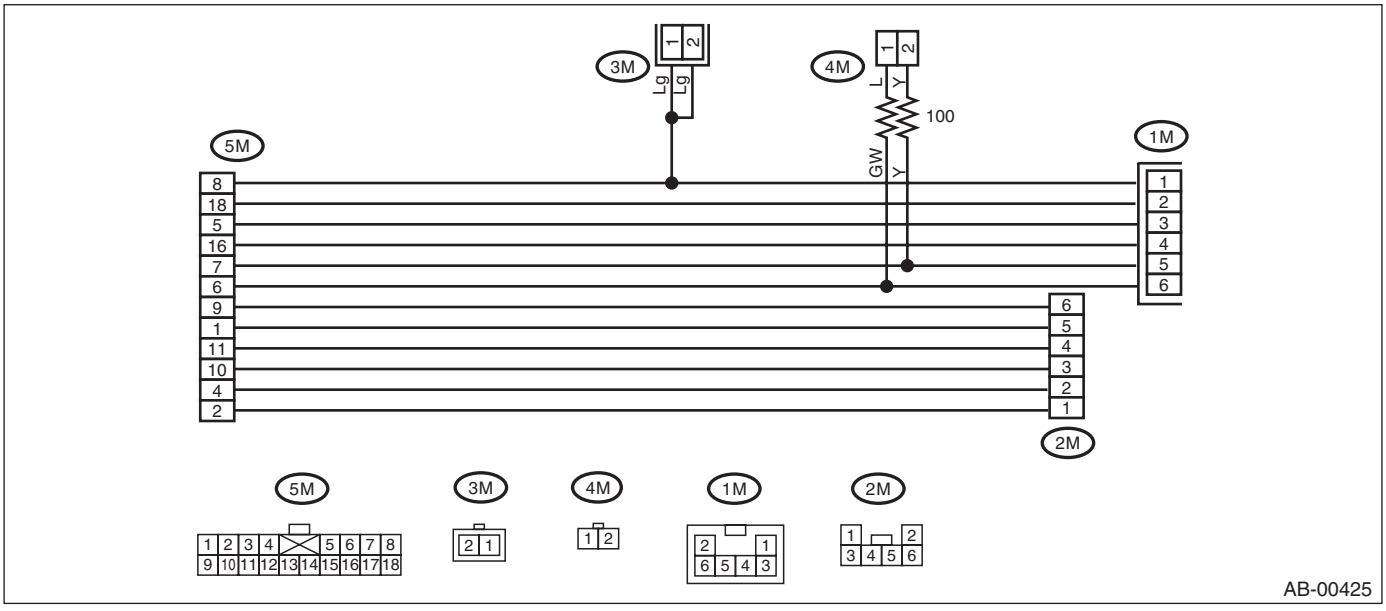
Above 1.260

C: PREPARATION TOOL

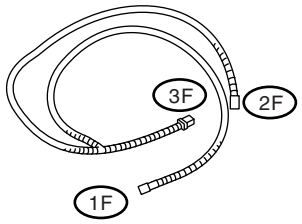
1. SPECIAL TOOL

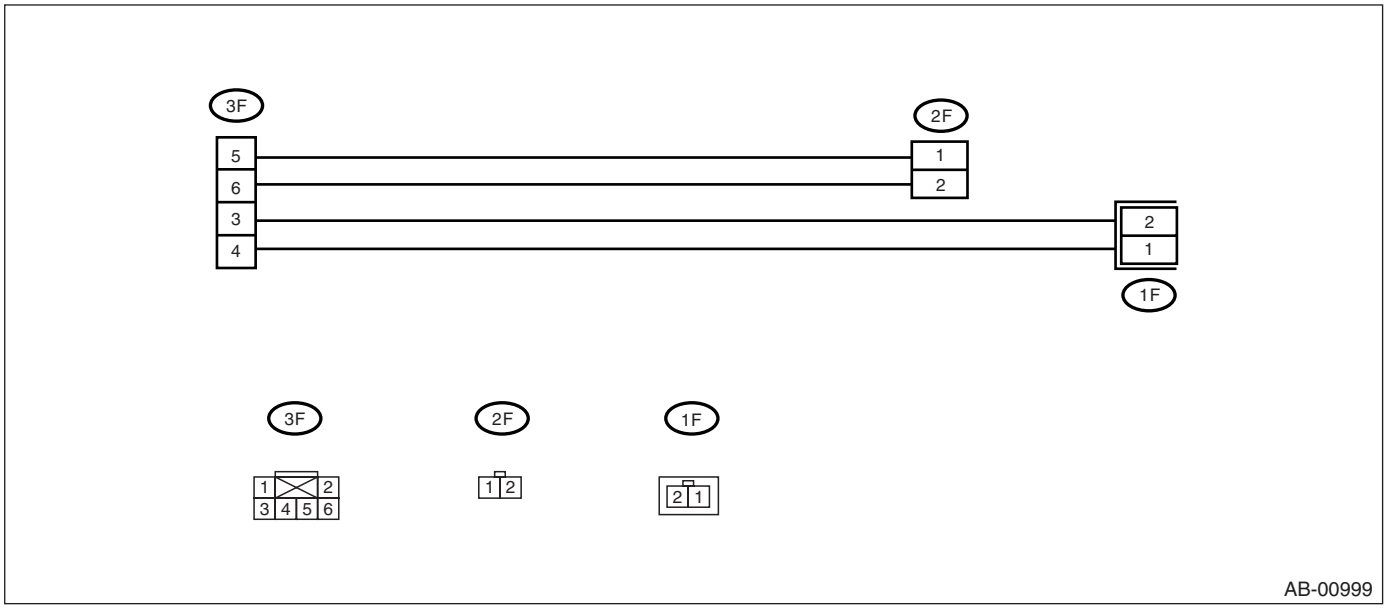
- TEST HARNESS M

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FE020	98299FE020	TEST HARNESS M	• Used when measuring voltage, resistance of airbag system. • Used with test harness T (98299SA060).

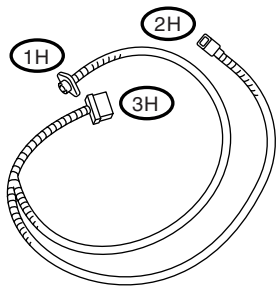


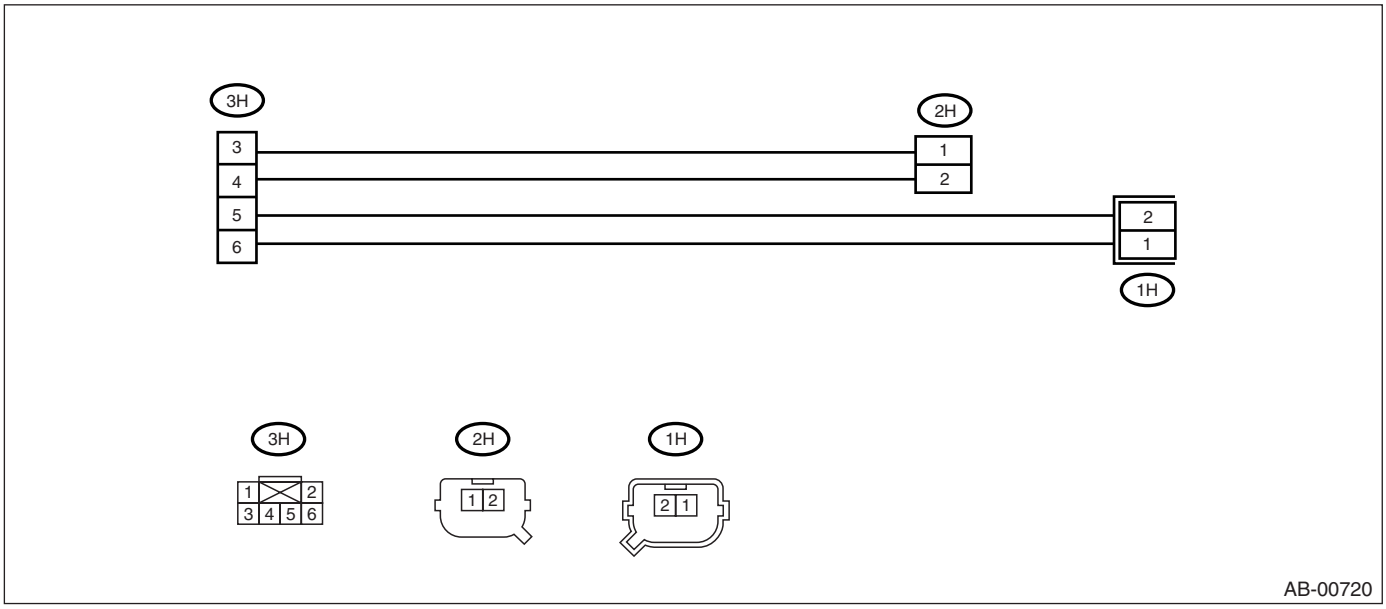
- TEST HARNESS F

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FC010	98299FC010	TEST HARNESS F	Used when measuring voltage, resistance of air-bag module harness.

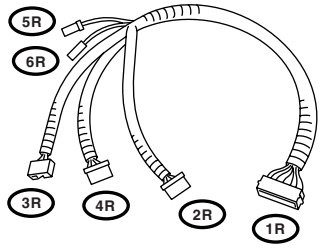


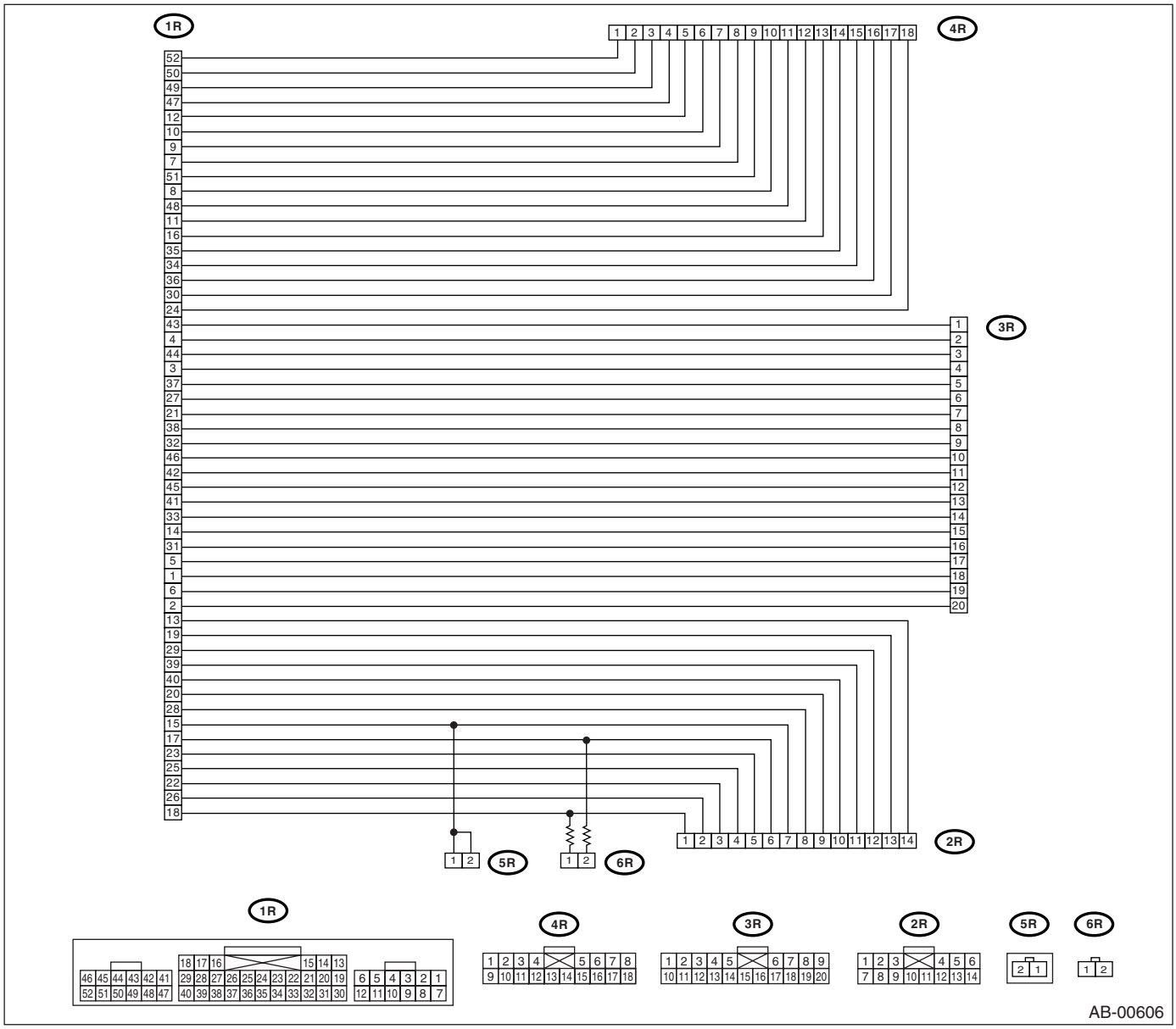
- TEST HARNESS H

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FA030	98299FA030	TEST HARNESS H	Used when measuring voltage, resistance of front sub-sensor.

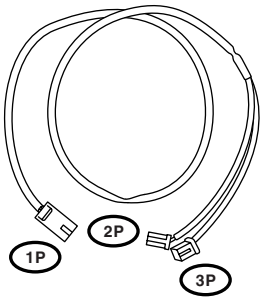


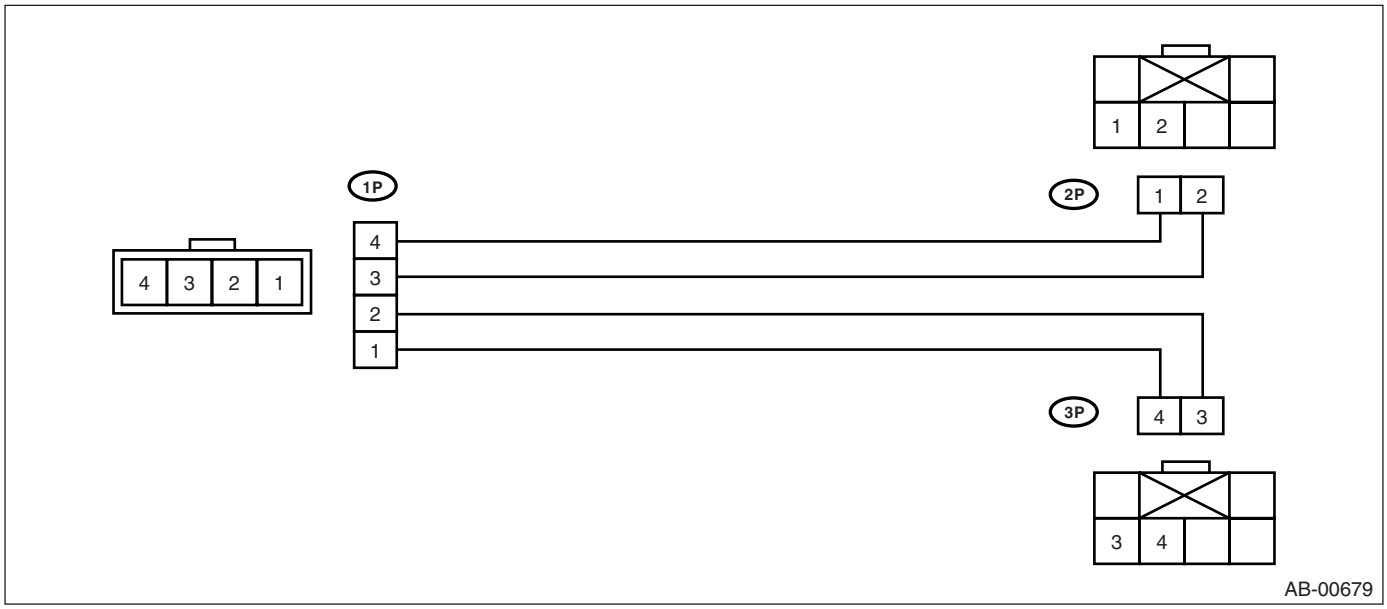
- TEST HARNESS R

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299FE030	98299FE030	TEST HARNESS R	Used when measuring voltage, resistance of air-bag control module.

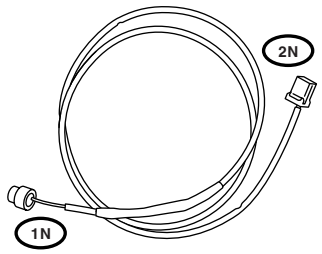


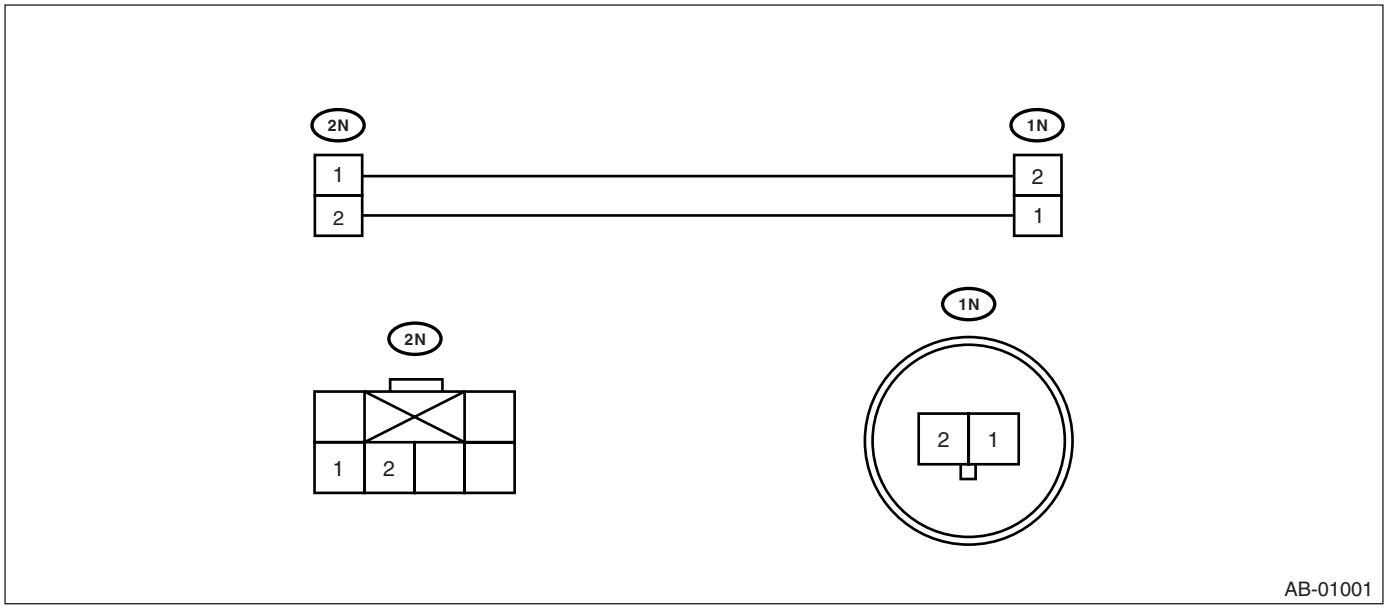
- TEST HARNESS P

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA020	98299SA020	TEST HARNESS P	Used when measuring voltage, resistance of passenger airbag module harness.

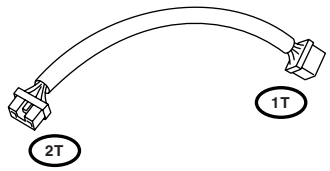


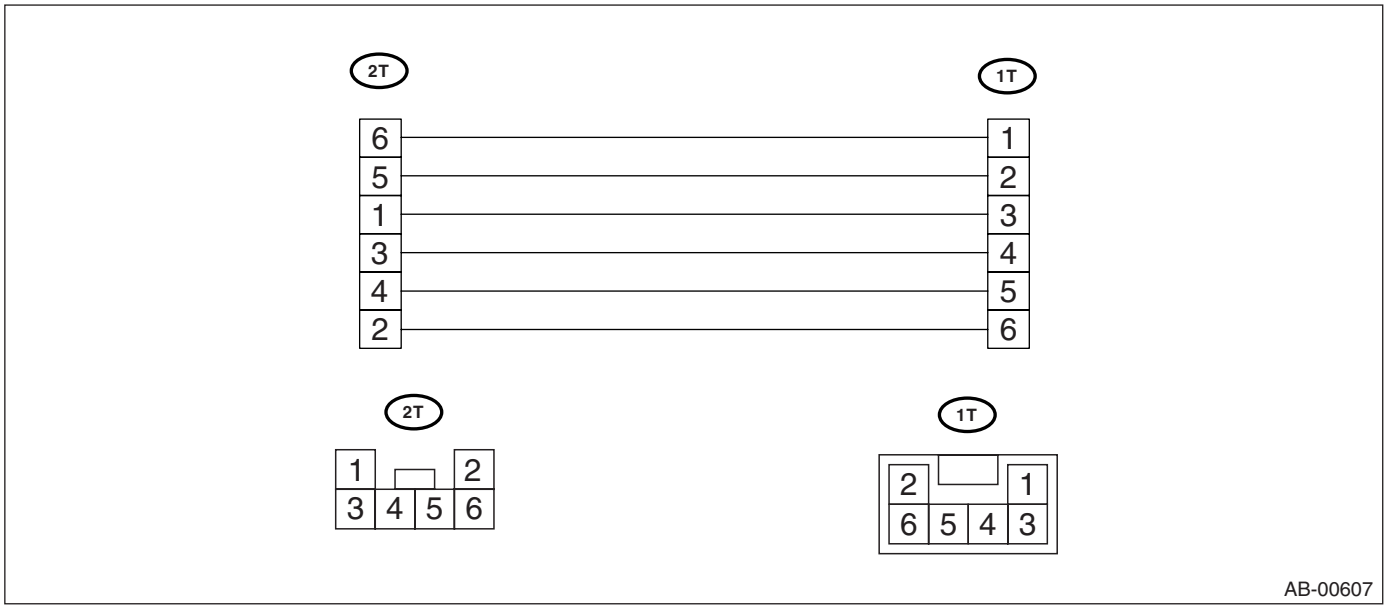
- TEST HARNESS N

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA000	98299SA000	TEST HARNESS N	Used when measuring voltage, resistance of driver's airbag module and seat belt pretensioner.

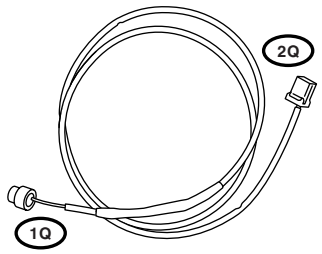


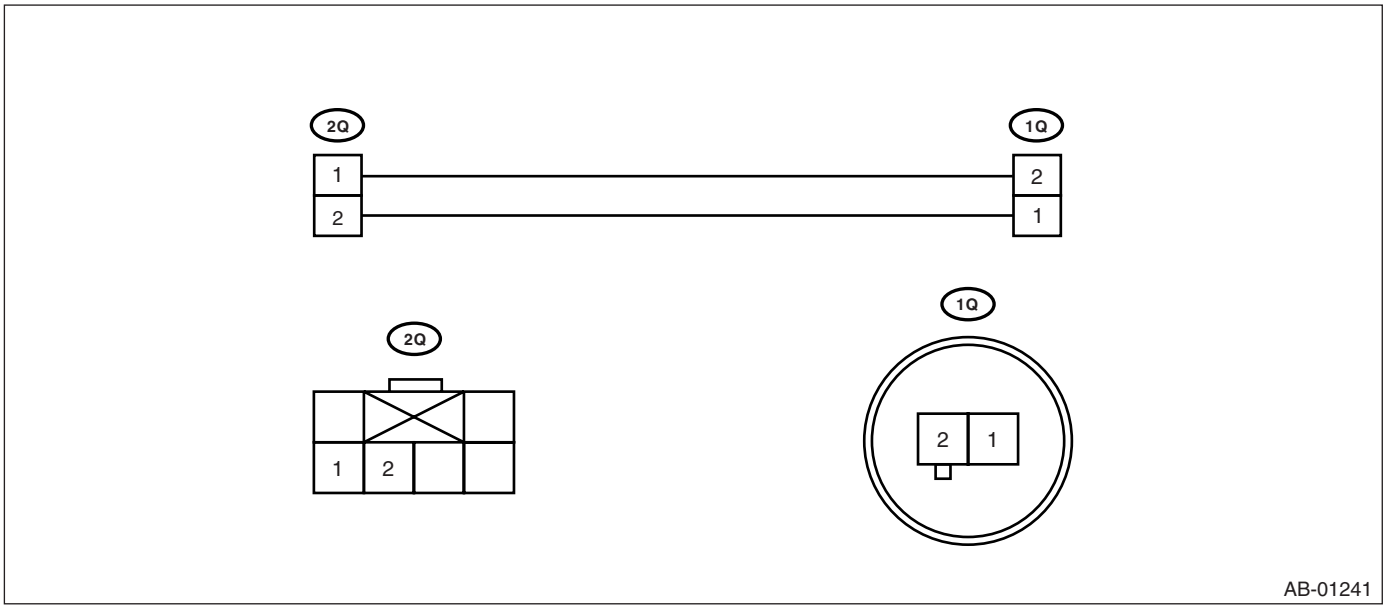
- TEST HARNESS T

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA060	98299SA060	TEST HARNESS T	• Used when measuring voltage, resistance of airbag system. • Used with test harness M (98299FE020).

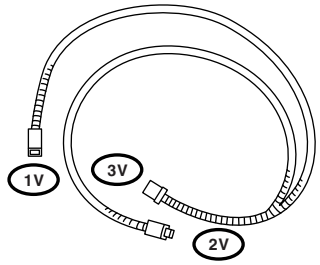


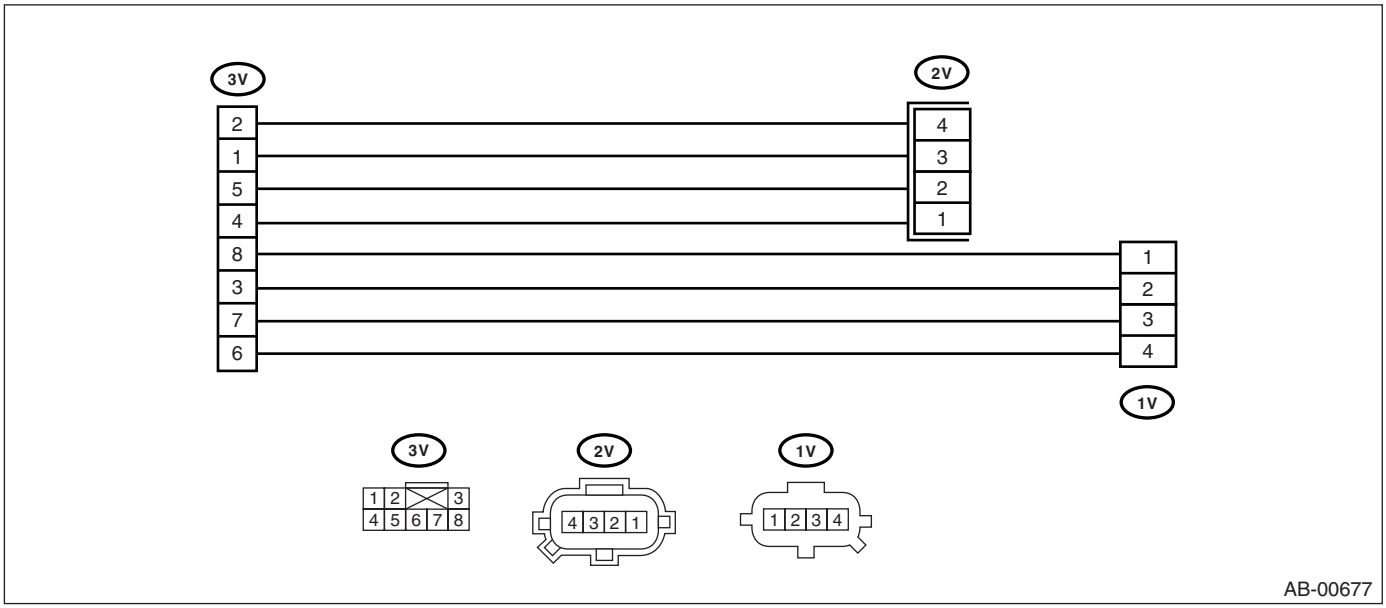
- TEST HARNESS Q

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA040	98299SA040	TEST HARNESS Q	Used when measuring voltage, resistance of lap seat belt pretensioner.

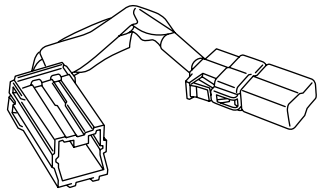


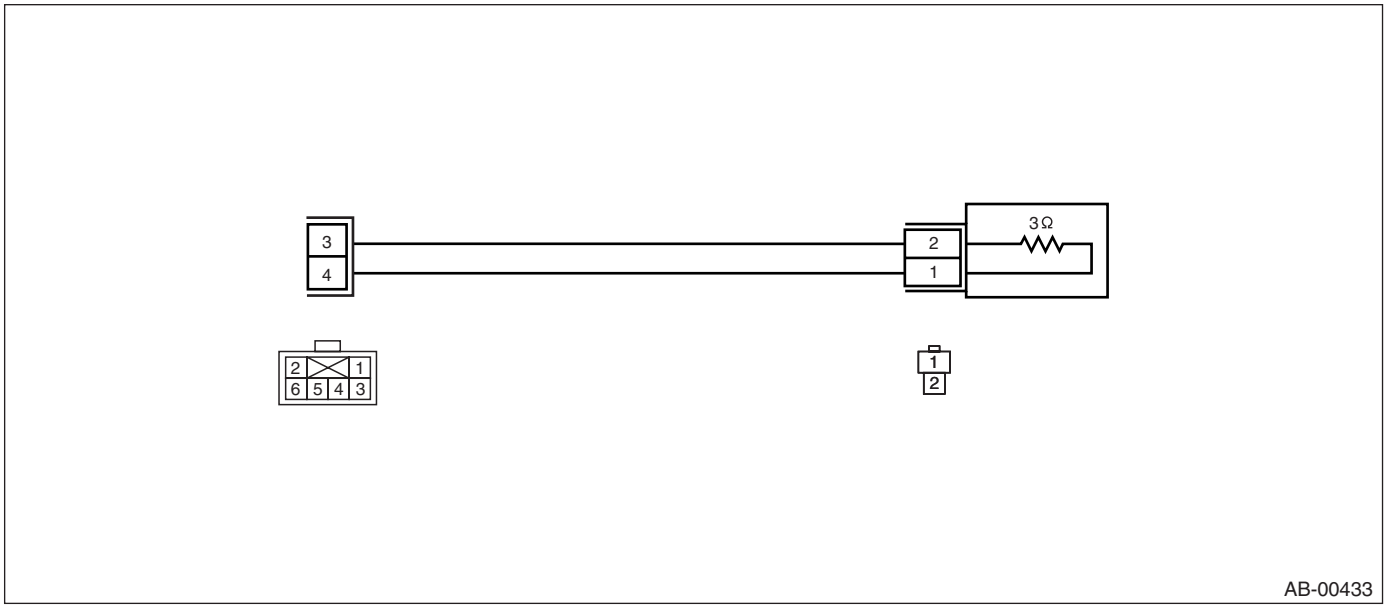
- TEST HARNESS V

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299AG010	98299AG010	TEST HARNESS V	Used when measuring voltage and resistance of side airbag sensor and curtain airbag sensor.



- AIRBAG RESISTOR

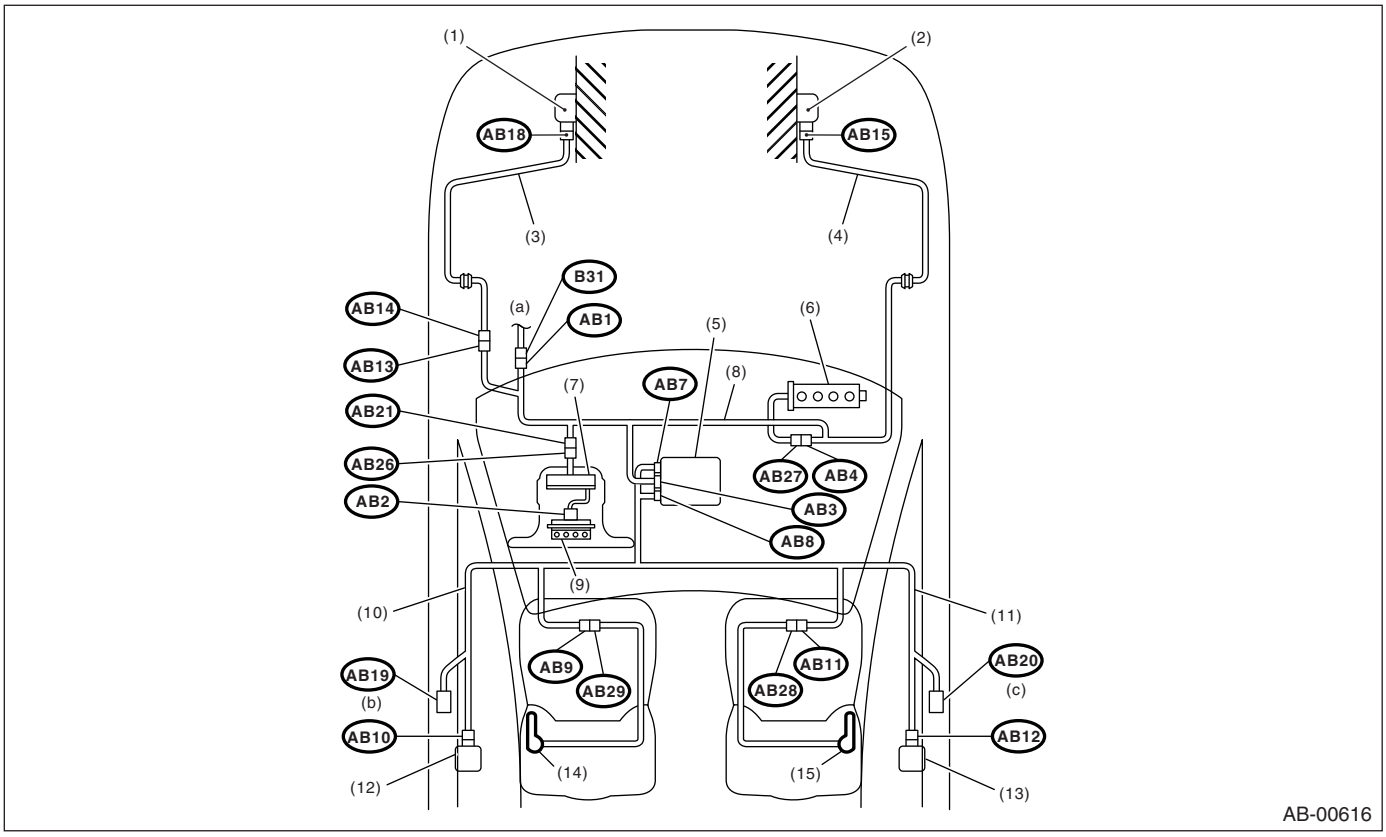
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299PA040	98299PA040	AIRBAG RESISTOR	Used in replacement of airbag module which resistance value is same as airbag module.



4. Electrical Component Location

A: LOCATION

1. LHD MODEL



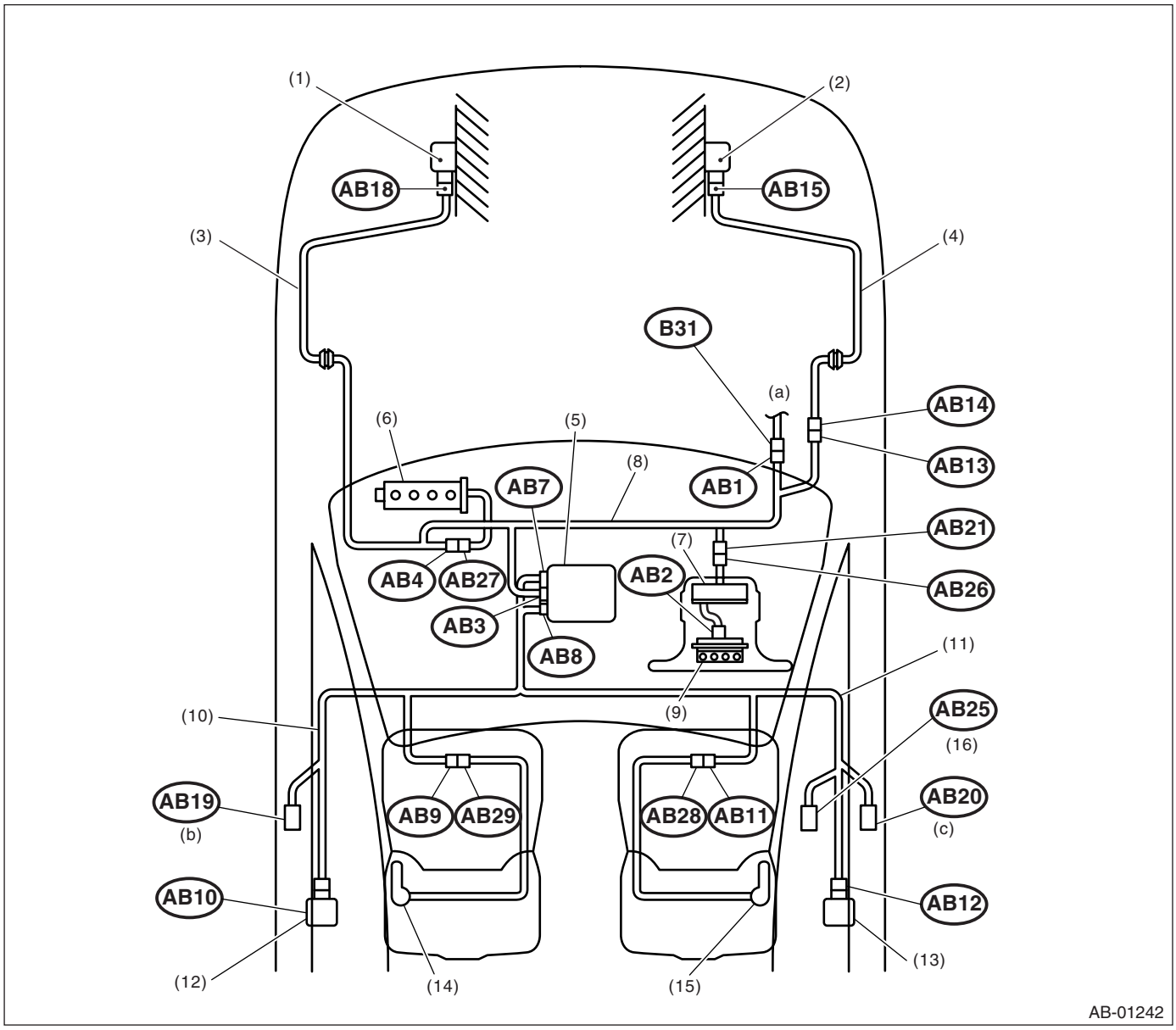
(a) To body harness
(b) To seat belt pretensioner (LH)
(c) To seat belt pretensioner (RH)

(1) Front sub sensor (LH)
(2) Front sub sensor (RH)
(3) Front sub sensor harness (LH)
(4) Front sub sensor harness (RH)
(5) Airbag control module with built-in safety and electric sensor
(6) Passenger's airbag module
(7) Roll connector
(8) Airbag main harness
(9) Driver's airbag module
(10) Side airbag harness (LH)
(11) Side airbag harness (RH)
(12) Side airbag sensor (LH)
(13) Side airbag sensor (RH)
(14) Side airbag module (LH)
(15) Side airbag module (RH)

Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	6	2	28	4	12	12	2	4	2	4	2	2
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male

Connector No.	(AB15)	(AB18)	(AB19)	(AB20)	(AB21)	(AB26)	(AB27)	(AB28)	(AB29)	(B31)		
Pole	2	2	2	2	2	2	4	2	2	6		
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow		
Male/Female	Female	Female	Female	Female	Female	Male	Male	Male	Male	Female		

2. RHD MODEL



(a)	To body harness	(b)	To seat belt pretensioner (LH)	(c)	To seat belt pretensioner (RH)
(1)	Front sub sensor (LH)	(6)	Passenger's airbag module	(12)	Side airbag sensor (LH)
(2)	Front sub sensor (RH)	(7)	Roll connector	(13)	Side airbag sensor (RH)
(3)	Front sub sensor harness (LH)	(8)	Airbag main harness	(14)	Side airbag module (LH)
(4)	Front sub sensor harness (RH)	(9)	Driver's airbag module	(15)	Side airbag module (RH)
(5)	Airbag control module with built-in safety and electric sensor	(10)	Side airbag harness (LH)	(16)	Lap pretensioner
		(11)	Side airbag harness (RH)		

Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pole	6	2	28	4	12	12	2	4	2	4	2	2
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male	Female

Connector No.	(AB15)	(AB18)	(AB19)	(AB20)	(AB21)	(AB25)	(AB26)	(AB27)	(AB28)	(AB29)	(B31)	
Pole	2	2	2	2	2	2	2	4	2	2	6	
Color	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	
Male/Female	Female	Female	Female	Female	Female	Female	Male	Male	Male	Male	Female	

5. Airbag Control Module I/O Signal

A: WIRING DIAGRAM

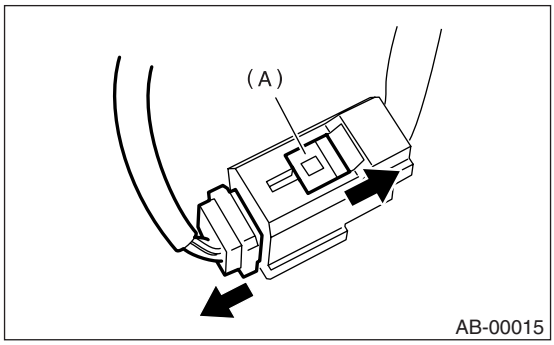
<Ref. to WI-185, WIRING DIAGRAM, Airbag System.>

6. Airbag Connector

A: PROCEDURE

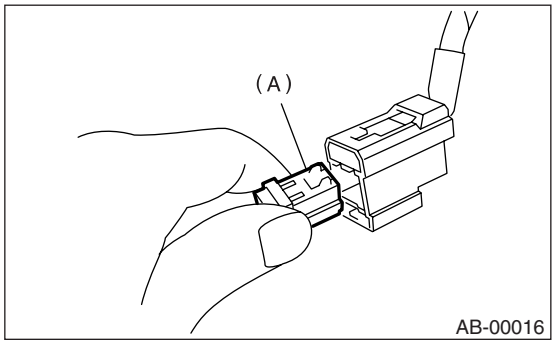
1. POWER SUPPLY

1) How to disconnect:
(1) Move the slide lock (A) in the direction of the arrow.
(2) Pull the female connector in the direction of the arrow with slide lock (A) moved.



CAUTION:
When pulling, be sure to hold onto the connector and not the wire.

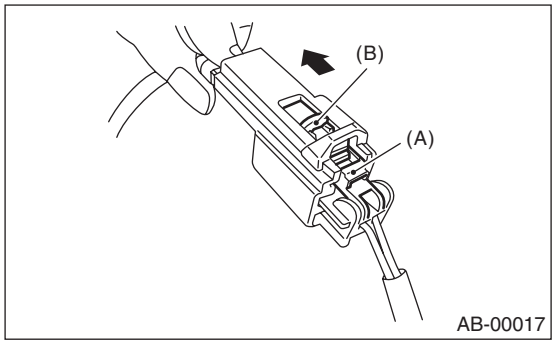
2) How to connect:
Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

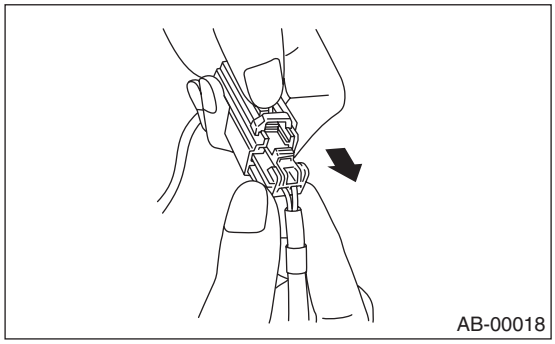
2. DRIVER'S AIRBAG (AIRBAG MAIN HARNESS AND ROLL CONNECTOR), SIDE AIRBAG AND PRETENSIONER

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



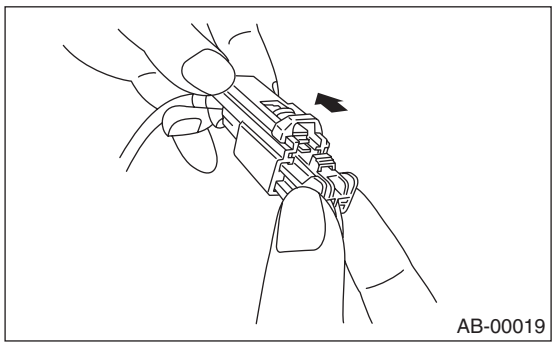
(3) With the slide lock pulled, remove the lock arm to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



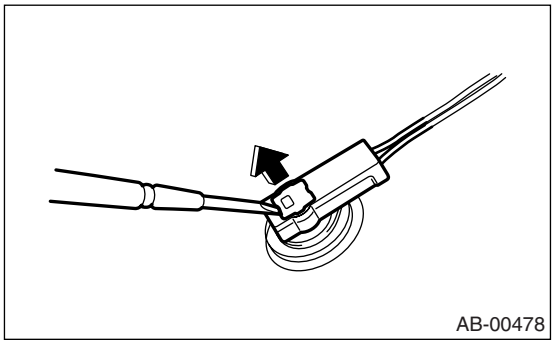
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

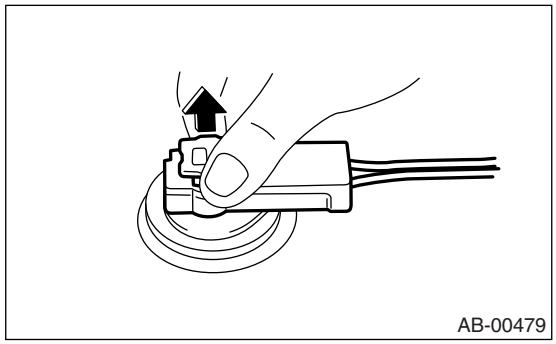


3. DRIVER'S AIRBAG, PRETENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock upward to unlock.

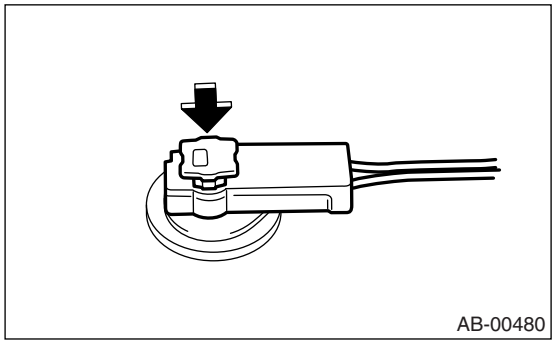


(2) Pull the connector to disconnect from driver's side airbag module assembly.



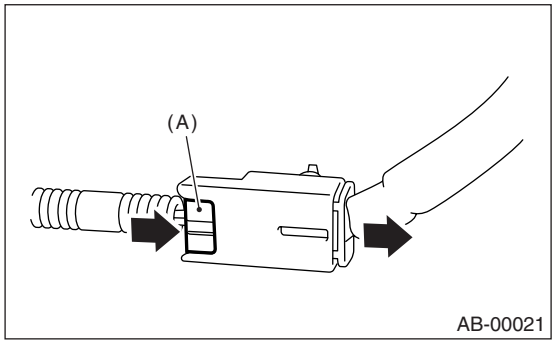
2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

CAUTION:
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.
• Be sure to insert the push lock.

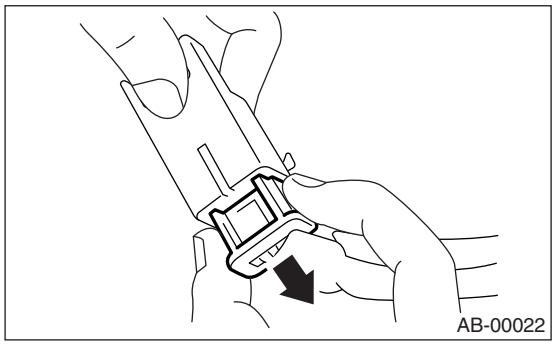


4. PASSENGER'S AIRBAG

1) How to disconnect:
(1) Push the lock arm (A).
(2) With the lock arm (A) pushed in, pull the connector in direction of arrow to separate.

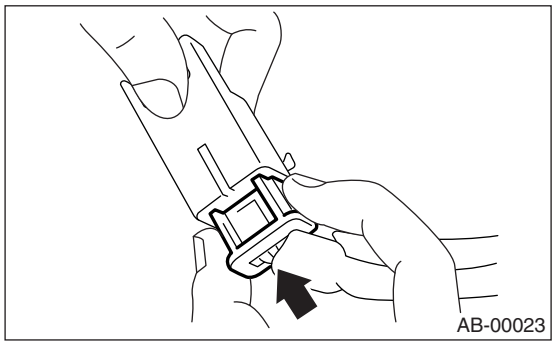


CAUTION:
When disconnecting the connector, be sure to hold onto the connector and not the wire.



2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

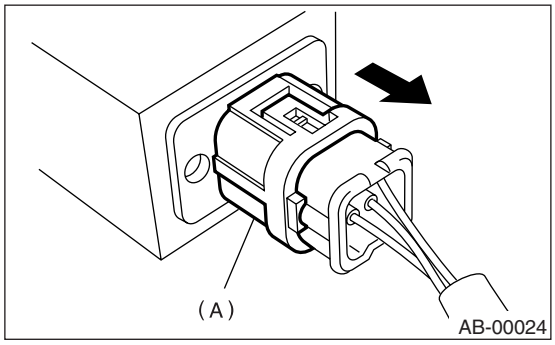
CAUTION:
Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



5. FRONT SUB-SENSOR AND SIDE AIR-BAG SENSOR

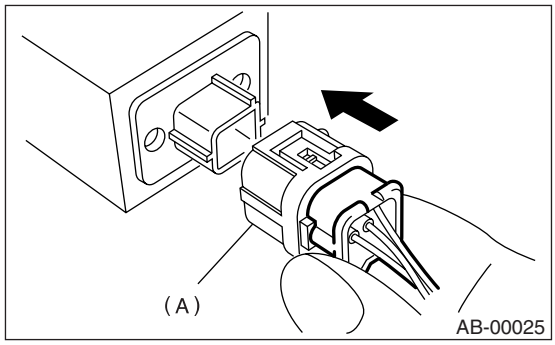
1) How to disconnect:
Holding outer part (A), pull it in the direction of the arrow.

CAUTION:
When pulling, be sure to hold onto the connector and not the wire.



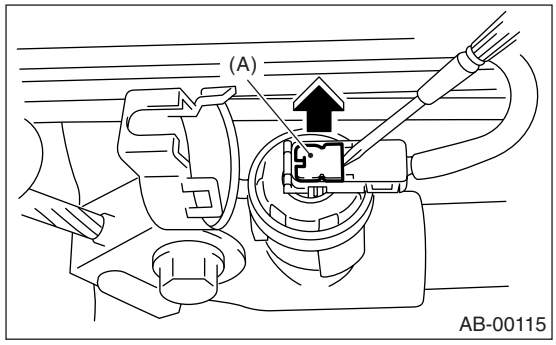
2) How to connect:
Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:
• Outer (A) moves back, and so do not put your hand on the outer part.
• Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

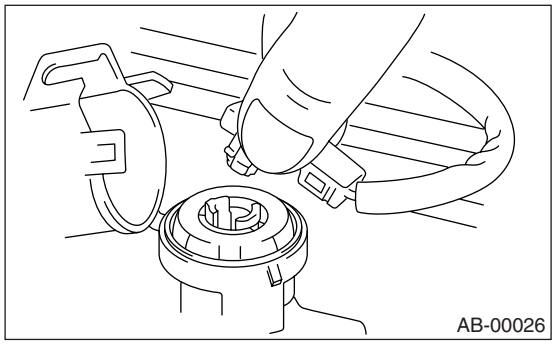


6. LAP SEAT BELT PRETENSIONER

1) How to disconnect:
(1) Using a flat tip screwdriver, pry the push lock (A) upward to unlock.



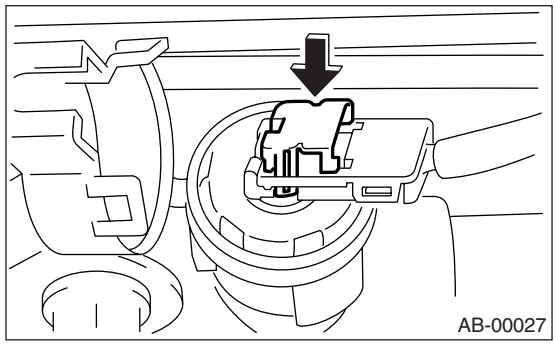
(2) Pull the connector to disconnect from lap seat belt pretensioner.



CAUTION:
When pulling the side lock, be sure to hold onto the connector and not the wire.

2) How to connect:
Connect the connector in reverse order of disconnecting. At this time, be sure to insert the connector in until connecting sound is heard.

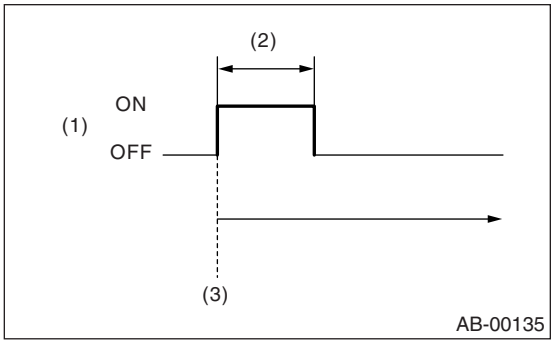
CAUTION:
• Be sure to insert the connector in until it locks.
Then pull on it gently to make sure that it is locked.
• Be sure to push the push lock in.



7. Airbag Warning Light Illumination Pattern

A: INSPECTION

Keep the ignition switch to ON, and confirm that the airbag warning light remains off approx. 6 seconds after being turned on.

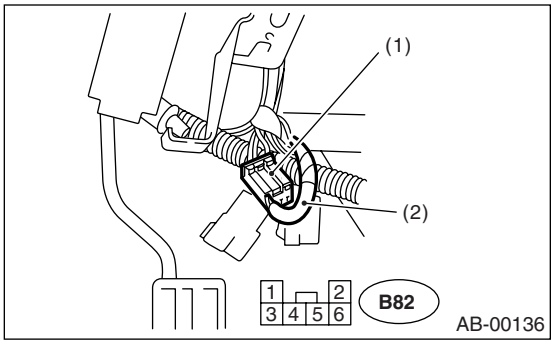


(1) Airbag warning light
(2) Approx. 6 seconds
(3) Ignition switch ON

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

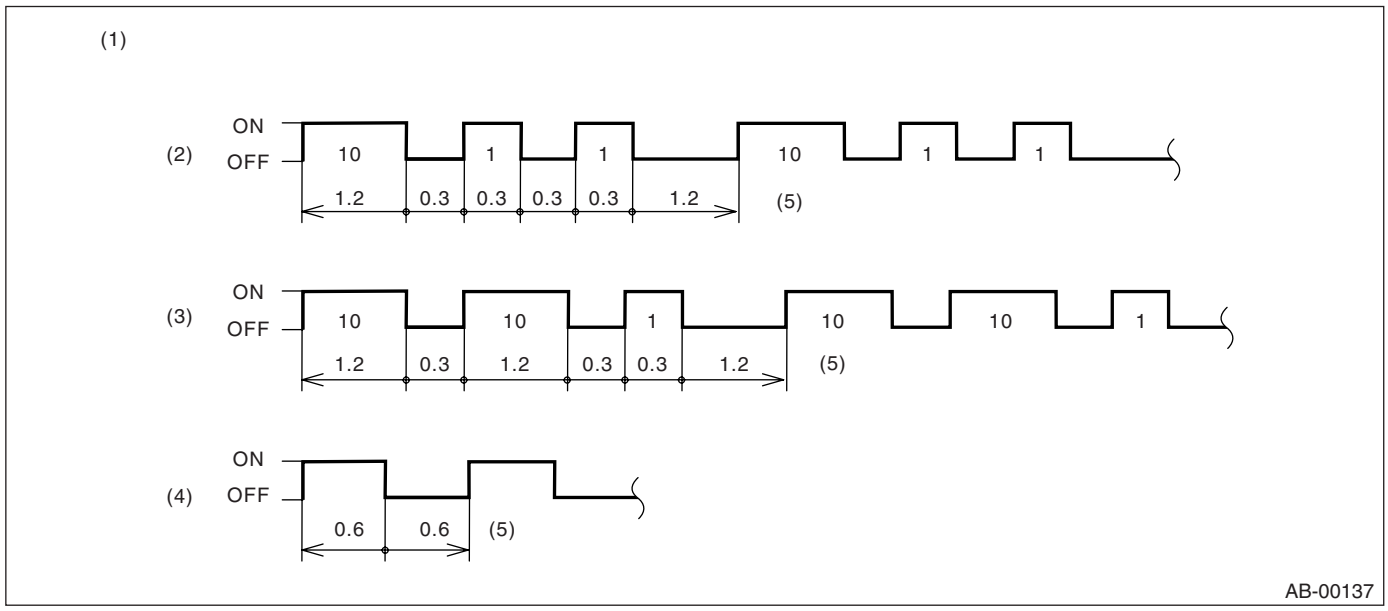
1) Turn the ignition switch to ON.
2) Connect the ground terminal to diagnostic connector terminal No. 1 in the instrument panel lower cover area.



(1) Diagnostic connector
(2) Ground terminal

3) Read the DTC by identifying the way airbag warning light flashes.
The airbag warning light flashes a code corresponding to the faulty parts.
The long segment (1.2 sec on) indicates a “ten”, and the short segment (0.3 sec on) indicates a “one”.

NOTE:
• “List of Diagnostic Trouble Code (DTC)” **<Ref. to AB(diag)-39, List of Diagnostic Trouble Code (DTC).>**
• “Airbag Warning Light Failure” **<Ref. to AB(diag)-29, Airbag Warning Light Failure.>**



(1) Example
(2) Flashing code 12:
(3) Flashing code 21:
(4) Flashing normal code:
(5) Sec

4) Turn the ignition switch to OFF, and disconnect the ground terminal from the diagnostic connector terminal No 1.
5) Wind tape around the ground terminal and return it to its original position.

9. Inspection Mode

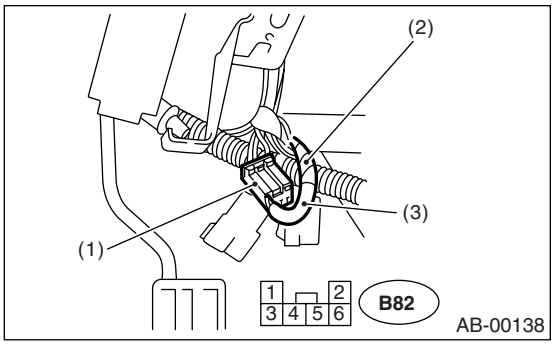
A: OPERATION

Recreate the circumstance by referring to the conditions described in the checklist.

10.Clear Memory Mode

A: OPERATION

1) Turn the ignition switch to ON.
2) Connect the ground terminal (ground, terminal “A”) to diagnostic connector terminal No. 1 in the instrument panel lower cover area.



(1) Diagnostic connector
(2) Ground terminal “B”
(3) Ground terminal “A”

3) While the airbag warning light flashes, connect another ground terminal (ground, terminal “B”) to diagnostic connector terminal No. 2.
4) Once the memory is erased, the airbag warning light returns to the normal flash rate (0.6 sec on). The failure to recover the normal flash rate indicates that trouble parts still remain. Having repaired such parts, erase the memory again and confirm that the normal flash rate has returned.
5) When the memory has been cleared, disconnect the ground terminal from the diagnostic connector.
6) Wind tape around the ground terminal and return it to its original position.

11.Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON.

DETECTING CONDITION:

- Airbag warning light unit is faulty.
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- (AB1) and (B31) are not connected properly.
- (AB3) is not connected properly to the airbag control module.

CAUTION:

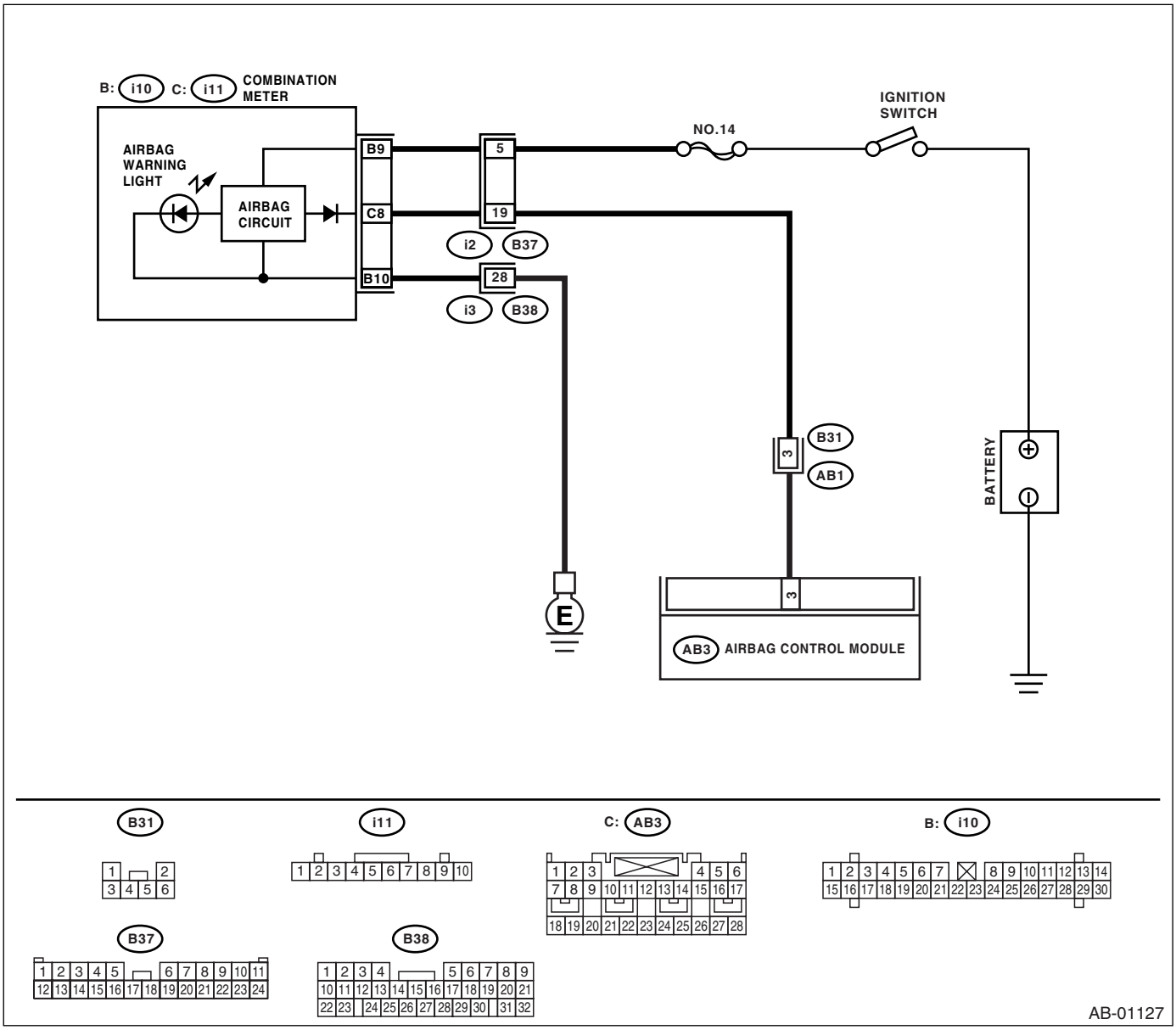
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

1. LHD MODEL

WIRING DIAGRAM:

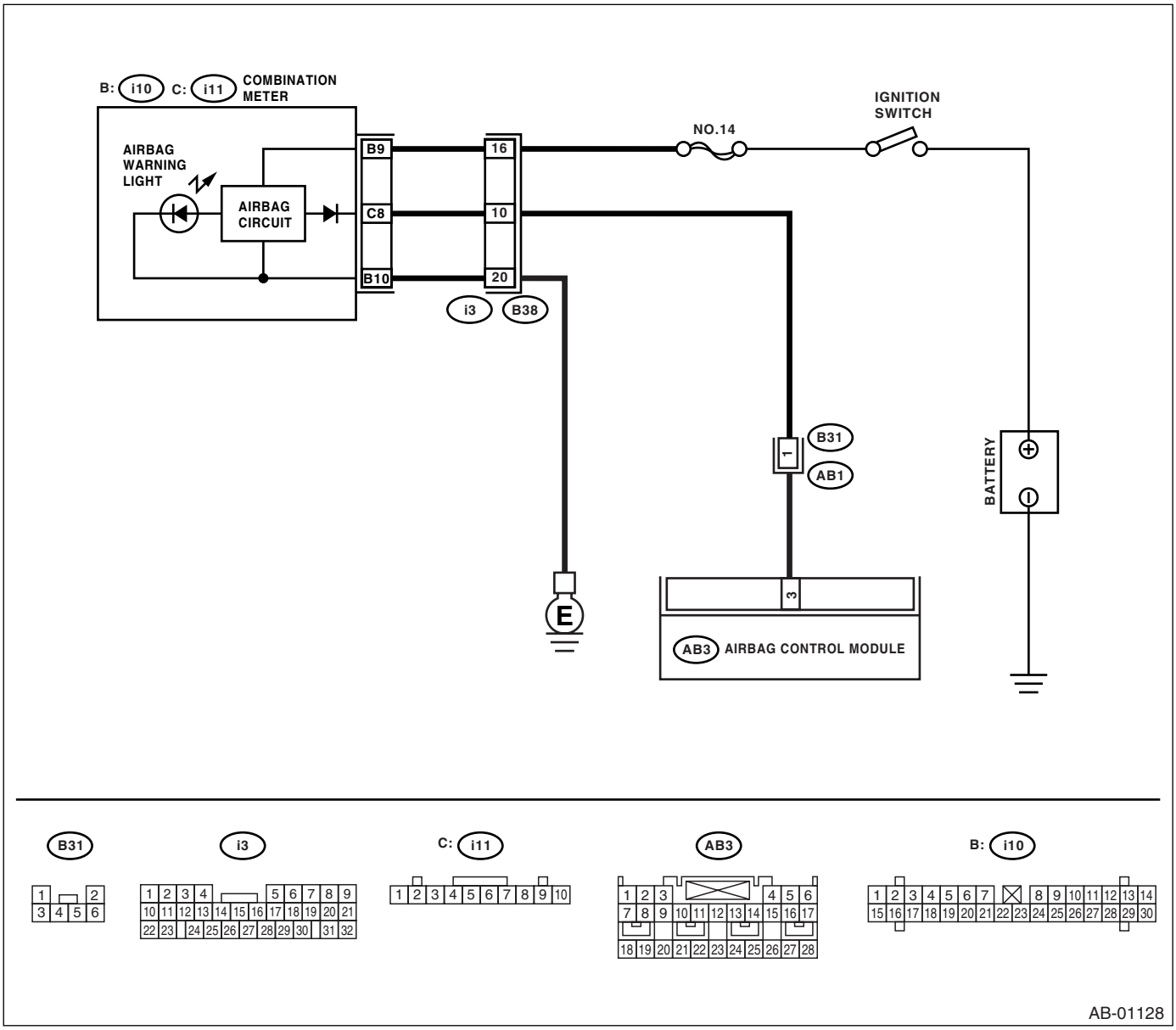


Step		Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the side sill cover. (Driver's side) 3) Confirm that firm contact is secured between connectors (AB1) and (B31).	Is the poor contact in connectors (AB1) and (B31)?	Repair the body harness or replace the airbag main harness with body harness.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK AIRBAG WARNING LIGHT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (1T) in test harness T to body harness connector (B31). 3) Connect the connector (1M) in test harness M to connector (2T) in test harness T. 4) Connect the battery ground cable and turn the ignition switch to ON. 5) Connect the connectors, (3M) and (4M) in test harness M.	Is the airbag warning light turned off?	Go to step **4.**	Go to step **3.**
3	**CHECK BODY HARNESS.** Check the body harness. NOTE: After problem has been eliminated, disconnect the connectors (3M) and (4M).	Is the anything unusual to body harness?	Repair the body harness.	Replace the combination meter printed circuit. <Ref. to IDI-10, Combination Meter.>
4	**CHECK POOR CONTACT.** Confirm that firm contact is secured between the airbag control module and the connector (AB3). <Ref. to AB-18, Airbag Control Module.>	Is the poor contact in connector (AB3)?	Replace the airbag main harness with body harness or replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connectors (AB2) and (AB30). 4) Remove the glove box and disconnect the connectors (AB4). 5) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Connect the connectors (5R) and (6R) in test harness R. NOTE: After problem has been eliminated, disconnect the connectors (5R) and (6R).	Is the airbag warning light turned off?	Go to step **6.**	Replace the airbag main harness with body harness.
6	**CHECK GROUNDING CIRCUIT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module. 3) Connect the connector (1R) in test harness R to body harness connector (AB3). 4) Measure the resistance between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 10 — Chassis ground:*** ***(2R) No. 11 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Repair the body-grounding circuit.

2. RHD MODEL

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the side sill cover. (Driver's side) 3) Confirm that firm contact is secured between connectors (AB1) and (B31).	Is the poor contact in connectors (AB1) and (B31)?	Repair the body harness or replace the airbag main harness with body harness.	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK AIRBAG WARNING LIGHT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (1M) in test harness M to body harness connector (B31). 3) Connect the battery ground cable and turn the ignition switch to ON. 4) Connect the connectors, (3M) and (4M) in test harness M.	Is the airbag warning light turned off?	Go to step **4.**	Go to step **3.**
3	**CHECK BODY HARNESS.** Check the body harness. NOTE: After problem has been eliminated, disconnect the connectors (3M) and (4M).	Is the anything unusual to body harness?	Repair the body harness.	Replace the combination meter printed circuit. <Ref. to IDI-10, Combination Meter.>
4	**CHECK POOR CONTACT.** Confirm that firm contact is secured between the airbag control module and the connector (AB3). <Ref. to AB-18, Airbag Control Module.>	Is the poor contact in connector (AB3)?	Replace the airbag main harness with body harness or replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **5.**
5	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connectors (AB21) and (AB26). 4) Remove the glove box and disconnect the connectors (AB4). 5) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Connect the connectors (5R) and (6R) in test harness R. NOTE: After problem has been eliminated, disconnect the connectors (5R) and (6R).	Is the airbag warning light turned off?	Go to step **6.**	Replace the airbag main harness with body harness.
6	**CHECK GROUNDING CIRCUIT.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module. 3) Connect the connector (1R) in test harness R to body harness connector (AB3). 4) Measure the resistance between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 10 — Chassis ground:*** ***(2R) No. 11 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Repair the body-grounding circuit.

B: AIRBAG WARNING LIGHT REMAINS OFF.

DETECTING CONDITION:

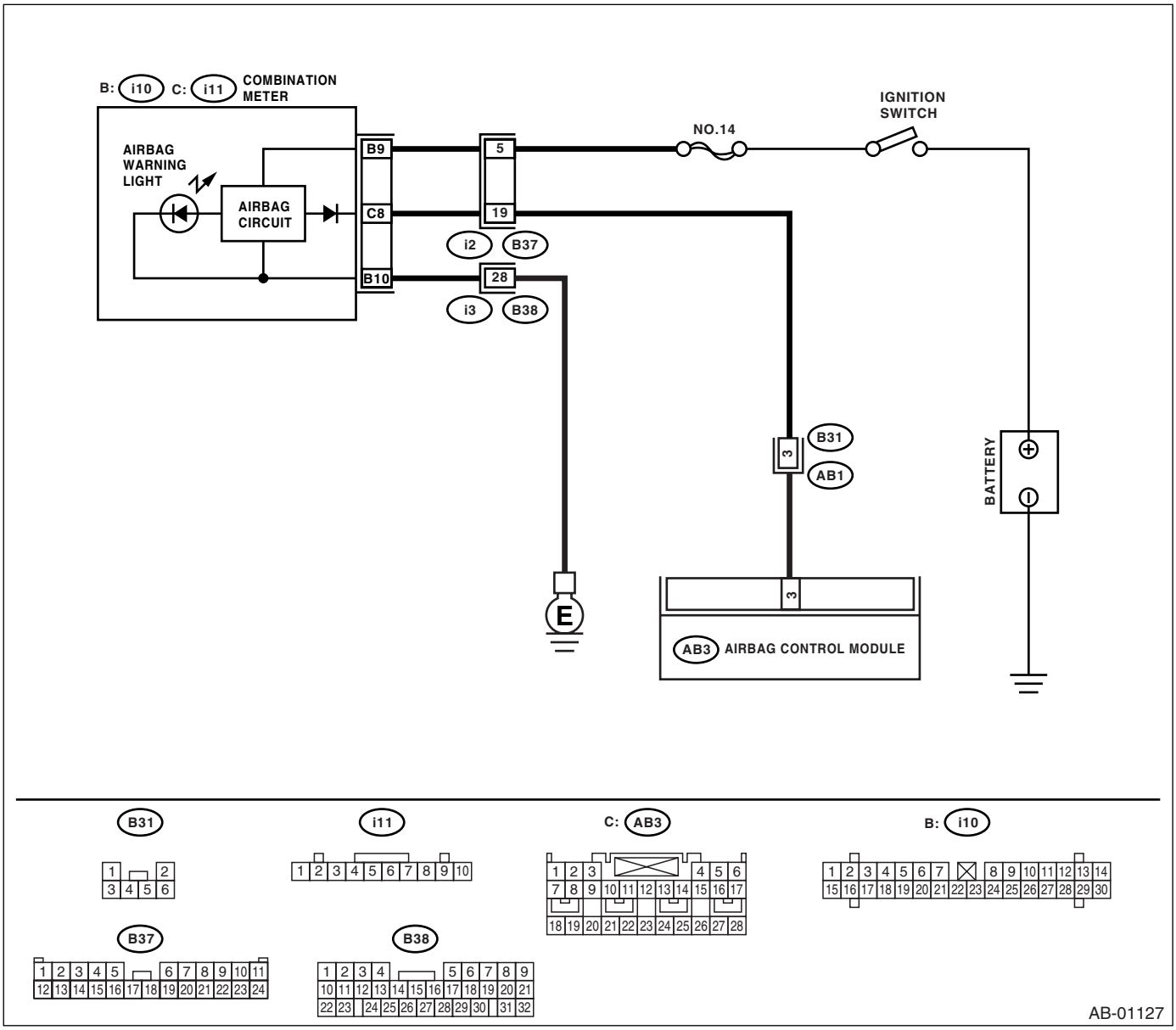
- Fuse No. 14 (in fuse box) is blown.
- Body harness circuit is open.
- Airbag warning light is faulty.
- Airbag main harness is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.
• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

1. LHD MODEL

WIRING DIAGRAM:

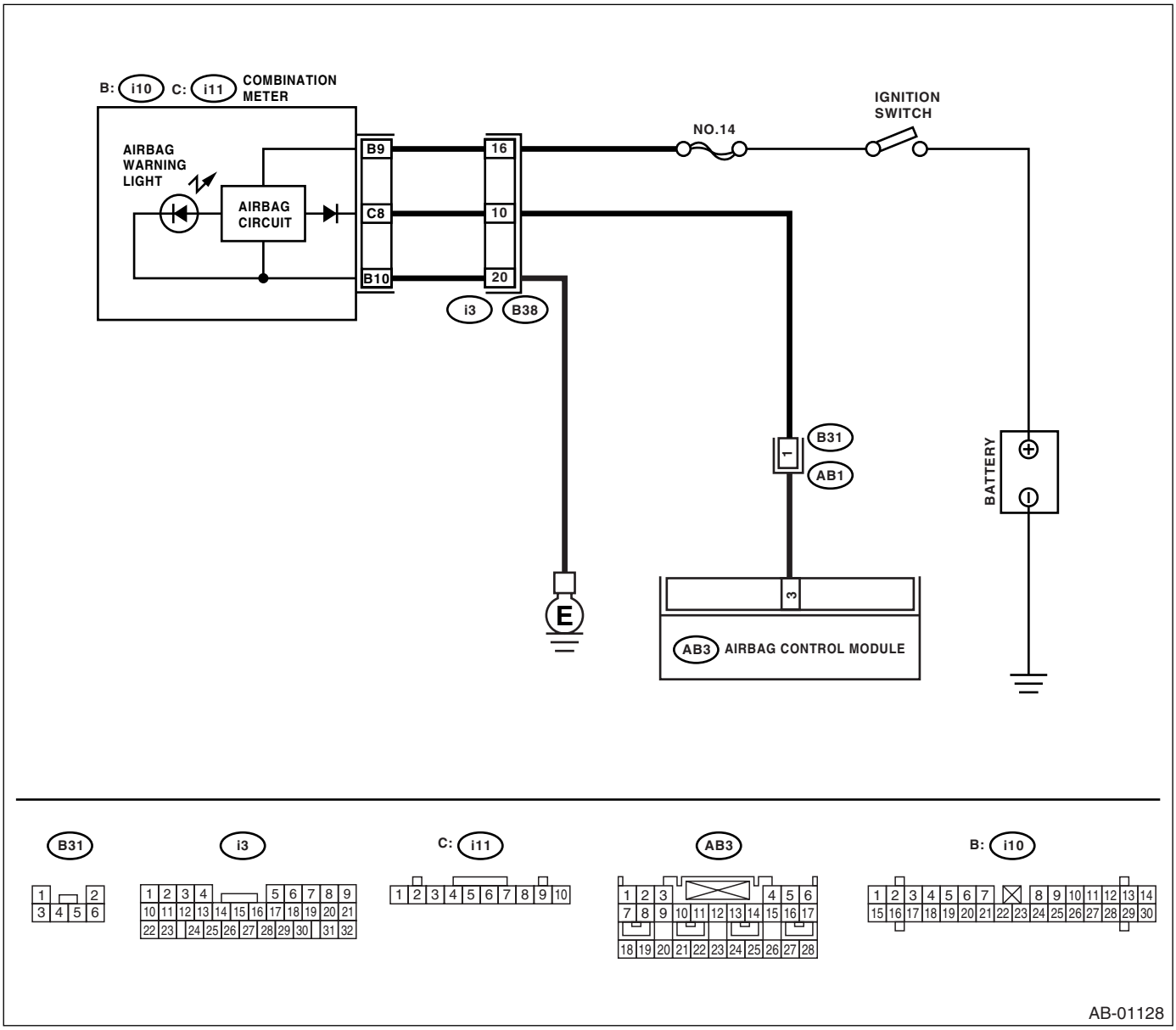


Step		Check	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch to ON, and confirm that warning lights equipped in the combination meter are turned on.	Do the warning lights not for airbag turn on?	Go to step **2.**	Repair the combination meter power supply. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK FUSE No. 14 (IN FUSE&RELAY BOX).** Remove the fuse No. 14 and perform visual inspection.	Is the fuse No. 14 (in fuse & relay box) blown out?	Replace the fuse No. 14. If fuse No. 14 blows again, go to step 3.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB1) from (B31). 3) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on?	Go to step **4.**	Replace the airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-10, Combination Meter.>
4	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

2. RHD MODEL

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK COMBINATION METER.** Turn the ignition switch to ON, and confirm that warning lights equipped in the combination meter are turned on.	Do the warning lights not for airbag turn on?	Go to step **2.**	Repair the combination meter power supply. <Ref. to IDI-3, Combination Meter System.>
2	**CHECK FUSE No. 14 (IN FUSE&RELAY BOX).** Remove the fuse No. 14 and perform visual inspection.	Is the fuse No. 14 (in fuse & relay box) blown out?	Replace the fuse No. 14. If fuse No. 14 blows again, go to step 3.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB1) from (B31). 3) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on?	Go to step **4.**	Replace the airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-10, Combination Meter.>
4	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 4) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

12.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Memory function	Contents of diagnostic	Index No.
11	Provided.	• Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness circuit (driver) is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB(diag)-42, DTC 11, Diagnostic Chart with Trouble Code.>
12	Provided.	• Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness circuit (passenger) is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB(diag)-45, DTC 12, Diagnostic Chart with Trouble Code.>
15	Provided.	• Airbag main harness circuit (driver) is shorted to power supply. • Airbag module harness (driver) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty.	<Ref. to AB(diag)-48, DTC 15, Diagnostic Chart with Trouble Code.>
16	Provided.	• Airbag main harness circuit (passenger) is shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB(diag)-51, DTC 16, Diagnostic Chart with Trouble Code.>
21	Provided.	Airbag control module is faulty.	<Ref. to AB(diag)-54, DTC 21, Diagnostic Chart with Trouble Code.>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB(diag)-55, DTC 22, Diagnostic Chart with Trouble Code.>
23	Not provided.	(AB3), (AB7) and (AB8) are not connected properly to airbag control module.	<Ref. to AB(diag)-57, DTC 23, Diagnostic Chart with Trouble Code.>
24	Not provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 11 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB(diag)-58, DTC 24, Diagnostic Chart with Trouble Code.>
25	Provided.	• Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 6 (in joint box) is blown. • Body harness circuit is open.	<Ref. to AB(diag)-62, DTC 25, Diagnostic Chart with Trouble Code.>
31	Provided.	• Front sub-sensor harness circuit (RH) is shorted, opened or shorted to power supply. • Airbag main harness circuit is shorted, opened or shorted to power supply. • Front sub-sensor (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-66, DTC 31, Diagnostic Chart with Trouble Code.>

DTC	Memory function	Contents of diagnostic	Index No.
32	Provided.	• Front sub-sensor harness circuit (LH) is shorted, opened or shorted to power supply. • Airbag main harness circuit is shorted, opened or shorted to power supply. • Front sub-sensor (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-68, DTC 32, Diagnostic Chart with Trouble Code.>
41	Provided.	• Side airbag harness (RH) is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-70, DTC 41, Diagnostic Chart with Trouble Code.>
42	Provided.	• Side airbag harness (LH) is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-72, DTC 42, Diagnostic Chart with Trouble Code.>
45	Provided.	• Side airbag harness (RH) is shorted to power supply. • Side airbag module (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-74, DTC 45, Diagnostic Chart with Trouble Code.>
46	Provided.	• Side airbag harness (LH) is shorted to power supply. • Side airbag module (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-76, DTC 46, Diagnostic Chart with Trouble Code.>
51	Provided.	• Side airbag sensor (RH) is faulty. • Side airbag harness (RH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-78, DTC 51, Diagnostic Chart with Trouble Code.>
52	Provided.	• Side airbag sensor (LH) is faulty. • Side airbag harness (LH) is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-80, DTC 52, Diagnostic Chart with Trouble Code.>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB(diag)-82, DTC 53, Diagnostic Chart with Trouble Code.>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB(diag)-82, DTC 54, Diagnostic Chart with Trouble Code.>
55	Provided.	Side airbag module is operate.	<Ref. to AB(diag)-82, DTC 55, Diagnostic Chart with Trouble Code.>
61	Provided.	• Seat belt pretensioner circuit (RH) is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty.	<Ref. to AB(diag)-83, DTC 61, Diagnostic Chart with Trouble Code.>
62	Provided.	• Seat belt pretensioner circuit (LH) is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty.	<Ref. to AB(diag)-85, DTC 62, Diagnostic Chart with Trouble Code.>
65	Provided.	• Seat belt pretensioner circuit (RH) is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-87, DTC 65, Diagnostic Chart with Trouble Code.>

DTC	Memory function	Contents of diagnostic	Index No.
66	Provided.	• Seat belt pretensioner circuit (LH) is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-89, DTC 66, Diagnostic Chart with Trouble Code.>
72	Provided.	• Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness circuit (passenger) is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB(diag)-91, DTC 72, Diagnostic Chart with Trouble Code.>
76	Provided.	• Airbag main harness circuit (passenger) is shorted or shorted to power supply. • Airbag module harness circuit (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty.	<Ref. to AB(diag)-93, DTC 76, Diagnostic Chart with Trouble Code.>
81	Provided.	• Lap seat belt pretensioner circuit (RH) is open, shorted or shorted to ground. • Lap pretensioner is faulty. • Lap pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-95, DTC 81, Diagnostic Chart with Trouble Code.>
85	Provided.	• Lap seat belt pretensioner circuit (RH) is shorted to power supply. • Lap pretensioner is faulty. • Lap pretensioner harness is faulty. • Airbag control module is faulty.	<Ref. to AB(diag)-97, DTC 85, Diagnostic Chart with Trouble Code.>

13.Diagnostic Chart with Trouble Code

A: DTC 11

DTC DETECTING CONDITION:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness circuit (Driver) is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

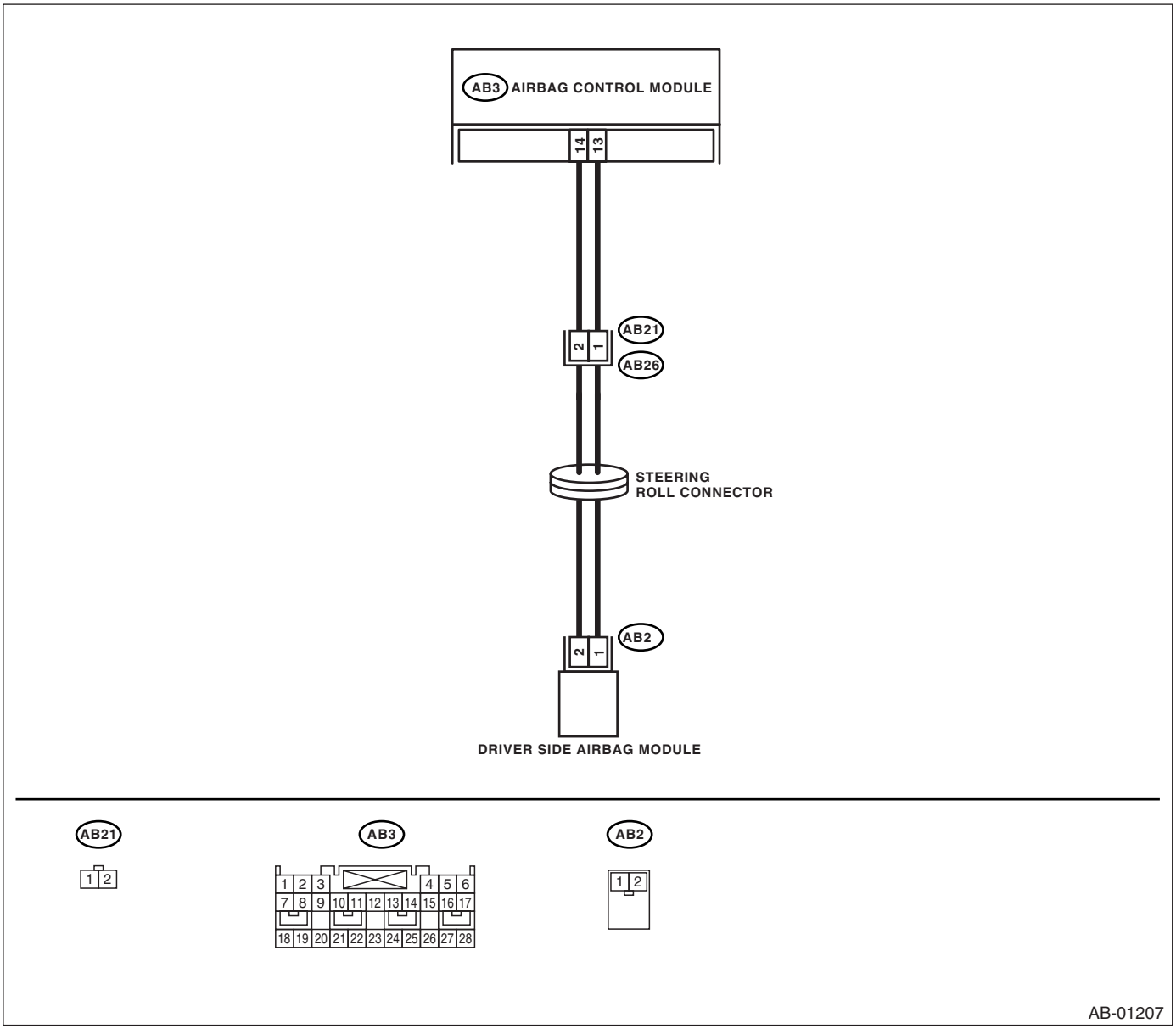
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, confirm that airbag warning light is turn normally after reconnect the each parts.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVERS AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.> 3) Connect the connector (1N) in test harness N to connector (AB2). 4) Connect the airbag resistor to connector (2N) in test harness N. 5) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 second. 2) Disconnect the test harness N from the connector (AB2). 3) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB21) and connect the connector (1F) in test harness F to connector (AB21). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turn on normally?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the glove box, and disconnect connectors (AB4) and passenger's airbag module (AB27). <Ref. to AB-15, Passenger's Airbag Module.> 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5) Measure the resistance between connector (2R) in test harness R and the connector (3F) in test harness F. ***Connector & terminal*** ***(2R) No. 2 — (3F) No. 3:*** ***(2R) No. 4 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 2 — (2R) No. 4:*** ***(2R) No. 4 — Chassis ground:*** ***(2R) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

B: DTC 12

DTC DETECTING CONDITION:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness circuit (Passenger) is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

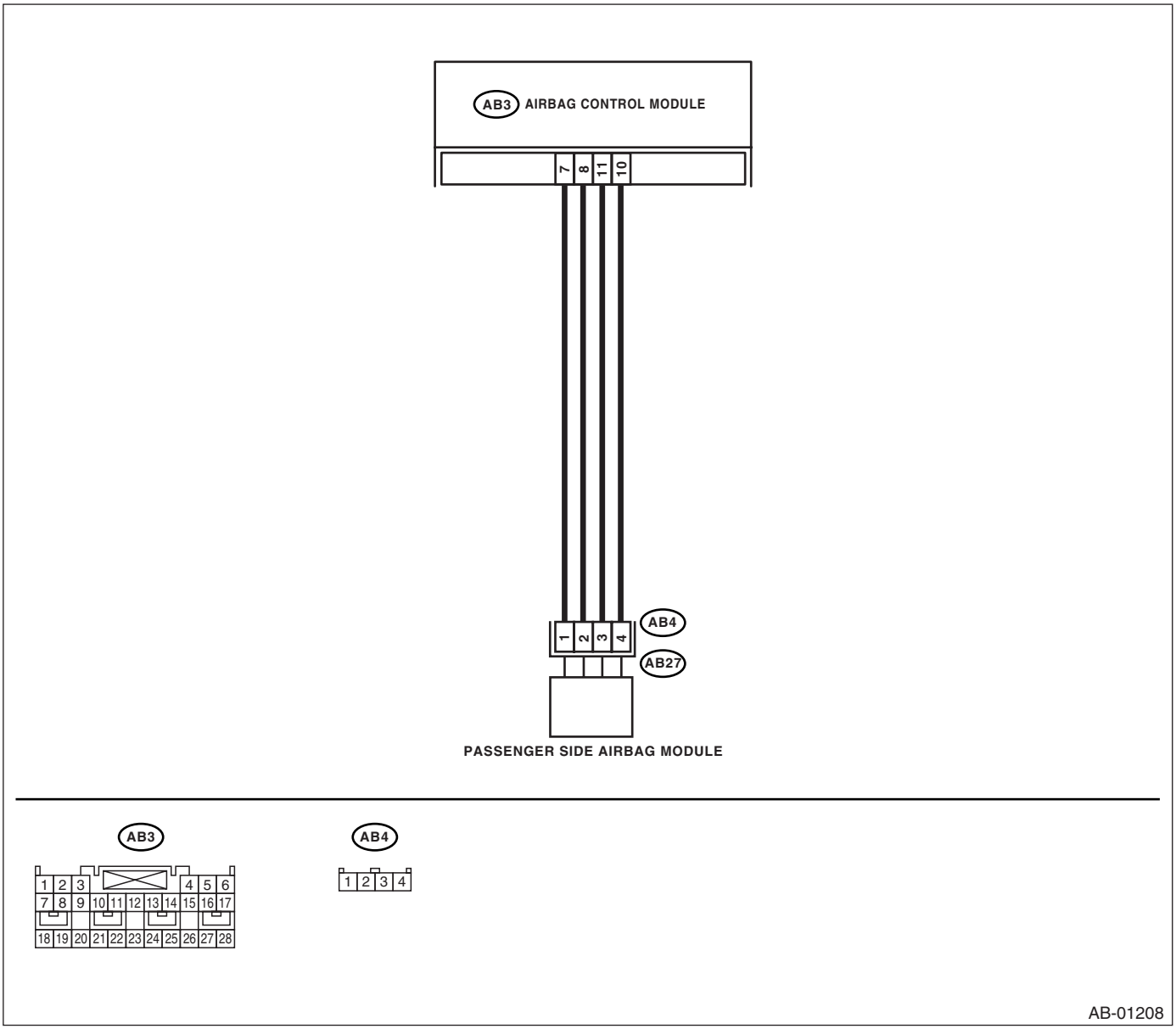
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, confirm that airbag warning light is turn normally after reconnect the each parts.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK PASSENGERS AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the glove box. 3) Disconnect the passenger's airbag connector (AB27) and (AB4). 4) Connect the connector (1P) in test harness P to connector (AB4). 5) Connect the airbag resistor to connector (2P), (3P) in test harness P. 6) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the passenger airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector in test harness P. 3) Remove the instrument panel lower cover and disconnect the connector (AB21) from (AB26). 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5) Measure the resistance between connector (2R) in test harness R and the connector (2P) in test harness P. ***Connector & terminal*** ***(2R) No. 3 — (2P) No. 3:*** ***(2R) No. 5 — (2P) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 3 — (2R) No. 5:*** ***(2R) No. 3 — Chassis ground:*** ***(2R) No. 5 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

C: DTC 15

DTC DETECTING CONDITION:

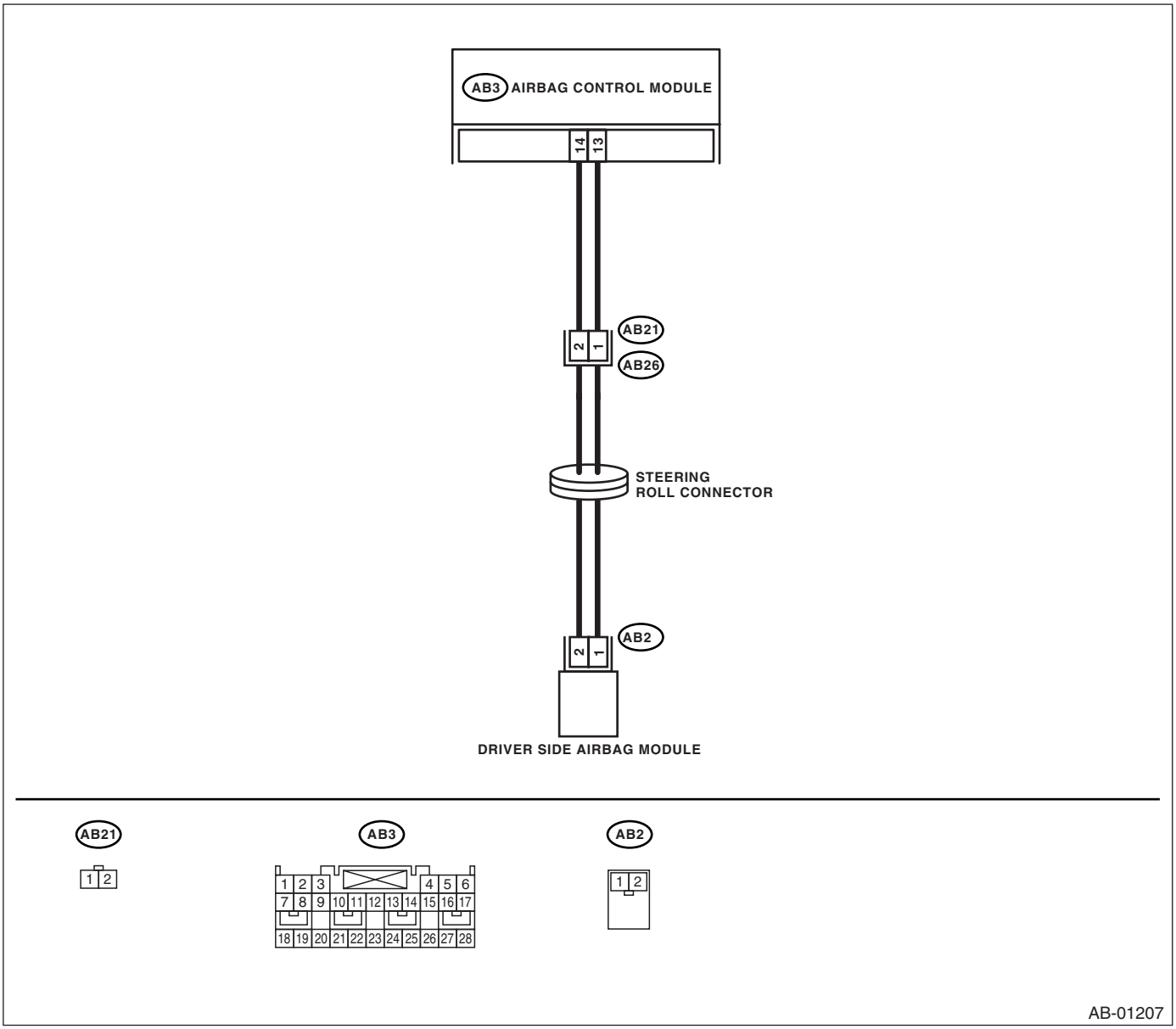
- Airbag main harness circuit (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- **Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.**
- **After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.**
- **When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.**

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK DRIVERS AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.> 3) Connect the connector (AB2) to connector (1N) in test harness N. 4) Connect the airbag resistor to connector (2N) in test harness N. 5) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK ROLL CONNECTOR.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from the connector (AB2). 3) Remove the instrument panel lower cover and disconnect the connector (AB21) from (AB26). 4) Connect the connector (1F) in test harness F to connector (AB21). 5) Connect the airbag resistor to connector (3F) in test harness F. 6) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step **3.**
3	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the glove box, and disconnect the connectors (AB4) and passenger's airbag module (AB27). 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5) Connect the battery ground cable and turn the ignition switch to ON. (engine OFF) 6) Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 2 (+) — Chassis ground (−):*** ***(2R) No. 4 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

D: DTC 16

DTC DETECTING CONDITION:

- Airbag main harness circuit (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

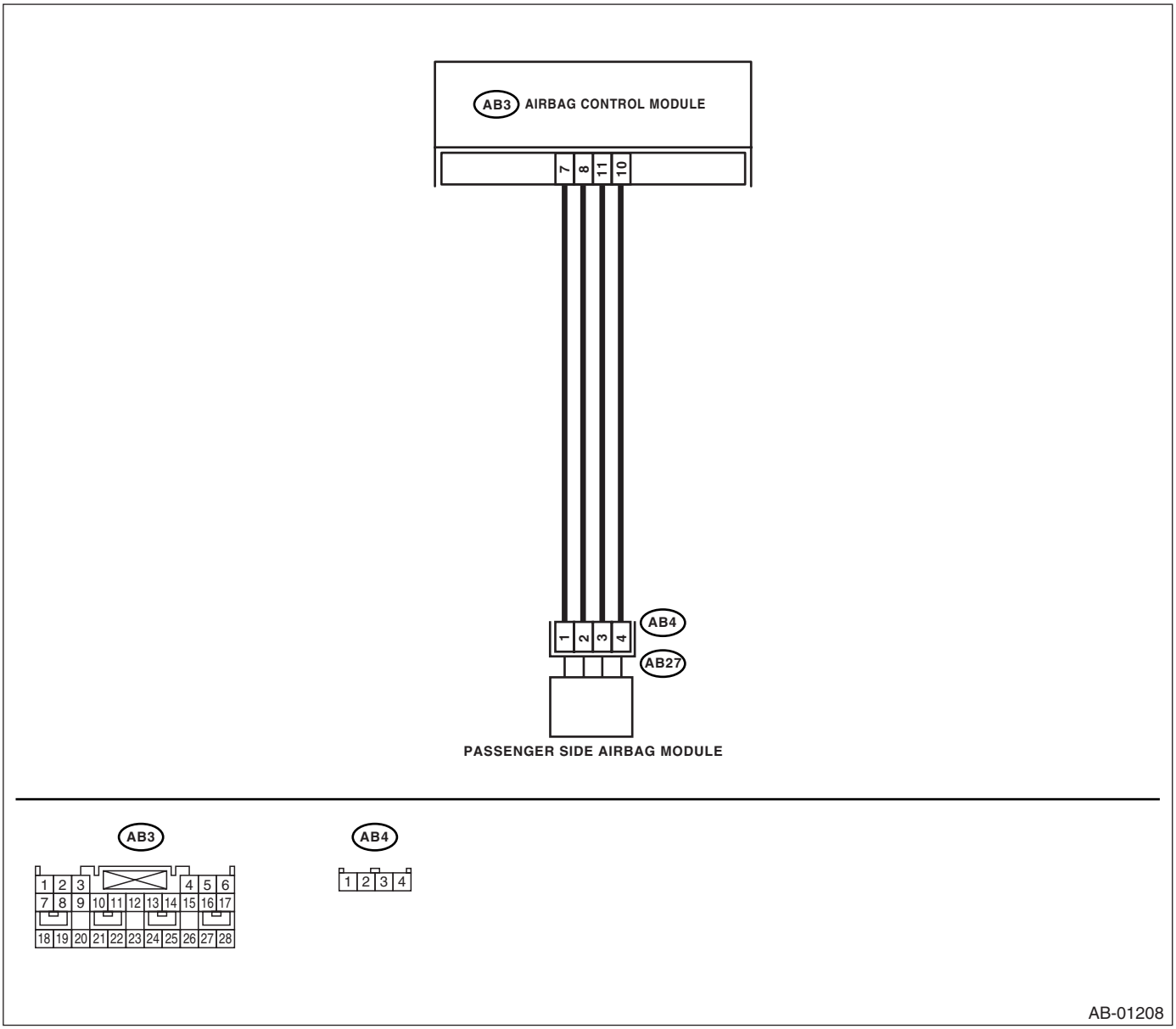
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the airbag module connector of the driver and passenger seats for safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK PASSENGERS AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the glove box. 3) Disconnect the passenger's airbag connector (AB27) and (AB4). 4) Connect the connector (1P) in test harness P to connector (AB4). 5) Connect the airbag resistor to connector (2P), (3P) in test harness P. 6) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the passenger airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector in test harness P. 3) Remove the instrument panel lower cover and disconnect the connector (AB21) from (AB26). 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5) Connect the battery ground cable and turn the ignition switch to ON. 6) Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 3 (+) — Chassis ground (−):*** ***(2R) No. 5 (+) — Chassis ground (−):***	Is the voltage less 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness with body harness.

E: DTC 21

DTC DETECTING CONDITION:

Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

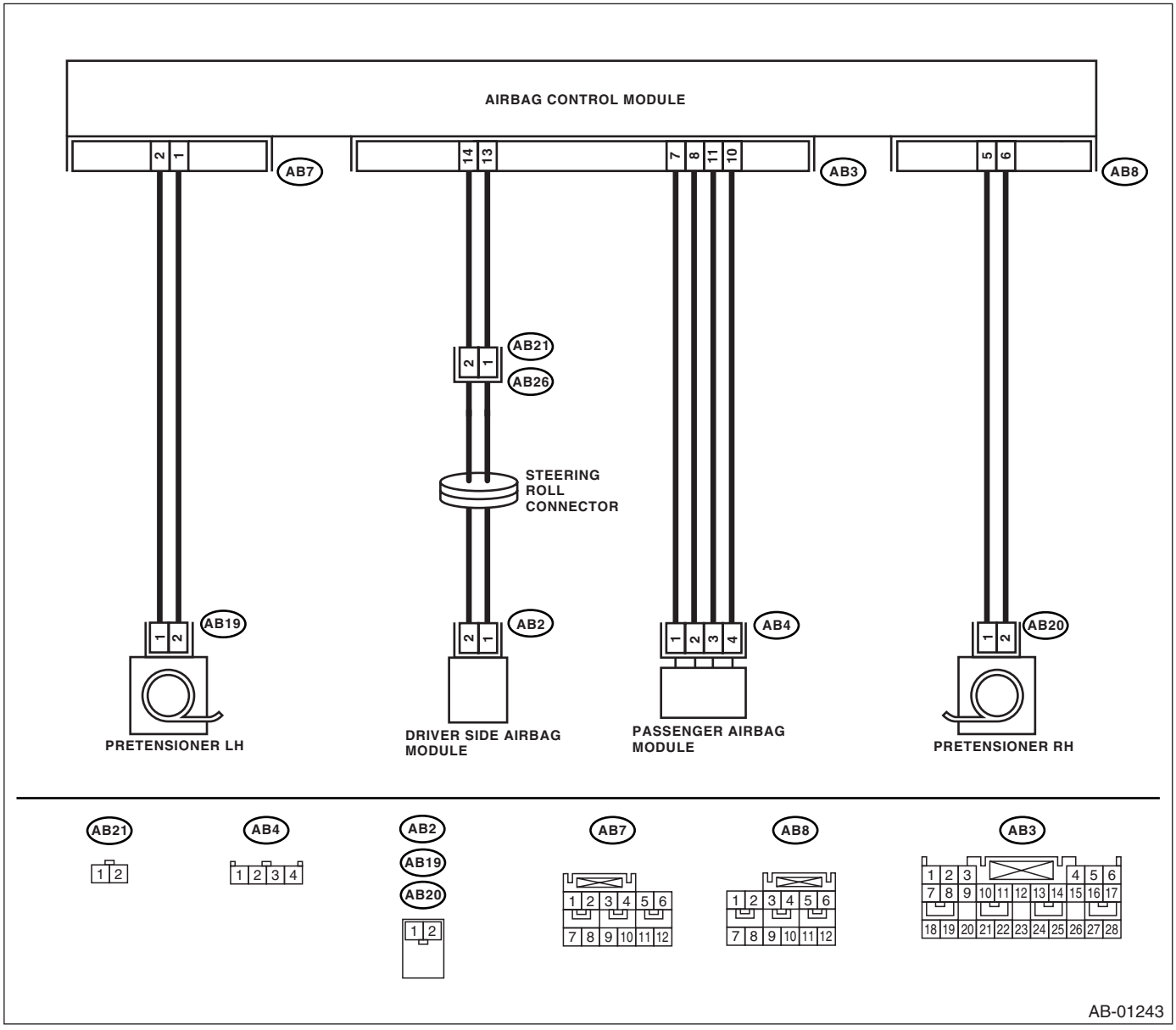
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

	Step	Check	Yes	No
1	**CHECK IF DTC 21 IS INDICATED.** Read the DTC. <Ref. to AB(diag)-26, Read Diagnostic Trouble Code (DTC).>	Is the airbag warning light DTC 21 indicated?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Perform the clear memory mode. <Ref. to AB(diag)-28, Clear Memory Mode.>

F: DTC 22

1. LHD MODEL

WIRING DIAGRAM:

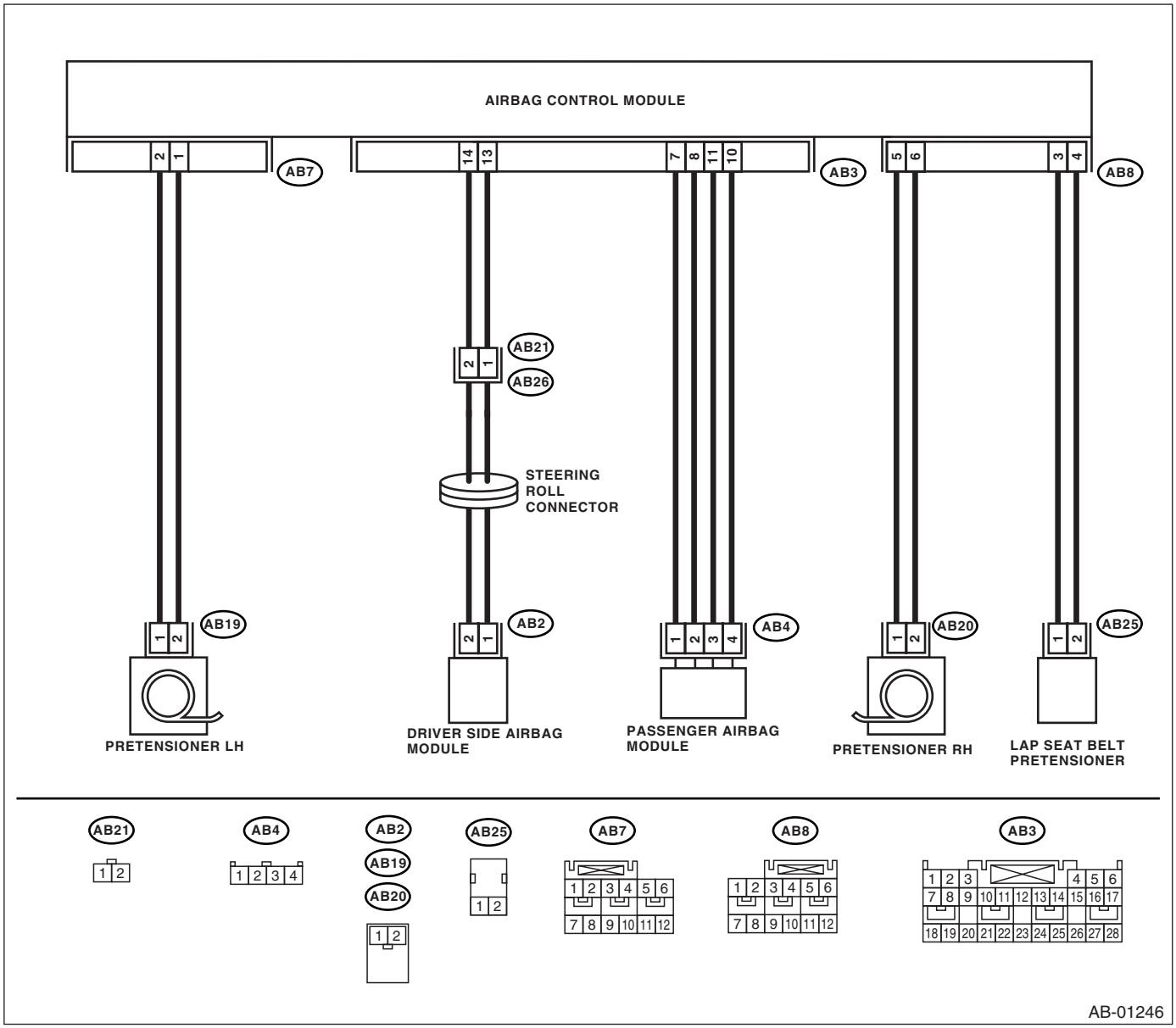


This code is indicated when the front airbag and the pretensioner are in operation.
Once this code is indicated, memory is not erasable; therefore replace the following parts.

- Airbag control module. **<Ref. to AB-18, Airbag Control Module.>**
- Driver's airbag module. **<Ref. to AB-14, Driver's Airbag Module.>**
- Passenger's airbag module. **<Ref. to AB-15, Passenger's Airbag Module.>**
- Front sub-sensor of both sides. **<Ref. to AB-21, Front Sub Sensor.>**
- Front seat belt outer with pretensioner of both sides. **<Ref. to SB-10, Front Seat Belt.>**

2. RHD MODEL

WIRING DIAGRAM:



This code is indicated when the front airbag, pretensioner and lap pretensioner are in operation.
Once this code is indicated, memory is not erasable; therefore replace the following parts.

- Airbag control module. **<Ref. to AB-18, Airbag Control Module.>**
- Driver's airbag module. **<Ref. to AB-14, Driver's Airbag Module.>**
- Passenger's airbag module. **<Ref. to AB-15, Passenger's Airbag Module.>**
- Front sub-sensor of both sides. **<Ref. to AB-21, Front Sub Sensor.>**
- Front seat belt outer with pretensioner of both sides. **<Ref. to SB-10, Front Seat Belt.>**

G: DTC 23

DTC DETECTING CONDITION:

(AB3), (AB7) and (AB8) are not connected properly to airbag control module.

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

NOTE:

After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

	Step	Check	Yes	No
1	**CHECK POOR CONTACT IN CONECTORS (AB3), (AB7) AND (AB8).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB3), (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Are there rust or damage on the harness connector and the control connector?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.> Replace the airbag main harness with body harness. Replace the side airbag harness with body harness.	Go to step **2.**
2	**CHECK POOR CONTACT IN CONECTORS (AB3), (AB7) and (AB8).** 1) Ensure that connectors are firmly reconnected. 2) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Finish the diagnostic.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>

H: DTC 24

DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 11 (in fuse and relay box) is blown.
- Body harness circuit is open.

CAUTION:

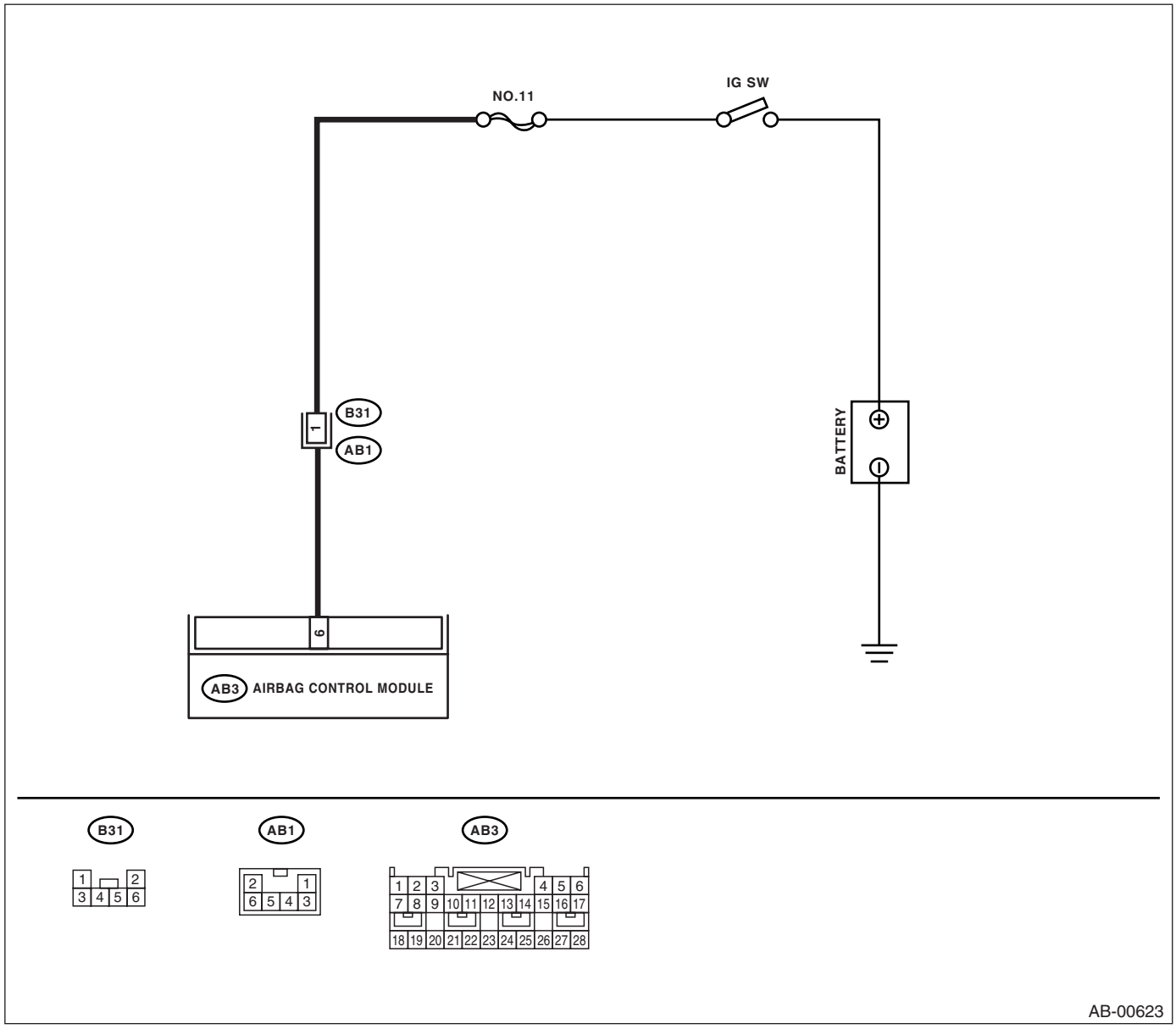
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

1. LHD MODEL

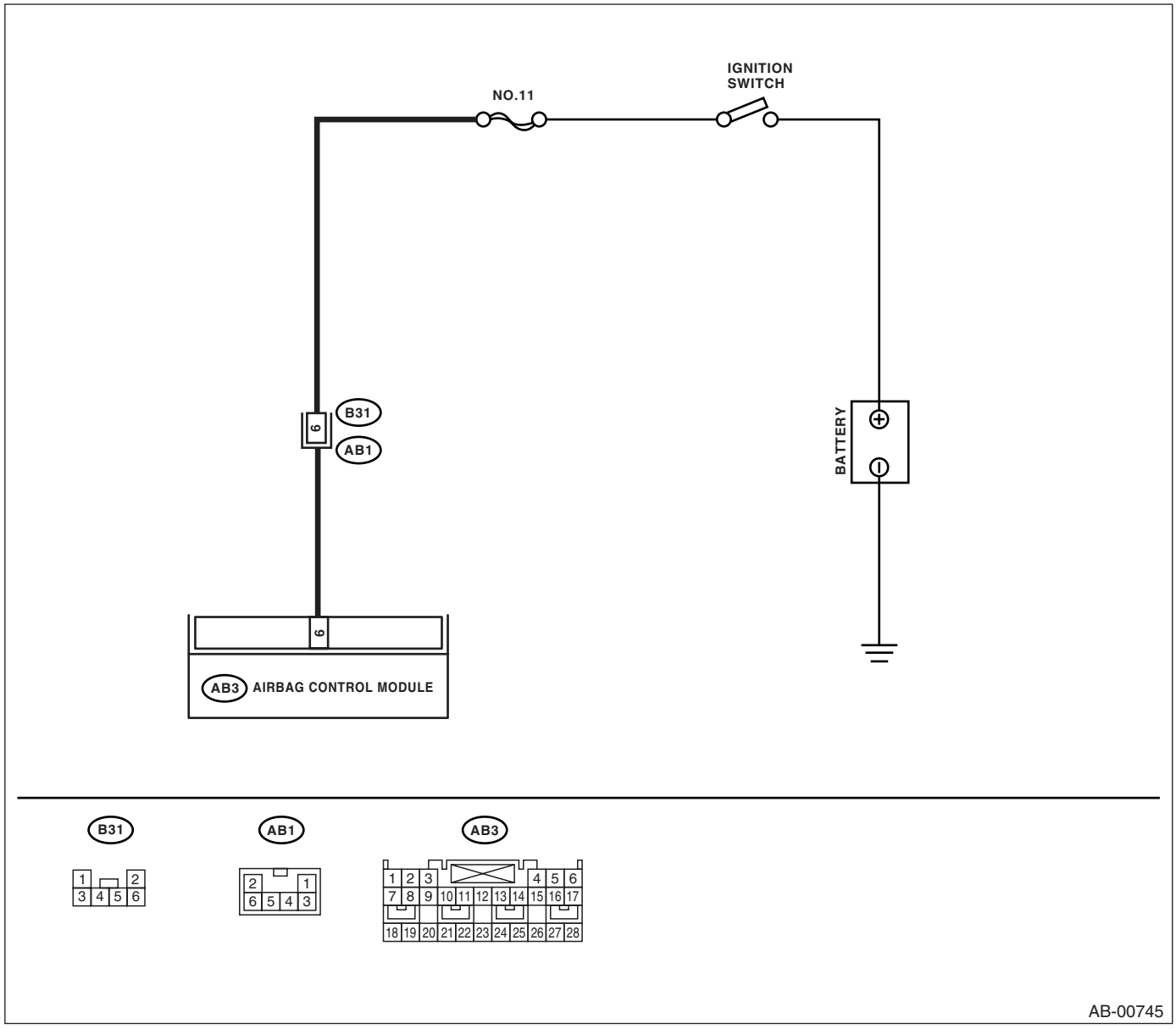
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 3) Connect the connector (1R) in test harness R to connector (AB3). 4) Connect the battery ground cable and turn the ignition switch to ON. 5) Measure the voltage between connector (2R) in test harness R and chassis ground. ***Connector & terminal*** ***(2R) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Connect the connector (2M) in test harness M to connector (AB1). 4) Measure the resistance between connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 2 — (2R) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 2 — Chassis ground:*** ***(2R) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE No. 11 (IN JOINT BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove the fuse No. 11 (in fuse and relay box) and perform visual inspection.	Is the fuse No. 11 blown out?	Replace the fuse No. 11. If fuse No. 11 blows out again, repair the body harness.	Repair the body harness.

2. RHD MODEL

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 3) Connect the connector (1R) in test harness R to connector (AB3). 4) Connect the battery ground cable and turn the ignition switch to ON. 5) Measure the voltage between connector (2R) in test harness R and chassis ground. ***Connector & terminal*** ***(2R) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Connect the connector (2M) in test harness M to connector (AB1). 4) Measure the resistance between connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 9 — (2R) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 9 — Chassis ground:*** ***(2R) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE No. 11 (IN FUSE AND RELAY BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove the fuse No. 11 (in fuse and relay box) and perform visual inspection.	Fuse No. 11 is not blown out.	Replace the fuse No. 11. If fuse No. 11 blows out again, repair the body harness.	Repair the body harness.

I: DTC 25

DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness circuit is open.

CAUTION:

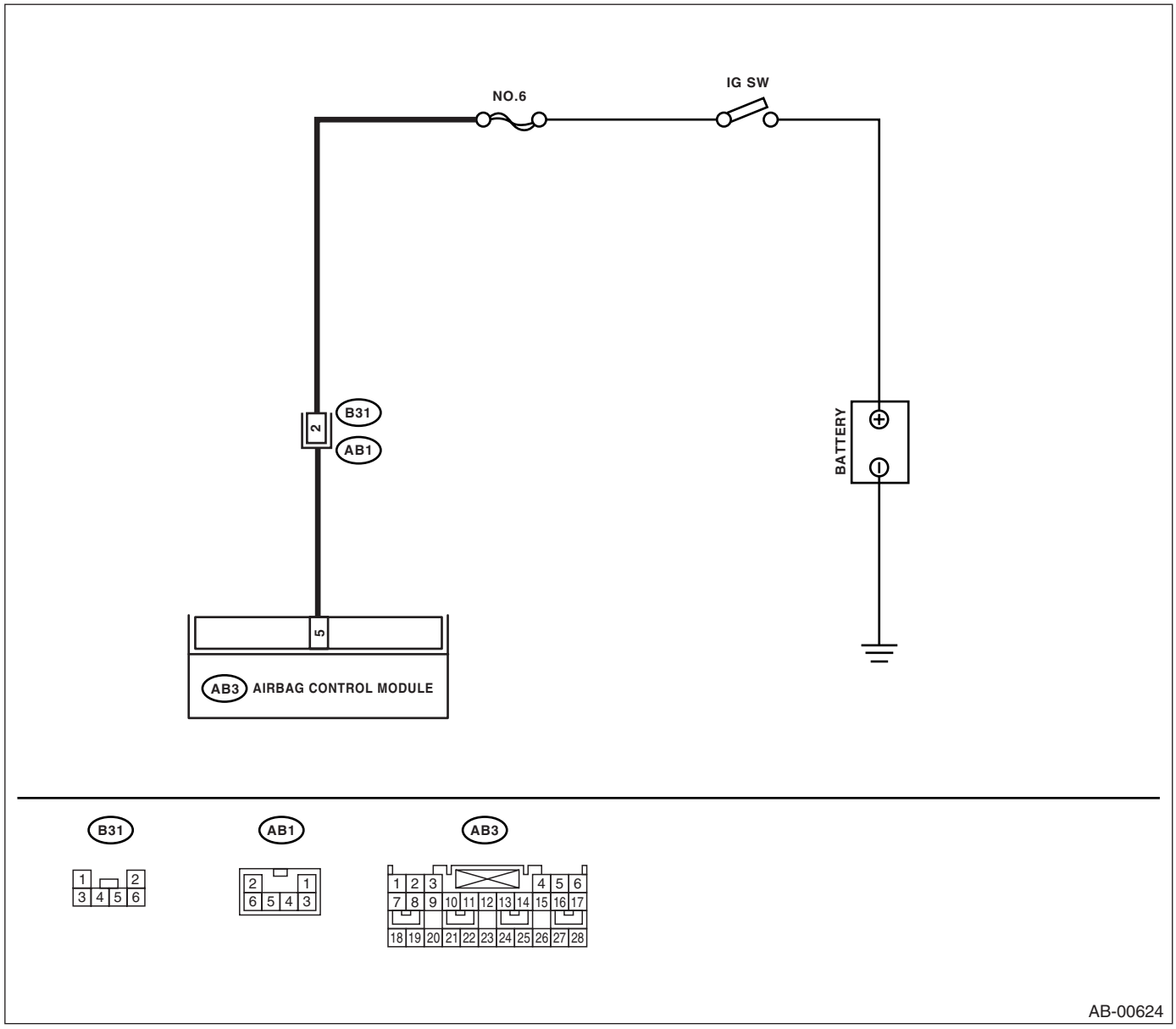
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

1. LHD MODEL

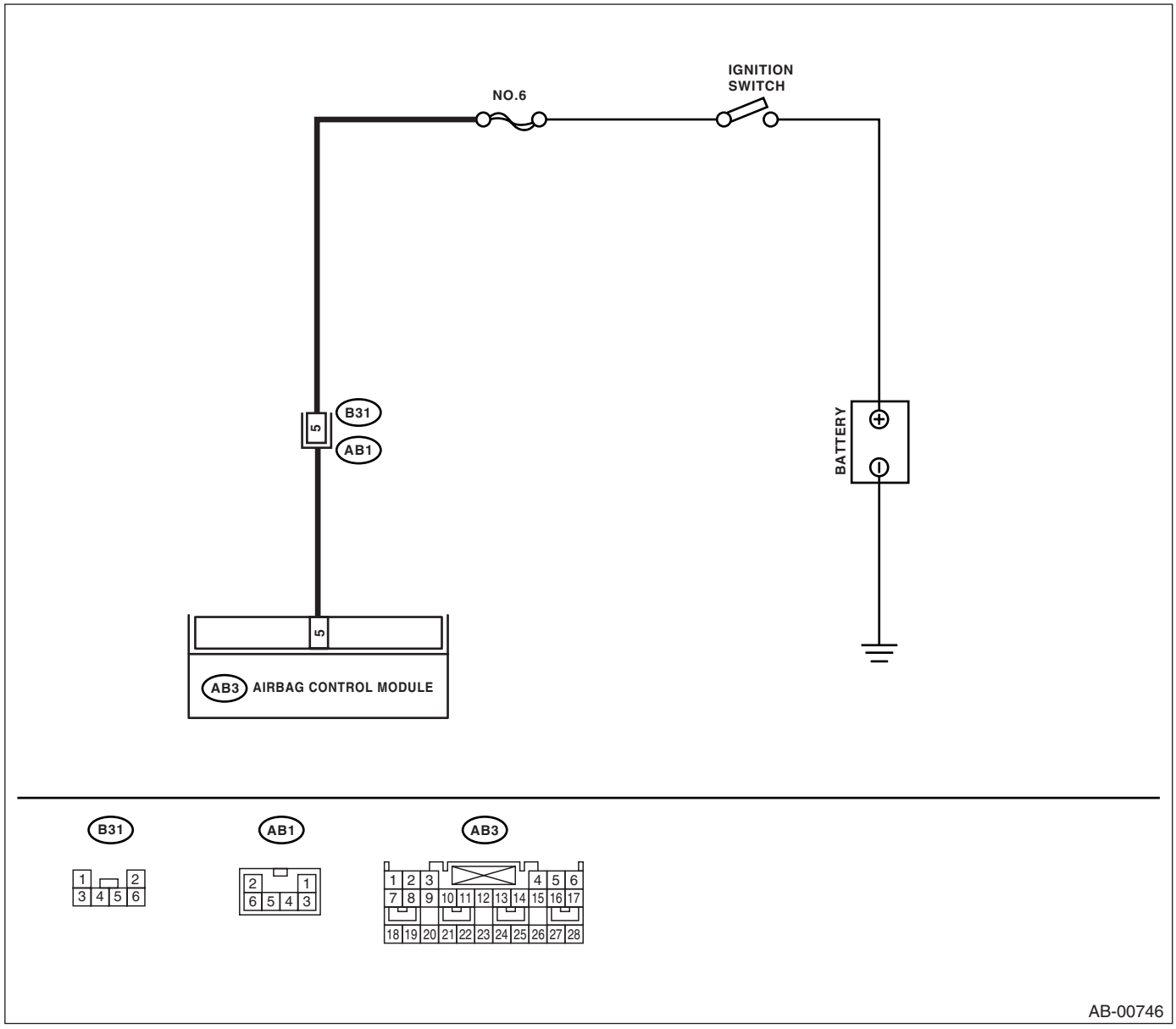
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from airbag control module. <Ref. to AB-18, Airbag Control Module.> 3) Connect the connector (1R) in test harness R to connector (AB3). 4) Connect the battery ground cable, and turn the ignition switch to ON. 5) Measure the voltage between the connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Connect the connector (2M) in test harness M to the airbag connector (AB1). 4) Measure the resistance between the connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 4 — (2R) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 4 — Chassis ground:*** ***(2R) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE No. 6 (IN FUSE AND RELAY BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove the No. 6 fuse (in fuse and relay box) and perform visual inspection.	Is the fuse No. 6 blown out?	Replace the fuse No. 6. If fuse No. 6 is blown out again, repair the body harness.	Repair the body harness.

2. RHD MODEL

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AIRBAG CONTROL MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from airbag control module. <Ref. to AB-18, Airbag Control Module.> 3) Connect the connector (1R) in test harness R to connector (AB3). 4) Connect the battery ground cable, and turn the ignition switch to ON. 5) Measure the voltage between the connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag connector (AB1) from the body harness (B31). 3) Connect the connector (2M) in test harness M to the airbag connector (AB1). 4) Measure the resistance between the connector (5M) in test harness M and the connector (2R) in test harness R. ***Connector & terminal*** ***(5M) No. 1 — (2R) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the following resistance with the above-mentioned condition maintained. ***Connector & terminal*** ***(5M) No. 1 — Chassis ground:*** ***(2R) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the airbag main harness with body harness.
4	**CHECK FUSE No. 6 (IN FUSE AND RELAY BOX).** 1) Confirm that the ignition switch is turned OFF. 2) Remove the No. 6 fuse (in fuse and relay box) and perform visual inspection.	Is the fuse No. 6 blown out?	Replace the fuse No. 6. If fuse No. 6 is blown out again, repair the body harness.	Repair the body harness.

J: DTC 31

DTC DETECTING CONDITION:

- Front sub-sensor harness circuit (RH) is shorted, open or shorted to power supply.
- Airbag main harness circuit is shorted, open or shorted to power supply.
- Front sub-sensor (RH) is faulty.
- Airbag control module is faulty.

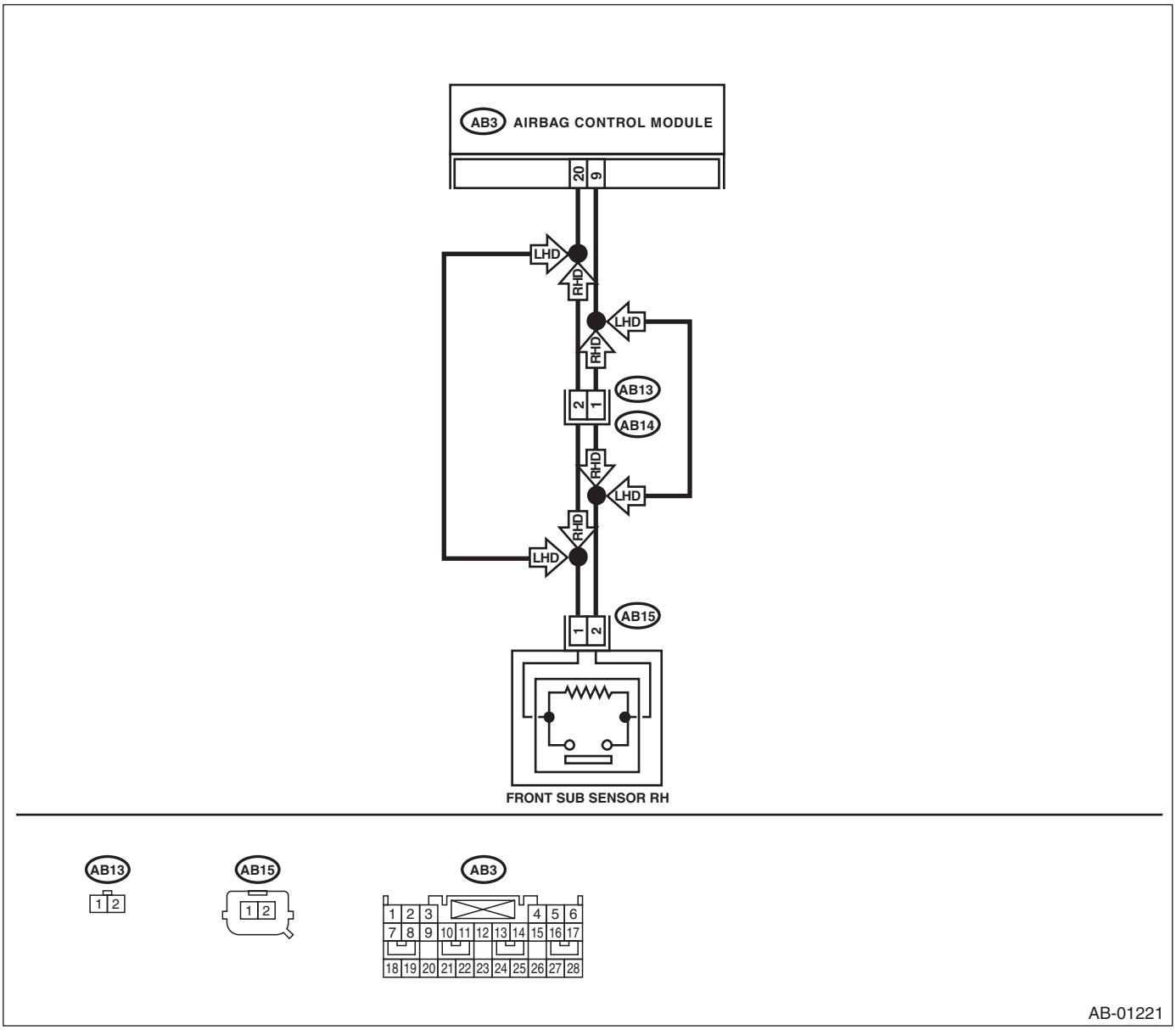
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (RH) AND AIRBAG HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 3) Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 7 — (3R) No. 9:***	Is the resistance 750 Ω and 1 KΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** 1) Disconnect the connector (AB15) from the front sub-sensor. <Ref. to AB-21, Front Sub Sensor.> 2) Connect the connector (IH) in test harness H to connector (AB15). 3) Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H. ***Connector & terminal*** ***(3R) No. 7 — (3H) No. 5:*** ***(3R) No. 9 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness and front sub-sensor harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 7 — (3R) No. 9:*** ***(3R) No. 7 — Chassis ground:*** ***(3R) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the airbag main harness and front sub-sensor harness with body harness.
4	**CHECK FRONT SUB-SENSOR (RH).** 1) Connect the connector (2H) in test harness H to front sub-sensor (RH). 2) Measure the resistance of the connector (3H) in test harness H. ***Connector & terminal*** ***(3H) No. 3 — No. 4:***	Is the resistance 750 Ω and 1 KΩ?	Go to step **5.**	Replace the front sub-sensor (RH). <Ref. to AB-21, Front Sub Sensor.>
5	**CHECK FRONT SUB-SENSOR (RH).** Measure the resistance between connector (3H) in test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Finish the diagnostic.	Replace the front sub-sensor (RH). <Ref. to AB-21, Front Sub Sensor.>

K: DTC 32

DTC DETECTING CONDITION:

- Front sub-sensor harness circuit (LH) is shorted, open or shorted to power supply.
- Airbag main harness circuit is shorted, open or shorted to power supply.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

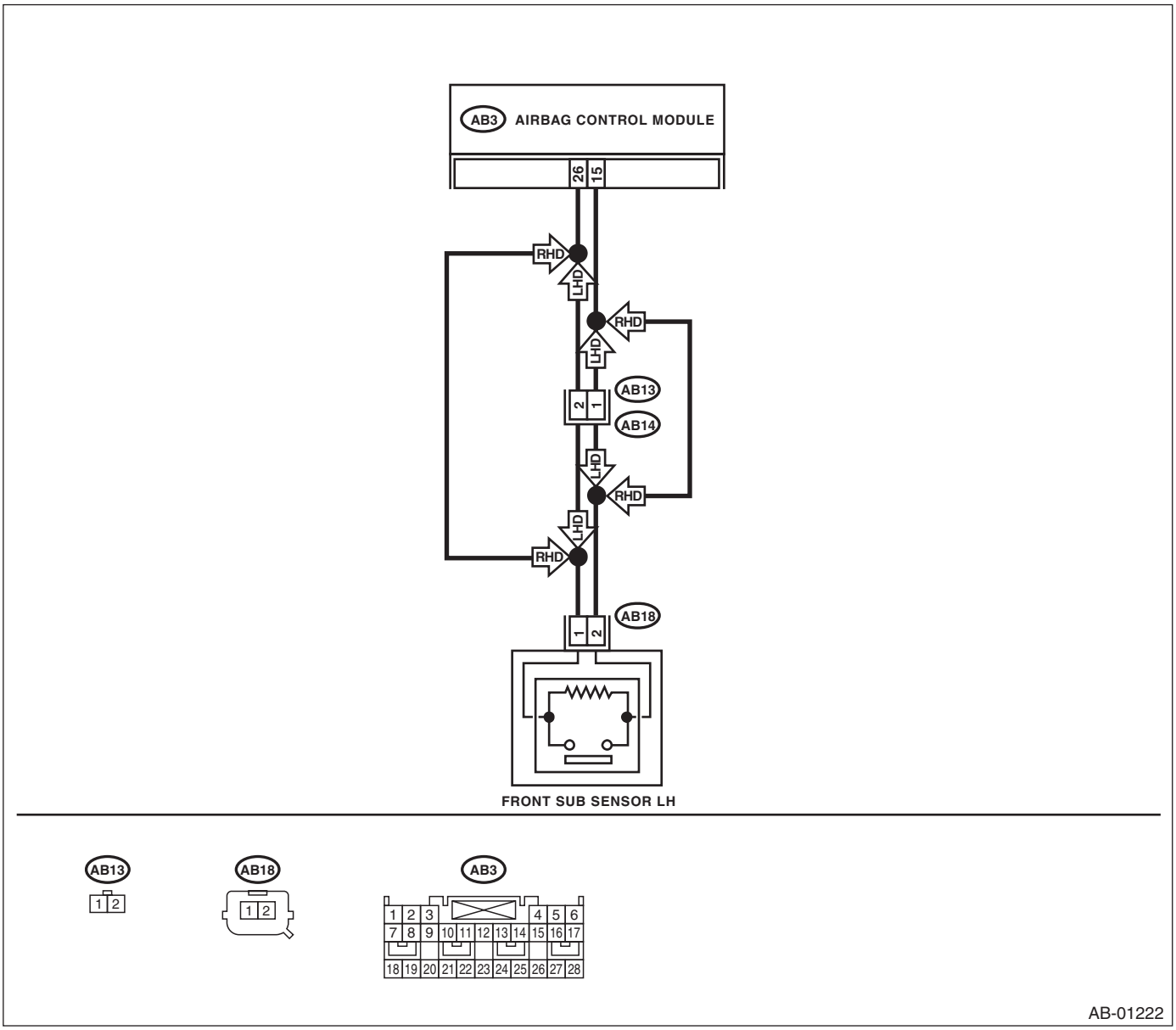
CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FRONT SUB-SENSOR (LH) AND AIRBAG HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB3) from the airbag control module, and connect connector (1R) in the test harness R to connector (AB3). <Ref. to AB-18, Airbag Control Module.> 3) Measure the resistance of the connector (3R) in the test harness R. ***Connector & terminal*** ***(3R) No. 6 — (3R) No. 8:***	Is the resistance 750 Ω — 1 KΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** 1) Disconnect the connector (AB18) from the front sub-sensor. <Ref. to AB-21, Front Sub Sensor.> 2) Connect the connector (1H) in test harness H to connector (AB18). 3) Measure the resistance between connector (3R) in test harness R and connector (3H) in test harness H. ***Connector & terminal*** ***(3R) No. 6 — (3H) No. 5:*** ***(3R) No. 8 — (3H) No. 6:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness and front sub-sensor harness with body harness.
3	**CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 6 — Chassis ground:*** ***(3R) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the airbag main harness and front sub-sensor harness with body harness.
4	**CHECK FRONT SUB-SENSOR (LH).** 1) Connect the connector (2H) in test harness H to front sub-sensor (LH). 2) Measure the resistance of the connector (3H) in test harness H. ***Connector & terminal*** ***(3H) No. 3 — (3H) No. 4:***	Is the resistance 750 Ω — 1 KΩ	Go to step **5.**	Replace the front sub-sensor (LH). <Ref. to AB-21, Front Sub Sensor.>
5	**CHECK FRONT SUB-SENSOR (LH).** Measure the resistance between connector (3H) in test harness H and the chassis ground. ***Connector & terminal*** ***(3H) No. 3 — Chassis ground:*** ***(3H) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Finish the diagnostic.	Replace the front sub-sensor (LH). <Ref. to AB-21, Front Sub Sensor.>

L: DTC 41

DTC DETECTING CONDITION:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

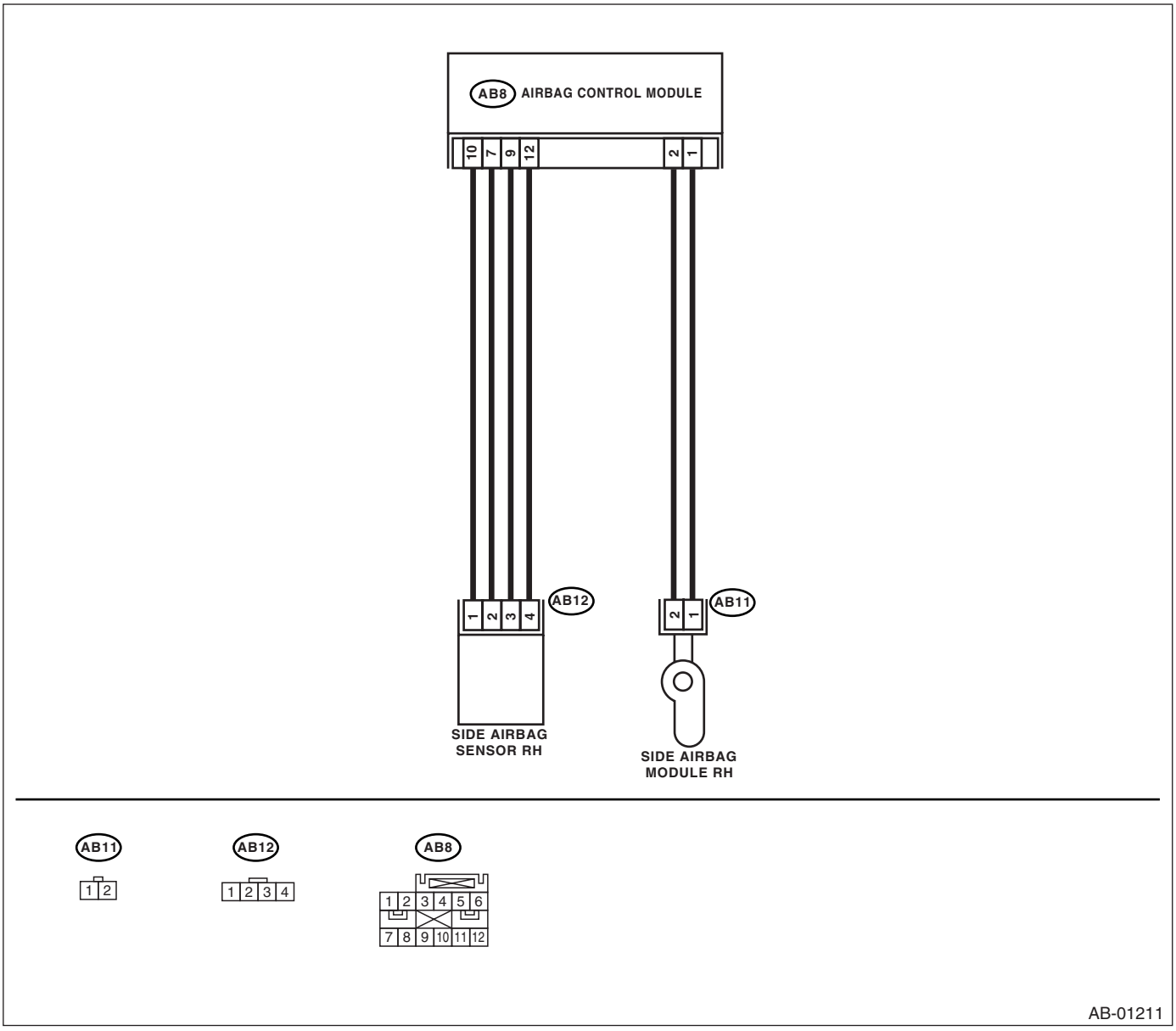
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector , seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB11) from side airbag module (RH), and connect the connector (1F) in test harness F to (AB11). 3) Connect the airbag resistor to connector (3F) in test harness F. 4) Connect the battery ground cable, and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the front seat with side airbag module (RH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.> 3) For the vehicle with lap seat belt pretensioner, disconnect the connector (AB25) from lap pretensioner. 4) Disconnect the airbag resistor from test harness F. 5) Disconnect the connector (AB8) from air bag control module. <Ref. to AB-18, Airbag Control Module.> 6) Connect the connector (1R) in test harness R to connector (AB8). 7) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 18 — (3F) No. 3:*** ***(3R) No. 20 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 18 — (3R) No. 20:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 18 — Chassis ground:*** ***(3R) No. 20 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

M: DTC 42

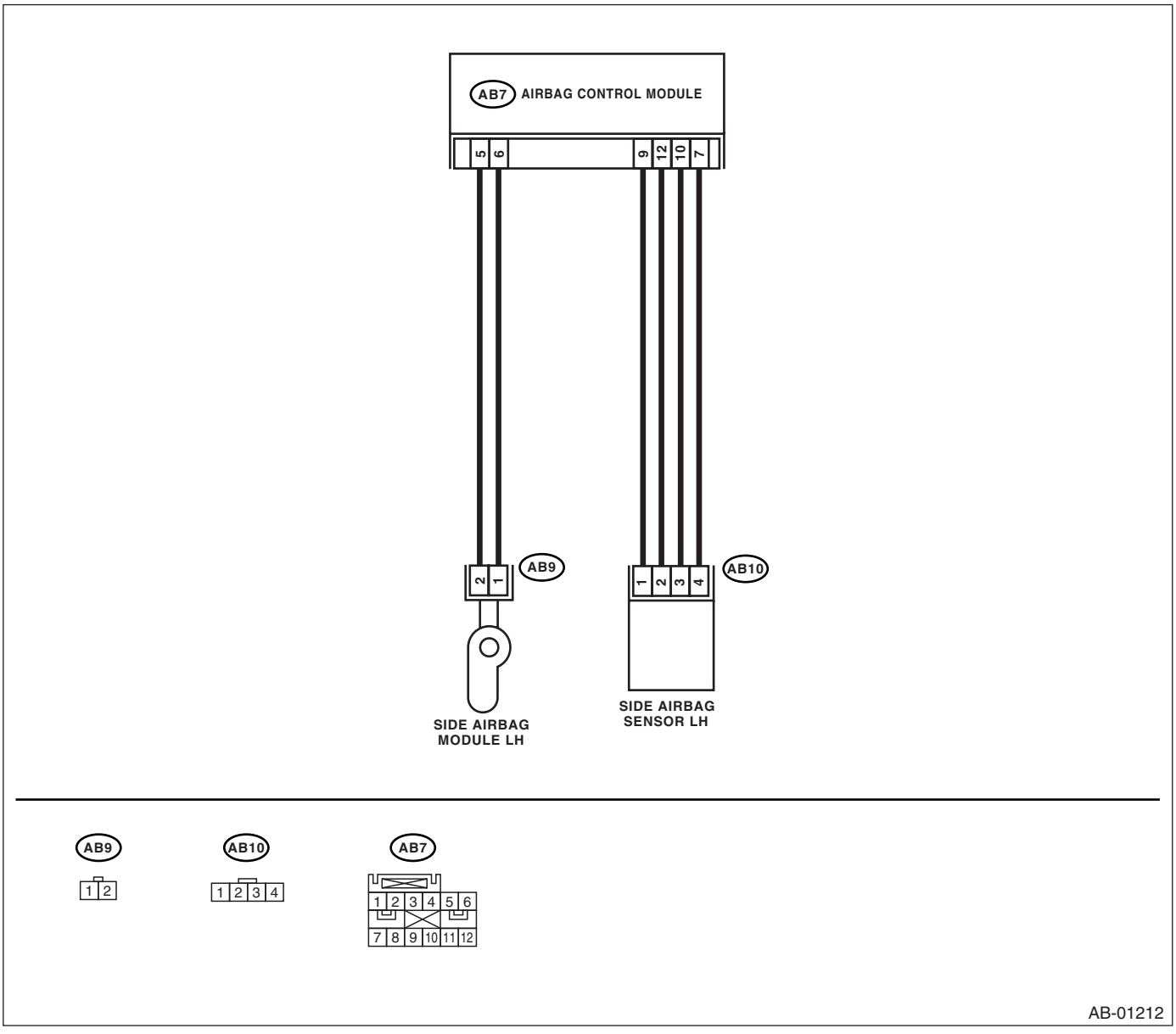
DTC DETECTING CONDITION:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.
• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.
• When inspecting the side airbag harness, disconnect the side airbag module connector and seat belt pretensioner connector for the safety reasons.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB9) from side airbag module (LH), and connect the connector (1F) in test harness F to (AB9). 3) Connect the airbag resistor to connector (3F) in test harness F. 4) Connect the battery ground cable, and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the front seat with side airbag module (LH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.> 3) Disconnect the airbag resistor from the test harness. 4) Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to connector (AB7). 6) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 12 — (3F) No. 3:*** ***(3R) No. 10 — (3F) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 12 — (3R) No. 10:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG HARNESS (LH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 10 — Chassis ground:*** ***(3R) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

N: DTC 45

DTC DETECTING CONDITION:

- Side airbag harness (RH) is shorted to power supply.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

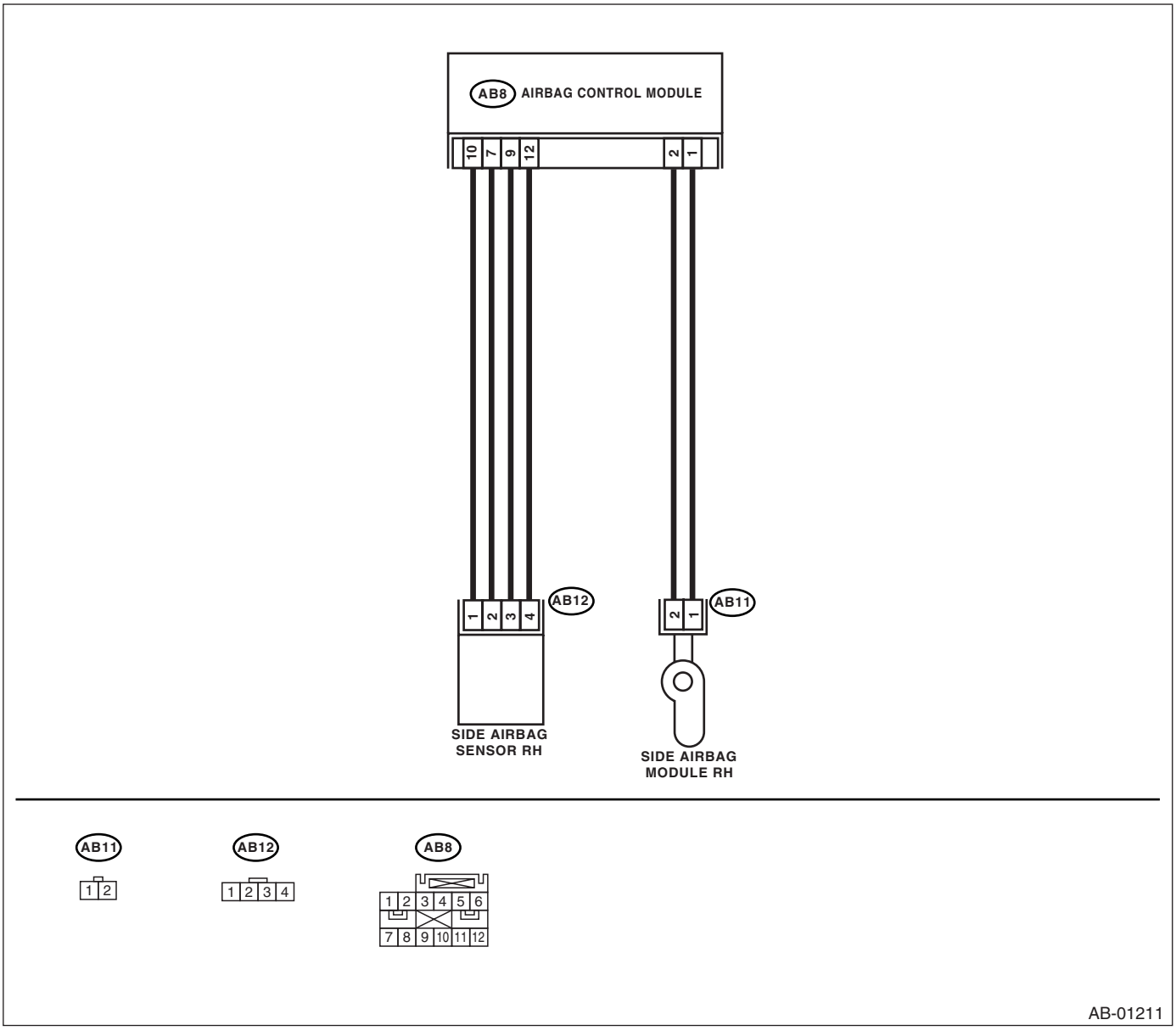
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB11) from side airbag module (RH), and connect the connector (1F) in test harness F to (AB11). 3) Connect the airbag resistor to connector (3F) in test harness F. 4) Connect the battery ground cable, and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the front seat with side airbag module (RH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.> 3) For the vehicle with lap seat belt pretensioner, disconnect the connector (AB25) from lap pretensioner. 4) Disconnect the airbag resistor from the test harness. 5) Disconnect the connector (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 6) Connect the connector (1R) in test harness R to connector (AB8). 7) Connect the battery ground cable, and turn the ignition switch to ON. 8) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 18 (+) — Chassis ground (−):*** ***(3R) No. 20 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

O: DTC 46

DTC DETECTING CONDITION:

- Side airbag harness (LH) is shorted to power supply.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

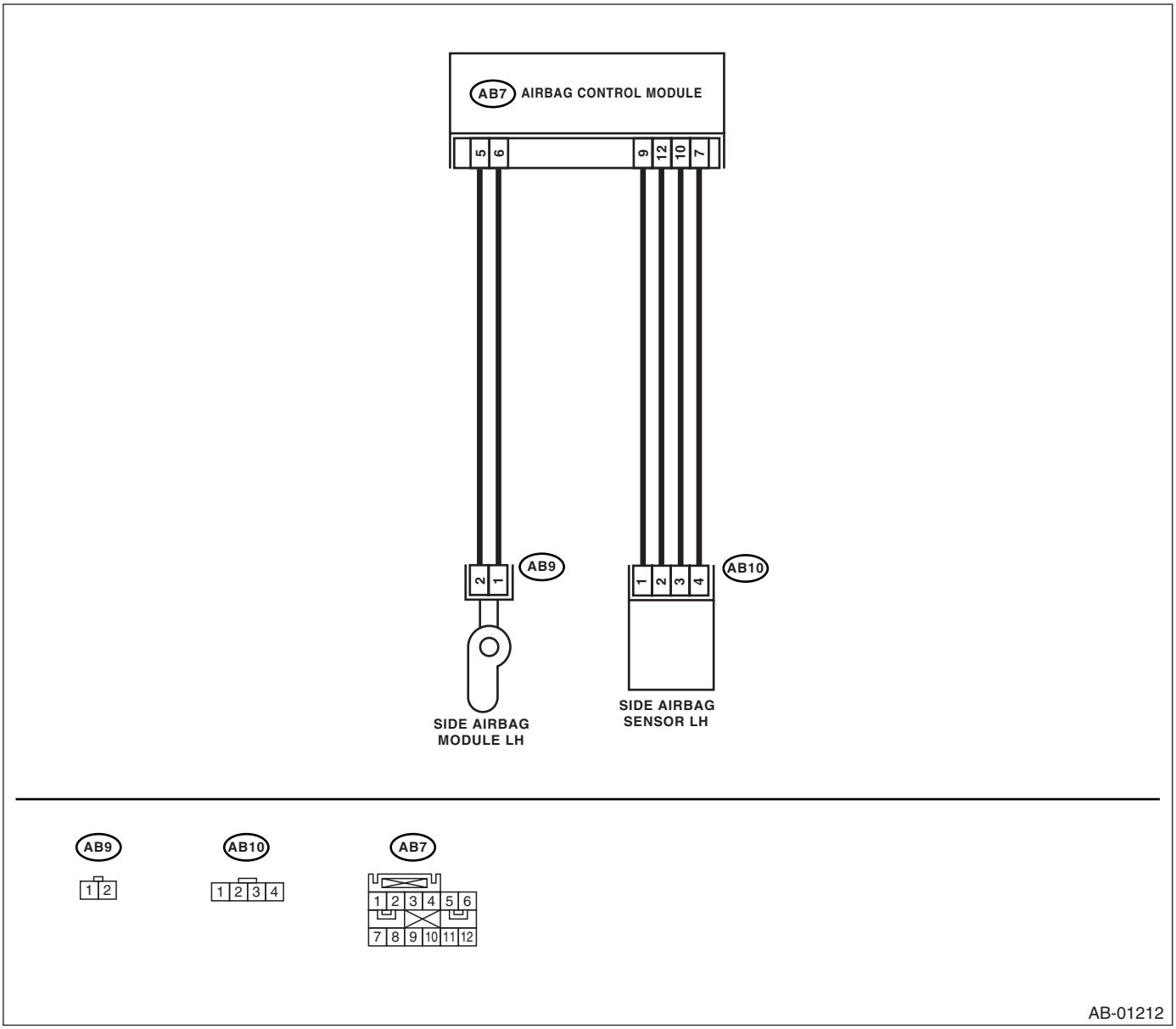
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG MODULE.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB9) from side airbag module (LH), and connect the connector (1F) in test harness F to (AB9). 3) Connect the airbag resistor to connector (3F) in test harness F. 4) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the front seat with side airbag module (LH). <Ref. to SE-6, Front Seat.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.> 3) Disconnect the airbag resistor from the test harness. 4) Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to connector (AB7). 6) Connect the battery ground cable, and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 10 (+) — Chassis ground (−):*** ***(3R) No. 12 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

P: DTC 51

DTC DETECTING CONDITION:

- Side airbag sensor (RH) is faulty.
- Side airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

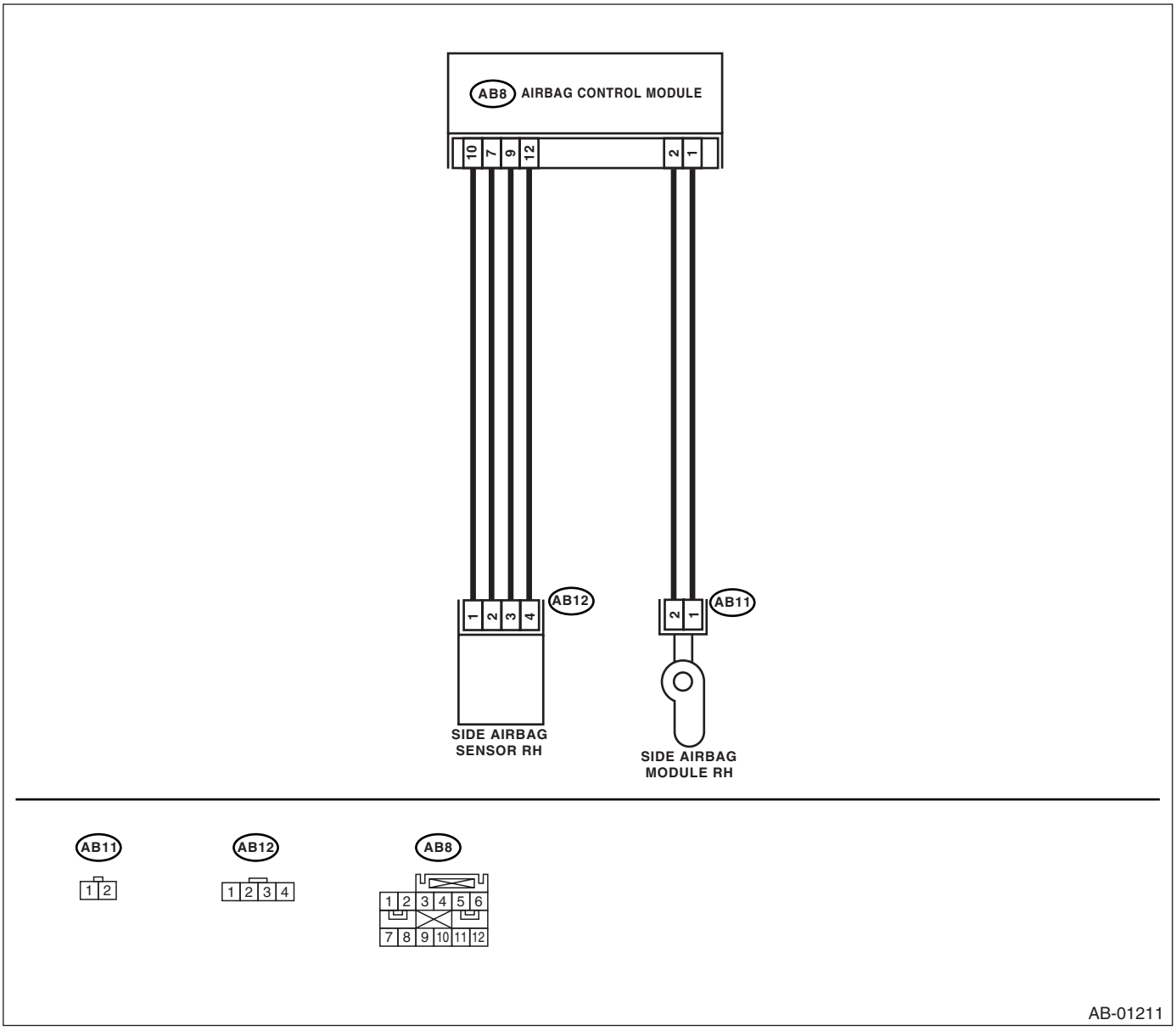
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG (RH) HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.> 3) For the vehicle with lap seat belt pretensioner, disconnect the connector (AB25) from lap pretensioner. 4) Disconnect the connector (AB11) from side airbag module (RH). 5) Disconnect the connector (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 6) Connect the connector (1R) in test harness R to the connector (AB8). 7) Disconnect the connector (AB12) from the side airbag sensor (RH), and connect the connector (2 V) in test harness V to connector (AB12). 8) Measure the resistance between connector (4R) in test harness R and connector (3 V) in test harness V. ***Connector & terminal*** ***(4R) No. 5 — (3 V) No. 2:*** ***(4R) No. 6 — (3 V) No. 4:*** ***(4R) No. 7 — (3 V) No. 1:*** ***(4R) No. 8 — (3 V) No. 5:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the side airbag harness with body harness.
2	**CHECK SIDE AIRBAG HARNESS.** Measure the resistance between connector (4R) in test harness R and the chassis ground and the resistance of the connector (4R). ***Connector & terminal*** ***(4R) No. 5 — Chassis ground:*** ***(4R) No. 6 — Chassis ground:*** ***(4R) No. 7 — Chassis ground:*** ***(4R) No. 8 — Chassis ground:*** ***(4R) No. 5 — (4R) No. 7:*** ***(4R) No. 5 — (4R) No. 6:*** ***(4R) No. 5 — (4R) No. 8:*** ***(4R) No. 6 — (4R) No. 7:*** ***(4R) No. 6 — (4R) No. 8:*** ***(4R) No. 7 — (4R) No. 8:***	Is the resistance more than 1 MΩ?	Replace the side airbag sensor (RH). <Ref. to AB-19, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

Q: DTC 52

DTC DETECTING CONDITION:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

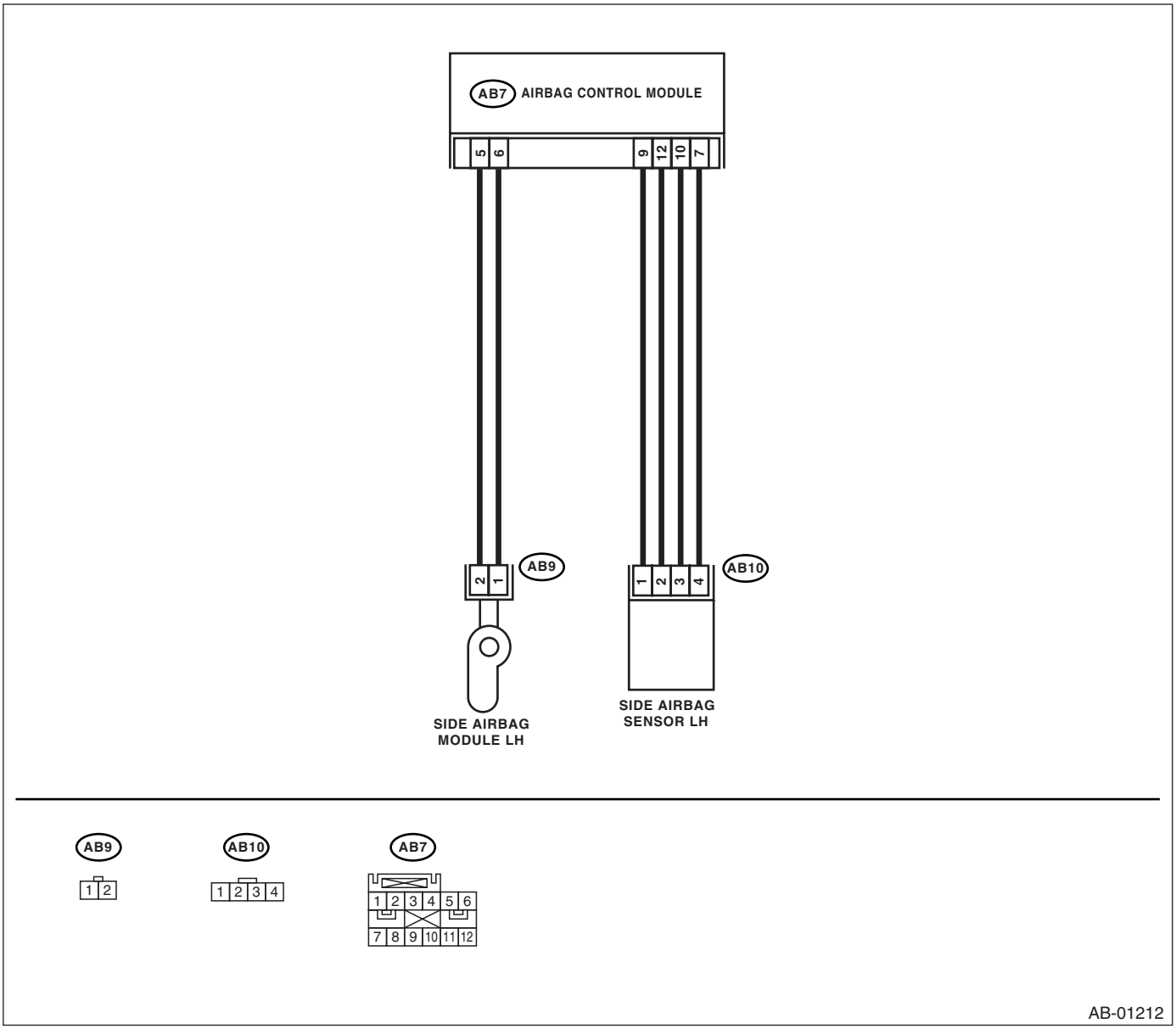
• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SIDE AIRBAG (LH) HARNESS.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.> 3) Disconnect the connector (AB9) from side airbag module (LH). 4) Disconnect the connector (AB7) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to connector (AB7). 6) Disconnect the connector (AB10) from the side airbag sensor (LH), and connect the connector (2 V) in test harness V to connector (AB10). 7) Measure the resistance between connector (4R) in test harness R and connector (3 V) in test harness V. ***Connector & terminal*** ***(4R) No. 4 — (3 V) No. 2:*** ***(4R) No. 3 — (3 V) No. 4:*** ***(4R) No. 2 — (3 V) No. 1:*** ***(4R) No. 1 — (3 V) No. 5:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the side airbag harness with body harness.
2	**CHECK SIDE AIRBAG (LH) HARNESS.** Measure the resistance between connector (4R) in test harness R and the chassis ground. and the resistance of the connector (4R). ***Connector & terminal*** ***(4R) No. 4 — Chassis ground:*** ***(4R) No. 3 — Chassis ground:*** ***(4R) No. 2 — Chassis ground:*** ***(4R) No. 1 — Chassis ground:*** ***(4R) No. 4 — (4R) No. 3:*** ***(4R) No. 4 — (4R) No. 2:*** ***(4R) No. 4 — (4R) No. 1:*** ***(4R) No. 3 — (4R) No. 2:*** ***(4R) No. 3 — (4R) No. 1:*** ***(4R) No. 2 — (4R) No. 1:***	Is the resistance more than 1 MΩ?	Replace the side airbag sensor (LH). <Ref. to AB-19, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

R: DTC 53

DTC DETECTING CONDITION:

- Side airbag sensor (RH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).

<Ref. to AB-19, Side Airbag Sensor.>

S: DTC 54

DTC DETECTING CONDITION:

- Side airbag sensor (LH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).

<Ref. to AB-19, Side Airbag Sensor.>

T: DTC 55

This code is displayed when the side airbag is operate.

When this code is displayed, the memory cannot be erased. Replace the following parts.

- Airbag control module. **<Ref. to AB-18, Airbag Control Module.>**
- Front seat with side airbag module. (Operating side) **<Ref. to SE-6, Front Seat.>**
- Side airbag sensor. (Operating side) **<Ref. to AB-19, Side Airbag Sensor.>**

U: DTC 61

DTC DETECTING CONDITION:

- Seat belt pretensioner circuit (RH) is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

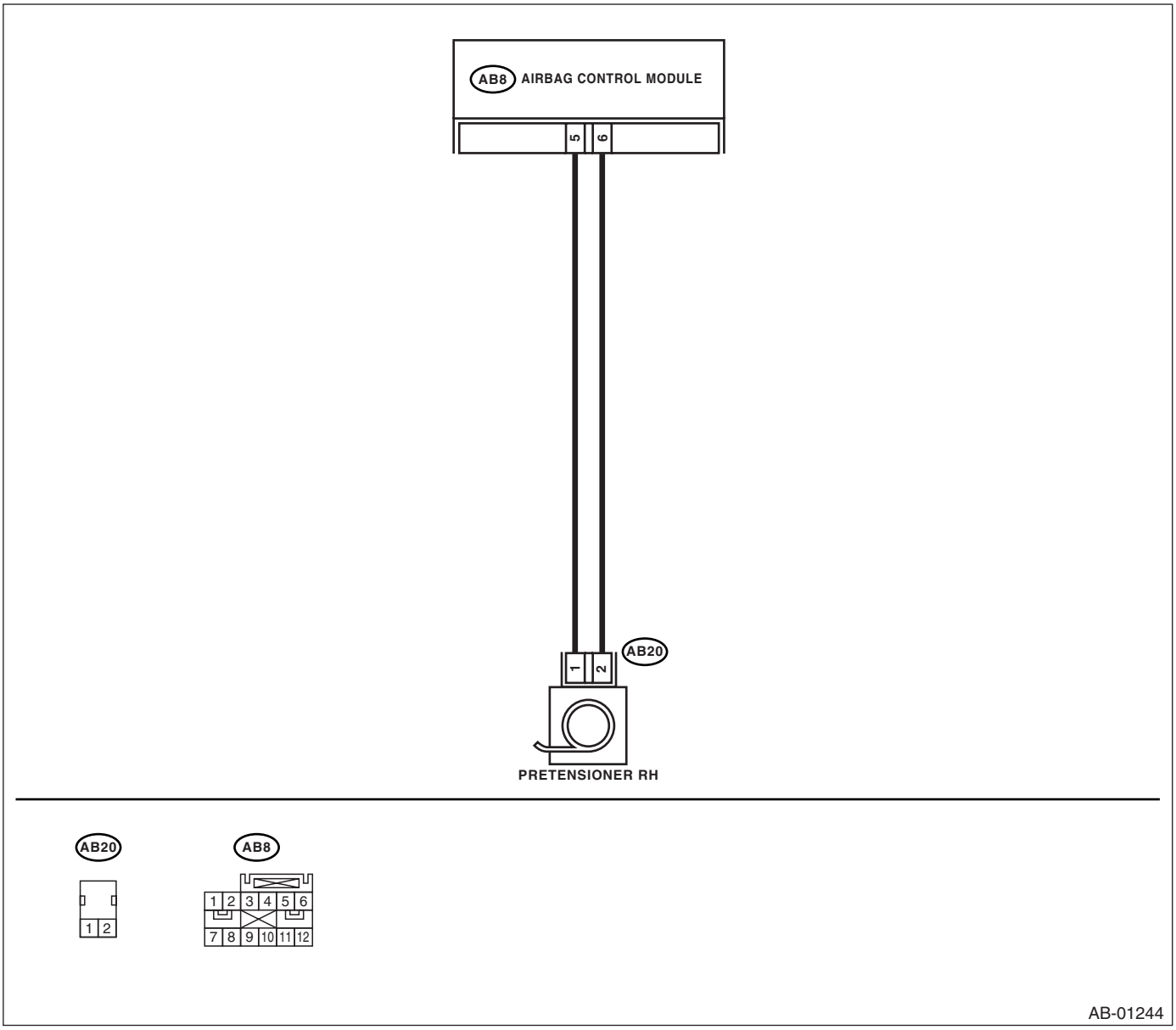
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB20). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB11) from side airbag module (RH). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to connector (AB8). 6) Measure the resistance between connector (3R) in test harness R and connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 17 — (3F) No. 4:*** ***(3R) No. 19 — (3F) No. 3:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 17 — (3R) No. 19:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG HARNESS (RH).** Measure the resistance between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 17 — Chassis ground:*** ***(3R) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

V: DTC 62

DTC DETECTING CONDITION:

- Seat belt pretensioner circuit (LH) is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

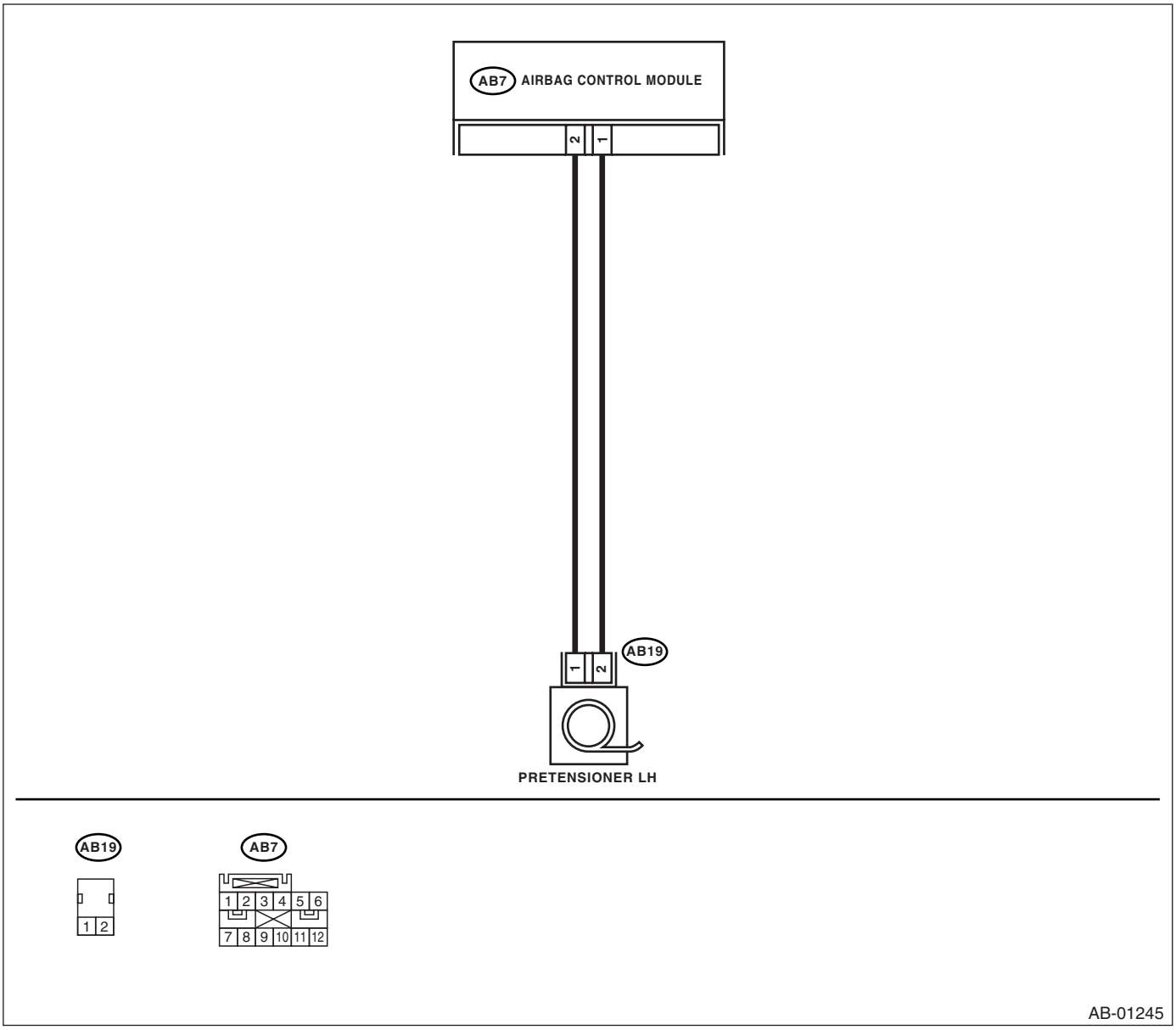
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB19). 4) Connect the airbag resistor to the connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB9) from side airbag module (LH). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to the connector (AB7). 6) Measure the resistance between connector (3R) in test harness R and the connector (3F) in test harness F. ***Connector & terminal*** ***(3R) No. 11 — (3F) No. 4:*** ***(3R) No. 13 — (3F) No. 3:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG (LH) HARNESS.** Measure the resistance of the connector (3R) in test harness R. ***Connector & terminal*** ***(3R) No. 11 — (3R) No. 13:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the side airbag harness with body harness.
4	**CHECK SIDE AIRBAG (LH) HARNESS.** Measure the resistance between the connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 11 — Chassis ground:*** ***(3R) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

W: DTC 65

DTC DETECTING CONDITION:

- Seat belt pretensioner circuit (RH) is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

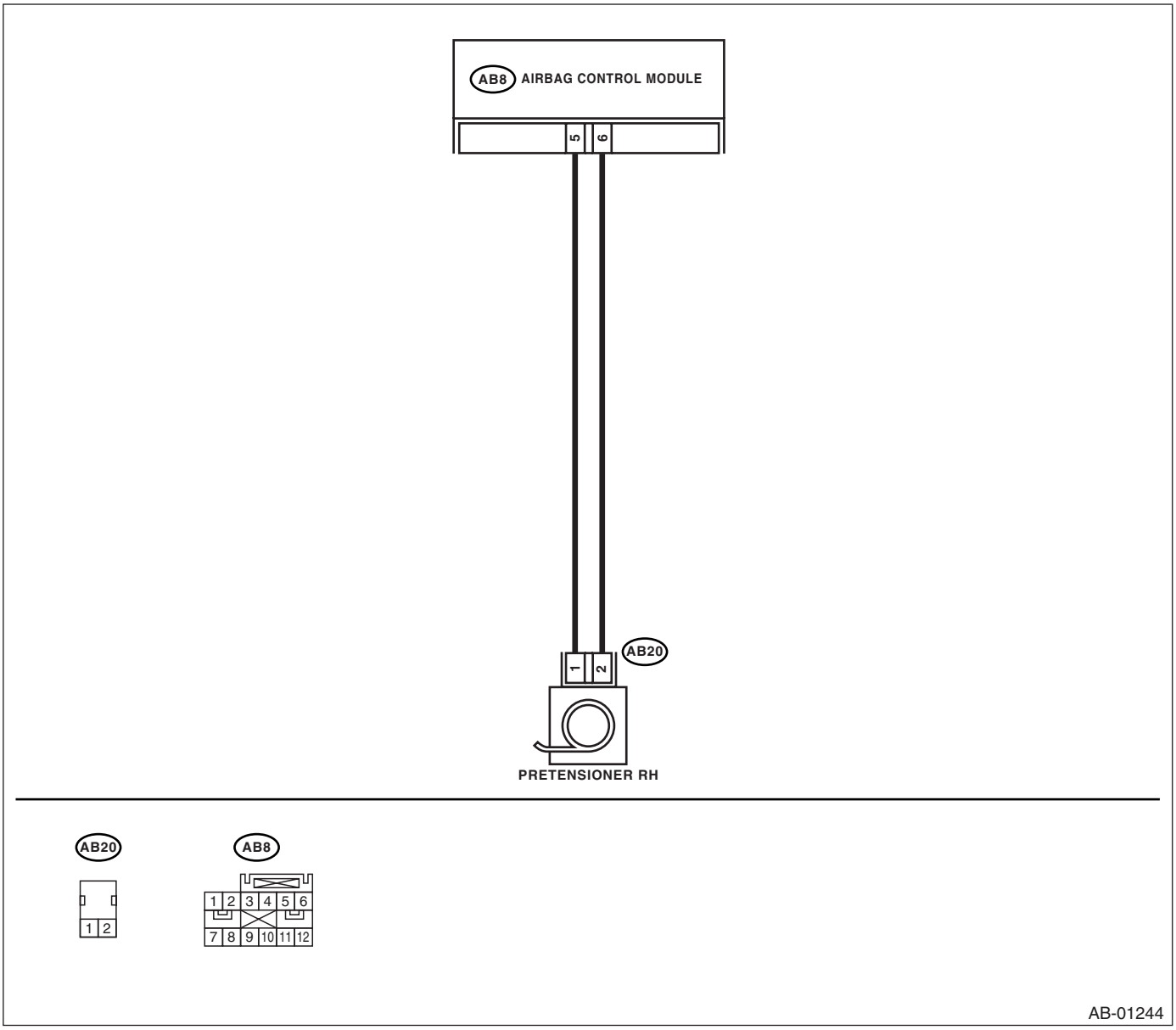
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB20). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB11) from side airbag module (RH). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to the connector (AB8). 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 17 (+) — Chassis ground (−):*** ***(3R) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

X: DTC 66

DTC DETECTING CONDITION:

- Seat belt pretensioner circuit (LH) is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

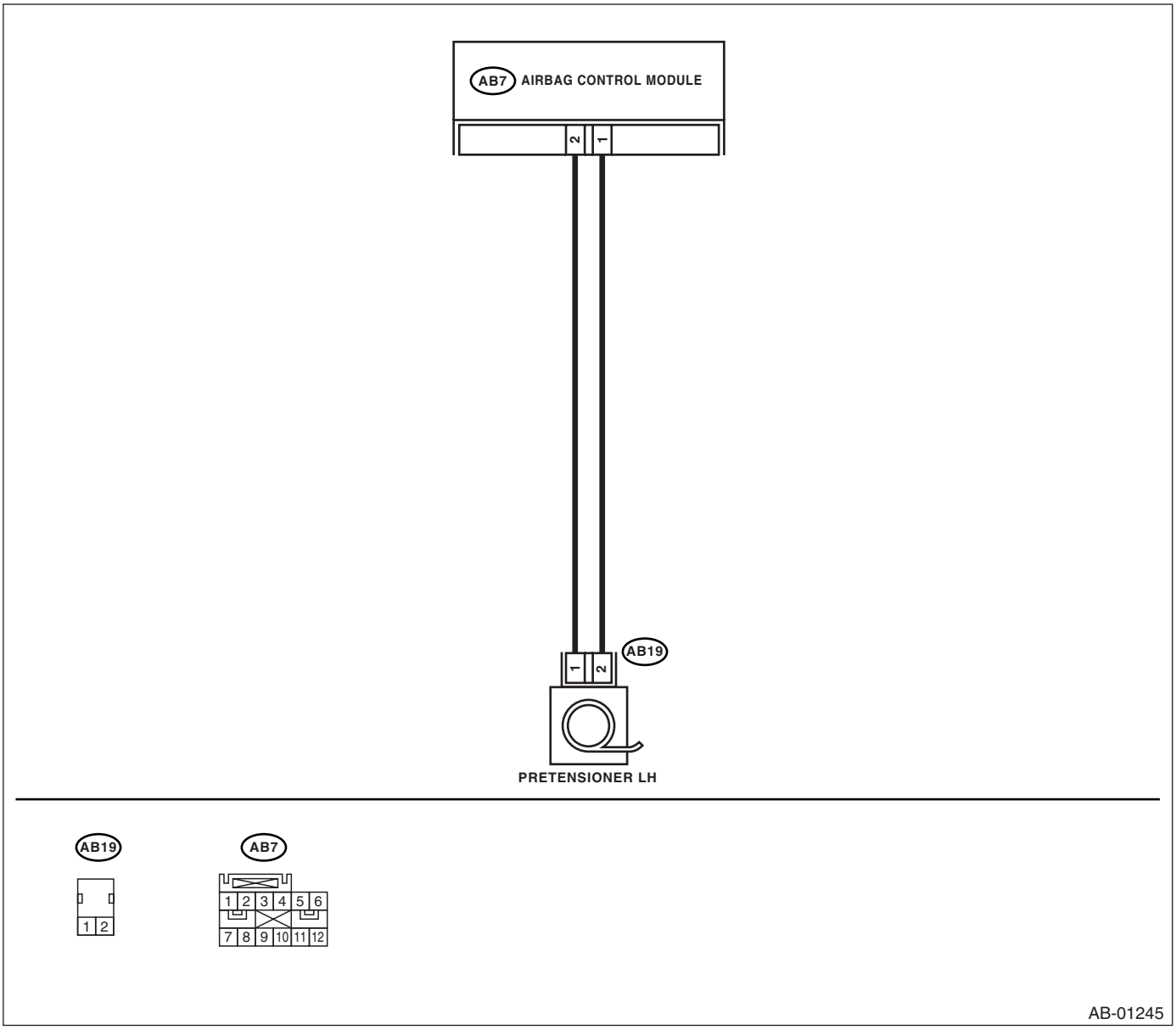
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.> 3) Connect the connector (1F) in test harness F to (AB19). 4) Connect the airbag resistor to the connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (LH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB9) from side airbag module (LH). 4) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 5) Connect the connector (1R) in test harness R to the connector (AB7). 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 11 (+) — Chassis ground (−):*** ***(3R) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

Y: DTC 72

DTC DETECTING CONDITION:

- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness circuit (Passenger) is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

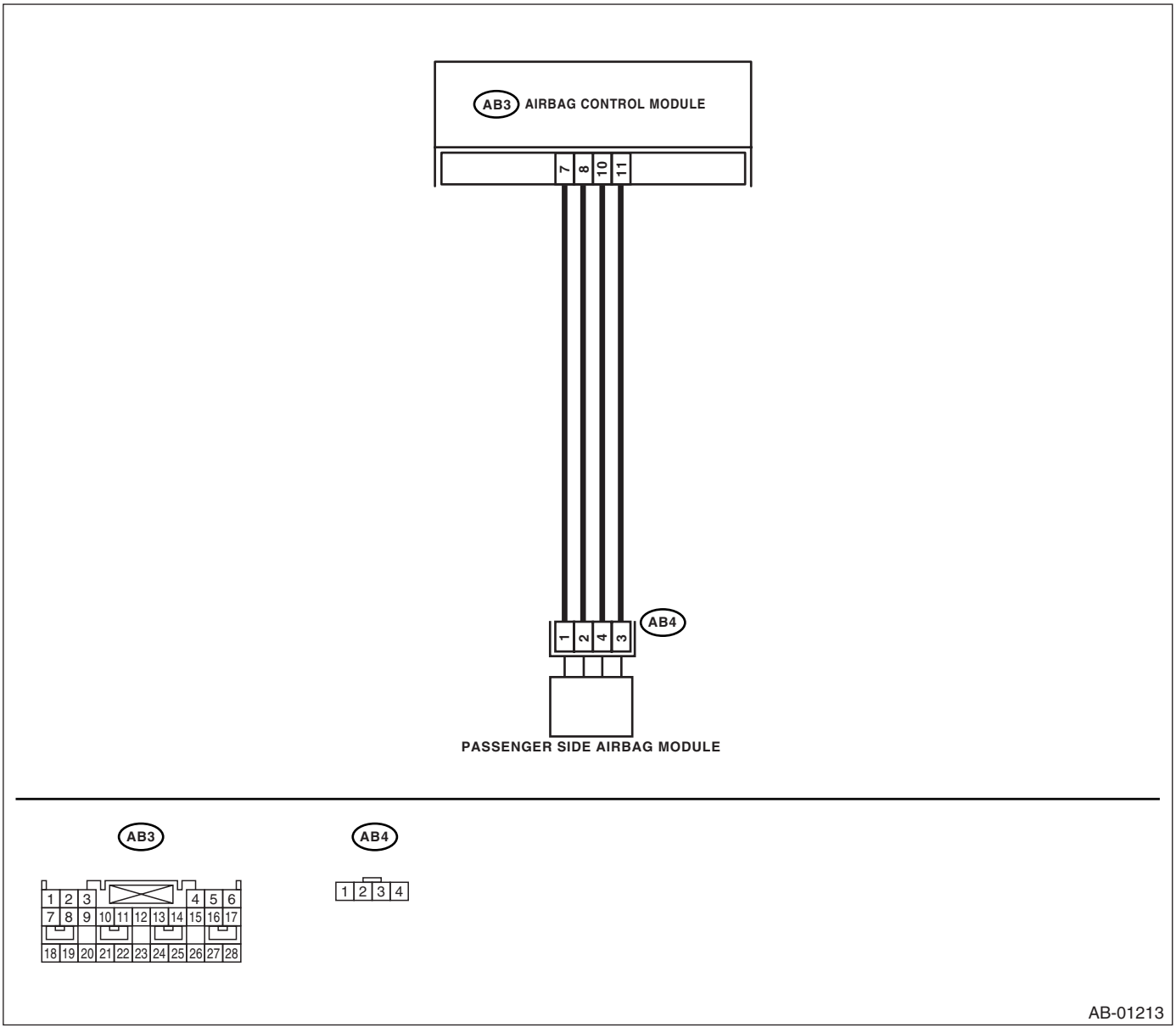
• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGERS AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the glove box. 3) Disconnect the connector passenger's airbag module from (AB4). 4) Connect the connector (1P) in test harness K to connector (AB4). 5) Connect two airbag resistors to connectors (2P) and (3P) in test harness P. 6) Connect the battery ground cable and turn the ignition switch ON.	Is the airbag warning light turned on normally?	Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (2P) and (3P) in test harness P. 3) Remove the lower cover and disconnect the connector (AB21) from (AB26). 4) Disconnect the connector (AB3) from the air bag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5) Measure the resistance between connector (2R) in test harness R and the connector (3P) in test harness P. ***Connector & terminal*** ***(2R) No. 9 — (3P) No. 3:*** ***(2R) No. 13 — (3P) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the airbag main harness together with body harness as a unit.
3	**CHECK AIRBAG MAIN HARNESS.** Measure the resistance of the connector (2R) in test harness R. ***Connector & terminal*** ***(2R) No. 9 — No. 13:*** ***(2R) No. 9 — Chassis ground:*** ***(2R) No. 13 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness together with body harness as a unit.

Z: DTC 76

DTC DETECTING CONDITION:

- Airbag main harness circuit (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

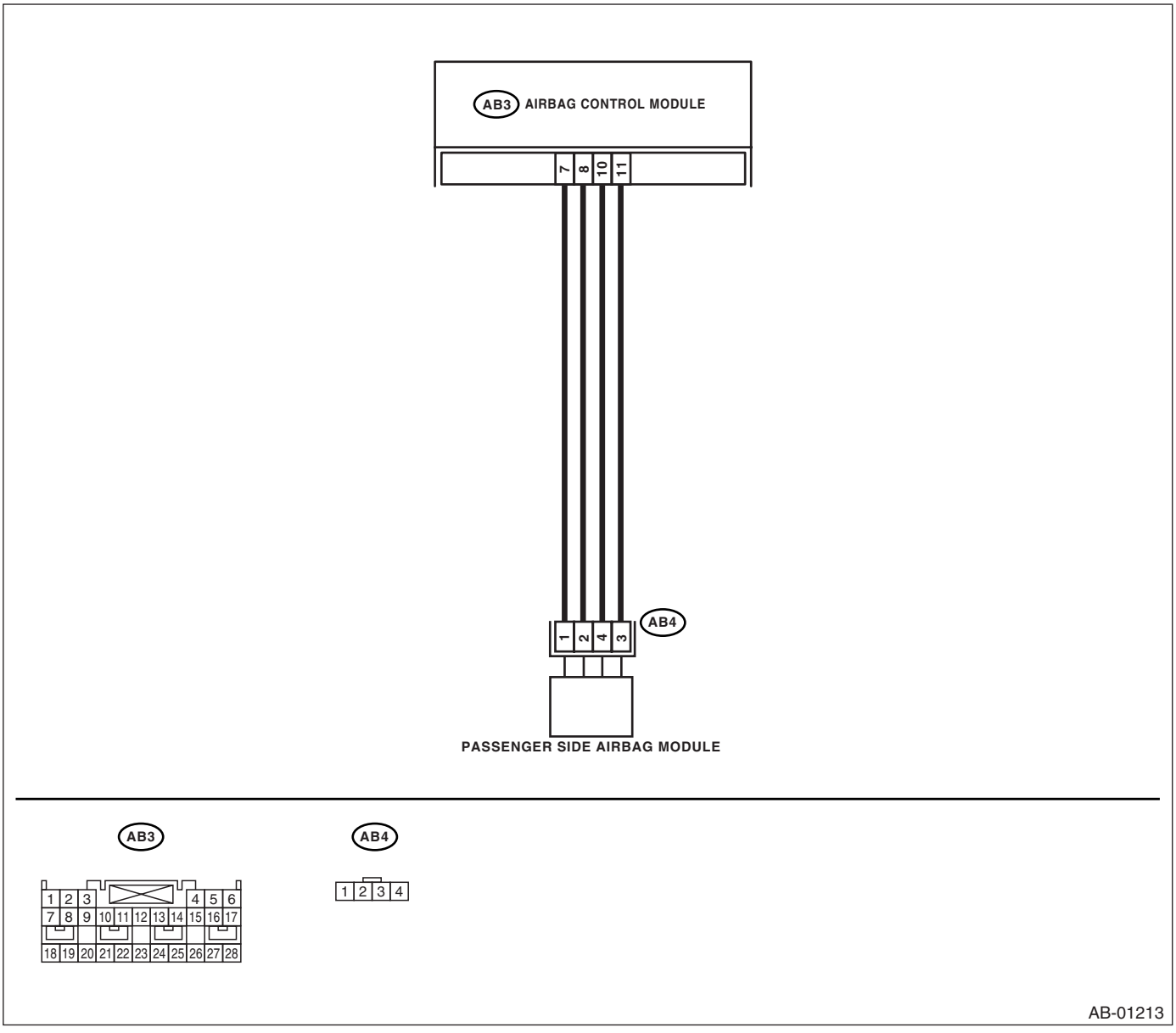
• Before diagnosing the airbag system, be sure to turn the ignition switch OFF, disconnect the ground cable from the battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK PASSENGERS AIRBAG MODULE.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the glove box. 3) Disconnect the connector (AB4) from passenger's airbag module. 4) Connect the connector (1P) in test harness D to connector (AB4). 5) Connect two airbag resistors to connectors (2P) and (3P) in test harness P. 6) Connect the battery ground cable and turn the ignition switch ON.	Is the airbag warning light turned on normally?	Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step **2.**
2	**CHECK AIRBAG MAIN HARNESS.** 1) Turn the ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect two airbag resistors from the connectors (2P) and (3P) in test harness P. 3) Remove the lower cover and disconnect the connector (AB21) from (AB26). 4) Disconnect the connector (AB3) from the airbag control module, and connect the connector (1R) in test harness R. <Ref. to AB-18, Airbag Control Module.> 5) Connect the battery ground cable, and then turn the ignition switch to ON. 6) Measure the voltage between connector (2R) in test harness R and the chassis ground. ***Connector & terminal*** ***(2R) No. 9 (+) — Chassis ground (−):*** ***(2R) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness together with body harness as a unit.

AA:DTC 81

DTC DETECTING CONDITION:

- Lap seat belt pretensioner circuit (RH) is open, shorted or shorted to ground.
- Lap pretensioner is faulty.
- Lap pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

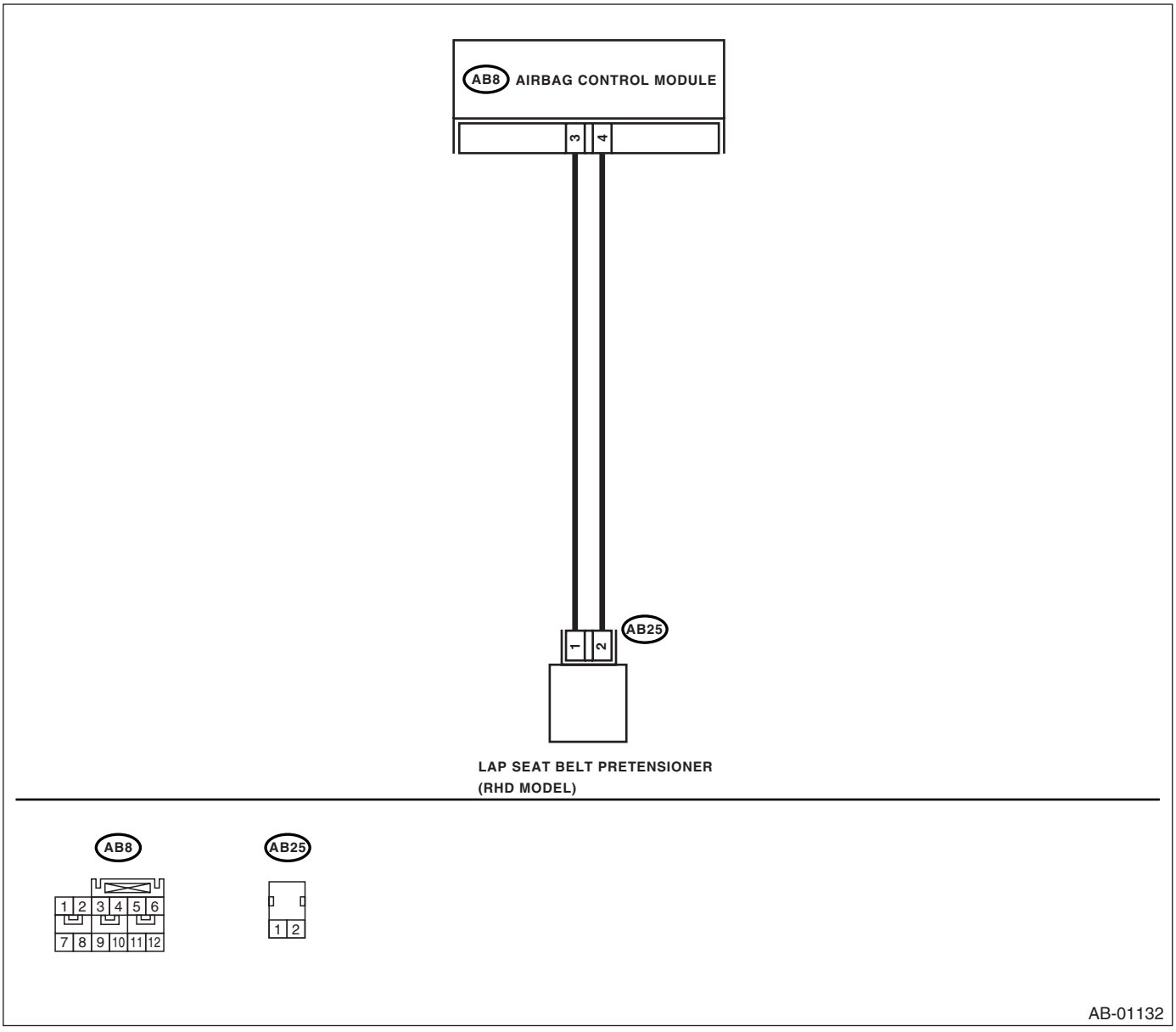
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK LAP SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB25) from the lap seat belt pretensioner (RH). 3) Connect the connector (1Q) in test harness Q to (AB25). 4) Connect the airbag resistor to connector (2Q) in test harness Q. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the lap seat belt pretensioner (RH). <Ref. to SB-10, FRONT OUTER SEAT BELT WITH LAP SEAT BELT PRETENSIONER, REMOVAL, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB11) from side airbag module (RH). 4) Disconnect the connectors (AB20) from seat belt pretensioner. 5) Disconnect the connector (AB8) from airbag control module. <Ref. to AB-18, Airbag Control Module.> 6) Connect the connector (1R) in test harness R to the connector (AB8). 7) Measure the resistance between connector (3R) in test harness R and connector (2Q) in test harness Q. ***Connector & terminal*** ***(3R) No. 2 — (2Q) No. 1:*** ***(3R) No. 4 — (2Q) No. 2:***	Is the resistance less than 10 Ω?	Go to step **3.**	Replace the side airbag harness with body harness.
3	**CHECK SIDE AIRBAG HARNESS.** Measure the resistance between the connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 2 — (3R) No. 4:*** ***(3R) No. 2 — Chassis ground:*** ***(3R) No. 4 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

AB:DTC 85

DTC DETECTING CONDITION:

- Lap seat belt pretensioner circuit (RH) is shorted to the power supply.
- Lap pretensioner is faulty.
- Lap pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

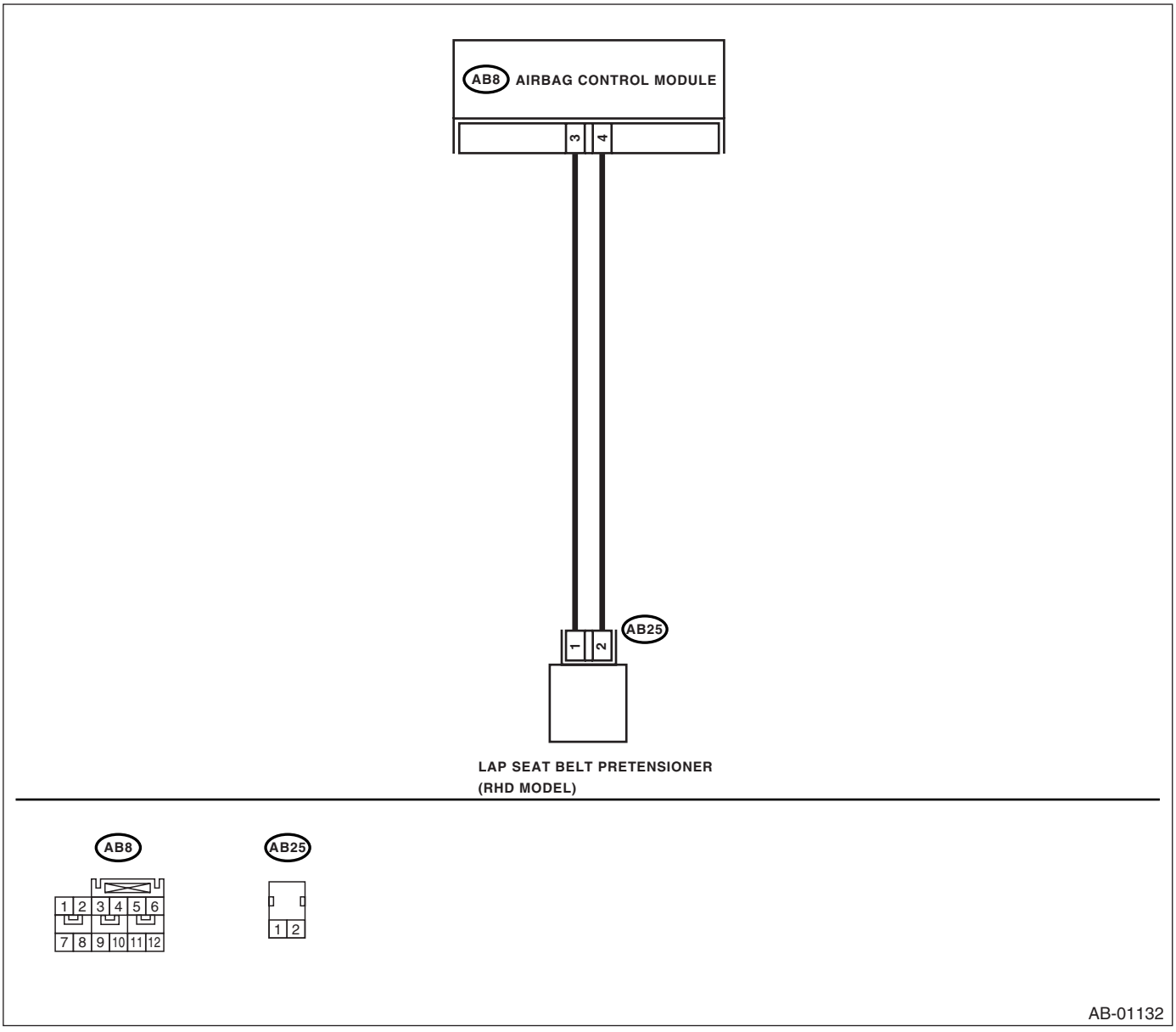
• Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.

• After replacing the airbag module, seat belt pretensioner, roll connector, control module or sensor, reconnect each part and confirm that the airbag warning light operates properly.

• When inspecting the side airbag harness, disconnect the side airbag module connector, seat belt pretensioner connector and lap seat belt pretensioner connector for the safety reasons.

NOTE:
After an air bag warning light turns ON an ignition switch, it is normal for about 6 seconds to put out the light after lighting.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK LAP SEAT BELT PRETENSIONER.** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB25) from the lap seat belt pretensioner (RH). 3) Connect the connector (1Q) in test harness Q to (AB25). 4) Connect the airbag resistor to the connector (2Q) in test harness Q. 5) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on normally?	Replace the lap seat belt pretensioner (RH). <Ref. to SB-10, FRONT OUTER SEAT BELT WITH LAP SEAT BELT PRETENSIONER, REMOVAL, Front Seat Belt.>	Go to step **2.**
2	**CHECK SIDE AIRBAG HARNESS (RH).** 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the test harness. 3) Disconnect the connector (AB11) from side airbag module (RH). 4) Disconnect the connector (AB20) from seat belt pretensioner. 5) Disconnect the connectors (AB7) and (AB8) from the airbag control module. <Ref. to AB-18, Airbag Control Module.> 6) Connect the connector (1R) in test harness R to the connector (AB7). 7) Connect the battery ground cable and turn the ignition switch to ON. 8) Measure the voltage between connector (3R) in test harness R and the chassis ground. ***Connector & terminal*** ***(3R) No. 2 (+) — Chassis ground (−):*** ***(3R) No. 4 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the side airbag harness with body harness.

SEAT BELT SYSTEM

SB

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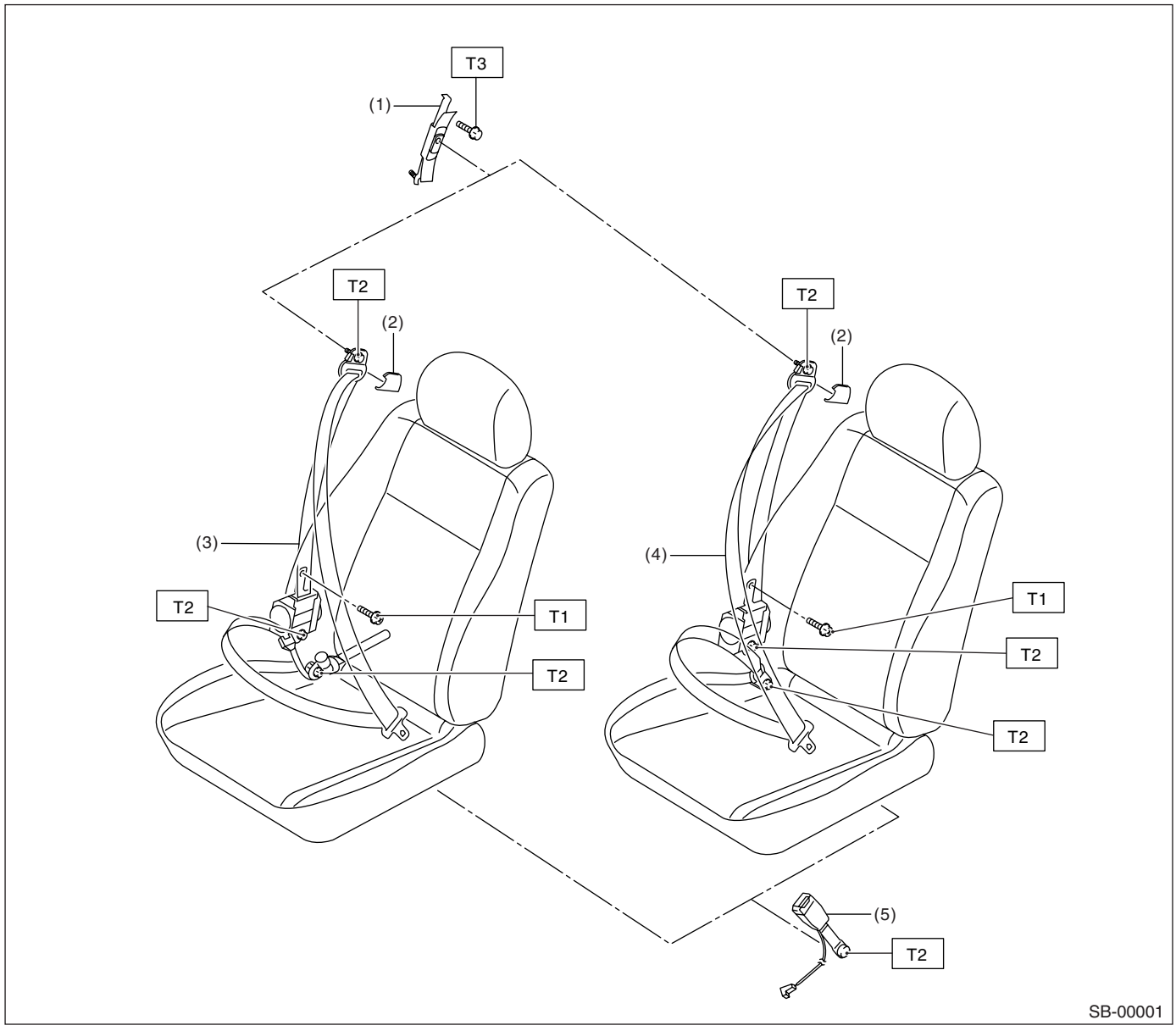
2. Inspection Locations After a Collision 6
3. Seat Belt Warning System 7
4. Front Seat Belt 10
5. Rear Seat Belt 12
6. Disposal of Pretensioner 14

1. General Description

A: COMPONENT

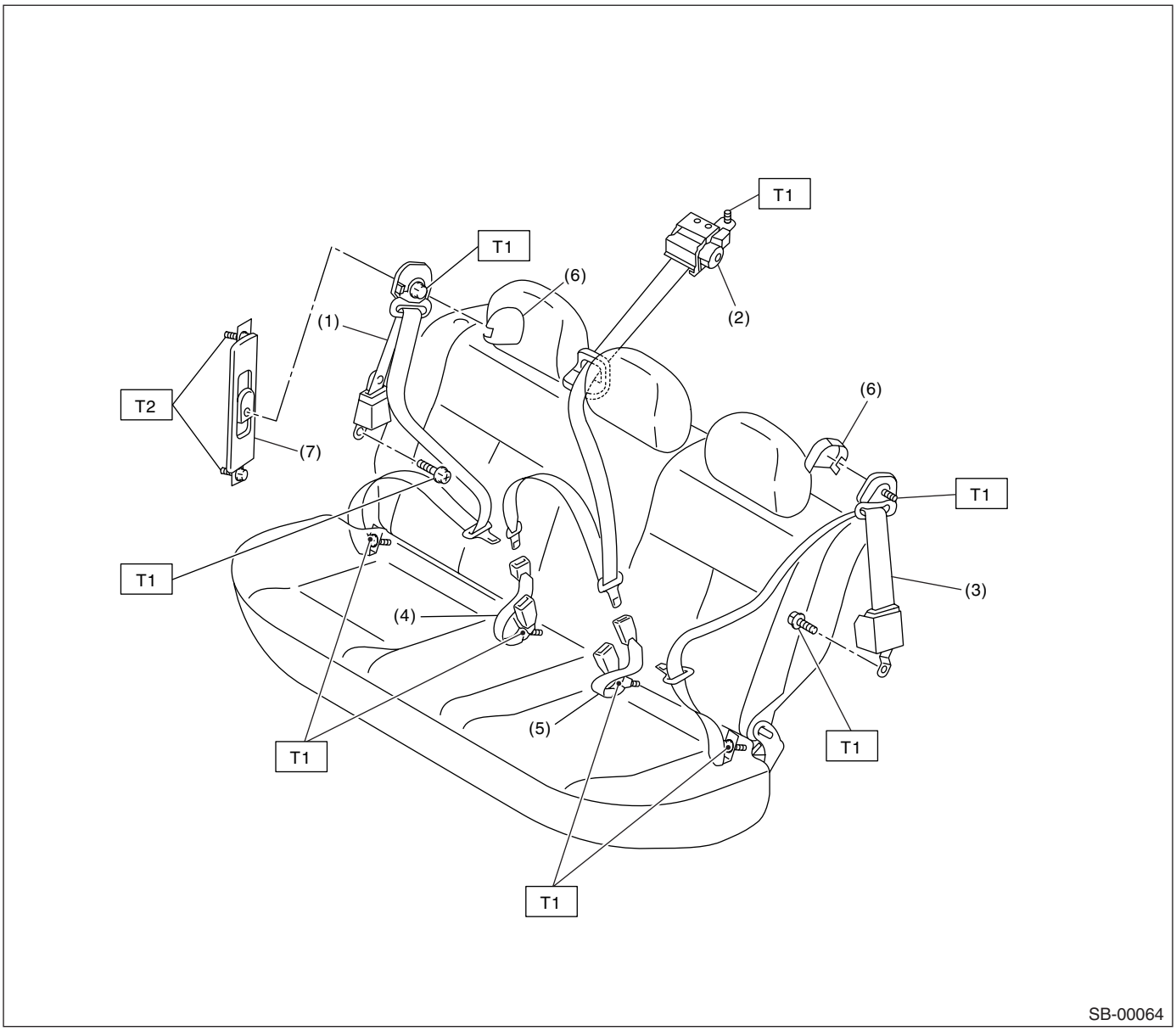
1. FRONT SEAT BELT



(1) Adjuster anchor ASSY
(2) Anchor cover
(3) Outer belt ASSY with lap pretensioner (For Australia model)
(4) Outer belt ASSY
(5) Inner belt ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 30 (3.1, 22.1)
T3: 53 (5.4, 39)

2. REAR SEAT BELT



(1) Outer seat belt RH
(2) Outer seat belt CENTER
(3) Outer seat belt LH
(4) Inner seat belt RH
(5) Inner seat belt LH
(6) Anchor cover
(7) Adjuster anchor ASSY

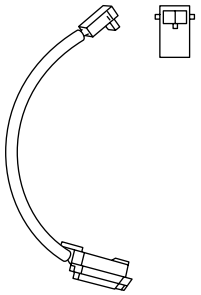
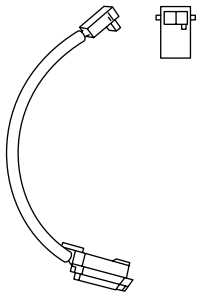
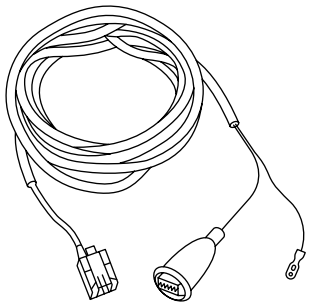
Tightening torque: N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.1)
T2: 53 (5.4, 39)

B: CAUTION

• Before starting, turn the ignition switch to OFF, disconnect the battery ground cable and wait for 20 seconds or more.
• The pretension system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting work.
• Do not drop or apply any impact to the pretensioner.
• If oil, grease, or water gets on the pretensioner, wipe it off immediately with a dry cloth.
• Do not expose the pretensioner to high temperature or flame.
• Do not allow current to flow through or voltage to reach the pretensioner. Do not use a circuit tester to check resistance of the pretensioner.
• Do not disassemble or attempt to repair the pretensioner. If it is dented, cracked, or deformed, replace it with a new one.
• Do not use the airbag or pretensioner parts from other vehicles. Always replace parts with new parts.
• When handling a seat belt with a deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
• Do not re-use a seat belt with a deployed pretensioner again.
• Be sure to deploy pretensioner before disposal. **<Ref. to SB-14,** OPERATION**, Disposal of Pretensioner.>**
• If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299SA010	98299SA010	DEPLOYMENT ADAPTER D	• Used for deploying the pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299SA050	98299SA050	DEPLOYMENT ADAPTER F	• Used for deploying the lap seat belt pretensioner. • Used with DEPLOYMENT TOOL (98299PA030).
 ST98299PA030	98299PA030	DEPLOYMENT TOOL	• Used for deploying the pretensioner. • Used with DEPLOYMENT ADAPTER D (98299SA010) or DEPLOYMENT ADAPTER F (98299SA050).

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Inspection Locations After a Collision

A: INSPECTION

Check for the following, and then replace with new parts if necessary.

- Center pillar lower garnish is discolored or cracked.
- Wiring harness and/or connector is damaged.

3. Seat Belt Warning System

A: WIRING DIAGRAM

<Ref. to WI-212, WIRING DIAGRAM**, Seat Belt Warning System.>**

B: INSPECTION

TROUBLE SYMPTOM:

- Seat belt warning light does not come on or go off.
- Buzzer does not beep.

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN SEAT BELT TIMER MODULE AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from seat belt timer module. 3) Measure the resistance between seat belt timer module harness connector and chassis ground. ***Connector & terminal*** ***(B44) No. 3 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between seat belt timer module and chassis ground.
2	**CHECK POWER SUPPLY OF SEAT BELT TIMER MODULE.** 1) Turn the ignition switch to ON. 2) Measure the voltage between seat belt timer module connector and chassis ground. ***Connector & terminal*** ***(B44) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open harness, short circuit and poor contact of connector between seat belt timer module and battery.
3	**CHECK HARNESS AND SEAT BELT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from seat belt timer module. 3) Hold the tang plate disconnected from seat belt buckle. 4) Measure the resistance between seat belt timer module harness connector and chassis ground. ***Connector & terminal*** ***(B44) No. 6 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the short circuit of harness between seat belt timer module connector and chassis ground.
4	**CHECK SEAT BELT SWITCH AND HARNESS.** 1) Turn the ignition switch to OFF. 2) Insert the tang plate into seat belt buckle. 3) Measure the resistance between seat belt timer module connector and chassis ground. ***Connector & terminal*** ***(B44) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Go to step **5.**
5	**CHECK HARNESS BETWEEN SEAT BELT TIMER MODULE AND SEAT BELT SWITCH.** Measure the resistance of harness between seat belt timer module connector and seat belt switch. ***Connector & terminal*** ***(B44) No. 6 — (R8) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness and poor contact of connector between seat belt timer module connector and seat belt switch.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN SEAT BELT SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between seat belt switch and chassis ground. ***Connector & terminal*** ***(R8) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the open circuit of harness between seat belt switch and chassis ground.
7	**CHECK SEAT BELT SWITCH.** 1) Hold the tang plate disconnected from seat belt buckle. 2) Measure the resistance between seat belt switch terminals. ***Terminals*** ***(R8) No. 1 — (R8) No. 2:***	Is the resistance less than 1 Ω?	Go to step **8.**	Replace the inner belt assembly.
8	**CHECK SEAT BELT SWITCH.** 1) Insert the tang plate into seat belt buckle. 2) Measure the resistance between seat belt switch terminals. ***Terminals*** ***(R8) No. 1 — (R8) No. 2:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Replace the inner belt assembly.
9	**CHECK OPERATION OF SPEEDOMETER IN COMBINATION METER.** Check the speedometer indicates vehicle speed correctly.	Does the speedometer operate correctly?	Go to step **10.**	Check the speedometer circuit.
10	**CHECK VEHICLE MODEL.** Check the model of vehicle.	Is the vehicle MT model?	Go to step **11.**	Go to step **13.**
11	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND SEAT BELT TIMER MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of vehicle speed sensor. 3) Measure the resistance between vehicle speed sensor harness connector and seat belt timer module connector. ***Connector & terminal*** ***(B17) No. 1 — (B44) No. 7:***	Is the resistance less than 10 Ω?	Go to step **12.**	Repair the open harness between vehicle speed sensor and seat belt timer module.
12	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND SEAT BELT TIMER MODULE.** Measure the resistance between seat belt timer module harness connector and chassis ground. ***Connector & terminal*** ***(B44) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **15.**	Repair the short of harness.
13	**CHECK HARNESS BETWEEN TCU AND SEAT BELT TIMER MODULE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector of TCU. 3) Measure the resistance of harness between TCU harness connector and seat belt timer module harness connector ***Connector & terminal*** ***Non-turbo model*** ***(B56) No. 17 — (B44) No. 7:*** ***Turbo model*** ***(B56) No. 1 — (B44) No. 7:***	Is the resistance less than 10 Ω?	Go to step **14.**	Repair the open harness between TCU and seat belt timer module.

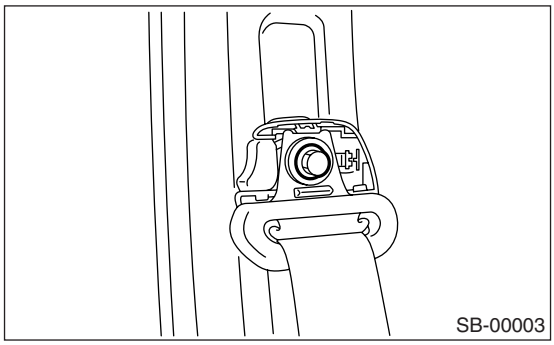
	Step	Check	Yes	No
14	**CHECK HARNESS BETWEEN TCU AND SEAT BELT TIMER MODULE.** Measure the resistance between seat belt timer module harness connector and chassis ground. ***Connector & terminal*** ***(B44) No. 7 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **15.**	Repair the short of harness.
15	**CHECK SEAT BELT TIMER MODULE OUTPUT SIGNAL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between seat belt timer module harness connector and chassis ground. ***Connector & terminal*** ***(B44) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **16.**	Check the wiring harness and combination meter, and then repair or replace them.
16	**CHECK POOR CONTACT.** Check the poor contact of seat belt warning light circuit.	Is there any poor contact occurs?	Repair the poor contact.	Go to step **17.**
17	**CHECK SEAT BELT TIMER MODULE.** 1) Connect all connectors. 2) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off floor. 3) Hold the tang plate disconnected from seat belt buckle. 4) Start the engine, and set the vehicle speed less than 19 km/h (12 MPH) NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When diagnostic is finished, perform the ABS memory clearance procedure of OBD system. <Ref. to ABS(diag)-27, Clear Memory Mode.> Check seat belt warning light comes on.	Does the seat belt warning light come on?	Go to step **18.**	Replace the seat belt timer module.
18	**CHECK SEAT BELT TIMER MODULE.** 1) Connect all connectors. 2) Lift-up the vehicle and place rigid racks. NOTE: Raise all wheels off floor. 3) Hold the tang plate disconnected from seat belt buckle. 4) Start the engine, and set the vehicle speed more than 25 km/h (16 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When diagnostic is finished, perform the ABS memory clearance procedure of OBD system. <Ref. to ABS(diag)-27, Clear Memory Mode.> Check seat belt warning light comes on and buzzer beeps.	Does the seat belt warning light come on and buzzer beep?	Temporary poor contact of connector or harness may be the cause. Check the poor contact.	Replace the seat belt timer module.

4. Front Seat Belt

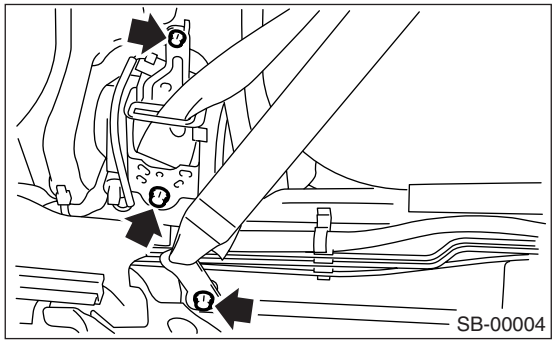
A: REMOVAL

1. FRONT OUTER BELT

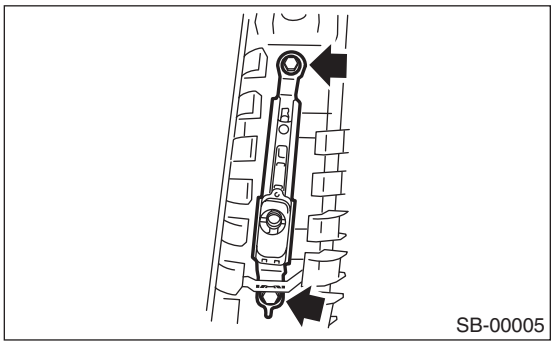
1) Fold backrest all the way forward, and then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the center pillar lower trim. **<Ref. to EI-45,** REMOVAL**, Lower Inner Trim.>**
4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.


SB-00003

5) Turn over the floor mat to remove the bolts.


SB-00004

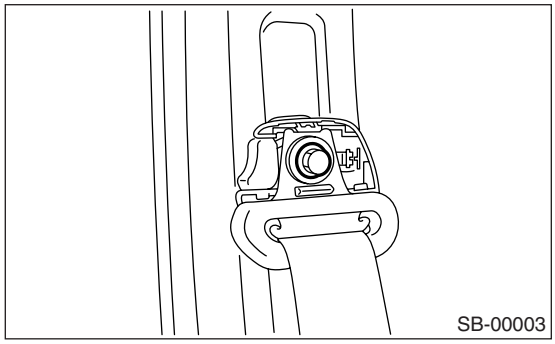
6) Disconnect the yellow connector of pretensioner harness, and remove the front outer belt.
7) Remove the center pillar upper trim. **<Ref. to EI-44,** REMOVAL**, Upper Inner Trim.>**
8) Remove the two bolts and adjustable anchor assembly.


SB-00005

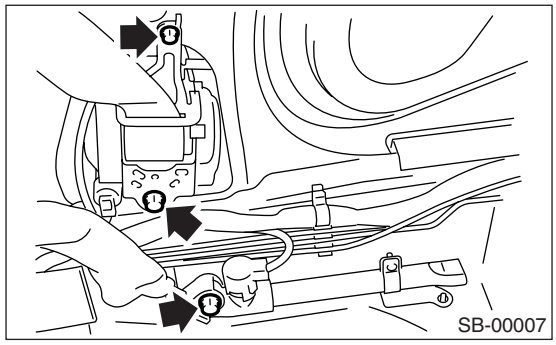
CAUTION:
• Do not drop or apply any impact to the pretensioner.
• Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

2. FRONT OUTER SEAT BELT WITH LAP SEAT BELT PRETENSIONER

1) Fold backrest forward, and then move front seat forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the center pillar lower trim. **<Ref. to EI-45,** REMOVAL**, Lower Inner Trim.>**
4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.

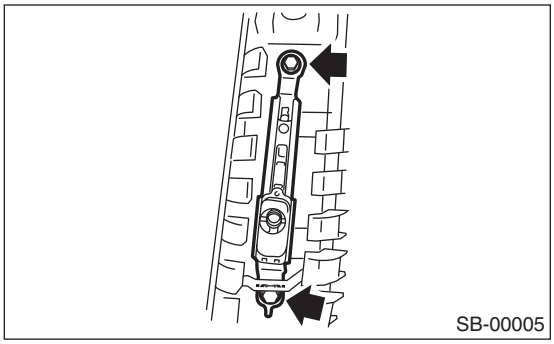

SB-00003

5) Turn over the floor mat to remove the bolts.


SB-00007

6) Disconnect the yellow connector of pretensioner harness and orange connector of lap pretensioner harness, and remove the front outer belt.
7) Remove the center pillar upper trim. **<Ref. to EI-44,** REMOVAL**, Upper Inner Trim.>**

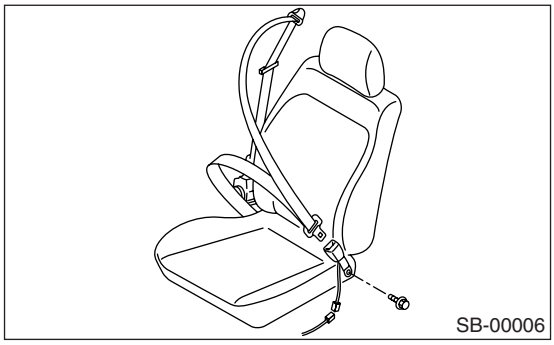
8) Remove the two bolts and adjustable anchor assembly.


SB-00005

CAUTION:
• Do not drop or apply any impact to the pretensioner.
• Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

3. FRONT INNER BELT

1) Disconnect the connector.
2) Remove the anchor bolt, and then detach the inner belt.


SB-00006

B: INSTALLATION

1. FRONT OUTER BELT

Install in the reverse order of removal.

CAUTION:
• The parts on right and left are not identical. Before installation, make sure that the correct part is used.
• Be careful not to twist the belts during installation.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

2. FRONT OUTER BELT WITH LAP SEAT BELT PRETENSIONER

Install in the reverse order of removal.

CAUTION:
• The parts on right and left are not identical. Before installation, make sure that the correct part is used.
• Be careful not to twist the belts during installation.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

3. FRONT INNER BELT

Install in the reverse order of removal.

Tightening torque:
<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

1. FRONT OUTER BELT

Check for the following, and replace with new parts if necessary.
• Pretensioner is cracked or deformed.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. FRONT INNER BELT

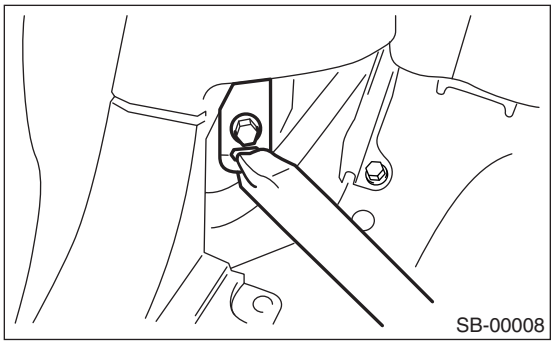
Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

5. Rear Seat Belt

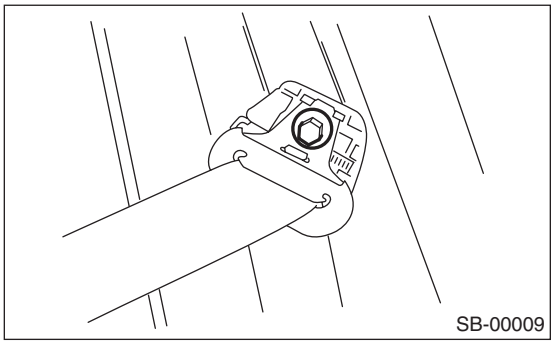
A: REMOVAL

1. OUTER BELT SIDE

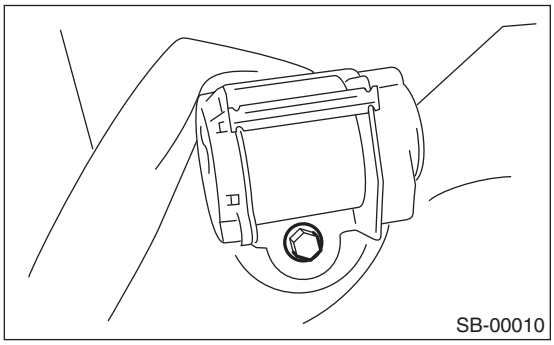
1) Remove the luggage floor mat. **<Ref. to EI-51,** REMOVAL**, Luggage Floor Mat.>**
2) Remove the rear seat. **<Ref. to SE-13,** REMOVAL**, Rear Seat.>**
3) Remove the rear quarter trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
4) Remove the seat belt lower anchor bolt.


SB-00008

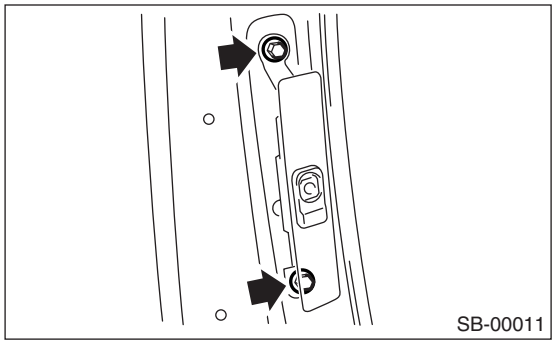
5) Remove the anchor cover. Remove the bolt and shoulder anchor from pillar.


SB-00009

6) Remove the rear quarter trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
7) Remove the bolts, and then detach the outer belt side.

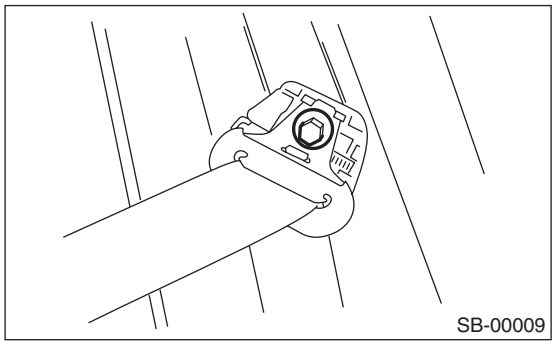

SB-00010

8) Remove the two bolts and adjustable anchor assembly.

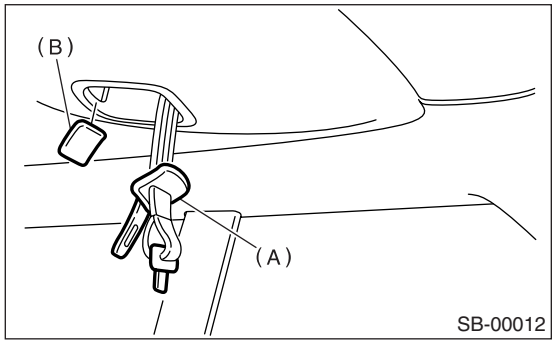

SB-00011

2. OUTER BELT CENTER

1) Remove the anchor cover. Remove the bolt and then detach the shoulder anchor from pillar.


SB-00009

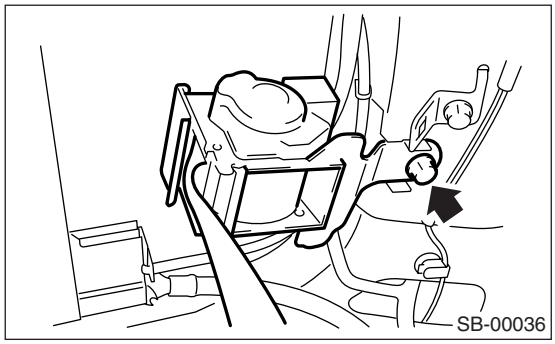
2) Remove the strut cap. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
3) Remove the rear rail trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
4) Remove the rear pillar upper trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
5) Remove the rear skirt trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
6) Remove the rear quarter lower trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
7) Remove the cover (B) while detaching snap lock carefully. Put the outer belt center tongue (A) out to the other side of the trim through the hole.



SB-00012

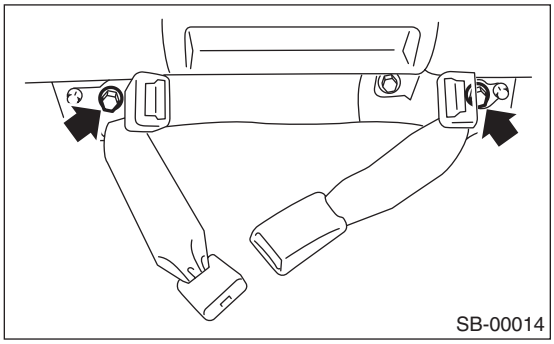
8) Remove the clips and hang down rear end of roof trim.

9) Disconnect the harness and connector, and then remove the outer belt center assembly.



3. INNER BELT

1) Remove the rear cushion.
2) Remove the bolt, and then detach the inner belt.



B: INSTALLATION

1. OUTER BELT SIDE

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts can be smoothly extended and wound.

Tightening torque:
<Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

2. OUTER BELT CENTER

Install in the reverse order of removal.

CAUTION:
• During installation, make sure that the seat belts are not twisted.
• After installation, make sure that the seat belts are smoothly extended and wound.

Tightening torque:
<Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

3. INNER BELT

Install in the reverse order of removal.

CAUTION:
During installation, make sure that the seat belts are not twisted.

Tightening torque:
<Ref. to SB-3, REAR SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

1. OUTER BELT SIDE

Check for the following, and replace with new parts if necessary.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

2. OUTER BELT CENTER

Check for the following, and replace with new parts if necessary.
• Seat belt is slackened, bent, or frayed. Seat belt is abnormally wound or extended.

3. INNER BELT

Check for the following, and replace with new parts if necessary.
• Inner belt is deformed or damaged.
• Seat belt buckle is engaged improperly.

6. Disposal of Pretensioner

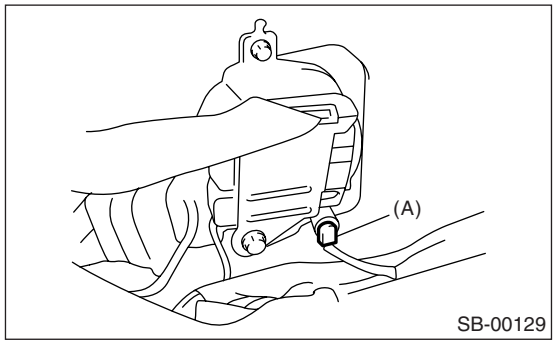
A: CAUTION

• Do not discard undeployed pretensioners, because they may cause serious personal injury when accidentally deployed.
• Deployment of the pretensioners should be done on a flat place free from any possible danger. Avoid deploying outdoors during heavy rainy or strong windy weather.
• Do not drop or damage the pretensioner.
• Because deploying the pretensioners causes a high-explosive noise, be sure to warn people in the area, and do not allow anyone within a 5 m (16 ft) radius of the disposal site.
• Some smoke will be emitted after deployment of the pretensioners. Therefore, it must be deployed in a well-ventilated area with no smoke alarms nearby.
• Wear gloves, goggles, and earplugs during this operation. Wash your hands afterwards.
• After deployment, the pretensioner is especially hot. Leave it unattended for 40 minutes or longer, and then discard it.
• Do not let water get on the deployed pretensioner.
• Wrap the deployed pretensioner in an airtight vinyl bag, and then discard it.
• If circumstances do not permit pretensioner deployment, contact a SUBARU dealer.

B: OPERATION

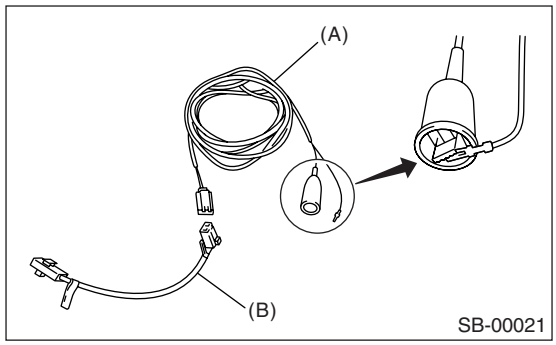
1. DEPLOYING OF PRETENSIONER WHILE INSTALLED IN VEHICLE

1) Fold backrest all the way forward, and then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the center pillar lower trim. **<Ref. to EI-45,** REMOVAL**, Lower Inner Trim.>**
4) Disconnect the connector (A) of pretensioner.



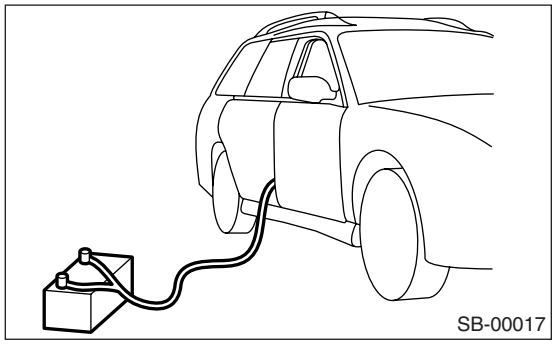
5) Short the terminal to alligator clip furnished as deployment tool (A).
6) Connect the deployment tool and deployment adapter D (B).

CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.

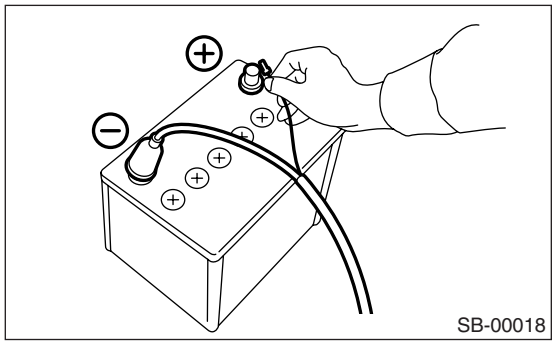


(A) Deployment tool: (Tool No. 98299PA030)
(B) Deployment adapter D: (Tool No. 98299SA010)

7) Connect the deployment adapter D connector and pretensioner yellow connector.
8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

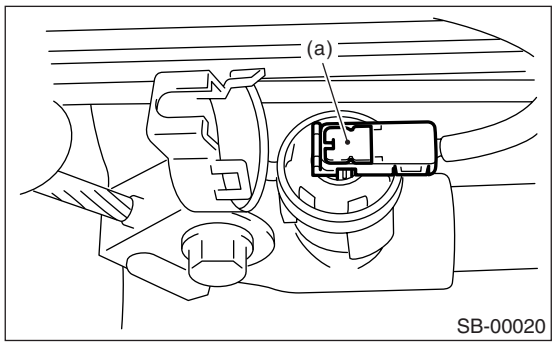


9) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (−) terminal.
10) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.



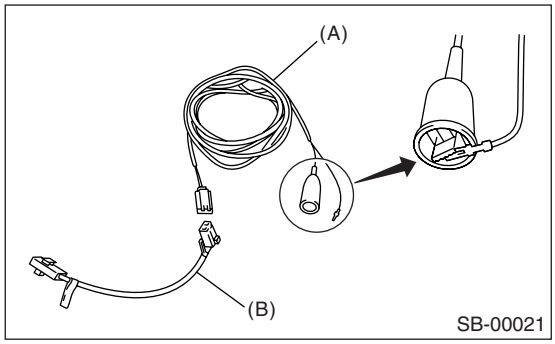
CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

11) Perform the following steps 12) through 17) for the vehicle with lap pretensioner.
12) Disconnect the orange connector (a) from lap pretensioner.



13) Connect the deployment tool (A) and deployment adapter F (B).

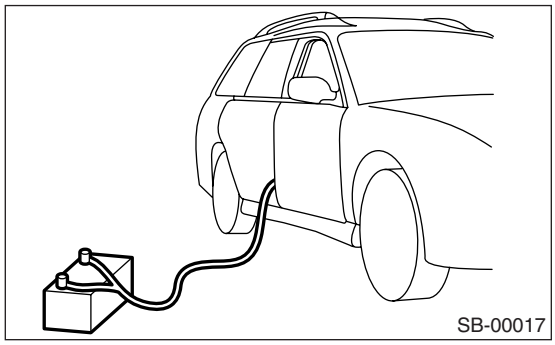
CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.



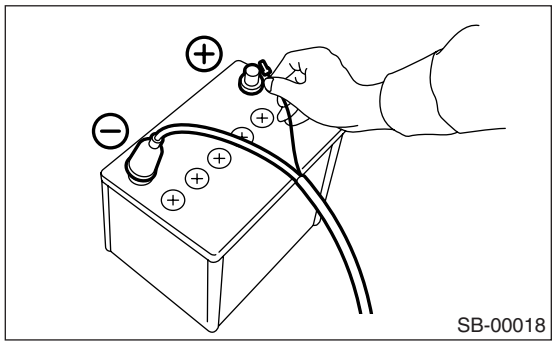
(A) Deployment tool: (Tool No. 98299PA030)
(B) Deployment adapter F: (Tool No. 98299SA050)

14) Connect the deployment adapter F connector and lap seat belt pretensioner orange connector.

15) Extened the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof and rear gate completely.

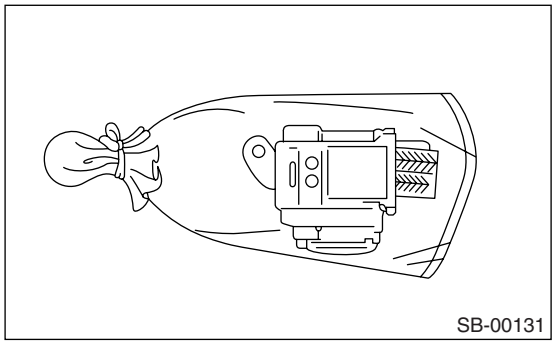


16) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (−) terminal.
17) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.



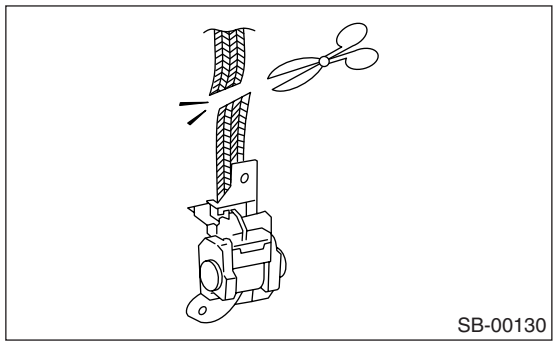
CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

18) Remove the front outer belt. **<Ref. to SB-10,** REMOVAL**, Front Seat Belt.>**
19) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.



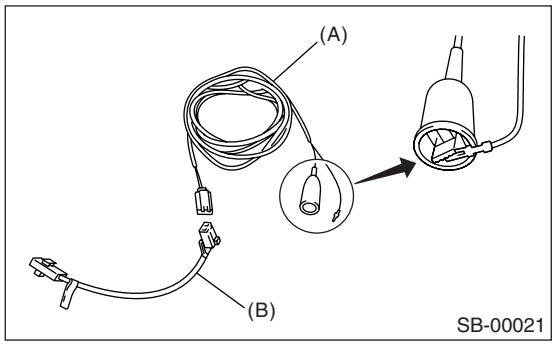
2. DEPLOYING OF RETRACTOR PRETENSIONER AFTER REMOVAL FROM VEHICLE

1) Fold backrest all the way forward, then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the front outer belt. **<Ref. to SB-10,** REMOVAL**, Front Seat Belt.>**
4) Cut off the seat belt as close to retractor as possible.


SB-00130

5) Short the terminal to alligator clip furnished as a deployment tool.
6) Connect the deployment tool (A) and deployment adapter D (B).

CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.

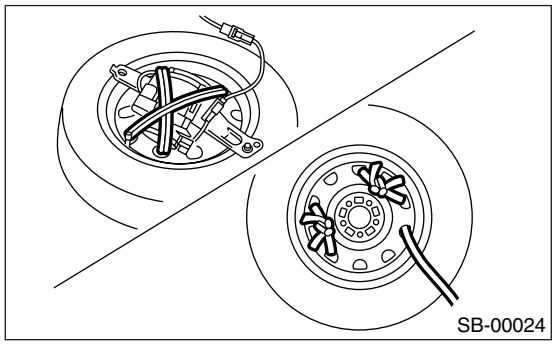


SB-00021

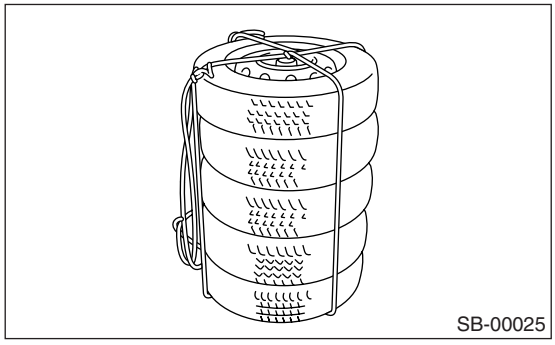
(A) Deployment tool: (Tool No. 98299PA030)
(B) Deployment adapter D: (Tool No. 98299SA010)

7) Connect the deployment adapter D connector and pretensioner yellow connector.

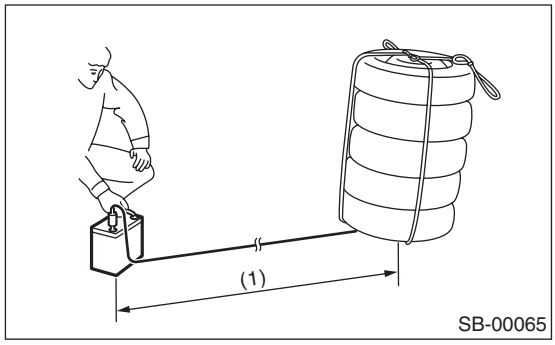
8) Install the pretensioner on a wheel with tire. Then, bundle three automotive wiring harness [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and bind them twofold around the pretensioner bracket and wheel.


SB-00024

9) Put three tires without a wheel on the tire installed with pretensioner. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.


SB-00025

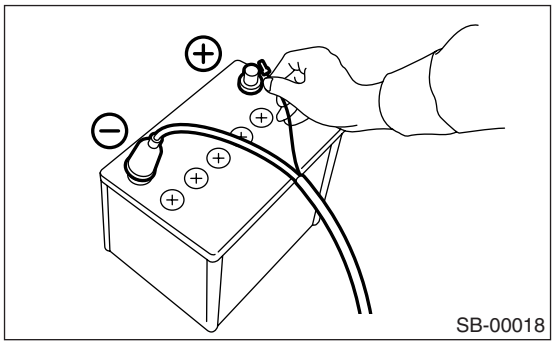
10) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (−) terminal.



SB-00065

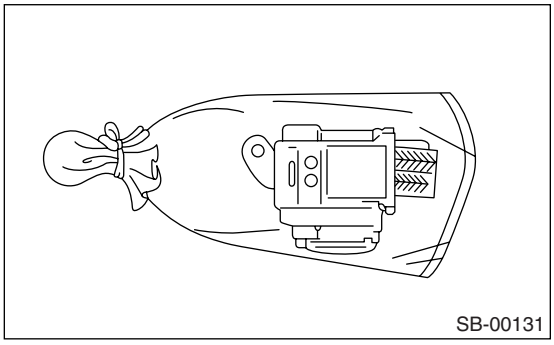
(1) 5 m (16 ft) or more

11) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.


SB-00018

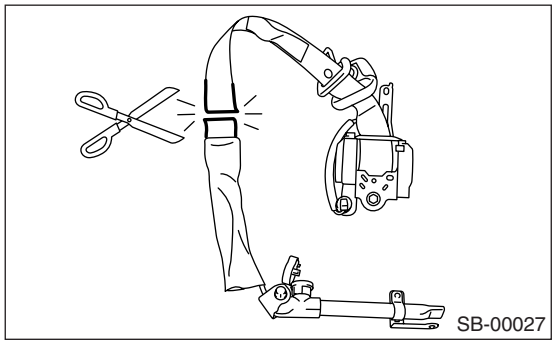
CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

12) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.


SB-00131

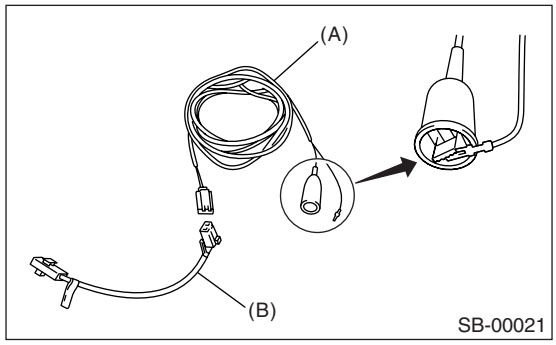
3. DEPLOYING LAP PRETENSIONER AFTER REMOVAL FROM VEHICLE

1) Fold backrest all the way forward, then move front seat all the way forward.
2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
3) Remove the fornt outer belt. **<Ref. to SB-10,** REMOVAL**, Front Seat Belt.>**
4) Cut off the seat belt as close to lap seat belt pretensioner as possible.


SB-00027

5) Short the terminal to alligator clip furnished as a deployment tool (A).
6) Connect the deployment tool and deployment adapter F (B).

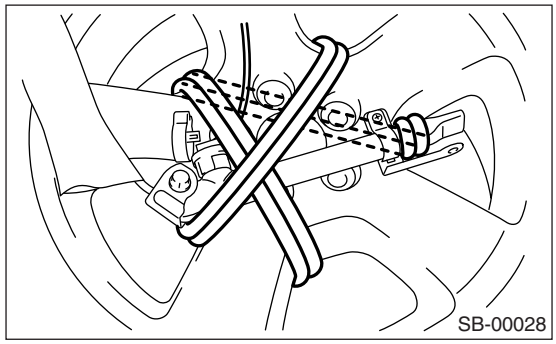
CAUTION:
The deployment tool terminals should be kept shorted until just before deployment of the pretensioner.



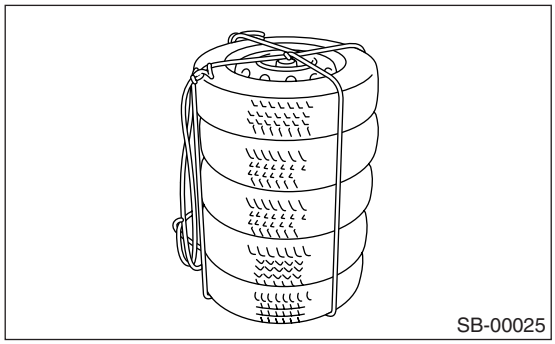
SB-00021

(A) Deployment tool: (Tool No. 98299PA030)
(B) Deployment adapter F: (Tool No. 98299SA050)

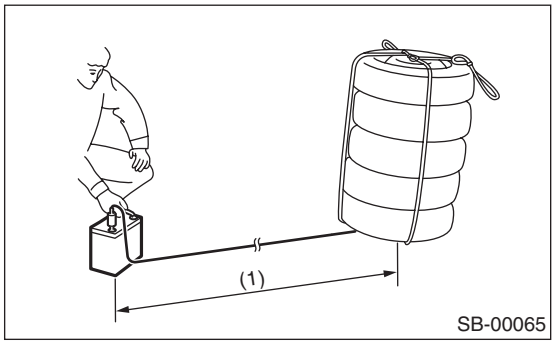
7) Connect the deployment adapter F connector to pretensioner yellow connector.
8) Install the pretensioner on a wheel with tire. Then, bundle three automotive wiring harness [each with a sectional area of 1.25 mm^2 (0.00194 sq in) or more], and bind them twofold around the pretensioner bracket and wheel.


SB-00028

9) Put three tires without a wheel on the tire installed with pretensioner. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.

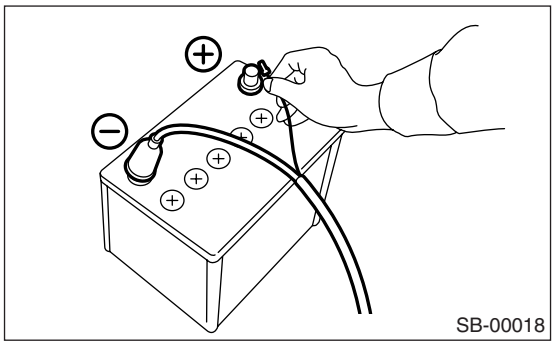

SB-00025

10) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (−) terminal.



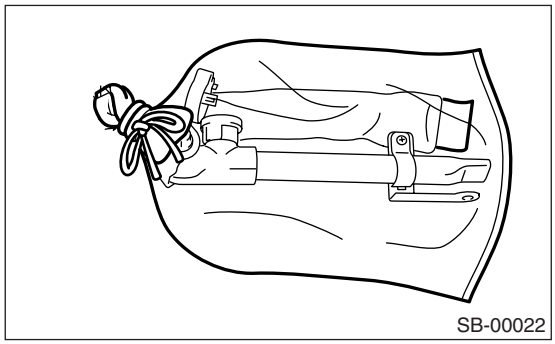
(1) 5 m (16 ft) or more

11) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.



CAUTION:
• After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes or longer.
• Do not let water get on the deployed pretensioner.

12) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.



LIGHTING SYSTEM

LI

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1. General Description

A: SPECIFICATION

Headlight		12 V — 55 W/60 W
Front turn signal light		12 V — 21 W
Clearance light		12 V — 5 W
Side marker light		12 V — 5 W
Front fog light		12 V — 55 W
Rear combination light	Tail/Stop light	12 V — 5/21 W
	Turn signal light	12 V — 21 W
	Back-up light	12 V — 16 W
License plate light		12 V — 5 W
High-mounted stop light	Standard type	12 V — 10 W
	Rear spoiler built-in type	12 V — 1.2 W
Room light		12 V — 8 W
Spot map light		12 V — 8 W
Luggage room light		12 V — 5 W

B: PRECAUTIONS

- Before removing and installing parts, always disconnect the battery ground cable. When replacing audio, control module, and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
- Reassemble in reverse order of disassembly, unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

WARNING:

• Airbag system wiring harness is routed near electrical parts and switches. All airbag system wiring harnesses and connectors are yellow. Do not use electric test equipment on these circuits.

• Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: WIRING DIAGRAM

1. HEADLIGHT

<Ref. to WI-216, WIRING DIAGRAM, Headlight System.>

2. CLEARANCE LIGHT AND ILLUMINATION LIGHT

<Ref. to WI-226, WIRING DIAGRAM, Clearance Light and Illumination Light System.>

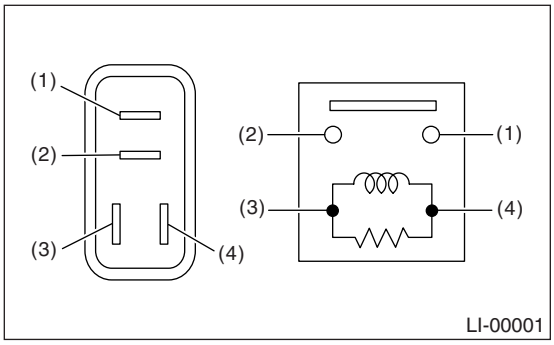
B: INSPECTION

1. HEADLIGHT SWITCH

<Ref. to LI-11, INSPECTION, Combination Switch (Light).>

2. HEADLIGHT RELAY

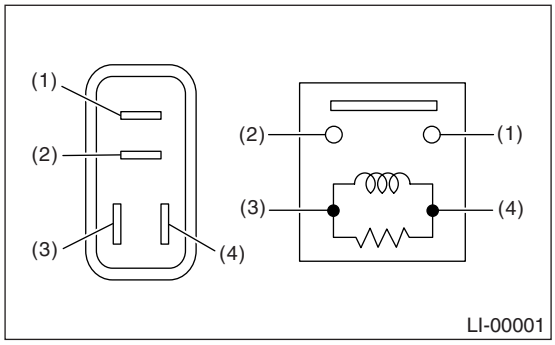
Measure the headlight relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

3. TAIL AND ILLUMINATION RELAY

Measure the tail and illumination relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

3. Front Fog Light System

A: WIRING DIAGRAM

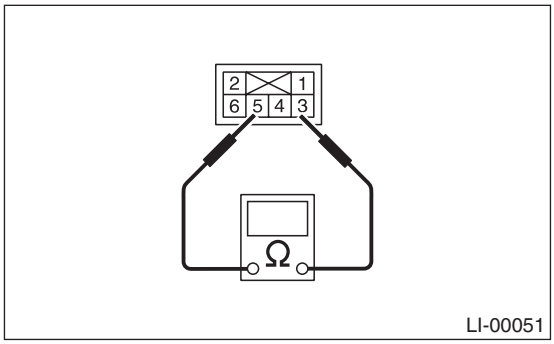
1. FRONT FOG LIGHT

<Ref. to WI-220, WIRING DIAGRAM, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

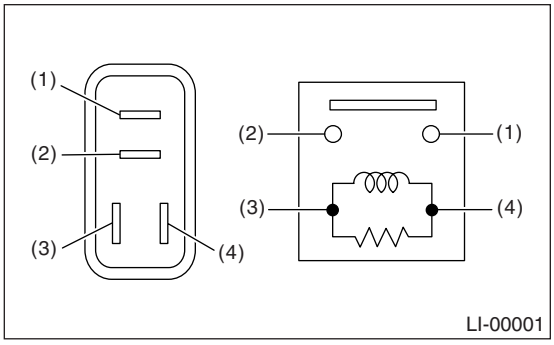
Measure the resistance between front fog light switch terminals.



Switch position	Terminal No.	Standard
OFF	3 and 5	More than 1 MΩ
ON		Less than 1 Ω

2. FRONT FOG LIGHT RELAY

Measure the front fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

4. Rear Fog Light System

A: WIRING DIAGRAM

1. REAR FOG LIGHT

<Ref. to WI-222, WIRING DIAGRAM, Rear Fog Light System.>

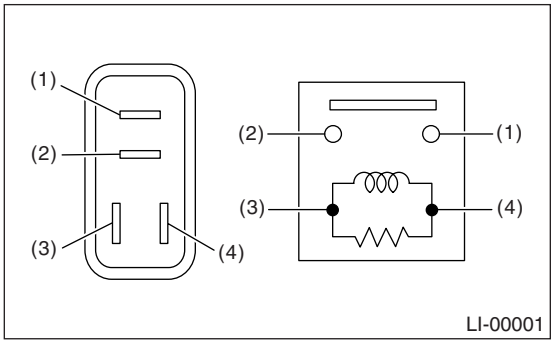
B: INSPECTION

1. REAR FOG LIGHT SWITCH

1) Turn the ignition switch to ON.
2) Turn on the headlight or front fog light.
3) Push the rear fog light switch and check if the rear fog light turns on.

2. REAR FOG LIGHT RELAY

Measure the rear fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1 Ω
No flow		More than 1 MΩ

5. Turn Signal Light and Hazard Light System

A: WIRING DIAGRAM

1. TURN SIGNAL LIGHT AND HAZARD LIGHT

<Ref. to WI-235, WIRING DIAGRAM, Turn Signal Light and Hazard Light System.>

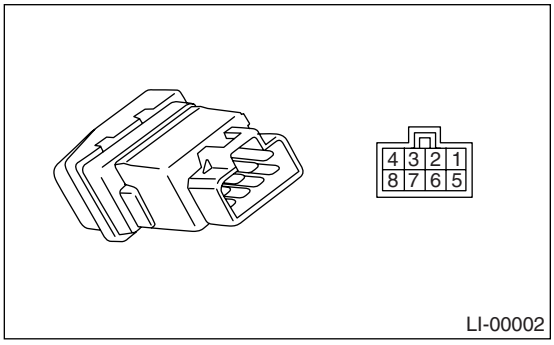
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-11, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

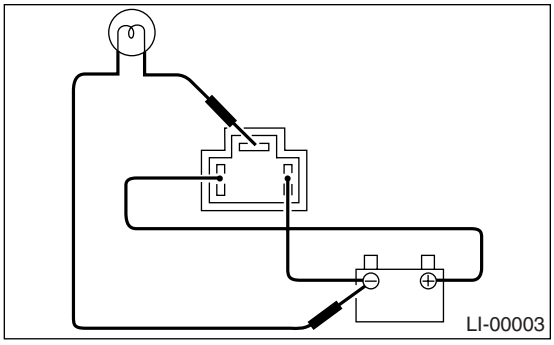
Measure the resistance between hazard switch terminals.



Switch position	Terminal No.	Standard
OFF	6 and 7	Less than 1 Ω
ON	1, 3 and 4	Less than 1 Ω
	7 and 8	Less than 1 Ω

3. TURN SIGNAL AND HAZARD MODULE

Connect the battery and the turn signal light bulb to module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



6. Back-up Light System

A: WIRING DIAGRAM

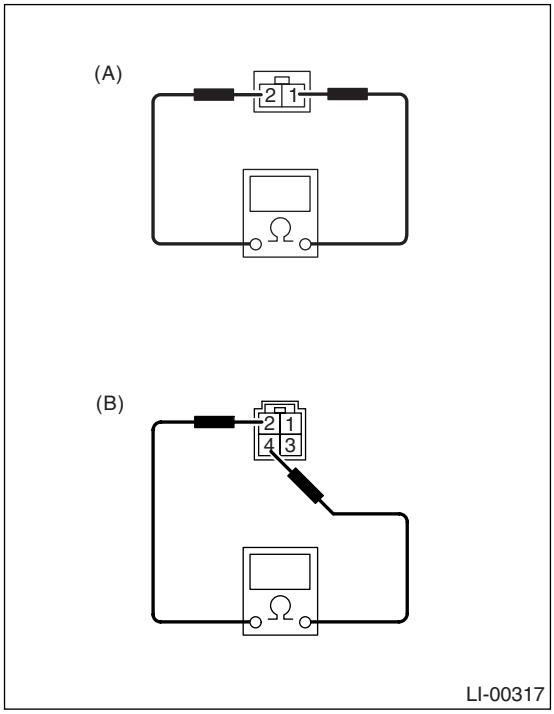
1. BACK-UP LIGHT

<Ref. to WI-224, WIRING DIAGRAM, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (MT MODEL)

Measure the resistance between back-up light switch terminals.

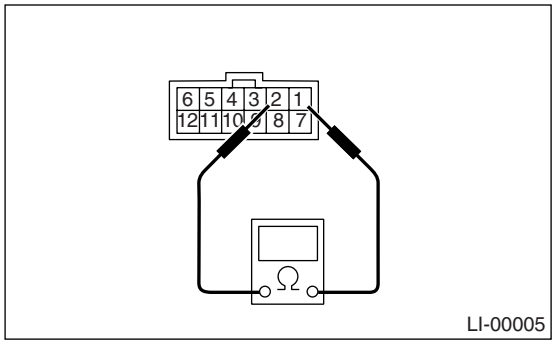


(A) Non-turbo model
(B) Turbo model

Switch position	Terminal No.	Standard
When shift lever is set in reverse position	Non-turbo model: 1 and 2 Turbo model: 2 and 4	Less than 1 Ω
Other positions		More than 1 MΩ

2. INHIBITOR SWITCH (AT MODEL)

Measure the resistance between inhibitor switch terminals.



Switch position	Terminal No.	Standard
When select lever is set in “R” range	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

7. Stop Light System

A: WIRING DIAGRAM

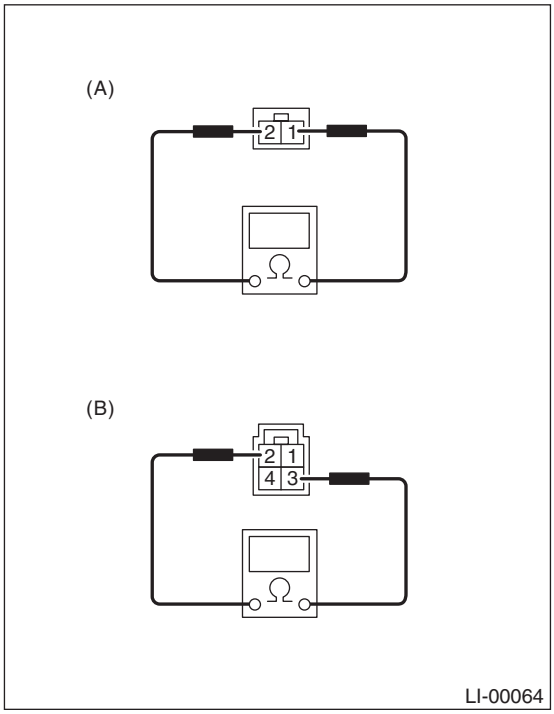
1. STOP LIGHT

<Ref. to WI-225, WIRING DIAGRAM, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure the resistance between stop light switch terminals.



(A) Without cruise control
(B) With cruise control

Switch position	Terminal No.	Standard
When brake pedal is depressed	1 and 2: Without cruise control 2 and 3: With cruise control	Less than 1 Ω
When brake pedal is released		More than 1 MΩ

8. Room Light System

A: WIRING DIAGRAM

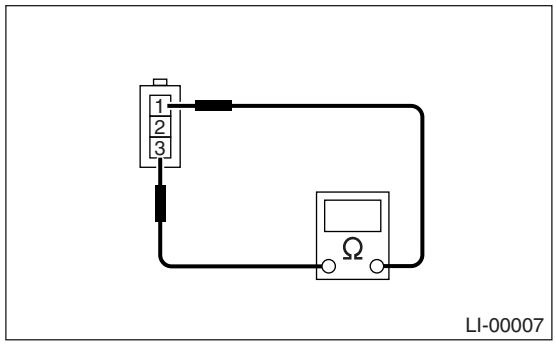
1. ROOM LIGHT

<Ref. to WI-239, WIRING DIAGRAM, Room Light System.>

B: INSPECTION

1. DOOR SWITCH

Measure the resistance between door switch terminals.



Switch position	Terminal No.	Standard
When door is open	1 and 3	Less than 1 Ω
When door is closed		More than 1 MΩ

2. REAR GATE LATCH SWITCH

Measure the resistance between rear gate latch switch terminals.

Switch position	Terminal No.	Standard
When rear gate is open	1 and 2	Less than 1 Ω
When rear gate is closed		More than 1 MΩ

9. Headlight Beam Leveler System

A: WIRING DIAGRAM

1. HEADLIGHT BEAM LEVELER

<Ref. to WI-218, WIRING DIAGRAM, Headlight Beam Leveler System.>

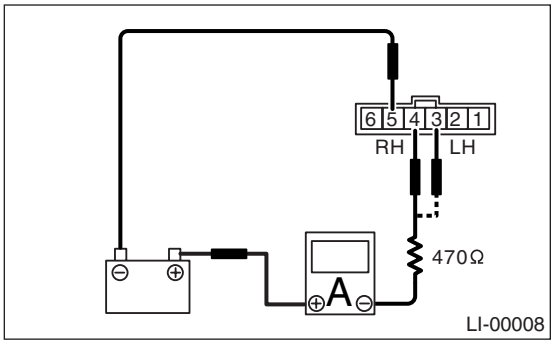
B: INSPECTION

1. HEADLIGHT BEAM LEVELER ACTUATOR

1) Turn on the headlights.
2) Confirm the headlight beam level is lowered by changing the switch position to 0 → 1 → 2 → 3 → 4 → 5.

2. HEADLIGHT BEAM LEVELER SWITCH

Connect the battery, headlight beam leveler switch connector, circuit tester and resistor (470 Ω) as shown in the figure. Measure the current at each switch position.

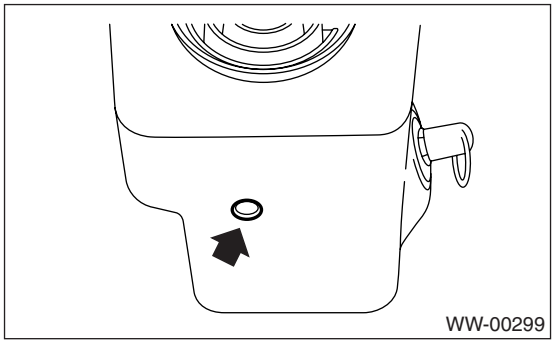


Switch position	Current (mA)
0	3.8
1	7.0
2	9.8
3	14.7
4	20.3
5	25.5

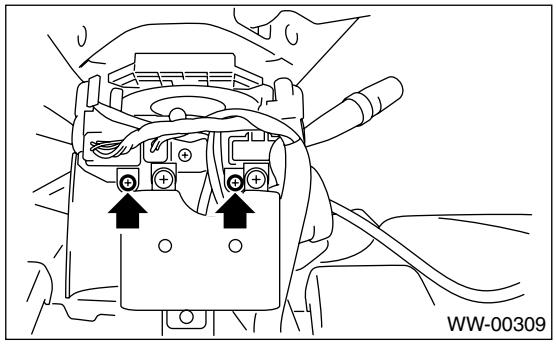
10.Combination Switch (Light)

A: REMOVAL

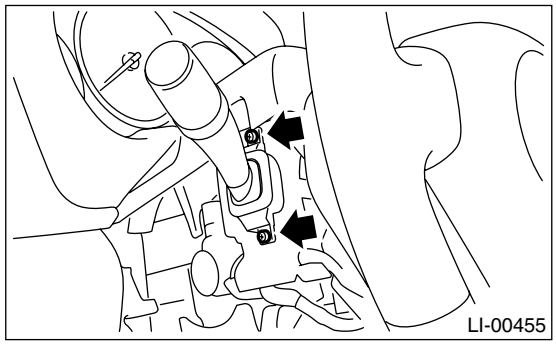
1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Remove the screw which secure upper column cover to lower column cover.



4) Remove the screws which secure the upper column cover.



5) Disconnect the connector from combination switch.
6) Remove the screws which secure the switch, and then remove the switch.

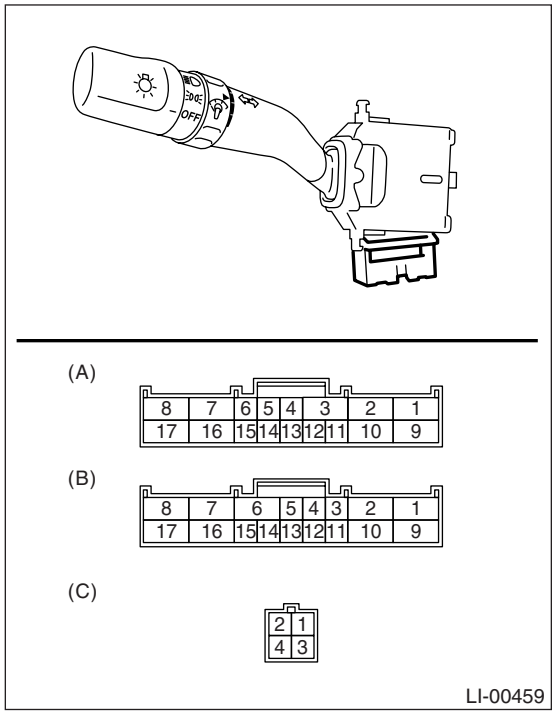


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the combination switch resistance.



(A) Lighting & turn signal switch connector (LHD and RHD model without illumination control)
(B) Lighting & turn signal switch connector (RHD model with illumination control)
(C) Parking switch connector

1. LIGHTING SWITCH

LHD and RHD model without illumination control:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
Tail	14 and 16	Less than 1 Ω
Head	13, 14 and 16	Less than 1 Ω

RHD model with illumination control:

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
Tail	9 and 15	Less than 1 Ω
Head	9, 14 and 15	Less than 1 Ω

2. DIMMER AND PASSING SWITCH

LHD and RHD model without illumination control:

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	Less than 1 Ω
Low beam	16 and 17	Less than 1 Ω
High beam	7 and 16	Less than 1 Ω

RHD model with illumination control:

Switch position	Terminal No.	Standard
Passing	1, 2 and 9	Less than 1 Ω
Low beam	9 and 10	Less than 1 Ω
High beam	2 and 9	Less than 1 Ω

3. TURN SIGNAL SWITCH

LHD and RHD model without illumination control:

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1 Ω
Neutral	—	More than 1 MΩ
Right	2 and 3	Less than 1 Ω

RHD model with illumination control:

Switch position	Terminal No.	Standard
Left	6 and 7	Less than 1 Ω
Neutral	—	More than 1 MΩ
Right	7 and 8	Less than 1 Ω

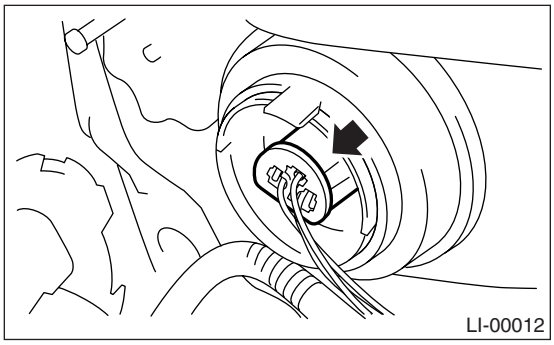
4. PARKING SWITCH

Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1 Ω
ON	1 and 4	Less than 1 Ω

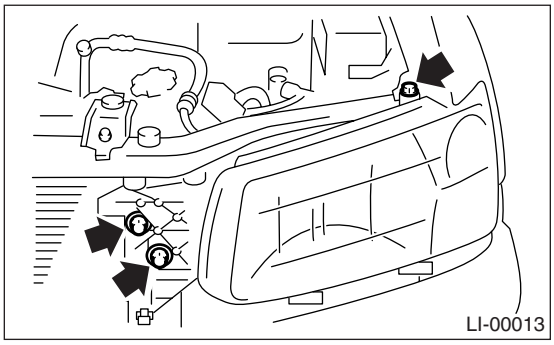
11.Headlight Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air intake duct (when removing the headlight RH). <Ref. to IN(H4SO)-7, REMOVAL, AIR INTAKE DUCT.>
3) Remove the front grille and headlight side cover. <Ref. to EI-18, REMOVAL, Front Grille.> <Ref. to EI-23, REMOVAL, Front Bumper.>
4) Disconnect the headlight bulb connector.


LI-00012

5) Remove the three bolts, and disconnect the connectors, and then detach the headlight assembly.


LI-00013

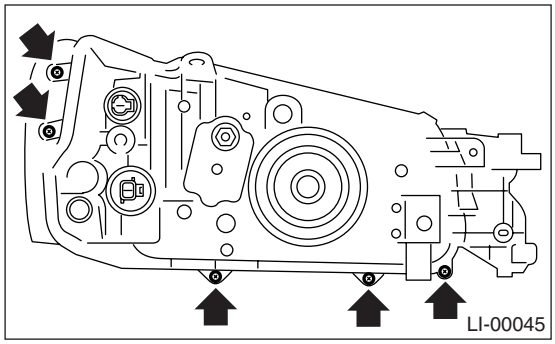
B: INSTALLATION

Install in the reverse order of removal.

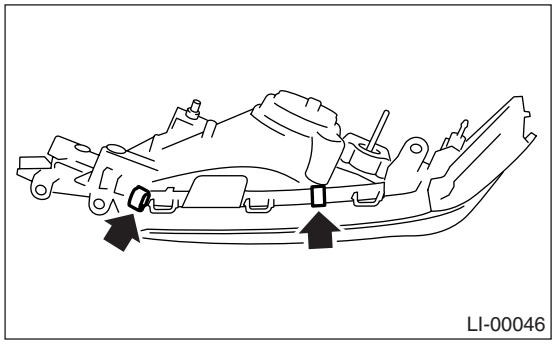
C: DISASSEMBLY

CAUTION:
- **Do not touch the bulb glass portion.**
- **Do not touch inside the lens (extension portion) or reflector portion.**
- **Replace the packing with a new one.**

1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
2) Remove the five screws.

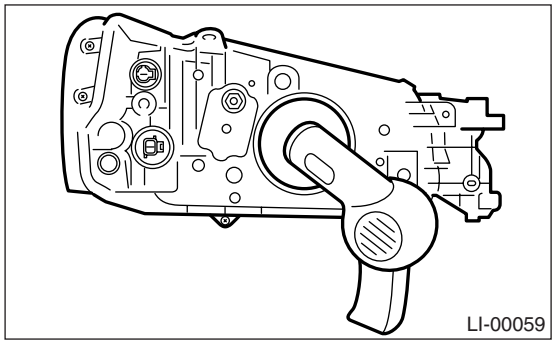

LI-00045

3) Remove the two clips.

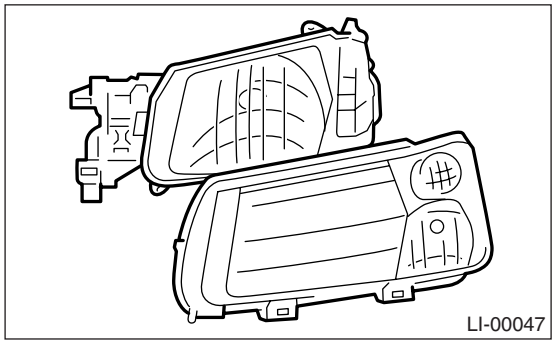

LI-00046

4) Remove the rubber cap, and then detach the bulb.
5) Heat the seal portion using a dryer through the bulb mounting hole.

CAUTION:
Avoid heating one specific point of the seal portion and heating the headlight assembly to 120°C (248°F) or more.

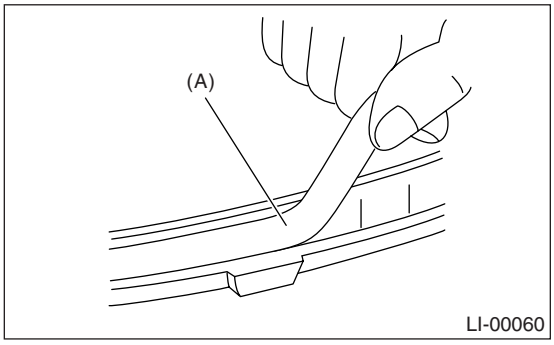

LI-00059

6) Unhook the hook, and then take the lens off the headlight assembly.


LI-00047

7) Remove the packing (A) from seal groove.

CAUTION:
Completely remove the packing not to leave any chips behind.

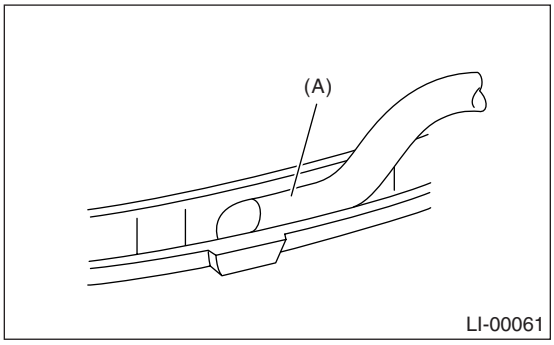


(A) Packing

D: ASSEMBLY

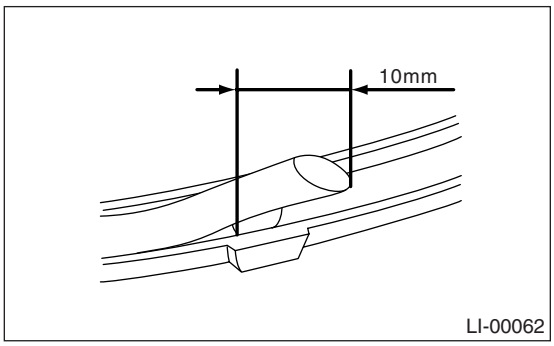
1) Cut the tip of packing (A) at an angle of 45°.
2) With the cut end facing upward, insert the packing (A) into groove around seal.

CAUTION:
• If the packing protrudes, slowly take it off the groove.
• Do not stretch the packing. If the packing is stretched, seal fails.



(A) Packing

3) After making a round of the seal, cut its tip at an angle of 45°, with its length 10 mm (0.39 in) longer than the circumference of seal so that the tip overlaps the other. Then, press it onto the seal, using a screwdriver.



4) Match the positions of the lens and headlight assembly, and then insert the lens into headlight assembly.
5) Secure the hook, and then install the clip and screw.
6) Put the seal portion of headlight assembly into the water and check that water does not enter inside the headlight.

CAUTION:
Be sure that water does not enter inside the headlight through the bulb socket or ventilation hole.

E: ADJUSTMENT

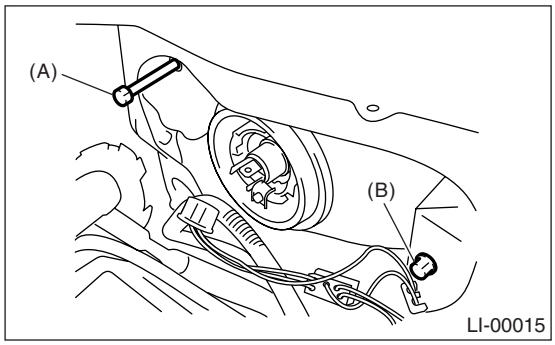
1. HEADLIGHT AIMING

CAUTION:
Turn off the light before adjusting headlight aiming. If the light is necessary to check aiming, do not turn on for more than two minutes.

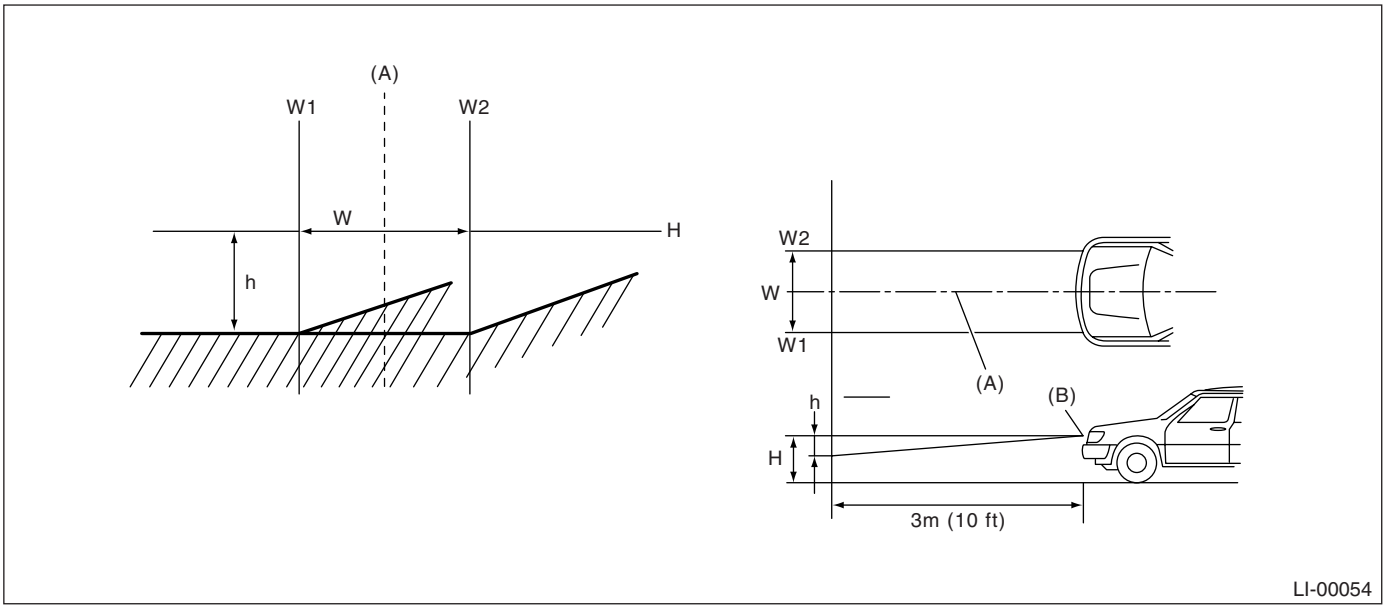
NOTE:
Before checking the headlight aiming, be sure of the following:
• The area around the headlight has not sustained any accident, damage or other type of deformation.
• Vehicle is parked on a level surface.
• The inflation pressure of tires is correct.
• Vehicle's fuel tank is fully charged.

1) Bounce the vehicle several times to normalize the suspension.
2) Make certain that someone is seated in the driver's seat.
3) Turn the headlights on and then adjust the low beam pattern by following positions on the screen.

NOTE:
• Set the headlight beam leveler switch to "0" position.
• Adjust the vertical aim (A) first, then horizontal aim (B).



- This illustration is for LHD model. The pattern for RHD model is symmetrically opposite.



(A) Vehicle center (B) Bulb center

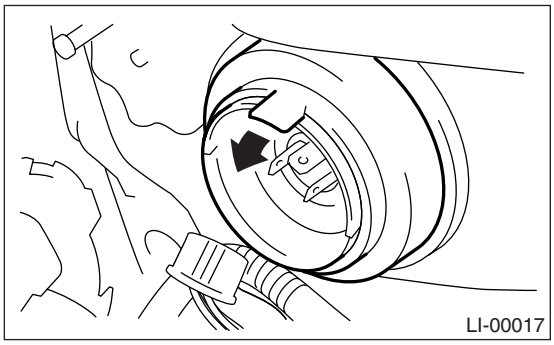
W mm (in)	H mm (in)	h mm (in) at 3 m (10 ft)
1,140 (44.88)	733 (28.9)	30 (1.18)

12.Headlight Bulb

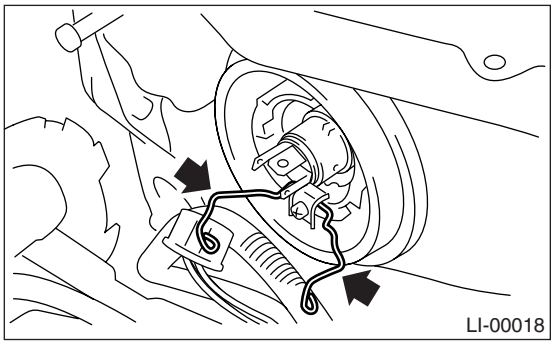
A: REMOVAL

CAUTION:
• Because the halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb. Never touch the glass portion.
• Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

1) Disconnect the ground cable from battery.
2) Remove the air intake duct (when removing the headlight RH).
3) Disconnect the harness connector.
4) Remove the rubber cap.



5) Remove the light bulb retaining spring to remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Attach the rubber cap with letters TOP on the top so the drain hole will be on the lower side.

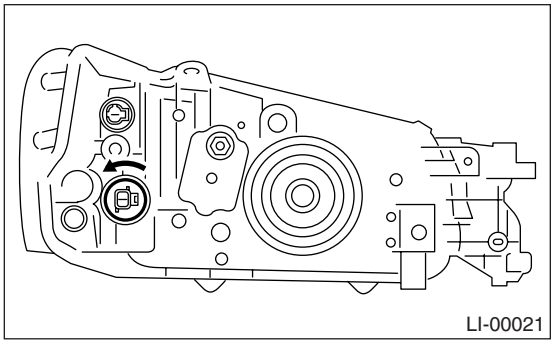
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

13.Front Turn Signal Light Bulb

A: REMOVAL

1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

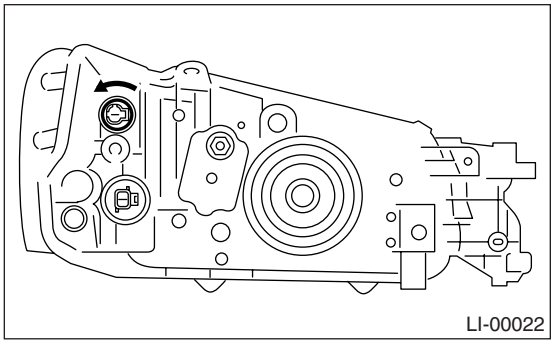
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

14.Clearance/Parking Light Bulb

A: REMOVAL

1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

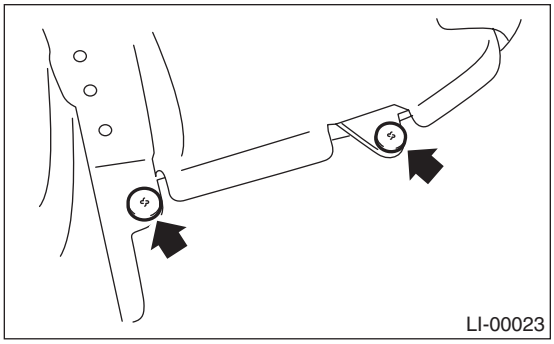
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

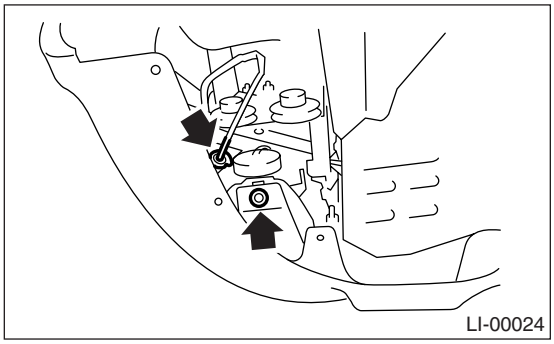
15.Front Fog Light Assembly

A: REMOVAL

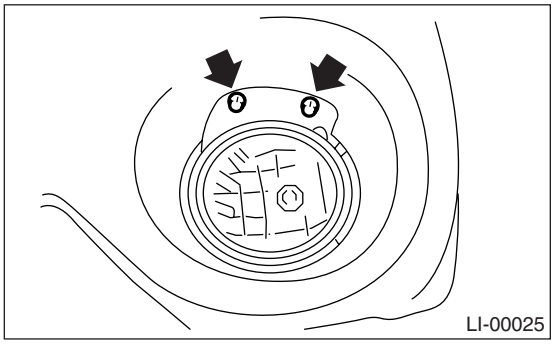
1) Disconnect the ground cable from battery.
2) Remove the two clips and lower mudguard.



3) Disconnect the harness connector.
4) Remove the lower bolts.



5) Remove the mounting bolts and clip, and then detach the fog light assembly.



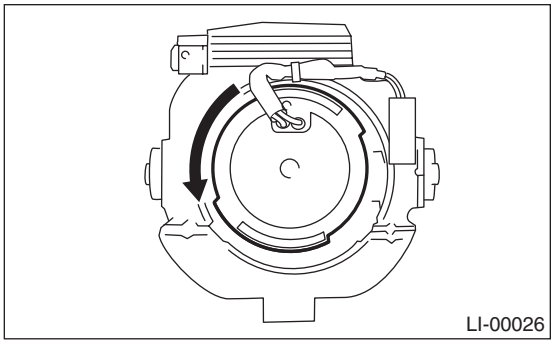
B: INSTALLATION

Install in the reverse order of removal.

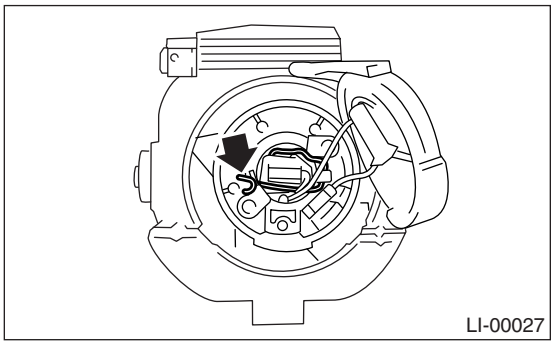
16.Front Fog Light Bulb

A: REMOVAL

1) Remove the front fog light assembly. <Ref. to LI-19, REMOVAL, Front Fog Light Assembly.>
2) Remove the back cover.



3) Remove the spring retainer, and then detach the fog light bulb.



B: INSTALLATION

Install in the reverse order of removal.

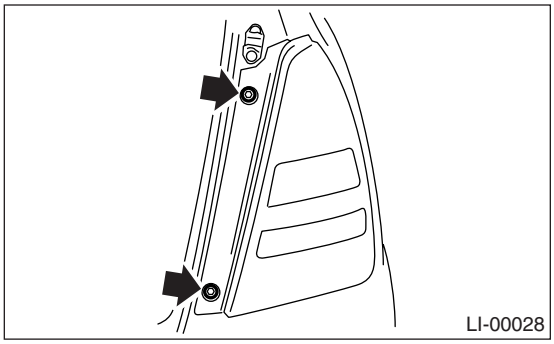
C: INSPECTION

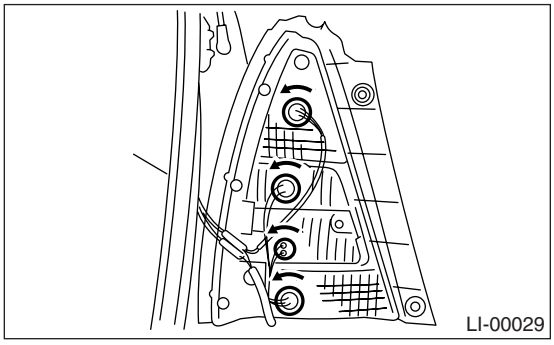
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

17.Rear Combination Light Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the two bolts, and then turn the socket and disconnect cord assembly to remove rear combination light.





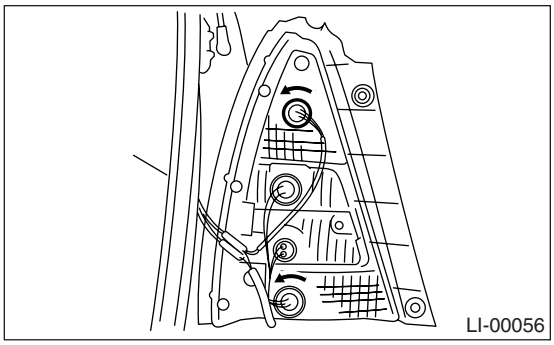
B: INSTALLATION

Install in the reverse order of removal.

18.Tail/Stop Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

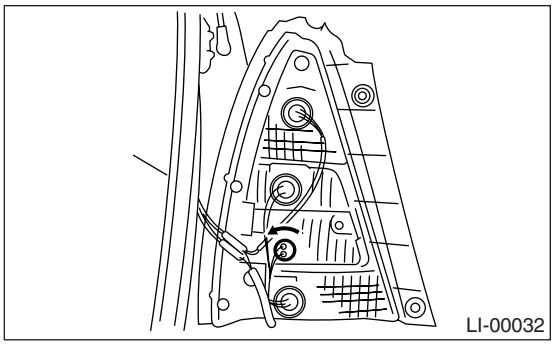
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

19.Back-up Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

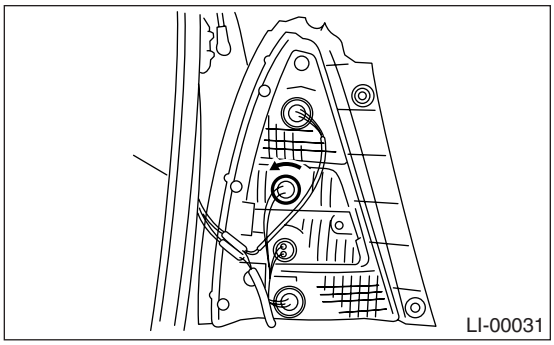
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

20.Rear Turn Signal Light Bulb

A: REMOVAL

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

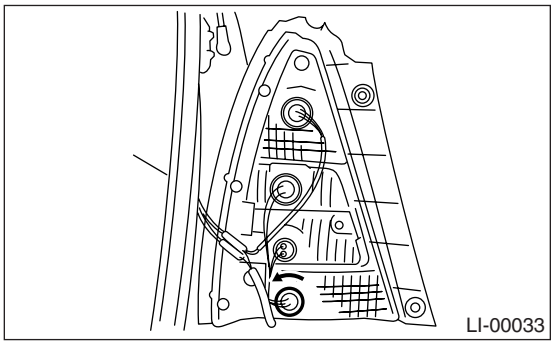
1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

21.Rear Fog Light Bulb

A: REMOVAL

NOTE:
Rear fog light bulb is attached only to driver's side combination light.

1) Remove the rear combination light assembly. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

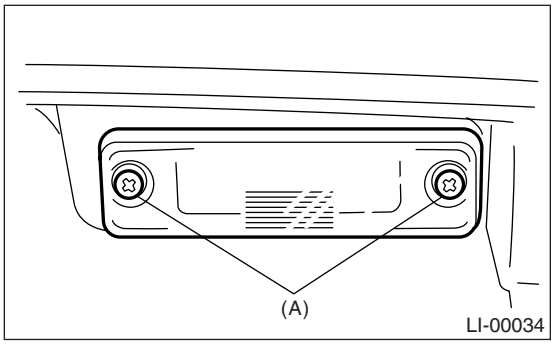
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

22.License Plate Light

A: REMOVAL

1) Remove the license plate light mounting screw (A), and then remove the lens.



2) Remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

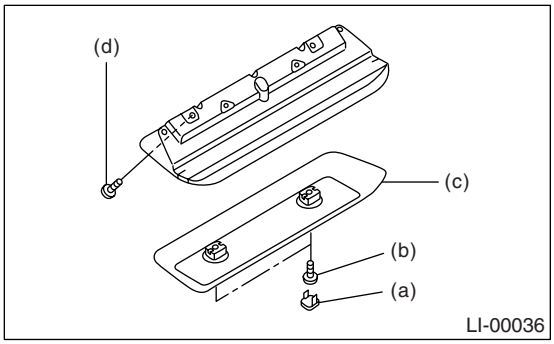
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

23.High-mounted Stop Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the cap (a) by prying on the edge with screwdriver.
3) Remove the screws (b), and then detach the cover (c).
4) Remove the screws (d), disconnect the connector, and then detach the high-mounted stop light.



B: INSTALLATION

Install in the reverse order of removal.

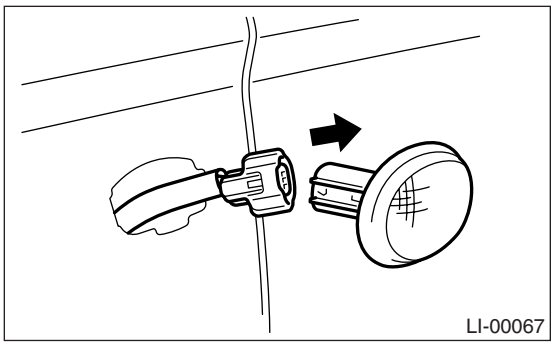
C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

24.Side Turn Signal Light Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Pull out the light from body while pushing it in direction of vehicle front.
3) Disconnect the harness connector and remove the light.



B: INSTALLATION

Install in the reverse order of removal.

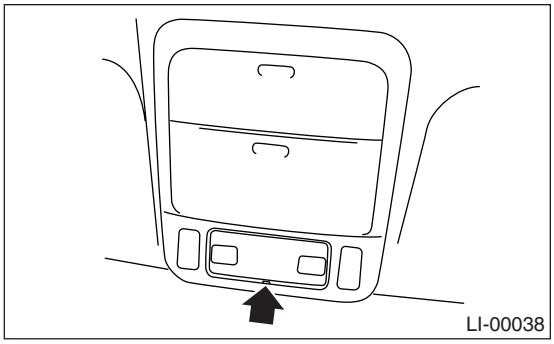
C: INSPECTION

1) Check the bulb for blow out using tester.
2) If NG, replace the side turn signal light assembly with a new one.

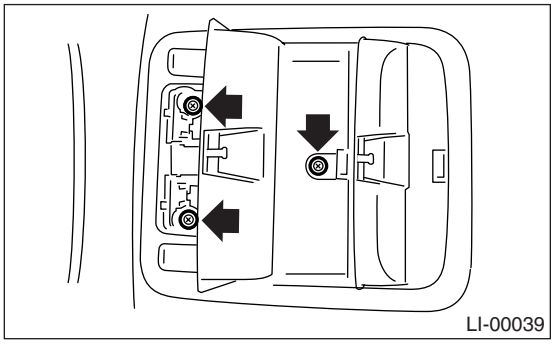
25.Spot Map Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Insert a flat tip screwdriver to the slot of lens, and then pry the lens to remove.



3) Remove the spot map light installation screws.



4) Disconnect the harness connectors and remove the spot map light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SPOT MAP LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

2. SPOT MAP LIGHT SWITCH

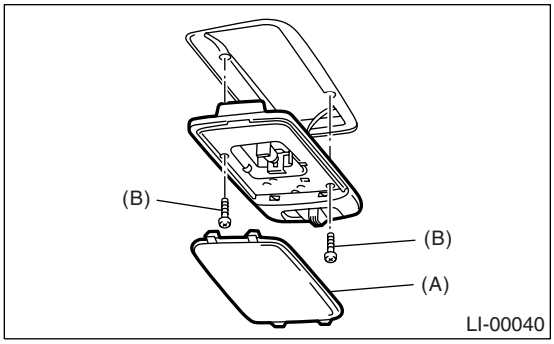
Measure the spot map light switch resistance.

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 2	18±5.4 Ω

26.Room Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and room light mounting screws (B).



3) Disconnect the harness connectors and remove the room light.

B: INSTALLATION

Install in the reverse order of removal.

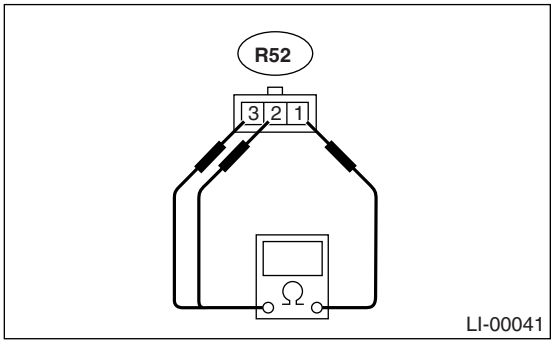
C: INSPECTION

1. ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

2. ROOM LIGHT SWITCH

Measure the resistance between room light switch terminals.

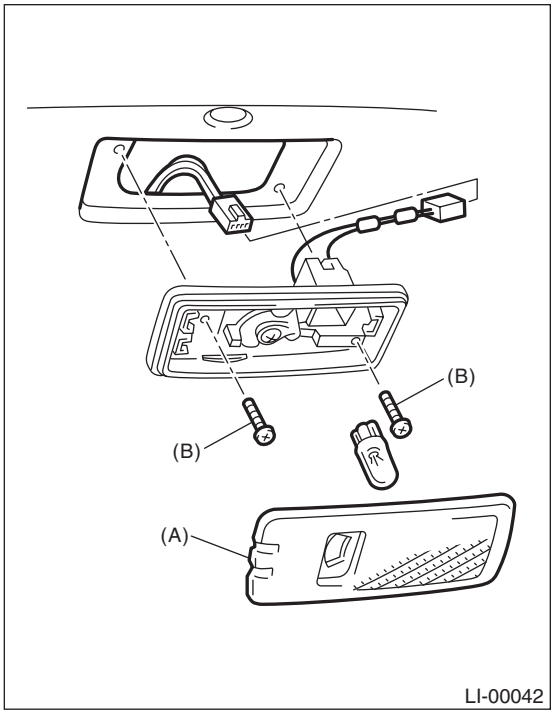


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

27.Luggage Room Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the lens (A) and luggage room light mounting screws (B).



3) Disconnect the harness connectors and remove the luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

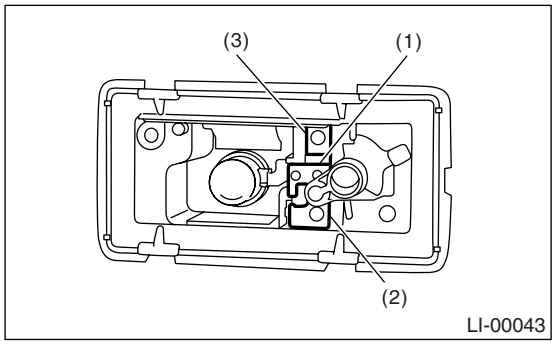
C: INSPECTION

1. LUGGAGE ROOM LIGHT BULB

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

2. LUGGAGE ROOM LIGHT SWITCH

Measure the resistance between luggage room light switch terminals.

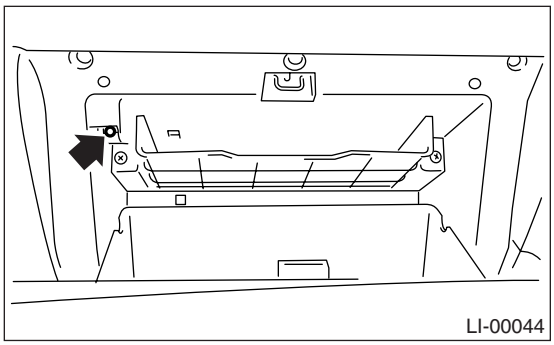


Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

28.Glove Box Light

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. <Ref. to EI-37, REMOVAL, GLOVE BOX.>
3) Disconnect the harness connector.
4) Remove the glove box light.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Visually check the bulb for blow out.
2) Check the bulb specification. <Ref. to LI-2, SPECIFICATION, General Description.>
3) If NG, replace the bulb with a new one.

WIPER AND WASHER SYSTEM

WW

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6.	Front Wiper Arm	12
7.	Front Wiper Motor and Link	13
8.	Front Washer Nozzle	15
9.	Rear Wiper Arm	16
10.	Rear Wiper Motor	17
11.	Rear Washer	18
12.	Wiper Control Relay	19
13.	Headlight Washer	20
14.	Headlight Washer Switch	21

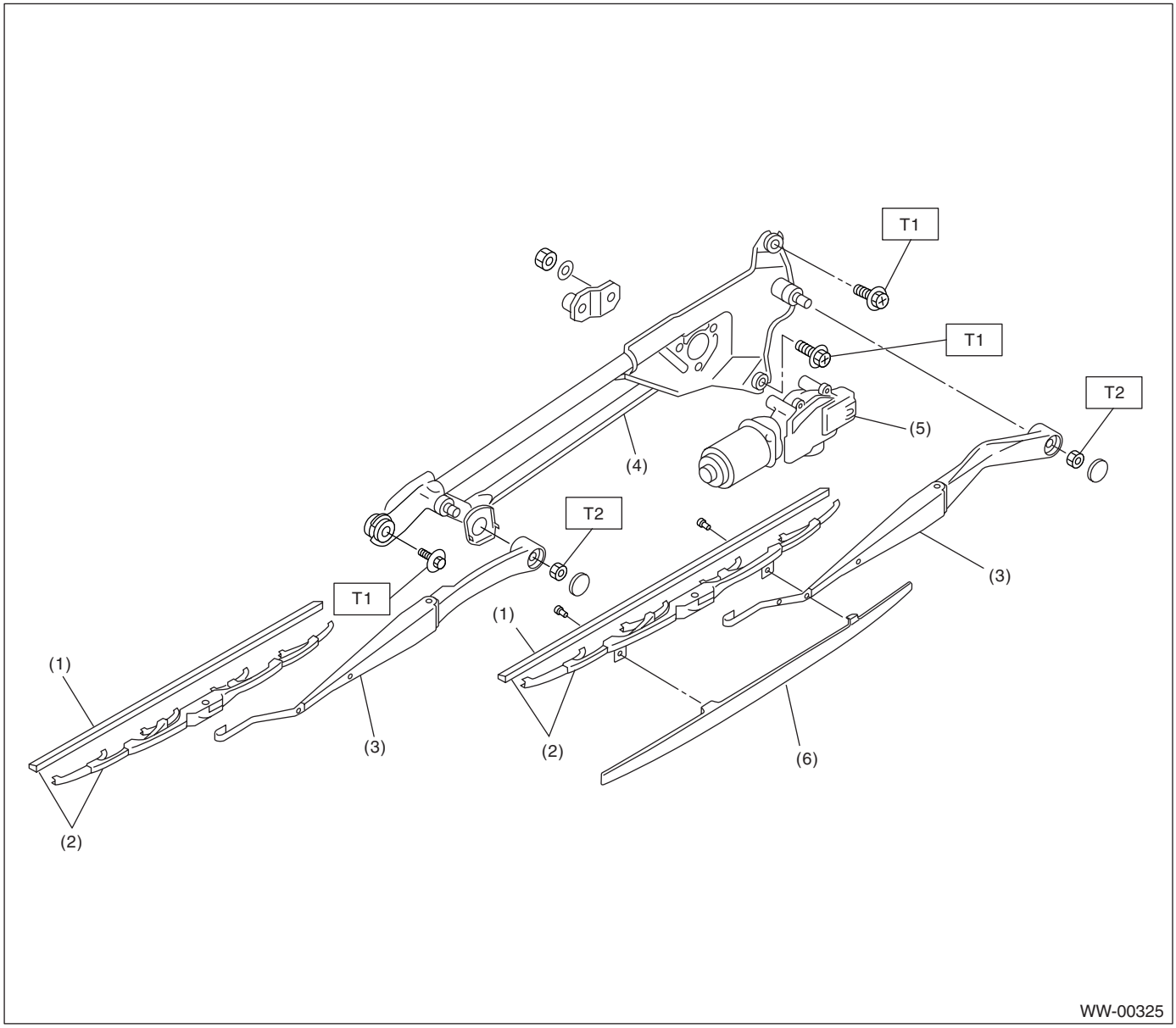
1. General Description

A: SPECIFICATION

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 42 W or less
Front washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less
Rear washer motor	Pump type	Centrifugal
	Input	12 V — 36 W or less

B: COMPONENT

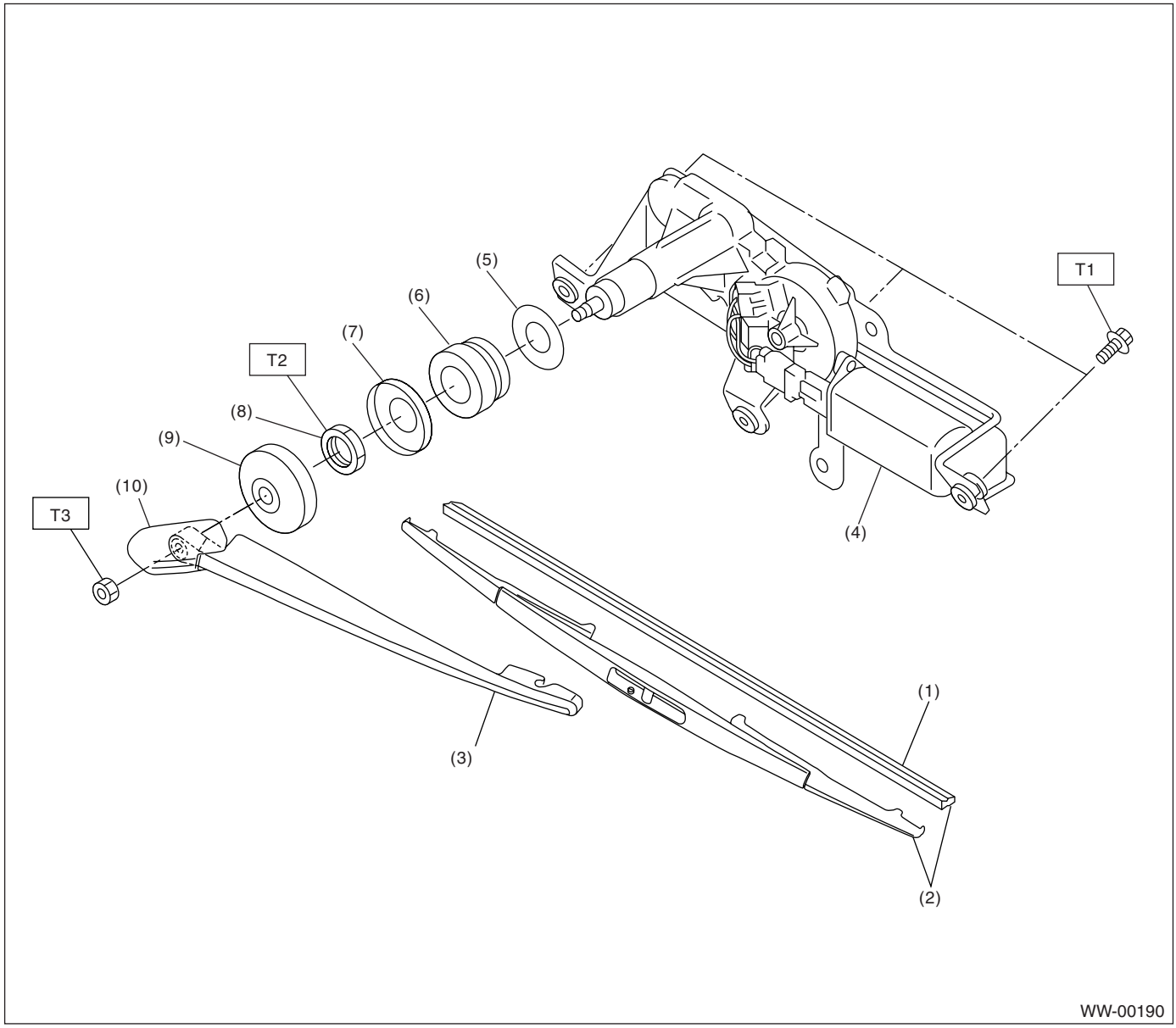
1. FRONT WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper rink
(5) Wiper motor
(6) Blade fin

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 20 (2.0, 14.5)

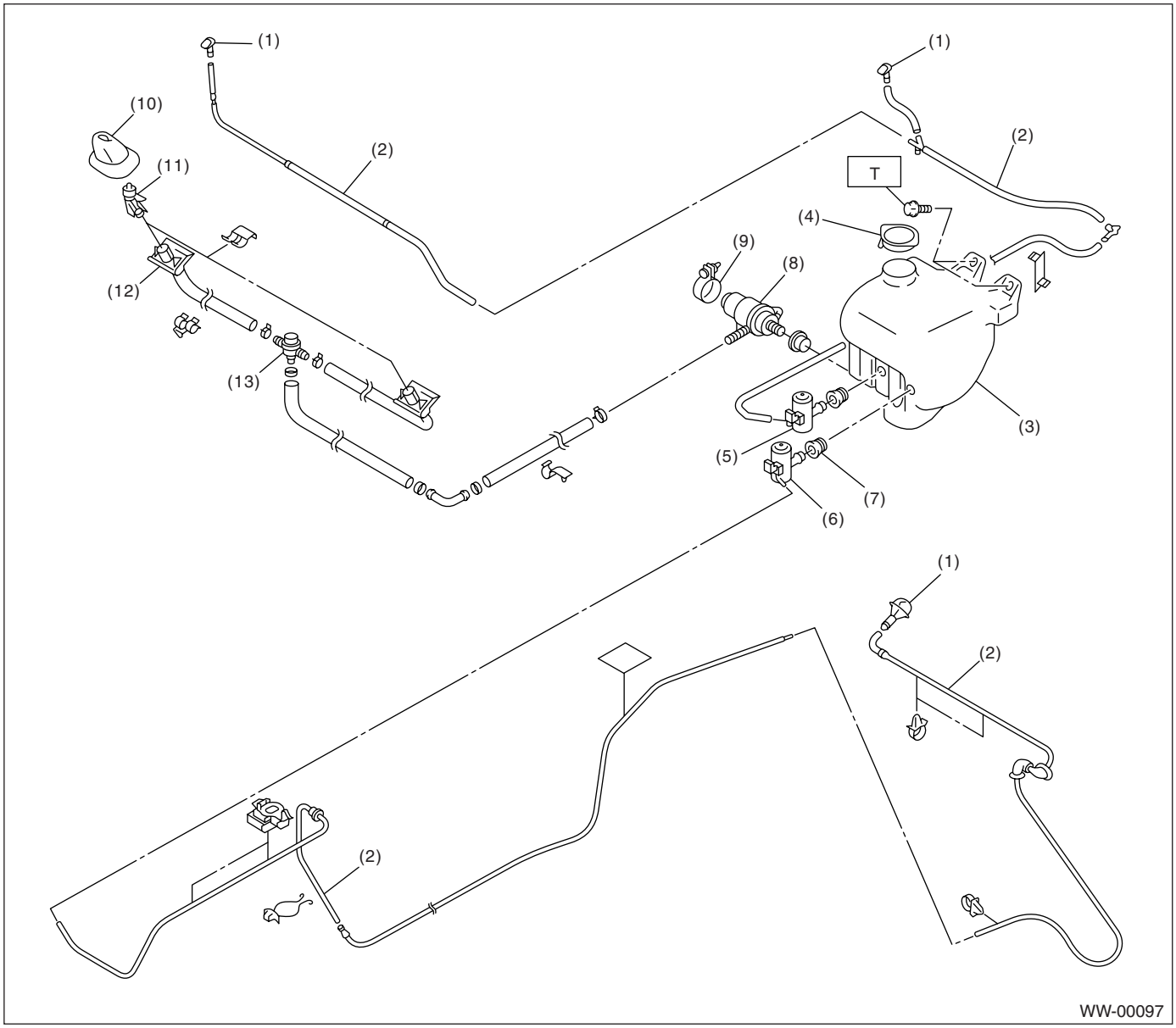
2. REAR WIPER



(1) Wiper rubber
(2) Wiper blade ASSY
(3) Wiper arm
(4) Wiper motor
(5) Spacer A
(6) Cushion
(7) Spacer B
(8) Nut
(9) Cap
(10) Wiper arm cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.0 (0.61, 4.4)
T2: 7.5 (0.76, 5.5)
T3: 8.0 (0.8, 5.8)

3. WASHER TANK



(1) Washer nozzle
(2) Washer hose
(3) Washer tank
(4) Washer tank cap
(5) Front washer motor
(6) Rear washer motor
(7) Grommet
(8) Headlight washer motor
(9) Motor bracket
(10) Headlight washer case
(11) Headlight washer upper nozzle
(12) Headlight washer lower nozzle
(13) Valve

Tightening torque: N·m (kgf-m, ft-lb)
T: 6.0 (0.61, 4.4)

C: CAUTION

• Reconnect the connectors and hoses securely. After reconnecting, confirm that each function operates normally.
• Be careful that wiring harnesses of airbag system pass near electrical parts and switches.
• Wiring harnesses and connectors of all airbag system are yellow color. Do not use a tester on these circuits.
• Care must be taken when installing the piping hose so that no bending, jamming, etc. are caused.
• If even a little oil or grease such as silicon oil gets in the tank and washer passages, an oil film easily forms on the glass, causing the wiper to chatter and judder. Therefore, be careful not to let this happen.

