

# NISSAN

## PATROL GQ

MODEL Y60 SERIES



GENERAL INFORMATION \_\_\_\_\_

GI

MAINTENANCE \_\_\_\_\_

MA

ENGINE MECHANICAL \_\_\_\_\_

EM

ENGINE LUBRICATION &  
COOLING SYSTEMS \_\_\_\_\_

LC

ENGINE CONTROL SYSTEM \_\_\_\_\_

EC

ACCELERATOR CONTROL,  
FUEL & EXHAUST SYSTEM \_\_\_\_\_

FE

CLUTCH \_\_\_\_\_

CL

MANUAL TRANSMISSION \_\_\_\_\_

MT

AUTOMATIC TRANSMISSION \_\_\_\_\_

AT

TRANSFER \_\_\_\_\_

TF

PROPELLER SHAFT &  
DIFFERENTIAL CARRIER \_\_\_\_\_

PD

FRONT AXLE & FRONT SUSPENSION \_\_\_\_\_

FA

REAR AXLE & REAR SUSPENSION \_\_\_\_\_

RA

BRAKE SYSTEM \_\_\_\_\_

BR

STEERING SYSTEM \_\_\_\_\_

ST

BODY & TRIM \_\_\_\_\_

BF

HEATER & AIR CONDITIONER \_\_\_\_\_

HA

ELECTRICAL SYSTEM \_\_\_\_\_

EL

# FOREWORD

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This manual contains maintenance and repair procedures for NISSAN PATROL GR, model Y61 series.

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

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## IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.

The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.

Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.



**NISSAN EUROPE S.A.S.**

Service Engineering Section

Paris, France



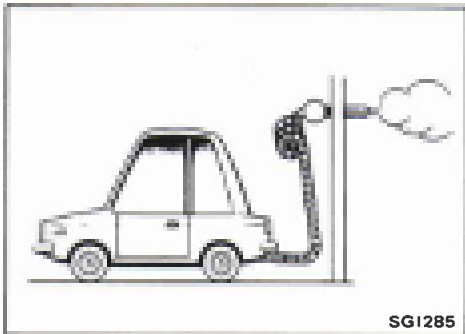
**SECTION GI**

**CONTENTS**

PRECAUTIONS ..... GI- 2  
HOW TO USE THIS MANUAL ..... GI- 4  
HOW TO READ WIRING DIAGRAMS ..... GI- 6  
IDENTIFICATION INFORMATION ..... GI- 9  
RECOMMENDED FUEL AND CAPACITY ..... GI-15  
LIFTING POINTS AND TOW TRUCK TOWING ..... GI-16  
TIGHTENING TORQUE OF STANDARD BOLTS ..... GI-22

## PRECAUTIONS

Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.



1. Do not operate the engine for an extended period of time without proper exhaust ventilation.

Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.

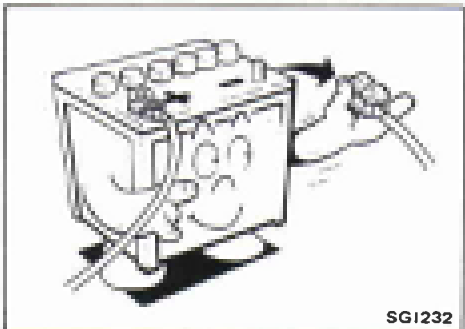
Do not smoke while working on the vehicle.



2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.

These operations should be done on a level surface.

3. When removing a heavy component such as the engine or transaxle/transmission, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.



4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.



5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.

## PRECAUTIONS

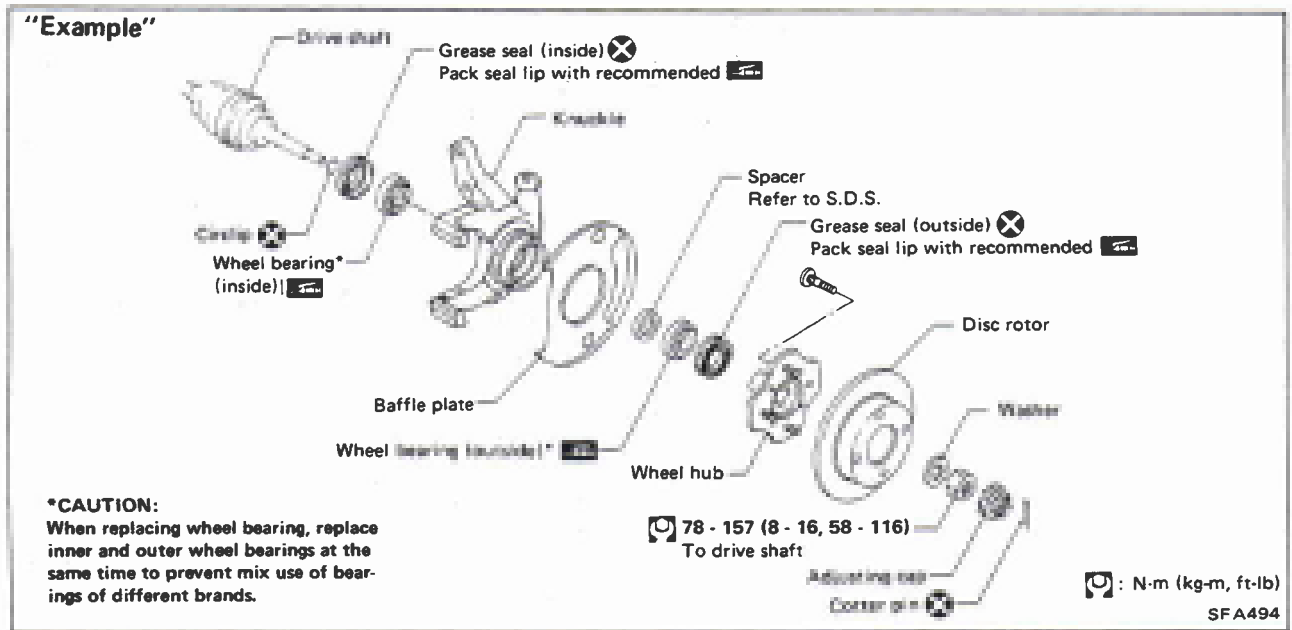
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6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers.  
Take caution that keys, buckles or buttons on your person do not scratch the paint.
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
9. Replace inner and outer races of tapered roller bearings and needle bearings as a set.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which use microcomputers (such as electronic control units).  
Static electricity may damage internal electronic components.
12. After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
13. Use only the lubricants specified in MA section.
14. Use approved bonding agent, sealants or their equivalents when required.
15. Use tools and recommended special tools where specified for safe and efficient service repairs.
16. When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.

## HOW TO USE THIS MANUAL

1. **A QUICK REFERENCE INDEX**, a black tab (e.g. **FA** ) is provided on the first page. You can quickly find the first page of each section by matching it to the section's black tab.
2. **THE CONTENTS** are listed on the first page of each section.
3. **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
4. **THE PAGE NUMBER** of each section consists of two letters, which designate the particular section, and a number (e.g. "FA-5").
5. **THE LARGE ILLUSTRATION** is an exploded view (See below) and contains tightening torques, lubrication points and other information necessary to perform repairs.  
The illustration should be used in reference to the service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG**.



6. **THE SMALL ILLUSTRATION** shows the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustration. Assembly, inspection and adjustment procedures for the complicated units such as the automatic trans-axle or transmission, etc. are presented in a step-by-step format where necessary.
7. The followings **SYMBOLS AND ABBREVIATIONS** are used:



: Tightening Torque



: Should be lubricated with grease.  
Unless otherwise indicated, use recommended multi-purpose grease.



: Should be lubricated with oil.



: Sealing point



: Checking point



: Always replace after every disassembly.

S.D.S.: Service Data and Specifications

L.H., R.H.: Left-Hand, Right-Hand

M/T: Manual Transaxle/Transmission

A/T: Automatic Transaxle/Transmission

Tool: Special Service Tools

L.H.D., Left-Hand drive models, Right-Hand

R.H.D.: drive models

## HOW TO USE THIS MANUAL

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8. The **UNIT** given in this manual are primarily expressed with the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.

**“Example”**

**Tightening torque**

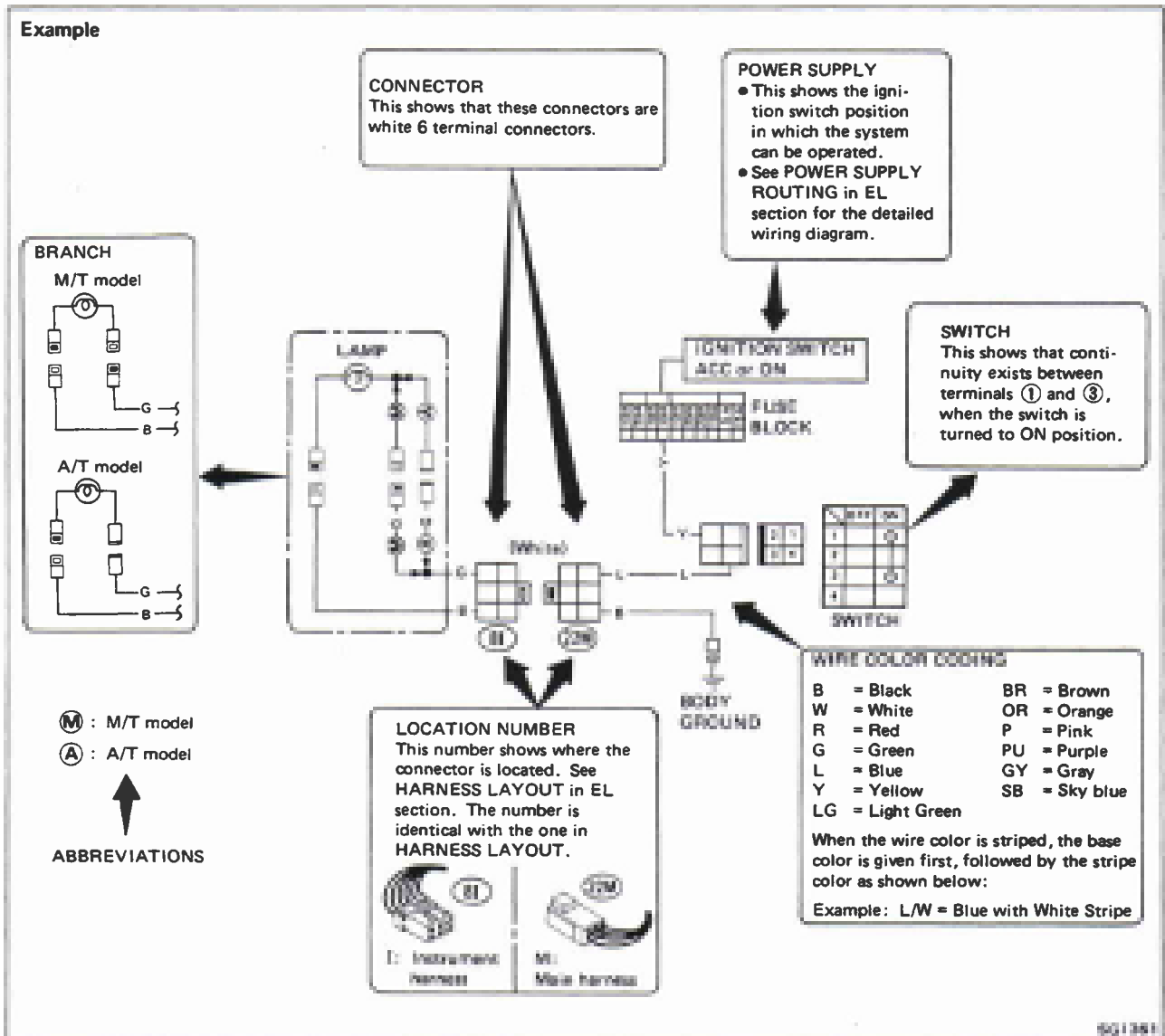
**59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)**

9. **TROUBLE DIAGNOSES AND CORRECTIONS** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** is contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.

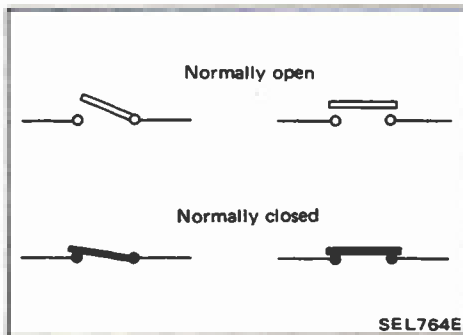
# HOW TO READ WIRING DIAGRAMS

## WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below.



## HOW TO READ WIRING DIAGRAMS

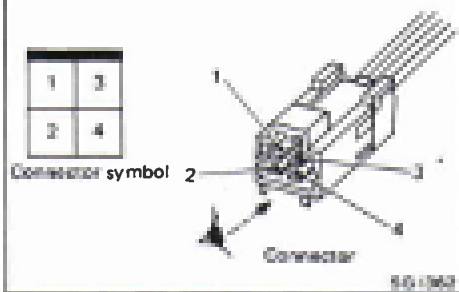


### SWITCH POSITIONS

Wiring diagram switches are shown with the vehicle in the following condition:

- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

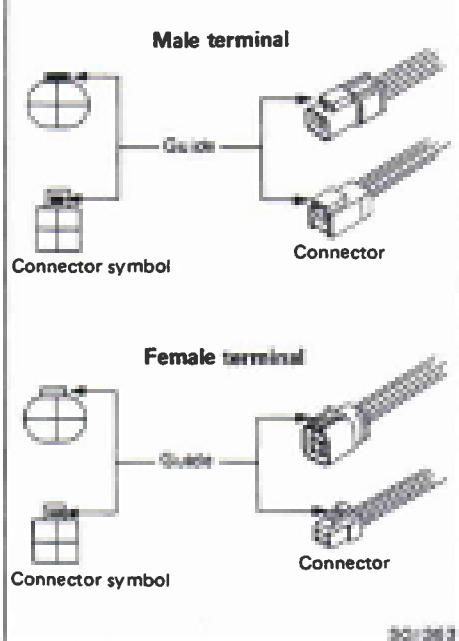
### Example



### CONNECTOR SYMBOLS

- All connector symbols in wiring diagrams are shown from the terminal side.

### Example



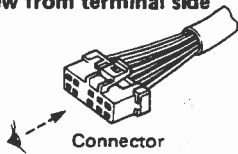
- Male and female terminals

Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

## HOW TO READ WIRING DIAGRAMS

### Example

View from terminal side



Connector

Connector symbol



Single line

Direction mark



View from harness side



Connector

Connector symbol



Double lines

Direction mark



SG1304

### DIRECTION MARK

A direction mark is shown to clarify the side of connector (terminal side or harness side).

Direction marks are mainly used in the illustrations indicating terminal inspection.



: View from terminal side . . . T.S.

- All connector symbols shown from the terminal side are enclosed by a single line.



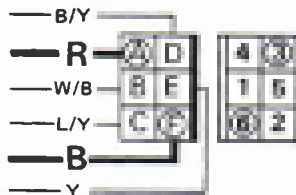
: View from harness side . . . H.S.

- All connector symbols shown from the harness side are enclosed by double lines.

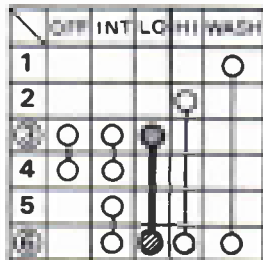
### MULTIPLE SWITCH

The continuity of the multiple switch is identified in the switch chart in wiring diagrams.

### Example



WIPER SWITCH



Continuity circuit of wiper switch

SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3 - 4
INT	3 - 4, 5 - 6
LO	3 - 6
HI	2 - 6
WASH	1 - 6

Example: Wiper switch in LO position

Continuity circuit: Red wire - (A) terminal - (3) terminal - Wiper switch (● - ●): LO) - (6) terminal - (F) terminal - Black wire

SG1365



GI-9

Destination	Handle	Cabin	Transmission	Tires	Model	Hardtop				Station Wagon	
						Forward facing	Less	Side facing	Side facing	High-roof	
										2nd center split bench 3rd forward facing	2nd center split bench 3rd side facing
										H233B	
H233B											
Gulf standard (Middle East)	L.H.	TB42	FS5R50A	TX12A	STD	KLY60SFR	-	KLY60GSFR	JLY60GSFR	-	WLG Y60GSFR
			FS5R50A		DX	KLY60FR	-	-	-	WLG Y60FR	WLG Y60GFR
			RE4R03A		DX	KLY60KR	-	-	-	WLG Y60KR	-
Except Gulf standard (Middle East) and Australia	L.H.	TB42	FN4R50A	TX12A	STD	KLY60S	-	-	JLY60GS	-	-
			FS5R50A		STD	-	-	-	-	-	
			FS5R50A		DX	KLY60F	-	-	-	-	
		TD42	FN4R50A		STD	KRLY60S	-	-	JRLY60GS	-	-
			FS5R50A		STD	-	-	-	-	-	
			FS5R50A		DX	KRLY60F	-	-	-	-	
	R.H.	TB42	FN4R50A		STD	KY60SU	-	-	JY60GSU	-	-
			FS5R50A		STD	-	-	-	-	-	
			FS5R50A		DX	KY60FU	-	-	-	-	
		TD42	FN4R50A		STD	KRY60SU	-	-	JRY60GSU	-	-
			FS5R50A		STD	-	-	-	-	-	
			FS5R50A		DX	KRY60FU	-	-	-	-	
Australia	R.H.	TB42	FS5R50A	STD	KY60SFM	-	-	-	-	-	
			FS5R50A	DX	KY60FM	-	-	-	-		
			RE4R03A	DX	KY60KM	-	-	-	-		
		TD42	FS5R50A	STD	KRY60SFM	KRY60LSFM	-	-	-		
			FS5R50A	DX	KRY60FM	-	-	-	-		

Model Variation

IDENTIFICATION INFORMATION

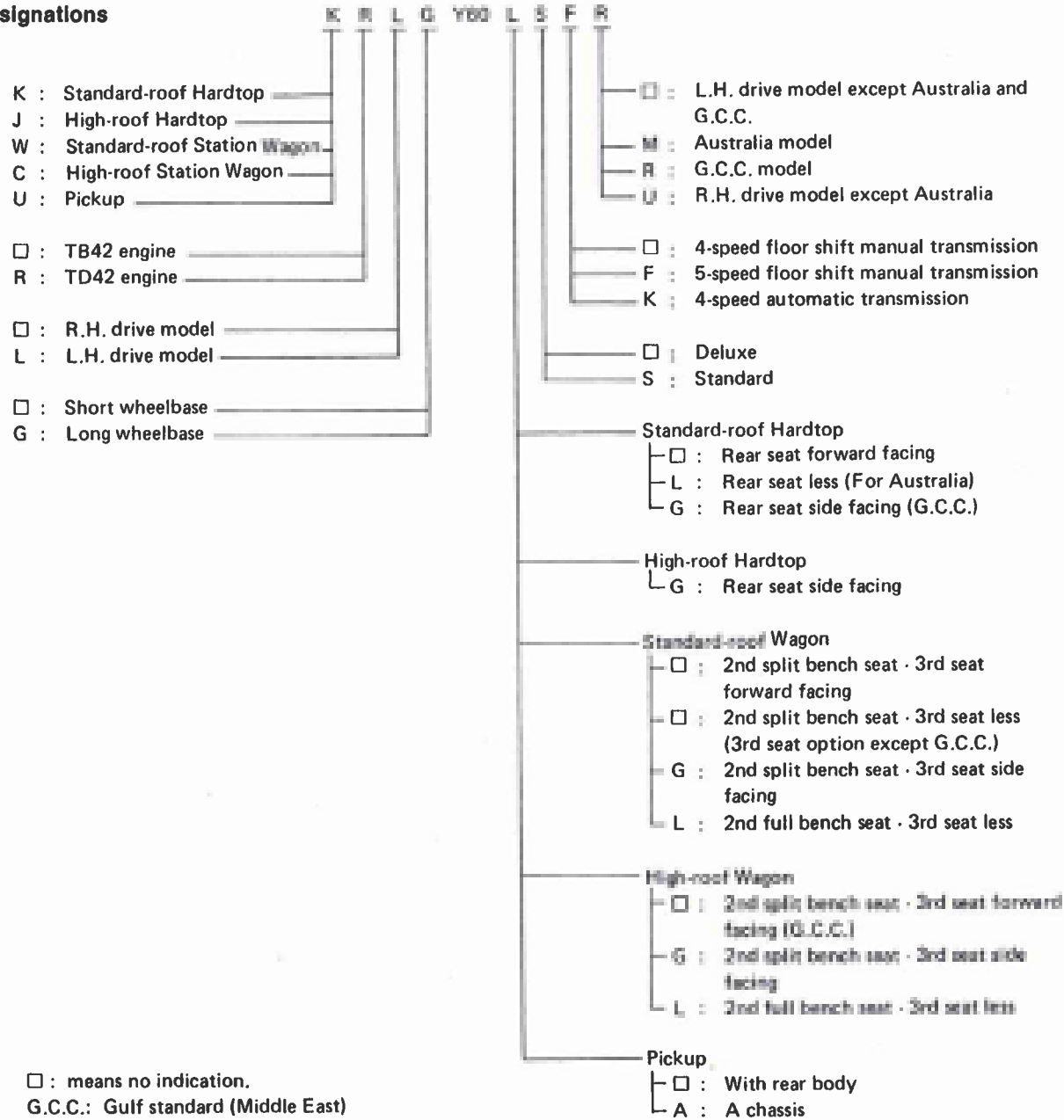
GI-10

Model				Station Wagon						Pickup	
				High-roof						A chassis	
				2nd center split bench 3rd less	2nd full bench 3rd less	2nd center split bench 3rd forward facing	2nd center split bench 3rd side facing	2nd full bench 3rd less			
				H233B						H260	
Rear seat arrangement				H233B						H260	
Front differential				H233B						H260	
Rear differential				H233B						H260	
Grade				H233B						H260	
Transfer				H233B						H260	
Gulf standard (Middle East)	L.H.	TB42	FS5R50A	STD	-	-	-	-	-	ULGY60SFR	-
			FS5R50A	DX	-	-	CLGY60FR	CLGY60GFR	-	-	-
			RE4R03A	DX	-	-	-	CLGY60GKR	-	-	-
Except Gulf standard (Middle East) and Australia	L.H.	TB42	FN4R50A	STD	WLGY60S	WLGY60LS	-	CLGY60GS	CLGY60LS	ULGY60S	ULGY60AS
			FS5R50A	STD	-	-	-	-	-	ULGY60SF	ULGY60ASF
			FS5R50A	DX	WLGY60F	-	-	CLGY60GF	-	-	-
		TD42	FN4R50A	STD	WRLGY60S	WRLGY60LS	-	CRLGY60GS	CRLGY60LS	URLGY60S	URLGY60AS
			FS5R50A	STD	-	-	-	-	-	URLGY60SF	URLGY60ASF
			FS5R50A	DX	WRLGY60F	-	-	CRLGY60GF	-	-	-
	R.H.	TB42	FN4R50A	STD	WGY60SU	WGY60LSU	-	-	-	UGY60SU	UGY60ASU
			FS5R50A	STD	-	-	-	-	-	UGY60SFU	UGY60ASFU
			FS5R50A	DX	WGY60FU	-	-	CGY60GFU	-	-	-
		TD42	FN4R50A	STD	WRGY60SU	WRGY60LSU	-	CRGY60GSU	-	URGY60SU	URGY60ASU
			FS5R50A	STD	-	-	-	-	-	URGY60SFU	URGY60ASFU
			FS5R50A	DX	WRGY60FU	-	-	CRGY60GFU	-	-	-
Australia	R.H.	TB42	FS5R50A	STD	WGY60SFM	WGY60LSFM	-	-	-	UGY60SFM	UGY60ASFM
			FS5R50A	DX	WGY60FM	-	-	-	-	-	-
			RE4R03A	DX	WGY60KM	-	-	-	-	-	-
	TD42	FS5R50A	STD	WRGY60SFM	WRGY60LSFM	-	-	-	URGY60SFM	URGY60ASFM	
		FS5R50A	DX	WRGY60FM	-	-	-	-	-	-	

Model Variation (Cont'd)

IDENTIFICATION INFORMATION

**Prefix and suffix designations**

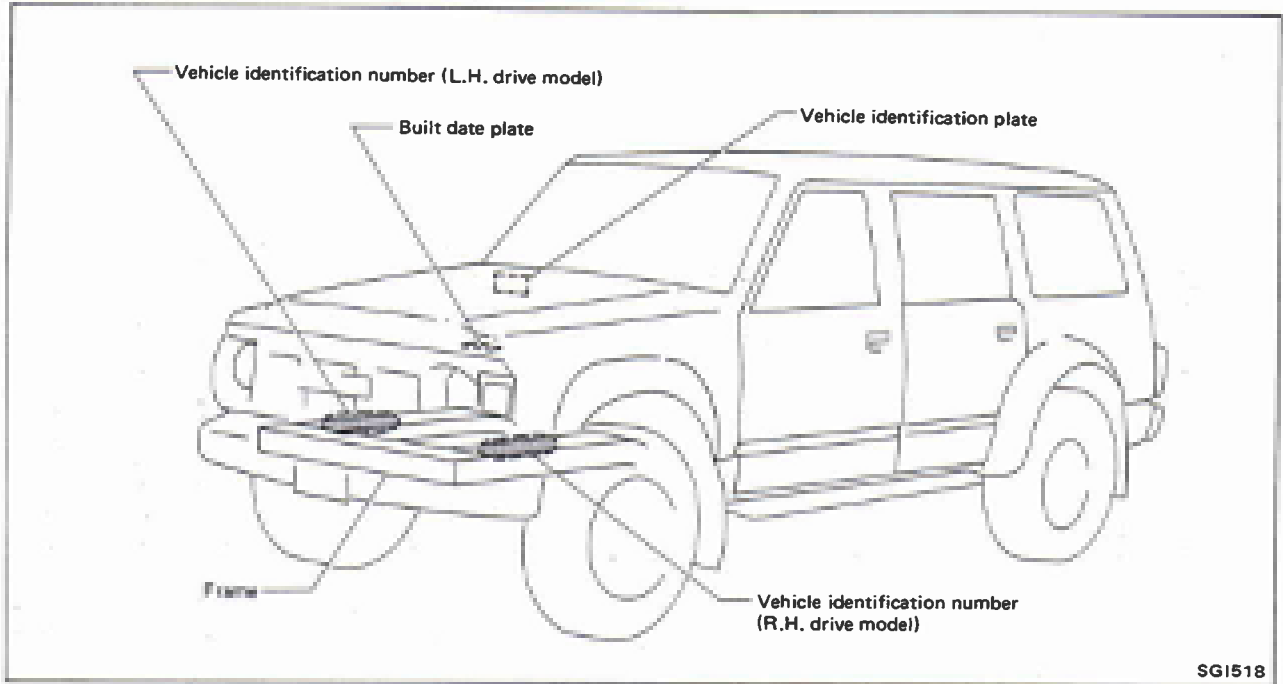


GI-11

IDENTIFICATION INFORMATION  
Model Variation (Cont'd)

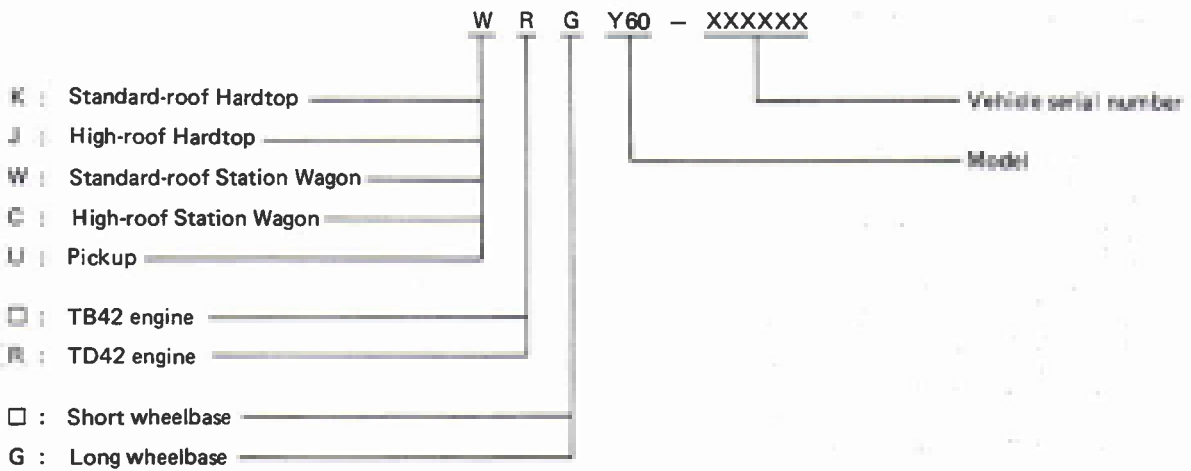
# IDENTIFICATION INFORMATION

## Identification Number



### VEHICLE IDENTIFICATION NUMBER (Chassis number)

Prefix and suffix designations



# IDENTIFICATION INFORMATION

## Identification Number (Cont'd)

### IDENTIFICATION PLATE

NISSAN MOTOR CO., LTD. JAPAN		
型式	TYPE TIPO	△
CHASSIS NO. NO. DE CHASSIS		△
MODEL MODELO		△
○ カラー-COLOR TRIM トリム-COLOR GUARNICION		△ △ ○
エンジン MOTOR		△ △ CC
ミッション TRANS. AXLE		△ △
アクスル TRANS. EJE		△ △
	工場 PLANT PLANTA	
日産自動車株式会社		MADE IN JAPAN


501534

- 1 Type
- 2 Vehicle identification number (Chassis number)
- 3 Model
- 4 Body color code
- 5 Trim color code
- 6 Engine model
- 7 Engine displacement
- 8 Transmission model
- 9 Axle model

### ENGINE SERIAL NUMBER

**TB42 engine**

Stamped on the cylinder block

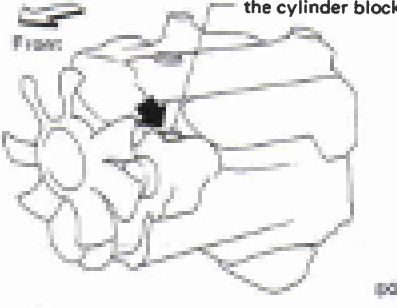


Front

501529

**TD42 engine**

Stamped on the cylinder block

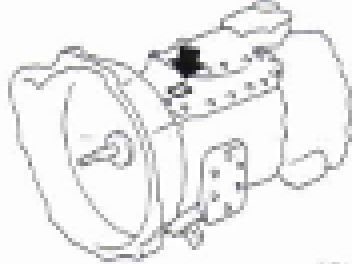


Front

501520

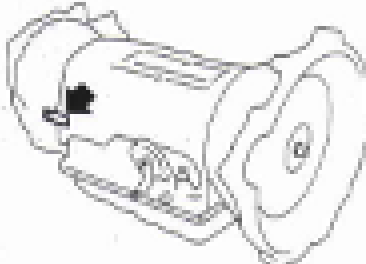
### TRANSMISSION SERIAL NUMBER

**Manual transmission**



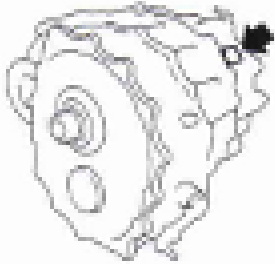
501521

**Automatic transmission**



501545

### TRANSFER SERIAL NUMBER



501523

## IDENTIFICATION INFORMATION

### Dimensions

		Station Wagon	Hardtop	Pickup
Overall length*5	mm (in)	4,810 (189.4), 4,850 (190.9)*1	4,240 (166.9), 4,280 (168.5)*1	4,970 (195.7)
Overall width	mm (in)	1,800 (70.9)	1,800 (70.9)	1,690 (66.5)
Overall height	mm (in)	1,815 (71.5), 1,995 (78.5)*2, 1,785 (70.3)*3, 1,815 (71.5)*4	1,825 (71.9), 1,995 (78.5)*2, 1,795 (70.7)*3, 1,825 (71.9)*4	1,855 (73.0)
Front tread	mm (in)	1,530 (60.2)	1,530 (60.2)	1,435 (56.5)
Rear tread	mm (in)	1,535 (60.4)	1,535 (60.4)	1,405 (55.3)
Wheelbase	mm (in)	2,970 (116.9)	2,400 (94.5)	2,970 (116.9)

\*1: For Gulf standard (Middle East)

\*2: High-roof models

\*3: For Australia equipped with 215/80R16 tires

\*4: For Australia

\*5: For models with winch ... over length beyond 185 mm (7.3 in)

### Wheels & Tires

Road wheel		5.50F-16SDC	6JJ-16	5.50F-15SDC	7JJ-15
Size					
Offset	mm (in)	30 (1.18)	30 (1.18)	-5 (-0.20)	5 (0.20)
Tire size		6.50-16-6PRLT 7.00-16-6PRLT (Front) 7.00-16-10PRLT (Rear) 7.50-16-6PRLT 7.50-16-8PRLT 7.50R16-6PRLT 7.50R16-8PRLT	215/80R16 107Q	9.00-15-6PR	10R15-6PRLT

## **RECOMMENDED FUEL AND CAPACITY**

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### **GASOLINE ENGINE**

**For Australia ... Unleaded gasoline of above 91 octane (RON)**

**Do not use leaded gasoline.**

**Except for Australia ... Gasoline of above 88 octane (RON)**

### **DIESEL ENGINE**

**Above 45 cetane**

### **FUEL TANK CAPACITY**

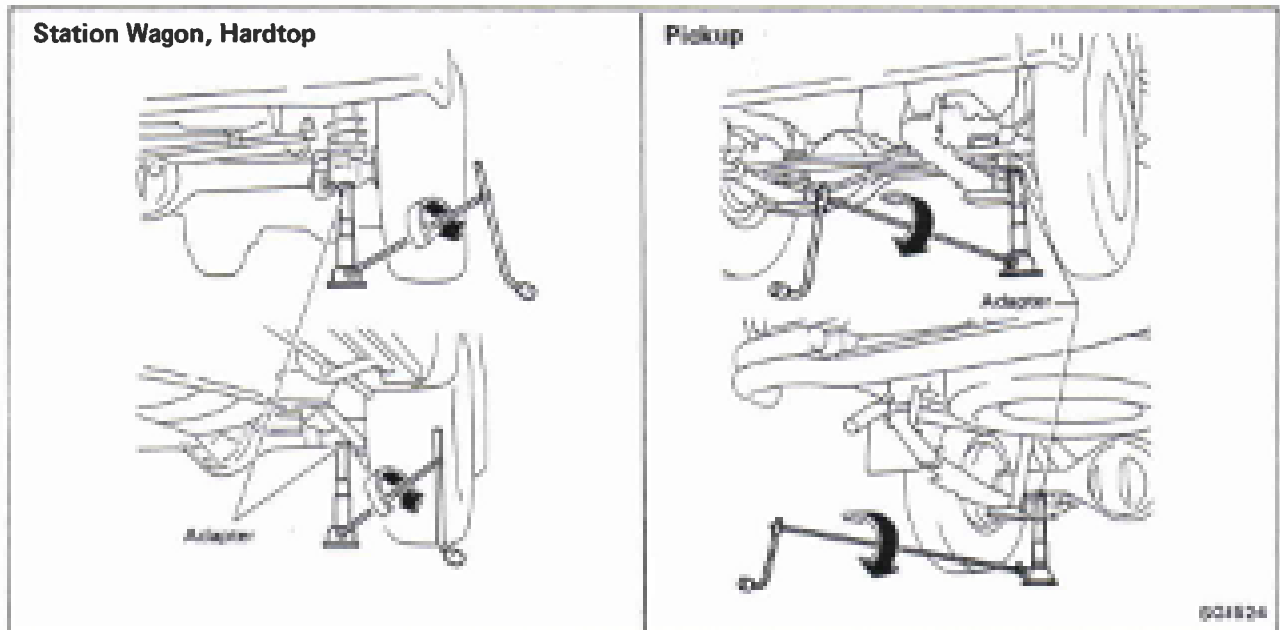
**95ℓ (20-7/8 Imp gal)**

## LIFTING POINTS AND TOW TRUCK TOWING

### WARNING:

- a. Never get under the vehicle while it is supported only by the jack. Always use safety stands to support the frame when you have to get under the vehicle.
- b. Place wheel chocks at both front and back of the wheel which is diagonally opposite the jack position.  
Example: If the jack is positioned at the L.H. front wheel, place wheel chocks at R.H. rear wheel.

### Screw Jack





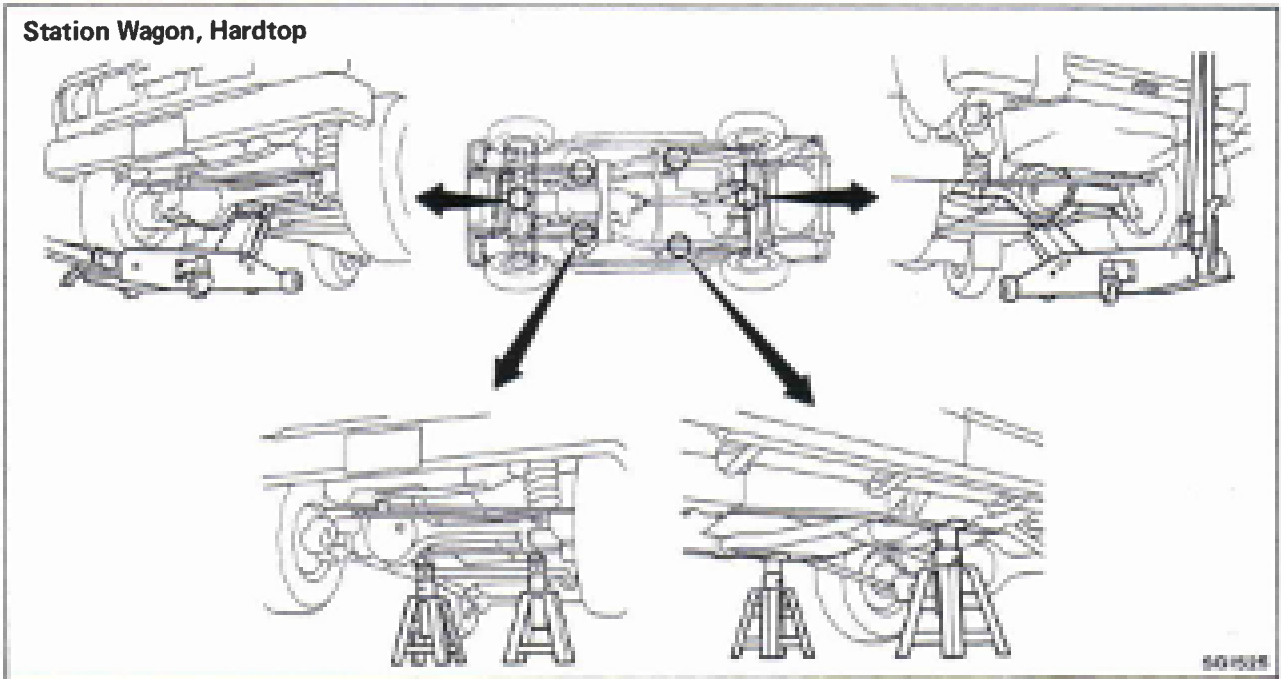
## LIFTING POINTS AND TOW TRUCK TOWING

### Garage Jack and Safety Stand

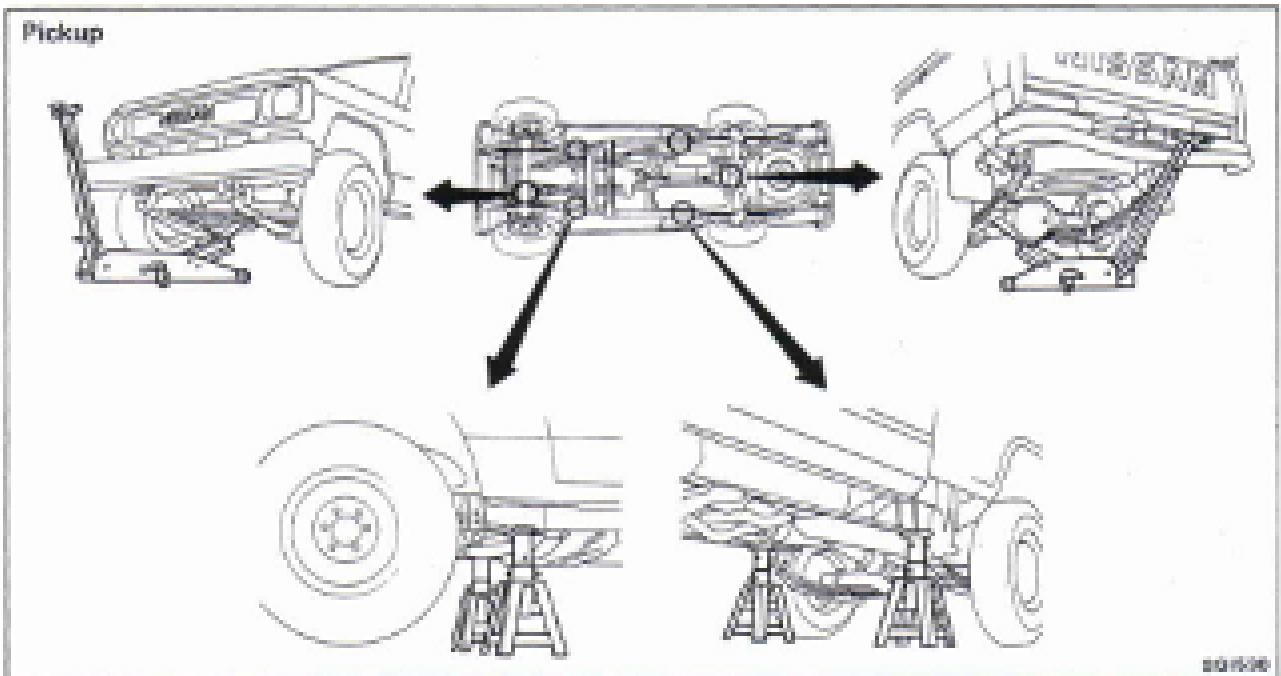
**CAUTION:**

- Place a wooden or rubber block between safety stand and vehicle body when the supporting body is flat.

**Station Wagon, Hardtop**



**Pickup**



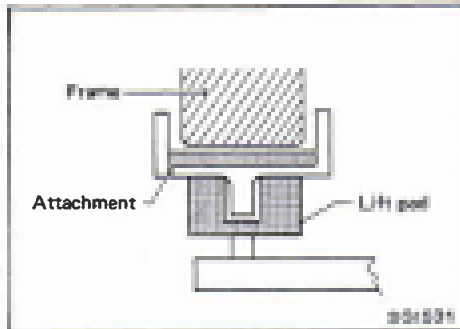
## LIFTING POINTS AND TOW TRUCK TOWING

### 2-pole Lift

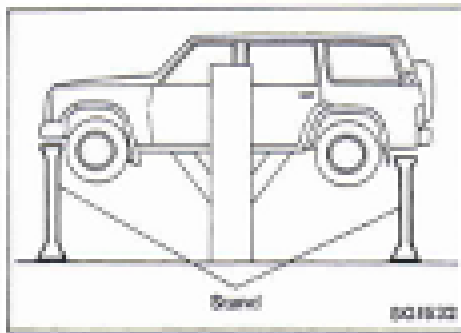
**WARNING:**

When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.

When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.

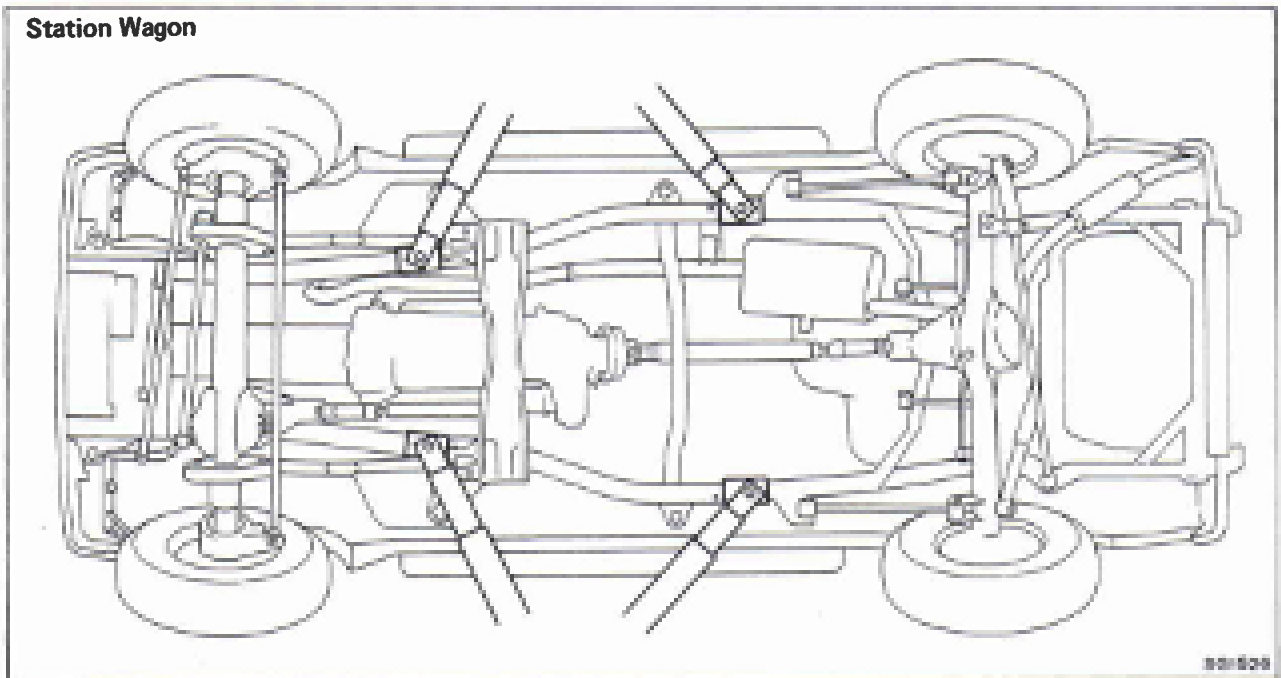


Put the attachment in the slit of the lift pad to prevent the frame from slipping.



Use suitable stands at the correct places as illustrated, to prevent the vehicle from becoming unbalanced.

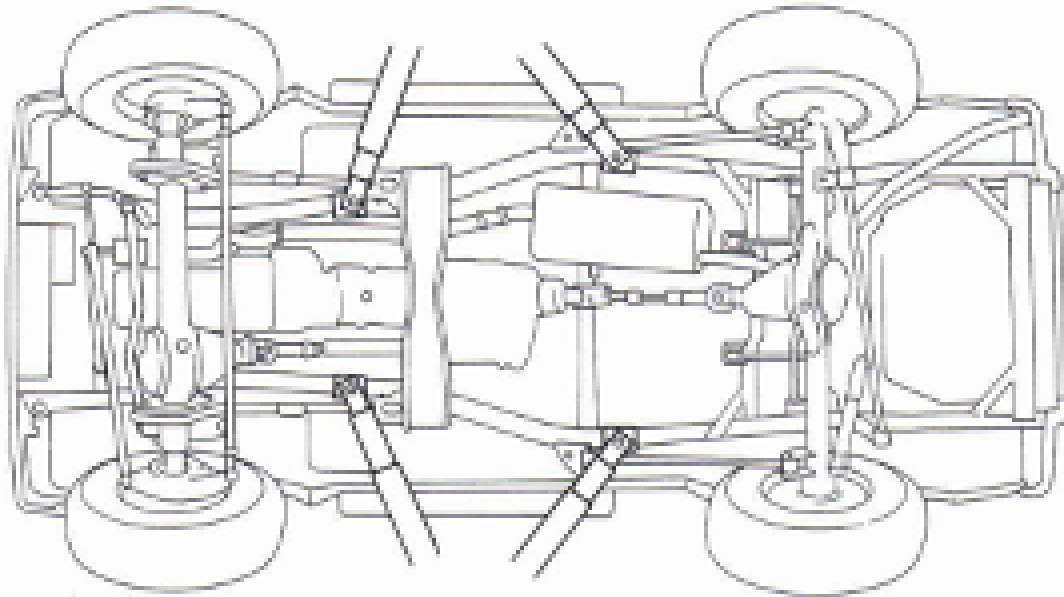
### Station Wagon



# LIFTING POINTS AND TOW TRUCK TOWING

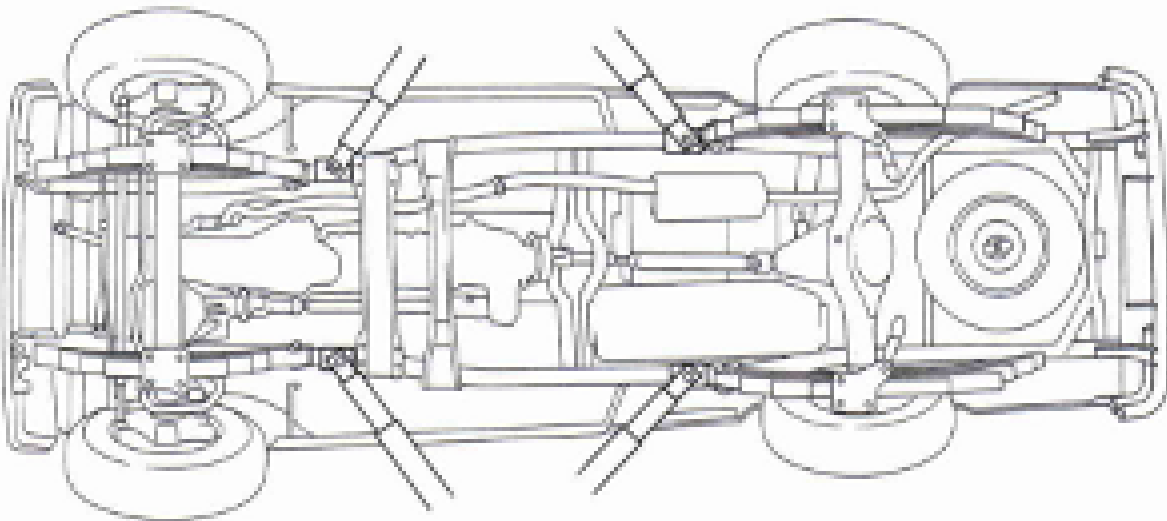
## 2-pole Lift (Cont'd)

Hardtop



9-01 1027

Pickup



9-01 1028

## LIFTING POINTS AND TOW TRUCK TOWING

### Tow Truck Towing

#### CAUTION:

- All applicable local laws regarding the towing operation must be obeyed.
- It is necessary to use proper towing equipment to avoid possible damage to the vehicle during a towing operation.
- Attach safety chains for all towing.
- When towing, make sure that the transmission, steering system and power train are in good order. If any unit is damaged, a dolly must be used.
- When towing with the front wheels on the ground:  
Turn the ignition key to the "OFF" position and secure the steering wheel in a straight-ahead position with a rope or similar device. Never place the ignition key in the "LOCK" position. This will result in damage to the steering lock mechanism.

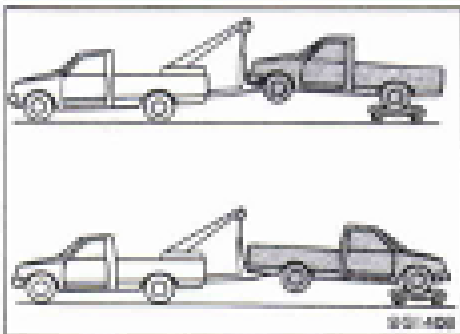
- When towing with the rear wheels on the ground:

For M/T model

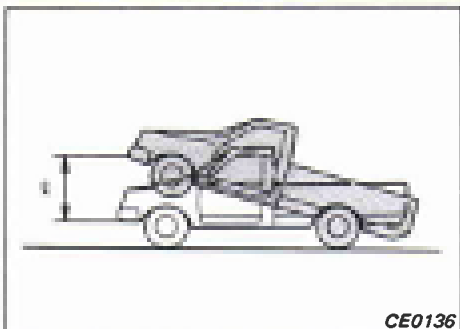
Release parking brake, set free-running hubs to the free position. Move both gearshift and transfer lever to neutral ("N" position).

For A/T model

Release parking brake, set free-running hubs to the free position. Move gearshift lever to "N" position, and move transfer lever to "2H" position.



NISSAN recommends that a dolly be used as illustrated.



If you have to tow a manual transmission model with front wheels raised (with rear wheels on ground)

Observe the following restricted raising heights.

- Do not raise the front end over  $\ell$ .

Wagon/Pickup/Van

$\ell = 600 \text{ mm (23.62 in)}$

Hardtop

$\ell = 500 \text{ mm (19.69 in)}$

## LIFTING POINTS AND TOW TRUCK TOWING

### Tow Truck Towing (Cont'd)

If you have to tow an automatic transmission model with four wheels on ground or tow an automatic transmission model with front wheels raised (with rear wheels on ground)

Observe the following restricted towing speeds, distances and raising heights.

- Speed: Below 50 km/h (30 MPH)
- Distance: Less than 65 km (40 miles)
- Do not raise the front end over  $\ell$ .

Wagon/Pickup

$\ell = 600 \text{ mm (23.62 in)}$

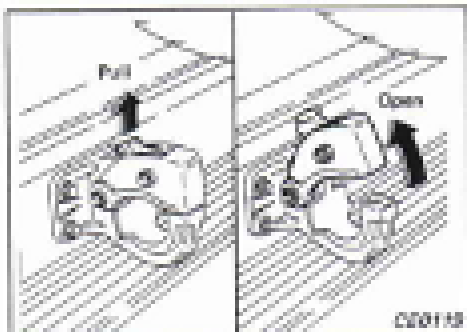
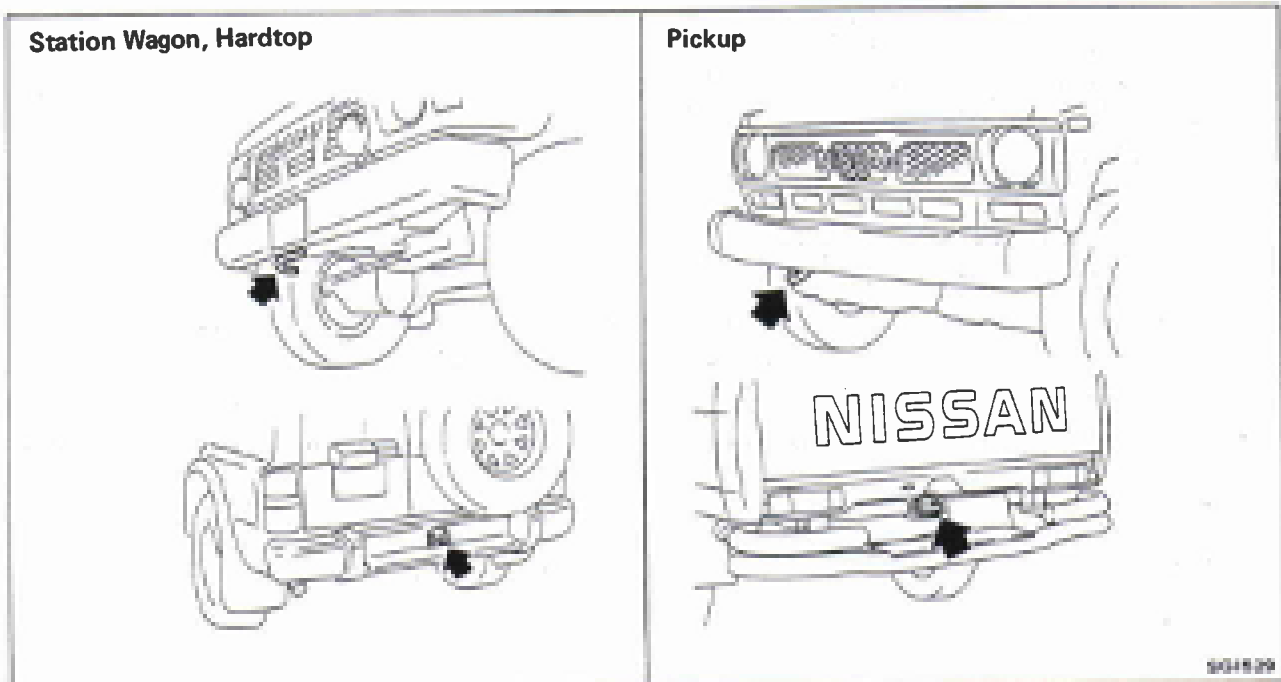
Hardtop

$\ell = 500 \text{ mm (19.69 in)}$

If the speed, distance or height must be greater, remove the front and rear propeller shafts beforehand to prevent damage to the transmission.

### TOWING HOOKS

The towing hooks are provided only for emergency.



### PINTLE HOOK

Do not use the pintle hook for towing another vehicle, trailer, etc. This hook is designed for use only in an emergency, i.e., when getting the vehicle out of the mud.

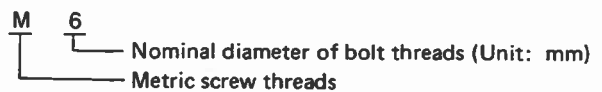
## TIGHTENING TORQUE OF STANDARD BOLTS

Grade	Bolt size	Bolt diameter* mm	Pitch mm	Tightening torque (Without lubricant)					
				Hexagon head bolt			Hexagon flange bolt		
				N-m	kg-m	ft-lb	N-m	kg-m	ft-lb
4T	M6	6.0	1.0	5.1	0.52	3.8	6.1	0.62	4.5
	M8	8.0	1.25	13	1.3	9	15	1.5	11
			1.0	13	1.3	9	16	1.6	12
	M10	10.0	1.5	25	2.5	18	29	3.0	22
			1.25	25	2.6	19	30	3.1	22
	M12	12.0	1.75	42	4.3	31	51	5.2	38
1.25			46	4.7	34	56	5.7	41	
M14	14.0	1.5	74	7.5	54	88	9.0	65	
7T	M6	6.0	1.0	8.4	0.86	6.2	10	1.0	7
	M8	8.0	1.25	21	2.1	15	25	2.5	18
			1.0	22	2.2	16	26	2.7	20
	M10	10.0	1.5	41	4.2	30	48	4.9	35
			1.25	43	4.4	32	51	5.2	38
	M12	12.0	1.75	71	7.2	52	84	8.6	62
1.25			77	7.9	57	92	9.4	68	
M14	14.0	1.5	127	13.0	94	147	15.0	108	
9T	M6	6.0	1.0	12	1.2	9	15	1.5	11
	M8	8.0	1.25	29	3.0	22	35	3.6	26
			1.0	31	3.2	23	37	3.8	27
	M10	10.0	1.5	59	6.0	43	70	7.1	51
			1.25	62	6.3	46	74	7.5	54
	M12	12.0	1.75	98	10.0	72	118	12.0	87
1.25			108	11.0	80	137	14.0	101	
M14	14.0	1.5	177	18.0	130	206	21.0	152	

1. Special parts are excluded.
2. This standard is applicable to bolts having the following marks embossed on the bolt head.

\*: Nominal diameter

Grade	Mark
4T .....	4
7T .....	7
9T .....	9



# MAINTENANCE

# SECTION MA


MA

## CONTENTS

PREPARATION .....	MA- 2
PRE-DELIVERY INSPECTION ITEMS .....	MA- 3
MAINTENANCE SCHEDULE .....	MA- 4
RECOMMENDED LUBRICANTS .....	MA- 8
ENGINE MAINTENANCE .....	MA-10
CHASSIS AND BODY MAINTENANCE .....	MA-31
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	MA-42

## PREPARATION

### SPECIAL SERVICE TOOL

Tool number Tool name	Description
EG17650301 Radiator cap tester adapter	 <p>Adapting radiator cap tester to radiator filler neck</p>



## PRE-DELIVERY INSPECTION ITEMS

Shown below are Pre-delivery Inspection Items required for the new vehicle. It is recommended that necessary items other than those listed here be added, paying due regard to the conditions in each country.

Perform applicable items on each model. Consult text of this section for specifications.

### UNDER HOOD — engine off

- Radiator coolant level and coolant hose connections for leaks
- Battery fluid level, specific gravity and conditions of battery terminals
- Drive belts tension
- Fuel filter for water or dusts, and fuel lines and connections for leaks
- Engine oil level and oil leaks
- Clutch and brake reservoir fluid level and fluid lines for leaks
- Windshield and rear window washer and headlamp cleaner reservoir fluid level
- Power steering reservoir fluid level and hose connections for leaks

### ON INSIDE AND OUTSIDE

- Remove front spring/strut spacer (If applicable)
- Operation of all instruments, gauges, lights and accessories
- Operation of horn(s), wiper and washer
- Steering lock for operation
- Check air conditioner for gas leaks
- Front and rear seats, and seat belts for operation
- All moldings, trims and fittings for fit and alignment
- All windows for operation and alignment
- Hood, trunk lid, door panels for fit and alignment
- Latches, keys and locks for operation
- Weatherstrips for adhesion and fit
- Headlamp aiming
- Tighten wheel nuts (Inc. inner nuts if applicable)
- Tire pressure (Inc. spare tire)
- Check front wheels for toe-in
- Install clock/voltmeter/room lamp fuse (If applicable)
- Install deodorizing filter to air purifier (If applicable)
- Remove wiper blade protectors (If applicable)

### UNDER BODY

- Manual transmission/transaxle, transfer and differential gear oil level
- Brake and fuel lines and oil/fluid reservoirs for leaks
- Tighten bolts and nuts of steering linkage and gear box, suspension, propeller shafts and drive shafts
- Tighten rear body bolts and nuts (Models with wooden bed only)

### ROAD TEST

- Clutch operation
- Parking brake operation
- Service brake operation
- Automatic transmission/transaxle shift timing and kickdown
- Steering control and returnability
- Engine performance
- Squeaks and rattles

### ENGINE OPERATING AND HOT

- Adjust idle mixture and speed, and ignition timing
- Automatic transmission/transaxle fluid level
- Engine idling and stop knob operation (Diesel only)

### FINAL INSPECTION

- Install necessary parts (outside mirror, wheel covers, seat belts, mat, carpet or mud flaps)
- Inspect for interior and exterior metal and paint damage
- Check for spare tire, jack, tools (wheel chock), and literature
- Wash, clean interior and exterior

## MAINTENANCE SCHEDULE

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

**Periodic maintenance beyond the last period shown on the tables requires similar maintenance.**

MAINTENANCE OPERATION		MAINTENANCE INTERVAL										Reference page	
		km x 1,000 (Miles x 1,000) Months	1 (0.6)	10 (6)	20 (12)	30 (18)	40 (24)	50 (30)	60 (36)	70 (42)	80 (48)		
<b>ENGINE AND EMISSION CONTROL MAINTENANCE</b>													
<b>Underhood and under vehicle</b>													
												Gasoline	Diesel
	Torque check manifolds, exhaust tube & carburetor fixing nuts*1		☒									MA-10	MA-21
	Adjust intake & exhaust valve clearances		☒		☒		☒		☒		☒	MA-10	MA-21
	Check drive belts for cracks, fraying, wear & tension		☒		☒		☒		☒		☒	MA-11	MA-22
	Change engine anti-freeze coolant (Ethylene glycol base, L.L.C.)						☒				☒	MA-12	MA-23
	Change engine coolant (Soft water)*1			☒	☒	☒	☒	☒	☒	☒	☒	MA-12	MA-23
	Check cooling system			☒		☒		☒		☒		MA-13	MA-24
	Check fuel lines						☒				☒	MA-13	MA-26
	Clean & replace air cleaner filter (Dry paper type)*1	Clean*		☒	☒	☒		☒	☒	☒	☒	MA-14	MA-26
		Replace*						☒			☒	MA-14	MA-26
	Replace air cleaner filter (Viscous paper type)*						☒				☒	MA-14	MA-26
	Check cyclone pre-air cleaner*						☒				☒	MA-15	MA-27
	Change engine oil (Use API SE or SF oil.) & oil filter*			☒	☒	☒	☒	☒	☒	☒	☒	MA-15, 16	
	Check & adjust idle rpm & mixture ratio (Check mixture ratio only on models bound for areas affected by emission regulations.)		☒	☒*1	☒	☒*1	☒	☒*1	☒	☒*1	☒	EF & EC-36	
	Adjust ignition timing			X*1	☒	X*1	☒	X*1	☒	X*1	☒		
	Replace fuel filter*						☒				☒	MA-14	
GASOLINE ENGINE	Check & replace distributor breaker point	Check*1		☒		☒		☒		☒		MA-16	
		Replace			☒		☒		☒		☒	MA-16	
	Check & replace spark plugs	Check*1		☒		☒		☒		☒		MA-17	
		Replace			☒		☒		☒		☒	MA-17	
	Check ignition wires						☒				☒	MA-18	
	Check choke mechanism (Choke plate & linkage)*2				☒		☒		☒		☒	MA-18	
	Check positive crankcase ventilation (P.C.V.) system				☒		☒		☒		☒	MA-18	
	Replace P.C.V. filter*						☒				☒	MA-18	
	Check vacuum hoses & connections				☒		☒		☒		☒	MA-19	
	Check automatic temperature control air cleaner				☒		☒		☒		☒	MA-19	
Check vapor lines (Hoses, connections, etc.) (Australia & Gulf standard models only)						☒				☒	MA-19		
Check E.G.R. control system (Gulf standard models with A/T only)				☒		☒		☒		☒	MA-20		
DIESEL ENGINE	Check fuel filter & drain water*2			☒	☒	☒		☒	☒	☒		MA-20	
	Replace fuel filter*						☒				☒	MA-25	
	Change engine oil (Use API CC or CD oil.)*						Every 5,000 km (3,000 miles) or 3 months				MA-22		
	Change oil filter*				☒	☒	☒	☒	☒	☒	☒	MA-23	
	Check nozzle						See NOTE (1).				MA-27		
	Check idling speed			☒		☒		☒		☒		MA-27	
	Drain oil & lubricate diaphragm (Governor chamber for injection pump)*1			☒	☒	☒	☒	☒	☒	☒	☒	MA-23	

- NOTE: (1) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check and, if necessary, adjust the fuel injection nozzle's starting pressure and the fuel spray pattern.**
- (2) Maintenance items with "\*" should be performed more frequently according to "Maintenance under severe driving conditions".**

Check: Check. Correct or replace if necessary.

\*1: Non-Australia models only

\*2: Australia models only

## MAINTENANCE SCHEDULE

MAINTENANCE OPERATION		MAINTENANCE INTERVAL										Reference page
Perform either at number of kilometers (miles) or months, whichever comes first.	km x 1,000	1	10	20	30	40	50	60	70	80		
	(Miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(38)	(42)	(48)		
Months		-	6	12	18	24	30	36	42	48		
<b>CHASSIS AND BODY MAINTENANCE</b>												
<i>Underhood</i>												
Check brake, clutch, automatic transmission & steering gear fluid or oil level & for leaks*		X	X	X	X	X	X	X	X	X	X	MA-31, 32, 36, 39
Change brake fluid*						X					X	MA-37
Check brake booster vacuum hoses, connections & check valve						X					X	MA-37
Check power steering fluid & lines		X	X	X	X	X	X	X	X	X	X	MA-39
<i>Under vehicle</i>												
Check brake, clutch, exhaust systems for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.		X	X	X	X	X	X	X	X	X	X	MA-31, 36
Check oil level & change oil in manual transmission, transfer & differential gear	Check	X	X	X			X	X	X			MA-31, 33, 34
	Change					X					X	MA-31, 33, 35
Grease greasing points of steering linkage & propeller shafts*		X	X	X	X	X	X	X	X	X	X	MA-34, 40
Check steering gear box & linkage, axle & suspension parts & propeller shaft for damaged, loose & missing parts & lubrication*		X	X	X	X	X	X	X	X	X	X	MA-33, 39 & FA-6, RA-5
Check steering damper			X			X			X		X	MA-40
Fasten body mountings		X	X			X			X		X	BF-48
<i>Outside and inside</i>												
Check wheel alignment. If necessary, rotate & balance wheels			X			X			X		X	MA-31, 33 & FA-6
Check brake pads, discs & other brake components for wear, deterioration & leaks*		X	X	X	X	X	X	X	X	X	X	MA-37
Check brake linings, drums & other brake components for wear, deterioration & leaks*			X			X			X		X	MA-38
Check front wheel bearing grease & free-running hub grease*			X						X			MA-35
Repack front wheel bearing & front axle joint grease, & check free-running hub grease						X					X	MA-35
Lubricate locks, hinges & hood latch*		X	X	X	X	X	X	X		X	X	MA-41
Check seat belts, buckles, retractors, anchors & adjuster			X			X			X		X	MA-41
Check foot brake, parking brake & clutch for free play, stroke & operation		X	X	X	X	X	X	X	X	X	X	CL-5 & BR-8

**NOTE:** Maintenance items with "\*" should be performed more frequently according to "Maintenance under severe driving conditions".

Check: Check. Correct or replace if necessary.

## MAINTENANCE SCHEDULE

### MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance is required to be performed on the following items as shown in the table.

#### Severe driving conditions

- A — Driving under dusty conditions
- B — Driving repeatedly short distances
- C — Towing a trailer
- D — Extensive idling
- E — Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high
- F — Driving in high humidity areas or in mountainous areas
- G — Driving in areas using salt or other corrosive materials
- H — Driving on rough and/or muddy roads or in the desert
- I — Frequent driving in water

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page	
				Gasoline	Diesel
A . . . . .	Air cleaner filter	Check	More frequently	MA-14	MA-26
	Dry paper type				
	All types	Replace		MA-14	MA-26
	Cyclone pre-air cleaner	Check		MA-15	MA-27
A B C D . . . . .	P.C.V. filter	Replace		MA-19	--
	Engine oil				
A B C D . . . . .	Gasoline engine	Replace	Every 5,000 km (3,000 miles) or 3 months	MA-15	--
	Diesel engine	Replace	More frequently	--	MA-33
A B C D . . . . .	Engine oil filter	Replace	Every 5,000 km (3,000 miles) or 3 months	MA-15	MA-33
A . . . . .	Fuel filter	Replace	Every 20,000 km	MA-14	MA-25
. . . . .	Brake fluid	Replace	(12,000 miles) or 12 months	MA-37	
. . . . .	Automatic transmission fluid	Replace	Every 40,000 km (24,000 miles) or 24 months	MA-33	
. . . . . G H .	Steering gear & linkage, axle & suspension parts & propeller shafts	Check	Every 5,000 km (3,000 miles) or 3 months	MA-33, 39 & FA-6, RA-5	
A B C . . . . G H .	Brake pads, discs & other brake components	Check		MA-37	
A B C . . . . G H .	Brake linings, drums & other brake components	Check	Every 10,000 km (6,000 miles) or 6 months	MA-38	
. . . . . G H I	Greasing points of steering linkage & propeller shafts	Lubricate		MA-34, 40	
. . . . . I	Front wheel bearing grease & free-running hub grease	Check	Every 5,000 km (3,000 miles) or 3 months	MA-35, 36	
. . . . .	Lock, hinges & hood latch	Lubricate		MA-41	

Maintenance operation: Check = Check. Correct or replace if necessary.

## **MAINTENANCE SCHEDULE**

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### **Maintenance for off-road driving**

Whenever you drive off-road through sand, mud or water as deep as the wheel hub, more frequent maintenance may be required of the following items:

- ▲ Brake pads and discs
- ▲ Brake lining and drums
- ▲ Brake lines and hoses
- ▲ Wheel bearing grease and free-running hub grease
- ▲ Differential, transmission and transfer oil
- ▲ Steering linkage
- ▲ Propeller shafts
- ▲ Air cleaner filter
- ▲ Clutch housing and knuckle flange (Check water entry. Refer to MA-32 & 36.)

## RECOMMENDED LUBRICANTS

### Lubricants

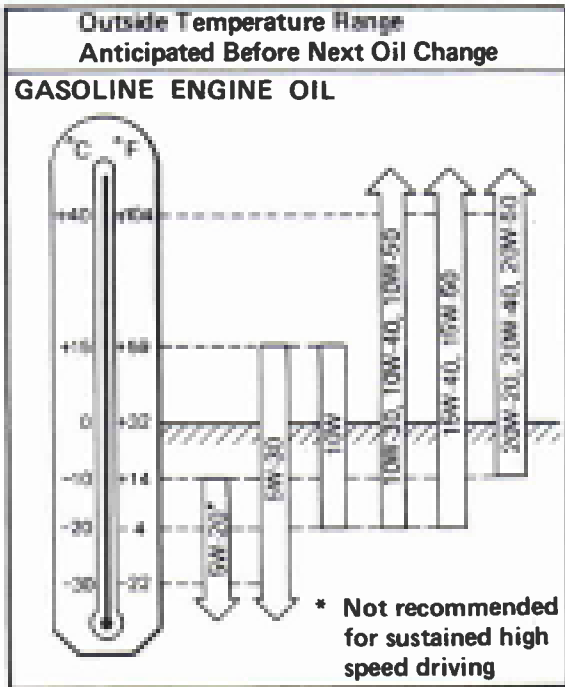
	Capacity (Approximate)		Recommended lubricants	
	Liter	Imp measure		
<b>Engine oil (Refill)</b>				
<b>With oil filter</b>				
TB42	8.2	7-1/4 qt	Gasoline engine: API SE or SF* 1 Diesel engine: API CC or CD* 1	
TD42	9.2	8-1/8 qt		
<b>Without oil filter</b>				
TB42	7.7	6-3/4 qt		
TD42	8.0	7 qt		
<b>Cooling system (With reservoir tank)</b>				
<b>With heater</b>				
TB42	M/T	13.9	Anti-freeze coolant (Ethylene glycol base) or soft water	
TB42	A/T	13.6		
TD42	M/T	13.6		
TD42	M/T	12-1/4 qt		
<b>Without heater</b>				
TB42	M/T	13.3		
TB42	A/T	13.0		
TD42	M/T	12.8		
Cooling system	13	11-1/2 qt	Anti-freeze coolant (Ethylene glycol base) or soft water	
Injection pump diaphragm oil	—	—	Cod liver oil or BOSCH 0L36V 1	
Manual transmission gear oil	3.9	6-7/8 pt		
Transfer oil	2.2	2 qt	API GL-4* 1	
Steering gear oil	0.5	7/8 pt		
<b>Differential carrier gear oil</b>				
<b>Front</b>				
H233B	5.4	4-3/4 qt (Except for Pickup)	Standard differential: API GL-5* 1 Limited-slip differential: Gear oil hypoid L.S.D. (Part No.: KLD31-14002) or equivalent* 2	
H233B	4.3	3-3/4 qt (Pickup)		
<b>Rear</b>				
H233B	2.1	1-7/8 qt		
H260	4.7	4-1/8 qt		
Automatic transmission fluid	8.5	7-1/2 qt	Type DEXRON™	
Power steering fluid	0.9 - 1.0	3/4 - 7/8 qt		
Brake and clutch fluid	—	—	DOT3 (US FMVSS No. 116)	
Multi-purpose grease	—	—	NLGI No. 2 (Lithium soap base)	
Front axle joint grease	—	—	NLGI No.2 (Molybdenum disulphide lithium soap base)	
Auto free-running hub grease	—	—	Nissan genuine grease (Part No.: KRC19-00025) or equivalent	

\*1: For further details, see "SAE Viscosity Number".

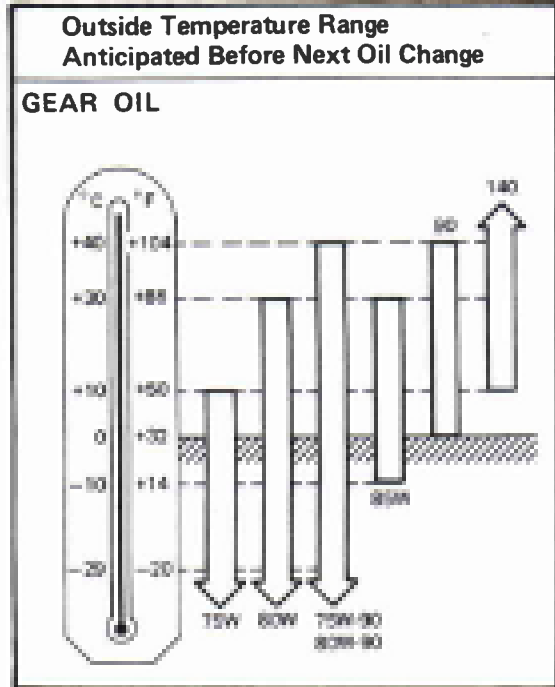
\*2: API GL-5, SAE 140 and 10% volume of L.S.D. friction modifier (Part No.: 38469-C6000) or equivalent.

# RECOMMENDED LUBRICANTS

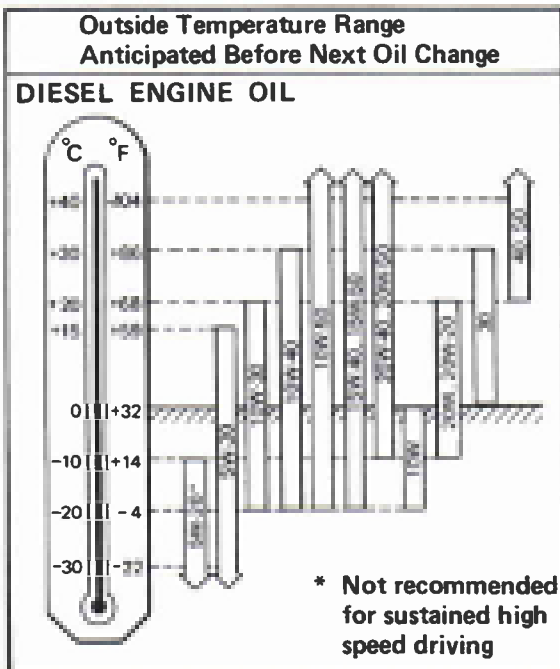
## SAE Viscosity Number



- For warm and cold areas: 10W-30 is preferable for ambient temperatures above  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ).
- For hot areas: 20W-40 and 20W-50 are suitable.

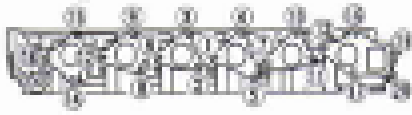


- For warm and cold areas: 75W-90 for transmission of gasoline engine model and transfer, 80W-90 for differential carrier and 90 for transmission of diesel engine model are preferable.
- For hot areas: 90 is suitable for ambient temperatures below  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ).



- For cold areas: 10W-30 is preferable.
- For hot and warm areas: 20W-40 and 20W-50 are suitable.

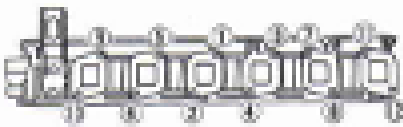
Intake side



Tighten in numerical order.

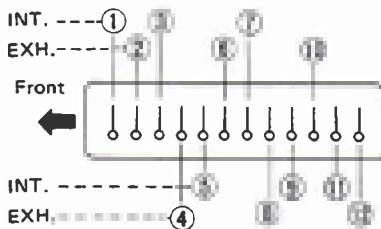
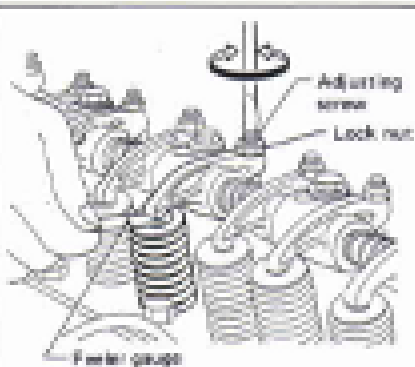
SMA872B

Exhaust side



Tighten in numerical order.

SMA873B



SMA874B

### Checking Tightening Torque

- Checking should be performed while engine is cold.

### MANIFOLD BOLTS AND NUTS

☞ Intake manifold

16 - 19 N·m (1.6 - 1.9 kg-m, 12 - 14 ft-lb)

☞ Exhaust manifold

27 - 31 N·m (2.8 - 3.2 kg-m, 20 - 23 ft-lb)

### EXHAUST TUBE NUTS

☞ 43 - 50 N·m (4.4 - 5.1 kg-m, 32 - 37 ft-lb)

### CARBURETOR NUTS

☞ 16 - 19 N·m (1.6 - 1.9 kg-m, 12 - 14 ft-lb)

### Adjusting Intake and Exhaust Valve Clearance

Adjustment should be made while engine is warm but not running.

1. Set No. 1 cylinder at top dead center on its compression stroke, and adjust valve clearances ①, ②, ③, ⑥, ⑦ and ⑩.
2. Set No. 6 cylinder at top dead center on its compression stroke, and adjust valve clearances ④, ⑤, ⑧, ⑨, ⑪ and ⑫.

Valve clearance:

Intake ①, ③, ⑤, ⑦, ⑨ and ⑪

0.38 mm (0.015 in)

Exhaust ②, ④, ⑥, ⑧, ⑩ and ⑫

0.38 mm (0.015 in)

Adjusting screw lock nuts

☞ 16 - 22 N·m (1.6 - 2.2 kg-m, 12 - 16 ft-lb)

- Tighten rocker cover bolts in numerical order.

☞ 1 - 3 N·m (0.1 - 0.3 kg-m, 0.7 - 2.2 ft-lb)

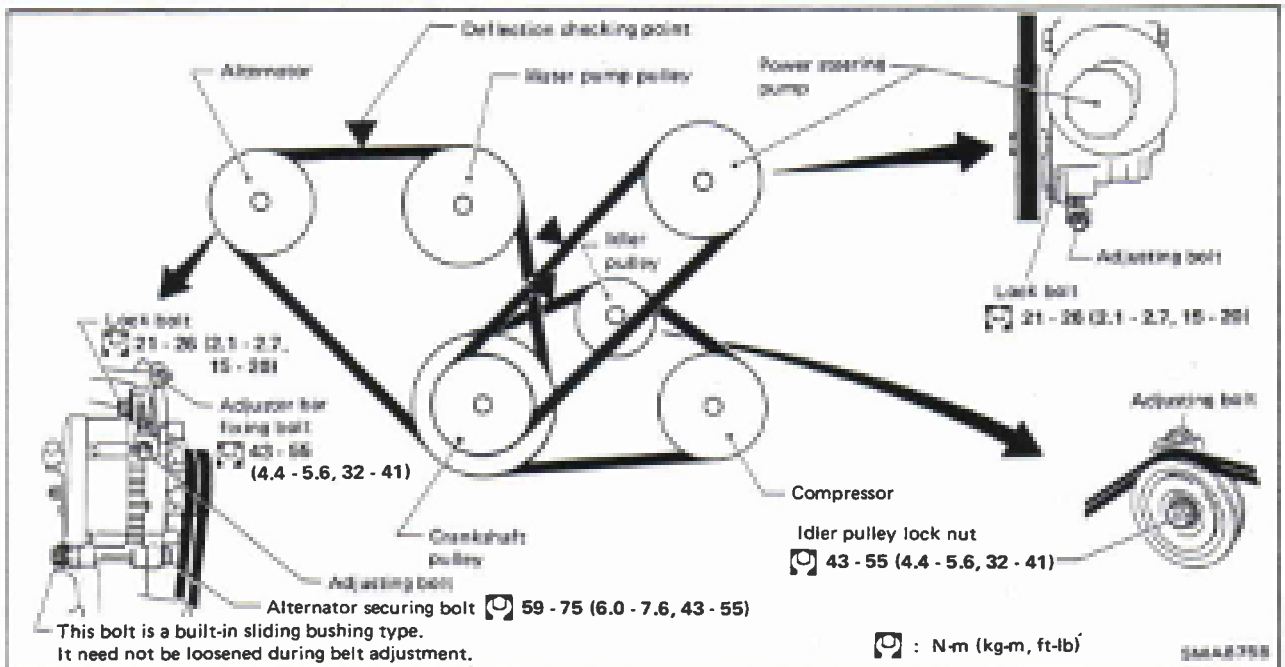


Tighten in numerical order.

SMA891B



Checking Drive Belts



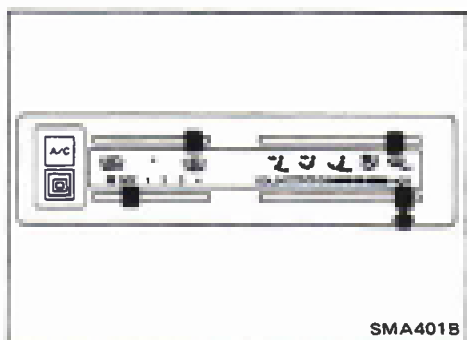
1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
  2. Inspect drive belt deflections by pushing on the belt midway between pulleys.
- Adjust if belt deflections exceed the limit.**

**Belt deflection:**

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjusted deflection	
Alternator	16 (0.63)	13 - 15 (0.51 - 0.59)	10 - 12 (0.39 - 0.47)
Air conditioner compressor	11 (0.43)	8 - 10 (0.31 - 0.39)	6 - 8 (0.24 - 0.31)
Power steering oil pump	19 (0.75)	15 - 17 (0.59 - 0.67)	14 - 16 (0.55 - 0.63)
Applied pushing force	98 N (10 kg, 22 lb)		

**Inspect drive belt deflections when engine is cold.**

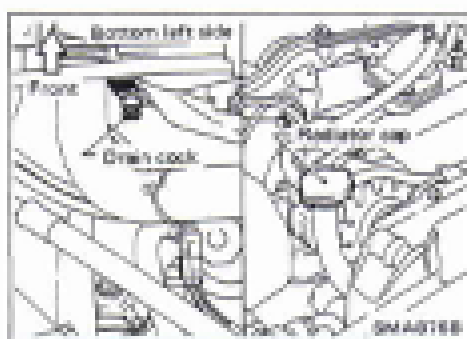


## Changing Engine Coolant

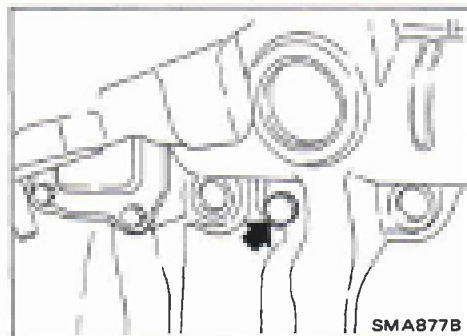
### WARNING:

To avoid being scalded, never change the coolant when the engine is hot.

1. Move heater "TEMP" control lever all the way to "HOT" position.

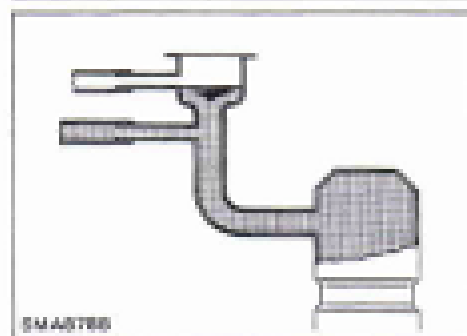


2. Open drain cock at the bottom of radiator, and remove radiator cap.
  - Be careful not to allow coolant to contact drive belts.



3. Remove cylinder block drain plug.
4. Close drain cock and tighten drain plug securely.
5. Fill radiator with water and warm up engine.
6. Stop engine and wait until it cools down.
7. Repeat step 2 through step 6 until clear water begins to drain from radiator.
8. Drain water.
  - Apply sealant to the thread of drain plug.

⌘: 34 - 44 N·m (3.5 - 4.5 kg·m, 25 - 33 ft·lb)



9. Fill radiator with coolant up to specified level. Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

**Coolant capacity (With reservoir tank): liter (Imp qt)**

**With heater**

M/T 13.9 (12-1/4)

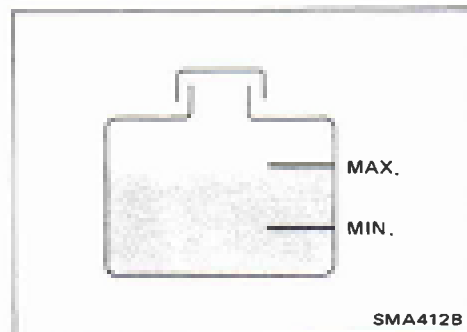
A/T 13.6 (12)

**Without heater**

M/T 13.3 (11-3/4)

A/T 13.0 (11-1/2)

**Pour coolant through coolant filler neck slowly to allow air in system to escape.**

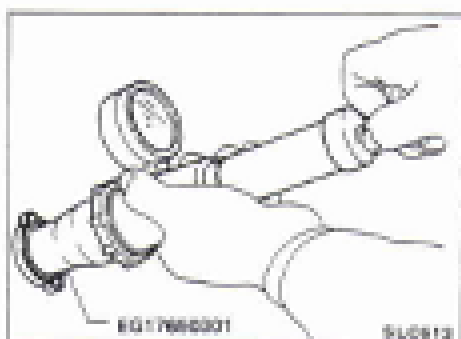


10. Remove reservoir tank, drain coolant, then clean reservoir tank.
11. Fill reservoir tank with coolant up to "MAX" level.
12. Run engine and warm it up.
13. Stop engine and cool it down, then add coolant as necessary.

## Checking Cooling System

### CHECKING HOSES

Check hoses for proper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



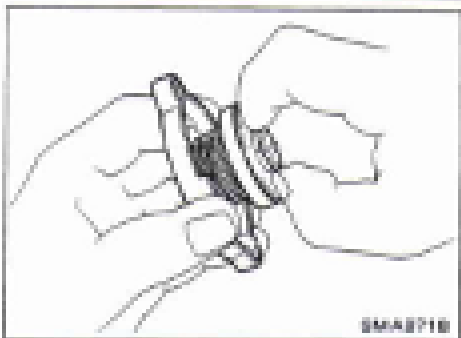
### CHECKING RADIATOR CAP

Apply pressure to radiator cap with cap tester to see if it is satisfactory.

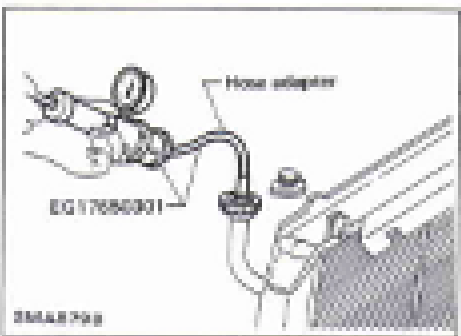
**Radiator cap relief pressure:**

**78 - 98 kPa**

**(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm<sup>2</sup>, 11 - 14 psi)**



Pull the negative-pressure valve to open it. Check that it closes completely when released.



### CHECKING COOLING SYSTEM FOR LEAKS

Apply pressure to the cooling system with cap tester to check for leakage.

**Testing pressure:**

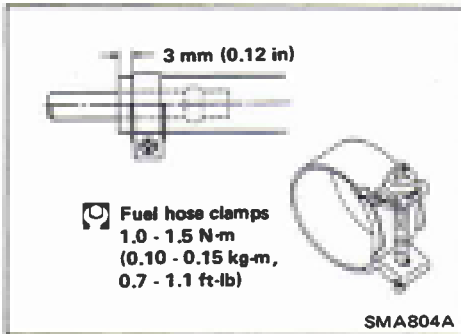
**98 kPa (0.98 bar, 1.0 kg/cm<sup>2</sup>, 14 psi)**

#### CAUTION:

**Higher pressure than the specified value may cause damage to radiator.**

### Checking Fuel Lines

Inspect fuel lines and tank for proper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration. If necessary, repair or replace faulty parts.



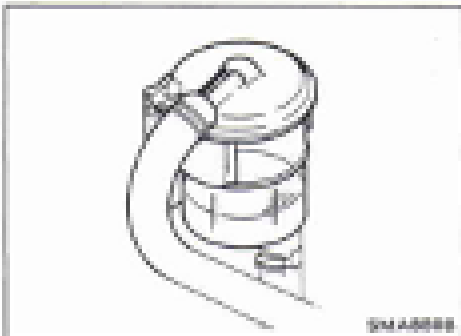
### Checking Fuel Lines (Cont'd)

**CAUTION:**

Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

Tightening torque specifications are the same for all rubber hose clamps.

Ensure that screw does not contact adjacent parts.



### Changing Fuel Filter

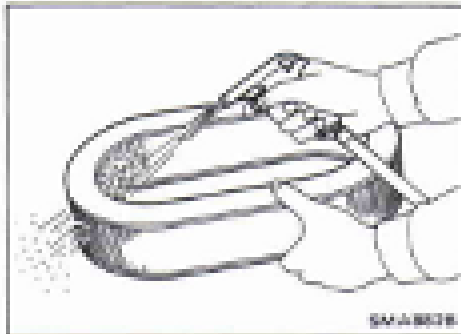
Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.



### Cleaning and Changing Air Cleaner Filter

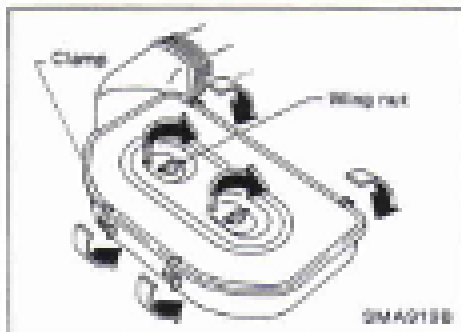
**Viscous paper type**

The viscous paper type filter does not need cleaning between renewals.

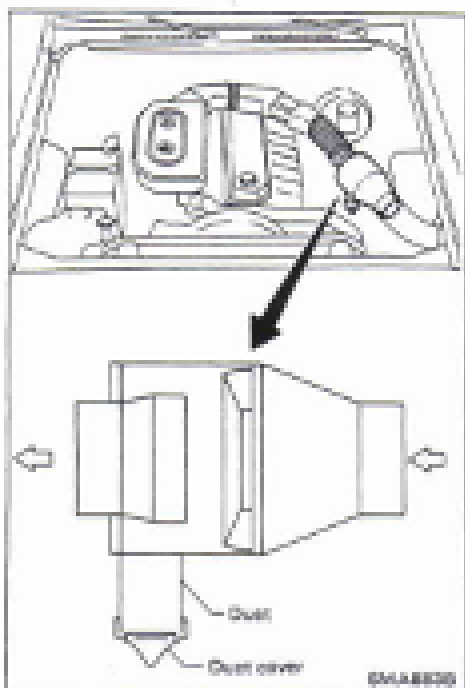


**Dry paper type**

It is necessary to clean the element or replace it at the recommended intervals, more often under dusty driving conditions.

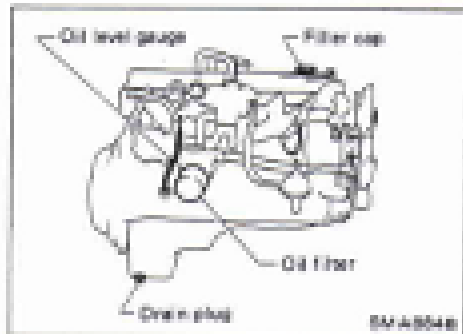


To properly tighten wing nuts, position clamps at four places and tighten wing nuts until they touch air cleaner. Then tighten them three more turns.



## Checking Cyclone Pre-air Cleaner

Remove dust cover and check duct for dust clogging. Clean away any dust.



## Changing Engine Oil

### WARNING:

**Be careful not to burn yourself, as the engine oil is hot.**

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.
3. Drain oil and refill with new engine oil.

### Refill oil capacity (Approximate):

Unit: liter (Imp qt)

With oil filter change	8.2 (7-1/4)
Without oil filter change	7.7 (8-3/4)

### CAUTION:

- Be sure to clean drain plug and install with new washer.

☐: Drain plug

29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

- Use recommended engine oil.



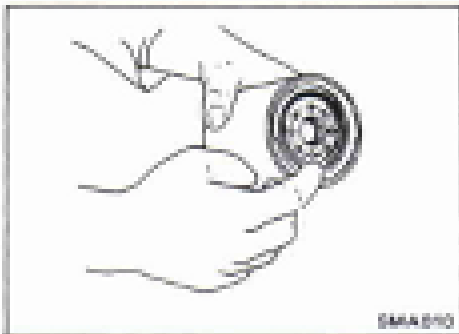
4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

### Changing Oil Filter

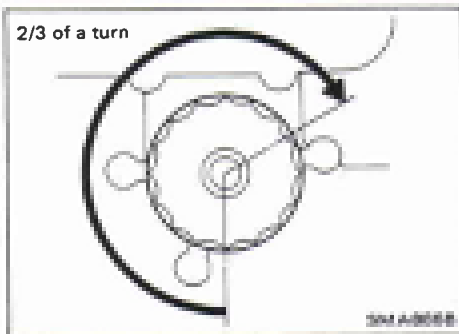
1. Remove oil filter with a suitable tool.

**WARNING:**

**Be careful not to burn yourself, as the engine and the engine oil are hot.**



2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.

4. Add engine oil.

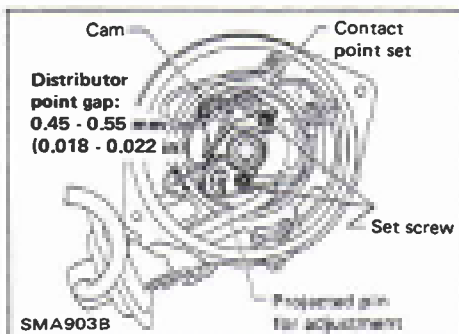
**Refer to Changing Engine Oil.**

### Checking and Changing Distributor Breaker Point

**VISUAL CHECK**

1. Check points for excessive burning or pitting.
2. Use a point file to clean contact area and remove scale from points.

**Do not attempt to remove all roughness.**



**POINT GAP**

1. Set contact point on the nose of cam, and check point gap with oilless feeler gauge.

**Point gap:**

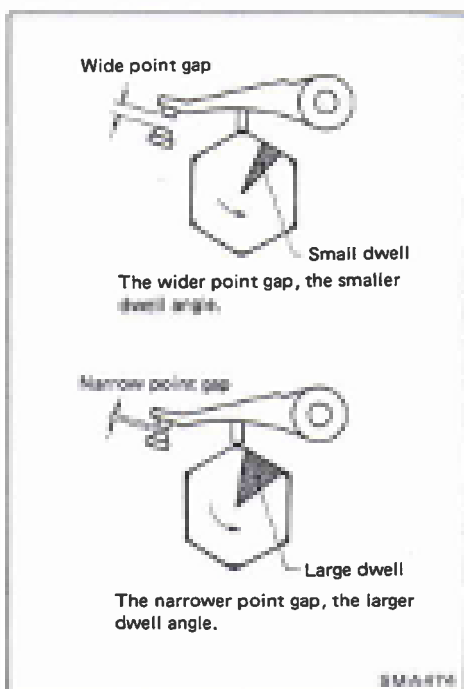
**0.45 - 0.55 mm (0.018 - 0.022 in)**

2. If out of specification, loosen contact point plate set screw and adjust point gap by pivoting projected pin.

### Checking and Changing Distributor Breaker Point (Cont'd)

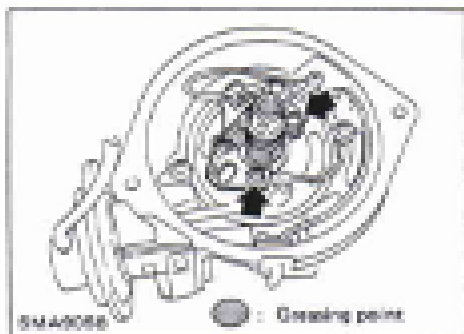
#### DWELL ANGLE

1. Start engine and warm it up.
2. Run engine at idle speed and measure dwell angle with a dwell meter.  
**Dwell angle: 34° - 40°**
3. If dwell angle is not within the specified value turn off engine and adjust point gap.
4. If dwell angle is not within the specified value when point gap is correct, cam lobe is worn. replace cam.



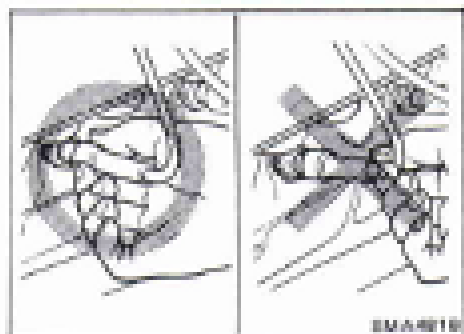
#### DISTRIBUTOR BREAKER POINT

1. Install new set and adjust point gap and dwell angle.
2. Apply the specified grease to cam and cam head.



### Checking and Changing Spark Plugs

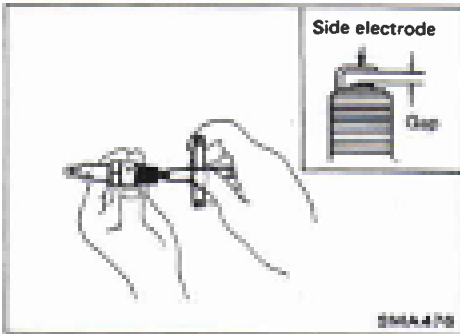
1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.
2. Remove spark plugs with spark plug wrench.
3. Clean plugs in sand blast cleaner.
4. Check insulator for cracks or chips, gasket for damage or deterioration and electrode for wear and burning. If they are excessively worn away, replace with new spark plugs.



#### Spark plug:

Standard type	BP6ES
Hot type	BP4ES
Cold type	BP1ES, BP7ES

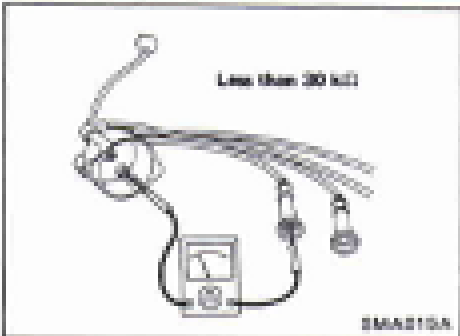
## Checking and Changing Spark Plugs (Cont'd)



5. Check spark plug gap.  
**Gap: 0.8 - 0.9 mm (0.031 - 0.035 in)**
6. Install spark plugs. Reconnect ignition wires according to Nos. indicated on them.

☐: Spark plug

20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)

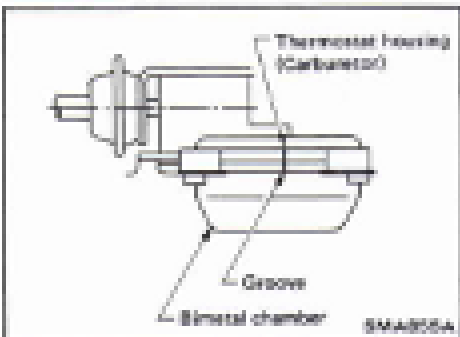


## Checking Ignition Wires

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires and check for intermittent breaks by shaking them.

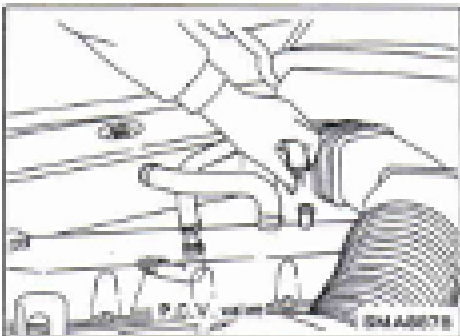
**Resistance: Less than 30 kΩ**

If it exceeds the limit, replace the ignition wire with a new one.



## Checking Choke Mechanism

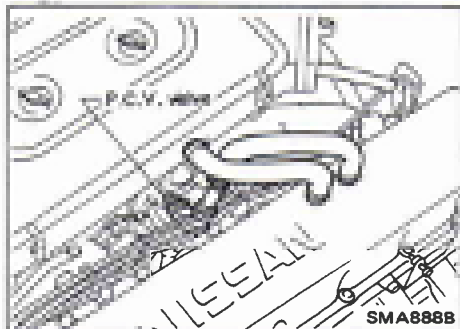
1. When engine is shut off and cold, check choke valve and mechanism to make sure that they operate freely.
  - (1) Fully open throttle valve and insure that choke valve closes properly.
  - (2) Push choke valve and, check it for binding or unsmooth movement.
2. Check that bimetal cover index mark is set at the choke housing index mark.
3. Start engine and run it at idle. Check to see if choke valve gradually opens approaching full open as engine warms up.



## Checking Positive Crankcase Ventilation (P.C.V.) System

### CHECKING P.C.V. VALVE

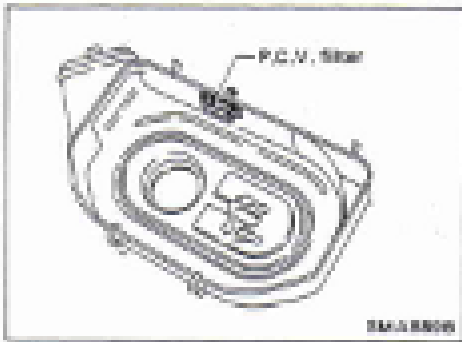
With engine running at idle, remove ventilation hose from rocker cover; if valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



### CHECKING VENTILATION HOSES

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



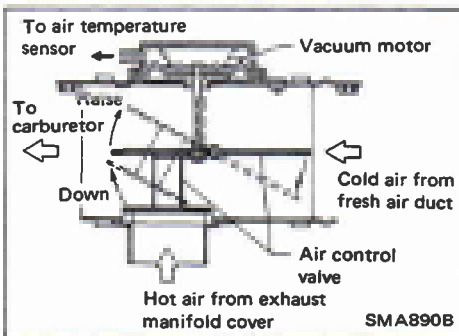


### Changing Positive Crankcase Ventilation (P.C.V.) Filter

Remove air cleaner cover and replace P.C.V. filter.

### Checking Vacuum Hoses and Connections

Check vacuum hoses for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.



### Checking Automatic Temperature Control (A.T.C.) Air Cleaner

Engine	Temperature	Air control valve position	Intake air temperature
Stopped	Any	Closed	—
	Low	Open	Hot
Running	High	Closed	Cold

1. Inspect vacuum hoses (Intake manifold to temperature sensor and vacuum motor) for secure connections.
2. Check each hose for cracks or distortion.
3. Check A.T.C. system for proper function.

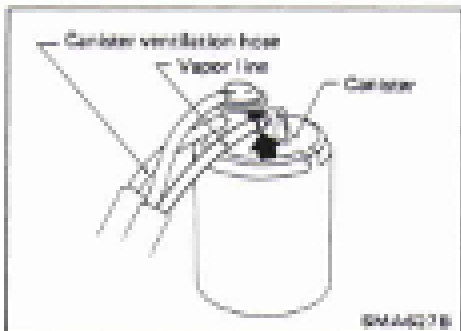
- Make sure that air control valve moves when engine is raced under no-load.
- Make sure that air control valve partially rises as engine warms up.

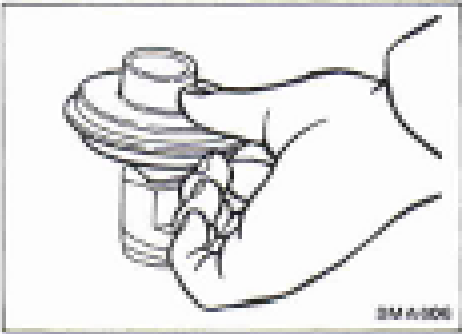
Refer to **AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER SYSTEM INSPECTION** in EF & EC section.

### Checking Vapor Lines

1. Visually inspect vapor lines for proper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

Refer to **EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION** in EF & EC section.





### Checking Exhaust Gas Recirculation (E.G.R.) Control System (Gulf standard A/T model)

1. Start engine and warm it up sufficiently.
2. Make sure that the diaphragm of E.G.R. control valve moves with a finger when raising engine speed.  
If it does not move, check vacuum lines and T.V.V. valve.  
Refer to **EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM INSPECTION** in EF & EC section.

**Checking Tightening Torque  
MANIFOLD BOLTS AND NUTS**

Intake

☐: 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

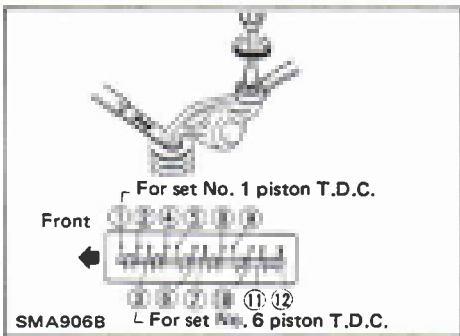
Exhaust

☐: 25 - 29 N·m (2.5 - 3.0 kg-m, 18 - 22 ft-lb)

Checking should be performed while engine is cold.

**EXHAUST TUBE NUTS**

☐: 43 - 50 N·m (4.4 - 5.1 kg-m, 32 - 37 ft-lb)



**Adjusting Intake and Exhaust Valve Clearance**

Adjustment should be made while engine is warm but not running.

1. Set No. 1 cylinder in top dead center on its compression stroke, and adjust valve clearance ①, ②, ④, ⑤, ⑧ and ⑨.
2. Set No. 6 cylinder in top dead center on its compression stroke, and adjust valve clearance ③, ⑥, ⑦, ⑩, ⑪ and ⑫.

**Valve clearance:**

Intake ①, ③, ⑤, ⑦, ⑨ and ⑪

0.35 mm (0.014 in)

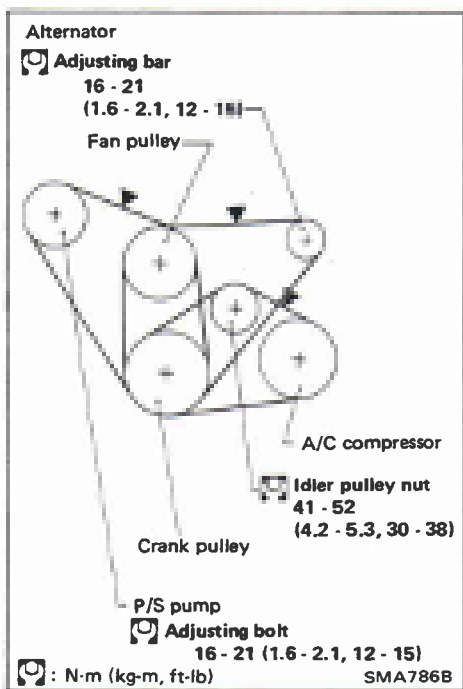
Exhaust ②, ④, ⑥, ⑧, ⑩ and ⑫

0.35 mm (0.014 in)

**Adjusting screw lock nuts**

☐: 15 - 20 N·m

(1.5 - 2.0 kg-m, 11 - 14 ft-lb)



**Checking Drive Belt**

1. Inspect for cracks, fraying, wear or oil adhesion. Replace if necessary.  
**The belts should not touch the bottom of the pulley groove.**
2. Check drive belt deflection by pushing on the belt midway between pulleys.  
**Adjust if belt deflections exceed the limit.**

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjusted deflection	
Alternator	20 (0.79)	11 - 13 (0.43 - 0.51)	9 - 11 (0.35 - 0.43)
Air conditioner compressor	10.5 (0.413)	6 - 7 (0.24 - 0.28)	5 - 6 (0.20 - 0.24)
Power steering oil pump	20 (0.79)	11.5 - 13.0 (0.453 - 0.512)	10.5 - 11.5 (0.413 - 0.453)
Applied pushing force	98 N (10 kg, 22 lb)		

**Check drive belt deflections when engine is cold. If engine is hot, check deflections after 30 minutes or more.**

**Changing Engine Oil**

1. Warm up engine, and check for oil leakage from engine components.
2. Remove oil filler cap and drain plug.
3. Drain oil and fill with new engine oil.

**Refill oil capacity (Approximate):**

**With oil filter change**

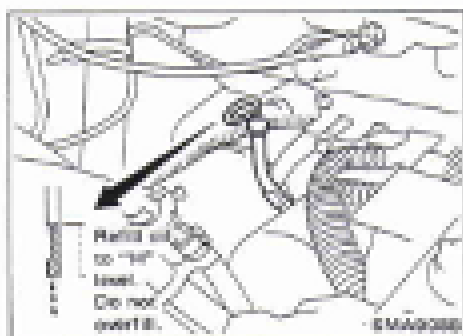
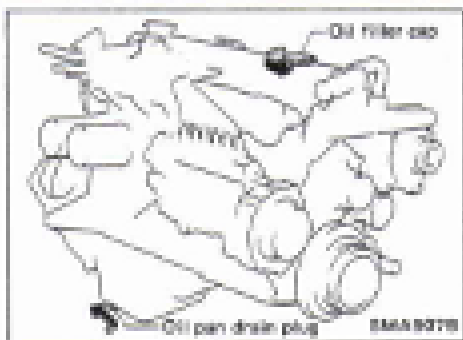
**9.2 ℓ (8-1/8 Imp qt)**

**Without oil filter change**

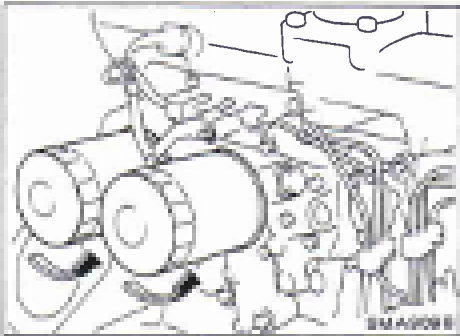
**8.0 ℓ (7 Imp qt)**

**WARNING:**

- Be careful not to burn yourself, as the engine oil may be hot.
- Be sure to clean and install oil pan drain plug with washer.  
 [ ]: Drain plug  
**54 - 59 N·m (5.5 - 6.0 kg·m, 40 - 43 ft·lb)**
- Use recommended engine oil. Refer to GI section.



4. Check oil level.
5. Start engine. Check area around drain plug and oil filter for any sign of oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes check oil level.

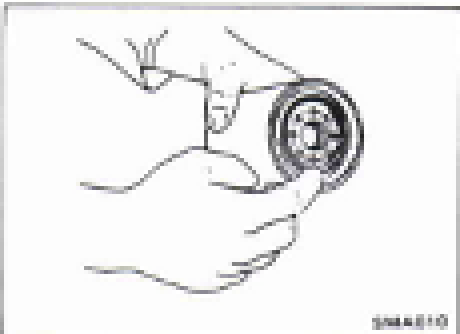


**Changing Oil Filter**

1. Remove oil filter with a suitable wrench.

**WARNING:**

Be careful not to burn yourself as engine and engine oil is hot.



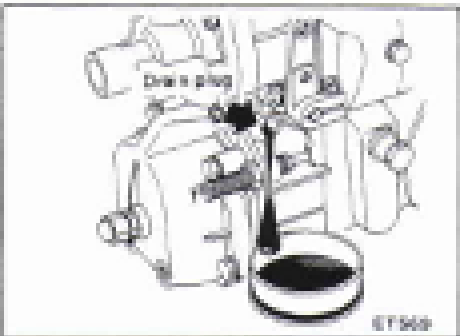
2. Before installing new oil filter, smear a little engine oil on rubber seal of oil filter and mounting surface on cylinder block.

3. Install oil filter.

When installing oil filter, screw it in until a slight resistance is felt, then tighten an additional 2/3 turn or more.

4. Add engine oil.

Refer to Changing Engine Oil.



**Lubricating Injection Pump Governor Diaphragm (In-line type)**

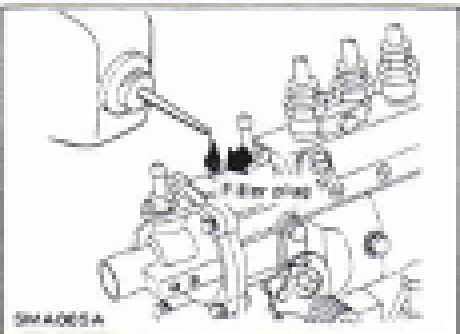
1. Drain oil from governor chamber.

2. Lubricate governor diaphragm.

Fill with three to four droplets of diaphragm oil.

**Diaphragm oil**

OL36V1 or cod liver oil



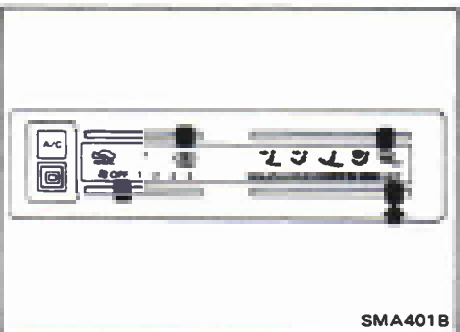
**Changing Engine Coolant**

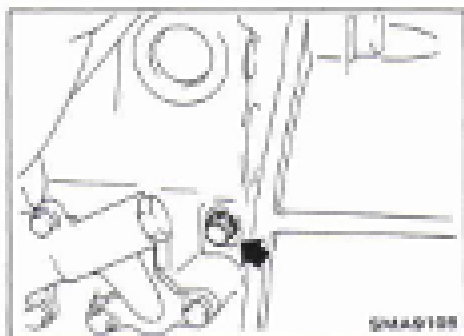
**WARNING:**

To avoid the danger of being scalded, never attempt to change the coolant when the engine is hot.

1. Set heater "TEMP" control lever all the way to "HOT" position.

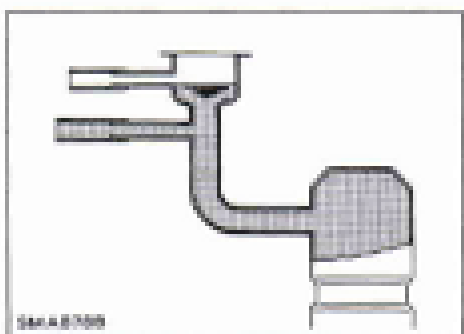
2. Open drain cock at the bottom of radiator, and remove radiator cap.





## Changing Engine Coolant (Cont'd)

3. Remove cylinder block water drain plug located at left rear of cylinder block.
4. Drain coolant and then tighten drain plug securely.  
**Cylinder block drain plug:**  
 $\tau$ : 29 - 39 N·m (3.0 - 4.0 kg·m, 22 - 29 ft·lb)
5. Fill radiator with water and warm up engine.
6. Stop engine and wait until it cools down.
7. Repeat step 2 through step 5 two or three times.
8. Drain water.



9. Fill radiator with coolant up to filler opening. Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

### Coolant capacity (With reservoir tank) (Approximate):

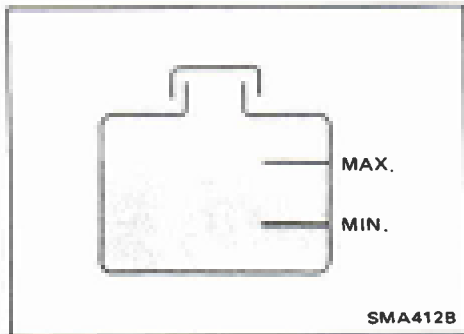
**With heater**

M/T 13.6 ℓ (12 Imp qt)

**Without heater**

M/T 12.8 ℓ (11-1/4 Imp qt)

**Slowly pour coolant through coolant filler neck to allow air in system to escape.**

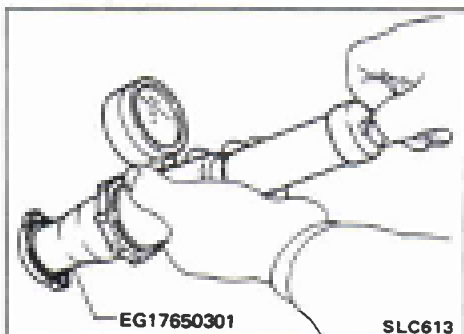


10. Fill reservoir tank up to "MAX" level.
11. Run the engine at approximately 2,000 rpm for about one minute.
12. Stop engine and cool it down, then refill the radiator and the reservoir tank.

## Checking Cooling System

### CHECKING HOSES

Check hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



### CHECKING RADIATOR CAP

Apply pressure to radiator cap by means of a cap tester to see if it is satisfactory.

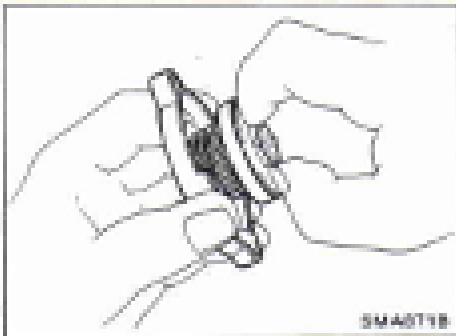
**Radiator cap relief pressure:**

78 - 98 kPa

(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm<sup>2</sup>, 11 - 14 psi)

**Checking Cooling System (Cont'd)**

Pull the negative-pressure valve to open it. Check that it closes completely when released.



**CHECKING COOLING SYSTEM FOR LEAKS**

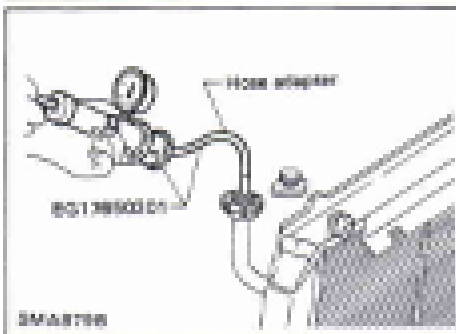
Apply pressure to the cooling system by means of a tester to check for leakage.

**Testing pressure:**

98 kPa (0.98 bar, 1.0 kg/cm<sup>2</sup>, 14 psi)

**CAUTION:**

Higher than the specified pressure may cause radiator damage.

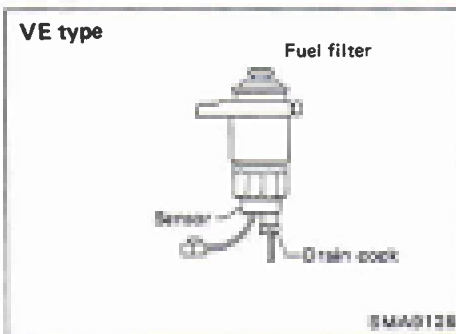
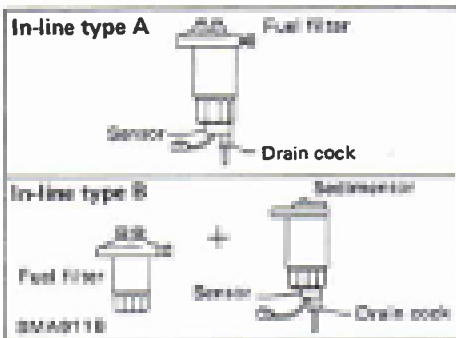


**Checking and Replacing Fuel Filter and Draining Water**

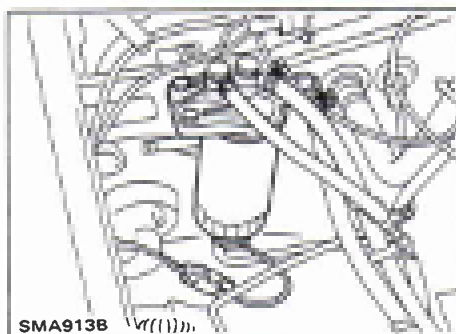
Be careful not to spill fuel in engine compartment. Place a rag to absorb fuel.

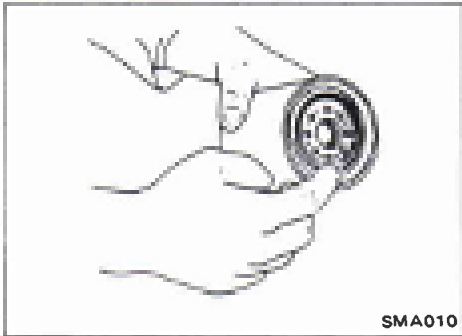
**REPLACING FUEL FILTER**

1. Remove fuel filter sensor and drain fuel.



2. Remove fuel filter, using suitable tool.





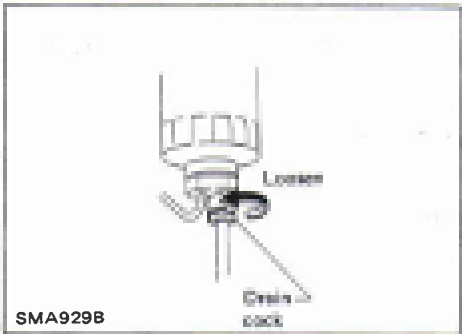
SMA010

**Checking and Replacing Fuel Filter and Draining Water (Cont'd)**

3. Wipe clean fuel filter mounting surface on fuel filter bracket and smear a little fuel on rubber seal of fuel filter.
4. Screw fuel filter on until a slight resistance is felt, then tighten an additional more than 2/3 turn.
5. Install fuel filter sensor to new fuel filter.
6. Bleed air from fuel line.

**Refer to Bleeding Fuel System in EF & EC section.**

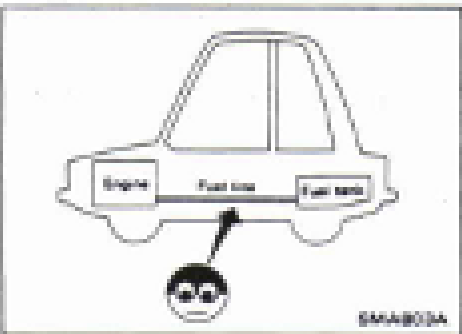
7. Start engine and check for leaks.



SMA929B

**DRAINING WATER (VE type only)**

1. Loosen drain cock and drain water.  
**Loosening drain cock 4 to 5 turns causes water to start draining. Do not remove drain cock by loosening it excessively.**
2. Bleed air.  
Refer to section EF & EC for fuel system bleeding instructions.



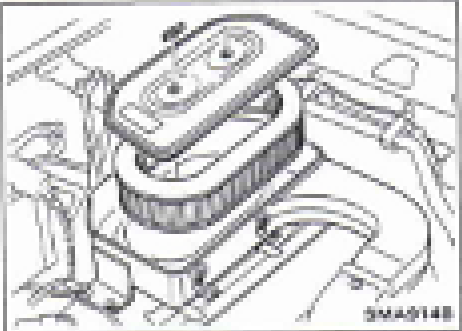
SMA903A

**Checking Fuel Lines**

Check fuel lines and tank for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

**CAUTION:**

- Keep clean parts with compressed air when assembling.

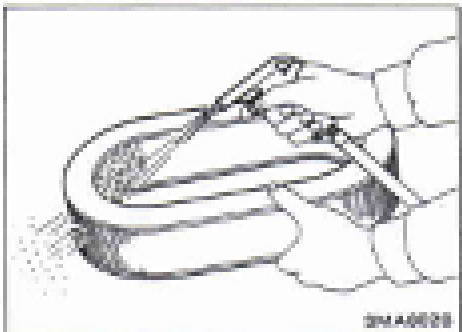


SMA914B

**Cleaning and Changing Air Cleaner Filter**

**Viscous paper type**

The viscous paper type filter does not need cleaning between renewals.



SMA902B

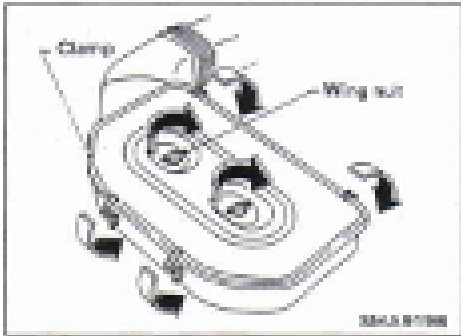
**Dry paper type**

It is necessary to clean the element or replace it at the recommended intervals, more often under dusty driving conditions.



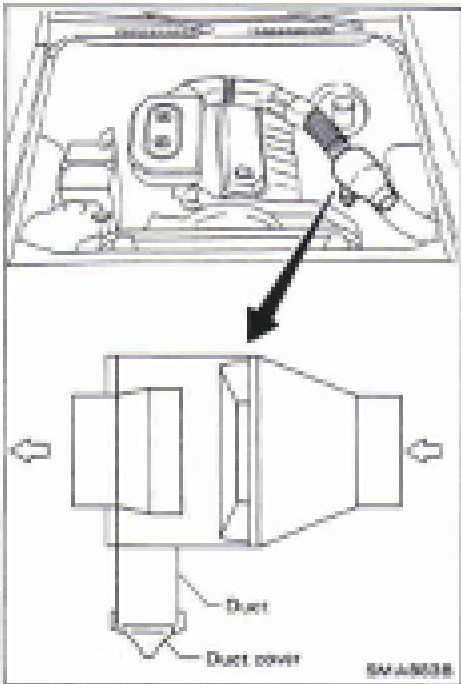
**Cleaning and Changing Air Cleaner Filter (Cont'd)**

To properly tighten wing nuts, position clamps at four places and tighten wing nuts until they touch air cleaner. Then tighten them three more turns.



**Checking Cyclone Pre-air Cleaner**

Remove dust cover and check duct for dust clogging. Clean away and dust.



**Checking Injection Nozzle**

**WARNING:**

When using nozzle tester, do not allow fuel sprayed from nozzle to contact your hand or body, and make sure that your eyes are properly protected with goggles.

1. Check initial injection pressure by pumping tester handle one time per second.

**Initial injection pressure:**

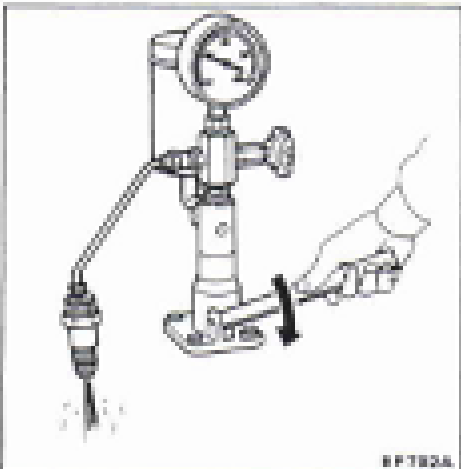
**Used nozzle**

9,807 - 10,297 kPa  
 (98.1 - 103.0 bar, 100 - 105 kg/cm<sup>2</sup>,  
 1,422 - 1,493 psi)

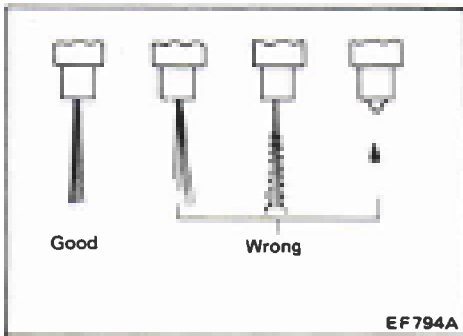
**New nozzle**

10,297 - 11,278 kPa  
 (103.0 - 112.8 bar, 105 - 115 kg/cm<sup>2</sup>,  
 1,493 - 1,635 psi)

- Always check initial injection pressure before installing new nozzle.



**Checking Injection Nozzle (Cont'd)**



2. Check spray pattern by pumping tester handle 4 to 6 times or more per second.
3. If spray pattern is not correct, clean injection nozzle tip or replace it.

- For details, refer to **INJECTION NOZZLE ASSEMBLY** in EF & EC section.

☐: Injection nozzle to cylinder head

54 - 64 N·m

(5.5 - 6.5 kg-m, 40 - 47 ft-lb)

Spill tube nut

29 - 39 N·m

(3.0 - 4.0 kg-m, 22 - 29 ft-lb)

Injection tube

20 - 25 N·m

(2.0 - 2.5 kg-m, 14 - 18 ft-lb)

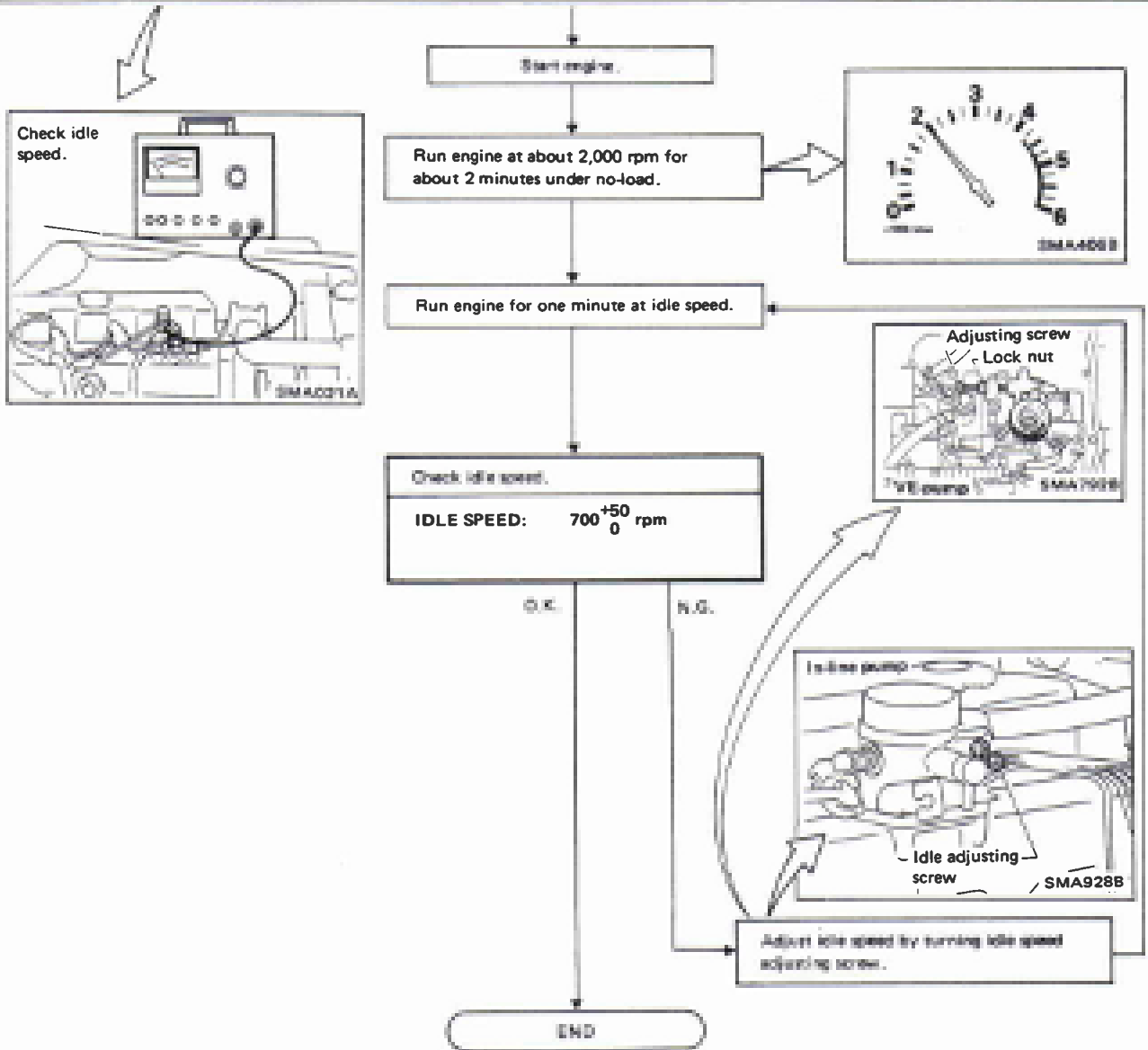
**Checking Idle Speed**

**Preparation**

1. Make sure that injection timing is correct.
2. Make sure that injection nozzles are in good condition.
3. Make sure that the following parts are in good condition.
  - Air cleaner clogging
  - Glow system
  - Engine oil and coolant levels
  - Valve clearance
  - Air intake system (Oil filler cap, oil level gauge, etc.)
4. Set shift lever in "Neutral" position. Engage parking brake and lock both front and rear wheels with wheel chocks.
5. Turn off air conditioner, lights and accessories.

Checking Idle Speed (Cont'd)

- Warm up engine until water temperature indicator points to middle of gauge.
  - Lights, heater fan and all accessories are off.
  - Attach tachometer's pick-up to No. 1 fuel injection tube.
- In order to take accurate reading of engine rpm, remove clamps that secure No. 1 fuel injection tube.**



- Race engine two or three times and allow engine to return to idle speed. If idle speed is not within the specified range, check acceleration linkage for binding and correct it if necessary.

**Checking Idle Speed (Cont'd)**

**AIR CONDITIONER EQUIPPED MODEL**

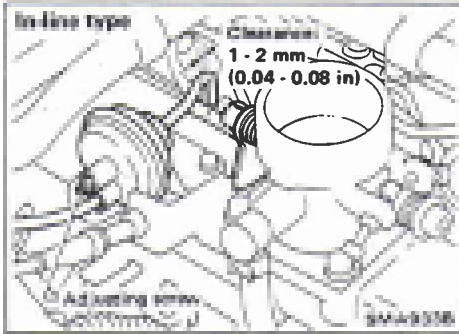
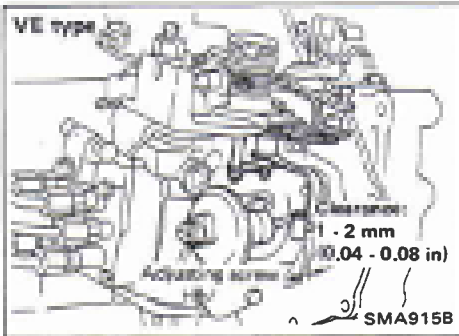
1. Make certain that the clearance between the actuator idle control lever pin and the injection pump control lever is within the specified limits.
2. Adjust idle speed to specified rpm without the air conditioner operating.
3. Then check the idle speed when the air conditioner is operating and make sure it is correct.

Unit: rpm

---

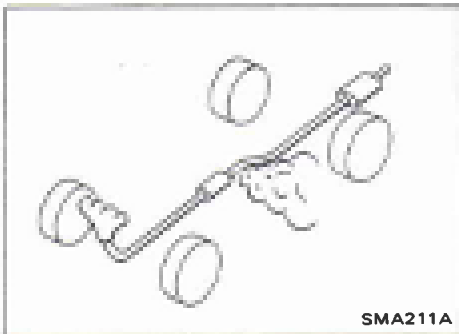
Idle speed (Air conditioner "ON")	850 <sup>0</sup> <sub>-50</sub>
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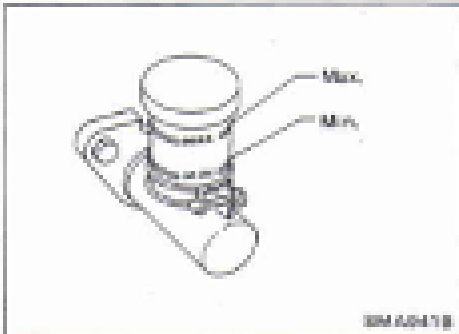
If not, adjust it by turning F.I.C.D. actuator stroke adjusting screw.

## CHASSIS AND BODY MAINTENANCE



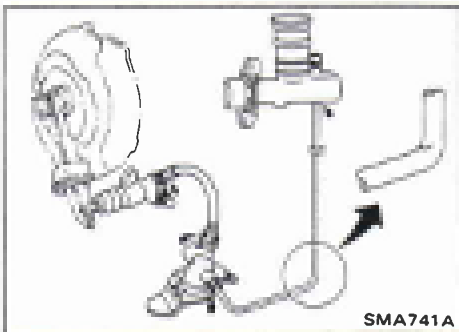
### Checking Exhaust System

Check exhaust pipes, muffler and mounting for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



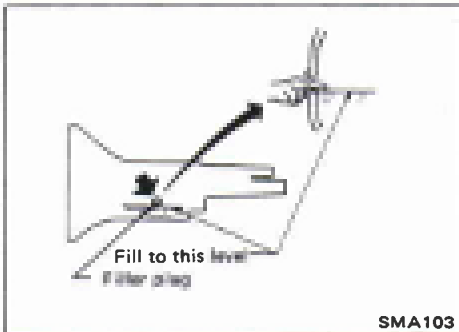
### Checking Clutch Fluid Level and Leaks

If fluid level is extremely low, check clutch system for leaks.



### Checking Clutch System

Check fluid lines and operating cylinder for improper attachment, cracks, damage, loose connections, chafing and deterioration.



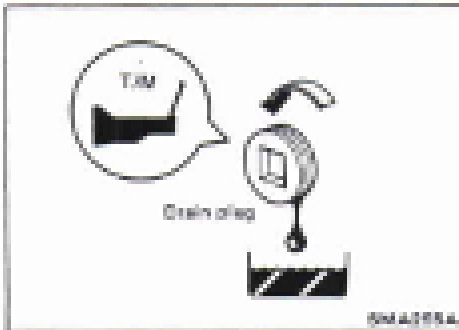
### Checking M/T Oil Level

**Never start engine while checking oil level.**

1. Check manual transmission for leakage.
2. Check oil level.

: Filler plug

25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



### Changing M/T Oil

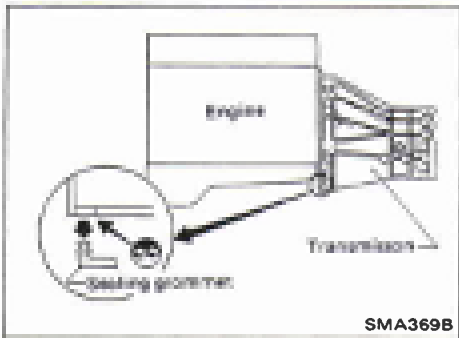
Oil capacity:

3.9 liters (6-7/8 Imp pt)

: Drain plug

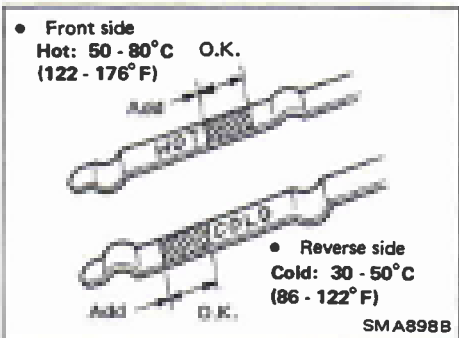
25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

## CHASSIS AND BODY MAINTENANCE



### Checking Water Entry

Check water entry in the clutch housing by removing the sealing grommet, whenever driving in deep water or mud.



### Checking A/T Fluid Level

1. Check for fluid leakage.
2. Check fluid level.

Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven approximately 5 minutes after engine is warmed up. But it can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick for reference after engine is warmed up and before driving. However, fluid level must be rechecked using "HOT" range.

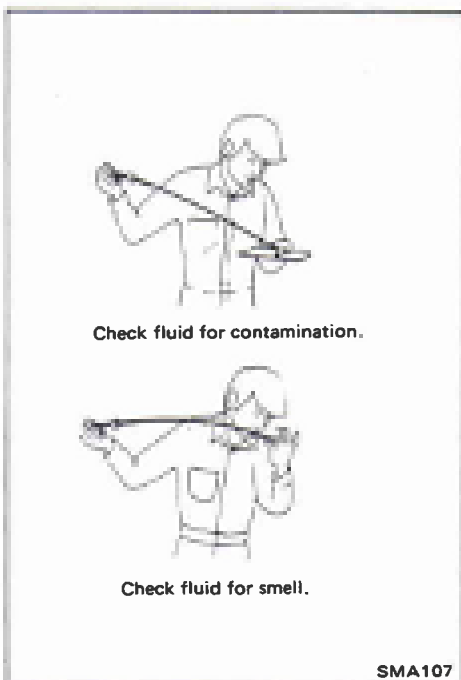
- (1) Park vehicle on level surface and set parking brake.
- (2) Start engine and then move selector lever through each gear range, ending in "P".
- (3) Check fluid level with engine idling.
- (4) Remove dipstick and wipe it clean with lint-free paper.
- (5) Re-insert dipstick into charging pipe as far as it will go.
- (6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

**Do not overfill.**

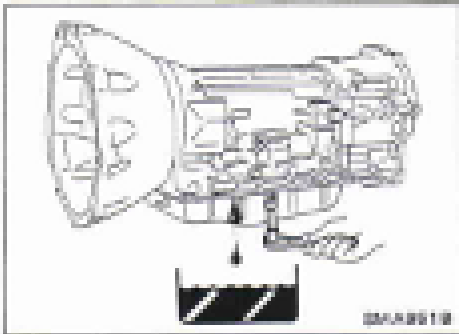
3. Check automatic fluid condition.

Check fluid for contamination. If fluid is very dark or smells burned, or contains the frictional material (clutches, band, etc.), check operation of A/T.

**Refer to section AT for checking operation of A/T.**



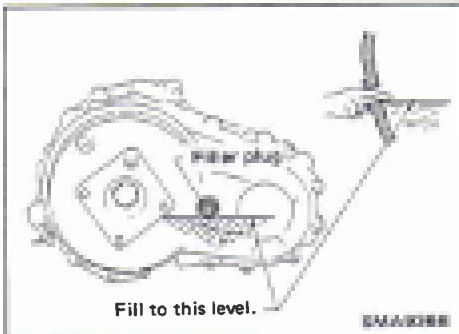
## CHASSIS AND BODY MAINTENANCE



### Changing A/T Fluid

1. Drain fluid by removing oil pan.
2. Replace gasket with new one.
3. Refill with fluid and then check fluid level.

**Oil capacity (With torque converter):**  
8.5 liters (7-1/2 Imp qt)



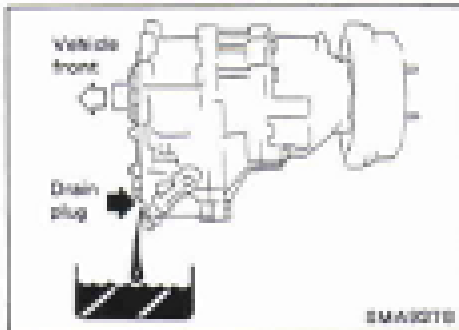
### Checking Transfer Oil Level

**Never start engine while checking oil level.**

1. Check transfer for leakage.
2. Check oil level.

 **Filler plug**

25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)



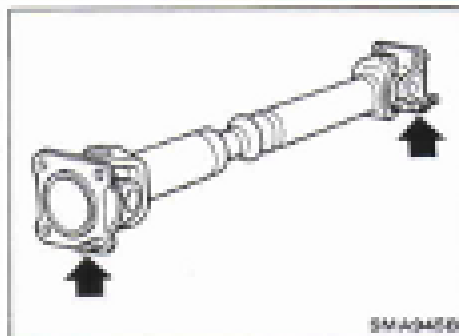
### Changing Transfer Oil

**Oil capacity:**

2.2 liters (2 Imp qt)

 **Drain plug**

25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

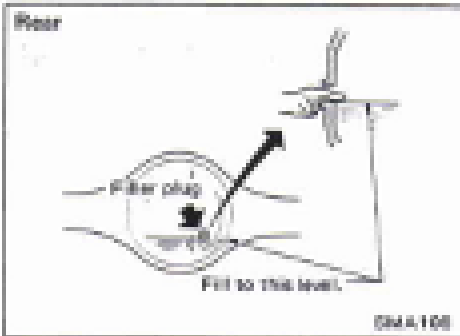
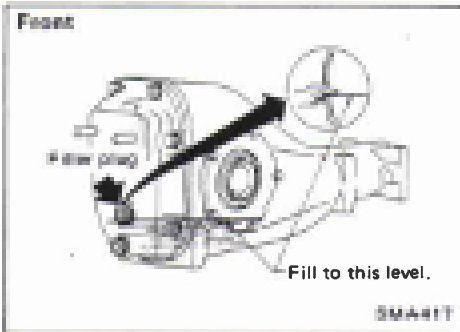
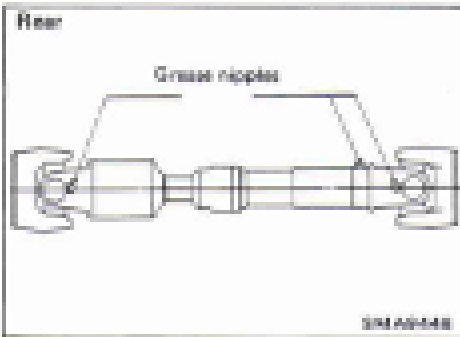
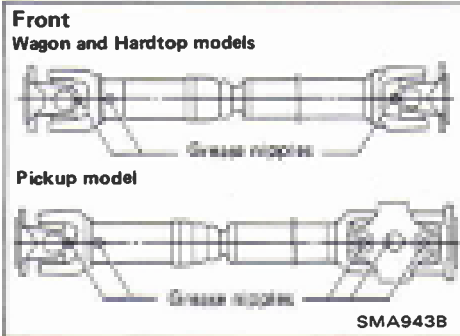


### Checking Propeller Shaft

Check propeller shaft for damage, looseness or grease leakage.

**Tightening torque: Refer to section PD.**

## CHASSIS AND BODY MAINTENANCE



### Greasing Nipples of Propeller Shafts

Apply multi-purpose grease to nipples of propeller shafts.

### Checking Differential Gear Oil

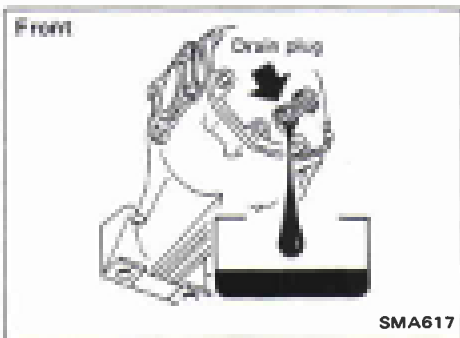
1. Check differential carrier for oil leakage.
2. Check oil level.

: Filler plug

59 - 98 N·m (6 - 10 kg-m, 43 - 72 ft-lb)



## CHASSIS AND BODY MAINTENANCE



### Changing Differential Gear Oil

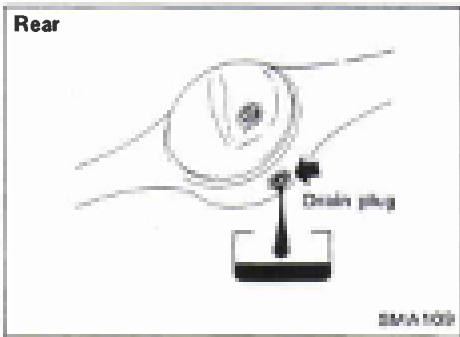
Oil capacity:

Front

H233B

5.4 liters (4-3/4 Imp qt) ... Except for Pickup

4.3 liters (3-3/4 Imp qt) ... For Pickup



Oil capacity:

Rear

H233B

2.1 liters (1-7/8 Imp qt)

H260

4.7 liters (4-1/8 Imp qt)

: Drain plug

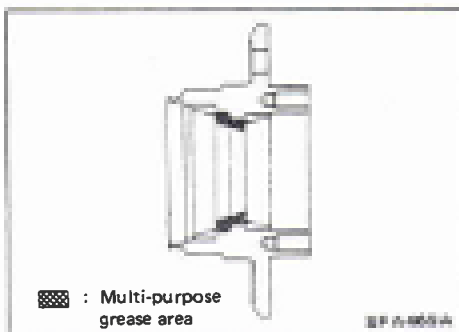
59 - 98 N·m (6 - 10 kg·m, 43 - 72 ft·lb)

### Limited-slip differential gear

- Use only approved or recommended limited-slip differential gear oil.
- Limited-slip differential identification.
  - (1) Lift both rear wheels off the ground.
  - (2) Turn one rear wheel by hand.
  - (3) If both rear wheels turn in the same direction simultaneously, vehicle is equipped with limited-slip differential.

### Checking Front Wheel Bearing Grease

- Check that wheel bearings operate smoothly.
- Check front wheel bearings for grease leakage and water or dust entry.
- Replace front wheel bearings or front wheel bearing grease if wheel bearings do not turn smoothly.



### Repacking Front Wheel Bearing and Axle Joint Grease

#### FRONT WHEEL BEARING GREASE

Apply multi-purpose grease sparingly to the following parts:

- Threaded portion of spindle
- Contact surface between wheel bearing washer and outer wheel bearing
- Grease seal lip
- Wheel hub (as shown at the left)

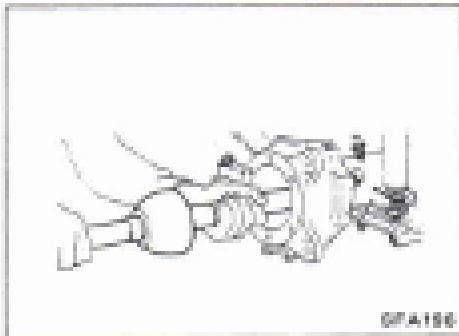
## CHASSIS AND BODY MAINTENANCE

### Repacking Front Wheel Bearing and Axle Joint Grease (Cont'd)

#### AXLE JOINT GREASE

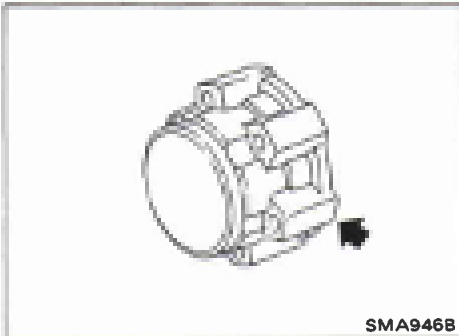
- Drain approximately 2 liters (1-3/4 Imp qt) of differential oil.
- Remove knuckle spindle.
- Slightly pull out axle and repack axle joint with recommended grease.

Refer to FA section.



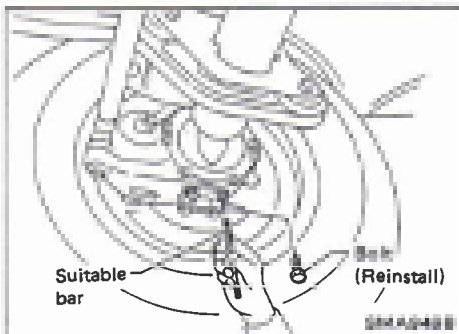
### Checking Free-running Hub Grease

Check free-running hub grease for leakage and water or dust entry.



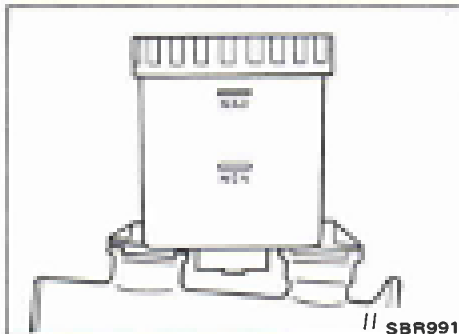
### Checking Water Entry in Knuckle Flange

- Check for water entry in knuckle flange by removing one bolt of lower knuckle flange bearing cap and probing with a suitable thin bar.
- After checking, be sure to reinstall the bolt to a tightening torque of 30 to 40 N·m (3.1 to 4.1 kg-m, 22 to 30 ft-lb).



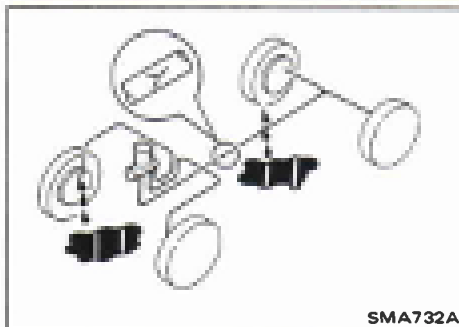
### Checking Brake Fluid Level and Leaks

If fluid level is extremely low, check brake system for leaks.

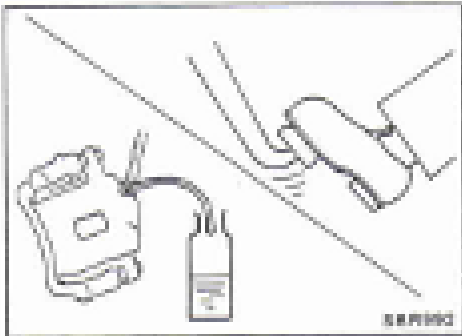


### Checking Brake System

Check brake fluid lines and parking brake cables for improper attachment, leaks, chafing, abrasion, deterioration, etc.



## CHASSIS AND BODY MAINTENANCE



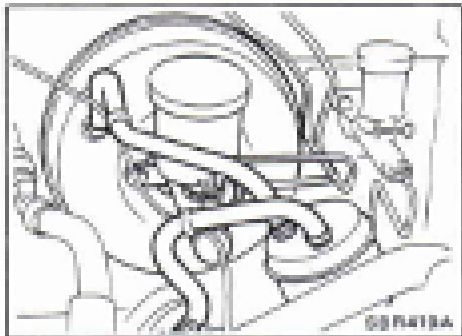
### Changing Brake Fluid

1. Drain brake fluid from each air bleeder valve.
2. Refill until new brake fluid comes out from each air bleeder valve.

Use same procedure as in bleeding hydraulic system to refill brake fluid.

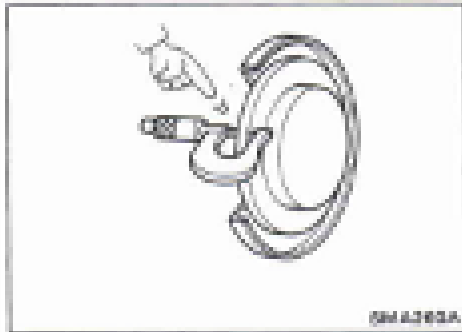
Refer to section BR.

- Refill with recommended brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.



### Checking Brake Booster, Vacuum Hoses, Connections and Check Valve

Check vacuum lines, connections and check valve for improper attachment, air tightness, chafing and deterioration.



### Checking Disc Brake

Check condition of disc brake components.

#### ROTOR

Check condition and thickness.

**Standard thickness:**

**CL36VA**

22.0 mm (0.866 in)

**AD20VC**

18.0 mm (0.709 in)

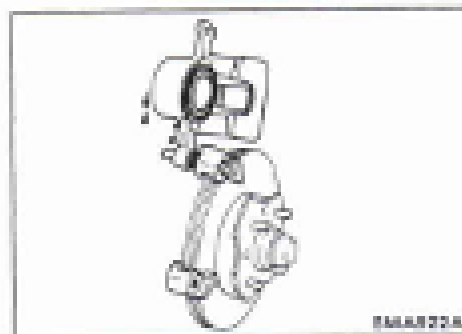
**Minimum thickness:**

**CL36VA**

20.0 mm (0.787 in)

**AD20VC**

16.0 mm (0.630 in)



#### CALIPER

Check operation and leakage.

## CHASSIS AND BODY MAINTENANCE

### Checking Disc Brake (Cont'd)

#### PAD

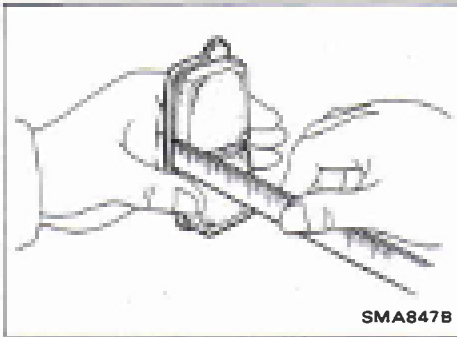
Check wear or damage.

**Standard thickness:**

11.0 mm (0.433 in)

**Minimum thickness:**

2.0 mm (0.079 in)

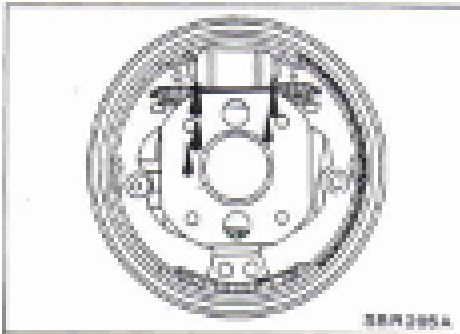


### Checking Drum Brake

Check condition of drum brake components.

#### WHEEL CYLINDER

Check operation and leakage.



#### DRUM

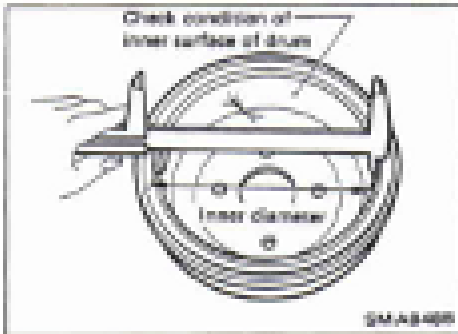
Check condition and inner surface.

**Standard diameter:**

295 mm (11.61 in)

**Drum repair limit (Inner diameter):**

296.5 mm (11.67 in)



#### LINING

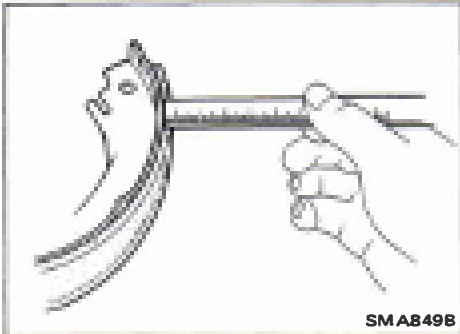
Check wear or damage

**Standard thickness:**

6.1 mm (0.240 in)

**Lining wear limit (Minimum thickness):**

1.5 mm (0.059 in)



### Balancing Wheels

Adjust wheel balance using the road wheel center.

**Maximum allowable unbalance at rim flange:**

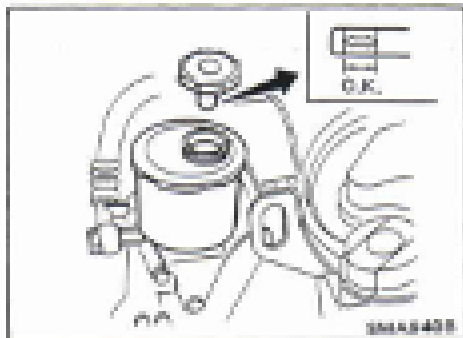
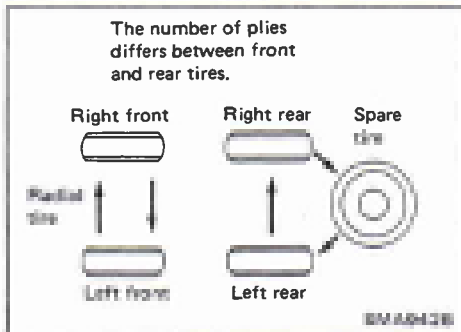
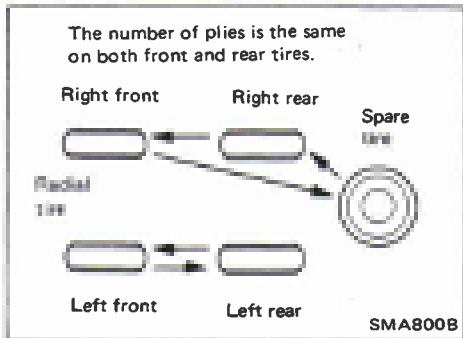
10 g (0.35 oz)

**Tire balancing weight:**

5 - 60 g (0.18 - 2.12 oz)

Spacing 5 g (0.18 oz)

## CHASSIS AND BODY MAINTENANCE



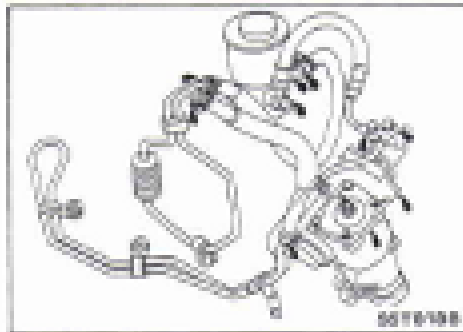
### Tire Rotation

Wheel nuts

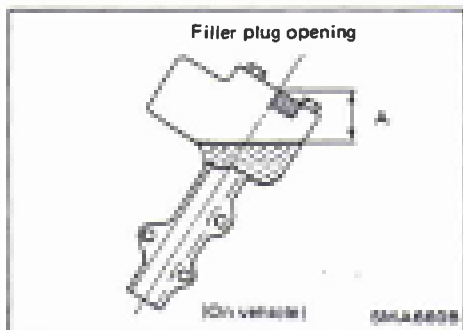
118 - 147 N·m (12 - 15 kg-m, 87 - 108 ft-lb)

### Checking Power Steering System Fluid and Lines

- Check fluid level, when the fluid is cold.



- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



### Checking Steering Gear Oil Level and Leaks

- Check steering gear for oil level and leakage.
- Check oil level.

Oil level:

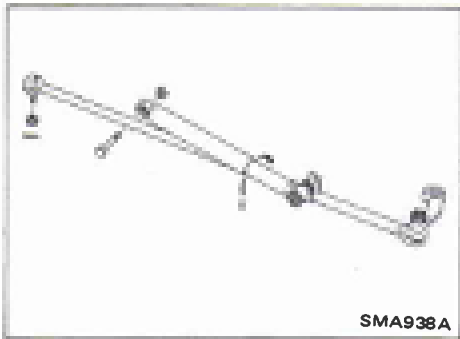
Distance "A"

37 mm (1.46 in) or less

Be careful not to overflow gear oil when filling up.

## CHASSIS AND BODY MAINTENANCE

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### Checking Steering Damper

Check steering damper for damage and oil leakage.

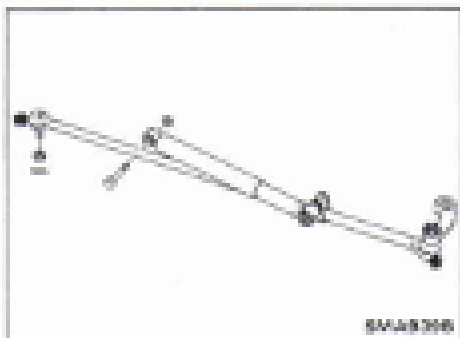
### Checking Steering Gear Box and Linkage

#### STEERING GEAR

- Check gear housing and boots for looseness, damage or grease leakage.
- Check connection with steering column for looseness.

#### STEERING LINKAGE

- Check ball joint, dust cover and other component parts for looseness, wear, damage or grease leakage.

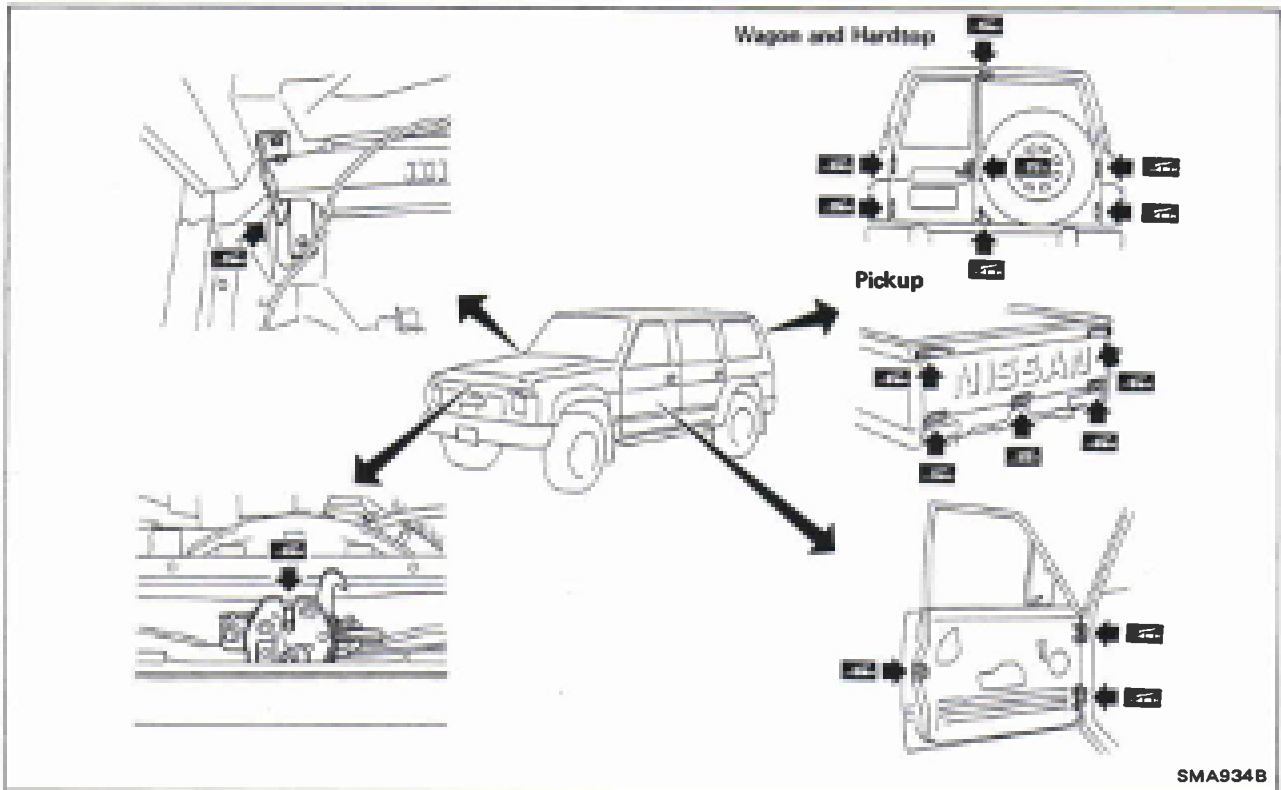


### Greasing Steering Linkage

Apply multi-purpose grease to greasing points using suitable grease nipples.

## CHASSIS AND BODY MAINTENANCE

### Lubricating Hood Latches, Locks and Hinges

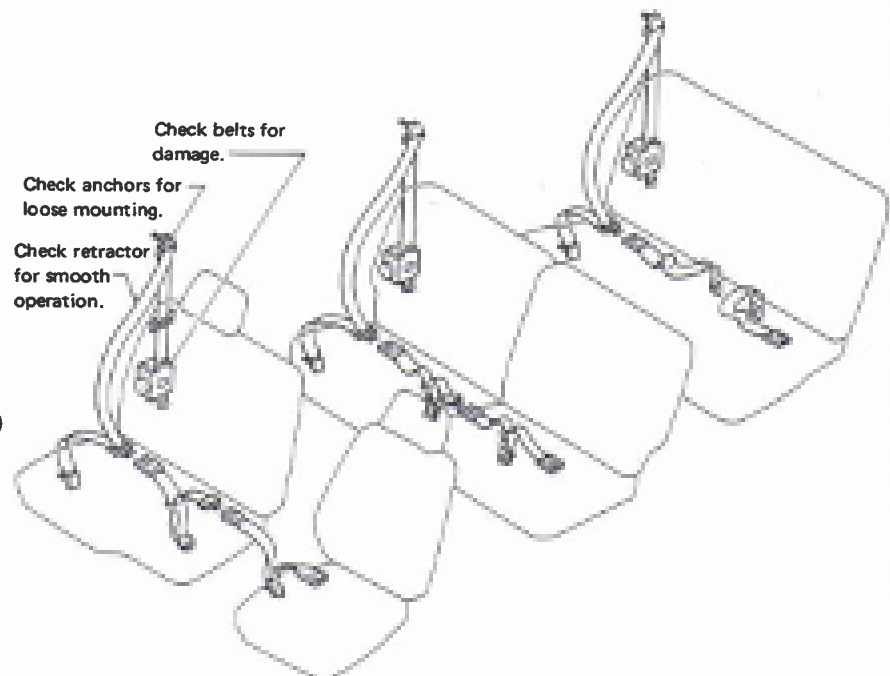


### Checking Seat Belts, Buckles, Retractors, Anchors and Adjuster

#### CAUTION:

1. If the vehicle is collided or overturned, replace the entire belt assembly, regardless of nature of accident.
2. If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.
3. If webbing is cut, frayed, or damaged, replace belt assembly.
4. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.
5. Use a NISSAN genuine seat belt assembly.

 Anchor bolt  
35.8 - 45.6 N·m  
(3.65 - 4.65 kg·m, 26.4 - 33.6 ft·lb)



Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Net deflection of new belt
	Limit	Adjusted deflection	
Alternator	16 (0.63)	13 - 15 (0.51 - 0.59)	10 - 12 (0.39 - 0.47)
Air conditioner compressor	11 (0.43)	8 - 10 (0.31 - 0.39)	6 - 8 (0.24 - 0.31)
Power steering oil pump	19 (0.75)	15 - 17 (0.59 - 0.67)	14 - 16 (0.55 - 0.63)
Applied pushing force	98 N (10 kg, 22 lb)		

Oil capacity (Refill capacity)

Unit: ℓ (Imp qt)

With oil filter change	8.2 (7-1/4)
Without oil filter change	7.7 (6-3/4)

Cooling system check

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)

Cooling system testing pressure	98 (0.98, 1.0, 14)
Radiator cap relief pressure	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)

Coolant capacity (With reservoir tank)

Unit: ℓ (Imp qt)

With heater	
M/T	13.9 (12-1/4)
A/T	13.6 (12)
Without heater	
M/T	13.3 (11-3/4)
A/T	13.0 (11-1/2)

Spark plug

Standard type	BP5ES
Hot type	BP4ES
Cold type	BP6ES, BP7ES
Plug gap	0.8 - 0.9 mm (0.031 - 0.035 in)

Valve clearance (Hot)

Unit: mm (in)

Intake	0.38 (0.015)
Exhaust	0.38 (0.015)

Ignition timing and idle speed

	M/T	A/T (in "D" position)
Ignition timing B.T.D.C. degree	10° ±1°	
Idle speed rpm	660 ±60	

Distributor

Point gap mm (in)	0.45 - 0.55 (0.018 - 0.022)
Dwell angle degree	34° - 40°

Mixture ratio

	M/T	A/T (in "D" position)
Idle CO %	1.8 ±0.8	



**Engine Maintenance (Cont'd)**

**TIGHTENING TORQUE**

Unit	N-m	kg-m	ft-lb
Intake manifold bolts and nuts	16 - 19	1.6 - 1.9	12 - 14
Exhaust manifold bolts and nuts	27 - 31	2.8 - 3.2	20 - 23
Exhaust tube nuts	43 - 50	4.4 - 5.1	32 - 37
Carburetor nuts	16 - 19	1.6 - 1.9	12 - 14
Valve rocker adjusting nuts	16 - 22	1.6 - 2.2	12 - 16
Rocker cover screw	1 - 3	0.1 - 0.3	0.7 - 2.2
Alternator adjusting lock bolt	21 - 26	2.1 - 2.7	15 - 20
Alternator adjusting bar fixing bolt	43 - 55	4.4 - 5.6	32 - 41
Alternator securing bolt	59 - 75	6.0 - 7.6	43 - 55
Power steering pump adjusting lock bolt	21 - 26	2.1 - 2.7	15 - 20
Idler pulley lock nut	43 - 55	4.4 - 5.6	32 - 41
Cylinder block drain plug	34 - 44	3.5 - 4.5	25 - 33
Air cleaner wing nuts	After wing nuts touch air cleaner, tighten them three more turns.		
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Distributor securing bolt	13 - 16	1.3 - 1.6	9 - 12

Engine Maintenance (Cont'd)

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Set deflection of new belt
	Limit	Adjusted deflection	
Alternator	20 (0.79)	11 - 13 (0.43 - 0.51)	9 - 11 (0.35 - 0.43)
Air conditioner compressor	10.5 (0.413)	6 - 7 (0.24 - 0.28)	5 - 6 (0.20 - 0.24)
Power steering oil pump	20 (0.79)	11.5 - 13.0 (0.453 - 0.512)	10.5 - 11.5 (0.413 - 0.453)
Applied pushing force	98 N (10 kg, 22 lb)		

Inspect drive belt deflections when engine is cold.  
If engine is hot, check deflections in 30 minutes or more.

Injection nozzle

Injection pressure kPa (bar, kg/cm <sup>2</sup> , psi)	
Used nozzle	9,807 - 10,297 (98.1 - 103.0, 100 - 105, 1,422 - 1,493)
New nozzle	10,297 - 11,278 (103.0 - 112.8, 105 - 115, 1,493 - 1,635)

Oil capacity (Refill capacity)

Unit: ℓ (Imp qt)

With oil filter change	9.2 (8-1/8)
Without oil filter change	8.5 (7-3/4)

Coolant capacity (With reservoir tank)

Unit: ℓ (Imp qt)

With heater M/T	13.6 (12)
Without heater M/T	12.8 (11-1/4)

Valve clearance (Hot)

Intake and exhaust mm (in) 0.35 (0.014)

Idle speed

	F.I.C.D. OFF	F.I.C.D. ON
Idle speed rpm	700 <sup>+50</sup> <sub>-5</sub>	850 <sup>0</sup> <sub>-50</sub>

Cooling system

Radiator cap relief pressure kPa (bar, kg/cm<sup>2</sup>, psi) 78 - 98  
(0.78 - 0.98, 0.8 - 1.0, 11 - 14)

Cooling system leakage testing pressure kPa (bar, kg/cm<sup>2</sup>, psi) 98 (0.98, 1.0, 14)

TIGHTENING TORQUE

Unit	ℓ·m	kg·m	ft·lb
Intake manifold nut/bolt	15 - 20	1.5 - 2.0	11 - 14
Exhaust manifold nut	25 - 29	2.5 - 3.0	18 - 22
Alternator adjusting bar bolt	16 - 21	1.6 - 2.1	12 - 15
Idler pulley nut (A/C compressor)	41 - 52	4.2 - 5.3	30 - 38
P/S oil pump adjusting lock bolt	16 - 21	1.6 - 2.1	12 - 15
Oil pan drain plug	54 - 59	5.5 - 6.0	40 - 43
Injection nozzle to cylinder head	54 - 64	5.5 - 6.5	40 - 47
Spill tube nut	29 - 39	3.0 - 4.0	22 - 29
Injection tube flare nut	20 - 25	2.0 - 2.5	14 - 18
Valve clearance adjusting screw lock nut	15 - 20	1.5 - 2.0	11 - 14
Rocker cover screw	1 - 2	0.1 - 0.2	0.7 - 1.4
Cylinder block drain plug	29 - 39	3.0 - 4.0	22 - 29
Air cleaner wing nuts	After wing nuts touch air cleaner, tighten them three more turns.		

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Chassis and Body Maintenance

#### INSPECTION AND ADJUSTMENT Clutch

Unit: mm (in)

Pedal height "H"	202 - 212 (7.95 - 8.35)
Pedal free play "A"	1.0 - 3.0 (0.039 - 0.118)

#### Front axle and front suspension

##### Wheel bearing preload

Wheel bearing axial end play mm (in)	0 - 0.08 (0 - 0.0031)
Wheel bearing lock nuts Tightening torque N·m (kg-m, ft-lb)	167 - 196 (17 - 20, 123 - 145)
Retightening torque after untightened N·m (kg-m, ft-lb)	3 - 5 (0.3 - 0.5, 2.2 - 3.6)
Measured starting force At wheel hub bolt N (kg, lb)	A
Turning adjusting nut in tight- ening direction and measuring starting force At wheel hub bolt N (kg, lb)	B
Calculated wheel bearing preload; B - A At wheel hub bolt N (kg, lb)	0 - 18.6 (0 - 1.9, 0 - 4.2)

#### Front wheel alignment (Unladen\*1)

Applied model	Hardtop	Wagon	Pickup
Camber degree	0° - 1°		
Caster degree	2°30' - 2°35'	2°05' - 2°05'	2°50' - 2°50'
Kingpin inclination degree	7° - 8°		
Toe-in mm (in) degree			
Rear tire 10R15-6PRLT	-2 to 0 (-0.08 to 0) -9° to 0°		—
215/80R16 107Q, 7.50R16	0 - 2 (0 - 0.08) 0° - 0°		
Rear tire	1 - 3 (0.04 - 0.12) 0° - 15°		
Front wheel turning angle (full turn) degree			
Inside	30° - 32°		28° - 30°
Outside	27° - 29°		26° - 28°

\*1: Tankful of fuel, radiator coolant and engine oil full.  
Spare tire, jack, hand tools, mats in designated position.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Chassis and Body Maintenance (Cont'd)

#### Brake

		Unit: mm (in)
<b>Disc brake</b>		
<b>Pad</b>		
Standard thickness	CL38VA	11.0 (0.433)
	AD38VC	11.0 (0.433)
Minimum thickness	CL38VA	2.0 (0.079)
	AD38VC	2.0 (0.079)
<b>Rotor</b>		
Standard thickness	CL38VA	22.0 (0.866)
	AD38VC	18.0 (0.709)
Minimum thickness	CL38VA	20.0 (0.787)
	AD38VC	18.0 (0.709)
<b>Drum brake</b>		
<b>Drum</b>		
Standard inner diameter		295.0 (11.61)
Repair limit		295.5 (11.637)
<b>Lining</b>		
Standard thickness		6.1 (0.240)
Repair limit		1.8 (0.071)
<b>Pedal free height</b>		
A/T		202 - 212 (7.95 - 8.35)
M/T		192 - 202 (7.56 - 7.95)
<b>Pedal depressed height</b>		
		120 (4.72) or more
<b>Parking brake</b>		
Number of notches [at pulling force 196 N (20 kg, 44 lb)]		7 - 9

#### Wheel and tire

Wheel balance (Maximum allowable unbalance at rim flange)	10 (0.35) gr (oz)
Tire balancing weight	5 - 60 (0.18 - 2.12) Spacing 5 (0.18) gr (oz)

#### TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
<b>Clutch</b>			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Master cylinder push rod lock nut	8 - 11	0.8 - 1.1	5.8 - 8.0
<b>Manual transmission</b>			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
<b>Transfer</b>			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
<b>Differential carrier</b>			
Drain and filler plugs			
Front	39 - 59	4 - 6	29 - 43
Rear	59 - 98	6 - 10	43 - 72
<b>Front axle and front suspension</b>			
Tie-rod lock nut	25 - 28	2.5 - 2.9	18 - 21
<b>Brake</b>			
Air bleeder valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Stop lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
<b>Wheel and tire</b>			
Wheel nut	118 - 147	12 - 15	87 - 108

# ENGINE MECHANICAL

## SECTION **EM**

**EM**

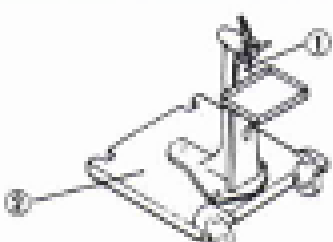
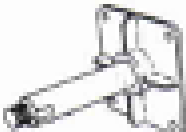




### CONTENTS

<hr/>	
<b>TB42 &amp; TD42</b>	
PREPARATION .....	EM- 2
<hr/>	
<b>TB42</b>	
COMPRESSION PRESSURE .....	EM- 7
ENGINE REMOVAL .....	EM- 8
OUTER COMPONENT PARTS .....	EM-10
OIL PAN .....	EM-11
TIMING CHAIN .....	EM-13
OIL SEAL REPLACEMENT .....	EM-19
CYLINDER HEAD .....	EM-21
CYLINDER BLOCK .....	EM-31
<hr/>	
<b>TD42</b>	
COMPRESSION PRESSURE .....	EM-48
ENGINE REMOVAL .....	EM-50
OUTER COMPONENT PARTS .....	EM-52
OIL SEAL REPLACEMENT .....	EM-54
CYLINDER HEAD .....	EM-56
CYLINDER BLOCK .....	EM-69
<hr/>	
<b>TB42 &amp; TD42</b>	
SERVICE DATA AND SPECIFICATRIONS (S.D.S.) .....	EM-89

## PREPARATION

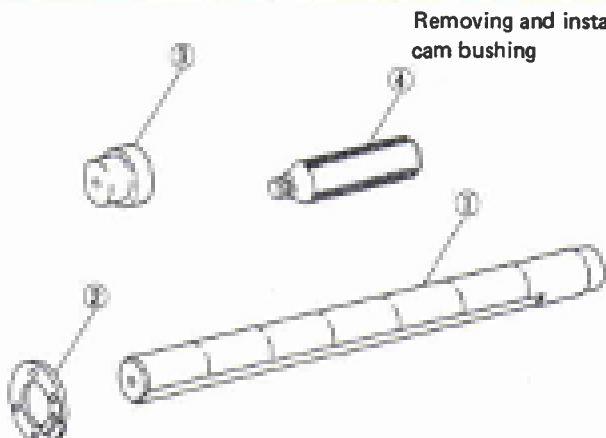

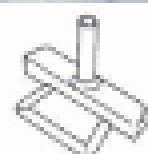
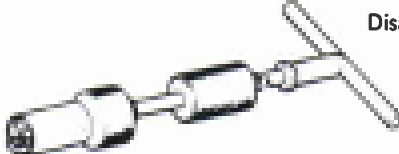



### SPECIAL SERVICE TOOLS

\*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application		
		TB42	TD42	
<b>ST0501S000*</b> Engine stand assembly ① ST05011000 Engine stand ② ST05012000 Base		Disassembling and assembling	X	X
<b>KV10106500*</b> Engine stand shaft			X	X
<b>KV11104800*</b> Engine sub-attachment			X	X
<b>KV101092S0*</b> Valve spring compressor ① KV10109210 Compressor ② KV10111200 Adapter		Disassembling and assembling valve components	X	X
<b>EM03470000*</b> Piston ring compressor		Installing piston assembly into cylinder bore	X	X
<b>ST16610001*</b> Pilot bushing puller		Removing crankshaft pilot bushing	X	X




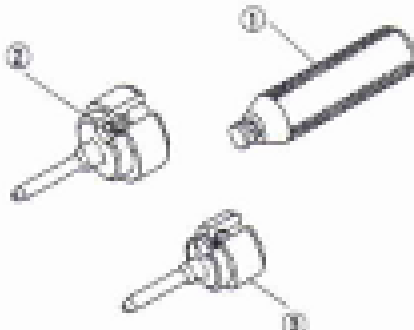
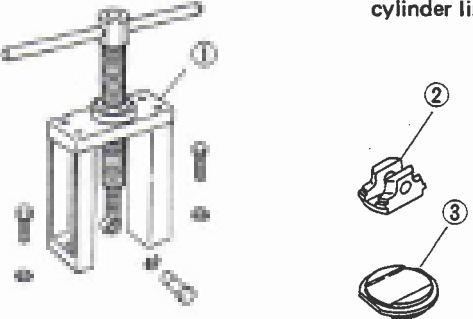
## PREPARATION

\*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application	
		TB42	TD42
KV111045S0 Cam bushing replacer set ① KV11104510 Replacer bar ② KV11104520 Guide plate ③ KV11104530 Adapter (1st bushing) ④ ST15243000 Drift	 <p style="text-align: right;">Removing and installing cam bushing</p>	X	X
WS39930000* Tube presser	 <p style="text-align: right;">Pressing the tube of fluid gasket</p>	X	X
KV10111100 Seal cutter	 <p style="text-align: right;">Removing oil pan</p>	X	-
KV10107900* Valve oil seal puller	 <p style="text-align: right;">Disassembling valve oil seal</p>	-	X
KV11103400 Valve oil seal drift	 <p style="text-align: right;">Installing valve oil seal</p>	-	X
KV10113000 Valve oil seal drift	 <p style="text-align: right;">Installing valve oil seal</p>	X	-
ST11033000* Valve guide drift	 <p style="text-align: right;">Removing valve guide</p>	-	X

## PREPARATION

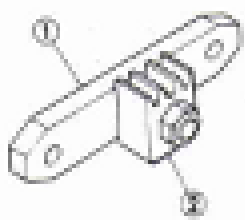

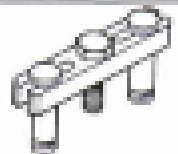

\*: Special tool or commercial equivalent

Tool number Tool name	Description	Engine application	
		TB42	TD42
KV11103900* Valve guide drift	 Installing valve guide	-	X
ST11032000* Valve guide reamer 8.0 mm (0.315 in) dia.	 Reaming valve guide	-	X
① KV11101110 Valve seat remover ② KV11103610 Adapter (Intake) ③ KV11103620 Adapter (Exhaust)	 Removing valve seat	-	X
① ST15243000 Valve seat drift ② KV11103810 Adapter (Intake) ③ KV11103820 Adapter (Exhaust)	 Installing valve seat	-	X
① KV11104010 Cylinder liner tool ② KV11104110 Adapter for removing ③ KV11104030 Adapter for installing	 Removing and installing cylinder liner	-	X





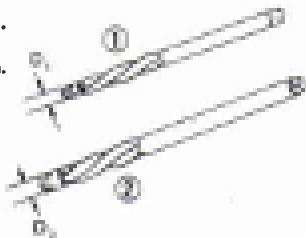





## PREPARATION

\* Special tool or commercial equivalent

Tool number Tool name	Description	Engine application		
		TB42	TD42	
KV111033S0 Engine stopper ① KV11103310 Stopper plate ② KV10105630 Stopper gear		Preventing crankshaft from rotating	-	X
KV10109300* Injection pump drive gear holder		Preventing drive gear from rotating (VE-type)	-	X
KV11103000* Injection pump drive gear puller		Removing drive gear (VE-type)	-	X
① ED19601000 Compression gauge ② ED19600600 Compression gauge adapter (for glow plug hole) ③ ED19600700 Compression gauge adapter (for injector hole)		Checking compression pressure	-	X

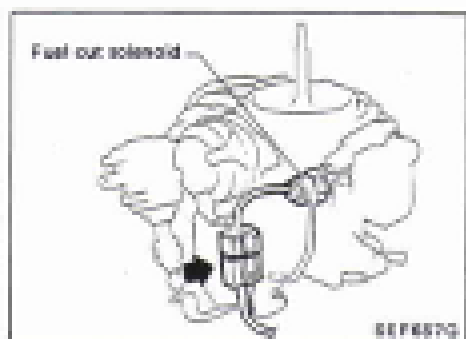
## PREPARATION

### COMMERCIAL SERVICE TOOLS

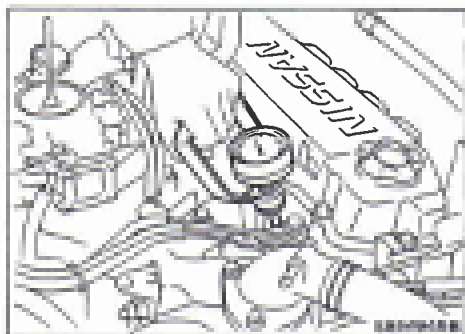
Tool name	Description	Engine application	
		TB42	TD42
Pulley holder	 <p>Holding camshaft pulley while tightening or loosening camshaft bolt</p>	X	-
Valve guide drift	<p>Intake: } A = 11.5 mm           } (0.453 in) dia. Exhaust: } B = 7.6 mm            } (0.299 in) dia.</p>  <p>Removing and installing valve guide</p>	X	-
Valve guide reamer	<p>Intake: } D<sub>1</sub> = 8.0 mm           } (0.315 in) dia. Exhaust: } D<sub>2</sub> = 12.2 mm            } (0.480 in) dia.</p>  <p>Reaming valve guide (①) or hole for over-size valve guide (②)</p>	X	-
Valve seat cutter set	 <p>Finishing valve seat dimensions</p>	X	X
Front oil seal drift	<p>A = 90 mm (3.54 in) dia. B = 57 mm (2.24 in) dia.</p>  <p>Installing front oil seal</p>	X	-
Rear oil seal drift	<p>A = 110 mm (4.33 in) dia. B = 85 mm (3.35 in) dia.</p>  <p>Installing rear oil seal</p>	X	-
Piston pin drift	<p>A = 22.5 mm (0.886 in) dia. B = 12.5 mm (0.492 in) dia.</p>  <p>Removing and installing piston pin</p>	X	-
Piston ring expander	 <p>Removing and installing piston ring</p>	X	X

**Measurement of Compression Pressure  
(On-vehicle service)**

1. Warm up engine.
2. Turn ignition switch off.
3. Remove air cleaner and all spark plugs.
4. Disconnect distributor center cable.



5. Disconnect fuel cut solenoid valve connector.



6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank the engine and record the highest gauge indication.
9. Repeat the measurement on each cylinder as shown below.
- **Always use a fully-charged battery to obtain specified engine revolution.**

**Compression pressure: kPa (bar, kg/cm<sup>2</sup>, psi)/rpm**  
**Standard**

**1,177 (11.77, 12.0, 171)/200**

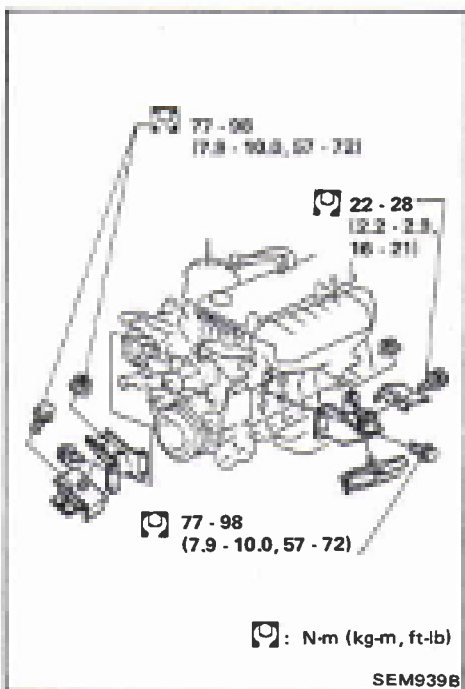
**Minimum**

**883 (8.83, 9.0, 128)/200**

**Difference limit between cylinders:**

**98 (0.98, 1.0, 14)/200**

10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.
  - **If adding oil helps the compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
  - **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.). If valve or valve seat is damaged excessively, replace them.**
  - **If compression in any two adjacent cylinders is low and if adding oil does not help the compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.**

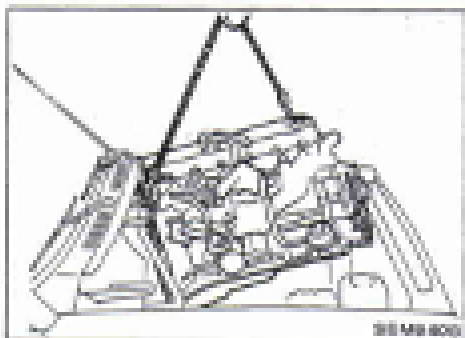


**WARNING:**

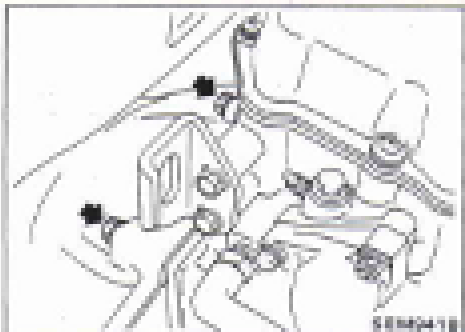
- a. Situate vehicle on a flat and solid surface.
- b. Place chocks at front and back of rear wheels.
- c. Do not remove engine until exhaust system has completely cooled off.  
Otherwise, you may burn yourself and/or fire may break out in the fuel line.
- d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
- e. Be sure to hoist engine in a safe manner.

**CAUTION:**

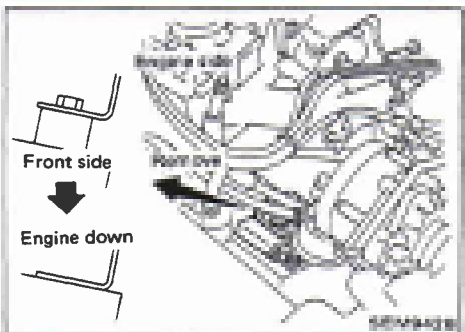
- When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.
- For engines not equipped with engine slingers, attach proper slingers and bolts described in the PARTS CATALOG.



- Remove engine after disconnecting from transmission.



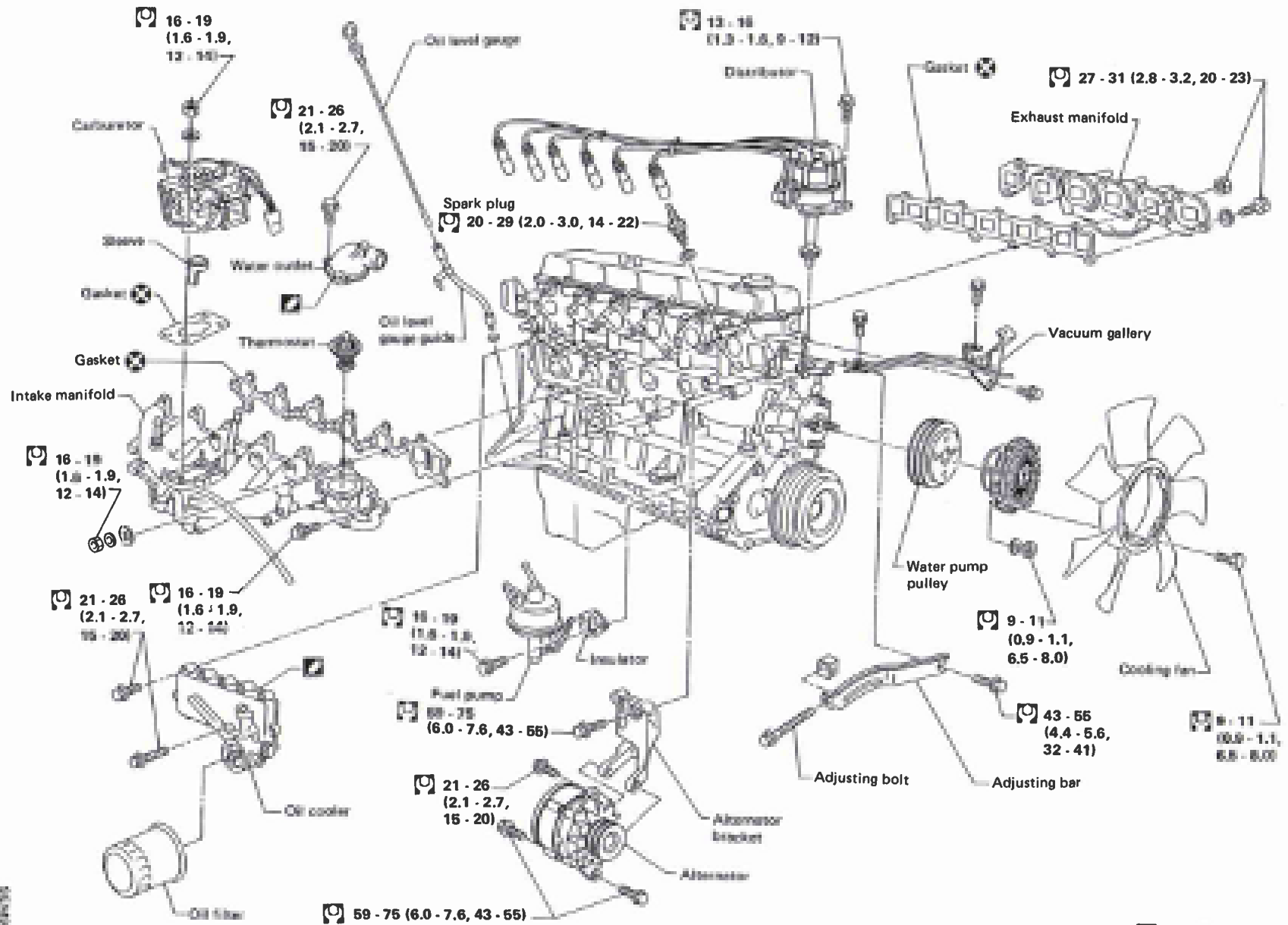
- (1) Before removing two mounting bolts from upper side of transmission, remove front engine mounts and lower engine to the level of the front mount.





- (2) Before separating transmission and rear plate, remove transmission mounting bolts. Position Tool into mating surface of transmission and rear plate, and slide it along mating surface.

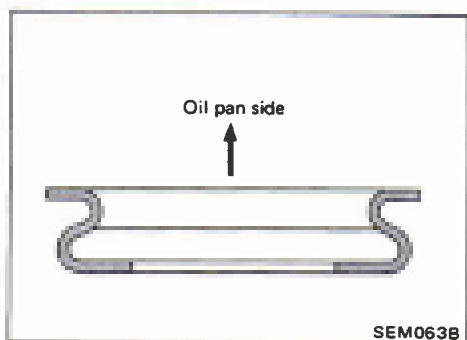
EM-10



⊗ : N-m (kg-m, ft-lb)

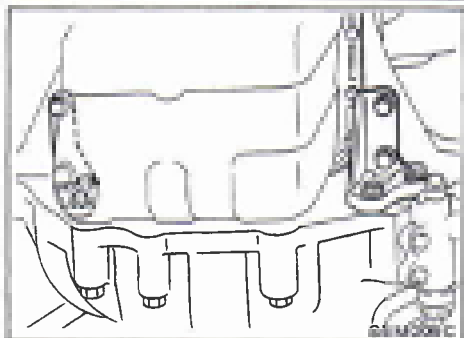
OUTER COMPONENT PARTS

TB42

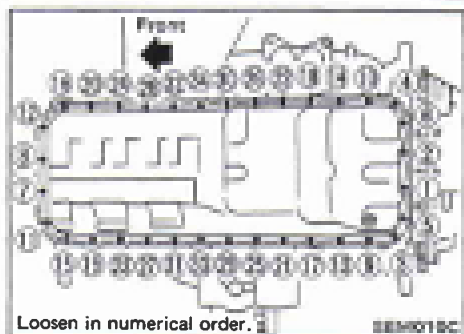


### Removal (On-vehicle service)

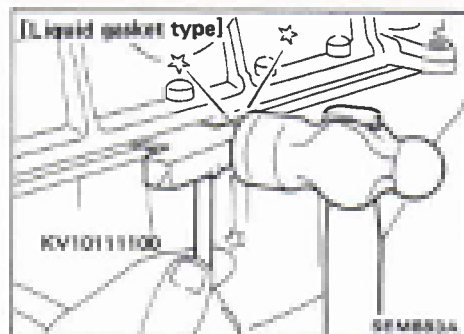
1. Drain engine oil.
  - When installing drain plug washer, make sure it faces correct direction.
2. Remove engine gussets.



2. Remove engine gussets.

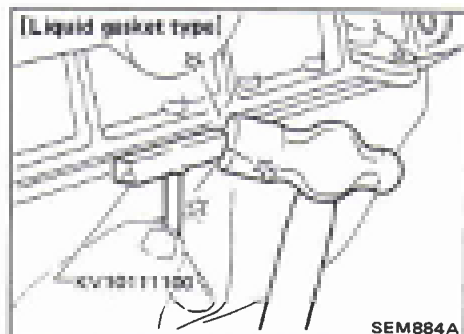


3. Remove oil pan.
  - (1) Remove oil pan bolts and nuts in numerical order.

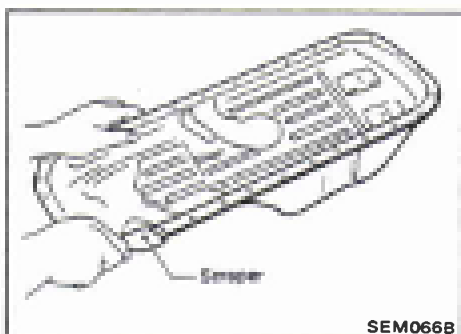


The following operation is only for the liquid gasket type.

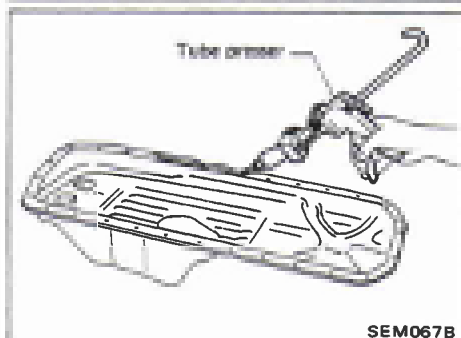
- (2) Insert Tool between cylinder block and oil pan.
  - Do not insert screwdriver, or oil pan flange will be deformed.
  - Do not insert Tool into rear oil seal retainer portion; otherwise, it will be damaged.



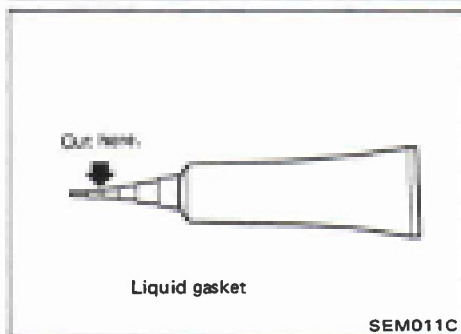
- (3) Slide Tool by tapping its side with a hammer, and remove oil pan.



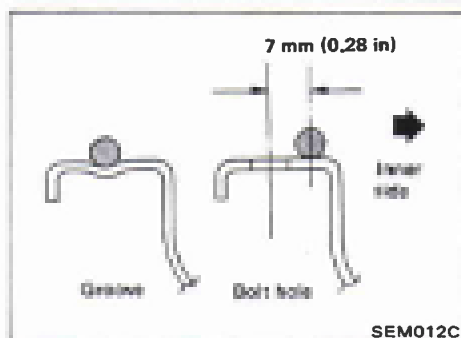
SEM066B



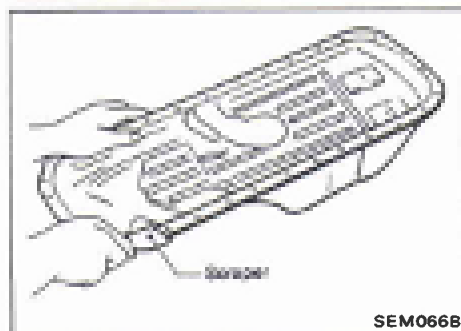
SEM067B



SEM011C



SEM012C



SEM066B

## Installation (On-vehicle service)

### LIQUID GASKET TYPE

1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
  - Also remove traces of liquid gasket from mating surface of cylinder block.

2. Apply a continuous bead of liquid gasket to mating surface of oil pan.

■ **Use Genuine Liquid Gasket or equivalent.**

■ Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.

3. Apply liquid gasket to inner sealing surface instead of surface where there is no groove at bolt hole.

● Attaching should be done within 5 minutes after coating.

4. Install oil pan.

● Install bolts and nuts in reverse order of removal.

● Wait at least 30 minutes before refilling engine oil.

### CONVENTIONAL GASKET TYPE

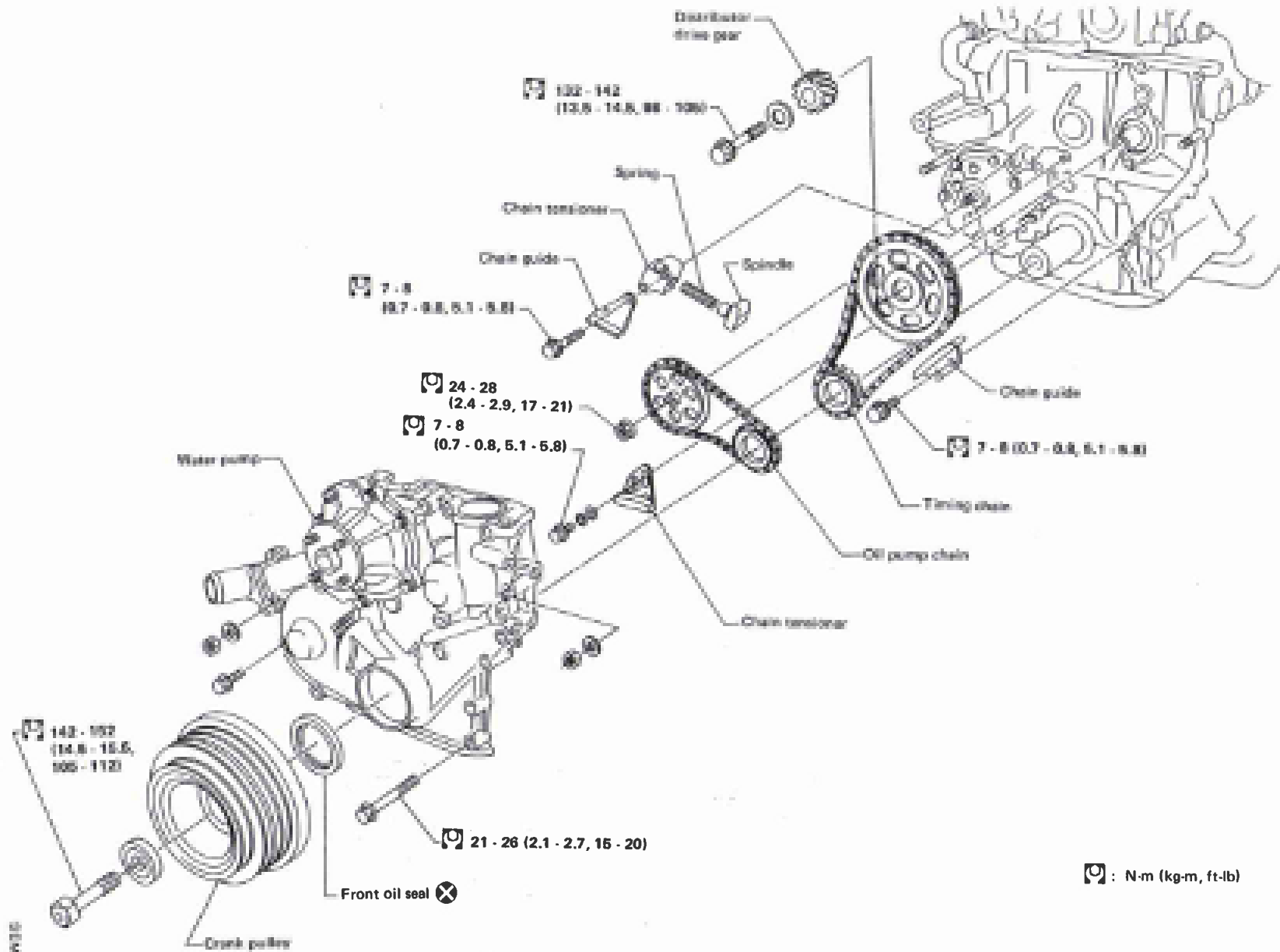
1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
  - Also remove traces of liquid gasket from mating surface of cylinder block.

Perform the above operation only when liquid gasket is used between oil pan and cylinder block.

2. Install gasket and oil pan.

● Install bolts and nuts in reverse order of removal.





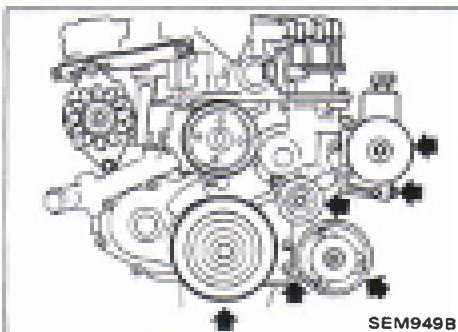
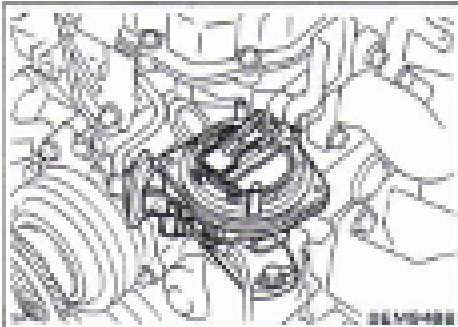
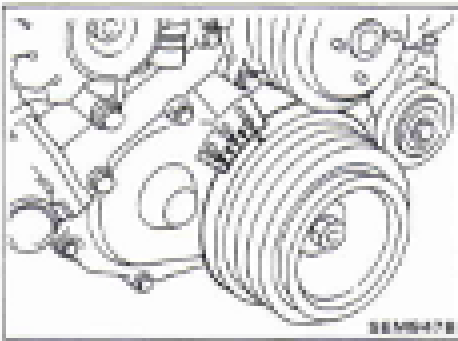
: N-m (kg-m, ft-lb)

**CAUTION:**

- After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.
- When tightening camshaft bolt, oil pump sprocket nuts and crank pulley bolt, apply new engine oil to the threaded portions and seat surfaces of bolts or nuts.

**Removal (On-vehicle service)**

1. Drain coolant from radiator.  
**Be careful not to spill coolant on drive belts.**
2. Remove radiator and cooling fan.
3. Remove the following belts.
  - Power steering drive belt
  - Alternator drive belts
  - Compressor drive belt
4. Set No. 1 piston at T.D.C. on its compression stroke.

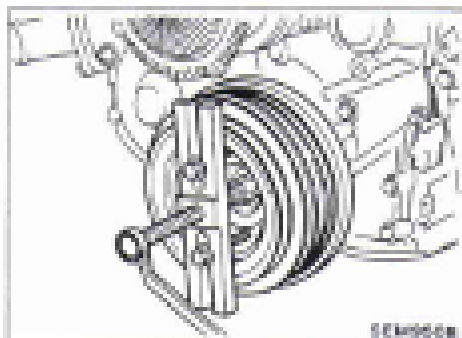


5. Remove the following parts.
  - Power steering pump and power steering bracket
  - A/C compressor, idler pulley and compressor bracket

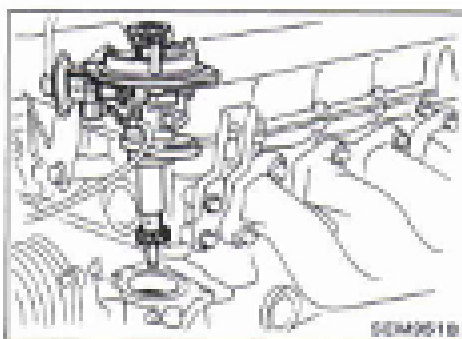
## TIMING CHAIN

TB42

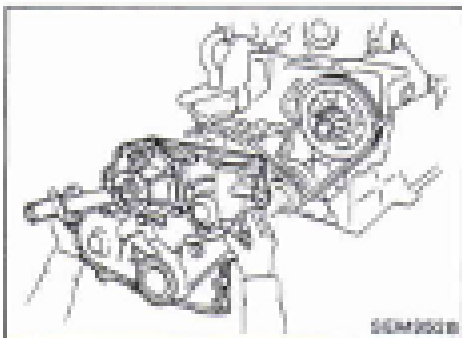
### Removal (On-vehicle service) (Cont'd)



6. Remove crankshaft pulley.

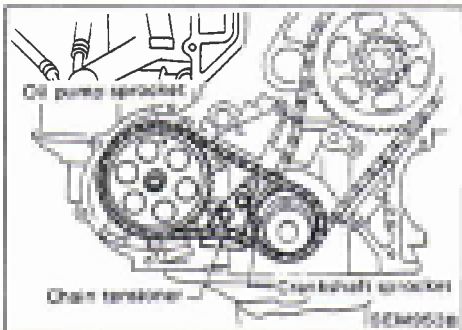


7. Remove distributor.



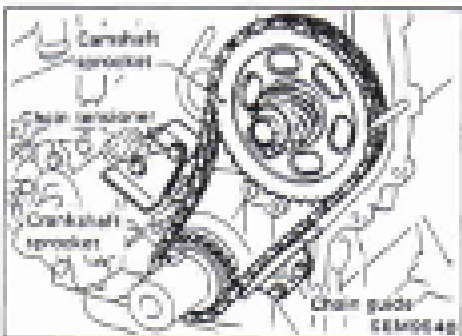
8. Remove oil pan.

9. Remove front cover.



10. Remove the following parts.

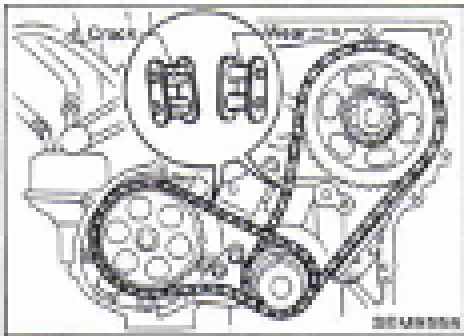
- Chain tensioner
- Oil pump chain and sprocket



11. Remove the following parts.

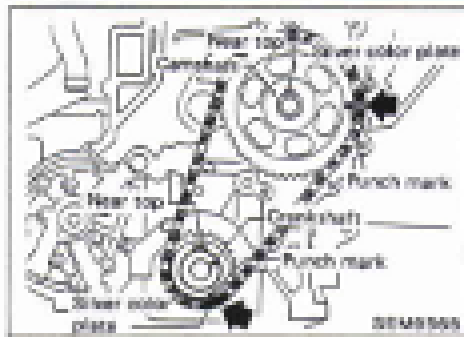
- Chain tensioner
- Chain guides
- Timing chain and sprocket

**Carefully remove chain tensioner. Otherwise, spring may fall.**



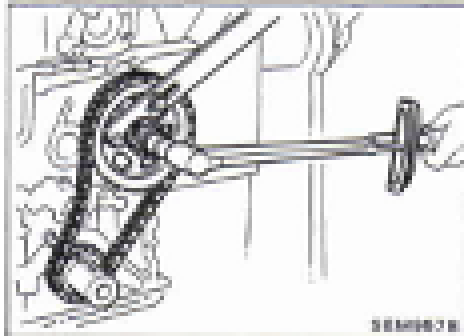
### Inspection

Check for cracks and excessive wear at roller links. Replace if necessary.

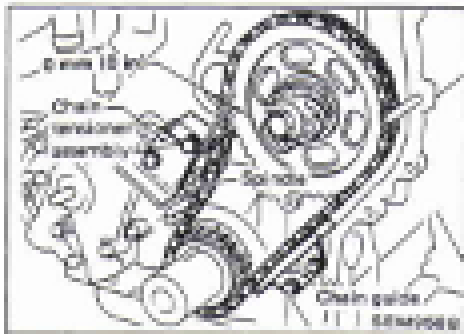


### Installation (On-vehicle service)

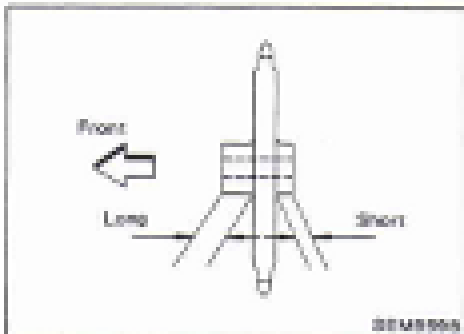
1. Install camshaft sprocket and timing chain.
  - Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.
  - **Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket.**



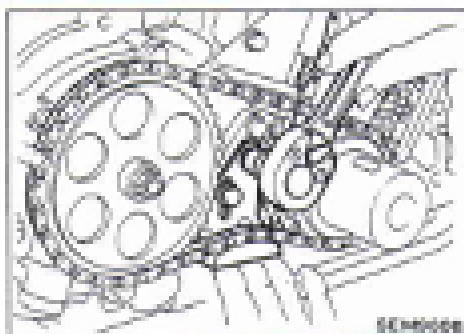
2. Tighten camshaft sprocket bolt.



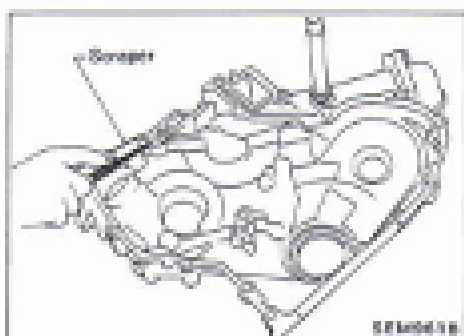
3. Install chain tensioner and chain guides.
  - **Adjust protrusion of timing chain tensioner spindle to 0 mm (0 in) with slack chain guide.**



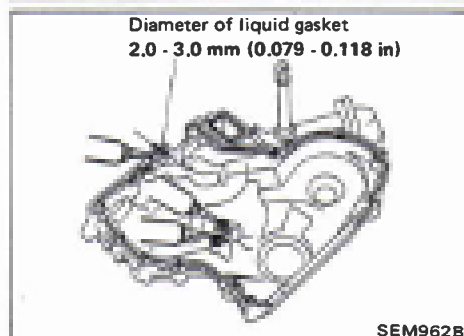
4. Install oil pump sprocket and oil pump chain.

**Installation (On-vehicle service) (Cont'd)**

5. Install oil pump chain tensioner.  
Tighten bolts while applying pressure to oil pump chain with one hand.



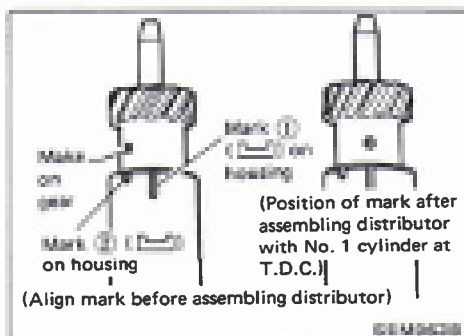
6. Before installing front cover, remove all traces of liquid gasket from mating surface using a scraper.




Diameter of liquid gasket  
2.0 - 3.0 mm (0.079 - 0.118 in)

7. Apply a continuous bead of liquid gasket to front cover.
  - Use Genuine Liquid Gasket or equivalent.
  - a. Coat of liquid gasket should be maintained within 2.0 to 3.0 mm (0.079 to 0.118 in) dia. range.
  - b. Attach front cover to cylinder block within five minutes after coating.
  - c. Wait at least 30 minutes before refilling engine oil or starting engine.

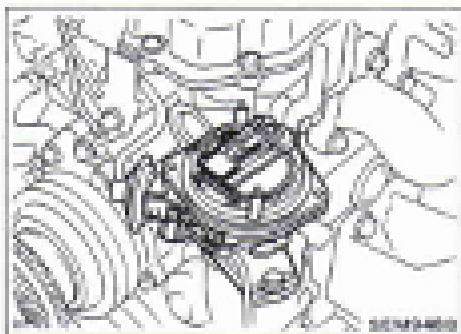
8. Install front cover.  
**Be careful not to damage cylinder head gasket.**
9. Install oil pan.  
**Refer to Installation of OIL PAN.**
10. Install crankshaft pulley.



11. Install distributor.  
Set the distributor gear position.  
[Be sure mark ② (  ) on housing is aligned with mark on gear.]

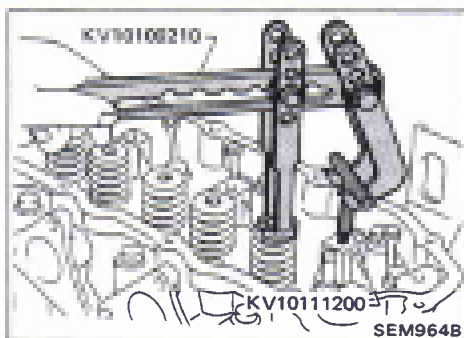
**Installation (On-vehicle service) (Cont'd)**

12. Make sure that No. 1 cylinder is set at T.D.C. and that distributor rotor is set at No. 1 cylinder spark position.

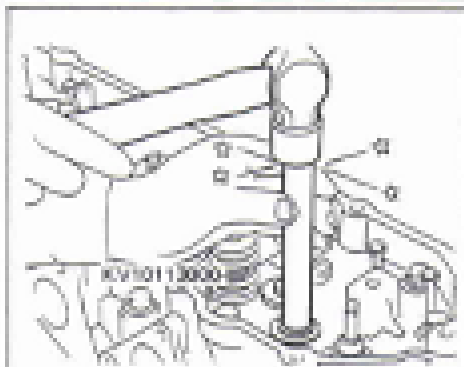


## VALVE OIL SEAL (On-vehicle service)

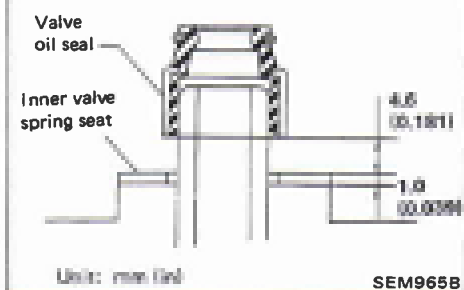
1. Remove air cleaner and air duct.
2. Remove rocker cover.
3. Remove rocker shaft assembly.



4. Remove valve springs and valve oil seals with Tool. **Piston concerned should be set at T.D.C. to prevent valve from falling off.**

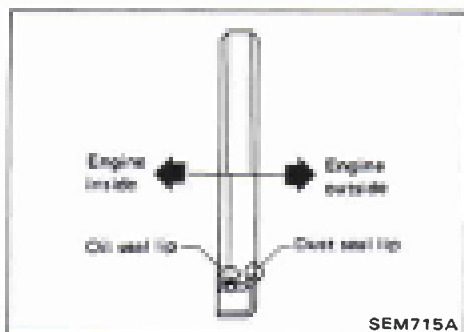


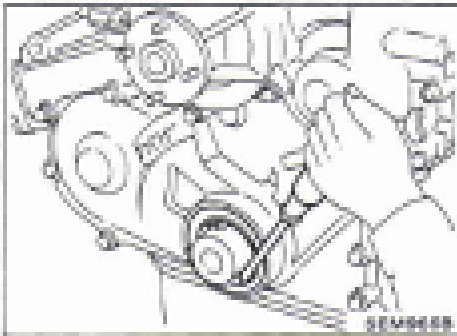
5. Apply engine oil to new valve oil seal and install it with Tool.
  - **Before installing valve oil seal, install inner valve spring seat.**



## OIL SEAL INSTALLING DIRECTION

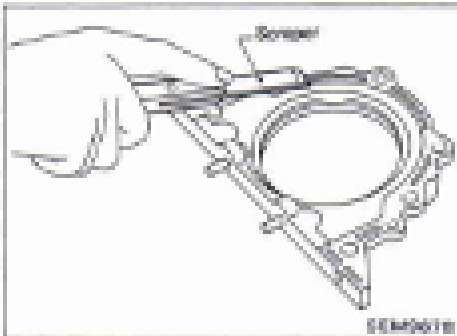
- When installing a new front or rear seal, make sure its mounting direction is correct.





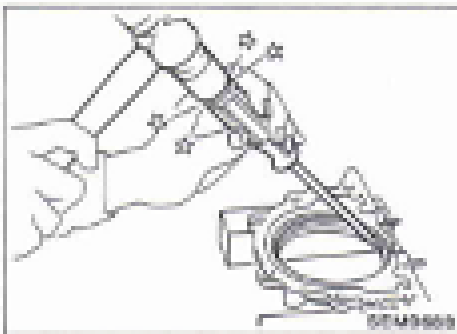
### CRANKSHAFT FRONT OIL SEAL (On-vehicle service)

1. Remove radiator and radiator shroud.
2. Remove cooling fan.
3. Remove drive belts.
4. Remove crank pulley.
5. Remove crankshaft oil seal.
  - Be careful not to damage sealing surfaces of crankshaft.
6. Apply engine oil to new oil seal and install it using suitable tool.

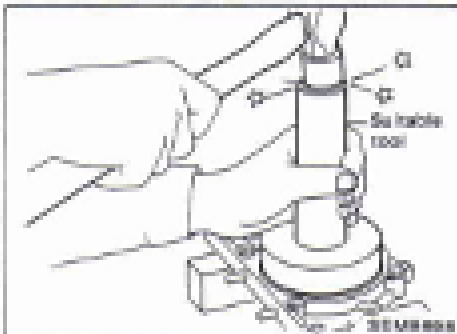


### REAR OIL SEAL (On-vehicle service)

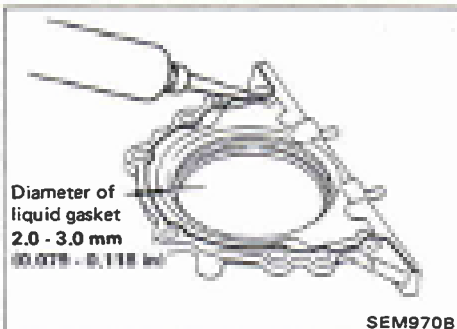
1. Remove flywheel or drive plate.
2. Remove oil pan.
3. Remove rear oil seal retainer.
4. Remove traces of liquid gasket using scraper.



5. Remove rear oil seal from retainer.



6. Apply engine oil to new oil seal and install it using suitable tool.

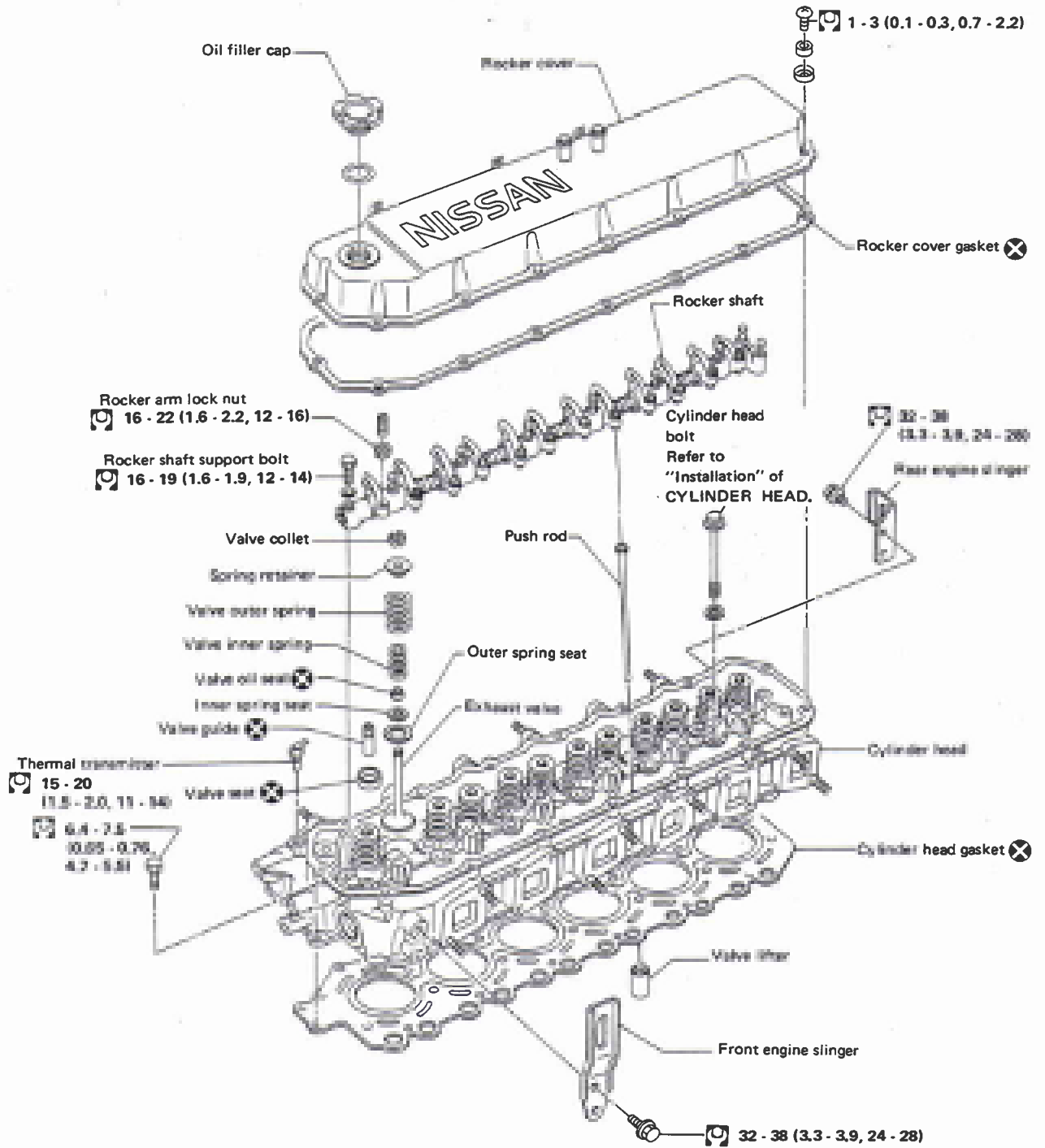


7. Apply a continuous bead of liquid gasket to rear oil seal retainer.
  - Use Genuine Liquid Gasket or equivalent.
    - a. Coat of liquid gasket should be maintained within 2.0 to 3.0 mm (0.079 to 0.118 in) dia. range.
    - b. Attach oil seal retainer to cylinder block within five minutes after coating.
    - c. Wait at least 30 minutes before refilling engine oil or starting engine.



# CYLINDER HEAD

T042



: N·m (kg-m, ft-lb)

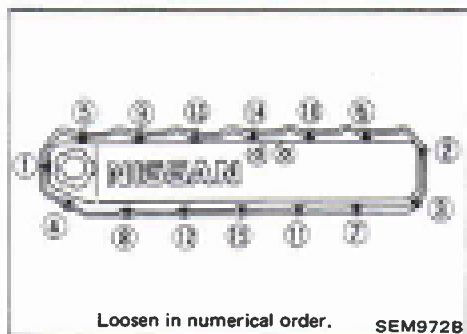
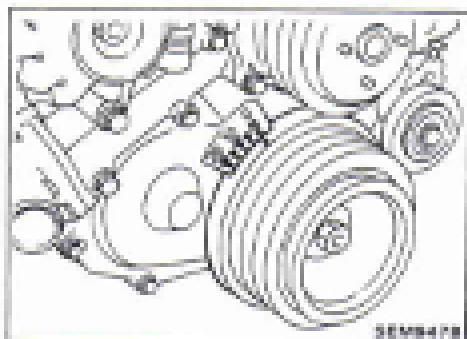
SEM971B

**CAUTION:**

- When installing sliding parts such as rocker arms and rocker shaft brackets, be sure to apply new engine oil on their sliding surfaces.
- When tightening cylinder head bolts and rocker shaft bracket bolts, apply new engine oil to the thread portions and seat surfaces of bolts.

**Removal (On-vehicle service)**

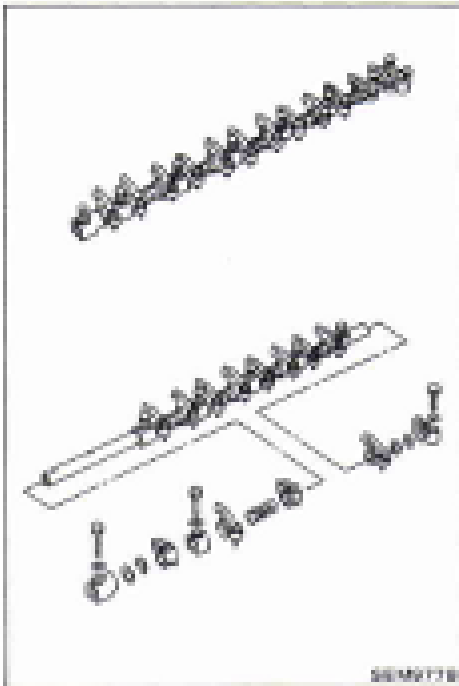
1. Drain coolant from radiator.  
**Be careful not to spill coolant on drive belts.**
2. Remove the following parts.
  - Air cleaner and duct
  - Disconnect vacuum hoses, harness, water hoses and fuel hose
  - Disconnect high tension wires from spark plugs
  - Disconnect accelerator wire and choke wire
  - Alternator adjusting bar
3. Disconnect front exhaust tube from exhaust manifold.
4. Set No. 1 piston at T.D.C. on its compression stroke.



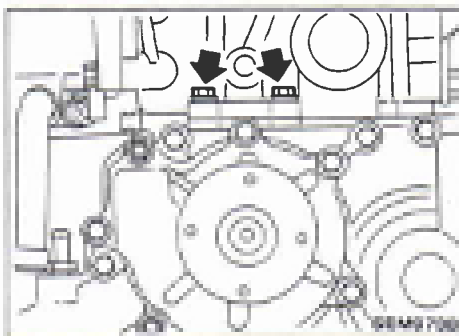
5. Remove rocker cover.
  - Loosen rocker cover bolts in numerical order.

**Removal (On-vehicle service) (Cont'd)**

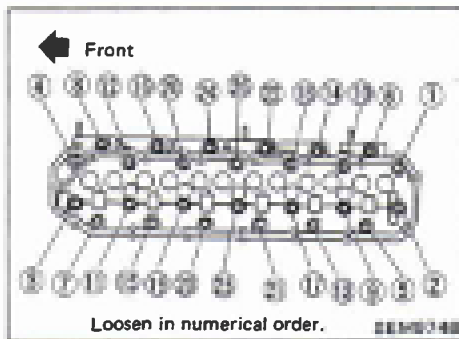
6. Remove rocker shaft with rocker arms.  
**Before removal, fully loosen valve clearance adjusting screws. The bolts should be loosened in two or three steps.**
7. Remove push rods.



SEM977B



8. Remove front cover tightening bolts to cylinder head.



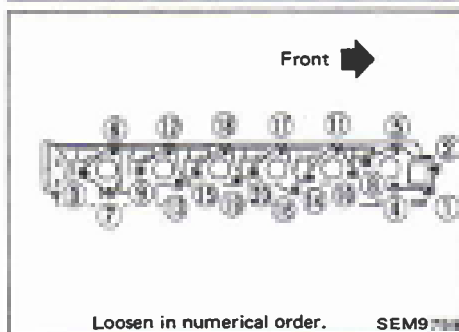
Loosen in numerical order.

SEM974B

9. Remove cylinder head with manifolds.
  - **Head warpage or cracking could result from removing in incorrect order.**
  - **Cylinder head bolts should be loosened in two or three steps.**

**Disassembly**

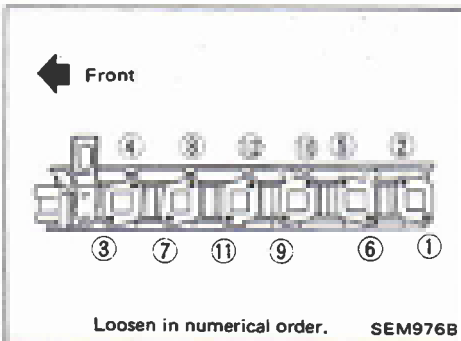
1. Remove intake manifold.
  - Loosen intake manifold bolts in numerical order.



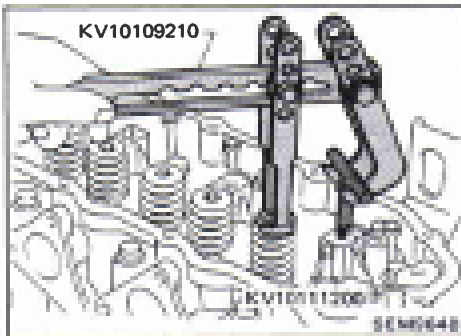
Loosen in numerical order.

SEM975B

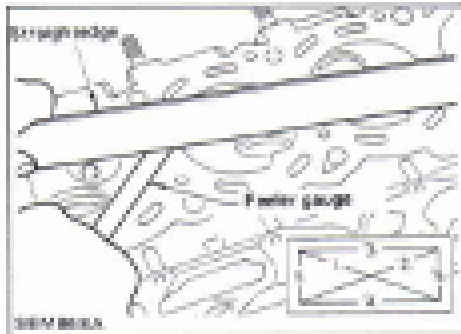
**Disassembly (Cont'd)**



2. Remove exhaust manifold.
  - Loosen exhaust manifold bolts in numerical order.



3. Remove valve springs and valve oil seals with Tool.



**Inspection**

**CYLINDER HEAD DISTORTION**

**Head surface flatness:**

**Less than 0.07 mm (0.0028 in)**

If beyond the specified limit, replace it or resurface it.

**Resurfacing limit:**

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

**Amount of cylinder head resurfacing is "A"**

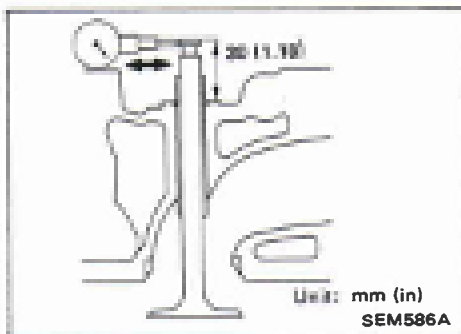
**Amount of cylinder block resurfacing is "B"**

**The maximum limit is as follows:**

$$A + B = 0.2 \text{ mm (0.008 in)}$$

**Nominal cylinder head height:**

**117.19 - 117.59 mm (4.6138 - 4.6295 in)**



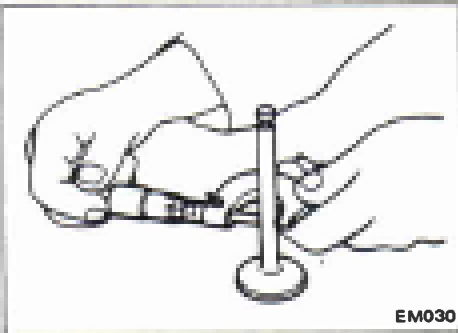
**VALVE GUIDE CLEARANCE**

1. Measure valve deflection in a parallel direction with rocker arm. (Valve and valve guide mostly wear in this direction.)

**Valve deflection limit (Dial gauge reading):**

**0.2 mm (0.008 in)**

**Inspection (Cont'd)**



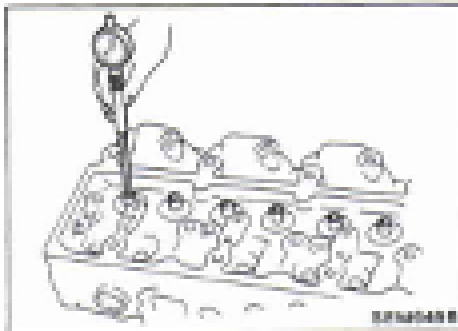
2. If it exceeds the limit, check valve to valve guide clearance.
- (1) Measure valve stem diameter "d" and valve guide inner diameter.

- (2) Check that clearance is within the specification.

**Valve to valve guide clearance limit:**

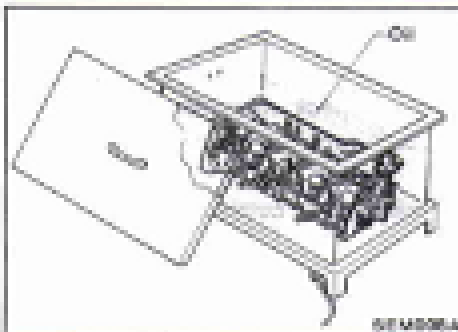
**0.1 mm (0.004 in)**

- (3) If it exceeds the limit, replace valve or valve guide.

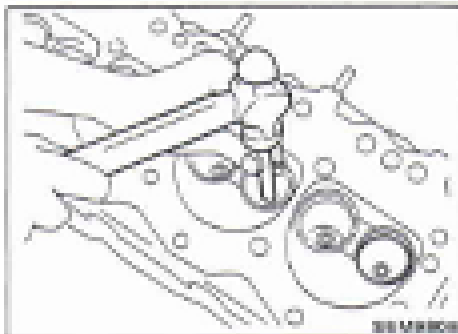


**VALVE GUIDE REPLACEMENT**

1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).



2. Drive out valve guide with a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.

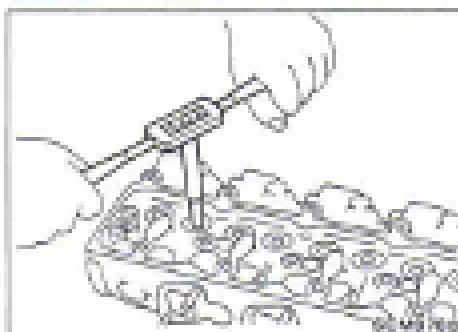


3. Ream cylinder head valve guide hole.

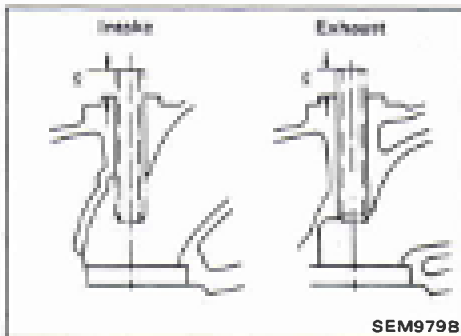
**Valve guide hole diameter (for service parts):**

**Intake and exhaust**

**12.233 - 12.244 mm (0.4816 - 0.4820 in)**



**Inspection (Cont'd)**

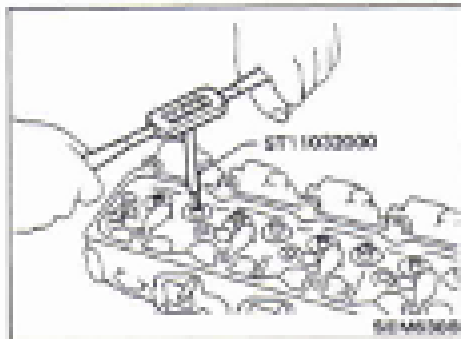


SEM979B

- Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.

**Projection "Q":**

**11.7 - 12.3 mm (0.461 - 0.484 in)**



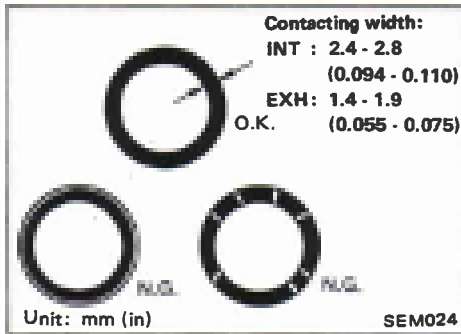
SEM4510B

- Ream valve guide.

**Finished size:**

**Intake and exhaust**

**8.000 - 8.018 mm (0.3150 - 0.3157 in)**



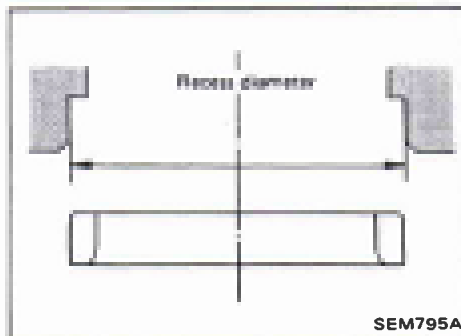
Unit: mm (in)

SEM024

**VALVE SEATS**

Check valve seats for any evidence of pitting at valve contact surface, and reseat or replace if it has worn out excessively.

- Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.
- Cut with both hands to uniform the cutting surface.



SEM795A

**REPLACING VALVE SEAT FOR SERVICE PARTS**

- Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.

- Ream cylinder head recess.

**Reaming bore for service valve seat**

**Oversize [0.5 mm (0.020 in)]:**

**Intake**

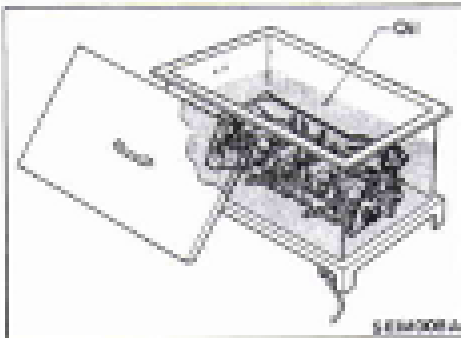
**48.500 - 48.516 mm (1.9094 - 1.9101 in)**

**Exhaust**

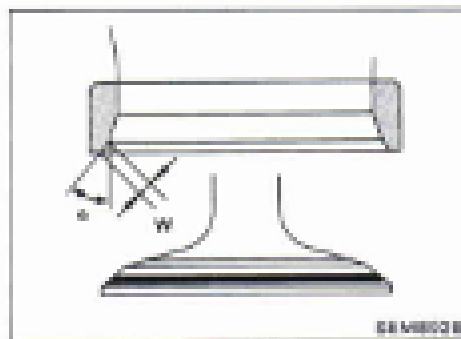
**40.500 - 40.516 mm (1.5945 - 1.5951 in)**

Reaming should be done to the concentric circles to valve guide center so that valve seat will have the correct fit.

**Inspection (Cont'd)**



3. Heat cylinder head to 150 to 160°C (302 to 320°F).
4. Press fit valve seat until it seats on the bottom.



5. Cut or grind valve seat using suitable tool at the specified dimensions as shown in S.D.S.
6. After cutting, lap valve seat with an abrasive compound.
7. Check valve seating condition.

**Seat face angle "α": 45 deg.**

**Contacting width "W":**

**Intake**

**2.4 - 2.8 mm (0.094 - 0.110 in)**

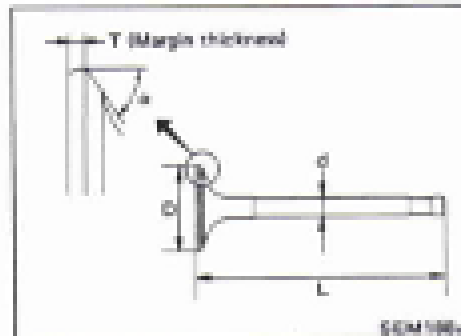
**Exhaust**

**1.4 - 1.9 mm (0.055 - 0.075 in)**

**VALVE DIMENSIONS**

Check dimensions in each valve. For dimensions, refer to S.D.S. When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace the valve.

**Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.**



**VALVE SPRING SQUARENESS**

1. Measure "S" dimension.

**Out-of-square:**

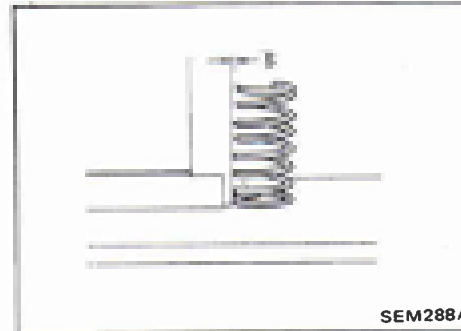
**Outer**

**Less than 2.2 mm (0.087 in)**

**Inner**

**Less than 1.9 mm (0.075 in)**

2. If it exceeds the limit, replace spring.



**VALVE SPRING PRESSURE HEIGHT**

Check valve spring pressure height.

**Pressure height: mm/N (mm/kg, in/lb)**

**Outer**

**30.0/512.9 (30.0/52.3, 1.181/115.3)**

**Inner**

**25.0/255.0 (25.0/26.0, 0.984/57.3)**



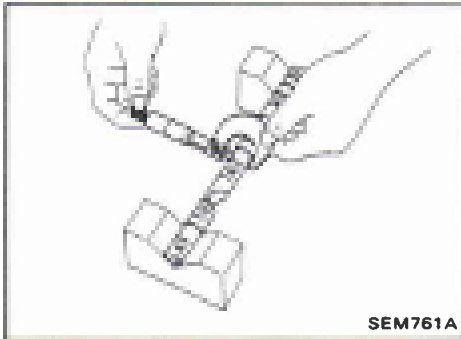
**Inspection (Cont'd)**

**ROCKER SHAFT AND ROCKER ARM**

1. Check rocker shaft for scratches, seizure and wear.
2. Check outer diameter of rocker shaft.

**Diameter:**

**19.979 - 20.000 mm (0.7866 - 0.7874 in)**



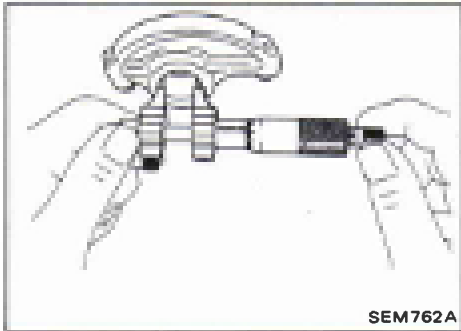
3. Check inner diameter of rocker arm.

**Diameter:**

**20.020 - 20.038 mm (0.7882 - 0.7889 in)**

**Rocker arm to shaft clearance:**

**0.020 - 0.059 mm (0.0008 - 0.0023 in)**



**VALVE LIFTER AND PUSH ROD**

**Valve lifter**

1. Check valve lifters for excessive wear on the face.
2. Replace with new ones if worn beyond repair.

**a. Valve lifter end should be smooth.**

**b. Valve lifter to lifter hole clearance:**

**Standard**

**0.020 - 0.063 mm (0.0008 - 0.0025 in)**

**Limit**

**Less than 0.20 mm (0.0079 in)**

**Valve lifter outer diameter "A":**

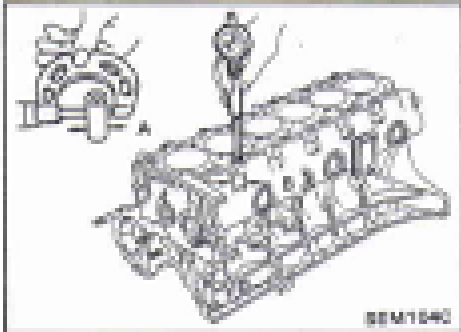
**Standard**

**24.970 - 24.980 mm (0.9831 - 0.9835 in)**

**Cylinder block valve lifter hole diameter "B":**

**Standard**

**25.000 - 25.033 mm (0.9843 - 0.9855 in)**



**Push rod**

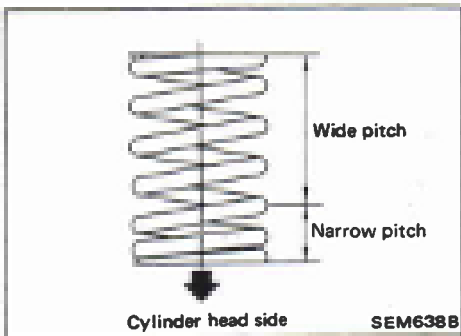
1. Inspect push rod for excessive wear on the face.
2. Replace if worn or damaged beyond repair.
3. Check push rod for bend using a dial gauge.

**Maximum allowable bend**

**(Total indicator reading):**

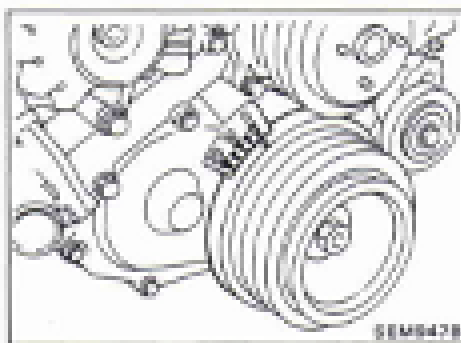
**Less than 0.5 mm (0.020 in)**





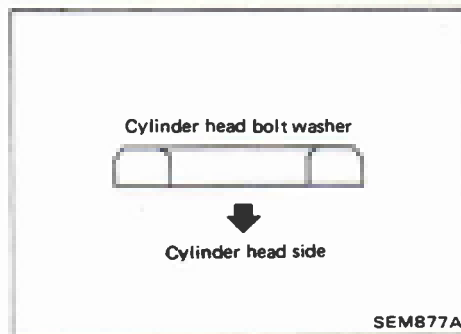
**Assembly**

1. Install valve component parts.
  - Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.
  - Before installing valve oil seal, install inner spring seat.
  - Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.
2. Install intake and exhaust manifolds.  
Tighten manifold bolts and nuts in two or three steps in reverse order of removal.  
Refer to "Removal" of CYLINDER HEAD.

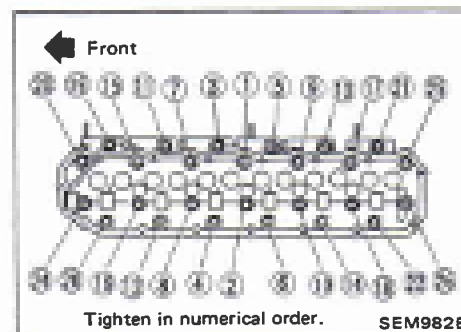


**Installation (On-vehicle service)**

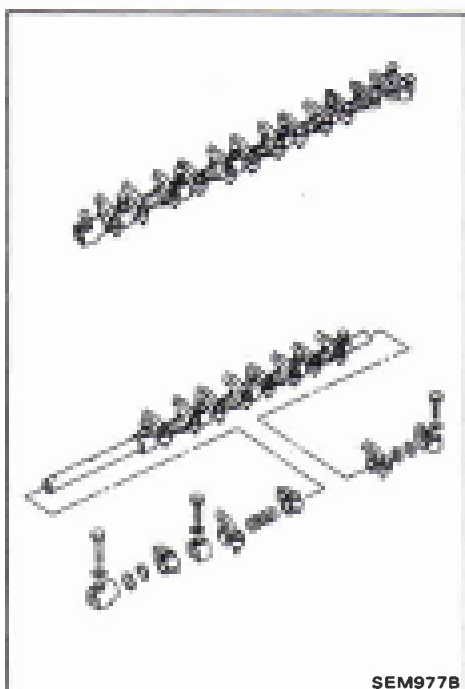
1. Set No. 1 piston at T.D.C. on its compression stroke.



2. Install cylinder head with new gasket.
  - Be sure to install washers between bolts and cylinder head.
  - Do not rotate crankshaft and camshaft separately, valves will hit piston heads.



3. Tighten cylinder head bolts in numerical order.
  - Tightening procedure.
    - (1) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
    - (2) Tighten all bolts from 57 to 67 N·m (5.8 to 6.8 kg-m, 42 to 49 ft-lb).
    - (3) Loosen all bolts completely.
    - (4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
    - (5) Tighten all bolts from 64 to 74 N·m (6.5 to 7.5 kg-m, 47 to 54 ft-lb) or if you have an angle wrench, turn all bolts 69 to 74 degrees clockwise.



SEM977B

**Installation (On-vehicle service) (Cont'd)**

4. Install push rods and rocker shaft with rocker arms.
5. Adjust valve clearance.

**Valve clearance:**

	Unit: mm (in)	
	*Cold	Hot
Intake	0.20 (0.008)	0.38 (0.015)
Exhaust	0.20 (0.008)	0.38 (0.015)

\* At temperature of approximately 20°C (68°F)

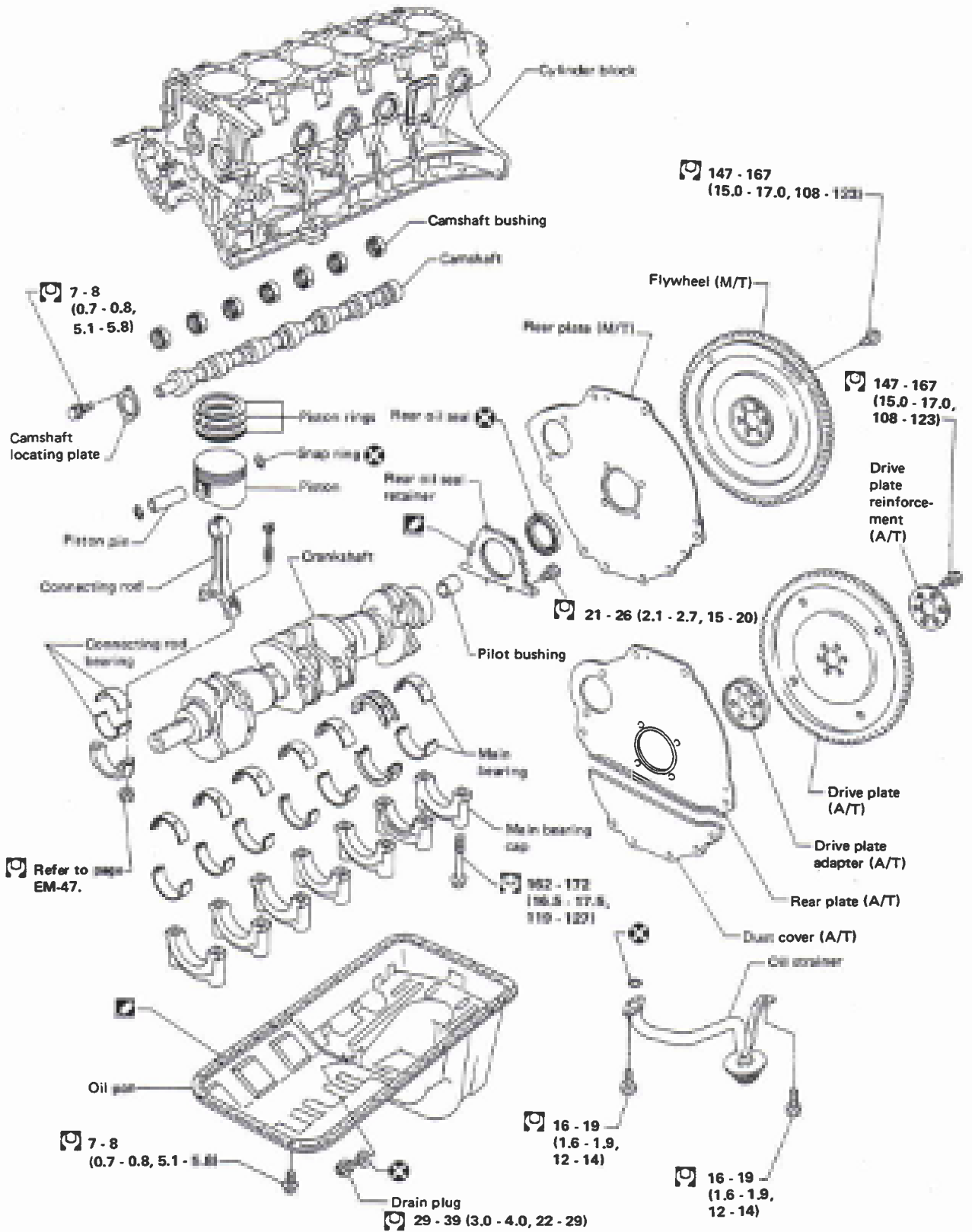
Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

Refer to MA section.

6. Install rocker cover.  
Tighten rocker cover bolts in reverse order of removal.  
Refer to "Removal" of CYLINDER HEAD.

# CYLINDER BLOCK

TB42

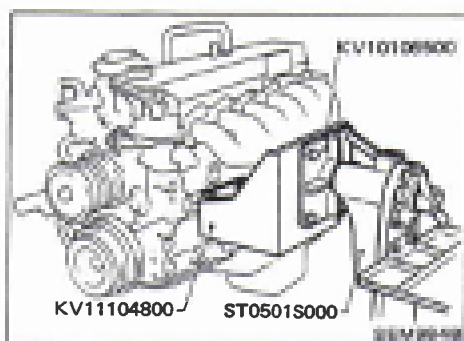


: N·m (kg·m, ft·lb)

SEM983B

**CAUTION:**

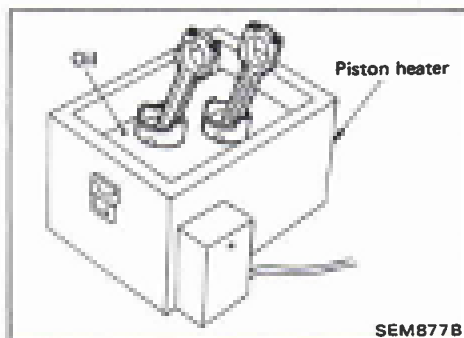
- When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.
- Place the removed parts such as bearings and bearing caps in their proper order and direction.
- When tightening connecting rod bolts, main bearing cap bolts and flywheel bolts, apply engine oil to the thread portion of bolts and seating surface of nuts.



**Disassembly**

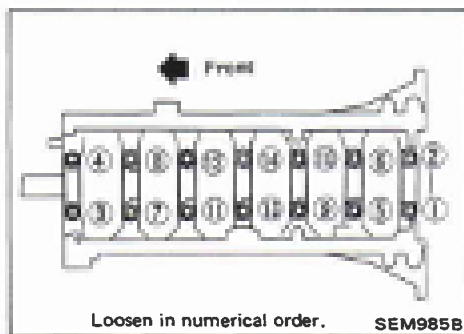
**PISTON AND CRANKSHAFT**

1. Place engine on work stand.
2. Drain coolant and remove water pump.
3. Drain oil.
4. Remove oil pan and oil strainer.
5. Remove distributor.
6. Remove front cover.
7. Remove oil pump chain.
8. Remove timing chain.
9. Remove rocker cover.
10. Remove rocker shaft with rocker arms and push rods.
11. Remove cylinder head.
12. Remove valve lifters and camshaft.



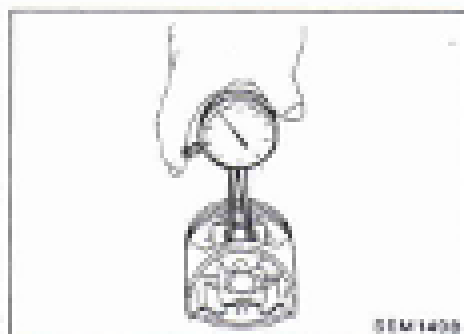
13. Remove pistons.

- When disassembling piston and connecting rod, remove snap rings first, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



14. Remove bearing cap and crankshaft.

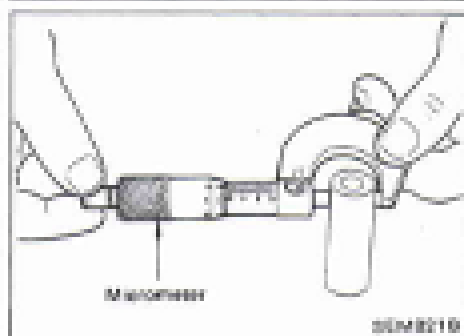
- Before removing bearing cap, measure crankshaft end play.



**Inspection**

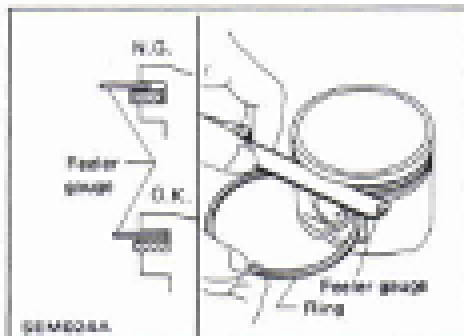
**PISTON AND PISTON PIN CLEARANCE**

1. Measure inner diameter of piston pin hole "dp".  
**Standard diameter "dp":**  
**22.987 - 22.993 mm (0.9050 - 0.9052 in)**



2. Measure outer diameter of piston pin "Dp".  
**Standard diameter "Dp":**  
**22.989 - 22.995 mm (0.9051 - 0.9053 in)**
3. Calculate piston pin clearance.  
**-0.008 to 0.004 mm (-0.0003 to 0.0002 in)**

If it exceeds the limit, replace piston assembly with pin.