2. Wiper and Washer System

A: WIRING DIAGRAM

1. WIPER AND WASHER (FRONT)

<Ref. to WI-243, WIRING DIAGRAM, Front Wiper and Washer System.>

2. WIPER AND WASHER (REAR)

<Ref. to WI-244, WIRING DIAGRAM, Rear Wiper and Washer System.>

3. HEADLIGHT WASHER

<Ref. to WI-246, WIRING DIAGRAM, Headlight Washer System.>

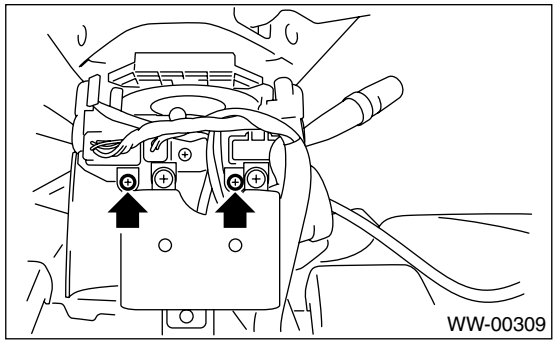
B: INSPECTION

Symptom	Repair order
Wiper and washers do not operate.	(1) Wiper fuse (F/B No. 14, 15) (2) Combination switch (3) Wiper motor (4) Wiring harness
Wipers do not operate in LO or HI.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Wipers do not operate in INT.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Washer motor does not operate.	(1) Washer switch (2) Washer motor (3) Wiring harness
Wipers do not operate when washer switch is ON.	(1) Washer motor (2) Wiring harness
Washer fluid spray does not operate.	(1) Washer motor (2) Washer hose and nozzle

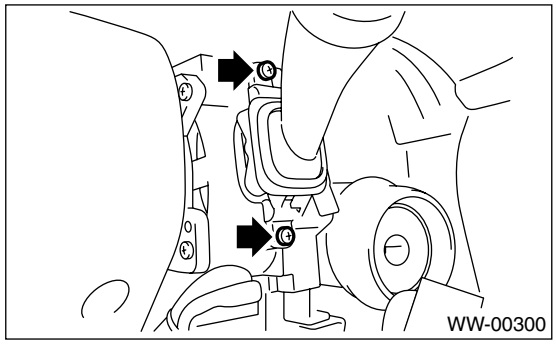
3. Combination Switch (Wiper)

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-40, REMOVAL, Instrument Panel Assembly.>
3) Loosen the screw to remove steering column cover lower.
4) Remove the screw to steering column cover upper.



5) Disconnect the connectors from combination switches.
6) Loosen the screw to remove combination switch.

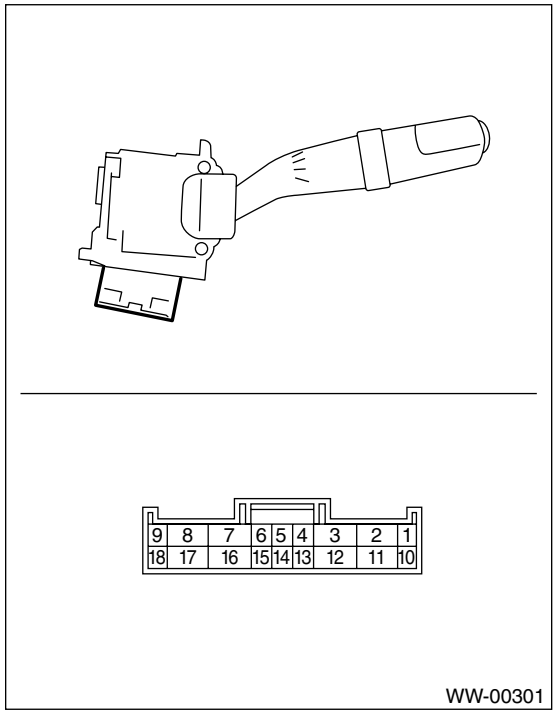


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Inspect the continuity between each connector terminal.



- Except for KA model:

	Switch position	Terminal No.	Standard
FRONT	OFF	7 and 16	Less than 1 Ω
	INT	7 and 16	Less than 1 Ω
	LO	7 and 17	Less than 1 Ω
	HI	8 and 17	Less than 1 Ω
	Washer ON	2 and 11	Less than 1 Ω
REAR	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω
	OFF	—	More than 1 MΩ
	INT	2 and 13	Less than 1 Ω
	ON	2 and 10	Less than 1 Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω

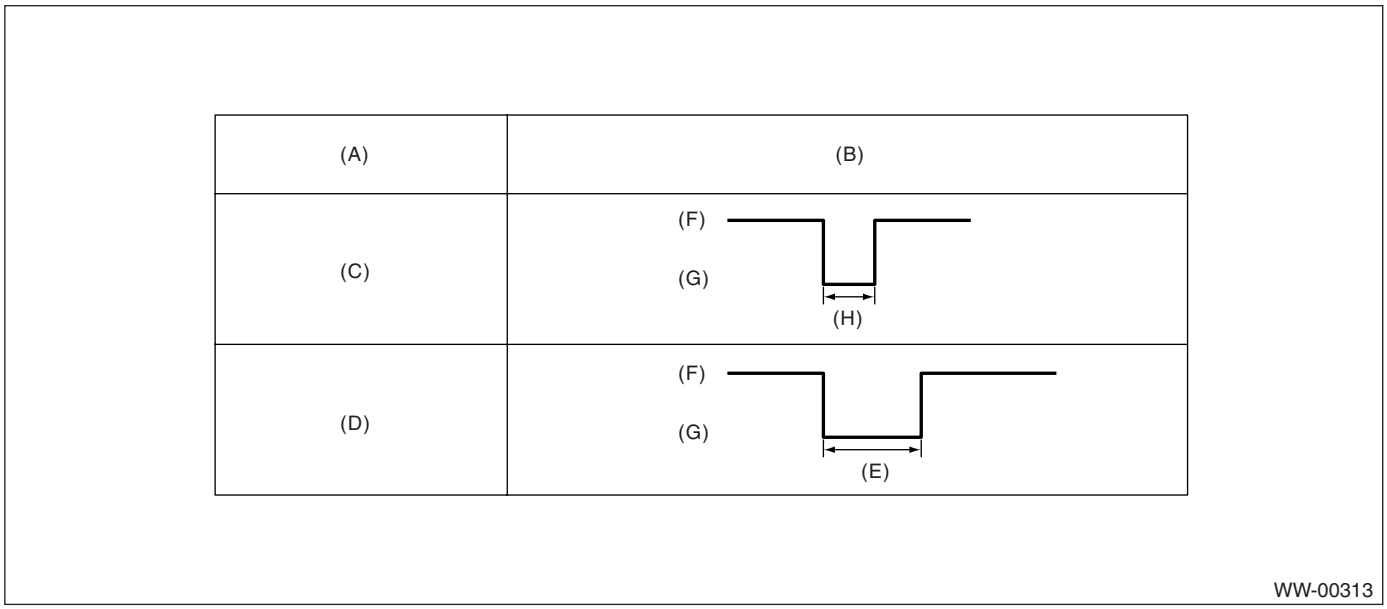
- KA model:

	Switch position	Terminal No.	Standard
FRONT	OFF	3 and 12	Less than 1Ω
	INT	3 and 12	Less than 1Ω
	LO	3 and 11	Less than 1Ω
	HI	2 and 11	Less than 1Ω
	Washer ON	8 and 17	Less than 1Ω
REAR	Washer ON	8 and 18 18 and 16 8 and 16	Less than 1Ω
	OFF	—	More than 1MΩ
	INT	8 and 15	Less than 1Ω
	ON	8 and 18	Less than 1Ω
	Washer ON	8 and 18 18 and 16 8 and 16	Less than 1Ω

If continuity is not as specified, replace the switch.

2) Intermittent operation inspection
   (1) Turn the wiper switch to INT.
   (2) Adjust the intermittent control switch to MAX.
   (3) Apply battery voltage to switch terminals 16 and 2.
   (4) Measure the voltage between combination switch terminal.

Terminals:
No. 7 — No. 2:



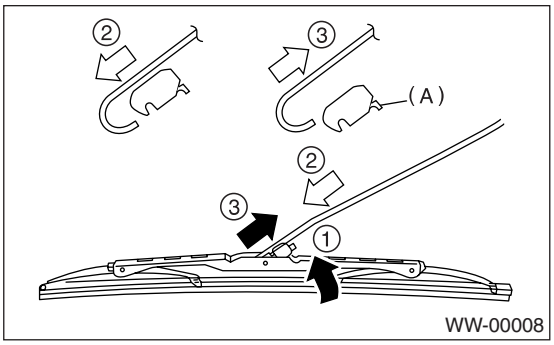
(A) Switch position
(B) Voltage
(C) MIN.
(D) MAX.
(E) 16±6 sec.
(F) 12 V
(G) 0 V
(H) Approx. 2 sec.

If operation is not as specified, replace the switch.

4. Wiper Blade

A: REMOVAL

While pushing the locking clip (A) up, pull out the blade from arm to arrow direction.

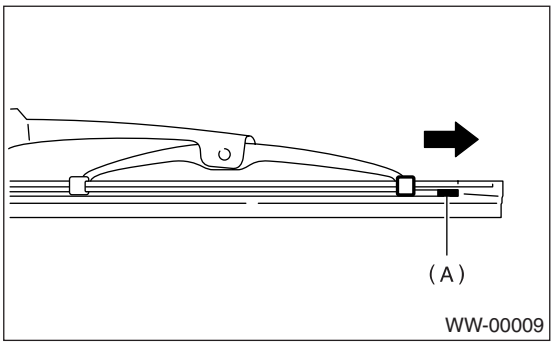


B: INSTALLATION

1) Install in the reverse order of removal.
2) Confirm that the clip is locked securely.

C: DISASSEMBLY

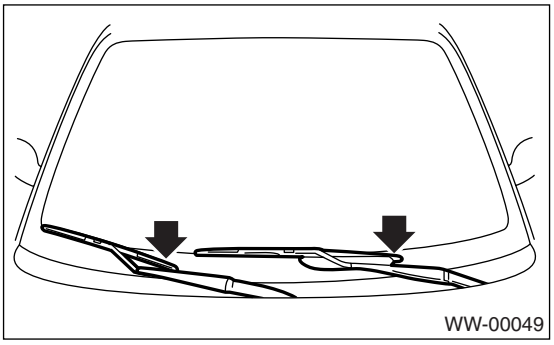
Pull on side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.



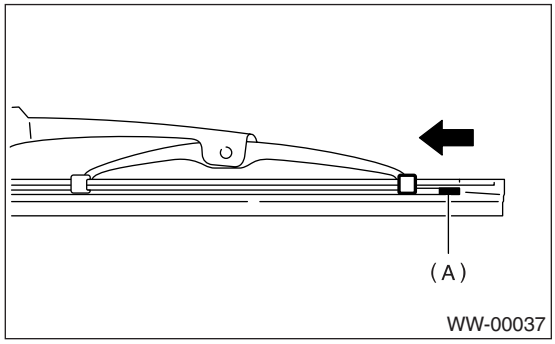
D: ASSEMBLY

1. METAL TYPE

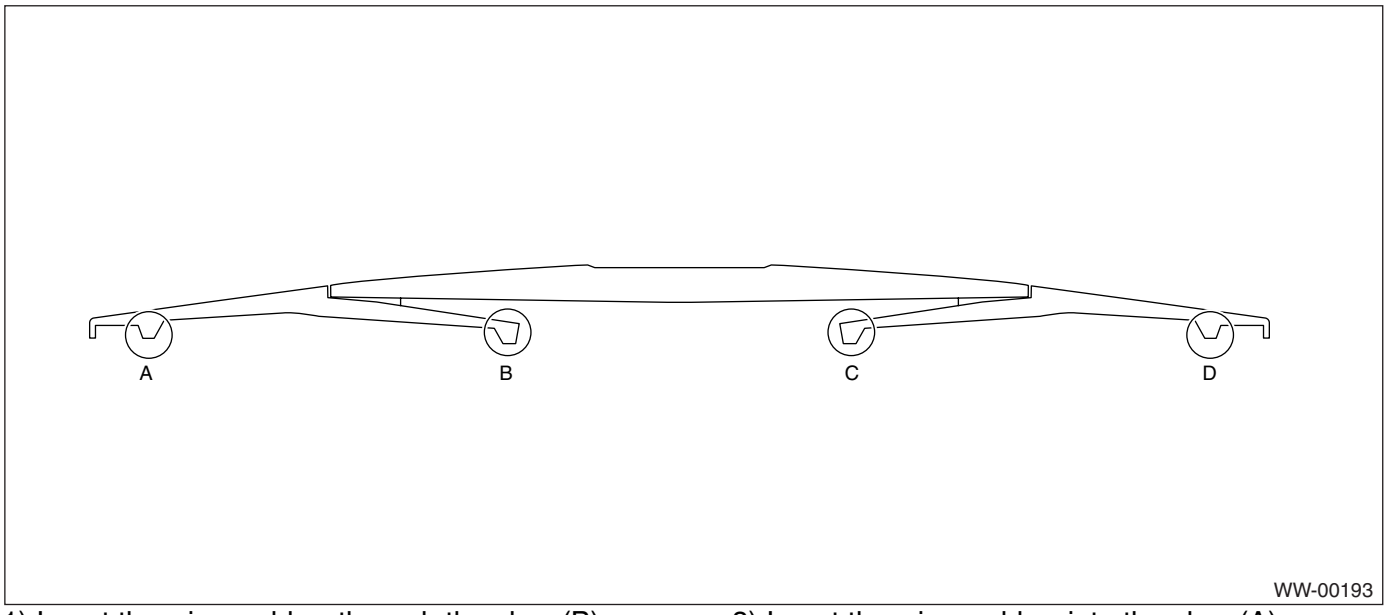
1) Insert the wiper rubber onto the blade so that the stopper is in the position shown.



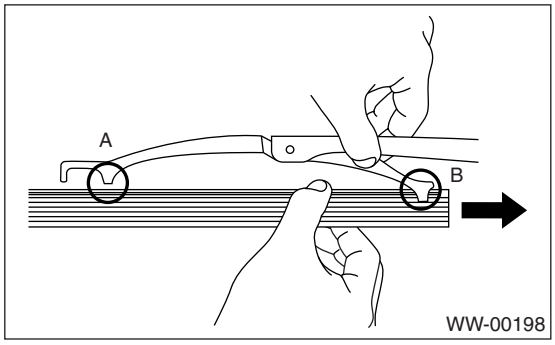
2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



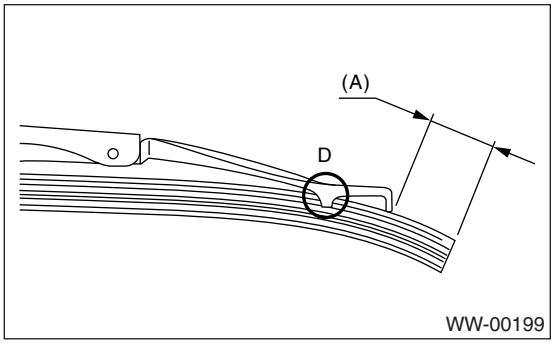
2. RESIN TYPE



1) Insert the wiper rubber through the claw (B).

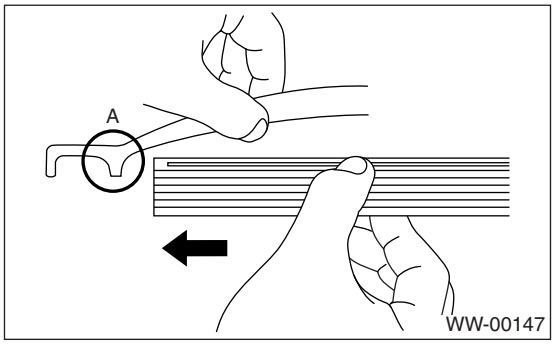


2) Insert the wiper rubber top until it protrudes about 20 mm (0.79 in) from the stopper (D).



(A) 20 mm (0.79 in)

3) Insert the wiper rubber into the claw (A).



E: INSPECTION

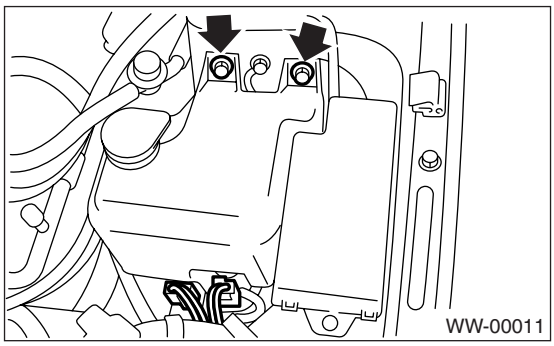
1) When the wiper does not perform well, inspect the following:
- Make sure the movable part of the blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

2) Replace with a new part if damage is found.

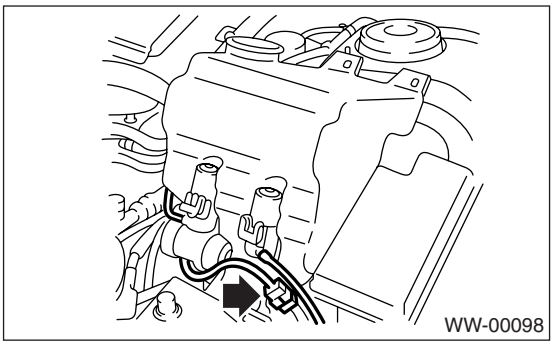
5. Washer Tank and Motor

A: REMOVAL

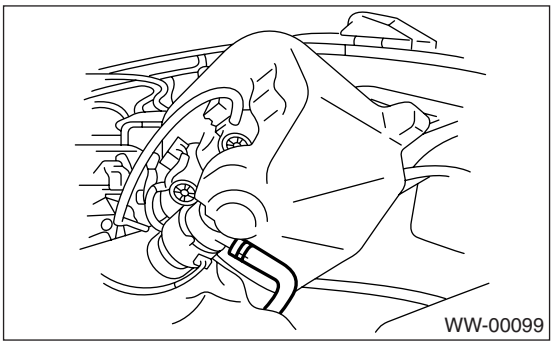
1) Open the hood.
2) Disconnect the ground cable from battery.
3) Remove the two bolts, hose and connector, and then remove the tank.



4) For the model with headlight washer, proceed to step 5) and 6).
5) Lift the washer tank, and then disconnect the connector from headlight washer motor. Disconnect washer hoses.



6) Disconnect the washer hose from the motor, and then detach the washer tank.



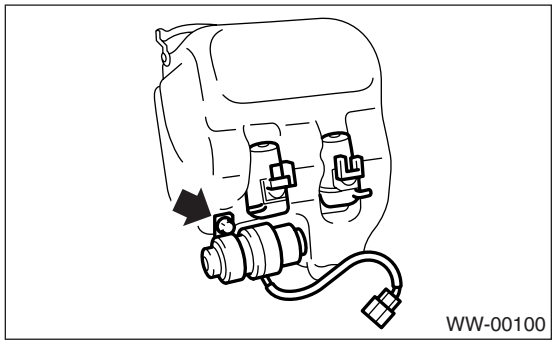
B: INSTALLATION

Install in the reverse order of removal.

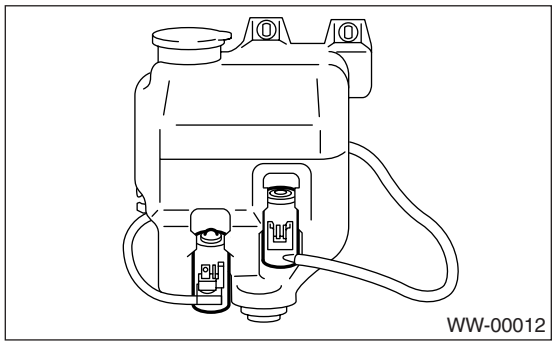
Tightening torque:
6.0 N·m (0.61 kgf-m, 4.4 ft-lb)

C: DISASSEMBLY

1) Remove bolt, and then pull out headlight washer motor from tank. (Model with headlight washer)



2) Pull out the washer motor from tank.

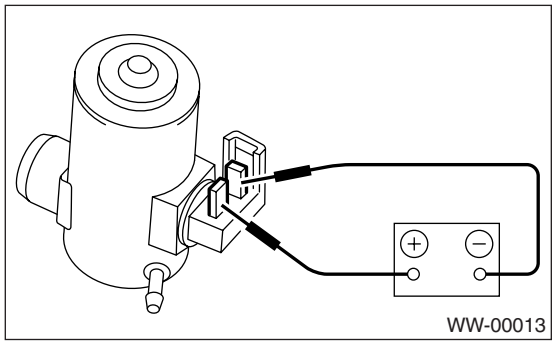


D: ASSEMBLY

1) Assemble in the reverse order of disassembly.
2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

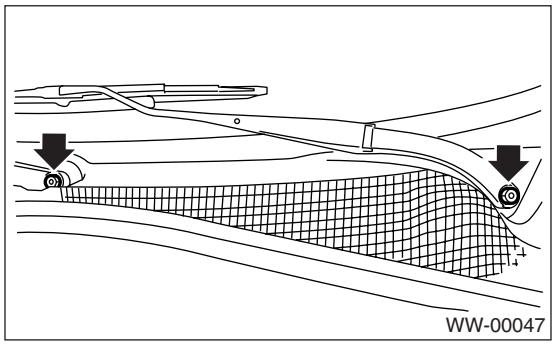
Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



6. Front Wiper Arm

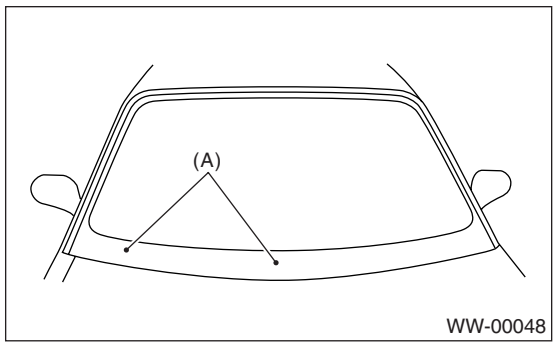
A: REMOVAL

1) Open the hood.
2) Remove the cap.
3) Loosen the nut to remove arm.



B: INSTALLATION

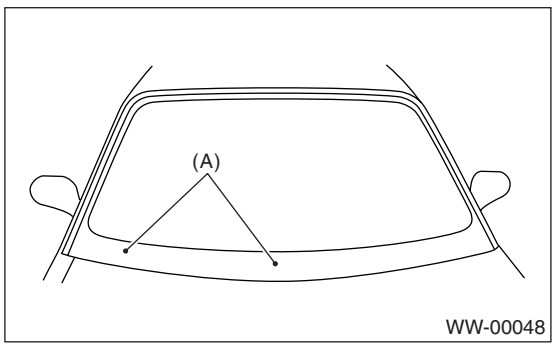
1) Install in the reverse order of removal.
2) Operate the wiper once.
3) Align the wiper blade to ceramic print point mark (A) of front window panel.



Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

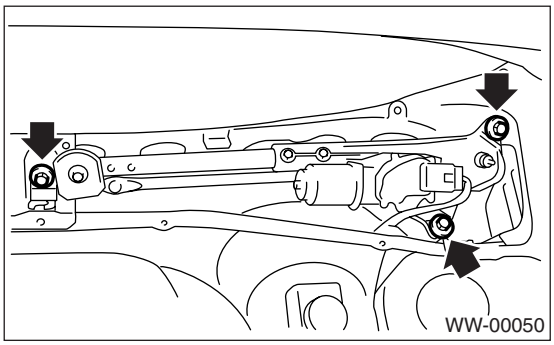
Operate the wiper once. Align the wiper blade to ceramic print point mark (A) of front window panel.



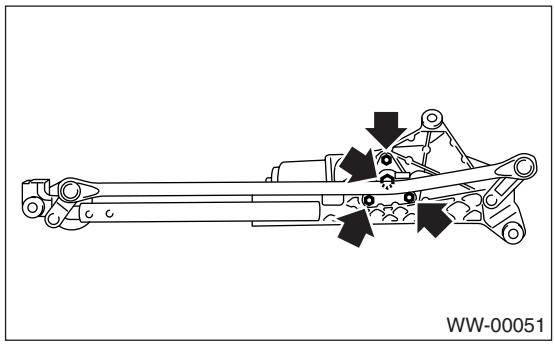
7. Front Wiper Motor and Link

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
3) Disconnect the connector of motor.
4) Loosen the bolts and nuts to remove wiper link.

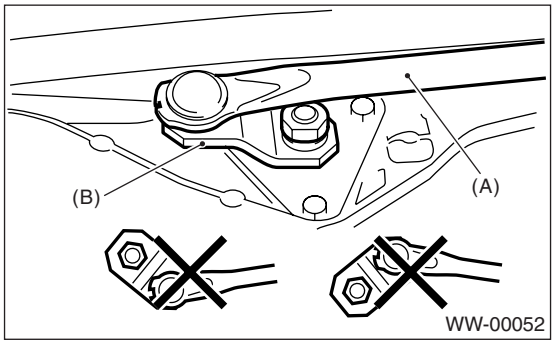


5) Loosen the bolts and nuts to remove motor.



B: INSTALLATION

1) Install the wiper link to the vehicle, and then connect the motor connector.
2) Connect the battery ground cable to battery.
3) To confirm that the motor is at auto stop position, connect the harness to motor and turn the wiper switch ON/OFF once.
4) Disconnect the ground cable from battery.
5) Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.

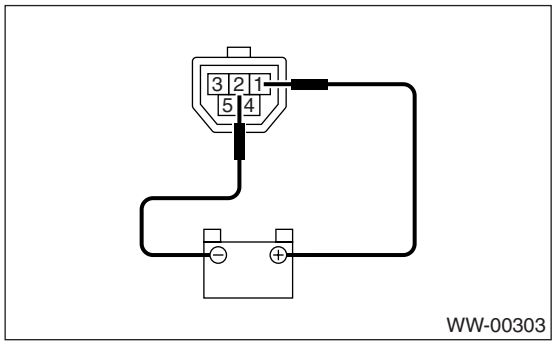


6) Install in the reverse order of removal.

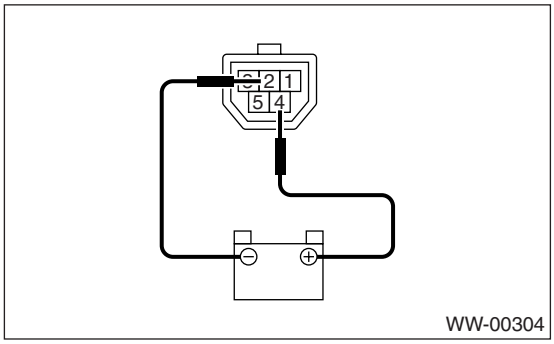
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: INSPECTION

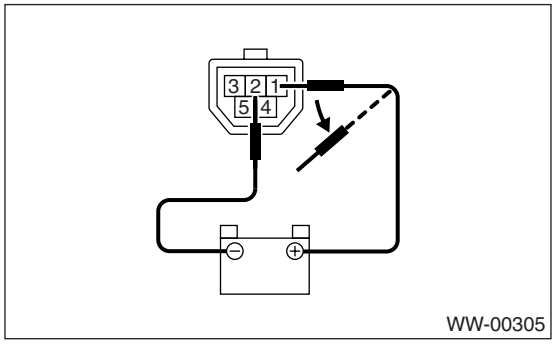
1) When the battery is connected to wiper motor connectors and confirm that motor operates at low speed.



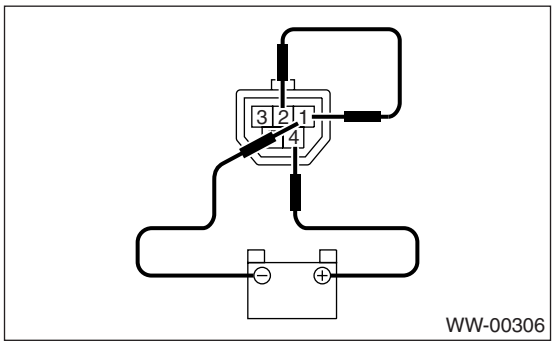
2) When the battery is connected to terminal of connectors and confirm that motor operates at high speed.



3) Connect the battery to terminals of connector, and remove the terminal connection with motor rotated at low speed, and stop the wiper motor through operation.



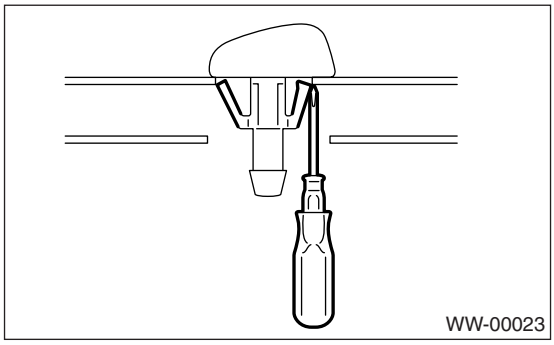
4) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



8. Front Washer Nozzle

A: REMOVAL

1) Remove the washer hose from the washer nozzle.
2) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Hoses have rib as eyemark for twist-proof.

2) Adjust the position of the washer liquid sprayer. <Ref. to WW-15, ADJUSTMENT, Front Washer Nozzle.>

C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Check hoses for twist or fold.

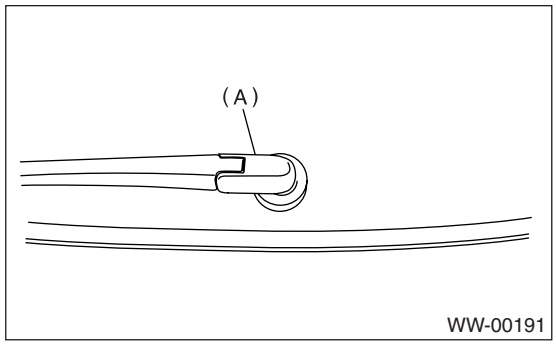
D: ADJUSTMENT

NOTE:
It is not necessary to adjust the washer injection position because of spreading nozzle type.

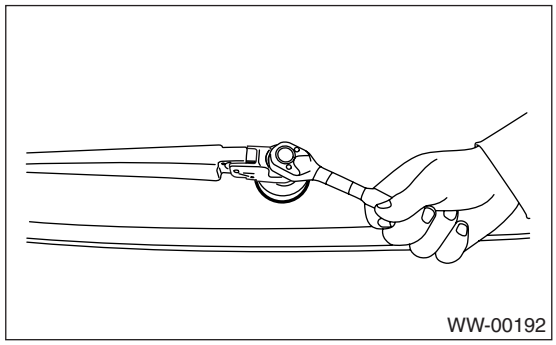
9. Rear Wiper Arm

A: REMOVAL

1) Remove the wiper arm cover (A).

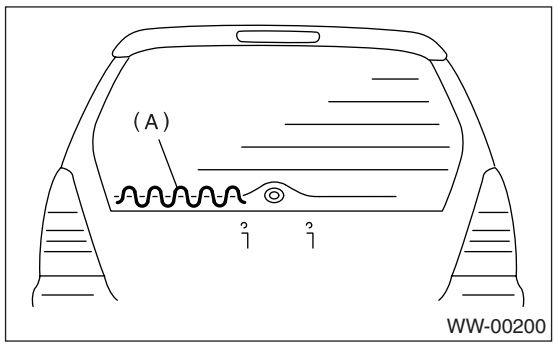


2) Loosen the nut to remove wiper arm.



B: INSTALLATION

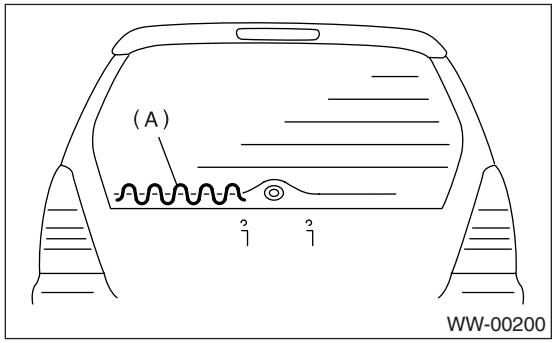
1) Install in the reverse order of removal.
2) Operate the rear wiper once.
3) Align the blade to the center of rear defogger heat wire (A).



Tightening torque:
Refer to COMPONENT in General Description. <Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

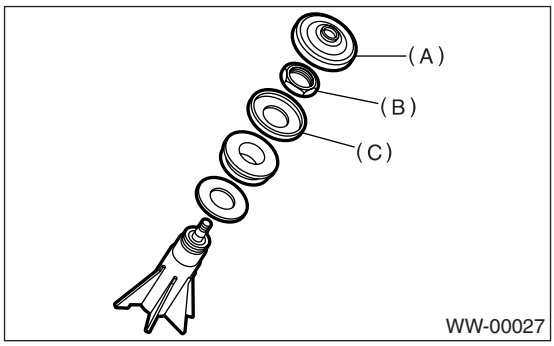
1) Operate the rear wiper once.
2) Align the blade to the center of rear defogger heat wire (A).



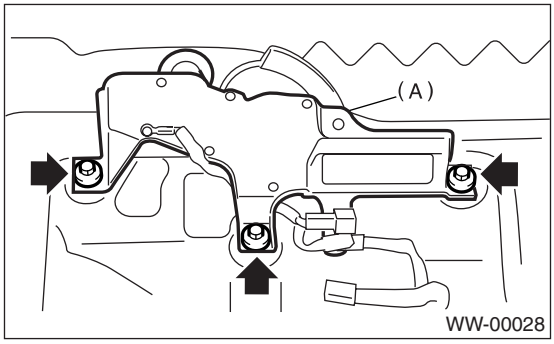
10.Rear Wiper Motor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear wiper arm.
3) Remove the cap (A), nut (B), and spacer (C) from rear wiper shaft.

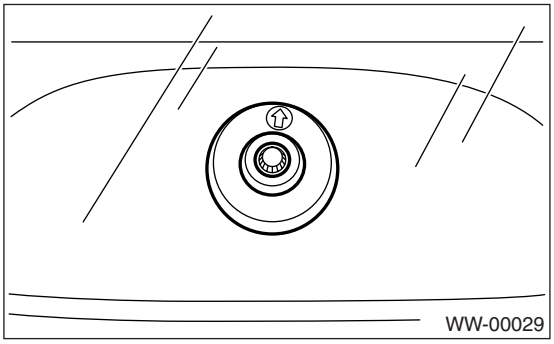


4) Remove the rear gate lower trim. <Ref. to EI-49, REMOVAL, Rear Gate Trim.>
5) Unclip the clip of harness and disconnect the connector of wiper motor.
6) Loosen the bolts to remove the wiper motor assembly (A).



B: INSTALLATION

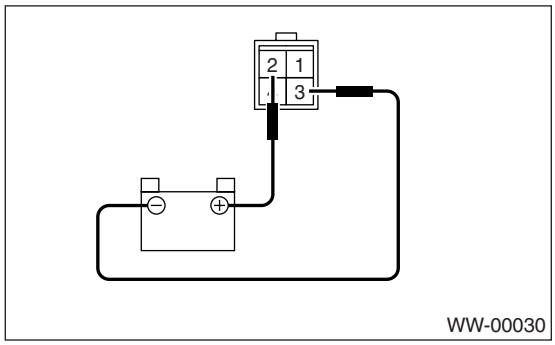
1) Install in the reverse order of removal.
2) Install the rear wiper cushion with the arrow mark facing up, as shown in the figure.



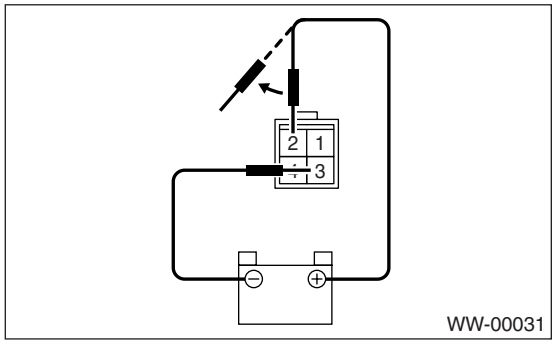
Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: INSPECTION

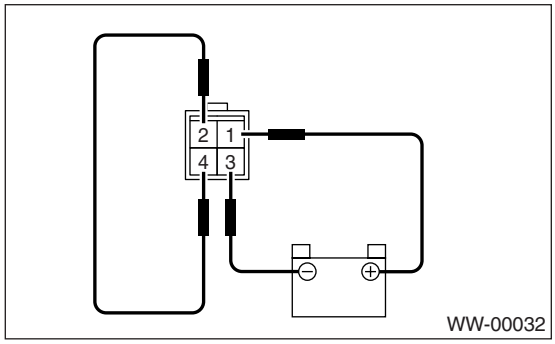
1) Connect the battery to wiper motor connector and confirm that the wiper motor operates.



2) Connect the battery to terminal of connector and remove the terminal connections with motor rotated, and stop the wiper motor through operation.



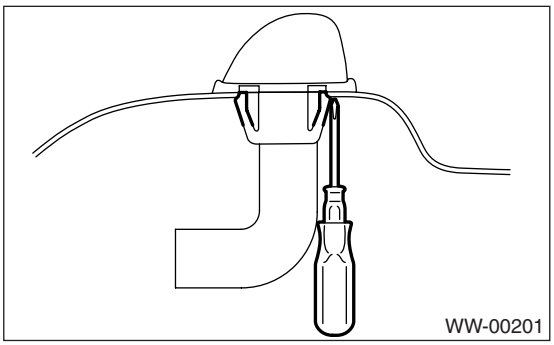
3) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



11.Rear Washer

A: REMOVAL

1) Remove the rear gate upper trim. <Ref. to EI-49, REMOVAL, Rear Gate Trim.>
2) Remove the washer hose from the washer nozzle.
3) Push the anchor portion of washer nozzle with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the position of the washer liquid sprayer. <Ref. to WW-18, ADJUSTMENT, Rear Washer.>

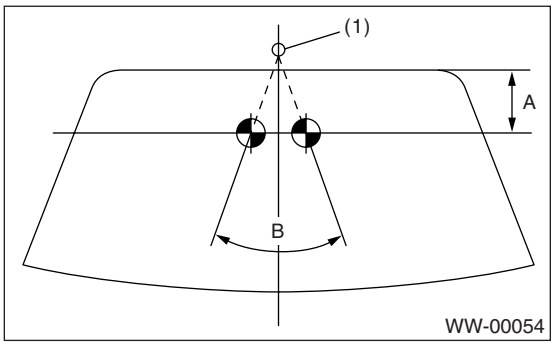
C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Check hoses for twist or fold.

D: ADJUSTMENT

1) Turn the wiper switch to OFF position.
2) When the vehicle stops, adjust the washer injection position as shown in the figure.

Injection position:
A: 35 mm (1.38 in)
B: 72°

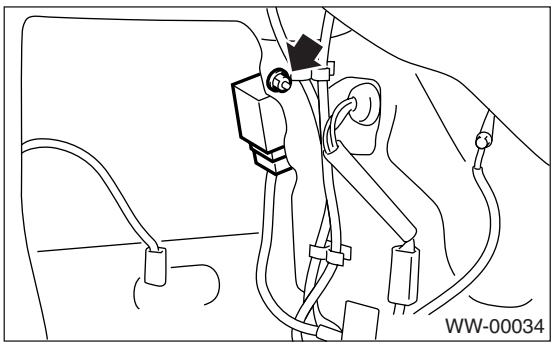


(1) Nozzle

12.Wiper Control Relay

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the right quarter lower trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>
3) Loosen the nut to remove control unit.

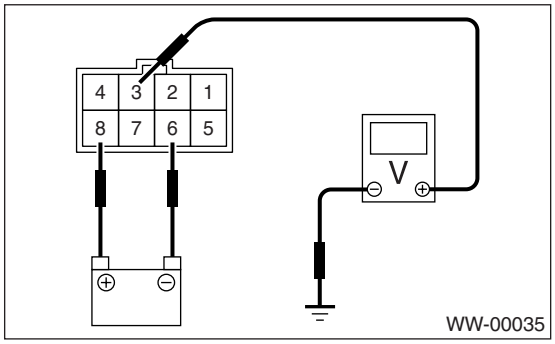


B: INSTALLATION

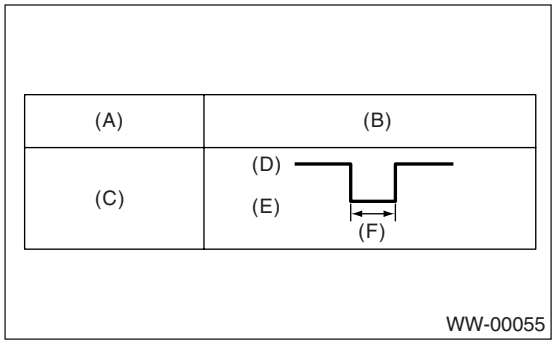
Install in the reverse order of removal.

C: INSPECTION

1) Disconnect the connector from the wiper control relay.
2) Connect the positive (+) lead from the battery to terminal 8 and the negative (–) lead to terminal 6. Connect the positive (+) lead from the voltmeter to terminal 3 and the negative (–) lead to ground.



3) Measure the voltage when the wiper relay is operated.



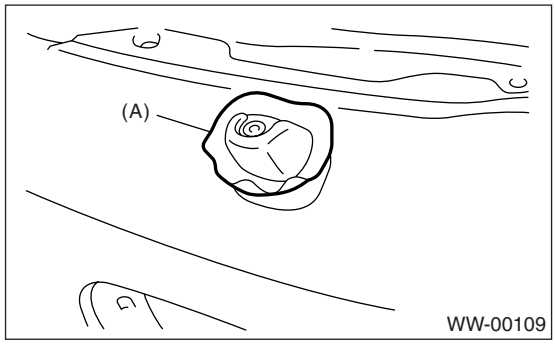
(A) Switch position
(B) Voltage
(C) ON
(D) 12 V
(E) 0 V
(F) 9±2 sec.

If operation is not as specified, replace the switch.

13.Headlight Washer

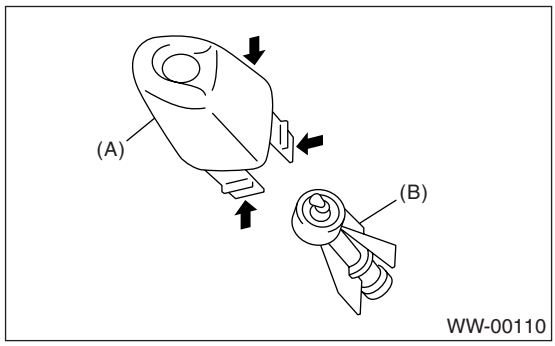
A: REMOVAL

1) Disconnect the ground cable from the battery.
2) Remove the front grille. **<Ref. to EI-18,** REMOVAL, Front Grille.>
3) Remove the headlight. **<Ref. to LI-13,** REMOVAL, Headlight Assembly.>
4) Remove outer case (A).



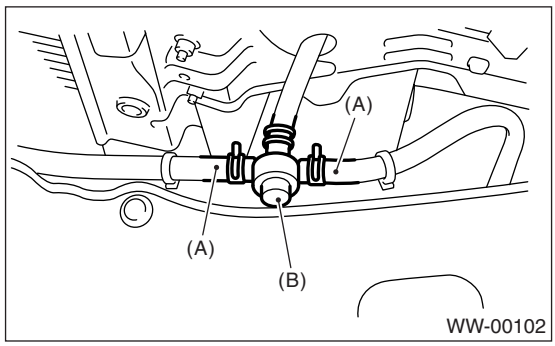
5) Push the three pawls to remove case (A). Then pull out upper nozzle (B).

NOTE:
Before pushing the case (A) pawls, cover the bumper to avoid scratches.



6) Draw out headlight washer hose.
7) Disconnect hose (A) from valve (B).

NOTE:
Washer fluid may drain from valve. Put a pan under the valve, then disconnect valve from hose while pinching the hose edge.



8) Remove the lower nozzle from bumper beam.

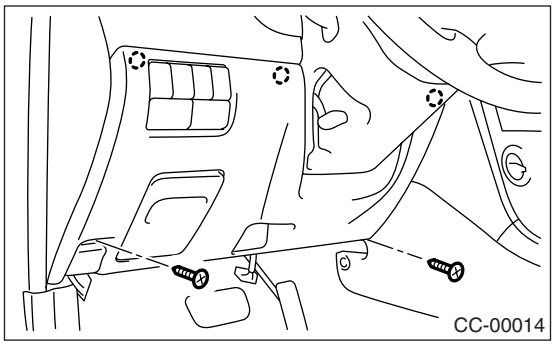
B: INSTALLATION

Install in the reverse order of removal.

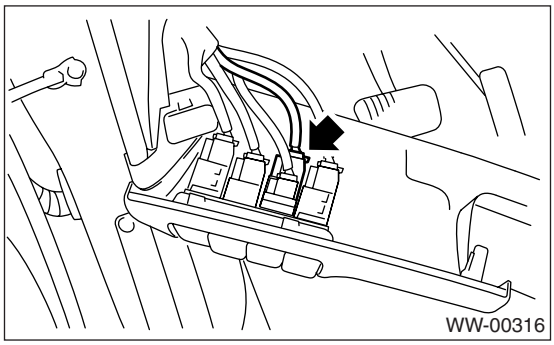
14.Headlight Washer Switch

A: REMOVAL

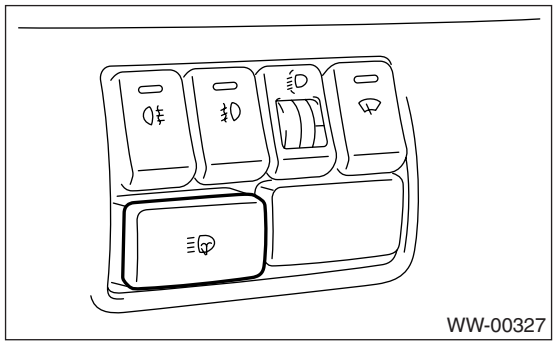
1) Disconnect the ground cable from battery.
2) Remove the screws and clip from instrument panel lower cover.
3) Remove the instrument panel lower cover.



4) Disconnect the connector from headlight washer switch.



5) Remove the headlight washer switch by pushing it outward.

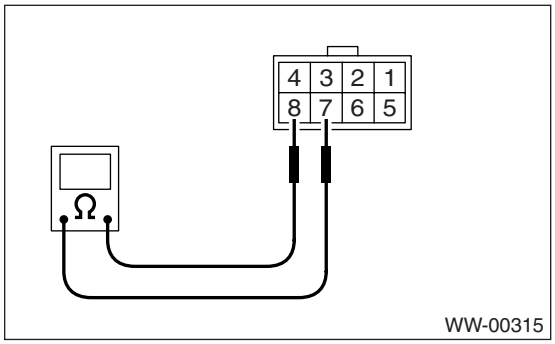


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the headlight washer switch resistance.



Switch position	Terminal No.	Standard
OFF (released)	7 and 8	More than 1 MΩ
ON (depressed)		Less than 1 Ω

If NG, replace the headlight washer switch.

ENTERTAINMENT

ET

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3.	Front Accessory Power Supply Socket System	4
4.	Radio Body	5
5.	Front Speaker	6
6.	Antenna	7
7.	Antenna Amplifier	8
8.	Front Accessory Power Supply Socket	9

1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Conductive silver composition (DUPONT No. 4817 or equivalent)	Used for repairing antenna wire.

2. Radio System

A: WIRING DIAGRAM

1. RADIO

<Ref. to WI-247, WIRING DIAGRAM, Audio System.>

B: INSPECTION

Symptom	Repair order
No power coming in. (No display and no sound from speakers.)	(1) Check the fuse and power supply for radio. (2) Check the radio ground. (3) Remove the radio for repair.
A specific speaker does not operate.	(1) Check the speaker. (2) Check the output circuit between radio and speaker.
Radio generates noise with engine running.	(1) Check the radio ground. (2) Check the generator. (3) Check the ignition coil. (4) Remove the radio for repair.
AM and FM modes are weak or noisy.	(1) Check the antenna. (2) Check the antenna amplifier. (3) Check the noise suppressor. (4) Check the radio ground. (5) Remove the radio for repair.

3. Front Accessory Power Supply Socket System

A: WIRING DIAGRAM

1. FRONT ACCESSORY POWER SUPPLY SOCKET SYSTEM

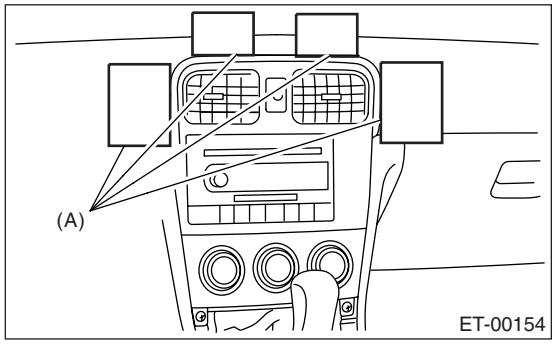
<Ref. to WI-257, WIRING DIAGRAM, Front Accessory Power Supply Socket System.>

4. Radio Body

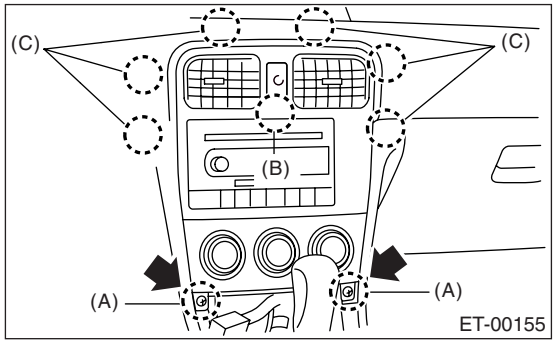
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front cover. <Ref. to EI-39, REMOVAL, Console Box.>
3) Apply the thick protective tape (A) to instrument panel pad to protect the surface of it.

NOTE:
Also apply the protective tape to the deep inside portion between center console panel and instrument panel pad.



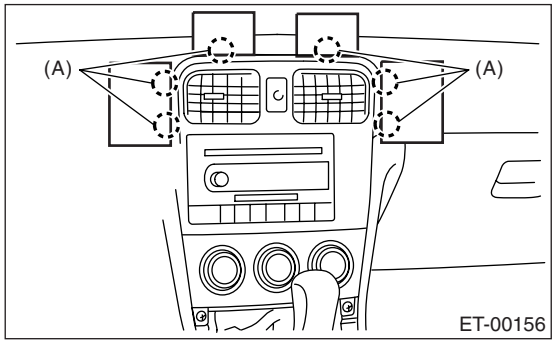
4) Loosen the screws.



(A) Screw
(B) Clip
(C) Claw

5) Insert the flat tip screwdriver to the position (A) and release the claw with pulling out the lower portion of center console panel.

CAUTION:
Do not insert the flat tip screwdriver into any portion except for indicated in the figure. The instrument panel may be damaged.



(A) Inserting position of flat tip screwdriver

6) Disconnect the connector, remove the center console panel.
7) Disconnect the ground cable connector on back radio mounting bracket lower end.
8) Remove the fitting screws, and slightly pull out the radio from center console.
9) Disconnect the harness connectors and antenna feeder cord.

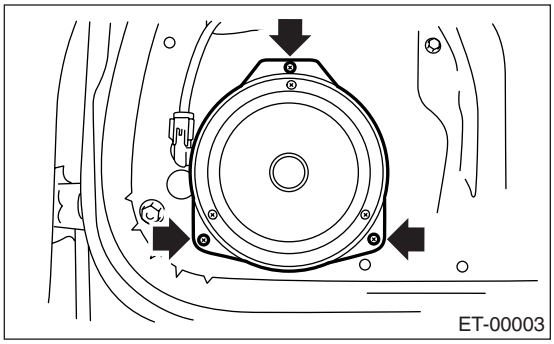
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
3) Remove the front speaker mounting screws.



4) Disconnect the harness connector and remove front speaker.

B: INSTALLATION

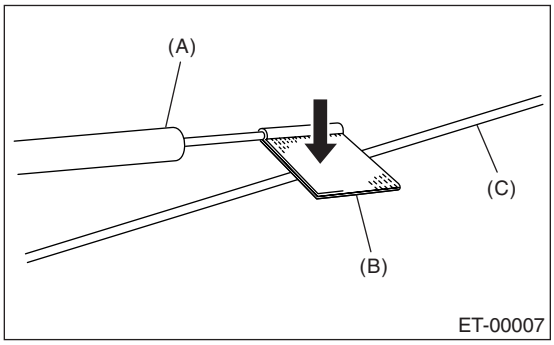
Install in the reverse order of removal.

6. Antenna

A: INSPECTION

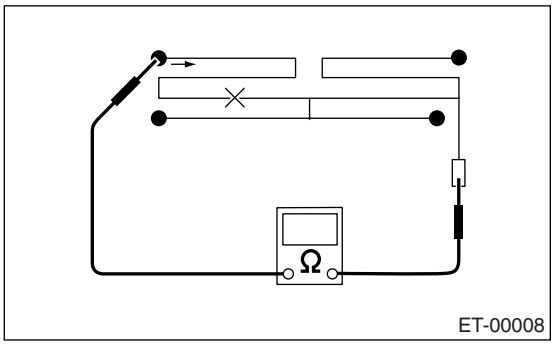
Measure the resistance between antenna terminal and each antenna wire.
If an antenna wire is OK, resistance will be less than 1 Ω. If an antenna wire is broken, the resistance will be more than 1 MΩ.

NOTE:
When checking the continuity, wind a piece of aluminum foil around the tip of tester probe and press aluminum foil against wire with your finger.



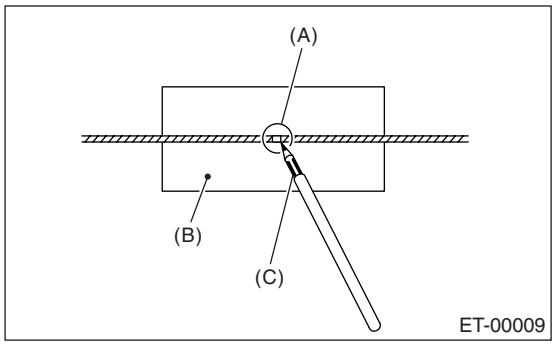
(A) Tester probe
(B) Aluminum foil
(C) Antenna wire

To locate the broken point, move the probe along antenna wire.



B: REPAIR

1) Clean the antenna wire and surrounding area with a cloth dampened by alcohol.
2) Paste a thin masking film on the glass along broken wire.
3) Deposit conductive silver composition (DUPONT No. 4817) on the broken portion with a drawing pen.



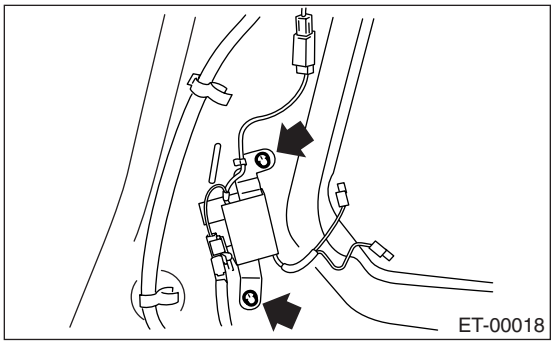
(A) Broken portion
(B) Masking thin film
(C) Conductive silver composition

4) Dry out the deposited portion.
5) After repair has been completed, measure the resistance in repaired wire.

7. Antenna Amplifier

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear quarter upper trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>
3) Disconnect the harness connector and terminal.
4) Remove the mounting screws and detach antenna amplifier.

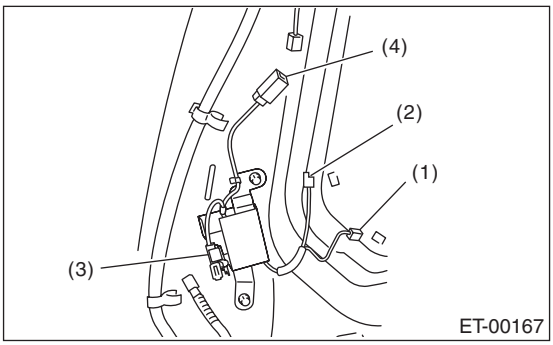


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the antenna amplifier resistance.



1) Check cable swagging portion for insulation failure (short).

Terminal No.	Standard
(1) and Amplifier body	More than 10 kΩ
(2) and Amplifier body	More than 10 kΩ
(3) and Amplifier body	More than 10 kΩ
(4) and Amplifier body	More than 10 kΩ

2) Check antenna amplifier.
Disconnect each connector, and then measure direct-current electricity value at point described above by the tester check.

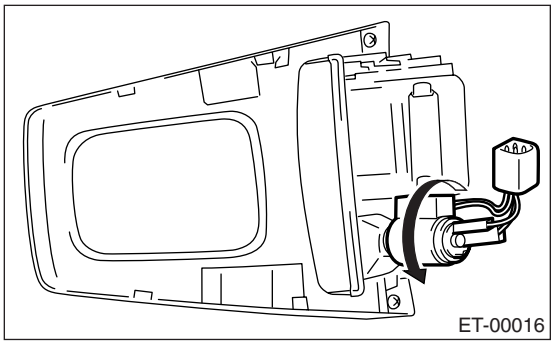
Standard value:
(+B = 13.5 V) → 50±10 mA

8. Front Accessory Power Supply Socket

A: REMOVAL

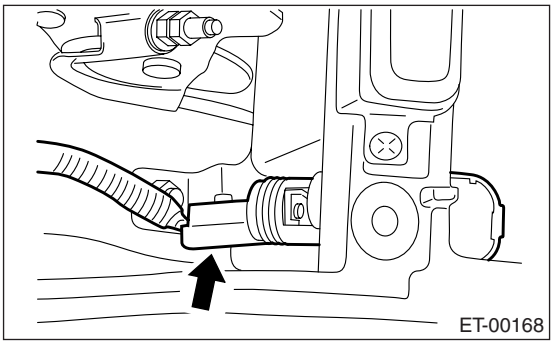
1. FRONT

1) Disconnect the ground cable from battery.
2) Remove the front cover. <Ref. to EI-39, REMOVAL, Console Box.>
3) Disconnect the harness connectors and remove the front accessory power supply socket.



2. REAR

1) Disconnect the ground cable from battery.
2) Remove the console cover. <Ref. to EI-39, REMOVAL, CONSOLE BOX.>
3) Disconnect the harness connector, and remove the accessory power supply socket.



B: INSTALLATION

Install in the reverse order of removal.

Front Accessory Power Supply Socket

COMMUNICATION SYSTEM

COM

Page

1. General Description 2
2. Horn System 3
3. Horn 4
4. Horn Switch 5

1. General Description

A: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When replacing radio, control module and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Horn System

A: WIRING DIAGRAM

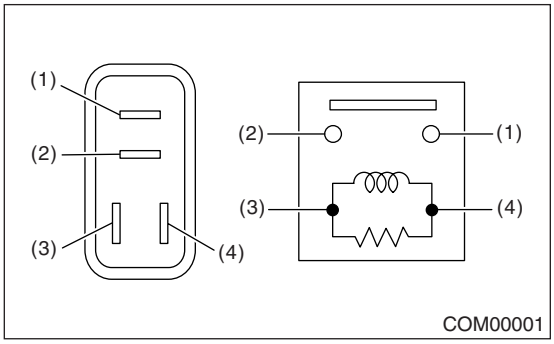
1. HORN

<Ref. to WI-261, WIRING DIAGRAM, Horn System.>

B: INSPECTION

1. HORN RELAY

Measure the horn relay resistance between terminals (indicated in table below) when connecting terminal (4) to battery positive terminal and terminal (3) to battery negative terminal.

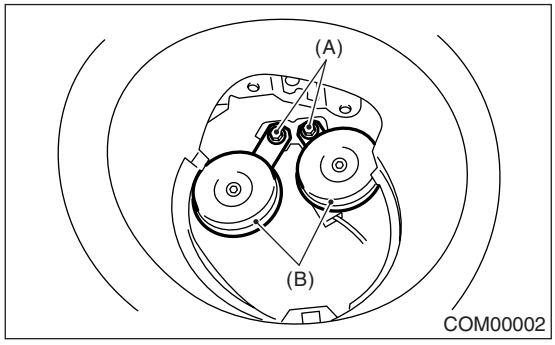


Current	Terminal No.	Standard
Flow	(1) and (2)	Less than 1Ω
No Flow		More than 1MΩ

3. Horn

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front fog light assembly (LH). <Ref. to LI-19, REMOVAL, Front Fog Light Assembly.>
3) Remove the horn bracket mounting bolt (A).
4) Disconnect the harness connector and remove the horn assembly (B).

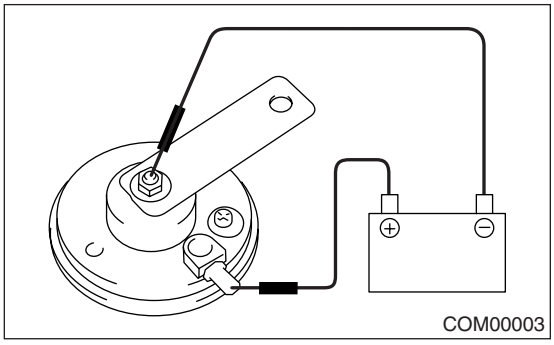


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supplied between horn terminal and case ground, check that the horn sounds properly.



4. Horn Switch

A: REMOVAL

WARNING:
Before servicing, be sure to read the notes in AB section for proper handling of driver's airbag module. <Ref. to AB-3, CAUTION, General Description.>

NOTE:
Horn switch is a unit with the driver's airbag module.

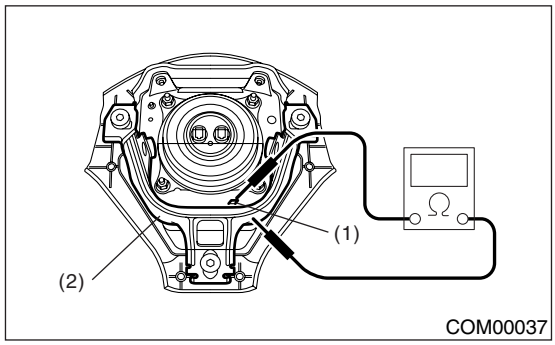
1) Disconnect the ground cable from battery.
2) Remove the driver's airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance between horn switch terminal and airbag module bracket.



(1) Horn switch terminal
(2) Airbag module bracket

Switch position	Terminal No.	Resistance
When airbag module bracket is pushed.	Horn switch terminal and airbag module bracket	Less than 1 Ω
When airbag module bracket is not pushed.		More than 1 MΩ

GLASS/WINDOWS/MIRRORS

GW

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4.	Remote Control Mirror System	11
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7.	Outer Mirror	15
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10.	Front Regulator and Motor Assembly	22
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12.	Rear Regulator and Motor Assembly	25
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17.	Rear Window Defogger	34
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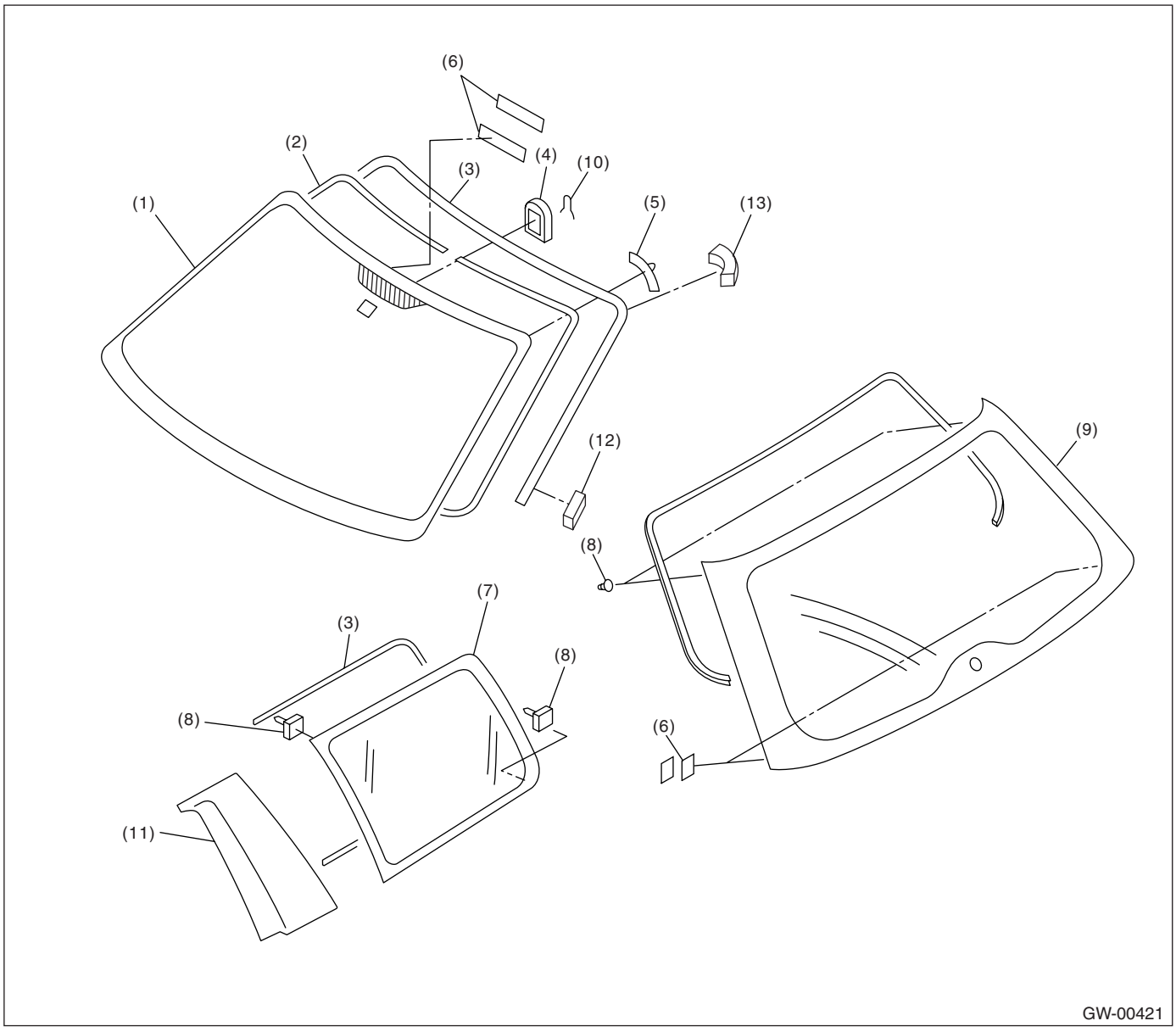
19.	Sun Roof Glass	37

1. General Description

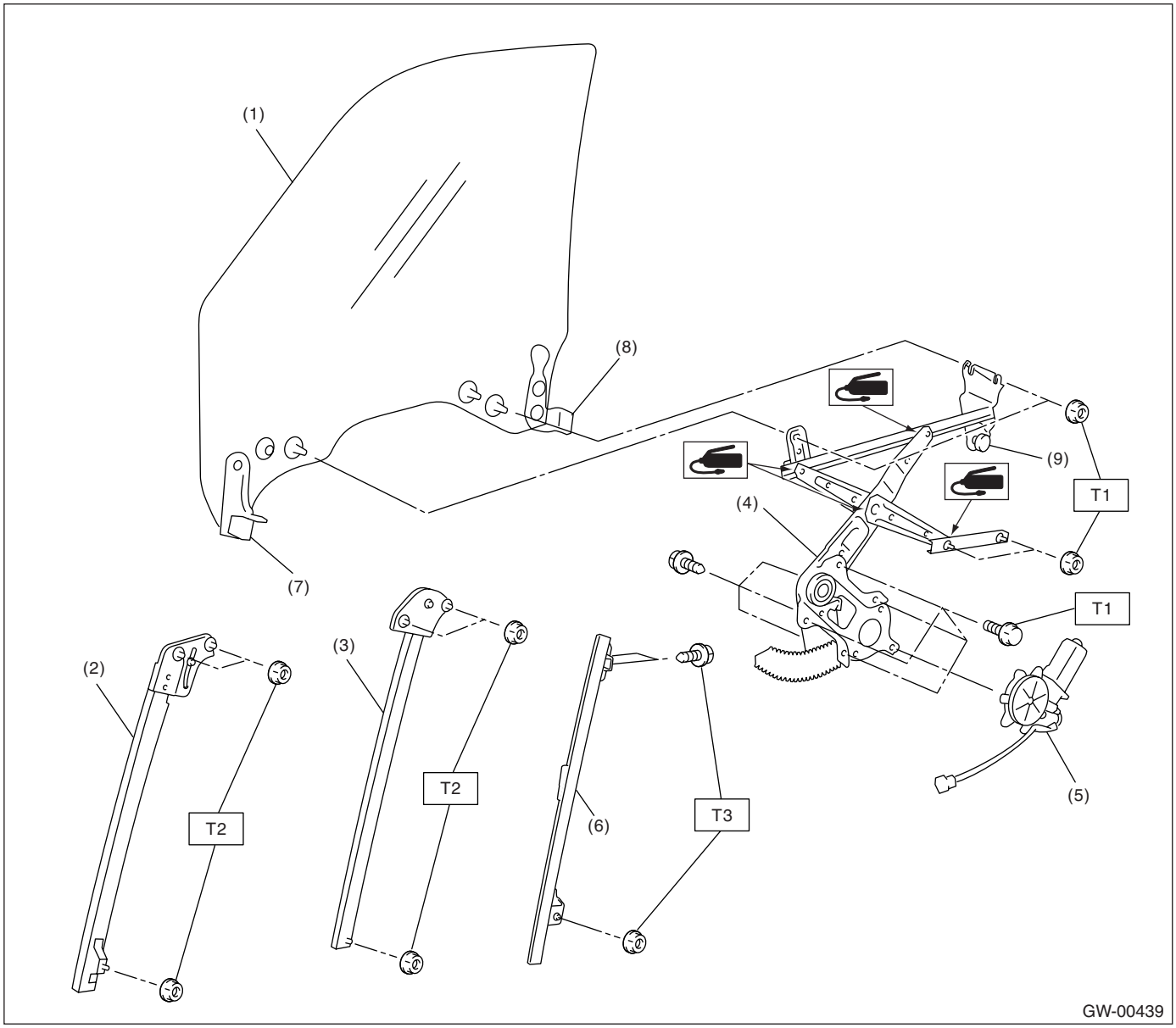
A: COMPONENT

1. FIXED GLASS



(1) Windshield glass
(2) Dam rubber
(3) Molding
(4) Rearview mirror mount
(5) Locate pin
(6) Fastener
(7) Rear quarter glass
(8) Locate pin
(9) Rear gate glass
(10) Spring
(11) Cover C pillar
(12) Seal A
(13) Seal B

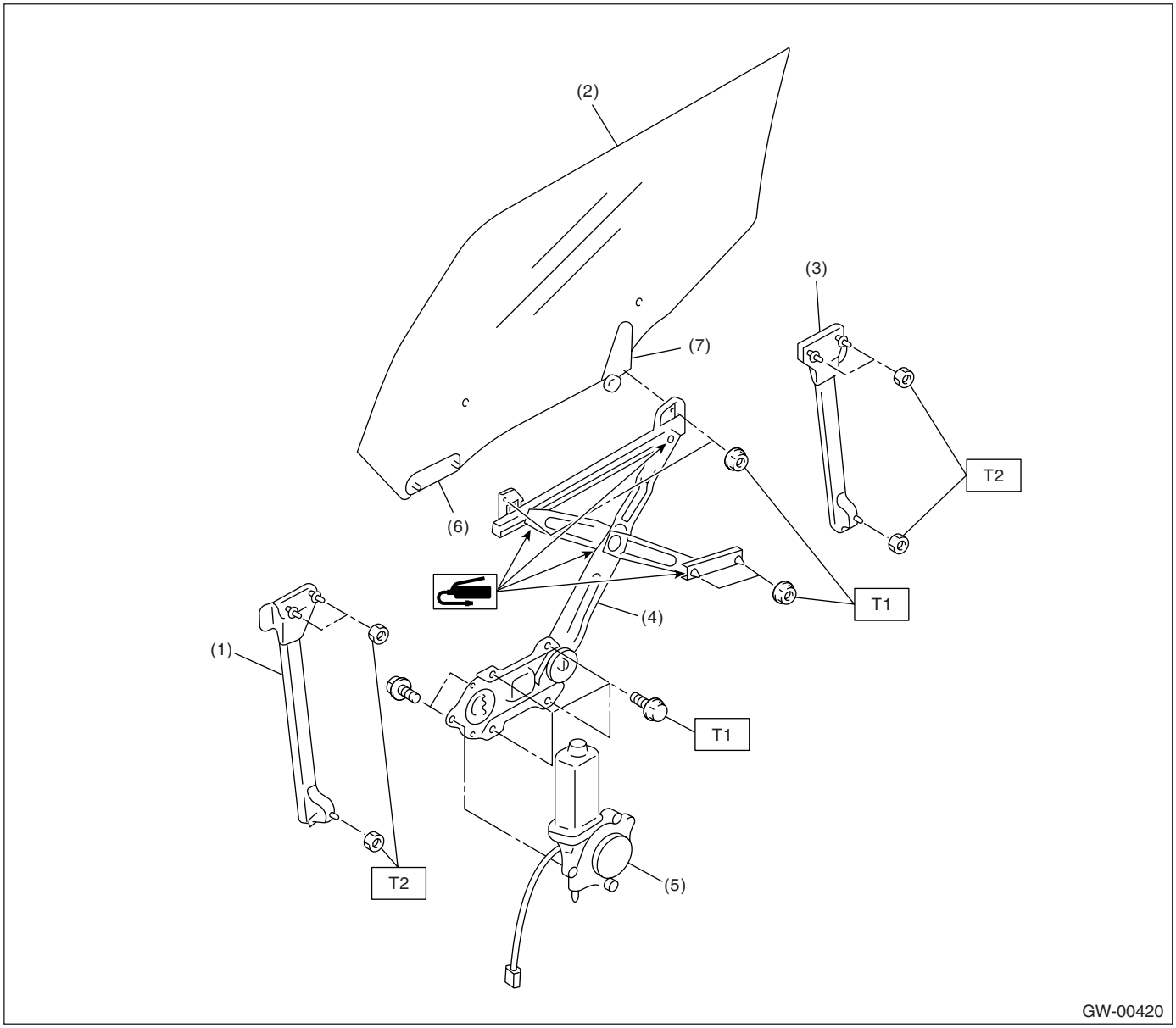
2. FRONT DOOR GLASS



(1) Glass
(2) Door sash (Front)
(3) Door sash (Rear)
(4) Regulator ASSY
(5) Motor ASSY
(6) Guide rail
(7) Holder (Front)
(8) Holder guide
(9) Slider

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.4, 10.3)
T3: 6 (0.6, 4.3)

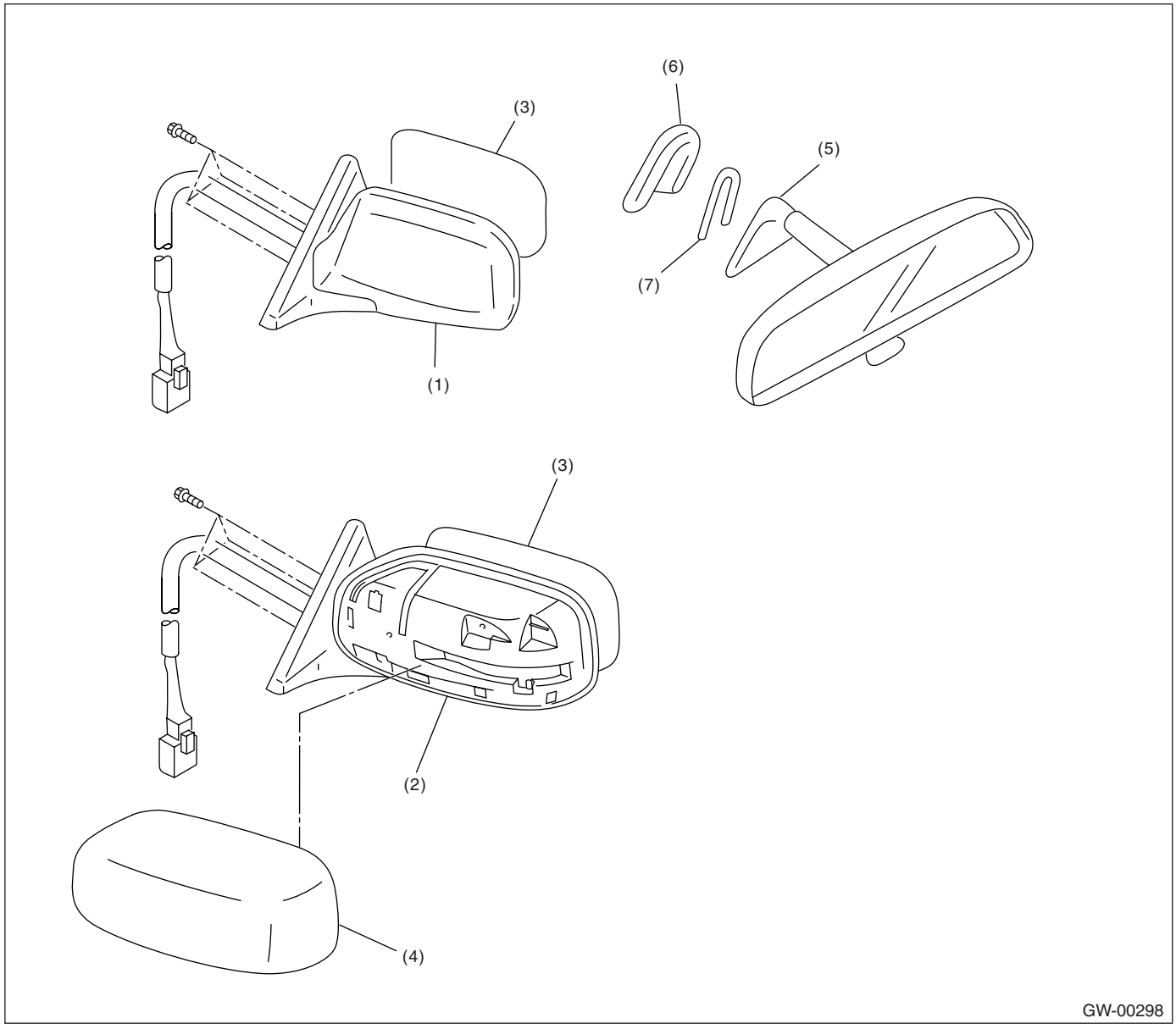
3. REAR DOOR GLASS



(1) Door sash (Front)
(2) Glass
(3) Door sash (Rear)
(4) Regulator ASSY
(5) Motor ASSY
(6) Holder (Front)
(7) Holder (Rear)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.4, 10.3)

4. MIRRORS



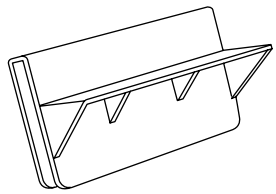
(1) Outer mirror (Large-sized)
(2) Outer mirror (Standard)
(3) Mirror
(4) Scalp cap
(5) Rearview mirror
(6) Mount
(7) Spring

B: CAUTION

- When the electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to glass.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST61299AE000	61299AE000	SPACER	Used for adjusting the upper end position of door glass. (Glass thickness: 5 mm (0.197 in))

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit Tester	Used for checking voltage and continuity.
Piano Wire	Used for window glass removal.
Windshield Knife	Used for window glass removal.

2. Power Window System

A: WIRING DIAGRAM

1. POWER WINDOW

<Ref. to WI-262, WIRING DIAGRAM, Power Window System.>

B: INSPECTION

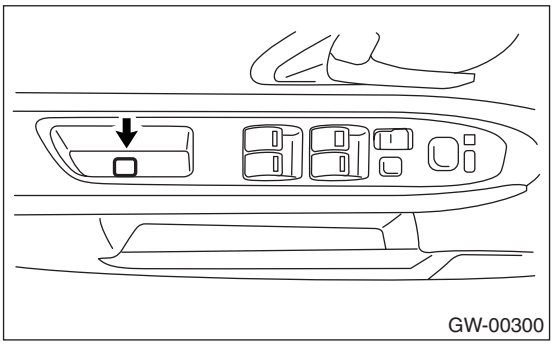
Symptom	Repair order
All power windows does not operate.	(1) Fuse (SBF-6) (F/B No. 18) (2) Power window circuit breaker (3) Power window relay (4) Wire harness
One window does not operate.	(1) Power window main switch (2) Power window sub switch (3) Power window motor (4) Wiring harness
“Window Lock” does not operate.	Power window main switch

3. Power Window Control Switch

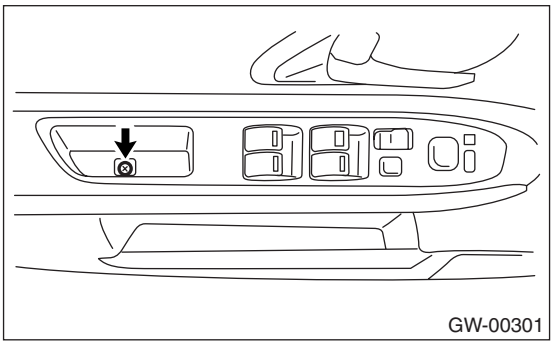
A: REMOVAL

1. MAIN SWITCH

1) Disconnect the ground cable from battery.
2) Using a flat tip screwdriver, remove the screw cover.



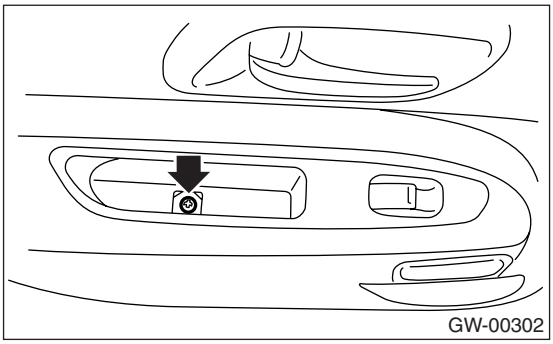
3) Loosen the screw to remove the power window main switch.



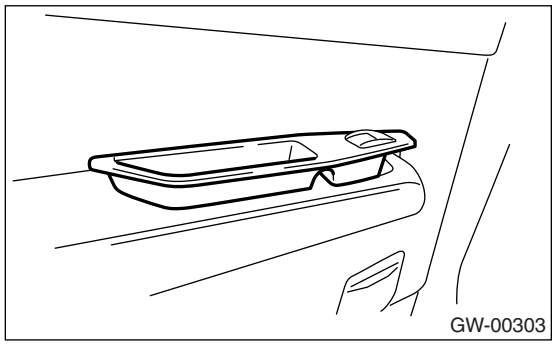
4) Disconnect the connector.

2. SUB-SWITCH

1) Disconnect the ground cable from battery.
2) Remove the screw which secures switch panel.



3) Remove the switch panel.



4) Disconnect the connector.

B: INSTALLATION

1. MAIN SWITCH

Install in the reverse order of removal.

2. SUB-SWITCH

Install in the reverse order of removal.

C: INSPECTION

1. MAIN SWITCH

Measure the switch resistance.

• LHD MODEL

	Switch position	Terminal No.	Standard
Driver's side	AUTO UP	13 and 2, 1 and 5	Less than 1 Ω
	UP	13 and 2, 1 and 5	Less than 1 Ω
	OFF	1 and 2 1 and 5 2 and 5	Less than 1 Ω
	DOWN	13 and 1, 2 and 5	Less than 1 Ω
	AUTO DOWN	13 and 1, 2 and 5	Less than 1 Ω
Front passenger's side	UP	13 and 7, 6 and 5	Less than 1 Ω
	OFF	5 and 6 5 and 7 6 and 7	Less than 1 Ω
	DOWN	13 and 6, 7 and 5	Less than 1 Ω
Rear LH	UP	10 and 13, 11 and 5	Less than 1 Ω
	OFF	5 and 11 5 and 10 11 and 10	Less than 1 Ω
	DOWN	13 and 11, 10 and 5	Less than 1 Ω
Rear RH	UP	13 and 15, 16 and 5	Less than 1 Ω
	OFF	5 and 15 5 and 16 15 and 16	Less than 1 Ω
	DOWN	13 and 16, 15 and 5	Less than 1 Ω

If NG, replace the main switch.

• RHD MODEL

	Switch position	Terminal No.	Standard
Driver's side	AUTO UP	12 and 7, 6 and 1	Less than 1 Ω
	UP	12 and 7, 6 and 1	Less than 1 Ω
	OFF	1 and 6 1 and 7 6 and 7	Less than 1 Ω
	DOWN	12 and 6, 7 and 1	Less than 1 Ω
	AUTO DOWN	12 and 6, 7 and 1	Less than 1 Ω
Front passenger's side	UP	12 and 2, 3 and 1	Less than 1 Ω
	OFF	1 and 2 1 and 3 2 and 3	Less than 1 Ω
	DOWN	12 and 3, 2 and 1	Less than 1 Ω
Rear LH	UP	12 and 10, 9 and 1	Less than 1 Ω
	OFF	1 and 9 1 and 10 9 and 10	Less than 1 Ω
	DOWN	12 and 9, 10 and 1	Less than 1 Ω
Rear RH	UP	12 and 14, 13 and 1	Less than 1 Ω
	OFF	1 and 13 1 and 14 13 and 14	Less than 1 Ω
	DOWN	12 and 13, 14 and 1	Less than 1 Ω

If NG, replace the main switch.

2. SUB-SWITCH

Measure the switch resistance.

	Switch position	Terminal No.	Standard
Front passenger's side and rear	UP	8 and 5, 6 and 7, 1 and 8, 1 and 5	Less than 1 Ω
	OFF	4 and 5, 6 and 7	Less than 1 Ω
	DOWN	8 and 7, 4 and 5, 1 and 8, 1 and 7	Less than 1 Ω

If NG, replace the sub-switch.

4. Remote Control Mirror System

A: WIRING DIAGRAM

1. REMOTE CONTROL MIRROR

<Ref. to WI-272, WIRING DIAGRAM, Remote Control Mirror System.>

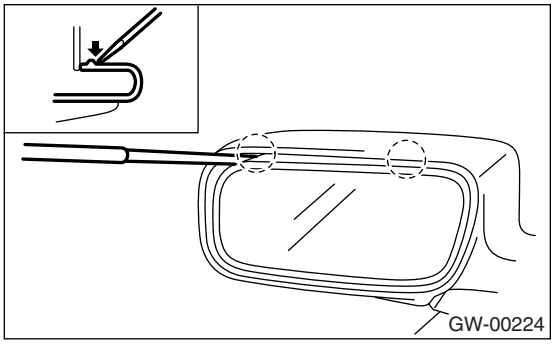
B: INSPECTION

Symptom	Repair order
All function does not operate.	(1) Fuse (F/B No. 4) (F/B No. 13) (F/B No. 17) (F/B No. 18) (2) Mirror switch (3) Wiring harness
One side of the mirror motor does not operate.	(1) Mirror switch (2) Mirror motor (3) Wiring harness
Mirror heater does not operate.	(1) Mirror switch (2) Mirror heater (3) Wiring harness

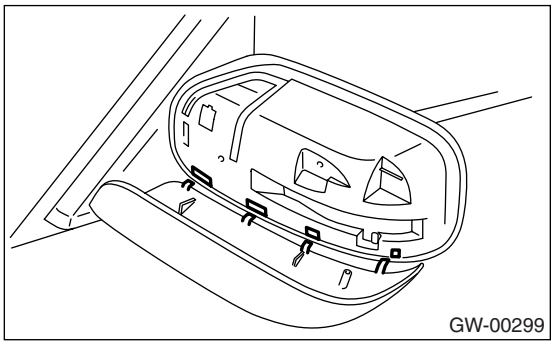
5. Scalp Cap

A: REPLACEMENT

1) Turn the mirror downward.
2) Insert a thin screw driver, push the clip part of scalp cap, and remove the scalp cap.



3) Insert the claw at the bottom of scalp cap into outer mirror.

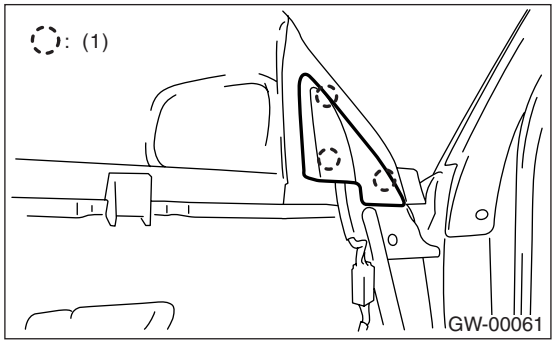


4) Install the scalp cap securely.

6. Outer Mirror Assembly

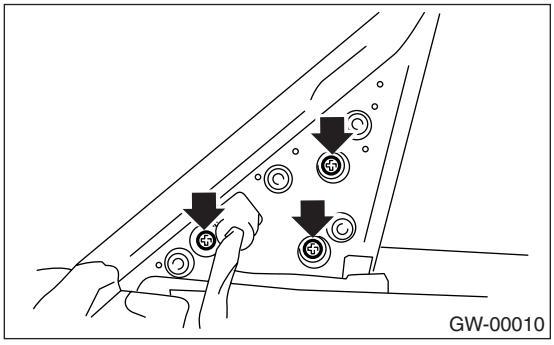
A: REMOVAL

1) Remove the door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
2) Remove the mirror gusset cover.



(1) Hook

3) Disconnect the mirror connector.
4) Remove the grommet, and then loosen the screws to remove outer mirror assembly.

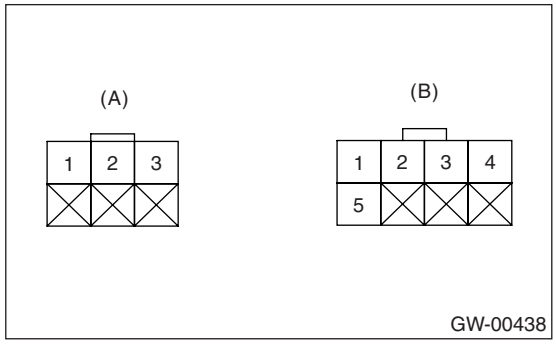


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check to ensure that the outer mirror moves properly when battery voltage is applied to terminals.



(A) Model without mirror heater
(B) Model with mirror heater

- Model without mirror heater

Switch position	Terminal No.
OFF	—
UP	1 (+) and 3 (–)
DOWN	3 (+) and 1 (–)
LEFT	2 (+) and 3 (–)
RIGHT	3 (+) and 2 (–)

If NG, replace the outer mirror assembly.

- Model with mirror heater

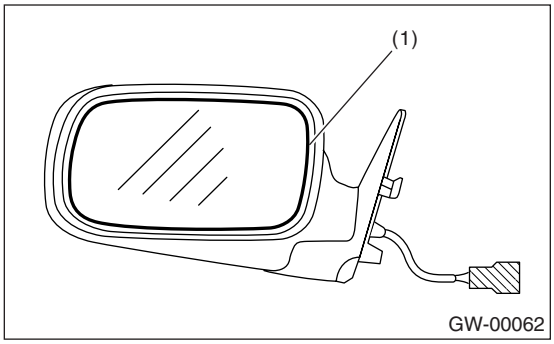
Switch position	Terminal No.
OFF	—
UP	2 (+) and 4 (–)
DOWN	4 (+) and 2 (–)
LEFT	3 (+) and 4 (–)
RIGHT	4 (+) and 3 (–)

If NG, replace the outer mirror assembly.

7. Outer Mirror

A: REPLACEMENT

1) Remove the door mirror assembly. <Ref. to GW-13, REMOVAL, Outer Mirror Assembly.>
2) Warm the area around the mirror holder (1) with a hair drier until the edges of the mirror holder become soft (about 2 or 3 minutes with a 1,000 W drier.)
3) Use a flat tip screwdriver without sharp edges to lift the mirror out of the mirror holder (1). (Also disconnect the mirror heater connector from the back of mirror (Model with mirror heater).)



4) When installing the mirror, warm the area around the mirror holder with a hair drier until the edges of the mirror holder become soft again (about 2 or 3 minutes with a 1,000 W drier.)
5) Connect the mirror heater connector from the back of mirror. (Model with mirror heater)
6) Remove the backing of the new double-stick tape, and push the mirror in to install it.

NOTE:
Unless the mirror holder is warmed sufficiently, the mirror holder edges may be damaged or the mirror cracked.

8. Remote Control Mirror Switch

A: REMOVAL

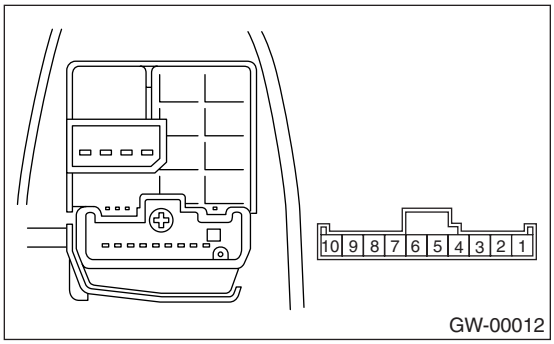
Refer to Power Window Control Switch, because the remote control mirror switch is integrated with power window control switch. <Ref. to GW-8, REMOVAL, Power Window Control Switch.>

B: INSTALLATION

Refer to Power Window Control Switch, because the remote control mirror switch is integrated with power window control switch. <Ref. to GW-8, INSTALLATION, Power Window Control Switch.>

C: INSPECTION

Move the remote control mirror switch to each position and check continuity between terminals.



- Change over switch right position

Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	8 and 3, 6 and 7	Less than 1 Ω
DOWN	8 and 6, 3 and 7	Less than 1 Ω
LEFT	8 and 2, 6 and 7	Less than 1 Ω
RIGHT	8 and 6, 2 and 7	Less than 1 Ω

- Change over switch left position

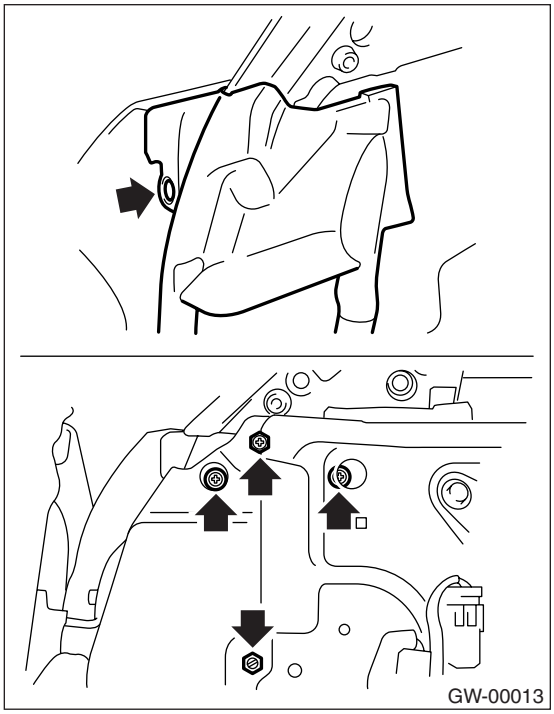
Switch position	Terminal No.	Standard
OFF	—	More than 1 MΩ
UP	8 and 4, 6 and 7	Less than 1 Ω
DOWN	8 and 6, 4 and 7	Less than 1 Ω
LEFT	8 and 5, 6 and 7	Less than 1 Ω
RIGHT	8 and 6, 5 and 7	Less than 1 Ω

If NG, replace the switch.

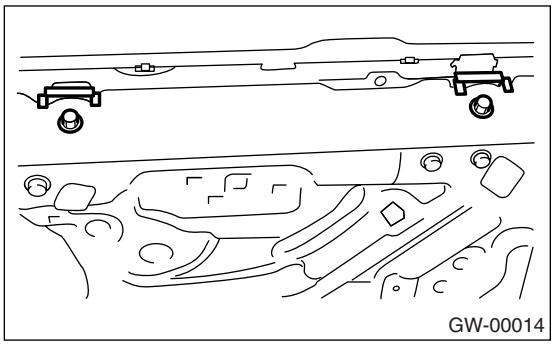
9. Front Door Glass

A: REMOVAL

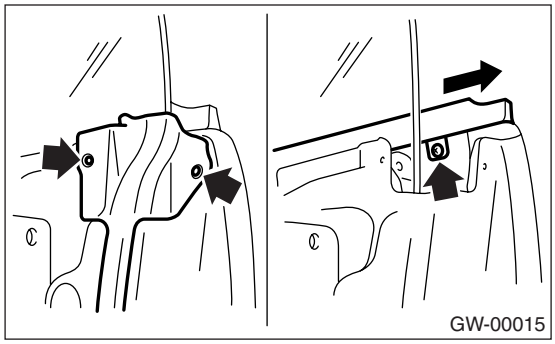
1) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
2) Remove the front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>
3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
4) Remove the outer mirror assembly. <Ref. to GW-13, REMOVAL, Outer Mirror Assembly.>
5) Remove the front end of door weatherstrip and gusset.


GW-00013

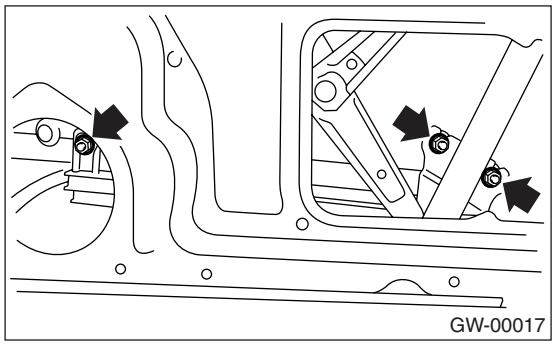
6) Remove the stabilizers.


GW-00014

7) Remove the rear end of door weatherstrip and weatherstrip outer.


GW-00015

8) Operate the power window switch to move the glass to position shown in the figure, and then remove the three nuts from service holes.


GW-00017

9) Take out the door glass.

CAUTION:
• Do not turn the regulator in closing direction after removal of the glass. Otherwise gear may be disengaged.
• Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Make sure that the glass holder (Front), holder guide and slider of regulator is placed securely in sash.

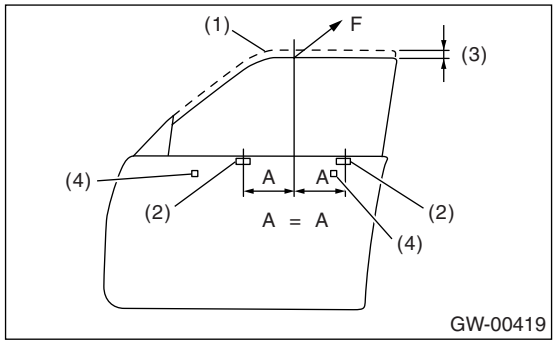
2) Adjust the front door glass. <Ref. to GW-19, ADJUSTMENT, Front Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, GENERAL DESCRIPTION.> <Ref. to GW-2, FIXED GLASS, COMPONENT, GENERAL DESCRIPTION.>

C: ADJUSTMENT

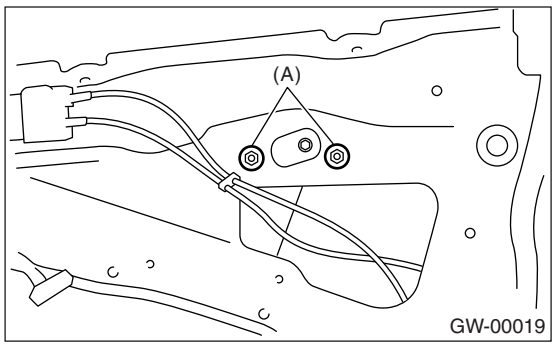
NOTE:
Before adjustment, ensure that all adjusting nuts of stabilizer, upper stopper, and sash are loose and door glass is raised so that it is in contact with weatherstrip.

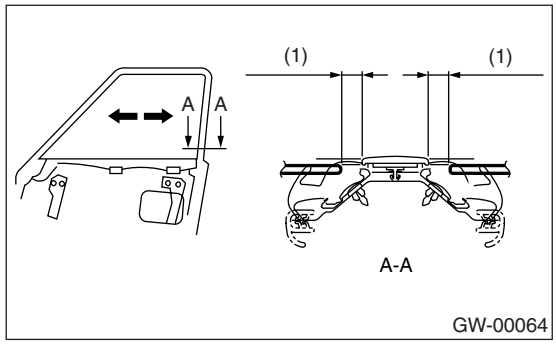
1) Temporarily tighten one adjusting nuts on one side of rear sash at the midpoint of slotted hole in the inner panel.
2) Temporarily tighten the regulator B-channel in a position at the top of slotted hole.
3) Lower the door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of 45.0±5 N (4.6±0.5 kgf, 10.1±1.1 lbf) (F) to upper edge of glass above midpoint of two outer stabilizers, press the inner stabilizer at pressure of 25±5 N (2.5±0.5 kgf, 5.5±1.1 lbf) to the glass, then secure it.



(1) Full close
(2) Stabilizer
(3) 10 — 15 mm (0.39 — 0.59 in)
(4) Upper stopper

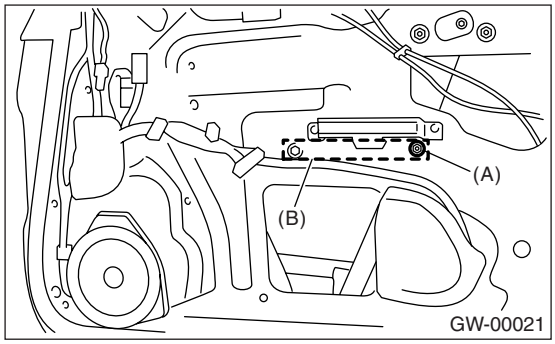
4) For adjustment of clearance between front door glass and center pillar cover, loosen the nuts (A), and move the rear sash back and forward until clearance becomes the value shown. (Clearance between upper side and lower side is within 1.5 mm (0.059 in).)



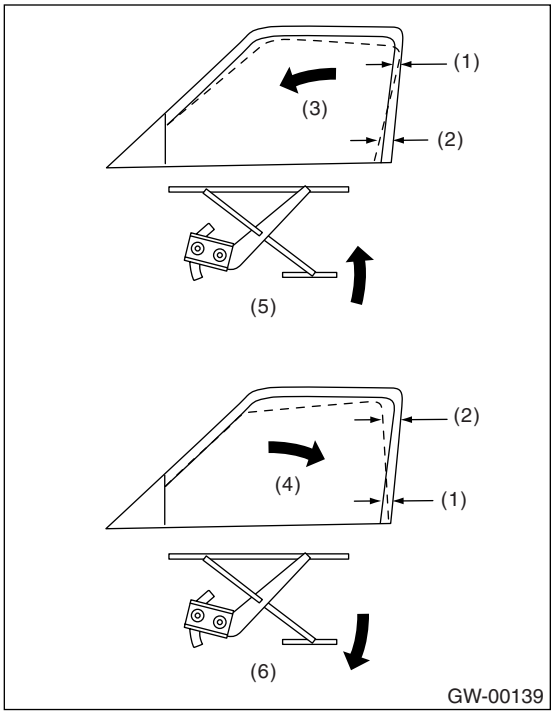


(1) 12±1 mm (0.472±0.039 in)

5) For adjustment of upper and lower ends of center pillar, loosen the adjusting nut (A) of B-channel (B).



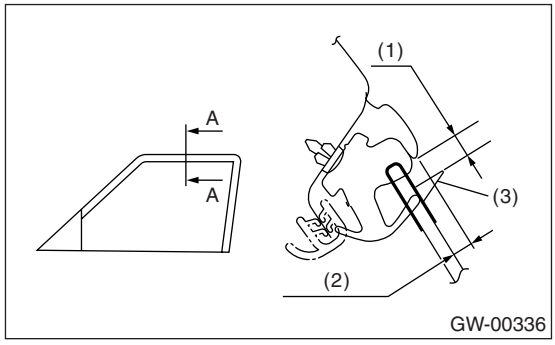
6) Adjust so that the upper and lower ends of center pillar are the same size.



(1) Narrow
(2) Wide
(3) Glass tilts too far rearward
(4) Glass tilts too far forward
(5) Raise B channel
(6) Lower B channel

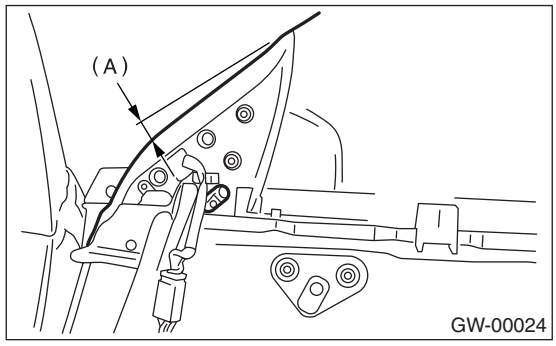
7) For glass stroke adjustment, install the ST to glass, close the door, and raise the glass with regulator until positional relationship between glass and weatherstrip becomes as shown. And secure the glass so that the upper stopper correctly touches the glass holder.

ST 61299AE000 SPACER (Glass thickness: 5 mm (0.197 in) for door glass)



(1) 2.2 — 3.8 mm (0.087 — 0.150 in)
(2) At no replacing the weatherstrip:
8.5 — 10.5 mm (0.335 — 0.413 in)
At replacing the weatherstrip:
7.5 — 9.5 mm (0.295 — 0.374 in)
(3) ST

For preventing wind noise, adjust the glass at the position where tip of gusset is raised up a little.



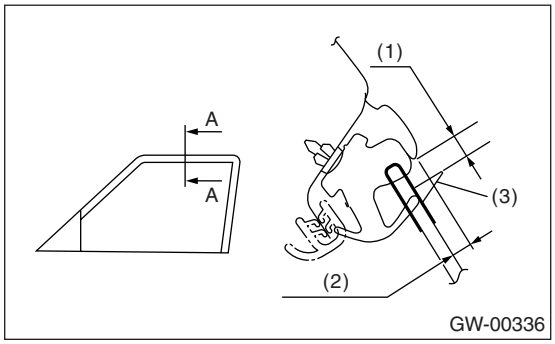
(A) 0 — 1.5 mm (0 — 0.059 in)

8) After stabilizer adjustment, carry out the glass crimp adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A).

NOTE:
If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, secure the other.

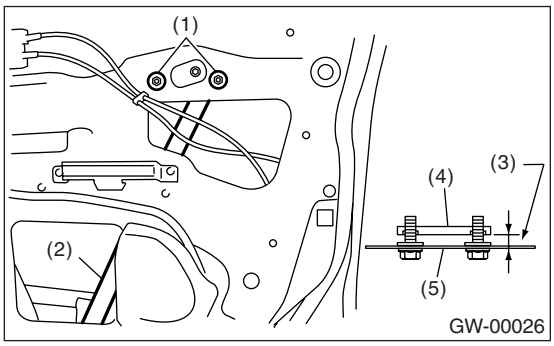
9) Make the same adjustment of two adjusting bolts of rear sash.

ST 61299AE000 SPACER (Glass thickness: 5 mm (0.197 in) for door glass)



(1) 2.2 — 3.8 mm (0.087 — 0.150 in)
(2) At no replacing the weatherstrip:
8.5 — 10.5 mm (0.335 — 0.413 in)
At replacing the weatherstrip:
7.5 — 9.5 mm (0.295 — 0.374 in)
(3) ST

NOTE:
Do not tilt the sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.

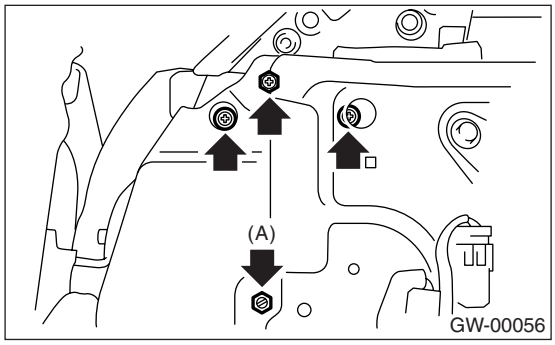


(1) Sash bracket
(2) Rear sash
(3) Adjust a line parallel
(4) Rear sash
(5) Inner panel

10) Make adjustment of front sash in the same manner as that of rear sash.

NOTE:
Although front and rear sashes must, as a rule, be adjusted in the same manner, in some door installation, the adjustment in a different manner may be required. However, adjustment of one sash to the maximum amount and the other to the minimum amount is not permitted. Such adjustment may result in application of excessive load to regulator.

11) After adjustments, tighten the nuts.
12) After adjustment to glass, close the door. If there is a gap between outer lip of gusset and glass surface, adjust the gap with adjusting nut (A) in lower fitting part of the gusset to prevent generation of wind noise.
13) During adjustments, loosen the other three clamping screws.

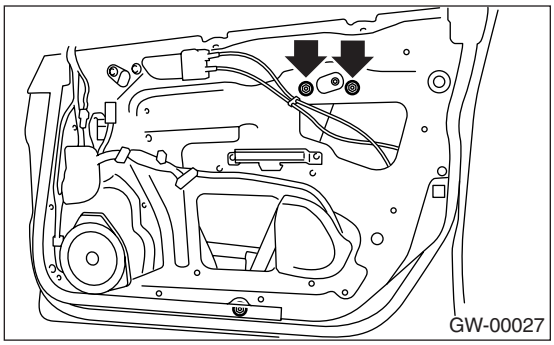


14) After adjustment, tighten the bolts and nuts.

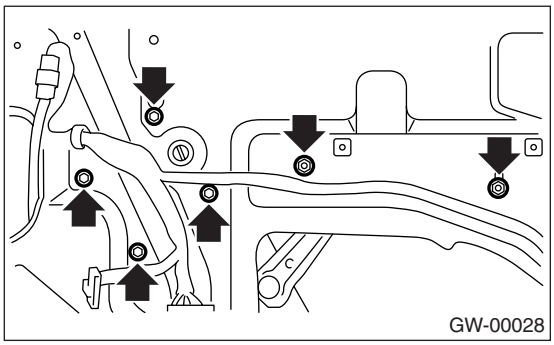
10.Front Regulator and Motor Assembly

A: REMOVAL

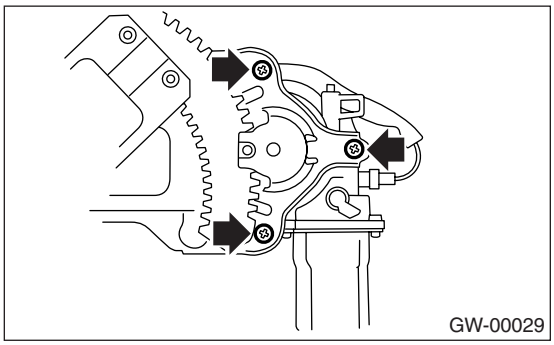
1) Remove the door glass. <Ref. to GW-18, REMOVAL, Front Door Glass.>
2) Loosen the nuts to remove rear sash.



3) Disconnect the motor connector.
4) Loosen the four bolts and two nuts to remove regulator assembly.



5) Loosen the screws to remove motor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the front door glass. <Ref. to GW-19, ADJUSTMENT, Front Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, GENERAL DESCRIPTION.>

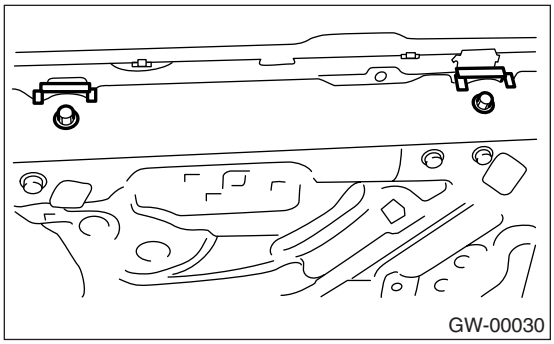
C: INSPECTION

1) Make sure that the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
2) Change polarity of battery connections to terminals to ensure that the motor rotates in reverse direction.

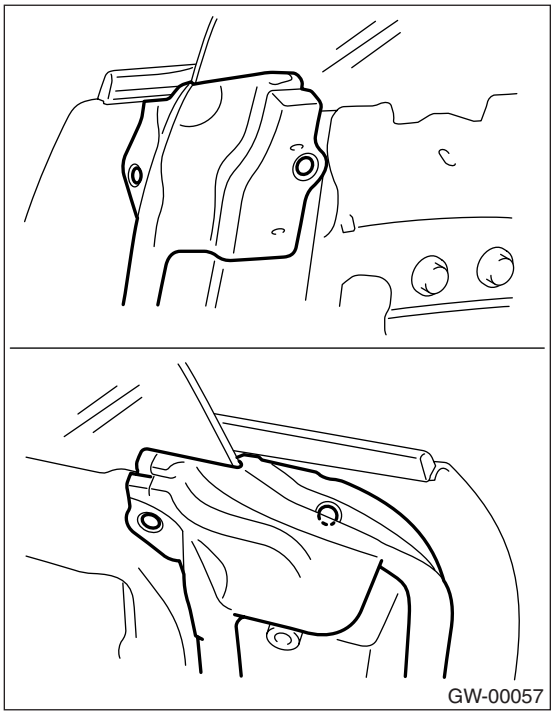
11.Rear Door Glass

A: REMOVAL

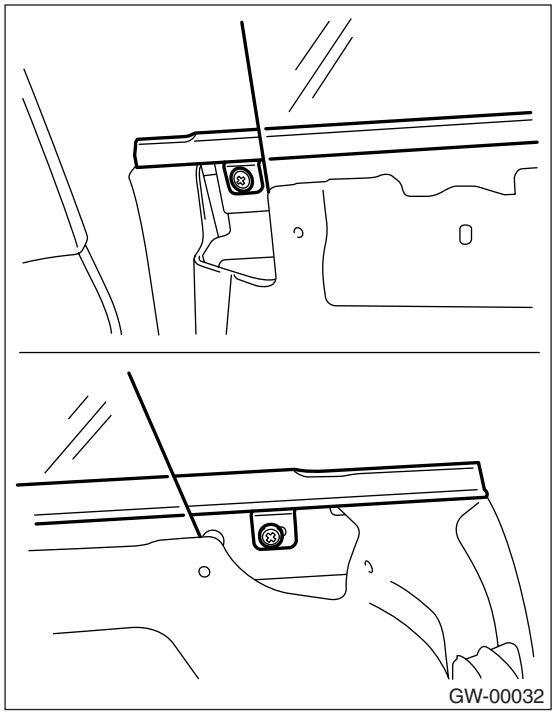
1) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
2) Remove the front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>
3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
4) Remove the stabilizer.


GW-00030

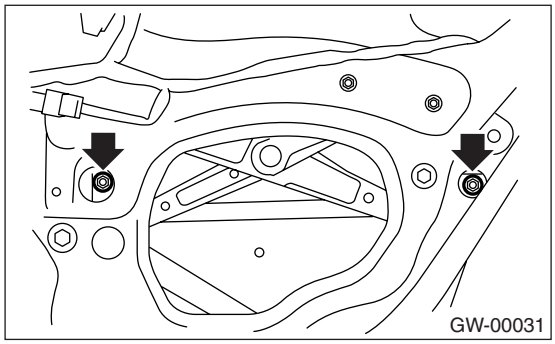
5) Remove the door weatherstrip.


GW-00057

6) Loosen the two screws to remove the weatherstrip outer.


GW-00032

7) Operate the power window switch to remove glass as shown in the figure, and then remove two nuts.


GW-00031

8) Take out the door glass.

CAUTION:
Avoid impact and damage to the glass.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:
Make sure that the glass holder (Front) and holder (Rear) is placed securely in sash.

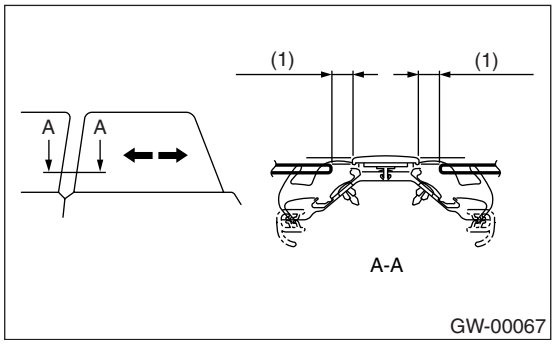
2) Adjust the rear door glass. <Ref. to GW-24, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, GENERAL DESCRIPTION.> <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, GENERAL DESCRIPTION.>

C: ADJUSTMENT

NOTE:
The rear door glass, as a rule, should be adjusted in the same manner as front door glass, although they are different in dimension. Special notes for the rear glass are given below.

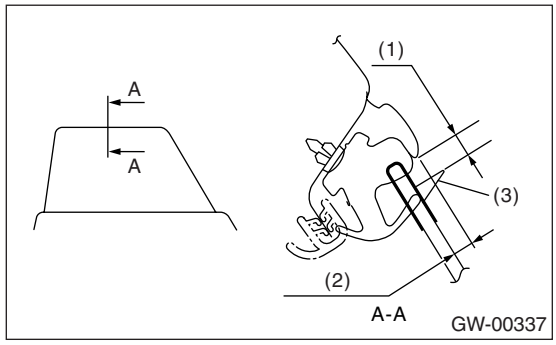
1) Adjust the glass position using the following dimensions as a guide line. (Clearance between upper side and lower side is within 1.5 mm (0.059 in).)



(1) 12±1 mm (0.472±0.039 in)

NOTE:
• If the dimensions are smaller than the given dimensions, glass may get caught in weatherstrip during lifting/lowering operation. In the worst case, it may cause the glass not to be opened fully.
• After adjustment, move the glass up and down to check whether it is caught.

2) Install the ST to glass and adjust the glass adhesion to the value shown.
ST 61299AE000 SPACER (Glass thickness: 5 mm (0.197 in) for door glass)



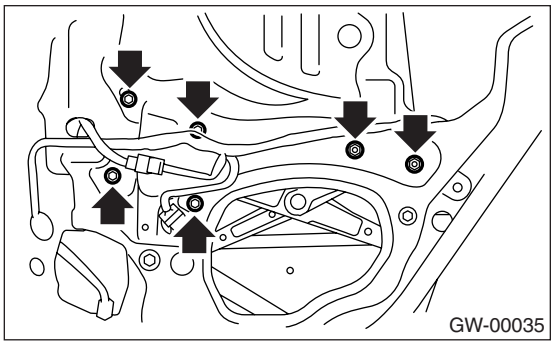
(1) 2.2 — 3.8 mm (0.087 — 0.150 in)
(2) At no replacing the weatherstrip:
8.5 — 10.5 mm (0.335 — 0.413 in)
At replacing the weatherstrip:
7.5 — 9.5 mm (0.295 — 0.374 in)
(3) ST

NOTE:
• If the crimp of rear glass is higher than necessary, glass may get caught in weatherstrip of center pillar corner, resulting in early wear of weatherstrip. Be careful when adjusting.
• After adjustment, move the glass up and down to check whether it is caught.

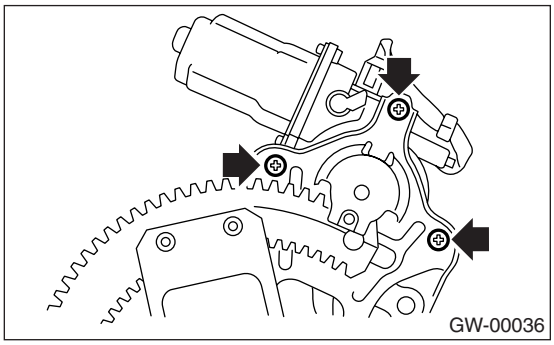
12. Rear Regulator and Motor Assembly

A: REMOVAL

1) Remove the door glass. <Ref. to GW-23, REMOVAL, Rear Door Glass.>
2) Remove the front sash.
3) Disconnect the motor connector.
4) Loosen the four bolts and two nuts to remove regulator assembly.



5) Loosen the screws to remove motor assembly.



B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the rear door glass. <Ref. to GW-24, ADJUSTMENT, Rear Door Glass.>

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, GENERAL DESCRIPTION.>

C: INSPECTION

1) Make sure that the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
2) Change polarity of battery connections to the terminals to ensure that the motor rotates in reverse direction.

13.Windshield Glass

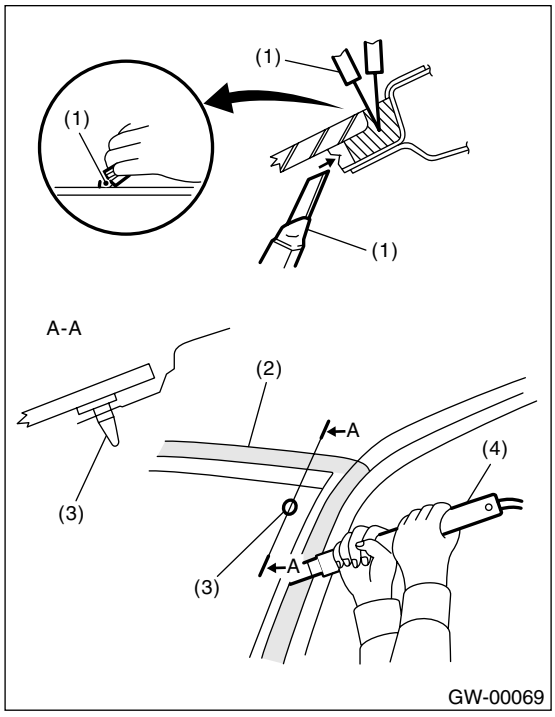
A: REMOVAL

1. USING WINDSHIELD GLASS KNIFE

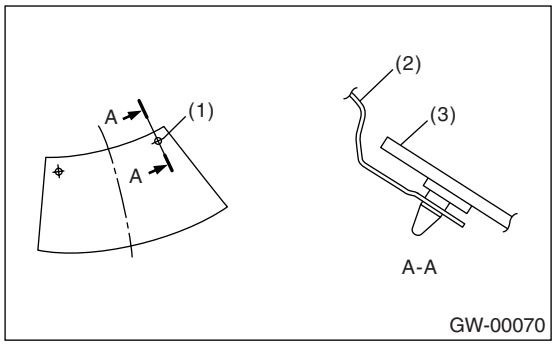
1) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
2) Remove the glass molding.
3) Tape the body side of the circumference of windshield glass for protection.
4) Apply sufficient amount of soapy water to the adhesive layer.
5) Use a putty knife to produce a slit so that the windshield glass knife can be inserted easily.
6) Insert the windshield knife into the adhesive layer.
7) While holding the knife edge and windshield glass edge at a right angle, move the windshield knife in parallel to the windshield glass edge along face and edge of windshield glass to cut the adhesive layer.

NOTE:
• Do not twist the windshield knife.
• Cutting of adhesive layer shall be started with wider gap between windshield glass and body.
• Because the locating pins are bonded to corners of glass, use piano wire to cut the pin.

8) Remove the front pillar trim, and then disconnect the connector of harness. (Model with wiper deicer)



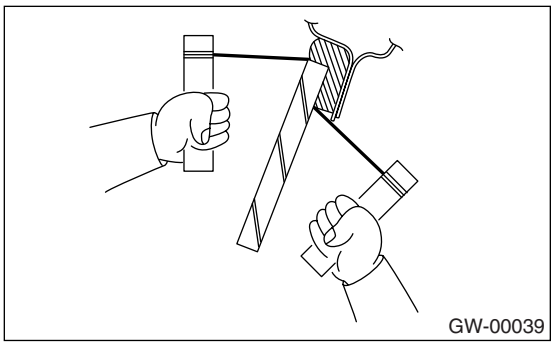
(1) Putty knife
(2) Protective tape
(3) Locating pin
(4) Windshield glass knife



(1) Locating pin
(2) Body panel
(3) Glass

2. USING PIANO WIRE

1) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
2) Remove the upper front molding.
3) Tape the body side of the circumference of windshield glass for protection.
4) Make a hole in the adhesive layer using a drill or knife.
5) Pass the piano wire through the hole, and attach securely both the wire ends to pieces of wood.



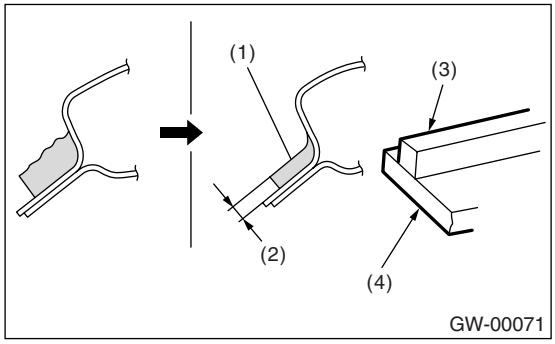
6) Pull the wire ends alternately to cut off the adhesive layer.

CAUTION:
• Do not tightly pull the piano wire against the windshield glass edge.
• Be careful not to damage the interior and exterior parts.
• When removal is made with area close to instrument panel, place a protection plate over it. Pay particular attention to the removal.
• Do not cross piano wires. Otherwise they may be cut.

B: INSTALLATION

1) Clean the external circumference of windshield glass with alcohol or white gasoline.
2) Remove the adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.

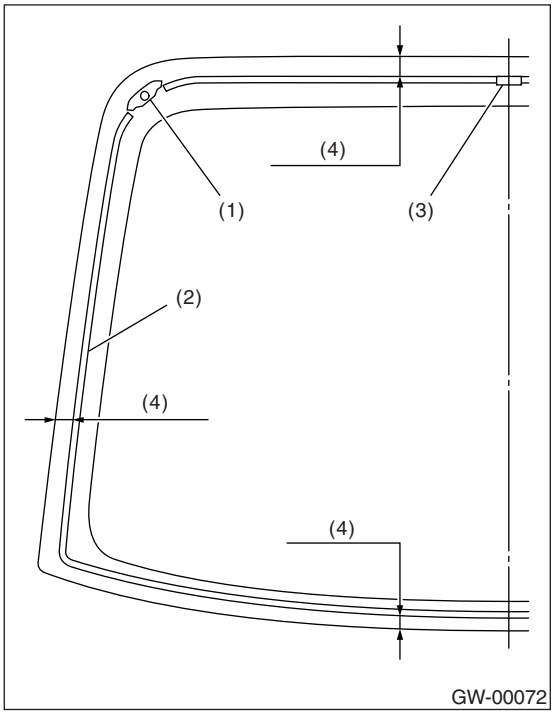
CAUTION:
Be careful not to damage the body and paint surface.



(1) Adhesive
(2) 2 mm (0.08 in)
(3) Dam rubber
(4) Glass

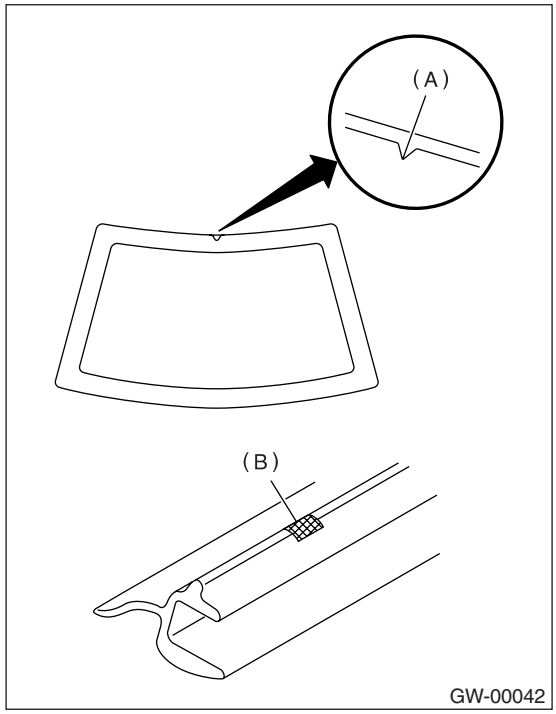
3) Clean the body with alcohol or white gasoline to remove thoroughly chips, dusts and dirts from body face.

4) Apply the dam rubber to back of glass.



(1) Locating pin
(2) Dam rubber
(3) Fastener
(4) 13 mm (0.51 in)

5) Remove the backing of double-faced adhesive tape, and then align the molding mark (B) to notch (A). Attach the molding around the edge of glass, and then press it evenly to fit.



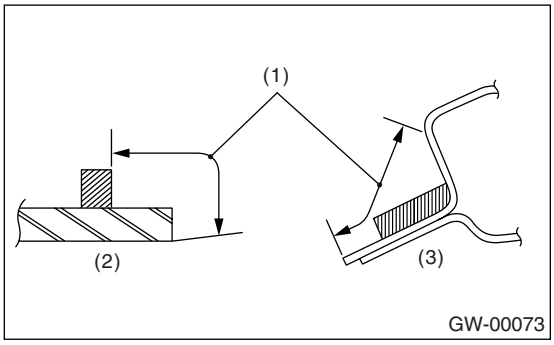
6) Apply primer to the adhesive layer of glass using sponge.

Glass primer:
Dow Automotive
U-401 or U-402

7) Apply primer to the adhesive layer of body.

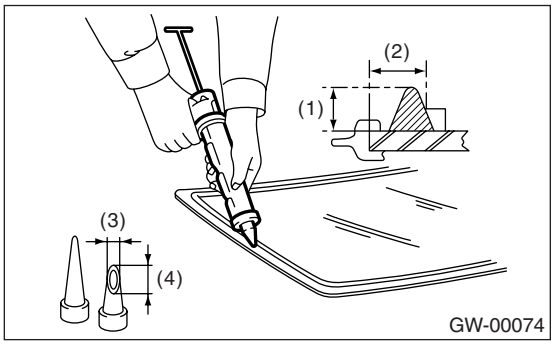
Painted surface primer:
Dow Automotive
U-413

NOTE:
• Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
• Let the primer dry for about ten minutes before installing the glass.
• Do not touch the surface coated with primer.



(1) Application of primer
(2) Glass side
(3) Body side

8) Cut off the cartridge nozzle tip and set it in sealant gun as shown.

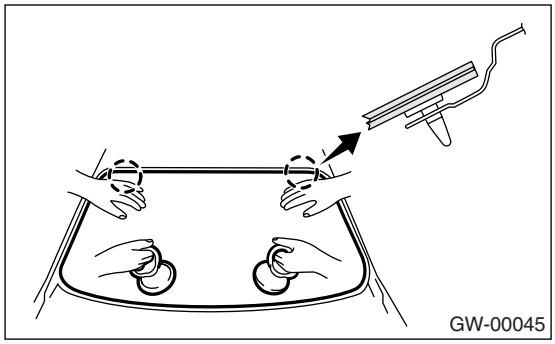


(1) 10 — 13 mm (0.39 — 0.51 in)
(2) 13 mm (0.51 in)
(3) 10 mm (0.39 in)
(4) 15 mm (0.59 in)

9) Apply adhesive to the glass end surface as shown.

Adhesive:
Dow Automotive
ESSEX U-400 HV

10) Fit the locating pins using suction rubber cup to install the windshield glass.



11) Lightly press the windshield glass for tight fit.
12) Make flush the adhesive surface jutted out using spatula.
13) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
• When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
• Move the vehicle slowly.
• For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

14) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

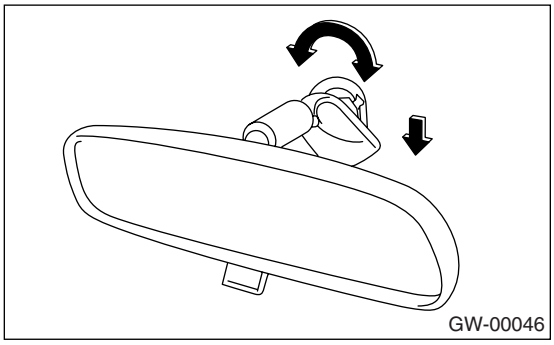
15) Install the cowl panel. <Ref. to EI-32, INSTALLATION, Cowl Panel.>

14.Rearview Mirror

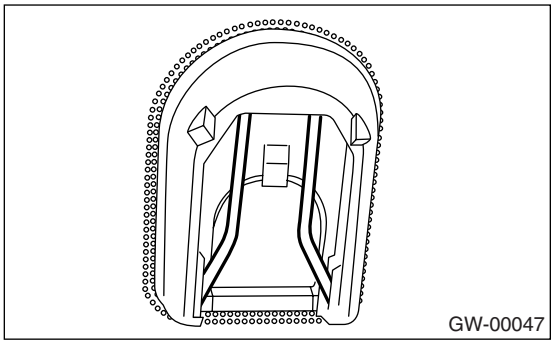
A: REMOVAL

NOTE:
The spring cannot be reused. Prepare a new spring before removal.

1) Turn the mirror base 90 degrees clockwise or counterclockwise to remove it.



2) Remove the spring from mirror base.



CAUTION:
Be careful not to damage the mirror surface.

3) If the mirror base is damaged, remove the mirror base using piano wire or spatula, etc.

CAUTION:
Be careful not to damage the windshield glass.

B: INSTALLATION

1) If removing the mirror base, remove the remaining adhesive thoroughly, and then fit the mirror base to mark on windshield glass to install.

Adhesive:
REPAIR KIT IN MR (Part No. 65029FC000)

2) Verify that the mirror base is adhered securely, and then install the spring.
3) Install in the reverse order of removal.

C: INSPECTION

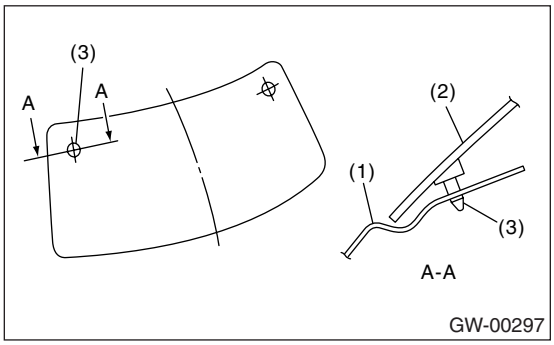
Check for any damage to the mirror.

15.Rear Gate Glass

A: REMOVAL

1) Remove the rear gate garnish. <Ref. to EB-20, REMOVAL, Rear Gate Garnish.>
2) Remove the electrical connector from rear defogger terminal.
3) Remove the glass in same procedure as for windshield glass. <Ref. to GW-26, REMOVAL, Windshield Glass.>

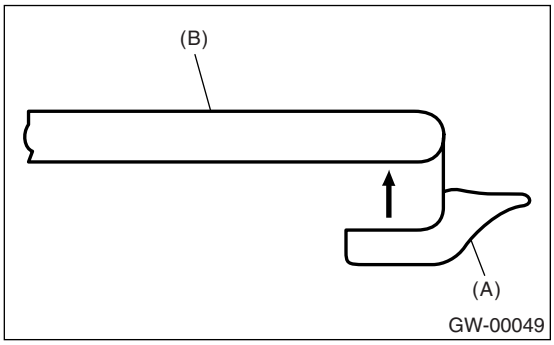
NOTE:
A locating pin is cemented to corners of the glass on the compartment side. Use a piano wire when cutting each pin.



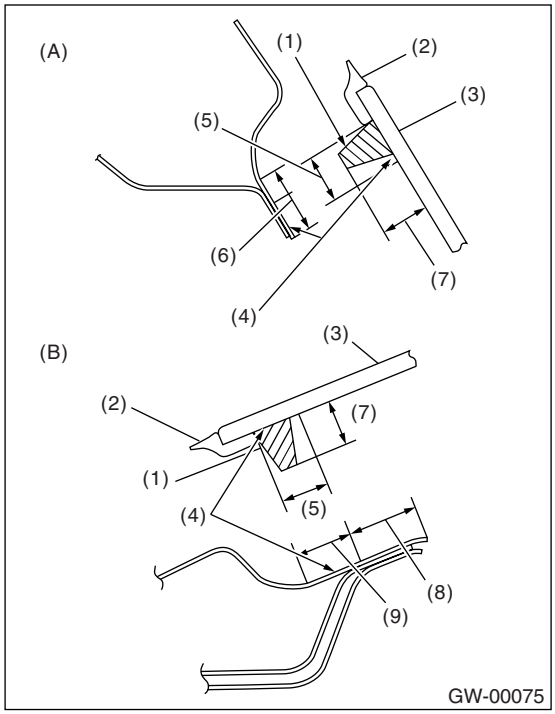
(1) Body panel
(2) Glass
(3) Locating pin

B: INSTALLATION

1) Install a new rubber strip (A) by aligning it with the end of the rear gate glass (B).



2) Install the glass in same procedure as for windshield glass.



(A) Upper side
(B) Left and right side
(1) Adhesive
(2) Strip rubber
(3) Glass
(4) Primer
(5) 12 mm (0.47 in)
(6) 14 mm (0.55 in)
(7) 10 — 13 mm (0.39 — 0.51 in)
(8) 8 mm (0.31 in)
(9) 12 mm (0.47 in)

3) About one hour after installation, conduct a leak test.
4) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
• When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
• Move the vehicle slowly.
• For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.
• When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

5) Connect the rear defogger terminals.
6) Install the rear gate garnish. <Ref. to EB-20, INSTALLATION, Rear Gate Garnish.>

16.Rear Window Defogger System

A: WIRING DIAGRAM

1. REAR WINDOW DEFOGGER

<Ref. to WI-270, WIRING DIAGRAM, Rear Window Defogger System.>

B: INSPECTION

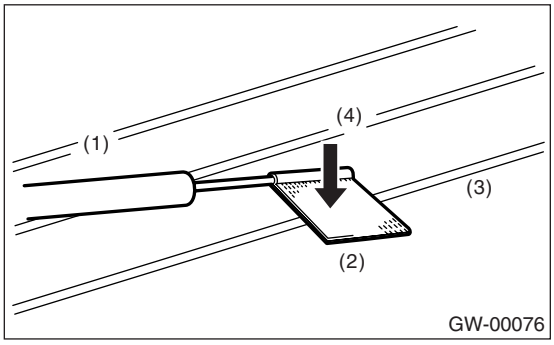
Symptom	Repair order
Rear window defogger does not operate.	(1) Fuse (M/B No. 1) (F/B No. 17) (2) Rear defogger relay (3) Rear defogger timer (4) Defogger switch (5) Rear defogger condenser (6) Defogger wire (7) Wiring harness

17.Rear Window Defogger

A: INSPECTION

CAUTION:
When wiping stain on glass off with cloth, use a dry and soft cloth and move it in the direction of heat wire extension to avoid damage to heat wire.

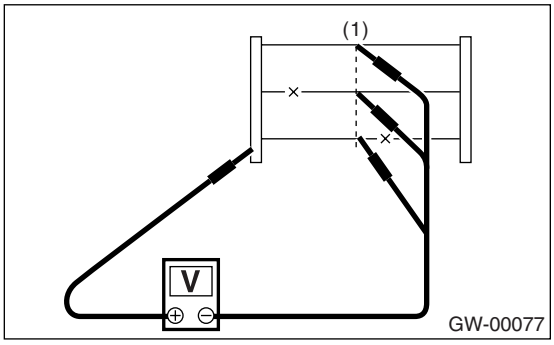
1) Turn the ignition switch to ON.
2) Turn the defogger switch to ON.
3) Wrap the tips of tester pins with aluminum foil to avoid damage to heat wire.



(1) Tester probe
(2) Aluminum foil
(3) Heat wire
(4) PRESS

4) Measure the voltage at heat wire center (1) with DC voltmeter.

Standard voltage:
Approx. 6 V



(1) Center of heat wire

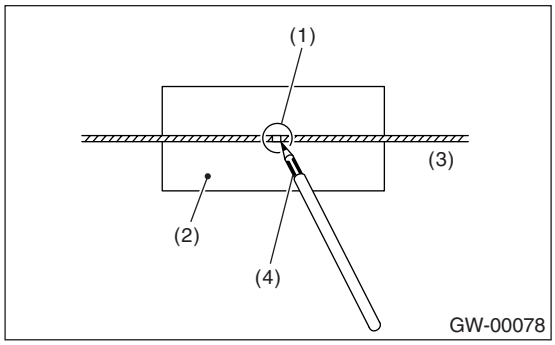
Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

NOTE:
• If the measured value is 12 volts, heat wire is open between wire center and positive (+) end.
• If zero volt, heat wire is open between wire center and ground.

5) Apply positive lead of voltmeter to positive terminal of heat wire, and then move the negative lead along the wire up to negative terminal end. If voltage changes from zero to several volts during movement of lead, heat wire is open at the voltage change point.

B: REPAIR

1) Clean the broken portion with alcohol or white gasoline.
2) Mask both side of heat wire with thin film.
3) Apply conductive silver composition (DUPONT No. 4817) to broken portion.



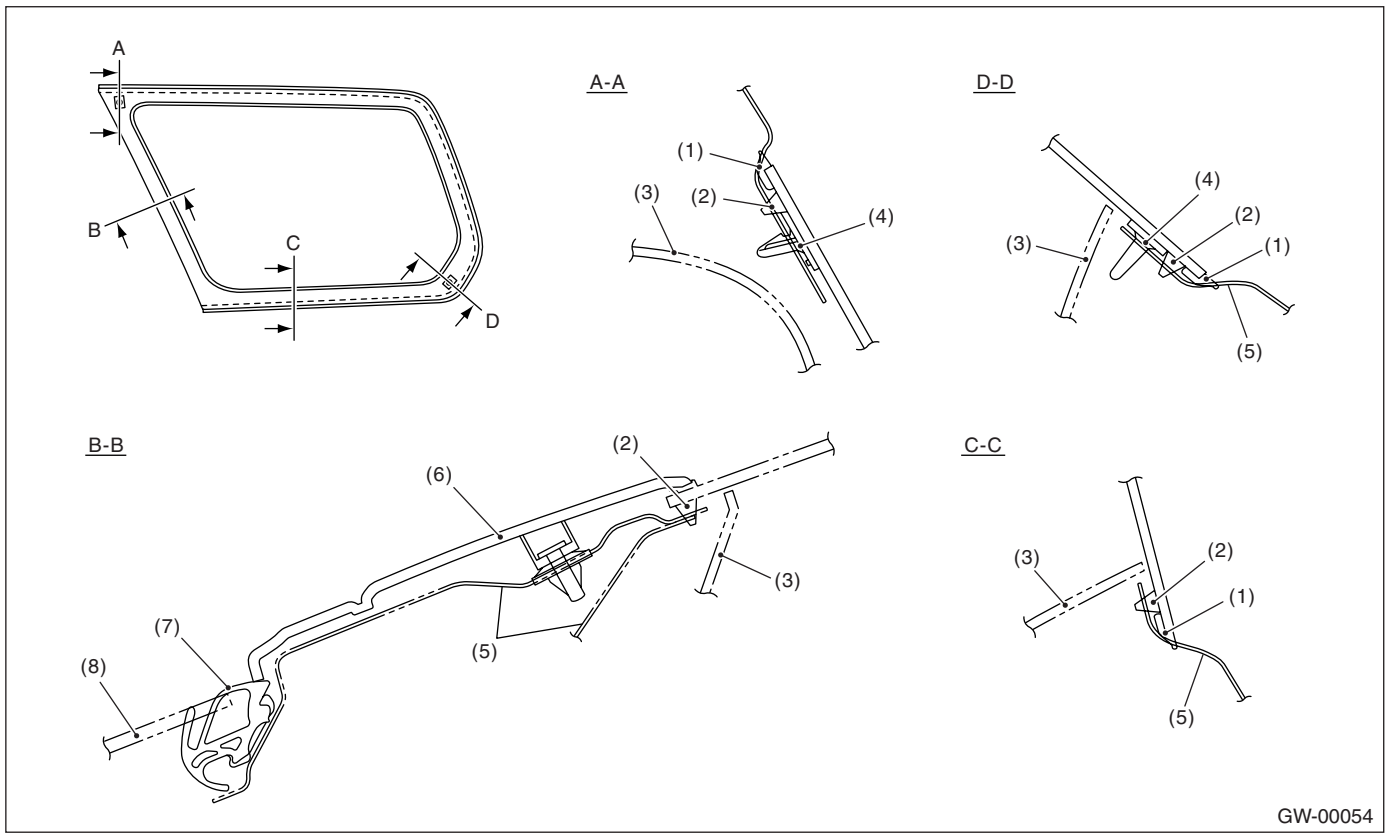
(1) Broken portion
(2) Masking thin film
(3) Broken heat wire
(4) Conductive silver composition (DUPONT No.4817)

4) After repair, check the heat wire.

18.Rear Quarter Glass

A: REMOVAL

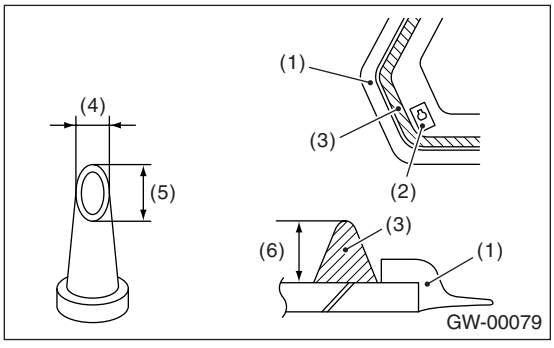
Remove the glass in the same procedure as for windshield glass. <Ref. to GW-26, REMOVAL, Windshield Glass.>



(1) Molding
(2) Adhesive
(3) Interior trim
(4) Locating pin
(5) Body
(6) Cover C pillar
(7) Weatherstrip
(8) Rear door glass

B: INSTALLATION

1) Cut off the nozzle tip as shown in the figure.



(1) Molding
(2) Locating pin
(3) Adhesive
(4) 10 mm (0.39 in)
(5) 15 mm (0.59 in)
(6) 10 — 13 mm (0.39 — 0.51 in)

2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-27, INSTALLATION, Windshield Glass.>
3) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:
• When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
• Move the vehicle slowly.
• For minimum drying time and time the vehicle must be left standing before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

4) After curing of adhesive, pour water on external surface of vehicle to check that there are no water leaks.

NOTE:
When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

19.Sun Roof Glass

A: REMOVAL

<Ref. to SR-5, REMOVAL, Sunroof Lid.>

B: INSTALLATION

<Ref. to SR-5, INSTALLATION, Sunroof Lid.>

C: ADJUSTMENT

<Ref. to SR-5, ADJUSTMENT, Sunroof Lid.>

BODY STRUCTURE

BS

Page

1. General Description 2
2. Datum Points 3
3. Datum Dimensions 11

1. General Description

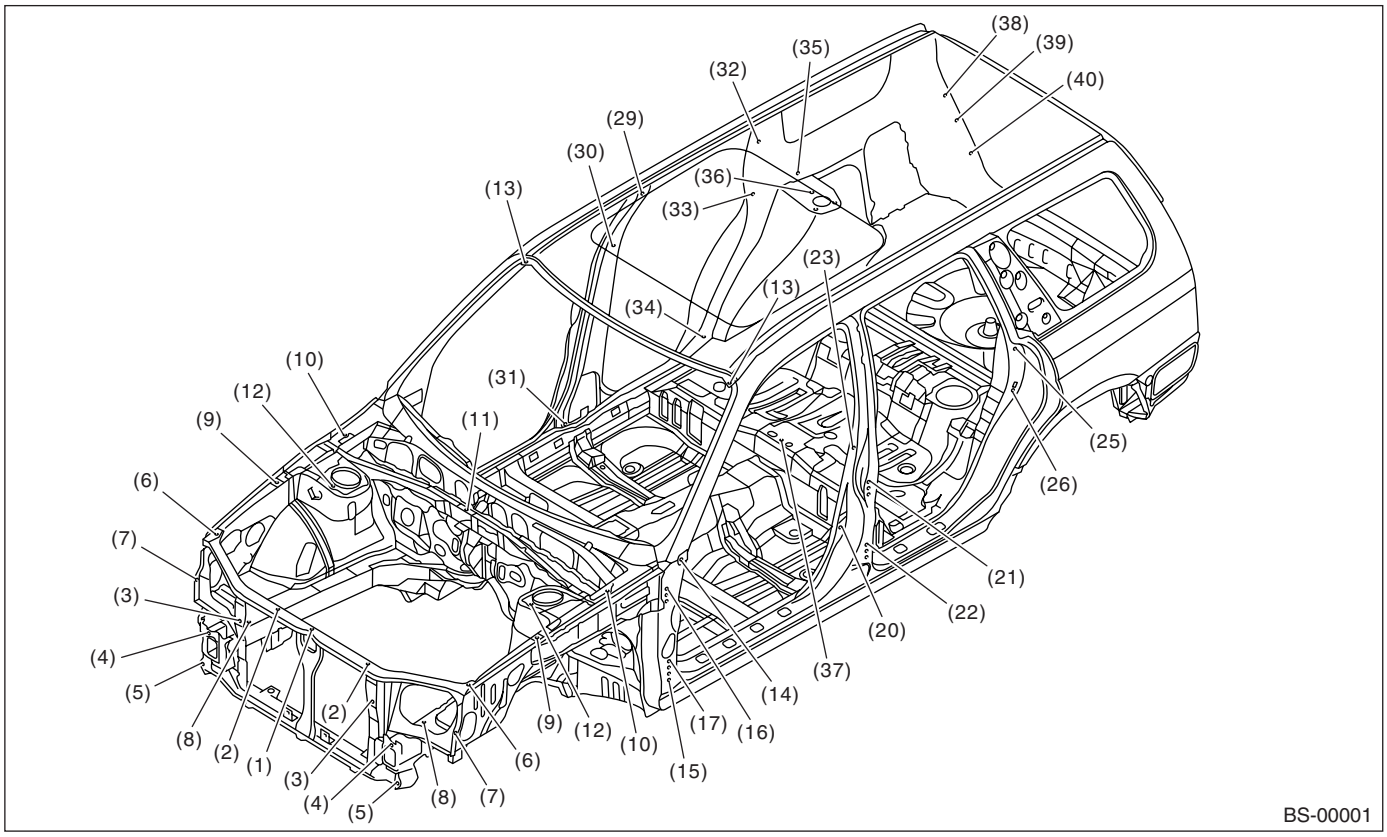
A: PREPARATION TOOL

TOOL NAME	REMARKS
Tram tracking gauge	Used for measuring dimension.
Tape measure	Used for measuring dimension.

2. Datum Points

A: LOCATION

NOTE:
- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.
- Both right and left reference points are symmetrical.



Datum Points

(1) Radiator panel gauge hole 6 mm (0.24 in) dia. (Vehicle center)

(2) Radiator attaching hole 12 mm (0.47 in) dia.

(3) Headlight attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(4) Frame plate gauge hole 8 mm (0.31 in) dia. (Symmetrical)

(5) Bumper beam attaching hole 11 mm (0.43 in) dia. (Symmetrical)

(6) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(7) Fender attaching hole 9 mm (0.35 in) dia. (Symmetrical)

(8) Power steering tank attaching hole RH ATF cooler pipe attaching hole LH 9 mm (0.35 in) dia.

(9) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical)

(10) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(11) Modular bracket gauge hole 8 mm (0.31 in) dia. (Vehicle center)

(12) Front strut attaching hole 9.5 mm (0.37 in) dia. (Symmetrical)

(13) Front glass attaching hole LH 6.5 × 10.5 mm (0.26 × 0.41 in) RH 6.5 × 7 mm (0.26 × 0.28 in)

(14) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical)

(15) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical)

(16) Front door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical)

(17) Front door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical)

(20) Front door switch attaching hole 4.1 mm (0.16 in) dia. (Symmetrical)

(21) Rear door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical)

(22) Rear door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical)

(23) Front weather strip attaching hole 5.2 mm (0.20 in) dia. (Symmetrical)

(25) Rear weather strip attaching hole 5.2 mm (0.20 in) dia. (Symmetrical)

(26) Rear door switch attaching hole 4.1 mm (0.16 in) dia. (Symmetrical)

(29) Trim attaching hole 8.5 mm (0.33 in) dia. (Symmetrical)

(30) Pad attaching hole 5 mm (0.20 in) dia. (Symmetrical)

(31) Harness attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(32) Trim attaching hole 8.5 mm (0.33 in) dia. (Symmetrical)

(33) Trim attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(34) Harness attaching hole 7 × 7 mm (0.28 × 0.28 in) (Symmetrical)

(35) Tonneau cover bracket attaching hole 5.5 mm (0.22 in) dia. (Symmetrical)

(36) Rear strut attaching hole 10 mm (0.39 in) (Symmetrical)

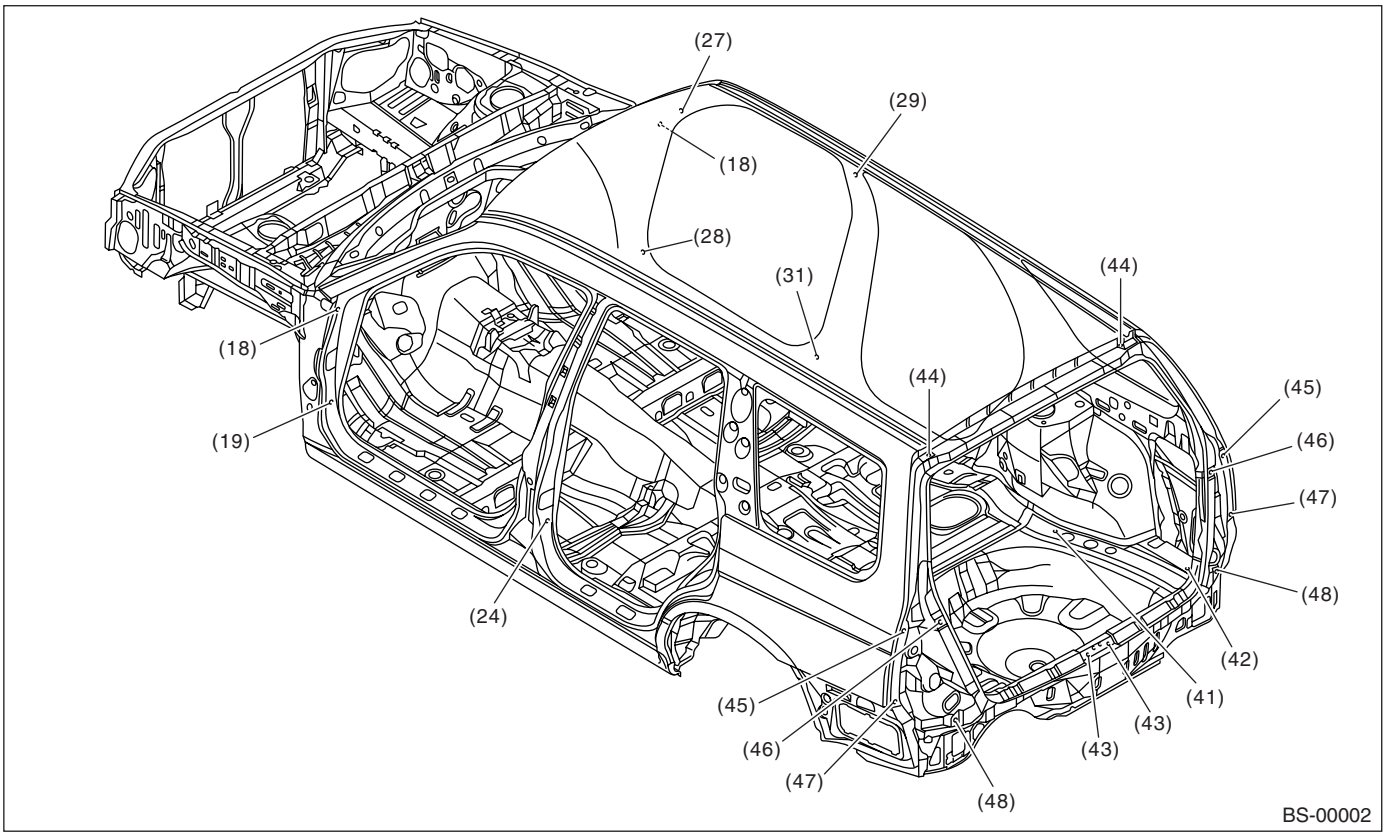
(37) Floor mat attaching hole 8 mm (0.31 in) dia.

(38) Trim attaching hole 9 × 9 mm (0.35 × 0.35 in) (Symmetrical)

(39) Trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)

(40) Trim attaching hole 8 mm (0.31 in) dia. (Symmetrical)

Datum Points



(18) Front weather strip attaching hole 5.2 mm (0.20 in) dia. (Symmetrical)

(19) Trim attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(24) Trim attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(27) Front pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical)

(28) Insulator attaching hole 8 mm (0.31 in) dia. (Symmetrical)

(29) Trim attaching hole 8.5 mm (0.33 in) dia. (Symmetrical)

(31) Harness attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(41) Harness attaching hole 7.5 mm (0.30 in) dia.

(42) Bumper beam attaching hole 12 mm (0.47 in) dia.

(43) Striker gauge hole 5 mm (0.20 in) dia. (Symmetrical)

(44) Harness attaching hole 7 × 7 mm (0.28 × 0.28 in) dia. (Symmetrical)

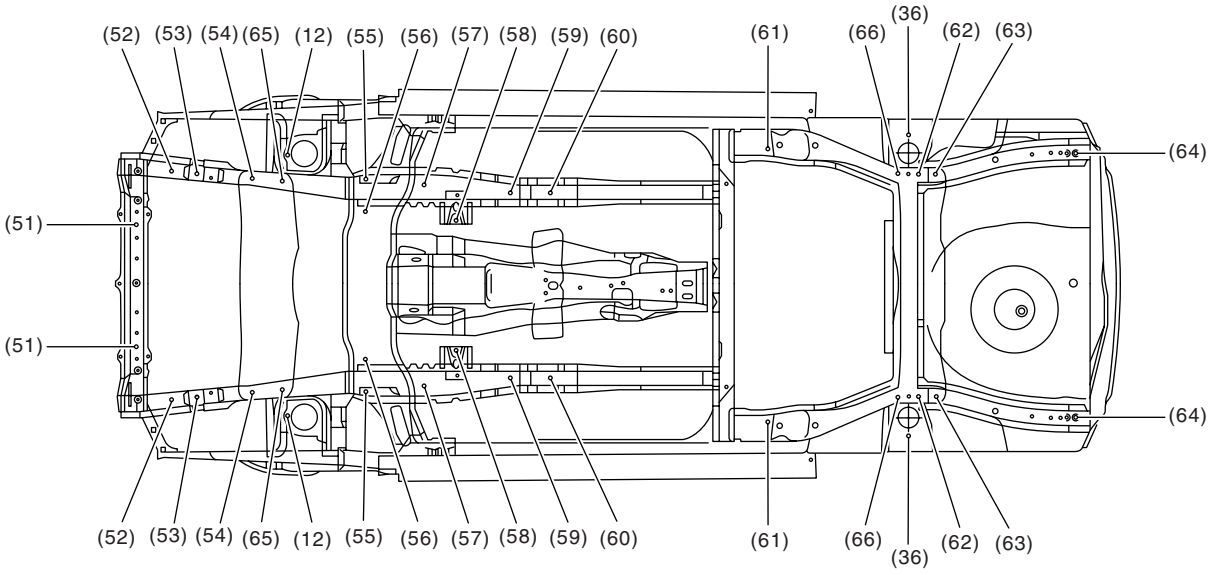
(45) Combination light attaching hole 9.5 mm (0.37 in) dia. (Symmetrical)

(46) Combination light attaching hole 7 mm (0.28 in) dia. (Symmetrical)

(47) Combination light attaching hole 8 × 15 mm (0.31 × 0.59 in) (Symmetrical)

(48) Bumper bracket attaching hole 7 mm (0.28 in) dia. (Symmetrical)

Datum Points



BS-00003

(12) Front strut attaching hole 9.5 mm (0.37 in) dia. (Symmetrical)

(36) Rear strut attaching hole 10 mm (0.39 in) dia. (Symmetrical)

(51) Radiator lower frame gauge hole 12 mm (0.47 in) dia. (Symmetrical)

(52) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical)

(53) Sub-frame attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(54) Front cross member attaching hole 12.4 mm (0.49 in) dia. (Symmetrical)

(55) Transverse link attaching hole 17 mm (0.69 in) dia. (Symmetrical)

(56) Transverse link attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(57) Sub-frame attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(58) Transmission cross member attaching hole 14 mm (0.55 in) dia. (Symmetrical)

(59) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical)

(60) Rear side frame gauge hole 18 mm (0.71 in) dia. (Symmetrical)

(61) Rear differential attaching hole 16 mm (0.63 in) dia. (Symmetrical)

(62) Rear cross member gauge hole 16 mm (0.63 in) dia. (Symmetrical)

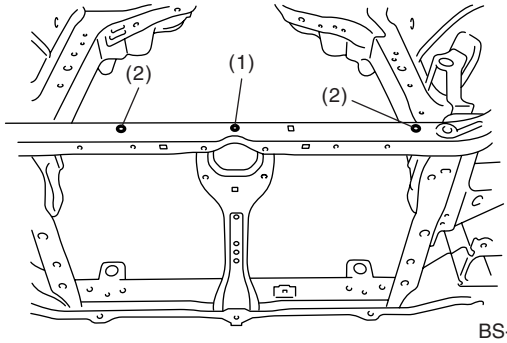
(63) Rear cross member attaching hole 12 mm (0.47 in) dia. (Symmetrical)

(64) Rear bumper beam attaching hole RH 15 mm (0.57 in) dia. LH 19 × 15 mm (0.75 × 0.59 in)

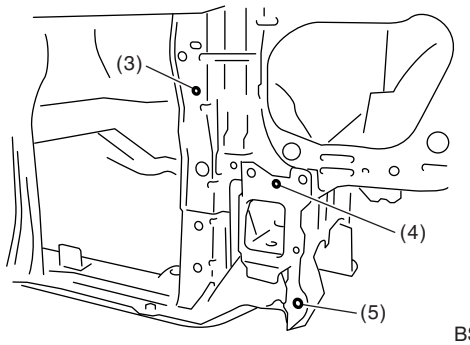
(65) Front cross member attaching hole 12.4 mm (0.49 in) dia. (Symmetrical)

(66) Rear cross member attaching hole 16 mm (0.63 in) dia. (Symmetrical)

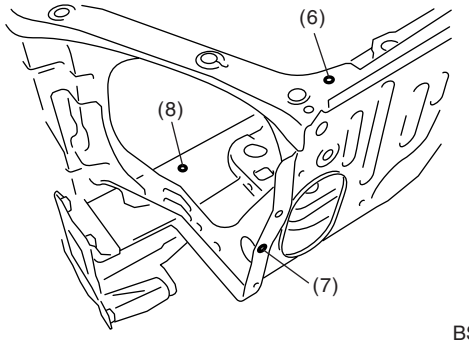
Datum Points



BS-00004



BS-00005



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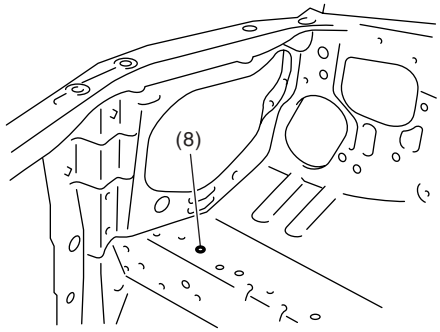

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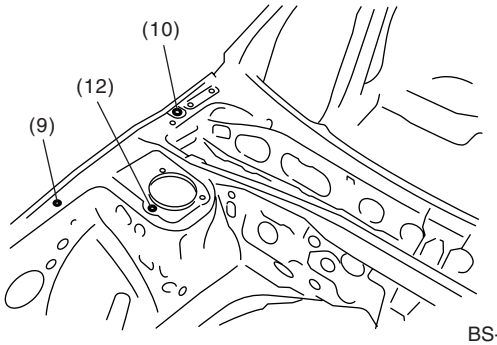
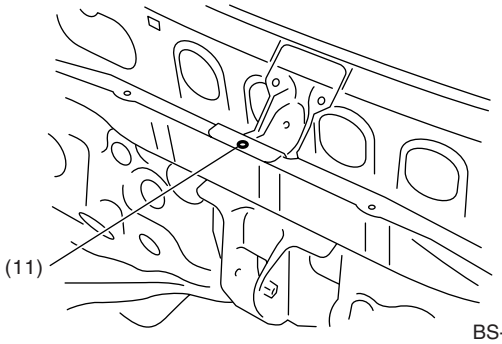


BS-00008



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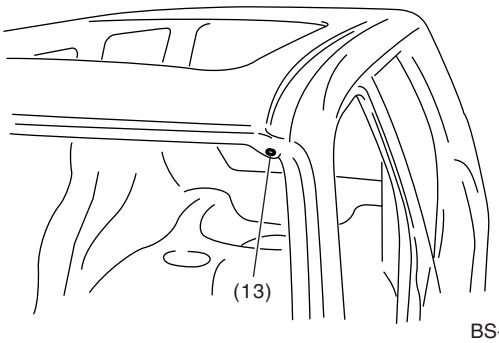
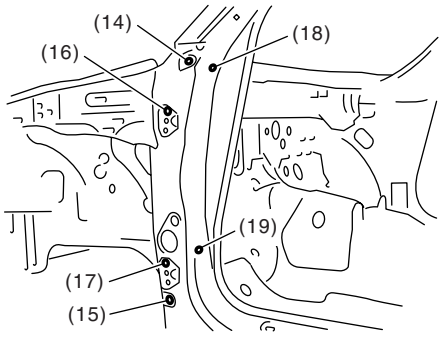
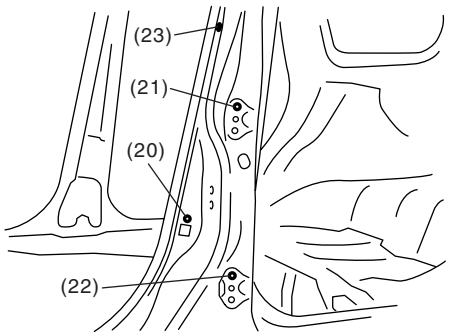


BS-00010



BS-00011

Datum Points



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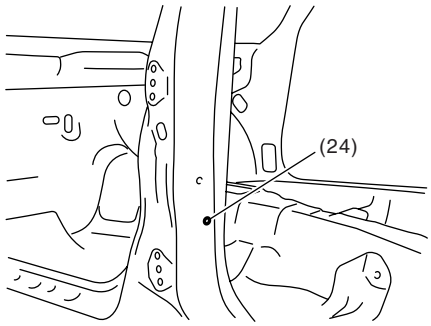
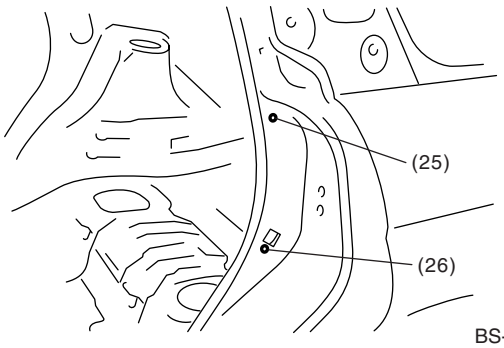
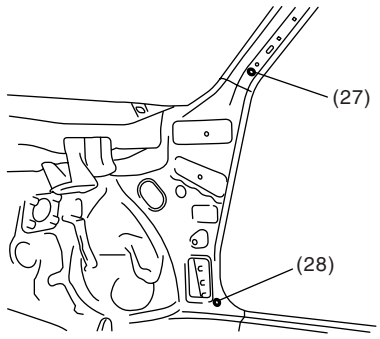


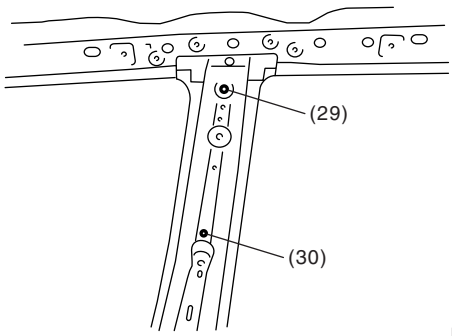
BS-00015



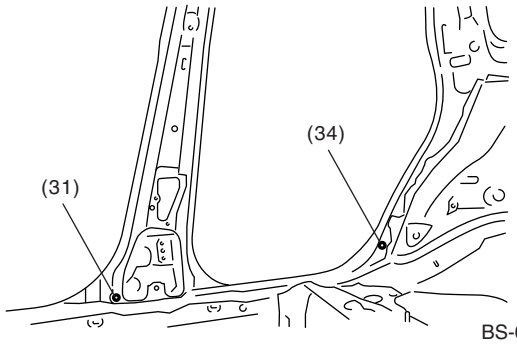
BS-00016



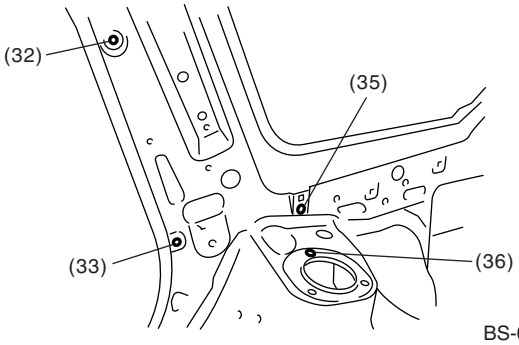
BS-00017



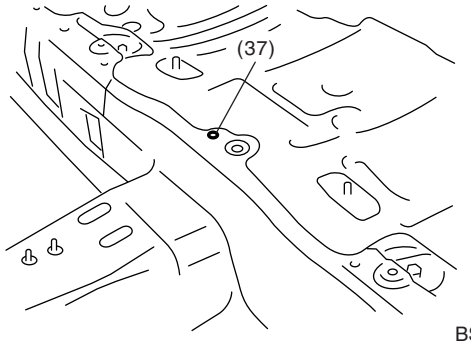
BS-00018



BS-00019

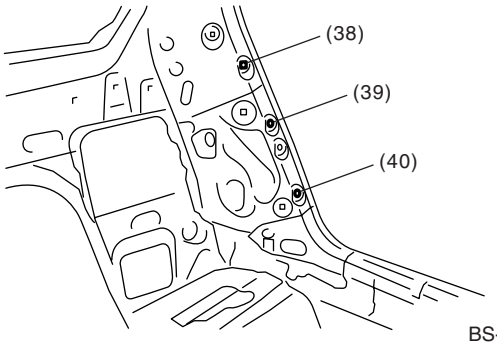


BS-00020

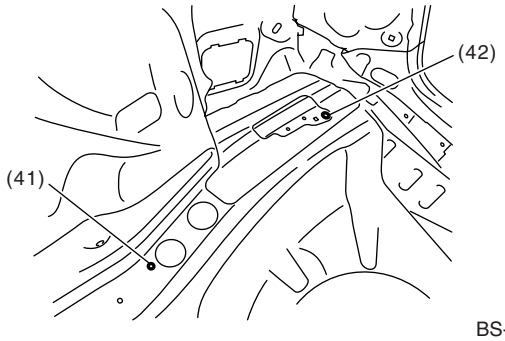


BS-00021

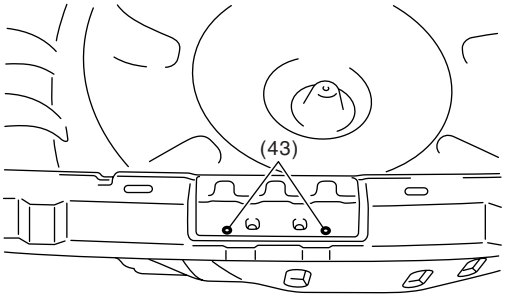
Datum Points



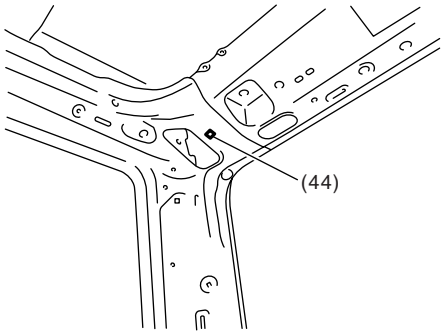
BS-00022



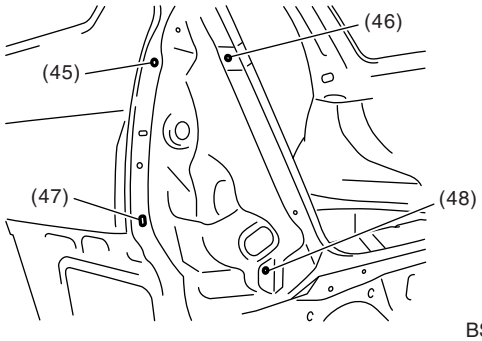
BS-00023



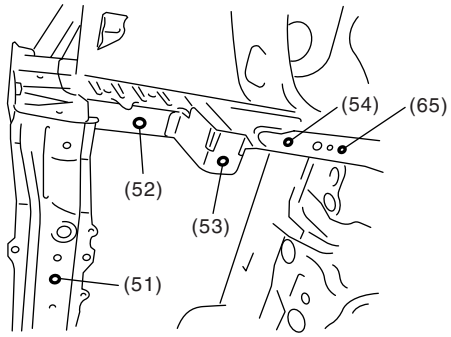
BS-00024



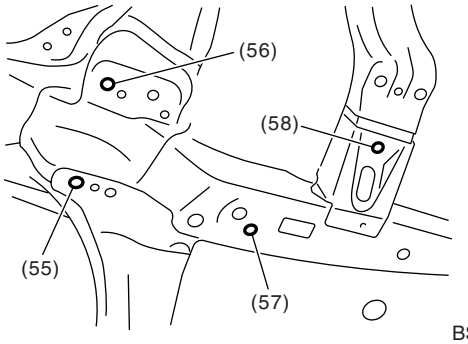
BS-00025



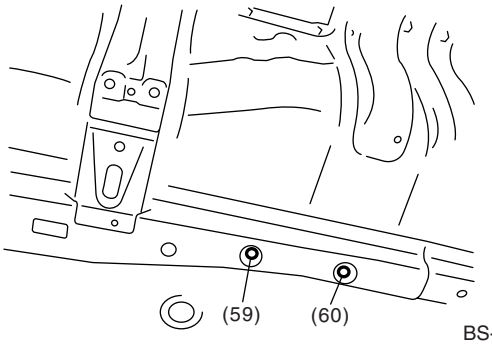
BS-00026



BS-00027

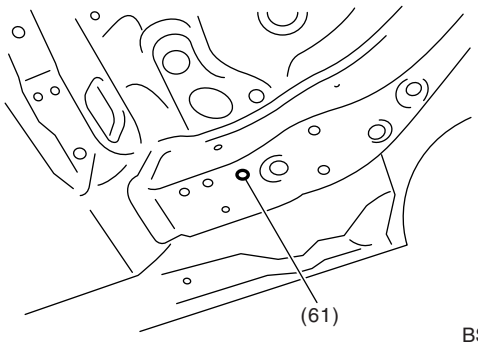


BS-00028

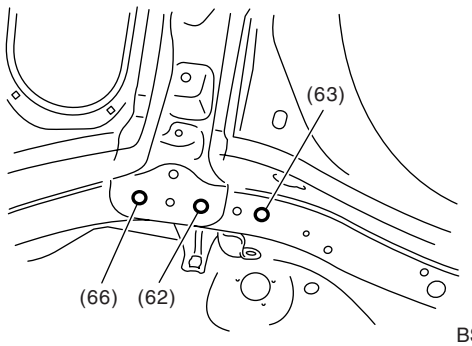


BS-00029

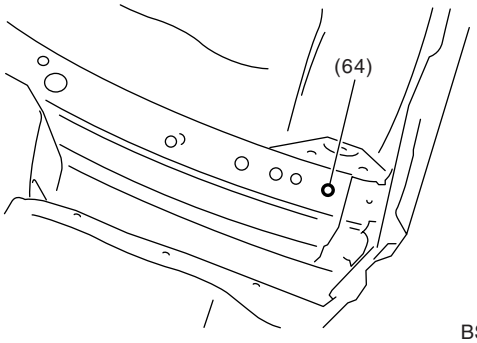
Datum Points



BS-00030



BS-00031



BS-00032

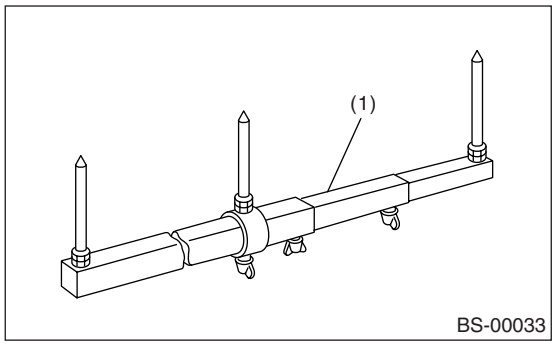
3. Datum Dimensions

A: MEASUREMENT

Refer to LOCATION for details on measurement points. <Ref. to BS-3, LOCATION, Datum Points.>

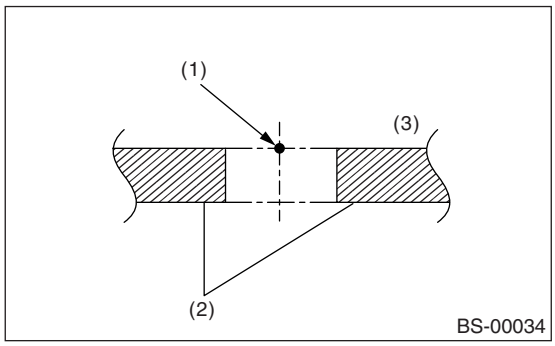
NOTE:

- Using a tram tracking gauge, measure all dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes “RH” and “LH” indicate right-hand and left-hand.



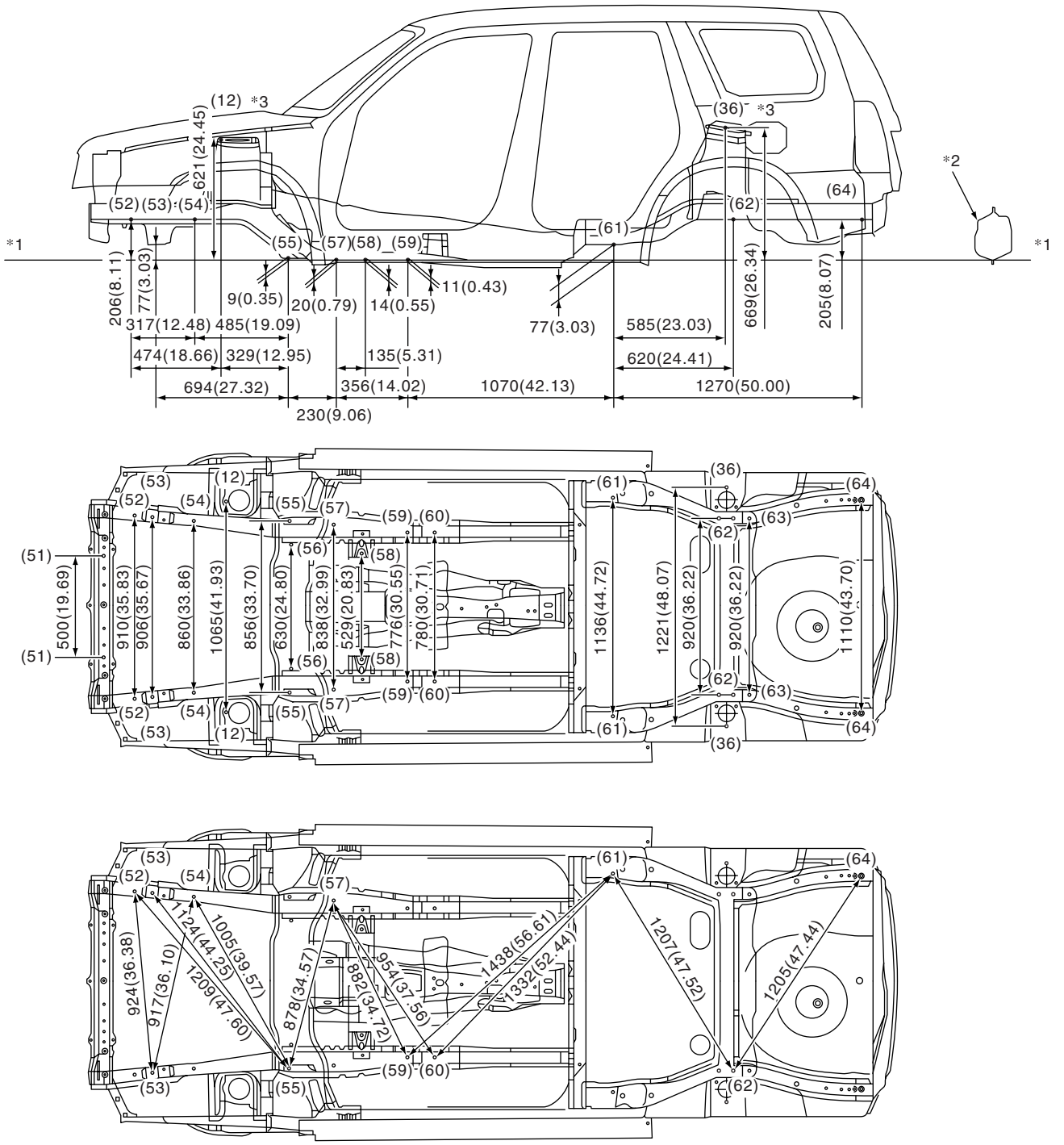
(1) Tram tracking gauge

- Measure at the center of the circle around the outside of the body panel.



(1) Datum point
(2) Body panel
(3) Outside

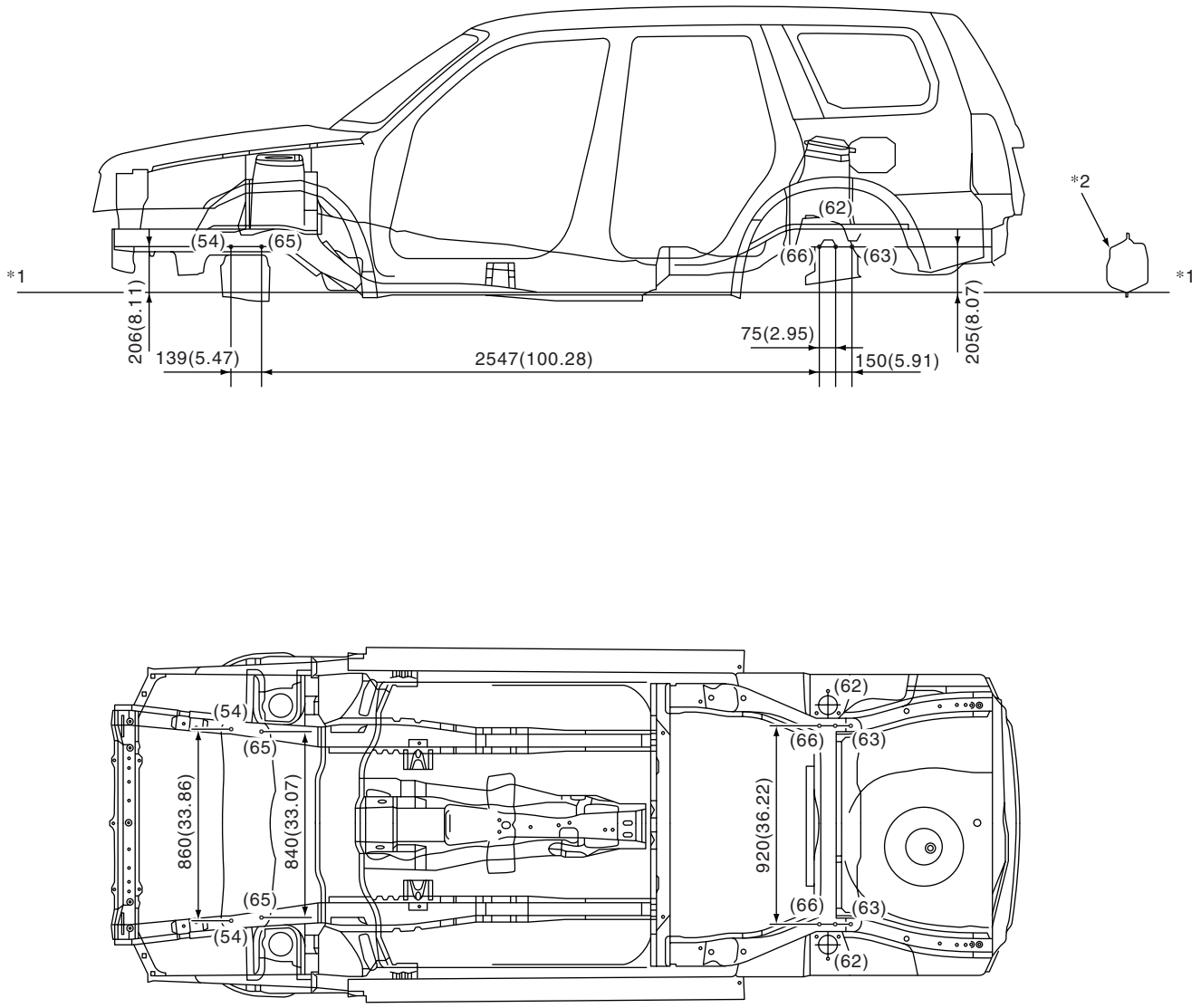
1. CENTER STRUCTURE



BS-00035

*1: Standard line
*2: Side sill
*3: Upper surface
Unit: mm (in)

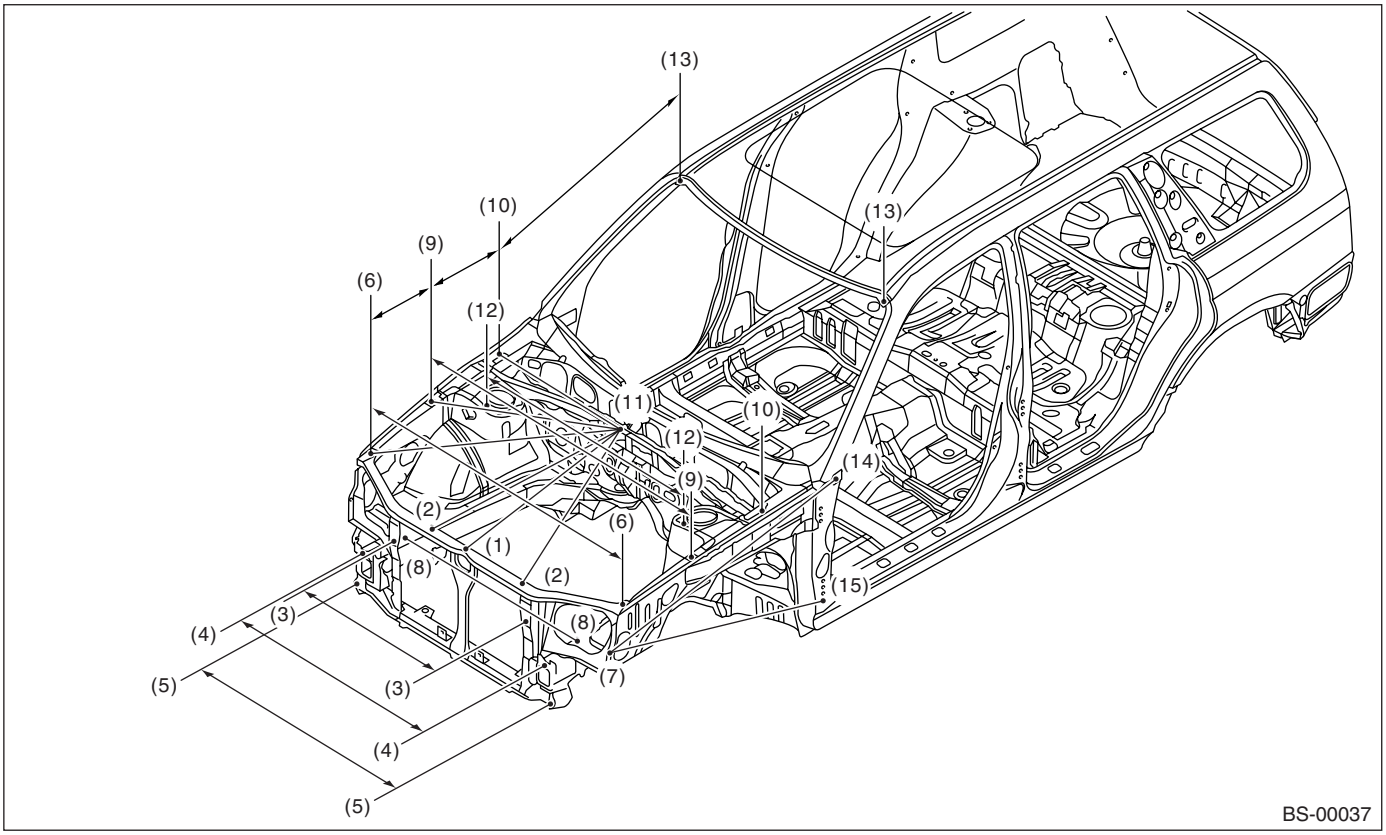
2. SUSPENSION CROSSMEMBER



BS-00036

*1: Standard line
*2: Side sill
Unit: mm (in)

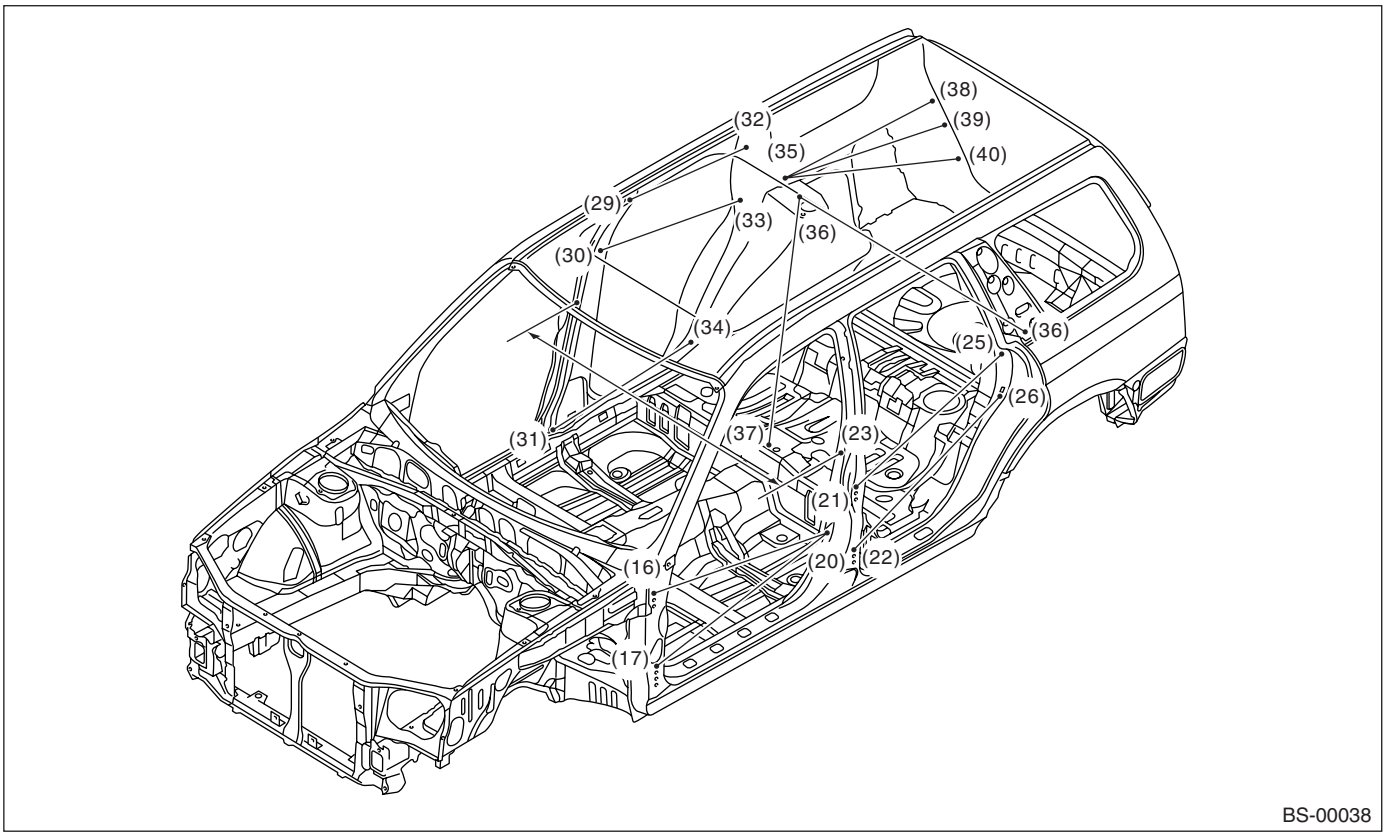
3. FRONT STRUCTURE



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(1) to (11)	822 (32.36)	(7) LH to (15) LH	1,067 (42.01)
(2) RH to (11)	842 (33.15)	(8) RH to (8) LH	921 (36.26)
(2) LH to (11)	875 (34.45)	(9) RH to (9) LH	1,396 (54.96)
(3) RH to (3) LH	716 (28.19)	(9) RH to (10) RH	398 (15.67)
(4) RH to (4) LH	978 (38.50)	(9) LH to (10) LH	398 (15.67)
(5) RH to (5) LH	1,049 (41.30)	(9) RH to (11)	767 (30.20)
(6) RH to (6) LH	1,341 (52.80)	(9) LH to (11)	767 (30.20)
(6) RH to (9) RH	349 (13.74)	(10) RH to (11)	722 (28.43)
(6) LH to (9) LH	349 (13.74)	(10) LH to (11)	722 (28.43)
(6) RH to (11)	944 (37.17)	(10) RH to (13) RH	907 (35.71)
(6) LH to (11)	944 (37.17)	(10) LH to (13) LH	907 (35.71)
(7) RH to (14) RH	1,155 (45.47)	(11) to (12) RH	565 (22.24)
(7) LH to (14) LH	1,155 (45.47)	(11) to (12) LH	565 (22.24)
(7) RH to (15) RH	1,067 (42.01)	(12) RH to (12) LH	1,065 (41.93)

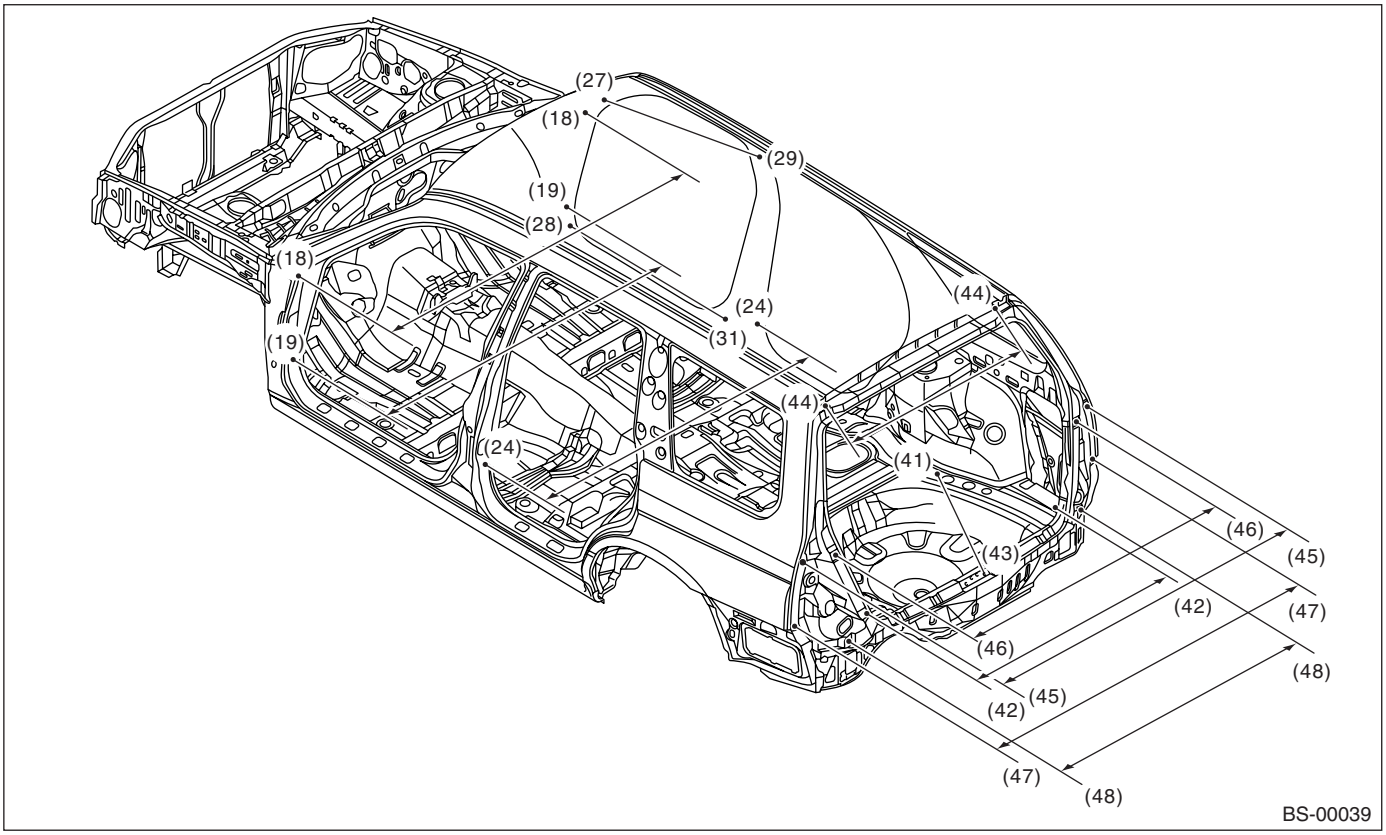
Datum Dimensions



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(16) RH to (20) RH	980 (38.58)	(30) LH to (33) LH	796 (31.34)
(16) LH to (20) LH	980 (38.58)	(31) RH to (34) RH	759 (29.88)
(17) RH to (20) RH	982 (38.66)	(31) LH to (34) LH	759 (29.88)
(17) LH to (20) LH	982 (38.66)	(35) RH to (38) RH	665 (26.18)
(21) RH to (25) RH	853 (33.58)	(35) LH to (38) LH	665 (26.18)
(21) LH to (25) LH	853 (33.58)	(35) RH to (39) RH	711 (27.99)
(22) RH to (26) RH	895 (35.24)	(35) LH to (39) LH	711 (27.99)
(22) LH to (26) LH	895 (35.24)	(35) RH to (40) RH	784 (30.87)
(23) LH to (23) RH	1,429 (56.26)	(35) LH to (40) LH	784 (30.87)
(29) RH to (32) RH	674 (26.54)	(36) LH to (36) RH	1,221 (48.07)
(29) LH to (32) LH	674 (26.54)	(36) RH to (37) RH	1,067 (42.01)
(30) RH to (33) RH	796 (31.34)	(36) LH to (37) LH	1,067 (42.01)

4. REAR STRUCTURE



Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(18) RH to (18) LH	1,449 (57.05)	(41) RH to (43) RH	794 (31.26)
(19) RH to (19) LH	1,459 (57.44)	(41) LH to (43) LH	805 (31.69)
(27) RH to (29) RH	1,007 (39.65)	(42) RH to (42) LH	1,110 (43.70)
(27) LH to (29) LH	1,007 (39.65)	(44) RH to (44) LH	878 (34.57)
(28) RH to (31) RH	813 (32.01)	(45) RH to (45) LH	1,474 (58.03)
(28) LH to (31) LH	813 (32.01)	(46) RH to (46) LH	1,252 (49.29)
(24) RH to (24) LH	1,438 (56.61)	(47) RH to (47) LH	1,552 (61.10)
(41) RH to (41) LH	950 (37.40)	(48) RH to (48) LH	1,210 (47.64)

INSTRUMENTATION/DRIVER INFO

IDI

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1. General Description

A: SPECIFICATION

Combination meter	Speedometer	Electric pulse type
	Temperature gauge	Cross coil type
	Fuel gauge	Cross coil type
	Tachometer	Electric pulse type
	Turn signal indicator light	14 V — 2 W
	Charge indicator light	14 V — 1.4 W
	Oil pressure indicator light	LED
	ABS warning light	14 V — 1.4 W
	Malfunction indicator light	LED
	HI-beam indicator light	14 V — 2 W
	Door open warning light	LED
	Seat belt warning light	LED
	Brake fluid and parking brake warning light	14 V — 2 W
	AWD warning light	LED
	AIRBAG warning light	LED
	Meter illumination light	14 V — 3.4 W, 14 V — 2 W
	AT OIL TEMP. warning light	LED
	LO indicator light	LED
	HOLD indicator light	LED
	Immobilizer indicator light	LED
	Rear differential oil temperature warning light	14 V — 2 W
	Cruise indicator light	14 V — 1.4 W
	Rear fog light indicator light	14 V — 2 W
	POWER indicator light	14 V — 1.4 W
	Low fuel warning light	LED
	AT select lever position indicator light	LCD
	LCD back light	14 V — 1.4 W
	Cruise set indicator light	14 V — 1.4 W
	Vehicle dynamics control (VDC) operation indicator light	14 V — 3 W
	Vehicle dynamics control (VDC) warning light	LED

B: CAUTION

- Be careful not to damage meters and instrument panel.
- Be careful not to damage meter glasses.
- Make sure that electrical connector is connected securely.
- After installation, make sure that each meter operates normally.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply excessive force to the printed circuit.
- Do not drop or otherwise apply impact.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Combination Meter System

A: WIRING DIAGRAM

1. COMBINATION METER

<Ref. to WI-274, WIRING DIAGRAM, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-282, WIRING DIAGRAM, Outside Temperature Display System.>

B: INSPECTION

CAUTION:
When measuring voltage and resistance of the ECM, TCM or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 2 mm (0.08 in).

1. SYMPTOM CHART

Symptom	Repair order	Reference
Combination meter assembly does not operate.	(1) Power supply (2) Ground circuit	<Ref. to IDI-5, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>
Speedometer does not operate.	(1) Vehicle speed sensor (MT model) TCM (AT model) (2) Harness (3) Speedometer	MT model: <Ref. to IDI-5, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>
		AT model: <Ref. to IDI-6, CHECK TRANSMISSION CONTROL MODULE (TCM), INSPECTION, Combination Meter System.>
Tachometer does not operate.	(1) ECM (2) Harness (3) Tachometer	<Ref. to IDI-7, CHECK ENGINE CONTROL MODULE (ECM), INSPECTION, Combination Meter System.>
Fuel gauge does not operate.	(1) Fuel level sensor (2) Harness (3) Fuel gauge	<Ref. to IDI-7, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>
Water temperature gauge does not operate.	(1) Engine coolant temperature sensor (2) Harness (3) Water temperature gauge	<Ref. to IDI-8, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
Outside temperature indicator does not operate.	(1) Ambient sensor (2) Harness (3) Combination meter	<Ref. to IDI-8, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR COMBINATION METER.** 1) Remove the combination meter. <Ref. to IDI-10, REMOVAL, Combination Meter.> 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between ignition switch and combination meter.
2	**CHECK POWER SUPPLY FOR COMBINATION METER.** Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 8 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between fuse and combination meter.
3	**CHECK GROUND CIRCUIT OF COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 10 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the combination meter printed circuit.	Repair the wiring harness.

3. CHECK VEHICLE SPEED SENSOR

	Step	Check	Yes	No
1	**CHECK VEHICLE SPEED SENSOR.** 1) Lift-up the vehicle and support it with rigid racks. 2) Remove the combination meter with harness connector. 3) Drive the vehicle at a speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to get caught in the running wheels.** 4) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 12 (+) — Chassis ground (–):***	Is the voltage 1 V ← → 5 V?	Check the speedometer. <Ref. to IDI-13, INSPECTION, Speedometer.>	Go to step **2.**
2	**CHECK VEHICLE SPEED SENSOR POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the vehicle speed sensor harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between ignition switch and vehicle speed sensor.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor connector and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the wiring harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER.** 1) Disconnect the connector from combination meter. 2) Measure the resistance between vehicle speed sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(B17) No. 1 — (i10) No. 12:***	Is the resistance less than 10 Ω?	Replace the vehicle speed sensor.	Repair the wiring harness.

4. CHECK TRANSMISSION CONTROL MODULE (TCM)

	Step	Check	Yes	No
1	**CHECK TCM SIGNAL.** 1) Lift-up the vehicle and support it with rigid racks. 2) Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to get caught in the running wheels.** 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***Non-turbo model*** ***(B56) No. 17 (+) — Chassis ground (−):*** ***Turbo model*** ***(B56) No. 1 (+) — Chassis ground (−):***	Is the voltage 1 V ← → 5 V?	Go to step **2.**	Check TCM. <Ref. to 4AT(diag)-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN TCM AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and combination meter. 3) Measure the resistance between TCM harness connector and combination meter harness connector. ***Connector & terminal*** ***Non-turbo model*** ***(B56) No. 17 — (i10) No. 12:*** ***Turbo model*** ***(B56) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Check the speedometer. <Ref. to IDI-13, INSPECTION, Speedometer.>	Repair the wiring harness.

5. CHECK ENGINE CONTROL MODULE (ECM)

	Step	Check	Yes	No
1	**CHECK ECM SIGNAL.** 1) Start the engine. 2) Measure the voltage between ECM connector and engine ground. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 10 (+) — Engine ground (−):*** ***Turbo model*** ***(B134) No. 23 (+) — Engine ground (−):***	Is the voltage 0 V ← → 14 V?	Go to step **2.**	Check ECM. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>
2	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and combination meter. 3) Measure the resistance between ECM harness connector and combination meter harness connector. ***Connector & terminal*** ***Non-turbo model*** ***(B134) No. 10 — (i10) No. 11:*** ***Turbo model*** ***(B134) No. 23 — (i10) No. 11:***	Is the resistance less than 10 Ω?	Check the tachometer. <Ref. to IDI-14, INSPECTION, Tachometer.>	Repair the wiring harness.

6. CHECK FUEL LEVEL SENSOR

	Step	Check	Yes	No
1	**CHECK FUEL LEVEL SENSOR.** 1) Remove the fuel level sensor. <Ref. to FU(H4SO)-57, REMOVAL, Fuel Level Sensor.> 2) Measure the resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 3 — No. 5:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 50 to 52 Ω (EMPTY)?	Go to step **2.**	Replace the fuel level sensor.
2	**CHECK FUEL SUB LEVEL SENSOR.** 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-58, REMOVAL, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor terminals when setting the float to FULL and EMPTY position. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 0.5 to 2.5 Ω (FULL) and 42 to 44 Ω (EMPTY)?	Go to step **3.**	Replace the fuel sub level sensor.
3	**CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER.** 1) Disconnect the connector from combination meter. 2) Measure the resistance between fuel sub level sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(R59) No. 1 — (i11) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the wiring harness.

	Step	Check	Yes	No
4	**CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR.** Measure the resistance between fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal. ***Connector & terminal*** ***(R58) No. 3 — (R59) No. 2:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the wiring harness.
5	**CHECK FUEL LEVEL SENSOR GROUND CIRCUIT.** Measure the resistance between fuel level sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(R58) No. 5 — Chassis ground:***	Is the resistance less than 10 Ω?	Check the fuel gauge. <Ref. to IDI-15, INSPECTION, Fuel Gauge.>	Repair the wiring harness.

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

	Step	Check	Yes	No
1	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** Check the engine coolant temperature sensor. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>	Is the engine coolant temperature sensor OK?	Go to step **2.**	Replace the engine coolant temperature sensor.
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor and combination meter. 3) Measure the resistance between engine coolant temperature sensor harness connector and combination meter harness connector. ***Connector & terminal*** ***(E8) No. 3 — (i11) No. 10:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the wiring harness.
3	**CHECK WATER TEMPERATURE GAUGE GROUND CIRCUIT.** Measure the resistance between combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 9 — Chassis ground:***	Is the resistance less than 10 Ω?	Check the water temperature gauge. <Ref. to IDI-16, INSPECTION, Water Temperature Gauge.>	Repair the wiring harness.

8. CHECK OUTSIDE TEMPERATURE INDICATOR

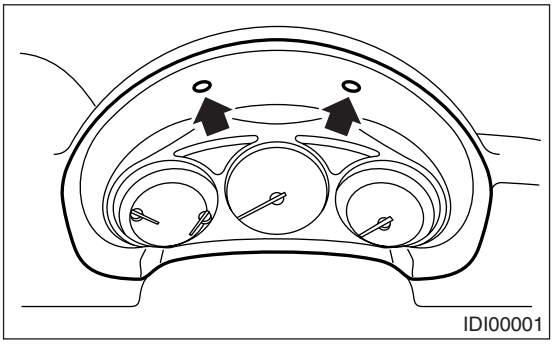
	Step	Check	Yes	No
1	**CHECK POWER SUPPLY FOR AMBIENT SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from outside temperature sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between outside temperature sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(F78) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **3.**	Go to step **2.**

	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ambient sensor harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(F78) No. 1 — (i10) No. 25:*** ***(F78) No. 2 — (i10) No. 24:***	Is the resistance less than 10 Ω?	Replace the combination meter printed circuit.	Repair the wiring harness.
3	**CHECK AMBIENT SENSOR.** 1) Remove the ambient sensor. 2) Check the ambient sensor. <Ref. to IDI-17, INSPECTION, Ambient Sensor.>	Is the ambient sensor OK?	Go to step **4.**	Replace the ambient sensor.
4	**CHECK OUTSIDE TEMPERATURE INDICATOR.** 1) Connect the combination meter harness connector. 2) Connect a resistor (3 kΩ) between terminals of ambient sensor harness connector. 3) Turn the ignition switch to ON and check the outside temperature indicator display.	Does the outside temperature indicator indicate 25°C (77°F)?	Repair the poor contact of ambient sensor harness connector.	Replace the combination meter printed circuit.

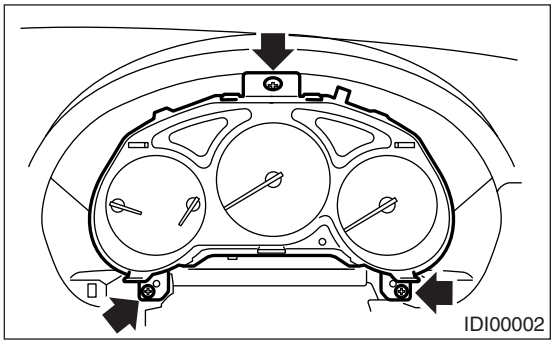
3. Combination Meter

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Set the tilt steering at lowest position.
3) Remove the screws and detach meter visor.



4) Remove the screws of combination meter and pull out the meter toward you.



5) Disconnect the connector in the upper area of combination meter to remove meter.

CAUTION:
• Be careful not to damage the meter or instrument panel.
• Pay particular attention to avoid damaging the meter glass.

B: INSTALLATION

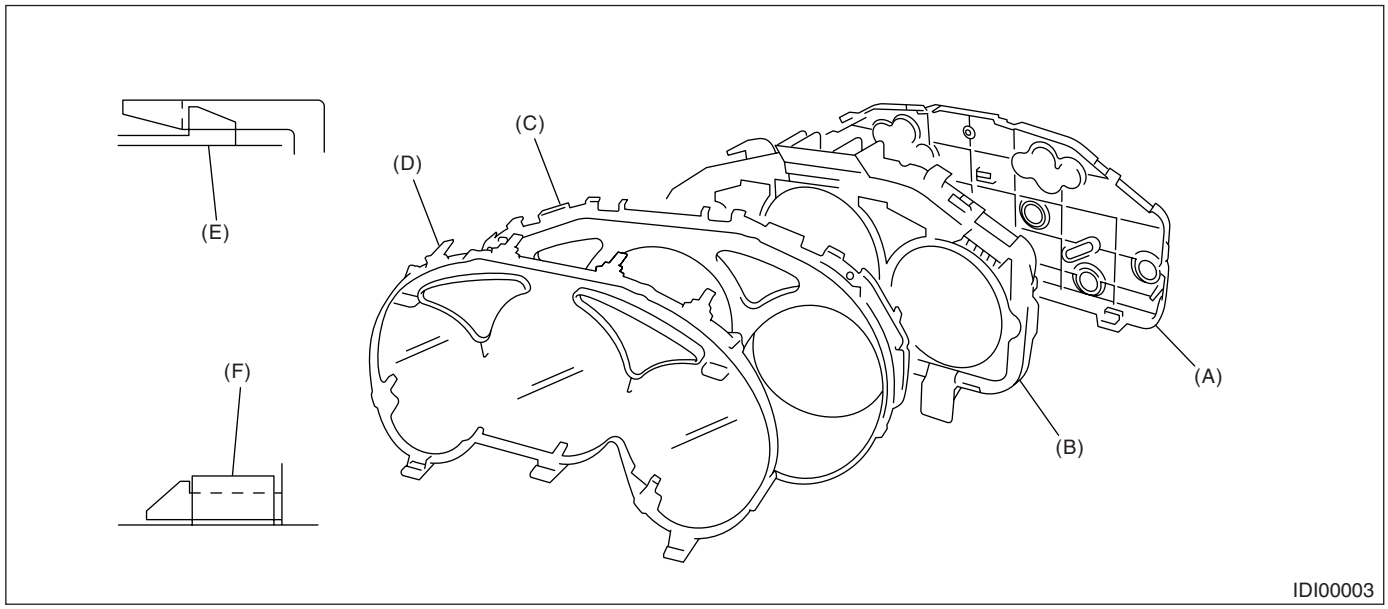
Install in the reverse order of removal.

CAUTION:
• Make sure that electrical connector is connected securely.
• Make sure that each meter operates normally.

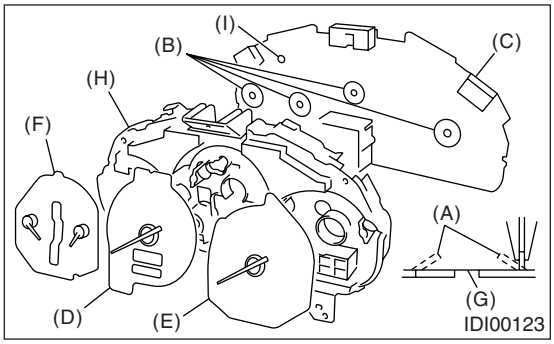
C: DISASSEMBLY

CAUTION:
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

1) Disengage the claw (E) to remove case (B) from back cover (A).
2) Disengage the claw (F) to remove meter glass (D) and reflector (C) from inner case.

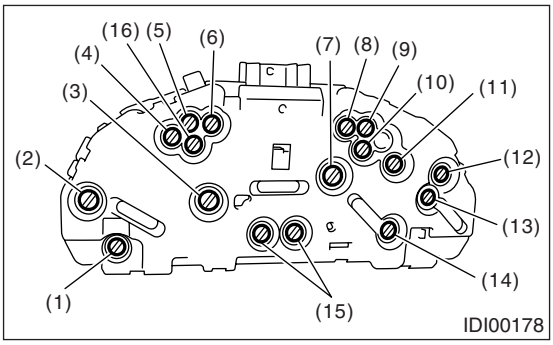


3) Pull up the claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out the speedometer (D), tachometer (E) and fuel gauge & water temperature gauge assembly (F) using hole (G).
4) Pull up the claw in center of combination meter printed circuit (C), and remove the printed circuit from case (H).



5) Remove the AT select indicator light (I) from printed circuit (C).

1. BULB REPLACEMENT



(1) Charge warning
(2) Tachometer
(3) Speedometer and tachometer
(4) Rear fog light indicator light
(5) HI-beam indicator
(6) Turn signal indicator RH
(7) Speedometer
(8) Turn signal indicator LH
(9) Rear differential oil temperature warning light
(10) Brake warning
(11) ABS warning
(12) AT power mode indicator light
(13) Fuel gauge
(14) Temperature gauge
(15) LCD (Outside temperature indicator, Odometer and tripmeter, AT select lever position indicator light)
(16) Vehicle dynamics control (VDC) operation indicator light

D: ASSEMBLY

Assemble in the reverse order of disassembly.

4. Speedometer

A: REMOVAL

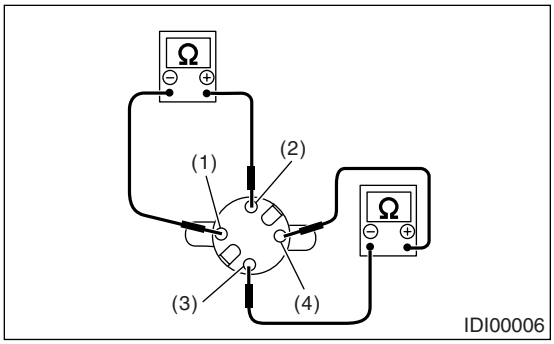
Disassemble the combination meter, and then remove the speedometer. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the speedometer resistance.



(1) COS−
(2) COS+
(3) SIN−
(4) SIN+

Terminal	Resistance
Terminals SIN + and SIN−	200±8 Ω
Terminals COS + and COS−	200±8 Ω

If NG, replace the speedometer.
If OK, replace the combination meter printed circuit.

5. Tachometer

A: REMOVAL

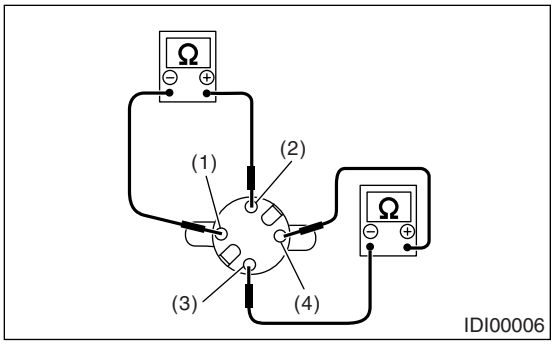
Disassemble the combination meter, and then remove the tachometer. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the tachometer resistance.



(1) COS−
(2) COS+
(3) SIN−
(4) SIN+

Terminal	Resistance
Terminals SIN + and SIN−	200±8 Ω
Terminals COS + and COS−	200±8 Ω

If NG, replace the tachometer.
If OK, replace the combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

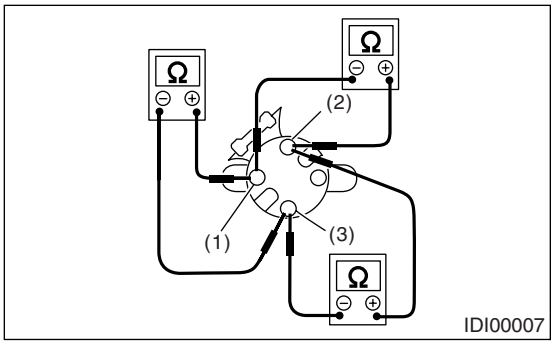
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the fuel gauge resistance.



(1) UNIT
(2) IGN
(3) GND

Terminal	Resistance
Terminals IGN and GND	170±10 Ω
Terminals IGN and UNIT	35±10 Ω
Terminals UNIT and GND	136±10 Ω

If NG, replace the water temperature gauge and fuel gauge assembly.
If OK, replace the combination meter printed circuit.

7. Water Temperature Gauge

A: REMOVAL

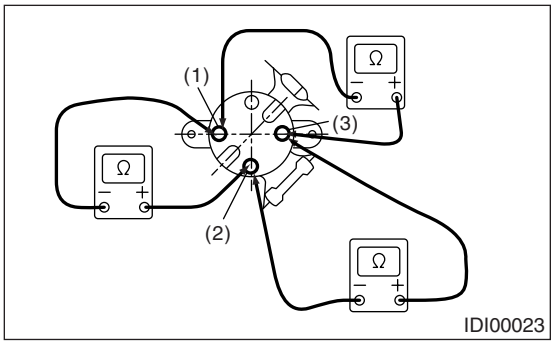
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the water temperature gauge resistance.



(1) GND
(2) IGN
(3) UNIT

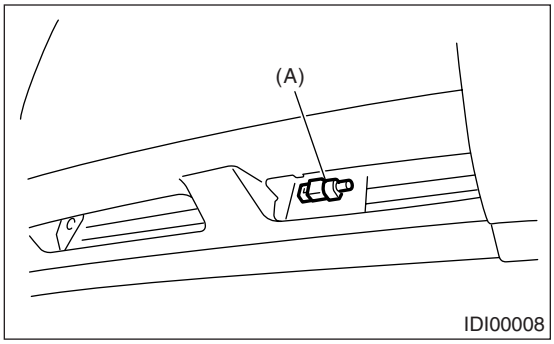
Terminal	Resistance
Terminals IGN and GND	208±10 Ω
Terminals IGN and UNIT	56±10 Ω
Terminals UNIT and GND	264±10 Ω

If NG, replace the water temperature gauge & fuel gauge assembly.
If OK, replace the combination meter printed circuit.

8. Ambient Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the ambient sensor connector.
3) Remove the ambient sensor (A) from radiator lower panel.

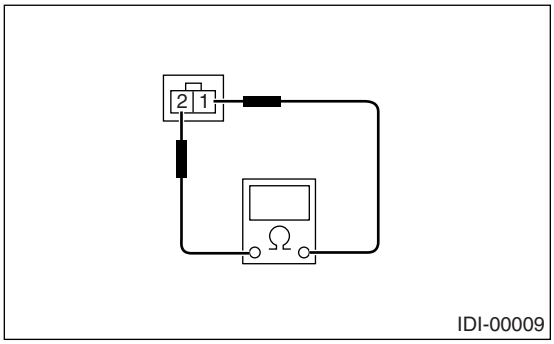


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the ambient sensor resistance.



Terminal	Resistance
1 and 2	3 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

SEATS

SE

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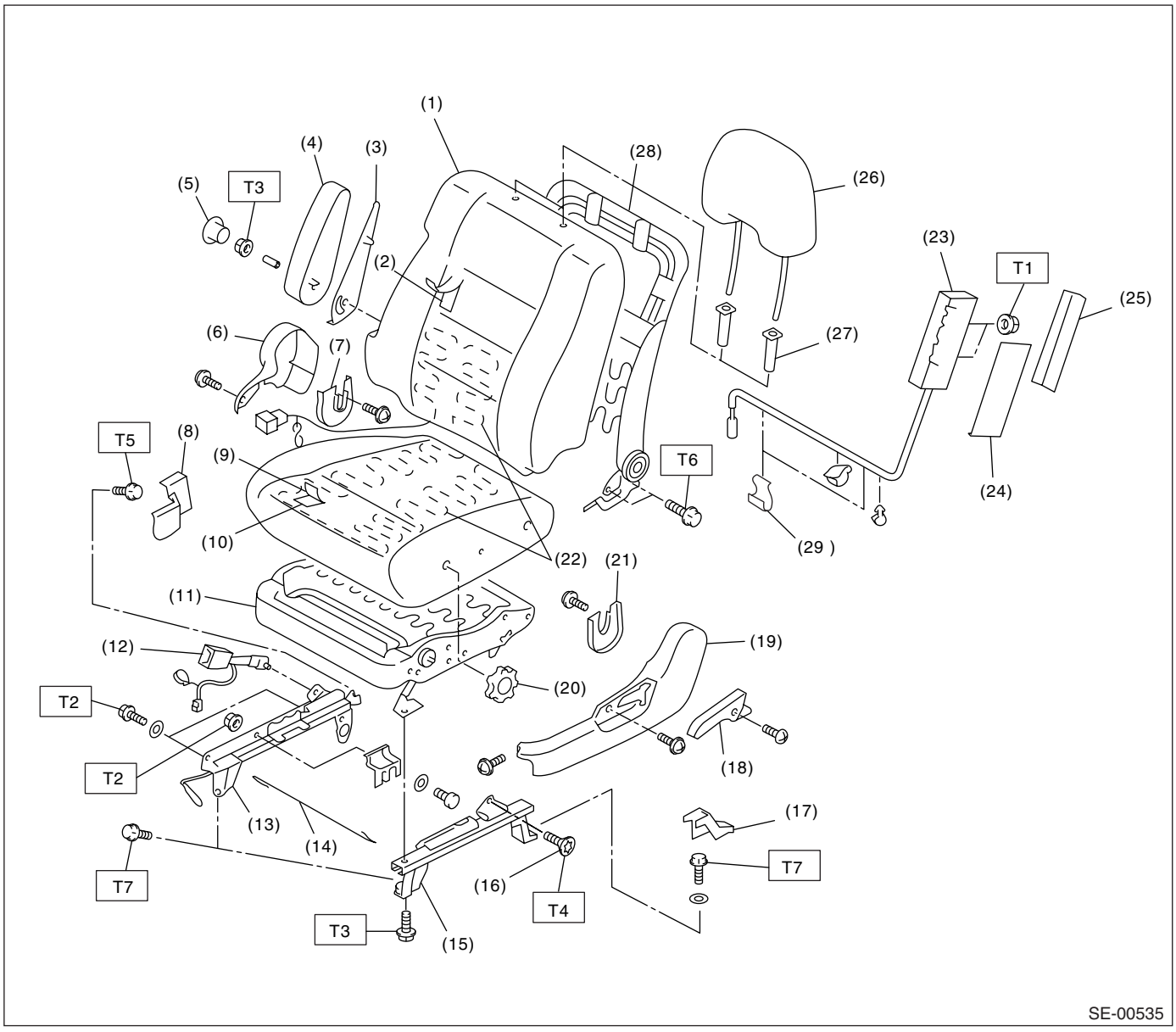
1. General Description 2
2. Front Seat 6
3. Rear Seat 13

1. General Description

A: COMPONENT

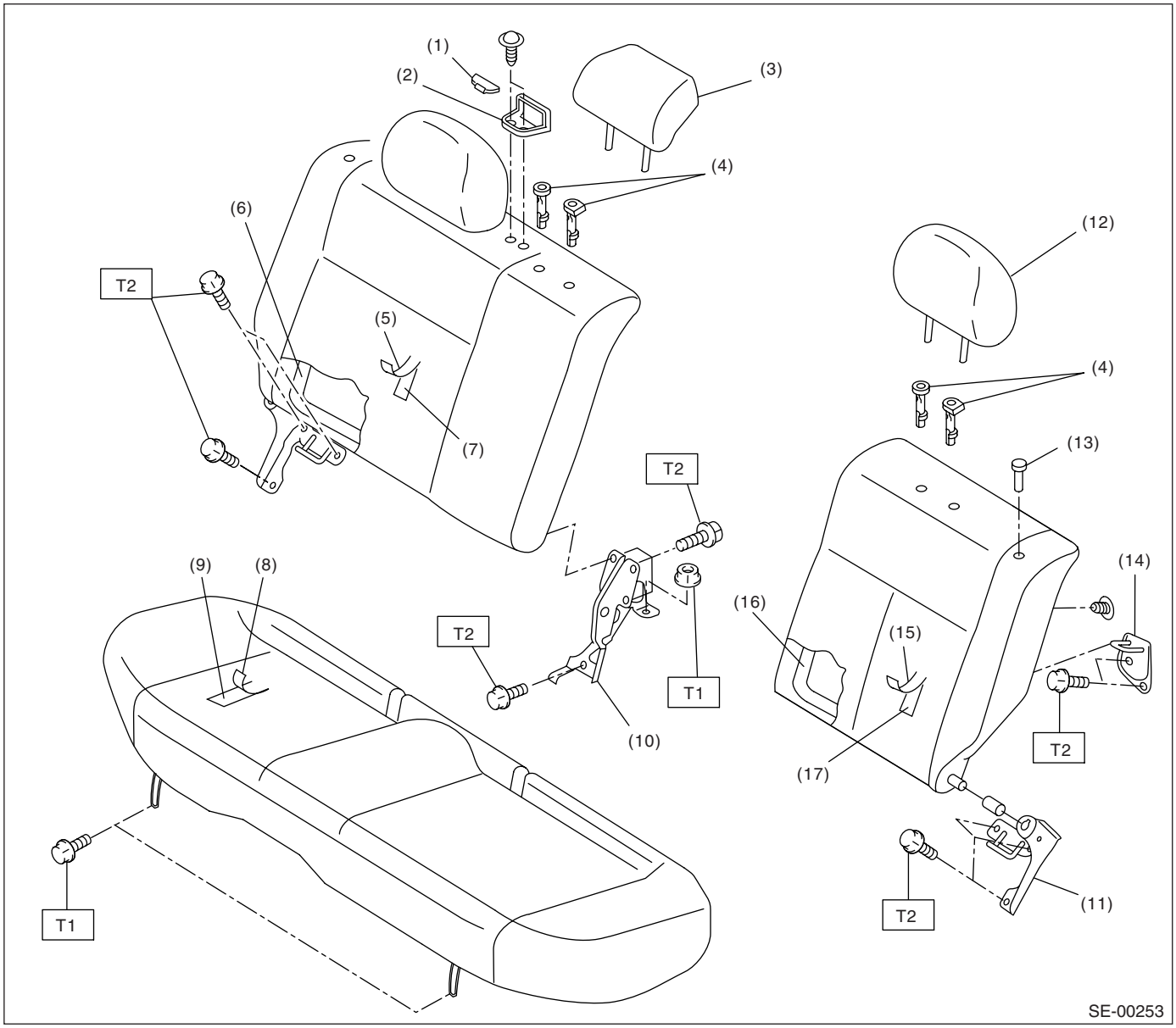
1. FRONT SEAT



(1) Backrest cover
(2) Backrest pad
(3) Backrest side cover
(4) Armrest ASSY
(5) Hinge cover cap
(6) Seat hinge outer cover LH
(7) Seat hinge inner cover LH
(8) Bolt cover LH
(9) Seat cushion cover
(10) Seat cushion pad ASSY
(11) Seat cushion frame ASSY
(12) Inner belt
(13) Inner slide rail
(14) Connecting wire
(15) Outer slide rail
(16) TORX® bolt
(17) Bolt cover RH
(18) Reclining lever
(19) Seat hinge outer cover RH
(20) Seat lifter dial
(21) Seat hinge inner cover RH
(22) Seat heater unit
(23) Side airbag module ASSY
(24) Support pad (A)
(25) Support pad (B)
(26) Headrest ASSY
(27) Headrest lock bushing
(28) Backrest frame ASSY
(29) Tape

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	***5.9 (0.6, 4.4)***
T2:	***10 (1.0, 7.2)***
T3:	***17.7 (1.8, 13.0)***
T4:	***20 (2.0, 14.5)***
T5:	***30 (3.1, 22.1)***
T6:	***52 (5.3, 38.3)***
T7:	***53 (5.4, 39.0)***

2. REAR SEAT



(1) Webbing guide cap
(2) Webbing guide
(3) Center pillow
(4) Headrest free bushing
(5) Backrest cover RH
(6) Backrest frame RH
(7) Backrest pad
(8) Seat cushion cover
(9) Seat cushion pad
(10) Hinge CTR
(11) Hinge LH
(12) Headrest
(13) Rear backrest knob
(14) Striker
(15) Backrest cover LH
(16) Backrest frame LH
(17) Backrest pad LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 24.5 (2.5, 18.1)
T2: 33 (3.4, 25)

B: CAUTION

When removing the front seat from a side airbag loaded vehicle, follow cautions given in the airbag section.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Long nose pliers	Used for removing hog ring.
Hog ring pliers	Used for installing hog ring.
TORX®	Used for removing and installing slide rail.

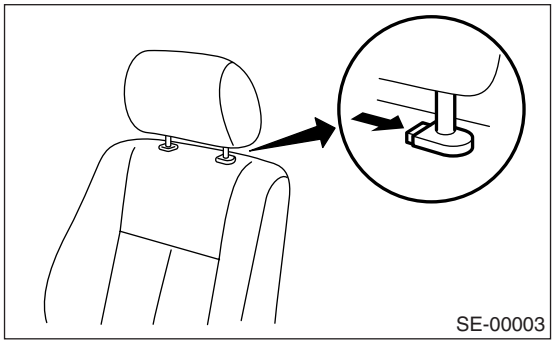
2. Front Seat

A: REMOVAL

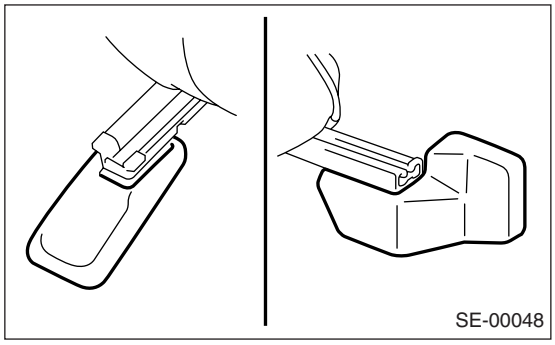
1) Disconnect the ground cable from battery.

WARNING:
The airbag system is fitted with a backup power source. If the airbag system is serviced within 20 seconds after the ground cable is disconnected, it may inflate.

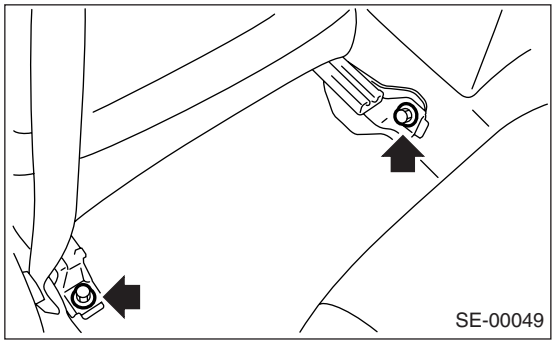
2) While pressing the headrest lock button, remove the headrest.



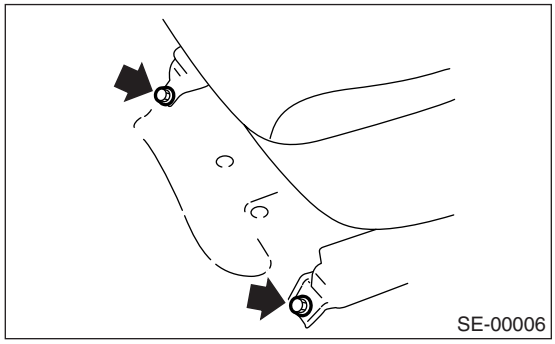
3) Tilt forward the backrest.
4) Move the seat to full front end.
5) Remove the bolt cover at rear end of slide rail.



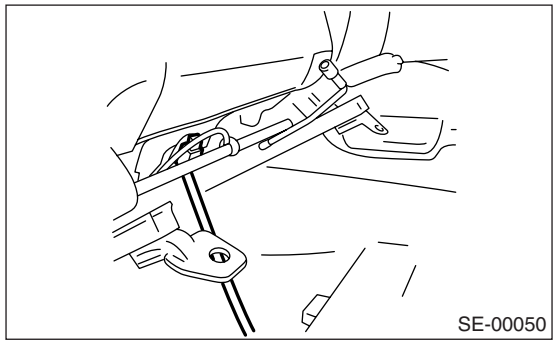
6) Remove the two bolts at rear side of seat rail.



7) Move the seat to full rear end.
8) Remove the two bolts at front side of seat rail.



9) Disconnect the side airbag connector under seat.
- Side airbag connector
- Seat belt warning light connector (Driver's seat)
- Seat heater connector (Model with seat heater)



10) Remove the front seat from the vehicle.

B: INSTALLATION

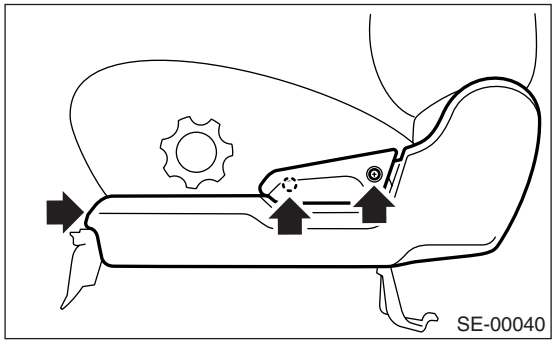
Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

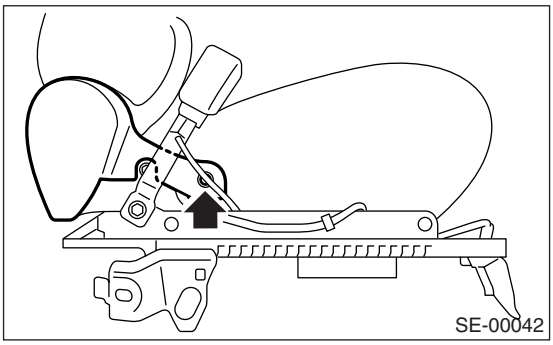
C: DISASSEMBLY

1. DRIVER'S SEAT

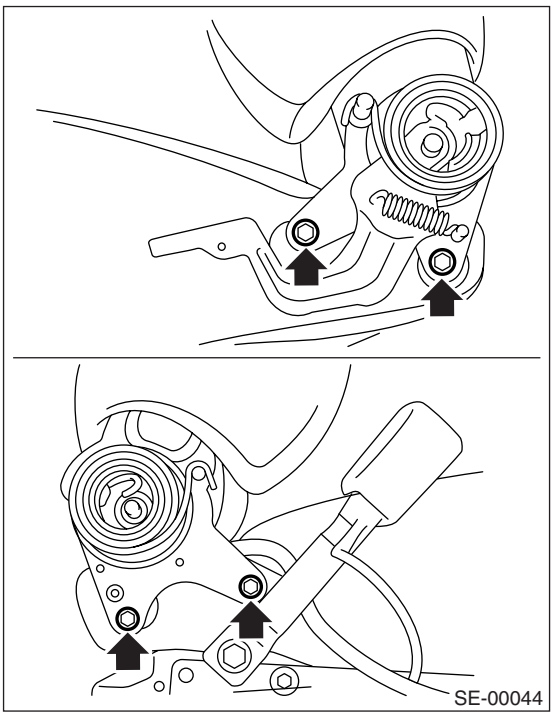
1) Remove the seat from the vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the reclining lever and reclining hinge cover.



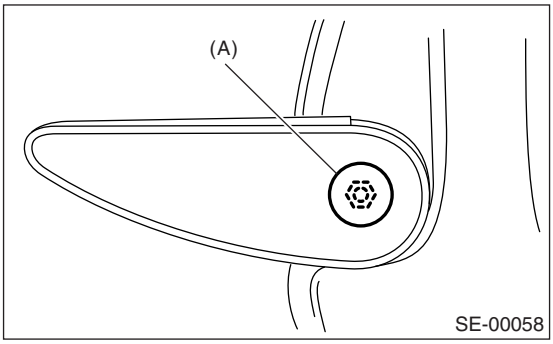
3) Loosen the screw, and then remove the hinge cover.



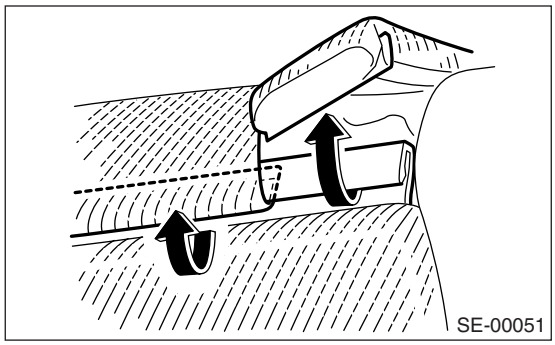
4) Remove two reclining hinge securing bolts on each side.



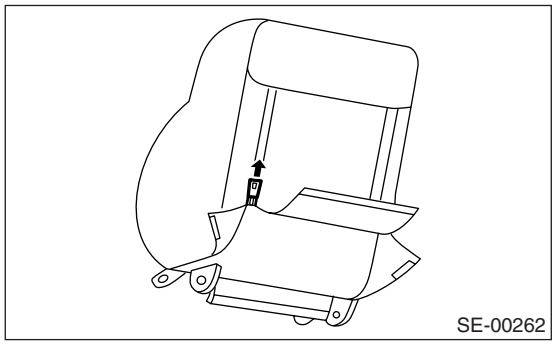
5) Remove the cover (A), and then loosen the nuts to remove arm rest and arm rest guide plate.



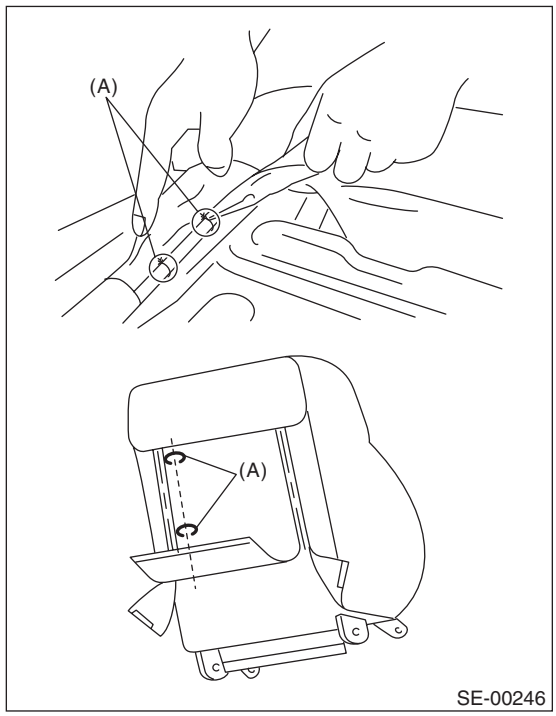
6) Remove the hook at bottom of seat backrest.



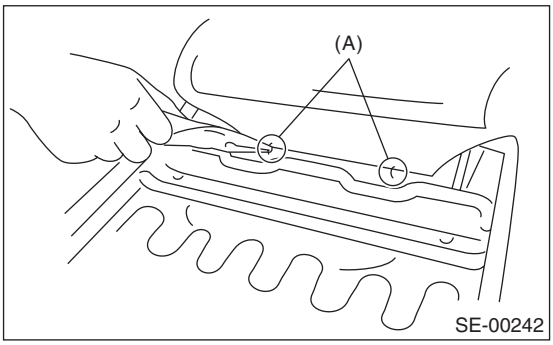
7) Open the zipper behind backrest.



8) Remove the hog rings (A) at side of inside backrest from backrest frame. (Side airbag equipped seat)

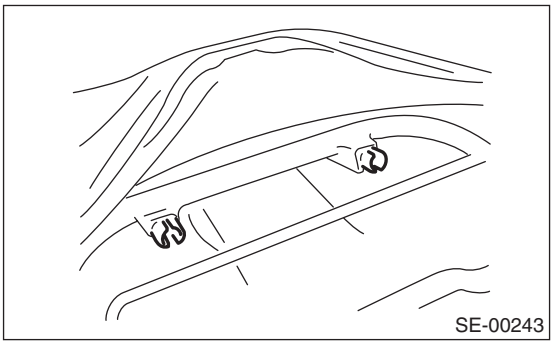


9) Remove the hog rings (A) which secure the backrest cover and backrest pad.

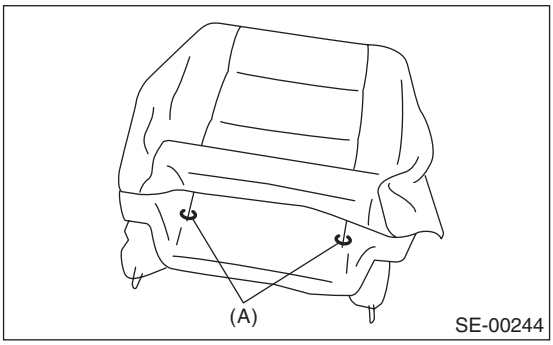


10) Remove the headrest bushes.

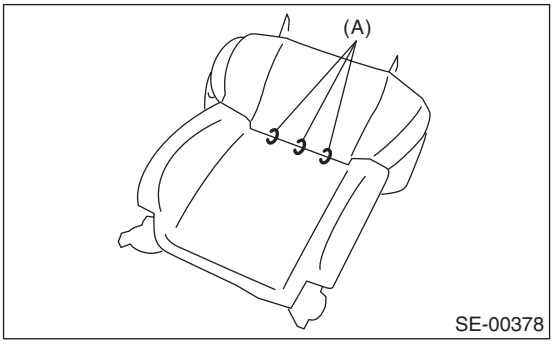
NOTE:
Push the headrest bushes to outside of seat from inside, and then remove them.



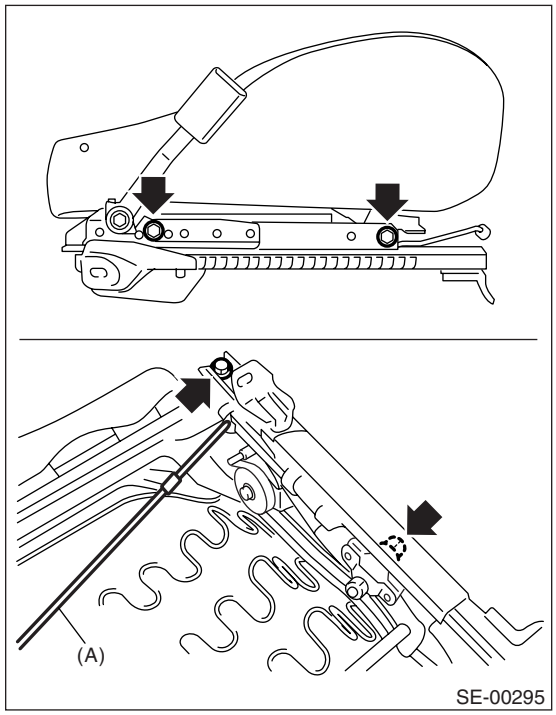
11) Pull out the backrest frame.
12) Remove the hog rings (A) at bottom of seat back.



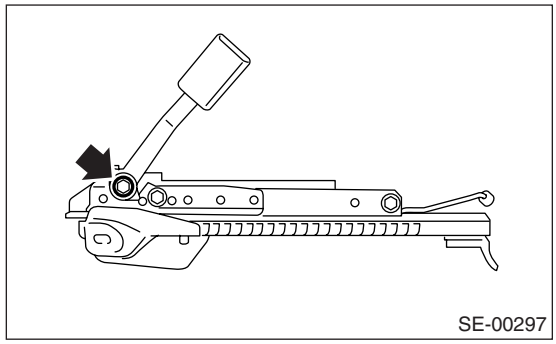
13) Remove the hog rings (A) at front of seat back, and then remove the seat back cover from seat back.



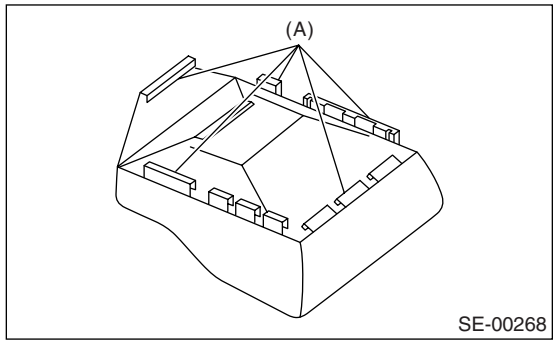
14) Remove the connecting wire (A), and then loosen the bolts and nuts to remove slide rail.



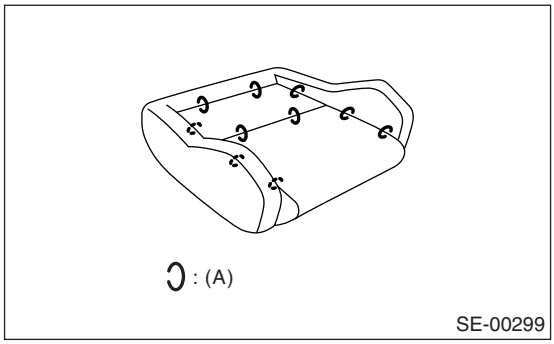
15) Remove the inner belt.



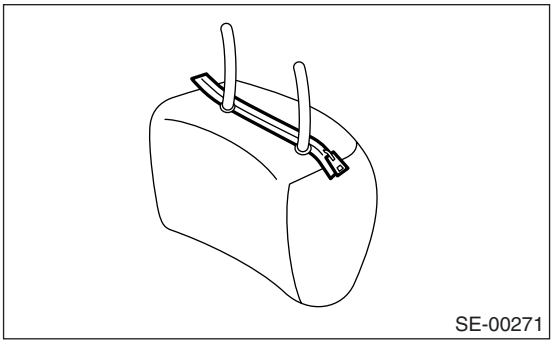
16) Remove the hook (A), and then remove the seat cushion frame.



17) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.

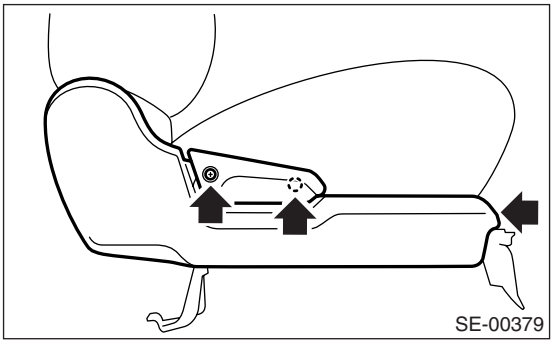


18) Open the zipper at bottom of headrest, and then remove the headrest cover from headrest.

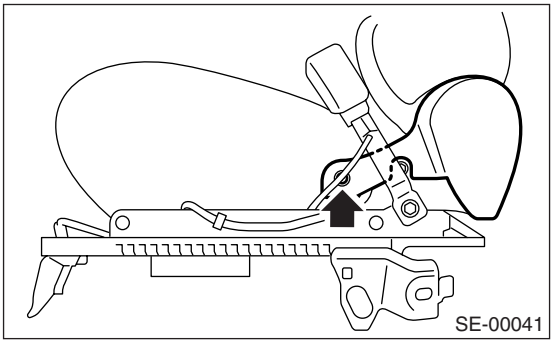


2. PASSENGER'S SEAT

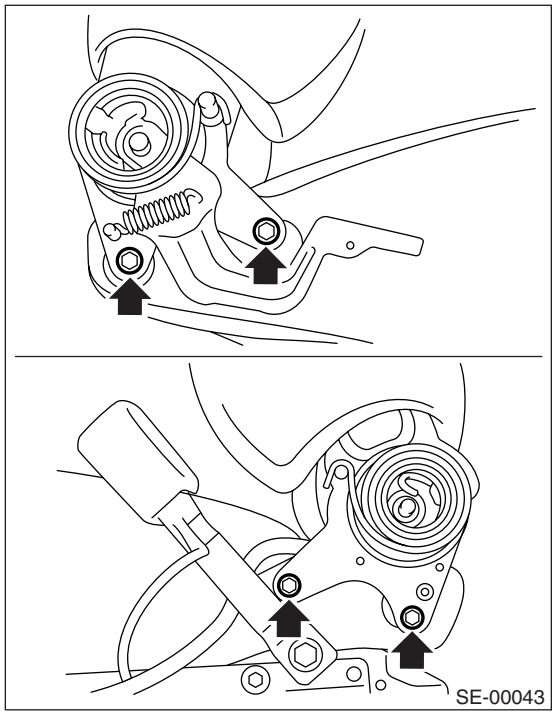
1) Remove the seat from vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>
2) Remove the reclining lever cover and hinge cover.



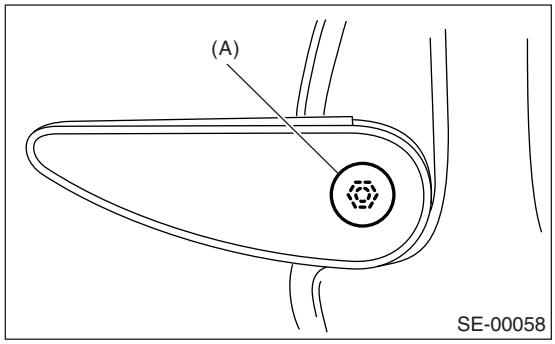
3) Loosen the screw, and then remove the hinge cover.



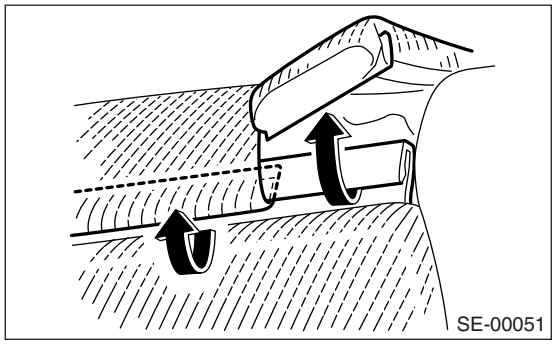
4) Remove two bolts from the reclining hinge on each side.



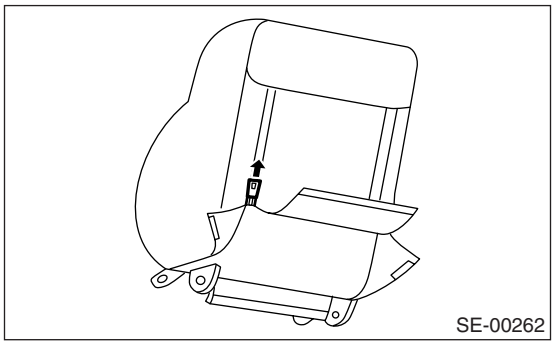
5) Remove the cover (A), and then loosen the nuts to remove arm rest and arm rest guide plate.



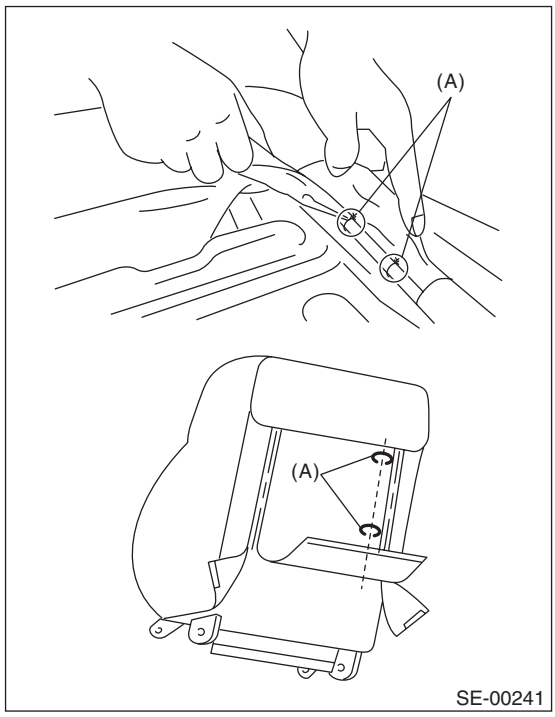
6) Remove the hook at bottom of seat back rest.



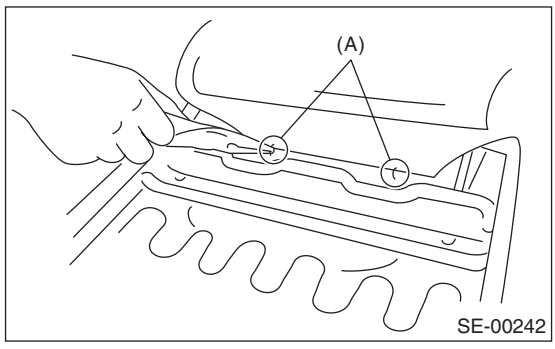
7) Open the zipper behind backrest.



8) Remove the hog rings (A) at side of inside backrest from backrest frame. (Side airbag equipped seat)

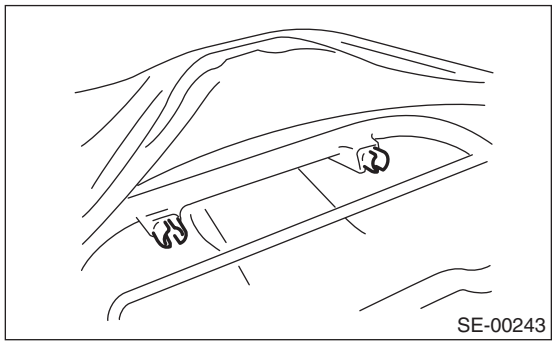


9) Remove the hog rings (A) which secure the backrest cover and backrest pad.



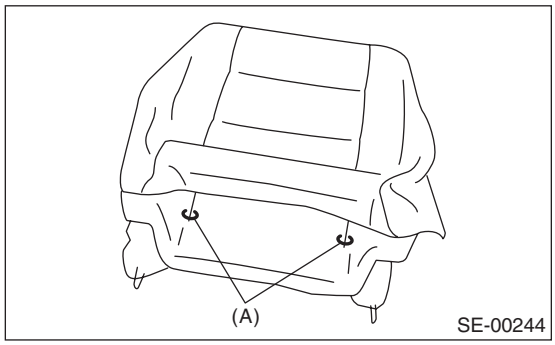
10) Remove the headrest bushes.

NOTE:
Push the headrest bushes to outside of seat from inside, and then remove them.

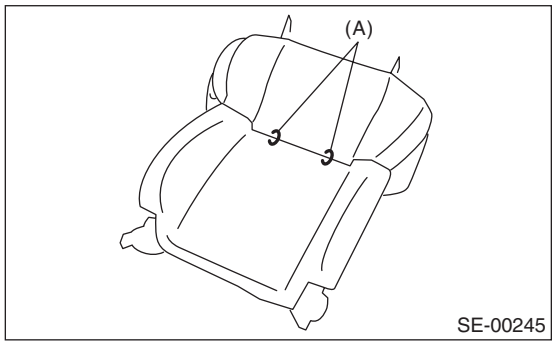


11) Pull out the backrest frame.

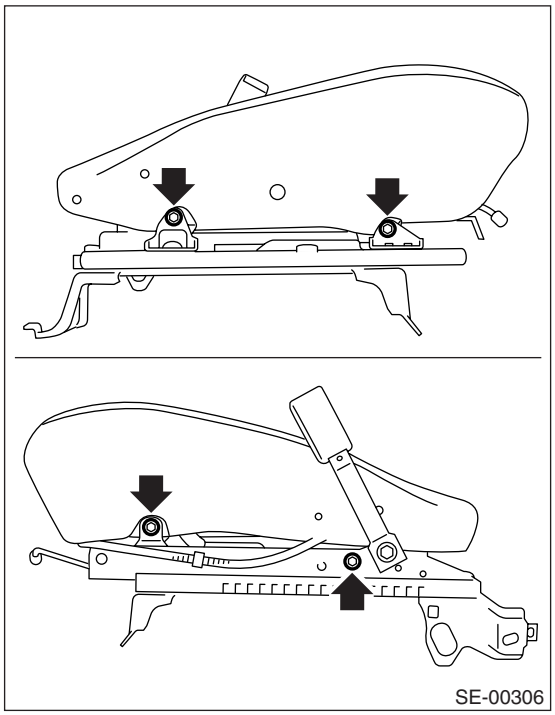
12) Remove the hog rings (A) at bottom of seat back. (Side airbag equipped seat)



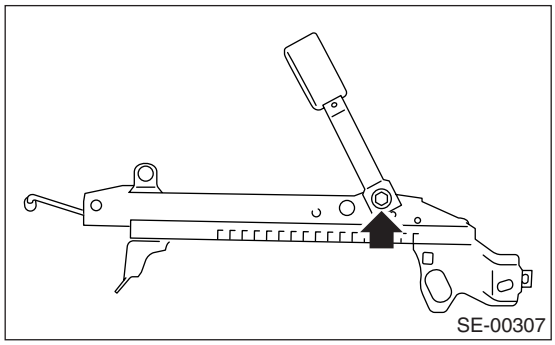
13) Remove the hog rings (A) at front of seat back, and then remove the seat back cover from seat back.



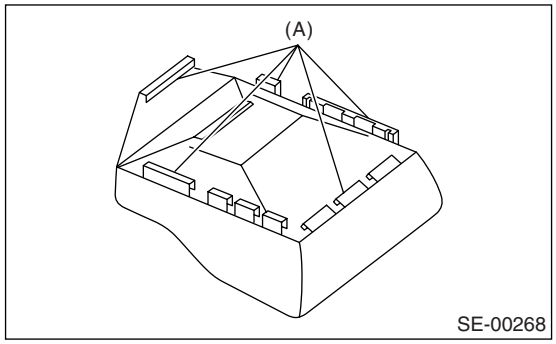
14) Loosen the bolts and nuts to remove the seat cushion from slide rail.


SE-00306

15) Remove the inner belt.

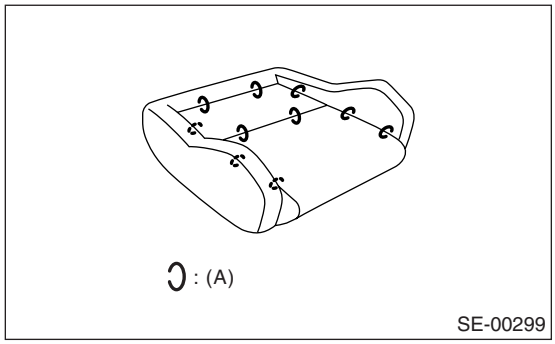

SE-00307

16) Remove the hooks (A), and then remove the seat cushion frame.



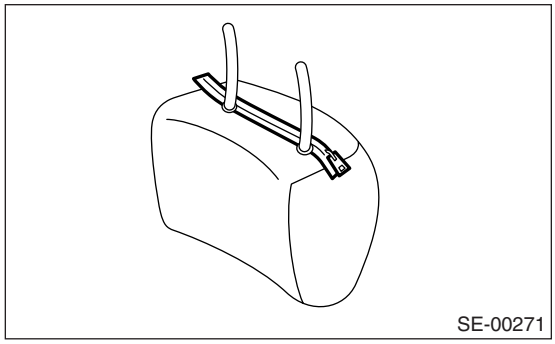
SE-00268

17) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



SE-00299

18) Open the zipper at bottom of headrest, and then remove the headrest cover from headrest.


SE-00271

D: ASSEMBLY

1. DRIVER'S SIDE

Assemble in the reverse order of disassembly.

2. PASSENGER'S SIDE

Assemble in the reverse order of disassembly.

CAUTION:
Because it may cause the side airbag to activate incorrectly, observe the following steps to install the side airbag correctly.
- **Be careful not to dirty or damage the backrest cover.**
- **Always use new hog rings.**
- **Secure the hog ring using hog ring pliers.**
- **Install the hog ring to its original position, and not to twist or wrinkle the backrest cover.**

Tightening torque:
Refer to "COMPONENT" of "General Description". <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

E: INSPECTION

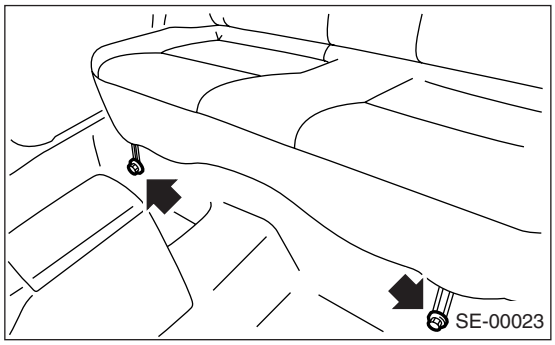
Inspect that there is no tear and fray on backrest cover assembly.

NOTE:
When there is tear or fray on the door side of backrest cover assembly, replace the backrest cover assembly with a new one, because there is a possibility that the side airbag will not operate normally.

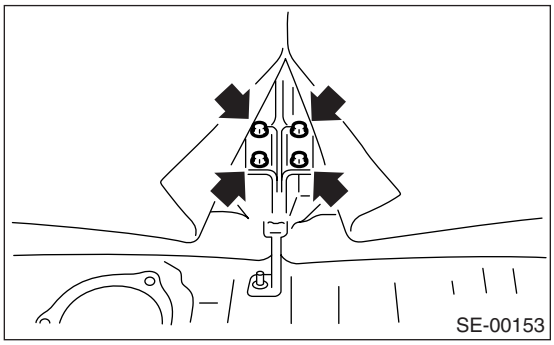
3. Rear Seat

A: REMOVAL

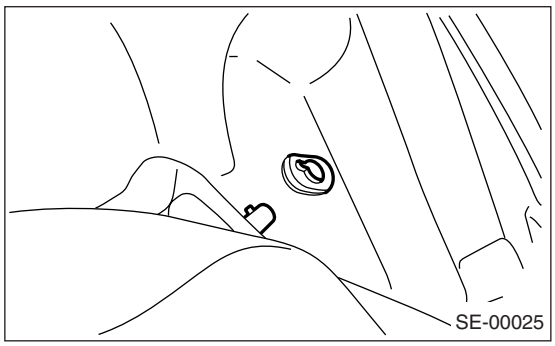
1) Remove the bolts, and then detach the rear seat cushion.



2) Remove the headrest.
3) Remove the luggage floor mat.
<Ref. to EI-51, REMOVAL, LUGGAGE FLOOR MAT.>
4) Fold down the rear seat backrest.
5) Turn over the mat to remove bolts.



6) Remove the rear seat backrest.



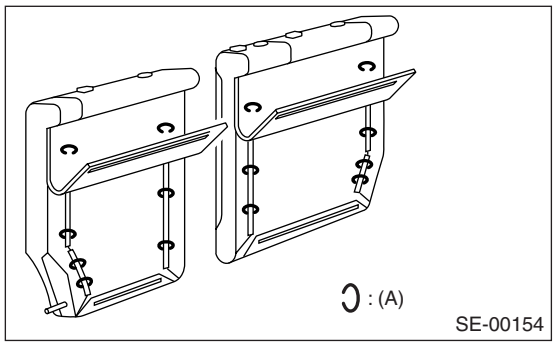
B: INSTALLATION

Install in the reverse order of removal.

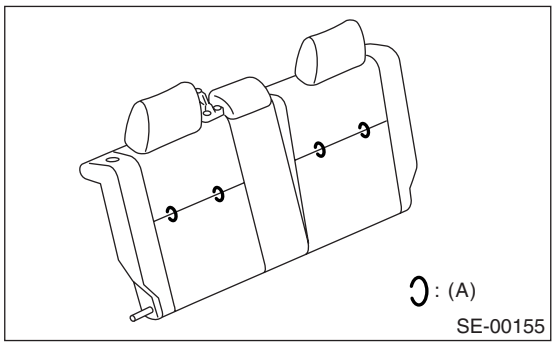
Tightening torque:
Refer to COMPONENT in General Description. <Ref. to SE-4, REAR SEAT, COMPONENT, General Description.>

C: DISASSEMBLY

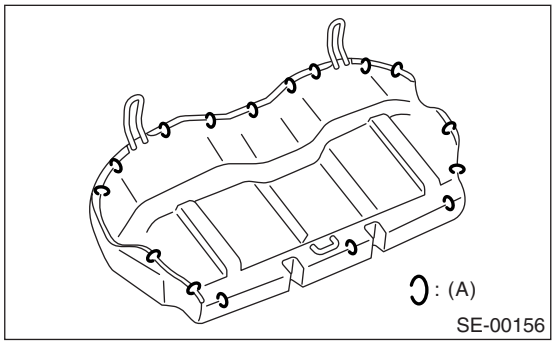
1) Remove the rear seat. <Ref. to SE-13, REMOVAL, Rear Seat.>
2) Remove the hog rings (A) from around the seat backrest.



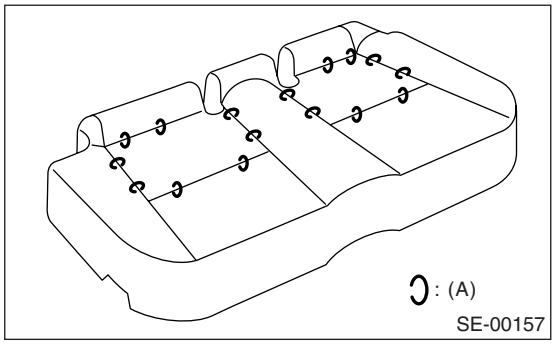
3) Remove the hog rings (A) on front side of cushion pad, and then remove the cover.



4) Remove the hog rings (A) from around the seat cushion.



5) Remove the hog rings (A), and then remove the cover.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

SECURITY AND LOCKS

SL

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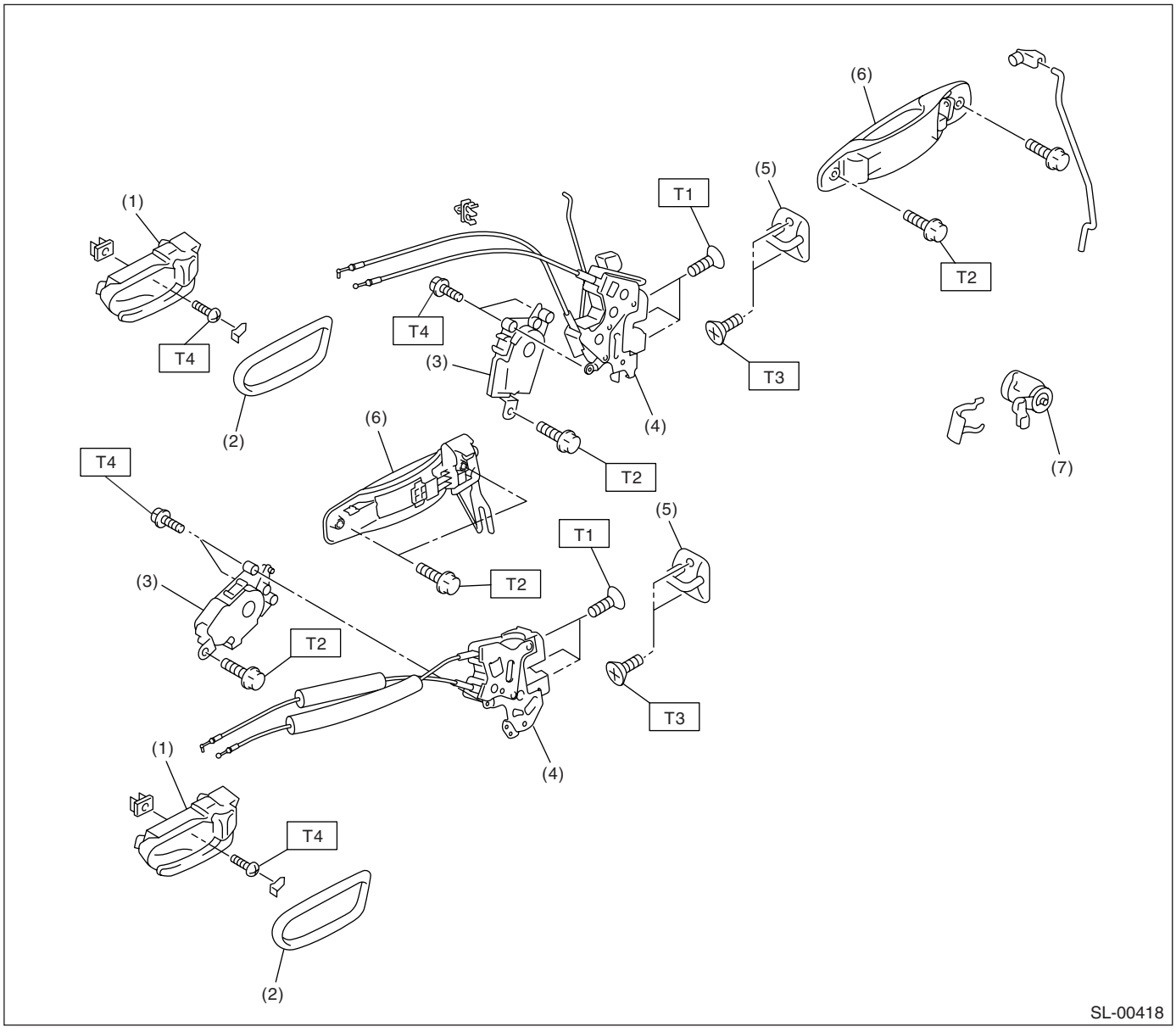
1. General Description

A: COMPONENT

1. DOOR LOCK ASSEMBLY

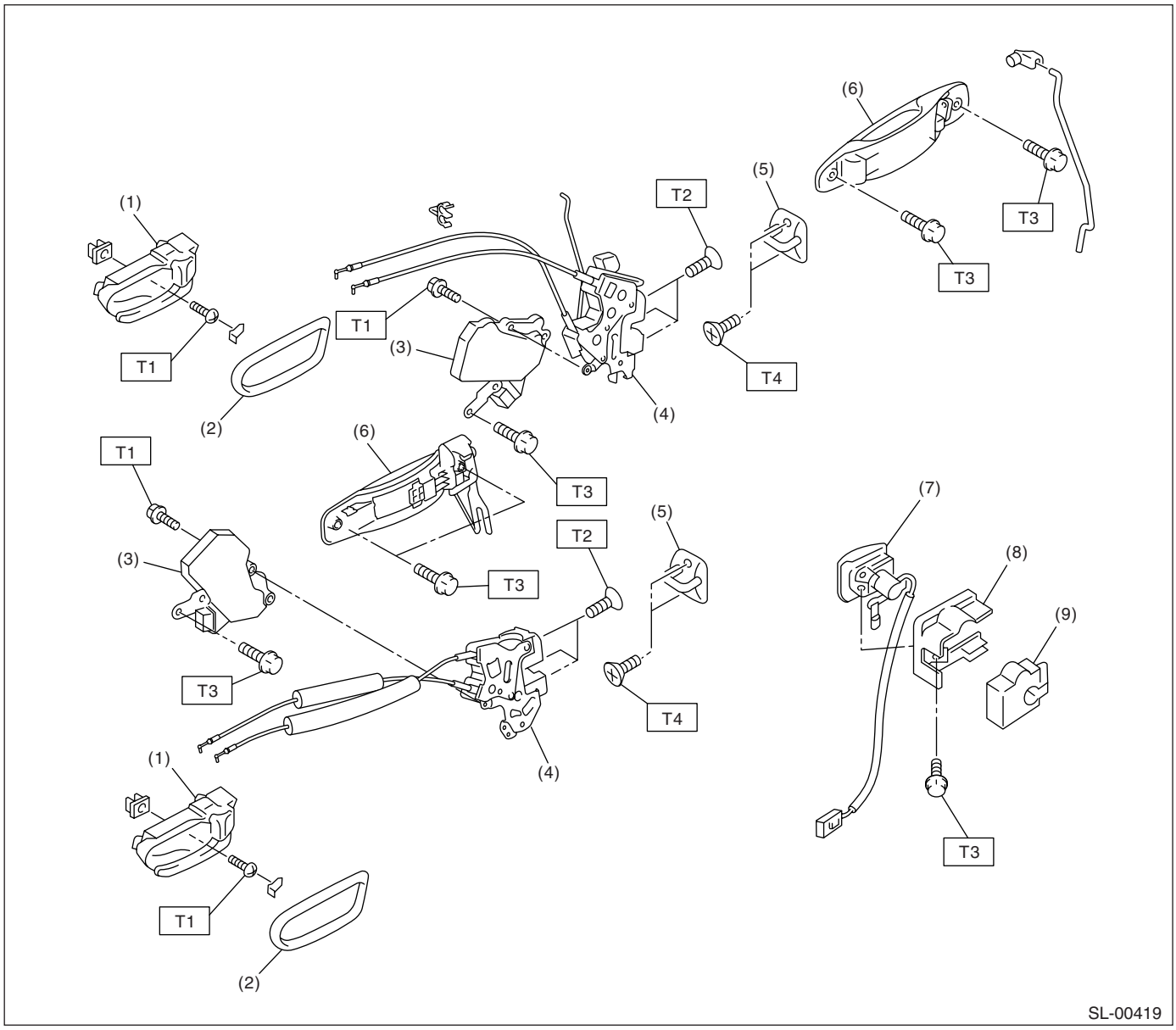
- Without double lock



(1) Inner remote ASSY
(2) Inner remote cover
(3) Auto-door lock actuator
(4) Door latch
(5) Striker
(6) Door outer handle
(7) Key cylinder

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.5 (0.66, 4.8)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13)
T4: 1.5 (0.15, 1.1)

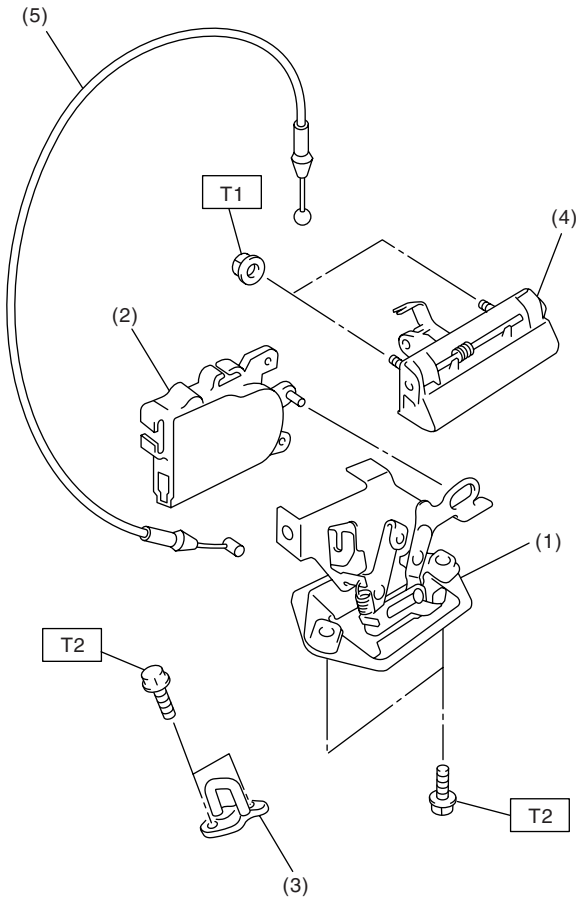
- With double lock



(1) Inner remote ASSY
(2) Inner remote cover
(3) Auto-door lock actuator
(4) Door latch
(5) Striker
(6) Door outer handle
(7) Key cylinder (switch)
(8) Key cylinder retainer
(9) Key cylinder retainer cover

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.5 (0.15, 1.1)
T2: 6.4 (0.65, 4.7)
T3: 7.4 (0.75, 5.4)
T4: 17.6 (1.8, 13.0)

2. REAR GATE LOCK

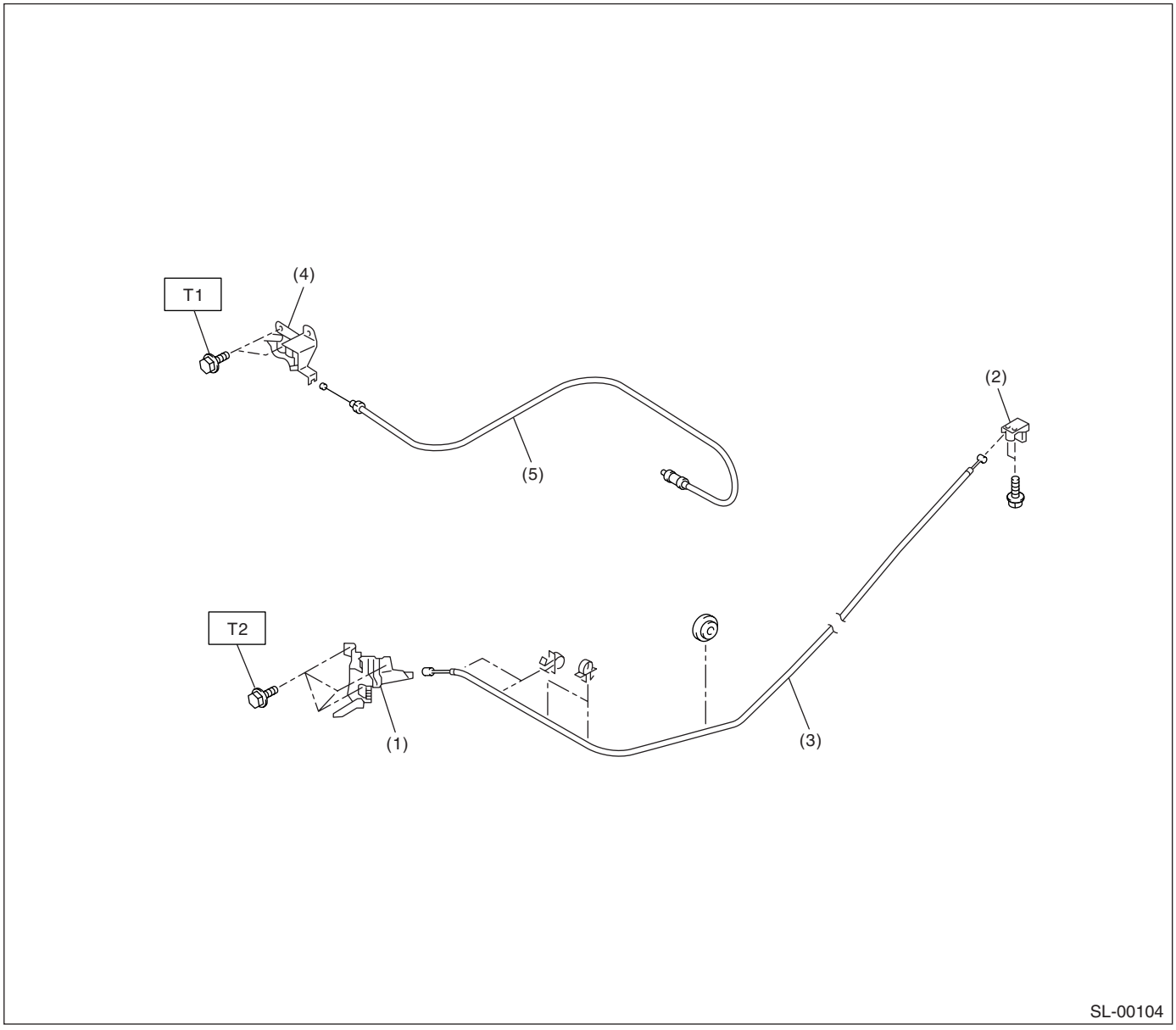


SL-00002

(1) Rear gate latch ASSY
(2) Rear gate actuator
(3) Striker
(4) Rear gate outer handle
(5) Cable

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.5, 18.1)

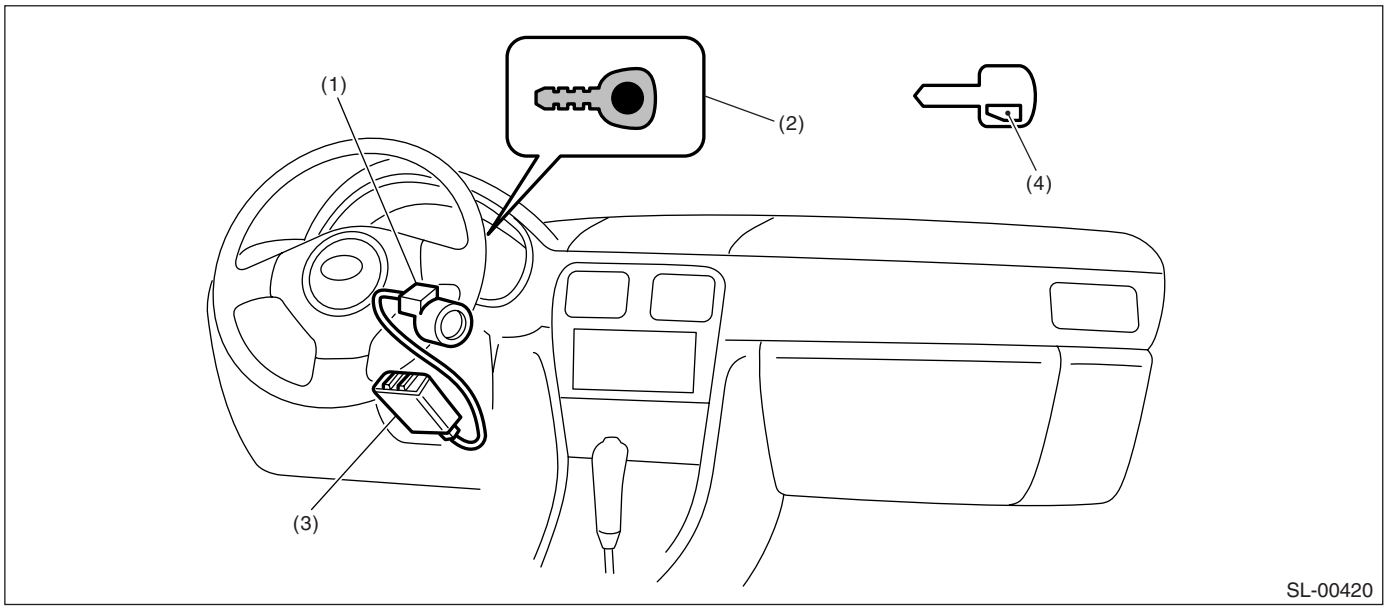
3. HOOD LOCK AND REMOTE OPENERS



(1) Hood lock ASSY
(2) Lever ASSY
(3) Hood cable ASSY
(4) Pull handle ASSY
(5) Fuel flap cable ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 25)

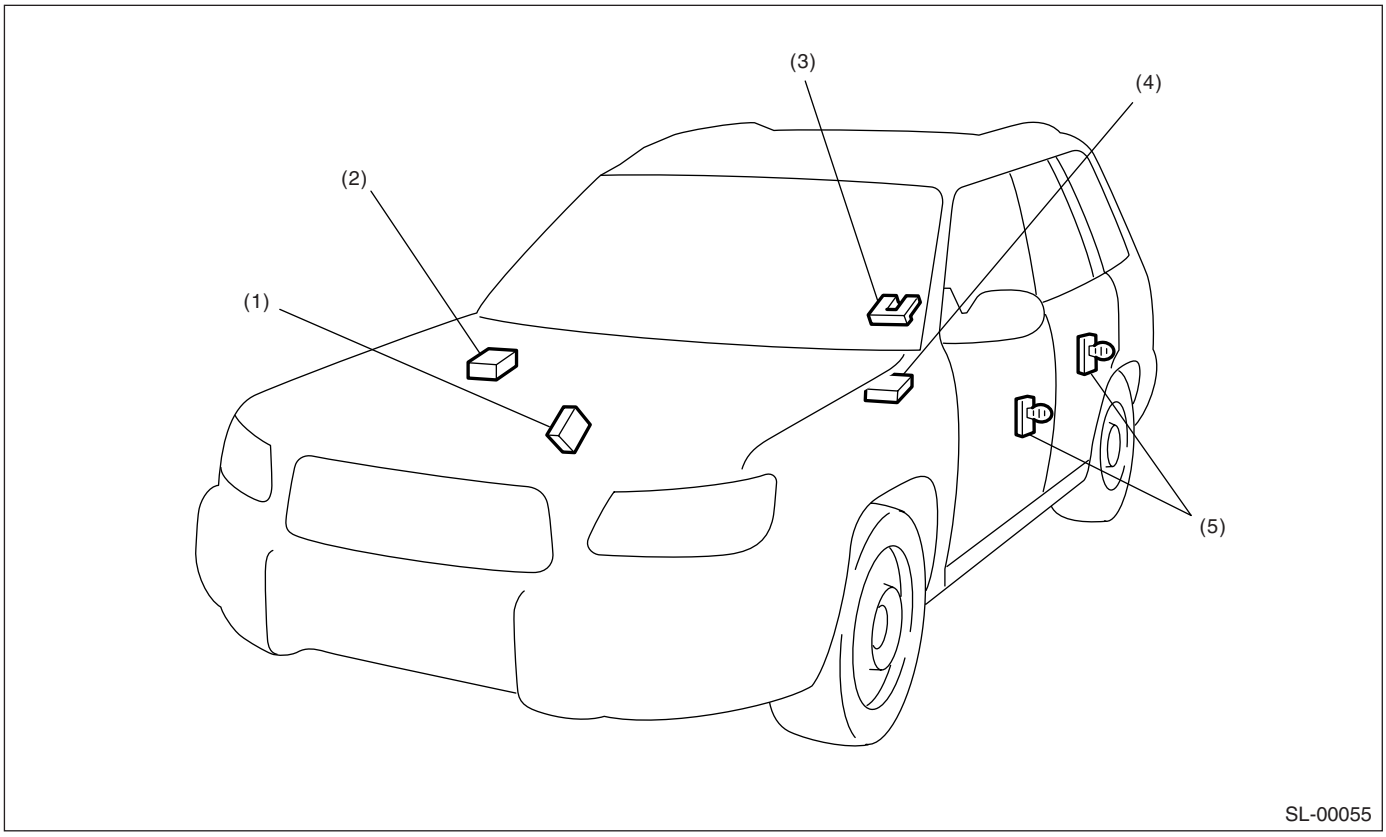
4. IMMOBILIZER SYSTEM



(1) Antenna
(2) Immobilizer indicator light (LED bulb)
(3) Immobilizer control unit (IMM ECU)
(4) Transponder

NOTE:
IMM ECM location for RHD model is symmetrically opposite.

5. KEYLESS ENTRY SYSTEM



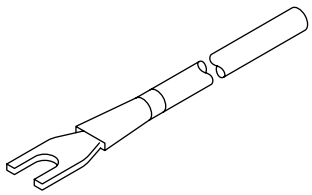
(1) Double lock module (with double lock)
(2) Keyless entry control module (LHD model)
(3) Rear gate latch switch
(4) Keyless entry control module (RHD model)
(5) Door switch

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the ground cable from battery. When repairing radio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting the ground cable from battery. Otherwise, these contents are cancelled upon disconnection.
• Reassemble parts in the reverse order of disassembly procedure unless otherwise indicated.
• Adjust parts to specifications contained in this manual if so designated.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure all functional parts operate smoothly.
• Airbag system wiring harness is routed near the electrical parts and switch.
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the ignition key cylinder.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925580000	925580000	PULLER	Used for removing trim clip.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Drill	Used for replacing ignition key lock.

2. Door Lock Control System

A: WIRING DIAGRAM

1. DOOR LOCK CONTROL

<Ref. to WI-290, WIRING DIAGRAM, Keyless Entry System.>

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-10, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for keyless entry control module (Model without double lock) or double lock module (Model with double lock).	<Ref. to SL-10, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-11, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and the circuit.	<Ref. to SL-12, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The door lock switch does not operate.	Check the door lock switch and the circuit.	<Ref. to SL-11, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and the circuit.	<Ref. to SL-12, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The key cylinder lock switch does not operate. (with double lock)	Check the key cylinder lock switch and circuit.	<Ref. to SL-12, CHECK KEY CYLINDER LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
The double lock does not operate. (Model with double lock)	Check the door lock actuator (double lock) and circuit.	<Ref. to SL-13, CHECK DOOR LOCK ACTUATOR (DOUBLE LOCK) AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

Step		Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box) and No.3 (in the Fuse & relay box).	In the fuse blown out?	Replace the fuse with a new one.	Check the power supply and ground circuit. <Ref. to SL-10, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step		Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the keyless entry control module or double lock module harness connector. 2) Measure the voltage between the harness connector terminal and chassis ground. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 5, 16 (+) — Chassis ground (−):*** ***Model with double lock:*** ***(B324) No. 7, 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits or shorts between the keyless entry control module or double lock module and the fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 6, 14 — Chassis ground:*** ***Model with double lock:*** ***(B324) No. 9 — Chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit is OK.	Repair the harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK DOOR LOCK SWITCH CIRCUIT.** 1) Disconnect the keyless entry control module or double lock module harness connector. 2) Measure the resistance between the harness connector terminal and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 10 — Chassis ground:*** ***Model with double lock:*** ***(B325) No. 7 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR LOCK SWITCH CIRCUIT.** Measure the resistance between the harness connector terminal and chassis ground when the door lock switch is moved to UNLOCK. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 8 — Chassis ground:*** ***Model with double lock:*** ***(B325) No. 4 — Chassis ground:***	Is the resistance less than 10 Ω?	The door lock switch is OK.	Go to step **3.**
3	**CHECK DOOR LOCK SWITCH.** 1) Disconnect the door lock switch harness connector. 2) Measure the resistance between the door lock switch terminals when moving the door lock switch to LOCK. ***Connector & terminal*** ***LHD model:*** ***(D7) No. 5 — No. 9*** ***RHD model:*** ***(D7) No. 15 — Switch ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the door lock switch.
4	**CHECK DOOR LOCK SWITCH.** Measure the resistance between the door lock switch terminals when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***LHD model:*** ***(D7) No. 5 — No. 8*** ***RHD model:*** ***(D7) No. 16 — Switch ground:***	Is the resistance less than 1 Ω?	Check the harness for open circuits or shorts between the keyless entry control module or double lock module and the door lock switch.	Replace the door lock switch.

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of keyless entry control module or double lock module and chassis ground when moving the door lock switch to LOCK. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 18 (+) — Chassis ground (–):*** ***Model with double lock:*** ***(B324) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the keyless entry control module or double lock module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the harness connector terminal of keyless entry control module or double lock module and chassis ground when moving the door lock switch to UNLOCK. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 17 (+) — Chassis ground (–):*** ***Model with double lock:*** ***(B324) No. 5 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Replace the keyless entry control module or double lock module.
3	**CHECK DOOR LOCK ACTUATOR.** Check the door lock actuator. Front door lock actuator: <Ref. to SL-25, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-29, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-32, Rear Gate Latch Lock Actuator.>	Is the door lock actuator OK?	Check the harness for open circuits or shorts between the keyless entry control module or double lock module and the door lock actuator.	Replace the door lock actuator.

6. CHECK KEY CYLINDER LOCK SWITCH AND CIRCUIT

	Step	Check	Yes	No
1	**CHECK KEY CYLINDER LOCK SWITCH CIRCUIT.** 1) Disconnect the double lock module harness connector. 2) Measure the resistance between harness connector terminal and chassis ground when turning the key cylinder lock switch to lock position. ***Connector & terminal*** ***(B325) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **2.**	Go to step **3.**
2	**CHECK KEY CYLINDER LOCK SWITCH CIRCUIT.** Measure the resistance between harness connector terminal and chassis ground when turning the key cylinder lock switch to unlock position. ***Connector & terminal*** ***(B325) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Key cylinder lock switch is normal.	Go to step **3.**

	Step	Check	Yes	No
3	**CHECK KEY CYLINDER LOCK SWITCH.** 1) Disconnect the key cylinder lock switch connector. 2) Measure the resistance between key cylinder lock switch terminals when turning the key cylinder lock switch to lock position. ***Terminals*** ***No. 1 — No. 2***	Is the resistance less than 1 Ω?	Go to step **4.**	Replace the key cylinder lock switch.
4	**CHECK KEY CYLINDER LOCK SWITCH.** Measure the resistance between key cylinder lock switch terminals when turning the key cylinder lock switch to unlock position. ***Terminals*** ***No. 2 — No. 3***	Is the resistance less than 1 Ω?	Check the harness for open or short circuits between double lock module and key cylinder lock switch.	Replace the key cylinder lock switch.

7. CHECK DOOR LOCK ACTUATOR (DOUBLE LOCK) AND CIRCUIT

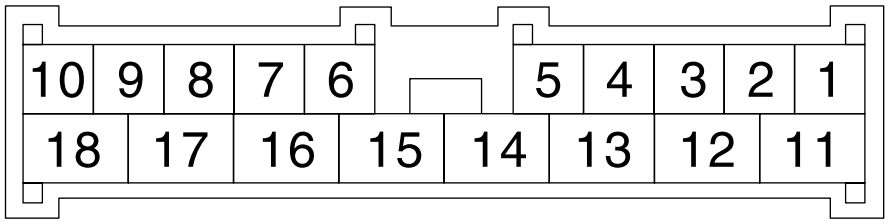
	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the resistance between double lock module harness connector terminal and chassis ground when turning the key cylinder lock switch to lock position. ***Connector & terminal*** ***(B324) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the double lock module.
2	**CHECK OUTPUT SIGNAL.** Measure the resistance between double lock module harness connector terminal and chassis ground when turning the key cylinder lock switch to unlock position. ***Connector & terminal*** ***(B324) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Replace the double lock module.
3	**CHECK DOOR LOCK ACTUATOR.** Check door lock actuator. Front door lock actuator: <Ref. to SL-25, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-29, Rear Door Lock Actuator.>	Is the door lock actuator normal?	Check the harness for open or short circuits between double lock module and door lock actuator.	Replace the door lock actuator.

3. Keyless Entry System

A: WIRING DIAGRAM

<Ref. to WI-290, WIRING DIAGRAM**, Keyless Entry System.>**

B: ELECTRICAL SPECIFICATION



SL-00036

Content	Terminal No.	Measuring condition
Key warning switch	1 (INPUT)	Battery voltage is present when inserting the key into ignition switch.
Registration connector	2 (INPUT)	0 V is present when connecting the registration connector.
Door switch	3 (INPUT)	0 V is present when any door is open.
Power supply	5	Battery voltage is constantly present.
Empty	6	—
Empty	7	—
Door lock switch (Unlock)	8 (INPUT)	0 V is present when the door lock switch is turned to unlock position.
Empty	9	—
Door lock switch (Lock)	10 (INPUT)	0 V is present when the door lock switch is turned to lock position.
Room light/Ignition switch illumination	11 (OUTPUT)	• 0 V is present when pressing the transmitter OPEN button. • 0 V is present when any door is open.
Turn signal light (Left)	12 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN or LOCK button.
Turn signal light (Right)	13 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN or LOCK button.
Ground	14	0 V is constantly present.
Power supply (Hazard light)	15	Battery voltage is constantly present.
Power supply	16	Battery voltage is constantly present.
Door, rear gate lock actuator (Model without double lock) or double lock module (Model with double lock)	17 (OUTPUT)	Battery voltage is present when pressing the transmitter OPEN button.
Door, rear gate lock actuator (Model without double lock) or double lock module (Model with double lock)	18 (OUTPUT)	Battery voltage is present when pressing the transmitter LOCK button.

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of keyless entry system operate.	1. Check the keyless transmitter battery.	<Ref. to SL-16, CHECK KEYLESS TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-16, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-17, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Unit.>
The keyless transmitter cannot be registered.	1. Check the keyless transmitter battery.	<Ref. to SL-16, CHECK KEYLESS TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the registration connector circuit.	<Ref. to SL-17, CHECK REGISTRATION CONNECTOR CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Check the door lock switch and circuit.	<Ref. to SL-18, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Unit.>
The door lock or unlock does not operate. NOTE: If the door lock control system does not operate when using the door lock switch, check the door lock control system. <Ref. to SL-9, INSPECTION, Door Lock Control System.>	1. Check the keyless transmitter battery.	<Ref. to SL-16, CHECK KEYLESS TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Make sure the registration connector is not connected.	Make sure the registration connector is not connected because keyless entry system does not operate during the registration connector connected.
	3. Check the key warning switch.	<Ref. to SL-19, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the door switch.	<Ref. to SL-18, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	5. Check output signal to double lock module. (Model with double lock)	<Ref. to SL-21, CHECK OUTPUT SIGNAL TO DOUBLE LOCK MODULE, INSPECTION, Keyless Entry System.>
	6. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Unit.>
The hazard light does not operate.	1. Check the hazard light operation.	<Ref. to SL-20, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Replace the keyless entry control module.	<Ref. to SL-39, Keyless Entry Control Unit.>

Symptom	Repair order	Reference
The room light and ignition switch illumination operation does not activate.	1. Check the room light operation.	<Ref. to SL-20, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Check the ignition switch illumination circuit.	<Ref. to SL-21, CHECK IGNITION SWITCH ILLUMINATION CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module. (without double lock)	<Ref. to SL-39, Keyless Entry Control Unit.>
	4. Replace the double lock module. (Model with double lock)	<Ref. to SL-40, Double Lock Module.>

2. CHECK KEYLESS TRANSMITTER BATTERY

	Step	Check	Yes	No
1	**CHECK KEYLESS TRANSMITTER BATTERY.** 1) Remove the battery from keyless transmitter. <Ref. to SL-41, REMOVAL, Keyless Transmitter.> 2) Check the battery voltage. <Ref. to SL-41, INSPECTION, Keyless Transmitter.> NOTE: If the keyless transmitter battery voltage is 2.5 V or less, the range of transmission becomes very short.	Is the voltage more than 2.5 V?	If further inspection is necessary, refer to "SYMPTOM CHART". <Ref. to SL-15, SYMPTOM CHART, INSPECTION, Keyless Entry System.>	Replace the keyless transmitter battery.

3. CHECK FUSE

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 2 (in the main fuse box), No. 3 (in the fuse and relay box) and SBF-6 (in the main fuse box)	Is the fuse blown out?	Replace the fuse with a new one.	Check the power supply and ground circuit. <Ref. to SL-17, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>

4. CHECK POWER SUPPLY AND GROUND CIRCUIT

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 5, No. 16 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuits or shorts between keyless entry control module and fuse.
2	**CHECK GROUND CIRCUIT.** Measure the resistance between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 6, No. 14 — Chassis ground:***	Is the resistance less than 10 Ω?	The power supply and ground circuit are OK.	Repair the harness.

5. CHECK REGISTRATION CONNECTOR CIRCUIT

	Step	Check	Yes	No
1	**REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION** 1) Disconnect the registration connector. 2) Measure the voltage between keyless entry control module harness connector and chassis ground. ***Connector & terminal*** ***(B176) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and (or) connector.
2	**REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION** 1) Connect the registration connector. 2) Measure the voltage between keyless entry control module harness connector and chassis ground. ***Connector & terminal*** ***(B176) No. 2 (+) — Chassis ground (–):***	Is the voltage less than 0 V?	Registration connector circuit is OK.	Repair the harness and (or) connector.

6. CHECK DOOR SWITCH

	Step	Check	Yes	No
1	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between keyless entry control module harness connector terminal and chassis ground. NOTE: The voltage is not 0 V due to noise, etc. ***Connector & terminal*** ***(B176) No. 3 (+) — Chassis ground (−):***	Is the voltage approx. less than 0 V when any one of the doors or rear gate is opened?	Go to step **2.**	Go to step **3.**
2	**CHECK DOOR SWITCH CIRCUIT.** Measure the voltage between keyless entry control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V when all doors and rear gate are closed?	The door switch is OK.	Go to step **3.**
3	**CHECK DOOR SWITCH.** 1) Disconnect the door switch harness connector. 2) Measure the resistance between door switch terminals. ***Terminal*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch No. 1 — No. 2:***	Is the resistance more than 1 MΩ when the door switch is pressed?	Go to step **4.**	Replace the door switch.
4	**CHECK DOOR SWITCH.** Measure the resistance between door switch terminals. ***Terminal*** ***Door switch No. 1 — No. 3:*** ***Rear gate latch switch No. 1 — No. 2:***	Is the resistance less than 1 Ω when the door switch is released?	Check the harness for open circuits or shorts between keyless entry control module and door switch.	Replace the door switch.

7. CHECK KEY WARNING SWITCH

	Step	Check	Yes	No
1	**CHECK FUSE.** Remove and visually check the fuse No. 6 (in the main fuse box).	Is the fuse blown out?	Go to step **2.**	Replace the fuse with a new one.
2	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Disconnect the keyless entry control module harness connector. 2) Insert the key into ignition switch. (LOCK position) 3) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B176) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK KEY WARNING SWITCH CIRCUIT.** 1) Remove the key from ignition switch. 2) Measure the voltage between harness connector terminal and chassis ground. NOTE: The voltage is not 0 V due to noise, etc. ***Connector & terminal*** ***(B176) No. 1 (+) — Chassis ground (−):***	Is the voltage approx. less than 0 V?	The key warning switch is OK.	Go to step **4.**
4	**CHECK KEY WARNING SWITCH.** 1) Disconnect the key warning switch harness connector. 2) Insert the key into ignition switch. (LOCK position) 3) Measure the resistance between key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **5.**	Replace the key warning switch.
5	**CHECK KEY WARNING SWITCH.** 1) Remove the key from ignition switch. 2) Measure the resistance between key warning switch terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance less than 1 MΩ?	Check the following: • Harness for open circuits or shorts between the key warning switch and fuse • Harness for open circuits and shorts between the keyless entry control module and key warning switch	Replace the key warning switch.

8. CHECK HAZARD LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK HAZARD LIGHT OPERATION.** Make sure the hazard light blinks when hazard switch is turned ON.	Does the hazard light blink?	Go to step **2.**	Check the hazard light circuit.
2	**CHECK OUTPUT SIGNAL.** 1) Remove the key from ignition switch. 2) Close all doors and rear gate. 3) Measure the voltage between keyless entry control module harness connector terminal and chassis ground when LOCK or OPEN button of keyless transmitter is pressed. ***Connector & terminal*** ***(B176) No. 12, No. 13 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check the harness for open or short between keyless entry control module and turn signal lights.	Replace the keyless entry control module.

9. CHECK ROOM LIGHT OPERATION

	Step	Check	Yes	No
1	**CHECK ROOM LIGHT OPERATION.** Make sure the room light illuminates when the room light switch is turned ON.	Does the room light illuminate?	Go to step **2.**	Check the room light circuit.
2	**CHECK HARNESS BETWEEN ROOM LIGHT AND KEYLESS ENTRY CONTROL MODULE (MODEL WITHOUT DOUBLE LOCK) OR DOUBLE LOCK MODULE (MODEL WITH DOUBLE LOCK).** 1) Disconnect the keyless entry control module or double lock module harness connector and room light harness connector. 2) Measure the resistance between keyless entry control module or double lock module harness connector terminal and room light harness connector terminal. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 11 — (R52) No. 2:*** ***Model with double lock:*** ***(B325) No. 1 — (R52) No. 2:***	Is the resistance less than 10 Ω?	The room light operation circuit is OK.	Check the harness for open circuits or shorts between keyless entry control module (Model without double lock) or double lock module (Model with double lock) and room light.

10.CHECK IGNITION SWITCH ILLUMINATION CIRCUIT

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH ILLUMINATION POWER SUPPLY.** 1) Disconnect the ignition switch illumination harness connector. 2) Measure the voltage between ignition switch illumination harness connector terminal and chassis ground. ***Connector & terminal*** ***(B224) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open circuit or shorts between ignition switch illumination and fuse.
2	**CHECK HARNESS BETWEEN IGNITION SWITCH ILLUMINATION AND KEYLESS ENTRY CONTROL MODULE (MODEL WITHOUT DOUBLE LOCK) OR DOUBLE LOCK MODULE (MODEL WITH DOUBLE LOCK).** 1) Disconnect the keyless entry control module or double lock module harness connector. 2) Measure the resistance between keyless entry or double lock module harness connector terminal and ignition switch illumination harness connector. ***Connector & terminal*** ***Model without double lock:*** ***(B176) No. 11 — (R224) No. 1:*** ***Model with double lock:*** ***(B325) No. 1 — (R224) No. 2:***	Is the resistance less than 10 Ω?	Check the ignition switch illumination. If NG, replace the ignition switch illumination.	Repair the harness.

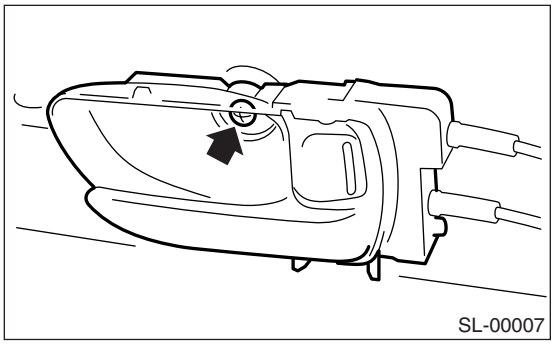
11.CHECK OUTPUT SIGNAL TO DOUBLE LOCK MODULE

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when OPEN button of keyless transmitter is pressed. ***Connector & terminal*** ***(B176) No. 17 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	Replace the keyless entry control module.
2	**CHECK OUTPUT SIGNAL.** Measure the voltage between the keyless entry control module harness connector terminal and chassis ground when LOCK button of keyless keyless transmitter is pressed. ***Connector & terminal*** ***(B176) No. 18 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Replace the double lock module.	Check the harness for open circuit or shorts between the keyless entry control module and double lock module.

4. Front Inner Remote

A: REMOVAL

1) Remove the door trim. **<Ref. to EI-35,** REMOVAL**, Front Door Trim.>**
2) Remove the sealing cover. **<Ref. to EB-13,** REMOVAL**, Front Sealing Cover.>**
3) Remove a screw and two cables.
4) Remove the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and cable work smoothly.

NOTE:
• If the remote handle is metalclad type, make sure that grease is sufficiently applied to the cable connection portion.
• If the grease is insufficient, apply additional grease to the cable connection portion before connecting the cable.

5. Front Outer Handle

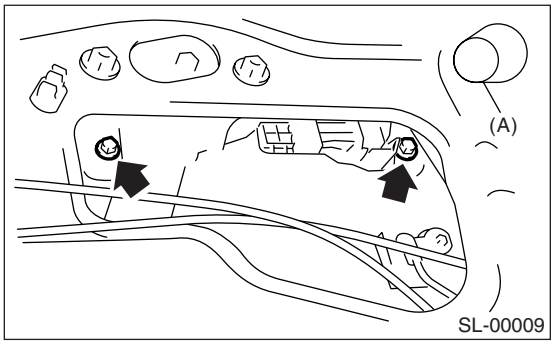
A: REMOVAL

1) Remove the door trim. **<Ref. to EI-35,** REMOVAL**, Front Door Trim.>**

CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

2) Remove the sealing cover. **<Ref. to EB-13,** REMOVAL**, Front Sealing Cover.>**
3) Remove the front inner remote. **<Ref. to SL-22,** REMOVAL**, Front Inner Remote.>**
4) Remove the cable from cable holder to make cable move freely.
5) Remove two bolts and rod clamp, and then remove the front outer handle.

NOTE:
The rear bolt can be removed from service hole (A) of inner panel by adjusting the glass position.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

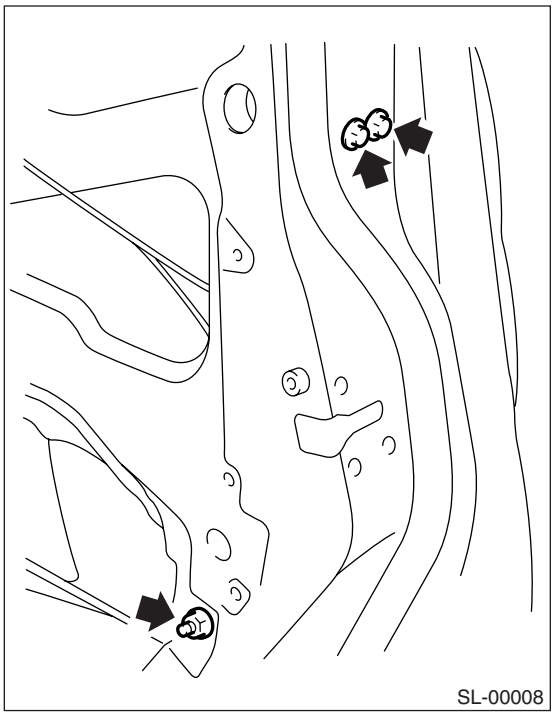
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and rod work smoothly.

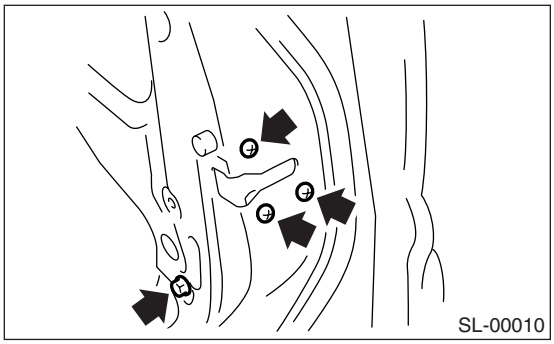
6. Front Door Latch and Door Lock Actuator Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. **<Ref. to EI-35,** REMOVAL**, Front Door Trim.>**
3) Remove the sealing cover. **<Ref. to EB-13,** REMOVAL**, Front Sealing Cover.>**
4) Remove the front inner remote. **<Ref. to SL-22,** REMOVAL**, Front Inner Remote.>**
5) Remove two bolts and nut, and then remove the guide rail.



6) Remove the three screws and bolt.



7) Remove the front door latch assembly, and then disconnect the connector.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

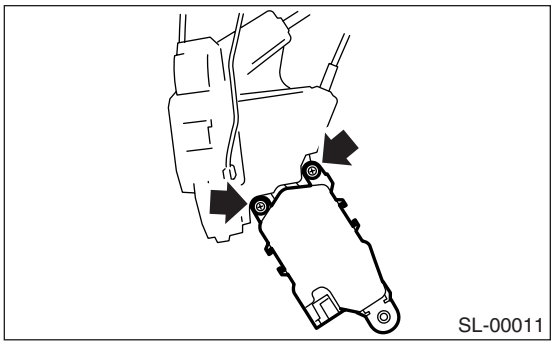
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever, rod and cable work smoothly.

7. Front Door Lock Actuator

A: REMOVAL

1) Remove the front door latch assembly. **<Ref. to SL-24,** REMOVAL**, Front Door Latch and Door Lock Actuator Assembly.>**
2) Loosen the two screws to remove front door lock actuator.


SL-00011

B: INSTALLATION

Install in the reverse order of removal.

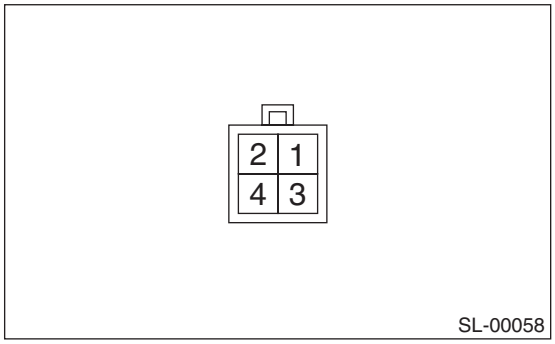
NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.
If NG, replace the door lock actuator.