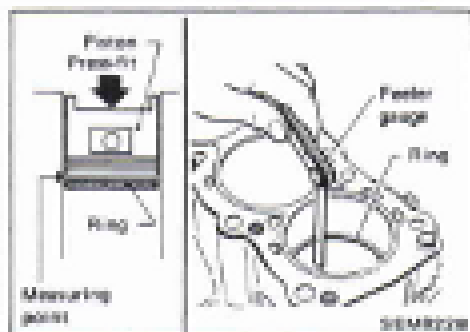
**PISTON RING SIDE CLEARANCE**

**Side clearance:**

- Top ring**  
0.040 - 0.073 mm (0.0016 - 0.0029 in)
- 2nd ring**  
0.030 - 0.063 mm (0.0012 - 0.0025 in)
- Oil ring**  
0.015 - 0.185 mm (0.0006 - 0.0073 in)

**Max. limit of side clearance (Top and 2nd rings):**  
**0.1 mm (0.004 in)**

If out of specification, replace piston and piston pin assembly.



**PISTON RING GAP**

**Standard ring gap:**

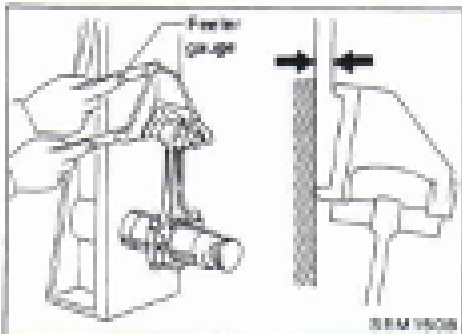
- Top ring**  
0.30 - 0.45 mm (0.0118 - 0.0177 in)
- 2nd ring**  
0.30 - 0.45 mm (0.0118 - 0.0177 in)
- Oil ring**  
0.20 - 0.60 mm (0.0079 - 0.0236 in)

**Max. limit of ring gap:**  
**1.5 mm (0.059 in)**

**Inspection (Cont'd)**

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, rebore the cylinder and use oversized piston and piston ring assembly.

**Refer to S.D.S.**



**CONNECTING ROD BEND AND TORSION**

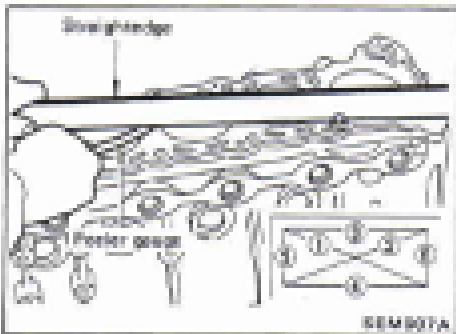
**Bend:**

**Limit 0.15 mm (0.0059 in)  
per 100 mm (3.94 in) length**

**Torsion:**

**Limit 0.3 mm (0.012 in)  
per 100 mm (3.94 in) length**

If it exceeds the limit, replace connecting rod assembly.



**CYLINDER BLOCK DISTORTION AND WEAR**

1. Clean upper face of cylinder block and measure the distortion.

**Limit:**

**0.10 mm (0.0039 in)**

2. If out of specification, resurface it.

The resurfacing limit is determined by the cylinder head resurfacing in engine.

**Amount of cylinder head resurfacing is "A"**

**Amount of cylinder block resurfacing is "B"**

**The maximum limit is as follows:**

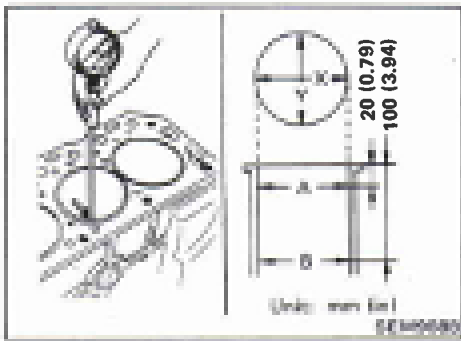
**A + B = 0.2 mm (0.008 in)**

**Nominal cylinder block height**

**from crankshaft center:**

**254.95 - 255.05 mm (10.0374 - 10.0413 in)**

3. If necessary, replace cylinder block.



**Inspection (Cont'd)**

**PISTON-TO-BORE CLEARANCE**

**Method A (Using bore gauge and micrometer)**

- Using a bore gauge, measure cylinder bore for wear, out-of-round or taper.

**Standard inner diameter:**

96.000 - 96.050 mm (3.7795 - 3.7815 in)

**Wear limit:**

0.20 mm (0.0079 in)

**Out-of-round (X—Y) limit:**

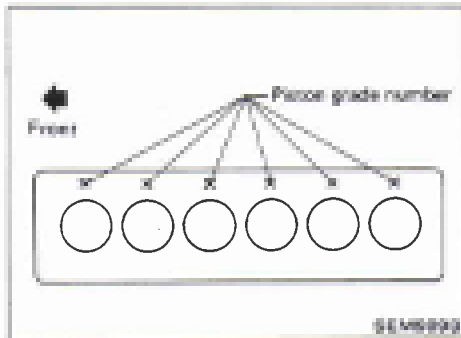
0.015 mm (0.0006 in)

**Taper (A—B) limit:**

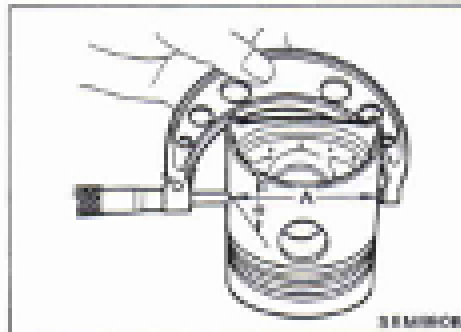
0.010 mm (0.0004 in)

If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

- Check for scratches or seizure. If seizure is found, hone it.



- If cylinder block or piston is replaced with a new one, select piston of the same grade number punched on cylinder block upper surface.



- Measure piston skirt diameter.

**Piston diameter "A":**

Refer to S.D.S.

**Measuring point "a" (Distance from the bottom):**

20 mm (0.79 in)

- Check that piston-to-bore clearance is within the specification.

**Piston-to-bore clearance "B":**

0.015 - 0.035 mm (0.0006 - 0.0014 in)

- Determine piston oversize according to amount of cylinder wear.

**Oversize pistons are available for service. Refer to S.D.S.**

**Inspection (Cont'd)**

6. Cylinder size is determined by adding piston-to-bore clearance to piston diameter "A".

**Rebored size calculation:**

$$D = A + B - C$$

where,

**D: Bored diameter**

**A: Piston diameter as measured**

**B: Piston-to-bore clearance**

**C: Honing allowance 0.02 mm (0.0008 in)**

7. Install main bearing caps, and tighten to the specified torque to prevent distortion of cylinder bores in final assembly.
8. Cut cylinder bores.
- **When any cylinder needs boring, all other cylinders must also be bored.**
  - **Do not cut too much out of the cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**
- 9.hone the cylinders to obtain specified piston-to-bore clearance.
10. Measure the finished cylinder bore for out-of-round and taper.
- **Measurement should be done after cylinder bore cools down.**

**Method B (Using feeler gauge)**

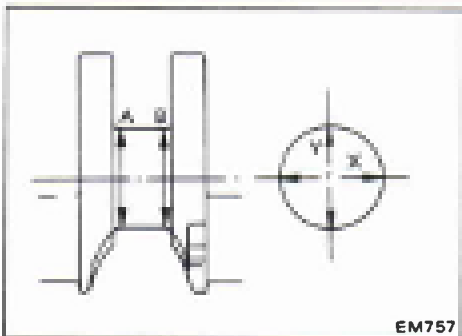
Measure the extracting force by pulling feeler gauge straight upward.

**Feeler gauge thickness:**

**0.04 mm (0.0016 in)**

**Extracting force:**

**2.0 - 14.7 N (0.2 - 1.5 kg, 0.4 - 3.3 lb)**

**CRANKSHAFT**

1. Check crankshaft main and pin journals for score, bias, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.

**Out-of-round (X—Y):**

**Less than 0.0025 mm (0.0001 in)**

**Taper (A—B):**

**Less than 0.0025 mm (0.0001 in)**

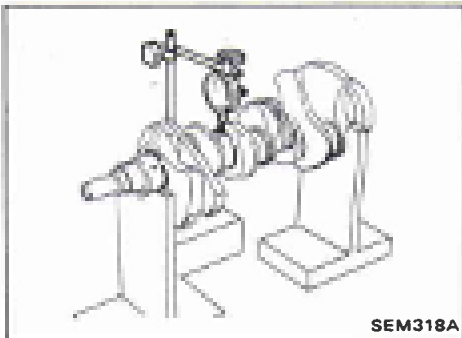


**Inspection (Cont'd)**

3. Measure crankshaft runout.

**Runout (Total indicator reading):**

**Less than 0.20 mm (0.0079 in)**



SEM318A

**Upper main bearing**

With oil groove and oil hole



No. 1

Lower main bearing

SEM986B

**BEARING CLEARANCE**

**Method A (Using bore gauge and micrometer)**

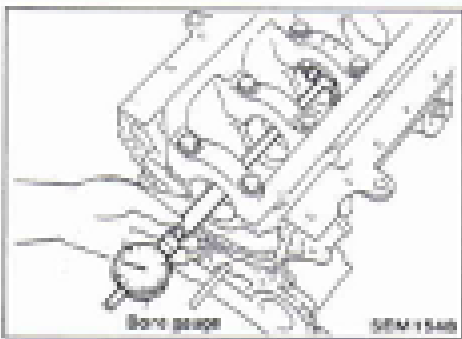
**Main bearing clearance**

1. Set main bearings in their proper positions on cylinder block and main bearing cap.

2. Install main bearing cap to cylinder block.

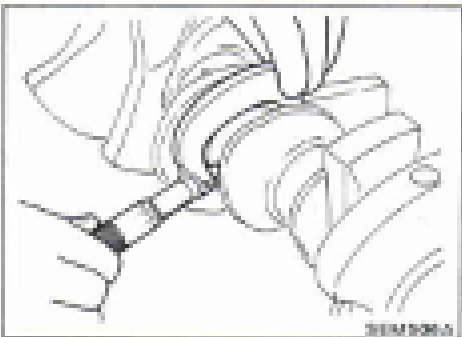
**Tighten all bolts in correct order in two or three stages.**

3. Measure inner diameter "A" of main bearing.



Bore gauge

SEM154b



SEM508A

4. Measure outer diameter "Dm" of crankshaft main journal.

5. Calculate main bearing clearance.

$$\text{Main bearing clearance} = A - Dm$$

**Standard:**

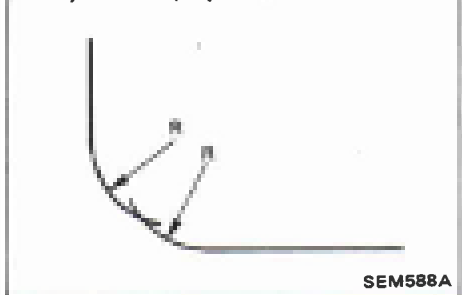
**0.041 - 0.087 mm (0.0016 - 0.0034 in)**

**Limit: 0.09 mm (0.0035 in)**

6. If it exceeds the limit, replace bearing.

7. If the clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

**Main journal and pin journal**



SEM588A

a. When grinding crank pin and crank journal, fillets should be finished as shown in the figure.

**R: Main journal**

**2.5 - 2.6 mm (0.098 - 0.102 in)**

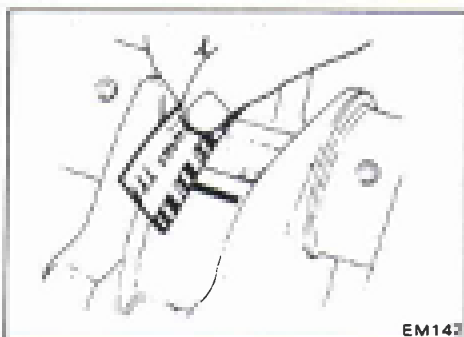
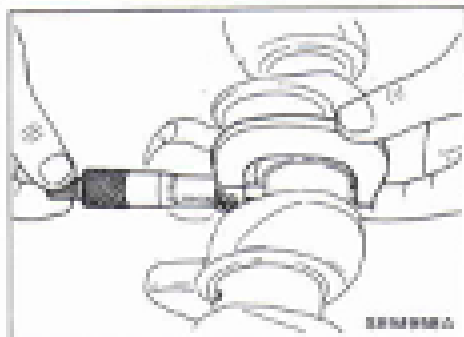
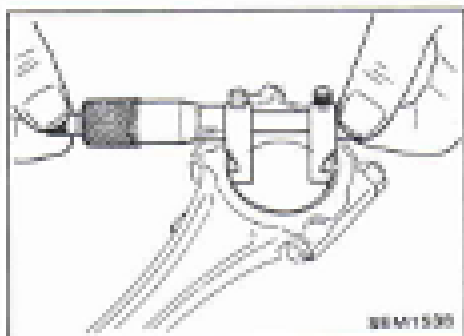
**Pin journal**

**3.0 - 3.1 mm (0.118 - 0.122 in)**

b. Refer to S.D.S. for grinding crankshaft and available service parts.

**Inspection (Cont'd)**

8. If crankshaft, cylinder block and main bearings are replaced with new ones, check that the clearance of main bearing is within specifications.

**CONNECTING ROD BEARING CLEARANCE (Big end)**

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

**Tighten bolts to the specified torque.**

3. Measure inner diameter "C" of bearing.

4. Measure outer diameter "Dp" of crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

$$\text{Connecting rod bearing clearance} = C - Dp$$

**Standard:**

**0.027 - 0.061 mm (0.0011 - 0.0024 in)**

**Limit: 0.09 mm (0.0035 in)**

6. If it exceeds the limit, replace bearing.
7. If the clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

Refer to step 7 of "MAIN BEARING CLEARANCE".

**Method B (Using plastigage)****CAUTION:**

- Do not turn crankshaft or connecting rod while the plastigage is being inserted.
- When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use thicker main bearing or undersized bearing so that the specified bearing clearance is obtained.

**Main bearing clearance:**

**Standard**

**0.051 - 0.097 mm (0.0020 - 0.0038 in)**

**Limit**

**0.1 mm (0.004 in)**

**Connecting rod bearing clearance:**

**Standard**

**0.040 - 0.074 mm (0.0016 - 0.0029 in)**

**Limit**

**0.1 mm (0.004 in)**

**Inspection (Cont'd)**

**CONNECTING ROD BUSHING CLEARANCE (Small end)**

1. Measure inner diameter "C" of bushing.

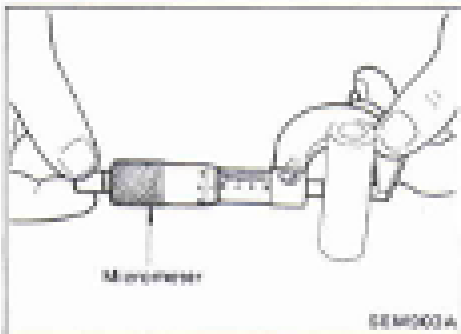


SEM151B

2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bearing clearance.  

$$C - D_p = 0.005 - 0.017 \text{ mm (0.0002 - 0.0007 in)}$$

If it exceeds the limit, replace connecting rod bushing and/or piston set with pin.



Micrometer

SEM003A

**REPLACEMENT OF CONNECTING ROD SMALL END BUSHING**

1. Drive in the small end bushing until it is flush with the end surface of the rod.

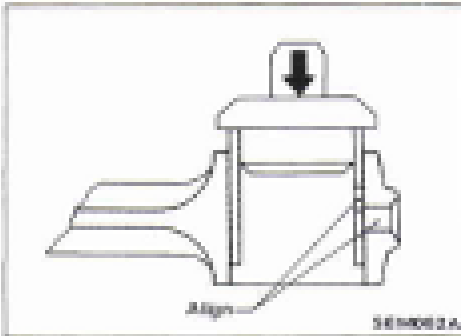
**Be sure to align the oil holes.**

2. After driving in the small end bushing, ream the bushing.

**Small end bushing inside diameter:**

**Finished size**

**23.000 - 23.006 mm (0.9055 - 0.9057 in)**



Align

SEM002A

**FLYWHEEL OR DRIVE PLATE RUNOUT**

**Runout (Total indicator reading):**

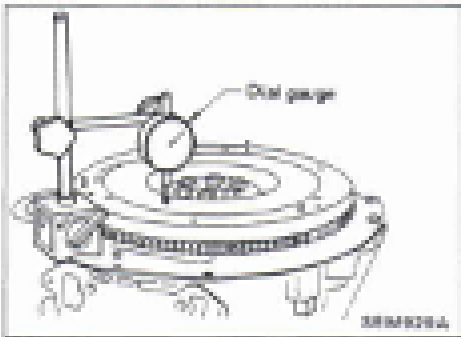
**Flywheel (M/T model)**

**0.1 mm (0.004 in) or less**

**Drive plate (A/T model)**

**0.1 mm (0.004 in) or less**

If runout exceeds the limit, replace flywheel or drive plate.



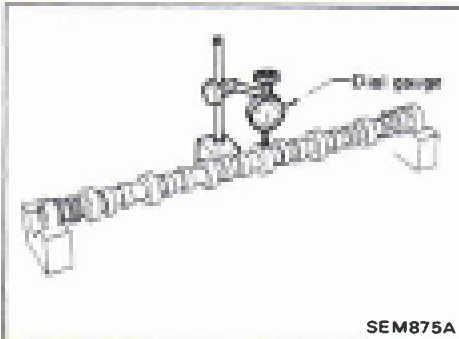
Dial gauge

SEM004A

**CAMSHAFT VISUAL CHECK**

Check camshaft for scratches, seizure and wear.

**Inspection (Cont'd)  
CAMSHAFT RUNOUT**



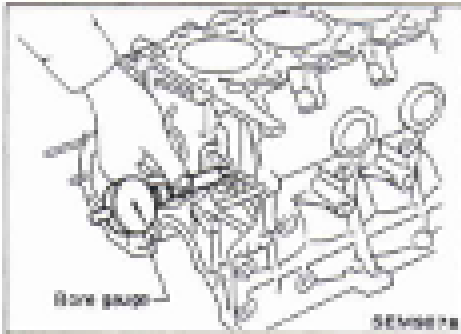
1. Measure camshaft runout at the center journal.  
**Runout (Total indicator reading):  
Limit 0.06 mm (0.0024 in)**
2. If it exceeds the limit, replace camshaft.

**CAMSHAFT CAM HEIGHT**

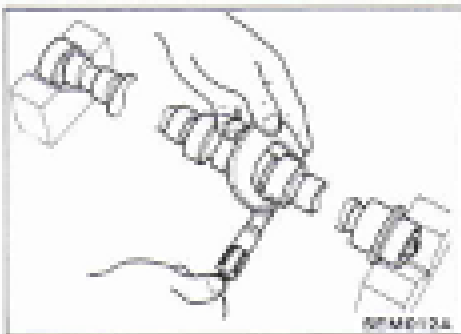


1. Measure camshaft cam height.  
**Standard cam height:  
42.311 - 42.561 mm (1.6658 - 1.6756 in)**  
**Cam wear limit:  
0.15 mm (0.0059 in)**
2. If wear is beyond the limit, replace camshaft.

**CAMSHAFT JOURNAL CLEARANCE**



1. Measure the inner diameter of camshaft bushings.  
**Standard inner diameter:**
  - Front**  
50.76 - 50.83 mm (1.9984 - 2.0012 in)
  - 2nd**  
50.56 - 50.63 mm (1.9905 - 1.9933 in)
  - 3rd**  
50.36 - 50.43 mm (1.9827 - 1.9854 in)
  - 4th**  
50.16 - 50.23 mm (1.9748 - 1.9776 in)
  - 5th**  
49.96 - 50.03 mm (1.9669 - 1.9697 in)
  - 6th**  
49.76 - 49.83 mm (1.9591 - 1.9618 in)
  - Rear**  
49.56 - 49.63 mm (1.9512 - 1.9539 in)



2. Measure the outer diameter of camshaft journal.  
**Standard outer diameter:**
  - Front**  
50.721 - 50.740 mm (1.9969 - 1.9976 in)
  - 2nd**  
50.521 - 50.540 mm (1.9890 - 1.9898 in)
  - 3rd**  
50.321 - 50.340 mm (1.9811 - 1.9819 in)
  - 4th**  
50.121 - 50.140 mm (1.9733 - 1.9740 in)

**Inspection (Cont'd)**

5th

49.921 - 49.940 mm (1.9654 - 1.9661 in)

6th

49.721 - 49.740 mm (1.9575 - 1.9583 in)

Rear

49.521 - 49.540 mm (1.9496 - 1.9504 in)

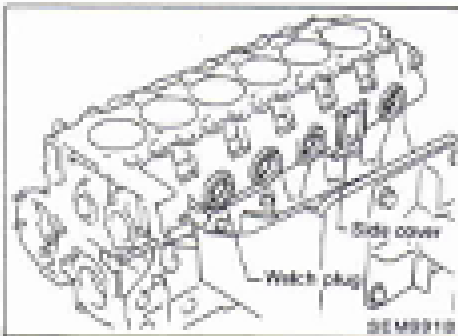
- If the clearance exceeds the limit, replace camshaft and/or camshaft bushings.

**Camshaft journal clearance limit:**

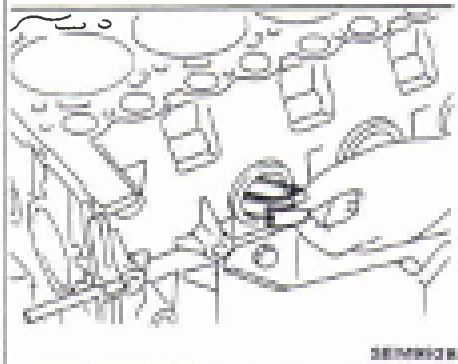
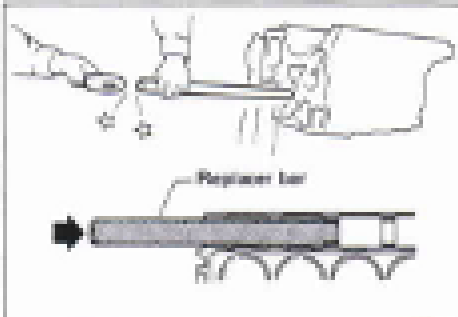
0.15 mm (0.0059 in)

**REPLACING CAMSHAFT BUSHING**

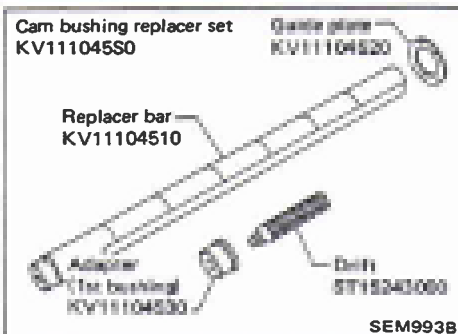
- Remove welch plugs and side cover.

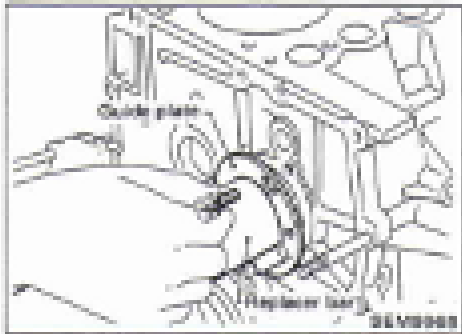
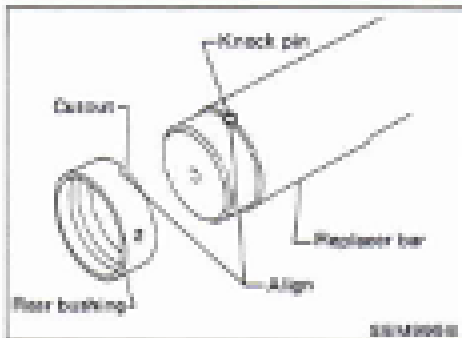
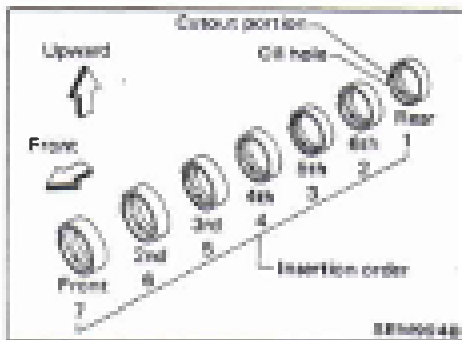


- Using Tool, remove camshaft bushings from engine. Some bushings must be broken in order to remove.



- Using Tool, install camshaft bushings as follows:



**Inspection (Cont'd)**

- (1) Install camshaft bushings in the order of "rear", "6th", "5th", "4th", "3rd", "2nd" and "front". All bushings must be installed from the front.
- (2) Face the cutout rightward and toward the front of engine during installation.

- (3) Rear camshaft bushing  
Align the cutout of rear bushing with knock pin of replacer bar before installation.

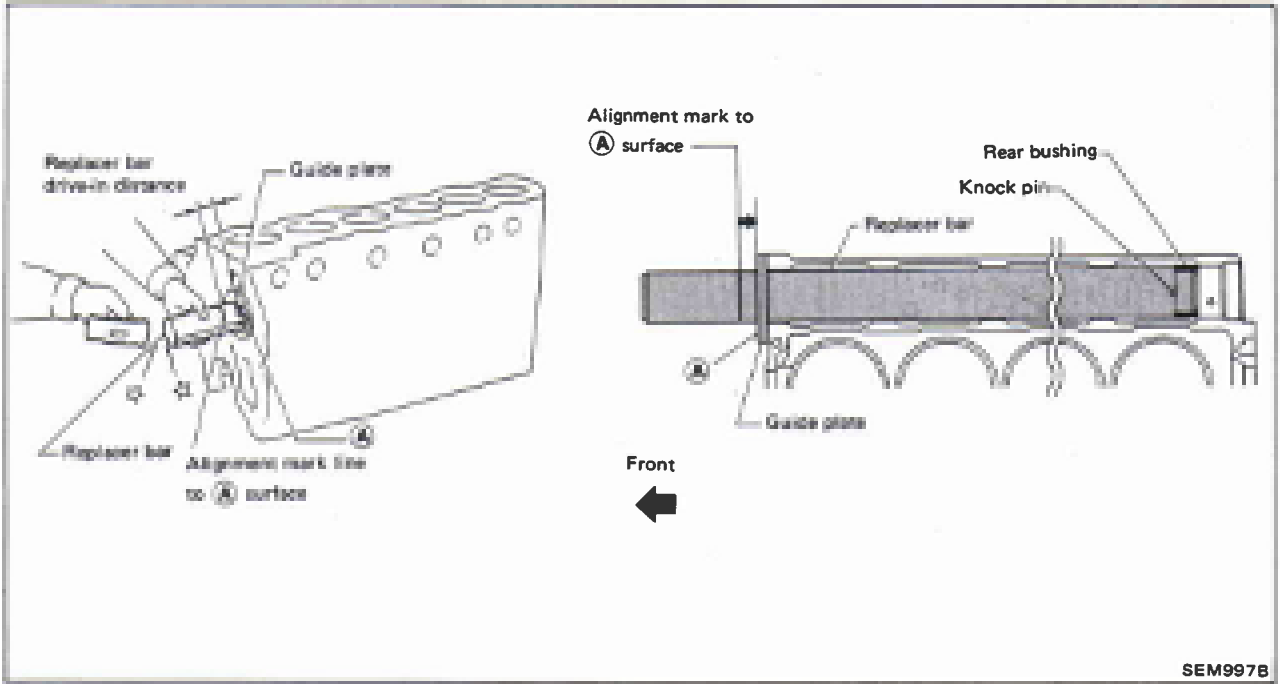
Insert rear bushing with replacer bar into cylinder block. Install guide plate with bolt holes (on the "TB" mark side) facing upper side of cylinder block. Tighten bolts.

**Inspection (Cont'd)**

Drive replacer bar until the alignment mark on replacer bar is aligned with the end of guide plate.

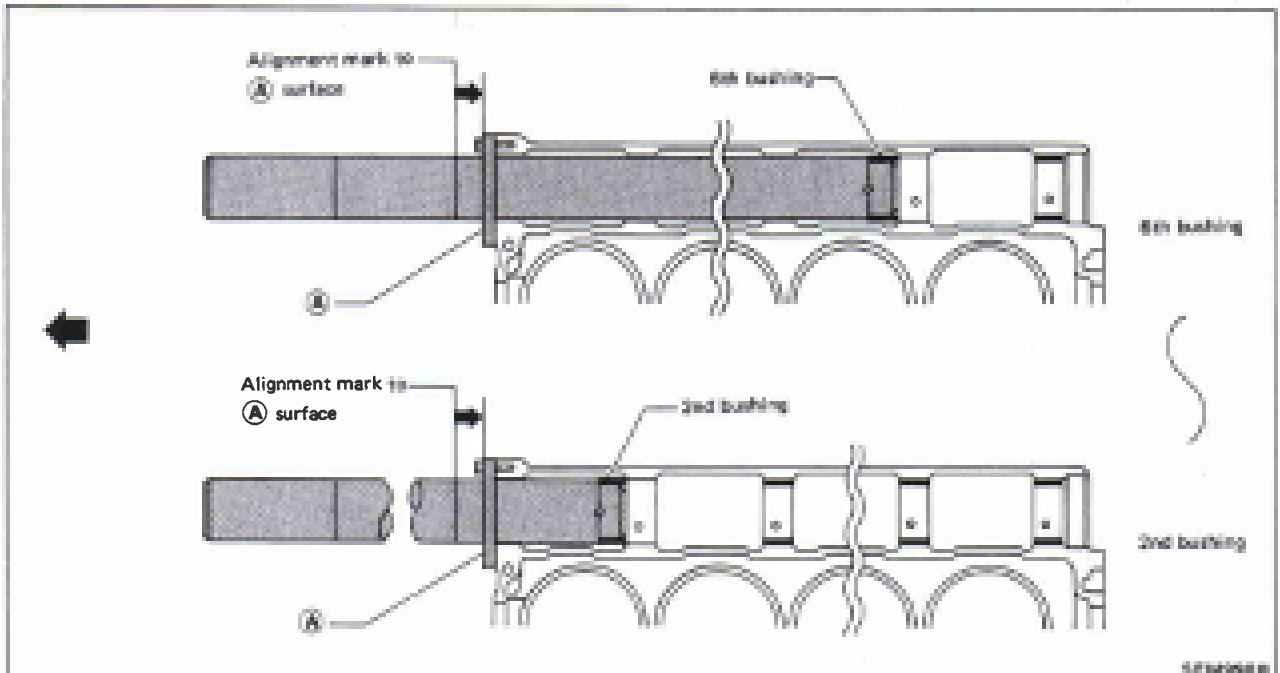
Remove replacer set.

After installation, check that oil holes 4.3 mm (0.169 in) dia. in camshaft bushings are aligned with oil holes 6 mm (0.24 in) dia. in the cylinder block.



SEM997B

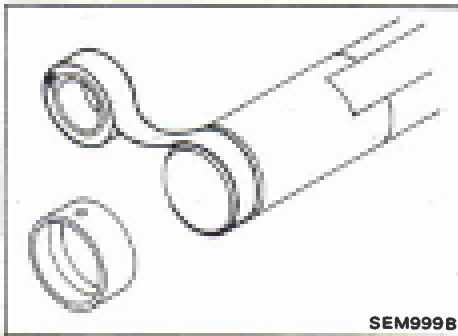
- (4) 6th, 5th, 4th, 3rd and 2nd camshaft bushings  
Install in the same manner as rear camshaft bushing.



SEM997B

**Inspection (Cont'd)**

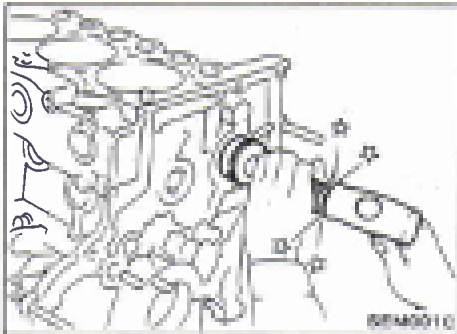
When setting 6th through 2nd bushings on replacer bar, tape the bar to prevent movement.



SEM999B

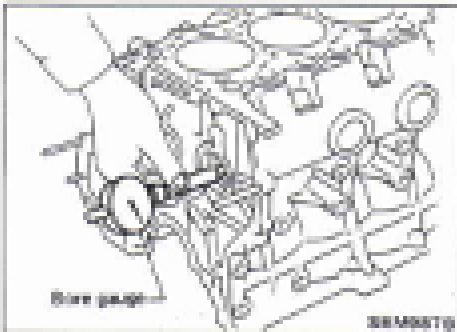
**(5) Front camshaft bushing**

Using 1st bushing adapter, position front camshaft bushing so that oil hole in cylinder block is aligned with oil hole in bushing.



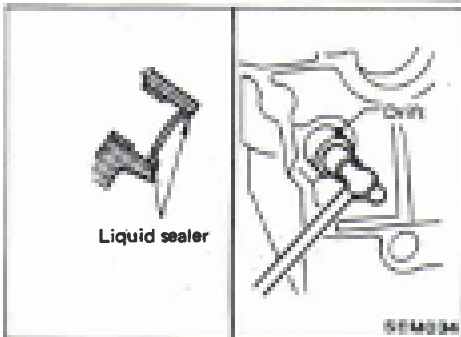
SEM0010

**4. Check camshaft bushing inner diameter.**



SEM0015

**5. Install new Welch plugs with a drift.  
Apply liquid sealer.**



SEM0024

**6. Install side cover.**

**Apply liquid gasket.**

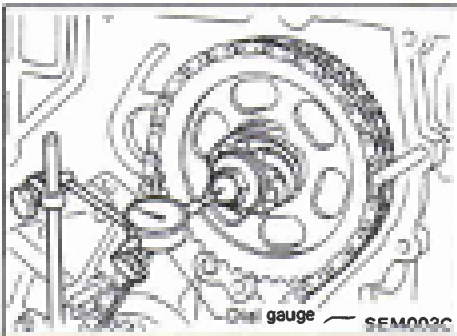
- Use Genuine Liquid Gasket or equivalent.



SEM002C



**Inspection (Cont'd)**  
**CAMSHAFT END PLAY**



1. Install camshaft in cylinder block.
2. Measure camshaft end play.

**Camshaft end play:**

**Standard**

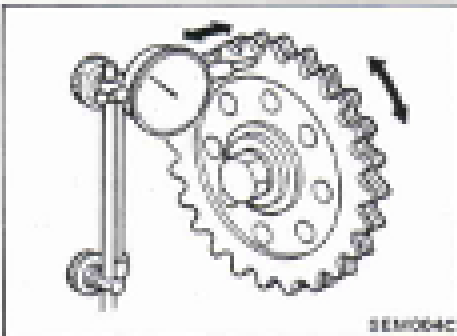
0.08 - 0.28 mm (0.0031 - 0.0110 in)

**Limit**

0.05 mm (0.0020 in)

3. If end play exceeds the limit, replace locating plate.

**CAMSHAFT SPROCKET RUNOUT**



1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.

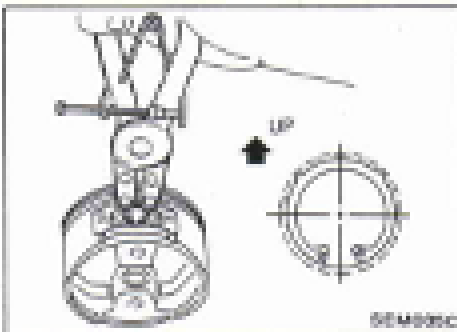
**Runout (Total indicator reading):**

**Limit 0.1 mm (0.004 in)**

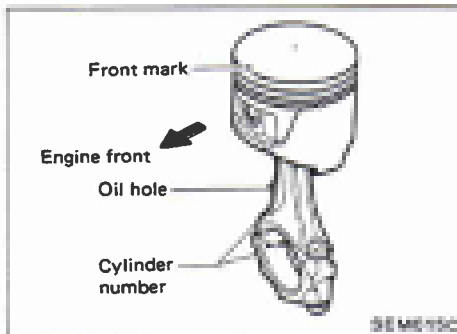
3. If it exceeds the limit, replace camshaft sprocket.

**Assembly**

**PISTON**

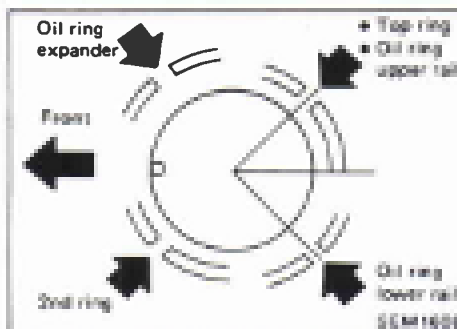


1. Install a new snap ring on one side of the piston pin hole. **Ensure that ends of snap ring face down and fit properly into groove.**



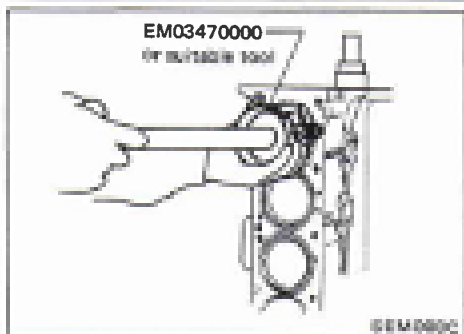
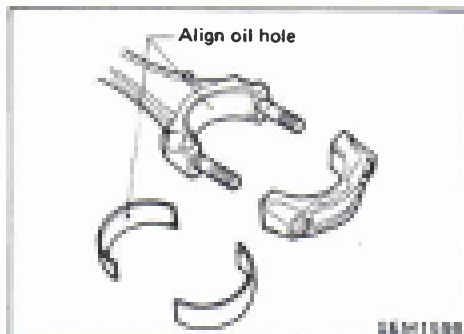
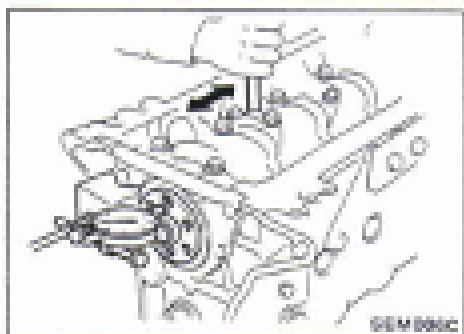
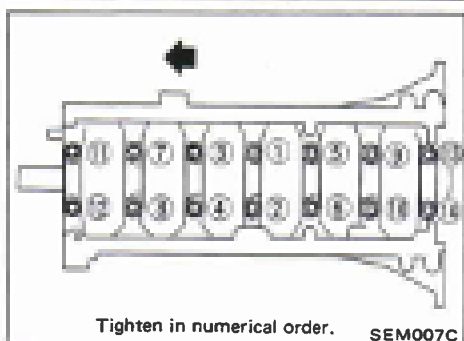
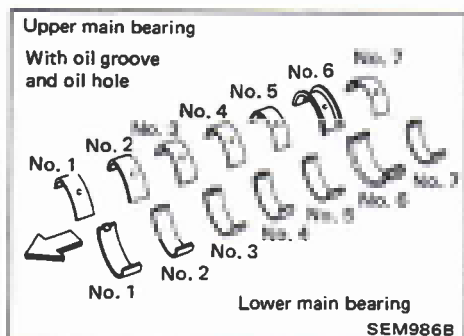
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**



- **After assembly, make sure piston swings smoothly.**

3. Set piston rings as shown.



**Assembly (Cont'd)  
CRANKSHAFT**

1. Set main bearings in their proper positions on cylinder block and main bearing cap.

- Do not confuse upper and lower sides of main bearings.

2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.

- Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.

- Tighten bearing cap bolts gradually in two or three stages start with the center bearing and move outward sequentially.

- After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.

3. Measure crankshaft end play.

**Crankshaft end play:**

**Standard**

0.05 - 0.17 mm (0.0020 - 0.0067 in)

**Limit**

0.3 mm (0.012 in)

If end play exceeds the limit, replace No. 6 bearing.

4. Install connecting rod bearings in connecting rods and connecting rod caps.

- Confirm that correct bearings are used. Refer to "Inspection".

- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.

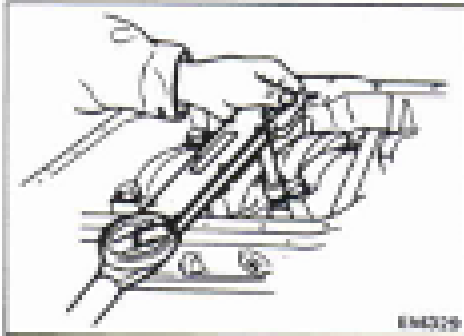
5. Install pistons with connecting rods.

(1) Install them into corresponding cylinders with Tool.

- Be careful not to scratch cylinder wall by connecting rod.

- Arrange so that front mark on piston head faces toward front of engine.

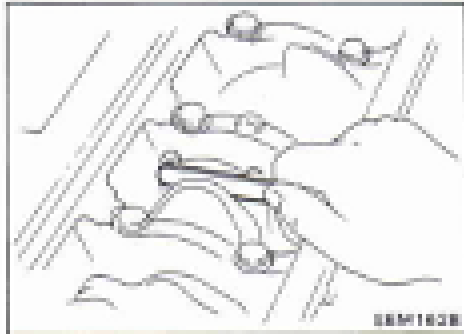
**Assembly (Cont'd)**



- (2) Install connecting rod bearing caps.  
Tighten connecting rod bearing cap nuts to the specified torque.

**☐: Connecting rod bearing nut**

- (1) Tighten to 38 to 40 N·m  
(3.9 to 4.1 kg-m, 28 to 30 ft-lb).
- (2) Tighten to 67 to 71 N·m  
(6.8 to 7.2 kg-m, 49 to 52 ft-lb)  
or if you have an angle wrench, tighten bolts 40 to 45 degrees clockwise.



6. Measure connecting rod side clearance.

**Connecting rod side clearance:**

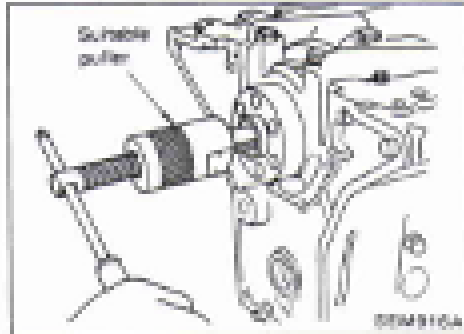
**Standard**

0.2 - 0.3 mm (0.008 - 0.012 in)

**Limit**

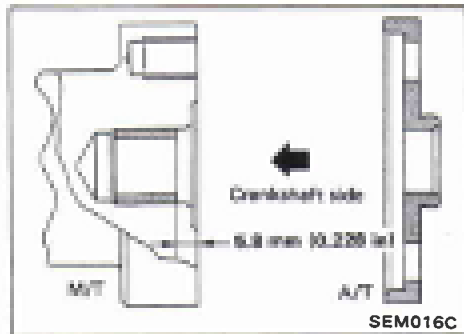
0.4 mm (0.016 in)

If clearance exceeds the limit, replace connecting rod and/or crankshaft.

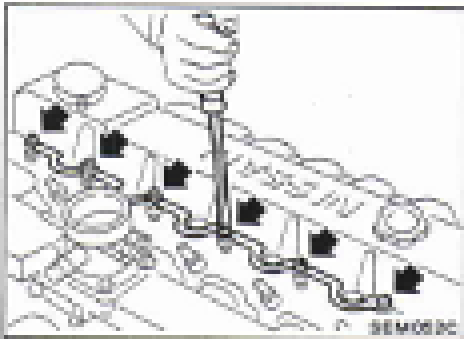


**REPLACING PILOT BUSHING**

1. Remove pilot bushing (M/T) or pilot converter (A/T).

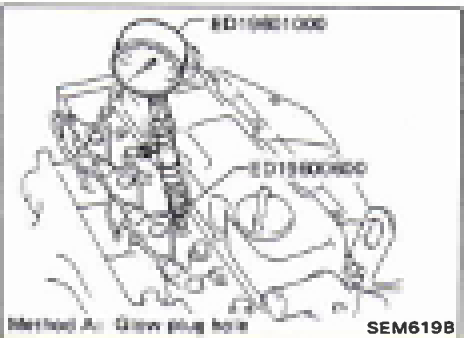


2. Install pilot bushing (M/T) or pilot converter (A/T).

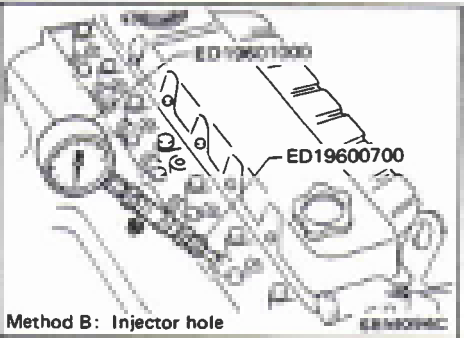


**Measurement of Compression Pressure  
(On-vehicle service)**

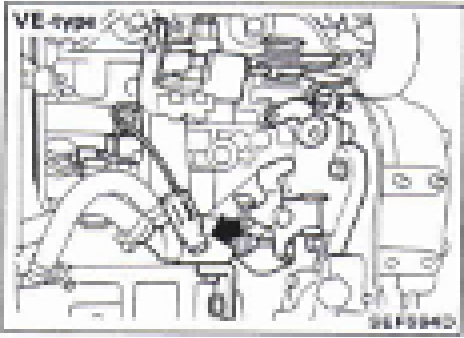
1. Warm up engine.
2. Remove glow plate or injector.



3. Fit compression gauge adapter to cylinder head.  
**Compression gauge adapter:**  
 □: 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)  
 (For glow plug hole)  
 54 - 64 N·m (5.5 - 6.5 kg-m, 40 - 47 ft-lb)  
 (For injector hole)



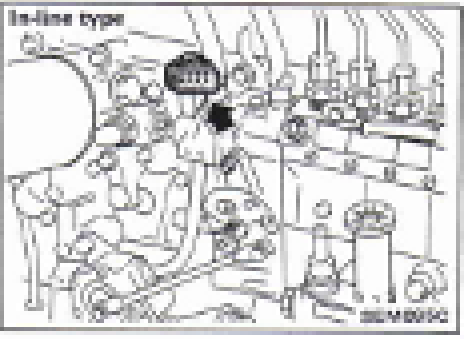
4. Set no fuel injected condition.
  - VE-type  
Disconnect fuel cut solenoid wire.
  - In-line type  
Disconnect injection pump controller harness connector.
5. Crank engine, then read gauge indication.
  - In case of engine equipped with in-line type, depress accelerator pedal fully and crank engine.
  - Engine compression measurement should be made as quickly as possible.



**Compression pressure:**

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)/200 rpm

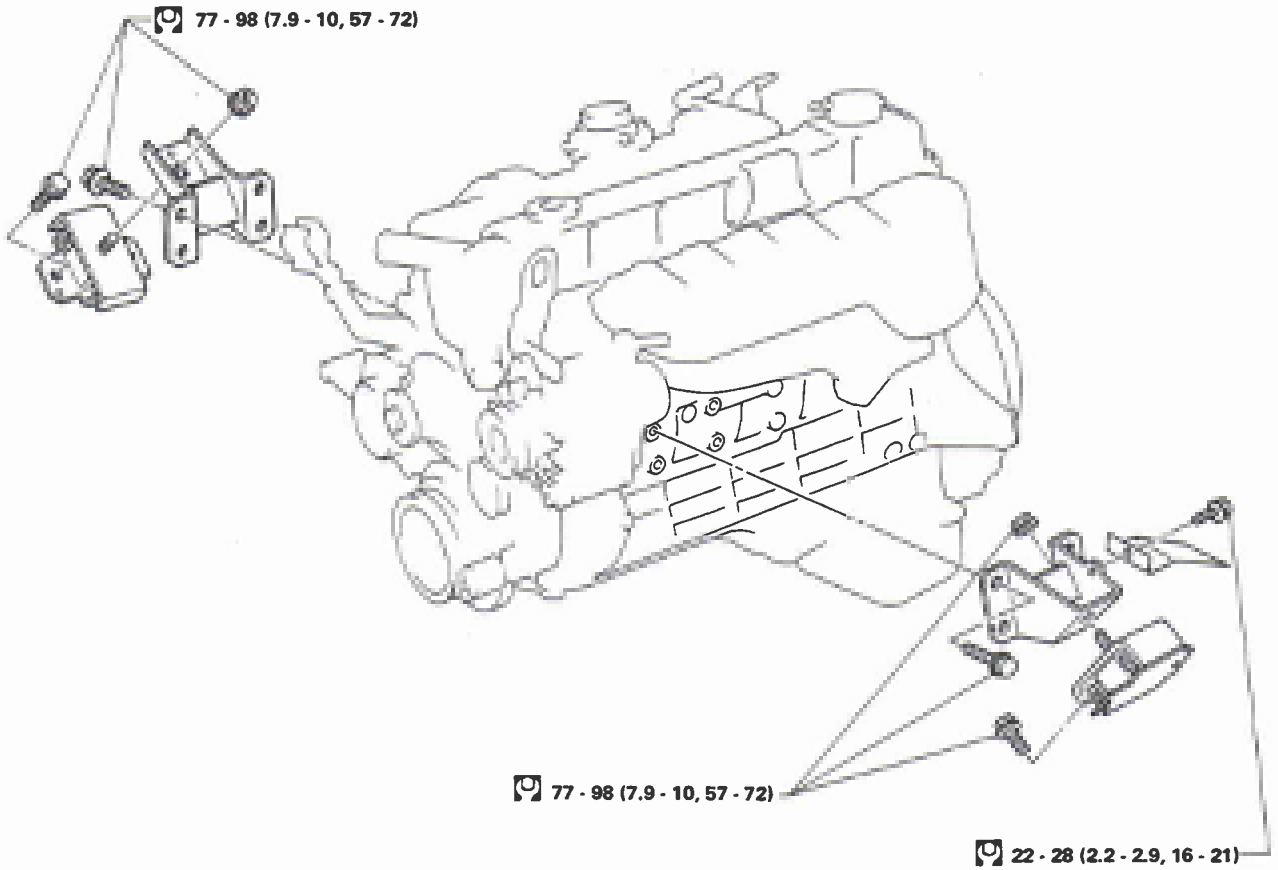
Standard	2,942 (29.4, 30, 427)
Minimum	2,452 (24.5, 25, 356)
Differential limit between cylinders	294 (2.9, 3, 43)



6. If cylinder compression in one or more cylinders is low, pour a small quantity of engine oil into cylinders through the glow holes and retest compression.

**Measurement of Compression Pressure  
(On-vehicle service) (Cont'd)**

- If adding oil helps the compression pressure, chances are that piston rings are worn or damaged.
- If pressure stays low, valve may be sticking or seating improperly.
- If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past the gasket surface.  
Oil and water in combustion chambers can result from this problem.



: N-m (kg-m, ft-lb)

**WARNING:**

- a. Place vehicle on a flat and solid surface.
- b. Place chocks at front and back of rear wheels.
- c. Do not remove engine until exhaust system has completely cooled off.  
Otherwise, you may burn yourself and/or fire may break out in the fuel line.
- d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
- e. Be sure to hoist engine and transmission in a safe manner.

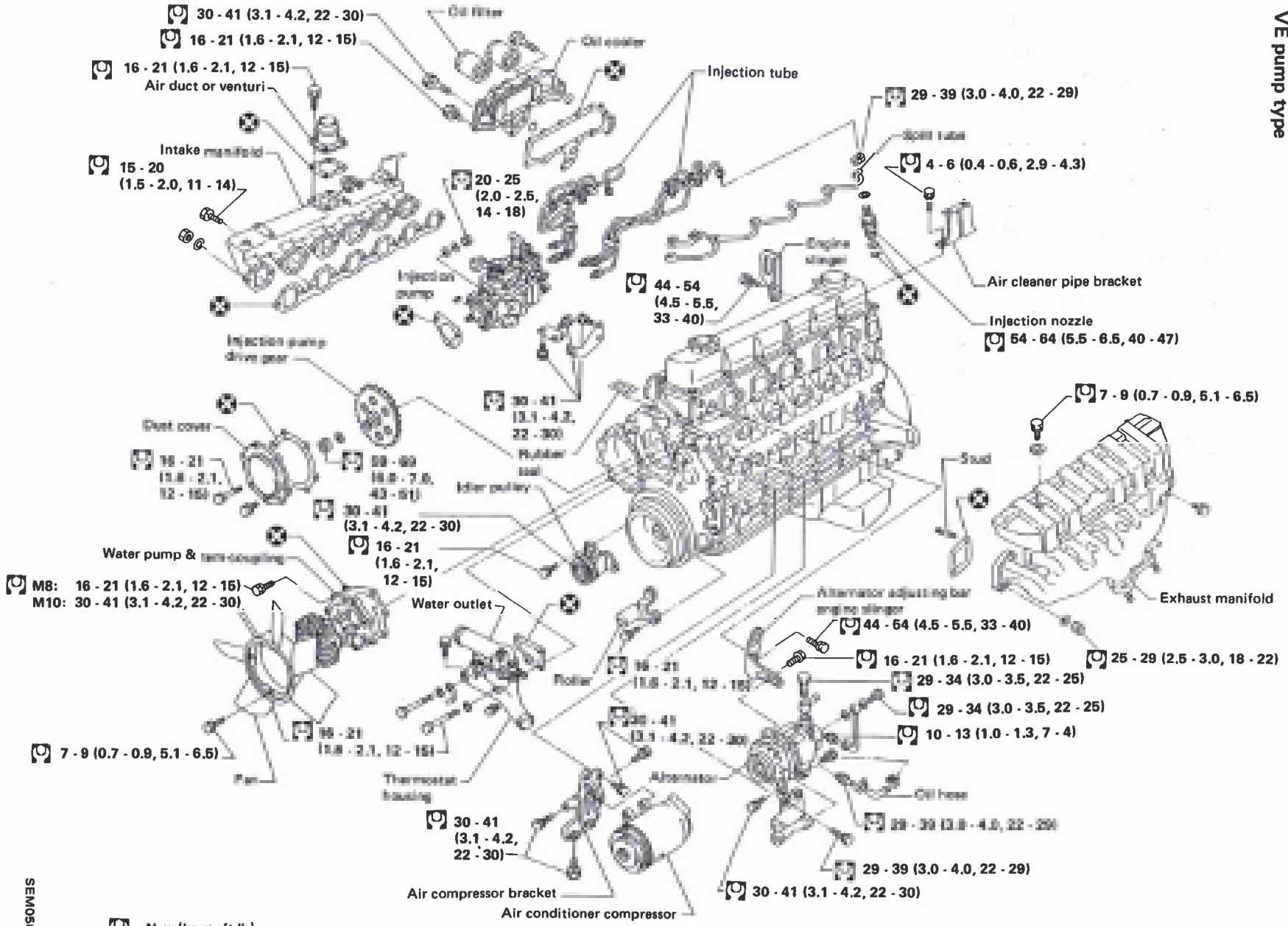
**CAUTION:**

- When lifting engine, be careful not to strike adjacent parts, especially the accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.
- For engines not equipped with engine slingers, attach proper slingers and bolts described in the PARTS CATALOG.

VE pump type

OUTER COMPONENT PARTS

TD42



: N-m (kg-m, ft-lb)

EM-52

SEMOSOC

M8: 16 - 21 (1.6 - 2.1, 12 - 15)  
M10: 30 - 41 (3.1 - 4.2, 22 - 30)

30 - 41 (3.1 - 4.2, 22 - 30)  
 16 - 21 (1.6 - 2.1, 12 - 15)

16 - 21 (1.6 - 2.1, 12 - 15)  
Air duct or venturi

15 - 20 (1.5 - 2.0, 11 - 14)  
Intake manifold

20 - 25 (2.0 - 2.5, 14 - 18)  
Injection pump

44 - 54 (4.5 - 5.5, 33 - 40)  
Engine slinger

29 - 39 (3.0 - 4.0, 22 - 29)  
Injection tube

4 - 6 (0.4 - 0.6, 2.9 - 4.3)  
Scrub tube

54 - 64 (5.5 - 6.5, 40 - 47)  
Injection nozzle

7 - 9 (0.7 - 0.9, 5.1 - 6.5)  
Exhaust manifold

30 - 41 (3.1 - 4.2, 22 - 30)  
Rubber seal

16 - 21 (1.6 - 2.1, 12 - 15)  
Dust cover

30 - 41 (3.1 - 4.2, 22 - 30)  
Idle pulley

M8: 16 - 21 (1.6 - 2.1, 12 - 15)  
 M10: 30 - 41 (3.1 - 4.2, 22 - 30)  
Water pump & belt coupling

16 - 21 (1.6 - 2.1, 12 - 15)  
Water outlet

44 - 54 (4.5 - 5.5, 33 - 40)  
Alternator adjusting bar engine slinger

25 - 29 (2.5 - 3.0, 18 - 22)  
Exhaust manifold

7 - 9 (0.7 - 0.9, 5.1 - 6.5)  
Fan

16 - 21 (1.6 - 2.1, 12 - 15)  
Roller

16 - 21 (1.6 - 2.1, 12 - 15)  
Roller

16 - 21 (1.6 - 2.1, 12 - 15)  
Roller

29 - 34 (3.0 - 3.5, 22 - 25)  
Alternator adjusting bar engine slinger

29 - 34 (3.0 - 3.5, 22 - 25)  
Alternator adjusting bar engine slinger

10 - 13 (1.0 - 1.3, 7 - 4)  
Alternator adjusting bar engine slinger

30 - 41 (3.1 - 4.2, 22 - 30)  
Thermostat housing

30 - 41 (3.1 - 4.2, 22 - 30)  
Alternator

29 - 39 (3.0 - 4.0, 22 - 29)  
Oil hose

30 - 41 (3.1 - 4.2, 22 - 30)  
Air compressor bracket

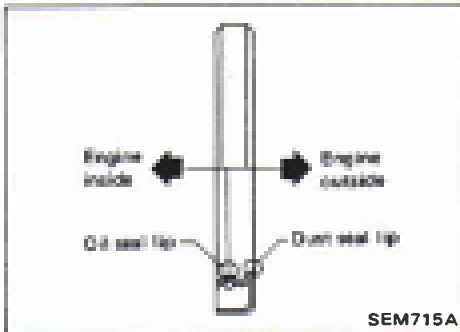
30 - 41 (3.1 - 4.2, 22 - 30)  
Air conditioner compressor

30 - 41 (3.1 - 4.2, 22 - 30)  
Alternator

29 - 39 (3.0 - 4.0, 22 - 29)  
Oil hose

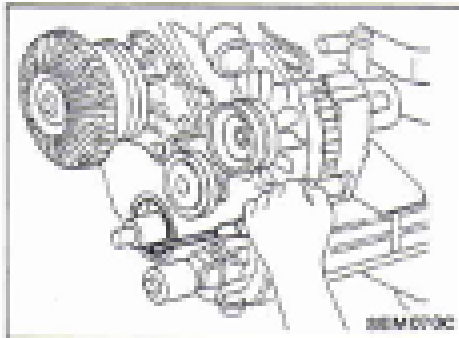






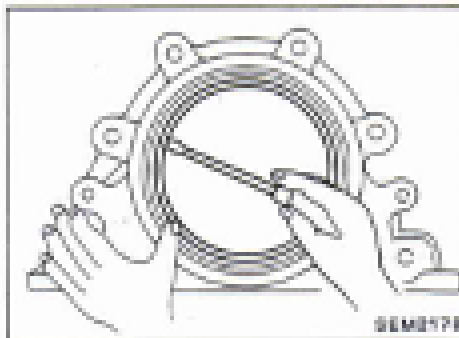
## OIL SEAL INSTALLING DIRECTION

- When installing a new front or rear seal, make sure its mounting direction is correct.



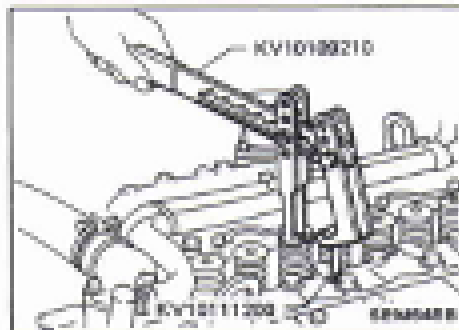
## CRANKSHAFT FRONT OIL SEAL (On-vehicle service)

1. Remove radiator shroud.
2. Remove cooling fan.
3. Remove drive belts.
4. Remove crank pulley.
5. Remove crankshaft oil seal.
  - Be careful not to damage sealing surfaces of crankshaft.
6. Coat new oil seal with engine oil and install it in place.



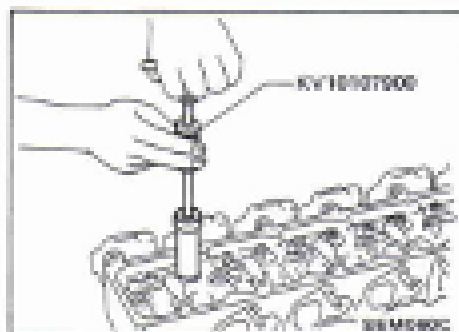
## CRANKSHAFT REAR OIL SEAL (On-vehicle service)

1. Dismount transmission.
2. Remove clutch cover assembly.
3. Remove flywheel and rear plate.
4. Remove engine gusset and oil pan.
5. Remove oil seal retainer assembly, then remove oil seal.
  - Be careful not to damage sealing surfaces of crankshaft.
6. Coat new oil seal with engine oil and install it in place.



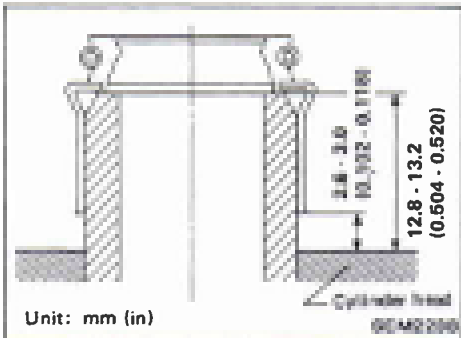
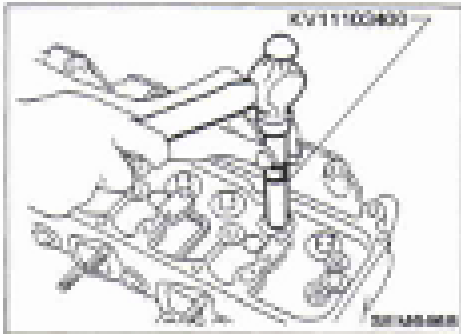
## VALVE OIL SEAL (On-vehicle service)

1. Remove rocker cover.
2. Remove rocker shaft assembly.
3. Remove valve spring.



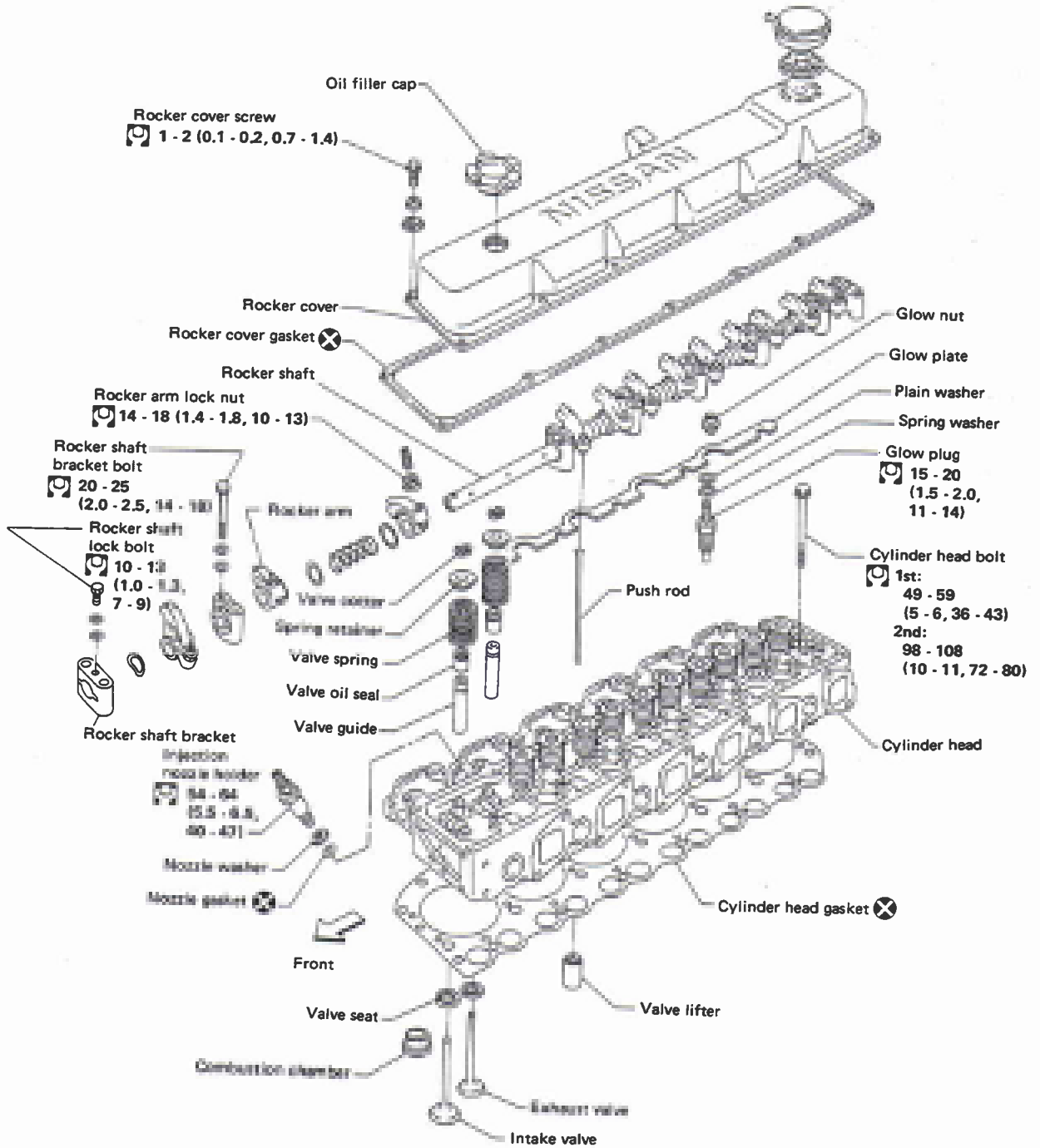
4. Remove valve oil seals.

5. Apply engine oil to valve oil seal and install it in place.



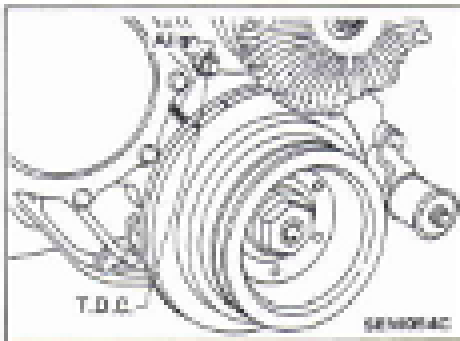
# CYLINDER HEAD

TD42



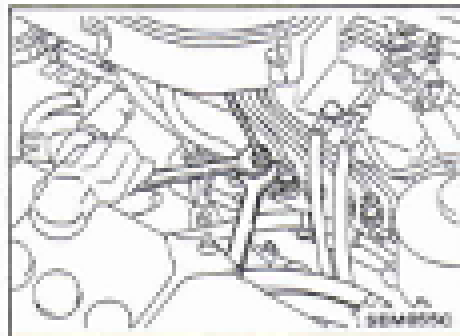
: N·m (kg·m, ft·lb)

SEM053C

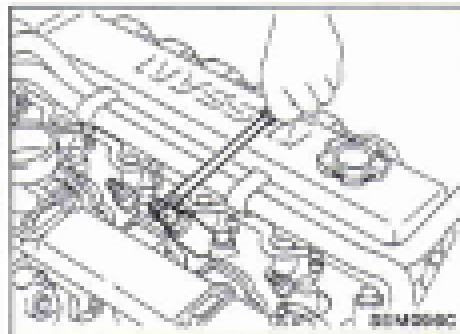


**Removal (On-vehicle service)**

1. Set No. 1 cylinder at T.D.C. on its compression stroke.
2. Drain engine coolant from drain plugs on cylinder block and radiator.
3. Remove air cleaner and/or air duct.
4. Remove alternator adjusting bolt.
5. Disconnect exhaust manifold from front exhaust tube.
6. Disconnect radiator outlet hose and thermostat housing water inlet hose.

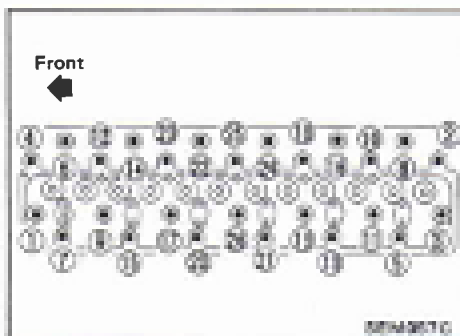


7. Remove fuel injection tube assembly and spill tube.

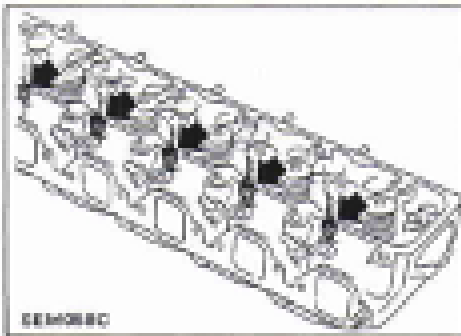


8. Remove injection nozzle holder and top nozzle gasket using deep socket wrench.

9. Remove rocker cover.
10. Remove rocker shaft with rocker arms.
11. Remove push rods.



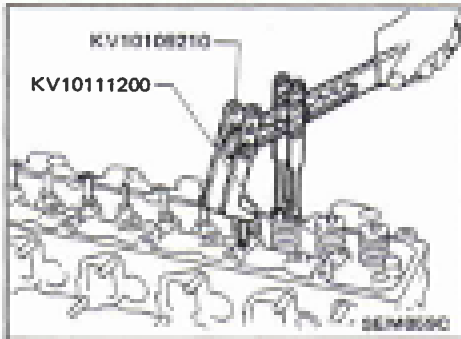
12. Remove cylinder head bolts in numerical order and remove cylinder head.  
**Head warpage or cracking could result from removing in incorrect order.**



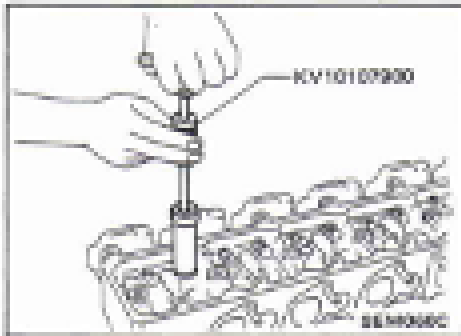
### Disassembly

1. Remove the following parts:

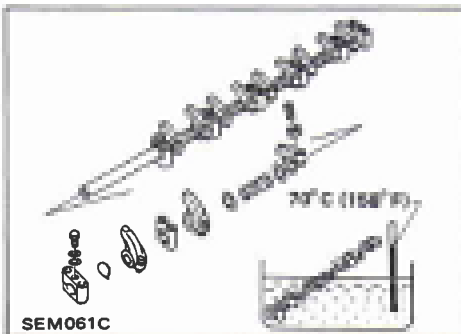
- Intake manifold
- Exhaust manifold
- Thermostat housing
- Alternator adjusting bar & engine slinger
- Glow plate and glow plugs



2. Remove valve component parts with Tool.



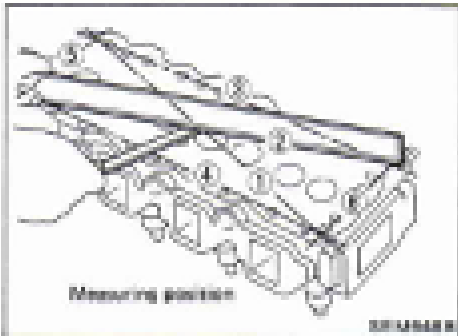
3. Remove valve oil seals with Tool.



4. Disassemble rocker shaft assembly.

- a. Remove rocker shaft lock bolt.
- b. Remove valve rocker and rocker shaft bracket.

**If it is difficult to remove rocker shaft bracket, immerse rocker shaft assembly in oil of 70°C (158°F) for a few minutes and then remove bracket.**



**Inspection**

**CYLINDER HEAD DISTORTION**

Cylinder head distortion:

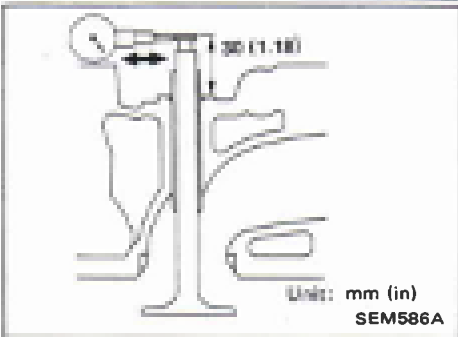
Standard

Less than 0.07 mm (0.0028 in)

Limit

0.2 mm (0.008 in)

If beyond the specified limit, correct with a surface grinder. Cylinder head height should be greater than 89.7 mm (3.531 in) after surface has been ground.



**VALVE GUIDE CLEARANCE**

- Valve guide clearance should be measured parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)

Stem to guide clearance:

Limit

Intake 0.15 mm (0.0059 in)

Exhaust 0.20 mm (0.0079 in)

Maximum allowable deflection  
(Dial indicator reading)

Intake 0.30 mm (0.0118 in)

Exhaust 0.40 mm (0.0157 in)

- To determine the correct replacement part, measure valve stem diameter and valve guide inner diameter.

Valve stem diameter:

Standard

Intake

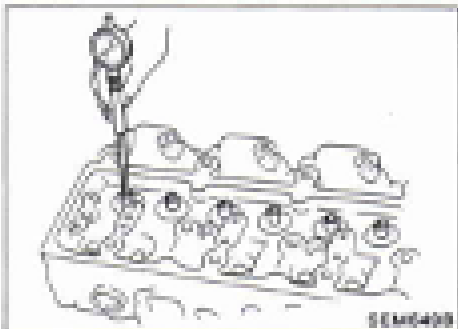
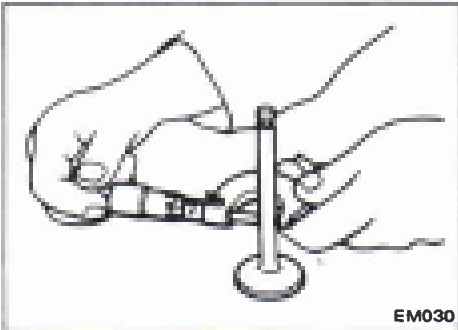
7.962 - 7.977 mm (0.3135 - 0.3141 in)

Exhaust

7.945 - 7.960 mm (0.3128 - 0.3134 in)

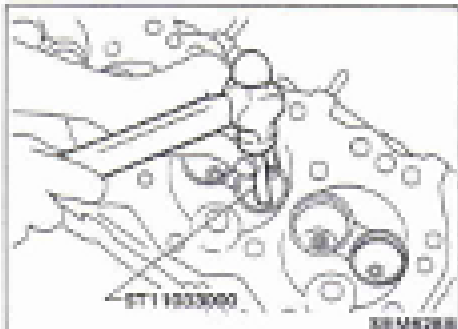
Valve guide inner diameter:

8.00 - 8.015 mm (0.3150 - 0.3156 in)

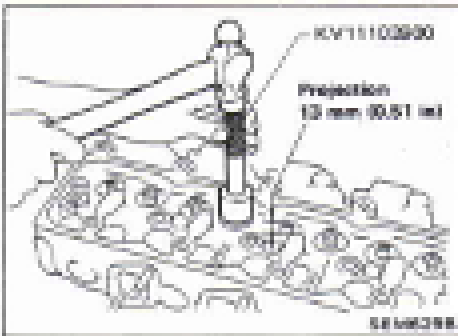


**VALVE GUIDE REPLACEMENT**

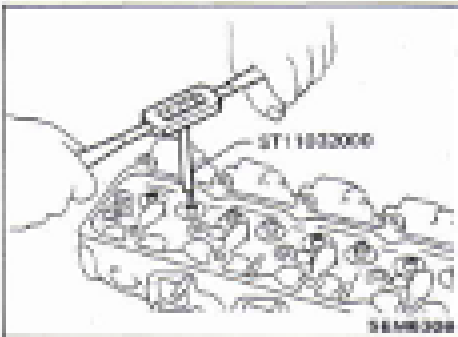
1. Drive out valve guide with a press [under a 20 kN (2t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer, and suitable tool.



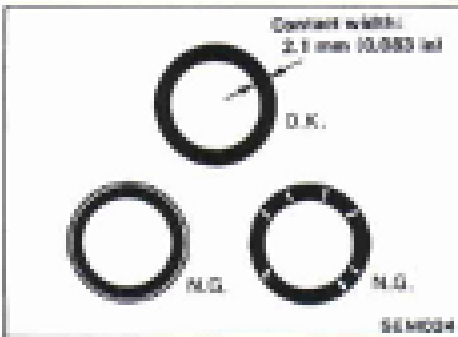
**Inspection (Cont'd)**



2. Press service valve guide onto cylinder head using suitable tool until the guide projects out 13 mm (0.51 in).



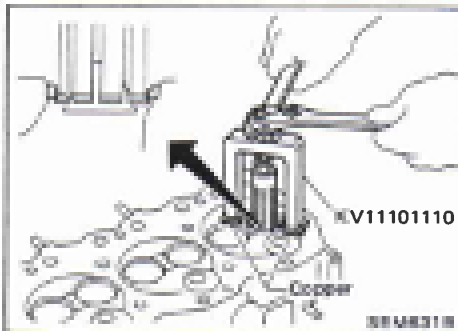
3. Ream valve guide.  
**Finished size:**  
**8.000 - 8.015 mm (0.3150 - 0.3156 in)**



**VALVE SEATS**

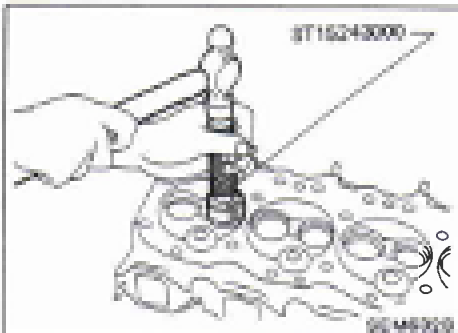
Check valve for any evidence of pitting at valve contact surface, and reseal or replace if worn out excessively.

- When repairing valve seats, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.
- The cutting should be done with both hands for uniform cutting.



**REPLACING VALVE SEAT FOR SERVICE PARTS**

1. Bore out old seat until it collapses or remove valve seats with Tool.  
**Place a copper seat between contact surface of Tool and cylinder head.**



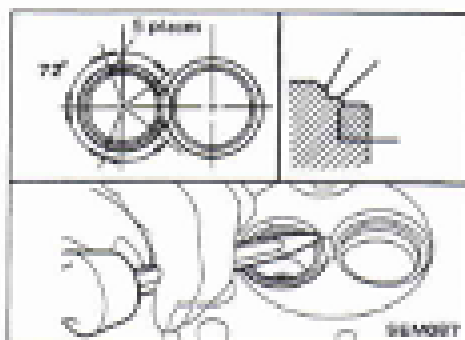
2. Place new valve seats on dry ice and allow them to cool for five minutes.

**WARNING:**

**Do not touch cooled valve seats with bare hand.**

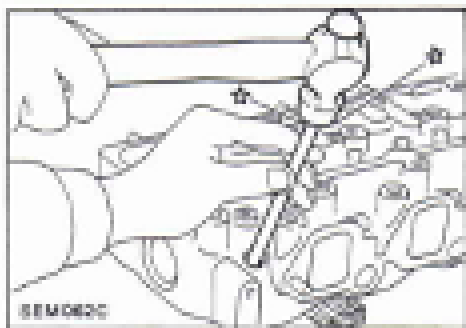
3. Heat cylinder head to 80°C (176°F).
4. Install cooled valve seats on cylinder head with Tool.



**Inspection (Cont'd)**

5. Stake exhaust valve seat at five places with punch.  
**When staking valve seat, select different places than those staked before.**

6. Cut or grind valve seat using suitable tool at the specified dimensions as shown in S.D.S.
7. After cutting, lap valve seat with a lapping compound.
8. Check contact condition of valve seat.

**COMBUSTION CHAMBER**

Check combustion chamber for cracks and other damage. If necessary, replace.

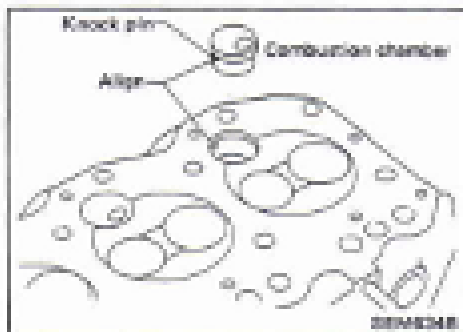
**REPLACING COMBUSTION CHAMBER**

**Usually combustion chamber should not be removed.**

1. Remove combustion chamber so that cylinder head cannot be damaged.
2. Install combustion chamber.
- (1) Cool combustion chamber with dry ice for approximately 5 to 10 minutes.

**WARNING:**

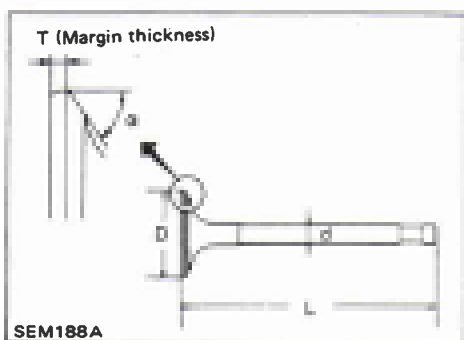
**Do not touch cooled combustion chamber with bare hand.**



- (2) Align combustion chamber knock pin with cylinder head notch, and drive in combustion chamber with a soft hammer.
3. Check amount of protrusion of combustion chamber.

**Protrusion:****Standard**

-0.05 to 0.10 mm (-0.0020 to 0.0039 in)

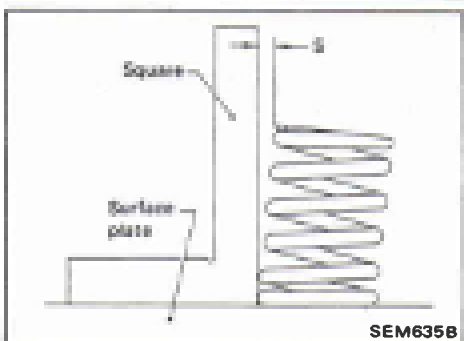


**Inspection (Cont'd)**

**VALVE DIMENSIONS**

Check dimensions in each valve. For dimensions, refer to S.D.S. When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace the valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



**VALVE SPRING SQUARENESS**

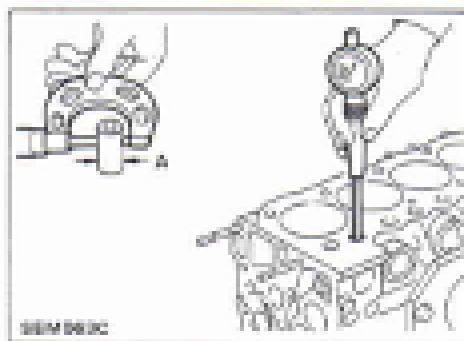
Out of square "S":

Less than 2.0 mm (0.079 in)



**VALVE SPRING PRESSURE LOAD**

Refer to S.D.S.



**VALVE LIFTER AND PUSH ROD**

**Valve lifter**

1. Check valve lifters for excessive wear on the face.
2. Replace with new ones if worn beyond repair.

- a. Valve lifter end should be smooth.
- b. Valve lifter to lifter hole clearance:

Standard

0.030 - 0.073 mm (0.0012 - 0.0029 in)

Limit

Less than 0.20 mm (0.0079 in)

Valve lifter outer diameter "A":

Standard

24.960 - 24.970 mm (0.9827 - 0.9831 in)

Cylinder block valve lifter hole diameter "B":

Standard

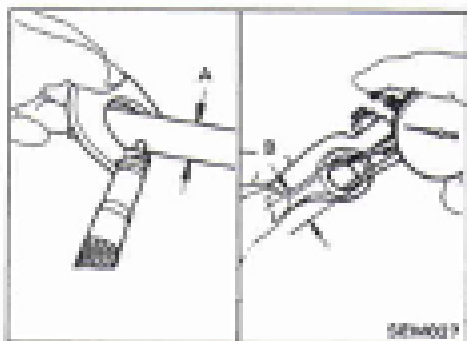
25.000 - 25.033 mm (0.9843 - 0.9855 in)

**Inspection (Cont'd)****Push rod**

1. Inspect push rod for excessive wear on the face.
2. Replace if worn or damaged beyond repair.
3. Check push rod for bend using a dial gauge.

**Maximum allowable bend****(Total indicator reading):****Less than 0.5 mm (0.020 in)****ROCKER SHAFT AND ROCKER ARM**

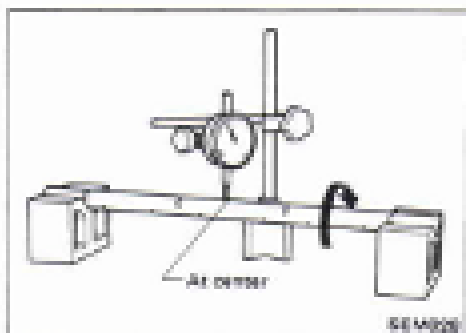
1. Check valve rockers, brackets and rocker shafts for scoring, wear or distortion. Replace if necessary.



2. Check clearance between valve rockers and rocker shaft. If specified clearance is exceeded, replace affected valve rockers or shafts.

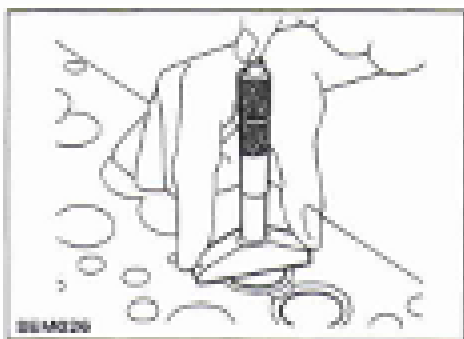
**Specified clearance:****Limit****Less than 0.15 mm (0.0059 in)****Rocker shaft outer diameter "A":****Standard**

- 19.979 - 20.000 mm (0.7866 - 0.7874 in)

**Rocker arm inner diameter "B":****Standard****20.014 - 20.035 mm (0.7880 - 0.7888 in)**

3. Check rocker shaft bend at its center. If bend is within specified limit, straighten it; and if it is greater than specified limit, replace rocker shaft.

**Rocker shaft bend****(Total indicator reading):****Limit****Less than 0.3 mm (0.012 in)**

**Inspection (Cont'd)****MEASURING CYLINDER HEAD TO VALVE DISTANCE**

Measure distance from cylinder head surface to intake and exhaust valves. If specified distance is exceeded, replace valve(s) or valve seat(s).

**Specified distance:****Standard****Intake**

0.275 - 0.675 mm (0.0108 - 0.0266 in)

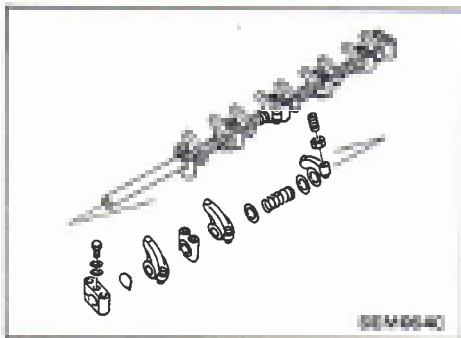
**Exhaust**

0.305 - 0.695 mm (0.0120 - 0.0274 in)

**Limit****Less than**

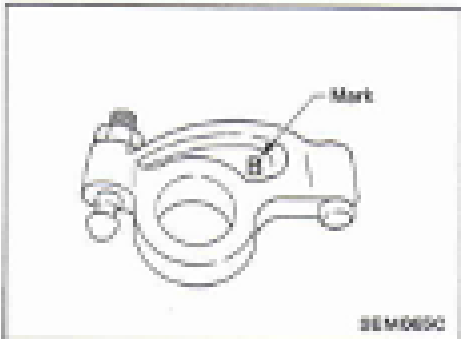
1.25 mm (0.0492 in)

for intake and exhaust valves



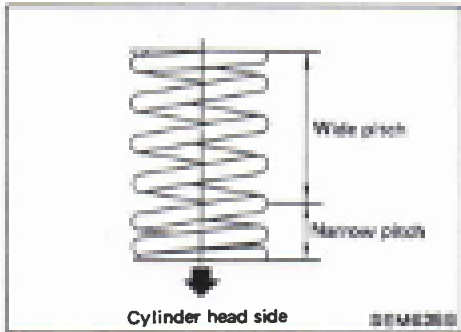
**Assembly**

1. Assemble rocker shaft component parts.



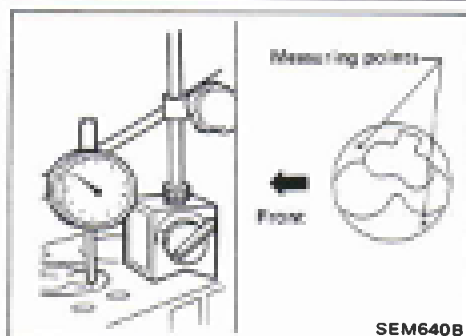
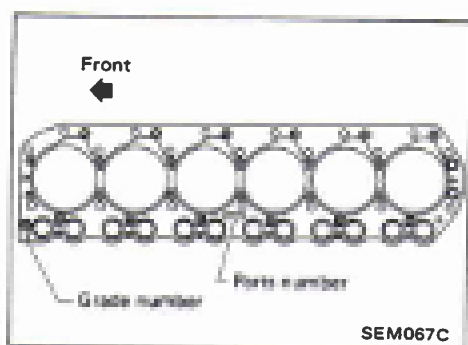
- Identification of rocker arms

Identification mark (on rocker arm)	For use with
B	Intake
C	Exhaust



2. Install valve component parts.

- Always use new valve oil seal. (Refer to OIL SEAL REPLACEMENT.)
- Install valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.



**Installation (On-vehicle service)**

1. Install cylinder head gasket.
  - a. When replacing only cylinder head gasket, install same grade gasket as the one formerly used.
  - b. When replacing or repairing cylinder block, cylinder head, piston, connecting rod and crankshaft, select gasket as follows:

- (1) Measure piston projection.
  - Set each piston at its top dead center. With piston held in that position, measure its projections at two points.
  - Calculate the average value of the two measurements.
  - Determine the amount of projection of the other three pistons.
- (2) Select suitable cylinder head gasket which conforms to the largest amount of projection of the four pistons.

Unit: mm (in)

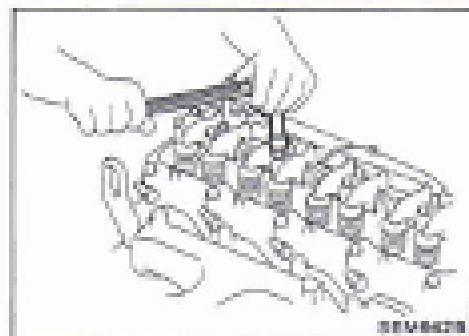
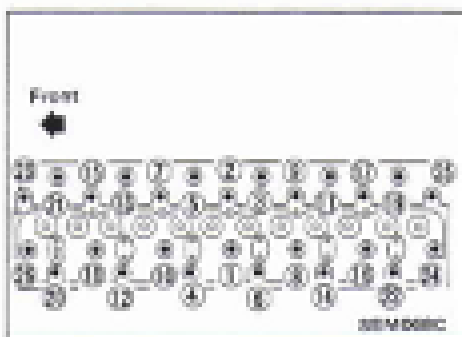
Average values piston projections	Gasket thickness	Gasket grade number
Less than 0.118 (0.0046)	1.15 (0.0453)	1
0.118 - 0.168 (0.0046 - 0.0066)	1.20 (0.0472)	2
More than 0.168 (0.0066)	1.25 (0.0492)	3

**Make sure that No. 1 piston is at T.D.C. on its compression stroke.**

2. Install cylinder head.
3. Apply oil to the thread portion and seat surface of bolts and tighten cylinder head bolts using Tool.

**CAUTION:**

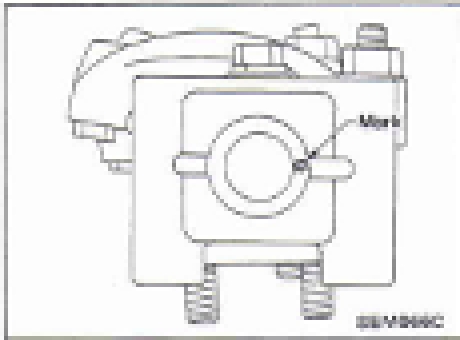
- **Tightening procedure:**
  - 1st Tighten bolts to 49 - 59 N·m (5.0 - 6.0 kg-m, 36 - 43 ft-lb)
  - 2nd Tighten bolts to 98 - 108 N·m (10.0 - 11.0 kg-m, 72 - 80 ft-lb)



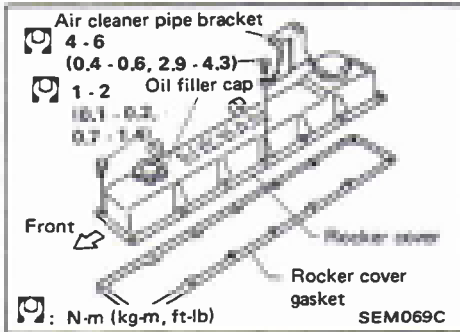
4. Apply engine oil and install push rods.
  5. Install rocker shaft assembly.
    - Rocker shaft bracket bolt:**
      - 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)
- Adjusting intake and exhaust valve clearance tentatively. Refer to section MA.

Installation (On-vehicle service) (Cont'd)

- Face punch mark toward the front of the engine.



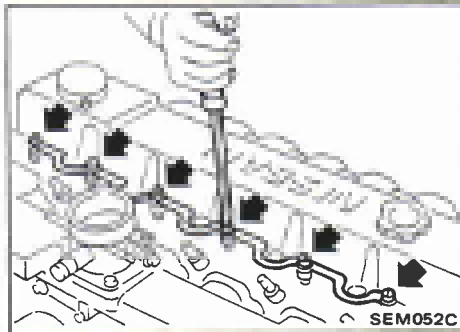
6. Install rocker cover with air cleaner pipe bracket.



7. Install glow plugs and glow plate.

Glow plug:

⌚: 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

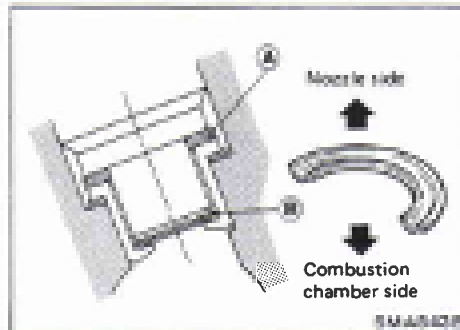
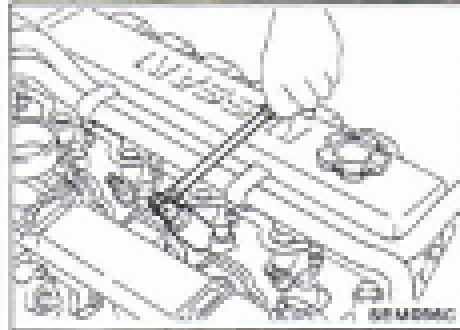


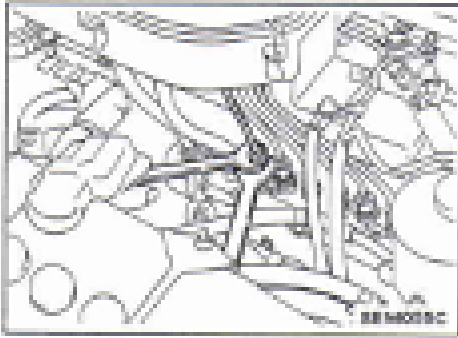
8. Install top nozzle gasket, nozzle washer and injection nozzle.

Injection nozzle:

⌚: 54 - 64 N·m (5.5 - 6.5 kg-m, 40 - 47 ft-lb)


- Always replace nozzle gasket and washer.




**Installation (On-vehicle service) (Cont'd)**

9. Install spill tube and injection tube.

**Spill tube fixing nut:**

: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

**Injection tube flared nut:**

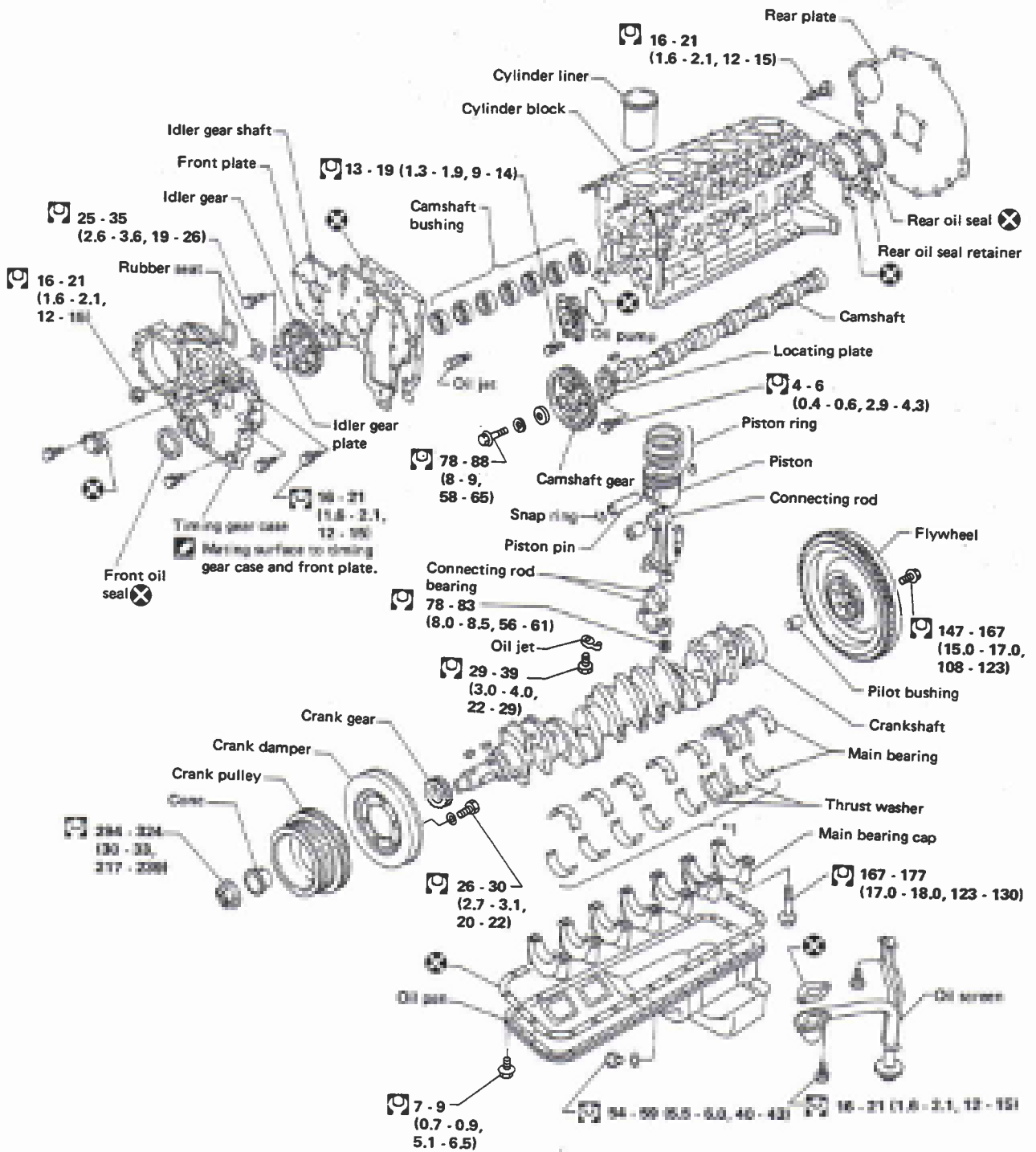
: 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)

10. Connect thermostat housing water inlet hose and radiator hose.
11. After assembling all disassembled parts, fill radiator and engine with new coolant up to filler opening.



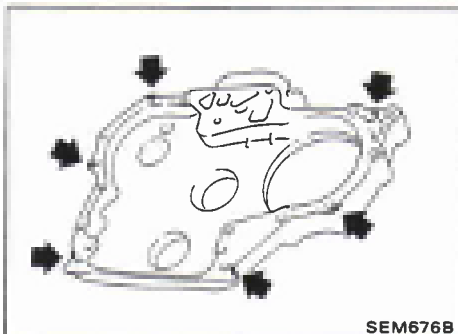
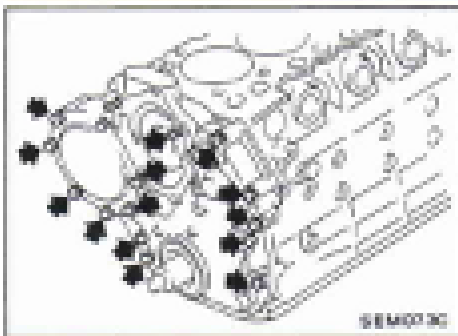
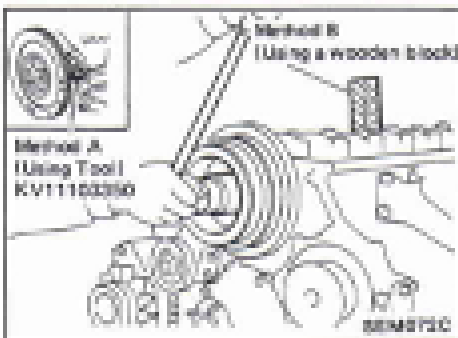
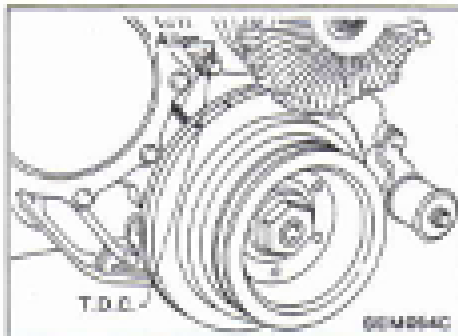
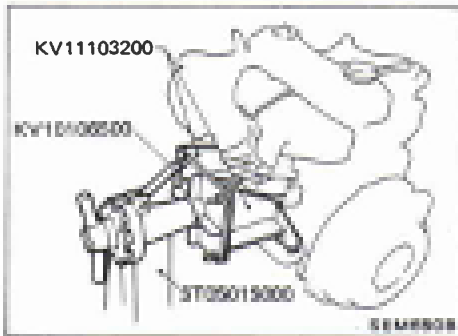
# CYLINDER BLOCK

TD42



- : N-m (kg-m, ft-lb)
- : Apply liquid gasket.
- \*1 : Keep in correct order.

SEM071C



**Disassembly**

**PISTON AND CRANKSHAFT**

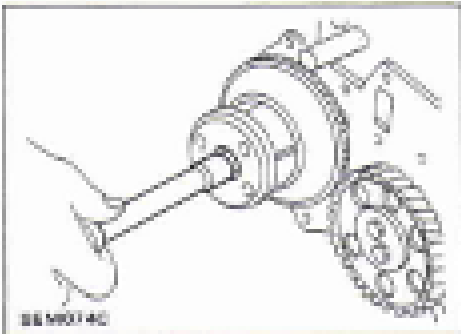
1. Remove exhaust manifold cover and manifold.
2. Remove drive belts.
3. Remove alternator, air conditioner and power steering bracket.
4. Place engine on work stand.
5. Drain coolant and oil.
6. Remove cylinder head.
7. Remove oil pan and oil strainer.
8. Align crank pulley and timing gear case mark so that No. 1 piston is at top dead center on its compression stroke.
9. Remove crank pulley.
  - (1) Remove crank pulley nut and install it in reverse.
  - (2) Remove cone bushing by tapping crank pulley nut end.
  - (3) Remove crank pulley nut and crank pulley.
10. Remove thermostat housing.
11. Remove water pump.
12. Remove timing gear case.

If the timing case is hard to remove due to liquid gasket, pry it off with a suitable tool at the cutout section.

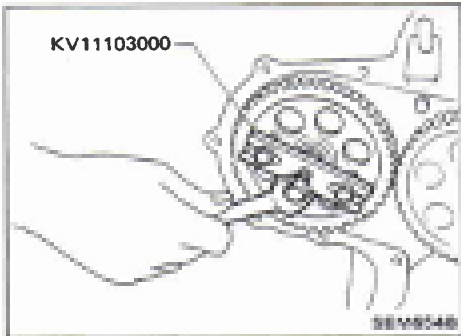
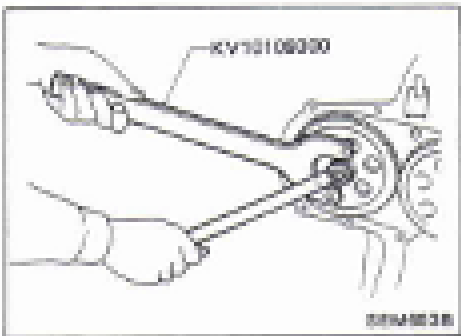
Disassembly (Cont'd)

13.

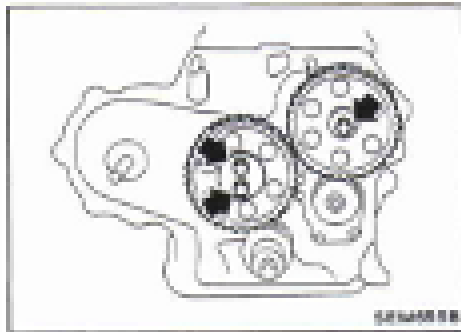
- In-line pump  
Remove timer cover and timer.



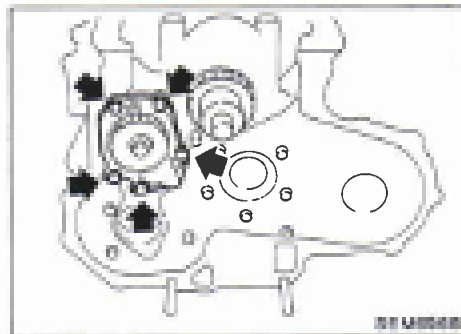
- VE-pump  
Remove injection pump gear.



- 14. Remove idler gear and idler gear shaft.
- 15. Remove camshaft gear, camshaft and valve lifters.



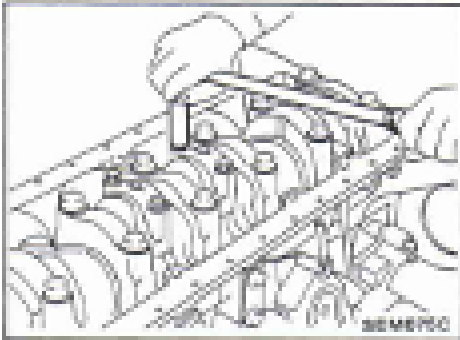
- 16. Remove oil pump assembly.



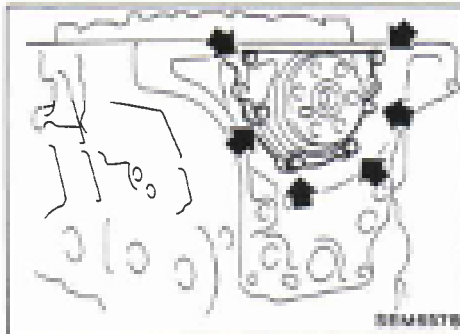
## CYLINDER BLOCK

TD42

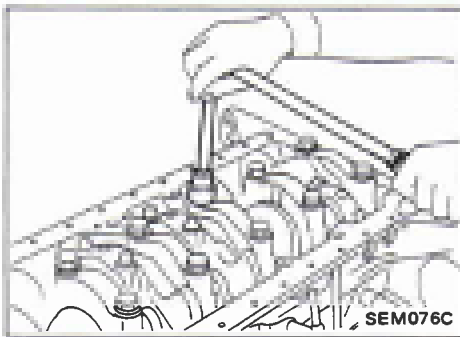
### Disassembly (Cont'd)



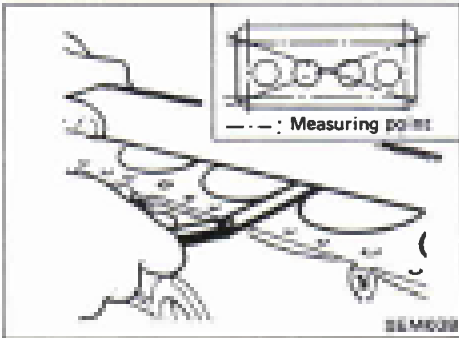
17. Remove crankshaft gear.
18. Remove flywheel and rear plate.
19. Remove oil jets.
20. Remove connecting rod caps.
21. Remove pistons.



22. Remove rear oil seal retainer.



23. Remove main bearing cap and crankshaft.  
**Place the bearings and caps in their proper order.**



**Inspection and Replacement  
CYLINDER BLOCK DISTORTION**

If beyond the specified limit, replace it.

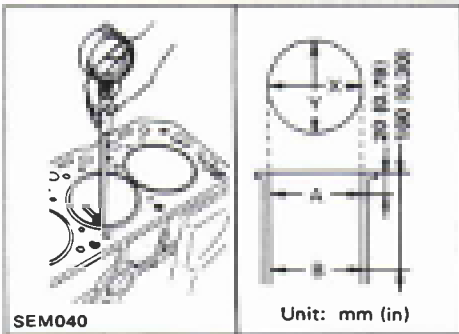
**Cylinder block distortion:**

**Standard**

Less than 0.05 mm (0.0020 in)

**Limit**

0.2 mm (0.008 in)



**CYLINDER LINER WEAR**

1. Measure cylinder liner bore for out-of-round and taper with a bore gauge. If beyond the limit, replace cylinder liner.

**Standard inside diameter:**

96.000 - 96.030 mm (3.7795 - 3.7807 in)

Refer to S.D.S.

**Wear limit:**

0.20 mm (0.0079 in)

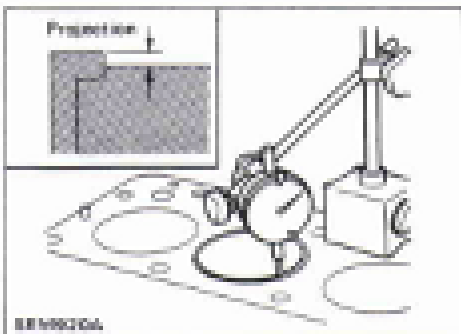
**Out-of-round (X—Y) limit:**

0.020 mm (0.0008 in)

**Taper (A—B) limit:**

0.20 mm (0.0079 in)

2. Check for scratches or seizure. If seizure is found, replace cylinder liner.



3. Check amount of projection of cylinder liner.

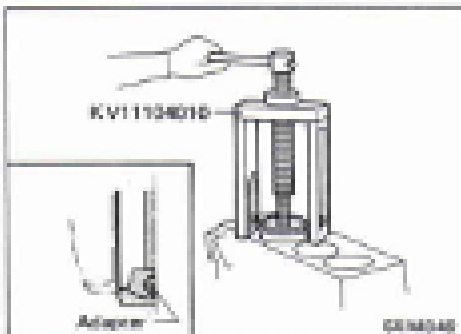
**Cylinder liner projection:**

**Standard**

0.02 - 0.09 mm (0.0008 - 0.0035 in)

**Deviation of each cylinder:**

Less than 0.05 mm (0.0020 in)



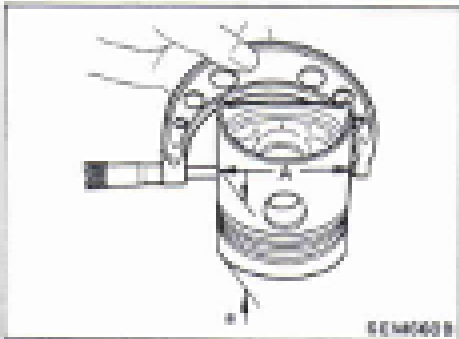
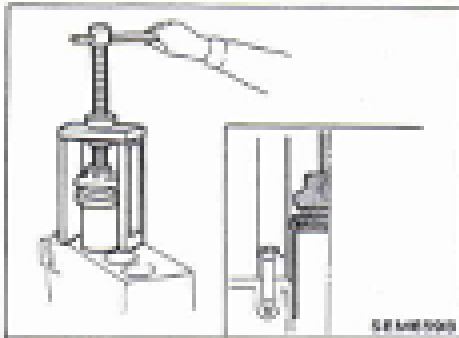
**CYLINDER LINER**

**Replacement**

1. Remove cylinder liner with Tool.

**Inspection and Replacement (Cont'd)**

2. Install cylinder liner with Tool.
3. Check amount of projection of cylinder liner.



**PISTON TO CYLINDER WALL CLEARANCE**

**Method A (Using micrometer)**

1. Measure piston and cylinder bore diameter.

**Piston diameter "A":**

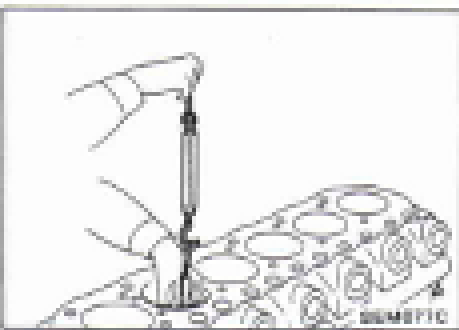
**Refer to S.D.S.**

**Measuring point "a" (Distance from the top):**  
70 mm (2.76 in)

2. Check that piston clearance is within the specification.

**Piston clearance:**

0.05 - 0.07 mm (0.0020 - 0.0028 in)



**Method B (Using feeler gauge)**

Measure the extracting force, and pull feeler gauge straight upward.

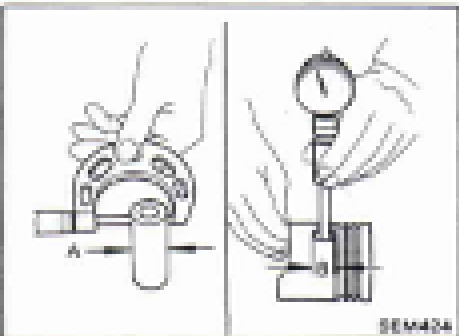
**It is recommended that piston and cylinder be heated to 20°C (68°F).**

**Feeler gauge thickness:**

0.06 mm (0.0024 in)

**Extracting force:**

5.9 - 11.8 N (0.6 - 1.2 kg, 1.3 - 2.6 lb)



**PISTON AND PISTON PIN CLEARANCE**

Check clearance between pistons and piston pins.

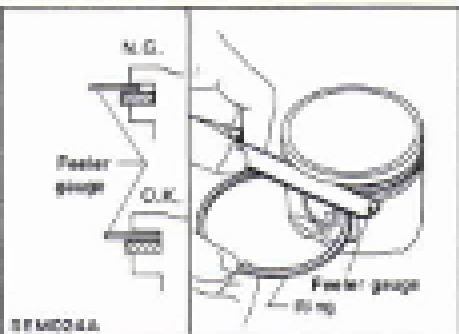
**Clearance (A—B):**

**Standard**

-0.008 to 0.007 mm (-0.0003 to 0.0003 in)

**Limit**

Less than 0.1 mm (0.004 in)



**PISTON RING SIDE CLEARANCE**

**Side clearance:**

**Top ring**

0.06 - 0.10 mm (0.0024 - 0.0039 in)

**2nd ring**

0.04 - 0.08 mm (0.0016 - 0.0031 in)

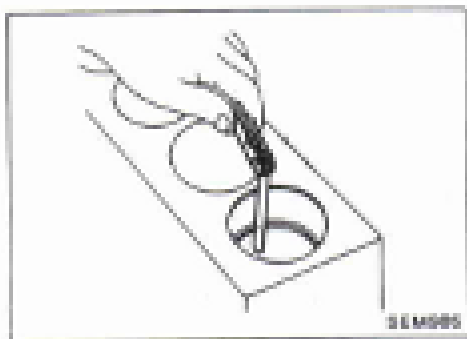
**Oil ring**

0.02 - 0.06 mm (0.0008 - 0.0024 in)

**Inspection and Replacement (Cont'd)**

**Max. limit of side clearance:**

- Top**  
0.50 mm (0.0197 in)
- 2nd**  
0.30 mm (0.0118 in)
- Oil**  
0.15 mm (0.0059 in)



**PISTON RING GAP**

**Standard ring gap:**

- Top ring**  
0.30 - 0.45 mm (0.0118 - 0.0177 in)
- 2nd ring**  
0.20 - 0.35 mm (0.0079 - 0.0138 in)
- Oil ring**  
0.30 - 0.50 mm (0.0118 - 0.0197 in)

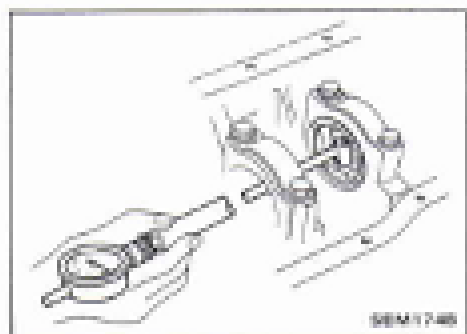
**Max. limit of ring gap:**

- 1.5 mm (0.059 in)

**MAIN BEARING CLEARANCE**

**Main bearing clearance:**

- Standard**  
0.035 - 0.087 mm (0.0014 - 0.0034 in)
- Limit**  
Less than 0.15 mm (0.0059 in)



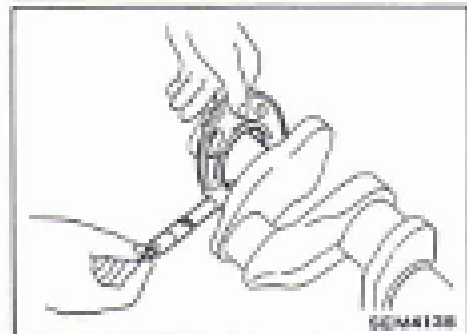
1. Install main bearings to cylinder block and main bearing cap.
2. Install main bearing cap to cylinder block.

**Tighten all bolts in correct order and in two or three stages.**

**☞: 167 - 177 N·m**

**(17.0 - 18.0 kg-m, 123 - 130 ft-lb)**

3. Measure inside diameter "A" of main bearing.



4. Measure outside diameter "Dm" of main journal in crankshaft.

**Inspection and Replacement (Cont'd)**

5. Calculate main bearing clearance:

$$\text{Main bearing clearance} = A - D_m$$

**CONNECTING ROD BEARING CLEARANCE**

Connecting rod bearing clearance:

**Standard**


0.035 - 0.081 mm (0.0014 - 0.0032 in)

**Limit**

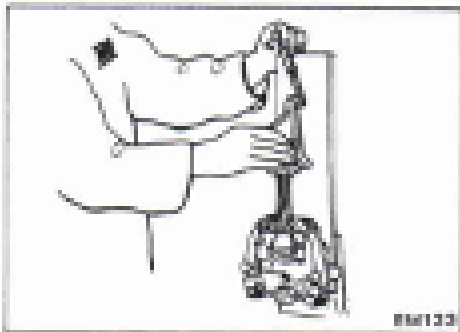
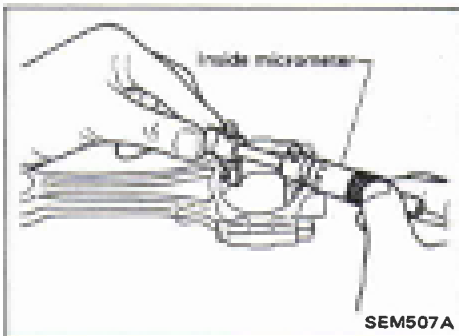
Less than 0.15 mm (0.0059 in)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

**Apply oil to the thread portion of bolts and seating surface of nuts.**

: 78 - 83 N·m (8.0 - 8.5 kg-m, 58 - 61 ft-lb)

3. Measure inside diameter "A" of bearing.
4. Measure outside diameter "Dp" of pin journal in crankshaft.
5. Calculate connecting rod bearing clearance.  
Connecting rod bearing clearance = A - Dp

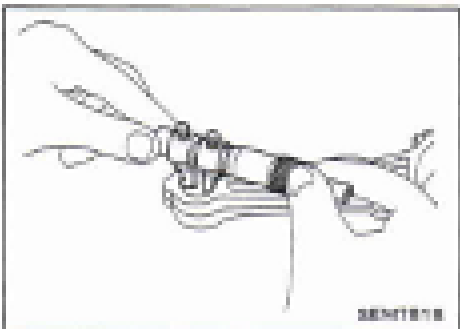
**CONNECTING ROD BEND AND TORSION**

Bend and torsion:

**Limit**

0.05 mm (0.0020 in)

per 100 mm (3.94 in) length

**CONNECTING ROD SMALL END BUSHING CLEARANCE**

1. Measure inside diameter "A" of connecting rod small end bushings.



## CYLINDER BLOCK

### Inspection and Replacement (Cont'd)

2. Measure outside diameter "D" of piston pin.
3. Calculate connecting rod small end bushing clearance.  
Connecting rod small end bushing clearance = A - D

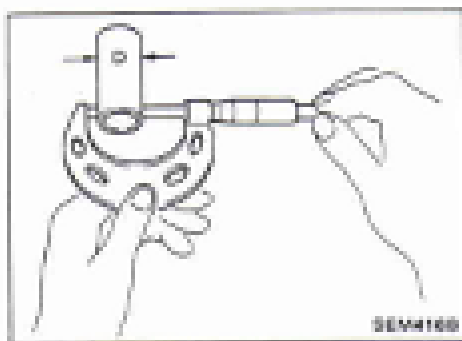
**Bushing clearance:**

**Standard**

0.025 - 0.045 mm (0.0010 - 0.0018 in)

**Limit**

0.15 mm (0.0059 in)



### REPLACEMENT OF CONNECTING ROD SMALL END BUSHING

1. Drive in the small end bushing until it is flush with the end surface of the rod.

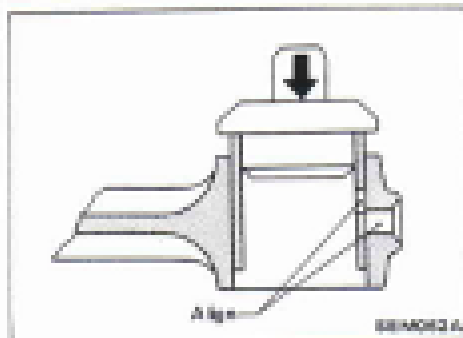
**Be sure to align the oil holes.**

2. After driving in the small end bushing, ream the bushing.

**Small end bushing inside diameter:**

**Finished size**

28.025 - 28.038 mm (1.1033 - 1.1039 in)



### CRANKSHAFT

1. Check crankshaft journals and pins for score, bias, wear or cracks. If faults are minor, correct with fine crocus cloth.
2. Check journals and pins with a micrometer for taper and out-of-round.

**Out-of-round (X—Y):**

**Standard**

Less than 0.01 mm (0.0004 in)

**Limit**

0.02 mm (0.0008 in)

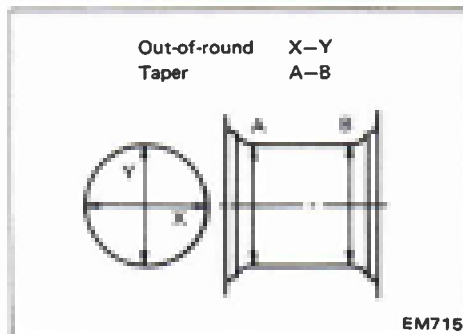
**Taper (A—B):**

**Standard**

Less than 0.01 mm (0.0004 in)

**Limit**

0.02 mm (0.0008 in)



3. Check crankshaft runout.

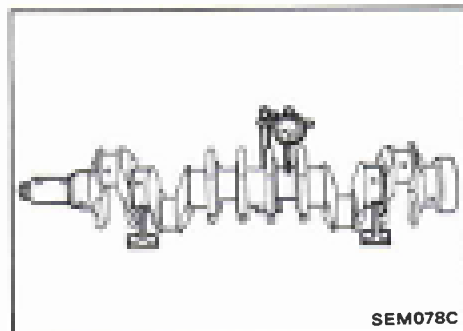
**Runout [T.I.R. (Total Indicator Reading)]:**

**Standard**

0 - 0.03 mm (0 - 0.0012 in)

**Limit**

0.10 mm (0.0039 in)



## CYLINDER BLOCK

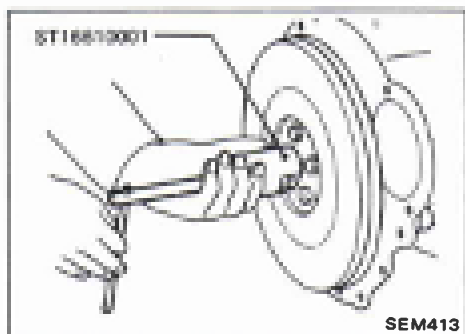
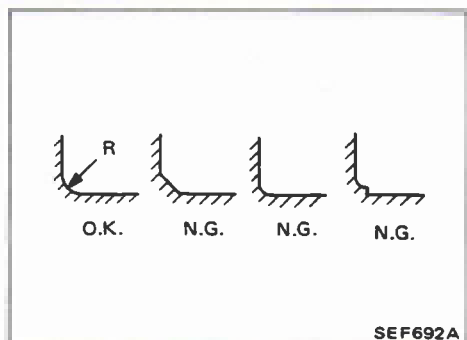
### Inspection and Replacement (Cont'd) RESURFACING OF CRANKSHAFT JOURNAL AND CRANK PIN

When using undersize main bearings and connecting rod bearings, the crankshaft journals or crank pins must be finished to match the bearings.

- R: Crank journal:**  
3.0 mm (0.118 in)  
**Crank pin:**  
3.5 mm (0.138 in)

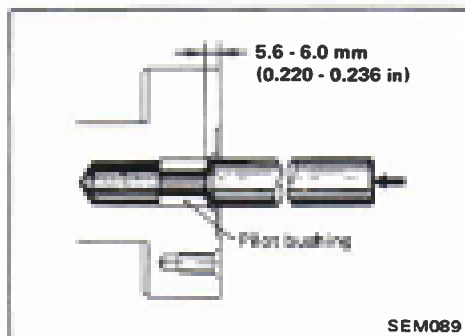
**CAUTION:**

- At the same time make sure that the surface width does not increase.
- Do not attempt to cut counterweight of crankshaft.



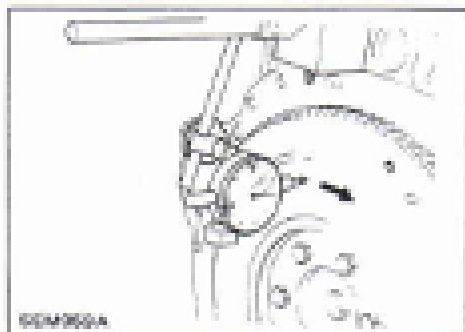
### CRANKSHAFT PILOT BUSHING Crankshaft pilot bushing replacement

1. Pull out bushing with Tool.



2. Insert pilot bushing until distance between flange end and bushing is specified value.

**Distance:**  
Approx. 5.6 - 6.0 mm (0.220 - 0.236 in)



### FLYWHEEL RUNOUT

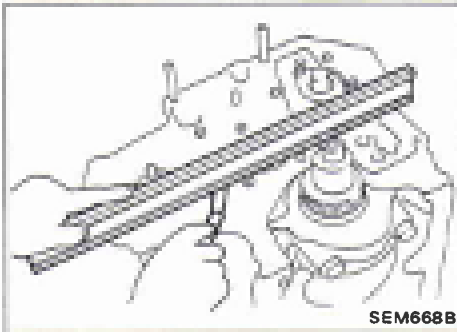
**Runout (Total indicator reading):**  
0.15 mm (0.0059 in) or less

### Inspection and Replacement (Cont'd) FRONT PLATE

Check front plate for warpage. If not within the limit, make flat or replace front plate.

**Warpage limit:**

0.2 mm (0.008 in)



### GEAR TRAIN

**Camshaft drive gear, injection pump drive gear, oil pump gear, idler gear and crankshaft gear**

1. If gear tooth and key have scratches or are excessively worn, replace gear and key.
2. Check gear train backlash before disassembling and after assembling.

Method A (Using dial gauge)

Method B (Using fuse wire)

If beyond the limit, replace gear.

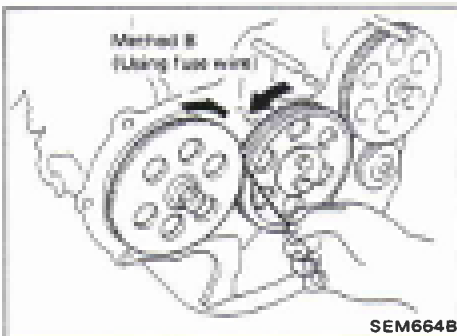
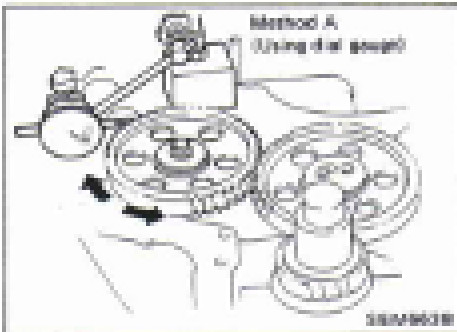
**Backlash:**

**Standard**

0.06 - 0.12 mm (0.0024 - 0.0047 in)

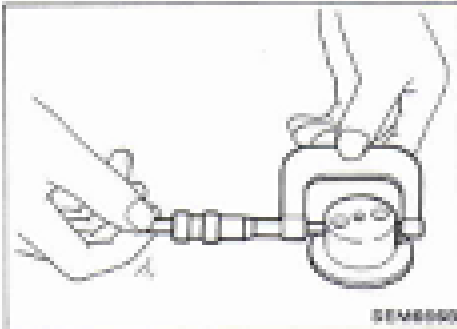
**Limit**

0.20 mm (0.0079 in)



### IDLER GEAR BUSHING CLEARANCE

1. Measure idler gear shaft outer diameter.



2. Measure idler gear bushing inner diameter.
3. Calculate idler gear bushing clearance.

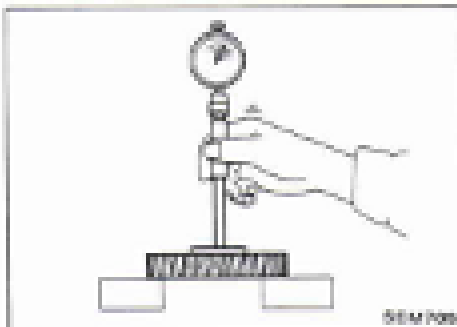
**Bushing oil clearance:**

**Standard**

0.025 - 0.061 mm (0.0010 - 0.0024 in)

**Limit**

0.20 mm (0.0079 in)



**Inspection and Replacement (Cont'd)  
IDLER GEAR END PLAY**

Measure idler gear end play between gear plate and gear.

**Idler gear end play:**

**Standard**

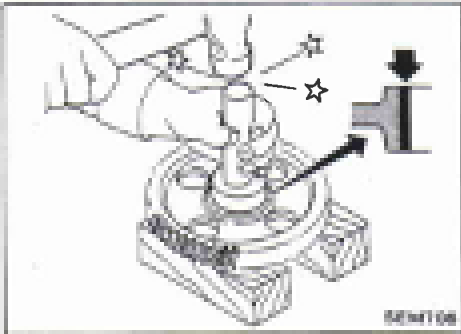
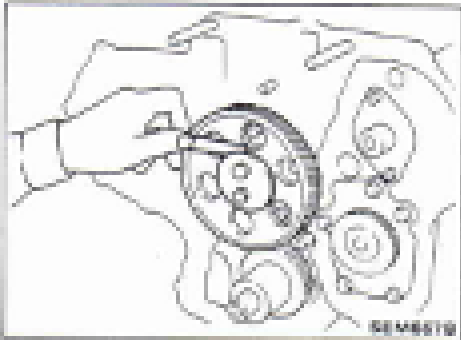
0.03 - 0.14 mm (0.0012 - 0.0055 in)

**Limit**

Less than 0.3 mm (0.012 in)

**Idler gear shaft bolt:**

☐: 25 - 35 N·m (2.6 - 3.6 kg-m, 19 - 26 ft-lb)



**REPLACEMENT OF IDLER GEAR BUSHING**

1. Use a suitable tool to replace bushing.
2. Ream idler gear bushing.

**Finished size:**

42.00 - 42.02 mm (1.6535 - 1.6543 in)

**Idler gear shaft**

Install idler gear shaft so that oil hole of shaft faces upward.

**CAMSHAFT AND CAMSHAFT BUSHING**

**Camshaft bushing clearance**

Measure inside diameter of camshaft bushing and outside diameter of camshaft journal with a suitable gauge.

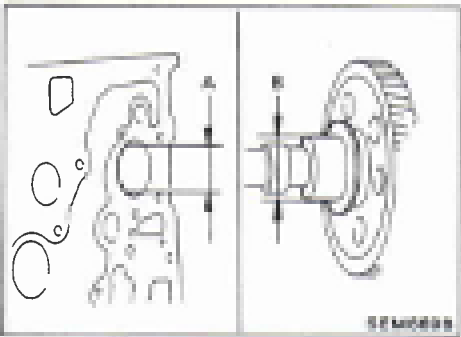
**Clearance between camshaft and bushing (A—B):**

**Standard**

0.020 - 0.109 mm (0.0008 - 0.0043 in)

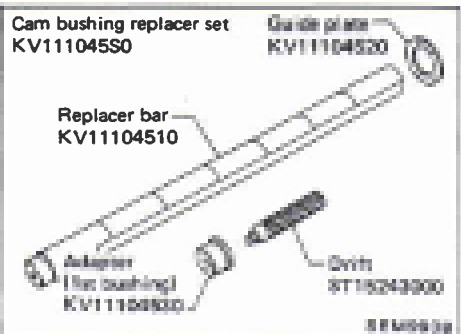
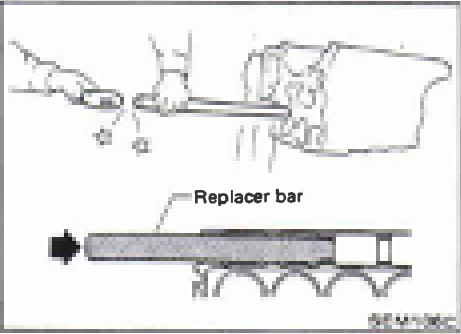
**Limit**

Less than 0.15 mm (0.0059 in)



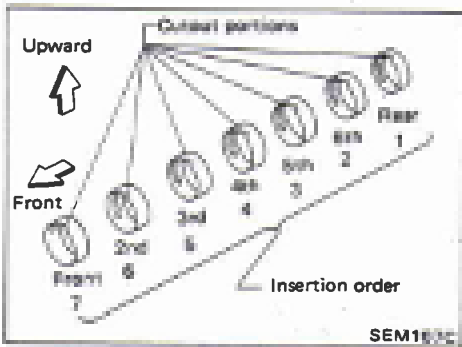
**REPLACING CAMSHAFT BUSHING**

1. Using Tool, remove camshaft bushings from the engine. Some bushings must be broken in order to remove.

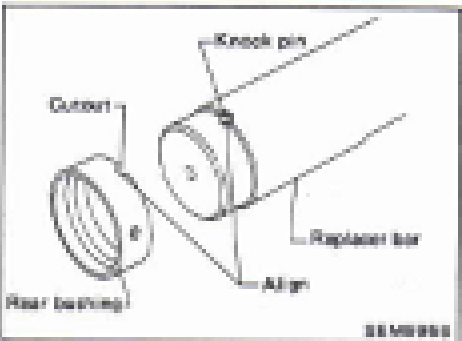


2. Using Tool, install camshaft bushings as follows:

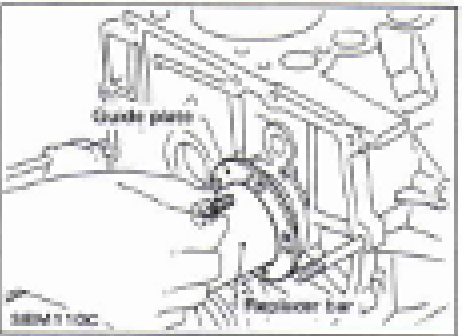
**Inspection and Replacement (Cont'd)**



- (1) Install camshaft bushings in the order of "rear", "6th", "5th", "4th", "3rd", "2nd" and "front". All bushings must be installed from the front.
- (2) Face the cutout upward during installation.

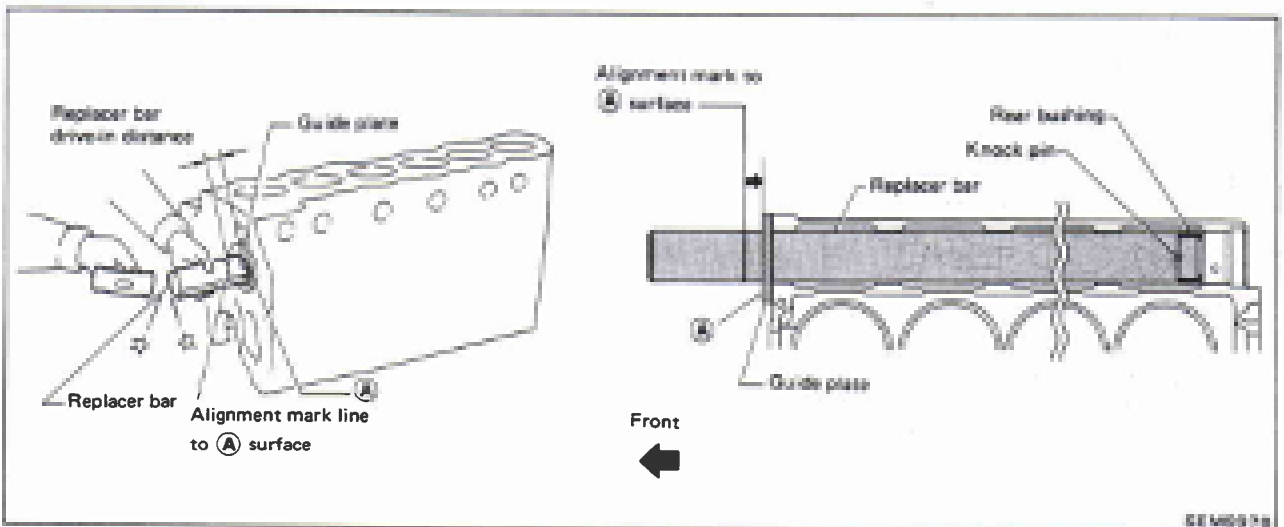


- (3) Rear camshaft bushing  
Align the cutout of rear bushing with knock pin of replacer bar before installation.



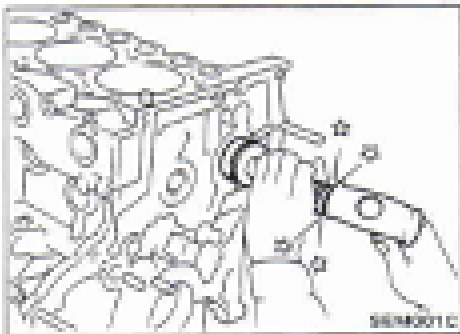
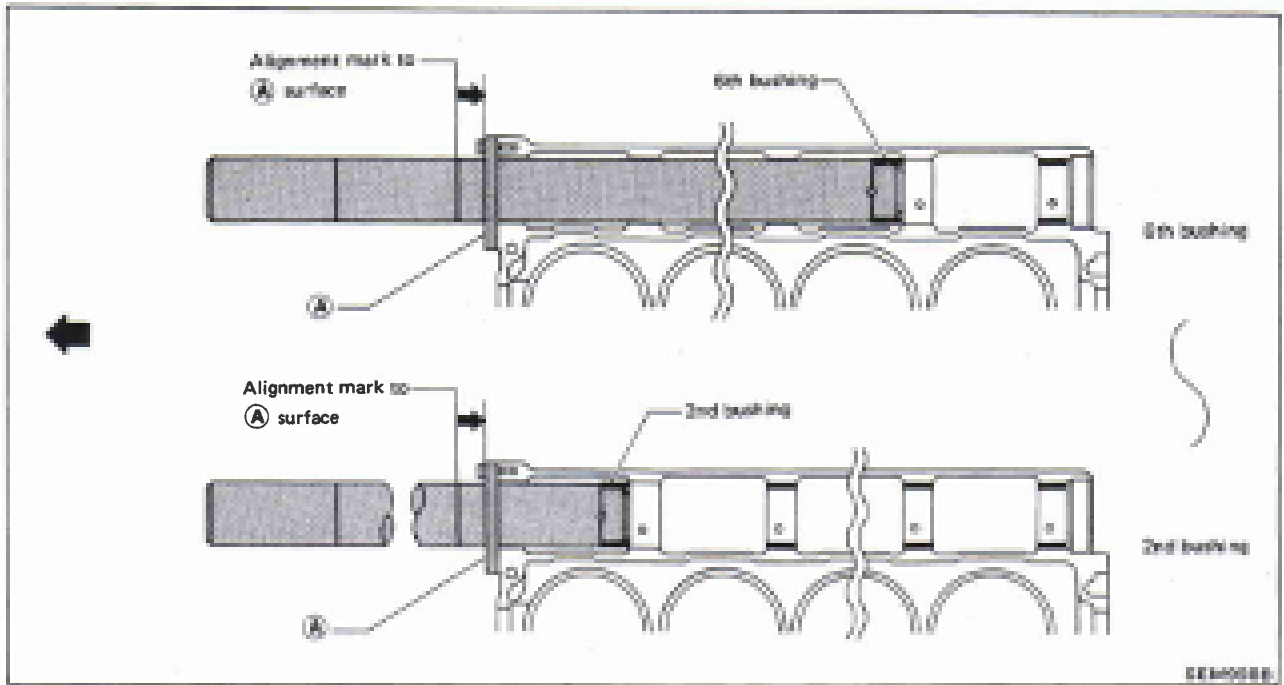
Insert rear bushing with replacer bar into the engine. Install guide plate with bolt holes (on the "TD" mark side) facing upper side of cylinder block. Tighten bolts.

Drive replacer bar until the alignment mark on replacer bar is aligned with the end of replacer guide.  
Remove replacer set.  
After installation, check that oil holes in camshaft bushings are aligned with oil holes in cylinder block.

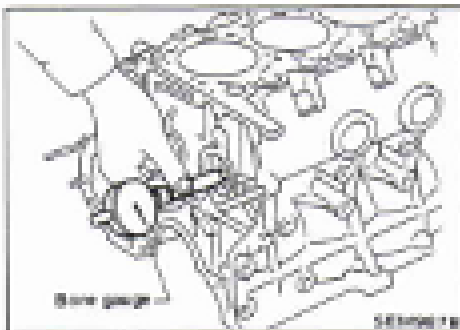


Inspection and Replacement (Cont'd)

- (4) 6th, 5th, 4th, 3rd and 2nd camshaft bushings  
Install in the same manner as rear camshaft bushing.



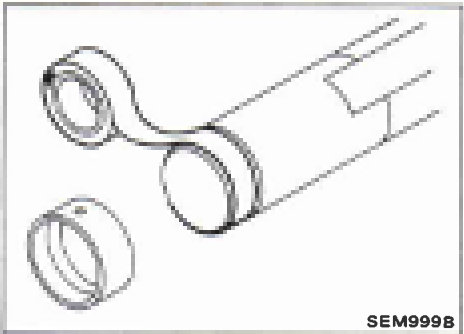
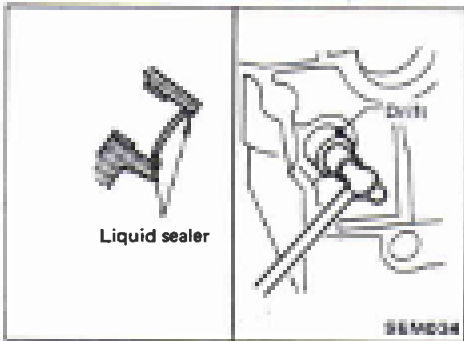
- (5) Front camshaft bushing  
Using 1st bushing adapter, position front camshaft bushing so that oil hole in cylinder block is aligned with oil hole in bushing.



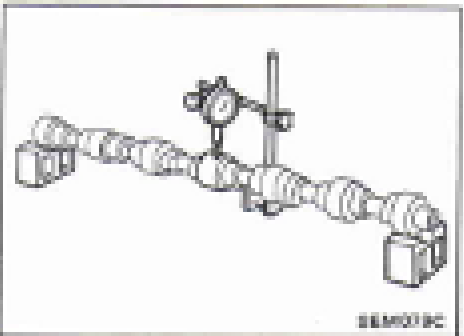
3. Check camshaft bushing clearance.

**Inspection and Replacement (Cont'd)**

4. Install new welch plug with a drift.  
Apply liquid sealer.



When setting 6th through 2nd bushings on replacer bar, tape the bar to prevent movement.



**CAMSHAFT ALIGNMENT**

1. Check camshaft journal and cam surface for bend, wear or damage.  
If fault is beyond limit, replace.
2. Check camshaft bend at center journal.  
If bend is greater than specified limit, repair or replace camshaft.

**Camshaft bend (Total indicator reading):**

**Standard**

Less than 0.02 mm (0.0008 in)

**Limit**

Less than 0.06 mm (0.0024 in)



3. Measure camshaft end play between locating plate and gear.  
If beyond the specified limit, replace camshaft locating plate.

**Camshaft end play:**

**Standard**

0.08 - 0.28 mm (0.0031 - 0.0110 in)

**Limit**

Less than 0.5 mm (0.020 in)

**Inspection and Replacement (Cont'd)**

4. Measure camshaft cam height. If beyond the specified limit, replace camshaft.

**Cam height:****Standard****Intake**

41.71 - 41.75 mm (1.6421 - 1.6437 in)

**Exhaust**

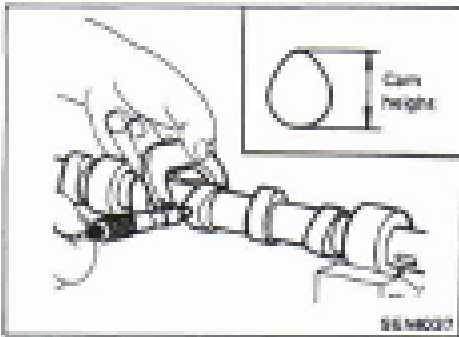
41.88 - 41.92 mm (1.6488 - 1.6504 in)

**Limit****Intake**

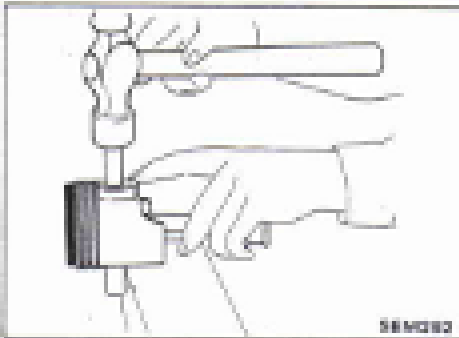
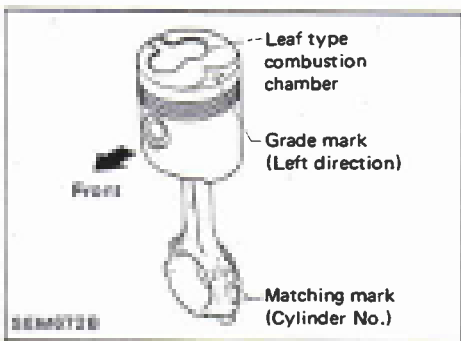
Less than 41.20 mm (1.6220 in)

**Exhaust**

Less than 41.30 mm (1.6260 in)







### Assembly PISTON

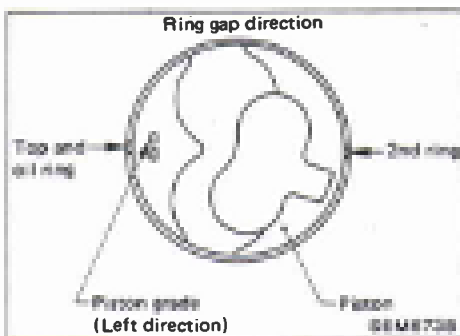
Assemble pistons, piston pins, snap rings and connecting rods.

- a. Numbers are stamped on the connecting rod and cap corresponding to each cylinder. Care should be taken to avoid a wrong combination including bearing.
- b. When inserting piston pin in connecting rod, heat piston with a heater or hot water [approximately 60 to 70°C (140 to 158°F)] and apply engine oil to pin and small end of connecting rod.
- c. After assembling, ascertain that piston swings smoothly.

Install piston assembly.

#### CAUTION:

- a. Stretch the piston rings only enough to fit them in the piston grooves.
- b. Be sure the manufacturer's mark faces upward.

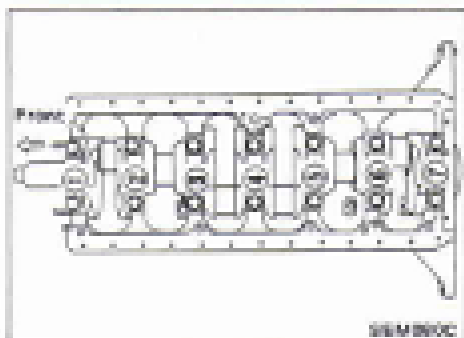


- c. Install No. 1 piston ring in such a way that its gap faces the direction of the piston pin; and then install piston rings so that their gap positioned at 180° to one another.

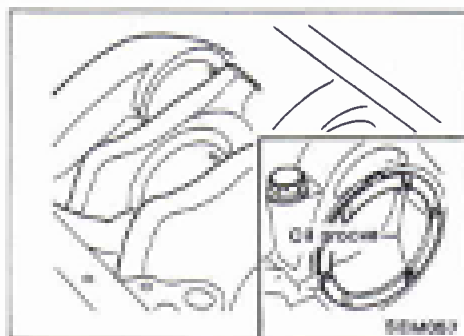
### CRANKSHAFT

1. Install crankshaft.
  - (1) Set main bearings in the proper position on cylinder block.
    - a. If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.
    - b. Upper bearings have oil hole and oil groove, however lower bearings do not.

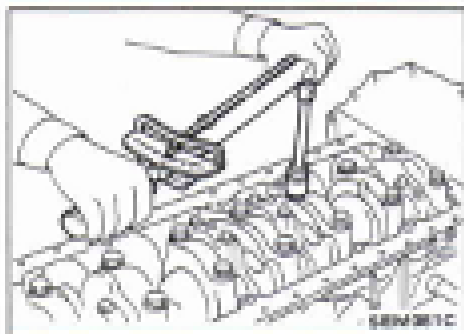
## Assembly (Cont'd)



- (2) Apply engine oil to crankshaft journal and pin and install crankshaft.
- (3) Install main bearing caps.
  - a) Install main bearing cap with the number facing the front of vehicle.
  - b) Apply engine oil to main bearing cap and cylinder block contact surfaces.
  - c) Install rear oil seal assembly. Apply engine oil to contact surface of rear end oil seal and crankshaft.



- (4) Install crankshaft thrust washer at the 6th journal from front. **Install thrust washer so that oil groove can face crankshaft.**

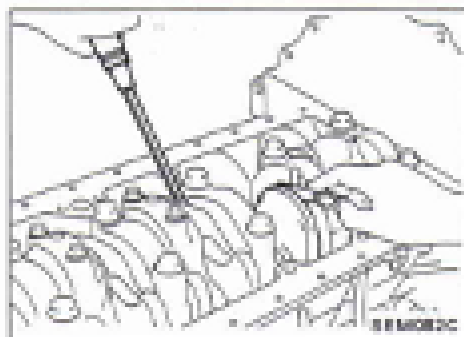


- (5) Tighten main bearing cap bolts gradually in stages, starting from two to three separate stages, from center bearing and moving outward in sequence.

**Main bearing cap bolt:**

: 167 - 177 N·m

(17.0 - 18.0 kg-m, 123 - 130 ft-lb)



- (6) Measure crankshaft free end play at No. 6 bearing.

**Crankshaft free end play:**

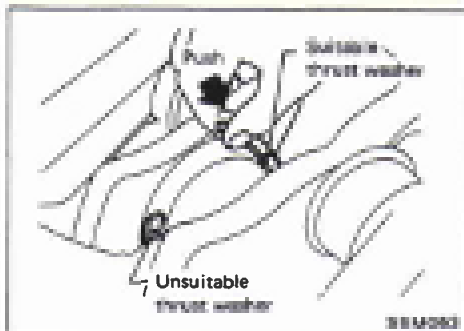
**Standard**

0.055 - 0.140 mm (0.0022 - 0.0055 in)

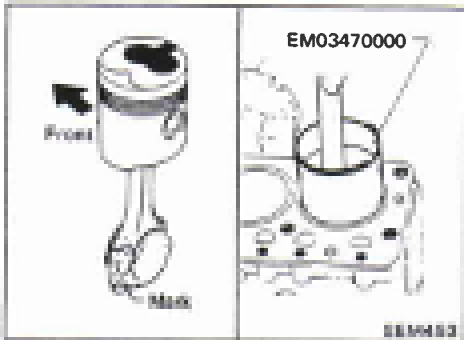
**Limit**

0.4 mm (0.016 in)

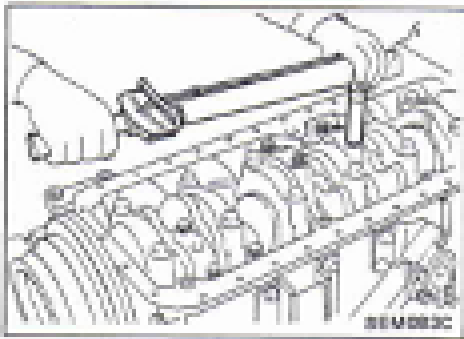
- If beyond the limit, replace No. 6 main bearing thrust washer. Refer to S.D.S.**



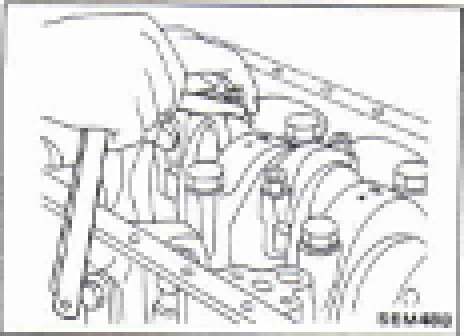
**Assembly (Cont'd)**



2. Install pistons with connecting rods.  
 (1) Install them into corresponding cylinder using Tool.  
 ● Be careful not to scratch cylinder wall with connecting rod.  
 ● Apply engine oil to cylinder wall, piston and bearing.  
 ● The leaf type combustion chamber on piston head must be at right side of engine.



- (2) Install connecting rod bearing caps.  
**Connecting rod bearing nut:**  
 □:78 - 83 N·m (8.0 - 8.5 kg-m, 58 - 61 ft-lb)

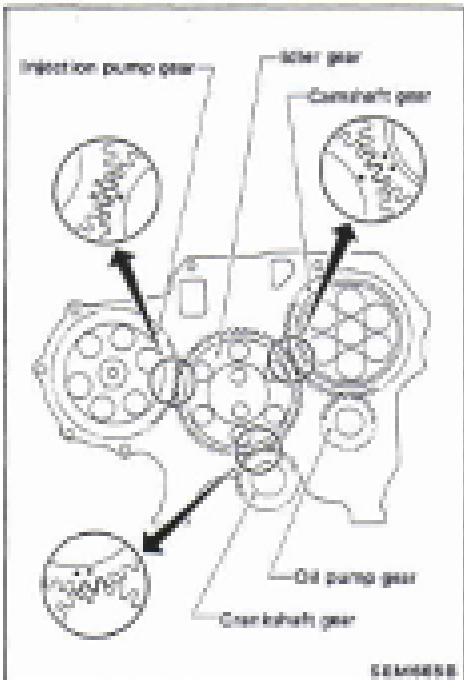


3. Measure connecting rod side clearance.  
**Connecting rod side clearance:**  
**Standard**  
 0.10 - 0.22 mm (0.0039 - 0.0087 in)  
**Limit**  
 0.22 mm (0.0087 in)

If beyond the limit, replace connecting rod and/or crankshaft.

**GEAR TRAIN**

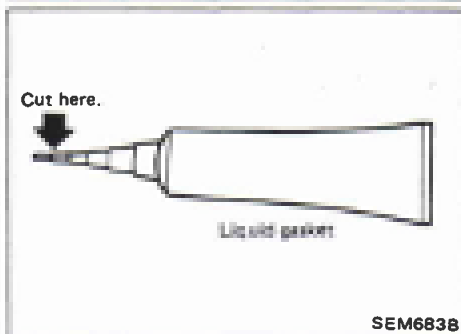
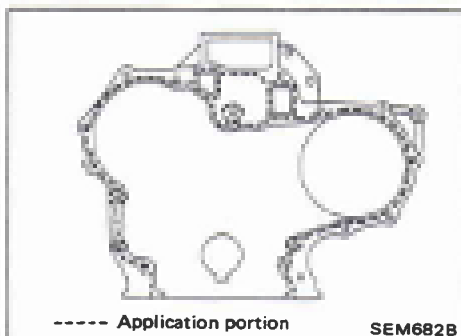
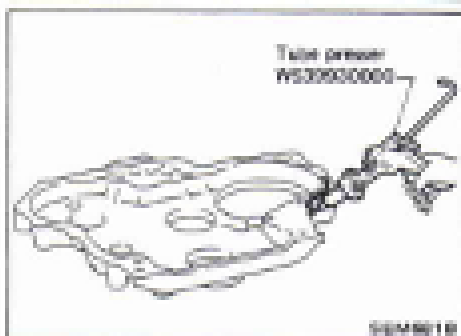
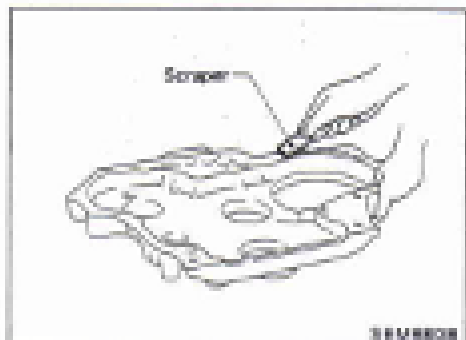
1. Set No. 1 piston at its top dead center.  
 2. Align each gear mark and install gears.



### Assembly (Cont'd) TIMING GEAR CASE

#### Installation

1. Before installing timing gear case, remove all traces of liquid gasket from mating surface using a scraper. Also remove traces of liquid gasket from mating surface of front plate.
2. Apply a continuous bead of liquid gasket to mating surface of timing gear case.



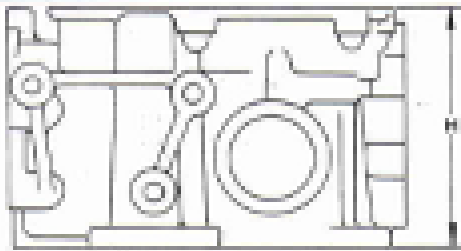
- Be sure liquid gasket is 2.5 to 3.5 mm (0.098 to 0.138 in) wide.
- Attach timing gear case to front plate within 10 minutes after coating.
- Wait at least 30 minutes before refilling engine coolant or starting engine.
- Use Genuine Liquid Gasket or equivalent.

**General Specifications**

		Unit: kPa (bar, kg/cm <sup>2</sup> , psi)/rpm		
Cylinder arrangement		6, in-line		
Displacement	cm <sup>3</sup> (cu in)	4,169 (254.39)	Compression pressure	
Bore and stroke	mm (in)	96 x 96 (3.78 x 3.78)	Standard	1,177 (11.77, 12.0, 171)/200
Valve arrangement		O.H.V.	Minimum	883 (8.83, 9.0, 128)/200
Firing order		1-5-3-6-2-4	Differential limit between cylinders	98 (0.98, 1.0, 14)/200
Number of piston rings				
Compression		2		
Oil		1		
Number of main bearings		7		
Compression ratio		8.3		

**Inspection and Adjustment**

**CYLINDER HEAD**



SEM013C

Unit: mm (in)

	Standard	Limit
Height (H)	117.19 - 117.59 (4.6138 - 4.6295)	0.2 (0.008)*
Surface distortion	Less than 0.07 (0.0028)	0.2 (0.008)

\* Total amount of cylinder head resurfacing and cylinder block resurfacing

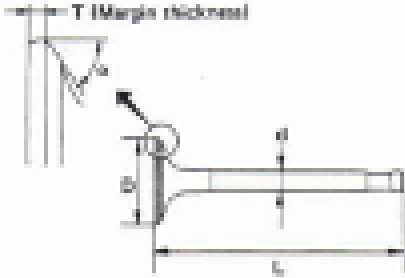
# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

TM42

## Inspection and Adjustment (Cont'd)

### VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	47.0 - 47.2 (1.850 - 1.858)
Exhaust	38.0 - 38.2 (1.496 - 1.504)
Valve length "L"	
Intake	116.7 - 117.0 (4.594 - 4.606)
Exhaust	117.0 - 117.3 (4.606 - 4.618)
Valve stem diameter "d"	
Intake	7.965 - 7.980 (0.3136 - 0.3142)
Exhaust	7.945 - 7.960 (0.3128 - 0.3134)
Valve seat angle "α"	
Intake	45°30'
Exhaust	
Valve margin "T"	
Intake	1.3 (0.051)
Exhaust	1.5 (0.059)
Valve margin "T" limit	More than 0.5 (0.020)
Valve stem end surface grinding limit	Less than 0.2 (0.008)

### Valve clearance

Unit: mm (in)

	* Cold	Hot
Intake	0.20 (0.008)	0.38 (0.015)
Exhaust	0.20 (0.008)	0.38 (0.015)

\* At temperature of approximately 20°C (68°F)

Whenever valve clearances are adjusted to cold specifications, check that the clearances satisfy hot specifications and adjust again if necessary.

### Valve spring

Free height		mm (in)
Outer	49.77 (1.9594)	
Inner	44.10 (1.7362)	
Pressure height		mm/N (mm/kg, in/lb)
Outer	30.0/512.9 (30.0/52.3, 1.181/115.3)	
Inner	25.0/255.0 (25.0/26.0, 0.984/57.3)	
Assembled height		mm/N (mm/kg, in/lb)
Outer	40.0/225.6 (40.0/23.0, 1.575/50.7)	
Inner	35.0/107.9 (35.0/11.0, 1.378/24.3)	
Out-of-square		mm (in)
Outer	2.2 (0.087)	
Inner	1.9 (0.075)	

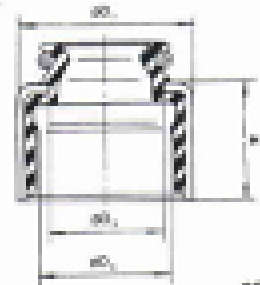
### Valve lifter and push rod

Unit: mm (in)

	Standard	Limit
Valve lifter outer diameter	24.970 - 24.980 (0.9831 - 0.9835)	-
Cylinder block valve lifter hole diameter	25.000 - 25.033 (0.9843 - 0.9855)	-
Valve lifter to lifter hole clearance	0.020 - 0.063 (0.0008 - 0.0025)	0.1 (0.004)
Push rod bend (T.I.R.)*	Less than 0.2 (0.008)	0.5 (0.020)

\*: Total indicator reading

### Valve oil seal



SEM188 1/4

	φD <sub>1</sub>	φD <sub>2</sub>	φD <sub>3</sub>	H
Intake side	15.0 (0.591)	11.68 - 11.78 (0.4598 - 0.4638)	10.2 (0.402)	8.5 (0.335)
Exhaust side		mm (in)		

Inspection and Adjustment (Cont'd)

Valve guide

Unit: mm (in)

	Standard	Oversize
Valve guide		
Outer diameter		
Intake	12.033 - 12.044	12.233 - 12.244
Exhaust	(0.4737 - 0.4742)	(0.4816 - 0.4820)
Valve guide		
Inner diameter		
[Finished size]		
Intake	8.000 - 8.018	(0.3150 - 0.3157)
Exhaust		
Cylinder head valve		
guide hole diameter		
Intake	11.970 - 11.988	12.170 - 12.188
Exhaust	(0.4713 - 0.4720)	(0.4791 - 0.4798)
Interference fit of valve		
guide		
Intake	0.045 - 0.074	(0.0018 - 0.0029)
Exhaust		
	Standard	Max. tolerance
Stem to guide clearance		
Intake	0.020 - 0.053	0.1 (0.004)
	(0.0008 - 0.0021)	
Exhaust	0.040 - 0.073	
	(0.0016 - 0.0029)	
Valve deflection limit	—	0.2 (0.008)

Rocker shaft and rocker arm

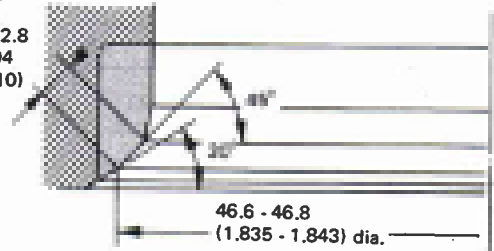
Unit: mm (in)

Rocker shaft	
Outer diameter	19.979 - 20.000 (0.7866 - 0.7874)
Rocker arm	
Inner diameter	20.020 - 20.038 (0.7882 - 0.7889)
Clearance between rocker arm and rocker shaft	0.020 - 0.059 (0.0008 - 0.0023)

Intake valve seat

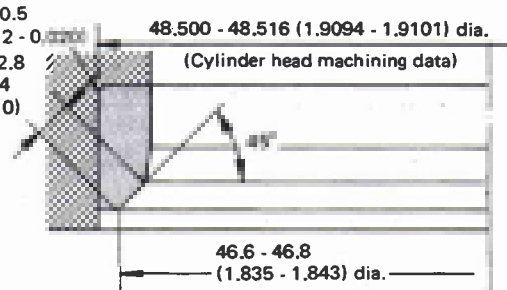
Standard

2.4 - 2.8  
(0.094  
- 0.110)



Oversize [0.5 (0.020)]

R0.3 - 0.5  
(0.012 - 0.020)



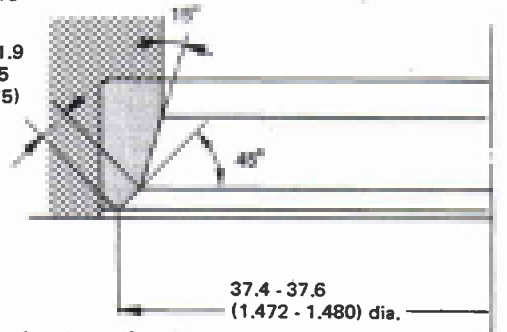
Unit: mm (in)

SEM755A

Exhaust valve seat

Standard

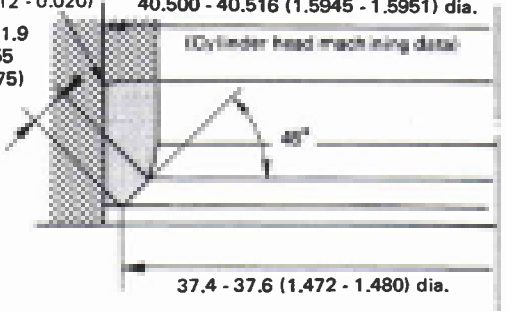
1.4 - 1.9  
(0.055  
- 0.075)



Oversize [0.5 (0.020)]

R0.3 - 0.5  
(0.012 - 0.020)

1.4 - 1.9  
(0.055  
- 0.075)



Unit: mm (in)

SEM108C

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

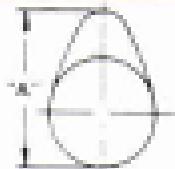
TBM2

## Inspection and Adjustment (Cont'd)

### CAMSHAFT AND CAMSHAFT BUSHING

Unit: mm (in)

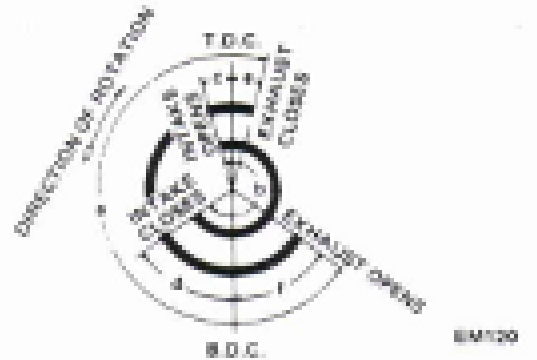
	Standard	Limit
Camshaft journal to bushing clearance [Oil clearance]	0.020 - 0.109 (0.0008 - 0.0043)	0.15 (0.0059)
Inner diameter of camshaft bushing		
Front	50.76 - 50.83 (1.9984 - 2.0012)	-
2nd	50.56 - 50.63 (1.9905 - 1.9933)	-
3rd	50.36 - 50.43 (1.9827 - 1.9854)	-
4th	50.16 - 50.23 (1.9748 - 1.9776)	-
5th	49.96 - 50.03 (1.9669 - 1.9697)	-
6th	49.76 - 49.83 (1.9591 - 1.9618)	-
Rear	49.56 - 49.63 (1.9512 - 1.9539)	-
Outer diameter of camshaft journal		
Front	50.721 - 50.740 (1.9969 - 1.9976)	-
2nd	50.521 - 50.540 (1.9890 - 1.9898)	-
3rd	50.321 - 50.340 (1.9811 - 1.9819)	-
4th	50.121 - 50.140 (1.9733 - 1.9740)	-
5th	49.921 - 49.940 (1.9654 - 1.9661)	-
6th	49.721 - 49.740 (1.9575 - 1.9583)	-
Rear	49.521 - 49.540 (1.9496 - 1.9504)	-
Camshaft bend (Total indicator reading)	Less than 0.02 (0.0008)	0.06 (0.0024)
Camshaft end play	0.08 - 0.28 (0.0031 - 0.0110)	0.5 (0.020)



BM171

Cam height "A"	
Intake	42.311 - 42.561 (1.6658 - 1.6756)
Exhaust	
Wear limit of cam height	0.15 (0.0059)

Valve timing

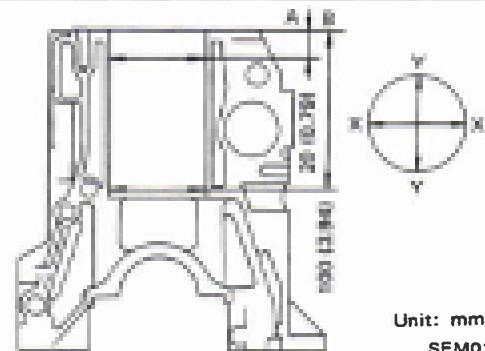


Unit: degree

a	b	c	d	e	f
248	248	18	82	8	82

### CYLINDER BLOCK

Unit: mm (in)



Unit: mm (in)  
SEM014C

Surface flatness	
Standard	Less than 0.03 (0.0012)
Limit	0.10 (0.0039)
Cylinder bore	
Inner diameter	
Standard	
Grade No. 1	96.000 - 96.010 (3.7795 - 3.7799)
Grade No. 2	96.010 - 96.020 (3.7799 - 3.7803)
Grade No. 3	96.020 - 96.030 (3.7803 - 3.7807)
Grade No. 4	96.030 - 96.040 (3.7807 - 3.7811)
Grade No. 5	96.040 - 96.050 (3.7811 - 3.7815)
Wear limit	0.20 (0.0079)
Out-of-round (X-Y)	Less than 0.015 (0.0006)
Taper (A-B)	Less than 0.010 (0.0004)
Difference in inner diameter between cylinders	
Standard	Less than 0.05 (0.0020)
Wear limit	0.20 (0.0079)



## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

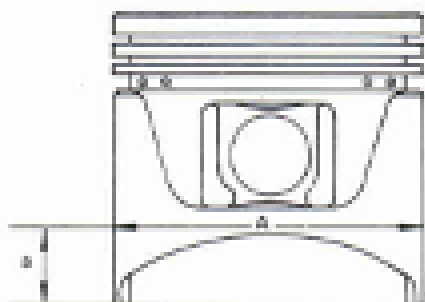
TBM2

### Inspection and Adjustment (Cont'd)

#### PISTON, PISTON RING AND PISTON PIN

##### Available piston

Unit: mm (in)



SEM891B

##### Piston skirt diameter "A"

###### Standard

Grade No. 1	95.975 - 95.985 (3.7785 - 3.7789)
Grade No. 2	95.985 - 95.995 (3.7789 - 3.7793)
Grade No. 3	95.995 - 96.005 (3.7793 - 3.7797)
Grade No. 4	96.005 - 96.015 (3.7797 - 3.7801)
Grade No. 5	96.015 - 96.025 (3.7801 - 3.7805)

###### Oversize

0.50 (0.0197)	
(mark: "50")	96.475 - 96.525 (3.7982 - 3.8002)
1.00 (0.0394)	
(mark: "100")	96.975 - 97.025 (3.8179 - 3.8199)

"a" dimension	20 (0.79)
Piston pin hole diameter	22.987 - 22.993 (0.9050 - 0.9052)
Piston clearance to cylinder block	0.015 - 0.035 (0.0006 - 0.0014)

\*Values measured at ambient temperature of 20°C (68°F)

#### Piston ring

Unit: mm (in)

	Standard	Limit
Side clearance		
Top	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
2nd	0.030 - 0.063 (0.0012 - 0.0025)	
Oil	0.015 - 0.185 (0.0006 - 0.0073)	
Ring gap (at mark: bore D = 96.000 13.7785)		
Top	0.30 - 0.45 (0.0118 - 0.0177)	1.5 (0.059)
2nd	0.30 - 0.45 (0.0118 - 0.0177)	
Oil	0.20 - 0.60 (0.0079 - 0.0236)	

#### Piston pin

Unit: mm (in)

Piston pin outer diameter	22.989 - 22.995 (0.9051 - 0.9053)
Interference fit of piston pin to piston	-0.008 to 0.004 (-0.0003 to 0.0002)
Piston pin to connecting rod bush clearance	0.005 - 0.017 (0.0002 - 0.0007)

\*Values measured at ambient temperature of 20°C (68°F)

#### CONNECTING ROD

Unit: mm (in)

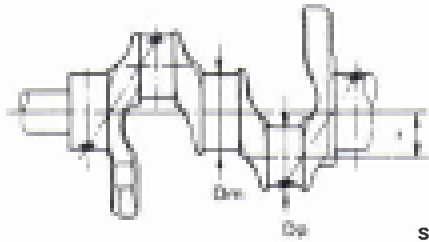
Center distance	166.45 - 166.55 (6.5531 - 6.5571)
Bend. tension (per 100)	
Limit	Bend 0.15 (0.0059) Tension 0.3 (0.0118)
Piston pin bushing inner diameter	23.006 - 23.008 (0.9056 - 0.9057)
Connecting rod big end inner diameter	59.987 - 60.000 (2.3617 - 2.3622)
Side clearance	
Standard	0.20 - 0.30 (0.0079 - 0.0118)
Limit	0.40 (0.0157)

**Inspection and Adjustment (Cont'd)**

**CRANKSHAFT**

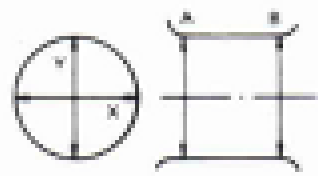
Unit: mm (in)

Main journal dia. "Dm"	70.907 - 70.920 (2.7916 - 2.7921)
Pin journal dia. "Dp"	56.913 - 56.926 (2.2407 - 2.2412)
Center distance "r"	48 (1.89)
Out-of-round (X-Y) Standard	Less than 0.0025 (0.0001)
Taper (A-B) Standard	Less than 0.0025 (0.0001)
Runout [T.I.R.] Standard	Less than 0.20 (0.0079)
Free end play Standard	0.05 - 0.17 (0.0020 - 0.0067)
Limit	0.30 (0.0118)



SEM645

Out-of-round X-Y  
Taper A-B



EM715

**AVAILABLE MAIN BEARING**

Unit: mm (in)

	Thickness "T"	Main journal diameter "Dm"
Standard	2.003 - 2.007 (0.0789 - 0.0790)	—
Undersize 0.25 (0.0098)	2.128 - 2.132 (0.0838 - 0.0839)	Grind so that bearing clearance is the specified value.
0.50 (0.0197)	2.253 - 2.257 (0.0887 - 0.0889)	
0.75 (0.0295)	2.378 - 2.382 (0.0936 - 0.0938)	
1.00 (0.0394)	2.503 - 2.507 (0.0985 - 0.0987)	

**AVAILABLE CONNECTING ROD BEARING**

Unit: mm (in)

	Thickness "T"	Crank pin journal diameter "Dp"
Standard	1.513 - 1.517 (0.0596 - 0.0597)	—
Undersize 0.25 (0.0098)	1.638 - 1.642 (0.0645 - 0.0646)	Grind so that bearing clearance is the specified value.
0.50 (0.0197)	1.763 - 1.767 (0.0694 - 0.0696)	
0.75 (0.0295)	1.888 - 1.892 (0.0743 - 0.0745)	
1.00 (0.0394)	2.013 - 2.017 (0.0793 - 0.0794)	

**MISCELLANEOUS COMPONENTS**

Unit: mm (in)

Flywheel & drive plate Runout [T.I.R.]	Less than 0.1 (0.004)
---	-----------------------

**Bearing clearance**

Unit: mm (in)

Main bearing clearance Standard	0.041 - 0.087 (0.0016 - 0.0034)
Limit	0.09 (0.0035)
Connecting rod bearing clearance Standard	0.027 - 0.061 (0.0011 - 0.0024)
Limit	0.09 (0.035)

General Specifications

Cylinder arrangement	6, in-line	
Displacement	cm <sup>3</sup> (cu in)	4,169 (254.39)
Bore and stroke	mm (in)	96 x 96 (3.78 x 3.78)
Valve arrangement	O.H.V.	
Firing order	1-4-2-6-3-5	
Number of piston rings		
Compression	2	
Oil	1	
Number of main bearings	7	
Compression ratio	22.7	

Inspection and Adjustment

COMPRESSION PRESSURE

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)/rpm

Standard	2,942 (29.4, 30, 427)/200	
Minimum	2,452 (24.5, 25, 356)/200	
Differential limit between cylinders	294 (2.9, 3, 43)/200	

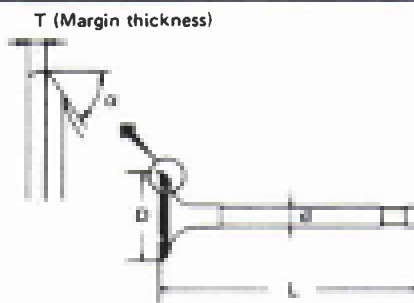
CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.07 (0.0028)	0.2 (0.008)

VALVE

Unit: mm (in)



	Standard
Valve head diameter "D"	
Intake	43.4 - 43.6 (1.709 - 1.717)
Exhaust	37.9 - 38.1 (1.492 - 1.500)
Valve length "L"	
Intake	117 (4.61)
Exhaust	
Valve stem diameter "D"	
Intake	7.962 - 7.977 (0.3135 - 0.3141)
Exhaust	7.945 - 7.960 (0.3128 - 0.3134)
Valve seat angle "α"	
Intake	45° - 45°30'
Exhaust	
Valve margin "T" limit	1.0 (0.039)
Valve stem end surface grinding limit	0.2 (0.008)
Valve clearance (Hot)	
Intake	0.35 (0.0138)
Exhaust	

Inspection and Adjustment (Cont'd)

Valve guide

Unit: mm (in)

	Standard	Service
Valve guide outside diameter	12.000 - 12.044 (0.4724 - 0.4742)	—
Valve guide inner diameter (Finished size)	8.00 - 8.015 (0.3150 - 0.3156)	
Cylinder head valve guide hole diameter	12.00 - 12.011 (0.4724 - 0.4729)	—
Interference fit of valve guide	0.002 - 0.044 (0.0009 - 0.0017)	
	Standard	Max. clearance
Stem to guide clearance		
Inlet	0.003 - 0.063 (0.0009 - 0.0025)	0.18 (0.0069)
Exhaust	0.04 - 0.07 (0.0016 - 0.0028)	0.30 (0.0079)
Valve deflection limit		
Inlet	0.30 (0.0118)	
Exhaust	0.40 (0.0157)	

Valve spring

Free length	mm (in)	
Painted red		52.15 (2.0531)
Painted yellow		53.0 (2.0917)
Pressure height	mm/N (mm/kg, in/lb)	
Painted red		32.3/672.8 - 759.1 (32.3/68.6 - 77.4, 1.272/151.3 - 170.7)
Painted yellow		31.8/667.3 - 776.7 (31.8/71.1 - 79.6, 1.252/158.8 - 176.3)
Assembled height	mm/N (mm/kg, in/lb)	
Standard		42.3/287.3 - 330.5 (42.3/29.3 - 33.7, 1.665/64.6 - 74.3)
Limit		42.3/270.7 (42.3/27.6, 1.665/60.9)
Out-of-square	mm (in)	0.0 (0.000)

VALVE LIFTER AND PUSH ROD

Unit: mm (in)

	Standard	Limit
Valve lifter outer diameter	24.960 - 24.970 (0.9827 - 0.9831)	—
Cylinder block valve lifter hole diameter	25.000 - 25.033 (0.9843 - 0.9855)	—
Valve lifter to lifter hole clearance	0.030 - 0.073 (0.0012 - 0.0029)	0.20 (0.0079)
Push rod bend (T.I.R.)*	Less than 0.3 (0.012)	0.5 (0.020)

\*: Total indicator reading

Rocker shaft and rocker arm

Unit: mm (in)

	Standard	Limit
Rocker shaft		
Outer diameter	19.979 - 20.00 (0.7866 - 0.7874)	—
Rocker shaft bend (T.I.R.)	0 - 0.10 (0 - 0.0039)	Less than 0.30 (0.0118)
Rocker arm		
Inner diameter	20.014 - 20.035 (0.7880 - 0.7888)	—
Clearance between rocker arm and rocker shaft	0.014 - 0.056 (0.0006 - 0.0022)	0.15 (0.0059)

CYLINDER HEAD TO VALVE DISTANCE

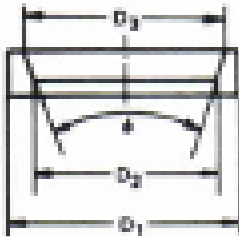
Unit: mm (in)

	Standard	Limit
Inlet	0.276 - 0.676 (0.0109 - 0.0266)	1.35 (0.0492)
Exhaust	0.305 - 0.695 (0.0120 - 0.0274)	1.35 (0.0492)

Inspection and Adjustment (Cont'd)

Valve seat

Unit: mm (in)



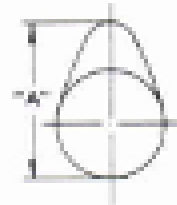
EM700

Intake	
Outer diameter "D <sub>1</sub> "	44.535 - 44.545 (1.7533 - 1.7537)
Inner diameter "D <sub>2</sub> "	38.4 - 38.6 (1.512 - 1.520)
Diameter of seat "D <sub>3</sub> "	41.7 - 41.9 (1.642 - 1.650)
Cylinder head valve seat diameter	44.500 - 44.515 (1.7520 - 1.7526)
Valve seat face angle "φ"	88° - 90°
Exhaust	
Outer diameter "D <sub>1</sub> "	Standard 39.535 - 39.545 (1.5565 - 1.5569)
0.3 (0.001) Oversize (Service)	39.735 - 39.745 (1.5644 - 1.5648)
0.4 (0.016) Oversize (Service)	39.935 - 39.945 (1.5722 - 1.5726)
Inner diameter "D <sub>2</sub> "	32.9 - 33.1 (1.295 - 1.303)
Diameter of seat "D <sub>3</sub> "	36.95 - 37.05 (1.4547 - 1.4587)
Cylinder head valve seat diameter	Standard 39.495 - 39.510 (1.5549 - 1.5555)
0.2 (0.008) Oversize	36.695 - 39.710 (1.5628 - 1.5634)
0.4 (0.016) Oversize	39.895 - 39.910 (1.5707 - 1.5713)
Valve seat face angle "φ"	88° - 90°

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Limit
Camshaft journal to bushing clearance [Oil clearance]	0.020 - 0.109 (0.0008 - 0.0043)	0.15 (0.0059)
Camshaft journal diameter		
Front	50.721 - 50.740 (1.9969 - 1.9976)	-
2nd	50.521 - 50.540 (1.9890 - 1.9898)	-
3rd	50.321 - 50.340 (1.9811 - 1.9819)	-
4th*	50.121 - 50.140 (1.9733 - 1.9740)	-
Rear	49.921 - 49.940 (1.9654 - 1.9661)	-
Camshaft bend (Total indicator reading)	Less than 0.02 (0.0008)	0.06 (0.0024)
Camshaft end play	0.08 - 0.28 (0.0031 - 0.0110)	0.50 (0.0197)



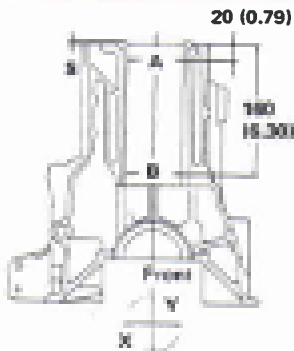
EM871

	Standard	Limit
Cam height "A"		
Intake	41.71 - 41.75 (1.6421 - 1.6437)	41.20 (1.6220)
Exhaust	41.88 - 41.92 (1.6488 - 1.6504)	41.30 (1.6260)

Inspection and Adjustment (Cont'd)

CYLINDER BLOCK AND CYLINDER LINER

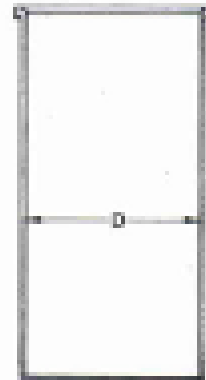
Unit: mm (in)



SEM679B

Surface flatness (Without cylinder liner) Standard	Less than 0.05 (0.0020)
Limit	0.2 (0.008)
Cylinder bore Inner diameter Standard	99.000 - 99.020 (3.8976 - 3.8984)
Cylinder bore (With cylinder liner) Inner diameter Standard	
Grade No. 1	96.000 - 96.010 (3.7795 - 3.7799)
Grade No. 2	96.010 - 96.020 (3.7799 - 3.7803)
Grade No. 3	96.020 - 96.030 (3.7803 - 3.7807)
Wear limit	0.20 (0.0079)
Out-of-round (X-Y)	Less than 0.020 (0.0008)
Taper (A-B)	Less than 0.20 (0.0079)
Projection "S"	0.02 - 0.09 (0.0008 - 0.0035)
Division of each cylinder "S"	Less than 0.05 (0.0020)
Interference fit cylinder liner to block	-0.01 to 0.03 (-0.0004 to 0.0012)

Unit: mm (in)



SEM427

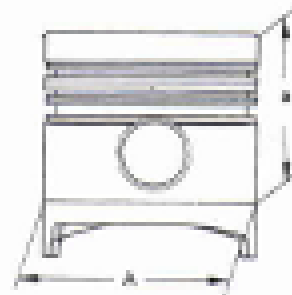
Cylinder liner diameter "D" (service)**	98.050 - 98.075 (3.8915 - 3.8923)
--	--------------------------------------

\*\* Before installing in cylinder block

PISTON, PISTON RING AND PISTON PIN

Available piston

Unit: mm (in)



SEM778A

Piston skirt diameter "A" Standard	
Grade No. 1	95.940 - 95.960 (3.7772 - 3.7778)
Grade No. 2	95.950 - 95.960 (3.7776 - 3.7778)
Grade No. 3*	95.960 - 95.970 (3.7778 - 3.7783)
"B" dimension	70 (2.76)
Piston pin hole diameter	27.992 - 28.000 (1.1020 - 1.1024)
Fit to cylinder liner clearance	0.05 - 0.07 (0.0020 - 0.0028)

\* Grade No. 3 piston is not provided as a service part

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

TD42

## Inspection and Adjustment (Cont'd)

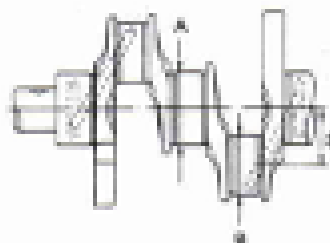
### Piston ring

Unit: mm (in)

	Standard	Limit
Side clearance		
Top	0.06 - 0.10 (0.0024 - 0.0039)	0.50 (0.0197)
2nd	0.04 - 0.08 (0.0016 - 0.0031)	0.30 (0.0118)
Oil	0.02 - 0.06 (0.0008 - 0.0024)	0.15 (0.0059)
Ring gap		
Top	0.30 - 0.45 (0.0118 - 0.0177)	1.5 (0.059)
2nd	0.20 - 0.35 (0.0079 - 0.0138)	
Oil (rail ring)	0.30 - 0.50 (0.0118 - 0.0197)	

### CRANKSHAFT

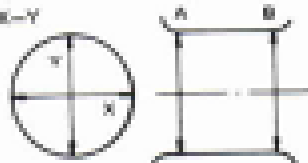
Unit: mm (in)



SEM100A

Journal diameter "A"	70.000 - 70.020 (2.75916 - 2.75921)
Pin diameter "B"	56.919 - 56.926 (2.2409 - 2.2412)
Center distance "C"	48.00 (1.89000)

Out-of-round X-Y  
Taper A-B



SEM718

Taper of journal and pin "A-B"	
Standard	0.01 (0.0004)
Limit	0.02 (0.0008)
Out-of-round of journal and pin "X-Y"	
Standard	0.01 (0.0004)
Limit	0.02 (0.0008)
Crankshaft bend	
Standard	0 - 0.03 (0 - 0.0012)
Limit	0.10 (0.0039)
Crankshaft end play	
Standard	0.055 - 0.14 (0.0022 - 0.0055)
Limit	0.40 (0.0157)

### Piston pin

Unit: mm (in)

Piston pin outer diameter	27.993 - 28.000 (1.1021 - 1.1024)
Piston pin to piston clearance	-0.008 to 0.007 (-0.0003 to 0.0003)
Piston pin to connecting rod clearance	
Standard	0.025 - 0.045 (0.00093 - 0.00161)
Limit	0.15 (0.0059)

### CONNECTING ROD

Unit: mm (in)

Center distance	156.975 - 157.025 (6.1801 - 6.1821)
Bend, torsion (per 100 (3.94))	
Limit	0.05 (0.0020)
Piston pin bore dia.	28.025 - 28.038 (1.1033 - 1.1039)
Side clearance	
Standard	0.10 - 0.22 (0.0039 - 0.0087)
Limit	0.22 (0.0087)

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

TD42

### Inspection and Adjustment (Cont'd)

#### AVAILABLE MAIN BEARING

##### Bearing clearance

Unit: mm (in)

	Crank journal diameter
Main bearing clearance	
Standard	0.035 - 0.087 (0.0014 - 0.0034)
Limit	0.15 (0.0059)
Connecting rod bearing clearance	
Standard	0.035 - 0.081 (0.0014 - 0.0032)
Limit	0.15 (0.0059)

##### Main bearing undersize

Unit: mm (in)

	Crank journal diameter
Standard	70.907 - 70.920 (2.7916 - 2.7921)
Undersize	
0.25 (0.0098)	70.657 - 70.670 (2.7818 - 2.7823)
0.50 (0.0197)	70.407 - 70.420 (2.7719 - 2.7724)
0.75 (0.0295)	70.157 - 70.170 (2.7621 - 2.7626)
1.00 (0.0394)	69.907 - 69.920 (2.7522 - 2.7528)

#### AVAILABLE CONNECTING ROD BEARING

##### Connecting rod bearing undersize

Unit: mm (in)

	Crank pin journal diameter
Standard	56.919 - 56.926 (2.2409 - 2.2412)
Undersize	
0.25 (0.0098)	56.669 - 56.676 (2.2311 - 2.2313)
0.50 (0.0197)	56.419 - 56.676 (2.2212 - 2.2313)
0.75 (0.0295)	56.169 - 56.176 (2.2114 - 2.2116)
1.00 (0.0394)	55.919 - 55.926 (2.2015 - 2.2018)

#### AVAILABLE THRUST WASHER

##### Thrust washer undersize

Unit: mm (in)

	Thrust washer thickness
Standard	
Standard mark A	2.275 - 2.325 (0.0896 - 0.0915)
B	2.300 - 2.350 (0.0906 - 0.0926)
C	2.325 - 2.375 (0.0915 - 0.0935)
Oversize	
0.25 (0.0098)	2.475 - 2.525 (0.0974 - 0.0994)
0.40 (0.0157)	2.675 - 2.725 (0.1053 - 0.1073)

#### MISCELLANEOUS COMPONENTS

Unit: mm (in)

Gear tooth backlash of each gear	0.06 - 0.12 (0.0024 - 0.0047)
Limit	0.20 (0.0079)
Flywheel Runout (Total indicator reading)	Less than 0.15 (0.0059)
Front plate Warpage limit	0.2 (0.008)



# ENGINE LUBRICATION & COOLING SYSTEMS

## SECTION **LC**



**LC**

### CONTENTS

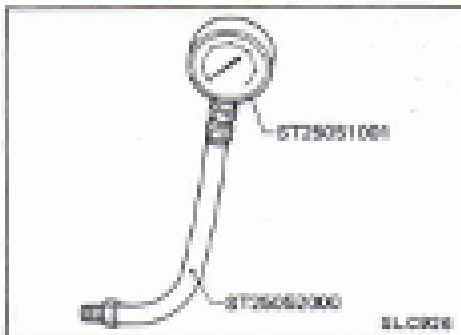
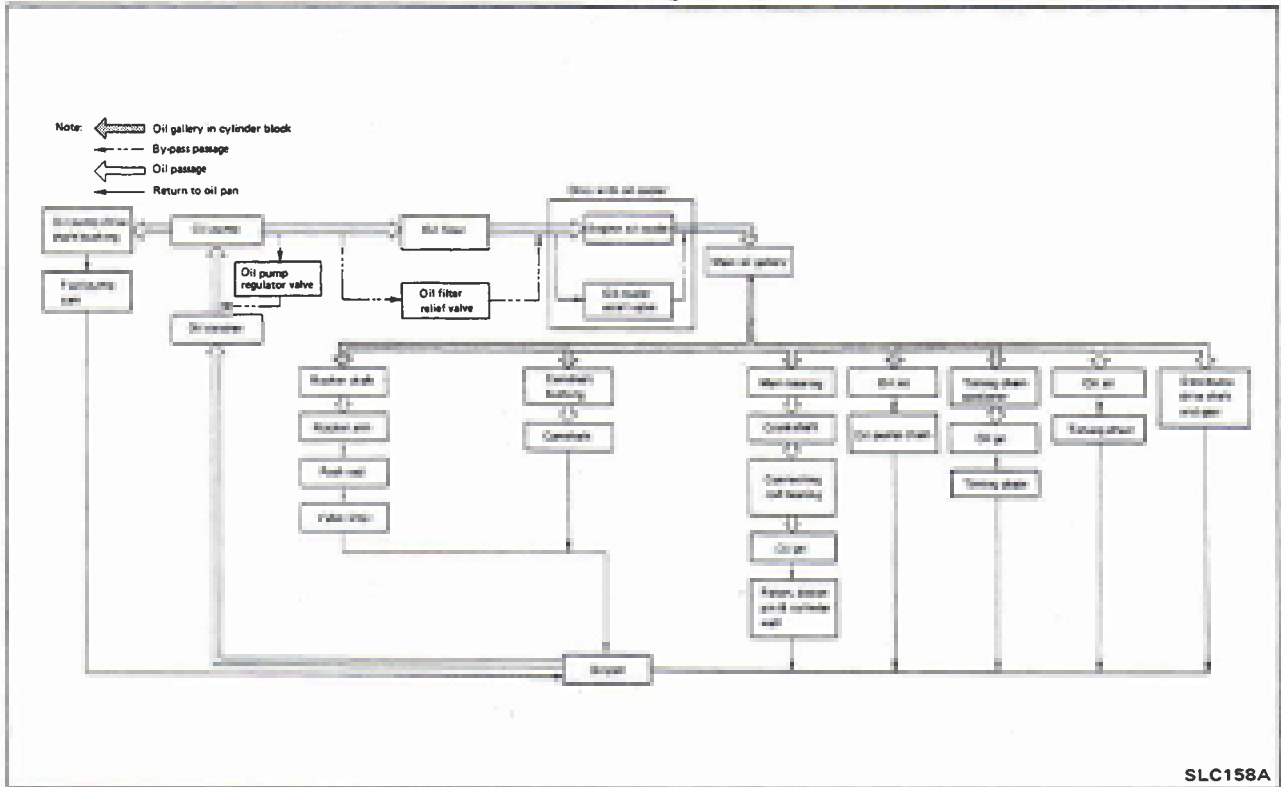
<b>TB42 &amp; TD42</b>	
PREPARATION .....	LC- 2
<b>TB42</b>	
ENGINE LUBRICATION SYSTEM .....	LC- 3
ENGINE COOLING SYSTEM .....	LC- 9
<b>TD42</b>	
ENGINE LUBRICATION SYSTEM .....	LC-17
ENGINE COOLING SYSTEM .....	LC-23
<b>TB42 &amp; TD42</b>	
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	LC-27

## PREPARATION

### SPECIAL SERVICE TOOLS

Tool number Tool name	Description
ST25051001 Oil pressure gauge	
ST25052000 Hose	 Adapting oil pressure gauge to cylinder block

Lubricating Circuit

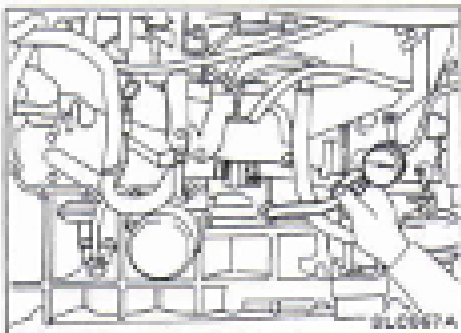


Oil Pressure Check

WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
- Oil pressure check should be done in "Neutral" gear position.

1. Check oil level.
2. Remove oil pressure switch.
3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.



Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , psi)
Idle speed	More than 49 (0.49, 0.5, 7)
2,800	392 - 451 (3.92 - 4.51, 4.0 - 4.6, 57 - 65)

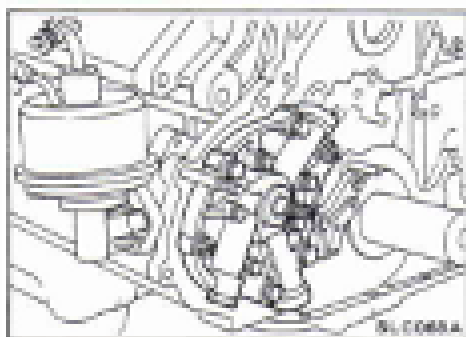
## Oil Pressure Check (Cont'd)

If difference is extreme, check oil passage and oil pump.

6. Install oil pressure switch with sealant.

Oil pressure switch:

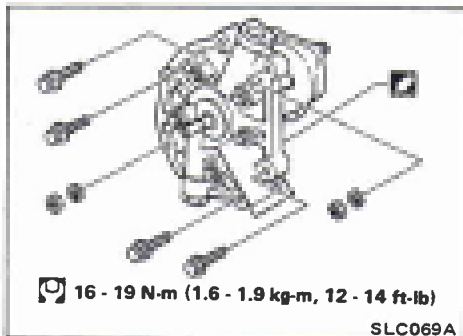
- ☐ : 10 - 16 N·m  
(1.0 - 1.6 kg-m, 7 - 12 ft-lb)



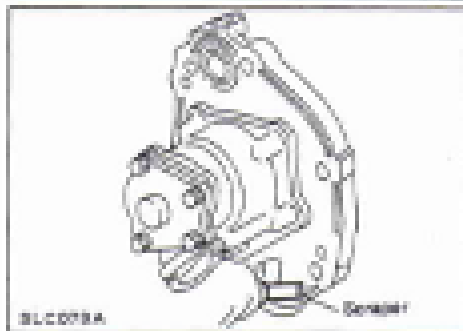
## Oil Pump

### REMOVAL AND INSTALLATION

1. Remove front cover.
2. Remove fuel pump.
3. Remove oil pump chain and sprocket.



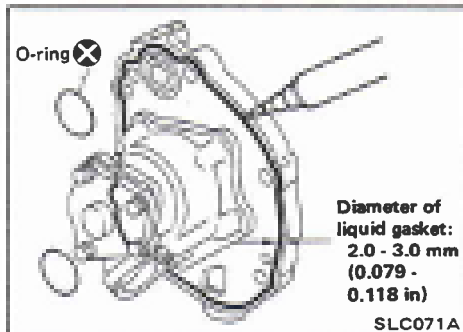
4. Remove oil pump assembly.
5. Installation is in reverse order of removal.



- Before installing oil pump, remove liquid gasket from mating surface of oil pump using a scraper.

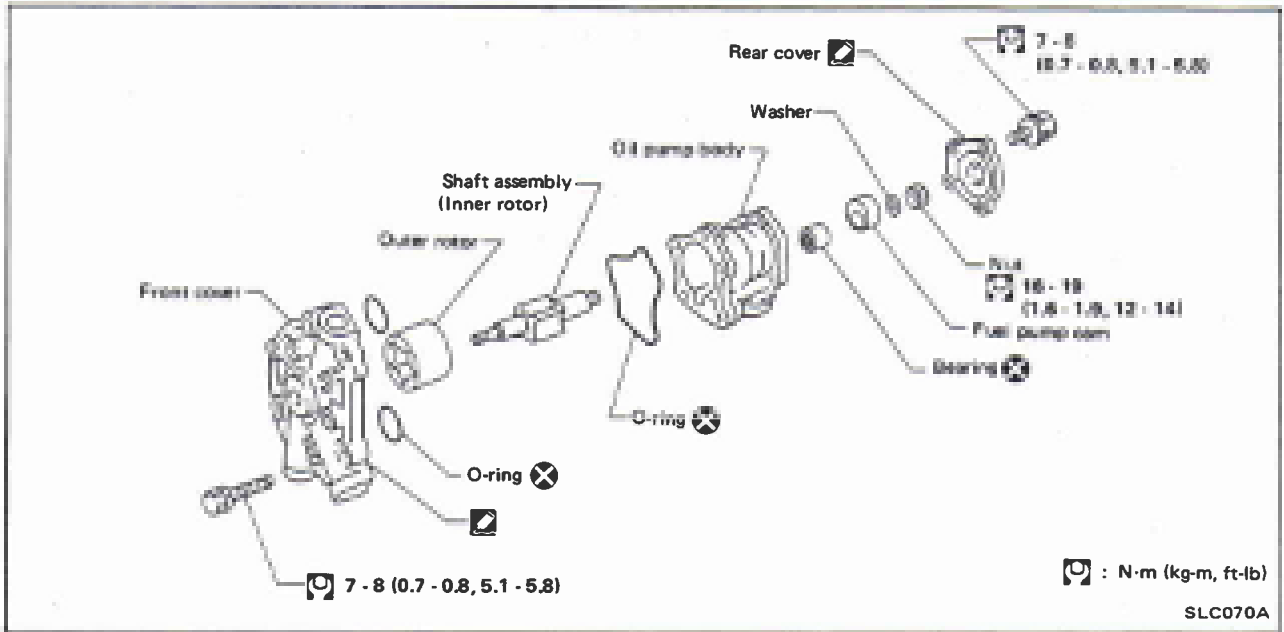
**Be sure liquid gasket in grooves is also removed.**

- Remove liquid gasket from mating surface of cylinder block.
- Clean all traces of liquid gasket using white gasoline.

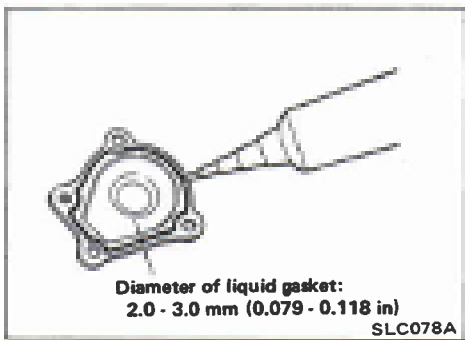


- Apply a continuous bead of liquid gasket to mating surface of oil pump as shown.
- Use Genuine Liquid Gasket or equivalent.
  - a. Be sure diameter of liquid gasket is within 2.0 to 3.0 mm (0.079 to 0.118 in) dia. range.
  - b. Attach pump housing to cylinder block within five minutes of applying liquid gasket.
  - c. After installing pump housing, wait at least 30 minutes before starting engine.
- Be sure that O-rings are properly fitted.

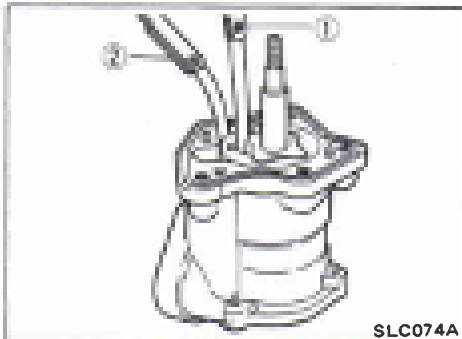
**Oil Pump (Cont'd)  
DISASSEMBLY AND ASSEMBLY**



- When installing oil pump, apply engine oil to inner and outer rotor.
- Be sure that O-rings are properly fitted.



- When installing oil pump rear cover, apply liquid gasket as shown.
- Use Genuine Liquid Gasket or equivalent.
- Follow procedures described under "Oil Pump" on page LC-4 when applying liquid gasket.



**Inspection**

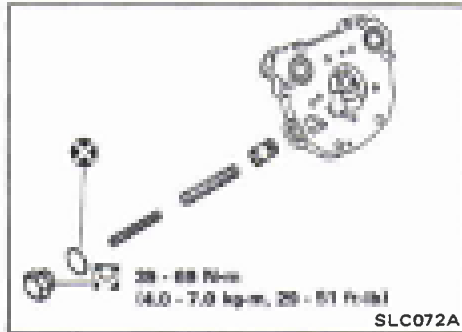
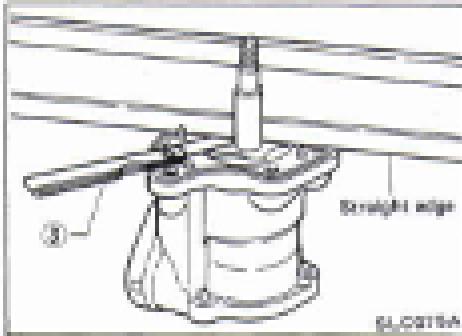
**OIL PUMP INSPECTION**

Using a feeler gauge, check the following clearances.

Unit: mm (in)

Rotor tip clearance ①	Less than 0.12 (0.0047)
Outer rotor to body clearance ②	0.14 - 0.22 (0.0055 - 0.0087)
Side clearance ③	0.050 - 0.109 (0.0020 - 0.0043)

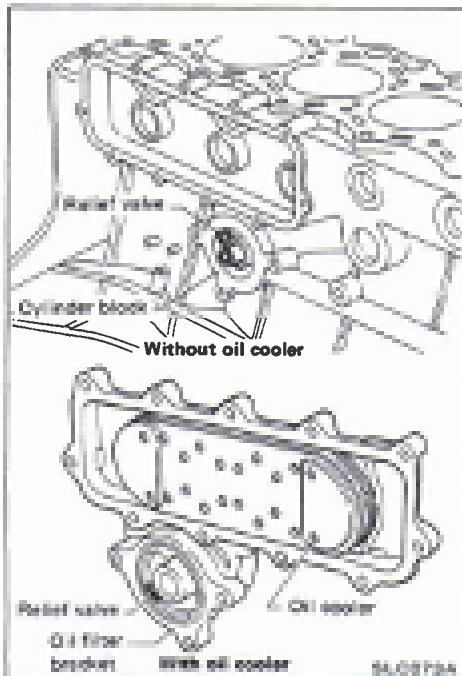
If it exceeds the limit, replace rotor or entire oil pump assembly.



**OIL PUMP REGULATOR VALVE INSPECTION**

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

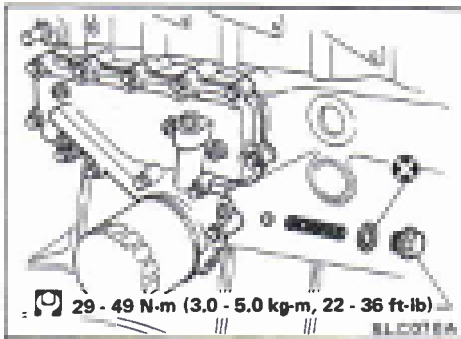
If damaged, replace regulator valve set or oil pump assembly.



**OIL FILTER RELIEF VALVE INSPECTION**

Inspect oil filter relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with suitable tool.

Install a new valve in place by tapping it.

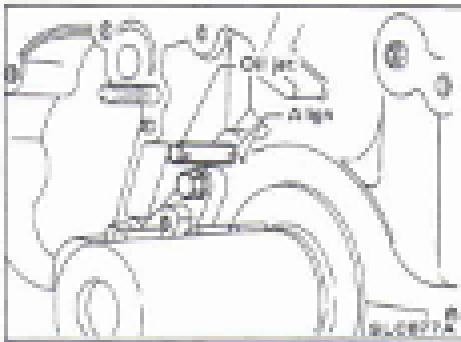


### Inspection (Cont'd)

#### OIL COOLER RELIEF VALVE INSPECTION

Inspect oil cooler relief valve for movement, cracks and breaks by pushing the ball.

If damaged, replace oil cooler relief valve set.



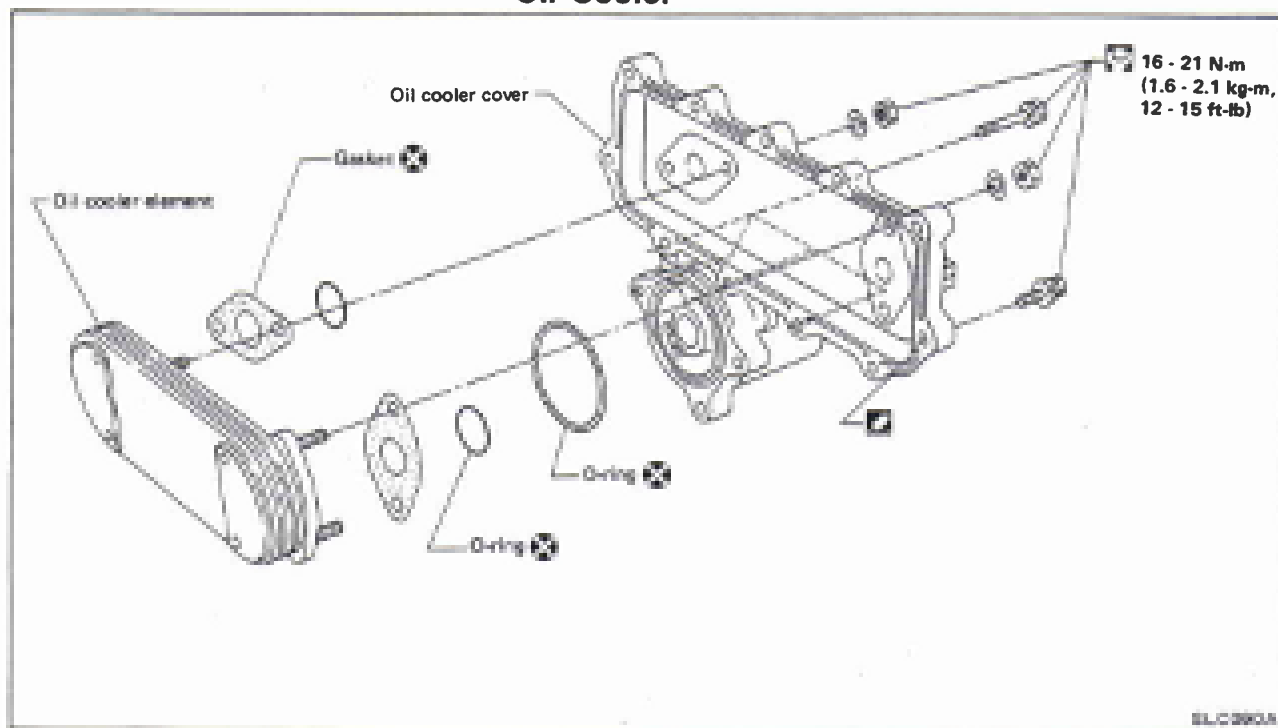
### Oil Jet

#### INSPECTION (For oil pump chain)

Make sure that the holes are not clogged. Clean them with a wire if necessary.

Drive oil jet into place after positioning alignment mark on cylinder block with that on oil pump.

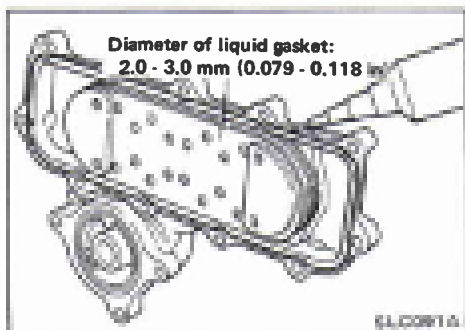
## Oil Cooler

**REMOVAL**

1. Drain coolant from radiator.
  2. Remove oil cooler cover.
- Do not remove yellow nut.**
3. Remove oil cooler element.

**INSPECTION**

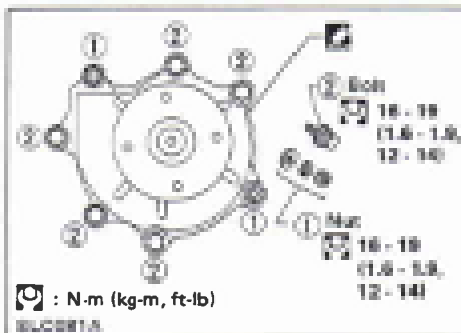
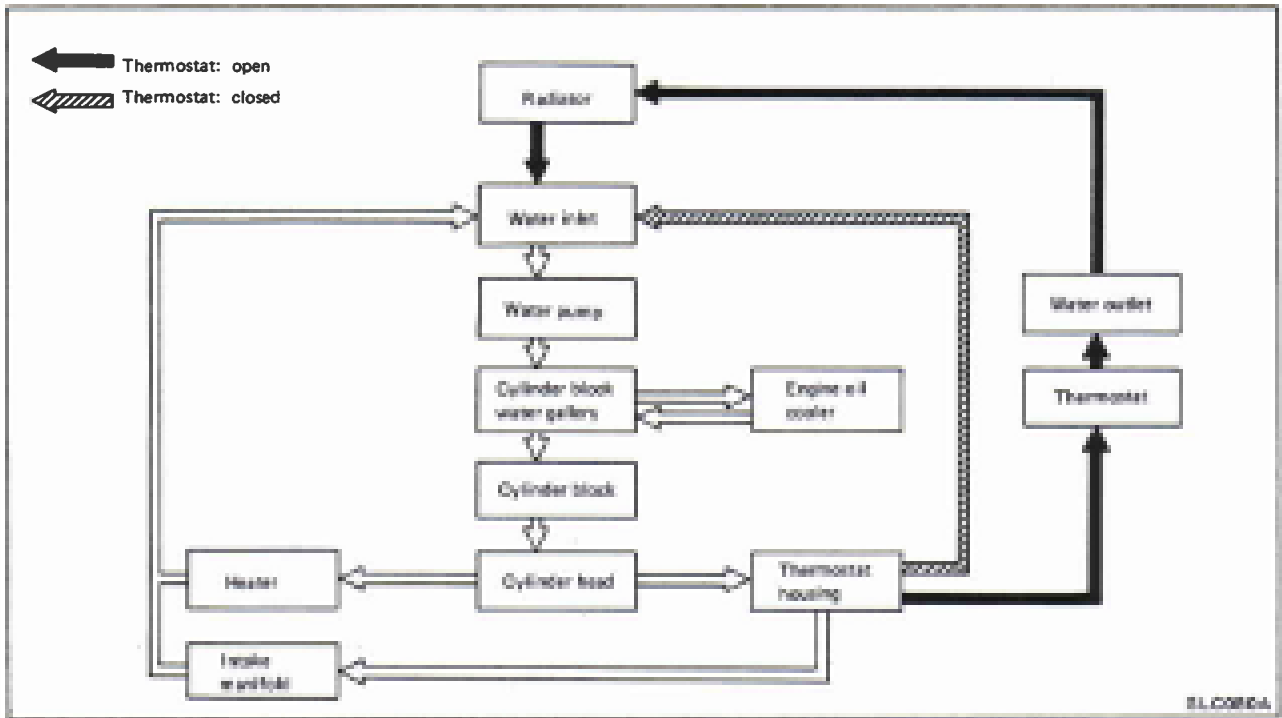
1. Check oil cooler element and housing for cracks.
2. Check oil cooler for clogging by blowing through coolant inlet.  
Replace it if necessary.

**INSTALLATION**

- When installing oil cooler, apply liquid gasket as shown.
  - Use Genuine Liquid Gasket or equivalent.
- Follow procedures described under "Oil Pump" on page LC-4 when applying liquid gasket.

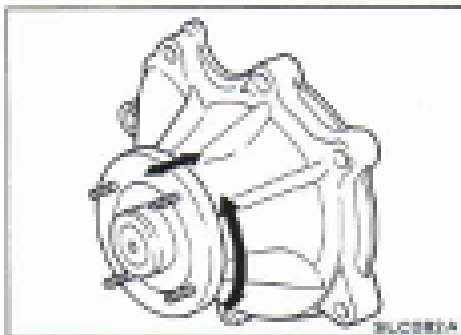


Cooling Circuit



**Water Pump  
REMOVAL**

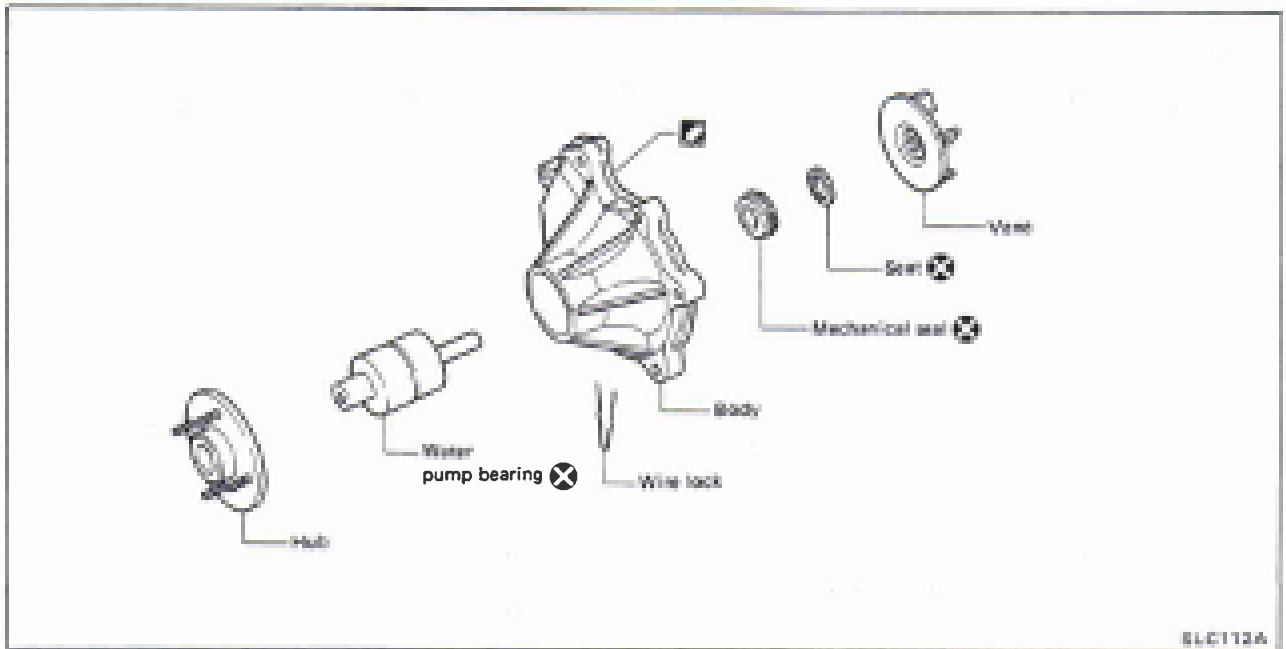
1. Drain coolant from radiator.
2. Remove fan belts, cooling fan and pulley.
3. Remove water pump.



**INSPECTION**

1. Check for excessive end play and rough operation.
  2. Check for badly rusted or corroded body assembly and vane.
- If damaged, replace the parts or entire water pump assembly.

### Water Pump (Cont'd) DISASSEMBLY

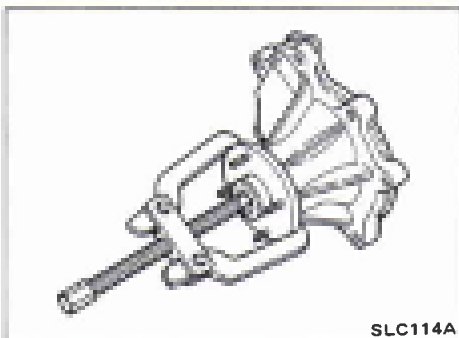


SLC113A



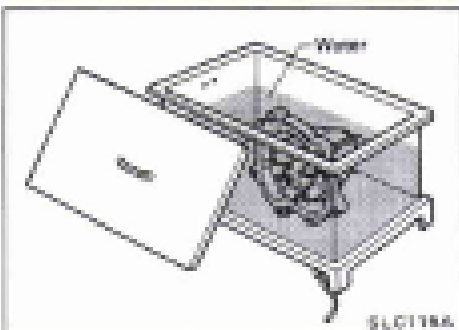
SLC113A

1. Remove wire lock.



SLC114A

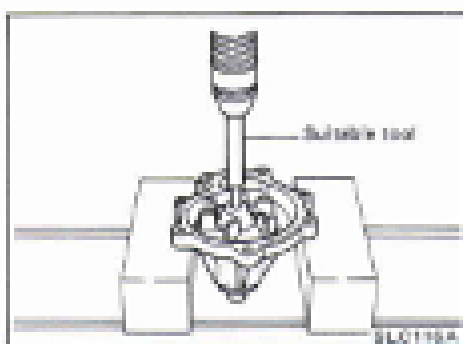
2. Remove hub.



SLC118A

3. Remove water pump bearing and vane.
  - a. Heat water pump to 80 to 100°C (176 to 212°F).

## Water Pump (Cont'd)



- b. Push out water pump bearing and vane by using a press and suitable tool.
4. Remove mechanical seal and seat.

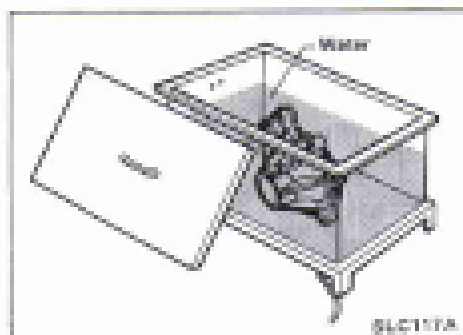
### ASSEMBLY

- Always assemble the water pump with a new mechanical seal and water pump bearing.

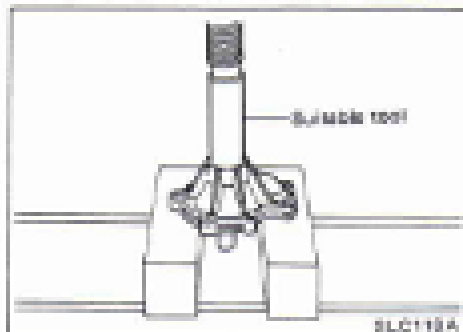
If body, hub and vane are to be reused, measure "interference fit" of each part to water pump bearing. Ensure that fit is within specified range as indicated below. If it is outside specified range, replace part with a new one.

Interference fit: mm (in)

Body to bearing	0.027 - 0.055 (0.0011 - 0.0022)
Hub to bearing	0.032 - 0.061 (0.0013 - 0.0024)
Vane to bearing	0.032 - 0.061 (0.0013 - 0.0024)



1. Install water pump bearing.
  - a. Heat water pump body to 80 to 100°C (176 to 212°F).



- b. Using a suitable tool and press, press in outer race of bearing.

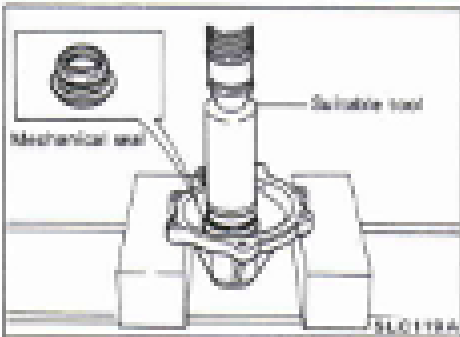
**Water Pump (Cont'd)**

c. Install wire lock.



2. Install mechanical seal.

a. Using a suitable tool and press, press in a new mechanical seal.



b. Place new seat into vane.

**Seal face runout (Total indicator reading):**

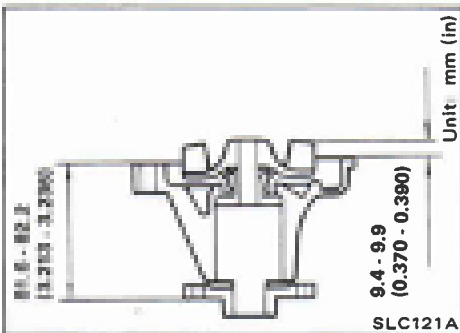
**Limit 0.15 mm (0.0059 in)**



3. Install hub and vane.

Using a suitable tool and press, press in hub and vane.

**Ensure that hub and vane are properly pressed to dimensions shown in figure.**

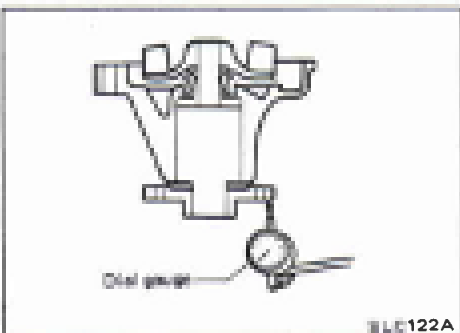


**INSPECTION**

1. Ensure that hub rotates smoothly by hand.

2. Measure face runout of hub.

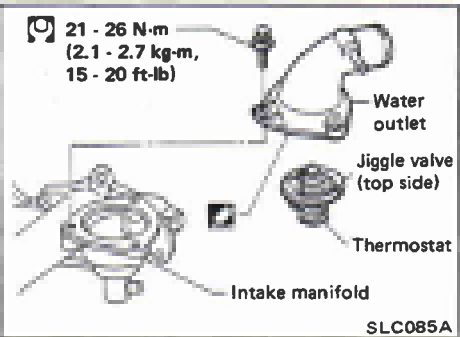
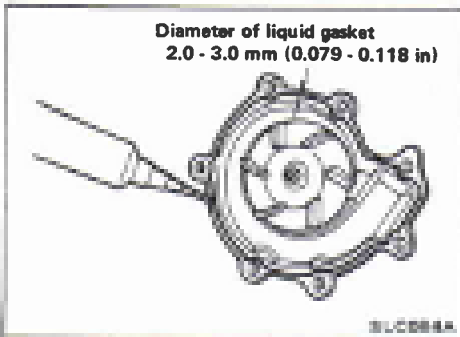
**Limit: 0.05 mm (0.0020 in)**



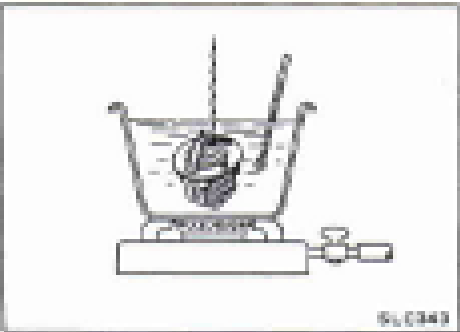
**Water Pump (Cont'd)**

**INSTALLATION**

- When installing water pump, apply liquid gasket as shown.
  - Use **Genuine Liquid Gasket** or equivalent.
- Follow procedures described under "Oil Pump" on page LC-4 when applying liquid gasket.
- After properly installing water pump, ensure that hub rotates smoothly by hand.



**Thermostat**



**INSPECTION**

1. Check valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

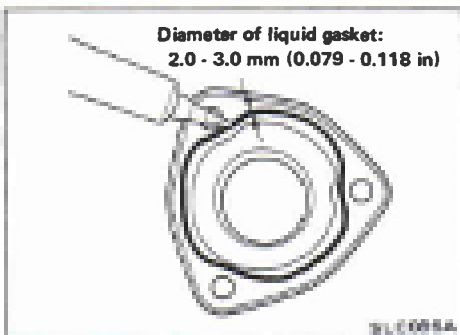
	Tropical type and Gulf standard model	Standard type and Australia model	Frigid type
Valve opening temperature °C (°F)	76.5 (170)	82 (180)	88 (190)
Maximum valve lift mm/°C (in/°F)	10/90 (0.39/194)	10/95 (0.39/203)	10/100 (0.39/212)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

**INSTALLATION**

**Liquid gasket type**

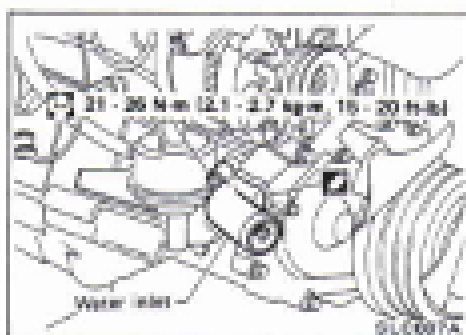
- When installing water outlet, apply liquid gasket as shown.
  - Use **Genuine Liquid Gasket** or equivalent.
- Follow procedures described under "Oil Pump" on page LC-4 when applying liquid gasket.



### Thermostat (Cont'd)

#### Conventional gasket type

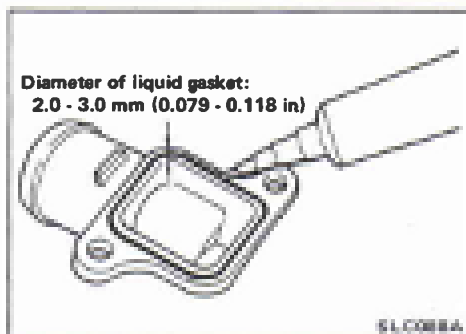
1. Before installing water outlet, remove all traces of liquid gasket from mating surface using a scraper.
  - Also remove traces of liquid gasket from mating surface of thermostat housing.  
Perform the above operation only when liquid gasket is used between water outlet and thermostat housing.
2. Install gasket, thermostat and water outlet.



### Water Inlet

#### INSPECTION

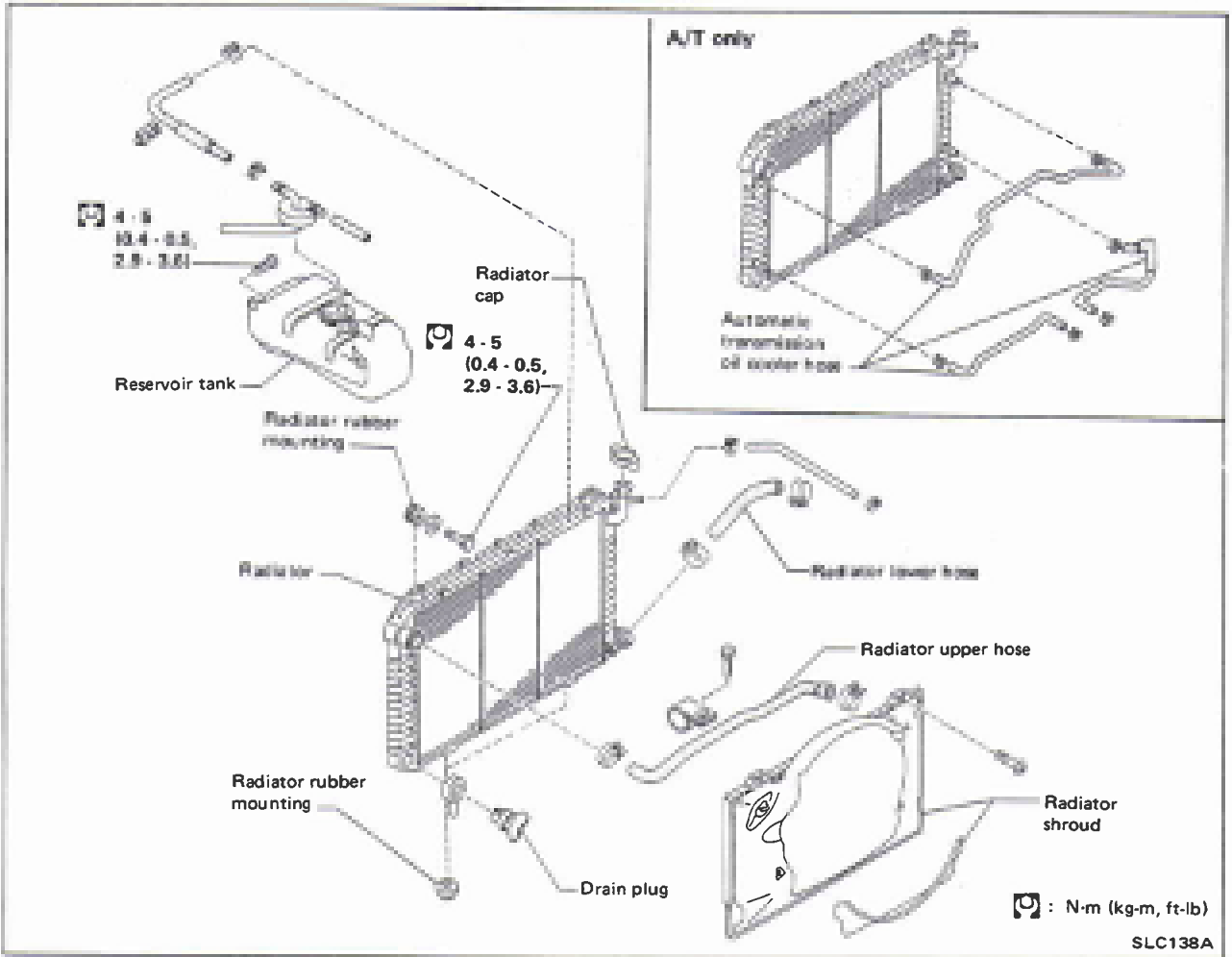
Visual inspection for water leaks. If there is leakage, replace liquid gasket.



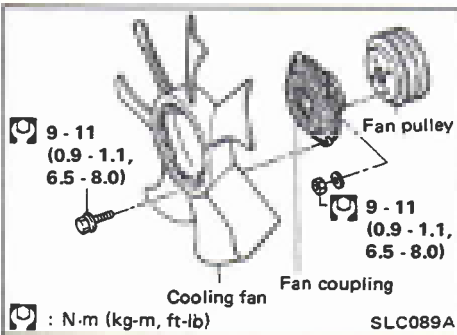
#### INSTALLATION

- When installing water inlet apply liquid gasket as shown.
  - Use **Genuine Liquid Gasket** or equivalent.
- Follow procedures described under "Oil Pump" on page LC-4 when applying liquid gasket.

Radiator

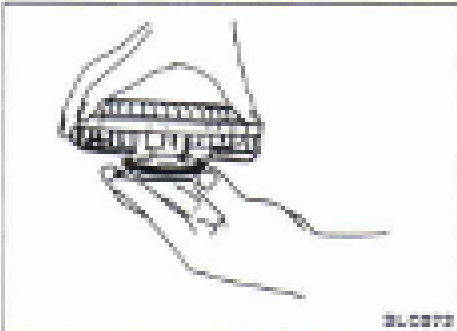


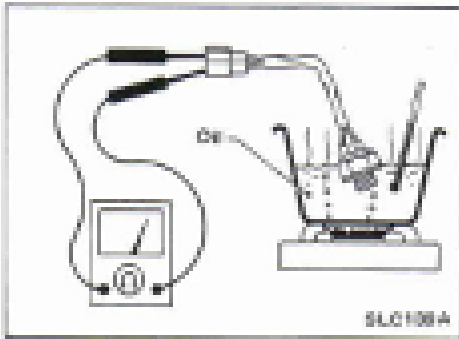
Cooling Fan  
DISASSEMBLY AND ASSEMBLY



INSPECTION

Check fan coupling for rough operation, oil leakage or bent bimetal.



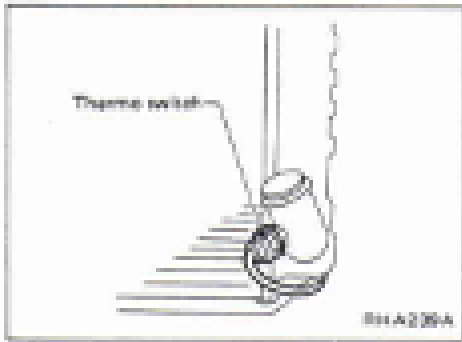


**Thermo Switch (For A/C cut system)**

**INSPECTION**

Check thermo switch for proper operation.

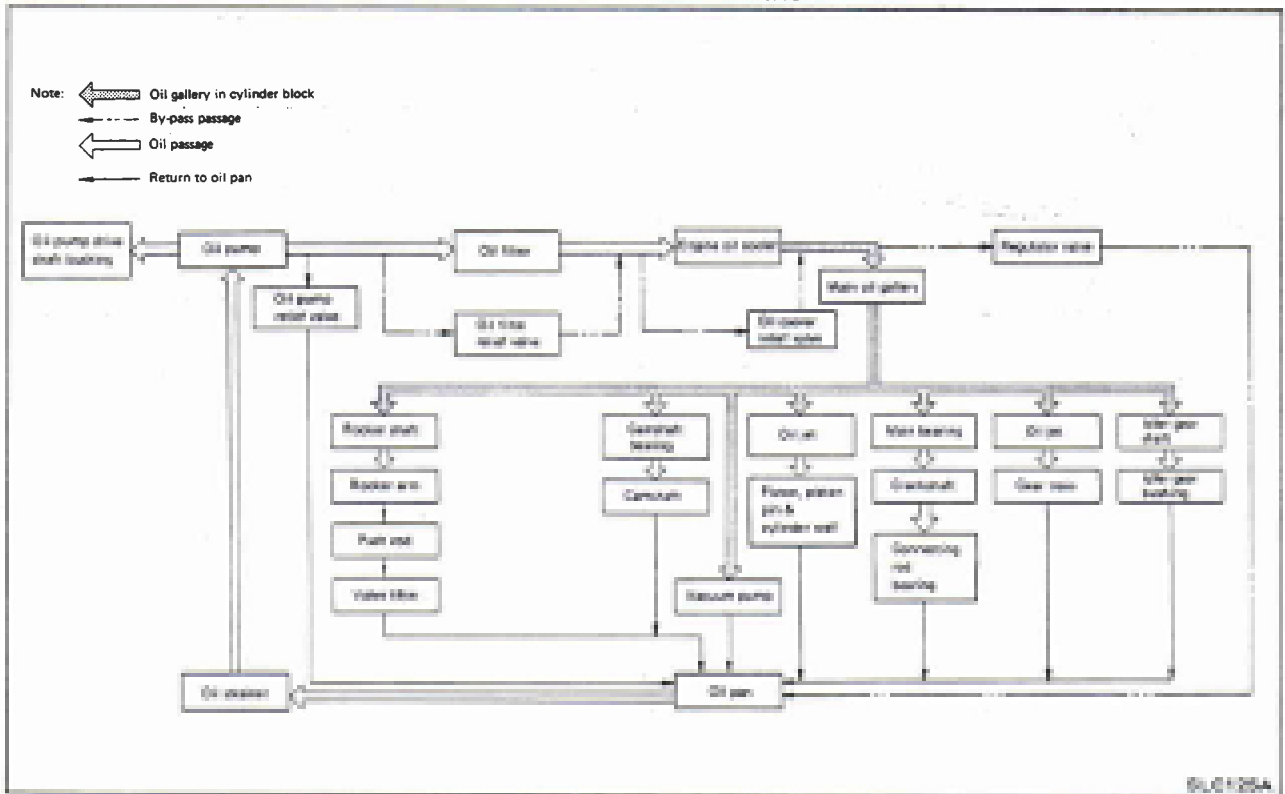
Operating temperature	°C (°F)	Operation
Increasing to 107	(225)	OFF → ON
Decreasing to 103	(217)	ON → OFF



**For Australia A/T models and Gulf standard models**



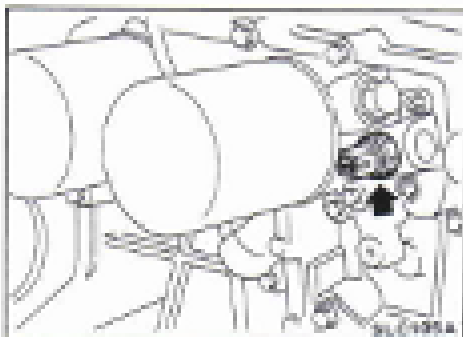
Lubrication Circuit



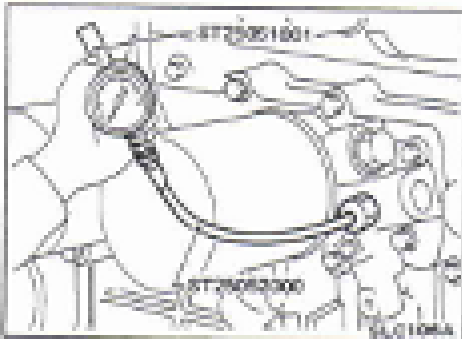
Oil Pressure Check (On-vehicle service)

WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
- Oil pressure check should be done in “Neutral” gear position.



1. Check oil level.
2. Remove oil pressure switch.



## Oil Pressure Check (On-vehicle service)(Cont'd)

3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,000	294 - 392 (2.94 - 3.92, 3.0 - 4.0, 43 - 57)

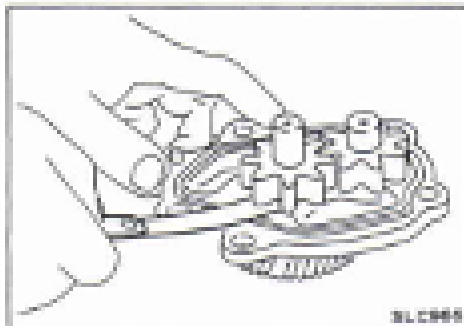
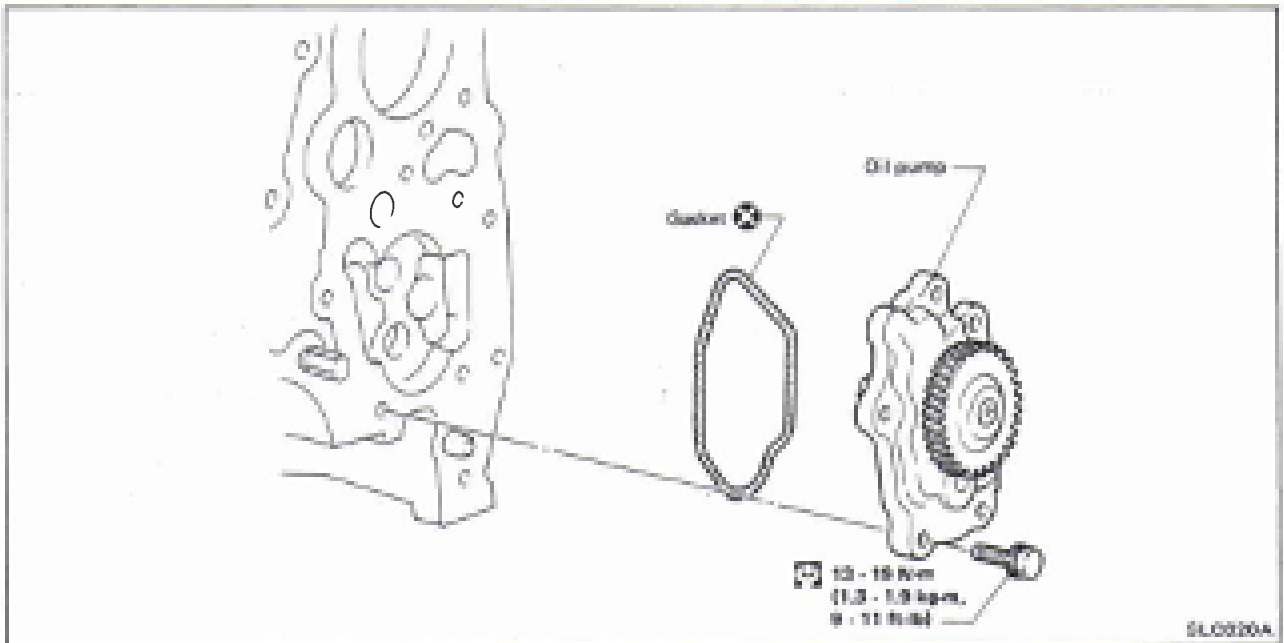
If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch.  
Use proper liquid sealant.

**Oil pressure switch:**

: 10 - 13 N·m (1.0 - 1.3 kg·m, 7 - 9 ft·lb)

## Oil Pump



## OIL PUMP INSPECTION

1. Inspect pump body, gears and drive shaft for wear and damage.
2. Using a feeler gauge and fuse wire, check the following clearances.

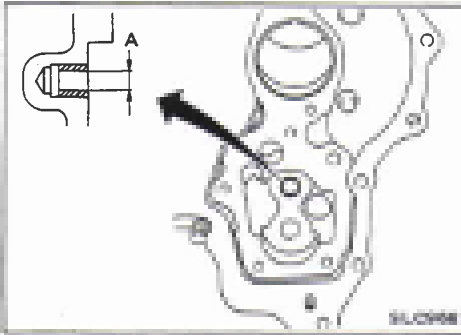
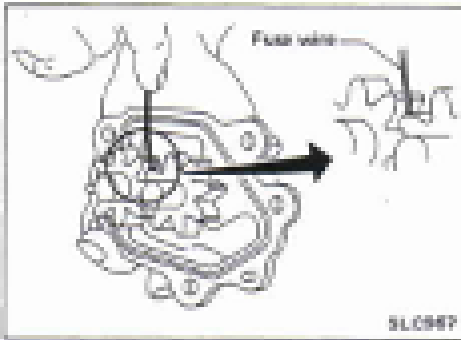
**Gear side clearance:**

Less than 0.13 mm (0.0051 in)

**Oil Pump (Cont'd)**

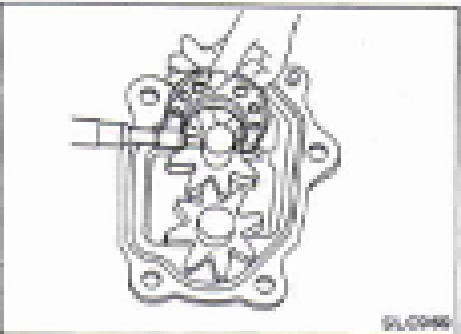
**Gear backlash:**

**Less than 0.30 mm (0.0118 in)**



3. Measure inside diameter "A" of bushing.

**A: 13.012 - 13.098 mm (0.5123 - 0.5157 in)**



4. Measure outside diameter "B" of drive gear shaft.

**B: 12.974 - 12.992 mm (0.5108 - 0.5115 in)**

5. Calculate oil pump bushing clearance.

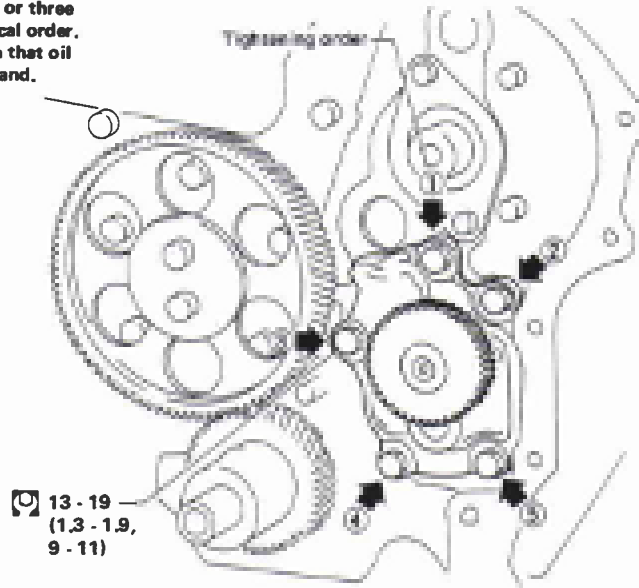
**Oil pump bushing clearance: A — B**

**Less than 0.15 mm (0.0059 in)**

**If it exceeds the limit, replace oil pump bushing or entire oil pump assembly.**

Oil Pump (Cont'd)

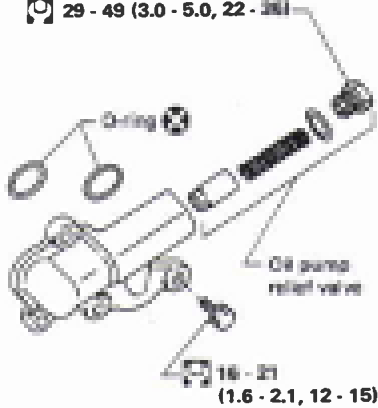
- When installing oil pump, the bolt should be tightened in two or three stages according to numerical order.
- After installation, ascertain that oil pump turns smoothly by hand.



: N-m (kg-m, ft-lb)

SLC965

29 - 49 (3.0 - 5.0, 22 - 36)



: N-m (kg-m, ft-lb)

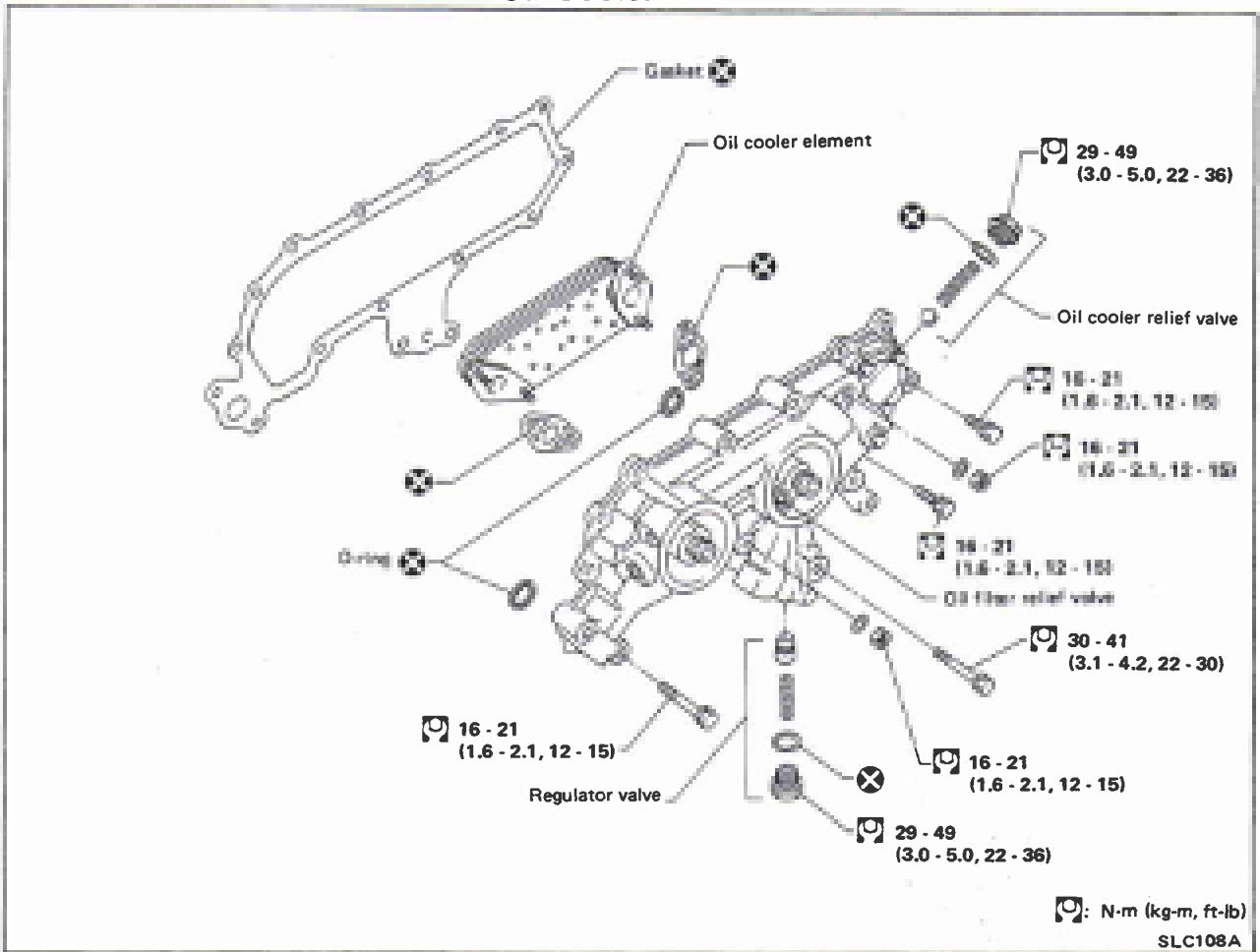
SLC107A

Oil Pump Relief Valve

OIL PUMP RELIEF VALVE INSPECTION

1. Visually inspect components for wear and damage.
  2. Coat relief valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
- If damaged, replace oil pump relief valve set.

Oil Cooler



**OIL FILTER RELIEF VALVE INSPECTION**

Inspect oil filter relief valve for movement, cracks and breaks by pushing the ball.

If damaged, replace oil filter bracket assembly.

**OIL COOLER RELIEF VALVE INSPECTION**

Inspect oil cooler relief valve for movement, cracks and breaks by pushing the ball.

If damaged, replace oil cooler relief valve set.

## Oil Cooler (Cont'd)

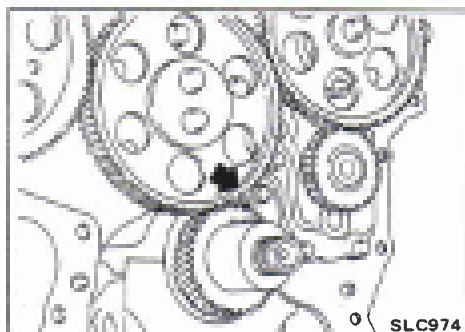
### REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
  2. Coat regulator valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
- If damaged, replace regulator valve set.

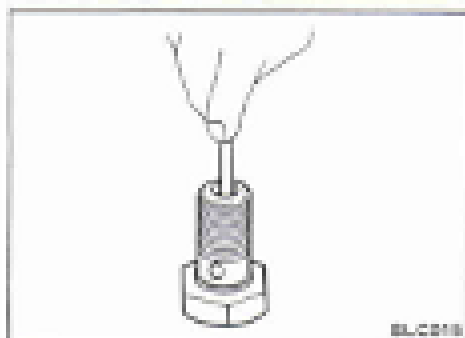
## Oil Jet

### INSPECTION (For gear train)

Make sure that the holes are not clogged. Clean them with a wire if necessary.

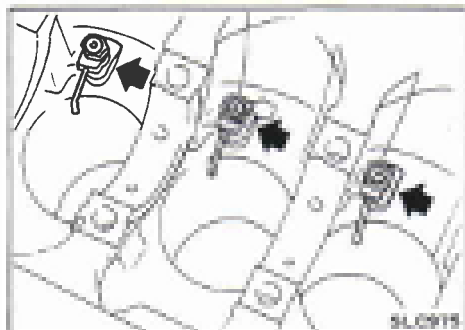


Oil jet has to be installed with oil hole facing crank gear and idler gear.



### INSPECTION (For piston)

1. Blow through outlet of oil jet and make sure that air comes out of inlet.
2. Push cut-off valve of oil jet bolt with a clean plastic or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.

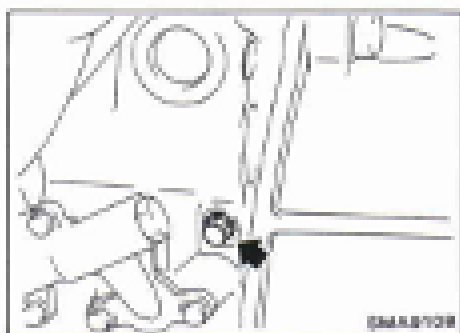
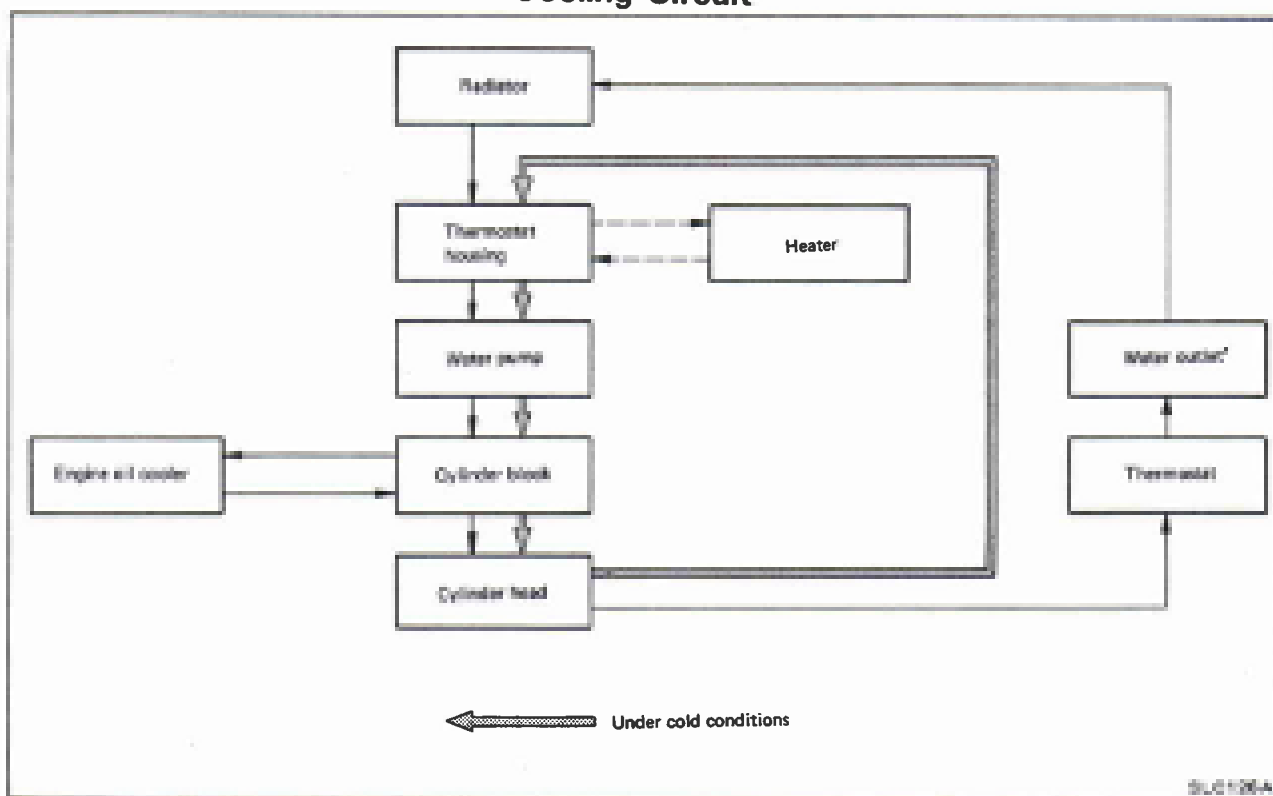


When installing oil jet, align oil jet's boss with hole on cylinder block.

: Oil jet bolt

29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

## Cooling Circuit



### Water Pump REMOVAL AND INSTALLATION

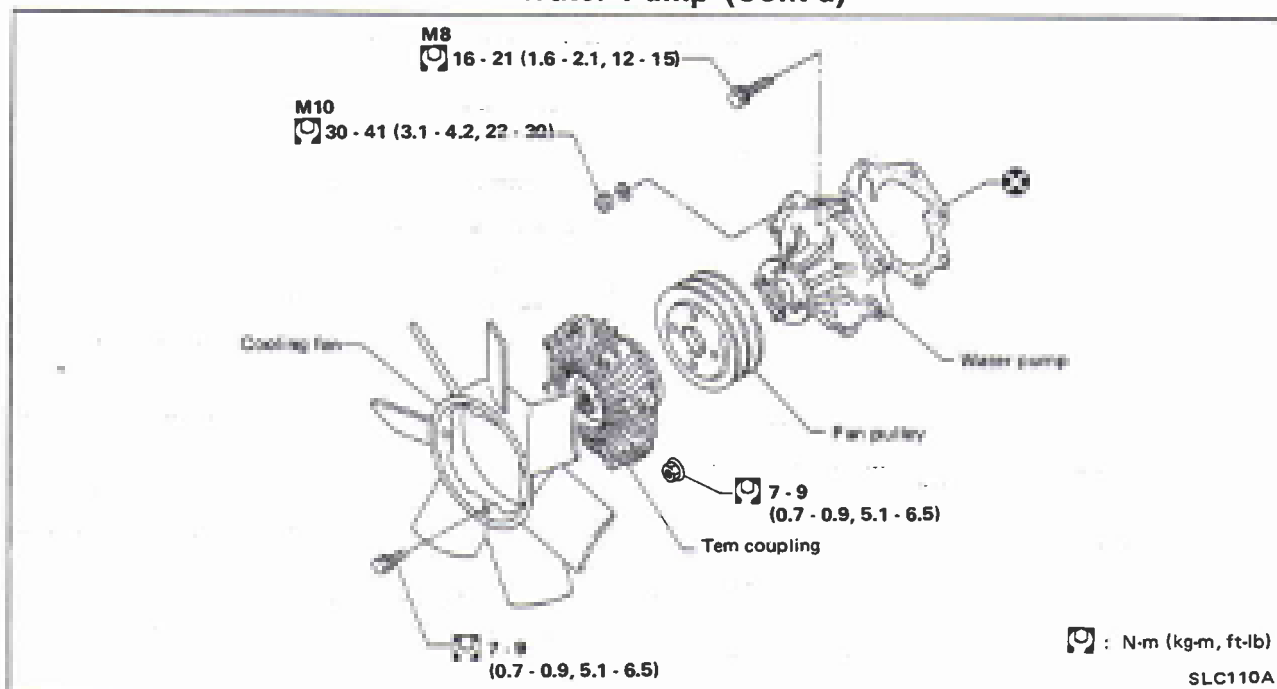
Drain coolant from drain plugs on cylinder block and radiator.

: Cylinder block drain plug

(Use proper sealant)

20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)

## Water Pump (Cont'd)

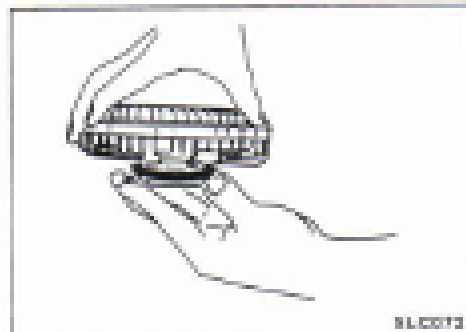


### CAUTION:

- When removing water pump assembly, be careful not to get coolant on drive belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.