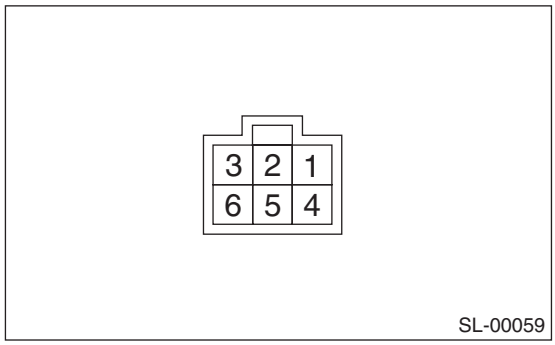
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 2 (–)	Locked → Unlocked

1. MODEL WITHOUT DOUBLE LOCK:



SL-00058

2. MODEL WITH DOUBLE LOCK:



SL-00059

DOOR ACTUATOR RH:

Terminal No.	Actuator operation
No. 1 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 1 (–)	Locked → Unlocked
No. 6 (+) and No. 3 (–)	Double lock released → Double lock set
No. 3 (+) and No. 6 (–)	Double lock set → Double lock released

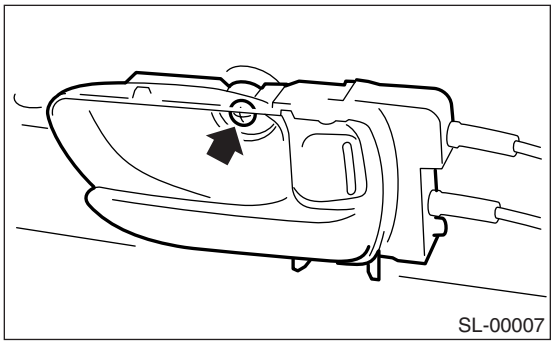
DOOR ACTUATOR LH:

Terminal No.	Actuator operation
No. 6 (+) and No. 3 (–)	Unlocked → Locked
No. 3 (+) and No. 6 (–)	Locked → Unlocked
No. 1 (+) and No. 4 (–)	Double lock released → Double lock set
No. 4 (+) and No. 1 (–)	Double lock set → Double lock released

8. Rear Inner Remote

A: REMOVAL

1) Remove the rear door trim. **<Ref. to EI-36,** REMOVAL**, Rear Door Trim.>**
2) Remove the sealing cover. **<Ref. to EB-16,** REMOVAL, Rear Sealing Cover.>
3) Remove a screw and two cables.
4) Remove the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the inner remote works properly after installation.

C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and cable work smoothly.
3) Make sure the child safety lock on rear doors work properly, when applicable.

NOTE:
• If the remote handle is metalclad type, make sure that grease is sufficiently applied to the cable connection portion.
• If the grease is insufficient, apply additional grease to the cable connection portion before connecting the cable.

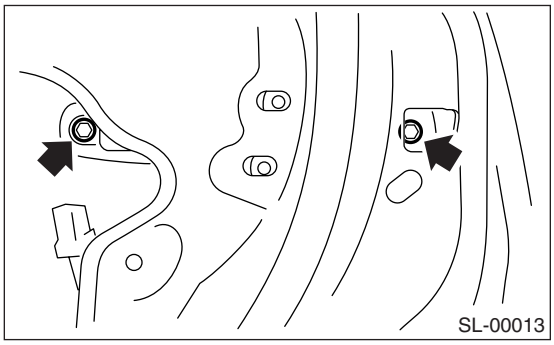
9. Rear Outer Handle

A: REMOVAL

1) Remove the rear door trim. **<Ref. to EI-36,** REMOVAL**, Rear Door Trim.>**

CAUTION:
Do not use excessive force to remove the door panel. This will deform it.

2) Remove the sealing cover. **<Ref. to EB-16,** REMOVAL, Rear Sealing Cover.>
3) Remove the rear inner remote. **<Ref. to SL-26,** REMOVAL**, Rear Inner Remote.>**
4) Remove the rear door latch assembly. **<Ref. to SL-28,** REMOVAL**, Rear Door Latch and Door Lock Actuator Assembly.>**
5) Remove two bolts, and then remove the rear outer handle.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

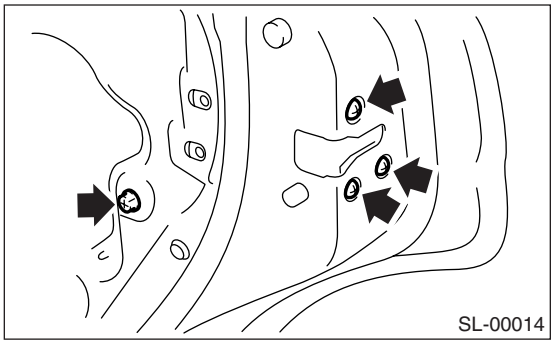
C: INSPECTION

1) Make sure the resinous lever is not deformed, damaged or cracked.
2) Make sure the resinous lever operate smoothly.

10.Rear Door Latch and Door Lock Actuator Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. **<Ref. to EI-36,** REMOVAL**, Rear Door Trim.>**
3) Remove the sealing cover. **<Ref. to EB-16,** REMOVAL, Rear Sealing Cover.>
4) Remove the rear inner remote. **<Ref. to SL-26,** REMOVAL**, Rear Inner Remote.>**
5) Remove the three screws and bolt.



6) Remove the rear door latch assembly, and then disconnect the connector.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

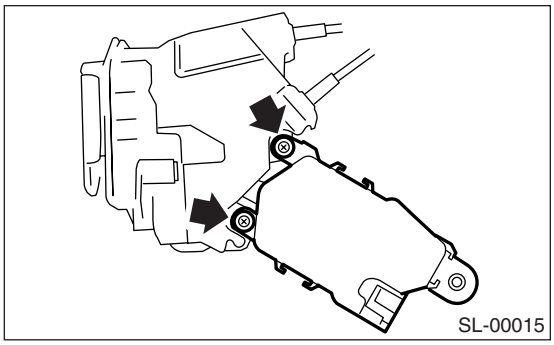
C: INSPECTION

1) Make sure the cable is not deformed.
2) Make sure the lever and cable work smoothly.

11.Rear Door Lock Actuator

A: REMOVAL

1) Remove the rear door latch assembly. **<Ref. to SL-28,** REMOVAL**, Rear Door Latch and Door Lock Actuator Assembly.>**
2) Loosen the two screws to remove rear door lock actuator.


SL-00015

B: INSTALLATION

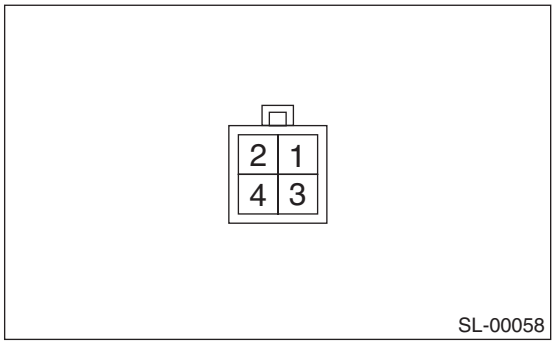
Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.
If NG, replace the door lock actuator.

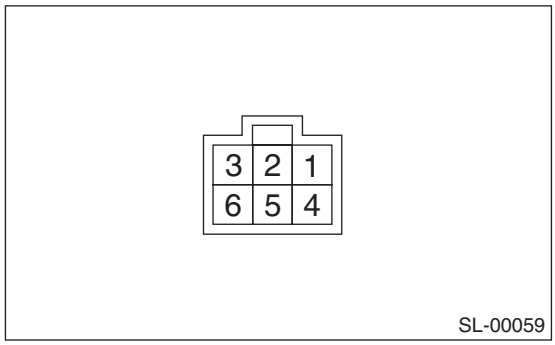
1. MODEL WITHOUT DOUBLE LOCK:



SL-00058

Terminal No.	Actuator operation
No. 2 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 2 (–)	Locked → Unlocked

2. MODEL WITH DOUBLE LOCK:



SL-00059

- DOOR ACTUATOR RH:

Terminal No.	Actuator operation
No. 1 (+) and No. 4 (–)	Unlocked → Locked
No. 4 (+) and No. 1 (–)	Locked → Unlocked
No. 6 (+) and No. 3 (–)	Double lock released → Double lock set
No. 3 (+) and No. 6 (–)	Double lock set → Double lock released

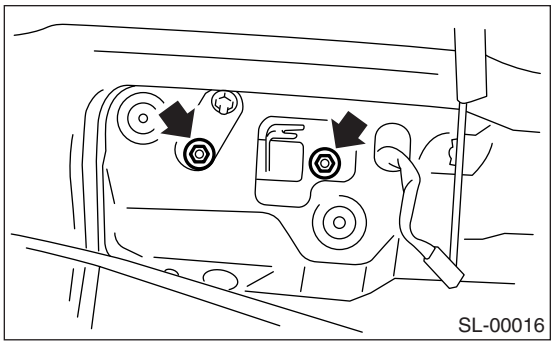
- DOOR ACTUATOR LH:

Terminal No.	Actuator operation
No. 6 (+) and No. 3 (–)	Unlocked → Locked
No. 3 (+) and No. 6 (–)	Locked → Unlocked
No. 1 (+) and No. 4 (–)	Double lock released → Double lock set
No. 4 (+) and No. 1 (–)	Double lock set → Double lock released

12.Rear Gate Outer Handle

A: REMOVAL

1) Remove the rear gate trim. **<Ref. to EI-49,** REMOVAL**, Rear Gate Trim.>**
2) Remove the rear wiper motor assembly.
<Ref. to WW-17, REMOVAL**, Rear Wiper Motor.>**
3) Remove the rear finisher.
4) Remove the cable, and then remove two nuts.



5) Remove the rear gate outer handle.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the outer handle works properly after installation.

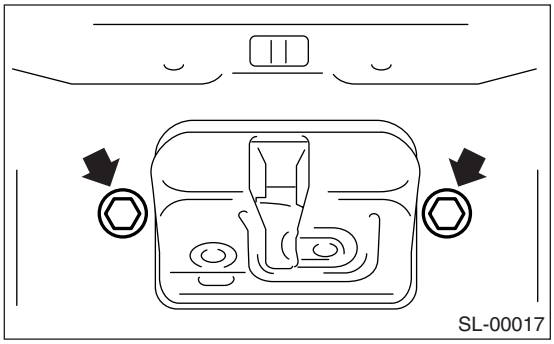
C: INSPECTION

1) Inspect the cable for deformation.
2) Make sure the lever and cable move smoothly.

13.Rear Gate Latch Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear gate trim. **<Ref. to EI-49,** REMOVAL**, Rear Gate Trim.>**
3) Remove two bolts.



4) Remove the rear gate latch assembly, and then disconnect the connector.
5) Remove the rear gate outer handle cable, and then remove the rear gate latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

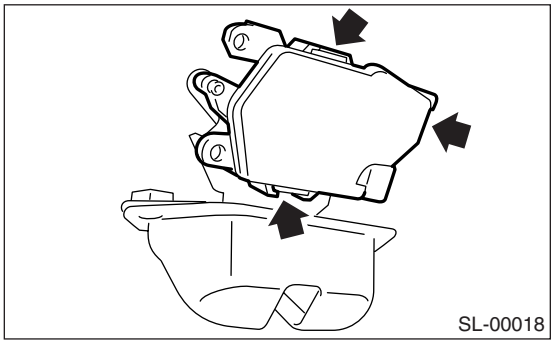
1) Make sure the cable is not deformed.
2) Make sure the lever, cable, rear gate latch switch and door lock operate smoothly.

14.Rear Gate Latch Lock Actuator

A: REMOVAL

1) Remove the rear gate latch assembly. **<Ref. to SL-31,** REMOVAL**, Rear Gate Latch Assembly.>**
2) Remove three pawls, and then remove the rear gate latch lock actuator from rear gate latch assembly.

CAUTION:
Do not use excessive force to remove the rear gate latch lock actuator. The pawl surroundings of rear gate latch assembly will be deformed.



B: INSTALLATION

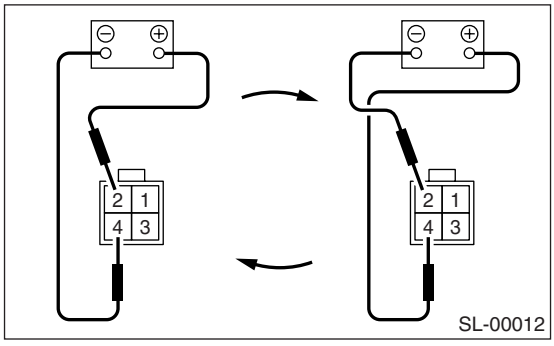
Install in the reverse order of removal.

CAUTION:
Be sure to align the lever groove of rear gate latch assembly and actuator lever.

NOTE:
Make sure the lock works properly after installation.

C: INSPECTION

1) Disconnect the door lock actuator harness connector.
2) Connect the battery to door lock actuator terminals.



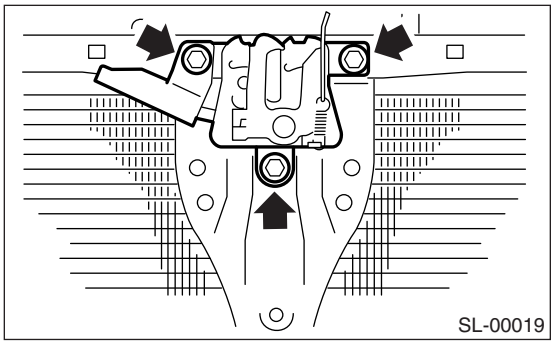
Terminal No.	Actuator operation
No. 4 (+) and No. 2 (–)	Unlocked → Locked
No. 2 (+) and No. 4 (–)	Locked → Unlocked

If NG, replace the rear gate latch lock actuator.

15.Front Hood Lock Assembly

A: REMOVAL

1) Open the hood.
2) Remove the front grille.
3) Remove the bolt. Remove the hood lock assembly.
4) Remove the release cable from lock assembly.



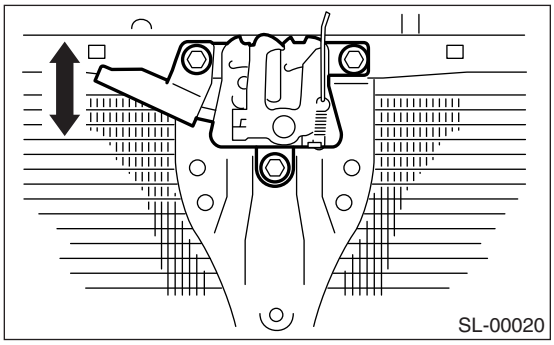
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
- Apply grease to parts that rub.
- Make sure the release cable works properly after installation.

C: ADJUSTMENT

Loosen the bolt. Adjust the lock assembly while moving it up and down.



D: INSPECTION

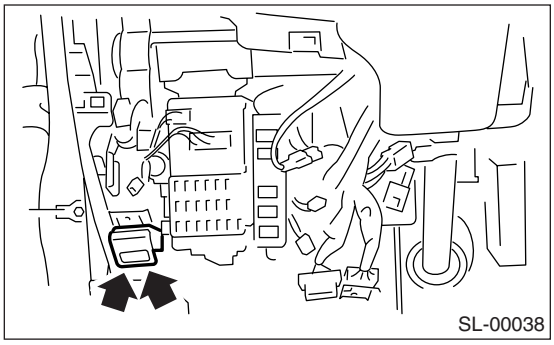
1) Check the striker for bending or abnormal wear.
2) Check the safety lever for improper movement.
3) Check other levers and the spring for rust formation and unsmooth movement.

16.Remote Openers

A: REMOVAL

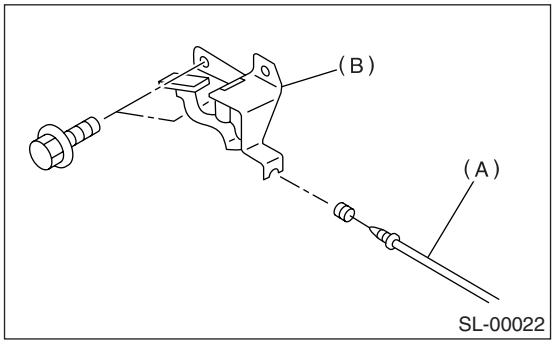
1. HOOD OPENER

1) Remove the front hood lock assembly. **<Ref. to SL-33,** REMOVAL**, Front Hood Lock Assembly.>**
2) Remove the release cable from hood lock.
3) Remove the bolt. Remove the opener lever.


SL-00038

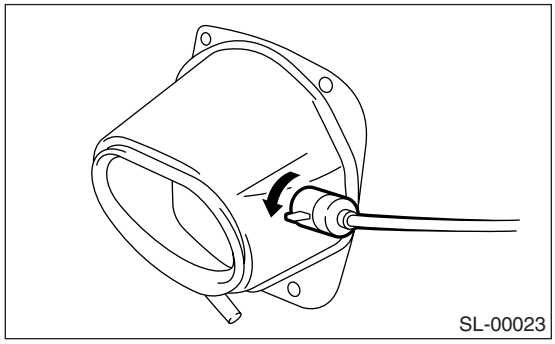
2. FUEL FLAP OPENER

1) Remove the rear seat. **<Ref. to SE-13,** REMOVAL**, Rear Seat.>**
2) Remove the center pillar lower trim and side sill cover. Remove the rear pillar lower trim. Pull back the floor mat.
3) Remove the right rear quarter trim. **<Ref. to EI-46,** REMOVAL**, Rear Quarter Trim.>**
Remove the clip holding the cable.
4) Remove the bolt. Remove the opener pull handle.
5) Remove the cable (A) from opener pull handle (B).



SL-00022

6) Rotate the fuel lock inside the quarter panel to left and remove.


SL-00023

B: INSTALLATION

1. HOOD OPENER

Install in the reverse order of removal.

2. FUEL FLAP OPENER

Install in the reverse order of removal.

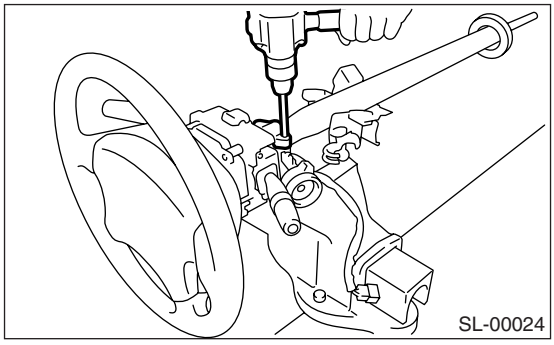
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

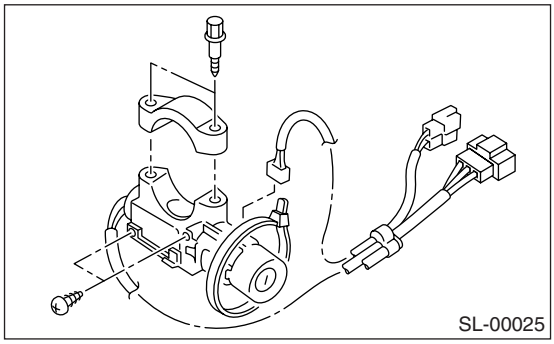
17.Ignition Key Lock

A: REPLACEMENT

1) Remove the ground cable from battery.
2) Remove the steering column. **<Ref. to PS-21,** REMOVAL, Tilt Steering Column.>
3) Secure the steering column in a vise. Remove the bolt with a drill.



4) Remove the ignition key lock.
5) Use a new torn bolt. Tighten the torn bolt to end of thread.



B: INSPECTION

1) Remove the instrument panel lower cover.
2) Remove the lower column cover.
3) Unfasten the holddown clip which secures harness and disconnect the connector of ignition switch from body harness.
4) Turn the ignition key plate to each position and check the continuity between terminals of ignition connector.

Switch position	Terminal No.	Standard
LOCK	—	—
ACC	No. 1 and No. 2	Less than 1 Ω
ON	No. 1 and No. 2 No. 1 and No. 4 No. 2 and No. 4	Less than 1 Ω
ST	No. 1 and No. 3 No. 1 and No. 4 No. 3 and No. 4	Less than 1 Ω

If NG, replace the ignition switch.

18.Key Lock Cylinders

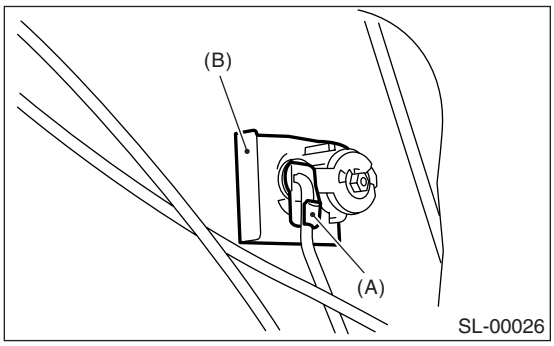
A: REPLACEMENT

1. FRONT DOOR

• MODEL WITHOUT DOUBLE LOCK:

1) Remove the door trim. **<Ref. to EI-35,** REMOVAL**, Front Door Trim.>**
2) Pull back the sealing cover. **<Ref. to EB-16,** REMOVAL, Rear Sealing Cover.>
3) Close the front door glass completely.
4) Remove the rod clamp (A). Remove the lock plate (B). Replace the key cylinder.

NOTE:
Be sure to replace the lock plate (B) with a new one.

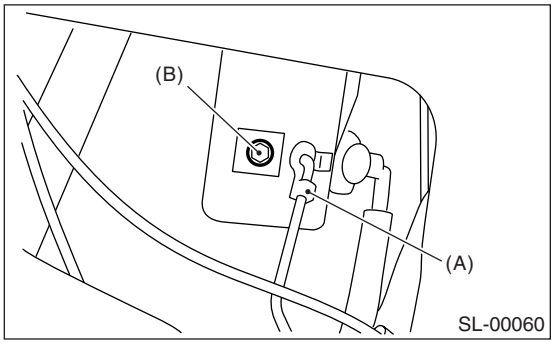


• MODEL WITH DOUBLE LOCK:

1) Remove the door trim. **<Ref. to EI-35,** REMOVAL**, Front Door Trim.>**
2) Remove the sealing cover. **<Ref. to EB-13,** REMOVAL**, Front Sealing Cover.>**
3) Close the front door glass completely.
4) Remove the key cylinder retainer cover, and then remove the rod clamp (A).

CAUTION:
Be sure to replace the key cylinder retainer cover with a new one when removing.

5) Remove the bolt (B) and key cylinder retainer to replace the key cylinder.

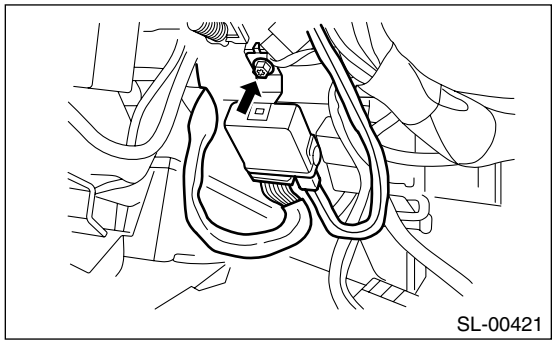


19.Immobilizer Control Unit

A: REMOVAL

NOTE:
• Prepare all registered immobilizer keys for the model with immobilizer.
• When replacing the immobilizer control unit, make a registration of immobilizer. At that time, a new immobilizer key is required. For detailed operation procedure, refer to “IMMOBILIZER REGISTRATION MANUAL”.
• If not replacing the immobilizer control unit, repeat registration of a key used before is not required.
• If not replacing the immobilizer control unit, a maximum of four keys, including the added key, can be registered at the time of key addition.
• The following positions for removal and installation are for LHD models. The positions for RHD models are symmetrically opposite.

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. **<Ref. to EI-40,** REMOVAL, Instrument Panel Assembly.>
3) Disconnect the connector from immobilizer control unit.
4) Remove the immobilizer control unit.



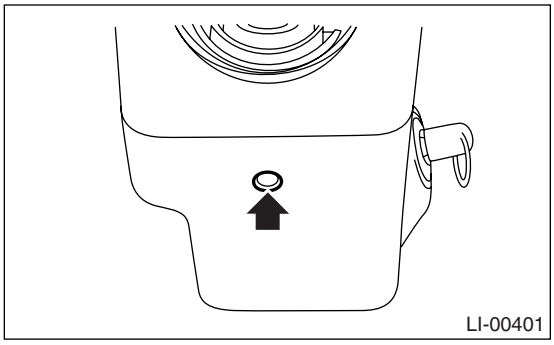
B: INSTALLATION

Install in the reverse order of removal.

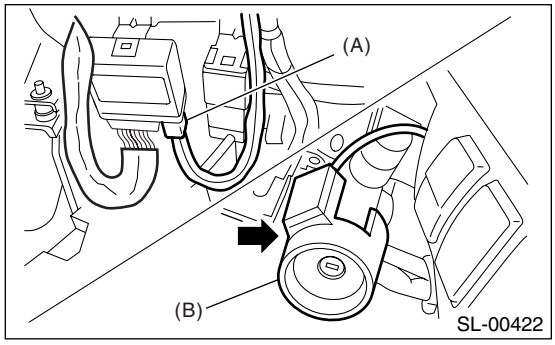
20.Immobilizer Antenna

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. **<Ref. to EI-40,** REMOVAL, Instrument Panel Assembly.>
3) Remove the screws, separate upper column cover and lower column cover.



4) Disconnect the immobilizer antenna connector (A) from immobilizer control unit.
5) Remove the screw, and detach the immobilizer antenna (B).



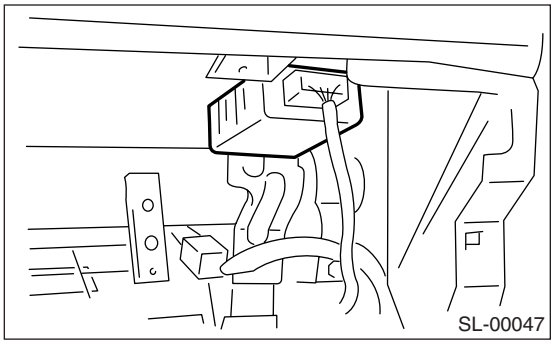
B: INSTALLATION

Install in the reverse order of removal.

21.Keyless Entry Control Unit

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the glove box. **<Ref. to EI-37,** REMOVAL**, Glove Box.>**
3) Remove the nut, and then remove the keyless entry control unit while disconnecting connector.



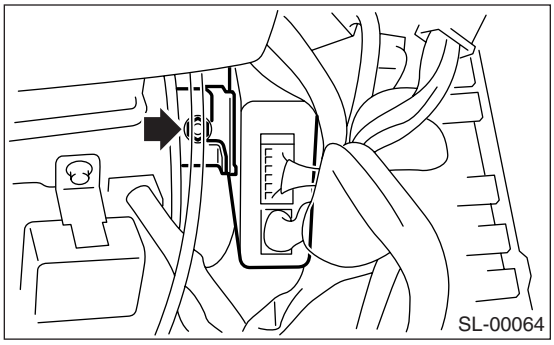
B: INSTALLATION

Install in the reverse order of removal.

22.Double Lock Module

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. **<Ref. to EI-40,** REMOVAL, Instrument Panel Assembly.>
3) Remove the nut, then remove the double lock module while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

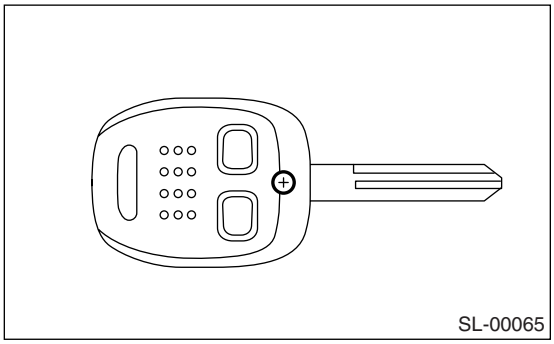
23.Keyless Transmitter

A: REMOVAL

1. KEYLESS TRANSMITTER BATTERY

Remove the battery from keyless transmitter.

NOTE:
To prevent static electricity damage to keyless transmitter printed circuit board, touch the steel area of building with hand to discharge the static electricity carried on body or clothes before disassembling keyless transmitter.



B: INSTALLATION

1. KEYLESS TRANSMITTER BATTERY

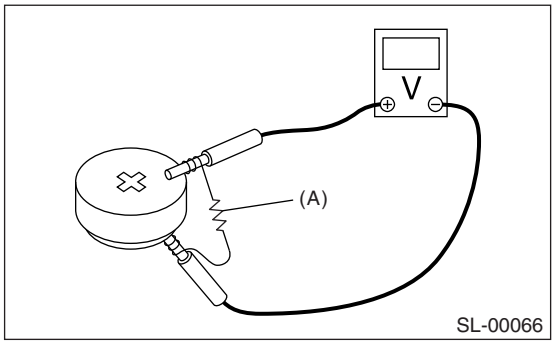
Install in the reverse order of removal.

C: INSPECTION

1. KEYLESS TRANSMITTER BATTERY

Measure the voltage between battery (+) terminal and (–) terminal.

NOTE:
Battery discharge occurs during measurement. Complete the measurement within 5 seconds.



(A) Resistance 300 Ω

Tester connection		Standard
(+)	(–)	
Battery (+) terminal	Battery (–) terminal	2.5 — 3.0 V

If NG, replace the battery. (Use CR1620 or equivalent.)

D: REPLACEMENT

1. KEYLESS TRANSMITTER REGISTRATION

NOTE:
• A maximum of three transmitters can be registered for each individual vehicle.
• When replacing the keyless transmitter (key), registration to immobilizer system is also necessary.

1) Remove the side sill cover at driver's side, then connect the registration connectors at front pillar lower section.
2) Unlock the door lock.
3) Press any button of the keyless transmitter twice while pressing driver's door lock switch to unlock side to be registered.
4) The door lock will automatically lock and unlock in sequence. This indicates the completion of keyless transmitter registration for first keyless transmitter.
5) If the registration of second and third keyless transmitter is now to be carried out, repeat the procedure 3) and 4).
6) Disconnect the registration connectors after the completion of all registration operations. After confirming the operation of door lock using newly registered keyless transmitter(s), reinstall the side sill cover at driver's side.

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

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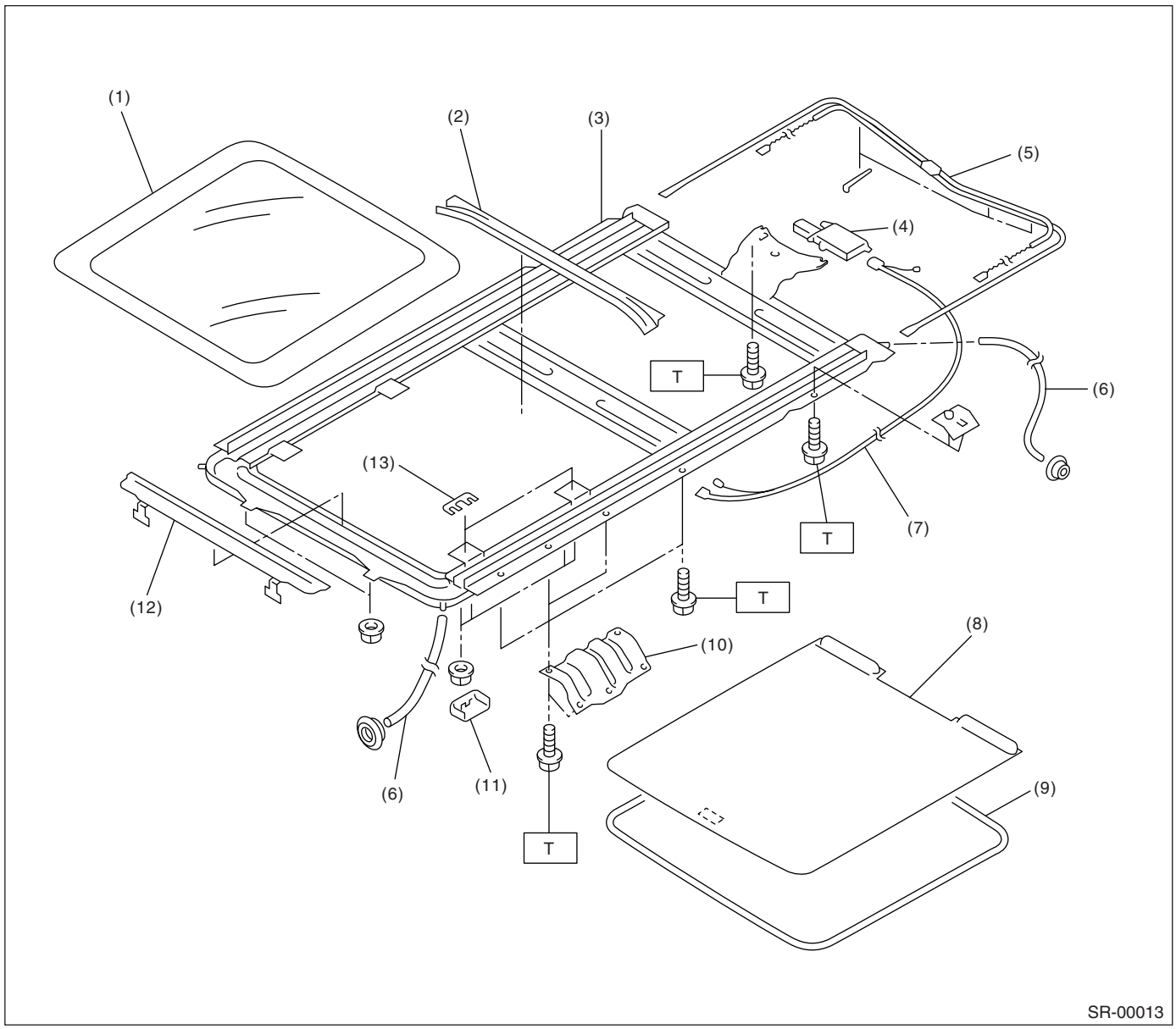
2. Sunroof Control System 4
3. Sunroof Lid 5
4. Sunroof Assembly 6
5. Sunroof Motor 8
6. Sunroof Switch 9

1. General Description

A: COMPONENT



(1) Sunroof lid
(2) Rear drain ASSY
(3) Sunroof frame
(4) Sunroof motor
(5) Drive unit
(6) Drain tube
(7) Harness
(8) Sunshade
(9) Garnish
(10) Frame bracket
(11) Cover
(12) Deflector
(13) Shim

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.4 (0.75, 5.4)

B: CAUTION

• Before disassembling or reassembling parts, always disconnect battery ground cable. When replacing radio, control module and other parts provided with memory functions, record memory contents before disconnecting the battery ground cable. Otherwise, the memory will be erased.
• Reassemble in reverse order of disassembly, unless otherwise indicated.
• Adjust parts to the given specifications.
• Connect connectors and hoses securely during reassembly.
• After reassembly, make sure functional parts operate smoothly.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Spring balance	Used for measuring the moving load of the sunshade.

2. Sunroof Control System

A: WIRING DIAGRAM

1. SUNROOF

<Ref. to WI-289, WIRING DIAGRAM, Sunroof Control System.>

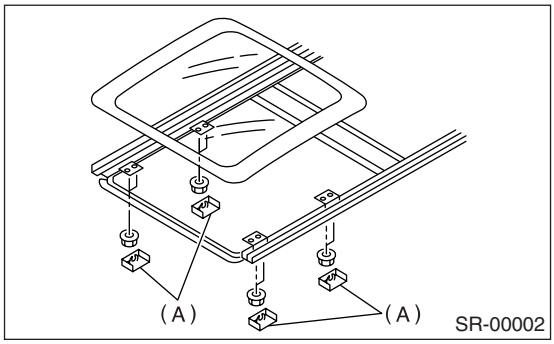
B: INSPECTION

Symptom	Checking order
Water leaks.	(1) Check roof panel and sunroof lid for improper or poor sealing. (2) Check drain tube for clogging. (3) Check sunroof frame seal and body for improper fit.
Booming noise, wind noise	(1) Check sunroof lid and roof panel for improper clearance. (2) Check sunshade and roof trim for improper clearance.
Abnormal motor noise	(1) Check motor for looseness. (2) Check gears and bearings for wear. (3) Check cables for wear. (4) Check cable pipe for deformities.
Failure of sunroof (Motor operates properly.)	(1) Check sunroof frame for foreign particles. (2) Check sunroof frame for improper installation. (3) Check parts for mutual interference. (4) Check cable slider for improper clinching. (5) Check cable for improper installation.
Motor does not rotate or rotates improperly.	(1) Check fuse for blow-out. (2) Check switch for improper function. (3) Check motor for incorrect terminal voltage. (4) Check relay for improper operation. (5) Check poor grounding system. (6) Check harness for open or short and terminals for poor connections.

3. Sunroof Lid

A: REMOVAL

1) Completely close sunroof lid and open sunshade.
2) Detach the four covers (A) and then remove eight nuts.



3) Carefully remove sunroof lid.

B: INSTALLATION

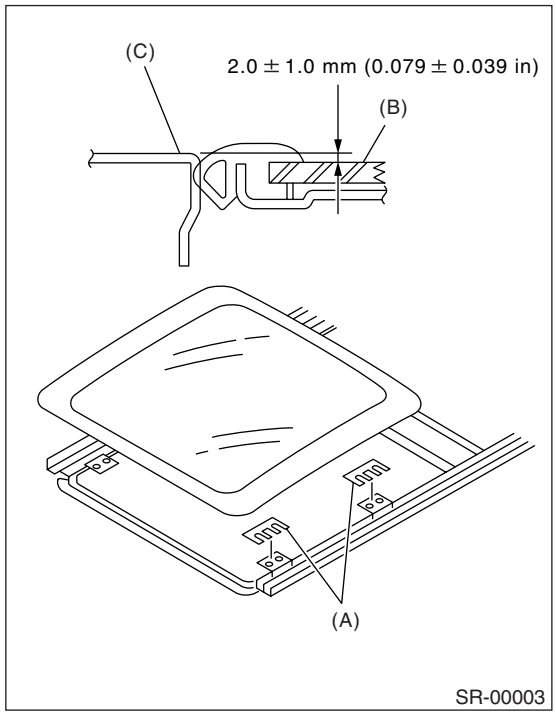
Install in the reverse order of removal.

C: ADJUSTMENT

1. ALIGNMENT OF HEIGHT BETWEEN SUNROOF LID AND ROOF PANEL

Loosen sunroof lid nuts and then adjust height by adding (max: four pieces) or extracting (min: zero piece) shims (standard: two pieces) between sunroof lid and roof panel.

Difference in height between sunroof lid and roof panel:
2.0±1.0 mm (0.079±0.039 in)

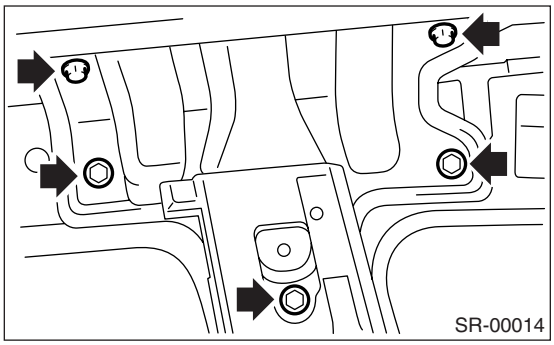


(A) Shim
(B) Sunroof lid
(C) Roof panel

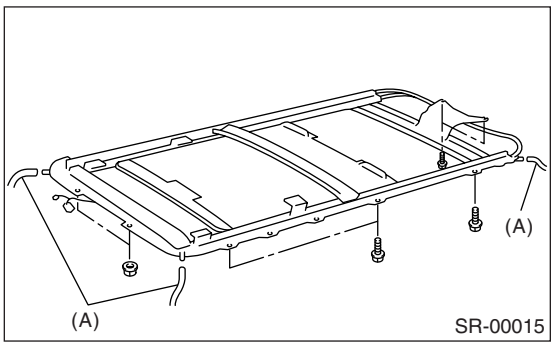
4. Sunroof Assembly

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove roof trim. <Ref. to EI-48, REMOVAL, Roof Trim.>
3) Remove sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
4) Disconnect the four drain tubes (A) from sunroof frame.
5) Disconnect sunroof harness connector.
6) Remove the bolts, and then remove the frame bracket.


SR-00014

7) Remove bolts and nuts and then detach sunroof frame.



SR-00015

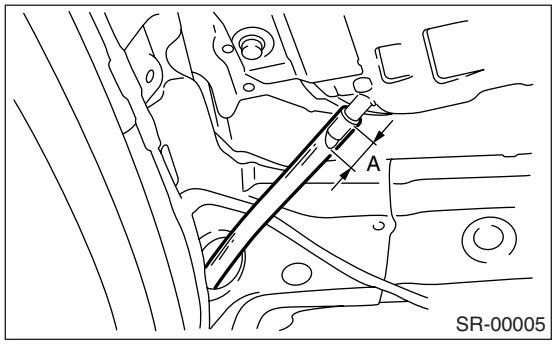
B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be careful not to snag harness.

NOTE:
- Make sure to connect harness connector.
- When installing drain tube, insert it securely into drain pipe.

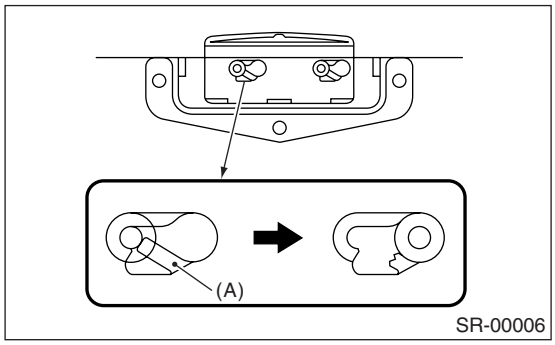
Length A:
15 mm (0.59 in) or more



SR-00005

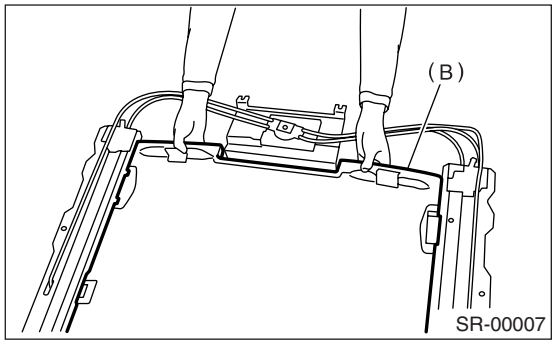
C: DISASSEMBLY

1) Remove sunroof frame.
2) Cut the pawl (A) of front sunshade RH.
3) Remove the front slider RH.



SR-00006

4) Pull out the sunshade (B) from sunroof frame.



SR-00007

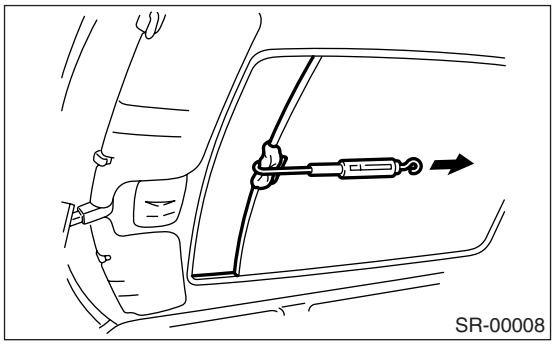
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

1. CHECK FOR MOVEMENT OF SUNSHADE

1) Attach a spring scale to sunshade edge using a cloth.



2) Pull the spring scale to measure force required to move the sunshade.

Force required to move sunshade:
25 N (2.5 kgf, 5.5 lbf) or less

NOTE:
Considerable effort is required to start sunshade moving, so take a scale reading while sunroof panel is moving smoothly.

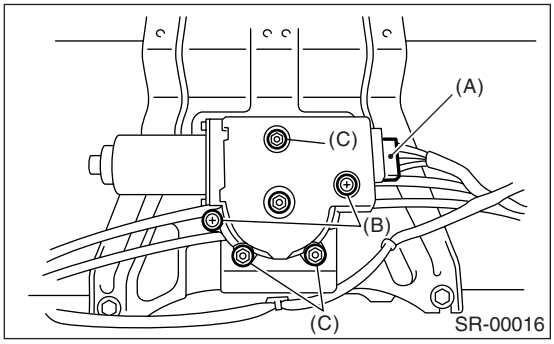
3) If force required exceeds specifications, check the sunroof glass lid, sunshade, deflector and sunroof frame assembly for improper installation

5. Sunroof Motor

A: REMOVAL

CAUTION:
• Fully close sunroof when removing sunroof motor.
• When removing clip, use great care to not damage the roof trim.

1) Completely close the sunroof lid.
2) Disconnect the ground cable from battery.
3) Remove roof trim. <Ref. to EI-48, REMOVAL, Roof Trim.>
4) Disconnect harness connector (A) and remove sunroof motor mounting screw (B) and nut (C).



B: INSTALLATION

CAUTION:
Be careful not to move the sunroof cable when installing sunroof motor.

1) Install sunroof motor.
2) Connect sunroof motor harness connector and then connect battery ground cable.
3) Reset the sunroof motor. <Ref. to SR-8, ADJUSTMENT, Sunroof Motor.>
4) Check sunroof operation with the following procedure.

Checking order	Switch position
(1) Completely close sunroof.	Closed
(2) Open sunroof 500 mm (19.7 in) away from completely closed position.	Open
(3) Completely open sunroof.	Open
(4) Close sunroof 200 mm (7.87 in) from completely closed position.	Closed
(5) Completely close sunroof.	Closed

5) Install the roof trim. <Ref. to EI-48, INSTALLATION, Roof Trim.>

C: ADJUSTMENT

Reset the sunroof motor.
1) Close the sunroof lid completely. At this time, the sunroof operates 50 mm (1.97 in) each intermittently. And also the switch is needed to push for several times.
2) And then push the switch to close for more than 1 second.
3) Open the sunroof lid approx. 400 mm (15.75 in).
4) Close the sunroof lid completely, and then push the switch to close for more than 1 second. (Sunroof operates automatically by performing this operation.)

D: INSPECTION

1. AUTO REVERSE FUNCTION

1) Open the sunroof lid.
2) While the sunroof lid closing automatically, press the switch to open and check if auto reverse function operates properly.
3) Check that the sunroof opens 150 mm (5.91 in) by auto reverse function operated.

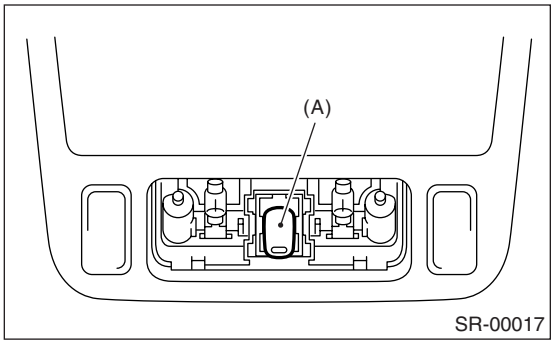
CAUTION:
Do not check the auto reverse operation with pinching any object.

NOTE:
• Auto function is canceled if auto reverse function operates more than five times.
• Reset if auto function is canceled. <Ref. to SR-8, ADJUSTMENT, Sunroof Motor.>

6. Sunroof Switch

A: REMOVAL

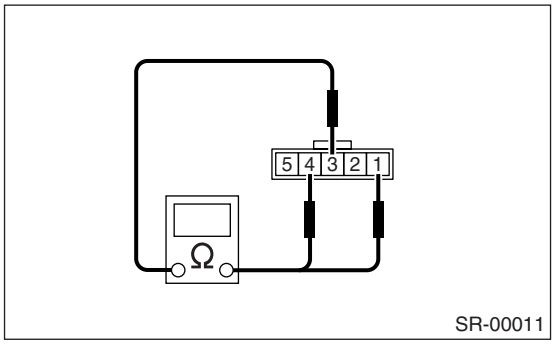
1) Disconnect ground cable from battery.
2) Remove the spot map light. <Ref. to LI-29, REMOVAL, Spot Map Light.>
3) Disconnect harness connectors and remove sunroof switch (A).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Check continuity between terminals when operating the switch.

Switch	Terminal No.	Standard value
Open	1 and 3	Less than 1 Ω
Close	3 and 4	More than 1 MΩ

EXTERIOR/INTERIOR TRIM

EI

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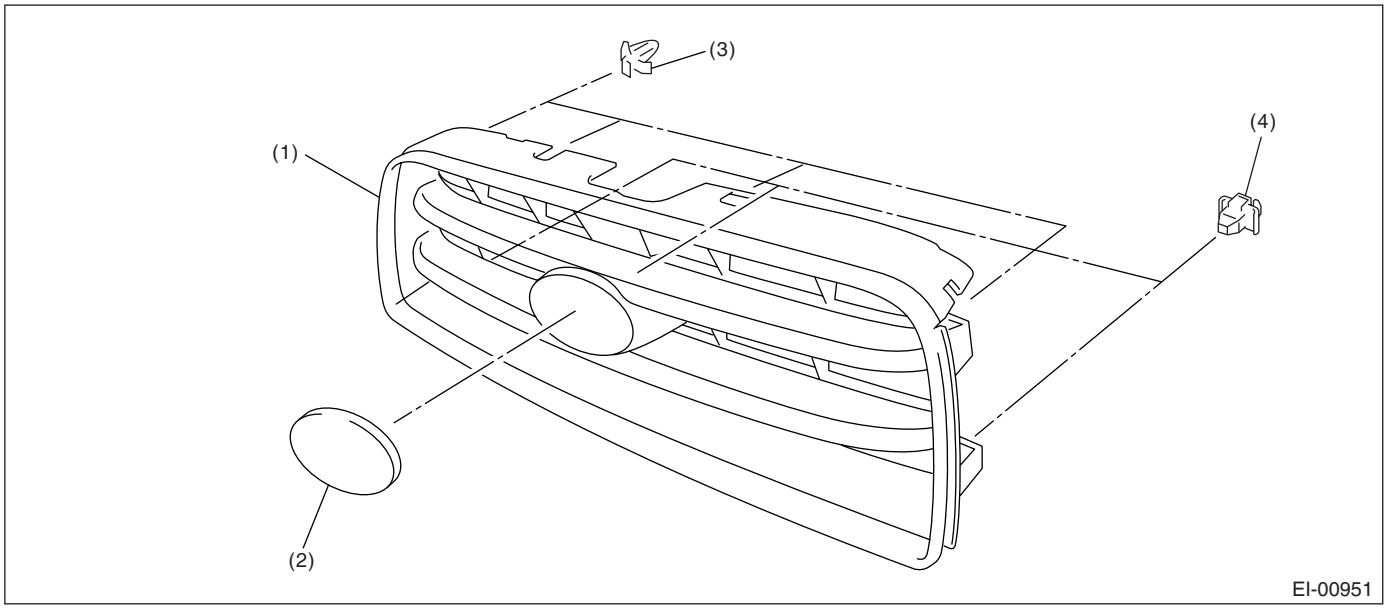
1. General Description

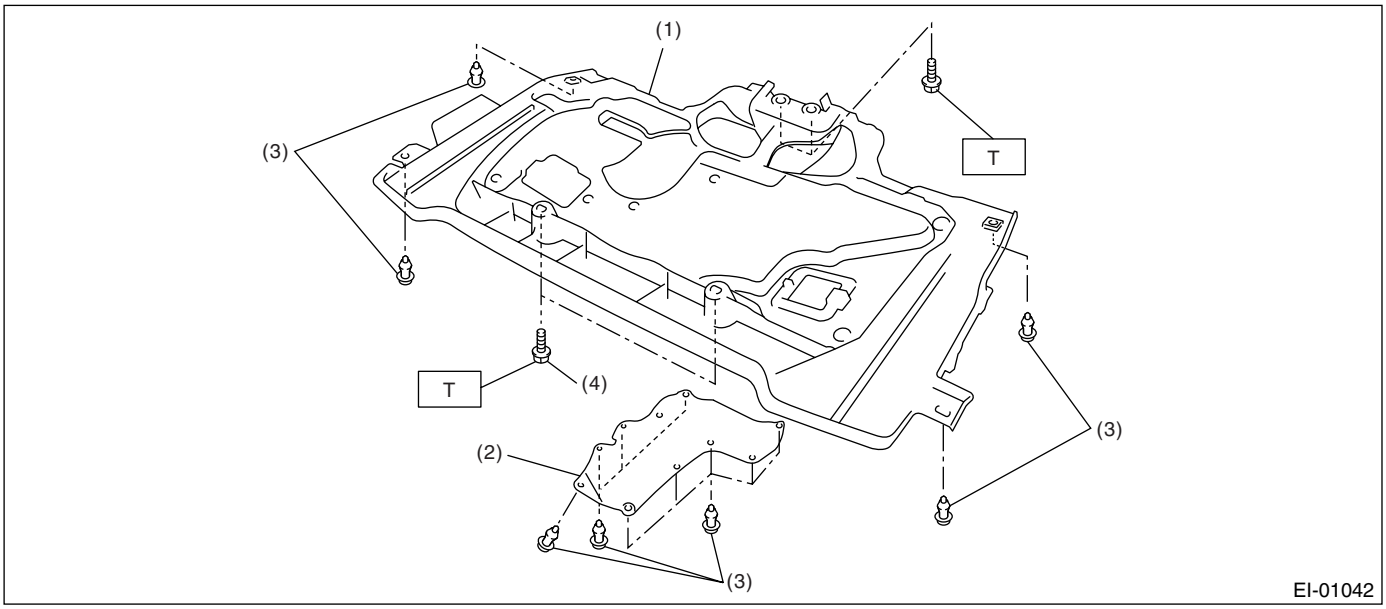
A: COMPONENT

1. FRONT GRILLE



(1) Front grille
(2) Front grille emblem
(3) Clip
(4) Hook

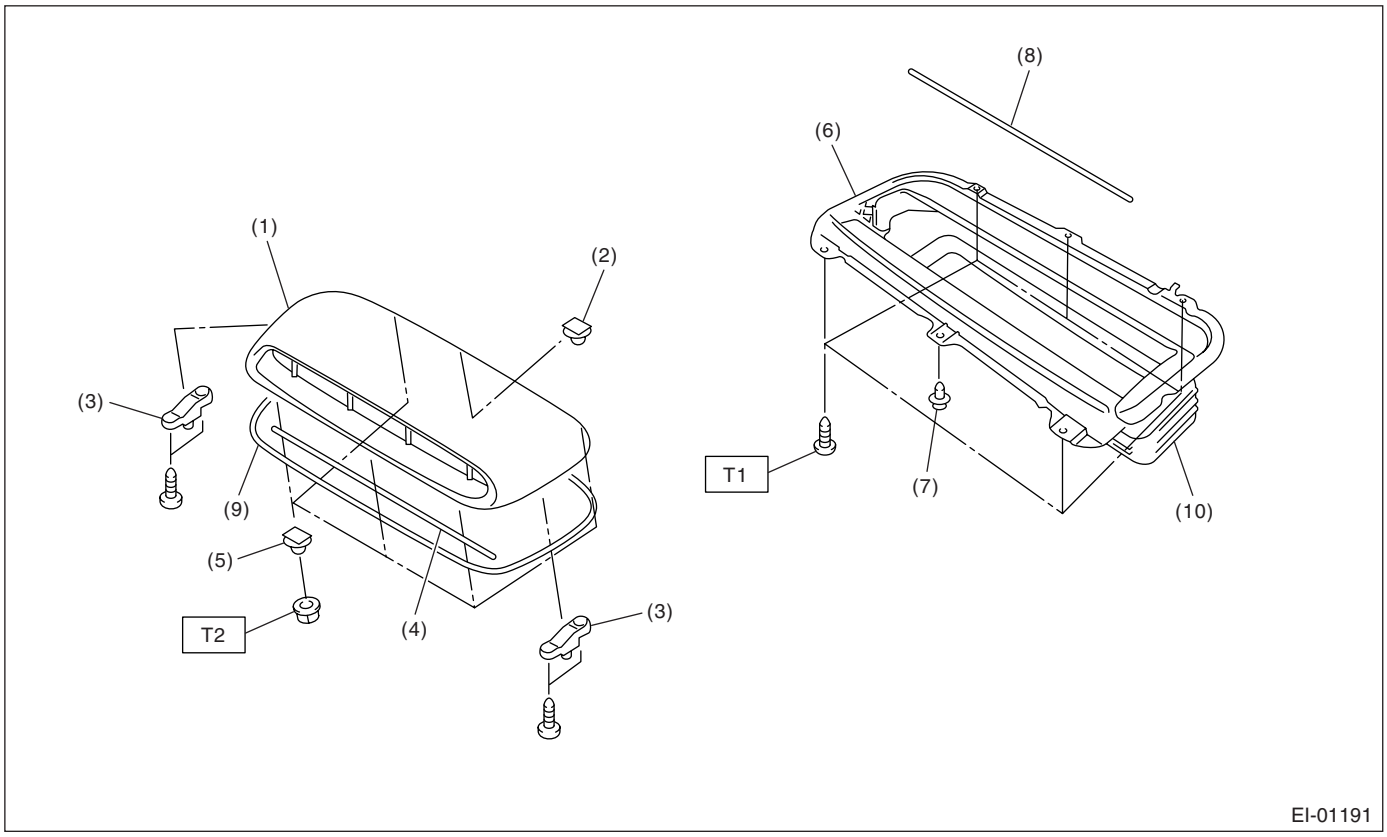
2. UNDER COVER



(1) Under cover
(2) Service hole cover
(3) Clip
(4) Bolt

Tightening torque: N·m (kgf-m, ft-lb)
T: 14 (1.42, 10.3)

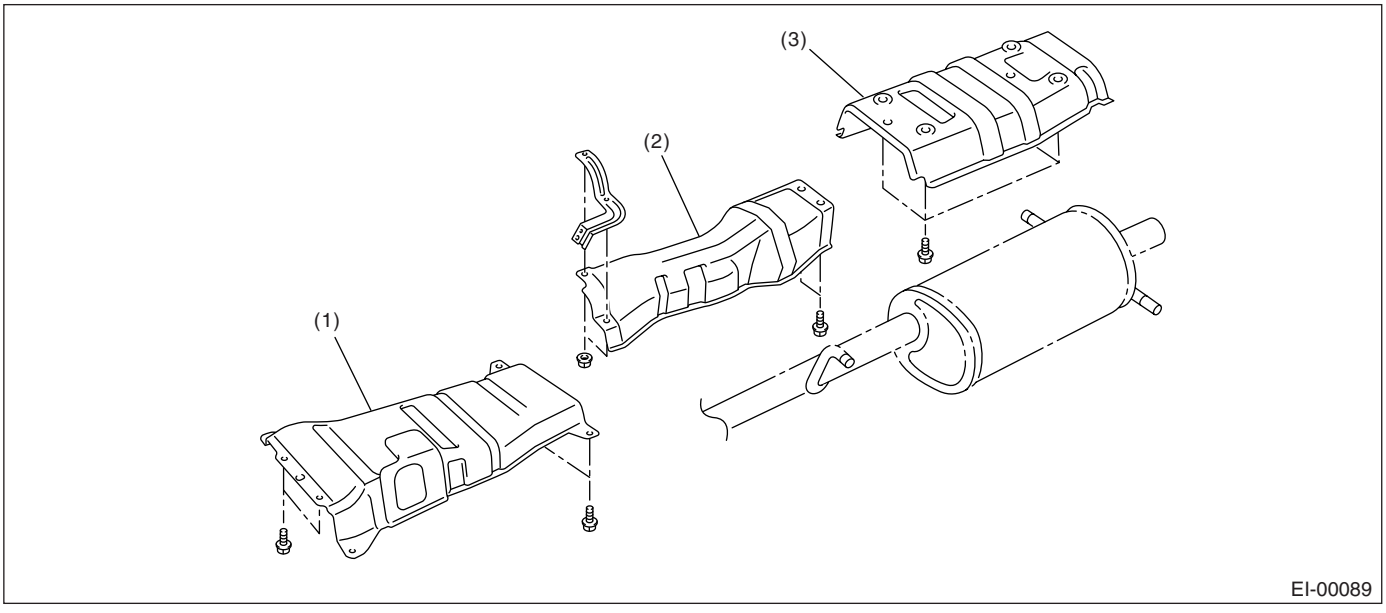
3. FRONT HOOD GRILLE



(1)	Front hood grille	(6)	Grille duct
(2)	Black clip	(7)	Clip
(3)	Black clip	(8)	Packing C
(4)	Packing B	(9)	Packing A
(5)	Bolt	(10)	Duct bellows

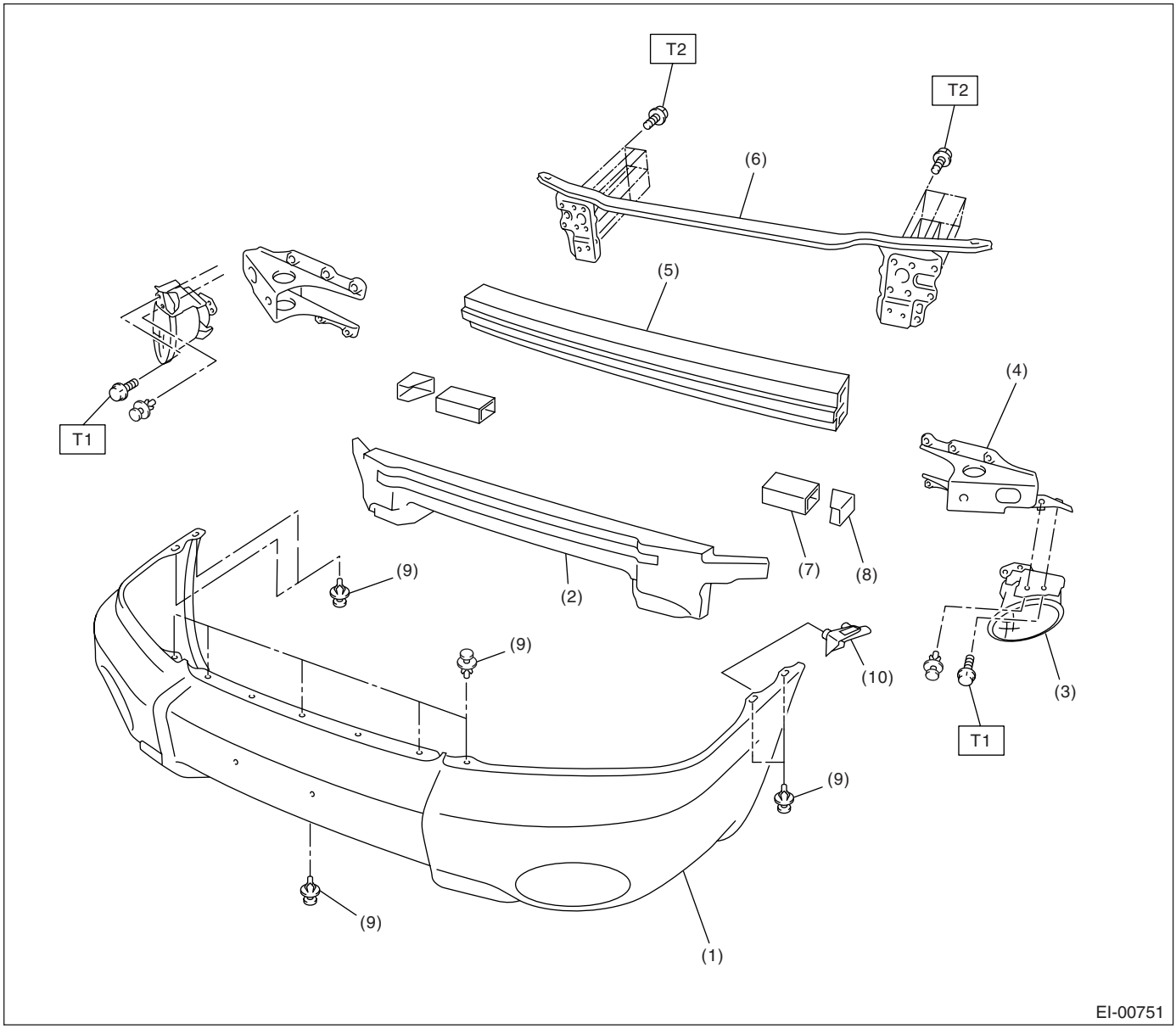
Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.0 (0.1, 0.7)
T2: 4.4 (0.45, 3.25)

4. HEAT SHIELD COVER



(1) Front heat shield cover (2) Center heat shield cover (3) Rear heat shield cover

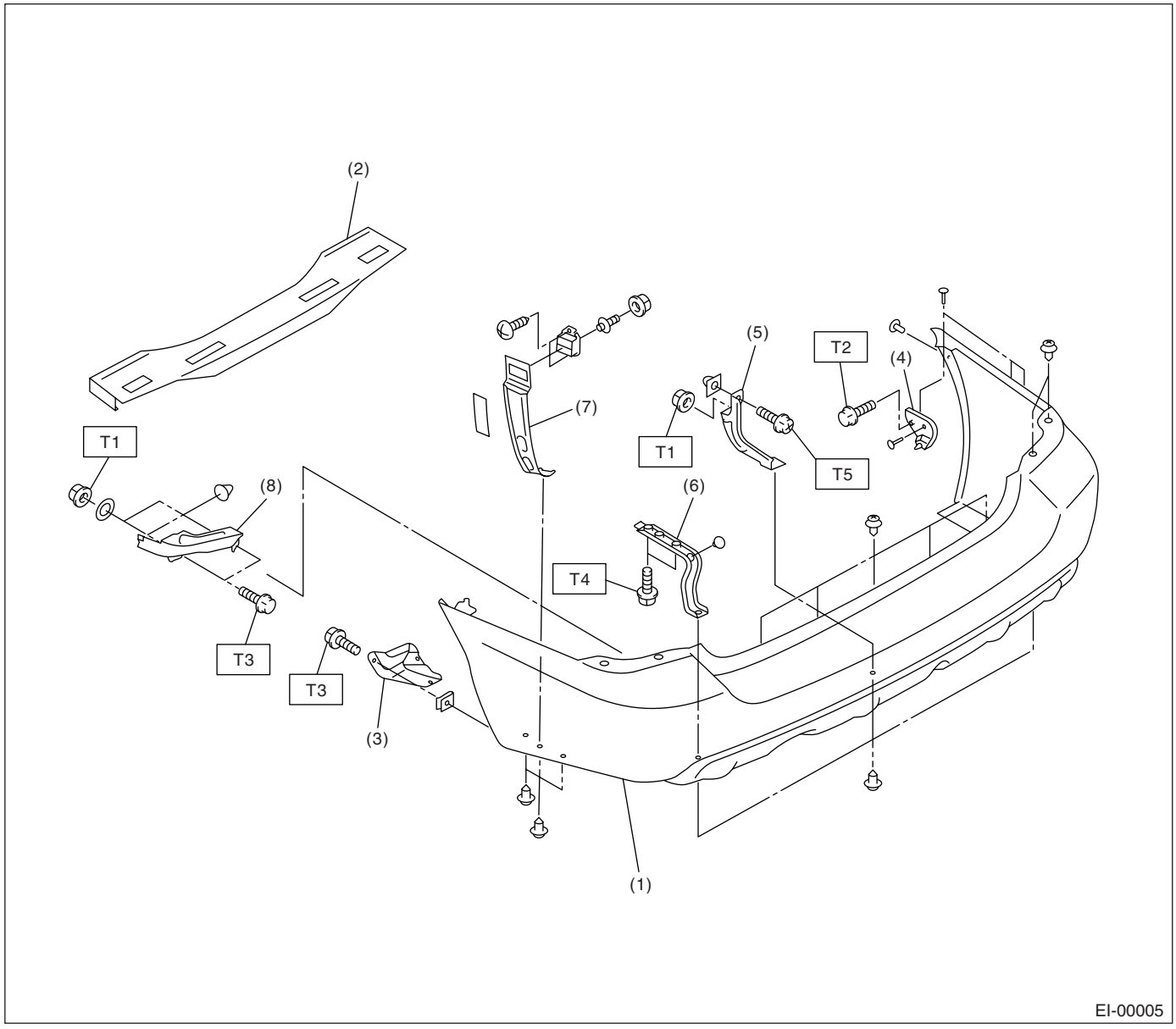
5. FRONT BUMPER



(1)	Bumper face	(6)	Upper beam
(2)	E/A form	(7)	Lower beam
(3)	Fog light	(8)	Lower beam reinforcement
(4)	Side bracket	(9)	Clip
(5)	Main beam	(10)	Slider side front

Tightening torque: N·m (kgf-m, ft-lb)
T1: 32 (3.3, 24)
T2: 69 (7.0, 51)

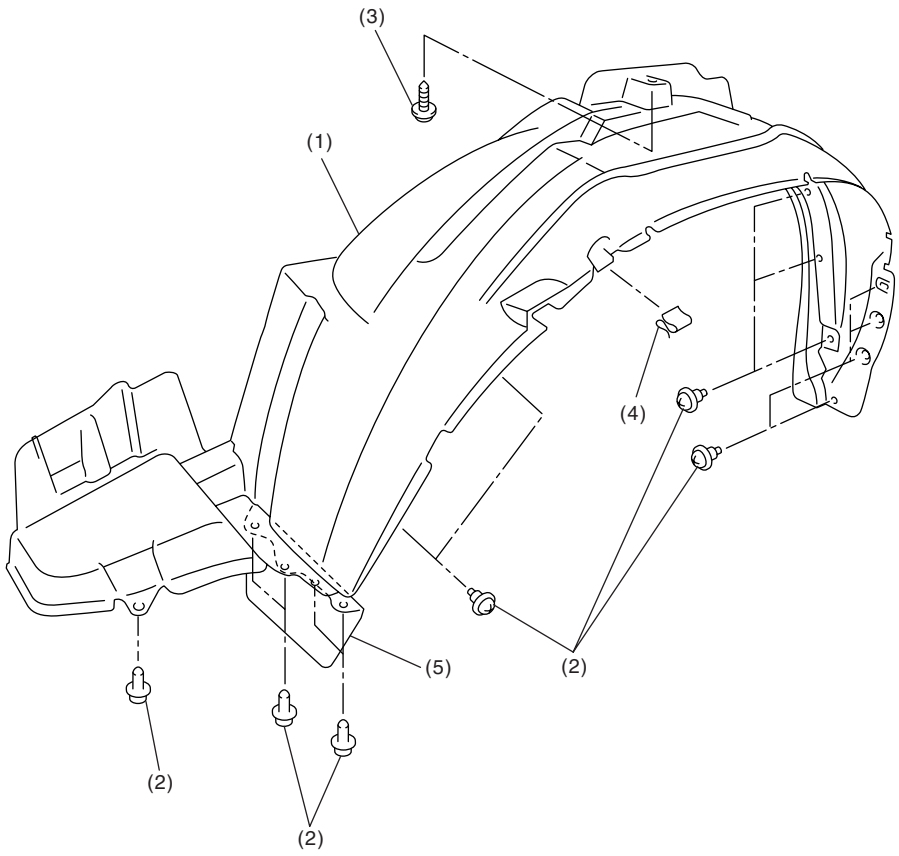
6. REAR BUMPER



(1)	Bumper face	(7)	Rear bumper side bracket ASSY
(2)	Rear bumper upper beam	(8)	Rear bumper upper beam side
(3)	Rear arch cover		
(4)	Rear bumper front side bracket		
(5)	Center bracket		
(6)	Stay COMPL		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 32 (3.3, 24)
T2: 7.4 (0.75, 5.4)
T3: 4.4 (0.45, 3.26)
T4: 93 (9.5, 68.7)
T5: 1.8 (0.18, 1.3)

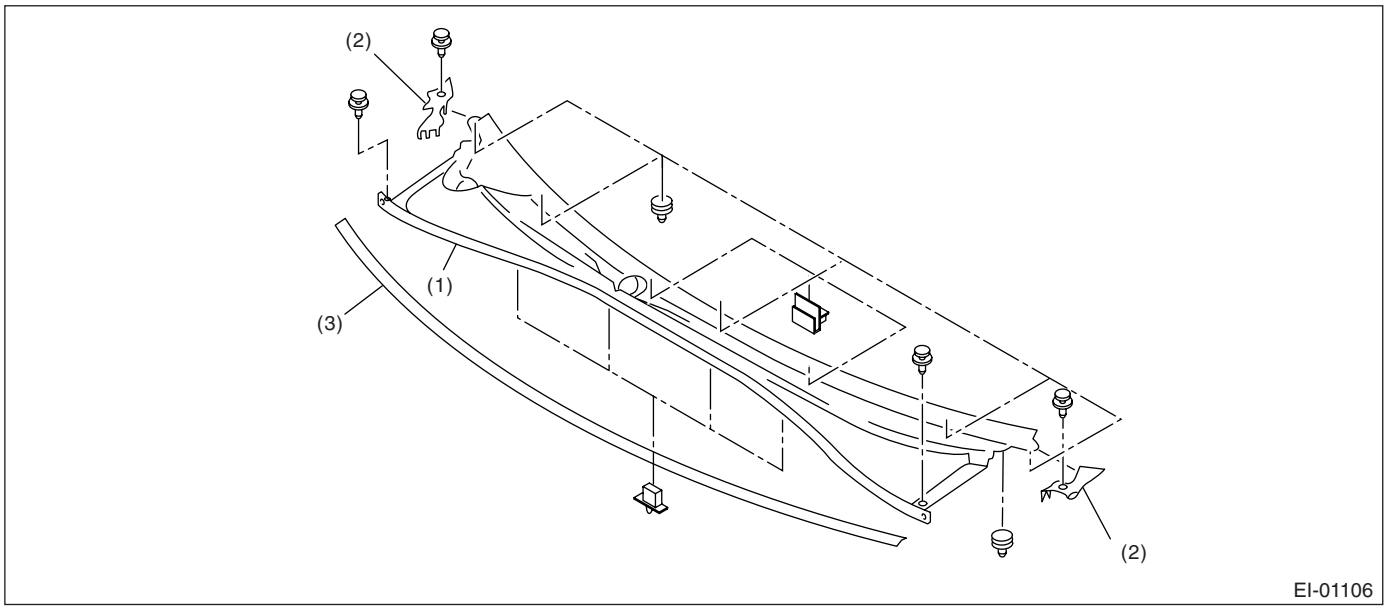
7. MUD GUARD



EI-00938

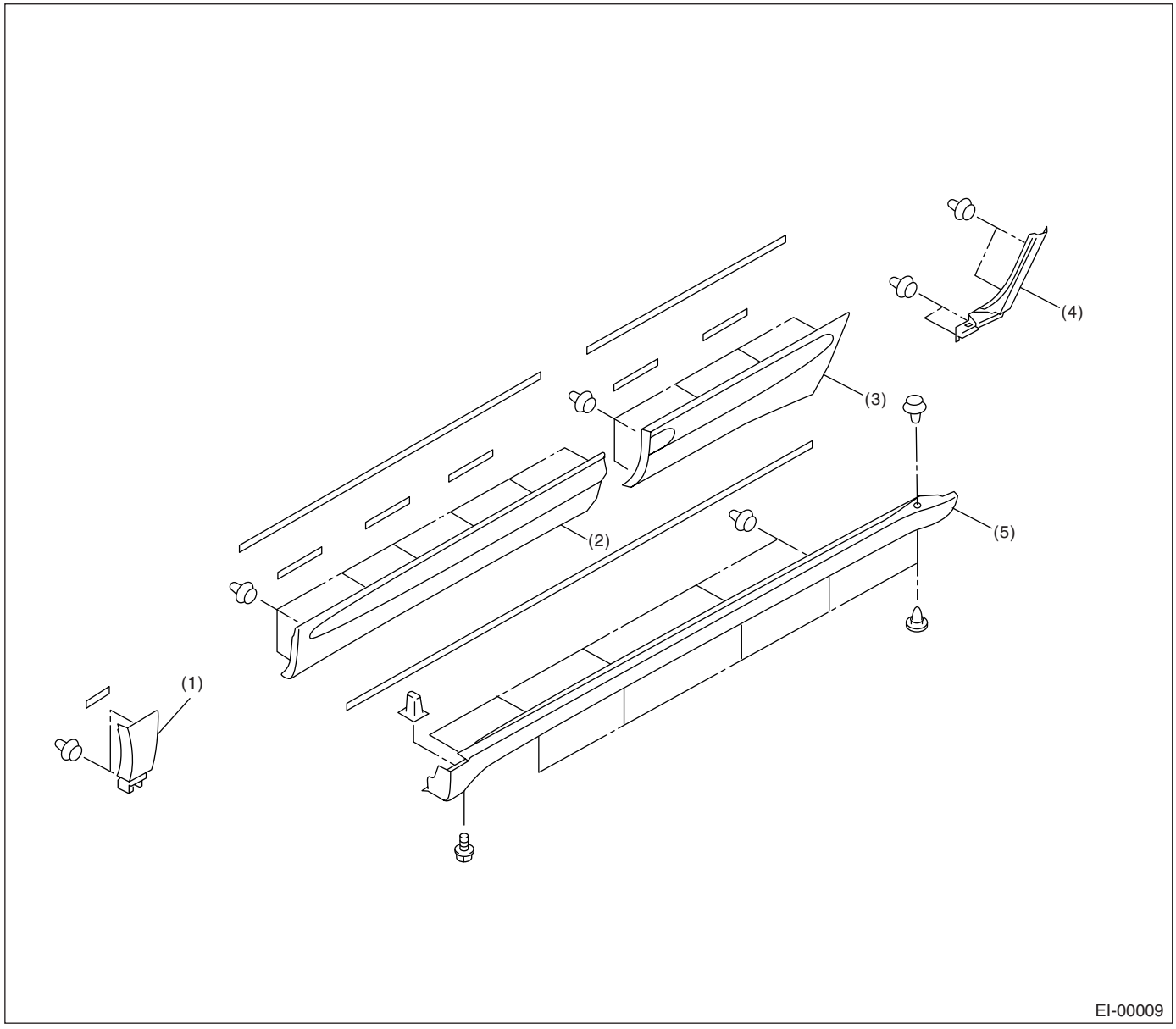
(1) Mud guard
(2) Clip
(3) Screw
(4) Clip (S-shape)
(5) Air flap

8. COWL PANEL



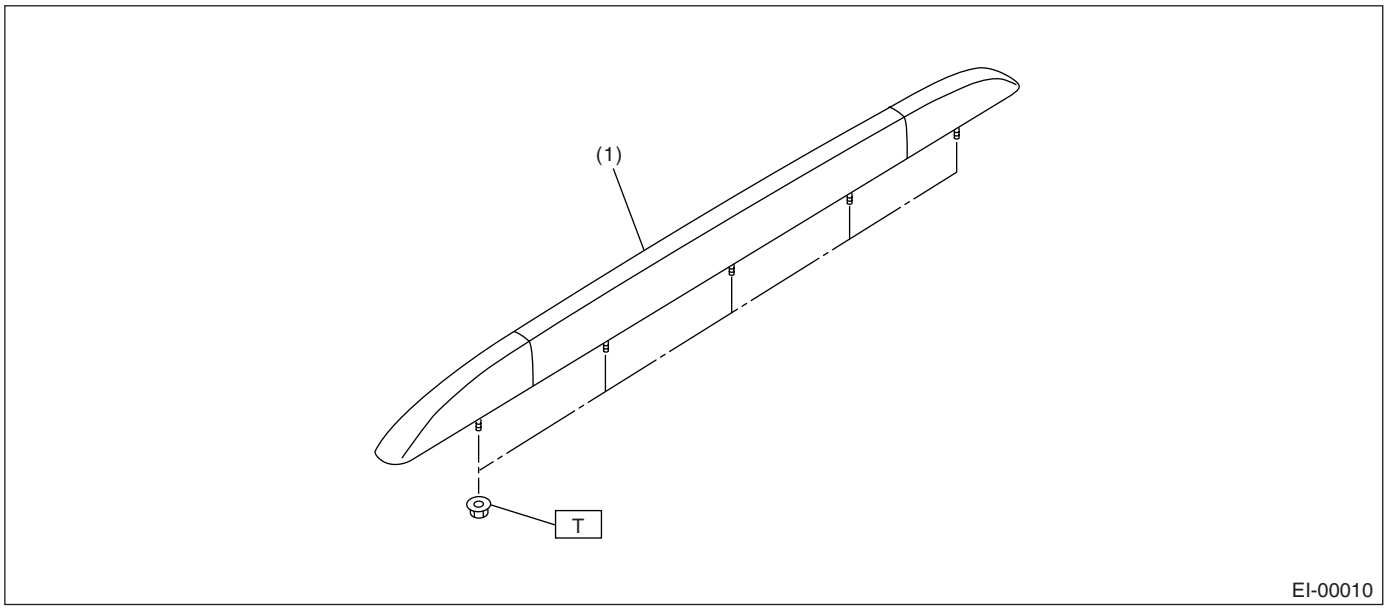
(1) Cowl panel (2) Cowl side panel (3) Seal

9. SIDE SILL SPOILER



(1) Side garnish (Front fender)
(2) Side garnish (Front door)
(3) Side garnish (Rear door)
(4) Side garnish (Rear quarter)
(5) Side garnish (Side sill)

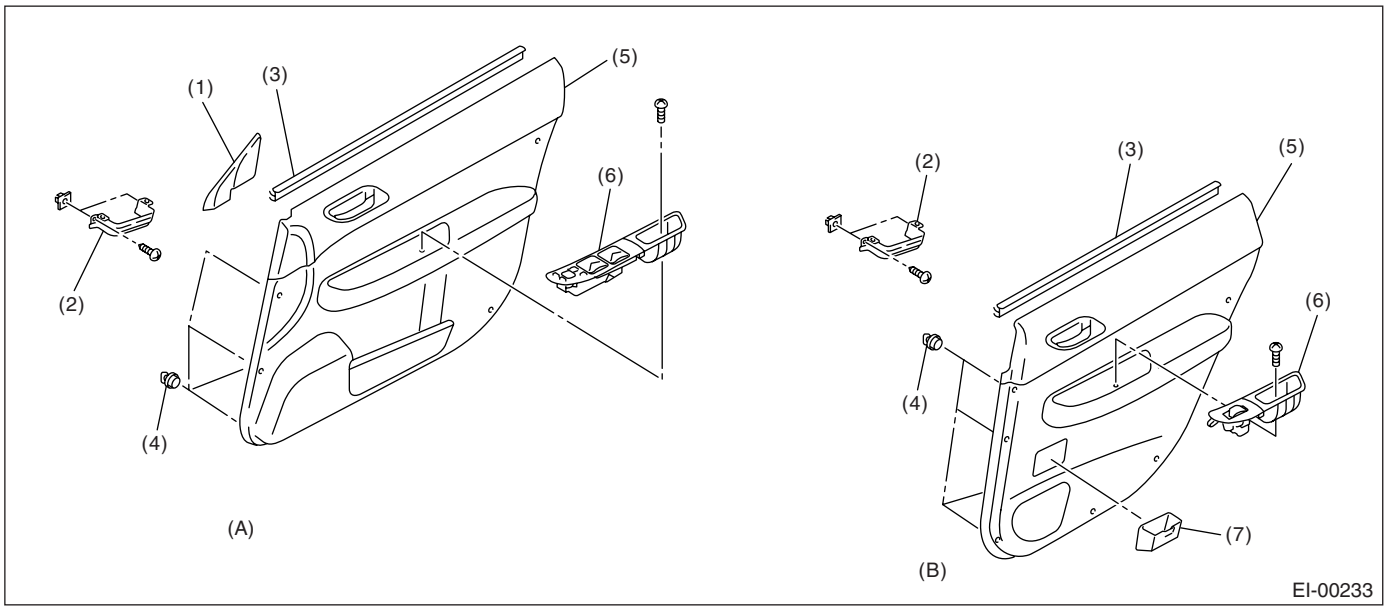
10.ROOF RAIL



(1) Roof rail

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

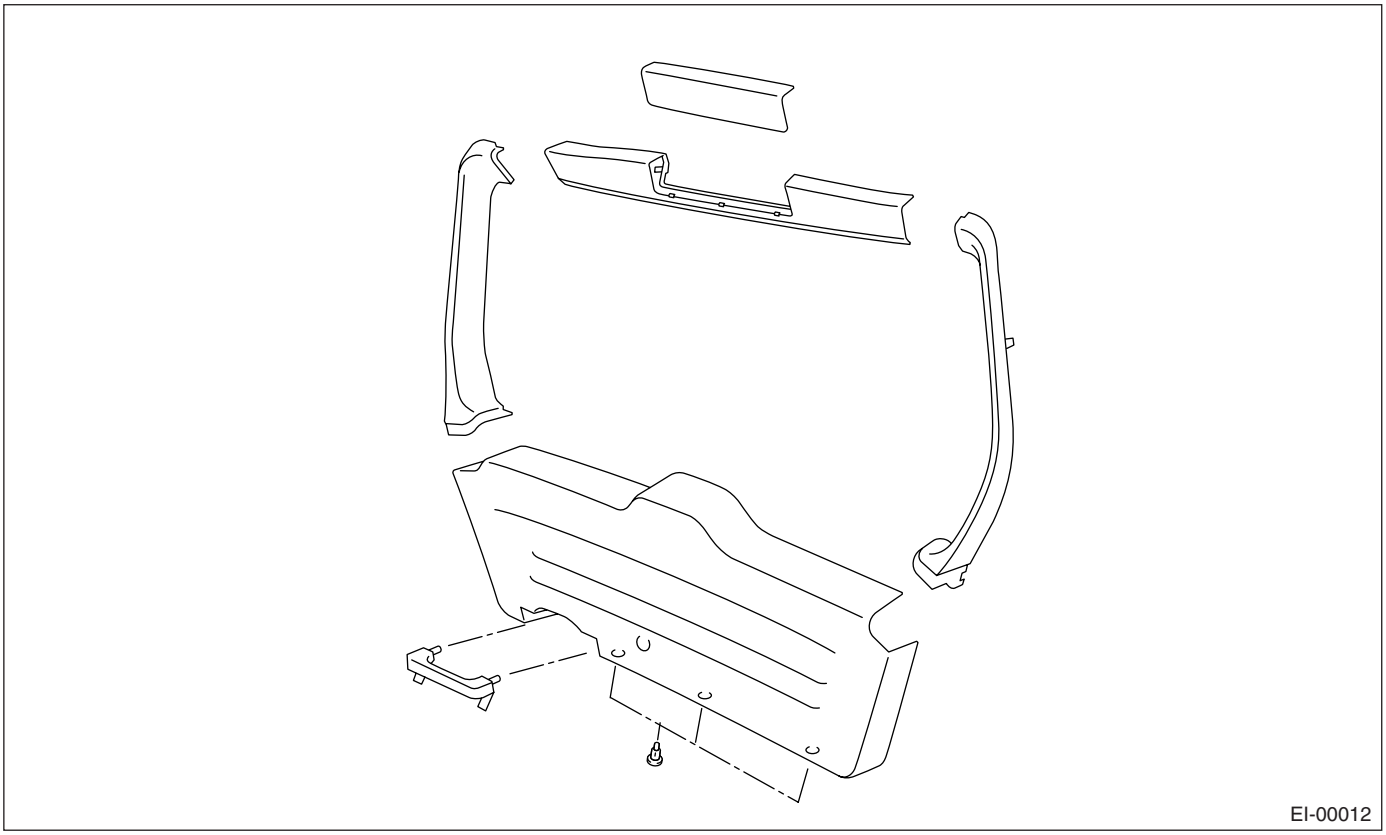
11.DOOR TRIM



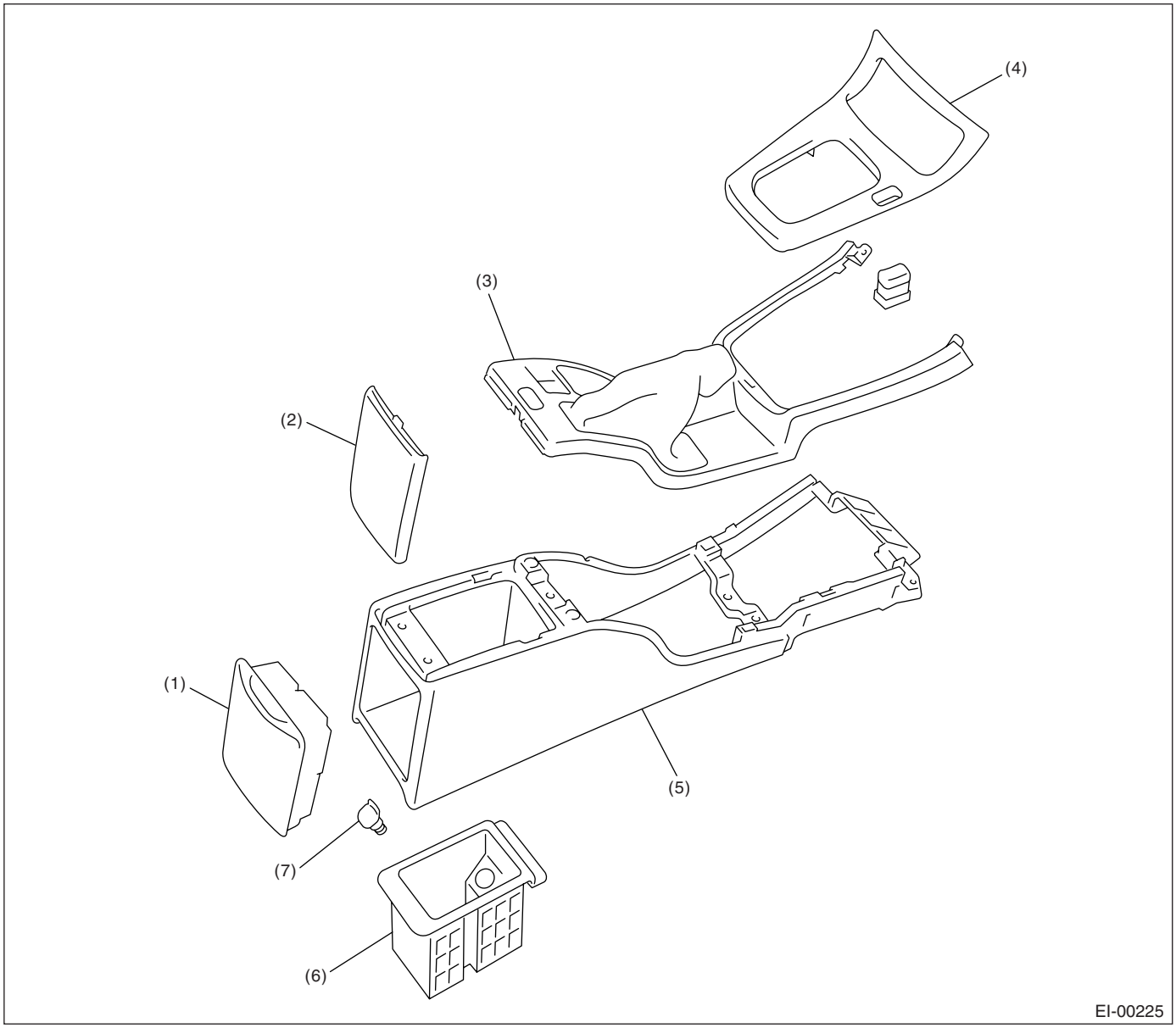
(A) Front door trim
(B) Rear door trim

(1) Gusset cover
(2) Bracket
(3) Weather strip upper
(4) Clip
(5) Trim panel
(6) Power window switch cover
(7) Ash tray

12.REAR GATE TRIM



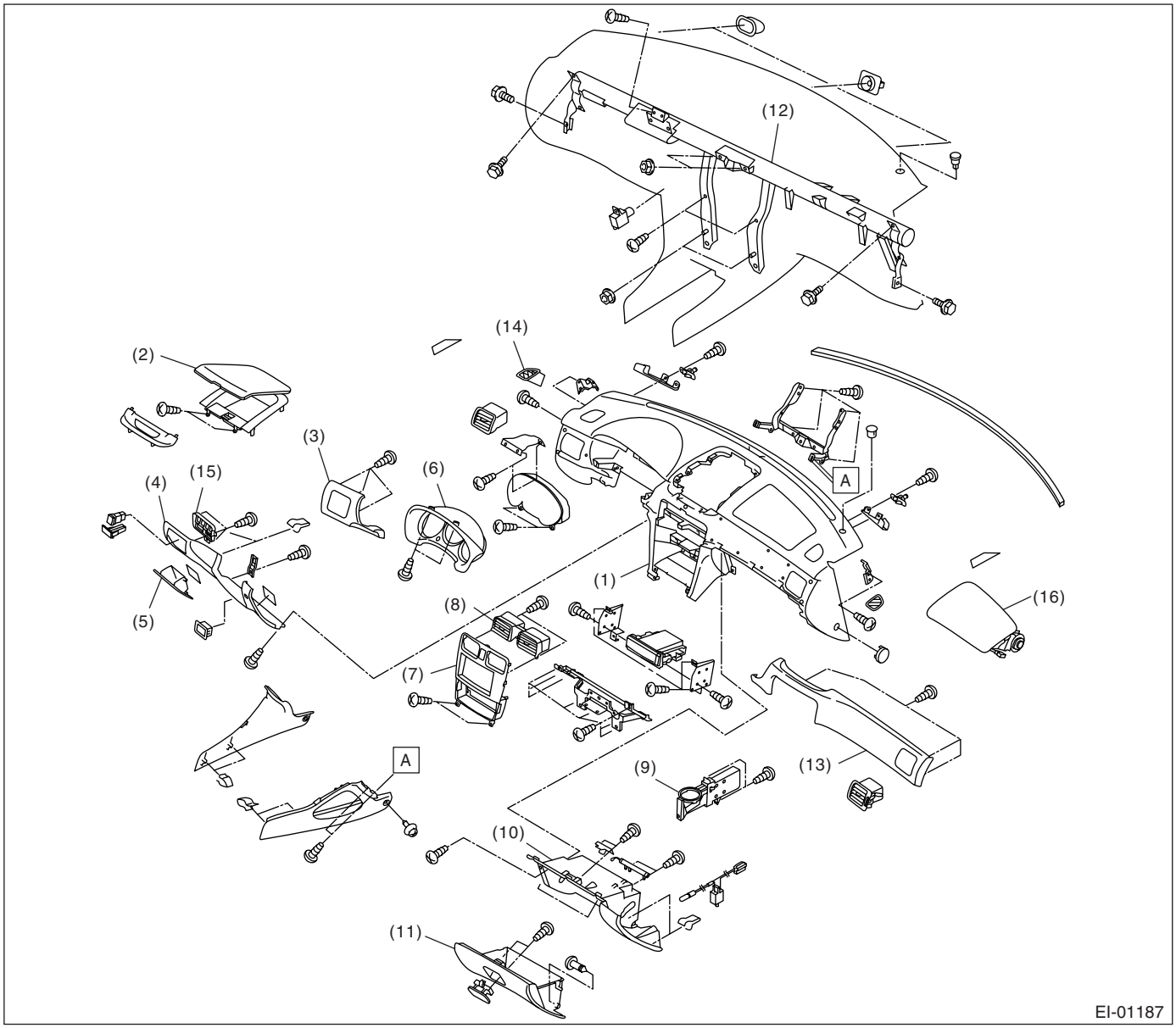
13.CONSOLE BOX



(1) Rear cup holder
(2) Console lid
(3) Console cover
(4) Console front cover
(5) Console box
(6) Console pocket
(7) Accessory socket

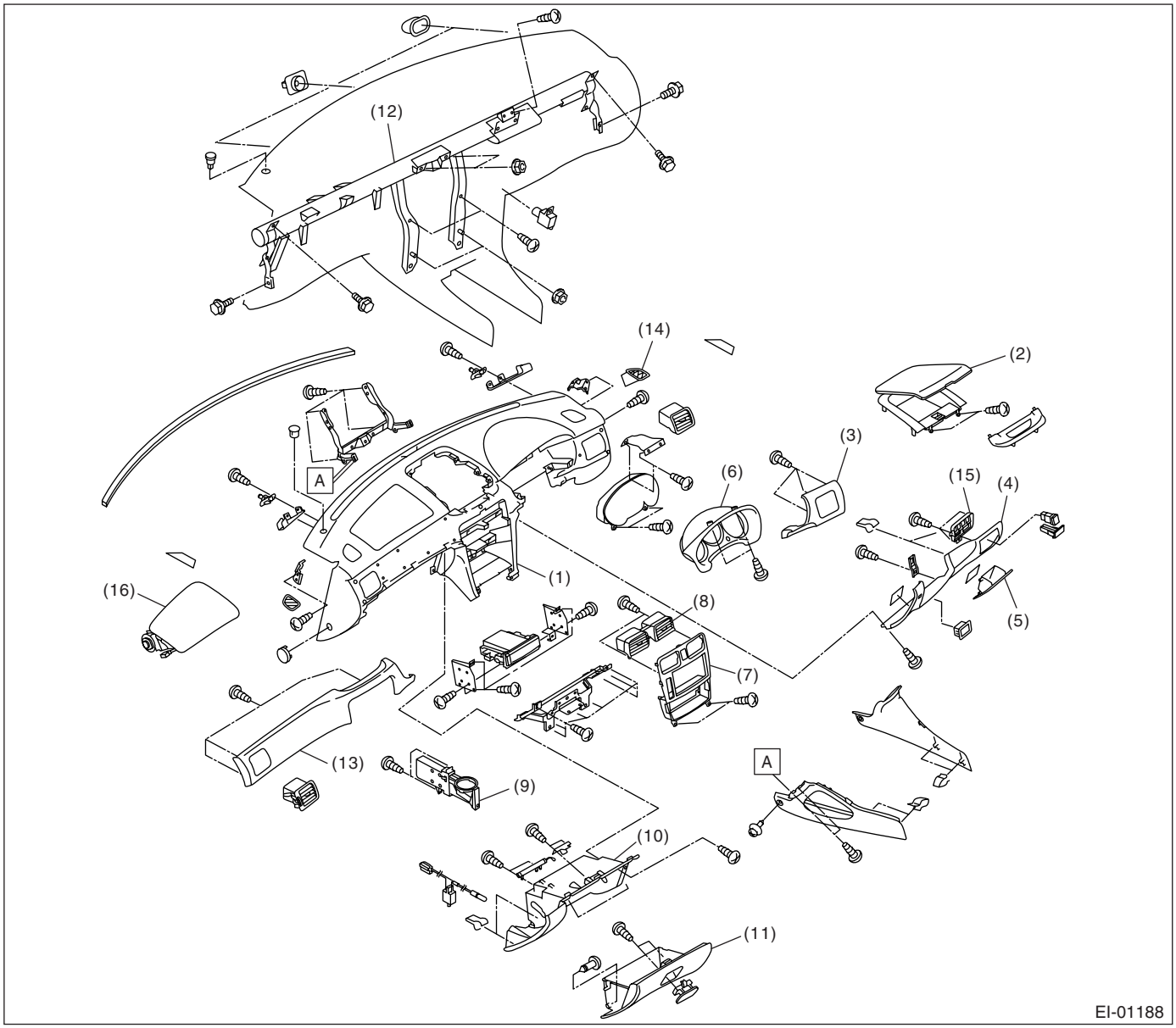
14.INSTRUMENT PANEL

- LHD model



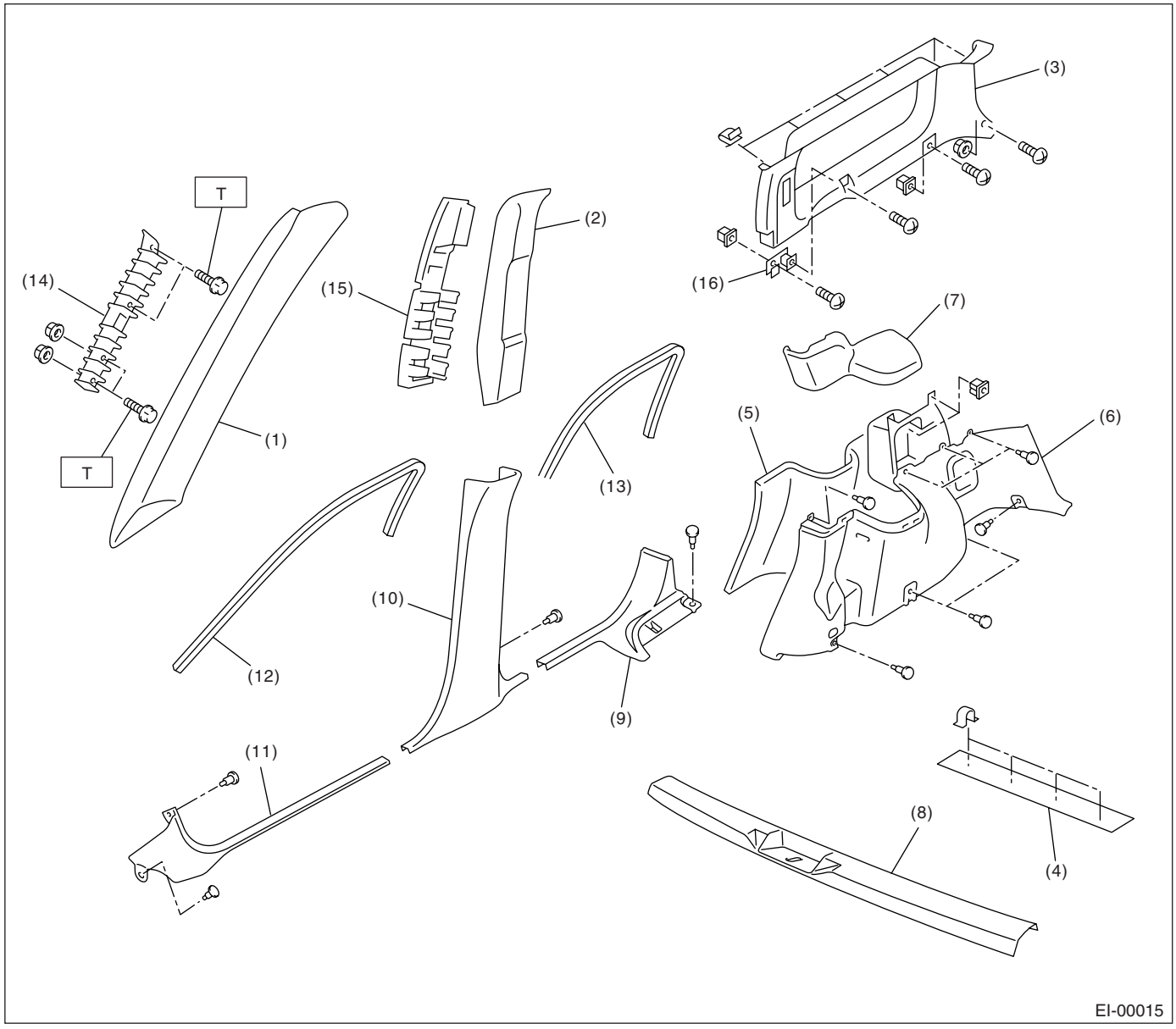
(1) Pad & frame
(2) Center compartment
(3) Grille cover
(4) Lower cover
(5) Coin box
(6) Meter visor
(7) Center panel
(8) Air vent grille
(9) Cup holder
(10) Glove box panel
(11) Glove box lid
(12) Steering beam
(13) Grille cover
(14) Air vent grille (Defroster)
(15) Switch panel
(16) Passenger's airbag module

- RHD model



(1) Pad & frame
(2) Center compartment
(3) Grille cover
(4) Lower cover
(5) Coin box
(6) Meter cover
(7) Center panel
(8) Air vent grille
(9) Cup holder
(10) Glove box panel
(11) Glove box lid
(12) Steering beam
(13) Grille cover
(14) Air vent grille (Defroster)
(15) Switch panel
(16) Passenger's airbag module

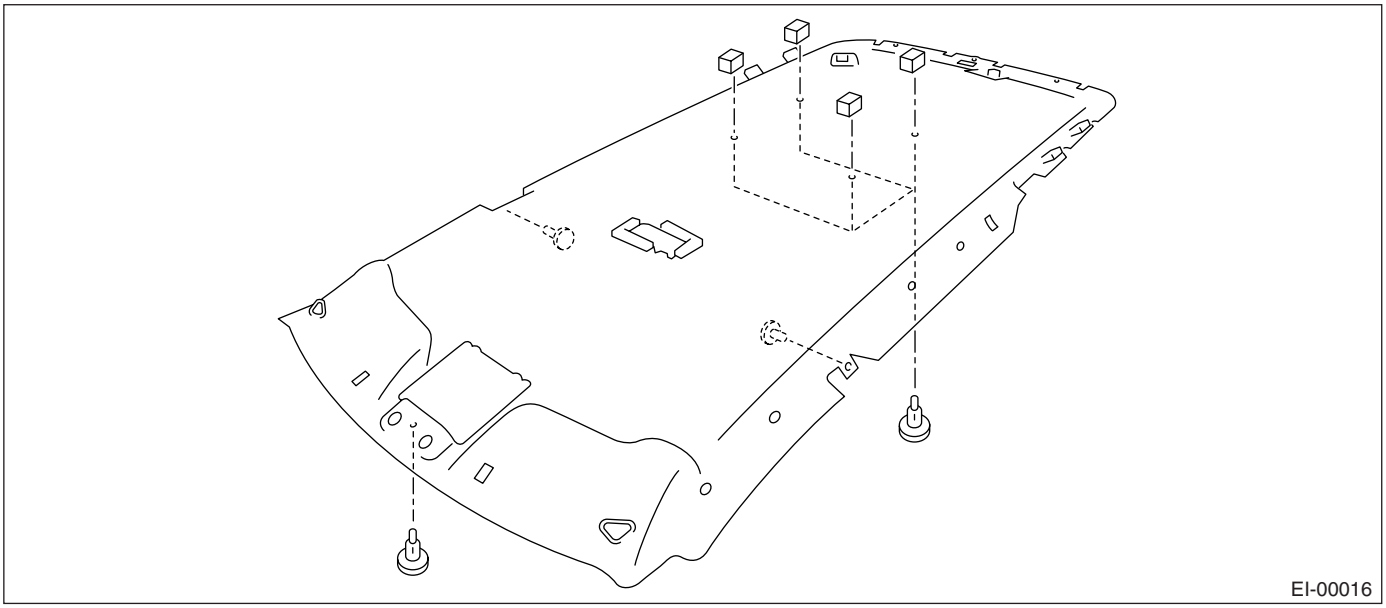
15.INNER TRIM



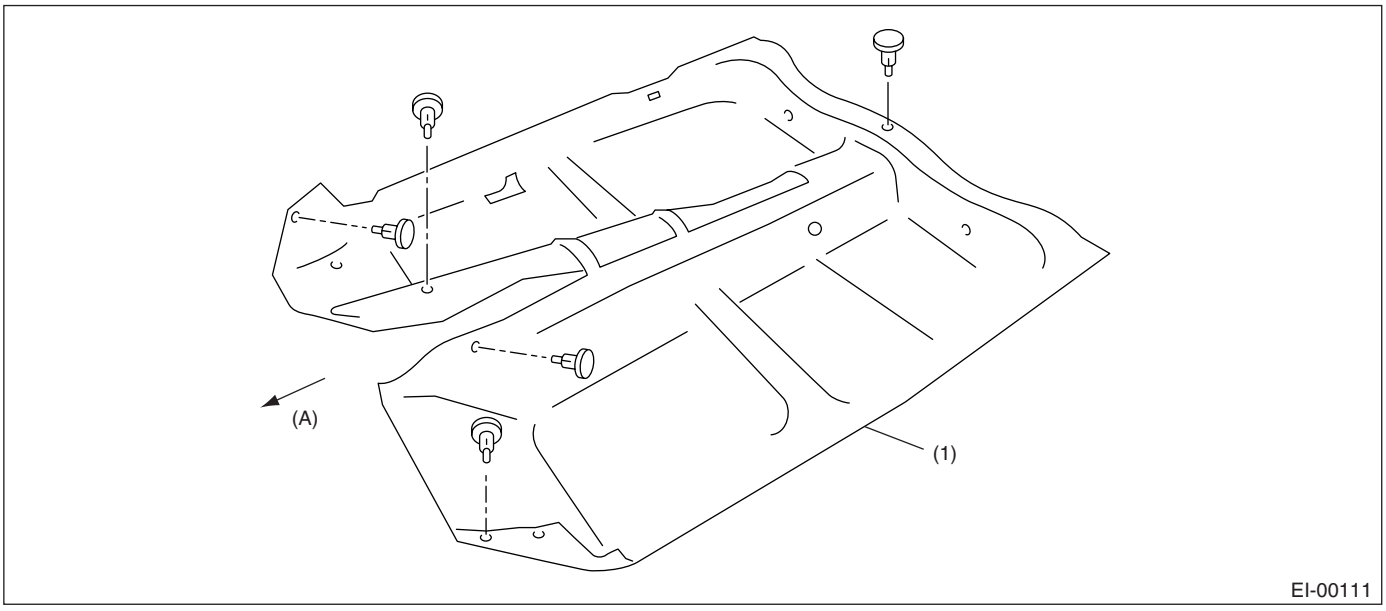
(1) Front pillar upper trim
(2) Center pillar upper trim
(3) Rear pillar upper trim
(4) Rear rail trim
(5) Insulator
(6) Rear quarter lower trim
(7) Strut cap
(8) Rear skirt trim
(9) Side sill rear cover
(10) Center pillar lower trim
(11) Side sill front cover
(12) Front garnish
(13) Rear garnish
(14) Front pillar inner rib
(15) Center pillar inner rib
(16) Bracket

Tightening torque: N·m (kgf-m, ft-lb)
T: 2 (0.20, 1.46)

16.ROOF TRIM



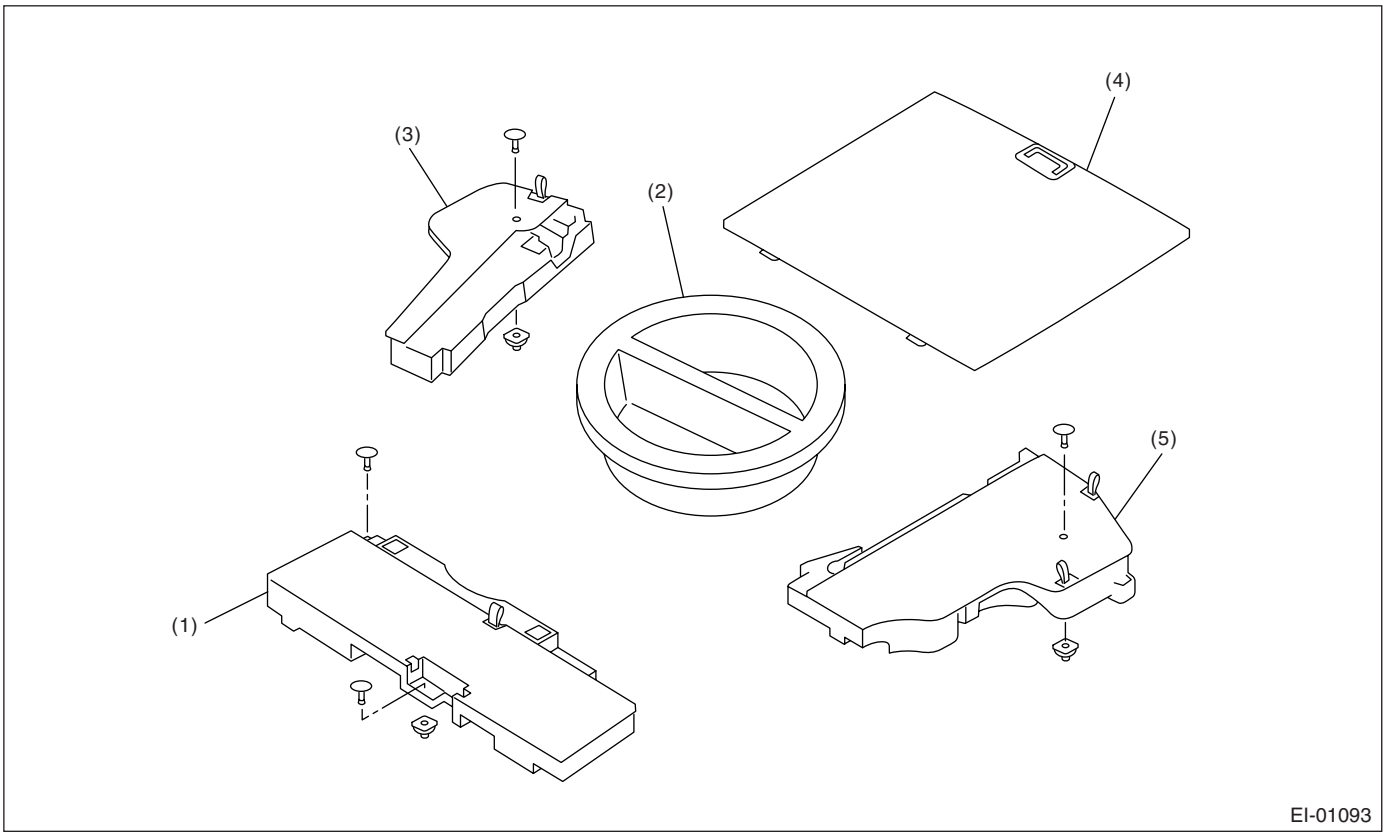
17.FLOOR MAT



(A) Vehicle front

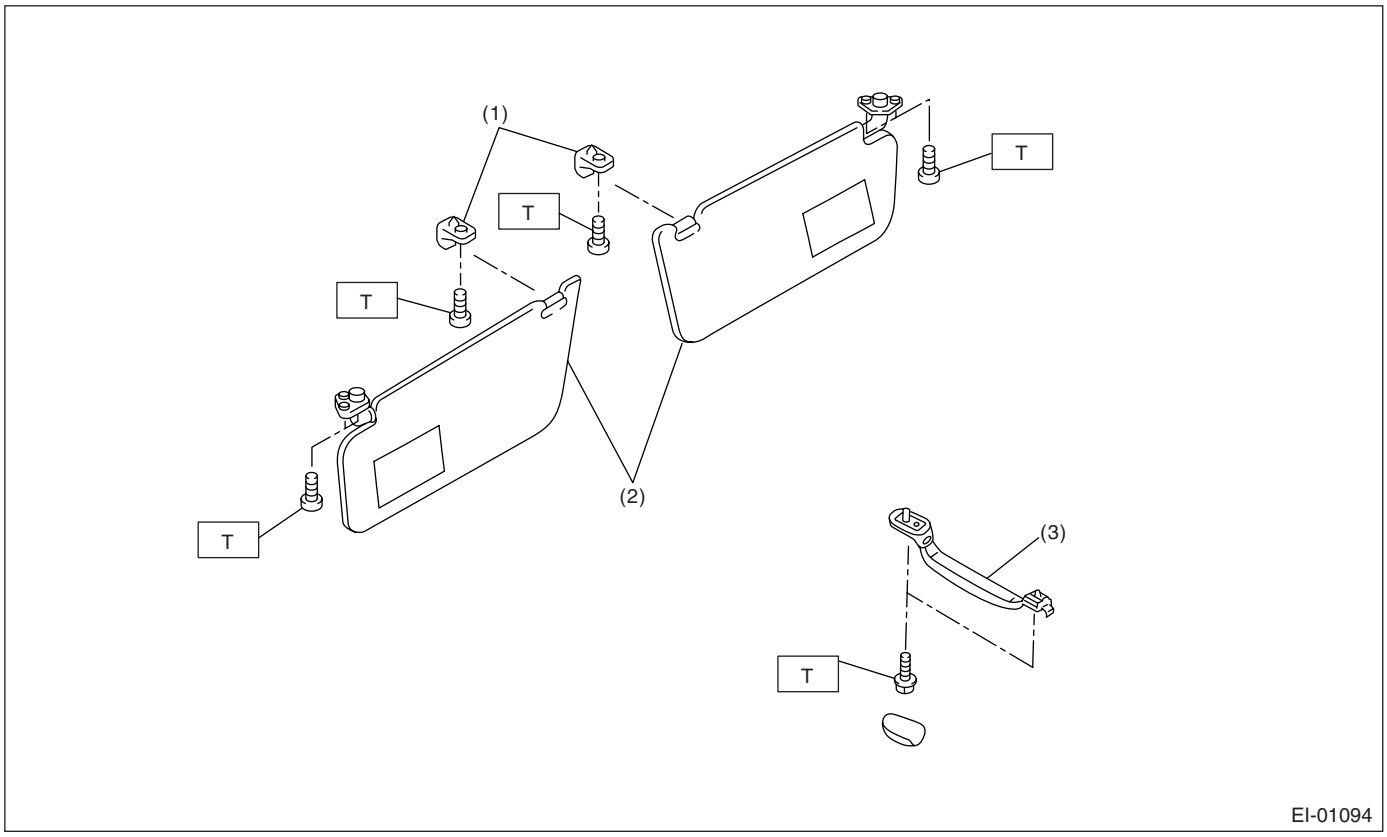
(1) Floor mat

18.LUGGAGE FLOOR MAT



(1) Front floor mat
(2) Floor box
(3) Side floor mat RH
(4) Center floor mat
(5) Side floor mat LH

19.INNER ACCESSORIES



(1) Hook
(2) Sun visor
(3) Assist grip (Retractable)

Tightening torque: N·m (kgf-m, ft-lb)
T: 2 (0.20, 1.46)

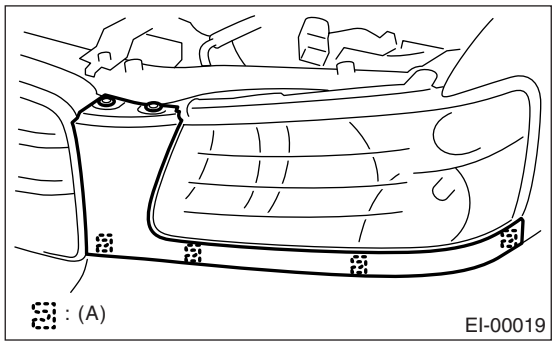
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removal of trim.
Clip clamp pliers	Used for removal of various clips and clamps.

2. Front Grille

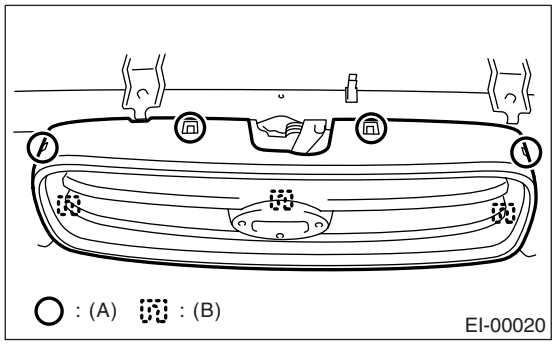
A: REMOVAL

1) Open the front hood.
2) Remove the two upper clips of front grille side. Slide the front grille side to vehicle outside, then remove the four lower hooks (A) to remove front grille side.



(A) Hook

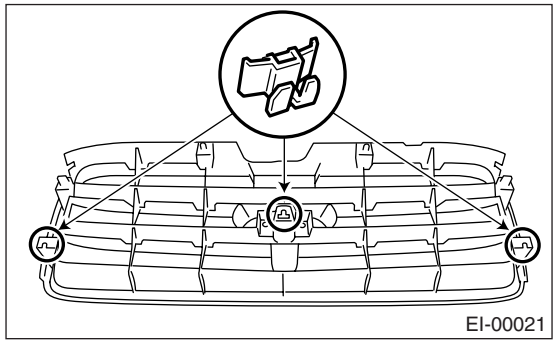
3) Remove the four upper clips (A) of front grille, then pull the front grille up and remove the three hooks (B) to remove front grille.



(A) Clip
(B) Hook

B: INSTALLATION

1) Remove the three hooks remained on body during removal, then install them to front grille.



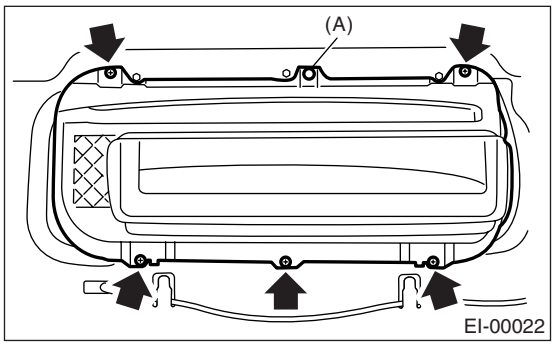
NOTE:
Make sure that the clip direction is correct.

2) Install the front grille to body.
3) Install the front grille side.

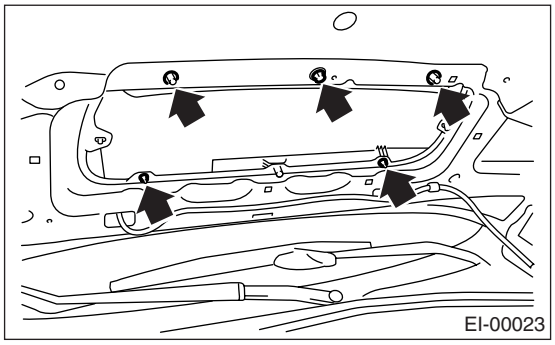
3. Front Hood Grille

A: REMOVAL

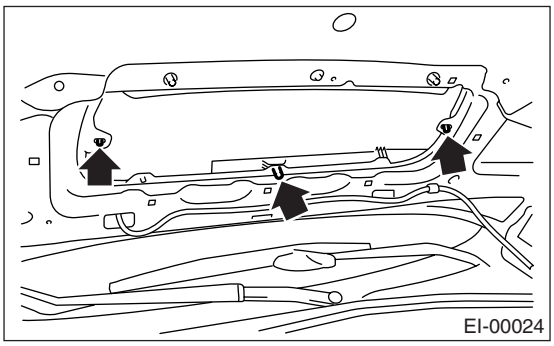
1) Remove the five screws and clip (A) to remove front hood duct.



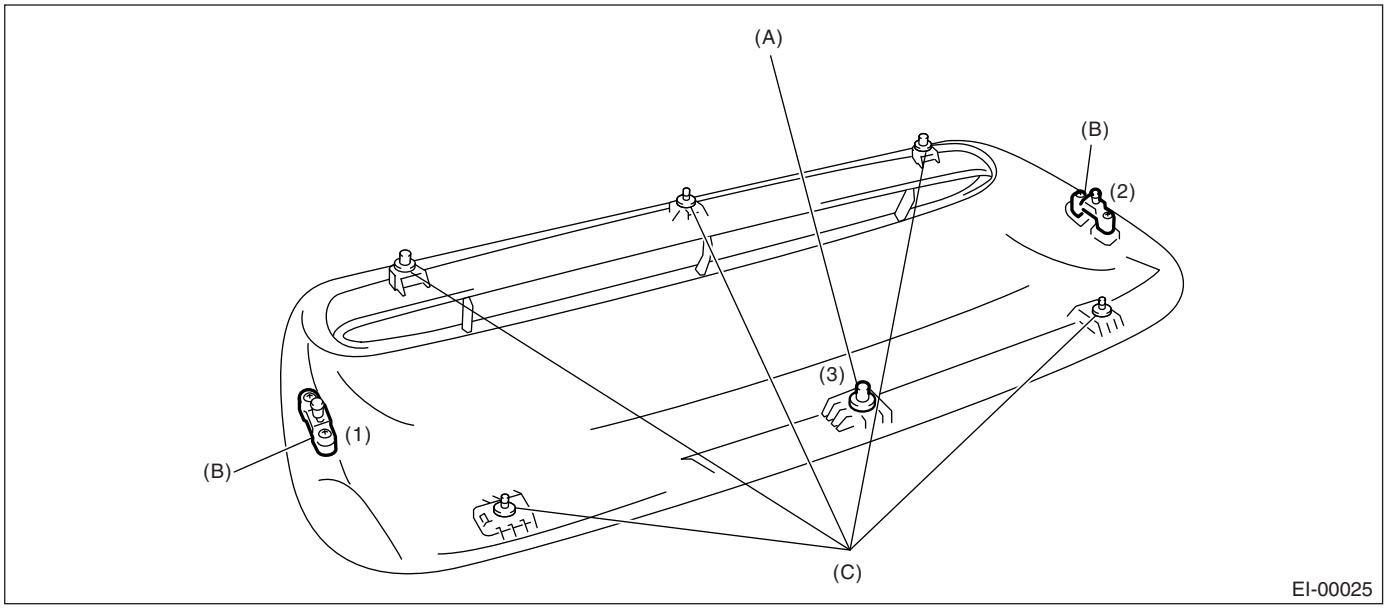
2) Remove the five nuts.



3) Remove the three black clips to remove front hood grille.

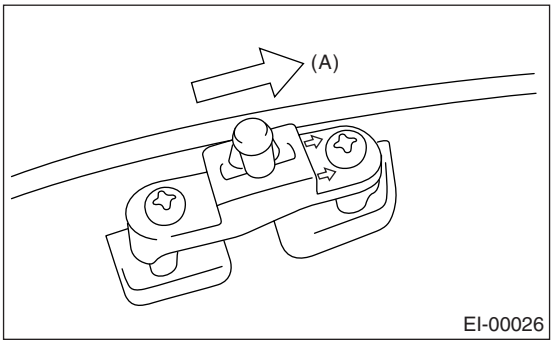


B: INSTALLATION



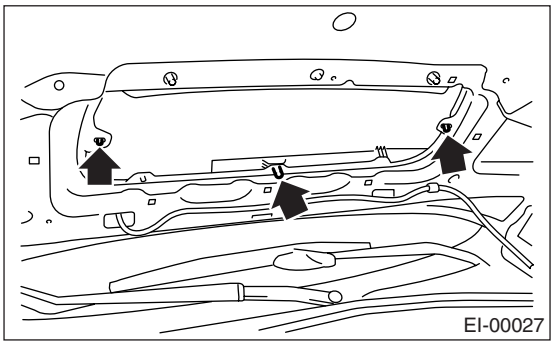
(A) Black clip (B) Black clip (C) Bolt

1) Replace the black clip (1), (2) with a new one. Install the clip with arrow mark facing the front side of grille (A).



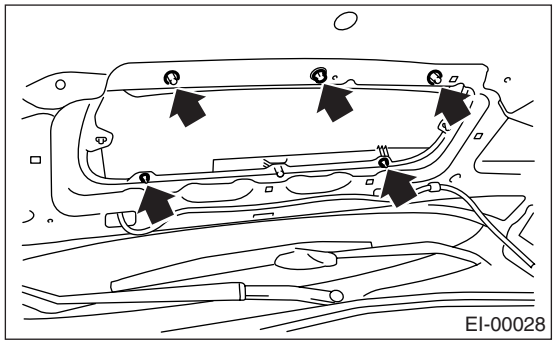
2) Replace the black clip (3) with a new one.
3) Insert the front hood grille clip and engage the three clips.

NOTE:
Make sure that the anchor portion of each clip is firmly engaged.

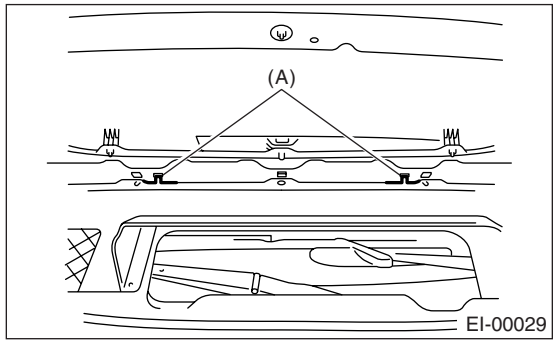


4) Install the five nuts.

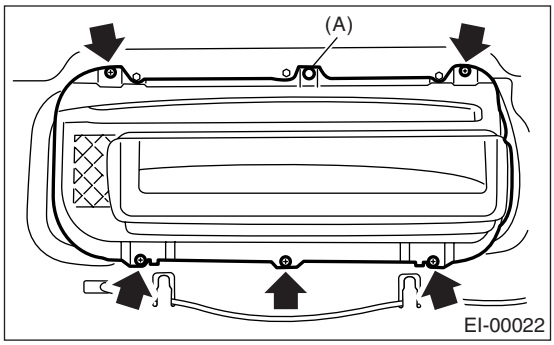
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.25 ft-lb)



5) Catch the two hooks (A) of front hood duct to the front hood holes.



6) Install the front hood duct with clip (A) and five screws.



Tightening torque:
1.0 N·m (0.1 kgf-m, 0.7 ft-lb)

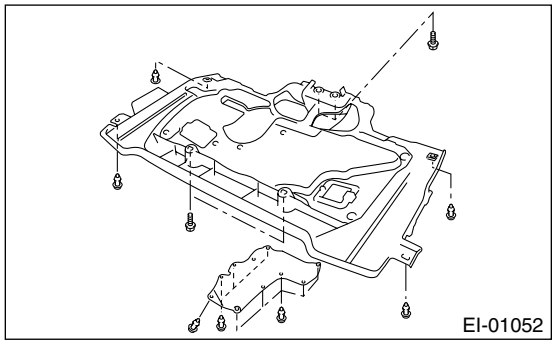
C: INSPECTION

Make sure that the clip is firmly engaged.
Make sure that there is no abnormal gap at whole periphery of front hood grille.
Make sure that there is no damage on front hood grille.

4. Front Under Cover

A: REMOVAL

1) Lift-up the vehicle.
2) Loosen the bolts, remove the clips, and then remove the under cover.



B: INSTALLATION

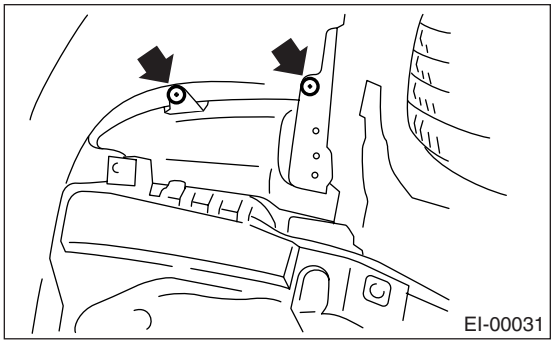
Install in the reverse order of removal.

Tightening torque:
14 N·m (1.42 kgf-m, 10.3 ft-lb)

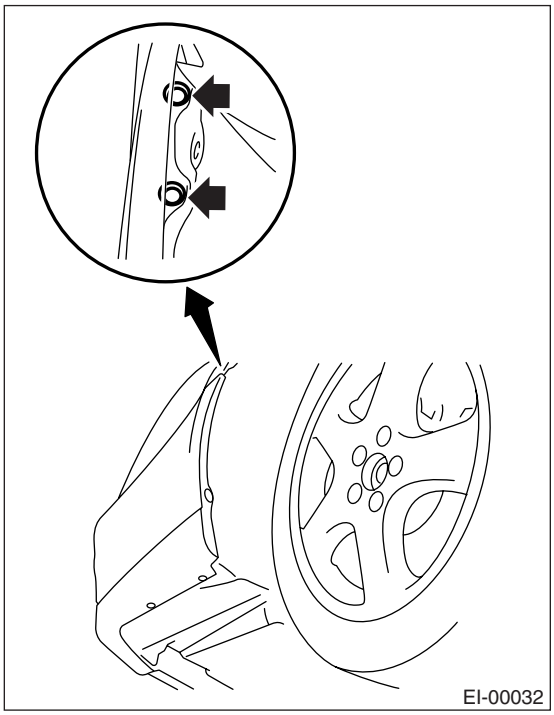
5. Front Bumper

A: REMOVAL

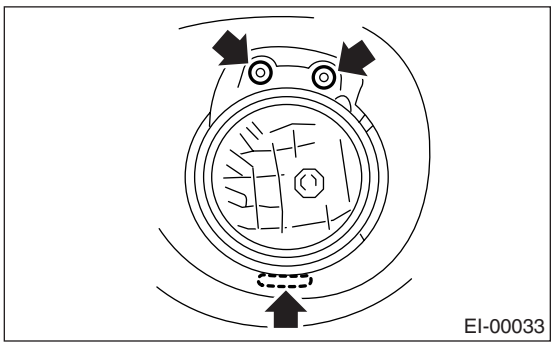
1) Disconnect the ground cable from battery.
2) Loosen the two clips to remove the mud guard and front under cover.



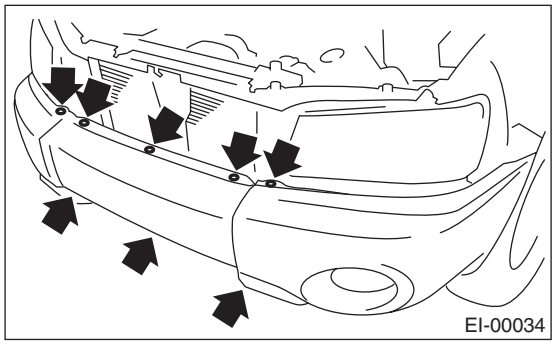
3) Turn over the mud guard, and remove two inside clips which securing front bumper to fender.



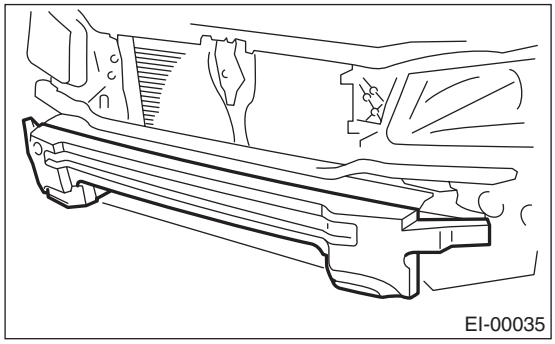
4) Turn over the mud guard, and disconnect the fog light connector before removing a bolt and clip which installed to under side of fog light hole.



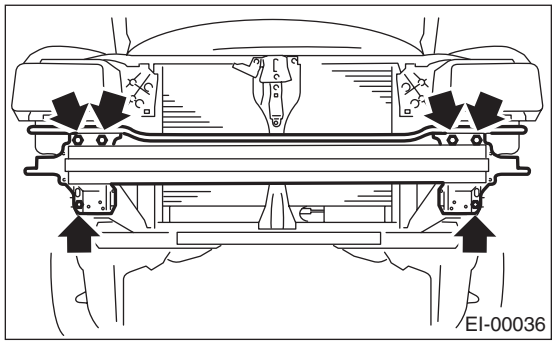
5) Remove the front grille and front grille side. <Ref. to EI-18, REMOVAL, Front Grille.>
6) Remove the eight clips, and pull out the bumper slightly.



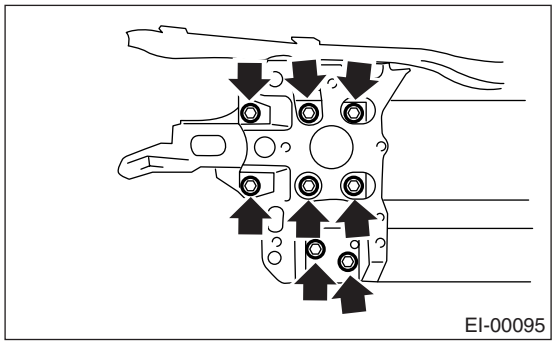
7) Remove the E/A FORM from bumper beam.
E/A FORM may easily break. Do not apply excessive force to it during removal.



8) Remove the bumper beam.



9) Remove the eight bolts to disassemble the front bumper beam.



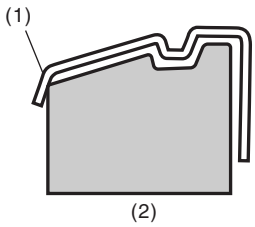
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EI-4, FRONT BUMPER, COMPONENT, GENERAL DESCRIPTION.>

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper mounting	Set the bumper on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible.	 EI-00038 (1) Bumper (2) Set bumper section
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).	
3	Degreasing, cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.	
6	Top coat paint (I)	Solid color	Metallic color
		Use section (block) paint for top coat. • Paint in use (for each color): Solid paint Hardener PB Thinner T-301 • Mixing ratio: Main agent vs. hardener = 4:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 35 — 45 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)	Use section (block) paint for top coat. • Paint in use (for each color): Metallic paint Hardener PB Thinner T-306 • Mixing ratio: Main agent vs. hardener = 10:1 • Viscosity: 10 — 13 sec/20°C (68°F) • Film thickness: 15 — 20 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)
7	Drying	Not required.	Dry at normal temperature [10 min. or more at 20°C (68°F)]. In half-dried condition, avoid dust, dirt.
8	Top coat paint (II)	Not required.	Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minutes intervals. • Paint in use: Metallic paint Hardener PB Thinner T-301 • Mixing ratio: Clear vs. hardener = 6:1 • Viscosity: 14 — 16 sec/20°C (68°F) • Film thickness: 25 — 30 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)
9	Drying	60°C (140°F), 60 min. or 80°C (176°F), 30 min. If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).	
10	Inspection	Paint check.	
11	Masking removal	Remove the masking in process No. 2.	

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

NOTE:
All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.

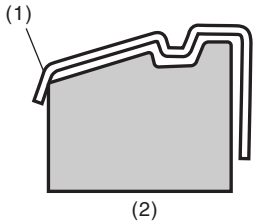
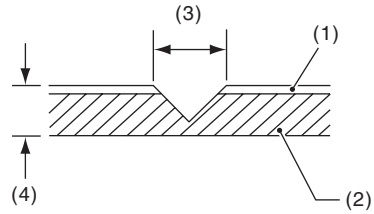
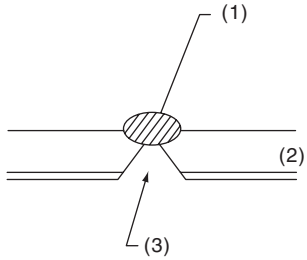
1) Minor damage causing only a change in the lustre of the bumper due to a light touch
Almost restorable.

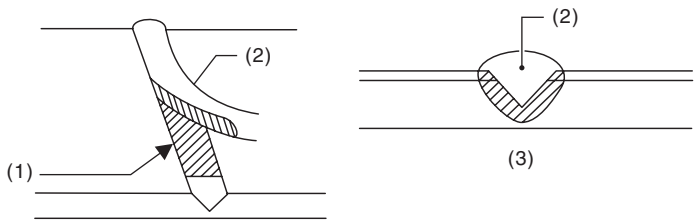
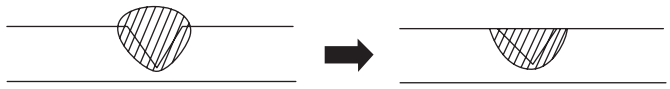
<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the area to be repaired using water.</td></tr>
<tr><td>2</td><td>Sanding</td><td colspan="2">Grind the repairing area with #500 sand paper in a “feathering” motion.</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Repeatedly apply wax to the affected area using a soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.</td><td rowspan="2">Perform either the same operation as for the resin section or process No. 18 and subsequent operations in the “3)” section, depending on the degree and nature of damage.</td></tr>
<tr><td>Polish the waxed area with a clean cloth after 5 to 10 minutes.</td></tr>
</table>

2) Deep damage caused by scratching fences, etc.
A dent cannot be repaired but a whitened or swelled part can be removed.

<table>
<tr><th>Process No.</th><th>Process name</th><th colspan="2">Job contents</th></tr>
<tr><td>1</td><td>Cleaning</td><td colspan="2">Clean the damaged area with water.</td></tr>
<tr><td>2</td><td>Removal of damaged area</td><td colspan="2">Cut off protruding area, if any, due to collision, using a putty knife.</td></tr>
<tr><td>3</td><td>Sanding</td><td colspan="2">Grind the affected area with #100 to #500 sand paper.</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Finish</td><td>Resin section</td><td>Coated section</td></tr>
<tr><td>Same as Process No. 3 in the “1)” section.</td><td>Perform Process No. 12 and subsequent operations in the “3)” section.</td></tr>
</table>

3) Deep damage such as a break or hole that requires filling
Much of the peripheral grained surface must be sacrificed for repair, and the degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)
Recommended repair kit: PP Part Repair Kit (NRM)

Process No.	Process name	Job contents	
1	Bumper removal	Remove the bumper as required.	
2	Part removal	Remove the parts built into bumper as required.	
3	Bumper placement	Place the bumper on a paint worktable as required. It is recommended that contour of worktable accommodate internal shape of bumper.	 EI-00038 (1) Bumper (2) Set bumper section
4	Surface preparation	Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol).	
5	Cutting	If nature of damage are cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Then, bevel or "vee-out" the affected area using a knife or grinder.	 EI-00235 (1) Paint surface (2) PP base surface (3) 20 — 30 mm (0.79 — 1.18 in) (4) 3 mm (0.12 in)
6	Sanding (I)	Grind beveled surface with sand paper (#40 to #60) to smooth finish.	
7	Cleaning	Clean the sanded surface with the same solvent as used in Process No. 4.	
8	Temporary welding	Grind the side just opposite the beveled area with sand paper (#40 to #60) and clean using a solvent. Temporarily spot-weld the side, using a PP welding rod and heater gun.	 EI-00236 (1) Welded spot (Use heater gun and PP welding rod) (2) PP base surface (3) Beveled section NOTE: • Do not melt the welding rod until it flows out. This results in reduced strength. • Leave the welded spot unattended until it cools completely.

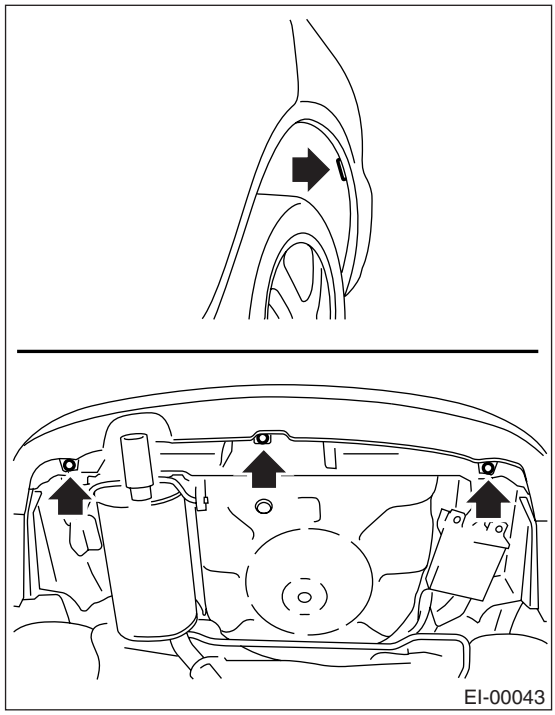
Process No.	Process name	Job contents
9	Welding	Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.  EI-00237 (1) Melt hatched area (2) Welding rod (3) Section NOTE: • Melt the sections indicated by hatched area. • Do not melt the welding rod until it flows out, in order to provide strength. • Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot. • Leave the welded spot unattended until it cools completely.
10	Sanding (II)	Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.  EI-00042 Sand the welded spot smooth with #240 sand paper.
11	Masking	Mask the black substrate section using masking tape. Recommended masking tape: Nichiban No. 533 or equivalent
12	Cleaning/ degreasing	Completely clean the entire coated area, using solvent similar to that used in Process No. 4.
13	Primer coating	Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary. Recommended primer: Mp/364 PP Primer NOTE: Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kgf/cm^2, 36 to 50 psi) with a spray gun.
14	Leave unattended.	Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry. NOTE: If dirt or dust comes in contact with the coated area, wipe it off with a cloth dampended with alcohol. (Do not use thinner since the coated area tends to melt.)
15	Primer surfacer coating	Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes. Recommended surfacer: • UPS 300 Flex Primer • No. 303 UPS 300 Exclusive hardener • NPS 725 Exclusive Reducer (thinner) • Mixing ratio: 2: 1 (UPS 300: No. 303) • Viscosity: 12 — 14 sec/20°C (68°F) • Coated film thickness: 40 — 50 μ
16	Drying	Allow the coated surface to dry for 60 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sand paper and water.
18	Cleaning/ degreasing	Same as Process No. 12.

Process No.	Process name	Job contents	
		Solid color	Metallic color
19	Top coat (I)	Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3: 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 40 — 50 μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)	Use a “block” coating method. • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3: 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30 μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)
20	Leave unattended.	Not required.	Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3: 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 10 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kgf/cm^2, 36 — 50 psi)
22	Drying	Allow the coated surface to dry at 20°C (68°F) for two hours or 60°C (140°F) for 30 minutes. NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.	
23	Inspection	Carefully check the condition of the repaired area.	
24	Masking removal	Remove the masking tape applied in Process No. 11 and 13.	
25	Parts installation	Install the parts on bumper in reverse order of removal.	
26	Bumper installation	Install the bumper.	

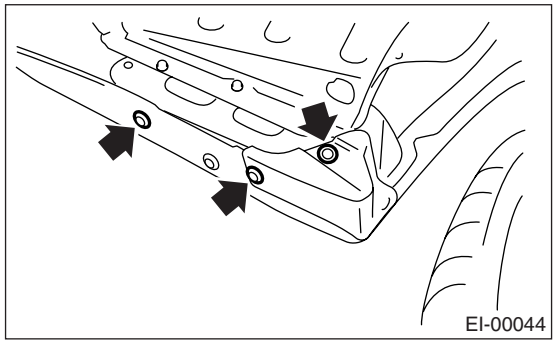
6. Rear Bumper

A: REMOVAL

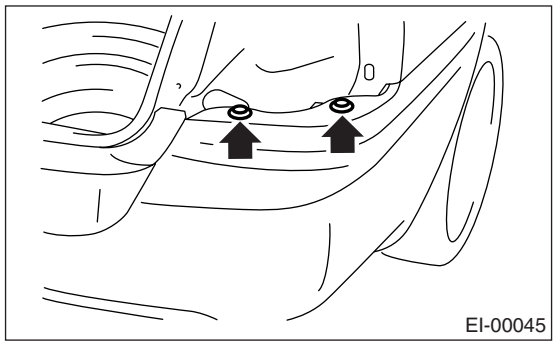
1) Disconnect the ground cable from battery.
2) Remove the bolts and clips.



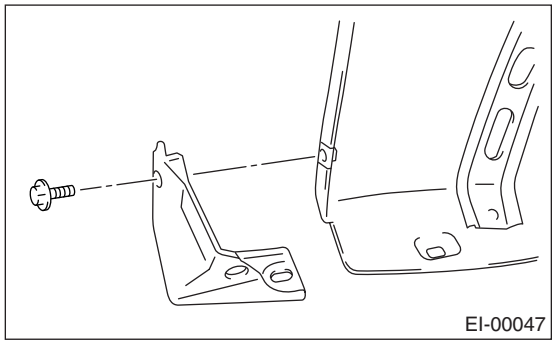
3) Remove the clips from bumper and bracket.



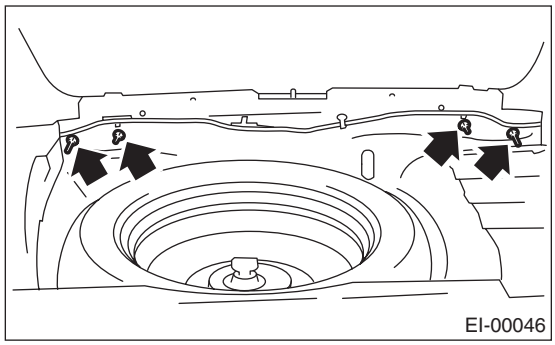
4) Remove the rear combination light assemblies from each side. <Ref. to LI-21, REMOVAL, Rear Combination Light Assembly.>
5) Remove the two clips from each side.



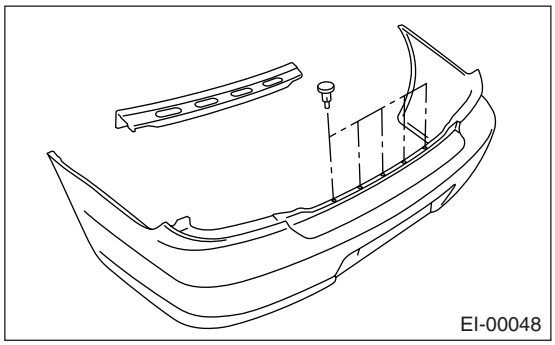
6) Remove the floor box.
7) Remove the rear skirt trim.
8) Remove the bolt to remove bracket from bumper.



9) Loosen the four nuts to remove rear bumper.



10) Disengage the clips to remove bumper upper beam.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EI-5, REAR BUMPER, COMPONENT, General Description.>

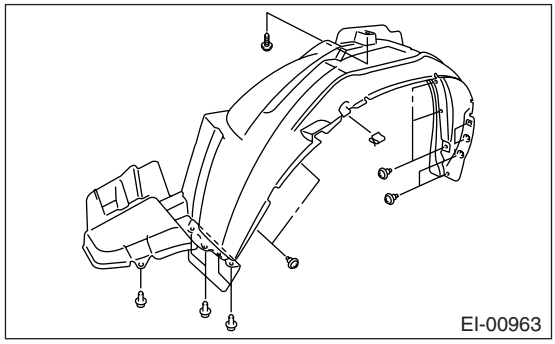
C: REPAIR

Refer to front bumper repair. <Ref. to EI-23, REMOVAL, Front Bumper.>

7. Mud Guard

A: REMOVAL

1) Jack-up the vehicle.
2) Remove the wheel. <Ref. to WT-5, REMOVAL, Steel Wheel.> or <Ref. to WT-6, REMOVAL, Aluminum Wheel.>
3) Remove the clip to remove air flap.
4) Remove the screws and clips to remove mud guard.



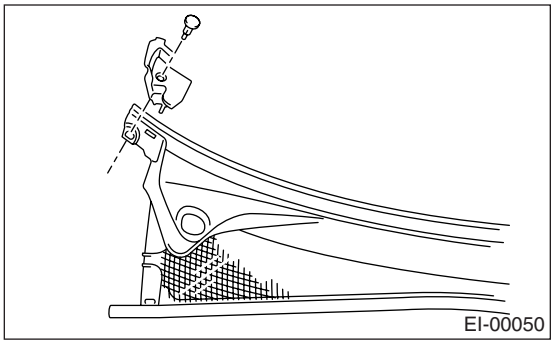
B: INSTALLATION

Install in the reverse order of removal.

8. Cowl Panel

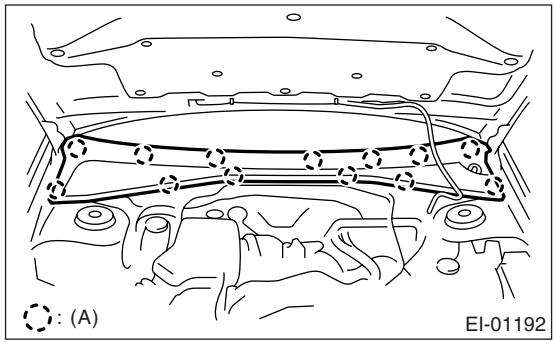
A: REMOVAL

1) Open the front hood.
2) Remove the wiper arm. <Ref. to WW-12, REMOVAL, Front Wiper Arm.>
3) Remove the clips to remove cowl side panels.



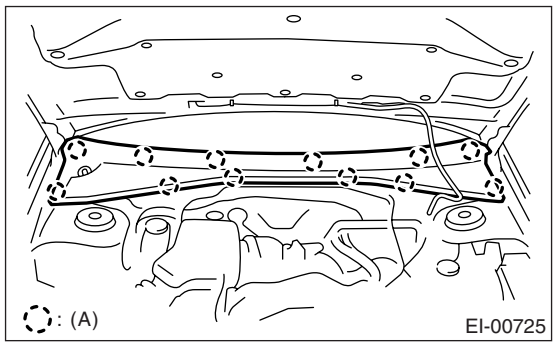
4) Loosen the clips to remove cowl panel.

- LHD model



(A) Clip

- RHD model



(A) Clip

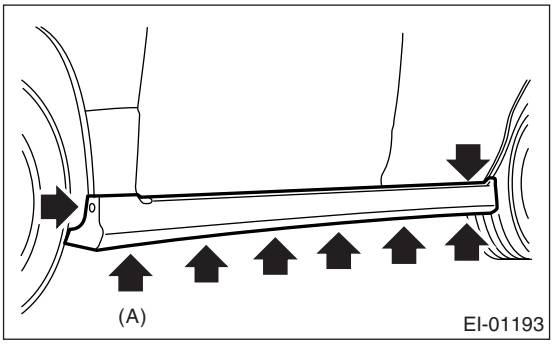
B: INSTALLATION

Install in the reverse order of removal.

9. Side Sill Spoiler

A: REMOVAL

Remove the clips (one on front fender arch, five on bottom of side sill spoiler, one on top of side sill spoiler) and bolt (one bottom of side sill spoiler), then remove the side sill spoiler.



(A) Bolt

B: INSTALLATION

Install in the reverse order of removal.

10.Side Garnish

A: REMOVAL

1) Incise the edge of garnish using cutter, and then remove the garnish with pulling towards you by hands.

NOTE:
Remove the garnish carefully. Forced removal of garnish may damage garnish and clips.

2) Adhere the masking tape around area where the double-sided tape of side garnish was adhere.
3) Apply the solvent (SUMITOMO 3M 4000 or equivalent) to the area where double-sided tape was adhered.

NOTE:
• Wipe off immediately when the solvent is touched on the garnish surface.
• Do not use the solvent to the body which repaired with lacquer paint.

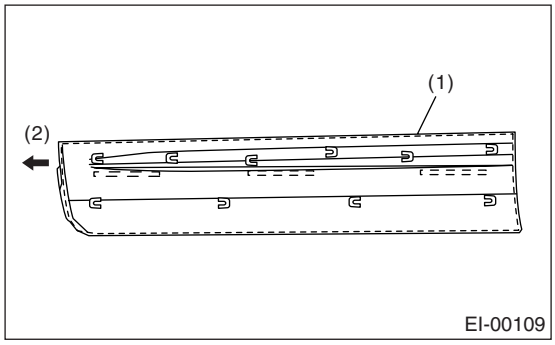
4) Cover the area where the solvent applied using plastic wrap, and then heat the double-sided tape was adhered for 5 to 15 minutes in 40 to 60°C (104 to 140°F) using heat lamp.
5) Remove the double-sided tape of side garnish side tape by following above step 3) and 4).

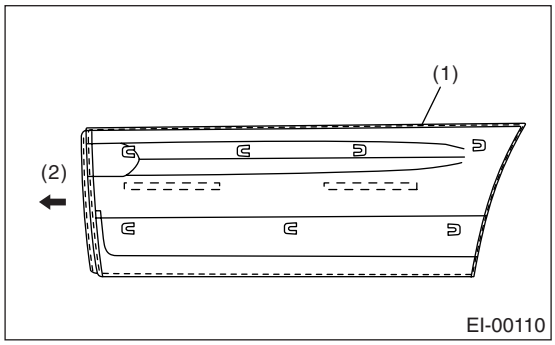
NOTE:
When the double-sided tape is not removed completely using above steps, use the scraper.

B: INSTALLATION

1) Apply the PRIMER (SUMITOMO 3M K-500 or equivalent) widely to the slightly larger area where double-sided tape was adhered, and then adhere the double-sided tape (SUMITOMO 3M 5305 or equivalent).

NOTE:
Use 5 mm (0.2 in) width and 1 mm (0.04 in) thickness double-sided tape.





(1) Double-sided tape
(2) Front side

2) Heat the vehicle body to 40 to 60°C (104 to 140°F) and garnish to 20 to 30°C (68 to 86°F) using heat lamp.
3) Remove the double-sided tape backing sheet, and then align the clips to vehicle body holes. Press and install the side garnish applying 69 — 98 N (7 — 10 kgf, 15 — 22 lbf) by the hands, using care to avoid air entering.

NOTE:
• To keep the adhesion, do not wash the vehicle within 24 hours.
• After the adhesion, use care not to move the side garnish up and down.

C: INSPECTION

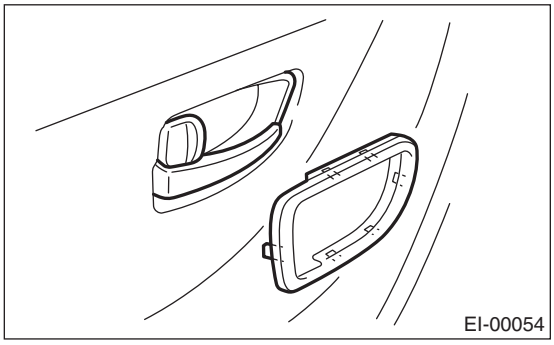
• Check the side garnish is not damaged or cracked.
• Check the clips are not broken.

11.Front Door Trim

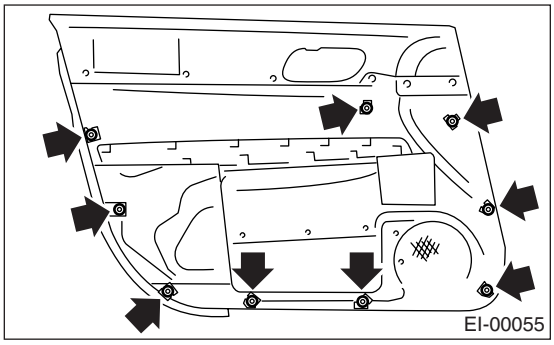
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

1) Disconnect the ground cable from battery.
2) Remove the gusset cover.
3) Pull up the inner remote cover toward you to remove upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.



4) Remove the power window control switch. <Ref. to GW-8, REMOVAL, Power Window Control Switch.>
5) Remove the clips of trim panel using clip remover to remove trim panel.



B: INSTALLATION

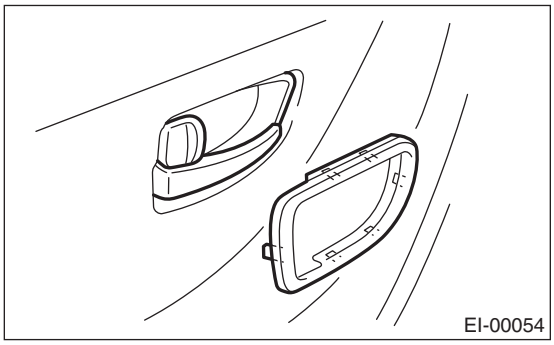
Install in the reverse order of removal.

12.Rear Door Trim

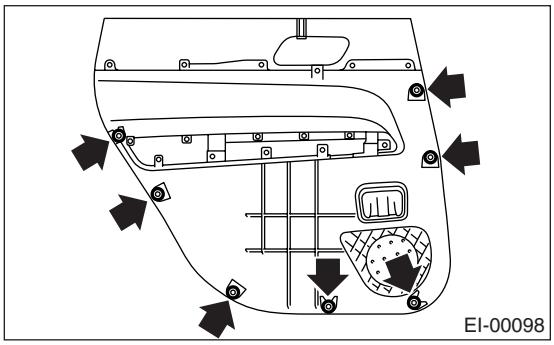
A: REMOVAL

CAUTION:
Do not apply excessive force to the clip. Otherwise the clip may be broken.

1) Disconnect the ground cable from battery.
2) Pull up the inner remote cover toward you to remove upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.



3) Remove the power window control switch. <Ref. to GW-8, REMOVAL, Power Window Control Switch.>
4) Remove the clips of trim panel using clip remover to remove trim panel.



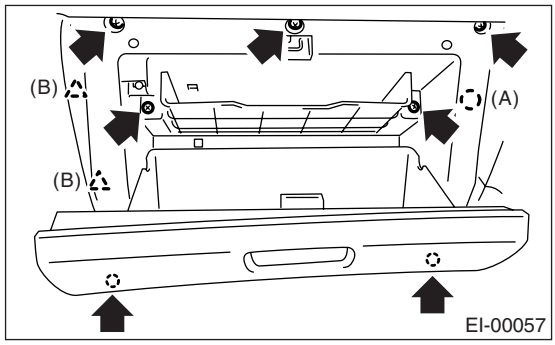
B: INSTALLATION

Install in the reverse order of removal.

13.Glove Box

A: REMOVAL

1) Open the glove box.
2) Loosen the screws to remove glove box.



(A) Hook
(B) Clip

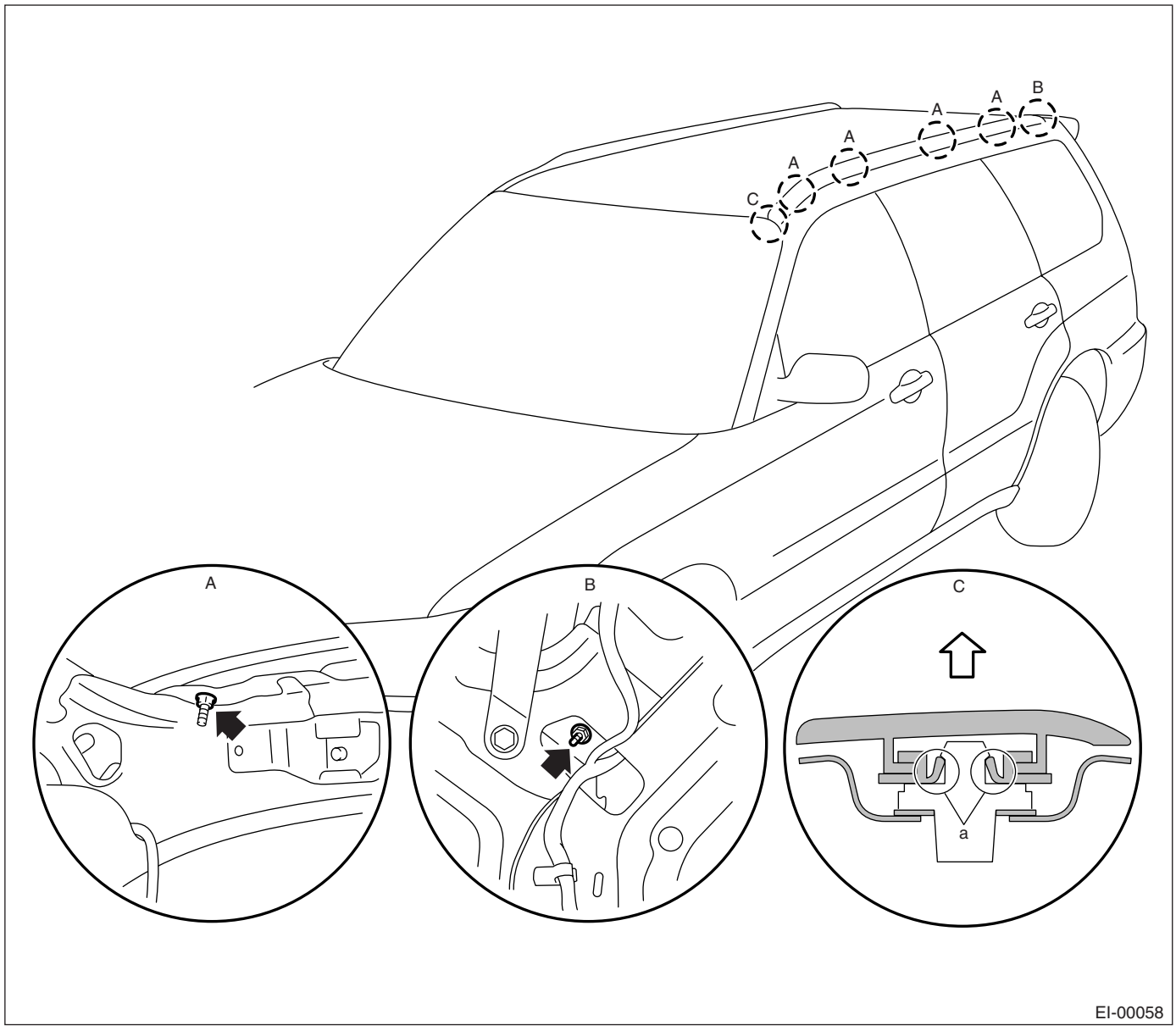
B: INSTALLATION

Install in the reverse order of removal.

14.Roof Rail

A: REMOVAL

1) Remove the roof trim. <Ref. to EI-48, REMOVAL, Roof Trim.>
2) Remove the five mounting nuts.
3) Detach the clip at front edge sideways carefully to remove the roof rail upwards.



NOTE:
Remove the clip at “C” area upwards while applying sideway force to deflect hook at “a” area.

B: INSTALLATION

Install in the reverse order of removal.

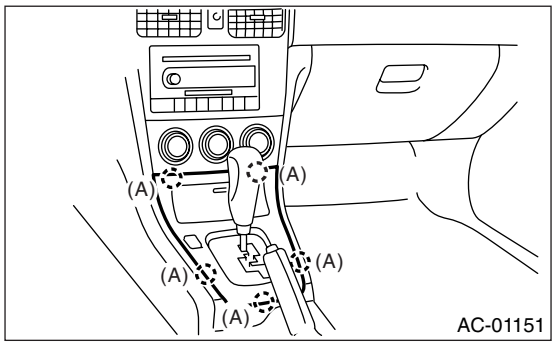
CAUTION:
Be careful not to scratch the body panels with roof rail stud bolts when removing and installing them.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

15.Console Box

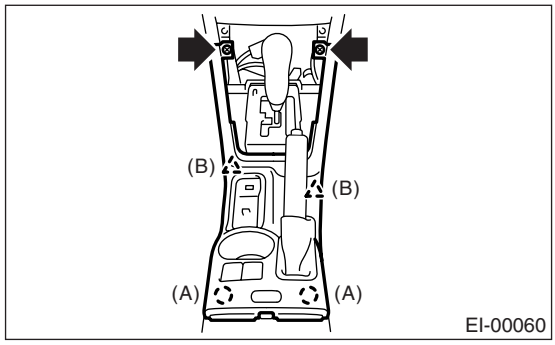
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the console front cover.



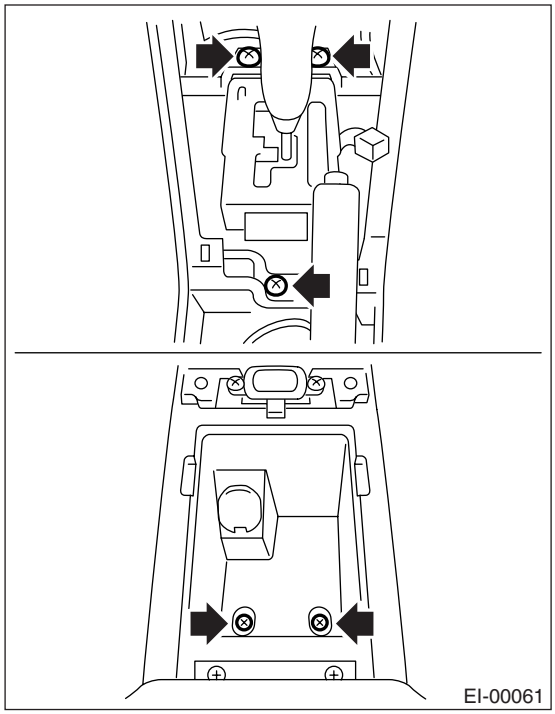
(A) Hook pawl

3) Remove the shift knob (MT model).
4) Loosen the screws to remove console cover.

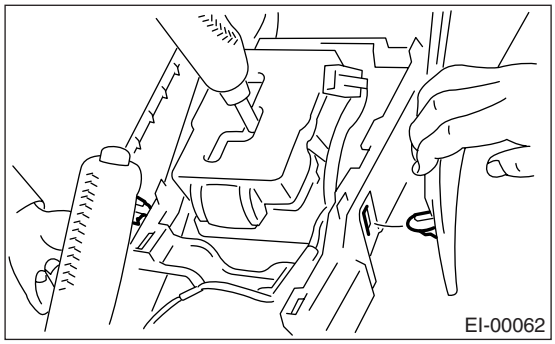


(A) Hook
(B) Clip

5) Loosen the screws.



6) Remove the hook pawl of console side panel to remove console box.



B: INSTALLATION

Install in the reverse order of removal.

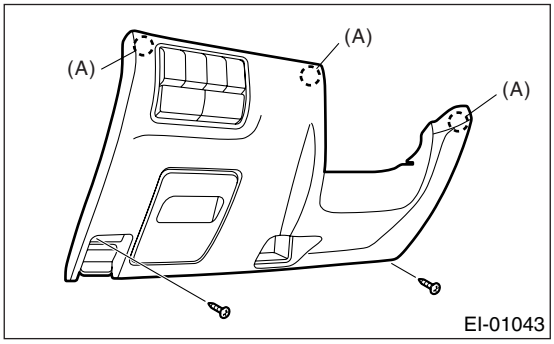
16.Instrument Panel Assembly

A: REMOVAL

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system harness when servicing the instrument panel.

1. REMOVAL OF INSTRUMENT PANEL ONLY

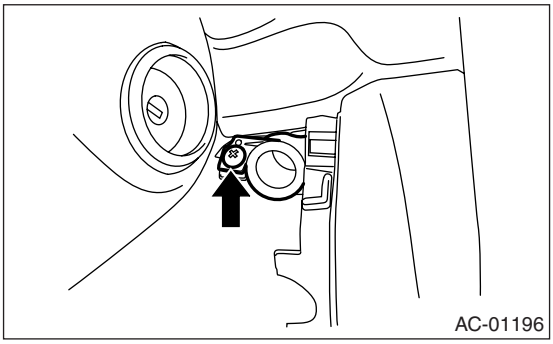
1) Disconnect the ground cable from battery.
2) Loosen the screws and clips, and then remove the lower cover.



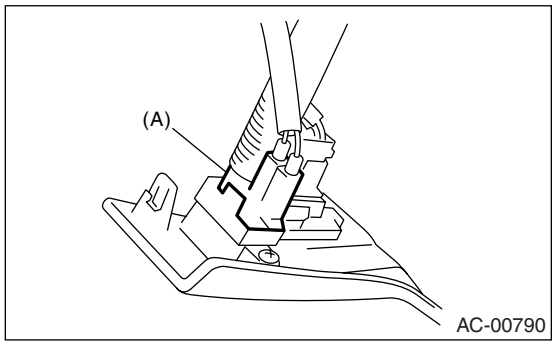
(A) Clip

3) For LHD model, loosen the in-vehicle sensor screws, and then remove the in-vehicle sensor from the instrument panel. For RHD model, disconnect the in-vehicle sensor hose and connector from in-vehicle sensor (A).

• LHD model

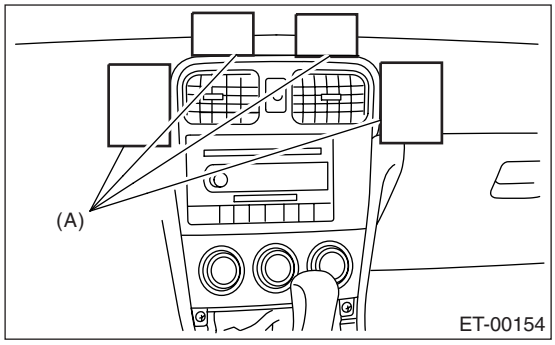


• RHD model

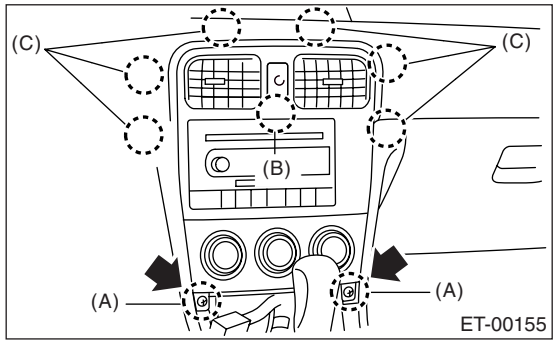


4) Remove the console front cover and console cover. <Ref. to EI-39, REMOVAL, Console Box.>
5) Apply the thick protective tape (A) to instrument panel pad to protect the surface of it.

NOTE:
Also apply the protective tape to the deep inside portion between center console panel and instrument panel pad.



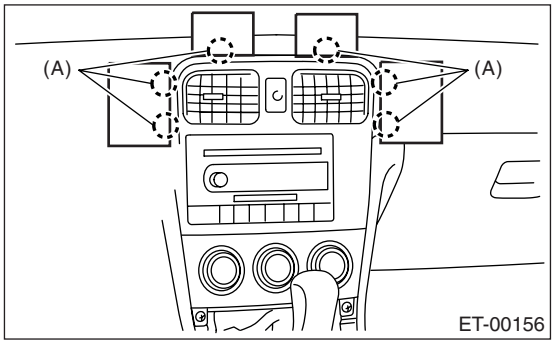
6) Loosen the screws.



(A) Screw
(B) Clip
(C) Claw

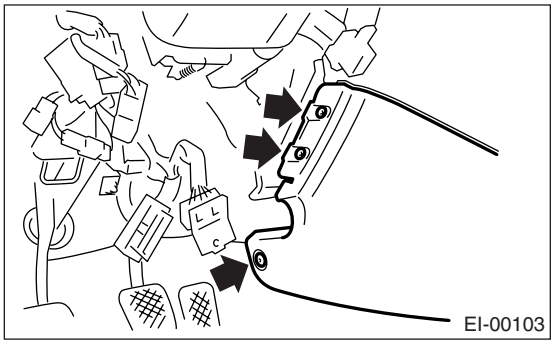
7) Insert the flat tip screwdriver to the position (A) and release the claw with pulling out the lower portion of center console panel.

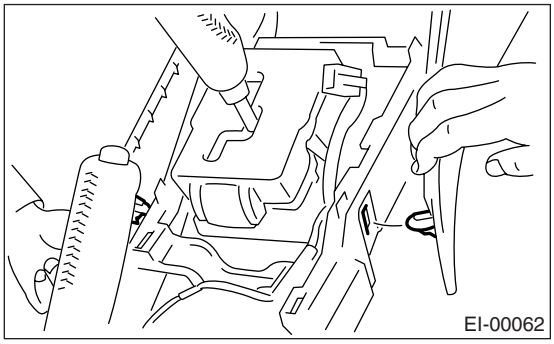
CAUTION:
Do not insert the flat tip screwdriver into any portion except for indicated in the figure. The instrument panel may be damaged.



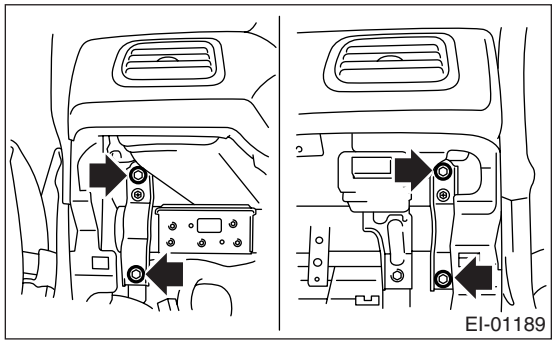
(A) Inserting position of flat tip screwdriver

8) Disconnect the connectors of A/C control panel and hazard switch.
9) Loosen the screws and clips, and then remove the side console panel.





10) Remove the passenger's airbag module. <Ref. to AB-15, REMOVAL, Passenger's Airbag Module.>
11) Remove the two steering column installation bolts. <Ref. to PS-21, REMOVAL, Tilt Steering Column.>
12) Loosen the four instrument panel installation bolts. (Do not remove the lower bolts for alignment of install location.)



13) Remove the combination meter assembly. <Ref. to IDI-10, REMOVAL, Combination Meter.>
14) Loosen the instrument panel installation screws.
15) Remove the instrument panel center compartment. <Ref. to EI-52, REMOVAL, Instrument Panel Center Compartment.>
16) Remove the radio. <Ref. to ET-5, REMOVAL, Radio Body.>
17) Remove the side cover of instrument panel assembly (both side), and then loosen two bolts.
18) Remove the instrument panel assembly.

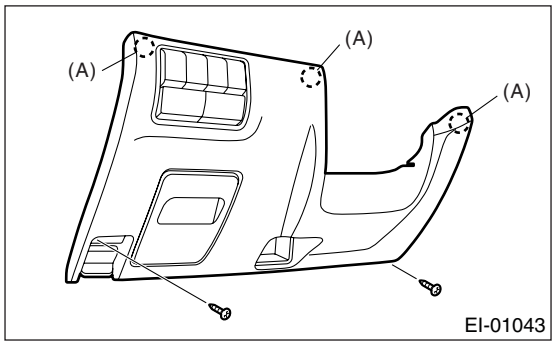
NOTE:
Remove the front pillar upper trim if necessary. <Ref. to EI-44, REMOVAL, Upper Inner Trim.>

19) Disconnect the combination meter harness connector.

CAUTION:
Do not disconnect the connector by pulling harness.

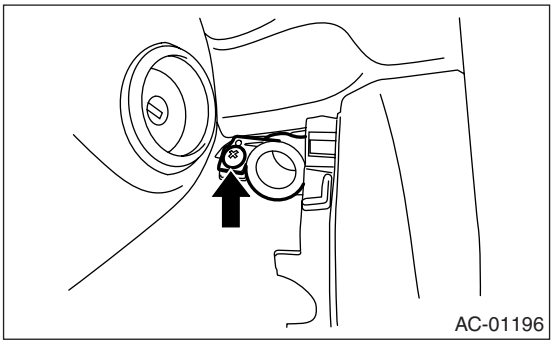
2. REMOVAL OF INSTRUMENT PANEL WITH STEERING BEAM

1) Disconnect the ground cable from battery.
2) Loosen the screws and clips (A), and then remove the lower cover.

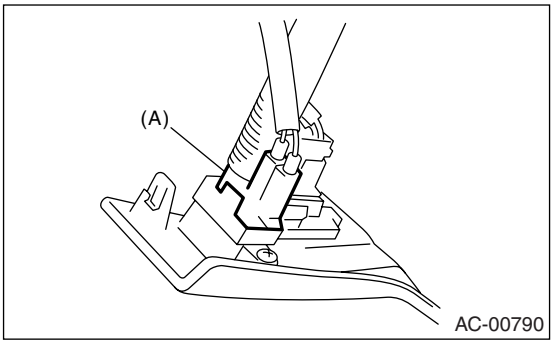


3) For LHD model, loosen the in-vehicle sensor screws, and then remove the in-vehicle sensor from the instrument panel. For RHD model, disconnect the in-vehicle sensor hose and connector from in-vehicle sensor (A).

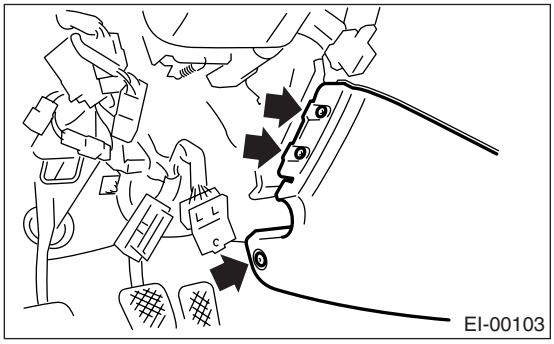
- LHD model



- RHD model

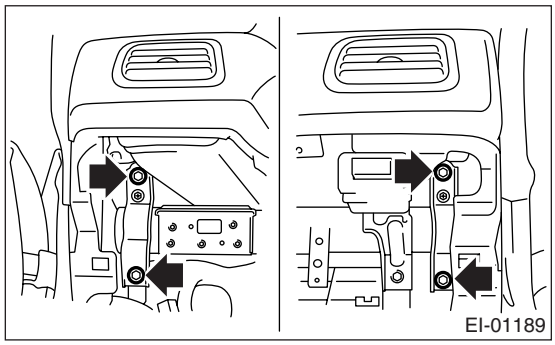


4) Remove the console front cover and console cover. <Ref. to EI-39, REMOVAL, Console Box.>
5) Loosen the screws and clips, and then remove the side console panel.



6) Remove the steering column.

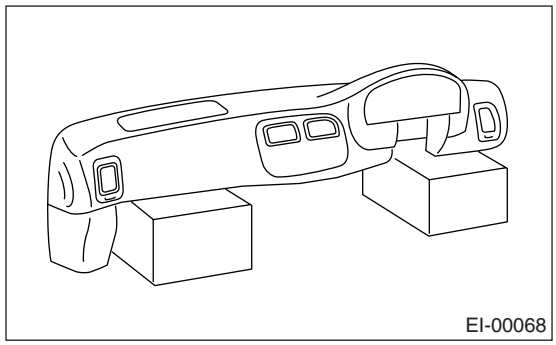
7) Loosen the four instrument panel installation bolts.



8) Remove the driver's and passenger's airbag module. <Ref. to AB-14, REMOVAL, DRIVER'S AIRBAG MODULE.> and <Ref. to AB-15, REMOVAL, Passenger's Airbag Module.>
9) Loosen the steering beam installation bolts.
10) Loosen the brake pedal installation bolts. <Ref. to BR-49, REMOVAL, Brake Pedal.>
11) Remove two clips from the edge of instrument panel assembly.
12) Remove the instrument panel assembly.

CAUTION:
Do not disconnect the connector by pulling harness.

NOTE:
- If necessary, make matching marks for easy reassembly.
- When storing the removed instrument panel, place it standing up on the floor.

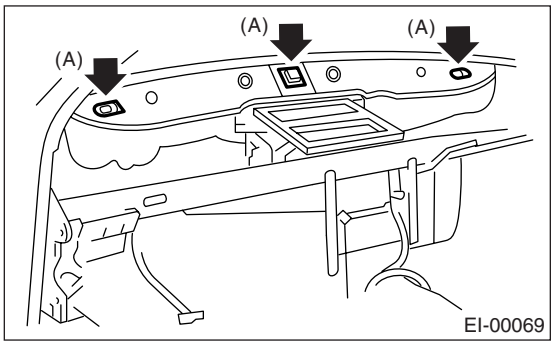


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
- **Be careful not to snag the harness.**
- **Make sure to connect the harness connector.**

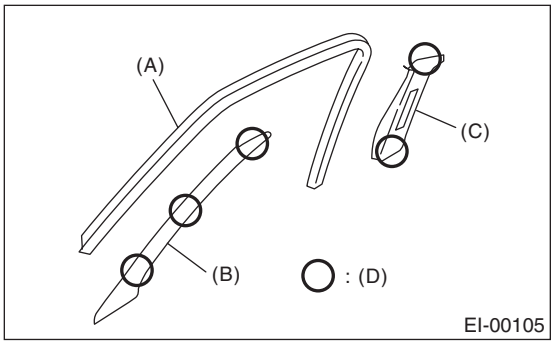
NOTE:
When setting the instrument panel into position, push the hook into grommet (A) on the body panel.



17.Upper Inner Trim

A: REMOVAL

1) Remove the lower inner trim. <Ref. to EI-45, REMOVAL, LOWER INNER TRIM.>
2) Remove the front molding (A).
3) Remove the front pillar upper trim (B).
4) Detach the front seat belt shoulder anchor, then remove the center pillar upper trim (C).



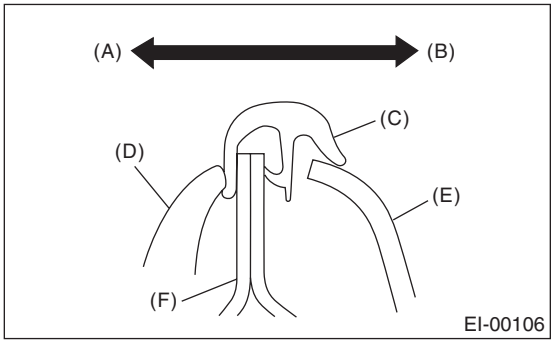
(D) Clip

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:
When installing the center pillar upper trim and front pillar upper trim, be sure to set the front molding as shown in the figure.

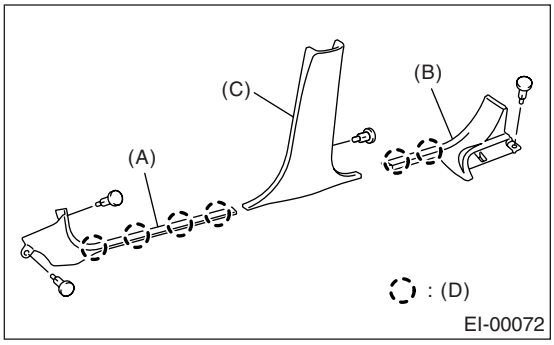


(A) Outside
(B) Inside
(C) Molding
(D) Weatherstrip
(E) Trim
(F) Body

18.Lower Inner Trim

A: REMOVAL

1) Remove the side sill front cover (A).
2) Remove the rear seat cushion <Ref. to SE-13, REMOVAL, Rear Seat.>, then remove side sill rear cover (B).
3) Remove the center pillar lower trim (C).



(D) Clip

B: INSTALLATION

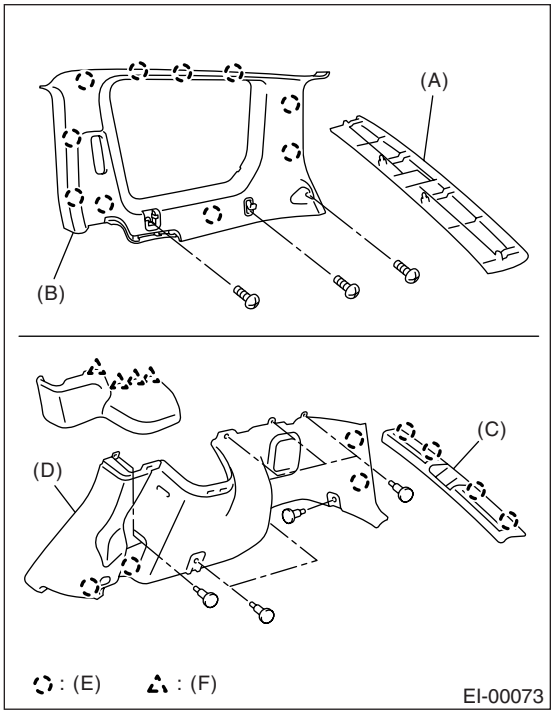
Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

19.Rear Quarter Trim

A: REMOVAL

1) Remove the rear seat. <Ref. to SE-13, REMOVAL, Rear Seat.>
2) Remove the side sill rear cover.
3) Remove the rear rail trim (A).
4) Remove the strut cap.
5) Remove the shoulder anchor of rear seat belt.
6) Loosen the screws and clips to remove rear quarter upper trim (B).
7) Remove the rear skirt trim (C).
8) Loosen the screws and clips to remove rear quarter lower trim (D).



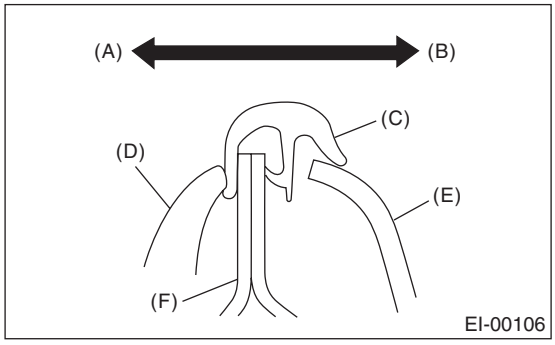
(E) Clip
(F) Hook

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:
Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:
When installing the rear quarter upper trim, be sure to set the rear molding as shown in the figure.

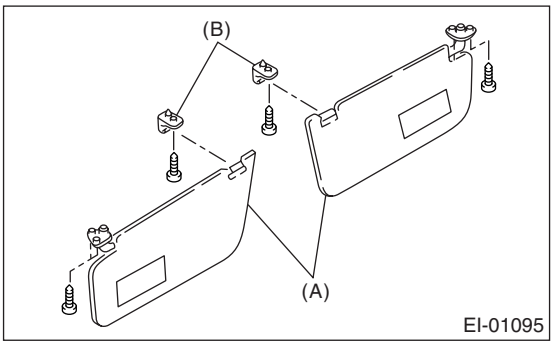


(A) Outside
(B) Inside
(C) Molding
(D) Weatherstrip
(E) Trim
(F) Body

20.Sun Visor

A: REMOVAL

Remove the mounting screws then detach sun visor (A) and hook (B).



B: INSTALLATION

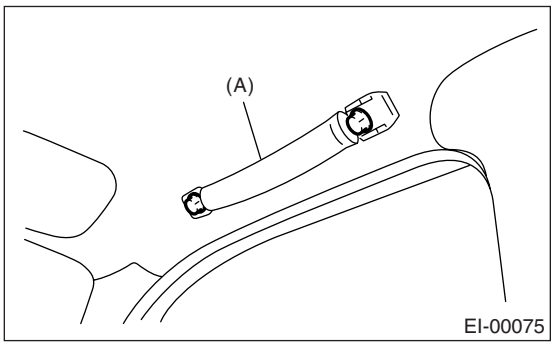
Install in the reverse order of removal.

21.Roof Trim

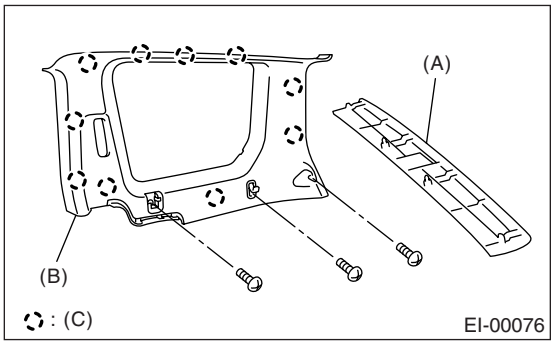
A: REMOVAL

CAUTION:
When removing the clip, use great care not to damage the roof trim.

1) Disconnect the ground cable from battery.
2) Remove the over head console. (Sunroof model) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
3) Remove the room light. <Ref. to LI-30, REMOVAL, Room Light.>
4) Remove the sun visor and hook or both sides. <Ref. to EI-47, REMOVAL, Sun Visor.>
5) Remove the assist grip cap to remove assist grip (A).

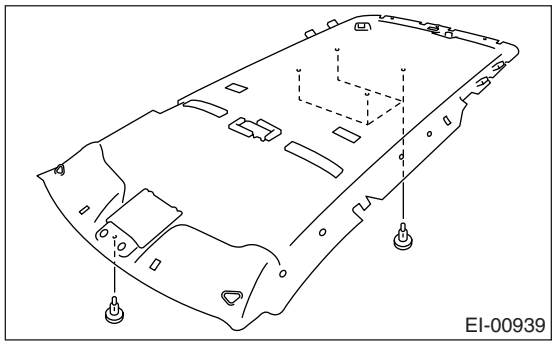


6) Remove the upper inner trim. <Ref. to EI-44, REMOVAL, UPPER INNER TRIM.>
7) Remove the rear quarter upper trim shown in the figure. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>
   (1) Remove the rear rail trim (A).
   (2) Remove the rear quarter upper trim (B) of both sides.



(C) Clip

8) Remove the clips, and then remove the roof trim.



B: INSTALLATION

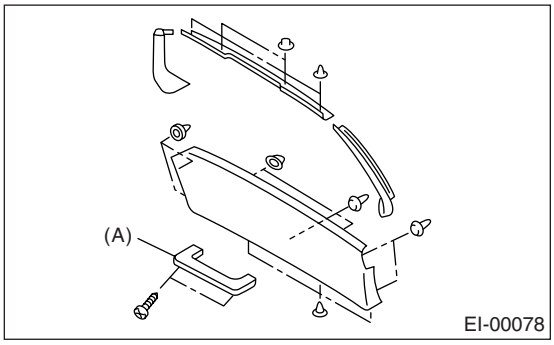
Install in the reverse order of removal.

22.Rear Gate Trim

A: REMOVAL

CAUTION:
Be careful not to damage the clips or their holes.

Remove the rear gate inner handle (A) from rear gate and then detach trim panel.



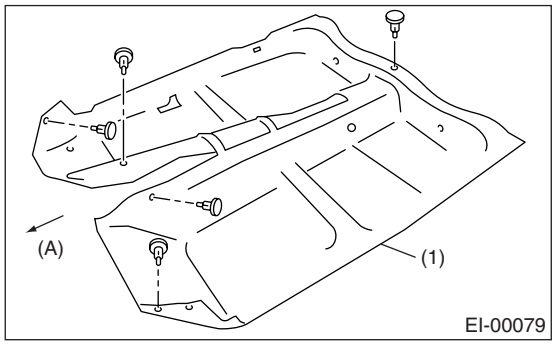
B: INSTALLATION

Install in the reverse order of removal.

23.Floor Mat

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front seats. <Ref. to SE-6, REMOVAL, Front Seat.>
3) Remove the rear seat cushion. <Ref. to SE-13, REMOVAL, Rear Seat.>
4) Remove the console box. <Ref. to EI-39, Console Box.>
5) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-45, REMOVAL, LOWER INNER TRIM.>
6) Remove the footrest or clips from floor mat.
7) Remove the mat hook.
8) Remove the mat from toe board area.
9) Remove the mat from rear heater duct.
10) Roll the mat, and then take it out of opened rear door.



(A) Vehicle front
(1) Floor mat

B: INSTALLATION

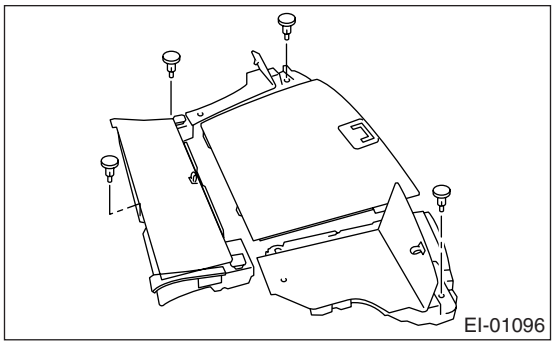
Install in the reverse order of removal.

NOTE:
- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

24.Luggage Floor Mat

A: REMOVAL

1) Remove the back mat of rear seat backrest.
2) Remove the clips, then detach the rear floor mats and boxes.



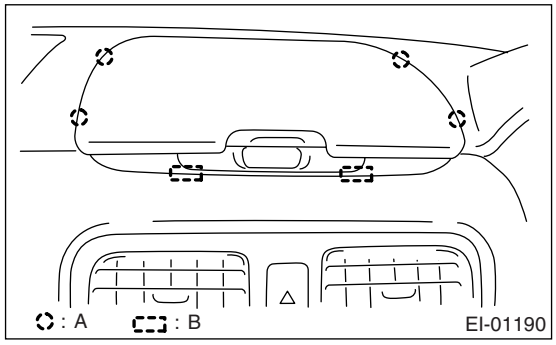
B: INSTALLATION

Install in the reverse order of removal.

25.Instrument Panel Center Compartment

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Insert a flat tip screwdriver, and then pry up to remove the clips.



(A) Clip
(B) Claw

3) Remove the instrument panel center compartment from instrument panel.
4) Disconnect the connector from clock.

B: INSTALLATION

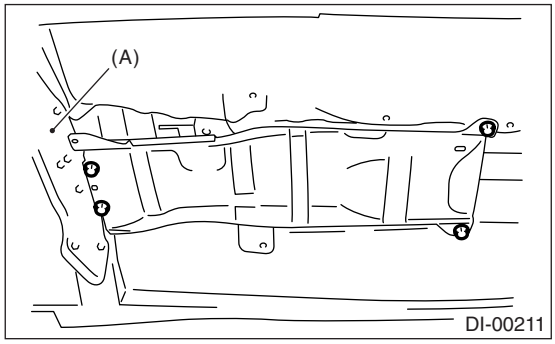
Install in the reverse order of removal.

26.Heat Shield Cover

A: REMOVAL

1. FRONT HEAT SHIELD COVER

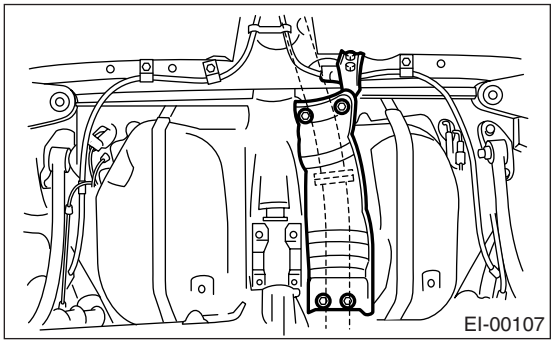
Loosen the four bolts to remove front heat shield cover.



(A) Transmission mount

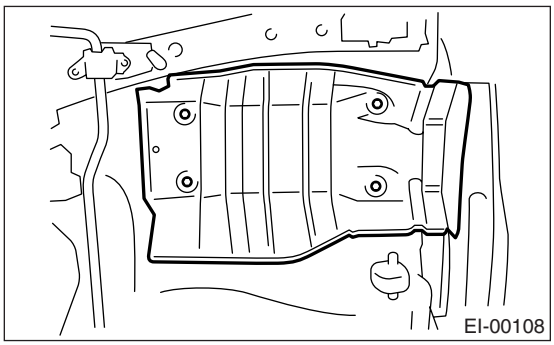
2. CENTER HEAT SHIELD COVER

Loosen the four bolts to remove center heat shield cover.



3. REAR HEAT SHIELD COVER

1) Remove the muffler. <Ref. to EX(H4SO)-13, REMOVAL, Muffler.>
2) Loosen the four bolts to remove rear heat shield cover.



B: INSTALLATION

Install in the reverse order of removal.

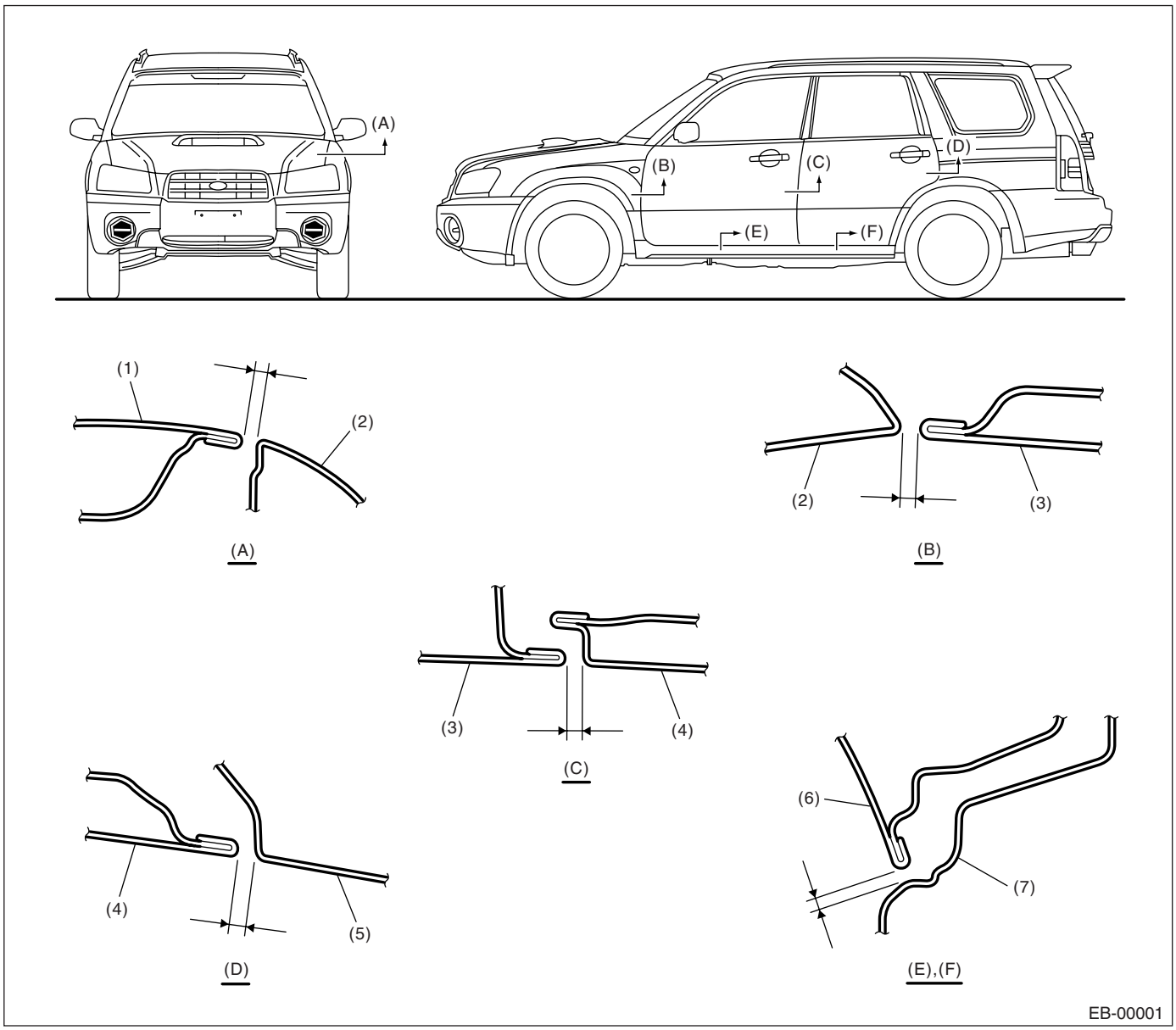
EXTERIOR BODY PANELS

EB

		Page
1.	General Description	2
2.	Front Hood	9
3.	Front Fender	10
4.	Front Door	11
5.	Front Sealing Cover	13
6.	Rear Door	14
7.	Rear Sealing Cover	16
8.	Rear Gate	17
9.	Rear Gate Garnish	20

1. General Description

A: SPECIFICATION

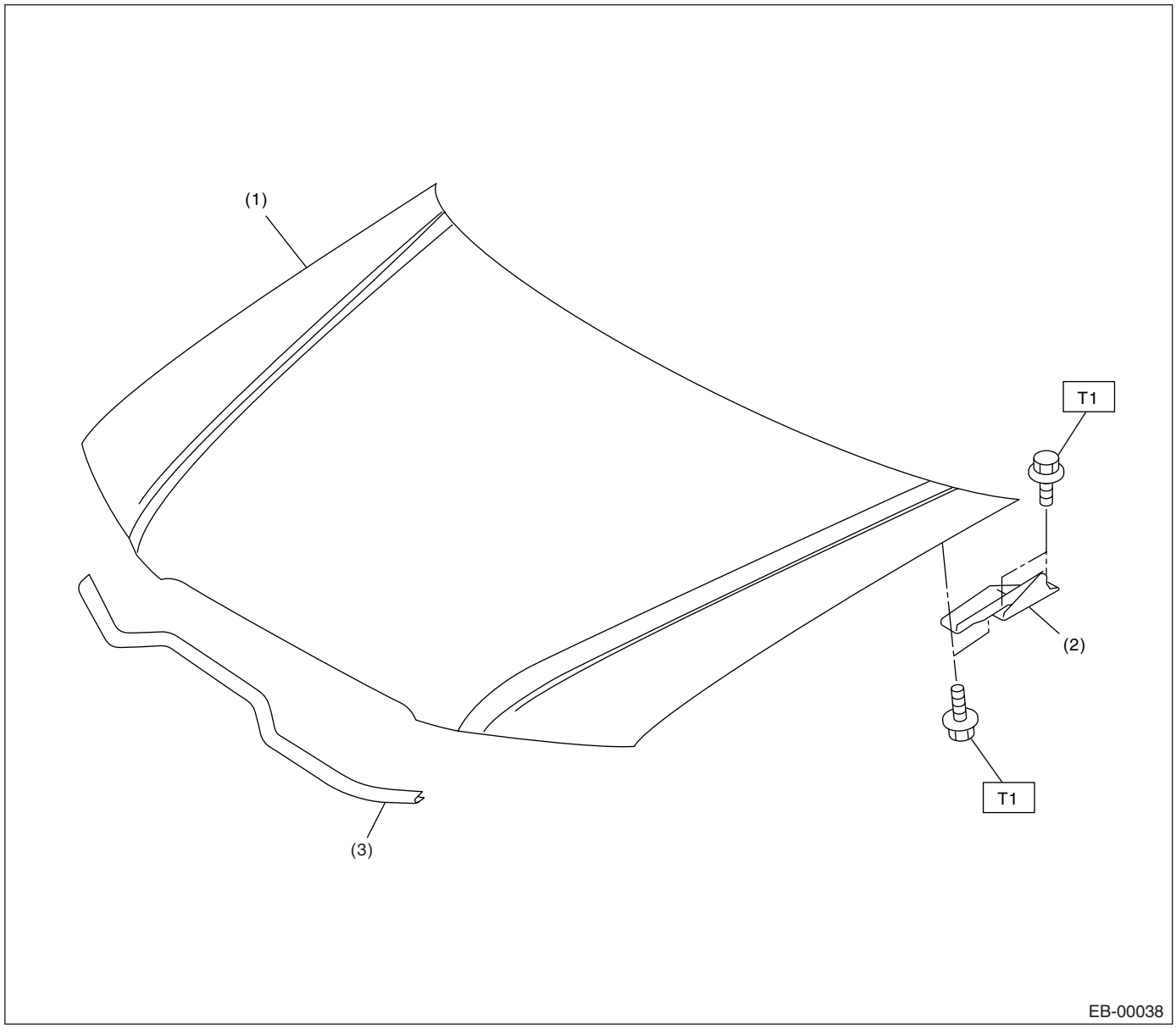


(1) Front hood panel
(2) Front fender panel
(3) Front door panel
(4) Rear door panel
(5) Rear quarter panel
(6) Door panel
(7) Side sill

Section	Part	Specification
(A)	Front hood panel to Front fender panel	3.5±1.0 mm (0.14±0.04 in)
(B)	Front fender panel to Front door panel	4.7±1.0 mm (0.19±0.04 in)
(C)	Front door panel to Rear door panel	5.1±1.0 mm (0.20±0.04 in)
(D)	Rear door panel to Rear quarter panel	4.6±1.0 mm (0.18±0.04 in)
(E), (F)	Door panel to Side sill	5.9 mm (0.23 in)

B: COMPONENT

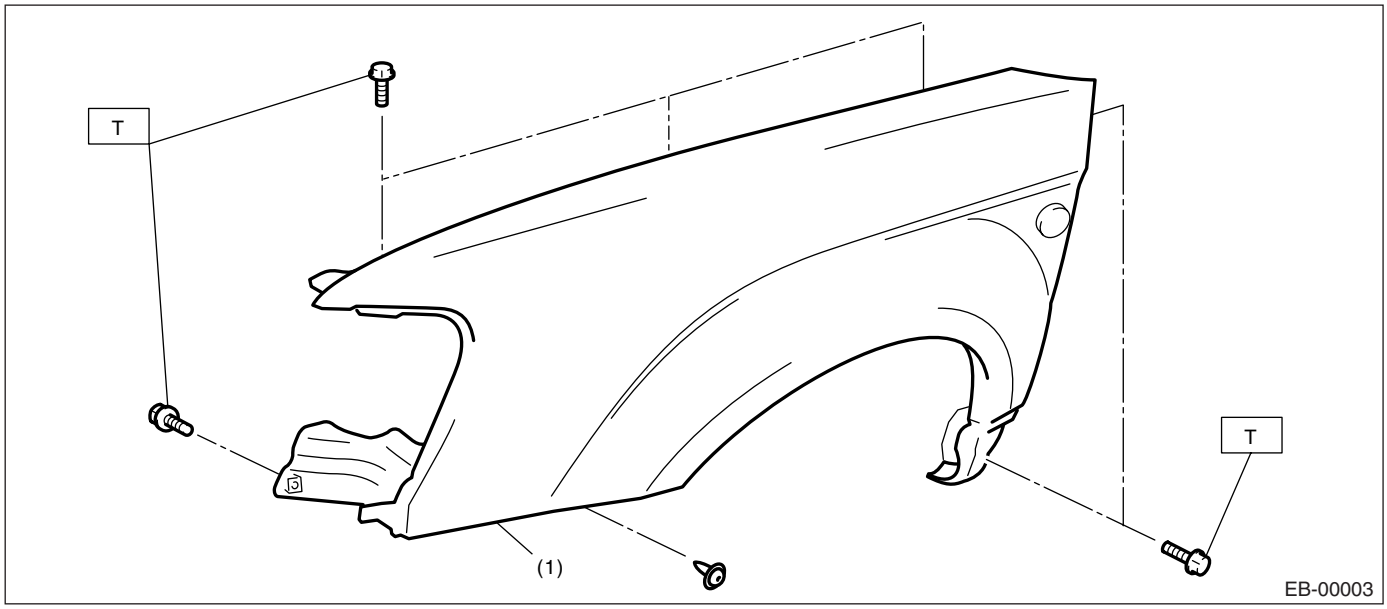
1. FRONT HOOD



(1) Front hood
(2) Hinge
(3) Seal

Tightening torque: N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.1)

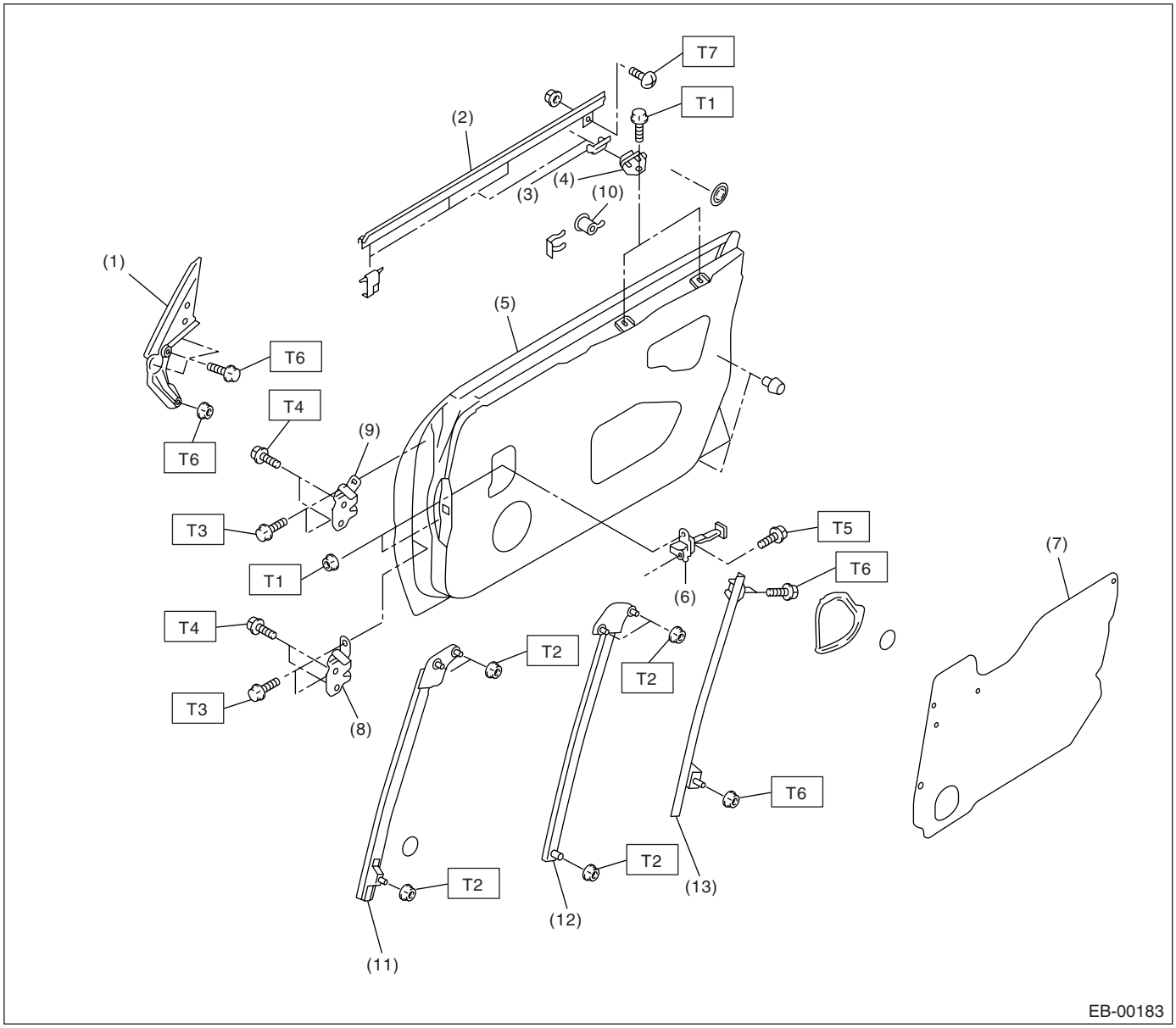
2. FRONT FENDER PANEL



(1) Front fender panel

Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

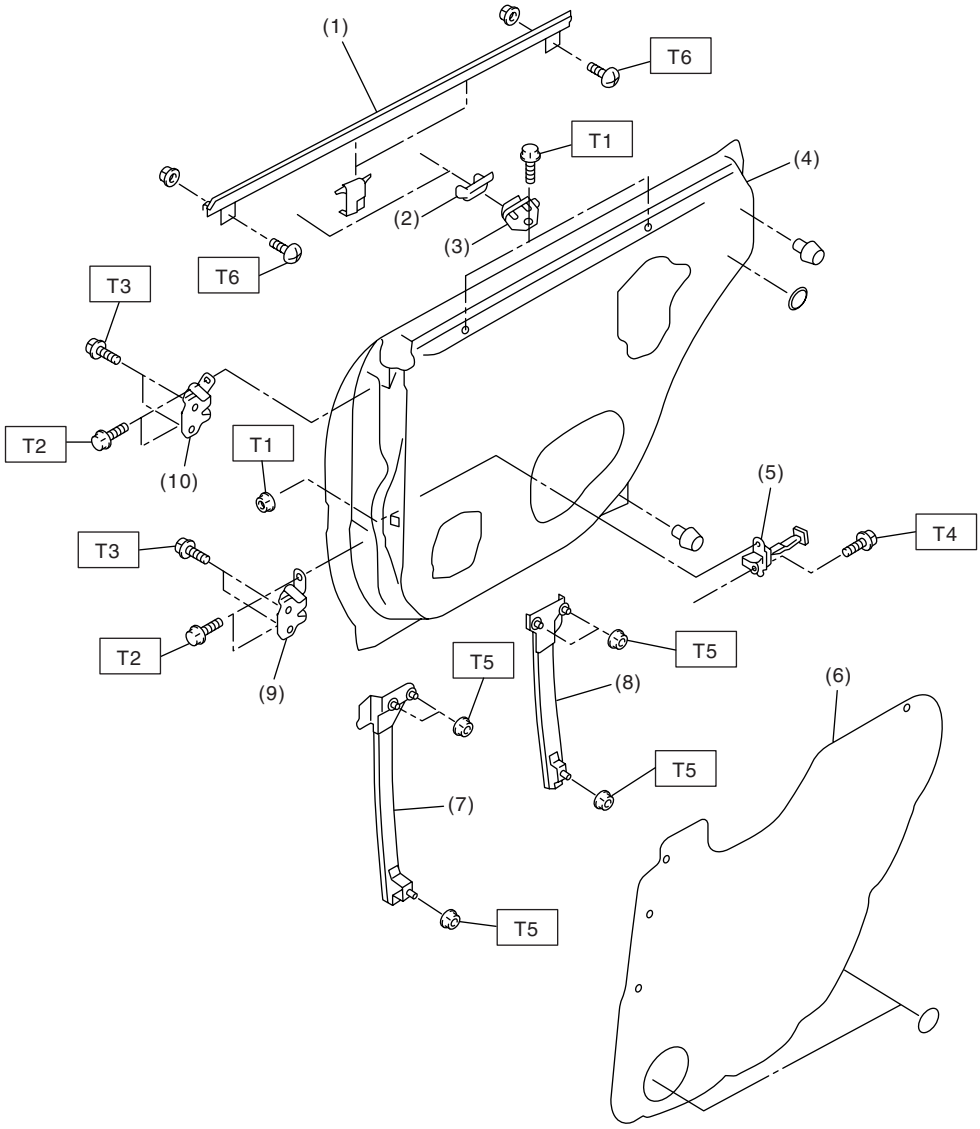
3. FRONT DOOR PANEL



(1) Gusset
(2) Weather strip
(3) Stabilizer (Outer)
(4) Stabilizer (Inner)
(5) Door panel
(6) Checker
(7) Sealing cover
(8) Lower hinge
(9) Upper hinge
(10) Key cylinder (Driver's side only)
(11) Front sash
(12) Rear sash
(13) Guide rail

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.4, 10.3)
T3: 25 (2.5, 18.1)
T4: 30 (3.1, 22.1)
T5: 33 (3.4, 25)
T6: 6 (0.6, 4.4)
T7: 1.5 (0.15, 1.1)

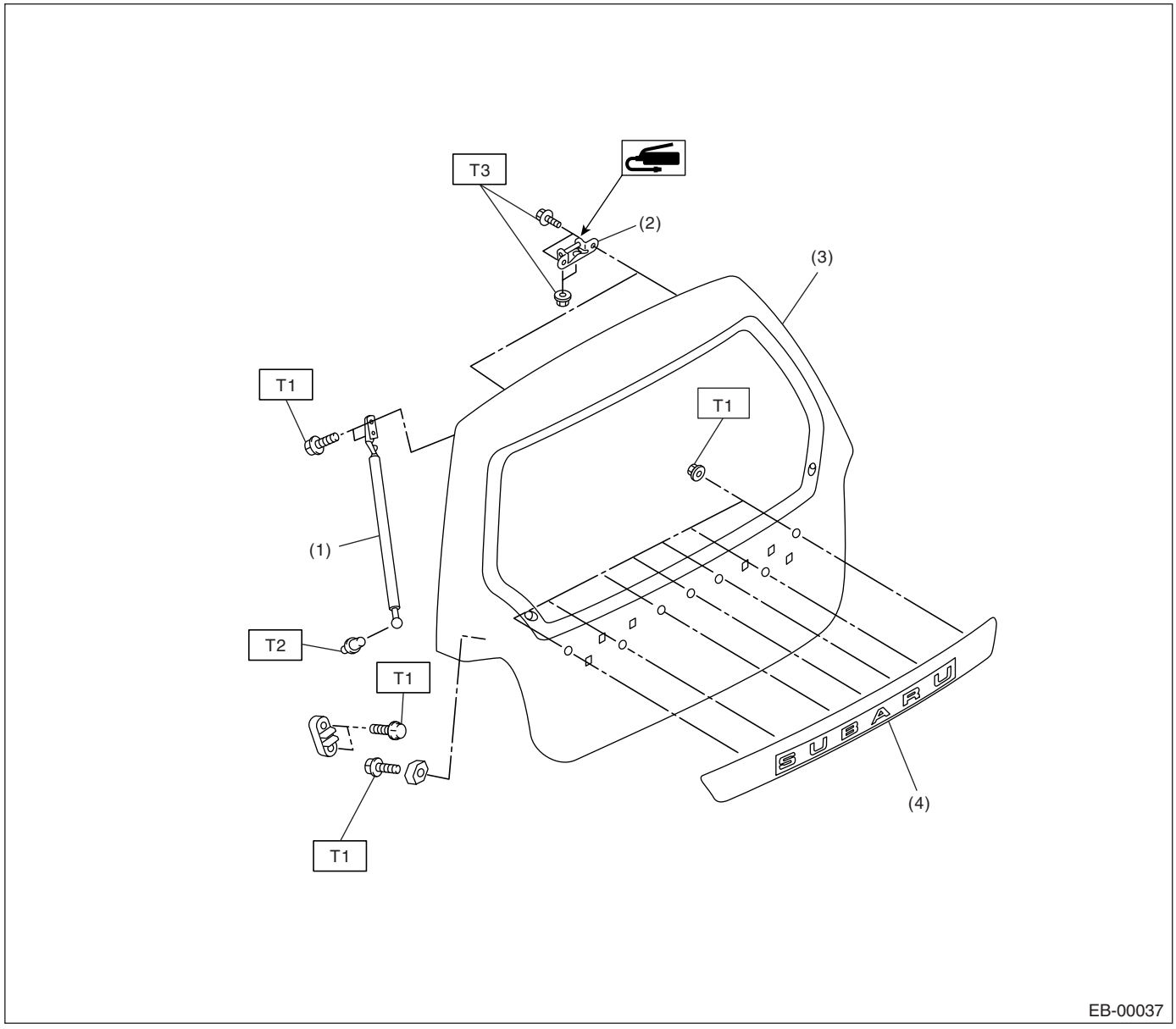
4. REAR DOOR PANEL



(1) Weather strip
(2) Stabilizer (Outer)
(3) Stabilizer (Inner)
(4) Door panel
(5) Checker
(6) Sealing cover
(7) Front sash
(8) Rear sash
(9) Lower hinge
(10) Upper hinge

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 25 (2.5, 18.1)
T3: 30 (3.1, 22.1)
T4: 33 (3.4, 25)
T5: 14 (1.4, 10)
T6: 1.5 (0.15, 1.1)

5. REAR GATE PANEL

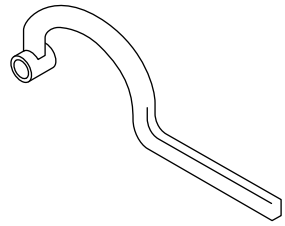


(1) Damper stay
(2) Hinge
(3) Rear gate
(4) Rear gate garnish

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 14 (1.4, 10)
T3: 25 (2.5, 18.1)

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-925610000	925610000	WRENCH	Used for removing and installing door hinge.

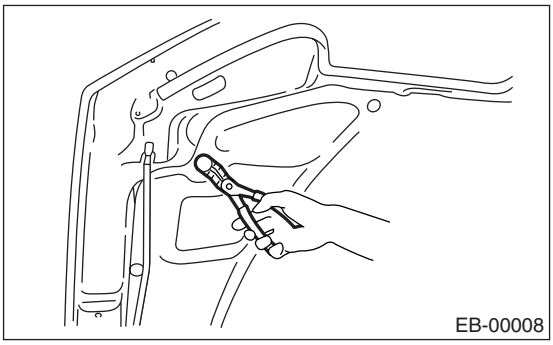
2. GENERAL TOOL

TOOL NAME	REMARKS
Jack	Used for supporting door panel.
Support jack	Used for supporting rear gate panel.

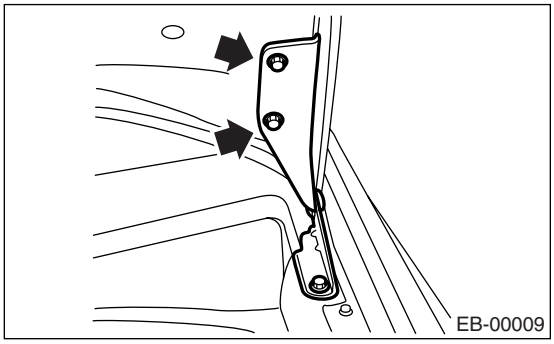
2. Front Hood

A: REMOVAL

1) Open the front hood to remove washer nozzles.
2) Release the clips to remove front hood insulator.



3) Remove the bolts to remove front hood from hinges.



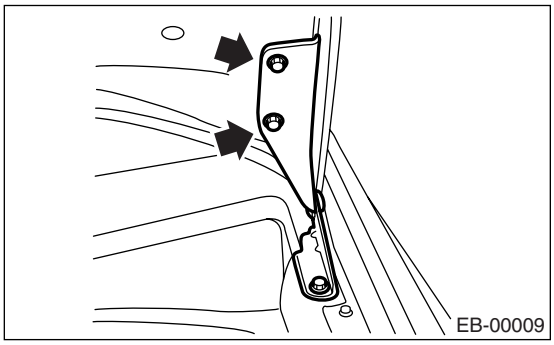
B: INSTALLATION

1) Install in the reverse order of removal.
2) Adjust the clearance between front hood panel and front fender panel. Clearance must be equal at both sides.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

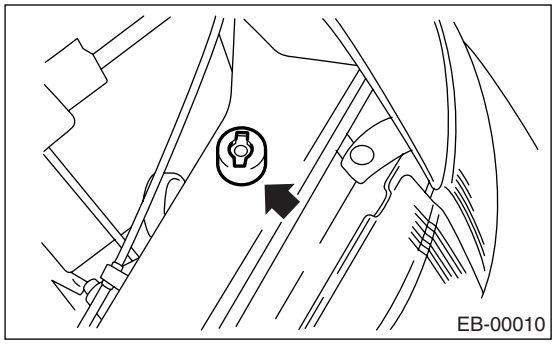
C: ADJUSTMENT

1) Use the hinge mounting holes to align the front hood longitudinally and laterally.



2) Adjust the height at front end of hood. <Ref. to SL-33, ADJUSTMENT, Front Hood Lock Assembly.>

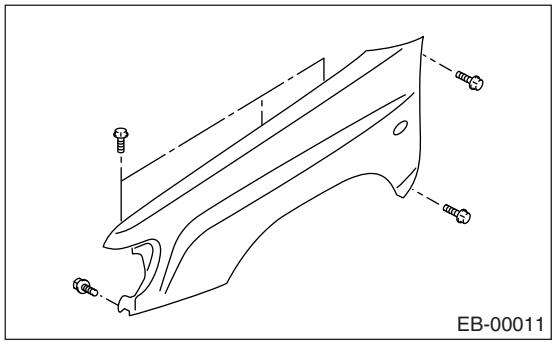
3) Rotate the hood buffer to adjust lateral height.



3. Front Fender

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front bumper face. <Ref. to EI-23, REMOVAL, Front Bumper.>
3) Remove the mud guard. <Ref. to EI-31, REMOVAL, Mud Guard.>
4) Remove the side sill spoiler. <Ref. to EI-33, REMOVAL, Side Sill Spoiler.>
5) Remove the side protector. <Ref. to EI-34, REMOVAL, Side Garnish.>
6) Loosen the bolts and clip to remove front fender panel.



B: INSTALLATION

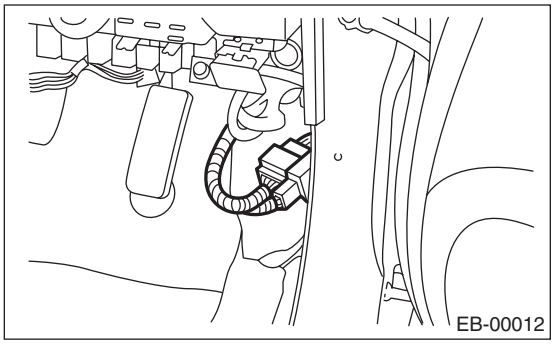
1) Install in the reverse order of removal.
2) When the front fender panel is installed, clearance between front fender panel and front hood panel must be equal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

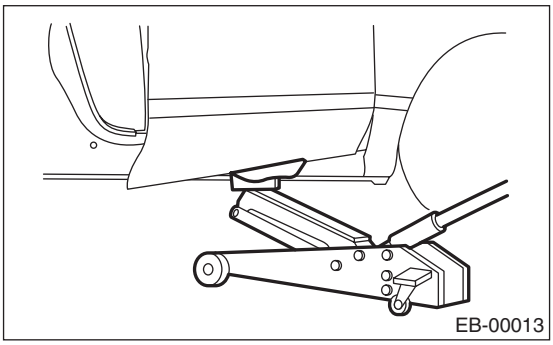
4. Front Door

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
3) Remove the outer mirror assembly. <Ref. to GW-13, REMOVAL, Outer Mirror Assembly.>
4) Remove the front sealing cover. <Ref. to EB-13, REMOVAL, FRONT SEALING COVER.>
5) Remove the front door glass. <Ref. to GW-18, REMOVAL, Front Door Glass.>
6) Remove the front door regulator and motor. <Ref. to GW-22, REMOVAL, Front Regulator and Motor Assembly.>
7) Remove the front door latch assembly. <Ref. to SL-24, REMOVAL, Front Door Latch and Door Lock Actuator Assembly.>
8) Remove the front outer handle. <Ref. to SL-23, REMOVAL, Front Outer Handle.>
9) Remove the front pillar lower trim to disconnect the connector from body harness.

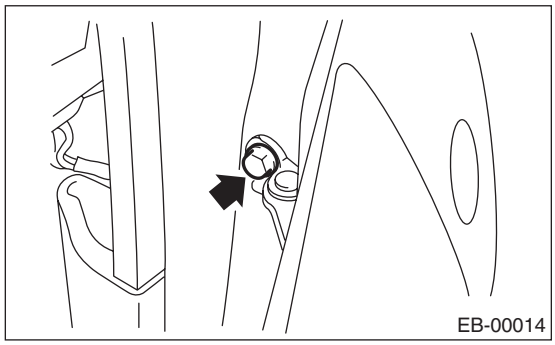

EB-00012

10) Put a wooden block on jack and place jack under door. Support the door with a jack to protect it from damage.

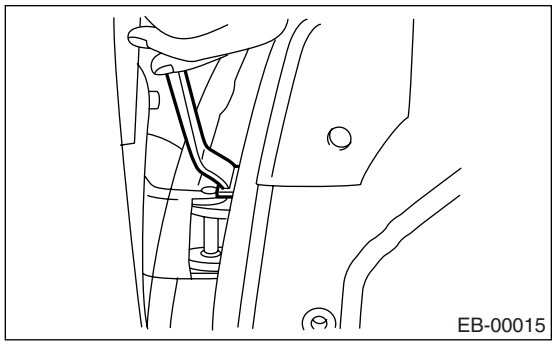

EB-00013

NOTE:
When supporting the door with a jack, be careful not to deform the door hinges while working.

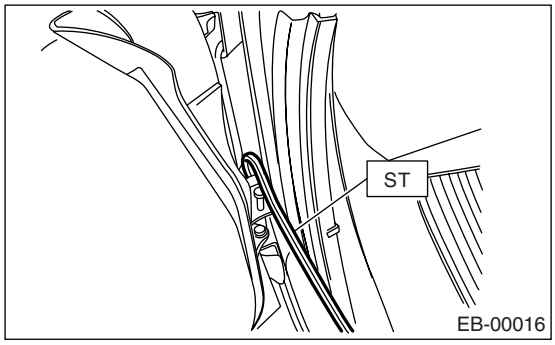
11) Remove the checker bolts.


EB-00014

12) Remove the door-side bolts for upper and lower hinges to remove the front door panel.


EB-00015

13) Using the ST, remove the body-side bolts for upper and lower hinges, and remove door hinges.
ST 925610000 WRENCH



EB-00016

B: INSTALLATION

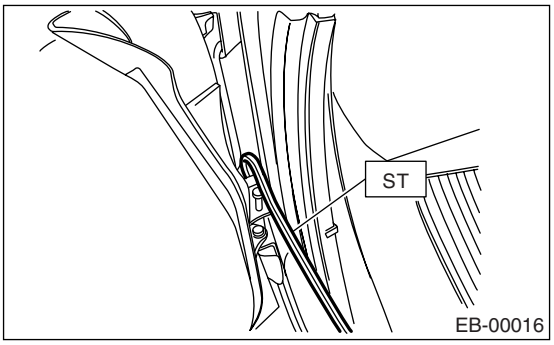
1) Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EB-5, FRONT DOOR PANEL, COMPONENT, General Description.>

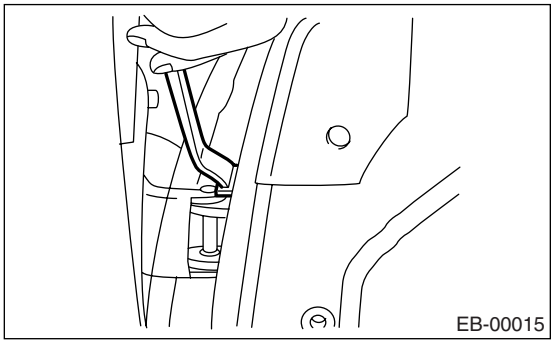
2) Apply grease to the sliding area of door hinges.

C: ADJUSTMENT

1) Using the ST, loosen the body-side bolts of upper and lower hinges to align the position of front door panel longitudinally and vertically.
ST 925610000 WRENCH

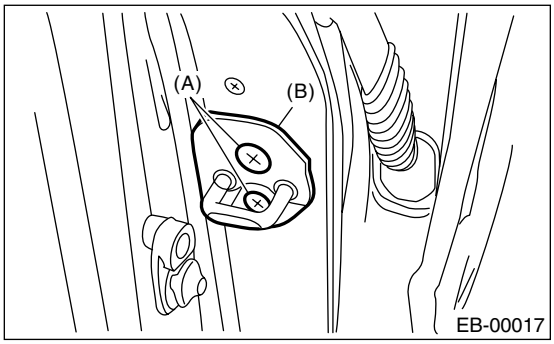


2) Loosen the door-side bolts of upper and lower hinges to align the position of front door panel vertically and laterally at the front end.



3) Loosen the screw (A) and lightly tap striker (B) using a plastic hammer to adjust striker to align the position of front door panel vertically and laterally at the rear end.

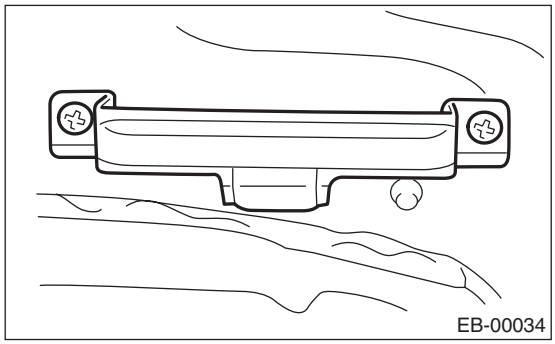
CAUTION:
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.



5. Front Sealing Cover

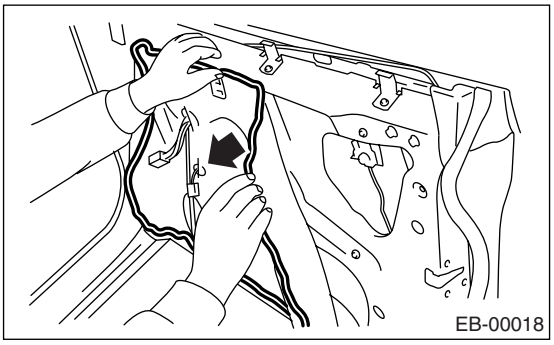
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the front door trim. <Ref. to EI-35, REMOVAL, Front Door Trim.>
3) Remove the front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>
4) Remove the door trim bracket.



5) Remove the sealing cover.

NOTE:
• Carefully remove the butyl tape. Excessive force will easily break the cover.
• If the cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing the sealing cover, use butyl tape.
3) Press the butyl tape-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

NOTE:
• Apply a uniform bead of butyl tape.
• Attach the sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

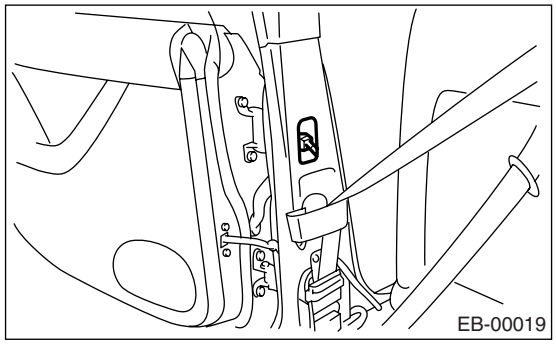
C: INSPECTION

If the sealing cover is damaged, replace it with a new one.

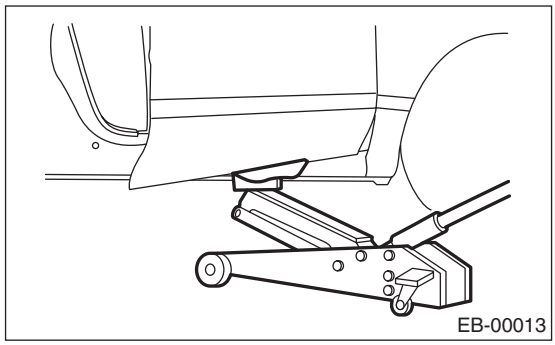
6. Rear Door

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
3) Remove the rear sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
4) Remove the rear door glass. <Ref. to GW-23, REMOVAL, Rear Door Glass.>
5) Remove the rear door regulator and motor assembly. <Ref. to GW-25, REMOVAL, Rear Regulator and Motor Assembly.>
6) Remove the rear door latch assembly. <Ref. to SL-28, REMOVAL, Rear Door Latch and Door Lock Actuator Assembly.>
7) Remove the rear outer handle. <Ref. to SL-27, REMOVAL, Rear Outer Handle.>
8) Remove the center pillar lower trim. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
9) Remove the seat belt bracket and blind plug.
Disconnect the connector of door harness and remove the door hinge nut.

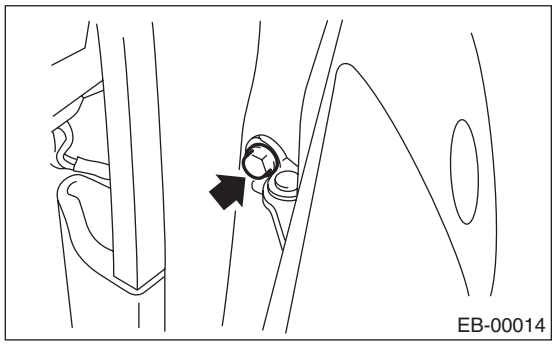

EB-00019

10) Put a wooden block on the jack and place the jack under the door. Support the door with the jack to protect it.

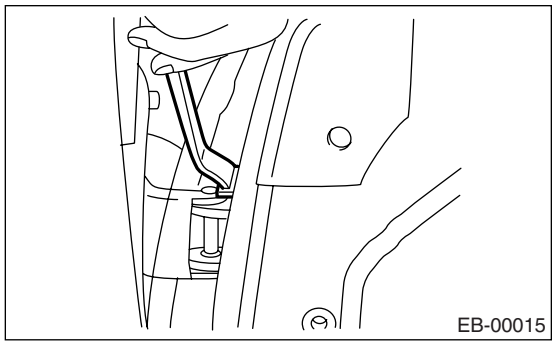

EB-00013

NOTE:
When supporting the door with a jack, be careful not to deform the door hinges while working.

11) Remove the checker bolts.


EB-00014

12) Remove the door-side bolts for upper and lower hinges to remove the rear door panel.


EB-00015

13) Using the ST, remove the body-side bolts for upper and lower hinges, and remove door hinges.
ST 925610000 WRENCH

B: INSTALLATION

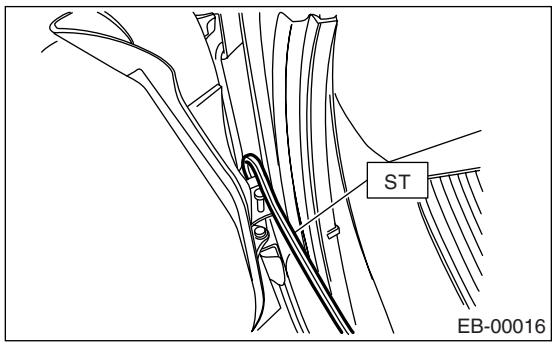
1) Install in the reverse order of removal.

Tightening torque:
Refer to COMPONENT in General Description.
<Ref. to EB-6, REAR DOOR PANEL, COMPONENT, General Description.>

2) Apply grease to the sliding area of door hinges.

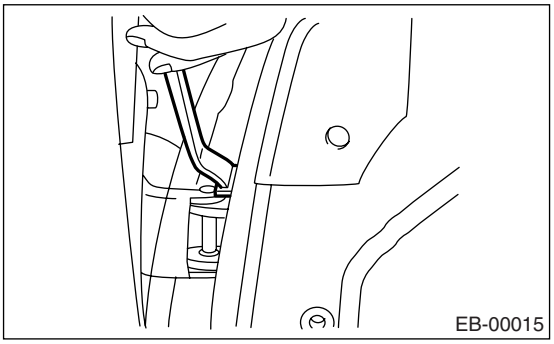
C: ADJUSTMENT

1) Using the ST, loosen the body-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.
ST 925610000 WRENCH



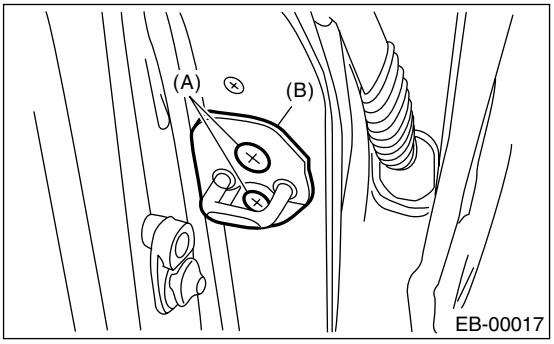
EB-00016

2) Loosen the door-side bolts of upper and lower hinges to align the position of rear door panel vertically and laterally at front-end.



3) Loosen the screw (A) and lightly tap striker (B) using plastic hammer to adjust striker to align the position of rear door panel vertically and laterally at the rear end.

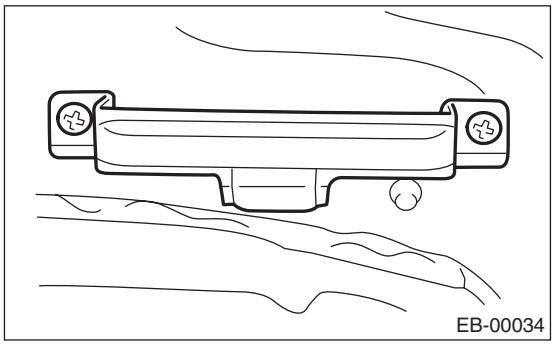
CAUTION:
Do not use an impact wrench. The welding area on the striker nut plate is easily broken.



7. Rear Sealing Cover

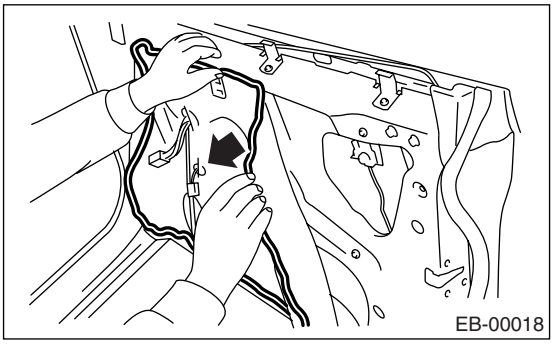
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the rear door trim. <Ref. to EI-36, REMOVAL, Rear Door Trim.>
3) Remove the door trim bracket.



4) Remove the sealing cover.

NOTE:
• Carefully remove the butyl tape. Excessive force will easily break the cover.
• If the cover gets broken, replace it with a new one.



B: INSTALLATION

1) Install in the reverse order of removal.
2) When replacing the sealing cover, use butyl tape.
3) Press the butyl tape-applied area firmly to prevent any floating on surface.

Butyl tape:
3M8626 or equivalent

NOTE:
• Apply an uniform bead of butyl tape.
• Attach the sealing cover, keeping it from becoming wrinkled.
• Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

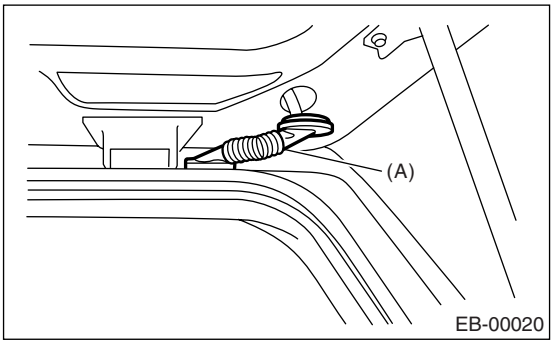
If the sealing cover is damaged, replace it with a new one.

8. Rear Gate

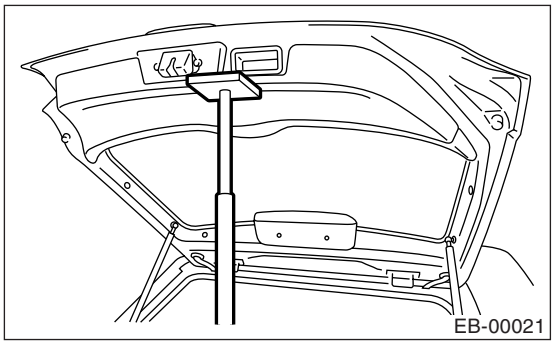
A: REMOVAL

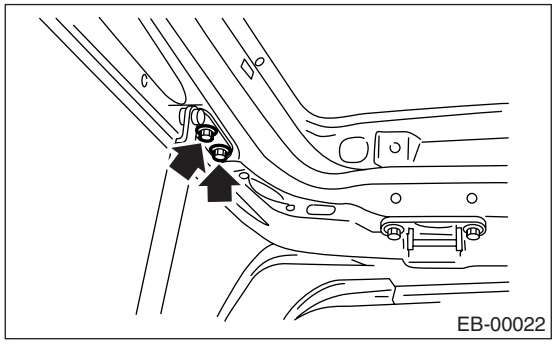
1. REAR GATE PANEL

1) Disconnect the ground cable from battery.
2) Open the rear gate.
3) Remove the rear gate trim. <Ref. to EI-49, REMOVAL, Rear Gate Trim.>
4) Remove the rear wiper motor. <Ref. to WW-17, REMOVAL, REAR WIPER MOTOR.>
5) Remove the rear gate garnish assembly. <Ref. to EB-20, REMOVAL, Rear Gate Garnish.>
6) Remove the rear gate outer handle. <Ref. to SL-30, REMOVAL, Rear Gate Outer Handle.>
7) Remove the rear gate latch assembly. <Ref. to SL-31, REMOVAL, Rear Gate Latch Assembly.>
8) Disconnect the connectors of rear wiper, rear defogger, and other lighting devices.
9) Disconnect the washer hose.
10) Remove the rubber duct (A) connection, and pull out the harness and washer hose from rear gate.



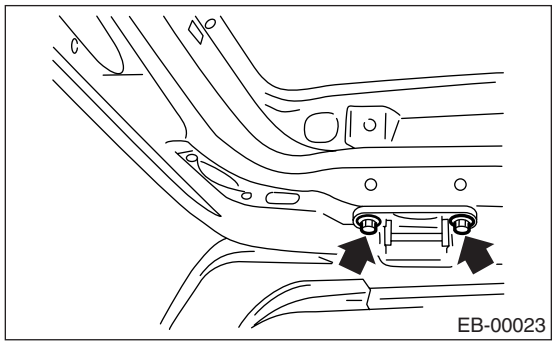
11) Using a support jack, support the rear gate and then remove damper stay mounting bolts.





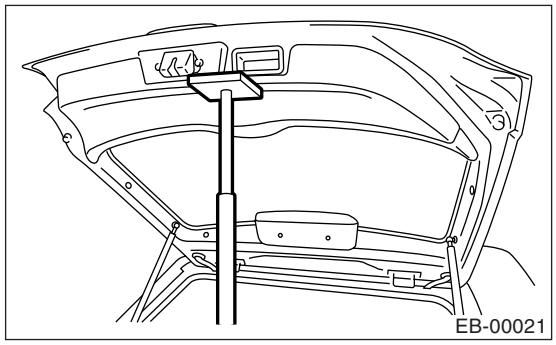
NOTE:
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between the body and gate.

12) Loosen the rear gate bolts to remove rear gate.



2. REAR GATE DAMPER STAY

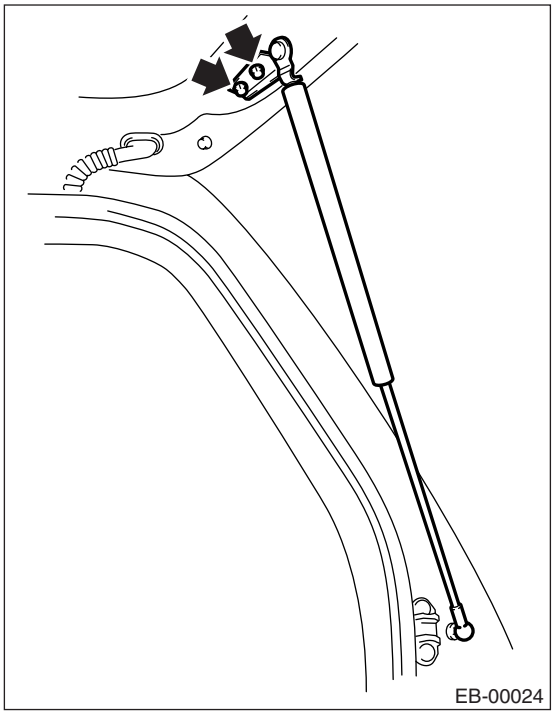
1) Open the rear gate. Use a support jack to support the rear gate.



NOTE:
After the rear gate damper stay is removed, the rear gate cannot stay open. Supporting the rear gate with a support jack, remove the bolts.

CAUTION:
- **Do not damage the piston rods and oil seals.**
- **Never disassemble the cylinders: They contain gas.**

2) Loosen the bolts to remove the rear gate damper stay from rear gate.



B: INSTALLATION

1. REAR GATE PANEL

1) Install in the reverse order of removal.
2) Install the rear gate panel with uniform clearance to the body.
3) Refer to COMPONENT of General Description for tightening torque. <Ref. to EB-7, REAR GATE PANEL, COMPONENT, General Description.>

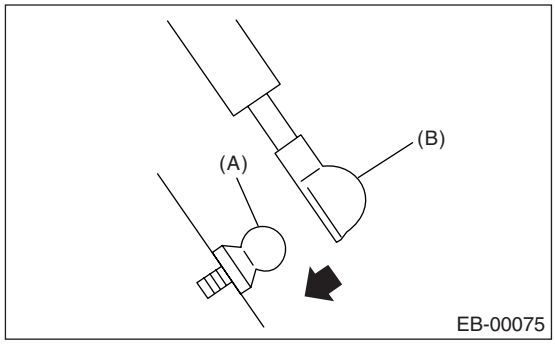
NOTE:
After supporting the rear gate with a jack, start working.

2. REAR GATE DAMPER STAY

1) Install the mounting bolt (A) to the rear gate panel and body.

Tightening torque:
14 N·m (1.4 kgf-m, 10.3 ft-lb)

2) Firmly install the rear gate damper stay (B) to mounting bolt (A).



3) Tighten the bolts at upper side of rear gate damper stay.

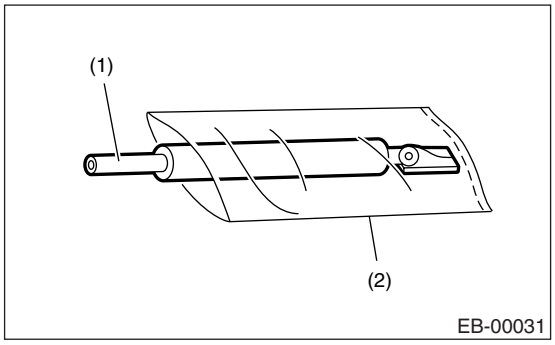
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: DISPOSAL

1. REAR GATE DAMPER STAY

CAUTION:
Gas is colorless, odorless and harmless. However, gas pressure may spray cutting powder or oil. Be sure to wear dust-resistant goggles.

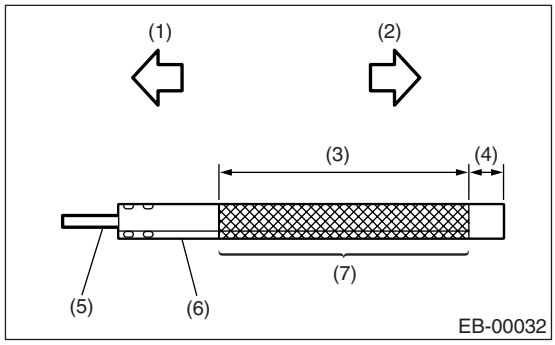
1) Cover with a vinyl case as shown in the figure.



(1) Rear gate damper stay
(2) Vinyl sack

NOTE:
Prevent the vinyl case from being caught by drill cutting edge.

2) Lift the body-side slightly with piston rods fully extended, and secure the body side on vise stand. Drill a hole in 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from the door side, and bleed the rear gate damper stay completely.



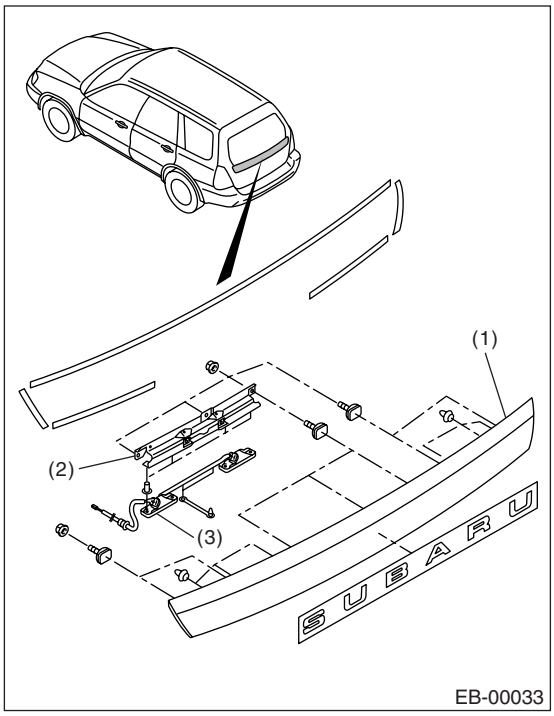
(1) Body-side
(2) Door-side
(3) 190 mm (7.48 in)
(4) 10 mm (0.39 in)
(5) Piston rod
(6) Cylinder
(7) Portion to be drilled

9. Rear Gate Garnish

A: REMOVAL

1) Remove the rear gate panel trim. <Ref. to EI-49, REMOVAL, Rear Gate Trim.>
2) Remove the rear wiper motor. <Ref. to WW-17, REMOVAL, REAR WIPER MOTOR.>
3) Remove the seven frange nuts from inside of rear gate panel.
4) Remove the license plate light assembly.
5) Close the gate, and then remove the rear gate garnish assembly, pulling it forward by hand.

NOTE:
Be careful not to pull it strongly to avoid damage to clips.



(1) Rear gate garnish ASSY
(2) Licence plate light bracket
(3) Licence plate light

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Check for serious scratches or cracks in rear gate garnish assembly.

CRUISE CONTROL SYSTEM

CC

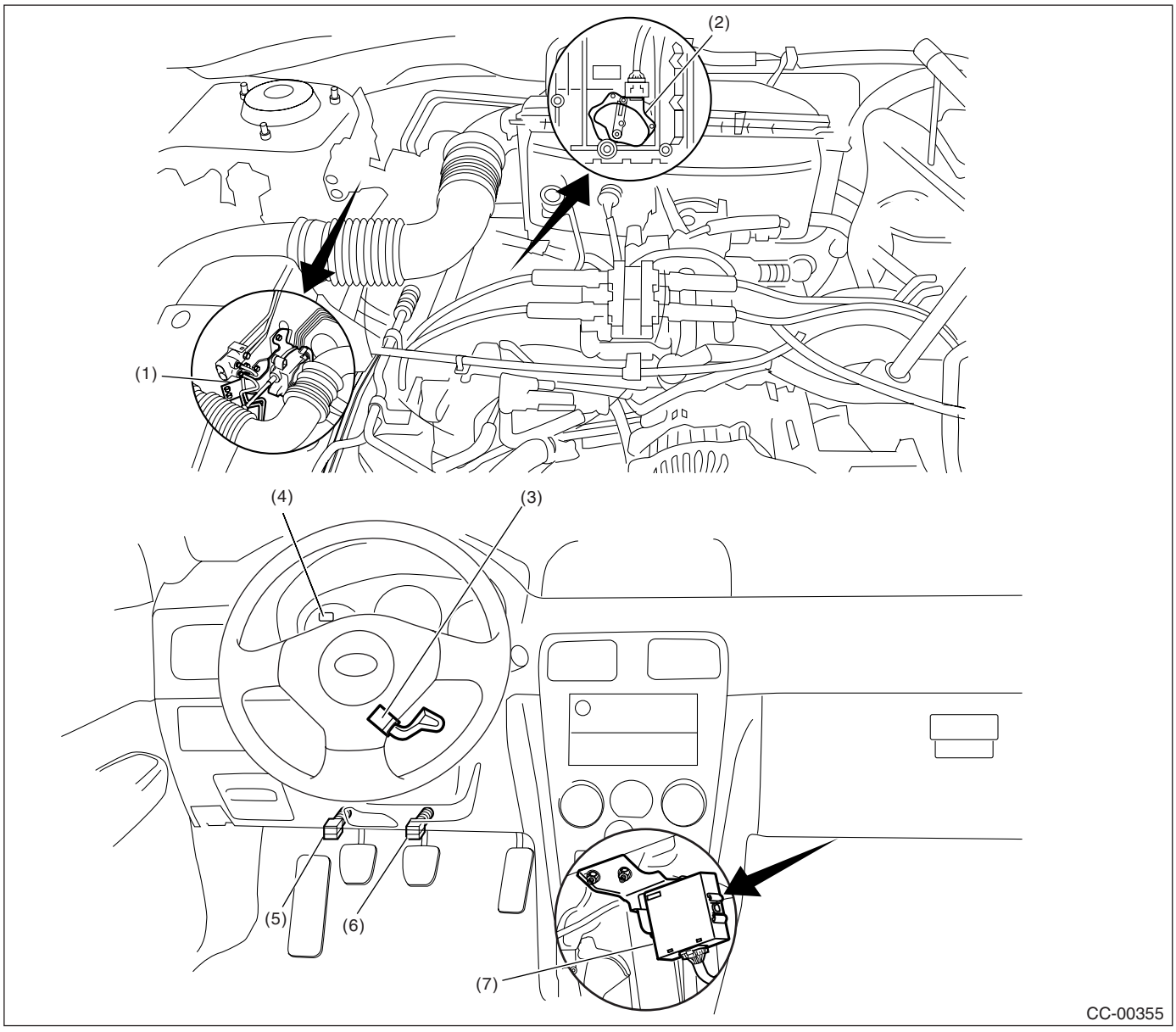
Page

1. General Description 2
2. Actuator 5
3. Cruise Control Unit 7
4. Cruise Control Command Switch 8
5. Stop Light and Brake Switch 10
6. Clutch Switch 11
7. Inhibitor Switch 12
8. Neutral Position Switch 13

1. General Description

A: COMPONENT

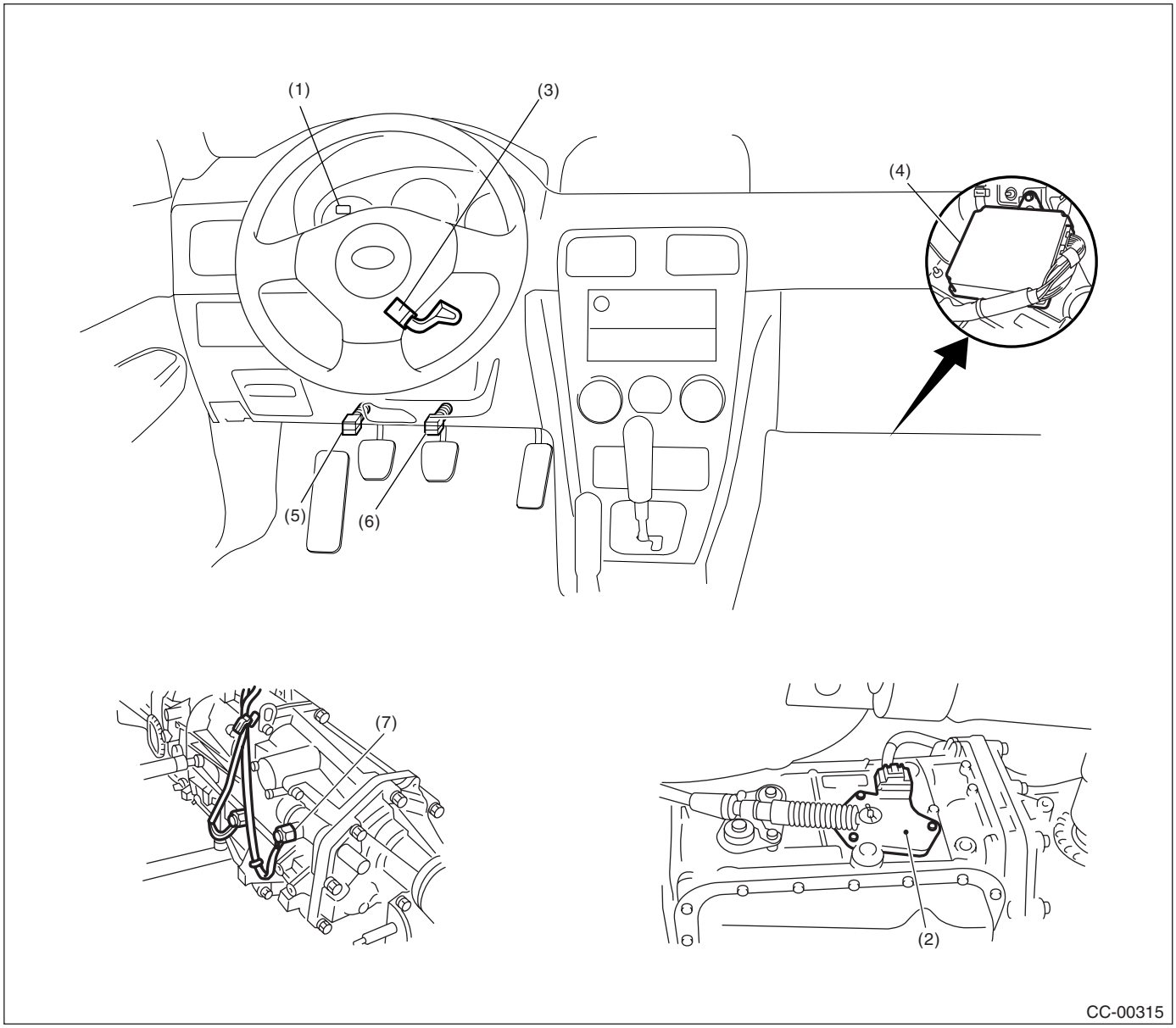
1. EXCEPT FOR 2.5 L TURBO MODEL



(1) Actuator
(2) Inhibitor switch (AT model)
(3) Cruise control command switch
(4) Cruise indicator & cruise set indicator light
(5) Clutch switch (MT model)
(6) Stop light and brake switch
(7) Cruise control module

NOTE:
Electrical component location are for LHD vehicles. Cruise control actuator and cruise control unit location for RHD vehicles are symmetrically opposite.

2. 2.5 L TURBO MODEL



(1) Cruise indicator light & cruise set indicator light
(2) Inhibitor switch (AT model)
(3) Cruise control command switch
(4) Engine control module (ECM)
(5) Clutch switch (MT model)
(6) Stop light and brake switch
(7) Neutral position switch (MT model)

B: CAUTION

• Before disassembling or reassembling parts, always disconnect the battery ground cable. When repairing the radio, control module and other parts with memory functions, make note of the memory before disconnecting the battery ground cable. All memory will be erased.
• Reassemble parts in the reverse order of disassembly unless otherwise indicated.
• Adjust parts to specifications specified in this manual.
• Connect the connectors and hoses securely during reassembly.
• After reassembly, ensure functional parts operate properly.

C: PREPARATION TOOL

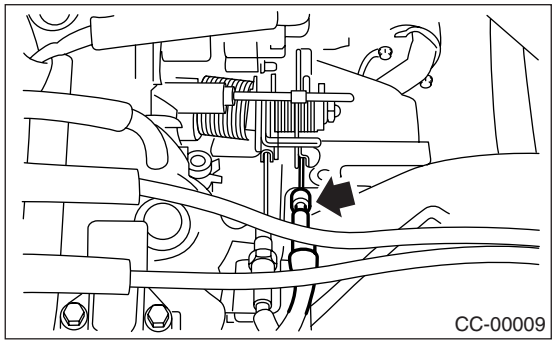
TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
TORX® BIT T30 (Tamper resistant type)	Used for removing cruise control command switch.

2. Actuator

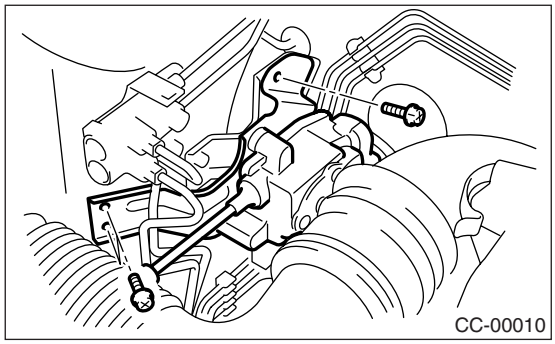
A: REMOVAL

CAUTION:
• Be careful not to apply excessive load to the wire cable when adjusting and/or installing; otherwise, the actuator may be deformed or damaged.
• Do not bend the cable sharply with a radius less than 100 mm (3.94 in); otherwise, cable may bend permanently, resulting in poor performance.
• When installing the cable, be careful not to sharply bend or pinch the inner cable; otherwise, the cable may break.

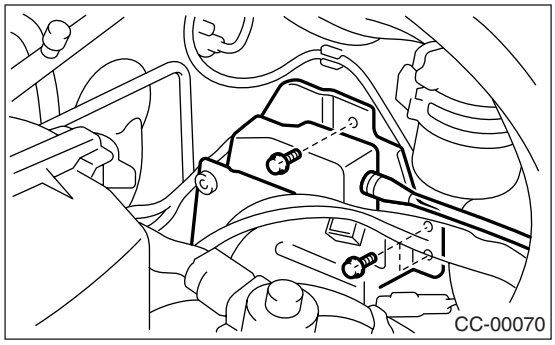
1) Disconnect the ground cable from battery.
2) Remove the clip bands from cruise control cable.
3) Loosen the nut which secures cruise control cable end to throttle cam, and then remove the cable from throttle cam.


CC-00009

4) Remove the four actuator attaching bolts.
5) Remove the actuator while disconnecting the connector.
• LHD model


CC-00010

• RHD model

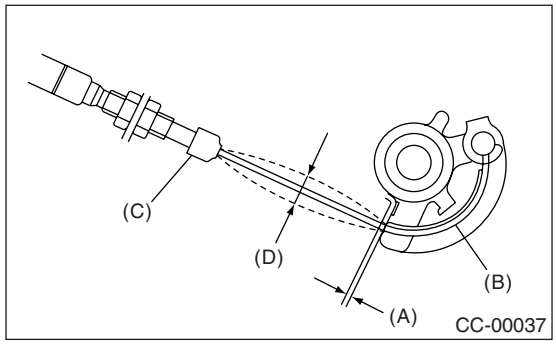

CC-00070

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
ACTUATOR
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Cable end nut
12 N·m (1.2 kgf-m, 9 ft-lb)

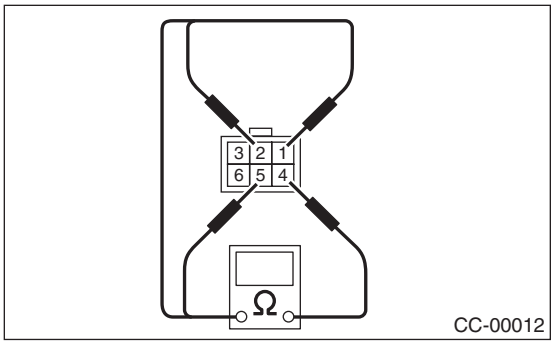
NOTE:
(A): Must be adjusted when the cable end outer is fixed in place, so that gap between throttle cam and lever is 0 — 1 mm (0 — 0.04 in), otherwise, inner cable deflection (D) is 1 — 8 mm (0.039 — 0.315 in) when the throttle cable is installed.
(Must be attached while the throttle cam is being pulled by wire cable.)
(B): Must be coated evenly on the cam end inner connection.
(C): Cover must be inserted securely, until tip of cable touches cover stopper.



CC-00037

C: INSPECTION

Measure the cruise control actuator resistance.



Terminal No.	Standard
4 and 1	Approx. 5 Ω
4 and 2	Approx. 5 Ω
4 and 5	Approx. 5 Ω
3 and 6	Approx. 39 Ω

If NG, replace the cruise control actuator.

3. Cruise Control Unit

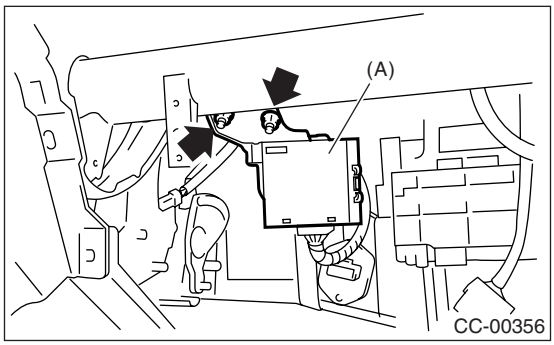
A: NOTE

Engine Control Module (ECM) controls cruise control system (2.5 L turbo model).

B: REMOVAL

1. EXCEPT FOR 2.5 L TURBO MODEL

1) Disconnect the ground cable from battery.
2) Remove the glove box. **<Ref. to EI-37,** REMOVAL**, Glove Box.>**
3) Disconnect the connector from cruise control module.
4) Remove the bolt, then detach the cruise control module (A).



2. 2.5 L TURBO MODEL

Engine Control Module (ECM) controls cruise control system (2.5 L turbo model). <Ref. to FU(H4DOTC 2.5)-43, REMOVAL, Engine Control Module (ECM).>

C: INSTALLATION

1. EXCEPT FOR 2.5 L TURBO MODEL

Install in the reverse order of removal.

NOTE:
Attach the part number label, facing the rear side of the vehicle.

2. 2.5 L TURBO MODEL

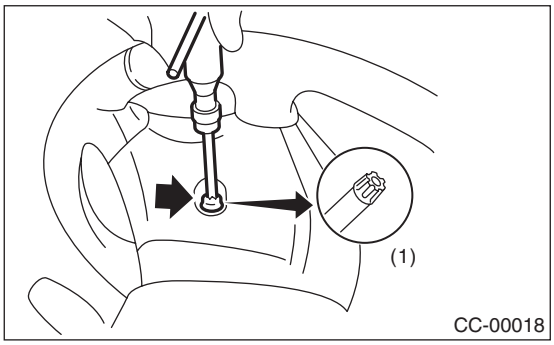
Engine Control Module (ECM) controls cruise control system (2.5 L turbo model). <Ref. to FU(H4DOTC 2.5)-43, INSTALLATION, Engine Control Module (ECM).>

4. Cruise Control Command Switch

A: REMOVAL

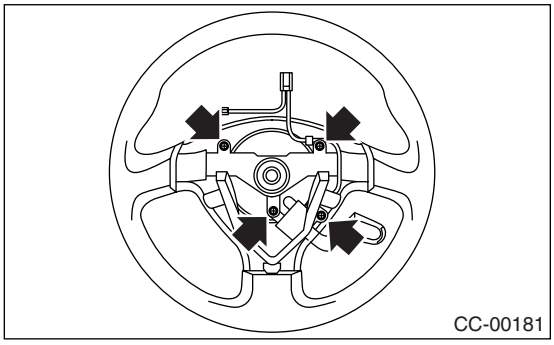
WARNING:
Before servicing, be sure to read the notes in the "AB" section for proper handling of the driver's airbag module. <Ref. to AB-3, CAUTION, General Description.>

1) Set the front wheels in straight ahead position.
2) Turn the ignition switch to OFF.
3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
4) Using TORX® BIT T30 (Tamper resistant type), loosen the two TORX® bolts which secure driver's airbag module.

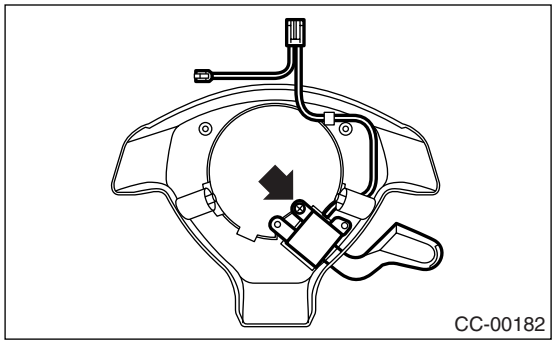


(1) TORX® BIT T30 (Tamper resistant type)

5) Disconnect the airbag module connector on back of the airbag module.
6) Remove the steering wheel. <Ref. to PS-18, REMOVAL, Steering Wheel.>
7) Remove the four screws to remove the lower cover from steering wheel.



8) Remove one screw to remove the cruise control command switch from lower cover.



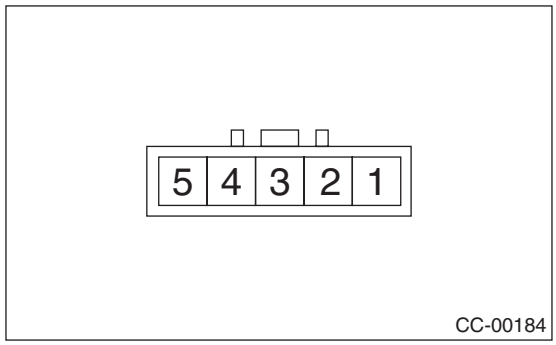
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. EXCEPT FOR 2.5 L TURBO MODEL

Measure the cruise control command switch resistance.

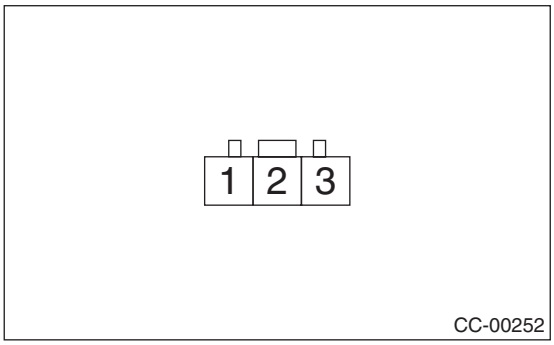


Switch	Position	Terminal No.	Standard value
CANCEL	ON	1 (+) and 2 (–)	Less than 1 Ω
	ON	1 (+) and 3 (–)	Less than 1 Ω
SET/COAST	OFF	1 and 3	More than 1 MΩ
	ON	1 and 3	Less than 1 Ω
RESUME/ ACCEL	OFF	1 and 2	More than 1 MΩ
	ON	1 and 2	Less than 1 Ω
MAIN SWITCH	OFF	5 and 4	More than 1 MΩ
	ON	5 and 4	Less than 1 MΩ

If NG, replace the cruise control command switch.

2. 2.5 L TURBO MODEL

Measure the cruise control command switch resistance.



Switch	Area	Terminal No.	Standard
CANCEL SET/COAST RESUME/ ACCEL	ALL OFF	2 and 3	Approx. 4 kΩ
CANCEL	ON	2 and 3	Less than 1 Ω
SET/COAST	ON	2 and 3	Approx. 250 Ω
RESUME/ ACCEL	ON	2 and 3	Approx. 1500 Ω
MAIN	OFF	1 and 2	More than 1 MΩ
	ON	1 and 2	Less than 1 Ω

If NG, replace the cruise control command switch.

5. Stop Light and Brake Switch

A: REMOVAL

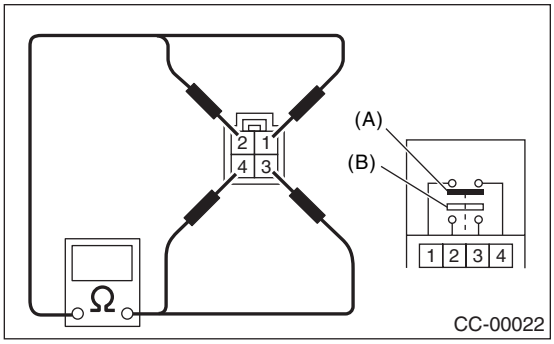
1) Disconnect the ground cable from battery.
2) Disconnect the connector from stop and brake switch, and then remove the switch. **<Ref. to BR-53,** REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



Switch	Pedal	Terminal No.	Standard
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	More than 1 MΩ
Stop light	Released	2 and 3	More than 1 MΩ
	Depressed	2 and 3	Less than 1 Ω

If NG, replace the stop light and brake switch.

6. Clutch Switch

A: REMOVAL

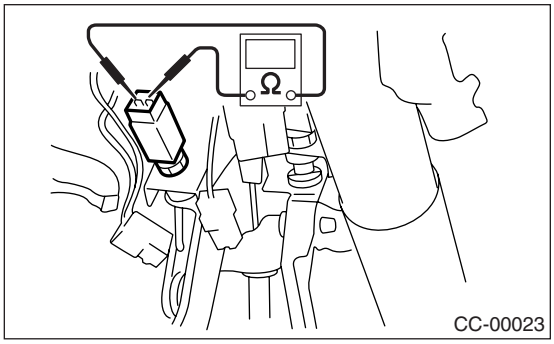
1) Disconnect the ground cable from battery.
2) Disconnect the connector from clutch switch, and then remove the switch. **<Ref. to CL-32,** REMOVAL**, Clutch Pedal.>**

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the clutch switch resistance.



Switch	Pedal	Terminal No.	Standard
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	More than 1 MΩ

If NG, replace the clutch switch.

7. Inhibitor Switch

A: REMOVAL

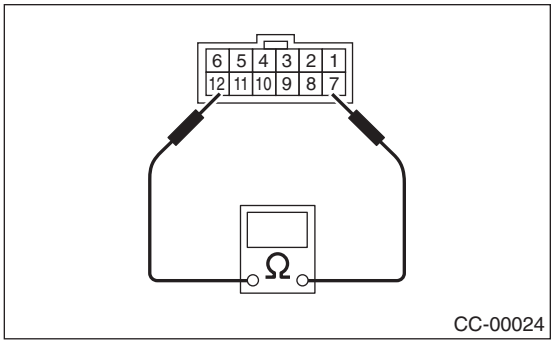
1) Disconnect the ground cable from battery.
2) Disconnect the connector from inhibitor switch, and then remove the switch. **<Ref. to 4AT-56,** REMOVAL**, Inhibitor Switch.>**

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the inhibitor switch resistance.



Selector lever position	Terminal No.	Standard
P	7 and 12	Less than 1 Ω
N		Less than 1 Ω
Except P and N		More than 1 MΩ

If NG, replace the inhibitor switch.

8. Neutral Position Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Disconnect the connector from neutral position switch, and then remove the switch. <Ref. to 5MT-43, BACK-UP LIGHT AND NEUTRAL POSITION SWITCH, REMOVAL, Switches and Harness.>

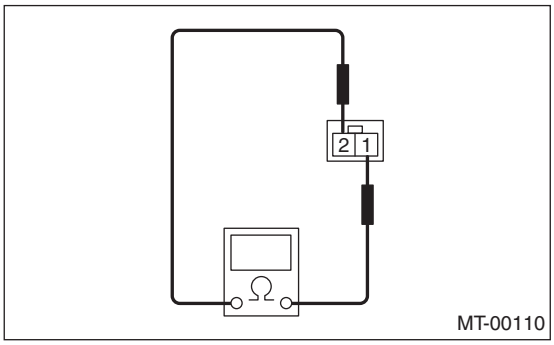
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

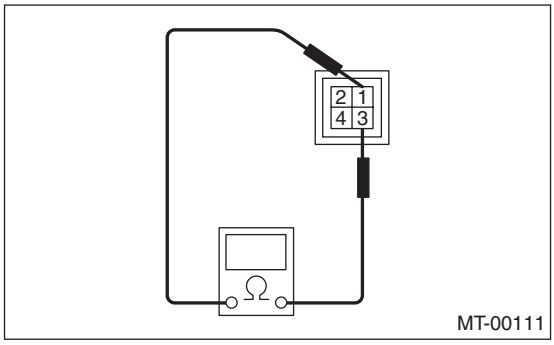
Measure the neutral position switch resistance.

- Non-turbo model



Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		More than 1 MΩ

- Turbo model



Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1 Ω
Other positions		More than 1 MΩ

If NG, replace the neutral position switch.

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC(diag)

Page

1. Basic Diagnostic Procedure 2
2. General Description 4
3. Electrical Component Location 6
4. Cruise Control Module I/O Signal 7
5. Subaru Select Monitor 9
6. Diagnostics with Phenomenon 11
7. List of Diagnostic Trouble Code (DTC) 25
8. Diagnostic Procedure with Diagnostic Trouble Code (DTC) 27

1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
This section is specified for H4SO and H4DOTC 2.0 L (model).

	Step	Check	Yes	No
1	**START DIAGNOSTIC.** 1) Perform the pre-inspection. <Ref. to CC(diag)-5, INSPECTION, General Description.> 2) Check the cruise control main switch operation.	Is the cruise control main switch turned ON?	Go to step **2.**	Go to symptom 1. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
2	**PREPARE SUBARU SELECT MONITOR.**	Is Subaru Select Monitor available?	Go to step **3.**	Go to step **4.**
3	**PERFORM CRUISE CANCEL CONDITIONS DIAGNOSTIC.** Perform the cruise cancel conditions diagnostic. <Ref. to CC(diag)-9, Subaru Select Monitor.>	Is DTC indicated?	Go to "List of Diagnostic Trouble Code (DTC)". <Ref. to CC(diag)-25, List of Diagnostic Trouble Code (DTC).>	Go to step **4.**
4	**CHECK CRUISE CONTROL SET OPERATION.** Check the cruise control set operation.	Can the cruise control be set while driving at 40 km/h (25 MPH)?	Go to step **5.**	Go to symptom 2. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
5	**CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.** Make sure the vehicle speed is held within set speed.	Is the vehicle speed held within set speed ±3 km/h (±2 MPH)?	Go to step **6.**	Go to symptom 3. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
6	**CHECK RESUME/ACCEL OPERATION.** Check the RESUME/ACCEL operation.	Does the vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step **7.**	Go to symptom 4. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
7	**CHECK SET/COAST OPERATION.** Check the SET/COAST operation.	Does the vehicle speed decrease after SET/COAST switch has been pressed?	Go to step **8.**	Go to symptom 5. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>

	Step	Check	Yes	No
8	**CHECK CANCEL OPERATION.** Check the CANCEL operation.	Is the cruise control released after CANCEL switch has been pressed?	Go to step **9.**	Go to symptom 6. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
9	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after brake pedal has been depressed?	Go to step **10.**	Go to symptom 7. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
10	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after clutch pedal has been depressed? (MT model)	Finish the diagnostics.	Go to symptom 8. <Ref. to CC(diag)-11, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>

2. General Description

A: CAUTION

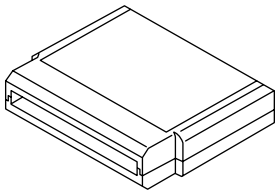
1. SUPPLEMENTAL RESTRAINT SYSTEM AIRBAG

Airbag system wiring harness is routed near the cruise control module and cruise control command switch.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the cruise control module and cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

NOTE:
This inspection procedure is specified for H4SO and H4DOTC 2.0 L (model).

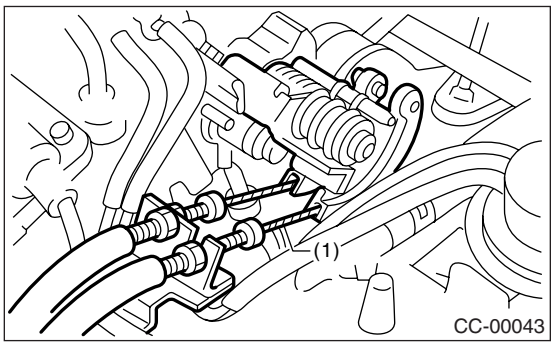
1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

Specific gravity:
Above 1.260

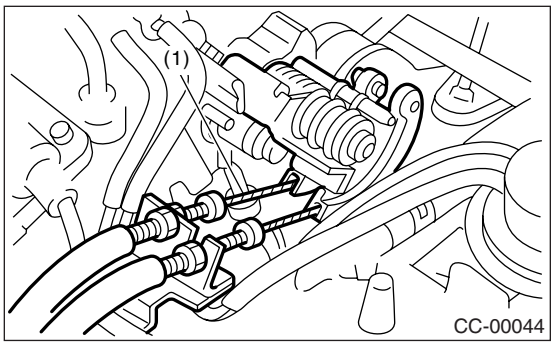
2. CRUISE CONTROL CABLE



(1) Cruise control cable

1) Check the cruise control cable installation.
2) If NG, install the cable securely.

3. ACCELERATOR CABLE



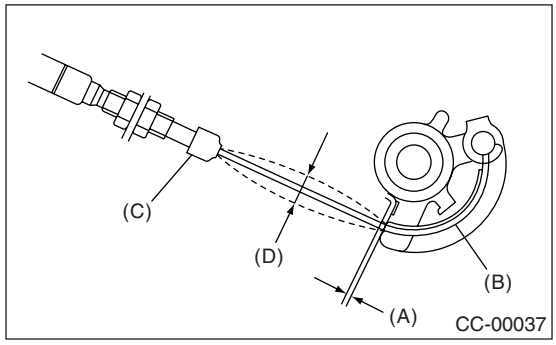
(1) Accelerator cable

1) Check the movement of accelerator cable when the cruise control throttle is moved by hand.
2) If NG, check the throttle cam.

4. THROTTLE CAM

1) Check that the throttle cam moves smoothly.
2) If NG, repair the throttle cam.

5. CABLE FREE PLAY



1) Check that the throttle cam-to-lever clearance (A) or cable (B) deflection amount (D) is within specifications.

Throttle cam-to-lever clearance:
0 — 1 mm (0 — 0.04 in)

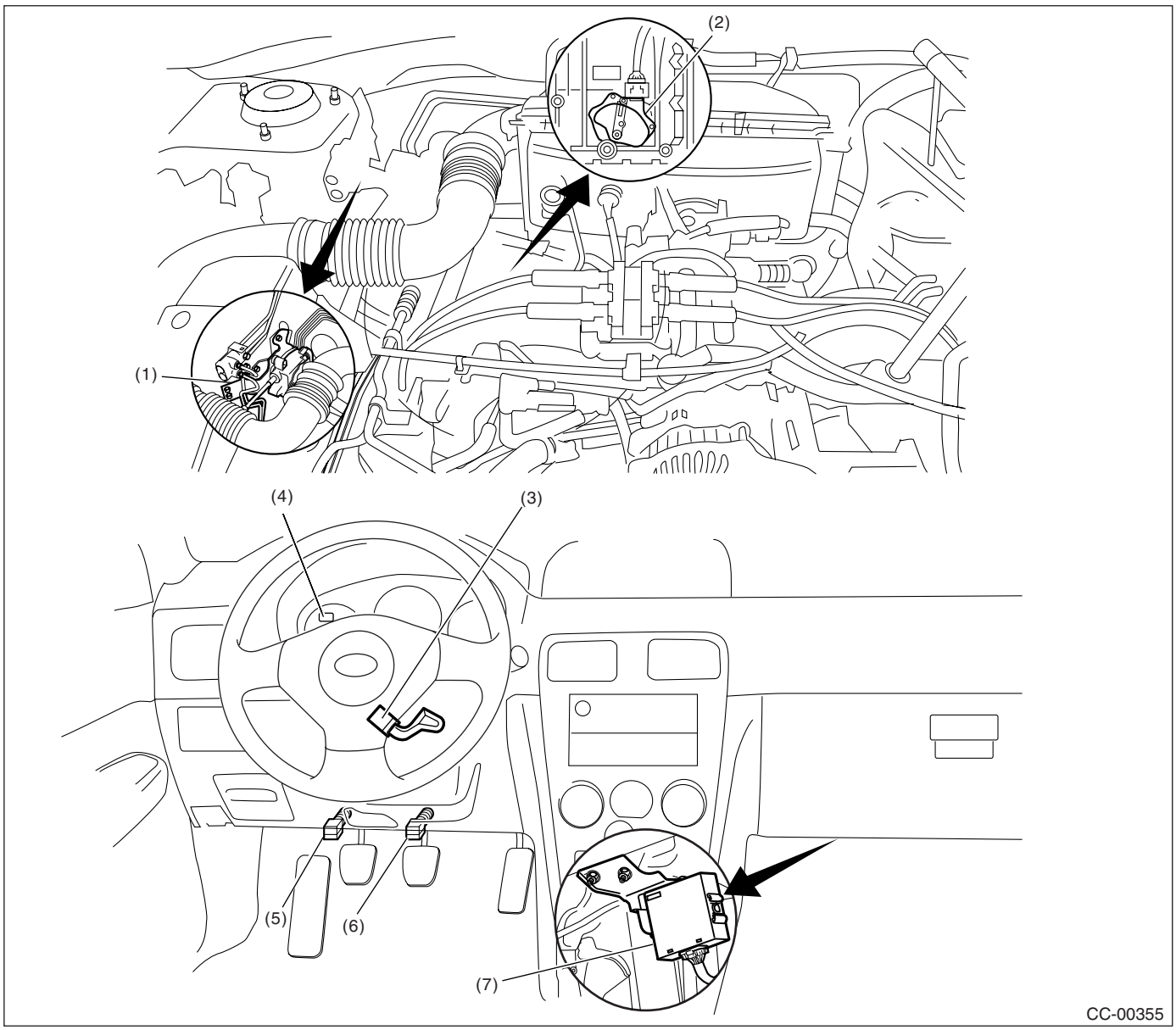
Inner cable deflection:
1 — 8 mm (0.04 — 0.31 in)

2) If NG, adjust the clearance with the adjusting nut.

NOTE:
Check that the cap (C) is positioned in the groove.

3. Electrical Component Location

A: LOCATION

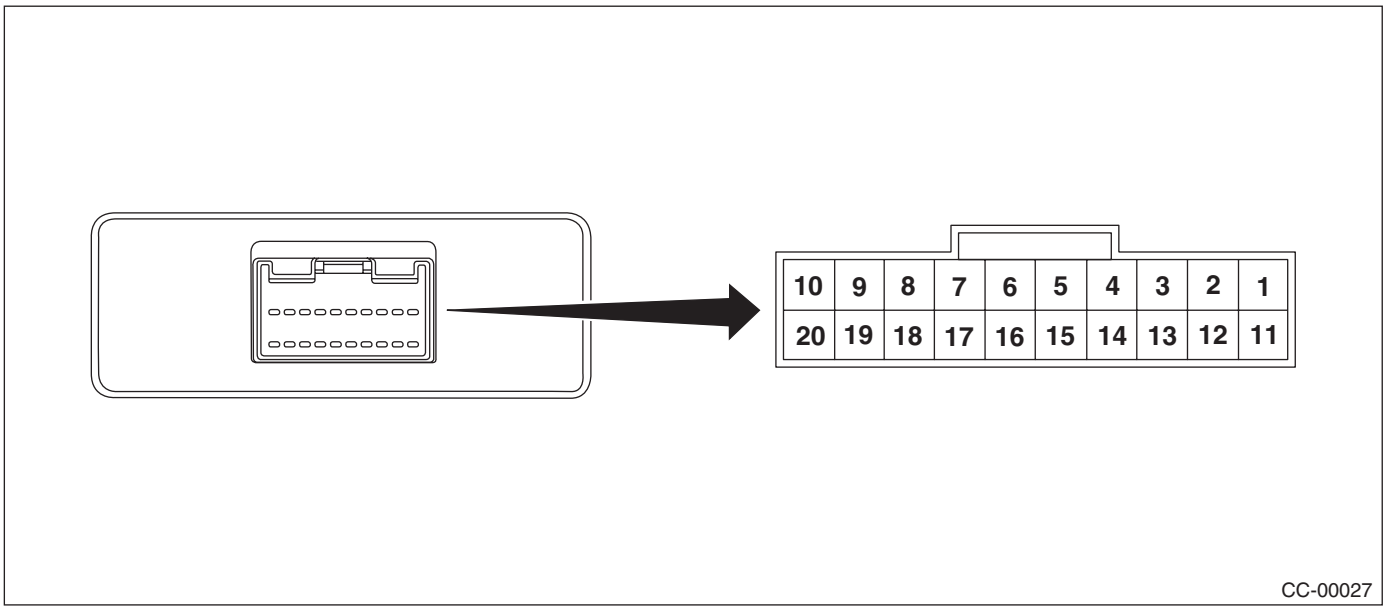


(1) Actuator
(2) Inhibitor switch (AT model)
(3) Cruise control command switch
(4) Cruise indicator & cruise set indicator light
(5) Clutch switch (MT model)
(6) Stop light and brake switch
(7) Cruise control module

NOTE:
Electrical component location are for LHD models. Cruise control actuator and cruise control unit location for RHD models are symmetrically opposite.

4. Cruise Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Cruise indicator light	1	• Battery voltage is present when main switch is turned ON. • "0" volt is present when main switch is turned OFF.
Inhibitor switch (AT model)	4	• Battery voltage is present when selector lever is other than "P" or "N" position. • "0" volt is present when selector lever is set to "P" or "N" position.
Motor B	5	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
Ground	6	—
Motor A	7	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
RESUME/ACCEL switch	9	• Battery voltage is present when command switch is turned to RESUME/ACCEL position. • "0" volt is present when command switch is released.
SET/COAST switch	10	• Battery voltage is present when command switch is turned to SET/COAST position. • "0" volt is present when command switch is released.
Main power supply	11	• Battery voltage is present when main power is turned ON. • "0" volt is present when main power is turned OFF.
Ignition switch	12	• Battery voltage is present when ignition switch is turned ON. • "0" volt is present when ignition switch is turned OFF.
Motor C	13	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when main switch is turned OFF.
Motor clutch	14	• ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. • "0" volt is present when vehicle is stopped.
Cruise control main switch	15	• Battery voltage is present while pressing the main switch. • "0" volt is present when main switch is released.

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Brake switch/Clutch switch (MT model)	16	Leave clutch pedal released (MT model), while cruise control main switch is turned ON. Then check that; • Battery voltage is present when brake pedal is released. • “0” volt is present when brake pedal is depressed. Additionally only in MT model, keep the cruise control main switch to ON and leave brake pedal released. Then check that; • Battery voltage is present when clutch pedal is released. • “0” volt is present when clutch pedal is depressed.
Data link connector	17	—
Data link connector	18	—
Vehicle speed sensor (MT model) TCM (AT model)	19	Lift-up the vehicle until all four wheels are raised off ground, and then rotate any wheel manually. Approx. “5” and “0” volt pulse signals are alternately input to cruise control module.
Stop light switch	20	Turn ignition switch to OFF. Then check that; • Battery voltage is present when brake pedal is depressed. • “0” volt is present when brake pedal is released.
NOTE: Voltage at terminals 5, 7, 13 and 14 cannot be checked unless vehicle is driving by cruise control operation.		

B: WIRING DIAGRAM

<Ref. to WI-195, WIRING DIAGRAM**, Cruise Control System.>**

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

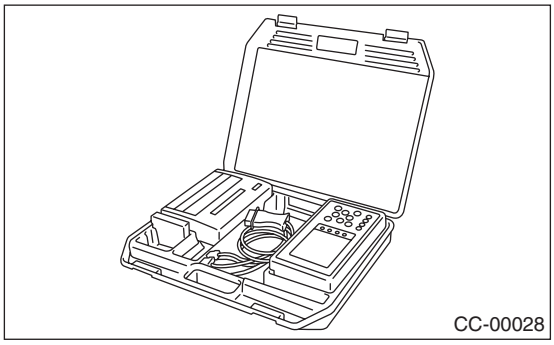
The on-board diagnostic function of the cruise control system uses an external Subaru Select Monitor.
The on-board diagnostic function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnostic:
(1) This category of diagnostic requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).
(2) Cruise control module memory stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:
• The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
• The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

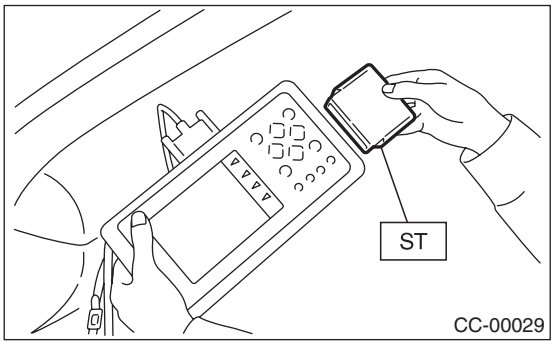
2) Real-time diagnostic:
The real-time diagnostic function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

2. CRUISE CANCEL CONDITIONS DIAGNOSTIC

1) Prepare the Subaru Select Monitor kit.

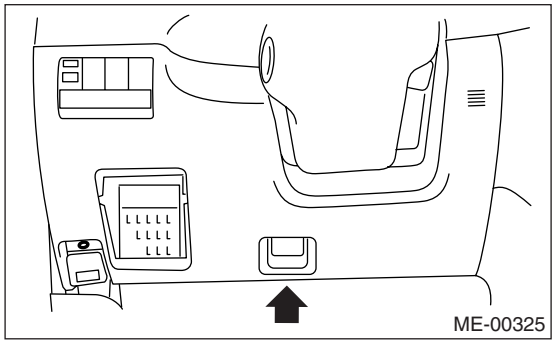

CC-00028

2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. **<Ref. to CC(diag)-4,** SPECIAL TOOL, PREPARATION TOOL**, General Description.>**



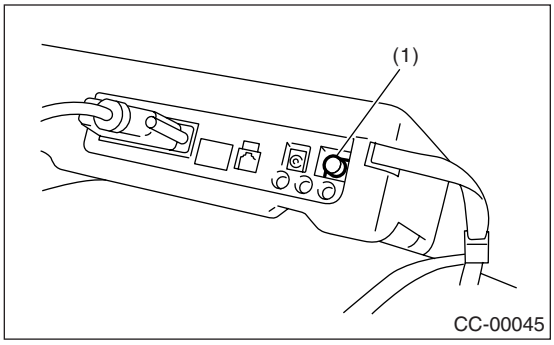
CC-00029

4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).


ME-00325

(2) Connect the diagnostic cable to data link connector.
5) Start the engine and turn the cruise control main switch to ON.

6) Turn the Subaru Select Monitor switch to ON.



(1) Power switch

7) On the Main Menu display screen, select the {All System Diagnosis} and press [YES] key.

NOTE:
DTC is also shown in the {Each System Check} mode. This mode is called up on the Cruise Control Diagnosis screen by selecting the item {Cancel Code(s) Display}.

8) Drive the vehicle at least 30 km/h (19 MPH) with cruise speed set.
9) If the cruise speed is canceled itself (without doing any cancel operations), DTC will appear on select monitor display.

CAUTION:
• DTC will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in the vehicle to assist in diagnostic during driving.

NOTE:
DTC will be cleared by turning the ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSTIC

1) Connect the select monitor.
2) Turn the ignition switch and cruise control main switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) On the Main Menu display screen, select the {Each System Check} and press [YES] key.
5) On the System Selection Menu display screen, select the {Cruise Control} and press [YES] key.
6) Press the [YES] key after displayed the information of engine type.
7) On the Cruise Control Diagnosis display screen, select the {Current Data Display & Save} and press [YES] key.
8) Make sure that normal indication is displayed when controls are operated as indicated below:
• Depress/release the brake pedal. (Stop light switch and brake switch turn ON or OFF.)
• Turn ON or OFF the “SET/COAST” switch.
• Turn ON or OFF the “RESUME/ACCEL” switch.
• Depress/release the clutch pedal. (MT model)
• Set the selector lever to P or N. (AT model)

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to CC(diag)-25, List of Diagnostic Trouble Code (DTC).>

6. Diagnostics with Phenomenon

A: DIAGNOSTIC PROCEDURE WITH PHENOMENON

NOTE:
This basic diagnostic procedure is specified for H4SO and H4DOTC 2.0 L (model).

Symptom		Repair area	Reference
1	Cruise control main switch is not turned ON.	(1) Check the power supply.	<Ref. to CC(diag)-13, CHECK POWER SUPPLY, Diagnostics with Phenomenon.>
		(2) Check the cruise control main switch.	<Ref. to CC(diag)-15, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics with Phenomenon.>
2	Cruise indicator light does not illuminate.	Check the cruise indicator light.	<Ref. to CC(diag)-17, CHECK CRUISE INDICATOR LIGHT, Diagnostics with Phenomenon.>
3	Cruise control cannot be set.	(1) Check the SET/COAST switch.	<Ref. to CC(diag)-15, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics with Phenomenon.>
		(2) Check the stop light switch and brake switch.	<Ref. to CC(diag)-19, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics with Phenomenon.>
		(3) Check the clutch switch (MT model).	<Ref. to CC(diag)-21, CHECK CLUTCH SWITCH (MT MODEL), Diagnostics with Phenomenon.>
		(4) Check the inhibitor switch (AT model).	<Ref. to CC(diag)-23, CHECK INHIBITOR SWITCH (AT MODEL), Diagnostics with Phenomenon.>
		(5) Check the vehicle speed sensor.	<Ref. to CC(diag)-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(6) Check the motor drive system.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(7) Check the motor clutch drive system.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
4	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	(1) Check the vehicle speed sensor.	<Ref. to CC(diag)-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(2) Check the motor drive system.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
5	Vehicle speed does not increase or does not return to set speed after RESUME/ ACCEL switch has been pressed.	(1) Check the RESUME/ ACCEL switch.	<Ref. to CC(diag)-15, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics with Phenomenon.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
6	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Check the SET/COAST switch.	<Ref. to CC(diag)-15, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics with Phenomenon.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

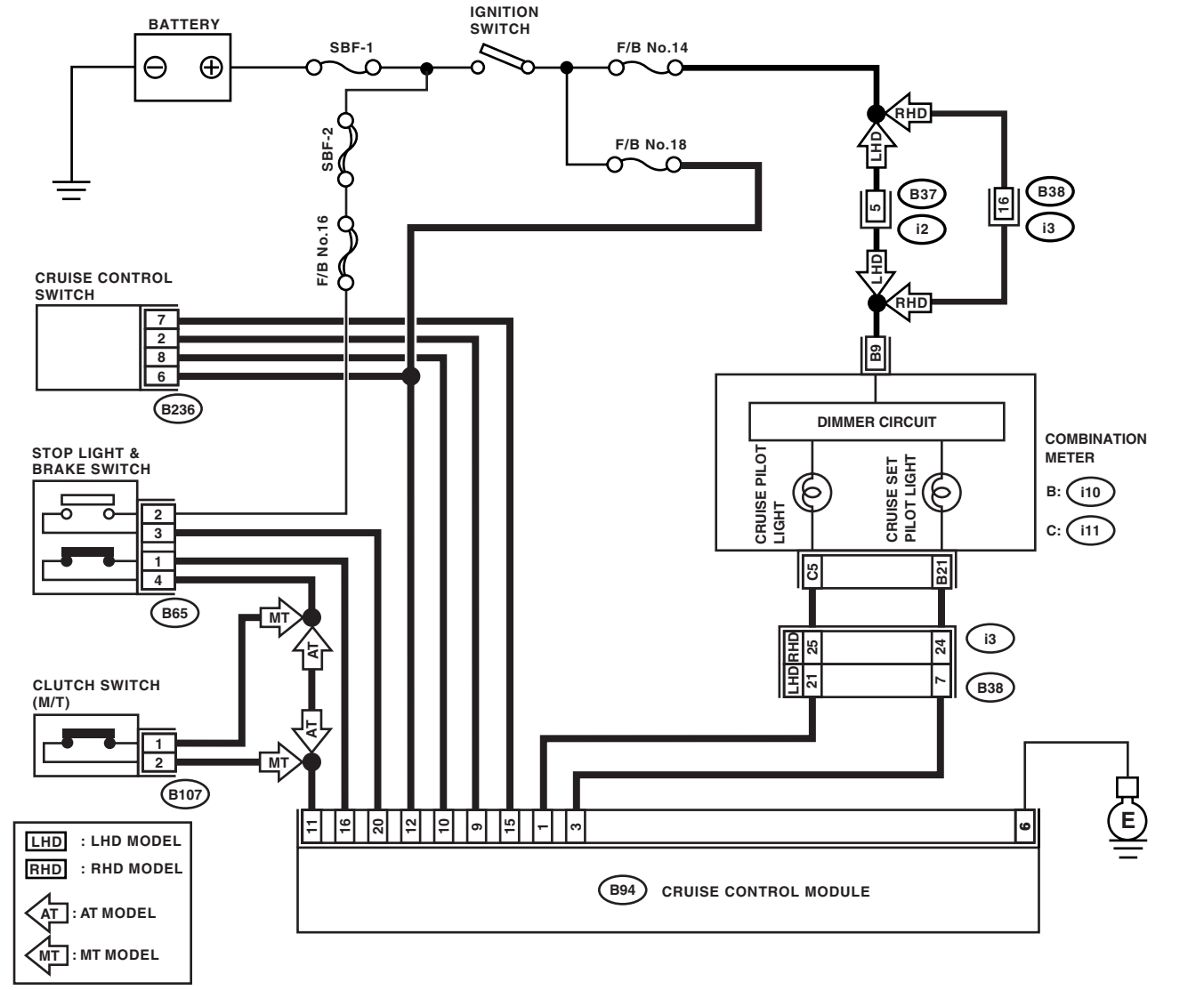
Symptom		Repair area	Reference
7	Cruise control is not released after CANCEL switch has been pressed.	(1) Check the CANCEL switch.	<Ref. to CC(diag)-15, CHECK CRUISE CONTROL MAIN SWITCH, Diagnostics with Phenomenon.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
8	Cruise control is not released after brake pedal has been depressed.	(1) Check the stop light switch and brake switch.	<Ref. to CC(diag)-19, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics with Phenomenon.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
9	Cruise control is not released after clutch pedal has been depressed (MT model).	(1) Check the clutch switch.	<Ref. to CC(diag)-21, CHECK CLUTCH SWITCH (MT MODEL), Diagnostics with Phenomenon.>
		(2) Check the motor drive system.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check the motor clutch drive system.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

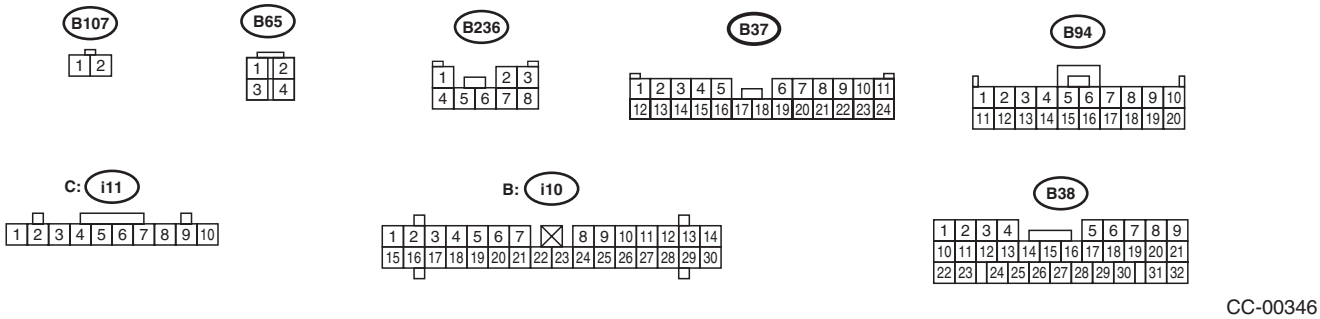
B: CHECK POWER SUPPLY

TROUBLE SYMPTOM:

Cruise control can be set normally, but indicator does not come on. (When main switch is pressed.)

WIRING DIAGRAM:





CC-00346

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control module and fuse & relay box.
2	**CHECK GROUND CIRCUIT.** 1) Turn the ignition switch OFF. 2) Measure the resistance between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Power supply and ground circuit are OK.	Repair the harness.

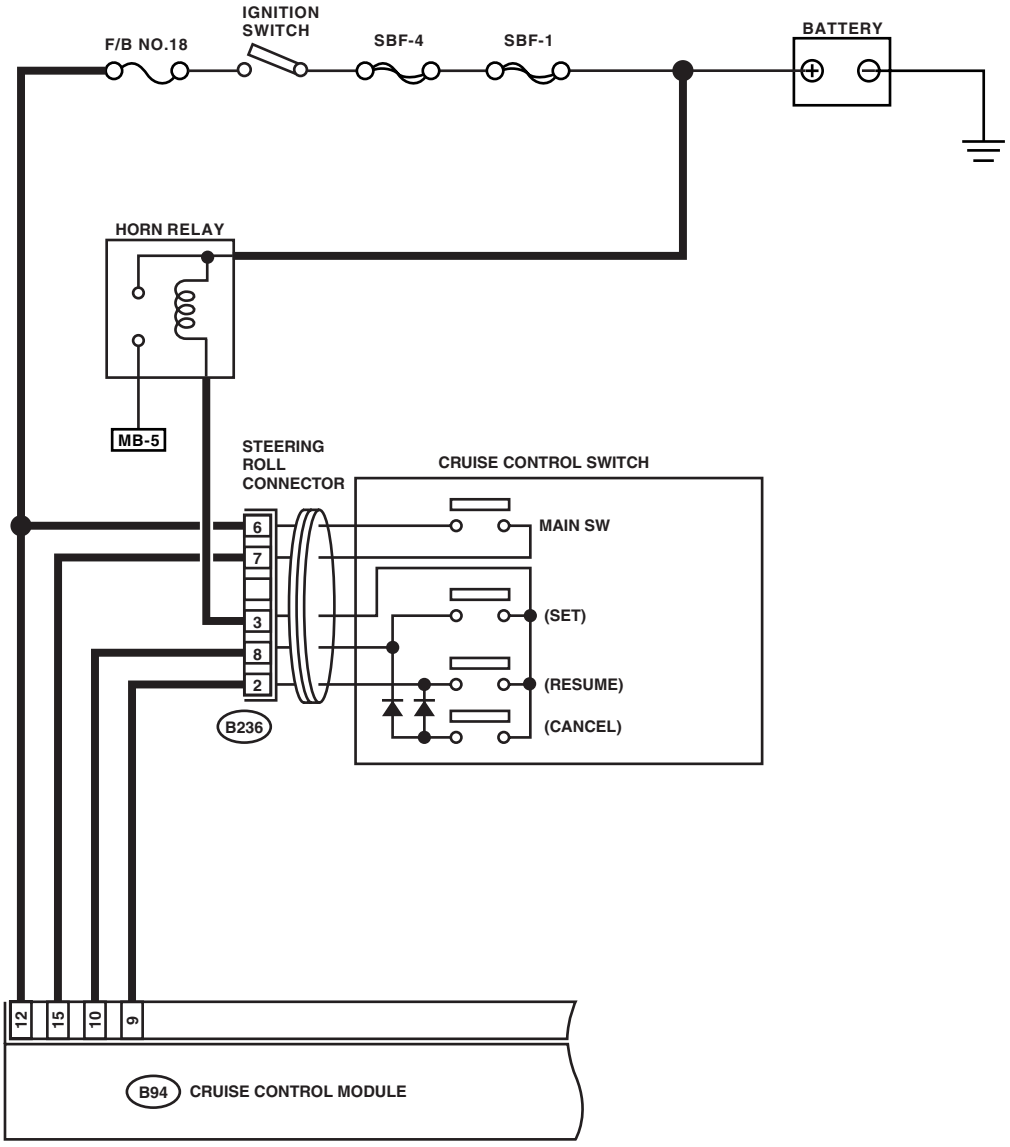
C: CHECK CRUISE CONTROL MAIN SWITCH

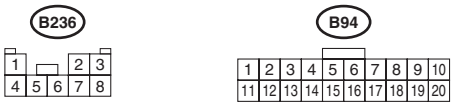
TROUBLE SYMPTOM:

Cruise control main switch is not turned ON and cruise control cannot be set.

NOTE:
When the main relay (built-in cruise control module) operates, the main switch circuit is in normal condition.
The main relay operation can be checked by hearing the operation sound.
This operation sound will be heard when the ignition switch and cruise control main switch is turned to ON.

WIRING DIAGRAM:





CC-00357

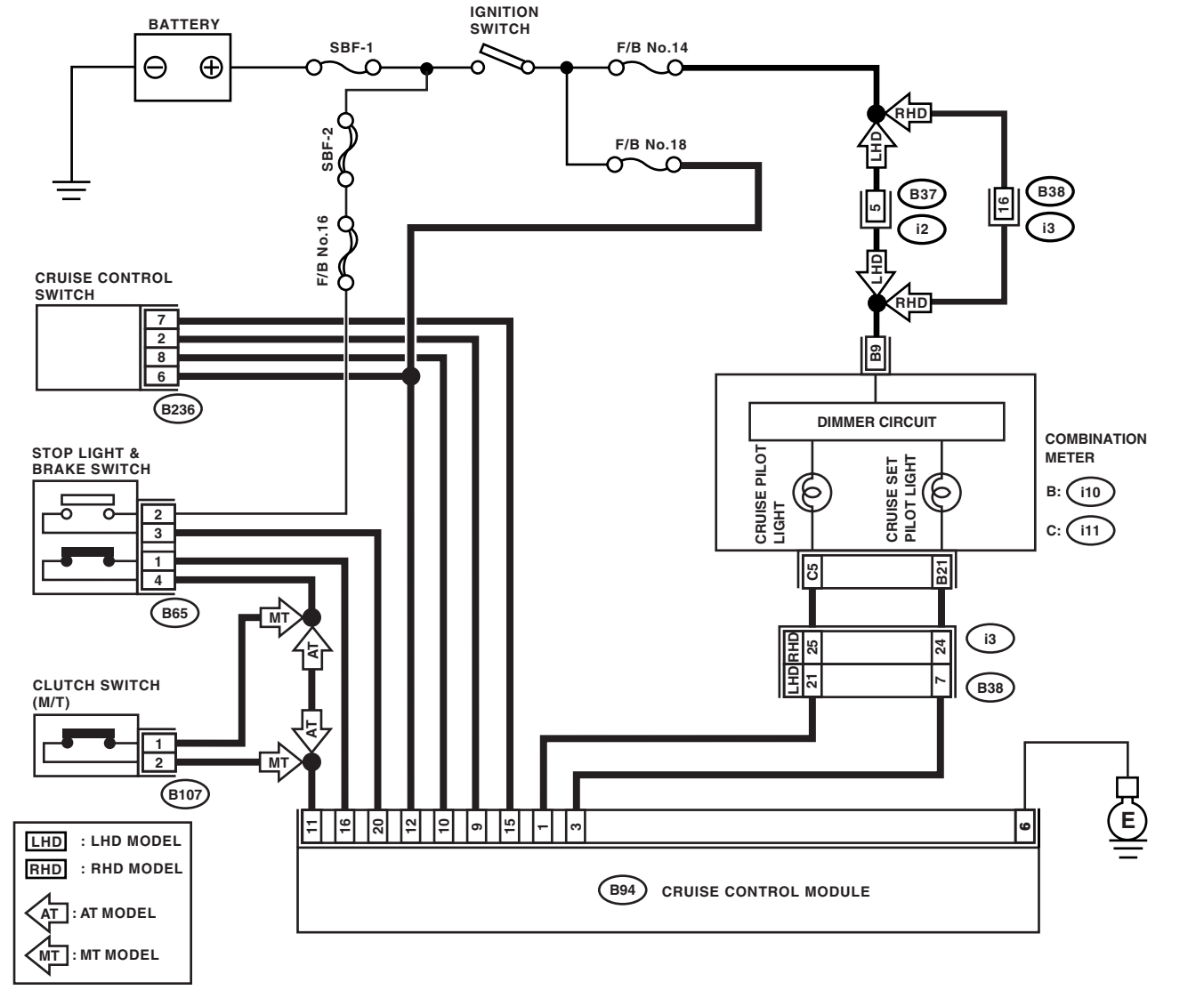
	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control unit harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground when the main switch is pressed and is not pressed. ***Connector & terminal*** ***(B94) No. 15 (+) — Chassis ground (−):***	Is the voltage 0 V when the main switch is not pressed? Is the voltage more than 10 V when the main switch is pressed?	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control command switch and fuse & relay box. If no malfunction is found after checking above, Go to step **6.**
2	**CHECK SET/COAST SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control unit harness connector. 3) Measure the voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 10 (+) — Chassis ground (−):***	Is the voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 10 V when SET/COAST switch is pressed?	Go to step **3.**	Go to step **5.**
3	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 10 (+) — Chassis ground (−):***	Is the voltage 0 V when RESUME/ACCEL switch is not pressed? Is the voltage more than 10 V when RESUME/ACCEL switch is pressed?	Go to step **4.**	Go to step **5.**
4	**CHECK CANCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B94) No. 10 (+) — Chassis ground (−):***	Is the voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?	Cruise control command switch circuit is OK.	Go to step **5.**
5	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check the horn operation.	Does the horn sound?	Go to step **6.**	• Check the fuse No. 6 (in main fuse box). • Check the horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check the harness for open or short between cruise control command switch and fuse & relay box.
6	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check the cruise control command switch. <Ref. to CC-8, Cruise Control Command Switch.>	Is the cruise control command switch OK?	Check the harness between cruise control command switch and ECM.	Replace the cruise control command switch.

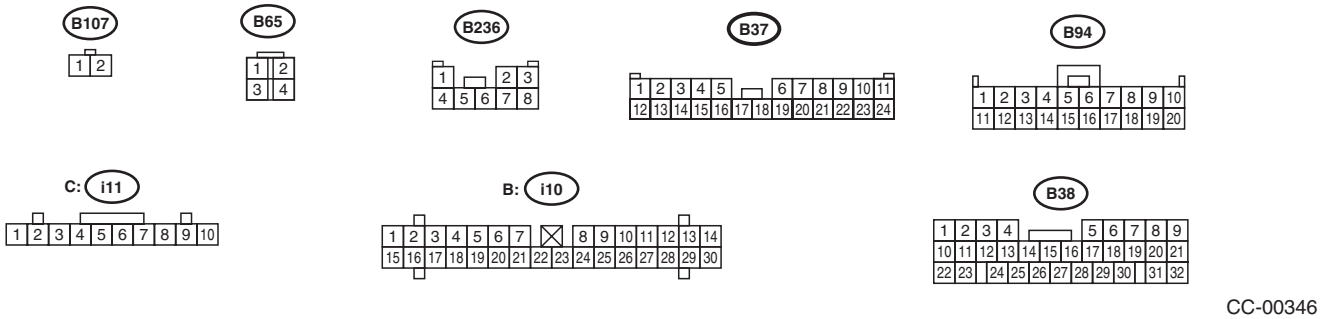
D: CHECK CRUISE INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set normally, but indicator light does not come on. (When main switch is pressed.)