### INSPECTION

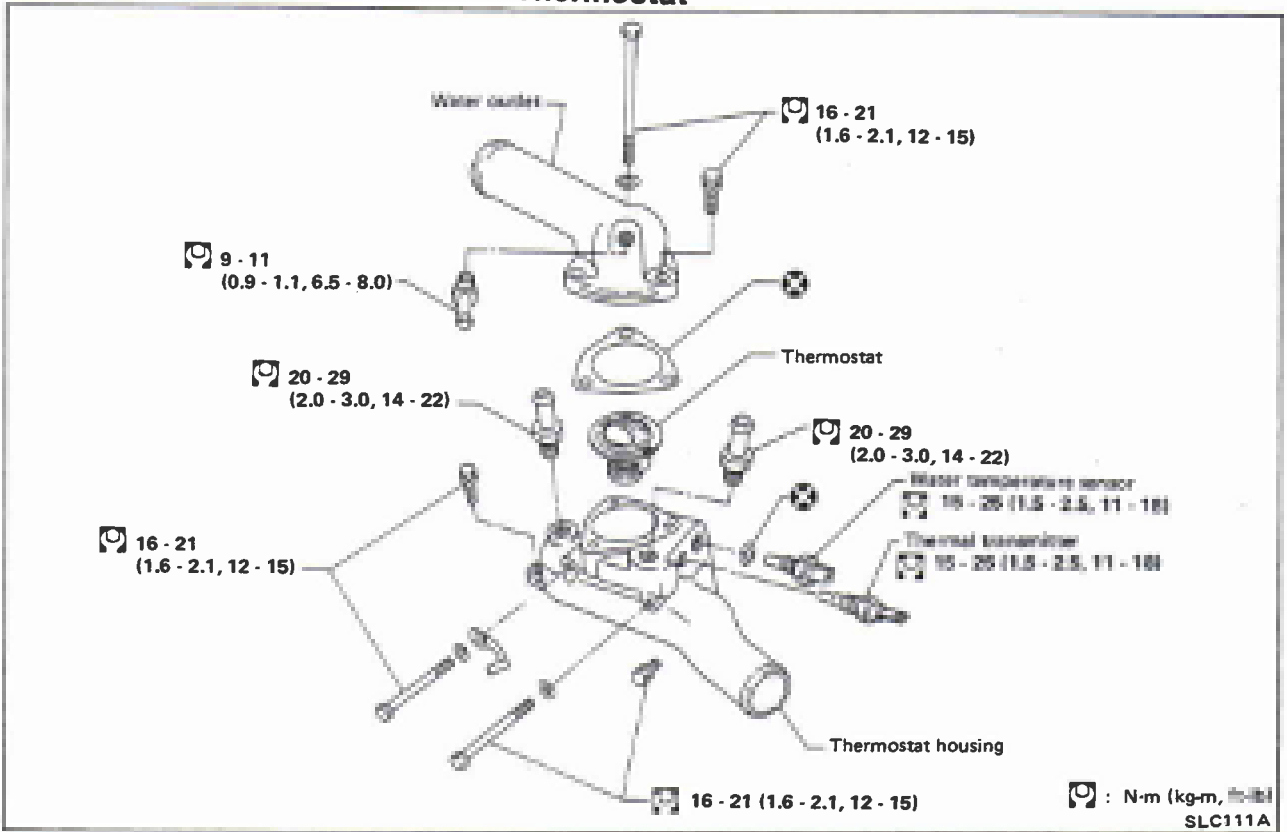
1. Check for badly rusted or corroded body assembly and vane.
2. Check for rough operation due to excessive end play.



3. Check fan coupling for rough operation, oil leakage or bent bimetal.



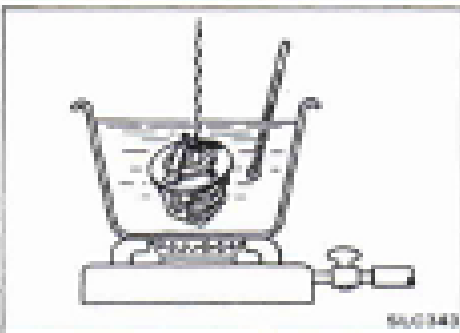
Thermostat



- After installation, run engine for a few minutes, and check for leaks.
- Be careful not to spill coolant over engine compartment. Place a rag to absorb coolant.

INSPECTION

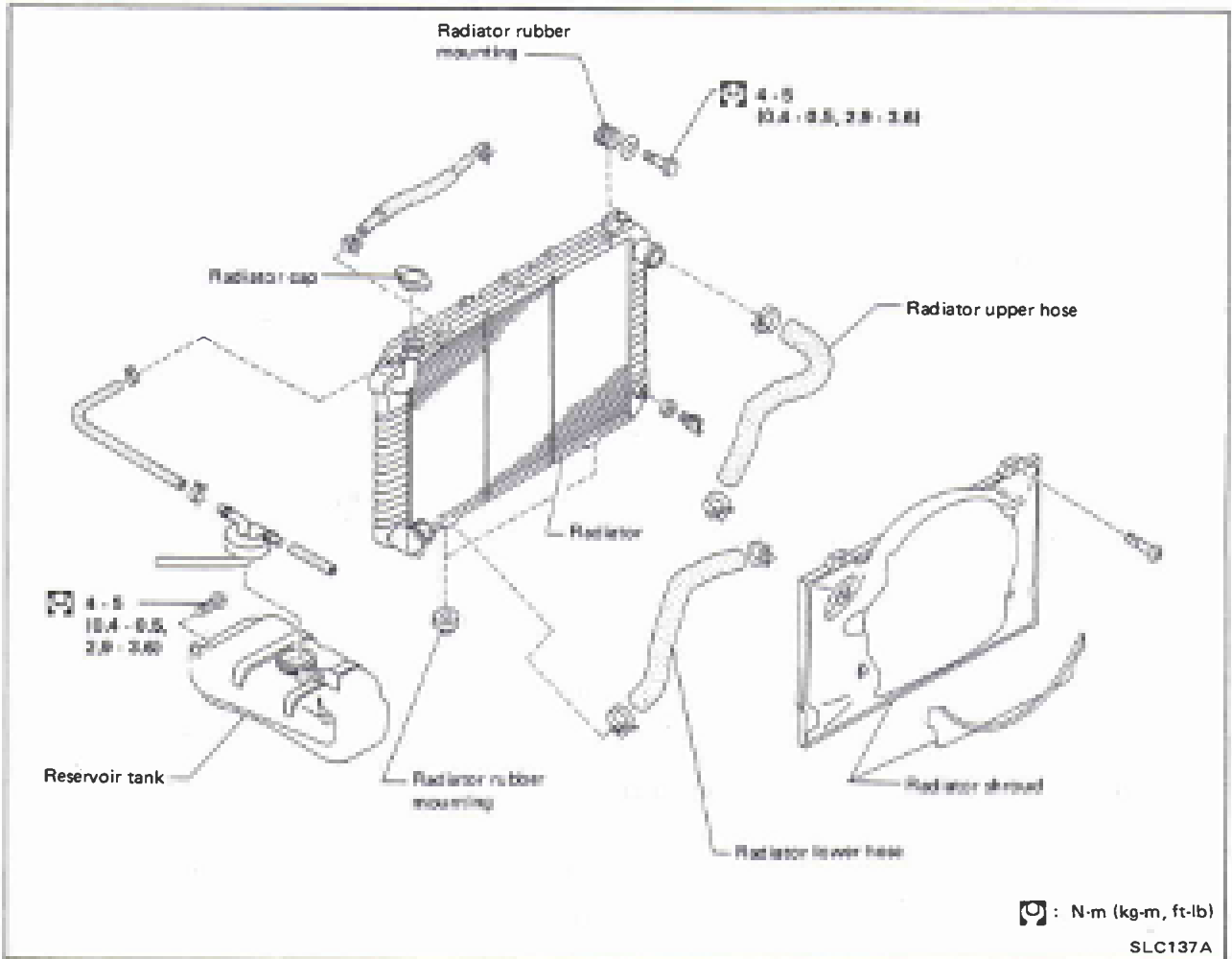
1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.



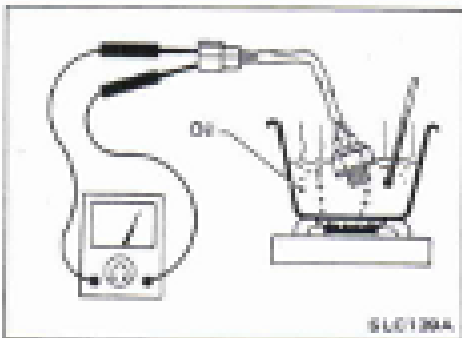
	Tropical type	Standard type
Valve opening temperature °C (°F)	76.5 (170)	82 (180)
Max. valve lift mm/°C (in/°F)	8/90 (0.31/194)	8/95 (0.31/203)

3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

**Radiator**



SLC137A



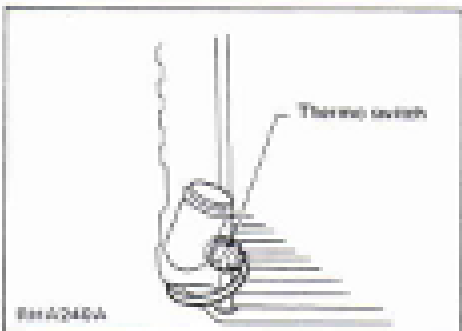
SLC139A

**Thermo Switch (For A/C cut system)**

**INSPECTION**

Check thermo switch for proper operation.

Operating temperature	°C (°F)	Operation
Increasing to 107	(225)	OFF → ON
Decreasing to 103	(217)	ON → OFF



RM4245A

For Hardtop and Wagon models except for Australia

**Engine Lubrication System**

**OIL PRESSURE CHECK**

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , psi)
Idle speed	More than 49 (0.49, 0.5, 7)
2,800	392 - 451 (3.92 - 4.51, 4.0 - 4.6, 57 - 65)

**OIL PUMP**

	Unit: mm (in)
Rotor tip clearance ①	Less than 0.12 (0.0047)
Outer rotor to body clearance ②	0.14 - 0.22 (0.0055 - 0.0087)
Side clearance ③	0.050 - 0.109 (0.0020 - 0.0043)

**Engine Cooling System**

**THERMOSTAT**

**Model except Australia and Gulf standard**

	Standard	Frigid type	Tropical type
Valve opening temperature °C (°F)	82 (180)	88 (190)	76.5 (170)
Max. valve lift mm/°C (in/°F)	10/95 (0.39/203)	10/100 (0.39/212)	10/90 (0.39/194)

**THERMO SWITCH**

Operating temperature	°C (°F)
OFF → ON	107 (225)
ON → OFF	100 (212)

**Australia model**

	Standard	Frigid type	Tropical type
Valve opening temperature °C (°F)	82 (180)	-	-
Max. valve lift mm/°C (in/°F)	10/95 (0.39/203)	-	-

**Gulf standard model**

	Standard	Frigid type	Tropical type
Valve opening temperature °C (°F)	76.5 (170)	-	-
Max. valve lift mm/°C (in/°F)	10/90 (0.39/194)	-	-

**Engine Lubrication System**

**OIL PRESSURE CHECK**

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm <sup>2</sup> , psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,000	294 - 392 (2.94 - 3.92, 3.0 - 4.0, 43 - 57)

**OIL PUMP INSPECTION**

Unit: mm (in)

Gear side clearance	Less than 0.13 (0.0051)
Gear backlash	Less than 0.30 (0.0118)
Oil pump bushing clearance	Less than 0.15 (0.0059)
Oil pump bushing inside diameter	13.012 - 13.098 (0.5123 - 0.5157)
Drive gear shaft outside diameter	12.974 - 12.992 (0.5108 - 0.5115)

**Engine Cooling System**

**THERMOSTAT**

	Tropical type	Standard type
Valve opening temperature °C (°F)	76.5 (170)	82 (180)
Max. valve lift mm/°C (in/°F)	8/90 (0.31/194)	8/95 (0.31/203)

**THERMO SWITCH**

Operating temperature	°C (°F)
OFF → ON	107 (225)
ON → OFF	103 (217)

# ENGINE FUEL & EMISSION CONTROL SYSTEM

## SECTION **EF & EC**

EF & EC

### CONTENTS

<hr/>	
<b>TB42 &amp; TD42</b>	
PREPARATION .....	EF & EC- 3
<hr/>	
<b>TB42</b>	
GENERAL DESCRIPTION .....	EF & EC- 11
ENGINE AND EMISSION CONTROL OVERALL SYSTEM .....	EF & EC- 12
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION .....	EF & EC- 18
CARBURETOR .....	EF & EC- 22
CARBURETOR — Inspection and Adjustment .....	EF & EC- 29
CHECKING AND ADJUSTING IDLE SPEED, IGNITION TIMING AND MIXTURE RATIO .....	EF & EC- 36
ALTITUDE COMPENSATION SYSTEM DESCRIPTION .....	EF & EC- 39
ALTITUDE COMPENSATION SYSTEM INSPECTION .....	EF & EC- 40
THROTTLE VALVE POSITION DETECTING SYSTEM INSPECTION (Only for control of automatic transmission) .....	EF & EC- 41
MECHANICAL FUEL PUMP INSPECTION .....	EF & EC- 42
EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM .....	EF & EC- 43
EVAPORATIVE EMISSION CONTROL SYSTEM DESCRIPTION .....	EF & EC- 44
EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION .....	EF & EC- 45
POSITIVE CRANKCASE EMISSION CONTROL SYSTEM DESCRIPTION .....	EF & EC- 46
POSITIVE CRANKCASE EMISSION CONTROL SYSTEM INSPECTION .....	EF & EC- 47
AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER SYSTEM .....	EF & EC- 48
ANTI-AFTERBURNING CONTROL SYSTEM INSPECTION .....	EF & EC- 50
IGNITION CONTROL SYSTEM INSPECTION .....	EF & EC- 52
<hr/>	
<b>TD42</b>	
INJECTION SYSTEM .....	EF & EC- 59
IN-LINE TYPE INJECTION PUMP .....	EF & EC- 61
VE-TYPE INJECTION PUMP .....	EF & EC- 89
INJECTION NOZZLE .....	EF & EC-117

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## Contents (Cont'd)

BLEEDING FUEL SYSTEM .....	EF & EC-122
FUEL FILTER .....	EF & EC-123
CRANKCASE EMISSION CONTROL SYSTEM .....	EF & EC-124
QUICK-GLOW SYSTEM .....	EF & EC-125
INJECTION PUMP CONTROL SYSTEM .....	EF & EC-133


**\_\_\_\_\_ TB42 & TD42 \_\_\_\_\_**

SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	EF & EC-145
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# PREPARATION

TB42

## SPECIAL SERVICE TOOL

Tool number Tool name	Description
1612562S00 Level gauge	 Checking fuel level

# PREPARATION

TD42

## SPECIAL SERVICE TOOLS In-line type injection pump

Tool number Tool name	Description
<p>① KV11244852 Universal vise</p> <p>② KV11244872 Bracket</p> <p>③ KV11244782 Bracket</p> <p>PE type: ① + ②</p> <p>PES type: ① + ② + ③</p>	
<p>DK57916432 Timer wrench</p>	
<p>DK57926512 Extractor</p>	
<p>DK57931612 Tappet clamp</p>	
<p>DK57920032 Delivery valve extractor</p>	




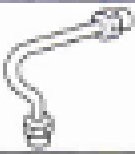







# PREPARATION

TD42

Tool number Tool name	Description
DK05780502 ① DK57916432 Timer wrench ② DK57932020 Timer spring support ③ DK57926581 Timer extractor DK57924162 Base assembly ④ DK57924190 Bushing ⑤ DK57924180 Bushing guide ⑥ DK57924170 Bushing guide ⑦ DK57924161 Base	
DK57931210 Tappet holder	
DK57915010 Special wrench	
DK57921012 Tappet insert	
DK57921412 Plunger insert	
DK57915422 Special wrench	
KV11257802 Nozzle holder	

# PREPARATION

TD42

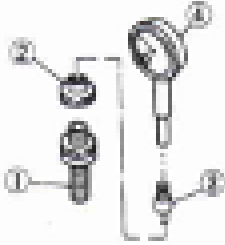
Tool number Tool name	Description
KV11257800 Nozzle	
KV11257805 Injection tube	
KV11205781 Securing stand	
KV11282402 Measuring device	
KV11284019 Timer coupling	
DK57911010 Tappet wrench	
DK05782618 Measuring device	
KV11282433 Measuring device for plunger pre-stroke	
KV11205782 Measuring device	

# PREPARATION

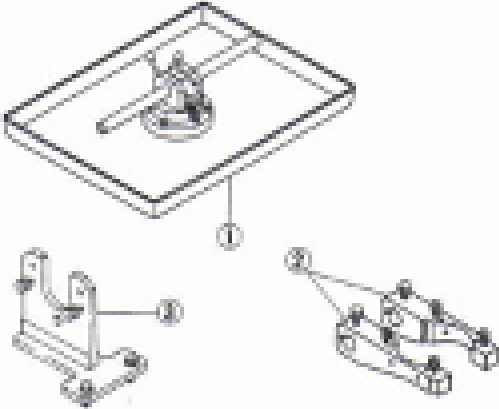



TD42

## SPECIAL SERVICE TOOLS VE-type injection pump

### Adjusting device on vehicle




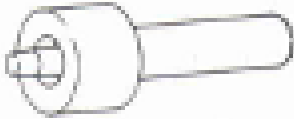





Tool number Tool name	Description
KV11229352 Measuring device (Set length of plunger spring) ① KV11229350 Holder ② KV11229360 Nut ③ KV11229370 Pin ④ KV11254410 Dial gauge	

### Disassembling and assembling tools

① KV11244852 Universal vise ② KV11244872 Bracket ③ KV11244792 Bracket	
KV11229072 Insert device	
KV11214110 Socket wrench for delivery valve	
KV11214270 Socket wrench for governor pivot bolt	








# PREPARATION

TD42

Tool number Tool name	Description
KV11214260 Socket wrench for regulating valve	
KV11214250 Socket wrench for distributor head plug	
KV11215262 Governor shaft adjusting device	
KV11229542 Feed pump holder	
KV11229852 "MS" measuring device set ① KV11229110 Block gauge ② KV11229820 Dummy shaft ③ KV11229830 Rod	
KV11229752 Block gauge (For high altitude compensator)	
KV11229762 Block gauge (For high altitude compensator)	
KV11229042 "K" & "KF" measuring device	
<b>Adjusting device on pump tester</b>	
KV11281036 Fixing stand	

# PREPARATION

TD42

Tool number Tool name	Description
KV11242442 Coupling	
KV11282815 Measuring device (Timer advance angle)	
KV11205032 Injection pipe [840 mm (33.07 in)]	
KV11229462 Extractor (Disassembling of regulating valve)	
KV11229522 Insert device (Assembling of regulating valve)	
KV11257802 Nozzle holder (Bosch type EF8511-9A)	
KV11257800 Nozzle (Bosch type DN12SD12T)	

SPECIAL SERVICE TOOLS  
Injection nozzle

Tool number Tool name	Description
<p>KV11289004 Nozzle cleaning kit</p> <ul style="list-style-type: none"> <li>① KV11290012 Box</li> <li>② KV11290110 Brush</li> <li>③ KV11290122 Nozzle oil sump scraper</li> <li>④ KV11290140 Nozzle needle tip cleaner</li> <li>⑤ KV11290150 Nozzle seat scraper</li> <li>⑥ KV11290210 Nozzle holder</li> <li>⑦ KV11290220 Nozzle hole cleaning needle</li> </ul>	
<p>KV11292210 Nozzle centering device</p>	
<p>KV11290122 Nozzle oil sump scraper</p>	
<p>KV11290140 Nozzle seat scraper</p>	

System Application

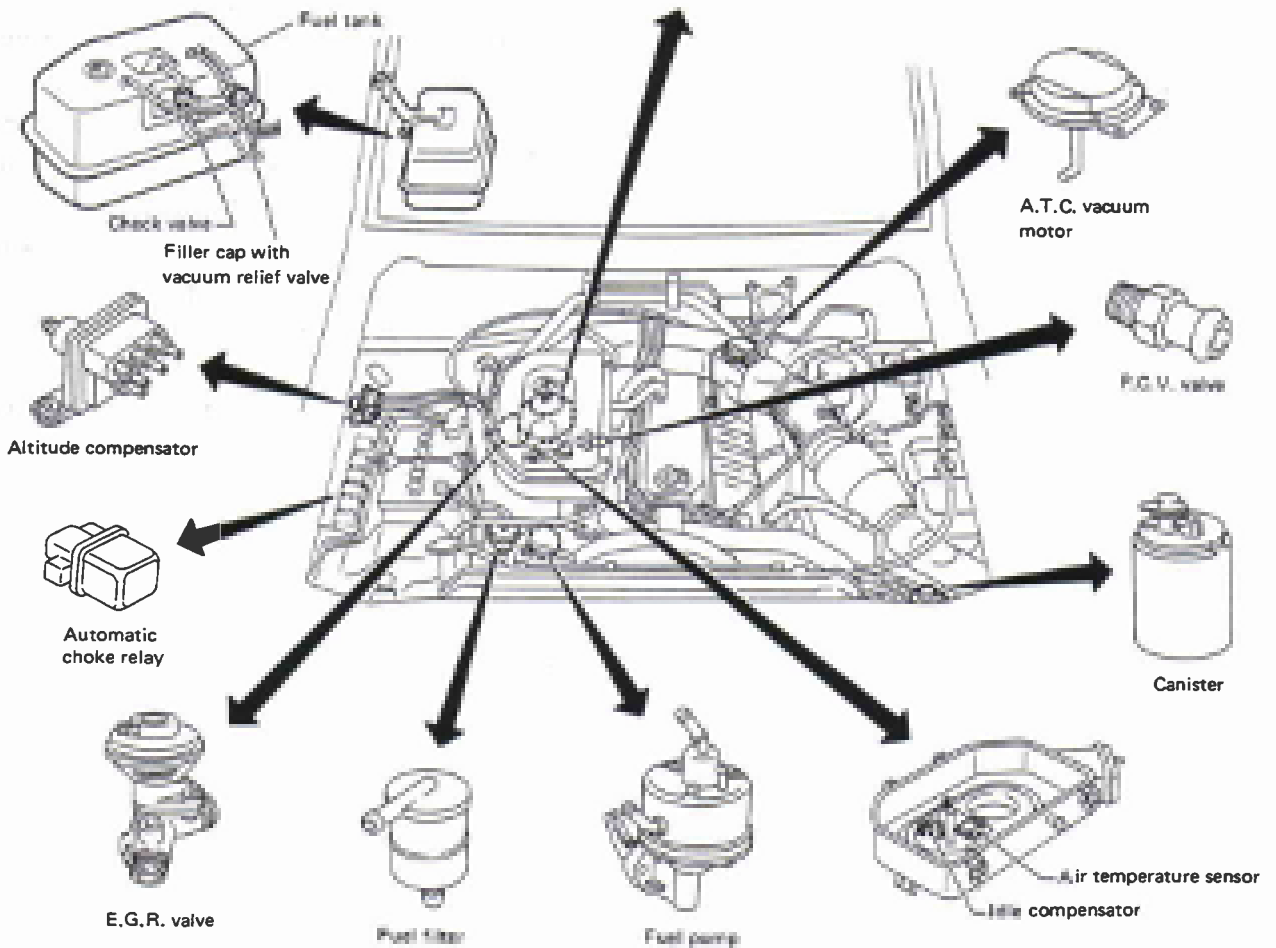
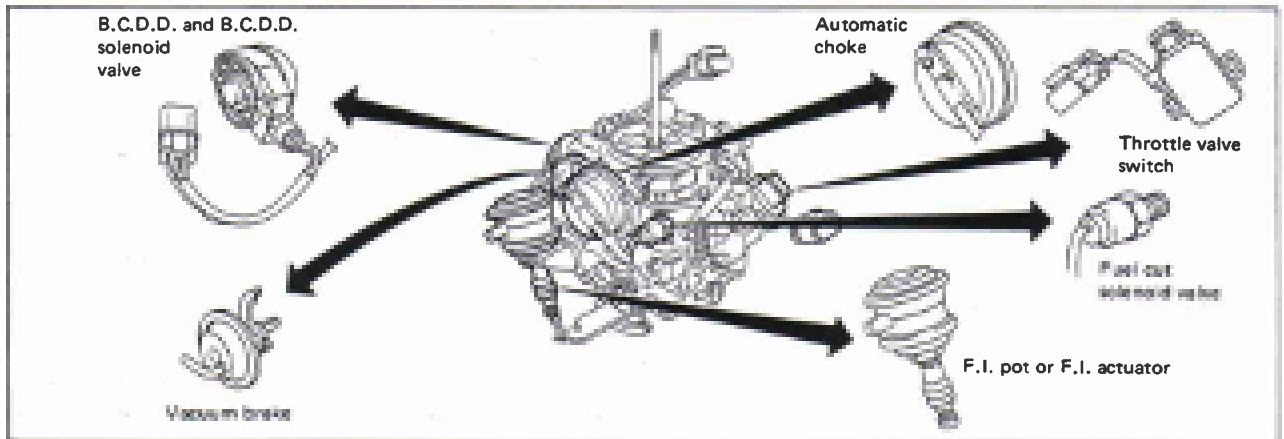
Destination System	Model except Australia and Gulf standard models	Australia model		Gulf standard model		Major unit
	M/T	M/T	A/T	M/T	A/T	
Crankcase emission control system	X	X	X	X	X	● P.C.V. valve
Boost controlled deceleration device (B.C.D.D.)	X	X*1	X	X*1	X	● B.C.D.D. unit ● B.C.D.D. control solenoid valve ● Speed detecting switch (M/T)
Exhaust gas recirculation control system (E.G.R. control system)	-	-	-	-	X	● E.G.R. valve ● T.V.V. (2 port-type)
Evaporative emission control system	-	X	X	X	X	● Carbon canister
Automatic temperature control air cleaner system	opt	X	X	opt	opt	● Temperature sensor ● Vacuum motor
Automatic choke	-	X	X	-	-	
Fast idle actuator (F.I. actuator)	X*2	X*2	-	X*2	-	● F.I. actuator
Fast idle pot (F.I. pot)	-	-	X*2	-	X*2	● F.I. pot
Altitude compensation system	opt	-	-	opt	opt	● Altitude compensator

X: Available    -: Not available    opt: Optional

\*1: With solenoid valve

\*2: With air conditioner model

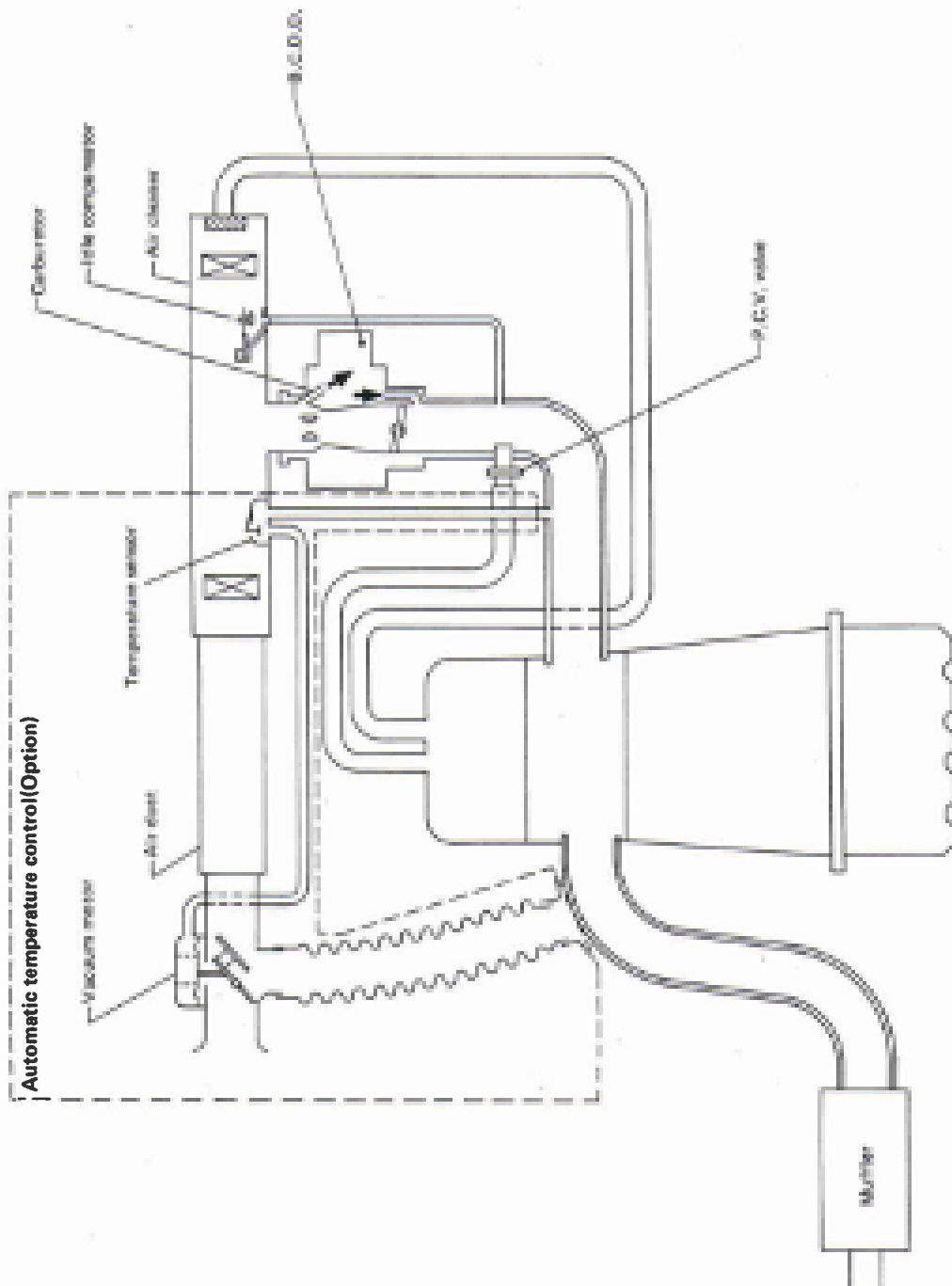
Component Parts Location





System Diagram

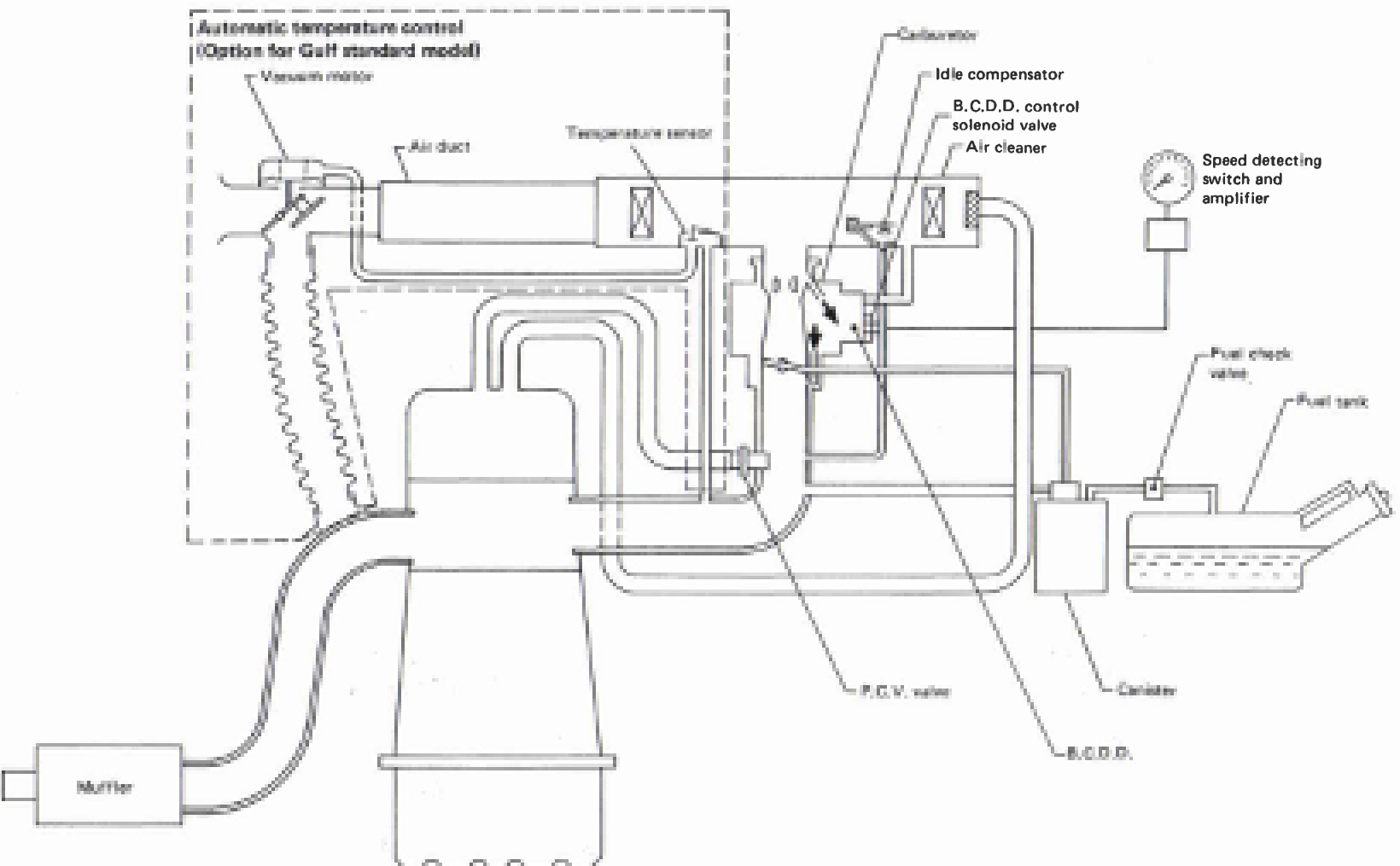
Model except Australia and Gulf standard models



# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Australia M/T and Gulf standard M/T model

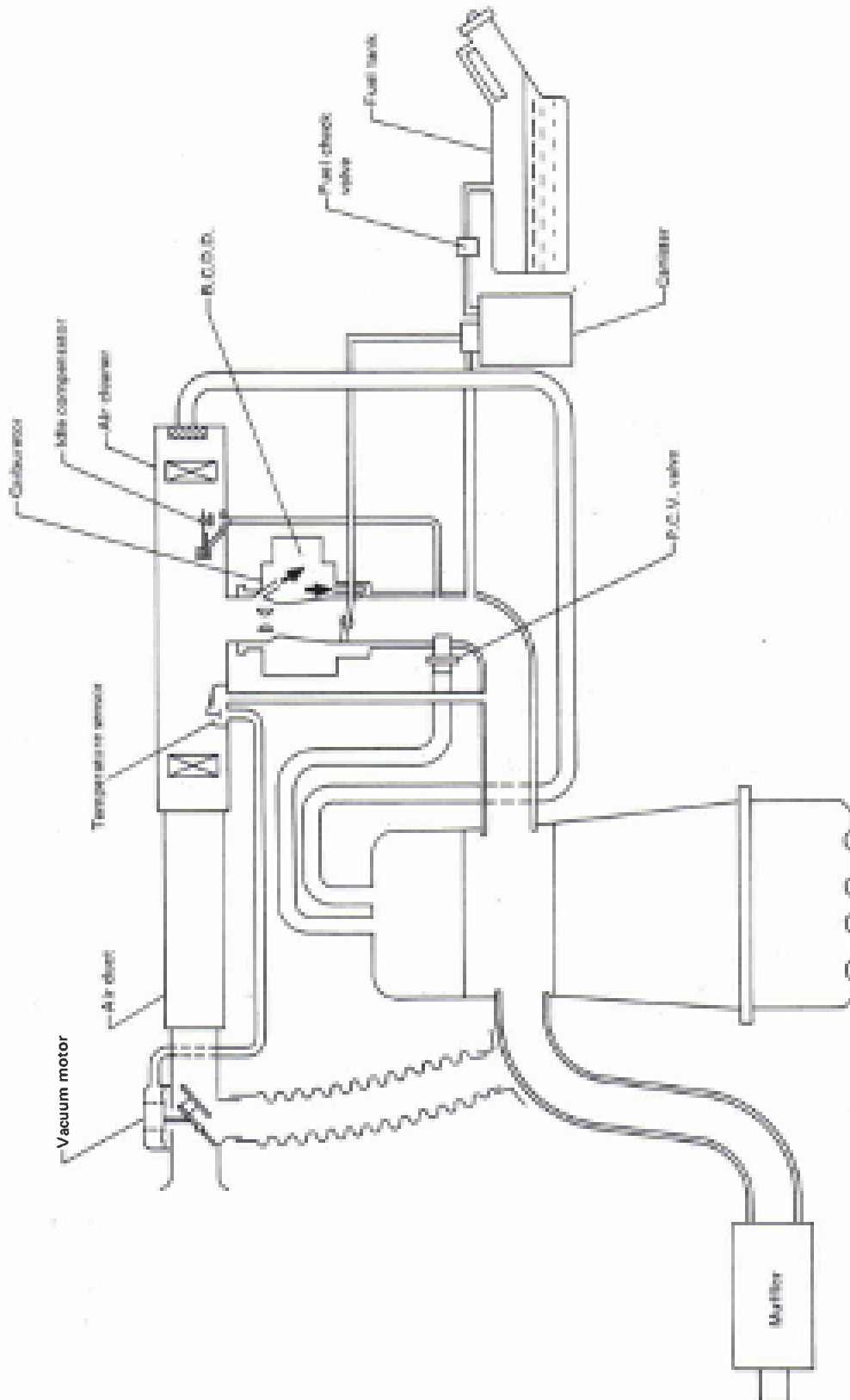
## System Diagram (Cont'd)



EF & EC-14

System Diagram (Cont'd)

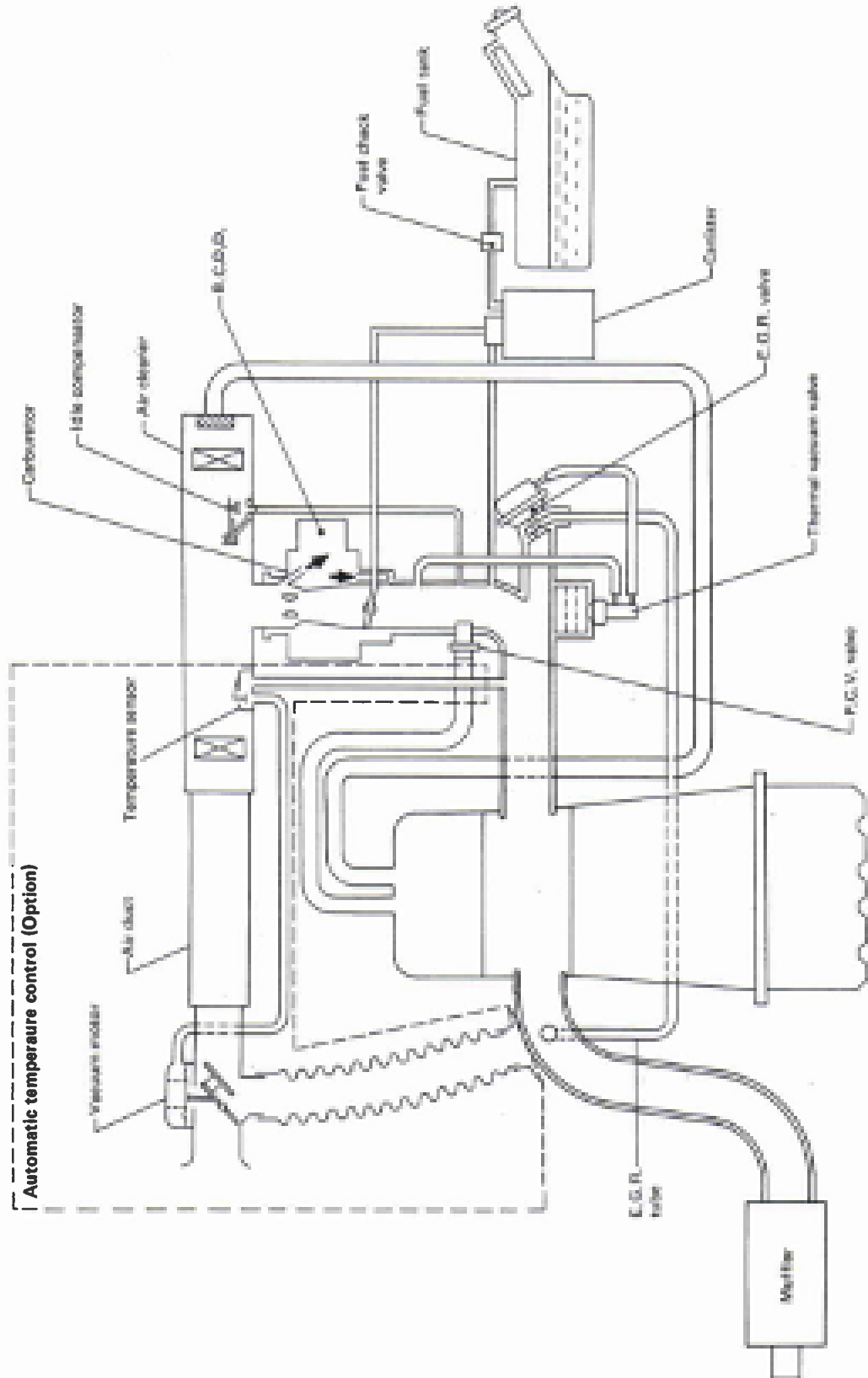
Australia A/T model



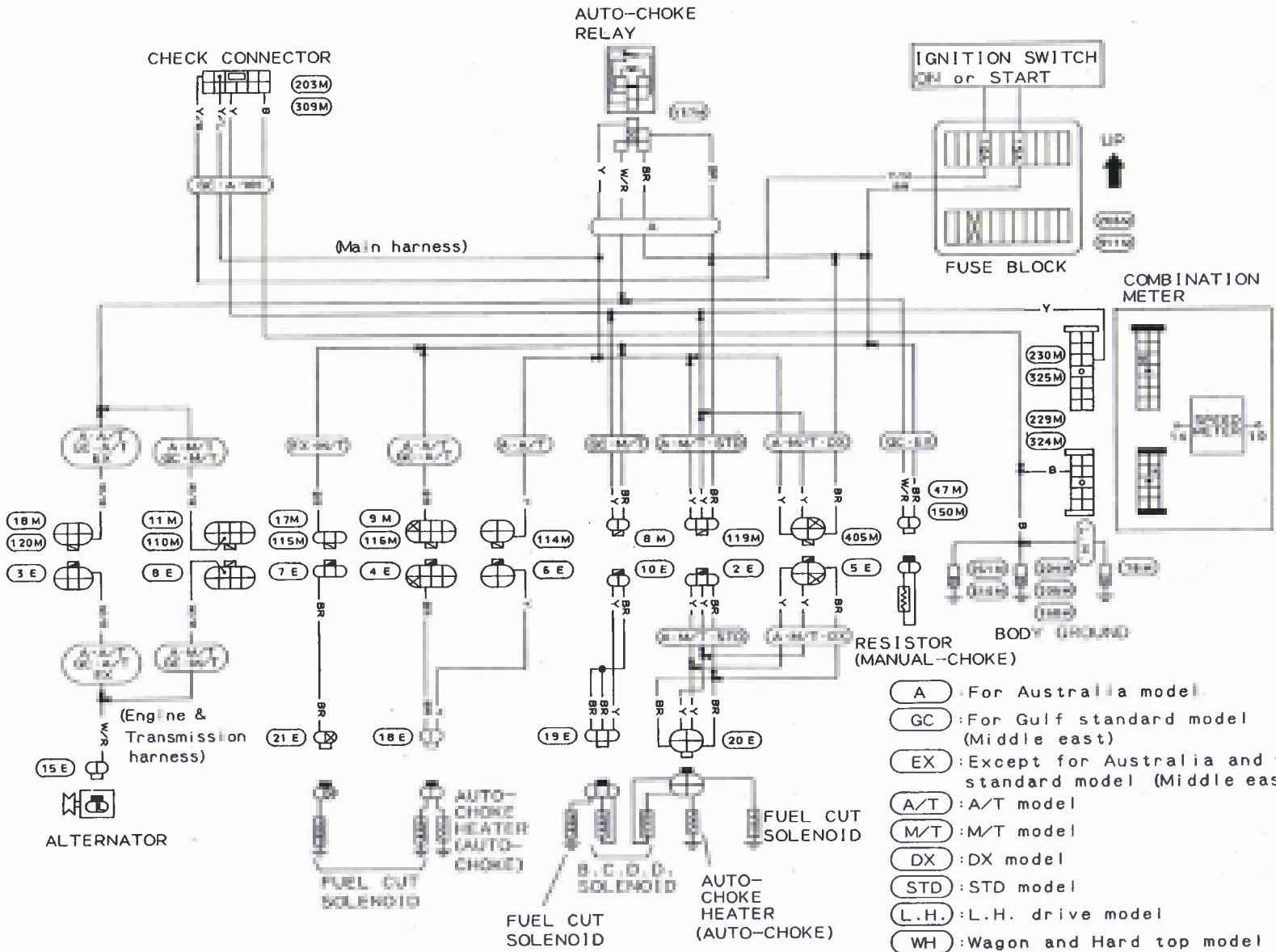
SEP4040

System Diagram (Cont'd)

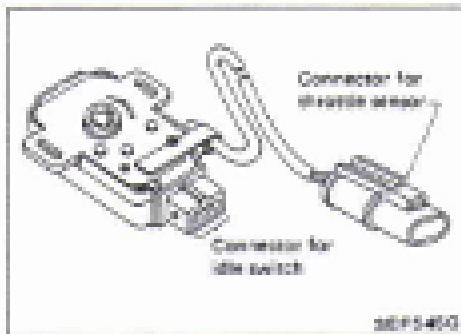
Gulf standard A/T model



Wiring Diagram



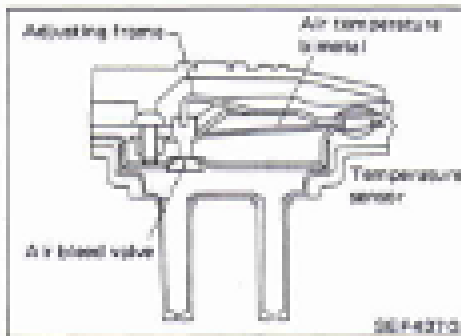
EF & EC-17



**Throttle Sensor & Throttle Valve Switch (Only for control of automatic transmission)**

The throttle sensor is attached on the carburetor and actuates in response to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the A/T control unit. In addition the sensor detects the opening and closing speed of the throttle valve, and sends the voltage change rate to the A/T control unit. The throttle valve switch actuates in response to accelerator pedal movement.

This switch has idle contact and full throttle contact. The idle contact is used for automatic transmission control. It closes when the throttle valve is positioned at idle and opens when it is at any other position.



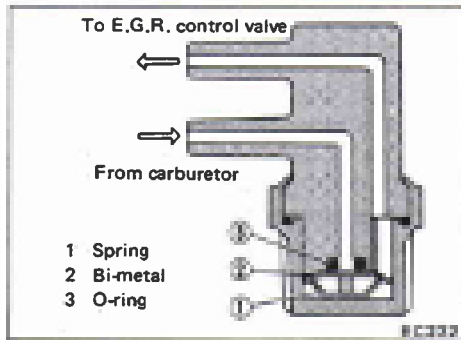
**Air Temperature Sensor**

The air temperature sensor is a bimetal valve type. It is located inside the air cleaner to detect the temperature of intake air. The bimetal valve closes to prevent fuel from icing during engine warm-up. When the valve closes, the vent valve causes the hot air duct side to activate. Manifold vacuum is then transmitted to the vacuum motor in order to deliver hot air from the hot air duct. As the engine progressively warms up, the valve opens in response to cool air being drawn in from the engine compartment. Manifold vacuum applied to the vacuum motor then begins to discharge into the atmosphere. As a result, the air vent valve closes to shut off the air passage heated by the hot air delivered from the hot air duct.



**E.G.R. Control Valve**

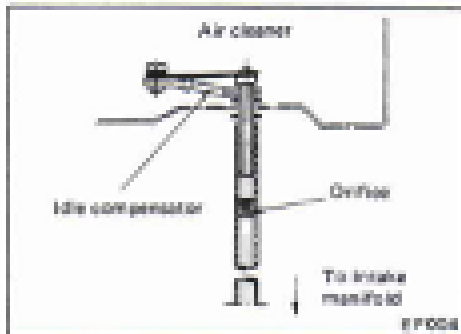
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



**Thermal Vacuum Valve (T.V.V.)**

Thermal vacuum valve detects engine coolant temperature by means of a built-in bimetal, and opens or closes the vacuum passage which controls E.G.R. system.

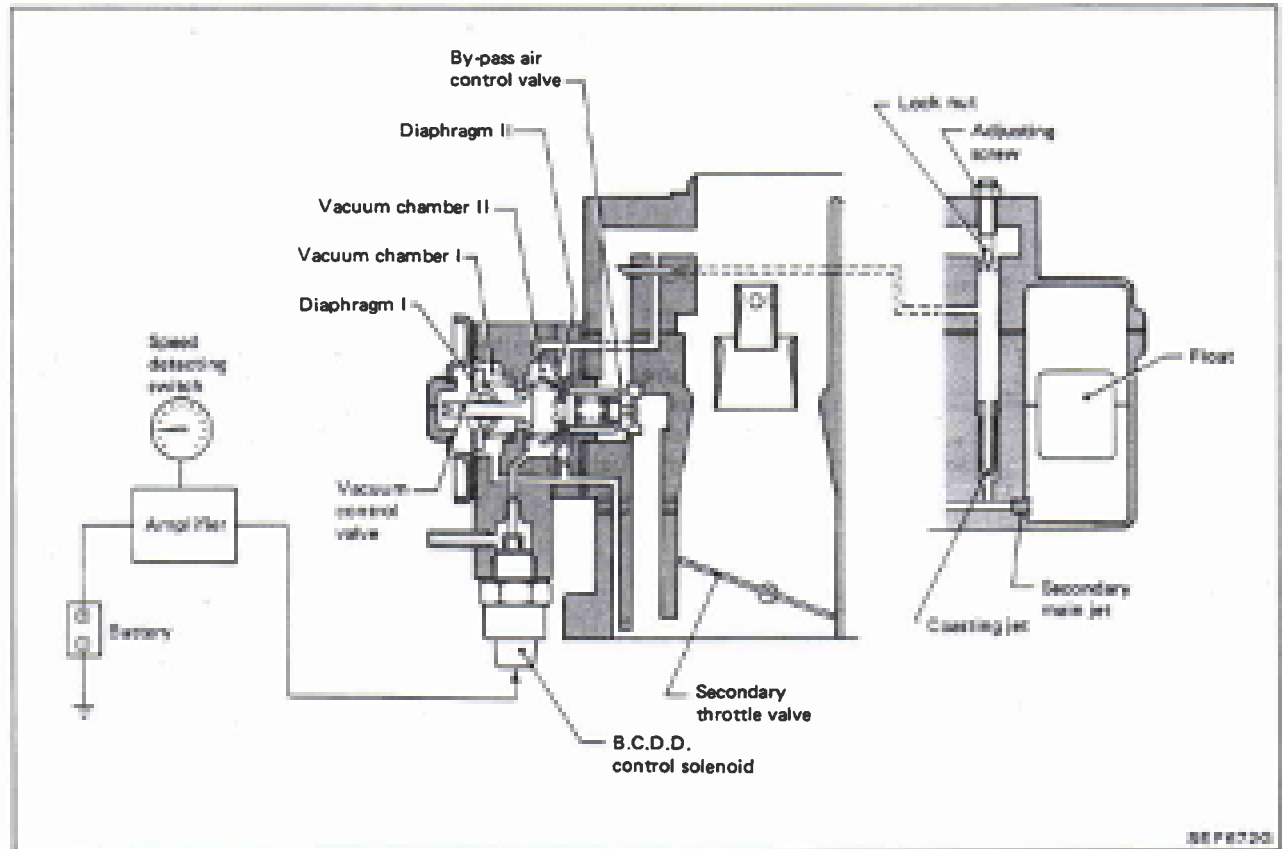
Water temperature °C (°F)	Thermal vacuum valve	E.G.R. system
Below 40 (104)	Closed	Not activated
Above 40 (104)	Open	Activated



**Idle Compensator**

The idle compensator is basically a thermostatic valve which introduces air directly from the air cleaner to the intake manifold to compensate for abnormal enrichment of mixture in high idle temperatures and to stabilize the engine. The idle compensator is installed on the air cleaner.

**B.C.D.D. (Boost Controlled Deceleration Device) Control Valve**



**B.C.D.D. (Boost Controlled Deceleration Device) Control Valve (Cont'd)**

The B.C.D.D. control valve opens and closes the air by-pass passage of the carburetor. When the throttle valve closes abruptly during deceleration, intake manifold vacuum increases abnormally. This causes engine oil to leak past the piston into the combustion chamber and unburned gases inside the intake manifold to be discharged into the atmosphere in the form of HC. To prevent an abnormal rise in intake manifold pressure and an abrupt decrease in engine speed during deceleration, the air by-pass passage opens to deliver a very small amount of fuel from the coasting jet when intake manifold vacuum pressure reaches the specified level.

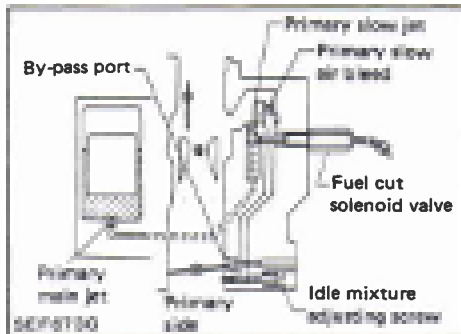
The B.C.D.D. control valve is installed on the intake manifold carburetor.

**B.C.D.D. Control Solenoid Valve**

The B.C.D.D. control solenoid valve stops B.C.D.D. operation when engine speed decreases to such an extent that the vehicle stops. This prevents abrupt movement of the vehicle.

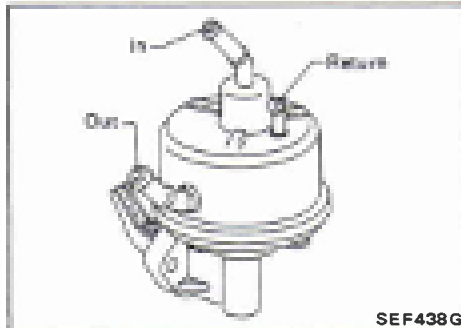
**Fuel Cut Solenoid Valve**

The fuel cut solenoid valve is attached to the carburetor with its needle valve facing the fuel passage of the primary slow system. When current flows through the fuel cut solenoid valve, the needle valve retracts, allowing the current to flow through the primary slow system. When current does not flow through this system, the fuel will be shut off.

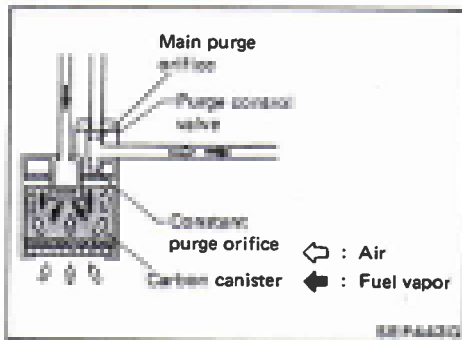


**Fuel Pump**

The fuel pump is a mechanical type and is mounted on the cylinder block. The end of the pump lever rests on the oil pump. When the cam rotates, the lever moves in a reciprocating motion to deliver fuel from the fuel tank to the carburetor.





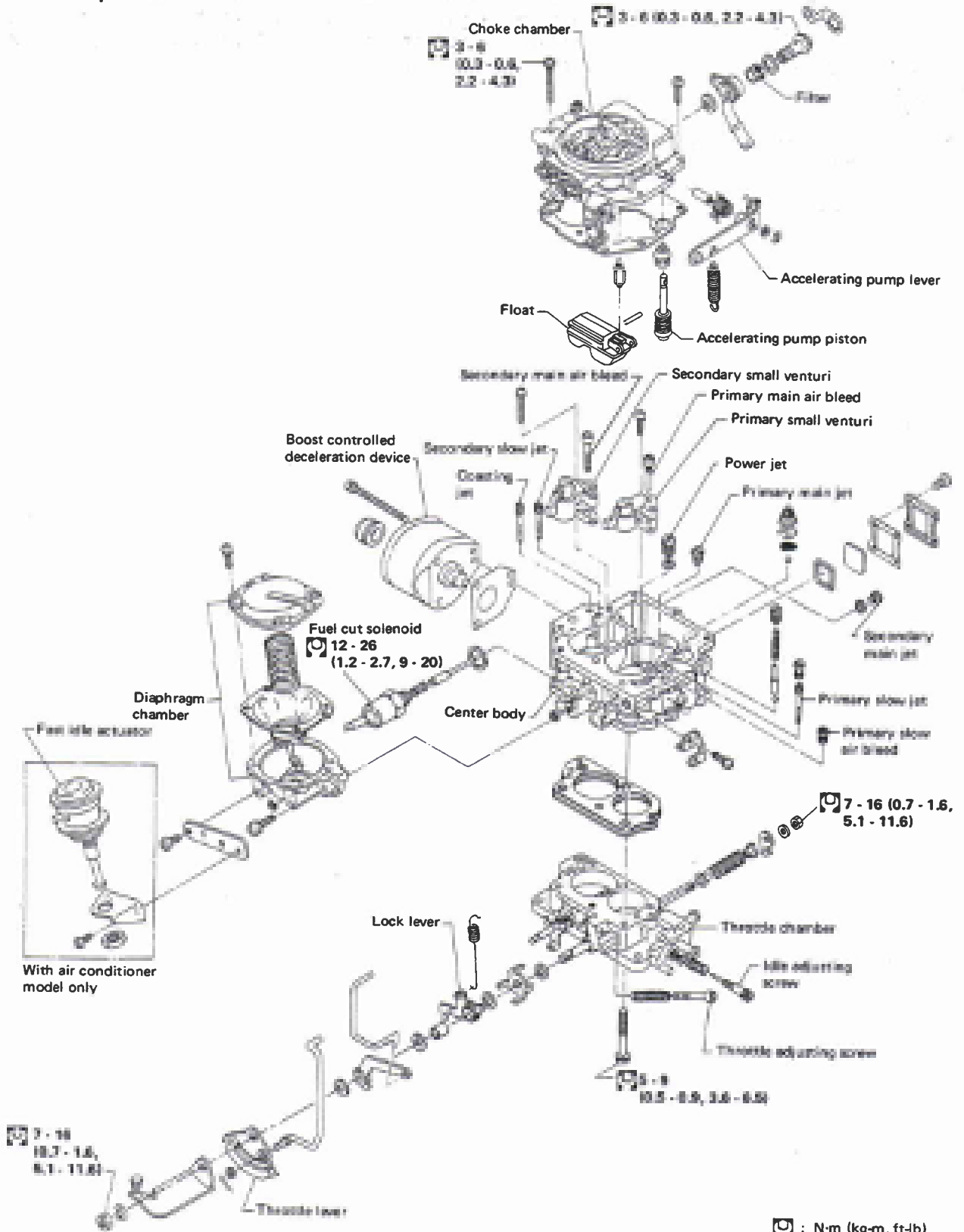


### Carbon Canister

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.

Component Parts

Model except Australia and Gulf standard models



: N·m (kg·m, ft·lb)

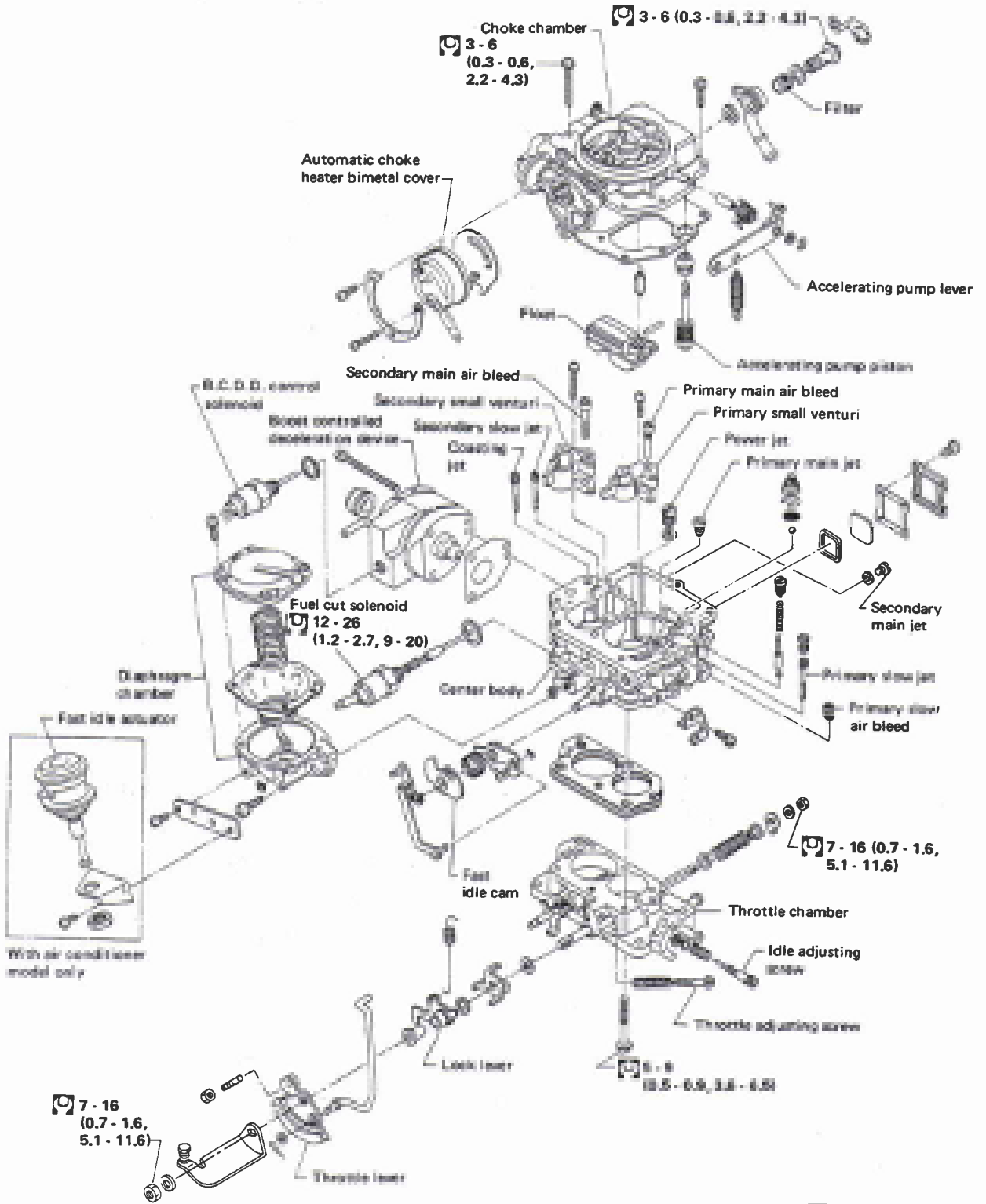
SEF446G

# CARBURETOR

TB42

## Component Parts (Cont'd)

Australia M/T model



: N-m (kg-m, ft-lb)

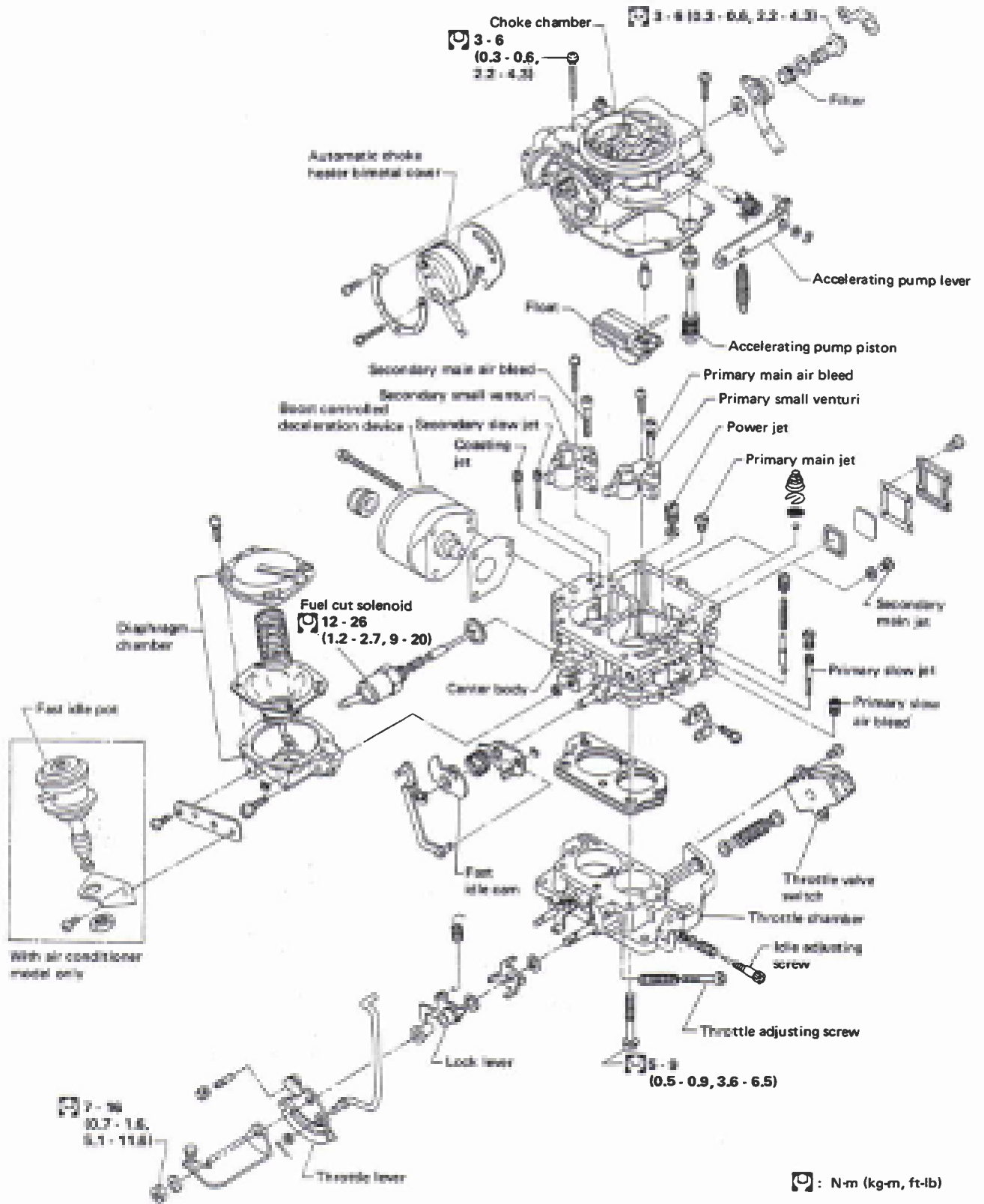
SEF457G

# CARBURETOR

TB42

## Component Parts (Cont'd)

Australia A/T model



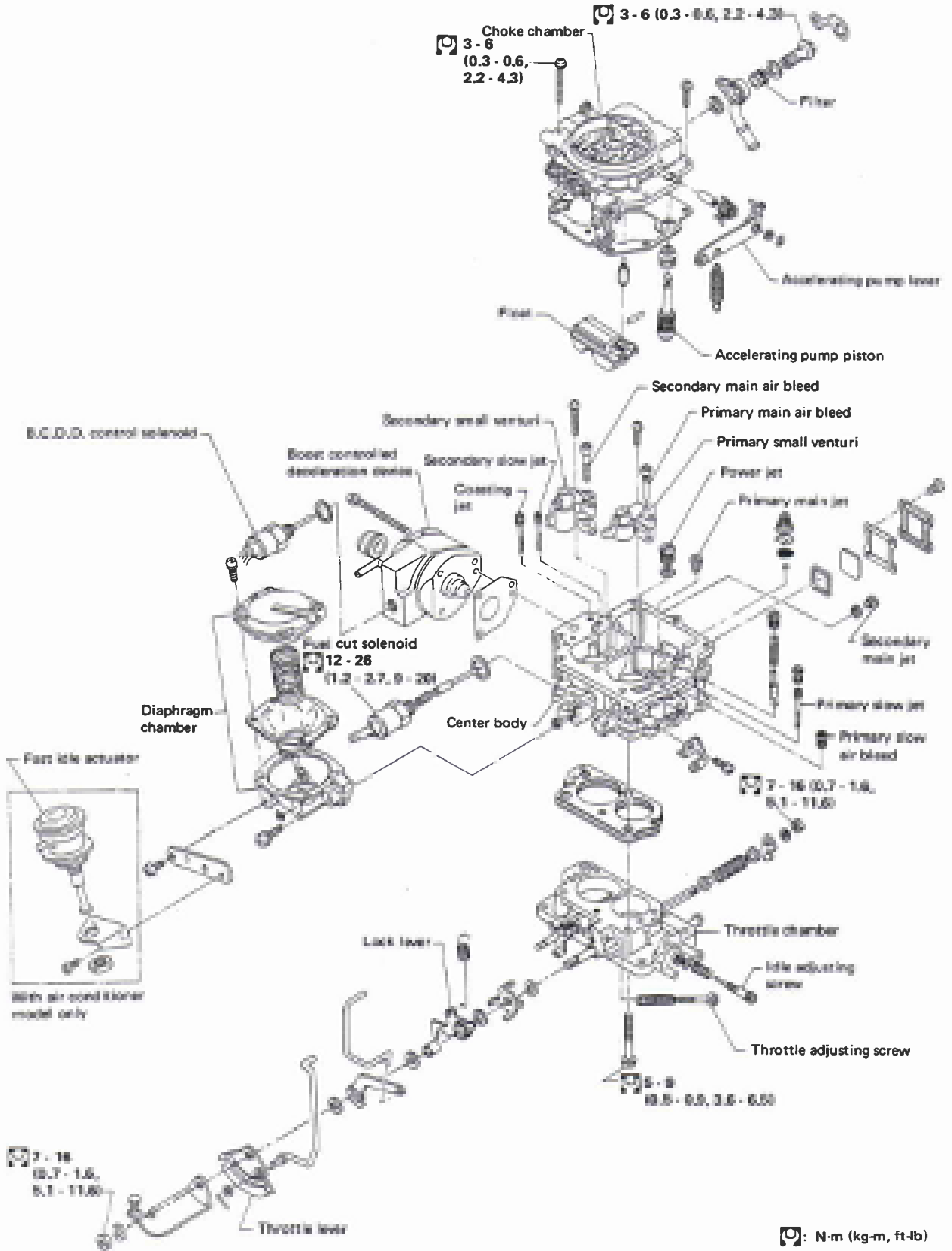
SEF458G

# CARBURETOR

TB42

## Component Parts (Cont'd)

Gulf standard M/T model



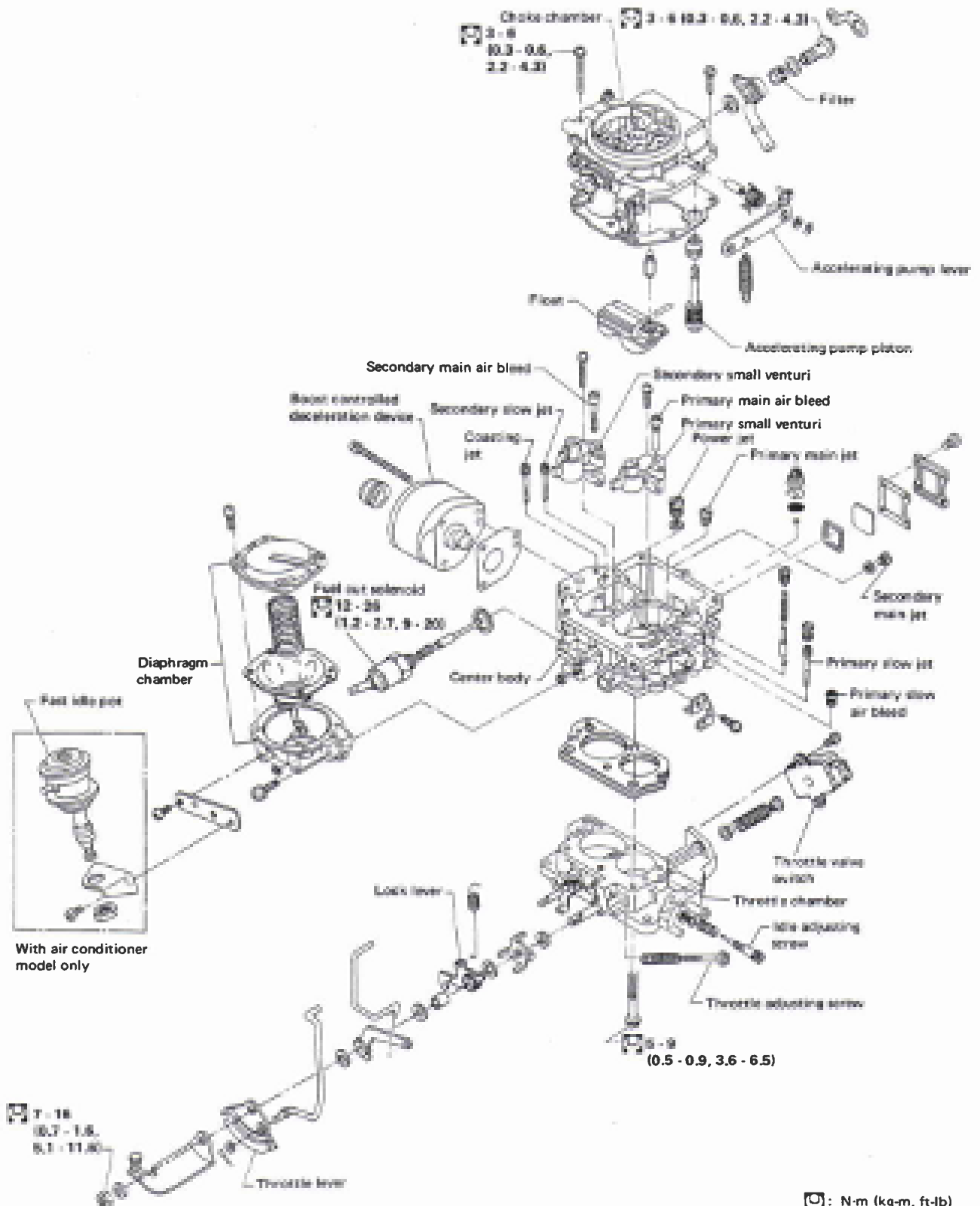
SEF488G

# CARBURETOR

TB42

## Component Parts (Cont'd)

Gulf standard A/T model

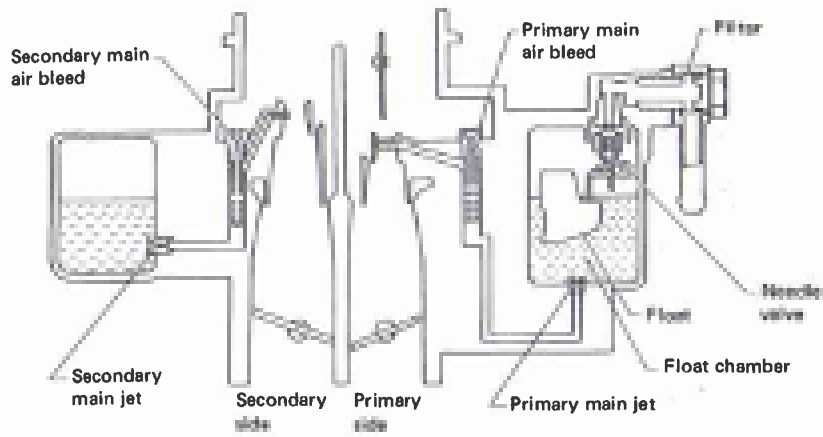


With air conditioner model only

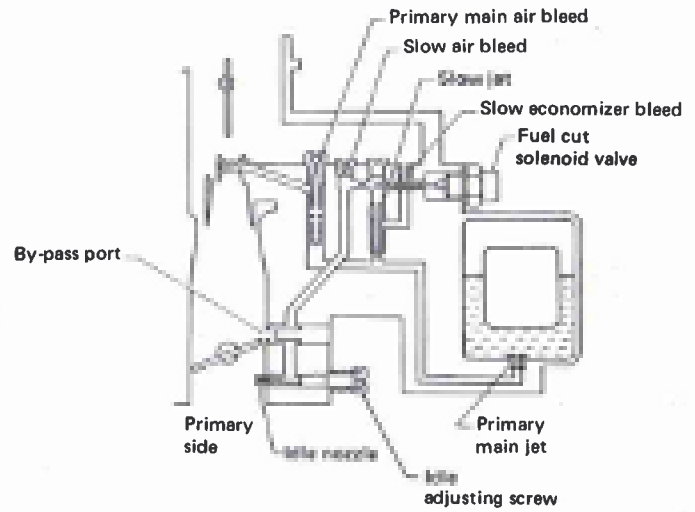
: N·m (kg·m, ft·lb)

SEF760G

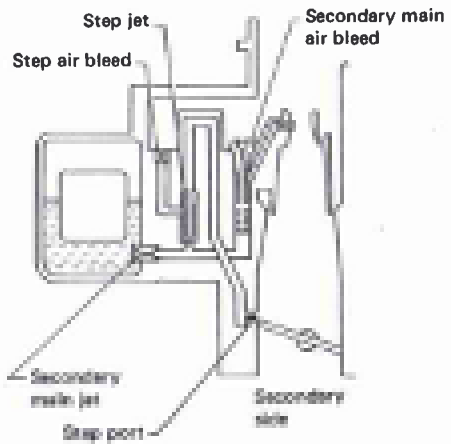
**Main system**



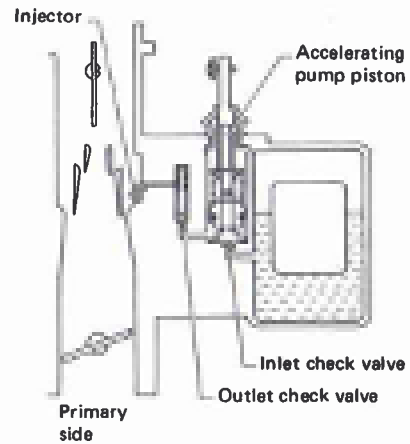
**Slow system**



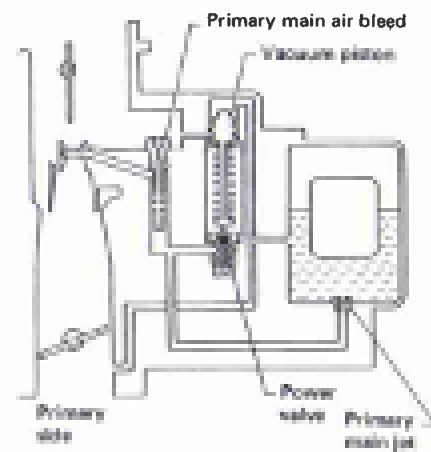
**Step system**



**Accelerating pump system**



**Power valve system**



**EF & EC-27**

10114900

### **Major Service Operation**

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds.

The carburetor should be maintained in its original condition in order to continue to deliver the proper ratio.

To maintain accurate carbureting through passages and discharge holes, extreme care must be taken in cleaning.

### **REMOVAL**

Remove carburetor from engine, taking sufficient care to do the following:

#### **PRECAUTIONS:**

- a. **When disconnecting fuel lines, do not spill fuel from fuel pipe.**
- b. **When removing carburetor, do not drop any nut or bolt into intake manifold.**
- **Be careful not to bend or scratch any part.**

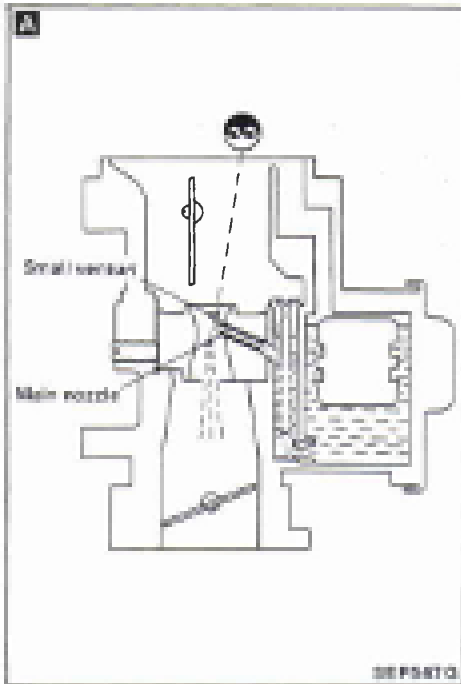
### **CLEANING AND INSPECTION**

Dirt, gum, water or carbon in or on exterior moving parts of carburetor can cause poor performance. Therefore, clean and inspect carburetor carefully.

Before assembling and installing carburetor, blow the passages and castings with compressed air, then blow all parts dry.

**Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.**





**Fuel Level  
INSPECTION**

Disconnect ignition wire between distributor and coil.

Disconnect fuel cut solenoid connector of carburetor.

**A** Check primary main nozzle to ensure that no fuel is discharging while cranking engine for approximately 3 seconds.

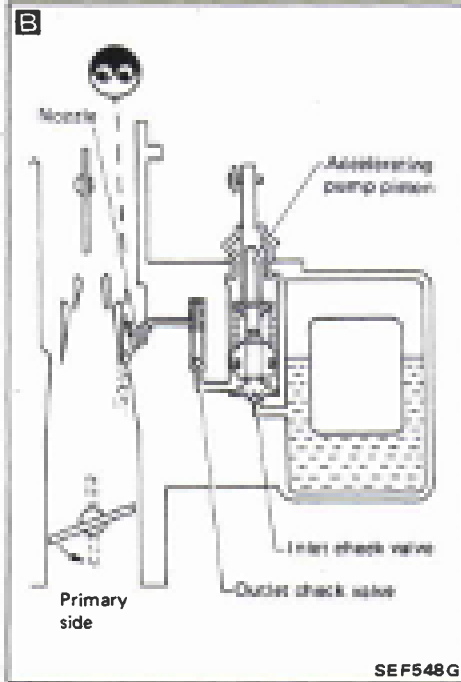
N.G.

Check needle valve for looseness or sticking. If necessary, repair or replace.  
Adjust fuel level.

**B** Check that acceleration pump nozzle injects fuel when throttle valve is opened.

N.G.

O.K.  
END



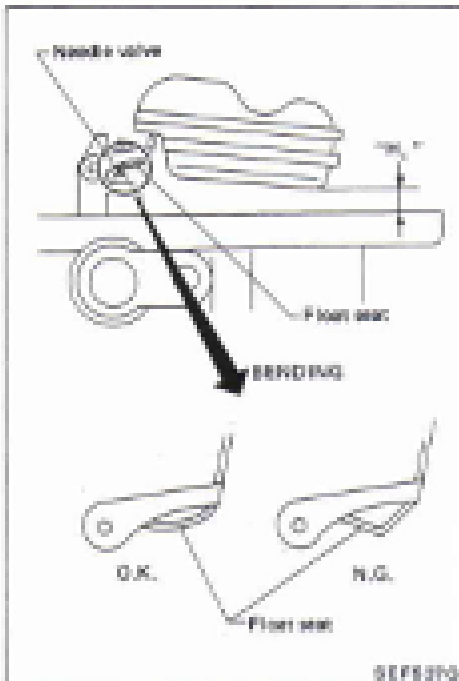
**Fuel Level (Cont'd)**

**ADJUSTMENT**

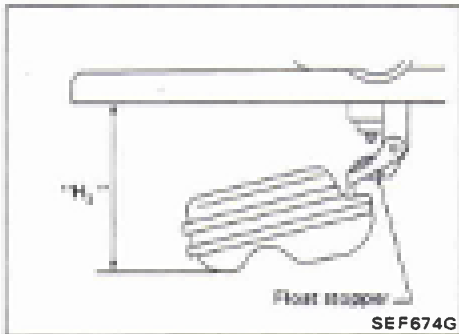
1. Remove carburetor from engine.
2. Remove float chamber cover from float chamber.
3. Turn carburetor upside down, and fix it horizontally.
4. Raise float fully, then lower it slowly until float seat contacts needle valve, and in this position, check height "H<sub>1</sub>".

**Height "H<sub>1</sub>": 9.5 - 10.5 mm (0.374 - 0.413 in)**

**If out of specification, adjust by bending float seat. Make sure needle valve slides smoothly on the float seat.**



SEF537G

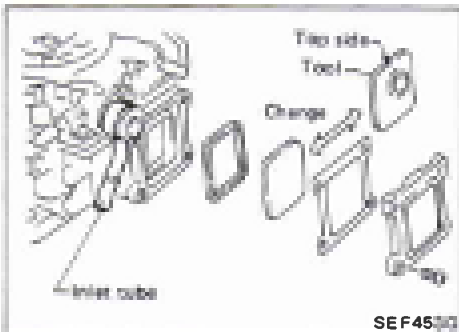


SEF674G

5. Lower float slowly until float stopper contacts carburetor, and in this position, check height "H<sub>2</sub>".

**Height "H<sub>2</sub>": 47.5 - 48.5 mm (1.870 - 1.909 in)**

**If out of specification, adjust by bending float stopper.**



SEF453G

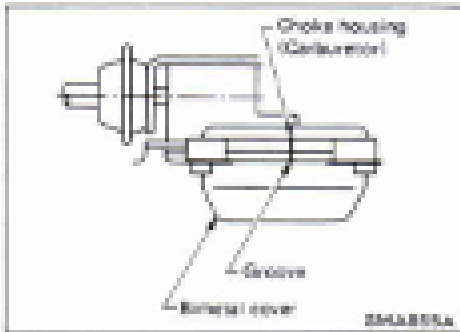
- If necessary, use Tool to visually check fuel level as follows:

1. Disconnect inlet fuel hose from carburetor, and plug opening.
  2. Start engine and wait for it to stop.
  3. Install Tool on carburetor, as shown.
- Be careful not to spill fuel.**
4. Connect inlet hose to carburetor.
  5. Start engine. Visually check fuel level.

**Automatic Choke**

**MECHANICAL CHECK**

1. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.
2. Push choke valve with your finger to check for smooth movement.

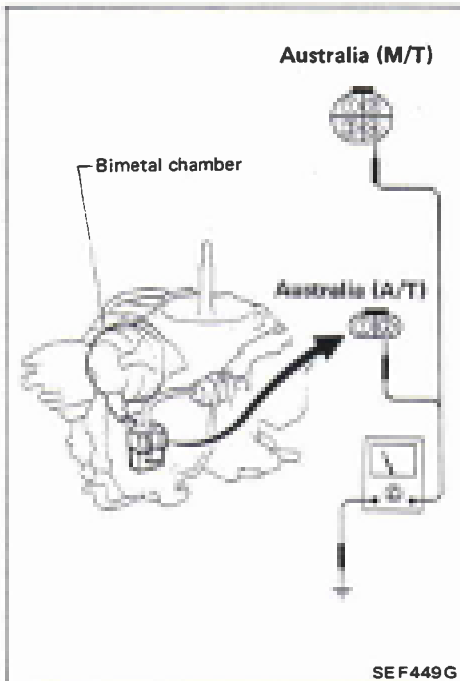


3. Make sure bimetal cover index mark is aligned with the center of choke housing index mark.
  4. Check wiring connection, and start engine.
  5. After warming up engine, ensure that choke valve is fully open.
- If not, check automatic choke circuit and heater.

**AUTOMATIC CHOKE HEATER**

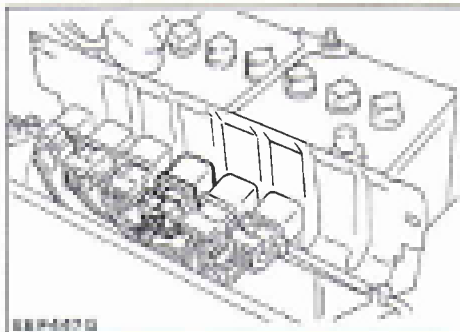
1. Disconnect carburetor harness connector.
2. Check for continuity between choke heater connector terminal ② or ④ and choke housing.

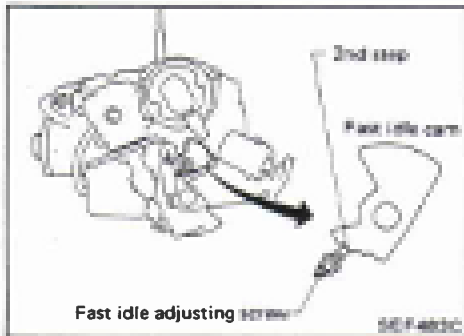
**Continuity should exist.**



**AUTOMATIC CHOKE RELAY**

Automatic choke relay is installed in the engine room. Check relay for proper operation.





**Fast Idle (Automatic Choke Model)**

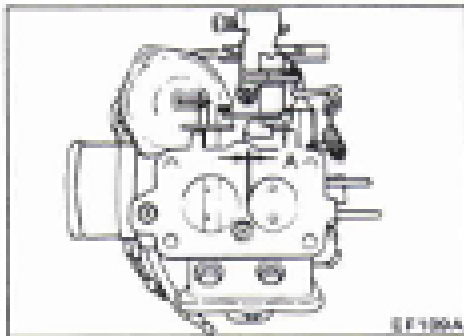
1. Warm up engine. Set fast idle arm on 2nd step of fast idle cam.
2. Check fast idle speed and if out of specification, adjust it by turning fast idle adjusting screw.

**Fast idle speed (at 2nd cam step):**

**M/T: 1,600 - 2,000 rpm**

**A/T: 1,800 - 2,200 rpm**

**Make sure that the engine is completely adjusted (idle rpm, ignition timing, etc.) before checking or adjusting fast idle speed.**



3. If out of specification, remove carburetor and make fast idle adjustments as follows.

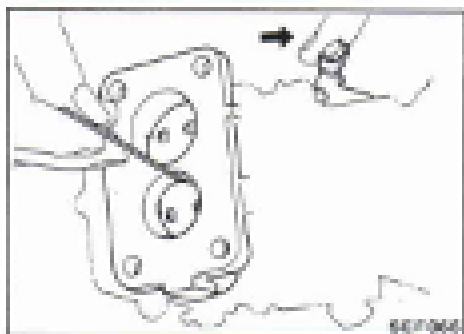
- 1) Place fast idle arm on 2nd step of fast idle cam, in the same manner as in step 1 above.
- 2) Adjust clearance "A" between primary throttle valve and inner carburetor wall by turning fast idle adjusting screw.

**Clearance "A":**

**M/T: 1.37 ± 0.14 mm (0.0539 ± 0.0055 in)**

**A/T: 1.64 ± 0.14 mm (0.0646 ± 0.0055 in)**

**If after adjustment and installation, the fast idle speed is out of specification, check clearance "A" values.**



**Fast Idle (Manual Choke Model)**

Check clearance "A" between primary throttle valve and inner wall by pulling choke lever completely.

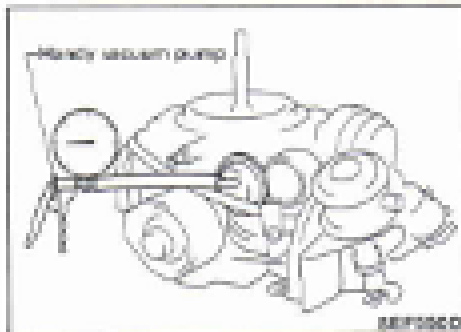
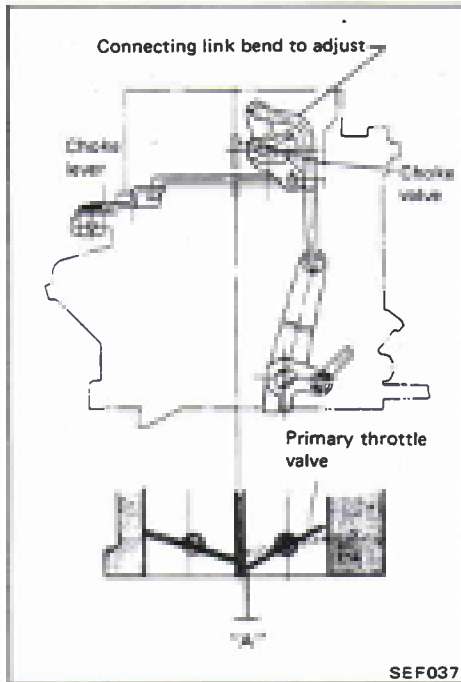
**Clearance "A":**

**M/T: 2.25 ± 0.15 mm (0.0886 ± 0.0059 in)**

**A/T: 2.58 ± 0.15 mm (0.1016 ± 0.0059 in)**

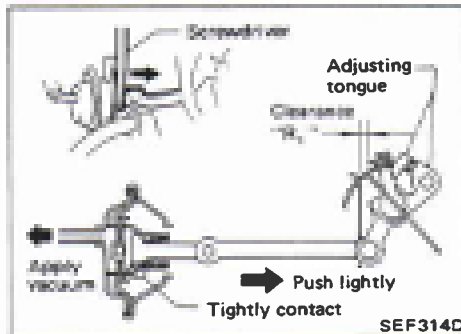
If out of specification, adjust it by bending choke connecting rod.

Fast Idle (Manual Choke Model) (Cont'd)

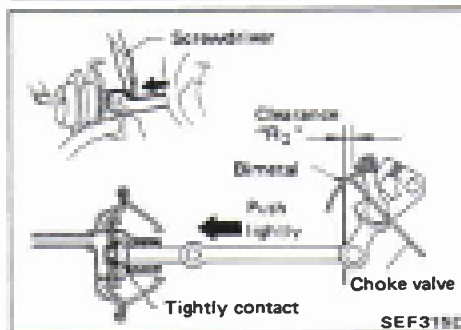


Vacuum Break

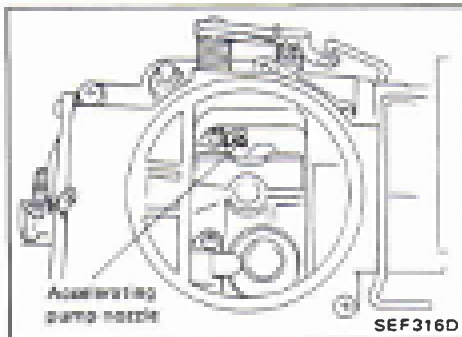
1. With engine cold, visually check that choke valve is fully closed.
2. Apply vacuum to vacuum break diaphragm with a handy vacuum pump.



3. Lightly push piston rod in the direction that closes choke valve and check clearance "R<sub>1</sub>".  
**Clearance "R<sub>1</sub>":**  
 $3.25 \pm 0.25 \text{ mm } (0.1280 \pm 0.0098 \text{ in})$   
 If out of specification, adjust "R<sub>1</sub>" by bending tongue.



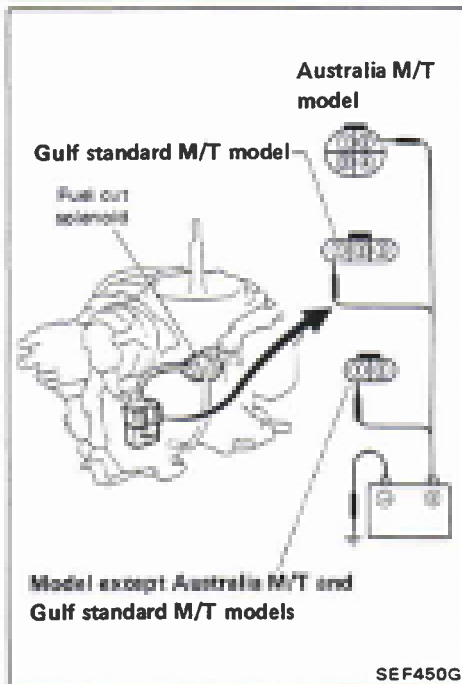
4. Lightly push piston rod toward diaphragm and check clearance "R<sub>2</sub>".  
**Clearance "R<sub>2</sub>":**  
 $5.0 \pm 0.5 \text{ mm } (0.197 \pm 0.020 \text{ in})$   
 If out of specification, recheck and adjust clearance "R<sub>1</sub>".



### Accelerating Pump

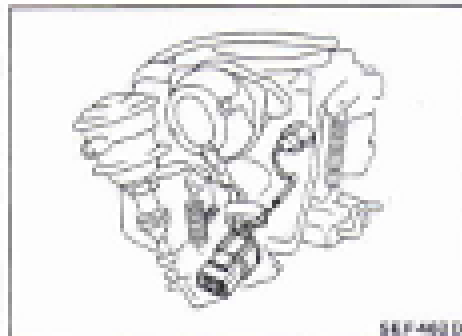
Operate accelerating pump by opening throttle lever with engine stopped. Check that pump nozzle located at primary port injects fuel smoothly without delay.

If it does not inject, check accelerating pump piston or linkage.



### Fuel Cut Solenoid Valve

1. Connect solenoid valve connector to battery.
2. Check "click" sound from solenoid valve when battery is connected and disconnected.



3. If no sound is heard from fuel cut solenoid valve, replace with a new one.

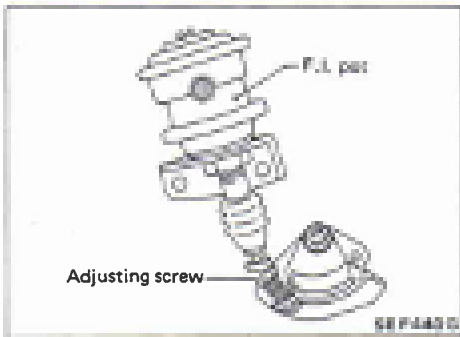
- 1) Disconnect harness from harness connector.



- 2) Remove fuel cut solenoid valve from carburetor.

- 3) Install new fuel cut solenoid valve.

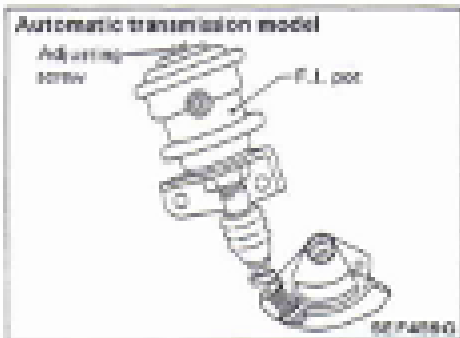
**After replacement, start engine and check that fuel cut solenoid is in good condition.**



**F.I. (Fast Idle) Pot (A/T model only)**

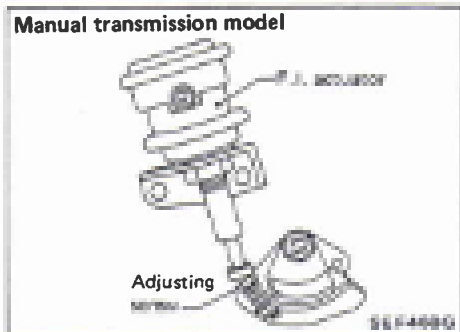
**DASH POT**

1. Warm up engine sufficiently.
2. Check idle speed and mixture ratio.
  - Idle speed:**
  - 650 ± 50 rpm (M/T)**
  - 650 ± 50 rpm (A/T in "D" position)**
  - Idle "CO":**
  - 1.5 ± 0.5%**
3. Turn throttle valve by hand, and read engine speed when dash pot just touches stopper lever.
  - Dash pot touch speed:**
  - 1,700 ± 100 rpm**
4. If out of specifications, adjust it by turning adjusting screw.
5. After adjusting, make sure that engine speed drops smoothly from 2,000 to 1,000 rpm in approximately three seconds.



**F.I. Actuator**

1. Warm up engine sufficiently.
2. Check idle speed and mixture ratio.
  - Idle speed:**
  - 650 ± 50 rpm (M/T)**
  - 650 ± 50 rpm (A/T in "D" position)**
  - Idle "CO":**
  - 1.5 ± 0.5%**
3. Turn air conditioner switch "ON", and check idle speed.
  - Idle speed (When A/C is "ON"):**
  - 1,100 ± 50 rpm (M/T)**
  - 900 ± 50 rpm (A/T in "N" position)**
4. If out of specification, adjust idle speed by turning adjusting screw.



## CHECKING AND ADJUSTING IDLE SPEED, IGNITION TIMING AND MIXTURE RATIO

---

T142

### CAUTION:

Do not attempt to screw idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

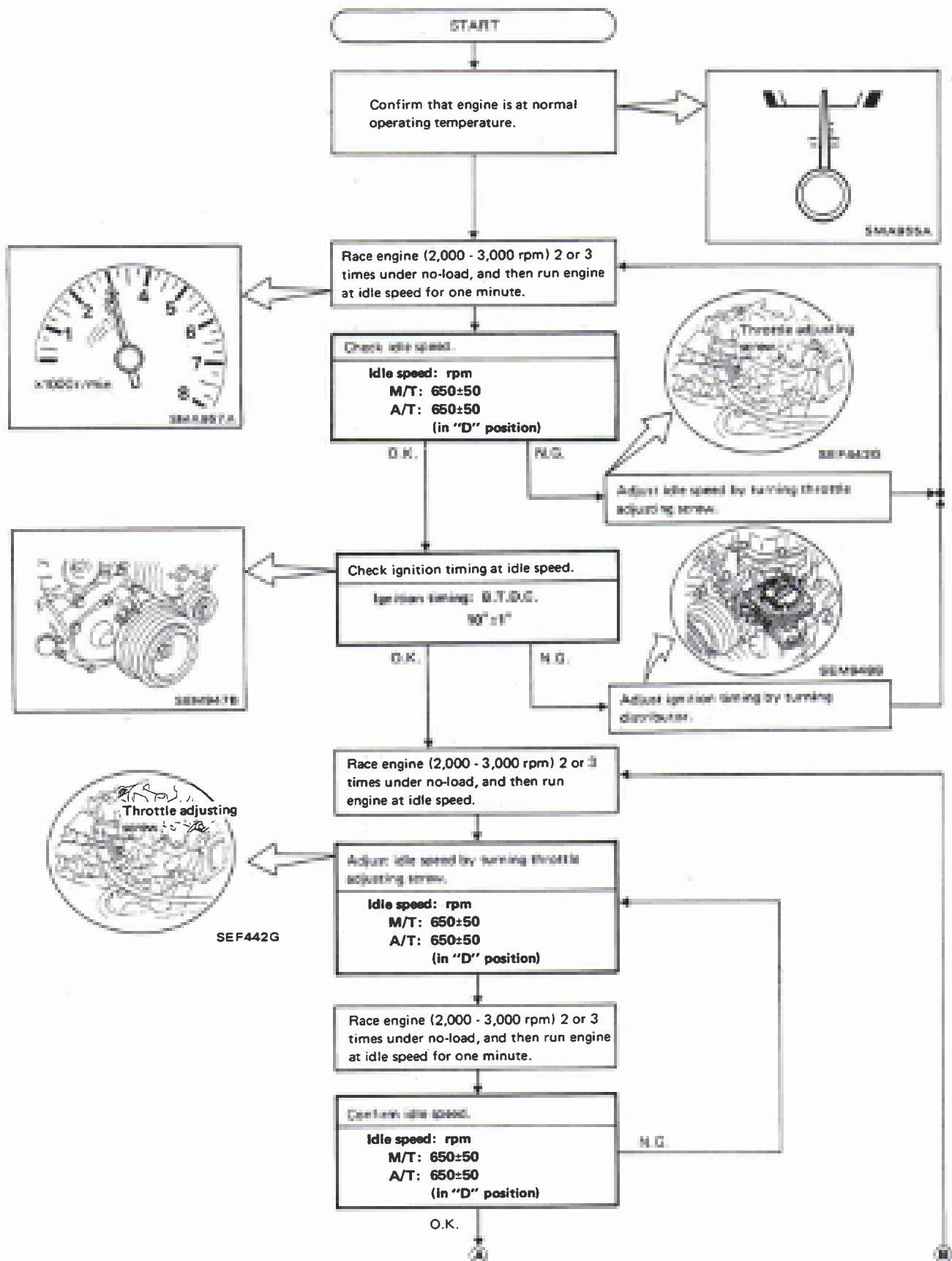
### PREPARATION

1. Set shift lever in "Neutral" position (in "N" or "P" position for the automatic transmission). Engage parking brake and lock both front and rear wheels with wheel chocks.
2. Turn off air conditioner and light switch.
3. Use "CO"-meter after it is fully warmed up, and insert "CO"-meter probe into tail pipe more than 0.4 m (1.3 ft).
4. Measure "CO"% with air cleaner installed.
5. During checking and adjusting, make sure that engine is at normal operating temperature.



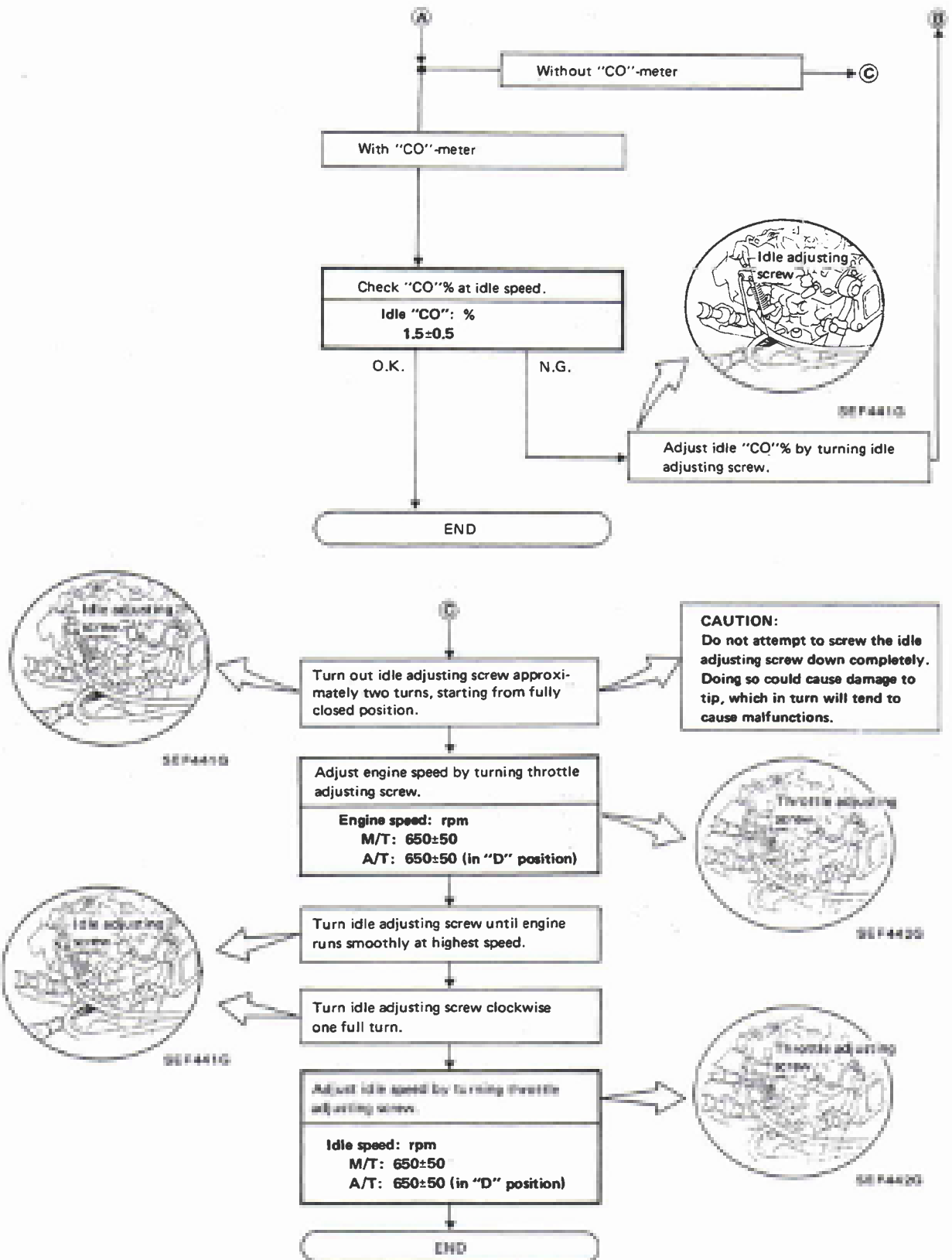
# CHECKING AND ADJUSTING IDLE SPEED, IGNITION TIMING AND MIXTURE RATIO

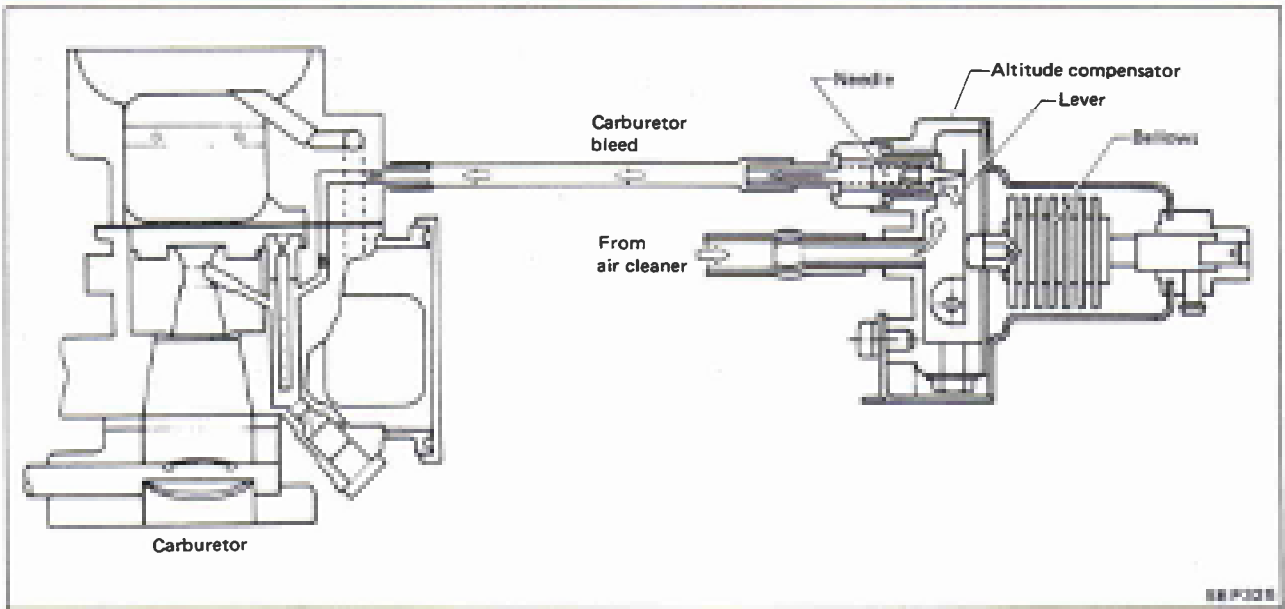
TB42



# CHECKING AND ADJUSTING IDLE SPEED, IGNITION TIMING AND MIXTURE RATIO

TB42



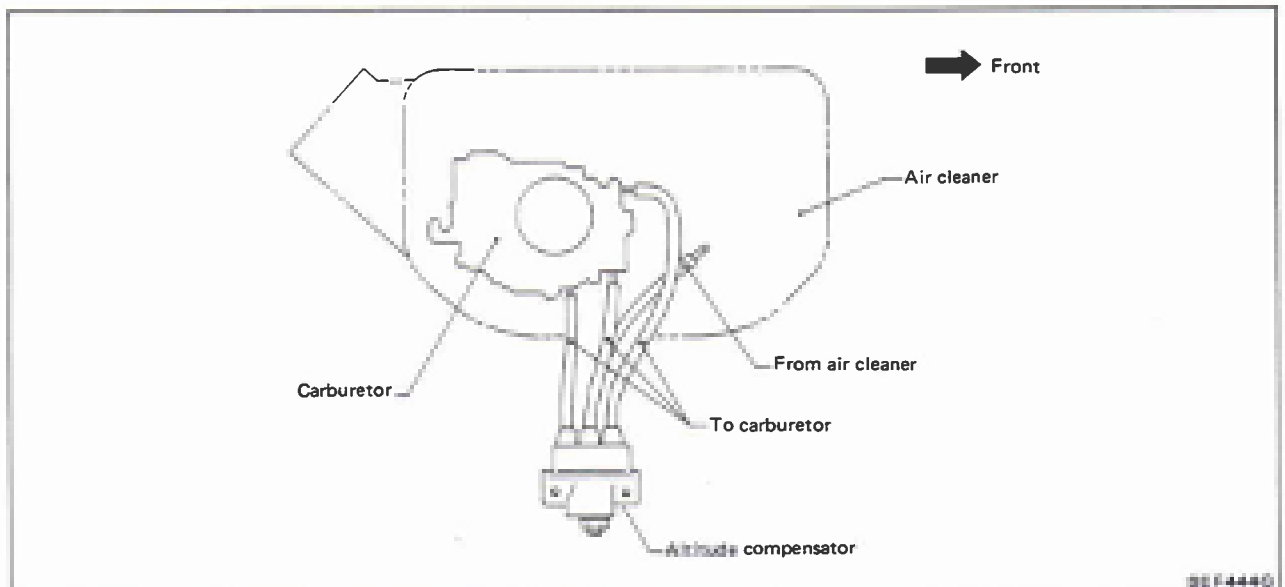


**System Description**

The higher the altitude, the thinner the density of air. At a higher altitude, therefore, the carburetor produces too rich of an air-fuel mixture.

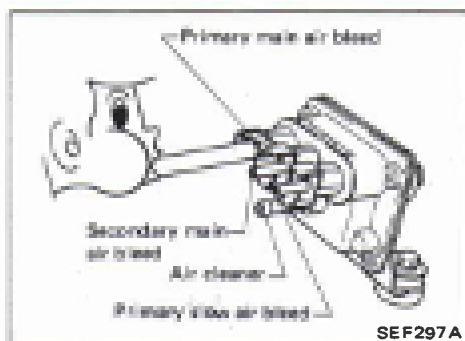
The altitude compensator automatically corrects air-fuel mixture to an optimum ratio. It operates in the following sequence in high altitudes.

1. The bellows in the altitude compensator extend.
2. The lever attached to the bellows then pushes up the needle.
3. When the needle is pushed up, the air passage becomes wider, allowing a larger amount of air to flow from the altitude compensator to the carburetor.
4. With this additional air in the carburetor, the air-fuel mixture thins to a proper ratio.



## System Inspection

- a. The altitude compensator is set to operate above an altitude of approximately 500 m (1,641 ft). It should be carefully checked.
- b. When making this check, ensure that all other parts are working properly.
- c. The altitude compensator cannot be adjusted; if it is found to be functioning unsatisfactorily, it must be replaced as an assembly.
- d. The hoses are color-coded. When connecting them, be sure to align them with the proper color marks on the unit.



## COMPENSATOR AT LOW ALTITUDES

If compensator operates at low altitudes:

When compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air flows through smoothly, replace the unit as an assembly.

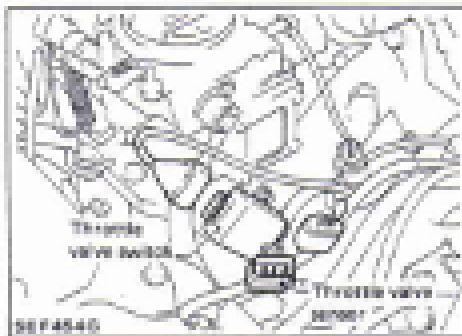
## COMPENSATOR AT HIGH ALTITUDES

If compensator does not operate at high altitudes:

When compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air does not flow through smoothly, replace the unit as an assembly.

**Wiring Diagram**

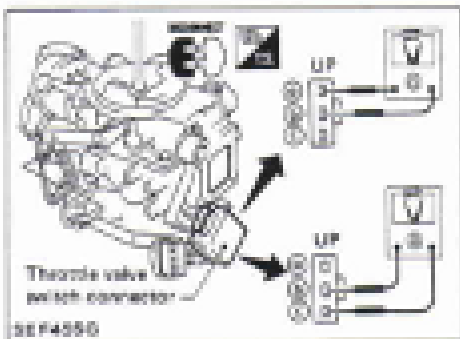
Refer to "AT" section.



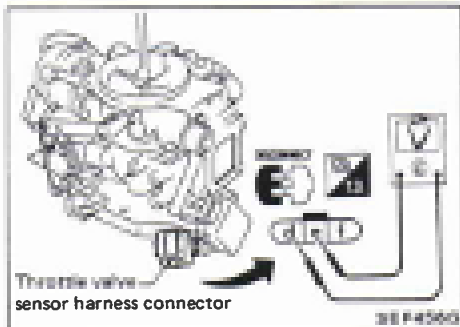
**Inspection**

**THROTTLE VALVE SWITCH**

1. Check engine speed during idle switch OFF → ON conversion.
  - 1) Warm up engine sufficiently.
  - 2) Disconnect throttle valve switch and throttle sensor harness connector.
  - 3) Check idle speed.
    - 650 ± 50 rpm (in "D" position)**
    - If not correct, adjust by turning throttle adjusting screw.
  - 4) Shift select lever to "N" position, then read idle speed Nat.
  - 5) Manually open throttle valve to about 2,000 rpm, lower engine speed slowly and read the engine speed at which the idle contact turns from OFF to ON.
    - (Nat + 250) ± 150 rpm (in "N" position)**
    - If not correct, adjust by loosening throttle valve switch securing screws and turning throttle valve switch.
  - 6) Reconnect throttle valve switch and throttle sensor harness connector.



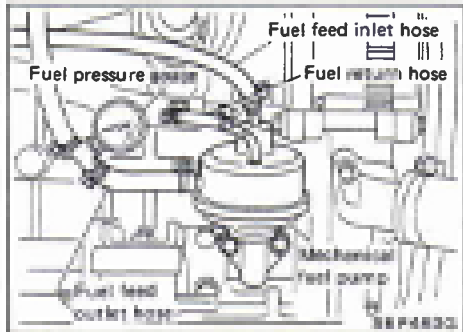
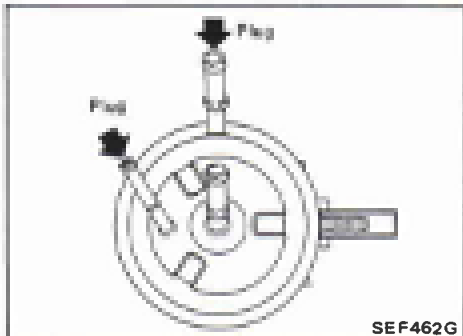
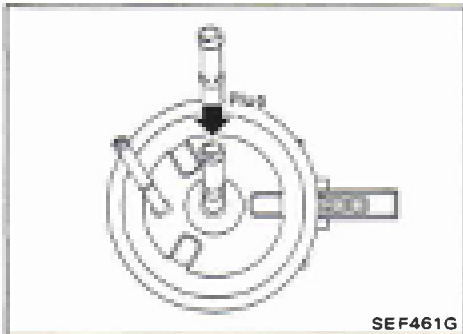
2. Check continuity of throttle valve switch.
  - 1) Disconnect throttle valve switch harness connector.
  - 2) Check resistance between terminals a and b when throttle valve switch closes fully.
    - Resistance:**
    - Approximately 0Ω**
  - 3) Check resistance between terminals b and c when throttle valve switch opens fully.
    - Resistance:**
    - Approximately 0Ω**
    - If necessary, replace throttle valve switch.



**THROTTLE VALVE SENSOR**

Check resistance of throttle valve sensor.

- 1) Disconnect throttle valve sensor harness connector.
- 2) Check resistance between d and e changes when opening throttle valve manually.
  - Resistance should change.**
  - If not, replace throttle valve sensor. Check engine speed during idle switch OFF → ON conversion.



## Operation

1. Flush pump by immersing it in a fuel bath and operating the rocker arm several times.
2. Drain fuel from fuel pump. Then plug up inlet port with fingers and check that pump arm does not move.
3. Remove finger from inlet port and listen for a suction sound which will confirm that sufficient suction was produced.
4. Plug up outlet port and return port. Once again operate rocker arm. After air pressure has been built up, confirm that the pressure remains for two or three seconds after.
5. Put a finger over the outlet port and again build up pressure in the pump. Then submerge pump in a fuel bath and check for air leaks.

## WARNING:

**Before starting to work on any part of fuel system, disconnect ground cable from battery. When disconnecting fuel hoses, use a container to catch fuel remaining in the hoses.**

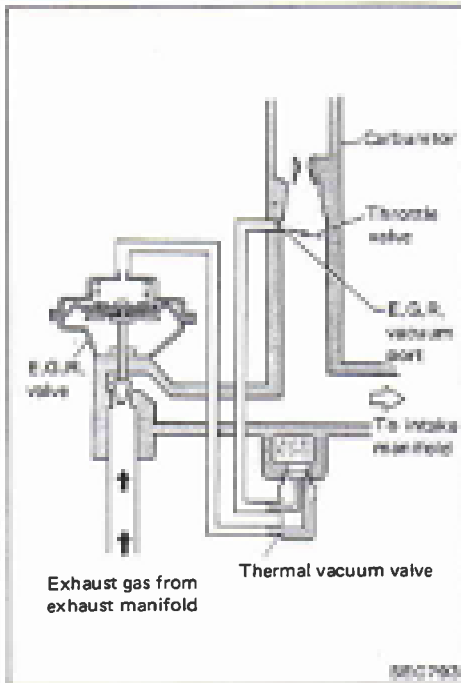
## Fuel Pressure

1. Disconnect fuel return hose and plug with a suitable blind plug.
2. Disconnect fuel feed outlet hose and connect fuel pressure gauge between fuel pump and carburetor.
3. Check static fuel pressure with engine running at various speeds.

### Fuel pump static pressure:

25.5 - 32.4 kPa (0.255 - 0.324 bar,  
0.26 - 0.33 kg/cm<sup>2</sup>, 3.7 - 4.7 psi)

**If out of specification, check for fuel filter clogging or improper fuel pump operation.**

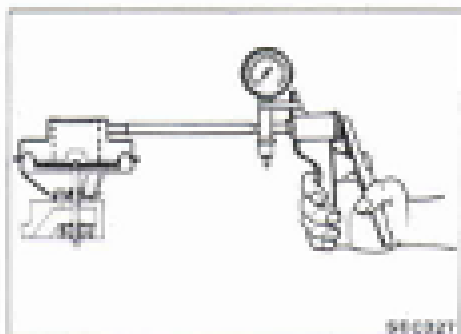


**System Description**

The exhaust gas recirculating system is provided as a means of emission control. It routes a portion of the exhaust gas into the intake manifold for recombustion, thereby reducing the NOx level. The amount of exhaust gas recirculated depends on the port vacuum which operates the E.G.R. control valve.

1. During idling  
No port vacuum is generated because of low exhaust gas pressure. The vacuum port located upstream of the throttle valve and the E.G.R. valve remains closed.
2. Exhaust gas pressure is less than the pressure of E.G.R. control valve return spring.  
The throttle valve begins to open, generating port vacuum. Hence, the E.G.R. control valve opens.
3. Exhaust gas pressure greater than E.G.R. control valve return spring.  
If the throttle valve opens further, the port vacuum weakens and the E.G.R. control valve begins to close.
4. With throttle valve fully open  
When the throttle valve opens fully, no port vacuum exists and the E.G.R. valve closes.

In addition to the above, a T.V.V. (Thermal Vacuum Valve) is installed in the E.G.R. control vacuum line. This valve closes the vacuum port at low temperatures, thereby keeping the E.G.R. control valve closed.

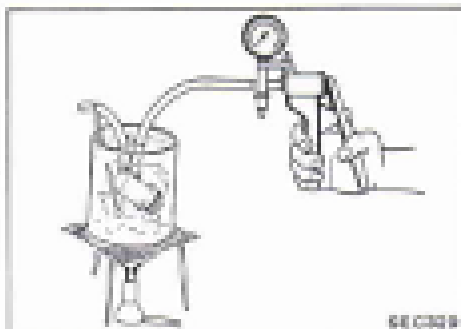


**System Inspection**

**E.G.R. CONTROL VALVE**

1. Supply the E.G.R. control valve with vacuum using a handy vacuum pump.
2. Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

**Full open of E.G.R. valve:**  
Over -14.7 kPa  
(-147 mbar, -110 mmHg, -4.33 inHg)



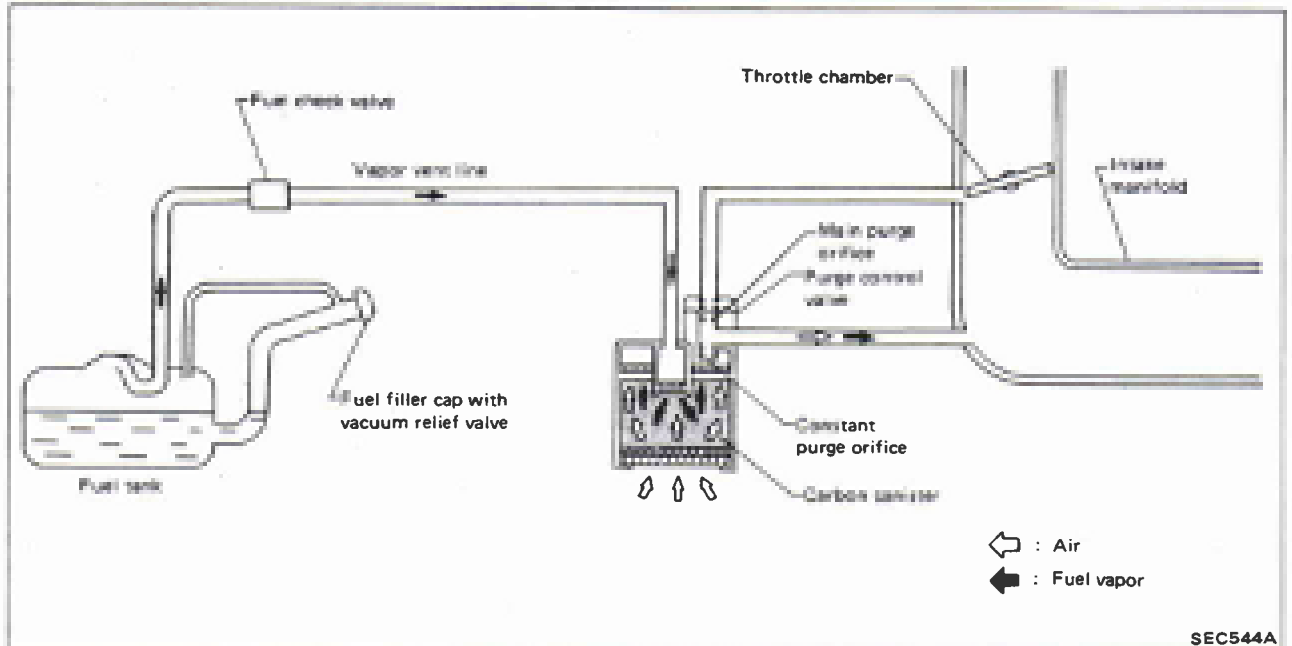
**T.V.V. (Thermal Vacuum Valve)**

Apply vacuum to thermal vacuum valve and ensure that thermal vacuum valve opens at a temperature of about 50°C (122°F) conducting vacuum passage.

**Do not let water enter thermal vacuum valve.**  
**Be sure to apply sealer to threads of the valve prior to installing new valve.**

**Ⓜ : Thermal vacuum valve**  
18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)

## System Chart



SEC544A

## System Description

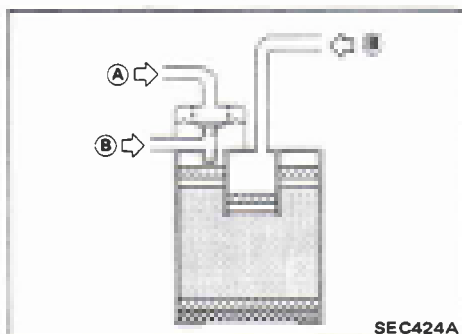
The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon, and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



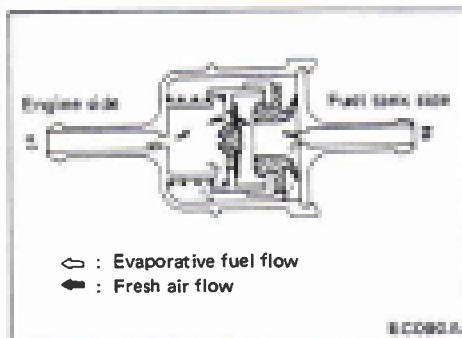


SEC424A

### Carbon Canister

Check carbon canister as follows.

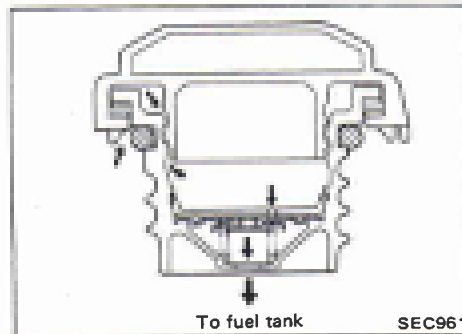
- Ⓐ : Blow air and ensure that there is no leakage.
- Ⓑ : Blow air and ensure that there is leakage.



SEC083A

### Fuel Check Valve

1. Blow air through connector on fuel tank side.  
A considerable resistance should be felt, and a portion of air flow should be directed toward the canister.
2. Blow air through connector on the canister side.  
Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

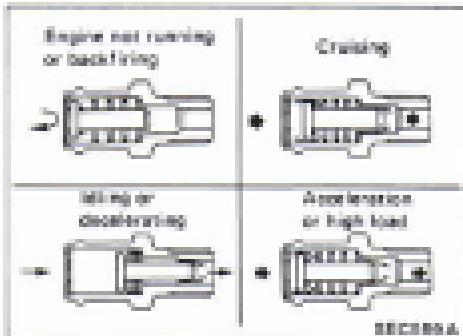
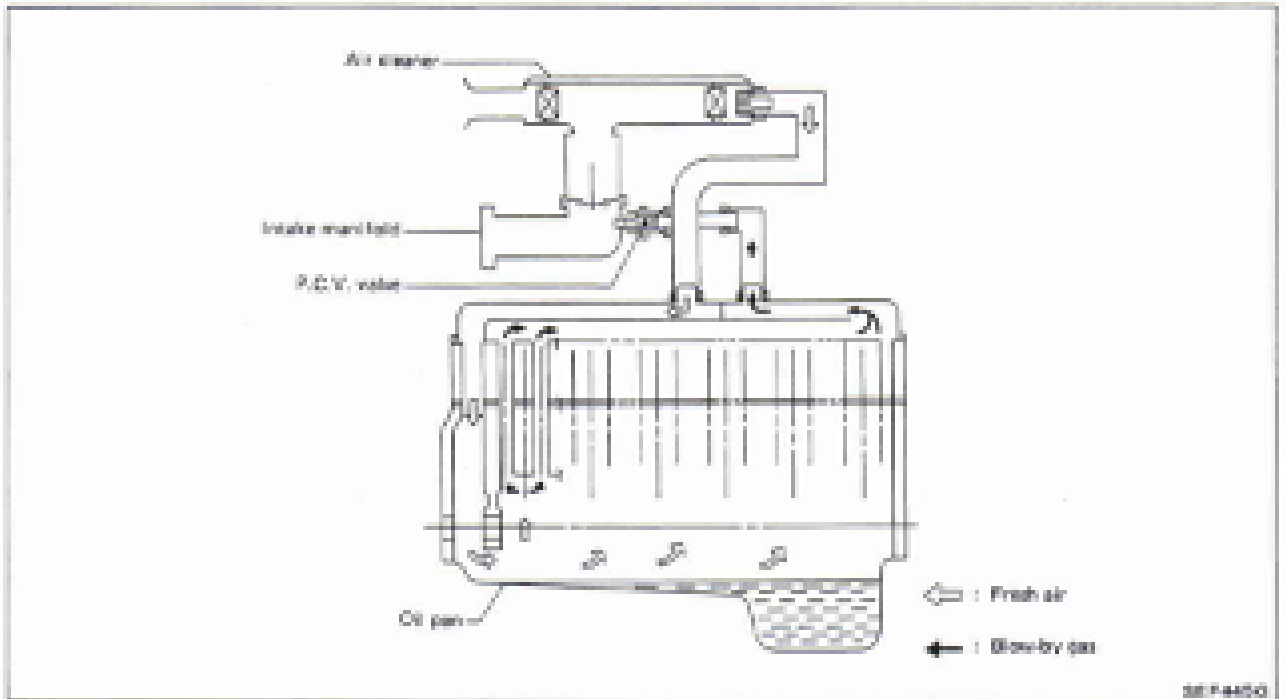


SEC961

### Fuel Tank Vacuum Relief Valve

1. Wipe clean valve housing.
2. Inhale air through fuel filler cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.

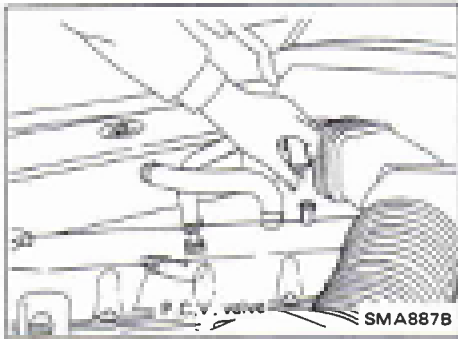
### System Description



The positive crankcase ventilation (P.C.V.) valve provides crankcase blow-by gas to the intake manifold.