WIRING DIAGRAM:





CC-00346

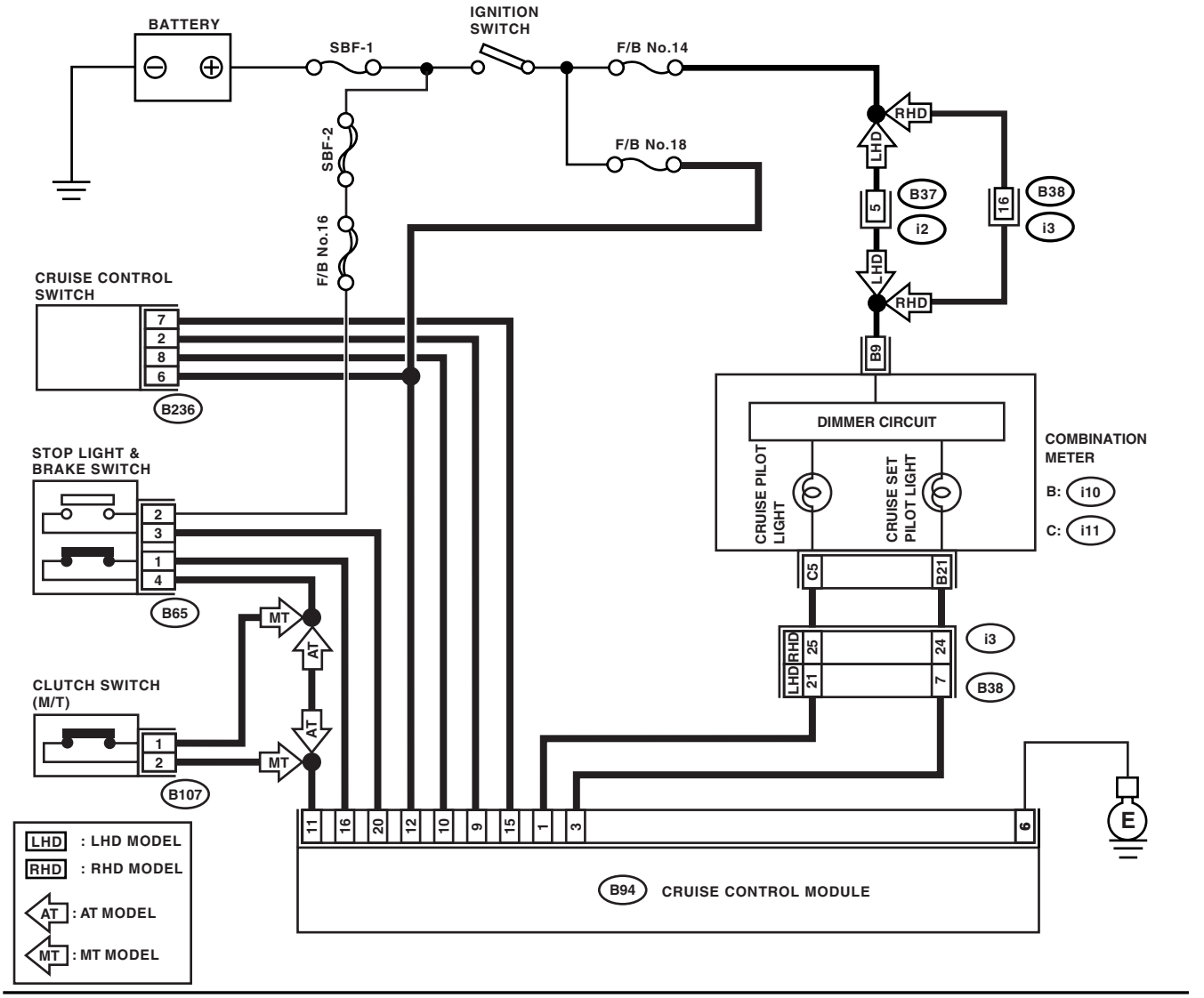
	Step	Check	Yes	No
1	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i11) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 13 (in fuse & relay box). • Check the harness for open or short between combination meter and fuse & relay box.
2	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(B94) No. 1 — (i11) No. 5:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** Ground the cruise control module harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B94) No. 1 — Chassis ground:***	Does the cruise indicator light illuminate?	Replace the cruise control module.	• With indicator built in combination meter: Check the cruise indicator light bulb in combination meter, and replace it if malfunction occurred. No malfunction found, replace the printed circuit of combination meter. • With indicator built in main switch: Replace the cruise control main switch.

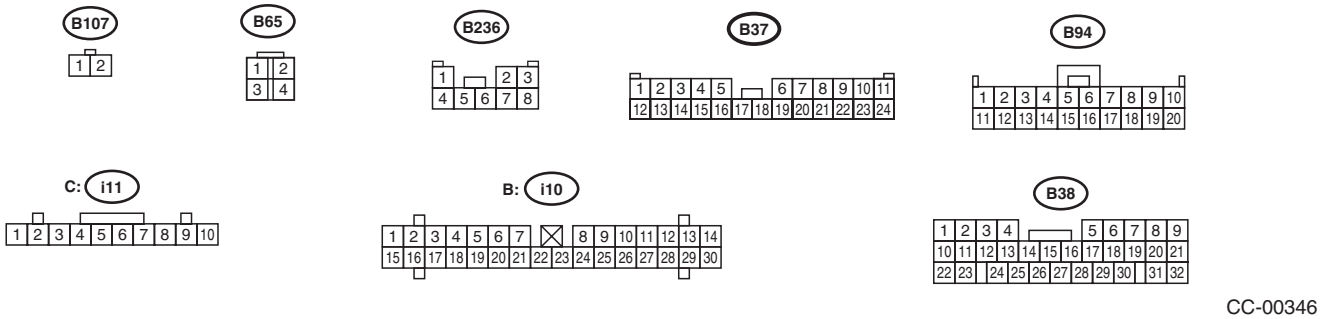
E: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00346

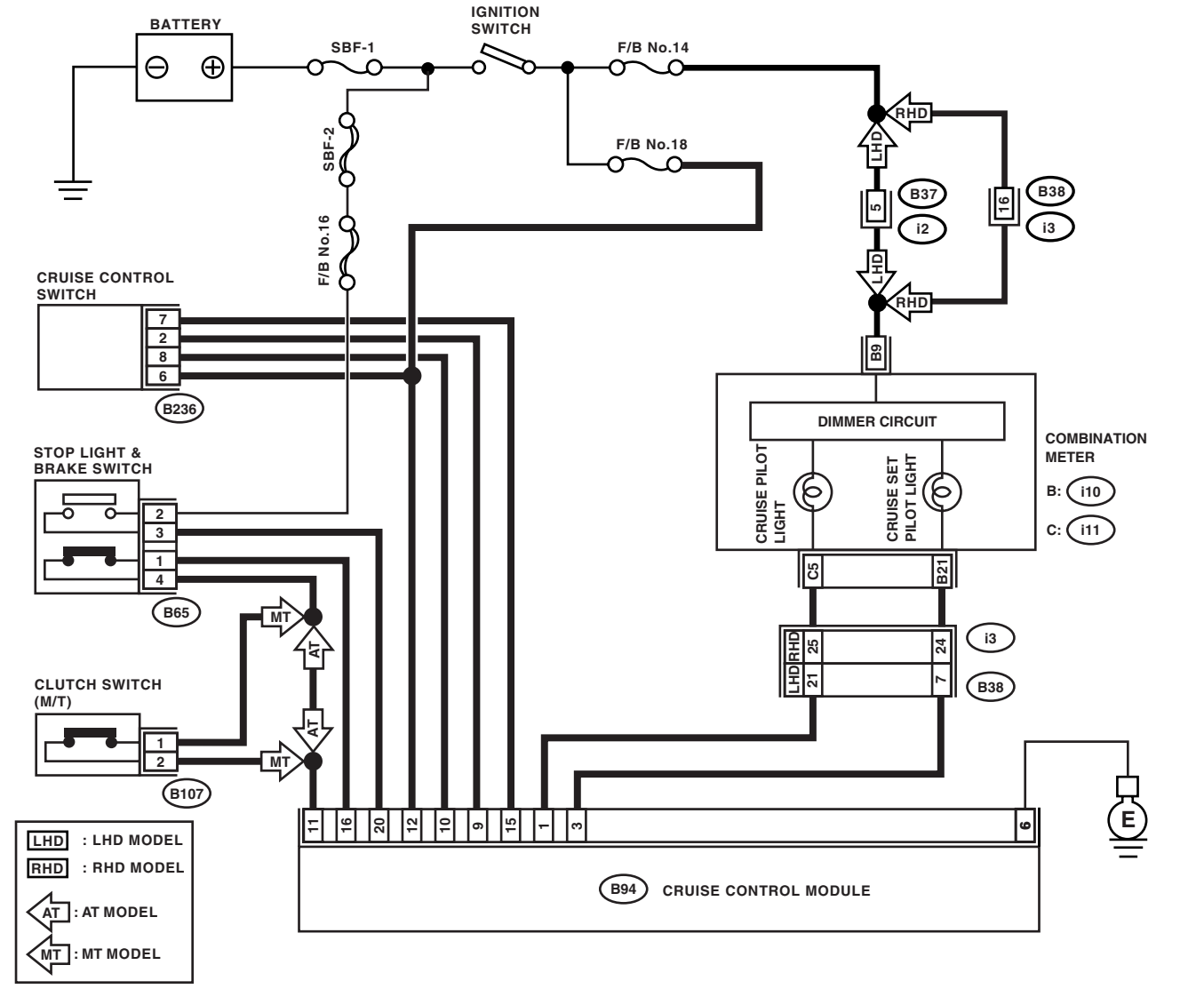
	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 16 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 4 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	• Check the harness for open or short between stop light/brake switch and cruise control module (AT model). • Check the clutch switch and circuit (MT model).
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the cruise control main switch and ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B94) No. 20 — (B65) No. 3:*** ***(B94) No. 16 — (B65) No. 1:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check the stop light switch and brake switch. <Ref. to CC-10, Stop Light and Brake Switch.>	Are the stop light switch and brake switch are OK?	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

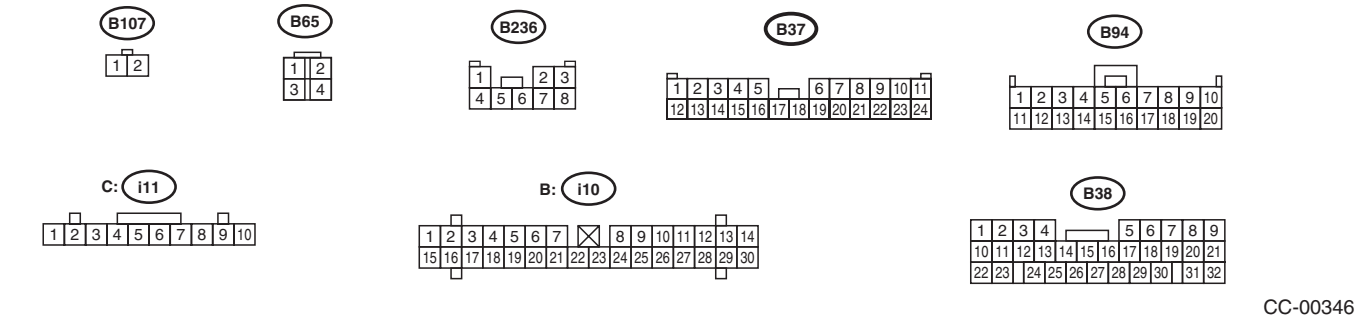
F: CHECK CLUTCH SWITCH (MT MODEL)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:





CC-00346

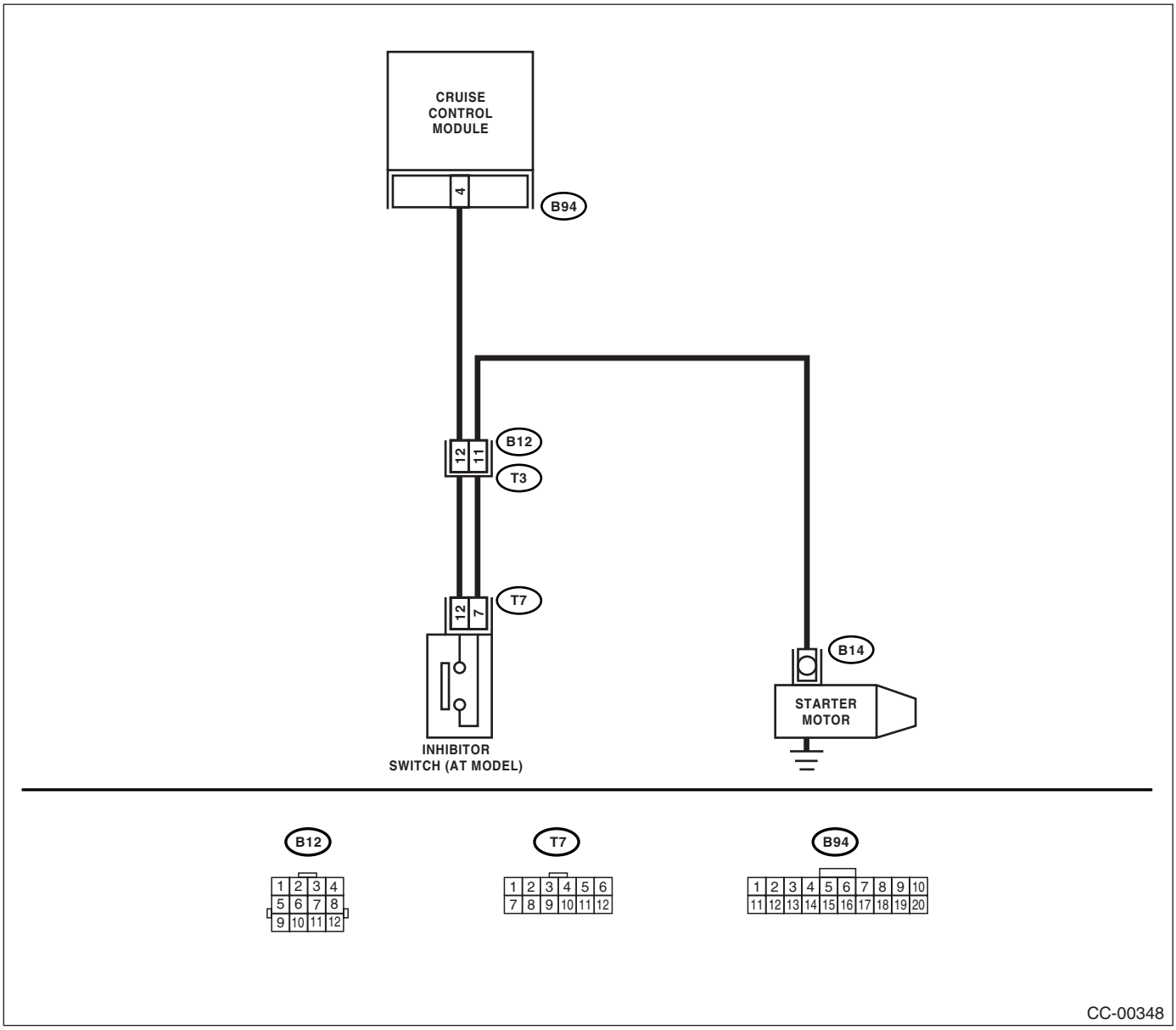
	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between clutch switch and cruise control module.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the cruise control main switch and ignition switch OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Measure the resistance between clutch switch harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B107) No. 1 — (B65) No. 4:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CLUTCH SWITCH.** Remove and check the clutch switch. <Ref. to CC-11, Clutch Switch.>	Is the clutch switch OK?	Clutch switch circuit is OK.	Replace the clutch switch.

G: CHECK INHIBITOR SWITCH (AT MODEL)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between inhibitor switch and cruise control module.
2	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the cruise control main switch and ignition switch to OFF. 2) Disconnect the starter motor harness connector. 3) Measure the resistance between inhibitor switch harness connector terminal and starter motor harness connector terminal. ***Connector & terminal*** ***(T7) No. 7 — (B14) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK INHIBITOR SWITCH.** Remove and check the inhibitor switch. <Ref. to CC-12, Inhibitor Switch.>	Is the inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace the inhibitor switch.

7. List of Diagnostic Trouble Code (DTC)

A: LIST

NOTE:
This diagnostic trouble code (DTC) is specified for H4SO and H4DOTC 2.0 L (model).

DTC	Item	Contents of diagnostic	Reference
21	Inner relay is seized.	Cruise control module inner relay is seized when main switch is OFF.	<Ref. to CC(diag)-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Vehicle speed sensor	Vehicle speed signal changes more than 10 km/h (6 MPH) within 350 ms.	<Ref. to CC(diag)-28, DTC 22 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Cruise control module is abnormal.	Two vehicle speed values stored in cruise control module memory are not the same.	<Ref. to CC(diag)-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	Cruise control module is abnormal.	Two output values stored in cruise control module memory are not the same.	<Ref. to CC(diag)-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	Wiring harness opened.	Open wiring harness circuit is detected via control module relay when main switch is ON.	<Ref. to CC(diag)-31, DTC 28 WIRING HARNESS OPENED., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Motor drive system is abnormal.	• Motor output circuit is open or shorted. • Motor drive circuit is open or shorted.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Trouble of motor turning speed	Motor turning speed is low.	<Ref. to CC(diag)-32, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Motor clutch drive system is abnormal.	• Motor clutch output circuit is open or shorted. • Motor clutch drive circuit is open or shorted.	<Ref. to CC(diag)-34, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Contents of diagnostic	Reference
38	Motor drive shaft does not engage properly.	Motor drive gear engagement is not properly adjusted.	<Ref. to CC(diag)-36, DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC(diag)-36, DTC 39 MOTOR IS OVERLOADED., Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2A	Cruise control module is abnormal.	Cruise control module self-diagnosis function senses abnormality.	<Ref. to CC(diag)-27, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

8. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM

NOTE:
This basic diagnostic procedure is specified for H4SO and H4DOTC 2.0 L (model).

DIAGTNOSTIC:

- Poor welding of built-in relay of cruise control module.
- Failure of built-in CPU RAM of cruise control module.

TROUBLE SYMPTOM:

- Cruise control is canceled and memorized cruise speed is also canceled.
- Once cruise control is canceled, cruise control cannot be set until the ignition switch and cruise control main switch turns OFF, and then turns ON again.

NOTE:
Check input/output signal and vehicle speed signal with select monitor. When signals are in good condition, failure is in cruise control module. (Check the power supply and ground conditions of cruise control module.)

B: DTC 22 VEHICLE SPEED SENSOR

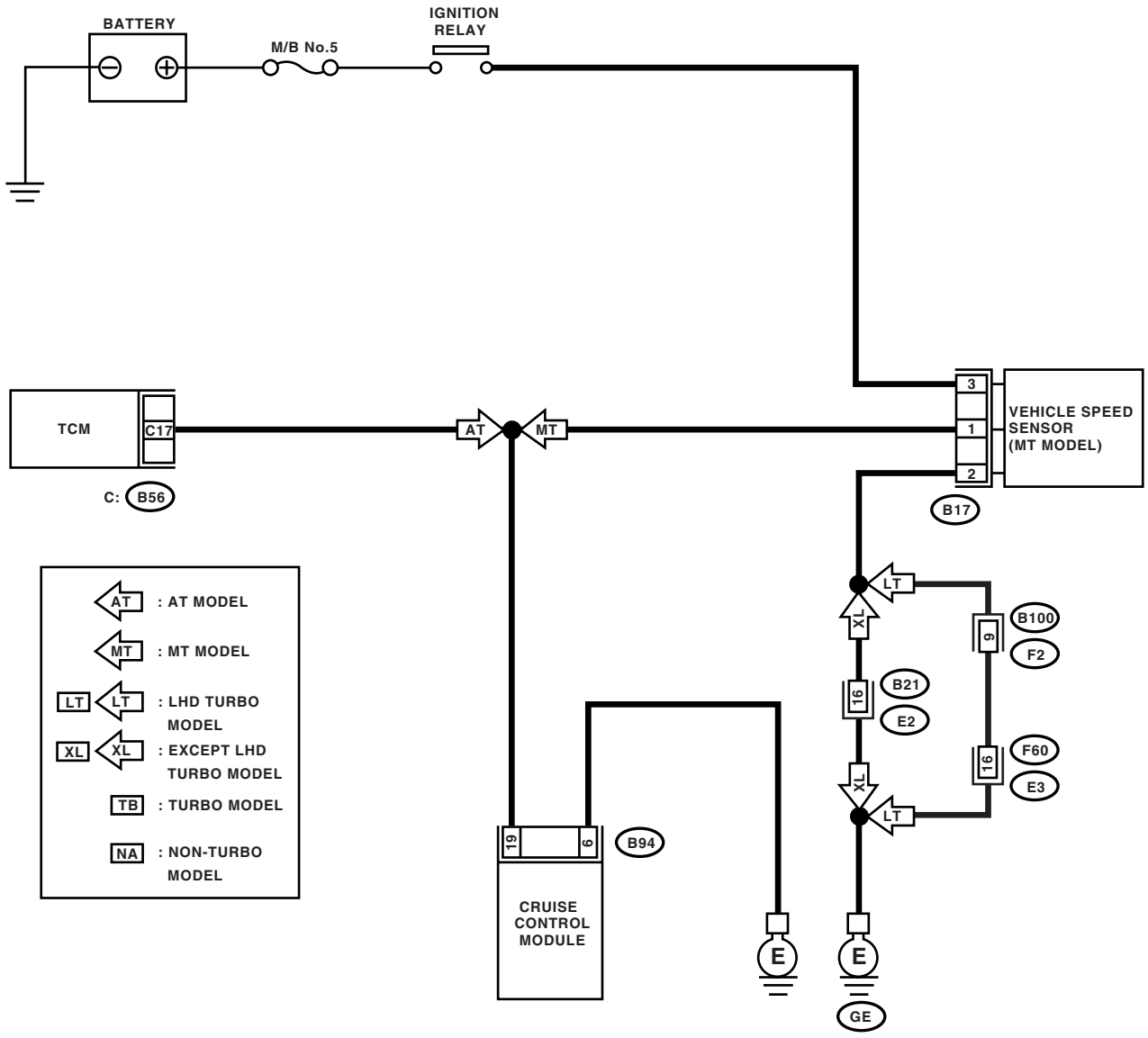
DIAGNOSTIC:

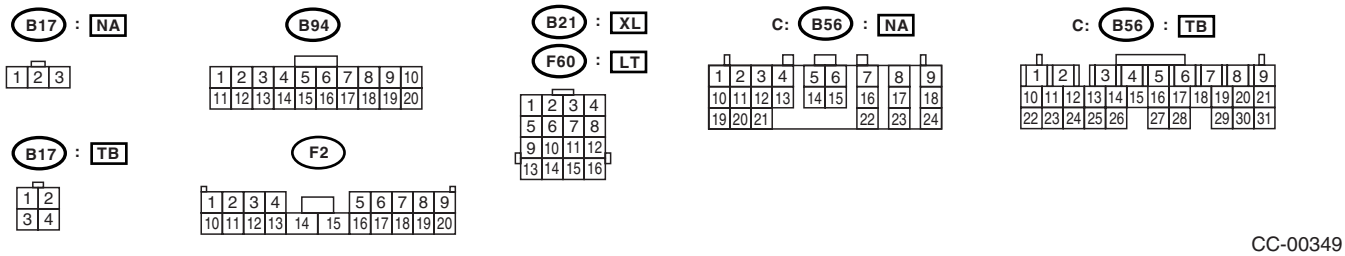
Disconnection or short circuit of vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00349

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the target MT model?	Go to step **2.**	Go to step **6.**
2	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from vehicle speed sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between fuse relay and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control module. 3) Measure the resistance between vehicle speed sensor harness connector terminal and cruise control module harness connector terminal. ***Connector & terminal*** ***(B17) No. 1 — (B94) No. 19:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK VEHICLE SPEED SENSOR.** 1) Connect the harness connector to vehicle speed sensor. 2) Lift-up the vehicle and support with rigid racks. 3) Drive the vehicle at speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4) Measure the voltage between cruise control module harness connector terminal and chassis ground. ***Connector & terminal*** ***(B94) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 0 V ← → more than 5 V?	Replace the cruise control module. <Ref. to CC-7, Cruise Control Unit.>	Replace the vehicle speed sensor.
6	**CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from TCM and cruise control module. 3) Measure the resistance between cruise control module harness connector terminal and TCM harness connector terminal. ***Connector & terminal*** ***(B94) No. 19 — (B56) No. 17:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the harness.

	Step	Check	Yes	No
7	**CHECK TCM.** 1) Connect the harness connector to TCM. 2) Lift-up the vehicle and support with rigid racks. 3) Drive the vehicle faster than 10 km/h (6 MPH). **Warning:** **Be careful not to be caught by the running wheels.** 4) Measure the voltage between TCM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B56) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 0 V ← → more than 5 V?	Replace the cruise control module. <Ref. to CC-7, Cruise Control Unit.>	Replace the TCM. <Ref. to 4AT-82, Transmission Control Module (TCM).>

C: DTC 28 WIRING HARNESS OPENED.

	Step	Check	Yes	No
1	**CHECK BATTERY.** Measure the battery specific gravity of electrolyte.	Is the battery specific gravity more than 1.260?	Go to step **2.**	Charge or replace the battery. Go to step **2.**
2	**CHECK FUSES, CONNECTORS AND HARNESSES.** Check the condition of fuses, and harnesses and connectors. Also check for proper grounding.	Is there anything unusual about the appearance of fuse, harness, connector and grounding?	Repair or replace the faulty parts.	End of inspection.

D: DTC 35 AND 36 ACTUATOR MOTOR

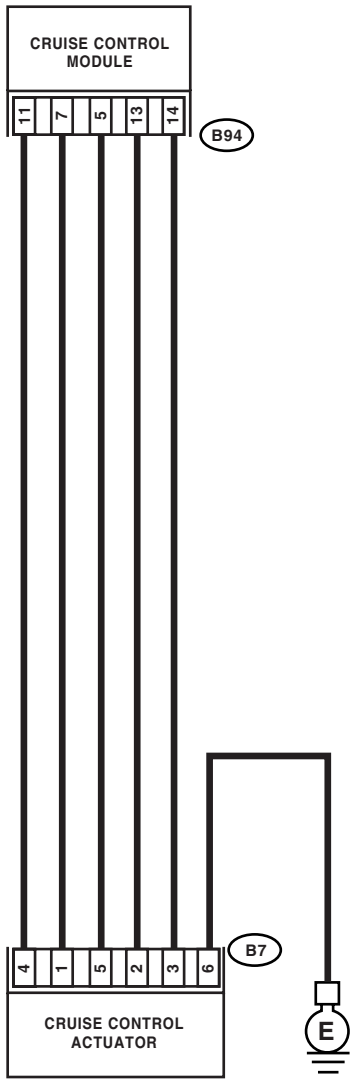
DIAGNOSTIC:

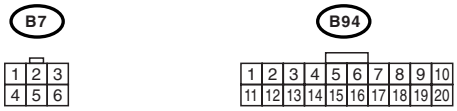
Open or poor contact of cruise control actuator motor.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00036

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn the ignition switch and cruise control main switch to OFF. 2) Measure the resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**MEASURE RESISTANCE OF ACTUATOR.** Measure the resistance of cruise control actuator motor. ***Terminals*** ***No. 4 — No. 1:*** ***No. 4 — No. 2:*** ***No. 4 — No. 5:***	Is the resistance approx. 5 Ω?	Go to step **4.**	Replace the cruise control actuator. <Ref. to CC-5, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1) Disconnect the harness connector from cruise control module. 2) Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 1 — (B94) No. 7:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 5 — (B94) No. 5:***	Is the resistance less than 10 Ω?	Replace the cruise control module. <Ref. to CC-7, Cruise Control Unit.>	Repair the harness.

E: DTC 37 ACTUATOR MOTOR CLUTCH

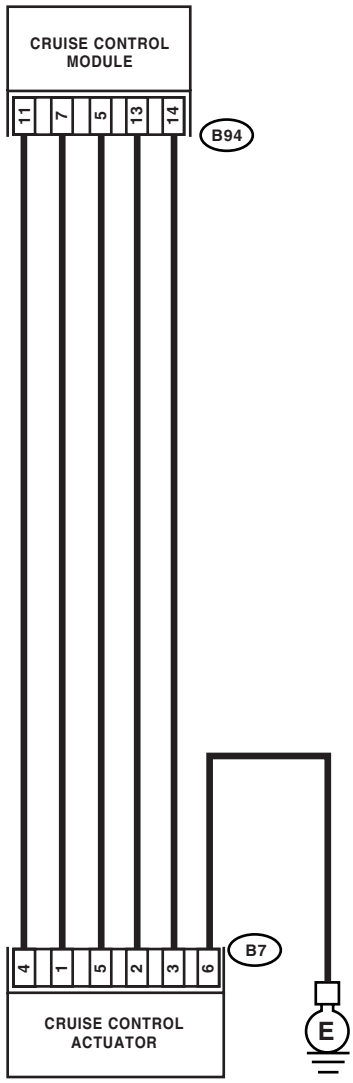
DIAGNOSTIC:

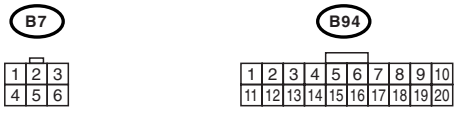
Open or poor contact of cruise control actuator motor clutch.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00036

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between cruise control module and cruise control actuator.
2	**CHECK GROUND CIRCUIT OF ACTUATOR.** 1) Turn the ignition switch and cruise control main switch to OFF. 2) Measure the resistance between cruise control actuator harness connector terminal and chassis ground. ***Terminals*** ***(B7) No. 6 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**MEASURE RESISTANCE OF ACTUATOR CLUTCH.** Measure the resistance of cruise control actuator clutch. ***Terminals*** ***No. 3 — No. 6:***	Is the resistance approx. 39 Ω?	Go to step **4.**	Replace the cruise control actuator. <Ref. to CC-5, Actuator.>
4	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** 1) Disconnect the harness connector from cruise control module. 2) Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 2 — (B94) No. 13:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE.** Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. ***Connector & terminal*** ***(B7) No. 3 — (B94) No. 14:***	Is the resistance less than 10 Ω?	Replace the cruise control module. <Ref. to CC-7, Cruise Control Unit.>	Repair the harness.

F: DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY.

	Step	Check	Yes	No
1	**CHECK ACTUATOR MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Remove the cruise control actuator from mounting bracket. 4) Pull the cable by hand to check for looseness or status of inner gear engagement.	Are foreign particles caught in the inner gear or does inner gear engage and disengage improperly?	Replace the cruise control actuator. <Ref. to CC-5, Actuator.>	Check the cruise control cable adjustment. <Ref. to CC(diag)-5, CABLE FREE PLAY, INSPECTION, General Description.>

G: DTC 39 MOTOR IS OVERLOADED.

	Step	Check	Yes	No
1	**CHECK THE OPERATING CURRENT TO ACTUATOR MOTOR.** 1) Connect the Subaru Select Monitor to data link connector. 2) Try to drive the vehicle while operating the cruise control system. 3) Measure the operation current to the cruise control actuator motor. ***Connector & terminal*** ***(B7) No. 4 — Chassis ground:***	Is the voltage more than 10 A?	Replace the cruise control module. <Ref. to CC-7, Cruise Control Unit.>	Check the power supply circuit. <Ref. to CC(diag)-13, CHECK POWER SUPPLY, Diagnostics with Phenomenon.>

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC(ETC)(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:
This section is specified for H4DOTC 2.5 L (model).

	Step	Check	Yes	No
1	**CHECK MALFUNCTION INDICATOR LIGHT.** Check the malfunction indicator light illuminates.	Does the malfunction indicator light illuminate?	Go to step **5.**	Go to step **2.**
2	**CHECK CRUISE INDICATOR LIGHT.** Check the cruise indicator light blinks.	Does the cruise indicator light blink?	Go to step **5.**	Go to step **3.**
3	**CHECK CRUISE CONTROL MAIN SWITCH OPERATION.** Check the cruise control main switch operation. (Check the cruise indicator light illuminates.)	Is the cruise control main switch set to on? (Does the cruise indicator light illuminate?)	Go to step **4.**	Go to symptom 1. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>
4	**CHECK CRUISE CONTROL SET OPERATION.** Check the cruise control set operation.	Can the cruise control be set while driving at 40 km/h (25 MPH)?	Go to step **6.**	Go to step **5.**
5	**PERFORM CRUISE CONTROL CANCEL CONDITION DIAGNOSTIC.** Perform the cruise control cancel condition diagnostic.	Are any DTC indicated?	Go to “List of DTC”. <Ref. to CC(ETC)(diag)-13, List of Diagnostic Trouble Code (DTC).>	Go to symptom 2. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>
6	**CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED.** Make sure the vehicle speed is held within set speed.	Is the vehicle speed held within set speed ±3 km/h (±2 MPH)? (Make an inspection on a level road.)	Go to step **7.**	Go to symptom 3. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>
7	**CHECK RESUME/ACCEL OPERATION.** Check the RESUME/ACCEL switch operation.	Does the vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step **8.**	Go to symptom 4. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>
8	**CHECK SET/COAST OPERATION.** Check the SET/COAST switch operation.	Does the vehicle speed decrease after SET/COAST switch has been pressed?	Go to step **9.**	Go to symptom 5. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>

	Step	Check	Yes	No
9	**CHECK CANCEL OPERATION.** Check the CANCEL switch operation.	Is the cruise control released after CANCEL switch has been pressed?	Go to step **10.**	Go to symptom 6. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>
10	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after brake pedal has been depressed?	Go to step **11.**	Go to symptom 7. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>
11	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after clutch pedal has been depressed?	Go to step **12.**	Go to symptom 8. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>
12	**CHECK CRUISE CONTROL RELEASE OPERATION.** Check the cruise control release operation.	Is the cruise control released after shifting to neutral position?	Finish the diagnostic.	Go to symptom 9. <Ref. to CC(ETC)(diag)-10, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostic with Phenomenon.>

2. General Description

A: CAUTION

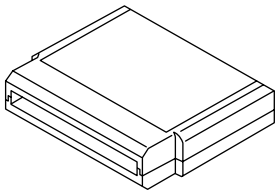
1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

Airbag system wiring harness is routed near the cruise control command switch.

CAUTION:
• All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
• Be careful not to damage the airbag system wiring harness when servicing the cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.

C: INSPECTION

NOTE:
This inspection procedure is specified for H4DOTC 2.5 L (model).

1. BATTERY

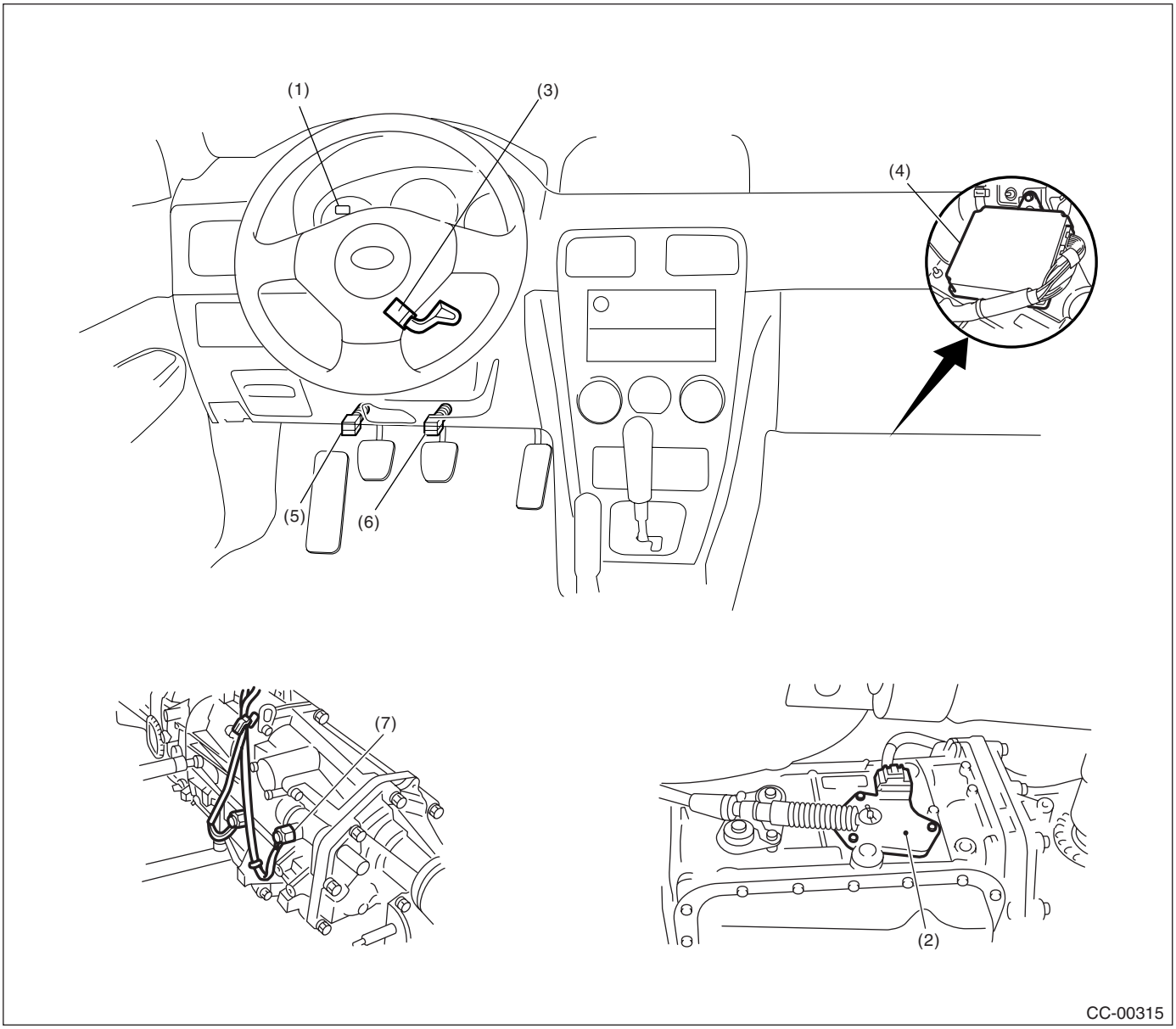
Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V or more

Specific gravity:
Above 1.260

3. Electrical Component Location

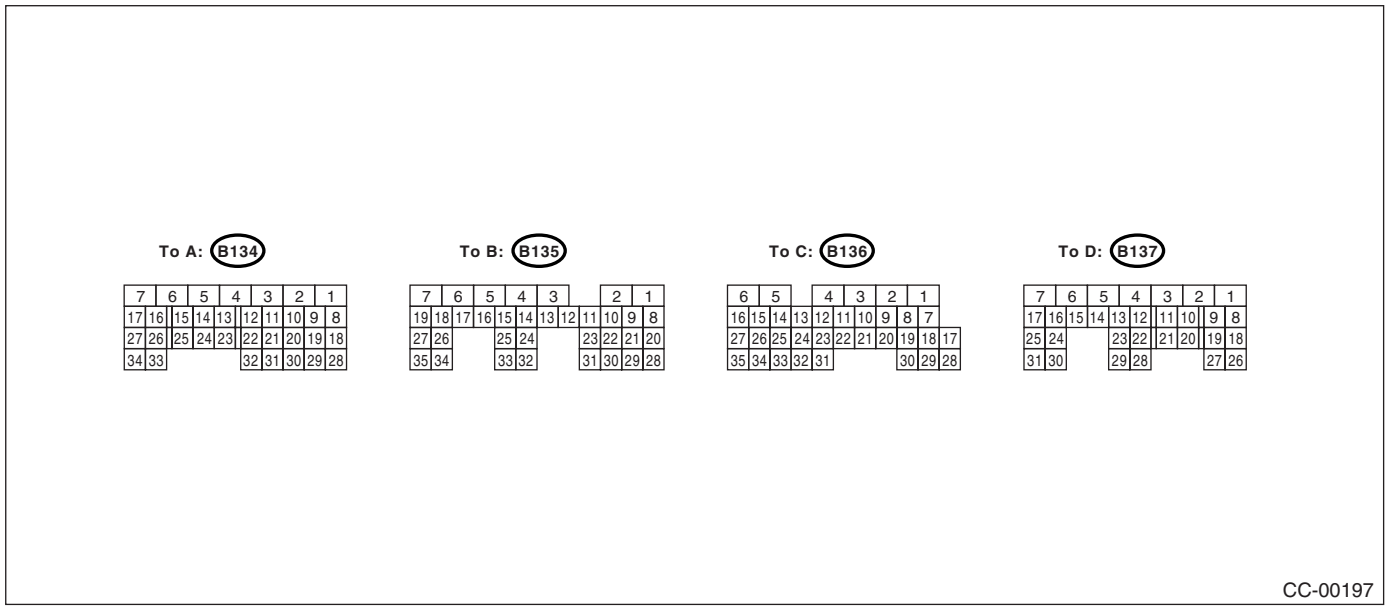
A: LOCATION



(1) Cruise indicator light & cruise set indicator light
(2) Inhibitor switch (AT models)
(3) Cruise control command switch
(4) Engine control module (ECM)
(5) Clutch switch (MT models)
(6) Stop and brake switch
(7) Neutral position switch (MT models)

4. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



Content		Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Clutch switch		A1	• Battery voltage is present when the clutch pedal is released. • "0 V" volt is present when the clutch pedal is depressed.
Cruise indicator light		A15	• Battery voltage is present when the main switch is turned to OFF. • "0 V" volt is present when the main switch is turned to ON.
Main power supply	VB (CONTROL 1) VB (CONTROL 2)	B6 B5	• Battery voltage is present when the main power supply is turned to ON. • "0 V" volt is present when the main power supply is turned to OFF.
Vehicle speed signal		B26	Lift-up the vehicle until all four wheels are raised off the ground, and then rotate any wheel manually. Approx. "5 V" and "0 V" pulse signals are alternately input to ECM.
SET/COAST switch		C11	• Battery voltage is present when the command switch is turned to SET/COAST position. • "0 V" volt is present when the command switch is released.
RESUME/ACCEL switch		C10	• Battery voltage is present when the command switch is turned to RESUME/ACCEL position. • "0 V" volt is present when the command switch is released.
Brake switch 1 (Brake switch)		C9	• Battery voltage is present when the brake pedal is released. • "0 V" volt is present when the brake pedal is depressed.
Brake switch 2 (Stop light switch)		C8	• Battery voltage is present when the brake pedal is depressed. • "0 V" volt is present when the brake pedal is released.
Main switch		C7	• Battery voltage is present while the main switch is depressed or is turned to ON. • "0 V" volt is present when the main switch is turned to OFF.
Ground	GND (CONTROL 1) GND (CONTROL 2)	D2 D1	—
Ignition switch		D15	• Battery voltage is present with the ignition switch is turned to ON. • "0 V" volt is present when the ignition switch is turned to OFF.
Neutral switch (MT model)		D9	• Battery voltage is present when the shift lever is in anywhere except neutral position. • "0 V" volt is present when the shift lever is in neutral position.
Inhibitor switch (AT model)		D9	• "0 V" volt is present when the select lever is in anywhere except N or P position. • "5 V" volt is present when the select lever is in N or P position.

B: WIRING DIAGRAM

<Ref. to WI-195, WIRING DIAGRAM, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

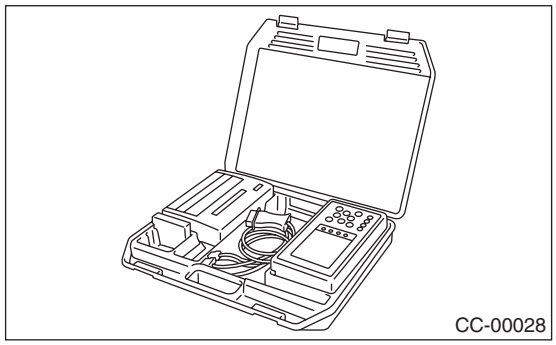
The on-board diagnostic function of the cruise control system uses the Subaru Select Monitor.
The on-board diagnostic function operates in two categories, which are used depending on the type of problems;
1) Cruise cancel conditions diagnostic:
(1) This category of diagnostic requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).
(2) Cruise control memory of ECM stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:
• The cruise control memory stores not only the cruise "cancel" which occurred (although "cancel" operation is not entered by the driver), but also the "cancel" condition input by the driver.
• The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

2) Real-time diagnostic:
The real-time diagnostic function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.
(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.
(2) Monitor the signal conditions from switches and sensors.

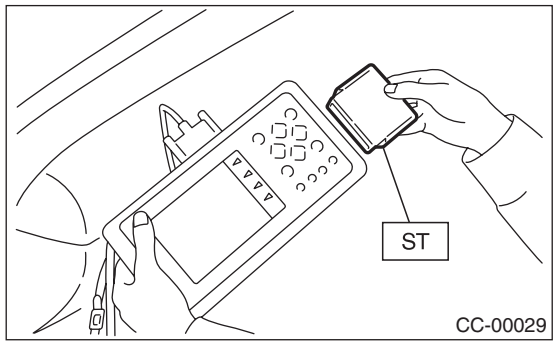
2. CRUISE CANCEL CONDITIONS DIAGNOSTIC

1) Prepare the Subaru Select Monitor kit.


CC-00028

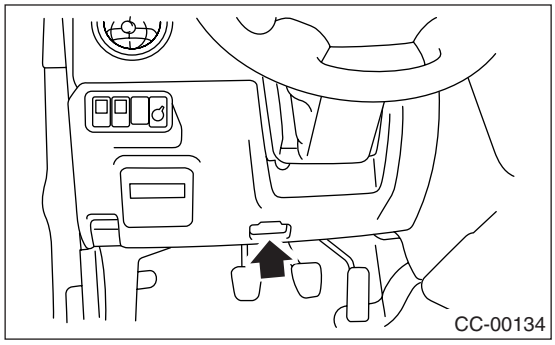
2) Connect the diagnostic cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to CC(ETC)(diag)-4, SPECIAL TOOL, PREPARATION TOOL, General Description.>

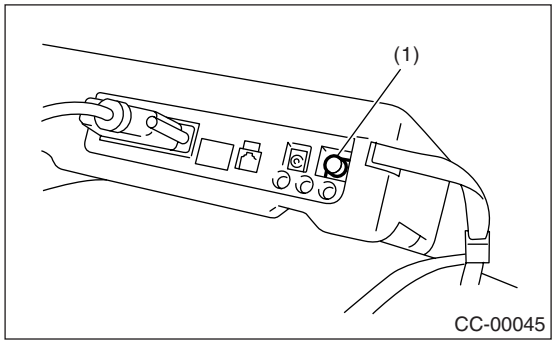


CC-00029

4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).


CC-00134

(2) Connect the diagnostic cable to data link connector.
5) Start the engine and turn the cruise control main switch to ON.
6) Turn the Subaru Select Monitor switch to ON.



CC-00045

(1) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Diagnosis} and press [YES] key. Select the {Engine} on the System Selection display screen and press [YES] key. Press [YES] key after the engine type displayed.
8) Drive the vehicle at least 40 km/h (25 MPH) with cruise speed set.

9) If the cruise speed is canceled itself (without doing any cancel operations), DTC will appear on select monitor display after {Cancel Code(s) Display} is selected on the Engine Diagnostic display screen and [YES] key is pressed.

CAUTION:
• DTC will also appear when cruise cancel is effected by driver. Do not confuse.
• Have a co-worker ride in the vehicle to assist in diagnostic during driving.

NOTE:
DTC will be cleared by turning the ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSTIC

1) Connect the select monitor.
2) Turn the ignition switch and cruise control main switch to ON.
3) Turn the Subaru Select Monitor switch to ON.
4) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
5) On the «System Selection» display screen, select the {Engine} and press [YES] key.
6) Press the [YES] key after the information of engine type displayed.
7) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
8) Make sure that normal indication is displayed when controls are operated as indicated below:
• Depress/release the brake pedal. (Stop light switch and brake switch turn ON.)
• Turn ON the “SET/COAST” switch.
• Turn ON the “RESUME/ACCEL” switch.
• Turn ON the “CANCEL” switch. (The “SET/COAST” and “RESUME/ACCEL” switch are turned ON at same time.)
• Depress/release the clutch pedal.
• Set the shift lever to except for neutral position.

NOTE:
• For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL.”
• For details concerning DTCs, refer to the “List of Diagnostic Trouble Code (DTC).” <Ref. to CC(ETC)(diag)-13, List of Diagnostic Trouble Code (DTC).>

6. Diagnostic with Phenomenon

A: DIAGNOSTIC PROCEDURE WITH PHENOMENON

NOTE:
This diagnostic procedure is specified for H4DOTC 2.5 L (model).

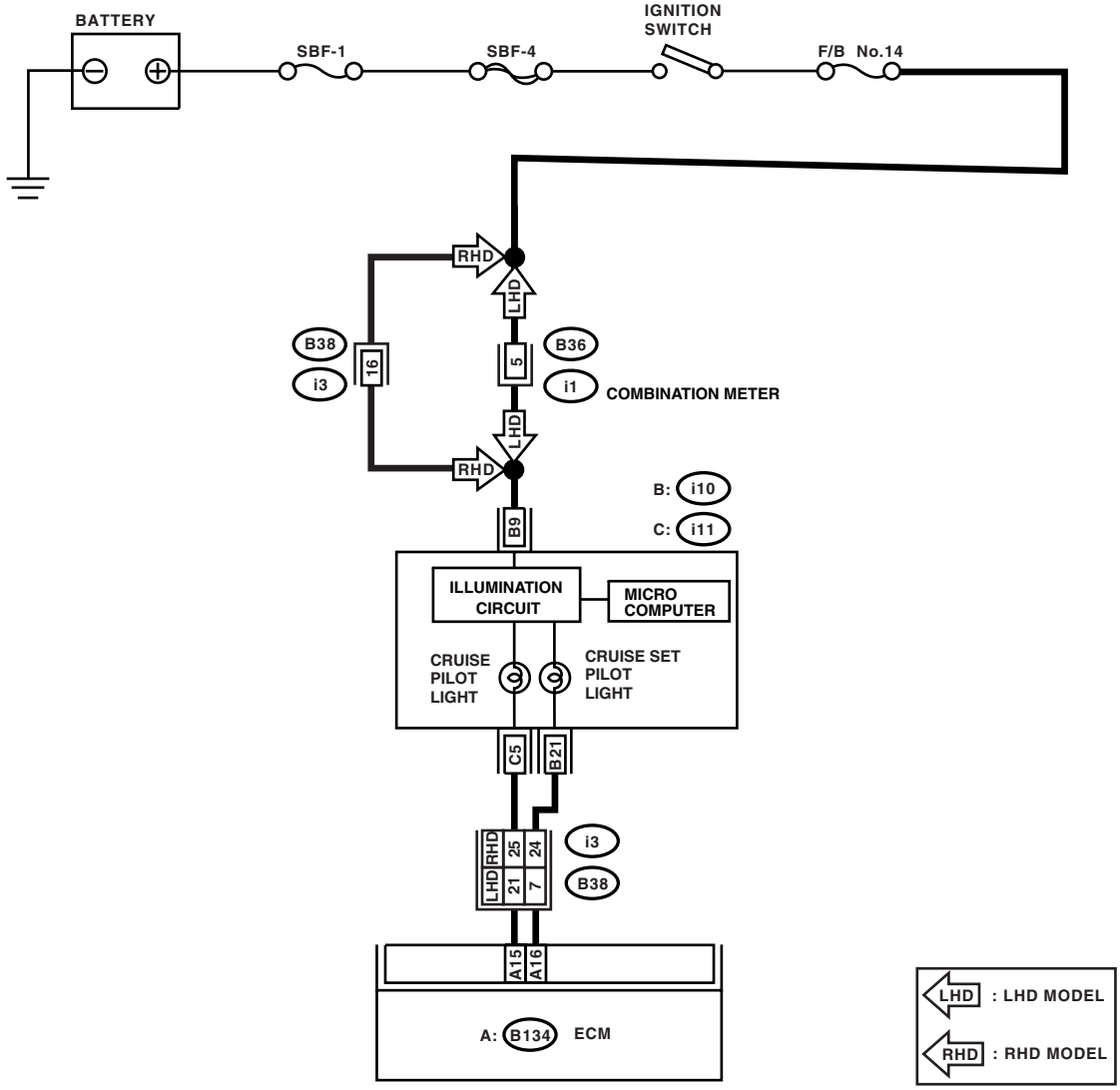
Symptom		Repair area	Reference
1	Cruise control main switch is not turned to ON. (Cruise indicator light does not illuminate)	(1) Check the cruise indicator light.	<Ref. to CC(ETC)(diag)-11, CHECK CRUISE INDICATOR LIGHT, Diagnostic with Phenomenon.>
		(2) Check the cruise control command switch.	<Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2	Cruise control cannot be set.	(1) Check the cruise control command switch	<Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(2) Check the stop light switch and brake switch.	<Ref. to CC(ETC)(diag)-18, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check the clutch switch.	<Ref. to CC(ETC)(diag)-20, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(4) Check the neutral switch.	<Ref. to CC(ETC)(diag)-22, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(5) Check the vehicle speed sensor.	<Ref. to CC(ETC)(diag)-26, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
3	Vehicle speed is not held within set speed ±3 km/h (±2 MPH).	Check the vehicle speed sensor.	<Ref. to CC(ETC)(diag)-26, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
4	Vehicle speed does not increase or does not return to set speed after RESUME/ ACCEL switch has been pressed.	Check the RESUME/ACCEL switch.	<Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
5	Vehicle speed does not decrease after SET/COAST switch has been pressed.	Check the SET/COAST switch.	<Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
6	Cruise control is not released after CANCEL switch has been pressed.	Check the CANCEL switch.	<Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
7	Cruise control is not released after the brake pedal has been depressed.	Check the stop light switch and brake switch.	<Ref. to CC(ETC)(diag)-18, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
8	Cruise control is not released after the clutch pedal has been depressed.	Check the clutch switch.	<Ref. to CC(ETC)(diag)-20, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
9	Cruise control is not released after shifting to neutral position.	Check the neutral switch.	<Ref. to CC(ETC)(diag)-22, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

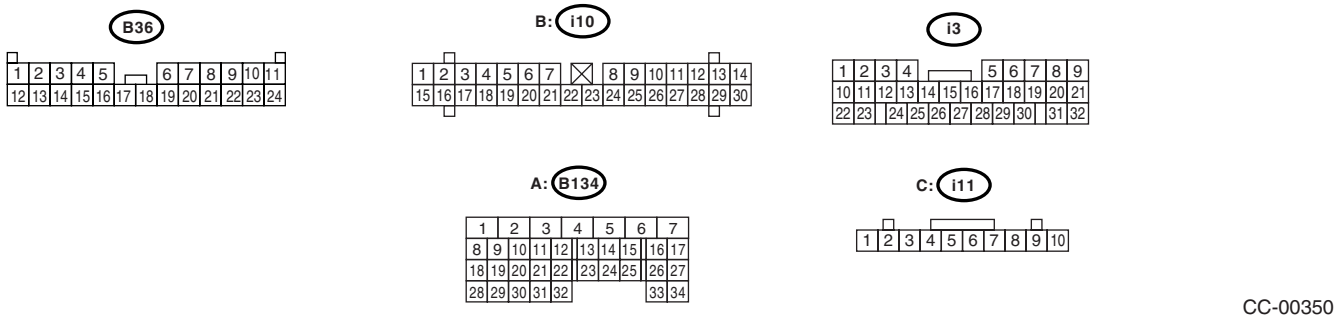
B: CHECK CRUISE INDICATOR LIGHT

TROUBLE SYMPTOM:

Cruise control can be set, but cruise indicator light does not illuminate.

WIRING DIAGRAM:





CC-00350

	Step	Check	Yes	No
1	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(i10) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 14 (in fuse & relay box). • Check the harness for open or short between combination meter and fuse & relay box.
2	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(B134) No. 15 — (i11) No. 5:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CRUISE INDICATOR LIGHT CIRCUIT.** Ground the ECM harness connector terminal with a suitable wire. ***Connector & terminal*** ***(B134) No. 15 — Chassis ground:***	Does the cruise indicator light illuminate?	Check the poor contact of ECM connector.	Replace the meter main assembly.

7. List of Diagnostic Trouble Code (DTC)

A: LIST

NOTE:
This diagnostic trouble code (DTC) is specified for H4DOTC 2.5 L (model).

DTC	Item	Contents of diagnostic	Reference
11	Main switch	Cruise control is released after the main switch of cruise control command switch is turned to OFF.	This DTC is indicated without operating the main switch. <Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Stop and brake switch	Cruise control is released after the stop light switch or brake switch is turned to ON.	This DTC is indicated without depressing the brake pedal. <Ref. to CC(ETC)(diag)-18, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Clutch switch	Cruise control is released after the clutch switch is turned to ON.	This DTC is indicated without depressing the clutch pedal. <Ref. to CC(ETC)(diag)-20, DTC 13 CLUTCH SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
14	Neutral switch	Cruise control is released after the neutral position switch is turned to ON.	This DTC is indicated without shifting to neutral position. <Ref. to CC(ETC)(diag)-22, DTC 14 NEUTRAL POSITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
15	Cancel switch	Cruise control is released after the cancel switch is turned to ON.	This DTC is indicated without operating the cancel switch. <Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
16	Ignition switch	Cruise control is released after the ignition switch is turned to OFF.	This DTC is indicated without operating the ignition switch. <Ref. to CC(ETC)(diag)-24, DTC 16 IGNITION SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Contents of diagnostic	Reference
21	Cruise control switch is abnormal when the ignition switch is turned to ON.	Each switch of cruise control command switch has already been ON when the ignition switch is turned to ON.	This DTC is indicated without operating the main switch. <Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Vehicle speed variation is abnormal.	Abnormality of vehicle speed variation is detected.	<Ref. to CC(ETC)(diag)-26, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Engine-related sensor is abnormal.	Abnormality related to engine is detected.	<Ref. to EN(H4DOTC 2.0)(diag)-2, Basic Diagnostic Procedure.>
24	Cruise control-related switch is abnormal.	Abnormality of command switch is detected. (Open circuit is detected when continuing to be ON for an extremely long time [approx. two minutes].)	This DTC is indicated with normal operation. <Ref. to CC(ETC)(diag)-16, DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	Brake switch input circuit is abnormal.	Abnormality of brake switch input circuit in ECM is detected.	<Ref. to CC(ETC)(diag)-18, DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	Engine speed signal.	• Abnormal increase of engine speed is detected. • Gear is shifted to neutral, 1st or reverse position.	Cruise with more than 2nd shift position.
32	Out of vehicle speed range of cruise control operation.	• Vehicle speed becomes under the control limit during cruise driving. • Set operation is conducted out of vehicle speed range for setting • RESUME operation is conducted without vehicle speed memory.	This DTC is also indicated when increasing the speed to the cruise set available vehicle speed and conducting the set operation again. <Ref. to CC(ETC)(diag)-26, DTC 22 AND 32 VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Prohibition of WAIT after acceleration operation.	Vehicle speed becomes over the control limit during cruise driving.	This DTC is indicated when running at the high speed which is not suitable for cruise control. In this case, conduct the cruise set operation again after decreasing the speed to the cruise set available vehicle speed.

DTC	Item	Contents of diagnostic	Reference
34	Prohibition when accelerator pedal position is continued to be large.	Vehicle is driven at the higher speed than set vehicle speed for an extremely long time (approx. 10 minutes) during cruise driving.	This DTC is indicated when running for a long time at the higher speed than cruise set available vehicle speed by accelerator operation. In this case, release the cruise set.
35	Prohibition when vehicle speed feedback is impossible.	During cruise driving, set vehicle speed cannot be maintained for some reasons such as sharp upslope, parking brake and engine output abnormal decrease.	This DTC is indicated when the driving condition is not suitable for cruise control. Conduct the cruise set operation again after clearing the estimated reasons.

8. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

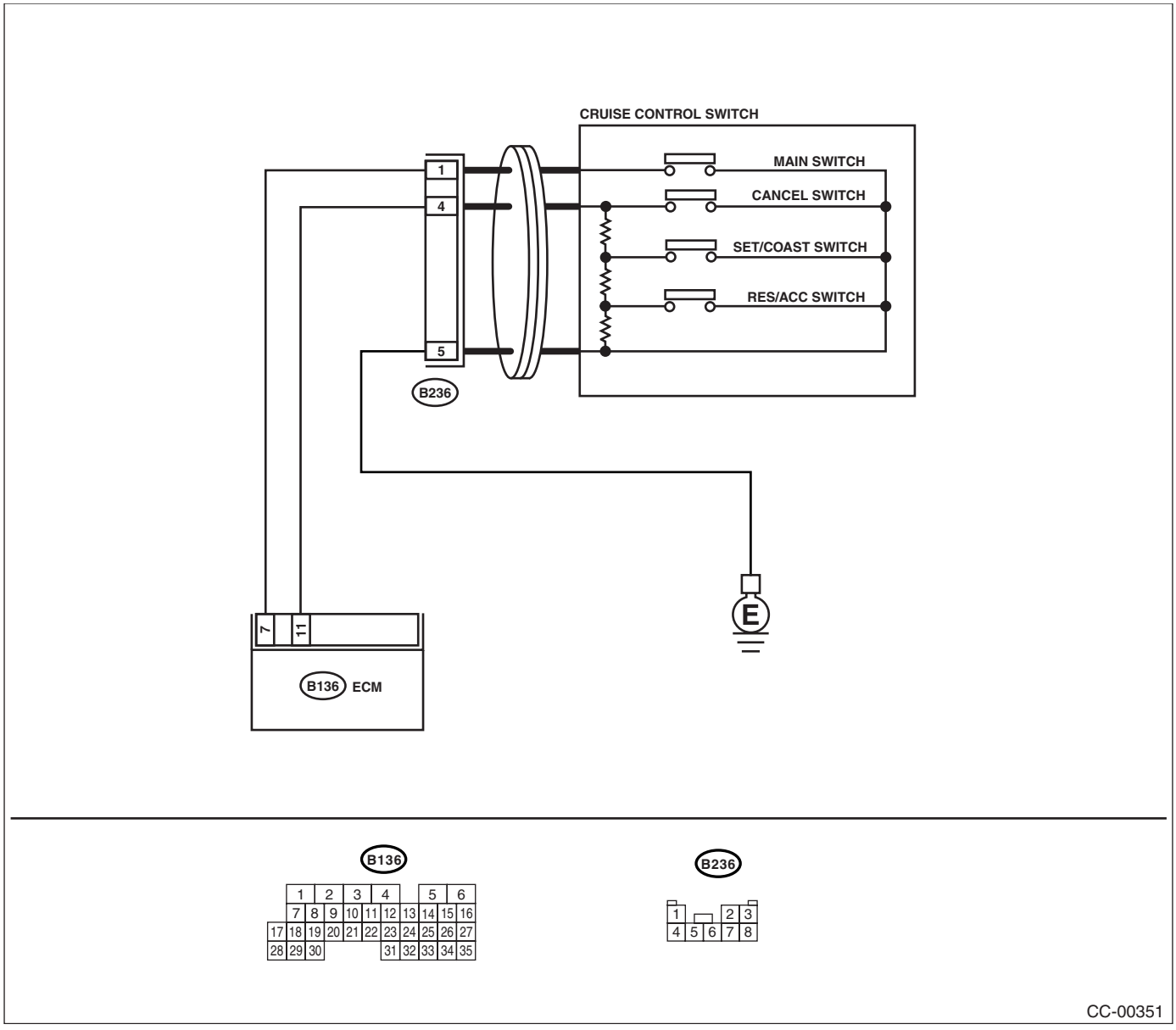
A: DTC 11, 15, 21 AND 24 CRUISE CONTROL COMMAND SWITCH

NOTE:
This diagnostic procedure is specified for H4DOTC 2.5 L (model).

TROUBLE SYMPTOM:

- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

WIRING DIAGRAM:



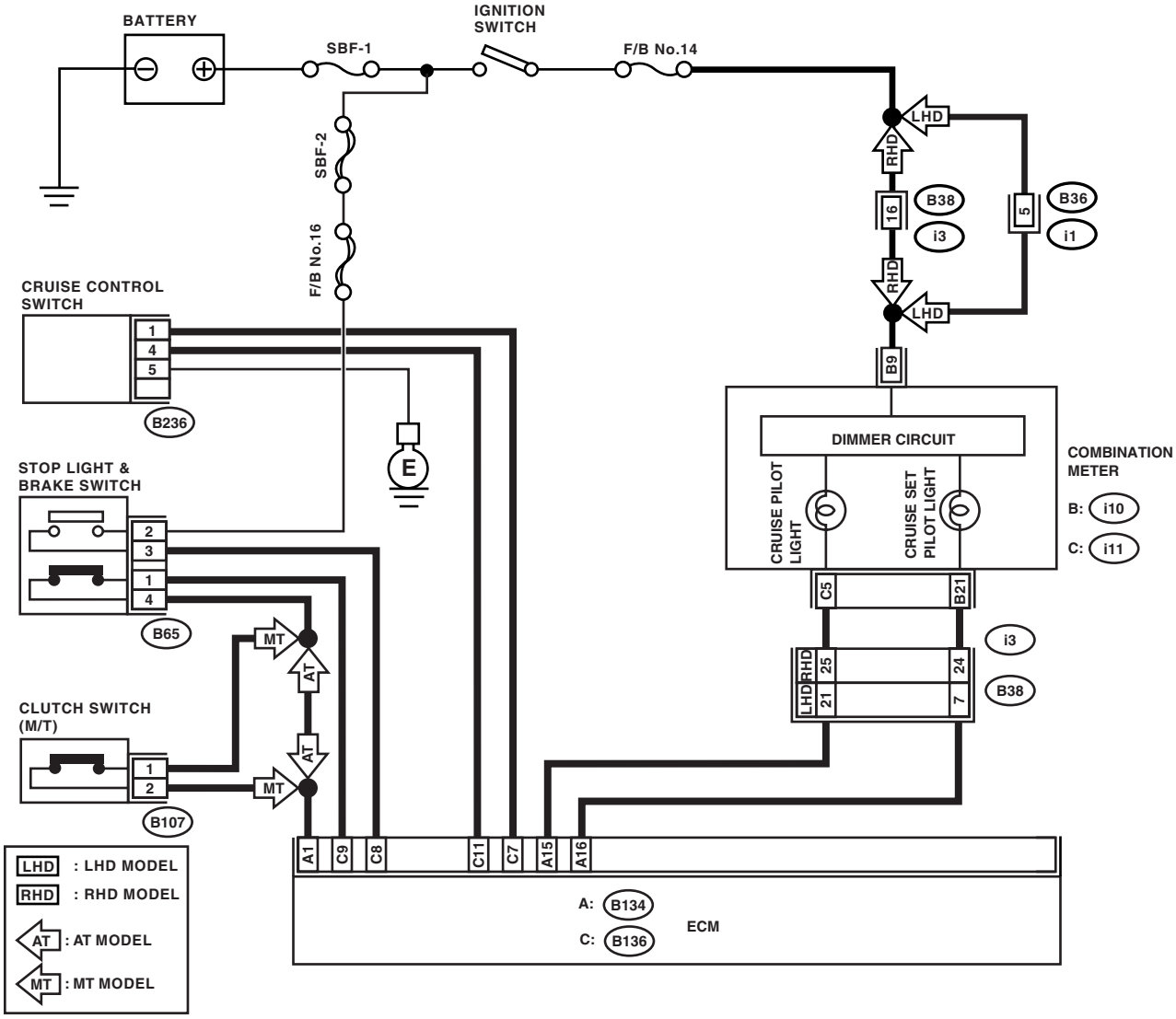
	Step	Check	Yes	No
1	**CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground when the main switch is pressed and is not pressed. ***Connector & terminal*** ***(B136) No. 7 (+) — Chassis ground (–):***	Is the voltage 0 V when the main switch is not pressed? Is the voltage more than 10 V when the main switch is pressed?	Go to step **2.**	• Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control command switch and fuse & relay box. If no malfunction is found after checking above, Go to step **6.**
2	**CHECK SET/COAST SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the voltage between harness connector terminal and chassis ground when SET/COAST switch is pressed and not pressed. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage 0 V when SET/COAST switch is not pressed? Is the voltage more than 6 V when SET/COAST switch is pressed?	Go to step **3.**	Go to step **5.**
3	**CHECK RESUME/ACCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when RESUME/ACCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage 0 V when RESUME/ACCEL switch is not pressed? Is the voltage more than 3 V when RESUME/ACCEL switch is pressed?	Go to step **4.**	Go to step **5.**
4	**CHECK CANCEL SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground when CANCEL switch is pressed and not pressed. ***Connector & terminal*** ***(B136) No. 11 (+) — Chassis ground (–):***	Is the voltage 0 V when CANCEL switch is not pressed? Is the voltage more than 10 V when CANCEL switch is pressed?	Cruise control command switch circuit is OK.	Go to step **5.**
5	**CHECK POWER SUPPLY FOR COMMAND SWITCH.** Check the horn operation.	Does the horn sound?	Go to step **6.**	• Check the fuse No. 6 (in main fuse box). • Check the horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check the harness for open or short between cruise control command switch and fuse & relay box.
6	**CHECK CRUISE CONTROL COMMAND SWITCH.** Remove and check the cruise control command switch. <Ref. to CC-8, Cruise Control Command Switch.>	Is the cruise control command switch OK?	Check the harness between cruise control command switch and ECM.	Replace the cruise control command switch.

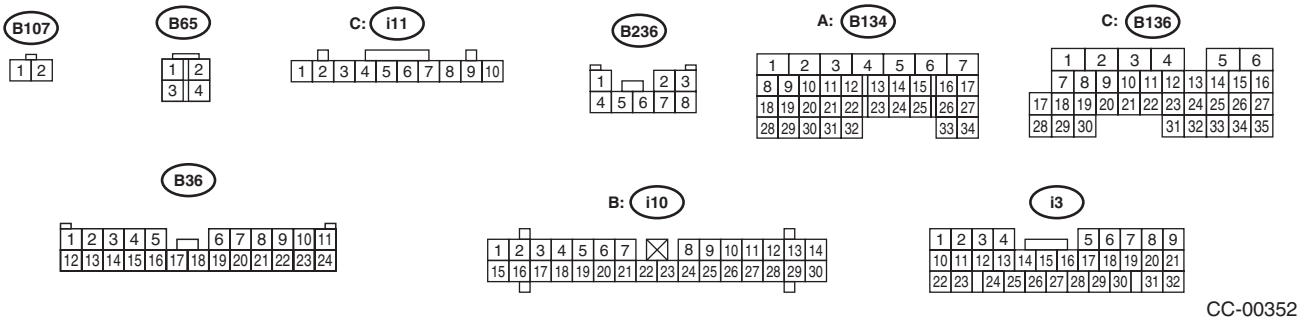
B: DTC 12 AND 25 STOP LIGHT SWITCH AND BRAKE SWITCH

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:





CC-00352

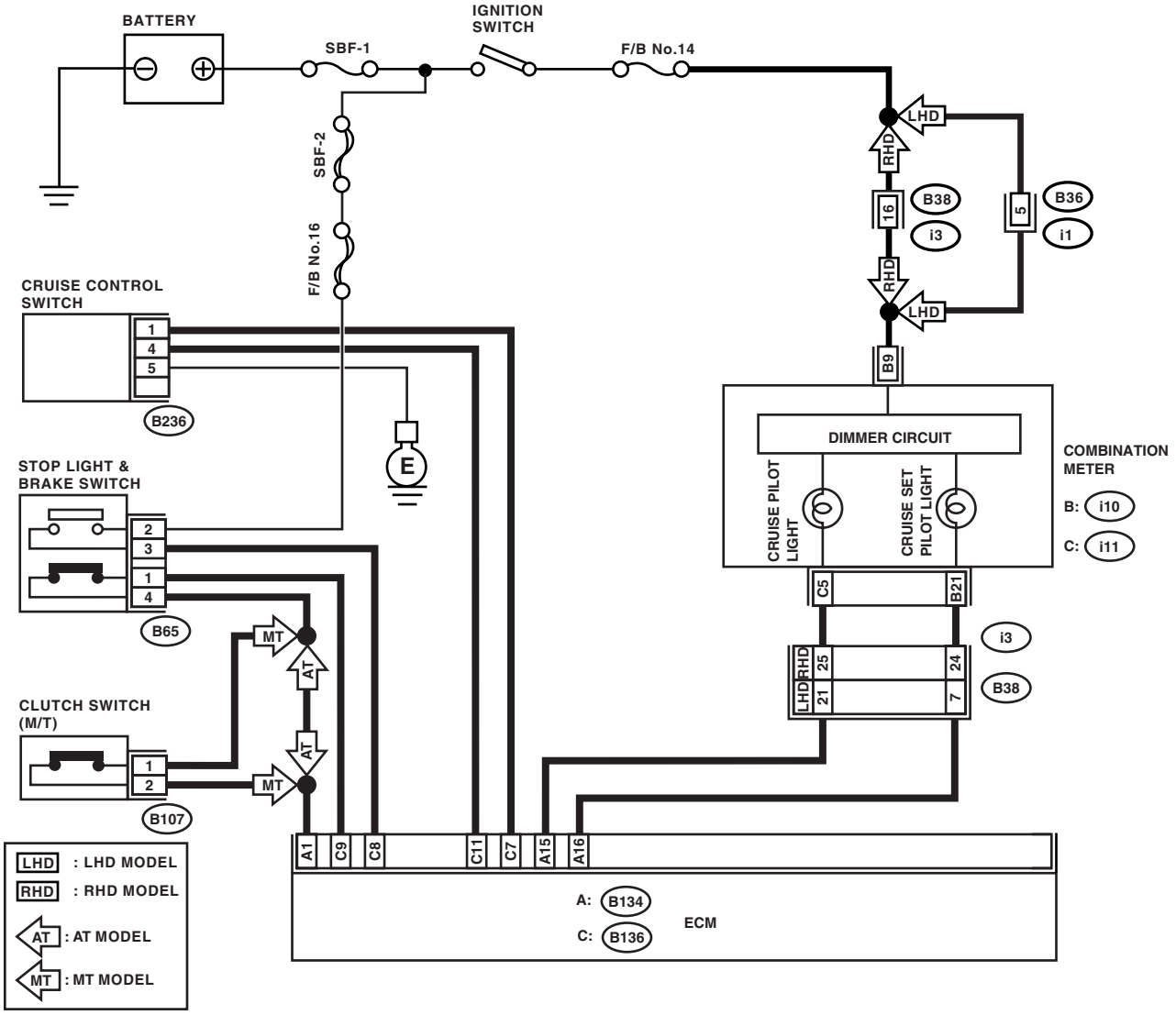
	Step	Check	Yes	No
1	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 16 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box.
2	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B65) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	• Check the fuse No. 11 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box. • Check the clutch switch and circuit.
3	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between ECM harness connector terminal and stop light switch and brake switch harness connector terminal. ***Connector & terminal*** ***(B136) No. 8 — (B65) No. 3:*** ***(B136) No. 9 — (B65) No. 4:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK STOP LIGHT SWITCH AND BRAKE SWITCH.** Remove and check the stop light switch and brake switch. <Ref. to CC-10, Stop Light and Brake Switch.>	Are the stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

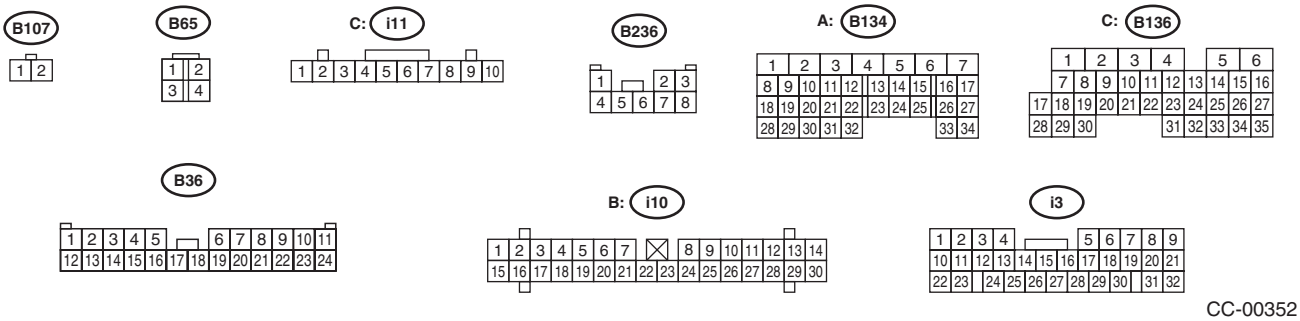
C: DTC 13 CLUTCH SWITCH

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:





CC-00352

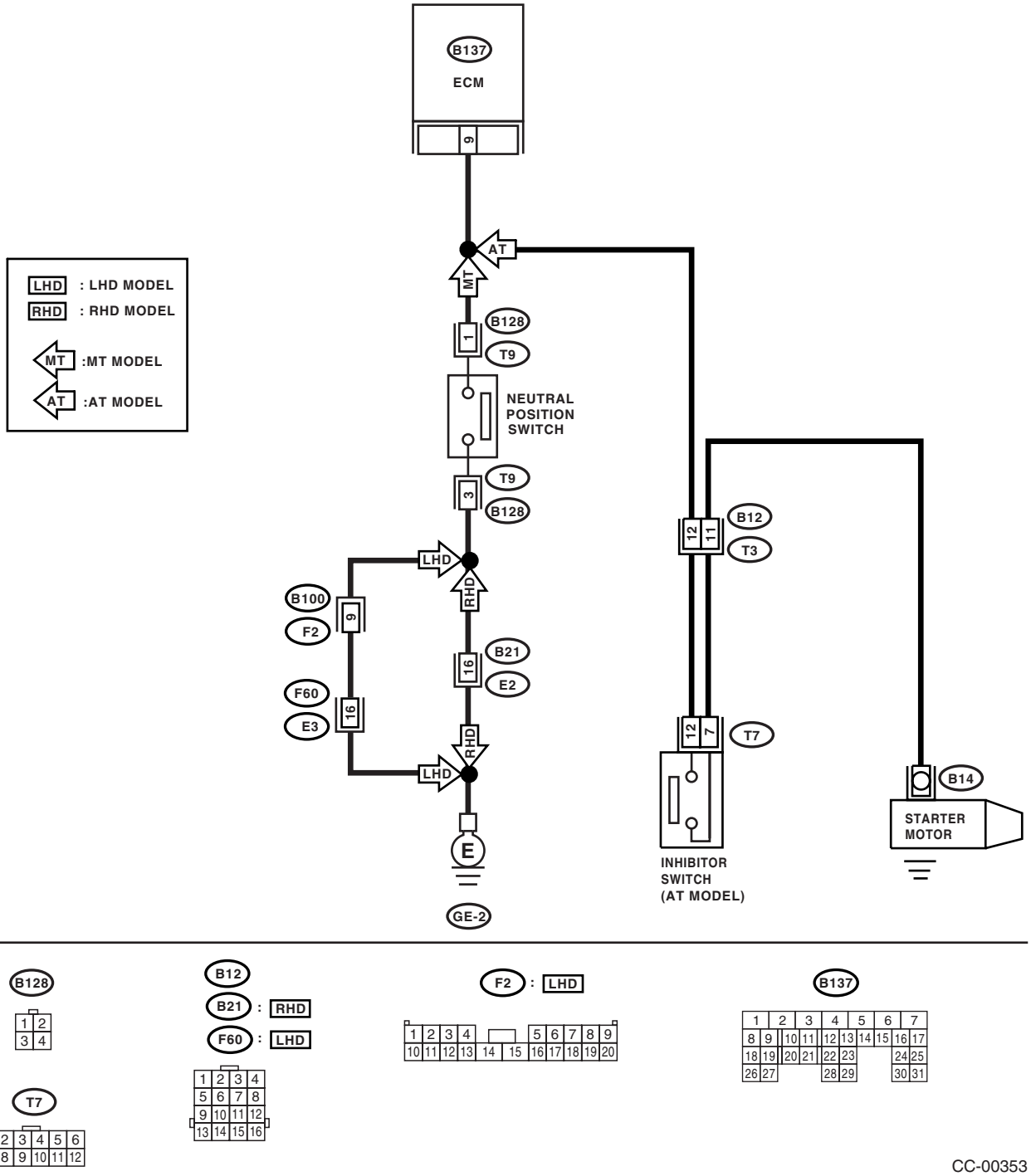
	Step	Check	Yes	No
1	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B107) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	• Check the fuse No. 11 (fuse & relay box). • Check the harness for open or short between clutch switch and fuse & relay box.
2	**CHECK CLUTCH SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Measure the resistance between clutch switch harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***(B107) No. 1 — (B134) No. 1:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the harness.
3	**CHECK CLUTCH SWITCH.** Remove and check the clutch switch. <Ref. to CC-11, Clutch Switch.>	Is the clutch switch OK?	Clutch switch circuit is OK.	Replace the clutch switch.

D: DTC 14 NEUTRAL POSITION SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



CC-00353

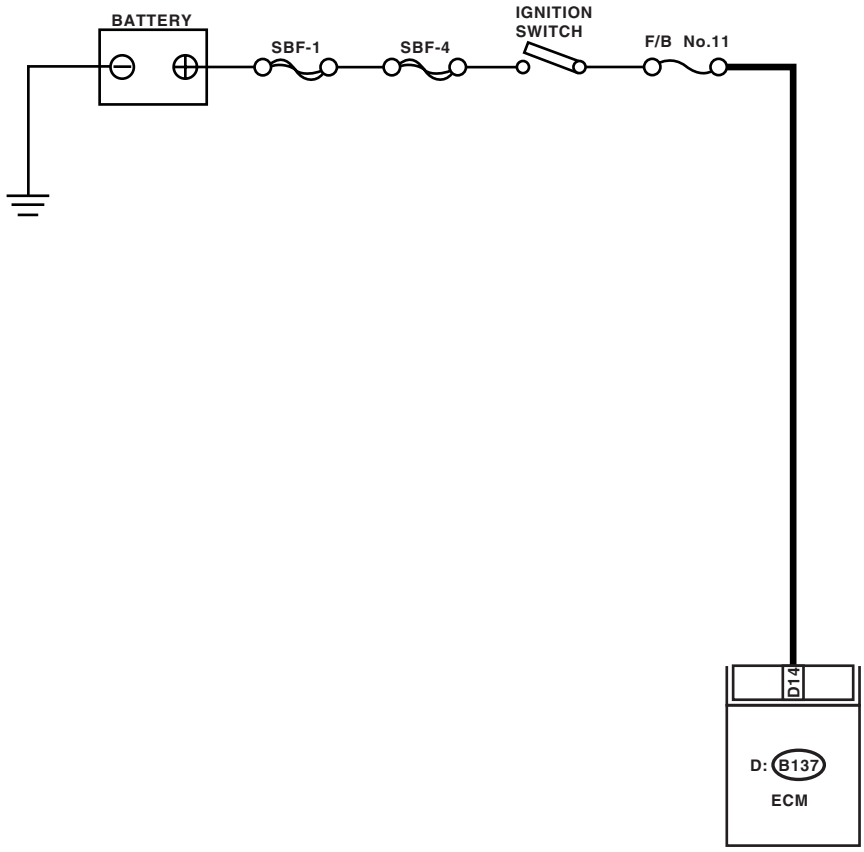
	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the target MT model?	Go to step **2.**	Go to step **5.**
2	**CHECK NEUTRAL POSITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the neutral position switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B128) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between neutral position switch and ECM.
3	**CHECK NEUTRAL POSITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between neutral position switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(B128) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK NEUTRAL POSITION SWITCH.** Remove and check the neutral position switch.	Is the neutral position switch OK?	Neutral position switch circuit is OK.	Replace the neutral position switch.
5	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 12 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Check the harness for open or short between inhibitor switch and ECM.
6	**CHECK INHIBITOR SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between inhibitor switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(T7) No. 7 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the harness.
7	**CHECK INHIBITOR SWITCH.** Remove and check the inhibitor switch.	Is the inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace the inhibitor switch.

E: DTC 16 IGNITION SWITCH

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



D: B137

1	2	3	4	5	6	7			
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23			24	25
26	27			28	29			30	31

CC-00259

	Step	Check	Yes	No
1	**CHECK IGNITION SWITCH CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. ***Connector & terminal*** ***(B137) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check the poor contact of ECM connector.	• Check the fuse No. 11 (fuse & relay box). • Check the harness for open or short between ignition switch and ECM.

F: DTC 22 AND 32 VEHICLE SPEED SENSOR

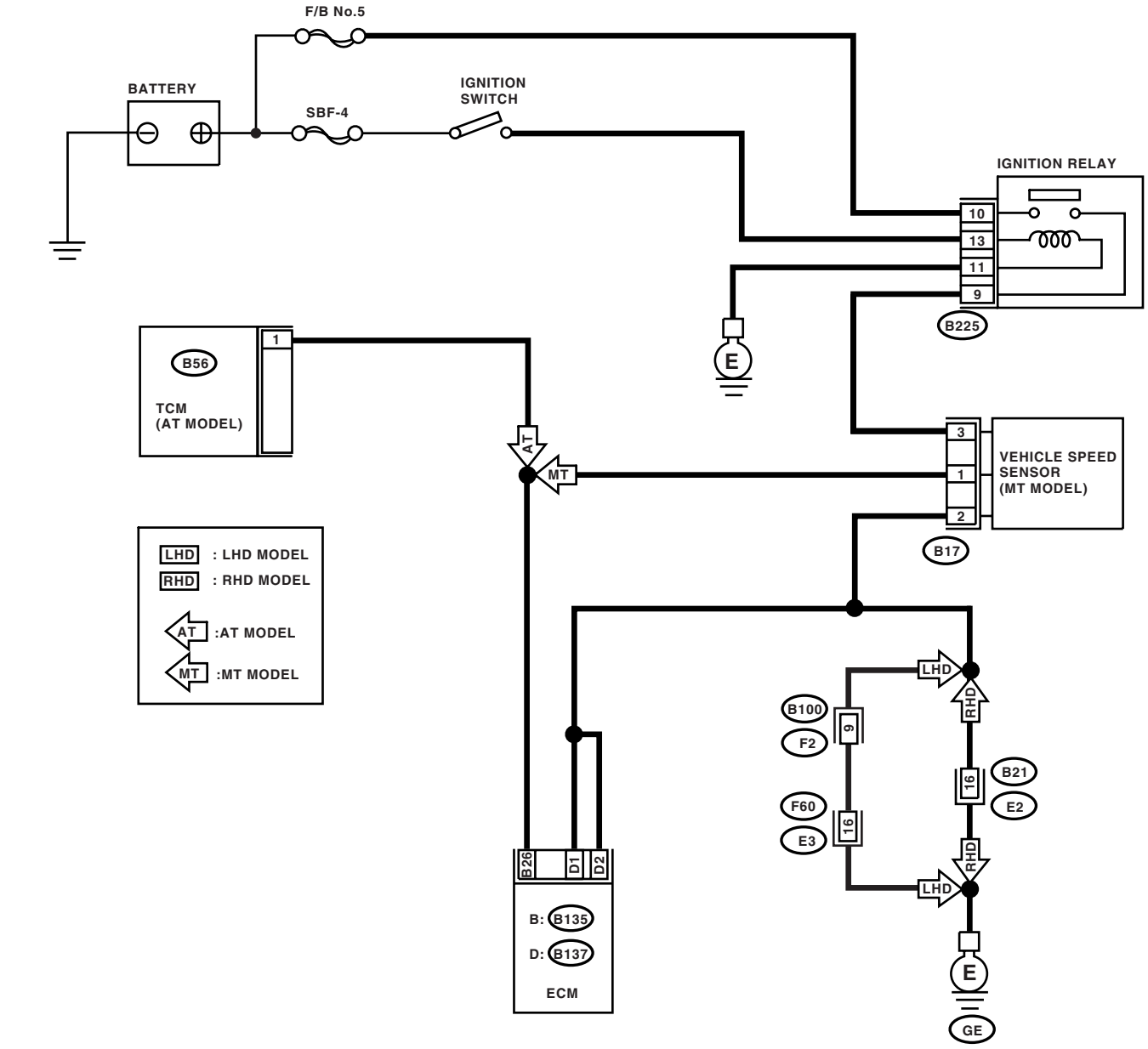
DTC DETECTING CONDITION:

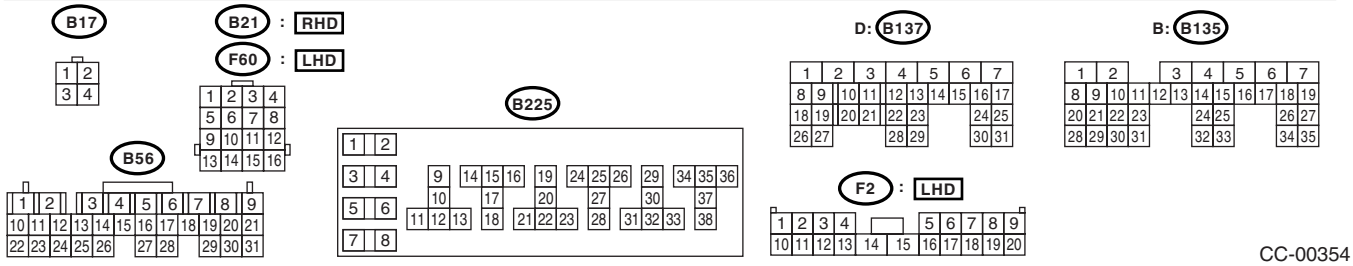
Disconnection or short circuit of vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:





CC-00354

	Step	Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the target MT model?	Go to step **2.**	Go to step **6.**
2	**CHECK HARNESS BETWEEN BATTERY AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from vehicle speed sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground. ***Connector & terminal*** ***(B17) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between fuse and vehicle speed sensor.
3	**CHECK HARNESS BETWEEN ECM AND VEHICLE SPEED SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from ECM. 3) Measure the resistance between vehicle speed sensor harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***(B17) No. 1 — (B135) No. 26:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the harness.
4	**CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor harness connector terminal and engine ground. ***Connector & terminal*** ***(B17) No. 2 — Engine ground:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the harness.
5	**CHECK VEHICLE SPEED SENSOR.** 1) Connect the harness connector to vehicle speed sensor. 2) Lift-up the vehicle and support with rigid racks. 3) Drive the vehicle at speed greater than 20 km/h (12 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4) Measure the voltage between ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B135) No. 26 (+) — Chassis ground (–):***	Is the voltage 1 V ← → 5 V?	Check the poor contact of ECM connector.	Replace the vehicle speed sensor.
6	**CHECK HARNESS BETWEEN ECM AND TCM.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from ECM and TCM. 3) Measure the resistance between ECM harness connector terminal and TCM harness connector terminal. ***Connector & terminal*** ***(B135) No. 26 — (B56) No. 1:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the harness.

	Step	Check	Yes	No
7	**CHECK TCM** 1) Connect the harness connector to TCM. 2) Lift-up the vehicle and support with rigid racks. 3) Drive the vehicle at speed greater than 10 km/h (6 MPH). **Warning:** **Be careful not to be caught up by the running wheels.** 4) Measure the voltage between TCM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B56) No. 1 (+) — Chassis ground (−):***	Is the voltage 1 V ← → 5 V?	Check the poor contact of ECM harness connector.	Check the poor contact of TCM harness connector.

IMMOBILIZER (DIAGNOSTICS)

IM(diag)

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1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT.** 1) Turn the ignition switch to OFF or ACC position. 2) Wait at least 60 seconds.	Does the immobilizer indicator light blink?	Go to step **2.**	Check the immobilizer indicator light circuit. <Ref. to IM(diag)-10, CHECK IMMOBILIZER INDICATOR CIRCUIT, INSPECTION, Diagnostics Chart for Immobilizer Indicator Light.>
2	**CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT.** Remove the key from ignition switch.	Does the immobilizer indicator light begin to blink within 1 second after the key is removed?	Go to step **3.**	Check the key switch circuit. <Ref. to IM(diag)-12, CHECK KEY WARNING SWITCH CIRCUIT, INSPECTION, Diagnostics Chart for Immobilizer Indicator Light.>
3	**CHECK ENGINE START.** Turn the ignition switch to START position.	Does the engine start?	Go to step **4.**	Go to step **5.**
4	**CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT.** Turn the ignition switch to ON.	Does the immobilizer indicator light illuminate?	Check the immobilizer indicator light circuit. <Ref. to IM(diag)-10, CHECK IMMOBILIZER INDICATOR CIRCUIT, INSPECTION, Diagnostics Chart for Immobilizer Indicator Light.>	Immobilizer system is normal.
5	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. <Ref. to IM(diag)-7, Subaru Select Monitor.> 3) Turn the ignition switch and Subaru Select Monitors witch to ON. 4) Read any DTC on the display.	Are DTCs indicated on display?	Go to step **6.**	Repair the related parts.
6	**PERFORM THE DIAGNOSTIC.** 1) Inspect using “Diagnostics Chart with Trouble Code”. <Ref. to IM(diag)-15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the clear memory mode. 4) Read any DTC again.	Are DTCs indicated on display?	Inspect using “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to IM(diag)-15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnostics.

2. General Description

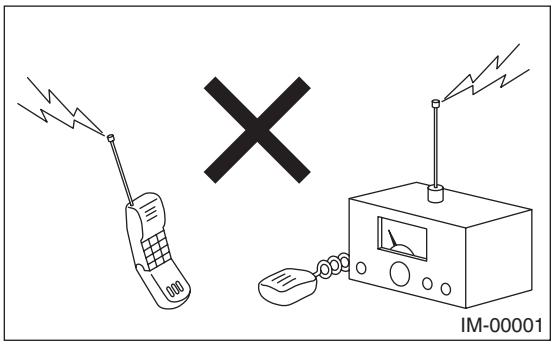
A: CAUTION

CAUTION:

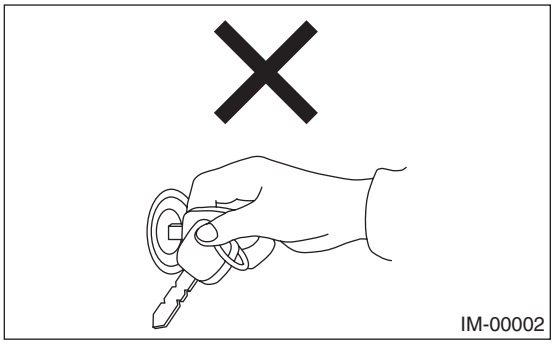
• The airbag system wiring harnesses routed near the immobilizer control module. All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.

• Be careful not to damage the airbag system wiring harness when servicing the immobilizer control module.

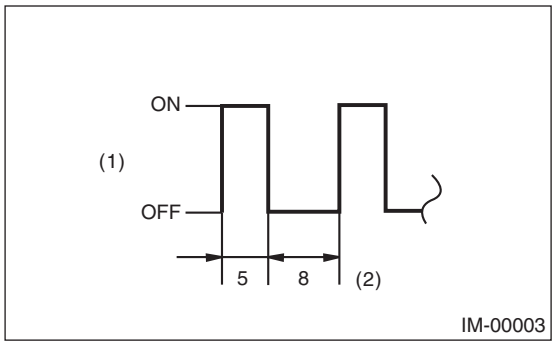
• While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.



• When the ignition switch is being turned ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes close to the ignition switch. If the ignition key is in a key holder, remove it from the holder before carrying out diagnoses.



• When repeatedly turning the ignition switch to ON or OFF while diagnostic items are being checked, it should be switched in cycles of "ON" for at least 5 seconds → "OFF" for at least 8 seconds.



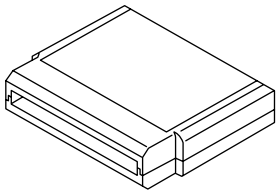
(1) Ignitions switch position
(2) Sec.

• If the engine fails to start with a registered ignition key, detach the ignition key from ignition switch and wait for approx. 1 second until immobilizer indicator light begins to flash. Start the engine again.

• Before checking the diagnostic items, obtain all keys for the vehicle to be checked possessed by owner.

B: PREPARATION TOOL

1. SPECIAL TOOL

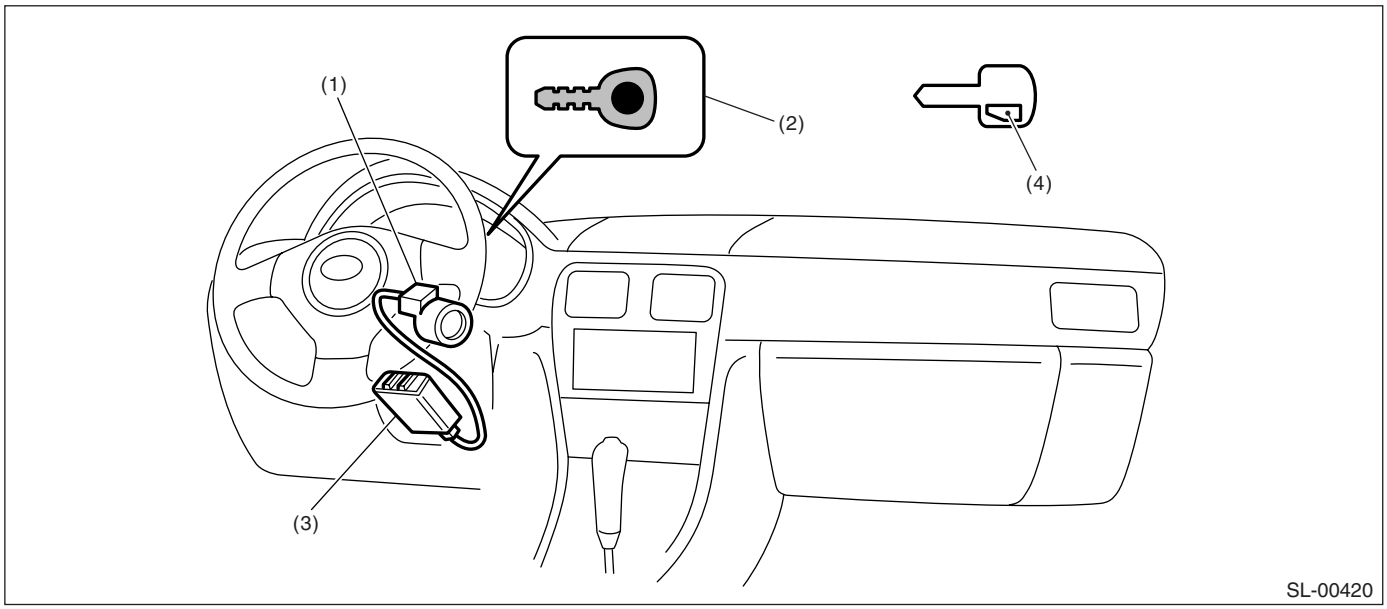
ILLUSTRATION	TOOLNUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000	CARTRIDGE	Troubleshooting for electrical systems.
ST22771AA030	22771AA030	SUBARUSELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOL

TOOLNAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.

3. Electrical Component Location

A: LOCATION



(1) Antenna
(2) Immobilizer indicator light (LED)
(3) Immobilizer control module (IMM ECM)
(4) Transponder

NOTE:
IMM ECM location for RHD model is symmetrically opposite.

4. Immobilizer Control Module I/O Signal

A: WIRING DIAGRAM

1. IMMOBILIZER

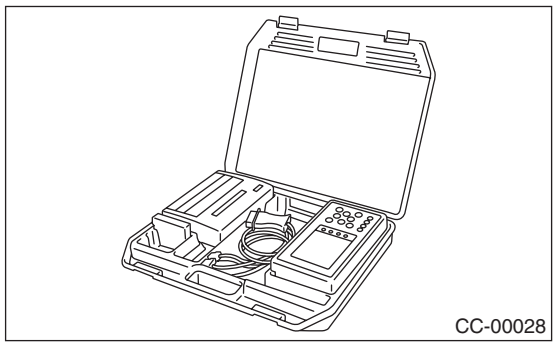
<Ref. to WI-191, WIRING DIAGRAM**, Immobilizer System.>**

5. Subaru Select Monitor

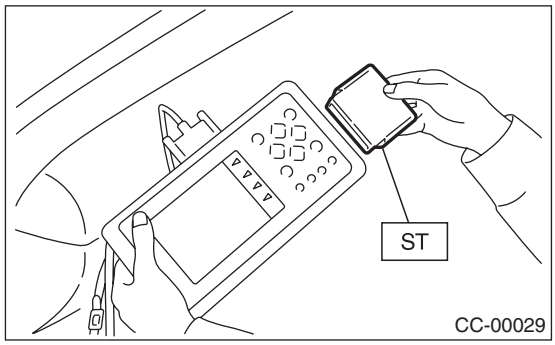
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit.

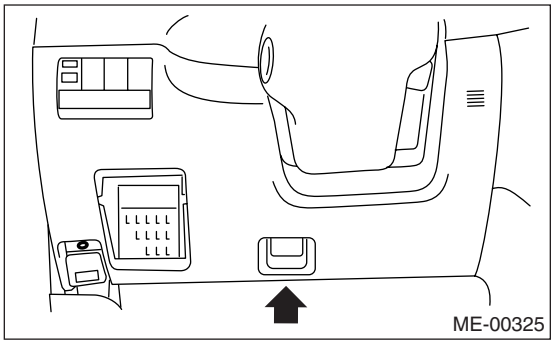


2) Connect the diagnostic cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor.



4) Connect the Subaru Select Monitor to data link connector.

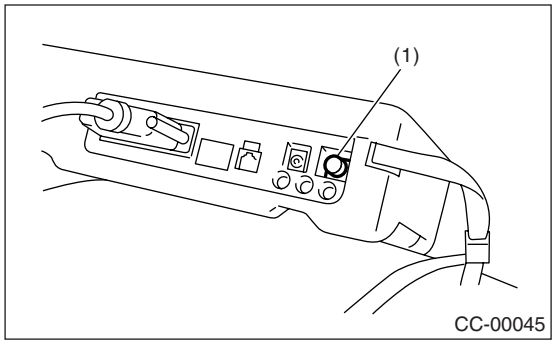
(1) Data link connector is located in the lower portion of the instrument panel (on driver's side).



(2) Connect the diagnostic cable to data link connector.

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF), and then Subaru Select Monitor switch to ON.



(1) Power switch

6) Using the Subaru Select Monitor, call up any DTCs and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE.

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. **<Ref. to IM(diag)-8, Read Diagnostic Trouble Code (DTC).>**

3. COMMUNICATION LINE CHECK

NOTE:
The communication line between ECM and IMM ECM can be checked in «System Operation Check Mode». This is referred to as "communication line check".

1) Connect the Subaru Select Monitor.
2) Set the «Each System Check» menu display screen, and then select {Engine}.
3) Set the «System Operation Check Mode» menu display screen, and then select {Immobilizer System}.
4) Start the communication line check.
5) Does "Communication Line not Shorted" appear on screen?
If "YES". Go to step 5).
If "NO". Go to step 6).
6) After diagnostic results, it is determined that the short circuit is not a diagnostic item. This completes communication line check.
7) If a problem is detected, repair. **<Ref. to IM(diag)-19,** DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) On the «Main Menu» display screen, select the {Each System Check}, and then press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
3) Press the [YES] key after displayed information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.
5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). **<Ref. to IM(diag)-14,** LIST**, List of Diagnostic Trouble Code (DTC).>**

7. Clear Memory Mode

A: OPERATION

1) On the «Main Menu» display screen, select the {Each System Check}, and then press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
3) Press the [YES] key after displayed information of engine type.
4) On the «Engine Diagnosis» display screen, select the {Clear Memory}, and then press the [YES] key.
5) When the 'Done' is shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

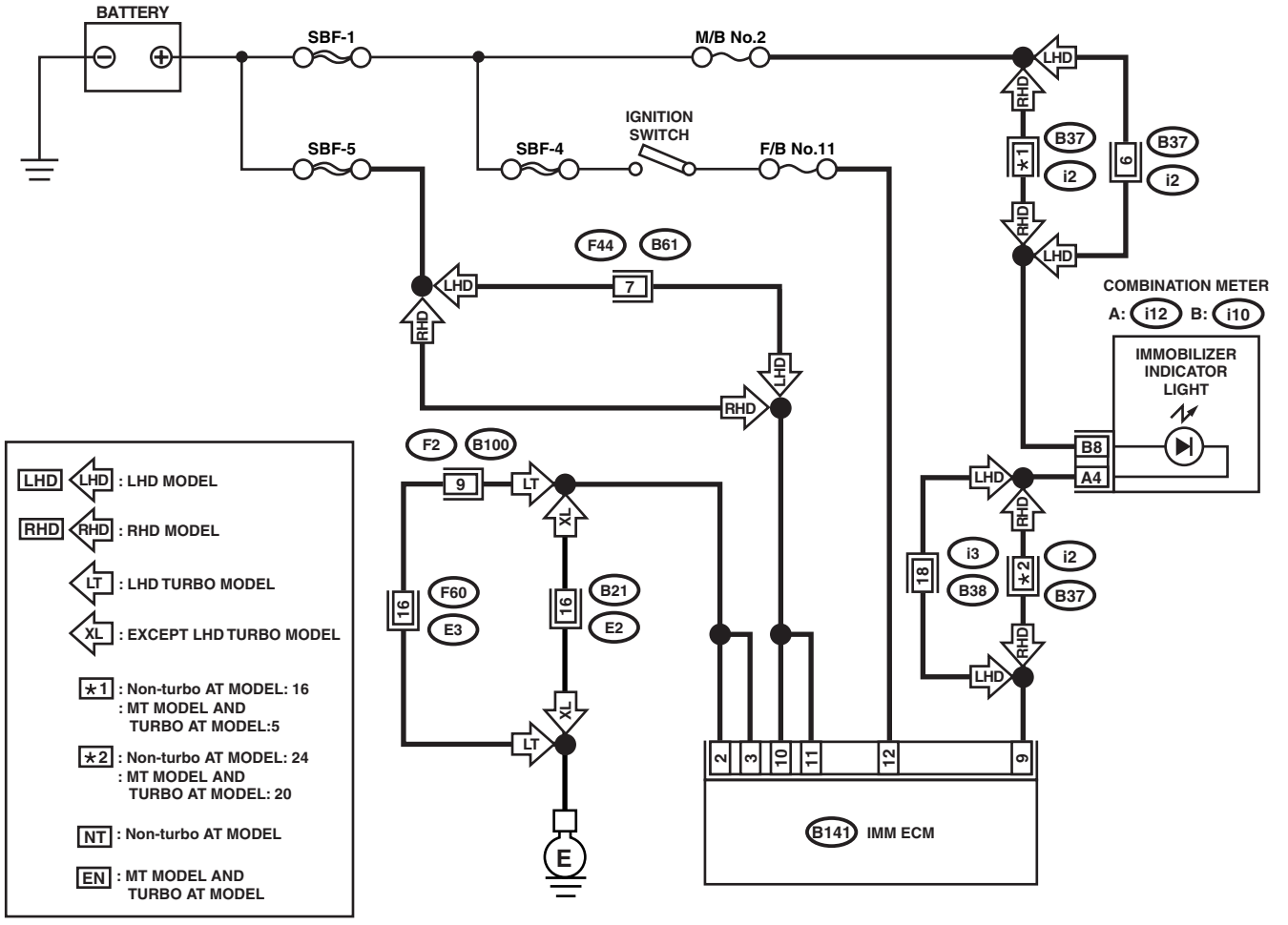
NOTE:
• After the memory has been cleared, the ISC must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
• For detailed operation procedure, refer to the SUBARUSELECT MONITOR OPERATION MANUAL.

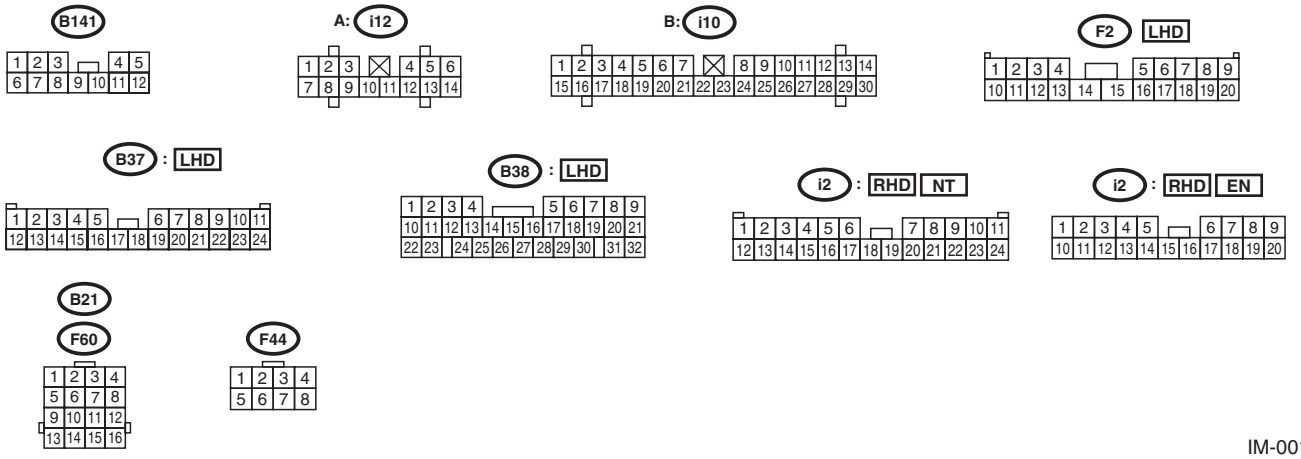
8. Diagnostics Chart for Immobilizer Indicator Light

A: INSPECTION

1. CHECK IMMOBILIZER INDICATOR CIRCUIT

WIRING DIAGRAM:





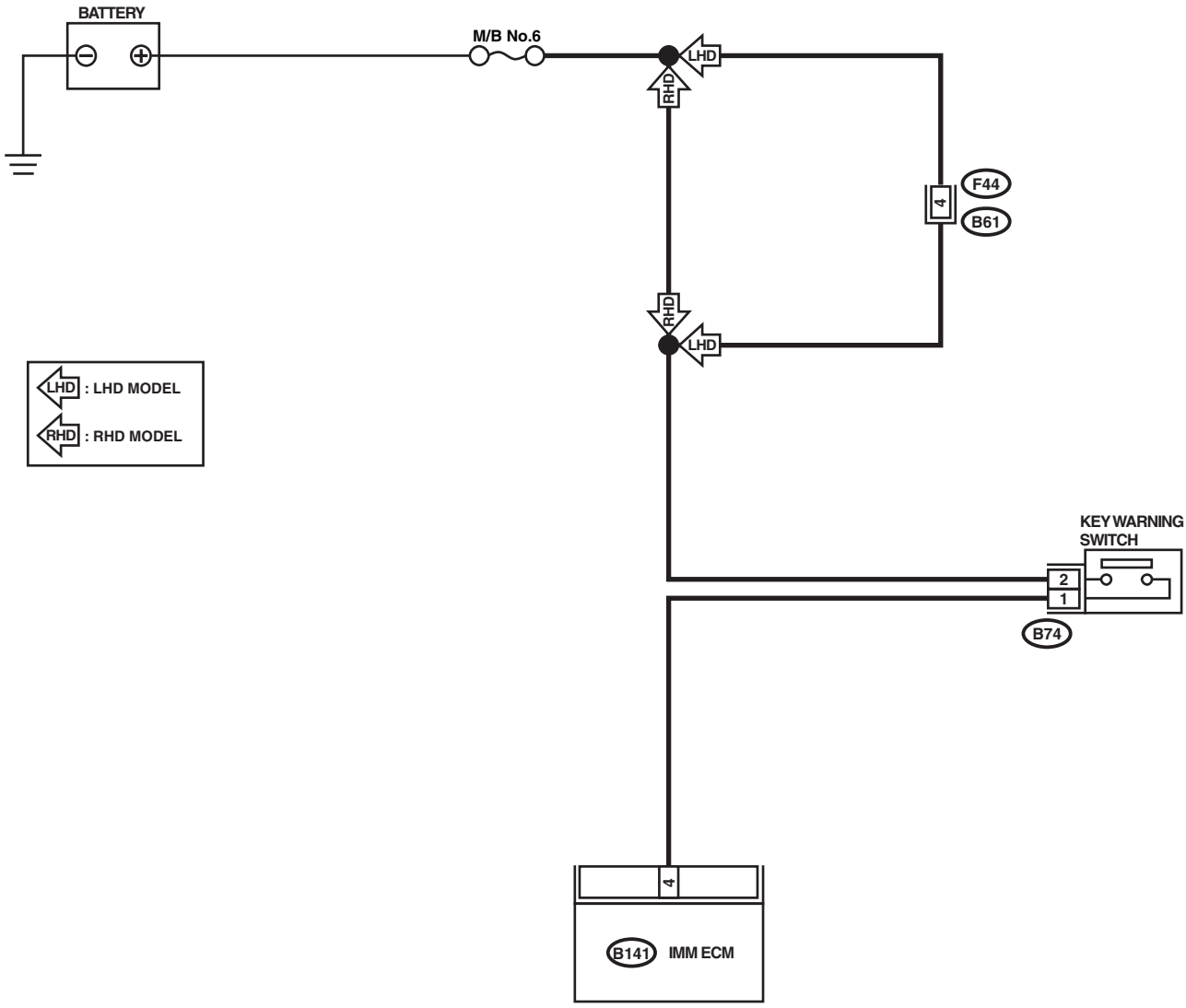
IM-00125

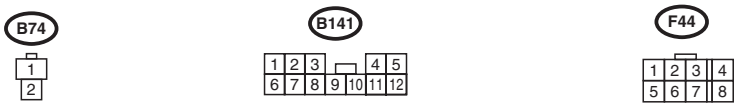
Diagnostics Chart for Immobilizer Indicator Light

	Step	Check	Yes	No
1	**CHECK IMMOBILIZER INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from IMM ECM. 3) Connect a resistor (750 Ω) between IMM ECM harness connector terminal No. 9 and chassis ground.	Does the immobilizer indicator light illuminate?	Go to step **2.**	Go to step **5.**
2	**CHECK IMM ECM GROUND CIRCUIT.** Measure the resistance between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 2, No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **3.**	Repair the open circuit of IMMECM ground circuit.
3	**CHECK IMM ECM IGNITION CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF.) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Check the harness for open or short between IMM ECM and ignition switch.
4	**CHECK IMM ECM POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 10, No. 11 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Check the harness for open or short between IMM ECM and fuse.
5	**CHECK COMBINATION METER CIRCUIT.** 1) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 2) Measure the voltage between combination meter harness connector terminal and chassis ground. ***Connector & terminal*** ***(i10) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Check the harness for open or short between combination meter and fuse.
6	**CHECK COMBINATION METER CIRCUIT.** Measure the resistance between IMM ECM harness connector terminal and combination meter harness connector terminal. ***Connector & terminal*** ***(B141) No. 9 — (i12) No. 4:***	Is the resistance less than 10 Ω?	Faulty LED. Replace the combination meter printed circuit. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>	Repair the harness or connector.

2. CHECK KEY WARNING SWITCH CIRCUIT

WIRING DIAGRAM:





IM-00126

Diagnostics Chart for Immobilizer Indicator Light

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT.** 1) Disconnect the harness connector from key warning switch. 2) Measure the voltage between key warning switch harness connector terminal and chassis ground. ***Connector & terminal*** ***(B74) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between key warning switch and fuse.
2	**CHECK KEY WARNING SWITCH.** 1) Insert the ignition key to the ignition switch. (OFF or ACC position) 2) Measure the resistance between key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Replace the key warning switch.
3	**CHECK KEY WARNING SWITCH.** 1) Remove the ignition key from the ignition switch. 2) Measure the resistance between key warning switch connector terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Replace the key warning switch.
4	**CHECK HARNESS BETWEEN KEY WARNING SWITCH AND IMM ECM.** 1) Disconnect the harness connector from key warning switch. 2) Disconnect the harness connector from IMM ECM. 3) Measure the resistance between key warning switch harness connector terminal and IMM ECM harness connector terminal. ***Connector & terminal*** ***(B74) No. 1 — (B141) No. 4:***	Is the resistance less than 10 Ω?	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to teaching operation manual (Pub. No. S0820GZ).	Repair the harness between key warning switch and IMM ECM.

9. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnostic	Index No.
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in IMM ECM)	<Ref. to IM(diag)-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	ANTENNA	Faulty antenna	<Ref. to IM(diag)-16, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	Reference code incompatibility between IMM ECM and ECM	<Ref. to IM(diag)-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	EGI — Immobilizer Communication (Except Antenna Circuit)	Communication failure between IMM ECM and ECM	<Ref. to IM(diag)-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key — Immobilizer Communication	Failure of IMM ECM to verify key (transponder) ID code	<Ref. to IM(diag)-22, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	ECM malfunctioning	<Ref. to IM(diag)-22, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMMControl Module EEPROM	IMM ECM malfunctioning	<Ref. to IM(diag)-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

NOTE:
Perform the engine DTC when the DTC except immobilizer DTC is detected. **<Ref. to EN(H4SO)(diag)-73, List of Diagnostic Trouble Code (DTC).> <Ref. to EN(H4DOTC 2.0)(diag)-74, List of Diagnostic Trouble Code (DTC).>** <Ref. to EN(H4DOTC 2.5)(diag)-69, List of Diagnostic Trouble Code (DTC).>

10.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

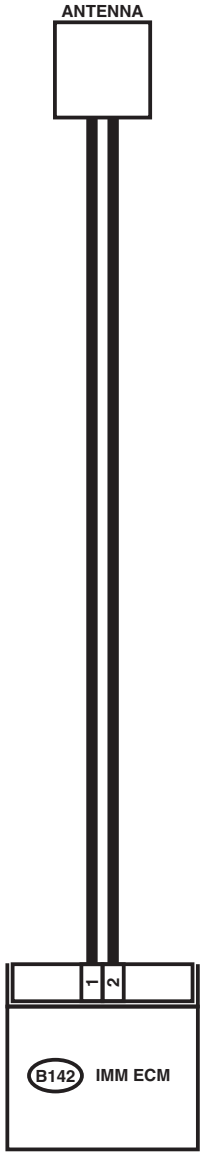
A: DTC P0513 INCORRECT IMMOBILIZER KEY

DTC DETECTING CONDITION:
Use of unregistered key in IMM ECM

	Step	Check	Yes	No
1	**PERFORM TEACHING OPERATION ON IGNITION KEY.** Perform teaching operation on all keys of the vehicle. Refer to the teaching operation manual (Pub. No. S0820GZ).	Is teaching operation for all keys completed?	END	Replace all ignition keys (including the transponder). Go to step **2.**
2	**PERFORM TEACHING OPERATION ON IGNITION KEY.** Perform teaching operation on all keys with vehicle. Refer to the teaching operation manual (Pub. No. S0820GZ).	Is teaching operation for all keys completed?	END	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

B: DTC P1570 ANTENNA

DTC DETECTING CONDITION:
Faulty antenna
WIRING DIAGRAM:



IM-00008

	Step	Check	Yes	No
1	**CHECK ANTENNA CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness antenna connector from IMM ECM. <Ref. to SL-38, Immobilizer Antenna.> 3) Measure the resistance of antenna circuit. ***Connector & terminal*** ***(B142) No. 1 — No. 2:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>
2	**CHECK ANTENNA CIRCUIT.** Measure the resistance between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 1 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>	Go to step **3.**
3	**CHECK ANTENNA CIRCUIT.** Measure the resistance between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 2 — Chassis ground:***	Is the resistance less than 10 Ω?	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>	Go to step **4.**
4	**CHECK ANTENNA CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF.) 2) Measure the voltage between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 1 (+) — Chassis ground (−):***	Is the voltage 0 V?	Go to step **5.**	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>
5	**CHECK ANTENNA CIRCUIT.** Measure the voltage between antenna harness connector and chassis ground. ***Connector & terminal*** ***(B142) No. 2 (+) — Chassis ground (−):***	Is the voltage 0 V?	Go to step **6.**	Replace the antenna. <Ref. to SL-38, Immobilizer Antenna.>
6	**CHECK IMM ECM FUNCTION.** 1) Turn the ignition switch to OFF. 2) Connect the antenna harness connector to IMM ECM. 3) Insert the key to ignition switch, measure changes in voltage between antenna harness connector. ***Connector & terminal*** ***(B142) No. 1 (+) — No. 2 (−):***	Is the voltage −30 to 30 V? (Approx. 0.1 second after inserting the key) Is the voltage 0 V? (Approx. 1 second after inserting the key)	Go to step **7.**	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).
7	**CHECK IGNITION KEY (TRANSPONDER).** 1) Remove the key from ignition switch. 2) Start the engine using other keys that have undergone the teaching operation, furnished with vehicle.	Does the engine start?	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

C: DTC P1571 REFERENCE CODE INCOMPATIBILITY

DTC DETECTING CONDITION:

Reference code incompatibility between IMM ECM and ECM

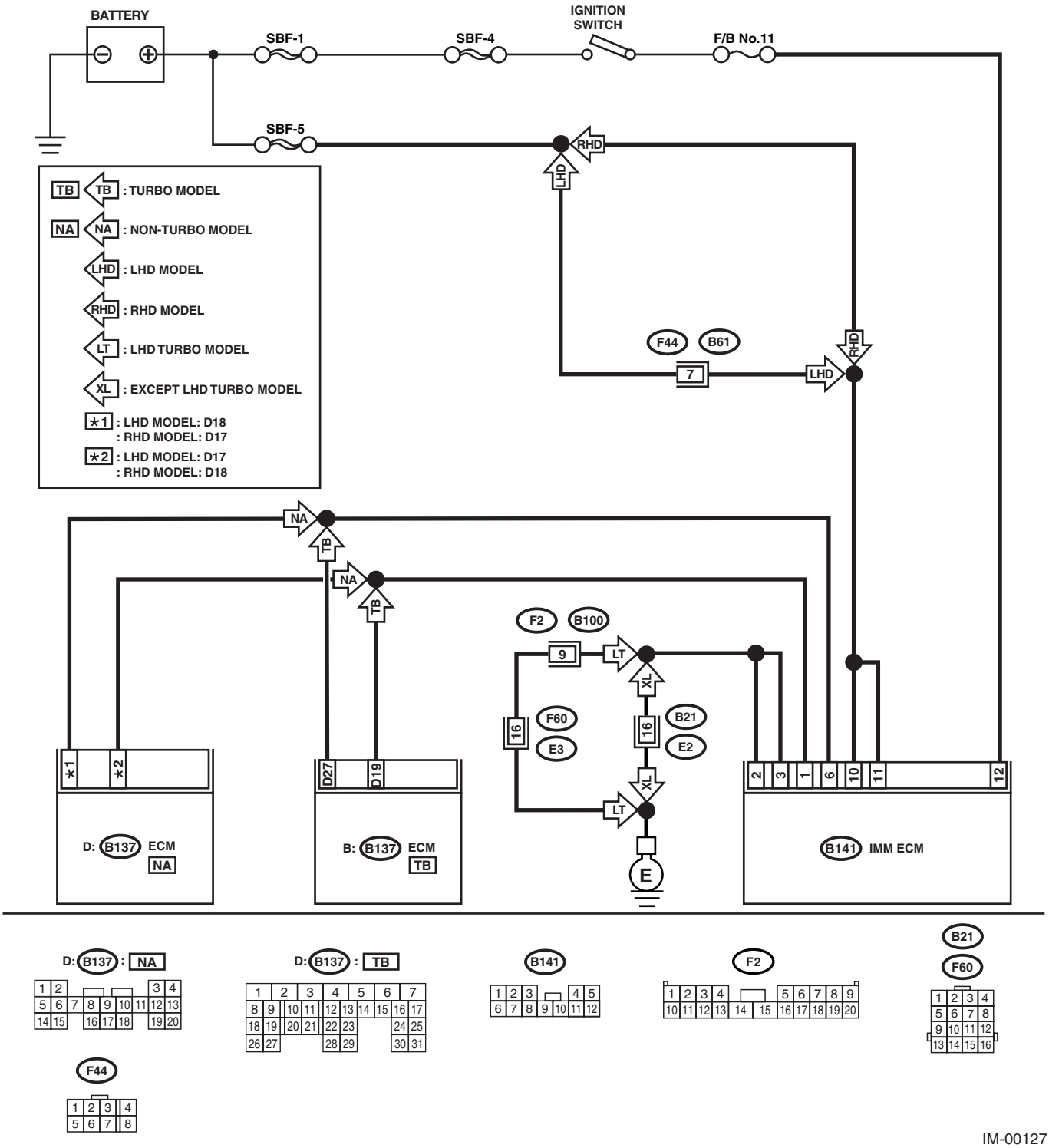
	Step	Check	Yes	No
1	**PERFORM TEACHING OPERATION ON IGNITION KEY.** Perform teaching operation on all keys of the vehicle. Refer to the teaching operation manual.	Is teaching operation for all keys completed?	END	Go to step **2.**
2	**CHECK DTC.**	Is there any DTC related to immobilizer except DTC P1571?	Eliminate the cause of DTC except DTC P1571, and perform the teaching operation again.	Replace the ECM <Ref. to FU(H4SO)-44, Engine Control Module (ECM).> <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).>, IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

D: DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

DTC DETECTING CONDITION:

Communication failure between IMM ECM and ECM

WIRING DIAGRAM:



IM-00127

	Step	Check	Yes	No
1	**CHECK POWER SUPPLY CIRCUIT OF IMM ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from IMM ECM. 3) Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 10, No. 11 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Check the harness for open or short between IMM ECM and fuse.
2	**CHECK IGNITION SWITCH CIRCUIT.** 1) Turn the ignition switch to ON. (engine OFF.) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Check the harness for open or short between IMM ECM and ignition switch.
3	**CHECK GROUND CIRCUIT OF IMM ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 2, No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **4.**	Repair the open circuit of IMMECM ground circuit.
4	**CHECK HARNESS BETWEEN IMM ECM AND ECM.** 1) Disconnect the harness connector from ECM and IMM ECM. 2) Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***Non-turbo LHD model*** ***(B141) No. 1 — (B137) No. 17:*** ***Non-turbo RHD model*** ***(B141) No. 1 — (B137) No. 18:*** ***Turbo model*** ***(B141) No. 1 — (B137) No. 19:***	Is the resistance less than 10 Ω?	Go to step **5.**	Repair the open circuit of harness between IMM ECM and ECM.
5	**CHECK HARNESS BETWEEN IMM ECM AND ECM.** Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. ***Connector & terminal*** ***Non-turbo LHD model*** ***(B141) No. 6 — (B137) No. 18:*** ***Non-turbo model*** ***(B141) No. 6 — (B137) No. 17:*** ***Turbo model*** ***(B141) No. 6 — (B137) No. 27:***	Is the resistance less than 10 Ω?	Go to step **6.**	Repair the open circuit of harness between IMM ECM and ECM.

	Step	Check	Yes	No
6	**CHECK HARNESS OF COMMUNICATION LINE.** 1) Turn the ignition switch to ON. (engine OFF.) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. ***Connector & terminal*** ***(B141) No. 1, No. 6 (+) — Chassis ground (−):***	Is the voltage 0 V?	Go to step **7.**	Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line.
7	**CHECK HARNESS OF COMMUNICATION LINE.** Measure the voltage between ECM harness connector terminal and engine ground. ***Connector & terminal*** ***Non-turbo model*** ***(B137) No. 17, No. 18 (+) — Engine ground (−):*** ***Turbo model*** ***(B137) No. 19, No. 27 (+) — Engine ground (−):***	Is the voltage 0 V?	Go to step **8.**	Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line.
8	**CHECK ECM BY COMMUNICATION LINE CHECK.** 1) Connect the harness connector to ECM. 2) Disconnect the harness connector from IMM ECM. 3) Perform communication line check. <Ref. to IM(diag)-7, COMMUNICATION LINE CHECK, OPERATION, Subaru Select Monitor.>	Does "Communication Line not Shorted" appear on the screen?	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Replace the ECM. <Ref. to FU(H4SO)-44, Engine Control Module (ECM).> <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).> <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).> Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

E: DTC P1574 KEY COMMUNICATION FAILURE

DTC DETECTING CONDITION:
Failure of IMM ECM to verify key (transponder) ID code

	Step	Check	Yes	No
1	**CHECK IMM ECM FUNCTION.** Insert the key to ignition switch (LOCK position), measure changes in voltage between Antenna connector. ***Connector & terminal*** ***(B142) No. 1 (+) — No. 2 (–):***	Is the voltage –30 to 30 V? (Approx. 0.1 second after inserting the key) Is the voltage 0 V? (Approx. 1 second after inserting the key)	Go to step **2.**	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).
2	**CHECK IGNITION KEY (TRANSPONDER).** 1) Remove the key from ignition switch. 2) Start the engine using other keys that have undergone the teaching operation, furnished with vehicle.	Does the engine start?	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Replace the IMM ECM <Ref. to SL-37, Immobilizer Control Unit.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

F: DTC P1576 EGI CONTROL MODULE EEPROM

DTC DETECTING CONDITION:
ECM malfunctioning

1. REPLACE ECM.

Replace the ECM.
<Ref. to FU(H4SO)-44, Engine Control Module (ECM).> <Ref. to FU(H4DOTC 2.0)-50, Engine Control Module (ECM).> <Ref. to FU(H4DOTC 2.5)-43, Engine Control Module (ECM).>
Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

G: DTC P1577 IMM CONTROL MODULE EEPROM

DTC DETECTING CONDITION:
IMM ECM malfunctioning

1. REPLACE IMM ECM.

Replace the IMM ECM **<Ref. to SL-37, Immobilizer Control Unit.>**, and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

WIRING SYSTEM SECTION

WIRING SYSTEM WI

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

FUJI HEAVY INDUSTRIES LTD. G8090GE7

WIRING SYSTEM

WI

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1. Basic Diagnostic Procedure

A: BASIC PROCEDURES

1. GENERAL

The most important purpose of diagnostics is to determine which part is malfunctioning quickly, to save time and labor.

2. IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on symptom.

3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check system's circuit. Then check the switch, relay, fuse, ground, etc.

4. LOCATION AND REPAIR OF TROUBLE

1) Using the diagnostics narrow down the causes.
2) If necessary, use a voltmeter, ohmmeter, etc.
3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problems are encountered, check the component parts.

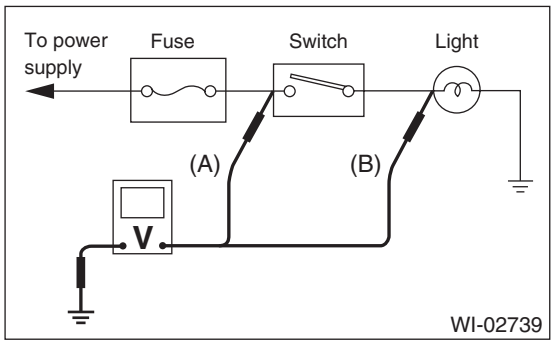
5. CONFIRMATION OF SYSTEM OPERATION

After repairing, ensure that the system operates properly.

B: BASIC INSPECTION

1. VOLTAGE MEASUREMENT

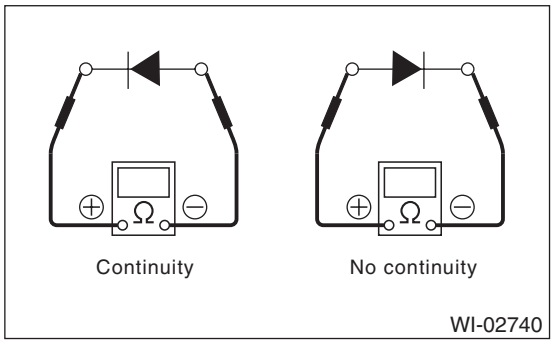
1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
2) Contact the positive probe of the voltmeter on connector (A).
The voltmeter will indicate a voltage.
3) Shift the positive probe to connector (B). The voltmeter will indicate no voltage.



4) With test set-up held as it is, turn the switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.
5) The circuit is in good order. If a problem such as a lamp failing to light occurs, use the procedures outlined above to track down malfunction.

2. CIRCUIT CONTINUITY CHECKS

1) Disconnect the battery cable or connector so there is no voltage between check points.
Contact the two leads of an ohmmeter to each of the check points.
If the circuit has diodes, reverse the two leads and check again.
2) Use an ohmmeter to check for the diode continuity. When contacting the negative lead to diode positive side and positive lead to negative side, there should be continuity.
When contacting the two leads in reverse, there should be no continuity.



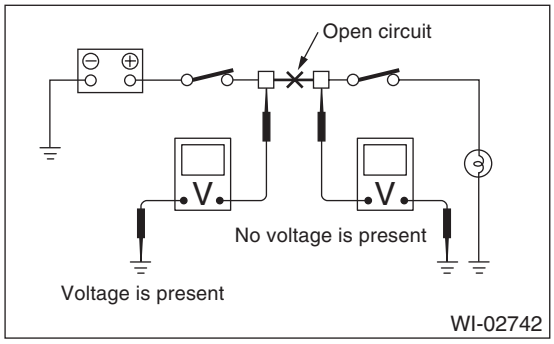
3) Symbol "❍—❍" indicates that continuity exists between two points or terminals. For example, when a switch position is "3", continuity exists among terminals 1, 3 and 6, as shown in table below.

Terminal / Switch Position	1	2	3	4	5	6
OFF						
1	○				○	○
2	○			○		○
3	○		○			○
4	○	○				○

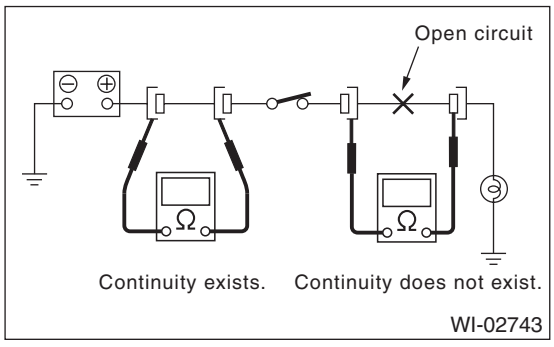
WI-02741

3. HOW TO DETERMINE AN OPEN CIRCUIT

1) Voltmeter Method:
An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and previous connector is open.

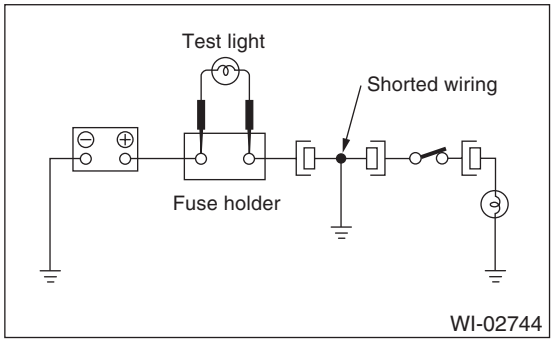


2) Ohmmeter method:
Disconnect all connectors affected, and check the continuity in wiring between adjacent connectors. When the ohmmeter indicates "infinite", the wiring is open.

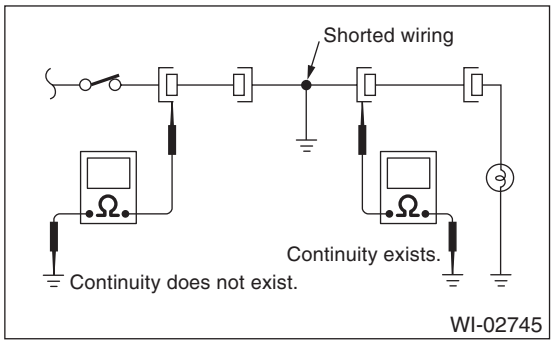


4. HOW TO DETERMINE A SHORT CIRCUIT

1) Test lamp method:
Connect a test lamp (rated at approx. 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit, starting with the one located farthest from power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and next connector (farther from the power supply) is shorted.



2) Ohmmeter method:
Disconnect all affected connectors, and check the continuity between each connector and ground. When the ohmmeter indicates continuity between a particular connector and ground, that the connector is shorted.

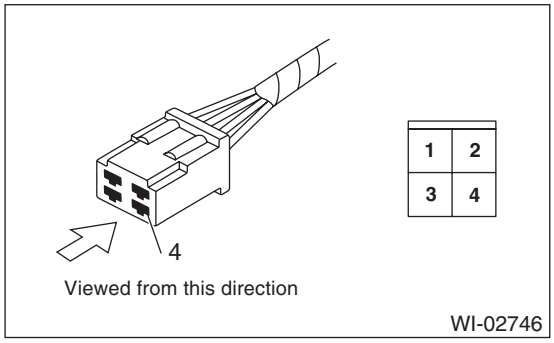


C: HOW TO READ WIRING DIAGRAMS

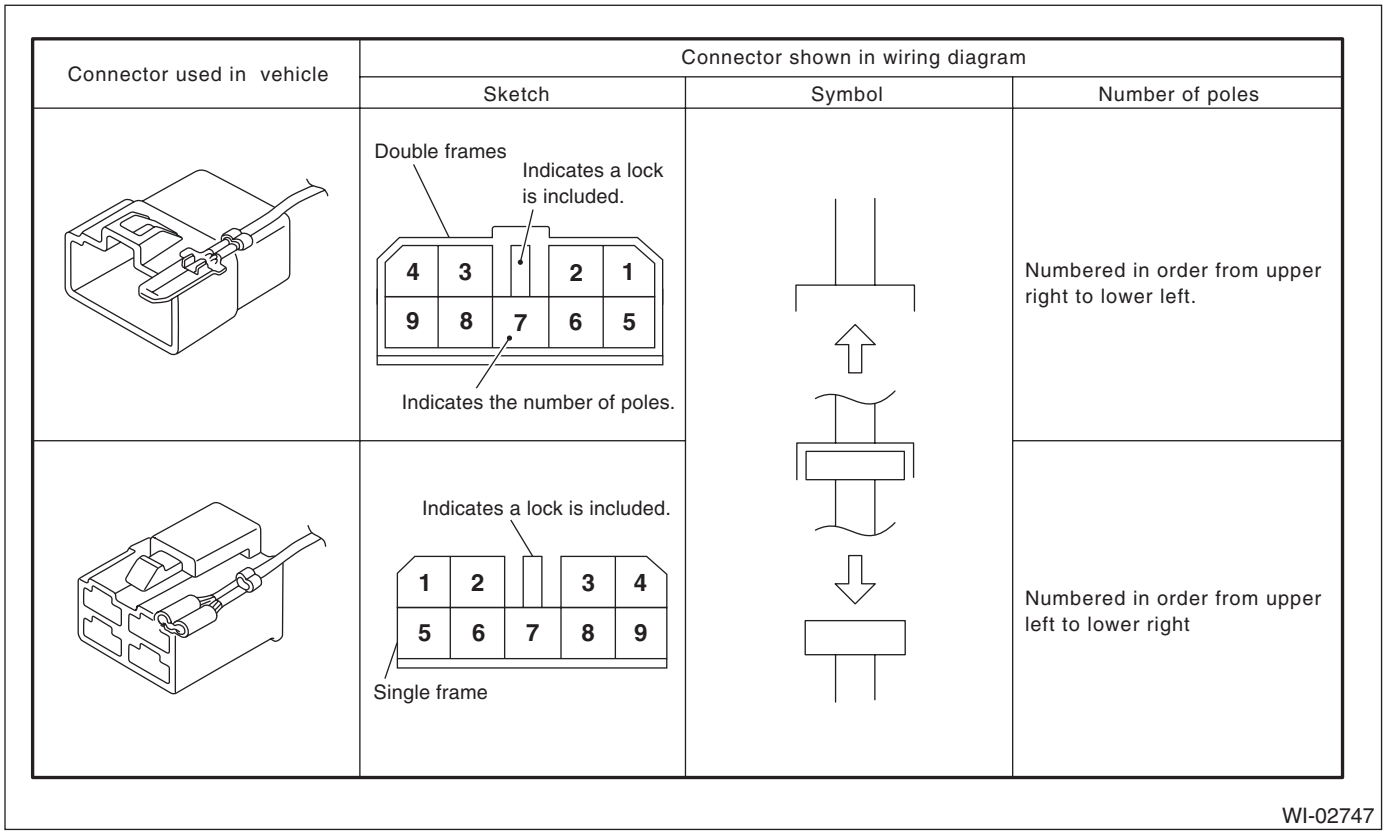
1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which electric current flows from battery.
Sketches and codes are used in the diagrams. They should read as follows:

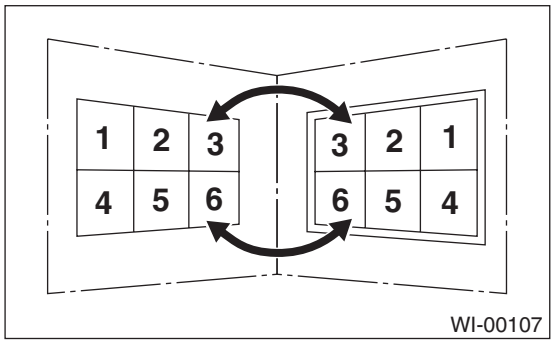
- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from front.



- The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which connector has. For example, the sketch of connector shown in the figure indicates the connector has 9 poles.



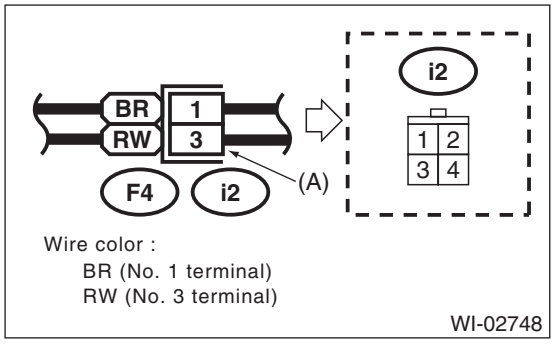
• When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of other. When these two connectors are connected as a unit, the poles which have the same number are joined.



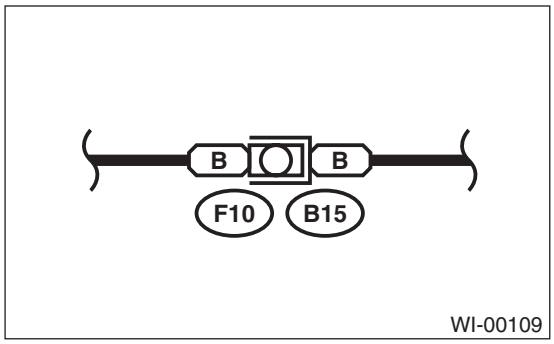
• Electrical wiring harness:
The connectors are numbered along with the number of poles, external colors, and mating connections in accompanying list.

• The sketch of each connector in the wiring diagram usually shows (A) side of the connector. The relationship between wire color, terminal number and connector is described in figure.

NOTE:
A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

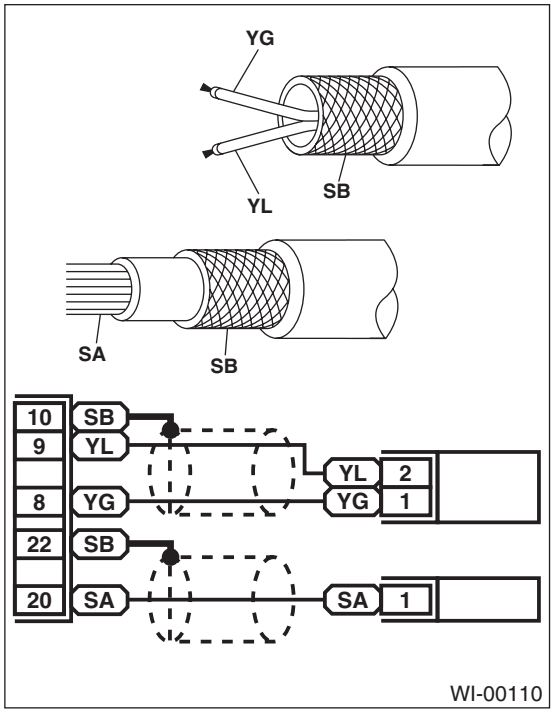


• In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

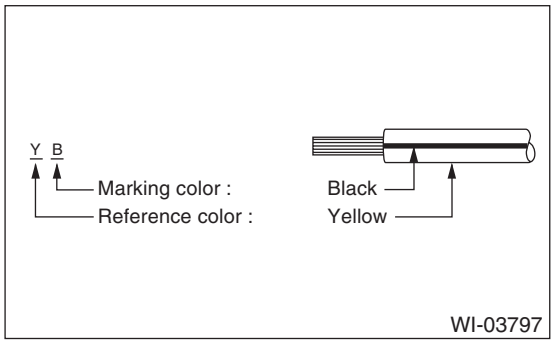


• The following color codes are used to indicate the colors of the wires used.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



• The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and stripe marking by its second or third letter.



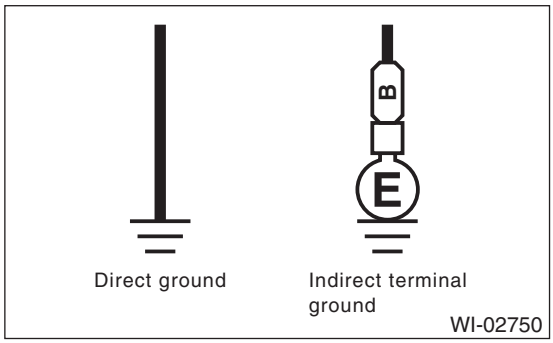
• The table lists the nominal sectional areas and allowable currents of wires.

CAUTION:
When replacing or repairing a wire, be sure to use the same size and type of wire which was originally used.

NOTE:
• The allowable current in the table indicates tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
• The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

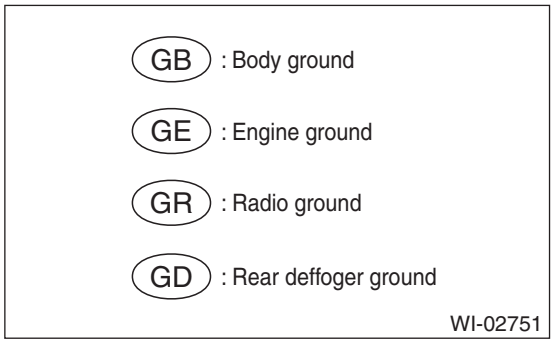
Nominal sectional area mm^2	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

• Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.

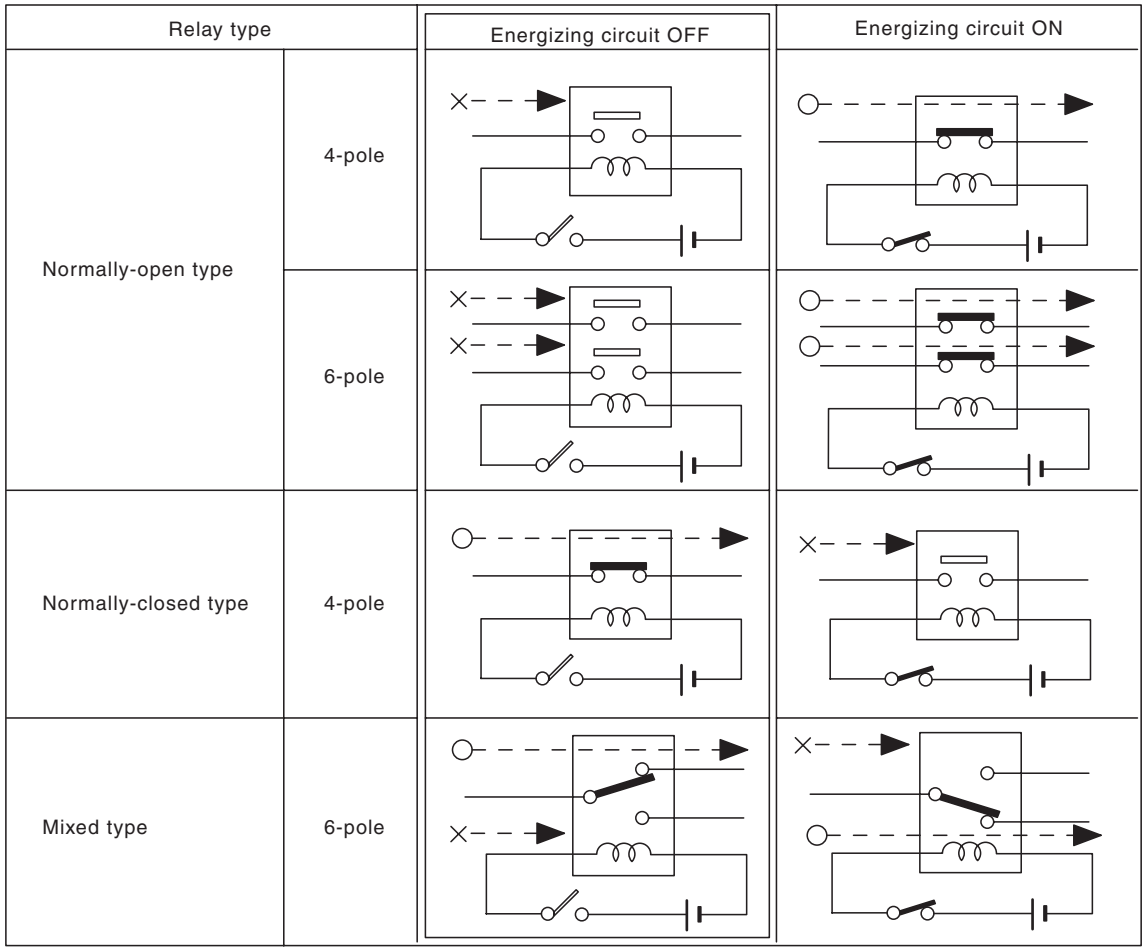


• The ground points shown in the wiring diagram refer to the following:

NOTE:
All wiring harnesses are provided with a ground point which should be securely connected.

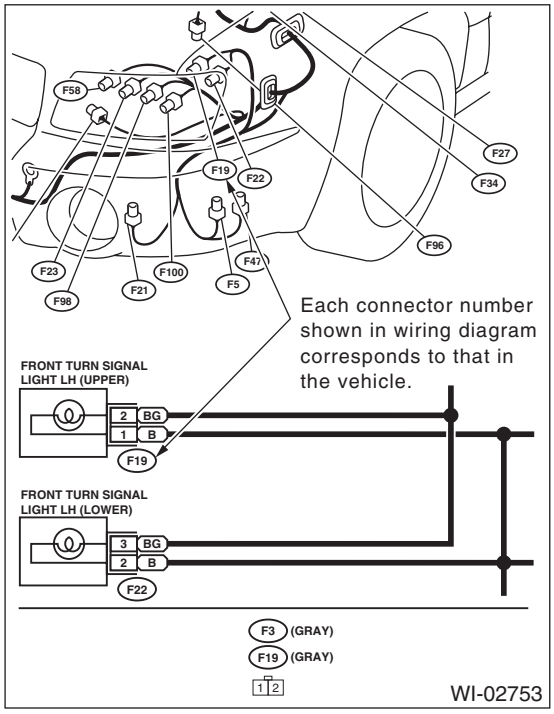


• Relays are classified as normally-open or normally-closed. The normally-closed relay has one or more contacts.
The wiring diagram shows the relay mode when energizing circuit is OFF.



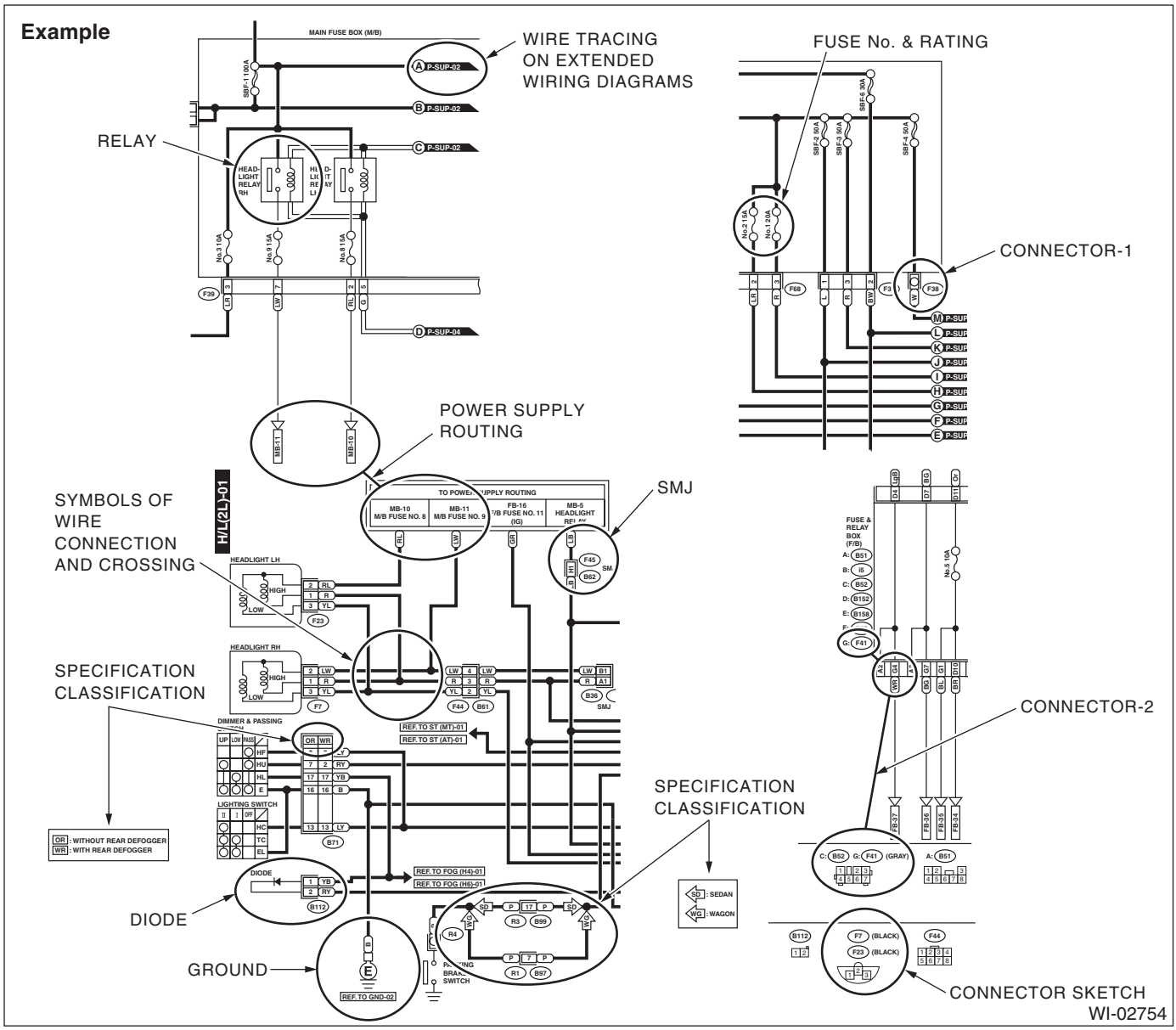
• Each connector number shown in the wiring diagram corresponds to that in wiring harness. The location of each connector in actual vehicle is determined by reading the first character of the connector (for example, a “F” for F8, “i” for i16, etc.) and type of wiring harness.
The first character of each connector number refers to the area or system of the vehicle.

Symbol	Wiring harness and cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord, Rear oxygen sensor cord
D	Door cord LH & RH, Rear door cord LH & RH, Rear gate cord
i	Instrument panel wiring harness
R	Rear wiring harness, Fuel tank cord, Roof cord
AB	Airbag wiring harness



D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



1. RELAY

A symbol used to indicate a relay.

2. CONNECTOR-1

The sketch of the connector indicates one-pole types.

3. WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols (as when two pages are needed for clear indication).

4. FUSE No. & RATING

The “FUSE No. & RATING” corresponds with that used in fuse box (main fuse box, fuse and joint box).

5. CONNECTOR-2

- Each connector is indicated by a symbol.
- Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
- For example, terminal number “G4” refers to No. 4 terminal of connector (G: F41) shown in the connector sketch.

6. CONNECTOR SKETCH

• Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
• When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

7. GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

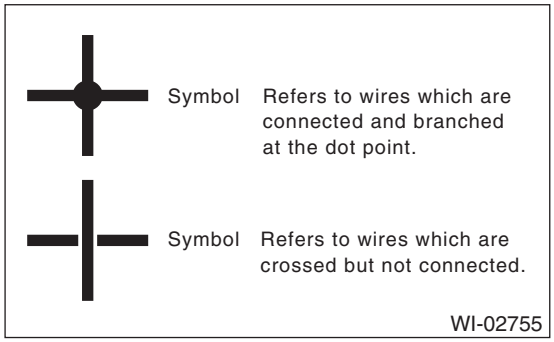
8. DIODE

A symbol is used to indicate a diode.

9. WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), facilitates wire tracing from one page to the next.
A ←→ A, B ←→ B

10.SYMBOLS OF WIRE CONNECTION AND CROSSING



11.POWER SUPPLY ROUTING

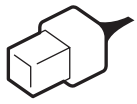
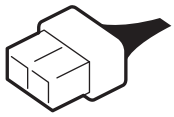
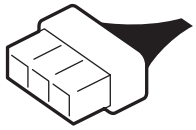
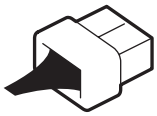
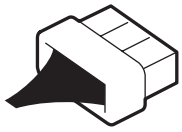
A symbol is used to indicate the power supply in each wiring diagram.
“MB-5”, “MB-6”, etc., which are used as power supply symbols throughout the text, correspond with those shown in POWER SUPPLY ROUTING in the wiring diagram.
Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

12.CLASSIFICATION BY SPECIFICATION

When the wiring diagrams differ according to vehicle specifications, the specification difference is described by using abbreviations.
The difference among destinations indicates by option code (EK, EC, etc.,). Option code is described on model number plate in engine compartment. <Ref. to ID-5, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

E: CONNECTOR SYMBOL IN WIRING HARNESS

Main symbols of connector (in wiring harness) are indicated in below.

Standard type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
		
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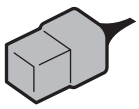
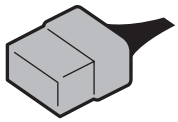
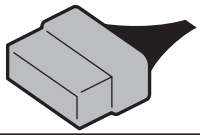
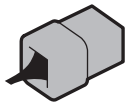
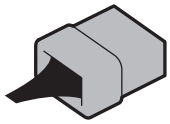
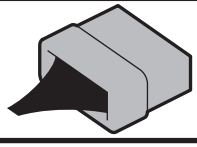
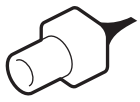
		
		

Water proof type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
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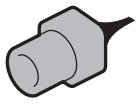
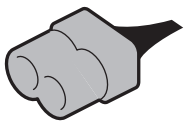
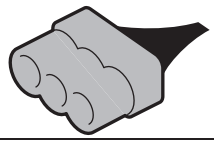
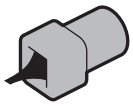
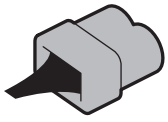
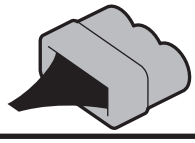
		
		

WI-02445

F: ABBREVIATION IN WIRING DIAGRAMS

Abbreviation	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
AT	Automatic Transmission
AU	Auto Up
A/B	Airbag
A/F	Air/Fuel (Air fuel ratio sensor)
ATF	Automatic transmission fluid
AWD	All Wheel Drive
B, BAT	Battery
CPC	Canister Purge Control
D	Drive Range
DN	Down
E	Ground
ELR	Emergency Locking Retractor
F/B	Fuse & Joint Box
FL1.5	Fusible link 1.5 mm^2
H/L	Headlight
I/F	Interface
IG	Ignition
Illumi.	Illumination
INT	Intermittent
LH	Left Hand
Lo	Low
M	Motor
M/B	Main Fuse Box
MG	Magnet
Mi	Middle
MT	Manual transmission
N	Neutral Range
OCV	Oil flow control solenoid valve
OP	Optional Parts
P	Parking Range
PASS	Passing
R	Reverse Range
RH	Right Hand
SBF	Slow Blow Fuse
ST	Starter
SW	Switch
TGV	Tumble Generated Valve
U, UP	Up
VDC	Vehicle Dynamics Control
WASH	Washer

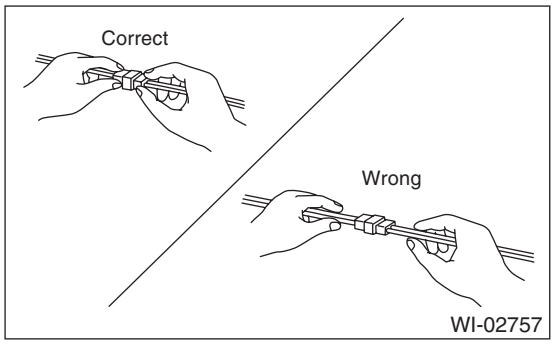
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

1) When working under a vehicle which is jacked-up, always be sure to use rigid racks.
2) The parking brake must always be applied during working. Also, in automatic transmission models, keep the select lever set to P (Parking) range.
3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
4) Be careful not to touch hot metal parts, especially the radiator and exhaust system immediately after the engine has been shut off.

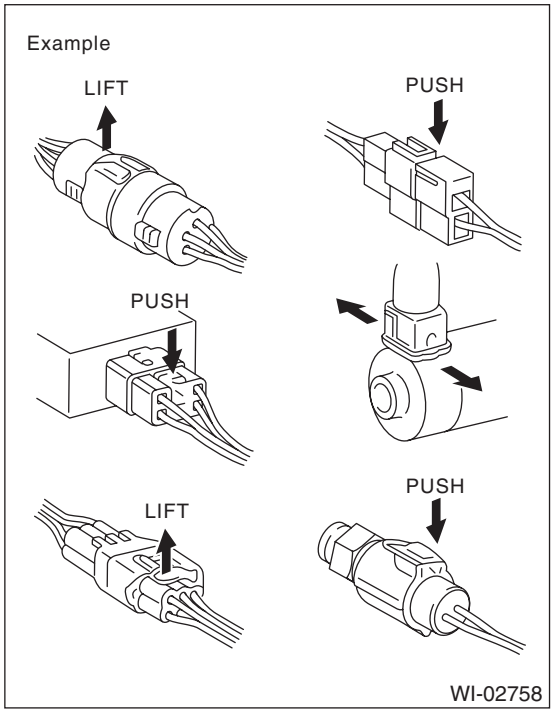
B: PRECAUTIONS IN TROUBLE DIAGNOSTIC AND REPAIR OF ELECTRIC PARTS

1) The battery cable must be disconnected from battery's (–) terminal, and the ignition switch must be set to OFF position, unless otherwise required by the diagnostics.
2) Securely fasten the wiring harness with clamps and clips so that the harness does not interfere with body end parts or edges and bolts or screws.
3) When installing the parts, be careful not to catch them on the wiring harness.
4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.

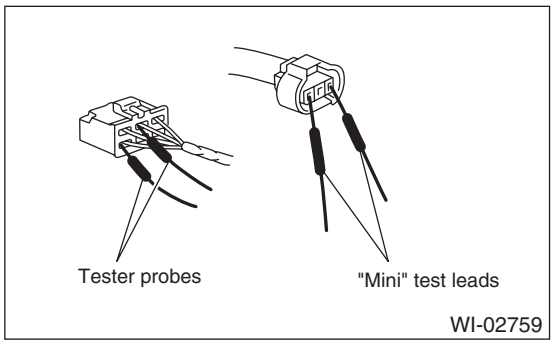


5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector.

To connect, insert the connector until it snaps and confirm that it is tightly connected.



6) When checking continuity between connector terminals, or measuring the voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use "mini" test leads.
To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage terminals.



7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts.
Handle them with care so that they are not dropped or mishandled.

3. Power Supply Circuit

A: WIRING DIAGRAM

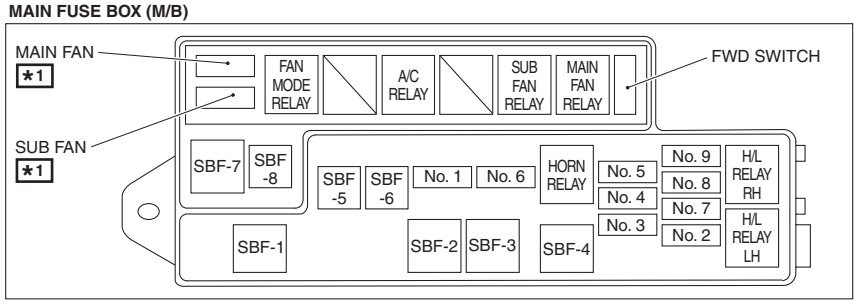
1. LHD MODEL

P-SUP(L)-01

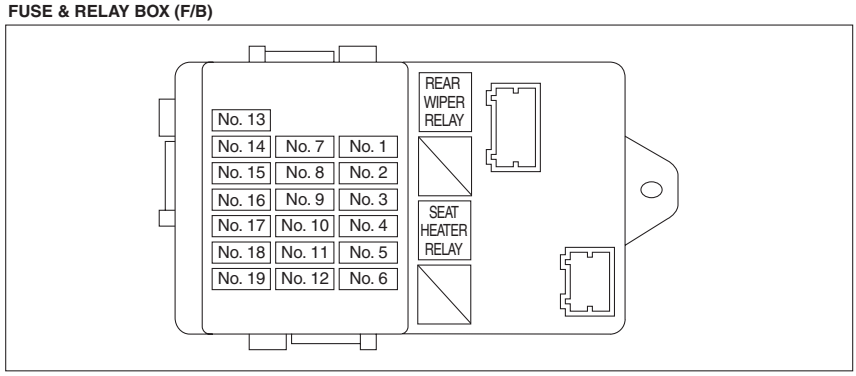
P-SUP(L)-01

*1	: 2.0L TURBO MT MODEL	: 20A
	2.0L NON-TURBO MT MODEL	: 20A
	2.0L NON-TURBO AT MODEL	: 20A
	2.0L TURBO AT MODEL	: 30A
	2.5L TURBO MT MODEL	: 30A

MAIN FUSE BOX (M/B)

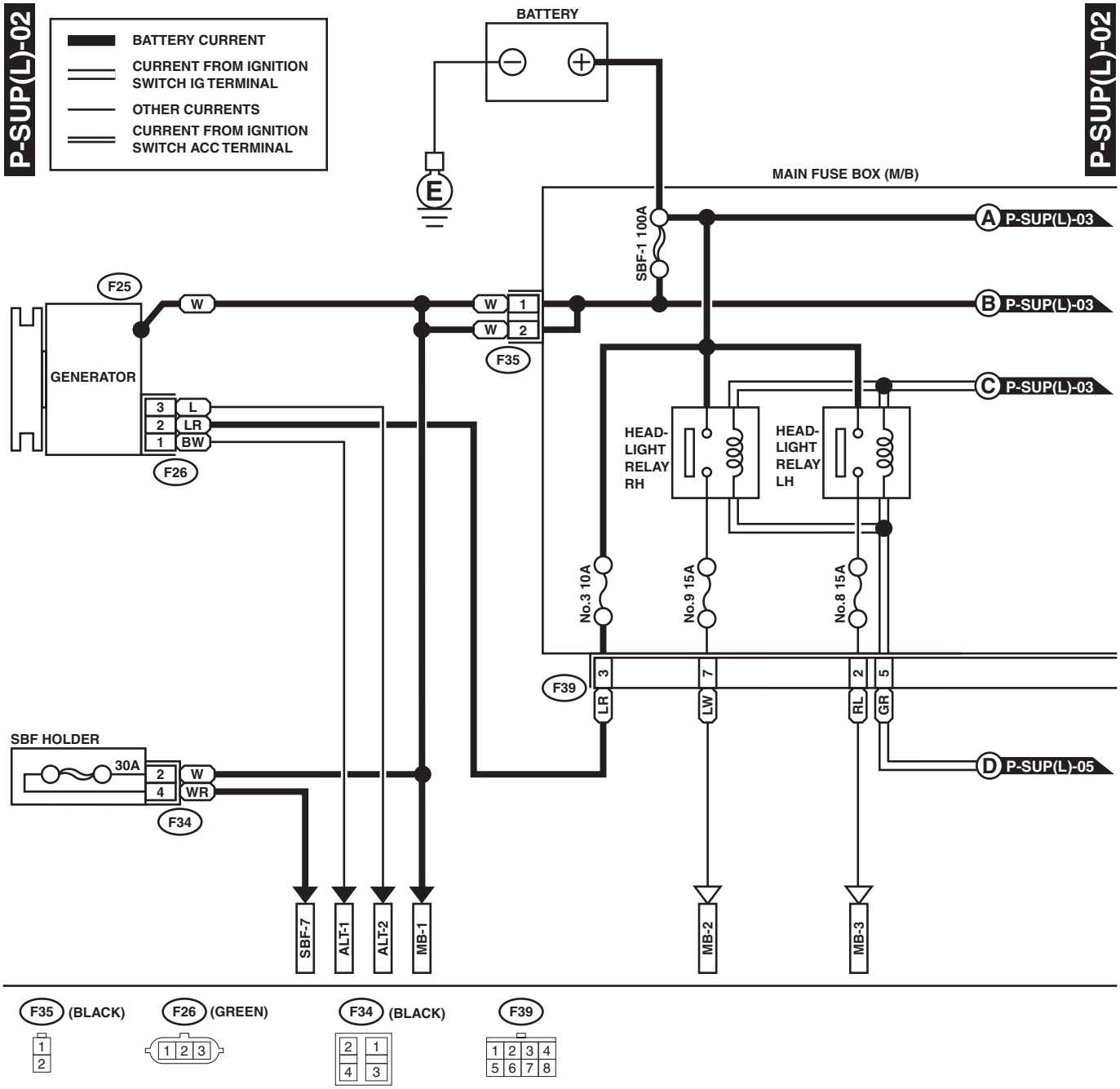


FUSE & RELAY BOX (F/B)

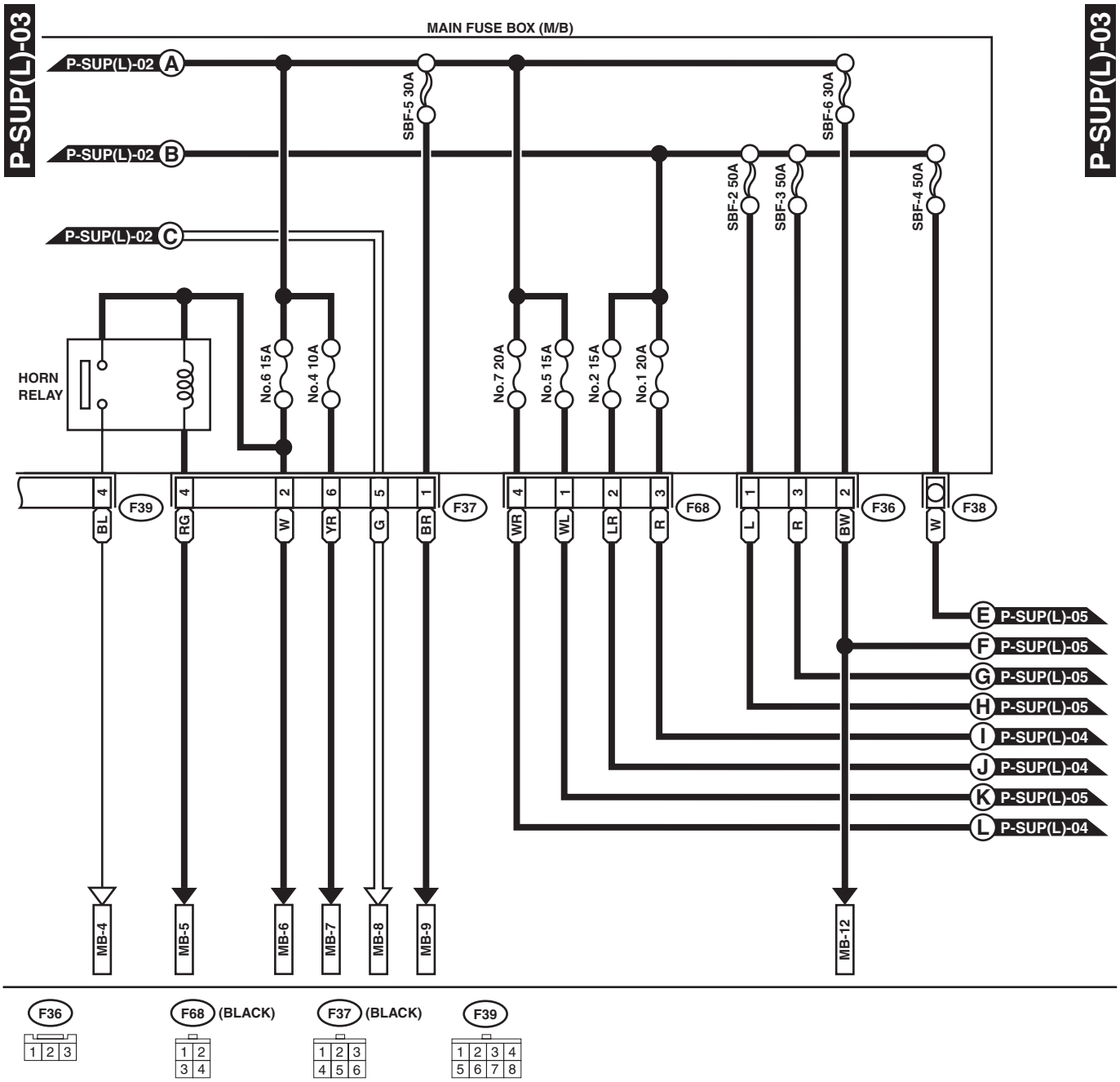


WI-07331

Power Supply Circuit

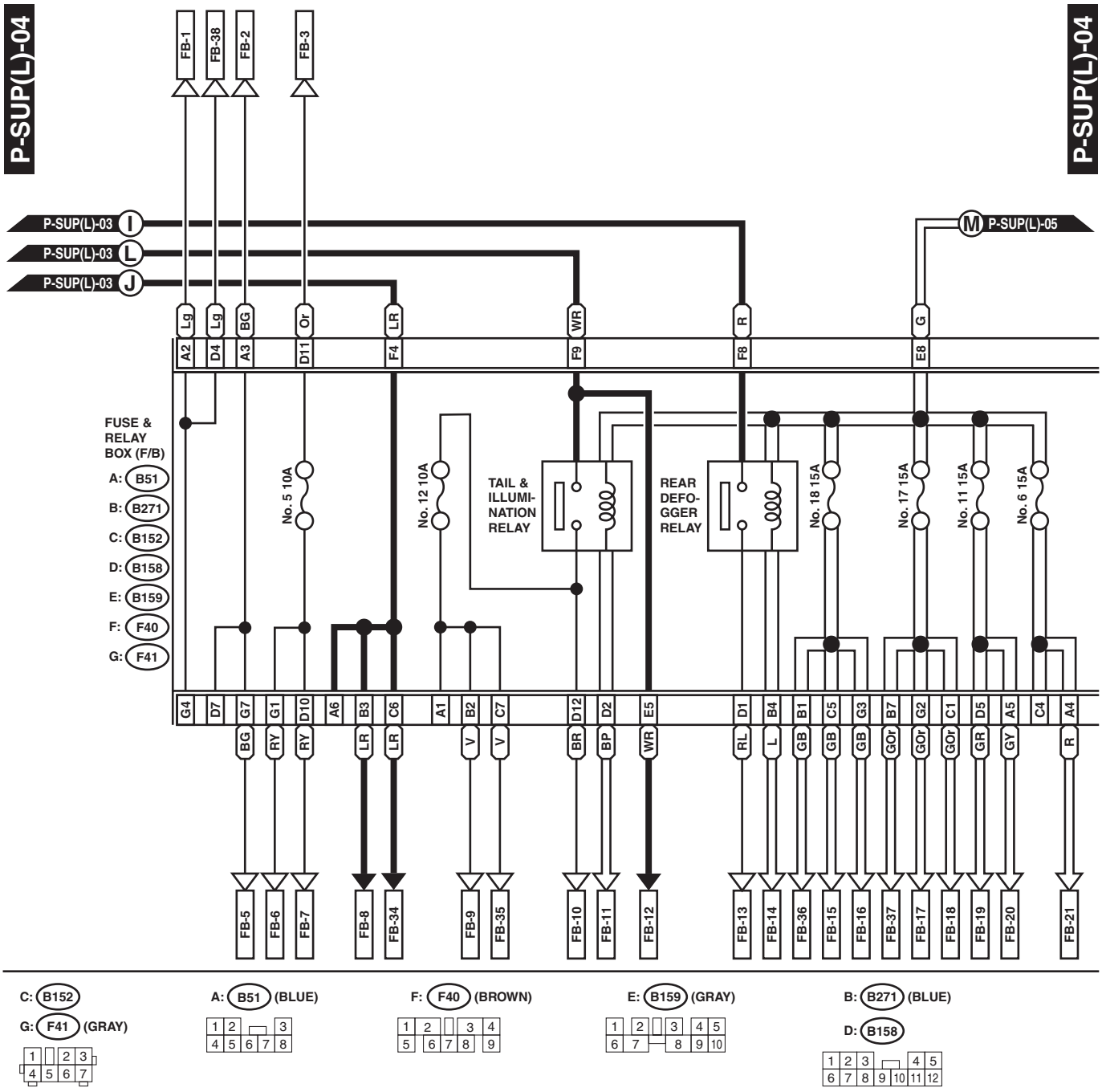


WI-05887


P-SUP(L)-03
P-SUP(L)-03
MAIN FUSE BOX (M/B)
P-SUP(L)-02 A
P-SUP(L)-02 B
P-SUP(L)-02 C
SBF-5 30A
SBF-6 30A
SBF-2 50A
SBF-3 50A
SBF-4 50A
HORN RELAY
No.6 15A
No.4 10A
No.7 20A
No.5 15A
No.2 15A
No.1 20A
F39
F37
F68
F36
F38
BL
RG
W
YR
G
BR
WR
WL
LR
R
L
R
BW
W
E P-SUP(L)-05
F P-SUP(L)-05
G P-SUP(L)-05
H P-SUP(L)-05
I P-SUP(L)-04
J P-SUP(L)-04
K P-SUP(L)-05
L P-SUP(L)-04
MB-4
MB-5
MB-6
MB-7
MB-8
MB-9
MB-12
F36
F68 (BLACK)
F37 (BLACK)
F39

WI-00226

Power Supply Circuit



C: B152
G: F41 (GRAY)

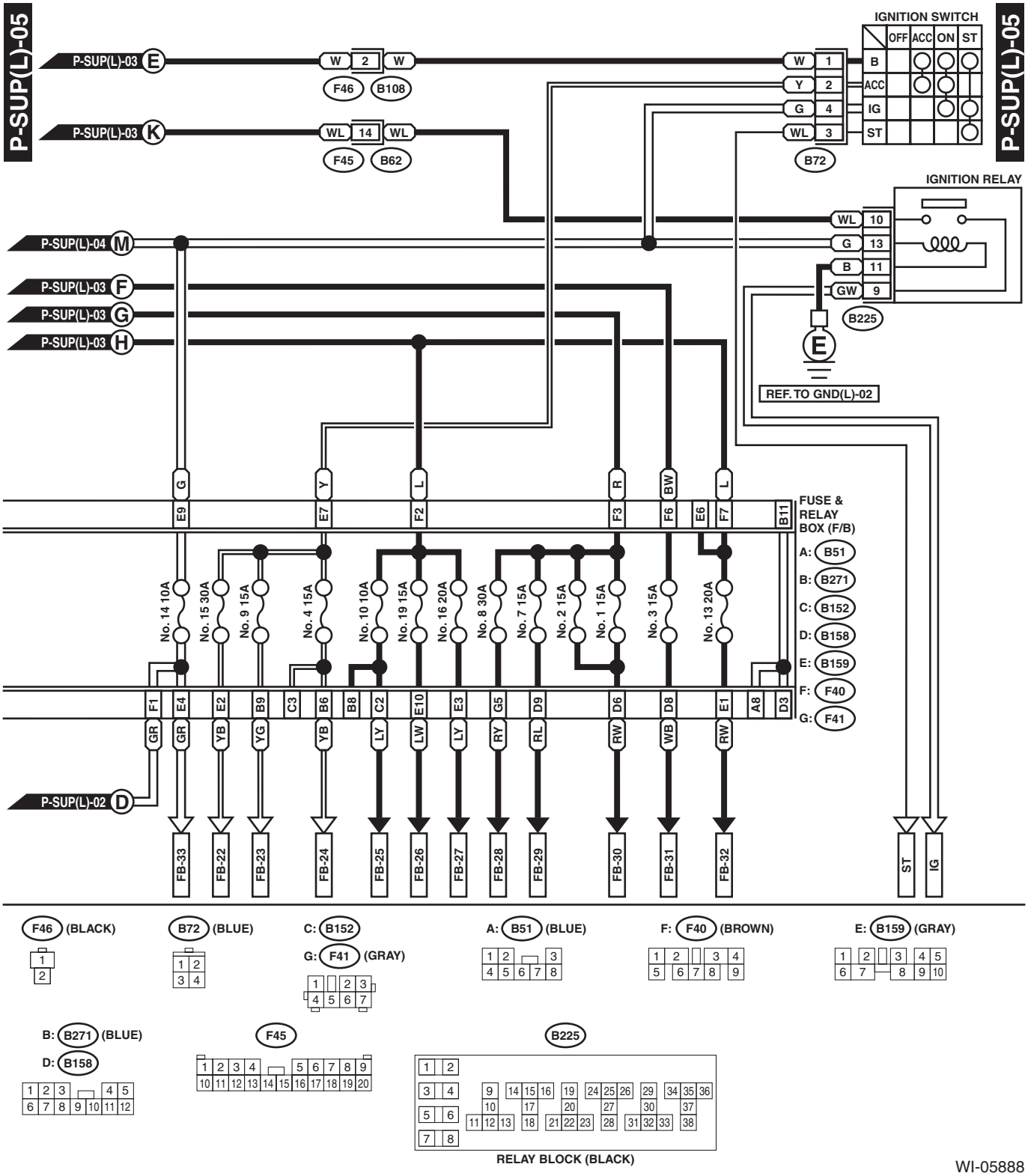
A: B51 (BLUE)

F: F40 (BROWN)

E: B159 (GRAY)

B: B271 (BLUE)
D: B158

WI-03183


P-SUP(L)-05
P-SUP(L)-03 E
P-SUP(L)-03 K
P-SUP(L)-04 M
P-SUP(L)-03 F
P-SUP(L)-03 G
P-SUP(L)-03 H
P-SUP(L)-02 D
F46
B108
F45
B62
B72
IGNITION SWITCH
OFF ACC ON ST
B
ACC
IG
ST
IGNITION RELAY
B225
REF. TO GND(L)-02
FUSE & RELAY BOX (F/B)
A: B51
B: B271
C: B152
D: B158
E: B159
F: F40
G: F41
No. 14 10A
No. 15 30A
No. 9 15A
No. 4 15A
No. 10 10A
No. 19 15A
No. 16 20A
No. 8 30A
No. 7 15A
No. 2 15A
No. 1 15A
No. 3 15A
No. 13 20A
FB-33
FB-22
FB-23
FB-24
FB-25
FB-26
FB-27
FB-28
FB-29
FB-30
FB-31
FB-32
ST
IG
F46 (BLACK)
B72 (BLUE)
C: B152
G: F41 (GRAY)
A: B51 (BLUE)
F: F40 (BROWN)
E: B159 (GRAY)
B: B271 (BLUE)
D: B158
F45
B225
RELAY BLOCK (BLACK)

WI-05888

No.	Load
MB-1	Air conditioning relay holder
MB-2	Combination meter Headlight RH
MB-3	Headlight LH
MB-4	Horn
MB-5	Horn switch
MB-6	Hazard switch Keyless entry control module Key warning switch Body integrated unit
MB-7	Transmission control module
MB-8	Diode (With rear fog light model) Lighting switch
MB-9	Data link connector Engine control module Fuel pump relay Immobilizer control module Main relay
MB-12	Headlight washer module Power window circuit breaker
SBF-7	ABS control module
ALT-1	Combination meter
ALT-2	Engine control module
IG	Hazard switch Check connector Headlight washer switch Ignition relay Vehicle speed sensor (MT model) Power window relay
ST	Engine control module Cruise control module Ignition switch Inhibitor switch (AT model) Starter motor (MT model)
FB-1	Combination meter Brake fluid level warning switch OP connector Parking switch
FB-2	Hazard switch Combination meter Rear turn signal light LH Trailer connector Keyless entry control module Turn signal switch
FB-3	Parking switch
FB-5	Front turn signal light LH Side turn signal light LH
FB-6	Headlight leveler LH Headlight leveler RH
FB-7	Front clearance light LH Front clearance light RH Rear combination light LH Rear combination light RH Trailer connector

No.	Load
FB-8	Auto A/C control module Radio Clock Combination meter Navigation unit Navigation system Luggage room light Room light Spot map light Trailer connector
FB-9	Combination meter Radio CD illumination light Hazard switch Auto A/C control module A/C switch (manual A/C) Navigation unit Navigation system
FB-10	Parking switch
FB-11	Engine control module Lighting switch
FB-12	Parking switch
FB-13	Auto A/C control module Rear defogger A/C switch
FB-14	Rear defogger timer
FB-15	Back light switch (MT model) Cruise control main switch Cruise control module Inhibitor switch (AT model) Navigation system Seat belt timer Clutch switch (MT model) Body integrated unit
FB-16	Main fan relay 1
FB-17	Main fan relay 2 Sub fan relay A/C relay Heater cock solenoid (2.0 L Non-turbo model)
FB-18	Wiper deicer switch Rear defogger timer
FB-19	Engine control module Fuel pump relay Ignition coil and ignitor Immobilizer control module Transmission control module
FB-20	Airbag control module
FB-21	Airbag control module
FB-22	Front washer motor Front wiper motor Front wiper switch
FB-23	Clock Navigation unit Navigation system Radio

No.	Load
FB-24	Front accessory power supply socket Rear accessory power supply socket Transmission control module (Turbo model) Remote controlled rearview mirror switch OP connector Seat heater relay Body integrated unit
FB-25	Rear fog light relay AT shift lock module
FB-26	Rear accessory power supply socket
FB-27	Stop light switch
FB-28	ABS control module
FB-29	Front fog light relay
FB-30	Blower motor relay
FB-31	Keyless entry control module OP connector
FB-32	Wiper deicer & Mirror heater relay
FB-33	Combination meter
FB-34	Keyless entry control module Ignition switch Illumination light
FB-35	At power mode & Hold mode switch Select lever illumination light Front accessory power supply socket Front fog light relay Front fog light switch Headlight leveler switch Headlight washer switch Lighting switch OP connector Rear fog light relay Glove box illumination light (Turbo model) Rear fog light switch Wiper deicer switch License plate light Steering switch
FB-36	ABS control module Wiper deicer & Mirror heater relay
FB-37	A/C switch Blower fan motor relay Auto A/C control module FRESH/RECIRC actuator

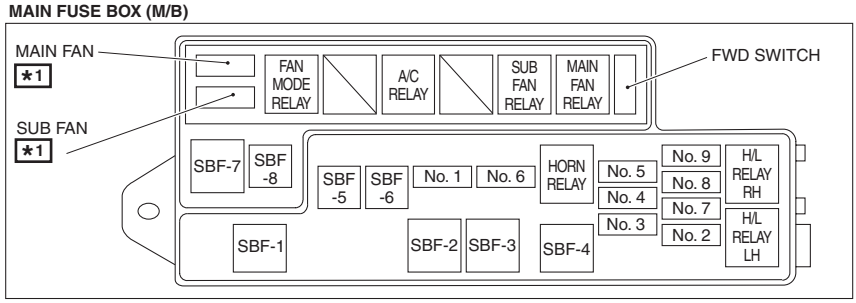
2. RHD MODEL

P-SUP(R)-01

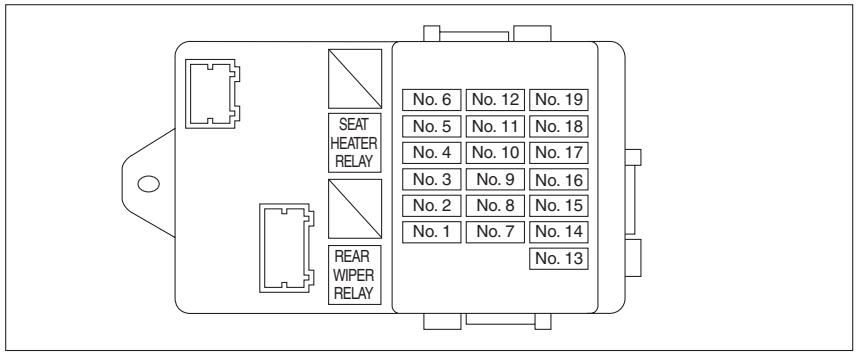
P-SUP(R)-01

✱1	: 2.0L TURBO MT MODEL : 20A 2.0L NON-TURBO MODEL : 20A 2.0L TURBO AT MODEL : 30A 2.5L TURBO MODEL : 20A

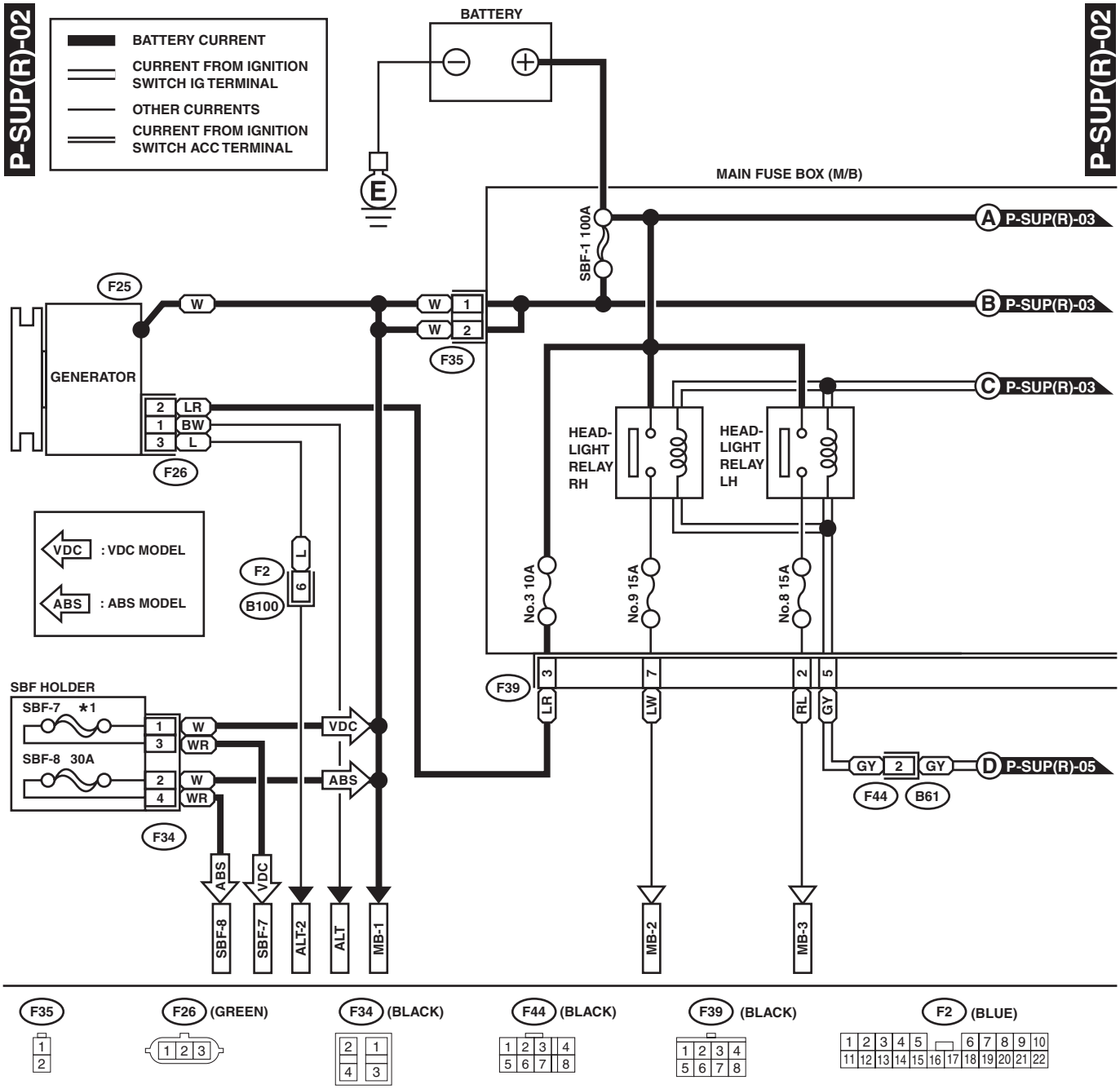
MAIN FUSE BOX (M/B)



FUSE & RELAY BOX (F/B)

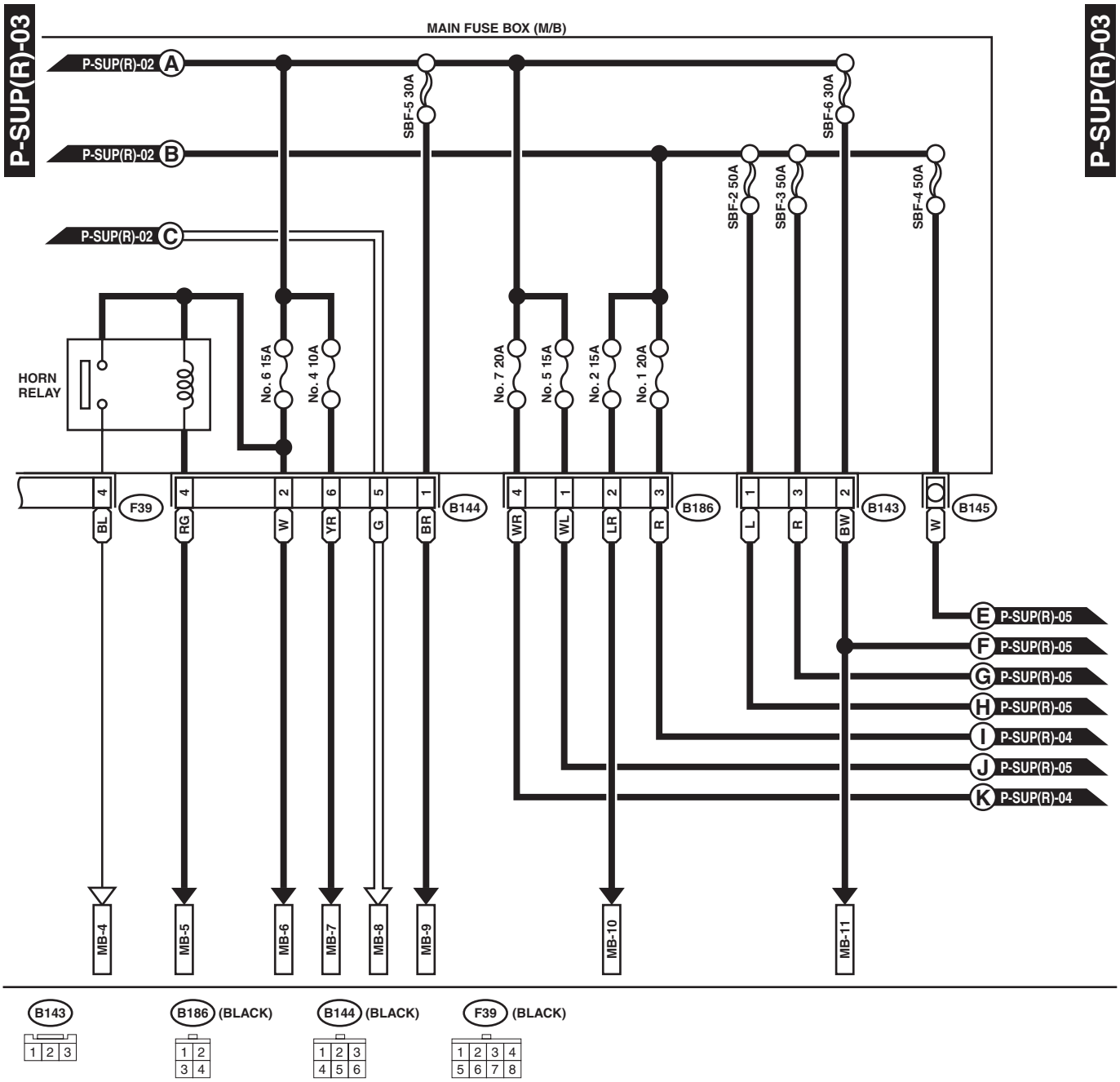


WI-07332

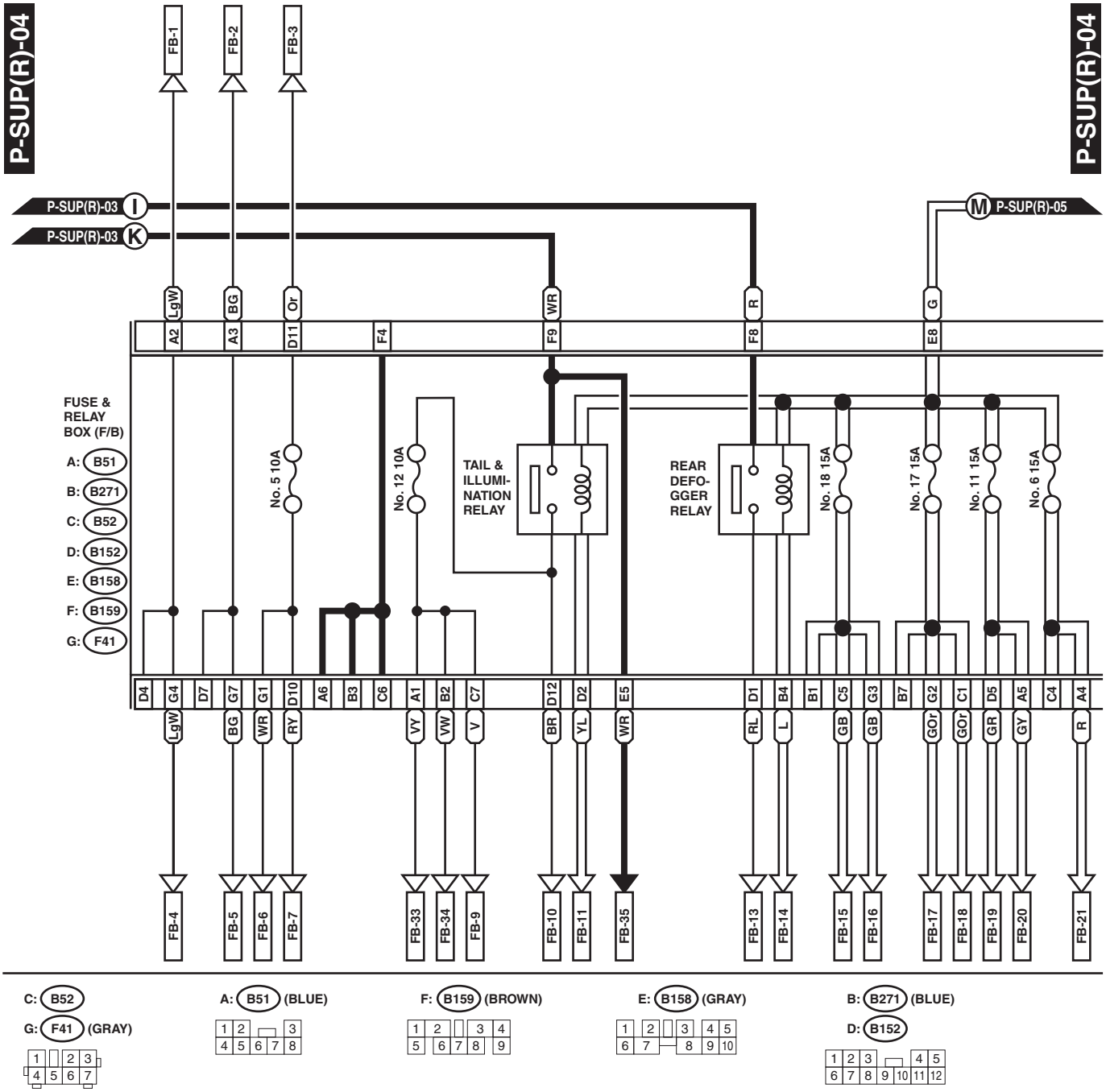

P-SUP(R)-02
BATTERY CURRENT
CURRENT FROM IGNITION SWITCH IG TERMINAL
OTHER CURRENTS
CURRENT FROM IGNITION SWITCH ACC TERMINAL
BATTERY
MAIN FUSE BOX (M/B)
SBF-1 100A
A P-SUP(R)-03
B P-SUP(R)-03
C P-SUP(R)-03
D P-SUP(R)-05
F25
W
W 1
W 2
F35
GENERATOR
2 LR
1 BW
3 L
F26
HEAD-LIGHT RELAY RH
HEAD-LIGHT RELAY LH
VDC : VDC MODEL
ABS : ABS MODEL
F2
L 6
B100
No.3 10A
No.9 15A
No.8 15A
F39
3 LR
7 LW
2 RL
5 GY
GY 2 GY
F44
B61
SBF HOLDER
SBF-7 *1
1 W
3 WR
SBF-8 30A
2 W
4 WR
VDC
ABS
F34
ABS
VDC
SBF-8
SBF-7
ALT-2
ALT
MB-1
MB-2
MB-3
F35
F26 (GREEN)
F34 (BLACK)
F44 (BLACK)
F39 (BLACK)
F2 (BLUE)

WI-07333

Power Supply Circuit

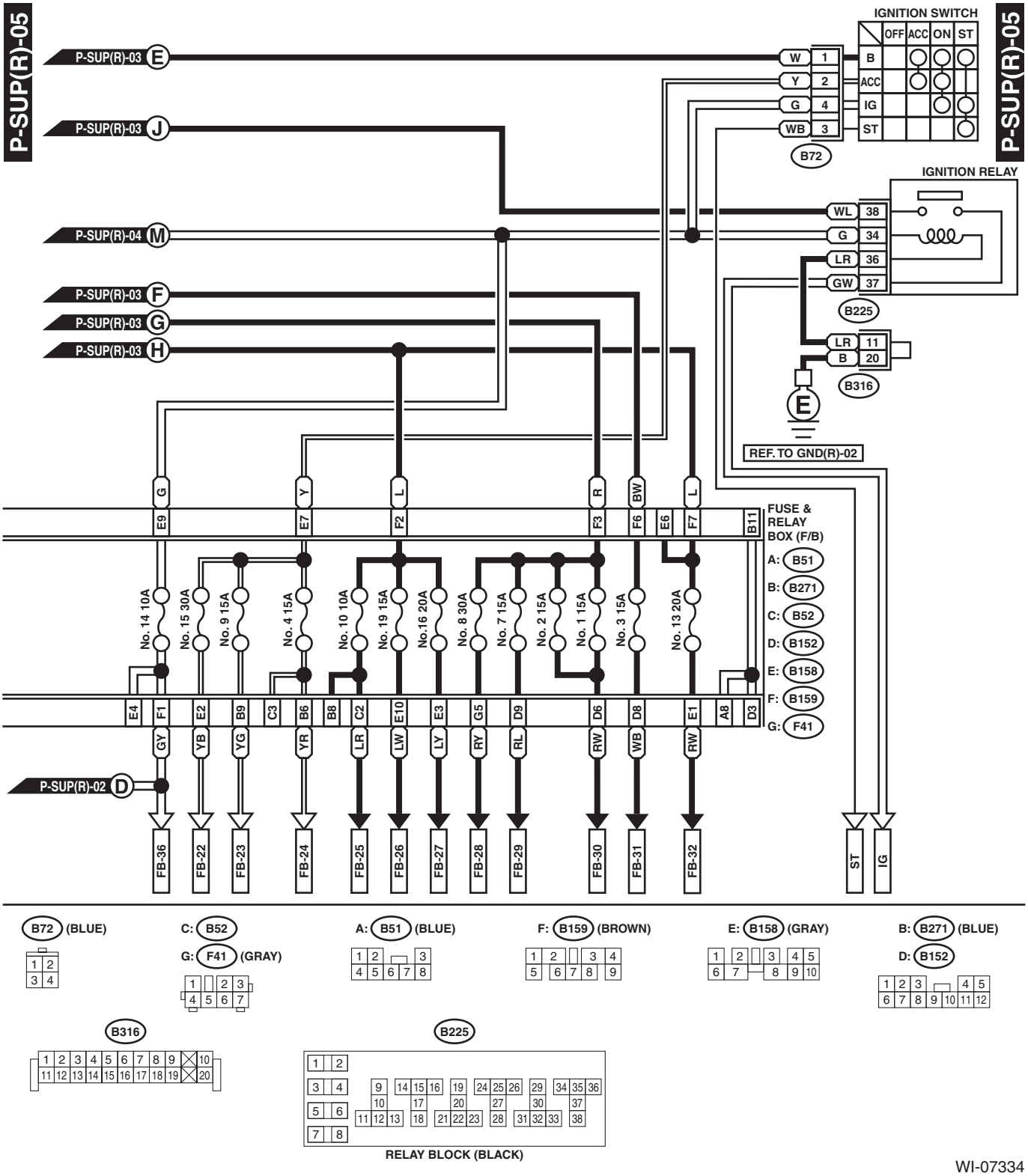


WI-00231


P-SUP(R)-04
P-SUP(R)-04
FB-1
FB-2
FB-3
P-SUP(R)-03 I
P-SUP(R)-03 K
M P-SUP(R)-05
LgW
BG
Or
WR
R
G
A2
A3
D11
F4
F9
F8
E8
FUSE & RELAY BOX (F/B)
A: B51
B: B271
C: B52
D: B152
E: B158
F: B159
G: F41
No. 5 10A
No. 12 10A
TAIL & ILLUMI-NATION RELAY
REAR DEFO-GGER RELAY
No. 18 15A
No. 17 15A
No. 11 15A
No. 6 15A
D4 G4 D7 G7 G1 D10 A6 B3 C6 A1 B2 C7 D12 D2 E5 D1 B4 B1 C5 G3 B7 G2 C1 D5 A5 C4 A4
LgW BG WR RY VY VW V BR YL WR RL L GB GB GOr GOr GR GY R
FB-4 FB-5 FB-6 FB-7 FB-33 FB-34 FB-9 FB-10 FB-11 FB-35 FB-13 FB-14 FB-15 FB-16 FB-17 FB-18 FB-19 FB-20 FB-21
C: B52
G: F41 (GRAY)
A: B51 (BLUE)
F: B159 (BROWN)
E: B158 (GRAY)
B: B271 (BLUE)
D: B152

WI-05890

Power Supply Circuit



WI-07334

No.	Load
MB-1	Air conditioning relay holder
MB-2	Combination meter Headlight RH
MB-3	Headlight LH
MB-4	Horn
MB-5	Horn switch
MB-6	Hazard switch Keyless entry control module Key warning switch Body integrated unit
MB-7	Transmission control module
MB-8	Diode (With rear fog light model) Lighting switch
MB-9	Data link connector Engine control module Fuel pump relay Immobilizer control module Main relay
MB-10	Combination meter Ignition switch illumination light Keyless entry control module Navigation unit Navigation system Luggage room light Radio Room light Security relay Trailer connector Double lock control module Spot map light
MB-11	Headlight washer module
	Power window circuit breaker
SBF-7	ABS control module VDC control module
ALT-1	Combination meter
ALT-2	Engine control module
IG	Hazard switch Check connector Headlight washer switch Ignition relay OP connector Power window relay Vehicle speed sensor (MT model)
ST	Engine control module Cruise control module Ignition switch Inhibitor switch (AT model) Security relay Starter motor (MT model)
FB-1	Hazard switch Combination meter Keyless entry control module Rear turn signal light LH Trailer connector Lighting switch Turn signal switch

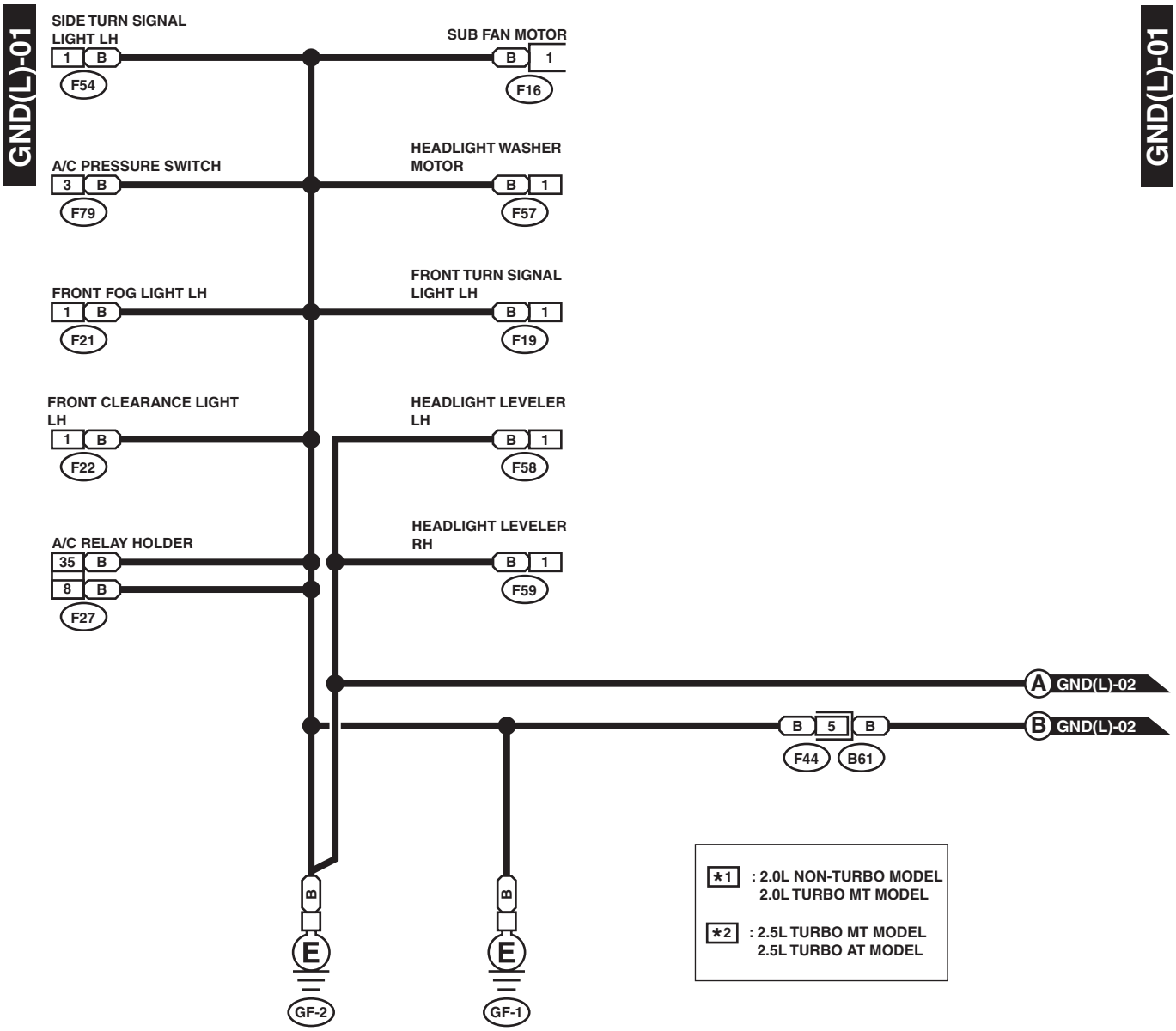
No.	Load
FB-2	Hazard switch Combination meter Front turn signal light LH Rear turn signal light LH Rear turn signal light RH Side turn signal light LH Trailer connector Keyless entry control module Lighting switch Turn signal switch
FB-3	Parking switch
FB-4	Front turn signal light RH Side turn signal light RH
FB-5	Front turn signal light LH
FB-6	Front clearance light LH Front clearance light RH Headlight leveler LH Headlight leveler RH
FB-7	License plate light Tail light LH Tail light RH Trailer connector
FB-9	Radio Combination meter Front accessory power supply socket Hazard switch Navigation system OP connector Wiper deicer switch Front fog light switch
FB-10	Parking switch
FB-11	Lighting switch
FB-13	Rear defogger
FB-14	Double lock control module Rear defogger timer
FB-15	Cruise control main switch Cruise control module Inhibitor switch (AT model) Wiper deicer relay Wiper deicer switch VDC control module
FB-16	ABS control module Main fan relay
FB-17	Air conditioning relay Pressure switch Sub fan relay
FB-18	AUTO A/C control module Blower motor relay Rear defogger switch Rear defogger timer Double lock control module FRESH/RECIRE actuator Heater cock solenoid (2.0 L Non-turbo model)

No.	Load
FB-19	Engine control module Fuel pump relay Immobilizer control module Security control module Body integrated unit Transmission control module
FB-20	Airbag control module
FB-21	Airbag control module
FB-22	Front washer motor Front wiper motor Front wiper switch
FB-23	Clock Navigation system Navigation unit Radio
FB-24	Front accessory power supply socket Rear accessory power supply socket OP connector Remote controlled rearview mirror switch Seat heater relay Body integrated unit
FB-25	Rear fog light relay
FB-26	Rear accessory power supply socket
FB-27	Stop light switch
FB-28	ABS control module VDC control module
FB-29	Front fog light relay
FB-30	Blower motor relay
FB-31	Double lock control module Keyless entry control module
FB-32	Wiper deicer relay
FB-33	Cruise control main switch Front fog light switch Front fog light relay Glove box illumination light (Turbo model) Headlight leveler switch Illumination control module Lighting switch Rear fog light relay
FB-34	At power mode & Hold mode switch Select lever illumination light
FB-35	Parking switch
FB-36	Combination meter

4. Ground Circuit

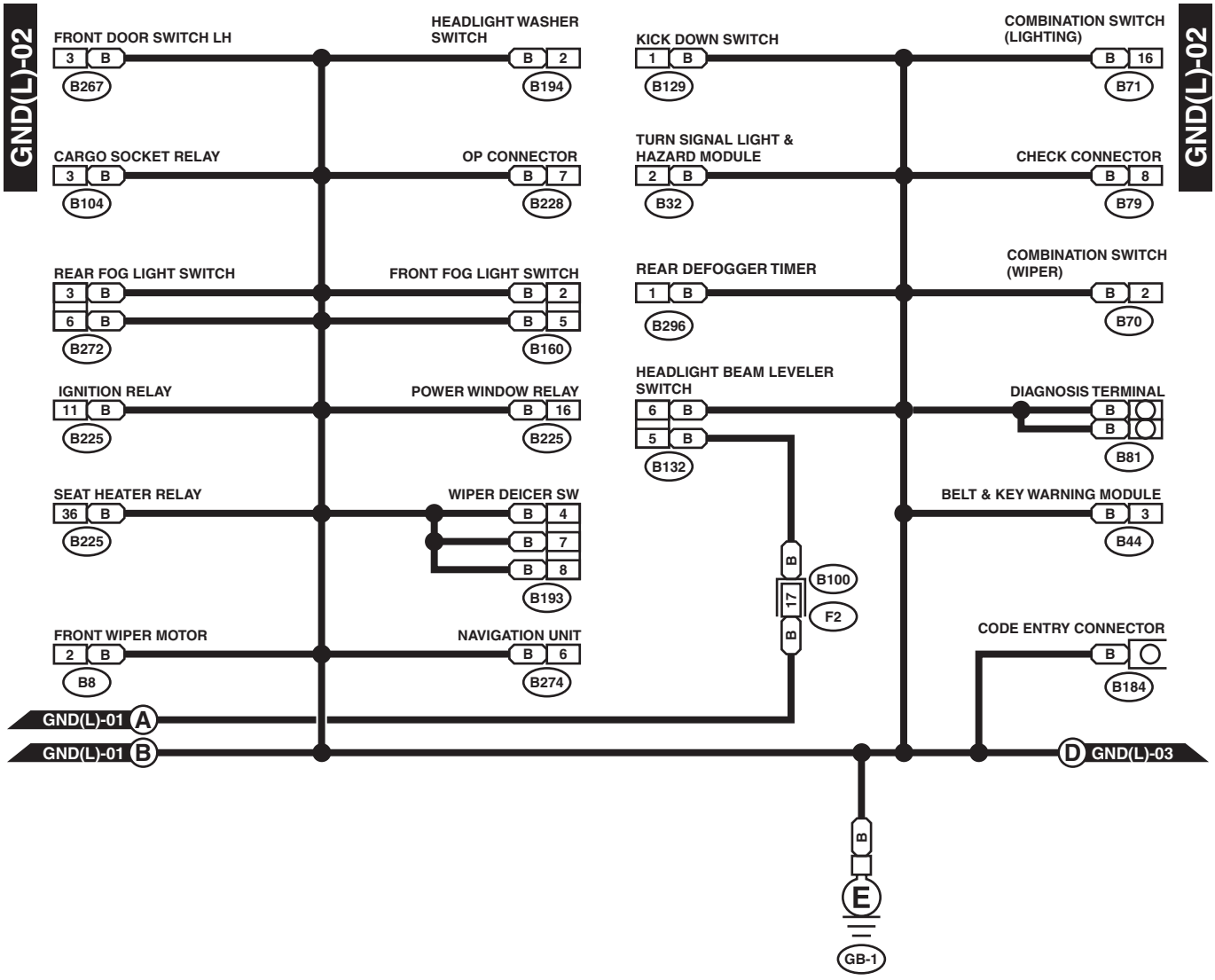
A: WIRING DIAGRAM

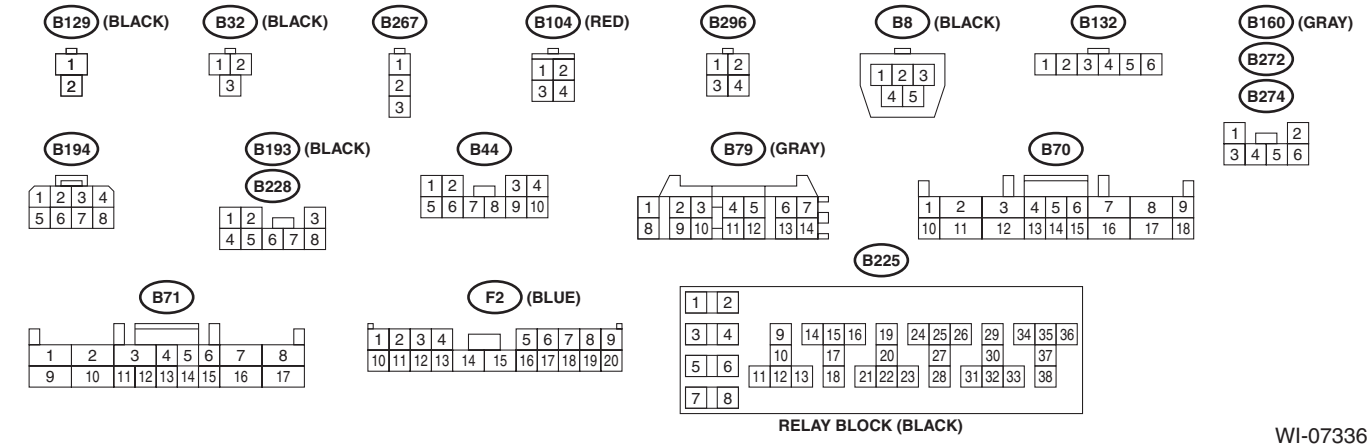
1. CHASSIS GROUND LHD MODEL



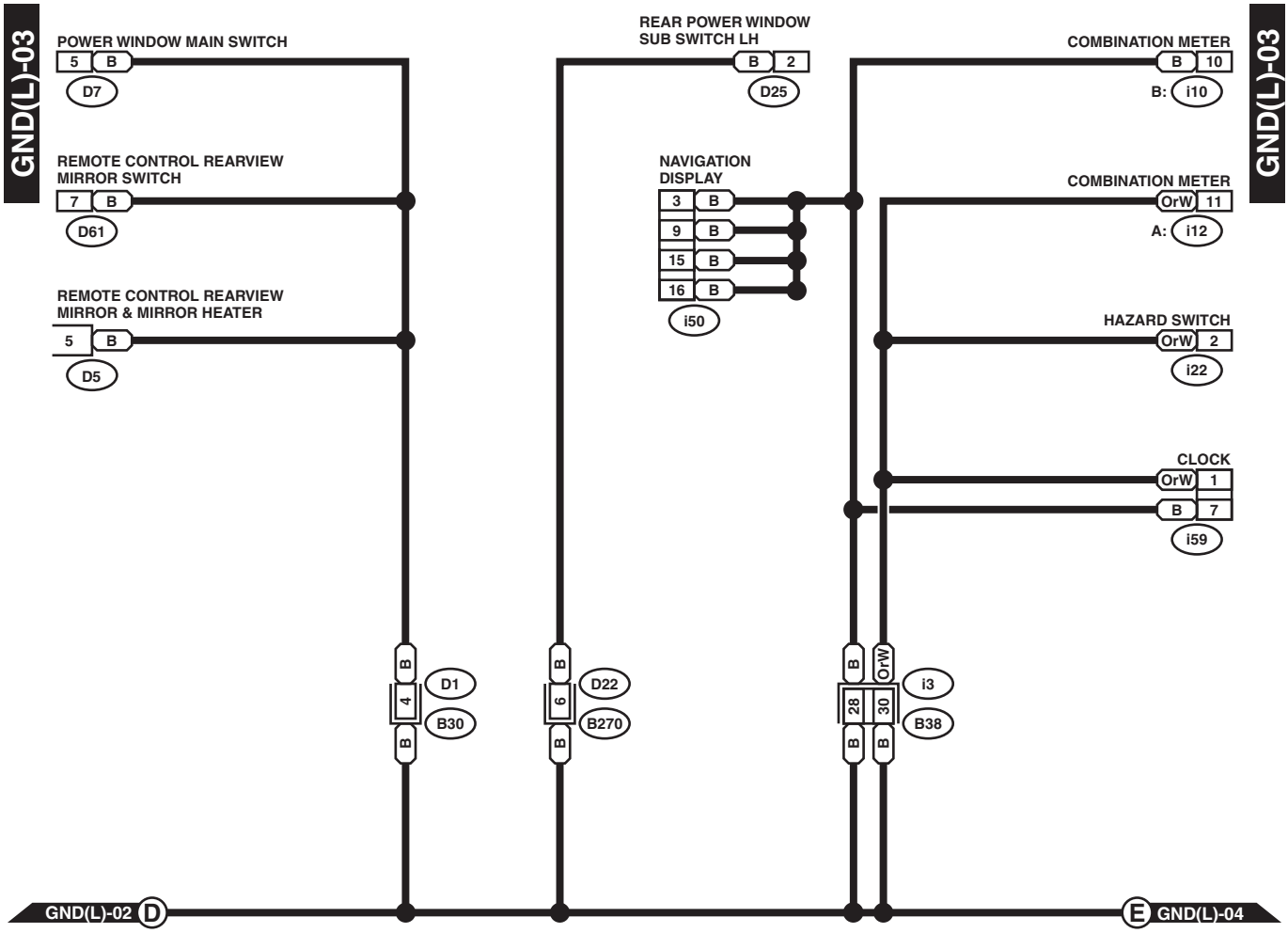
WI-07335

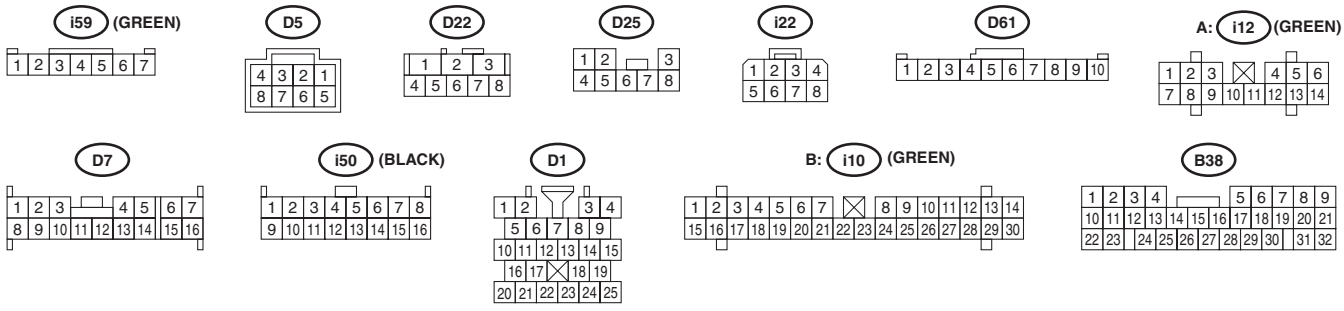
Ground Circuit





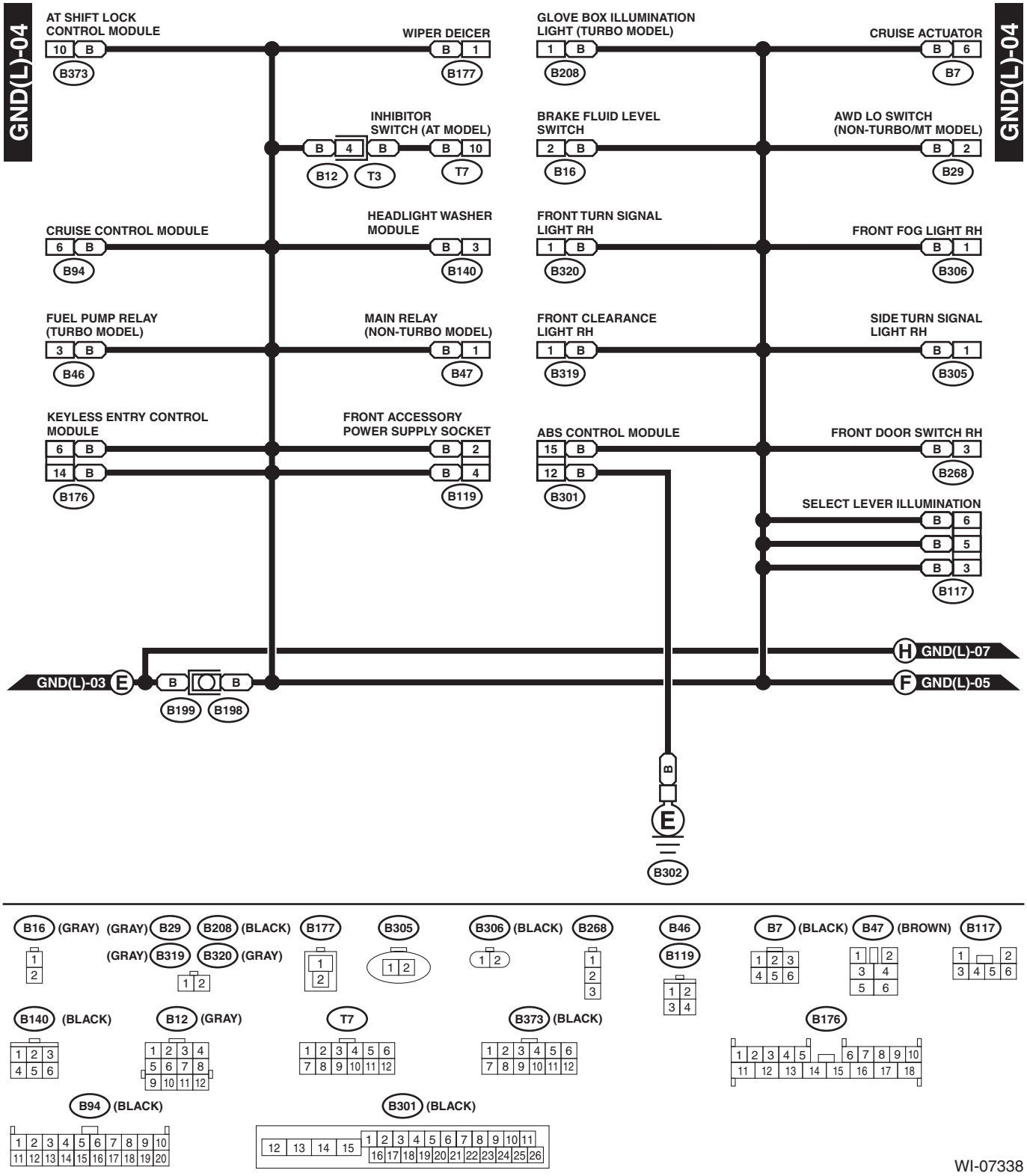
WI-07336


GND(L)-03
POWER WINDOW MAIN SWITCH
5 B
D7
REMOTE CONTROL REARVIEW MIRROR SWITCH
7 B
D61
REMOTE CONTROL REARVIEW MIRROR & MIRROR HEATER
5 B
D5
REAR POWER WINDOW SUB SWITCH LH
B 2
D25
NAVIGATION DISPLAY
3 B
9 B
15 B
16 B
i50
COMBINATION METER
B 10
B: i10
COMBINATION METER
OrW 11
A: i12
HAZARD SWITCH
OrW 2
i22
CLOCK
OrW 1
B 7
i59
GND(L)-03
B 4 B
D1
B30
B 6 B
D22
B270
B 28
OrW 30
B
i3
B38
GND(L)-02 D
E GND(L)-04

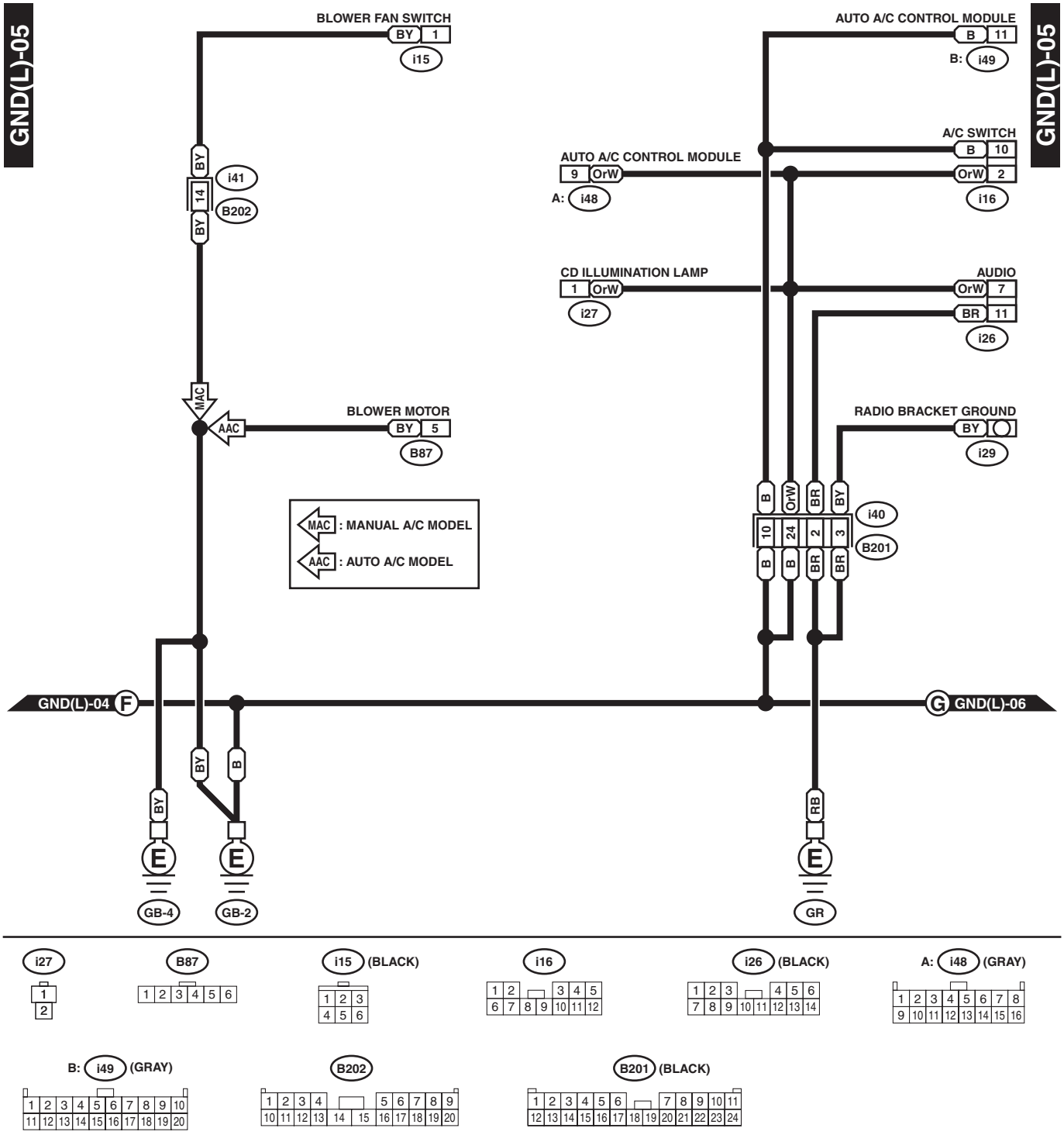

i59 (GREEN)
D5
D22
D25
i22
D61
A: i12 (GREEN)
D7
i50 (BLACK)
D1
B: i10 (GREEN)
B38

WI-07337

Ground Circuit

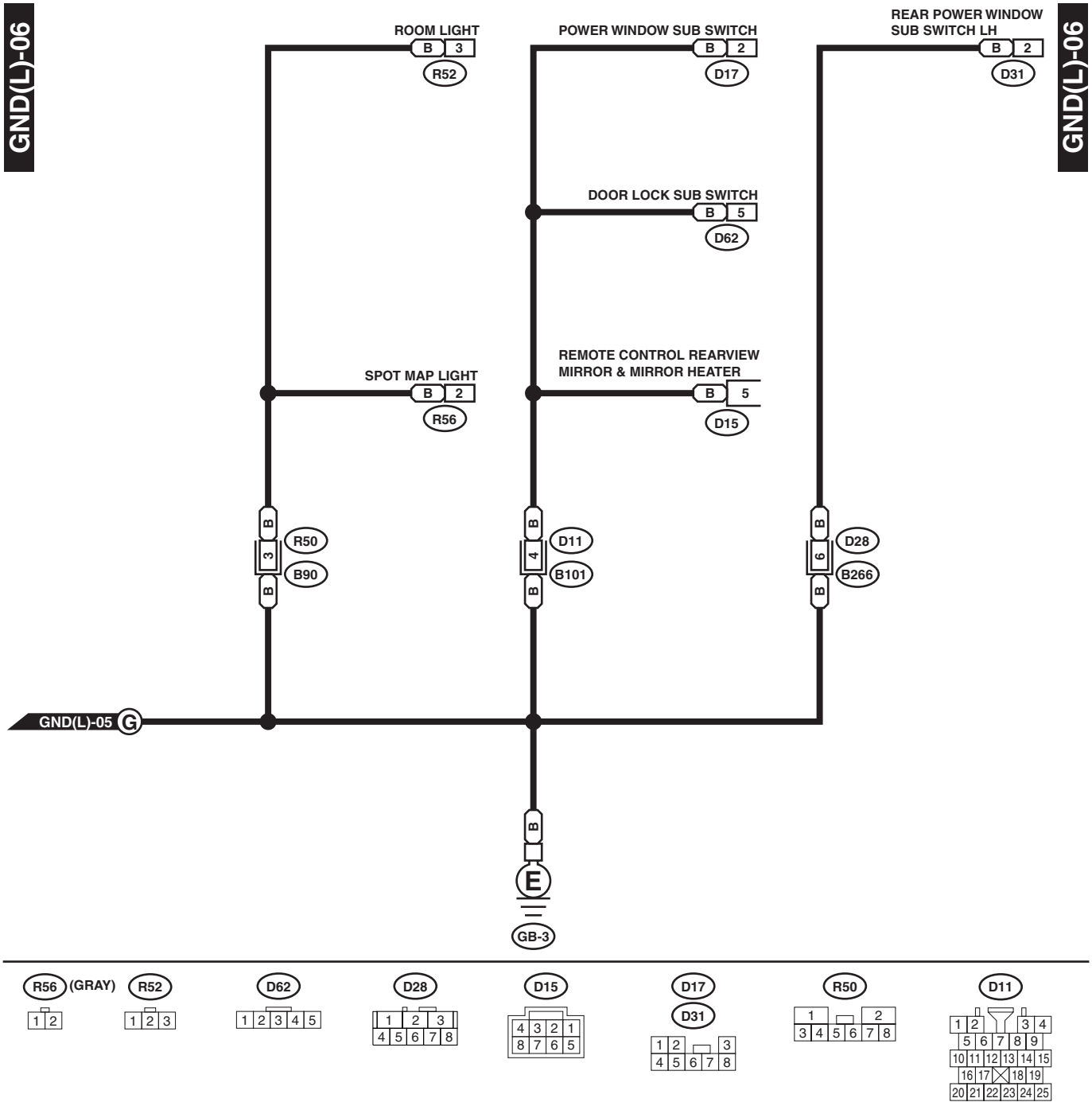


WI-07338

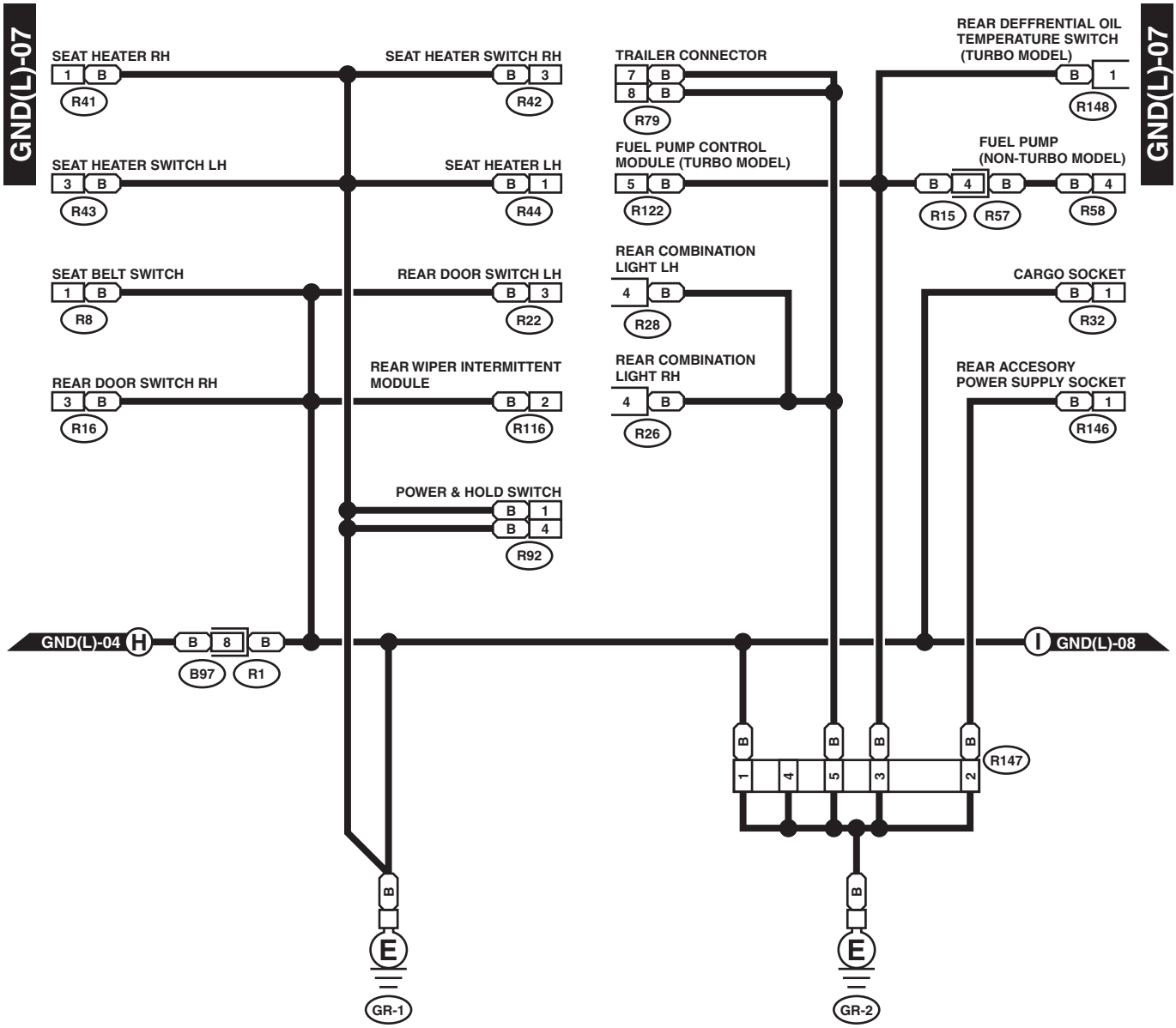

GND(L)-05
GND(L)-05
BLOWER FAN SWITCH
BY 1
i15
AUTO A/C CONTROL MODULE
B 11
B: i49
A/C SWITCH
B 10
OrW 2
i16
AUTO A/C CONTROL MODULE
9 OrW
A: i48
CD ILLUMINATION LAMP
1 OrW
i27
AUDIO
OrW 7
BR 11
i26
BY
i41
14
B202
BY
MAC
AAC
BLOWER MOTOR
BY 5
B87
RADIO BRACKET GROUND
BY
i29
MAC : MANUAL A/C MODEL
AAC : AUTO A/C MODEL
B
OrW
BR
BY
i40
10
24
2
3
B201
B
B
BR
BR
GND(L)-04 F
G GND(L)-06
BY
B
BY
RB
E
E
E
GB-4
GB-2
GR
i27
B87
i15 (BLACK)
i16
i26 (BLACK)
A: i48 (GRAY)
B: i49 (GRAY)
B202
B201 (BLACK)

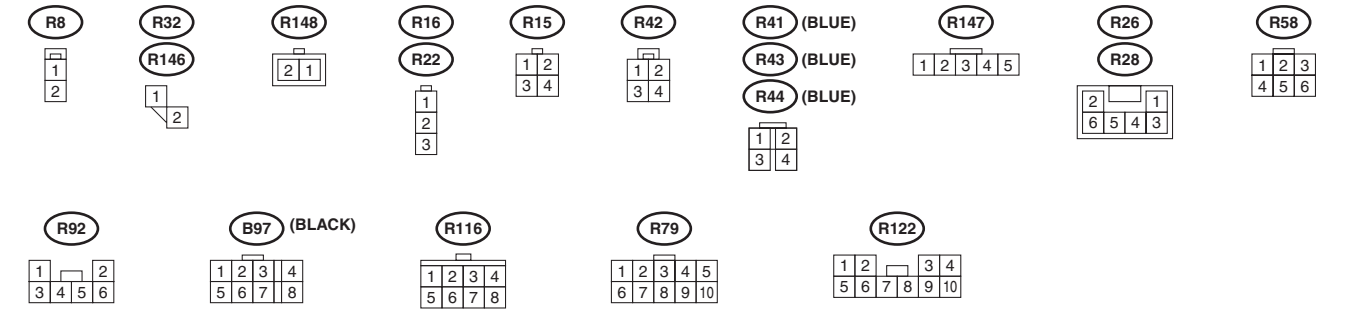
WI-07339

Ground Circuit



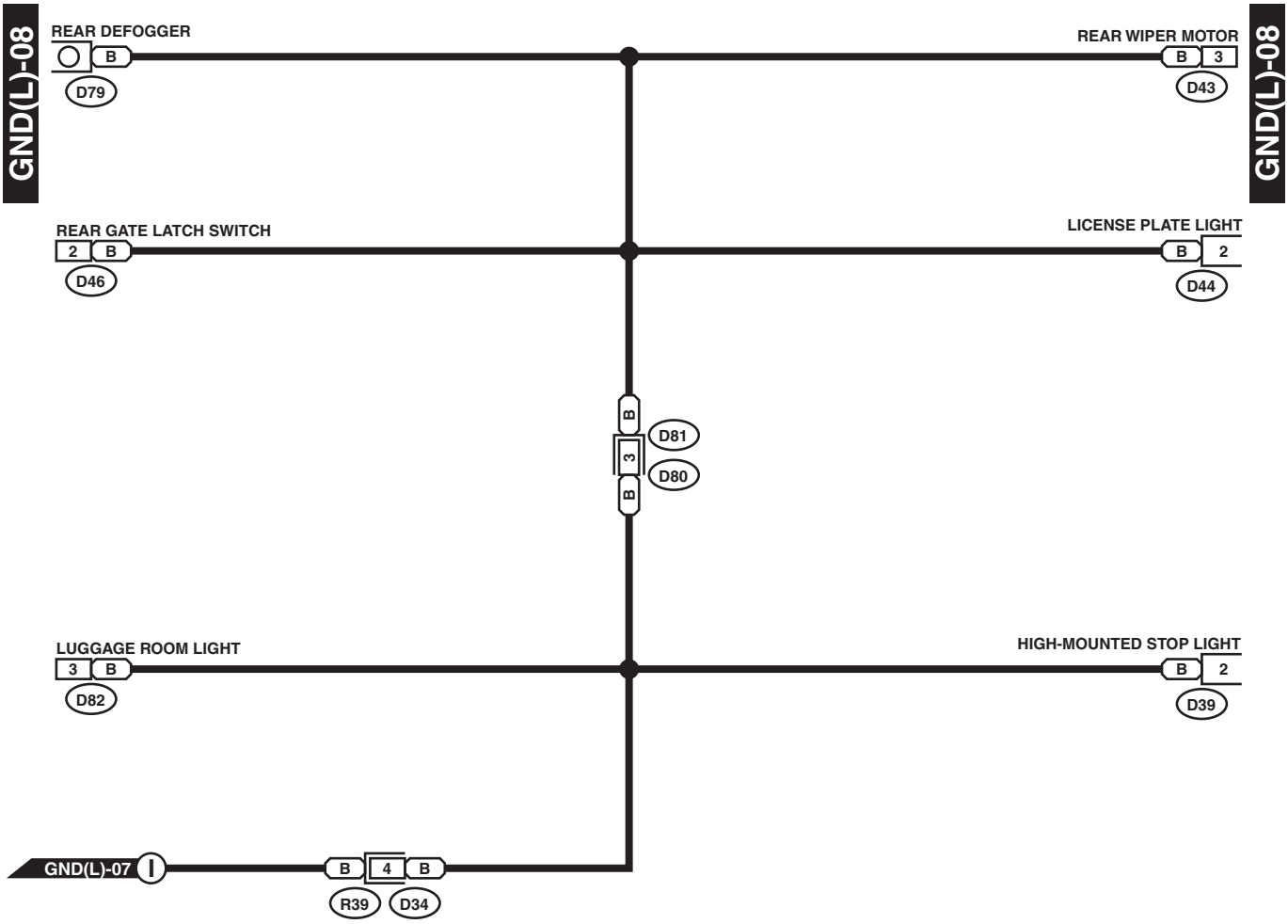
WI-07340

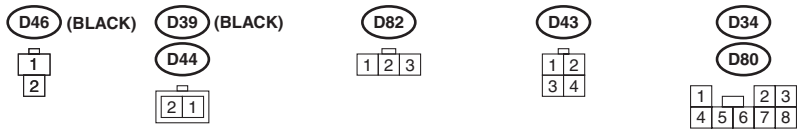

GND(L)-07
SEAT HEATER RH
SEAT HEATER SWITCH RH
SEAT HEATER SWITCH LH
SEAT HEATER LH
SEAT BELT SWITCH
REAR DOOR SWITCH LH
REAR DOOR SWITCH RH
REAR WIPER INTERMITTENT MODULE
POWER & HOLD SWITCH
TRAILER CONNECTOR
FUEL PUMP CONTROL MODULE (TURBO MODEL)
REAR COMBINATION LIGHT LH
REAR COMBINATION LIGHT RH
REAR DEFFRENTIAL OIL TEMPERATURE SWITCH (TURBO MODEL)
FUEL PUMP (NON-TURBO MODEL)
CARGO SOCKET
REAR ACCESORY POWER SUPPLY SOCKET
GND(L)-04
GND(L)-08
R41
R42
R43
R44
R8
R22
R16
R116
R92
R79
R122
R28
R26
R148
R15
R57
R58
R32
R146
R147
B97
R1
GR-1
GR-2


R8
R32
R146
R148
R16
R22
R15
R42
R41 (BLUE)
R43 (BLUE)
R44 (BLUE)
R147
R26
R28
R58
R92
B97 (BLACK)
R116
R79
R122

WI-05962

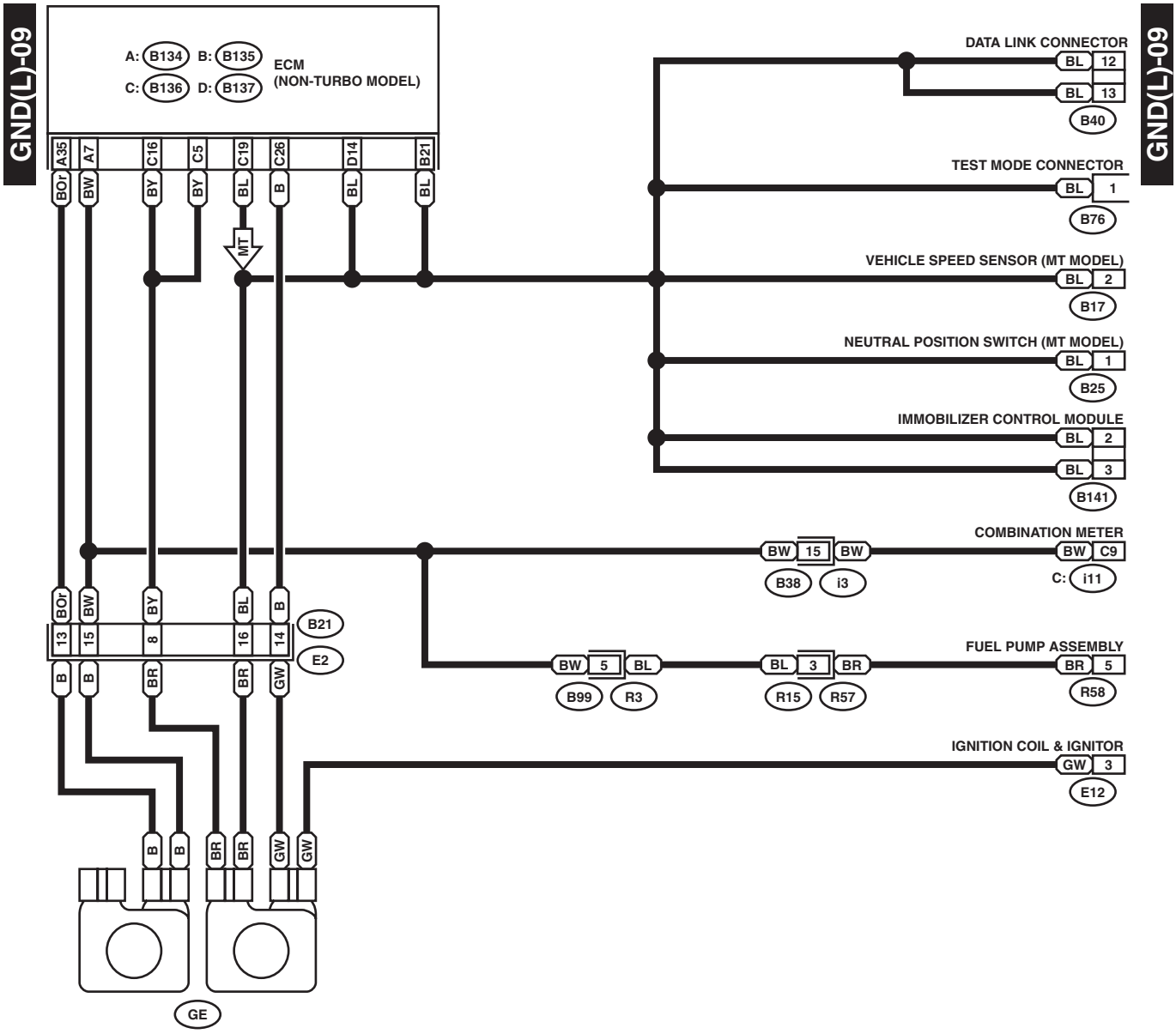
Ground Circuit

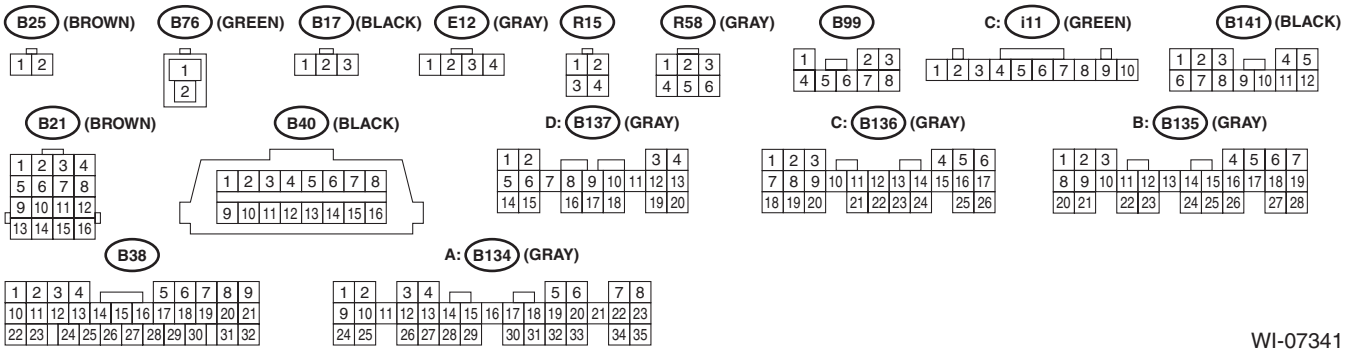




WI-05963

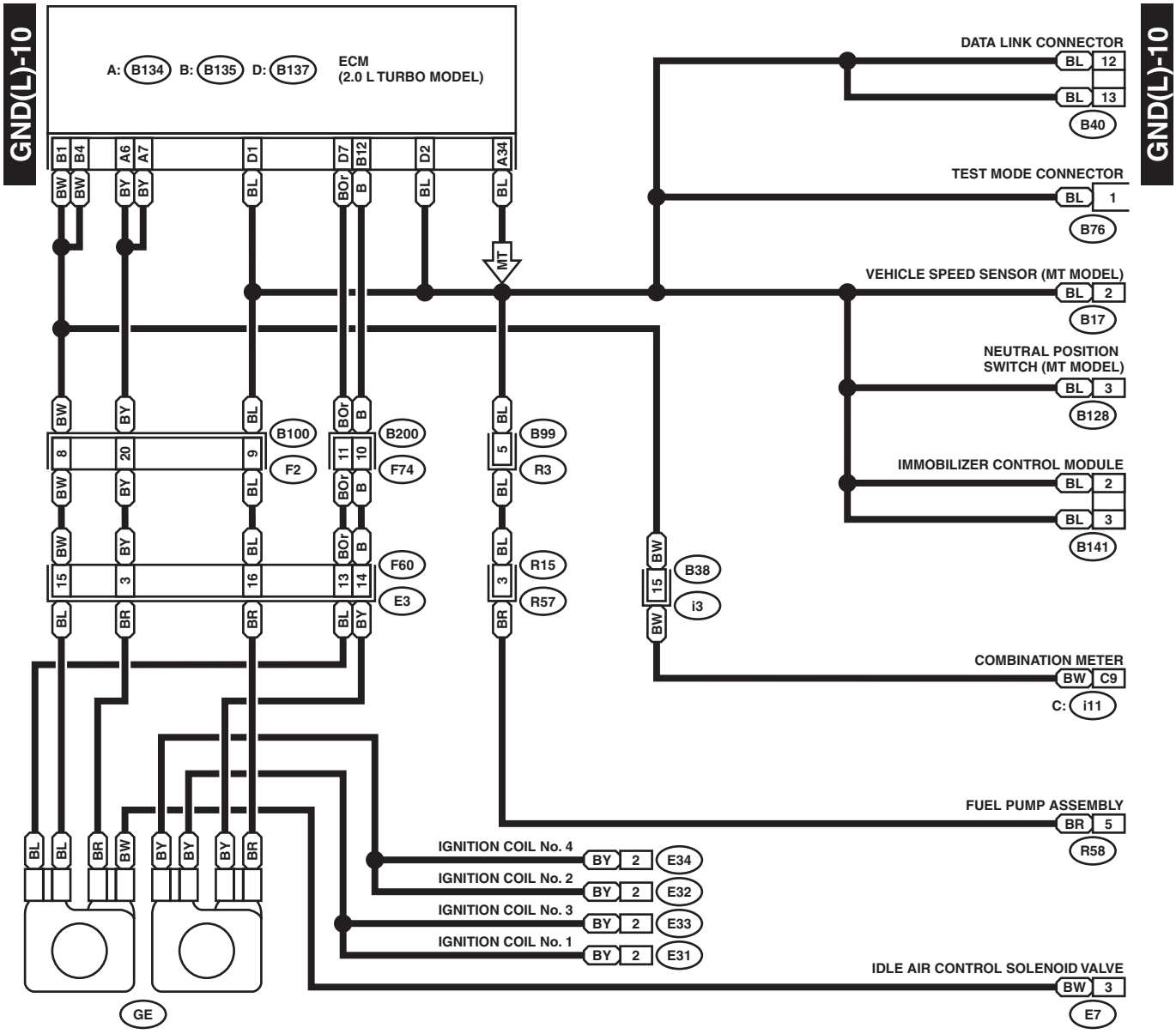
2. ENGINE GROUND LHD NON-TURBO MODEL

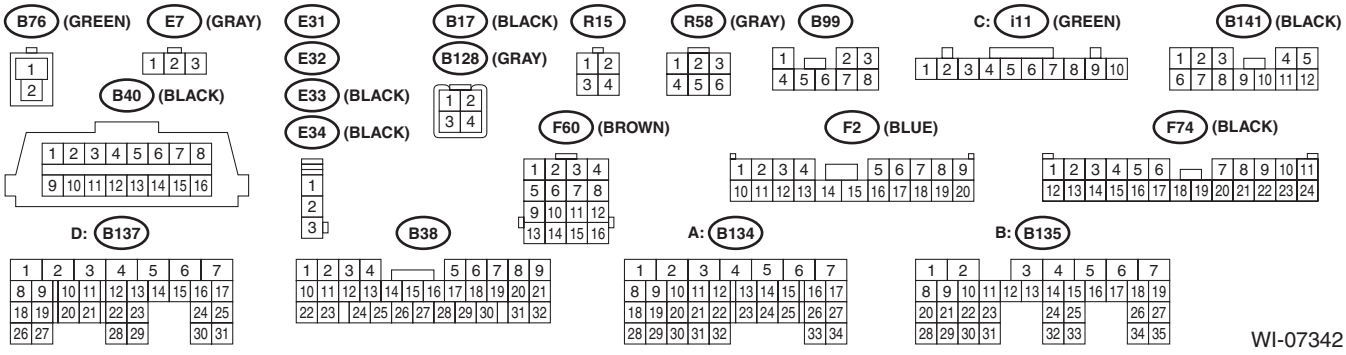




WI-07341

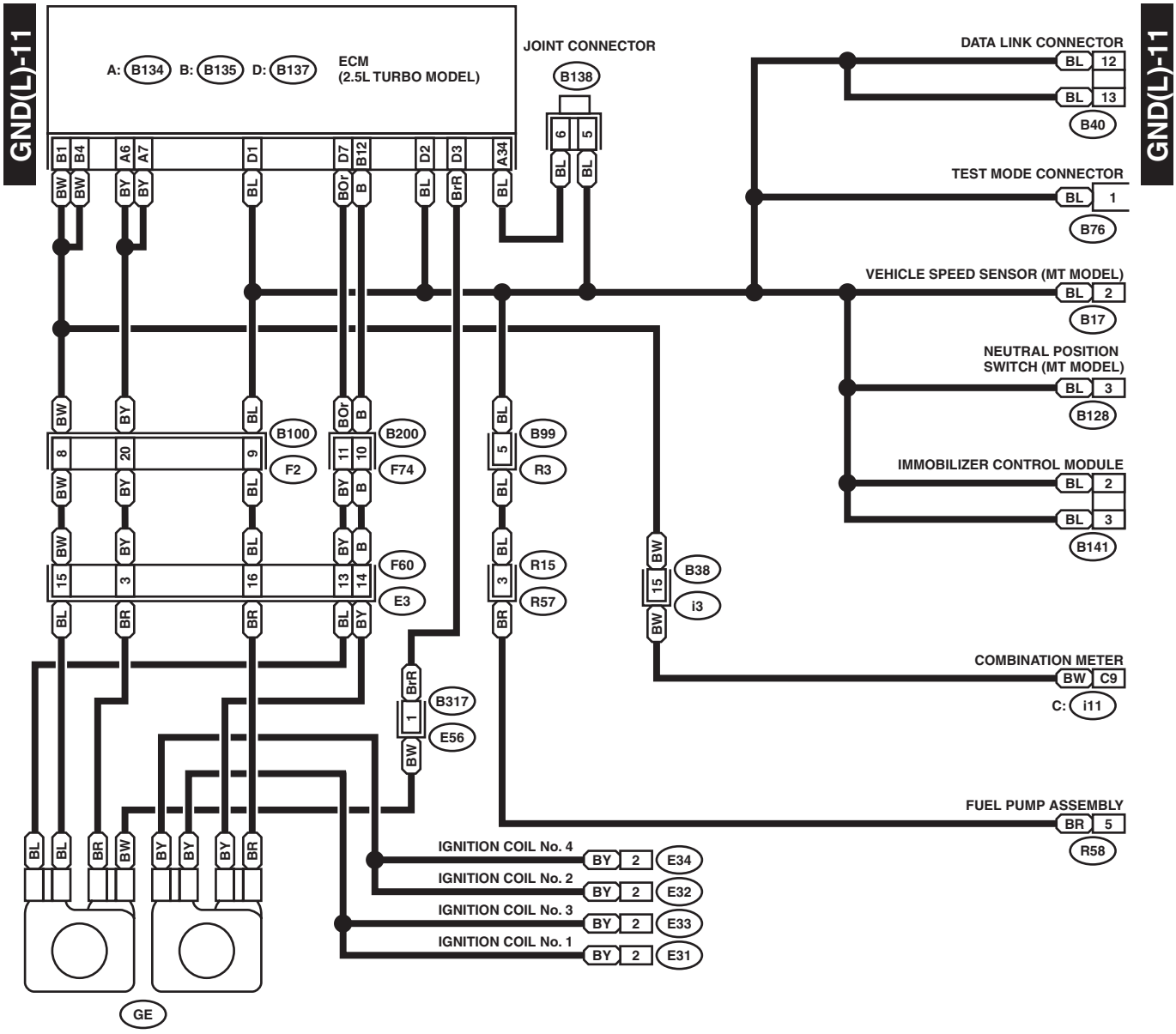
3. ENGINE GROUND LHD 2.0 L TURBO MODEL

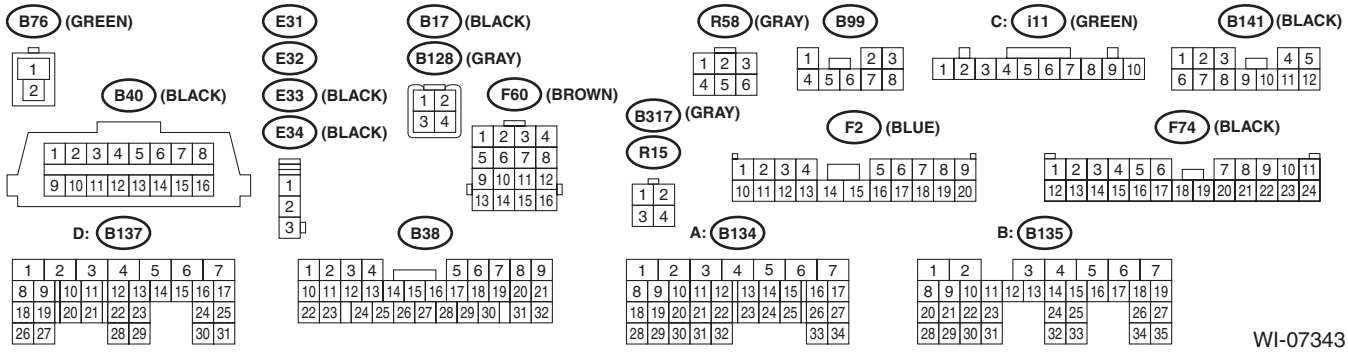




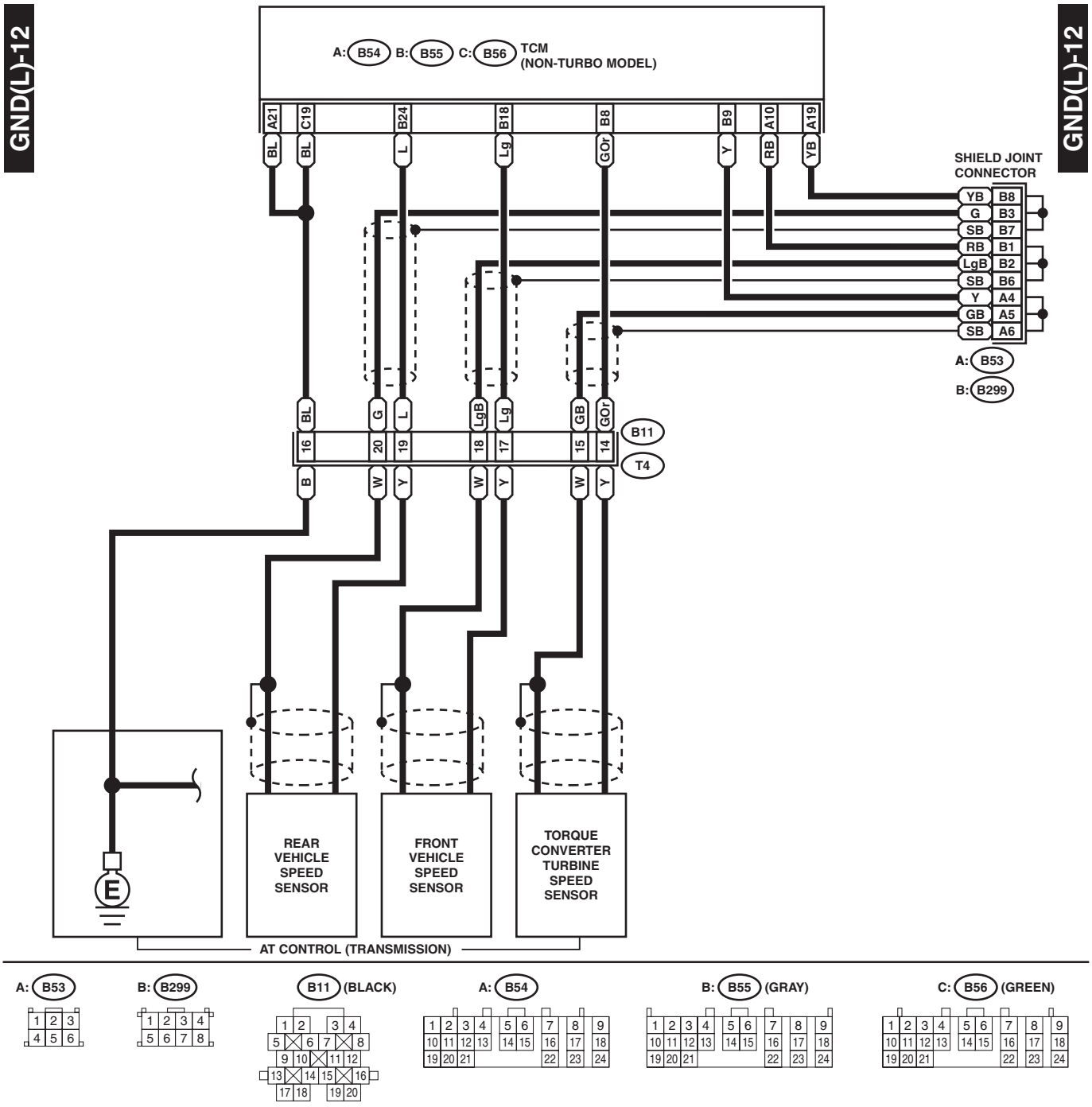
WI-07342

4. ENGINE GROUND LHD 2.5 L TURBO MODEL



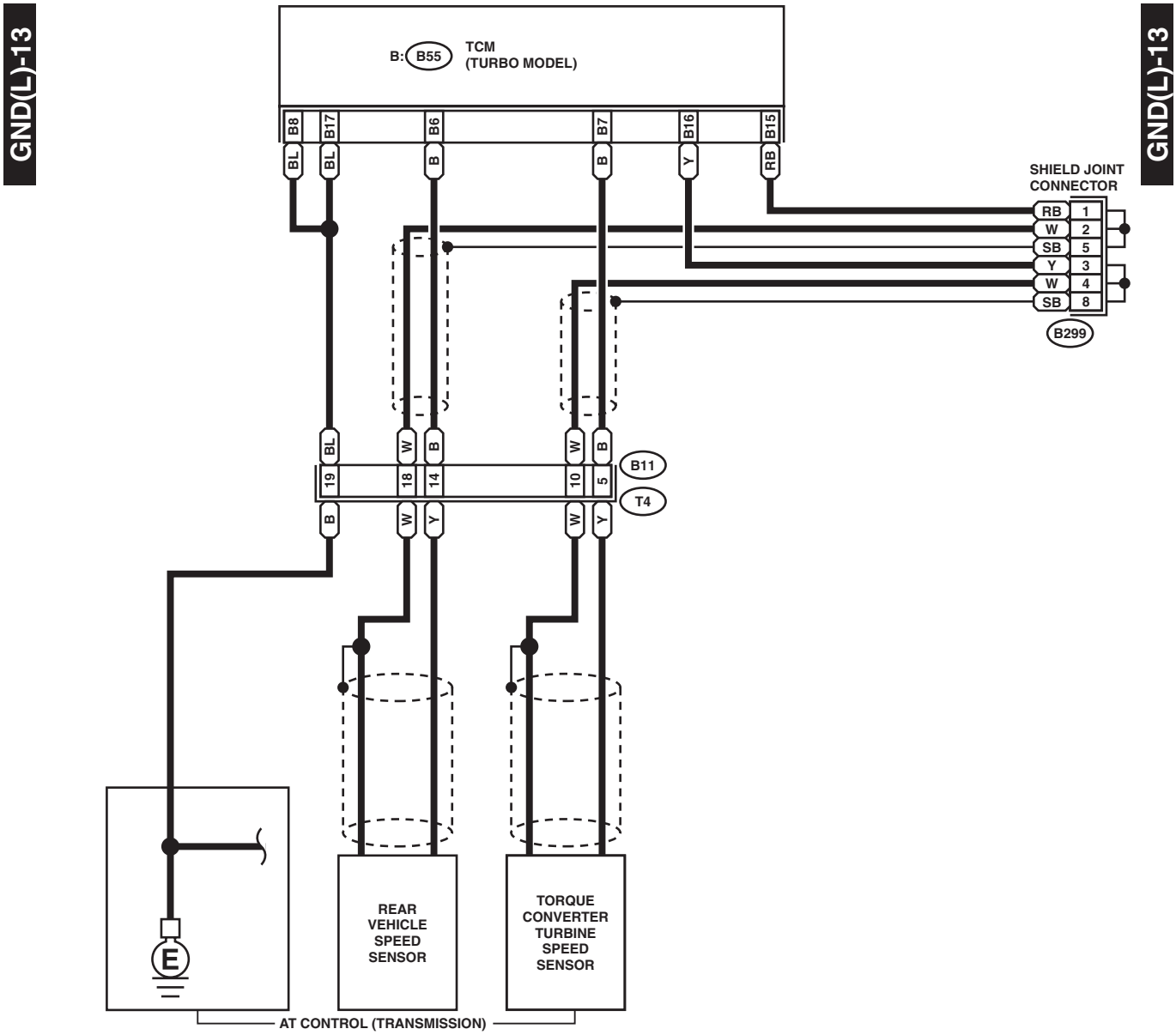


5. TRANSMISSION GROUND LHD NON-TURBO MODEL



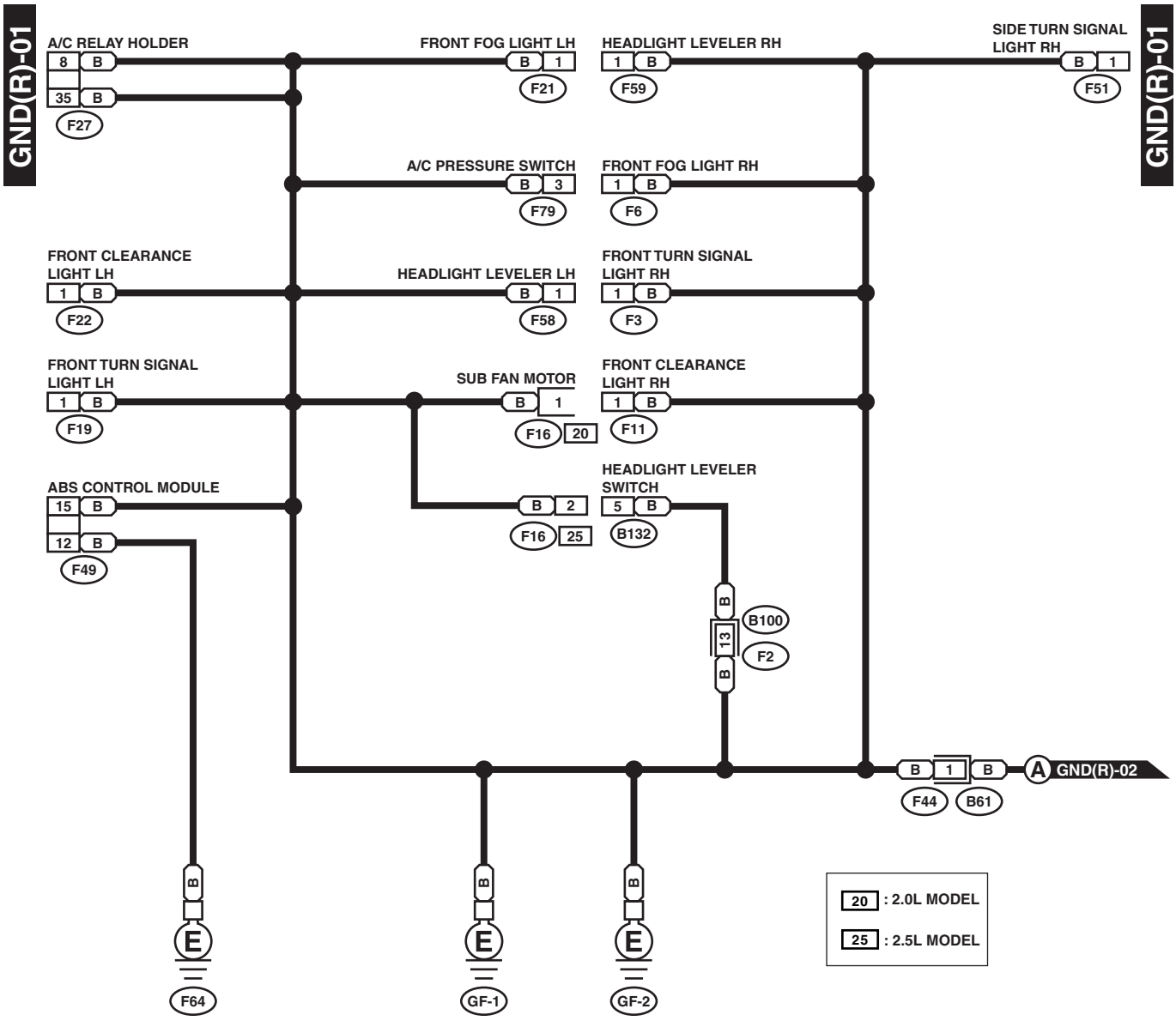
WI-03194

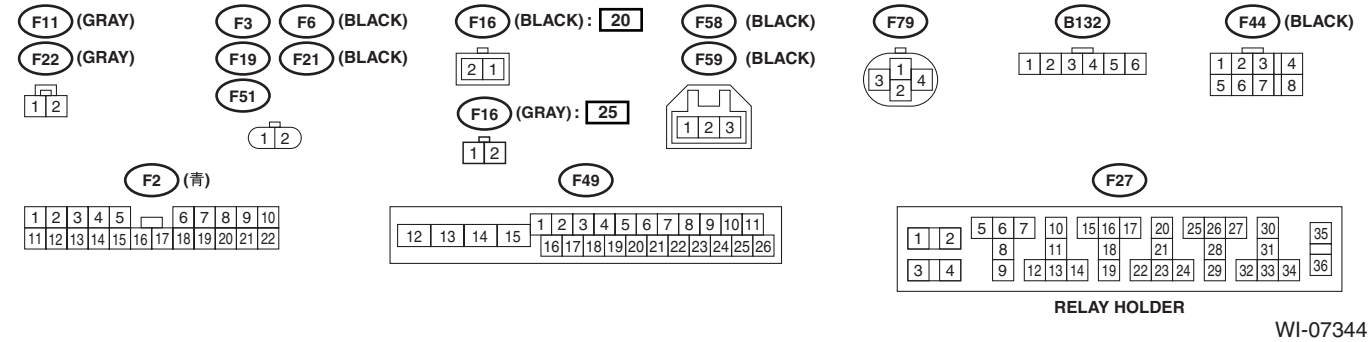
6. TRANSMISSION GROUND LHD TURBO MODEL



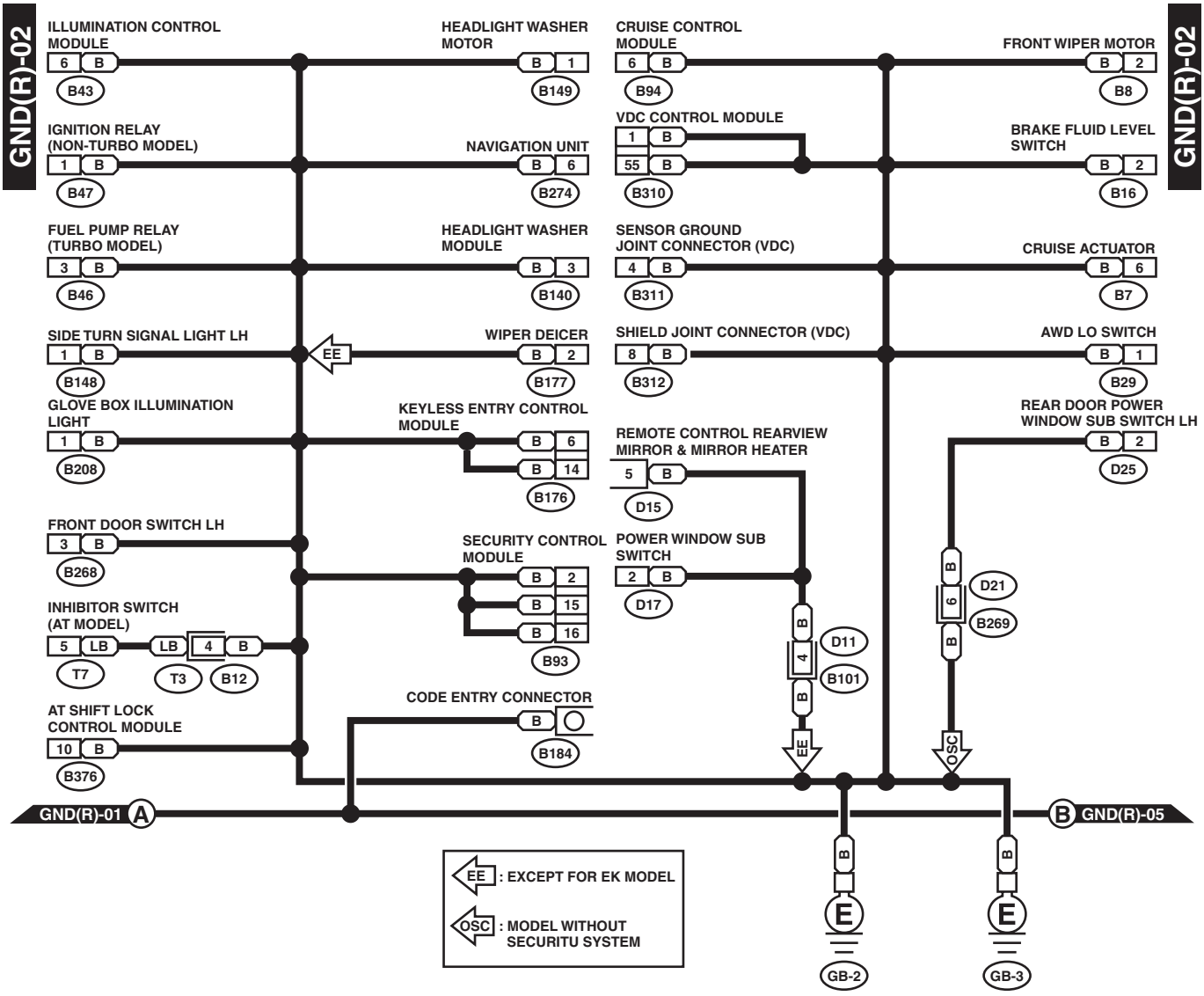
WI-05967

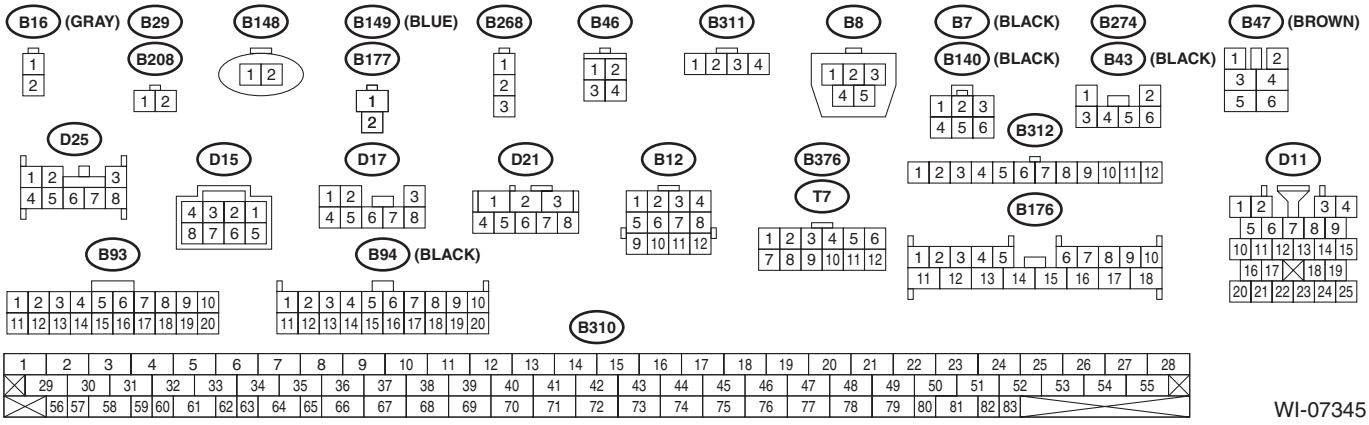
7. CHASSIS GROUND RHD MODEL





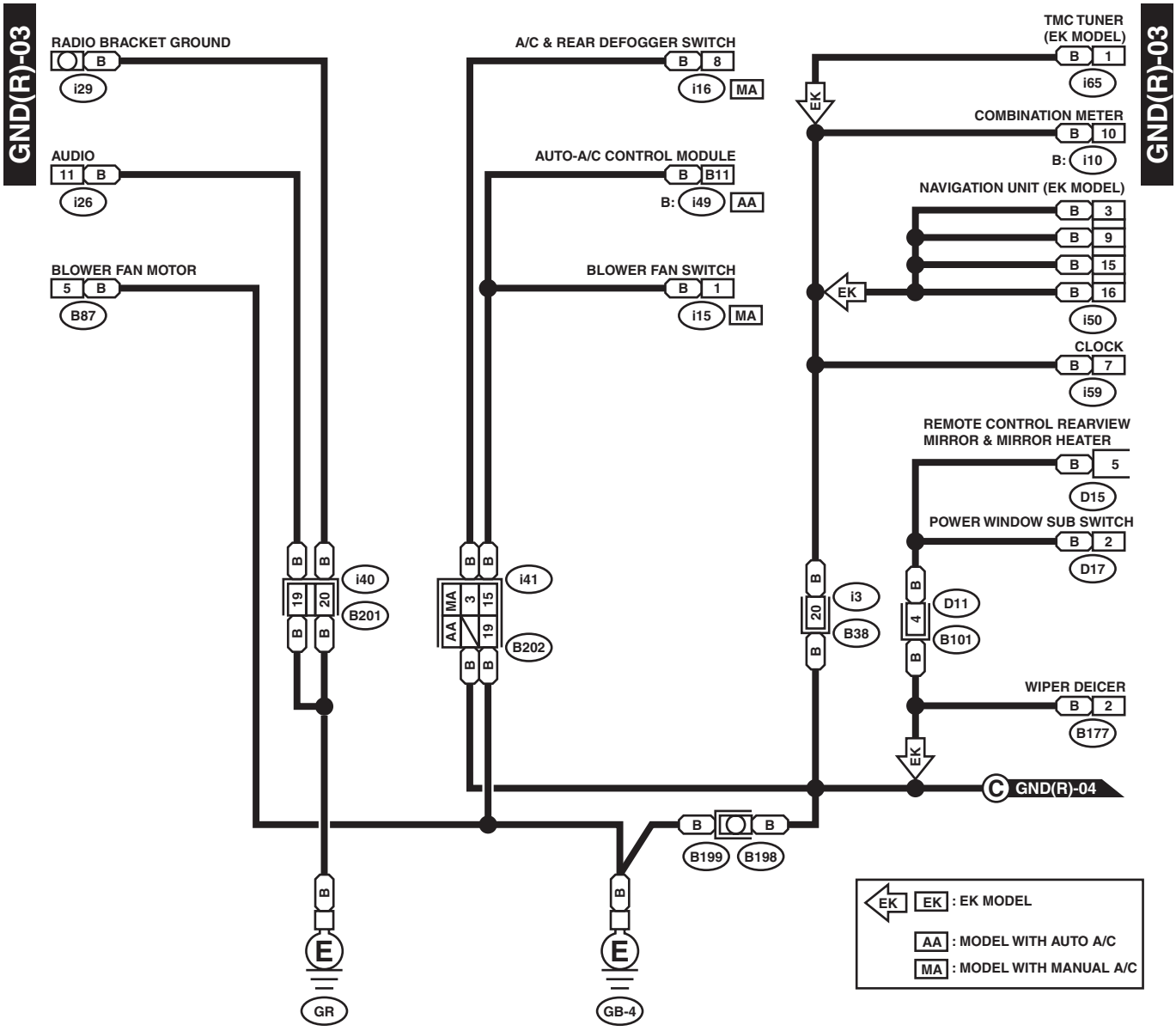
WI-07344

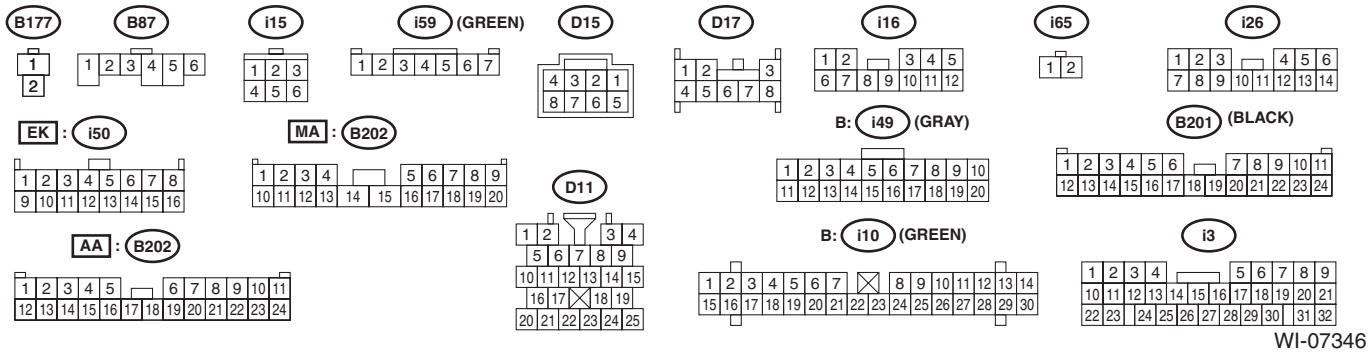

GND(R)-02
ILLUMINATION CONTROL MODULE
6 B
B43
HEADLIGHT WASHER MOTOR
B 1
B149
CRUISE CONTROL MODULE
6 B
B94
FRONT WIPER MOTOR
B 2
B8
GND(R)-02
IGNITION RELAY (NON-TURBO MODEL)
1 B
B47
NAVIGATION UNIT
B 6
B274
VDC CONTROL MODULE
1 B
55 B
B310
BRAKE FLUID LEVEL SWITCH
B 2
B16
FUEL PUMP RELAY (TURBO MODEL)
3 B
B46
HEADLIGHT WASHER MODULE
B 3
B140
SENSOR GROUND JOINT CONNECTOR (VDC)
4 B
B311
CRUISE ACTUATOR
B 6
B7
SIDE TURN SIGNAL LIGHT LH
1 B
B148
EE
WIPER DEICER
B 2
B177
SHIELD JOINT CONNECTOR (VDC)
8 B
B312
AWD LO SWITCH
B 1
B29
GLOVE BOX ILLUMINATION LIGHT
1 B
B208
KEYLESS ENTRY CONTROL MODULE
B 6
B 14
B176
REMOTE CONTROL REARVIEW MIRROR & MIRROR HEATER
5 B
D15
REAR DOOR POWER WINDOW SUB SWITCH LH
B 2
D25
FRONT DOOR SWITCH LH
3 B
B268
SECURITY CONTROL MODULE
B 2
B 15
B 16
B93
POWER WINDOW SUB SWITCH
2 B
D17
B
6
D21
B269
INHIBITOR SWITCH (AT MODEL)
5 LB
LB 4 B
T7
T3
B12
B
4
D11
B101
CODE ENTRY CONNECTOR
B
B184
AT SHIFT LOCK CONTROL MODULE
10 B
B376
EE
OSC
GND(R)-01 A
B GND(R)-05
B
E
GB-2
GB-3
EE : EXCEPT FOR EK MODEL
OSC : MODEL WITHOUT SECURITU SYSTEM


B16 (GRAY)
B29
B208
B148
B149 (BLUE)
B177
B268
B46
B311
B8
B7 (BLACK)
B140 (BLACK)
B274
B43 (BLACK)
B47 (BROWN)
D25
D15
D17
D21
B12
B376
T7
B312
B176
D11
B93
B94 (BLACK)
B310

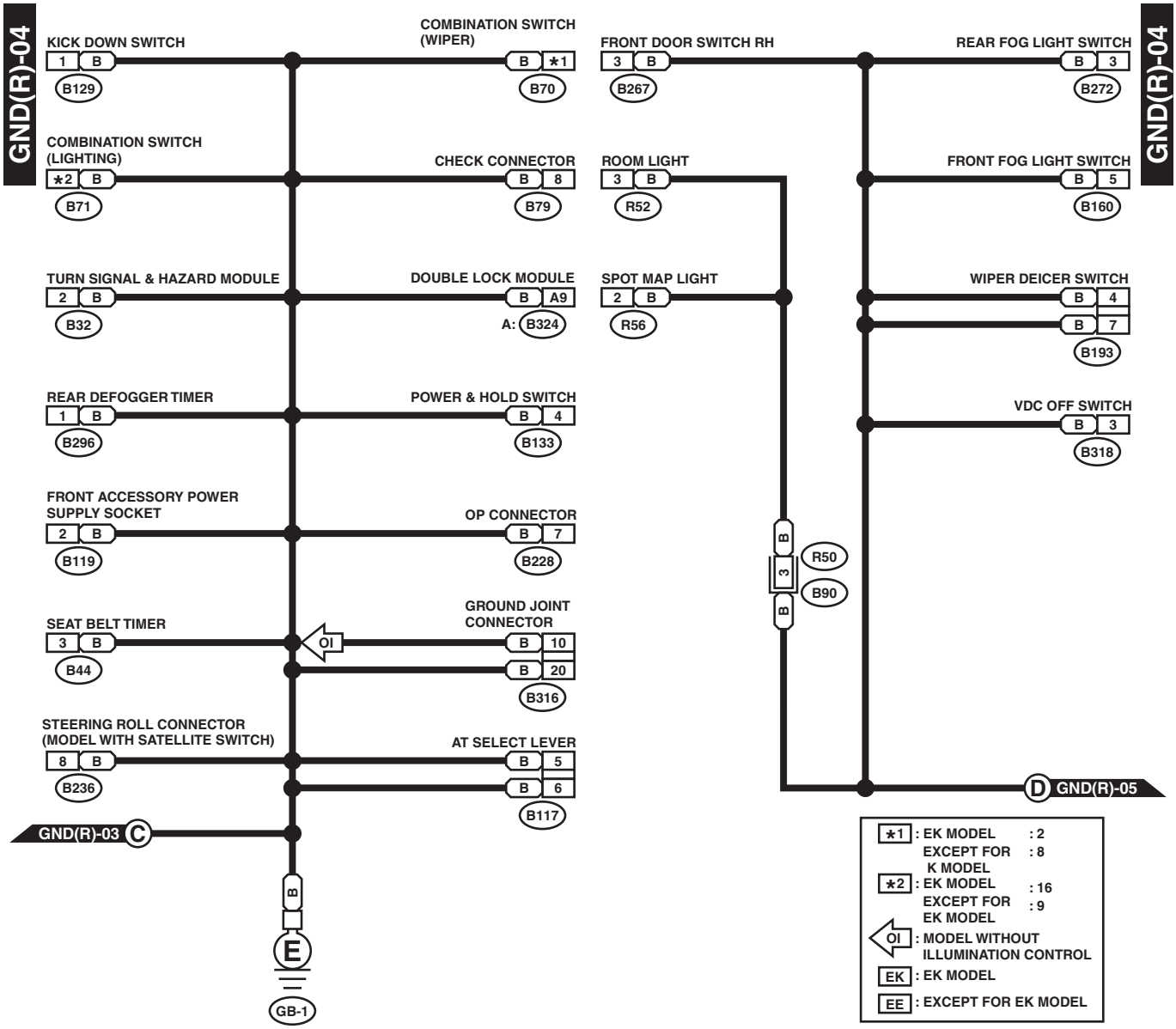
WI-07345

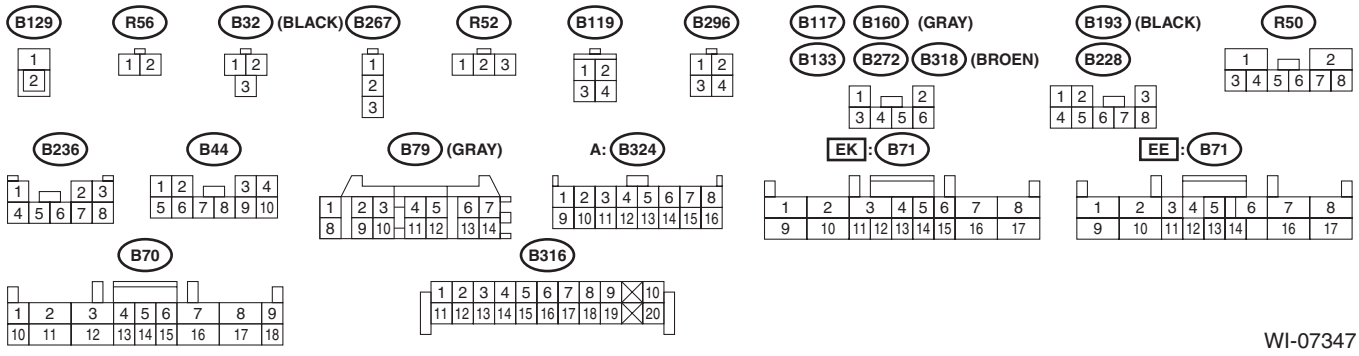
Ground Circuit





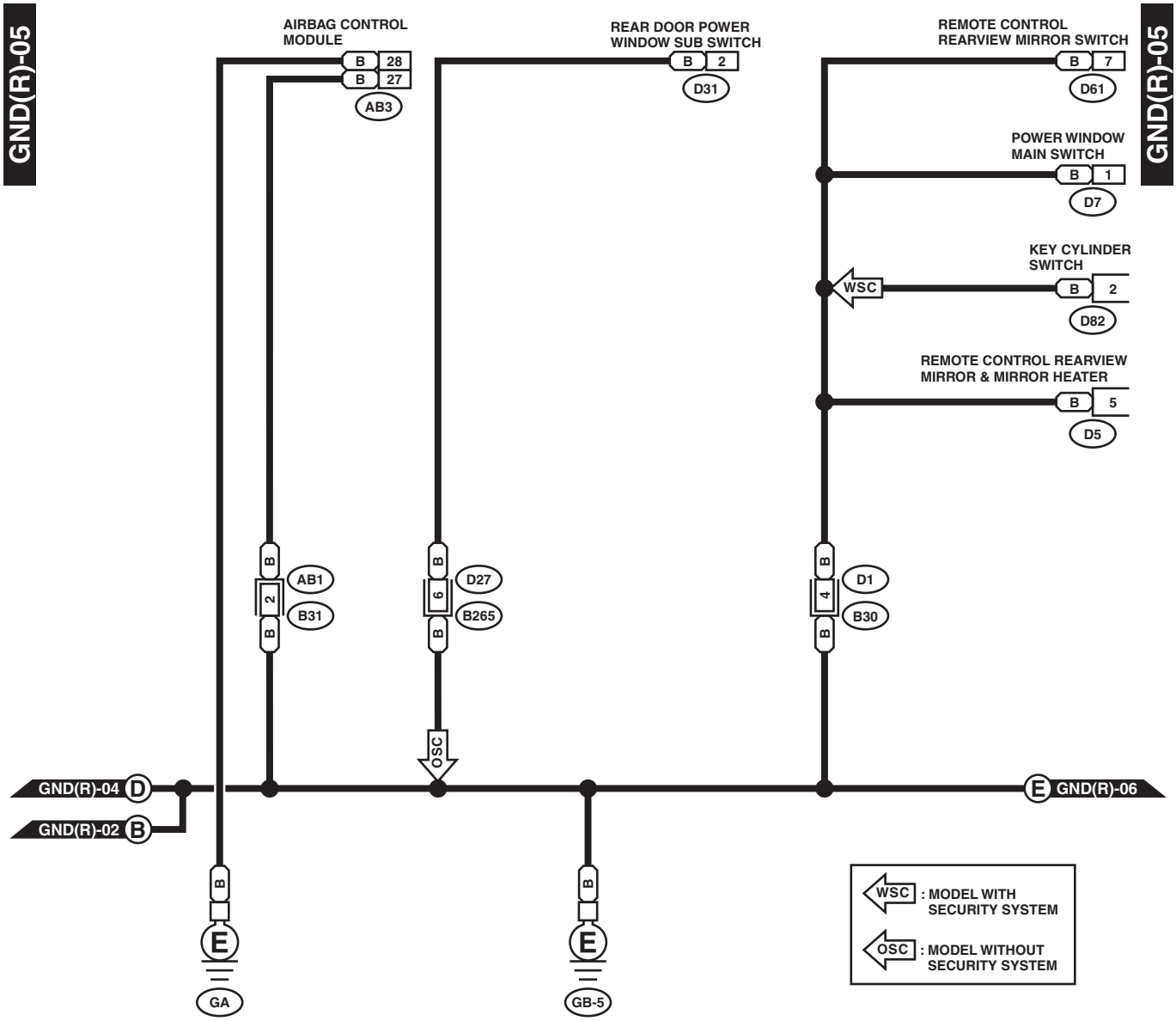
WI-07346

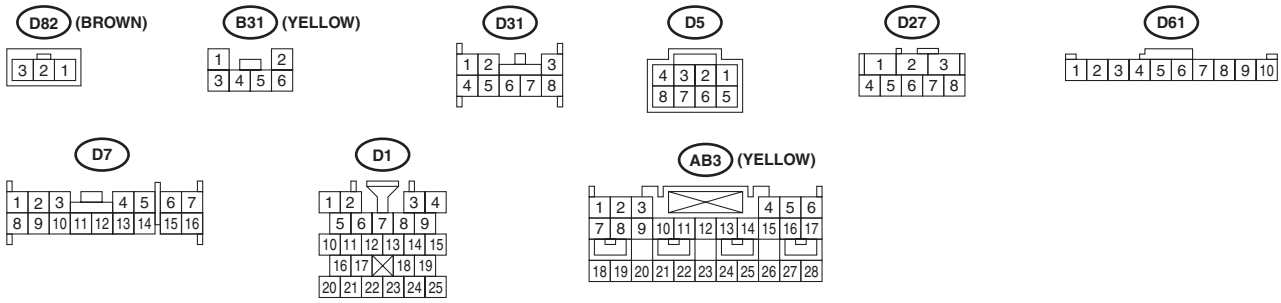

GND(R)-04
KICK DOWN SWITCH
1 B
B129
COMBINATION SWITCH (WIPER)
B *1
B70
COMBINATION SWITCH (LIGHTING)
*2 B
B71
CHECK CONNECTOR
B 8
B79
TURN SIGNAL & HAZARD MODULE
2 B
B32
DOUBLE LOCK MODULE
B A9
A: B324
REAR DEFOGGER TIMER
1 B
B296
POWER & HOLD SWITCH
B 4
B133
FRONT ACCESSORY POWER SUPPLY SOCKET
2 B
B119
OP CONNECTOR
B 7
B228
SEAT BELT TIMER
3 B
B44
OI
GROUND JOINT CONNECTOR
B 10
B 20
B316
STEERING ROLL CONNECTOR (MODEL WITH SATELLITE SWITCH)
8 B
B236
AT SELECT LEVER
B 5
B 6
B117
GND(R)-03 C
B
E
GB-1
FRONT DOOR SWITCH RH
3 B
B267
ROOM LIGHT
3 B
R52
SPOT MAP LIGHT
2 B
R56
B 3 B
R50
B90
REAR FOG LIGHT SWITCH
B 3
B272
FRONT FOG LIGHT SWITCH
B 5
B160
WIPER DEICER SWITCH
B 4
B 7
B193
VDC OFF SWITCH
B 3
B318
D GND(R)-05
GND(R)-04
*1 : EK MODEL : 2
EXCEPT FOR K MODEL : 8
*2 : EK MODEL : 16
EXCEPT FOR EK MODEL : 9
OI : MODEL WITHOUT ILLUMINATION CONTROL
EK : EK MODEL
EE : EXCEPT FOR EK MODEL


B129
R56
B32 (BLACK)
B267
R52
B119
B296
B117
B160 (GRAY)
B133
B272
B318 (BROEN)
B193 (BLACK)
B228
R50
B236
B44
B79 (GRAY)
A: B324
EK : B71
EE : B71
B70
B316

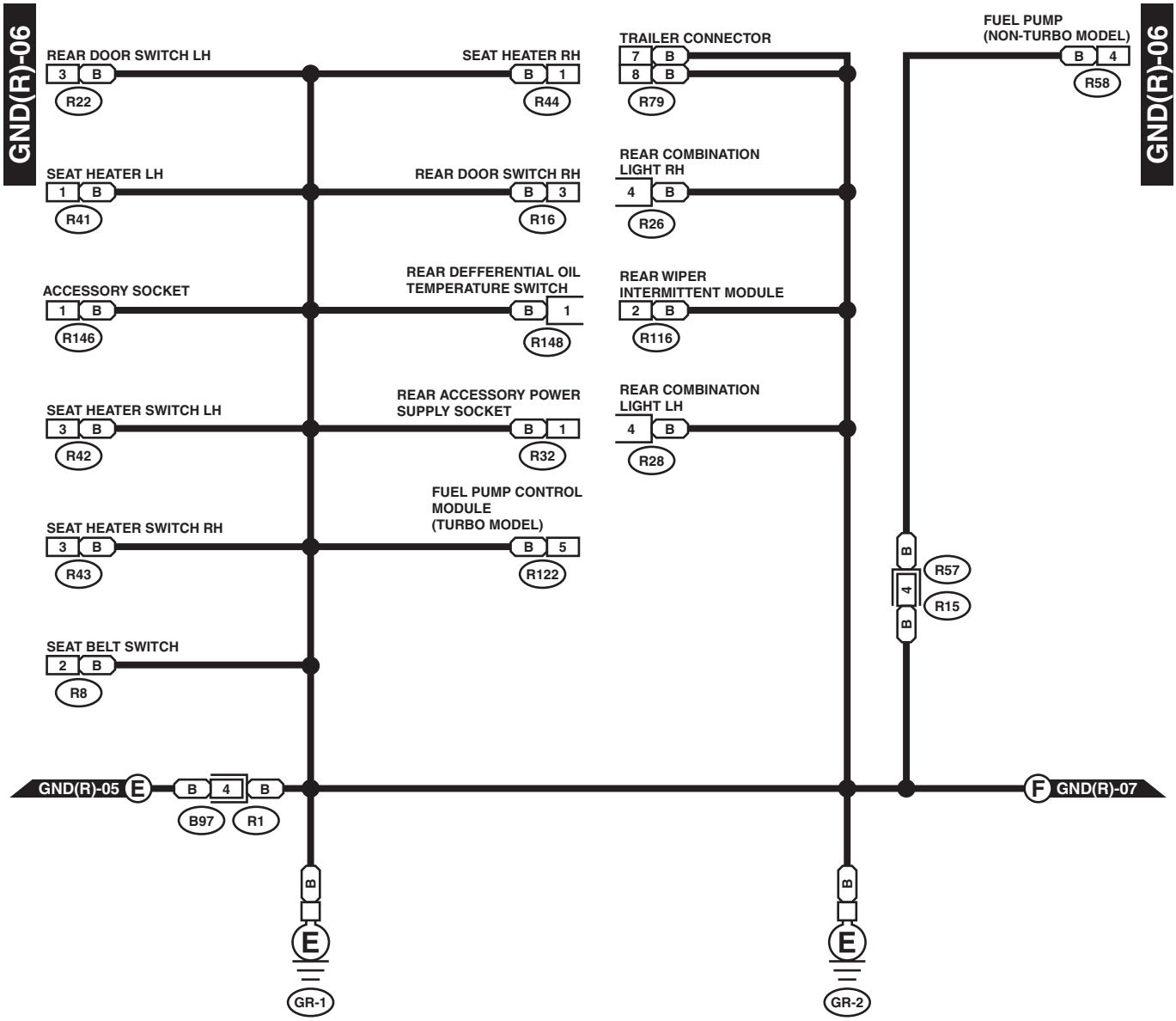
WI-07347

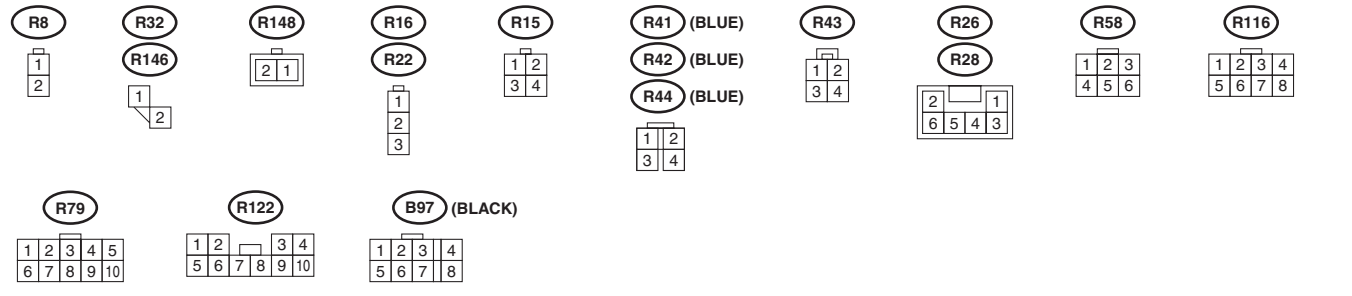
Ground Circuit





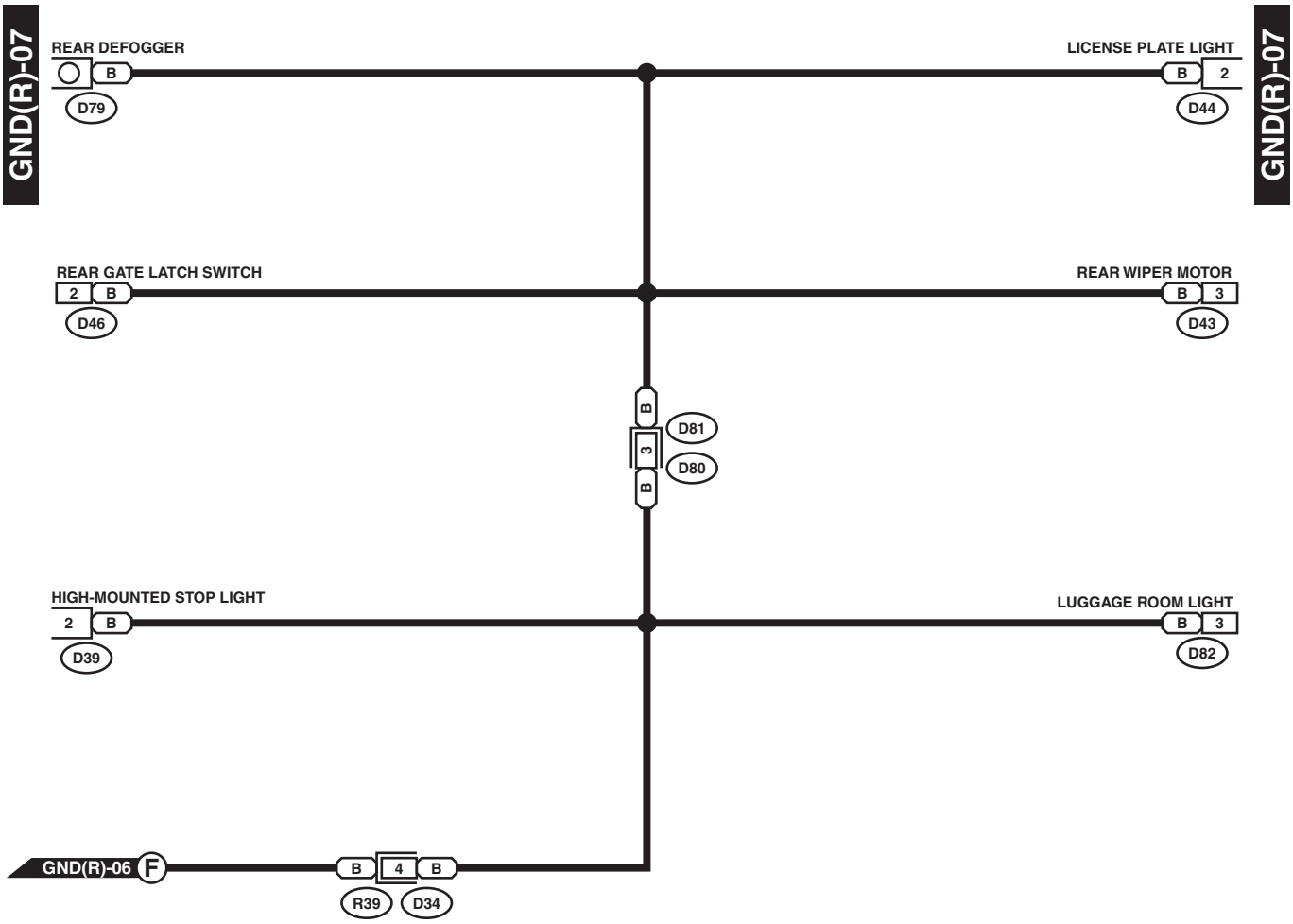
WI-07348

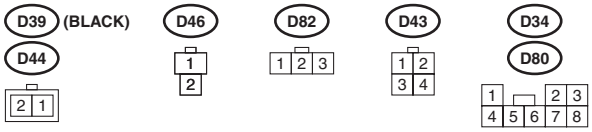

GND(R)-06
REAR DOOR SWITCH LH
3 B
R22
SEAT HEATER RH
B 1
R44
TRAILER CONNECTOR
7 B
8 B
R79
FUEL PUMP
(NON-TURBO MODEL)
B 4
R58
GND(R)-06
SEAT HEATER LH
1 B
R41
REAR DOOR SWITCH RH
B 3
R16
REAR COMBINATION
LIGHT RH
4 B
R26
ACCESSORY SOCKET
1 B
R146
REAR DEFFERENTIAL OIL
TEMPERATURE SWITCH
B 1
R148
REAR WIPER
INTERMITTENT MODULE
2 B
R116
SEAT HEATER SWITCH LH
3 B
R42
REAR ACCESSORY POWER
SUPPLY SOCKET
B 1
R32
REAR COMBINATION
LIGHT LH
4 B
R28
FUEL PUMP CONTROL
MODULE
(TURBO MODEL)
SEAT HEATER SWITCH RH
3 B
R43
B 5
R122
B
4
B
R57
R15
SEAT BELT SWITCH
2 B
R8
GND(R)-05 E
B 4 B
B97 R1
F GND(R)-07
B
E
GR-1
B
E
GR-2


R8
R32
R146
R148
R16
R22
R15
R41 (BLUE)
R42 (BLUE)
R44 (BLUE)
R43
R26
R28
R58
R116
R79
R122
B97 (BLACK)