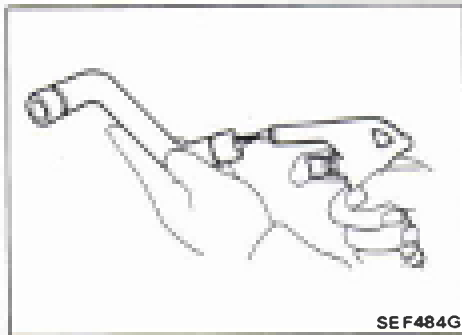
### System Inspection

Refer to MA section.



**P.C.V. (Positive Crankcase Ventilation) Valve**

With engine running at idle, remove ventilation hose from P.C.V. valve; if valve is working properly a hissing noise will be heard as air passes through it, and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

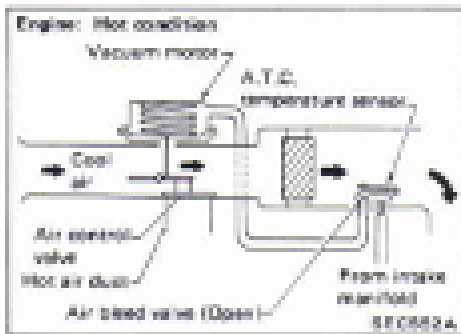
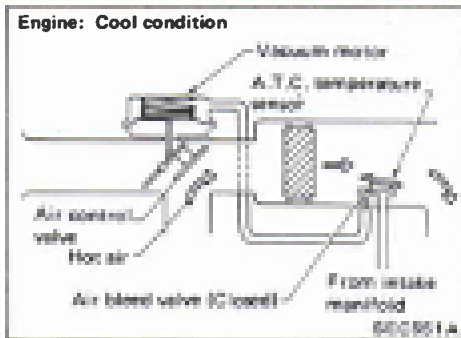


**Ventilation Hose**

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

# AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER SYSTEM

TB42



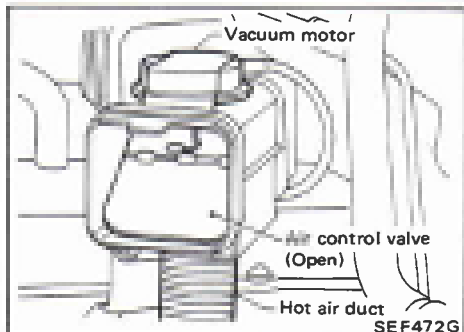
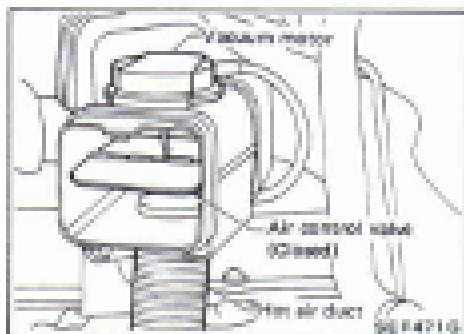
## System Description

The automatic temperature control system maintains the temperature of air sucked in the carburetor within the constant range, thereby enabling lean setting for carburetor calibration. In addition to this, the automatic temperature control system is effective to improve the warm-up characteristics of the engine and to prevent carburetor from icing.

The automatic temperature control system is controlled by the inlet air temperature and the load condition of the engine. The inlet air temperature is detected by the sensor, installed in the air cleaner, and the vacuum motor is actuated by the intake manifold vacuum.

When the engine is not warmed up sufficiently, since the A.T.C. temperature sensor passes the intake manifold vacuum to the vacuum motor, the motor actuates and hot air is introduced into the air cleaner. In this step, the higher the intake manifold vacuum is, the wider the air control valve opens.

When the engine is warmed up, the A.T.C. temperature sensor releases to the atmosphere the intake manifold vacuum leading to the vacuum motor. Therefore, the vacuum motor deactivates. In this step, the air control valve shuts off hot air, allowing normal temperature air to flow to the air cleaner.



## System Inspection

- Engine stall or hesitation
- Increase in fuel consumption
- Lack of power

If these phenomena occur, check A.T.C. system before carrying out inspection of carburetor.

1. Check hoses for cracks, distortion and improper position.
2. Check A.T.C. system for proper function while engine is cool. Check air control valve position.

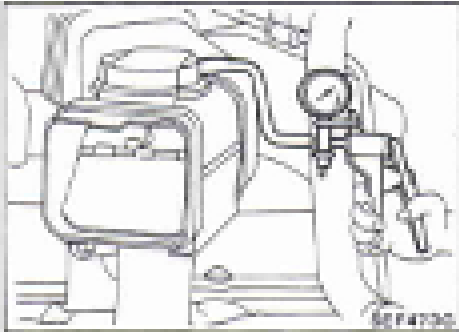
Air control valve is correct if it is in lower position.

3. Start engine and immediately check air control valve position. If it rises, it is correct.
4. Make sure that air control valve moves up and down when engine speed is quickly increased and decreased.
5. Make sure that air control valve partially rises when engine warm-up advances.

If the above test reveals any problem in the operation of air control valve, carry out the following test:

# AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER SYSTEM

TB42



## Vacuum Motor

Disconnect inlet vacuum hose of vacuum motor, and connect another hose to the inlet to apply vacuum to vacuum motor. Then, confirm that air control valve moves.

### Air control valve operating vacuum:

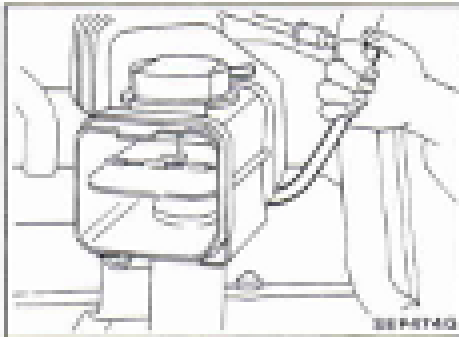
kPa (mbar, mmHg, inHg)

#### Opening starts

-9.6 (-96, -72, -2.83)

#### Full opening

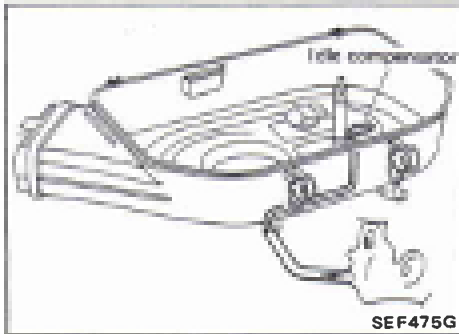
Over -19.5 (-195, -146, -5.75)



## Temperature Sensor

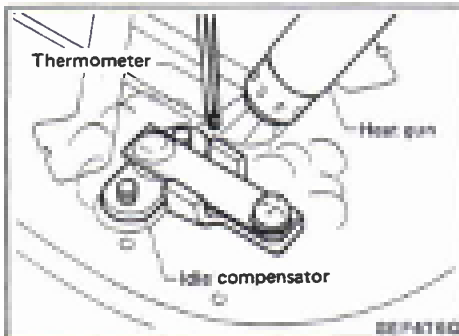
While engine is cool and idling, disconnect inlet vacuum hose of vacuum motor and make sure that intake manifold vacuum is present at the end of the vacuum hose. If vacuum is weak or is nonexistent, check vacuum hose for leakage.

Replace temperature sensor if vacuum hoses are in good condition. After engine warms up, make sure no vacuum exists. If necessary, replace temperature sensor.



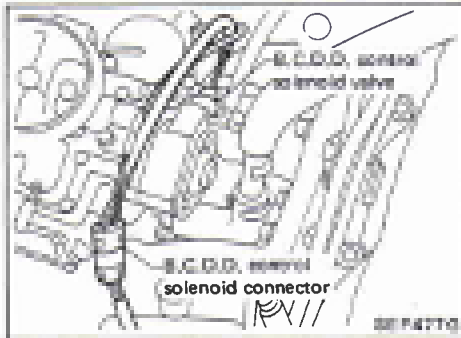
## Idle Compensator Inspection

1. Remove air cleaner.
2. Suck on the hose to make sure that idle compensator does not open.



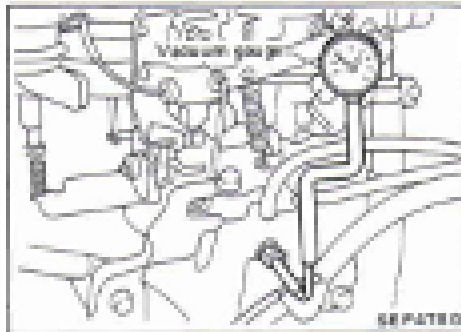
3. Direct warm air to idle compensator with a heat gun. And measure operating temperature of idle compensator.
  - Place thermometer as close as possible to idle compensator sensor.
4. Idle compensator is in good condition if air flow opens idle compensator when it reaches operating temperature.
  - Take care not to bend or damage bimetals of idle compensator.

Temperature around idle compensator	°C (°F)
idle compensator partially opens	65 - 74 (149 - 165)
Idle compensator fully opens	Above 74 (165)

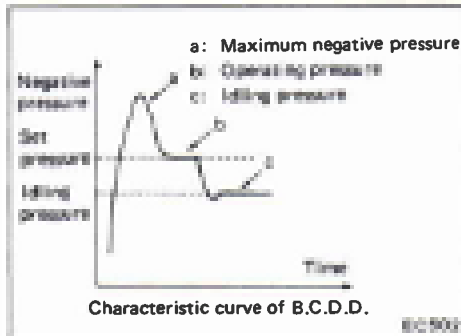


**Boost Controlled Deceleration Device (B.C.D.D.) Overall Inspection**

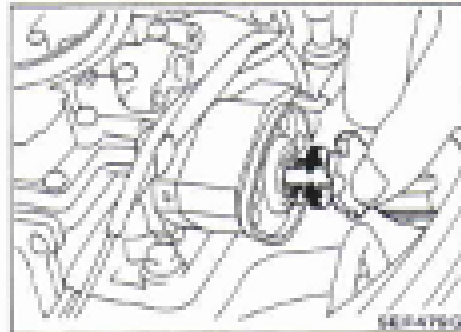
1. Disconnect B.C.D.D. control solenoid connector.
  - This is necessary for Australia M/T and Gulf standard M/T models. For other models, perform inspection and adjustment from item 2.



2. Fully loosen dash pot adjusting screw, if equipped. After inspection and adjustment have been made, readjust dash pot touch speed. Refer to EF & EC section.
3. Connect vacuum gauge to intake manifold.



4. Start engine and observe vacuum gauge while racing engine.
5. If B.C.D.D. is in good condition, vacuum gauge will follow the pattern shown in the figure at left. Set pressure are shown in item 6.



6. If it does not react as described above, adjust operating pressure.
  - 1) Remove rubber cap on B.C.D.D.
  - 2) Racing engine, turn adjusting screw until the specified set pressure is obtained.

**B.C.D.D. set pressure (at sea level):**

**For Australia M/T and Gulf standard M/T models**

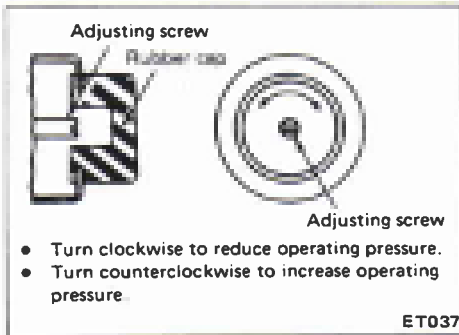
$-76.0 \pm 0.7$  kPa ( $-760 \pm 7$  mbar,  
 $-570 \pm 5$  mmHg,  $-22.44 \pm 0.20$  inHg)

**For model except Australia M/T and Gulf standard M/T models**

$-78.6 \pm 0.7$  kPa ( $-786 \pm 7$  mbar,  
 $-590 \pm 5$  mmHg,  $-23.23 \pm 0.20$  inHg)

## Boost Controlled Deceleration Device (B.C.D.D.) Overall Inspection (Cont'd)

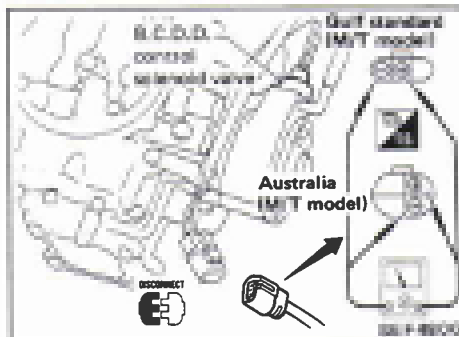
- Turning adjusting screw one-quarter rotation will cause a change in operation pressure of about 2.7 kPa (27 mbar, 20 mmHg, 0.79 inHg).
- Do not fit tip of screwdriver into screw slot.



## Circuit Check

- Disconnect carburetor harness connector.
- Turn ignition switch "ON" and check voltage between terminals of B.C.D.D. control solenoid valve at main harness side connector.

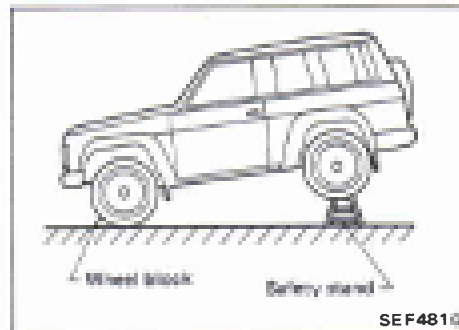
**Battery voltage should exist.**



- Jack up the rear of the vehicle, support with safety stands, block front wheels, and set parking brake.
- Start engine and drive rear wheels until speedometer indicates 20 km/h (12 MPH) by putting transmission in 1st gear and depressing accelerator pedal.

### WARNING:

**For safety, do not drive rear wheels, at higher speeds than necessity.**

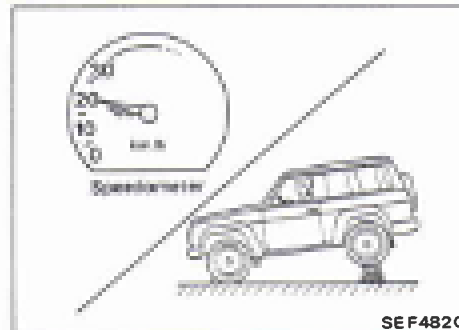


- Disengage clutch and slowly decelerate without braking.
- Ensure that voltmeter indicates as follows:

**Below 10 km/h (6 MPH): Battery voltage**

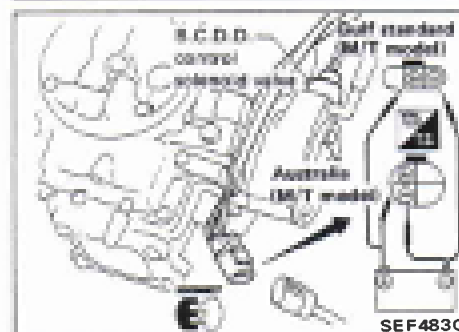
**Above 10 km/h (6 MPH): 0 [V]**

If out of specification, check harness continuity between B.C.D.D. control solenoid valve and ignition switch.

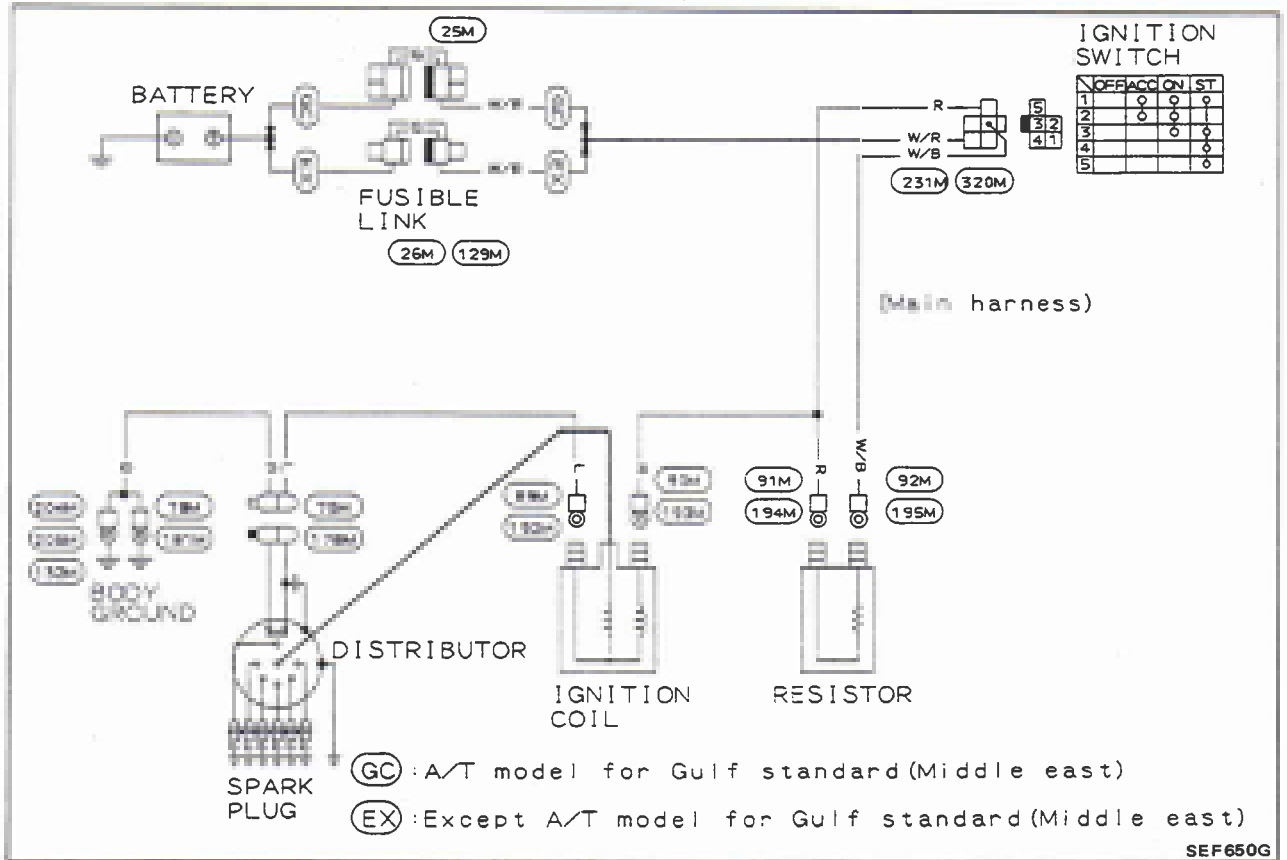


## B.C.D.D. Control Solenoid Valve

Check function of B.C.D.D. control solenoid valve after disconnecting its connector. Listen for clicking sound of solenoid valve, applying battery voltage to solenoid valve.

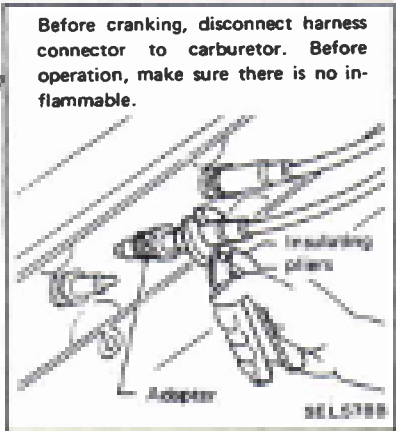
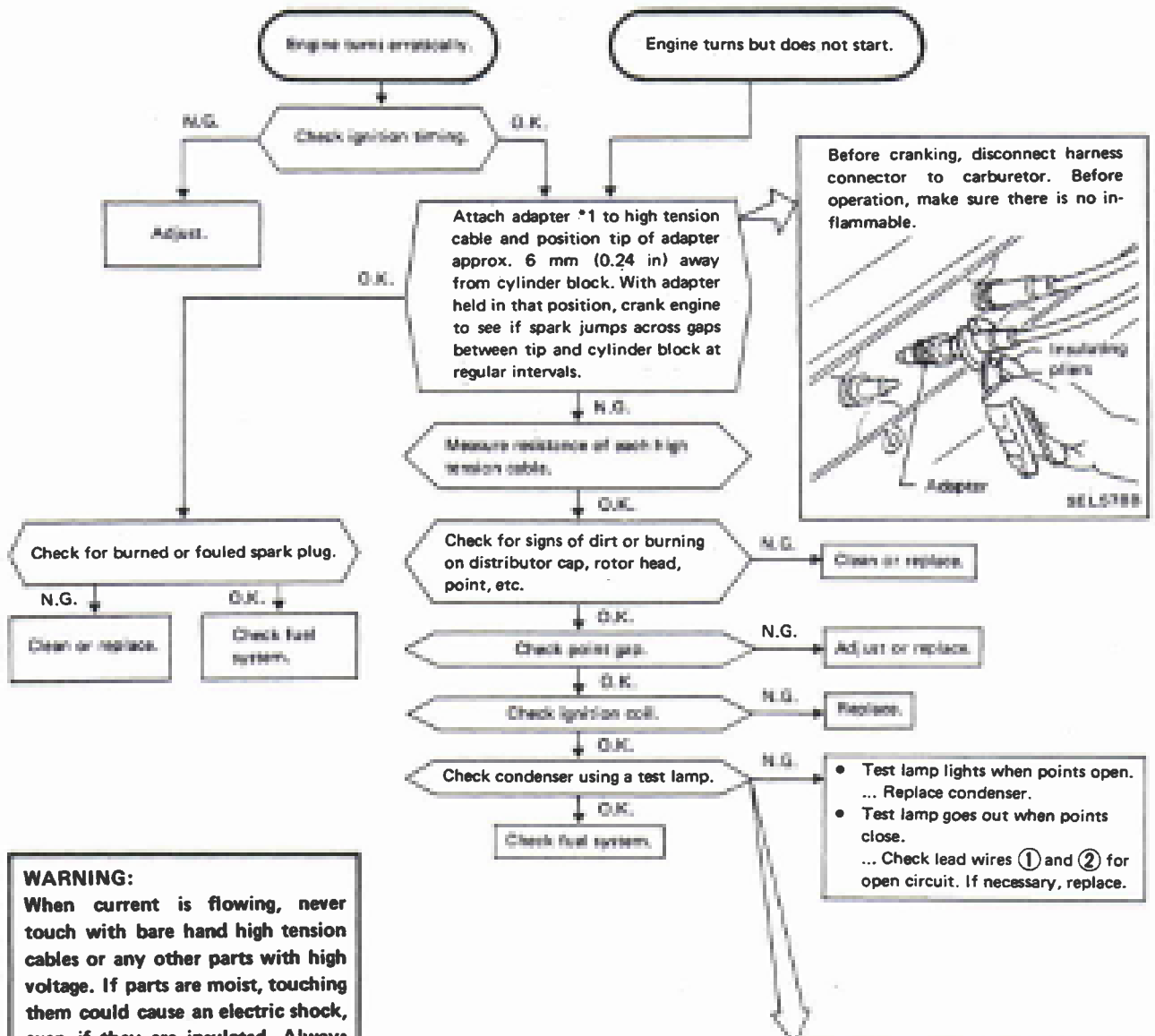


Wiring Diagram



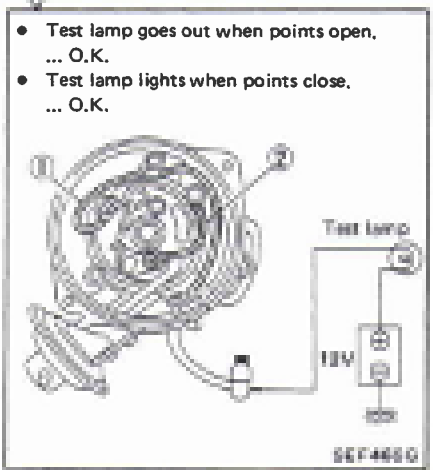
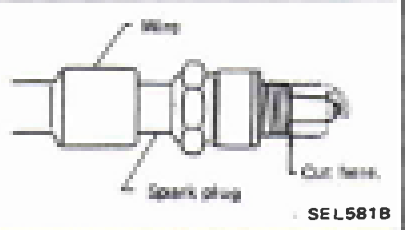


## Trouble-shooting

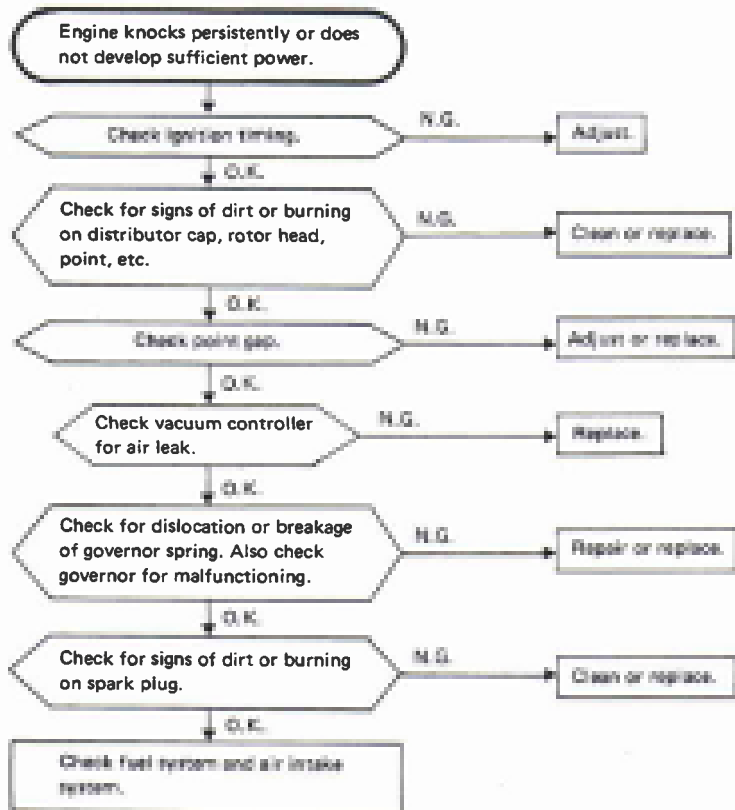


**WARNING:**  
 When current is flowing, never touch with bare hand high tension cables or any other parts with high voltage. If parts are moist, touching them could cause an electric shock, even if they are insulated. Always wear dry, well-insulated gloves or wrap affected parts with dry cloth before handling.

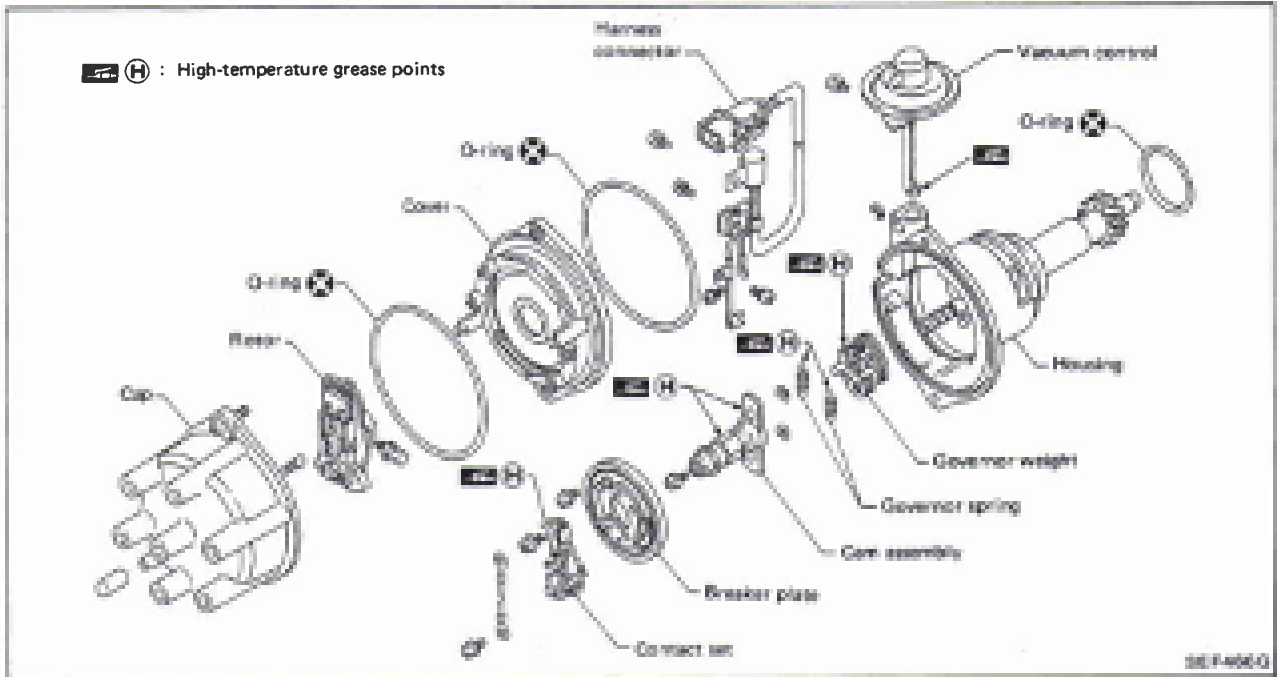
\*1:  
 Preparation of spark plug for checking  
 Many things can be utilized as an adapter. However, it is recommended that a used spark plug whose threaded portion has been half cut off as shown in the figure be utilized.

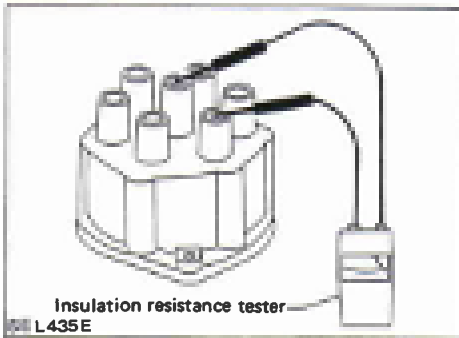


Trouble-shooting (Cont'd)



Construction





## Distributor Component Check

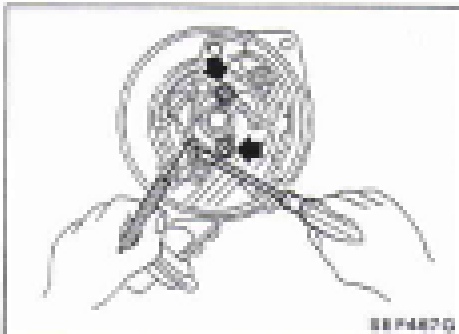
### CAP AND ROTOR HEAD

1. Check the cap and rotor head for dust, carbon deposits and cracks.
2. Measure insulation resistance between electrodes on ignition coil and spark plug sides on the cap.

#### Insulation resistance:

**More than 50 [MΩ]**

- Less than specified value ... Replace.

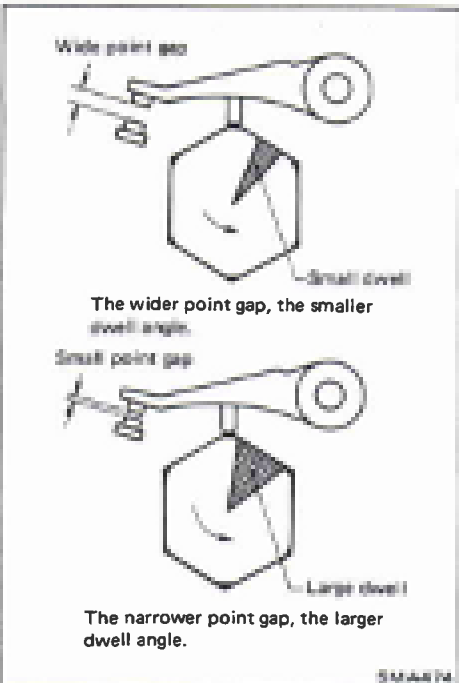


### CONTACT POINT

1. Check the point surface.  
Take off any irregularities with fine sandpaper (No. 500 or 600) or with oil stone.
2. Adjust point gap.  
Loosen breaker point set screw and adjust gap with a gap gauge.

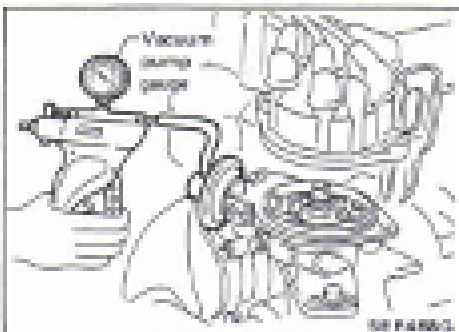
#### Point gap:

**0.45 - 0.55 mm (0.018 - 0.022 in)**



### DWELL ANGLE

1. Start engine and warm it up.
2. Run engine at idle speed and measure dwell angle with a dwell meter.  
**Dwell angle: 34° - 40°**
3. If dwell angle is not within the specified value, turn off engine and adjust point gap.
4. If dwell angle is not within the specified value when point gap is correct, cam lobe is worn. Replace cam.



### VACUUM ADVANCE

1. Connect vacuum pump gauge to vacuum controller and gradually draw a vacuum while watching breaker plate movement. Check for smooth operation with no evidence of binding.
2. Turn breaker plate right and left to check for freedom of movement.

**Distributor Component Check (Cont'd)**

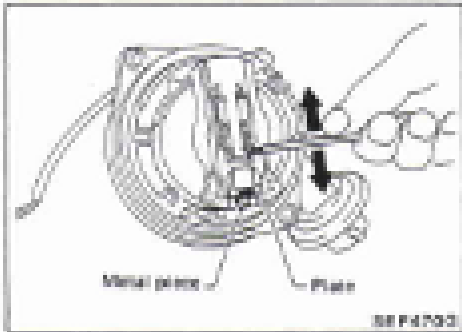
**GOVERNOR ADVANCE**

- Turn the head of cam assembly counterclockwise, release it, then check that it returns smoothly to the original position.



**ROTOR**

- Check that the plate moves smoothly to contact the metal piece. Also check that the spring acts securely.



**DISASSEMBLY**

Carefully observe the following instructions during disassembly.

- Put a matchmark across cam and shaft so that original combination can be restored at assembly.
- Inscribe a matchmark across spring and mating parts so that spring can be replaced in its original position during assembly.

Be careful not to stretch or deform governor spring.

**ASSEMBLY**

Carefully observe the following instructions.

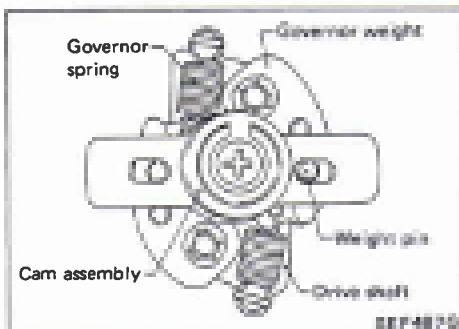
**Grease point**

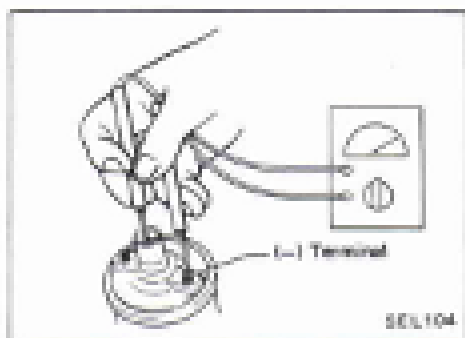
Apply high-temperature grease to:

- Governor spring
- Frictional surface of governor weight
- Frictional surface of breaker plate
- Vacuum control shaft
- Cam and cam head

**Installation of governor**

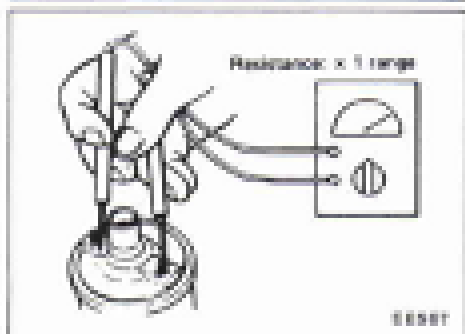
Install governor springs, governor weights and cam assembly to drive shaft as shown in the figure.





### Ignition Coil

1. Measure secondary resistance of ignition coil.  
**Resistance: Refer to S.D.S.**



2. Measure primary resistance of ignition coil.  
**Resistance: Refer to S.D.S.**

### Spark Plug

Clean and check spark plug gap.  
**Refer to MA section.**

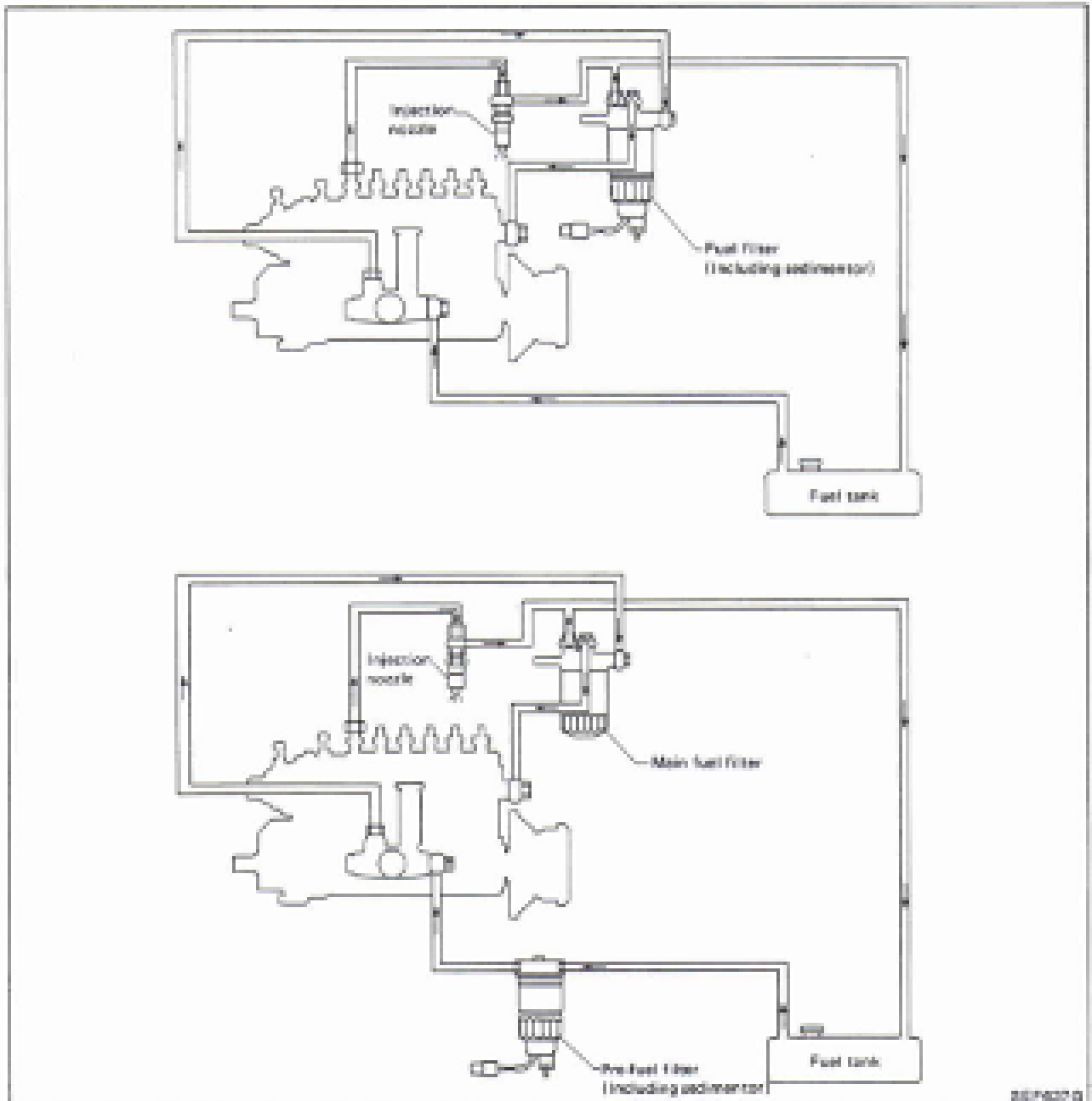
### Ignition Wire

Check ignition wires.  
**Refer to MA section.**

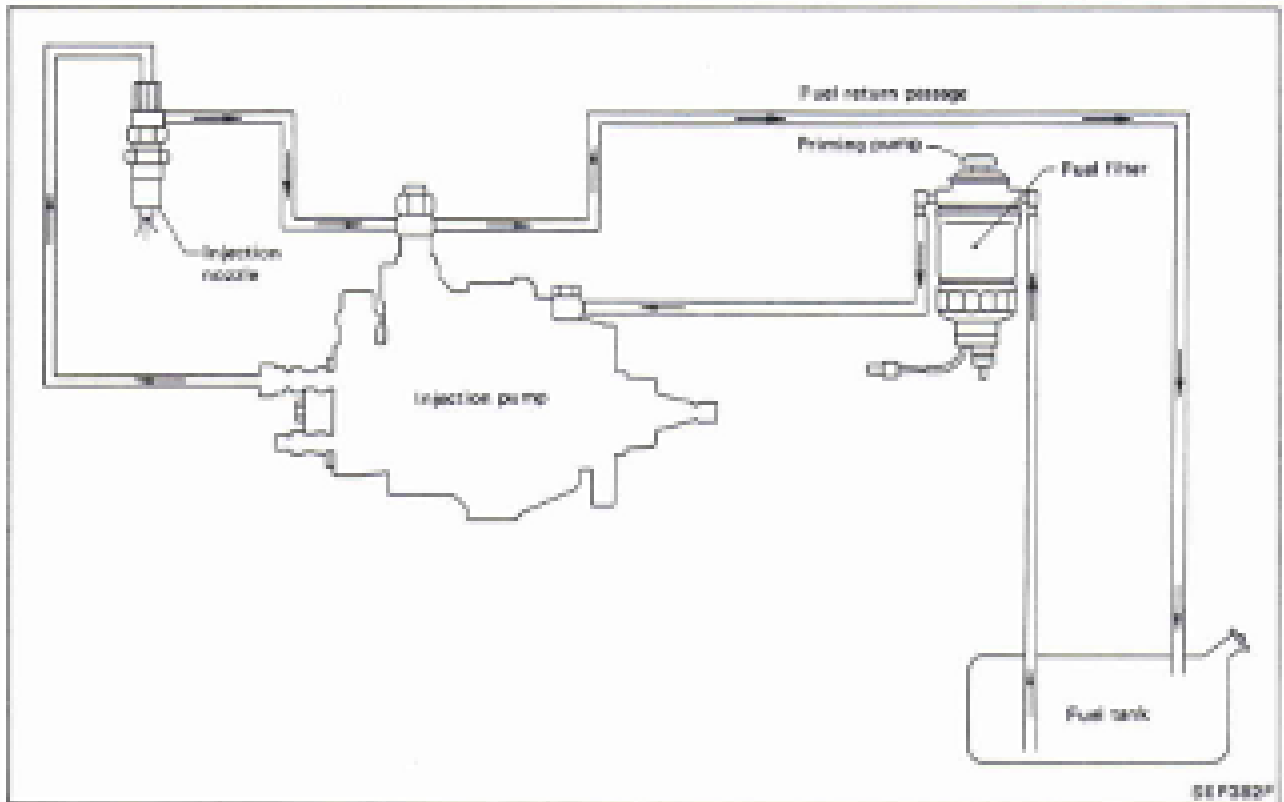
**CAUTION:**

- Disassembly and assembly of the injection pumps should be done only in service shops authorized by NISSAN or by the pump manufacturer.
- The pump tester is required for servicing the pump.
- Before removing fuel injection pump from vehicle, check closely to make sure that it is definitely malfunctioning.

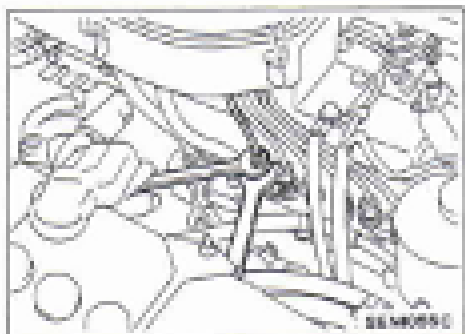
## Fuel System IN-LINE TYPE INJECTION PUMP



**Fuel System (Cont'd)  
VE-TYPE INJECTION PUMP**





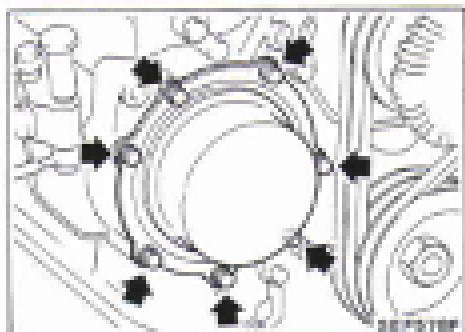


## Removal

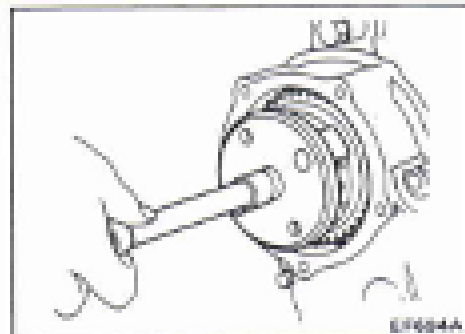
1. Remove injection tube.

Cover the delivery holders of the injection pump and injection nozzle holder assembly with a clean rag to prevent dust entry.

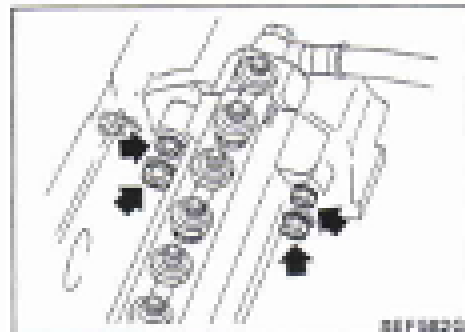
2. Disconnect governor hoses, fuel hoses and engine control wire from injection pump assembly and oil feed pipe (if so equipped).



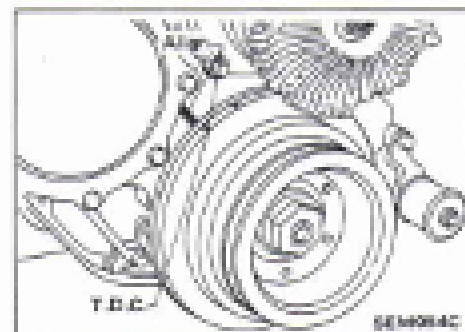
3. Remove timing gear cover.



4. Remove timer round nut.
5. Remove timer assembly.



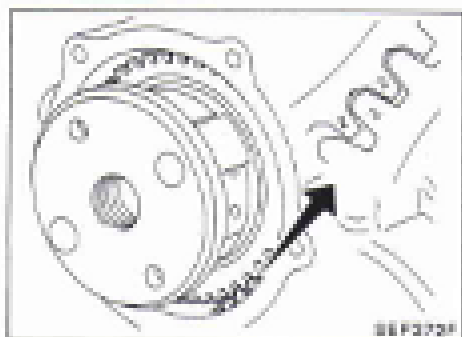
6. Remove injection pump assembly.



## Installation and Adjustment

1. Install injection pump assembly with new gasket temporarily.
  2. Install timer assembly.
- Align crank pulley and timing gear case cover marks so that No. 1 piston is at top dead center.

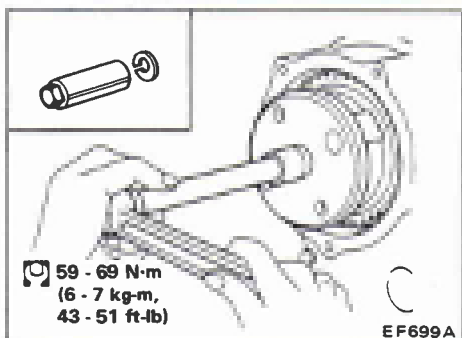
## Installation and Adjustment (Cont'd)



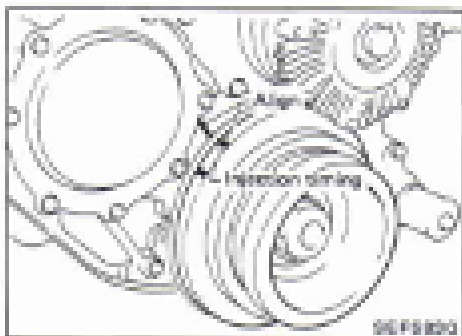
### 3. Injection pump

- (1) Temporarily set injection pump.
- (2) Mesh injection pump drive gear with idler gear at "Z" mark and then align gear to key way of injection pump camshaft while turning crank pulley.

Coat key with grease to prevent it from falling into front cover, and lay a rag on front cover.

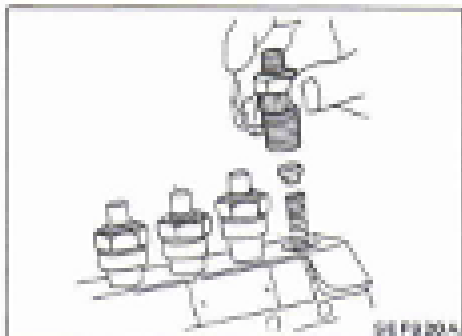


- (3) Secure timer assembly with lock washer and round nut.

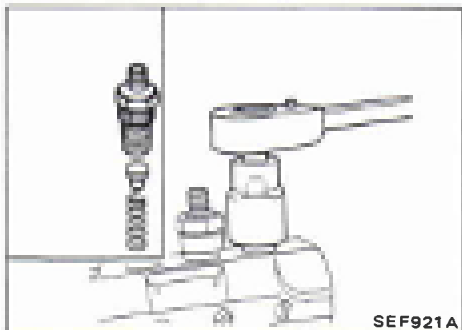


## INJECTION TIMING ADJUSTMENT

1. Turn crank pulley in standard rotating direction and set No. 1 piston at applicable B.T.D.C.  
**Select the right mark as applicable B.T.D.C.**
2. Remove all injection tubes and governor hoses.

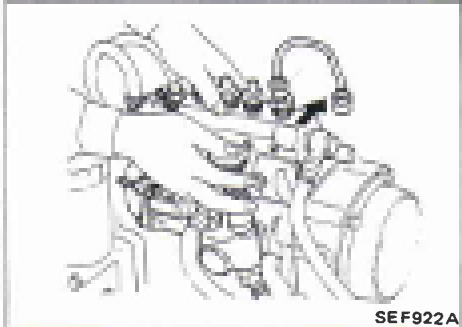


3. Remove No. 1 lock plate and delivery valve holder, and then pull out delivery stopper (if so equipped), delivery valve spring and delivery valve.

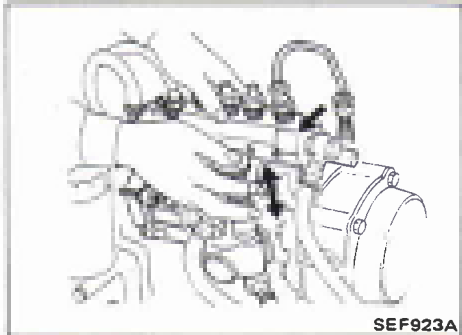


4. Install delivery valve holder without delivery valve spring, delivery valve stopper and delivery valve.

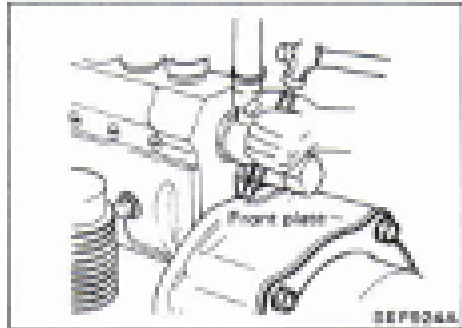
### Installation and Adjustment (Cont'd)



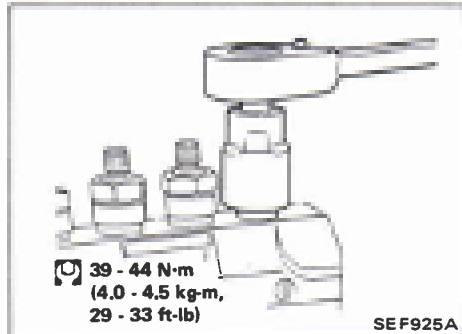
5. Connect test tube to the No. 1 delivery valve holder.
6. Push injection pump assembly fully down toward engine side.



7. While feeding fuel by operating priming pump, slowly move injection pump until fuel flow from No. 1 injection tube stops.
8. Fix injection pump in the position where fuel flow stops.



9. Check whether or not the injection timing marks of injection pump and front plate are aligned. If not aligned, stamp a new mark on front plate.



10. Remove No. 1 test tube and delivery valve holder.
11. Install delivery valve spring, delivery valve stopper, delivery valve holder and delivery valve.
12. Install injection tubes, new timing cover gasket and timer cover.

**Coat sealant with new timing cover gasket.**

13. Connect governor hoses, fuel hoses and engine control wire.
14. Bleed air. Refer to Bleeding Fuel System.

### IDLE AND MAXIMUM SPEED ADJUSTMENT

#### CAUTION:

- a. Do not remove sealing wires unless absolutely necessary.
- b. Maximum speed adjusting screw is retained by sealing wire and need not be adjusted under normal circumstances. However, if it should become necessary, adjust it with the screw. After adjustment, always wind up with sealing wire.

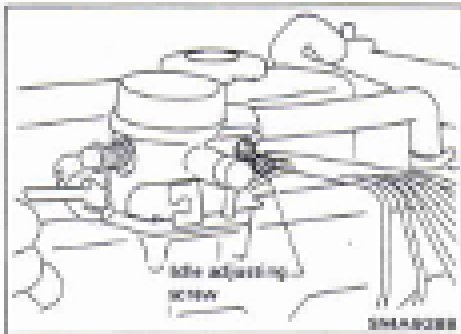
**Installation and Adjustment (Cont'd)**

**Throttle control wire adjustment**

1. Make sure that free play is 1 mm (0.04 in) at venturi's throttle lever.
2. If not within the specified range, adjust with wire adjusting nut.
3. After adjusting free play properly, tighten lock nut.

**Idle adjustment**

Refer to section MA for idle adjustment.



**Maximum speed adjustment**

Maximum speed adjustment screw is retained by sealing wire and need not be adjusted under normal circumstances. However, if it should become necessary to adjust it, the following procedures should be followed:

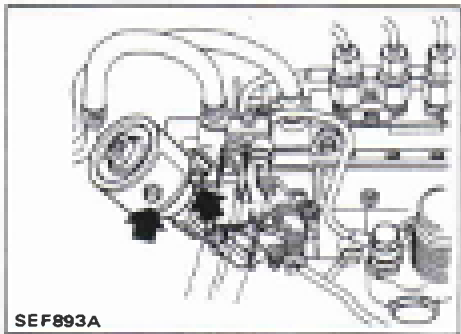
1. Start engine and warm it up until coolant temperature indicator points to middle of gauge.
2. Connect tachometer's pick-up to No. 1 fuel injection tube. To obtain accurate reading of engine rpm, loosen clamp that secures No. 1 fuel injection tubes.
3. To obtain maximum speed, turn the adjusting screw either direction while fully depressing accelerator pedal.

**Maximum engine speed**

(Under no-load):

**4,600± 100 rpm**

4. After adjustment, tighten lock nut securely.
5. Wind up with a sealing wire.



SEF893A

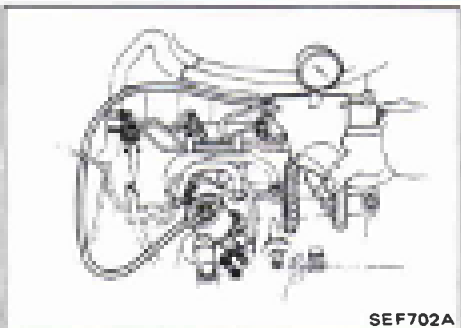
**Altitude Compensator (Engine on vehicle)**

**REMOVAL AND INSTALLATION**

1. Remove altitude compensator from bracket.
2. Disconnect vacuum hose and remove bracket from injection pump.
3. Install altitude compensator in the reverse order of removal.

**INSPECTION**

1. Check for loose connections.
2. Check for altitude compensator movement. If it does not move, contact a service shop authorized by the pump manufacturer.

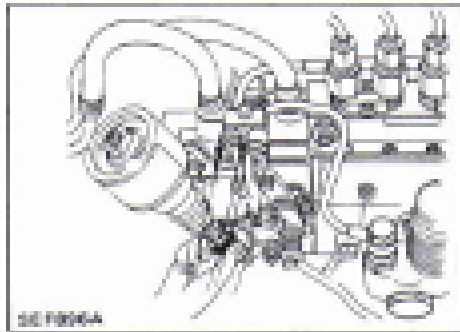
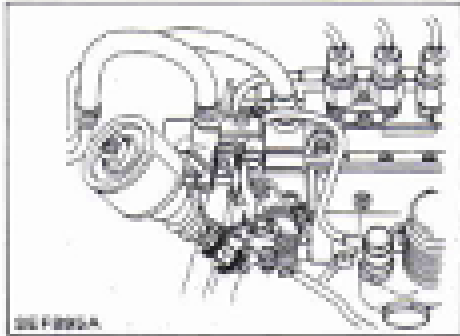


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**Altitude Compensator (Engine on vehicle)  
(Cont'd)**

**ADJUSTMENT**

This adjustment should be performed with injection lever in free position.



1. Loosen lock nut and cap nut of altitude compensator.
2. Turn cap nut touch with injection lever and temporary tighten lock nut.

3. Determining position of cap nut
  - (1) Precise method
    - a. Using a barometer, measure atmospheric pressure in areas where vehicles are to be operated.
    - b. Determine how much the cap nut should be loosened by using the equation below.

$$R = 9.878 \times 10^{-3} \times (760 - P)$$

where

R: Amount of loosening of cap nut (No. of revolutions of cap nut)

P: Measured atmospheric pressure (mmHg)

**Reference table**

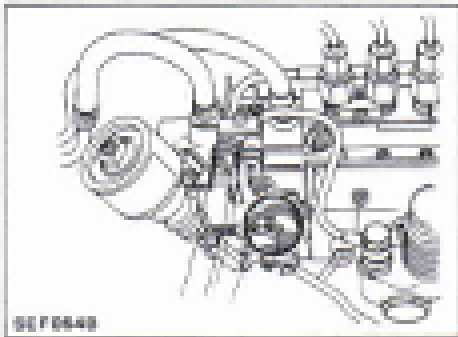
Atmospheric pressure P kPa (mbar, mmHg, inHg)	101.3 (1,013, 760, 29.92)	100.0 (1,000, 750, 29.53)	93.3 (933, 700, 27.56)	86.6 (866, 650, 25.59)	80.0 (800, 600, 23.62)	73.3 (733, 550, 21.65)	66.7 (667, 500, 19.69)
Amount of loosening of cap nut (No. of revolutions of cap nut)	0	0.1 - 0.3	0.4 - 0.8	0.9 - 1.3	1.4 - 1.8	1.9 - 2.3	2.4 - 2.6

## Altitude Compensator (Engine on vehicle) (Cont'd)

### (2) Expedient method

Determine how much the cap nut should be loosened, according to altitude above sea level.

Approximate altitude	0	120	700	1,300	2,000	2,700	3,400
m (ft)	(0)	(394)	(2,297)	(4,265)	(6,562)	(8,859)	(11,155)
Amount of loosening of cap nut (No. of revolutions of cap nut)	0	0.1 - 0.3	0.4 - 0.8	0.9 - 1.3	1.4 - 1.8	1.9 - 2.3	2.4 - 2.6

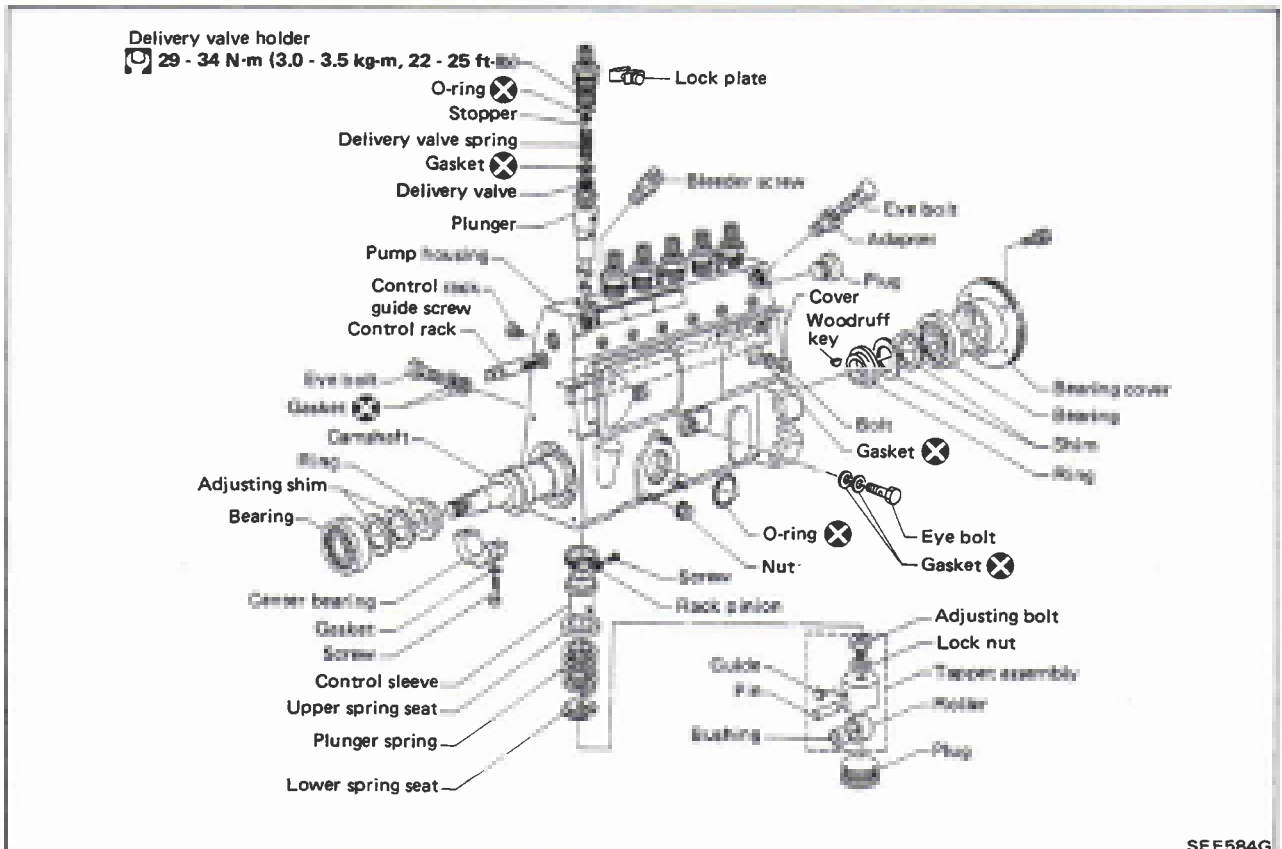


4. Mark cap nut indicating the number of times cap nut should be rotated according to altitudes in which vehicles are to be operated.

5. Tighten lock nut.

Ensure that bolt comes into contact with injection pump lever. If it does not, loosen the bolt and readjust.

## Disassembly



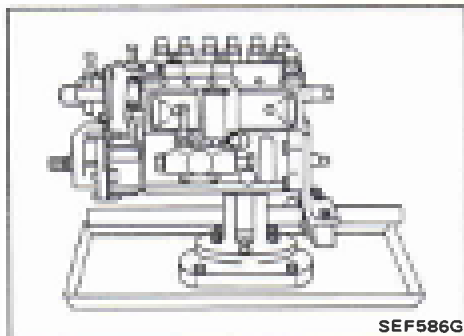
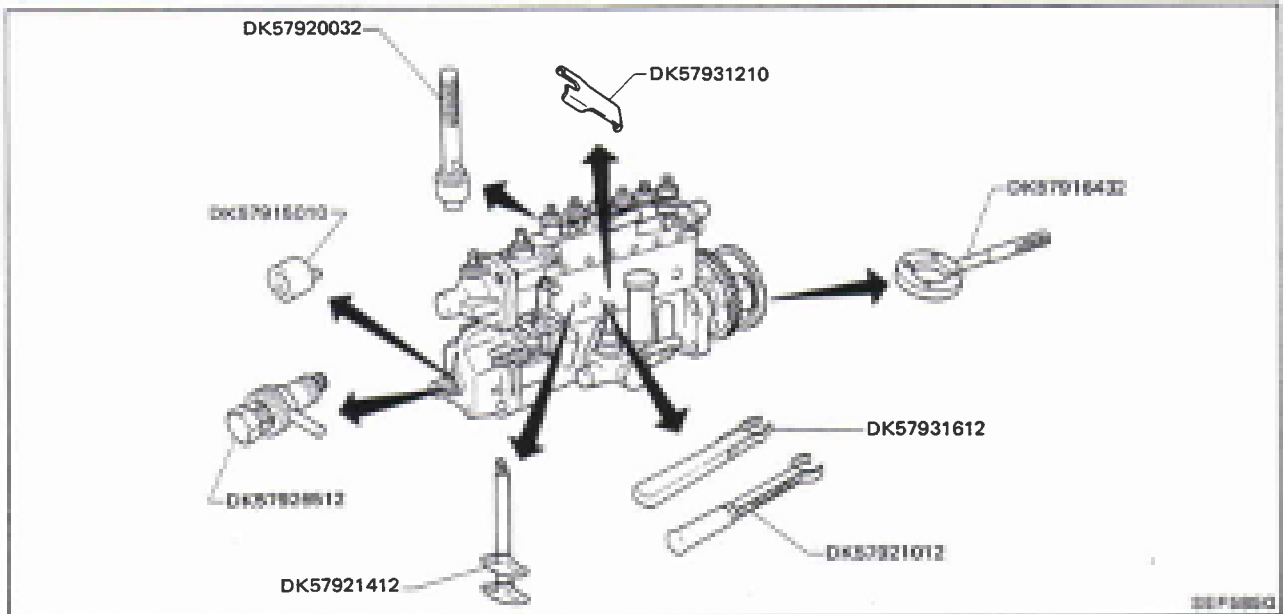
SEF584G

## Disassembly (Cont'd)

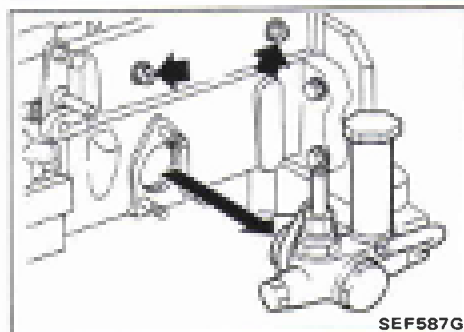
### PREPARATION

- Before performing disassembly and adjustment, test fuel injection pump and note test results except when testing is impossible.
- Prior to beginning to disassemble fuel injection pump, clean all dust and dirt from its exterior.
- Clean work bench completely, removing all foreign matter.
- Collect only those service tools necessary for disassembling and reassembling.
- Be careful not to bend or scratch any parts.
- Be careful not to mix parts of different cylinders.

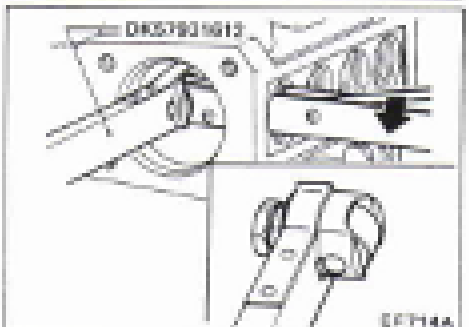
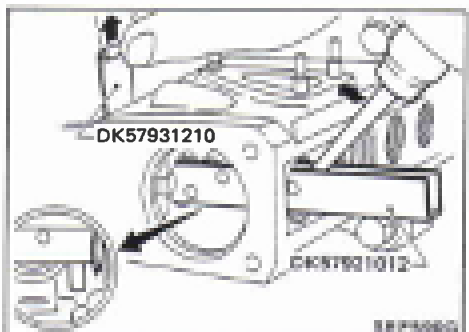
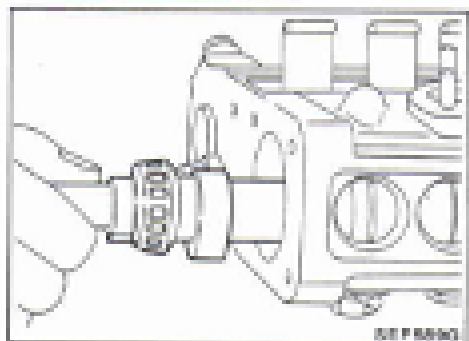
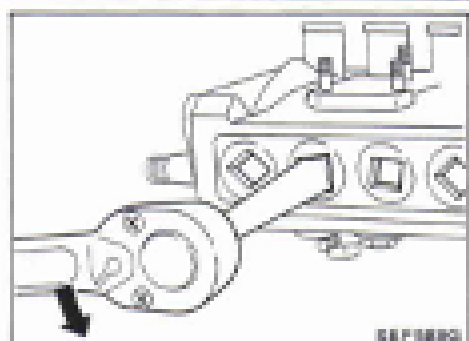
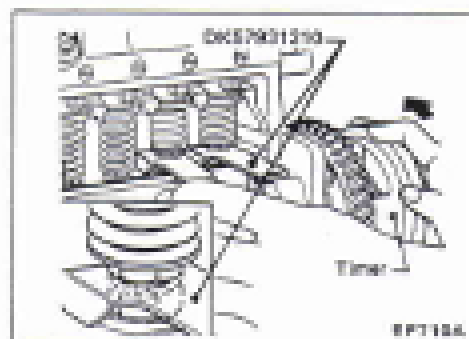
### Special tools for disassembling and reassembling fuel injection pump



1. Drain injection pump oil.
2. Attach injection pump with Tool.



3. Remove feed pump and cover plate.
4. Check backlash between control rack and control pinion. Refer to Inspection.



## Disassembly (Cont'd)

5.
  - (1) Temporarily install timer to injection pump.
  - (2) Turn timer until tappet is raised to T.D.C. for each cylinder and then install Tool between tappet adjusting bolt and nut. If Tool cannot be installed, loosen tappet adjusting bolt.
6. Check camshaft end play.  
**Refer to Inspection.**
7. Remove mechanical governor cover, diaphragm cover, diaphragm, flyweight and governor housing.  
**Refer to Governor for removal.**
8. Remove plug.

9. Draw out camshaft.

10. Remove Tool DK57931210 by pushing tappet with Tool DK57921012.

**CAUTION:**

Be careful not to damage housing plug hole threads.

11. Withdraw tappet assembly with Tool DK57931612 from camshaft chamber by loosening Tool DK57921012.

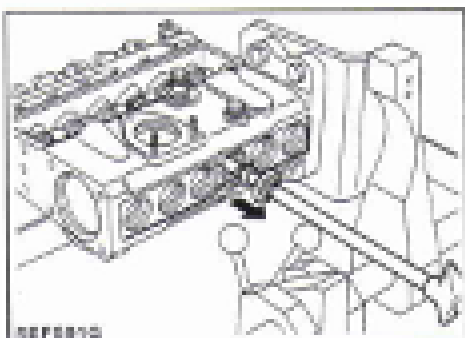


## Disassembly (Cont'd)

12. Remove plungers together with lower spring seat with Tool.

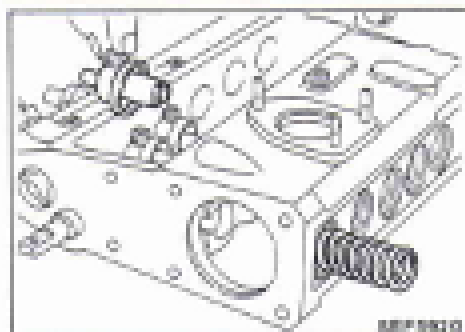
**CAUTION:**

Lay out plunger and plunger barrel in order in a pan of kerosene or solvent. Do not touch plunger with hand.



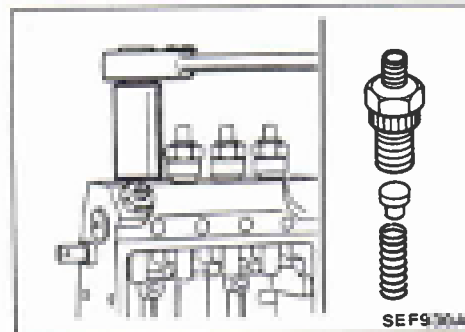
13. Remove plunger spring, upper spring seat and control sleeve assembly.

When disassembling control sleeve assembly, put matching mark.

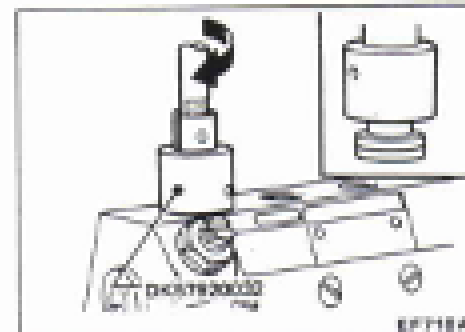


14. Remove lock plate.

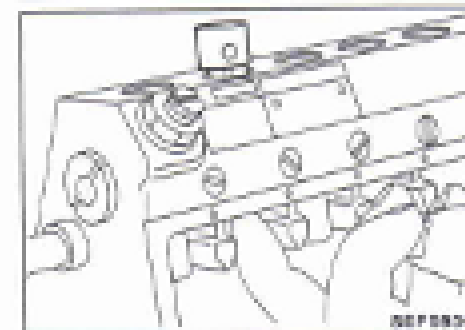
15. Remove delivery valve holder and then remove delivery holder spring, and delivery valve stopper.



16. Remove delivery valve by threading in Tool.

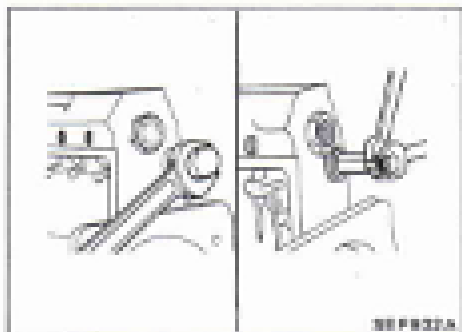


17. Remove plunger barrel by pushing it from below.

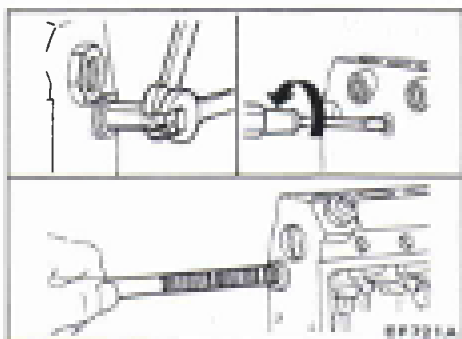


## Disassembly (Cont'd)

18. Remove cap and bolt and nut on control rack.



19. Remove control rack guide screw and then draw out control rack.



## Inspection

### PUMP HOUSING

1. Inspect for damage, cracks, etc.  
If excessively damaged, replace it with a new housing.
2. Check plunger barrel drum surface for proper contact with plunger barrel seating hole. Also, check for damage or cracks.  
If faulty, replace with a new plunger and plunger barrel.
3. Measure tappet to housing clearance. If worn beyond wear limit, replace tappet or housing.

Tappet to housing clearance (A-B):

Limit

0.2 mm (0.008 in)

### CAMSHAFT

1. Measure cam profile for uneven or excessive wear. If excessively or unevenly worn, replace camshaft with a new one.
2. Check for damage, cracks, etc.  
If excessively damaged, replace it with a new one.
3. Measure camshaft end play by pushing camshaft from timer end so as to move camshaft in shaft direction.

Camshaft end play:

Standard

0 - 0.02 mm (0 - 0.0008 in)

Limit

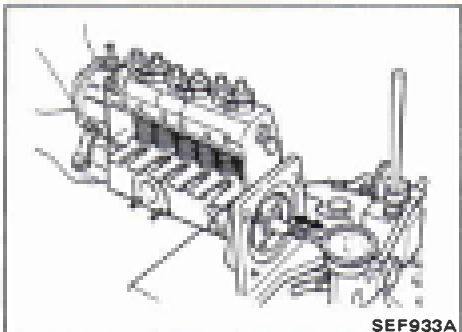
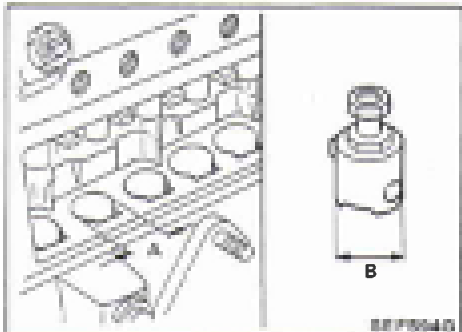
0.1 mm (0.004 in)

If camshaft end play is over limit, adjust as follows:

- (1) Remove bearing inner race from camshaft.
- (2) Based upon end play measurement, increase or decrease adjusting shims.

Use the same shim thickness on each end.

- (3) Re-install bearing inner race on camshaft.



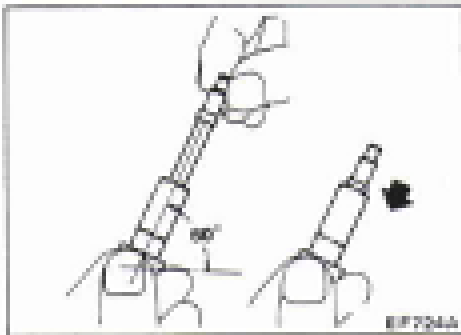
**Inspection (Cont'd)**

**BEARINGS**

Check for wear or discoloration. If faulty, replace with a new one.

**PLUNGER AND PLUNGER BARREL**

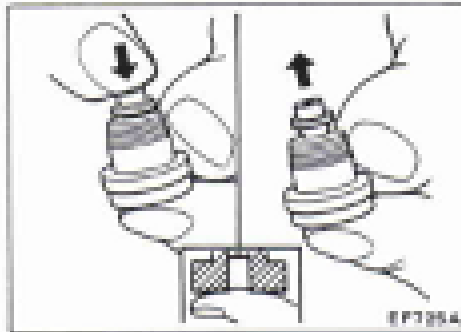
The operation of the plunger should be checked based on the results of fuel injection volume measurement.



**OIL-TIGHTNESS CHECK**

1. Thoroughly clean plunger barrel in clear kerosene or solvent.
2. Tilt it to approximately 60°. Then, let plunger slide down through barrel, making sure that plunger slides smoothly. Repeat this procedure by turning plunger to various positions, making sure that plunger slides smoothly in any of the positions.

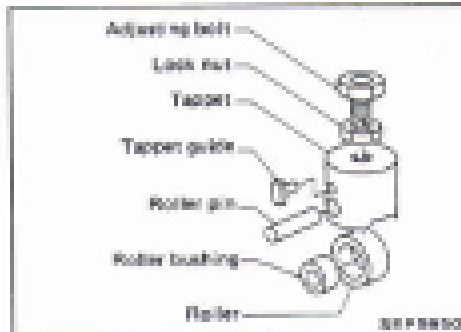
When replacement is required, replace both the plunger and plunger barrel as a set.



**DELIVERY VALVE**

**Air-tightness check**

1. Thoroughly clean delivery valve and delivery valve seat in clear kerosene or solvent.
2. Place finger over lower part of valve seat, lightly depress delivery valve with your finger tip, and make sure that valve springs back when released. If valve falls to valve seat, it is not operating properly due to excessive piston wear. If faulty, replace with a new valve and valve seat assembly.



**TAPPET**

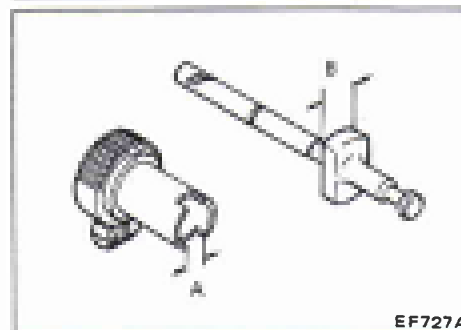
Inspect tappet, roller, roller bushing, and pin for wear or damage. If faulty, replace with new components, as required.

**Adjusting bolt head recess wear limit:**

0.20 mm (0.0079 in)

**Roller end play limit:**

0.20 mm (0.0079 in)



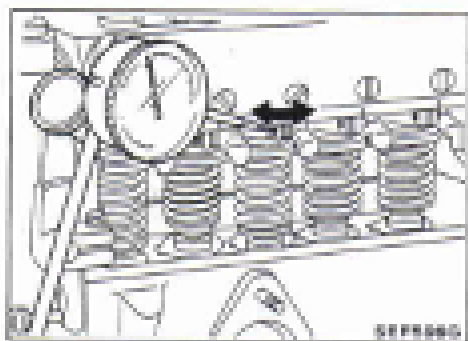
**CONTROL RACK AND CONTROL SLEEVE ASSEMBLY**

1. Inspect control rack for bending and damage. If faulty, repair or replace with a new control rack, as required.
2. Measure control sleeve to plunger lug clearance. If worn excessively, replace control sleeve or plunger, as required.

**Control sleeve to plunger lug clearance (A-B):**

**Limit**

0.12 mm (0.0047 in)



### Inspection (Cont'd)

3. Measure backlash between control rack and control pinion.

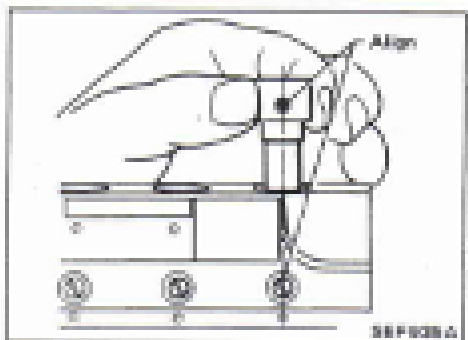
**Backlash between control rack and control pinion:**

**Limit**

**0.30 mm (0.0118 in)**

### SPRING

Inspect plunger and delivery valve springs for damage and squareness.



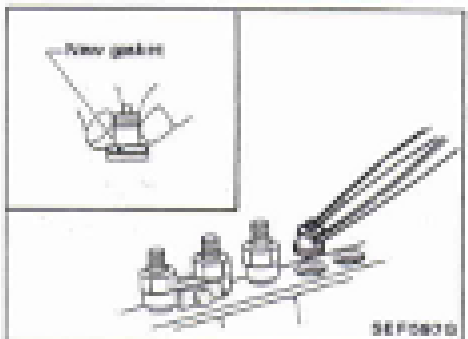
### Assembly

Clean parts thoroughly and apply a thin coat of engine oil to rotating and sliding parts.

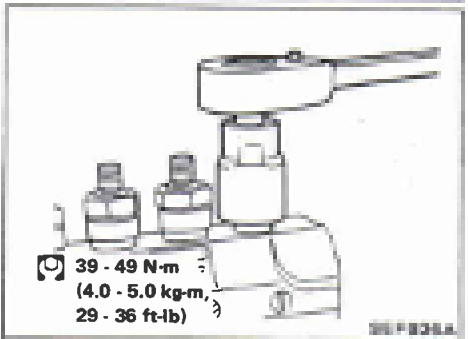
Assemble injection pump in the reverse order of disassembly.

Note the following items.

1. Set plunger barrel in position, with hole in barrel aligned with dowel pin of housing.

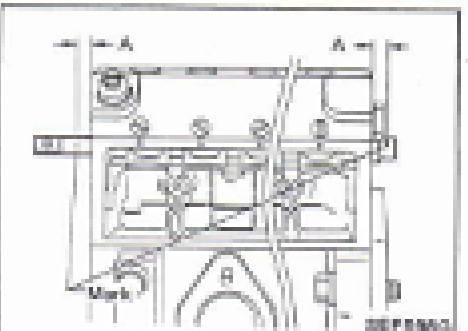


2. Install delivery valve with new gasket on the plunger barrel.



3. Install delivery valve spring delivery valve stopper (if so equipped) and delivery valve holder.

**39 - 49 N-m**  
**(4.0 - 5.0 kg-m)**  
**29 - 36 ft-lb**

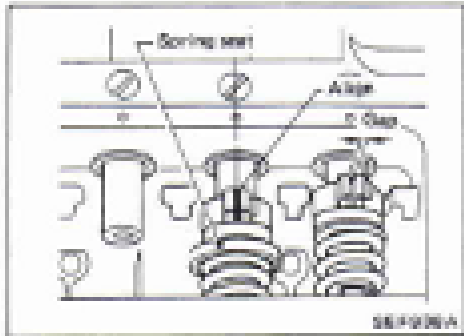


4. Install lock plates.

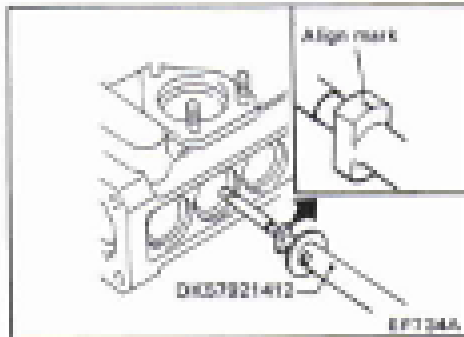
5.

- (1) Set the control rack so that marks on both sides are same distance "A" from each end of pump housing.
- (2) Adjust bolt length and tighten lock nut.
- (3) Then install control rack guide screw.

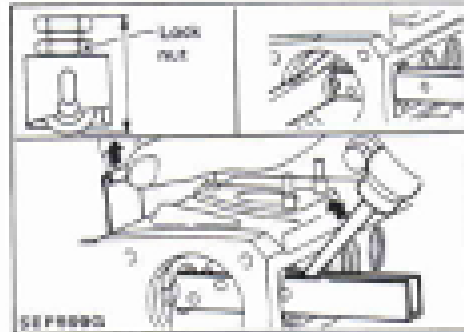
**Assembly (Cont'd)**



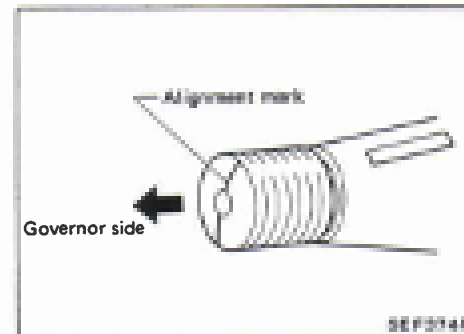
6. Install control sleeve assembly with gap of control sleeve facing straight up. Then install upper spring seats and plunger springs.



7. Install plunger together with lower spring seat by using Tool with plunger alignment mark facing upward (cover side of pump housing).  
Do not use plunger with a barrel from a different cylinder.




8. Install tappet assembly by reversing the removal procedure.



9. Install camshaft so that its alignment mark is toward governor.

10. Install governor housing and then adjust camshaft end play.  
Refer to Inspection.

11. Install screw plug on bottom of pump housing.  
Seal the plug with sealant.

 : Screw plug  
54 - 74 N·m  
(5.5 - 7.5 kg-m, 40 - 54 ft-lb)

12. Temporarily install timer and remove Tool DK57931210 while turning timer.

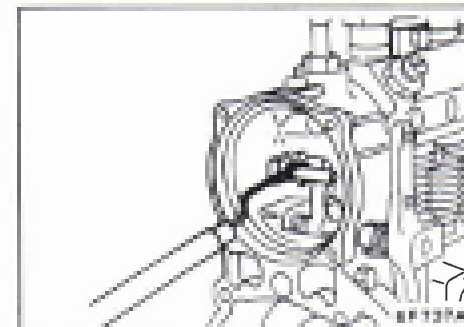
13. Measure control rack sliding resistance.

**Control rack sliding resistance:**  
Less than 1.471 N (150 g, 5.29 oz)

14. Install flyweight, diaphragm, diaphragm cover and mechanical governor cover in that order.

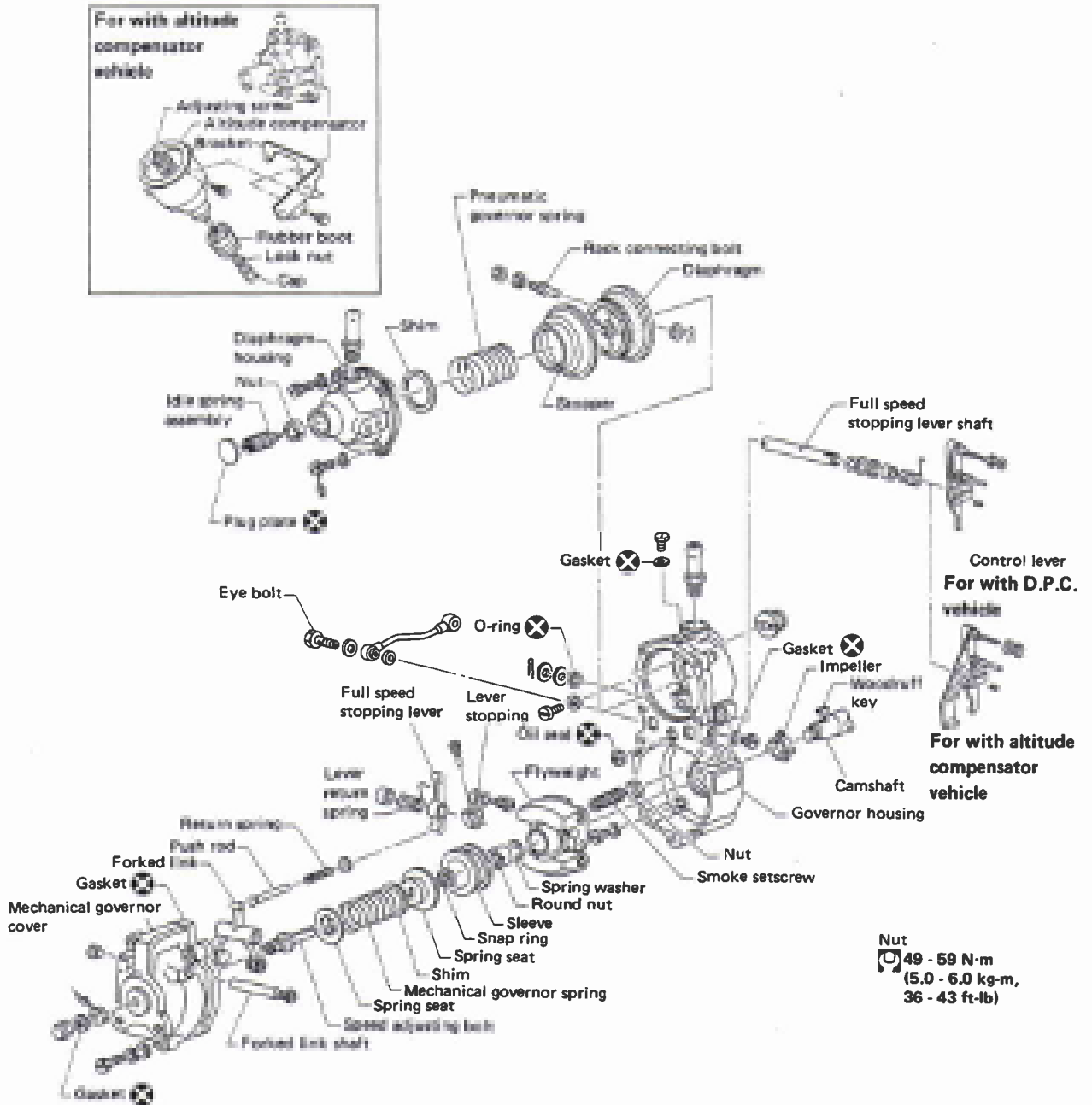
Refer to Governor for installation.

15. Install control rack cap, cover and feed pump.

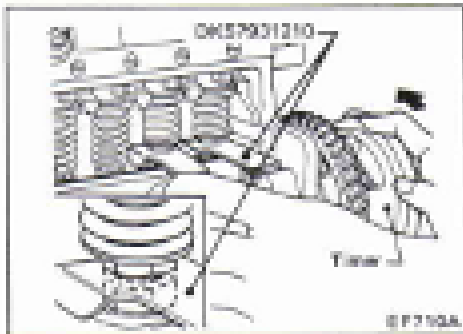


Governor

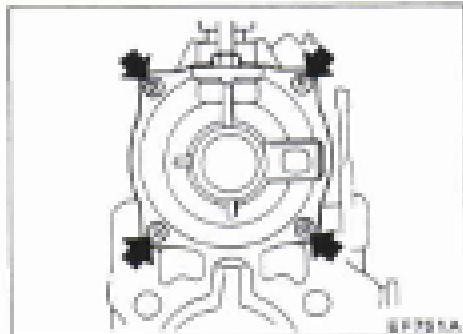
DISASSEMBLY



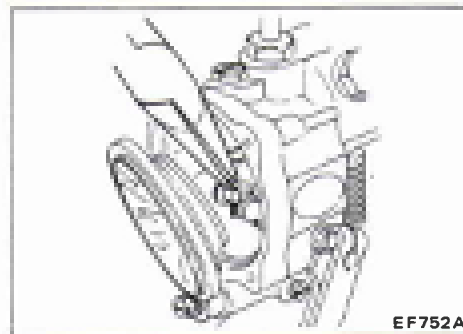
**Governor (Cont'd)**



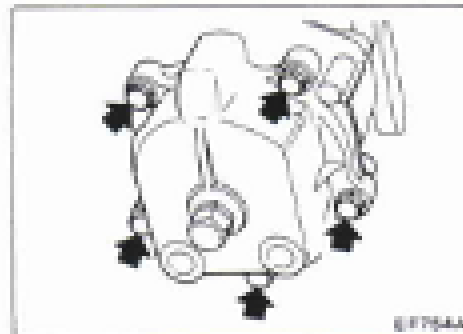
1. Attach injection pump with Tool KV11244852 (Universal vise) and then remove feed pump and cover plate.
2. Install Tool between tappet adjusting bolt and nut.  
Refer to Injection pump for tappet holder installation.



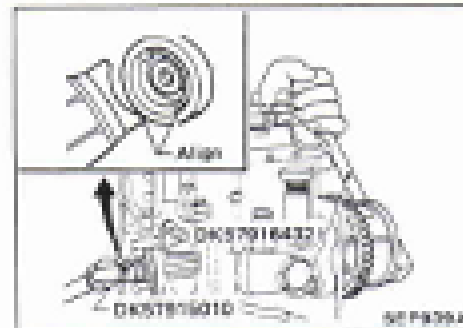
3. Remove diaphragm cover, pneumatic governor spring and shims.



4. Remove diaphragm by pulling cotter pin out with pulling it out from housing.  
Be careful not to damage the diaphragm.



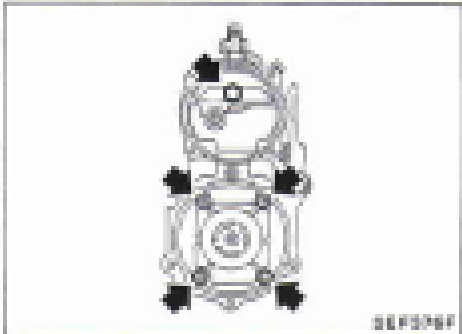
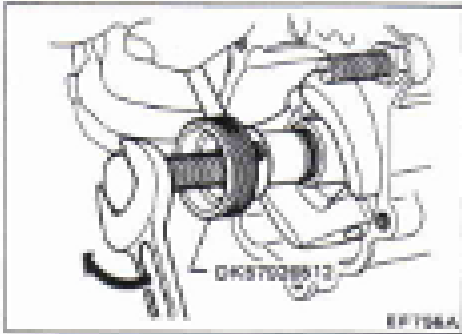
5. (1) Remove mechanical governor cover gasket, push rod, spring and shim.



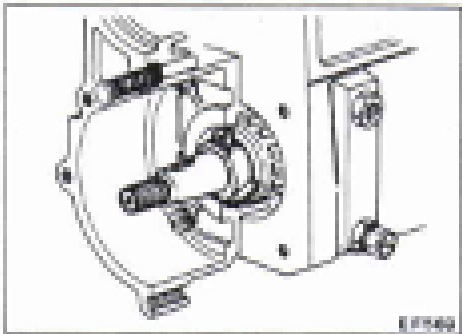
- (2) Attach timer and lock camshaft with Tool ST17080000 (DK57916432).  
Remove round nut with Tool DK57915010.

**Governor (Cont'd)**

(3) Remove flyweight with Tool.



6. Remove governor housing.

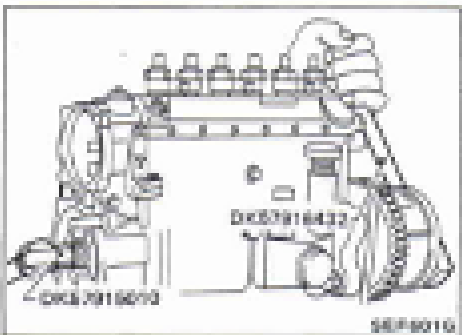


**ASSEMBLY**

Assemble governor in the reverse order of disassembly, noting following item.

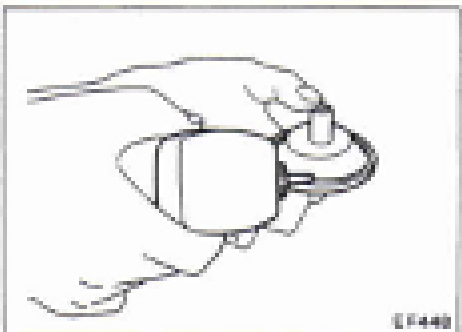
Do not install plate plug until idle adjustment is made.

1. Make sure that impeller is installed to the camshaft with flat blade side toward governor.



2. Apply liquid sealant to new governor cover gasket.

- ☐ : Flyweight round nut
- 49 - 59 N·m
- (5.0 - 6.0 kg-m, 36 - 43 ft-lb)



3. Apply diaphragm oil to diaphragm.

**CAUTION:**

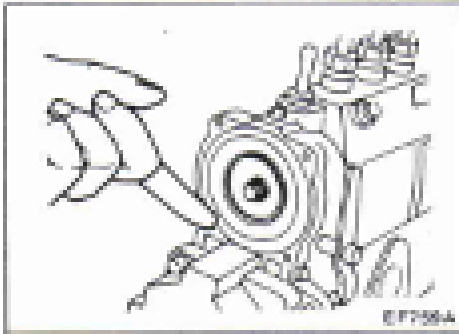
- Do not allow gasoline to be left on diaphragm.
- Use diaphragm oil.



## IN-LINE TYPE INJECTION PUMP

TC42

### Governor (Cont'd)



4. Coat caulking part of diaphragm and governor housing with grease. Be careful not to allow grease to get on the diaphragm surface.
5. Adjust injection pump with a pump tester. Refer to "Testing Injection Pump for Governor".

### Test

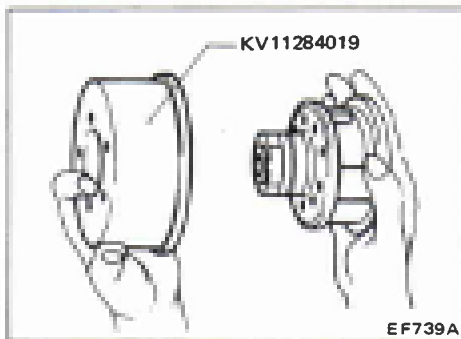
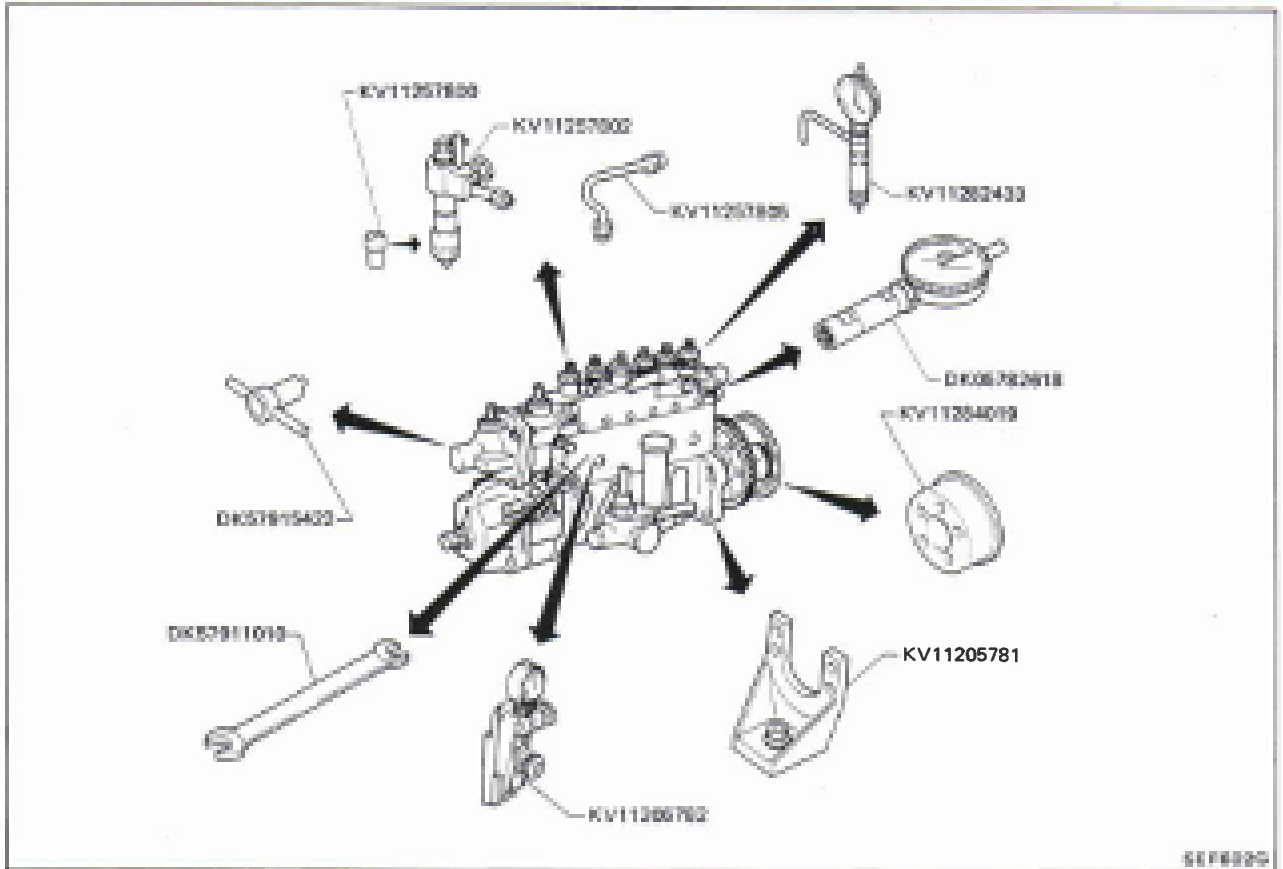
#### PREPARATION

##### Injection pump test conditions

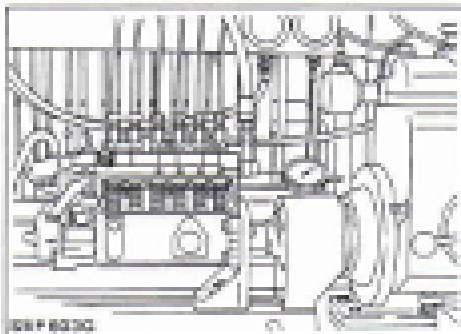
Nozzle		KV11257800
Nozzle holder		KV11257802
Nozzle starting pressure	kPa (bar, kg/cm <sup>2</sup> , psi)	17,162 (171.6, 175, 2,489)
Nozzle tube		KV11257805
Inner dia. x outer dia. x length	mm (in)	2.0 x 6.0 x 600 (0.079 x 0.236 x 23.62)
Fuel feed pressure	kPa (bar, kg/cm <sup>2</sup> , psi)	147 - 157 (1.47 - 1.57, 1.5 - 1.6, 21 - 23)
Fuel (test oil)		ISO 4113 or SAE Standard Test Oil (SAE J967d)
Fuel temperature	°C (°F)	40 - 45 (104 - 113)
Rotating direction		Right (observed from the drive shaft)
Injection sequence		1-4-2-6-3-5

Test (Cont'd)

1. Prepare necessary service tools.



2. Remove fuel feed pump and cover plate.
3. Remove timer drive gear and attach coupling.



4. Install fuel injection pump on the bed of tester with Tool KV11205781. Then attach timer to pump.
5. Connect coupling to tester drive shaft with coupling disc.
6. Connect flexible hose from tester to injection pump.
7. Bleed air from injection pump.

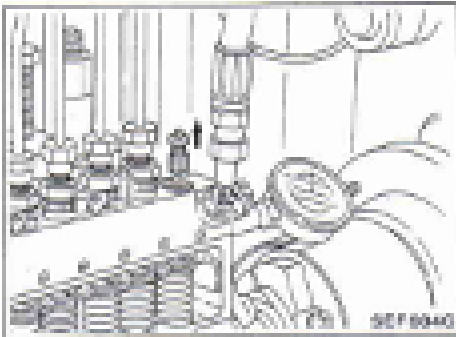
**Test (Cont'd)**

**ADJUSTMENT**

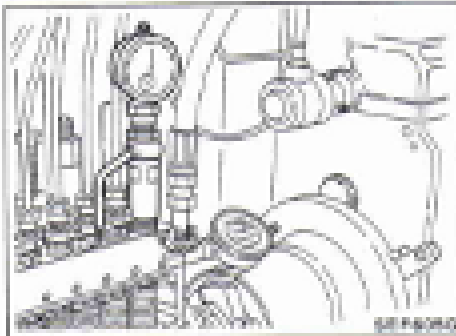
**Adjusting injection timing**

1. Adjust No. 1 injection timing.

- (1) Remove injection tube, delivery valve holder, spring and valve for No. 1 cylinder.



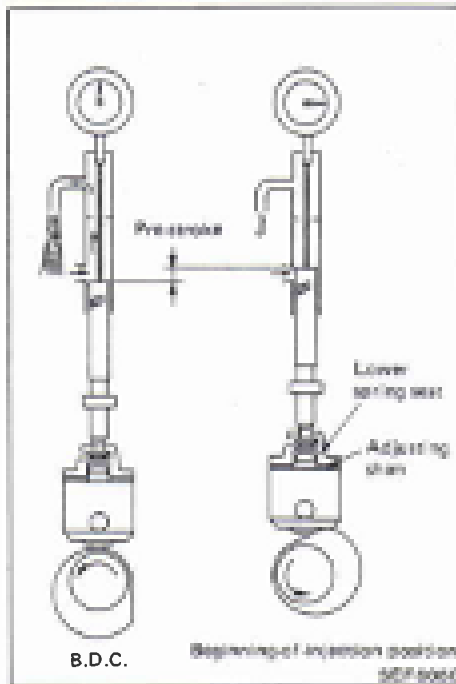
- (2) Set a Tool to the pump housing.



- (3) Rotate camshaft (pump tester) clockwise, and measure the lift of 1st plunger when fuel flow from the measuring device pipe stops.

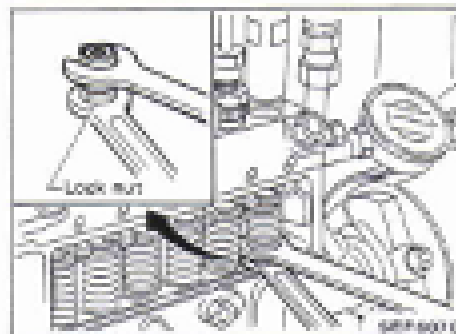
**Pre-stroke:**

Refer to S.D.S.



2. If pre-stroke is not within specification, adjust injection timing.

- (1) Rotate camshaft until cam reaches T.D.C. position.
- (2) Adjust the position of the adjusting bolt so that desired pre-stroke can be obtained.



**Test (Cont'd)**

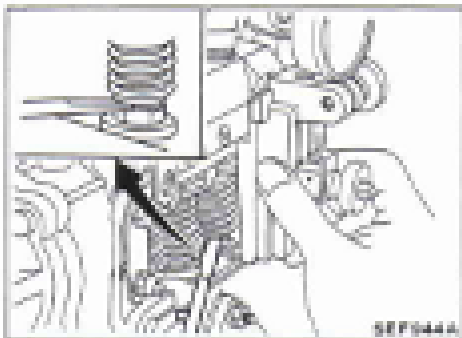
3. Adjust No. 2 to No. 6 cylinder injection timing.

(1) Set No. 1 cylinder to injection start timing position, and set angle scale on tester flywheel at "0°".

(2) Turn tester flywheel to the angle shown below, and make sure that fuel flow from test nozzle stops.

If pre-stroke (injection timing) is incorrect, adjust the timing by following step 2.

Cylinder No.	1	4	2	6	3	5
Injection starting angle	0	60°±30'	120°±30'	180°±30'	240°±30'	300°±30'



4. Check top clearance.

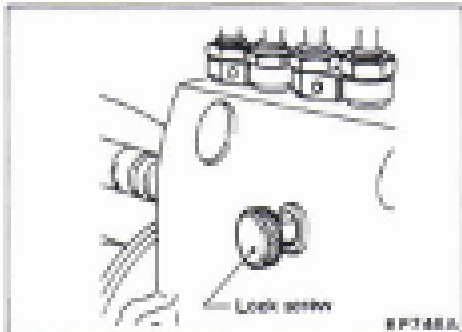
(1) Place the cam for each cylinder in the T.D.C. position.

(2) Insert a screwdriver between the tappet adjusting bolt and lock nut.

(3) Lift the tappet using the screwdriver.

(4) Measure the top clearance using the measuring device.

(5) Ensure the top clearance is 0.3 mm (0.012 in) or more. If the top clearance is less than 0.3 mm (0.012 in) readjust the pre-stroke.

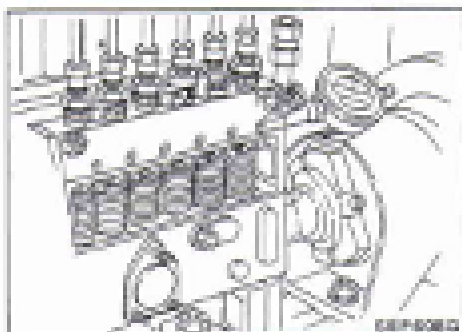


**Adjusting injection volume**

1. Remove control rack guide screw and install lock screw to fix control rack on pump housing.

**CAUTION:**

Tighten lock screw by hand.



2. Set Tool DK05782618 to control rack.

(1) When setting tool, push control rack fully toward governor side, and align the "0" on measuring device scale.

(2) Take off diaphragm housing together with governor spring. Otherwise, "0" position may not be obtained.

(3) Pull down full control lever toward fuel increasing side, and check the stroke of control rack.

**Control rack stroke:**

Refer to S.D.S.

**Test (Cont'd)**

3. Set fuel feed pressure.

Fuel feed pressure:

147 - 157 kPa (1.47 - 1.57 bar,

1.5 - 1.6 kg/cm<sup>2</sup>, 21 - 23 psi)

4.

(1) Measure injection volume for each cylinder at rated pump speed and control rack position.

Injection volume:

Refer to S.D.S.

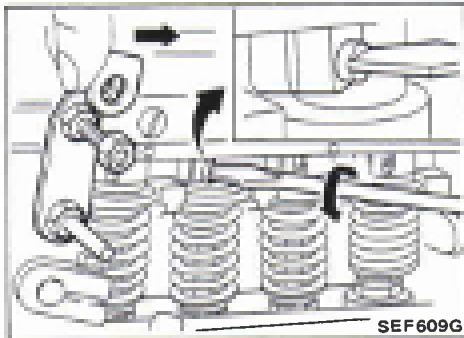
(2) Compute allowable imbalance of fuel injection volume.

Allowable imbalance =

$$\frac{\left( \begin{array}{c} \text{Max. or min.} \\ \text{injection volume} \\ \text{for each plunger} \end{array} \right) - \left( \begin{array}{c} \text{Mean} \\ \text{injection} \\ \text{volume} \end{array} \right)}{\text{Mean injection volume}} \times 100$$

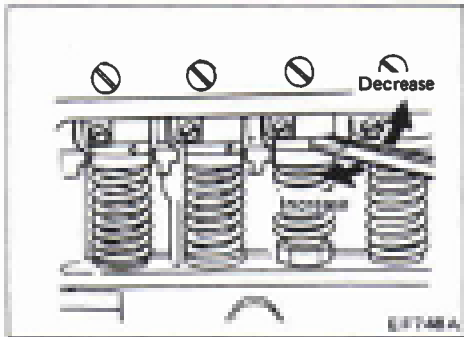
Allowable imbalance:

Refer to S.D.S.



5. Adjust injection volume so that specified injection volume and allowable imbalance are obtained.

(1) Loosen control pinion clamp screw.



(2) Place suitable tool into hole in control sleeve and adjust by rotating control sleeve.

(3) After adjustment is completed, tightly secure pinion set screw.

(4) Remove lock screw from control rack and reinstall guide screw.

6. Install diaphragm housing and governor spring.

**GOVERNOR**

**Adjustment**

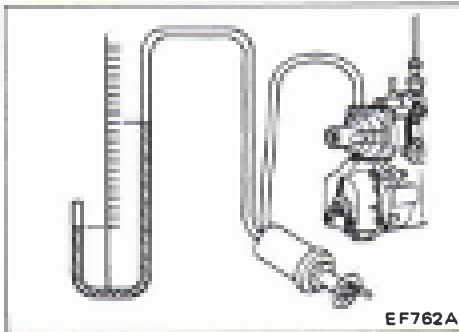
a. When making a governor performance test, maintain the pump speed at 500 rpm.

b. Gradually step up negative pressure when adjusting.

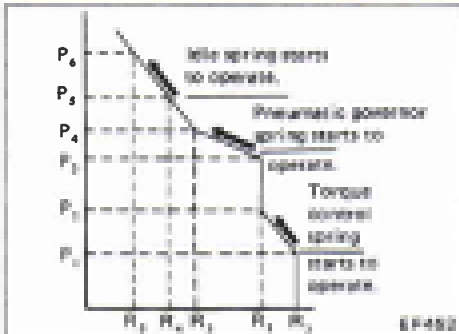
c. Test and adjust injection timing and injection volume before testing governor.

**Test (Cont'd)**

**Air-tight test**



1. Apply a negative pressure of 4.904 kPa (49.04 mbar, 500 mmH<sub>2</sub>O, 19.69 inH<sub>2</sub>O) to governor with rack set at position R<sub>1</sub>.

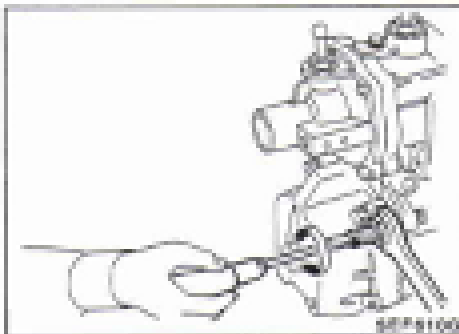


2. Make sure that negative pressure will not drop below the specified value within 10 seconds.

**Negative pressure:**

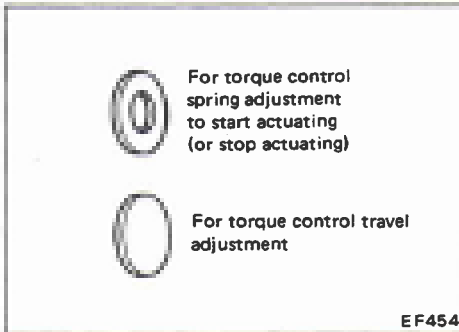
4.904 - 4.707 kPa (49.04 - 47.07 mbar,  
500 - 480 mmH<sub>2</sub>O, 19.69 - 18.90 inH<sub>2</sub>O)/  
more than 10 seconds

If it drops in less than 10 seconds, check the diaphragm and replace if necessary.



**Smoke setscrew adjustment**

With no negative pressure applied, adjust the smoke setscrew so that the rack is set at position R<sub>1</sub>.



**Torque mechanism adjustment**

1. Check that torque control spring starts to actuate at negative pressure P<sub>1</sub> and stops at P<sub>2</sub>. In other words, torque control travel is R<sub>1</sub> - R<sub>2</sub>.

**Torque control travel:**

Refer to S.D.S.

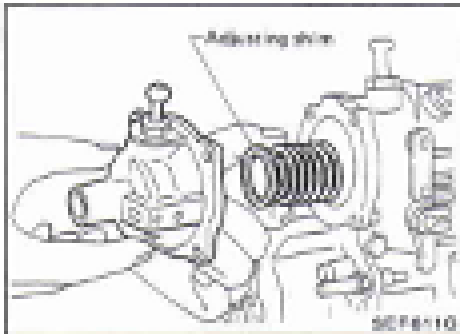
2. If torque mechanism adjustment is not within the specifications:
  - (1) Remove diaphragm.
  - (2) Add or remove shim(s) (two types) as required until correct torque mechanism adjustment is made.

After installing diaphragm, make an air-tight test again.

**Test (Cont'd)**

**High-speed adjustment (Pneumatic governor section)**

1. Increase negative pressure. Adjust governor shim until there is a balanced condition between rack position  $R_2$  and negative pressure  $P_3$ .
2. Gradually increase negative pressure. Make sure that negative pressure is  $P_5$  when rack is moved to position  $R_4$ .



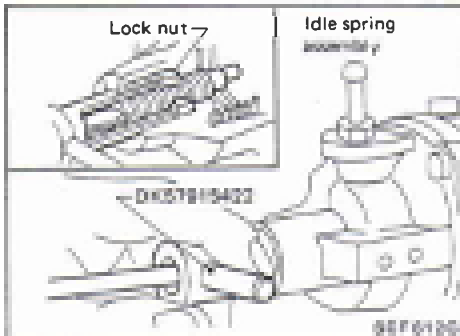
**Idle adjustment**

1. With negative pressure kept at  $P_4$ , turn idle spring screw in with Tool until rack is set at position  $R_3$ .
2. Tighten lock nut.
3. Further increase negative pressure. Make sure that negative pressure is  $P_6$  when rack is set at position  $R_5$ .

If necessary, replace idle spring as an assembly.

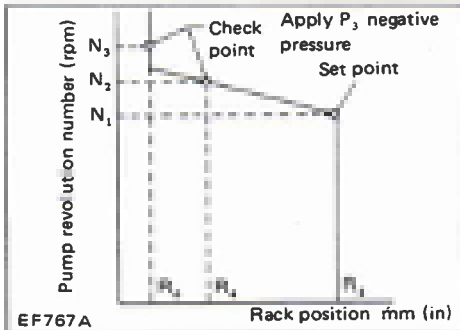
4. Install plate plug.

Apply adhesive to the plug in order to prevent air leaks or the plug from detaching.



**High-speed adjustment (Mechanical governor section):**

1. With negative pressure kept in condition  $P_3$ , increase pump speed.



2. Adjust adjusting bolt of governor spring so that pump speed is  $N_1$  when rack starts to be pulled from  $R_2$ .

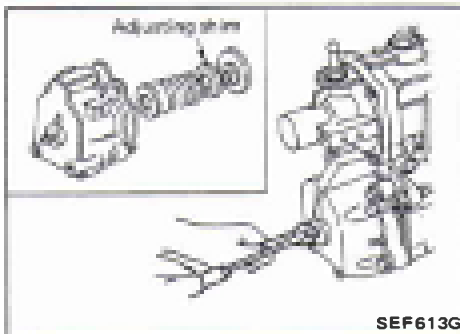
If above adjustment cannot be made properly by means of adjusting bolt, add or remove mechanical governor spring shim(s).

3. Increase pump speed, and make sure that pump speed is  $N_2$  when rack is set at point  $R_4$ .

If pump speed is within specified range, replace mechanical governor spring and readjust.

4. Further increase pump speed, and make sure that rack is set at point  $R_6$  when pump speed is  $N_3$ .

- a. If rack is not properly set at position  $R_6$ , check for wear on part(s) between flyweight and push rod and for proper assembly of pump housing.
- b. If necessary, replace push rod.



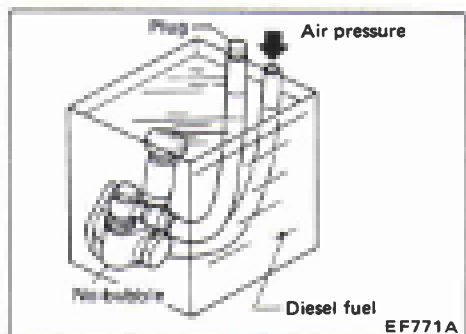
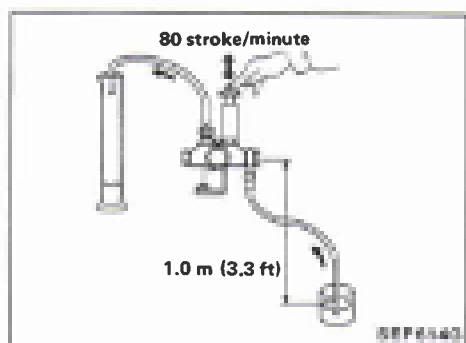
## Feed Pump

After installing feed pump, bleed air from system.

### TEST

#### Standard fuel feed volume

The volume of fuel displaced by the feed pump is more than 405 ml (14.3 Imp fl oz) for each 15 seconds at 1,000 rpm. The discharge pressure is 333 to 412 kPa (3.33 to 4.12 bar, 3.4 to 4.2 kg/cm<sup>2</sup>, 48 to 60 psi) at 600 rpm.



#### Pump performance test

1. Connect a pipe to intake side of feed pump, and set pump so that fuel can be sucked up from fuel level 1.0 m (3.3 ft) below the pump.
2. Operate priming pump at 80 strokes per minute, and make sure that fuel can be sucked up in less than 25 strokes.

#### Air-tightness test

1. Stop up fuel feed pump discharge port and apply 147 to 196 kPa (1.47 to 1.96 bar, 1.5 to 2.0 kg/cm<sup>2</sup>, 21 to 28 psi) of air pressure to intake side of pump.
2. Immerse pump in kerosene (light oil) and make sure that no air leaks from any of pump connections. If bubbles larger than one grain come from fuel feed pump housing or push rod joint continuously, replace oil seal at push rod or push rod.

Replace feed pump assembly, if necessary.

### INSPECTION

#### Feed pump housing

1. Check check valve seats. If they are damaged or excessively worn, replace housing.
2. Check push rod hole. If hole is excessively worn, replace housing.

#### Check valve and check valve spring

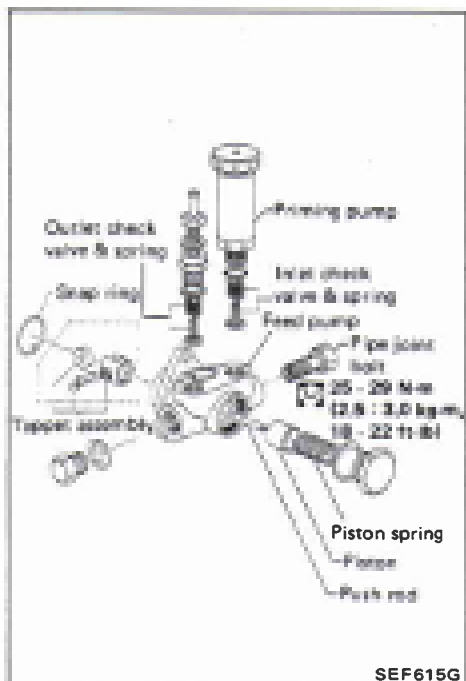
1. If seat of check valve is excessively worn or scarred, replace check valve with a new one.
2. If check valve spring is damaged or permanently stressed, replace valve spring.

#### Piston and piston spring

1. If periphery of piston is excessively worn or scarred, replace piston with a new one.
2. If piston spring is damaged or weakened, replace valve spring.

#### Tappet assembly

1. Tappet  
If periphery of tappet is worn or scarred, replace it with a new one.





## Feed Pump (Cont'd)

### 2. Tappet roller

If periphery of tappet roller is excessively worn or scarred, replace it with a new one.

Roller to pin clearance:

Limit

0.30 mm (0.0118 in)

Tappet roller outside diameter:

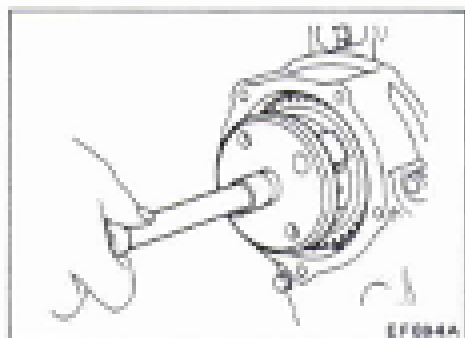
Wear limit

14.9 mm (0.587 in)

## Timer

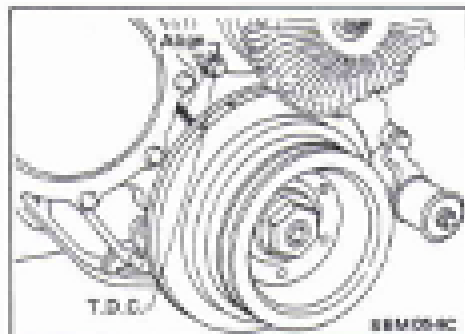
### REMOVAL

1. Remove timing gear cover.
2. Remove timer round nut.
3. Remove timer assembly by threading in Tool.



### INSTALLATION

1. Align crank pulley and timing gear case cover marks so that No. 1 piston is at top dead center.



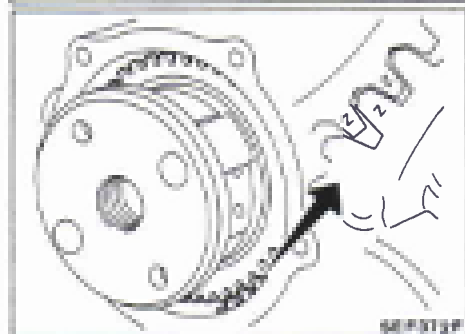
2. Mesh injection pump drive gear with idler gear at Z-mark, and then align gear to key way of injection pump camshaft while turning crank pulley.
3. Secure timer assembly with lock washer and round nut.

☐ : Round nut

59 - 69 N·m

(6 - 7 kg·m, 43 - 51 ft·lb)

4. Install timing gear cover with new gasket sealed.

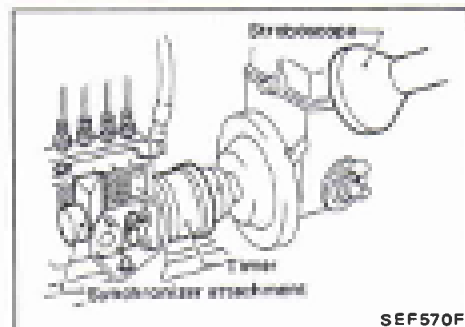


### ADJUSTMENT

1. Install stroboscope, using cover plate bolts, so that synchronizer lever attachment is applied to tappet.
2. Operate fuel injection pump, turn "ON" switch of stroboscope illuminating dial (angle scale) on flywheel, and measure angular change based on variations in pump speed.

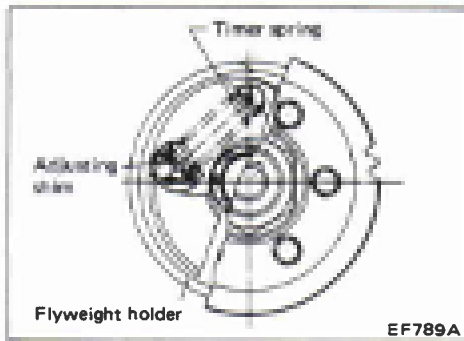
If tester does not have a dial (angle scale):

- (1) Attach a dial to timer coupling and mount a pointer on tester drive shaft.



**Timer (Cont'd)**

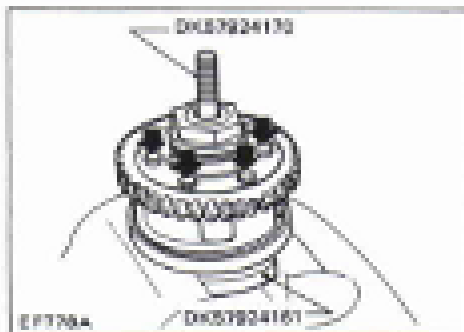
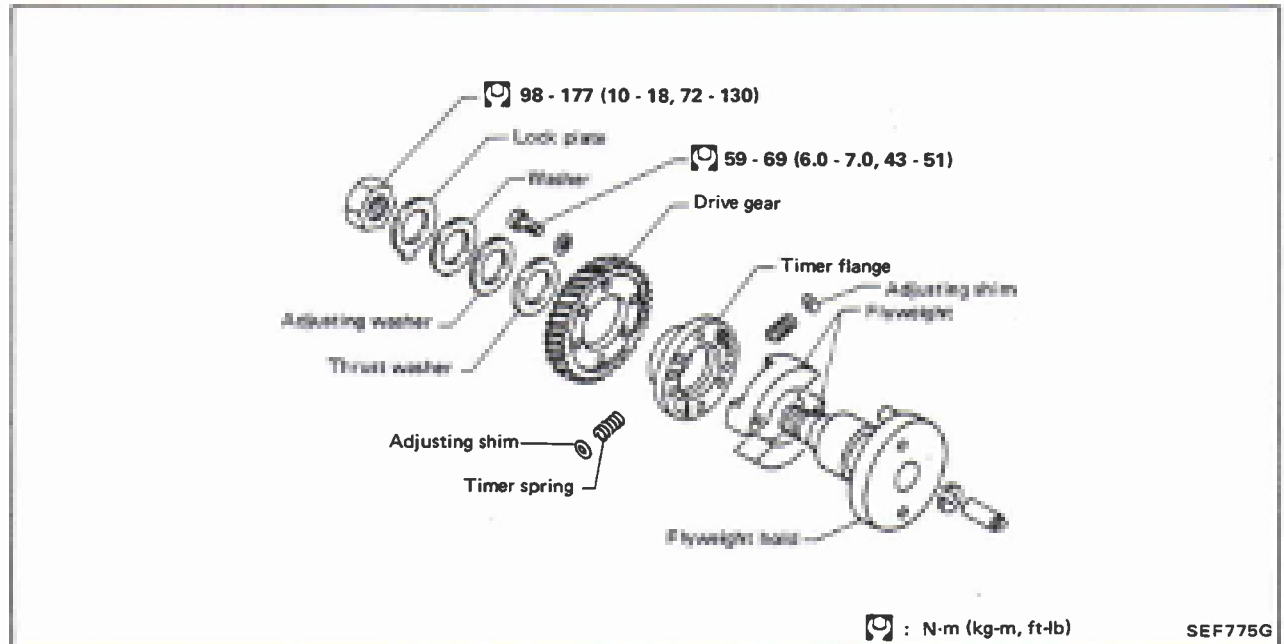
(2) Operate fuel injection pump and turn stroboscope "ON" so as to illuminate dial.



3. If advance angle is not within specified range, adjust by changing timer spring shims.
  - a. When injection timing is retarded, decrease shim thickness.
  - b. When injection timing is advanced, increase shim thickness.

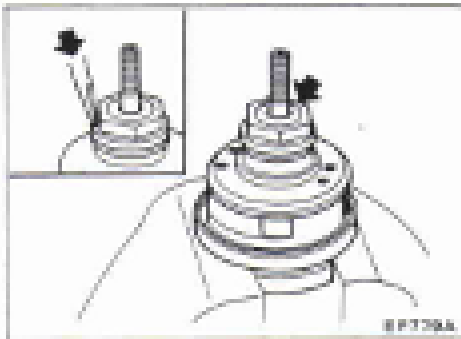
Timer advance curve:  
Refer to S.D.S.