WI-07349

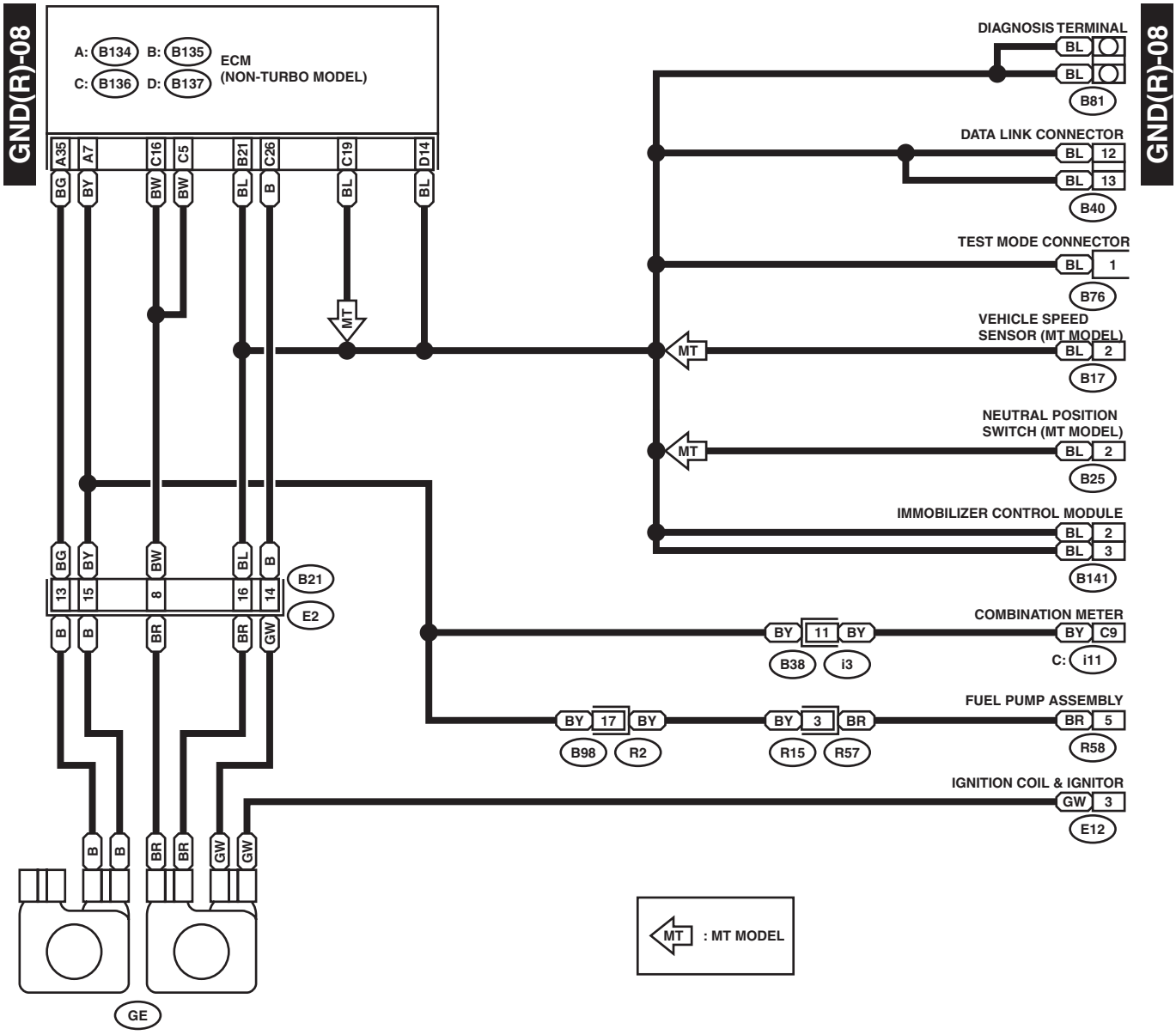
Ground Circuit

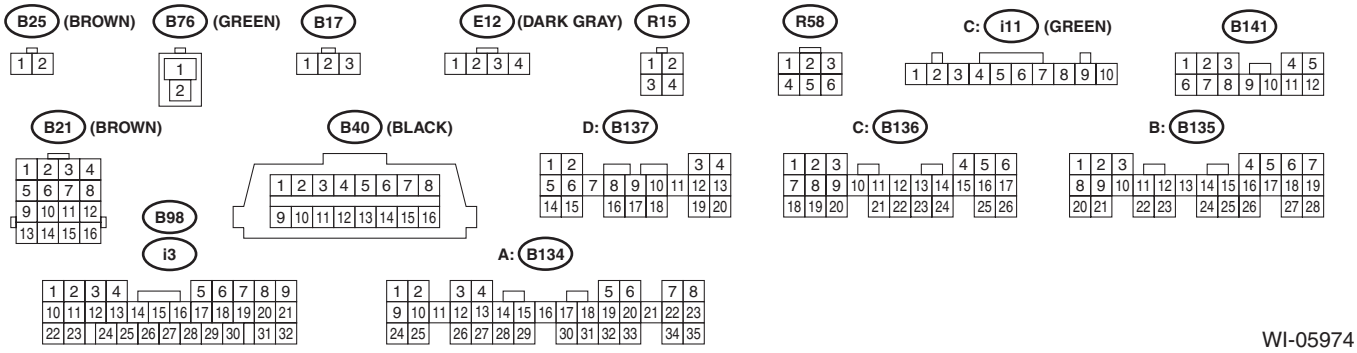




WI-00252

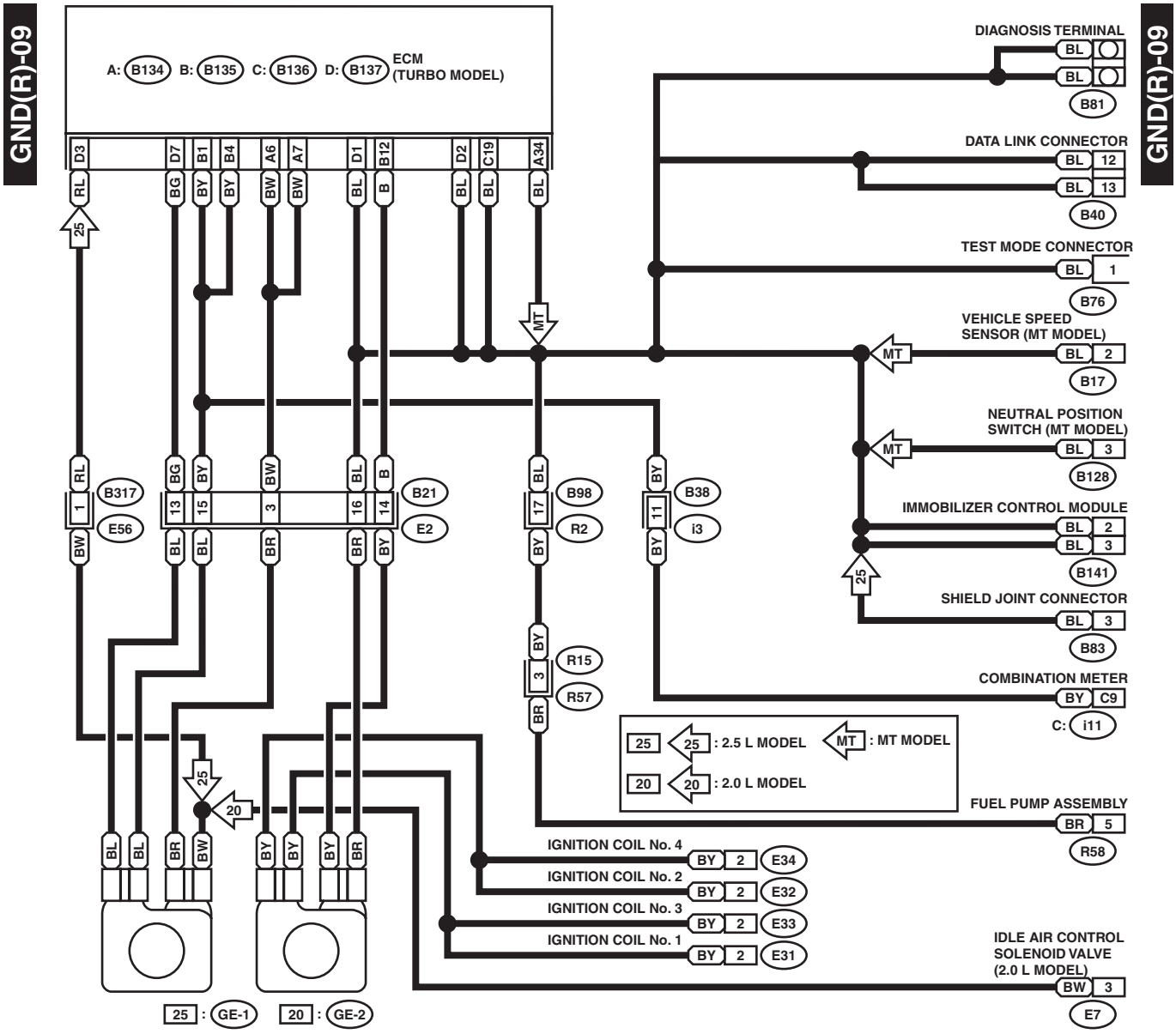
8. ENGINE GROUND RHD NON-TURBO MODEL

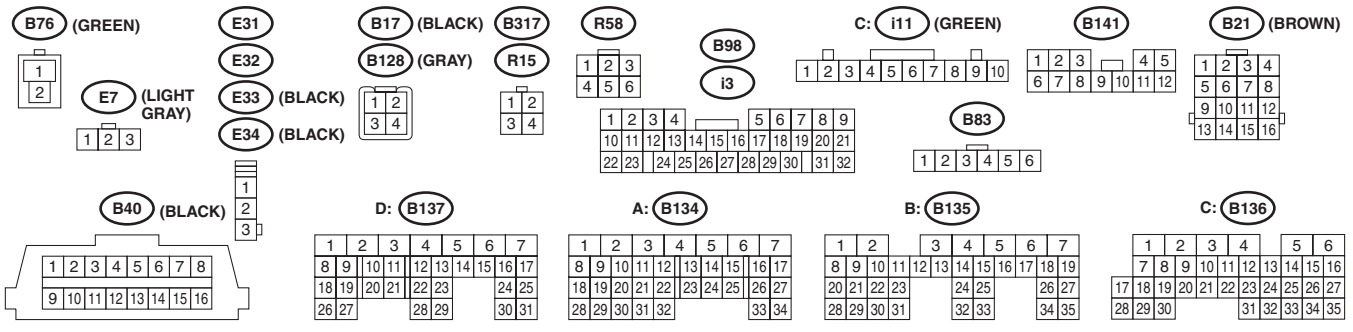




WI-05974

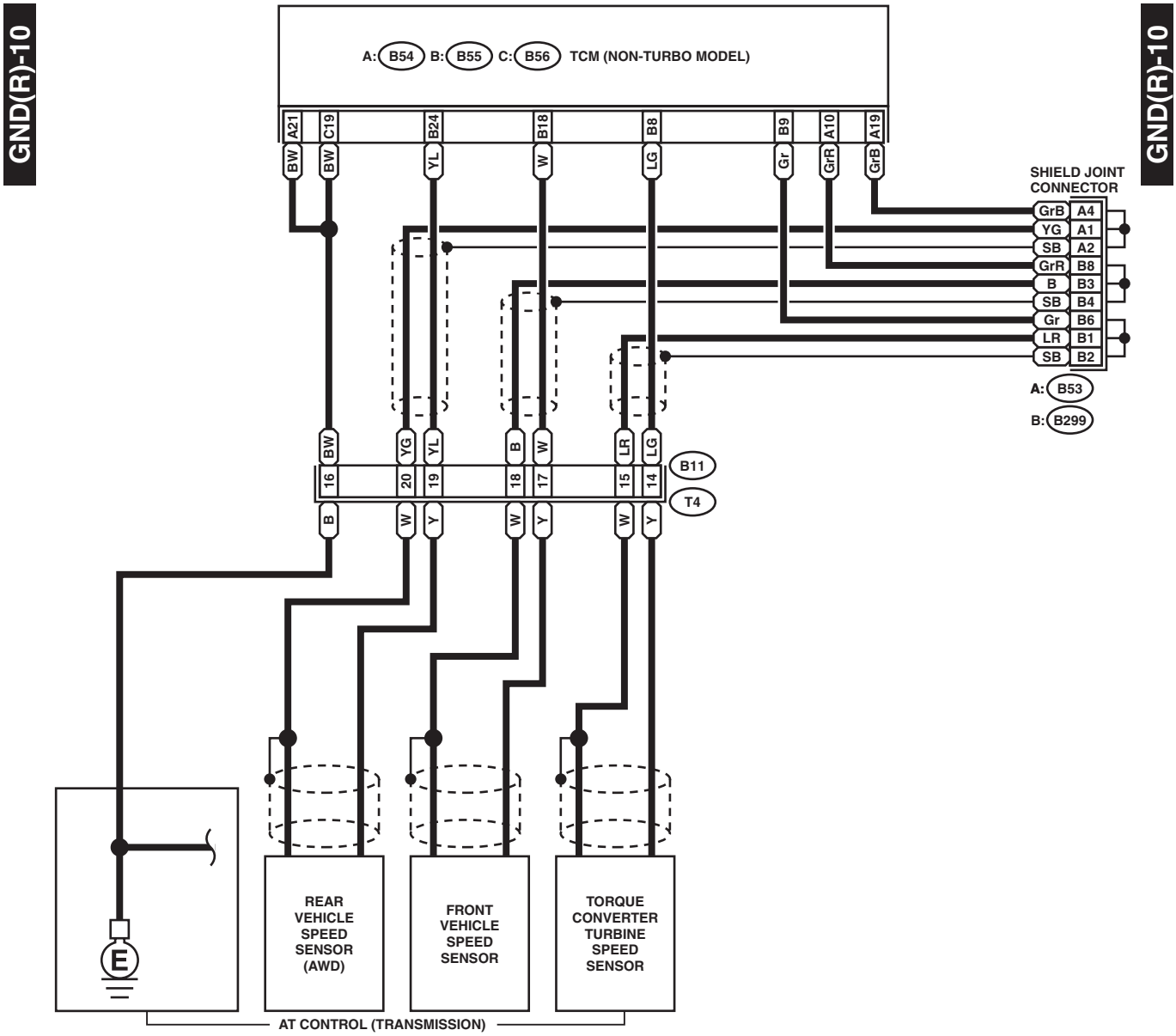
9. ENGINE GROUND RHD TURBO MODEL





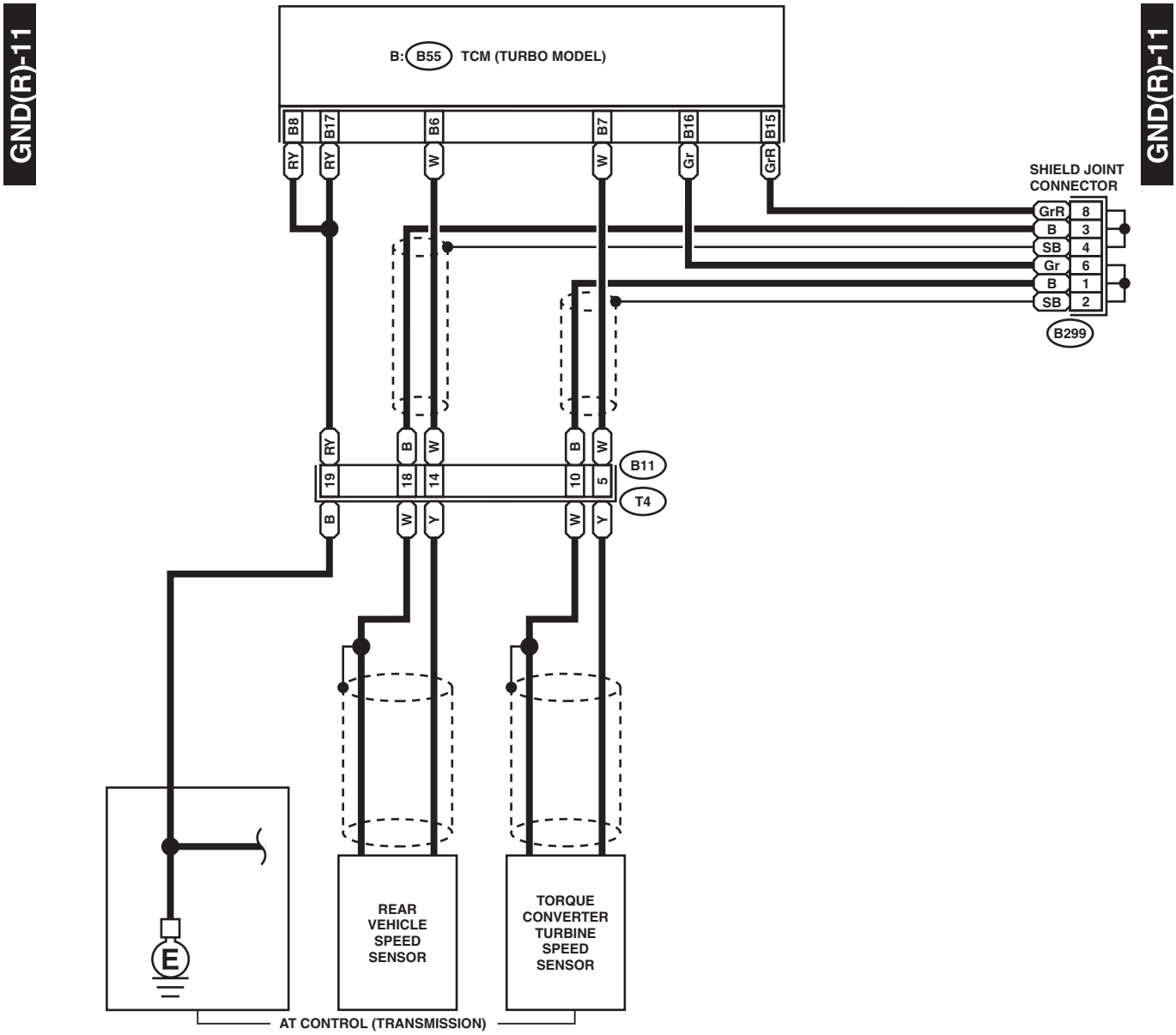
WI-05975

10.TRANSMISSION GROUND RHD NON-TURBO MODEL



WI-05976

11.TRANSMISSION GROUND RHD TURBO MODEL

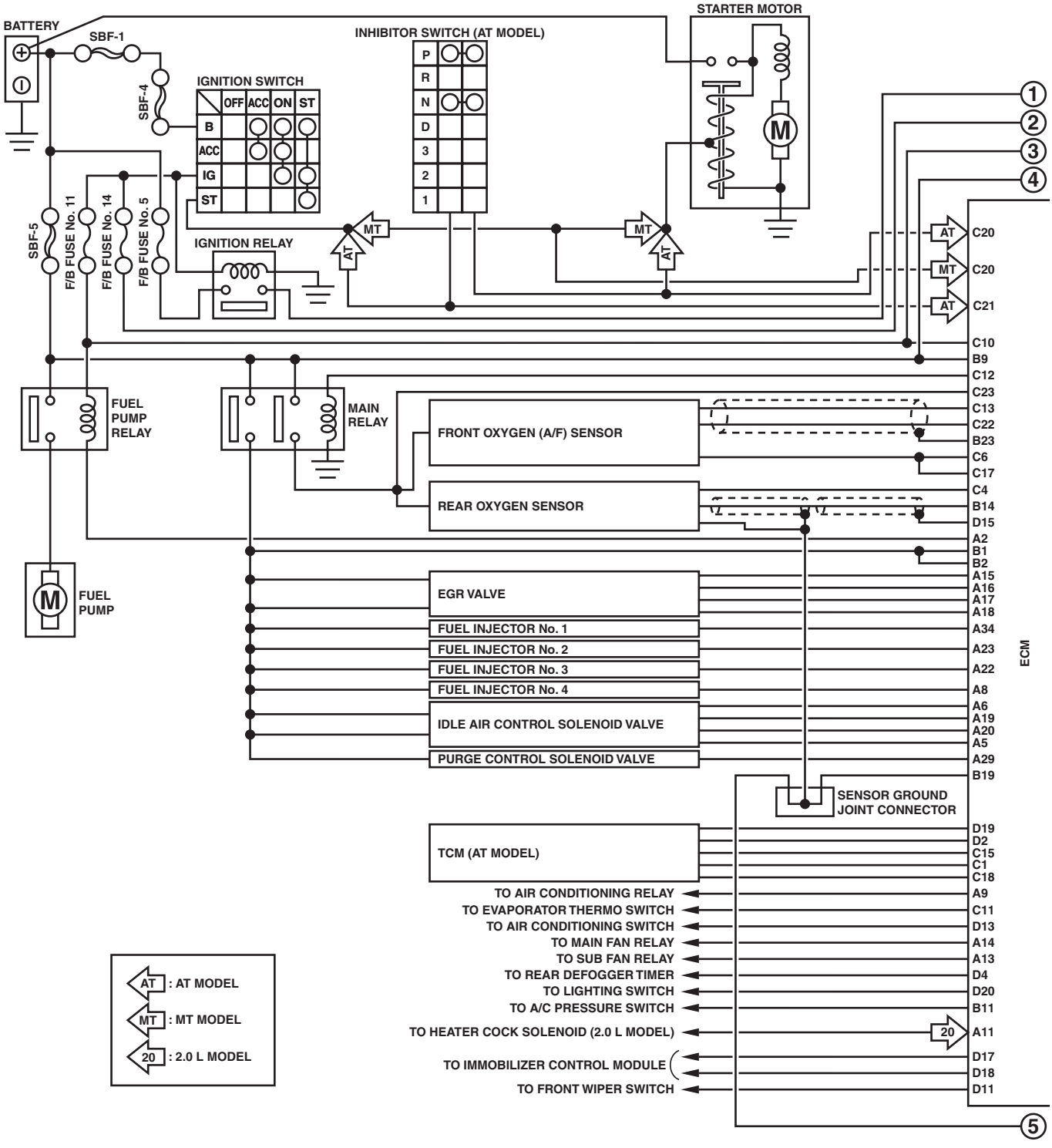


WI-05977

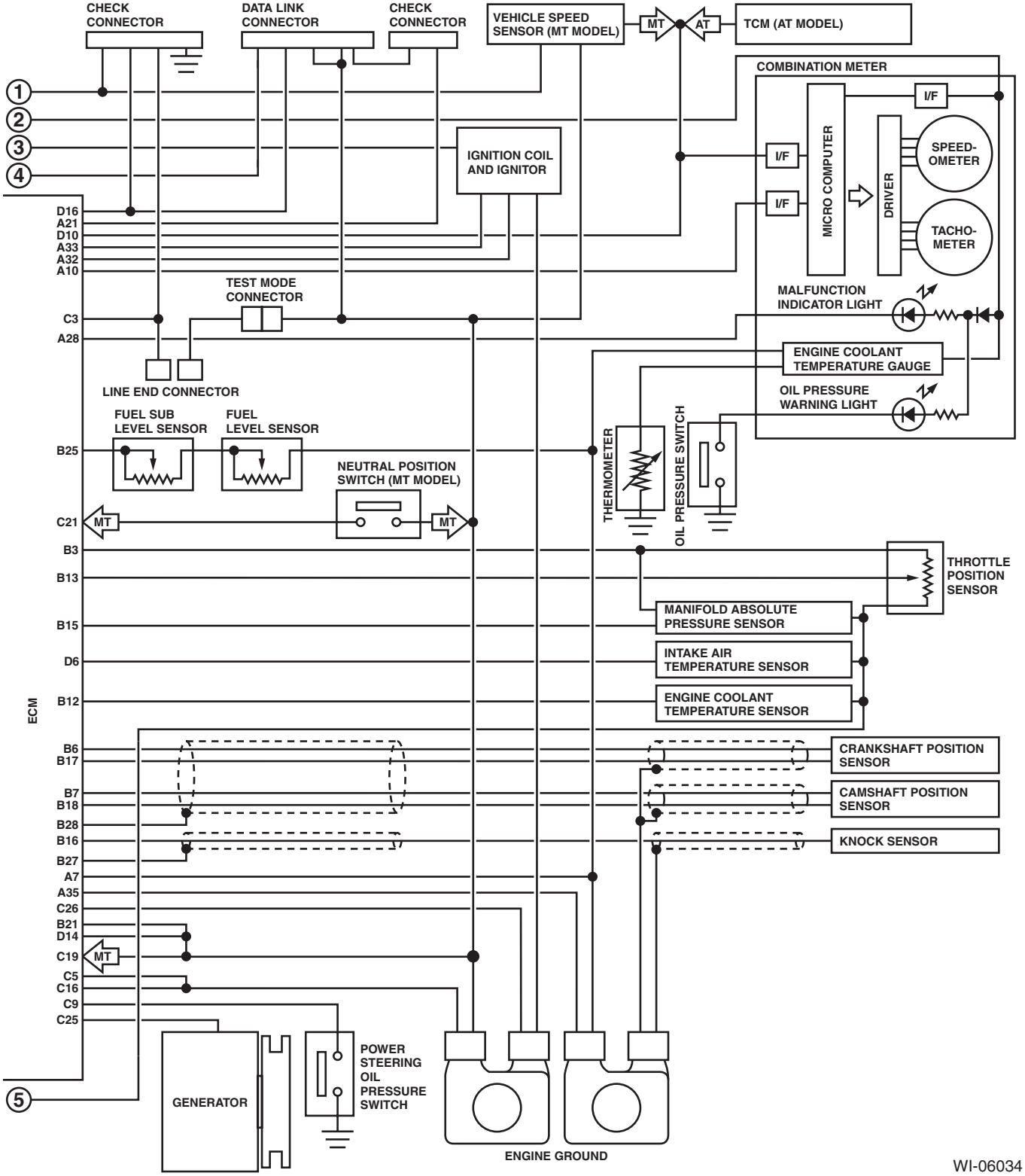
5. Engine Electrical System

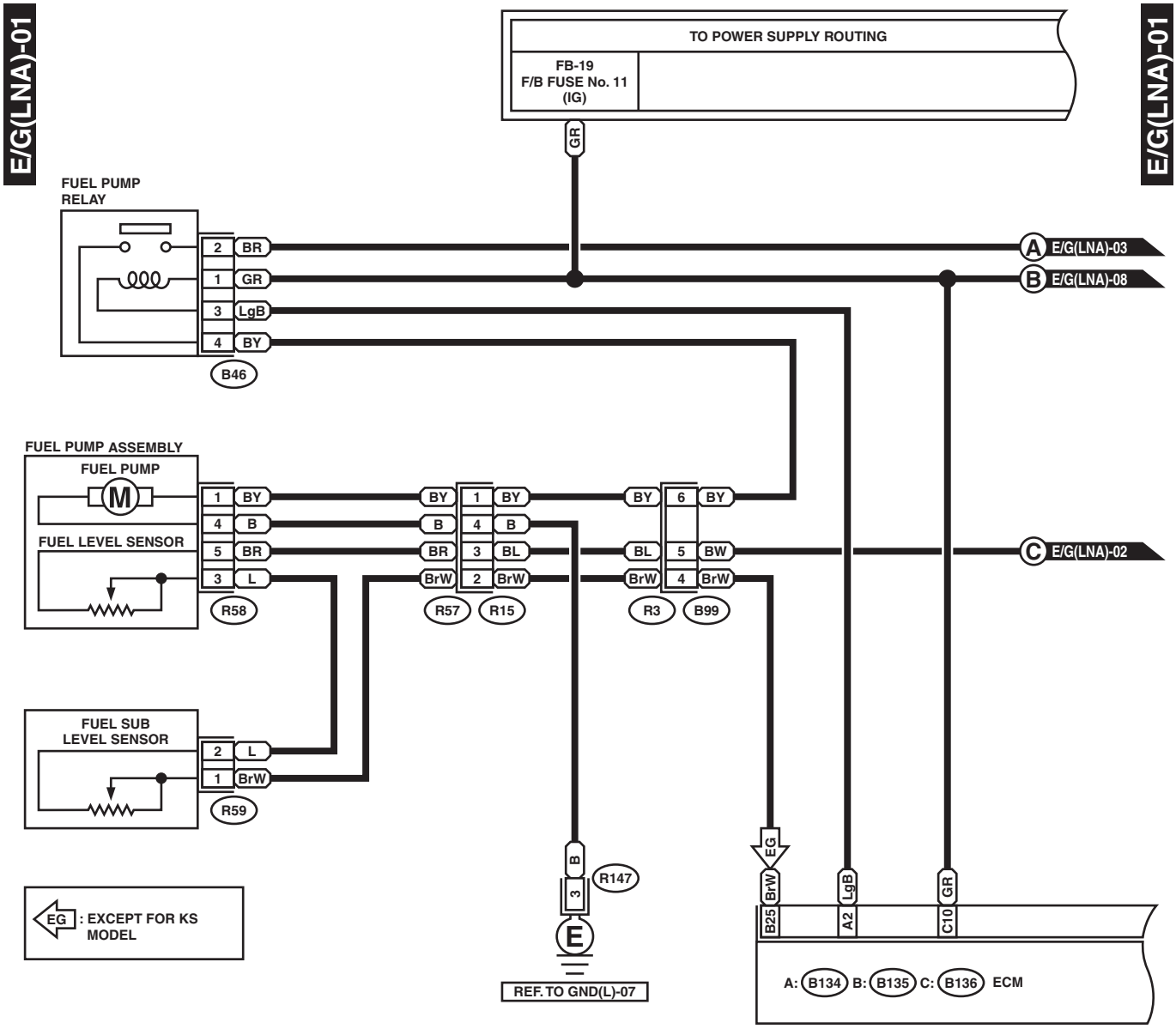
A: WIRING DIAGRAM

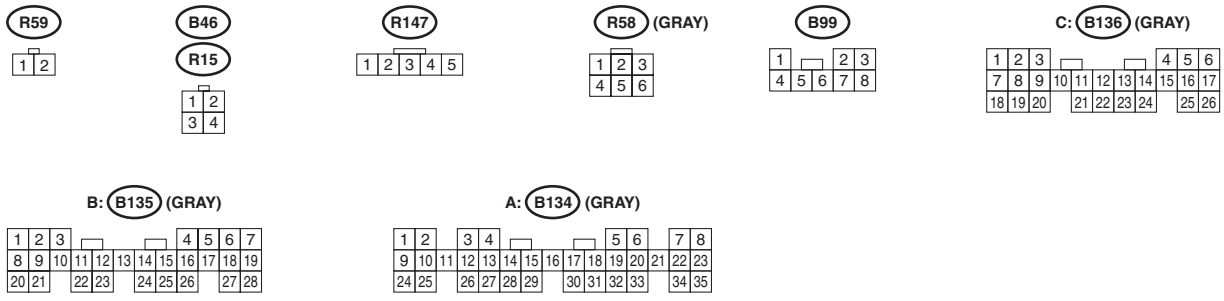
1. LHD NON-TURBO MODEL



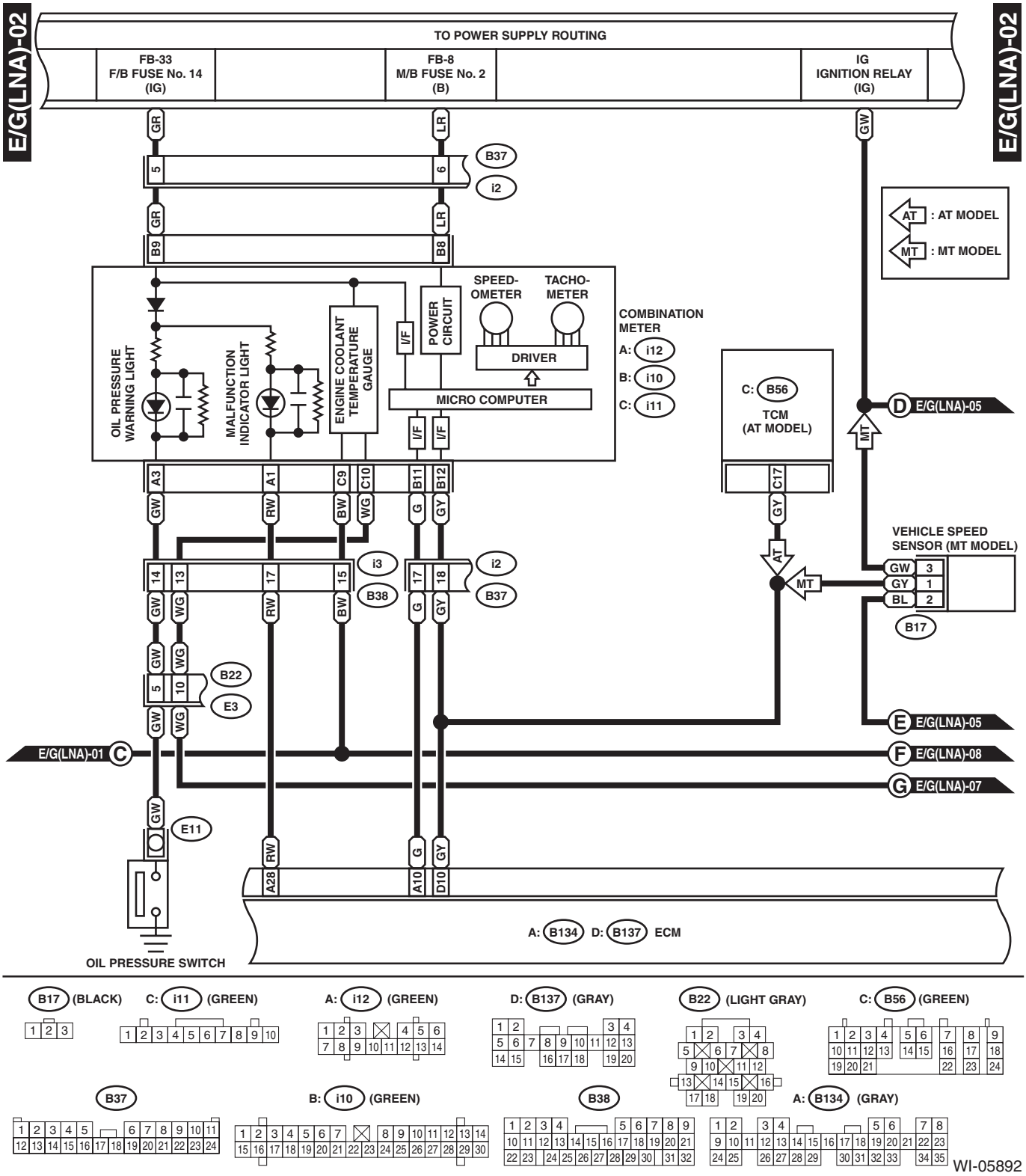
WI-06033


CHECK CONNECTOR
DATA LINK CONNECTOR
CHECK CONNECTOR
VEHICLE SPEED SENSOR (MT MODEL)
MT
AT
TCM (AT MODEL)
COMBINATION METER
I/F
I/F
I/F
MICRO COMPUTER
DRIVER
SPEED-OMETER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
IGNITION COIL AND IGNITOR
TEST MODE CONNECTOR
LINE END CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT MODEL)
THERMOMETER
OIL PRESSURE SWITCH
THROTTLE POSITION SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
ECM
1
2
3
4
5
D16
A21
D10
A33
A32
A10
C3
A28
B25
C21
B3
B13
B15
D6
B12
B6
B17
B7
B18
B28
B16
B27
A7
A35
C26
B21
D14
C19
C5
C16
C9
C25
GENERATOR
POWER STEERING OIL PRESSURE SWITCH
ENGINE GROUND
WI-06034

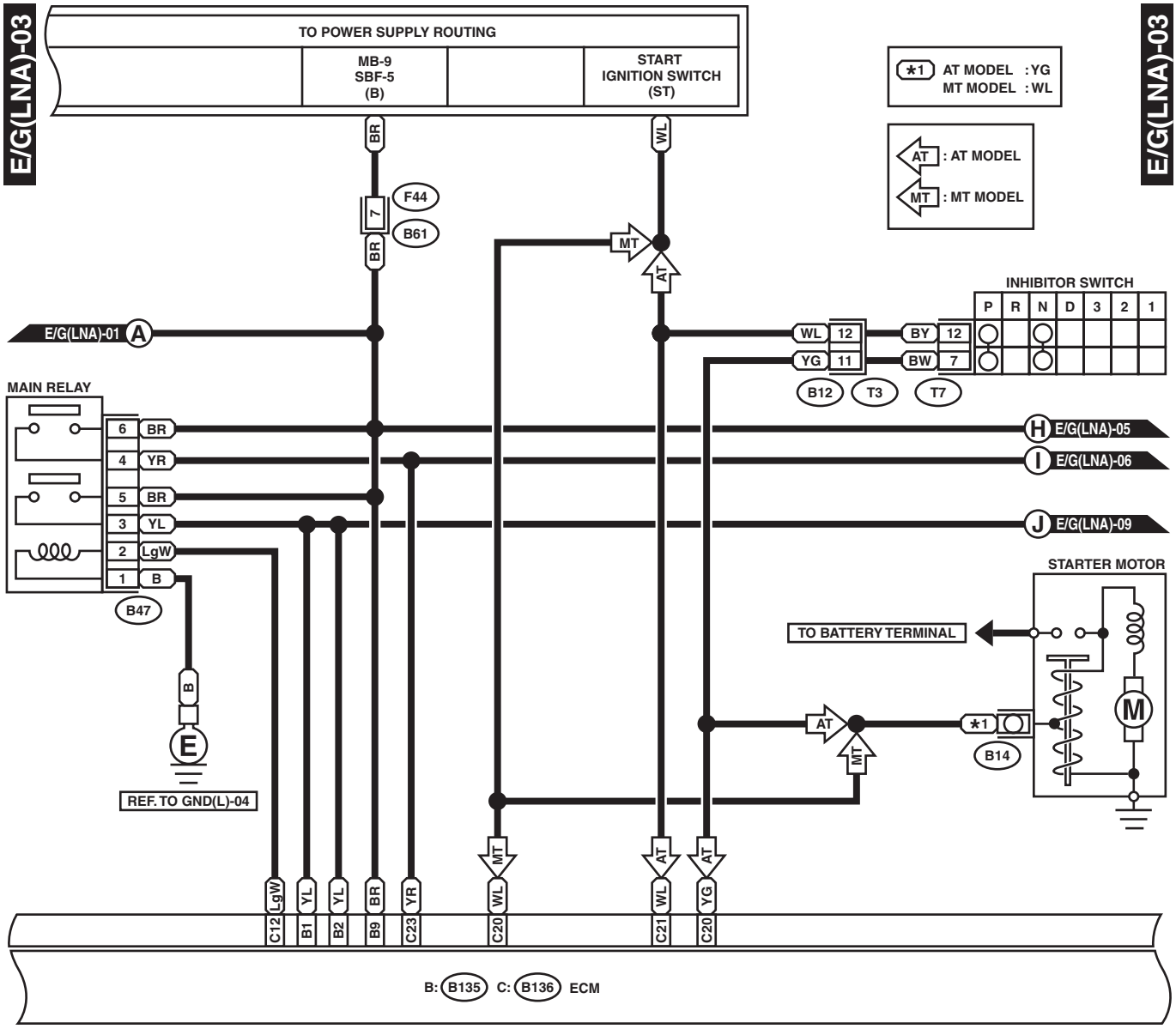

E/G(LNA)-01
E/G(LNA)-01
TO POWER SUPPLY ROUTING
FB-19
F/B FUSE No. 11
(IG)
GR
FUEL PUMP
RELAY
2 BR
1 GR
3 LgB
4 BY
B46
A E/G(LNA)-03
B E/G(LNA)-08
FUEL PUMP ASSEMBLY
FUEL PUMP
M
FUEL LEVEL SENSOR
1 BY
4 B
5 BR
3 L
R58
BY 1 BY
B 4 B
BR 3 BL
BrW 2 BrW
R57
R15
BY 6 BY
BL 5 BW
BrW 4 BrW
R3
B99
C E/G(LNA)-02
FUEL SUB
LEVEL SENSOR
2 L
1 BrW
R59
B
3
R147
E
REF. TO GND(L)-07
EG
BrW
LgB
GR
B25
A2
C10
A: B134 B: B135 C: B136 ECM
EG : EXCEPT FOR KS MODEL

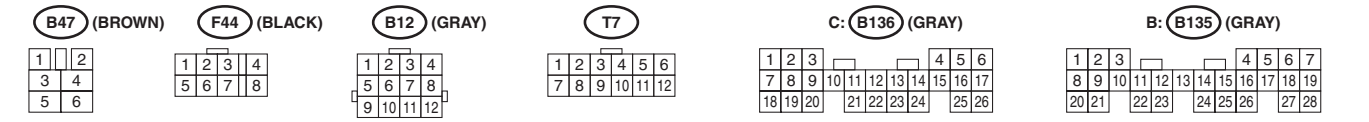

R59
1 2
B46
R15
1 2
3 4
R147
1 2 3 4 5
R58 (GRAY)
1 2 3
4 5 6
B99
1 2 3
4 5 6 7 8
C: B136 (GRAY)
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
B: B135 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28
A: B134 (GRAY)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35

WI-07350


E/G(LNA)-02
E/G(LNA)-02
TO POWER SUPPLY ROUTING
FB-33
F/B FUSE No. 14
(IG)
FB-8
M/B FUSE No. 2
(B)
IG
IGNITION RELAY
(IG)
B37
i2
B9
B8
AT : AT MODEL
MT : MT MODEL
SPEED-
OMETER
TACHO-
METER
COMBINATION
METER
A: i12
B: i10
C: i11
OIL PRESSURE
WARNING LIGHT
MALFUNCTION
INDICATOR LIGHT
ENGINE COOLANT
TEMPERATURE
GAUGE
I/F
POWER
CIRCUIT
DRIVER
MICRO COMPUTER
C: B56
TCM
(AT MODEL)
D E/G(LNA)-05
VEHICLE SPEED
SENSOR (MT MODEL)
i3
i2
B38
B37
B22
E3
E E/G(LNA)-05
E/G(LNA)-01 C
F E/G(LNA)-08
G E/G(LNA)-07
E11
B17
OIL PRESSURE SWITCH
A: B134 D: B137 ECM
B17 (BLACK)
C: i11 (GREEN)
A: i12 (GREEN)
D: B137 (GRAY)
B22 (LIGHT GRAY)
C: B56 (GREEN)
B37
B: i10 (GREEN)
B38
A: B134 (GRAY)

WI-05892

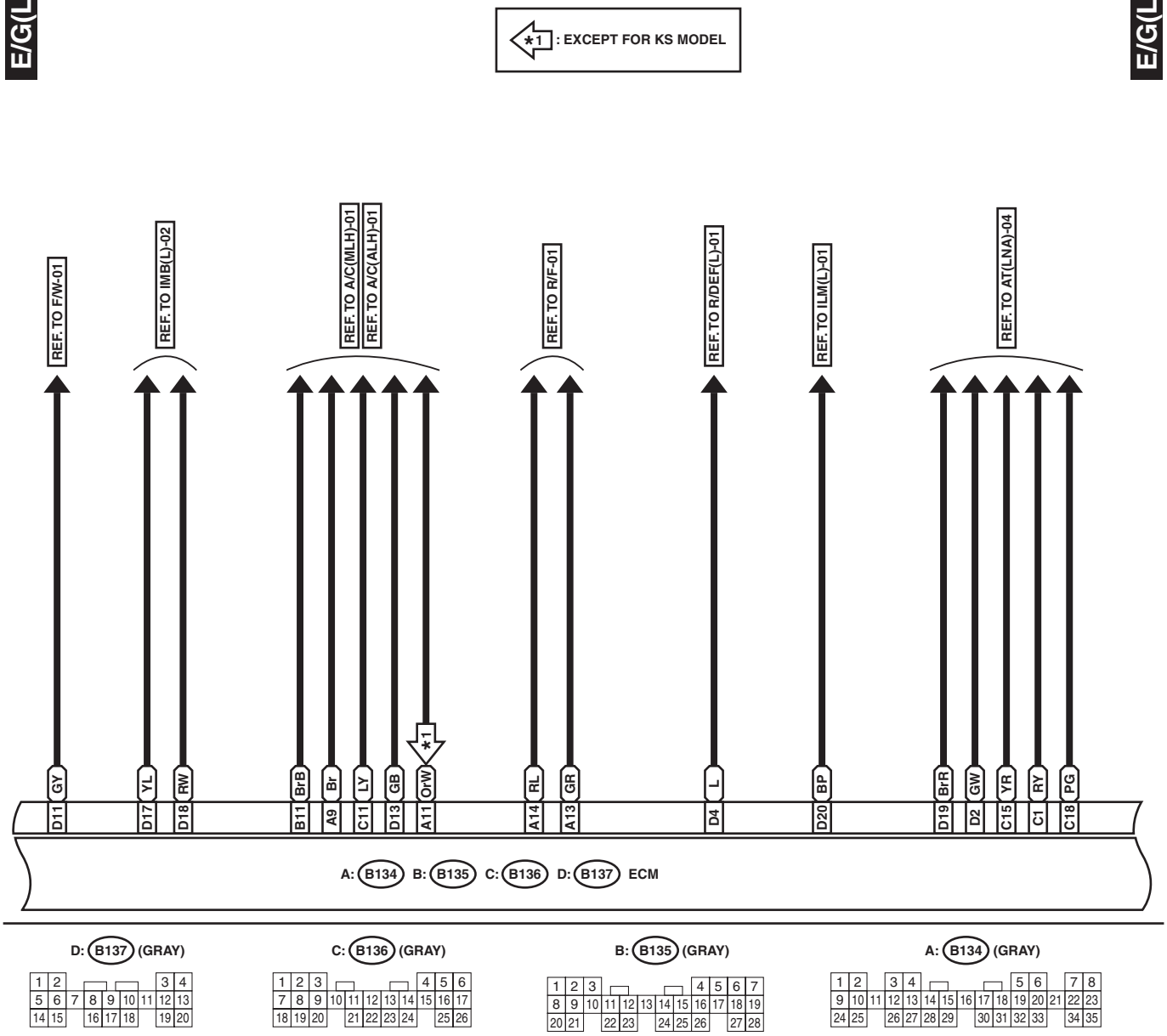

E/G(LNA)-03
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
START
IGNITION SWITCH
(ST)
*1 AT MODEL : YG
MT MODEL : WL
AT : AT MODEL
MT : MT MODEL
BR
WL
F44
7
B61
MT
AT
INHIBITOR SWITCH
P R N D 3 2 1
E/G(LNA)-01 A
WL 12
YG 11
BY 12
BW 7
B12 T3 T7
MAIN RELAY
6 BR
4 YR
5 BR
3 YL
2 LgW
1 B
B47
H E/G(LNA)-05
I E/G(LNA)-06
J E/G(LNA)-09
STARTER MOTOR
TO BATTERY TERMINAL
M
*1
B14
B
E
REF. TO GND(L)-04
LgW YL YL BR YR WL WL YG
C12 B1 B2 B9 C23 C20 C21 C20
B: B135 C: B136 ECM


B47 (BROWN)
F44 (BLACK)
B12 (GRAY)
T7
C: B136 (GRAY)
B: B135 (GRAY)

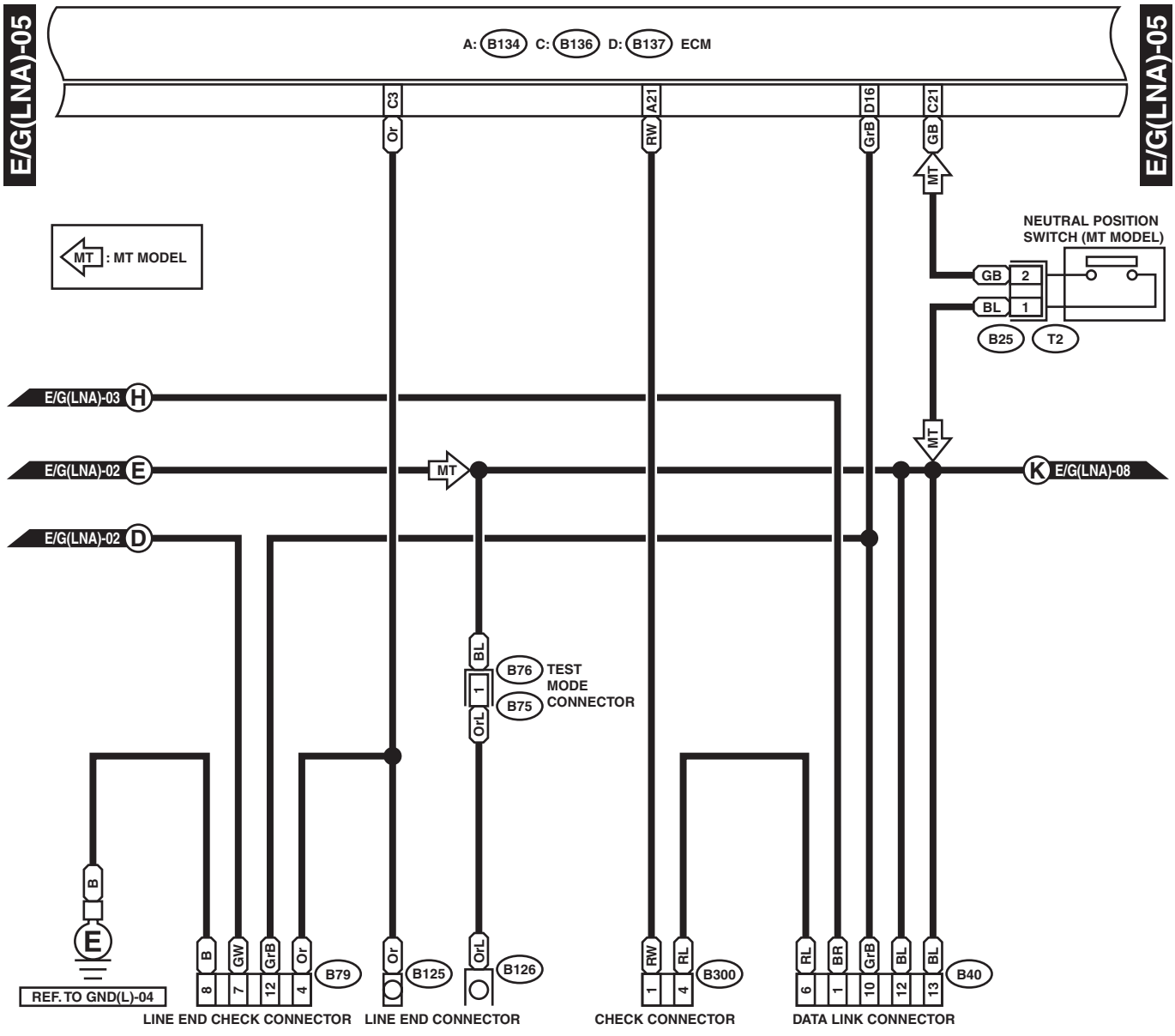
WI-07351

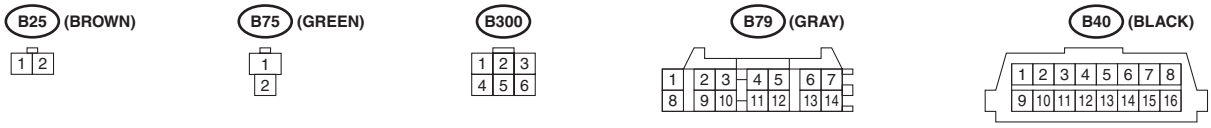
E/G(LNA)-04

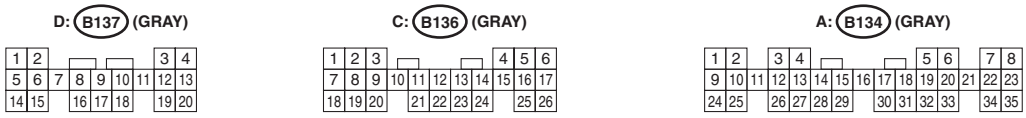
E/G(LNA)-04



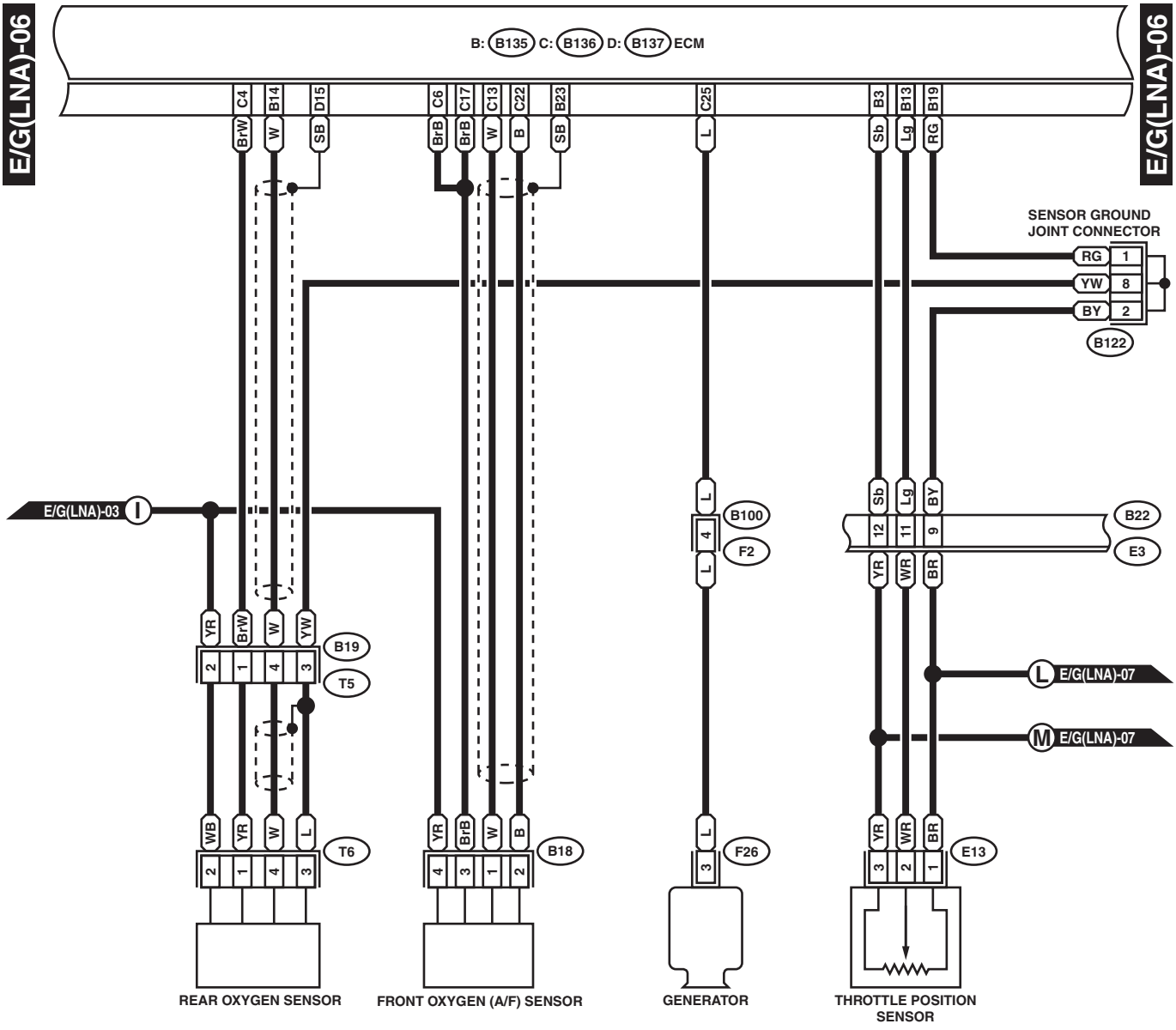
WI-07352


E/G(LNA)-05
A: B134 C: B136 D: B137 ECM
E/G(LNA)-05
C3
A21
D16
C21
Or
RW
GrB
GB
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT MODEL)
GB 2
BL 1
B25
T2
E/G(LNA)-03 H
E/G(LNA)-02 E
E/G(LNA)-02 D
K E/G(LNA)-08
BL
B76 TEST MODE CONNECTOR
B75
OrL
B
E
REF. TO GND(L)-04
B GW GrB Or
8 7 12 4
B79
Or
B125
OrL
B126
RW RL
1 4
B300
RL BR GrB BL BL
6 1 10 12 13
B40
LINE END CHECK CONNECTOR
LINE END CONNECTOR
CHECK CONNECTOR
DATA LINK CONNECTOR


B25 (BROWN)
1 2
B75 (GREEN)
1
2
B300
1 2 3
4 5 6
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16


D: B137 (GRAY)
1 2 3 4
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20
C: B136 (GRAY)
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
A: B134 (GRAY)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35

WI-03279

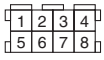


F26 (GREEN)
E13

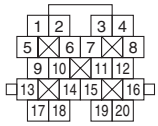
T5 (GRAY)

B18 (GRAY)
T6 (GRAY)

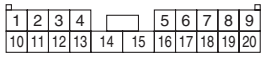
B122



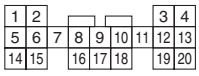
B22 (LIGHT GRAY)



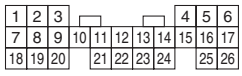
F2 (BLUE)



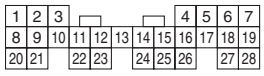
D: B137 (GRAY)



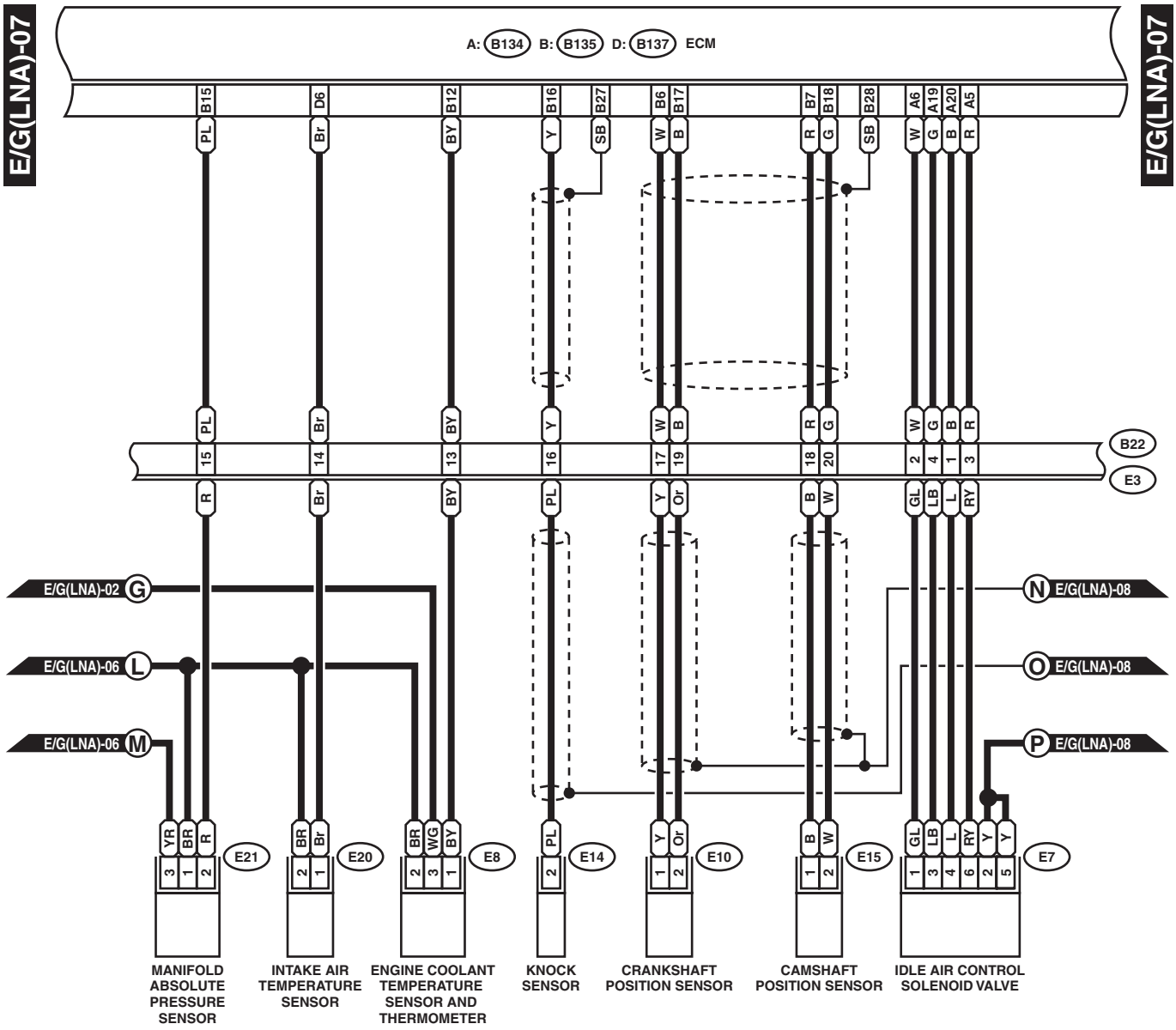
C: B136 (GRAY)

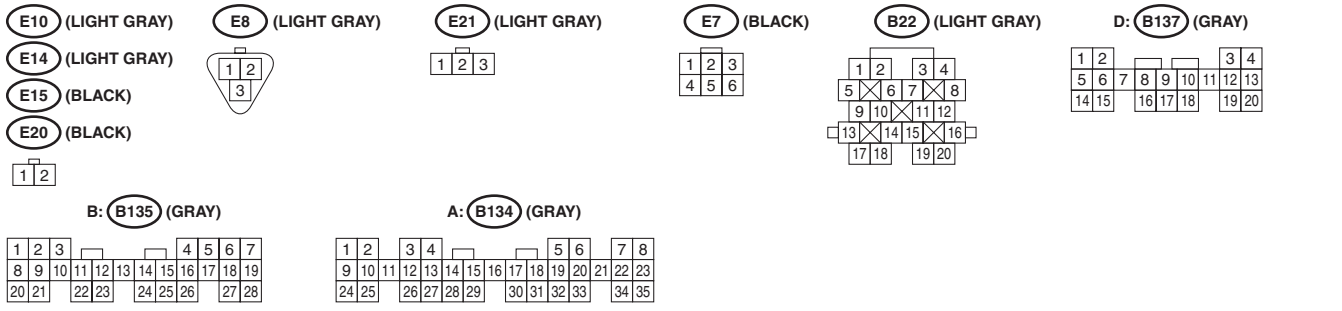


B: B135 (GRAY)

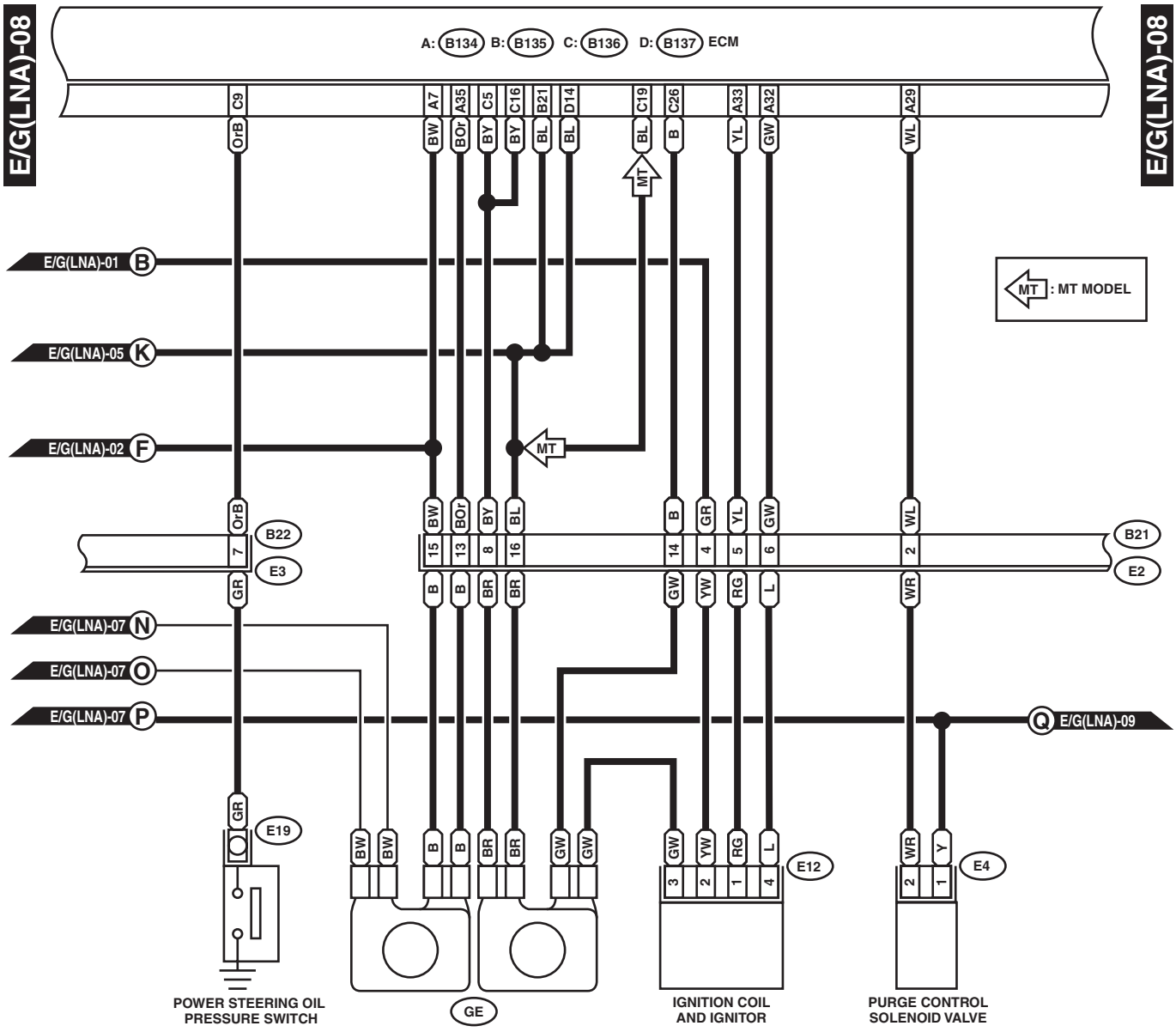


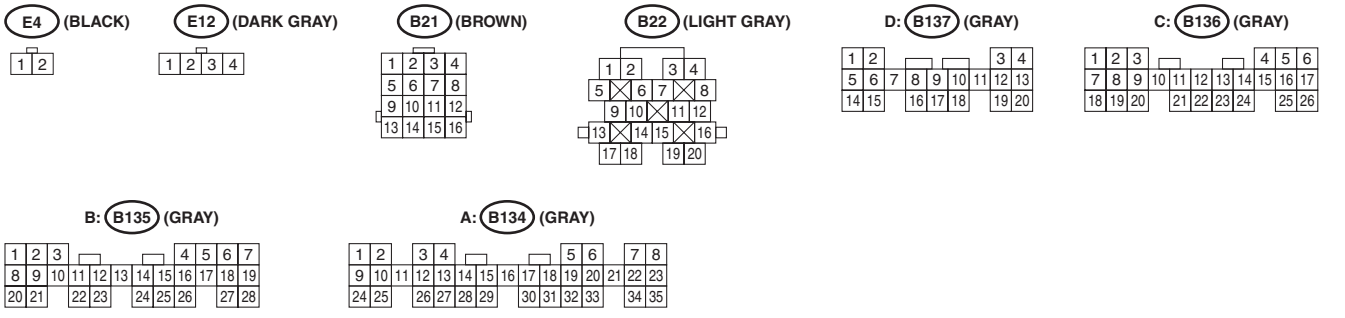
WI-05894


E/G(LNA)-07
E/G(LNA)-07
A: B134 B: B135 D: B137 ECM
B22
E3
E/G(LNA)-02 G
E/G(LNA)-06 L
E/G(LNA)-06 M
N E/G(LNA)-08
O E/G(LNA)-08
P E/G(LNA)-08
E21
E20
E8
E14
E10
E15
E7
MANIFOLD ABSOLUTE PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
IDLE AIR CONTROL SOLENOID VALVE

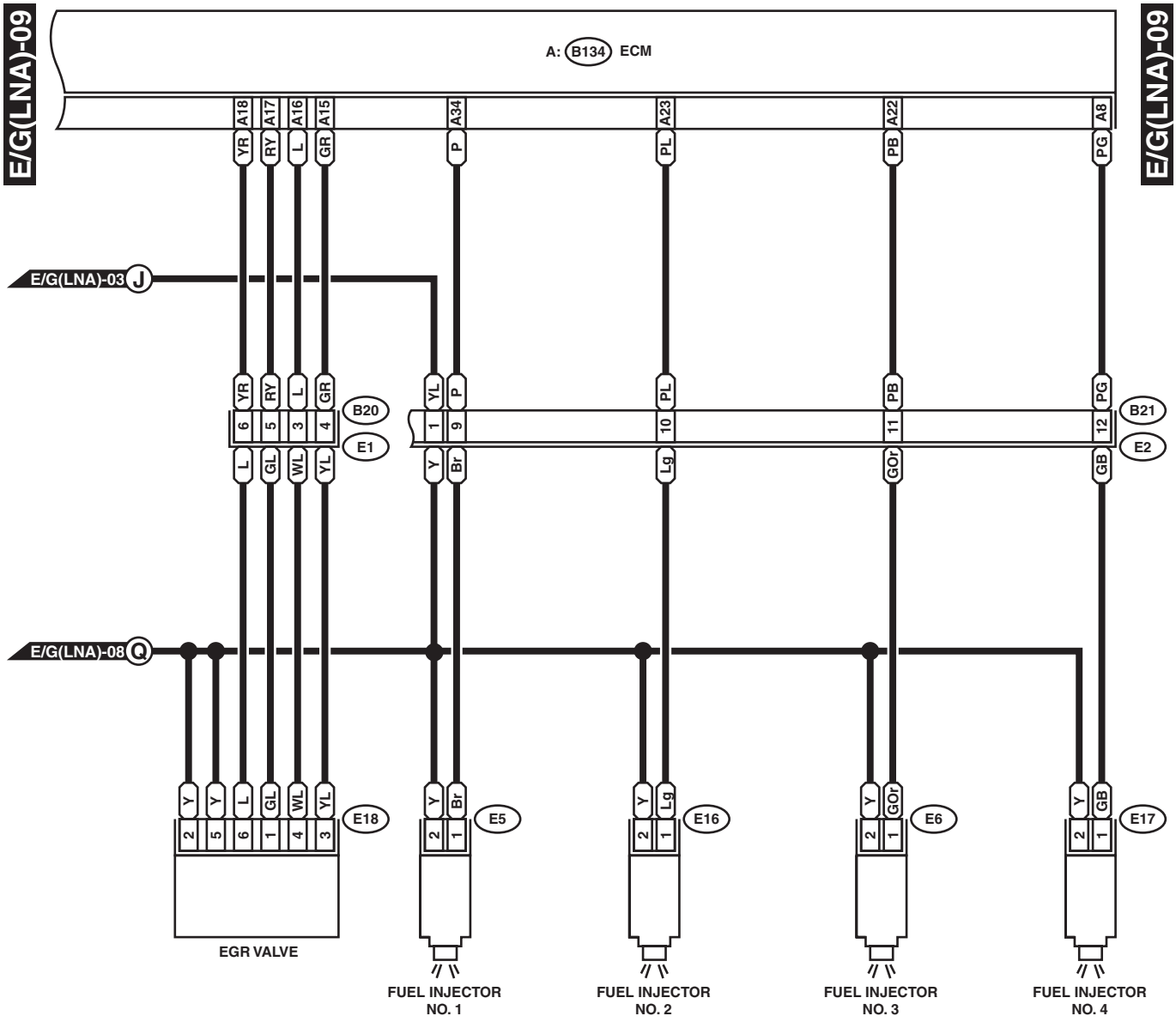

E10 (LIGHT GRAY)
E14 (LIGHT GRAY)
E15 (BLACK)
E20 (BLACK)
E8 (LIGHT GRAY)
E21 (LIGHT GRAY)
E7 (BLACK)
B22 (LIGHT GRAY)
D: B137 (GRAY)
B: B135 (GRAY)
A: B134 (GRAY)

WI-00360


E/G(LNA)-08
E/G(LNA)-08
A: B134 B: B135 C: B136 D: B137 ECM
C9 A7 A35 C5 C16 B21 D14 C19 C26 A33 A32 A29
OrB BW BOr BY BY BL BL BL B YL GW WL
MT
E/G(LNA)-01 B
E/G(LNA)-05 K
E/G(LNA)-02 F
MT : MT MODEL
B22
E3
B21
E2
E/G(LNA)-07 N
E/G(LNA)-07 O
E/G(LNA)-07 P
Q E/G(LNA)-09
E19
E12
E4
POWER STEERING OIL PRESSURE SWITCH
GE
IGNITION COIL AND IGNITOR
PURGE CONTROL SOLENOID VALVE


E4 (BLACK)
E12 (DARK GRAY)
B21 (BROWN)
B22 (LIGHT GRAY)
D: B137 (GRAY)
C: B136 (GRAY)
B: B135 (GRAY)
A: B134 (GRAY)

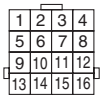
WI-00361



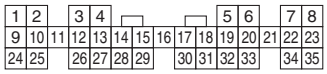
E5 (LIGHT GRAY)
E6 (LIGHT GRAY)
E16 (LIGHT GRAY)
E17 (LIGHT GRAY)

B20 (GRAY)
E18 (DARK GRAY)

B21 (BROWN)

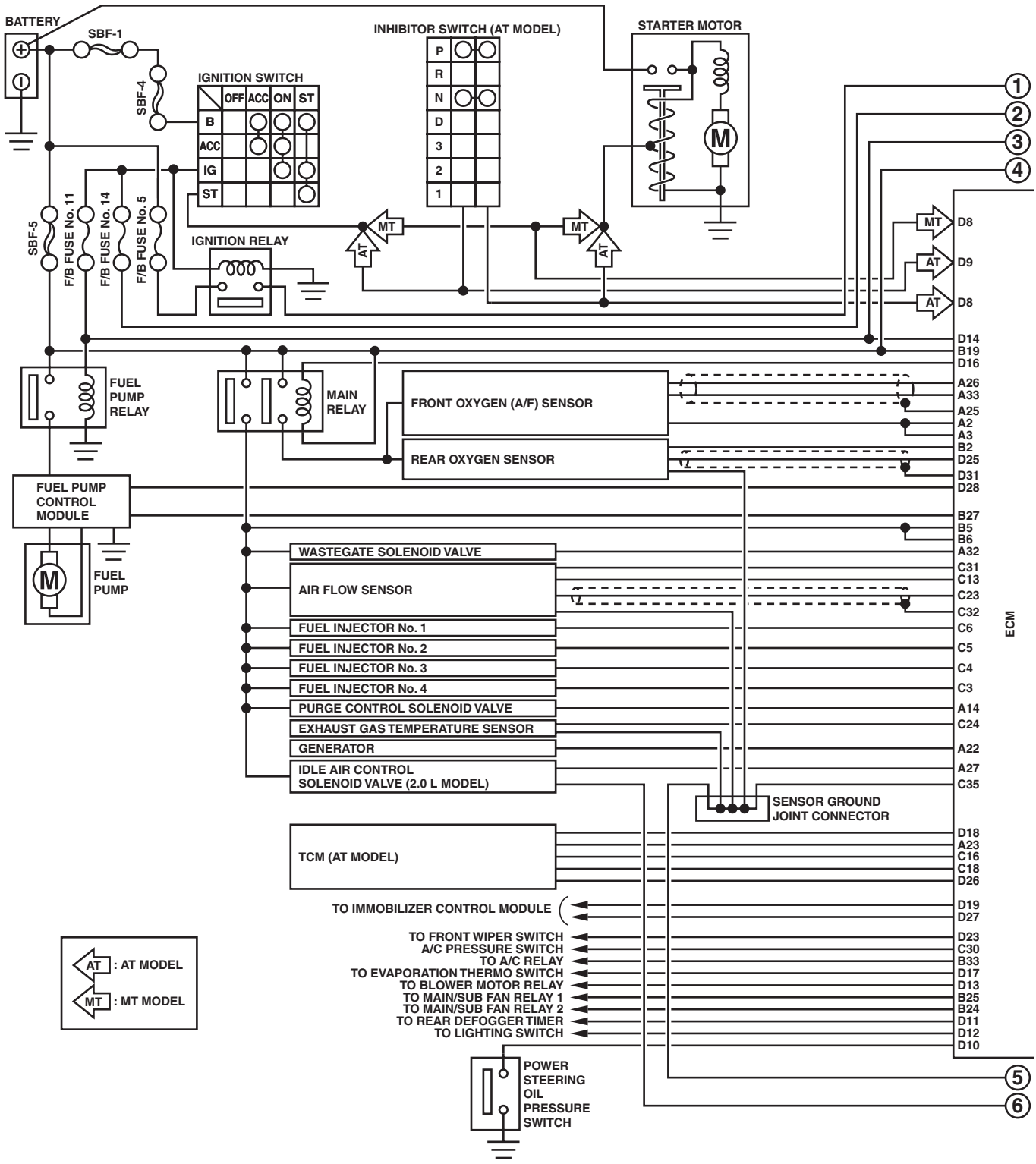


A: B134 (GRAY)

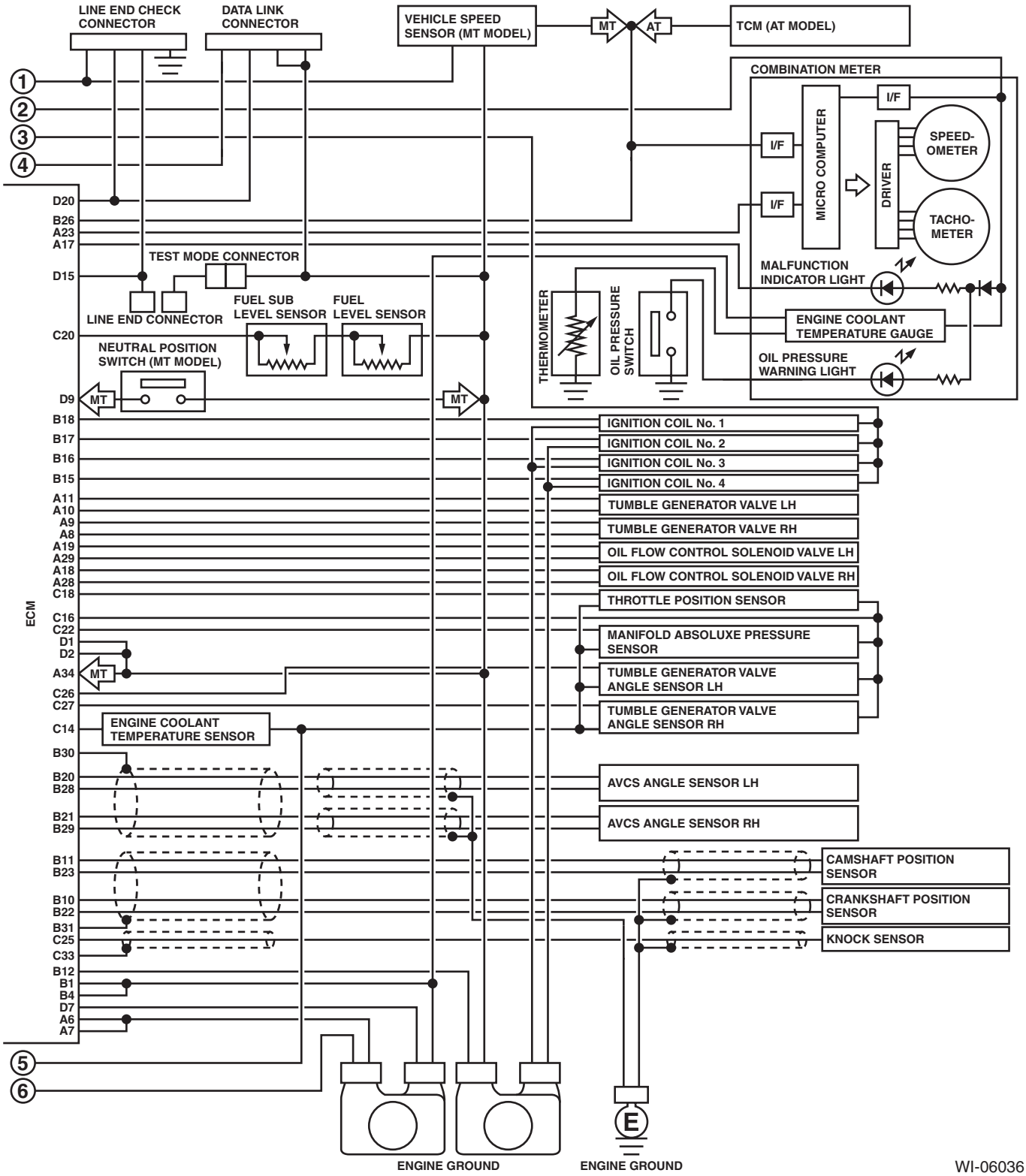


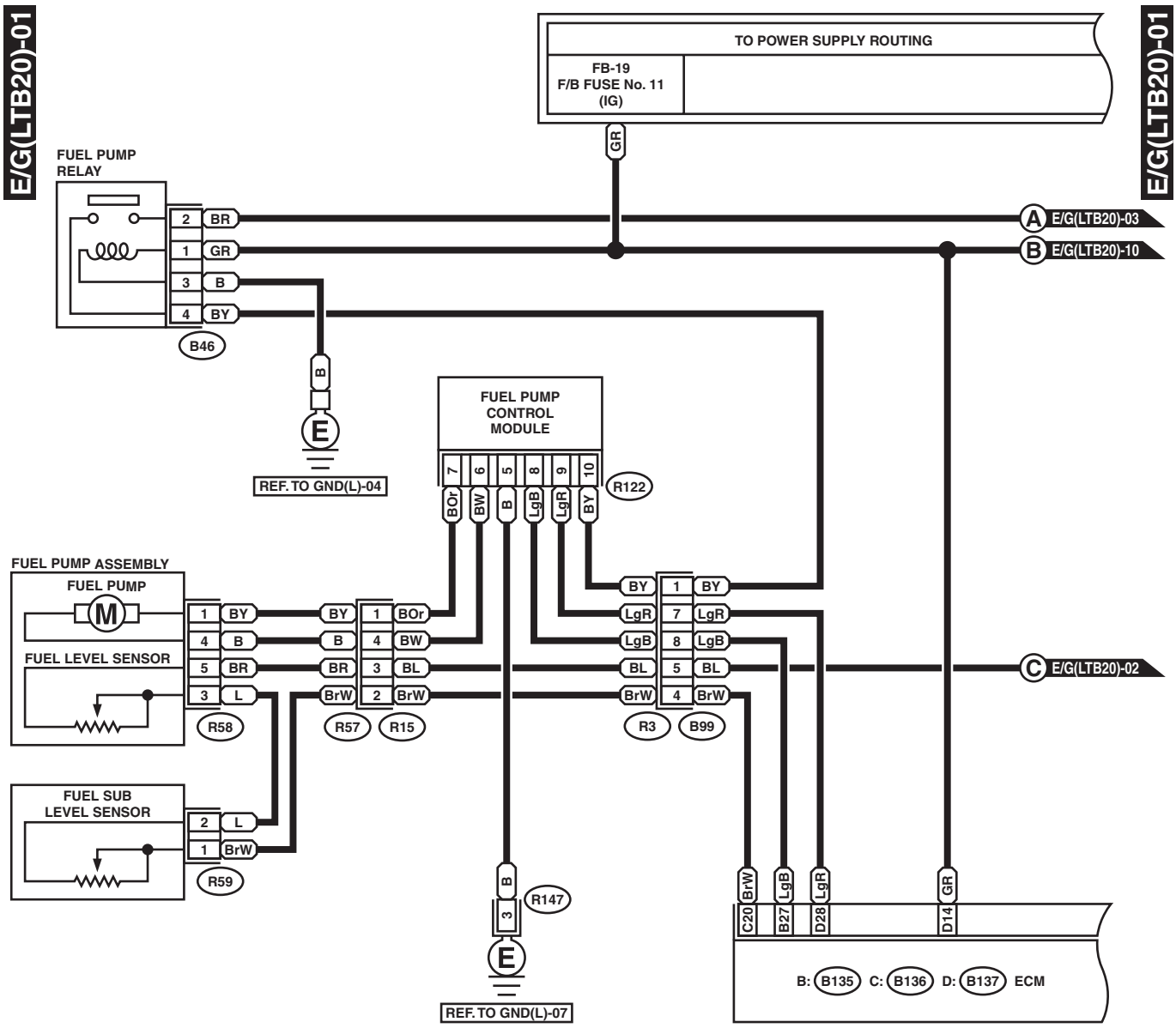
WI-07512

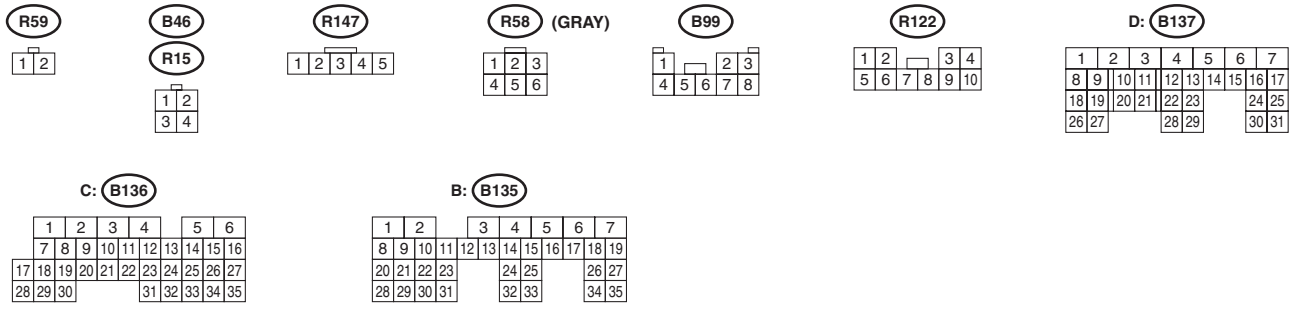
2. LHD 2.0 L TURBO MODEL



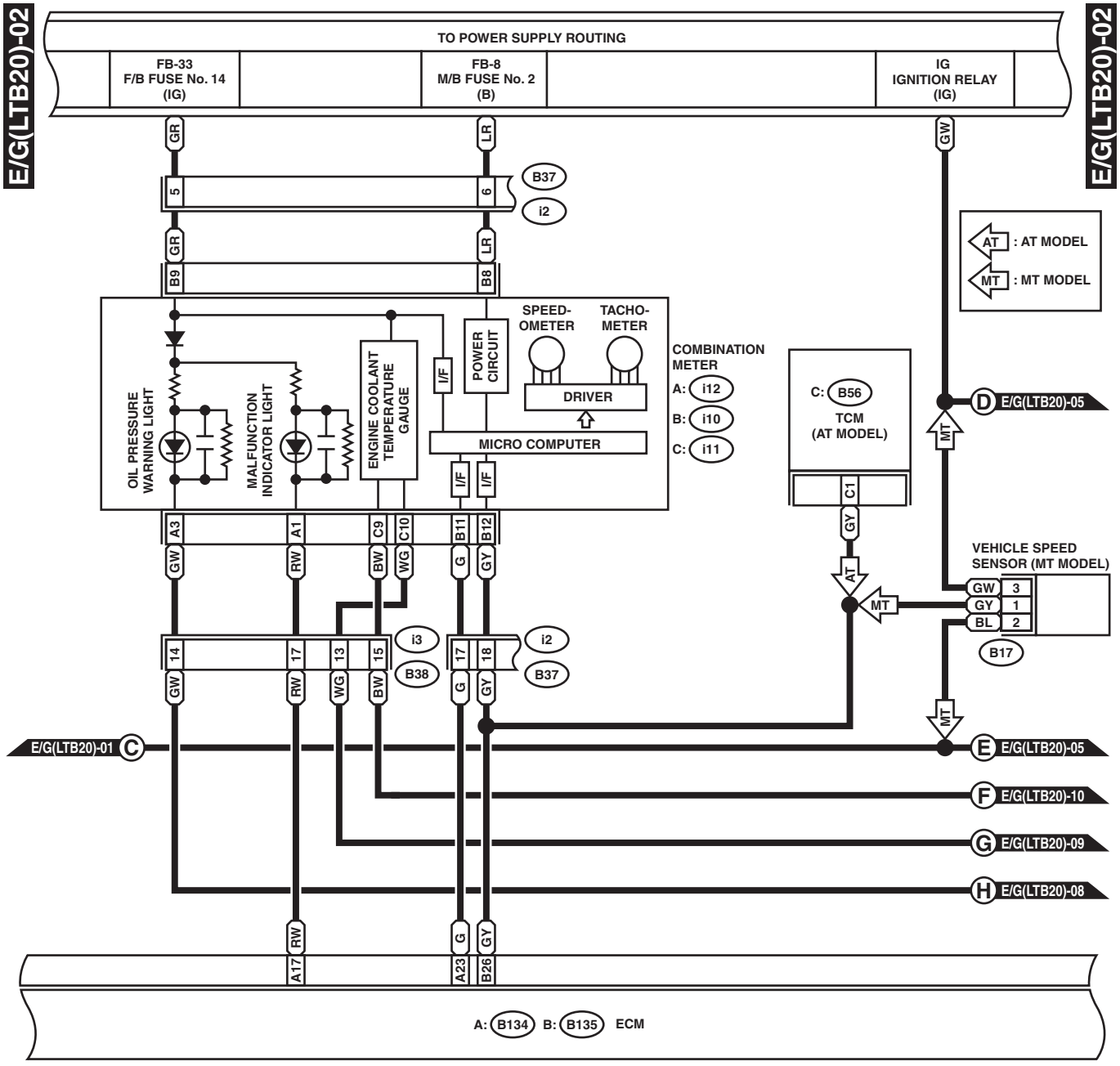
WI-06035

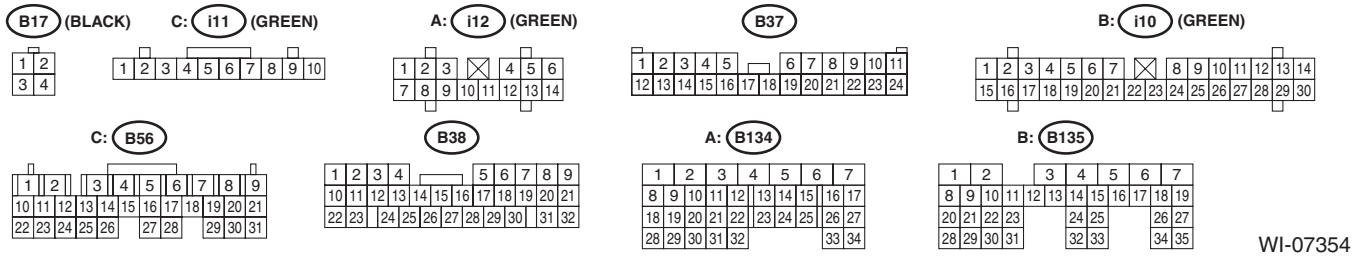

LINE END CHECK CONNECTOR
DATA LINK CONNECTOR
VEHICLE SPEED SENSOR (MT MODEL)
MT
AT
TCM (AT MODEL)
COMBINATION METER
I/F
MICRO COMPUTER
DRIVER
SPEED-OMETER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
THERMOMETER
OIL PRESSURE SWITCH
TEST MODE CONNECTOR
LINE END CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT MODEL)
ECM
D20
B26
A23
A17
D15
C20
D9
B18
B17
B16
B15
A11
A10
A9
A8
A19
A29
A18
A28
C18
C16
C22
D1
D2
A34
C26
C27
C14
B30
B20
B28
B21
B29
B11
B23
B10
B22
B31
C25
C33
B12
B1
B4
D7
A6
A7
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH
THROTTLE POSITION SENSOR
MANIFOLD ABSOLUXE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
ENGINE COOLANT TEMPERATURE SENSOR
AVCS ANGLE SENSOR LH
AVCS ANGLE SENSOR RH
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
ENGINE GROUND
ENGINE GROUND
WI-06036


E/G(LTB20)-01
E/G(LTB20)-01
TO POWER SUPPLY ROUTING
FB-19
F/B FUSE No. 11
(IG)
GR
FUEL PUMP
RELAY
2 BR
1 GR
3 B
4 BY
B46
A E/G(LTB20)-03
B E/G(LTB20)-10
B
E
REF. TO GND(L)-04
FUEL PUMP
CONTROL
MODULE
7 6 5 8 9 10
R122
BOr BW B LgB LgR BY
FUEL PUMP ASSEMBLY
FUEL PUMP
M
FUEL LEVEL SENSOR
1 BY
4 B
5 BR
3 L
R58
BY 1 BOr
B 4 BW
BR 3 BL
BrW 2 BrW
R57
R15
BY 1 BY
LgR 7 LgR
LgB 8 LgB
BL 5 BL
BrW 4 BrW
R3
B99
C E/G(LTB20)-02
FUEL SUB
LEVEL SENSOR
2 L
1 BrW
R59
B
3
R147
E
REF. TO GND(L)-07
C20 BrW
B27 LgB
D28 LgR
D14 GR
B: B135 C: B136 D: B137 ECM

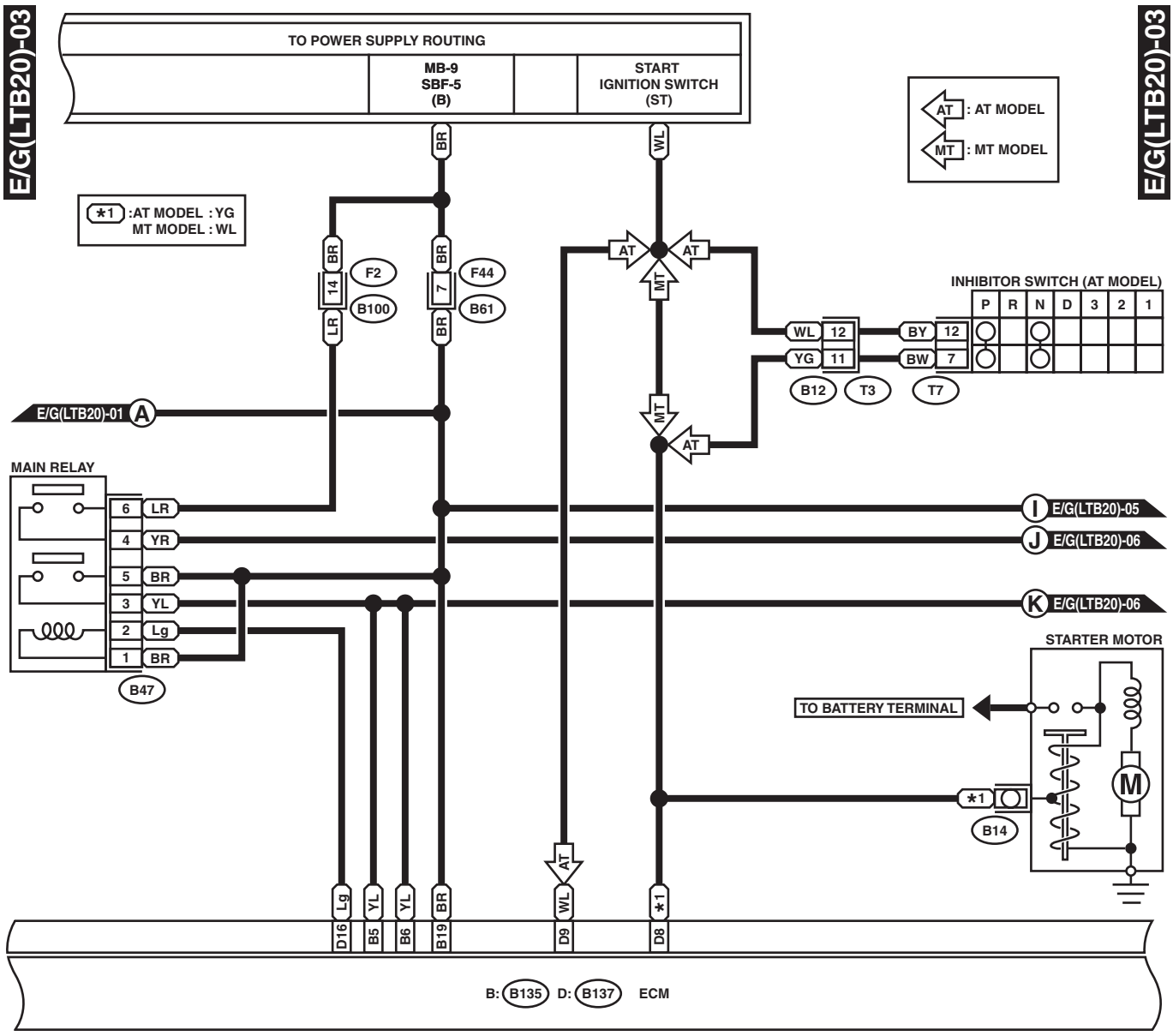

R59
1 2
B46
R15
1 2
3 4
R147
1 2 3 4 5
R58 (GRAY)
1 2 3
4 5 6
B99
1 2 3
4 5 6 7 8
R122
1 2 3 4
5 6 7 8 9 10
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
B: B135
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35

WI-07353


E/G(LTB20)-02
E/G(LTB20)-02
TO POWER SUPPLY ROUTING
FB-33
F/B FUSE No. 14
(IG)
FB-8
M/B FUSE No. 2
(B)
IG
IGNITION RELAY
(IG)
GR
LR
GW
B37
i2
AT : AT MODEL
MT : MT MODEL
SPEED-
OMETER
TACHO-
METER
COMBINATION
METER
A: i12
B: i10
C: i11
OIL PRESSURE
WARNING LIGHT
MALFUNCTION
INDICATOR LIGHT
ENGINE COOLANT
TEMPERATURE
GAUGE
I/F
POWER
CIRCUIT
DRIVER
MICRO COMPUTER
C: B56
TCM
(AT MODEL)
D E/G(LTB20)-05
VEHICLE SPEED
SENSOR (MT MODEL)
GW 3
GY 1
BL 2
B17
i3
B38
i2
B37
E/G(LTB20)-01 C
E E/G(LTB20)-05
F E/G(LTB20)-10
G E/G(LTB20)-09
H E/G(LTB20)-08
A: B134 B: B135 ECM


B17 (BLACK)
C: i11 (GREEN)
A: i12 (GREEN)
B37
B: i10 (GREEN)
C: B56
B38
A: B134
B: B135

WI-07354



B47 (BROWN)

1		2
3		4
5		6

F44 (BLACK)

1	2	3	4
5	6	7	8

B12 (GRAY)

1	2	3	4
5	6	7	8
9	10	11	12

T7

1	2	3	4	5	6
7	8	9	10	11	12

F2 (BLUE)

1	2	3	4		5	6	7	8	9
10	11	12	13	14	15	16	17	18	19	20

D: B137

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23			24	25
26	27			28	29			30	31

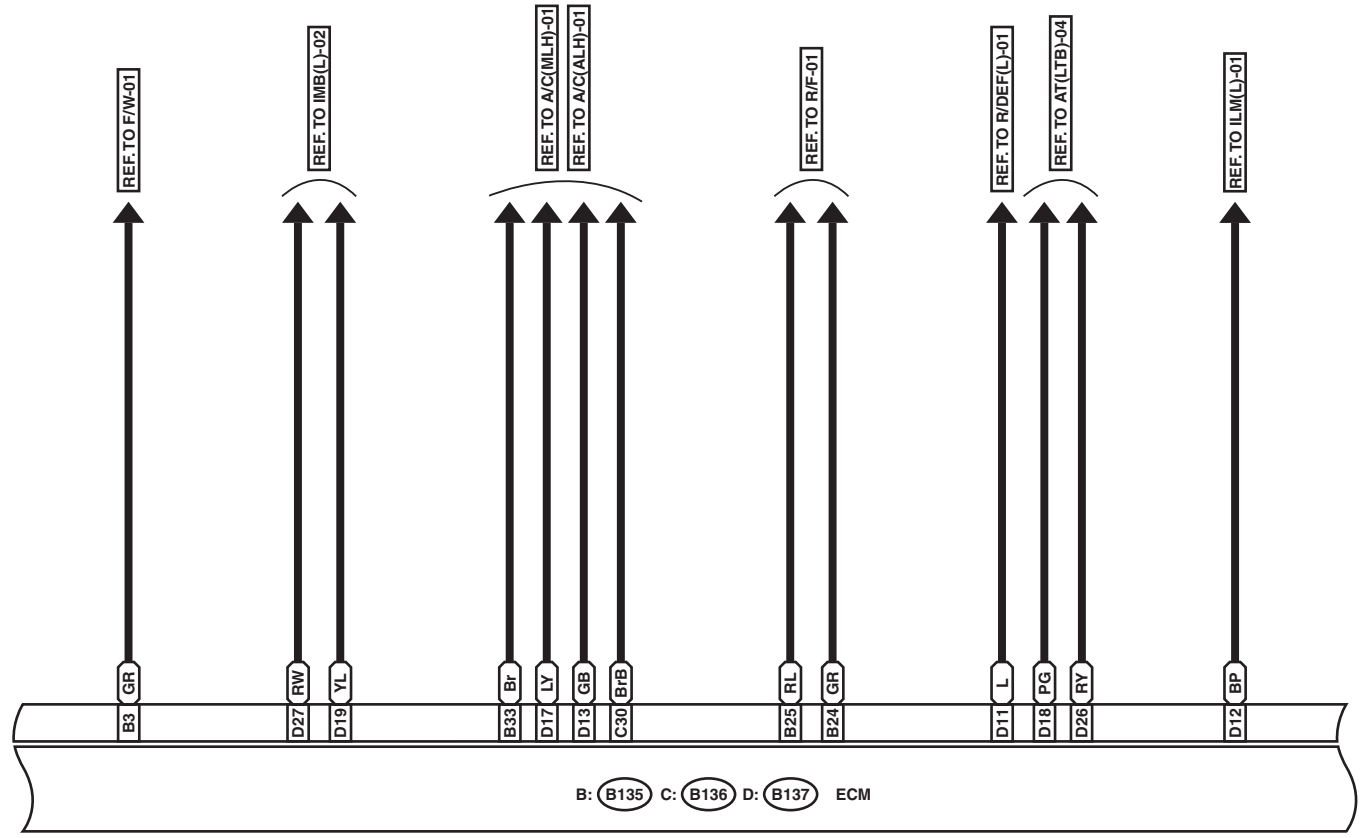
B: B135

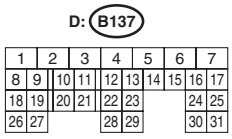
1	2				3	4	5	6	7					
8	9	10	11	12	13	14	15	16	17	18	19			
20	21	22	23			24	25			26	27			
28	29	30	31			32	33			34	35			

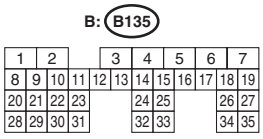
WI-07355

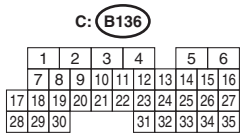
E/G(LTB20)-04

E/G(LTB20)-04

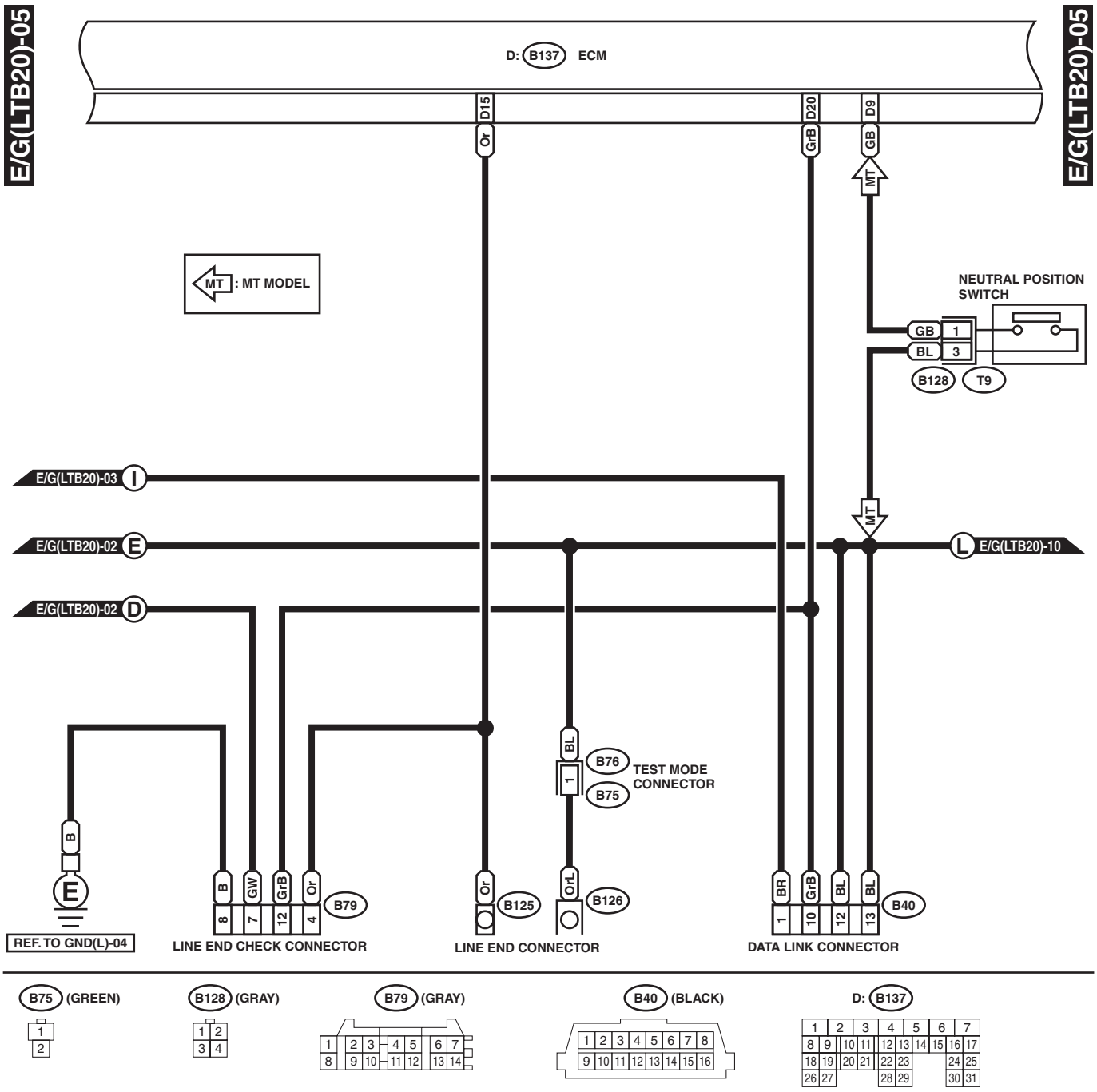






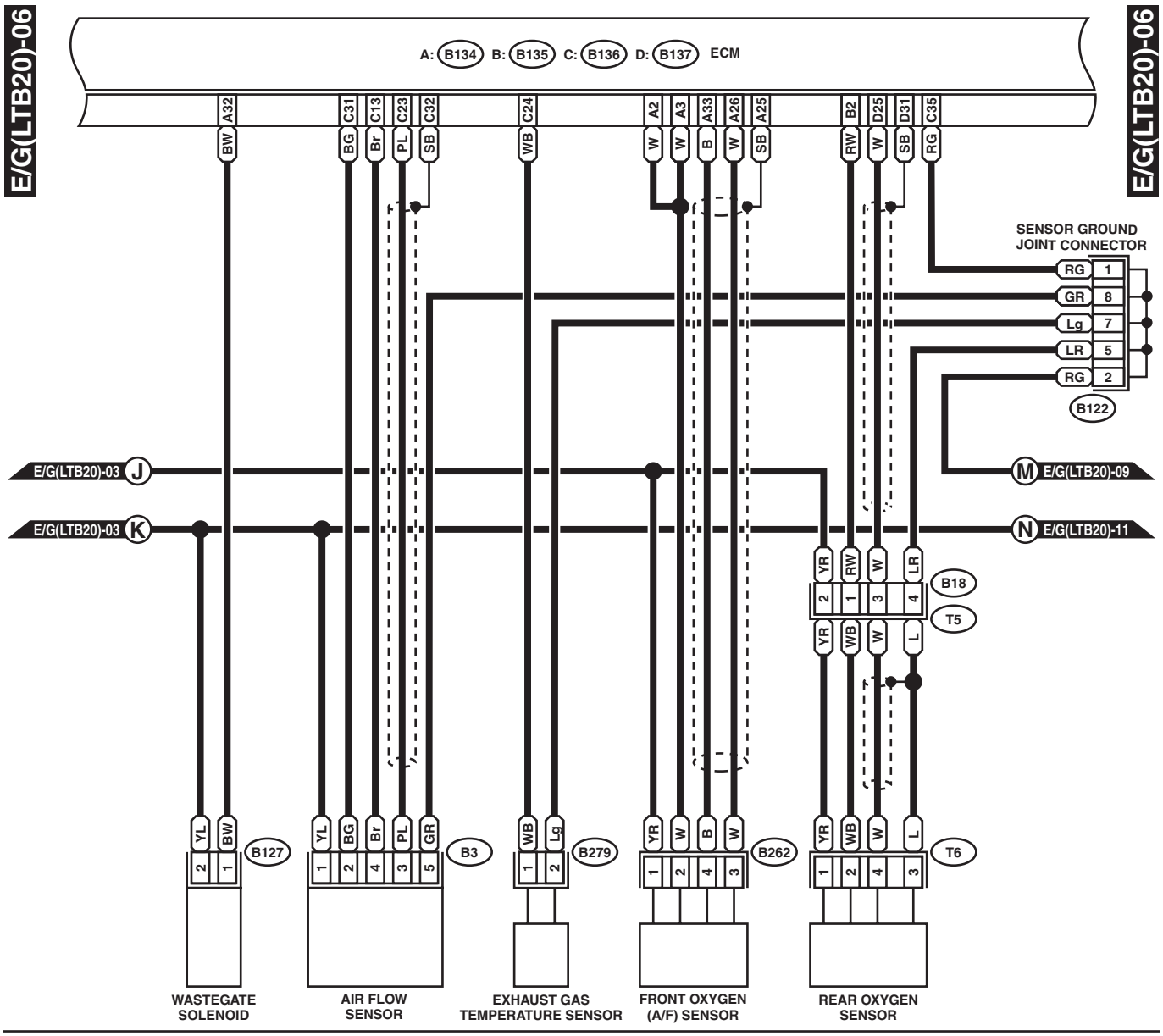


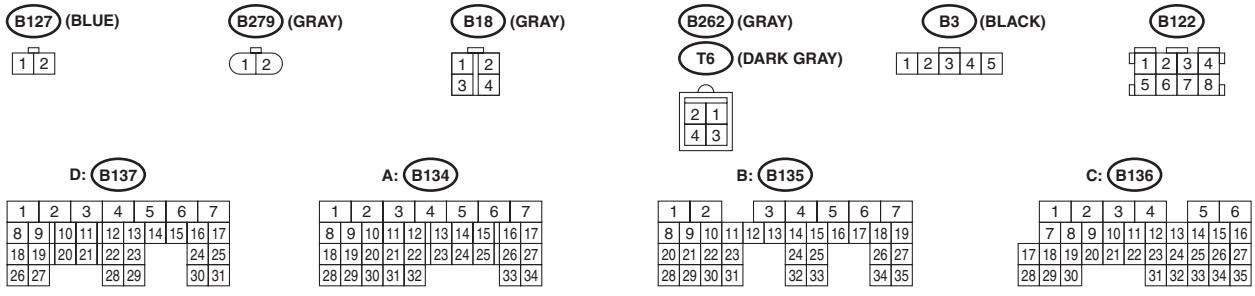
WI-07356


E/G(LTB20)-05
E/G(LTB20)-05
D: B137 ECM
D15
D20
D9
Or
GrB
GB
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH
GB 1
BL 3
B128
T9
E/G(LTB20)-03 I
E/G(LTB20)-02 E
E/G(LTB20)-02 D
L E/G(LTB20)-10
BL
B76
1
B75
TEST MODE CONNECTOR
B
E
REF. TO GND(L)-04
B
GW
GrB
Or
B79
8
7
12
4
LINE END CHECK CONNECTOR
Or
B125
OrL
B126
LINE END CONNECTOR
BR
GrB
BL
BL
B40
1
10
12
13
DATA LINK CONNECTOR

B75 (GREEN)
1
2
B128 (GRAY)
1 2
3 4
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31

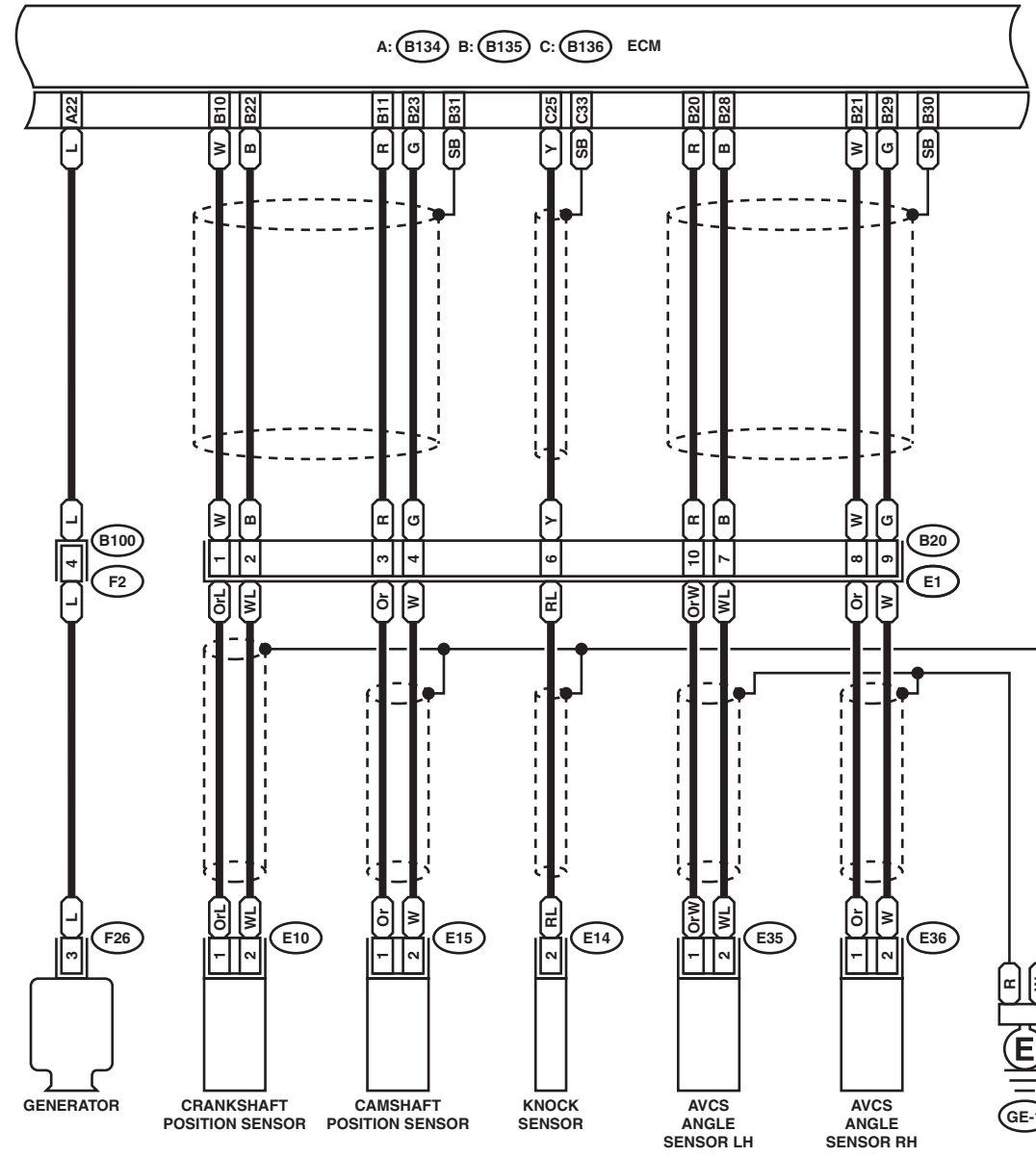
WI-05900


E/G(LTB20)-06
E/G(LTB20)-06
A: B134 B: B135 C: B136 D: B137 ECM
A32 C31 C13 C23 C32 C24 A2 A3 A33 A26 A25 B2 D25 D31 C35
BW BG Br PL SB WB W W B W SB RW W SB RG
SENSOR GROUND JOINT CONNECTOR
RG 1
GR 8
Lg 7
LR 5
RG 2
B122
E/G(LTB20)-03 J
E/G(LTB20)-03 K
M E/G(LTB20)-09
N E/G(LTB20)-11
YR RW W LR
B18
T5
YR WB W L
YL BW B127
YL BG Br PL GR B3
WB Lg B279
YR W B W B262
YR WB W L T6
WASTEGATE SOLENOID
AIR FLOW SENSOR
EXHAUST GAS TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR


B127 (BLUE)
B279 (GRAY)
B18 (GRAY)
B262 (GRAY)
T6 (DARK GRAY)
B3 (BLACK)
B122
D: B137
A: B134
B: B135
C: B136

WI-05901

E/G(LTB20)-07

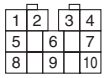


E/G(LTB20)-07

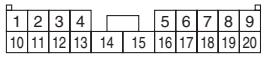
(LIGHT GRAY) E10 E35
(BROWN) E14 E36
(LIGHT GRAY) E15

F26 (GREEN)

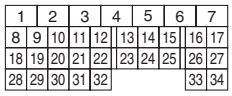
B20 (LIGHT GRAY)



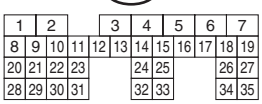
F2 (BLUE)



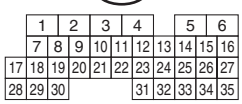
A: B134



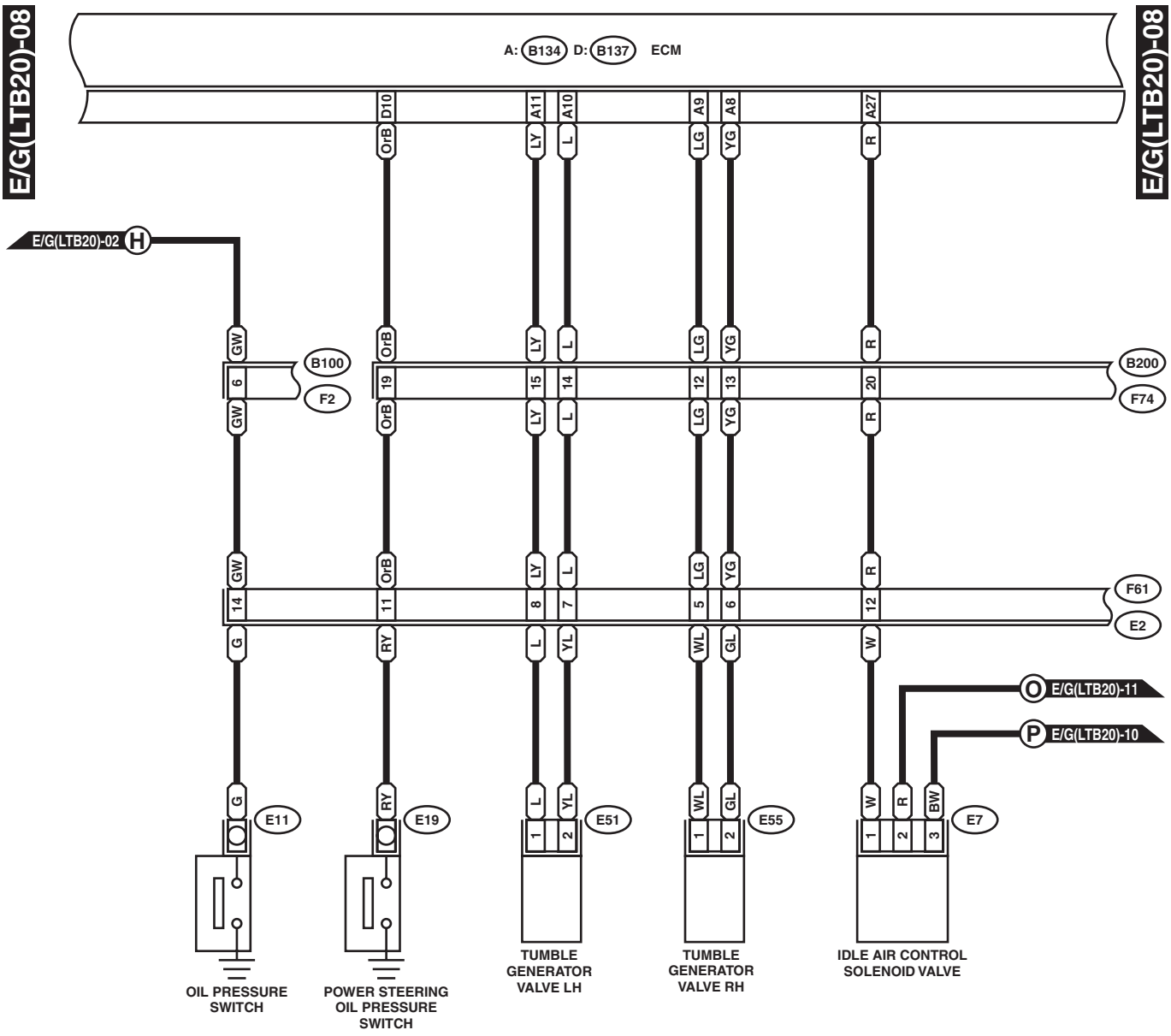
B: B135



C: B136



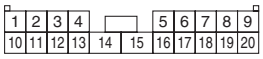
WI-05902



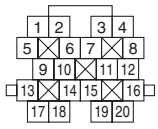
E51 (BLACK)
E55 (BLACK)

E7 (LIGHT GRAY)

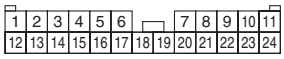
F2 (BLUE)



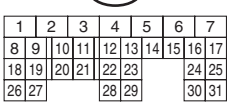
F61 (BLACK)



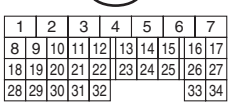
F74 (BLACK)



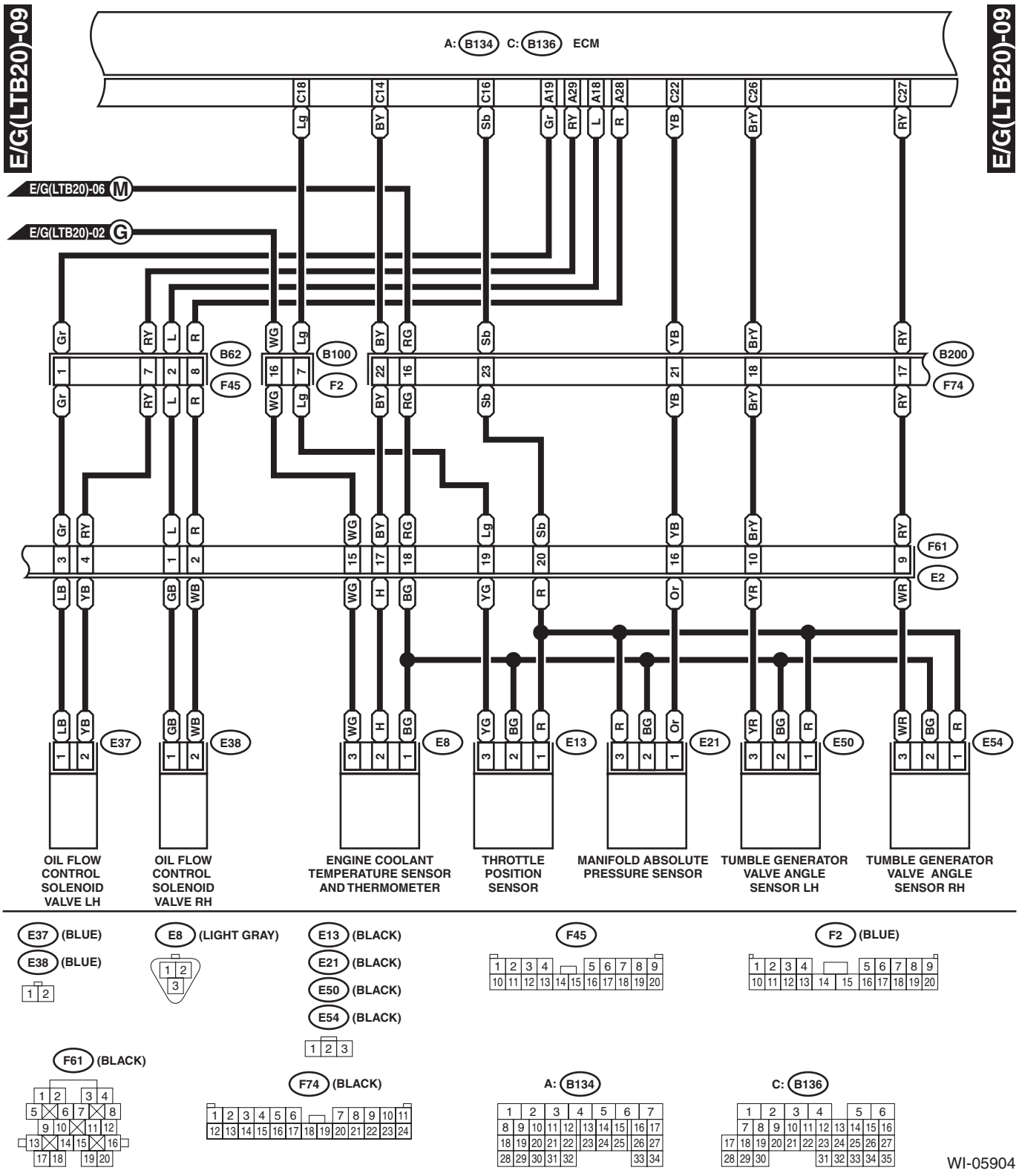
D: B137

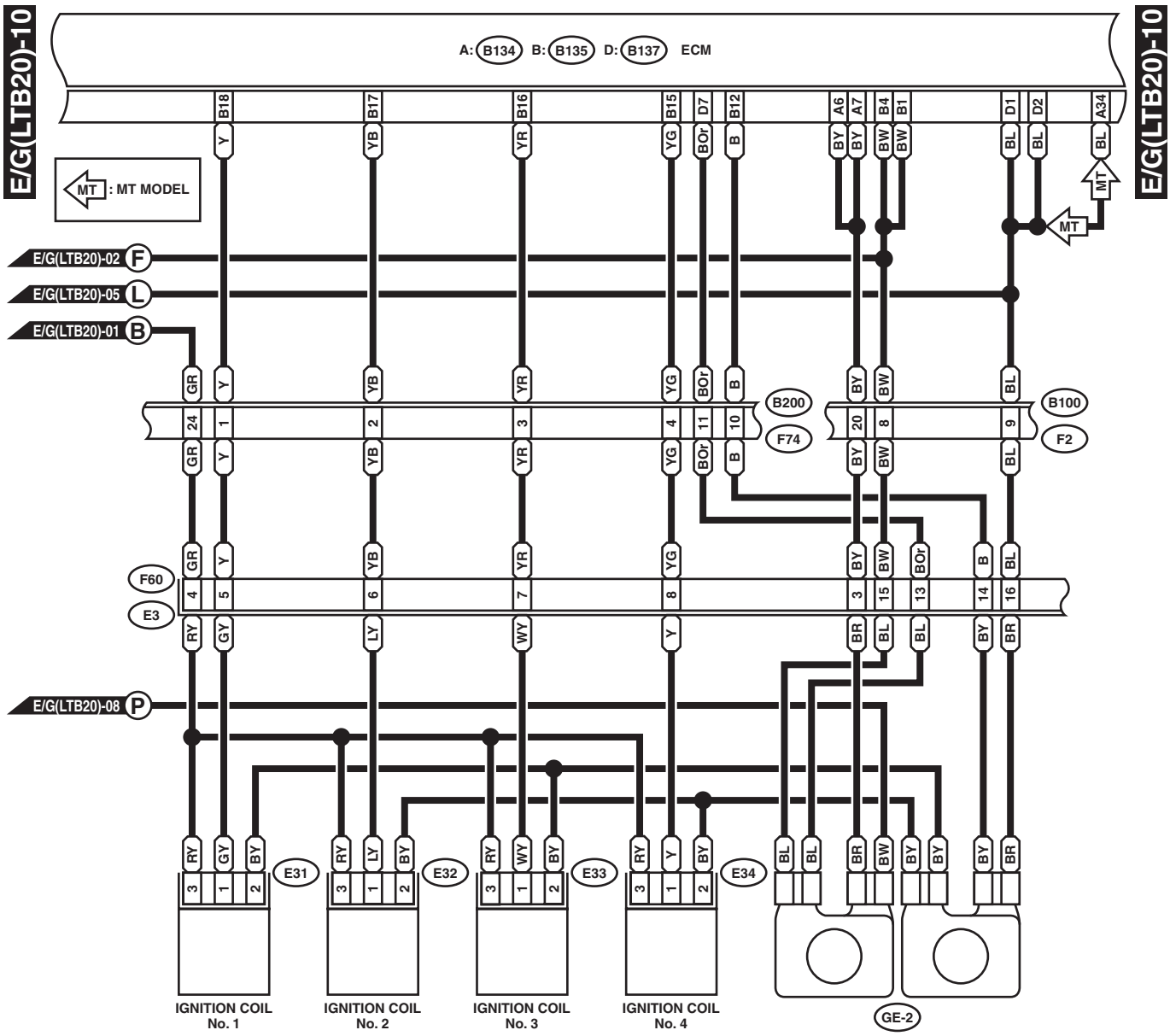


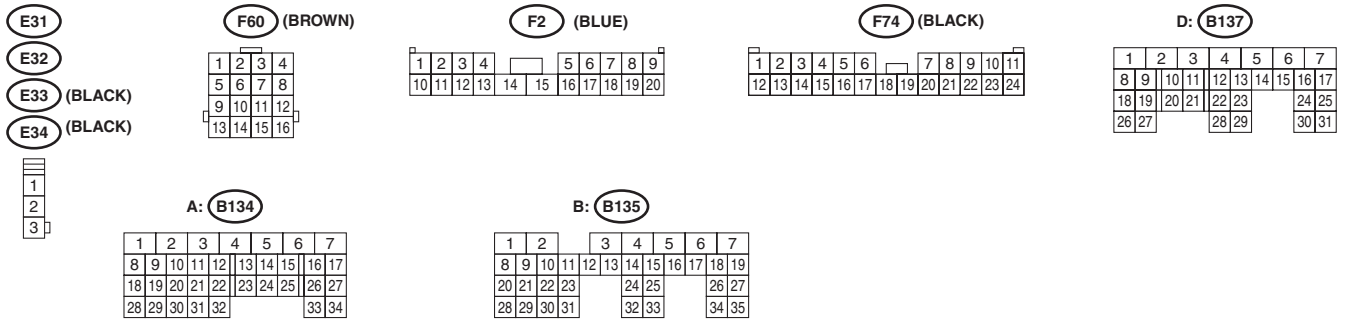
A: B134



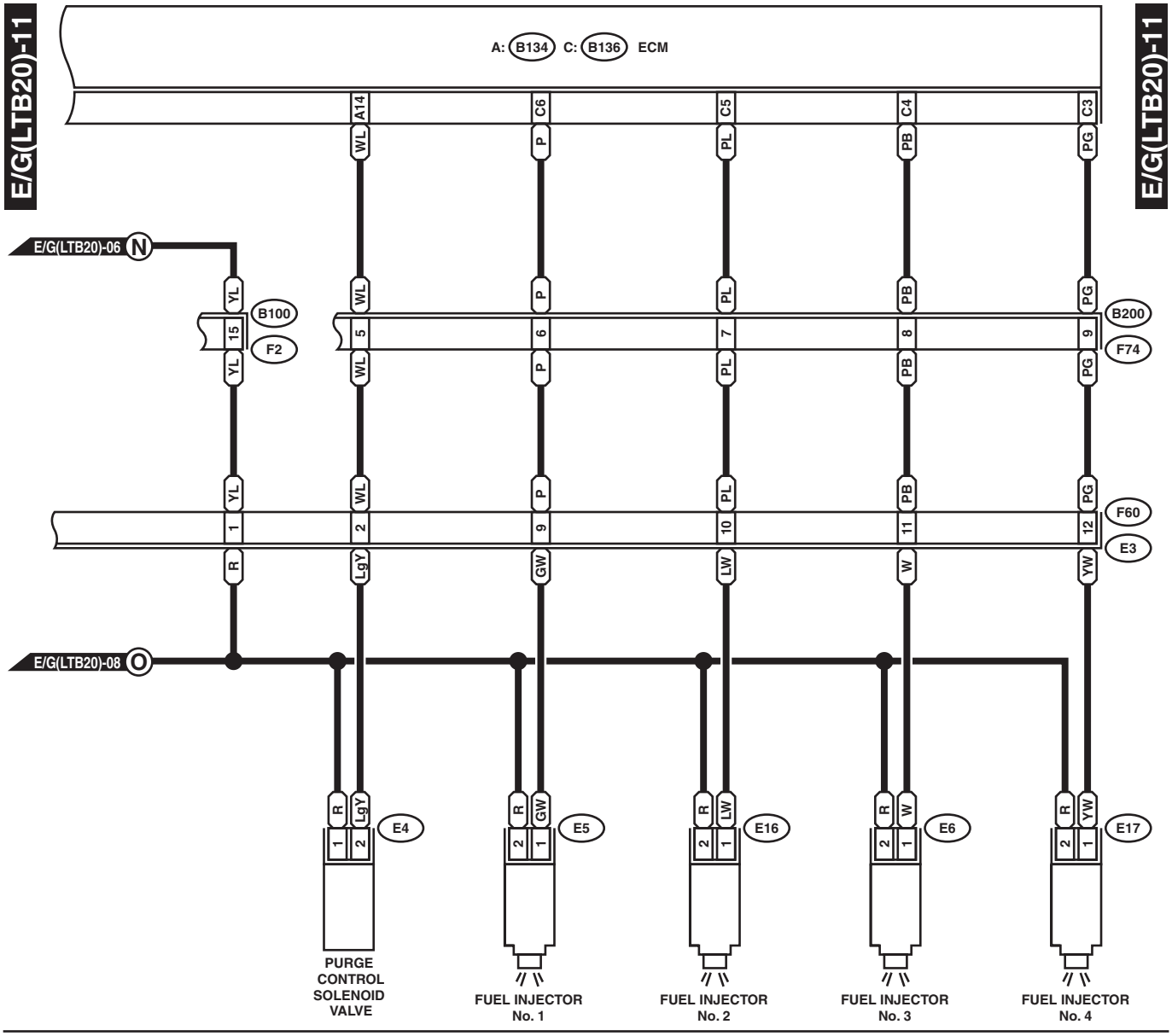
WI-05903


E/G(LTB20)-09
E/G(LTB20)-09
A: B134 C: B136 ECM
C18 C14 C16 A19 A29 A18 A28 C22 C26 C27
Lg BY Sb Gr RY L R YB BrY RY
E/G(LTB20)-06 M
E/G(LTB20)-02 G
B62 F45 B100 F2 B200 F74 F61 E2
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
THROTTLE POSITION SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
E37 (BLUE)
E38 (BLUE)
E8 (LIGHT GRAY)
E13 (BLACK)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
F45
F2 (BLUE)
F61 (BLACK)
F74 (BLACK)
A: B134
C: B136
WI-05904


E/G(LTB20)-10
A: B134 B: B135 D: B137 ECM
MT : MT MODEL
E/G(LTB20)-02 F
E/G(LTB20)-05 L
E/G(LTB20)-01 B
E/G(LTB20)-08 P
B200
F74
B100
F2
F60
E3
E31
E32
E33
E34
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
GE-2


E31
E32
E33 (BLACK)
E34 (BLACK)
F60 (BROWN)
F2 (BLUE)
F74 (BLACK)
D: B137
A: B134
B: B135

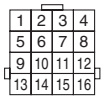
WI-05905



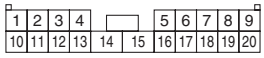
E5 (DARK GRAY)
E6 (DARK GRAY)
E16 (DARK GRAY)
E17 (DARK GRAY)

E4 (BLACK)

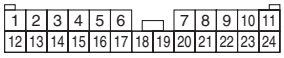
F60 (BROWN)



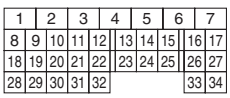
F2 (BLUE)



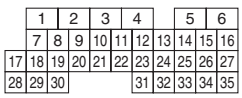
F74 (BLACK)



A: B134

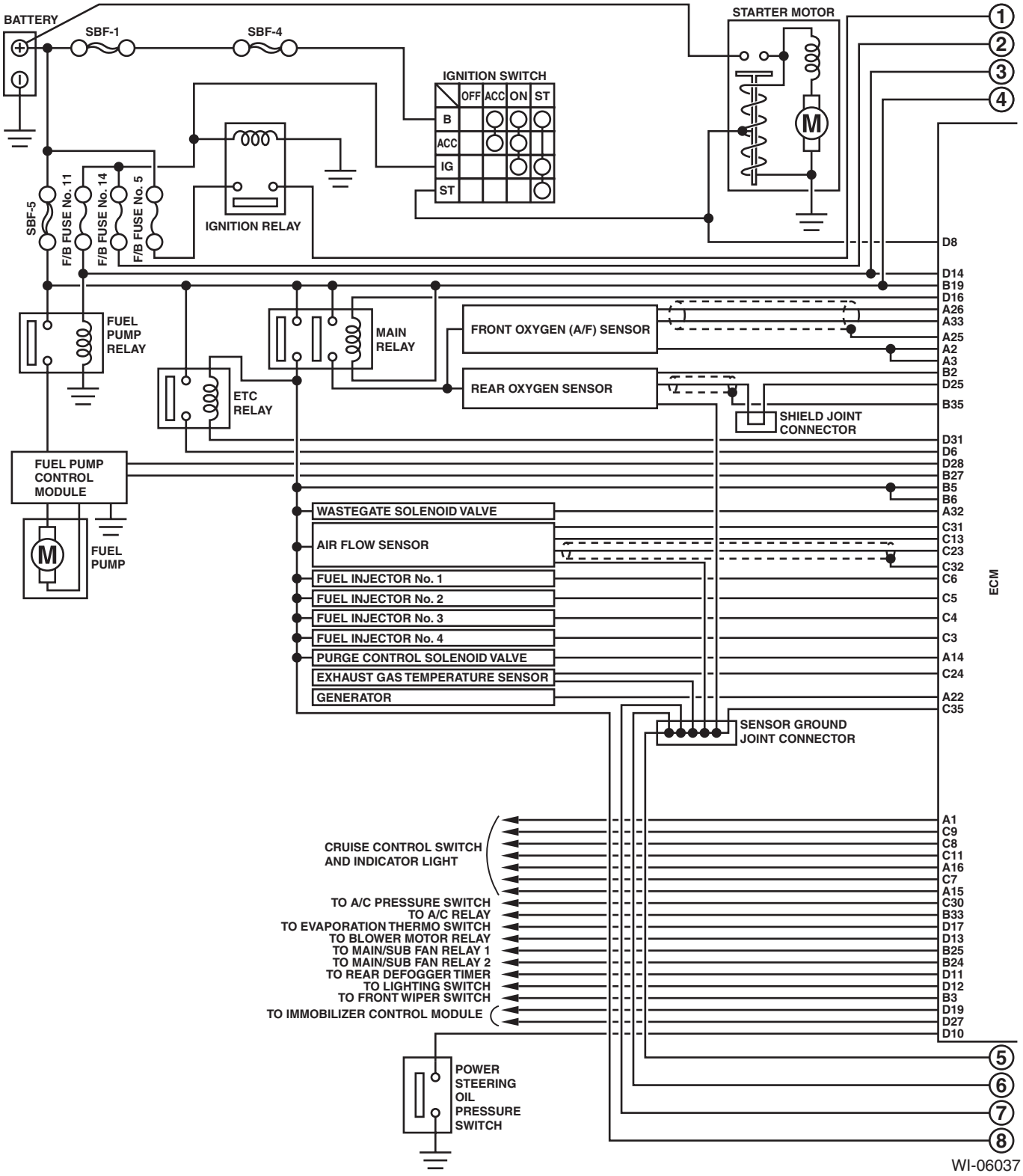


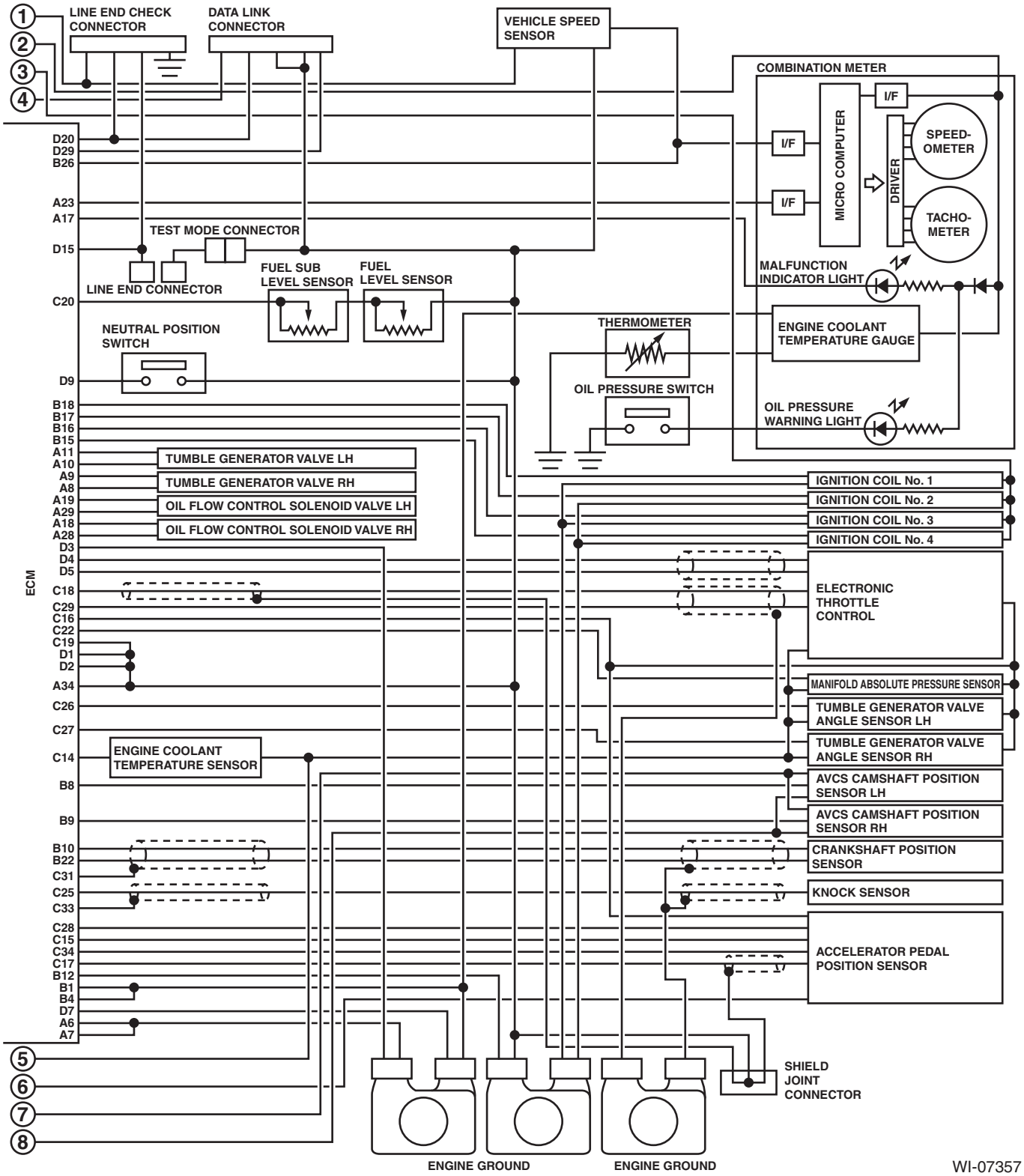
C: B136

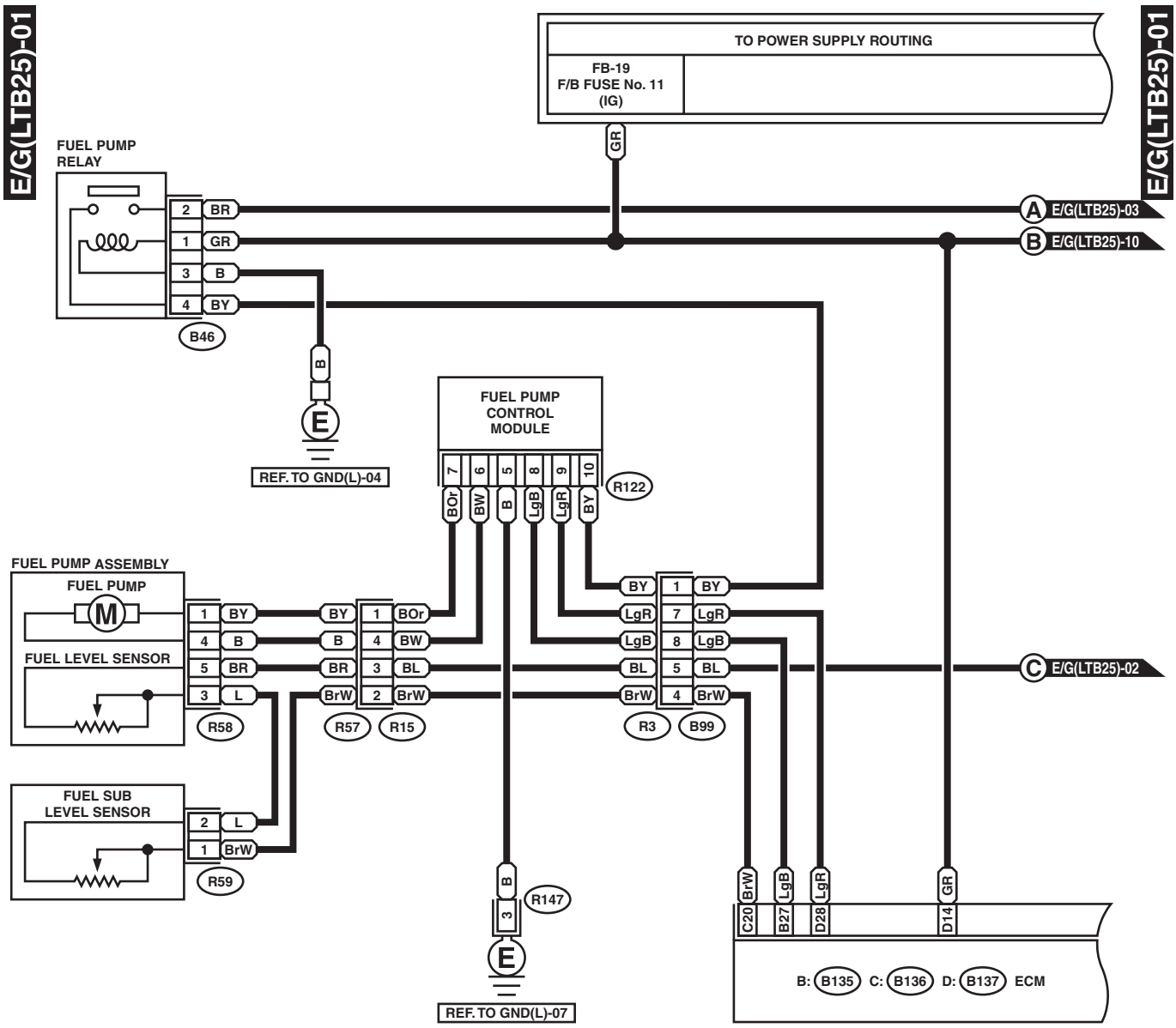


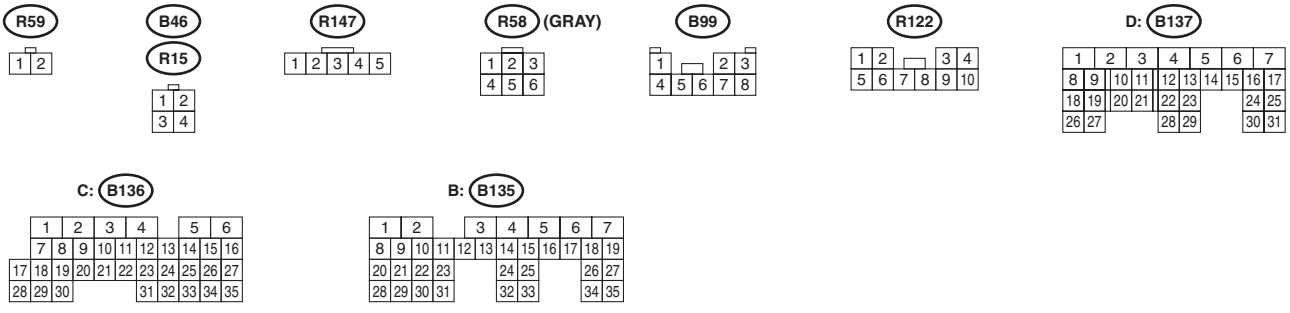
WI-05906

3. LHD 2.5 L TURBO MODEL

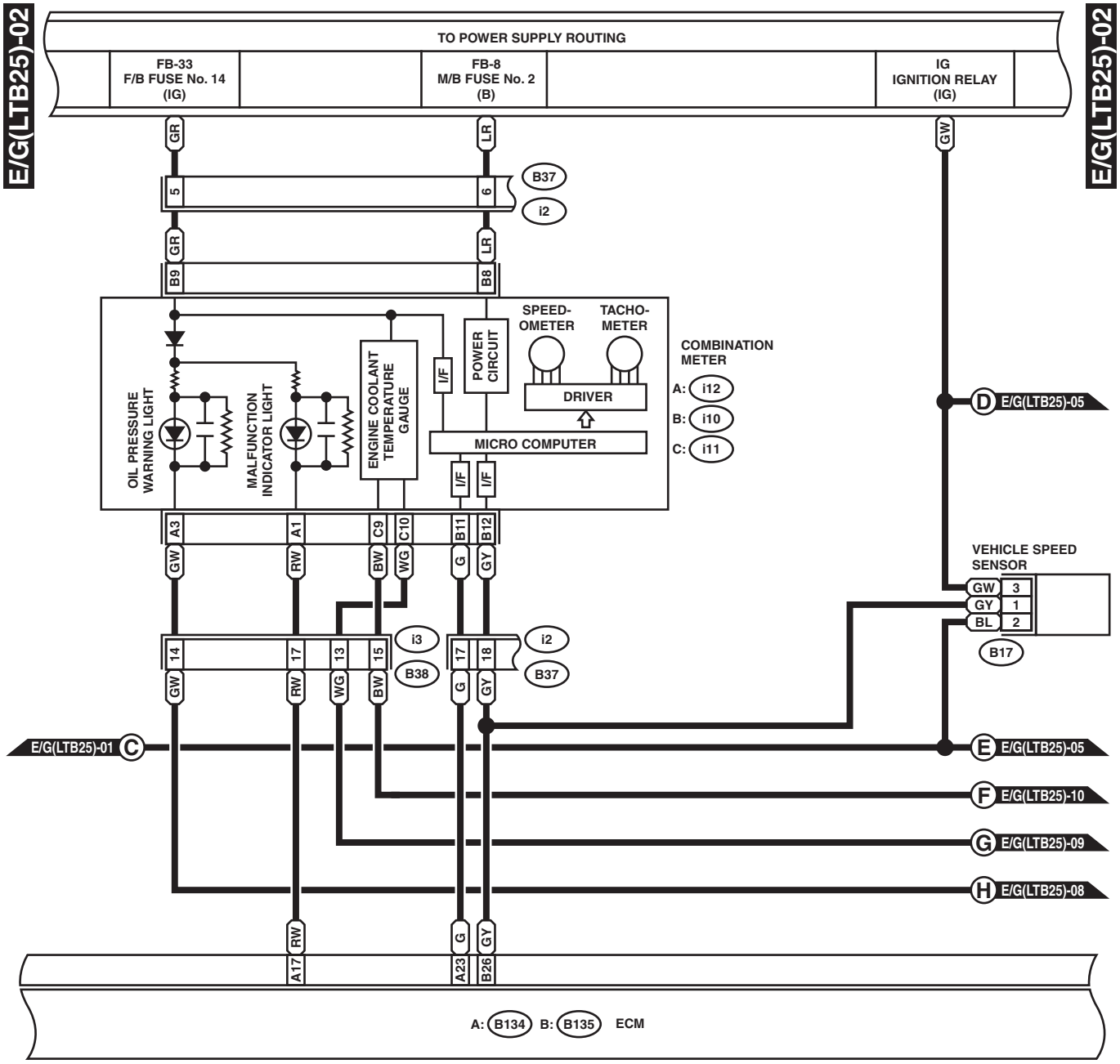


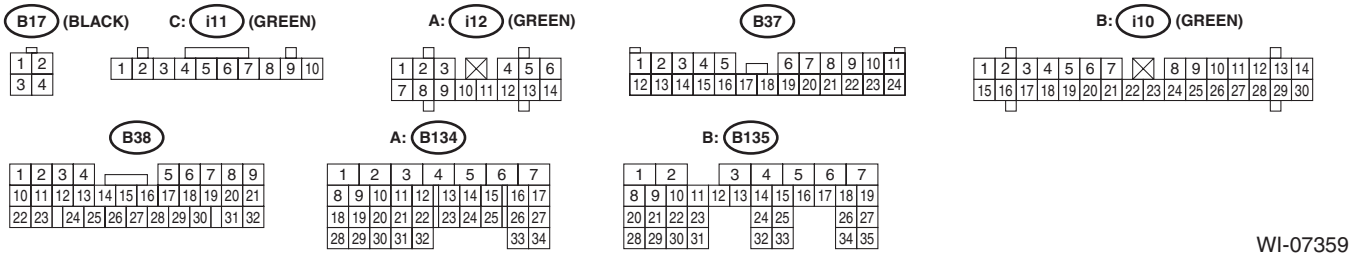

LINE END CHECK CONNECTOR
DATA LINK CONNECTOR
VEHICLE SPEED SENSOR
COMBINATION METER
I/F
MICRO COMPUTER
DRIVER
SPEED-OMETER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
TEST MODE CONNECTOR
LINE END CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH
THERMOMETER
OIL PRESSURE SWITCH
ECM
D20
D29
B26
A23
A17
D15
C20
D9
B18
B17
B16
B15
A11
A10
A9
A8
A19
A29
A18
A28
D3
D4
D5
C18
C29
C16
C22
C19
D1
D2
A34
C26
C27
C14
B8
B9
B10
B22
C31
C25
C33
C28
C15
C34
C17
B12
B1
B4
D7
A6
A7
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH
ENGINE COOLANT TEMPERATURE SENSOR
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
AVCS CAMSHAFT POSITION SENSOR LH
AVCS CAMSHAFT POSITION SENSOR RH
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
ACCELERATOR PEDAL POSITION SENSOR
SHIELD JOINT CONNECTOR
ENGINE GROUND
ENGINE GROUND
1
2
3
4
5
6
7
8
WI-07357


E/G(LTB25)-01
E/G(LTB25)-01
TO POWER SUPPLY ROUTING
FB-19
F/B FUSE No. 11
(IG)
GR
FUEL PUMP
RELAY
2 BR
1 GR
3 B
4 BY
B46
A E/G(LTB25)-03
B E/G(LTB25)-10
B
E
REF. TO GND(L)-04
FUEL PUMP
CONTROL
MODULE
7 6 5 8 9 10
R122
BOr BW B LgB LgR BY
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL LEVEL SENSOR
1 BY
4 B
5 BR
3 L
R58
BY 1 BOr
B 4 BW
BR 3 BL
BrW 2 BrW
R57
R15
BY 1 BY
LgR 7 LgR
LgB 8 LgB
BL 5 BL
BrW 4 BrW
R3
B99
C E/G(LTB25)-02
FUEL SUB
LEVEL SENSOR
2 L
1 BrW
R59
B
3
R147
E
REF. TO GND(L)-07
BrW LgB LgR GR
C20 B27 D28 D14
B: B135 C: B136 D: B137 ECM

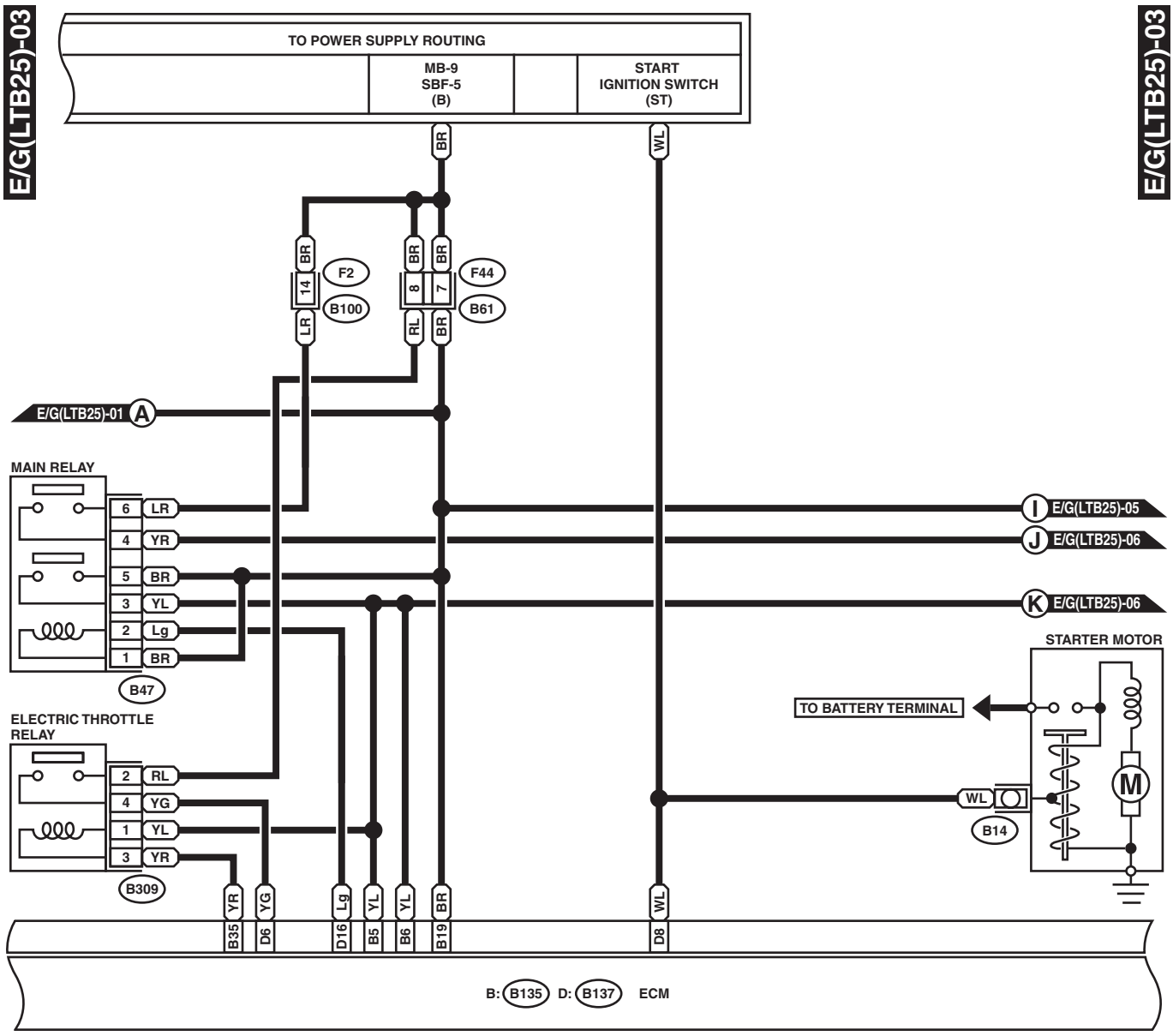

R59
1 2
B46
R15
1 2
3 4
R147
1 2 3 4 5
R58 (GRAY)
1 2 3
4 5 6
B99
1 2 3
4 5 6 7 8
R122
1 2 3 4
5 6 7 8 9 10
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
B: B135
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35

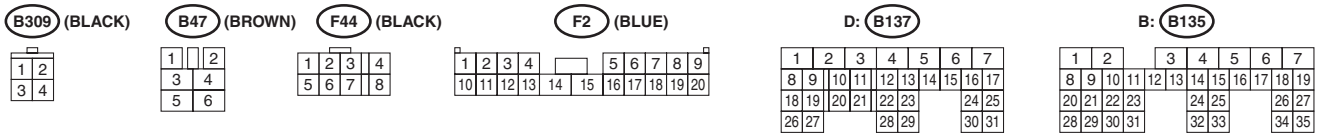
WI-07358


E/G(LTB25)-02
E/G(LTB25)-02
TO POWER SUPPLY ROUTING
FB-33
F/B FUSE No. 14
(IG)
FB-8
M/B FUSE No. 2
(B)
IG
IGNITION RELAY
(IG)
GR
LR
GW
B37
i2
B9
B8
SPEED-
OMETER
TACHO-
METER
COMBINATION
METER
A: i12
B: i10
C: i11
OIL PRESSURE
WARNING LIGHT
MALFUNCTION
INDICATOR LIGHT
ENGINE COOLANT
TEMPERATURE
GAUGE
I/F
POWER
CIRCUIT
DRIVER
MICRO COMPUTER
D E/G(LTB25)-05
A3
A1
C9
C10
B11
B12
RW
BW
WG
G
GY
VEHICLE SPEED
SENSOR
GW 3
GY 1
BL 2
B17
i3
i2
B38
B37
E/G(LTB25)-01 C
E E/G(LTB25)-05
F E/G(LTB25)-10
G E/G(LTB25)-09
H E/G(LTB25)-08
A17
A23
B26
A: B134 B: B135 ECM


B17 (BLACK)
C: i11 (GREEN)
A: i12 (GREEN)
B37
B: i10 (GREEN)
B38
A: B134
B: B135

WI-07359

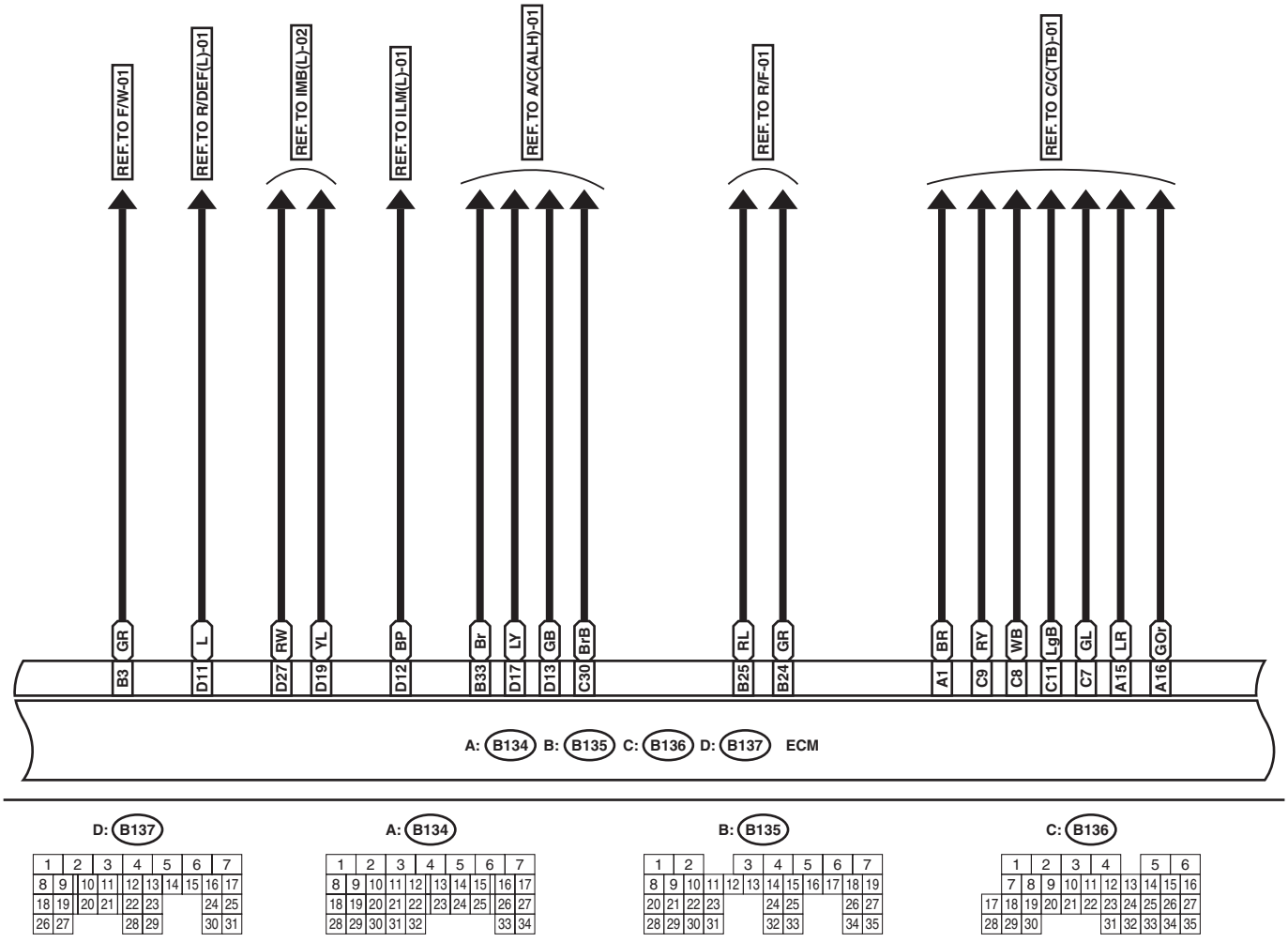

E/G(LTB25)-03
E/G(LTB25)-03
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
START
IGNITION SWITCH
(ST)
BR
WL
F2
B100
F44
B61
LR
RL
BR
E/G(LTB25)-01 A
MAIN RELAY
6 LR
4 YR
5 BR
3 YL
2 Lg
1 BR
B47
I E/G(LTB25)-05
J E/G(LTB25)-06
K E/G(LTB25)-06
STARTER MOTOR
TO BATTERY TERMINAL
WL
B14
M
ELECTRIC THROTTLE
RELAY
2 RL
4 YG
1 YL
3 YR
B309
YR
YG
Lg
YL
YL
BR
WL
B35
D6
D16
B5
B6
B19
D8
B: B135 D: B137 ECM


B309 (BLACK)
B47 (BROWN)
F44 (BLACK)
F2 (BLUE)
D: B137
B: B135

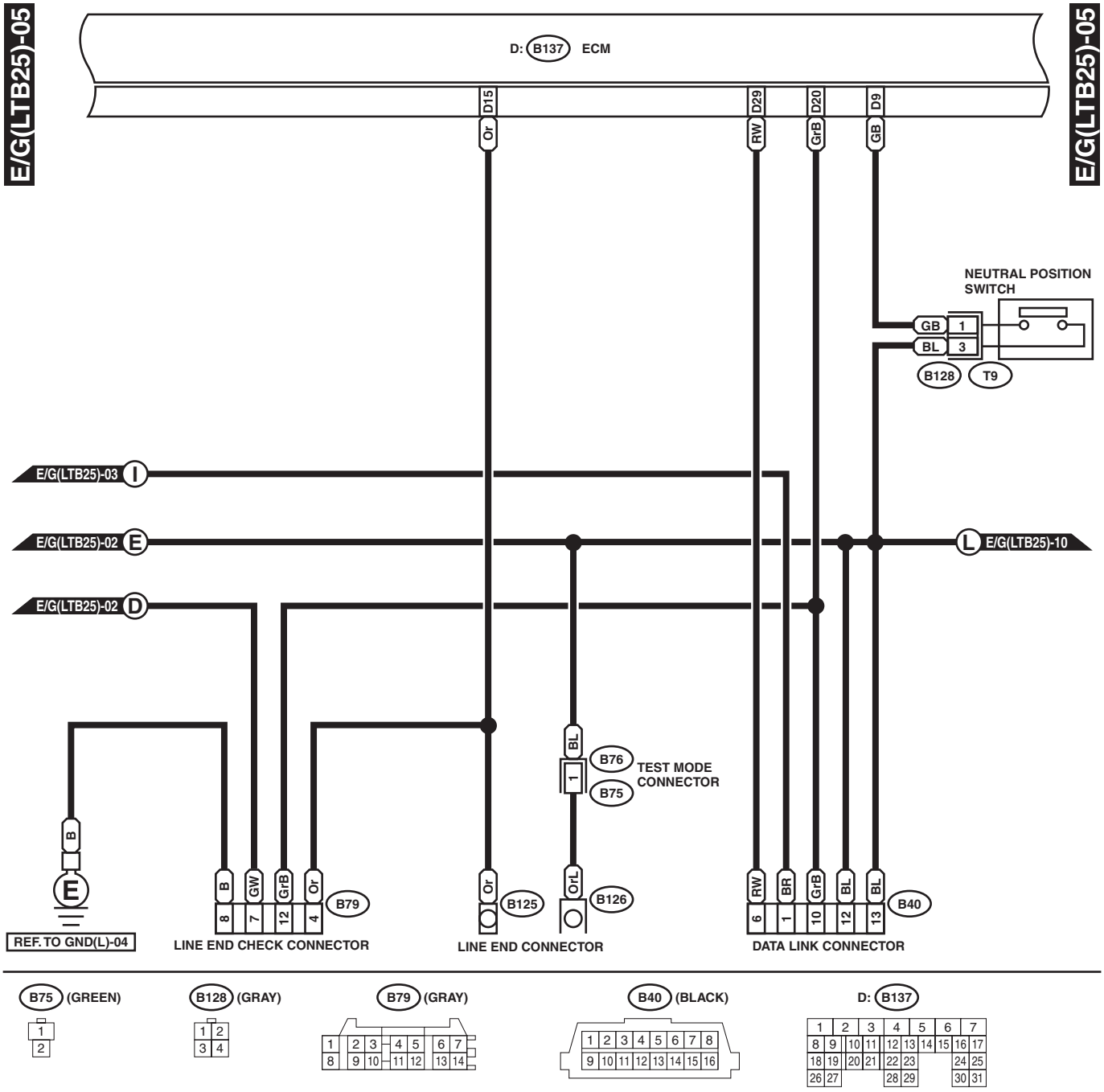
WI-07360

E/G(LTB25)-04

E/G(LTB25)-04

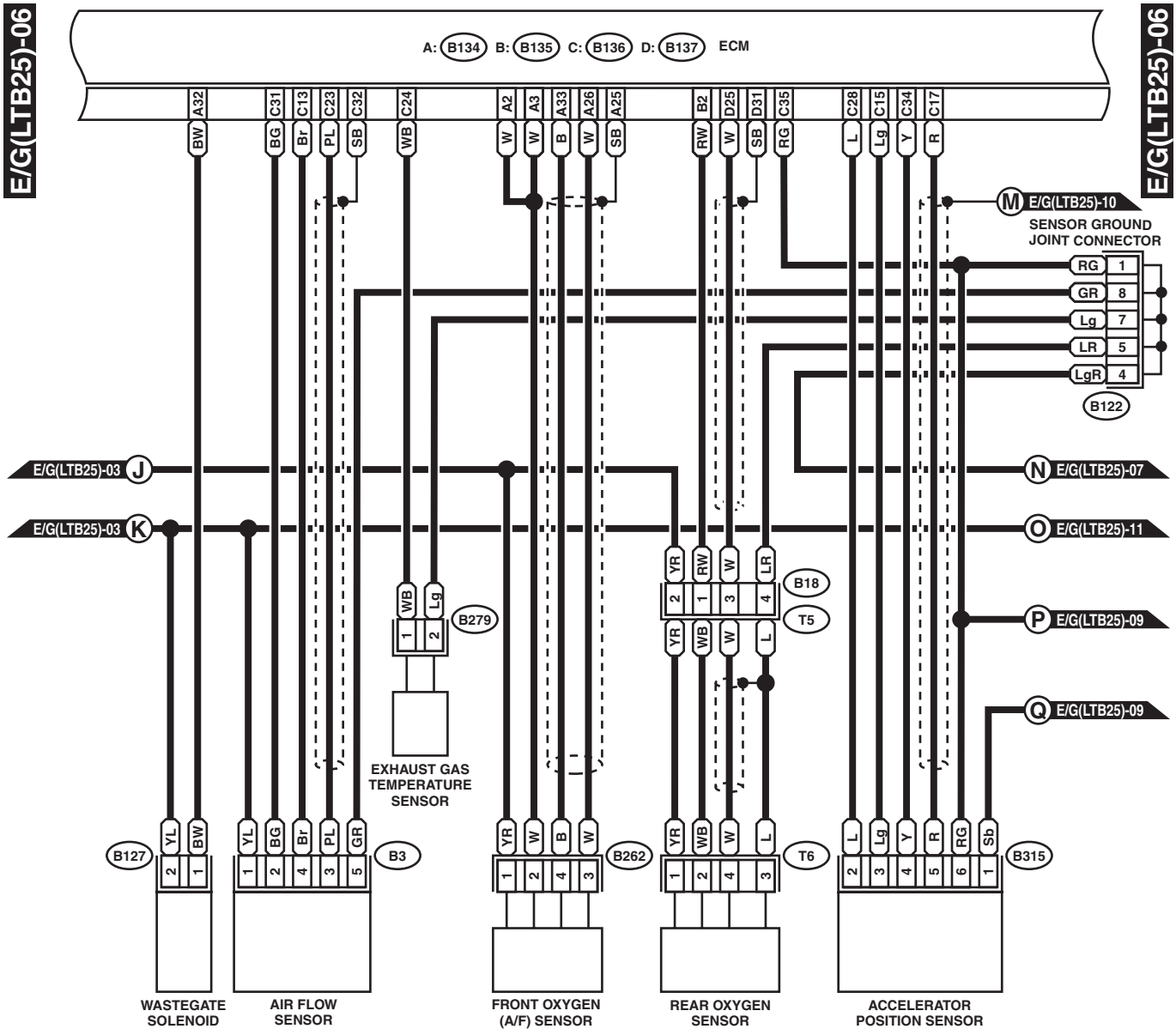


WI-05910


E/G(LTB25)-05
E/G(LTB25)-05
D: B137 ECM
D15
D29
D20
D9
Or
RW
GrB
GB
NEUTRAL POSITION SWITCH
GB 1
BL 3
B128
T9
E/G(LTB25)-03 I
E/G(LTB25)-02 E
E/G(LTB25)-02 D
L E/G(LTB25)-10
BL
B76
1
B75
TEST MODE CONNECTOR
B
E
REF. TO GND(L)-04
B GW GrB Or
8 7 12 4
B79
LINE END CHECK CONNECTOR
Or
B125
OrL
B126
LINE END CONNECTOR
RW BR GrB BL BL
6 1 10 12 13
B40
DATA LINK CONNECTOR

B75 (GREEN)
1
2
B128 (GRAY)
1 2
3 4
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31

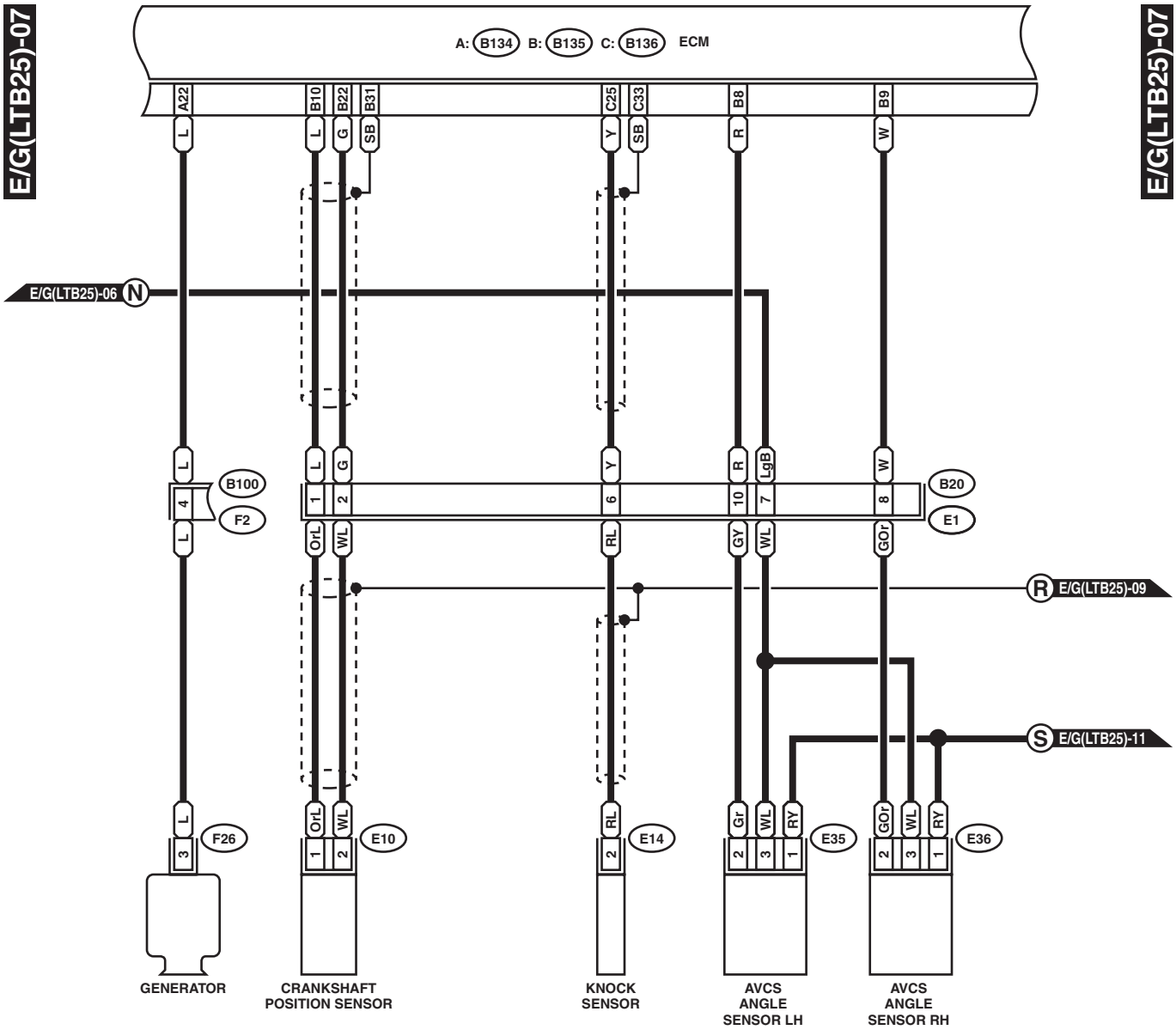
WI-05911



B127 (BLUE) B279 (GRAY) B18 (GRAY) B262 (GRAY) T6 (DARK GRAY) B3 (BLACK) B315 (BLACK) B122

D: B137 A: B134 B: B135 C: B136

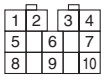
WI-05912



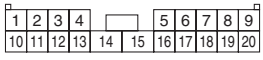
(LIGHT GRAY) E10
(BROWN) E14

F26 (GREEN)
E35 (LIGHT GRAY)
E36 (LIGHT GRAY)

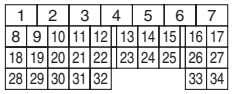
B20 (LIGHT GRAY)



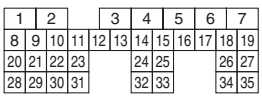
F2 (BLUE)



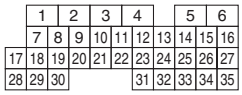
A: B134



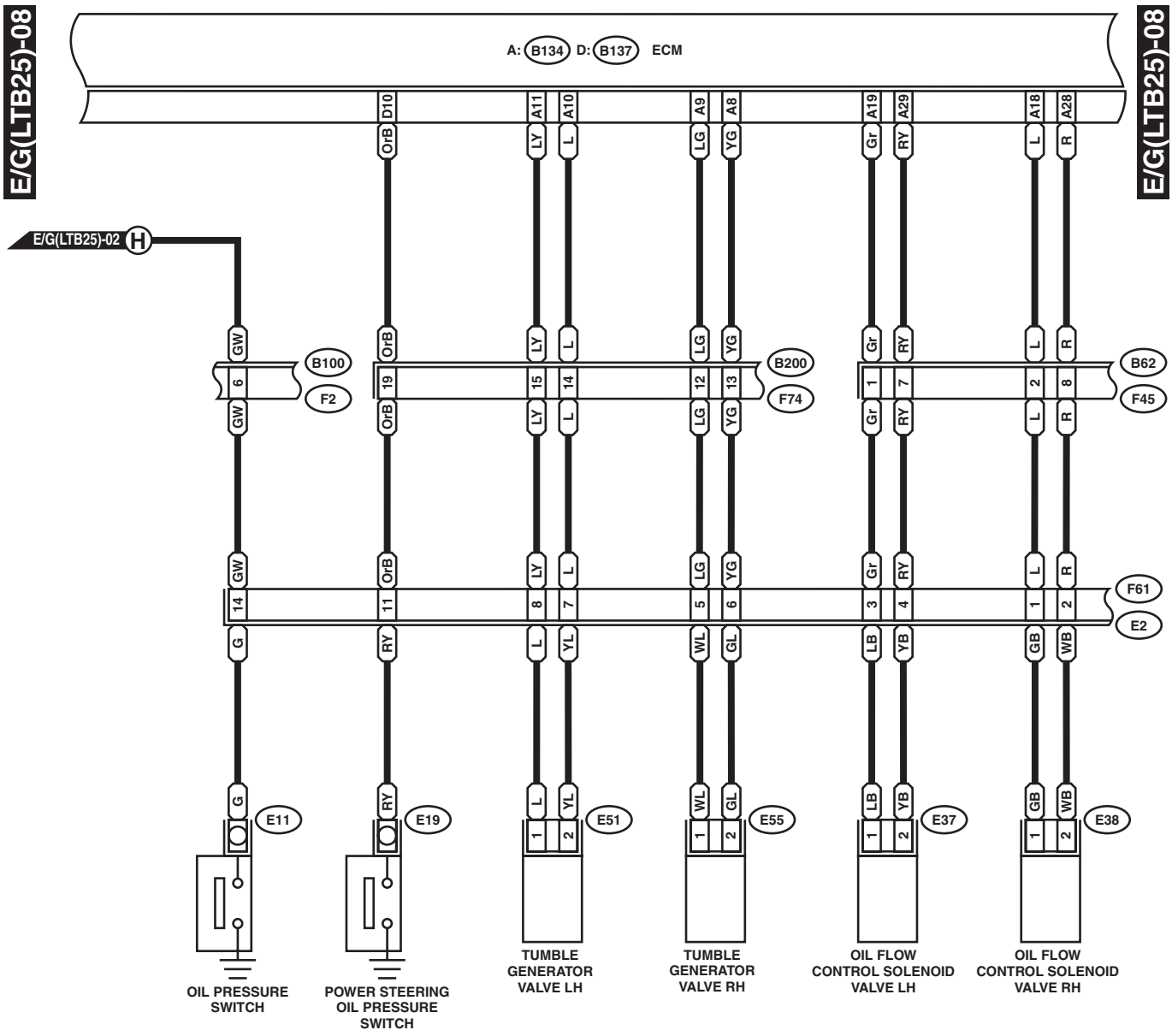
B: B135

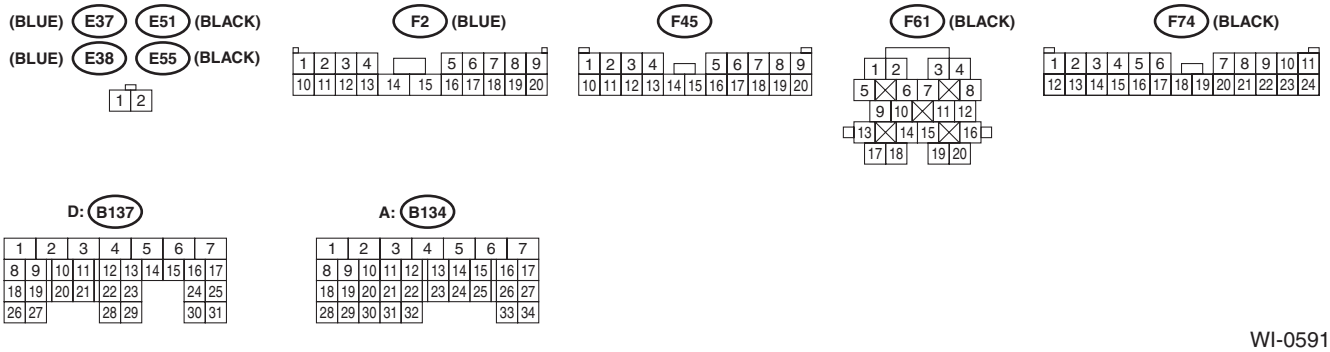


C: B136

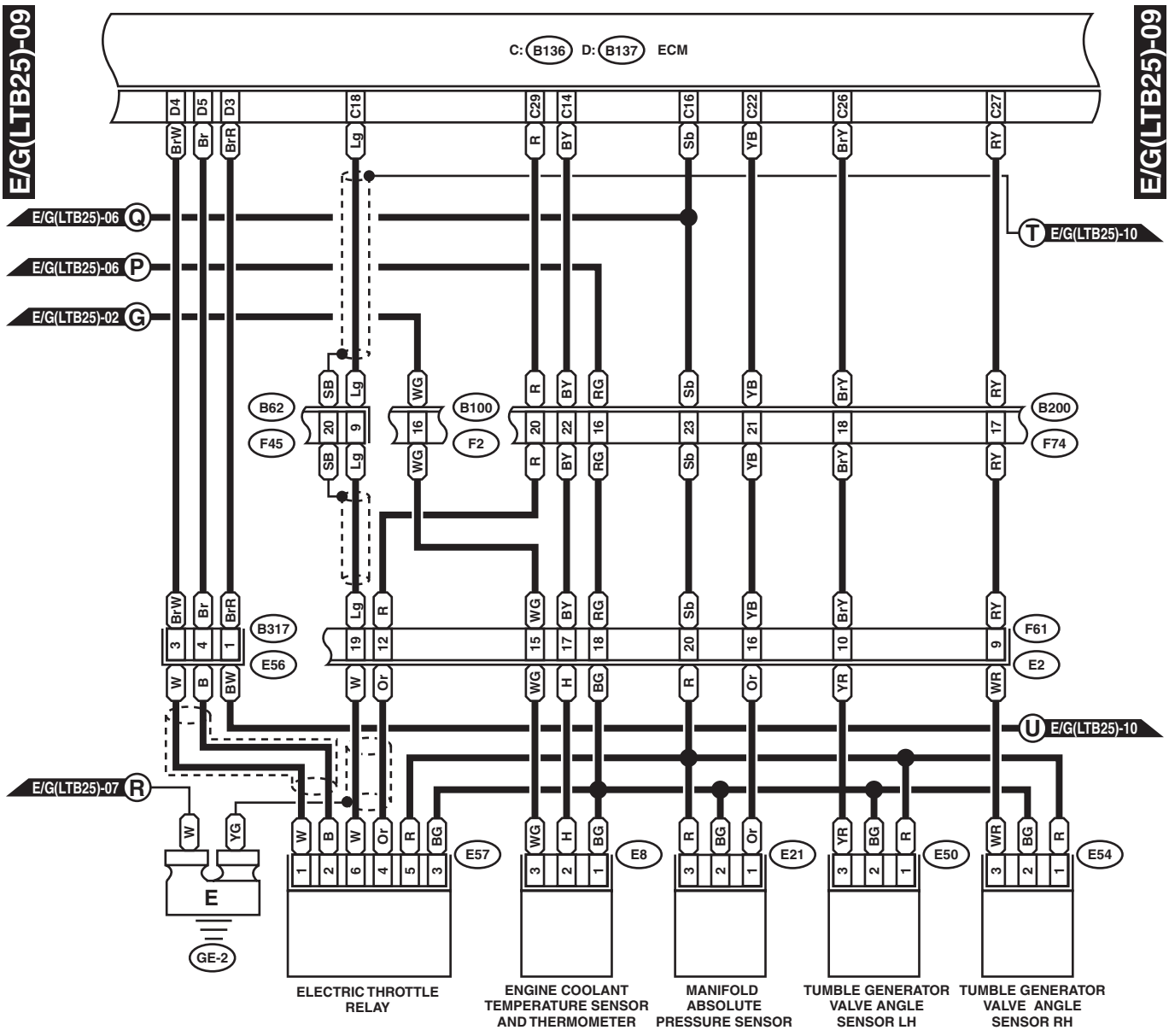


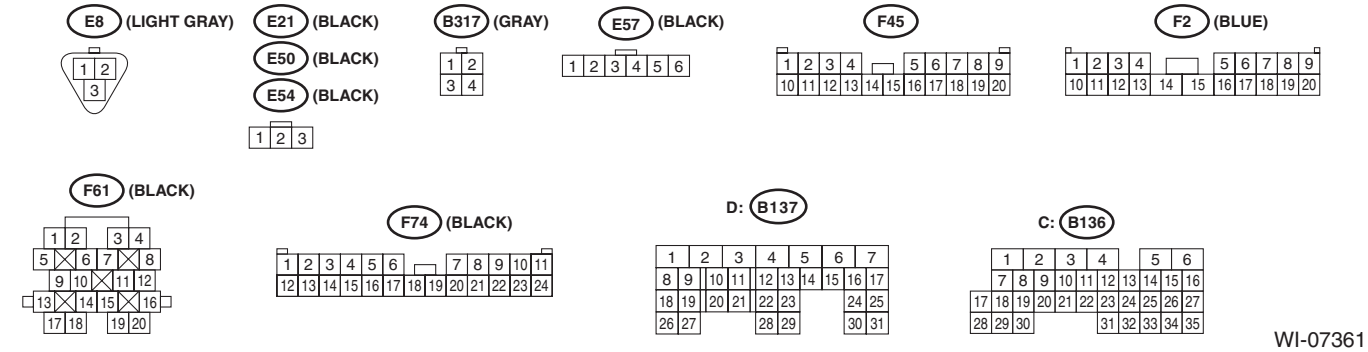
WI-05913


E/G(LTB25)-08
E/G(LTB25)-08
A: B134 D: B137 ECM
E/G(LTB25)-02 H
B100
F2
B200
F74
B62
F45
F61
E2
E11
E19
E51
E55
E37
E38
OIL PRESSURE SWITCH
POWER STEERING OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH

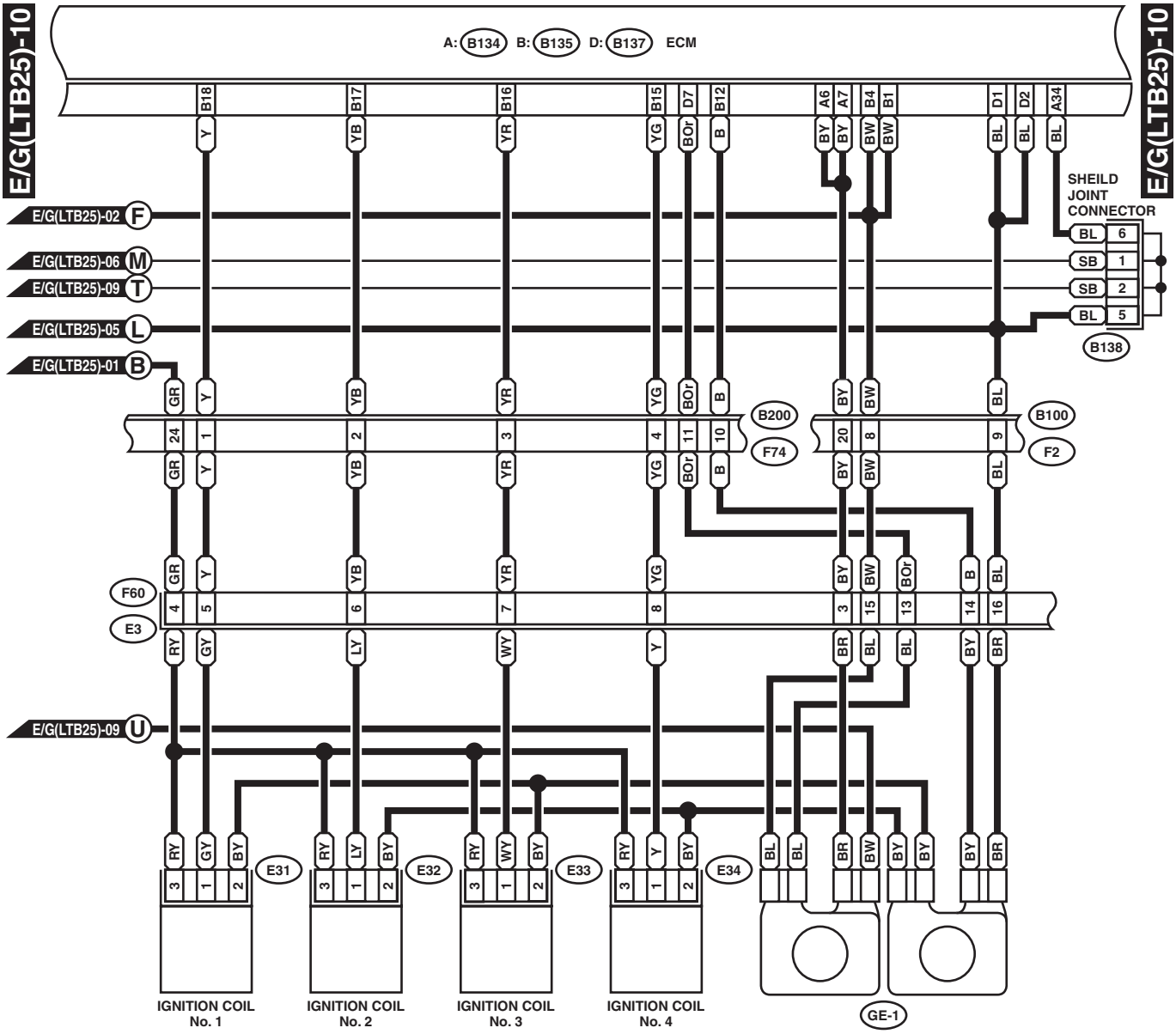

(BLUE) E37 E51 (BLACK)
(BLUE) E38 E55 (BLACK)
F2 (BLUE)
F45
F61 (BLACK)
F74 (BLACK)
D: B137
A: B134

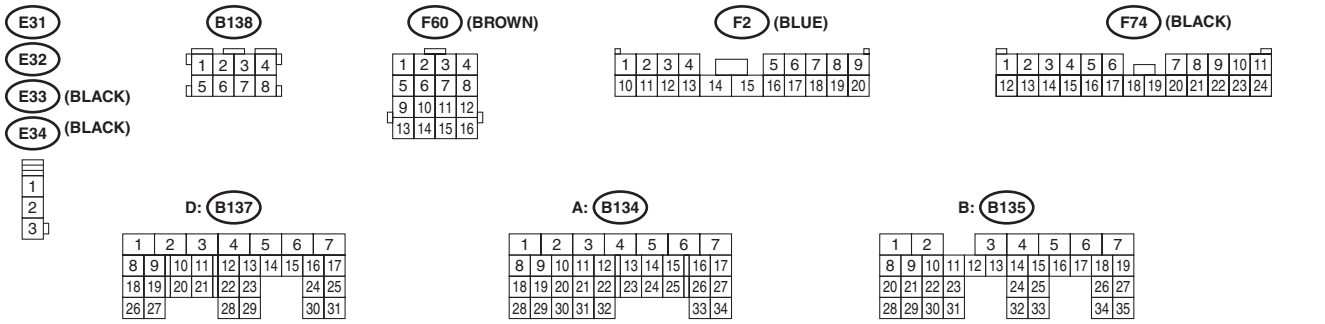
WI-05914


E/G(LTB25)-09
E/G(LTB25)-09
C: B136 D: B137 ECM
D4 D5 D3 C18 C29 C14 C16 C22 C26 C27
BrW Br BrR Lg R BY Sb YB BrY RY
E/G(LTB25)-06 Q
E/G(LTB25)-06 P
E/G(LTB25)-02 G
T E/G(LTB25)-10
B62
F45
B100
F2
B200
F74
B317
E56
F61
E2
U E/G(LTB25)-10
E/G(LTB25)-07 R
W YG B W Or R BG WG H BG R BG Or YR BG R WR BG R
E57 E8 E21 E50 E54
E
GE-2
ELECTRIC THROTTLE RELAY
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
MANIFOLD ABSOLUTE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH

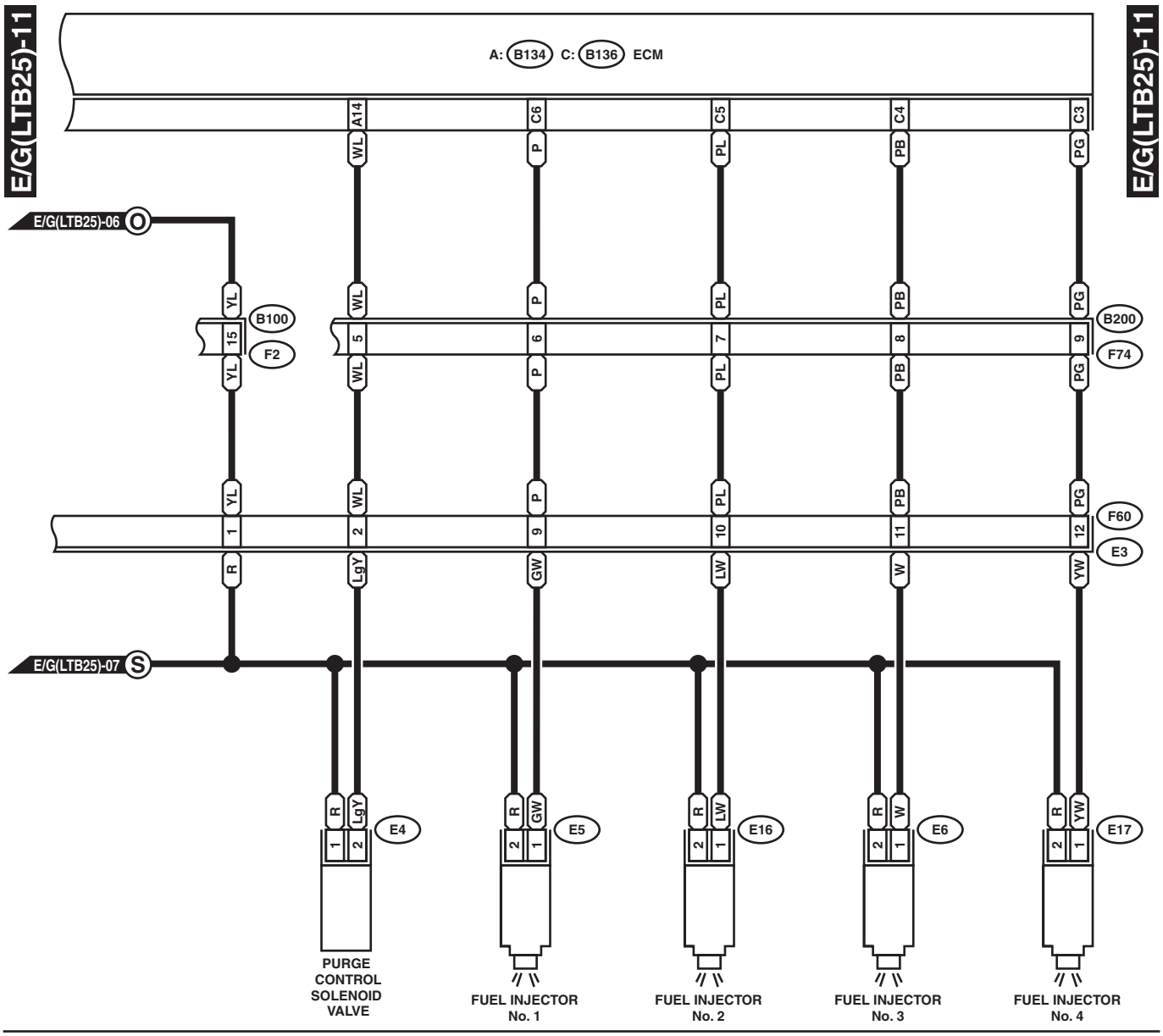

E8 (LIGHT GRAY)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
B317 (GRAY)
E57 (BLACK)
F45
F2 (BLUE)
F61 (BLACK)
F74 (BLACK)
D: B137
C: B136

WI-07361


E/G(LTB25)-10
A: B134 B: B135 D: B137 ECM
E/G(LTB25)-02 F
E/G(LTB25)-06 M
E/G(LTB25)-09 T
E/G(LTB25)-05 L
E/G(LTB25)-01 B
E/G(LTB25)-09 U
SHEILD JOINT CONNECTOR
B138
B200
F74
B100
F2
F60
E3
E31
E32
E33
E34
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
GE-1


E31
E32
E33 (BLACK)
E34 (BLACK)
B138
F60 (BROWN)
F2 (BLUE)
F74 (BLACK)
D: B137
A: B134
B: B135

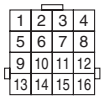
WI-05916



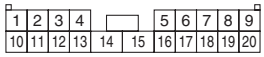
E5 (LIGHT GRAY)
E6 (LIGHT GRAY)
E16 (LIGHT GRAY)
E17 (LIGHT GRAY)

E4 (BLACK)

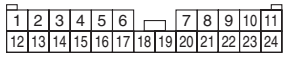
F60 (BROWN)



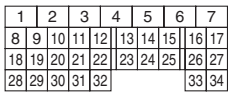
F2 (BLUE)



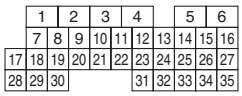
F74 (BLACK)



A: B134

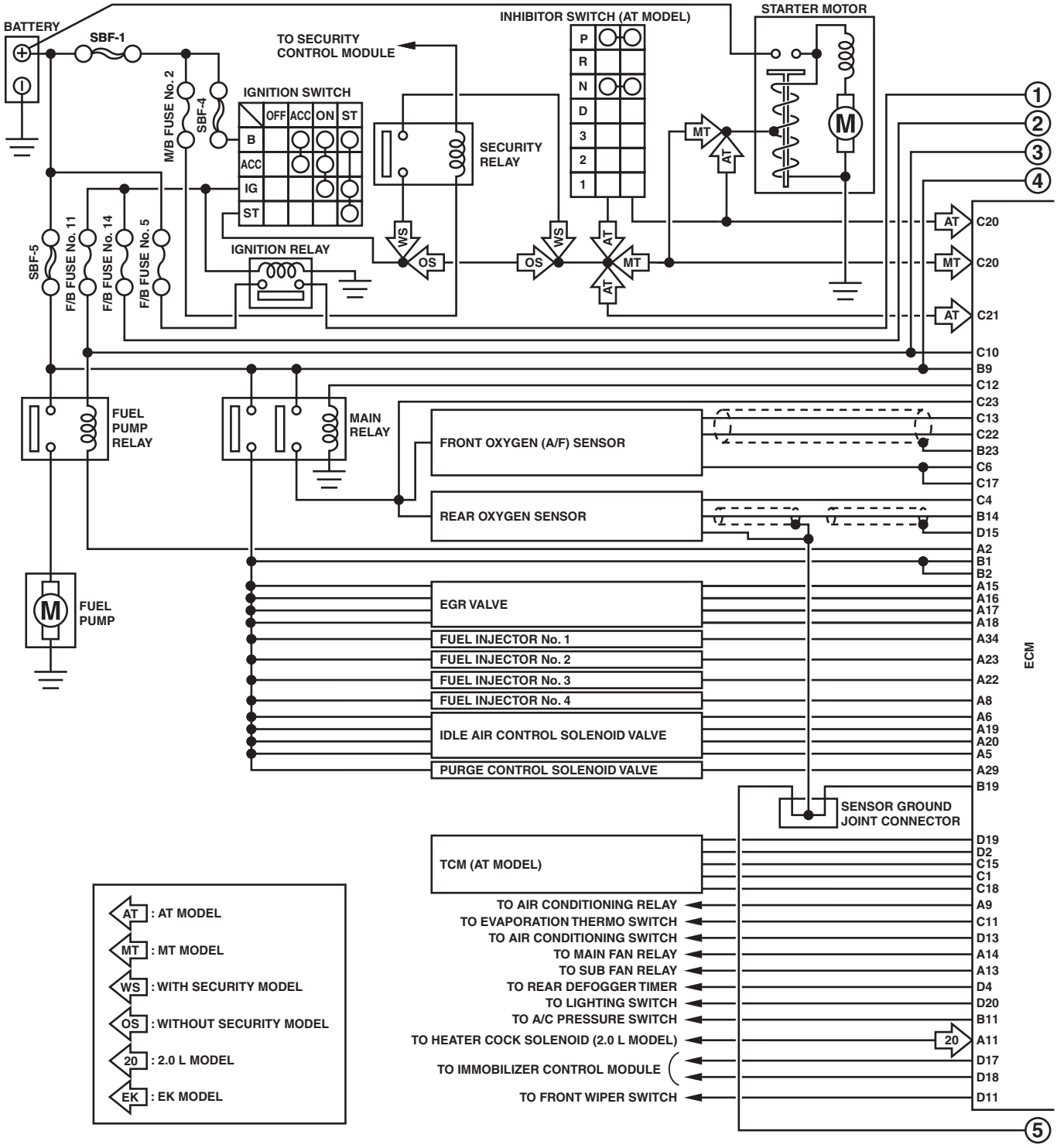


C: B136

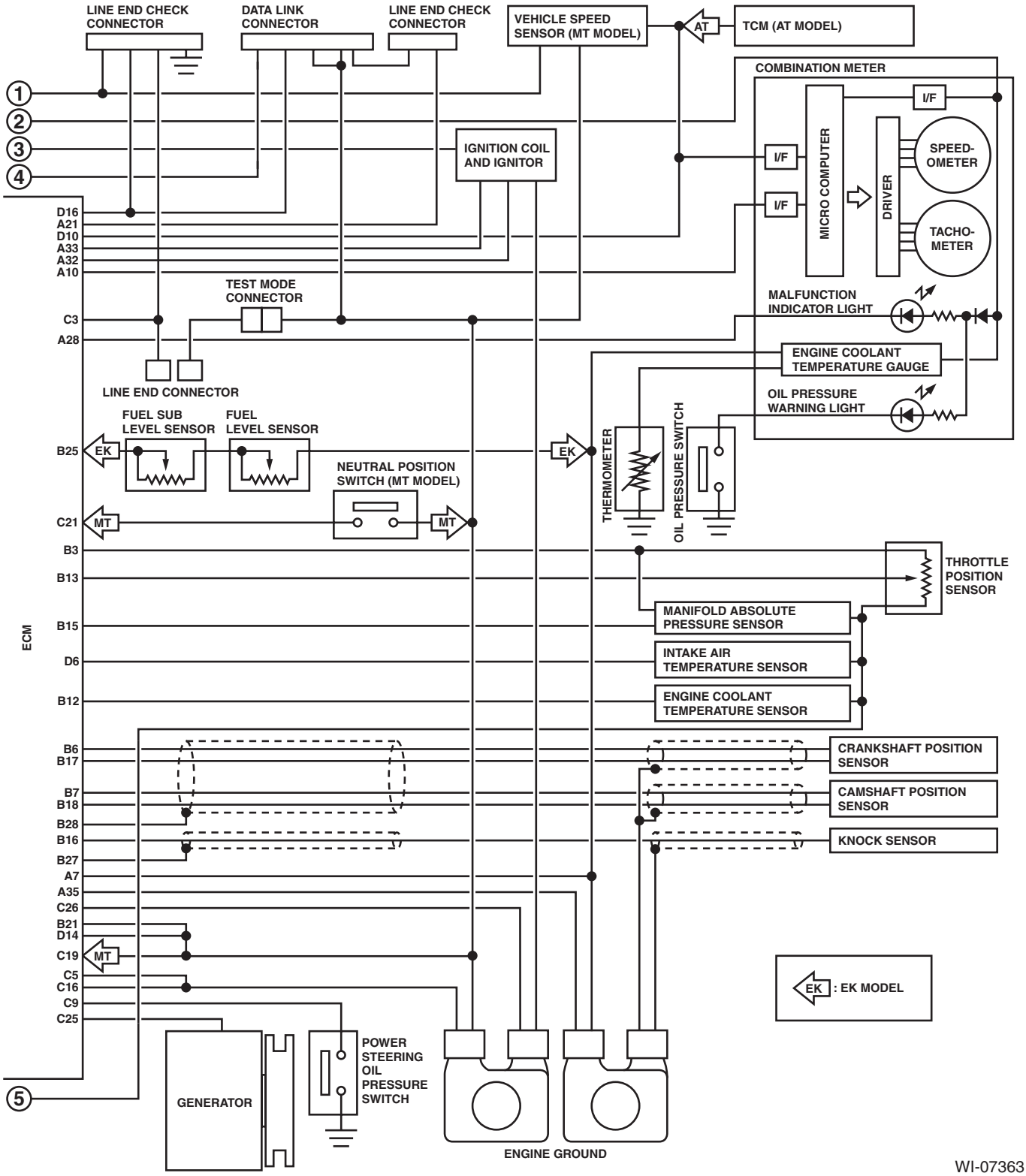


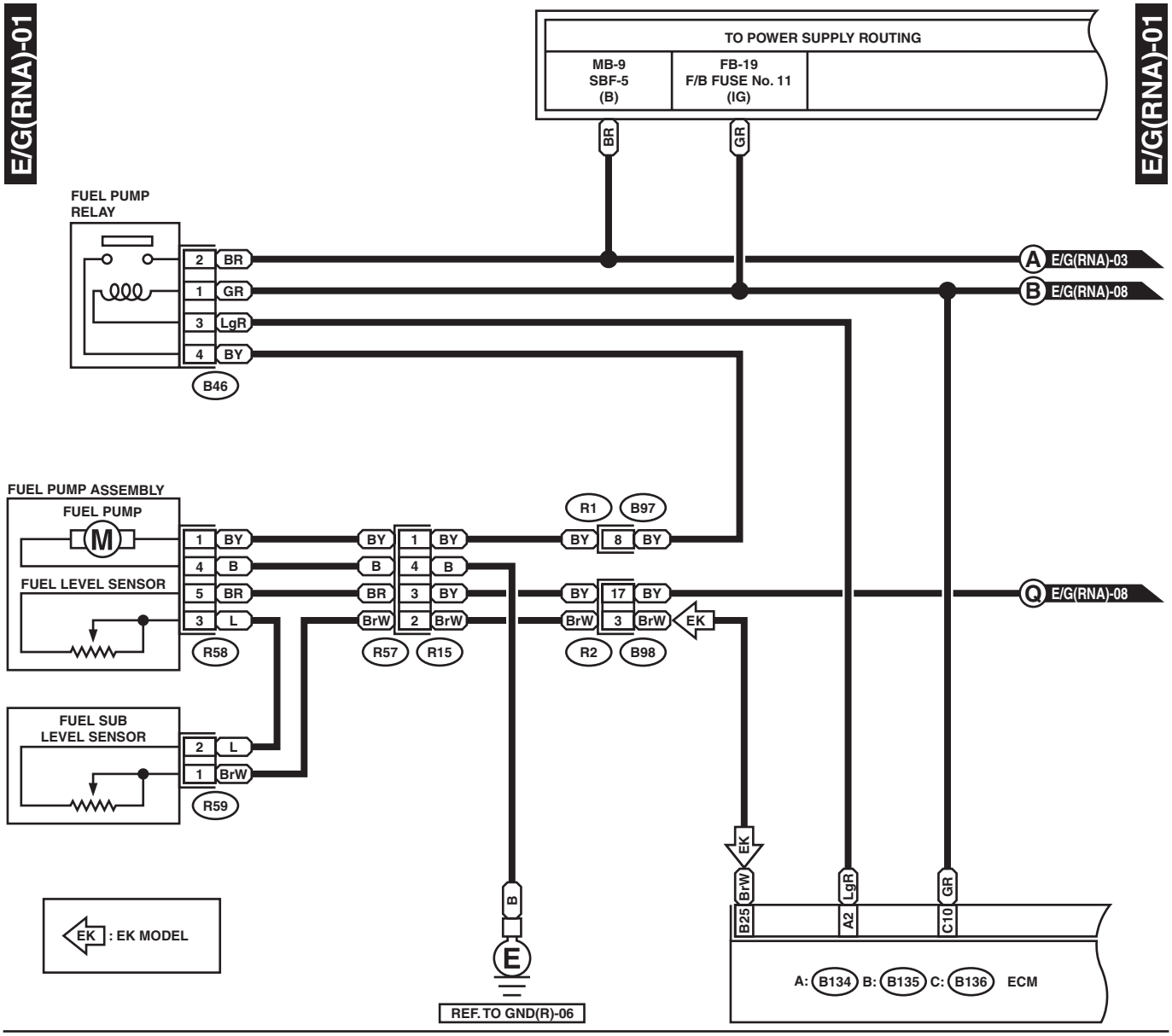
WI-05917

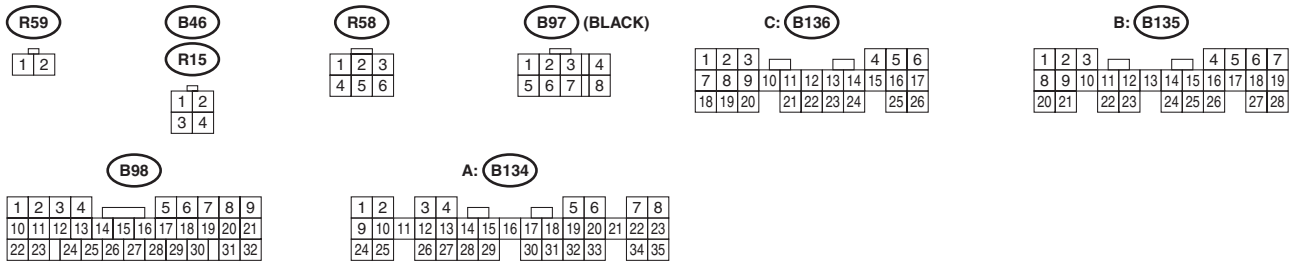
4. RHD NON-TURBO MODEL



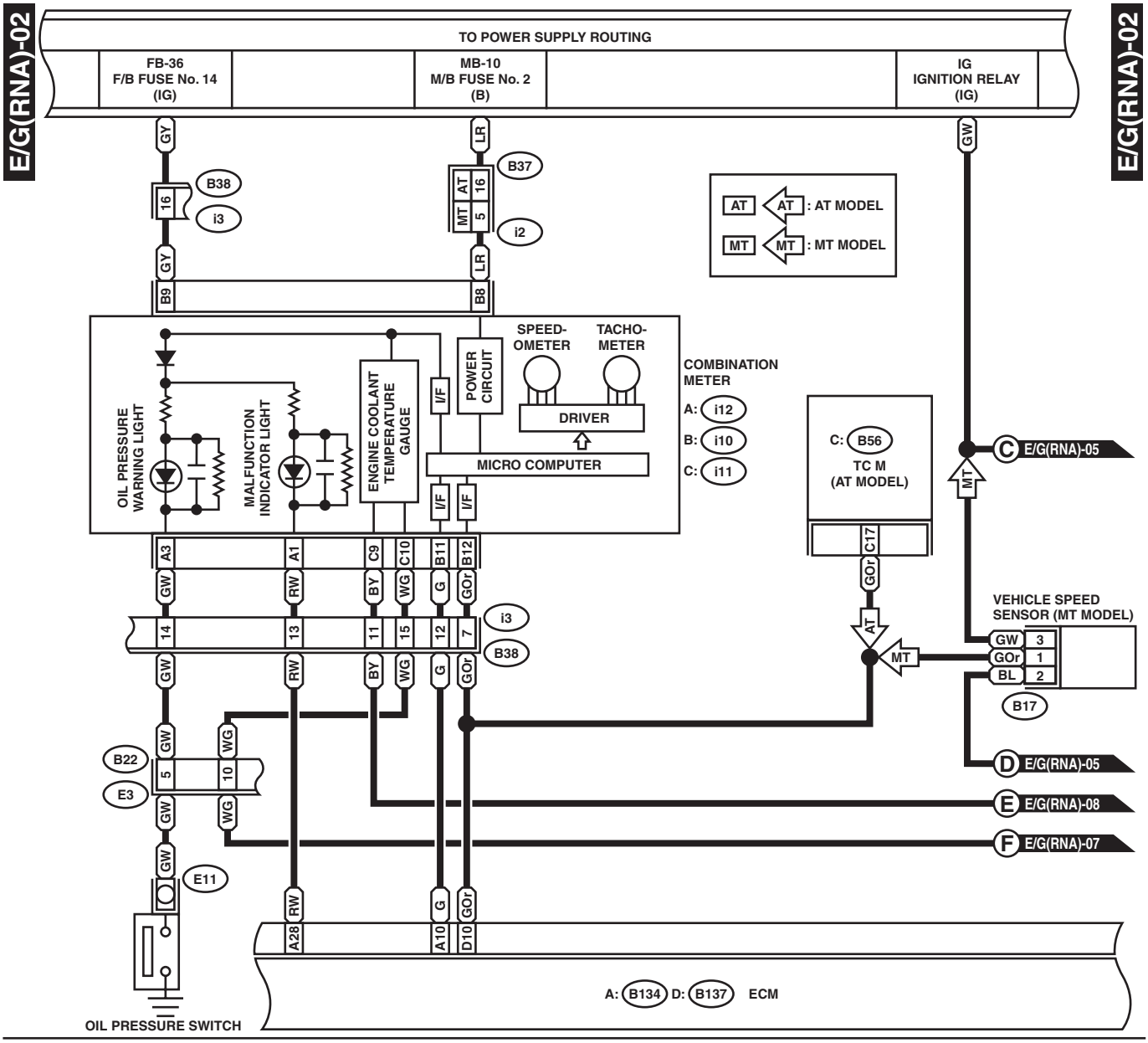
WI-07362

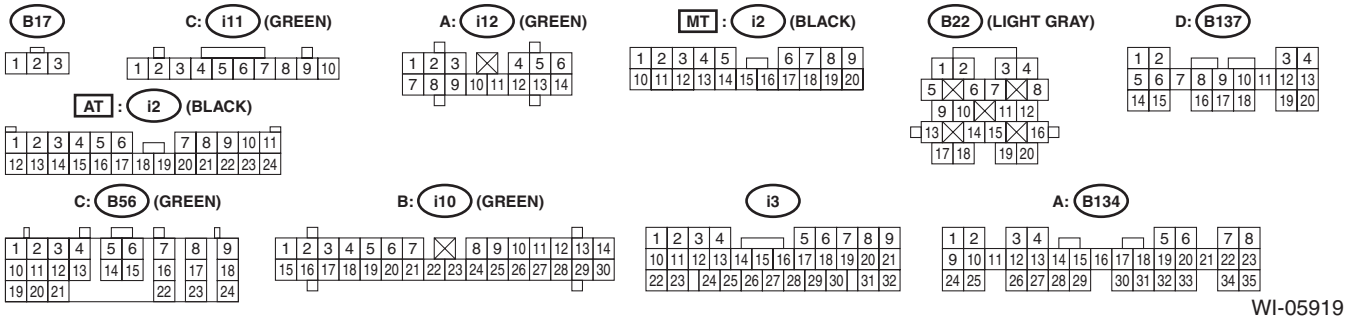

LINE END CHECK CONNECTOR
DATA LINK CONNECTOR
LINE END CHECK CONNECTOR
VEHICLE SPEED SENSOR (MT MODEL)
AT
TCM (AT MODEL)
COMBINATION METER
I/F
SPEED-OMETER
I/F
MICRO COMPUTER
DRIVER
I/F
TACHO-METER
IGNITION COIL AND IGNITOR
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
TEST MODE CONNECTOR
LINE END CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT MODEL)
THERMOMETER
OIL PRESSURE SWITCH
THROTTLE POSITION SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
KNOCK SENSOR
EK : EK MODEL
ECM
D16
A21
D10
A33
A32
A10
C3
A28
B25
C21
B3
B13
B15
D6
B12
B6
B17
B7
B18
B28
B16
B27
A7
A35
C26
B21
D14
C19
C5
C16
C9
C25
EK
MT
GENERATOR
POWER STEERING OIL PRESSURE SWITCH
ENGINE GROUND
WI-07363


E/G(RNA)-01
E/G(RNA)-01
TO POWER SUPPLY ROUTING
MB-9
SBF-5
(B)
FB-19
F/B FUSE No. 11
(IG)
BR
GR
FUEL PUMP
RELAY
2 BR
1 GR
3 LgR
4 BY
B46
A E/G(RNA)-03
B E/G(RNA)-08
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL LEVEL SENSOR
1 BY
4 B
5 BR
3 L
R58
BY 1 BY
B 4 B
BR 3 BY
BrW 2 BrW
R57
R15
R1
B97
BY 8 BY
BY 17 BY
BrW 3 BrW
EK
R2
B98
Q E/G(RNA)-08
FUEL SUB
LEVEL SENSOR
2 L
1 BrW
R59
EK : EK MODEL
B
E
REF. TO GND(R)-06
EK
BrW
LgR
GR
B25
A2
C10
A: B134 B: B135 C: B136 ECM

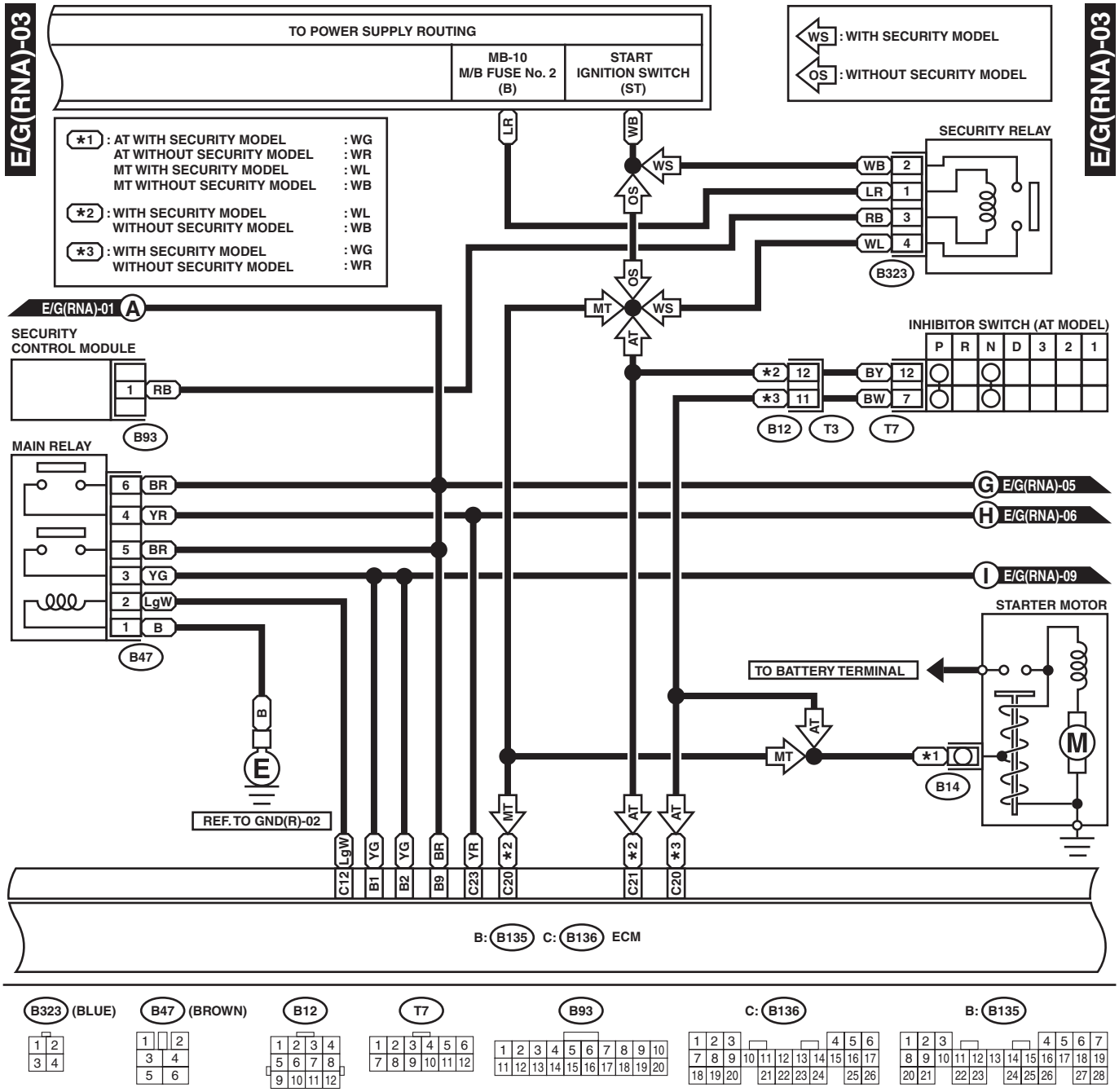

R59
B46
R15
R58
B97 (BLACK)
C: B136
B: B135
B98
A: B134

WI-07364


E/G(RNA)-02
E/G(RNA)-02
TO POWER SUPPLY ROUTING
FB-36
F/B FUSE No. 14
(IG)
MB-10
M/B FUSE No. 2
(B)
IG
IGNITION RELAY
(IG)
B38
i3
B37
i2
AT : AT MODEL
MT : MT MODEL
B9
B8
SPEED-
OMETER
TACHO-
METER
COMBINATION
METER
A: i12
B: i10
C: i11
OIL PRESSURE
WARNING LIGHT
MALFUNCTION
INDICATOR LIGHT
ENGINE COOLANT
TEMPERATURE
GAUGE
I/F
POWER
CIRCUIT
DRIVER
MICRO COMPUTER
C: B56
TC M
(AT MODEL)
C E/G(RNA)-05
VEHICLE SPEED
SENSOR (MT MODEL)
B17
D E/G(RNA)-05
E E/G(RNA)-08
F E/G(RNA)-07
B22
E3
E11
A: B134 D: B137 ECM
OIL PRESSURE SWITCH


B17
C: i11 (GREEN)
A: i12 (GREEN)
MT : i2 (BLACK)
B22 (LIGHT GRAY)
D: B137
AT : i2 (BLACK)
C: B56 (GREEN)
B: i10 (GREEN)
i3
A: B134

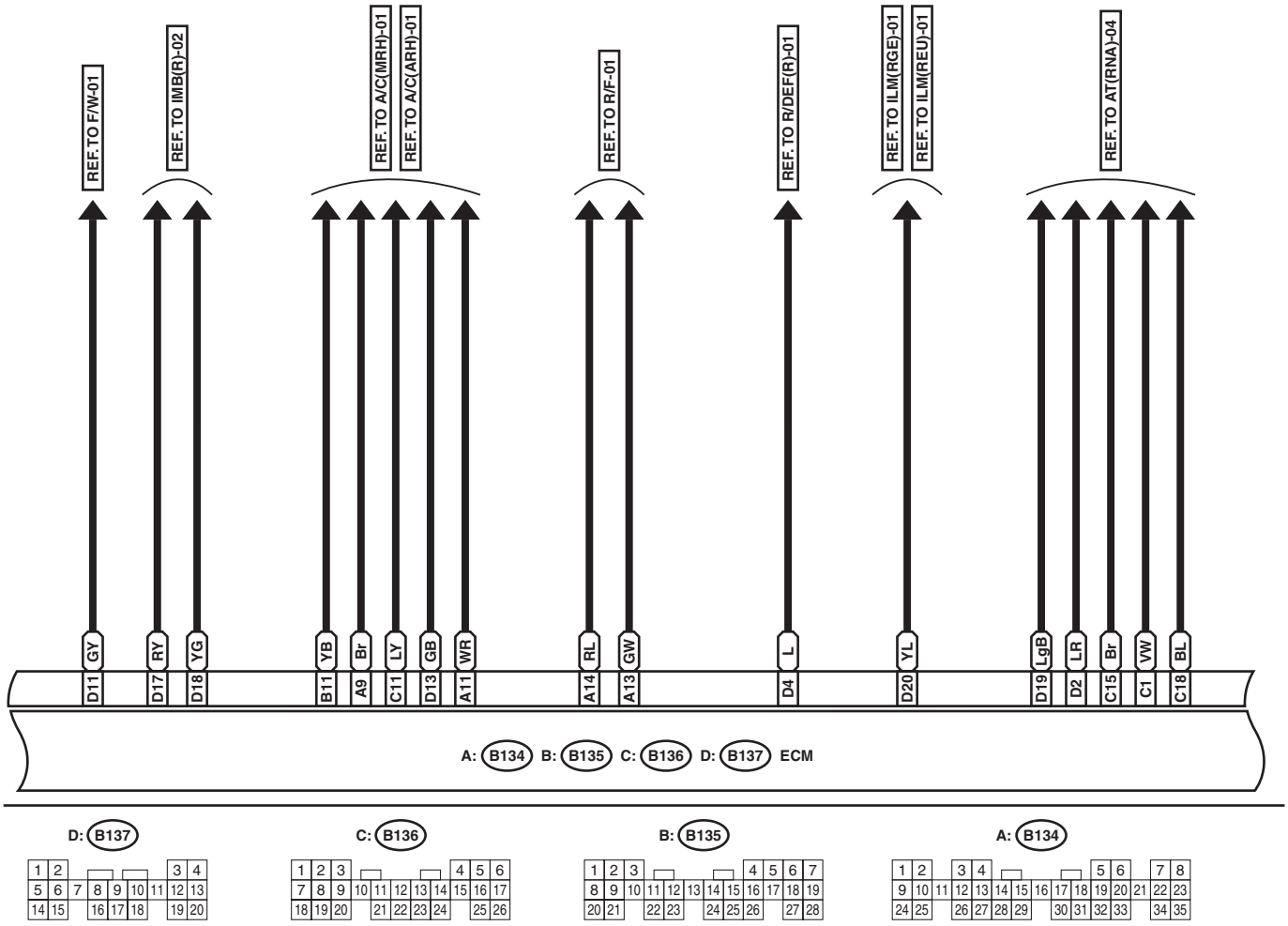
WI-05919


E/G(RNA)-03
TO POWER SUPPLY ROUTING
MB-10 M/B FUSE No. 2 (B)
START IGNITION SWITCH (ST)
WS : WITH SECURITY MODEL
OS : WITHOUT SECURITY MODEL
*1 : AT WITH SECURITY MODEL : WG
AT WITHOUT SECURITY MODEL : WR
MT WITH SECURITY MODEL : WL
MT WITHOUT SECURITY MODEL : WB
*2 : WITH SECURITY MODEL : WL
WITHOUT SECURITY MODEL : WB
*3 : WITH SECURITY MODEL : WG
WITHOUT SECURITY MODEL : WR
SECURITY RELAY
B323
E/G(RNA)-01 A
SECURITY CONTROL MODULE
B93
INHIBITOR SWITCH (AT MODEL)
P R N D 3 2 1
B12 T3 T7
MAIN RELAY
B47
G E/G(RNA)-05
H E/G(RNA)-06
I E/G(RNA)-09
STARTER MOTOR
TO BATTERY TERMINAL
B14
REF. TO GND(R)-02
B: B135 C: B136 ECM
B323 (BLUE)
B47 (BROWN)
B12
T7
B93
C: B136
B: B135

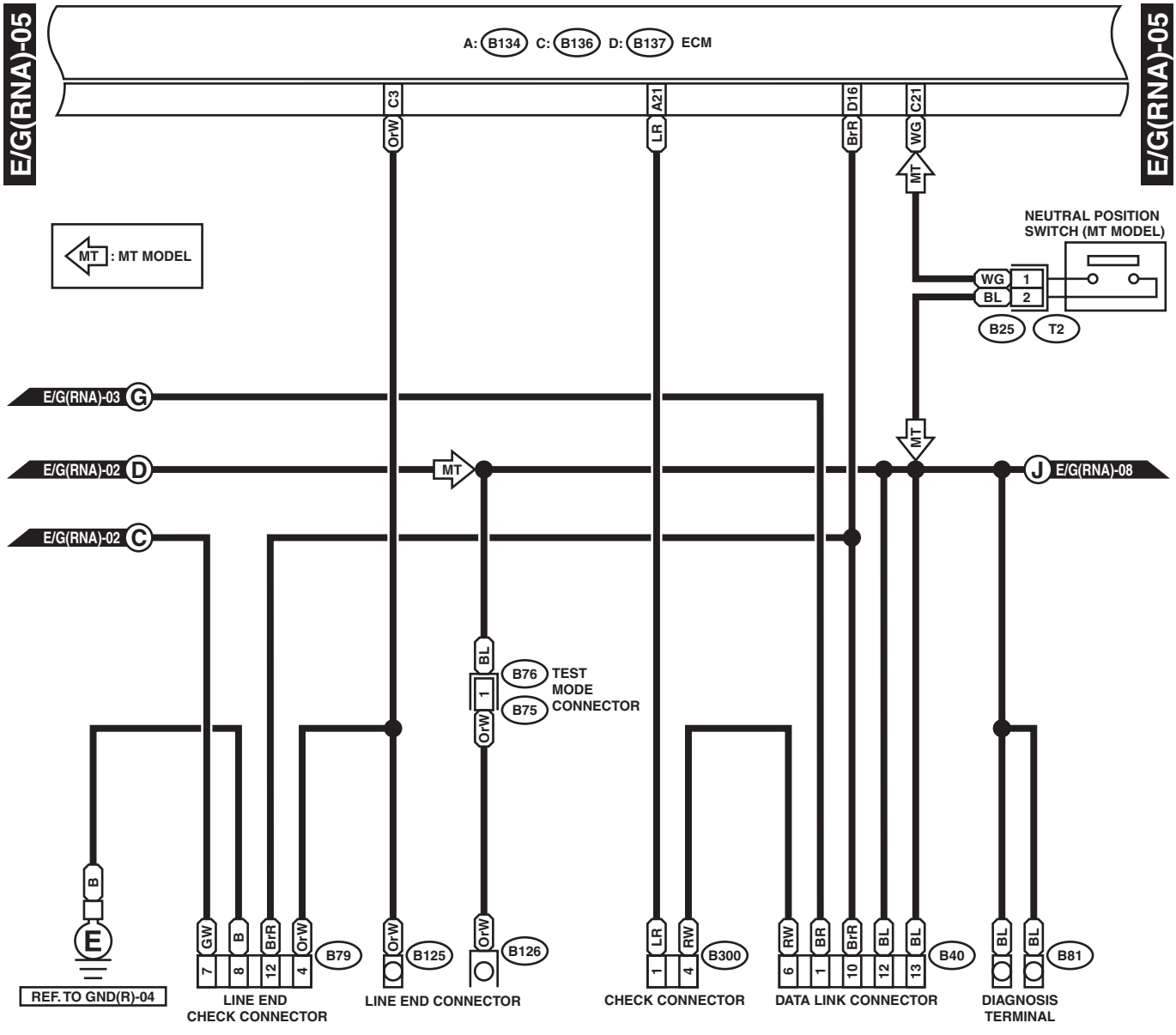
WI-00376

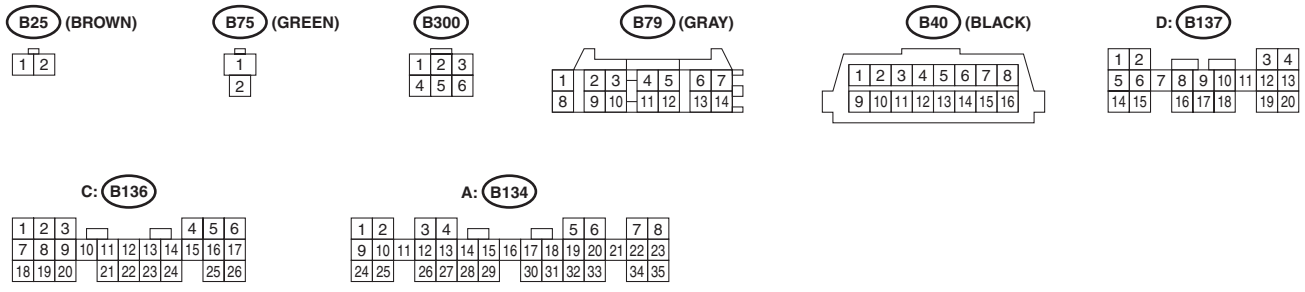
E/G(RNA)-04

E/G(RNA)-04

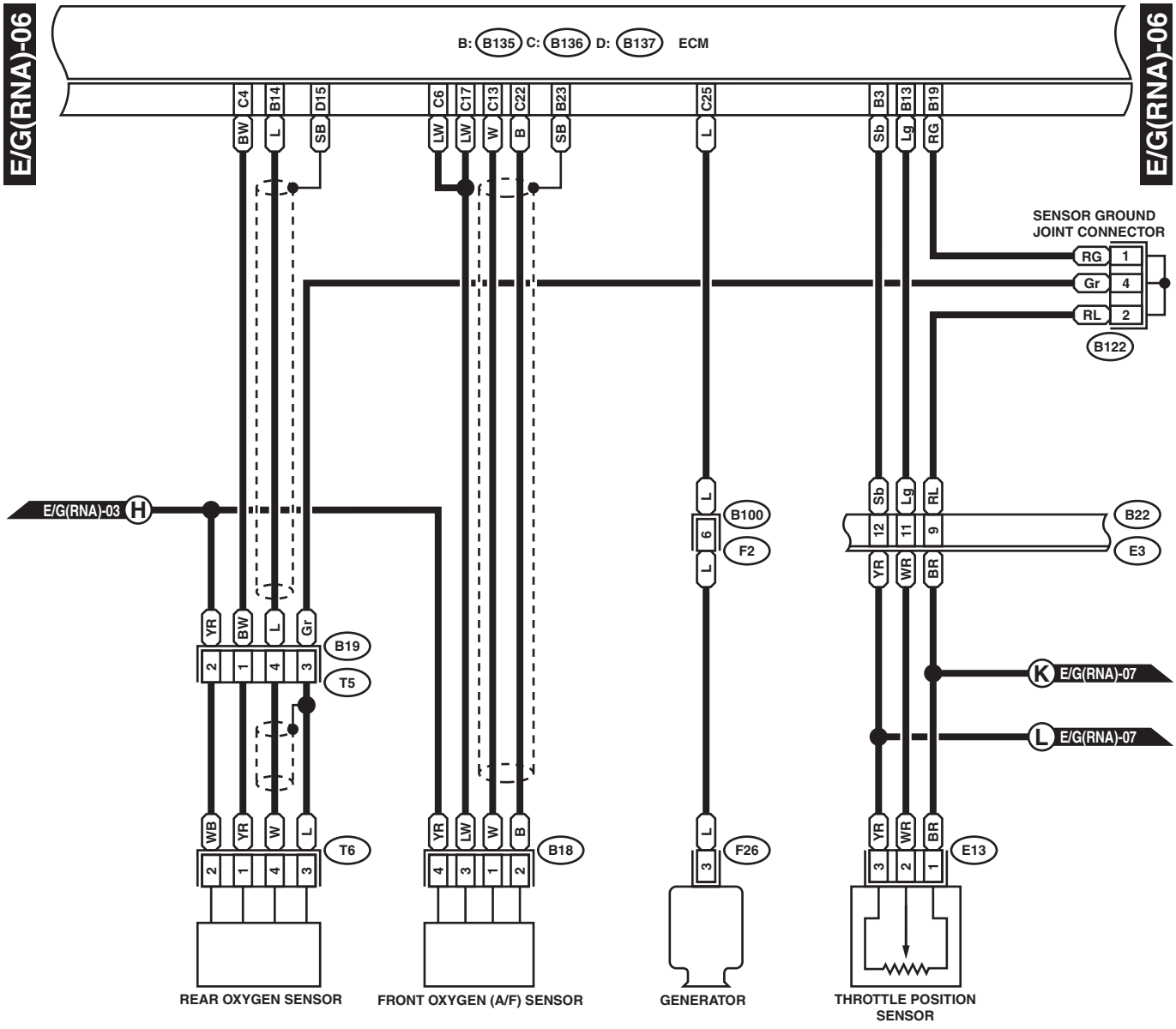


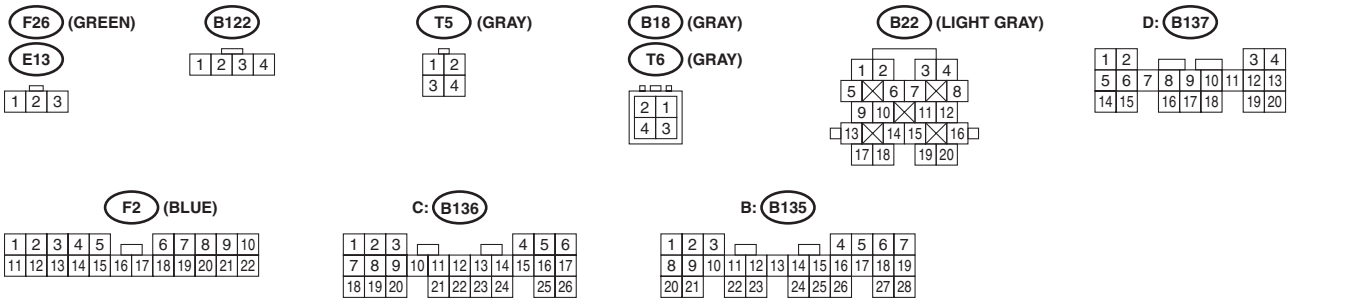
WI-03298


E/G(RNA)-05
A: B134 C: B136 D: B137 ECM
E/G(RNA)-05
C3
A21
D16
C21
OrW
LR
BrR
WG
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT MODEL)
WG 1
BL 2
B25
T2
E/G(RNA)-03 G
E/G(RNA)-02 D
E/G(RNA)-02 C
MT
J E/G(RNA)-08
BL
B76 TEST MODE CONNECTOR
B75
1
OrW
B
E
REF. TO GND(R)-04
GW
B
BrR
OrW
7
8
12
4
B79
LINE END CHECK CONNECTOR
OrW
B125
OrW
B126
LINE END CONNECTOR
LR
RW
1
4
B300
CHECK CONNECTOR
RW
BR
BrR
BL
BL
6
1
10
12
13
B40
DATA LINK CONNECTOR
BL
BL
B81
DIAGNOSIS TERMINAL

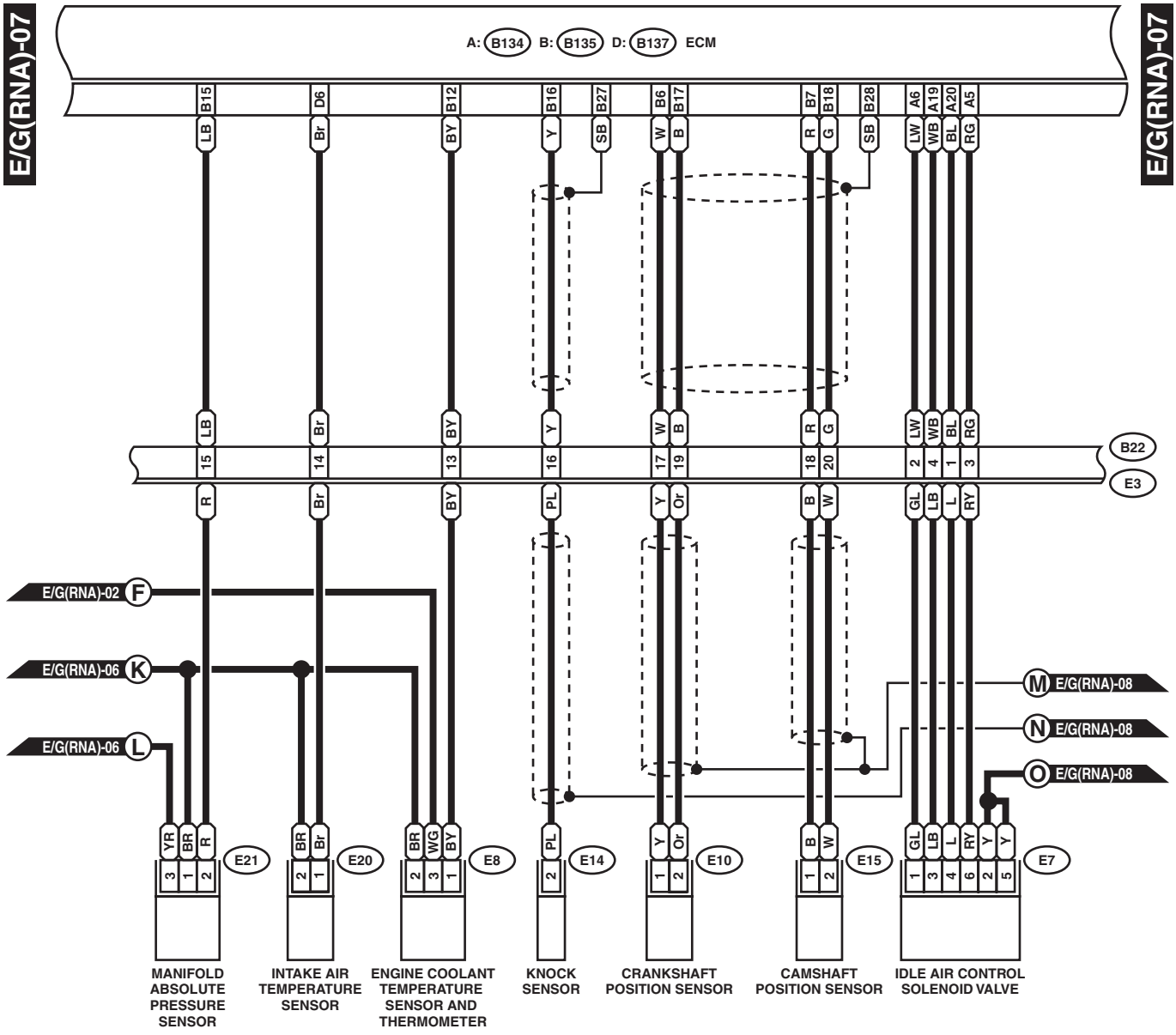

B25 (BROWN)
1 2
B75 (GREEN)
1
2
B300
1 2 3
4 5 6
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
D: B137
1 2
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20
3 4
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
A: B134
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
24 25 26 27 28 29 30 31 32 33 34 35

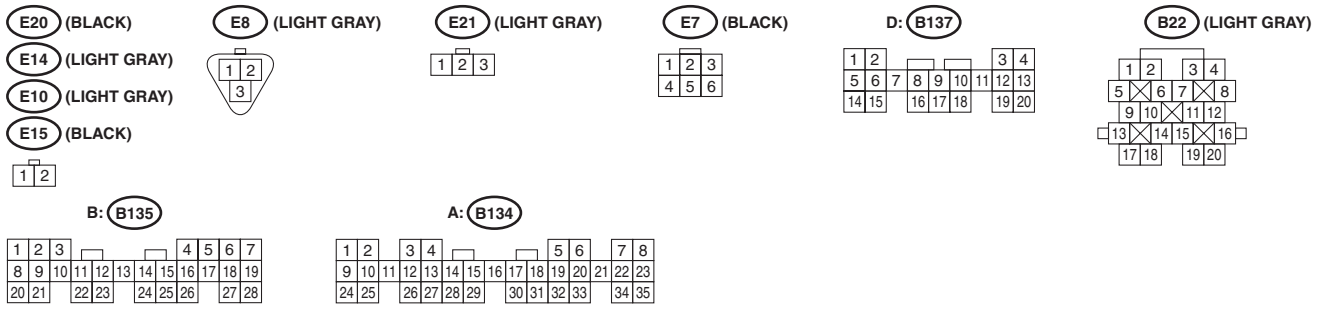
WI-03299


E/G(RNA)-06
E/G(RNA)-06
B: B135 C: B136 D: B137 ECM
C4 B14 D15 C6 C17 C13 C22 B23 C25 B3 B13 B19
BW L SB LW LW W B SB L Sb Lg RG
SENSOR GROUND JOINT CONNECTOR
RG 1
Gr 4
RL 2
B122
E/G(RNA)-03 H
L B100
6
L F2
Sb Lg RL
12 11 9
B22
E3
YR WR BR
K E/G(RNA)-07
L E/G(RNA)-07
YR BW L Gr
B19
2 1 4 3
T5
WB YR W L
T6
2 1 4 3
YR LW W B
B18
4 3 1 2
L F26
3
YR WR BR
E13
3 2 1
REAR OXYGEN SENSOR
FRONT OXYGEN (A/F) SENSOR
GENERATOR
THROTTLE POSITION SENSOR

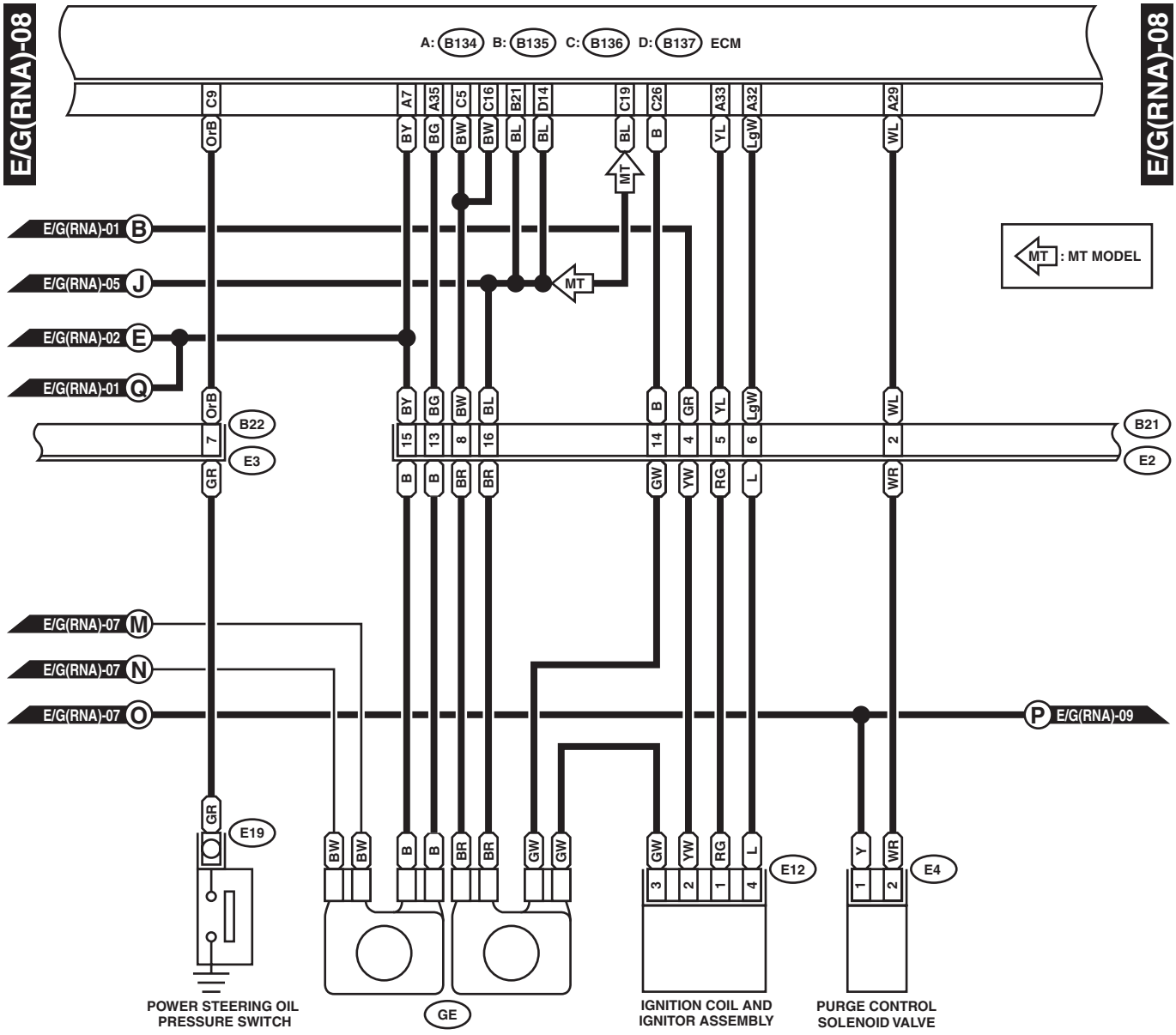

F26 (GREEN)
E13
1 2 3
B122
1 2 3 4
T5 (GRAY)
1 2
3 4
B18 (GRAY)
T6 (GRAY)
2 1
4 3
B22 (LIGHT GRAY)
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
D: B137
1 2 3 4
5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20
F2 (BLUE)
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20 21 22
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26
B: B135
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28

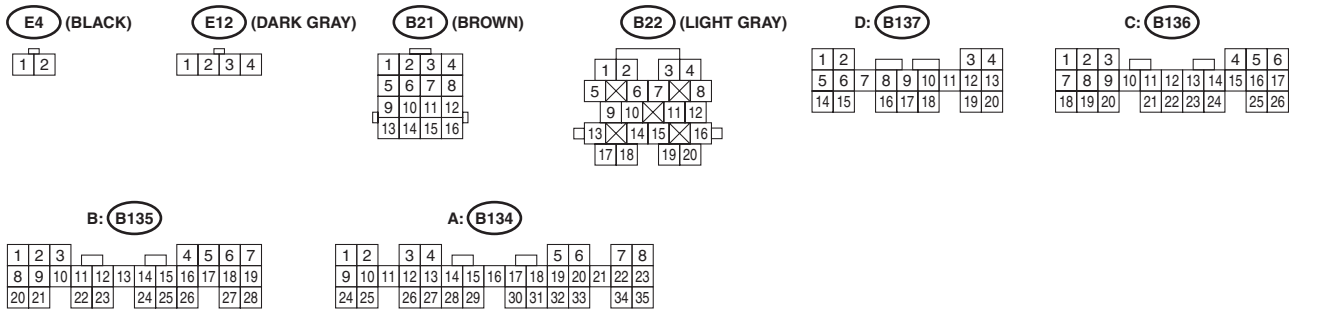
WI-05920


E/G(RNA)-07
A: B134 B: B135 D: B137 ECM
E/G(RNA)-07
B15 D6 B12 B16 B27 B6 B17 B7 B18 B28 A6 A19 A20 A5
LB Br BY Y SB W B R G SB LW WB BL RG
15 14 13 16 17 19 18 20 2 4 1 3
B22
E3
R Br BY PL Y Or B W GL LB L RY
E/G(RNA)-02 F
E/G(RNA)-06 K
E/G(RNA)-06 L
M E/G(RNA)-08
N E/G(RNA)-08
O E/G(RNA)-08
YR BR R E21
BR Br E20
BR WG BY E8
PL E14
Y Or E10
B W E15
GL LB L RY Y Y E7
MANIFOLD ABSOLUTE PRESSURE SENSOR
INTAKE AIR TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
KNOCK SENSOR
CRANKSHAFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
IDLE AIR CONTROL SOLENOID VALVE

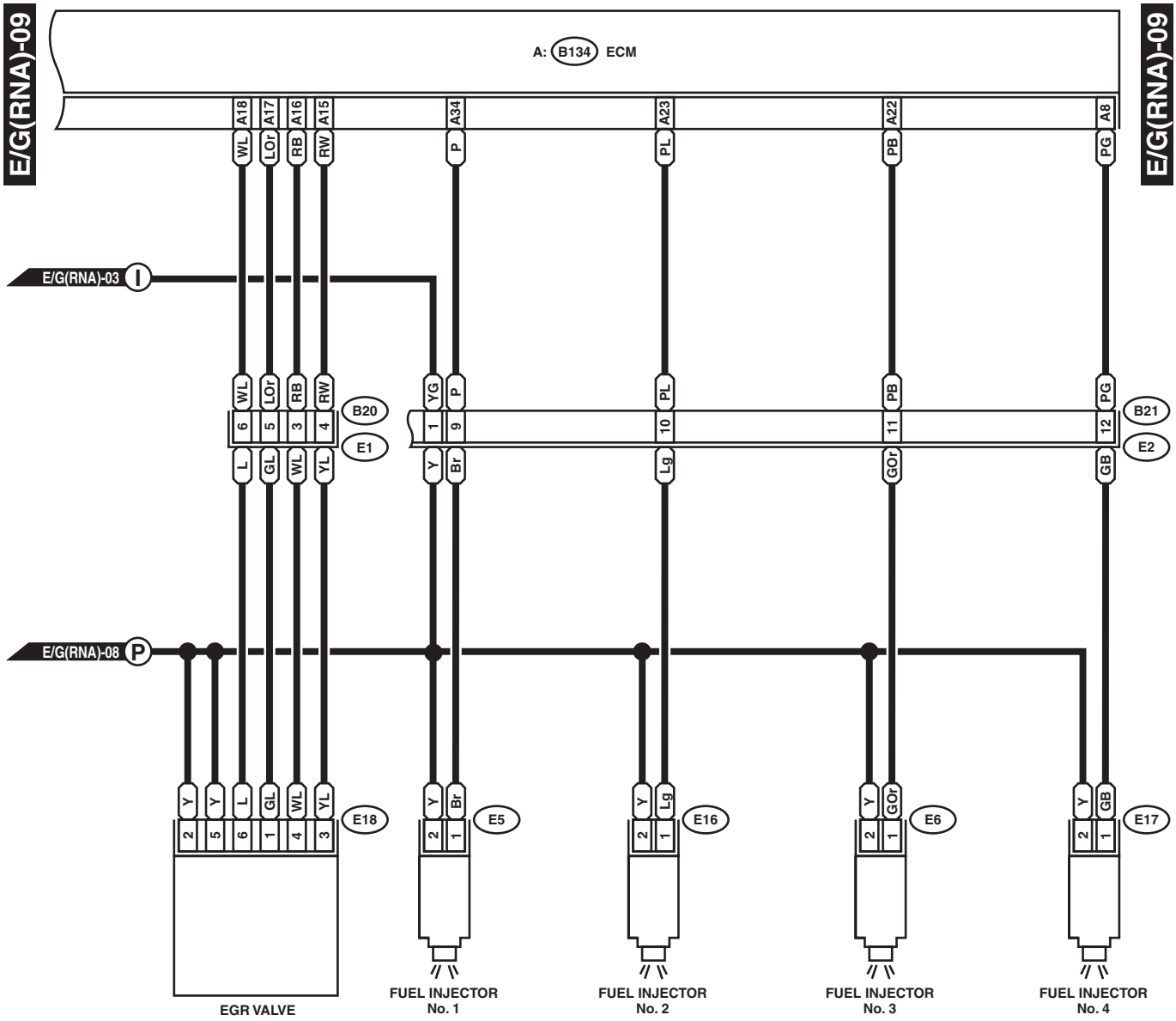

E20 (BLACK)
E14 (LIGHT GRAY)
E10 (LIGHT GRAY)
E15 (BLACK)
E8 (LIGHT GRAY)
E21 (LIGHT GRAY)
E7 (BLACK)
D: B137
B22 (LIGHT GRAY)
B: B135
A: B134

WI-00380


E/G(RNA)-08
E/G(RNA)-08
A: B134 B: B135 C: B136 D: B137 ECM
C9 A7 A35 C5 C16 B21 D14 C19 C26 A33 A32 A29
OrB BY BG BW BW BL BL BL B YL LgW WL
MT
E/G(RNA)-01 B
E/G(RNA)-05 J
E/G(RNA)-02 E
E/G(RNA)-01 Q
MT : MT MODEL
B22
E3
B21
E2
E/G(RNA)-07 M
E/G(RNA)-07 N
E/G(RNA)-07 O
P E/G(RNA)-09
E19
E12
E4
POWER STEERING OIL PRESSURE SWITCH
GE
IGNITION COIL AND IGNITOR ASSEMBLY
PURGE CONTROL SOLENOID VALVE


E4 (BLACK)
E12 (DARK GRAY)
B21 (BROWN)
B22 (LIGHT GRAY)
D: B137
C: B136
B: B135
A: B134

WI-03301



E5 (LIGHT GRAY)
E6 (LIGHT GRAY)
E16 (LIGHT GRAY)
E17 (LIGHT GRAY)

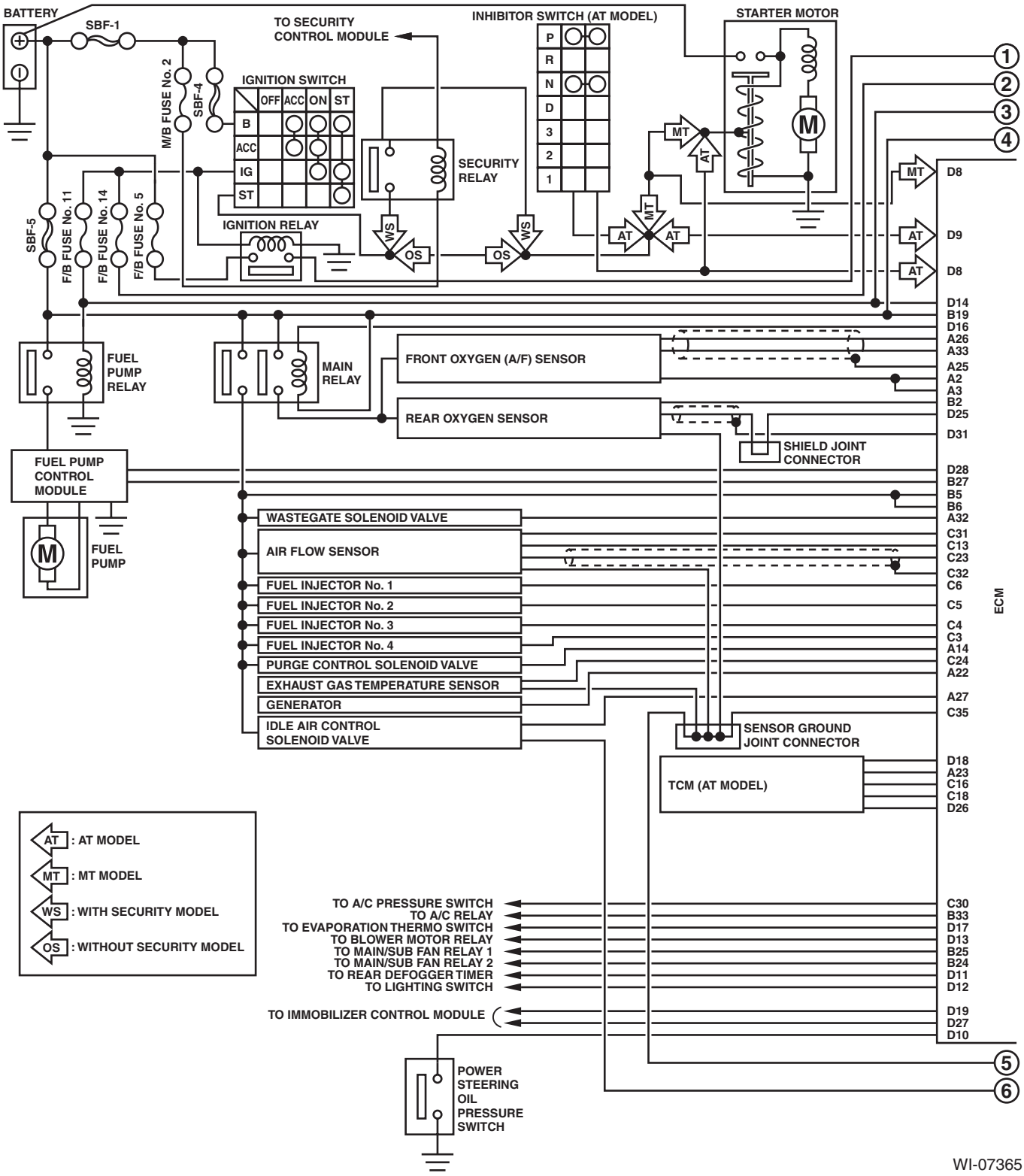
B20 (GRAY)
E18 (DARK GRAY)

B21 (BROWN)

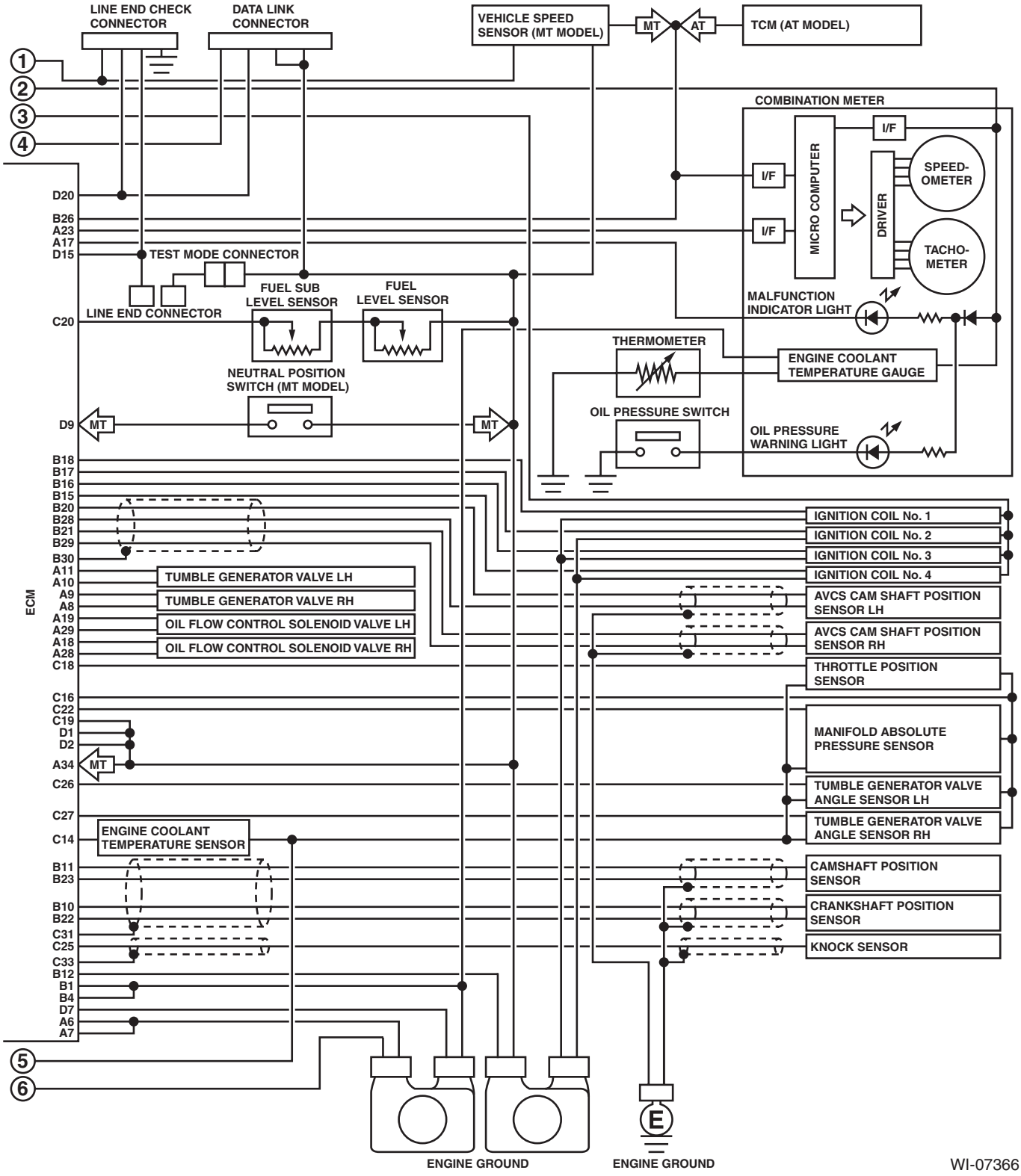
A: B134

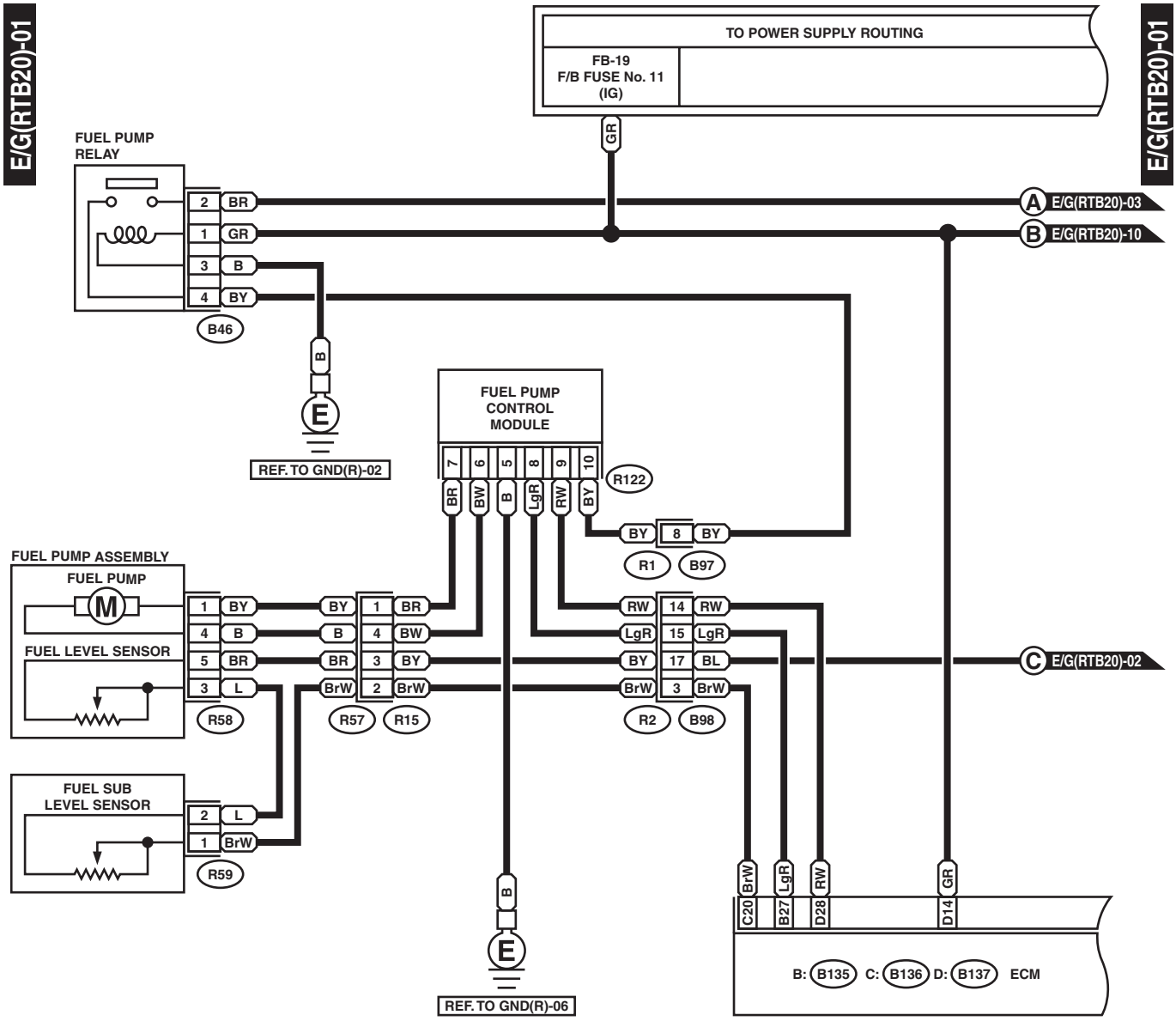
WI-00382

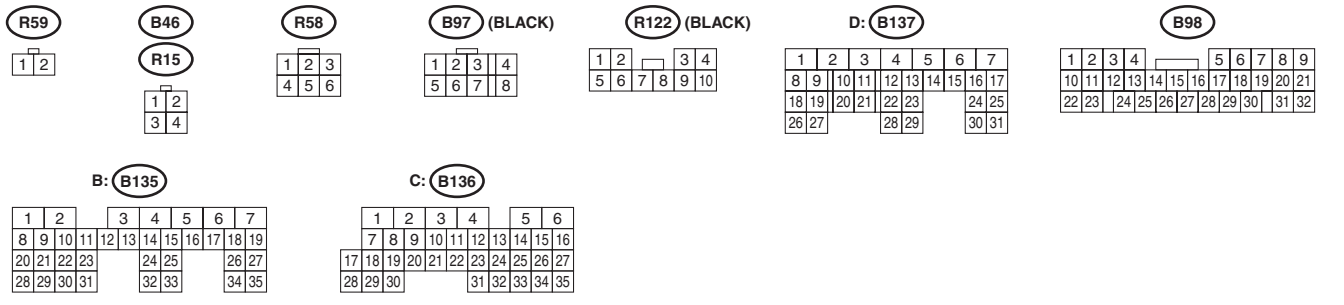
5. RHD 2.0 L TURBO MODEL



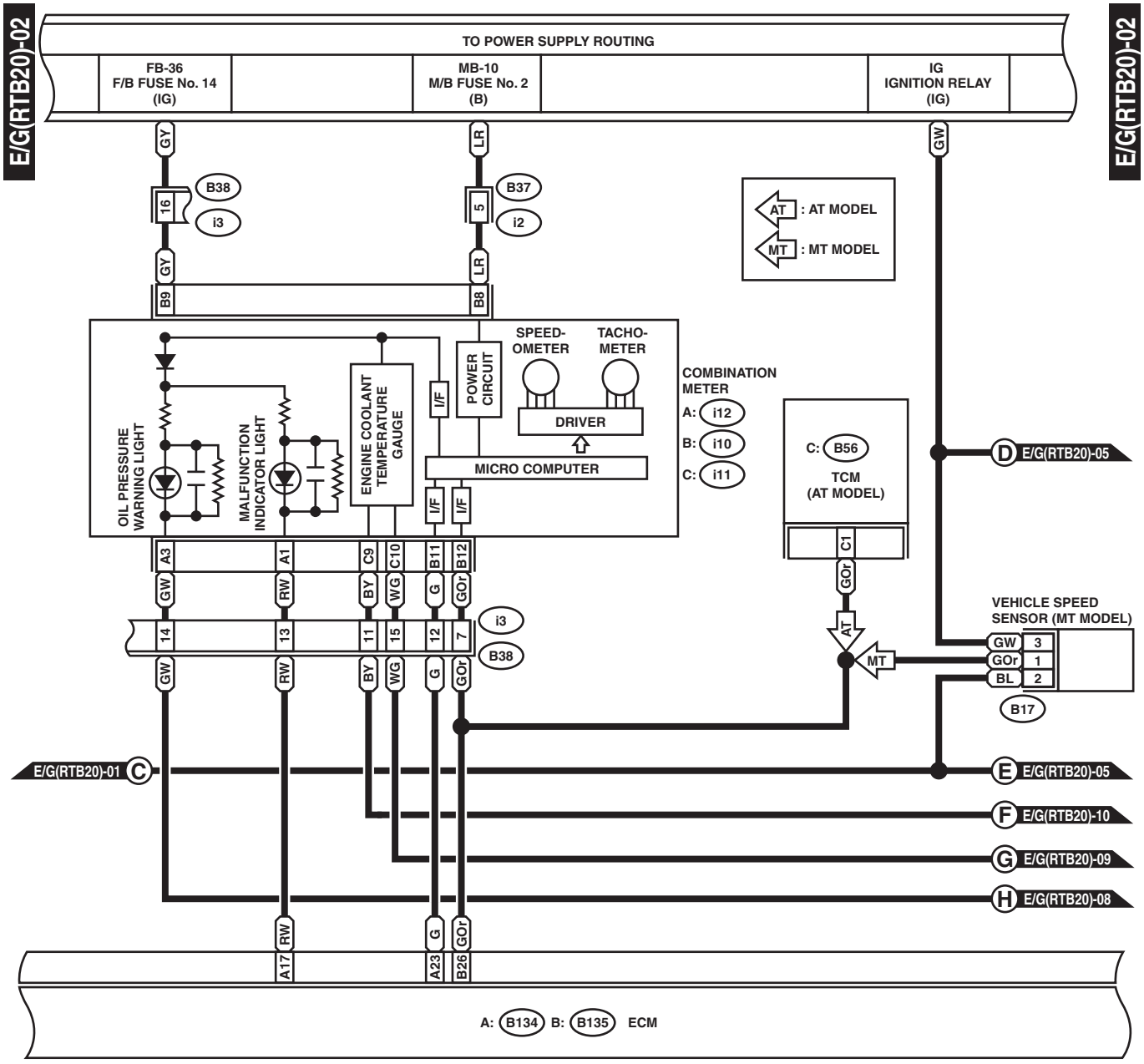
WI-07365

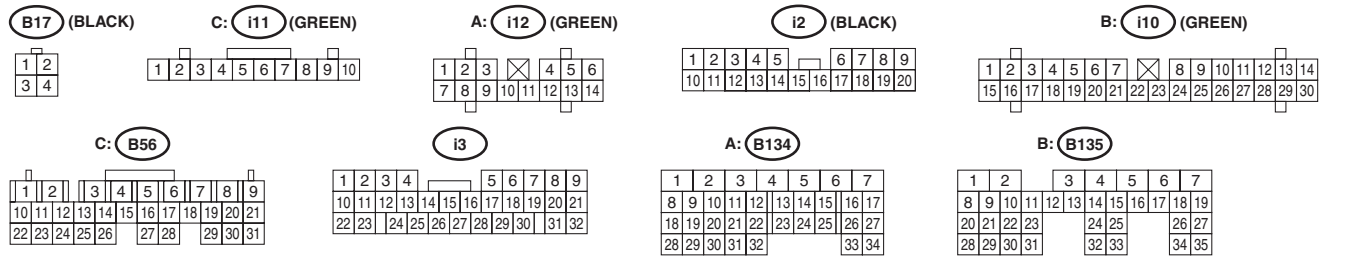

LINE END CHECK CONNECTOR
DATA LINK CONNECTOR
VEHICLE SPEED SENSOR (MT MODEL)
MT
AT
TCM (AT MODEL)
COMBINATION METER
I/F
MICRO COMPUTER
DRIVER
SPEED-OMETER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
THERMOMETER
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE SWITCH
OIL PRESSURE WARNING LIGHT
TEST MODE CONNECTOR
LINE END CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT MODEL)
ECM
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH
ENGINE COOLANT TEMPERATURE SENSOR
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
AVCS CAM SHAFT POSITION SENSOR LH
AVCS CAM SHAFT POSITION SENSOR RH
THROTTLE POSITION SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
CAMSHAFT POSITION SENSOR
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
ENGINE GROUND
ENGINE GROUND
WI-07366


E/G(RTB20)-01
E/G(RTB20)-01
TO POWER SUPPLY ROUTING
FB-19
F/B FUSE No. 11
(IG)
GR
FUEL PUMP
RELAY
2 BR
1 GR
3 B
4 BY
B46
A E/G(RTB20)-03
B E/G(RTB20)-10
B
REF. TO GND(R)-02
FUEL PUMP
CONTROL
MODULE
7 6 5 8 9 10
R122
BR BW B LgR RW BY
BY 8 BY
R1 B97
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL LEVEL SENSOR
1 BY
4 B
5 BR
3 L
R58
BY 1 BR
B 4 BW
BR 3 BY
BrW 2 BrW
R57 R15
RW 14 RW
LgR 15 LgR
BY 17 BL
BrW 3 BrW
R2 B98
C E/G(RTB20)-02
FUEL SUB
LEVEL SENSOR
2 L
1 BrW
R59
B
REF. TO GND(R)-06
BrW LgR RW GR
C20 B27 D28 D14
B: B135 C: B136 D: B137 ECM

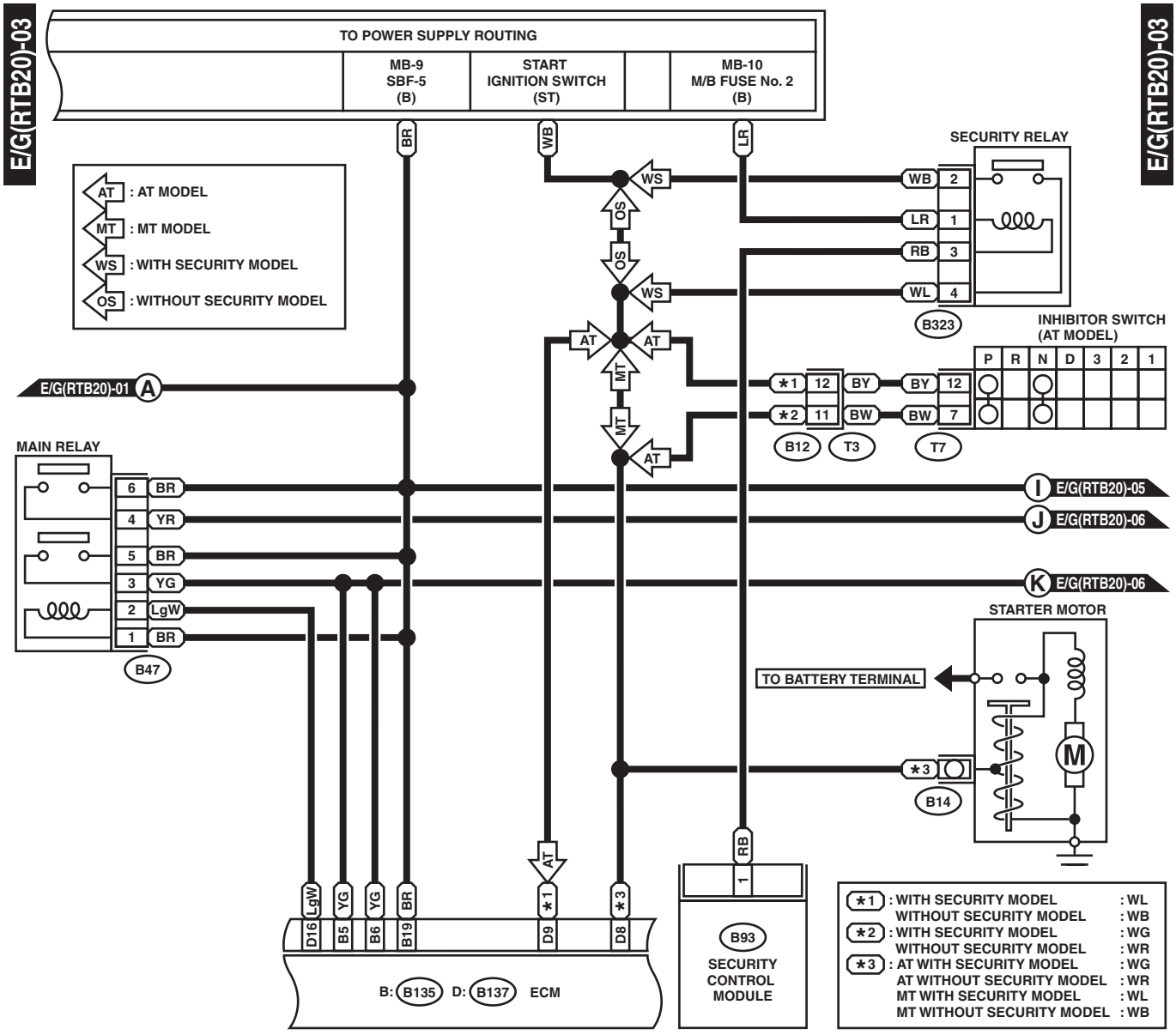

R59
1 2
B46
R15
1 2
3 4
R58
1 2 3
4 5 6
B97 (BLACK)
1 2 3 4
5 6 7 8
R122 (BLACK)
1 2 3 4
5 6 7 8 9 10
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
B98
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32
B: B135
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35

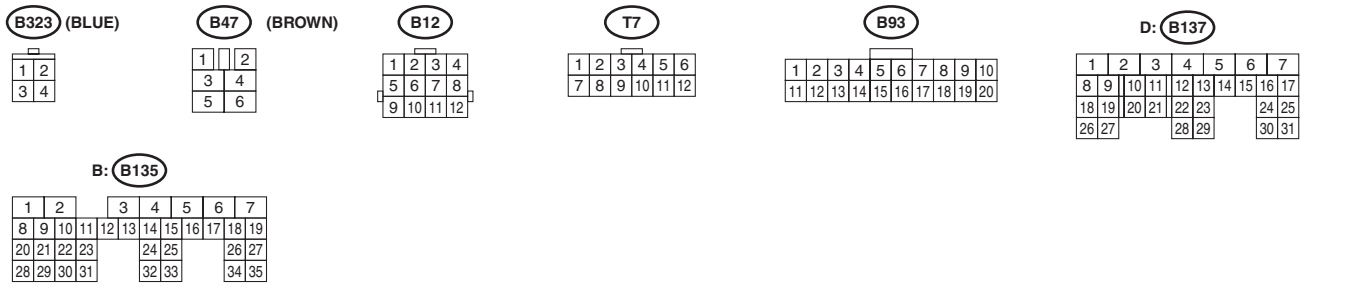
WI-05921


E/G(RTB20)-02
TO POWER SUPPLY ROUTING
FB-36
F/B FUSE No. 14
(IG)
MB-10
M/B FUSE No. 2
(B)
IG
IGNITION RELAY
(IG)
E/G(RTB20)-02
GY
LR
GW
B38
16
i3
B37
5
i2
AT : AT MODEL
MT : MT MODEL
B9
B8
SPEED-
OMETER
TACHO-
METER
COMBINATION
METER
A: i12
B: i10
C: i11
POWER
CIRCUIT
I/F
DRIVER
MICRO COMPUTER
OIL PRESSURE
WARNING LIGHT
MALFUNCTION
INDICATOR LIGHT
ENGINE COOLANT
TEMPERATURE
GAUGE
C: B56
TCM
(AT MODEL)
C1
D E/G(RTB20)-05
A3
A1
C9
C10
B11
B12
GW
RW
BY
WG
G
GOr
14
13
11
15
12
7
i3
B38
AT
MT
VEHICLE SPEED
SENSOR (MT MODEL)
GW 3
GOr 1
BL 2
B17
E/G(RTB20)-01 C
E E/G(RTB20)-05
F E/G(RTB20)-10
G E/G(RTB20)-09
H E/G(RTB20)-08
A17
A23
B26
A: B134 B: B135 ECM


B17 (BLACK)
C: i11 (GREEN)
A: i12 (GREEN)
i2 (BLACK)
B: i10 (GREEN)
C: B56
i3
A: B134
B: B135

WI-05922

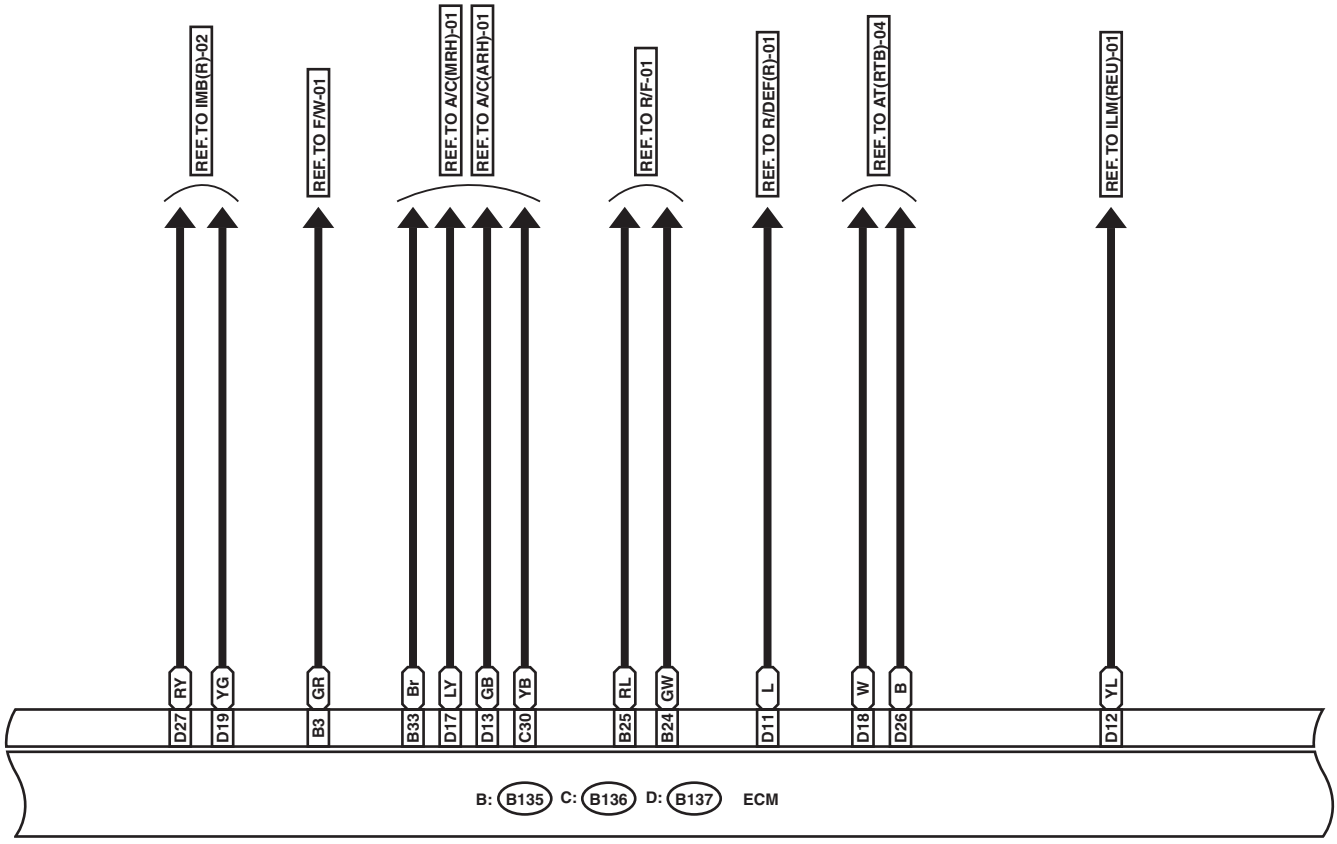

E/G(RTB20)-03
TO POWER SUPPLY ROUTING
MB-9 SBF-5 (B)
START IGNITION SWITCH (ST)
MB-10 M/B FUSE No. 2 (B)
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY MODEL
OS : WITHOUT SECURITY MODEL
SECURITY RELAY
INHIBITOR SWITCH (AT MODEL)
P R N D 3 2 1
E/G(RTB20)-01 A
MAIN RELAY
B47
B323
B12
T3
T7
B14
STARTER MOTOR
TO BATTERY TERMINAL
E/G(RTB20)-05
E/G(RTB20)-06
B93
SECURITY CONTROL MODULE
B: B135 D: B137 ECM
*1 : WITH SECURITY MODEL : WL
WITHOUT SECURITY MODEL : WB
*2 : WITH SECURITY MODEL : WG
WITHOUT SECURITY MODEL : WR
*3 : AT WITH SECURITY MODEL : WG
AT WITHOUT SECURITY MODEL : WR
MT WITH SECURITY MODEL : WL
MT WITHOUT SECURITY MODEL : WB

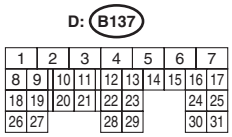

B323 (BLUE)
B47 (BROWN)
B12
T7
B93
D: B137
B: B135

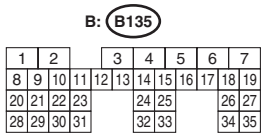
WI-05923

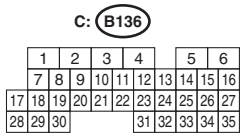
E/G(RTB20)-04

E/G(RTB20)-04

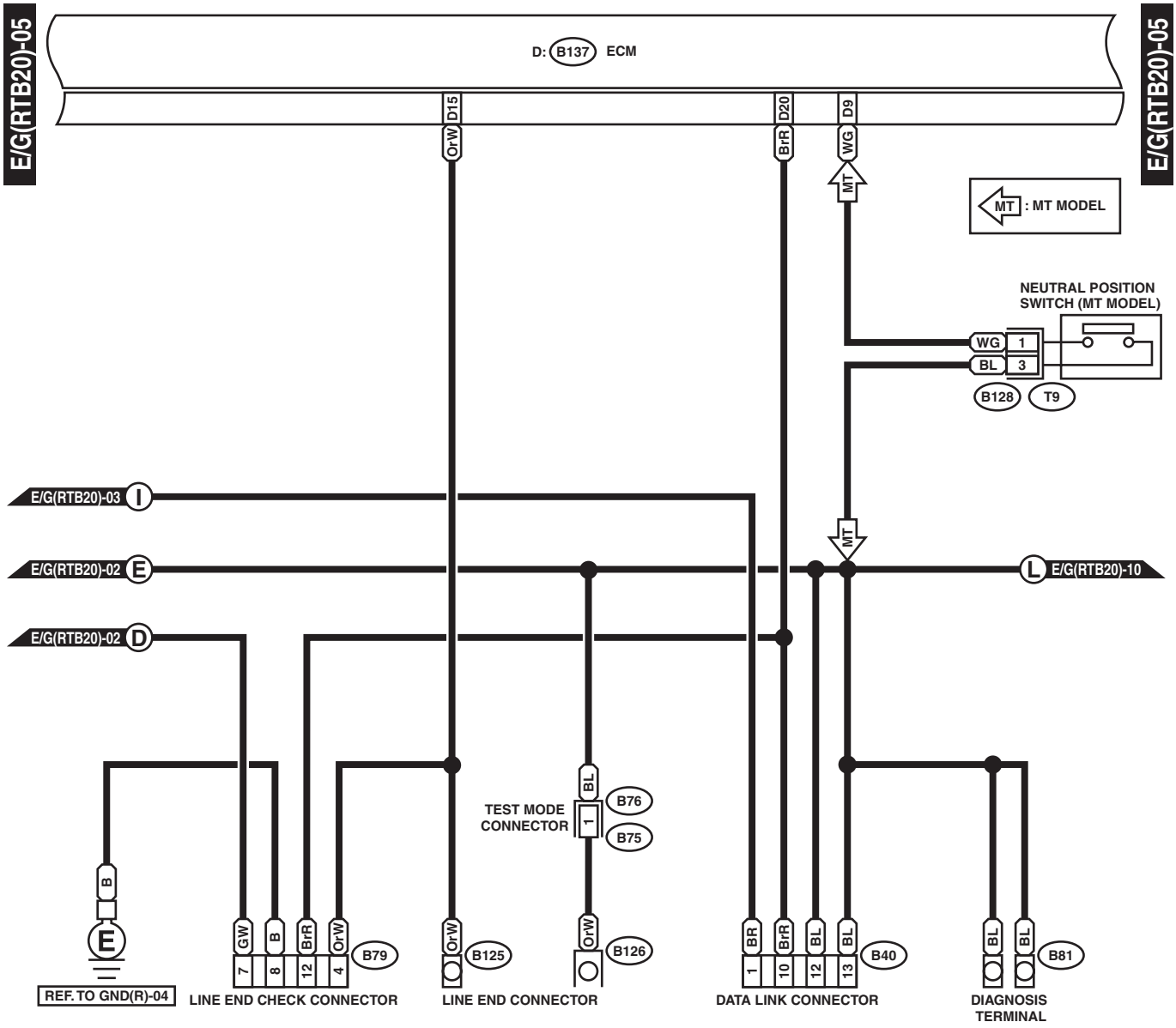


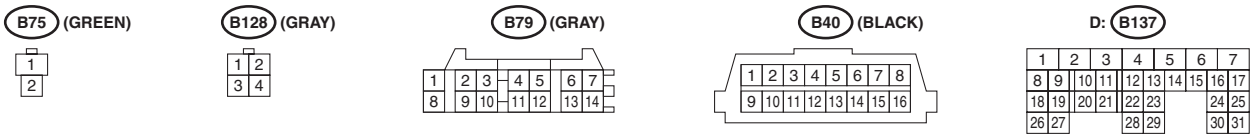




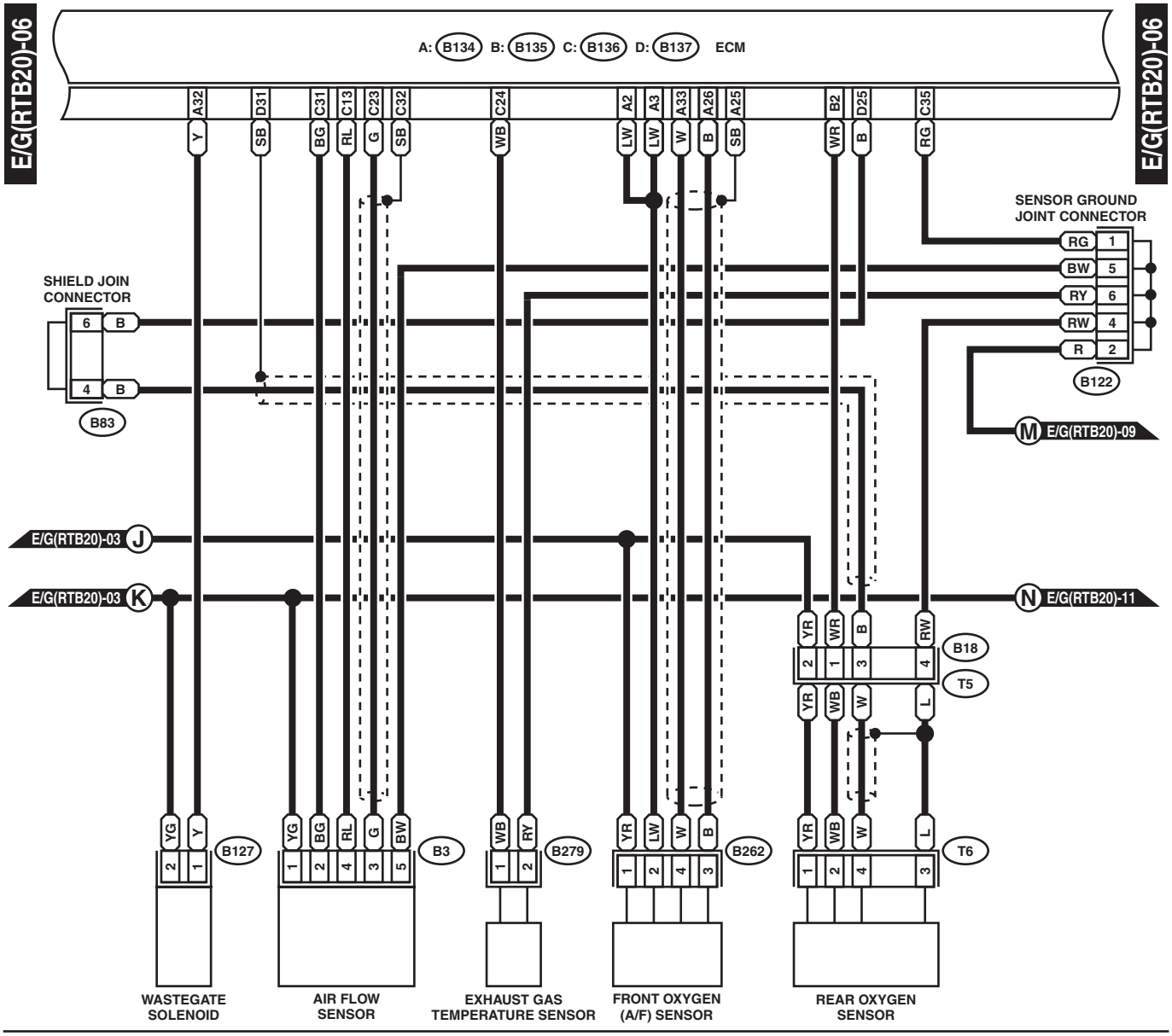


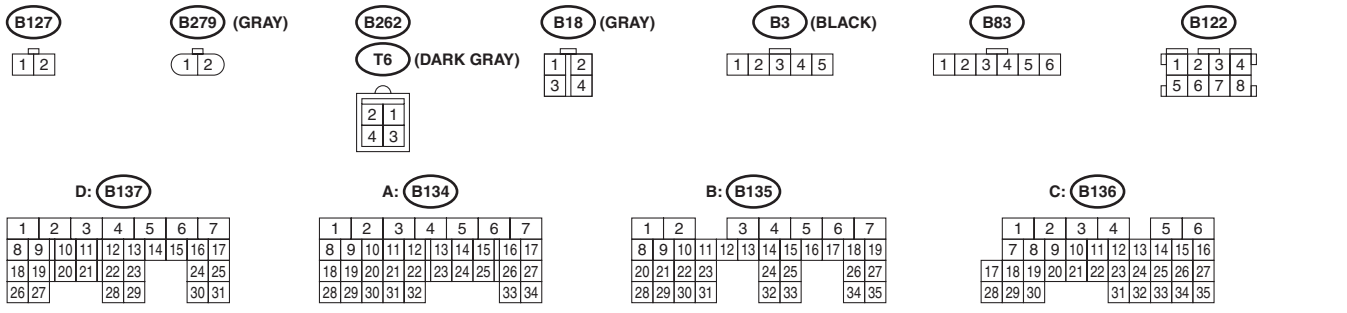
WI-05924


E/G(RTB20)-05
D: B137 ECM
E/G(RTB20)-05
D15
D20
D9
OrW
BrR
WG
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT MODEL)
WG 1
BL 3
B128
T9
E/G(RTB20)-03 I
E/G(RTB20)-02 E
E/G(RTB20)-02 D
L E/G(RTB20)-10
TEST MODE CONNECTOR
BL
1
B76
B75
B
E
REF. TO GND(R)-04
GW
B
BrR
OrW
7
8
12
4
B79
LINE END CHECK CONNECTOR
OrW
B125
LINE END CONNECTOR
OrW
B126
BR
BrR
BL
BL
1
10
12
13
B40
DATA LINK CONNECTOR
BL
BL
B81
DIAGNOSIS TERMINAL

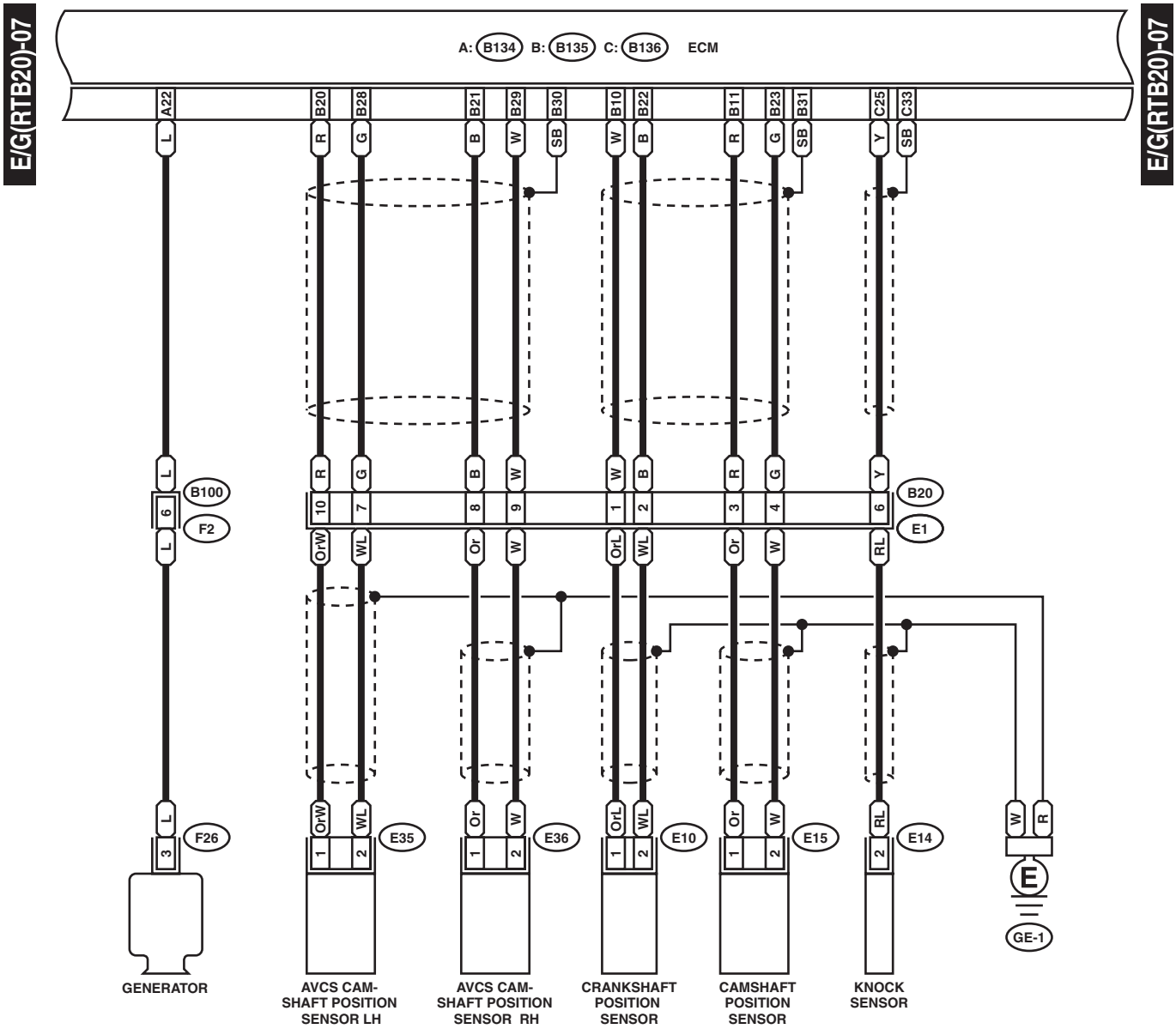

B75 (GREEN)
1
2
B128 (GRAY)
1 2
3 4
B79 (GRAY)
1 2 3 4 5 6 7
8 9 10 11 12 13 14
B40 (BLACK)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31

WI-03308


E/G(RTB20)-06
A: B134 B: B135 C: B136 D: B137 ECM
A32 D31 C31 C13 C23 C32 C24 A2 A3 A33 A26 A25 B2 D25 C35
Y SB BG RL G SB WB LW LW W B SB WR B RG
SENSOR GROUND JOINT CONNECTOR
RG 1
BW 5
RY 6
RW 4
R 2
B122
SHIELD JOIN CONNECTOR
6 B
4 B
B83
M E/G(RTB20)-09
E/G(RTB20)-03 J
E/G(RTB20)-03 K
N E/G(RTB20)-11
YR WR B RW
2 1 3 4
B18
T5
YR WB W L
YG Y
2 1
B127
YG BG RL G BW
1 2 4 3 5
B3
WB RY
1 2
B279
YR LW W B
1 2 4 3
B262
YR WB W L
1 2 4 3
T6
WASTEGATE SOLENOID
AIR FLOW SENSOR
EXHAUST GAS TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR


B127
1 2
B279 (GRAY)
1 2
B262
T6 (DARK GRAY)
2 1
4 3
B18 (GRAY)
1 2
3 4
B3 (BLACK)
1 2 3 4 5
B83
1 2 3 4 5 6
B122
1 2 3 4
5 6 7 8
D: B137
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25
26 27 28 29 30 31
A: B134
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34
B: B135
1 2 3 4 5 6 7
8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35
C: B136
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27
28 29 30 31 32 33 34 35

WI-05925



(LIGHT GRAY) E10 E35
(BROWN) E14 E36
(LIGHT GRAY) E15

F26 (GREEN)

B20 (LIGHT GRAY)

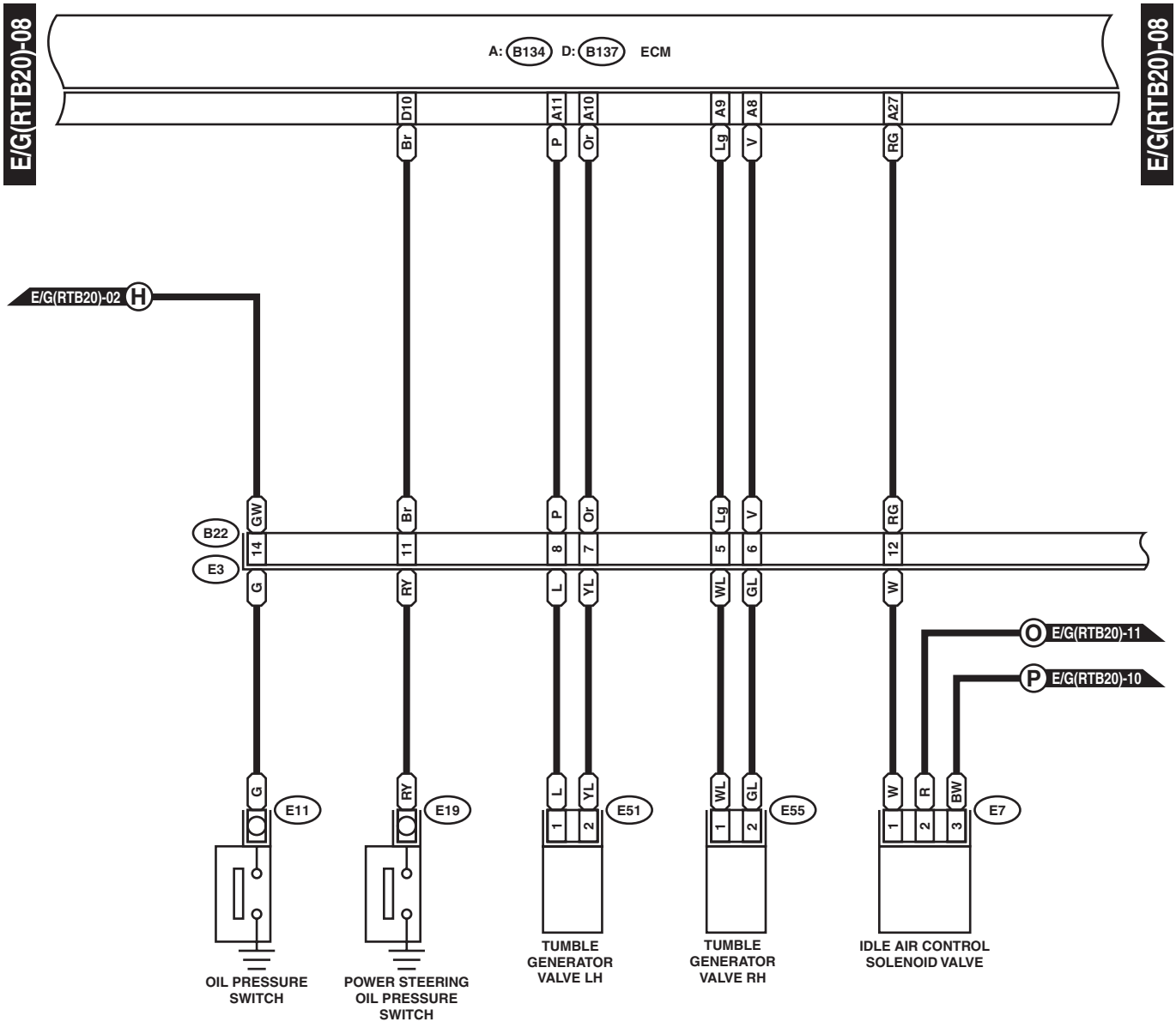
F2 (BLUE)

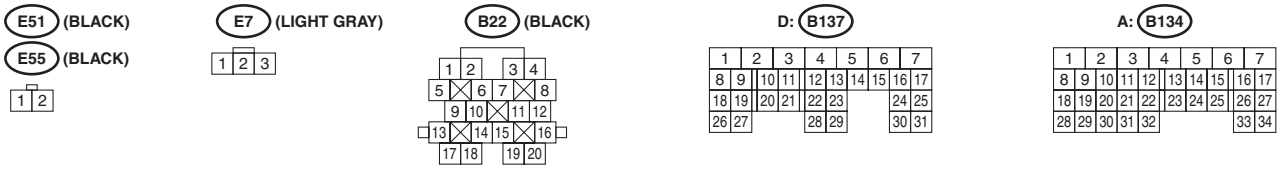
A: B134

B: B135

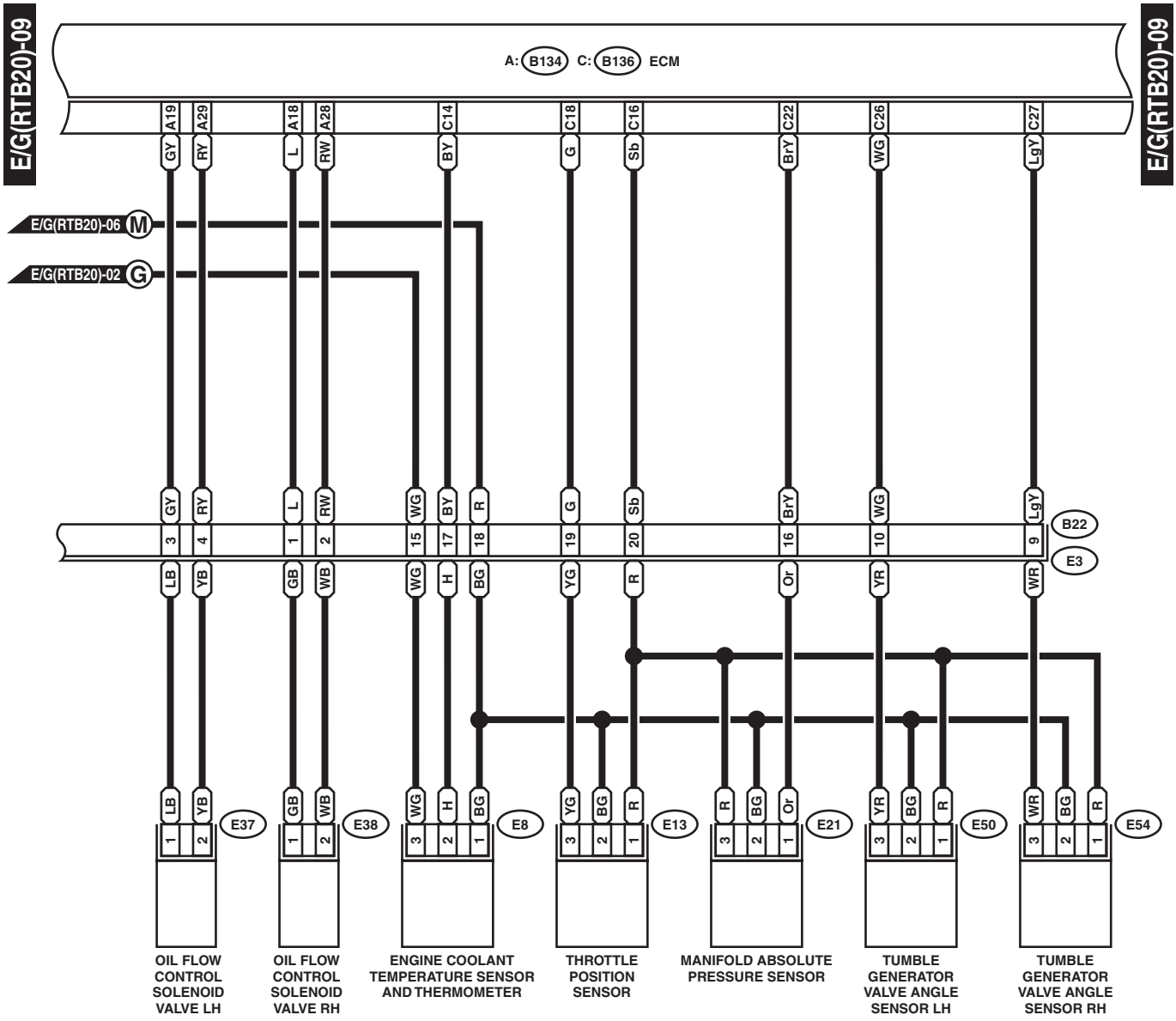
C: B136

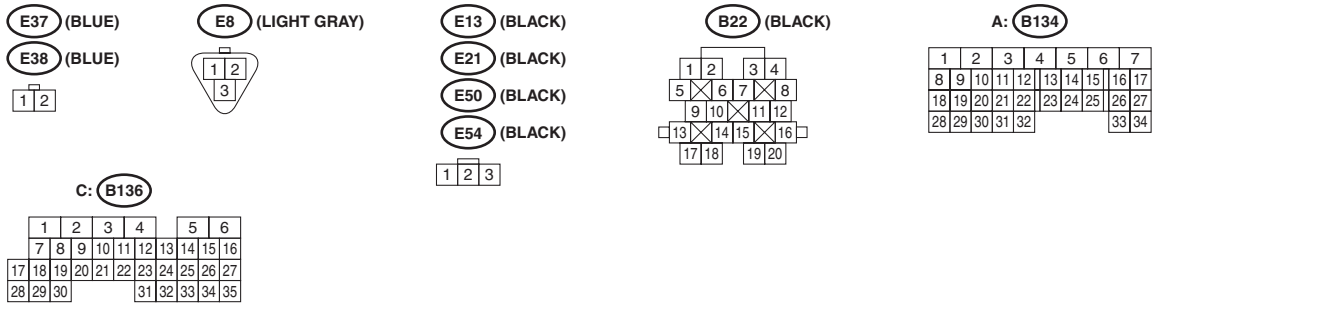
WI-05926


E/G(RTB20)-08
E/G(RTB20)-08
A: B134 D: B137 ECM
D10
A11
A10
A9
A8
A27
Br
P
Or
Lg
V
RG
E/G(RTB20)-02 H
B22
E3
GW
14
G
11
RY
8
L
7
YL
5
WL
6
GL
12
W
O E/G(RTB20)-11
P E/G(RTB20)-10
R
BW
E11
E19
E51
E55
E7
1
2
3
OIL PRESSURE SWITCH
POWER STEERING OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
IDLE AIR CONTROL SOLENOID VALVE

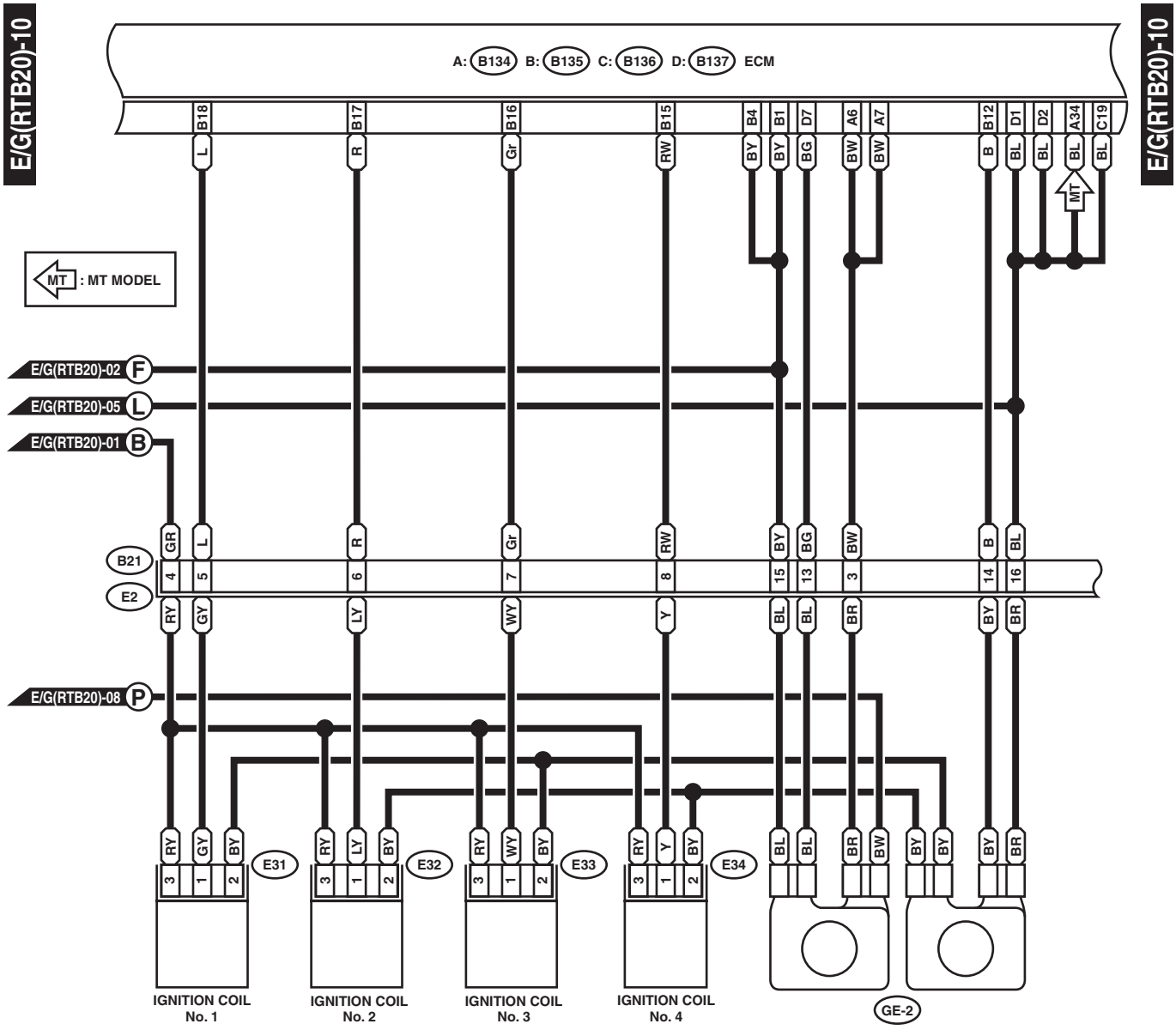

E51 (BLACK)
E55 (BLACK)
E7 (LIGHT GRAY)
B22 (BLACK)
D: B137
A: B134

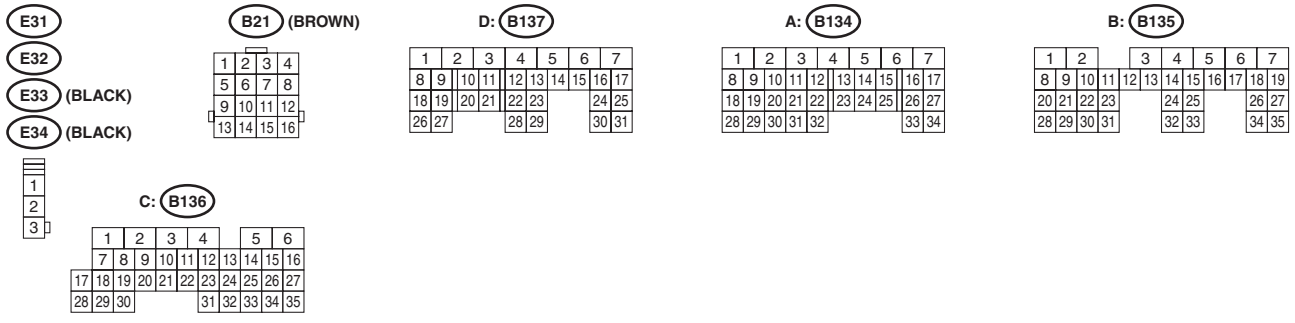
WI-05927


E/G(RTB20)-09
E/G(RTB20)-09
A: B134 C: B136 ECM
E/G(RTB20)-06 M
E/G(RTB20)-02 G
B22
E3
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
THROTTLE POSITION SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH

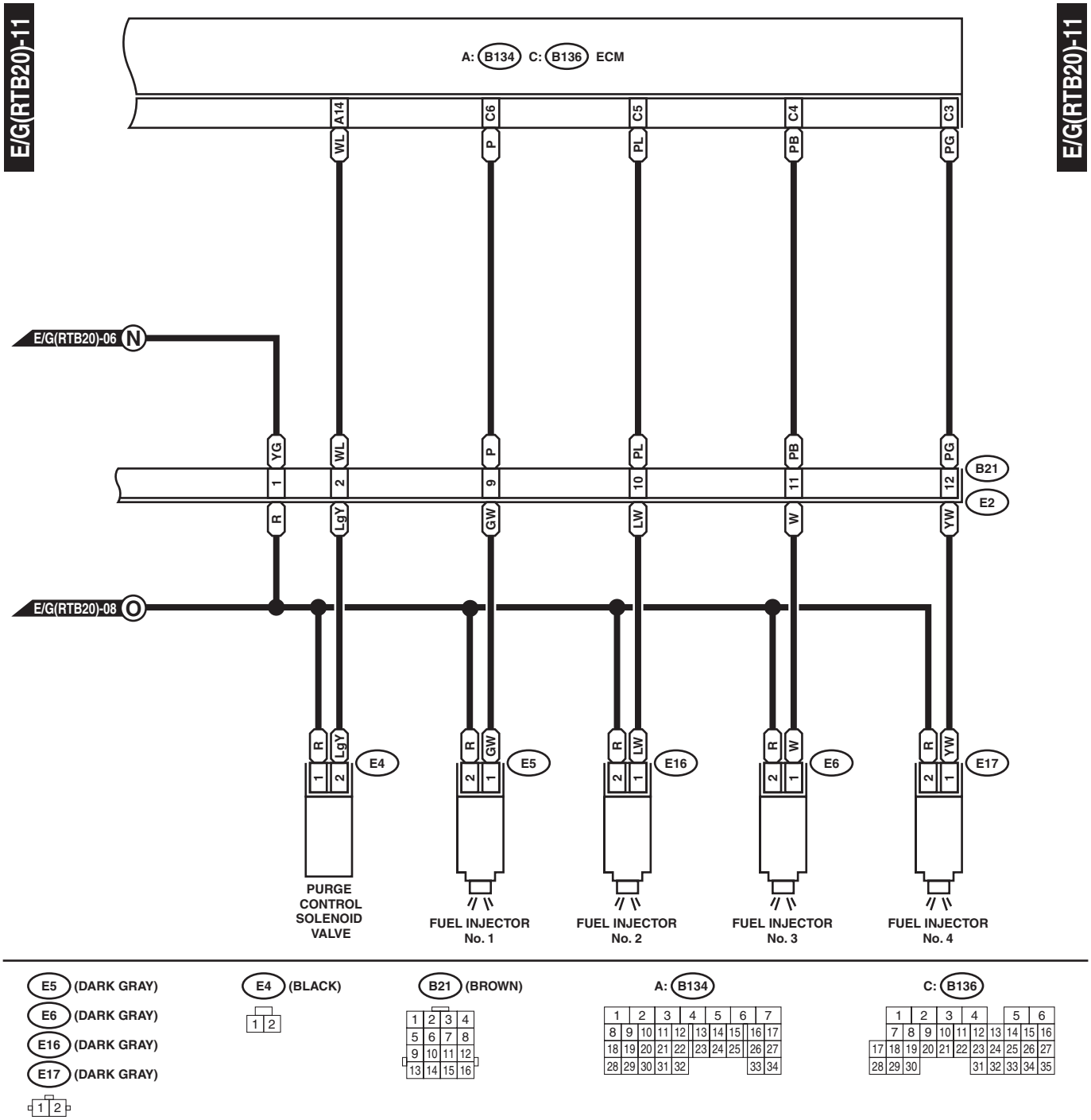

E37 (BLUE)
E38 (BLUE)
E8 (LIGHT GRAY)
E13 (BLACK)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
B22 (BLACK)
A: B134
C: B136

WI-07367


E/G(RTB20)-10
E/G(RTB20)-10
A: B134 B: B135 C: B136 D: B137 ECM
MT : MT MODEL
E/G(RTB20)-02 F
E/G(RTB20)-05 L
E/G(RTB20)-01 B
E/G(RTB20)-08 P
B21
E2
E31
E32
E33
E34
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
GE-2


E31
E32
E33 (BLACK)
E34 (BLACK)
B21 (BROWN)
D: B137
A: B134
B: B135
C: B136

WI-05928



E5 (DARK GRAY)
E6 (DARK GRAY)
E16 (DARK GRAY)
E17 (DARK GRAY)

E4 (BLACK)

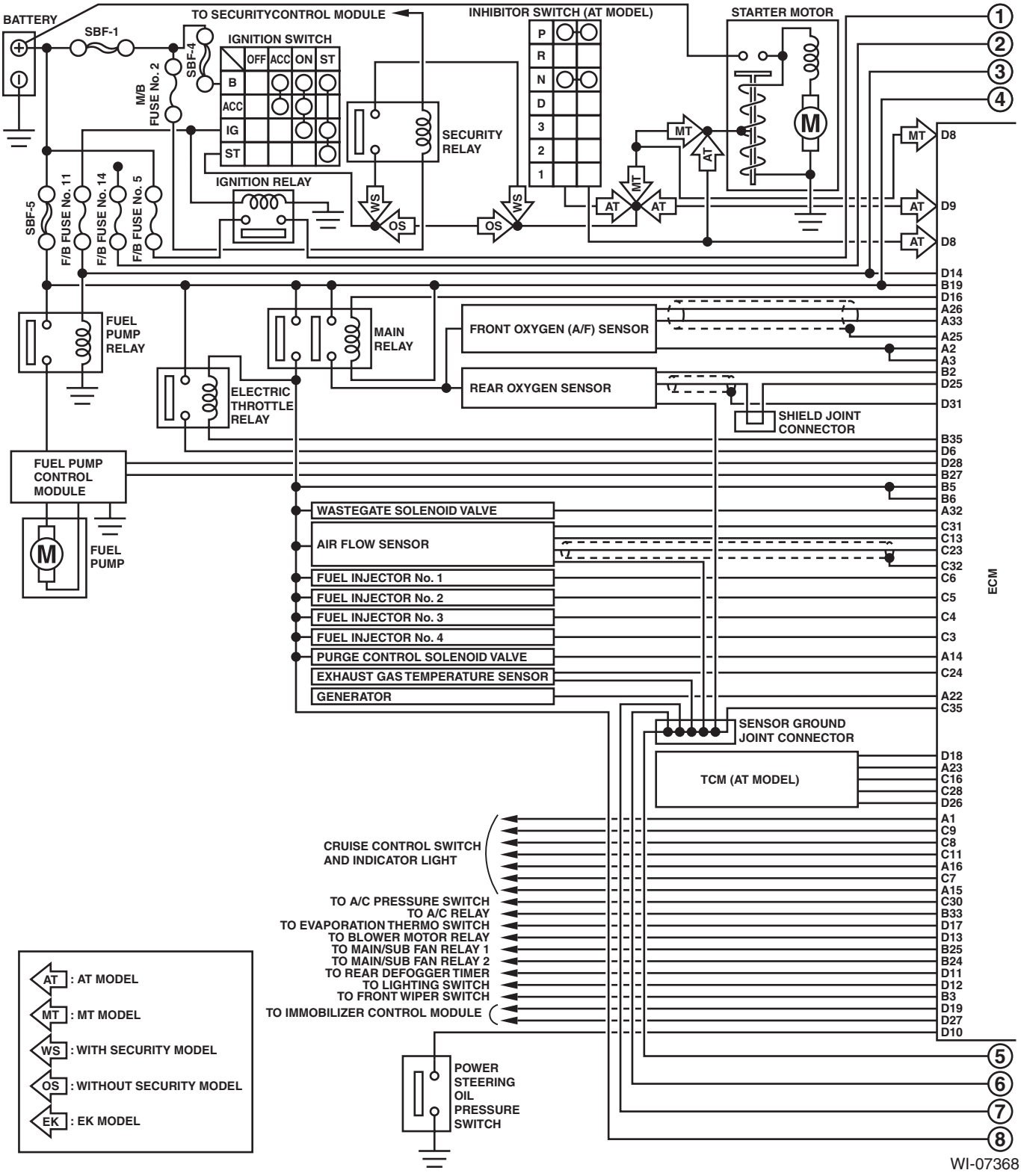
B21 (BROWN)

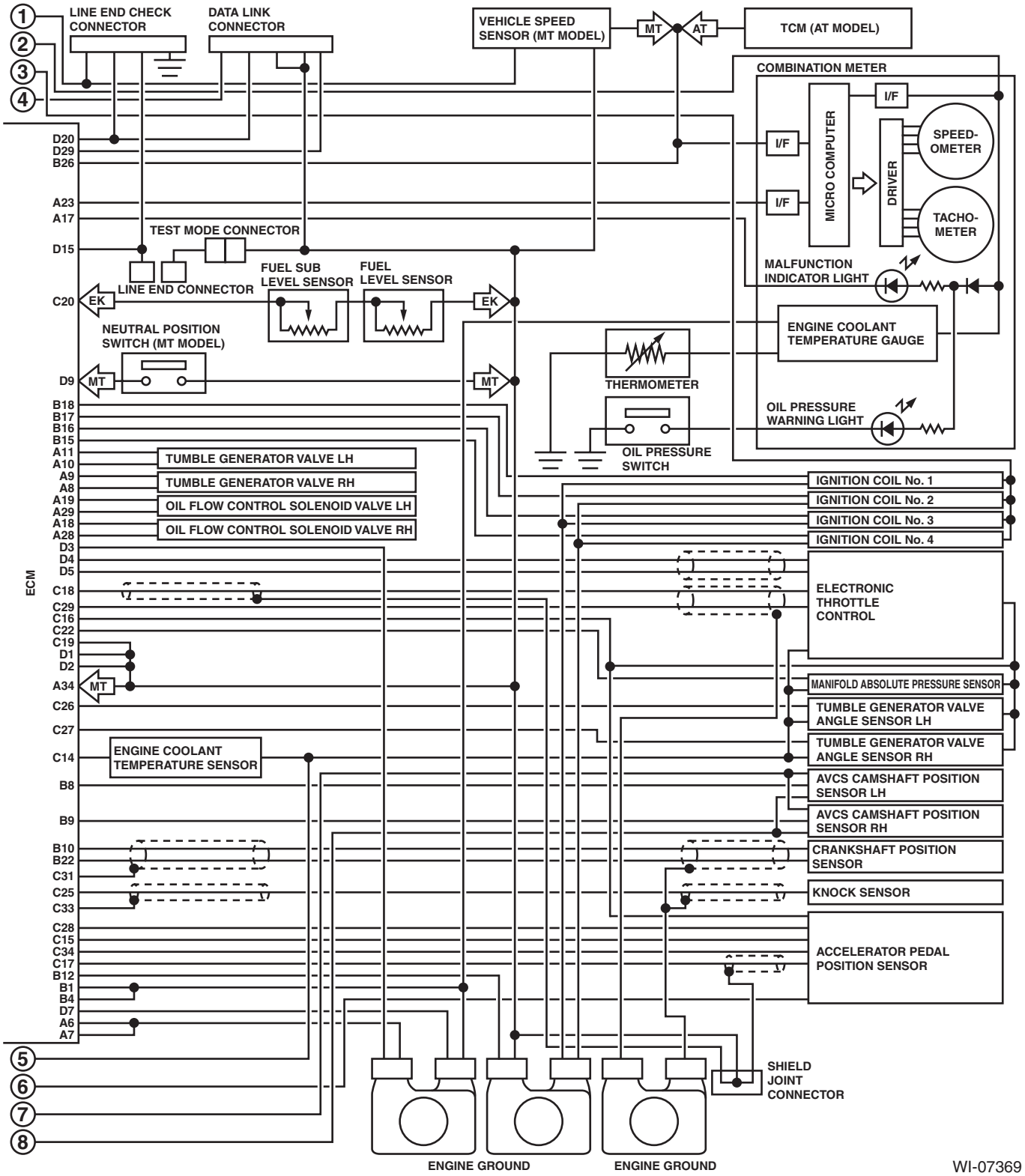
A: B134

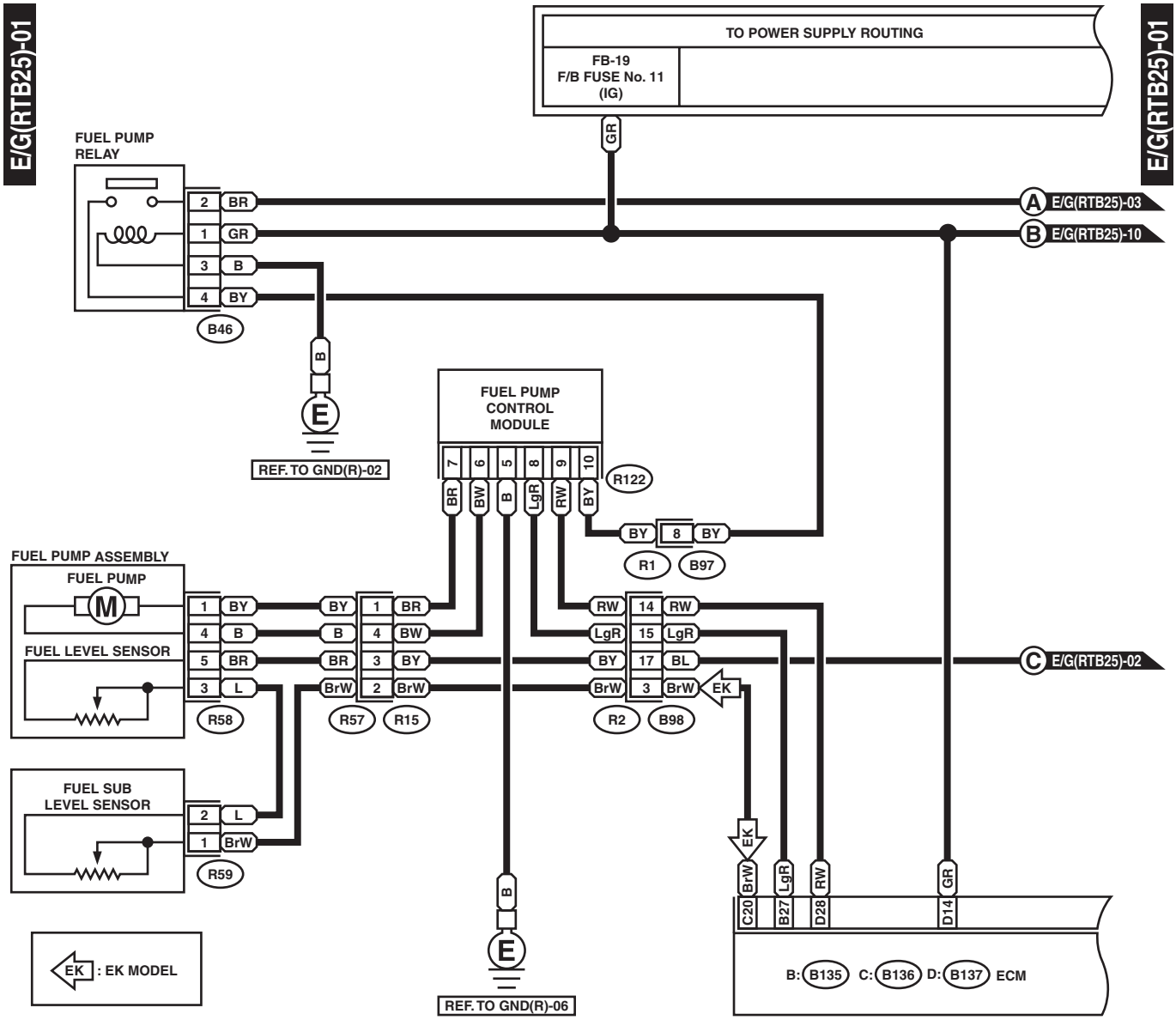
C: B136

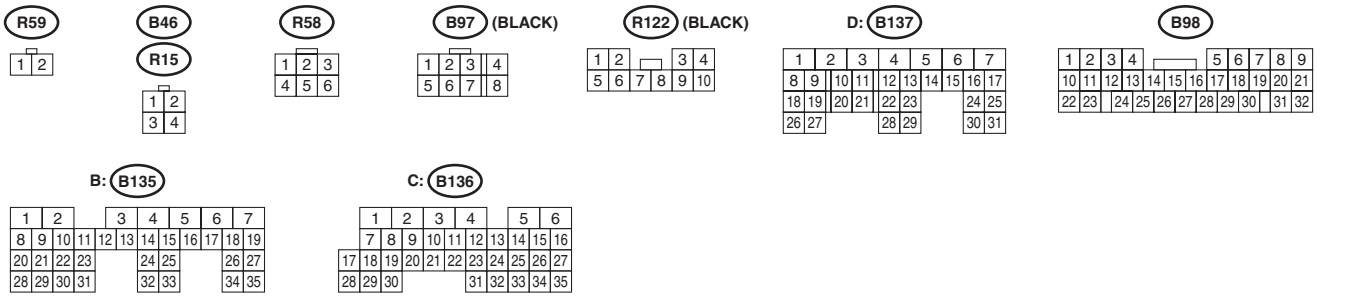
WI-03314

6. RHD 2.5 L TURBO MODEL

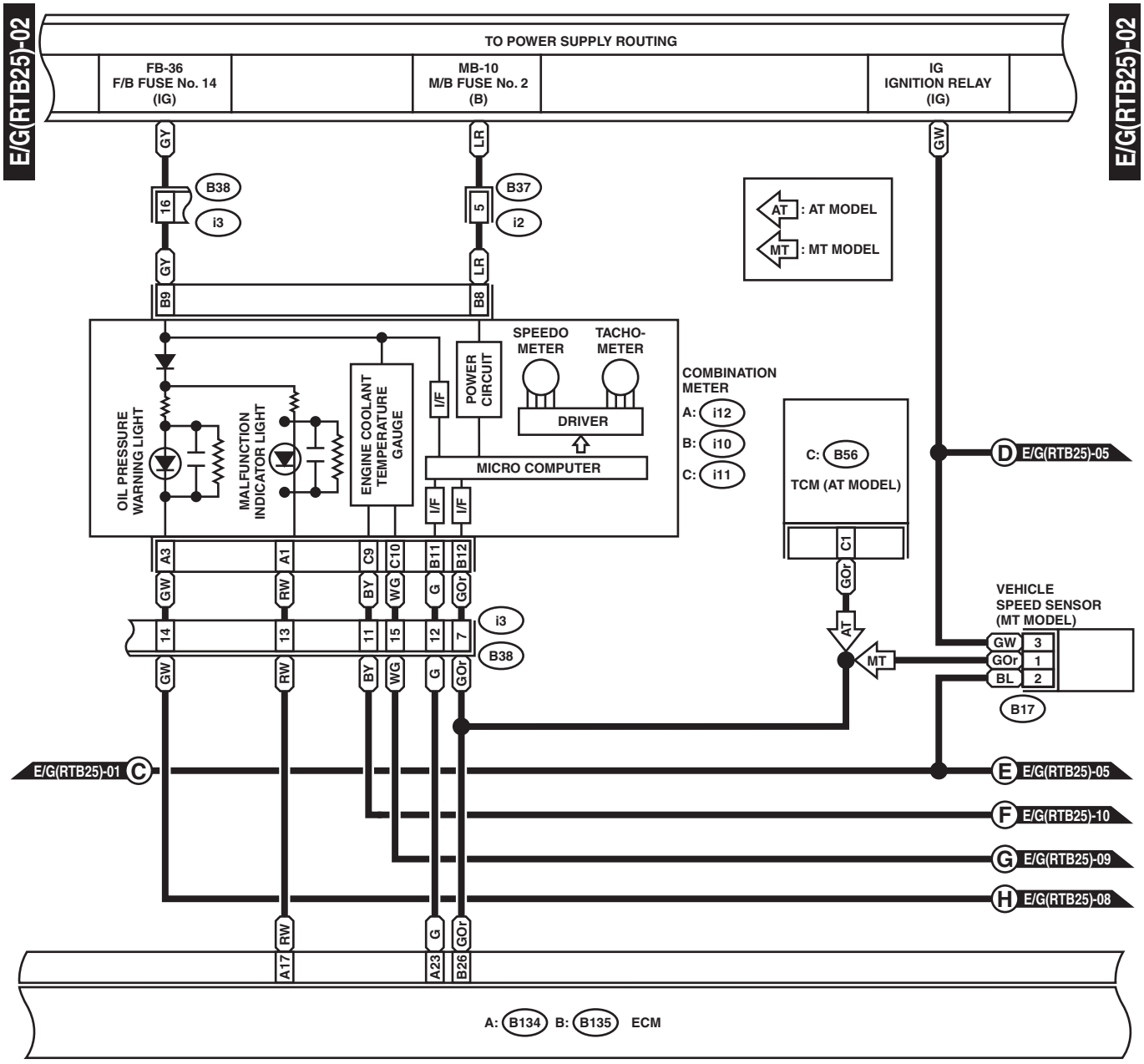


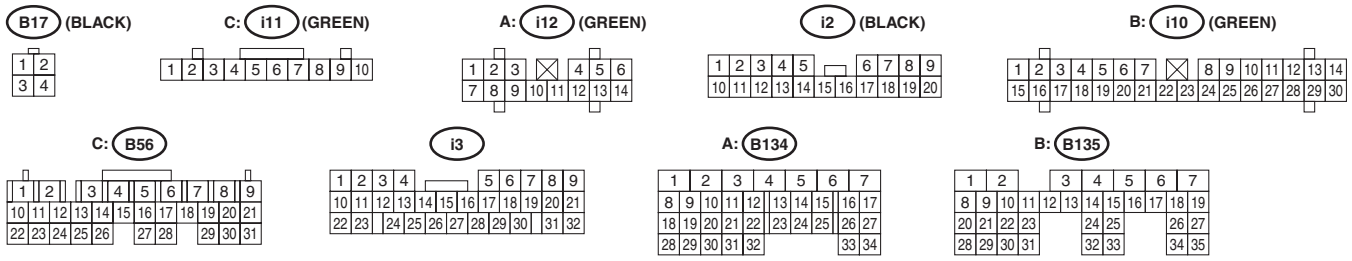

LINE END CHECK CONNECTOR
DATA LINK CONNECTOR
VEHICLE SPEED SENSOR (MT MODEL)
MT
AT
TCM (AT MODEL)
COMBINATION METER
I/F
MICRO COMPUTER
DRIVER
SPEED-OMETER
TACHO-METER
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
OIL PRESSURE WARNING LIGHT
TEST MODE CONNECTOR
LINE END CONNECTOR
FUEL SUB LEVEL SENSOR
FUEL LEVEL SENSOR
NEUTRAL POSITION SWITCH (MT MODEL)
THERMOMETER
OIL PRESSURE SWITCH
ECM
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH
ENGINE COOLANT TEMPERATURE SENSOR
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
ELECTRONIC THROTTLE CONTROL
MANIFOLD ABSOLUTE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH
AVCS CAMSHAFT POSITION SENSOR LH
AVCS CAMSHAFT POSITION SENSOR RH
CRANKSHAFT POSITION SENSOR
KNOCK SENSOR
ACCELERATOR PEDAL POSITION SENSOR
SHIELD JOINT CONNECTOR
ENGINE GROUND
ENGINE GROUND
WI-07369


E/G(RTB25)-01
E/G(RTB25)-01
TO POWER SUPPLY ROUTING
FB-19
F/B FUSE No. 11
(IG)
GR
FUEL PUMP
RELAY
2 BR
1 GR
3 B
4 BY
B46
A E/G(RTB25)-03
B E/G(RTB25)-10
B
REF. TO GND(R)-02
FUEL PUMP
CONTROL
MODULE
7 6 5 8 9 10
R122
BR BW B LgR RW BY
BY 8 BY
R1 B97
FUEL PUMP ASSEMBLY
FUEL PUMP
FUEL LEVEL SENSOR
1 BY BY 1 BR
4 B B 4 BW
5 BR BR 3 BY
3 L BrW 2 BrW
R58 R57 R15
RW 14 RW
LgR 15 LgR
BY 17 BL
BrW 3 BrW EK
R2 B98
C E/G(RTB25)-02
FUEL SUB
LEVEL SENSOR
2 L
1 BrW
R59
EK
BrW LgR RW GR
C20 B27 D28 D14
B
REF. TO GND(R)-06
EK : EK MODEL
B: B135 C: B136 D: B137 ECM

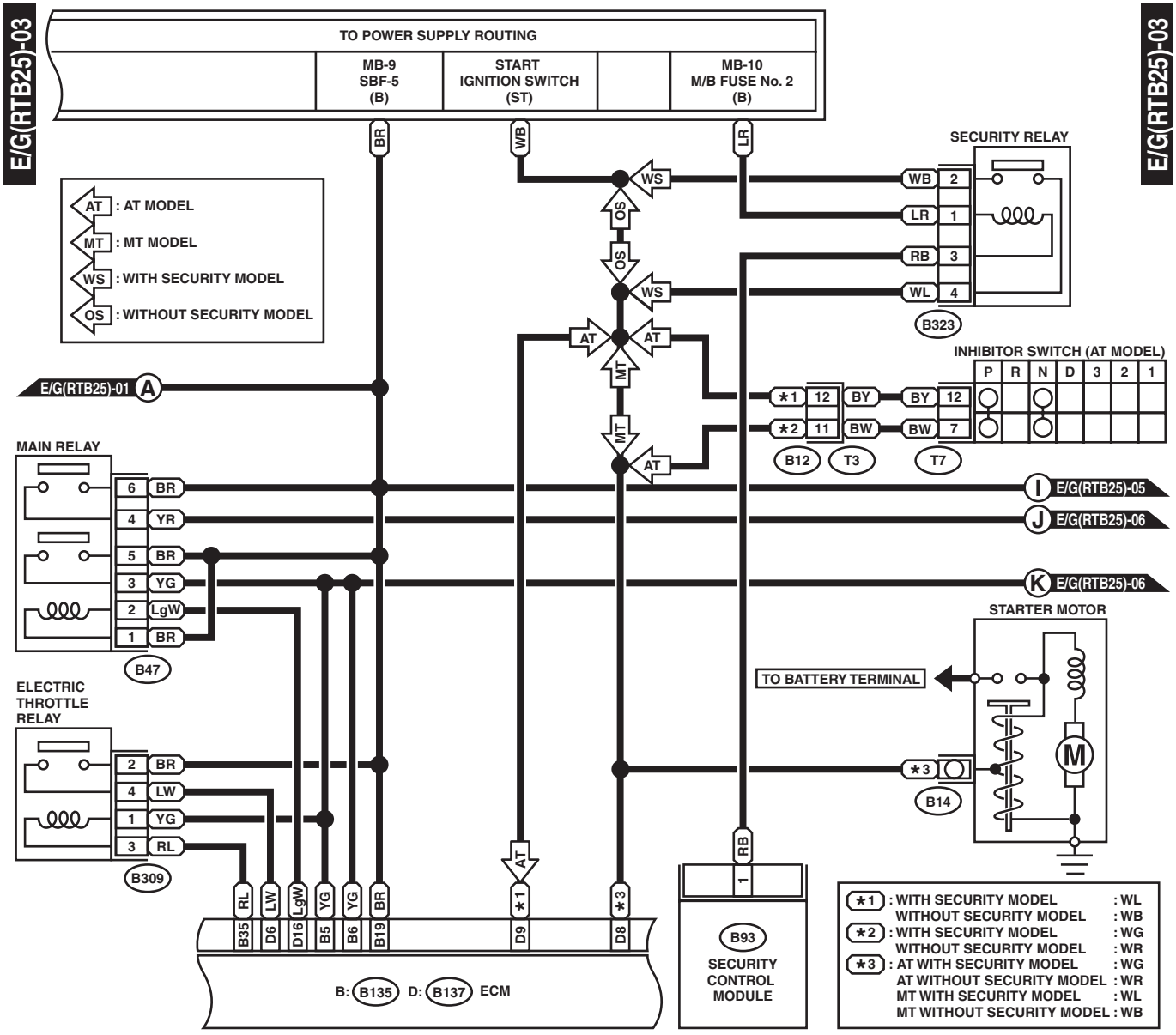

R59
B46
R15
R58
B97 (BLACK)
R122 (BLACK)
D: B137
B98
B: B135
C: B136

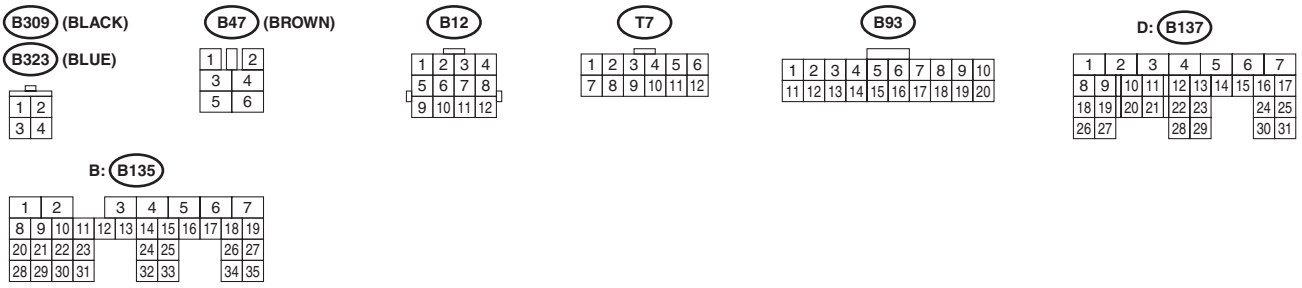
WI-07370


E/G(RTB25)-02
TO POWER SUPPLY ROUTING
FB-36
F/B FUSE No. 14
(IG)
MB-10
M/B FUSE No. 2
(B)
IG
IGNITION RELAY
(IG)
GY
LR
GW
B38
B37
16
5
i3
i2
AT : AT MODEL
MT : MT MODEL
B9
B8
SPEEDO METER
TACHO-METER
COMBINATION METER
A: i12
B: i10
C: i11
POWER CIRCUIT
I/F
DRIVER
MICRO COMPUTER
OIL PRESSURE WARNING LIGHT
MALFUNCTION INDICATOR LIGHT
ENGINE COOLANT TEMPERATURE GAUGE
C: B56
TCM (AT MODEL)
C1
GOr
D E/G(RTB25)-05
VEHICLE SPEED SENSOR (MT MODEL)
GW 3
GOr 1
BL 2
B17
A3
A1
C9
C10
B11
B12
RW
BY
WG
G
14
13
11
15
12
7
E/G(RTB25)-01 C
E/G(RTB25)-05 E
E/G(RTB25)-10 F
E/G(RTB25)-09 G
E/G(RTB25)-08 H
A17
A23
B26
A: B134 B: B135 ECM


B17 (BLACK)
C: i11 (GREEN)
A: i12 (GREEN)
i2 (BLACK)
B: i10 (GREEN)
C: B56
i3
A: B134
B: B135

WI-05930

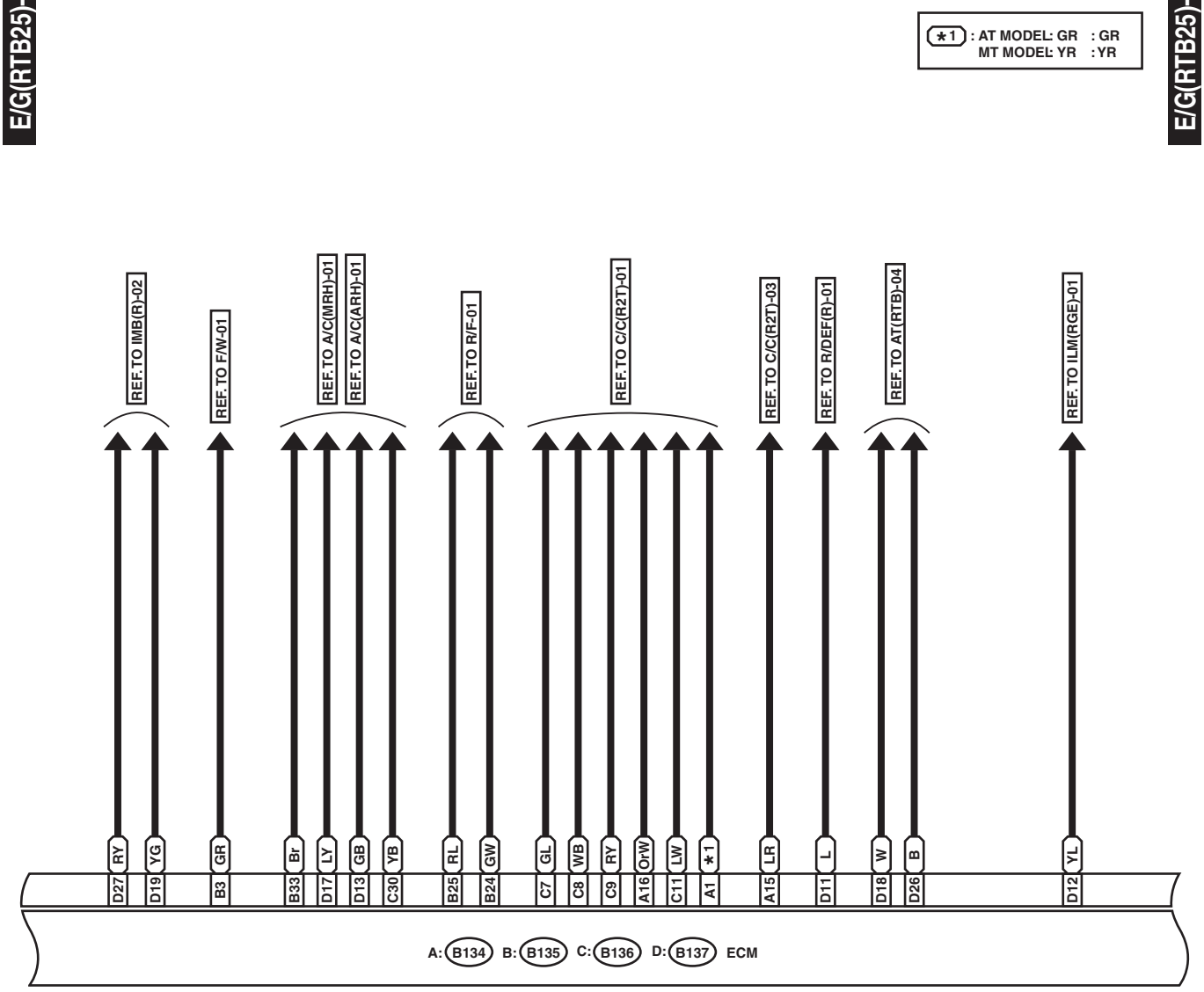

E/G(RTB25)-03
TO POWER SUPPLY ROUTING
MB-9 SBF-5 (B)
START IGNITION SWITCH (ST)
MB-10 M/B FUSE No. 2 (B)
AT : AT MODEL
MT : MT MODEL
WS : WITH SECURITY MODEL
OS : WITHOUT SECURITY MODEL
SECURITY RELAY
B323
INHIBITOR SWITCH (AT MODEL)
P R N D 3 2 1
E/G(RTB25)-01 A
MAIN RELAY
B47
ELECTRIC THROTTLE RELAY
B309
B12
T3
T7
I E/G(RTB25)-05
J E/G(RTB25)-06
K E/G(RTB25)-06
STARTER MOTOR
TO BATTERY TERMINAL
B14
B93
SECURITY CONTROL MODULE
B: B135 D: B137 ECM
*1 : WITH SECURITY MODEL : WL
WITHOUT SECURITY MODEL : WB
*2 : WITH SECURITY MODEL : WG
WITHOUT SECURITY MODEL : WR
*3 : AT WITH SECURITY MODEL : WG
AT WITHOUT SECURITY MODEL : WR
MT WITH SECURITY MODEL : WL
MT WITHOUT SECURITY MODEL : WB

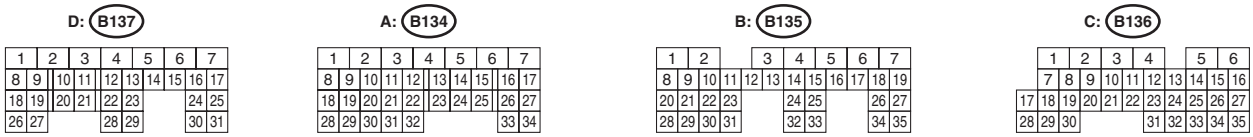

B309 (BLACK)
B323 (BLUE)
B47 (BROWN)
B12
T7
B93
D: B137
B: B135

WI-05931

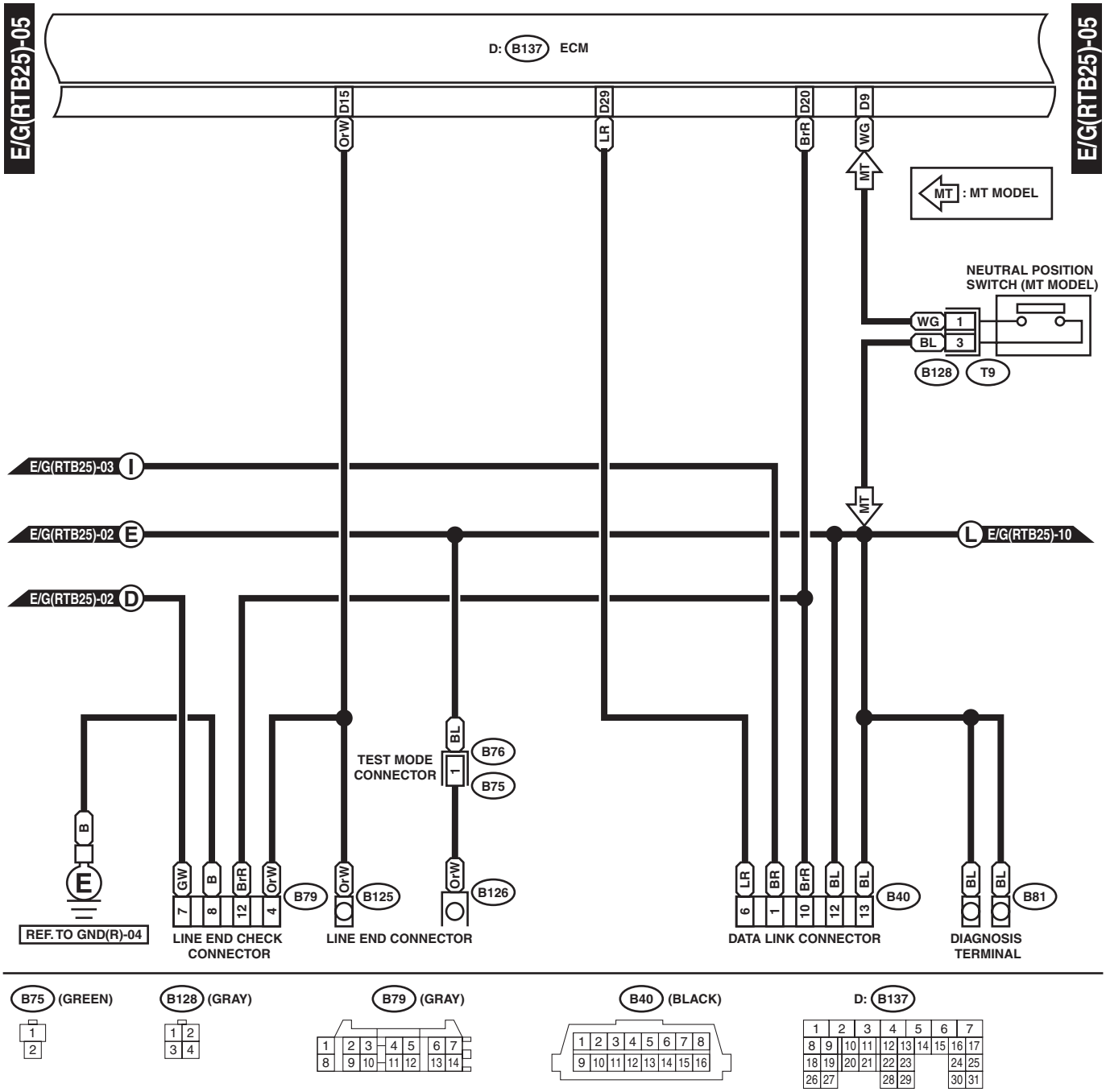
E/G(RTB25)-04

E/G(RTB25)-04



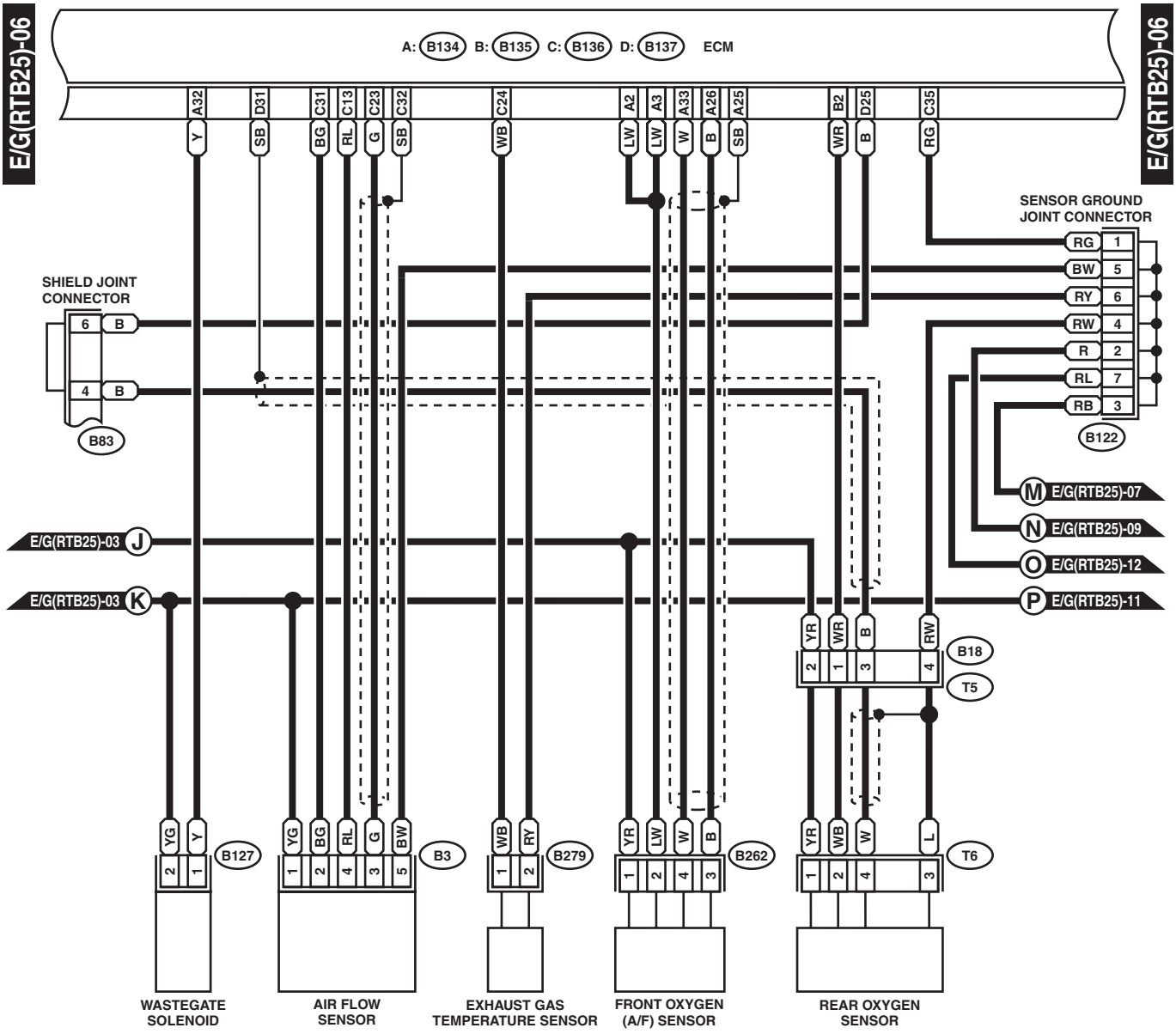


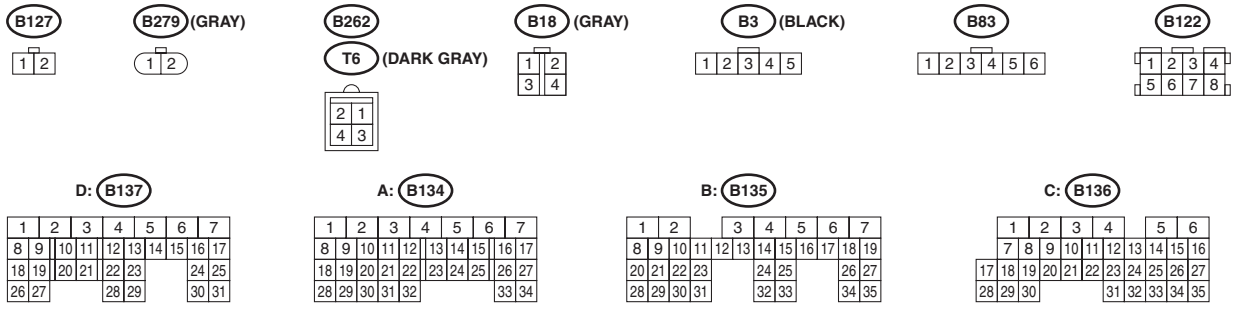
WI-07371


E/G(RTB25)-05
E/G(RTB25)-05
D: B137 ECM
D15
D29
D20
D9
OrW
LR
BrR
WG
MT
MT : MT MODEL
NEUTRAL POSITION SWITCH (MT MODEL)
WG 1
BL 3
B128
T9
E/G(RTB25)-03 I
E/G(RTB25)-02 E
E/G(RTB25)-02 D
L E/G(RTB25)-10
TEST MODE CONNECTOR
BL
1
B76
B75
B
E
REF. TO GND(R)-04
GW
B
BrR
OrW
7
8
12
4
B79
OrW
B125
OrW
B126
LINE END CHECK CONNECTOR
LINE END CONNECTOR
LR
BR
BrR
BL
BL
6
1
10
12
13
B40
BL
BL
B81
DATA LINK CONNECTOR
DIAGNOSIS TERMINAL

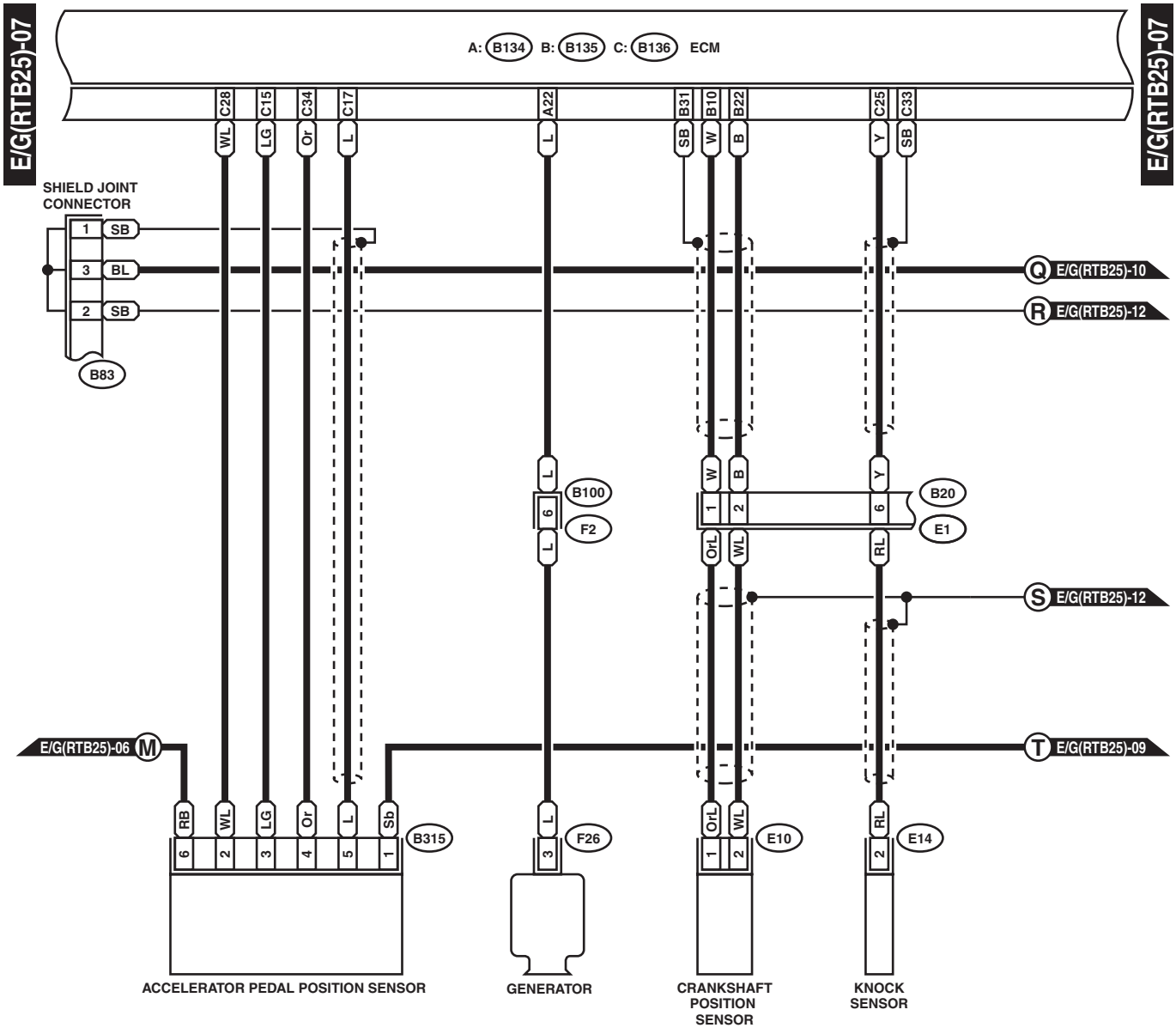
B75 (GREEN)
B128 (GRAY)
B79 (GRAY)
B40 (BLACK)
D: B137

WI-05933


E/G(RTB25)-06
E/G(RTB25)-06
A: B134 B: B135 C: B136 D: B137 ECM
A32 D31 C31 C13 C23 C32 C24 A2 A3 A33 A26 A25 B2 D25 C35
Y SB BG RL G SB WB LW LW W B SB WR B RG
SENSOR GROUND JOINT CONNECTOR
RG 1
BW 5
RY 6
RW 4
R 2
RL 7
RB 3
B122
SHIELD JOINT CONNECTOR
6 B
4 B
B83
M E/G(RTB25)-07
N E/G(RTB25)-09
O E/G(RTB25)-12
P E/G(RTB25)-11
E/G(RTB25)-03 J
E/G(RTB25)-03 K
YR WR B RW
B18
T5
YG Y B127
YG BG RL G BW B3
WB RY B279
YR LW W B B262
YR WB W L T6
WASTEGATE SOLENOID
AIR FLOW SENSOR
EXHAUST GAS TEMPERATURE SENSOR
FRONT OXYGEN (A/F) SENSOR
REAR OXYGEN SENSOR


B127
B279 (GRAY)
B262
T6 (DARK GRAY)
B18 (GRAY)
B3 (BLACK)
B83
B122
D: B137
A: B134
B: B135
C: B136

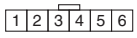
WI-05934



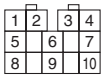
E10 (LIGHT GRAY)
E14 (BROWN)

F26 (GREEN)

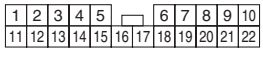
B83
B315 (BLACK)



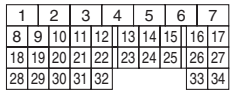
B20 (LIGHT GRAY)



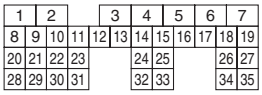
F2 (BLUE)



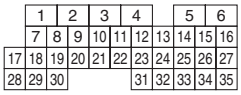
A: B134



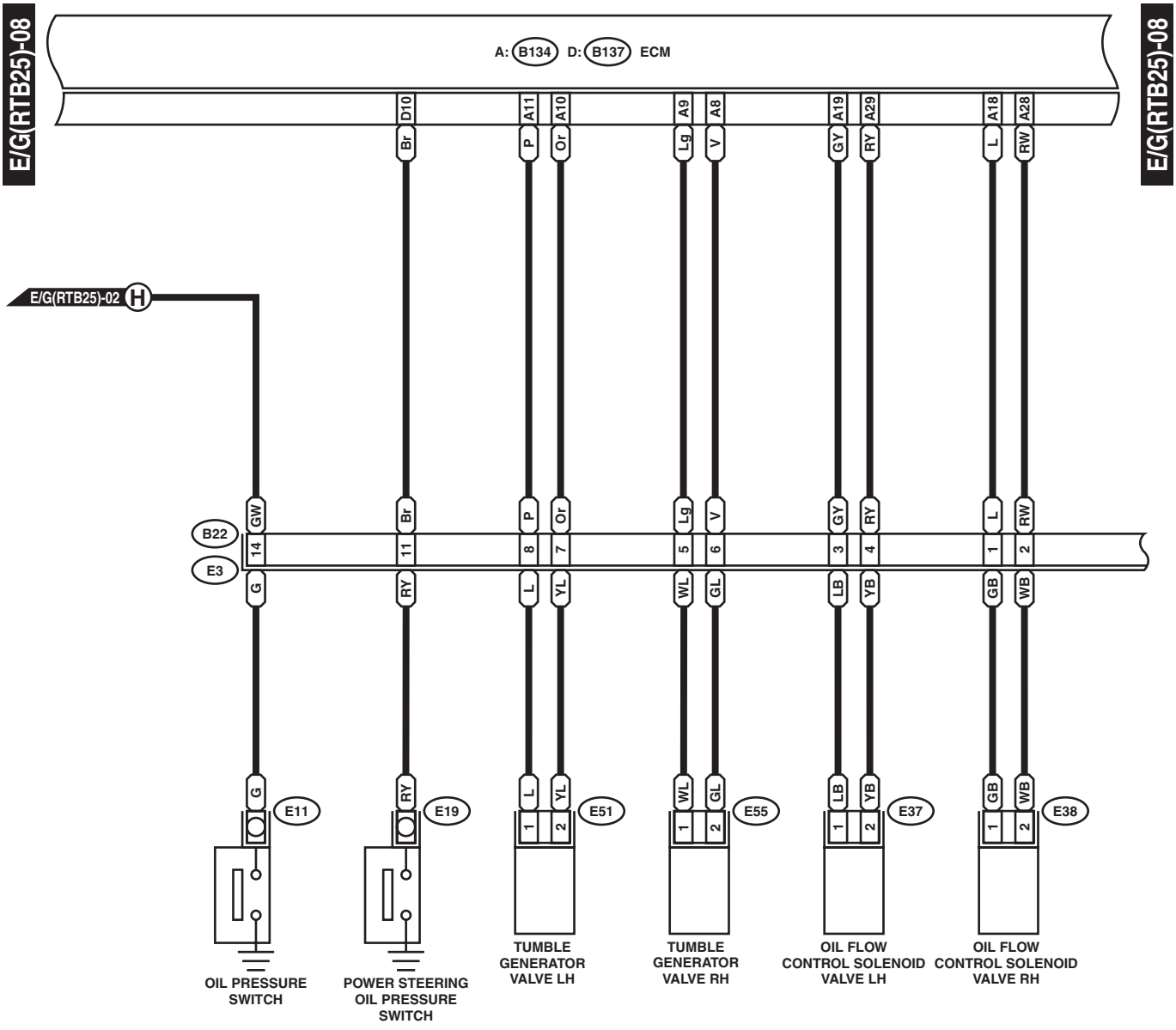
B: B135

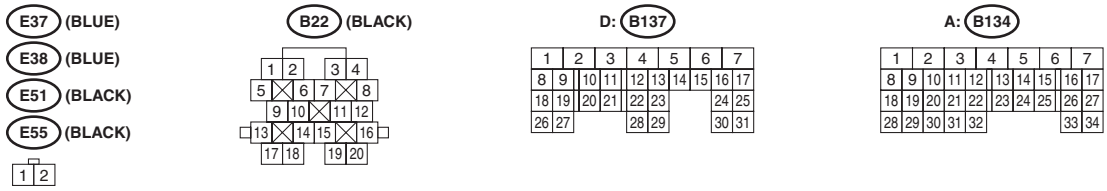


C: B136

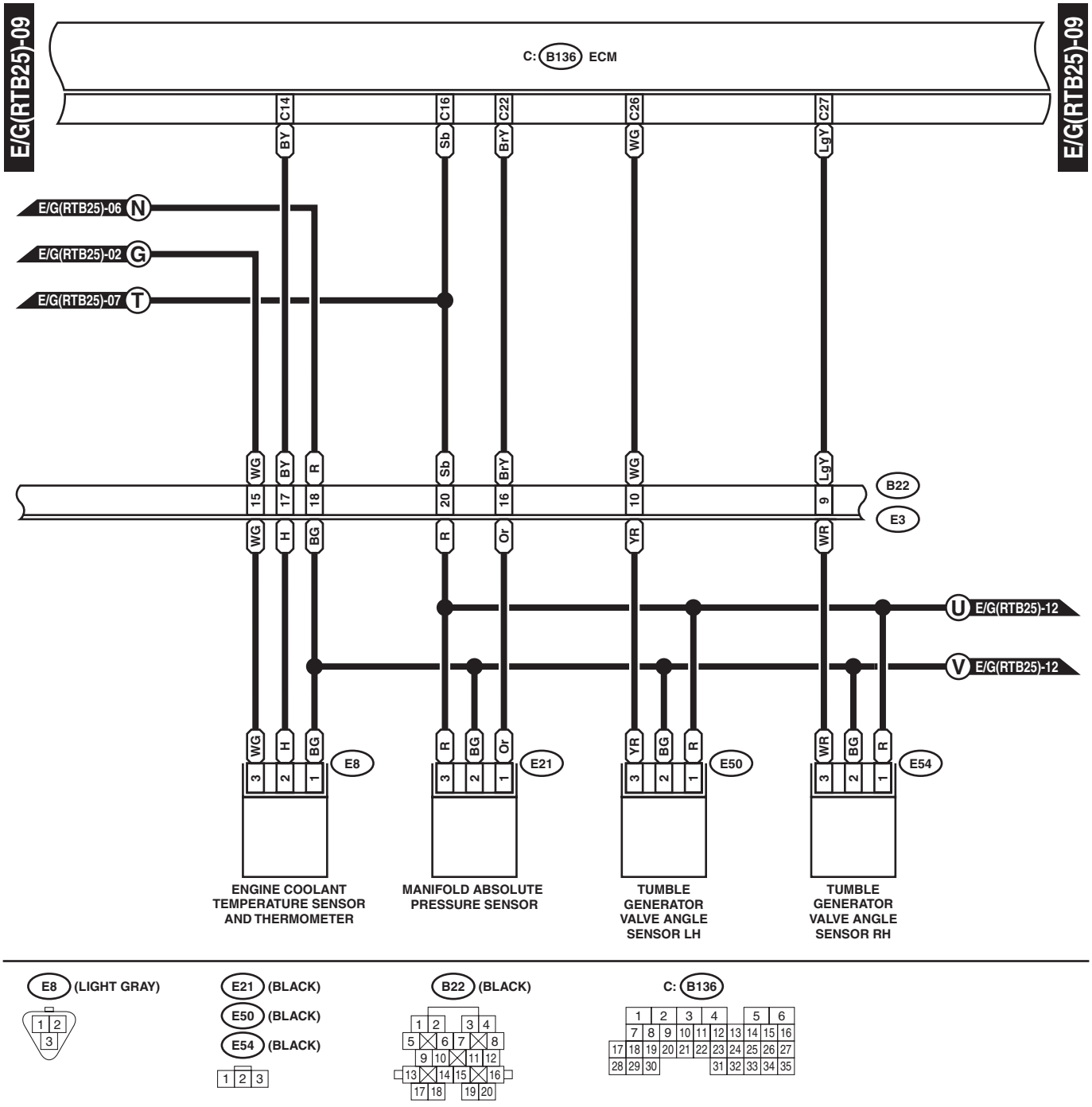


WI-05935


E/G(RTB25)-08
E/G(RTB25)-08
A: B134 D: B137 ECM
D10 A11 A10 A9 A8 A19 A29 A18 A28
Br P Or Lg V GY RY L RW
E/G(RTB25)-02 H
B22
E3
GW Br P Or Lg V GY RY L RW
14 11 8 7 5 6 3 4 1 2
G RY L YL WL GL LB YB GB WB
E11
E19
E51
E55
E37
E38
OIL PRESSURE SWITCH
POWER STEERING OIL PRESSURE SWITCH
TUMBLE GENERATOR VALVE LH
TUMBLE GENERATOR VALVE RH
OIL FLOW CONTROL SOLENOID VALVE LH
OIL FLOW CONTROL SOLENOID VALVE RH

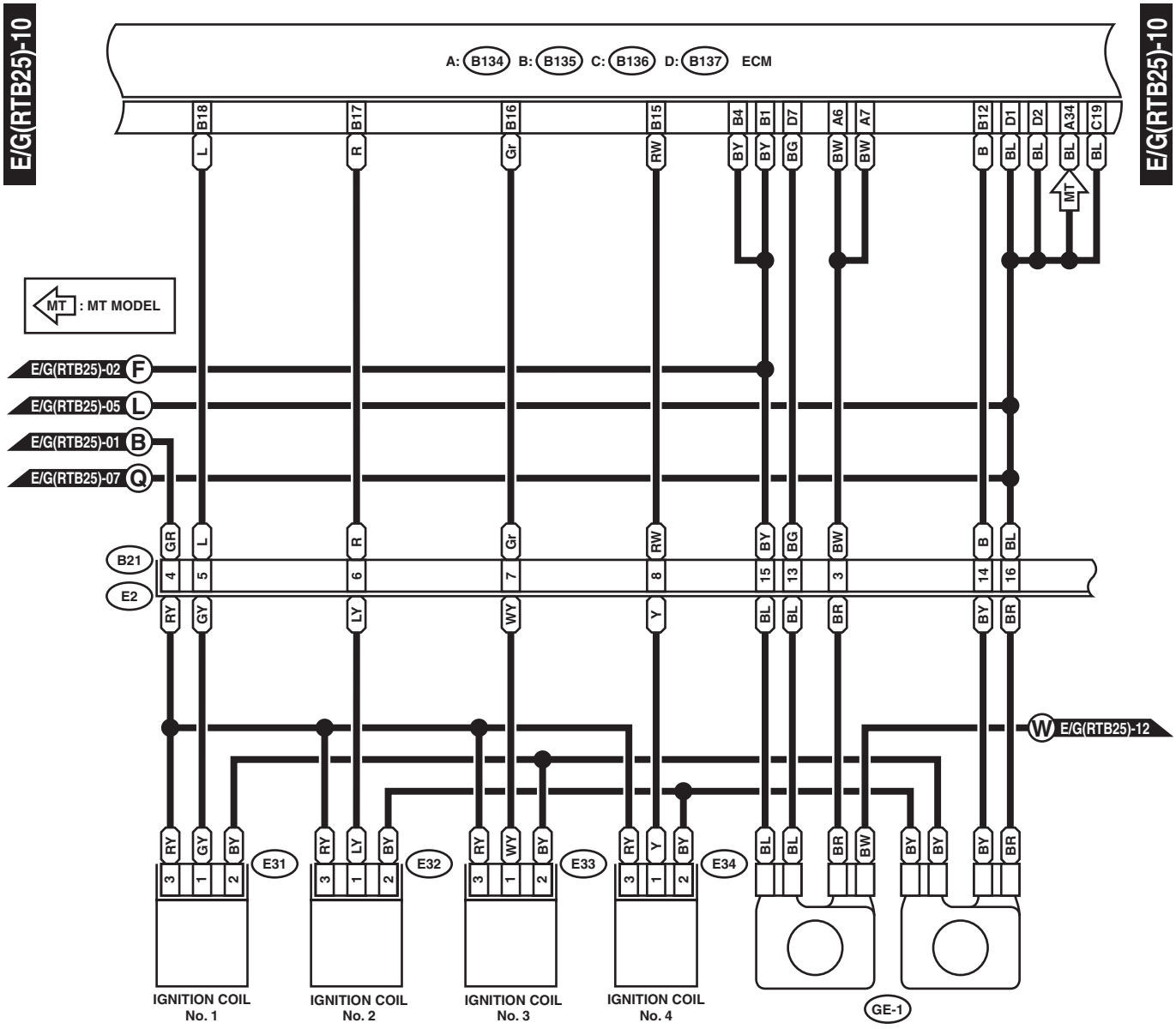

E37 (BLUE)
E38 (BLUE)
E51 (BLACK)
E55 (BLACK)
B22 (BLACK)
D: B137
A: B134

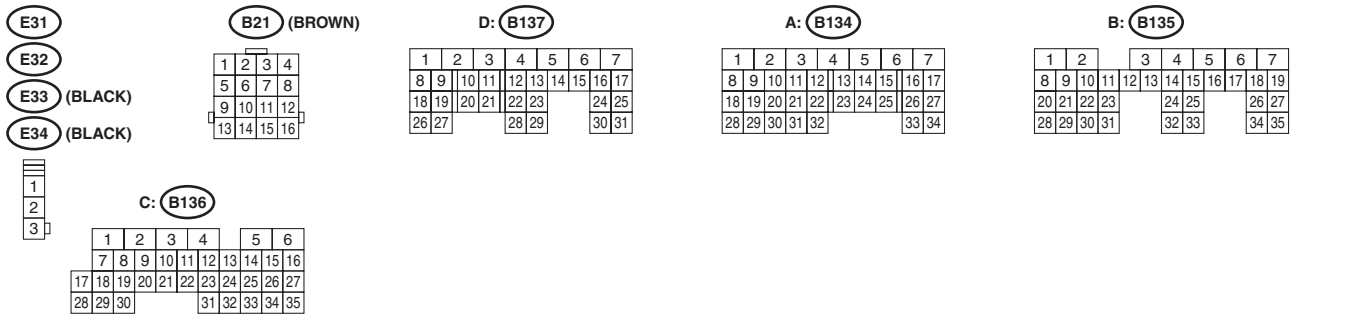
WI-03395


E/G(RTB25)-09
E/G(RTB25)-09
C: B136 ECM
C14
C16
C22
C26
C27
BY
Sb
BrY
WG
LgY
E/G(RTB25)-06 N
E/G(RTB25)-02 G
E/G(RTB25)-07 T
WG
BY
R
Sb
BrY
WG
LgY
15
17
18
20
16
10
9
B22
E3
WG
H
BG
R
Or
YR
WR
U E/G(RTB25)-12
V E/G(RTB25)-12
WG
H
BG
R
BG
Or
YR
BG
R
WR
BG
R
3
2
1
E8
E21
E50
E54
ENGINE COOLANT TEMPERATURE SENSOR AND THERMOMETER
MANIFOLD ABSOLUTE PRESSURE SENSOR
TUMBLE GENERATOR VALVE ANGLE SENSOR LH
TUMBLE GENERATOR VALVE ANGLE SENSOR RH

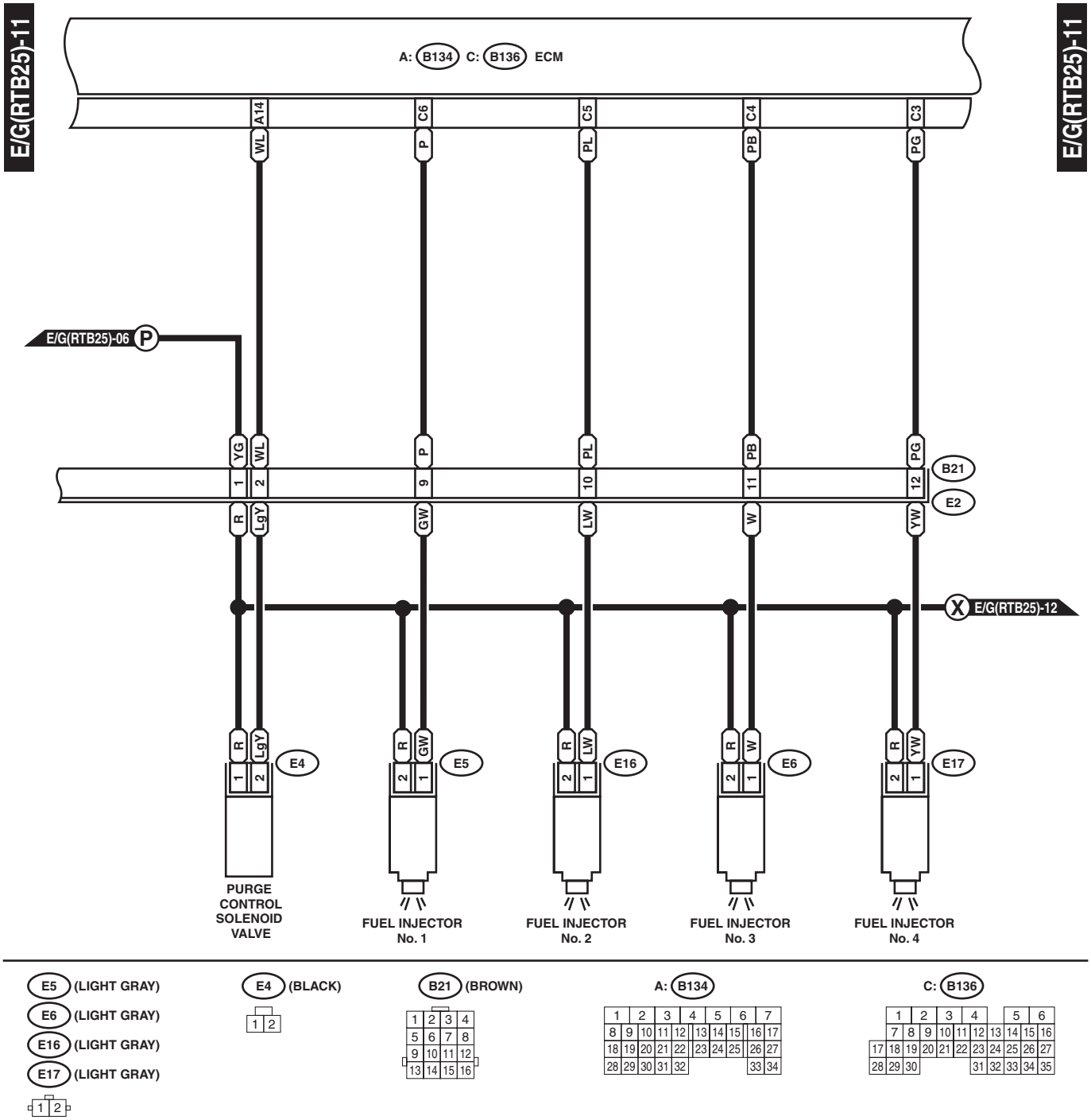
E8 (LIGHT GRAY)
E21 (BLACK)
E50 (BLACK)
E54 (BLACK)
B22 (BLACK)
C: B136

WI-05936


E/G(RTB25)-10
E/G(RTB25)-10
A: B134 B: B135 C: B136 D: B137 ECM
B18 B17 B16 B15 B4 B1 D7 A6 A7 B12 D1 D2 A34 C19
L R Gr RW BY BY BG BW BW B BL BL BL BL
MT
MT : MT MODEL
E/G(RTB25)-02 F
E/G(RTB25)-05 L
E/G(RTB25)-01 B
E/G(RTB25)-07 Q
B21
E2
GR L R Gr RW BY BG BW B BL
4 5 6 7 8 15 13 3 14 16
RY GY LY WY Y BL BL BR BY BR
W E/G(RTB25)-12
E31 E32 E33 E34
IGNITION COIL No. 1
IGNITION COIL No. 2
IGNITION COIL No. 3
IGNITION COIL No. 4
GE-1


E31
E32
E33 (BLACK)
E34 (BLACK)
B21 (BROWN)
D: B137
A: B134
B: B135
C: B136

WI-05937



E5 (LIGHT GRAY)
E6 (LIGHT GRAY)
E16 (LIGHT GRAY)
E17 (LIGHT GRAY)

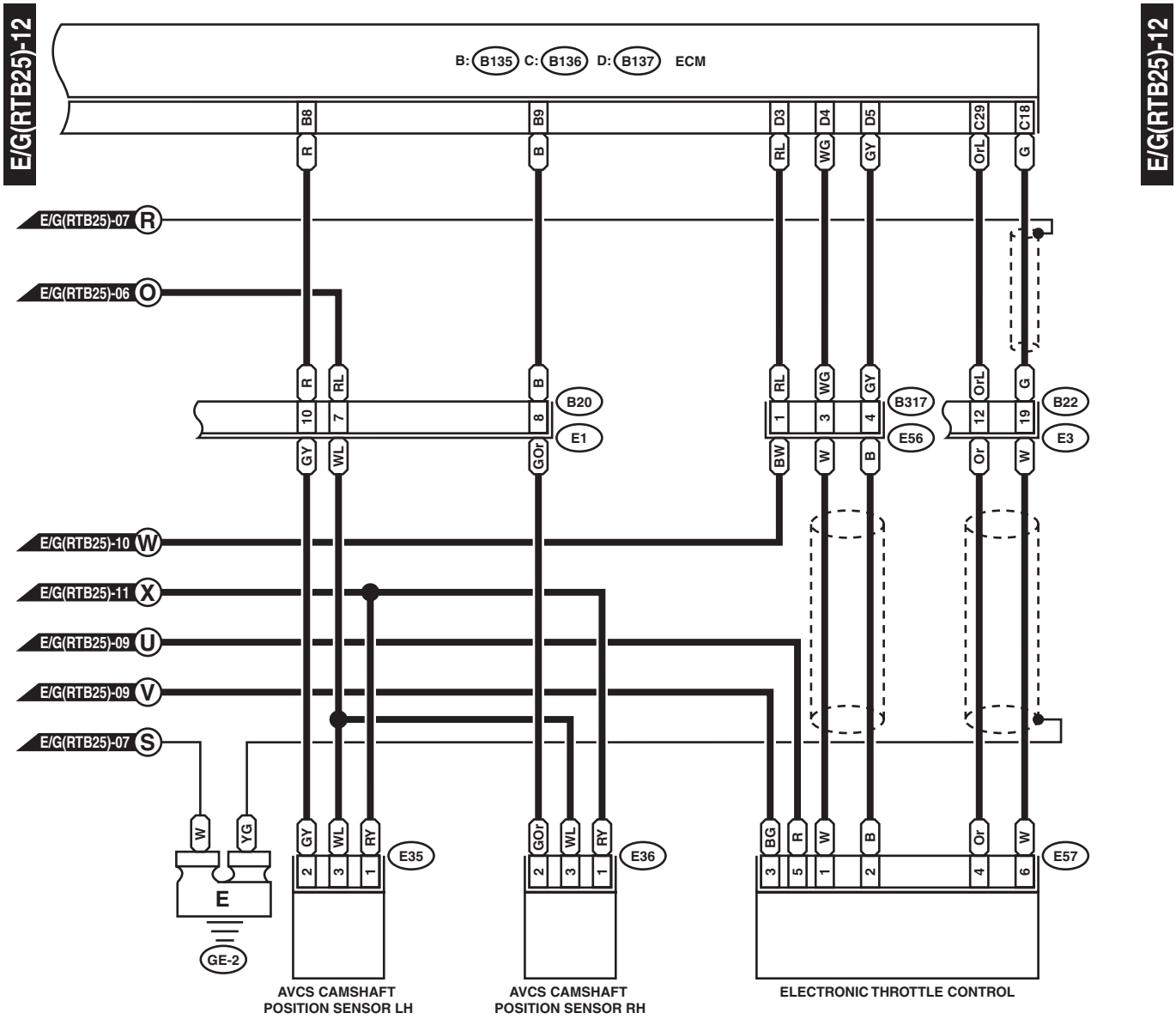
E4 (BLACK)

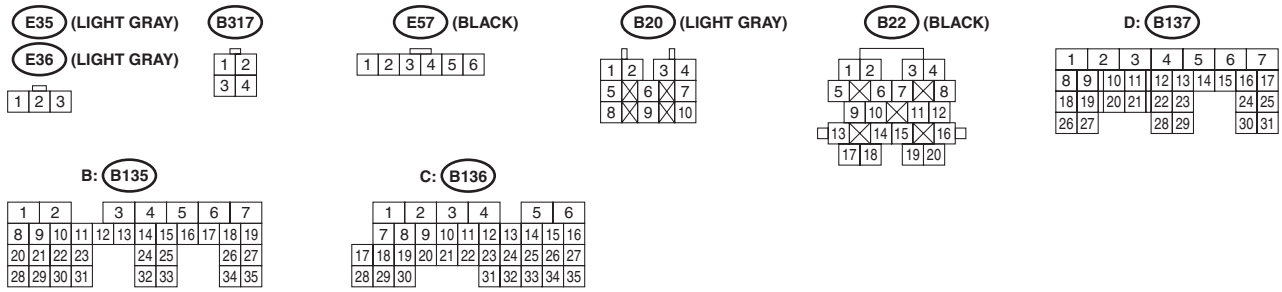
B21 (BROWN)

A: B134

C: B136

WI-05938


E/G(RTB25)-12
E/G(RTB25)-12
B: B135 C: B136 D: B137 ECM
B8 B9 D3 D4 D5 C29 C18
R B RL WG GY OrL G
E/G(RTB25)-07 R
E/G(RTB25)-06 O
B20
E1
B317
E56
B22
E3
E/G(RTB25)-10 W
E/G(RTB25)-11 X
E/G(RTB25)-09 U
E/G(RTB25)-09 V
E/G(RTB25)-07 S
W YG
E
GE-2
E35
E36
E57
AVCS CAMSHAFT POSITION SENSOR LH
AVCS CAMSHAFT POSITION SENSOR RH
ELECTRONIC THROTTLE CONTROL

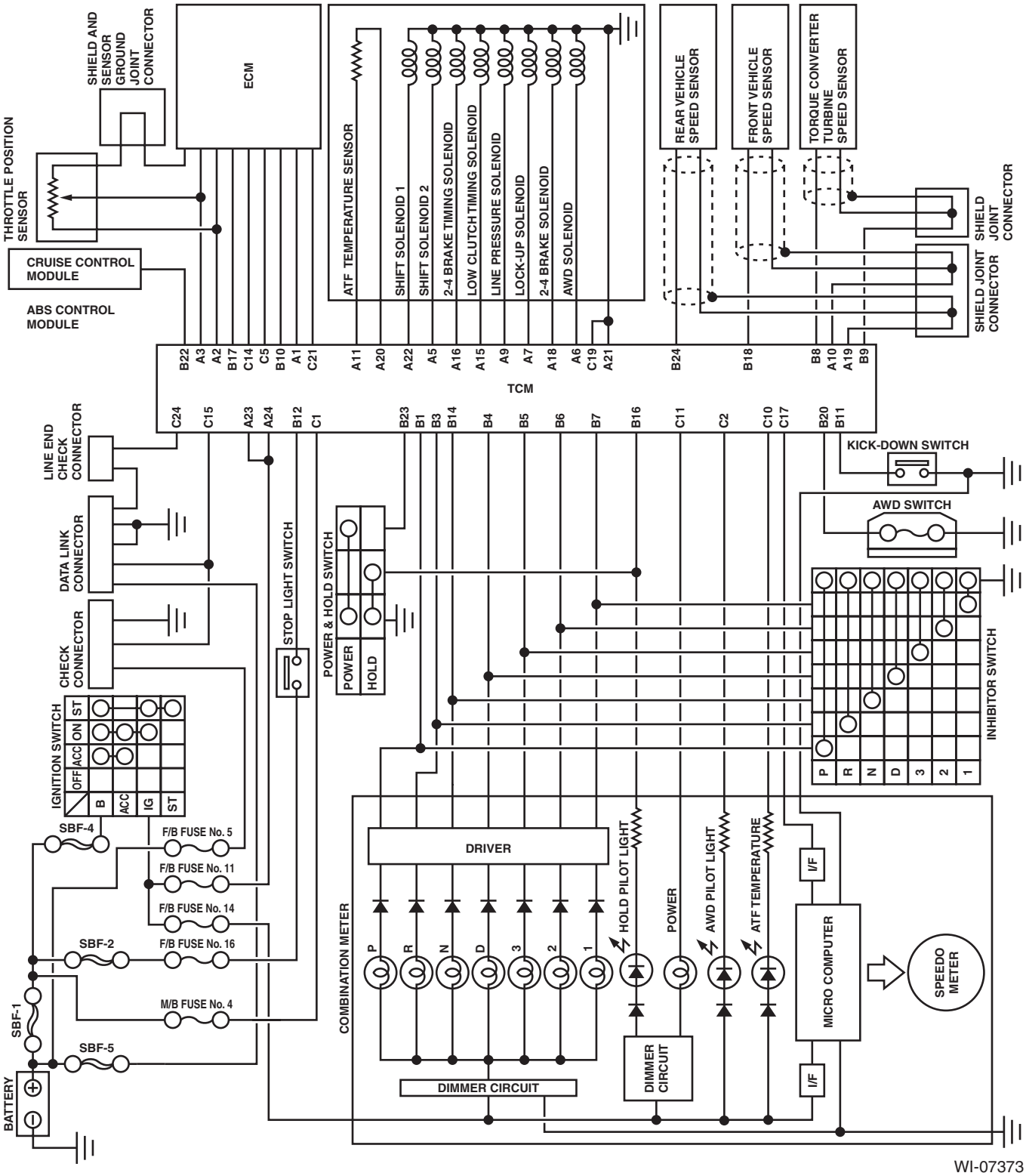

E35 (LIGHT GRAY)
E36 (LIGHT GRAY)
B317
E57 (BLACK)
B20 (LIGHT GRAY)
B22 (BLACK)
D: B137
B: B135
C: B136

WI-07372

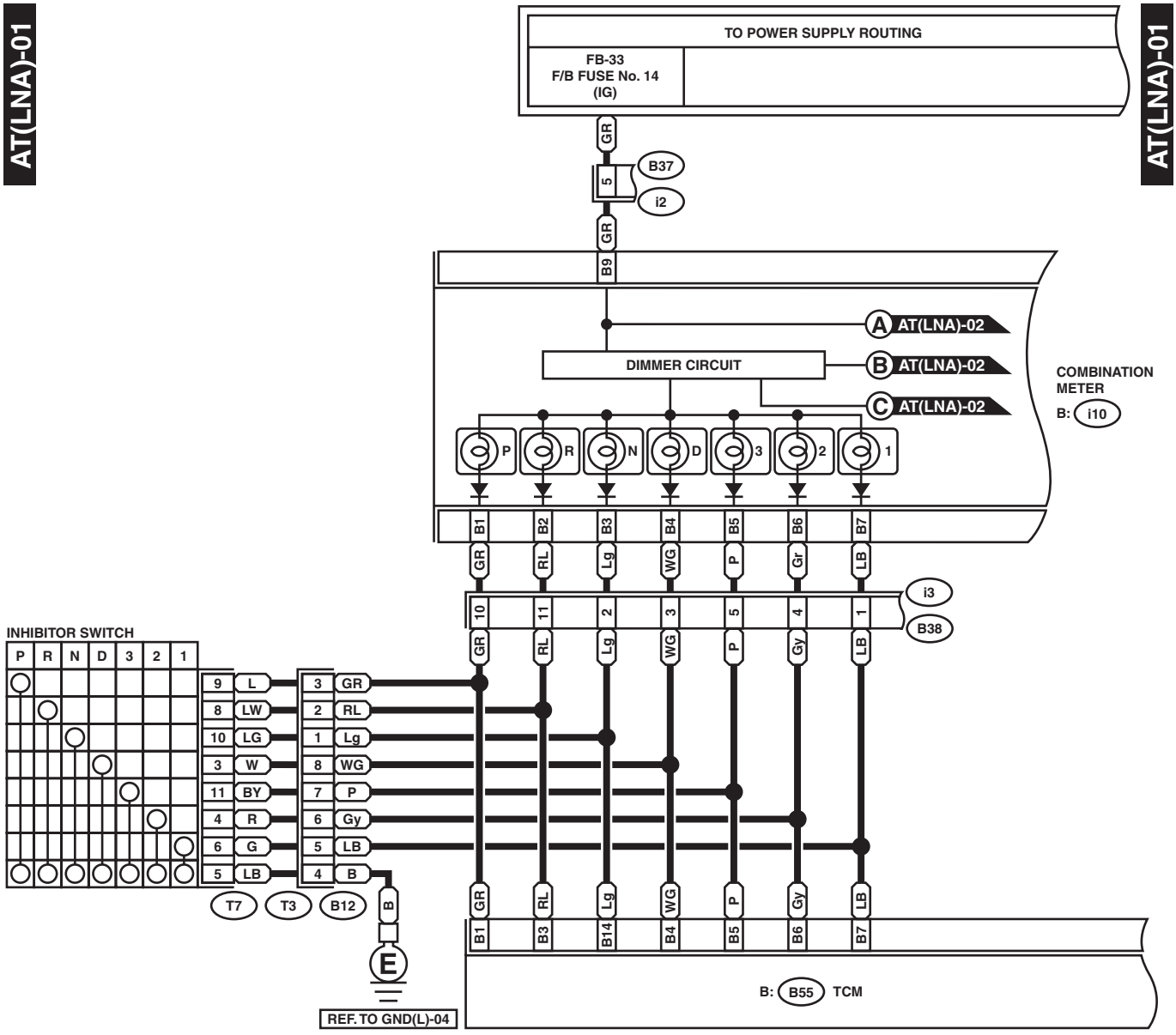
6. AT Control System

A: WIRING DIAGRAM

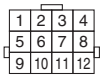
1. LHD NON-TURBO MODEL



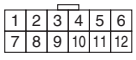
WI-07373



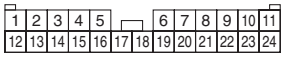
B12 (GRAY)



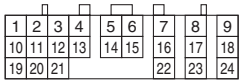
T7



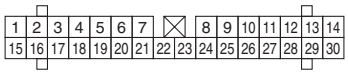
B37



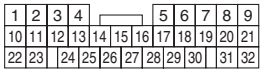
B: B55 (GRAY)



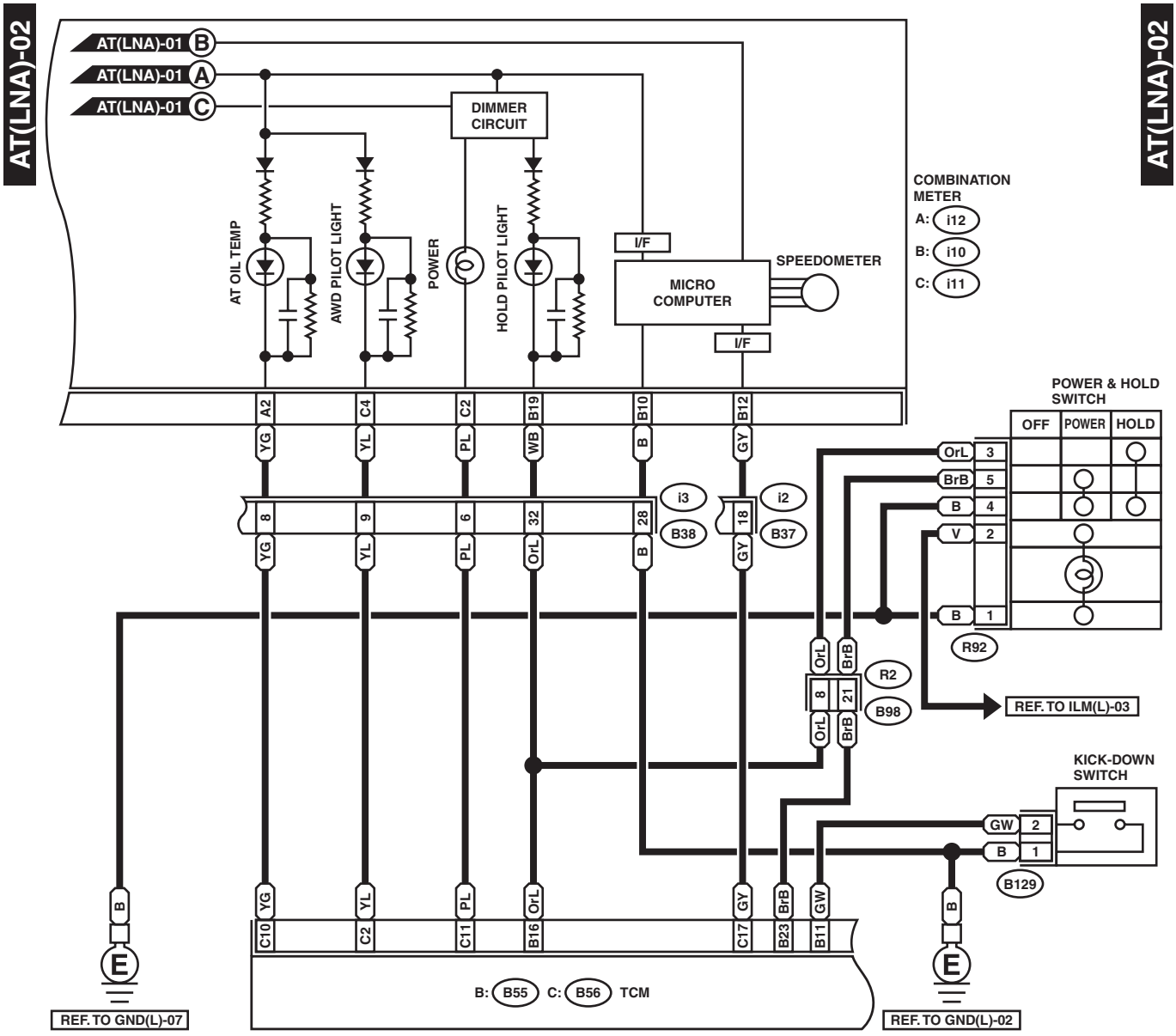
B: i10 (GREEN)

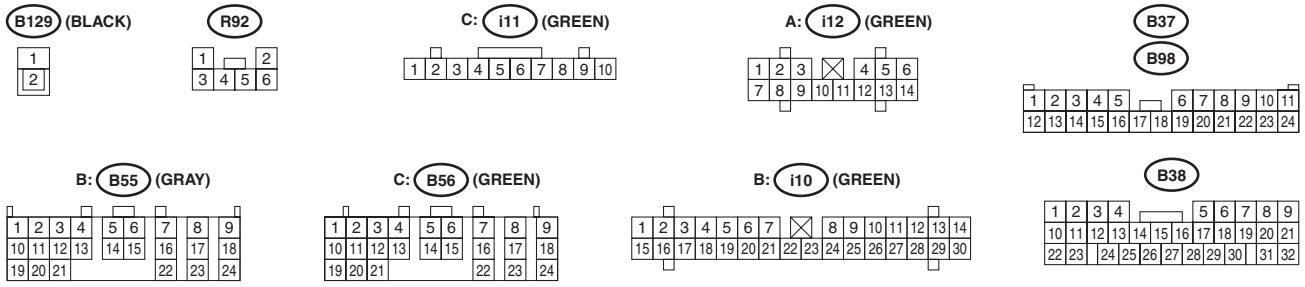


B38

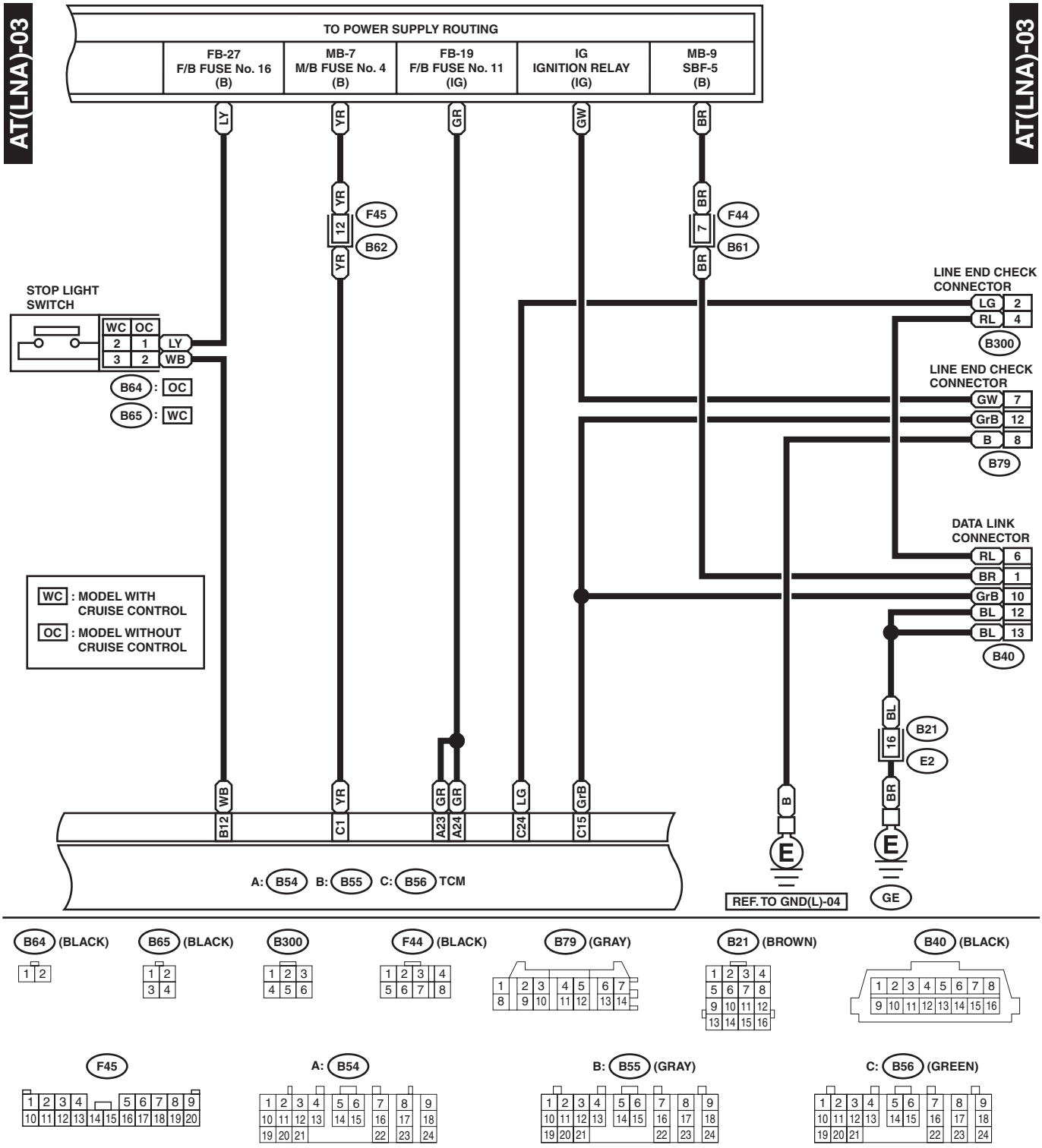


WI-07374

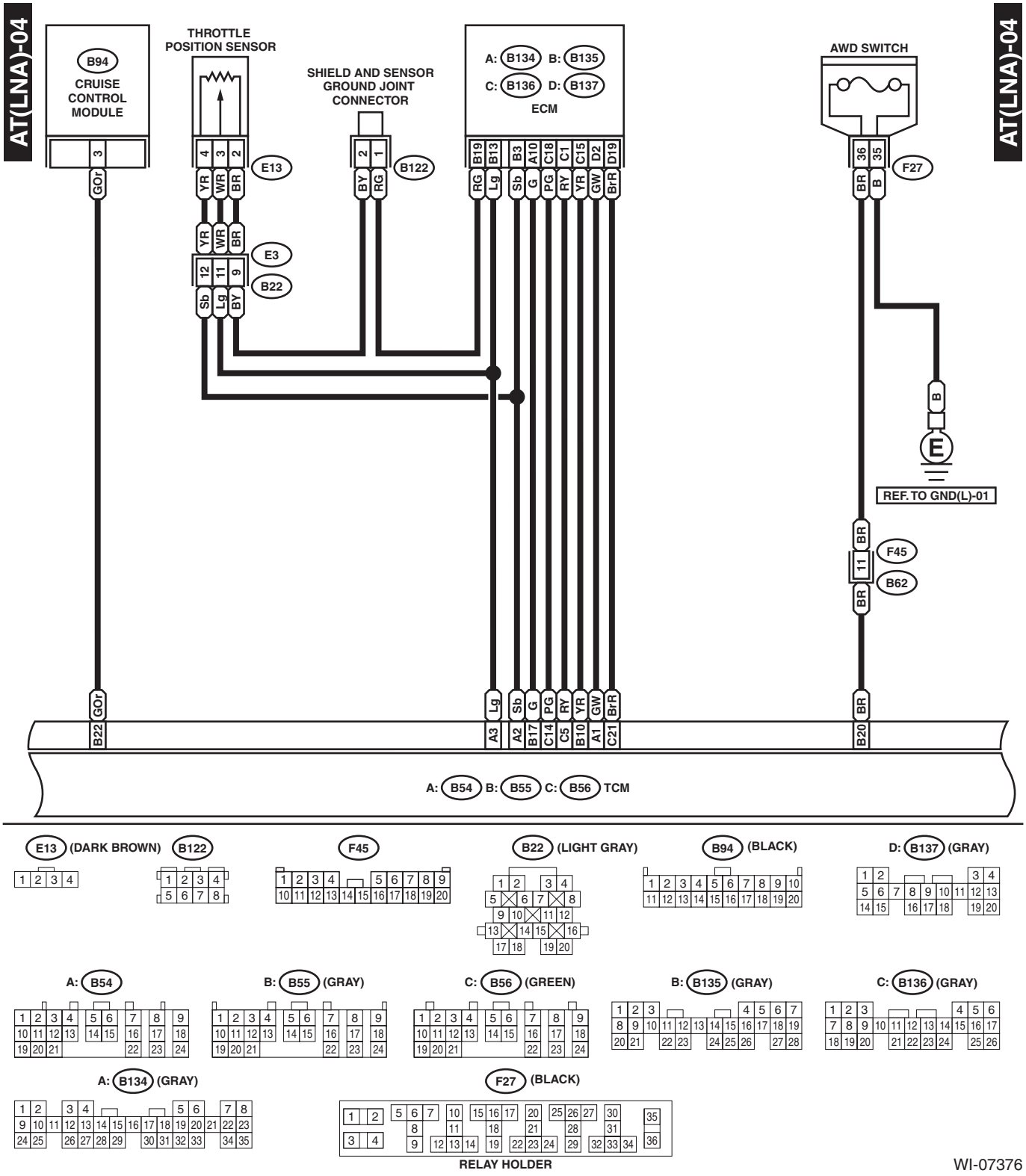

AT(LNA)-02
AT(LNA)-01 B
AT(LNA)-01 A
AT(LNA)-01 C
DIMMER CIRCUIT
AT OIL TEMP
AWD PILOT LIGHT
POWER
HOLD PILOT LIGHT
I/F
MICRO COMPUTER
SPEEDOMETER
I/F
COMBINATION METER
A: i12
B: i10
C: i11
POWER & HOLD SWITCH
OFF POWER HOLD
OrL 3
BrB 5
B 4
V 2
B 1
R92
REF. TO ILM(L)-03
KICK-DOWN SWITCH
GW 2
B 1
B129
A2 C4 C2 B19 B10 B12
YG YL PL WB B GY
8 9 6 32 28 18
i3 B38
i2 B37
R2 B98
C10 C2 C11 B16 C17 B23 B11
B: B55 C: B56 TCM
REF. TO GND(L)-07
REF. TO GND(L)-02


B129 (BLACK)
R92
C: i11 (GREEN)
A: i12 (GREEN)
B37
B98
B: B55 (GRAY)
C: B56 (GREEN)
B: i10 (GREEN)
B38

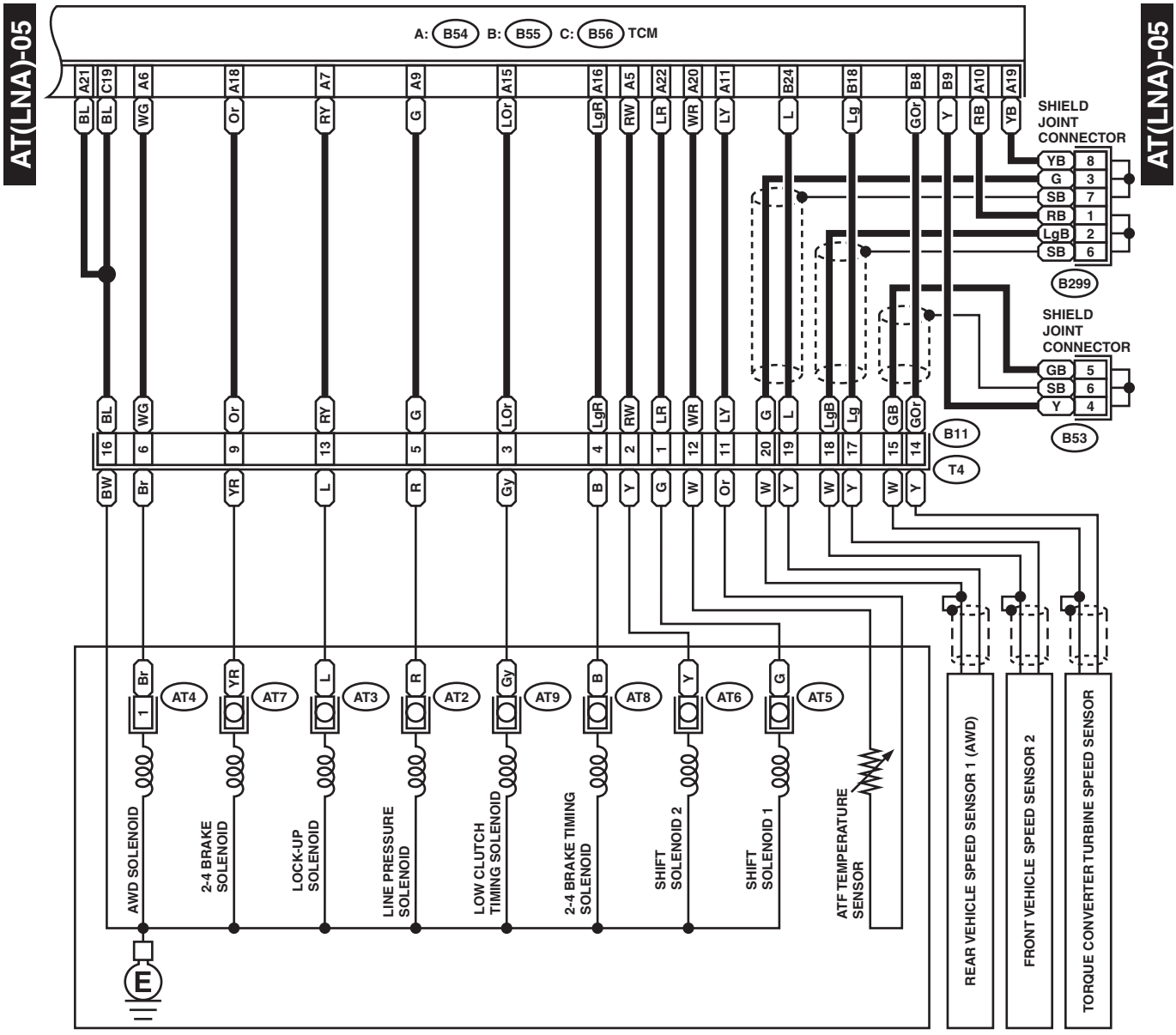
WI-05940

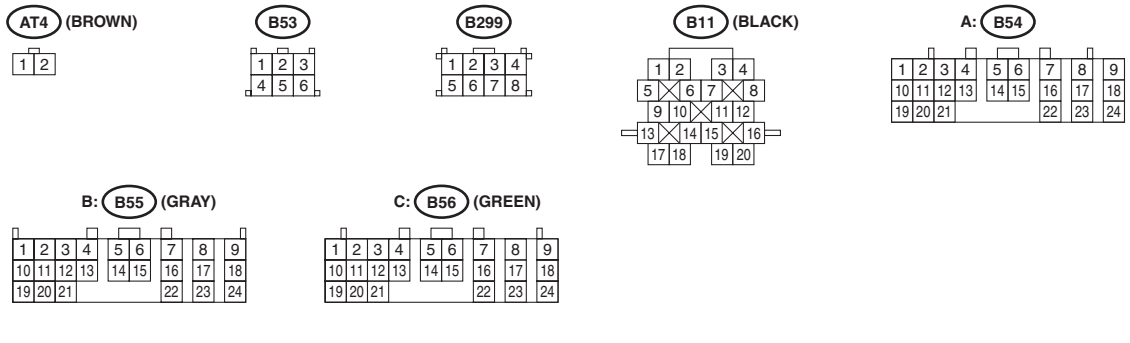

AT(LNA)-03
AT(LNA)-03
TO POWER SUPPLY ROUTING
FB-27 F/B FUSE No. 16 (B)
MB-7 M/B FUSE No. 4 (B)
FB-19 F/B FUSE No. 11 (IG)
IG IGNITION RELAY (IG)
MB-9 SBF-5 (B)
LY
YR
GR
GW
BR
F45
B62
F44
B61
STOP LIGHT SWITCH
WC OC
LY
WB
B64 : OC
B65 : WC
LINE END CHECK CONNECTOR
LG 2
RL 4
B300
LINE END CHECK CONNECTOR
GW 7
GrB 12
B 8
B79
DATA LINK CONNECTOR
RL 6
BR 1
GrB 10
BL 12
BL 13
B40
WC : MODEL WITH CRUISE CONTROL
OC : MODEL WITHOUT CRUISE CONTROL
B21
E2
B12
C1
A23
A24
C24
C15
A: B54 B: B55 C: B56 TCM
REF. TO GND(L)-04
GE
B64 (BLACK)
B65 (BLACK)
B300
F44 (BLACK)
B79 (GRAY)
B21 (BROWN)
B40 (BLACK)
F45
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

WI-07375


AT(LNA)-04
AT(LNA)-04
B94
CRUISE CONTROL MODULE
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134 B: B135
C: B136 D: B137
ECM
AWD SWITCH
E13
B122
E3
B22
F27
F45
B62
REF. TO GND(L)-01
A: B54 B: B55 C: B56 TCM
E13 (DARK BROWN)
B122
F45
B22 (LIGHT GRAY)
B94 (BLACK)
D: B137 (GRAY)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
B: B135 (GRAY)
C: B136 (GRAY)
A: B134 (GRAY)
F27 (BLACK)
RELAY HOLDER

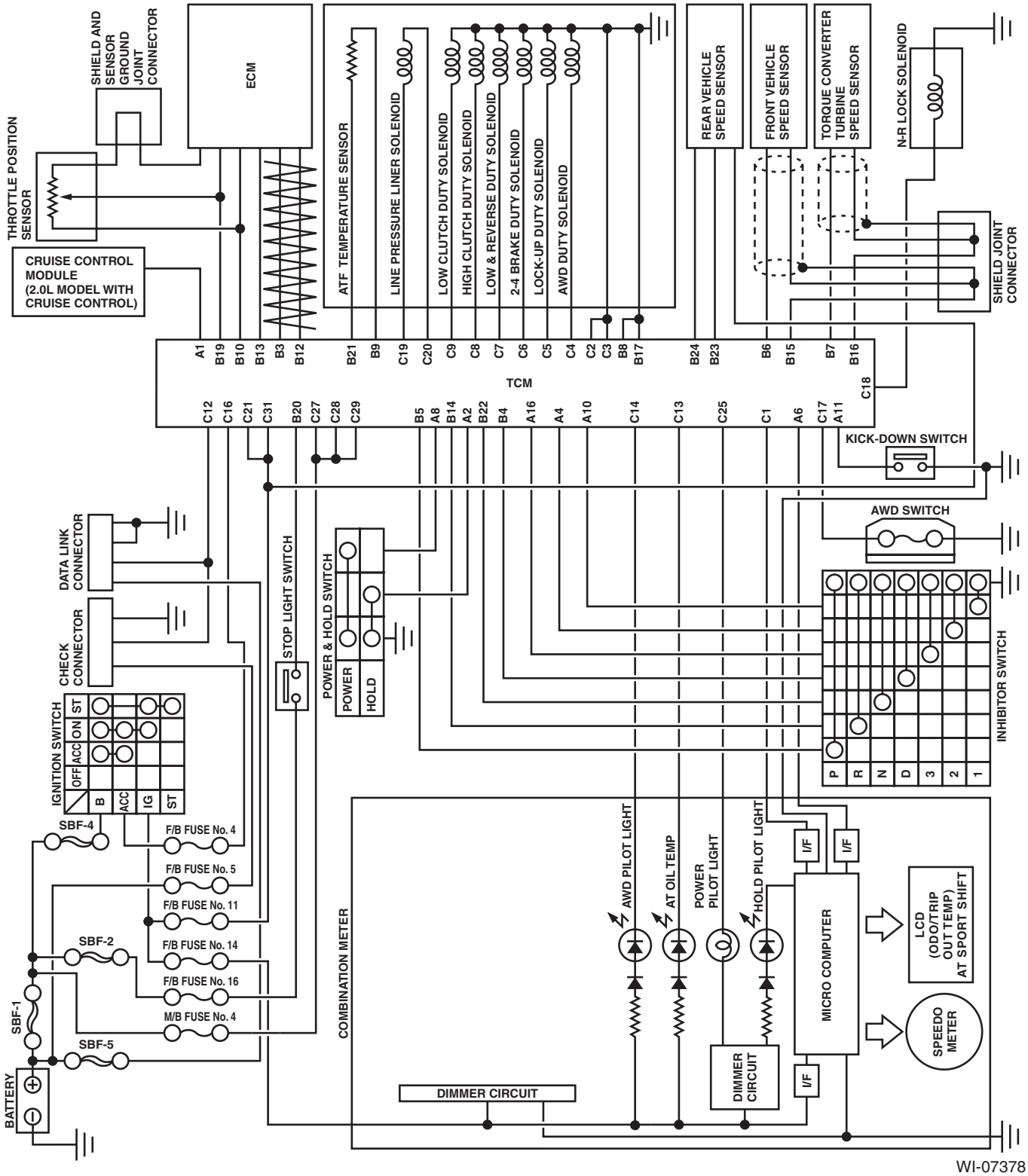
WI-07376


AT(LNA)-05
AT(LNA)-05
A: B54 B: B55 C: B56 TCM
SHIELD JOINT CONNECTOR
B299
SHIELD JOINT CONNECTOR
B53
B11
T4
AWD SOLENOID
2-4 BRAKE SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
LOW CLUTCH TIMING SOLENOID
2-4 BRAKE TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
REAR VEHICLE SPEED SENSOR 1 (AWD)
FRONT VEHICLE SPEED SENSOR 2
TORQUE CONVERTER TURBINE SPEED SENSOR

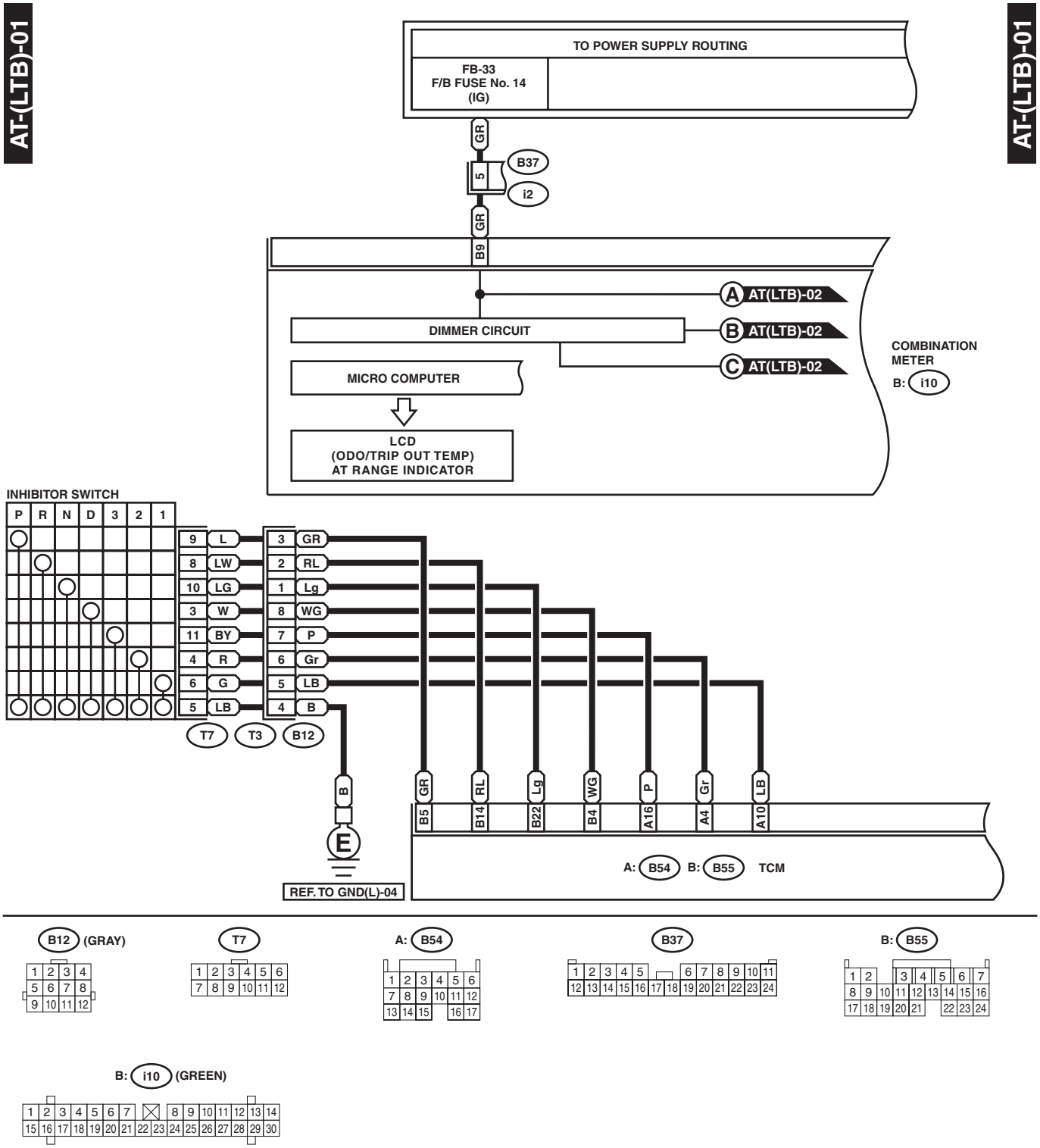

AT4 (BROWN)
B53
B299
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

WI-07377

2. LHD TURBO MODEL

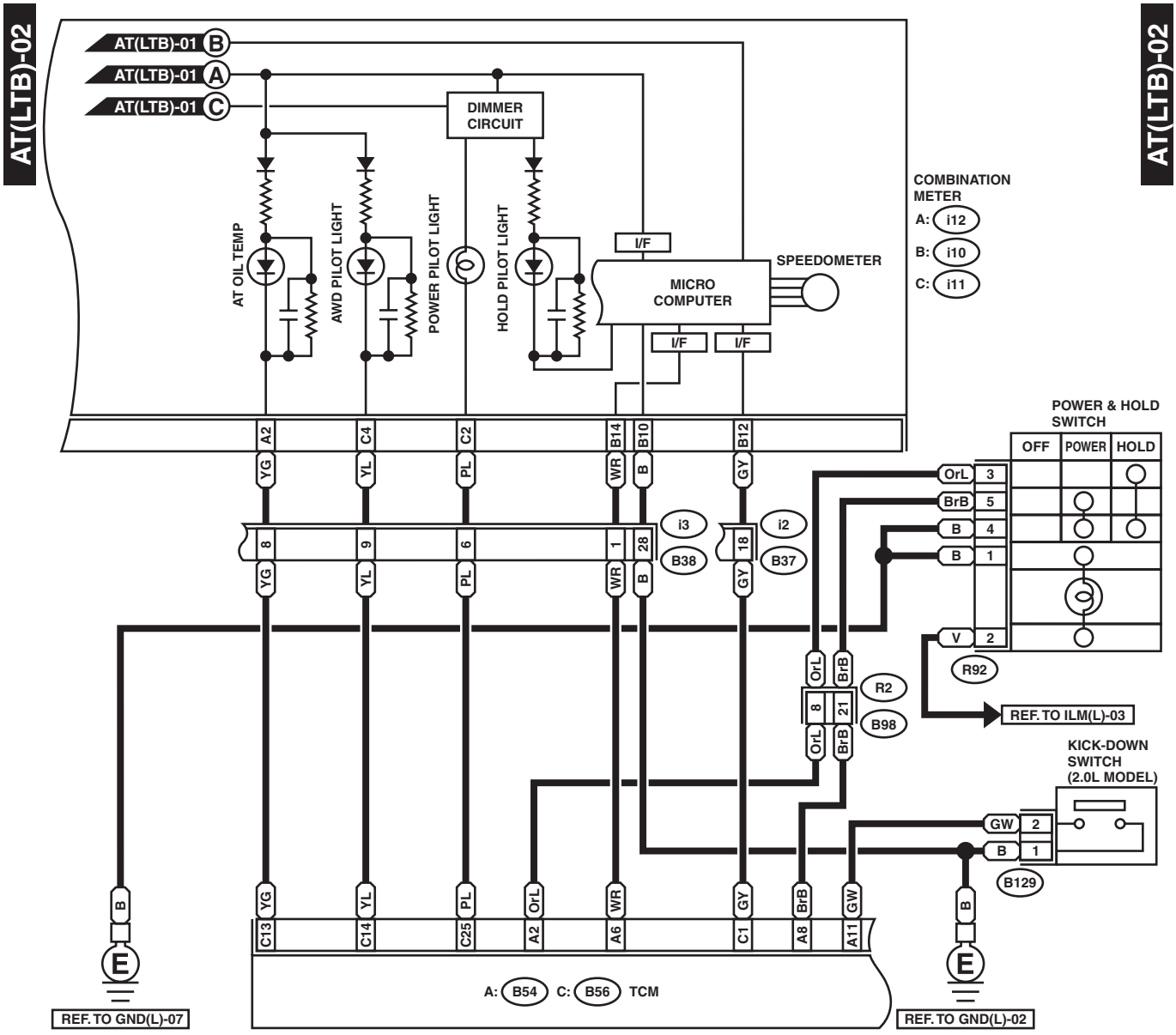


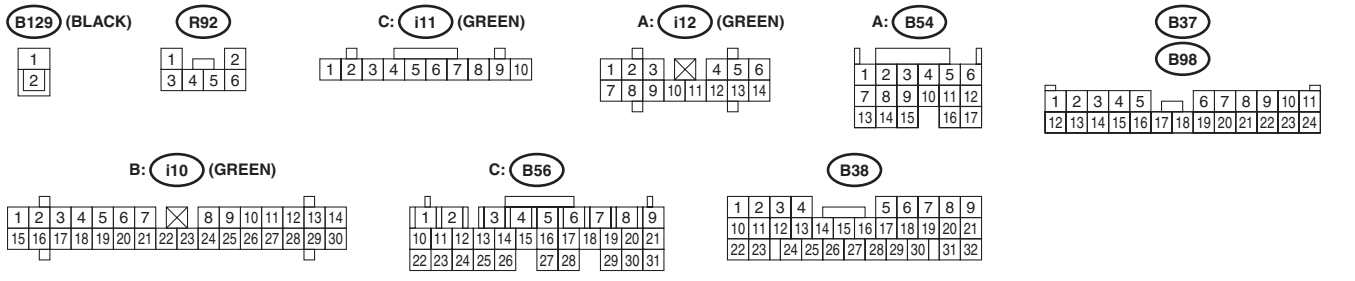
WI-07378


AT-(LTB)-01
AT-(LTB)-01
TO POWER SUPPLY ROUTING
FB-33
F/B FUSE No. 14
(IG)
GR
5
B37
i2
GR
B9
A AT(LTB)-02
DIMMER CIRCUIT
B AT(LTB)-02
C AT(LTB)-02
MICRO COMPUTER
LCD
(ODO/TRIP OUT TEMP)
AT RANGE INDICATOR
COMBINATION
METER
B: i10
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 GR
2 RL
1 Lg
8 WG
7 P
6 Gr
5 LB
4 B
T7 T3 B12
B
E
REF. TO GND(L)-04
GR RL Lg WG P Gr LB
B5 B14 B22 B4 A16 A4 A10
A: B54 B: B55 TCM

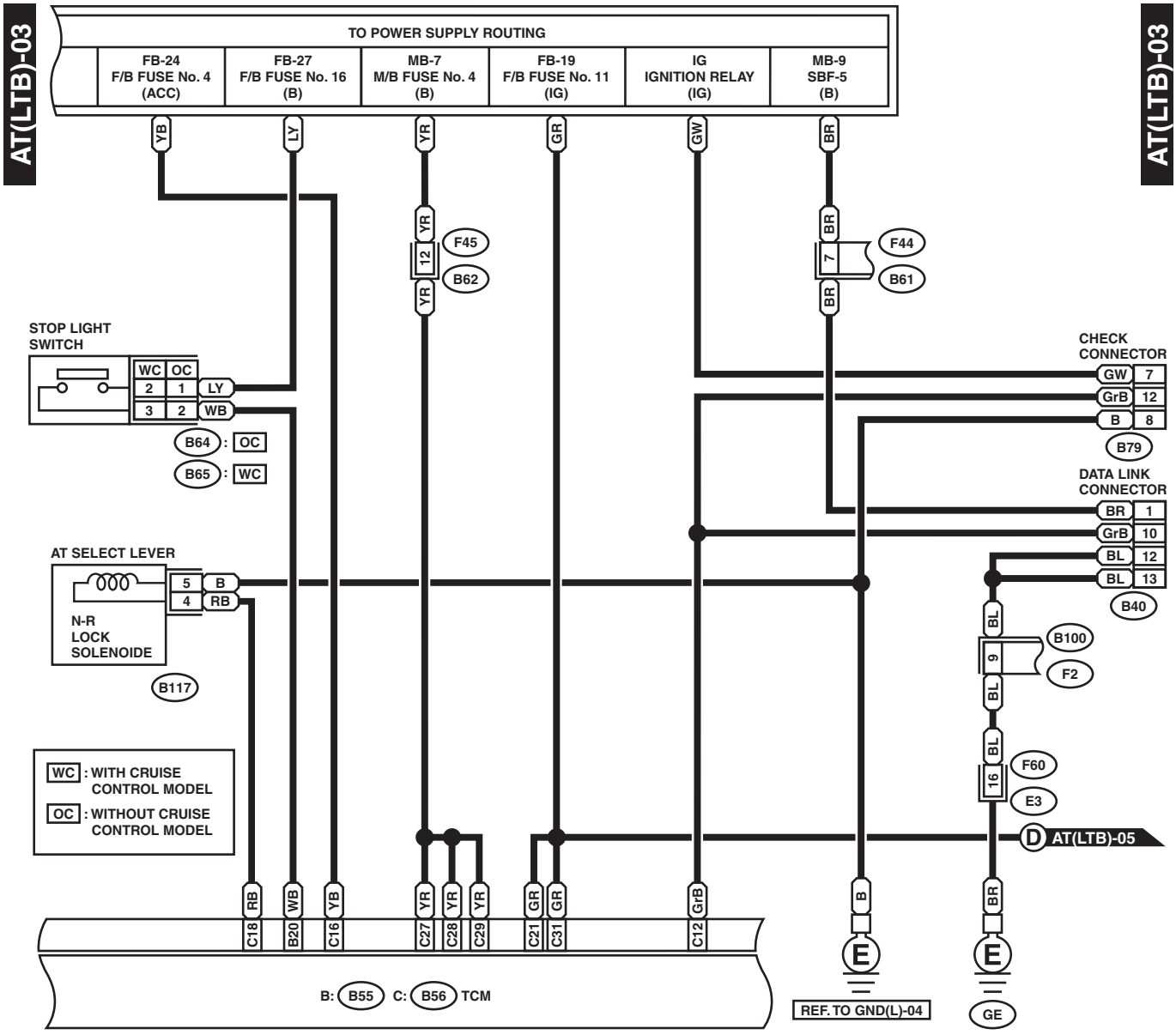
B12 (GRAY)
T7
A: B54
B37
B: B55
B: i10 (GREEN)

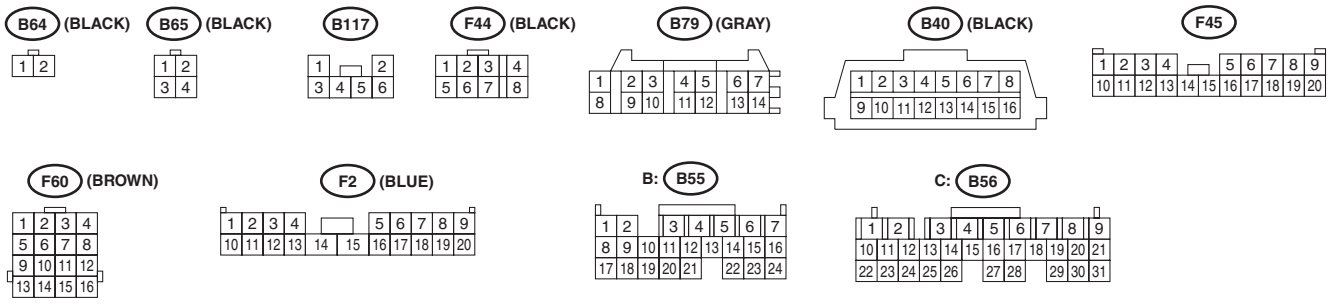
WI-07379


AT(LTB)-02
AT(LTB)-01 B
AT(LTB)-01 A
AT(LTB)-01 C
DIMMER CIRCUIT
AT OIL TEMP
AWD PILOT LIGHT
POWER PILOT LIGHT
HOLD PILOT LIGHT
I/F
MICRO COMPUTER
SPEEDOMETER
I/F
I/F
COMBINATION METER
A: i12
B: i10
C: i11
POWER & HOLD SWITCH
OFF
POWER
HOLD
OrL 3
BrB 5
B 4
B 1
V 2
R92
REF. TO ILM(L)-03
R2
B98
i3
B38
i2
B37
KICK-DOWN SWITCH (2.0L MODEL)
GW 2
B 1
B129
A2 C4 C2 B14 B10 B12
YG YL PL WR B GY
8 9 6 1 28 18
C13 C14 C25 A2 A6 C1 A8 A11
YG YL PL OrL WR GY BrB GW
A: B54 C: B56 TCM
REF. TO GND(L)-07
REF. TO GND(L)-02

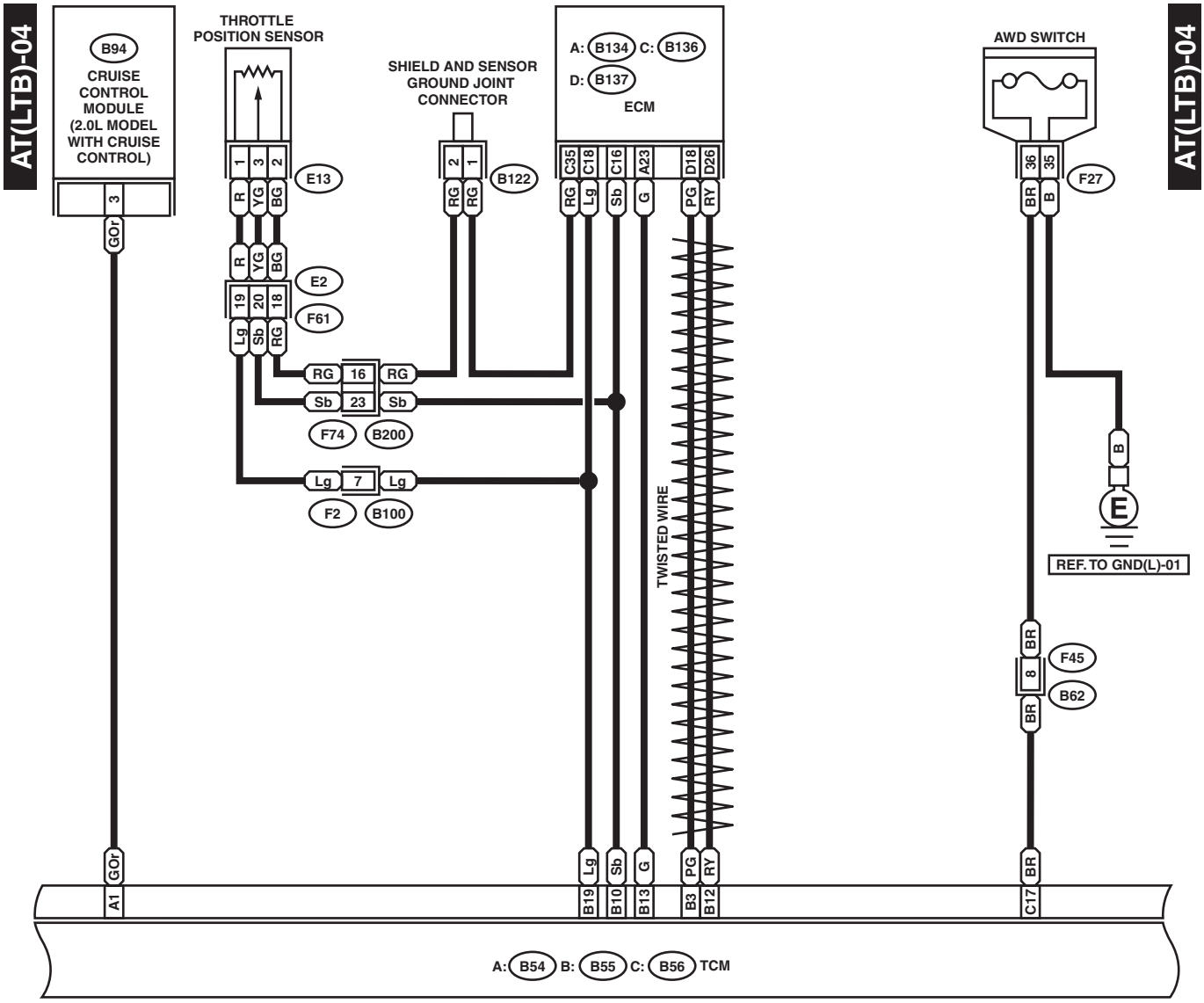

B129 (BLACK)
R92
C: i11 (GREEN)
A: i12 (GREEN)
A: B54
B37
B98
B: i10 (GREEN)
C: B56
B38

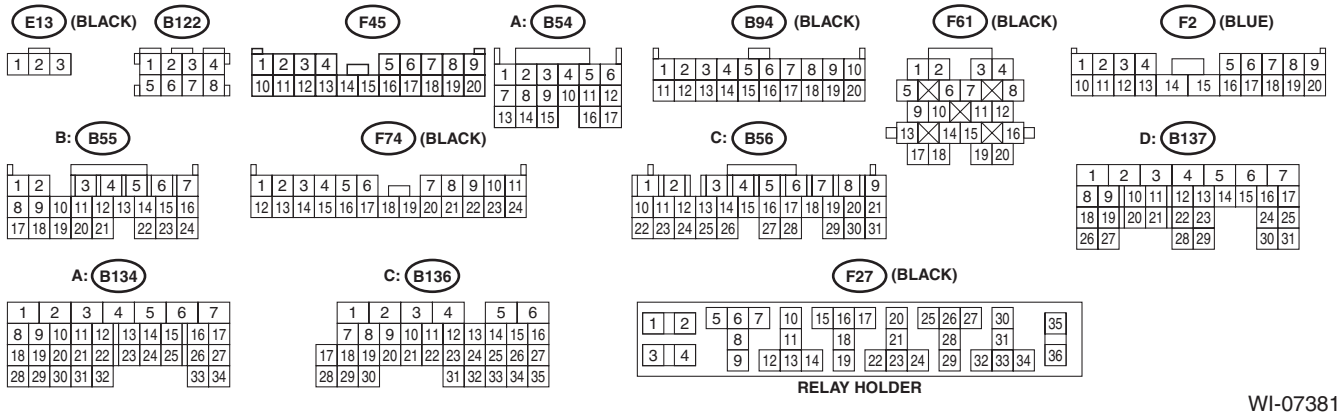
WI-07380


AT(LTB)-03
AT(LTB)-03
TO POWER SUPPLY ROUTING
FB-24 F/B FUSE No. 4 (ACC)
FB-27 F/B FUSE No. 16 (B)
MB-7 M/B FUSE No. 4 (B)
FB-19 F/B FUSE No. 11 (IG)
IG IGNITION RELAY (IG)
MB-9 SBF-5 (B)
YB
LY
YR
GR
GW
BR
F45
B62
F44
B61
STOP LIGHT SWITCH
WC OC
LY
WB
B64 : OC
B65 : WC
CHECK CONNECTOR
GW 7
GrB 12
B 8
B79
DATA LINK CONNECTOR
BR 1
GrB 10
BL 12
BL 13
B40
AT SELECT LEVER
5 B
4 RB
N-R LOCK SOLENOIDE
B117
B100
F2
F60
E3
WC : WITH CRUISE CONTROL MODEL
OC : WITHOUT CRUISE CONTROL MODEL
D AT(LTB)-05
RB
WB
YB
YR
YR
YR
GR
GR
GrB
B
BR
C18
B20
C16
C27
C28
C29
C21
C31
C12
E
E
B: B55 C: B56 TCM
REF. TO GND(L)-04
GE

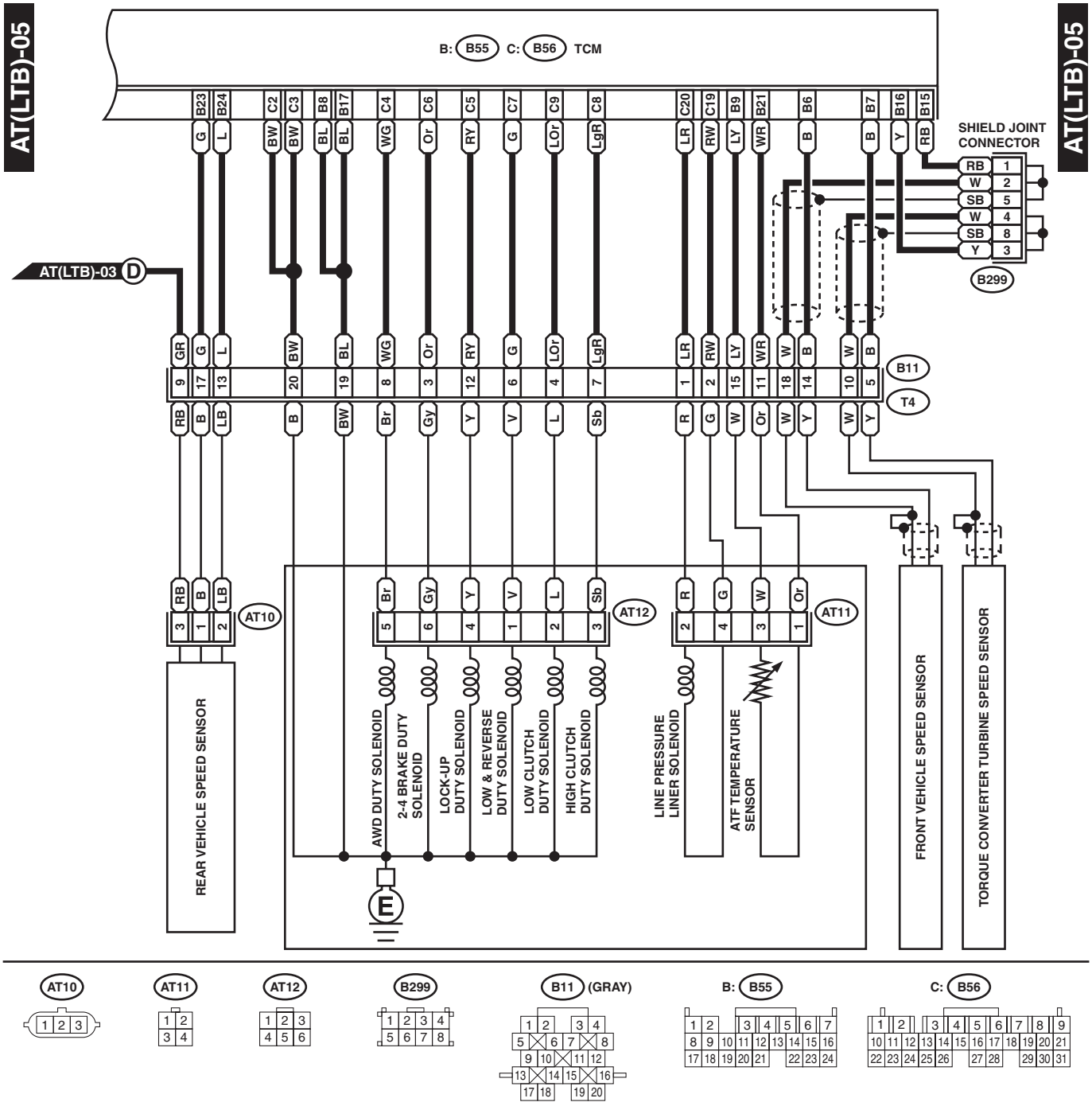

B64 (BLACK)
B65 (BLACK)
B117
F44 (BLACK)
B79 (GRAY)
B40 (BLACK)
F45
F60 (BROWN)
F2 (BLUE)
B: B55
C: B56

WI-05945


AT(LTB)-04
B94
CRUISE CONTROL MODULE (2.0L MODEL WITH CRUISE CONTROL)
THROTTLE POSITION SENSOR
E13
E2
F61
F74
B200
F2
B100
SHIELD AND SENSOR GROUND JOINT CONNECTOR
B122
A: B134 C: B136
D: B137
ECM
TWISTED WIRE
AWD SWITCH
F27
REF. TO GND(L)-01
F45
B62
A: B54 B: B55 C: B56 TCM

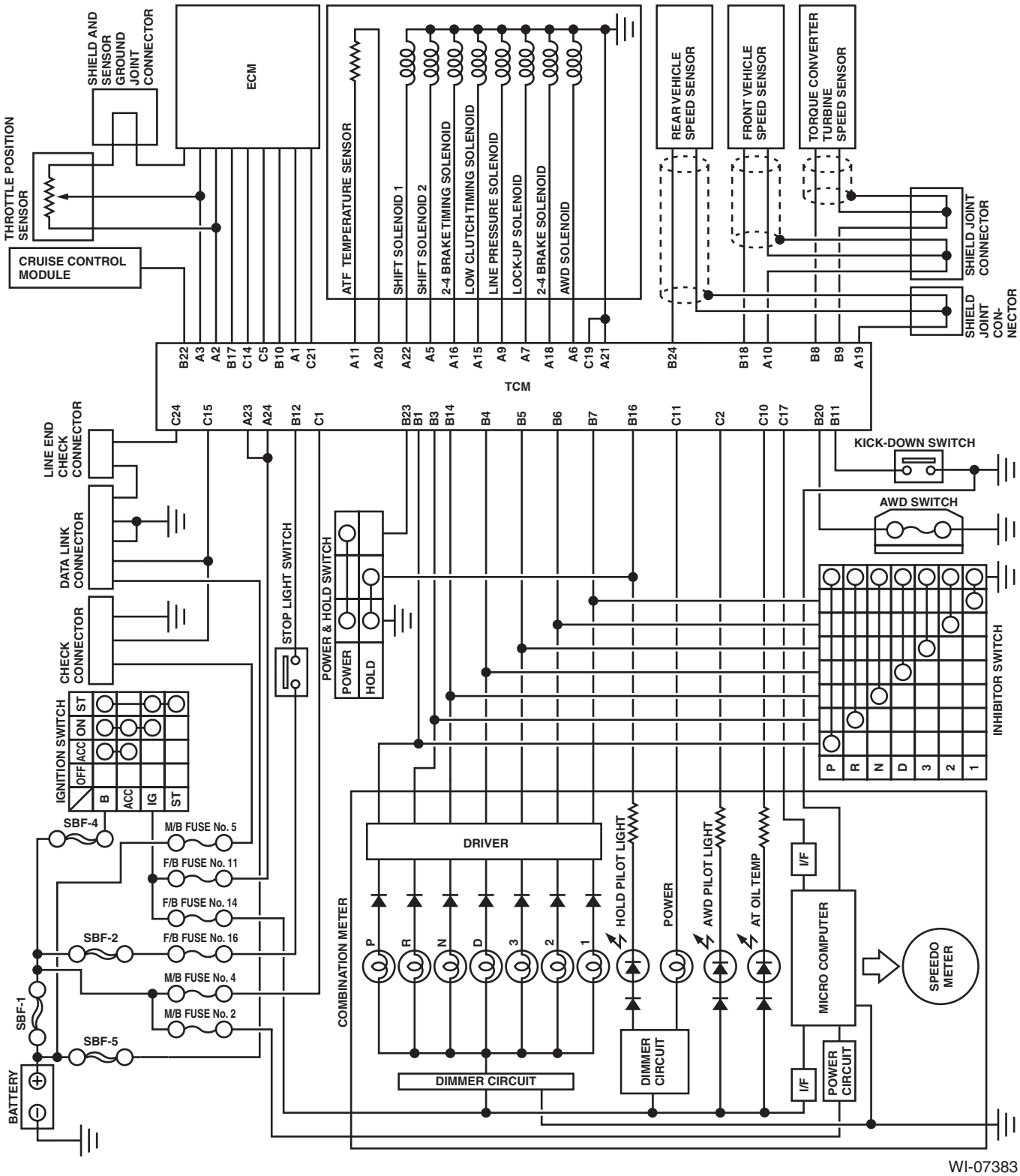

E13 (BLACK)
B122
F45
A: B54
B94 (BLACK)
F61 (BLACK)
F2 (BLUE)
B: B55
F74 (BLACK)
C: B56
D: B137
A: B134
C: B136
F27 (BLACK)
RELAY HOLDER

WI-07381

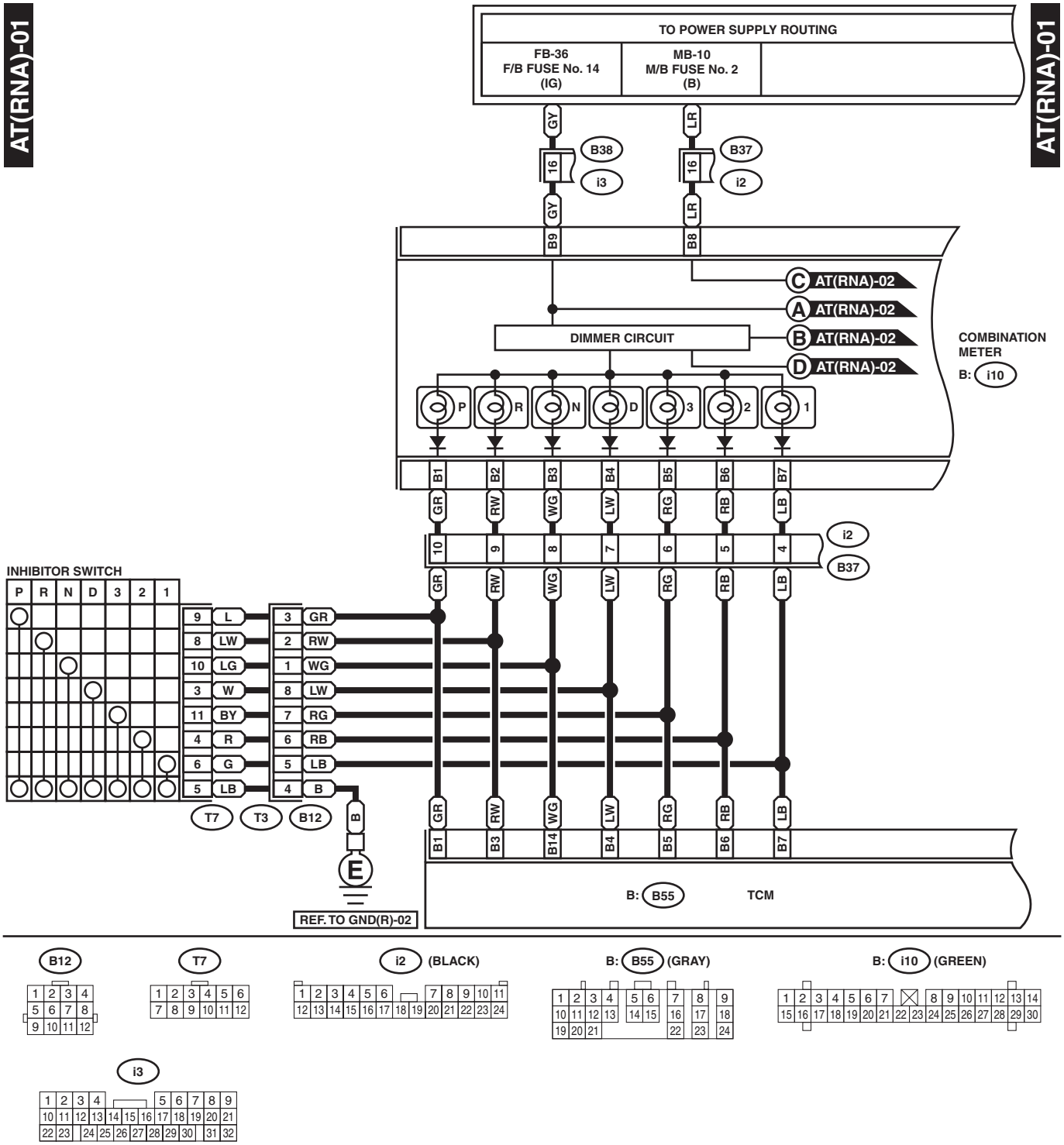

AT(LTB)-05
AT(LTB)-05
B: B55 C: B56 TCM
SHIELD JOINT CONNECTOR
AT(LTB)-03 D
B299
B11
T4
AT10
AT12
AT11
REAR VEHICLE SPEED SENSOR
AWD DUTY SOLENOID
2-4 BRAKE DUTY SOLENOID
LOCK-UP DUTY SOLENOID
LOW & REVERSE DUTY SOLENOID
LOW CLUTCH DUTY SOLENOID
HIGH CLUTCH DUTY SOLENOID
LINE PRESSURE LINER SOLENOID
ATF TEMPERATURE SENSOR
FRONT VEHICLE SPEED SENSOR
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT10
AT11
AT12
B299
B11 (GRAY)
B: B55
C: B56

WI-07382

3. RHD NON-TURBO MODEL

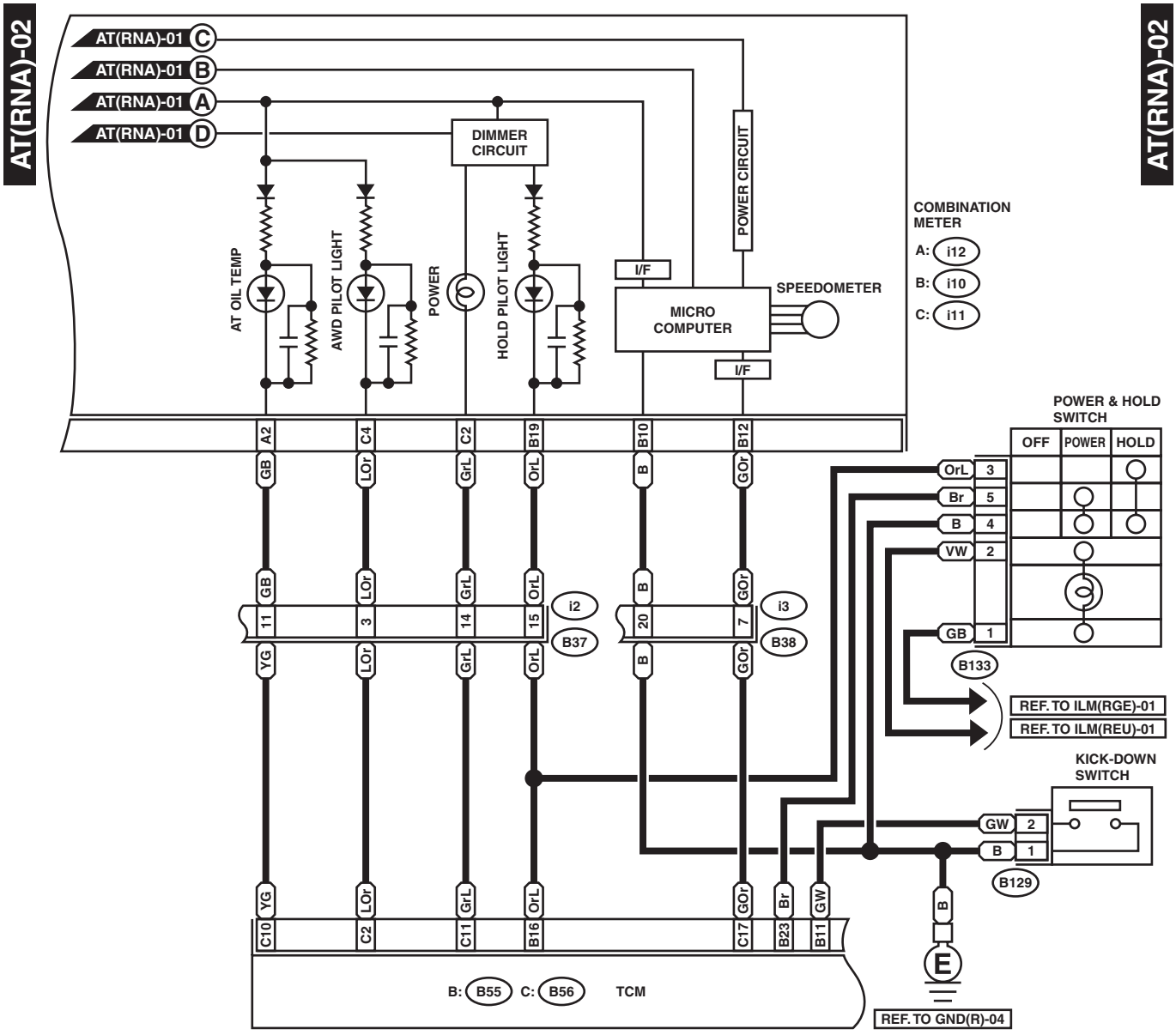


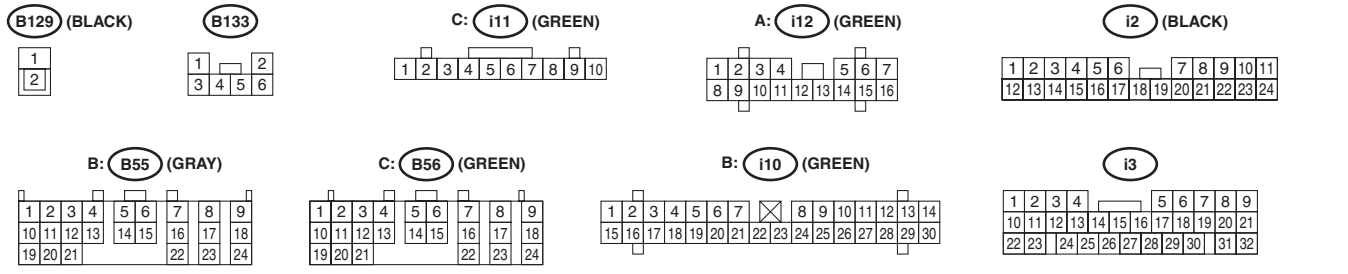
WI-07383


AT(RNA)-01
AT(RNA)-01
TO POWER SUPPLY ROUTING
FB-36
F/B FUSE No. 14
(IG)
MB-10
M/B FUSE No. 2
(B)
GY
LR
B38
B37
16
i3
i2
B9
B8
C AT(RNA)-02
A AT(RNA)-02
B AT(RNA)-02
D AT(RNA)-02
DIMMER CIRCUIT
COMBINATION METER
B: i10
P
R
N
D
3
2
1
B1
B2
B3
B4
B5
B6
B7
GR
RW
WG
LW
RG
RB
LB
10
9
8
7
6
5
4
INHIBITOR SWITCH
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 GR
2 RW
1 WG
8 LW
7 RG
6 RB
5 LB
4 B
T7
T3
B12
B
E
REF. TO GND(R)-02
B14
B: B55
TCM

B12
T7
i2 (BLACK)
B: B55 (GRAY)
B: i10 (GREEN)
i3

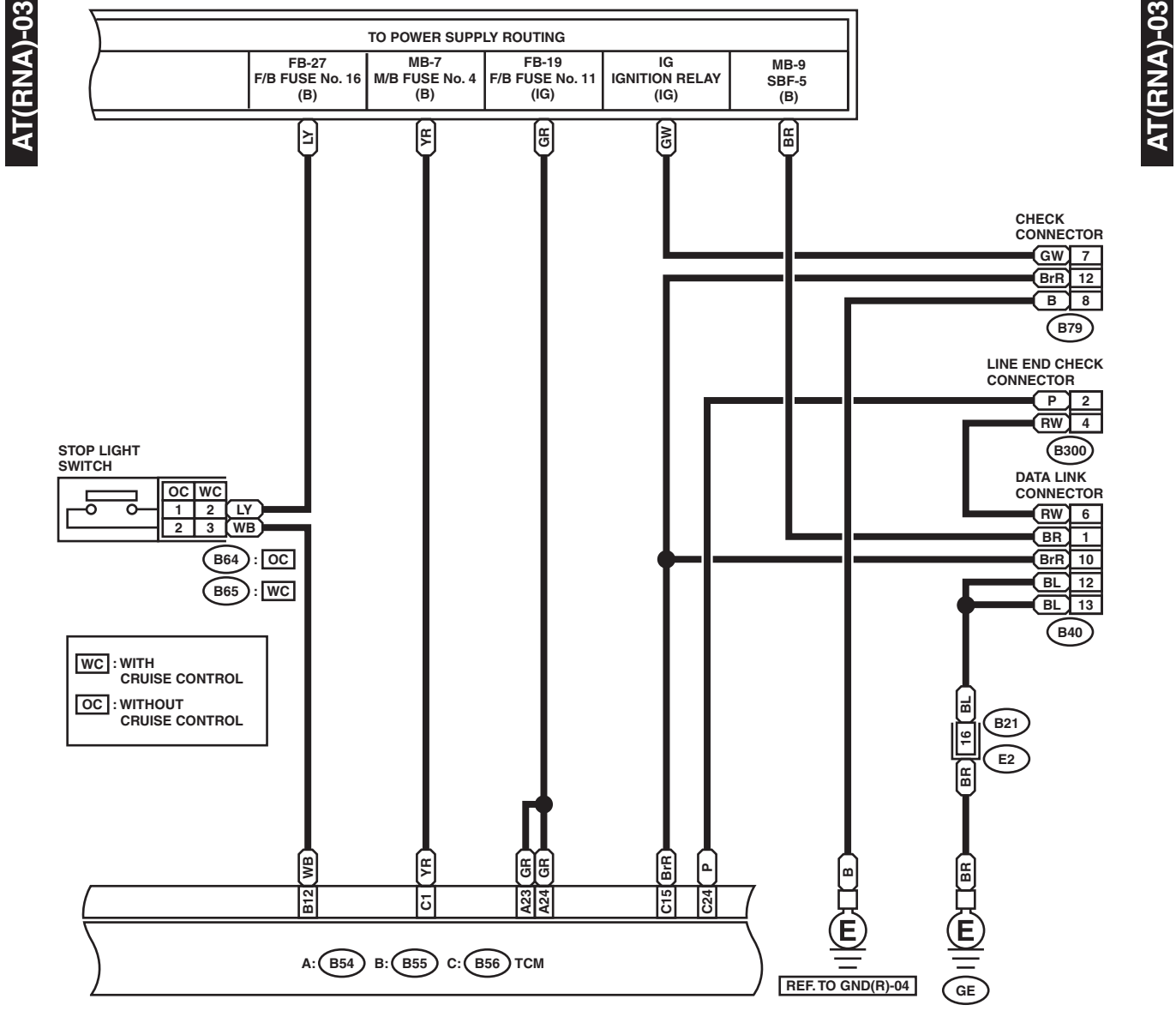
WI-07384

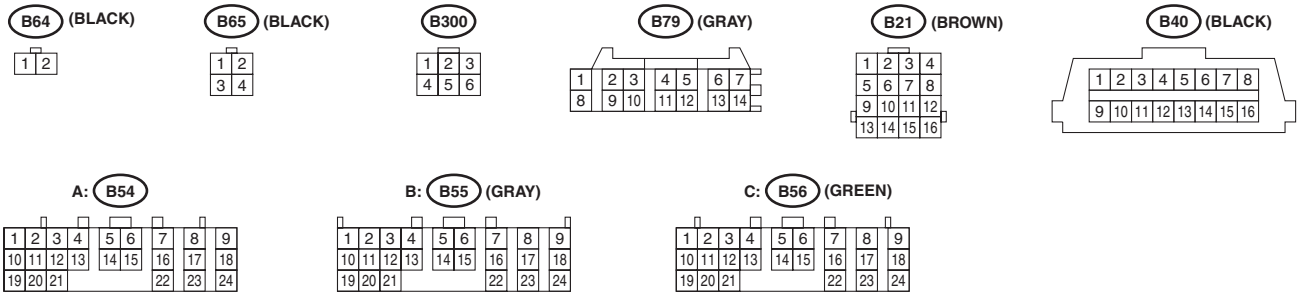

AT(RNA)-02
AT(RNA)-01 C
AT(RNA)-01 B
AT(RNA)-01 A
AT(RNA)-01 D
DIMMER CIRCUIT
POWER CIRCUIT
AT OIL TEMP
AWD PILOT LIGHT
POWER
HOLD PILOT LIGHT
I/F
MICRO COMPUTER
SPEEDOMETER
I/F
COMBINATION METER
A: i12
B: i10
C: i11
POWER & HOLD SWITCH
OFF
POWER
HOLD
KICK-DOWN SWITCH
REF. TO ILM(RGE)-01
REF. TO ILM(REU)-01
B133
B129
i2
B37
i3
B38
B: B55 C: B56 TCM
REF. TO GND(R)-04


B129 (BLACK)
B133
C: i11 (GREEN)
A: i12 (GREEN)
i2 (BLACK)
B: B55 (GRAY)
C: B56 (GREEN)
B: i10 (GREEN)
i3

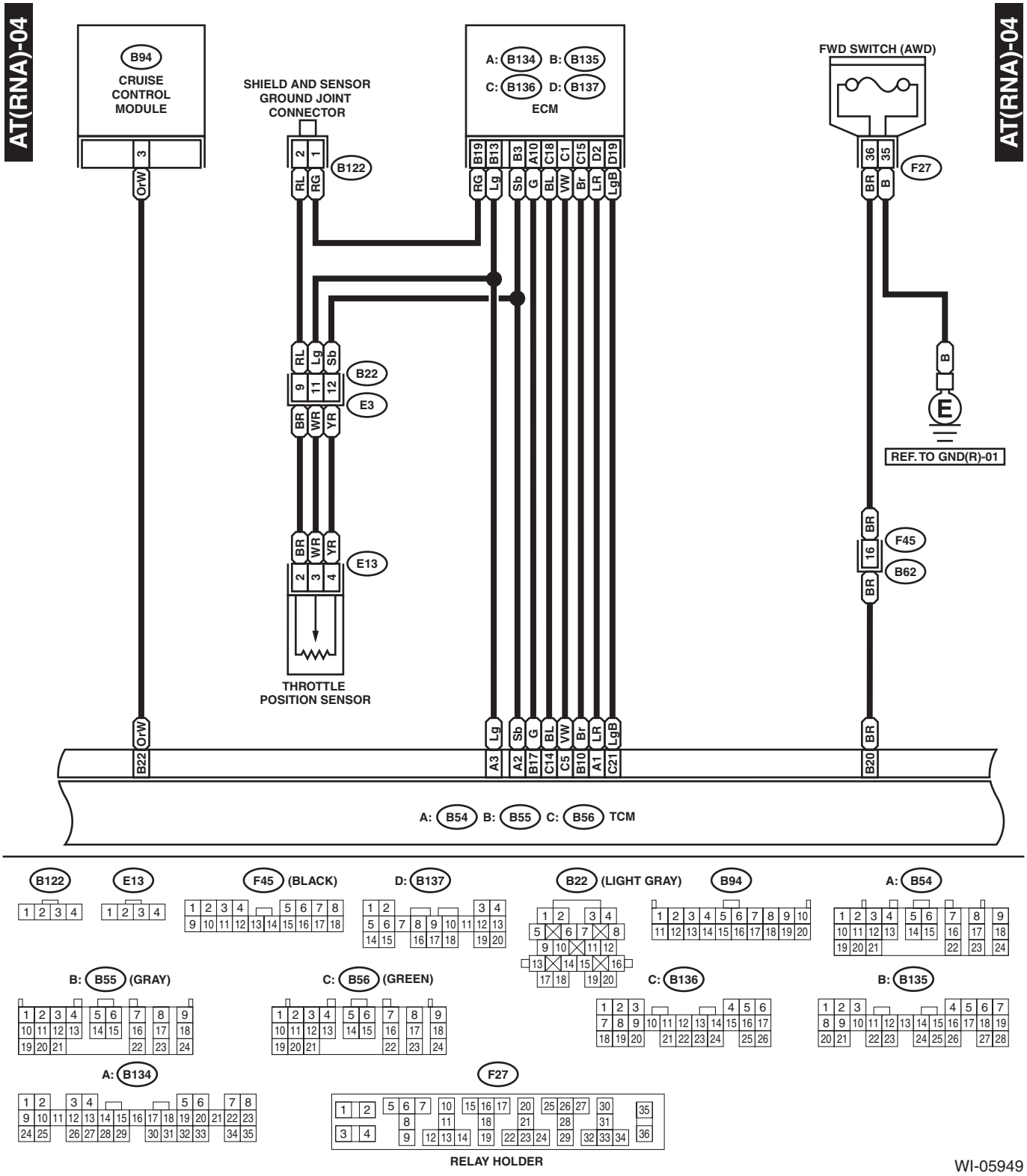
WI-07385

AT(RNA)-03

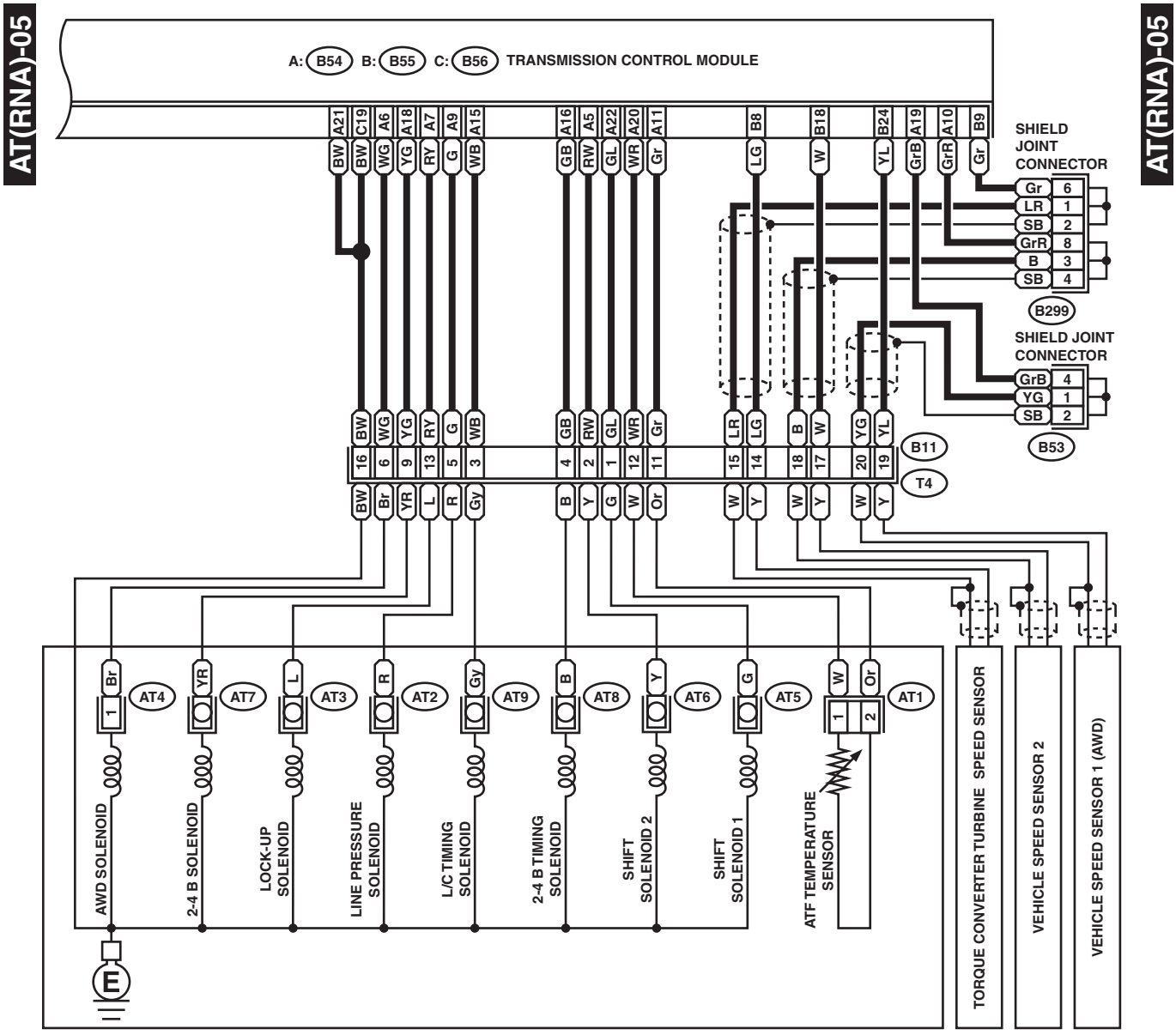


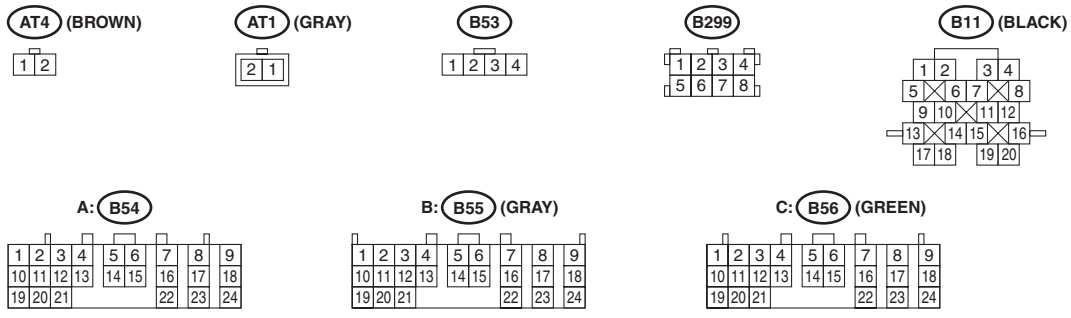


WI-03241


AT(RNA)-04
AT(RNA)-04
B94
CRUISE CONTROL MODULE
3
OrW
SHIELD AND SENSOR GROUND JOINT CONNECTOR
2
1
B122
RL
RG
A: B134 B: B135
C: B136 D: B137
ECM
B19 B13 B3 A10 C18 C1 C15 D2 D19
RG Lg Sb G BL VW Br LR LgB
FWD SWITCH (AWD)
36 35
F27
BR B
B
E
REF. TO GND(R)-01
RL Lg Sb
9 11 12
B22
E3
BR WR YR
BR WR YR
2 3 4
E13
THROTTLE POSITION SENSOR
BR
16
F45
B62
BR
OrW
B22
Lg Sb G BL VW Br LR LgB
A3 A2 B17 C14 C5 B10 A1 C21
BR
B20
A: B54 B: B55 C: B56 TCM
B122
E13
F45 (BLACK)
D: B137
B22 (LIGHT GRAY)
B94
A: B54
B: B55 (GRAY)
C: B56 (GREEN)
C: B136
B: B135
A: B134
F27
RELAY HOLDER

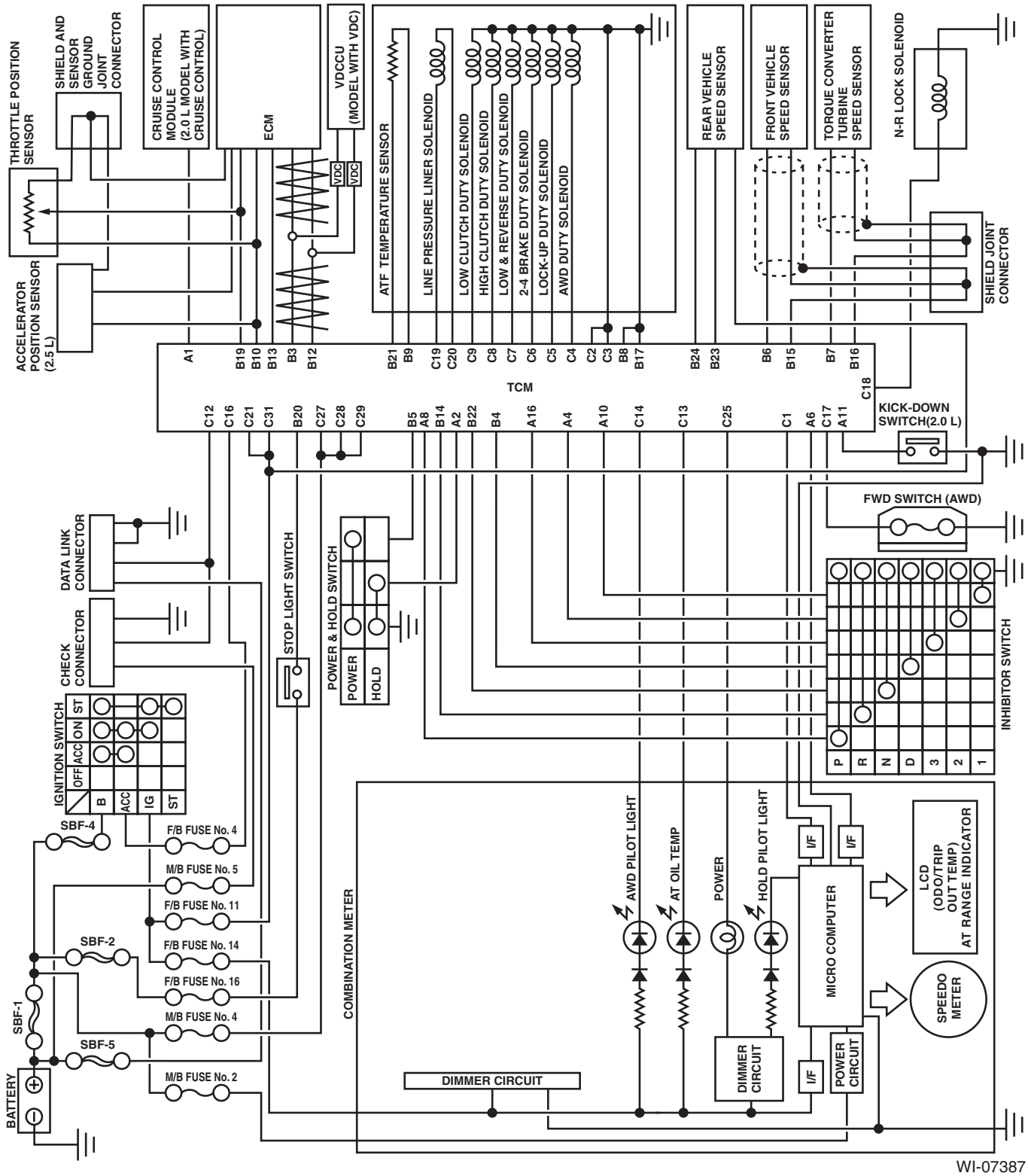
WI-05949

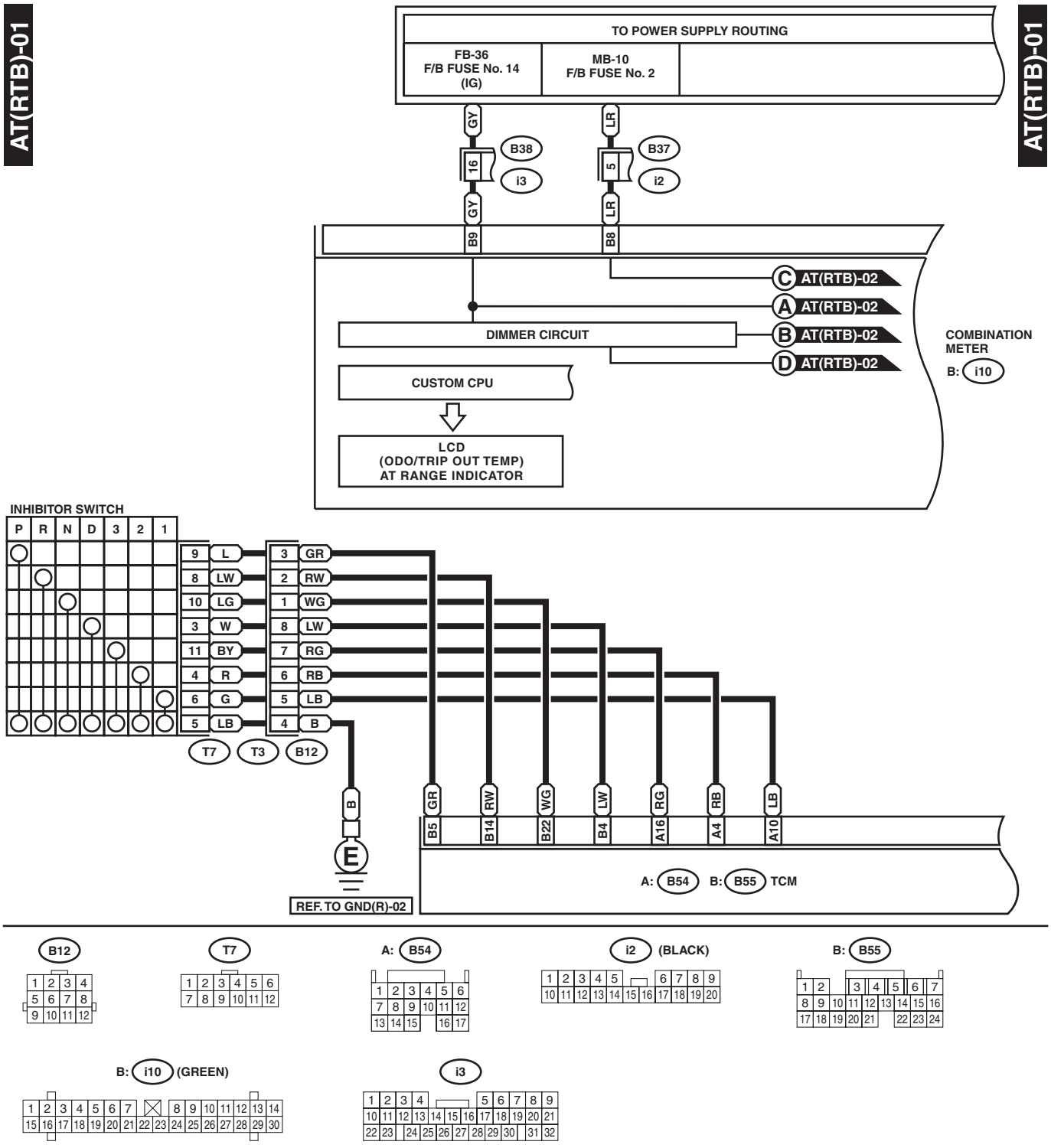

AT(RNA)-05
AT(RNA)-05
A: B54 B: B55 C: B56 TRANSMISSION CONTROL MODULE
SHIELD JOINT CONNECTOR
B299
SHIELD JOINT CONNECTOR
B53
B11
T4
AWD SOLENOID
2-4 B SOLENOID
LOCK-UP SOLENOID
LINE PRESSURE SOLENOID
L/C TIMING SOLENOID
2-4 B TIMING SOLENOID
SHIFT SOLENOID 2
SHIFT SOLENOID 1
ATF TEMPERATURE SENSOR
TORQUE CONVERTER TURBINE SPEED SENSOR
VEHICLE SPEED SENSOR 2
VEHICLE SPEED SENSOR 1 (AWD)
AT4
AT7
AT3
AT2
AT9
AT8
AT6
AT5
AT1


AT4 (BROWN)
AT1 (GRAY)
B53
B299
B11 (BLACK)
A: B54
B: B55 (GRAY)
C: B56 (GREEN)

WI-07386

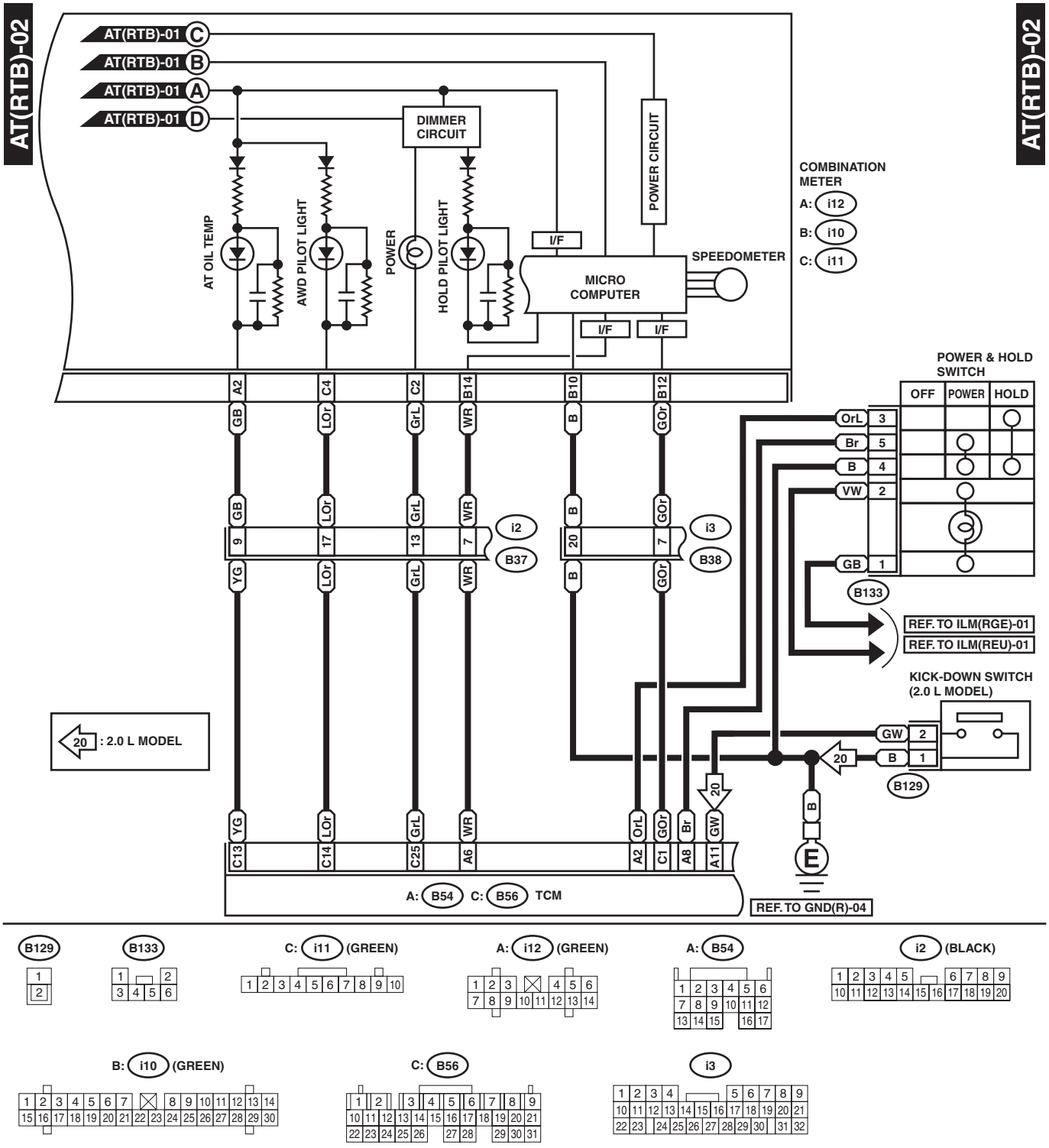
4. RHD TURBO MODEL




AT(RTB)-01
AT(RTB)-01
TO POWER SUPPLY ROUTING
FB-36
F/B FUSE No. 14
(IG)
MB-10
F/B FUSE No. 2
GY
16
B38
i3
LR
5
B37
i2
B9
B8
C AT(RTB)-02
A AT(RTB)-02
B AT(RTB)-02
D AT(RTB)-02
DIMMER CIRCUIT
CUSTOM CPU
LCD
(ODO/TRIP OUT TEMP)
AT RANGE INDICATOR
COMBINATION
METER
B: i10
INHIBITOR SWITCH
P R N D 3 2 1
9 L
8 LW
10 LG
3 W
11 BY
4 R
6 G
5 LB
3 GR
2 RW
1 WG
8 LW
7 RG
6 RB
5 LB
4 B
T7
T3
B12
B
E
REF. TO GND(R)-02
GR
RW
WG
LW
RG
RB
LB
B5
B14
B22
B4
A16
A4
A10
A: B54 B: B55 TCM

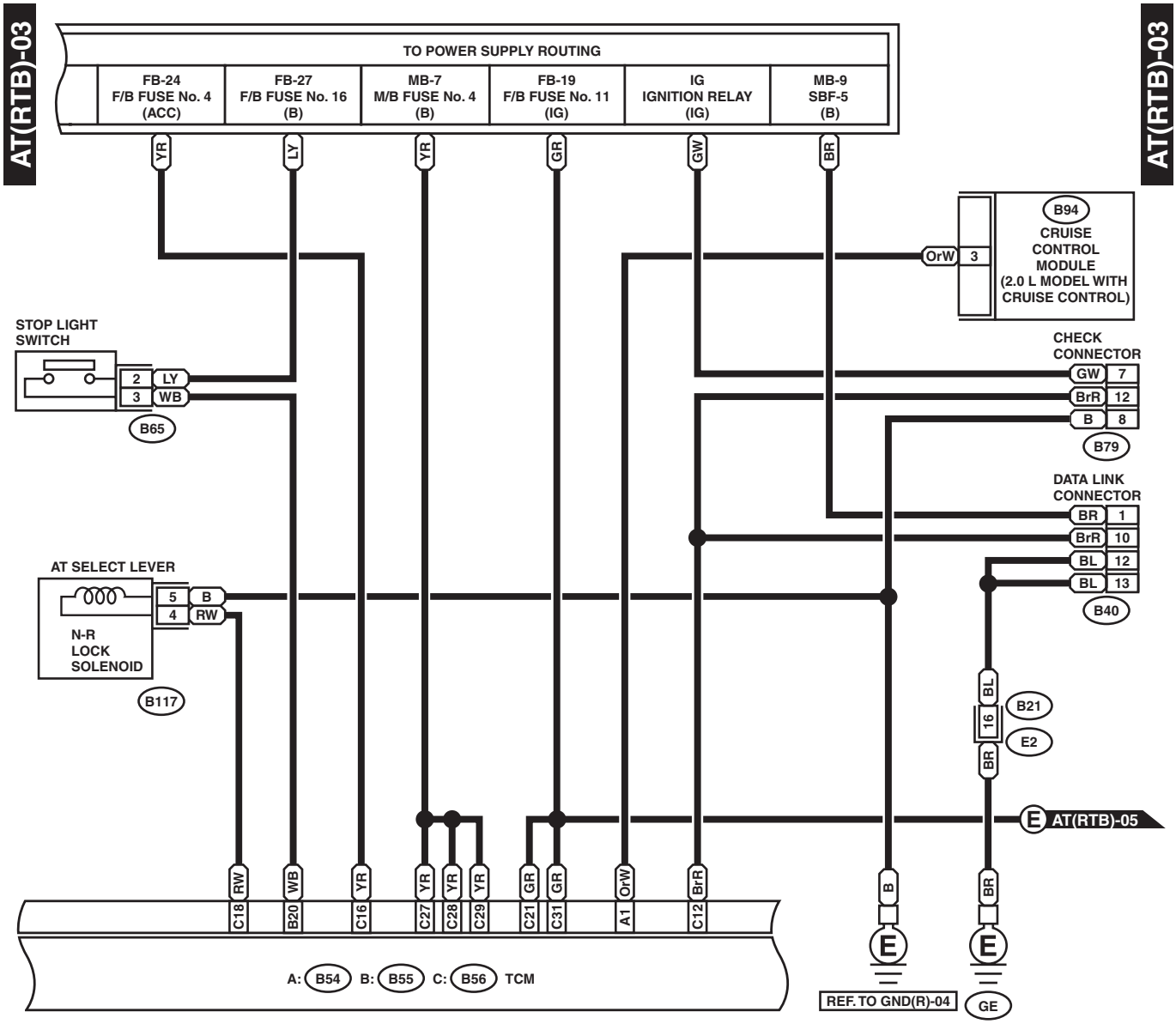
B12
T7
A: B54
i2 (BLACK)
B: B55
B: i10 (GREEN)
i3

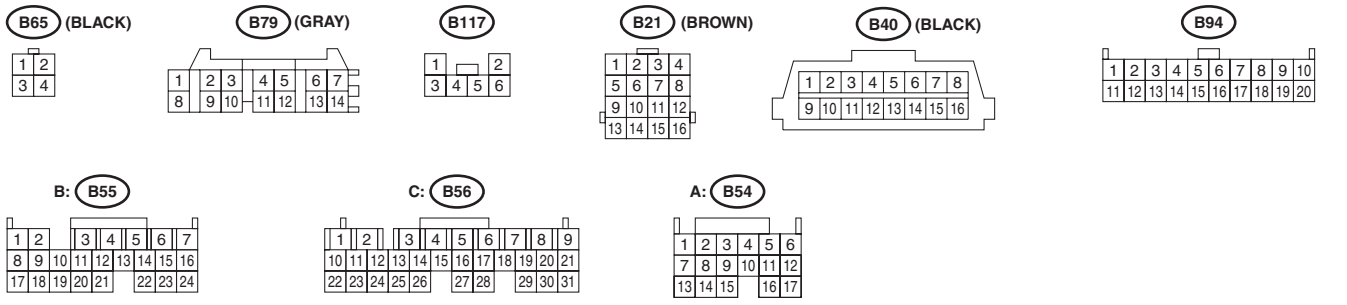
WI-07388


AT(RTB)-02
AT(RTB)-01 C
AT(RTB)-01 B
AT(RTB)-01 A
AT(RTB)-01 D
DIMMER CIRCUIT
POWER CIRCUIT
COMBINATION METER
A: i12
B: i10
C: i11
AT OIL TEMP
AWD PILOT LIGHT
POWER
HOLD PILOT LIGHT
I/F
MICRO COMPUTER
SPEEDOMETER
POWER & HOLD SWITCH
OFF
POWER
HOLD
KICK-DOWN SWITCH (2.0 L MODEL)
B133
REF. TO ILM(RGE)-01
REF. TO ILM(REU)-01
B129
i2
B37
i3
B38
20 : 2.0 L MODEL
A: B54 C: B56 TCM
REF. TO GND(R)-04

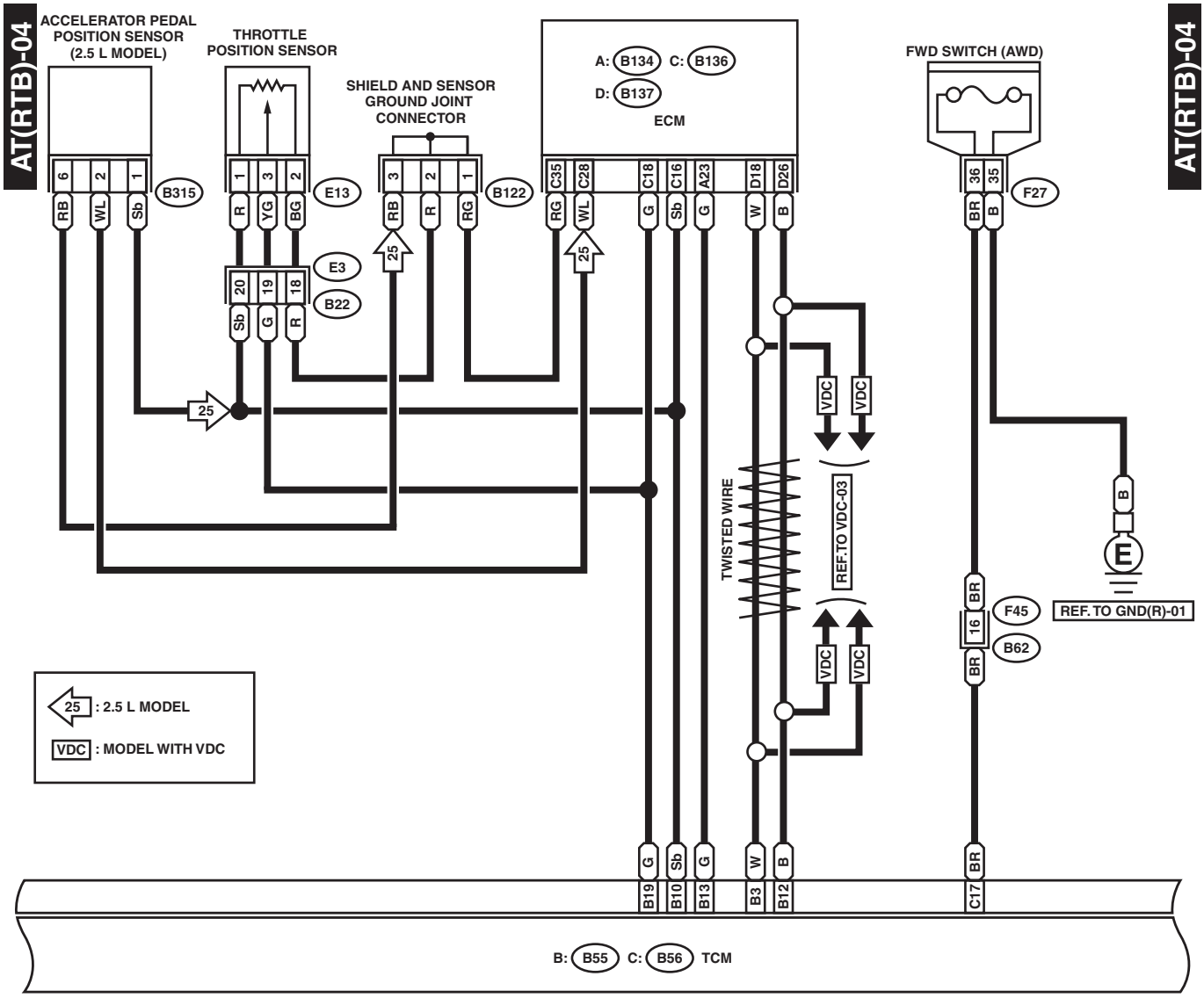
B129
B133
C: i11 (GREEN)
A: i12 (GREEN)
A: B54
i2 (BLACK)
B: i10 (GREEN)
C: B56
i3

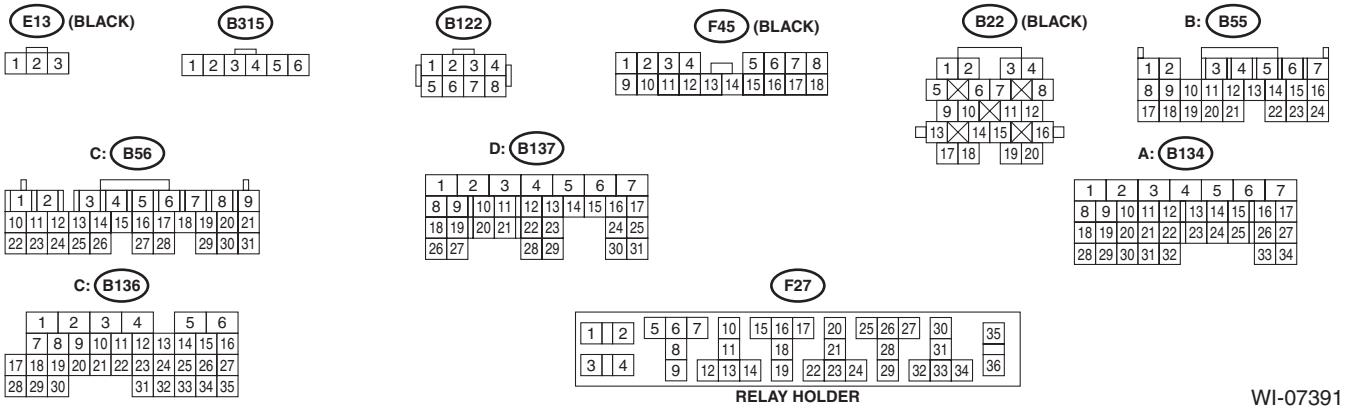
WI-07389


AT(RTB)-03
AT(RTB)-03
TO POWER SUPPLY ROUTING
FB-24 F/B FUSE No. 4 (ACC)
FB-27 F/B FUSE No. 16 (B)
MB-7 M/B FUSE No. 4 (B)
FB-19 F/B FUSE No. 11 (IG)
IG IGNITION RELAY (IG)
MB-9 SBF-5 (B)
YR
LY
YR
GR
GW
BR
B94
CRUISE CONTROL MODULE (2.0 L MODEL WITH CRUISE CONTROL)
OrW 3
STOP LIGHT SWITCH
2 LY
3 WB
B65
CHECK CONNECTOR
GW 7
BrR 12
B 8
B79
DATA LINK CONNECTOR
BR 1
BrR 10
BL 12
BL 13
B40
AT SELECT LEVER
5 B
4 RW
N-R LOCK SOLENOID
B117
BL
16
BR
B21
E2
E AT(RTB)-05
RW
WB
YR
YR
YR
YR
GR
GR
OrW
BrR
B
BR
C18
B20
C16
C27
C28
C29
C21
C31
A1
C12
A: B54 B: B55 C: B56 TCM
REF. TO GND(R)-04
GE

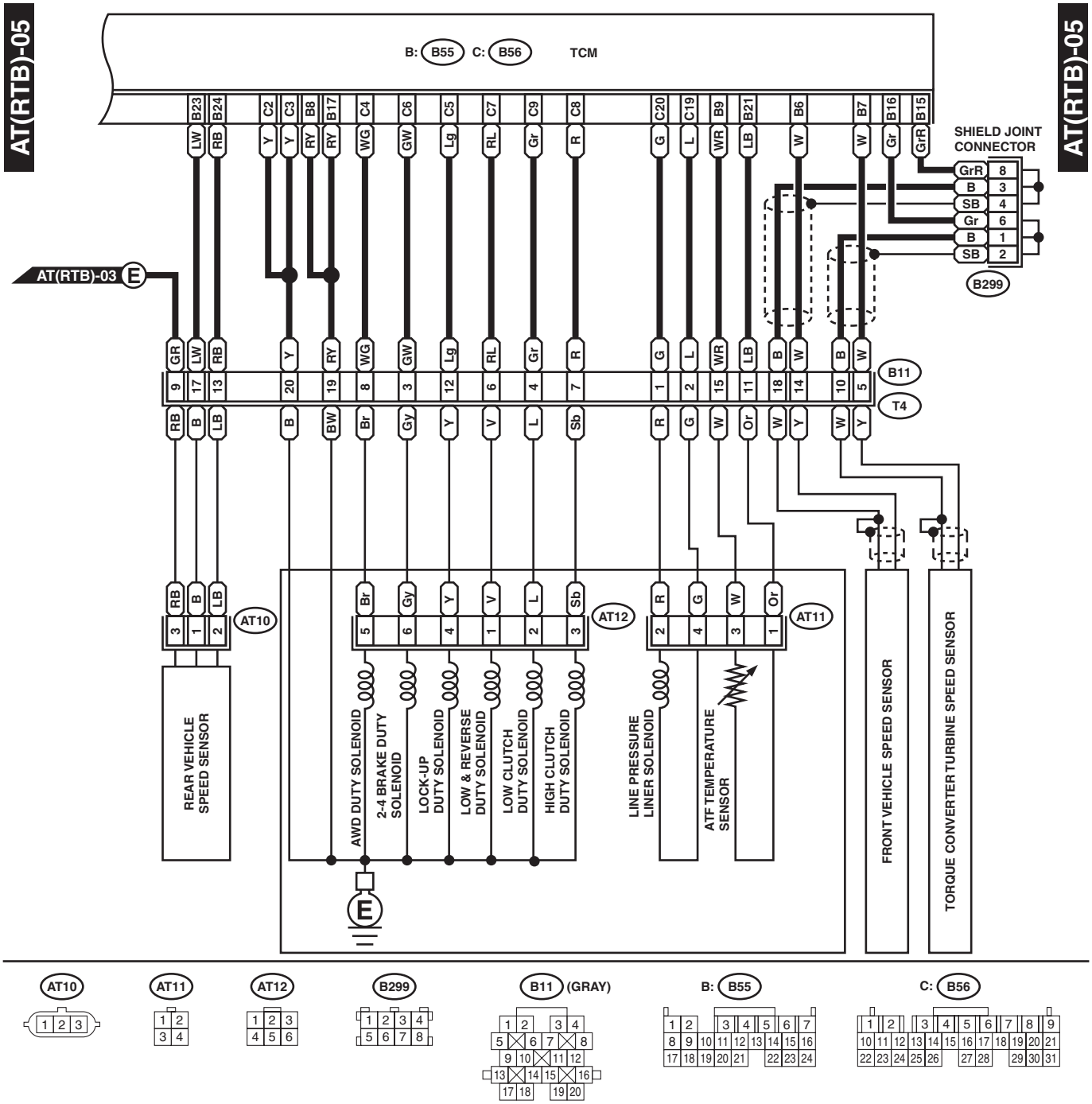

B65 (BLACK)
B79 (GRAY)
B117
B21 (BROWN)
B40 (BLACK)
B94
B: B55
C: B56
A: B54

WI-07390


AT(RTB)-04
ACCELERATOR PEDAL POSITION SENSOR (2.5 L MODEL)
THROTTLE POSITION SENSOR
SHIELD AND SENSOR GROUND JOINT CONNECTOR
A: B134 C: B136
D: B137
ECM
FWD SWITCH (AWD)
AT(RTB)-04
B315
E13
B122
F27
E3
B22
25
VDC
TWISTED WIRE
REF.TO VDC-03
F45
B62
REF. TO GND(R)-01
25 : 2.5 L MODEL
VDC : MODEL WITH VDC
B: B55 C: B56 TCM


E13 (BLACK)
B315
B122
F45 (BLACK)
B22 (BLACK)
B: B55
C: B56
D: B137
A: B134
C: B136
F27
RELAY HOLDER

WI-07391

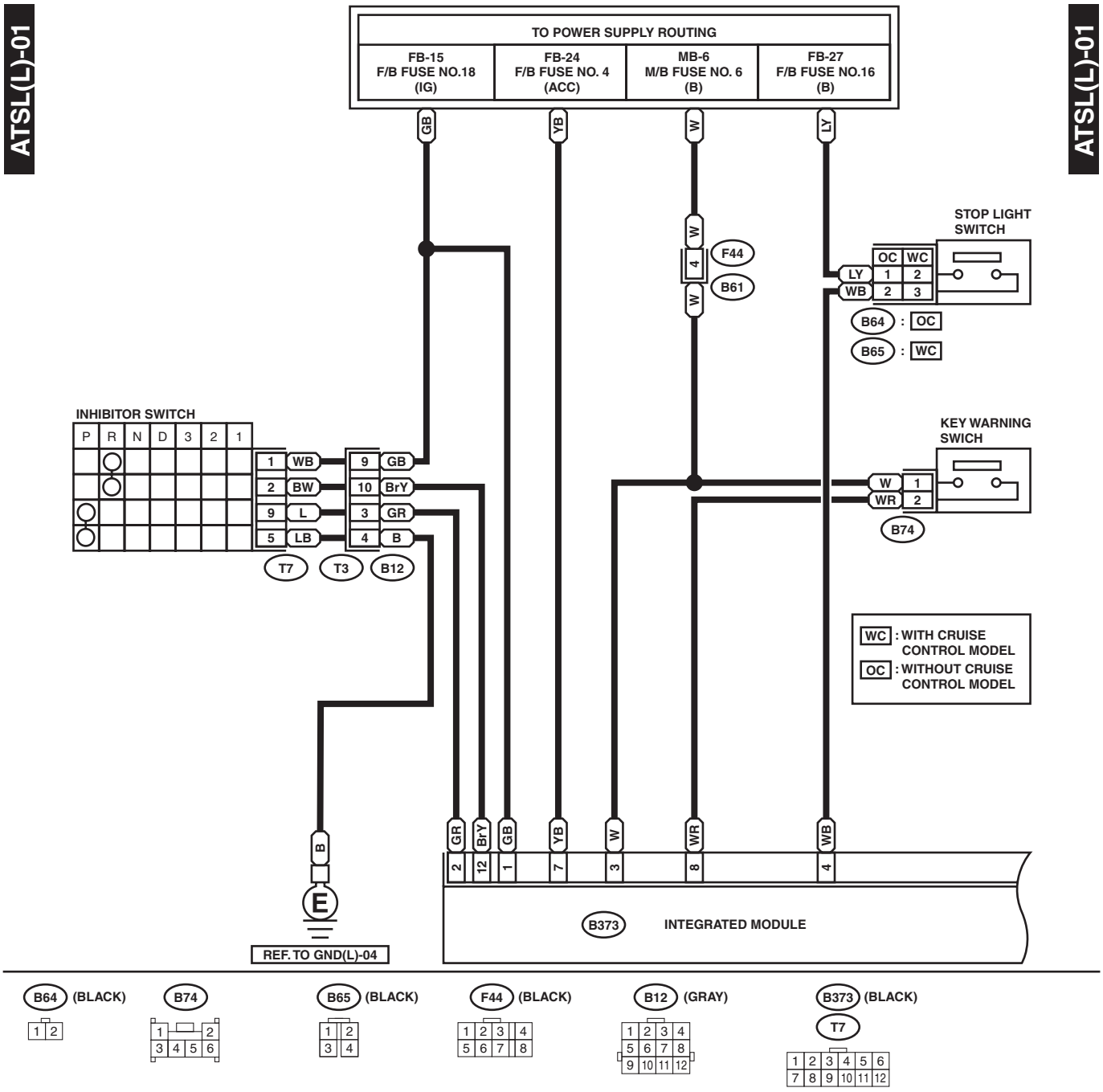

AT(RTB)-05
AT(RTB)-05
B: B55 C: B56 TCM
B23 B24 C2 C3 B8 B17 C4 C6 C5 C7 C9 C8 C20 C19 B9 B21 B6 B7 B16 B15
LW RB Y Y RY RY WG GW Lg RL Gr R G L WR LB W W Gr GrR
SHIELD JOINT CONNECTOR
GrR 8
B 3
SB 4
Gr 6
B 1
SB 2
B299
AT(RTB)-03 E
GR LW RB Y RY WG GW Lg RL Gr R G L WR LB B W B W
9 17 13 20 19 8 3 12 6 4 7 1 2 15 11 18 14 10 5
B11
T4
RB B LB B BW Br Gy Y V L Sb R G W Or W Y W Y
RB B LB
3 1 2
AT10
Br Gy Y V L Sb
5 6 4 1 2 3
AT12
R G W Or
2 4 3 1
AT11
REAR VEHICLE SPEED SENSOR
AWD DUTY SOLENOID
2-4 BRAKE DUTY SOLENOID
LOCK-UP DUTY SOLENOID
LOW & REVERSE DUTY SOLENOID
LOW CLUTCH DUTY SOLENOID
HIGH CLUTCH DUTY SOLENOID
LINE PRESSURE LINER SOLENOID
ATF TEMPERATURE SENSOR
FRONT VEHICLE SPEED SENSOR
TORQUE CONVERTER TURBINE SPEED SENSOR
E
AT10
AT11
AT12
B299
B11 (GRAY)
B: B55
C: B56

WI-07392

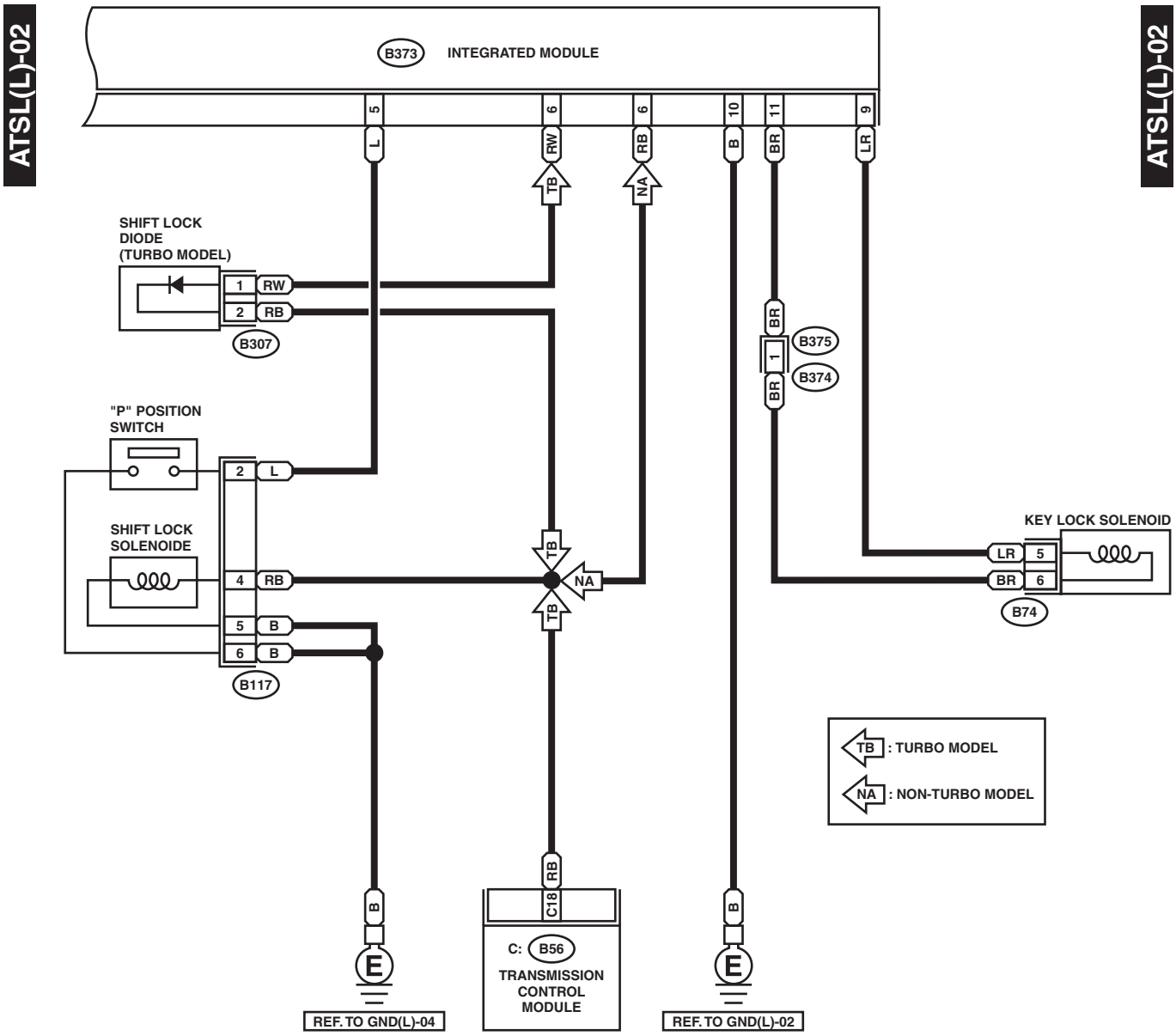
7. AT Shift Lock Control System

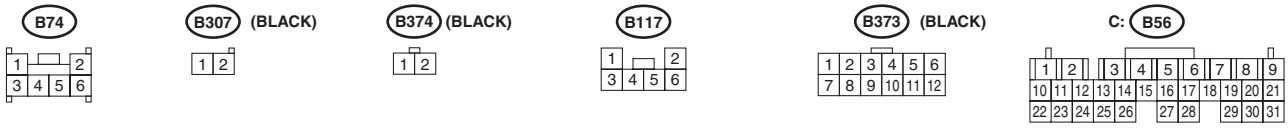
A: WIRING DIAGRAM

1. LHD MODEL



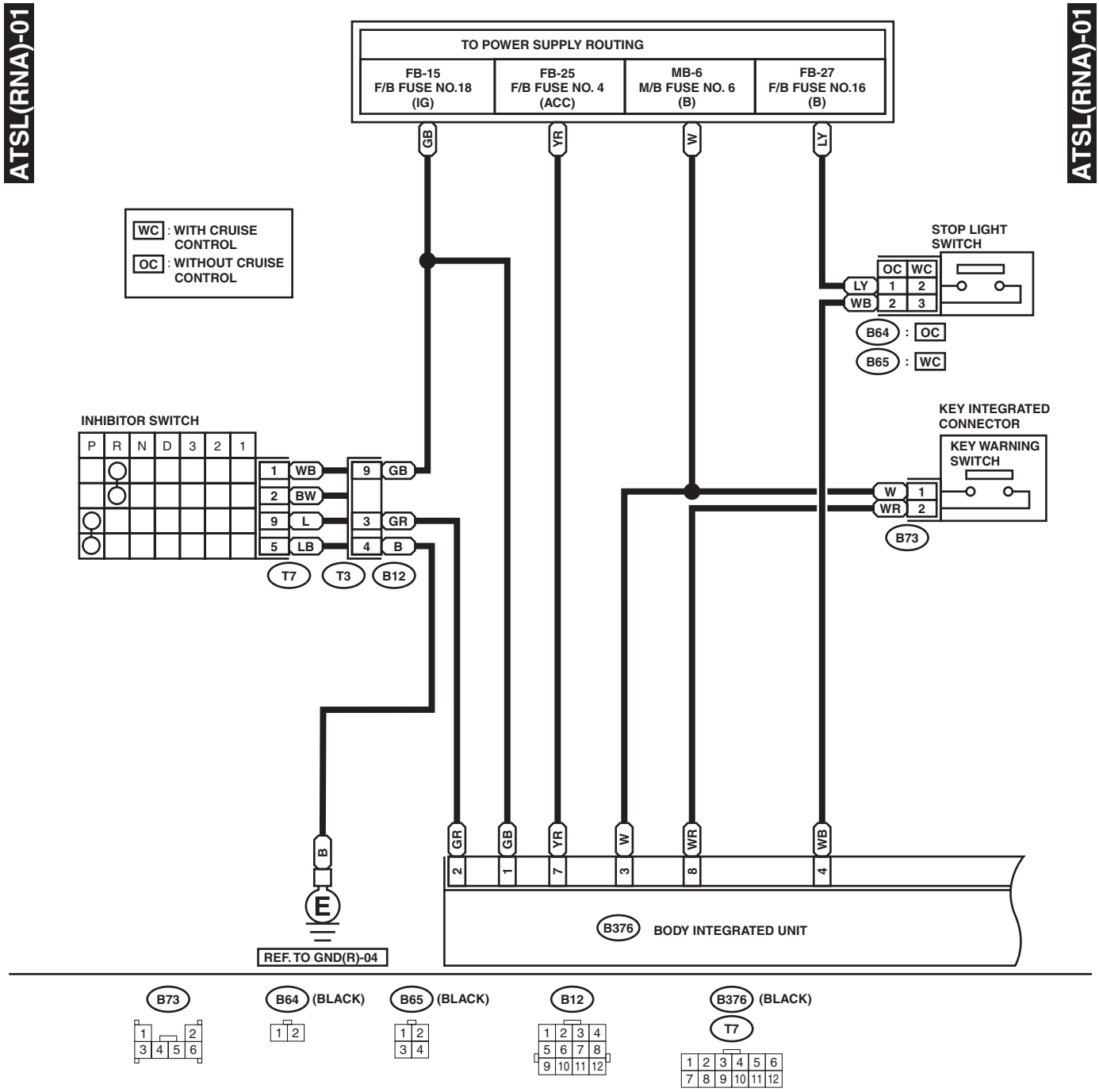
WI-07393


ATSL(L)-02
ATSL(L)-02
B373
INTEGRATED MODULE
5
6
6
10
11
9
L
RW
RB
B
BR
LR
TB
NA
SHIFT LOCK
DIODE
(TURBO MODEL)
1
RW
2
RB
B307
BR
1
B375
B374
BR
"P" POSITION
SWITCH
2
L
SHIFT LOCK
SOLENOIDE
4
RB
5
B
6
B
B117
TB
NA
TB
KEY LOCK SOLENOID
LR
5
BR
6
B74
TB : TURBO MODEL
NA : NON-TURBO MODEL
RB
C18
B
B
C:
B56
TRANSMISSION
CONTROL
MODULE
E
E
REF. TO GND(L)-04
REF. TO GND(L)-02

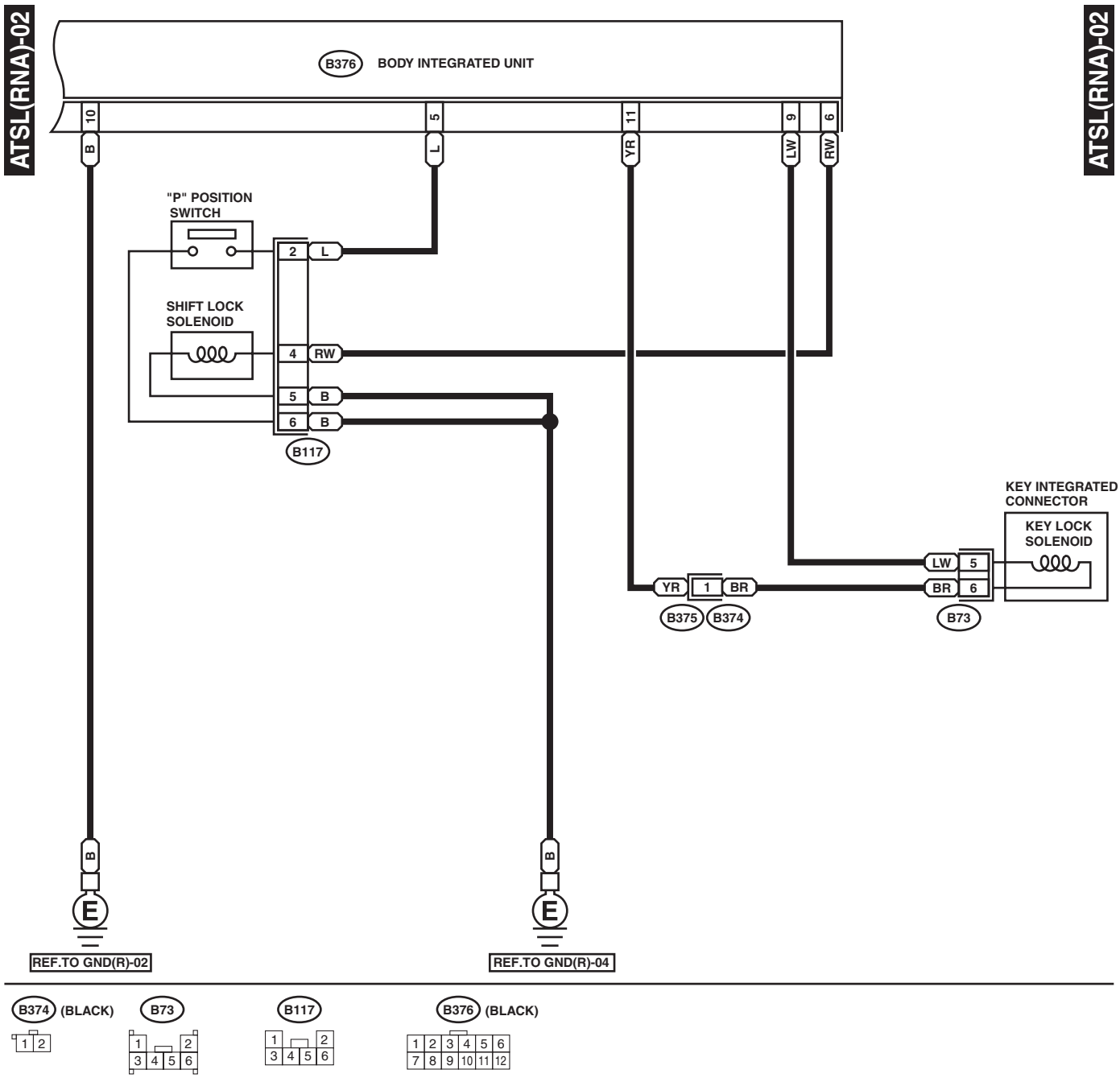

B74
1 2 3 4 5 6
B307 (BLACK)
1 2
B374 (BLACK)
1 2
B117
1 2 3 4 5 6
B373 (BLACK)
1 2 3 4 5 6
7 8 9 10 11 12
C: B56
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31

WI-07394

2. RHD NON-TURBO MODEL



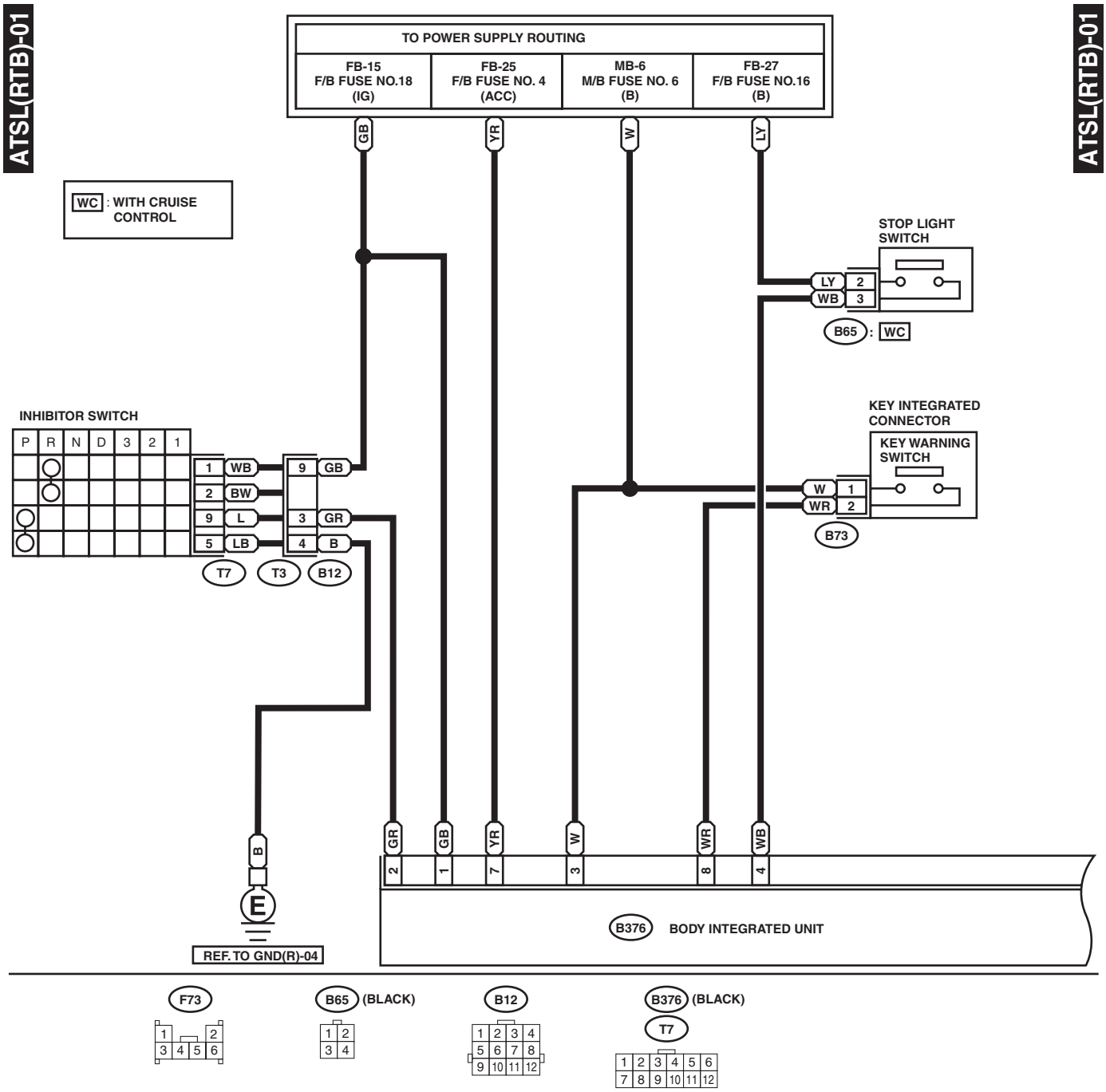
WI-07395


ATSL(RNA)-02
ATSL(RNA)-02
B376
BODY INTEGRATED UNIT
10
5
11
9
6
B
L
YR
LW
RW
"P" POSITION SWITCH
SHIFT LOCK SOLENOID
2
L
4
RW
5
B
6
B
B117
KEY INTEGRATED CONNECTOR
KEY LOCK SOLENOID
LW
5
YR
1
BR
BR
6
B375
B374
B73
B
B
E
E
REF.TO GND(R)-02
REF.TO GND(R)-04

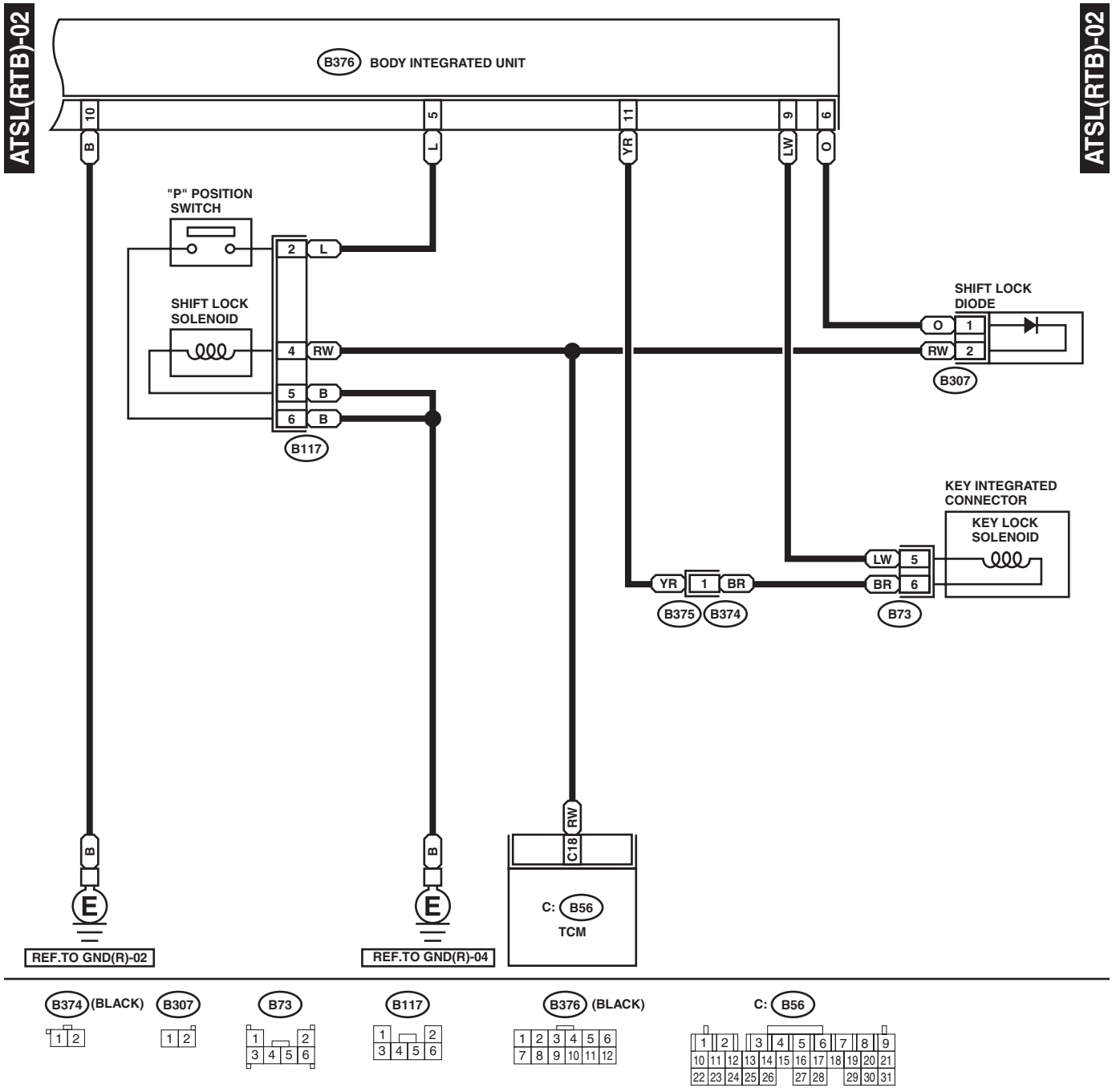
B374 (BLACK)
1 2
B73
1 2
3 4 5 6
B117
1 2
3 4 5 6
B376 (BLACK)
1 2 3 4 5 6
7 8 9 10 11 12

WI-07396

3. RHD TURBO MODEL



WI-07397

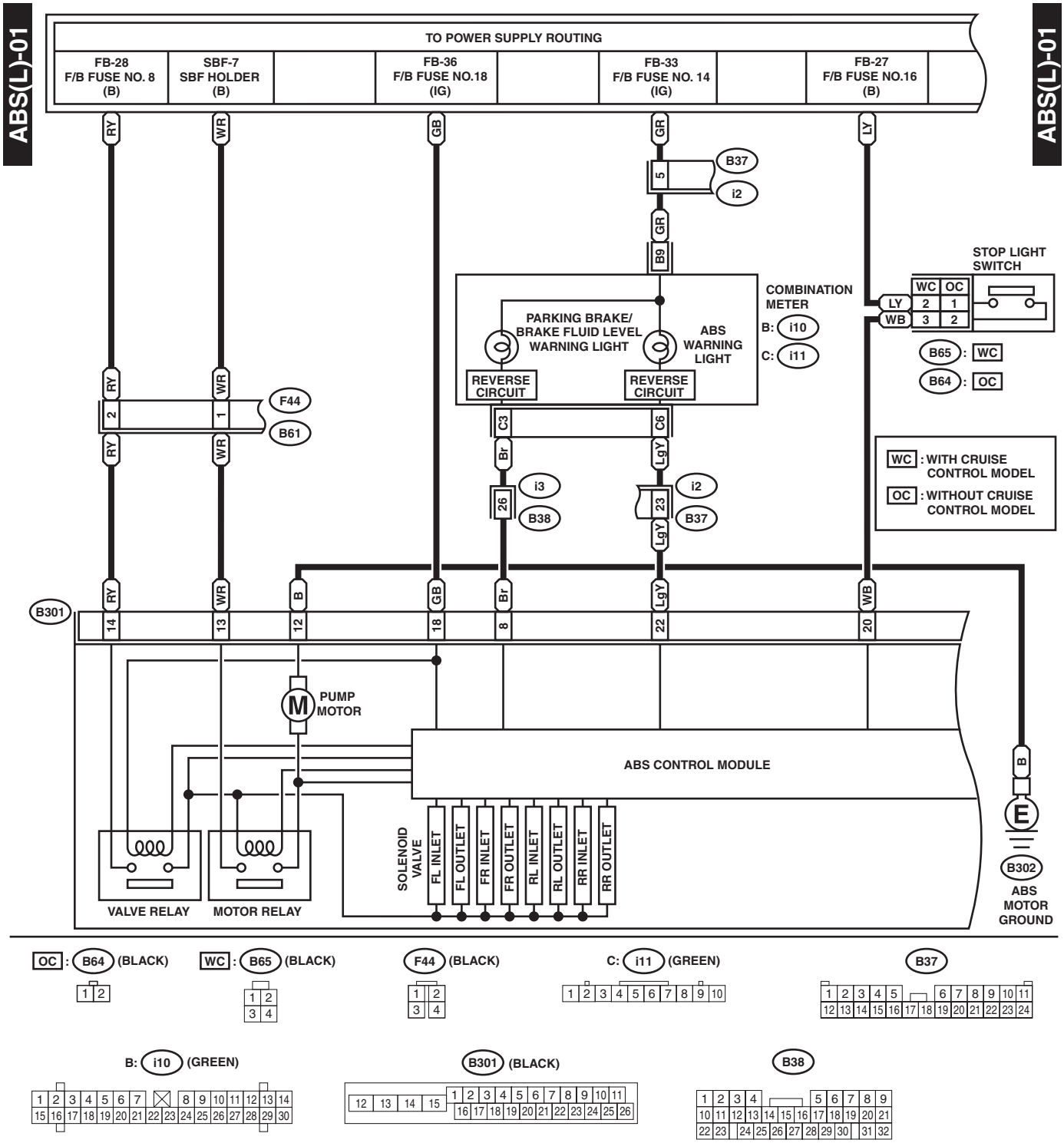

ATSL(RTB)-02
ATSL(RTB)-02
B376 BODY INTEGRATED UNIT
10
5
11
9
6
B
L
YR
LW
O
"P" POSITION SWITCH
2
L
SHIFT LOCK SOLENOID
4
RW
5
B
6
B
B117
SHIFT LOCK DIODE
O
1
RW
2
B307
KEY INTEGRATED CONNECTOR
KEY LOCK SOLENOID
LW
5
YR
1
BR
BR
6
B375
B374
B73
B
E
REF.TO GND(R)-02
B
E
REF.TO GND(R)-04
RW
C18
C: B56
TCM
B374 (BLACK)
B307
B73
B117
B376 (BLACK)
C: B56

WI-07398

8. Anti-lock Brake System

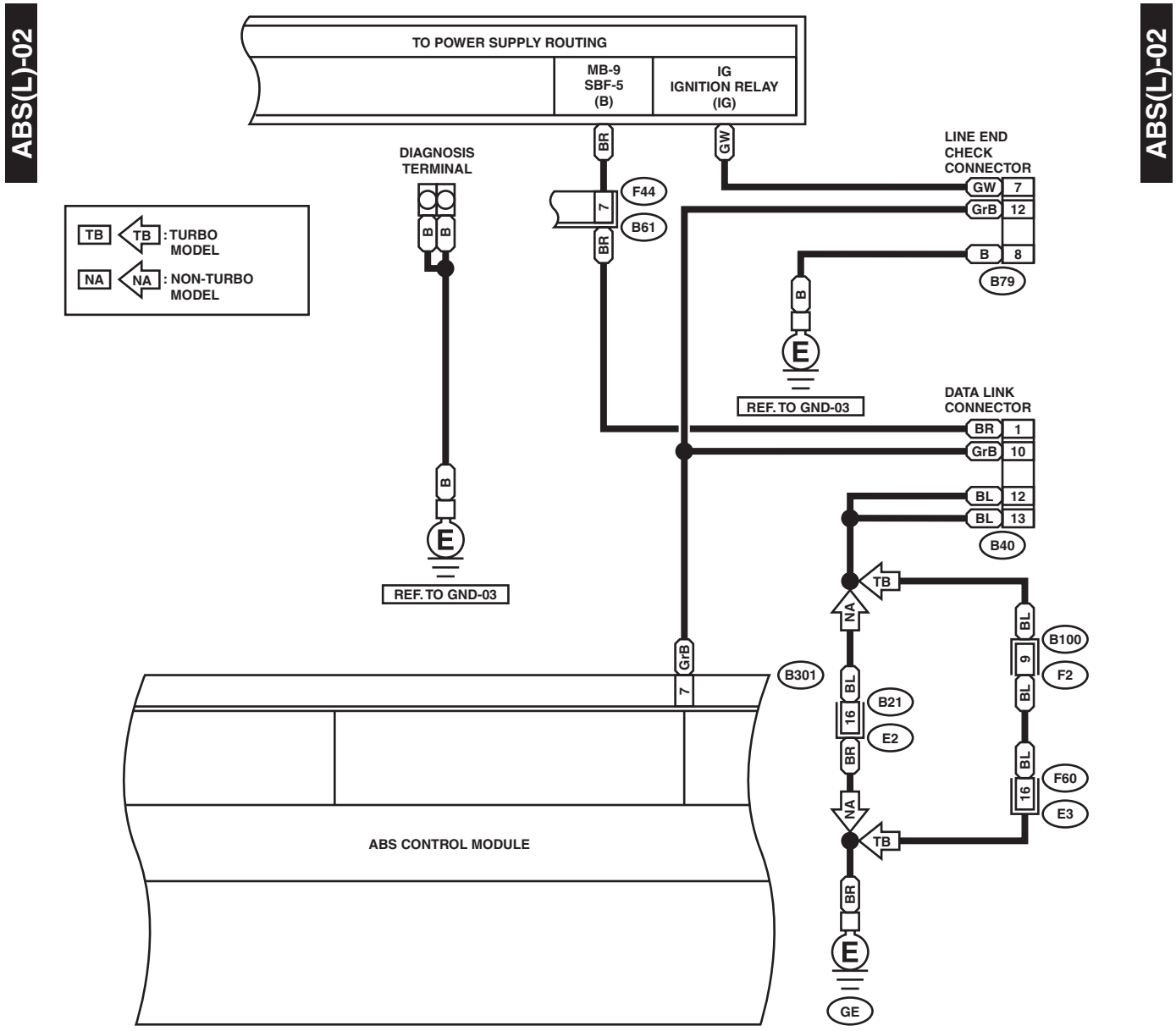
A: WIRING DIAGRAM

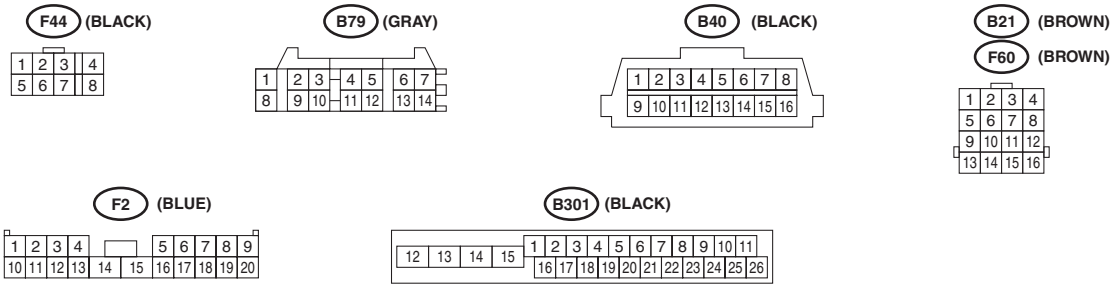
1. LHD MODEL



WI-07399

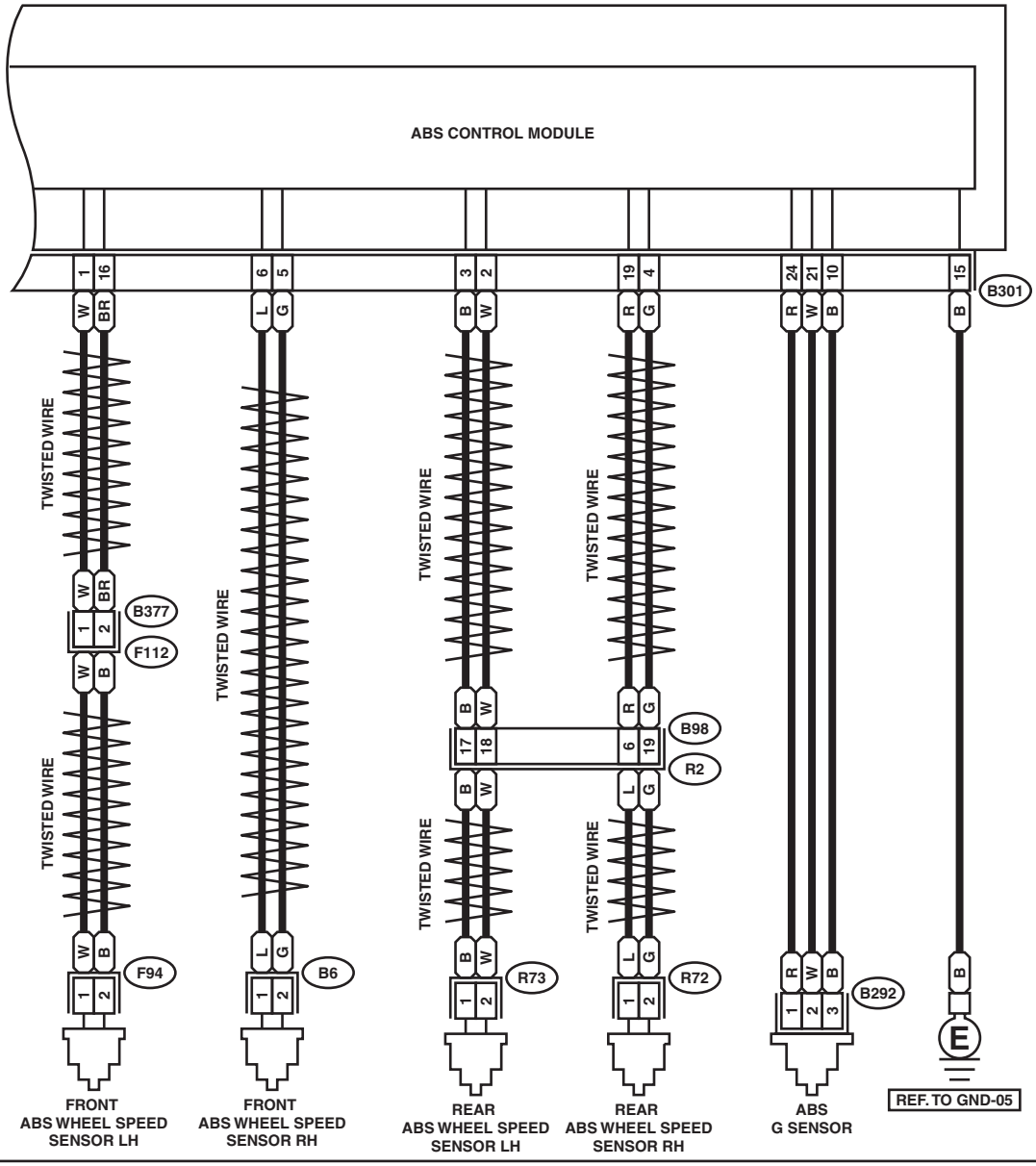
ABS(L)-02

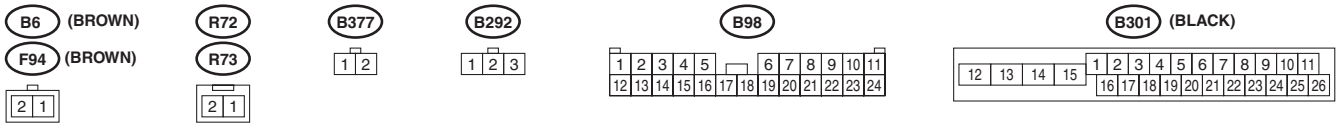




WI-07400

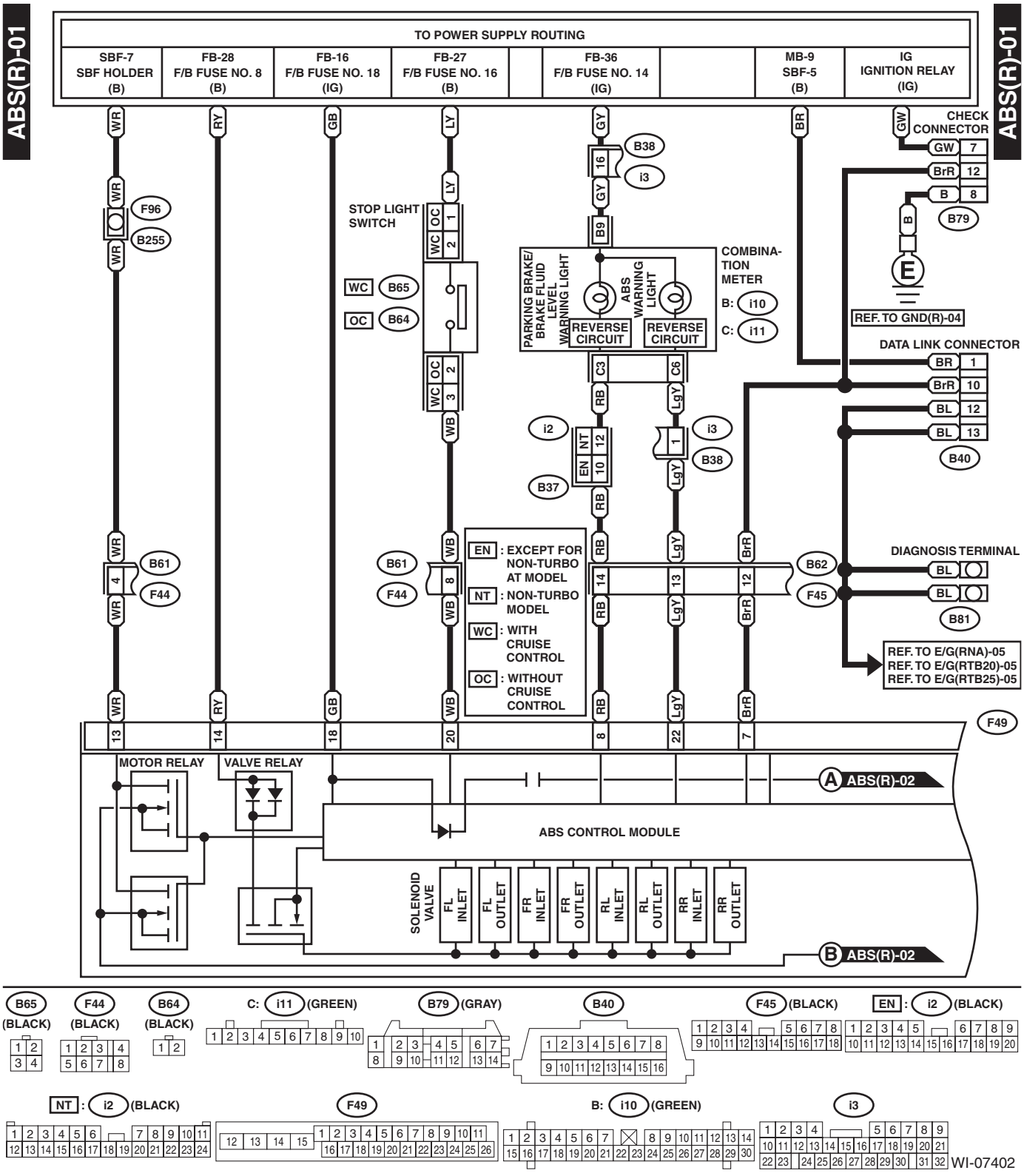
ABS(L)-03

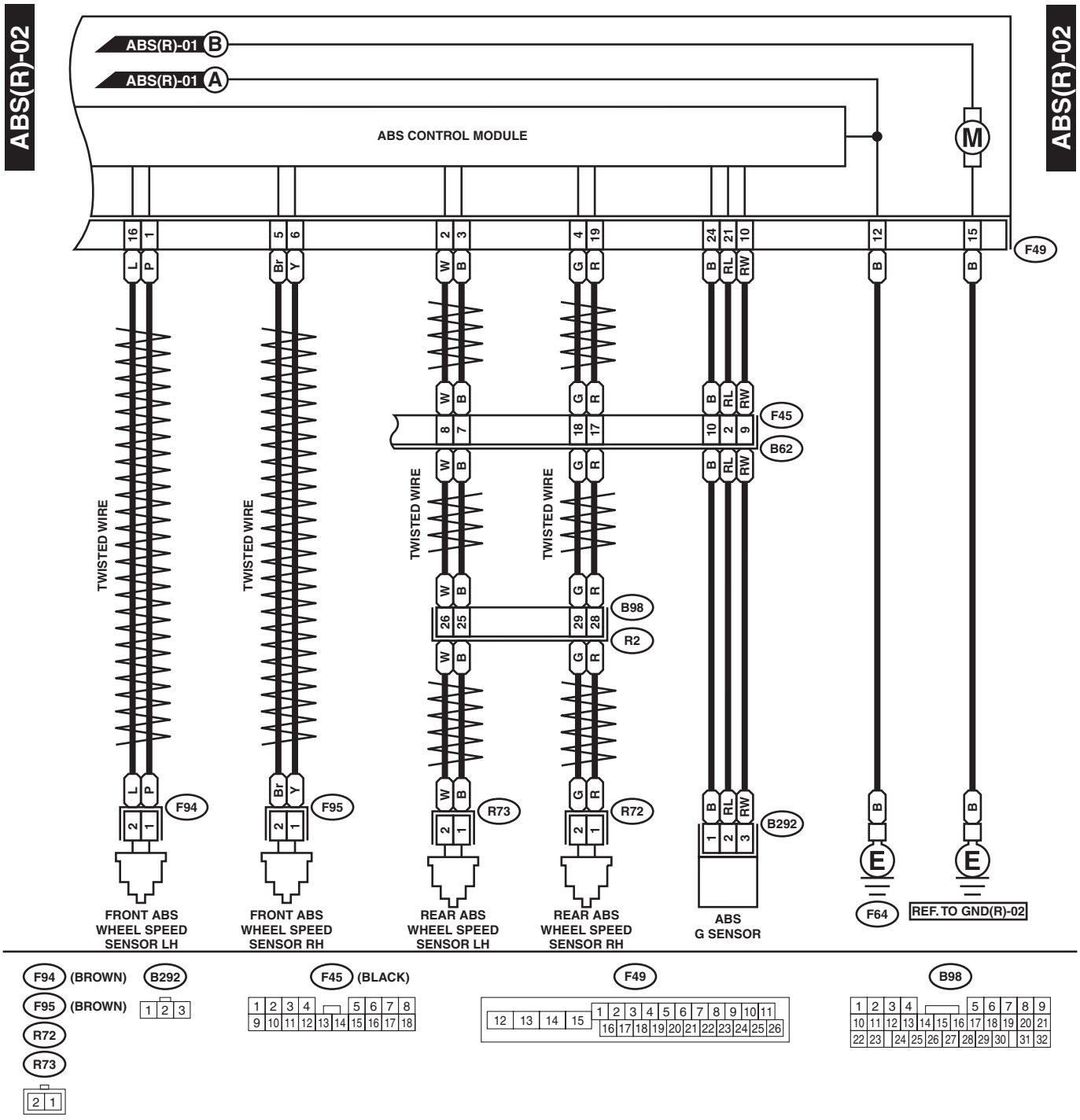




WI-07401

2. RHD MODEL

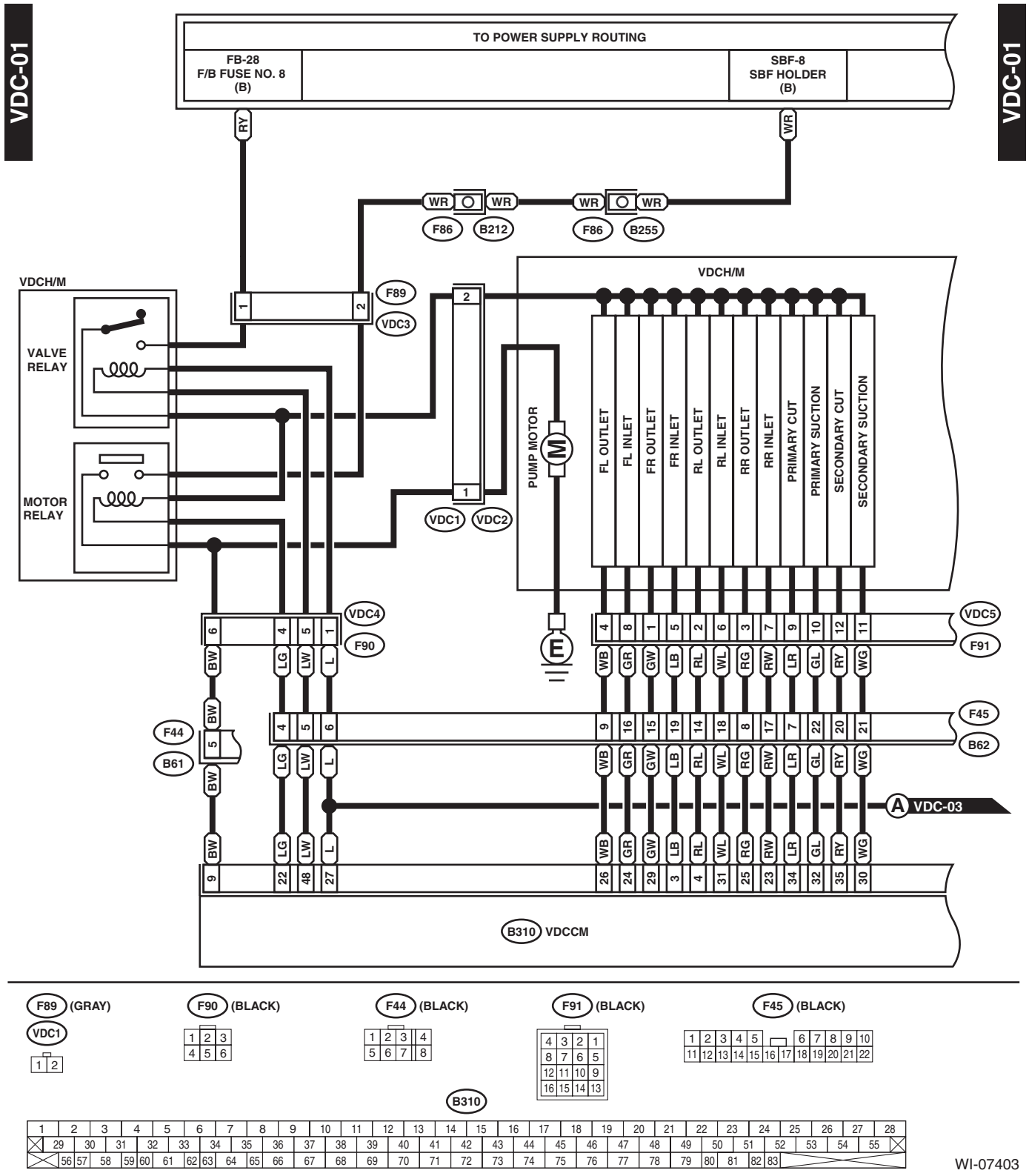

ABS(R)-01
TO POWER SUPPLY ROUTING
SBF-7 SBF HOLDER (B)
FB-28 F/B FUSE NO. 8 (B)
FB-16 F/B FUSE NO. 18 (IG)
FB-27 F/B FUSE NO. 16 (B)
FB-36 F/B FUSE NO. 14 (IG)
MB-9 SBF-5 (B)
IG IGNITION RELAY (IG)
CHECK CONNECTOR
STOP LIGHT SWITCH
COMBINATION METER
PARKING BRAKE/ BRAKE FLUID LEVEL WARNING LIGHT
ABS WARNING LIGHT
REVERSE CIRCUIT
DATA LINK CONNECTOR
DIAGNOSIS TERMINAL
EN : EXCEPT FOR NON-TURBO AT MODEL
NT : NON-TURBO MODEL
WC : WITH CRUISE CONTROL
OC : WITHOUT CRUISE CONTROL
REF. TO GND(R)-04
REF. TO E/G(RNA)-05
REF. TO E/G(RTB20)-05
REF. TO E/G(RTB25)-05
MOTOR RELAY
VALVE RELAY
ABS CONTROL MODULE
SOLENOID VALVE
FL INLET
FL OUTLET
FR INLET
FR OUTLET
RL INLET
RL OUTLET
RR INLET
RR OUTLET
A ABS(R)-02
B ABS(R)-02
B65 (BLACK)
F44 (BLACK)
B64 (BLACK)
C: i11 (GREEN)
B79 (GRAY)
B40
F45 (BLACK)
EN : i2 (BLACK)
NT : i2 (BLACK)
F49
B: i10 (GREEN)
i3
WI-07402


ABS(R)-02
ABS(R)-02
ABS(R)-01 B
ABS(R)-01 A
ABS CONTROL MODULE
M
F49
F45
B62
B98
R2
F94
F95
R73
R72
B292
F64
REF. TO GND(R)-02
TWISTED WIRE
TWISTED WIRE
TWISTED WIRE
TWISTED WIRE
FRONT ABS WHEEL SPEED SENSOR LH
FRONT ABS WHEEL SPEED SENSOR RH
REAR ABS WHEEL SPEED SENSOR LH
REAR ABS WHEEL SPEED SENSOR RH
ABS G SENSOR
F94 (BROWN)
F95 (BROWN)
R72
R73
B292
F45 (BLACK)
F49
B98

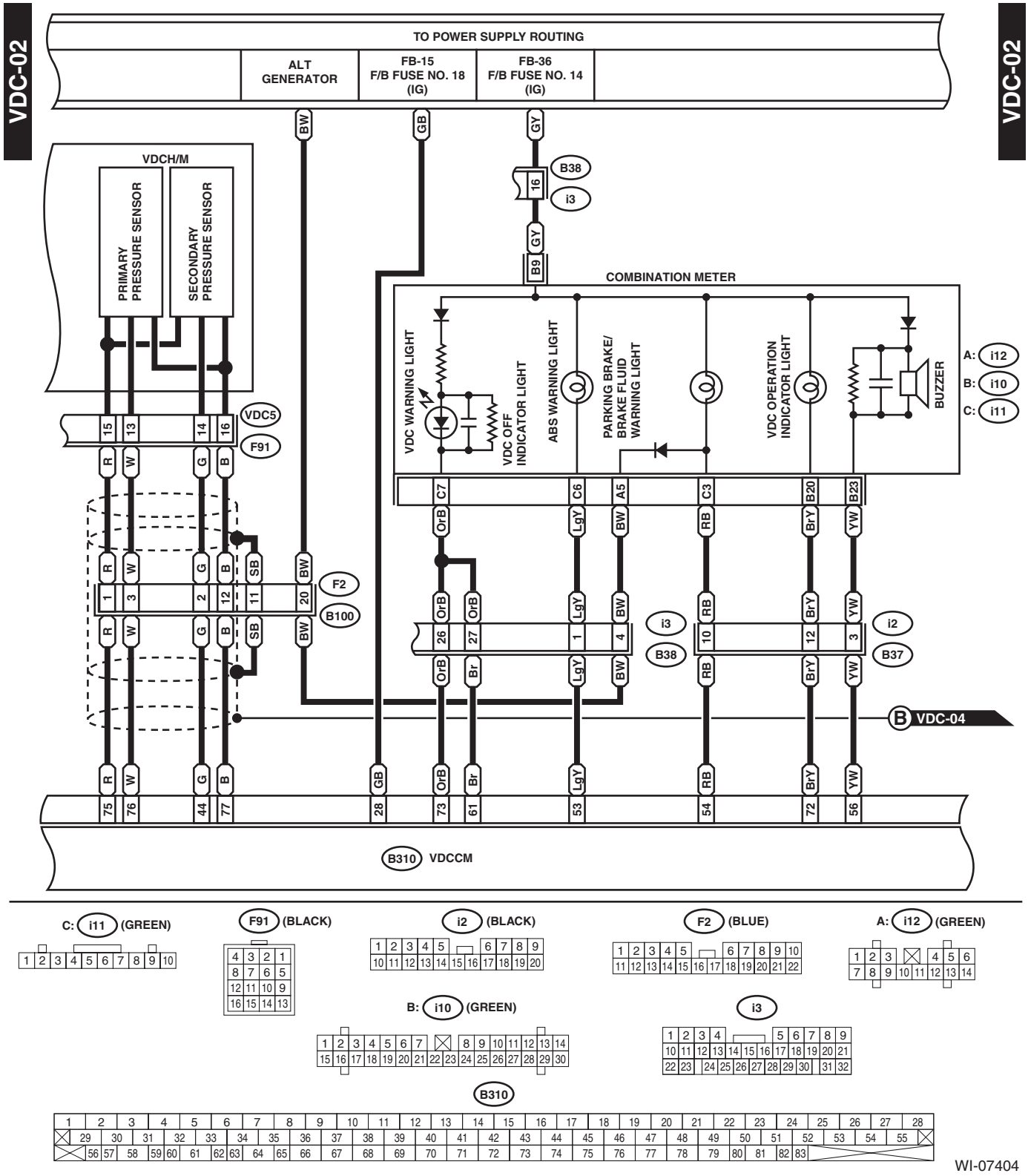
WI-05993

9. Vehicle Dynamics Control System

A: WIRING DIAGRAM

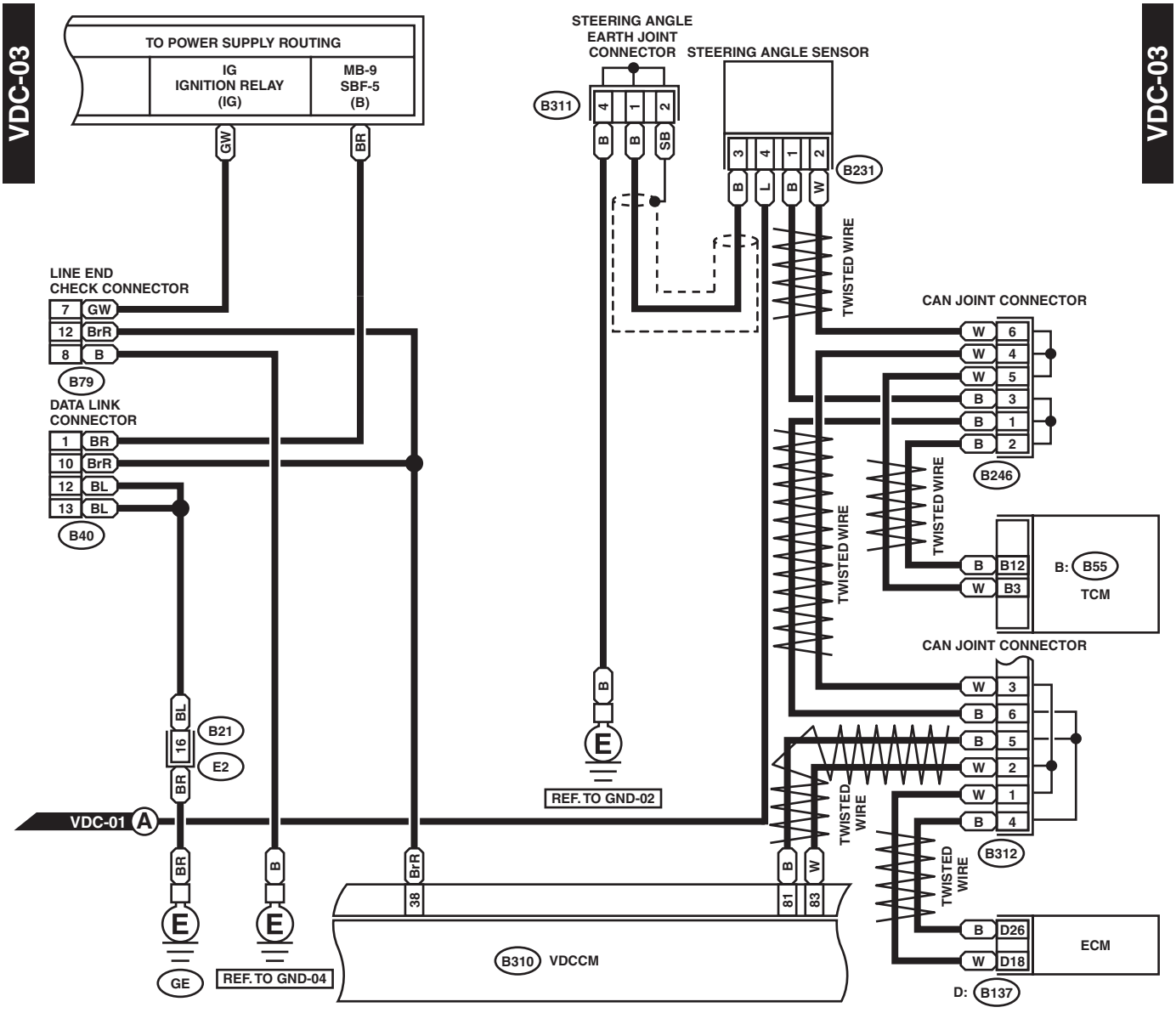


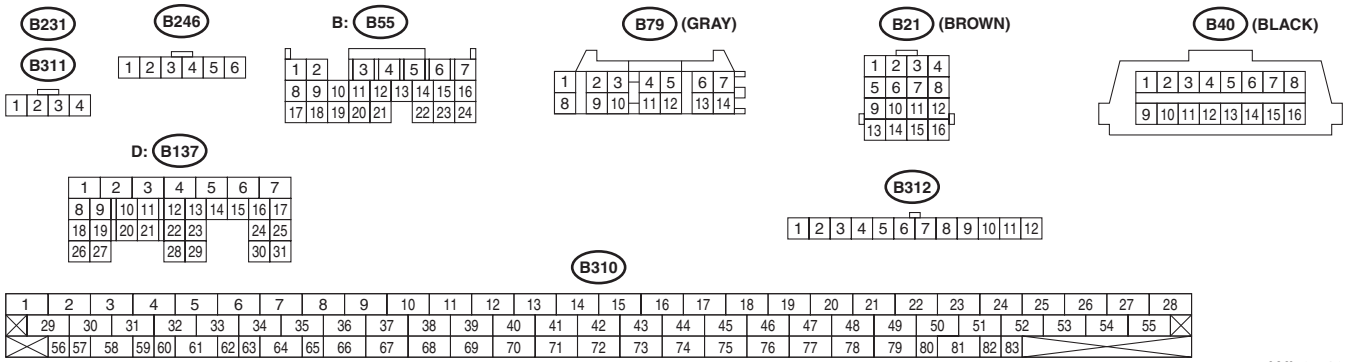
WI-07403


VDC-02
VDC-02
TO POWER SUPPLY ROUTING
ALT GENERATOR
FB-15 F/B FUSE NO. 18 (IG)
FB-36 F/B FUSE NO. 14 (IG)
VDCH/M
PRIMARY PRESSURE SENSOR
SECONDARY PRESSURE SENSOR
COMBINATION METER
VDC WARNING LIGHT
VDC OFF INDICATOR LIGHT
ABS WARNING LIGHT
PARKING BRAKE/ BRAKE FLUID WARNING LIGHT
VDC OPERATION INDICATOR LIGHT
BUZZER
VDC5
F91
F2
B100
B38
i3
B9
A: i12
B: i10
C: i11
B VDC-04
B310 VDCCM

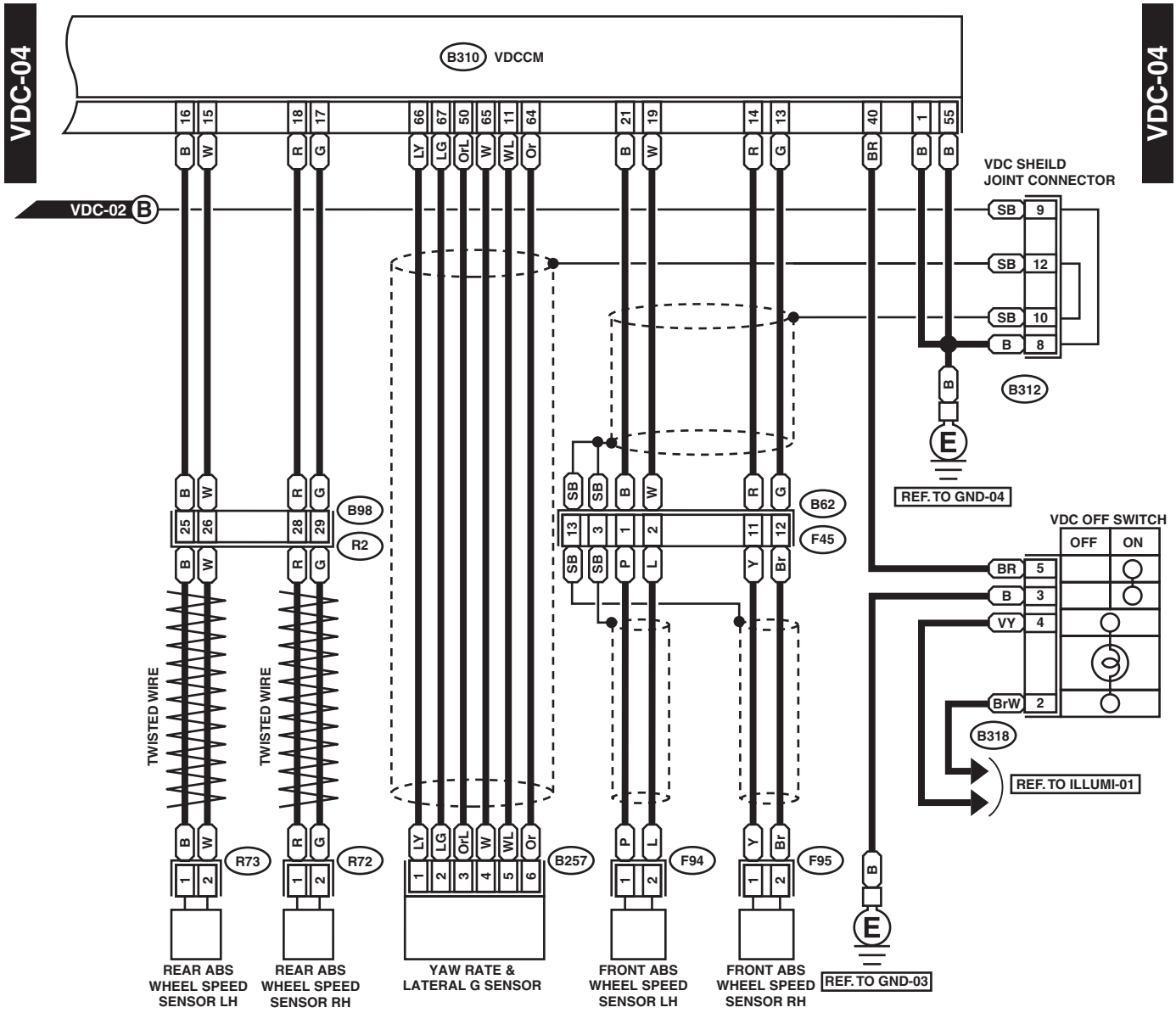
C: i11 (GREEN)
F91 (BLACK)
i2 (BLACK)
F2 (BLUE)
A: i12 (GREEN)
B: i10 (GREEN)
i3
B310

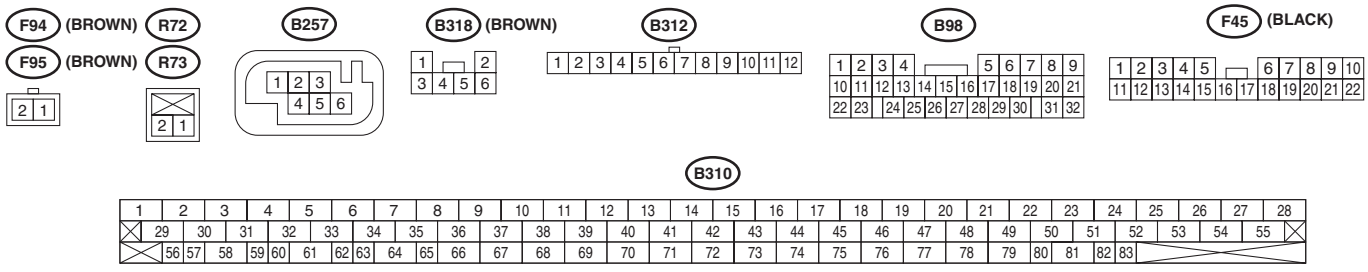
WI-07404


VDC-03
VDC-03
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
GW
BR
STEERING ANGLE
EARTH JOINT
CONNECTOR
STEERING ANGLE SENSOR
B311
B231
TWISTED WIRE
CAN JOINT CONNECTOR
B246
LINE END
CHECK CONNECTOR
B79
DATA LINK
CONNECTOR
B40
B21
E2
B: B55
TCM
CAN JOINT CONNECTOR
REF. TO GND-02
VDC-01 A
B312
B310 VDCCM
ECM
D: B137
GE
REF. TO GND-04


B231
B311
B246
B: B55
B79 (GRAY)
B21 (BROWN)
B40 (BLACK)
D: B137
B312
B310

WI-07405


VDC-04
VDC-04
B310 VDCCM
VDC-02 B
VDC SHEILD JOINT CONNECTOR
SB 9
SB 12
SB 10
B 8
B312
REF. TO GND-04
VDC OFF SWITCH
OFF
ON
BR 5
B 3
VY 4
BrW 2
B318
REF. TO ILLUMI-01
B98
R2
B62
F45
TWISTED WIRE
TWISTED WIRE
R73
R72
B257
F94
F95
REF. TO GND-03
REAR ABS WHEEL SPEED SENSOR LH
REAR ABS WHEEL SPEED SENSOR RH
YAW RATE & LATERAL G SENSOR
FRONT ABS WHEEL SPEED SENSOR LH
FRONT ABS WHEEL SPEED SENSOR RH

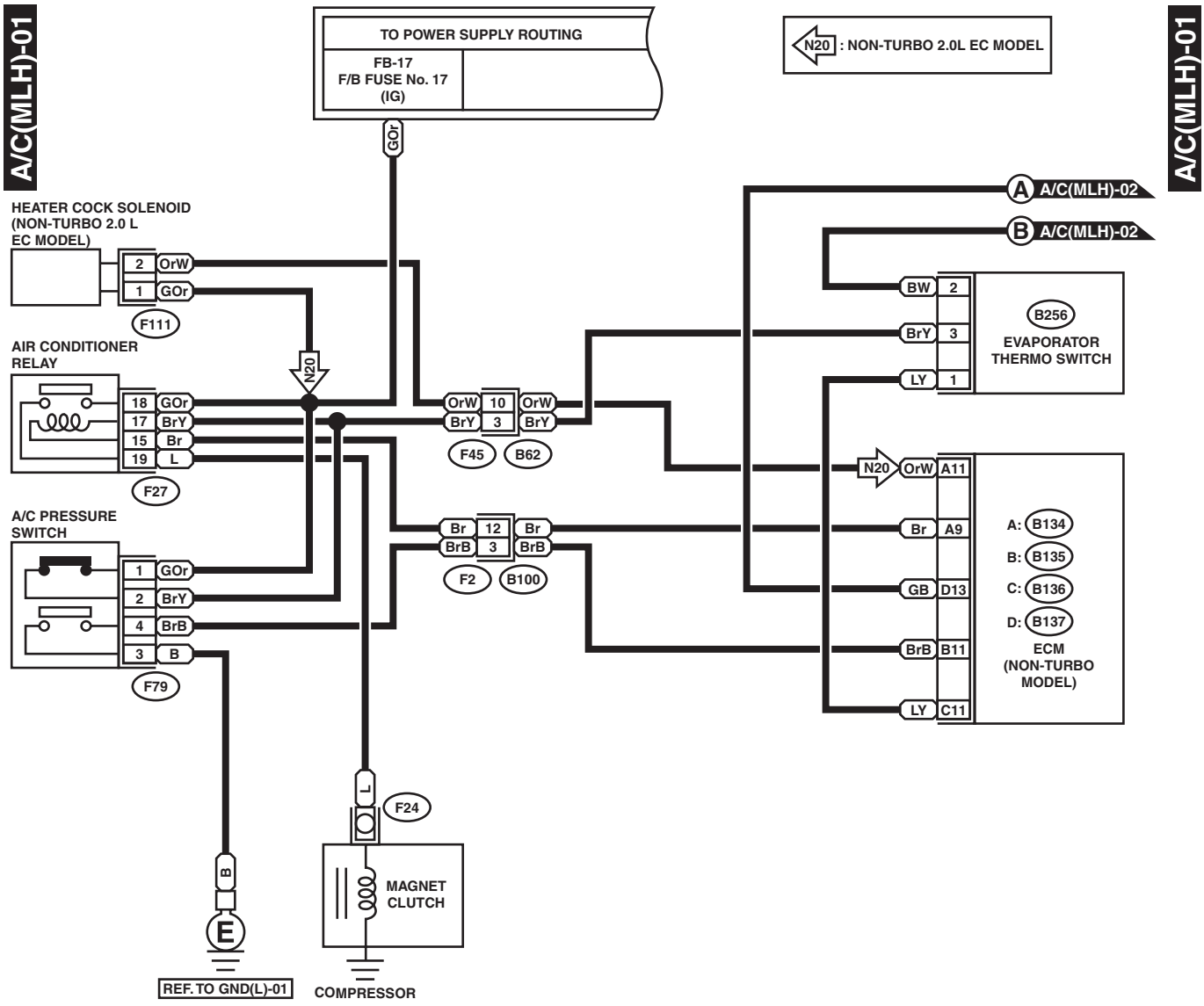

F94 (BROWN)
R72
F95 (BROWN)
R73
B257
B318 (BROWN)
B312
B98
F45 (BLACK)
B310

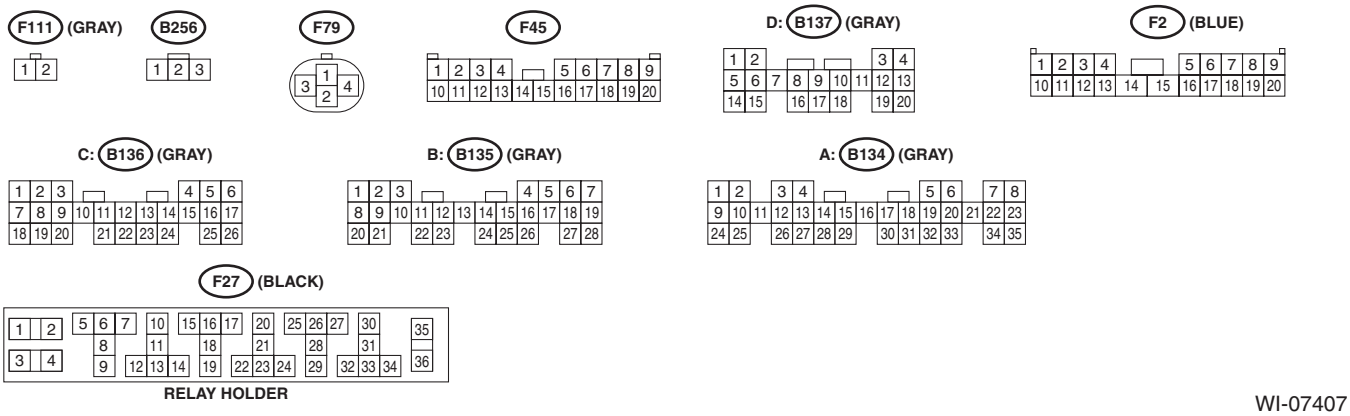
WI-07406

10.Air Conditioning System

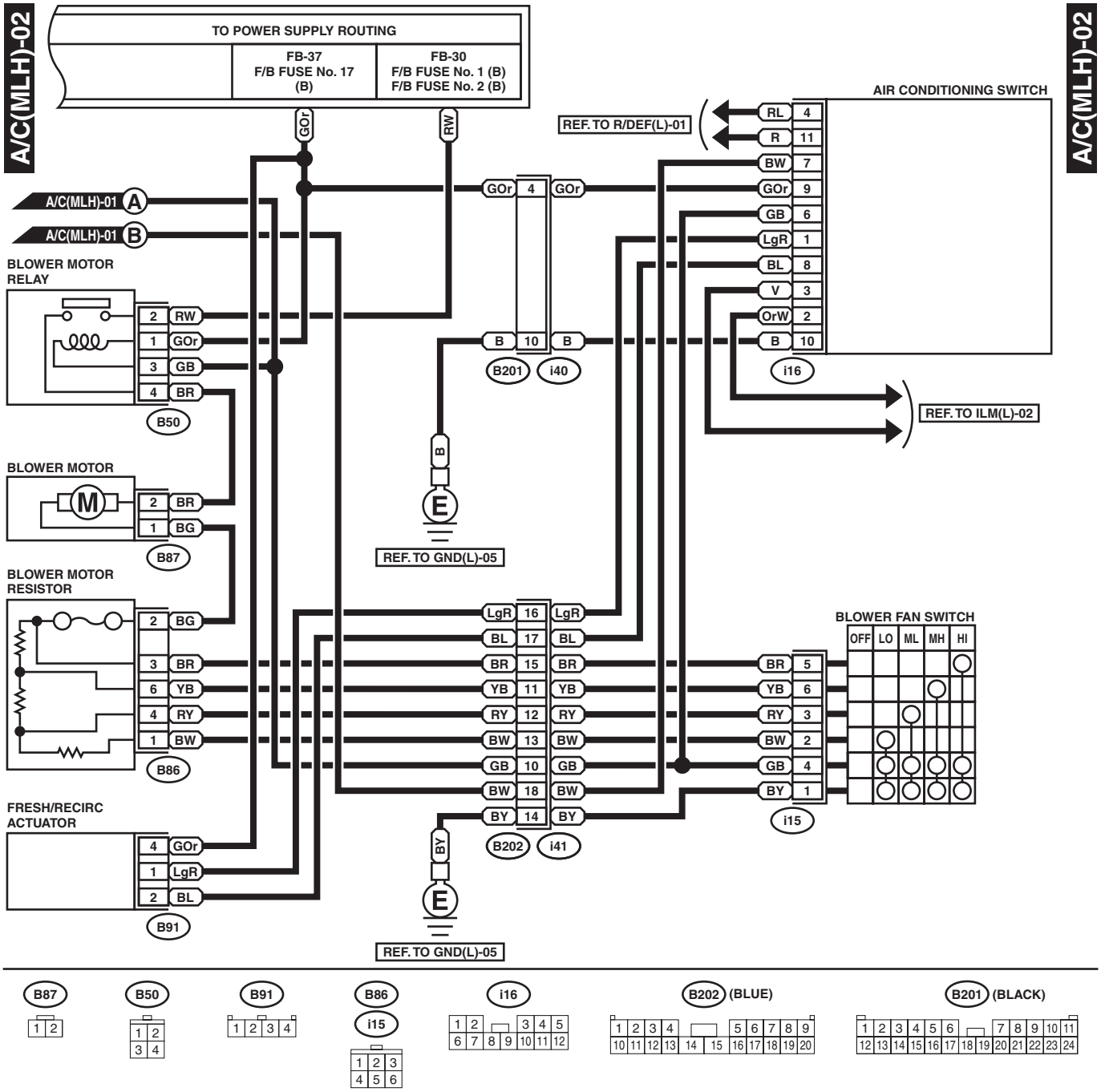
A: WIRING DIAGRAM

1. MANUAL A/C LHD MODEL



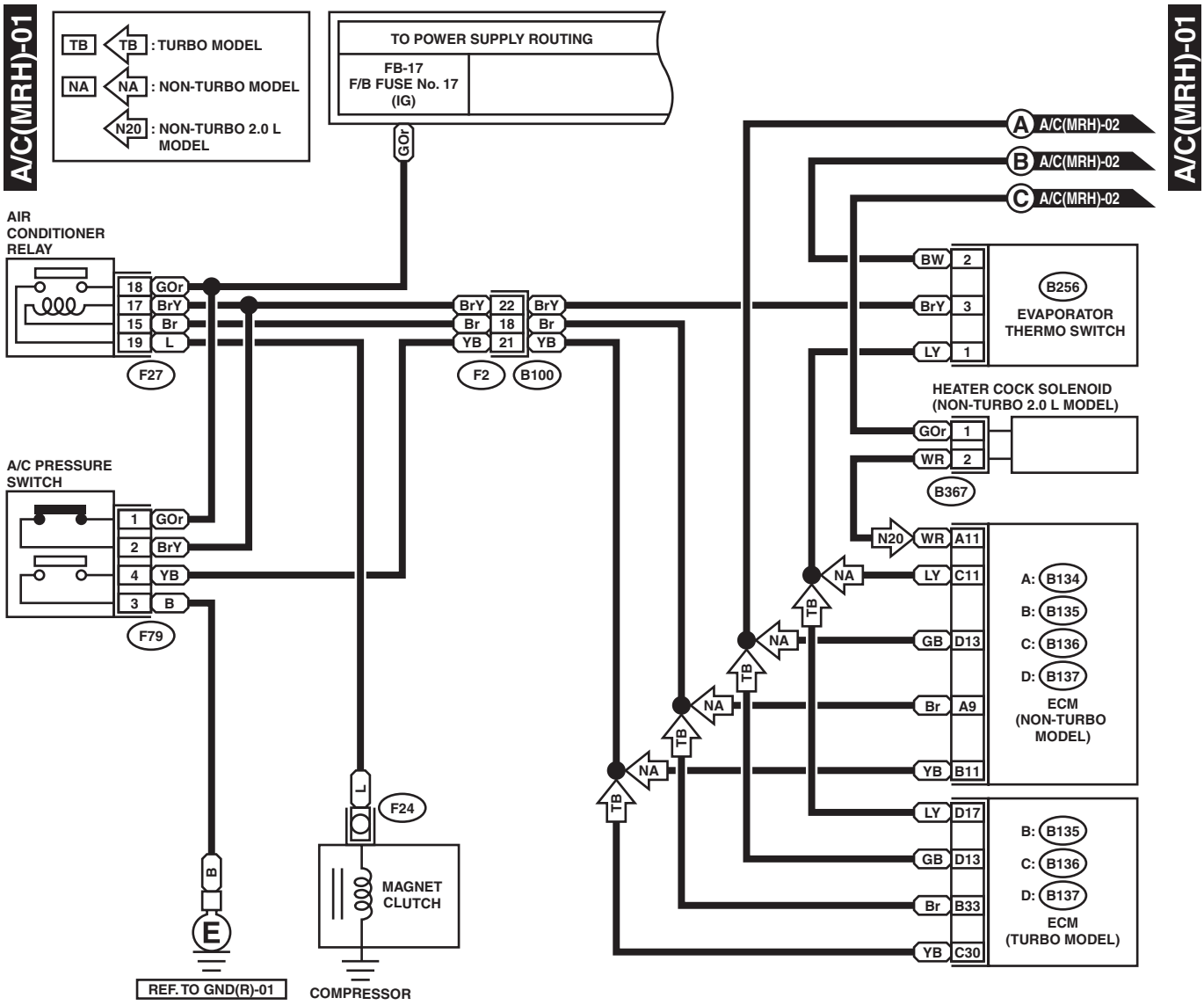


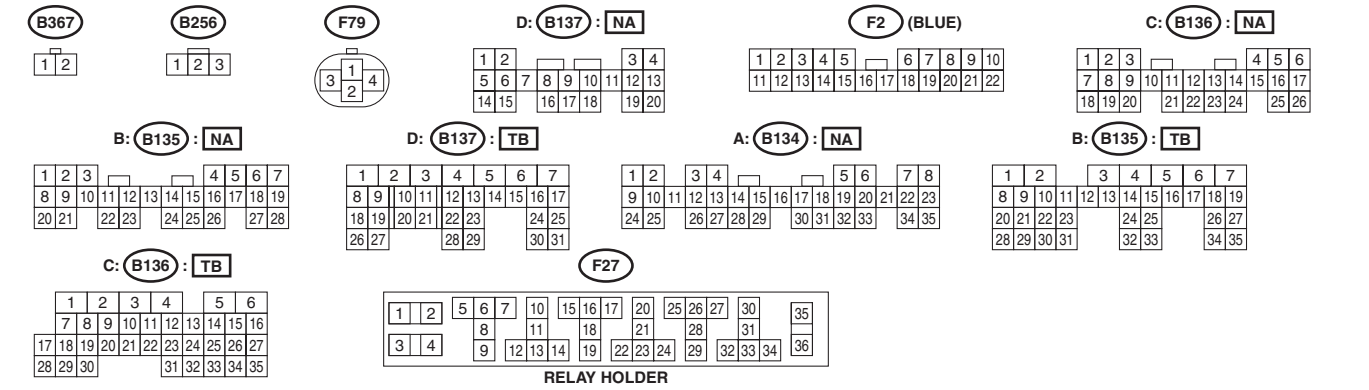
WI-07407


A/C(MLH)-02
TO POWER SUPPLY ROUTING
FB-37
F/B FUSE No. 17
(B)
FB-30
F/B FUSE No. 1 (B)
F/B FUSE No. 2 (B)
A/C(MLH)-02
AIR CONDITIONING SWITCH
REF. TO R/DEF(L)-01
RL 4
R 11
BW 7
GOr 9
GB 6
LgR 1
BL 8
V 3
OrW 2
B 10
i16
REF. TO ILM(L)-02
A/C(MLH)-01 A
A/C(MLH)-01 B
BLOWER MOTOR RELAY
2 RW
1 GOr
3 GB
4 BR
B50
BLOWER MOTOR
M
2 BR
1 BG
B87
BLOWER MOTOR RESISTOR
2 BG
3 BR
6 YB
4 RY
1 BW
B86
FRESH/RECIRC ACTUATOR
4 GOr
1 LgR
2 BL
B91
GOr 4 GOr
B 10 B
B201
i40
B
E
REF. TO GND(L)-05
LgR 16 LgR
BL 17 BL
BR 15 BR
YB 11 YB
RY 12 RY
BW 13 BW
GB 10 GB
BW 18 BW
BY 14 BY
B202
i41
BY
E
REF. TO GND(L)-05
BLOWER FAN SWITCH
OFF LO ML MH HI
BR 5
YB 6
RY 3
BW 2
GB 4
BY 1
i15
B87
B50
B91
B86
i15
i16
B202 (BLUE)
B201 (BLACK)

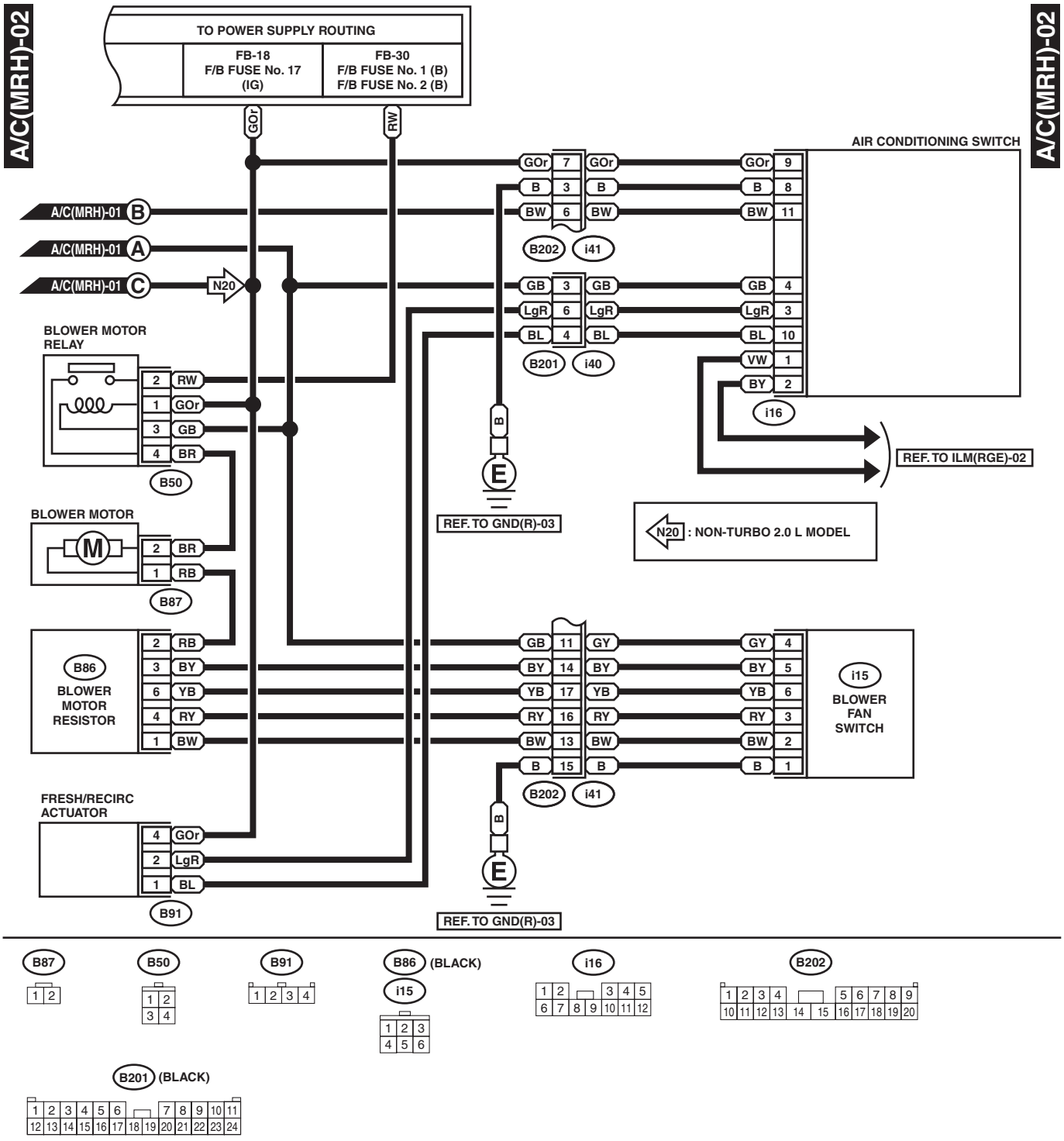
WI-07408

2. MANUAL A/C RHD MODEL



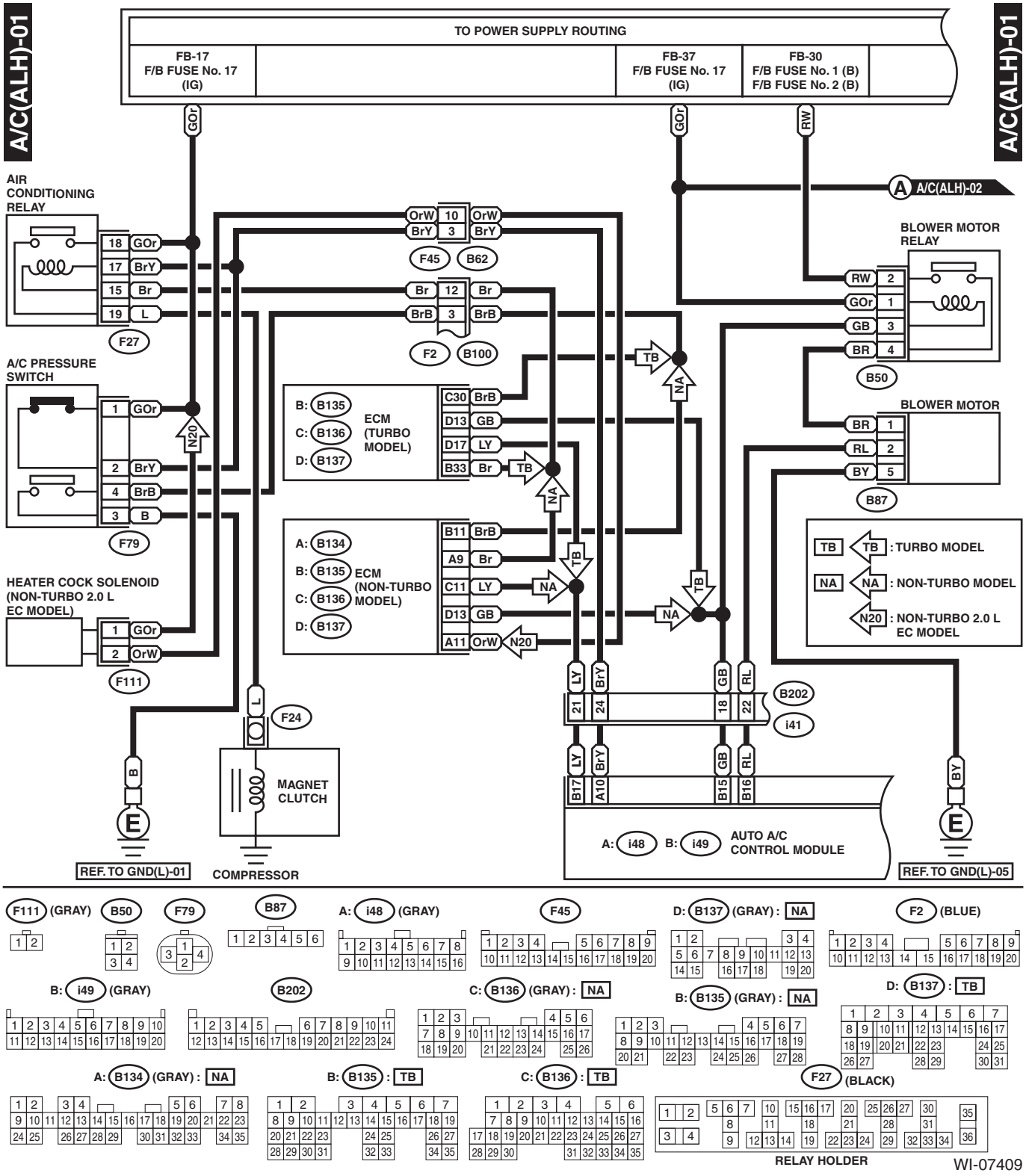


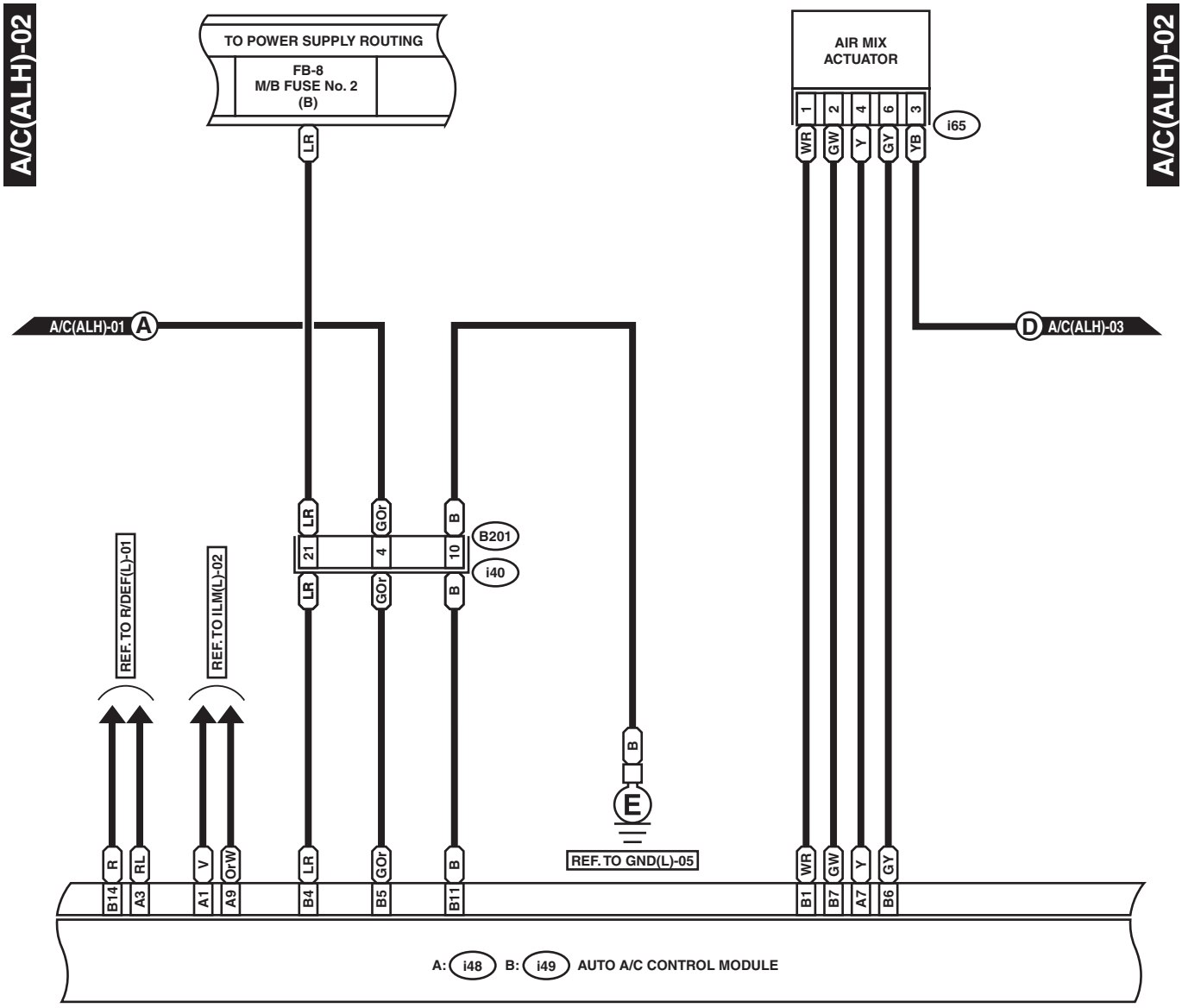
WI-03211

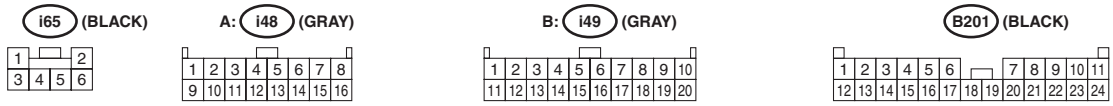

A/C(MRH)-02
A/C(MRH)-02
TO POWER SUPPLY ROUTING
FB-18
F/B FUSE No. 17
(IG)
FB-30
F/B FUSE No. 1 (B)
F/B FUSE No. 2 (B)
GOr
RW
AIR CONDITIONING SWITCH
A/C(MRH)-01 B
A/C(MRH)-01 A
A/C(MRH)-01 C
N20
B202
i41
B201
i40
i16
BLOWER MOTOR RELAY
B50
BLOWER MOTOR
B87
B86
BLOWER MOTOR RESISTOR
i15
BLOWER FAN SWITCH
FRESH/RECIRC ACTUATOR
B91
REF. TO GND(R)-03
REF. TO ILM(RGE)-02
N20 : NON-TURBO 2.0 L MODEL
B87
B50
B91
B86 (BLACK)
i15
i16
B202
B201 (BLACK)

WI-03212

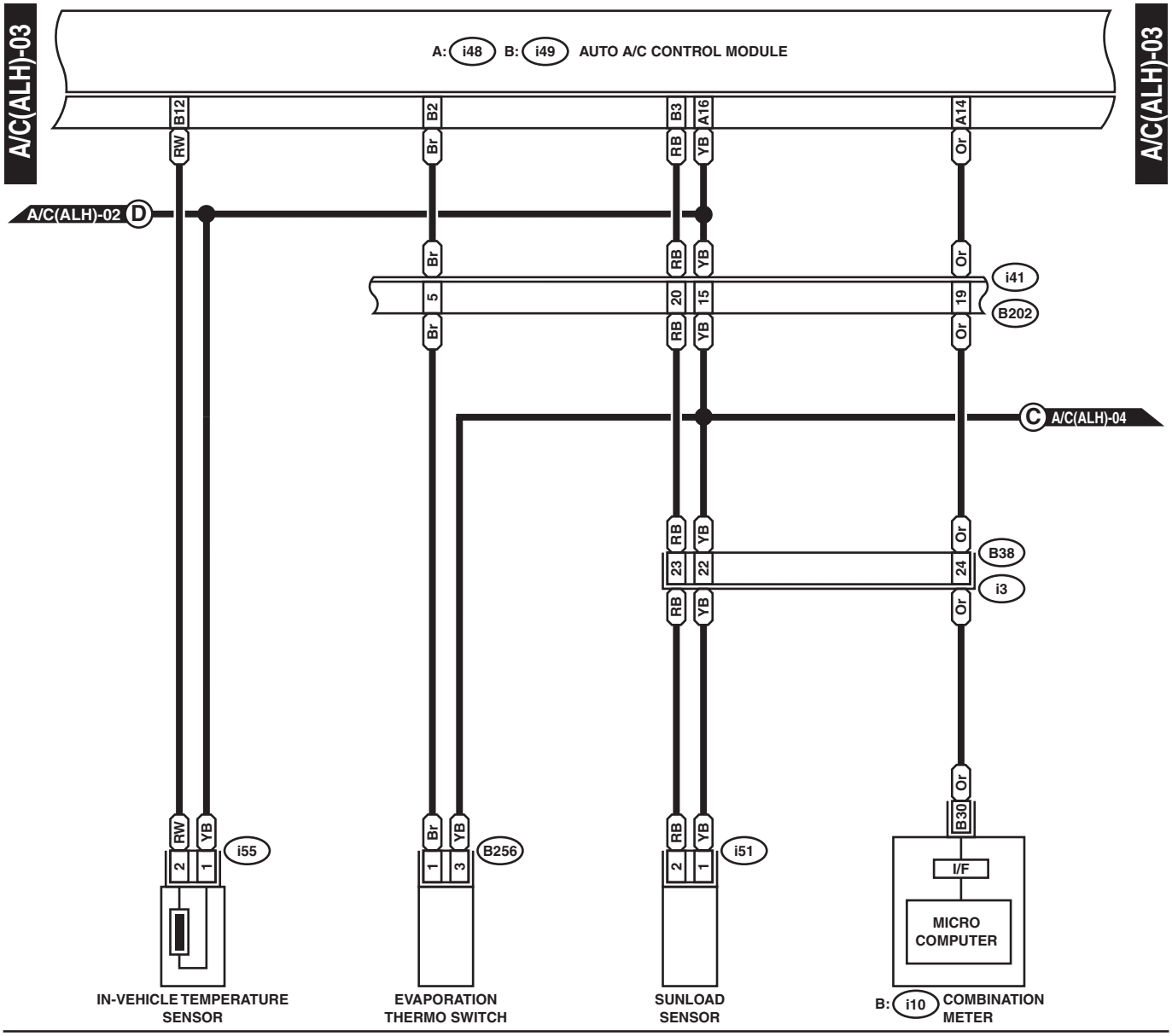
3. AUTO A/C LHD MODEL

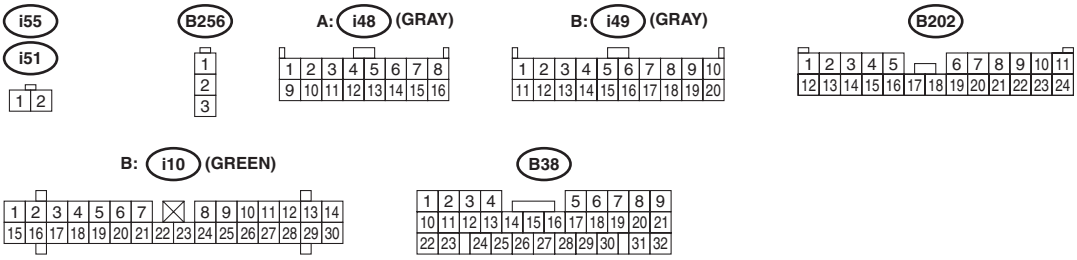



A/C(ALH)-02
TO POWER SUPPLY ROUTING
FB-8
M/B FUSE No. 2
(B)
AIR MIX
ACTUATOR
i65
A/C(ALH)-01 A
D A/C(ALH)-03
B201
i40
REF. TO R/DEF(L)-01
REF. TO ILM(L)-02
REF. TO GND(L)-05
A: i48 B: i49 AUTO A/C CONTROL MODULE

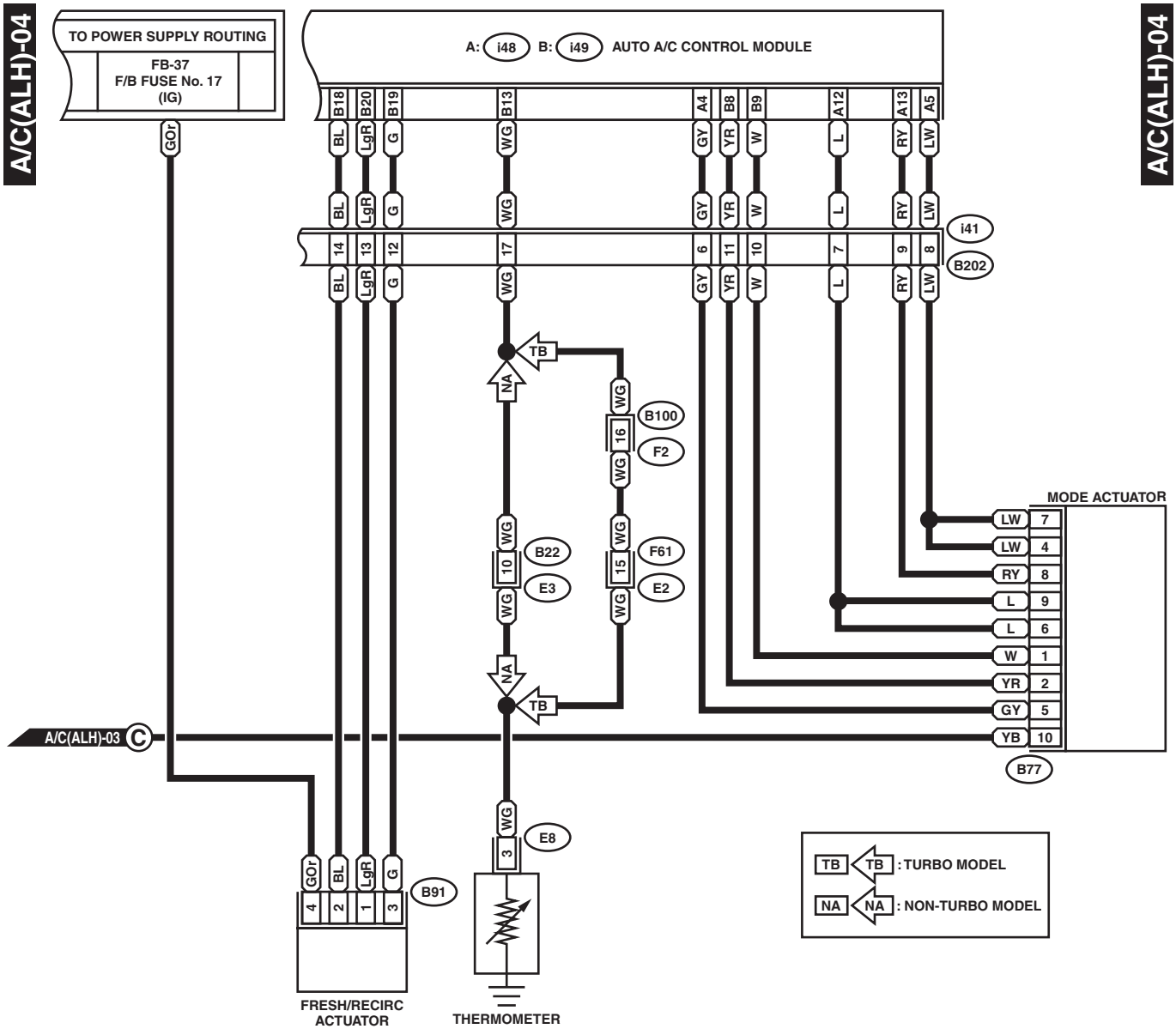

i65 (BLACK)
A: i48 (GRAY)
B: i49 (GRAY)
B201 (BLACK)

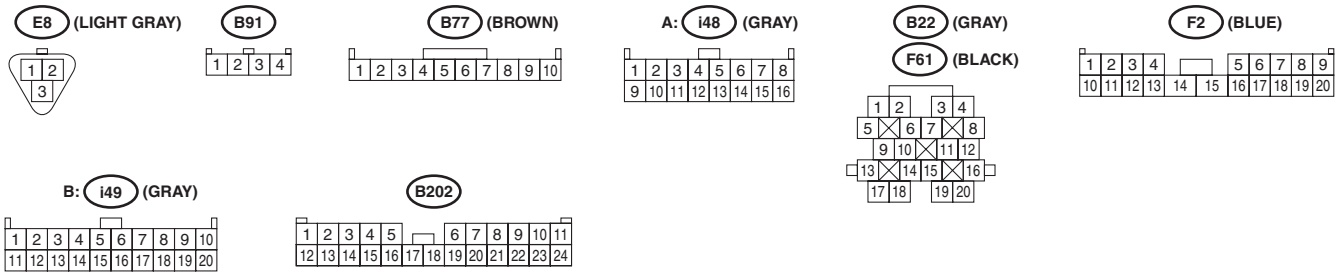
WI-05984


A/C(ALH)-03
A/C(ALH)-03
A: i48 B: i49 AUTO A/C CONTROL MODULE
B12
B2
B3
A16
A14
RW
Br
RB
YB
Or
A/C(ALH)-02 D
i41
B202
5
20
15
19
C A/C(ALH)-04
23
22
24
B38
i3
B30
i55
i51
B256
I/F
MICRO COMPUTER
IN-VEHICLE TEMPERATURE SENSOR
EVAPORATION THERMO SWITCH
SUNLOAD SENSOR
B: i10 COMBINATION METER


i55
i51
B256
A: i48 (GRAY)
B: i49 (GRAY)
B202
B: i10 (GREEN)
B38

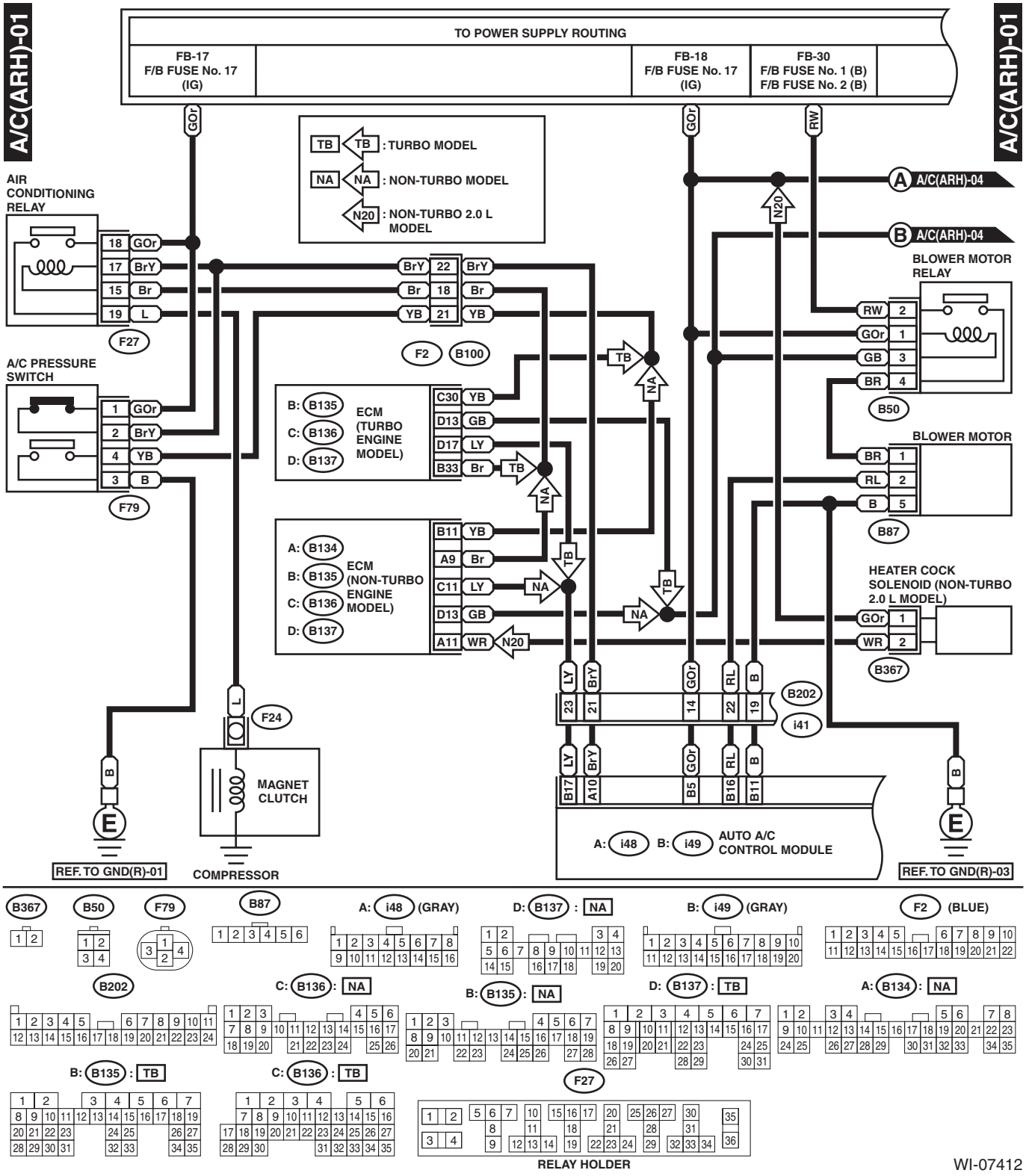
WI-07410

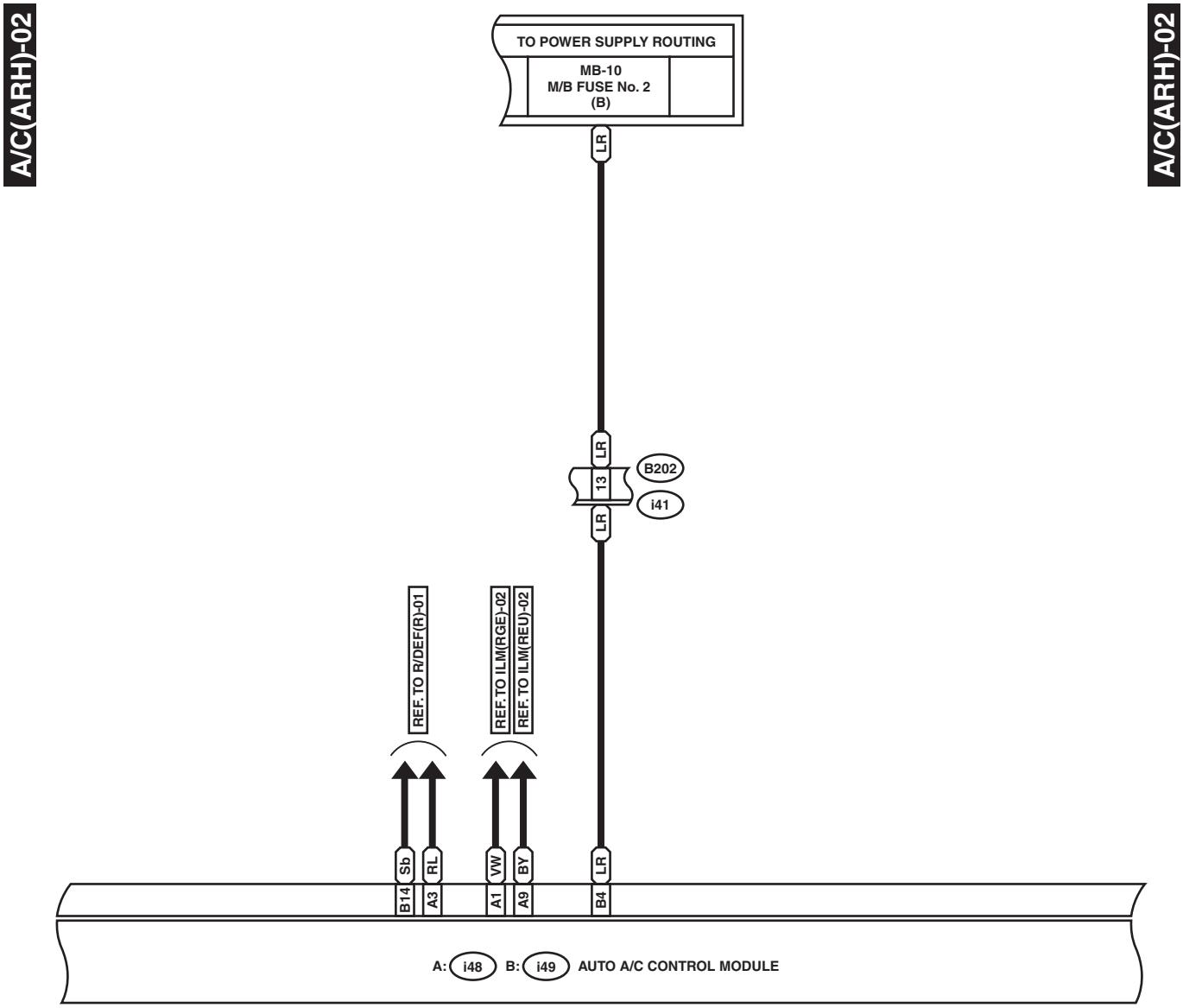

A/C(ALH)-04
TO POWER SUPPLY ROUTING
FB-37
F/B FUSE No. 17
(IG)
A: i48 B: i49 AUTO A/C CONTROL MODULE
i41
B202
MODE ACTUATOR
B100
F2
B22
E3
F61
E2
E8
B91
FRESH/RECIRC ACTUATOR
THERMOMETER
A/C(ALH)-03
B77
TB : TURBO MODEL
NA : NON-TURBO MODEL

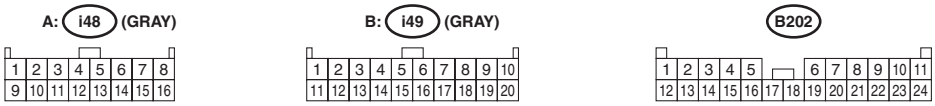

E8 (LIGHT GRAY)
B91
B77 (BROWN)
A: i48 (GRAY)
B22 (GRAY)
F61 (BLACK)
F2 (BLUE)
B: i49 (GRAY)
B202

WI-07411

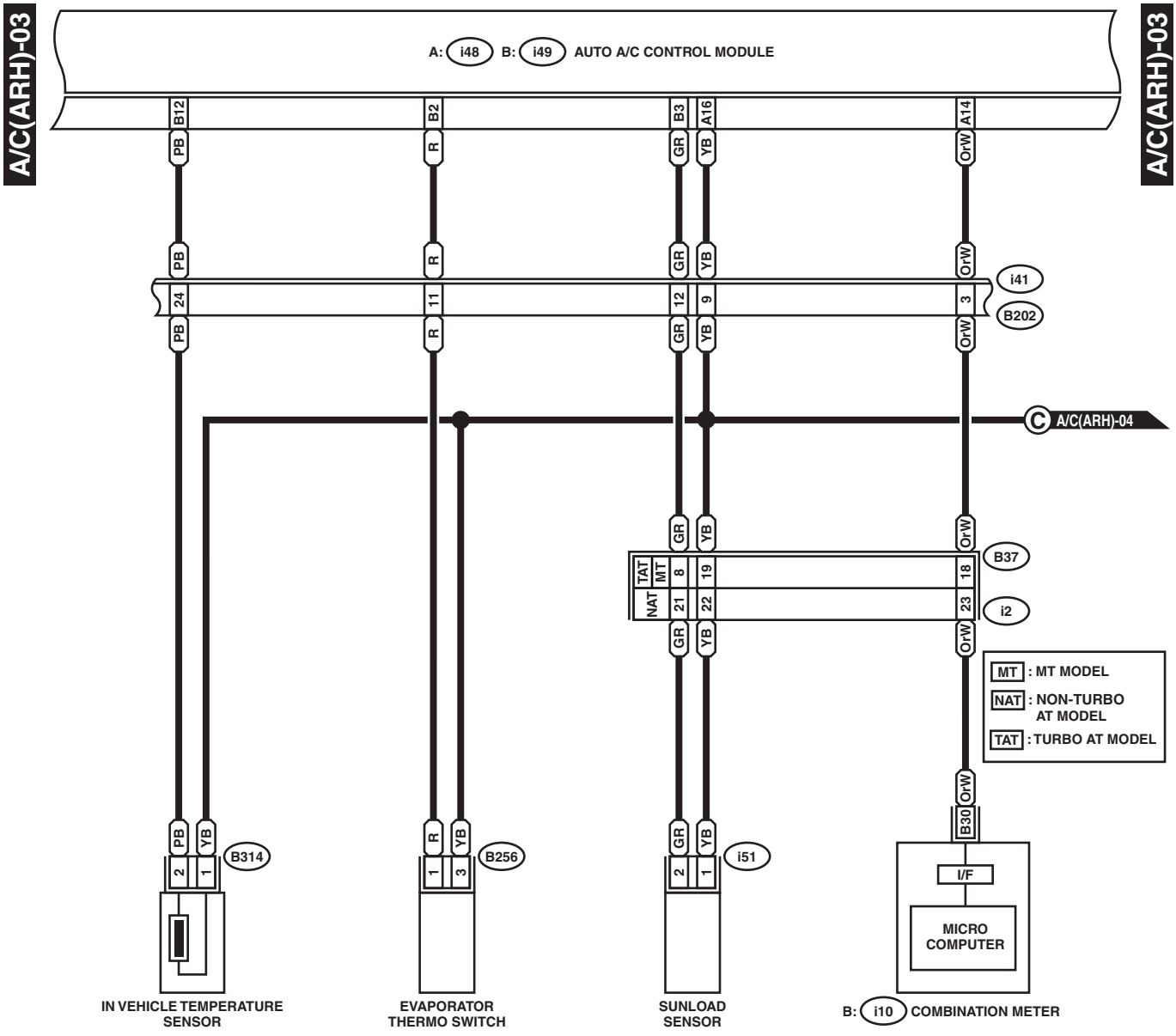
4. AUTO A/C RHD MODEL

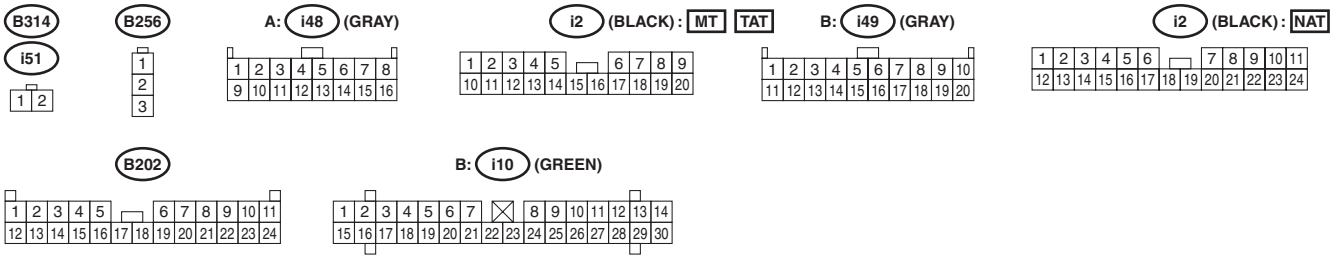



A/C(ARH)-02
A/C(ARH)-02
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE No. 2
(B)
LR
LR
13
B202
i41
LR
REF. TO R/DEF(R)-01
REF. TO ILM(RGE)-02
REF. TO ILM(REU)-02
Sb
RL
VW
BY
LR
B14
A3
A1
A9
B4
A: i48 B: i49 AUTO A/C CONTROL MODULE