**DISASSEMBLY**

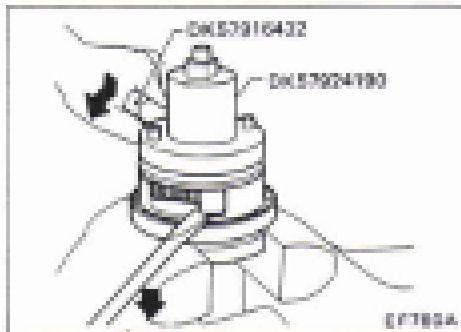


1. Place timer assembly on Tools with flyweight holder hole positioned on base pin.
2. Remove injection pump drive gear.

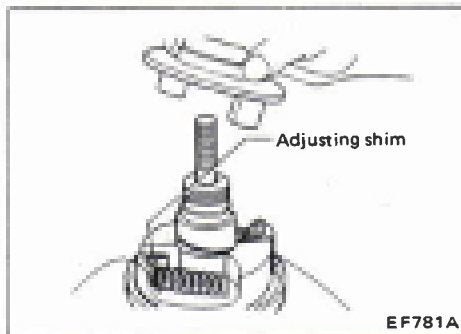
**Timer (Cont'd)**



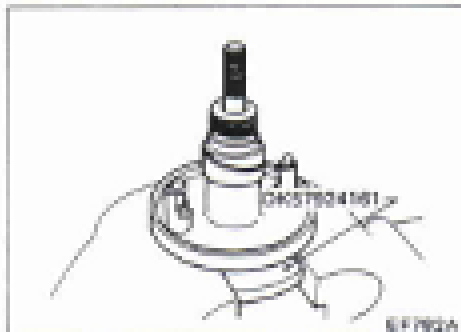
3. Remove nut, lock washer, lock plate, adjusting shim and thrust washer after unbending lock washer.



4. Remove timer flange by prying with lever while pressing spring with Tool DK57916432.

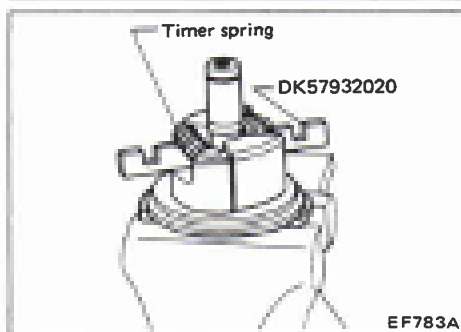


5. Remove timer spring, adjusting shim and flyweight.



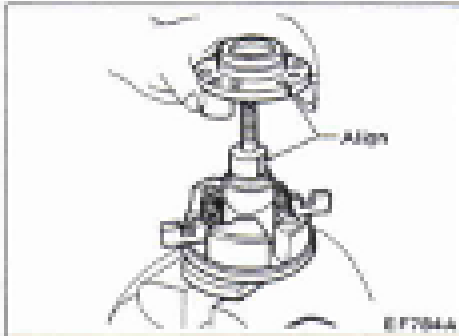
**ASSEMBLY**

1. Set flyweight holder on Tools with flyweight holder pin hole positioned on base pin.

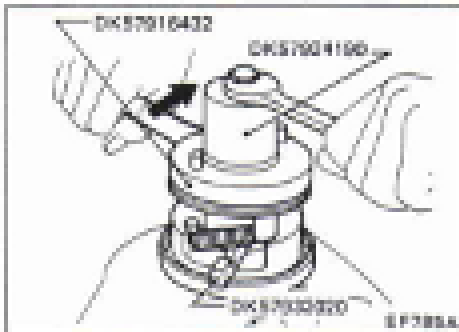


2. Apply grease to flyweight holder pin and flyweight holder hole.
3. Install flyweight and insert Tool under timer spring, positioning spring on flyweight.

**Timer (Cont'd)**

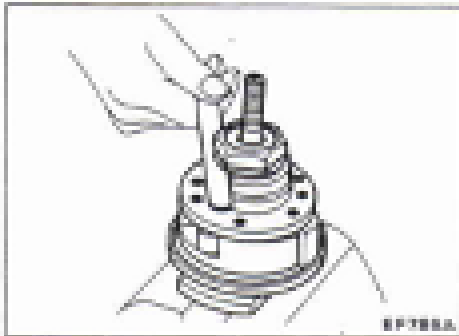


4. Insert suitable adjusting shim into hole at pin part of timer flange.
5. Cover timer flange to flyweight holder by matching notch of flange and key groove of flyweight holder.



6.
  - (1) Turn Tool DK57916432 in direction to compress timer spring, thread in Tool DK57924190, and then remove Tool DK57932020.
  - (2) Using a lever, insert timer spring into flange hole, thread in Tool DK57924190 all the way and install flange in its proper position.

**Make sure that spring is fully seated in holes in flange and flyweight holder.**



7. Adjust flyweight holder and flange clearance.
  - (1) Install thrust washer, lock plate and adjusting washer, and completely tighten them with nut.

 : Nut

98 - 177 N·m

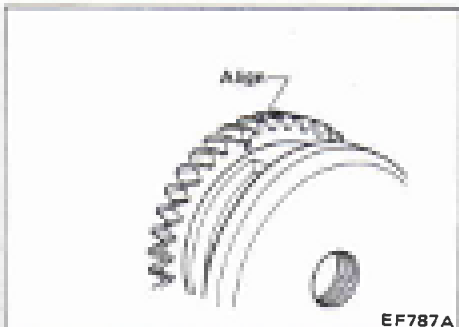
(10 - 18 kg-m, 72 - 130 ft-lb)

- (2) Measure lock plate and thrust washer clearance. If the clearance is not within specifications, adjust with adjusting washer.

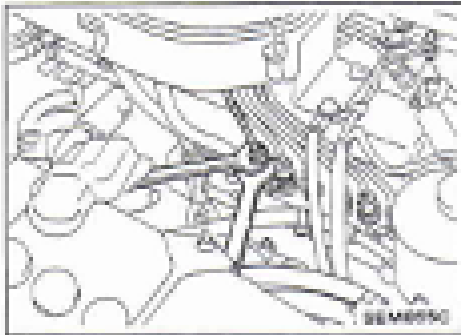
**Lock plate and thrust washer clearance:**

0.02 - 0.10 mm

(0.0008 - 0.0039 in)

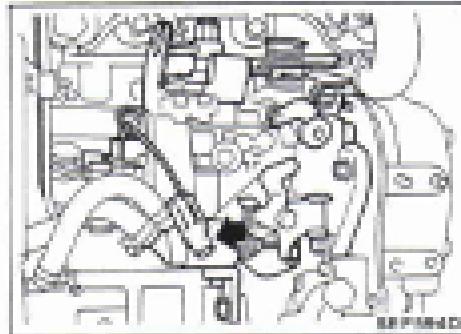


8. Align "O" mark on drive gear with notch in timer flange, and install drive gear.

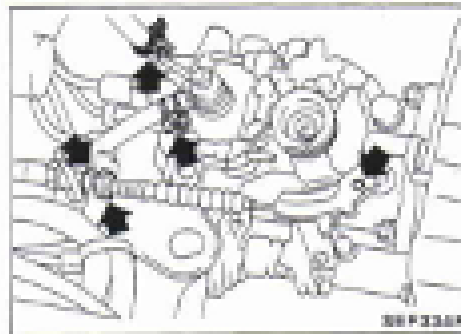
**Removal**

1. Remove injection tube.

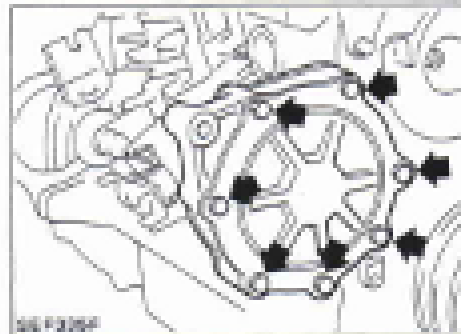
Cover the injection nozzle assembly with a plug to prevent dust entry.



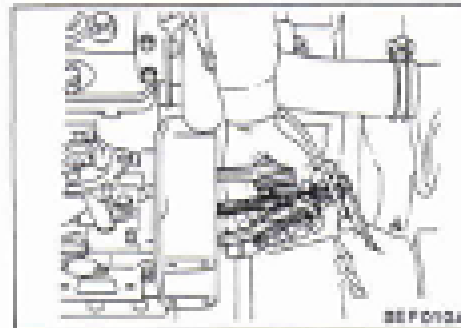
2. Remove fuel cut solenoid wire.



3. Remove accelerator wire and disconnect overflow hose, fuel inlet hose and fuel return hose.

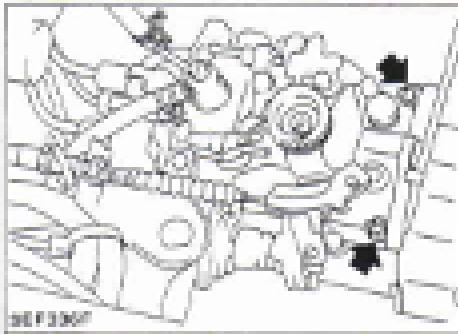


4. Remove injection pump drive gear cover.

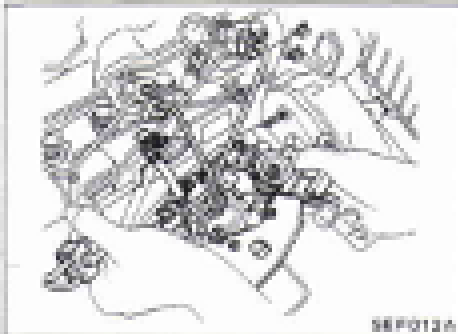


5. Loosen injection pump drive gear nut and remove drive gear by using puller.

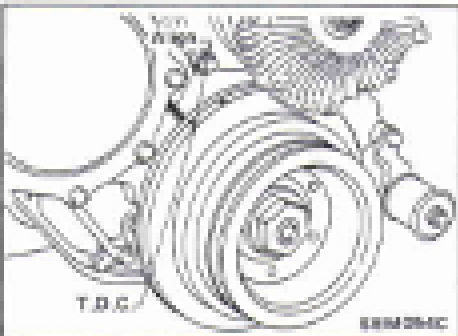
## Removal (Cont'd)



6. Remove injection pump fixing nuts and bolts.

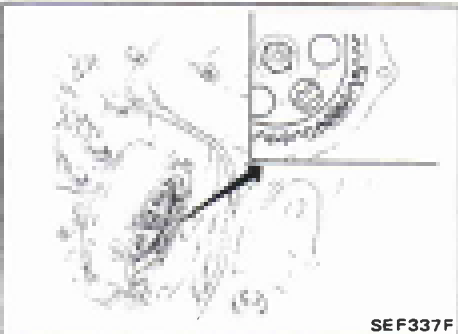


7. Remove injection pump with injection tubes.  
Disconnect injection tube from pump once it is removed.



## Installation and Adjustment


1. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.



2. Install injection pump.

(1) Temporarily set injection pump so that the flange of pump is aligned with aligning mark on front cover.

(2) Install injection drive gear.

 : 59 - 69 N-m (6 - 7 kg-m, 43 - 51 ft-lb)

Make sure that the key does not fall into the front cover.

Make sure that "Z" marks are aligned.

(3) Install drive gear cover with new gasket.

## PLUNGER LIFT ADJUSTMENT

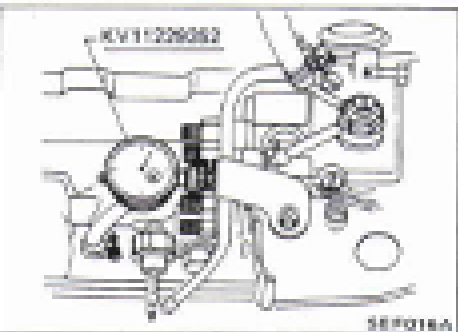
1. Remove plug bolt from distributor head and install measuring device.

2. Loosen injection pump mounting nuts and mounting bracket bolt.

3. Plunger lift measurement and adjustment.

(1) Turn crankshaft counterclockwise 20 to 25 degrees from No. 1 piston at T.D.C.

(2) Find dial gauge's needle rest position at step (1) set position, then set the gauge to zero.



**Installation and Adjustment (Cont'd)**

(3) Turn crankshaft clockwise until No. 1 piston is set at T.D.C.

(4) Read dial gauge indication.

$0.74 \pm 0.02$  mm ( $0.0291 \pm 0.0008$  in)  
(equivalent to  $6^\circ$  B.T.D.C.)

(5) If it is not within the above range, turn pump body until it comes within standard range.

a. If indication is smaller than the specified value, turn pump body counterclockwise.

b. If indication is larger than the specified value, turn pump body clockwise.

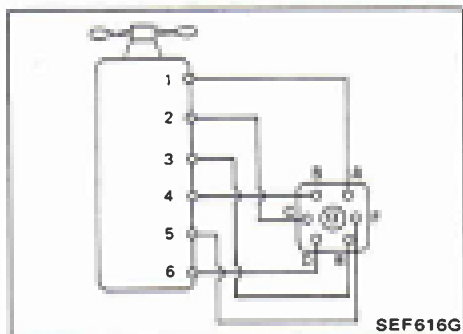
4. Tighten injection pump securely.

 : Injection pump fixing bolt

19 - 25 N·m (1.9 - 2.5 kg·m, 14 - 18 ft·lb)

Injection pump to mounting bracket

30 - 41 N·m (3.1 - 4.2 kg·m, 22 - 30 ft·lb)



5. Disconnect dial gauge and reinstall plug bolt with new washer.

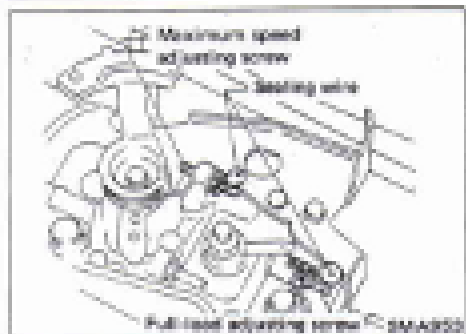
 : 14 - 20 N·m (1.4 - 2.0 kg·m, 10 - 14 ft·lb)

6. Connect injection tubes.

 : Flare nut

20 - 25 N·m (2.0 - 2.5 kg·m, 14 - 18 ft·lb)

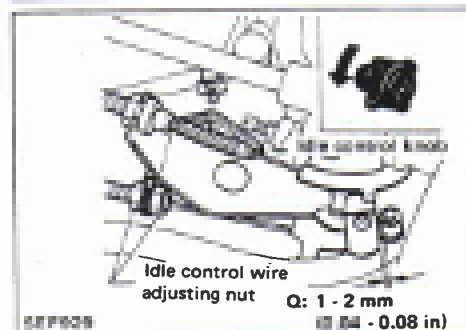
7. Bleed air from fuel system.

**IDLE AND MAXIMUM SPEED ADJUSTMENT**  
**CAUTION:**

a. Do not remove sealing wires unless absolutely necessary.

b. Disturbing full-load adjusting screw will change fuel flow characteristics, resulting in an improperly adjusted engine. Readjustment of fuel injection pump should be done using a pump tester.

c. If maximum speed adjusting screw is turned in direction that increases control lever angle, engine damage may result.

**Throttle control wire adjustment**

1. Turn idle control knob fully counterclockwise.

2. Make sure that clearance between idle control lever pin and fuel injection pump control lever is within the specified range.

Clearance:

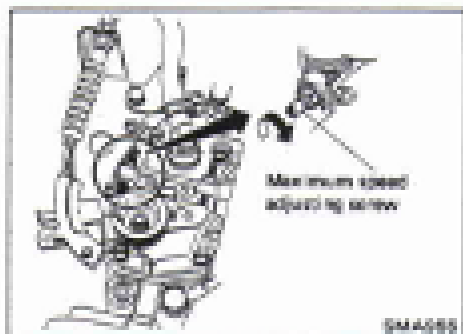
1 - 2 mm (0.04 - 0.08 in)

3. If not within the specified range, adjust with idle control wire adjusting nut.

4. After adjusting clearance, tighten lock nut.

**Installation and Adjustment (Cont'd)****Idle adjustment**

Refer to MA section.

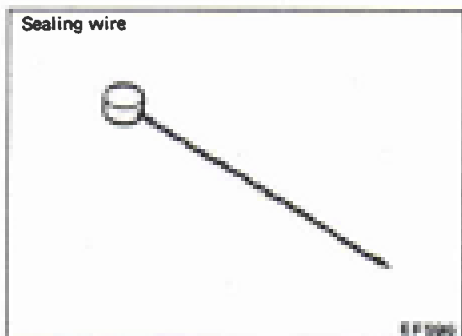
**Maximum speed adjustment**

Maximum speed adjusting screw is retained by sealing wire and need not be adjusted under normal circumstances. However, if it becomes necessary to adjust it, the following procedure should be followed:

1. Start engine and warm it up until coolant temperature indicator points to middle of gauge.
2. Connect tachometer's pick-up to No. 1 fuel injection tube.  
To obtain accurate reading of engine rpm, remove clamps that secure No. 1 fuel injection tube.
3. Depress accelerator pedal fully under no load and, at this point, read the tachometer indication.

**Maximum engine speed (Under no-load):**

**4,600±100 rpm**

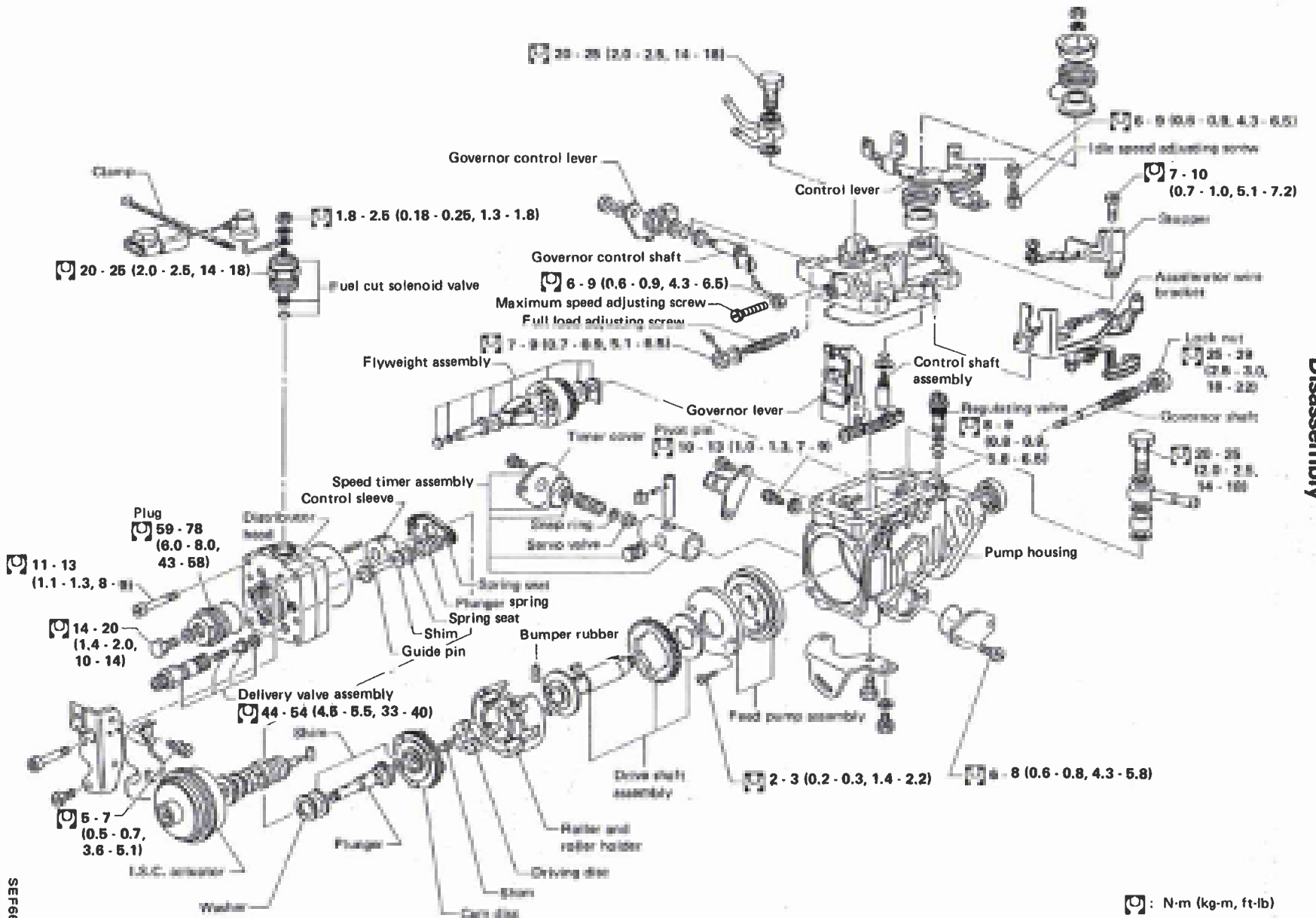


4. If indication is lower than specified maximum engine speed, turn maximum speed adjusting screw counterclockwise 1 or 2 rotations. Then depress accelerator pedal to floor under no load and, at this point, read indication.
5. If indication is still lower than specified speed, repeat step 4 above until specified engine speed is reached.
6. After adjustment, tighten lock nut securely.
7. Wind up with a sealing wire.

**Disassembly****PREPARATION**

- Before performing disassembly and adjustment, test the fuel injection pump and note test results.
- Prior to beginning disassembly of fuel injection pump, clean all dust and dirt from its exterior.
- Disconnect overflow valve and drain fuel.
- Clean work bench completely, removing all foreign matter.
- Collect only those service tools necessary for disassembling and reassembling.
- Be careful not to bend or scratch any parts.





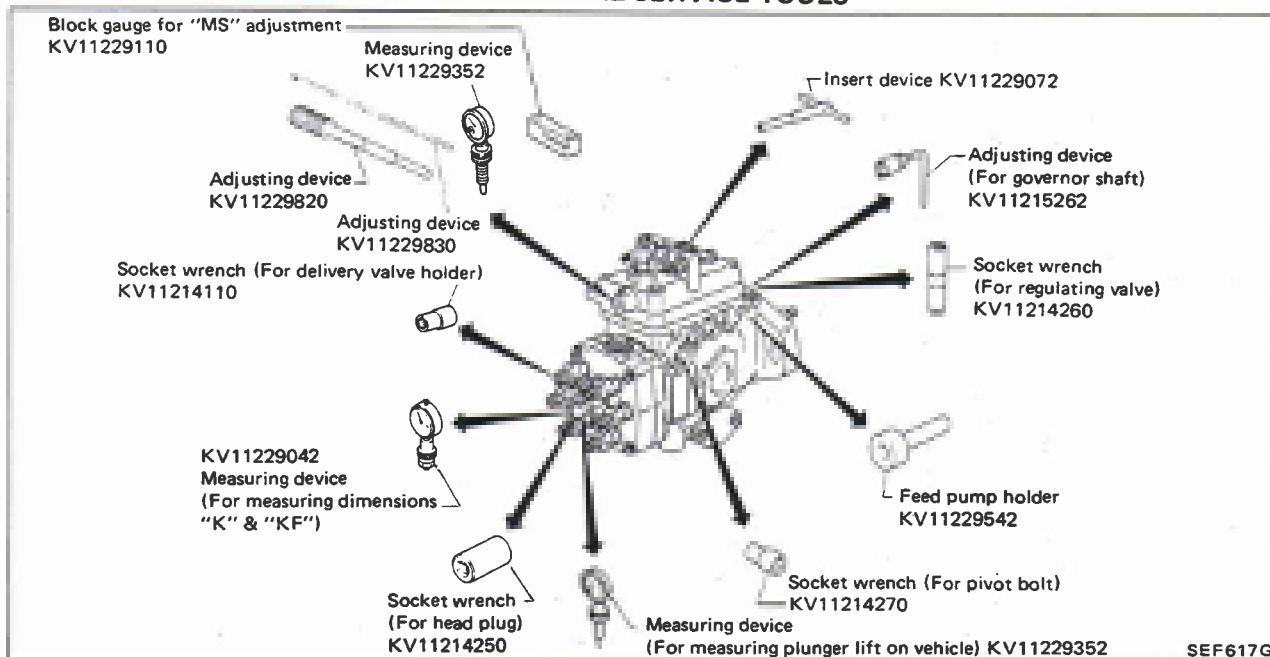
: N-m (kg-m, ft-lb)

EF & EC-93

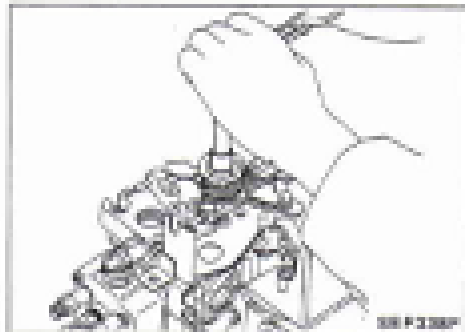
SEF662G

TD42

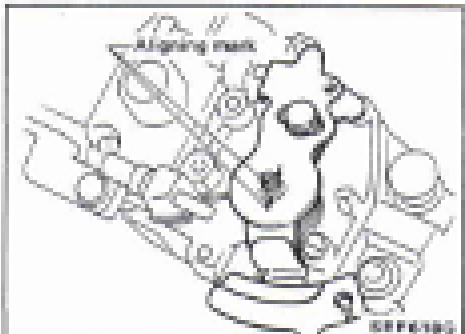
**Disassembly (Cont'd)**  
**SPECIAL SERVICE TOOLS**



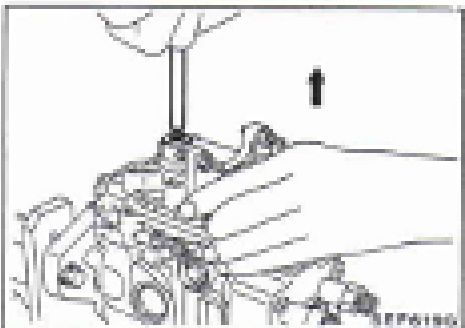
SEF617G



1. Remove governor cover.
  - (1) Remove nut, spring washer, spring seat and spring from control lever.



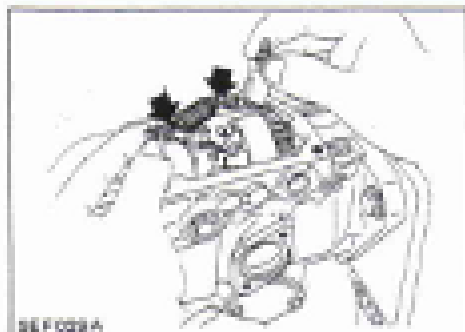
- (2) Check aligning marks on control lever and control shaft.



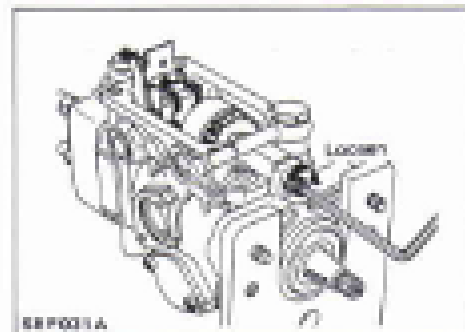
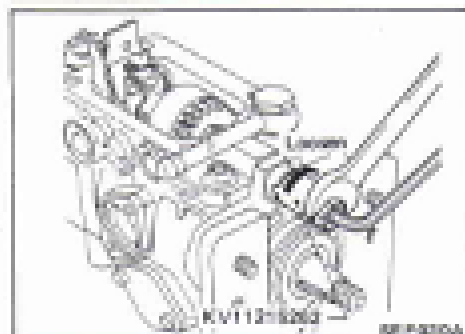
- (3) Remove governor cover.

## Disassembly (Cont'd)

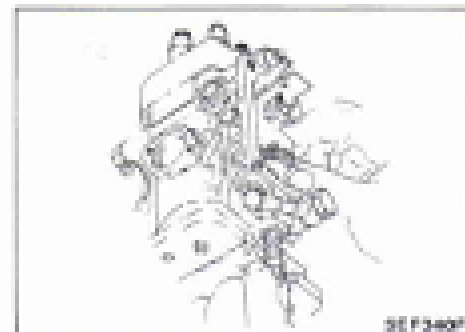
2. Remove control shaft from tension lever.



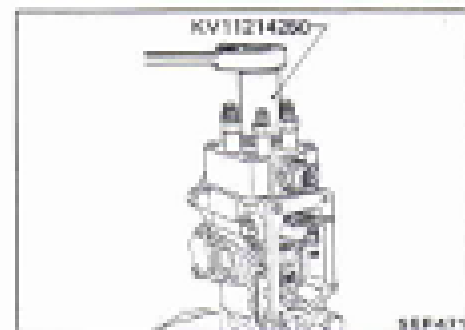
3. Remove governor shaft with special service tool.  
Loosen lock nut by turning it clockwise.



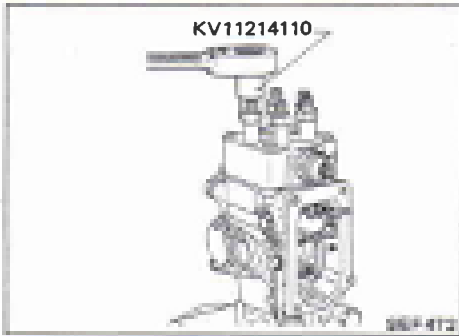
4. Remove governor sleeve, washer and flyweight, along with flyweight holder, then remove washer and shims.



5. Remove plug with special service tool.

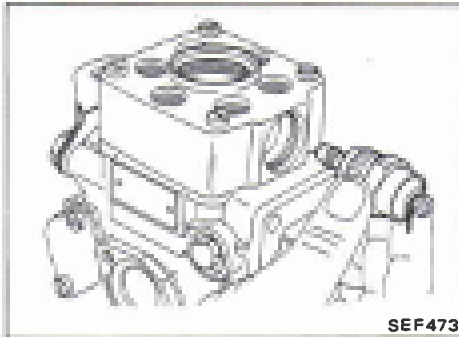


**Disassembly (Cont'd)**

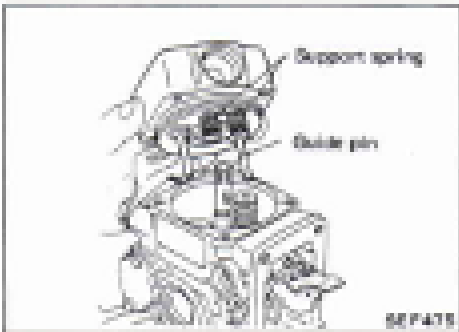


6. Remove delivery valve holder, spring, delivery valve and gasket.

Distributor head has letters (A, B, C, D) stamped on it. Remove lettered parts in alphabetical order and arrange neatly.

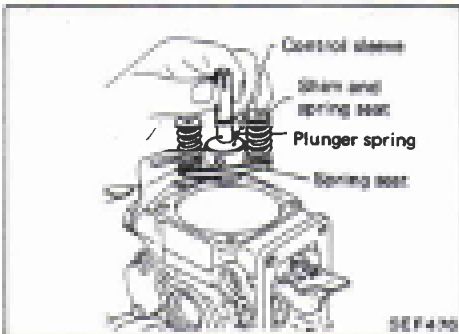


7. Remove fuel cut solenoid valve.



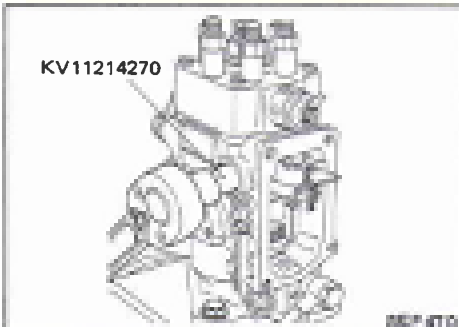
8. Remove distributor head.

Be careful not to drop the two support springs and guide pins.



9. Remove plunger assembly.

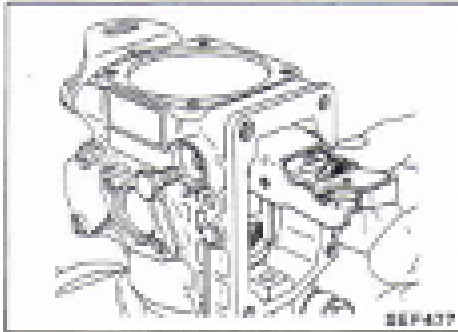
Lift plunger, along with control sleeve, shim, spring seat, plunger spring, washer and shim.



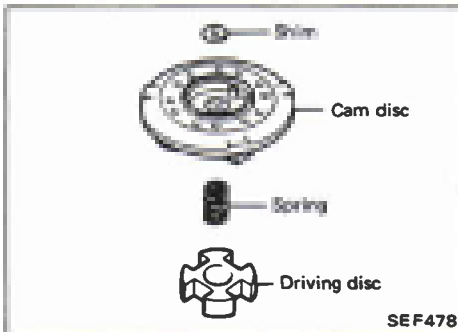
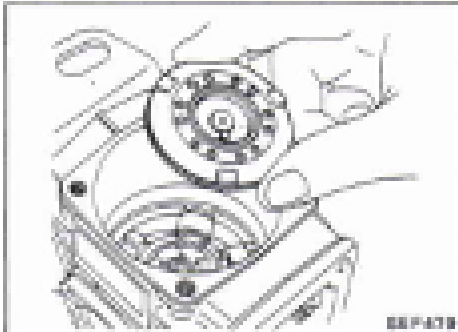
10. Loosen left and right governor pivot bolts.

**Disassembly (Cont'd)**

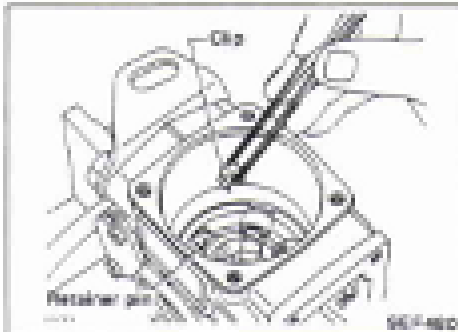
11. Remove governor pivot bolts and lever assembly.  
 Avoid pulling on start spring and start idle spring.



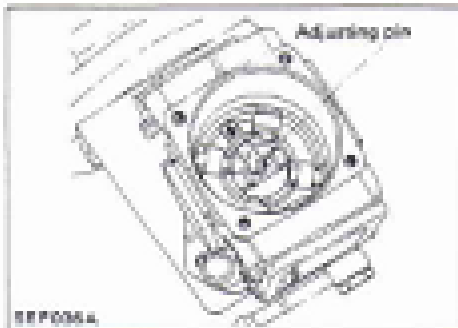
12. Remove shim, cam disc, spring and driving disc.



13. Remove clips and pins.

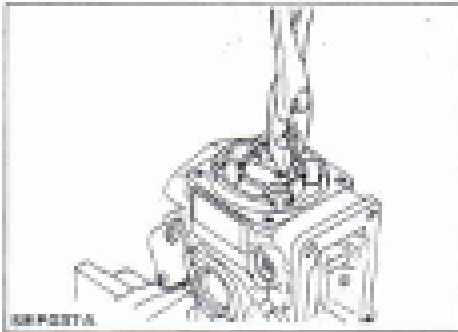


14. Move adjusting pin to center of roller holder, as shown.



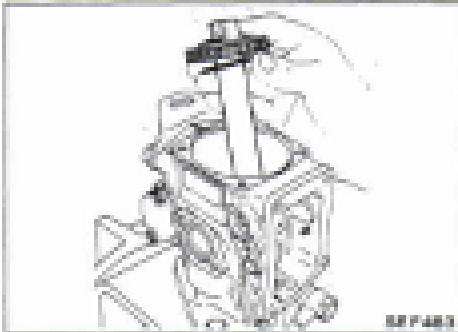
## Disassembly (Cont'd)

15. Lift out roller holder with rollers without tilting.  
Be careful not to drop rollers.

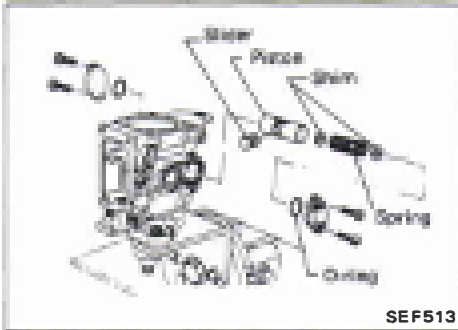


16. Attach oil seal guide onto the drive shaft and then remove drive shaft.

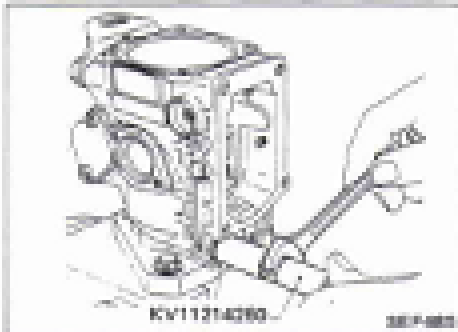
- a. Be careful not to scratch inner surface of fuel injection pump body.
- b. Remove drive gear side key.
- c. Be careful not to drop the key.



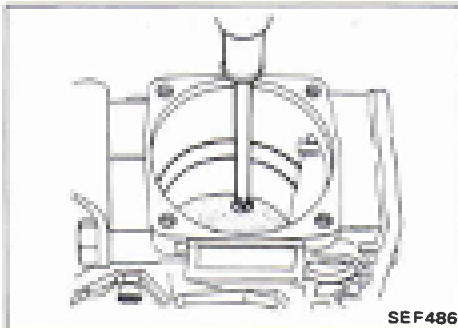
17. Remove speed timer cover, O-ring, shims, spring, piston and slider.

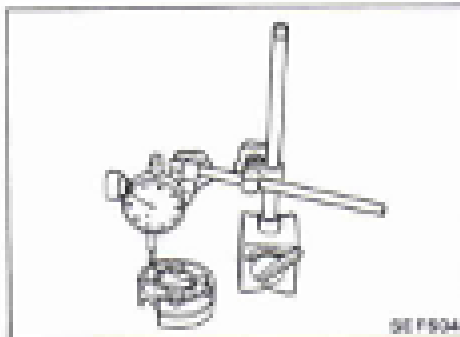
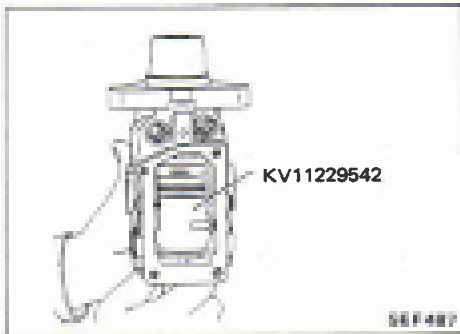


18. Remove regulating valve with special service tool.



19. Loosen screw from feed pump cover.





## Disassembly (Cont'd)

20. Remove cover and feed pump assembly as a unit.

- 1) Insert feed pump holder (KV11229542) into fuel injection pump housing.
- 2) Turn injection pump upside down, as shown.
- 3) Remove cover and feed pump assembly as a unit.
  - a. If cover and feed pump assembly are hard to remove or stuck midway, strike the pump body lightly.
  - b. Do not change positions of vanes.

## Inspection

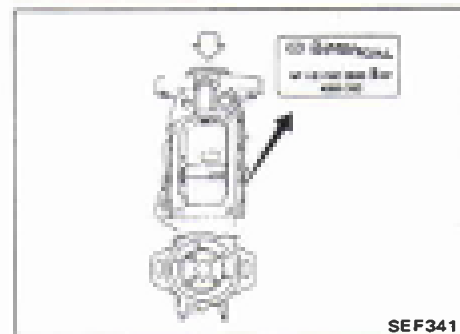
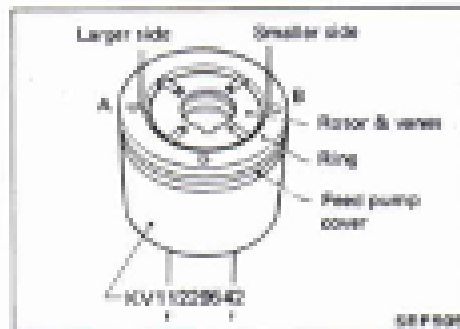
1. Wash all parts completely.
2. Replace worn or damaged parts.
3. Control edge of plunger must be sharp and contact surfaces must not exhibit any noticeable running tracks. If the condition is not good, replace plunger.
4. Check for height of all rollers.

Difference in maximum and minimum roller height should be less than 0.02 mm (0.0008 in).

## Assembly

Always replace the following service parts as assembly units.

- Distributor head, control sleeve and plunger
- Feed pump assembly (pump impeller and vanes with eccentric ring)
- Plunger spring kit
- Roller assembly
- Flyweight kit
- Governor lever assembly



## PREPARATION

Dip all movable parts and O-rings in test oil, then clean.

1. Set feed pump cover, rotor with vanes, and ring on special service tool KV11229542.

- 1) Align the three holes in feed pump cover and ring.
- 2) Do not change positions of vanes.
- 3) Holes A and B in ring are not equally spaced to inner wall of ring.

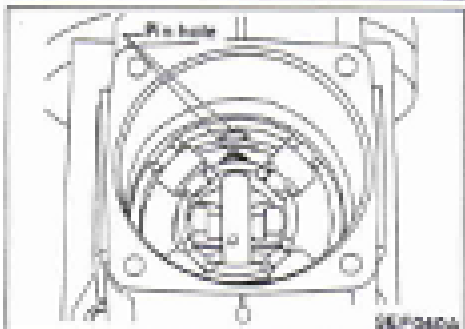
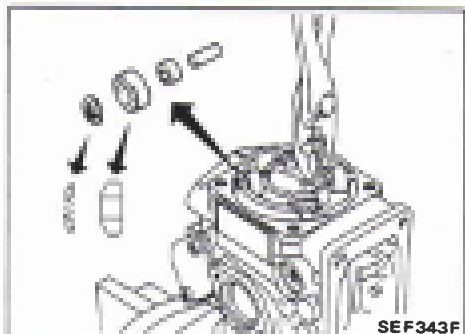
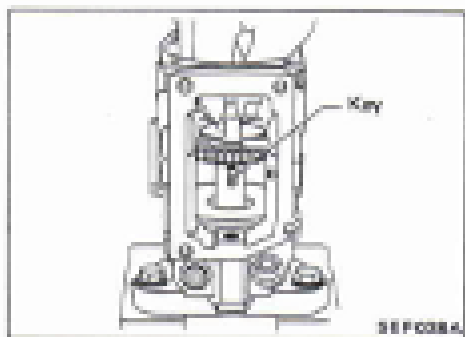
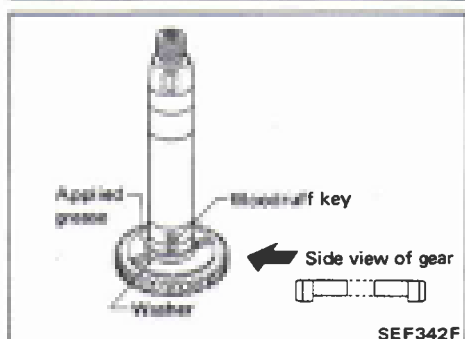
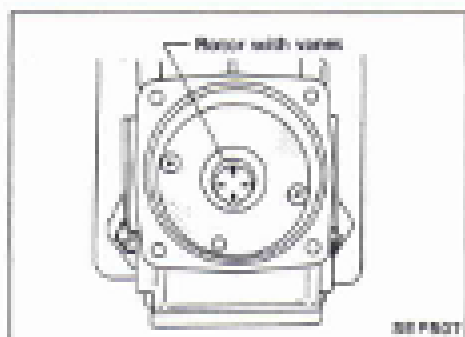
2. Install feed pump cover, rotor with vanes, and ring to pump housing.

Be careful to install ring correctly. If left and right are reversed, fuel will not be discharged from feed pump.

## Assembly (Cont'd)

When fuel injection pump rotates in direction "R"

The following description applies to fuel injection pumps that rotate in direction "R".



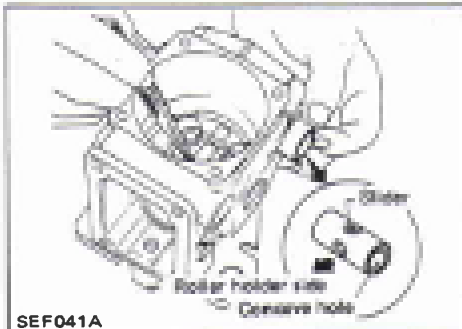
3. Turn fuel injection pump 180°, and remove special service tool KV11229542. Tighten screw to retain pump cover.
  - a. When tightening screws, be careful not to scratch inner wall of pump housing.
  - b. After tightening screws, make sure that rotor with vanes moves smoothly.
4. Make sure that drive shaft and gear are assembled properly, as shown.

5. Attach oil seal guide onto the drive shaft, then install drive shaft to housing while key in drive shaft engages with key groove in rotor.

6. Set drive shaft's nail parallel to timer.
7. Install roller and holder.
  - a. Do not interchange roller positions. If they are interchanged, refer to Inspection for correction.
  - b. Make sure that washer is situated outward of rollers.

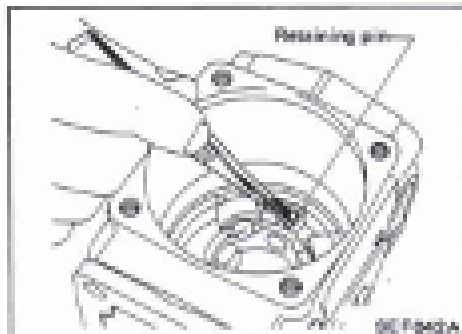
8. Align holder and timer adjusting pin holes.



**Assembly (Cont'd)**

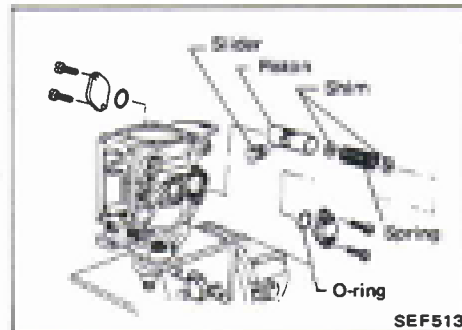
9. Install timer piston and slider as a unit.

- a. Make sure that hole in slider faces towards roller holder.
- b. Make sure that concave hole in piston is on same side as return hole.



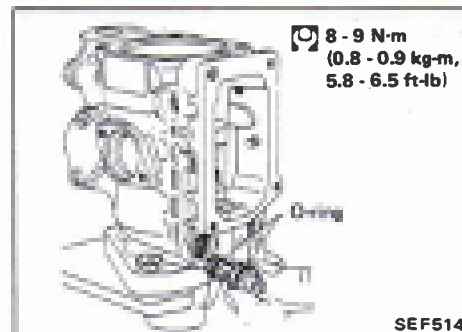
10. Insert timer adjusting pin into timer piston slider, and secure with retaining pin and clip.

**Make sure that timer piston moves smoothly.**



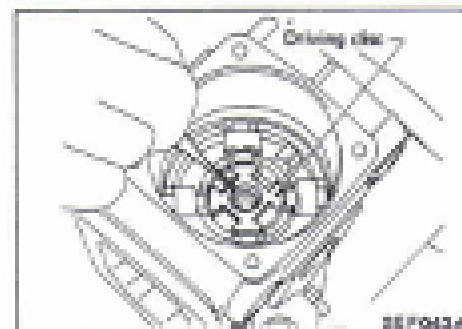
11. Install timer, using a 0.6 mm (0.024 in) thick shim, then install timer spring, shim, O-ring, and cover, in that order.

- a. Use at least one shim on each side of timer spring.
- b. Use shims that were selected during bench test.



12. Install regulating valve.

**Be careful not to scratch O-rings.**



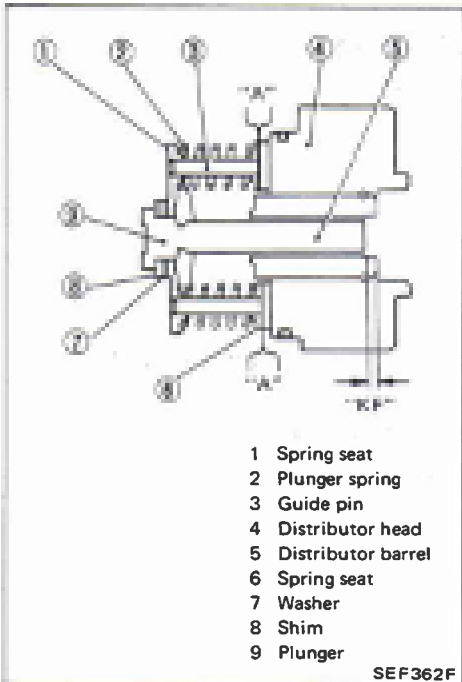
13. Install driving disc with its concave side facing up.

**Assembly (Cont'd)**

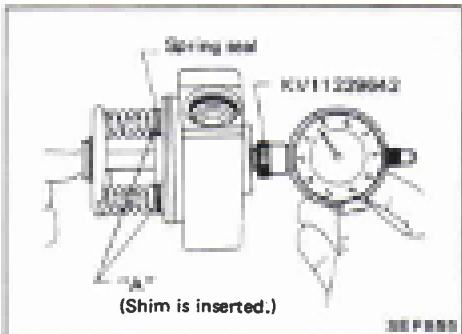
14. Measurement of plunger spring set length (dimension "KF")  
 Dimension "KF" is the distance between the end face of the distributor barrel and the end face of the plunger.

(1) Install distributor head, as shown.

- Do not insert shim into "A" portion before measuring.



(2) Set dial gauge so that it can compress 0 to 10 mm (0 to 0.39 in), and reset to zero.



(3) Apply force (not enough to compress plunger spring) to plunger's bottom in axial direction, and measure dimension "KF" with dial gauge, as shown.

(4) Determine the shim to be used by calculating difference between standard and measured dimensions.

**Standard dimension "KF":**

**5.7 - 5.9 mm (0.224 - 0.232 in)**

[Example]

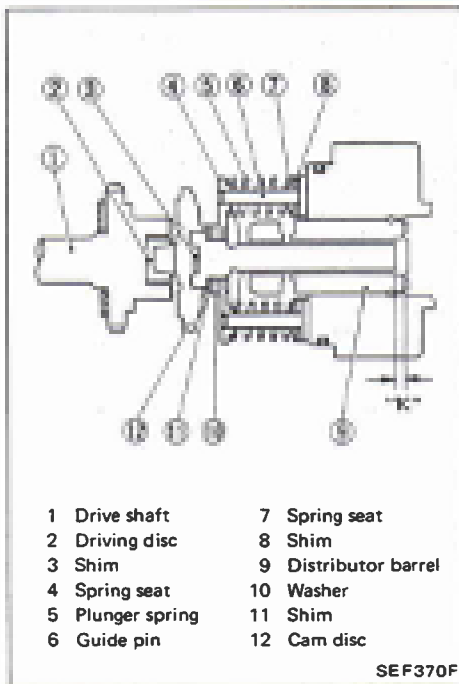
When measured (dial gauge reading) value is 5.2 mm,

**5.7 mm - 5.2 mm = 0.5 mm (shim thickness to be used)**

**Assembly (Cont'd)**

- a. When there are no shims available of a thickness which matches specified dimensions, use slightly thicker shims.
- b. Use selected shim with distributor head in step 14-(3) above.
- c. Use the same size shim on each side of distributor head.
- d. Shims are available in seven different thicknesses.

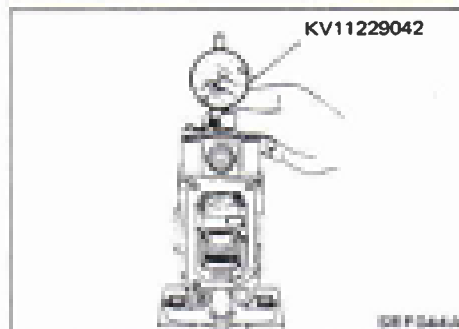
Part number	Thickness mm (in)
16882-V0700	0.5 (0.020)
16882-V0701	0.8 (0.031)
16882-V0702	1.0 (0.039)
16882-V0703	1.2 (0.047)
16882-V0704	1.5 (0.059)
16882-V0705	1.8 (0.071)
16882-V0706	2.0 (0.079)



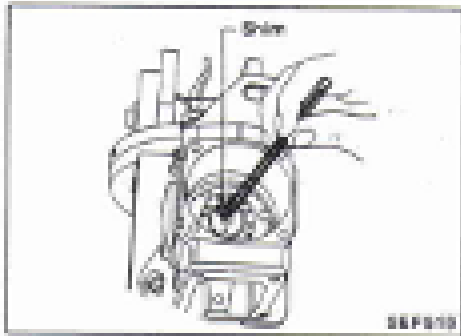
**15. Adjustment of plunger dimensions (Measurement of dimension "K")**

Dimension "K" is the distance from the end face of the distributor barrel to the end face of the plunger top, when the plunger is at the bottom dead center position.

- (1) Install parts as shown.
  - a. Do not install "spring" on driving disc.
  - b. When inserting plunger and shim into cam disc, make sure that drive pin is situated in groove at bottom of plunger.



- (2) Using a dial gauge, measure dimension as shown.
  - a. Rotate drive shaft so that plunger is set at bottom dead center.
  - b. Securely mount distributor head with screws.



**Assembly (Cont'd)**

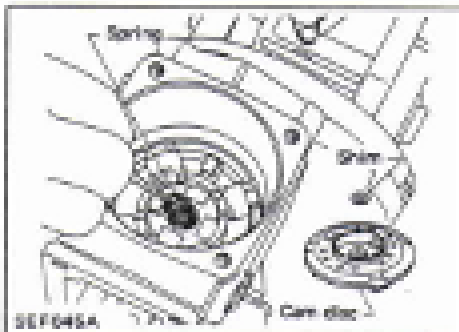
(3) Determine shim to be used by calculating difference between measured (dial gauge reading) value and standard dimension "K", and position that shim on plunger's bottom.

$$"K" = 3.2 - 3.4 \text{ mm}$$

$$(0.126 - 0.134 \text{ in})$$

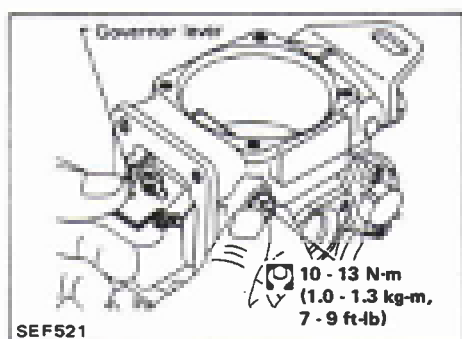
- a. When measured value is greater than standard dimension "K", use a thicker shim.
- b. After shim has been positioned, measure dimension again to ensure that it is correct.
- c. Shims are available in 25 different thicknesses.

Part number	Thickness mm (in)	Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)	16742-R8100	1.96 (0.0772)
16884-V0701	2.00 (0.0787)	16742-R8101	2.04 (0.0803)
16884-V0702	2.08 (0.0819)	16742-R8102	2.12 (0.0835)
16884-V0703	2.16 (0.0850)	16742-R8103	2.20 (0.0866)
16884-V0704	2.24 (0.0882)	16742-R8104	2.28 (0.0898)
16884-V0705	2.32 (0.0913)	16742-R8105	2.36 (0.0929)
16884-V0706	2.40 (0.0945)	16742-R8106	2.44 (0.0961)
16884-V0707	2.48 (0.0976)	16742-R8107	2.52 (0.0992)
16884-V0708	2.56 (0.1008)	16742-R8108	2.60 (0.1024)
16884-V0709	2.64 (0.1039)	16742-R8109	2.68 (0.1055)
16884-V0710	2.72 (0.1071)	16742-R8110	2.76 (0.1087)
16884-V0711	2.80 (0.1102)	16742-R8111	2.84 (0.1118)
16884-V0712	2.88 (0.1134)		



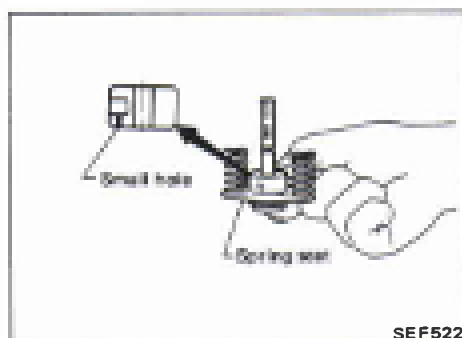
16. Install spring in top of driving disc, then install cam disc and shim.

Make sure cam disc drive pin and drive shaft key way face upwards.

**Assembly (Cont'd)**

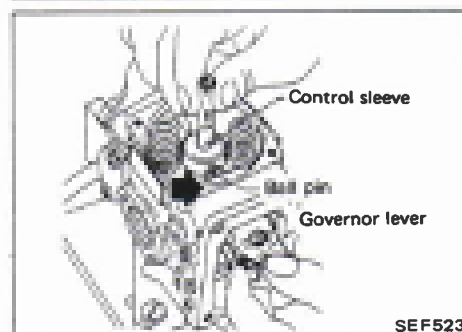
17. Install governor lever.

Avoid pulling on start spring and start idle spring.

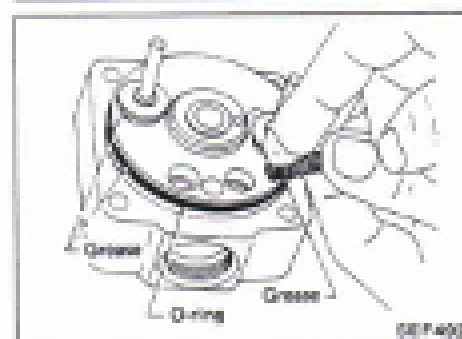


18. Install plunger assembly.

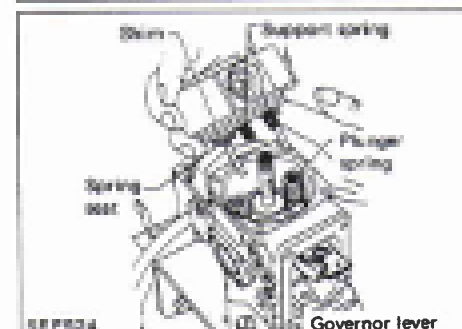
a. Make sure control sleeve is installed with its small hole facing spring seat side.



b. Insert ball pin for governor lever into hole in control sleeve (shown by arrow).



19. Apply a coat of grease to guide pin, shim and spring seat, and attach these parts to distributor head.



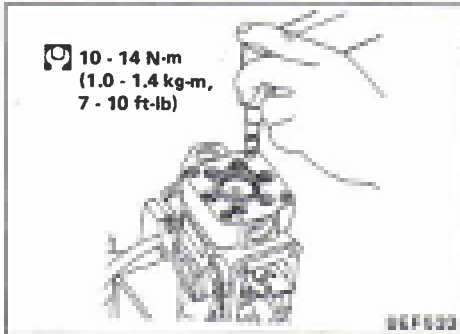
20. Install distributor head.

- a. Always face support spring toward governor lever.
- b. Be careful not to drop spring.
- c. Make sure that ball pin for governor lever is inserted properly into hole in control sleeve.
- d. After installing distributor head, make sure that plunger spring is at guide pin in spring seat.

**Assembly (Cont'd)**

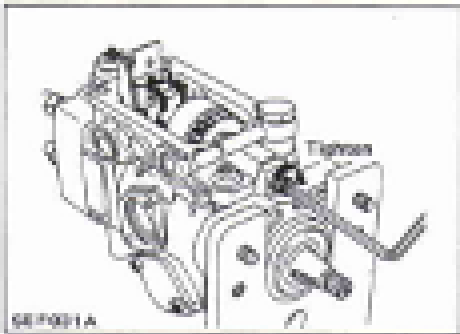
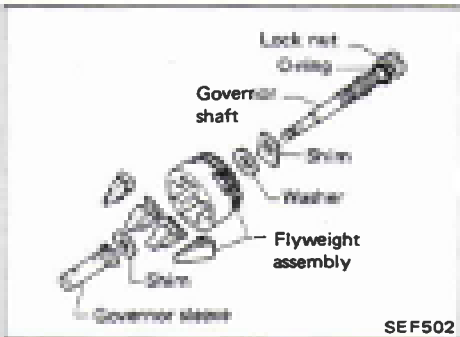
21. Tighten distributor head.

- ☞ : Distributor head bolts  
10 - 14 N·m (1.0 - 1.4 kg-m, 7 - 10 ft-lb)



22. Attach flyweight assembly.

When installing governor shaft, be careful not to scratch O-rings.



23. Adjust dimension "L".

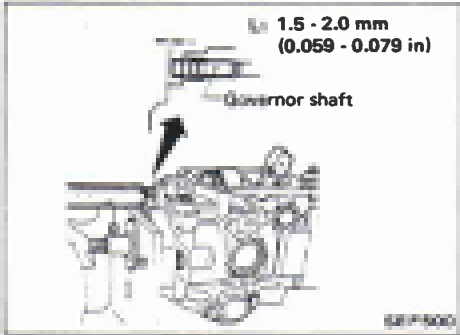
"L":

1.5 - 2.0 mm (0.059 - 0.079 in)

a. Tighten lock nut to specified torque.

☞ : 17 - 22 N·m (1.7 - 2.2 kg-m, 12 - 16 ft-lb)

b. Governor shaft has a left-hand thread for injection pumps designed to rotate in "R" direction, and a right-hand thread for those rotating in "L" direction.



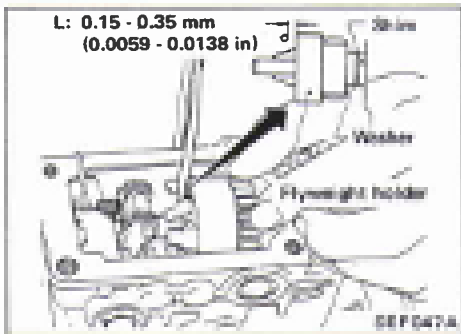
**Assembly (Cont'd)**

24. Measure axial play of flyweight holder. If it is not within specified range, adjust it by means of shims.

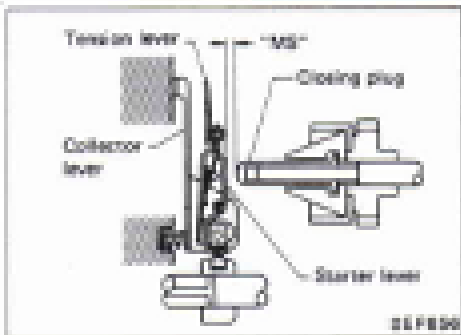
"L":

0.15 - 0.35 mm (0.0059 - 0.0138 in)

Shims are available in 5 different thicknesses.



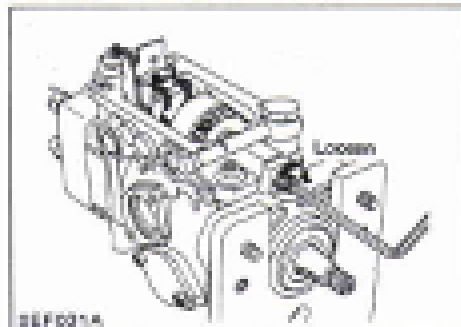
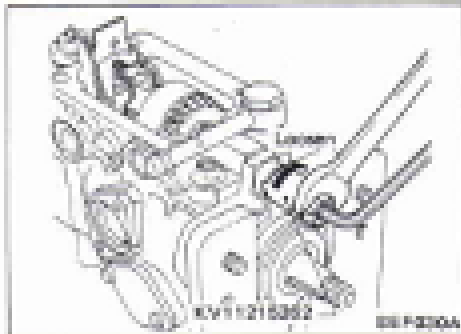
Part number	Thickness mm (in)
19208-V0700	1.05 (0.0413)
19208-V0701	1.25 (0.0492)
19208-V0702	1.45 (0.0571)
19208-V0703	1.65 (0.0650)
19208-V0704	1.85 (0.0728)



25. Measurement of dimension "MS" (for determining starting amount of fuel injection)

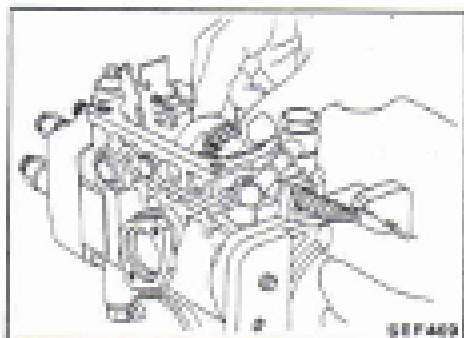
Dimensions "MS" is the distance between closing plug and start lever.

(1) Remove lock nut and governor shaft.

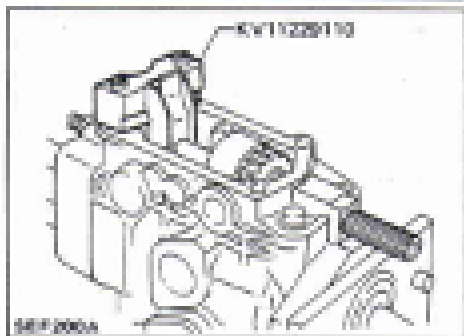


**Assembly (Cont'd)**

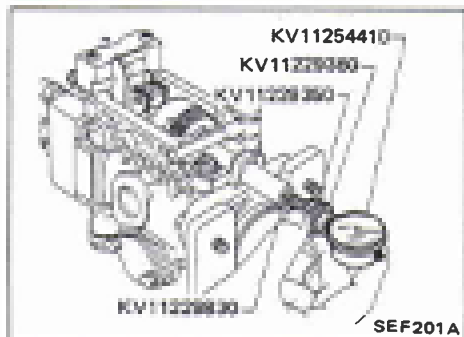
(2) Install special service tool at governor shaft position.



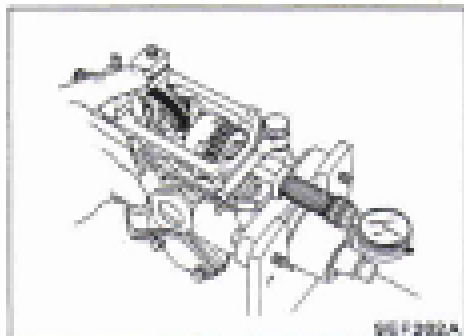
(3) Install special service tool (block gauge) to pump housing.



(4) Install special service tool (dial gauge) with rod.

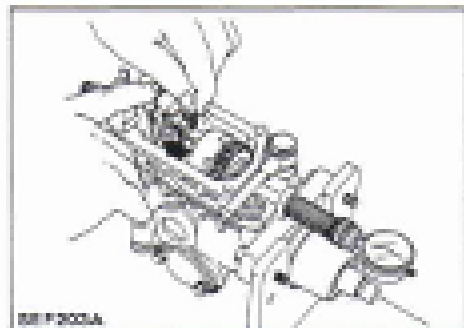


(5) Push governor sleeve against flyweight. Hold governor sleeve in that position and set dial gauge to zero.



(6) Push tension lever until it touches stopper pin. Back governor sleeve up until start lever touches tension lever. At this point read dial gauge.

**MS: Refer to S.D.S.**

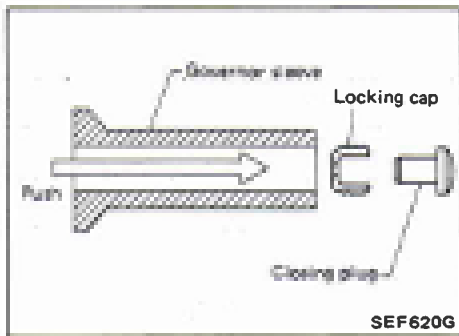




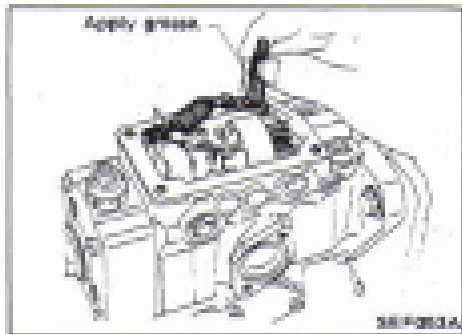
**Assembly (Cont'd)**

(7) If dial gauge indication is not within this range, replace closing plug and adjust dimension "MS" to that range.

**Closing plugs are available in 8 different lengths.**



Part number	Length mm (in)
16268-R8100	3.10 (0.1220)
16268-R8101	3.30 (0.1299)
16268-R8102	3.50 (0.1378)
16268-R8103	3.70 (0.1457)
16268-R8104	3.90 (0.1536)
16268-R8105	4.10 (0.1614)
16268-R8106	4.30 (0.1693)
16268-R8107	4.50 (0.1772)



26. Install control lever shaft.

**Apply a coat of grease to lever shaft end.**

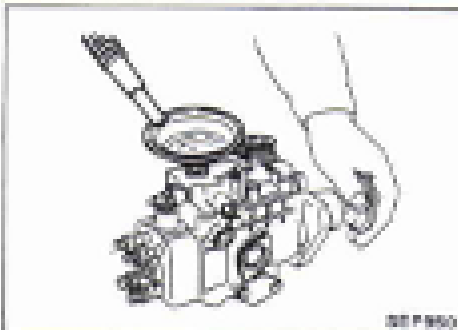
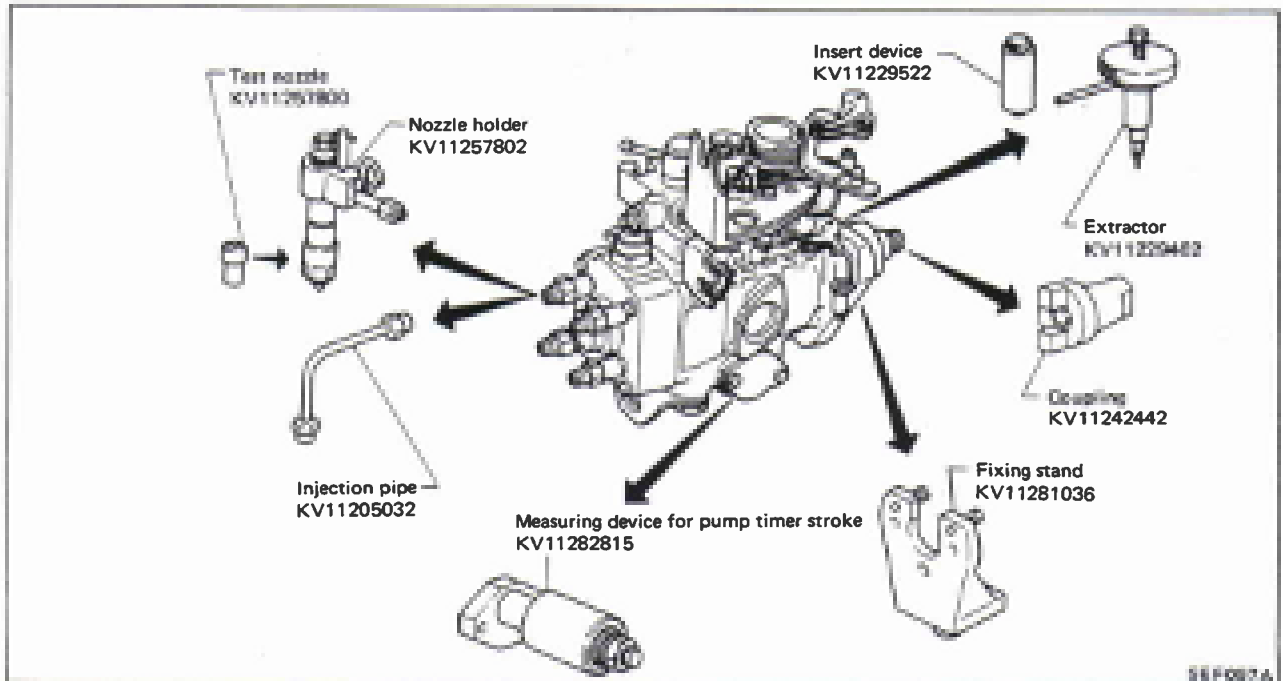
27. Install governor cover.

## Test

### PREPARATION

Nozzle		KV11257805
Nozzle holder		KV11257802
Nozzle starting pressure	kPa (bar, kg/cm <sup>2</sup> , psi)	14,711 - 15,201 (147.1 - 152.0, 150 - 155, 2,133 - 2,204)
Nozzle tube Inner dia. x outer dia. x length	mm (in)	KV11205032 2.0 x 6.0 x 840 (0.079 x 0.236 x 33.07)
Fuel feed pressure	kPa (bar, kg/cm <sup>2</sup> , psi)	20 (0.20, 0.2, 2.8)
Fuel (test oil)		ISO 4113 or SAE Standard Test Oil (SAE J967d)
Fuel temperature	°C (°F)	45 - 50 (113 - 122)
Rotating direction		Right (observed from the drive shaft)
Injection sequence		1-4-2-6-3-5

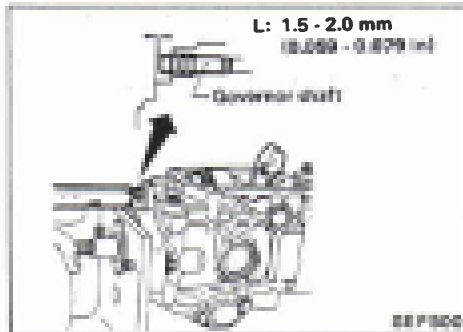
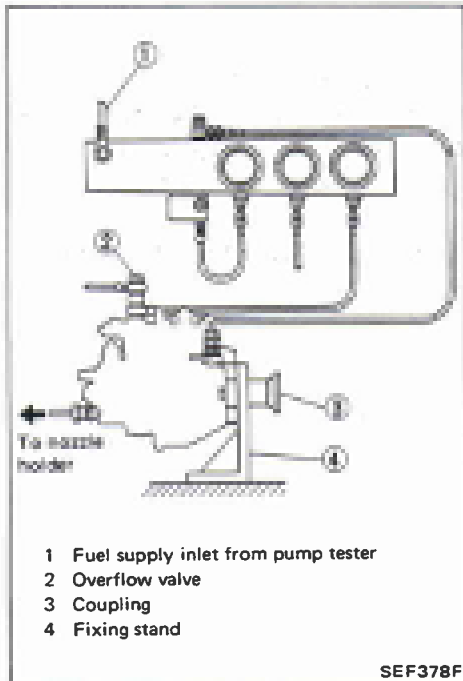
1. Prepare necessary service tools.



2. Pour test oil into fuel injection pump.  
**Test oil should be ISO 4113, SAE Standard Test Oil (SAE J967d) or its equivalent.**

**Test (Cont'd)**

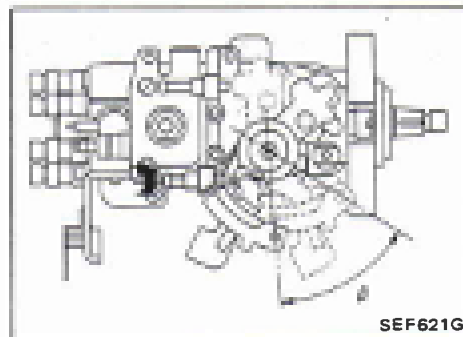
3. Install fuel injection pump to pump tester.
4. Connect necessary piping.



5. Make sure that governor shaft is properly installed.

 : Governor shaft lock nut

17 - 22 N·m (1.7 - 2.2 kg·m, 12 - 16 ft·lb)



6. Run fuel injection pump as follows:

- (1) Maintain test oil in tank at 45 to 50°C (113 to 122°F).
- (2) Set control lever at "full-load" using a spring.

**Set maximum speed adjusting screw in position shown, by turning it counterclockwise.**

$\beta$ : Refer to S.D.S.

- (3) Furnish specified voltage of 12 volts to fuel-cut solenoid valve to activate it.
- (4) Rotate fuel injection pump by hand to see if it moves smoothly.
- (5) Rotate fuel injection pump at 300 rpm to make sure that all air inside pump chamber is discharged through overflow valve.
- (6) Set feed oil pressure at 20 kPa (0.20 bar, 0.2 kg/cm<sup>2</sup>, 2.8 psi).
- (7) Run fuel injection pump at 1,000 rpm for ten minutes.

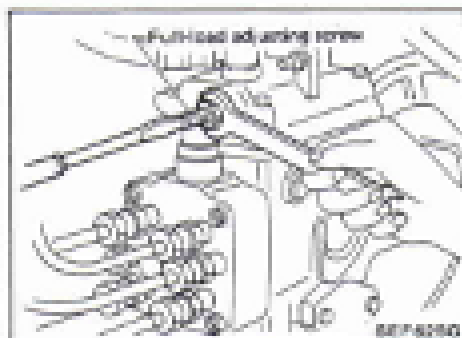
**If fuel leakage, fuel injection failure or unusual noise is noticed, immediately stop pump tester operation and check fuel injection pump for abnormalities.**

**Test (Cont'd)****ADJUSTMENT****Preadjust full-load delivery**

1. Set control lever at "full-load" using a spring.  
Set maximum speed adjusting screw in position shown, by turning it counterclockwise. Refer to step 6-(2) in Preparation.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Rotate fuel injection pump at 1,100 rpm, and measure amount of fuel injection.

**Standard fuel injection:**

Refer to S.D.S.



4. If fuel injection is less than standard, adjust it with full-load adjusting screw.

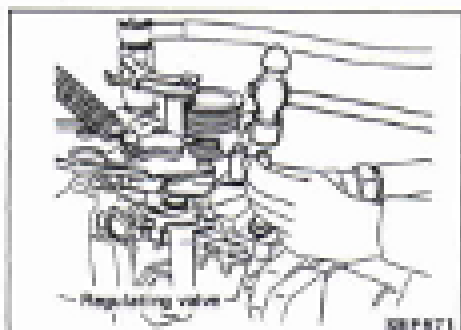
Turn adjusting screw clockwise to increase fuel injection.

**Adjustment of feed pump pressure**

1. Repeat steps 1 and 2 outlined under "Preadjust Full-Load Delivery" heading.
2. Measure feed pump pressure at specified fuel injection pump rpm.

**Standard pump pressure:**

Refer to S.D.S.

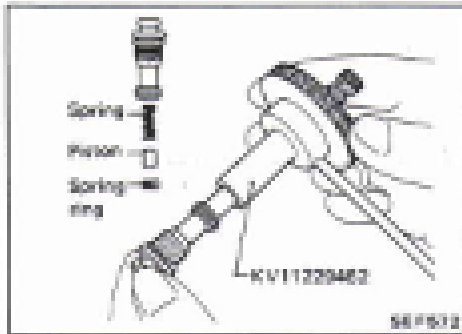


- a. When measured pressure is lower than specifications. Push in plug that is driven into regulating valve body. Be careful not to push plug in too far.

**Test (Cont'd)**

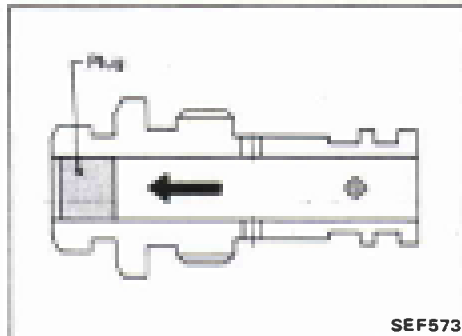
**b. When measured pressure is higher than specifications.**

Remove regulating valve from fuel injection pump, and disassemble regulating valve using service tool KV11229462.



Drive plug out until it is flush with end face of regulating valve. Install spring, piston and spring ring, in that order, to regulating valve.

Make sure that spring ring is flush with end face of regulating valve body when it is pushed in.



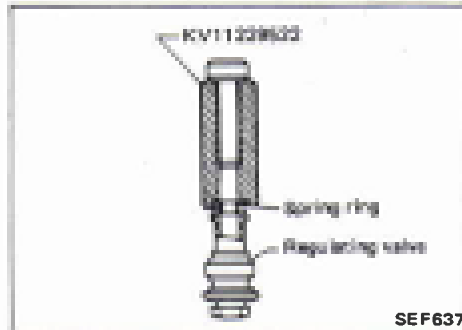
Attach regulating valve to fuel injection pump.

 : **Regulating valve**

**8 - 9 N·m**

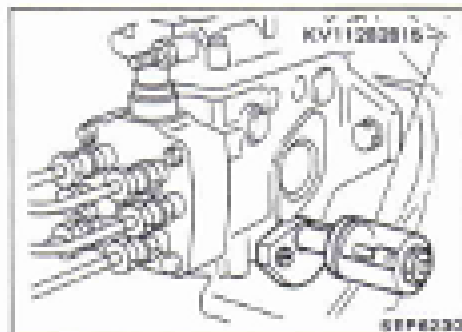
**(0.8 - 0.9 kg-m, 5.8 - 6.5 ft-lb)**

Adjust supply pump pressure to specifications. Refer to step 2-a.



**Adjustment of speed timer**

1. Repeat steps 1 and 2 outlined under "Preadjust Full-Load Delivery" heading.
2. Remove cover from high-pressure side (side without spring) of timer, and attach service tool KV11282815 to that side.



3. Measure timer piston strokes at specified fuel injection pump rpm indicated below.

**Standard timer piston stroke:**

**Refer to S.D.S.**

**Test (Cont'd)**

4. If timer piston stroke is not within specified range, remove cover from low-pressure side of timer and adjust piston stroke by adding shim(s).

**a. Shims (service parts)**

Part number	Thickness mm (in)
16880-V0700	0.5 (0.024)
16880-V0701	0.7 (0.028)
16880-V0702	0.9 (0.035)
16880-V0703	1.0 (0.039)
16880-V0704	1.2 (0.047)
16880-01T00	2.4 (0.094)

- b. Make sure that at least one shim is used on each side of timer spring.

**Adjustment of fuel injection under full-load**

1. Set control lever at "full-load" using a spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at each specified fuel injection pump rpm.

**Standard fuel injection:**

Refer to S.D.S.

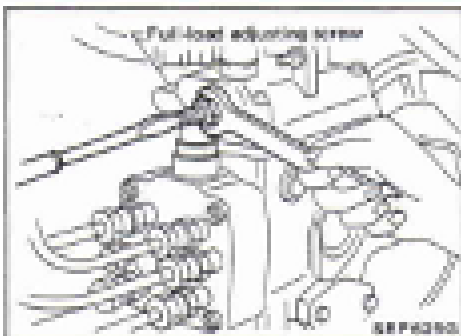
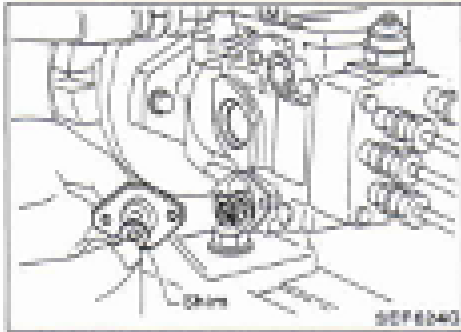
4. If fuel injection is not within standard range, adjust it using full-load adjusting screw.

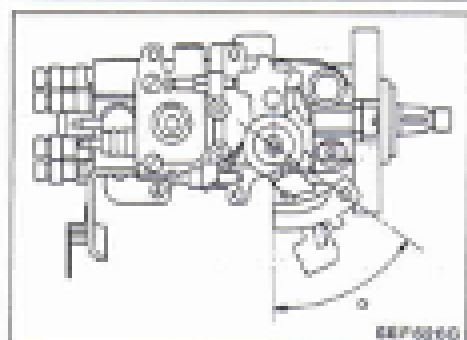
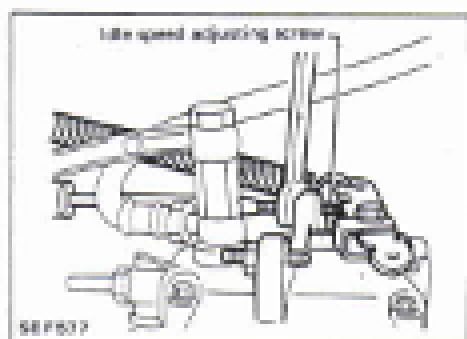
**Adjustment of fuel injection during idle**

1. Pull spring until control lever touches idle speed adjusting screw.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

**Standard fuel injection:**

Refer to S.D.S.



**Test (Cont'd)**

4. If fuel injection is not within specified range, adjust using idle speed adjusting screw.

- a. Tightening this screw will increase fuel injection amount.
- b. Make sure that control lever angle ( $\alpha$ ) is set at the specified range.

$\alpha$ : Refer to S.D.S.

If control lever angle is not within specified range, adjust it by repositioning control lever on control shaft. (One serration pitch:  $15^\circ$ )

After control lever has been repositioned, be sure to measure amount of fuel injection at idle speed again.

**Adjustment of fuel injection during start**

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection pump rpm.

**Standard fuel injection:**

Refer to S.D.S.

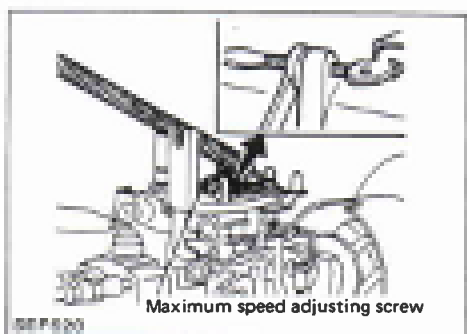
4. If fuel injection is lower than standard, check, "MS" dimension. Refer to step 25 for Injection Pump Assembly.

**Adjustment of fuel injection at maximum pump rpm**

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel injection at specified fuel injection rpm.

**Standard fuel injection:**

Refer to S.D.S.

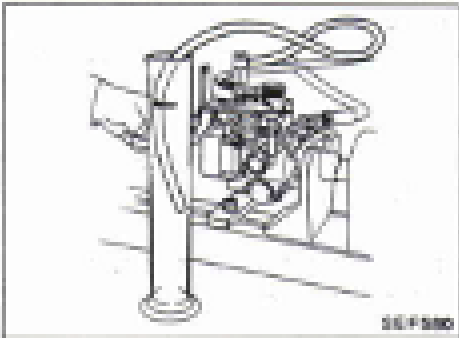
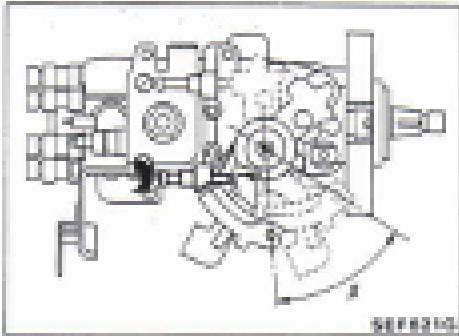


4. If fuel injection is not within standard range, adjust using maximum speed adjusting screw.

**Test (Cont'd)**

- a. Tightening screw will increase fuel injection.
- b. Make sure that control lever angle ( $\beta$ ) is within the specified range.

$\beta$ : Refer to S.D.S.

**Measurement of overflow amount**

1. Set control lever at "full-load" by pulling spring.
2. Furnish specified voltage of 12 volts to activate fuel cut solenoid valve.
3. Measure fuel overflow at specified fuel injection rpm.

**Fuel overflow:**

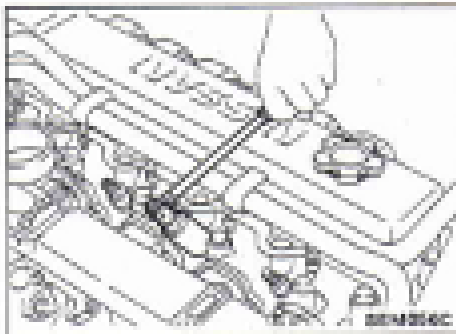
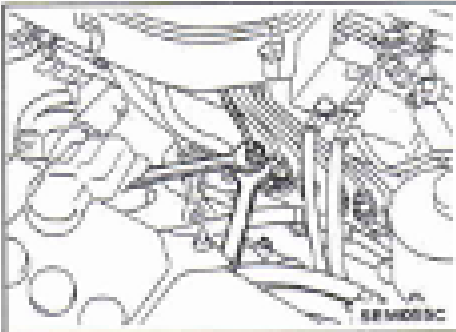
**43 - 87 ml**

**(1.51 - 3.06 Imp fl oz)/10 sec. at 1,100 rpm**

**Operation check of fuel cut solenoid valve**

When engine is idling and fuel cut solenoid valve current is OFF, be sure there is no injection. This check has to be done for approx. 5 seconds.





**Removal and Installation**

1. Remove injection tube assembly.
2. Remove spill tube assembly.

To prevent spill tube from breaking, remove it by gripping nozzle holder.

3. Remove injection nozzle assembly using deep socket wrench.
4. Install injection nozzle holder in the reverse order of removal.

☐ : Injection nozzle holder to cylinder head

54 - 64 N·m

(5.5 - 6.5 kg·m, 40 - 47 ft·lb)

Spill tube nut

29 - 39 N·m

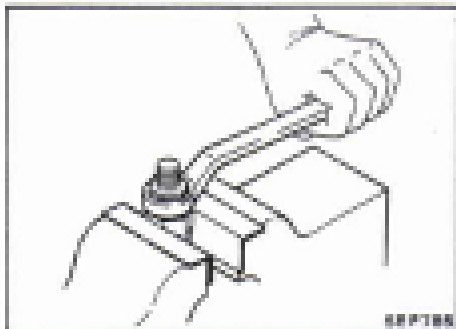
(3.0 - 4.0 kg·m, 22 - 29 ft·lb)

Injection tube flare nut

20 - 25 N·m

(2.0 - 2.5 kg·m, 14 - 18 ft·lb)

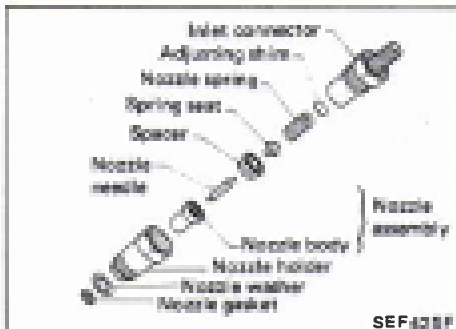
- a. Nozzle gaskets should always be replaced.
- b. To prevent spill tube from breaking later, spill tube nuts should be tightened gradually in sequence.
5. Bleed air from fuel system.  
Refer to BLEEDING FUEL SYSTEM.



**Disassembly**

1. Loosen inlet connector while keeping nozzle top from turning.

Use vise jaw cover to avoid damaging the nozzle holder body.

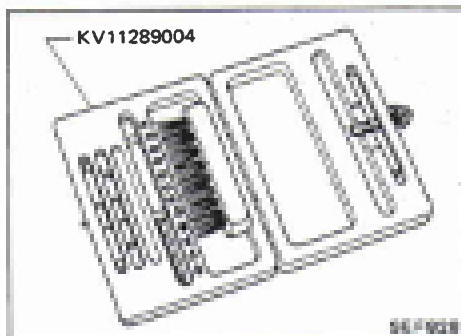


2. Arrange all disassembled parts in order shown at left.

## Inspection

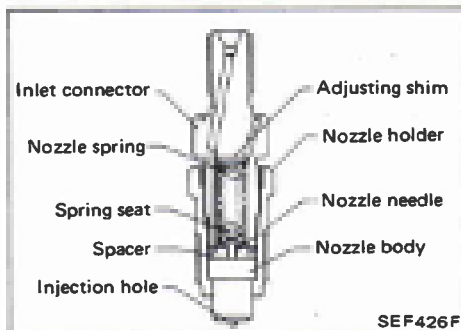
Thoroughly clean all disassembled parts with fresh kerosene or solvent.

- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or nozzle holder assembly.
- Check distance piece and nozzle holder for proper contact. If excessively worn or damaged, replace nozzle holder assembly.
- Check nozzle spring for excessive wear or damage. If excessively worn or damaged, replace nozzle holder assembly.

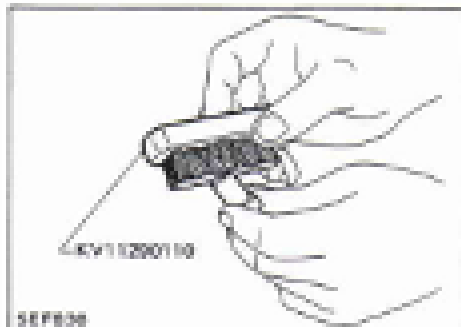


## Cleaning

1. Clean nozzle assembly using the nozzle cleaning kit (KV11289004), nozzle oil sump scraper (KV11290632) and nozzle seat scraper (KV11290620).



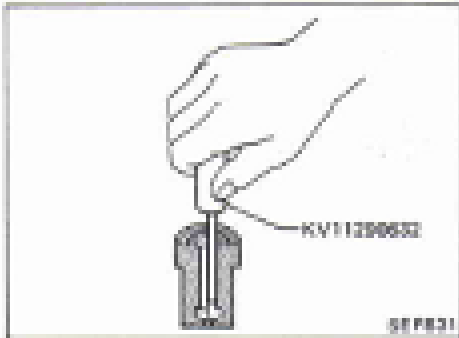
2. Portions which should be cleaned are indicated in the left figure.



3. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.

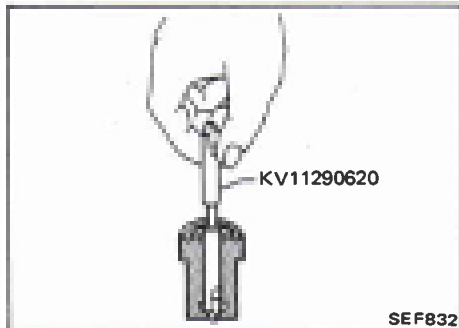
## Cleaning (Cont'd)

4. Clean fuel sump of nozzle body using Tool.



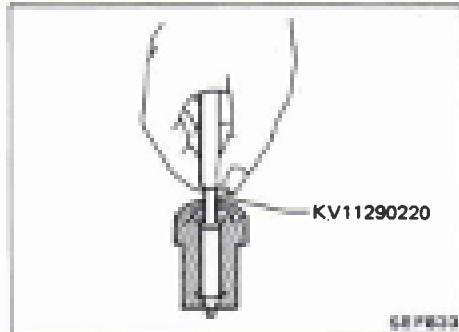
5. Clean nozzle seat by using Tool.

This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

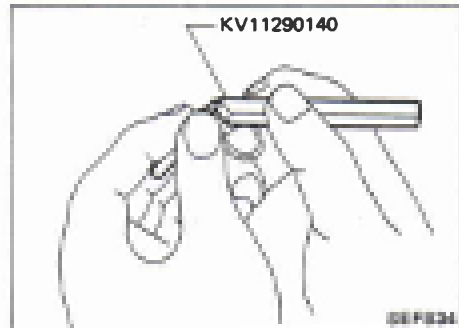


6. Clean spray hole of nozzle body by using Tool.

To prevent spray hole from canting, always clean it by starting with inner side and working towards outside.



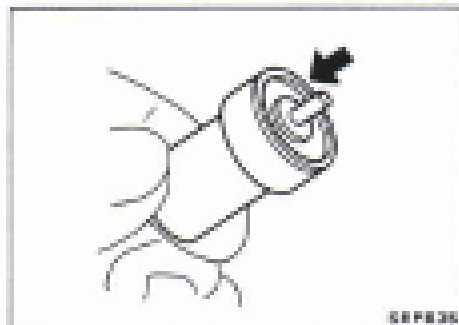
7. Decarbon nozzle needle tip by using Tool.

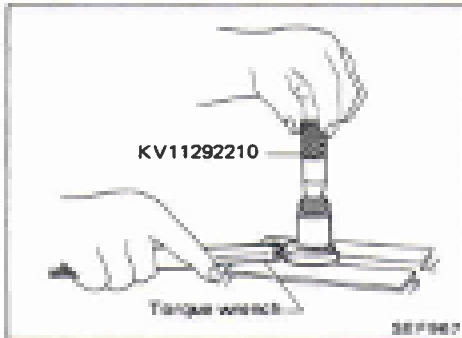


8. Check needle for proper position.

- (1) Pull needle about halfway out from body and then release it.
- (2) Needle should sink into body very smoothly from just its own weight.
- (3) Repeat this test and rotate needle slightly each time.

If needle fails to sink smoothly from any position, replace both needle and body as a unit.





**Assembly**

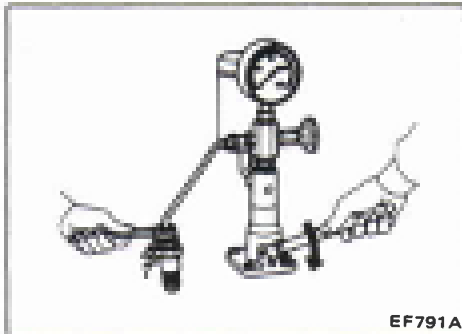
Assemble in the reverse order of disassembly.

- ☐ : Inlet connector to nozzle holder  
29 - 49 N·m  
(3.0 - 5.0 kg·m, 22 - 36 ft·lb)

**Test and Adjustment**

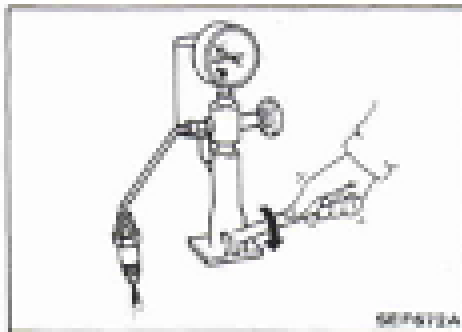
**WARNING:**

When using nozzle tester, be careful not to allow fuel sprayed from nozzle to come into contact with your hand or body, and make sure that your eyes are properly protected with goggles.



**INJECTION PRESSURE TEST**

1. Install nozzle to injection nozzle tester and bleed air from flare nut.



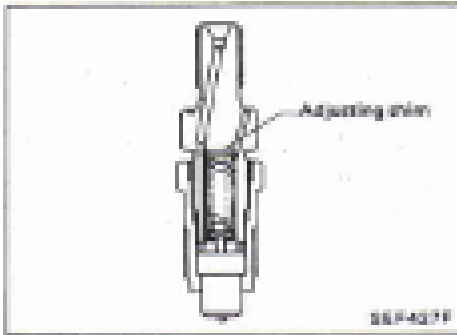
2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

**Initial injection pressure:**

- Used 9,807 - 10,297 kPa  
(98.1 - 103.0 bar, 100 - 105 kg/cm<sup>2</sup>,  
1,422 - 1,493 psi)
- New 10,297 - 11,278 kPa  
(103.0 - 112.8 bar, 105 - 115 kg/cm<sup>2</sup>,  
1,493 - 1,635 psi)

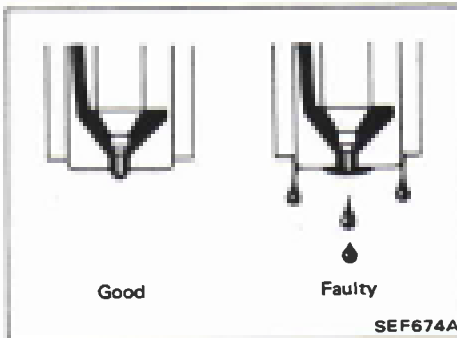
New nozzle is required to always check initial injection pressure.

**Test and Adjustment (Cont'd)**



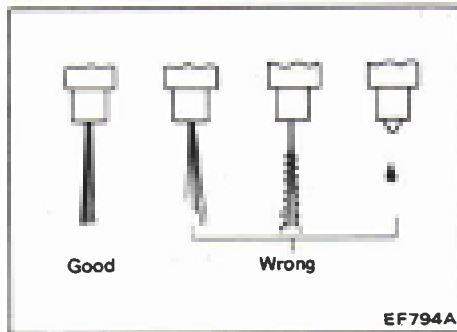
4. To adjust injection pressure, change adjusting shims.
  - a. Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.
  - b. A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.71 bar, 4.8 kg/cm<sup>2</sup>, 68 psi) in initial injection pressure.

Thickness	mm (in)	Part number
	0.1 (0.004)	16613-43G00
	0.2 (0.008)	16613-43G01
	0.3 (0.012)	16613-43G02
	0.4 (0.016)	16613-43G03
	0.5 (0.020)	16613-43G04
	0.52 (0.0205)	16613-43G05
	0.54 (0.0213)	16613-43G06
	0.56 (0.0220)	16613-43G07
	0.58 (0.0228)	16613-43G08
	0.8 (0.031)	16613-43G09



**LEAKAGE TEST**

1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm<sup>2</sup>, 142 to 284 psi) below initial injection pressure.
2. Check that there is no dripping from the nozzle tip or around the body.
3. If there is leakage, clean, overhaul injection nozzle or replace it.



**SPRAY PATTERN TEST**

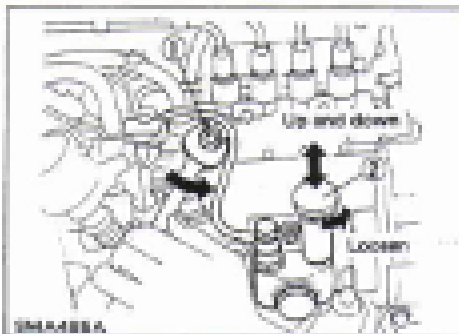
1. Pump the tester handle 4 to 6 times per second or more.
2. Check the spray pattern.
3. If the spray pattern is not correct, clean injection nozzle or replace it.

Air should be bled out of fuel system when injection pump is removed or fuel system is repaired.

Protect pump and engine mounts from fuel splash with rags.

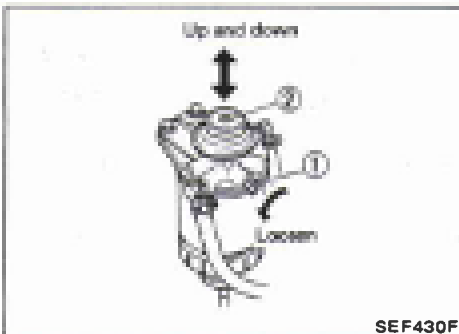
If engine will not start after bleeding air, loosen injection tubes at nozzle side and crank engine until fuel overflows from injection tube. Tighten injection tube flare nuts.

If the engine does not operate smoothly after it has started, race it two or three times.



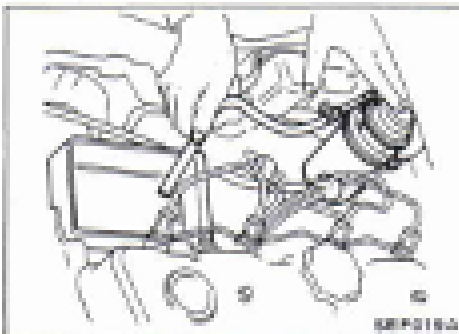
### In-line Pump

1. Remove the cap that covers the priming pump ②.
2. Turn the priming pump ② counterclockwise.
3. Loosen the air vent screws ①.
4. Move the priming pump ② up and down until no further air-bleed comes out of the air vent screws ①.
5. Tighten the air vent screws ①.
6. Push and turn the priming pump clockwise.
7. Install the cap.



### VE Pump

1. Loosen the air vent screw ①.
2. Move the priming pump ② up and down until no further air-bleed comes out of the air vent screw ①.
3. Tighten the air vent screw ①.
4. Move the priming pump ② up and down until there is suddenly more resistance in the movement.



### Checking Priming Pump

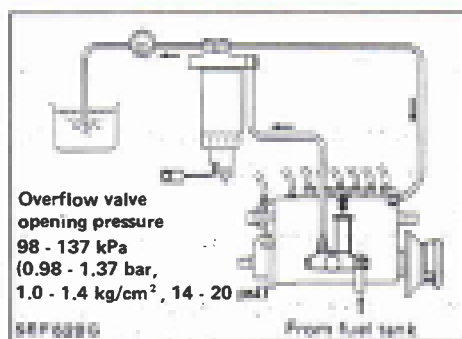
#### VE PUMP

Before checking priming pump, make sure that fuel filter is filled with fuel.

1. Disconnect fuel return hose.

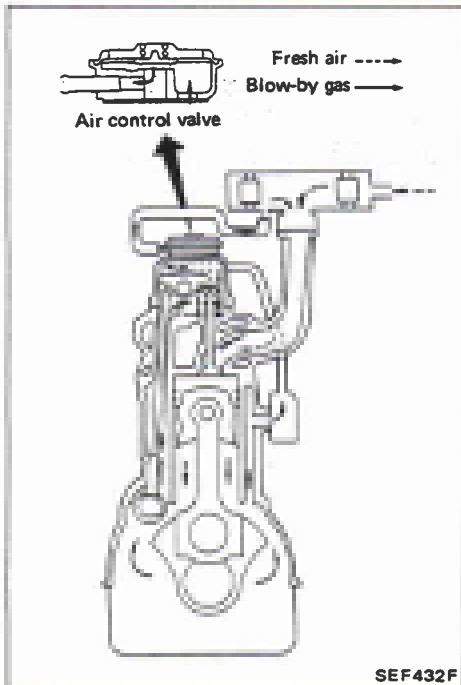
Place a suitable container beneath hose end.

2. Pump priming pump and check that the fuel overflows from the hose end. If not, replace priming pump.



### Overflow Valve IN-LINE PUMP

Attach a pressure gauge to fuel filter discharge port, and check valve opening pressure by operating priming pump. If pressure is not within range of 98 to 137 kPa (0.98 to 1.37 bar, 1.0 to 1.4 kg/cm<sup>2</sup>, 14 to 20 psi), replace overflow valve.



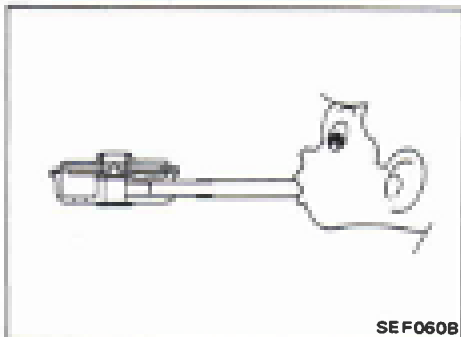
## Description

The closed-type crankcase ventilation system is utilized as a crankcase emission control system.

The closed-type crankcase emission control system prevents blow-by gas from entering the atmosphere and keeps the internal crankcase pressure constant.

During the valve operation, the blow-by gas is fed into the intake manifold by the air control valve.

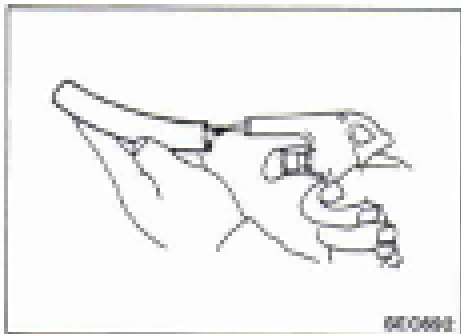
This is activated by the internal rocker cover pressure. When the intake air flow is restricted by the throttle chamber, the internal rocker cover pressure decreases. At this point, the crankcase emission control valve keeps the internal rocker cover pressure constant so that air or dust is not sucked in around the crankshaft oil seal.



## Inspection

### AIR CONTROL VALVE

1. Remove rocker cover.
2. Remove control valve from rocker cover.
3. After plugging the center hole with adhesive tape, check that air flows from inlet by blowing air from outlet and that air does not flow by inhaling air.

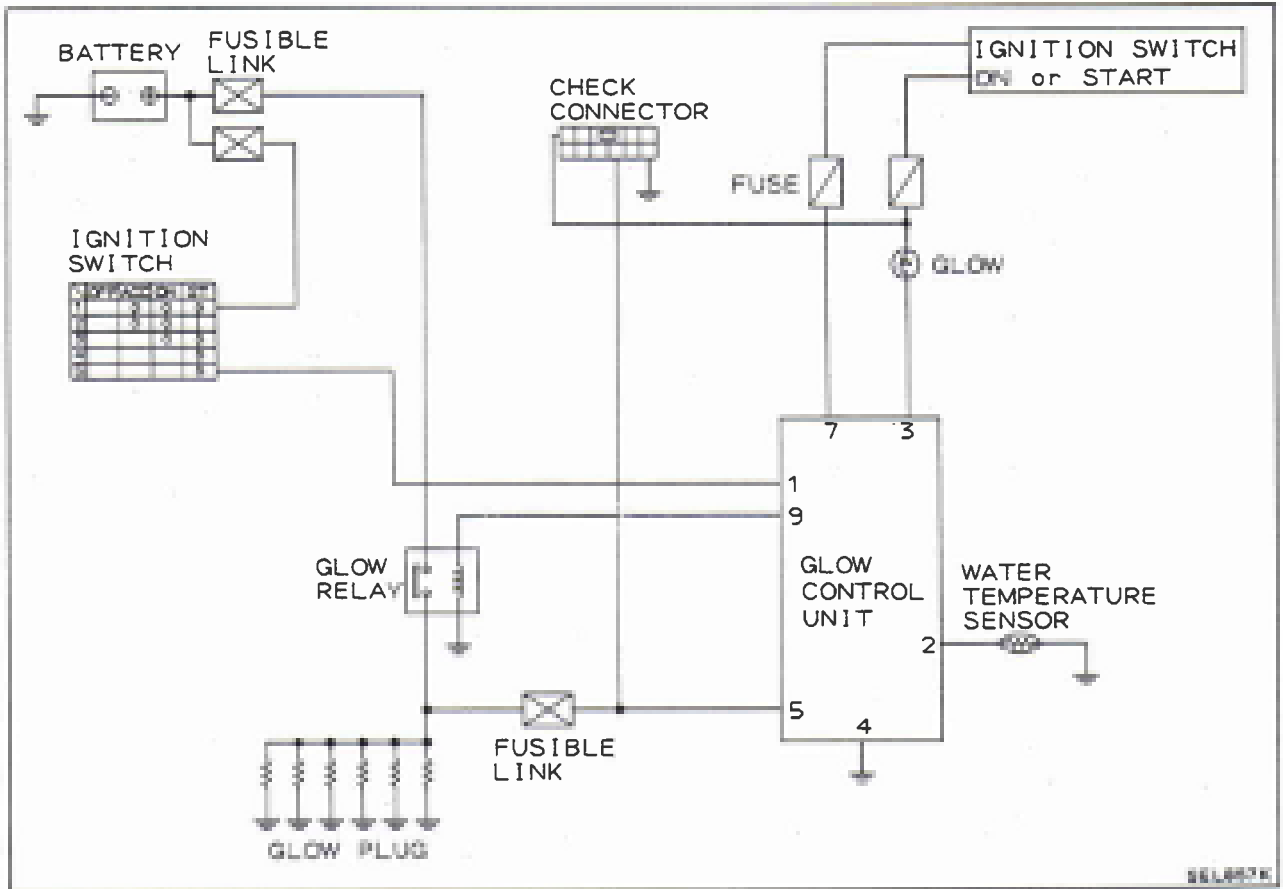


## Ventilation Hose

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.  
If any hose cannot be freed of obstructions, replace.

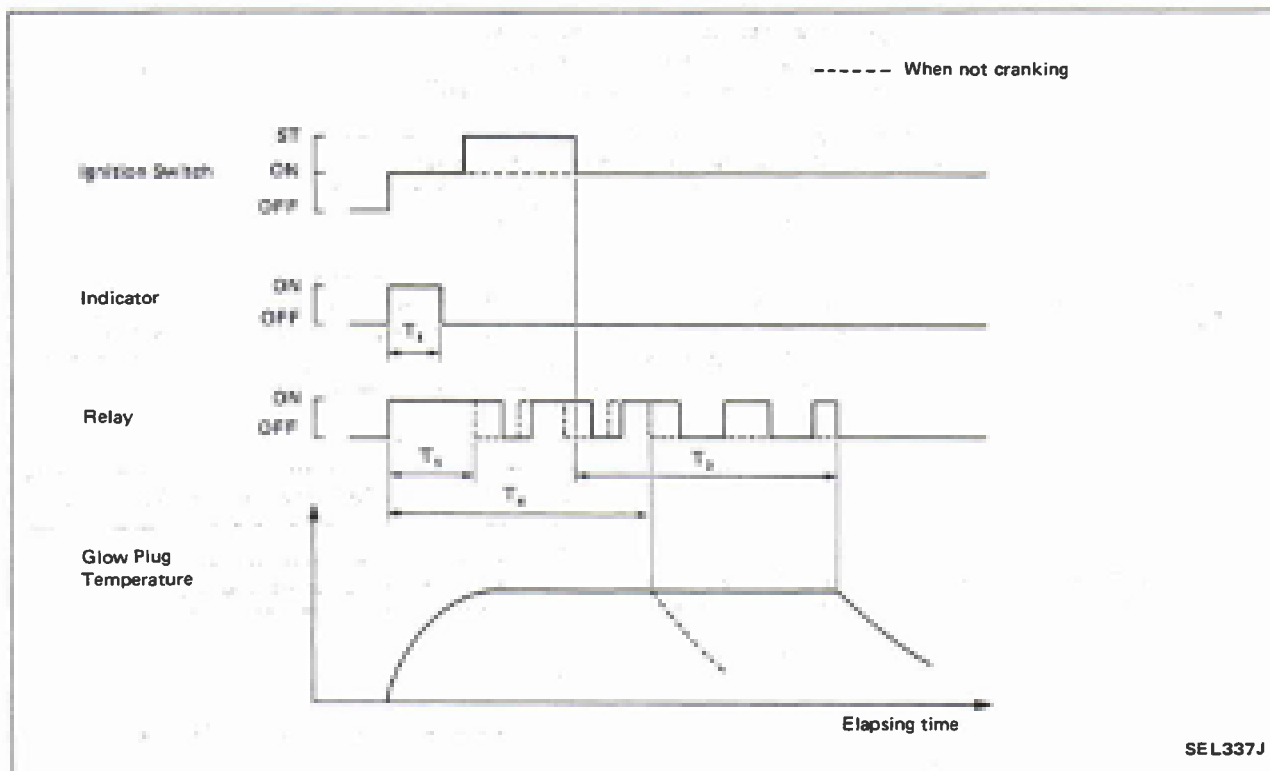


Schematic





Description



SEL337J

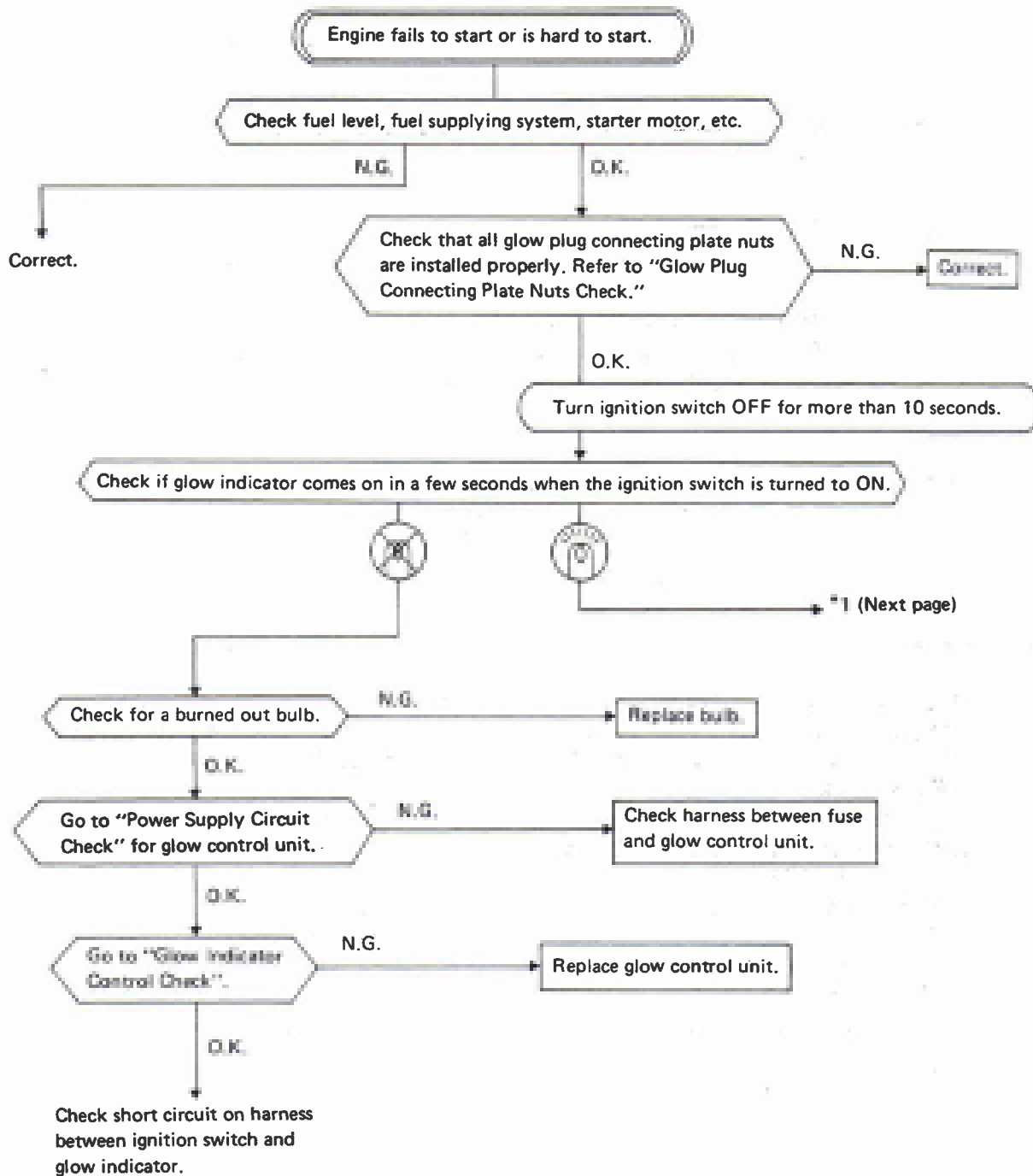
When the ignition switch is turned on, the relay is turned on and the "high-level" electric current flows through the glow plugs and heats them up quickly. After  $T_1$  seconds have passed, the control unit turns off the glow indicator but the relay remains on. The relay chops the electric current when the ignition switch turns to "START" from "ON".

The relay has been chopping for  $T_3$  seconds after the ignition switch has returned to "ON" from "START". When not cranking, the relay chops the electric current while  $T_4 - T_2$  seconds after the ignition switch has turned to "ON" from "OFF".

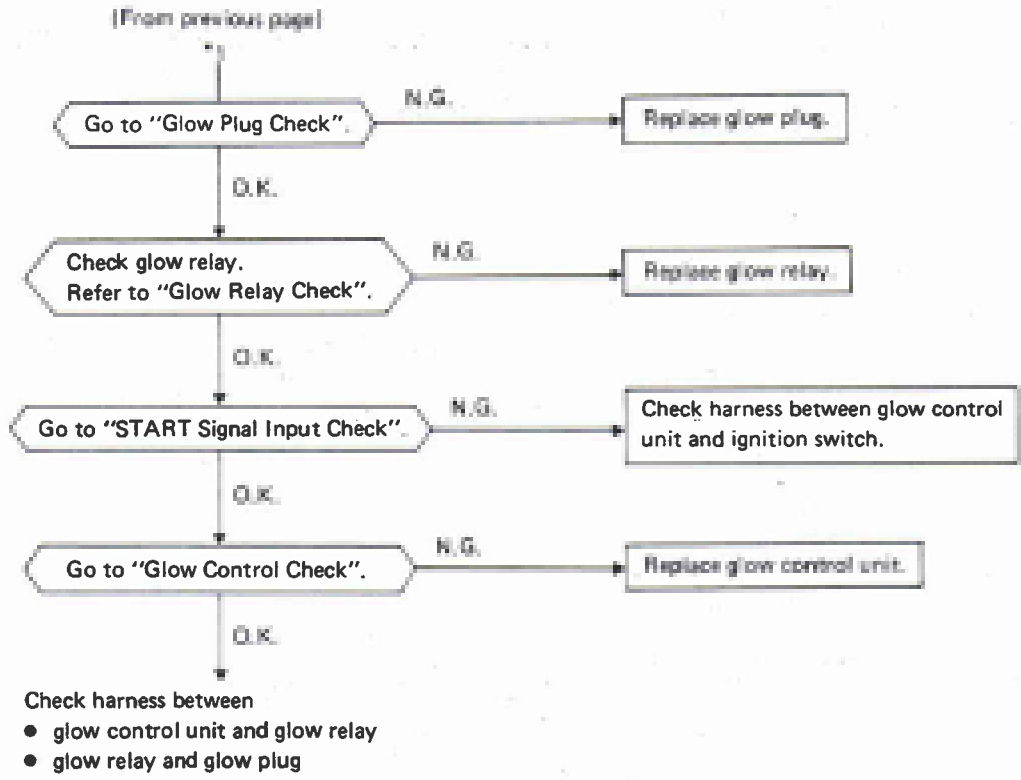
- $T_1$ : approx. 2 - 6 [sec.] (Varies with coolant temperature.)
- $T_2$ : approx. 3 - 14 [sec.] (Varies with glow plug terminal voltage.)
- $T_3$ : approx. 15 [sec.]
- $T_4$ : approx. 15 [sec.]

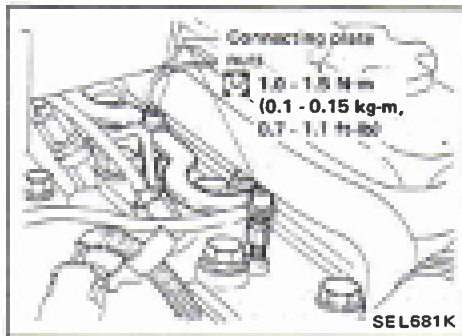
- When the ignition switch is repeatedly turned "ON" and "OFF",  $T_2$  becomes shorter.

Trouble-shooting



Trouble-shooting (Cont'd)

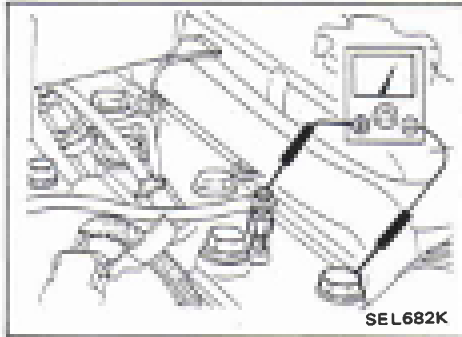




**Check**

**GLOW PLUG CONNECTING PLATE NUTS CHECK**

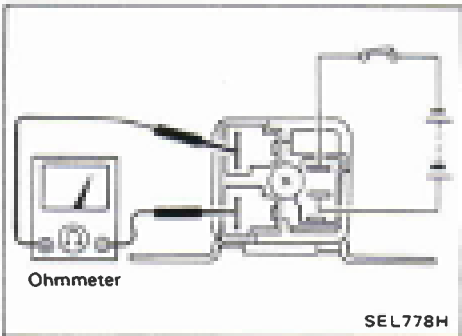
Check that all glow plug connecting plate nuts and harness nut are installed securely.



**GLOW PLUG CHECK**

Remove glow plug connecting plate and perform continuity test between each glow plug and cylinder head.

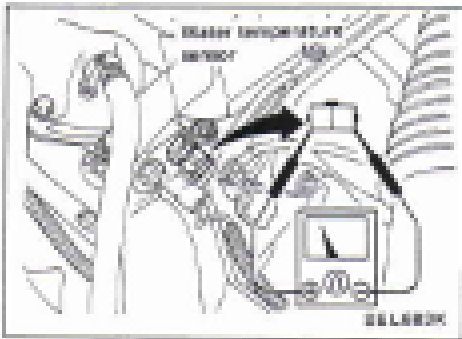
No continuity ... Replace glow plug.



**GLOW RELAY CHECK**

The glow relay is normally open.

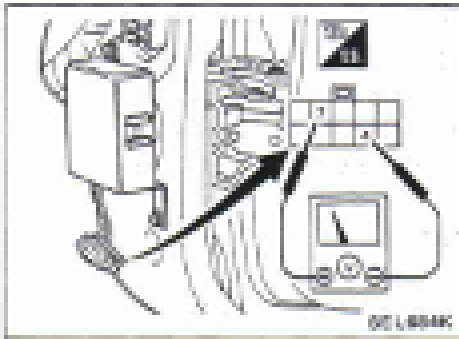
For check, refer to STANDARDIZED RELAY.



**WATER TEMPERATURE SENSOR UNIT CHECK**

Measure resistance to temperature as shown.

Coolant temp. °C (°F)	Resistance kΩ
-25 (-13)	19
0 (32)	5.6
20 (68)	2.5
40 (104)	1.2



**Control Unit Check**

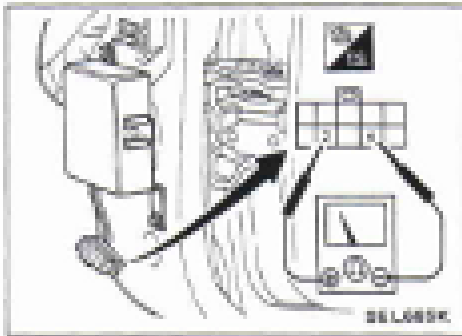
**POWER SUPPLY CIRCUIT CHECK**

Disconnect harness connector from glow control unit and perform voltage check and continuity check.

Voltmeter terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
②	④	0V	0V	Approx. 12V

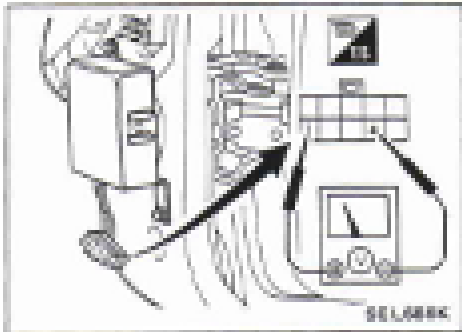
  

Ohmmeter terminals		Ignition switch OFF
(+)	(-)	
④	Body ground	Continuity exists



**WATER TEMPERATURE SENSOR CIRCUIT CHECK**

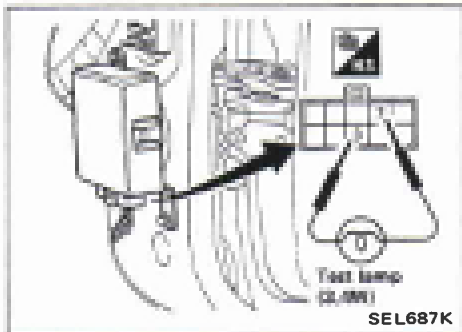
- Check continuity between terminals ② and ④ .  
Measure resistance to temperature approximately as shown in "Water temperature sensor check".



**START SIGNAL INPUT CHECK**

1. Turn ignition switch OFF.
2. Disconnect harness connector from the starter motor's "S" terminal.
3. Check terminal voltage between ① and ④ when the ignition switch is at "START".

**Voltage: approx. 12V**



**GLOW INDICATOR CONTROL CHECK**

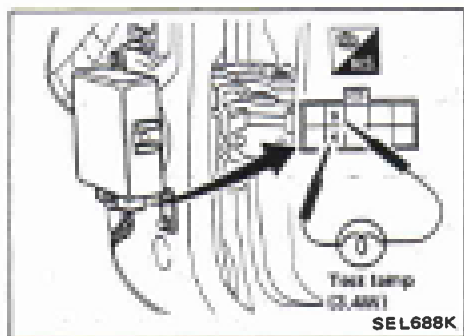
1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

**Time the test lamp should stay lit.**

**Approx. 2 - 6 seconds.**

**(Varies with coolant temperature)**

### Control Unit Check (Cont'd)



#### GLOW CONTROL CHECK

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

Time the test lamp should stay lit.

Approx. 3 - 14 seconds.

(Varies with glow plug terminal voltage)

The time will be shortened if ignition switch is OFF only a short time.

Therefore, when measuring the time, leave ignition switch OFF for more than 1 minute, and then turn ignition switch to ON.

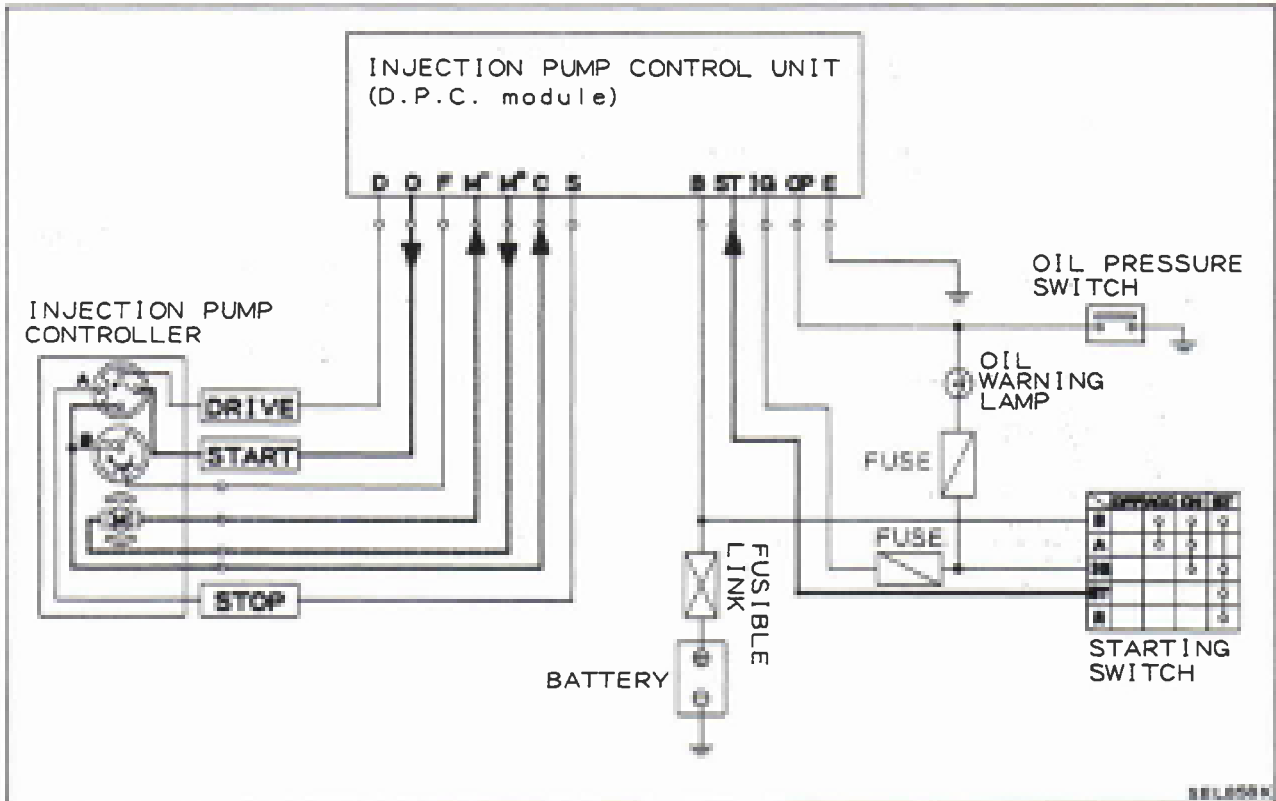
This time, the test lamp came on and went off approx. 1 - 3 times after which it stayed lit.