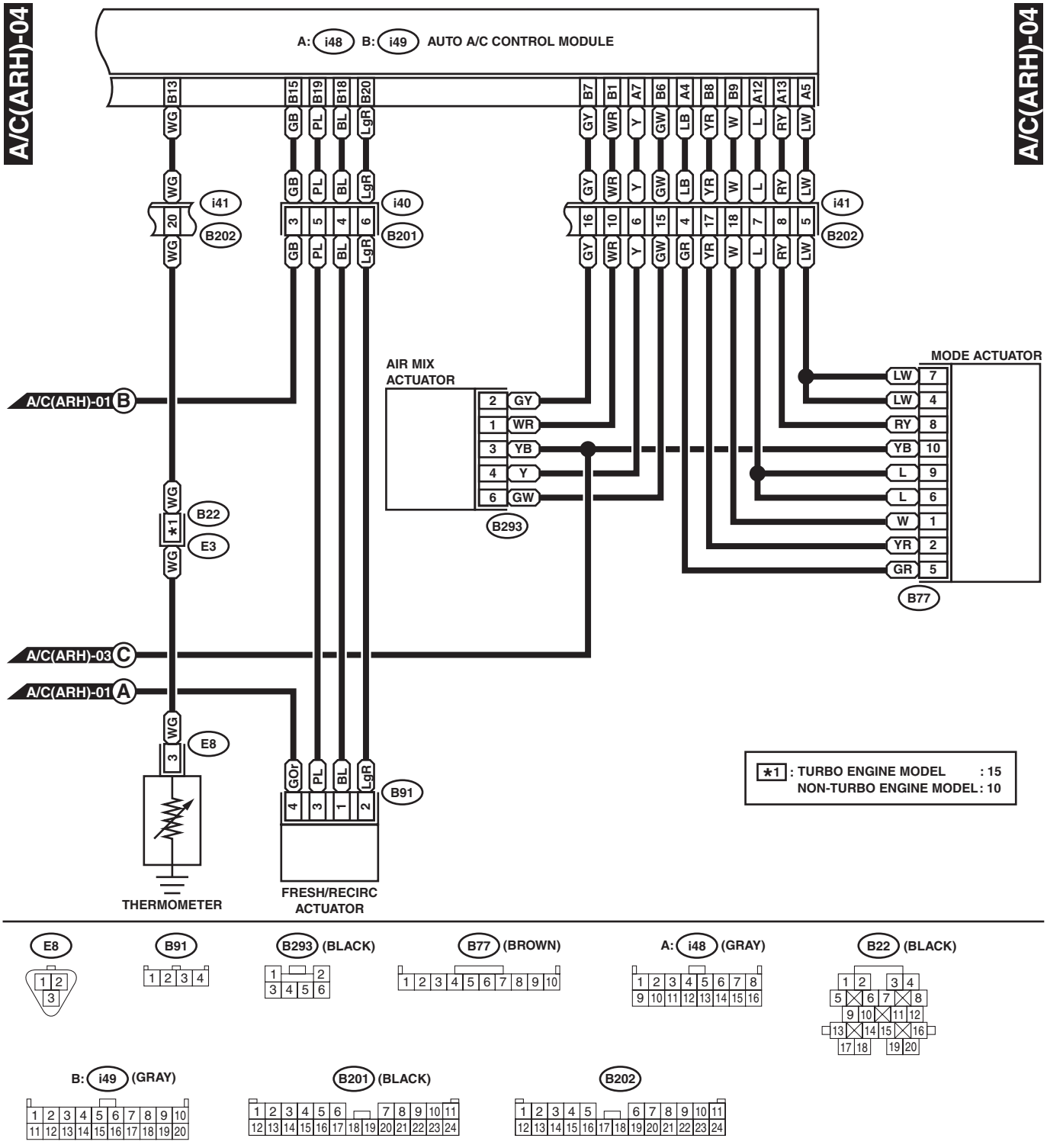

A: i48 (GRAY)
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15 16
B: i49 (GRAY)
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
B202
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16 17 18 19 20 21 22 23 24

WI-03217


A/C(ARH)-03
A/C(ARH)-03
A: i48 B: i49 AUTO A/C CONTROL MODULE
B12
B2
B3
A16
A14
PB
R
GR
YB
OrW
i41
B202
24
11
12
9
3
C A/C(ARH)-04
TAT
MT
NAT
8
19
18
21
22
23
B37
i2
MT : MT MODEL
NAT : NON-TURBO AT MODEL
TAT : TURBO AT MODEL
B30
I/F
MICRO COMPUTER
B: i10 COMBINATION METER
B314
2
1
IN VEHICLE TEMPERATURE SENSOR
B256
3
EVAPORATOR THERMO SWITCH
i51
SUNLOAD SENSOR


B314
i51
B256
A: i48 (GRAY)
i2 (BLACK) : MT TAT
B: i49 (GRAY)
i2 (BLACK) : NAT
B202
B: i10 (GREEN)

WI-07413


A/C(ARH)-04
A/C(ARH)-04
A: i48 B: i49 AUTO A/C CONTROL MODULE
B13 B15 B19 B18 B20 B7 B1 A7 B6 A4 B8 B9 A12 A13 A5
WG GB PL BL LgR GY WR Y GW LB YR W L RY LW
i41 20 B202
i40 3 5 4 6 B201
i41 16 10 6 15 4 17 18 7 8 5 B202
GR
AIR MIX ACTUATOR
2 GY
1 WR
3 YB
4 Y
6 GW
B293
MODE ACTUATOR
LW 7
LW 4
RY 8
YB 10
L 9
L 6
W 1
YR 2
GR 5
B77
A/C(ARH)-01 B
A/C(ARH)-03 C
A/C(ARH)-01 A
*1 B22 E3
E8 3
GOr
B91 4 3 1 2
THERMOMETER
FRESH/RECIRC ACTUATOR
*1 : TURBO ENGINE MODEL : 15
NON-TURBO ENGINE MODEL : 10

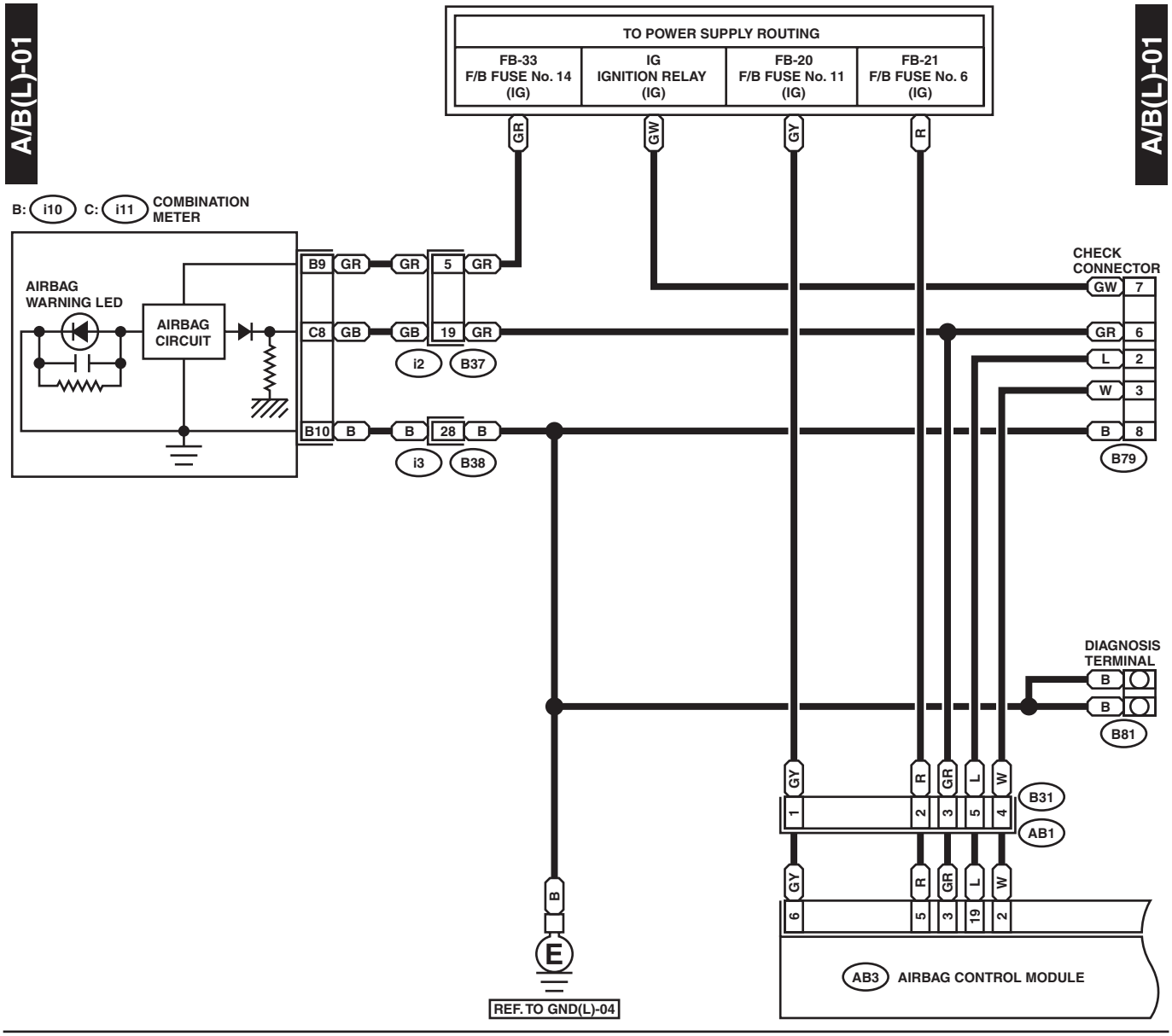
E8
B91
B293 (BLACK)
B77 (BROWN)
A: i48 (GRAY)
B22 (BLACK)
B: i49 (GRAY)
B201 (BLACK)
B202

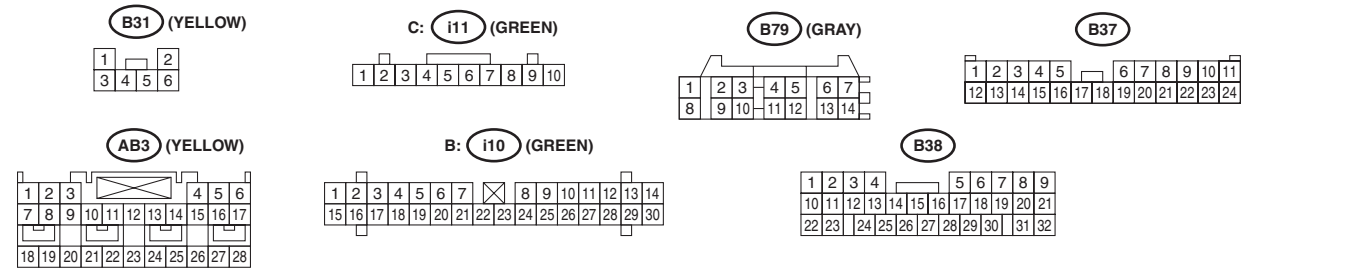
WI-00279

11.Airbag System

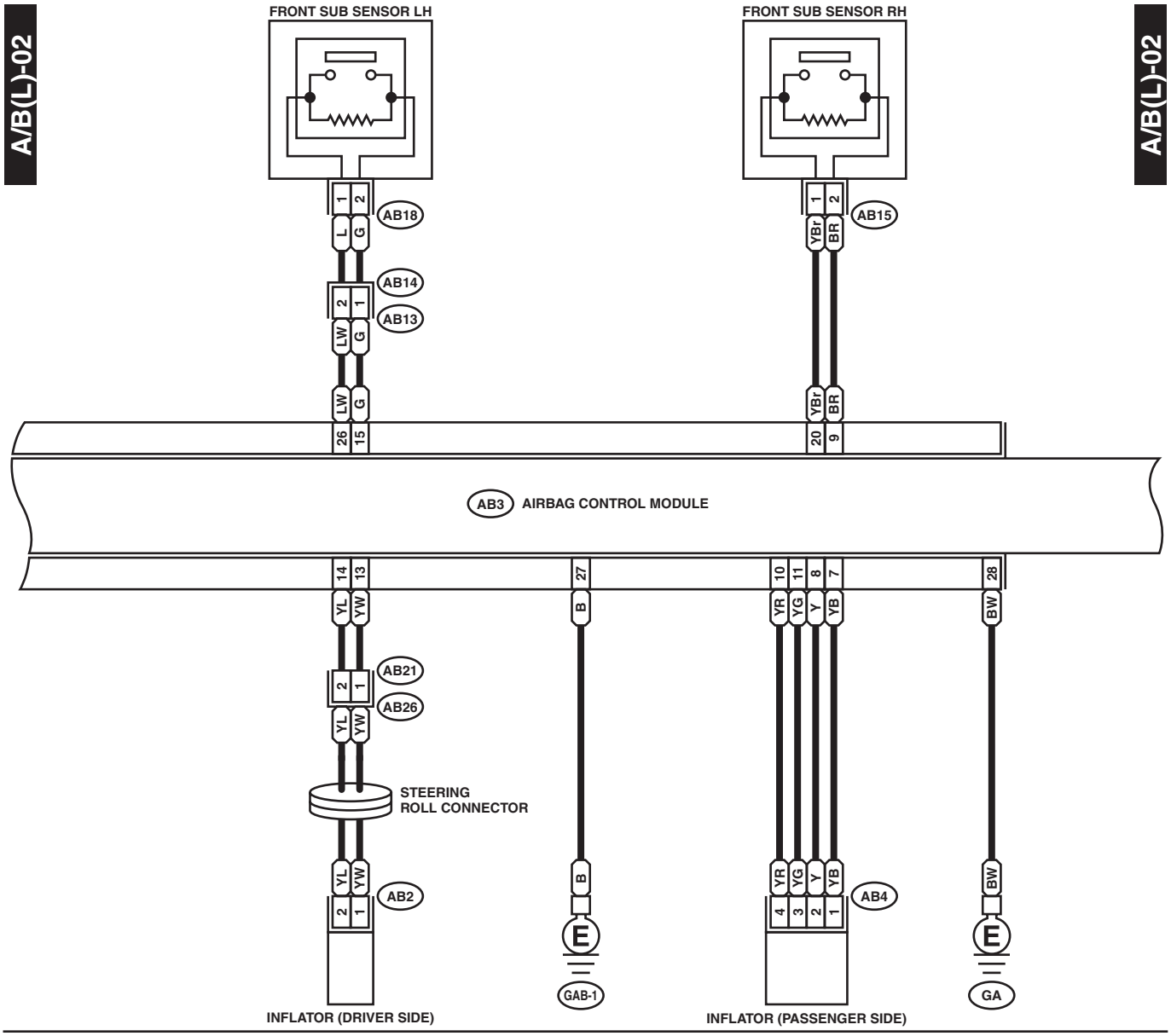
A: WIRING DIAGRAM

1. LHD MODEL

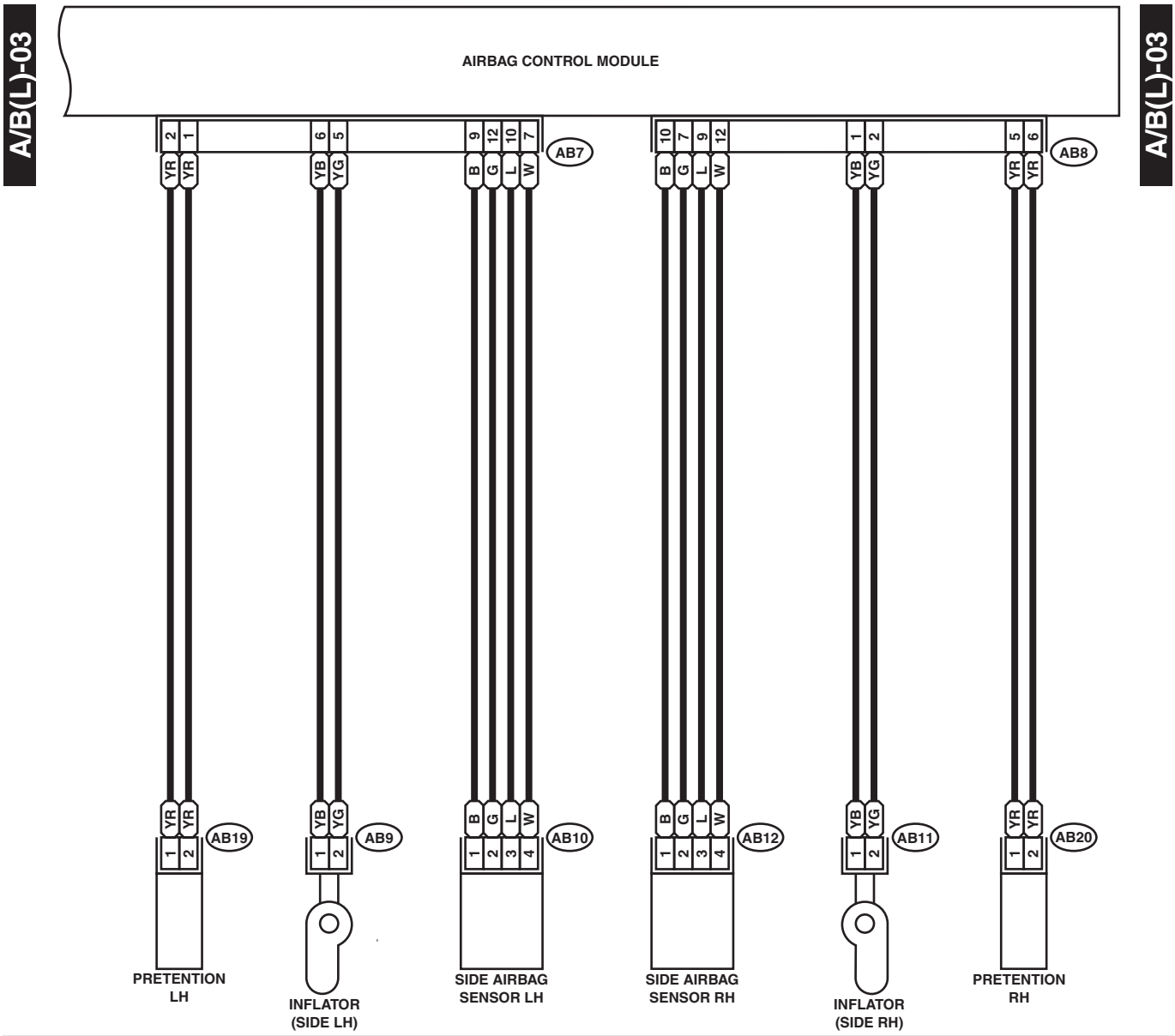




WI-07414

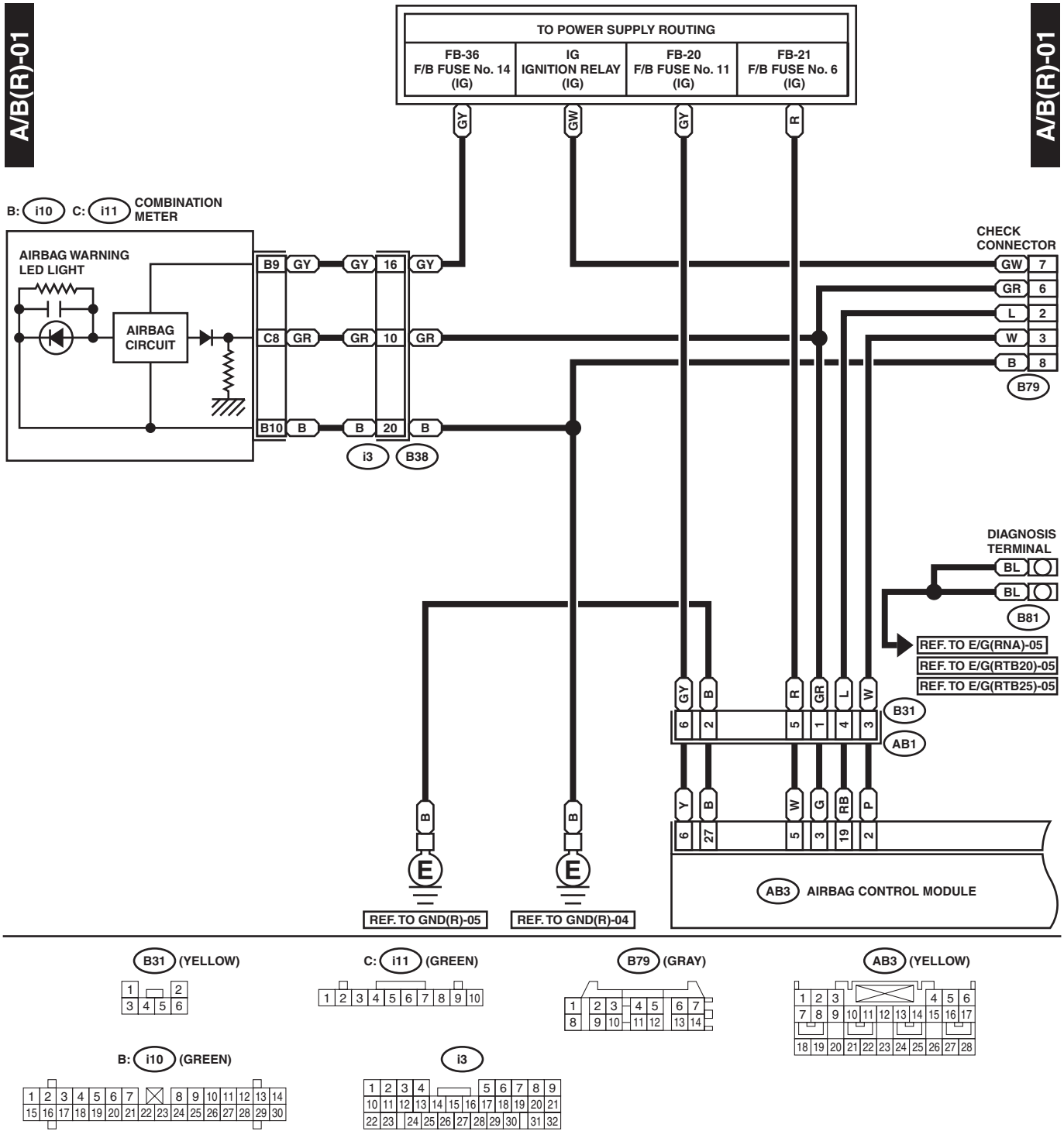

A/B(L)-02
A/B(L)-02
FRONT SUB SENSOR LH
FRONT SUB SENSOR RH
AB18
AB15
AB14
AB13
AB3 AIRBAG CONTROL MODULE
AB21
AB26
STEERING ROLL CONNECTOR
AB2
AB4
GAB-1
GA
INFLATOR (DRIVER SIDE)
INFLATOR (PASSENGER SIDE)
AB13 (YELLOW)
AB21 (YELLOW)
AB2 (BLACK)
AB15 (YELLOW)
AB18 (YELLOW)
AB4 (YELLOW)
AB3 (YELLOW)

WI-03205

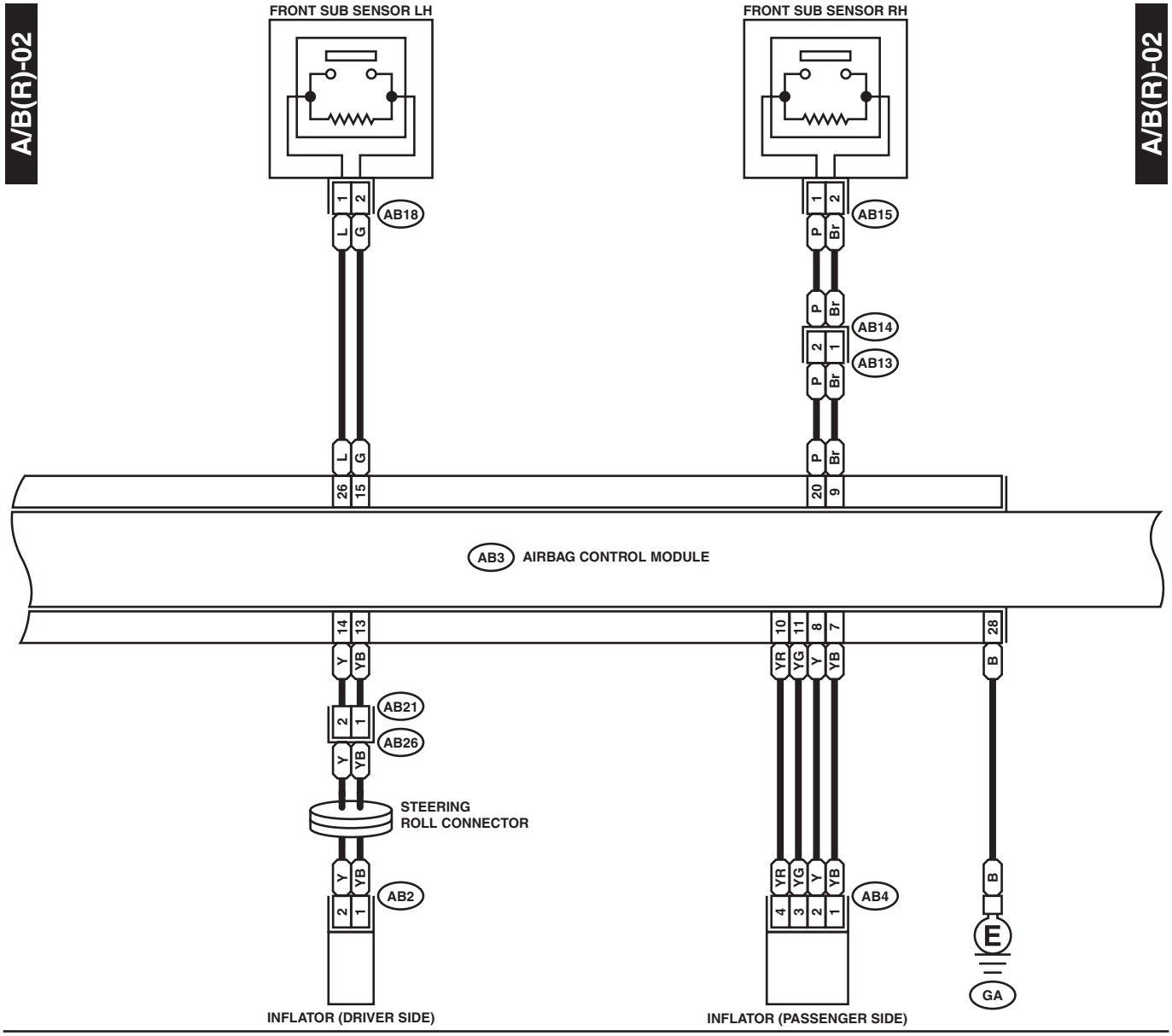

A/B(L)-03
AIRBAG CONTROL MODULE
A/B(L)-03
AB7
AB8
AB19
AB9
AB10
AB12
AB11
AB20
PRETENTION LH
INFLATOR (SIDE LH)
SIDE AIRBAG SENSOR LH
SIDE AIRBAG SENSOR RH
INFLATOR (SIDE RH)
PRETENTION RH
(YELLOW) AB9 AB11 (YELLOW)
(YELLOW) AB19 AB20 (YELLOW)
AB10 (YELLOW)
AB12 (YELLOW)
AB7 (YELLOW)
AB8 (YELLOW)

WI-07415

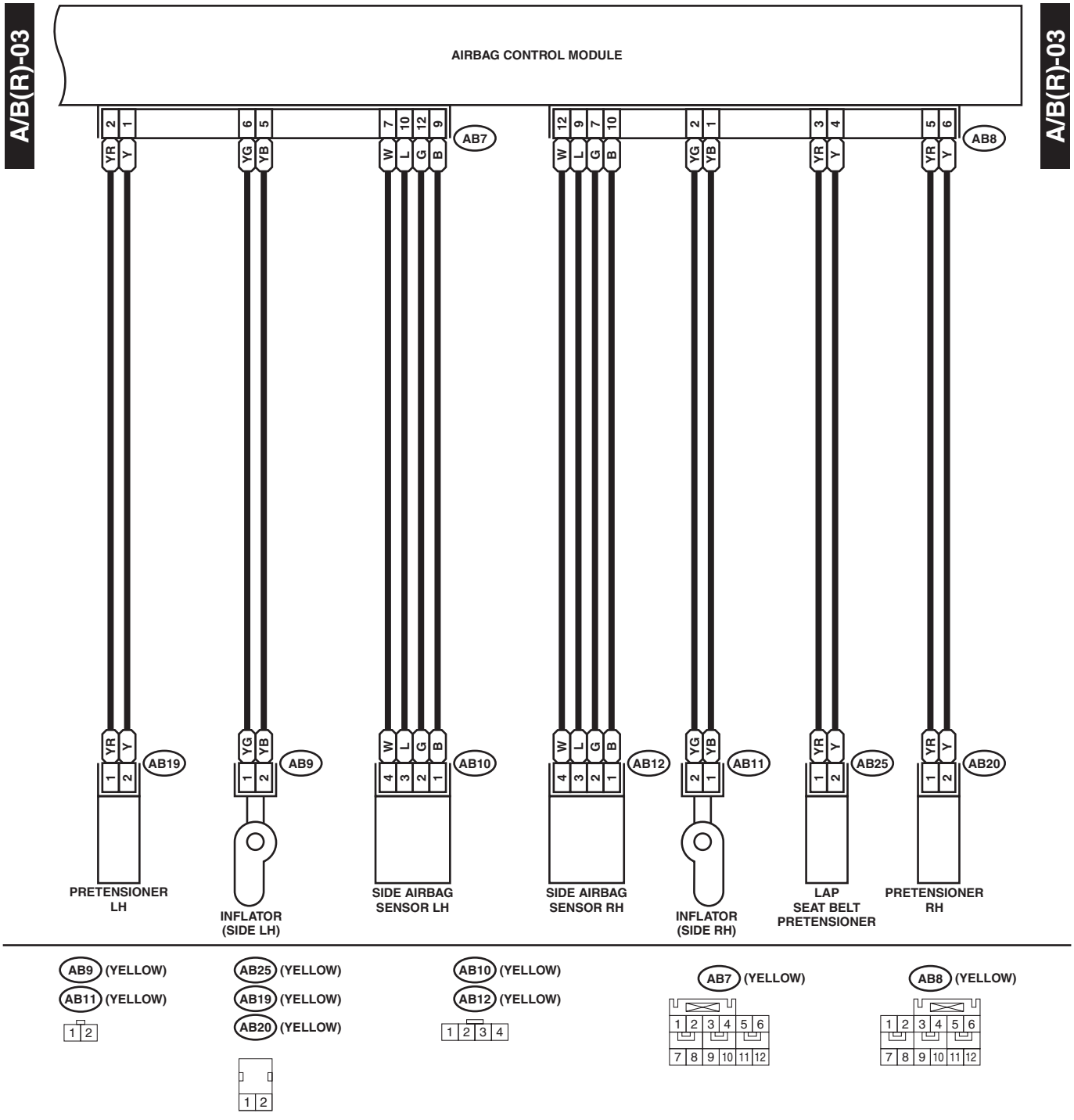
2. RHD MODEL



WI-07416


A/B(R)-02
A/B(R)-02
FRONT SUB SENSOR LH
FRONT SUB SENSOR RH
AB18
AB15
AB14
AB13
AB3 AIRBAG CONTROL MODULE
AB21
AB26
STEERING ROLL CONNECTOR
AB2
AB4
GA
INFLATOR (DRIVER SIDE)
INFLATOR (PASSENGER SIDE)
AB13 (YELLOW)
AB21 (YELLOW)
AB2 (BLACK)
AB15 (YELLOW)
AB18 (YELLOW)
AB4 (YELLOW)
AB3 (YELLOW)

WI-05980

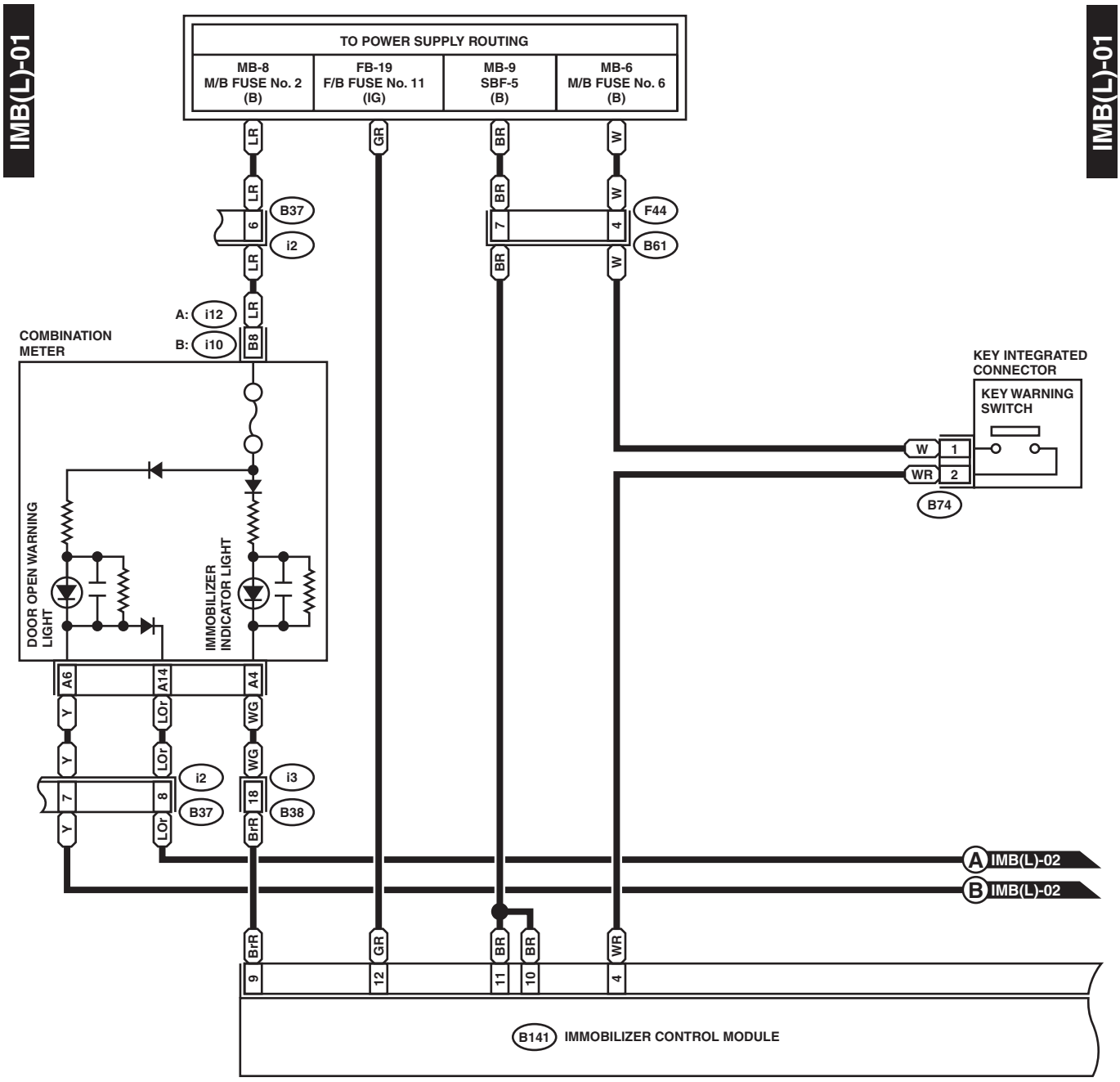

A/B(R)-03
AIRBAG CONTROL MODULE
A/B(R)-03
AB7
AB8
AB19
AB9
AB10
AB12
AB11
AB25
AB20
PRETENSIONER LH
INFLATOR (SIDE LH)
SIDE AIRBAG SENSOR LH
SIDE AIRBAG SENSOR RH
INFLATOR (SIDE RH)
LAP SEAT BELT PRETENSIONER
PRETENSIONER RH
AB9 (YELLOW)
AB11 (YELLOW)
AB25 (YELLOW)
AB19 (YELLOW)
AB20 (YELLOW)
AB10 (YELLOW)
AB12 (YELLOW)
AB7 (YELLOW)
AB8 (YELLOW)

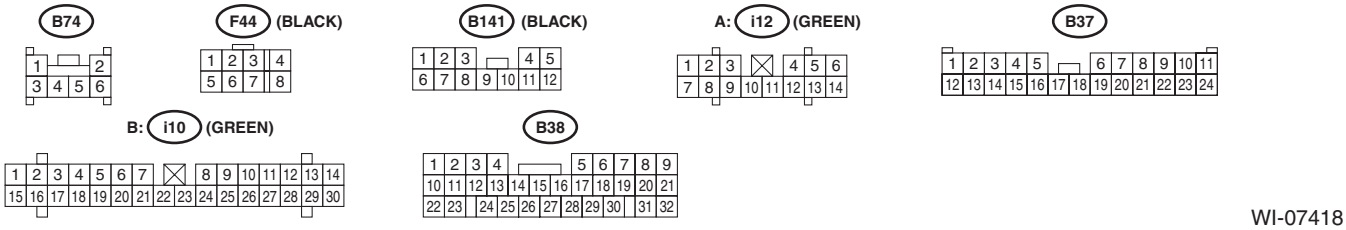
WI-07417

12.Immobilizer System

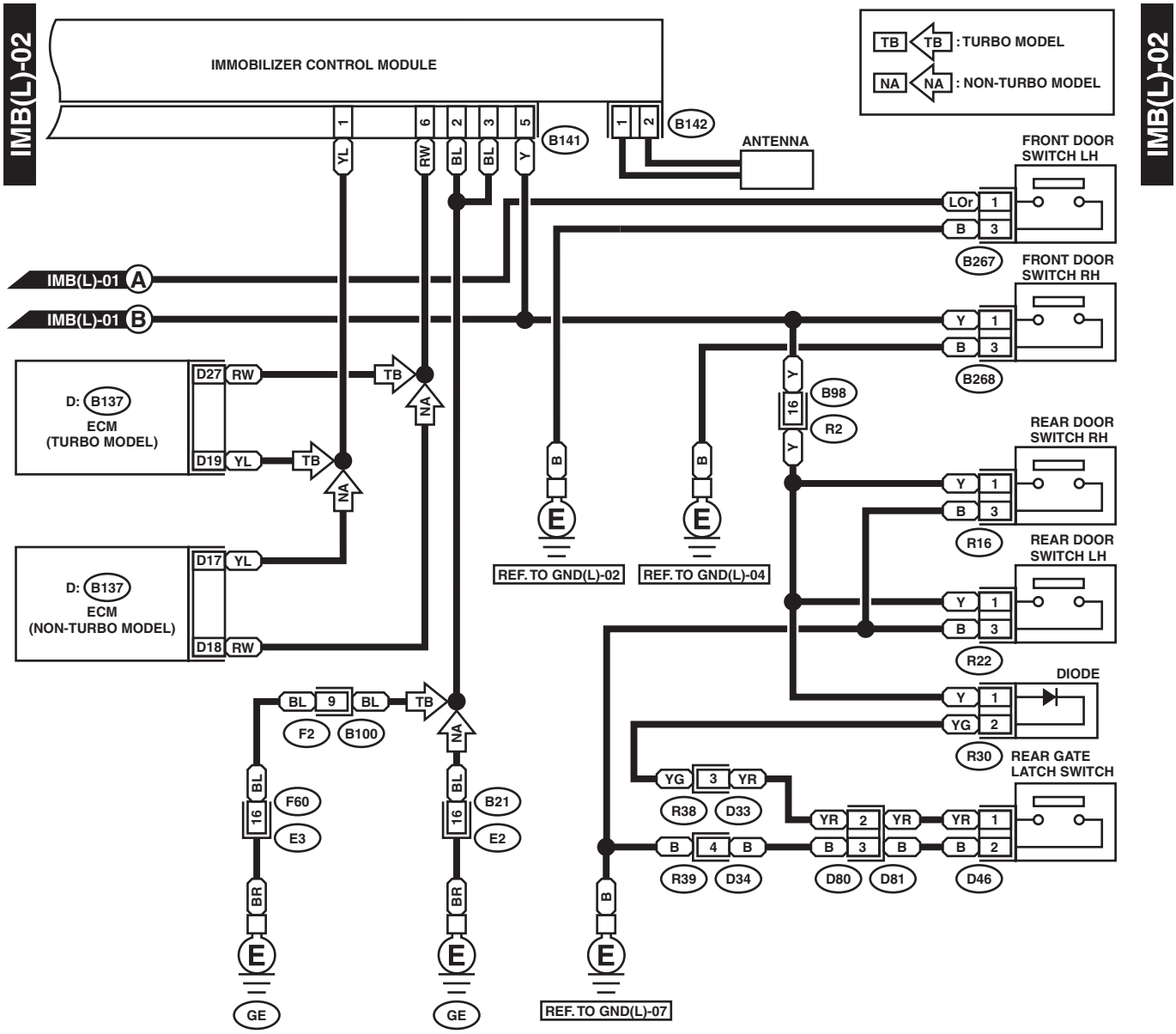
A: WIRING DIAGRAM

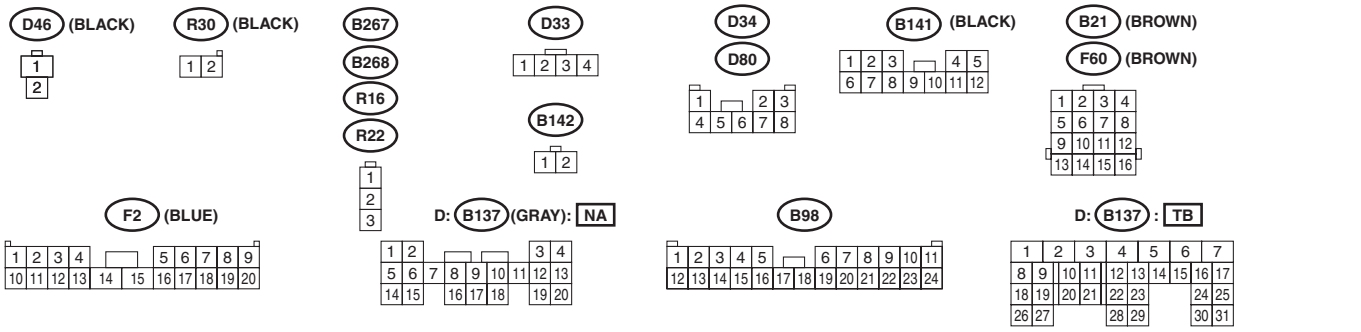
1. LHD MODEL





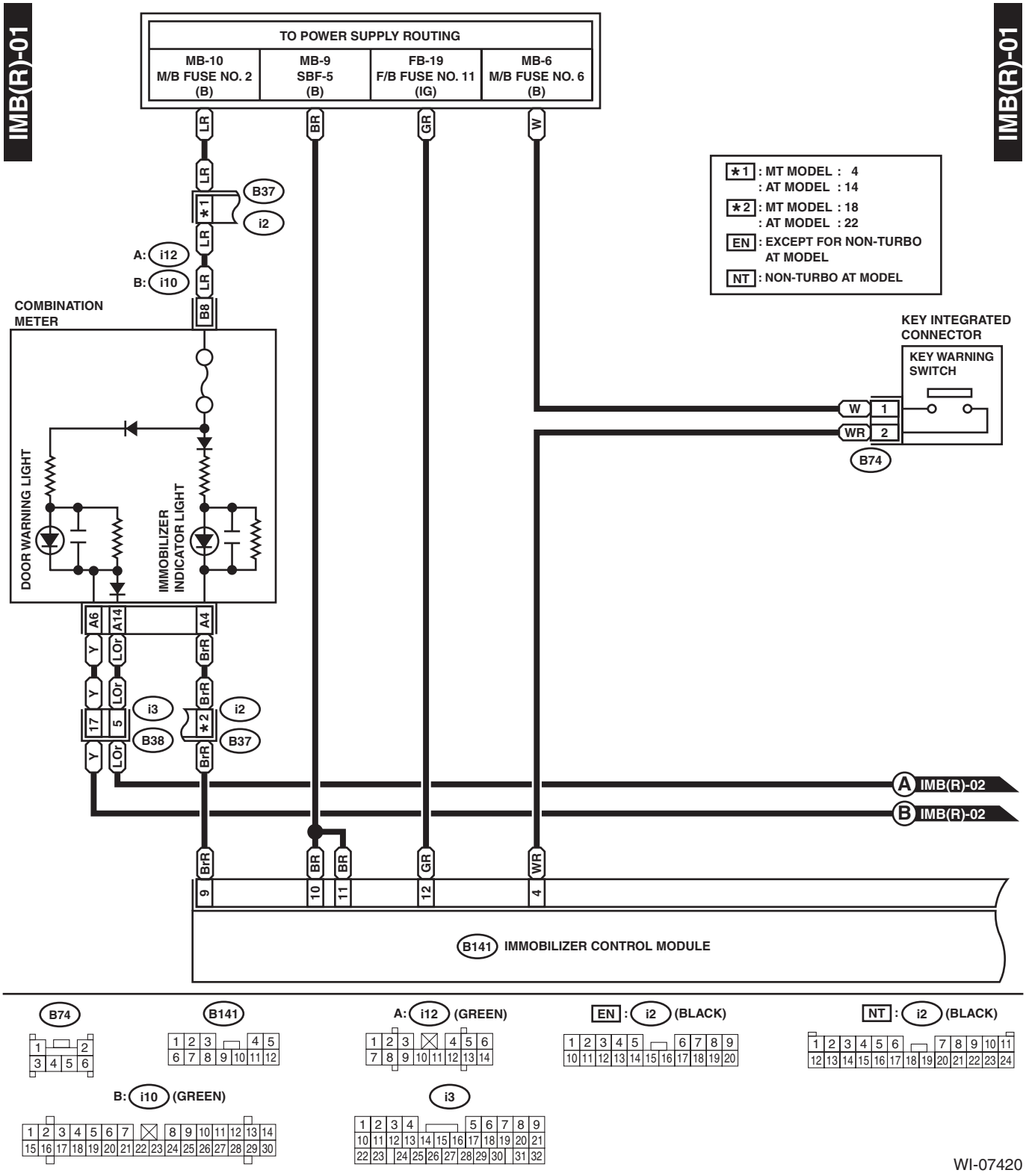
WI-07418


IMB(L)-02
IMMOBILIZER CONTROL MODULE
TB : TURBO MODEL
NA : NON-TURBO MODEL
B141
B142
ANTENNA
FRONT DOOR SWITCH LH
FRONT DOOR SWITCH RH
REAR DOOR SWITCH RH
REAR DOOR SWITCH LH
DIODE
REAR GATE LATCH SWITCH
B267
B268
R16
R22
R30
B98
R2
R38
D33
R39
D34
D80
D81
D46
IMB(L)-01 A
IMB(L)-01 B
D: B137
ECM (TURBO MODEL)
D: B137
ECM (NON-TURBO MODEL)
F2
B100
F60
E3
B21
E2
REF. TO GND(L)-02
REF. TO GND(L)-04
REF. TO GND(L)-07
GE
GE

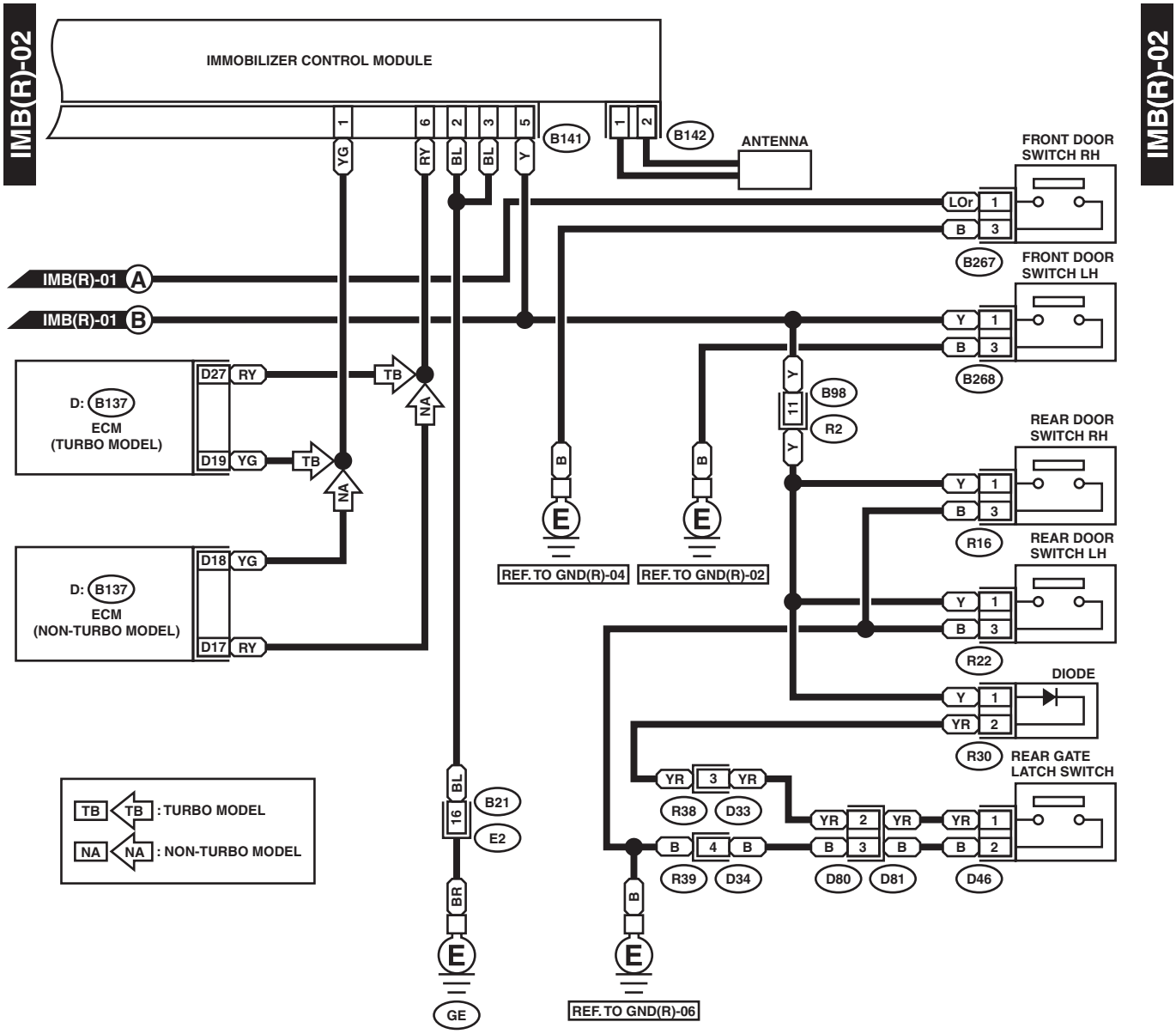

D46 (BLACK)
R30 (BLACK)
B267
B268
R16
R22
D33
B142
D34
D80
B141 (BLACK)
B21 (BROWN)
F60 (BROWN)
F2 (BLUE)
D: B137 (GRAY): NA
B98
D: B137 : TB

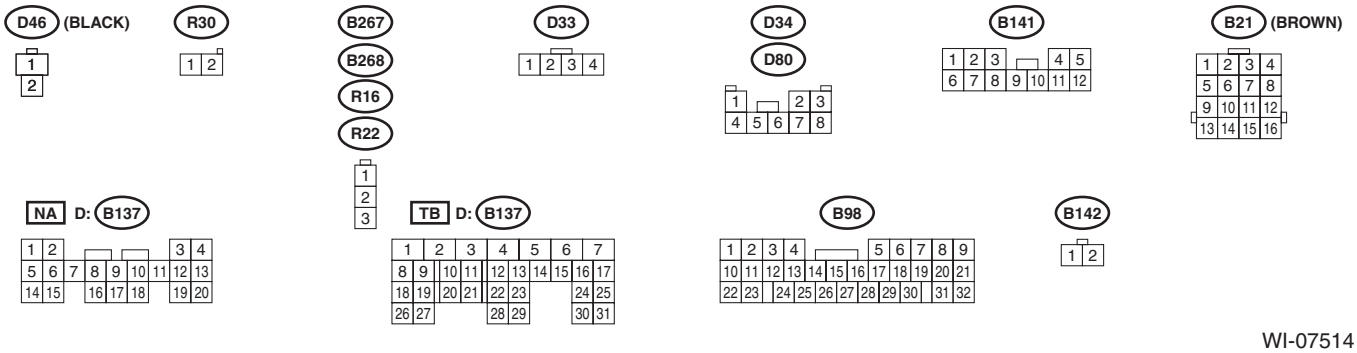
WI-07419

2. RHD MODEL



WI-07420


IMB(R)-02
IMMOBILIZER CONTROL MODULE
B141
B142
ANTENNA
FRONT DOOR SWITCH RH
FRONT DOOR SWITCH LH
REAR DOOR SWITCH RH
REAR DOOR SWITCH LH
DIODE
REAR GATE LATCH SWITCH
B267
B268
B98
R2
R16
R22
R30
R38
R39
D33
D34
D80
D81
D46
B21
E2
GE
IMB(R)-01 A
IMB(R)-01 B
D: B137
ECM (TURBO MODEL)
ECM (NON-TURBO MODEL)
REF. TO GND(R)-04
REF. TO GND(R)-02
REF. TO GND(R)-06
TB TB : TURBO MODEL
NA NA : NON-TURBO MODEL

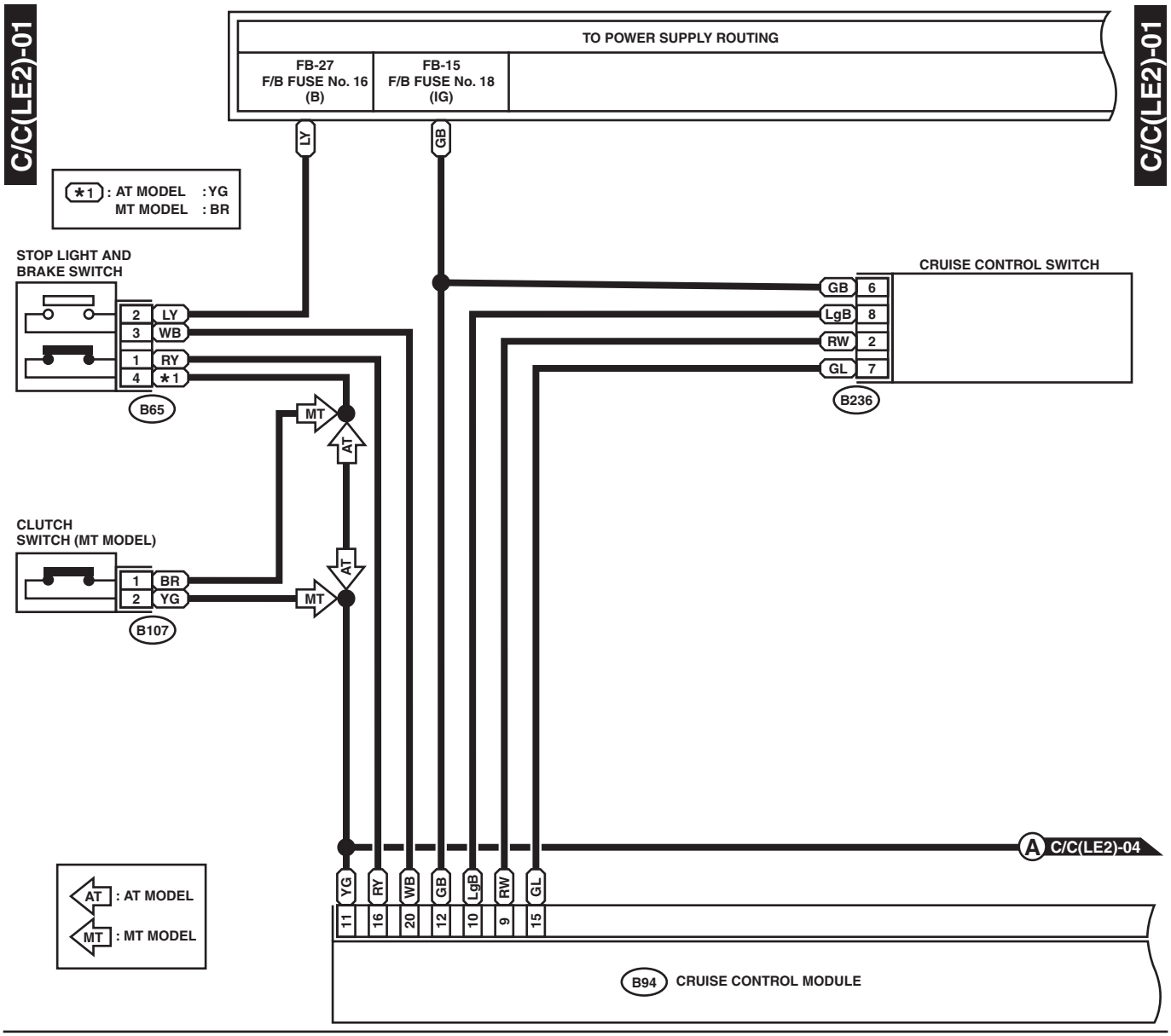

D46 (BLACK)
R30
B267
B268
R16
R22
D33
D34
D80
B141
B21 (BROWN)
NA D: B137
TB D: B137
B98
B142

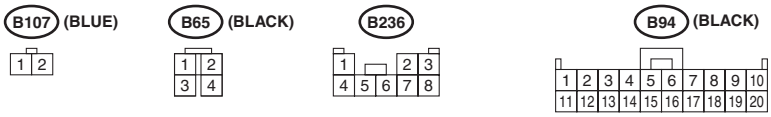
WI-07514

13.Cruise Control System

A: WIRING DIAGRAM

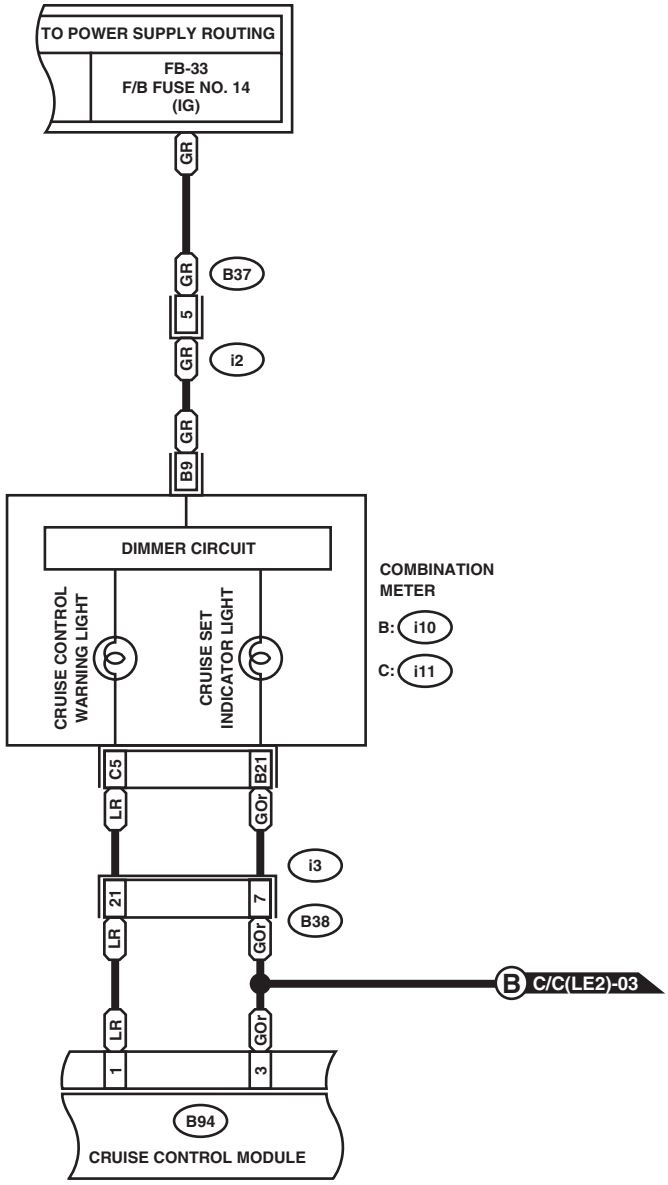
1. EXCEPT FOR LHD 2.5 L TURBO MODEL





WI-07421

C/C(LE2)-02



C/C(LE2)-02

C: i11 (GREEN)

1	2	3	4	5	6	7	8	9	10

B94 (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

B37

1	2	3	4	5		6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22	23	24

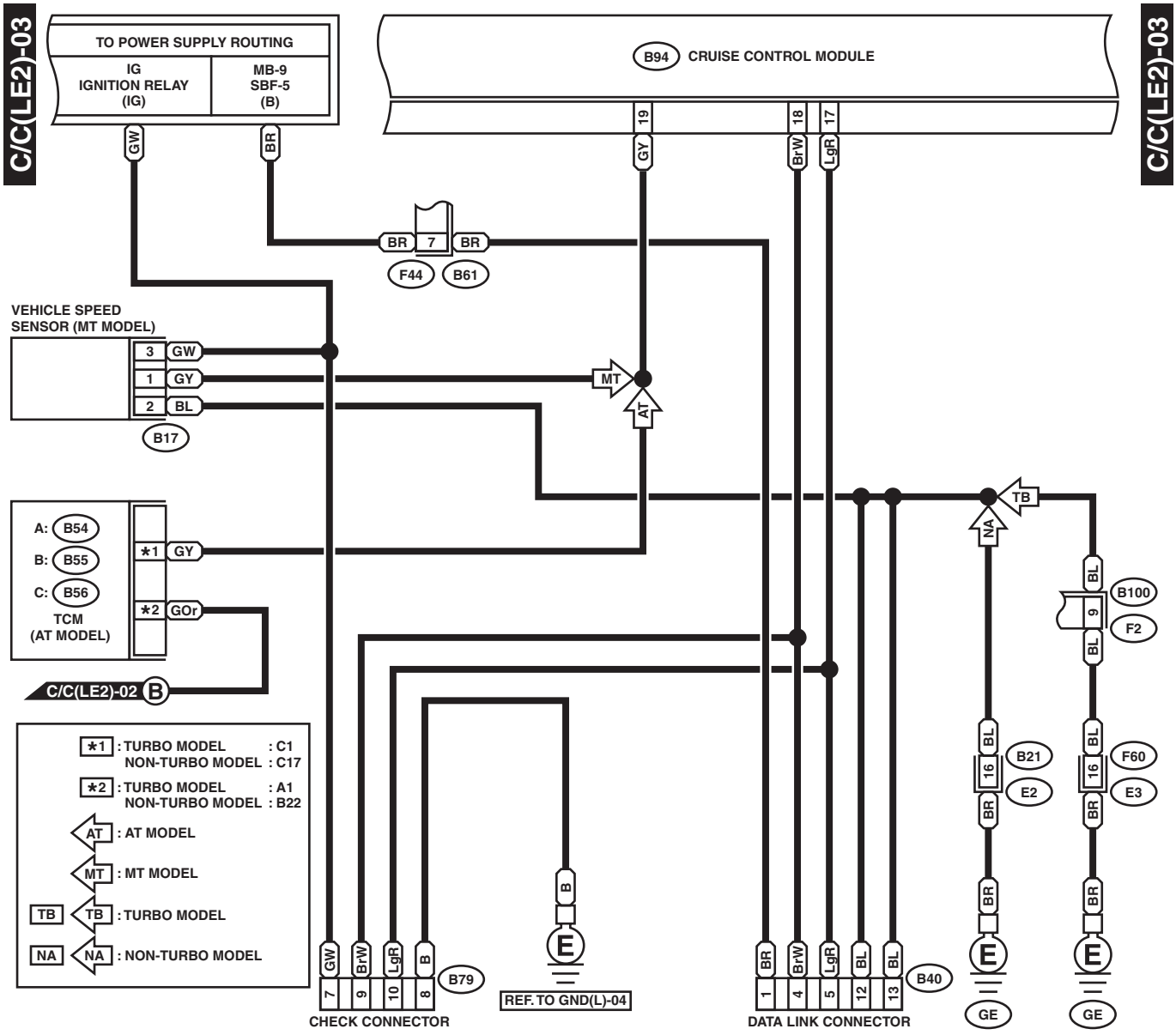
B: i10 (GREEN)

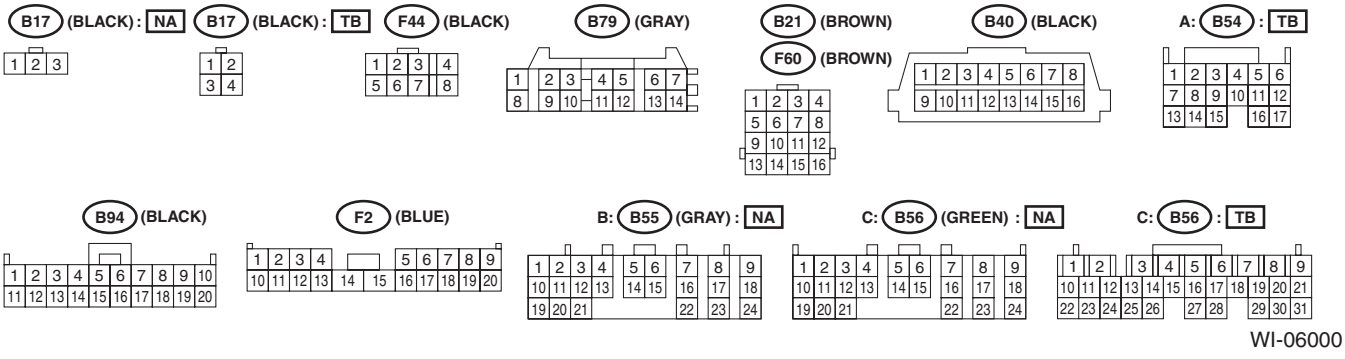
1	2	3	4	5	6	7		8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

B38

1	2	3	4			5	6	7	8	9
10	11	12	13	14	15	16	17	18	19	20	21
22	23		24	25	26	27	28	29	30		31	32

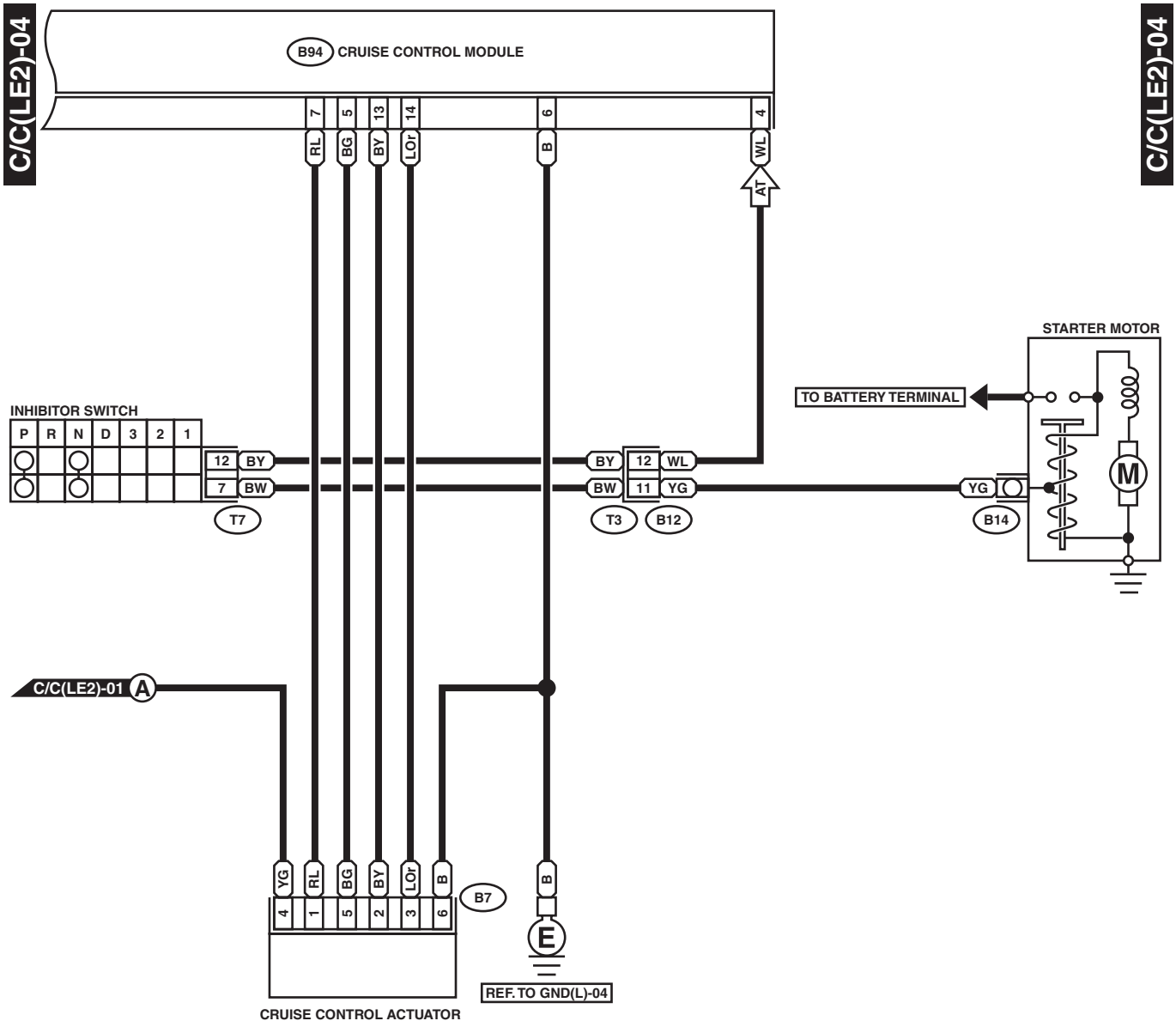
WI-07422

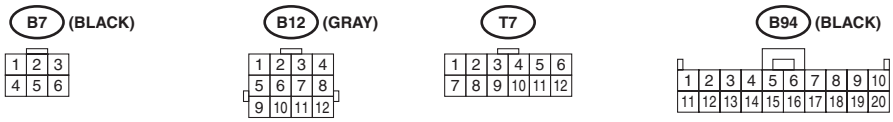

C/C(LE2)-03
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
B94 CRUISE CONTROL MODULE
C/C(LE2)-03
GW
BR
GY
BrW
LgR
19
18
17
BR 7 BR
F44
B61
VEHICLE SPEED
SENSOR (MT MODEL)
3 GW
1 GY
2 BL
B17
MT
AT
A: B54
B: B55
C: B56
TCM
(AT MODEL)
*1 GY
*2 GOr
C/C(LE2)-02 B
TB
NA
BL
B100
9
F2
B21
E2
F60
E3
16
BR
*1 : TURBO MODEL : C1
NON-TURBO MODEL : C17
*2 : TURBO MODEL : A1
NON-TURBO MODEL : B22
AT : AT MODEL
MT : MT MODEL
TB : TURBO MODEL
NA : NON-TURBO MODEL
GW
BrW
LgR
B
B79
7
9
10
8
CHECK CONNECTOR
REF. TO GND(L)-04
BR
BrW
LgR
BL
BL
B40
1
4
5
12
13
DATA LINK CONNECTOR
GE
GE


B17 (BLACK) : NA
B17 (BLACK) : TB
F44 (BLACK)
B79 (GRAY)
B21 (BROWN)
F60 (BROWN)
B40 (BLACK)
A: B54 : TB

B94 (BLACK)
F2 (BLUE)
B: B55 (GRAY) : NA
C: B56 (GREEN) : NA
C: B56 : TB

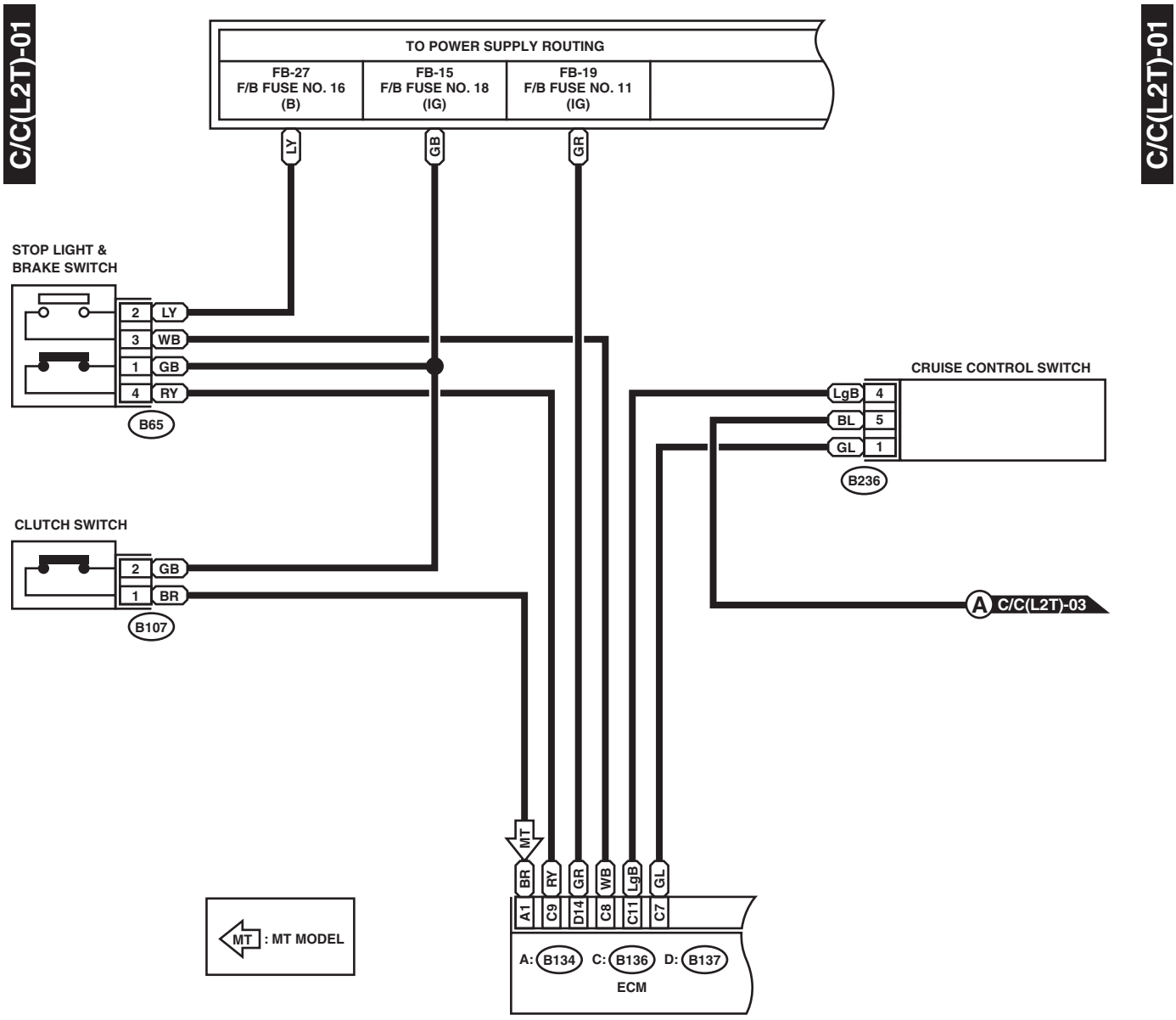
WI-06000

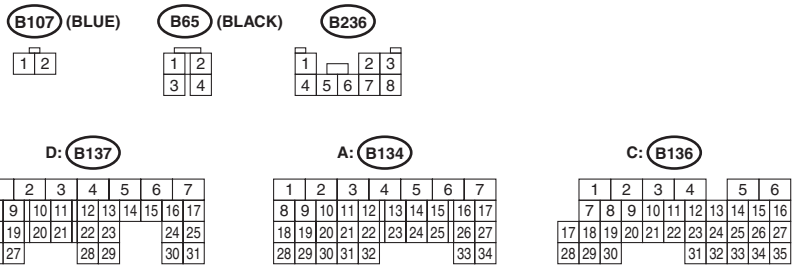

C/C(LE2)-04
B94 CRUISE CONTROL MODULE
7
5
13
14
6
4
RL
BG
BY
LOr
B
WL
AT
C/C(LE2)-04
STARTER MOTOR
TO BATTERY TERMINAL
INHIBITOR SWITCH
P R N D 3 2 1
12 BY
7 BW
T7
BY 12 WL
BW 11 YG
T3 B12
YG
B14
M
C/C(LE2)-01 A
YG RL BG BY LOr B
4 1 5 2 3 6
B7
B
E
REF. TO GND(L)-04
CRUISE CONTROL ACTUATOR


B7 (BLACK)
1 2 3
4 5 6
B12 (GRAY)
1 2 3 4
5 6 7 8
9 10 11 12
T7
1 2 3 4 5 6
7 8 9 10 11 12
B94 (BLACK)
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

WI-07423

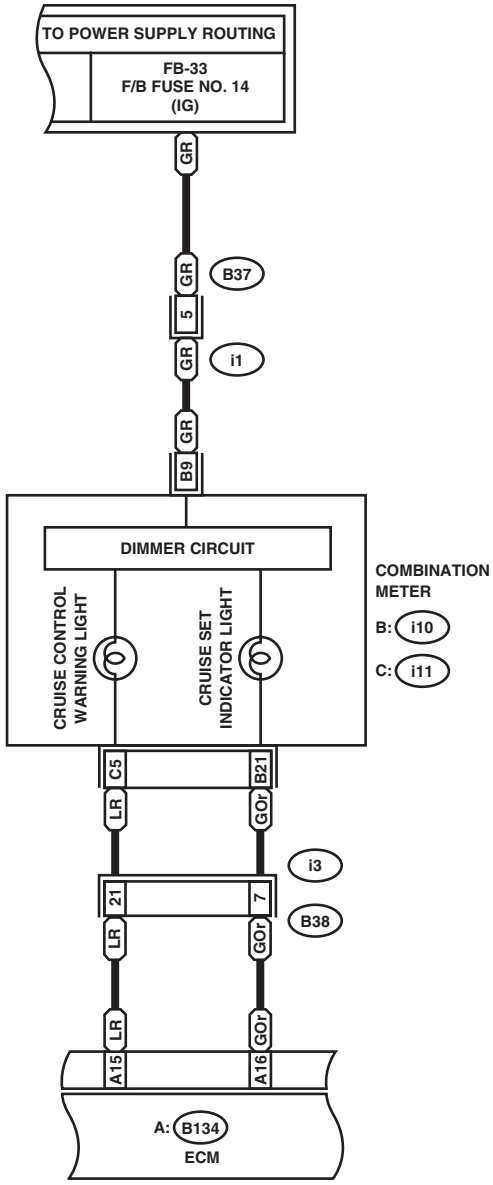
2. LHD 2.5 L TURBO MODEL



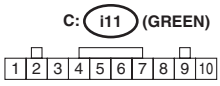


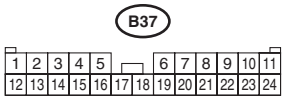
WI-07424

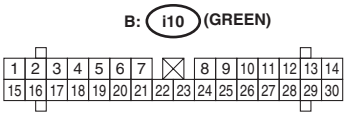
C/C(L2T)-02

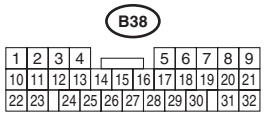


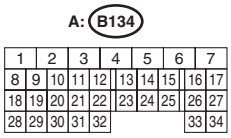
C/C(L2T)-02



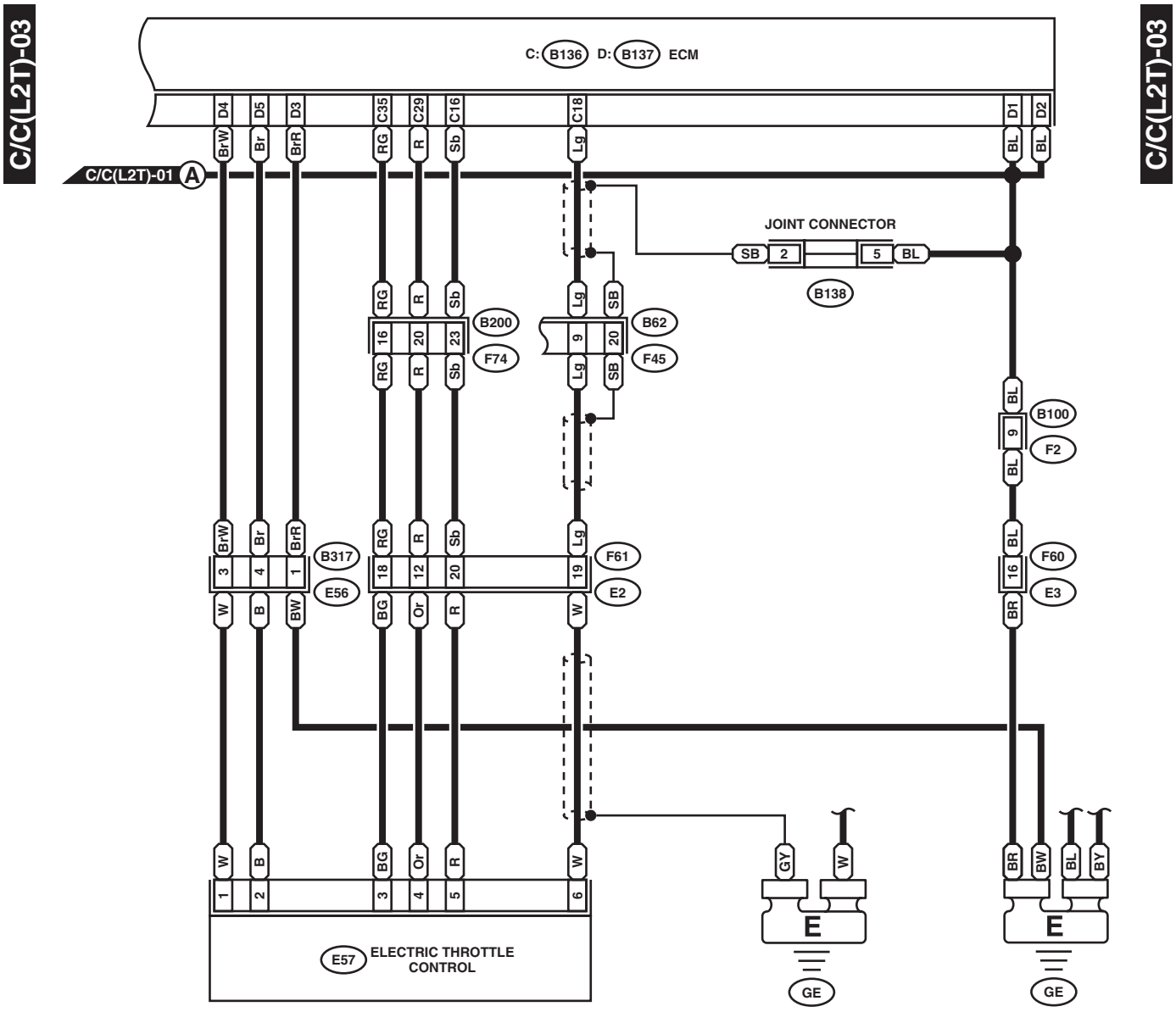


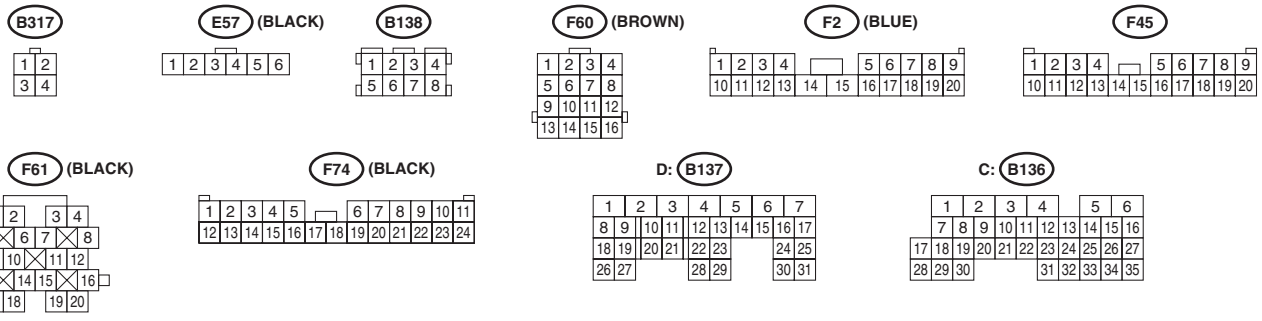






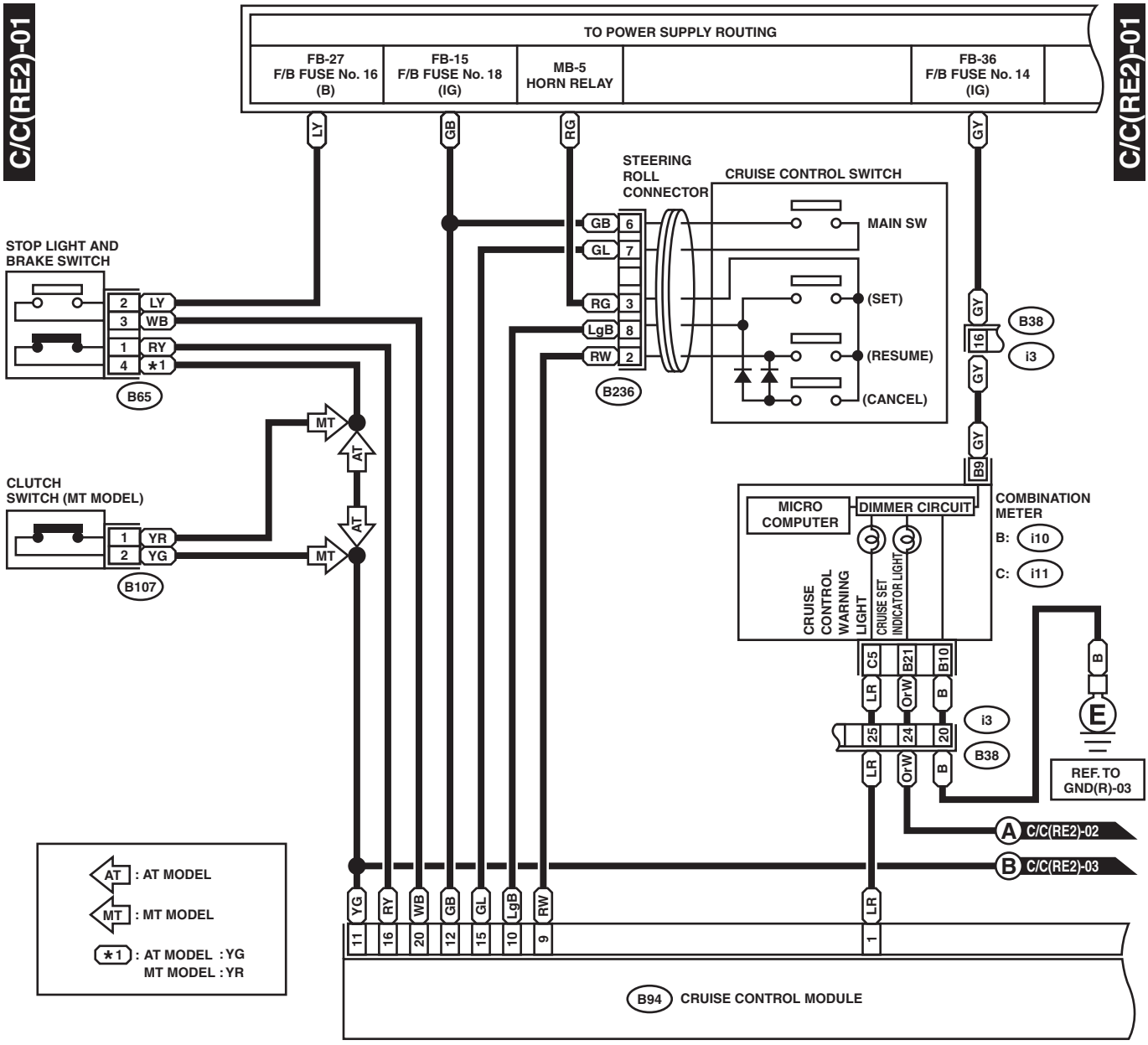
WI-07425

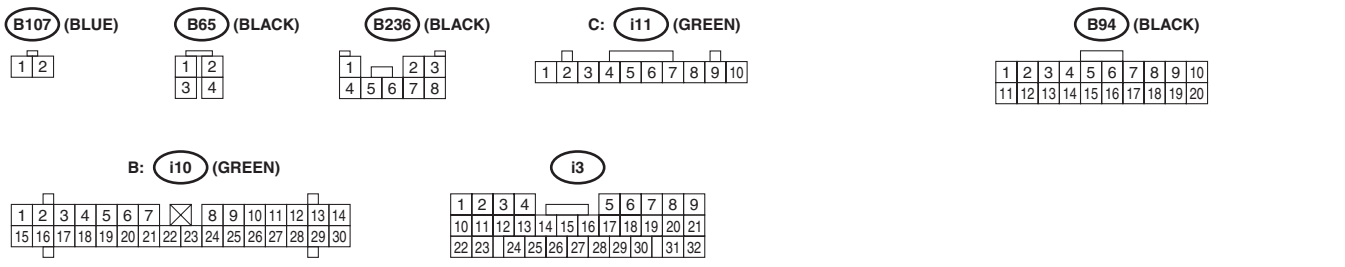

C/C(L2T)-03
C/C(L2T)-03
C: B136 D: B137 ECM
D4 D5 D3 C35 C29 C16 C18 D1 D2
BrW Br BrR RG R Sb Lg BL BL
C/C(L2T)-01 A
JOINT CONNECTOR
SB 2 5 BL
B138
B200
16 20 23
F74
B62
9 20
F45
B100
9
F2
B317
3 4 1
E56
F61
18 12 20 19
E2
F60
16
E3
W B BW BG Or R W BR
1 2 3 4 5 6
E57 ELECTRIC THROTTLE CONTROL
GY W BR BW BL BY
E
GE


B317
E57 (BLACK)
B138
F60 (BROWN)
F2 (BLUE)
F45
F61 (BLACK)
F74 (BLACK)
D: B137
C: B136

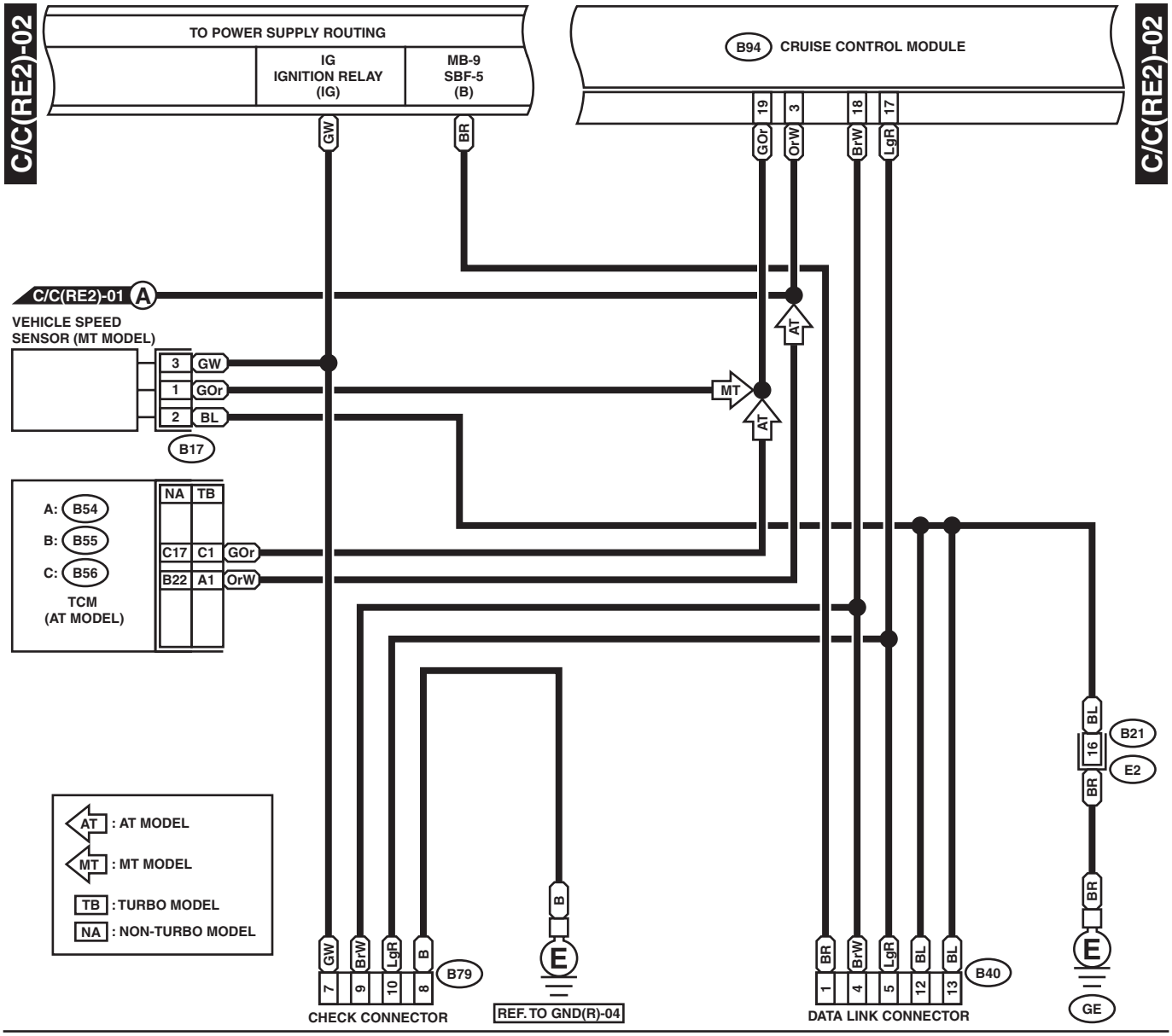
WI-06004

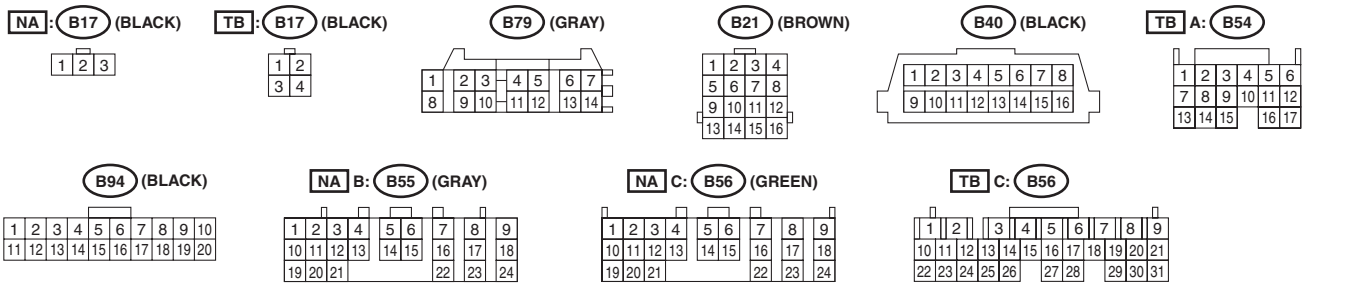
3. EXCEPT RHD 2.5 L TURBO MODEL



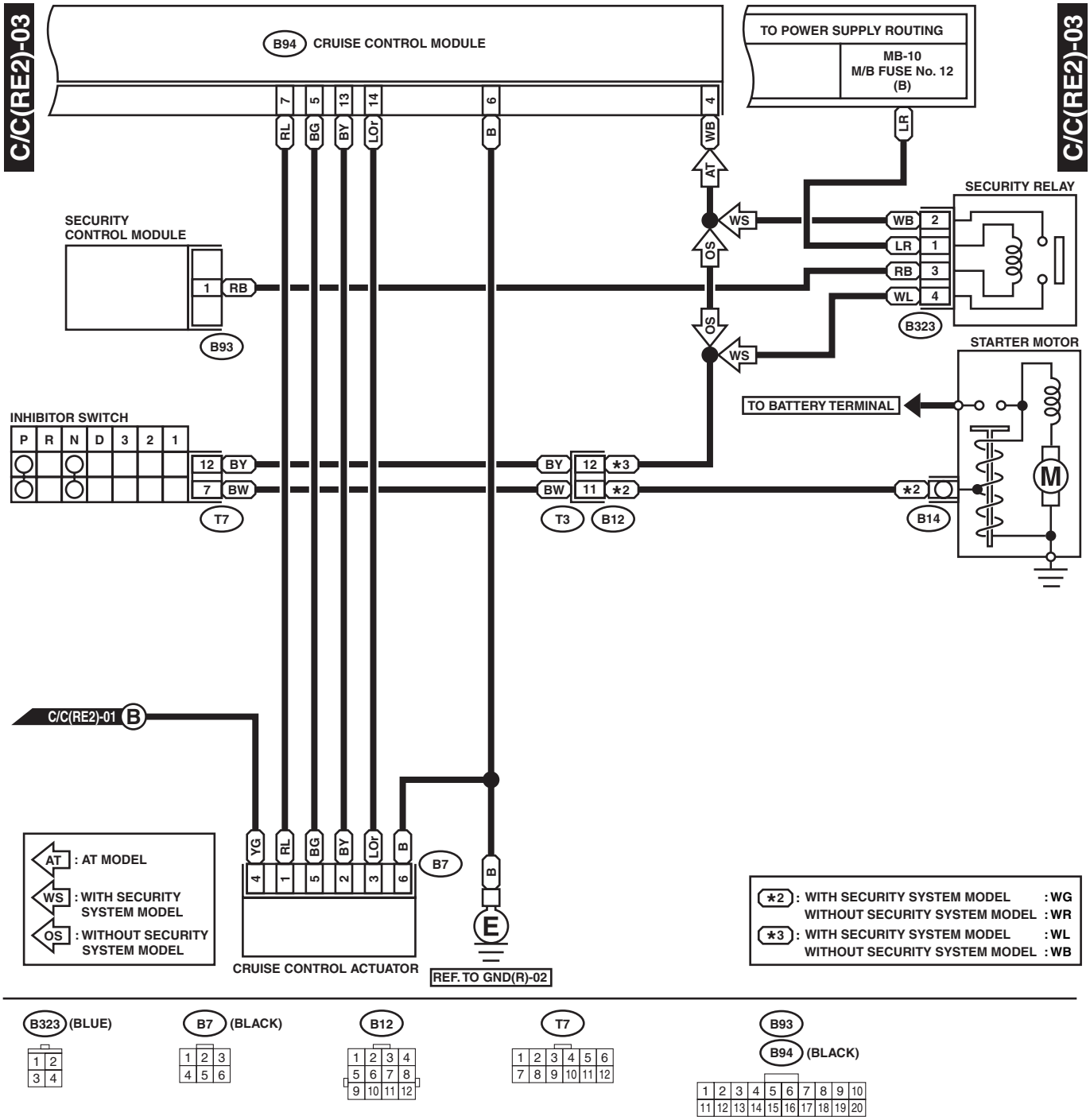


WI-06005


C/C(RE2)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
B94 CRUISE CONTROL MODULE
C/C(RE2)-02
GW
BR
19
3
18
17
GOr
OrW
BrW
LgR
C/C(RE2)-01 A
VEHICLE SPEED
SENSOR (MT MODEL)
3 GW
1 GOr
2 BL
B17
AT
MT
AT
A: B54
B: B55
C: B56
TCM
(AT MODEL)
NA TB
C17 C1 GOr
B22 A1 OrW
AT : AT MODEL
MT : MT MODEL
TB : TURBO MODEL
NA : NON-TURBO MODEL
GW BrW LgR B
7 9 10 8
B79
CHECK CONNECTOR
B
REF. TO GND(R)-04
BR BrW LgR BL BL
1 4 5 12 13
B40
DATA LINK CONNECTOR
BL
16
BR
B21
E2
BR
GE

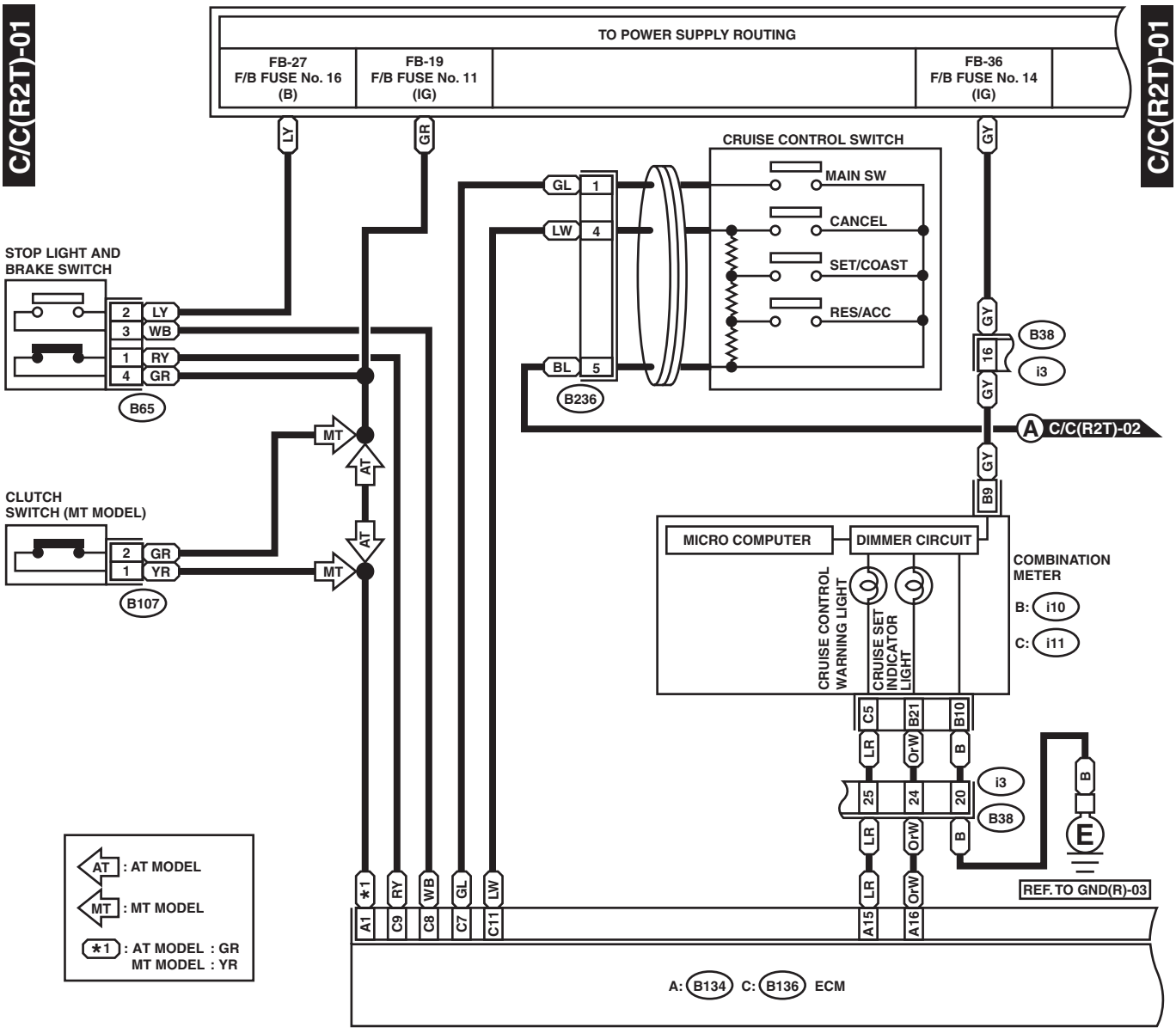

NA : B17 (BLACK)
TB : B17 (BLACK)
B79 (GRAY)
B21 (BROWN)
B40 (BLACK)
TB A: B54
B94 (BLACK)
NA B: B55 (GRAY)
NA C: B56 (GREEN)
TB C: B56

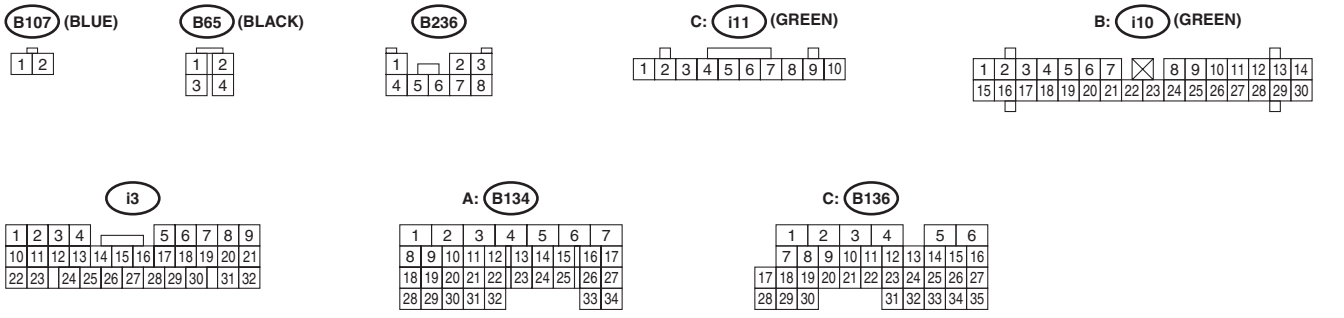
WI-06006


C/C(RE2)-03
B94 CRUISE CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE No. 12
(B)
C/C(RE2)-03
SECURITY RELAY
SECURITY
CONTROL MODULE
B93
B323
STARTER MOTOR
TO BATTERY TERMINAL
INHIBITOR SWITCH
P R N D 3 2 1
T7
T3
B12
B14
C/C(RE2)-01 B
AT : AT MODEL
WS : WITH SECURITY SYSTEM MODEL
OS : WITHOUT SECURITY SYSTEM MODEL
CRUISE CONTROL ACTUATOR
B7
REF. TO GND(R)-02
*2 : WITH SECURITY SYSTEM MODEL : WG
WITHOUT SECURITY SYSTEM MODEL : WR
*3 : WITH SECURITY SYSTEM MODEL : WL
WITHOUT SECURITY SYSTEM MODEL : WB
B323 (BLUE)
B7 (BLACK)
B12
T7
B93
B94 (BLACK)

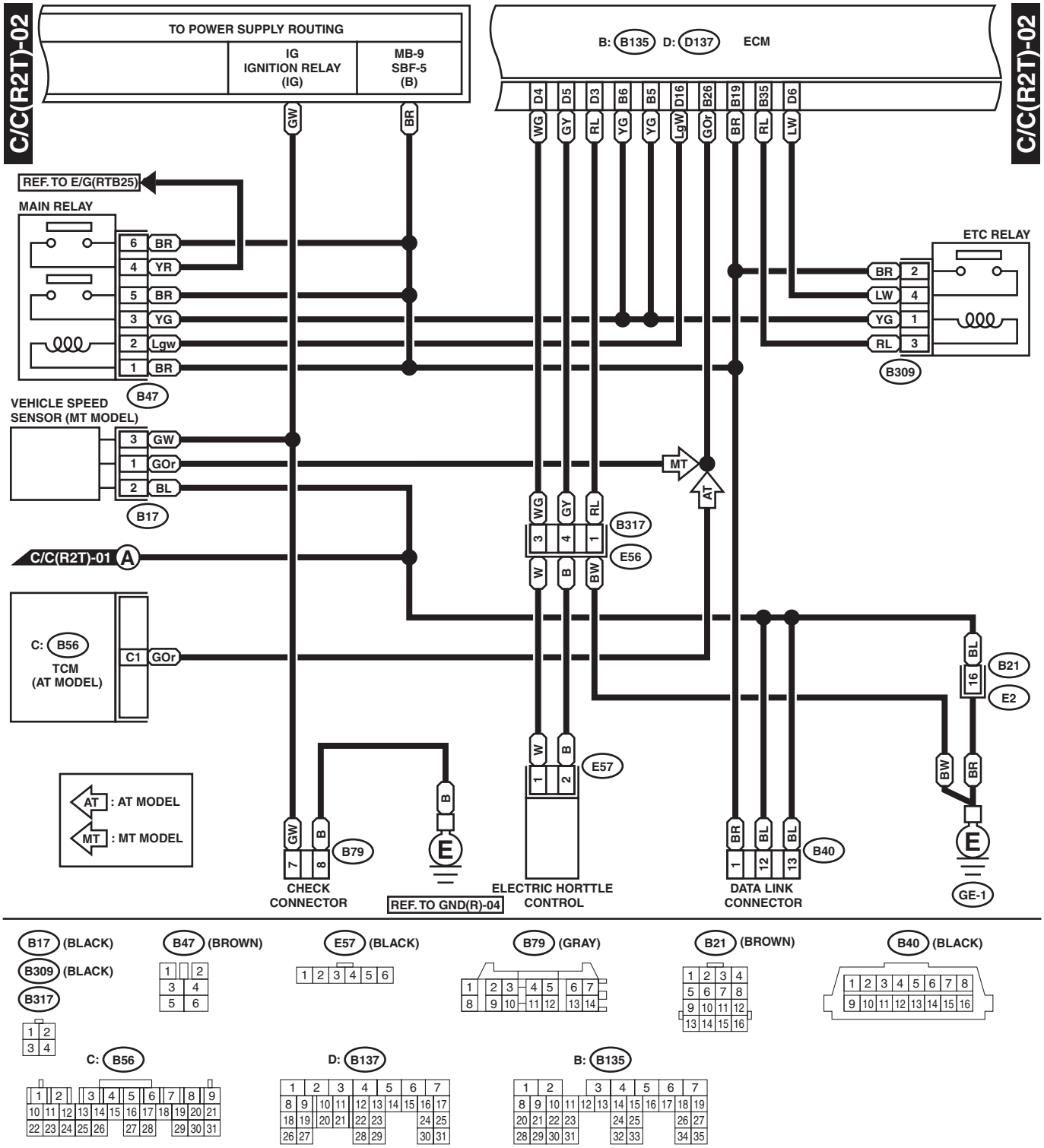
WI-06007

4. RHD 2.5 L TURBO MODEL



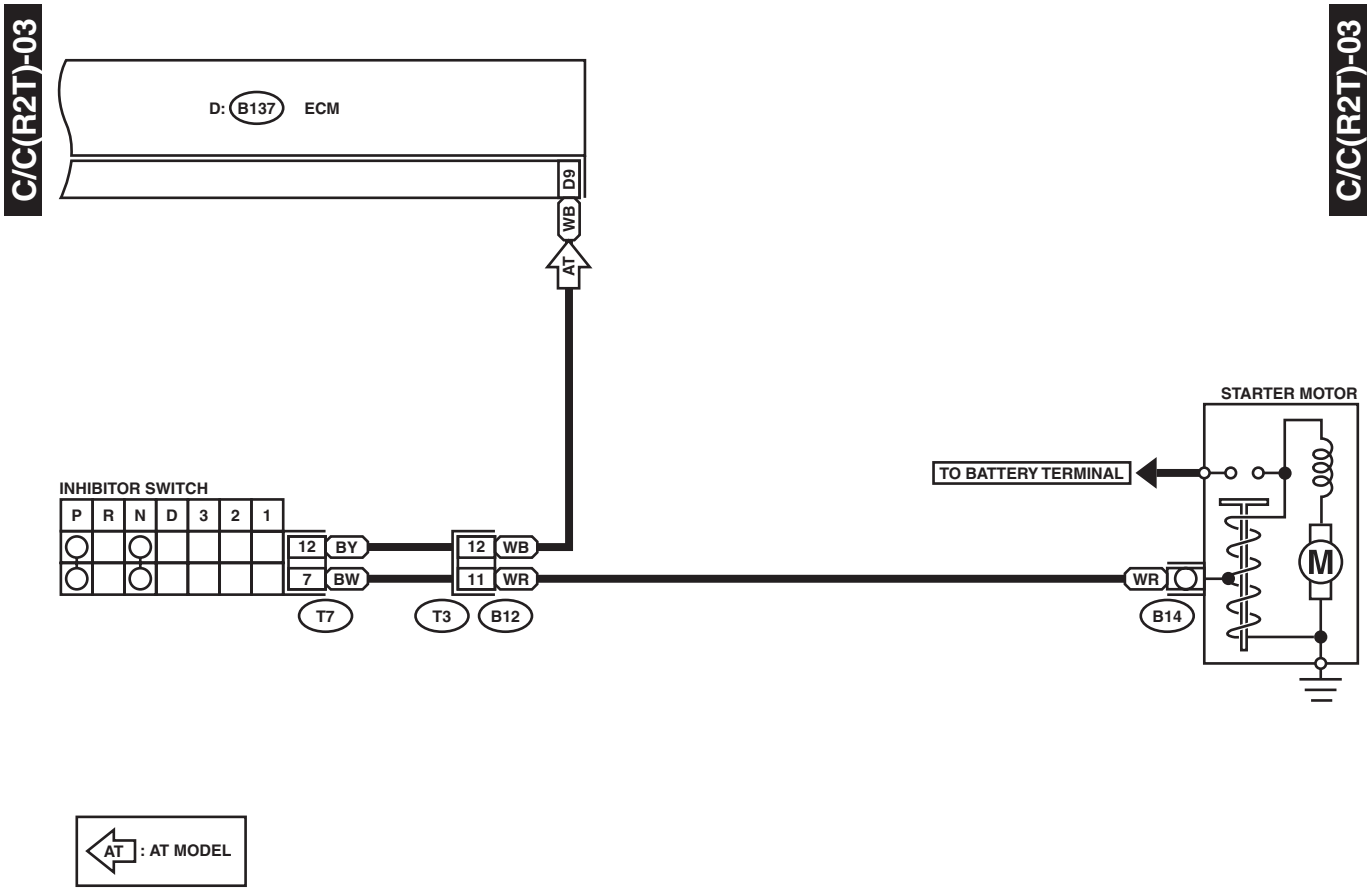


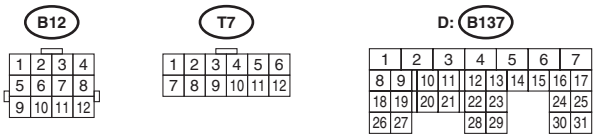
WI-06008


C/C(R2T)-02
TO POWER SUPPLY ROUTING
IG
IGNITION RELAY
(IG)
MB-9
SBF-5
(B)
B: B135 D: D137 ECM
C/C(R2T)-02
REF. TO E/G(RTB25)
MAIN RELAY
6 BR
4 YR
5 BR
3 YG
2 Lgw
1 BR
B47
ETC RELAY
BR 2
LW 4
YG 1
RL 3
B309
VEHICLE SPEED
SENSOR (MT MODEL)
3 GW
1 GOr
2 BL
B17
MT
AT
C/C(R2T)-01 A
B317
E56
E57
C: B56
TCM
(AT MODEL)
C1 GOr
B21
E2
AT : AT MODEL
MT : MT MODEL
B79
CHECK
CONNECTOR
REF. TO GND(R)-04
ELECTRIC HORTTLE
CONTROL
B40
DATA LINK
CONNECTOR
GE-1

B17 (BLACK)
B309 (BLACK)
B317
B47 (BROWN)
E57 (BLACK)
B79 (GRAY)
B21 (BROWN)
B40 (BLACK)
C: B56
D: B137
B: B135

WI-06009

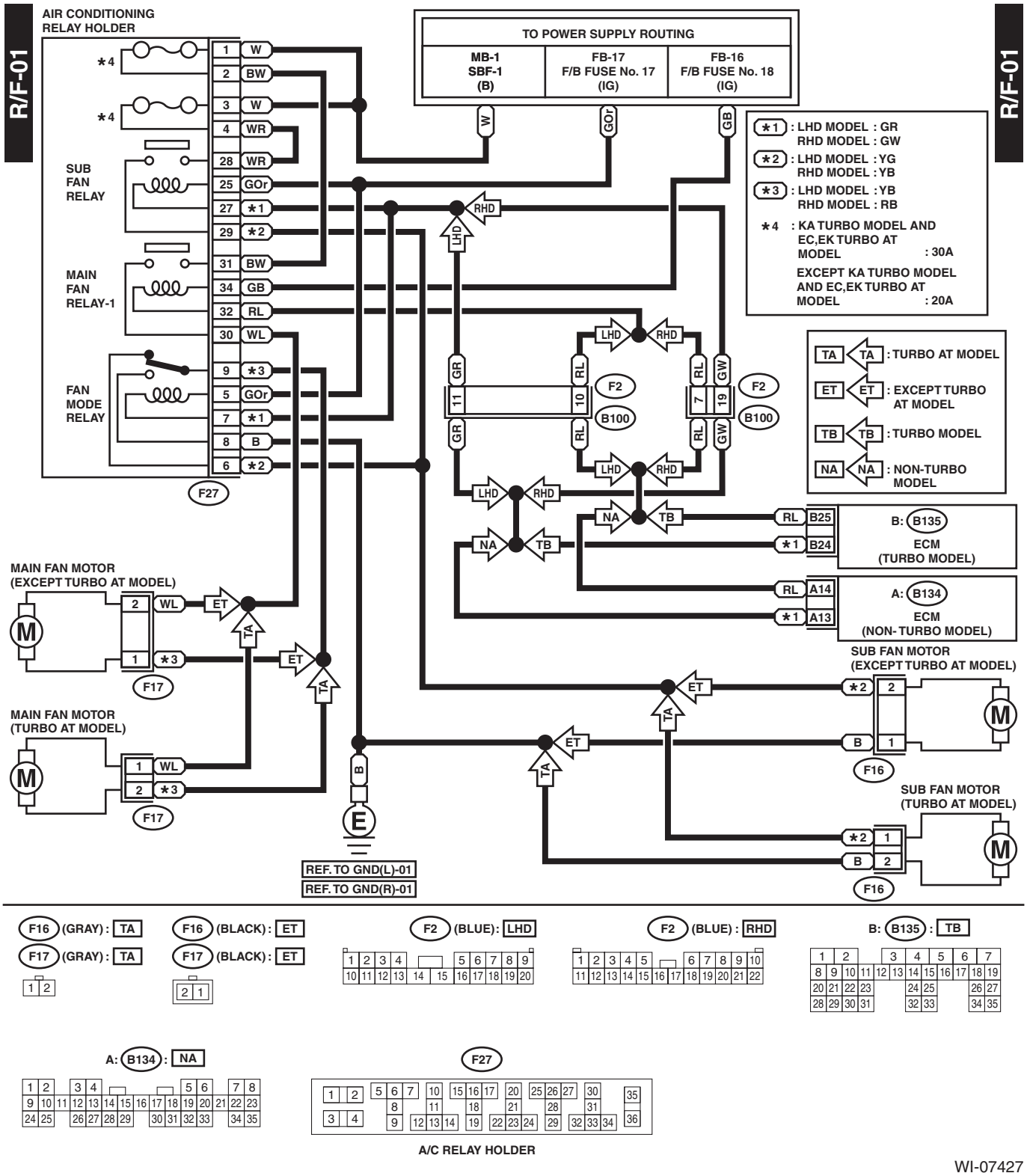

C/C(R2T)-03
C/C(R2T)-03
D: B137 ECM
D9
WB
AT
STARTER MOTOR
TO BATTERY TERMINAL
INHIBITOR SWITCH
P R N D 3 2 1
12 BY
7 BW
12 WB
11 WR
WR
M
T7
T3
B12
B14
AT : AT MODEL


B12
T7
D: B137

WI-07426

14.Radiator Fan System

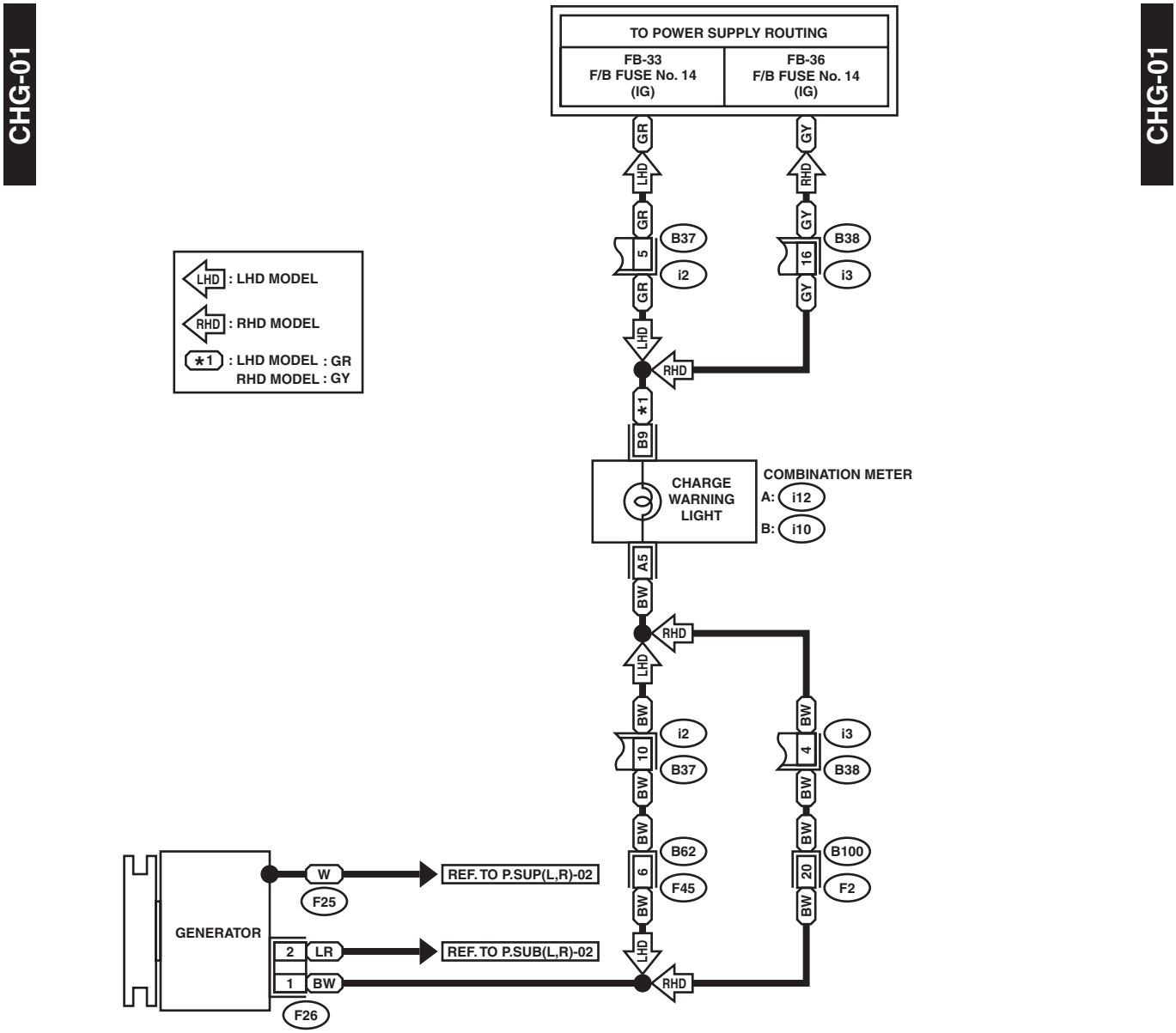
A: WIRING DIAGRAM



WI-07427

15.Charging System

A: WIRING DIAGRAM

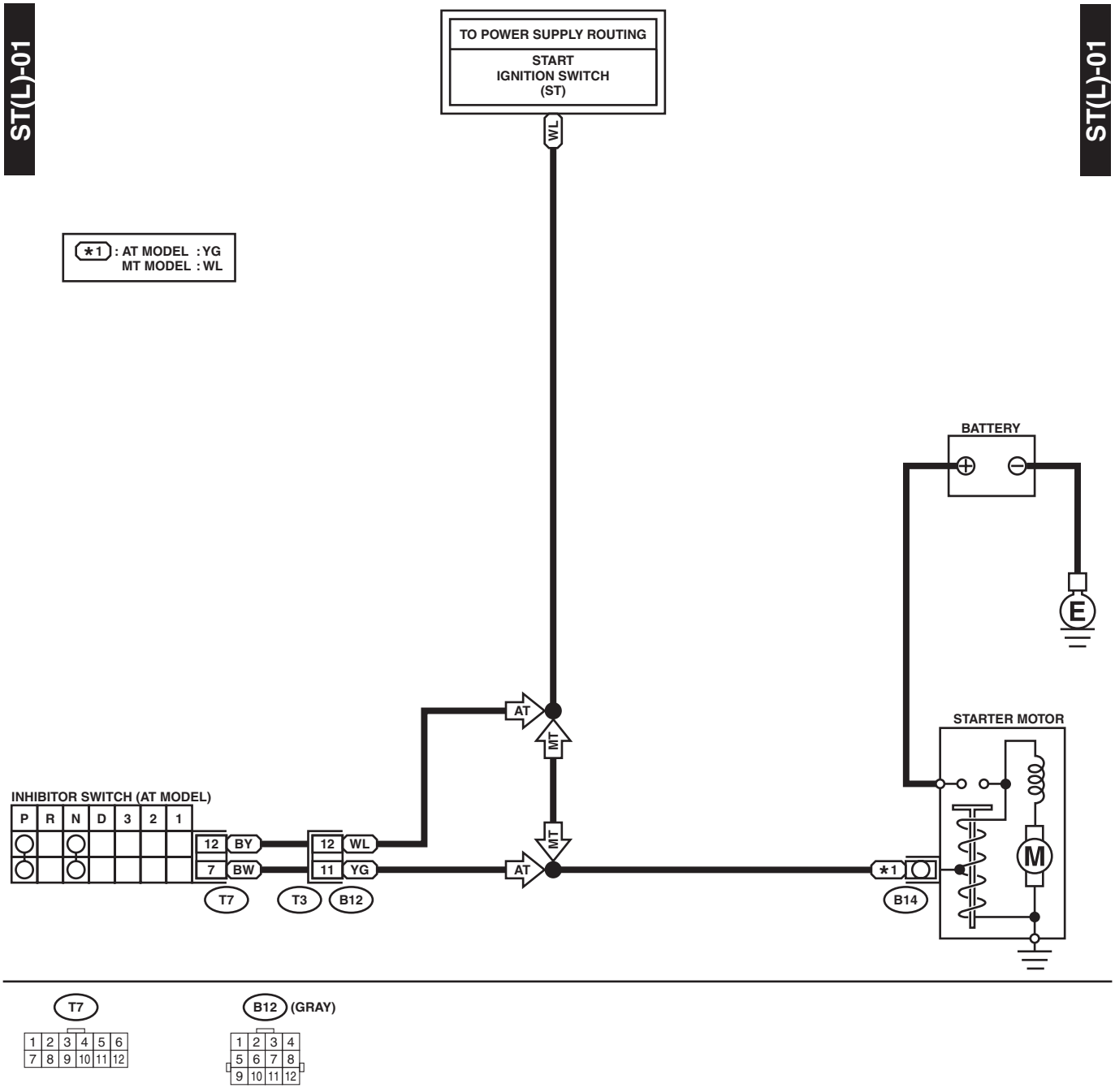


WI-07428

16.Starter System

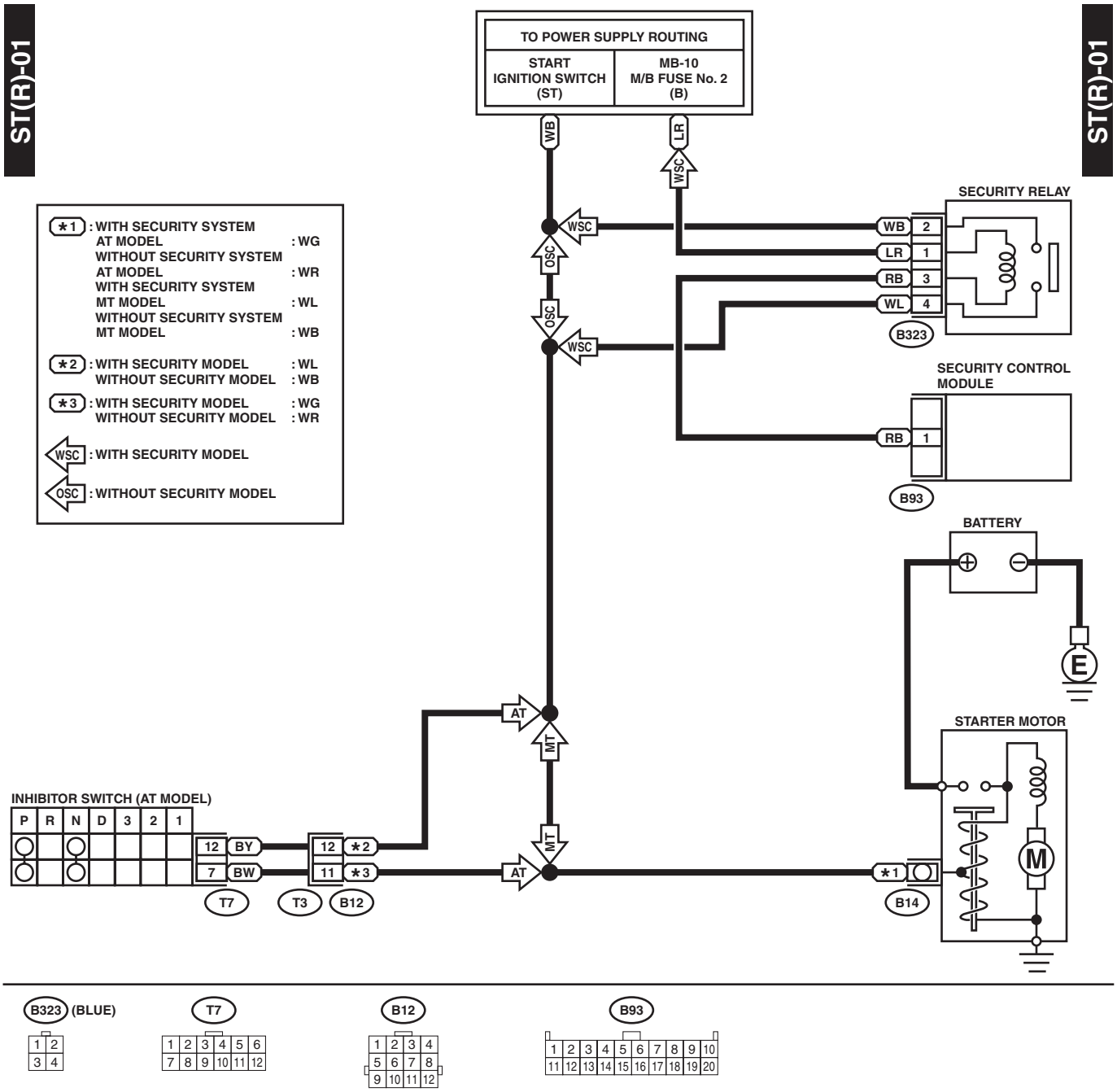
A: WIRING DIAGRAM

1. LHD MODEL



WI-07429

2. RHD MODEL

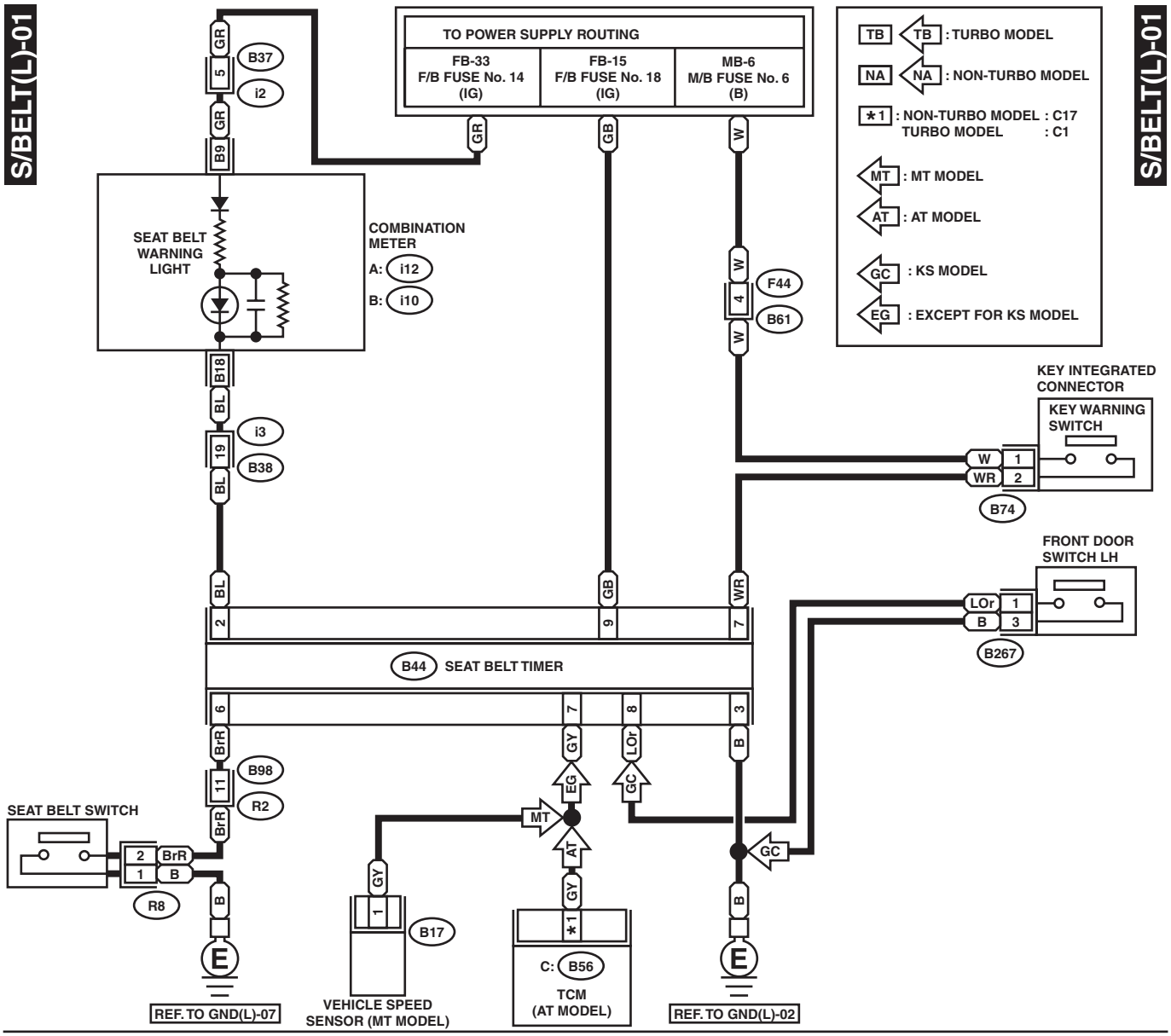


WI-03367

17.Seat Belt Warning System

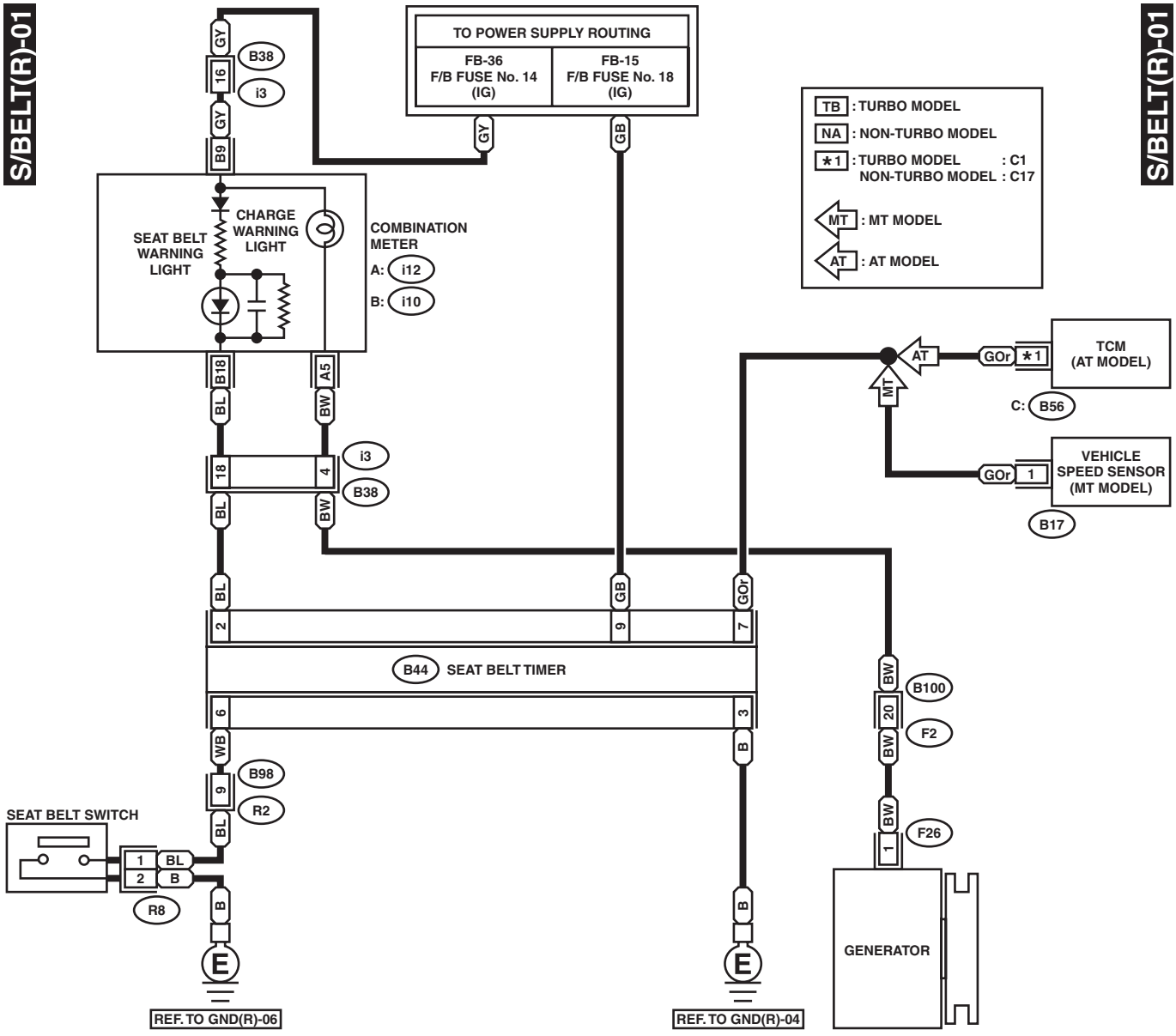
A: WIRING DIAGRAM

1. LHD MODEL



WI-07430

2. RHD MODEL

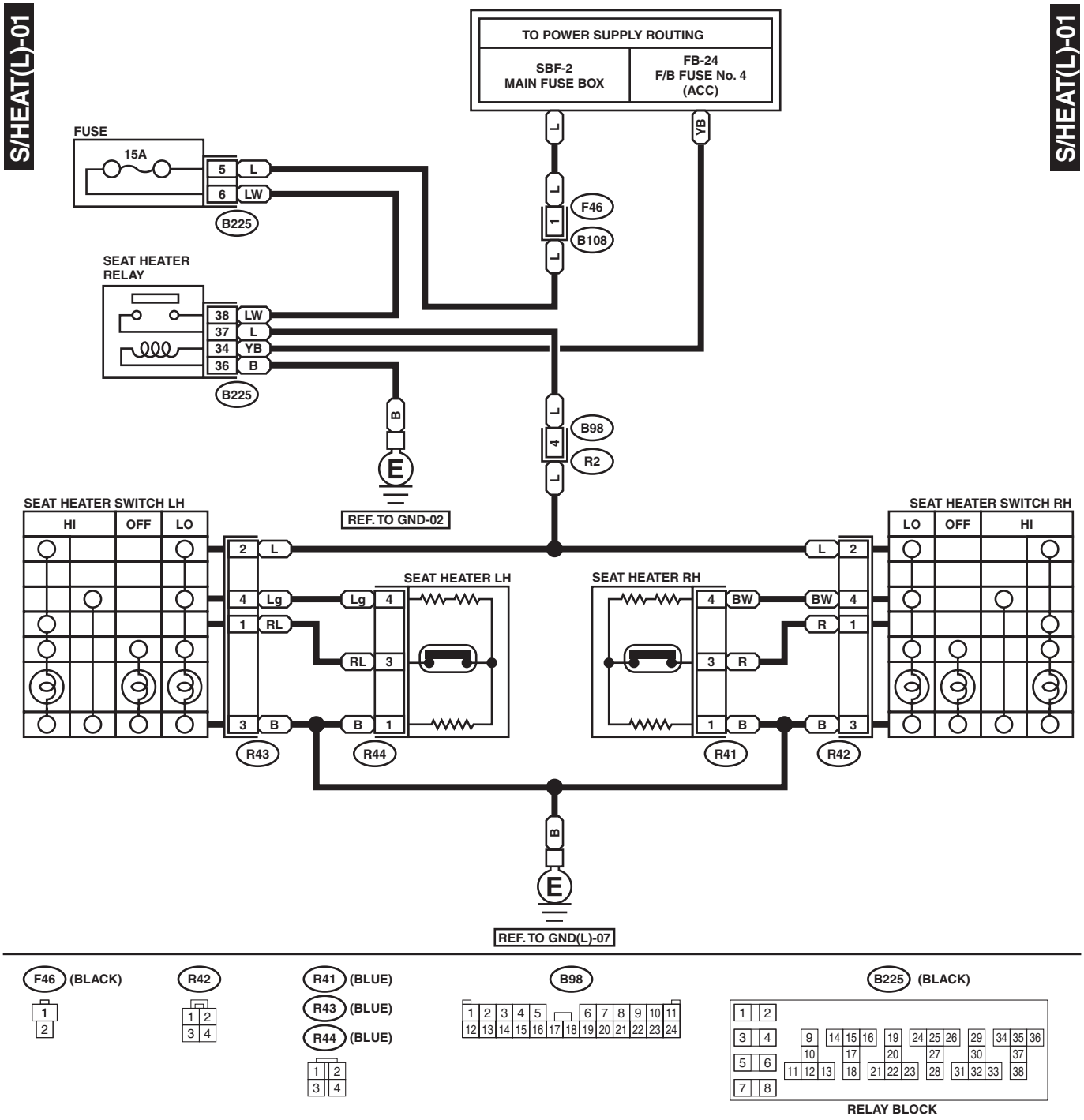


WI-07431

18.Seat Heater System

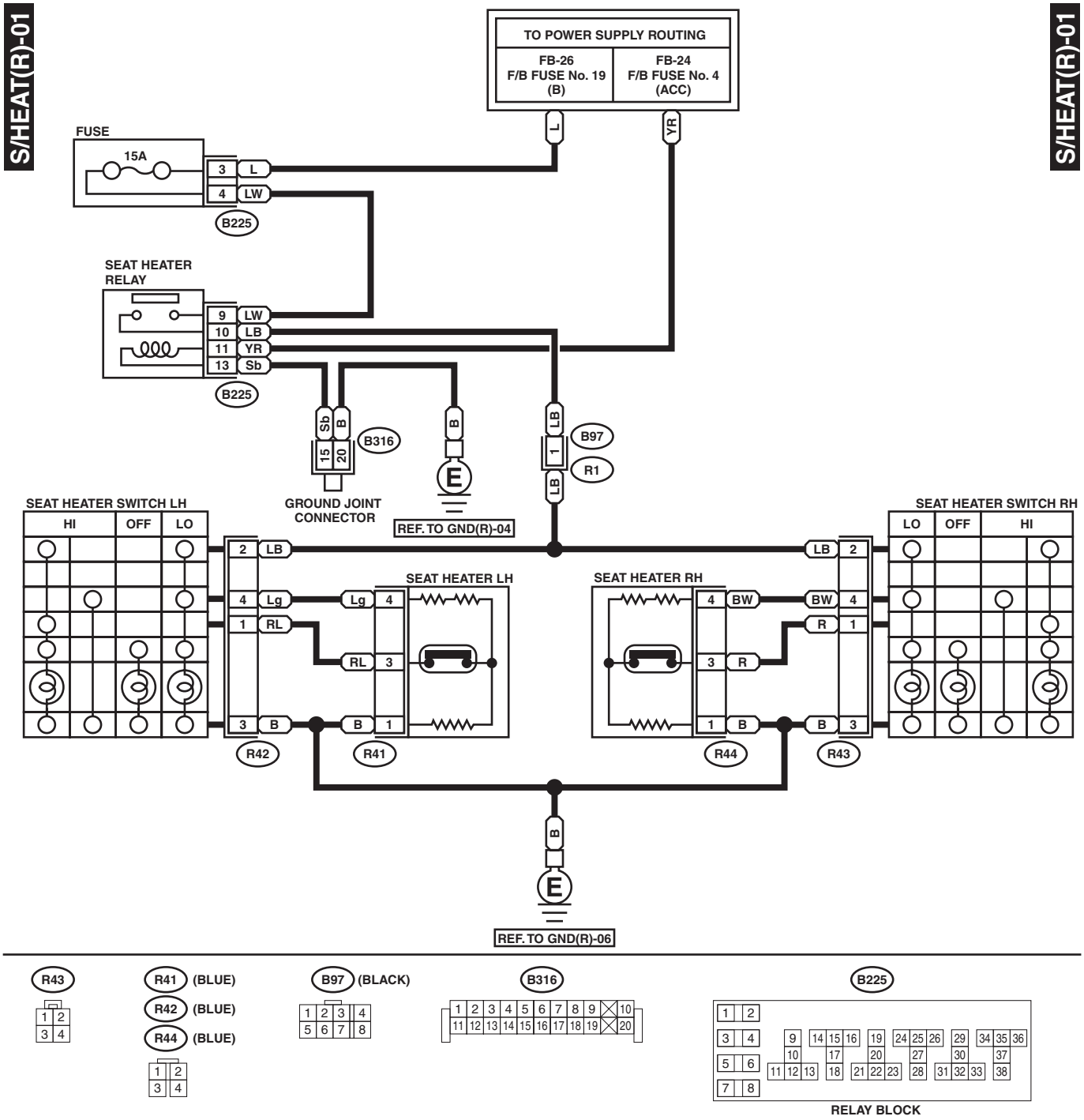
A: WIRING DIAGRAM

1. LHD MODEL



WI-07432

2. RHD MODEL

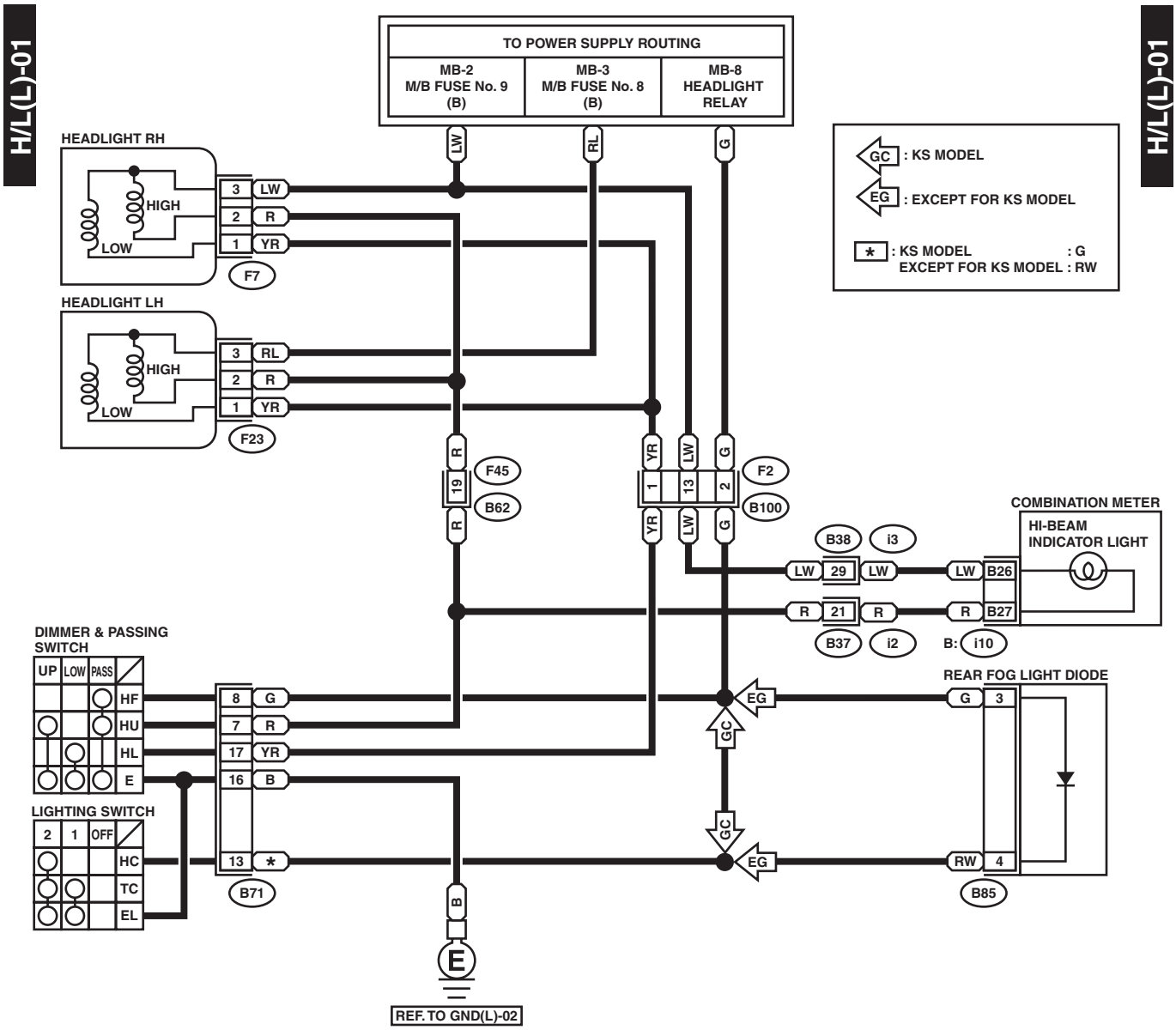


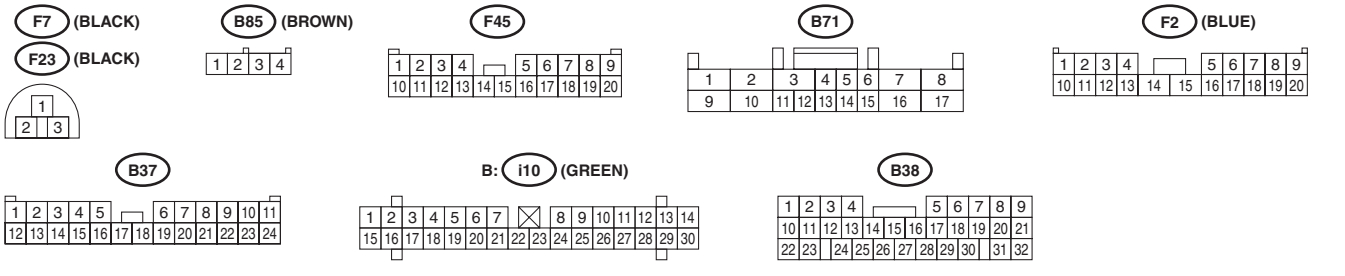
WI-07433

19.Headlight System

A: WIRING DIAGRAM

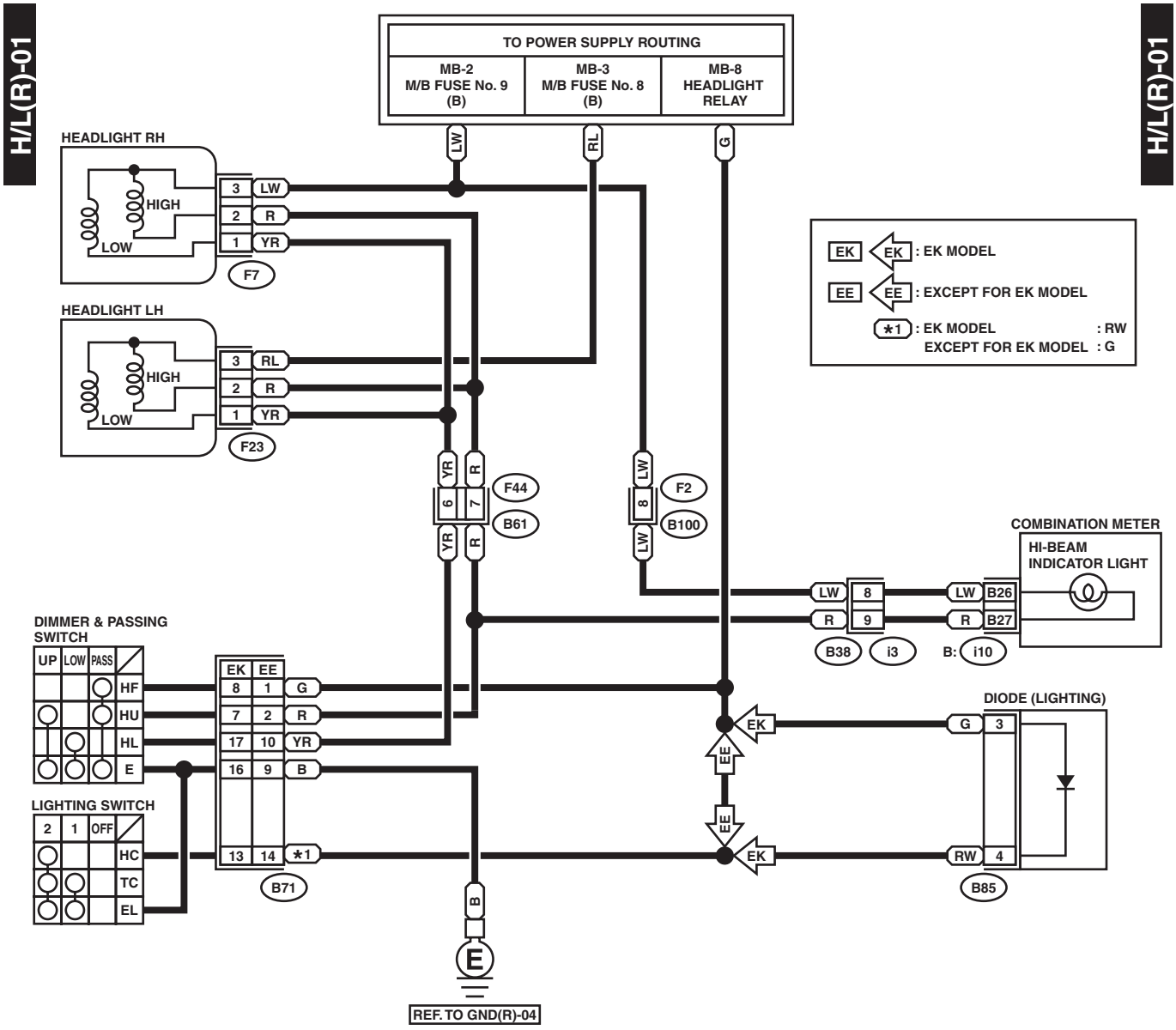
1. LHD MODEL

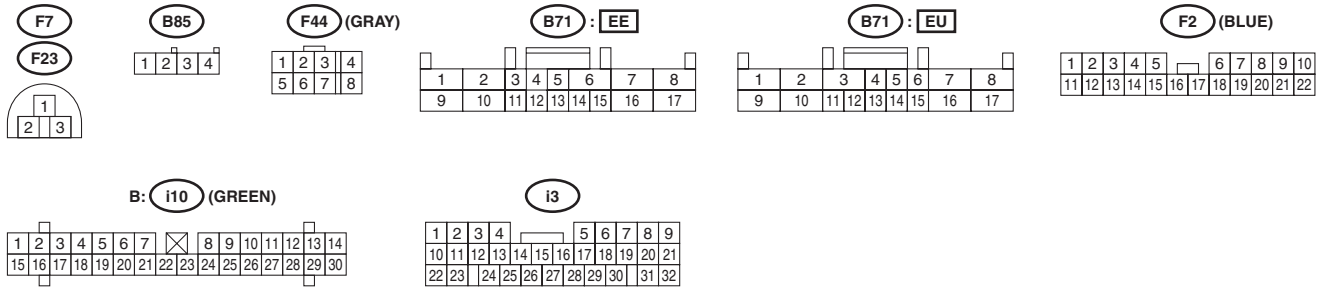




WI-07434

2. RHD MODEL



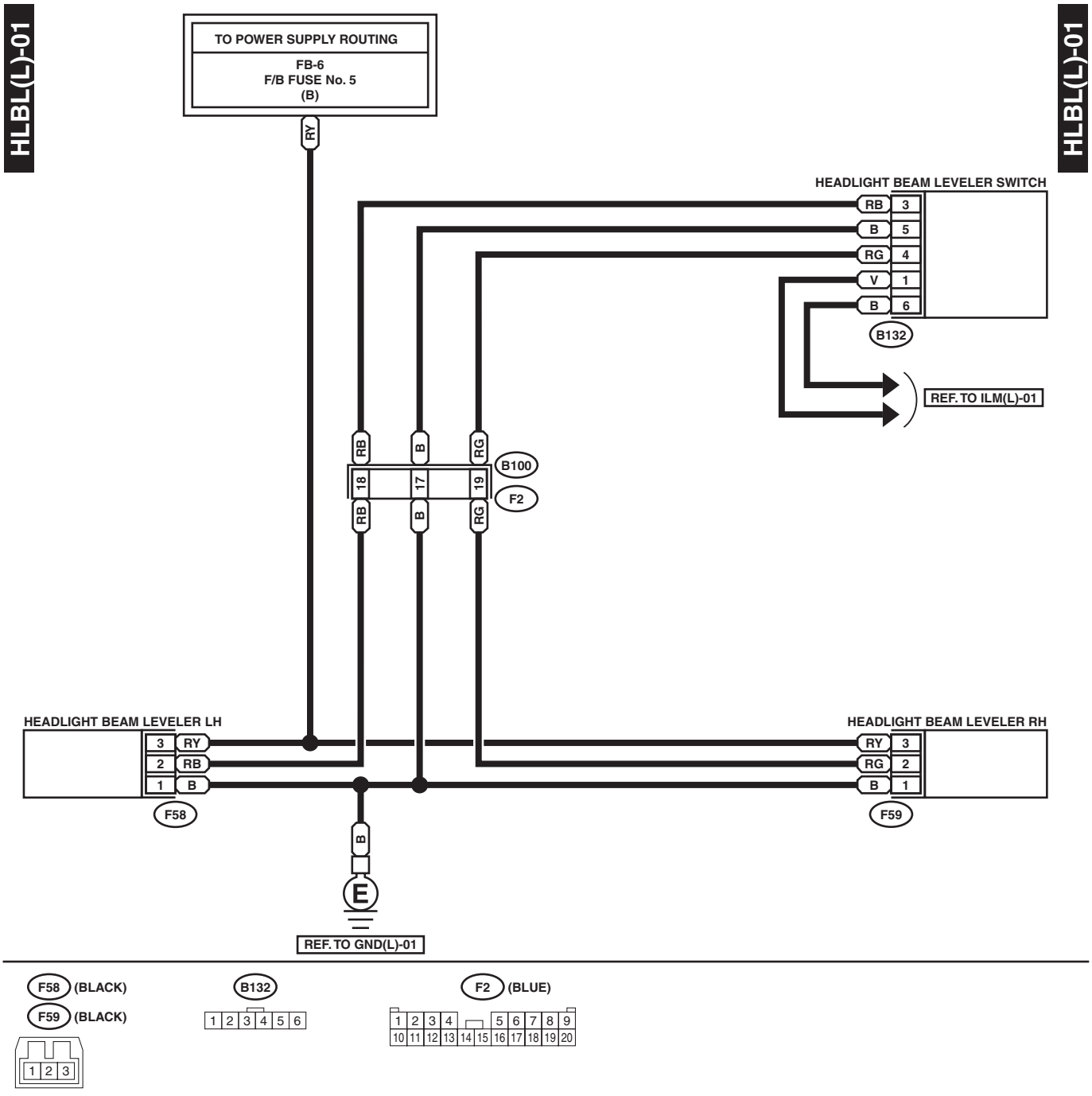


WI-07435

20.Headlight Beam Leveler System

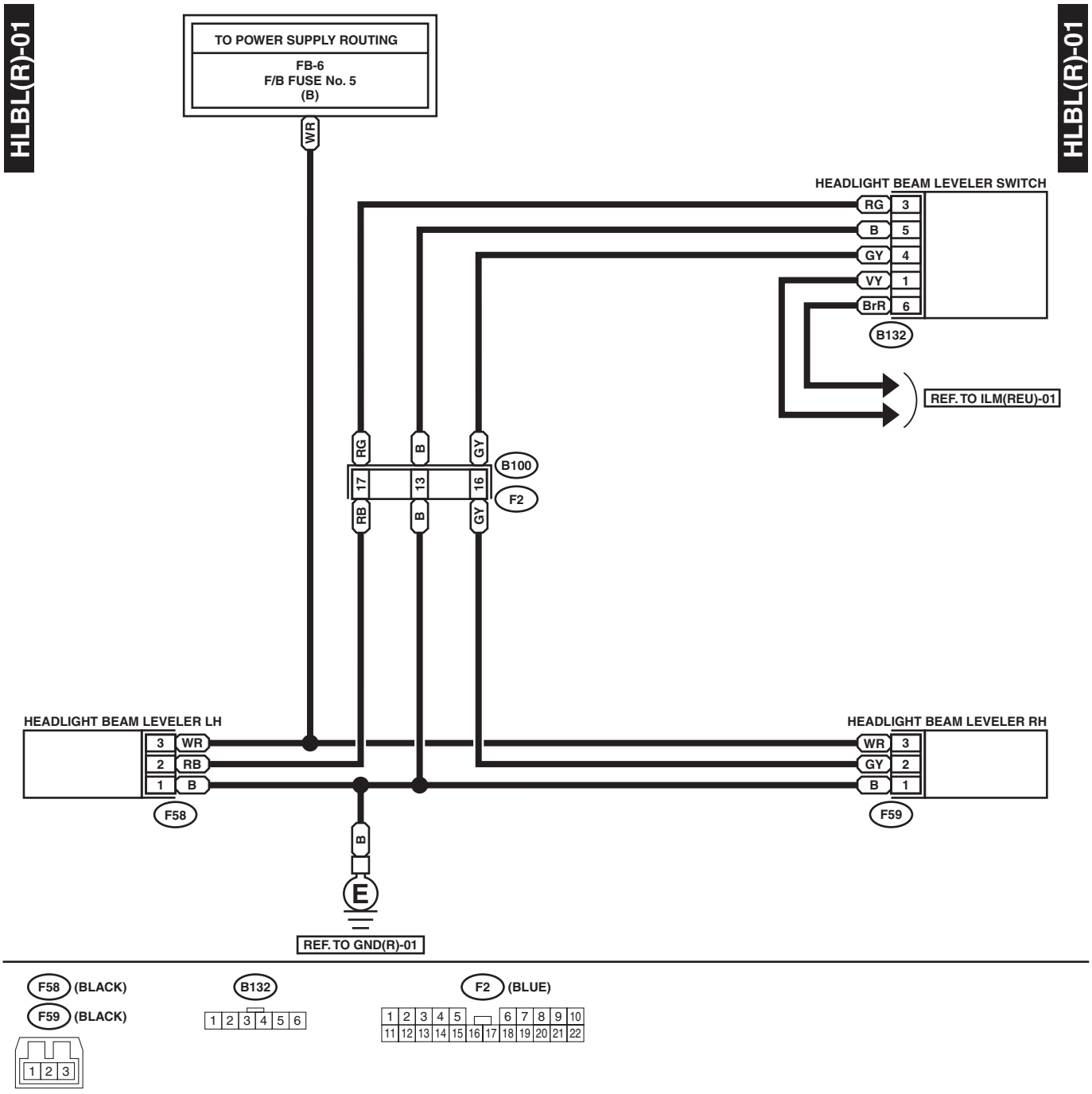
A: WIRING DIAGRAM

1. LHD MODEL



WI-03322

2. RHD MODEL

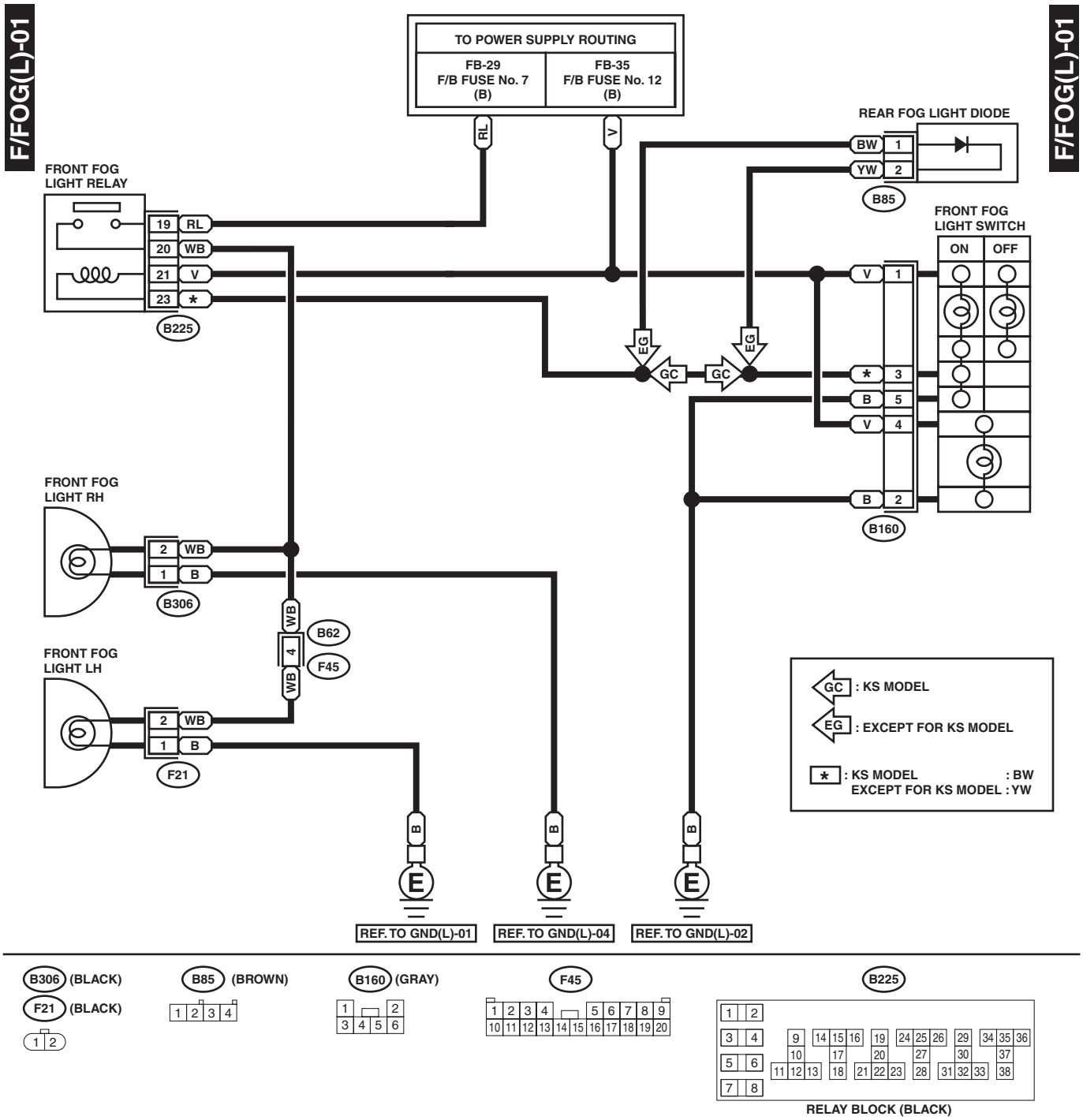


WI-03323

21.Front Fog Light System

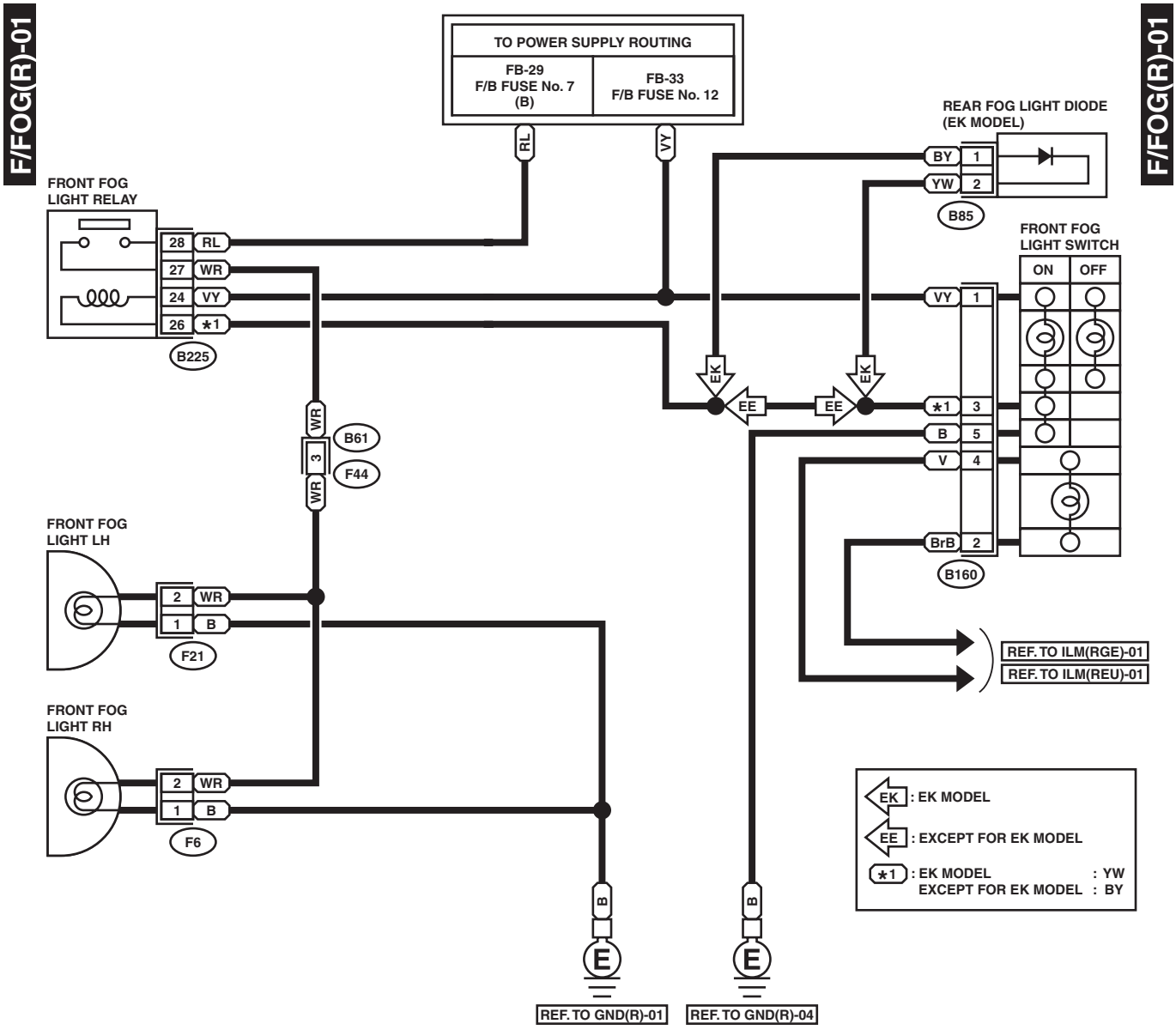
A: WIRING DIAGRAM

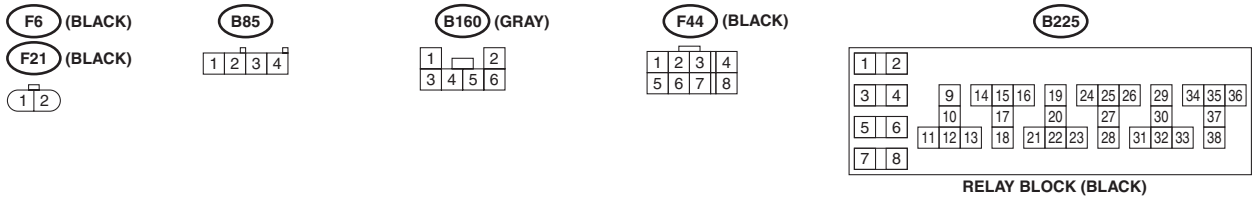
1. LHD MODEL



WI-07436

2. RHD MODEL



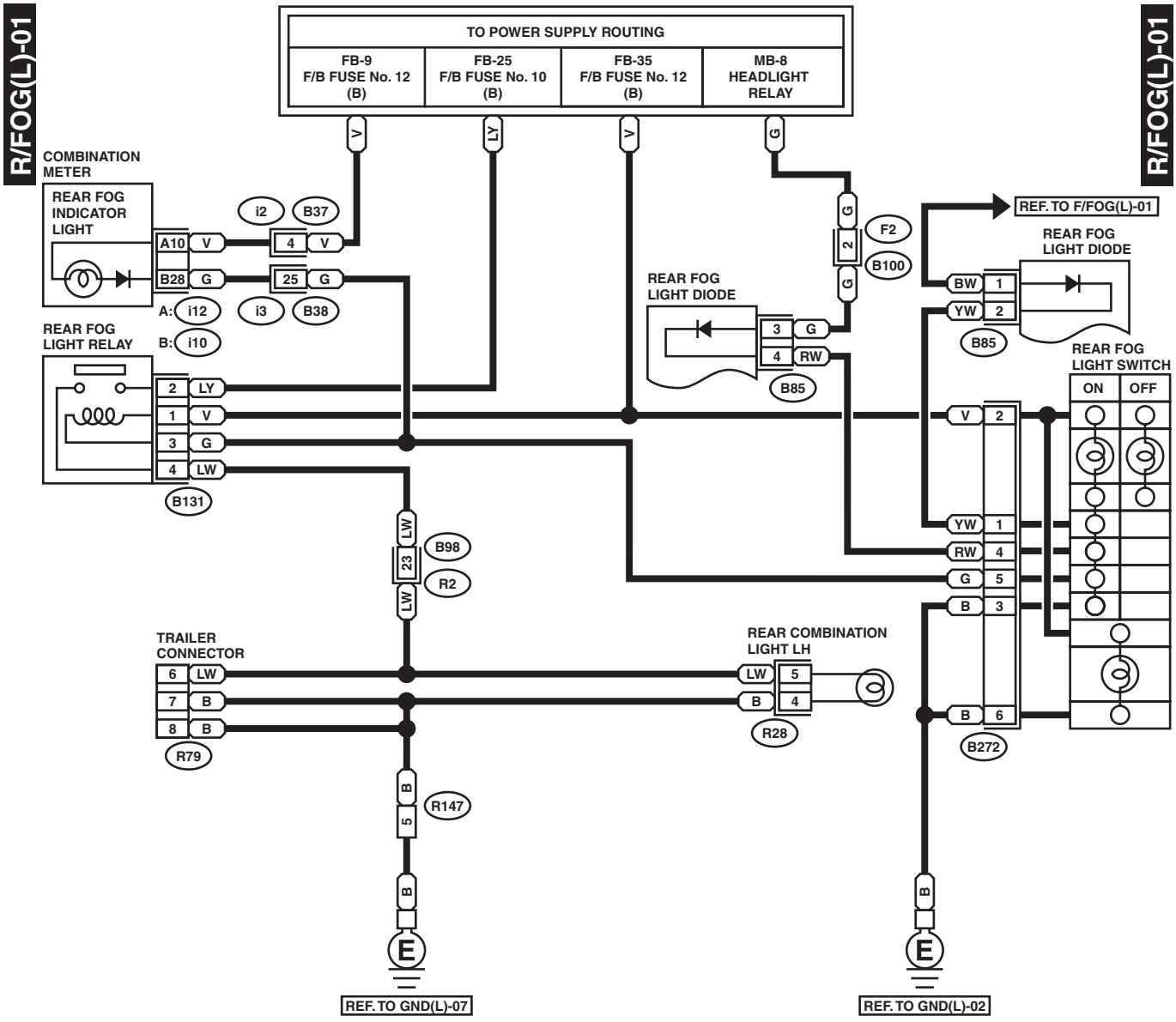


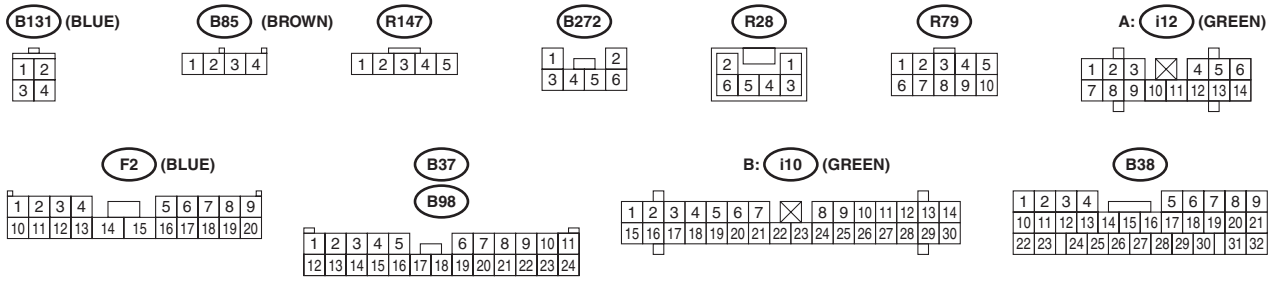
WI-07437

22.Rear Fog Light System

A: WIRING DIAGRAM

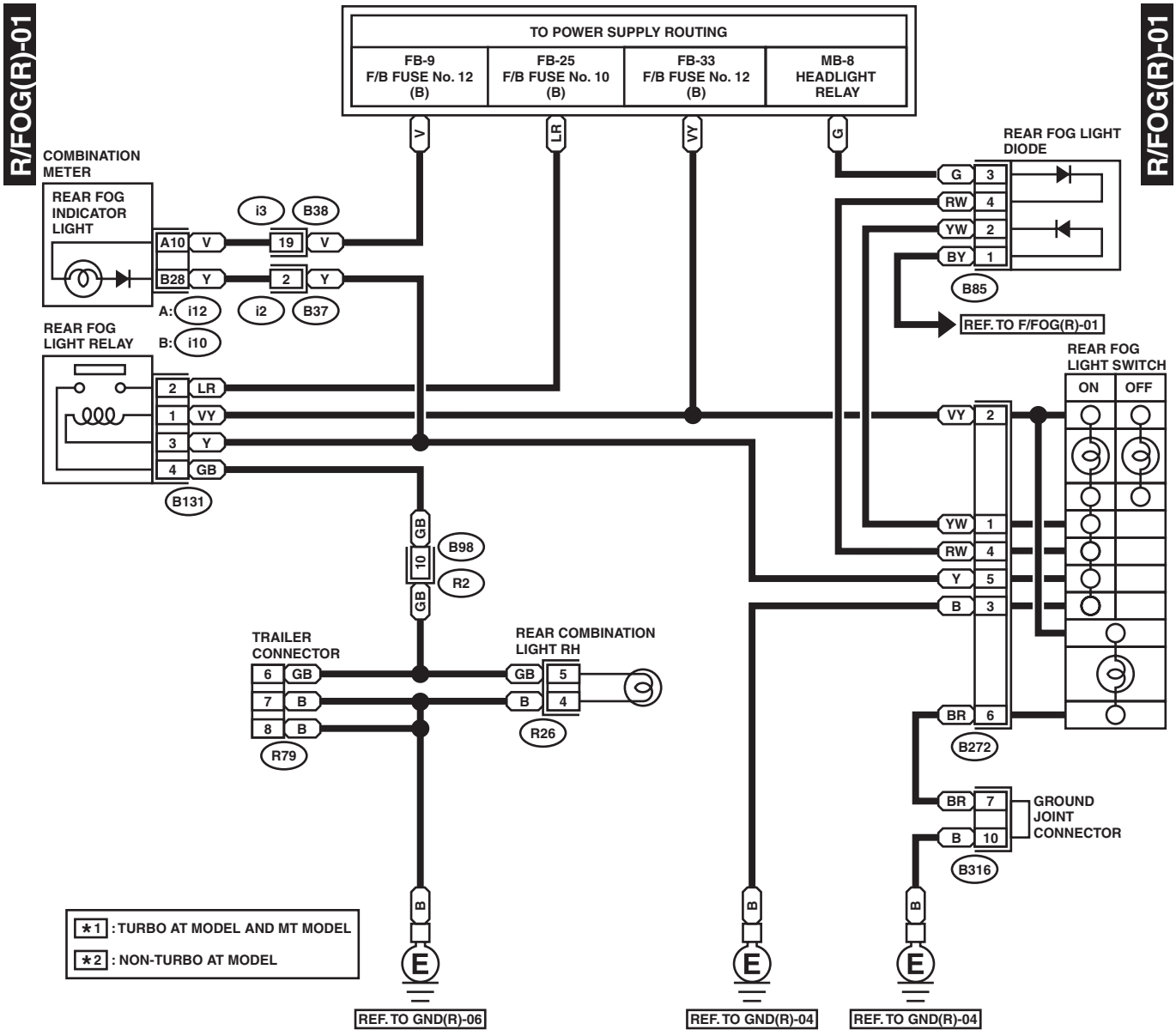
1. LHD MODEL





WI-07438

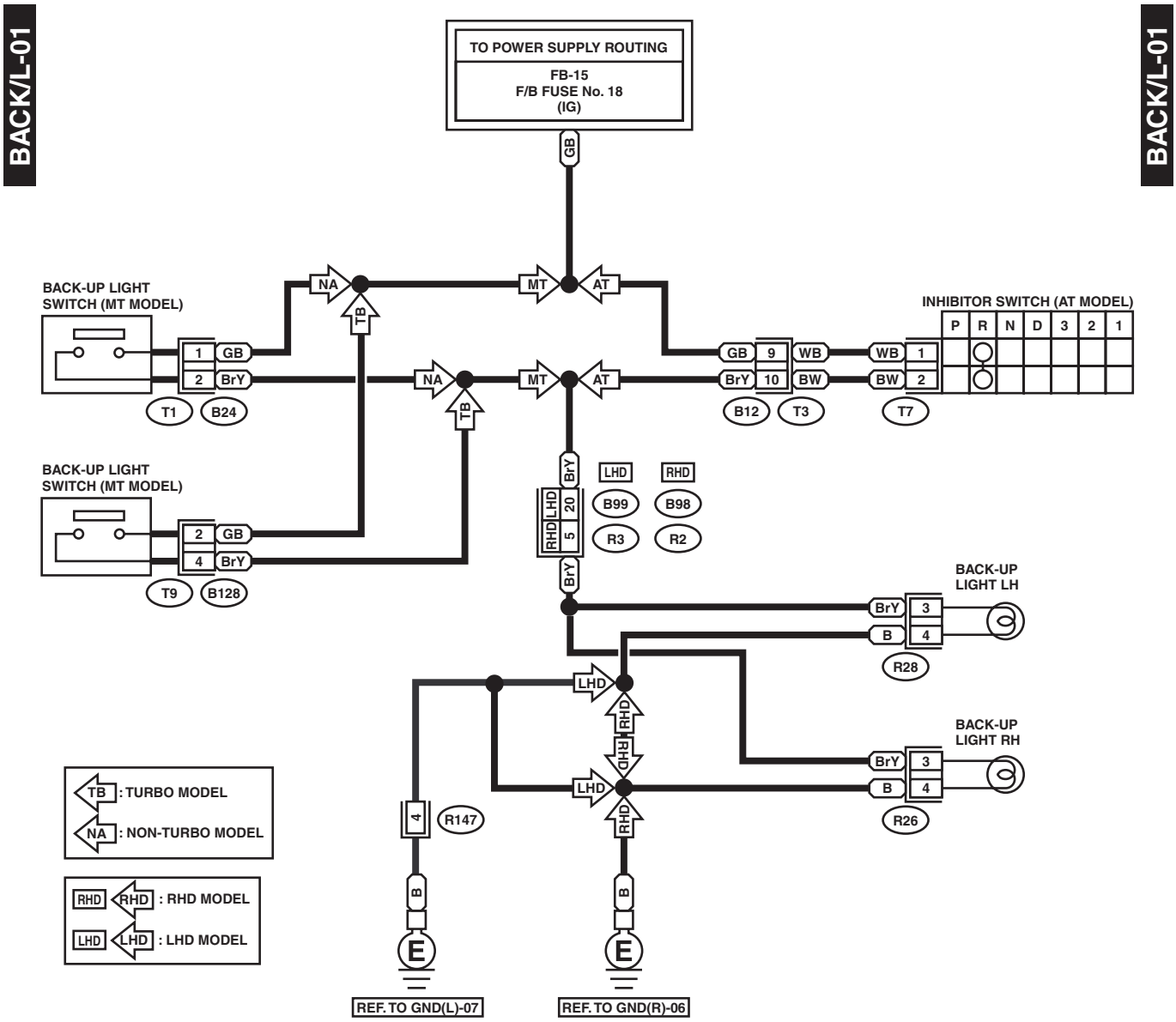
2. RHD MODEL

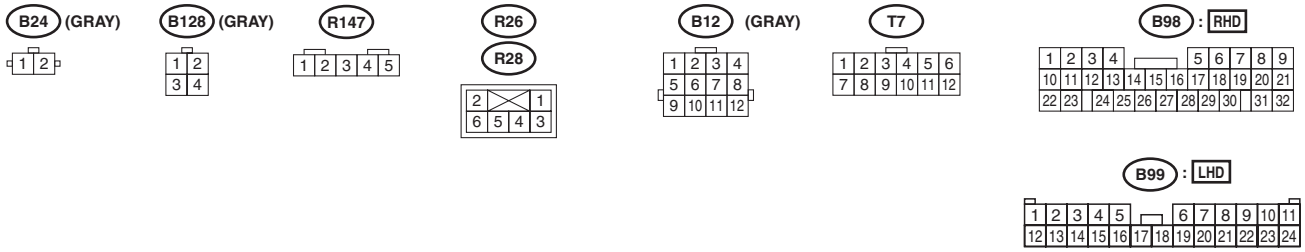


WI-06157

23.Back-up Light System

A: WIRING DIAGRAM

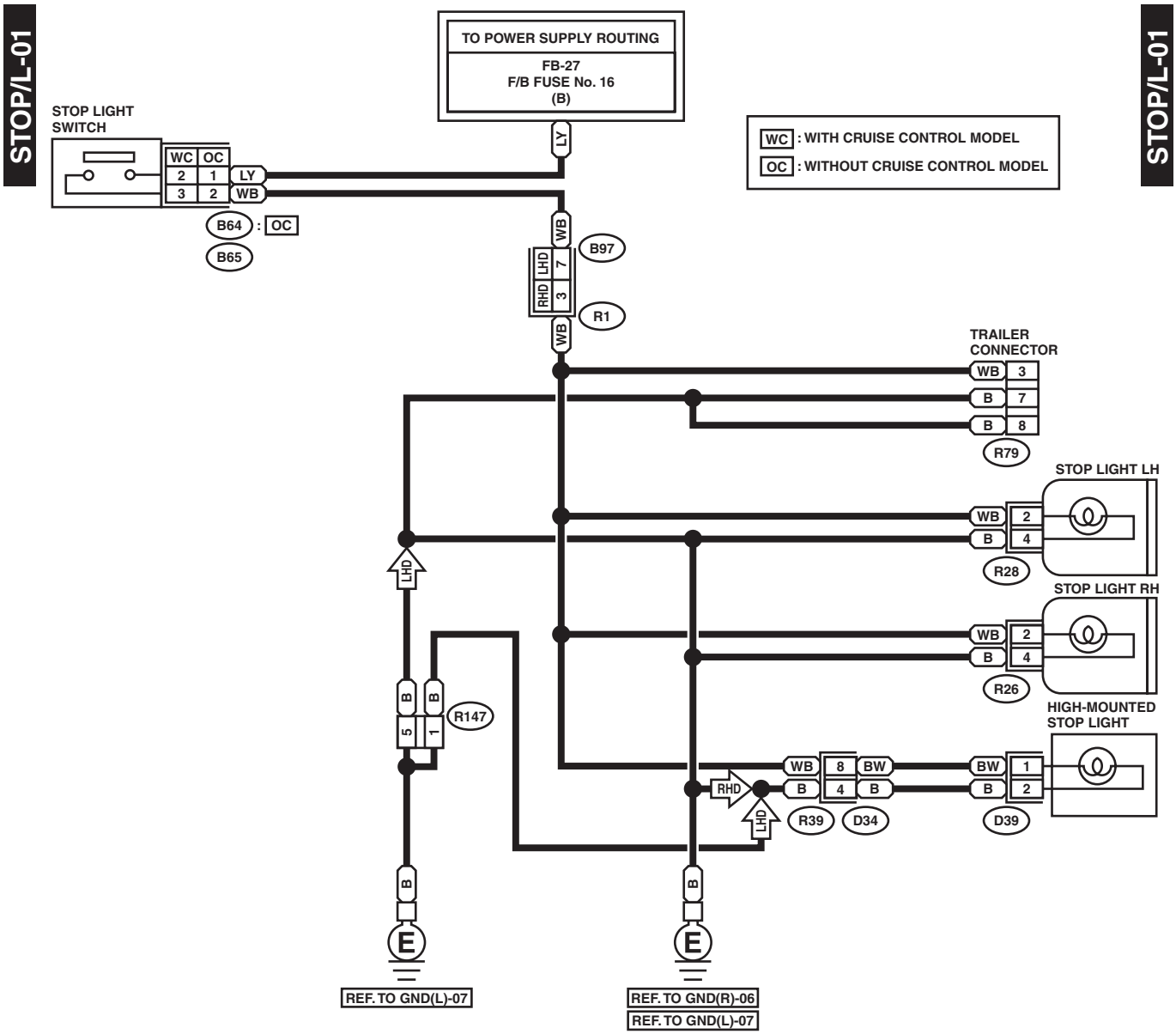


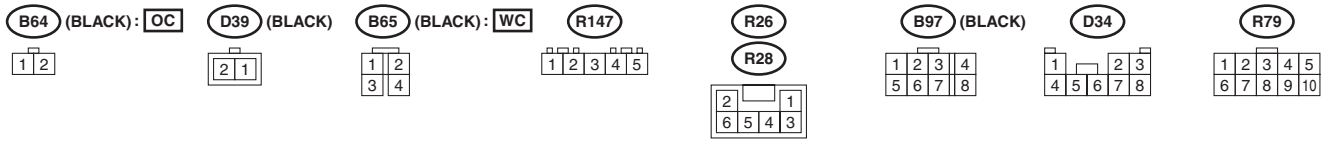


WI-07439

24.Stop Light System

A: WIRING DIAGRAM



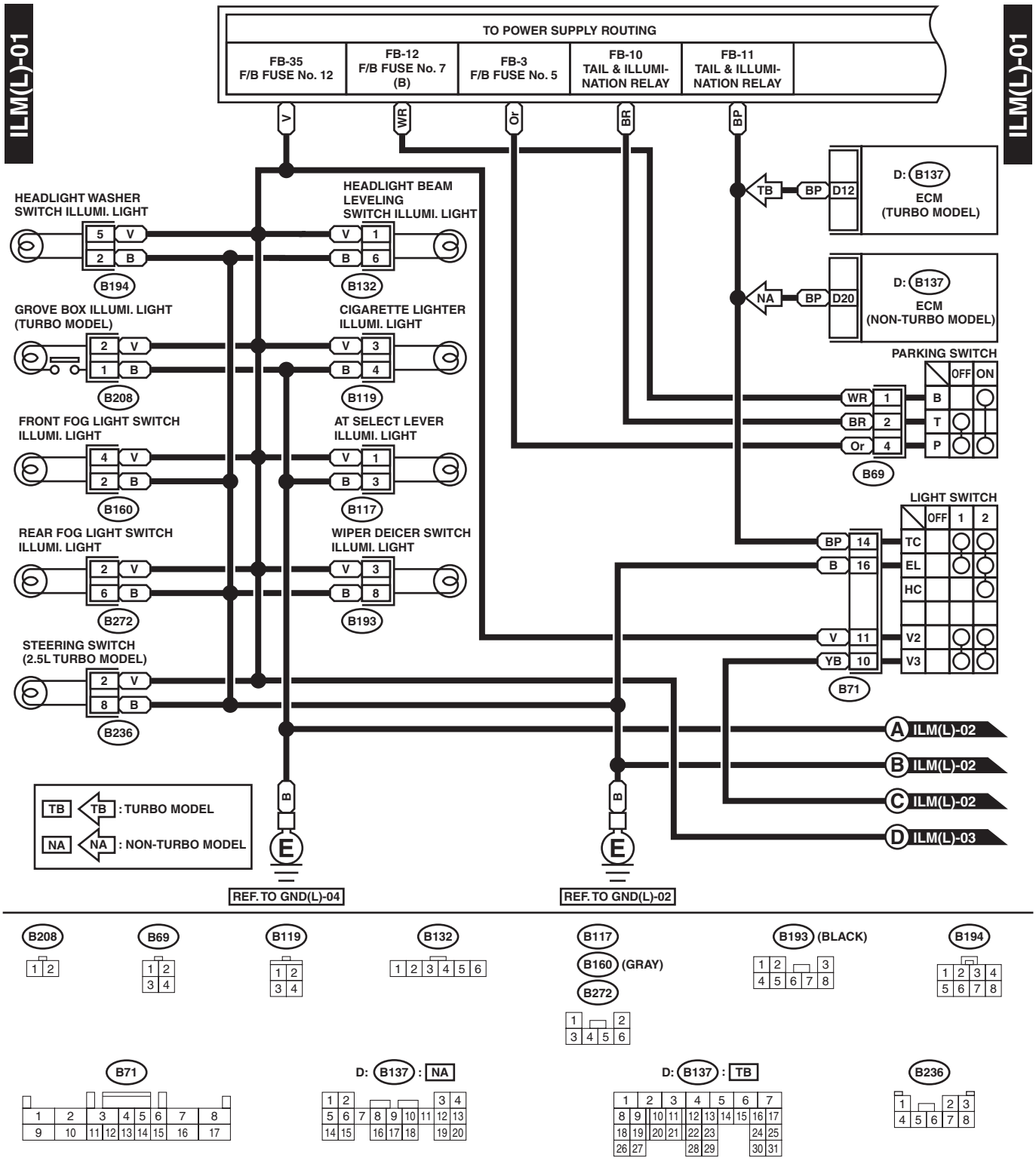


WI-07440

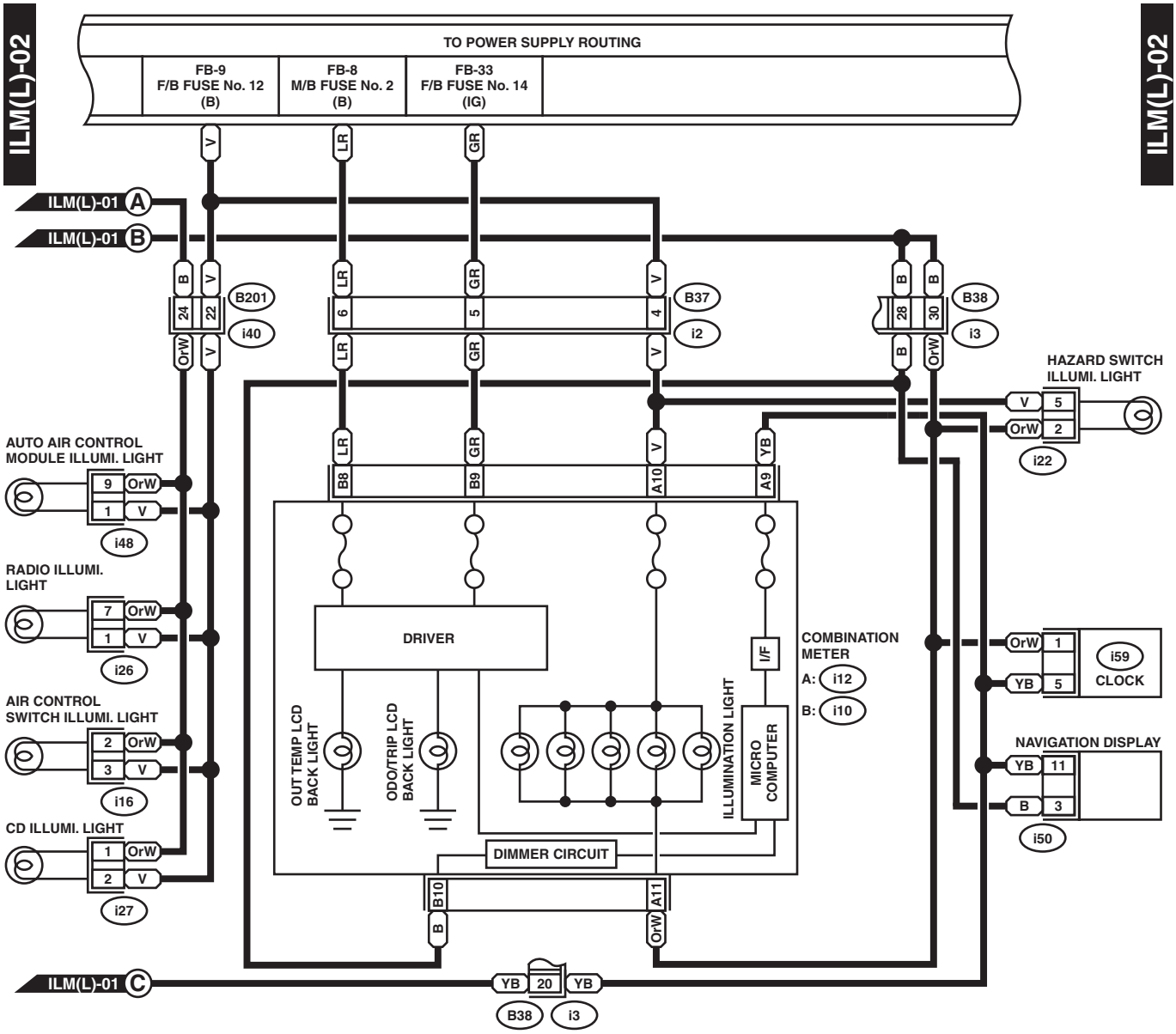
25.Clearance Light and Illumination Light System

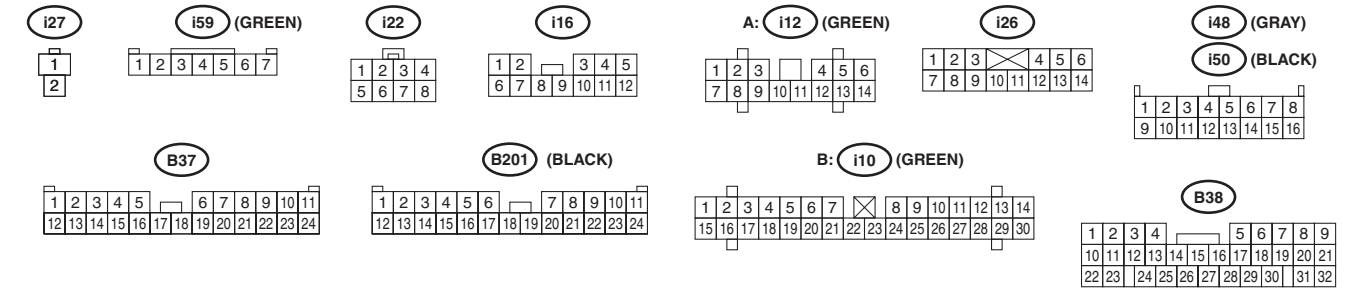
A: WIRING DIAGRAM

1. LHD MODEL

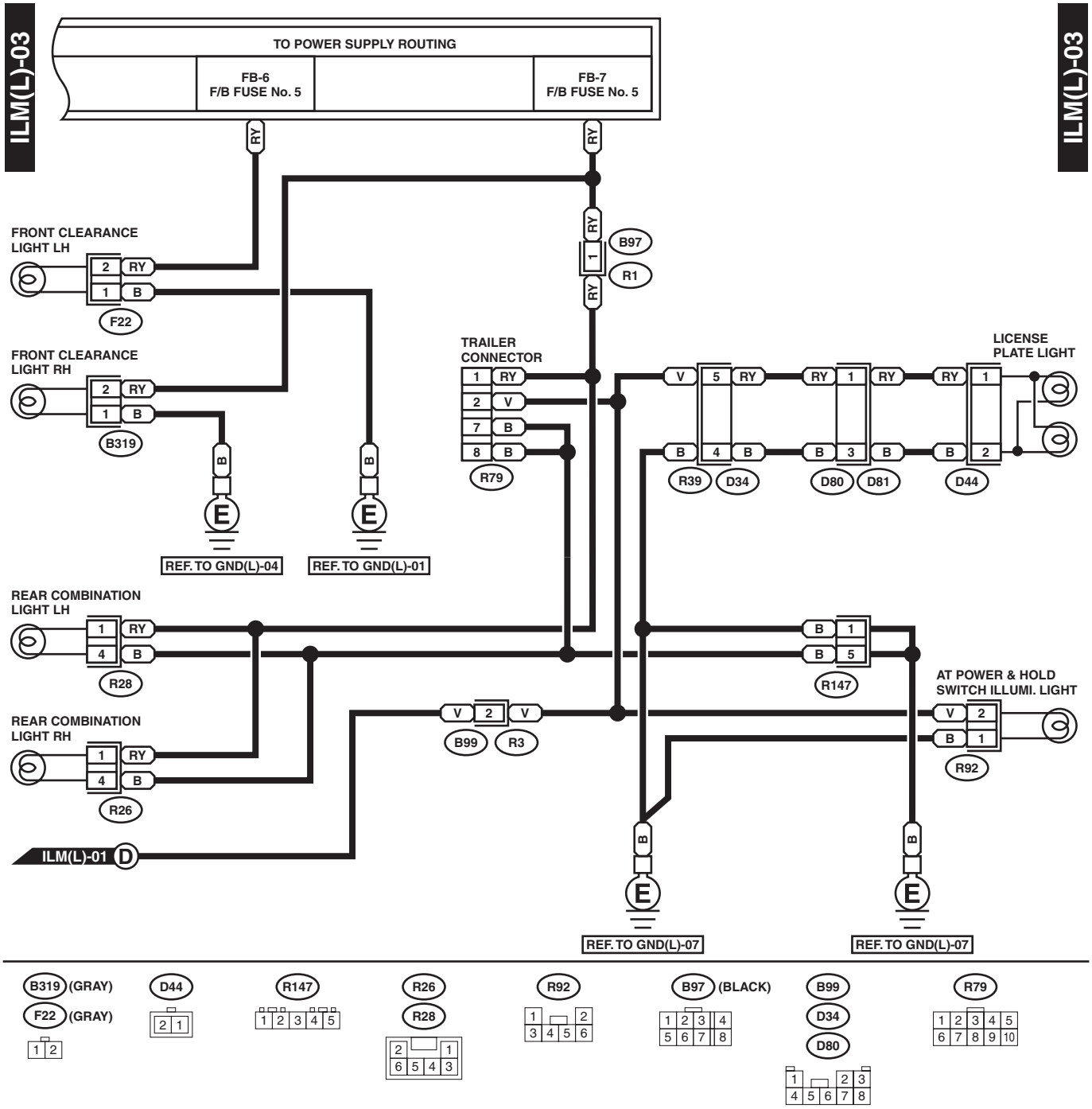


WI-06068


ILM(L)-02
ILM(L)-02
TO POWER SUPPLY ROUTING
FB-9
F/B FUSE No. 12
(B)
FB-8
M/B FUSE No. 2
(B)
FB-33
F/B FUSE No. 14
(IG)
ILM(L)-01 A
ILM(L)-01 B
ILM(L)-01 C
B201
i40
B37
i2
B38
i3
HAZARD SWITCH
ILLUMI. LIGHT
i22
AUTO AIR CONTROL
MODULE ILLUMI. LIGHT
i48
RADIO ILLUMI.
LIGHT
i26
AIR CONTROL
SWITCH ILLUMI. LIGHT
i16
CD ILLUMI. LIGHT
i27
DRIVER
OUT TEMP LCD
BACK LIGHT
ODO/TRIP LCD
BACK LIGHT
ILLUMINATION LIGHT
MICRO
COMPUTER
I/F
COMBINATION
METER
A: i12
B: i10
DIMMER CIRCUIT
CLOCK
i59
NAVIGATION DISPLAY
i50

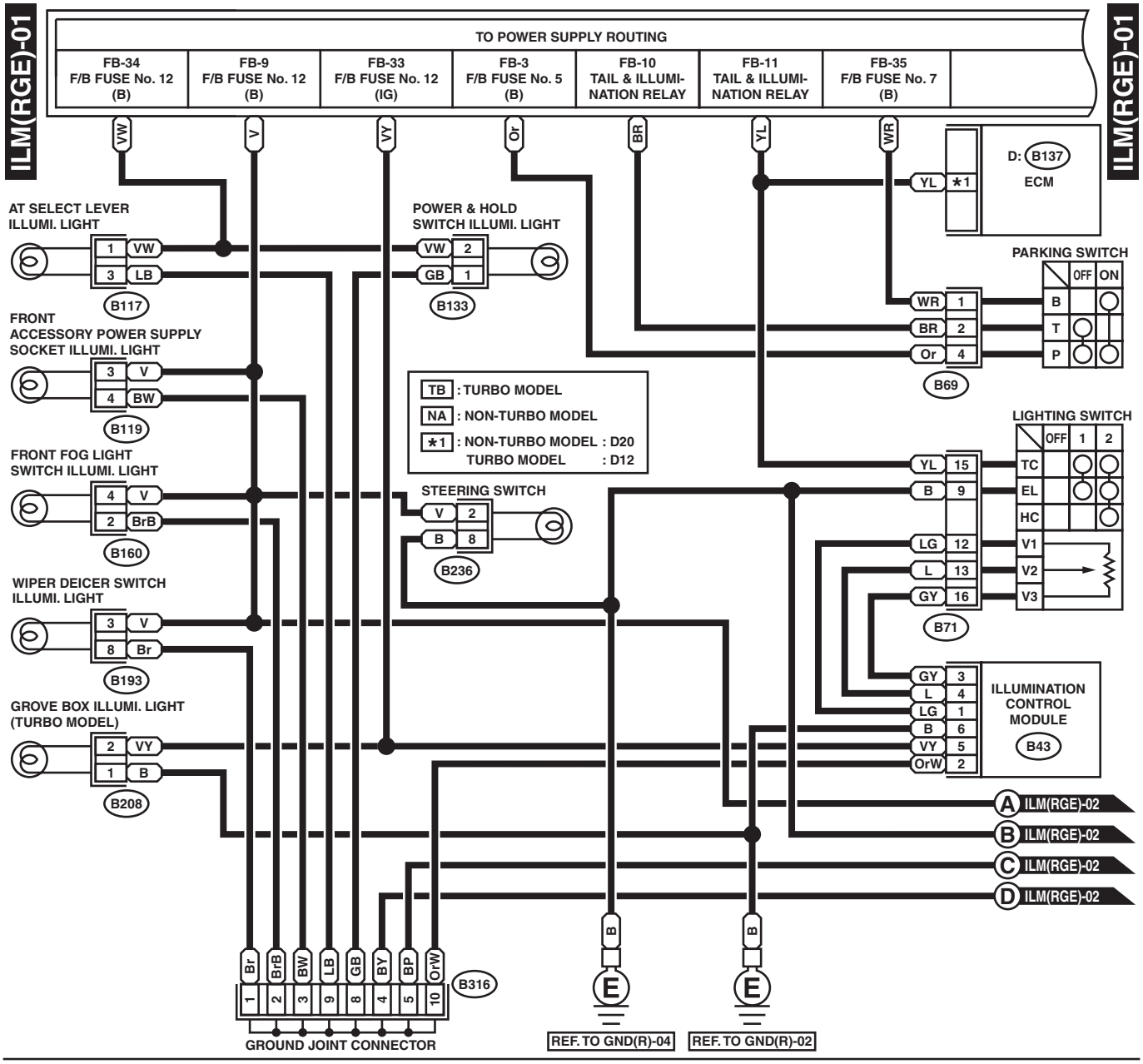

i27
i59 (GREEN)
i22
i16
A: i12 (GREEN)
i26
i48 (GRAY)
i50 (BLACK)
B37
B201 (BLACK)
B: i10 (GREEN)
B38

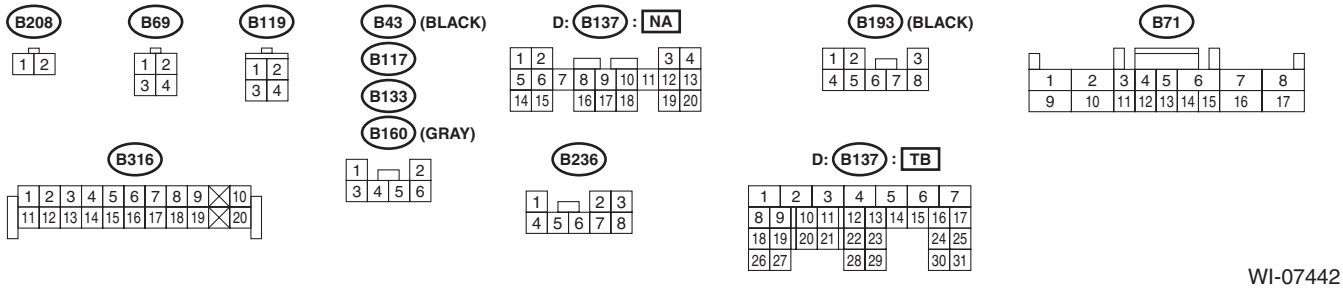
WI-07441


ILM(L)-03
ILM(L)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE No. 5
FB-7
F/B FUSE No. 5
RY
FRONT CLEARANCE
LIGHT LH
FRONT CLEARANCE
LIGHT RH
F22
B319
B97
R1
TRAILER
CONNECTOR
R79
LICENSE
PLATE LIGHT
R39
D34
D80
D81
D44
REF. TO GND(L)-04
REF. TO GND(L)-01
REAR COMBINATION
LIGHT LH
REAR COMBINATION
LIGHT RH
R28
R26
R147
B99
R3
AT POWER & HOLD
SWITCH ILLUMI. LIGHT
R92
ILM(L)-01
REF. TO GND(L)-07
REF. TO GND(L)-07
B319 (GRAY)
F22 (GRAY)
D44
R147
R26
R28
R92
B97 (BLACK)
B99
D34
D80
R79

WI-06070

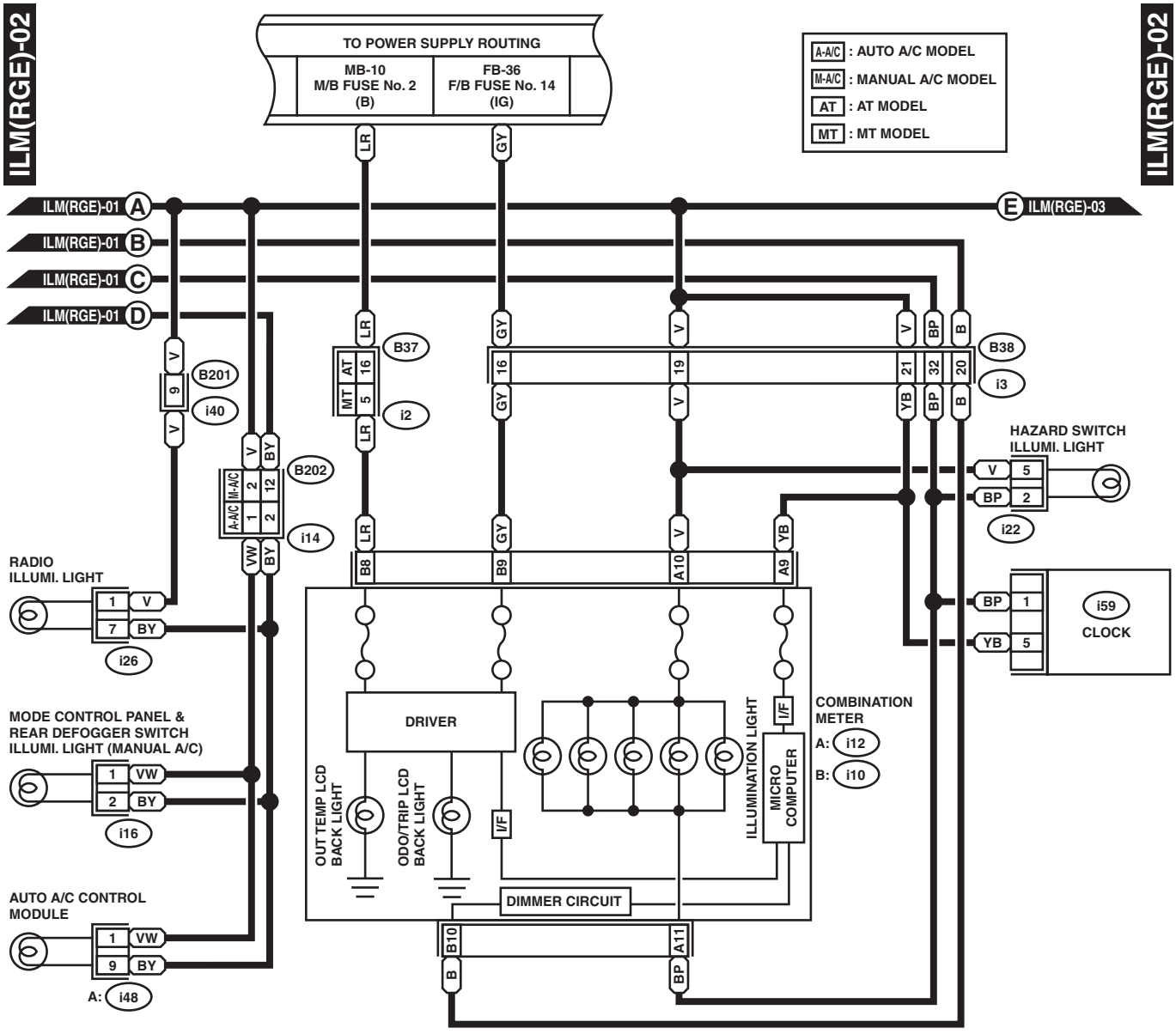
2. RHD WITH ILLUMINATION CONTROL MODEL

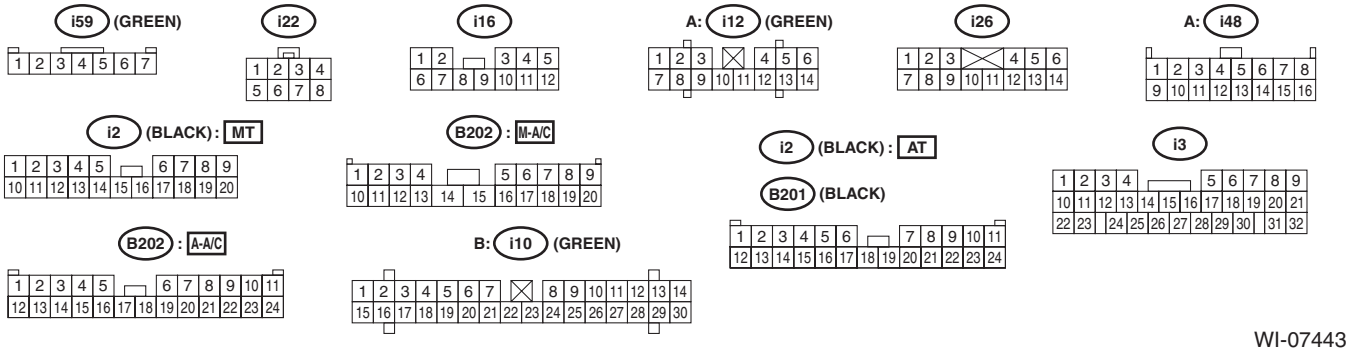




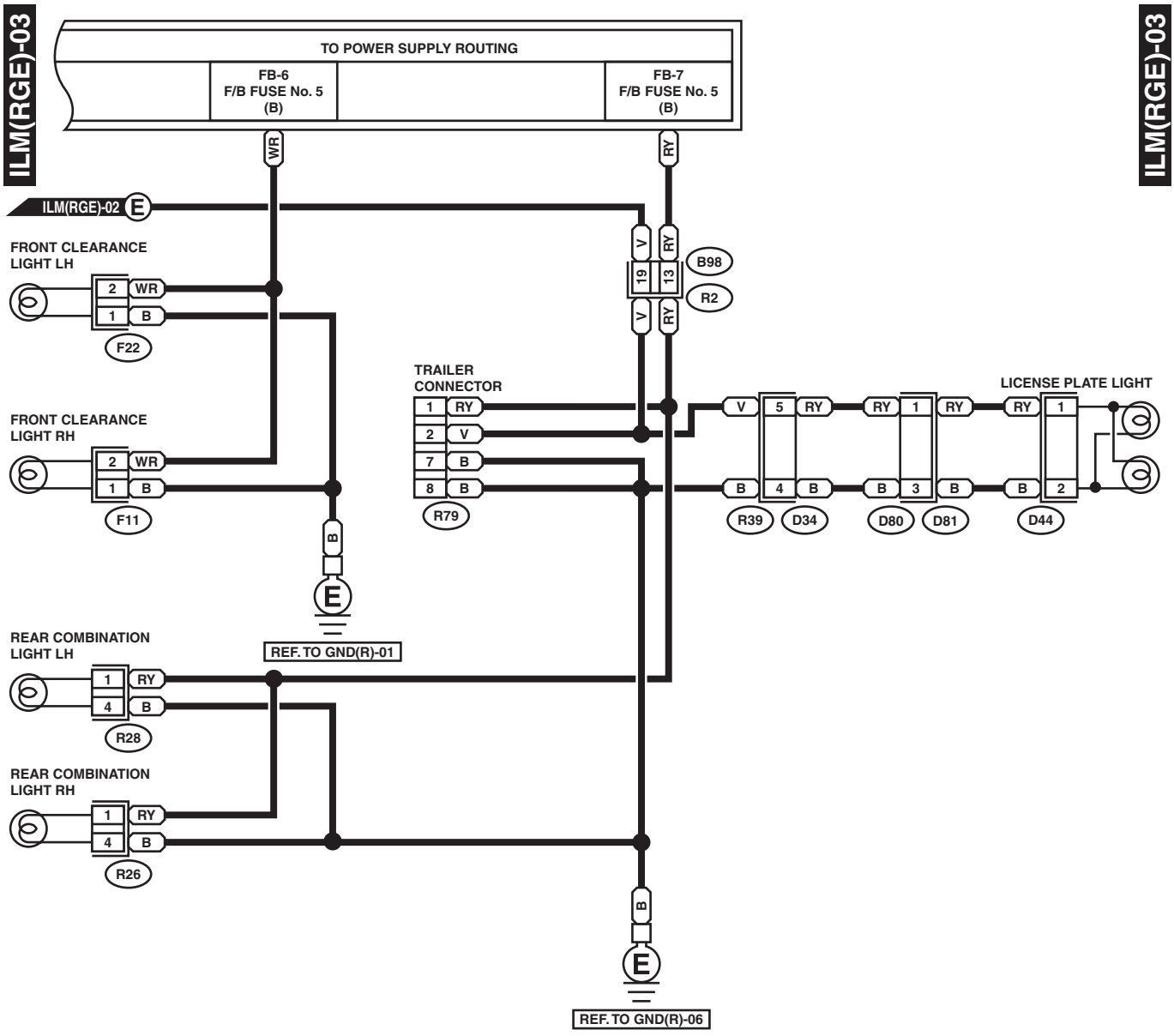
WI-07442

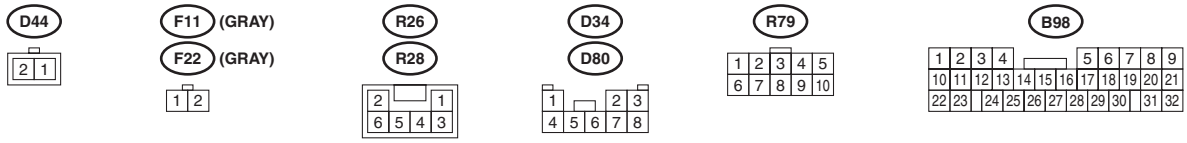
Clearance Light and Illumination Light System





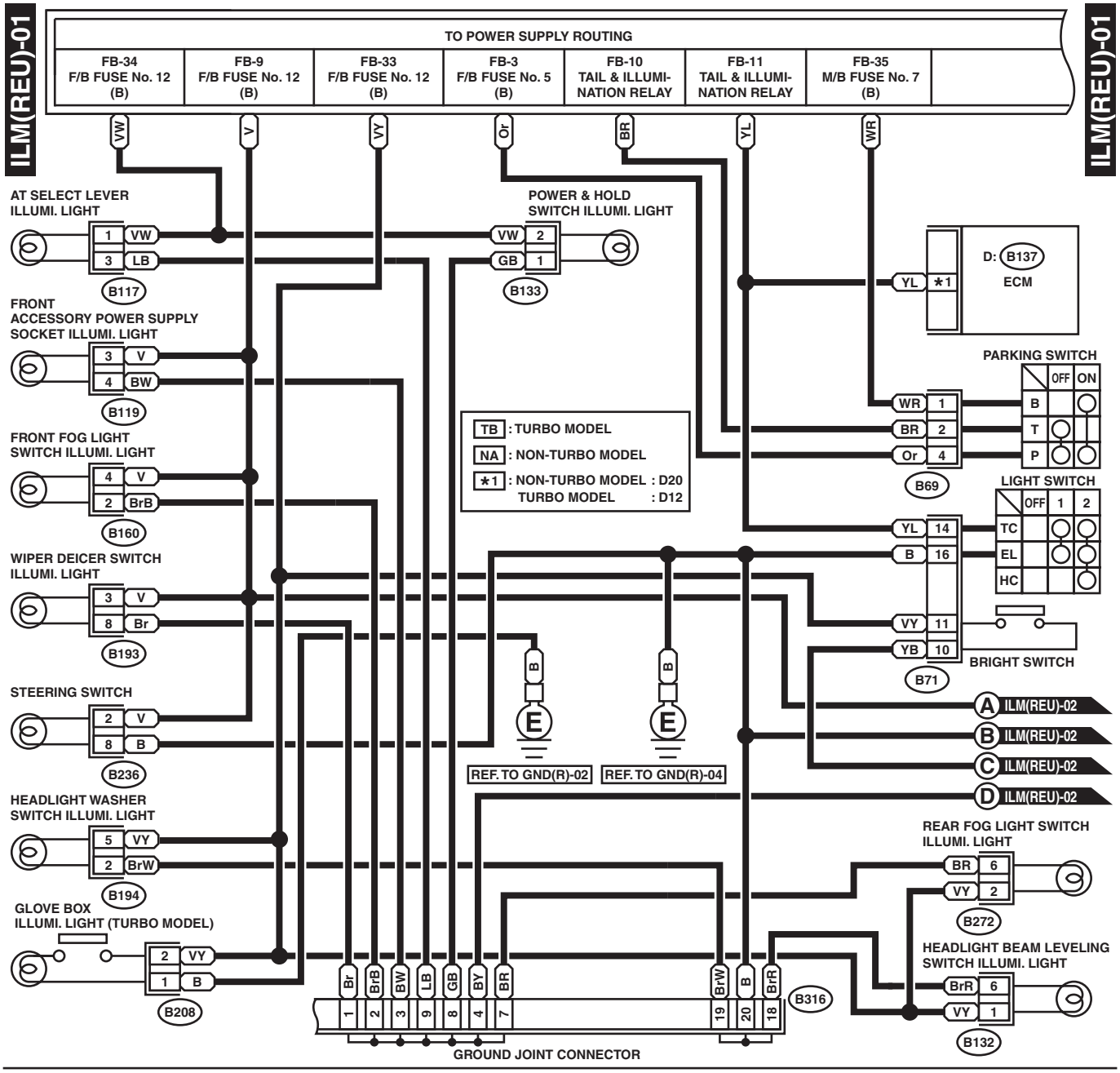
WI-07443

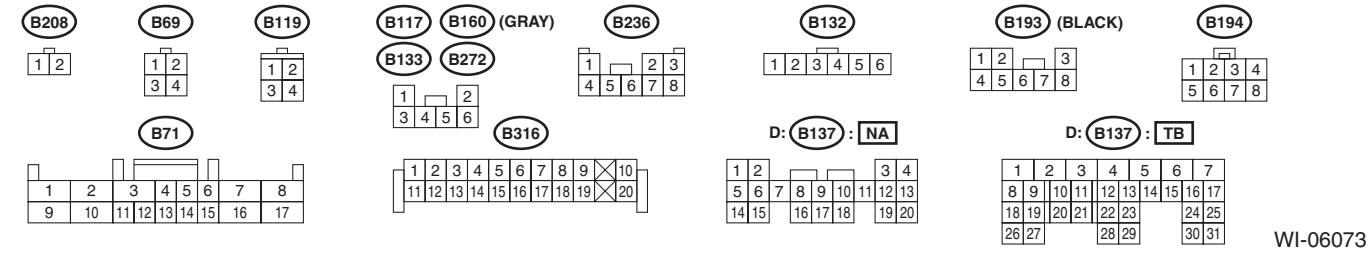

ILM(RGE)-03
ILM(RGE)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE No. 5
(B)
FB-7
F/B FUSE No. 5
(B)
WR
RY
ILM(RGE)-02
E
FRONT CLEARANCE
LIGHT LH
2 WR
1 B
F22
FRONT CLEARANCE
LIGHT RH
2 WR
1 B
F11
V
RY
19
13
B98
R2
TRAILER
CONNECTOR
1 RY
2 V
7 B
8 B
R79
LICENSE PLATE LIGHT
V 5 RY
RY 1 RY
RY 1
B 4 B
B 3 B
B 2
R39
D34
D80
D81
D44
B
E
REF. TO GND(R)-01
REAR COMBINATION
LIGHT LH
1 RY
4 B
R28
REAR COMBINATION
LIGHT RH
1 RY
4 B
R26
B
E
REF. TO GND(R)-06


D44
2 1
F11 (GRAY)
F22 (GRAY)
1 2
R26
R28
2 1
6 5 4 3
D34
D80
1 2 3
4 5 6 7 8
R79
1 2 3 4 5
6 7 8 9 10
B98
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32

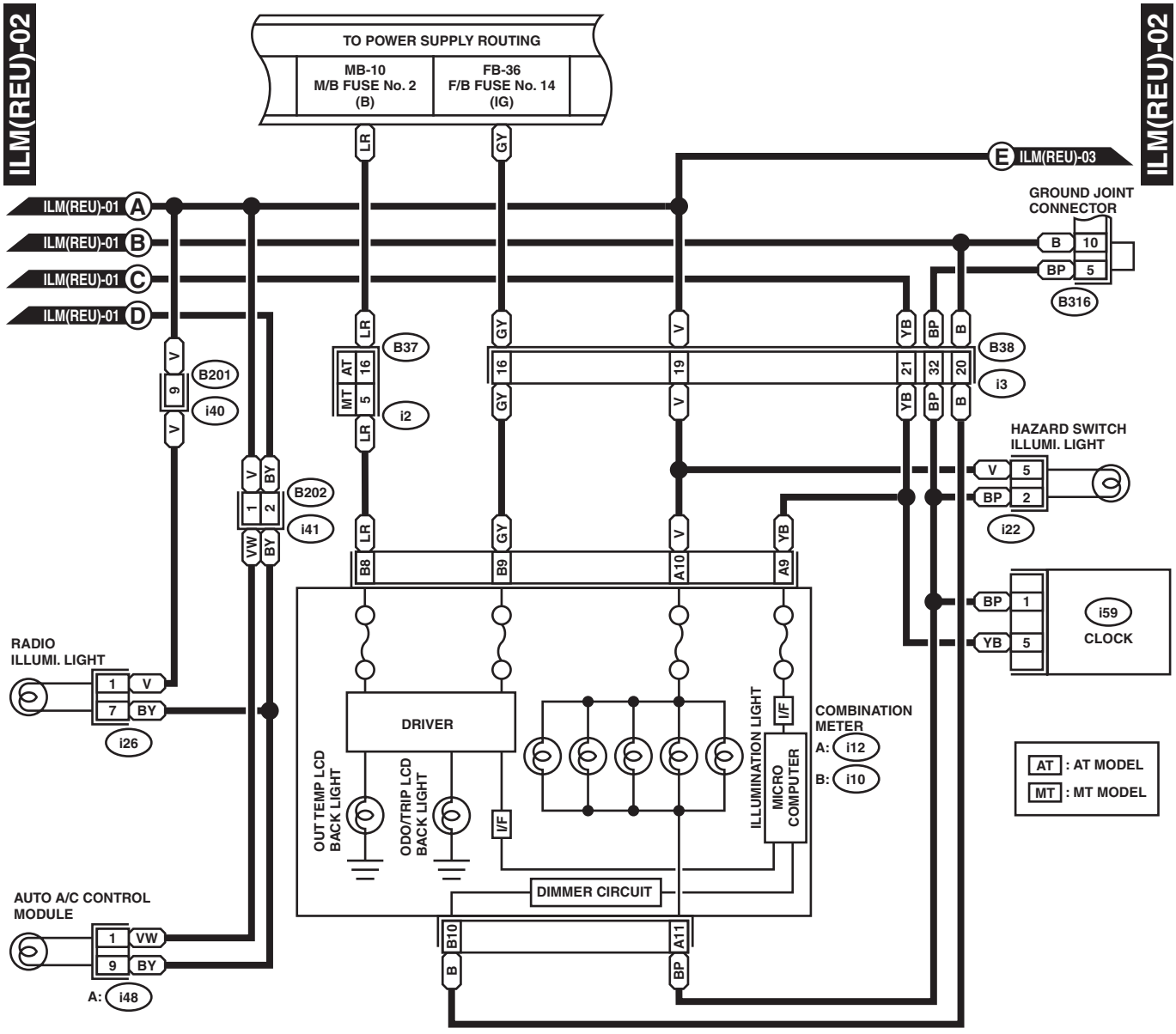
WI-03258

3. RHD WITH ILLUMINATION CONTROL MODEL

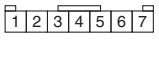




WI-06073

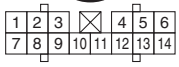


i59 (GREEN)

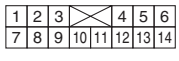


i22

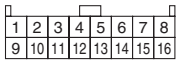
A: i12 (GREEN)



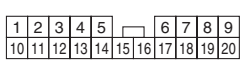
i26



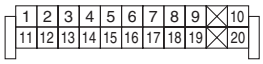
A: i48



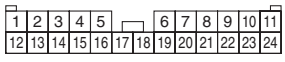
i2 (BLACK) : MT



B316

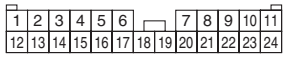


B202

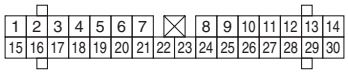


i2 (BLACK) : AT

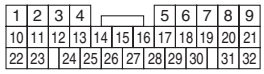
B201 (BLACK)



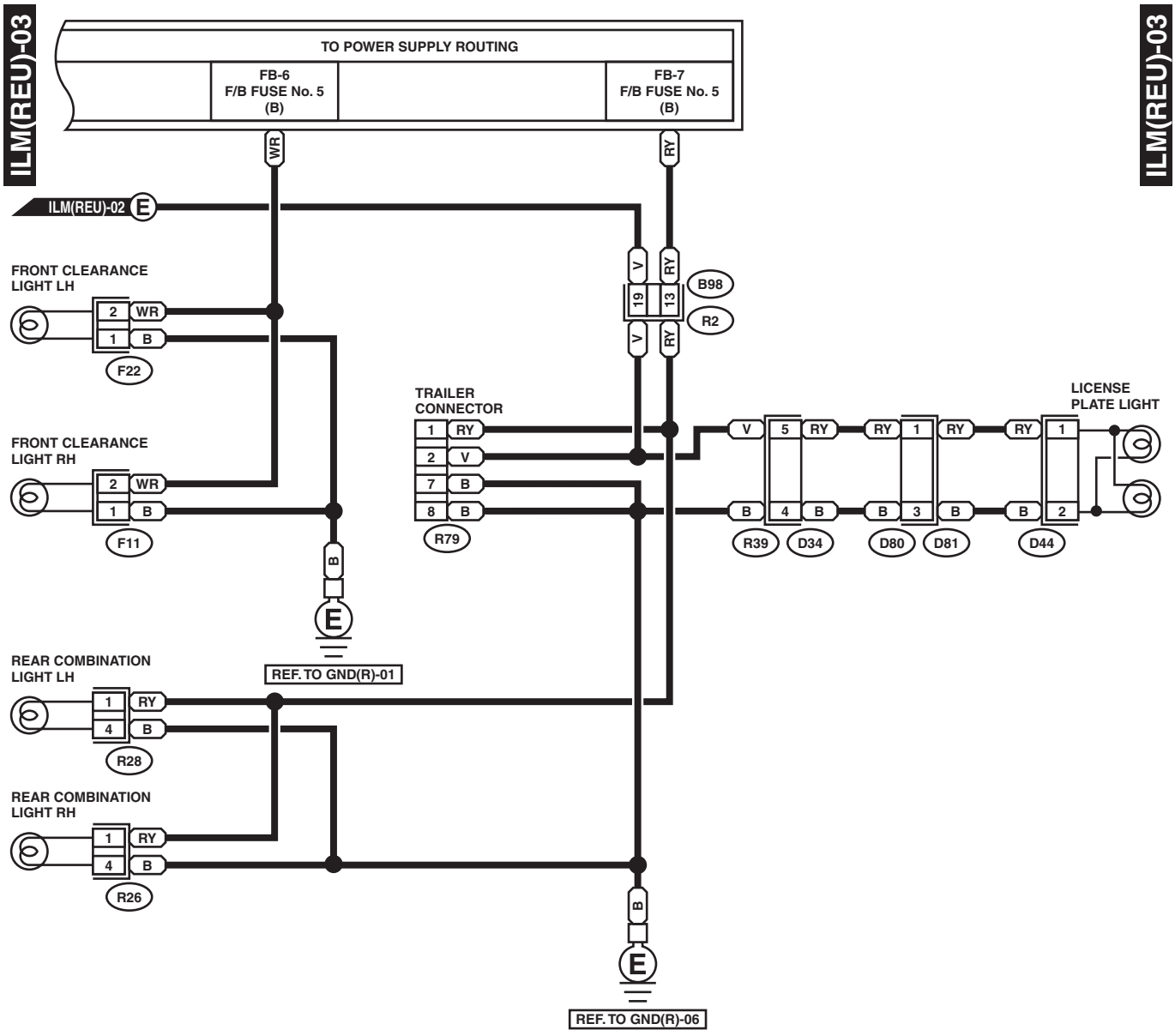
B: i10 (GREEN)

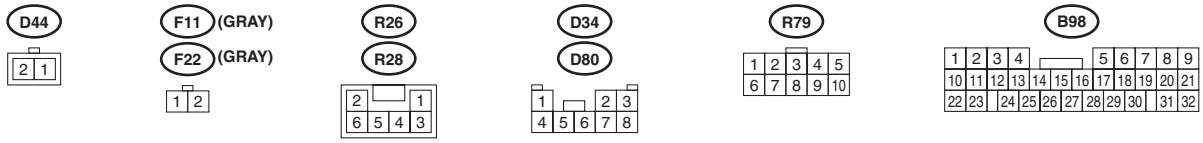


i3



WI-07444


ILM(REU)-03
ILM(REU)-03
TO POWER SUPPLY ROUTING
FB-6
F/B FUSE No. 5
(B)
FB-7
F/B FUSE No. 5
(B)
WR
RY
ILM(REU)-02
E
FRONT CLEARANCE
LIGHT LH
2 WR
1 B
F22
FRONT CLEARANCE
LIGHT RH
2 WR
1 B
F11
V
RY
19
13
B98
R2
TRAILER
CONNECTOR
1 RY
2 V
7 B
8 B
R79
LICENSE
PLATE LIGHT
V 5 RY
B 4 B
RY 1 RY
B 3 B
RY 1
B 2
R39
D34
D80
D81
D44
B
E
REF. TO GND(R)-01
REAR COMBINATION
LIGHT LH
1 RY
4 B
R28
REAR COMBINATION
LIGHT RH
1 RY
4 B
R26
B
E
REF. TO GND(R)-06

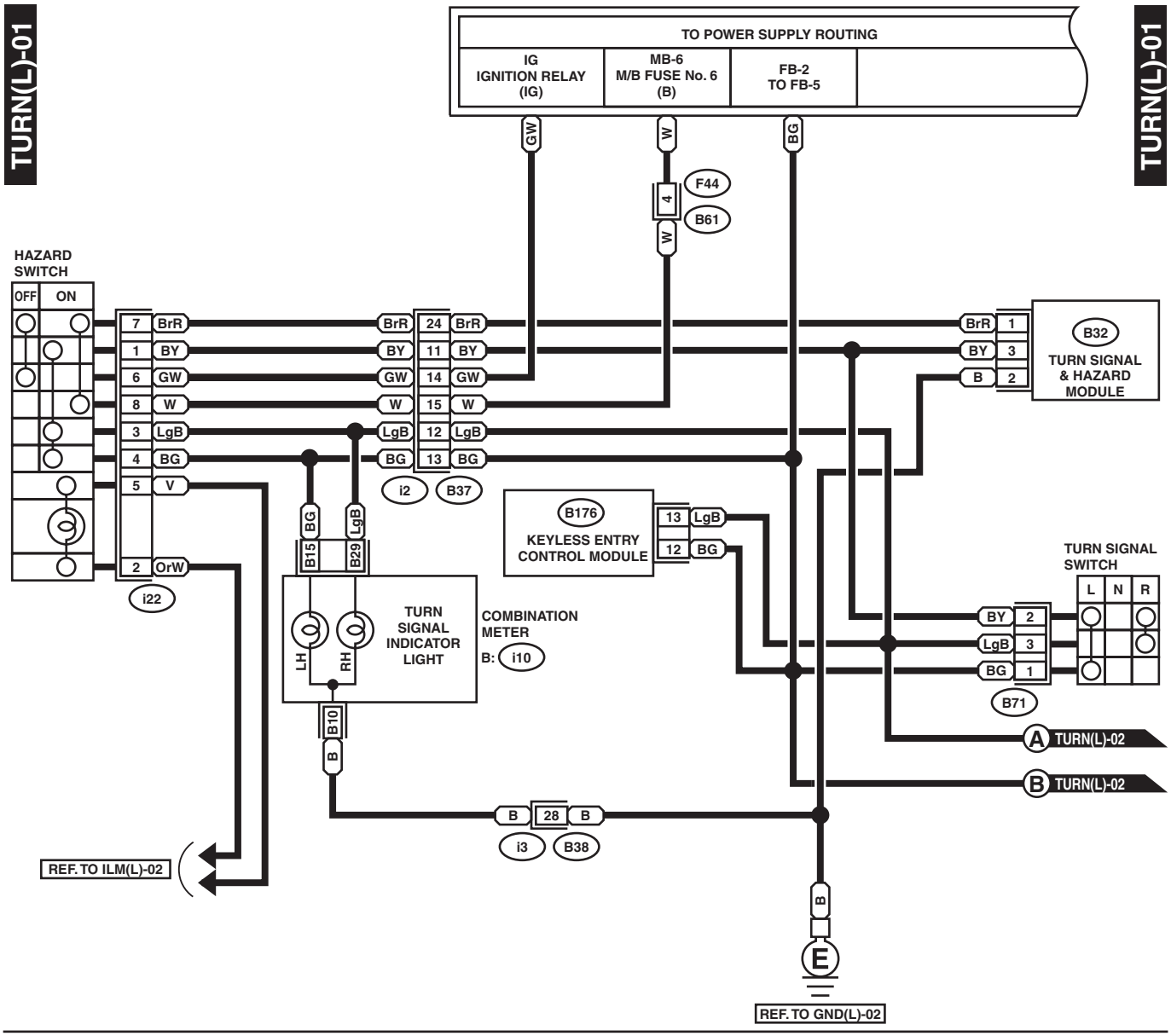

D44
2 1
F11 (GRAY)
F22 (GRAY)
1 2
R26
R28
2 1
6 5 4 3
D34
D80
1 2 3
4 5 6 7 8
R79
1 2 3 4 5
6 7 8 9 10
B98
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32

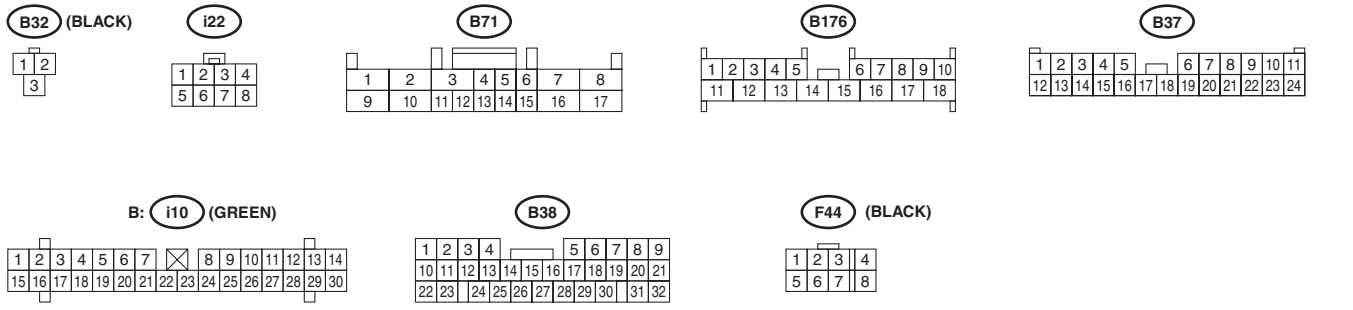
WI-03261

26.Turn Signal Light and Hazard Light System

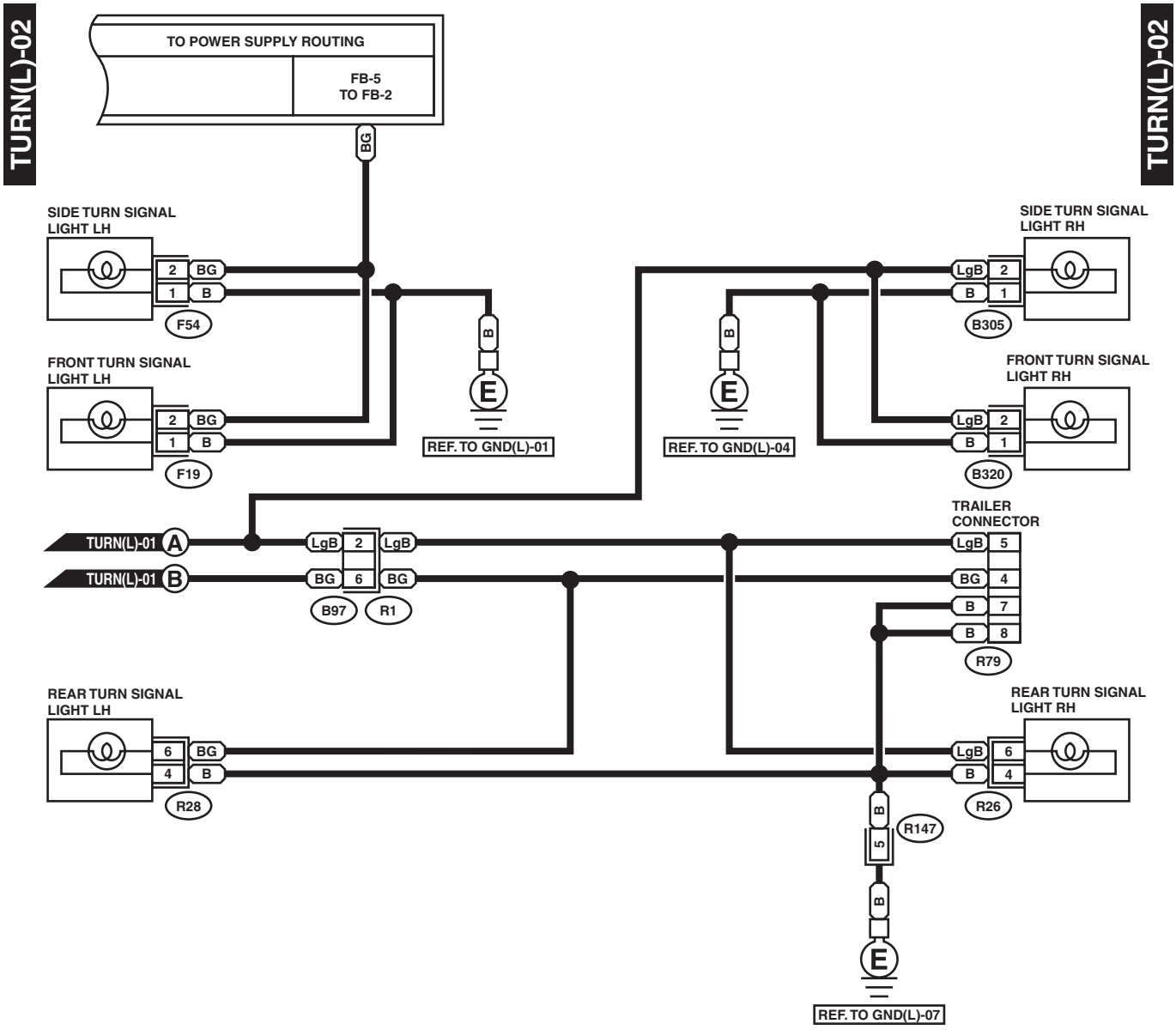
A: WIRING DIAGRAM

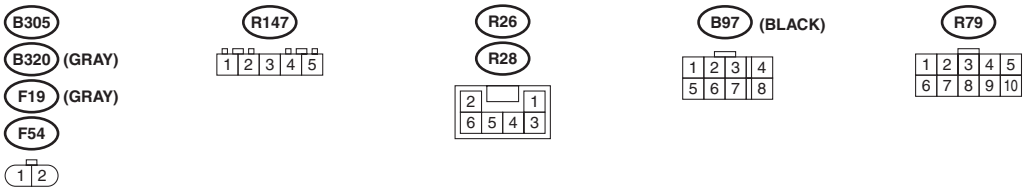
1. LHD MODEL





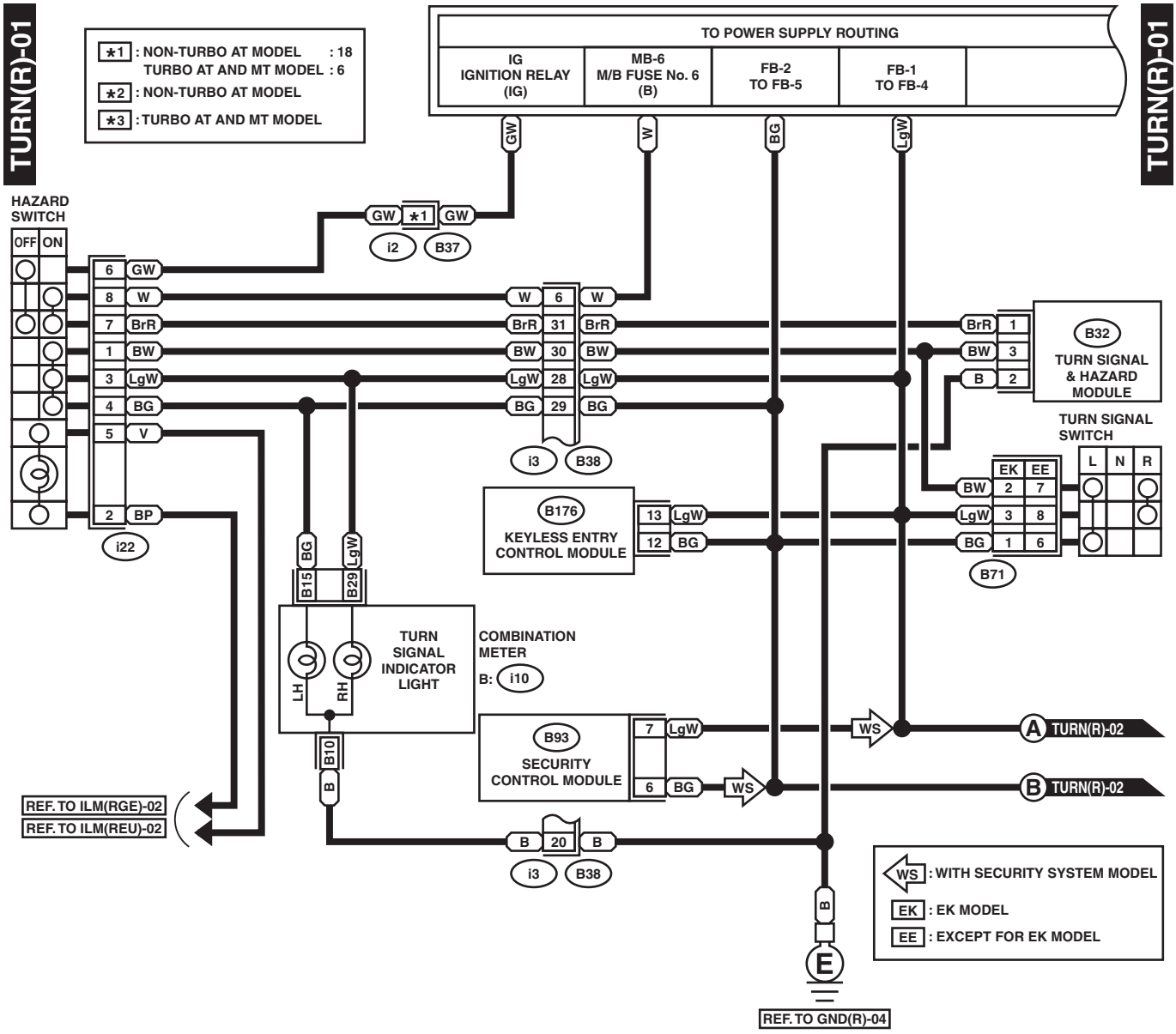
WI-07445

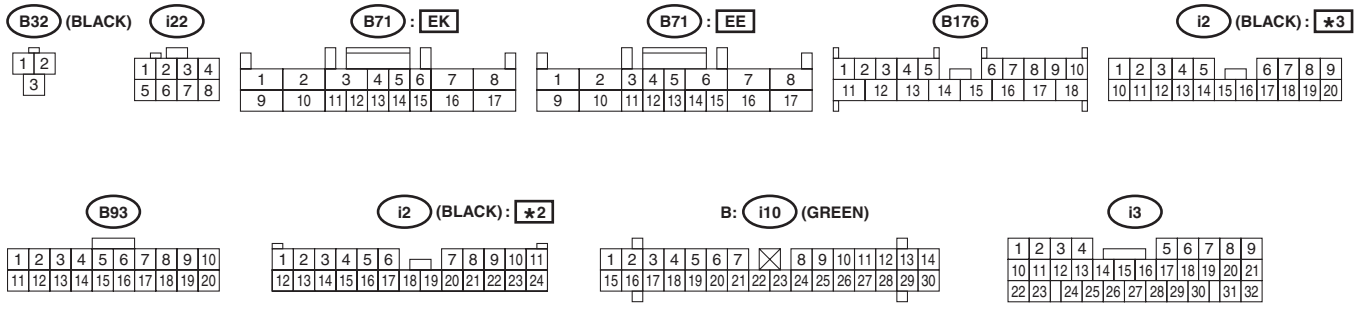

TURN(L)-02
TO POWER SUPPLY ROUTING
FB-5
TO FB-2
BG
SIDE TURN SIGNAL LIGHT LH
2 BG
1 B
F54
FRONT TURN SIGNAL LIGHT LH
2 BG
1 B
F19
B
E
REF. TO GND(L)-01
B
E
REF. TO GND(L)-04
SIDE TURN SIGNAL LIGHT RH
LgB 2
B 1
B305
FRONT TURN SIGNAL LIGHT RH
LgB 2
B 1
B320
TRAILER CONNECTOR
TURN(L)-01 A
TURN(L)-01 B
LgB 2 LgB
BG 6 BG
B97
R1
LgB 5
BG 4
B 7
B 8
R79
REAR TURN SIGNAL LIGHT LH
6 BG
4 B
R28
REAR TURN SIGNAL LIGHT RH
LgB 6
B 4
R26
B
5
R147
B
E
REF. TO GND(L)-07
TURN(L)-02


B305
B320 (GRAY)
F19 (GRAY)
F54
1 2
R147
1 2 3 4 5
R26
R28
2 1
6 5 4 3
B97 (BLACK)
1 2 3 4
5 6 7 8
R79
1 2 3 4 5
6 7 8 9 10

WI-06085

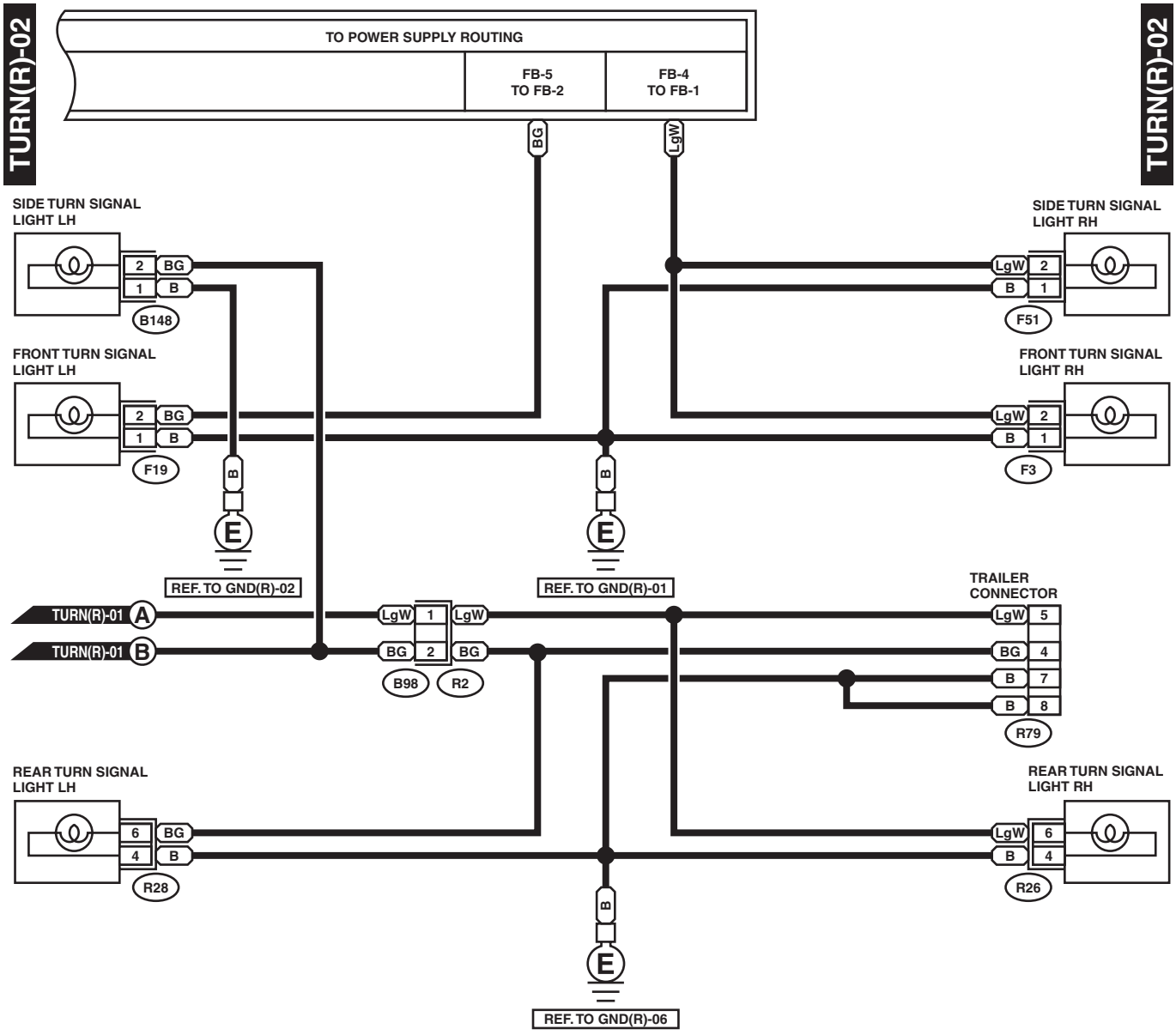
2. RHD MODEL

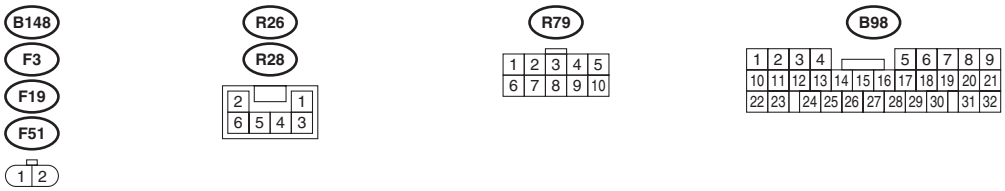




WI-07446

Turn Signal Light and Hazard Light System



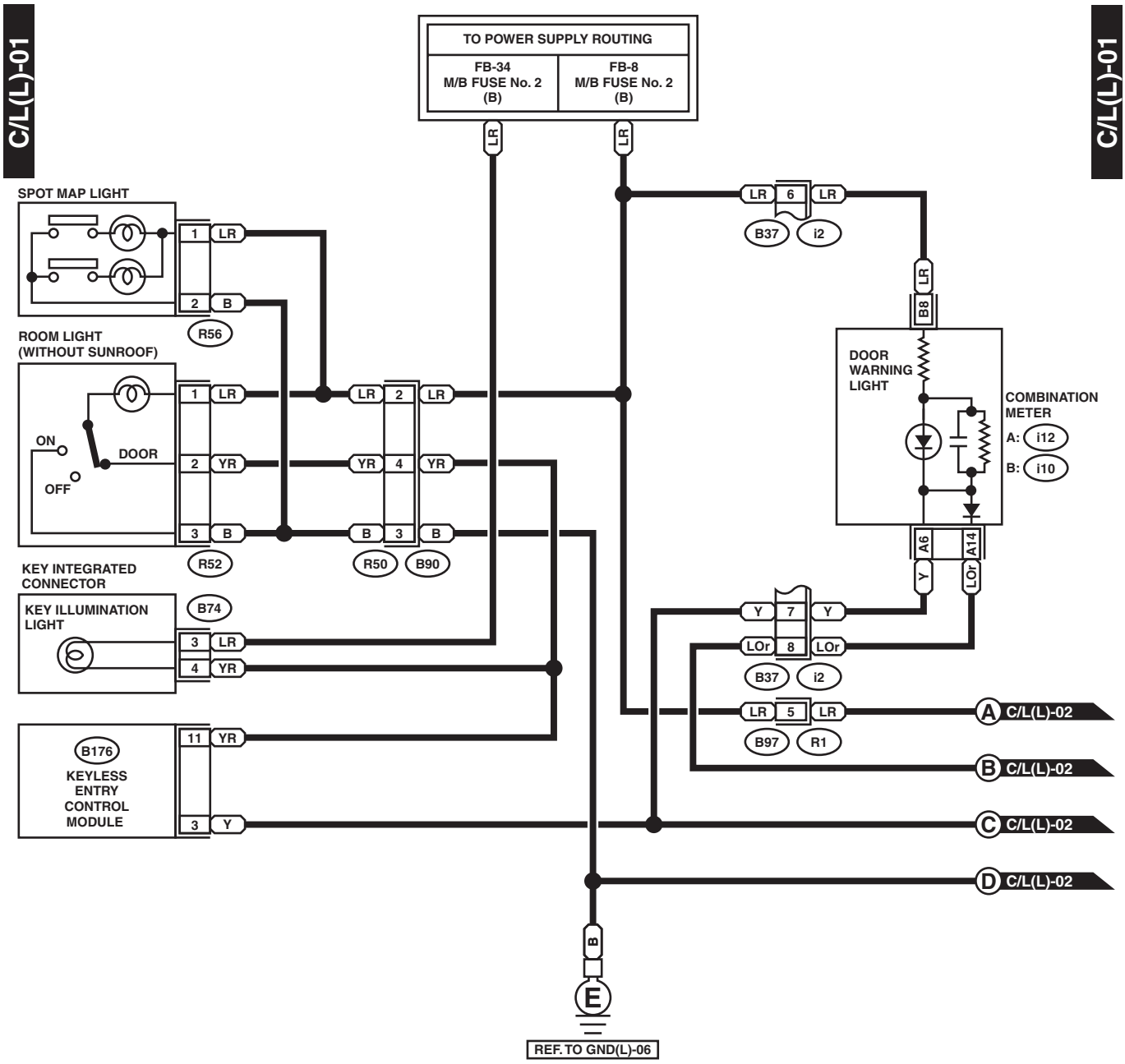


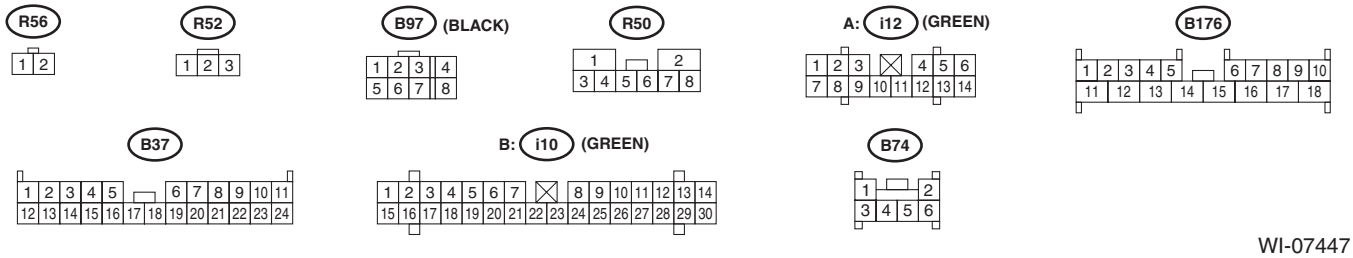
WI-00480

27.Room Light System

A: WIRING DIAGRAM

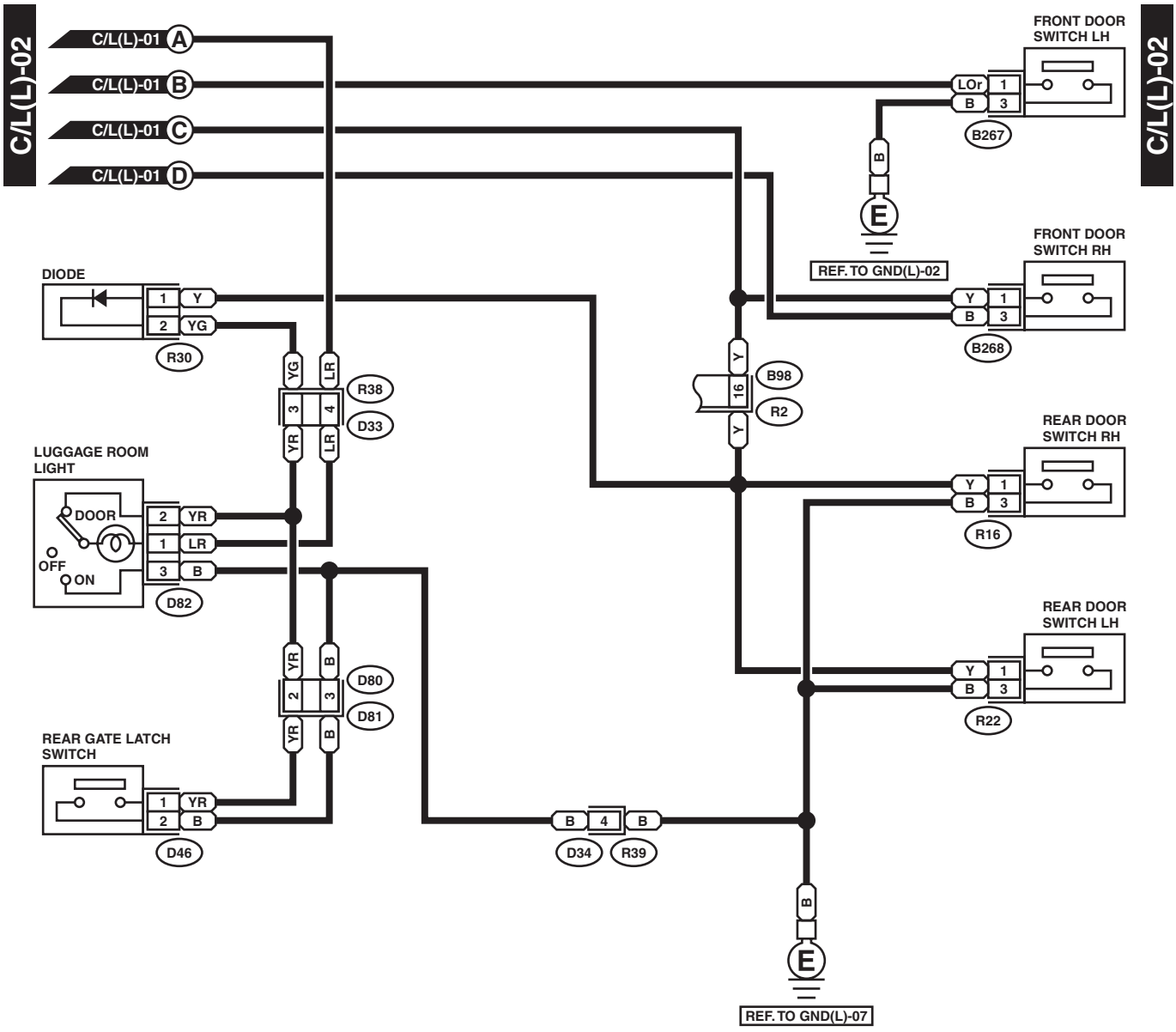
1. LHD MODEL

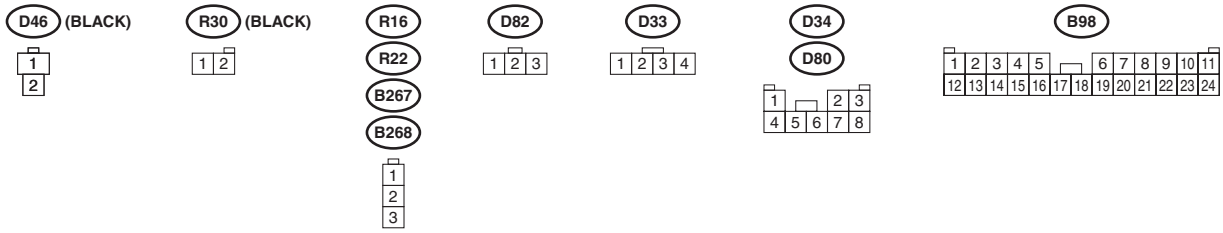




WI-07447

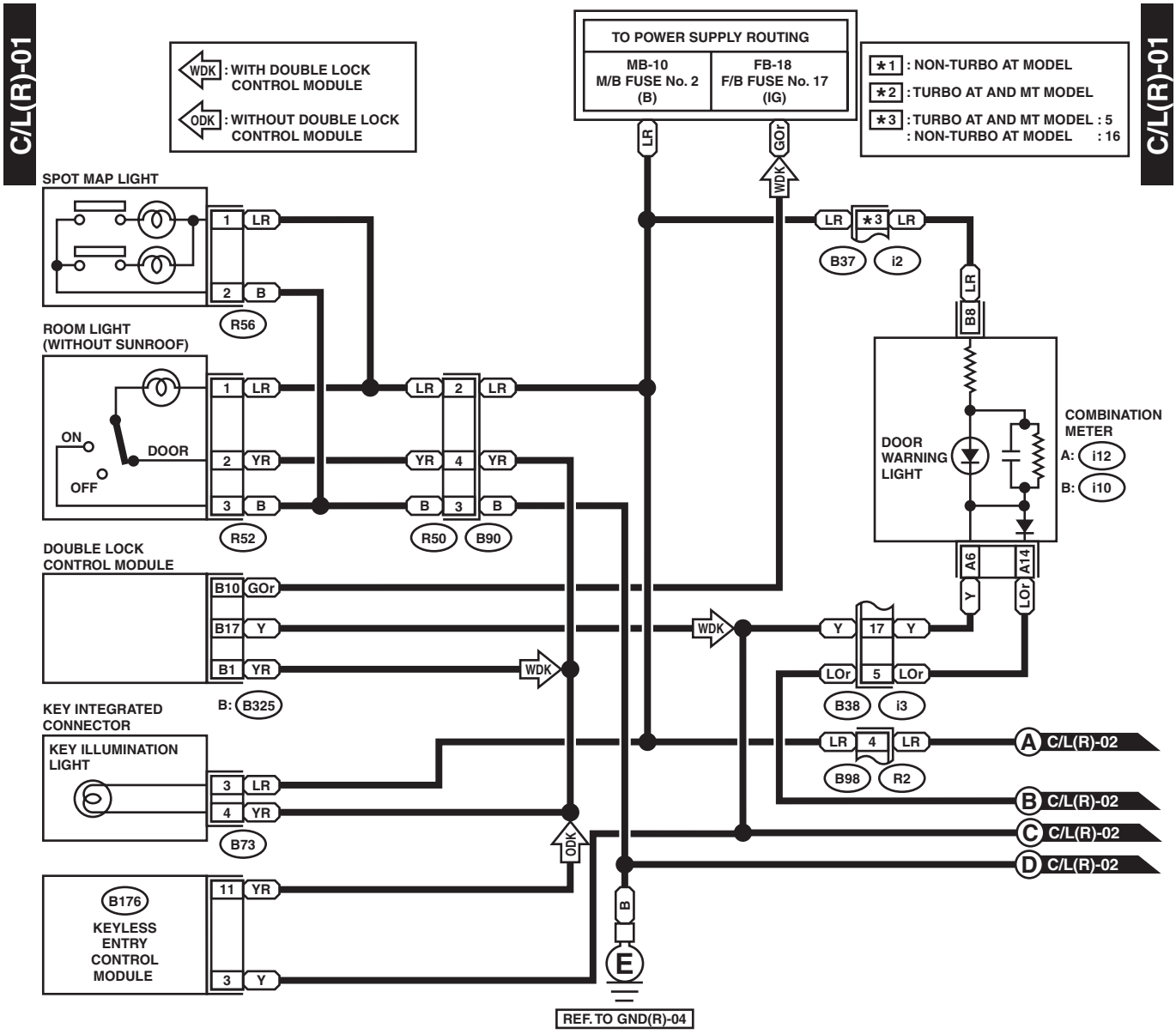
Room Light System

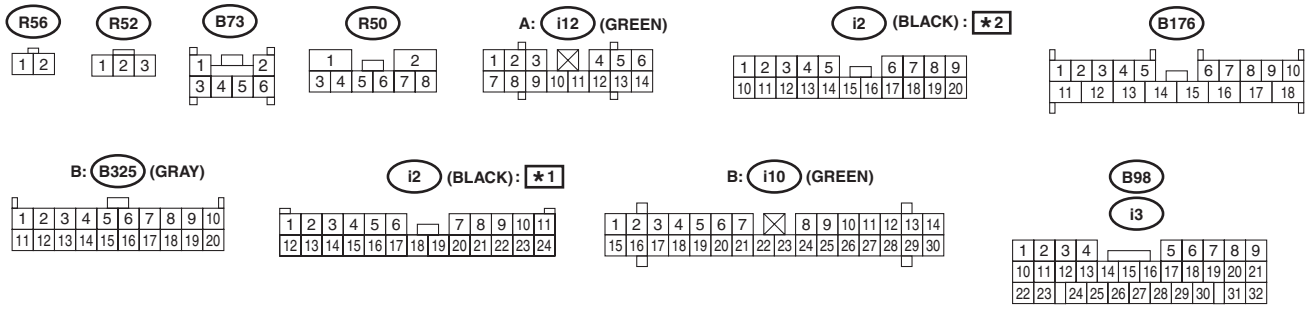




WI-03332

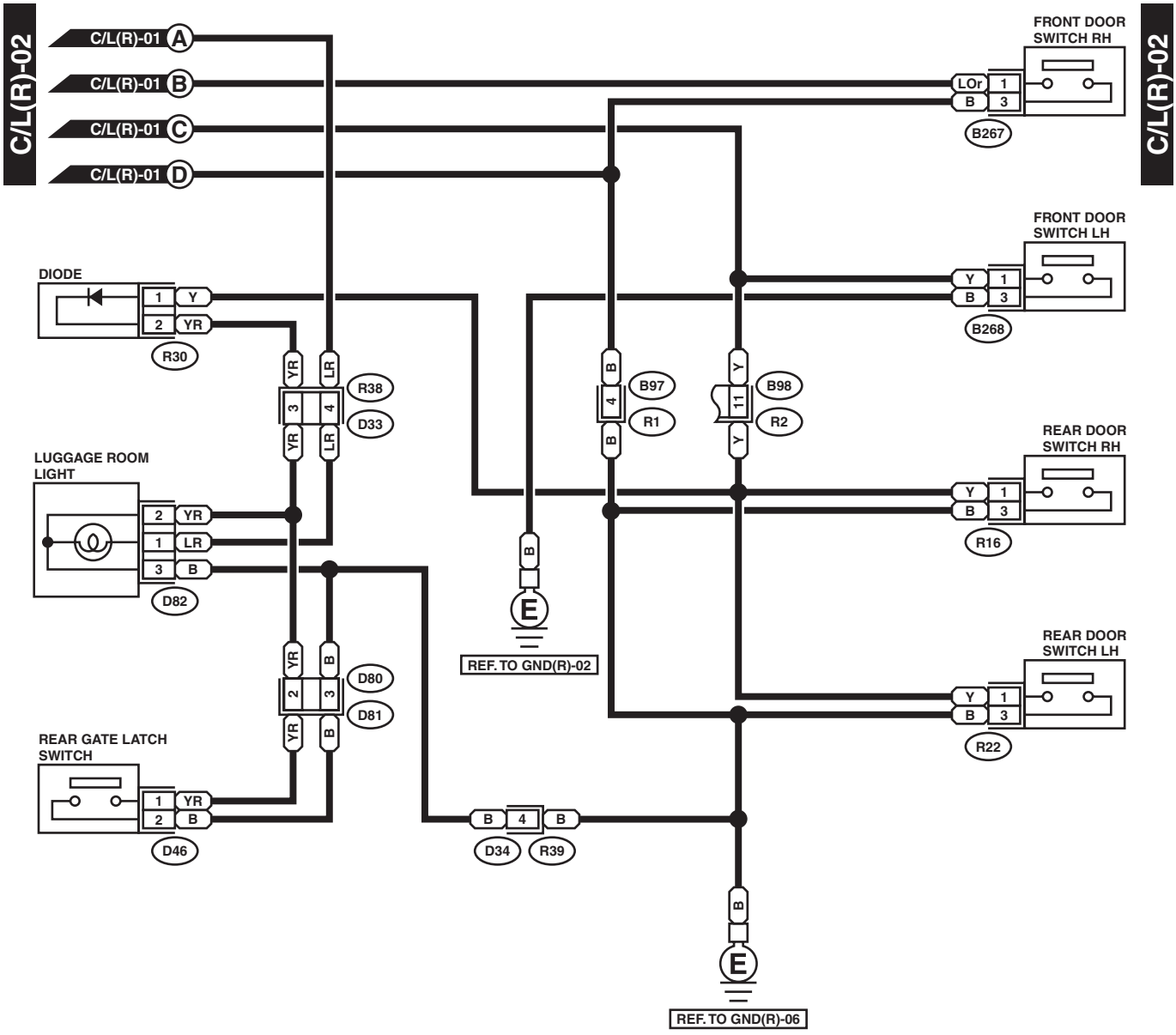
2. RHD MODEL

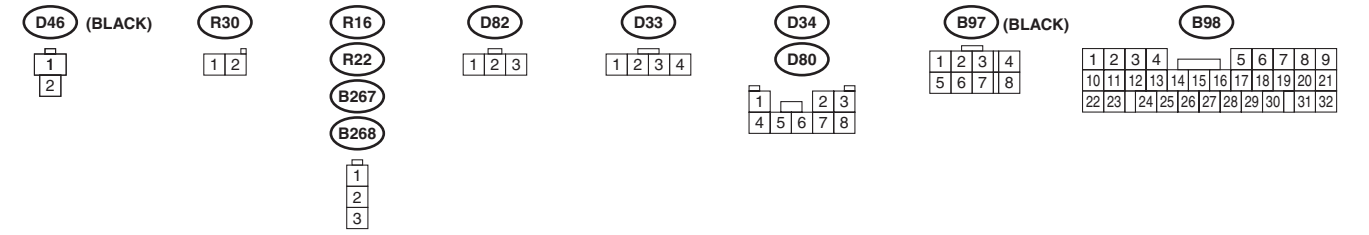




WI-07448

Room Light System

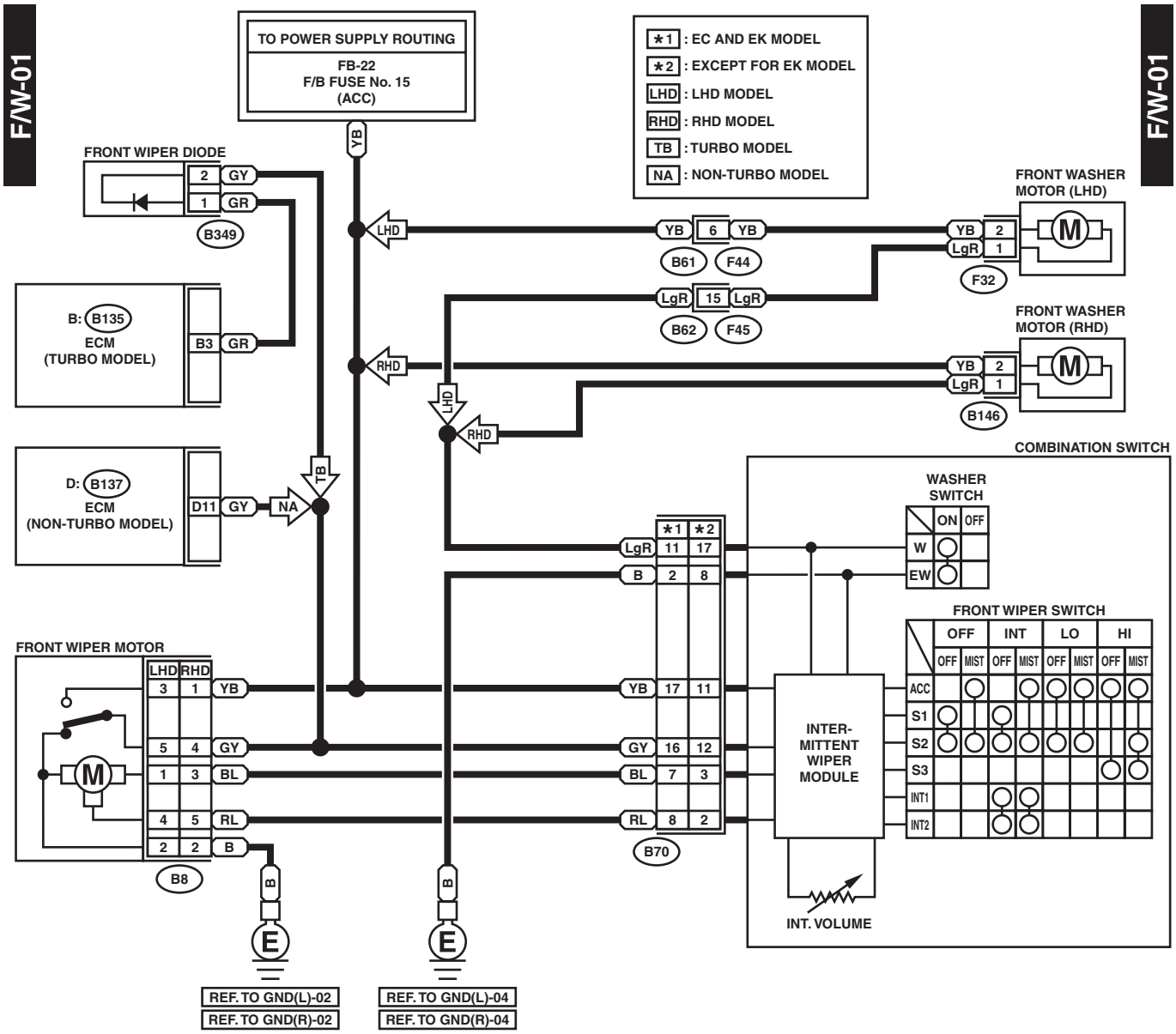


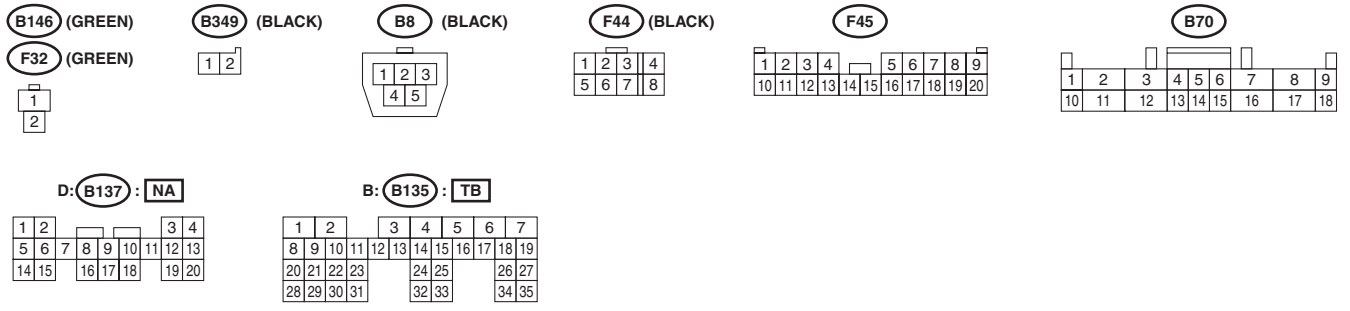


WI-06082

28.Front Wiper and Washer System

A: WIRING DIAGRAM

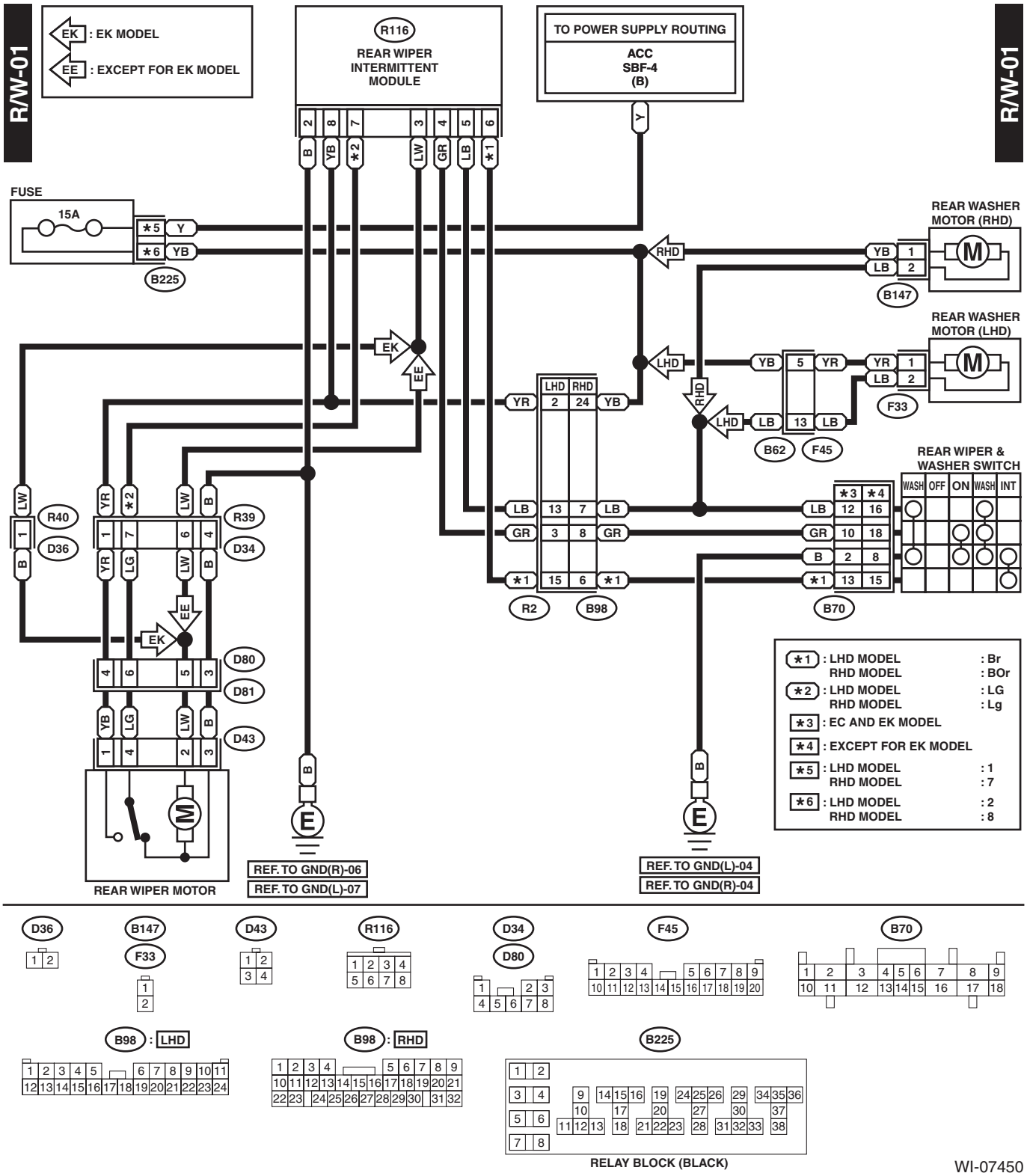




WI-07449

29.Rear Wiper and Washer System

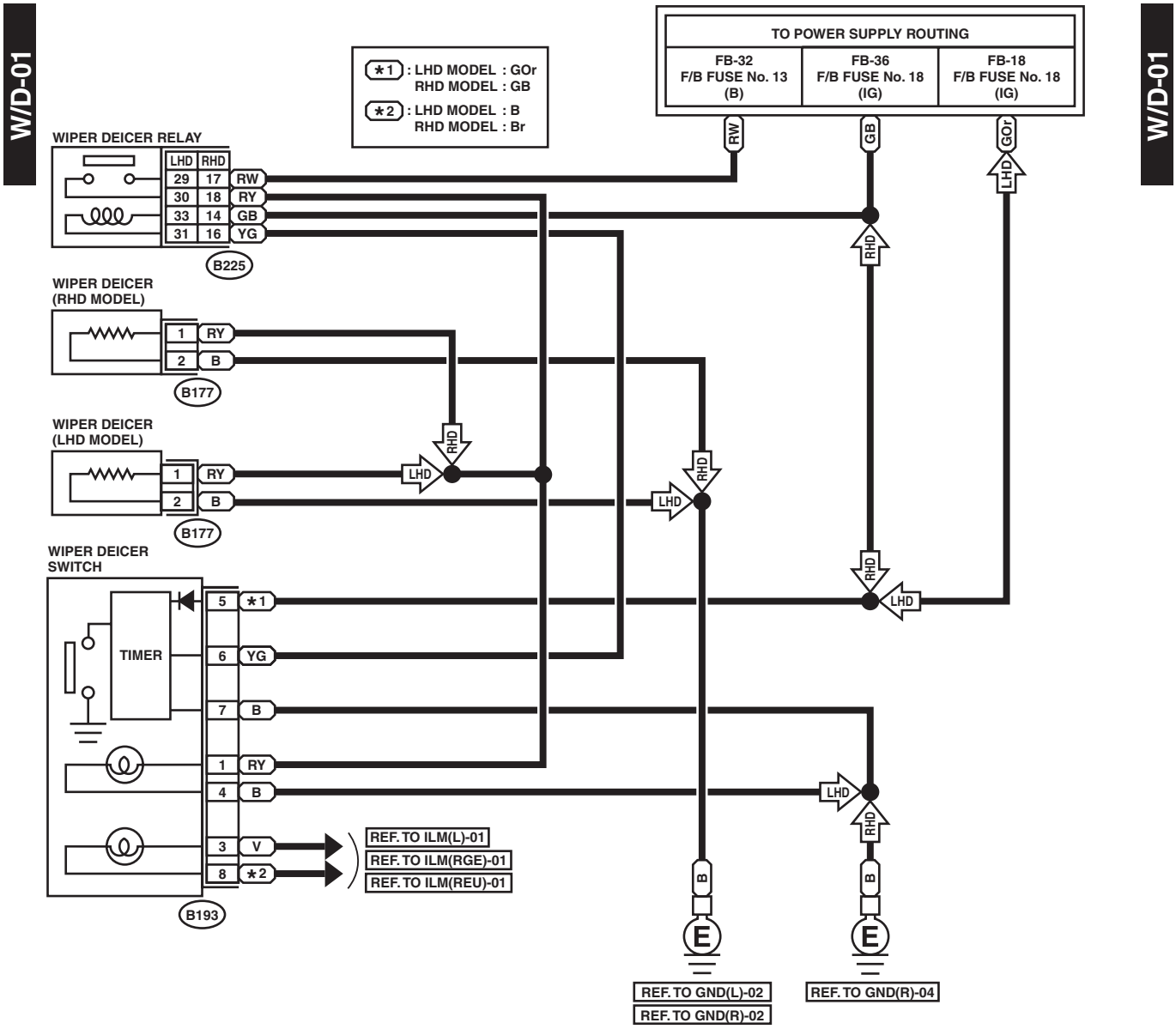
A: WIRING DIAGRAM

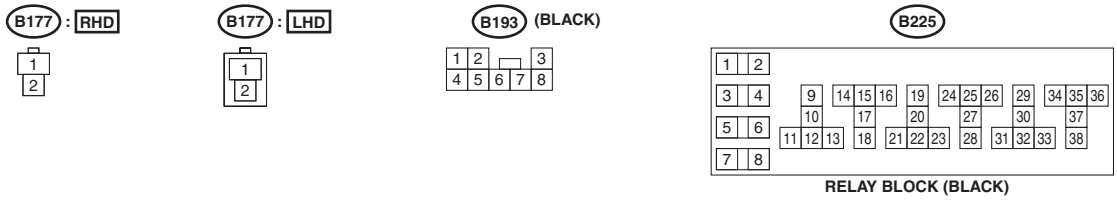


WI-07450

30.Wiper Deicer System

A: WIRING DIAGRAM

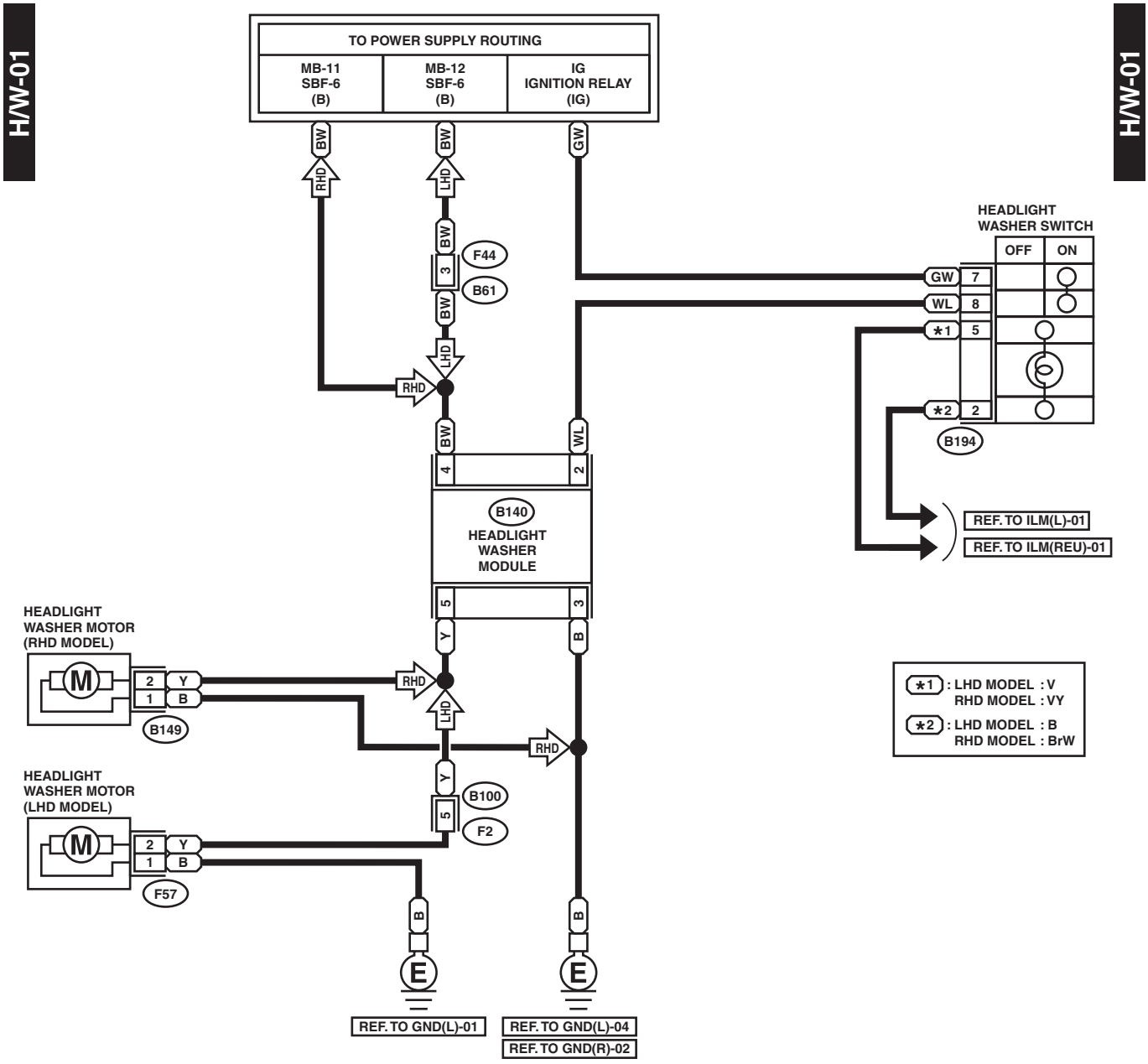


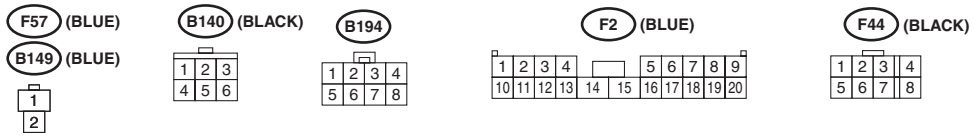


WI-06168

31.Headlight Washer System

A: WIRING DIAGRAM



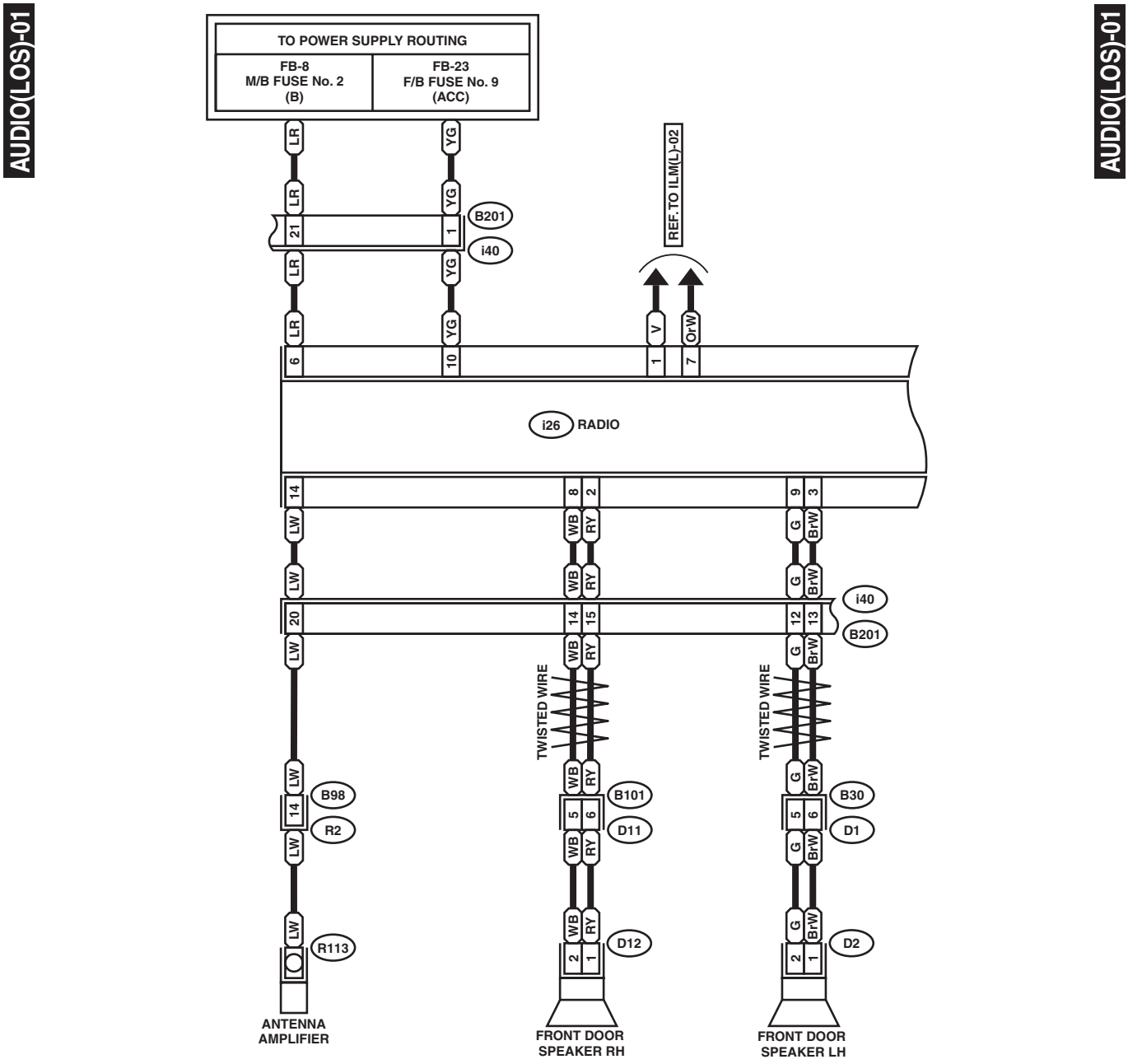


WI-06079

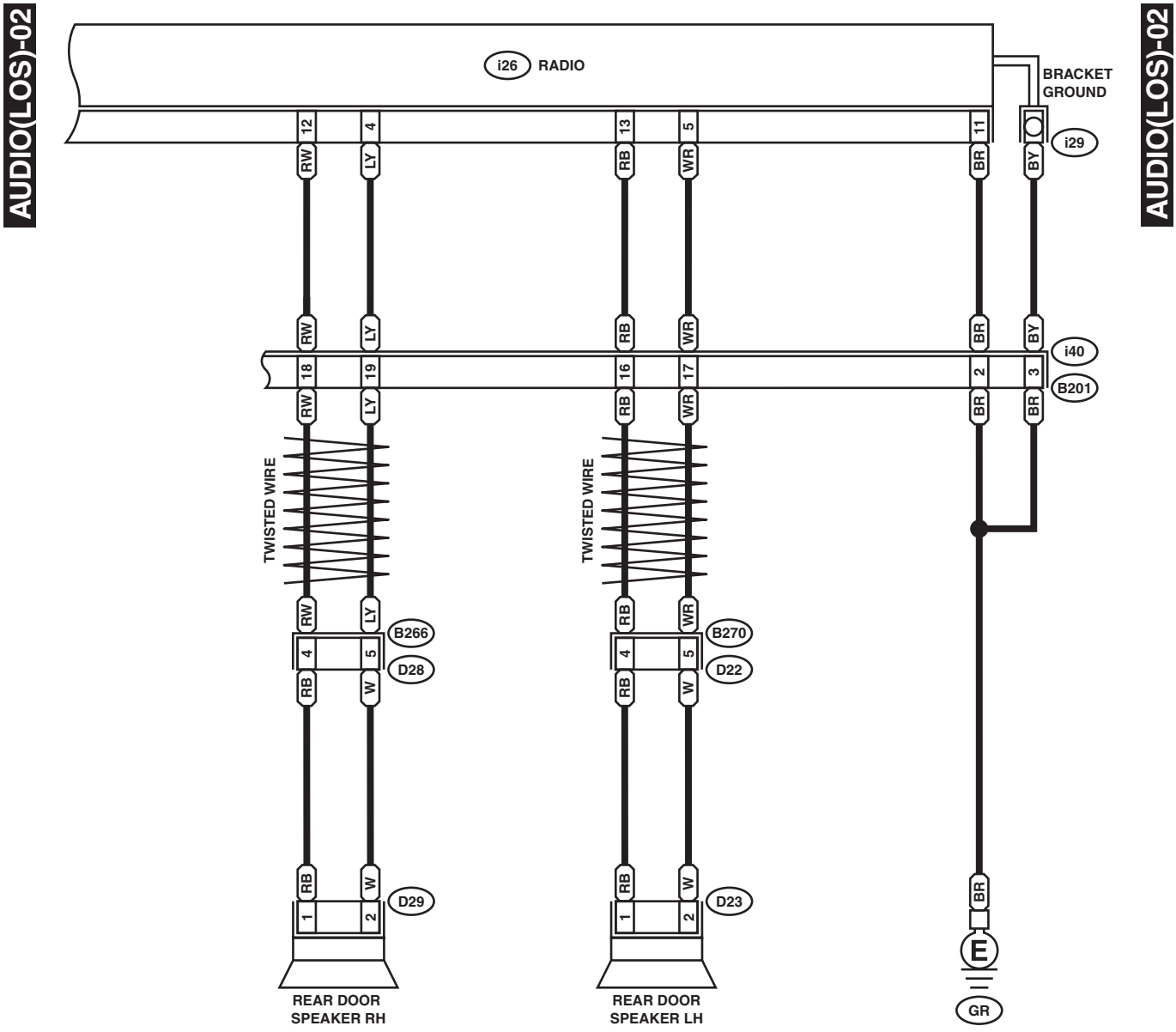
32.Audio System

A: WIRING DIAGRAM

1. LHD MODEL WITHOUT SATELLITE SWITCH

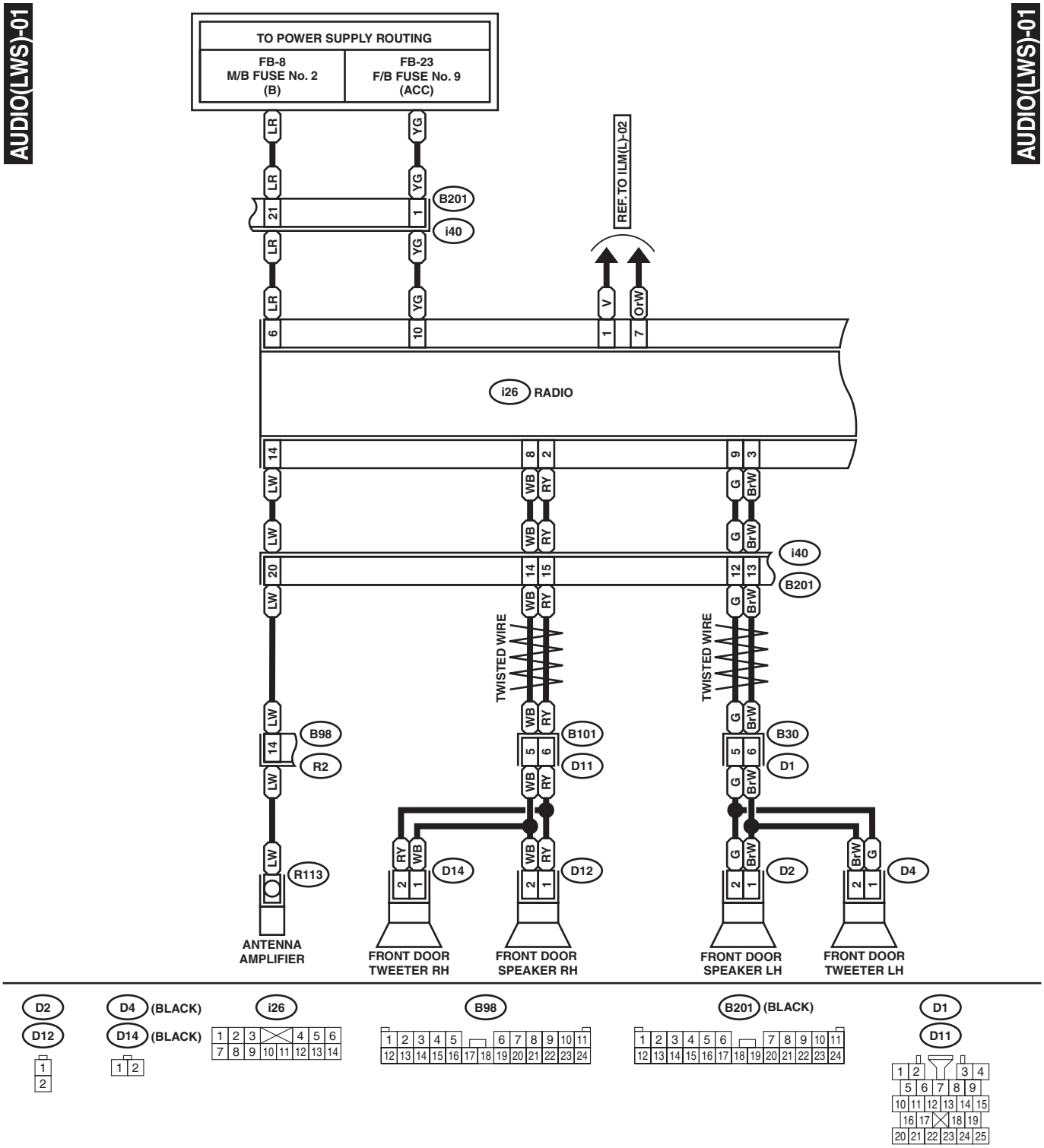


WI-07451

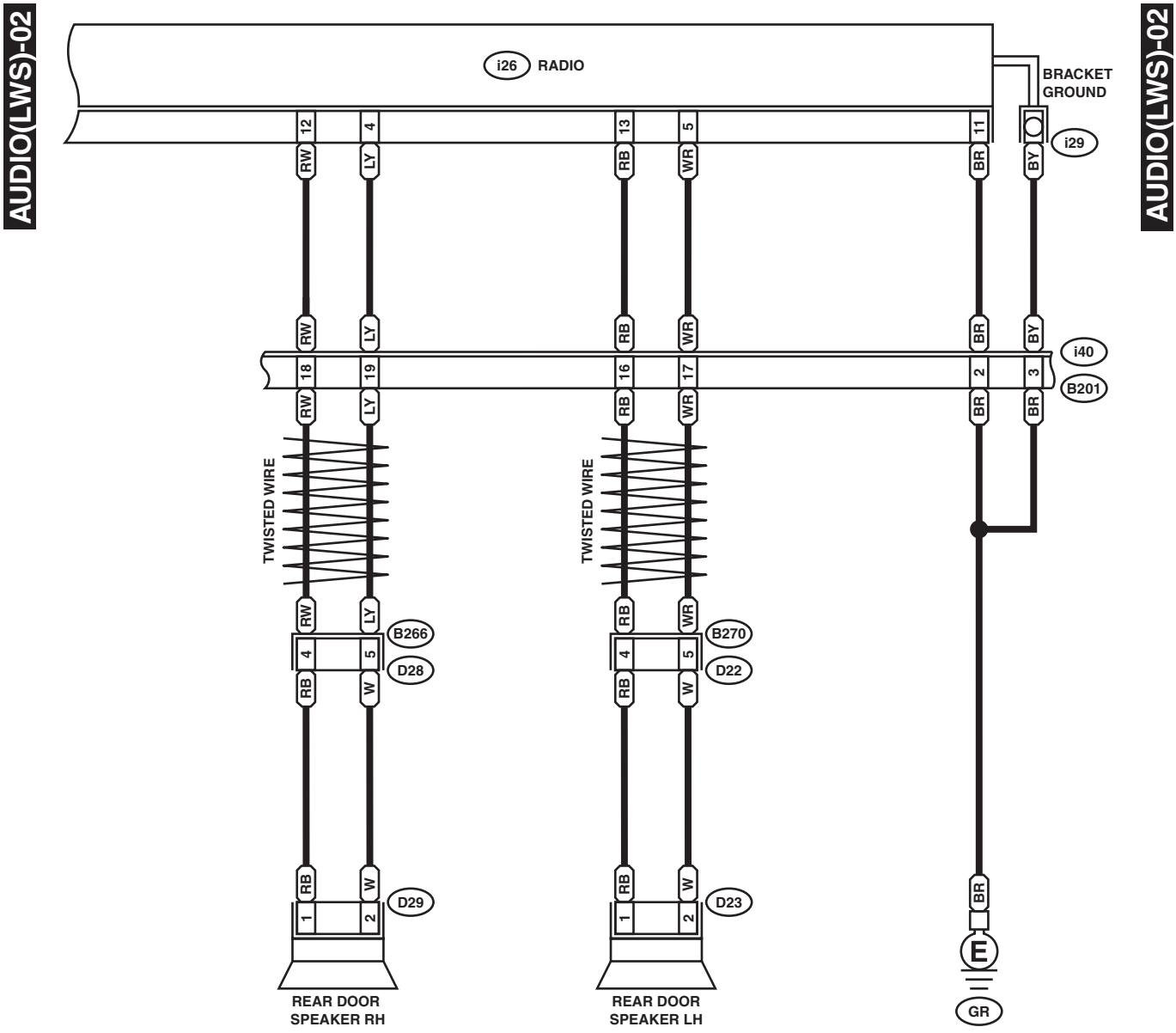

AUDIO(LOS)-02
AUDIO(LOS)-02
i26 RADIO
BRACKET GROUND
i29
i40
B201
B266
D28
B270
D22
D29
D23
TWISTED WIRE
TWISTED WIRE
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
E
GR
D23
D29
D22
D28
i26
B201 (BLACK)

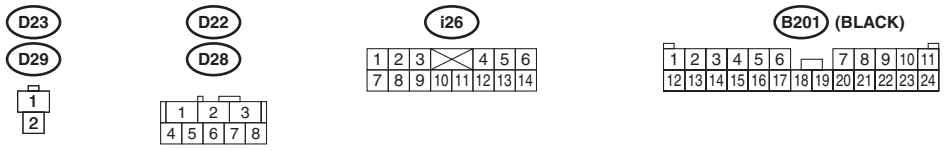
WI-06052

2. LHD MODEL WITH SATELLITE SWITCH



WI-07452

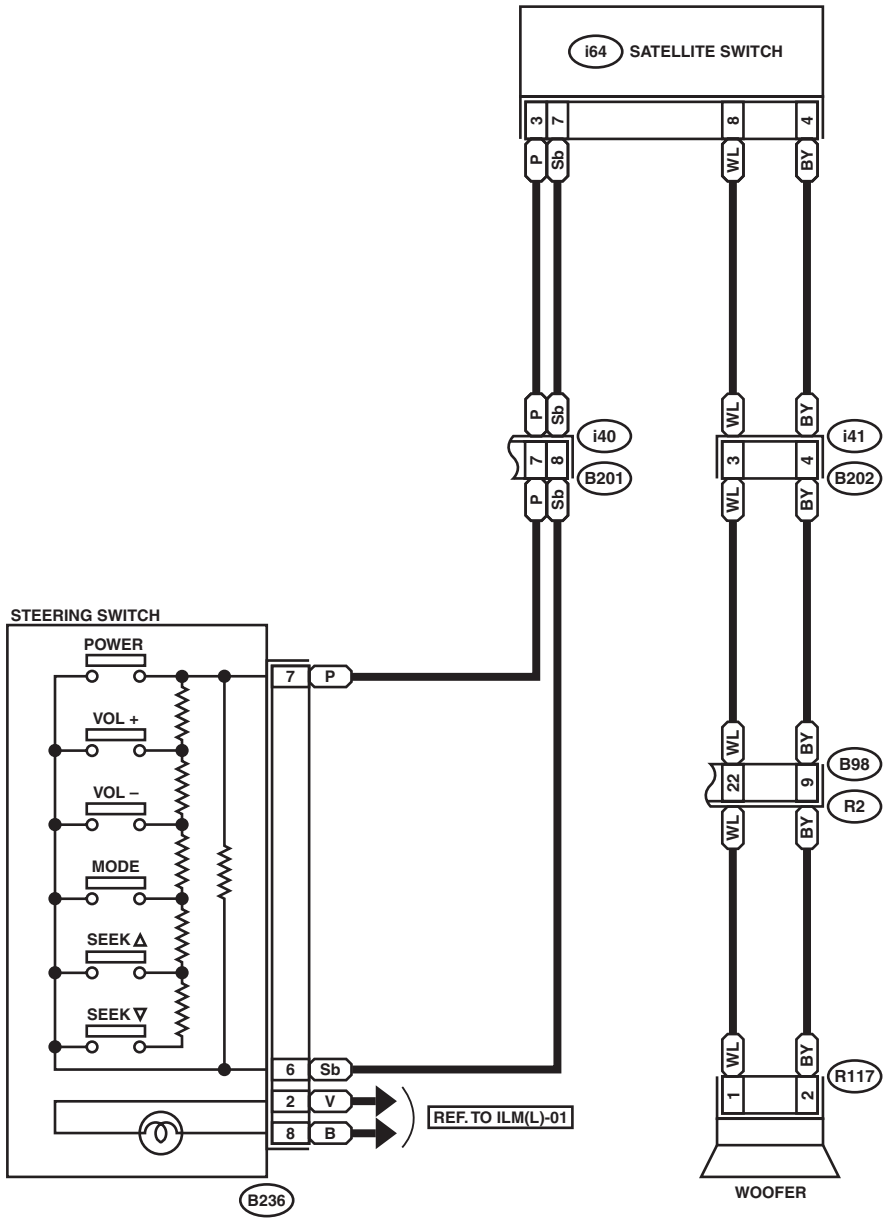

AUDIO(LWS)-02
AUDIO(LWS)-02
i26 RADIO
BRACKET GROUND
i29
i40
B201
TWISTED WIRE
TWISTED WIRE
B266
D28
B270
D22
D29
D23
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
E
GR


D23
D29
D22
D28
i26
B201 (BLACK)

WI-06054

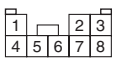
AUDIO(LWS)-03

AUDIO(LWS)-03



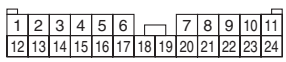
R117

B236

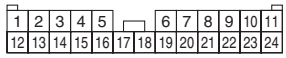


i64 (BLACK)

B201 (BLACK)

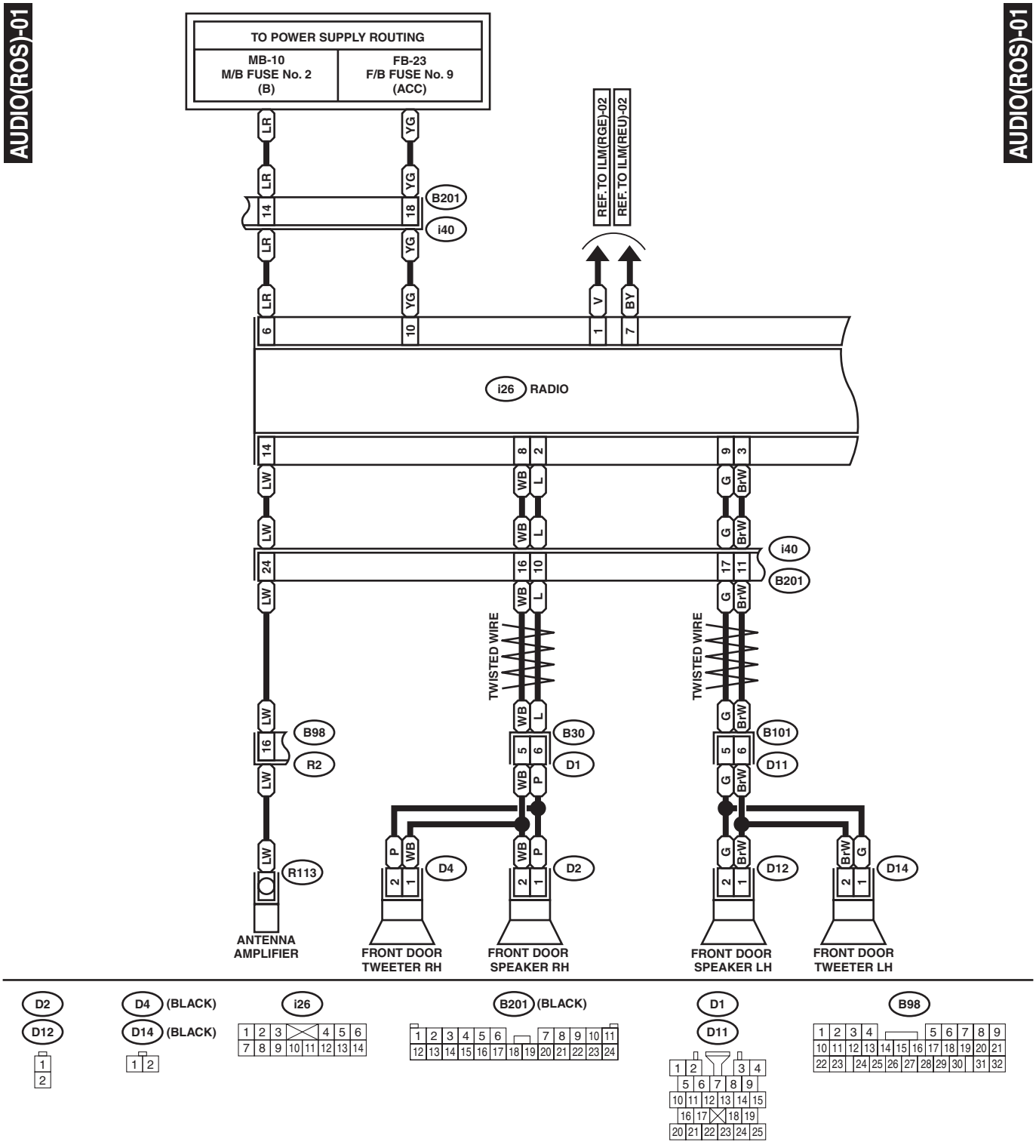


B202
B98

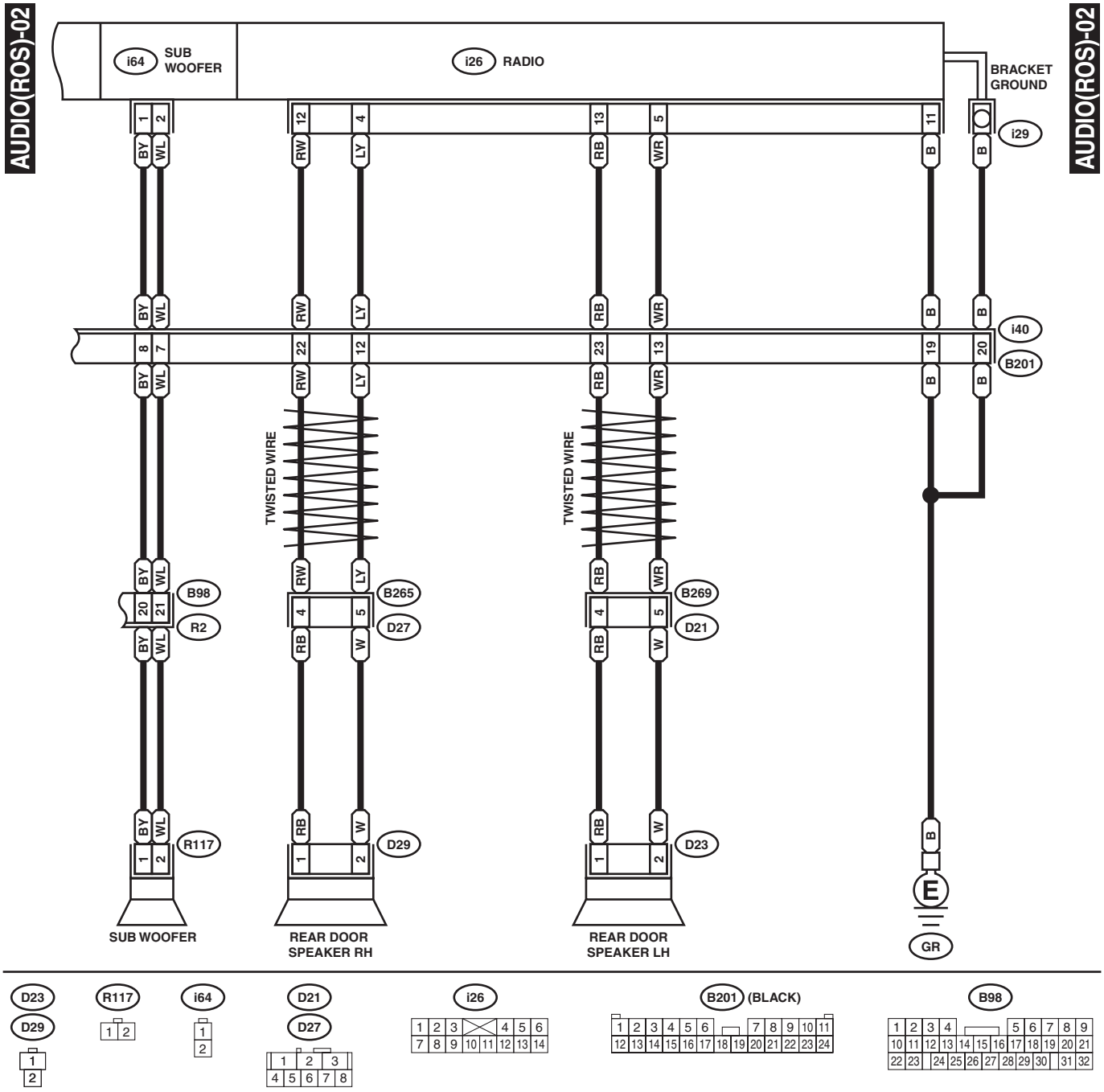


WI-07453

3. RHD MODEL WITHOUT SATELLITE SWITCH

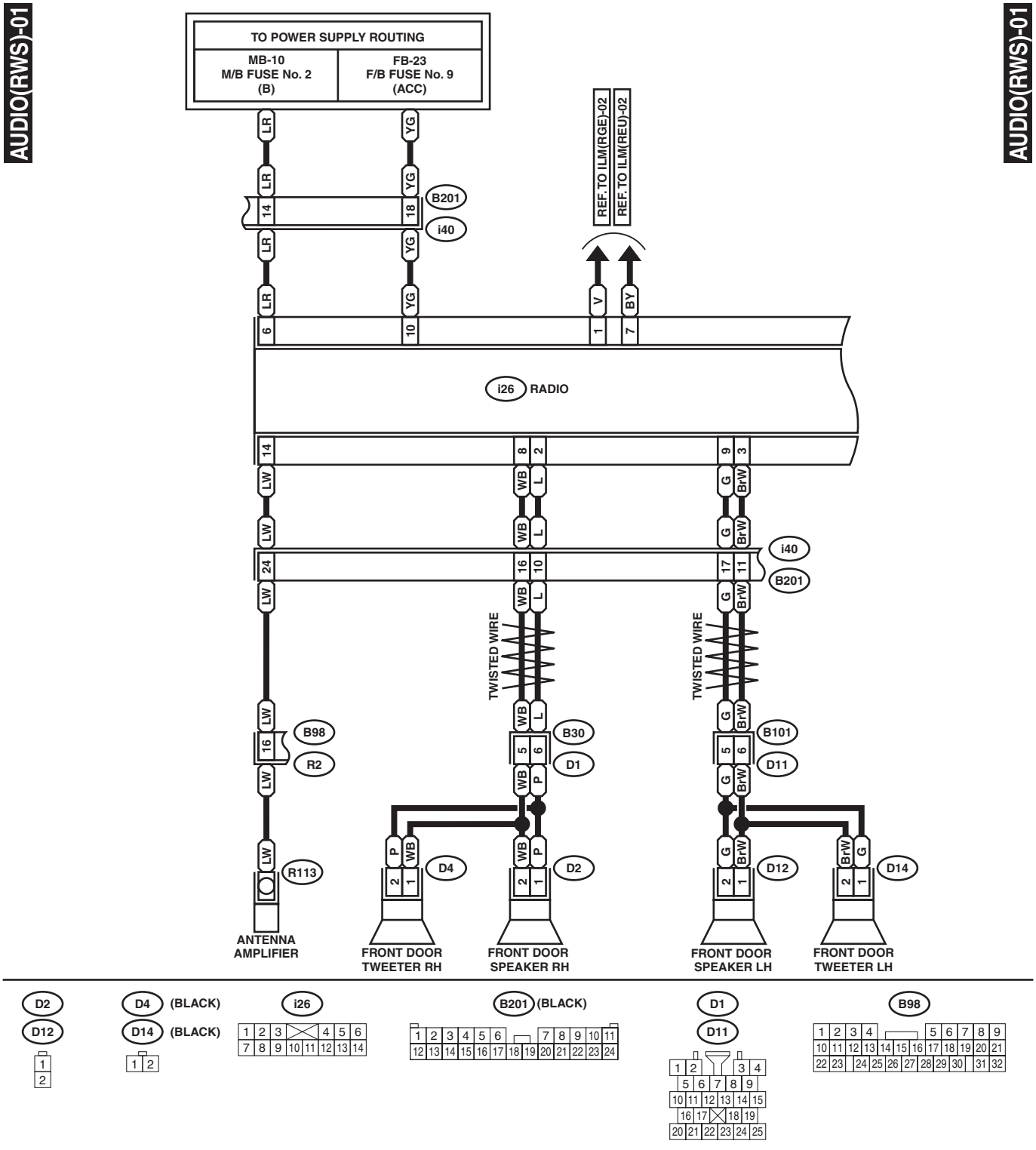


WI-06056

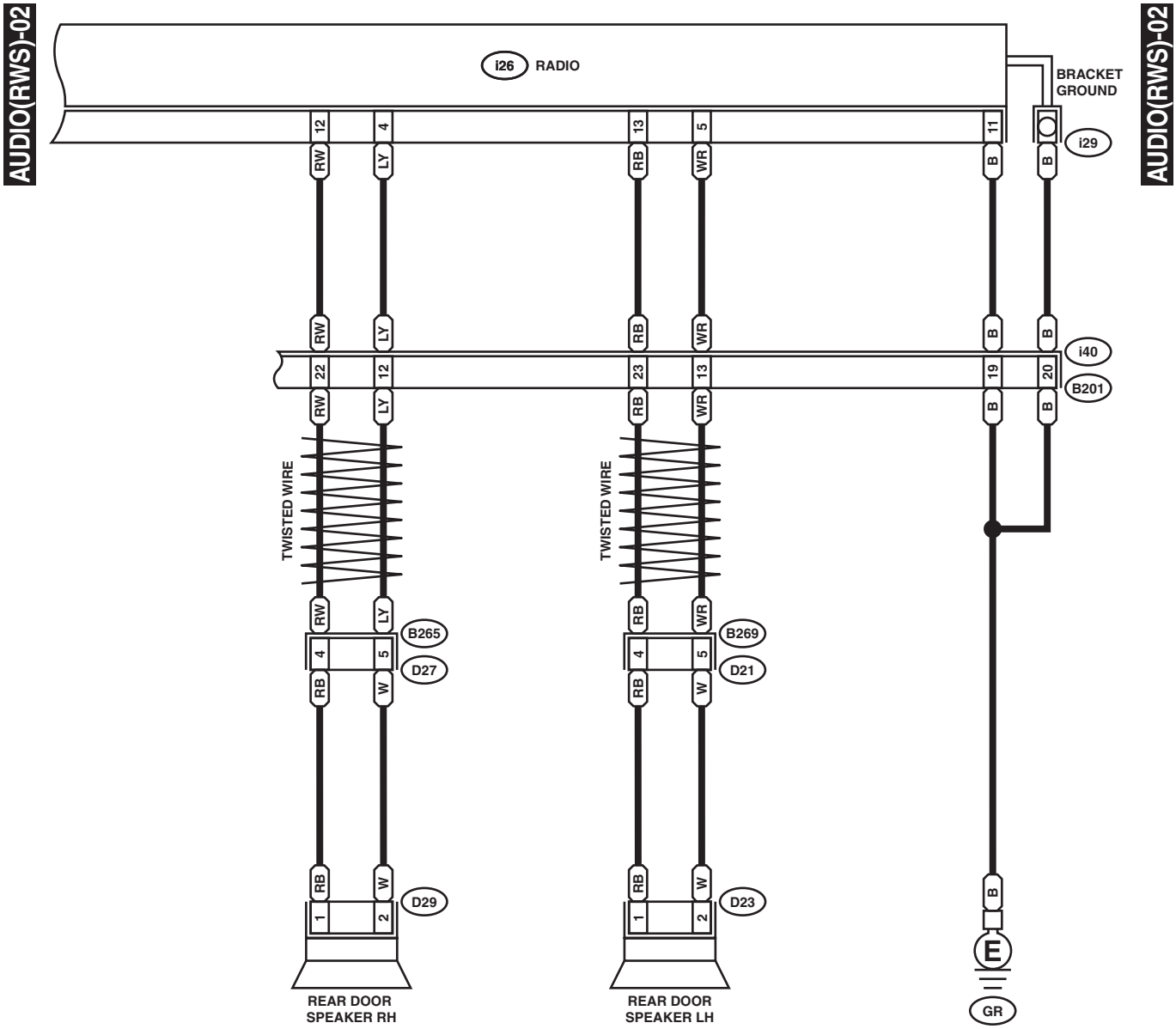

AUDIO(ROS)-02
AUDIO(ROS)-02
i64 SUB WOOFER
i26 RADIO
BRACKET GROUND
i29
i40
B201
B98
R2
B265
D27
B269
D21
R117
D29
D23
TWISTED WIRE
TWISTED WIRE
SUB WOOFER
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
GR
D23
D29
R117
i64
D21
D27
i26
B201 (BLACK)
B98

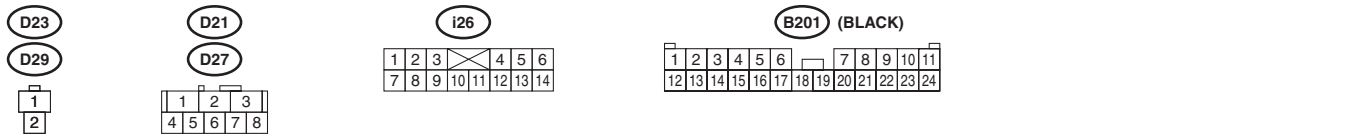
WI-07454

4. RHD MODEL WITH SATELLITE SWITCH



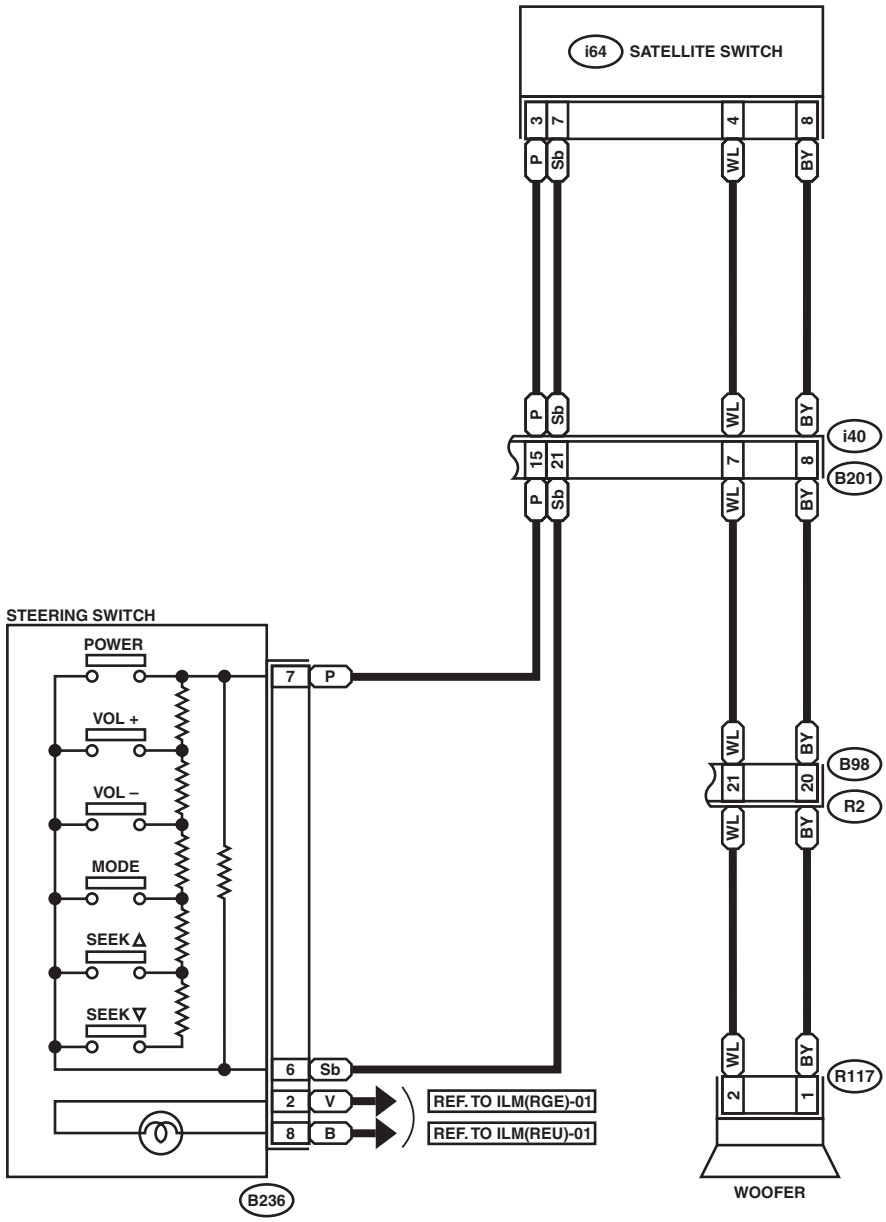
WI-06058


AUDIO(RWS)-02
AUDIO(RWS)-02
i26 RADIO
BRACKET GROUND
i29
i40
B201
TWISTED WIRE
TWISTED WIRE
B265
D27
B269
D21
D29
D23
REAR DOOR SPEAKER RH
REAR DOOR SPEAKER LH
E
GR

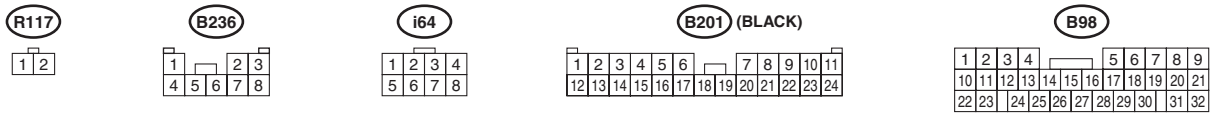

D23
D29
D21
D27
i26
B201 (BLACK)

WI-07455

AUDIO(RWS)-03



AUDIO(RWS)-03

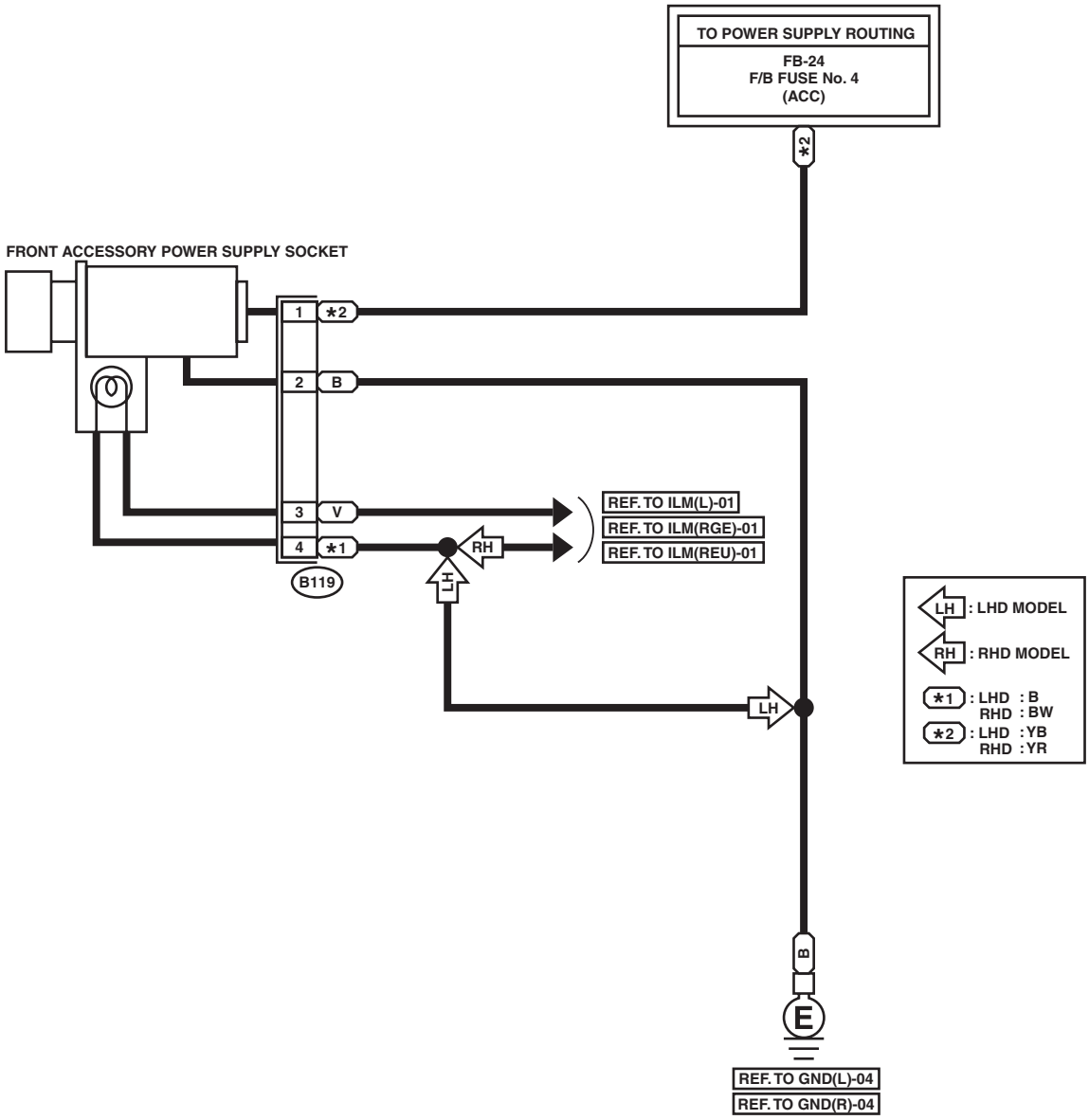


WI-06060

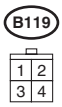
33.Front Accessory Power Supply Socket System

A: WIRING DIAGRAM

FAPS-01



FAPS-01

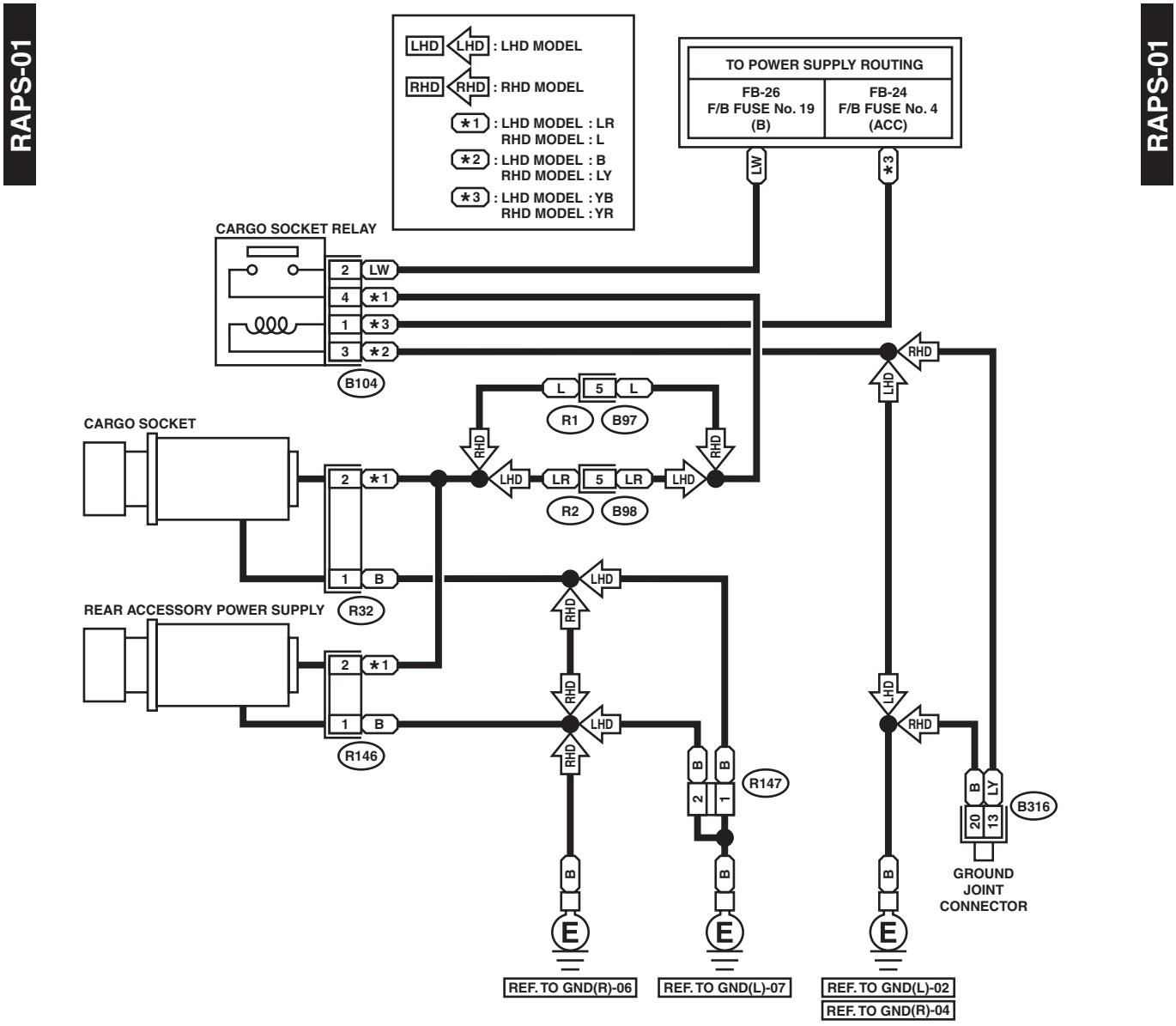


WI-03316

34.Rear Accessory Power Supply System

A: WIRING DIAGRAM

RAPS-01

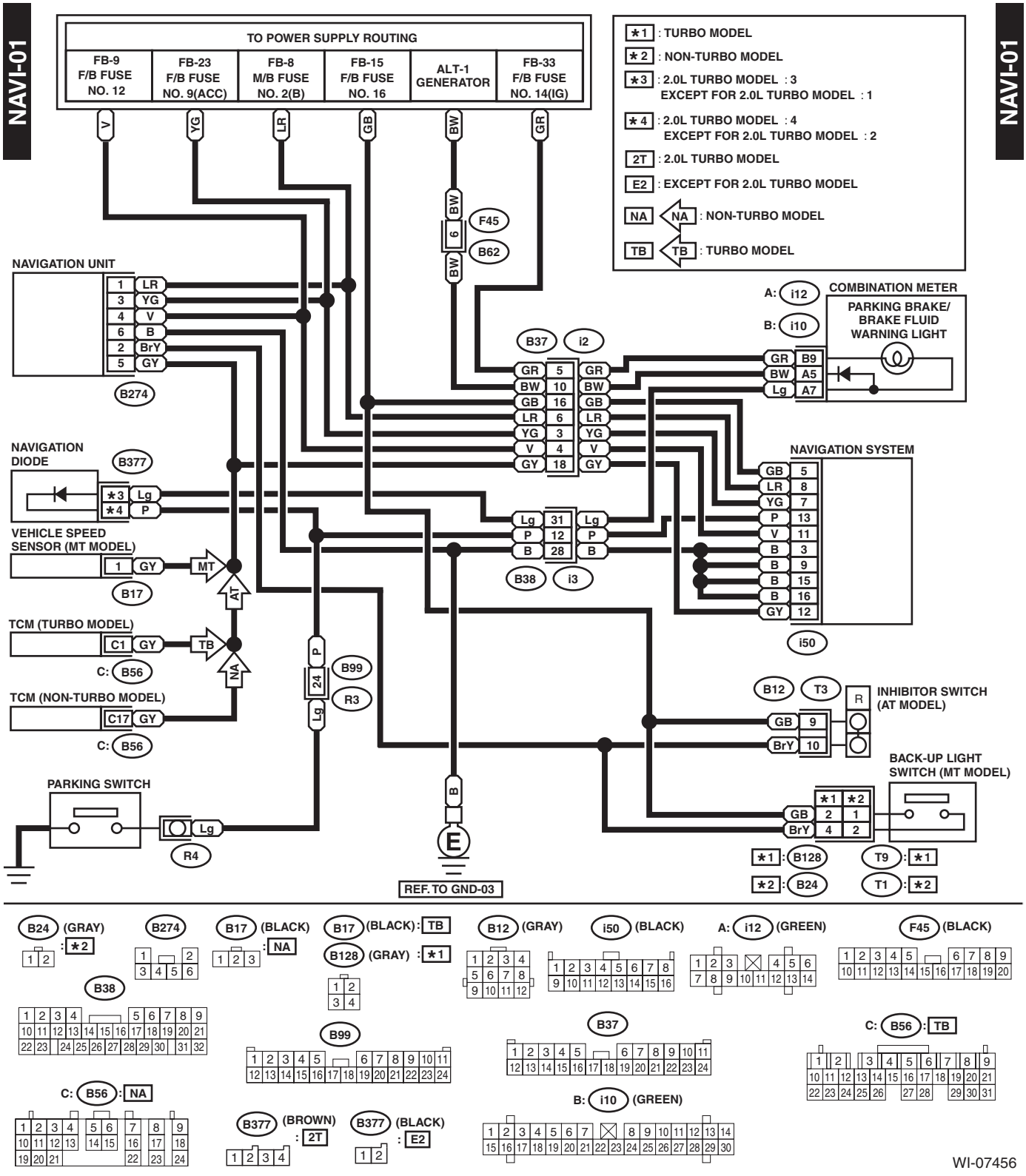


WI-06167

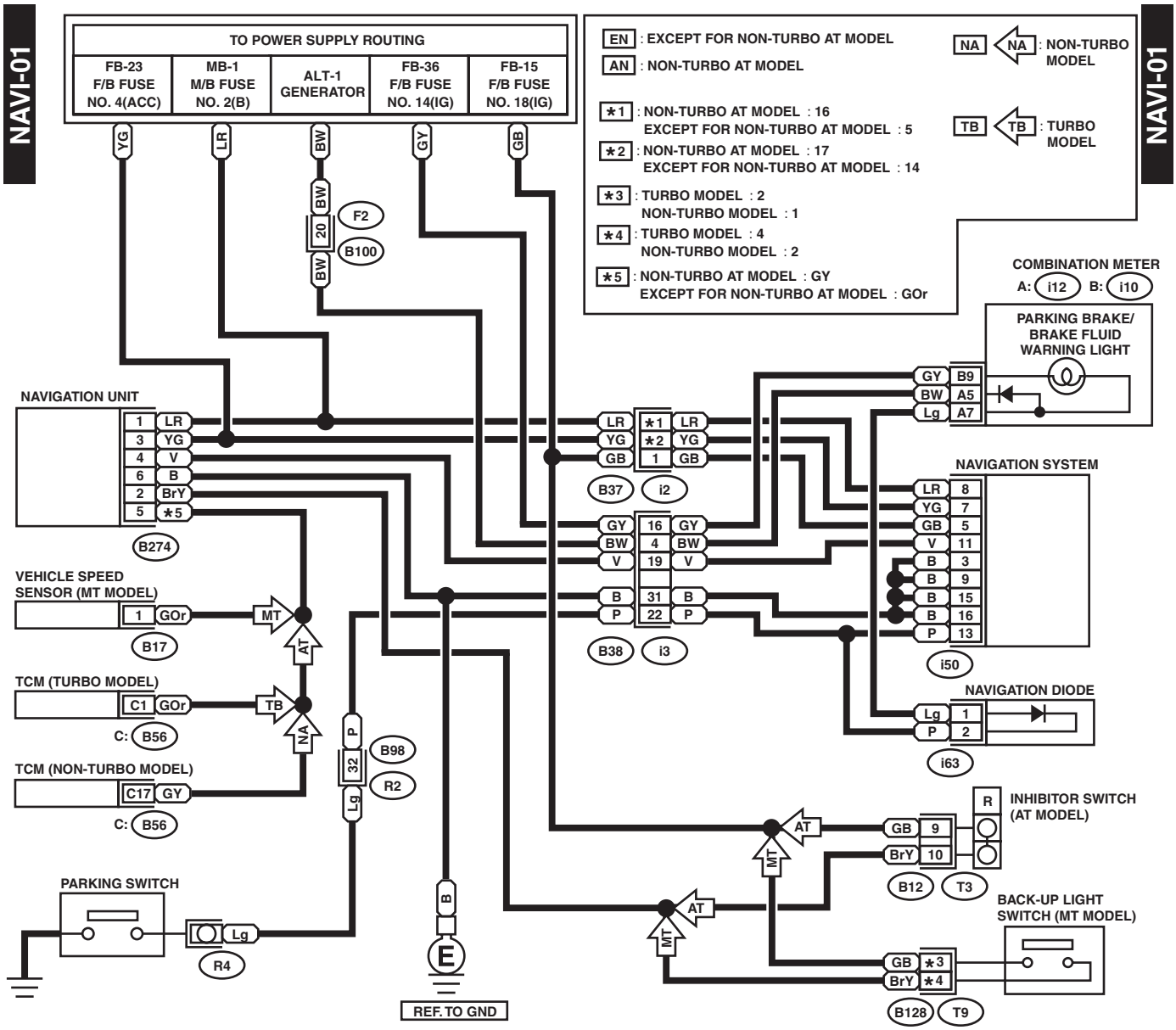
35.Navigation System

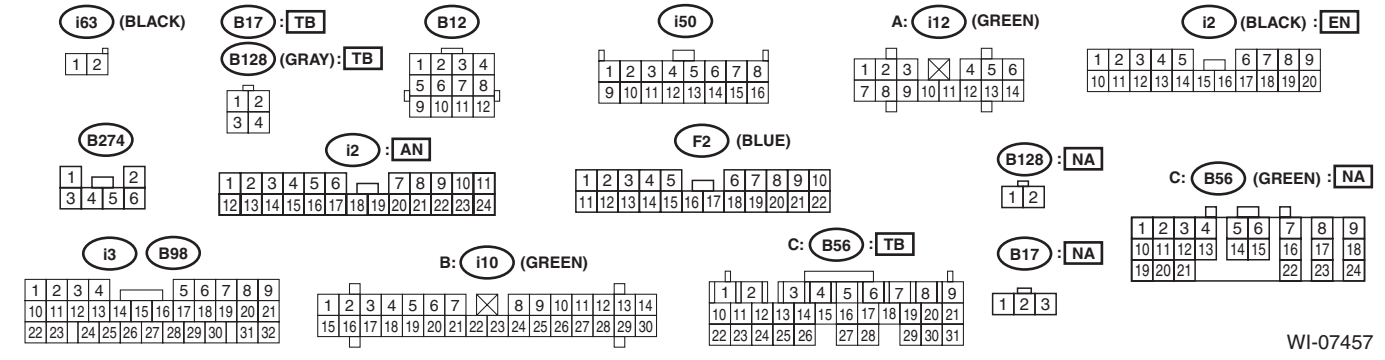
A: WIRING DIAGRAM

1. LHD MODEL



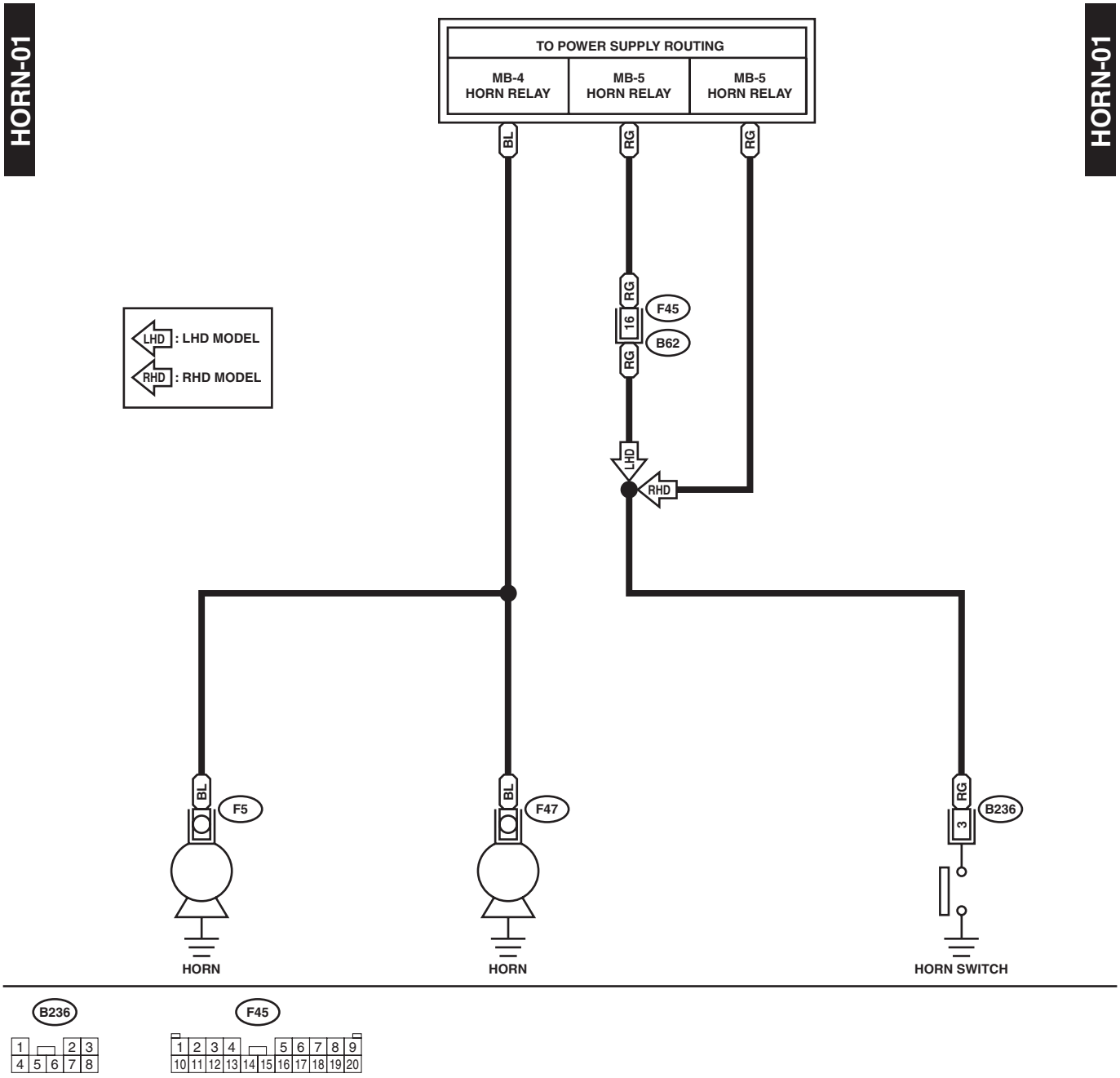
2. RHD EK MODEL





36.Horn System

A: WIRING DIAGRAM

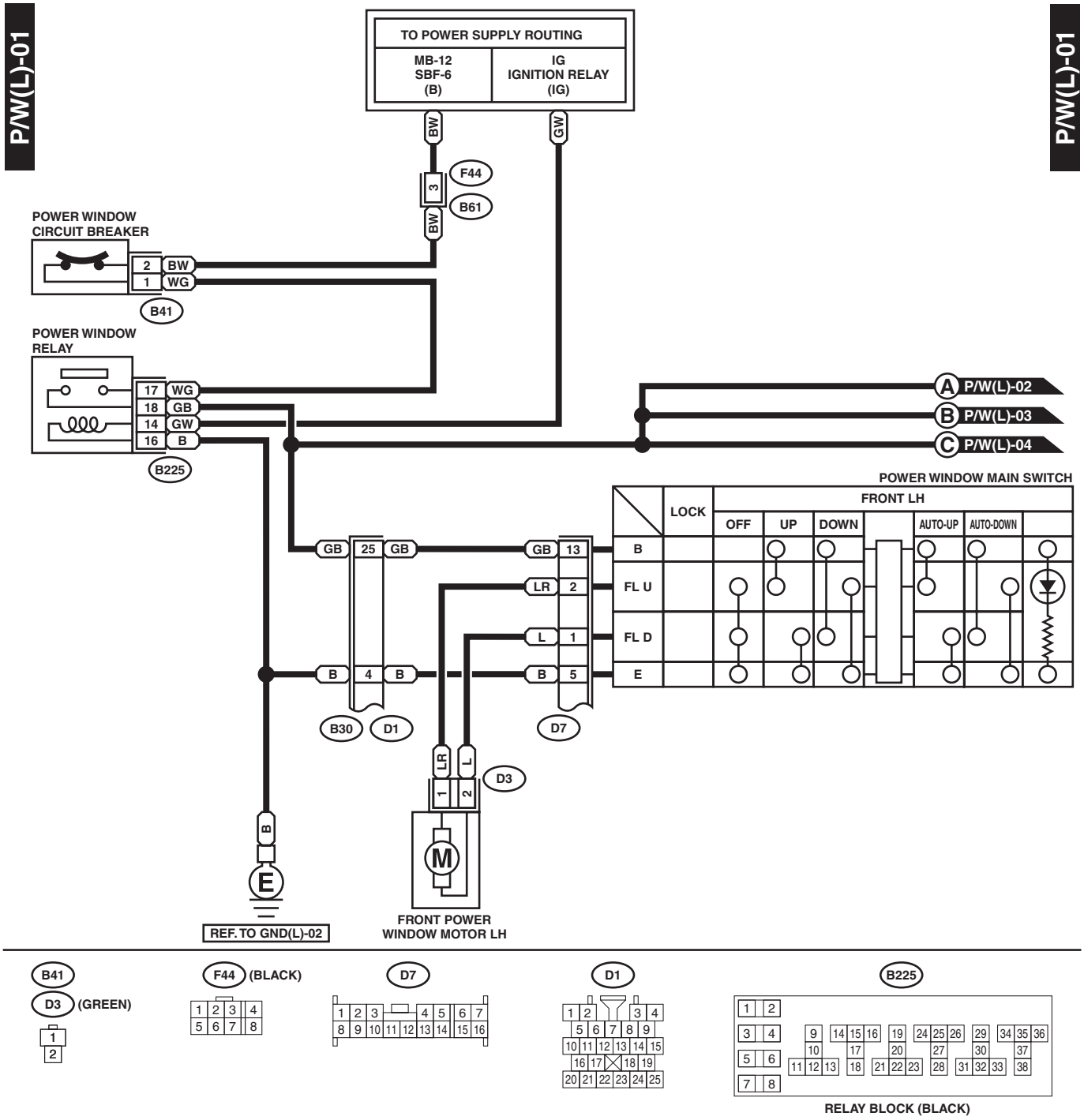


WI-06066

37.Power Window System

A: WIRING DIAGRAM

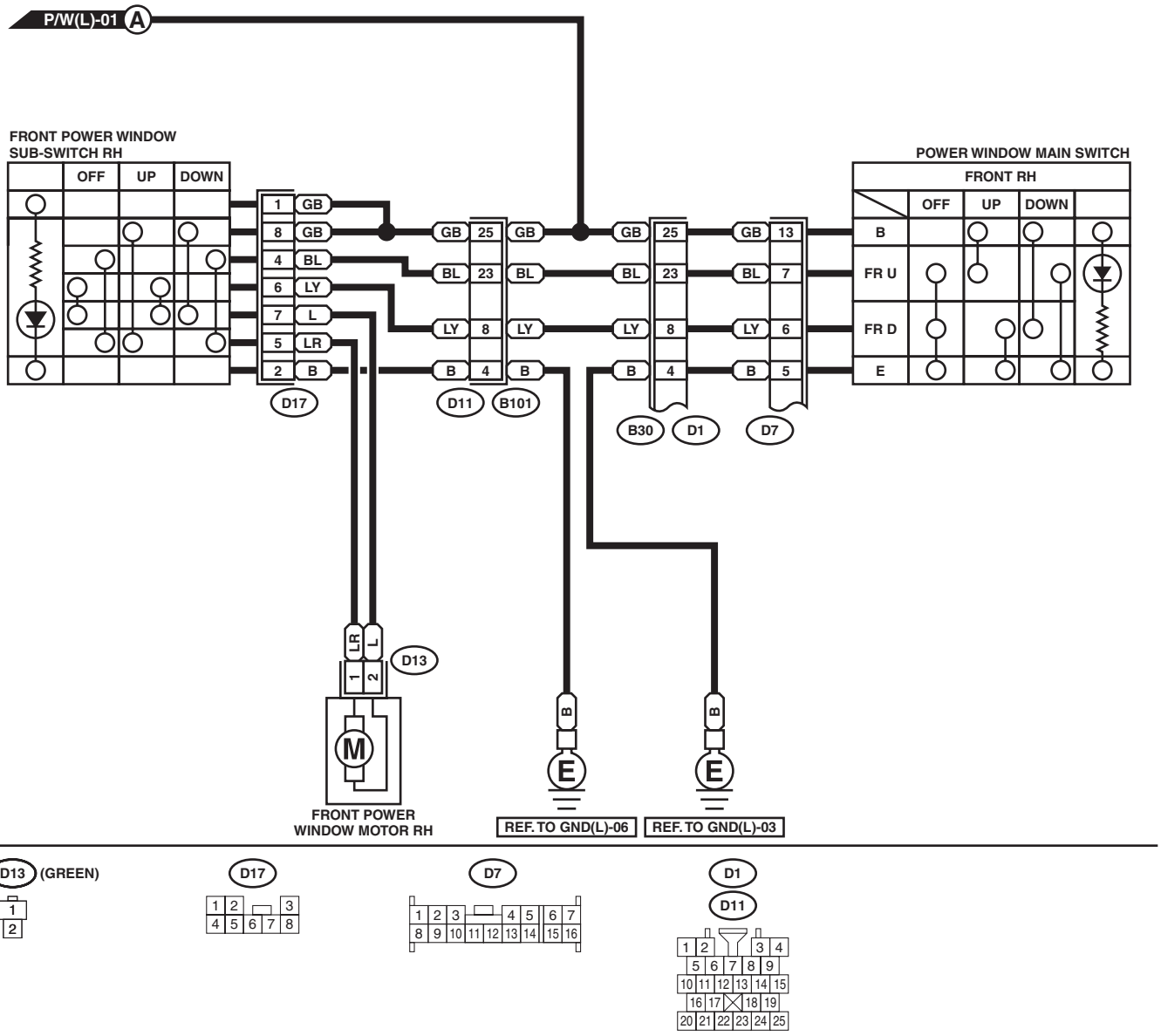
1. LHD MODEL



WI-06153

P/W(L)-02

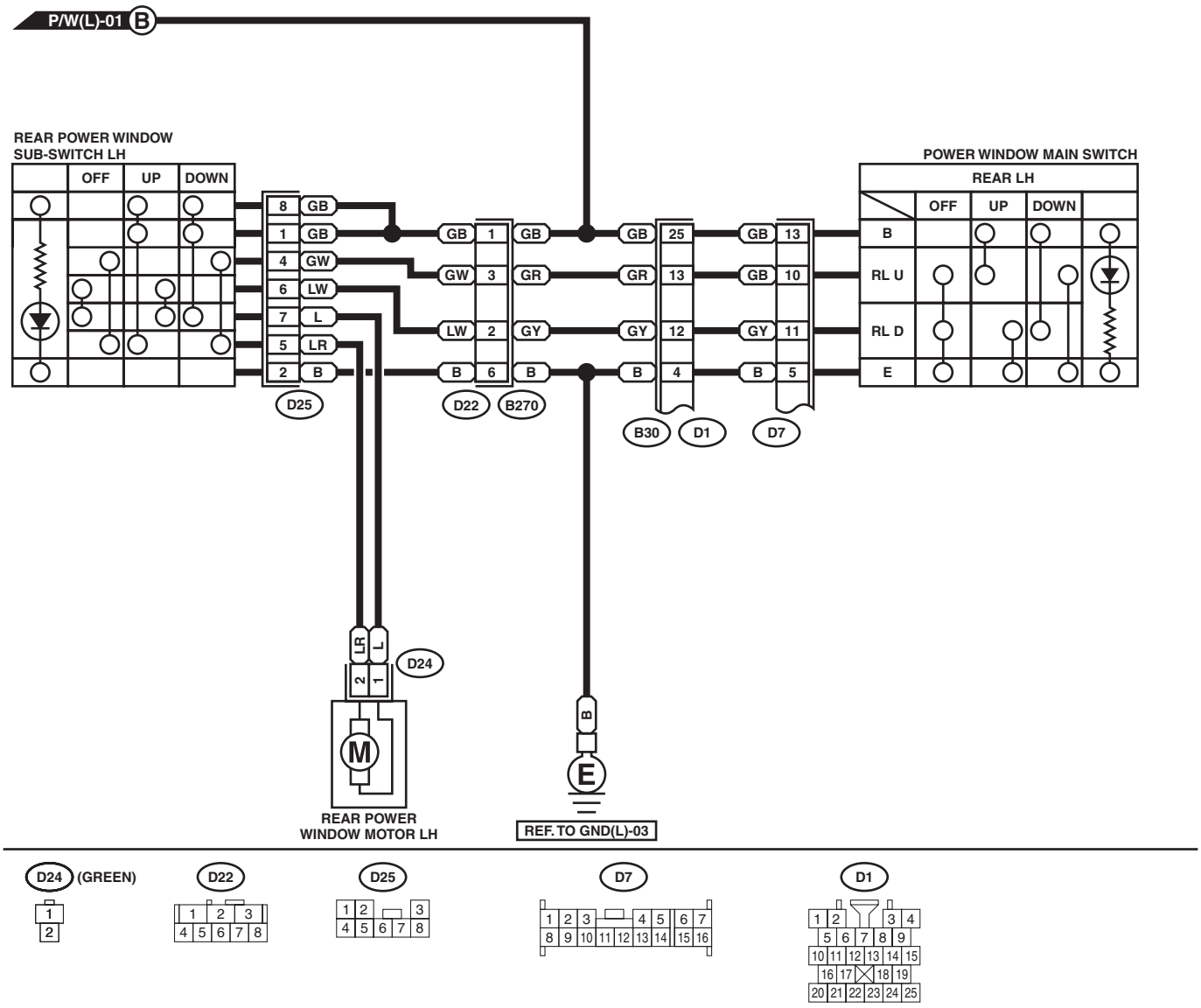
P/W(L)-02



WI-03346

P/W(L)-03

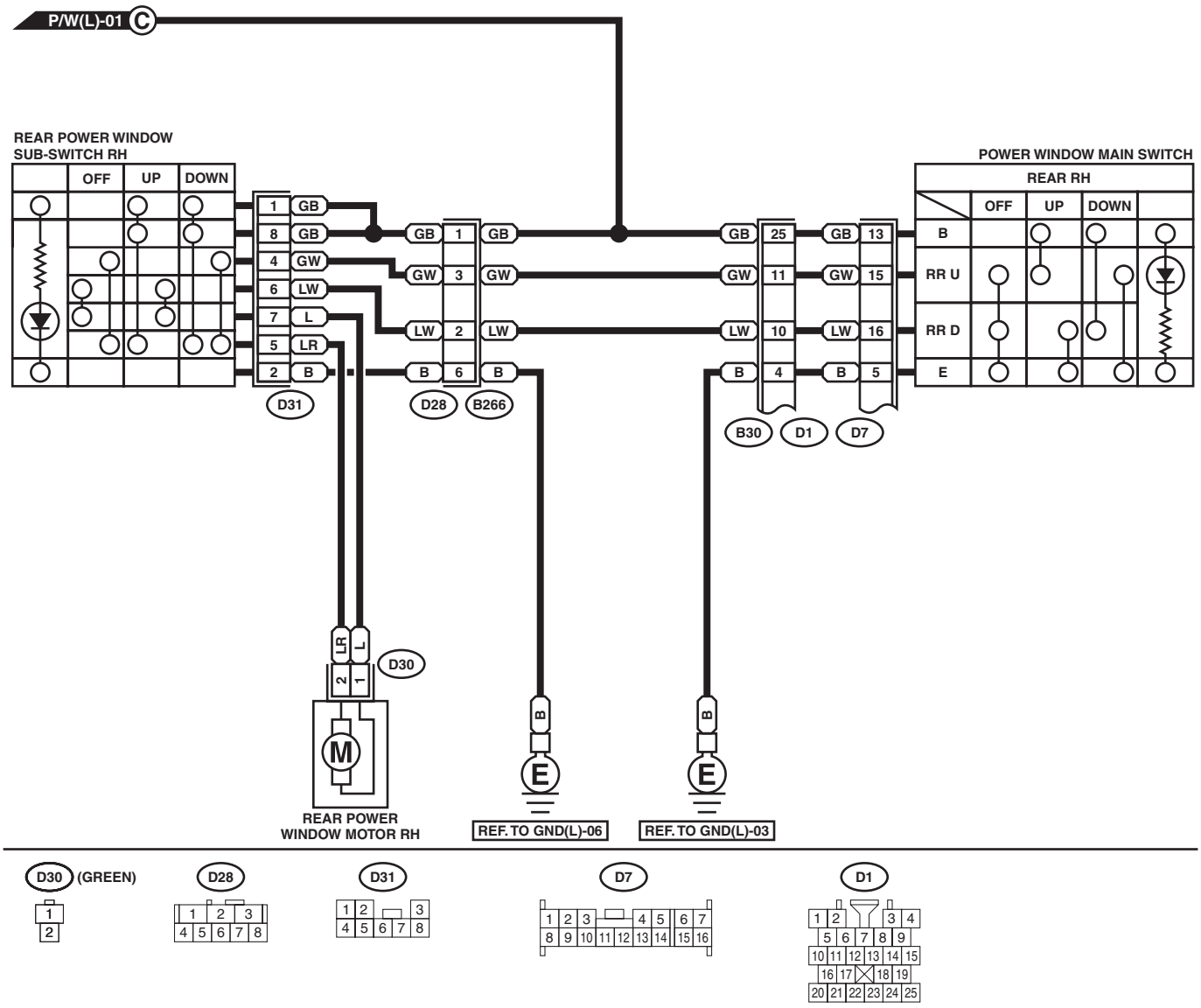
P/W(L)-03



WI-07458

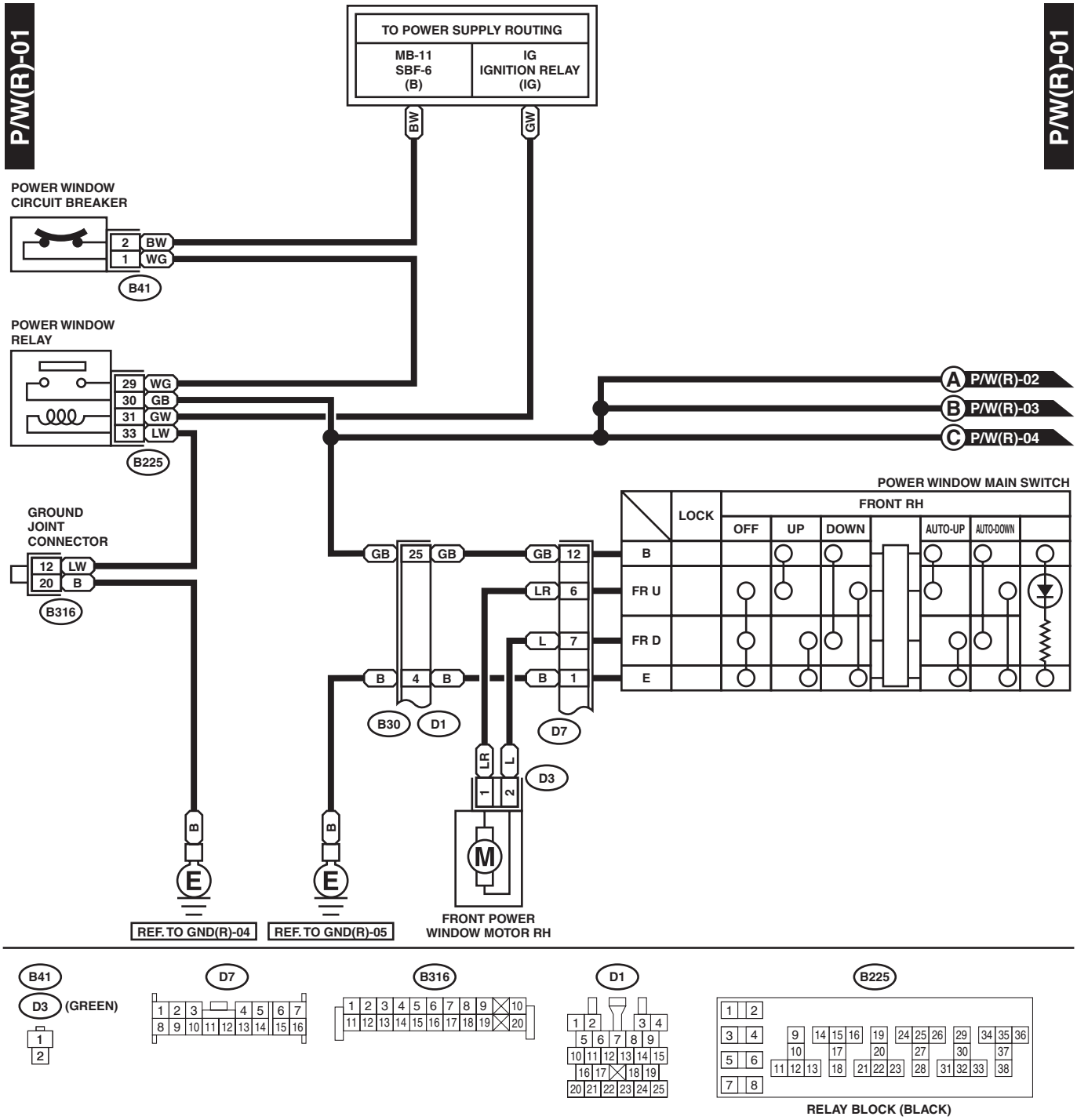
P/W(L)-04

P/W(L)-04



WI-07459

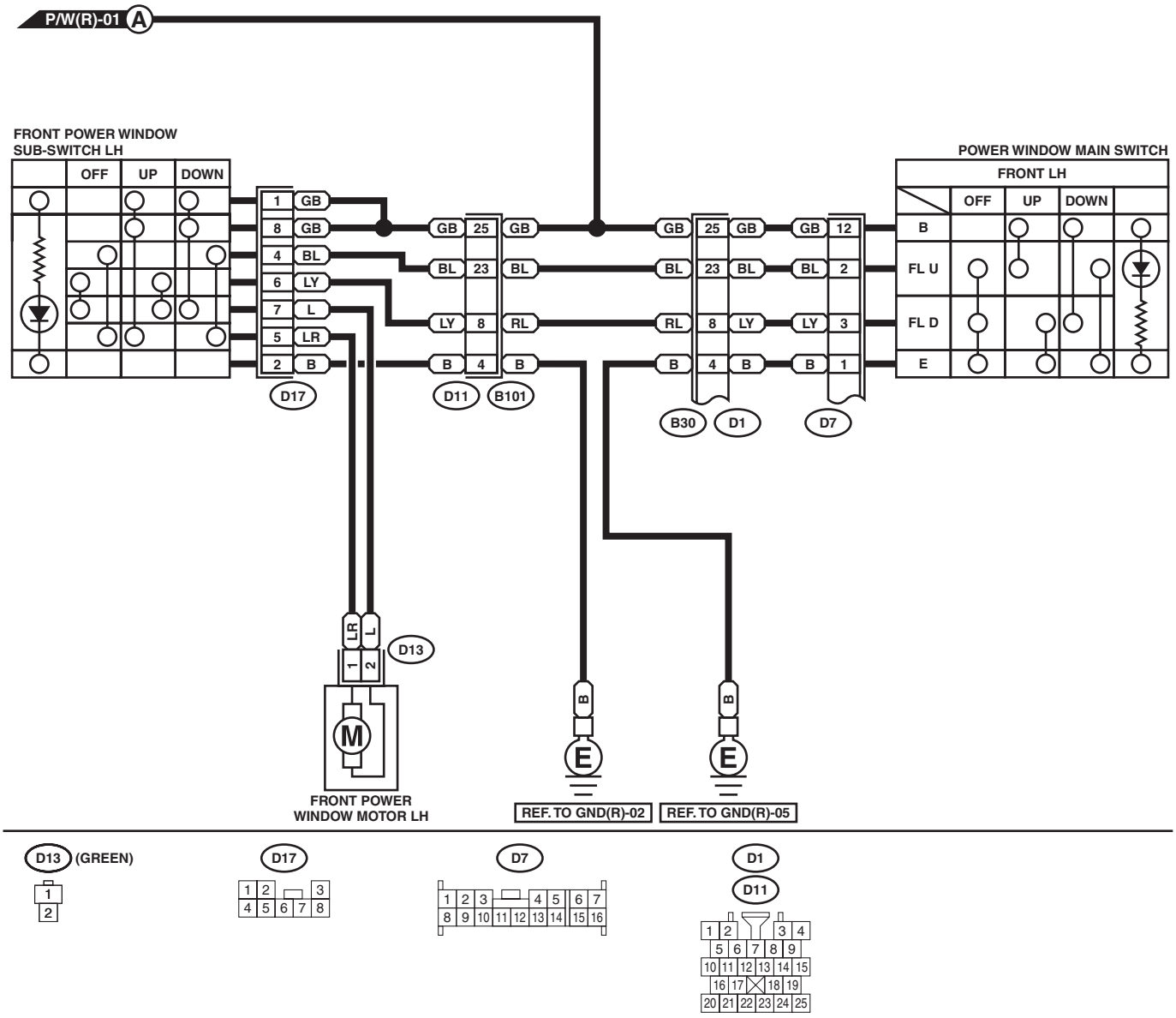
2. RHD MODEL



WI-00448

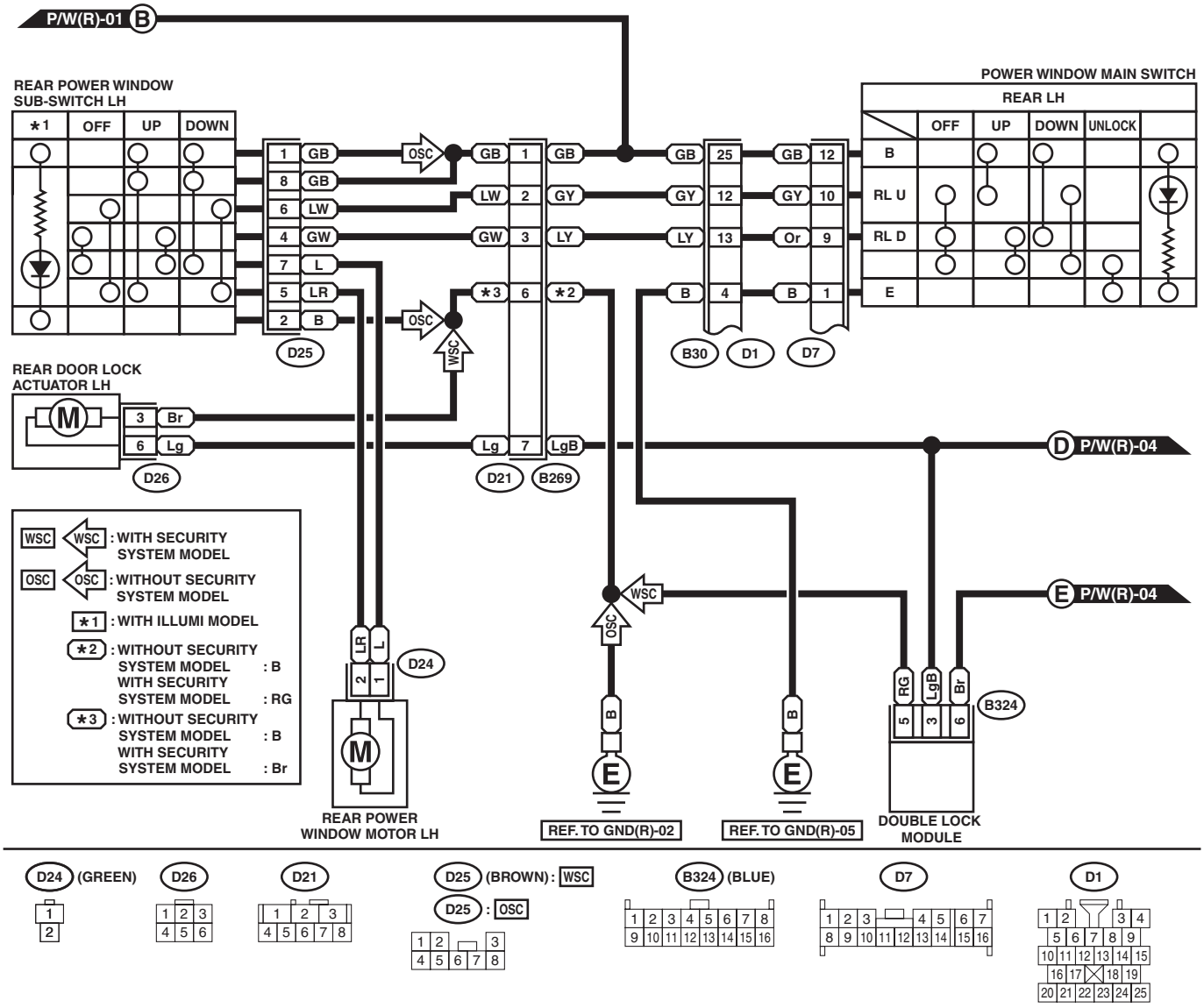
P/W(R)-02

P/W(R)-02



WI-03349

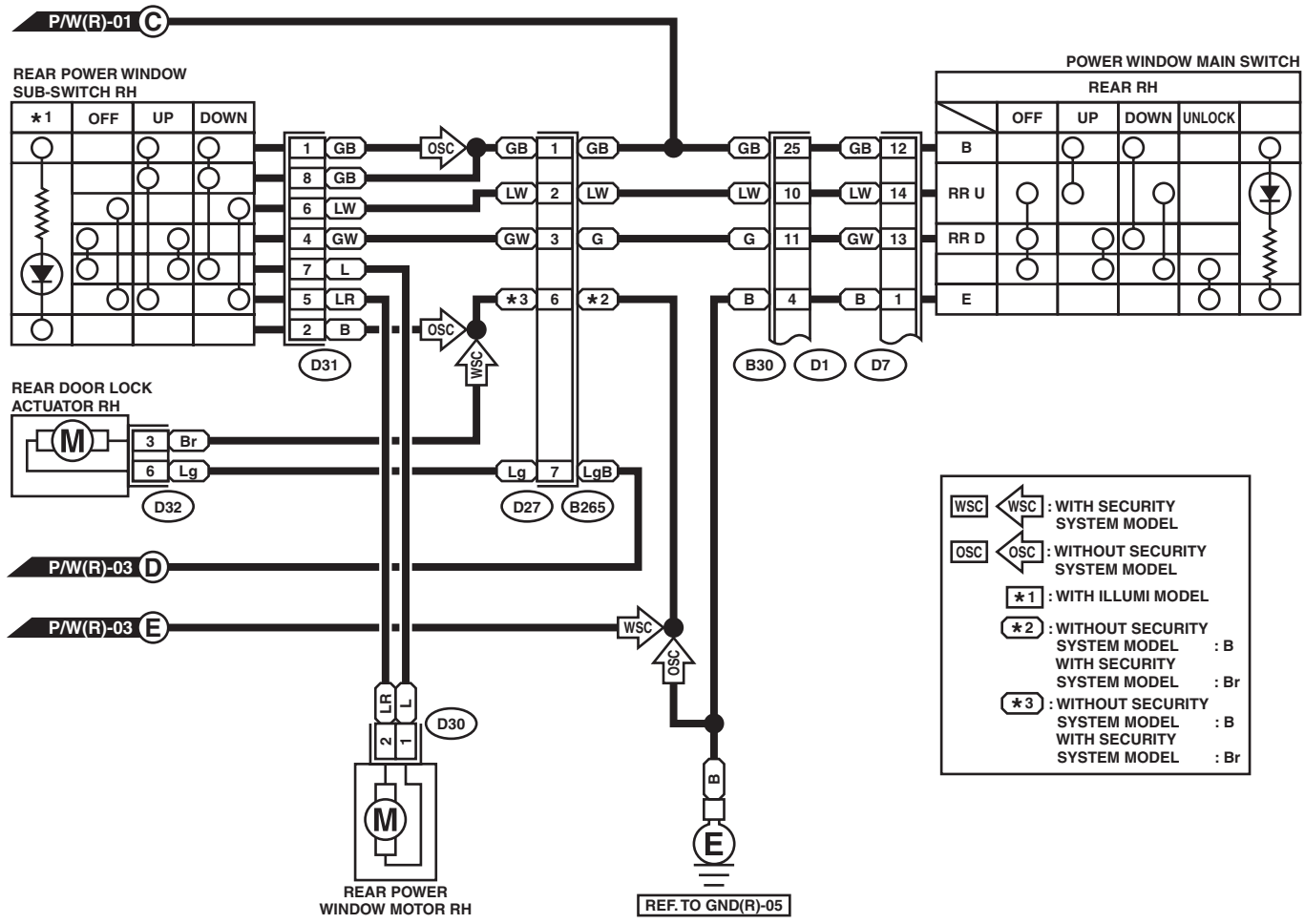
P/W(R)-03

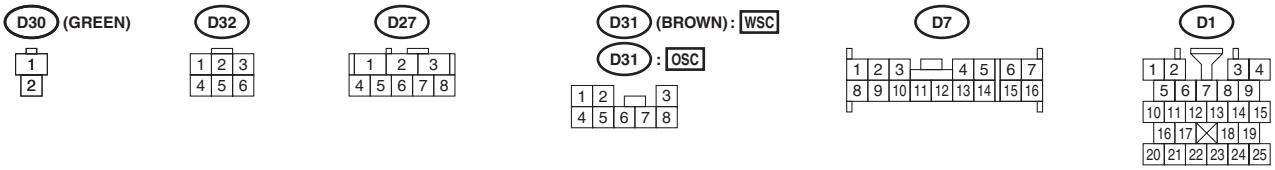


WI-07460

P/W(R)-04

P/W(R)-04



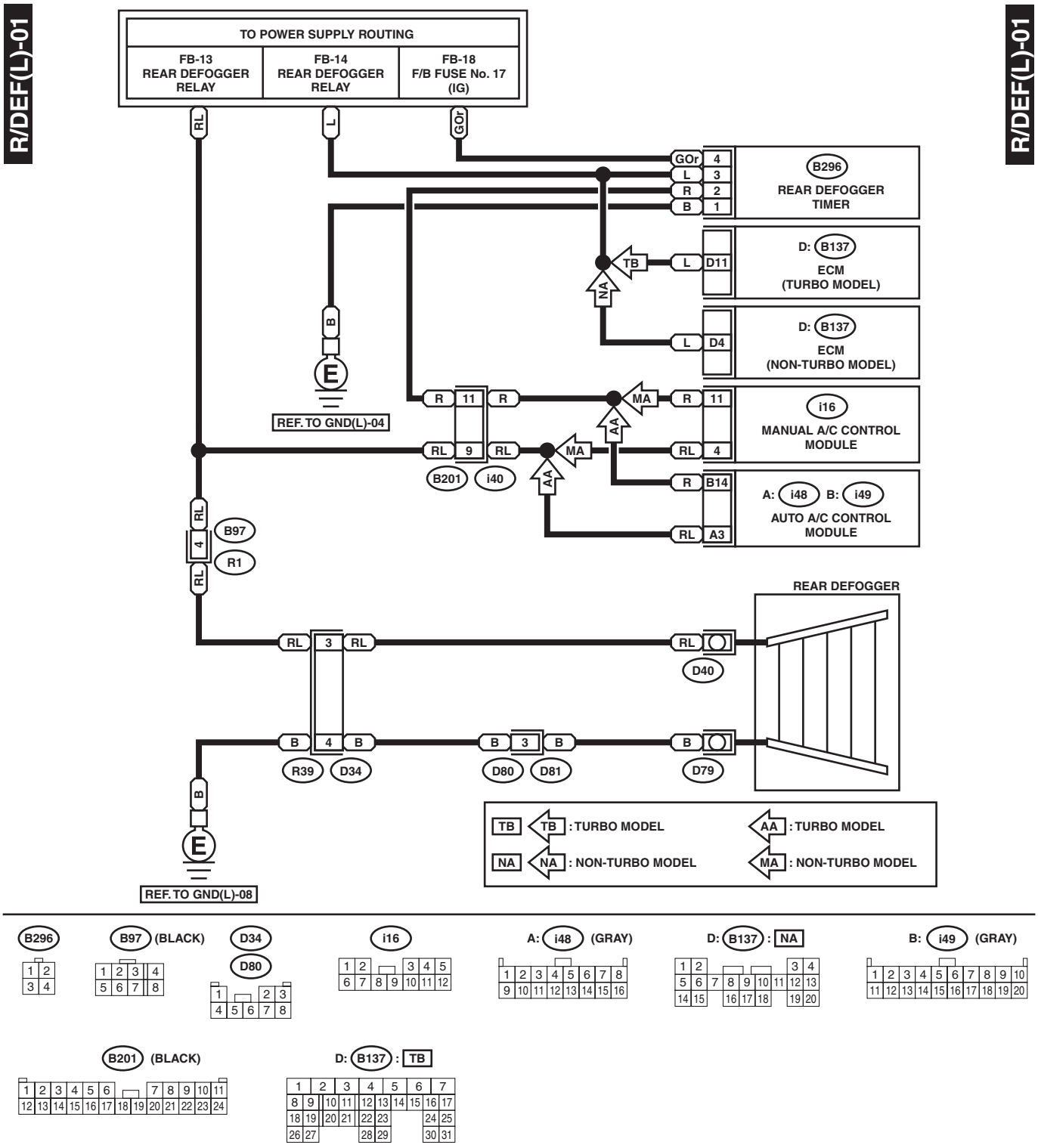


WI-03351

38.Rear Window Defogger System

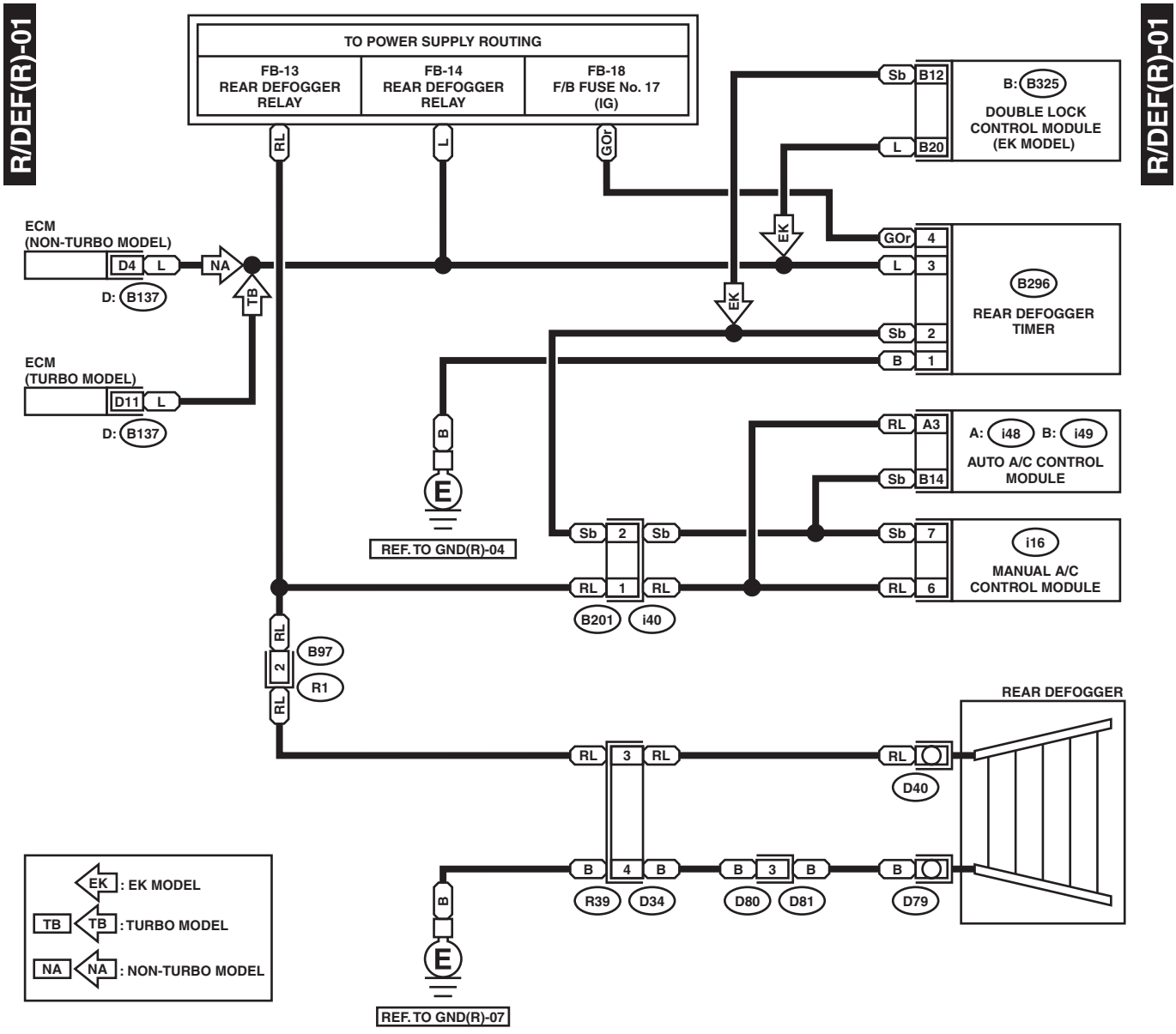
A: WIRING DIAGRAM

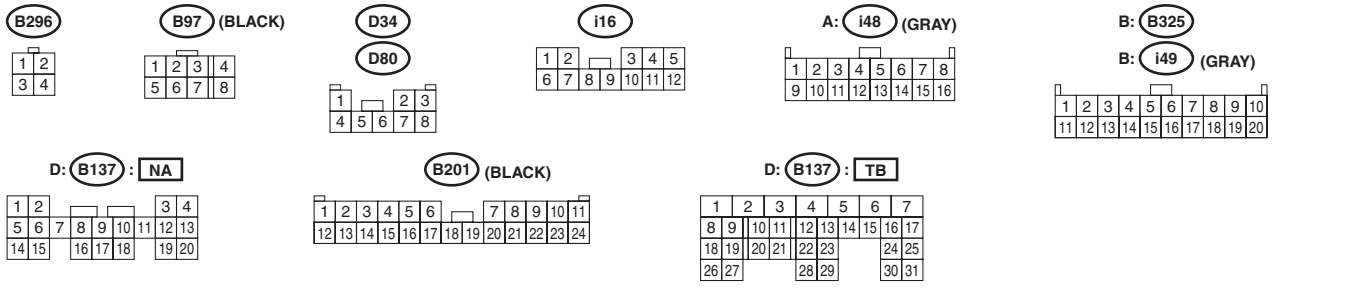
1. LHD MODEL



WI-07461

2. RHD MODEL



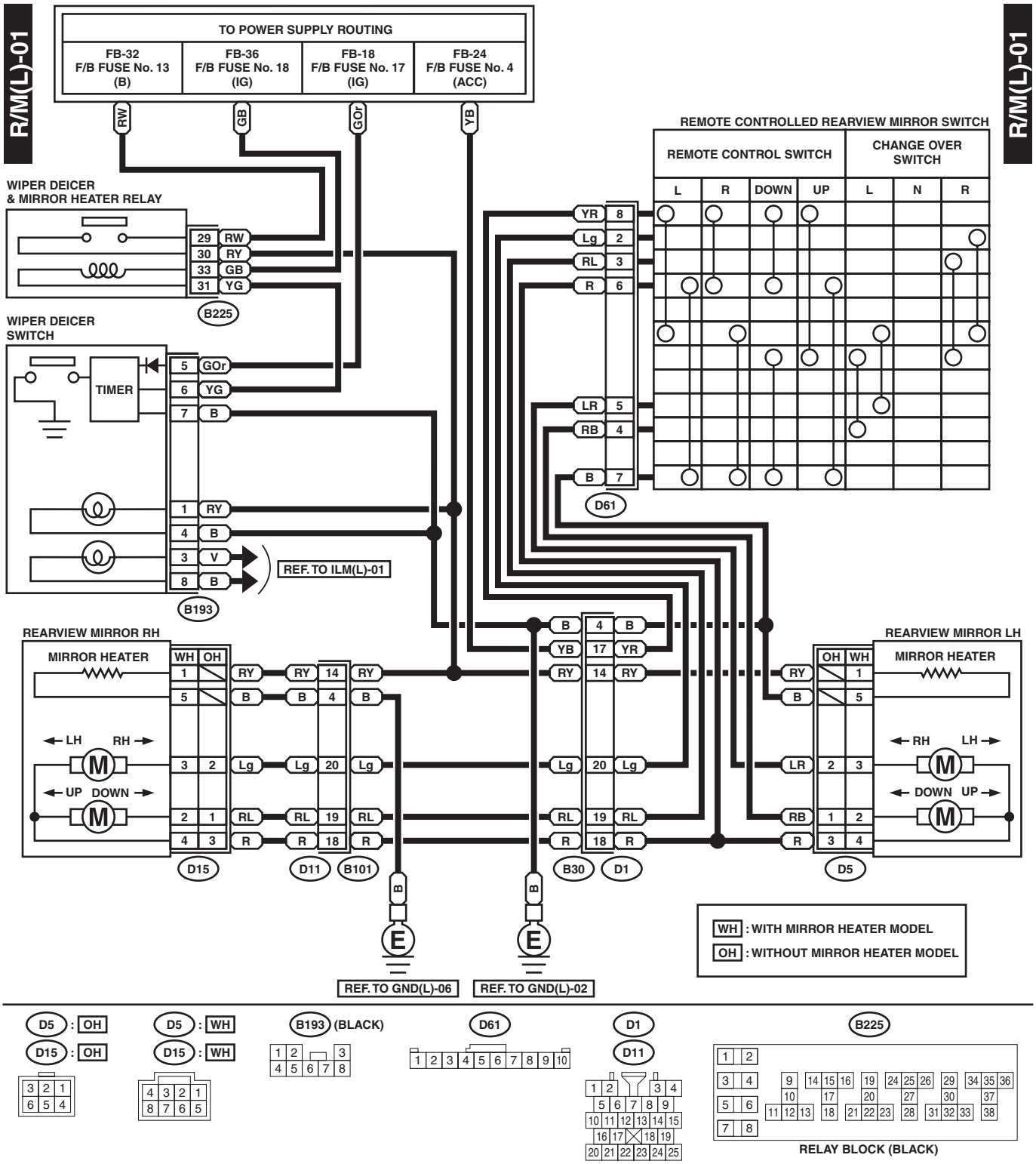


WI-07462

39.Remote Control Mirror System

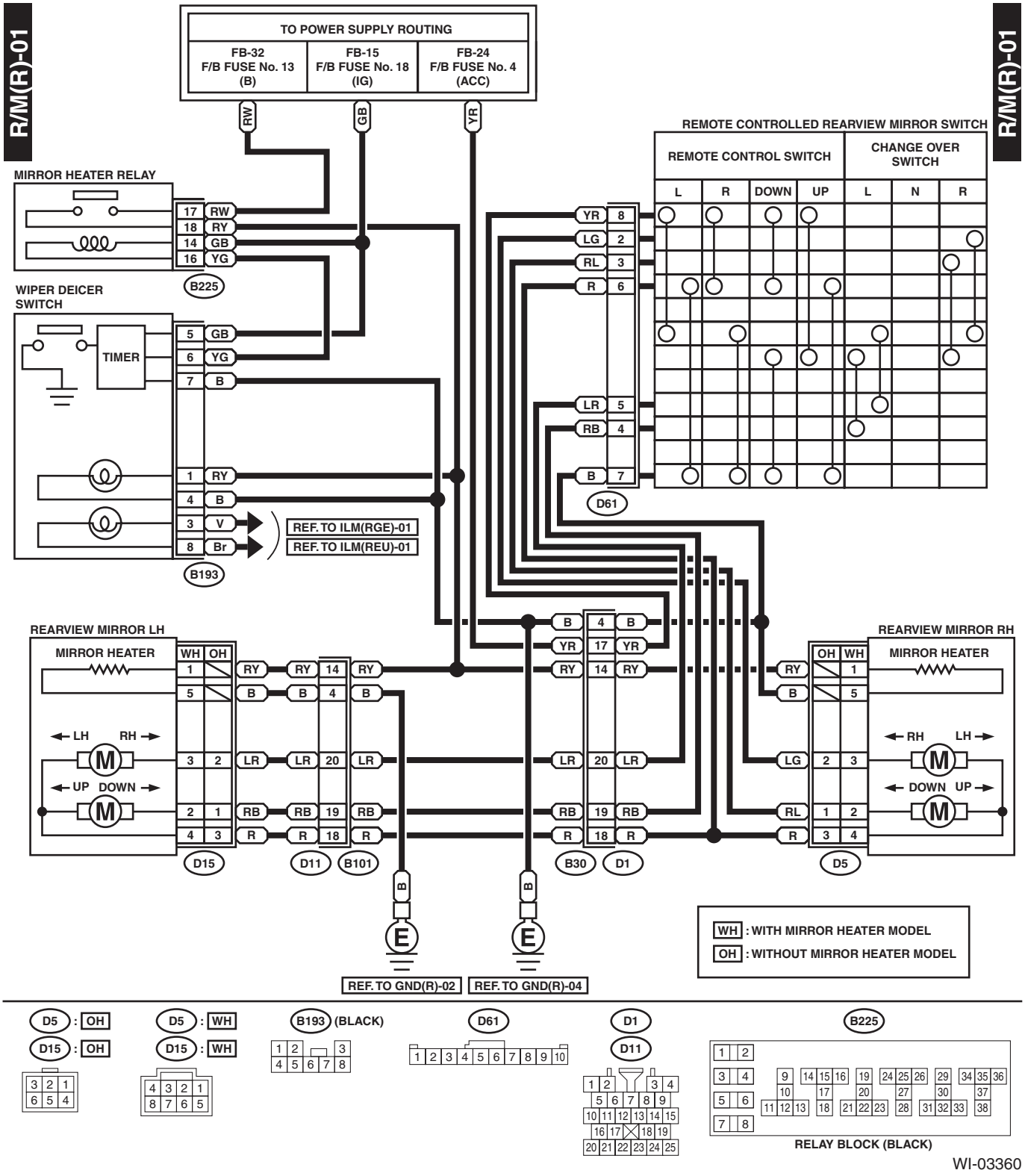
A: WIRING DIAGRAM

1. LHD MODEL



WI-03359

2. RHD MODEL



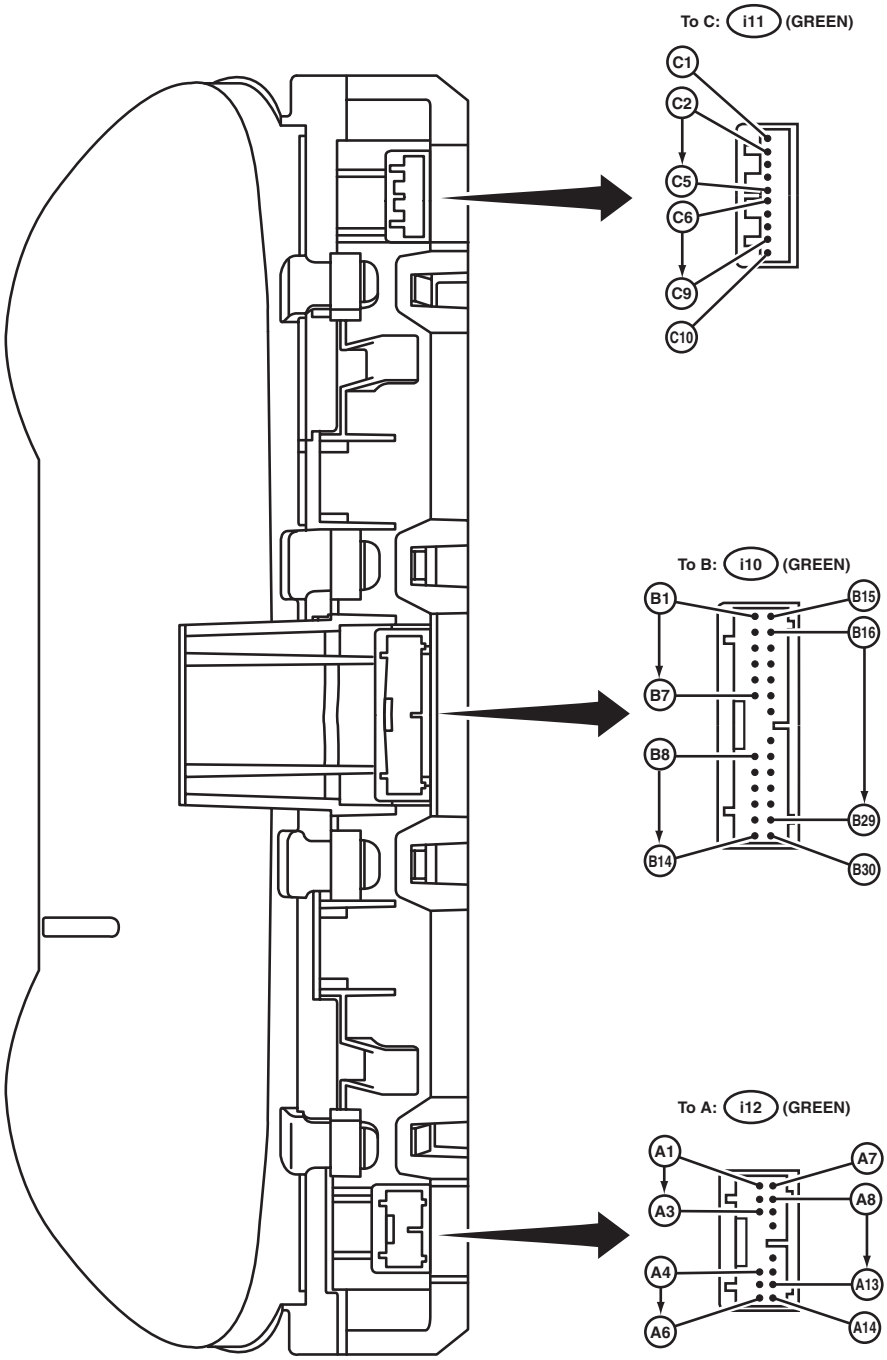
WI-03360

40.Combination Meter

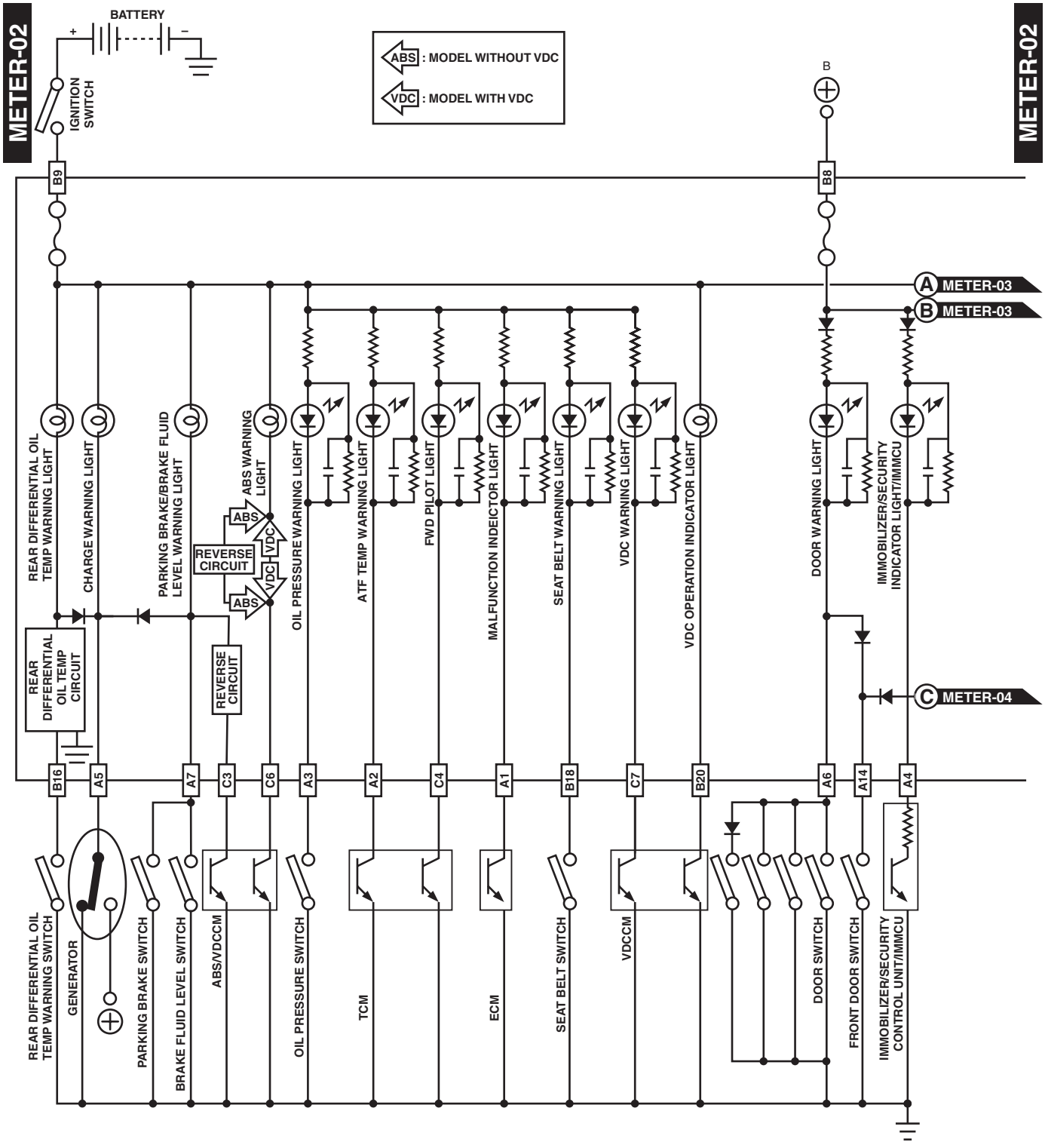
A: WIRING DIAGRAM

METER-01

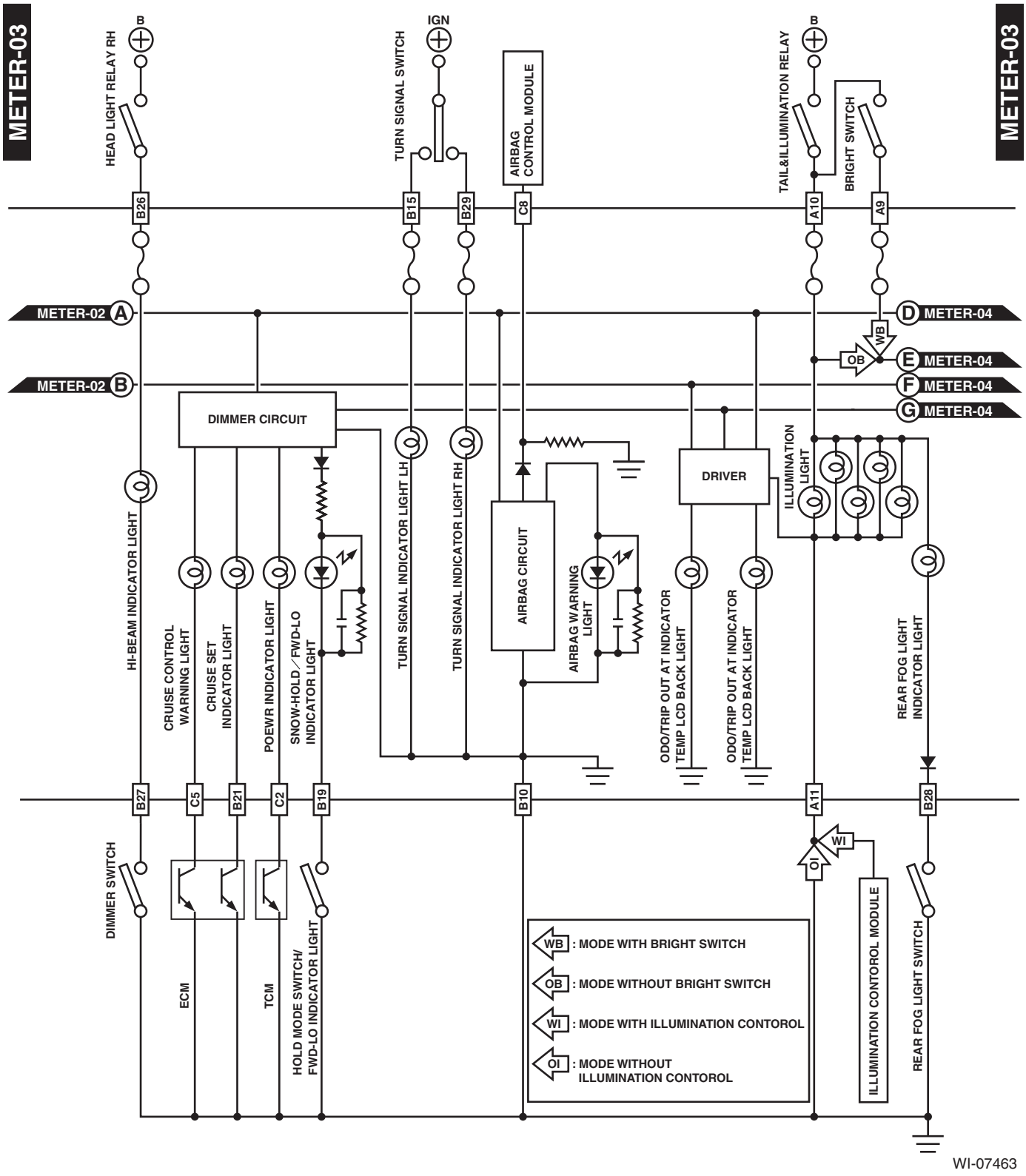
METER-01



WI-05994


METER-02
METER-02
BATTERY
IGNITION SWITCH
ABS : MODEL WITHOUT VDC
VDC : MODEL WITH VDC
B
B9
B8
A METER-03
B METER-03
C METER-04
REAR DIFFERENTIAL OIL TEMP WARNING LIGHT
CHARGE WARNING LIGHT
PARKING BRAKE/BRAKE FLUID LEVEL WARNING LIGHT
ABS WARNING LIGHT
ABS
VDC
REVERSE CIRCUIT
VDC
ABS
OIL PRESSURE WARNING LIGHT
ATF TEMP WARNING LIGHT
FWD PILOT LIGHT
MALFUNCTION INDEICTOR LIGHT
SEAT BELT WARNING LIGHT
VDC WARNING LIGHT
VDC OPERATION INDICATOR LIGHT
DOOR WARNING LIGHT
IMMOBILIZER/SECURITY INDICATOR LIGHT/IMMCU
REAR DIFFERENTIAL OIL TEMP CIRCUIT
REVERSE CIRCUIT
B16
A5
A7
C3
C6
A3
A2
C4
A1
B18
C7
B20
A6
A14
A4
REAR DIFFERENTIAL OIL TEMP WARNING SWITCH
GENERATOR
PARKING BRAKE SWITCH
BRAKE FLUID LEVEL SWITCH
ABS/VDCCM
OIL PRESSURE SWITCH
TCM
ECM
SEAT BELT SWITCH
VDCCM
DOOR SWITCH
FRONT DOOR SWITCH
IMMOBILIZER/SECURITY CONTROL UNIT/IMMCU

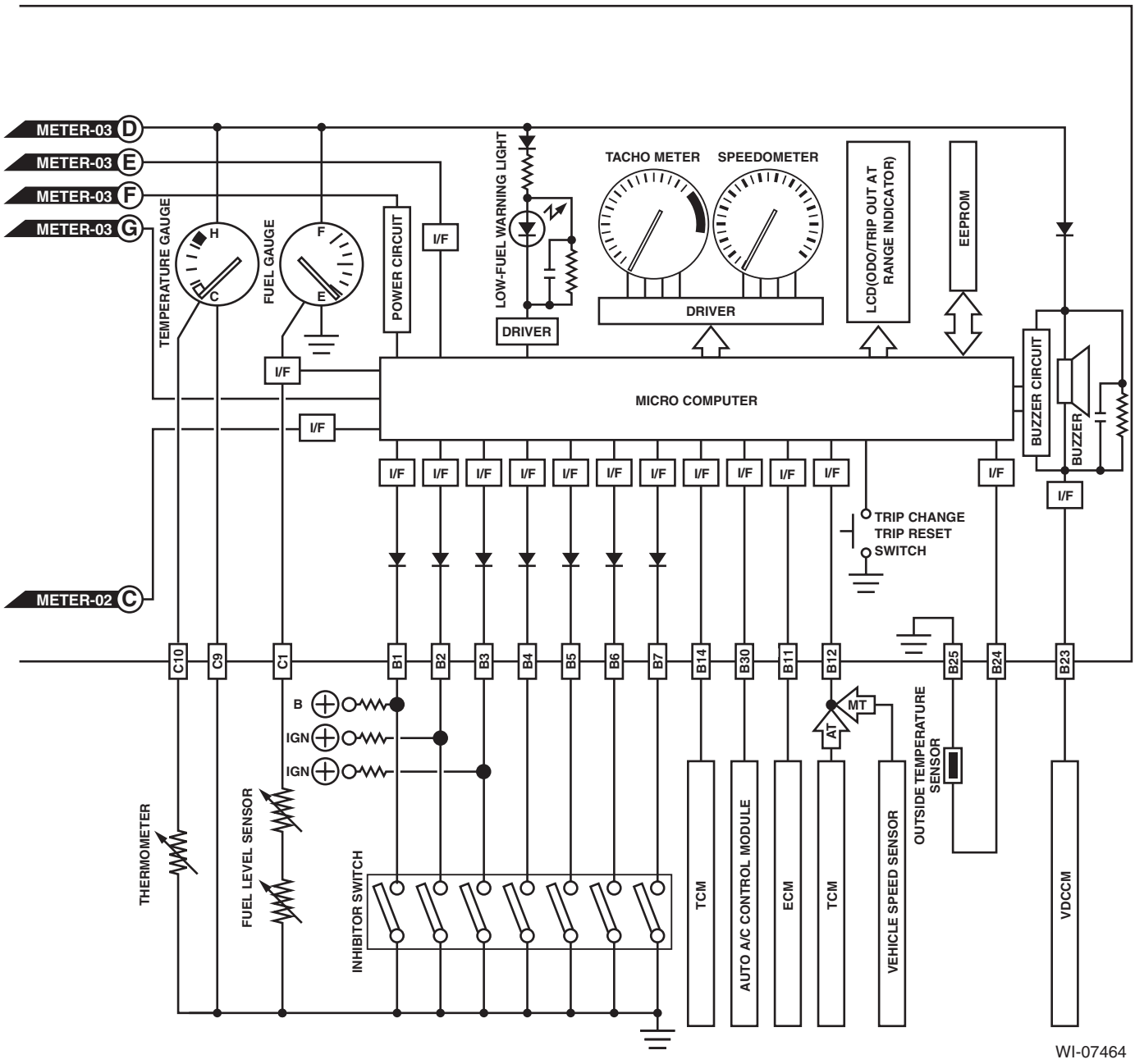
WI-05995


METER-03
METER-03
B
HEAD LIGHT RELAY RH
IGN
TURN SIGNAL SWITCH
AIRBAG CONTROL MODULE
B
TAIL&ILLUMINATION RELAY
BRIGHT SWITCH
B26
B15
B29
C8
A10
A9
METER-02 A
METER-02 B
D METER-04
E METER-04
F METER-04
G METER-04
WB
OB
DIMMER CIRCUIT
DRIVER
ILLUMINATION LIGHT
HI-BEAM INDICATOR LIGHT
CRUISE CONTROL WARNING LIGHT
CRUISE SET INDICATOR LIGHT
POEWR INDICATOR LIGHT
SNOW-HOLD／FWD-LO INDICATOR LIGHT
TURN SIGNAL INDICATOR LIGHT LH
TURN SIGNAL INDICATOR LIGHT RH
AIRBAG CIRCUIT
AIRBAG WARNING LIGHT
ODO/TRIP OUT AT INDICATOR TEMP LCD BACK LIGHT
ODO/TRIP OUT AT INDICATOR TEMP LCD BACK LIGHT
REAR FOG LIGHT INDICATOR LIGHT
B27
C5
B21
C2
B19
B10
A11
B28
OI
WI
DIMMER SWITCH
ECM
TCM
HOLD MODE SWITCH/ FWD-LO INDICATOR LIGHT
WB : MODE WITH BRIGHT SWITCH
OB : MODE WITHOUT BRIGHT SWITCH
WI : MODE WITH ILLUMINATION CONTOROL
OI : MODE WITHOUT ILLUMINATION CONTOROL
ILLUMINATION CONTOROL MODULE
REAR FOG LIGHT SWITCH

WI-07463

METER-04

METER-04

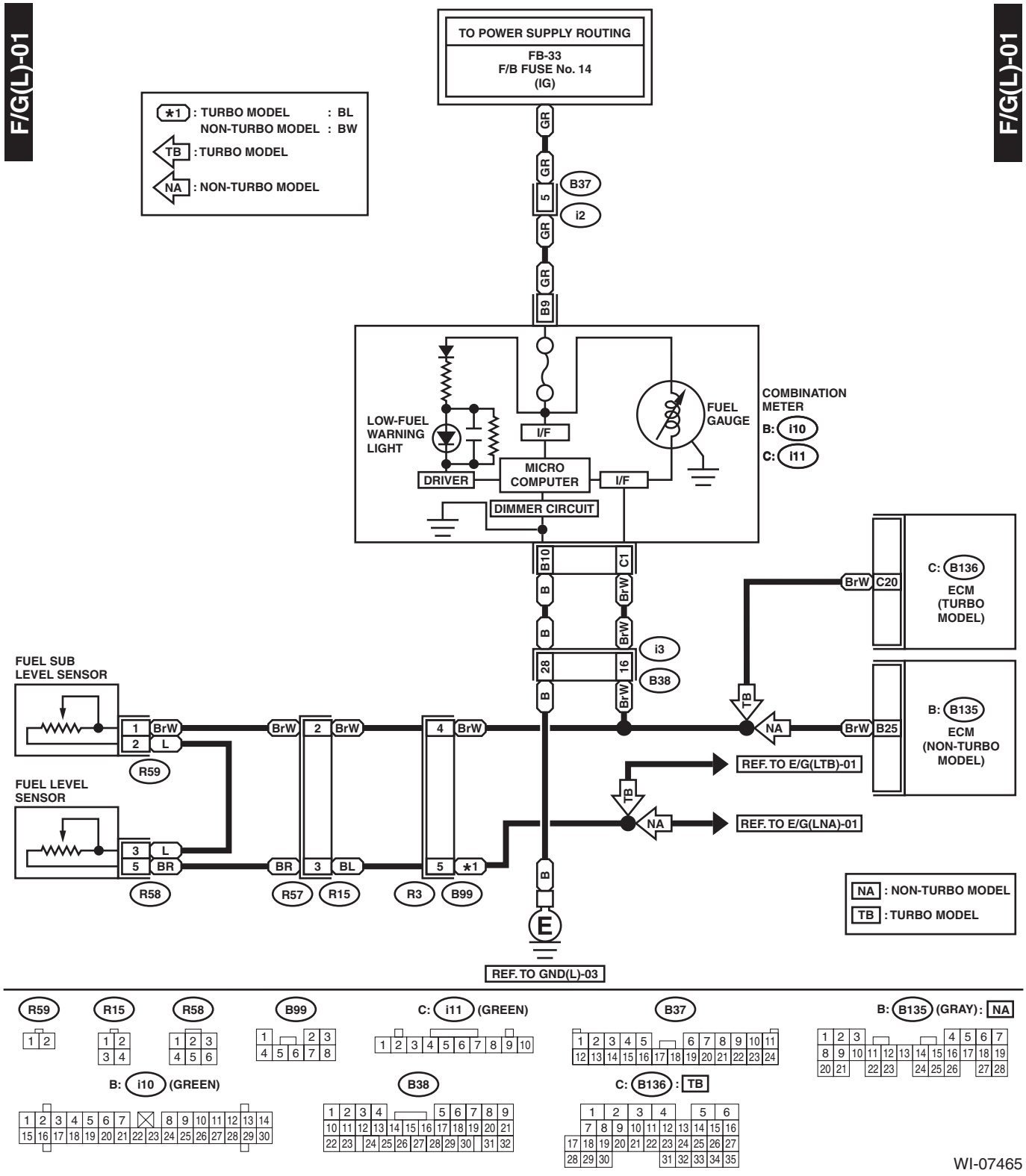


WI-07464

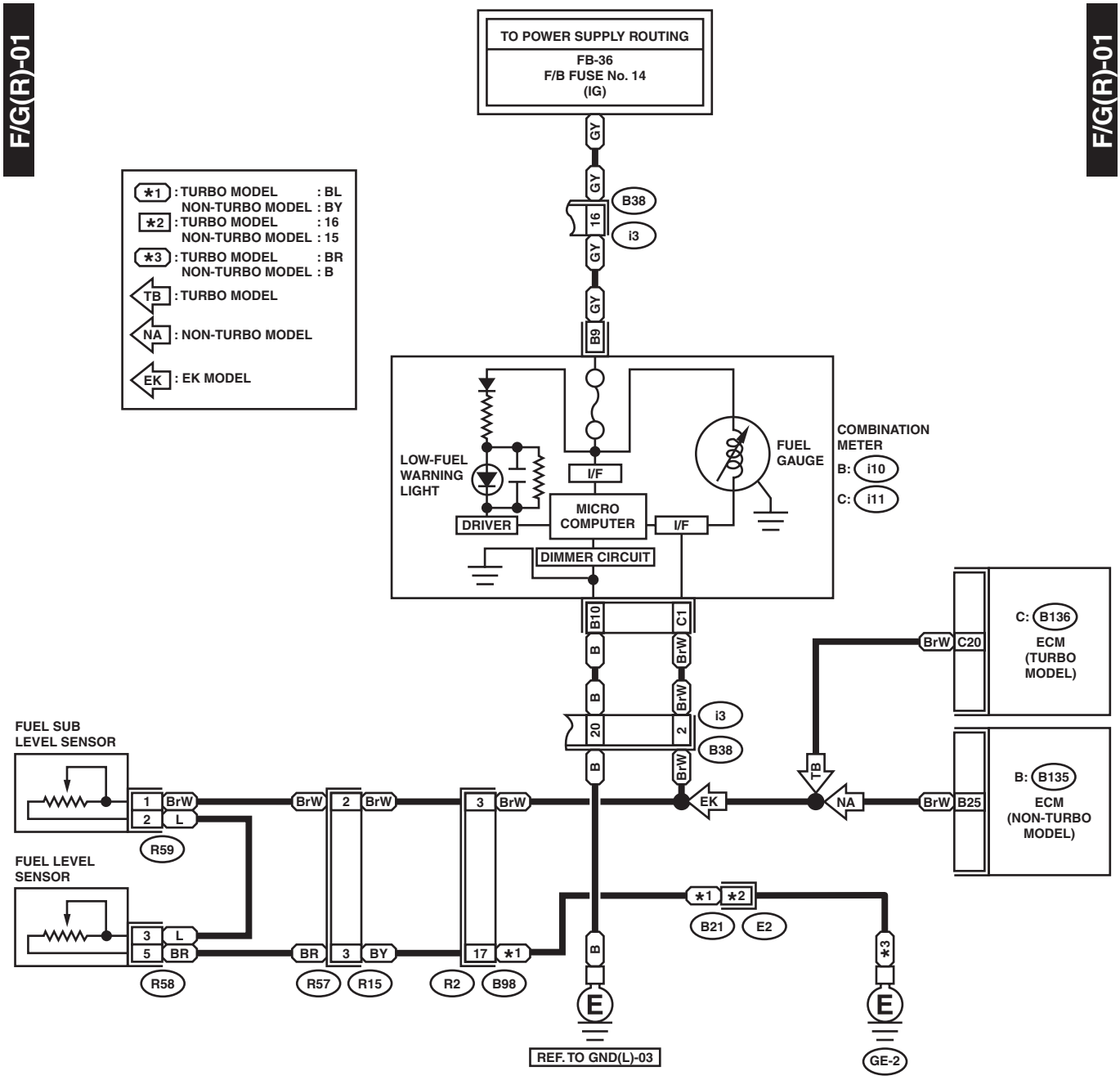
41.Fuel Gauge System

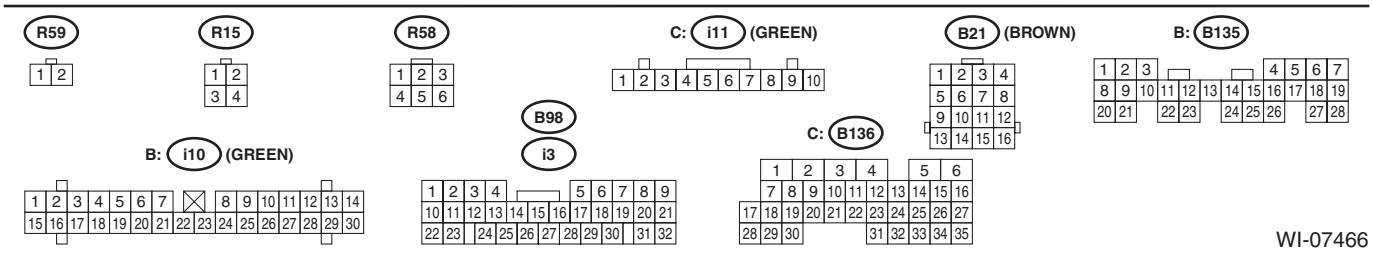
A: WIRING DIAGRAM

1. LHD MODEL



2. RHD MODEL



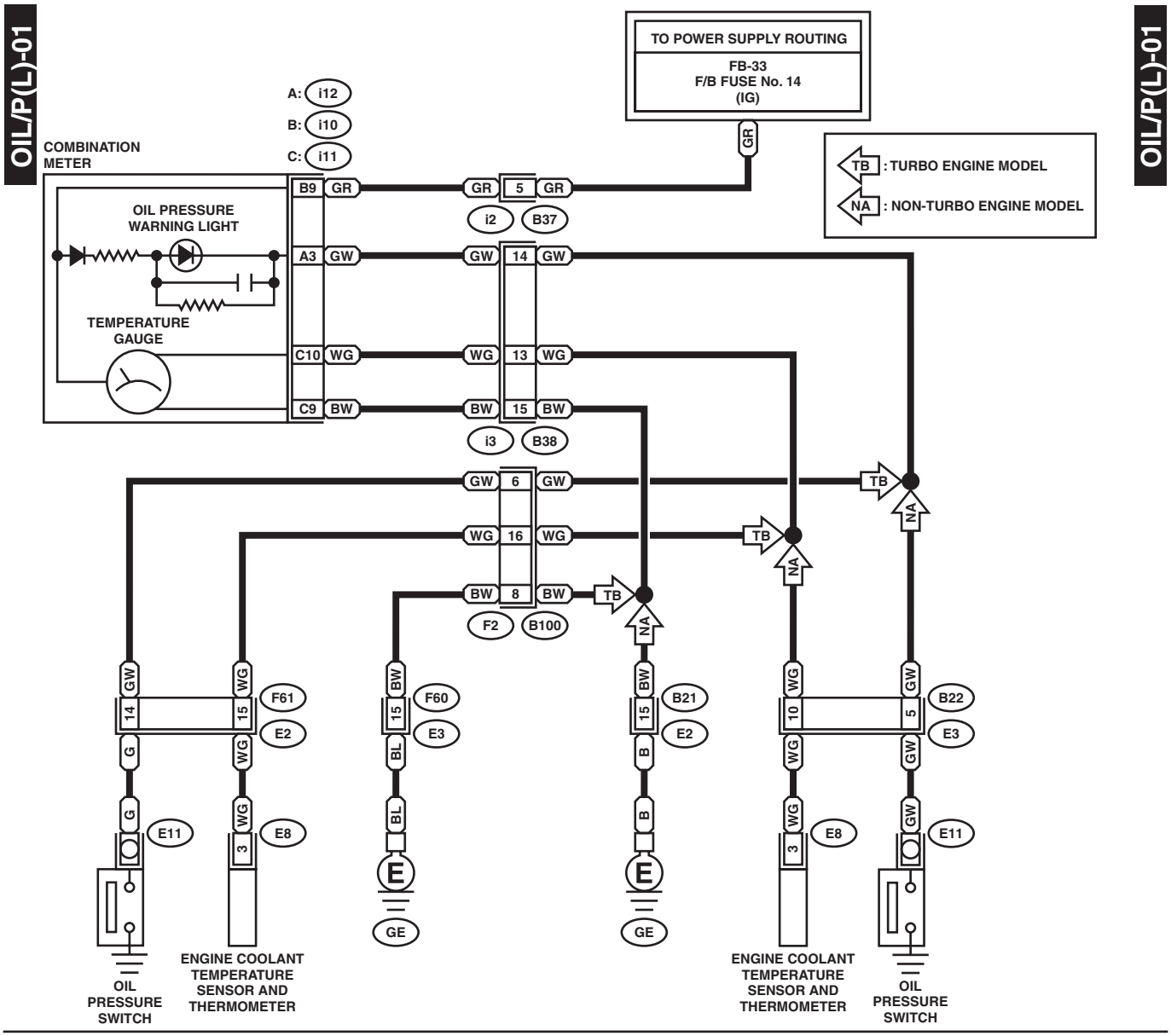


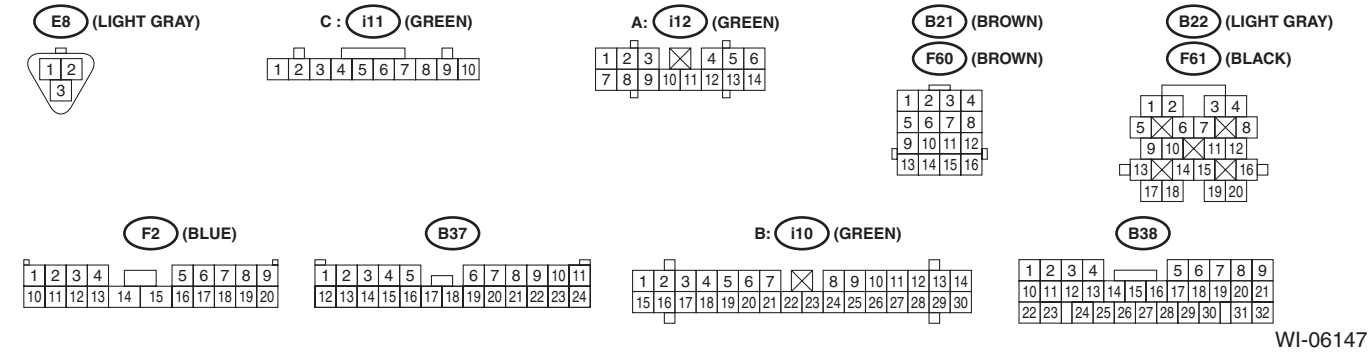
WI-07466

42.Oil Pressure Warning Light System

A: WIRING DIAGRAM

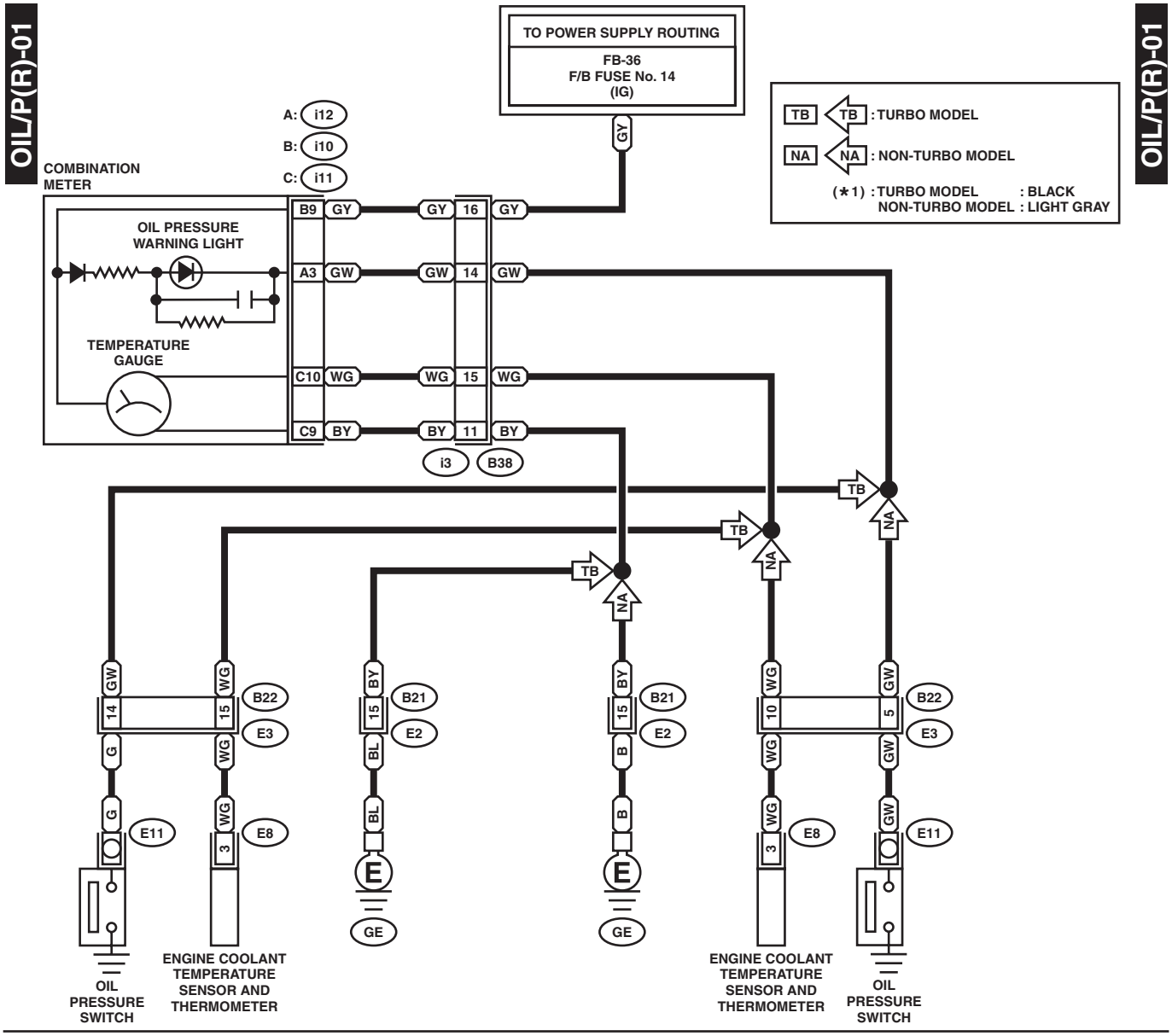
1. LHD MODEL

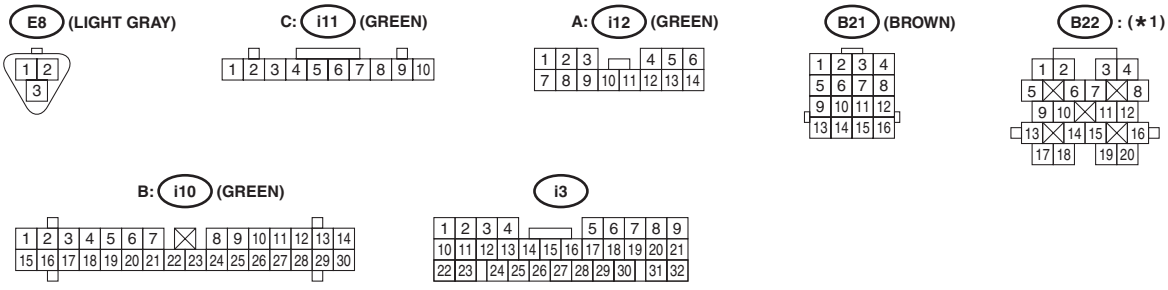




WI-06147

2. RHD MODEL



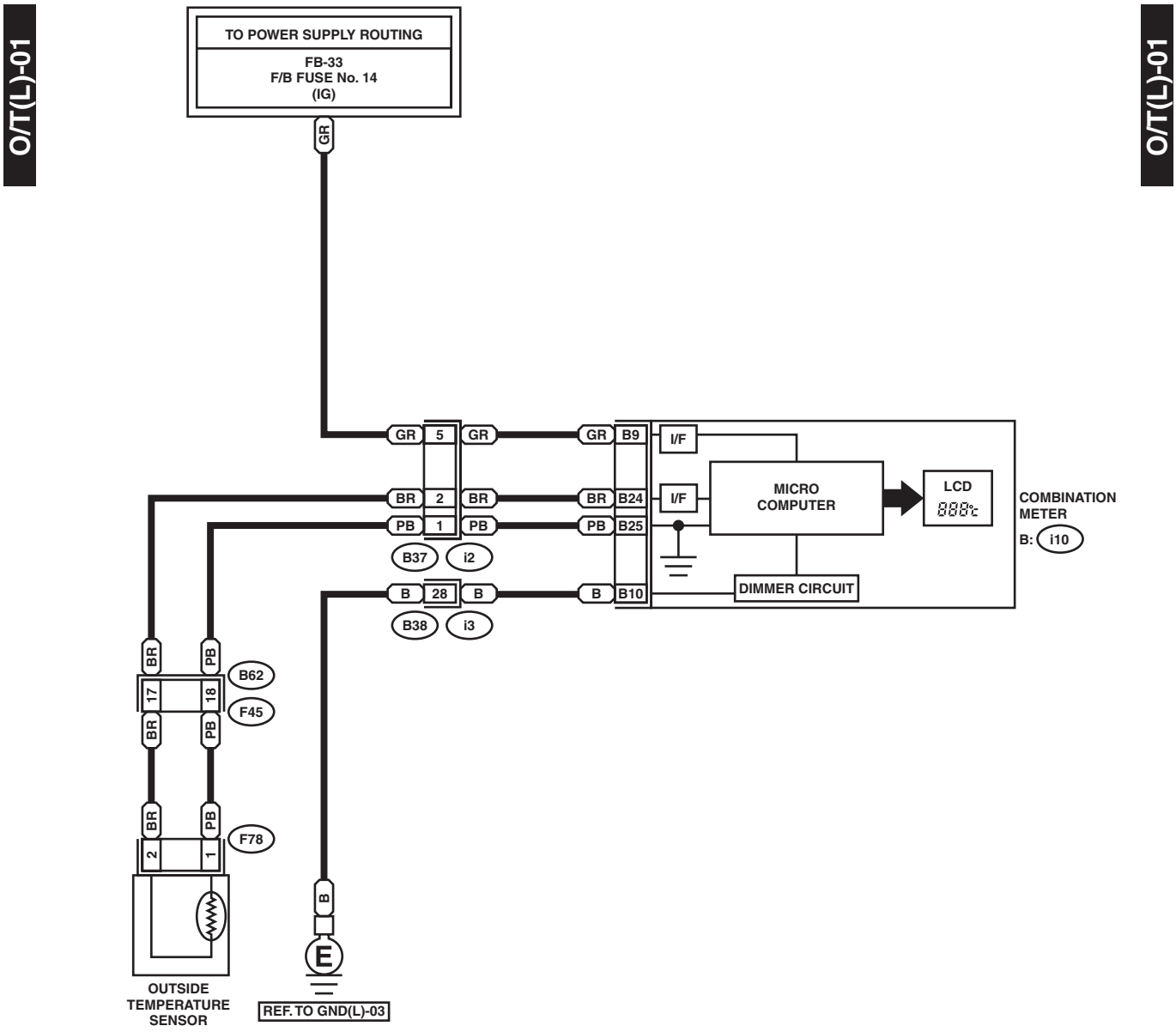


WI-06148

43.Outside Temperature Display System

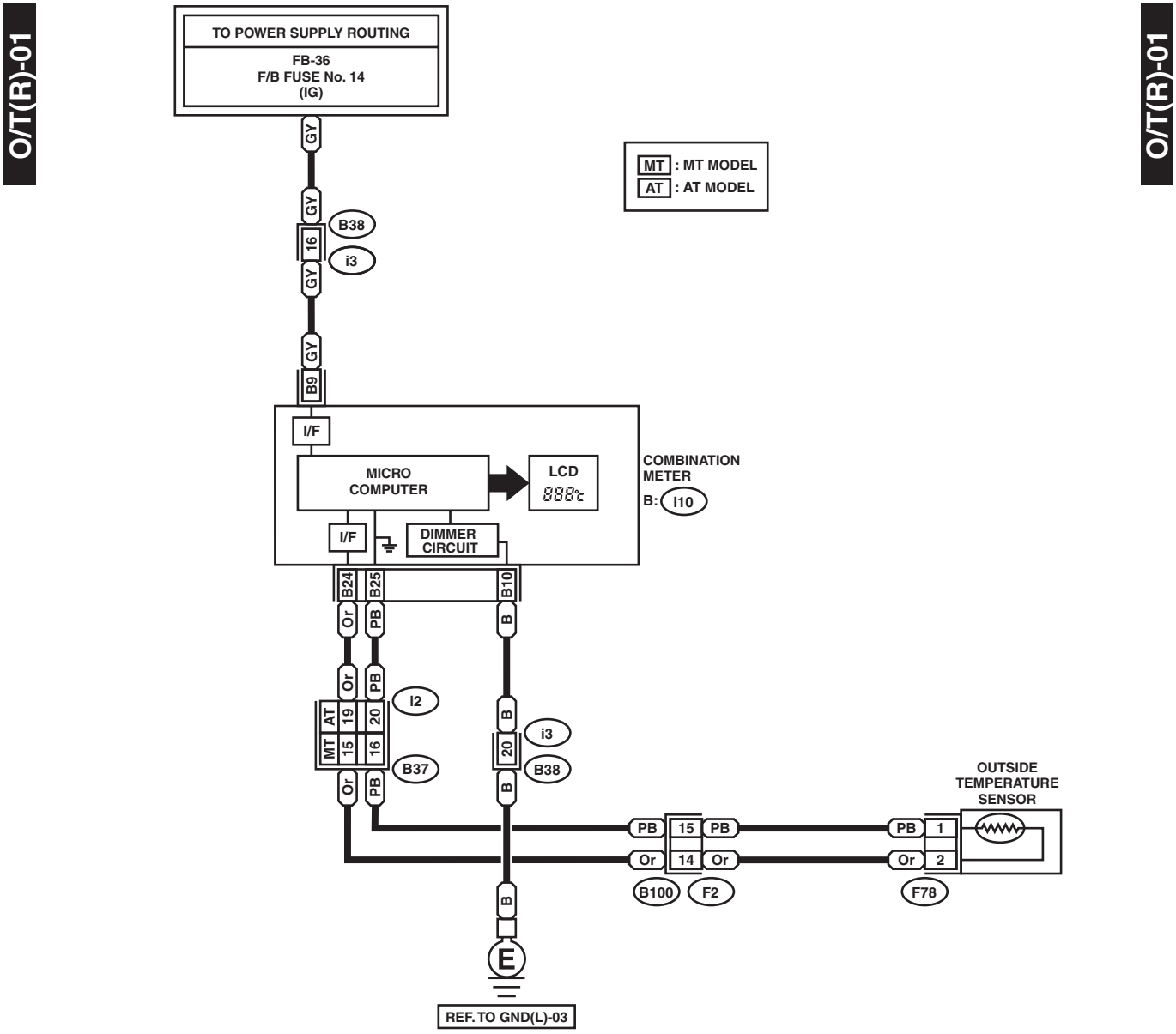
A: WIRING DIAGRAM

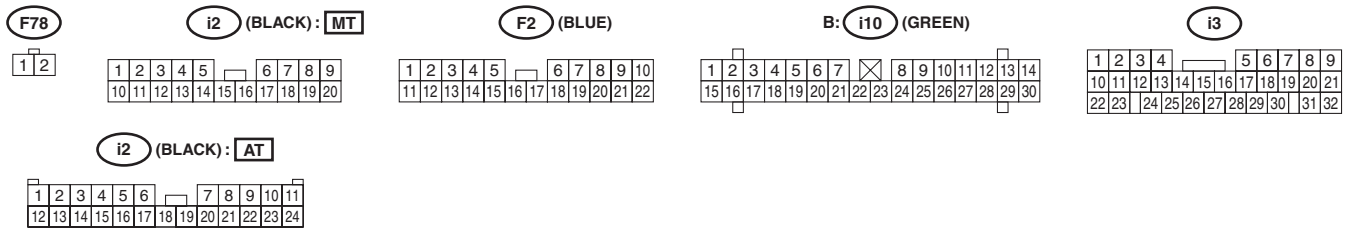
1. LHD MODEL



WI-06150

2. RHD MODEL



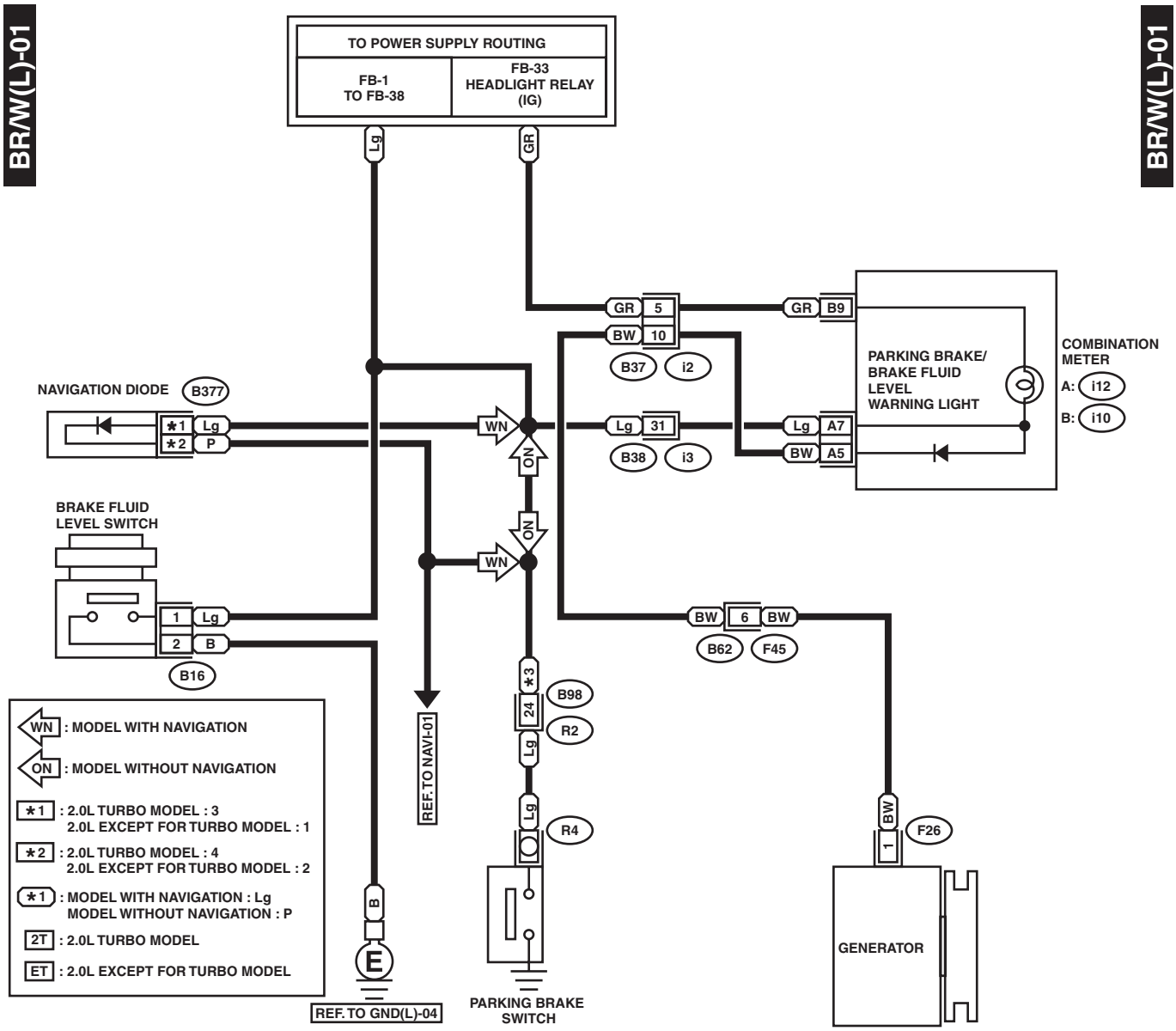


WI-06151

44.Parking Brake / Brake Fluid Level Warning System

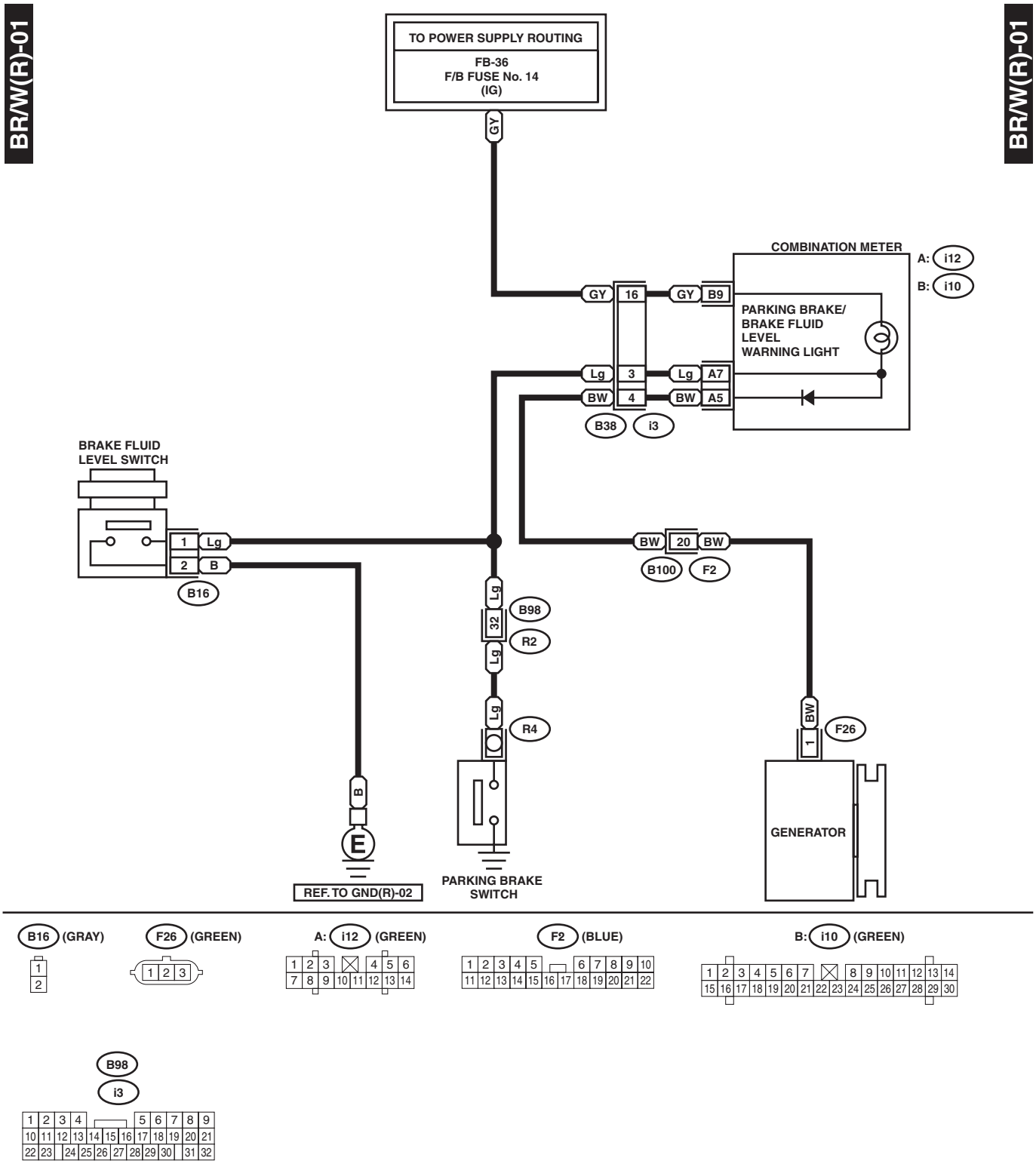
A: WIRING DIAGRAM

1. LHD MODEL



WI-07467

2. RHD MODEL

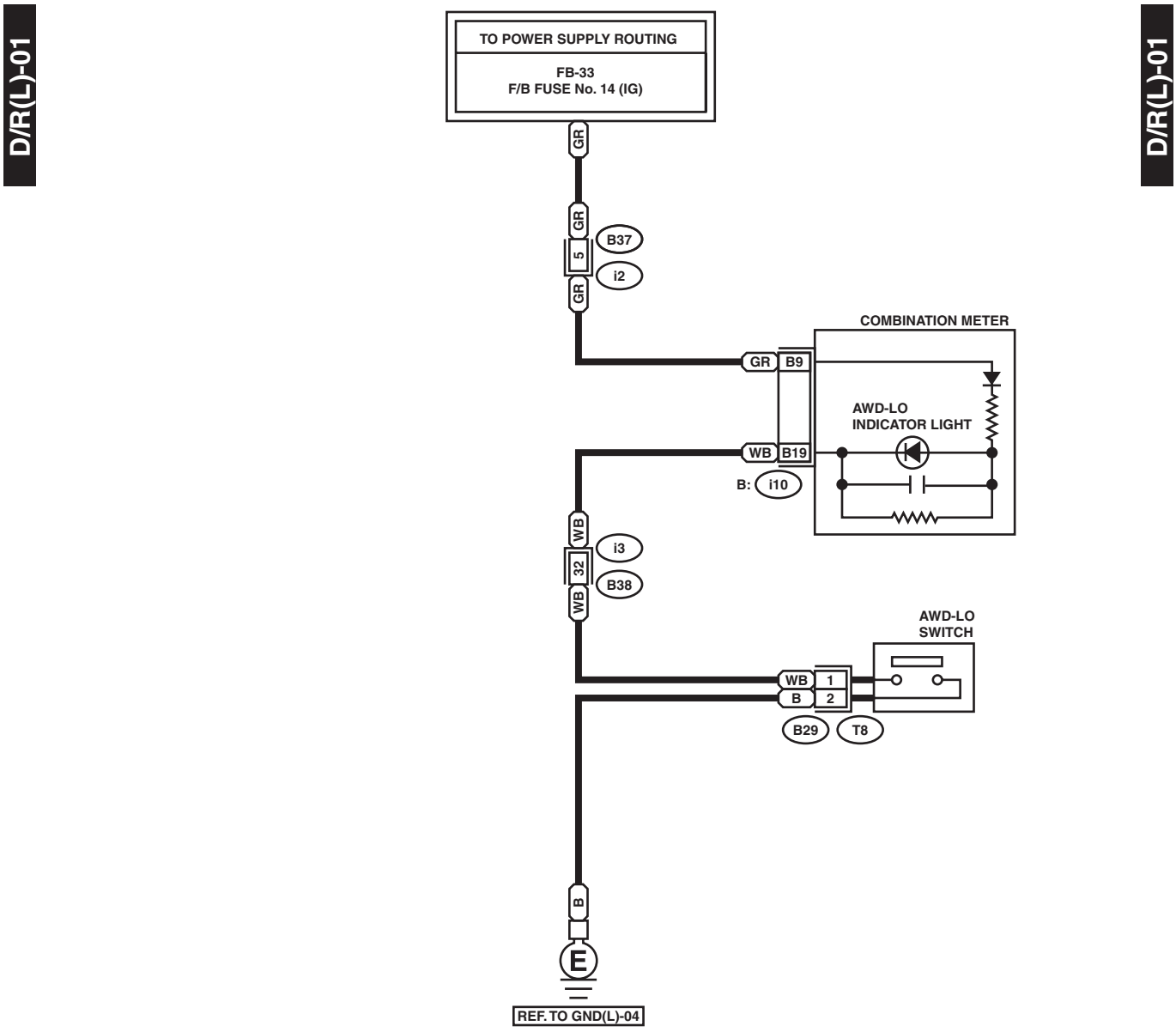


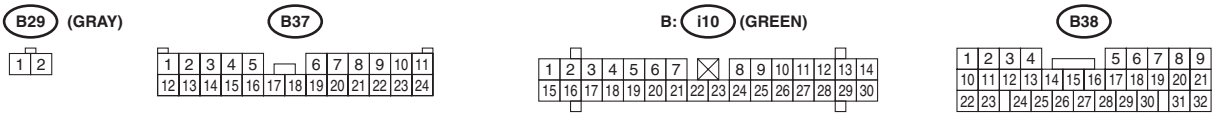
WI-00439

45.Full Time Dual-Range System

A: WIRING DIAGRAM

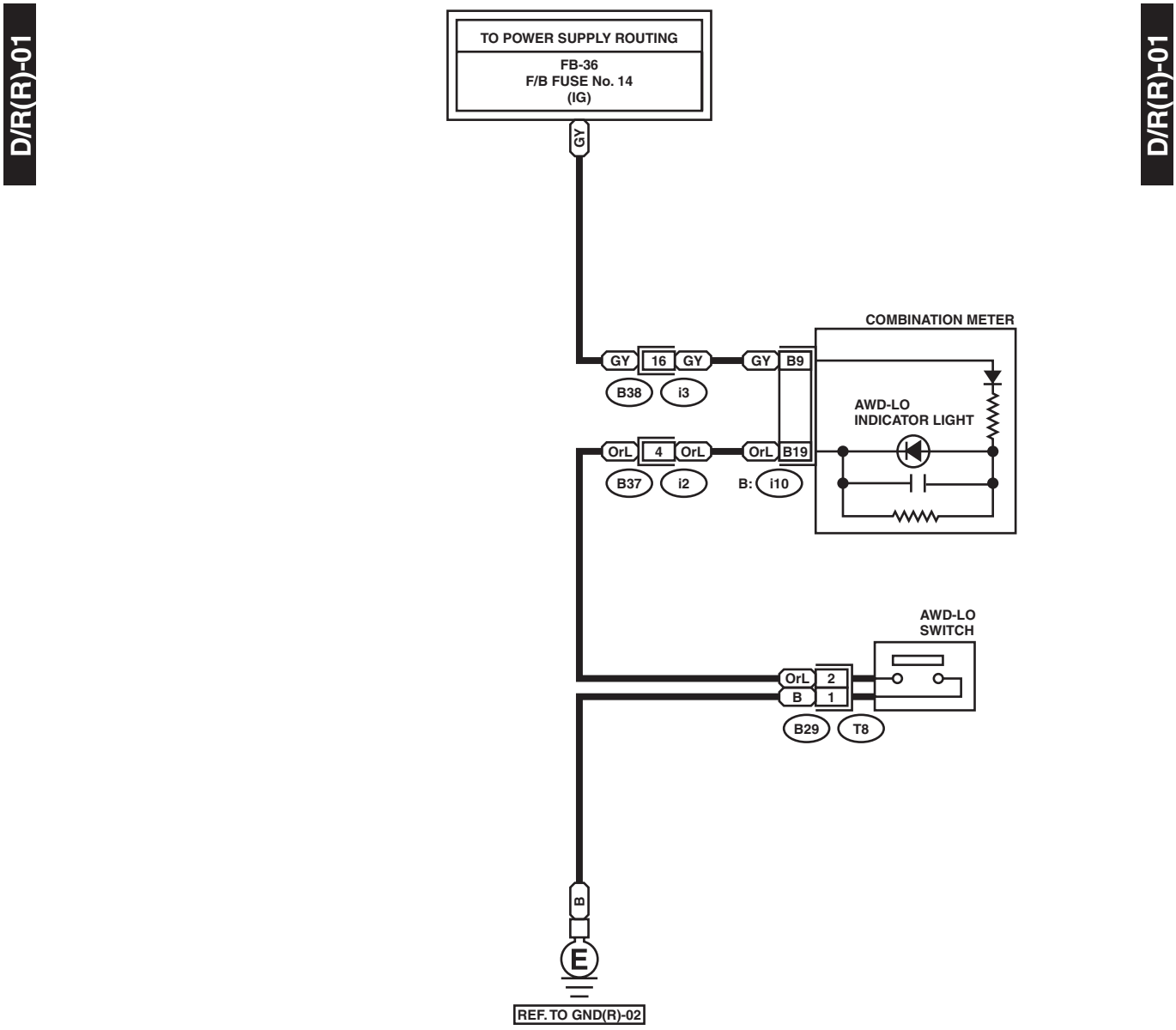
1. LHD MODEL





WI-07468

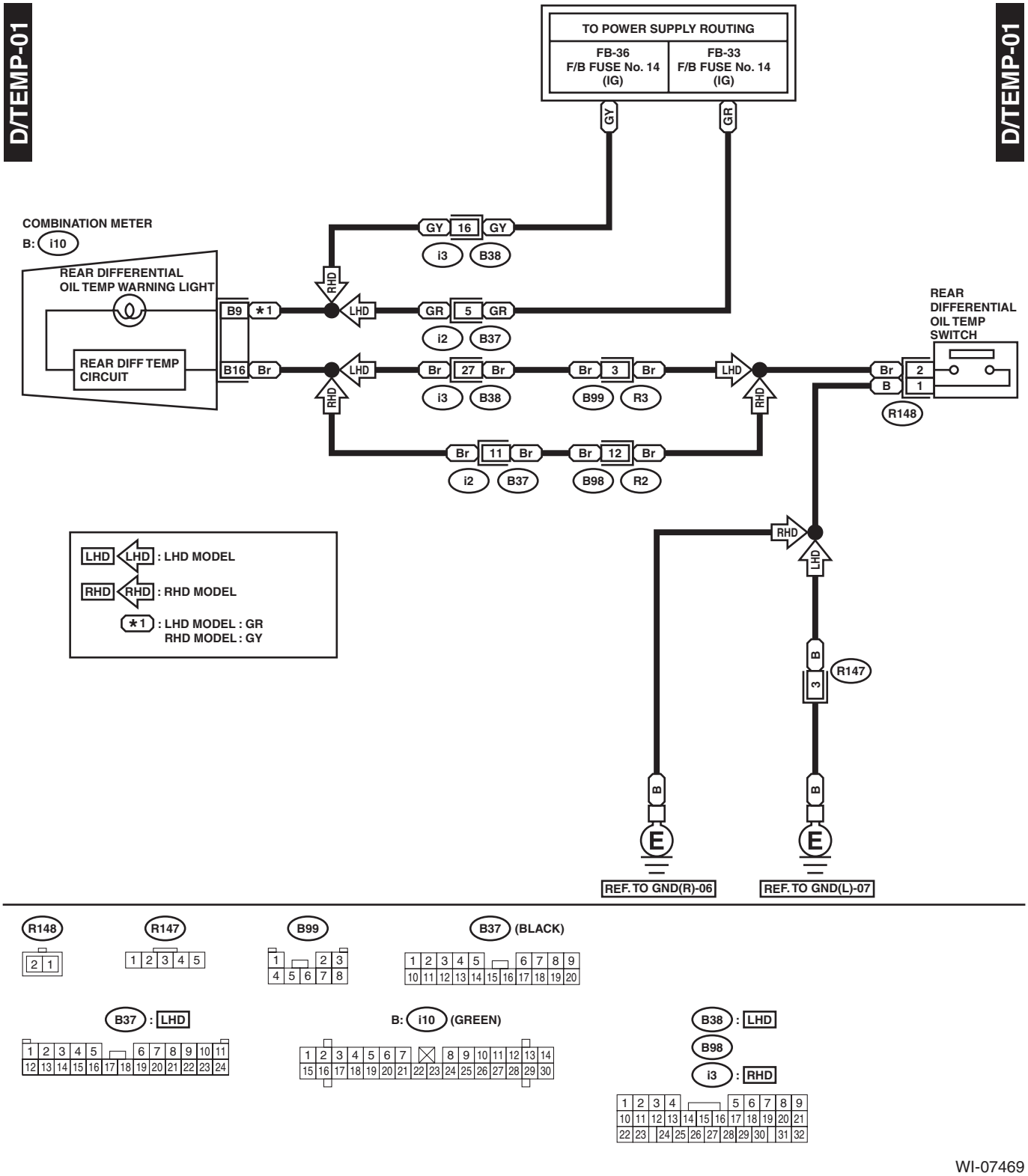
2. RHD MODEL



WI-06065

46.Rear Differential Oil Temperature Warning Light System

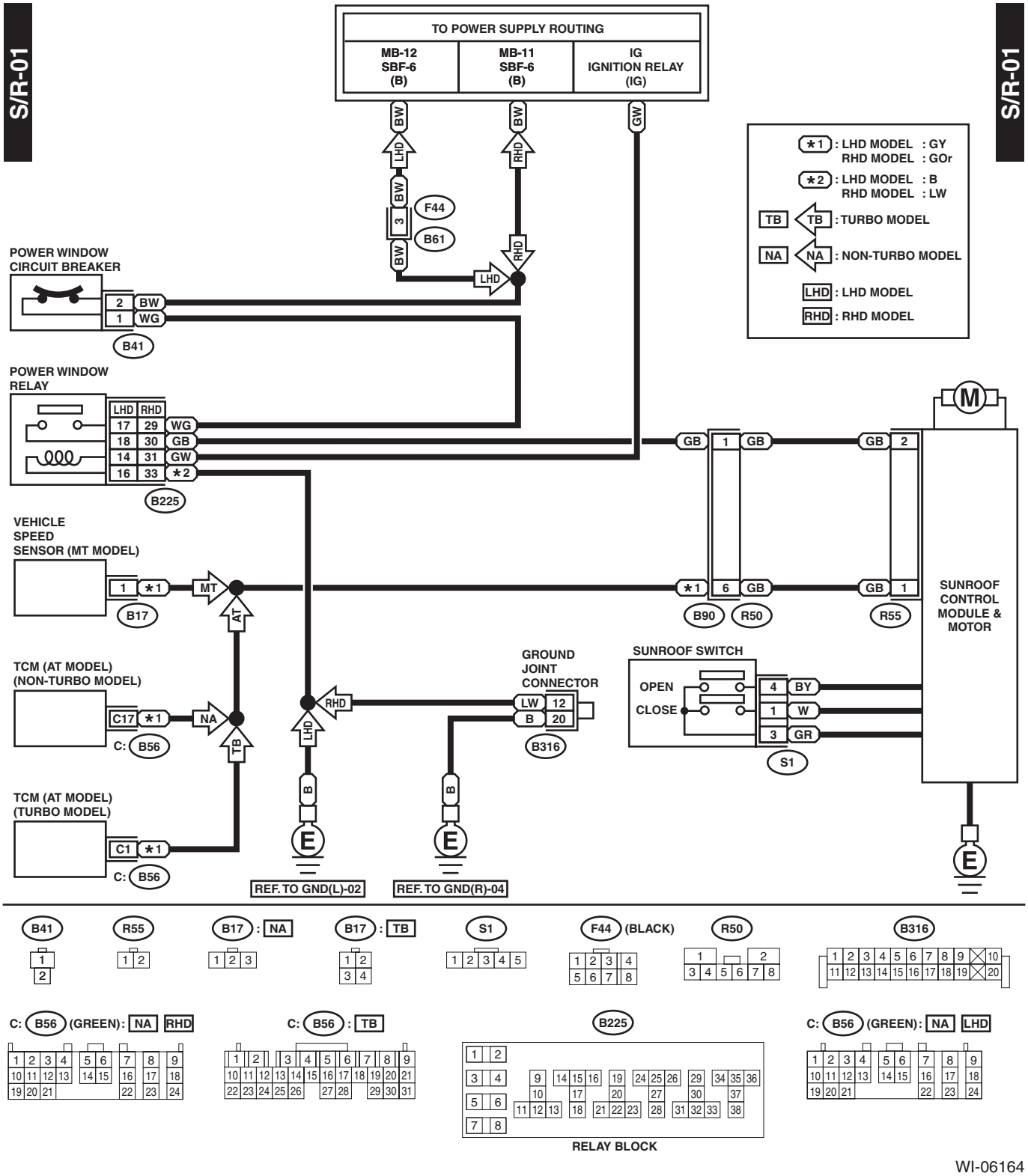
A: WIRING DIAGRAM



WI-07469

47.Sunroof Control System

A: WIRING DIAGRAM

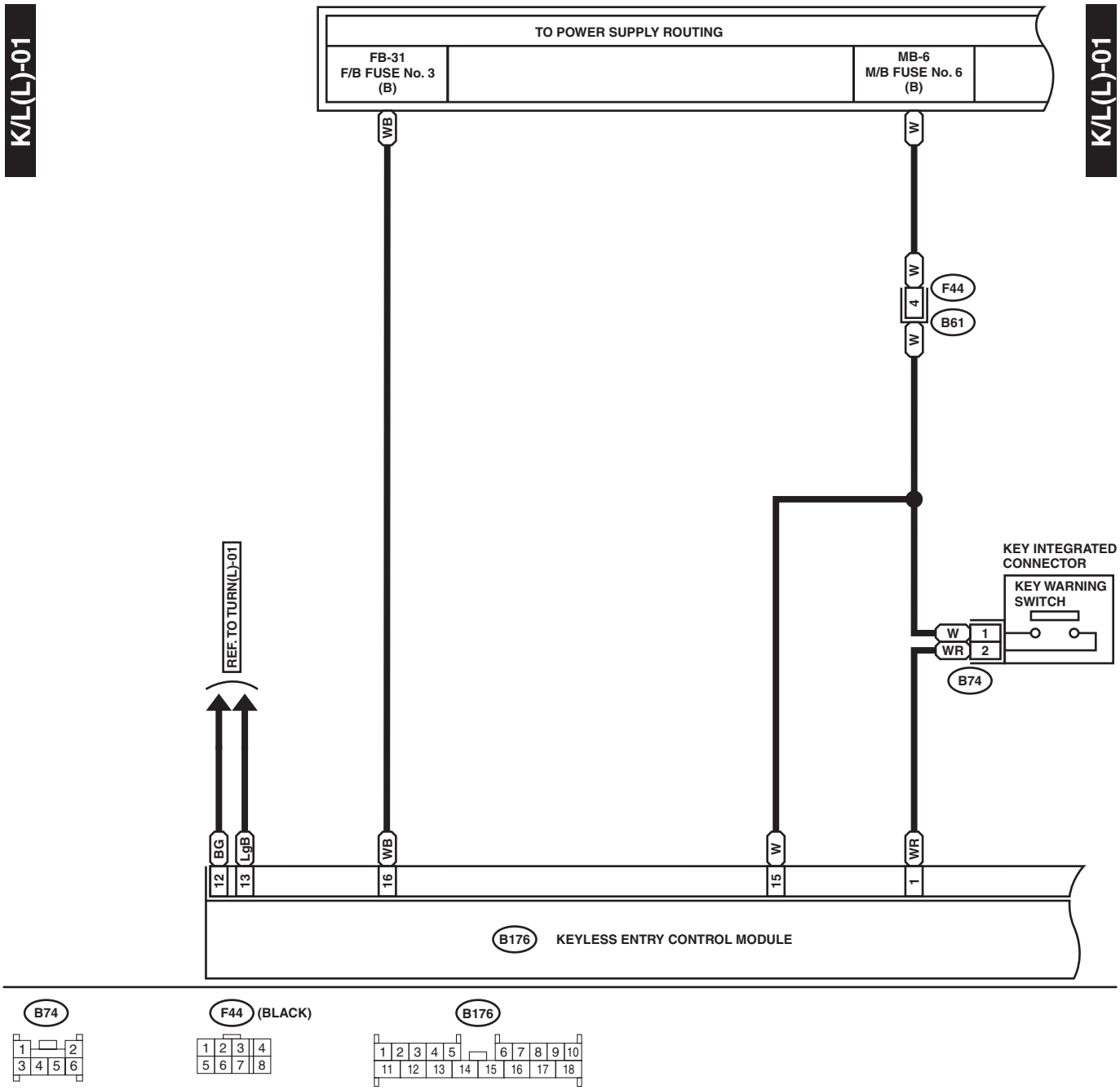


WI-06164

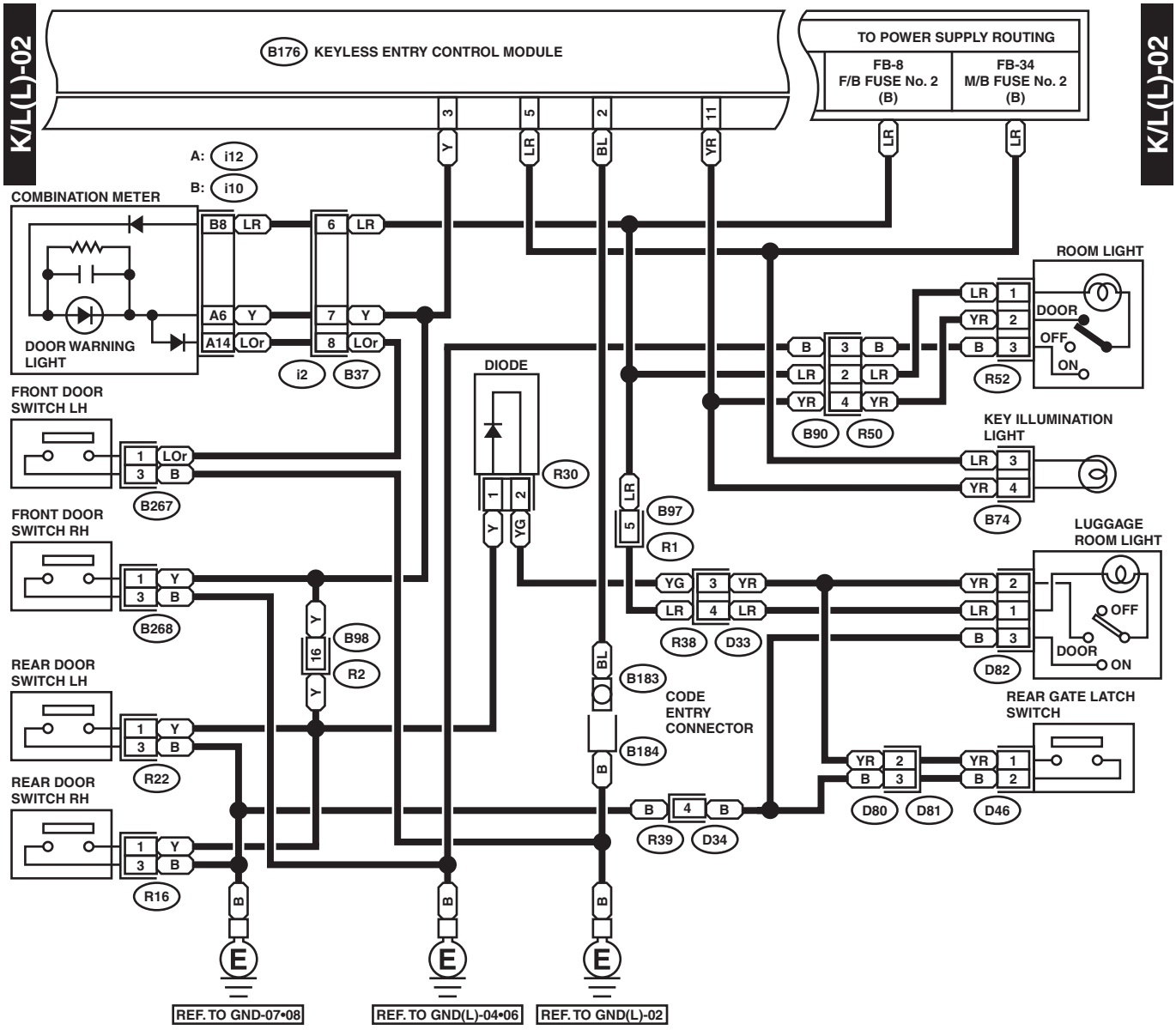
48.Keyless Entry System

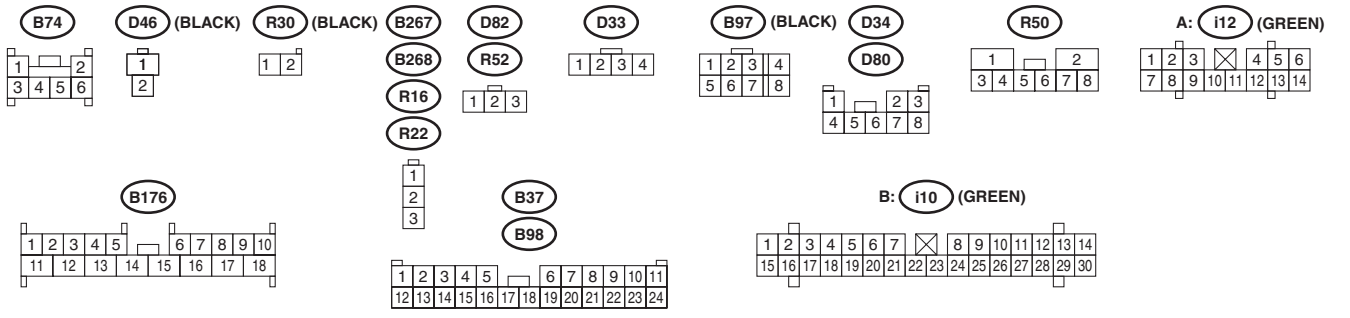
A: WIRING DIAGRAM

1. LHD MODEL

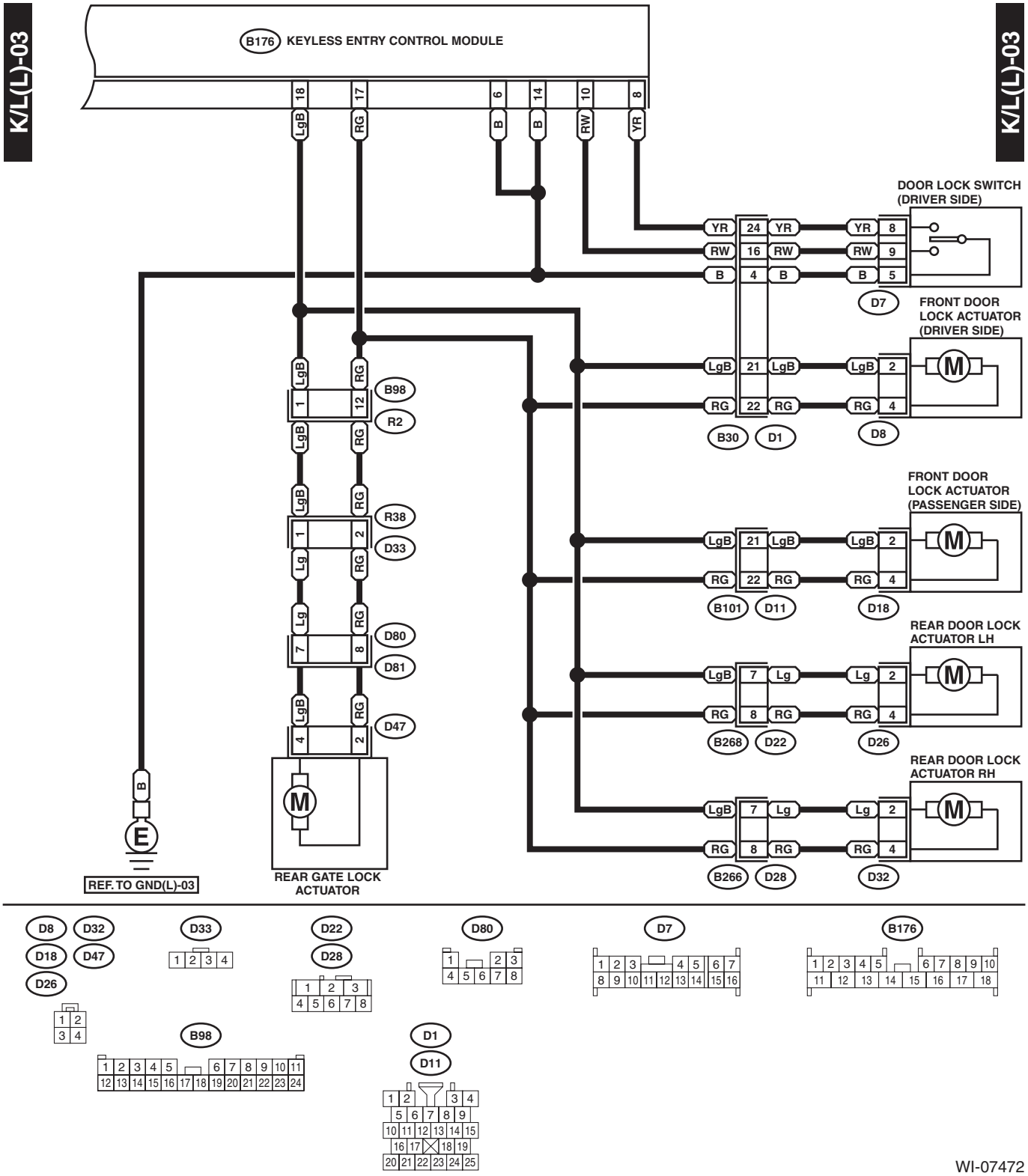


WI-07470

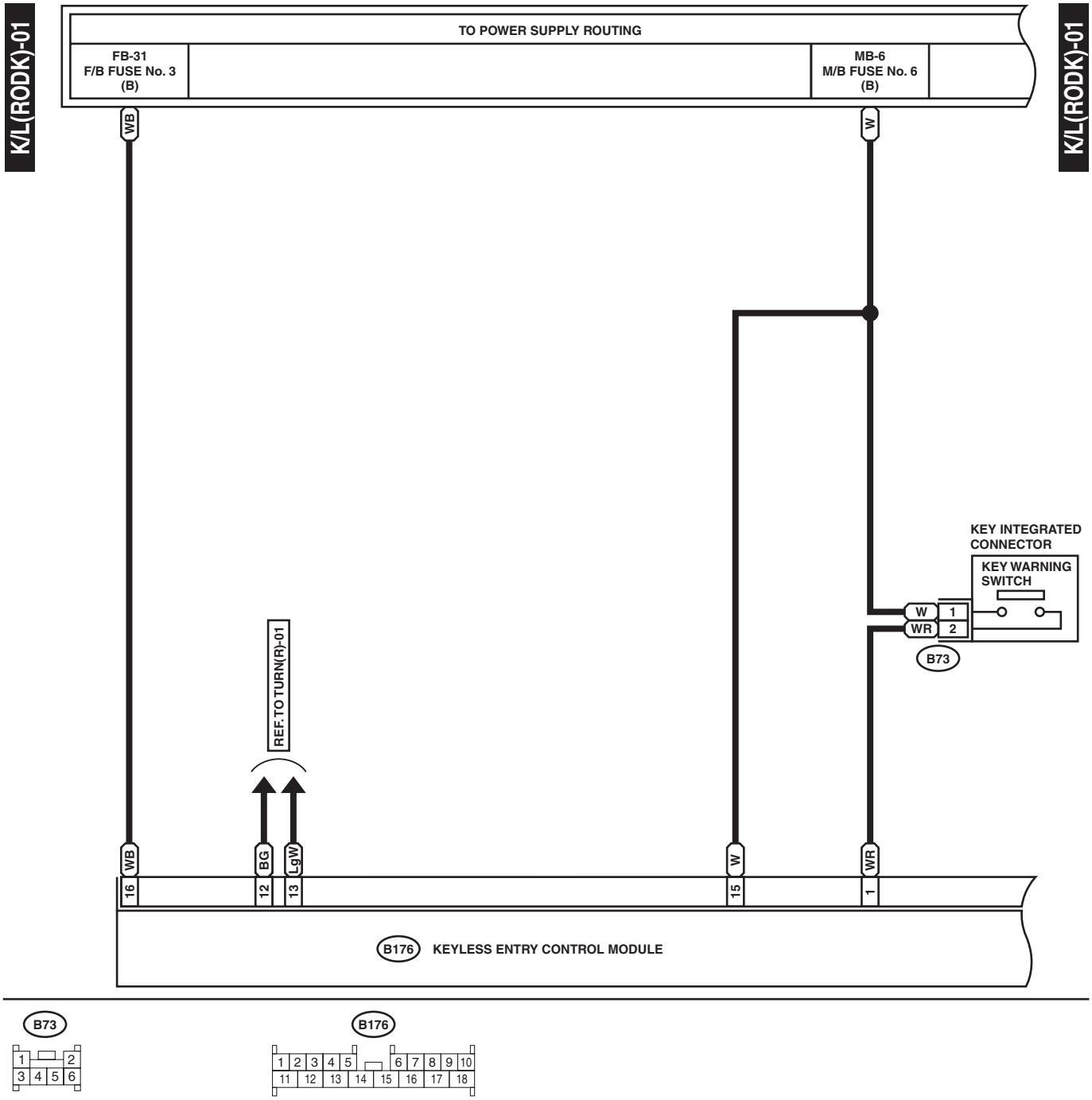

K/L(L)-02
K/L(L)-02
B176 KEYLESS ENTRY CONTROL MODULE
TO POWER SUPPLY ROUTING
FB-8 F/B FUSE No. 2 (B)
FB-34 M/B FUSE No. 2 (B)
A: i12
B: i10
COMBINATION METER
DOOR WARNING LIGHT
i2
B37
DIODE
R30
ROOM LIGHT
DOOR
OFF
ON
R52
B90
R50
KEY ILLUMINATION LIGHT
B74
FRONT DOOR SWITCH LH
B267
FRONT DOOR SWITCH RH
B268
B97
R1
LUGGAGE ROOM LIGHT
D82
B98
R2
R38
D33
REAR DOOR SWITCH LH
R22
B183
CODE ENTRY CONNECTOR
B184
REAR GATE LATCH SWITCH
D80
D81
D46
REAR DOOR SWITCH RH
R16
R39
D34
REF. TO GND-07•08
REF. TO GND(L)-04•06
REF. TO GND(L)-02


B74
D46 (BLACK)
R30 (BLACK)
B267
B268
R16
R22
D82
R52
D33
B97 (BLACK)
D34
D80
R50
A: i12 (GREEN)
B176
B37
B98
B: i10 (GREEN)

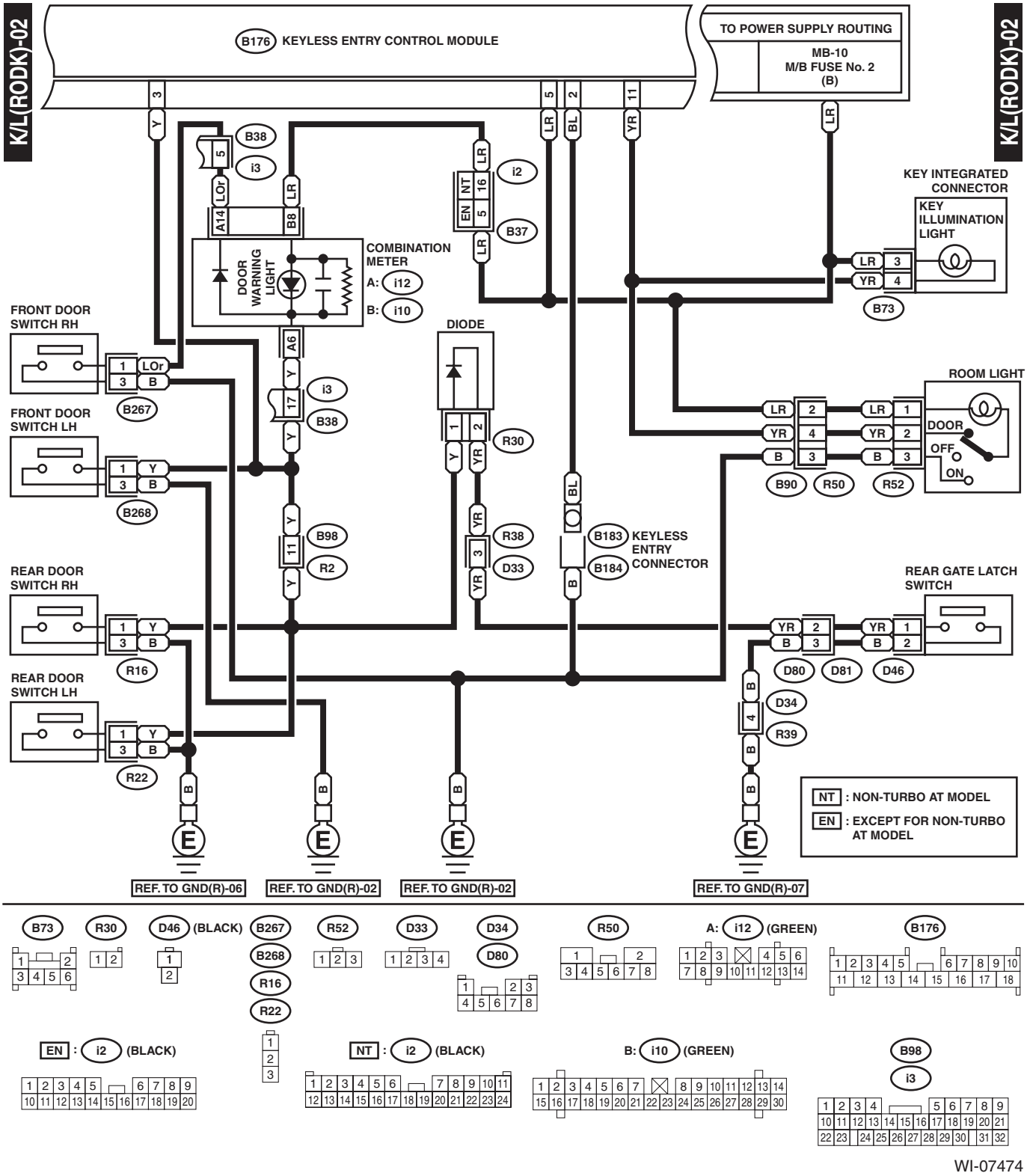
WI-07471


K/L(L)-03
K/L(L)-03
B176 KEYLESS ENTRY CONTROL MODULE
18
17
6
14
10
8
LgB
RG
B
B
RW
YR
DOOR LOCK SWITCH (DRIVER SIDE)
D7
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
B98
R2
R38
D33
D80
D81
D47
B30
D1
D8
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
B101
D11
D18
REAR DOOR LOCK ACTUATOR LH
B268
D22
D26
REAR DOOR LOCK ACTUATOR RH
B266
D28
D32
REAR GATE LOCK ACTUATOR
REF. TO GND(L)-03
D8
D32
D18
D47
D26
D33
D22
D28
D80
D7
B176
B98
D1
D11
WI-07472

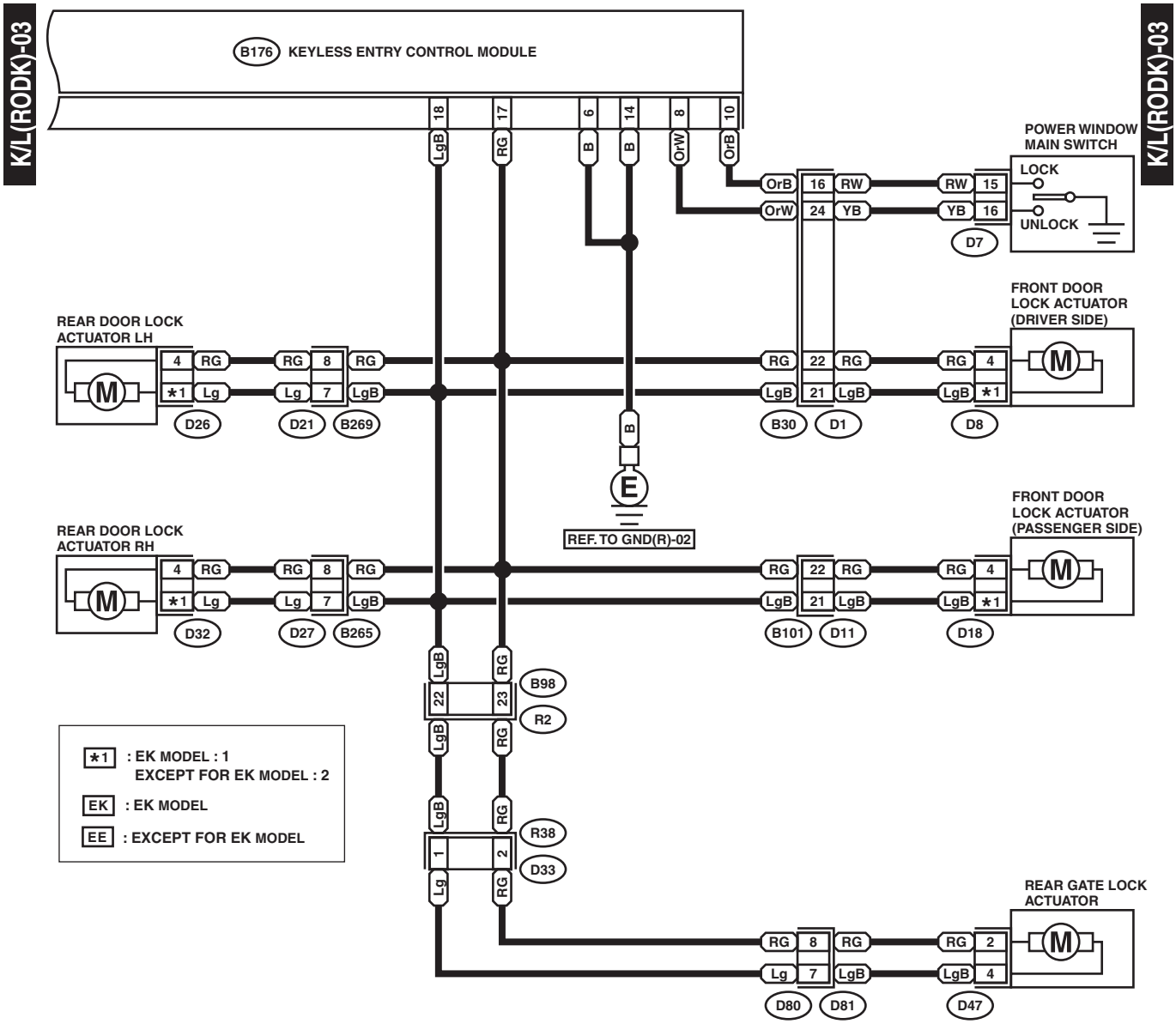
2. RHD WITHOUT DOUBLE LOCK MODEL



WI-07473

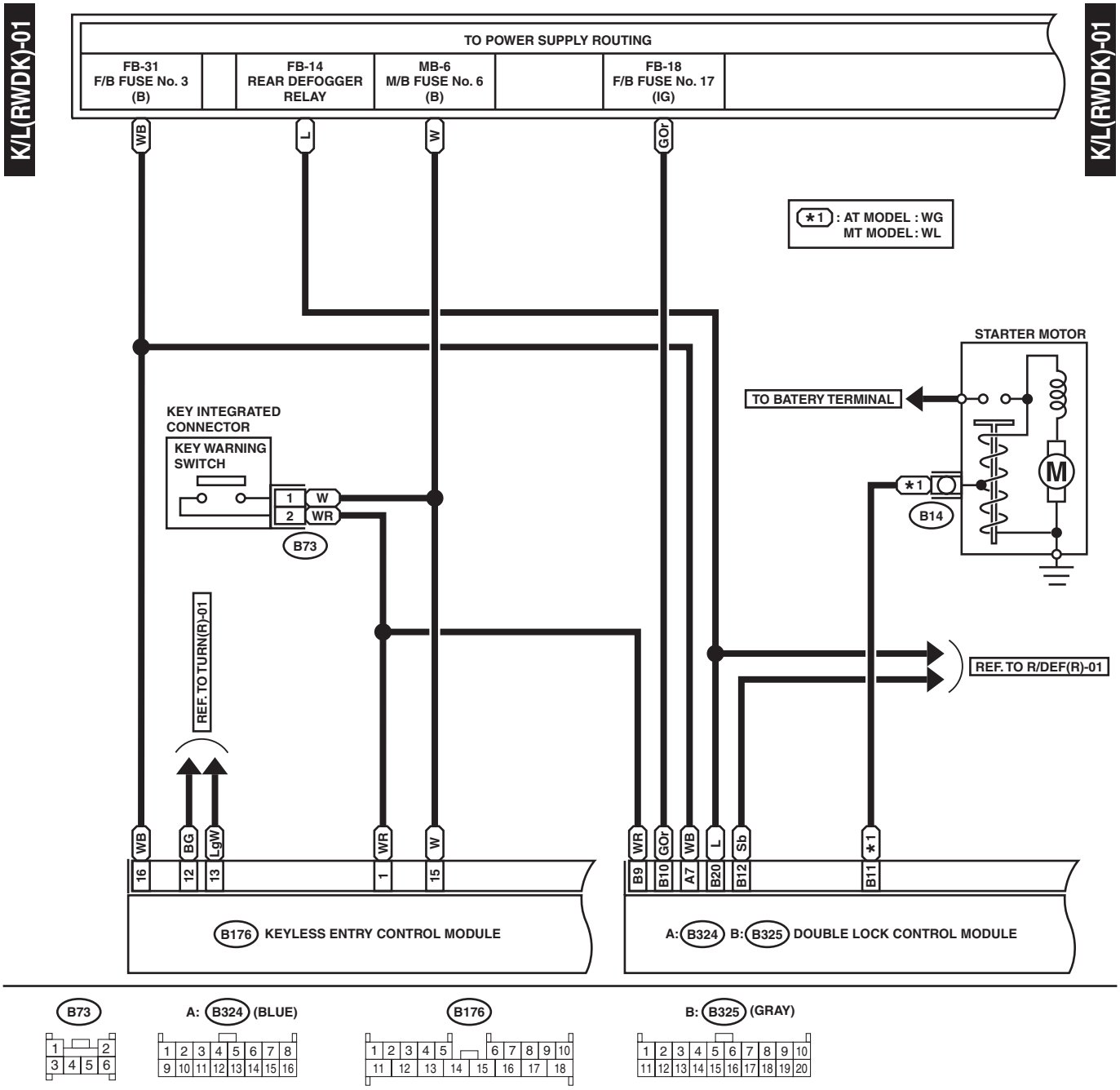

K/L(RODK)-02
B176 KEYLESS ENTRY CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE No. 2
(B)
KEY INTEGRATED CONNECTOR
KEY ILLUMINATION LIGHT
B73
B38
i3
i2
B37
COMBINATION METER
A: i12
B: i10
DOOR WARNING LIGHT
FRONT DOOR SWITCH RH
B267
FRONT DOOR SWITCH LH
B268
DIODE
R30
ROOM LIGHT
DOOR
OFF
ON
B90
R50
R52
B98
R2
D33
R38
B183 KEYLESS ENTRY CONNECTOR
B184
REAR DOOR SWITCH RH
R16
REAR DOOR SWITCH LH
R22
REAR GATE LATCH SWITCH
D80
D81
D46
D34
R39
NT : NON-TURBO AT MODEL
EN : EXCEPT FOR NON-TURBO AT MODEL
REF. TO GND(R)-06
REF. TO GND(R)-02
REF. TO GND(R)-02
REF. TO GND(R)-07
B73
R30
D46 (BLACK)
B267
B268
R16
R22
R52
D33
D34
D80
R50
A: i12 (GREEN)
B176
EN : i2 (BLACK)
NT : i2 (BLACK)
B: i10 (GREEN)
B98
i3

WI-07474

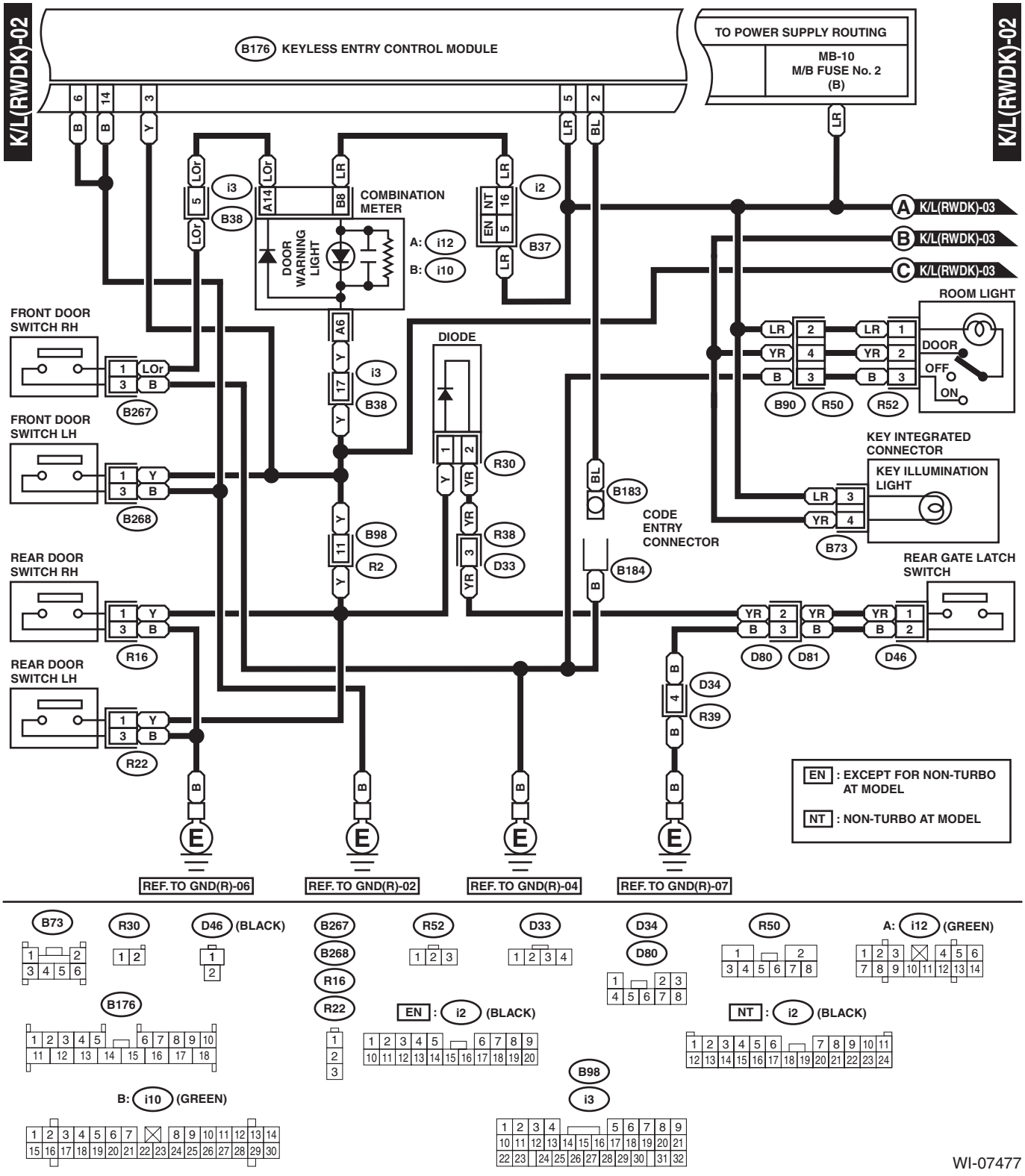

K/L(RODK)-03
K/L(RODK)-03
B176 KEYLESS ENTRY CONTROL MODULE
18 LgB
17 RG
6 B
14 B
8 OrW
10 OrB
POWER WINDOW MAIN SWITCH
LOCK
UNLOCK
OrB 16 RW
OrW 24 YB
RW 15
YB 16
D7
REAR DOOR LOCK ACTUATOR LH
4 RG
*1 Lg
RG 8 RG
Lg 7 LgB
D26
D21
B269
RG 22 RG
LgB 21 LgB
B30
D1
RG 4
LgB *1
D8
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
REAR DOOR LOCK ACTUATOR RH
D32
D27
B265
B101
D11
D18
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
E
REF. TO GND(R)-02
LgB 22 23 RG
B98
R2
LgB 1 2 RG
R38
D33
Lg RG
REAR GATE LOCK ACTUATOR
RG 8 RG
Lg 7 LgB
RG 2
LgB 4
D80
D81
D47
*1 : EK MODEL : 1
EXCEPT FOR EK MODEL : 2
EK : EK MODEL
EE : EXCEPT FOR EK MODEL
EE : D8 D32 : EE
EE : D18 D47
EE : D26
D33
D21
D27
D80
D7
B176
D1
D11
B98
EK : D8 D26 : EK
EK : D18 D32 : EK

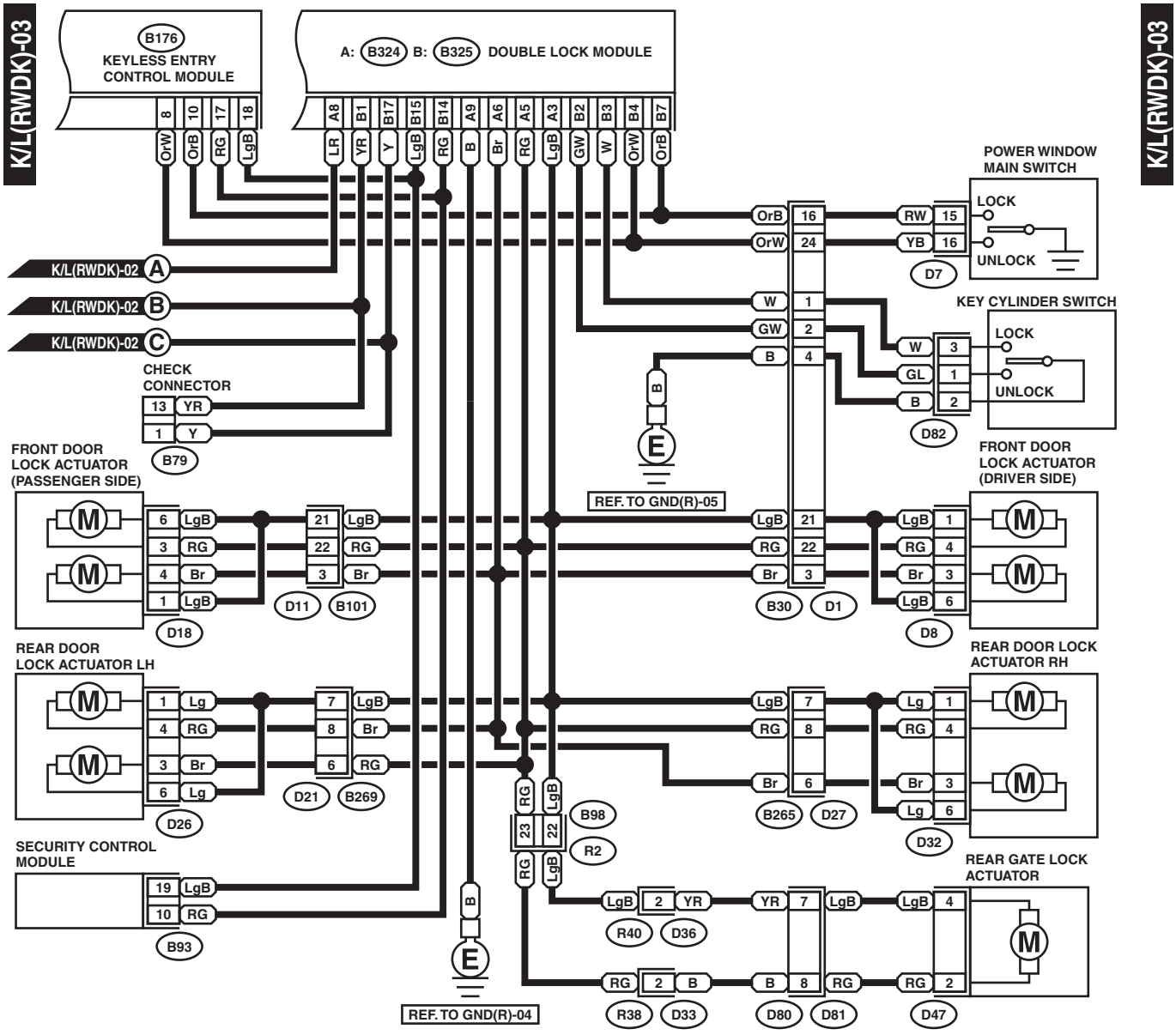
WI-07475

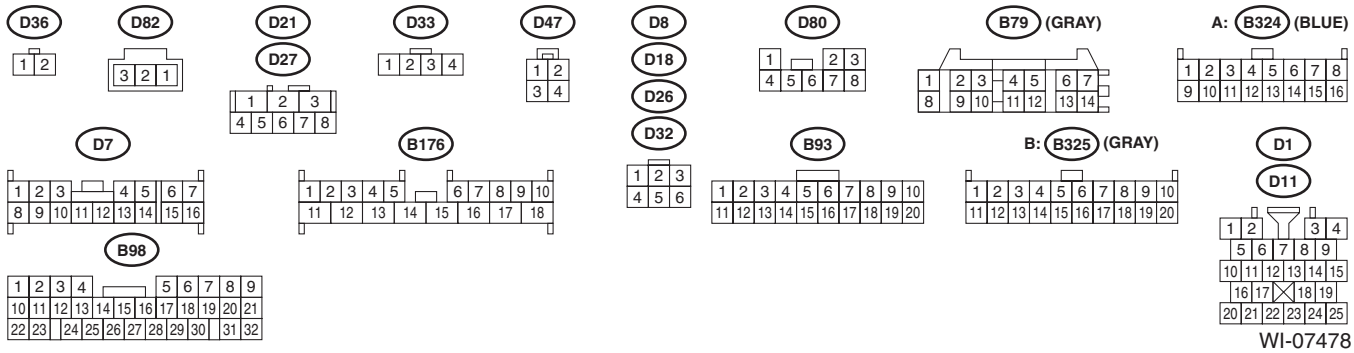
3. RHD WITH DOUBLE LOCK MODEL



WI-07476


K/L(RWDK)-02
B176 KEYLESS ENTRY CONTROL MODULE
TO POWER SUPPLY ROUTING
MB-10
M/B FUSE No. 2
(B)
COMBINATION METER
DOOR WARNING LIGHT
A: i12
B: i10
i3
B38
i2
B37
A K/L(RWDK)-03
B K/L(RWDK)-03
C K/L(RWDK)-03
ROOM LIGHT
DOOR
OFF
ON
B90
R50
R52
FRONT DOOR SWITCH RH
B267
FRONT DOOR SWITCH LH
B268
DIODE
R30
R38
D33
B98
R2
B183
B184
CODE ENTRY CONNECTOR
KEY INTEGRATED CONNECTOR
KEY ILLUMINATION LIGHT
B73
REAR GATE LATCH SWITCH
D80
D81
D46
REAR DOOR SWITCH RH
R16
REAR DOOR SWITCH LH
R22
D34
R39
EN : EXCEPT FOR NON-TURBO AT MODEL
NT : NON-TURBO AT MODEL
REF. TO GND(R)-06
REF. TO GND(R)-02
REF. TO GND(R)-04
REF. TO GND(R)-07
B73
R30
D46 (BLACK)
B267
B268
R16
R22
R52
D33
D34
D80
R50
A: i12 (GREEN)
B176
EN : i2 (BLACK)
NT : i2 (BLACK)
B: i10 (GREEN)
B98
i3
WI-07477

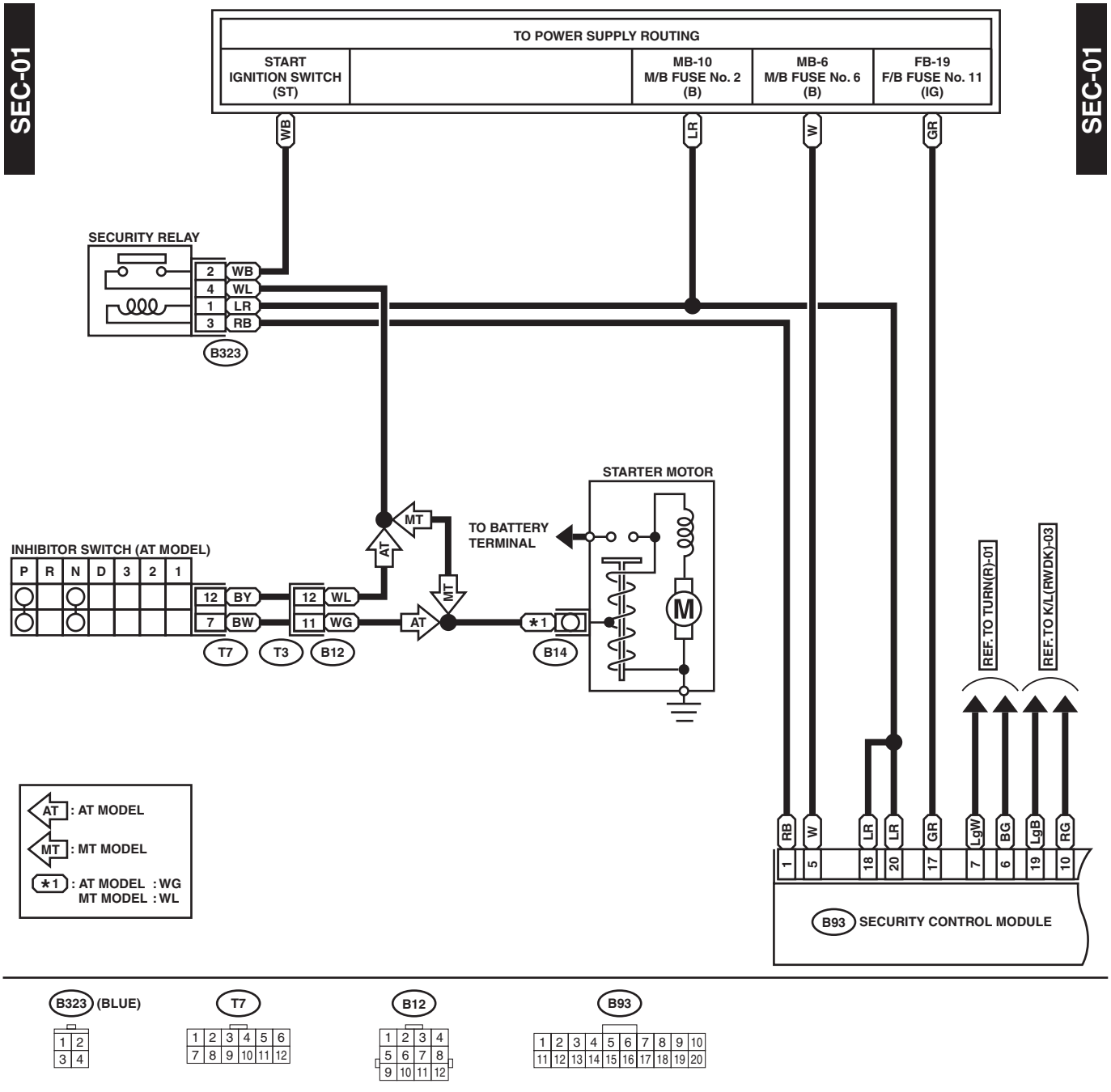

K/L(RWDK)-03
K/L(RWDK)-03
B176
KEYLESS ENTRY CONTROL MODULE
A: B324 B: B325 DOUBLE LOCK MODULE
POWER WINDOW MAIN SWITCH
LOCK
UNLOCK
D7
KEY CYLINDER SWITCH
LOCK
UNLOCK
D82
K/L(RWDK)-02 A
K/L(RWDK)-02 B
K/L(RWDK)-02 C
CHECK CONNECTOR
B79
FRONT DOOR LOCK ACTUATOR (PASSENGER SIDE)
FRONT DOOR LOCK ACTUATOR (DRIVER SIDE)
REF. TO GND(R)-05
D18
D11
B101
B30
D1
D8
REAR DOOR LOCK ACTUATOR LH
REAR DOOR LOCK ACTUATOR RH
D26
D21
B269
B265
D27
D32
SECURITY CONTROL MODULE
B98
R2
REAR GATE LOCK ACTUATOR
B93
R40
D36
REF. TO GND(R)-04
R38
D33
D80
D81
D47


D36
D82
D21
D27
D33
D47
D8
D18
D26
D32
D80
B79 (GRAY)
A: B324 (BLUE)
D7
B176
B93
B: B325 (GRAY)
D1
D11
B98

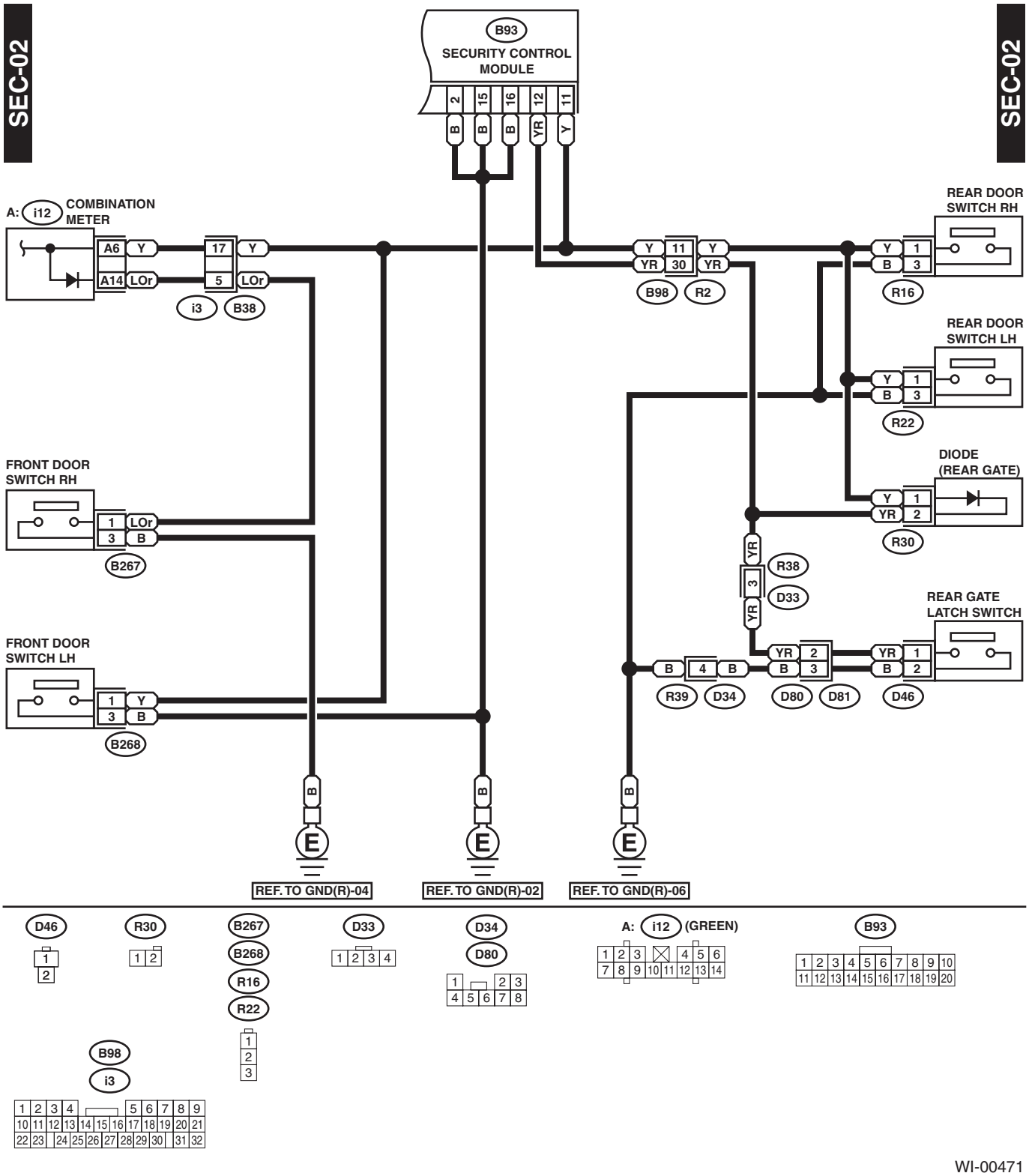
WI-07478

49.Security System

A: WIRING DIAGRAM



WI-03365

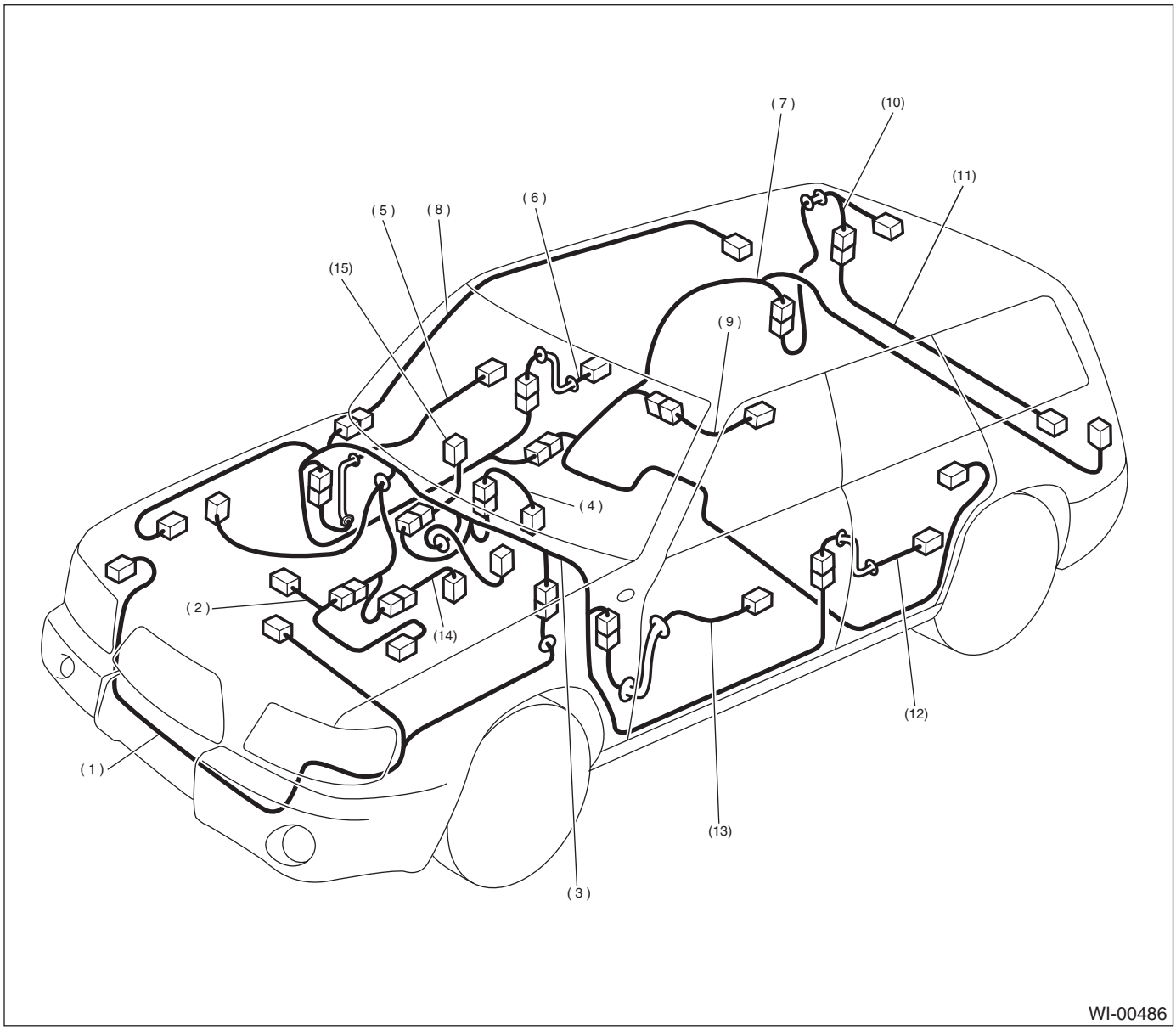

SEC-02
SEC-02
B93
SECURITY CONTROL MODULE
2 15 16 12 11
B B B YR Y
A: i12 COMBINATION METER
A6 Y
A14 LOr
17 Y
5 LOr
i3 B38
Y 11 Y
YR 30 YR
B98 R2
REAR DOOR SWITCH RH
Y 1
B 3
R16
REAR DOOR SWITCH LH
Y 1
B 3
R22
DIODE (REAR GATE)
Y 1
YR 2
R30
YR R38
3 D33
YR
REAR GATE LATCH SWITCH
YR 2 YR 1
B 4 B B 3 B 2
R39 D34 D80 D81 D46
FRONT DOOR SWITCH RH
1 LOr
3 B
B267
FRONT DOOR SWITCH LH
1 Y
3 B
B268
B B B
E E E
REF. TO GND(R)-04
REF. TO GND(R)-02
REF. TO GND(R)-06
D46
1
2
R30
1 2
B267
B268
R16
R22
1
2
3
D33
1 2 3 4
D34
D80
1 2 3
4 5 6 7 8
A: i12 (GREEN)
1 2 3 4 5 6
7 8 9 10 11 12 13 14
B93
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20
B98
i3
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 30 31 32

WI-00471

50.Harness Components Location

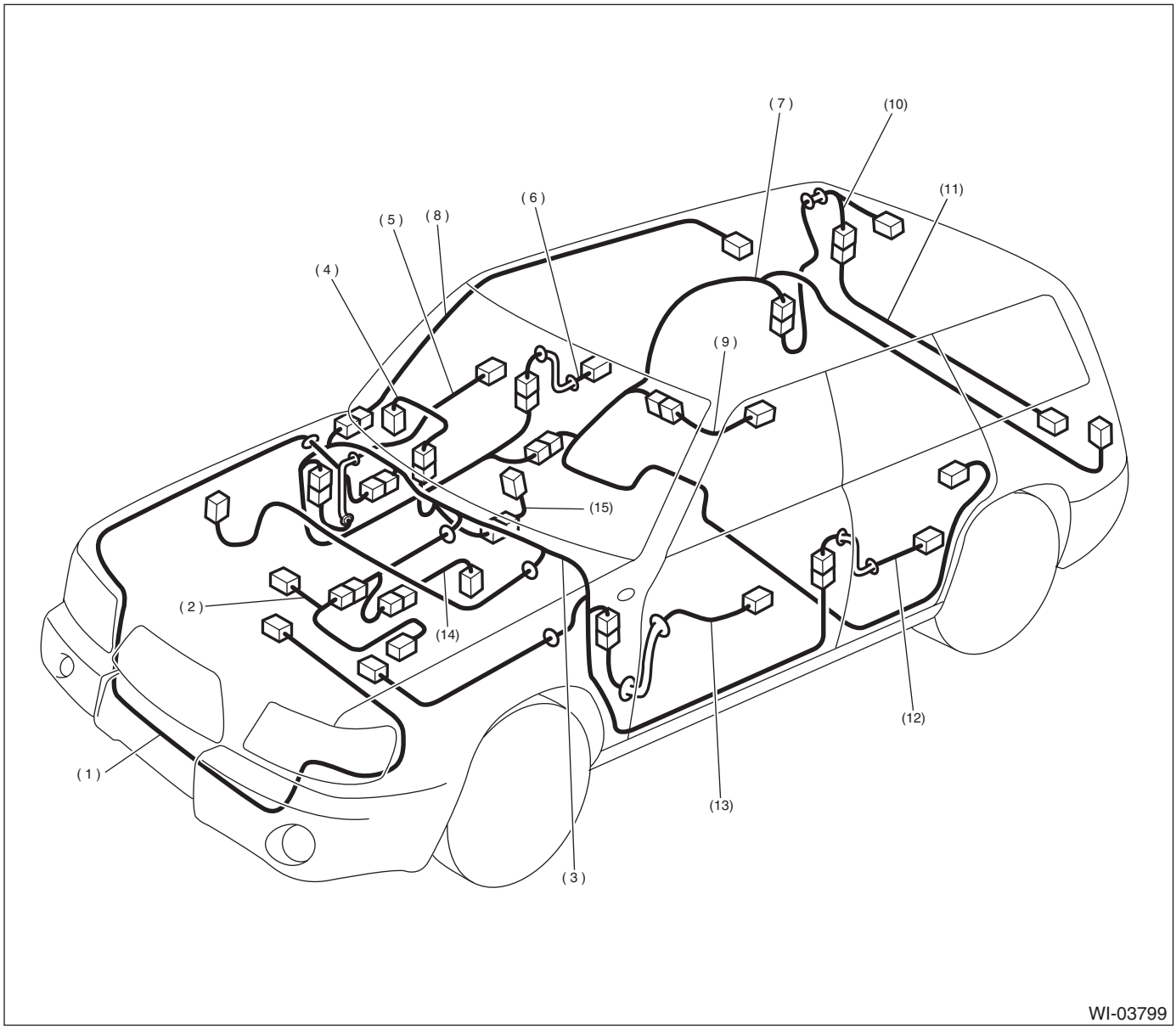
A: LOCATION

1. LHD MODEL



(1)	Front wiring harness	(6)	Rear door cord RH	(11)	Rear gate cord 2
(2)	Engine wiring harness	(7)	Rear wiring harness	(12)	Rear door cord LH
(3)	Bulkhead wiring harness	(8)	Roof cord	(13)	Front door cord LH
(4)	Instrument panel wiring harness	(9)	Fuel tank cord	(14)	Transmission cord
(5)	Front door cord RH	(10)	Rear gate cord 1	(15)	Center panel harness

2. RHD MODEL



(1)	Front wiring harness	(6)	Rear door cord RH	(11)	Rear gate cord 2
(2)	Engine wiring harness	(7)	Rear wiring harness	(12)	Rear door cord LH
(3)	Bulkhead wiring harness	(8)	Roof cord	(13)	Front door cord LH
(4)	Instrument panel wiring harness	(9)	Fuel tank cord	(14)	Transmission cord
(5)	Front door cord RH	(10)	Rear gate cord 1	(15)	Center panel harness

51.Front Wiring Harness

A: LOCATION

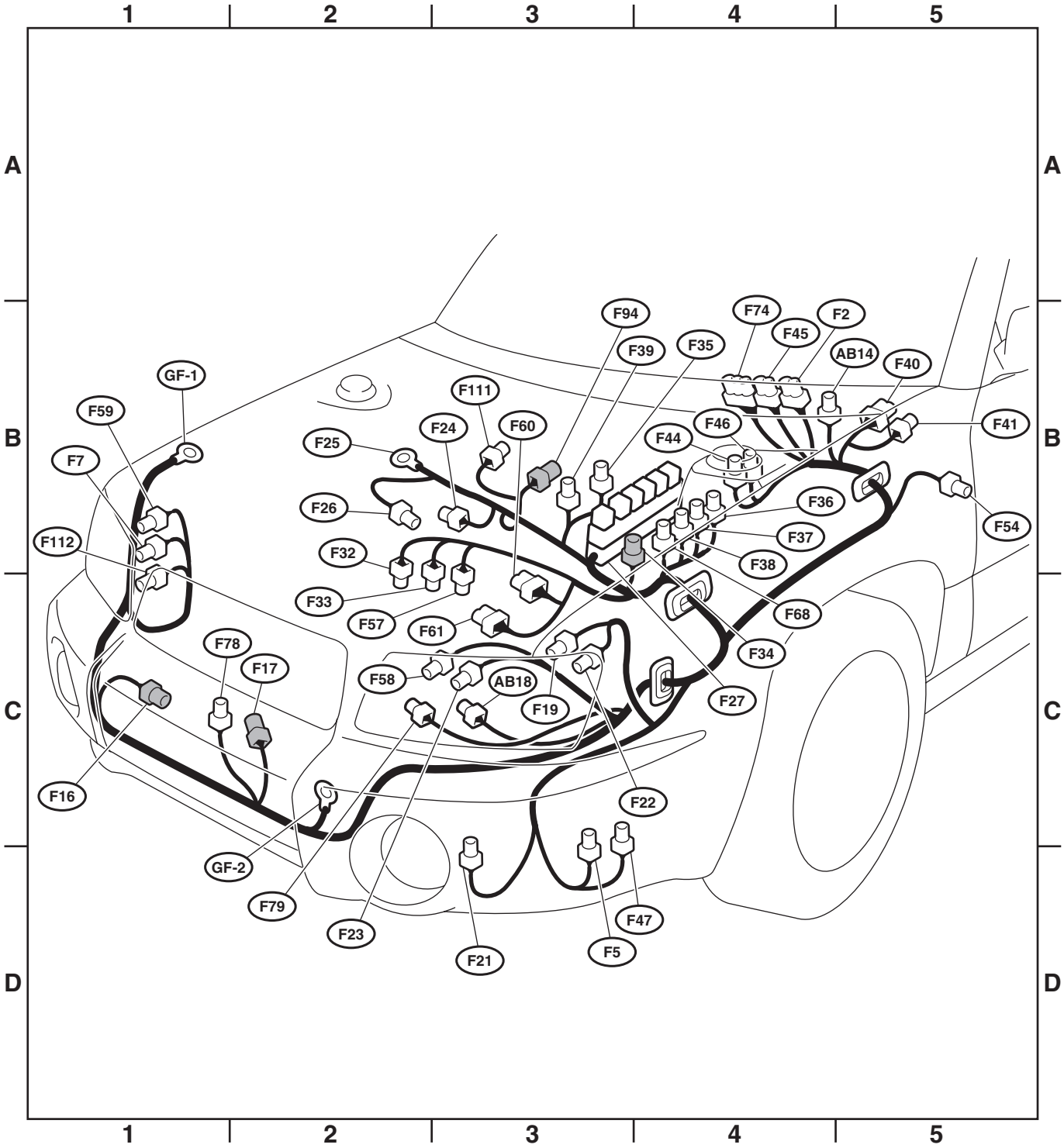
1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	20	Blue	B-4	B100	Bulkhead wiring harness
F5	1	Black	D-3		Horn
F7	3	Black	B-1		Headlight RH
F16	2	Black	C-1		Sub fan motor (70 W)
	2	Gray	C-1		Sub fan motor (120 W)
F17	2	Black	C-2		Radiator main fan motor (70 W)
	2	Gray	C-2		Radiator main fan motor (120 W)
F19	2	Gray	C-3		Front turn signal light RH
F21	2	Black	D-3		Front fog light LH
F22	2	Gray	C-3		Front clearance light LH
F23	3	Black	C-3		Headlight LH
F24	1	Black	B-3		A/C compressor
F25	1	★	B-2		Generator
F26	3	Green	B-2		
F27	36	Black	B-3		A/C relay holder
F32	2	Green	B-2		Front washer motor
F33	2	★	C-2		Rear washer motor
F34	4	Black	B-4		SBF holder
F35	2	Black	B-3		Main fuse box (M/B)
F36	3	★	B-4		
F37	6	Black	B-4		
F38	1	Brown	B-4		
F39	8	★	B-3		
F40	9	Brown	B-5		Fuse & relay box (F/B)
F41	7	Gray	B-5		
F44	8	Black	B-4	B61	Bulkhead wiring harness
F45	16	★	B-4	B62	
F46	2	Black	B-4	B108	
F47	1	Black	C-3		Horn
F54	2	★	B-5		Side turn signal light LH
F57	2	Blue	C-3		Headlight washer motor
F58	3	Black	C-3		Headlight beam leveler LH
F59	3	Black	B-1		Headlight beam leveler RH
F60	16	Brown	C-3	E3	Engine wiring harness (Turbo model)
F61	20	Black	C-3	E2	
F68	4	★	B-4		Main fuse box (M/B)
F74	24	Black	B-4	B200	Bulkhead wiring harness
F78	2	Black	C-1		Ambient sensor
F79	4	★	C-2		A/C pressure switch
F94	2	Brown	B-3		ABS front sensor LH
F111	2	Gray	B-3		Heater cock solenoid (Non-turbo 2.0 L Europe model)
F112	2	★	C-1	B377	Bulkhead wiring harness

★: Non-colored

Front Wiring Harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB14	2	Yellow	B-4	AB13	Airbag wiring harness
AB18	2	Yellow	C-3		Front sub sensor LH



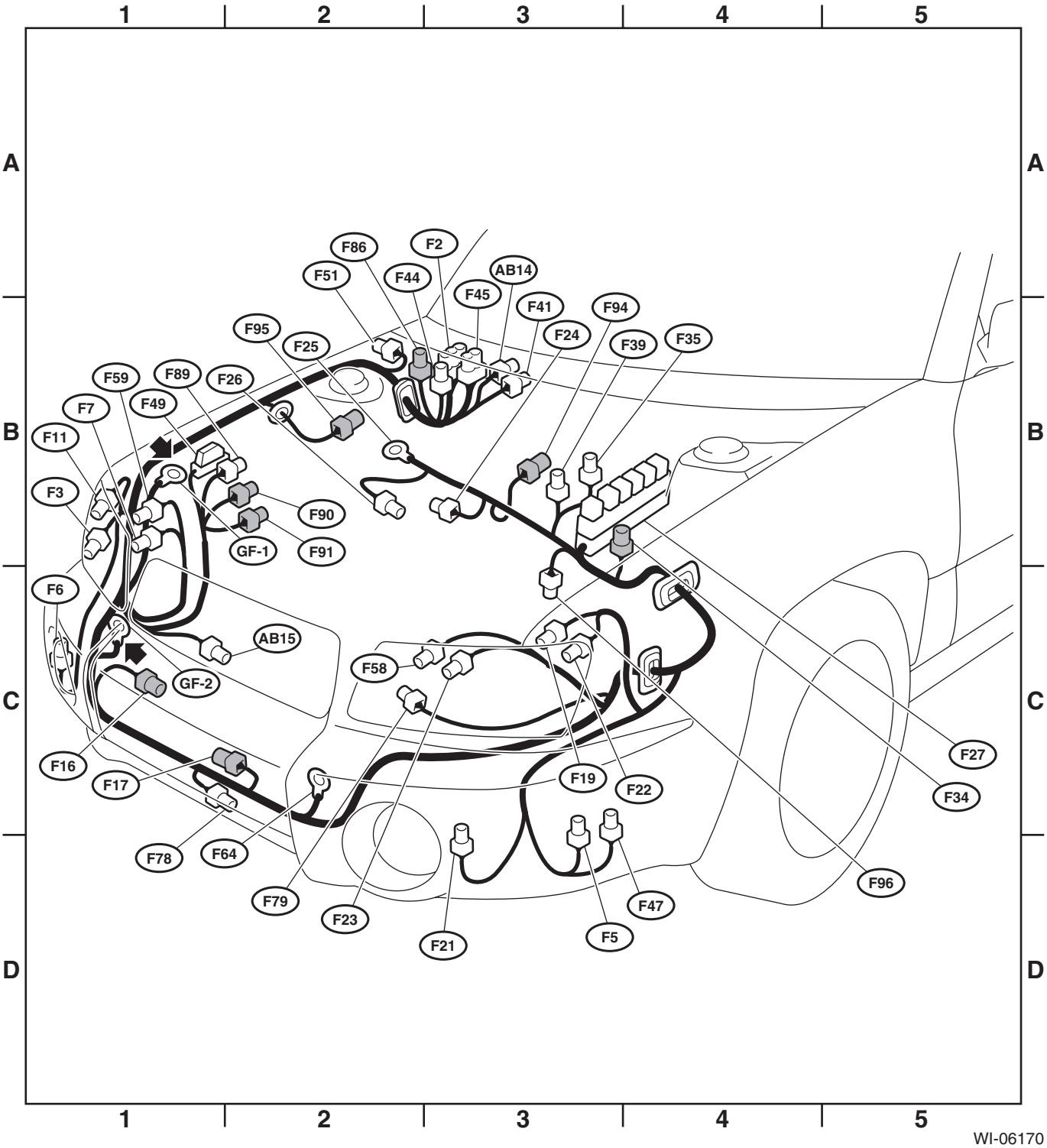
2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F2	22	Blue	B-3	B-100	Bulkhead wiring harness (ABS)
F3	2	★	B-1		Front turn signal light RH
F5	1	★	C-3		Horn
F6	2	Black	B-1		Front fog light RH
F7	3	★	B-1		Headlight RH
F11	2	Gray	B-1		Front clearance light RH
F16	2	Black	C-1		Sub fan motor (70 W)
		Gray			Sub fan motor (120 W)
F17	2	Black	C-2		Main fan motor (70 W)
		Gray			Main fan motor (120 W)
F19	2	★	C-3		Front turn signal light LH
F21	2	Black	D-3		Front fog light LH
F22	2	Gray	C-3		Front clearance light LH
F23	3	★	C-3		Headlight LH
F24	1	★	B-3		A/C compressor
F25	1	★	B-2		Generator
F26	3	Green	B-2		
F27	36	Black	B-4		A/C relay holder
F34	4	★	B-3		SBF holder (ABS)
F35	2	★	B-3		M/B
F39	8	Black	B-3		
F41	7	Gray	B-3		F/B
F44	8	Black	B-3	B61	Bulkhead wiring harness
F45	18	Black	B-3	B62	Bulkhead wiring harness (ABS)
	22				Bulkhead wiring harness (VDC)
F47	1	★	C-3		Horn
F49	26	★	B-1		ABS control module
F51	2	★	B-2		Side turn signal light RH
F58	3	Black	C-3		Headlight beam leveler LH
F59	3	Black	B-1		Headlight beam leveler RH
F64	1	★	C-2		ABS motor ground
F78	2	★	C-1		Ambient sensor
F79	4	★	C-2		A/C pressure switch
F86	1	Black	B-2	B212	Bulkhead wiring harness
F89	2	Gray	B-2		VDCCU&H/U
F90	6	Black	B-2		
F91	16	Black	B-2		
F94	2	Brown	B-3		ABS front sensor LH
F95	2	Brown	B-2		ABS front sensor RH
F96	1	★	C-3	B255	Bulkhead wiring harness

★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB14	2	Yellow	B-3	AB13	Airbag wiring harness
AB15	2	Yellow	C-1		Front sub sensor RH

Front Wiring Harness



52.Bulkhead Wiring Harness (In Engine Compartment)

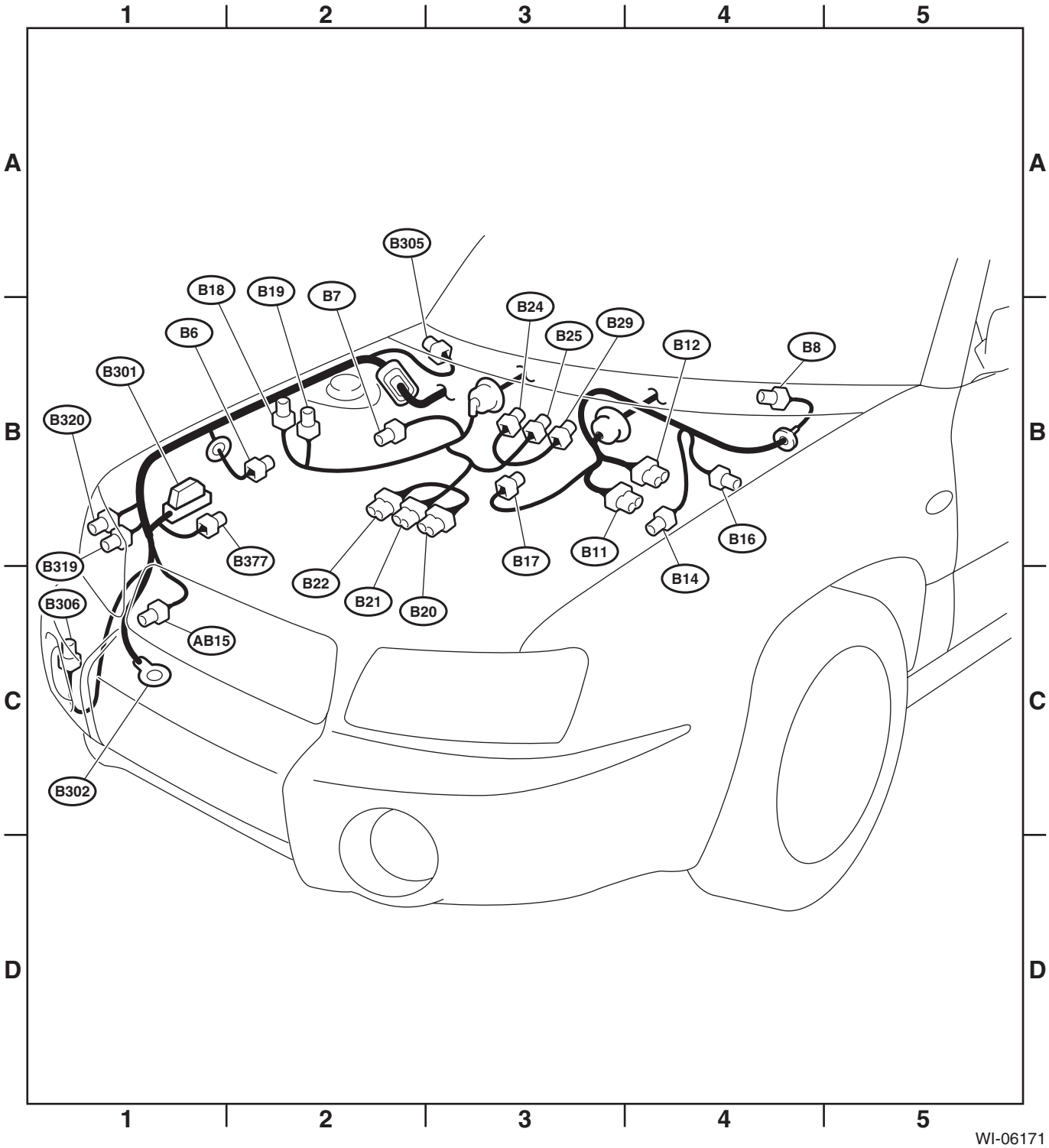
A: LOCATION

1. LHD NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B6	2	Brown	B-2		ABS front sensor RH
B7	6	Black	B-2		Cruise control actuator
B8	5	Black	B-4		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT model)
B12	12	Gray	B-4	T3	
B14	1	Black	B-4		Starter (Magnet)
B16	2	Gray	B-4		Brake fluid level switch
B17	3	Black	B-3		Vehicle speed sensor (MT model)
B18	4	★	B-2		Front oxygen (A/F) sensor
B19	4	Gray	B-2	T5	Rear oxygen sensor
B20	6	Gray	B-3	E1	Engine wiring harness
B21	16	Brown	B-2	E2	
B22	20	Gray	B-2	E3	
B24	2	Gray	B-3	T1	Back-up light switch (MT model)
B25	2	Brown	B-3	T2	Neutral position switch (MT model)
B29	2	Gray	B-3	T8	Lo (AWD) indicator light switch (MT model)
B301	26	Black	B-1		ABS control module
B302	1	★	C-1		ABS motor ground
B305	2	★	B-3		Side turn signal light RH
B306	2	Black	C-1		Front fog light RH
B319	2	Gray	B-1		Front clearance light RH
B320	2	Gray	B-1		Front turn signal light RH
B377	2	★	B-1	F112	Front wiring harness
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB15	2	Yellow	C-1		Front sub sensor RH

Bulkhead Wiring Harness (In Engine Compartment)

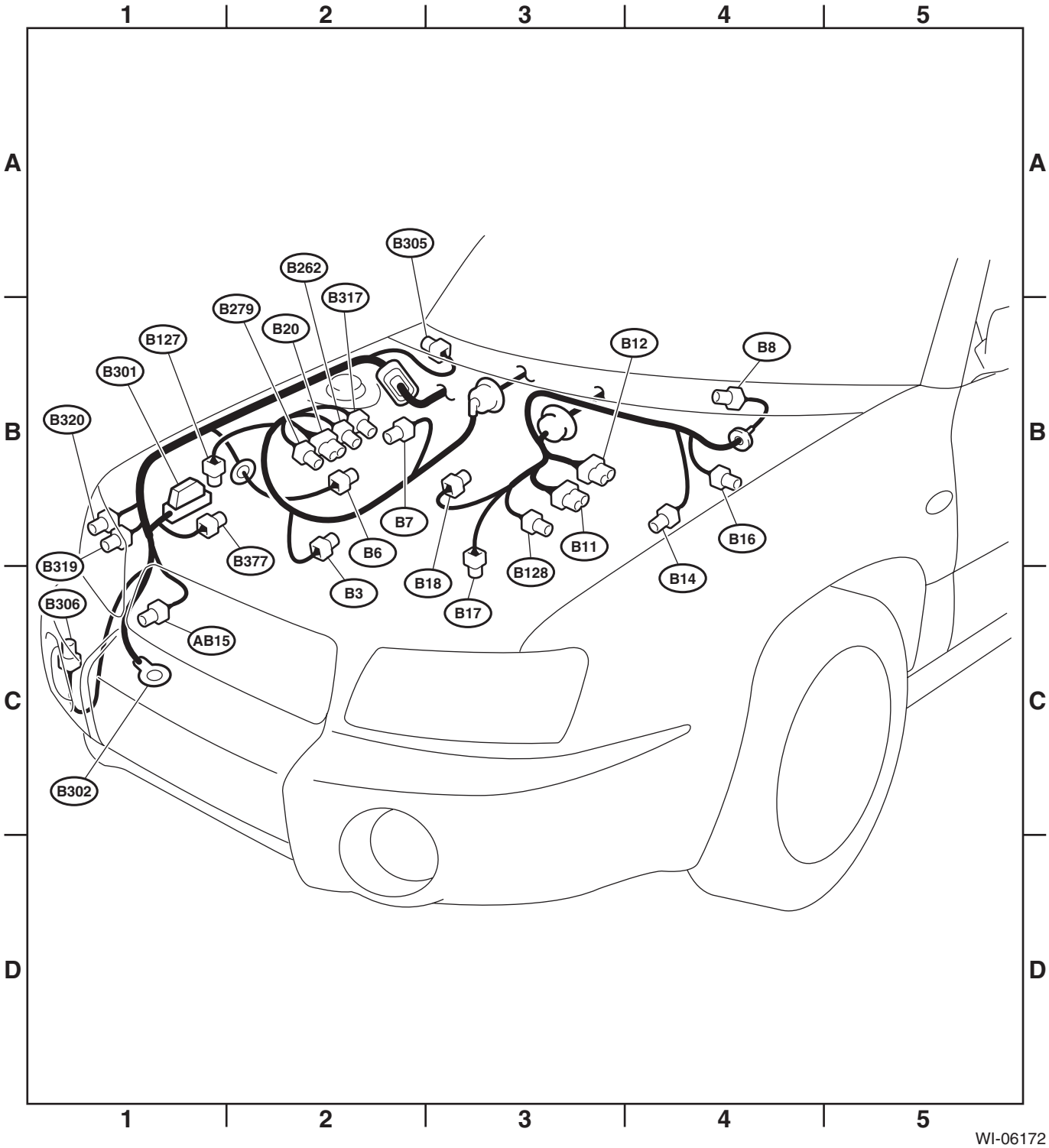


2. LHD TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	Black	B-2		Mass air flow sensor
B6	2	Brown	B-2		ABS front sensor RH
B7	6	Black	B-2		Cruise control actuator
B8	5	Black	B-4		Front wiper motor
B11	20	Gray	B-3	T4	Transmission (AT model)
B12	12	Gray	B-3	T3	
B14	1	Black	B-4		Starter (Magnet)
B16	2	Gray	B-4		Brake fluid level switch
B17	4	Black	B-3		Vehicle speed sensor (MT model)
B18	4	Gray	B-3		Front oxygen (A/F) sensor
B20	10	Gray	B-2	E1	Engine wiring harness
B127	2	Blue	B-1		Wastegate control solenoid valve
B128	4	Gray	B-3	T9	Transmission (MT model)
B262	4	Gray	B-2		Rear oxygen sensor
B279	2	Gray	B-2		Exhaust temperature sensor
B301	26	Black	B-1		ABS control module
B302	1	★	C-1		ABS motor ground
B305	2	★	B-3		Side turn signal light RH
B306	2	Black	C-1		Front fog light RH
B317	4	Gray	B-2	E56	Engine wiring harness (2.5 L Turbo model)
B319	2		B-1		Front clearance light RH
B320	2	Gray	B-1		Front turn signal light RH
B377	2	★	B-1	F112	Front wiring harness
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB15	2	Yellow	C-1		Front sub sensor RH

Bulkhead Wiring Harness (In Engine Compartment)

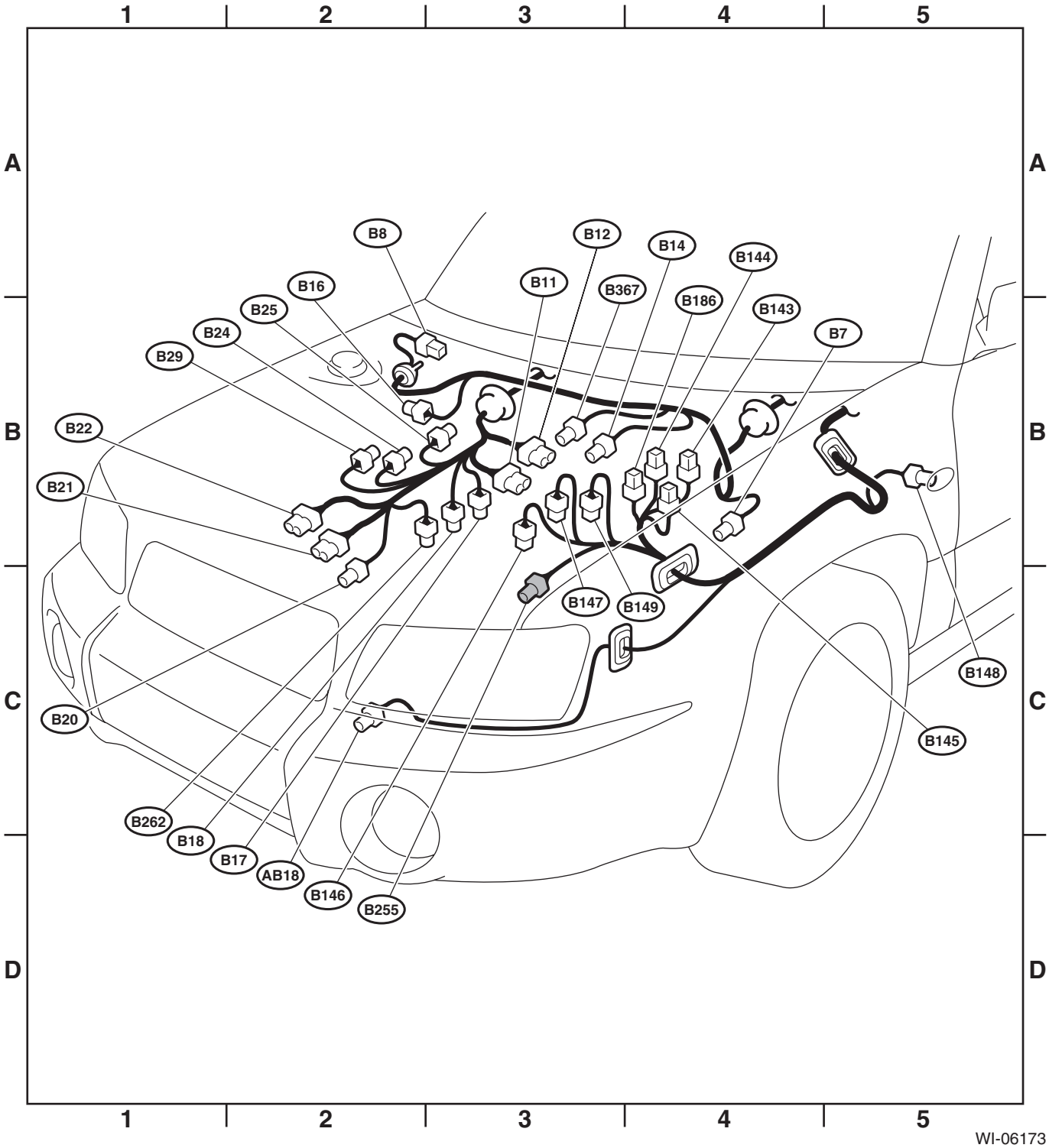


3. RHD NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B7	6	Black	B-4		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT model)
B12	12	★	B-3	T3	
B14	1	Black	B-3		Starter (Magnet)
B16	2	Gray	B-2		Brake fluid level switch
B17	3	Black	B-3		Vehicle speed sensor (MT model)
B18	4	★	B-3		Rear oxygen sensor
B20	6	★	C-2	E1	Engine wiring harness
B21	16	Brown	B-2	E2	
B22	20	Gray	B-2	E3	
B24	2	Gray	B-2	T1	Back-up light switch (MT model)
B25	2	Brown	B-3	T2	Neutral position switch (MT model)
B29	2	Gray	B-2	T8	Lo (AWD) indicator light switch (MT model)
B143	3	★	B-4		MAIN FUSE BOX (M/B)
B144	6	Black	B-4		
B145	1	★	B-4		
B146	2	Green	B-3		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	★	B-5		Side turn signal light LH
B149	2	Blue	B-3		Headlight washer motor
B186	4	Black	B-4		M/B
B255	1	★	C-3	F96	Front wiring harness (ABS)
B262	4	★	B-3		Front oxygen (A/F) sensor
B367	2	★	B-3		Heater cock solenoid (2.0 L model)
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB18	2	Yellow	C-2		Front sub sensor LH

Bulkhead Wiring Harness (In Engine Compartment)

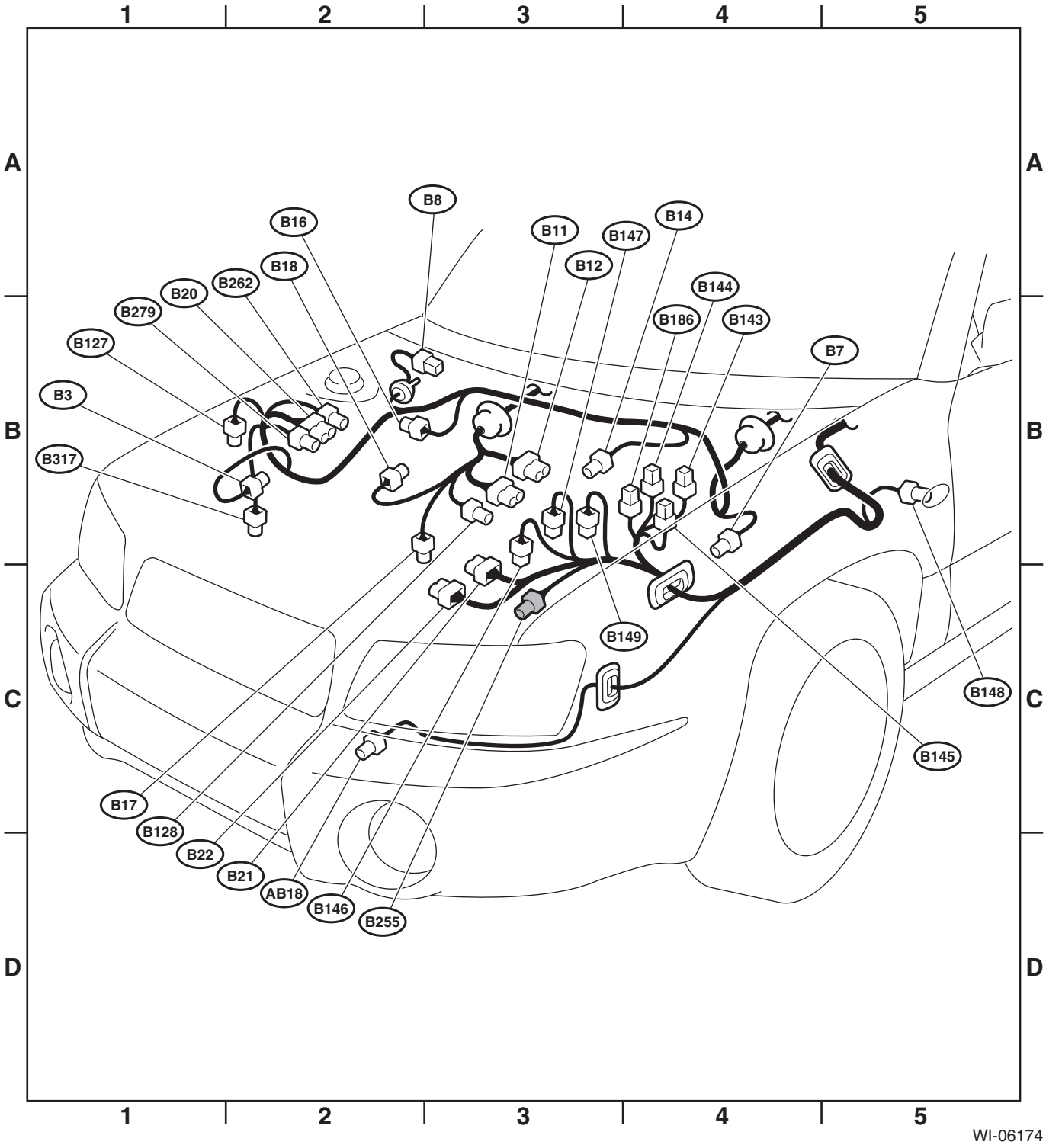


4. RHD TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	★	B-2		Mass air flow sensor
B7	6	Gray	B-4		Cruise control actuator
B8	5	★	B-3		Front wiper motor
B11	20	Gray	B-3	T4	Transmission (AT model)
B12	12	★	B-3	T3	
B14	1	★	B-3		Starter (Magnet)
B16	2	Gray	B-2		Brake fluid level switch
B17	4	Black	B-2		Vehicle speed sensor (MT model)
B18	4	★	B-2	T5	Rear oxygen sensor
B20	10	★	B-2	E1	Engine wiring harness
B21	16	Brown	C-3	E2	
B22	20	Black	C-3	E3	
B127	2	★	B-2		Wastegate control solenoid valve
B128	4	Gray	B-3	T9	Transmission (MT model)
B143	3	★	B-4		M/B
B144	6	Black	B-4		
B145	1	★	B-4		
B146	2	Green	B-3		Front washer motor
B147	2	★	B-3		Rear washer motor
B148	2	★	B-5		Side turn signal light LH
B149	2	Blue	B-3		Headlight washer motor
B186	4	Black	B-4		M/B
B255	1	★	C-3	F96	Front wiring harness (With ABS)
B262	4	★	B-2		Front oxygen (A/F) sensor
B279	2	Gray	B-2		Exhaust gas temperature sensor
B317	4	★	B-2	E-56	Engine wiring harness (2.5 L model)
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB18	2	Yellow	D-4		Front sub sensor LH

Bulkhead Wiring Harness (In Engine Compartment)



53. Bulkhead Wiring Harness (In Compartment)

A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-1	D1	Front door cord LH
B31	6	Yellow	D-1	AB1	SRS (Airbag) harness
B32	3	Black	B-2		Turn & hazard module
B37	24	★	C-1	i2	Instrument panel wiring harness
B38	32	★	C-1	i3	
B40	16	Black	C-2		Data link connector
B41	2	★	C-1		Power window circuit breaker
B44	10	★	C-2		Seat belt warning module
B46	4	★	B-5		Fuel pump relay
B47	6	Brown	B-5		Main relay
B50	4	★	C-1		Blower fan motor relay
B51	8	Blue	C-1		Fuse and relay box (F/B)
B53	6	★	C-2		Shield joint connector (Non-turbo AT model)
B54	24	★	B-2		Transmission control module (Non-turbo AT model)
	17	★	B-2		Transmission control module (Turbo AT model)
B55	24	Gray	B-2		Transmission control module (Non-turbo AT model)
	24	★	B-2		Transmission control module (Turbo AT model)
B56	24	Green	B-2		Transmission control module (Non-turbo AT model)
	31	★	B-2		Transmission control module (Turbo AT model)
B61	8	Black	B-2	F44	Front wiring harness
B62	20	★	B-2	F45	
B64	2	Black	B-2		Stop light switch
B65	4	Black	B-2		Stop light switch (With cruise control)
B69	4	★	B-3		Parking switch
B70	18	★	B-3		Combination switch
B71	17	★	B-3		
B72	4	Blue	C-3		Ignition switch
B74	6	★	C-3		Steering integrated switch
B75	2	Green	C-2	B76	Test mode connector
B76	2	Green	C-2	B75	
B77	10	Brown	B-3		Mode actuator (A-A/C)
B79	14	Gray	C-2		Check connector
B81	1 × 2	★	C-2		Diagnostic terminal (Ground)
B85	2	Brown	B-3		Diode (Rear fog light)
B86	6	Black	B-4		Blower fan motor resistor
B87	2	★	B-4		Blower fan motor (M-A/C)
	6	★	B-4		Blower fan motor (A-A/C)
B90	8	★	B-5	R50	Roof cord
B91	4	★	B-4		FRESH/RECIRC actuator
B94	20	Black	B-4		Cruise control module
B100	20	Blue	B-2	F2	Front wiring harness
B101	25	★	B-5	D30	Front door cord RH
B104	4	Red	C-1		Rear accessory power supply socket
B107	2	Blue	B-2		Clutch switch (MT model)
B108	2	Black	B-1	F46	Front wiring harness
B117	6	★	C-4		Select lever illumination light (AT model)
B119	4	★	C-4		Front accessory power supply socket
B122	8	★	C-4		Sensor ground joint connector
B125	2	Green	C-5	B126	Line end check connector
B126	2	Green	C-5	B125	
B129	2	Black	B-3		Kick down switch (AT model)
B131	4	Blue	C-1		Rear fog light relay
B132	6	★	C-2		Head light beam leveler switch
B134	34	★	C-4		Engine control module (Turbo model)
	35	Gray	C-4		Engine control module (Non-turbo model)
B135	28	Gray	B-4		Engine control module (Non-turbo model)
	35	★	B-4		Engine control module (Turbo model)
B136	26	Gray	B-4		Engine control module (Non-turbo model)
	35	★	B-4		Engine control module (Turbo model)
B137	20	Gray	B-4		Engine control module (Non-turbo model)
	31	★	B-4		Engine control module (Turbo model)

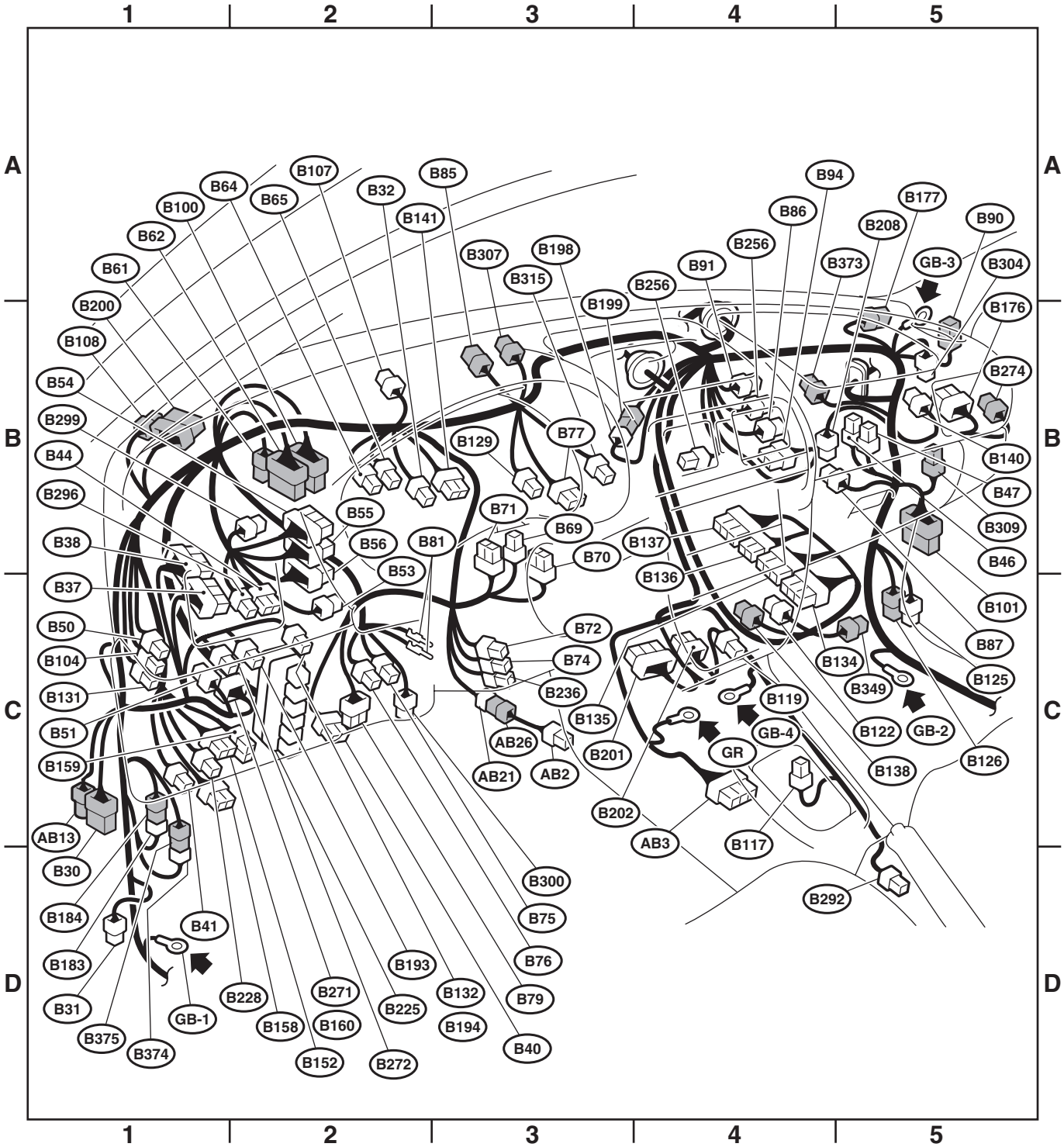
Bulkhead Wiring Harness (In Compartment)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B138	8	★	C-4		Ground joint connector
B140	6	Black	B-5		Headlight washer module
B141	12	Black	B-3		Immobilizer control module
B152	7	★	C-1		Fuse and relay box (F/B)
B158	12	★	C-1		
B159	10	Gray	C-2		
B160	6	Gray	C-2		Front fog light switch
B176	18	★	B-5		Keyless entry control module
B177	2	★	B-5		Wiper deicer
B183	1	★	C-1	B184	Joint connector (Keyless entry)
B184	1	★	C-1	B183	
B193	8	Black	C-2		Wiper deicer switch
B194	8	★	C-2		Headlight washer switch
B198	1	★	B-3	B199	Ground joint connector
B199	1	★	B-3	B198	
B200	24	Black	B-1	F74	Front wiring harness (Turbo model)
B201	24	Black	C-4	i40	Instrument panel wiring harness
B202	20	★	C-4	i41	Instrument panel wiring harness (M-A/C)
	24	Black	C-4	i41	Instrument panel wiring harness (A-A/C)
B208	2	Black	B-4		Glove box light (Turbo model)
B225	8	Black	C-2		Fuse (Relay block)
	5	Black	C-2		Power window relay (Relay block)
	5	Black	C-2		Front fog light relay (Relay block)
	5	Black	C-2		Ignition relay (Relay block)
	5	Black	C-2		Mirror heater relay (Relay block)
	5	Black	C-2		Seat heater relay (Relay block)
B228	8	★	C-1		OP connector
B236	8	★	C-3		Steering roll connector
B256	3	★	B-4		Evaporator thermo switch
B271	12	Blue	C-2		Fuse and relay box (F/B)
B272	6	★	C-1		Rear fog light switch
B274	6	★	B-5		Navigation unit
B292	3	★	D-5		ABS G sensor
B296	4	★	C-2		Rear defogger timer

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B299	8	★	B-2		Shield joint connector (AT model)
B300	6	★	C-2		Line end check connector
B304	2	★	B-5		ABS condenser
B307	2	★	B-3		Shift lock diode
B309	4	Black	B-5		Electronic throttle control (2.5 L Turbo model)
B315	6	★	B-3		Accelerator pedal position sensor (2.5 L Turbo model)
B349	2	Black	C-4		Front wiper diode
B373	12	Black	B-4		At shift lock control unit
B374	2	Black	D-1	B375	Joint connector (Key lock)
B375	2	Black	C-1	B374	

★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB2	2	Black	C-3		Inflator (Driver's seat)
AB3	28	Yellow	C-4		Airbag control module
AB13	2	Yellow	C-1	AB14	Front sub sensor harness LH
AB21	2	Yellow	C-3	AB26	Inflator (Driver's seat)



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2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B30	25	★	C-5	D1	Front door cord RH
B31	6	Yellow	D-5	AB1	SRS (Airbag) harness
B32	3	Black	B-3		Turn & hazard module
B37	20	Black	C-3	i2	Instrument panel wiring harness (MT model)
	24	Black	C-3	i2	Instrument panel wiring harness (AT model)
B38	32	★	C-3	i3	Instrument panel wiring harness
B40	16	Black	C-4		Data link connector
B41	2	★	C-5		Power window circuit breaker
B43	6	Black	B-1		Illumination control module
B44	10	★	B-4		Seat belt timer
B46	4	★	B-1		Fuel pump relay
B47	6	Brown	B-1		Main relay
B50	4	★	C-5		Blower fan motor relay
B51	8	Blue	C-5		Fuse and relay box (F/B)
B52	7	★	C-5		Fuse and relay box (F/B)
B53	4	★	B-4		Shield joint connector (AT model)
B54	24	★	B-4		Transmission control module (Non-turbo AT model)
	17		B-4		Transmission control module (Turbo AT model)
B55	24	Gray	B-4		Transmission control module (Non-turbo AT model)
	24	★	B-4		Transmission control module (Turbo AT model)
B56	24	Green	B-4		Transmission control module (Non-turbo AT model)
	31	★	B-4		Transmission control module (Turbo AT model)
B61	8	Black	B-5	F44	Front wiring harness
B62	18	Black	B-5	F45	Front wiring harness (ABS)
	22	Black	B-5	F45	Front wiring harness (VDC)
B65	4	Black	B-4		Stop & brake switch (With cruise control)
B69	4	★	B-3		Combination switch
B70	18	★	C-3		
B71	17	★	C-3		
B72	4	Blue	C-3		Ignition switch
B73	6	★	C-3		Key integrated connector (Key-lock solenoid, Key warning switch, Ignition switch, Illumination light)
B75	2	Green	C-4	B76	Test mode connector
B76	2	Green	C-4	B75	
B77	3	Brown	B-2		Mode actuator (A-A/C)
B79	14	Gray	C-4		Check connector
B81	1 × 2	★	C-4		Diagnostic terminal (Ground)
B83	6	★	C-1		Shield & sensor ground joint connector (E/G)
B85	4	★	B-4		Diode (Lighting)
B86	6	Black	B-2		Blower fan motor resistor (M-A/C)
B87	2	★	B-1		Blower fan motor (M-A/C)
	6	★	B-2		Blower fan motor (A-A/C)
B90	8	★	B-5	R50	Roof cord
B91	4	★	B-2		FRESH/RECIRC actuator
B93	20	★	B-2		Security control module
B94	20	★	B-2		Cruise control module
B100	22	Blue	B-5	F2	Front wiring harness
B101	25	★	C-1	D11	Front door cord LH
B104	4	Pink	C-5		Rear accessory power supply socket
B107	2	Blue	B-3		Clutch switch (MT model)
B117	6	★	C-2		Select lever illumination light (AT model)
B119	4	★	C-2		Front accessory power supply socket
B122	4	★	C-2		Shield & sensor ground joint connector (E/G) (Non-turbo model)
	8	★	C-2		Shield & sensor ground joint connector (E/G) (Turbo model)
B125	1	Green	B-1	B126	Line end connector
B126	1	Green	B-1	B125	
B129	2	★	C-4		Kick down switch (AT model)
B131	4	Blue	C-5		Rear fog light relay

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B132	6	★	C-4		Headlight beam leveler switch
B133	6	★	C-2		AT power mode & hold mode switch
B134	34	★	C-2		Engine control module (Turbo model)
	35	★	C-2		Engine control module (Non-turbo model)
B135	28	★	C-2		Engine control module (Non-turbo model)
	35	★	C-2		Engine control module (Turbo model)
B136	26	★	C-2		Engine control module (Non-turbo model)
	35	★	C-2		Engine control module (Turbo model)
B137	20	★	B-2		Engine control module (Non-turbo model)
	31	★	B-2		Engine control module (Turbo model)
B140	6	Black	B-1		Headlight washer module
B141	12	★	B-3		Immobilizer control module
B152	12	★	C-5		Fuse and relay box (F/B)
B158	10	Gray	C-5		
B159	9	Brown	C-5		
B160	6	Gray	C-4		Front fog light switch
B176	18	★	B-1		Keyless entry control module
B177	2	★	B-1		Wiper deicer
B183	1	★	D-5	B184	Joint connector
B184	1	★	C-5	B183	
B193	8	Black	C-4		Wiper deicer switch
B194	8	★	C-4		Headlight washer switch
B198	1	★	B-3	B199	Joint connection (Ground)
B199	1	★	B-3	B198	
B201	24	Black	C-2	i40	Instrument panel wiring harness
B202	20	★	C-2	i41	Instrument panel wiring harness (M-A/C)
	24	★	C-2	i41	Instrument panel wiring harness (A-A/C)
B208	2	★	B-1		Glove box light (Turbo model)
B212	1	★	B-5	F86	Front wiring harness (VDC)

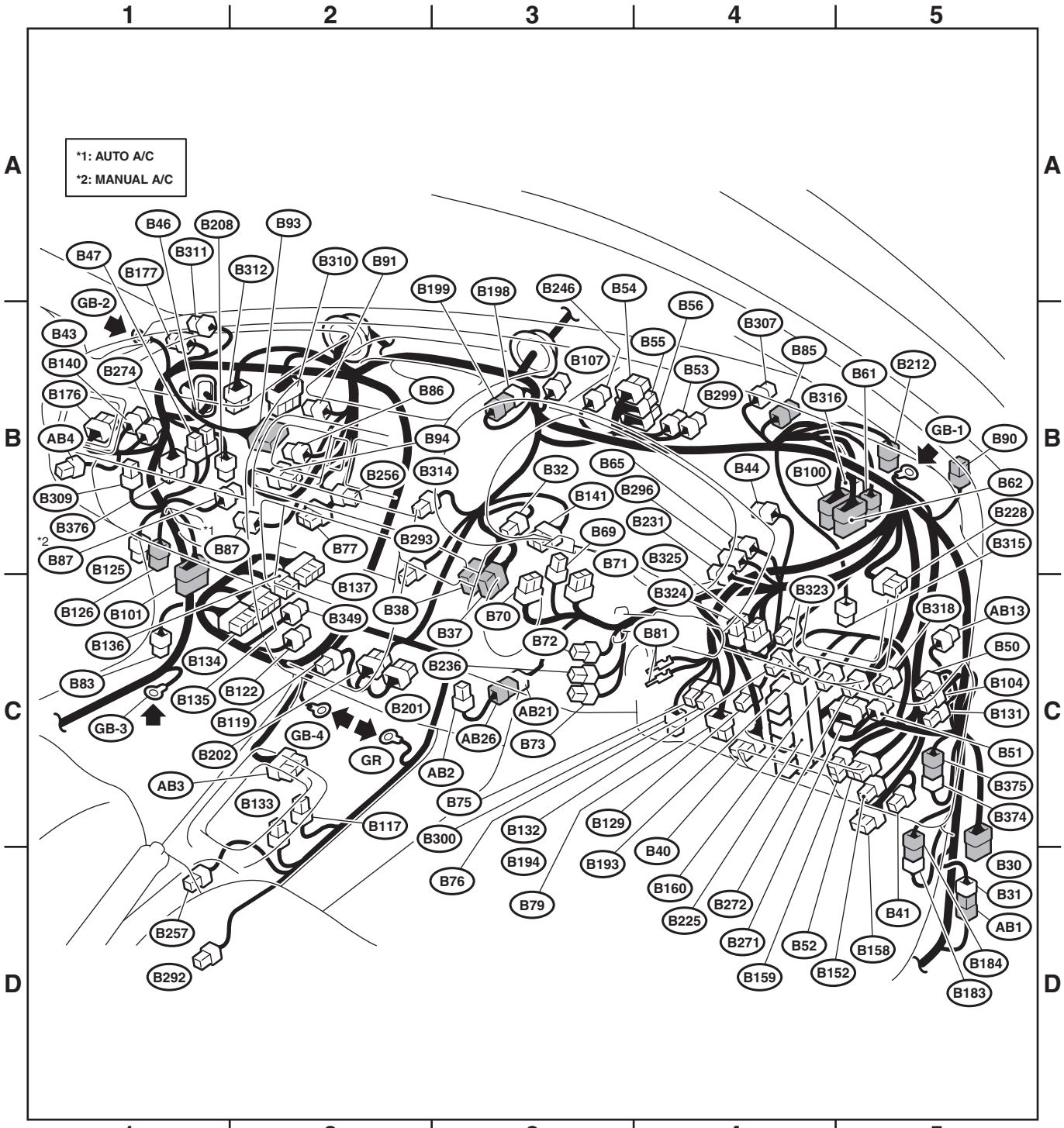
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B225	8	Black	C-4		Fuse (Relay block)
	5	Black	C-4		Power window relay (Relay block)
	5	Black	C-4		Front fog light relay (Relay block)
	5	Black	C-4		Ignition relay (Relay block)
	5	Black	C-4		Mirror heater relay (Relay block)
	5	Black	C-4		Seat heater relay (Relay block)
B228	8	★	C-5		OP connector
B231	4	★	B-4		Steering angle sensor (VDC)
B236	8	★	C-3		Cruise control sub switch
B246	6	★	B-3		CAN joint connector
B256	3	★	B-2		Evaporator sensor
B257	6	★	D-1		Yaw rate sensor
B271	12	Blue	C-5		F/B
B272	6	★	C-5		Rear fog light switch
B274	6	★	B-1		Navigation unit
B292	3	★	D-1		ABS G sensor
B293	6	Black	B-2		Air mix actuator (A-A/C)
B296	4	★	B-4		Rear defogger timer
B299	8	★	B-4		Shield joint connector
B300	6	★	C-4		Line end check connector
B307	2	★	B-4		Shift lock diode
B309	4	Black	B-1		ETC relay (Turbo 2.5 L model)
B310	83	★	B-2		VDCCM
B311	4	★	B-1		Steering angle joint earth connector
B312	12	★	B-2		VDC joint connector
B314	2	★	B-2		In-vehicle temperature sensor (A-A/C)
B315	6	Black	C-5		Accelerator pedal position sensor (Turbo 2.5 L model)
B316	20	★	B-5		Ground joint connector
B318	6	Blue	C-5		VDC OFF switch
B323	4	Blue	C-4		Security relay
B324	16	Gray	C-4		Double lock control module
B325	20	Gray	C-4		
B349	2	★	C-2		Wiper diode
B374	2	Black	C-5	B375	Joint connector (Key lock)
B375	2	Black	C-5	B374	
B376	12	★	B-1		AT shift lock control unit

★: Non-colored

Bulkhead Wiring Harness (In Compartment)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB1	6	Yellow	D-5	B31	Bulkhead wiring harness
AB2	2	Black	C-3	AB26	Inflator (Driver's seat)
AB3	28	Yellow	C-2		Airbag control module
AB4	4	Yellow	B-1		Inflator (Passenger's seat)
AB13	2	Yellow	C-5	AB14	Front sub sensor harness RH

Bulkhead Wiring Harness (In Compartment)



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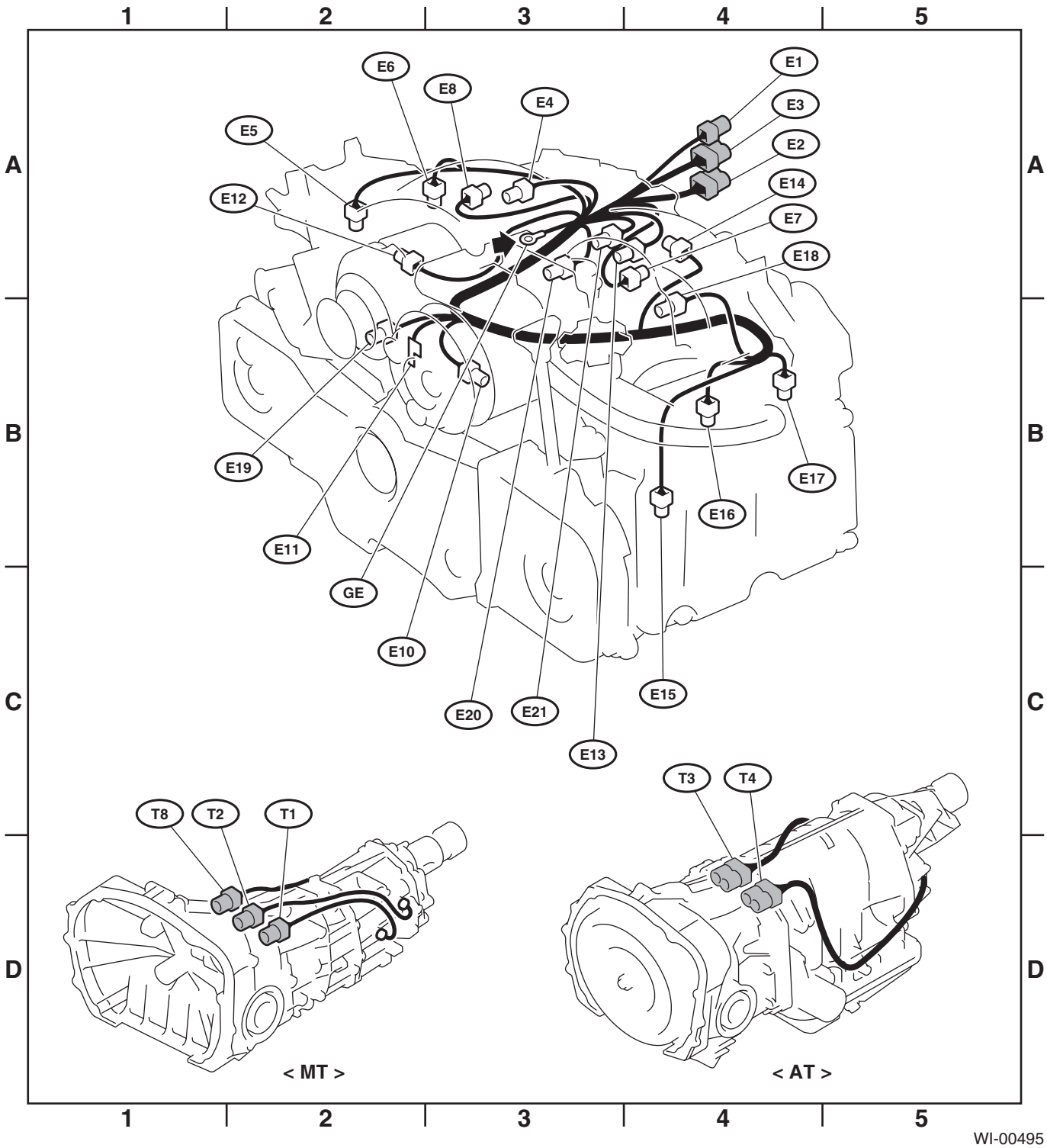
54.Engine Wiring Harness and Transmission Cord

A: LOCATION

1. NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	6	Black	A-4	B20	Bulkhead wiring harness
E2	16	Brown	A-4	B21	
E3	20	Light gray	A-4	B22	
E4	2	Black	A-3		Purge control solenoid valve
E5	2	Light gray	A-2		Fuel injector No. 1
E6	2	Light gray	A-3		Fuel injector No. 3
E7	6	Black	A-4		Idle air control solenoid valve
E8	3	Light gray	A-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-3		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	Dark gray	A-2		Ignition coil and ignitor
E13	4	Brown	A-4		Throttle position sensor
E14	2	Light gray	A-4		Knock sensor
E15	2	Black	B-4		Camshaft position sensor
E16	2	Light gray	B-4		Fuel injector No. 2
E17	2	Light gray	B-4		Fuel injector No. 4
E18	6	Dark gray	B-4		Exhaust gas recirculation solenoid valve
E19	1	★	B-2		Power steering oil pressure switch
E20	2	Black	A-3		Intake air temperature sensor
E21	3	Light gray	A-3		Pressure sensor
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray	D-2	B24	Bulkhead wiring harness (MT model)
T2	2	Brown	D-2	B25	
T3	12	Black	D-4	B12	Bulkhead wiring harness (AT model)
T4	20	Black	D-4	B11	
T8	2	Gray	D-1	B29	Bulkhead wiring harness (MT model)
★: Non-colored					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E20
E21
E15
E13
T8
T2
T1
T3
T4
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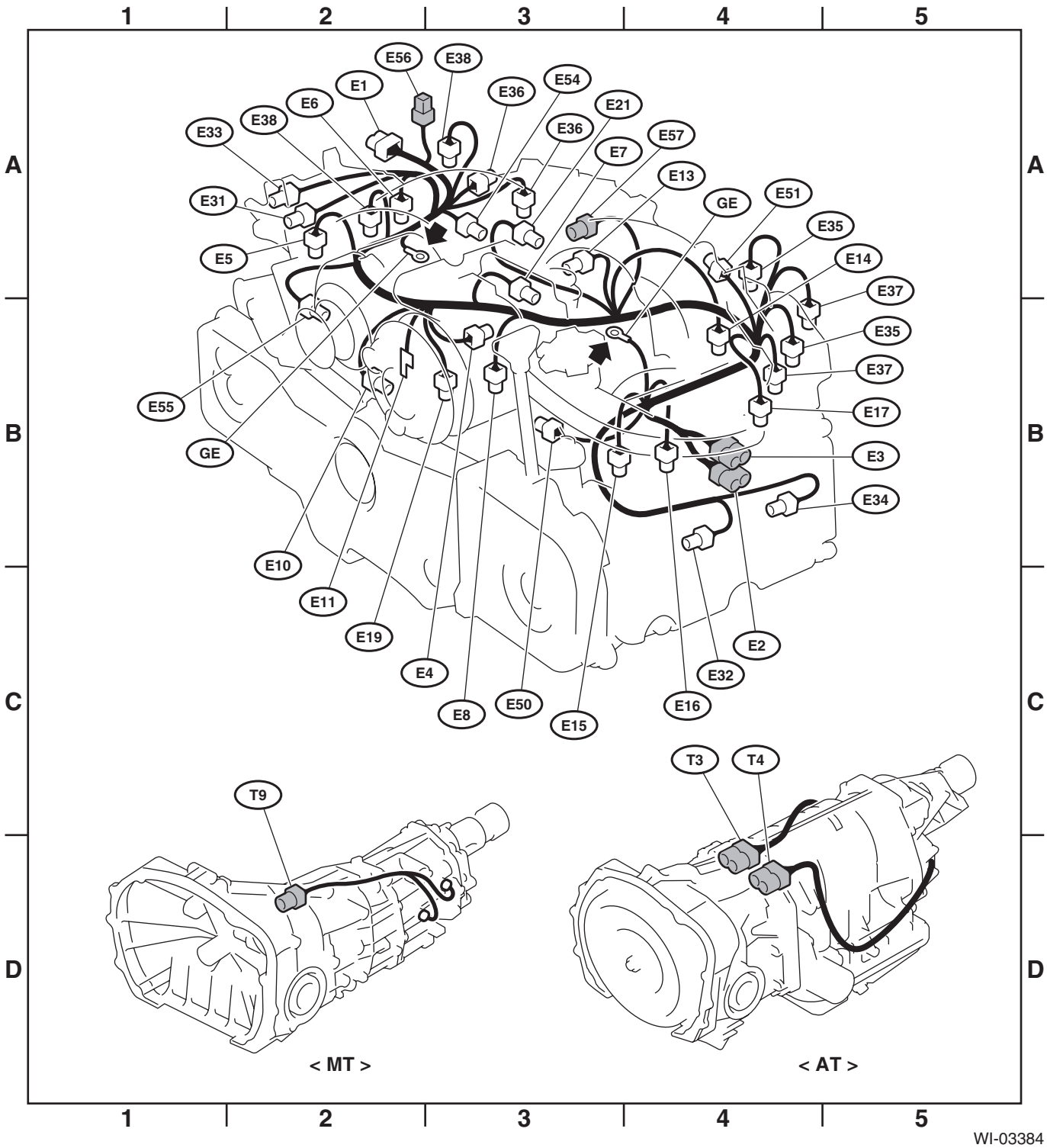
2. TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
E1	10	Light gray	A-2	B20	Bulkhead wiring harness
E2	20	Brown	B-4	F61	Front wiring harness (LHD model)
				B21	Bulkhead wiring harness (RHD model)
E3	16	Black	B-4	F60	Front wiring harness (LHD model)
				B22	Bulkhead wiring harness (RHD model)
E4	2	Black	B-3		Purge control solenoid valve
E5	2	Dark gray	A-2		Fuel injector No. 1
E6	2	Dark gray	A-2		Fuel injector No. 3
E7	3	Light gray	A-3		Idle air control solenoid valve
E8	3	Light gray	B-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E13	3	Black	A-3		Throttle position sensor
E14	2	Gray	B-4		Knock sensor
E15	2	Light gray	B-4		Camshaft position sensor
E16	2	Dark gray	B-4		Fuel injector No. 2
E17	2	Dark gray	B-4		Fuel injector No. 4
E19	2	★	B-3		Power steering oil pressure switch
E21	3	Black	A-3		Pressure sensor
E31	3	★	A-2		Ignition coil No. 1
E32	3	★	B-4		Ignition coil No. 2
E33	3	Black	A-2		Ignition coil No. 3
E34	3	Black	B-4		Ignition coil No. 4
E35	2	★	A-4		Active valve control camshaft position sensor LH (2.0 L model)
	3	Gray	A-3		Active valve control camshaft position sensor RH (2.5 L model)
E36	2	★	A-3		Active valve control camshaft position sensor RH (2.0 L model)
	3	Gray	A-4		Active valve control camshaft position sensor LH (2.5 L model)
E37	2	Blue	B-4		Active valve control solenoid valve LH
E38	2	Blue	A-3		Active valve control solenoid valve RH
E50	3	Black	B-3		Tumble generator valve angle sensor LH
E51	2	Black	A-4		Tumble generator valve LH
E54	3	Black	A-3		Tumble generator valve angle sensor RH
E55	2	Black	A-2		Tumble generator valve RH
E56	4	★	A-3	B317	Bulkhead wiring harness (2.5 L model)
E57	6	Black	A-3		Electronic throttle (2.5 L model)
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	★	D-4	B12	Bulkhead wiring harness (AT model)
T4	20	Black	D-4	B11	
T9	4	★	D-2	B128	Bulkhead wiring harness (MT model)
★: Non-colored					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WI-03384

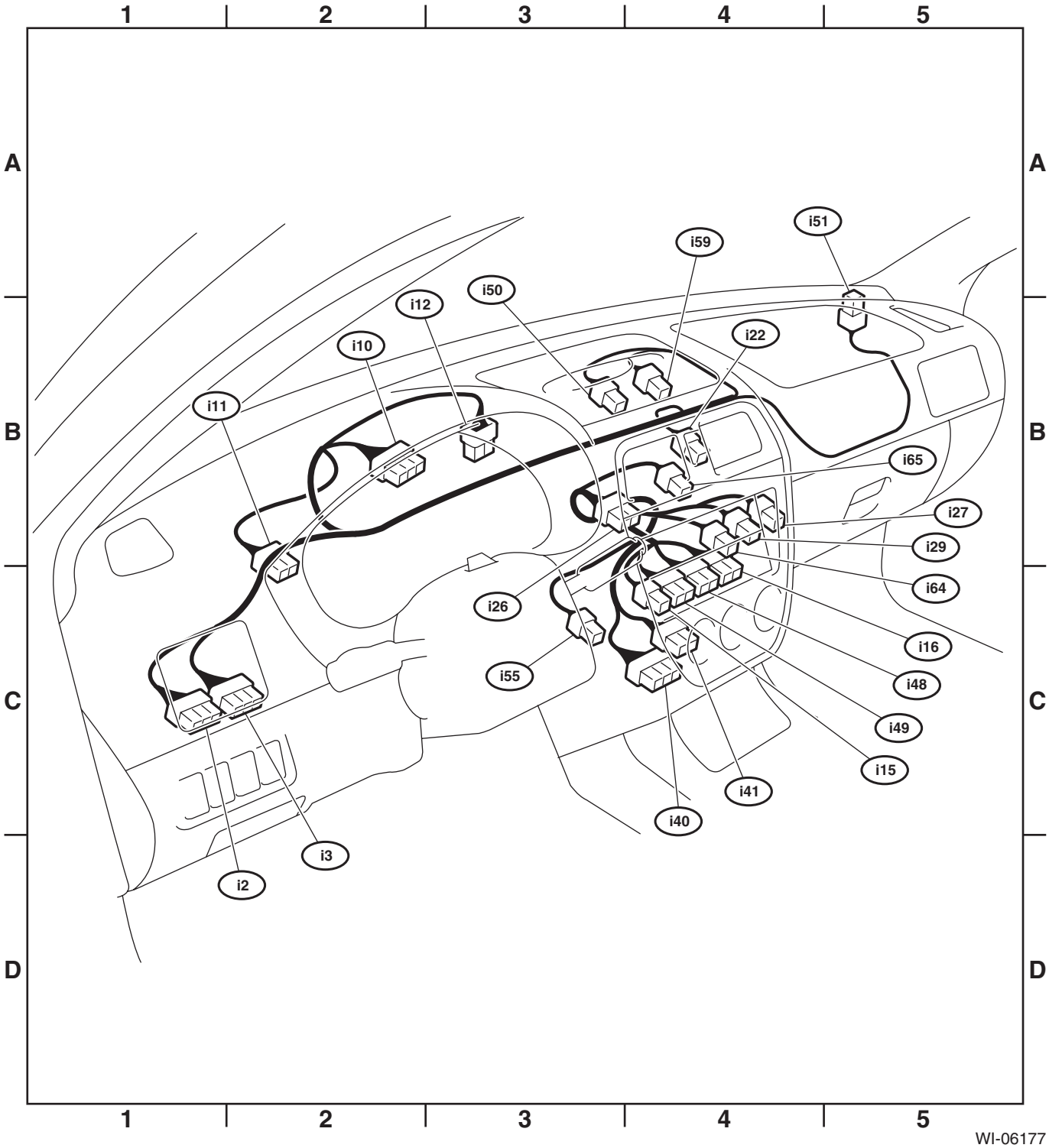
55.Instrument Panel Wiring Harness

A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i2	24	★	C-1	B37	Bulkhead wiring harness
i3	32	★	C-2	B38	
i10	30	Green	B-2		Combination meter
i11	10	Green	B-2		
i12	14	Green	B-3		
i15	6	Black	C-4		Blower fan switch (Manual A/C)
i16	12	★	B-4		Air conditioner switch (Manual A/C)
i22	8	★	B-4		Hazard switch
i26	14	Black	B-3		Radio
i27	2	★	B-4		CD player illumination light
i29	1	Black	B-4		Audio ground
i40	24	Black	C-4	B201	Bulkhead wiring harness
i41	20	★	C-4	B202	Bulkhead wiring harness (Manual A/C)
	24	★	C-4	B202	Bulkhead wiring harness (Auto A/C)
i48	16	Gray	C-4		Auto A/C control module
i49	20	Gray	C-4		
i50	16	Black	B-3		Navigation display
i51	2	★	A-5		Sunload sensor (Auto A/C)
i55	2	★	C-3		In-vehicle temperature sensor (Auto A/C)
i59	7	Green	B-4		Clock
i64	8	Black	B-4		Satellite switch
i65	6	Black	B-4		Air mix actuator (Auto A/C)
★: Non-colored					

Instrument Panel Wiring Harness



2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i2	22	Black	C-3	B37	Bulkhead wiring harness (Non-Turbo AT model)
	18	Black	C-3	B37	Bulkhead wiring harness (MT & Turbo AT model)
i3	32	★	C-3	B38	Bulkhead wiring harness
i10	30	Green	B-4		Combination meter
i11	10	Green	B-4		
i12	14	Green	B-3		
i15	6	★	C-2		Blower fan switch (Manual A/C)
i16	12	★	B-2		Air conditioner switch (Manual A/C)
i22	8	★	B-2		Hazard switch
i26	14	★	B-3		Radio
i29	1	★	B-2		Audio ground
i40	24	Black	C-2	B201	Bulkhead wiring harness
i41	20	★	C-2	B202	Bulkhead wiring harness (Manual A/C)
	24	★	C-2	B202	Bulkhead wiring harness (Auto A/C)
i48	16	★	C-2		Auto A/C control module
i49	20	★	C-2		
i50	16	Black	B-3		Navigation display
i51	2	★	A-1		Sunload sensor (A-A/C)
i59	7	Green	B-2		Clock
i63	2	★	B-3		Navigation diode
i64	2	★	B-2		Satellite switch
	8	★	B-2		Sub woofer
i65	2	★	B-3		TMC tuner

★: Non-colored

Instrument Panel Wiring Harness

56.Rear Wiring Harness

A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	Black	B-2	B97	Bulkhead wiring harness
R2	24	★	B-2	B98	
R3	8	★	B-2	B99	
R4	1	Black	B-3		Parking brake switch
R8	2	★	C-3		Seat belt switch
R15	4	★	B-3	R57	Fuel tank cord
R22	3	★	B-4		Rear door switch LH
R41	4	Blue	B-2		Seat heater RH
R42	4	★	B-2		Seat heater switch RH
R43	4	Blue	B-3		Seat heater switch LH
R44	4	Blue	C-3		Seat heater LH
R72	2	★	B-3		Rear ABS wheel speed sensor RH
R73	2	★	C-4		Rear ABS wheel speed sensor LH
R92	6	★	C-2		AT power mode & Hold mode switch
R146	2	★	B-3		Rear accessory power supply socket
★: Non-colored					

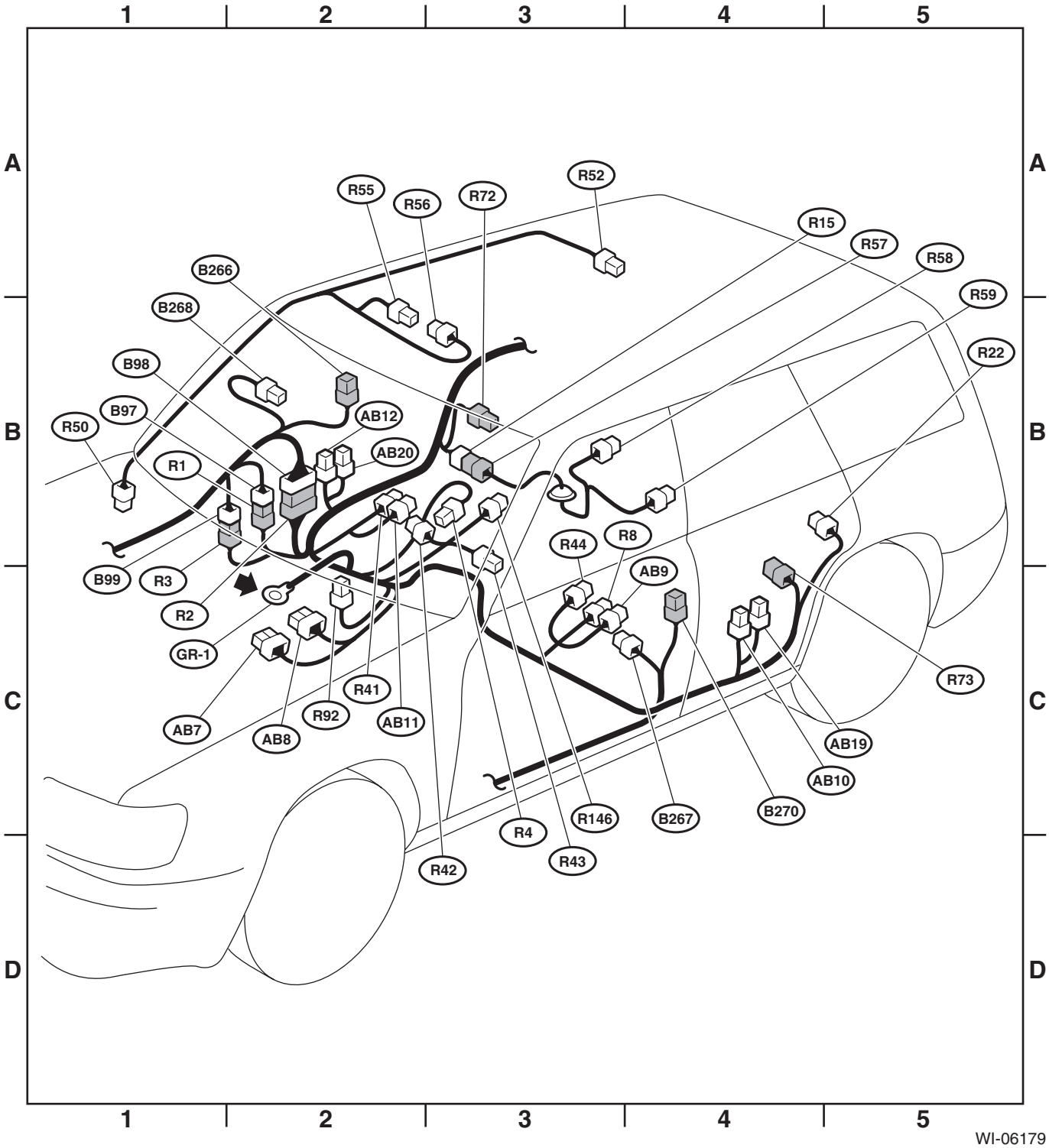
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B97	8	Black	B-2	R1	Rear wiring harness
B98	24	★	B-2	R2	
B99	8	★	B-2	R3	
B266	8	★	B-2	D28	Rear door cord RH
B267	3	★	C-3		Front door switch LH
B268	3	★	B-2		Front door switch RH
B270	8	★	C-4	D22	Rear door cord LH
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	8	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	2	★	B-2		Sunroof motor
R56	2	Gray	B-3		Spot map light
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	4	★	B-3	R15	Rear wiring harness
R58	6	Gray	B-3		Fuel pump assembly
R59	2	★	B-4		Fuel sub level sensor
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB7	12	Yellow	C-2		Airbag control module
AB8	12	Yellow	C-2		
AB9	2	Yellow	C-4		Seat airbag module LH
AB10	4	Yellow	C-4		Side sensor LH
AB11	2	Yellow	B-2		Seat airbag module RH
AB12	4	Yellow	B-2		Side sensor RH
AB19	2	Yellow	C-4		Pretensioner LH
AB20	2	Yellow	B-2		Pretensioner RH

Rear Wiring Harness



2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R1	8	Black	B-2	B97	Bulkhead wiring harness
R2	32	★	B-2	B98	
R4	1	★	B-3		Parking brake switch
R8	2	★	B-2		Seat belt switch
R15	4	★	B-3	R57	Fuel tank cord
R22	3	★	B-4		Rear door switch LH
R41	4	Blue	C-3		Seat heater RH
R42	4	Blue	B-3		Seat heater switch LH
R43	4	★	B-2		Seat heater switch LH
R44	4	Blue	B-2		Seat heater RH
R72	2	★	B-3		Rear ABS wheel speed sensor RH
R73	2	★	C-4		Rear ABS wheel speed sensor LH
R146	2	★	B-3		Rear accessory power supply socket
★: Non-colored					

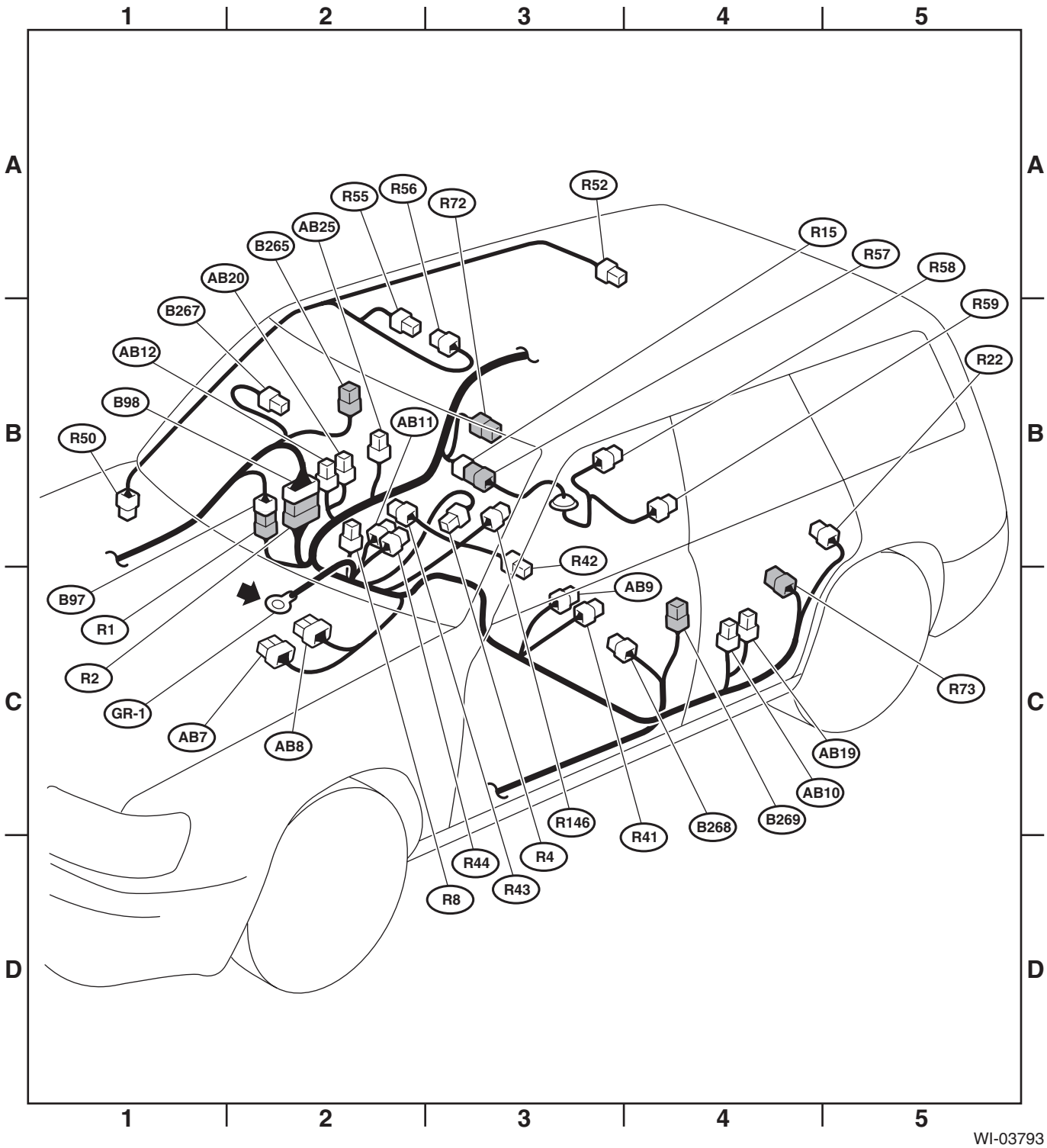
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B97	8	Black	B-2	R1	Rear wiring harness
B98	32	★	B-2	R2	
B265	8	★	B-2	D27	Rear door cord RH
B267	3	★	B-2		Front door switch RH
B268	3	★	C-3		Front door switch LH
B269	8	★	C-4	D21	Rear door cord LH
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	8	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	2	★	B-2		Sunroof motor
R56	2	★	B-3		Spot map light
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	4	★	B-3	R15	Rear wiring harness
R58	6	★	B-3		Fuel pump assembly
R59	2	★	B-4		Fuel sub level sensor
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
AB7	12	Yellow	C-2		Airbag control module
AB8	12	Yellow	C-2		
AB9	2	Yellow	C-3		Seat airbag module LH
AB10	4	Yellow	C-4		Side sensor LH
AB11	2	Yellow	B-2		Seat airbag module RH
AB12	4	Yellow	B-2		Side sensor RH
AB19	2	Yellow	C-4		Pretensioner LH
AB20	2	Yellow	B-2		Pretensioner RH
AB25	2	Orange	B-2		Lap seat belt pretensioner RH

Rear Wiring Harness



57.Door Cord

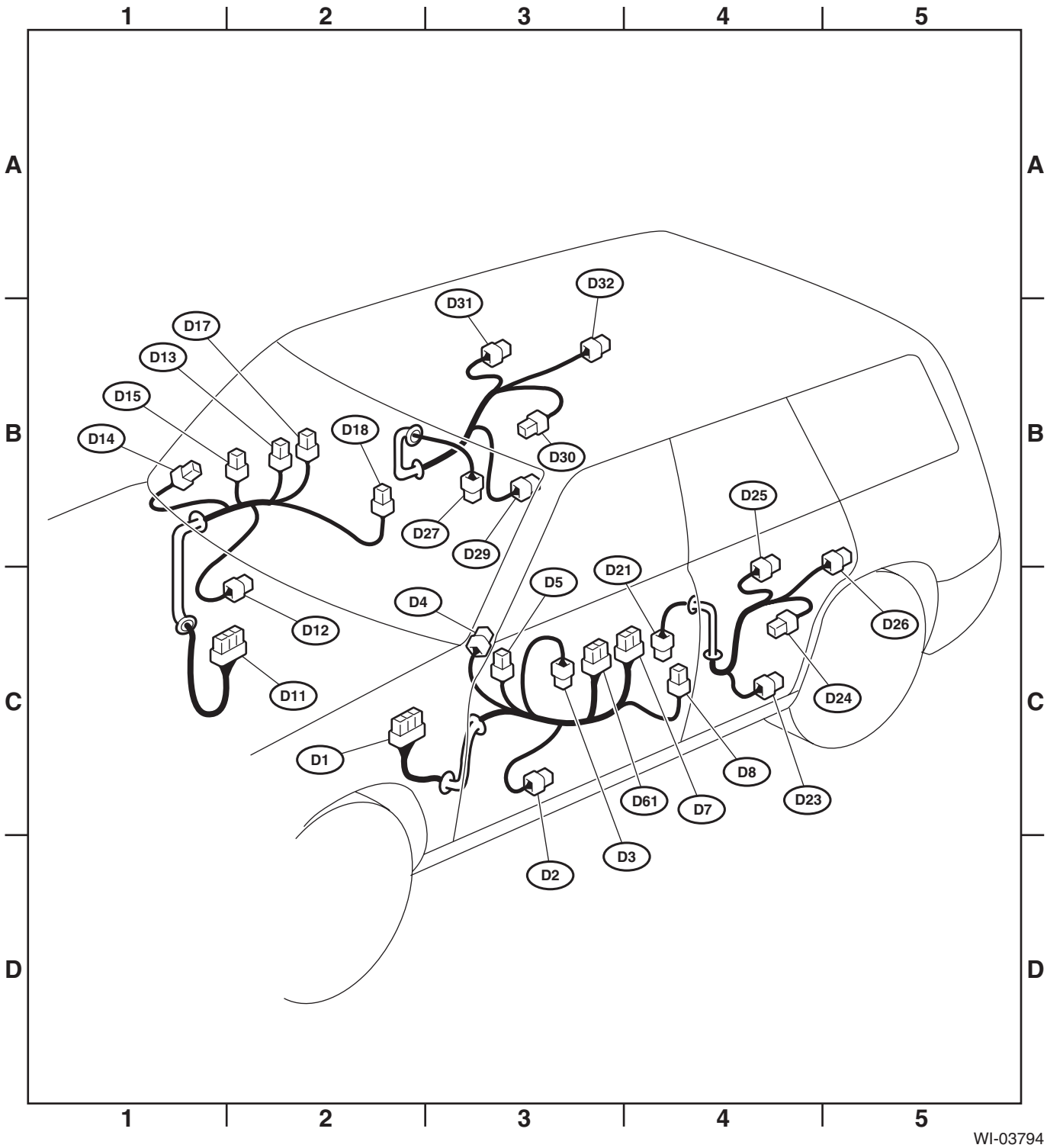
A: LOCATION

1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-2	B30	Bulkhead wiring harness
D2	2	★	C-3		Front door speaker (Driver side)
D3	2	Green	C-3		Front power window motor (Driver side)
D4	2	Black	C-3		Front door tweeter (Driver side)
D5	6	★	C-3		Remote control rearview mirror (Without mirror heater)
	8	★	C-3		Remote control rearview mirror (With mirror heater)
D7	16	★	C-4		Power window main switch
D8	4	★	C-4		Front door lock actuator LH
D11	25	★	C-1	B101	Bulkhead wiring harness
D12	2	★	C-2		Front door speaker RH
D13	2	Green	B-2		Front power window motor RH
D14	2	Black	B-1		Front door tweeter RH
D15	6	★	B-2		Remote control rearview mirror RH (Without mirror heater)
	8	★	B-2		Remote control rearview mirror RH (With mirror heater)
D17	8	★	B-2		Front power window sub switch RH
D18	4	★	B-2		Front door lock actuator RH
D21	8	★	C-4	B269	Bulkhead wiring harness
D23	2	★	C-4		Rear door speaker LH
D24	2	Green	C-4		Rear power window motor LH
D25	8	★	C-4		Rear power window sub switch LH
D26	4	★	B-5		Rear door lock actuator LH
D27	4	★	B-3	B265	Bulkhead wiring harness
D29	2	★	B-3		Rear door speaker RH
D30	2	Green	B-3		Rear power window motor RH
D31	8	★	B-3		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH
D61	10	★	C-3		Remote control rearview mirror switch

★: Non-colored

Door Cord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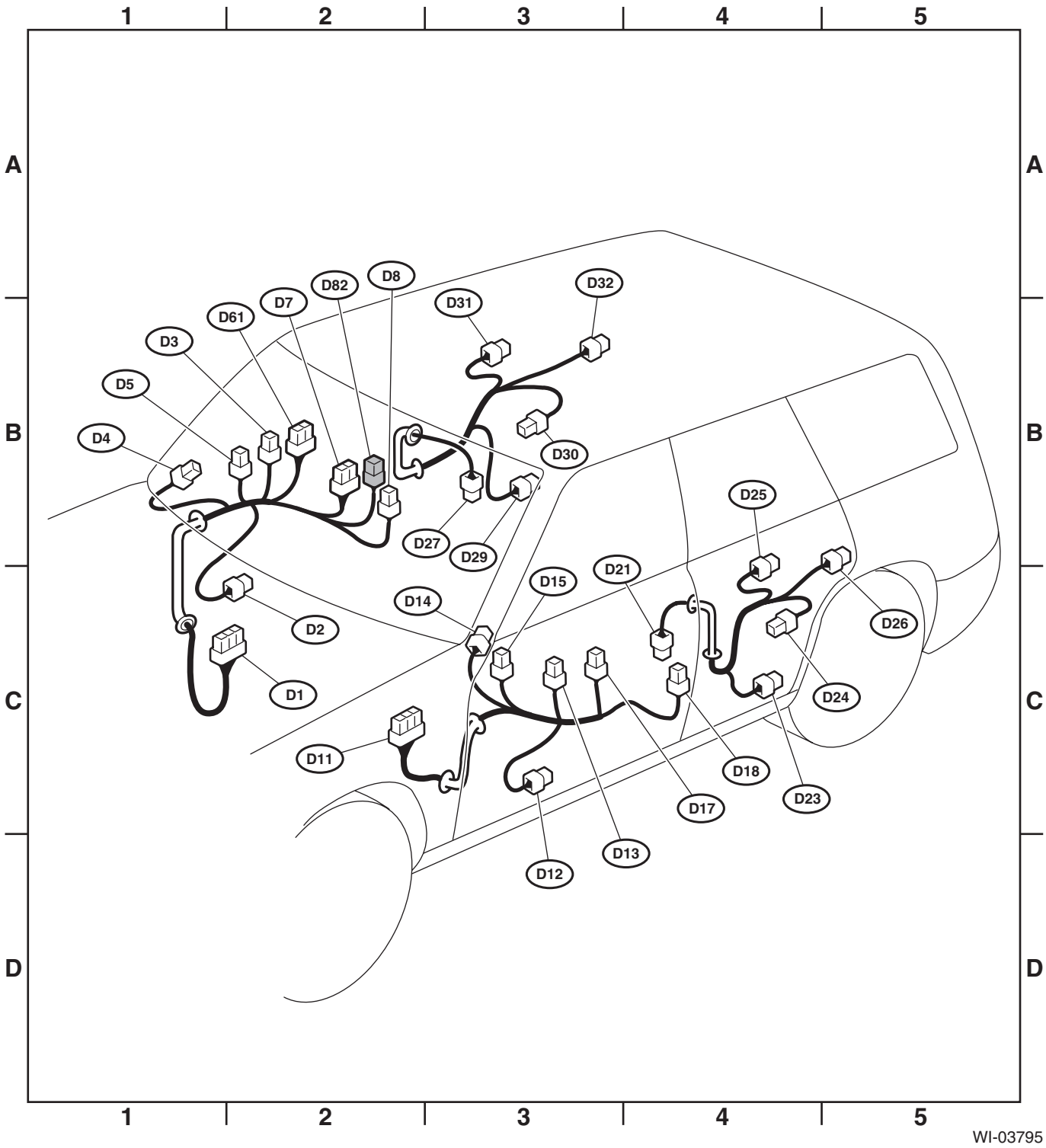
2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D1	25	★	C-2	B30	Bulkhead wiring harness
D2	2	★	C-2		Front door speaker (Driver side)
D3	2	Green	B-2		Front power window motor (Driver side)
D4	2	Black	B-1		Front door tweeter (Driver side)
D5	6	★	B-2		Remote control rearview mirror (Without mirror heater)
	8	Black	B-2		Remote control rearview mirror (With mirror heater)
D7	16	★	B-2		Power window main switch
D8	4	★	B-2		Front door lock actuator RH (Without double lock)
	6	Black	B-2		Front door lock actuator RH (With double lock)
D11	25	★	D-2	B101	Bulkhead wiring harness
D12	2	★	D-3		Front door speaker LH
D13	2	Green	C-3		Front power window motor LH
D14	2	Black	C-3		Front door tweeter LH
D15	6	★	C-3		Remote control rearview mirror LH (Without mirror heater)
	8	★	C-3		Remote control rearview mirror LH (With mirror heater)
D17	8	★	C-3		Front power window sub switch LH
D18	4	★	C-4		Front door lock actuator LH (Without double lock)
	6	Black	C-4		Front door lock actuator LH (With double lock)
D21	8	★	C-4	B269	Bulkhead wiring harness
D23	2	Green	C-4		Rear door speaker LH
D24	2	★	C-4		Rear power window motor LH
D25	8	★	B-4		Rear power window sub switch LH
D26	4	★	B-5		Rear door lock actuator LH (Without double lock)
	6	Black	B-5		Rear door lock actuator LH (With double lock)
D27	8	★	B-3	B265	Bulkhead wiring harness
D29	2	★	B-3		Rear door speaker RH
D30	2	Green	B-3		Rear power window motor RH
D31	8	★	B-3		Rear power window sub switch RH
D32	4	★	B-3		Rear door lock actuator RH (Without double lock)
	6	Black	B-3		Rear door lock actuator RH (With double lock)
D61	10	★	B-2		Remote controlled rearview mirror switch
D82	3	Brown	B-2	R81	Key cylinder switch
★: Non-colored					

Door Cord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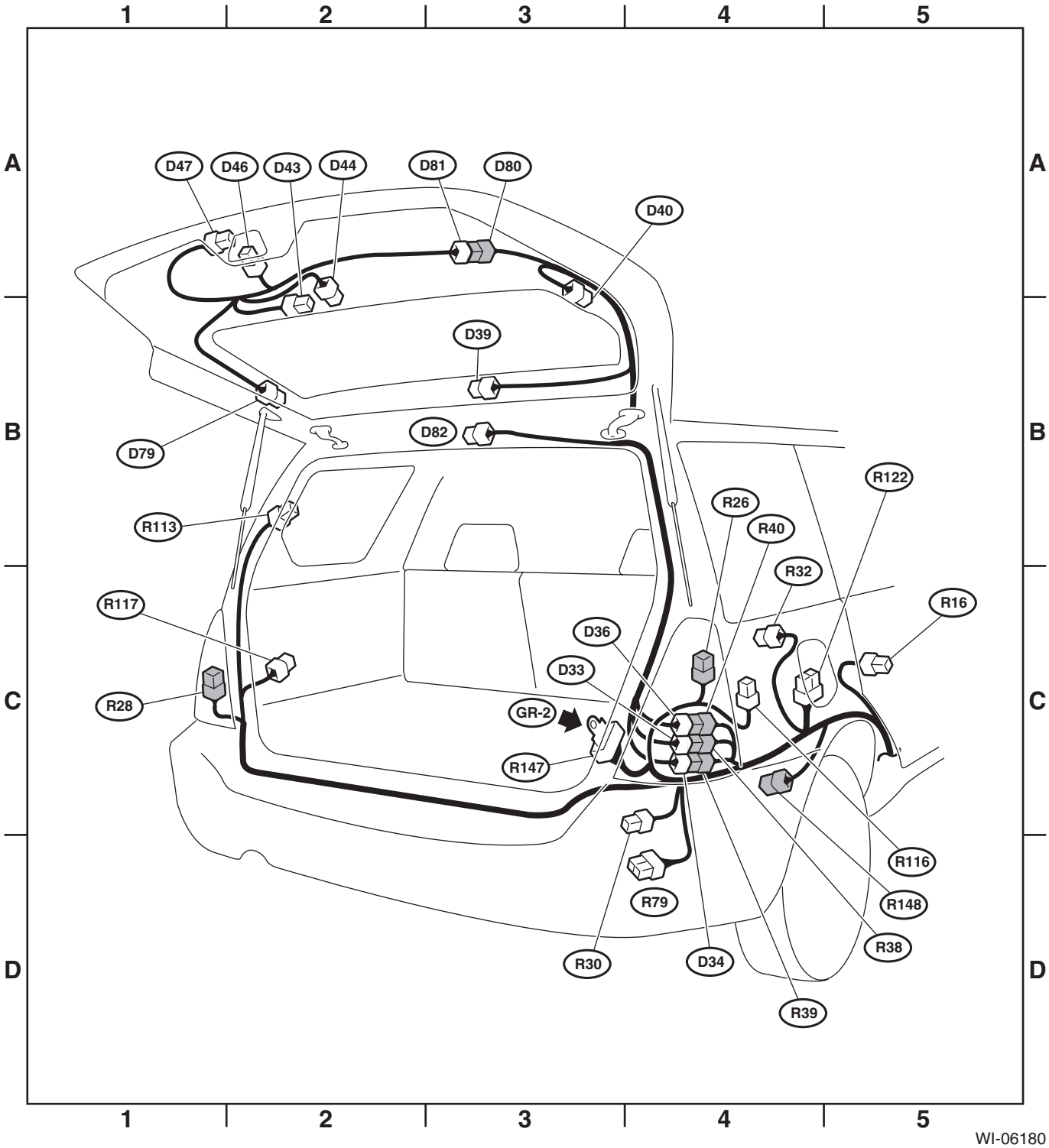
58.Rear Wiring Harness and Rear Gate Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R16	3	★	C-5		Rear door switch RH
R26	6	★	C-4		Rear combination light RH
R28	6	★	C-1		Rear combination light LH
R30	2	Black	C-4		Diode (Luggage room light)
R32	2	★	C-4		Rear accessory power supply socket
R38	4	★	C-4	D33	Rear gate cord
R39	8	★	C-4	D34	
R40	2	★	C-4	D36	Rear gate cord (RHD model)
R79	10	★	D-4		Trailer connector
R113	1	★	B-2		Antenna amp.
R116	8	★	C-4		Rear wiper intermittent module
R117	2	★	C-2		Woofer
R122	10	Black	C-4		Fuel pump control module (Turbo model)
R147	5	★	B-4		Ground joint connector (LHD model)
R148	2	★	C-4		Rear differential Oil temperature switch (Turbo model)
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D33	4	★	C-4	R38	Rear wiring harness
D34	8	★	C-4	R39	
D36	2	★	C-4	R40	Rear wiring harness (RHD model)
D39	2	Black	B-3		High-mounted stop light
D40	1	Black	A-3		Rear defogger
D43	4	★	B-2		Rear wiper motor
D44	2	★	A-2		License plate light
D46	2	Black	A-2		Rear gate latch switch
D47	4	★	A-1		Rear gate lock actuator
D79	1	Black	B-2		Rear defogger
D80	8	★	A-3	D81	Rear gate cord
D81	8	★	A-3	D80	
D82	3	★	B-3		Luggage room light
★: Non-colored					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