5. When ignition switch is turned to START and returned to ON, the test lamp comes on and goes off approx. 3 - 6 times.



## Description

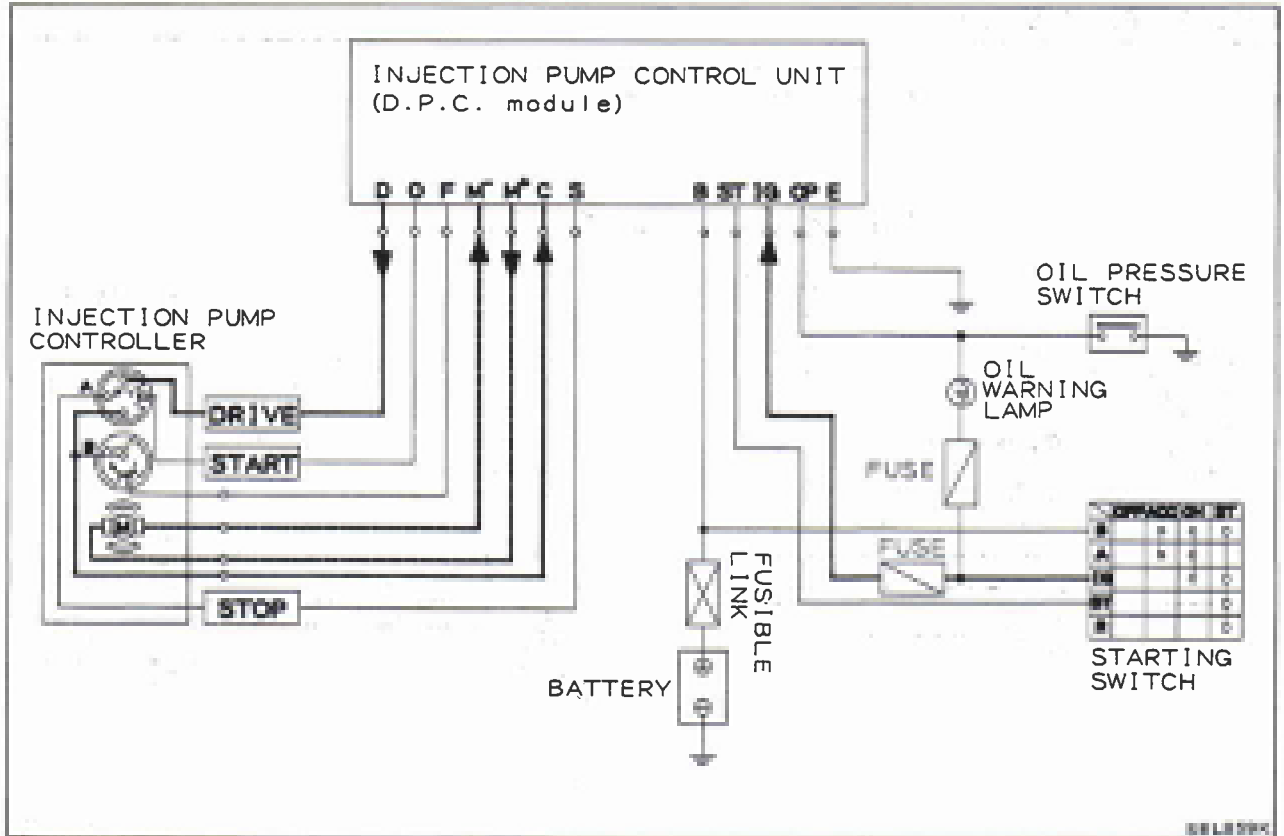
### FUEL EXCESS OPERATION



When the starting switch is turned to "START", the fuel injection control unit activates. This permits an electrical current to flow in sequence via rotor A of the fuel injection pump controller, from terminal O to rotor A and terminal C, causing the fuel injection controller motor to run. As the motor runs, rotor A rotates and, when it reaches its start position, current flow between terminal O and C is broken, which stops the motor's operation. The controller is thus brought to its **START** position.

## Description (Cont'd)

### DRIVE OPERATION



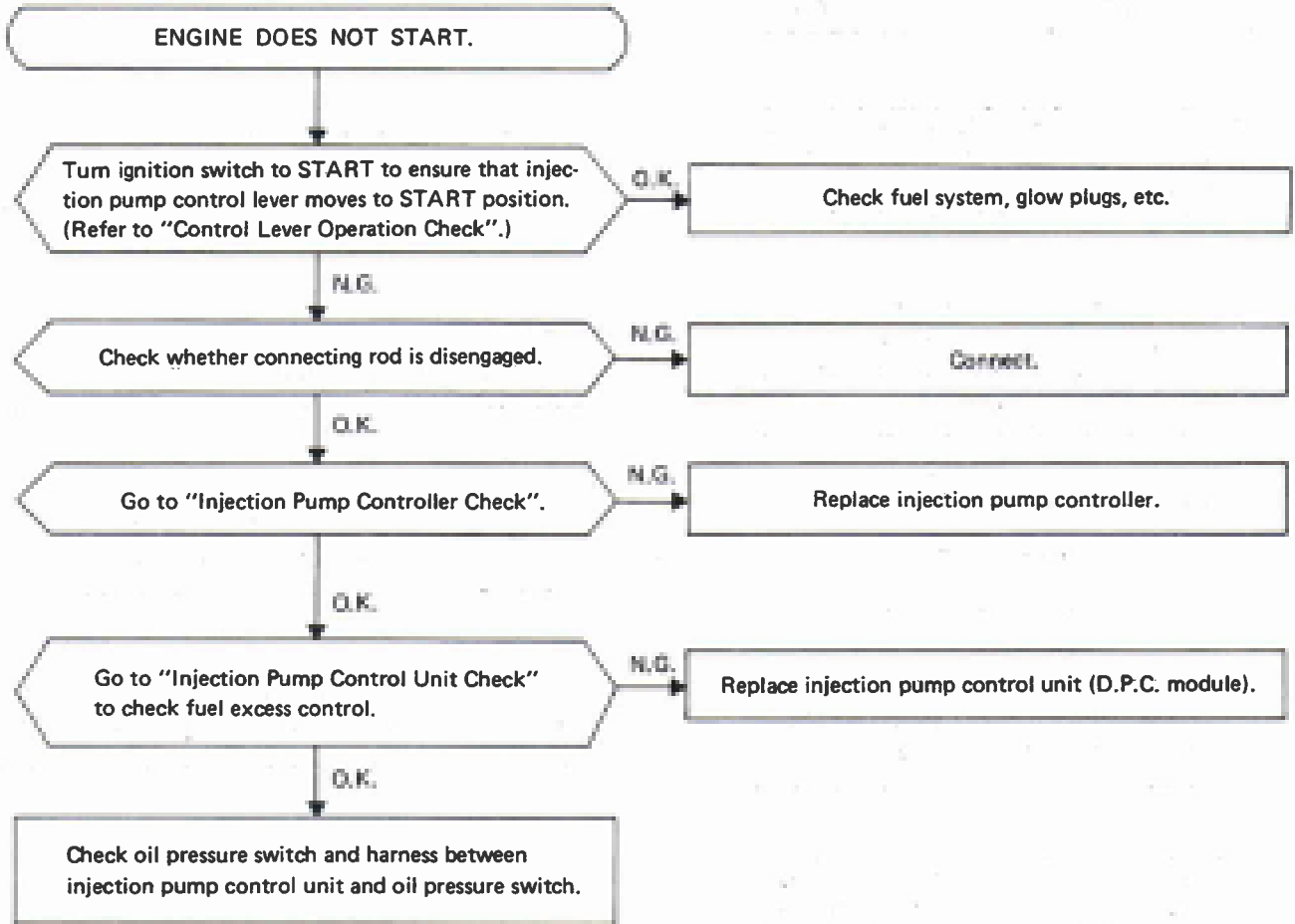
When the starting switch is turned from "START" to "ON", the fuel injection pump control unit activates. This permits an electrical current to flow in sequence via rotor A of the fuel injection pump controller, from terminal D to rotor A and terminal C, causing the fuel injection controller motor to run. As the motor runs, rotor A rotates and, when it reaches its drive position, current flow between terminals D and C is broken, which stops the motor's operation. Thus, the controller is set at its **DRIVE** position.





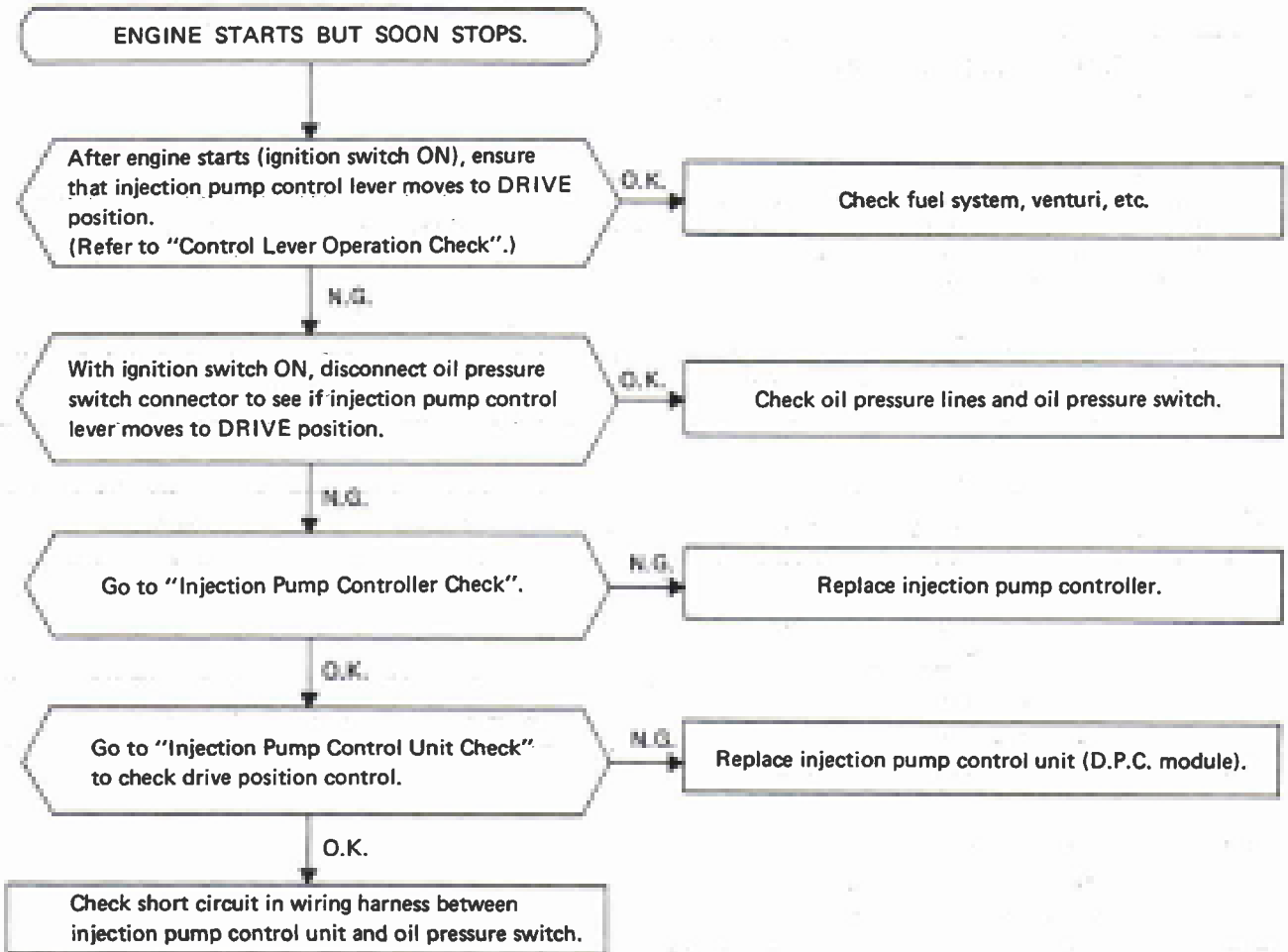
Trouble-shooting

CASE 1



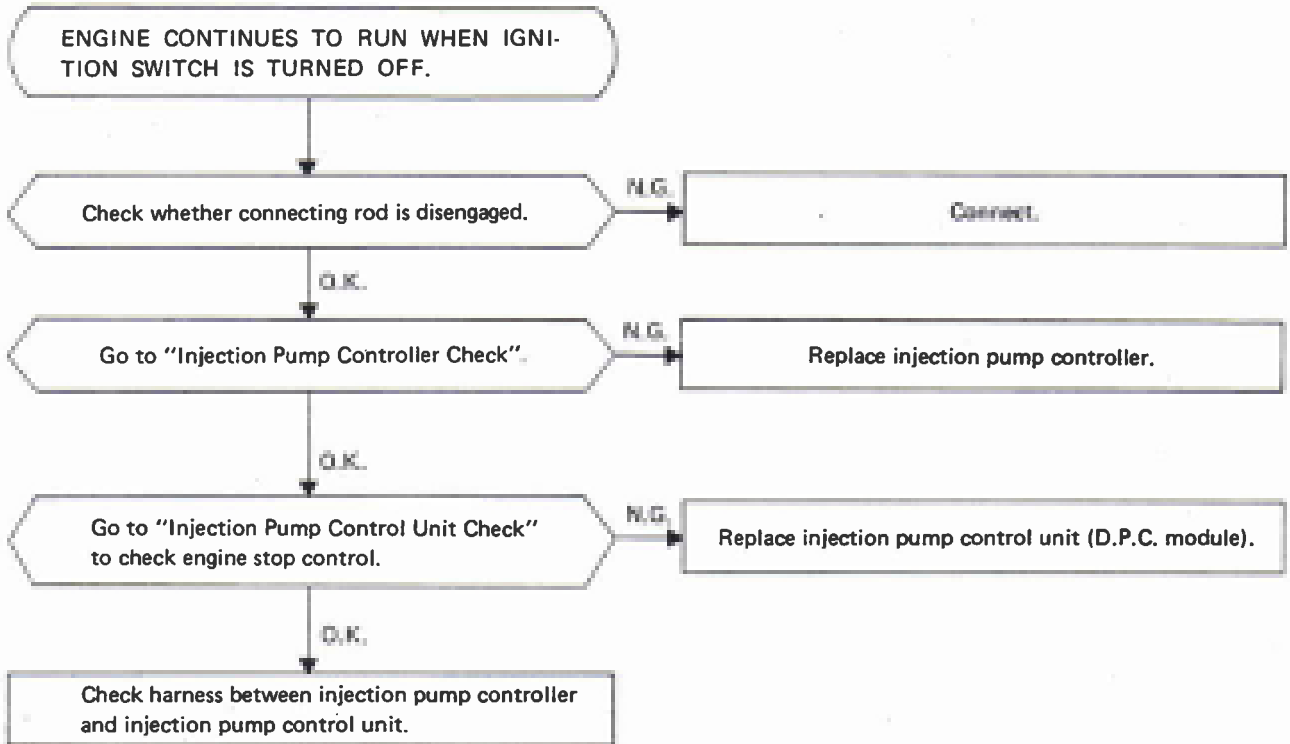
## Trouble-shooting (Cont'd)

### CASE 2

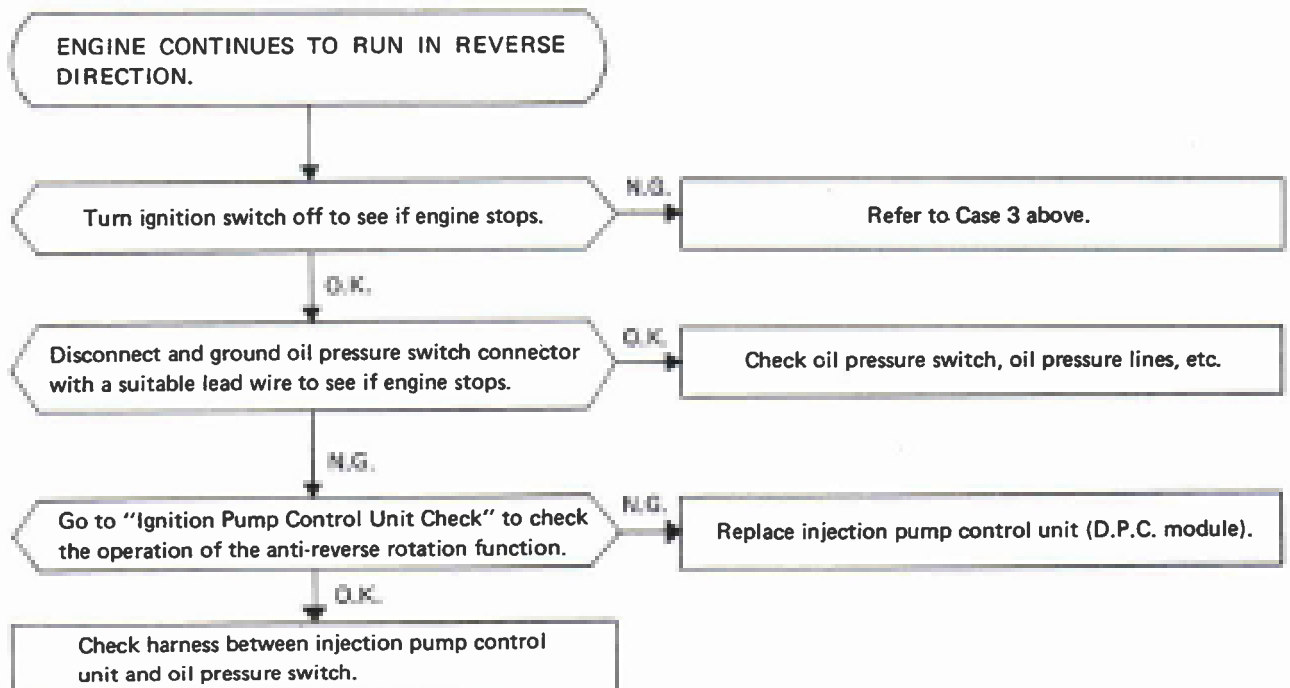


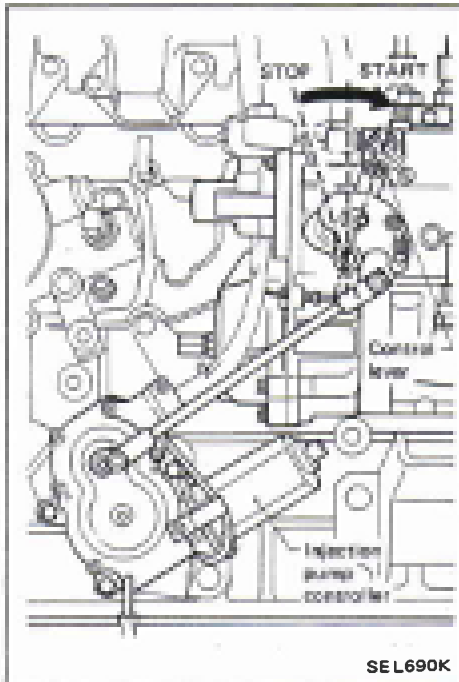
## Trouble-shooting (Cont'd)

### CASE 3



### CASE 4

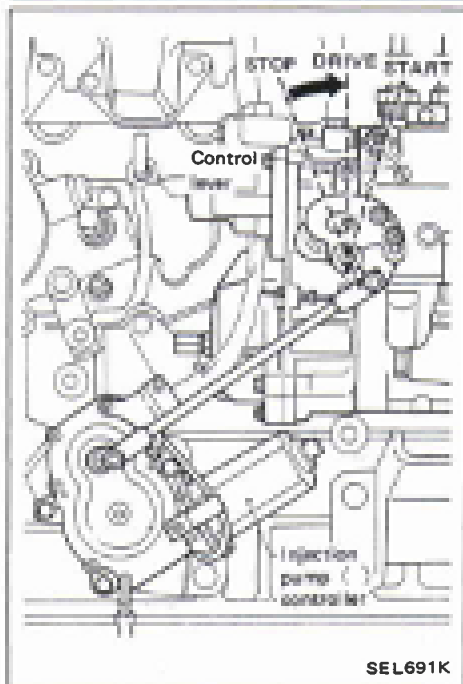




## Injection Pump Control Lever Operation Check

### (1) "START" OPERATION

1. Turn ignition switch OFF.
2. Disconnect harness connector from starter motor "S" terminal.
3. Turn ignition key to "START" in order to ensure that injection pump control lever moves to the start position.



### (2) "DRIVE" OPERATION

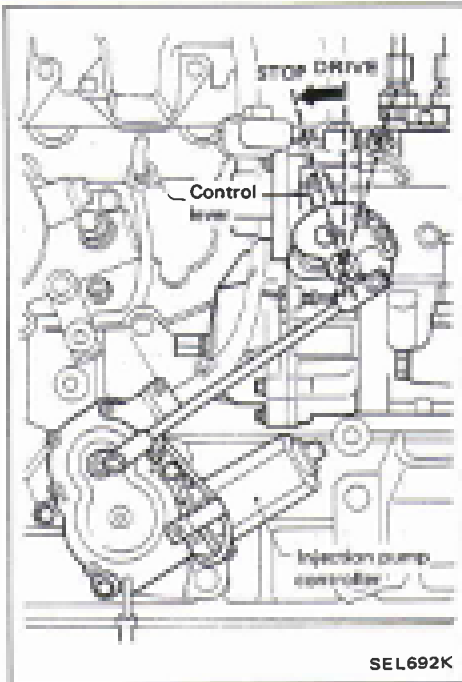
1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch.
3. Turn ignition key to "ON" to ensure that injection pump control lever moves to the drive position.



## Injection Pump Control Lever Operation Check (Cont'd)

### (3) "STOP" OPERATION

1. Turn ignition switch to "OFF" in order to ensure that injection pump control lever moves to the stop position.
2. Start engine. Disconnect and ground oil pressure switch connector with a suitable lead wire to see if injection pump control lever moves to the stop position.



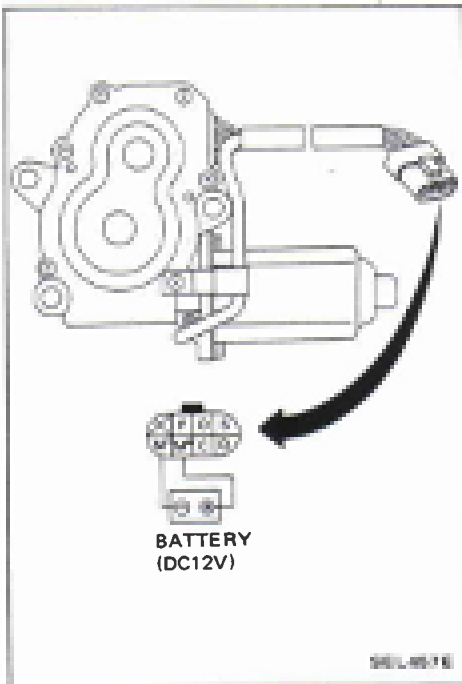
## Injection Pump Controller Check

### MOTOR CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from injection pump controller.
3. Apply battery voltage between terminals  $(M^+)$  and  $(M^-)$ . Injection pump controller motor should run and control lever should rotate.

If injection pump controller does not work, replace controller.

When replacing controller, be sure to disconnect 6-pin harness connector from injection pump control unit and then reconnect it after installing controller.

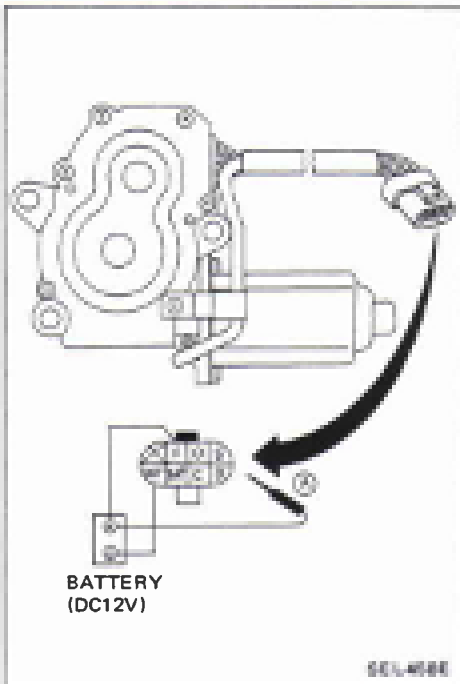


## Injection Pump Controller Check (Cont'd)

### LEVER POSITION CONTROL CHECK

Fabricate adapters, as shown in the following illustration, and connect terminal Ⓐ to each of terminals listed in the table below. Injection pump control lever should stop at corresponding position.

**Be careful not to connect lead wire to the wrong terminals as this will damage injection pump controller.**

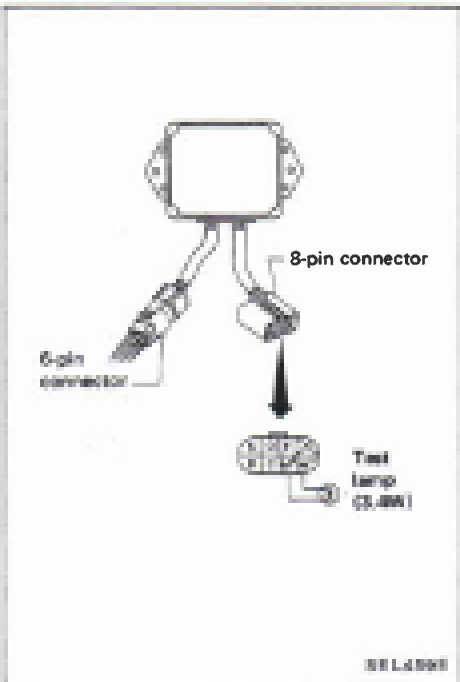


Connect terminal Ⓐ to:	Corresponding position of injection pump control lever
Terminal Ⓐ	START
Terminal Ⓑ	STOP
Terminal Ⓒ	DRIVE

### Injection Pump Control Unit (D.P.C. module) Check

#### PREPARATION FOR CHECK

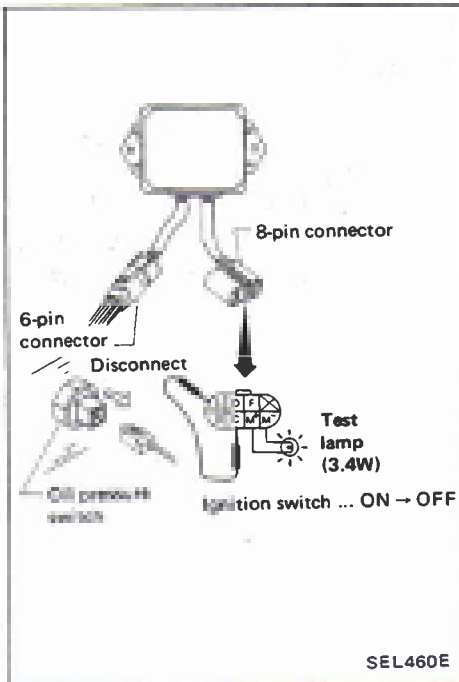
1. Turn ignition switch OFF.
2. Disconnect harness connector from starter motor "S" terminal.
3. Disconnect the 8-pin harness connector from the injection pump control unit.
4. Connect test lamp between terminals **M+** and **M-** of injection pump control unit.



## Injection Pump Control Unit (D.P.C. module) Check (Cont'd)

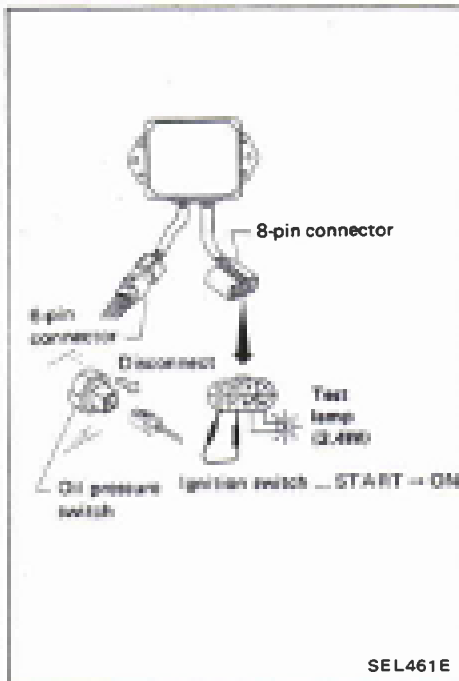
### ENGINE STOP CONTROL CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch.
3. Connect a suitable lead wire between terminals Ⓢ and ⓐ.
4. When ignition switch is turned to "OFF" from "ON", test lamp should come on and go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.



### DRIVE POSITION CONTROL CHECK

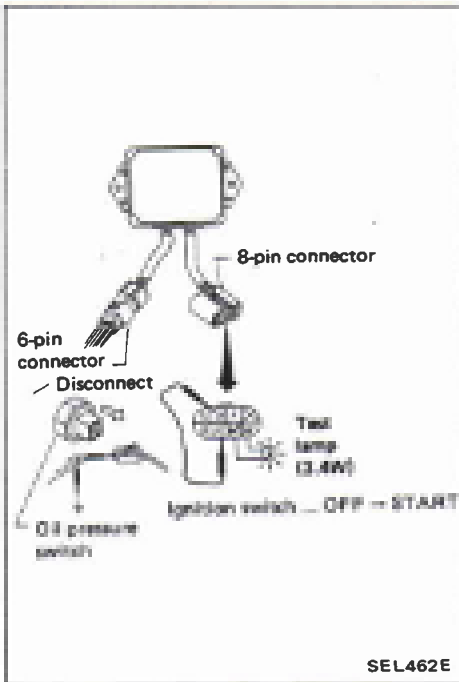
1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch.
3. Connect a suitable lead wire between terminals ⓓ and ⓐ.
4. When ignition switch is turned to "ON" from "START", test lamp should come on and go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.



## Injection Pump Control Unit (D.P.C. module) Check (Cont'd)

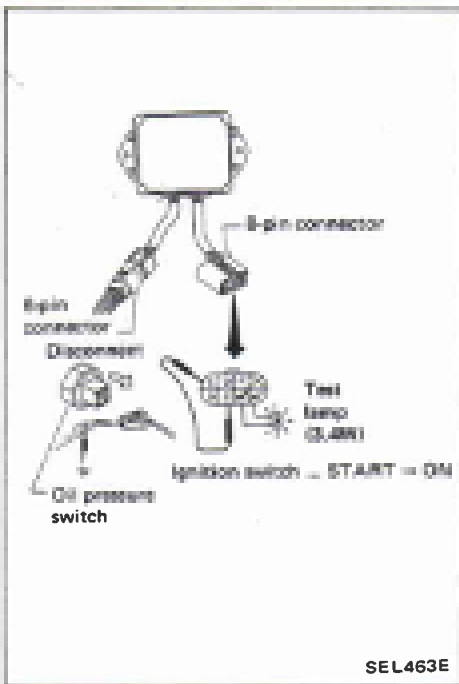
### FUEL EXCESS CONTROL CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch and ground it with a suitable lead wire.
3. Connect a suitable lead wire between terminals ⑤ and ③.
4. When ignition switch is turned to "START", test lamp should come on and then go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.



### ANTI-REVERSE ROTATION FUNCTION CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from oil pressure switch and ground it with a suitable lead wire.
3. Connect a suitable lead wire between terminals ⑤ and ③.
4. When ignition switch is turned to "ON" from "START", test lamp should come on, and then go off in about 10 to 20 seconds.
5. Disconnect 6-pin connector and then reconnect it.



General Specifications

CARBURETOR (Jet and air bleed size)

Carburetor model	Gulf standard model		Australia model		Model except Australia and Gulf standard models	
	M/T	A/T	M/T	A/T	Standard	Tropical
	21J360-26	21J360-28	21J360-23	21J360-24	21J360-27	21J360-28
Throttle chamber bore mm (in)	P	38 (1.52)				
	S	40 (1.57)				
Venturi diameter mm (in)	P	32 (1.26)				
	S	36 (1.42)				
Main jet	P	#142				
	S	#226	#230	#226		
Main air bleed	P	#60				
	S	#60				
Slow jet	P	#54				
	S	#130				
Slow air bleed	P	#180				
	S	#60				
Power jet		#130	#60	#130		

P: Primary S: Secondary #:  $\frac{1}{100}$  mm

Main jets for high altitude

Elevation m (ft)	P	S
1,000 (3,300)	#138	#230
2,000 (6,600)	#134	#212
3,000 (9,900)	#130	#206
4,000 (13,200)	#126	#200

Replacement of main jets is not necessary for models equipped with altitude compensation system.

E.G.R. CONTROL VALVE

kPa (mbar, mmHg, inHg)

Fully open vacuum Over -14.7 (-147, -110, -4.33)

VACUUM MOTOR

kPa (mbar, mmHg, inHg)

Opening starts -9.6 (-96, -72, -2.83)

Fully open Over -19.5 (-195, -146, -5.75)

Inspection and Adjustment

A.T.C. AIR CLEANER

Intake operating vacuum (kPa (bar, mmHg, inHg))	Atmospheric temperature °C (°F)	
	Below 30 (100)	Above 40 (110)
Below 10.7 (107, 80, 3.15)	Cool air	Cool air
Above 22.7 (227, 170, 6.69)	Hot air	Cool air

FUEL PUMP

Fuel pump capacity ml (Imp fl oz)/minute at 1,000 rpm	More than 2,600 (91.5)
Fuel pressure kPa (bar, kg/cm <sup>2</sup> , psi)	25.5 - 32.4 (0.255 - 0.324, 0.26 - 0.33, 3.7 - 4.7)
T.V.V. operation temperature Open °C (°F)	80±3 (172±5.4)
Closed °C (°F)	30 (86)

IDLE COMPENSATOR

Unit: °C (°F)

Idle compensator partially opens	65 - 74 (149 - 165)
Idle compensator fully opens	Above 74 (165)

B.C.D.D.

Model	Australia and Gulf standard models		Model except Australia and Gulf standard models
	M/T	A/T	M/T
B.C.D.D. set pressure (at sea level) kPa (mbar, mmHg, inHg)	-76.0±0.7 (-760±7, -570±5, -22.44±0.20)		-78.6±0.7 (-786±7, -590±5, -23.23±0.20)

CARBURETOR (Jet and air bleed size)

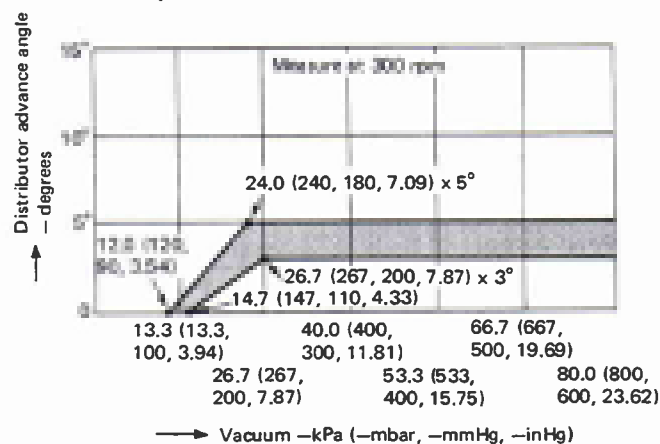
Carburetor model	Gulf standard model		Australia model		Model except Australia and Gulf standard models	
	M/T	A/T	M/T	A/T	Standard	Tropical
	21J360-25	21J360-26	21J360-23	21J360-24	21J360-27	21J360-28
Choke type	Manual choke		Automatic choke		Manual choke	
Fast idle adjustment Fast idle speed (A/T model in "N" position) rpm	1,100±50	900±50	1,100±50	900±50	1,100±50	
Clearance "A" (at 2nd cam step) mm (in)	2.25±0.15 (0.0886 ±0.0059)	2.58±0.15 (0.1016 ±0.0059)	1.37±0.14 (0.0539 ±0.0055)	1.64±0.14 (0.0646 ±0.0055)	2.25±0.15 (0.0886±0.0059)	
Vacuum break adjustment Clearance "R <sub>1</sub> "	3.25±0.25 (0.1280±0.0098)					
Clearance "R <sub>2</sub> "	5.0±0.5 (0.197±0.020)					
F.I. pot adjustment F.I. pot touch speed rpm	—	1,700±100	—	1,700±100	—	
Idle speed (A/T model in "D" position) rpm	650±50					
Idle CO %	1.5					

Inspection and Adjustment (Cont'd)

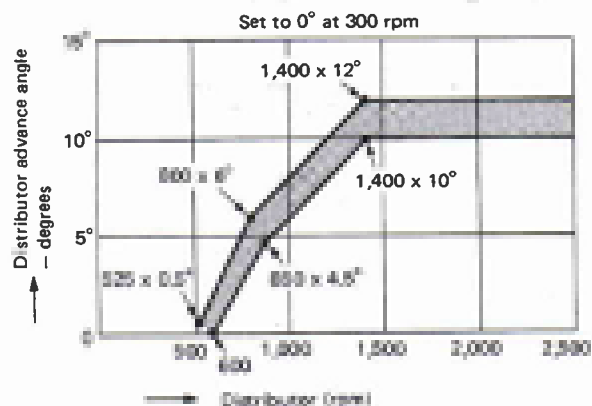
DISTRIBUTOR

Type		T0T00471
		[MITSUBISHI make]
Firing order		1-5-3-6-2-4
Rotating direction		Counterclockwise
Point gap	mm (Inch)	0.45 - 0.55 (0.018 - 0.022)
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50
Cap carbon point length	mm (Inch)	More than 3 (0.12) protruded length

Distributor spark advance curve



SEF485G



SEF486G

IGNITION COIL

Type		HG-15-40
		[HAIKOHIN make]
Primary voltage	V	12
Primary resistance (at 20°C (68°F))	Ω	1.00 - 1.30
Secondary resistance (at 20°C (68°F))	kΩ	9.0 - 13.0

**In-line Type Injection Pump**

**APPLICATION**

Destination	Part number	Pump number	Remarks
General areas	16700-06J60	101641-9292	Without high altitude compensator
	16700-06J61	101641-9302	With high altitude compensator

**INSPECTION AND ADJUSTMENT**

**Injection timing**

Injection timing	B.T.D.C. 10°
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**Injection pump**

	Standard mm (in)	Limit mm (in)
Pump housing to tappet clearance	0.02 - 0.062 (0.0008 - 0.0024)	0.20 (0.0079)
Control sleeve to plunger trunnion shaft clearance	0.02 - 0.08 (0.0008 - 0.0031)	0.12 (0.0047)
Camshaft end play	0 - 0.02 (0 - 0.0008)	0.10 (0.0039)
Control rack to pinion backlash	0.15 (0.0059)	0.30 (0.0118)
Control rack sliding resistance	Pump rpm = 0	Less than 1.471N (150 g, 5.29 oz)
	Pump rpm = 1,000	Less than 0.490N (50 g, 1.76 oz)
Injection internal (cam angle)	59°30' - 60°30'	-
Injection starting timing (pre-stroke: plunger lift from B.D.C.)	2.10 - 2.20 (0.0827 - 0.0866)	-
Camshaft end play adjusting shim	Thickness mm (in)	Part number
	0.10 (0.0039)	16741-37500
	0.12 (0.0047)	16741-37501
	0.14 (0.0055)	16741-37502
	0.16 (0.0063)	16741-37503
	0.18 (0.0071)	16741-37504
	0.30 (0.0118)	16741-37505
0.50 (0.0197)	16741-37506	

**Governor**

	Thickness mm (in)	Part number
Pneumatic governor spring adjusting shim	0.2 (0.008)	19241-37504
	0.3 (0.012)	19241-37505
	0.5 (0.020)	19241-37500
	1.0 (0.039)	19241-37501
	1.5 (0.059)	19241-37502
	2.0 (0.079)	19241-37503
Torque control travel adjusting shim	2.5 (0.098)	19241-37506
	3.0 (0.118)	19241-37507
	0.1 (0.004)	19227-37500
	0.2 (0.008)	19227-37501
	0.3 (0.012)	19227-37502
Torque control spring adjusting shim	0.5 (0.020)	19227-37503
	1.0 (0.039)	19227-37504
	0.1 (0.004)	19229-37500
	0.2 (0.008)	19229-37501
Torque control spring adjusting shim	0.3 (0.012)	19229-37502
	0.5 (0.020)	19229-37503
	1.0 (0.039)	19229-37504

**Feed pump**

	Standard mm (in)	Wear limit mm (in)
Roller to pin clearance	0.04 - 0.09 (0.0016 - 0.0031)	0.30 (0.0118)
Roller outer diameter	15.0 (0.591)	14.9 (0.587)
Oil feed rate	405 ml (14.3 Imp fl oz) or more within 15 seconds at a pump speed of 1,000 rpm.	
Pumping capacity	Discharge should occur within one minute (60 seconds) with a pump speed of 100 rpm and intake head of 1.0 meter (3.3 ft).	
Oil feed pressure	The time required to develop an oil feed pressure of 333 to 412 kPa (3.33 to 4.12 bar, 3.4 to 4.2 kg/cm <sup>2</sup> , 48 to 60 psi) with a feed pump speed of 600 rpm should be within 30 seconds.	
Pumping capacity (priming pump)	Operate the priming pump at a rate of 60 to 100 strokes per minute and verify that pumping is started within 25 strokes.	



## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

TD42

### In-line Type Injection Pump (Cont'd)

#### Timer

Flyweight holder to flange clearance (Lock plate to thrust washer clearance) mm (in)	0.02 - 0.10 (0.0008 - 0.0039)	
	<b>Thickness mm (in)</b>	<b>Part number</b>
Timer spring adjusting shim	0.1 (0.004)	16822-37500
	0.2 (0.008)	16822-Z9000
	0.3 (0.012)	16822-37501
	0.4 (0.016)	16826-99011
	0.5 (0.020)	16822-37502
	0.6 (0.024)	16822-Z9001
	0.7 (0.028)	16822-37506
	0.8 (0.031)	16822-37507
	0.9 (0.035)	16822-37508
	1.0 (0.039)	16822-Z9002
Timer plate bearing adjusting shim	0.10 (0.0039)	16826-99007
	0.12 (0.0047)	16828-99000
	0.14 (0.0055)	16826-99001
	0.16 (0.0063)	16826-99002
	0.18 (0.0071)	16826-99003
	0.20 (0.0079)	16826-99005
	0.30 (0.0118)	16826-99006
0.50 (0.0197)	16826-99004	

#### Fuel filter

Type	Full-flow, paper type filter
Overflow valve opening pressure kPa (bar, kg/cm <sup>2</sup> , psi)	98 - 137 (0.98 - 1.37, 1.0 - 1.4, 14 - 20)

#### Injection pump calibration data

**This data will be introduced later.**

VE-Type Injection Pump

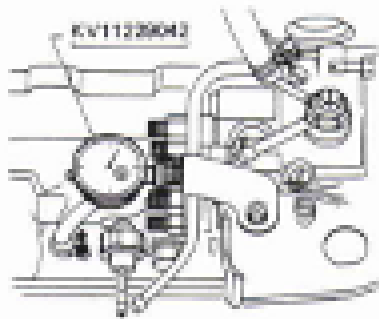
APPLICATION

Destination	Part No.	Pump No.	Remarks
Australia	16700-06J02	104760-4021	M/T without exhaust brake

INSPECTION AND ADJUSTMENT

Injection timing

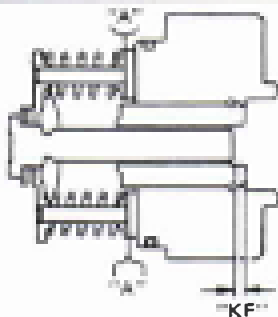
Plunger lift	mm (in)	0.74±0.02 (0.0291±0.0008) (equivalent to 6° B.T.D.C.)
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SEF016A

Use of adjustment value and adjusting shim when installing injection pump.

Dimension "KF"	mm (in)	6.5 - 6.7 (0.256 - 0.264)
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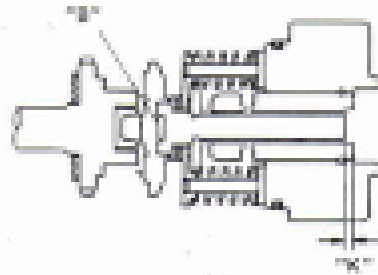


SEF028

Adjusting shim ("A" position)

Part number	Thickness mm (in)
16882-V0700	0.5 (0.020)
16882-V0701	0.8 (0.031)
16882-V0702	1.0 (0.039)
16882-V0703	1.2 (0.047)
16882-V0704	1.5 (0.059)
16882-V0705	1.8 (0.071)
16882-V0706	2.0 (0.079)

Dimension "K"	mm (in)	3.2 - 3.4 (0.126 - 0.134)
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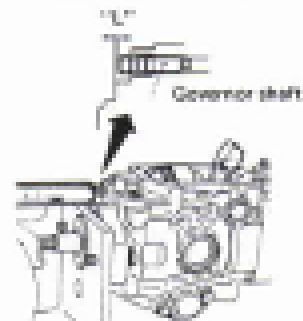


SEF029

Adjusting shim ("B" position)

Part number	Thickness mm (in)	Part number	Thickness mm (in)
16884-V0700	1.92 (0.0756)	16742-R8100	1.96 (0.0772)
16884-V0701	2.00 (0.0787)	16742-R8101	2.04 (0.0803)
16884-V0702	2.08 (0.0819)	16742-R8102	2.12 (0.0835)
16884-V0703	2.16 (0.0850)	16742-R8103	2.20 (0.0866)
16884-V0704	2.24 (0.0882)	16742-R8104	2.28 (0.0898)
16884-V0705	2.32 (0.0913)	16742-R8105	2.36 (0.0929)
16884-V0706	2.40 (0.0945)	16742-R8106	2.44 (0.0961)
16884-V0707	2.48 (0.0976)	16742-R8107	2.52 (0.0992)
16884-V0708	2.56 (0.1008)	16742-R8108	2.60 (0.1024)
16884-V0709	2.64 (0.1039)	16742-R8109	2.68 (0.1055)
16884-V0710	2.72 (0.1071)	16742-R8110	2.76 (0.1087)
16884-V0711	2.80 (0.1102)	16742-R8111	2.84 (0.1118)
16884-V0712	2.88 (0.1134)		

Dimension "L"	mm (in)	1.5 - 2.0 (0.059 - 0.079)
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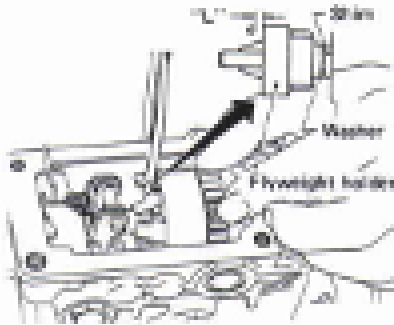
SEF030

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

TD-42

## VE-Type Injection Pump (Cont'd)

Axial play of flyweight holder "L" mm (in)	0.15 - 0.35 (0.0059 - 0.0138)
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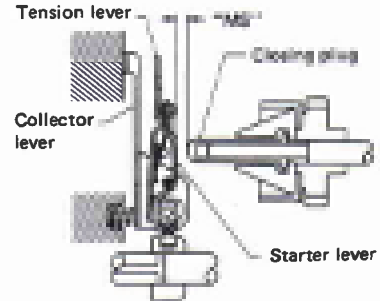


SEF047A

Adjusting shim

Part number	Thickness mm (in)
19208-V0700	1.05 (0.0413)
19208-V0701	1.25 (0.0492)
19208-V0702	1.45 (0.0571)
19208-V0703	1.65 (0.0650)
19208-V0704	1.85 (0.0728)

Dimension "MS"	mm (in)	0.9 - 1.1 (0.035 - 0.043)
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SEF856

Adjusting closing plug

Part number	Length mm (in)
16268-R8100	3.10 (0.1220)
16268-R8101	3.30 (0.1299)
16268-R8102	3.50 (0.1378)
16268-R8103	3.70 (0.1457)
16268-R8104	3.90 (0.1535)
16268-R8105	4.10 (0.1614)
16268-R8106	4.30 (0.1693)
16268-R8107	4.50 (0.1772)

**Injection pump calibration data**

This data will be introduced later.

# ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

## SECTION **FE**

### CONTENTS

ENGINE CONTROL SYSTEM .....	FE-2
FUEL SYSTEM .....	FE-4
EXHAUST SYSTEM .....	FE-6

**FE**

## **ENGINE CONTROL SYSTEM**

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### **Accelerator Control System**

- a. Warm up engine to normal operating temperature.
- b. Check to see if throttle valve fully opens when accelerator pedal is fully depressed and if it returns to idle position when released.
- c. Adjust accelerator pedal free play by turning adjusting nut.
- d. Check accelerator control parts for improper contact with any adjacent parts.
- e. When connecting accelerator wire, be careful not to twist or scratch its inner wire.
- f. Apply a light coat of recommended multi-purpose grease to all sliding or friction surfaces. Do not apply grease to wire.
- g. Make sure that engine speed returns to idle when idling control knob is turned completely counterclockwise.
- h. On automatic transmission models, make sure kickdown switch rod is fully pushed in when accelerator pedal is depressed completely.

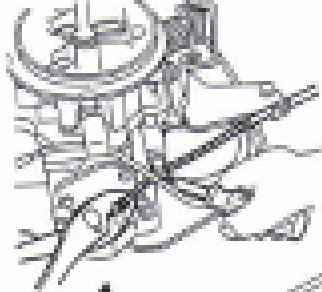
### **Choke Control Wire**

- Make sure choke valve opens fully when choke knob is pushed in all the way and closes when knob is fully pulled out.

# ENGINE CONTROL SYSTEM

## Accelerator Control System

Choke control wire adjustment



Choke control wire  
(Gasoline engine except auto-choke model)

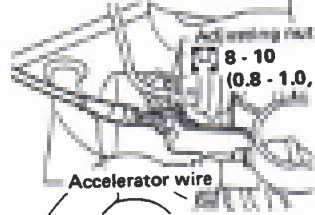


Gasoline engine model



Adjusting nut  
8 - 10  
(0.8 - 1.0, 5.8 - 7.2)

Diesel engine model



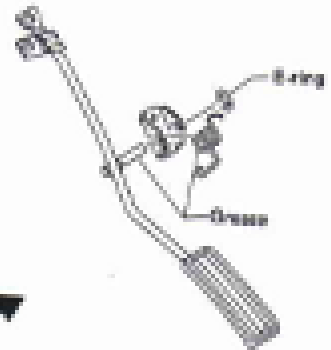
Adjusting nut  
8 - 10  
(0.8 - 1.0, 5.8 - 7.2)

Accelerator wire



Accelerator control wire

Idling control wire  
(Diesel engine model)



B-ring

Grease

0.3 - 1.0 mm  
(0.012 - 0.039 in)

3 - 4 (0.3 - 0.4, 2.2 - 2.9)

When accelerator pedal is depressed completely.

8 - 12 (0.8 - 1.2, 5.8 - 8.7)  
Kickdown switch  
(A/T)

Free play at pedal pad center:  
1 - 3 mm  
(0.04 - 0.12 in)

: N·m (kg·m, ft·lb)

SFE976

## FUEL SYSTEM

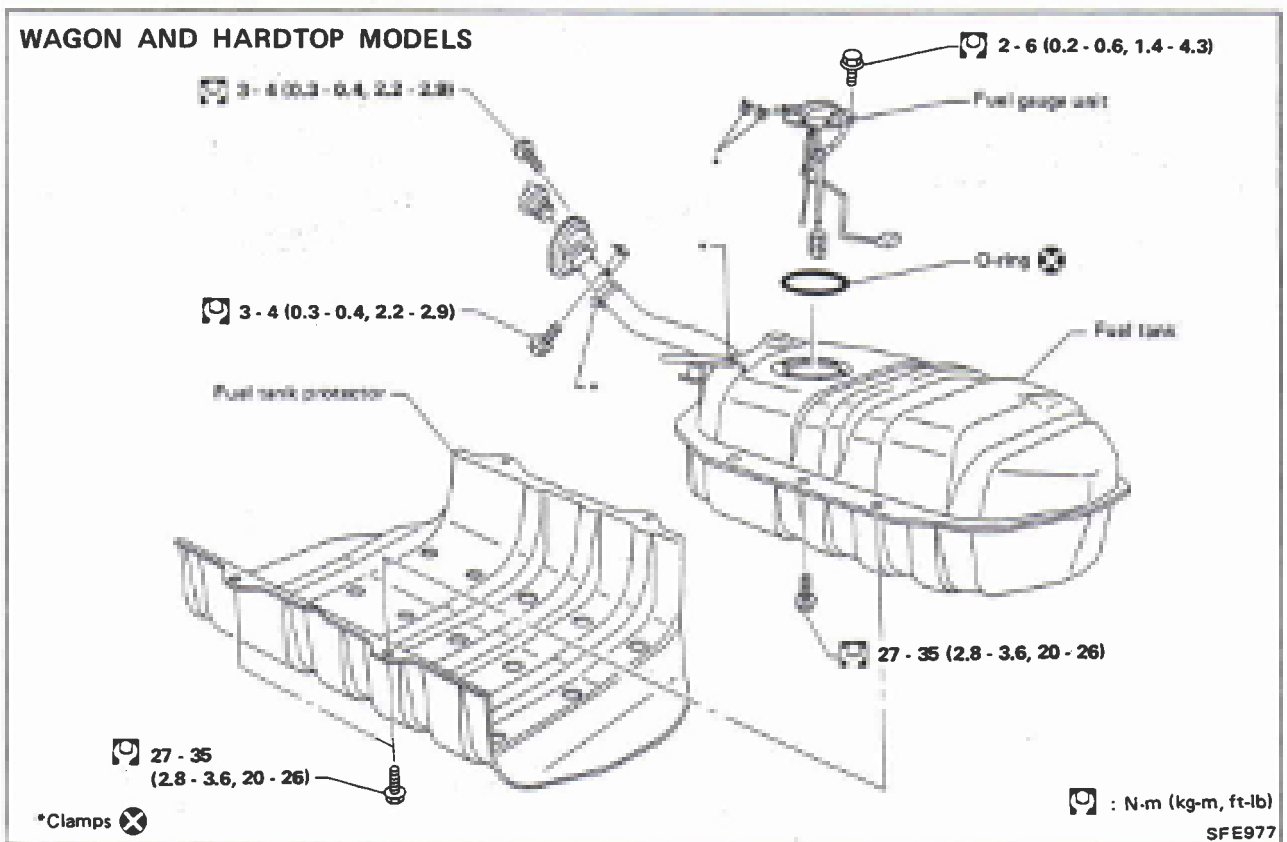
### WARNING:

When replacing fuel line parts, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Be sure to furnish the workshop with a CO<sub>2</sub> fire extinguisher.
- Be sure to disconnect battery ground cable before conducting operations.
- Put drained fuel in an explosion-proof container and put lid on securely.

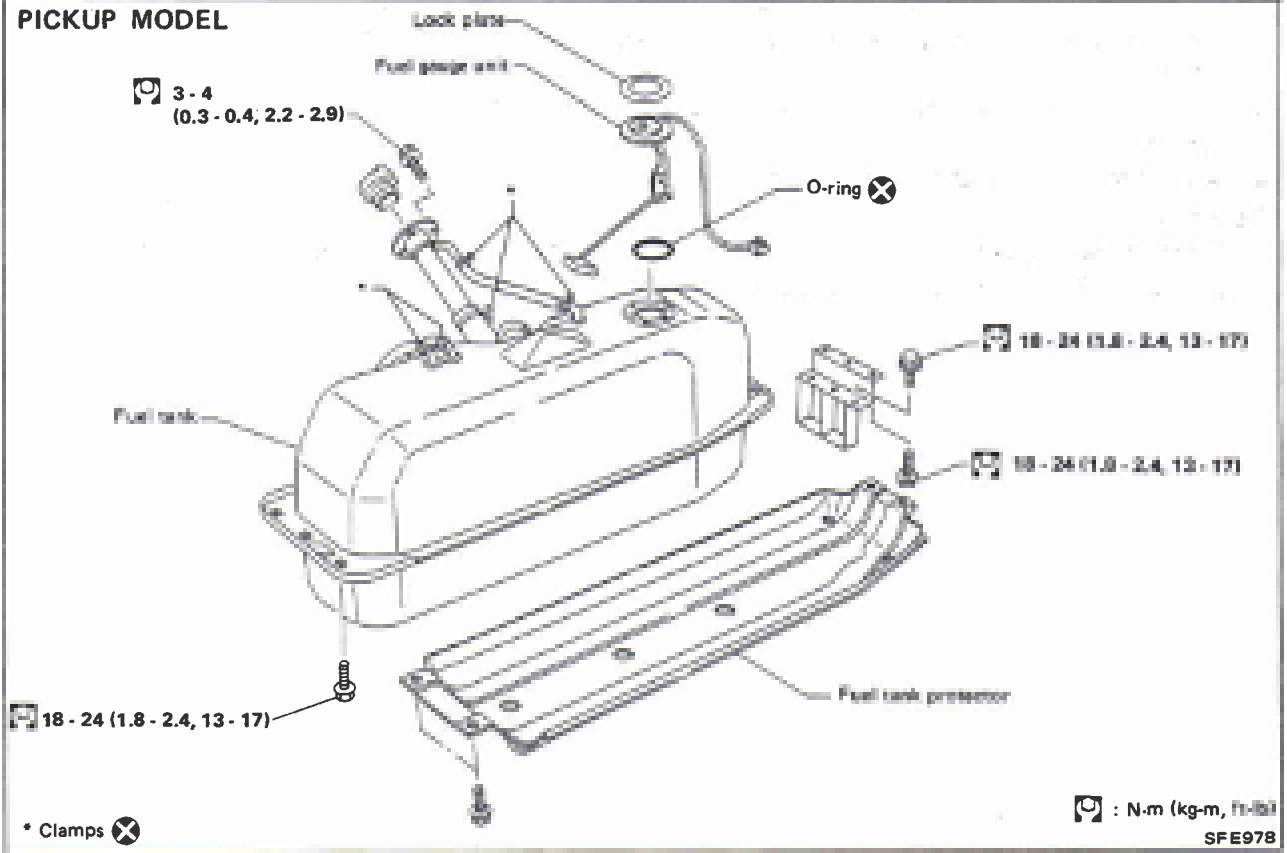
### CAUTION:

- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or dirt.
- Always replace O-ring and clamps with new ones.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose clamps excessively to avoid damaging hoses.
- When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)
- Run the engine and check for leaks at connections.



# FUEL SYSTEM

## PICKUP MODEL





## **EXHAUST SYSTEM**

---

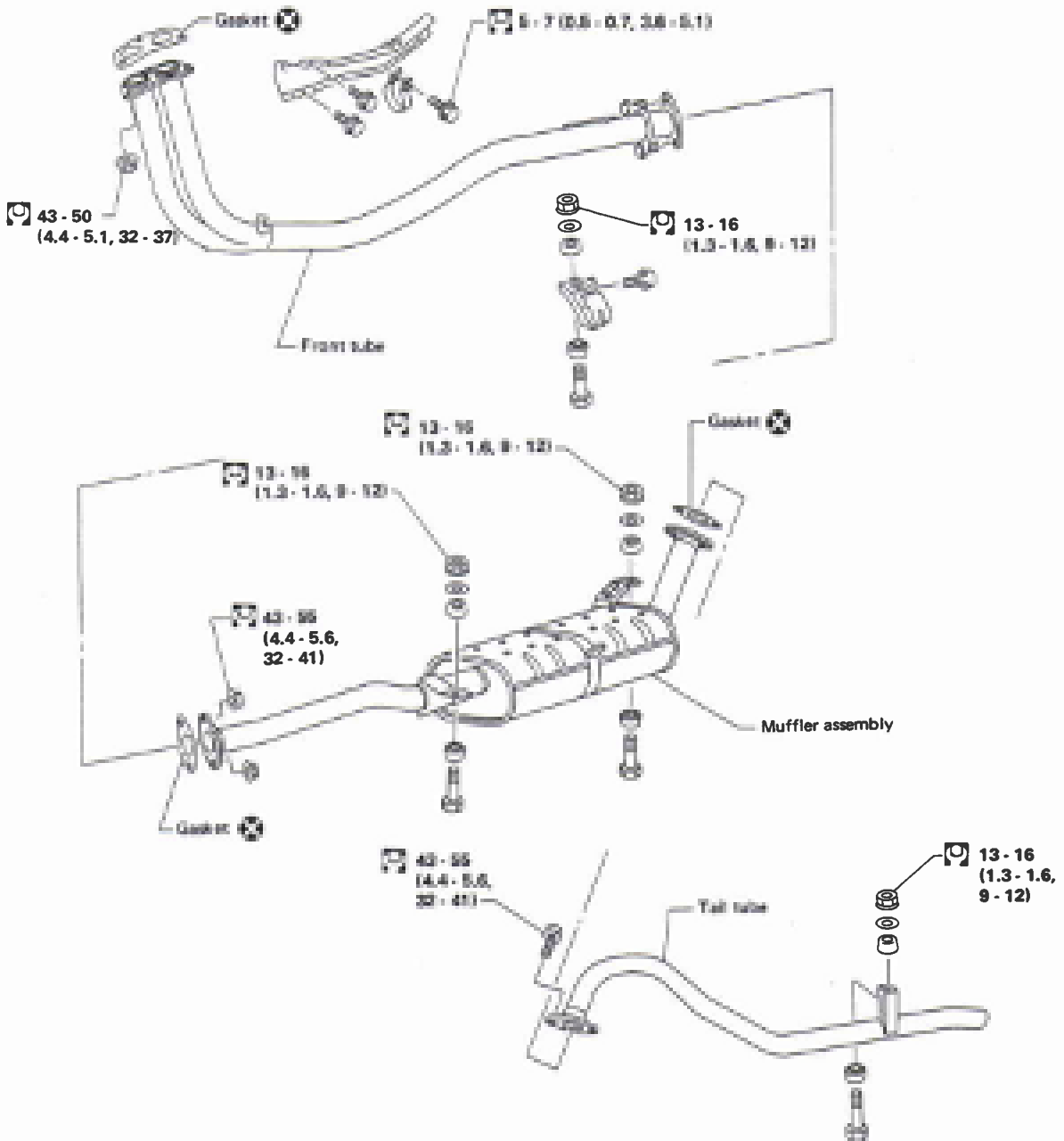
- After installation, check that mounting brackets and mounting insulator are free from undue stress. If any of above parts is not installed properly, excessive noises or vibrations may be transmitted to vehicle body.
- Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with engine running.
- Always replace exhaust gaskets with new ones when disassembling.

### **Pickup model**

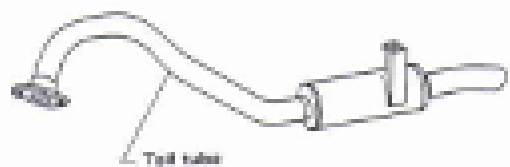
- When connecting center tube and muffler assembly, use the Genuine Nissan Sealant "Exhaust Sealant Kit 20720-N2225" or an equivalent to eliminate gas leakage at the joint.

# EXHAUST SYSTEM

## HARDTOP AND WAGON



### Australia model with TB42 and AT

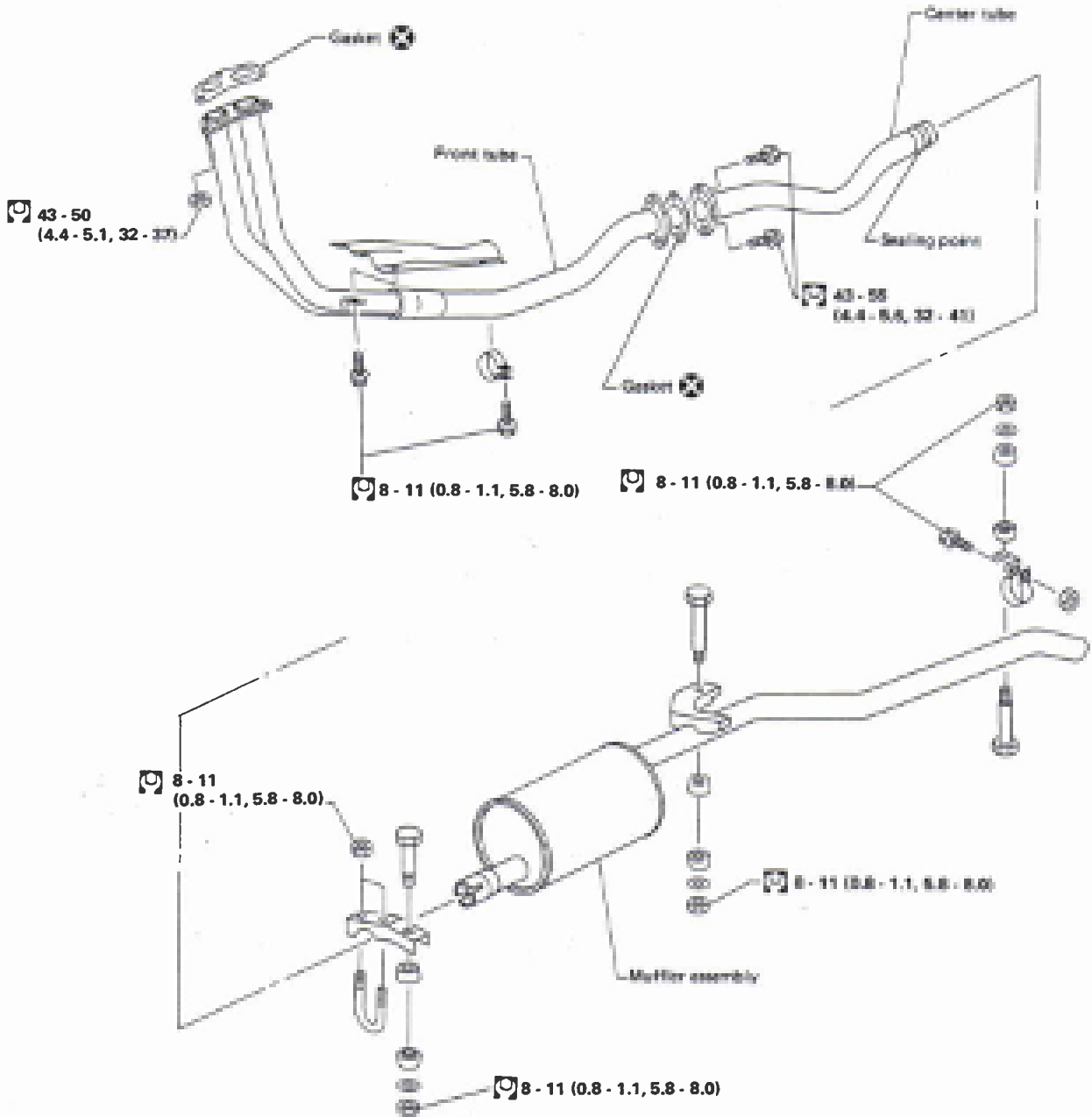


: N·m (kg·m, ft·lb)

SFE979

# EXHAUST SYSTEM

## PICKUP



 : N·m (kg·m, ft·lb)

SFE980

# CLUTCH

## SECTION **CL**

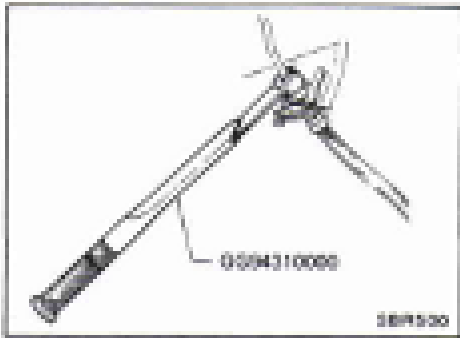
### CONTENTS

PRECAUTIONS .....	CL- 2
PREPARATION .....	CL- 3
CLUTCH SYSTEM .....	CL- 4
INSPECTION AND ADJUSTMENT .....	CL- 5
HYDRAULIC CLUTCH CONTROL .....	CL- 6
CLUTCH RELEASE MECHANISM .....	CL-10
CLUTCH DISC AND CLUTCH COVER .....	CL-12
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	CL-15

**CL**

## PRECAUTIONS

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### Precautions

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.
- Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.


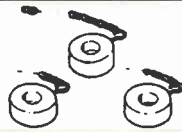



### WARNING:

After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

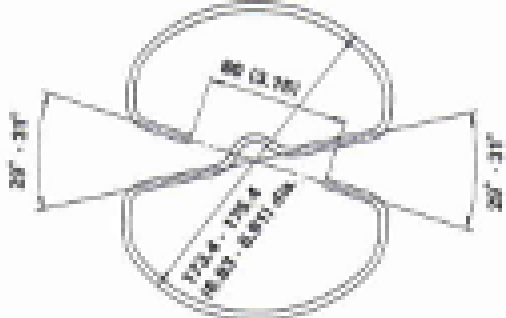
## PREPARATION

### SPECIAL SERVICE TOOLS

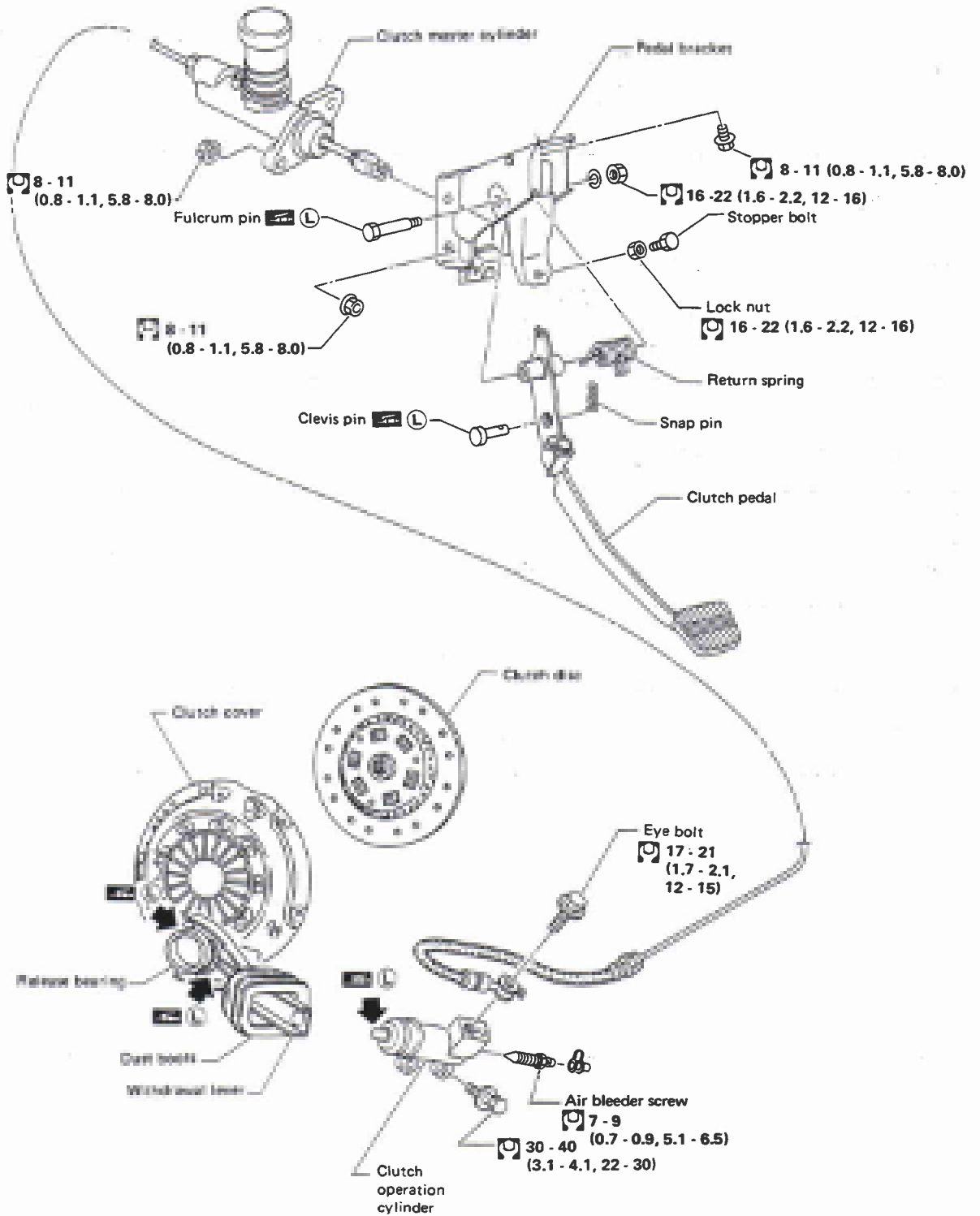
\*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST20050010 Base plate		Inspecting diaphragm spring of clutch cover
ST20050100 Distance piece		Inspecting diaphragm spring of clutch cover
GG94310000* Flare nut torque wrench		Removing and installing each clutch piping
ST20600000* (KV30100100) Clutch aligning bar		Installing clutch cover and clutch disc
ST20050240* Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover

### COMMERCIAL SERVICE TOOL

Tool name	Description	
Wire		Installing clutch cover  Wire: 3.2 (0.126) dia.  Unit: mm (in)

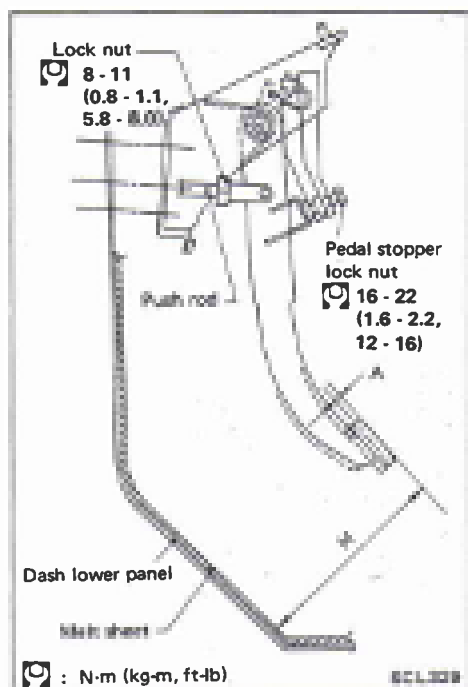
# CLUTCH SYSTEM



L : Apply lithium-based grease including molybdenum disulphide.  
 : N-m (kg-m, ft-lb)

SCL328

## INSPECTION AND ADJUSTMENT

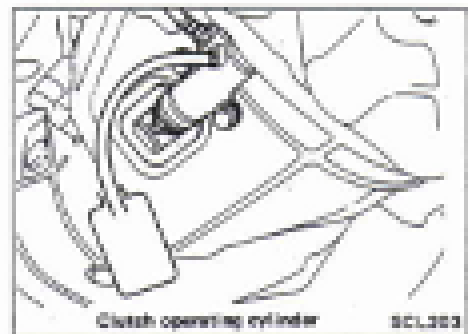


### Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper.  
**Pedal height "H\*":**  
**202 - 212 mm (7.95 - 8.35 in)**  
\*: Measured from surface of melt sheet to pedal pad
2. Adjust pedal free play with master cylinder push rod or clutch booster input rod. Then tighten lock nut.  
**Pedal free play "A":**  
**1.0 - 3.0 mm (0.039 - 0.118 in)**

**Pedal free play means the following total measured at position of pedal pad:**

- Play due to clevis pin and clevis pin hole in clutch pedal.
- Play due to piston and push rod.



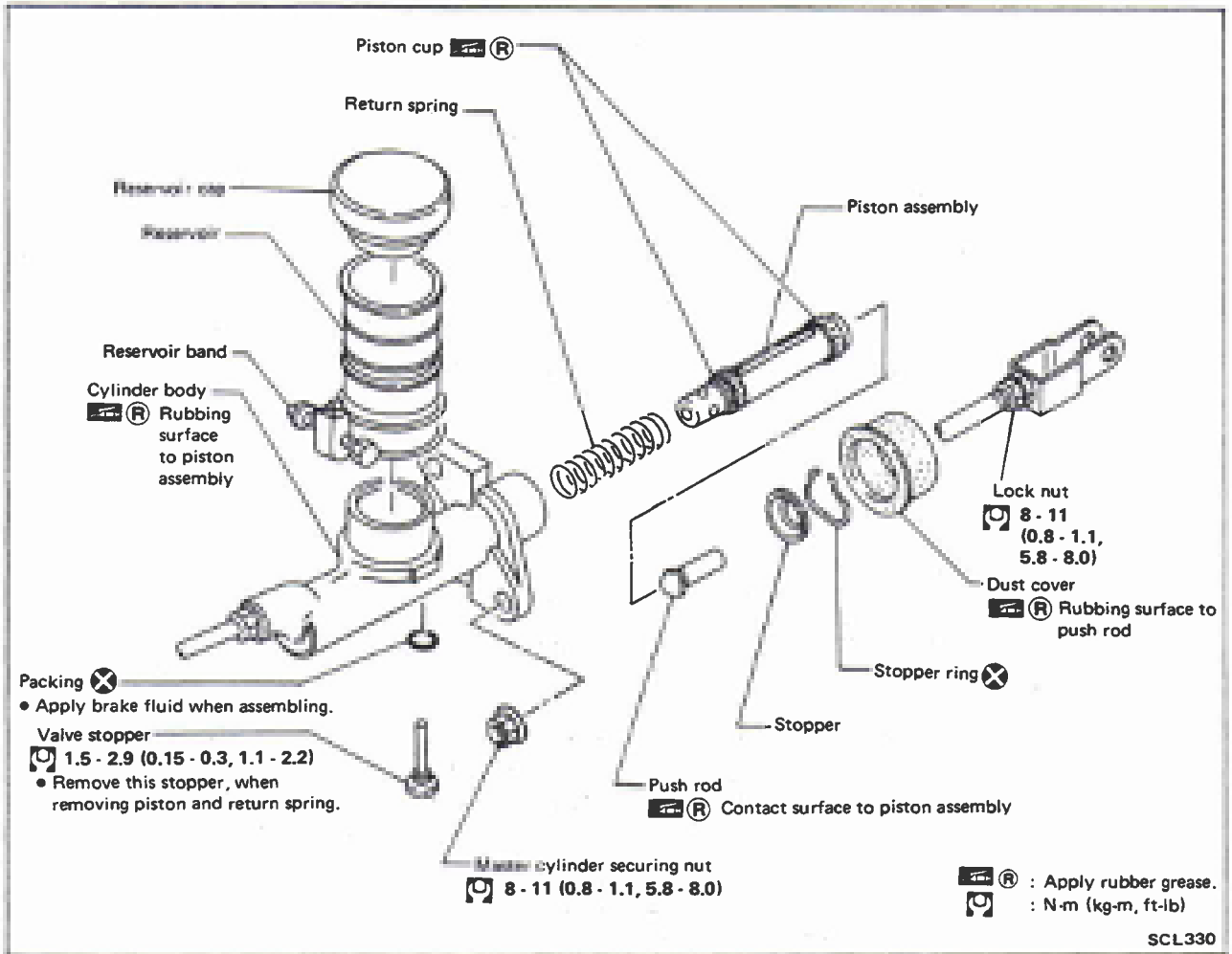
### Bleeding Procedure

- **Carefully monitor fluid level at master cylinder during bleeding operation.**
1. Top up reservoir tank with recommended brake fluid.
  2. Connect a transparent vinyl tube to air bleeder valve.
  3. Fully depress clutch pedal several times.
  4. With clutch pedal depressed, open bleeder valve to release air.
  5. Close bleeder valve.
  6. Repeat steps 4 through 6 above until clear brake fluid comes out of air bleeder valve.



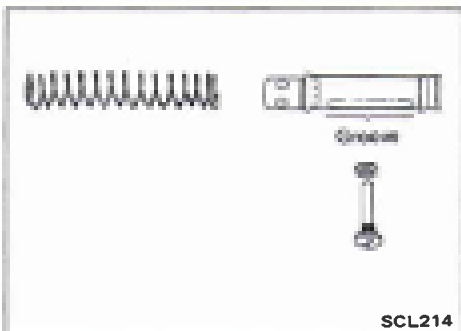
# HYDRAULIC CLUTCH CONTROL

## Clutch Master Cylinder



### DISASSEMBLY AND ASSEMBLY

- Push piston in cylinder body with screwdriver when removing and installing valve stopper.



- Align groove of piston assembly and valve stopper portion when installing valve stopper.
- Check direction of piston caps.

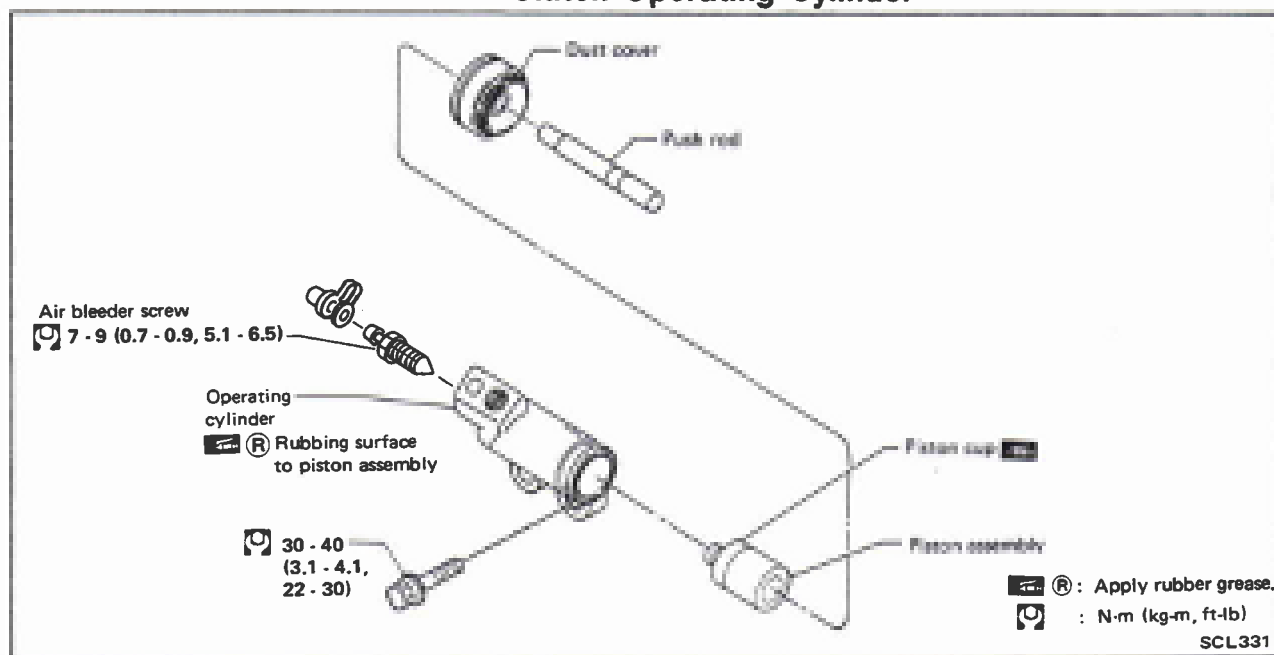
## HYDRAULIC CLUTCH CONTROL

### Clutch Master Cylinder (Cont'd)

#### INSPECTION

- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

### Clutch Operating Cylinder

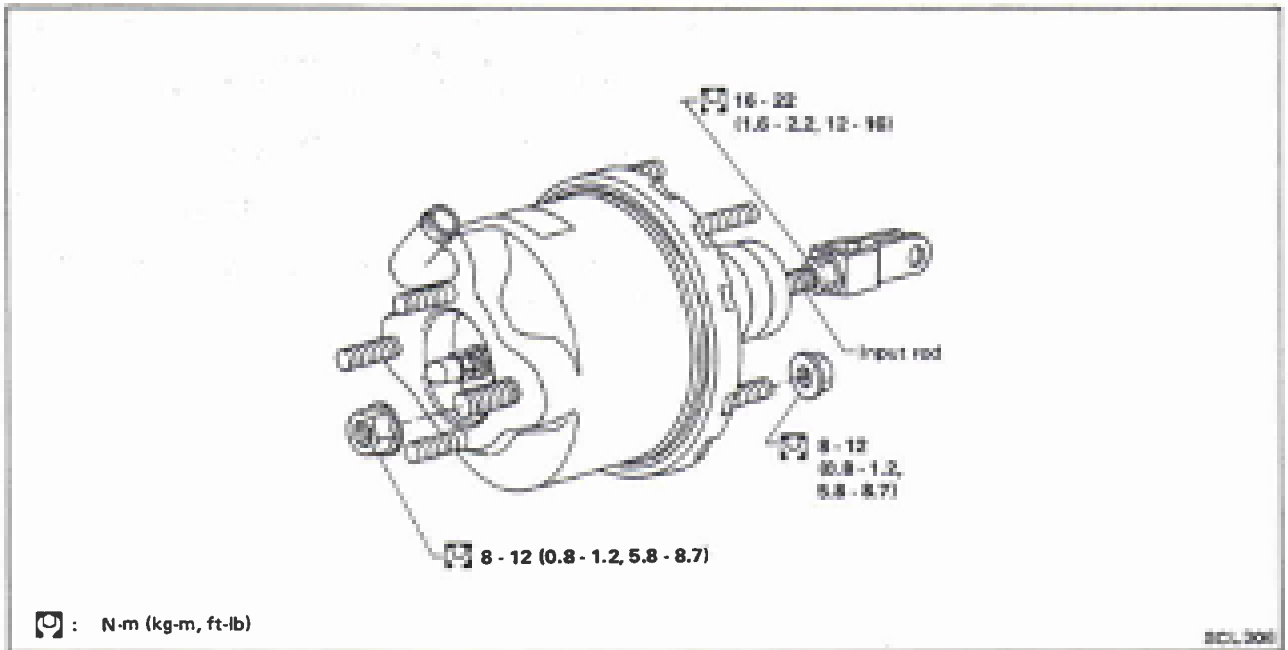


#### INSPECTION

- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

# HYDRAULIC CLUTCH CONTROL

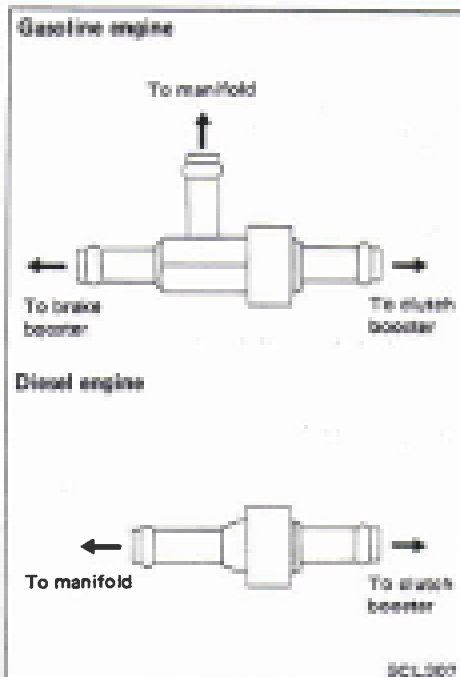
## Clutch Booster



### INSPECTION

#### Hoses and connectors

- Check condition of vacuum hoses and connections.
- Check vacuum hoses and check valve for air tightness.



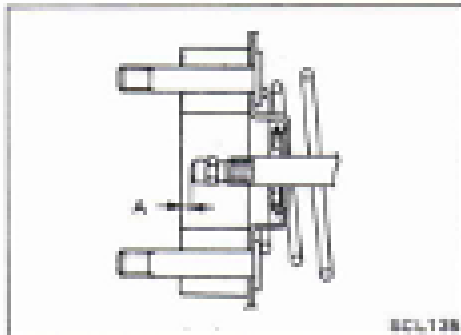
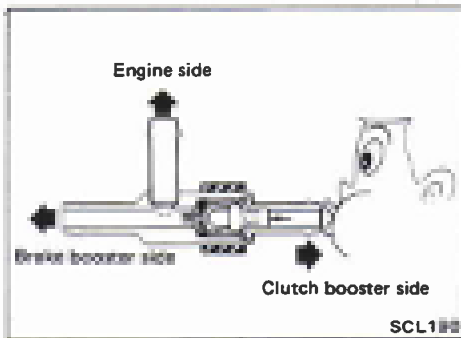
#### Check valve

- Install check valve properly paying attention to its direction.

## HYDRAULIC CLUTCH CONTROL

### Clutch Booster (Cont'd)

- When pressure is applied to the clutch booster side of check valve and valve does not open, replace check valve with a new one.

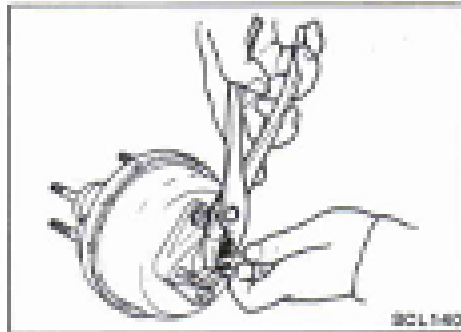


### ADJUSTMENT

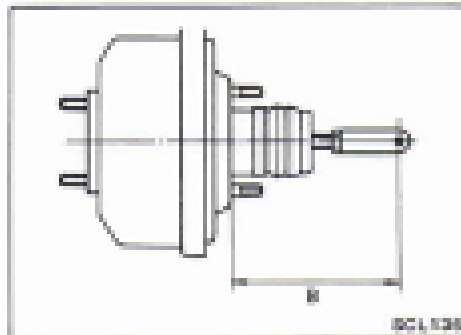
Output rod length:

Length "A"

1.30 - 1.55 mm (0.0512 - 0.0610 in)



If amount of adjustment required exceeds 0.5 mm (0.020 in), reaction disc may have either been dislocated or fallen off. Replace clutch booster assembly.

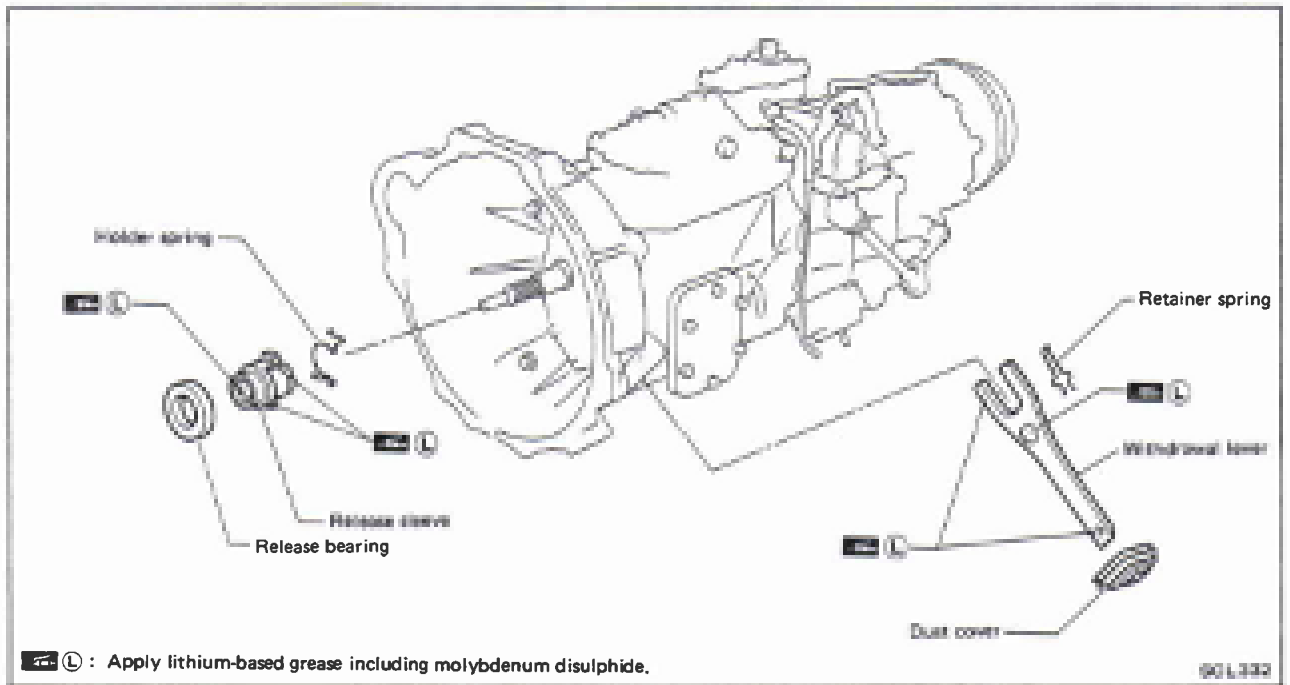


Input rod length:

Length "B"

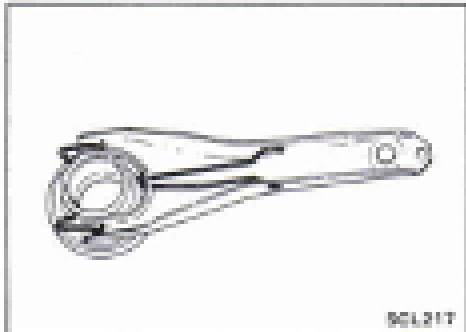
130 mm (5.12 in)

## CLUTCH RELEASE MECHANISM

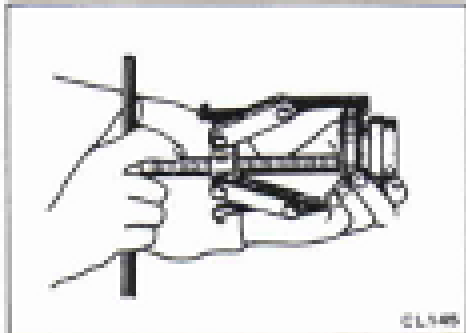


### REMOVAL AND INSTALLATION

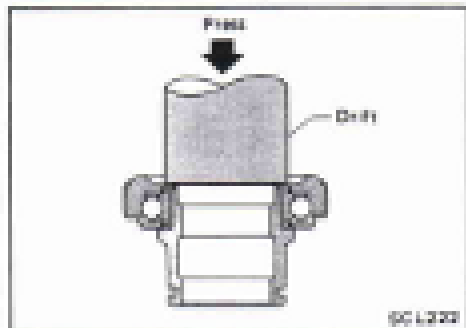
- Install retainer spring and holder spring.



- Remove release bearing.



- Install release bearing with suitable drift.



## CLUTCH RELEASE MECHANISM

---

### INSPECTION

- Check release bearing to see that it rolls freely and is free from noise, crack, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.

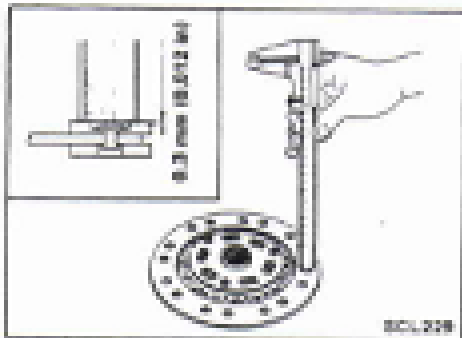
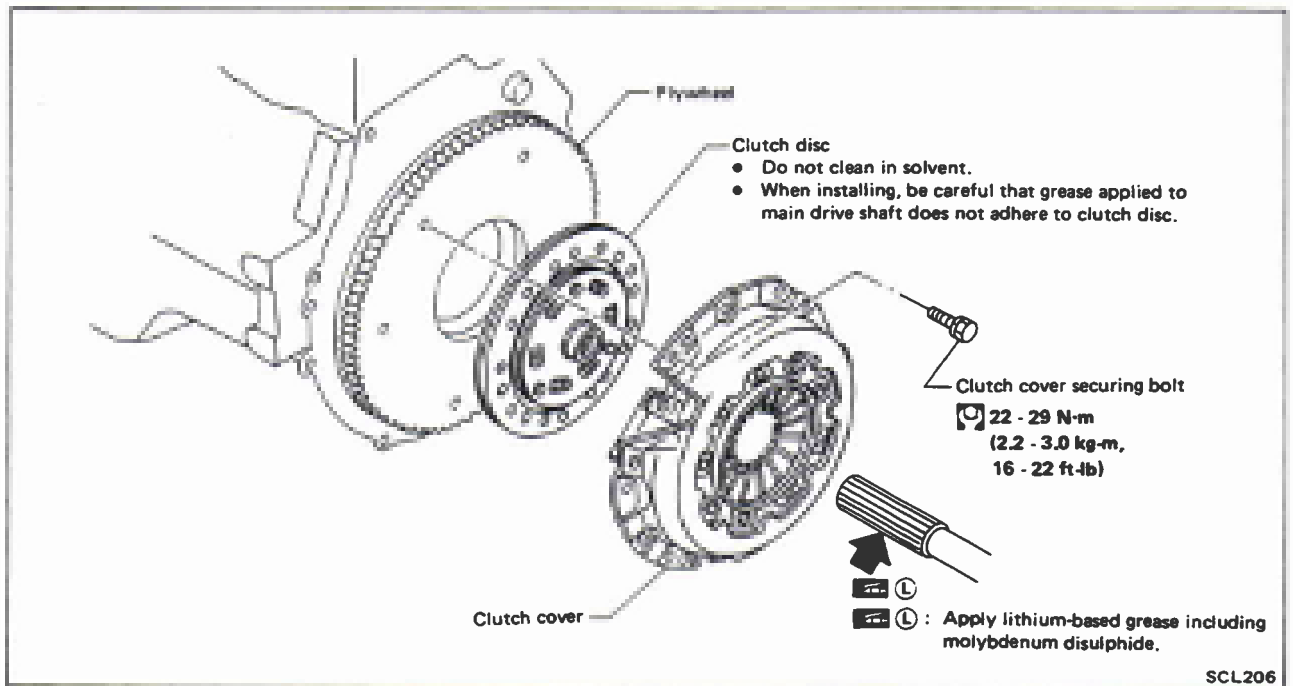


### LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

**Too much lubricant might cause clutch disc facing damage.**

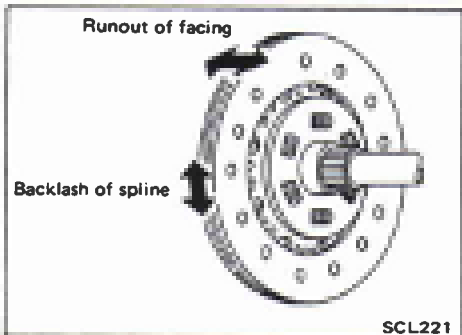
## CLUTCH DISC AND CLUTCH COVER



### Clutch Disc INSPECTION

Check clutch disc for wear of facing.

**Wear limit of facing surface to rivet head:**  
0.3 mm (0.012 in)



- Check clutch disc for backlash of spline and runout of facing.

**Maximum backlash of spline (at outer edge of disc):**  
1.1 mm (0.043 in)

**Runout limit:**  
1.3 mm (0.051 in)

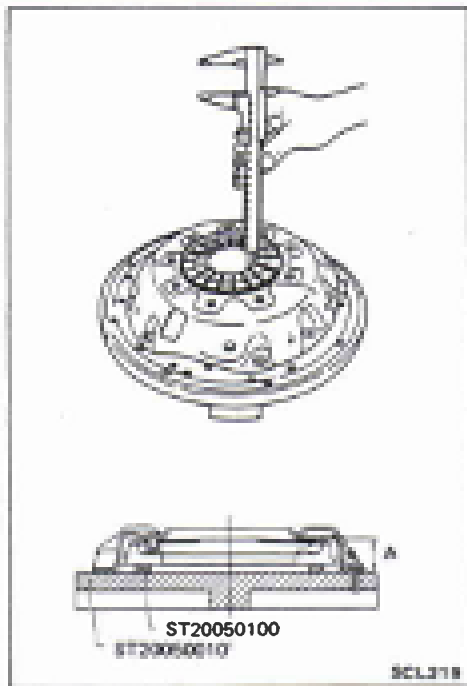
**Distance of runout check point (from hub center)**  
132.5 mm (5.22 in)

- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

### INSTALLATION

- Apply recommended grease to contact surface of spline portion.  
**Too much lubricant might cause clutch disc facing damage.**

## CLUTCH DISC AND CLUTCH COVER



### Clutch Cover and Flywheel INSPECTION

- Set Tool and check height and unevenness of diaphragm spring.

**Diaphragm spring height "A":**

**44 - 46 mm (1.73 - 1.81 in)**

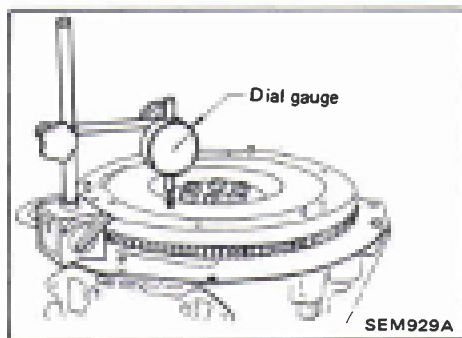
- Check thrust rings for wear or damage by shaking cover assembly up and down to listen for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.



- Adjust unevenness of diaphragm spring with Tool.

**Uneven limit:**

**0.5 mm (0.020 in)**



- Check flywheel and clutch disc contact surface for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

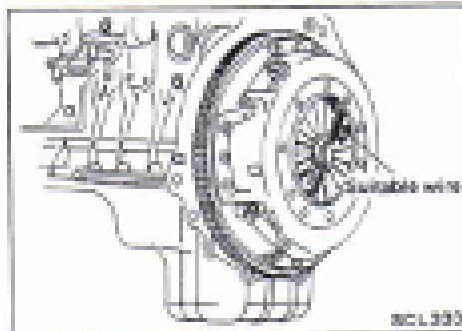
**Runout (Total indicator reading):**

**TD42 engine model**

**0.15 mm (0.0059 in) or less**

**TB42 engine model**

**0.1 mm (0.004 in) or less**



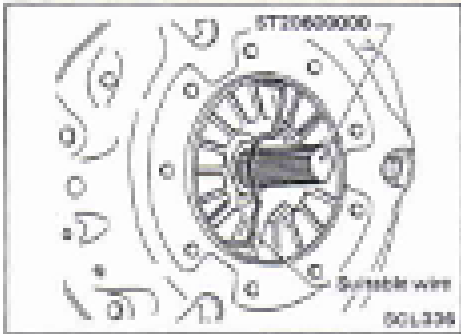
### INSTALLATION

- Use suitable wire when installing clutch cover.

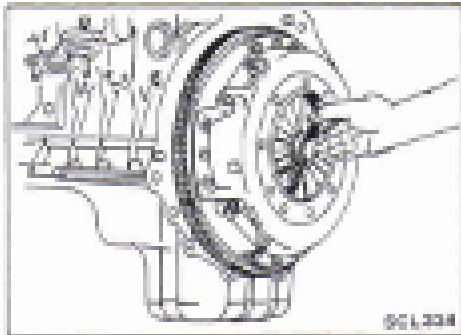


## CLUTCH DISC AND CLUTCH COVER

### Clutch Cover and Flywheel (Cont'd)



- Insert Tool into clutch disc hub when installing clutch cover and disc.



- Remove wire after installing clutch cover and disc.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### General Specifications

#### CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic
------------------------	-----------

#### CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)
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#### CLUTCH OPERATING CYLINDER

Engine		TD42, TB42
Inner diameter	mm (in)	19.05 (3/4)

#### CLUTCH BOOSTER

Engine	TD42	TB42	
Type	M45		
Diaphragm diameter	mm (in)		
	114.3 (4.50)		
Check valve type	Double check valve	Single check valve	

#### CLUTCH DISC

Model	218TBL
Engine	TD42, TB42
Facing size	mm (in)
(Outer dia. x inner dia. x thickness)	275 x 180 x 3.5 (10.83 x 7.09 x 0.138)
Thickness of disc assembly With load	7.8 - 8.2 (0.307 - 0.323)/ 5,394 (550, 1,213)
	mm (in)/N (kg, lb)

#### CLUTCH COVER

Model	D275K	
Engine	TD42	TB42
Full load	N (kg, lb)	
	5,394 (550, 1,213)	5,854 (600, 1,302)

### Inspection and Adjustment

#### CLUTCH PEDAL

Unit: mm (in)

Pedal height "H"	202 - 212 (7.95 - 8.35)
Pedal free play "A"	1.0 - 3.0 (0.039 - 0.118)

\*: Measured from surface of melt sheet to pedal pad

#### CLUTCH BOOSTER

Output rod length "A"	mm (in)	1.30 - 1.55 (0.0512 - 0.0610)
Input rod length "B"	mm (in)	130 (5.12)

#### CLUTCH DISC

Unit: mm (in)

Model	218TBL
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit of facing	1.3 (0.051)
Distance of runout check point (from the hub center)	132.5 (5.22)
Maximum backlash of spline (at outer edge of disc)	1.1 (0.043)

#### CLUTCH COVER

Unit: mm (in)

Model	D275K
Diaphragm spring height	0.5 (0.020)
Uneven limit of diaphragm spring toe height "A"	44 - 46 (1.73 - 1.81)

# MANUAL TRANSMISSION

## SECTION **MT**

### CONTENTS

PREPARATION .....	MT- 2
ON-VEHICLE SERVICE .....	MT- 5
REMOVAL AND INSTALLATION .....	MT- 6
MAJOR OVERHAUL .....	MT- 7
DISASSEMBLY .....	MT-11
REPAIR FOR COMPONENT PARTS .....	MT-15
ASSEMBLY .....	MT-28
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	MT-34

**MT**

## PREPARATION






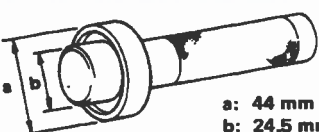


### SPECIAL SERVICE TOOLS

\*: Special tool or commercial equivalent

Tool number Tool name	Description
KV321022S1* Bushing hook set ① KV32102211* Bushing hook ② KV32102221* Spacer ③ KV32102240* Spacer ④ KV32102231* Bolt (M12) ⑤ KV32102250* Bolt (M8)	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p>                             a = 75 (2.95) dia.                              b = 59 (2.32) dia.                              c = 15 (0.59)                         </p> <p>                             a = 55 (2.17) dia.                              b = 42.2 (1.661) dia.                         </p> <p>                             a = 55 (2.17) dia.                              b = 40.2 (1.583) dia.                         </p> <p style="text-align: right;">Unit: mm (in)</p> </div> <div style="width: 35%; text-align: right;">                             Removing O.D. gear bushing                              Removing 3rd gear bushing                         </div> </div>
KV32102400* Counter gear stopper	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="text-align: right;">Unit: mm (in)</p> </div> <div style="width: 35%; text-align: right;">                             Installing O.D. gear bushing                         </div> </div>
KV32102501* Mainshaft stopper	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="text-align: right;">Unit: mm (in)</p> </div> <div style="width: 35%; text-align: right;">                             Installing mainshaft bearing                              Installing O.D. main gear                              Installing mainshaft rear end bearing                         </div> </div>
KV31100900* Pin punch	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> </div> <div style="width: 35%; text-align: right;">                             Removing and installing retaining pins to control arm                         </div> </div>
KV31100300* Pin punch	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> </div> <div style="width: 35%; text-align: right;">                             Removing and installing retaining pin for reverse check assembly, reverse shift fork, reverse fork rod bracket, striking lever, and control lever bracket                         </div> </div>

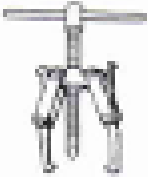


## PREPARATION

\*: Special tool or commercial equivalent

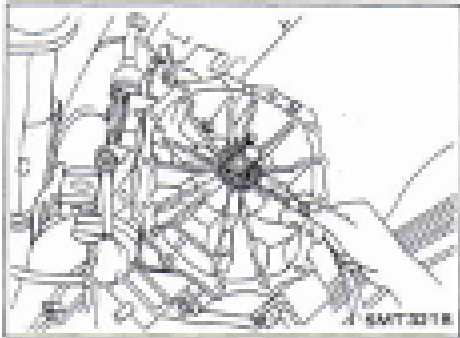
Tool number Tool name	Description
ST25420001* Clutch spring compressor	 <p style="text-align: right;">Installing sub-gear components</p>
ST30031000* Puller	 <p style="text-align: right;">Remvoing O.D. main gear Removing main drive gear bearing</p>
ST30613000* Drift	 <p style="text-align: right;">Installing main drive gear bearing Installing O.D. synchronizer cone</p> <p style="text-align: right;">a: 71.5 mm (2.815 in) dia. b: 47.5 mm (1.870 in) dia.</p>
ST33200000* Drift	 <p style="text-align: right;">Installing 3rd gear bushing Installing 3rd &amp; 4th synchronizer assembly Installing counter gear front bearing Installing counter gear rear bearing (Use with KV40100630)</p> <p style="text-align: right;">a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.</p>
KV40100630* Drift	 <p style="text-align: right;">Installing counter gear rear bearing (Use with ST33200000)</p> <p style="text-align: right;">a: 67.5 mm (2.657 in) dia. b: 44 mm (1.73 in) dia. c: 38.5 mm (1.516 in) dia.</p>
KV38102100 Drift	 <p style="text-align: right;">Installing front cover oil seal</p> <p style="text-align: right;">a: 44 mm (1.73 in) dia. b: 24.5 mm (0.965 in) dia.</p>
ST22452000* Drift	 <p style="text-align: right;">Installing O.D. gear bushing Installing O.D. main gear Installing mainshaft rear end bearing</p> <p style="text-align: right;">a: 45 mm (1.77 in) dia. b: 36 mm (1.42 in) dia.</p>
ST30720000* Drift	 <p style="text-align: right;">Installing rear oil seal</p> <p style="text-align: right;">a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.</p>

## PREPARATION

### COMMERCIAL SERVICE TOOLS

Tool name	Description
Puller	<div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>Removing companion flange                      Removing mainshaft rear end bearing                      Removing O.D. synchronizer assembly                      Removing O.D. gear bushing                      Removing O.D. main gear                      Removing mainshaft bearing                      Removing reverse synchronizer hub                      Removing 3rd &amp; 4th synchronizer hub                      Removing 3rd gear bushing</p> </div> </div>
Puller	<div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>Removing mainshaft low gear bearing                      Removing counter low &amp; high gear front bearing                      Removing counter gear front and rear bearing</p> </div> </div>
Drift	<div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>Installing reverse synchronizer hub                      Installing 1st &amp; 2nd synchronizer hub                      Installing mainshaft bearing</p> <p>Ø1: 48.8 mm (1.9213 in) dia.                      Ø2: 47.8 mm (1.8818 in) dia.                      Ø3: 46.0 mm (1.811 in)</p> </div> </div>

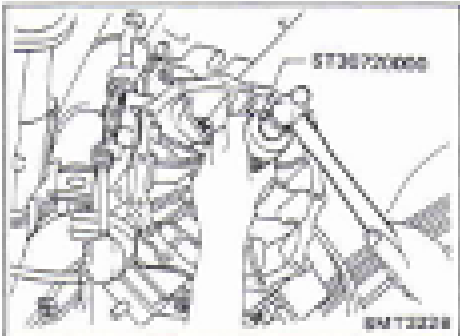
## ON-VEHICLE SERVICE



### Replacing Rear Oil Seal

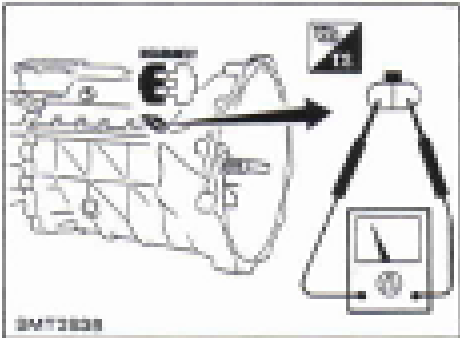
#### REMOVAL

1. Remove transfer assembly. — Refer to section TF.
2. Pull out rear oil seal.



#### INSTALLATION

1. Install rear oil seal.
  - Before installing apply multi-purpose grease to seal lip.
2. Install transfer assembly. — Refer to section TF.



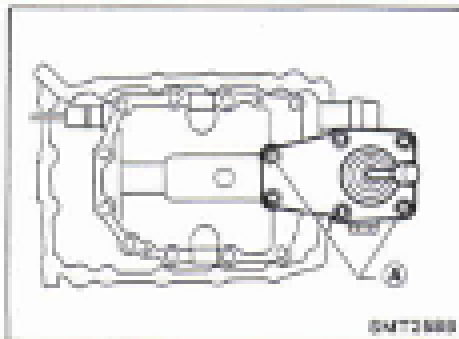
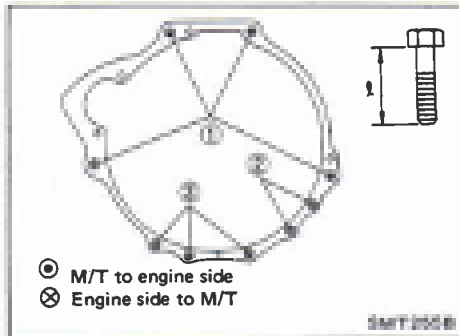
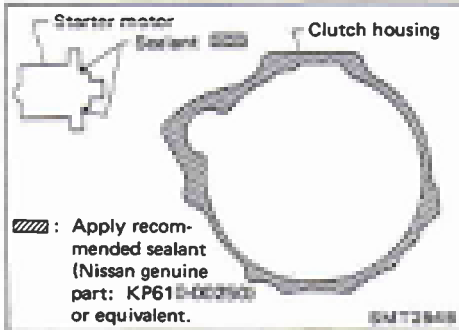
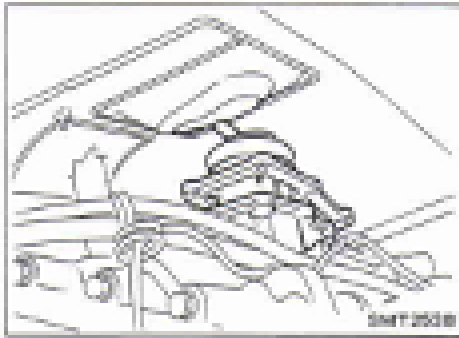
### Check of Position Switch

#### BACK-UP LAMP SWITCH

- Check continuity.

Shift position	Continuity
Reverse	Yes
Except reverse	No

## REMOVAL AND INSTALLATION



### Removal

- Remove front and rear propeller shafts. — Refer to section PD.
- Disconnect transfer control lever from transfer.
- Disconnect transmission control housing from gear shift housing cover after engine rear mounting member is disconnected from frame.
- Remove transmission with transfer from engine.
- **Support manual transmission with transfer, while removing it.**

### Installation

- Apply recommended sealant to mating surface of engine rear plate.

- Tighten all transmission bolts.

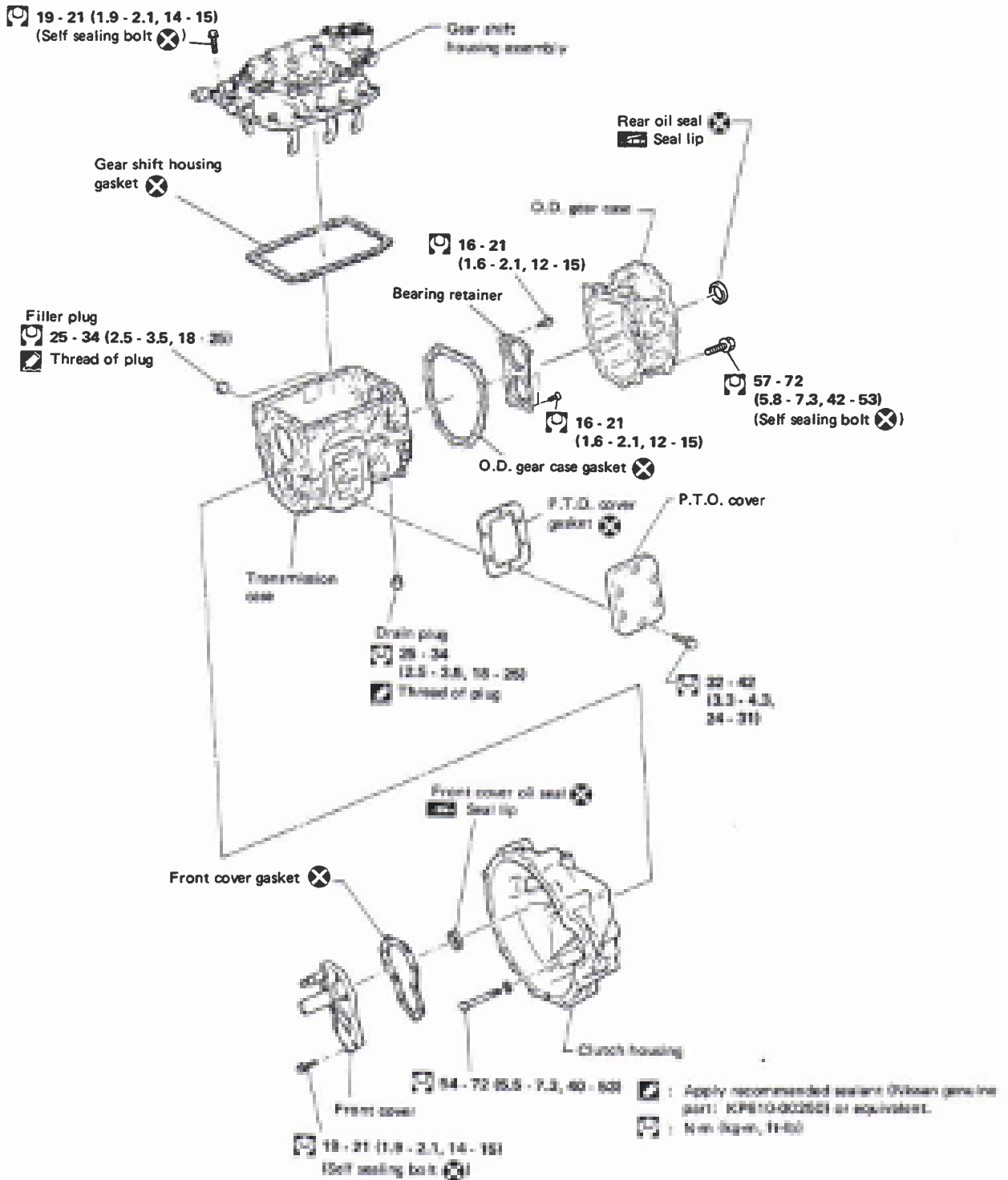
Bolt	Tightening torque N·m (kg·m, ft·lb)	ℓ mm (in)
1	83 - 113 (8.5 - 11.5, 61 - 83)	66 (2.60)
2	29 - 39 (3.0 - 4.0, 22 - 29)	36 (1.38)
3	29 - 39 (3.0 - 4.0, 22 - 29)	76 (2.96)
Gasket to engine	29 - 39 (3.0 - 4.0, 22 - 29)	36 (1.38) 76 (2.96)

- Connect control housing.
- **Bolts at portion A are longer than others.**



# MAJOR OVERHAUL

## Case Components

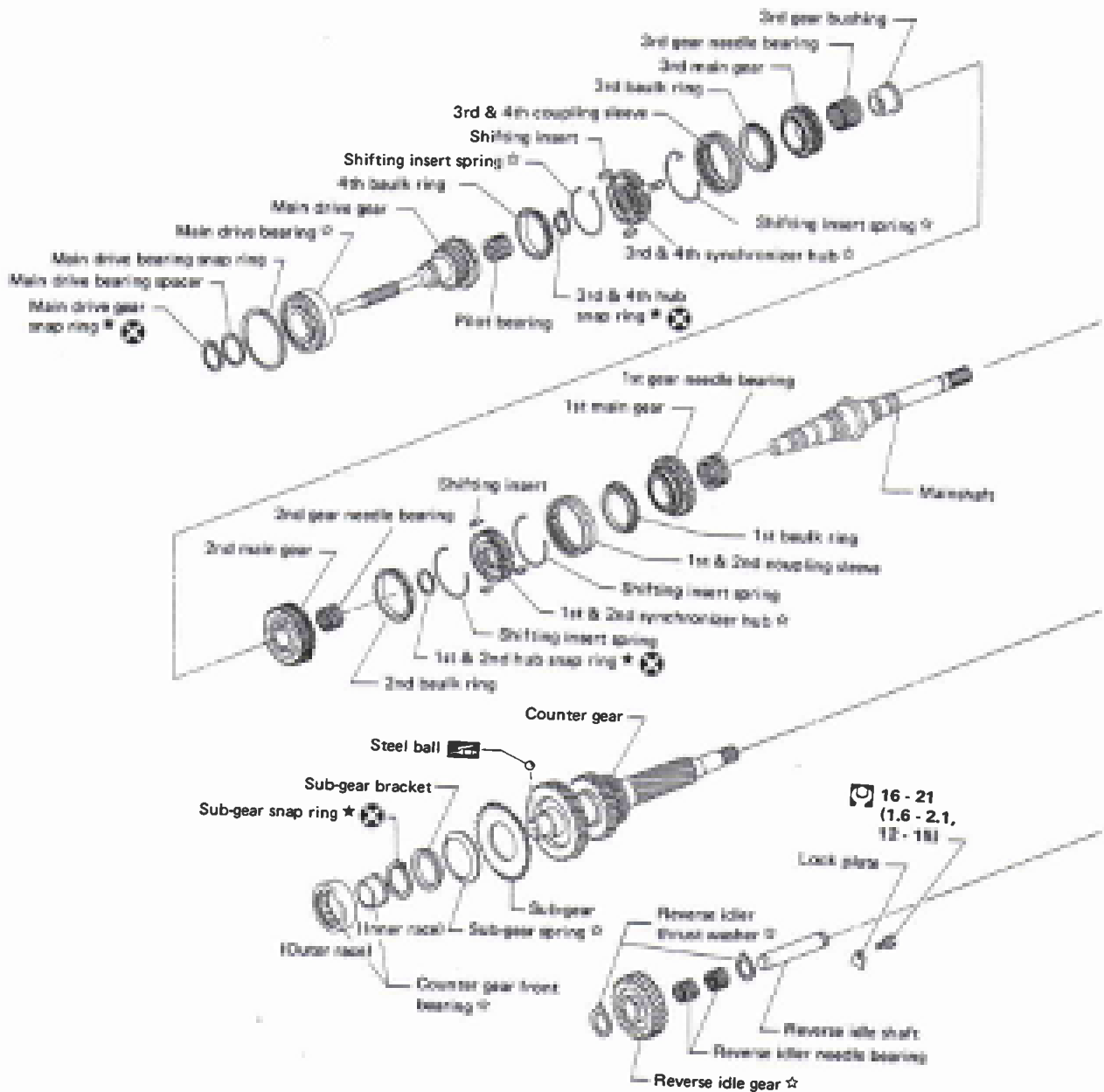


SMT256B

MT-7

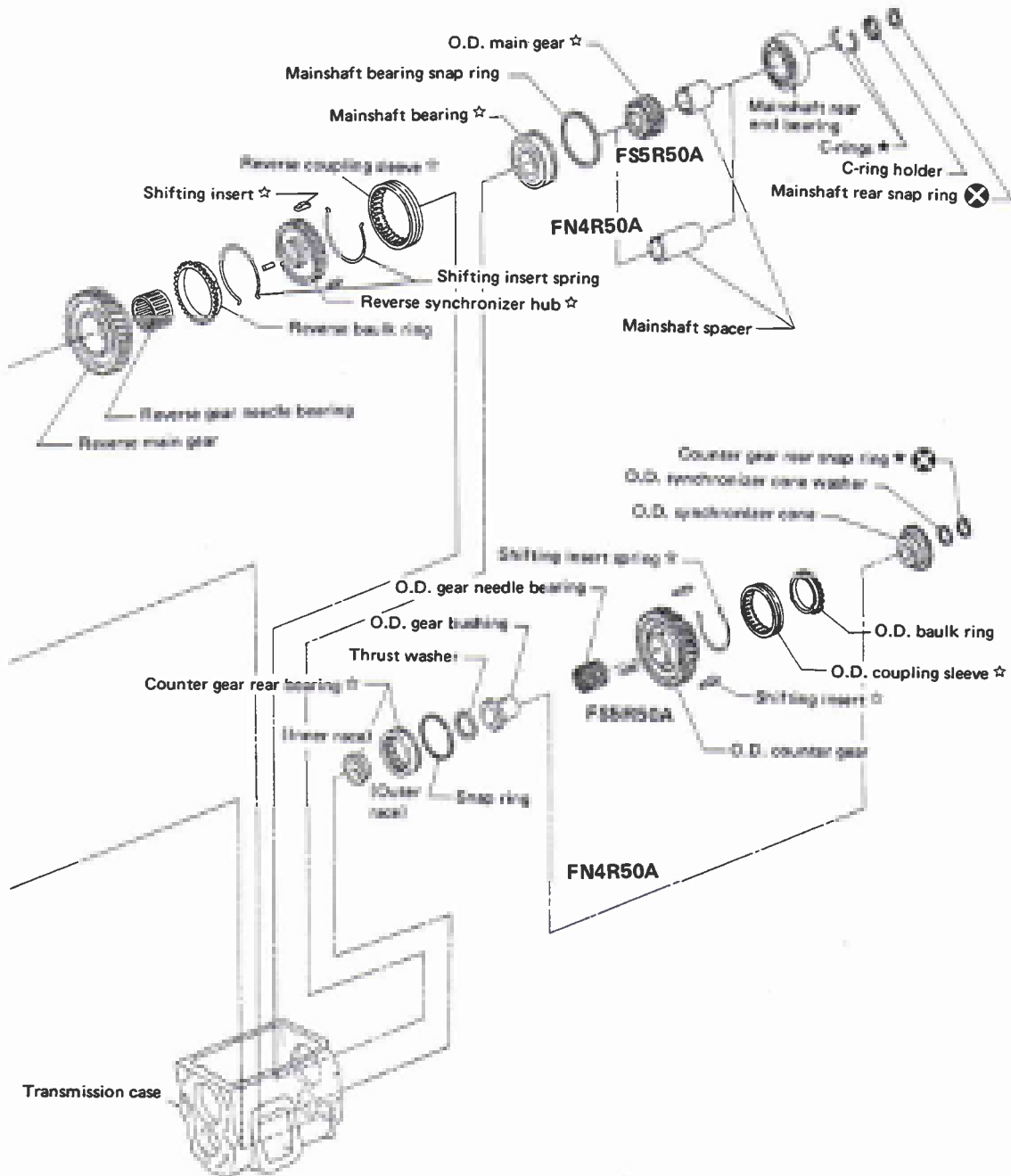
# MAJOR OVERHAUL

## Gear Components



# MAJOR OVERHAUL

## Gear Components (Cont'd)



Apply gear oil to gears, shafts, synchronizers and bearings when assembling.

★ : Select with proper thickness.

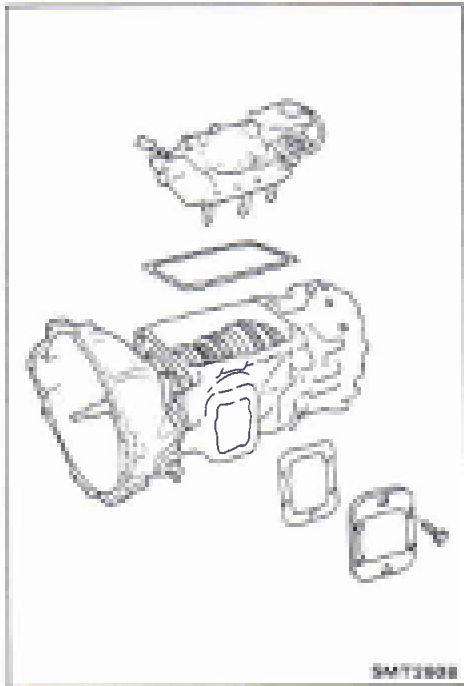
☆ : Pay attention to its direction.

⊗ : N-m (kg-m, ft-lb)

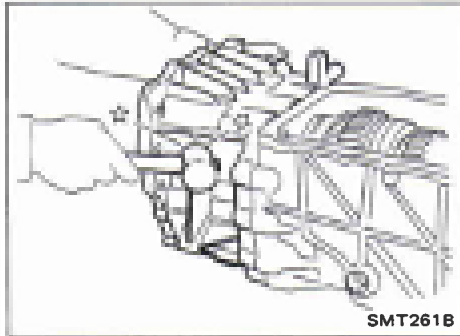
SMT257B



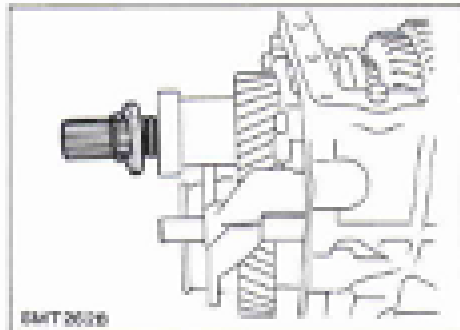
## DISASSEMBLY



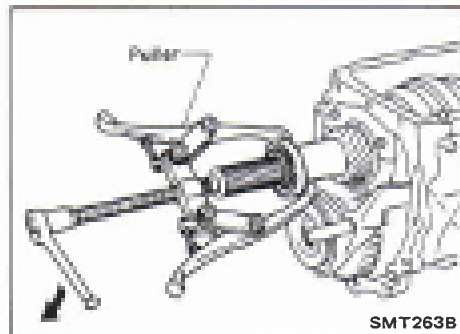
1. Remove transmission outer parts.
  - Shift control components
  - Clutch housing
  - P.T.O. cover or assembly if equipped
  - Transfer assembly



2. Remove O.D. gear case components.
  - a. Remove O.D. gear case.

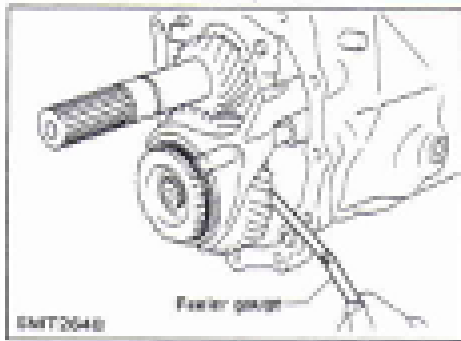


- b. Remove mainshaft rear C-ring holder and C-rings after removing snap ring.



- c. Pull out mainshaft rear end bearing, then remove spacer.

## DISASSEMBLY

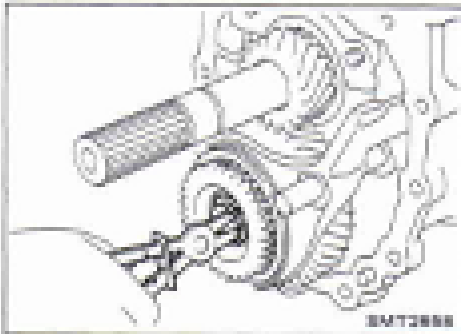


- d. Check O.D. counter gear end play. (FS5R50A only)

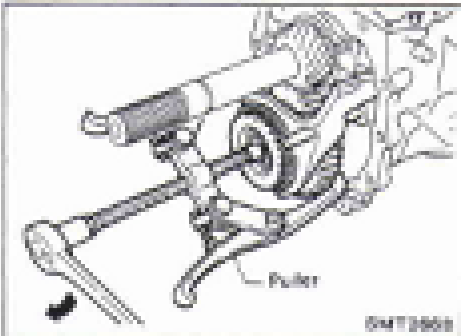
### Gear end play

Gear	End play mm (in)
O.D. counter gear	0.20 - 0.47 (0.0079 - 0.0185)

- If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.



- e. Remove counter gear rear snap ring.



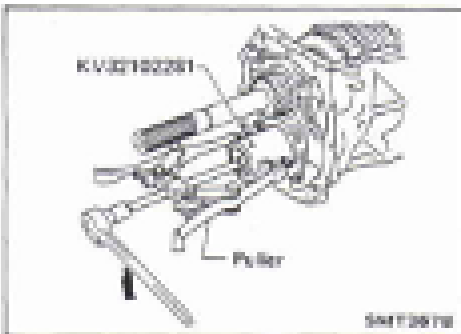
- f. Pull out the following parts.

— **FN4R50A** —

- O.D. synchronizer cone

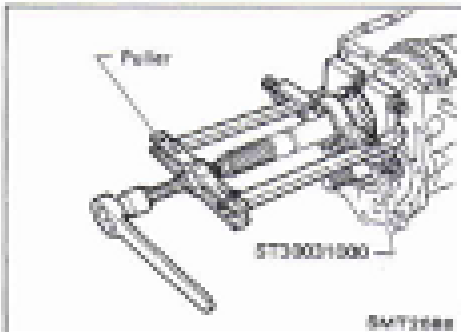
— **FS5R50A** —

- O.D. counter gear
- O.D. synchronizer assembly with O.D. shift fork and rod



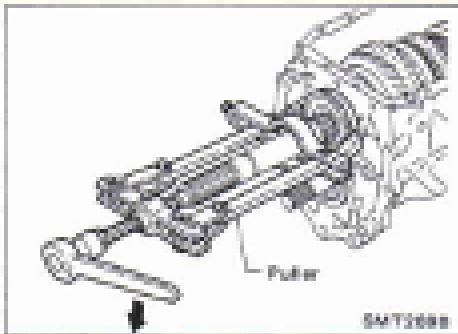
- g. Pull out O.D. gear bushing.

- h. Remove bolts securing bearing retainer and then remove bearing retainer.

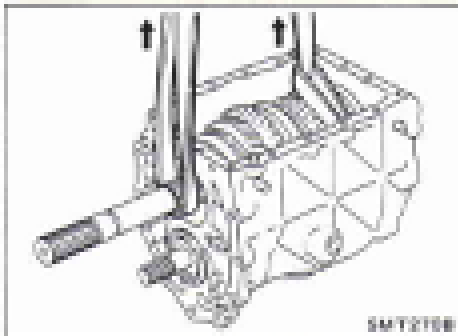


- i. Pull out O.D. main gear. (FS5R50A only)

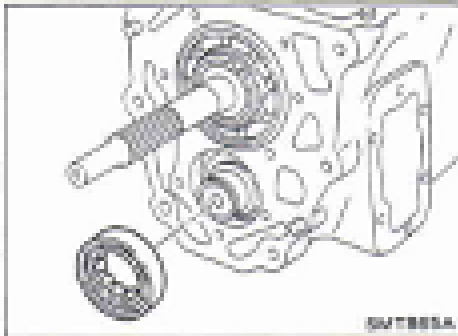
## DISASSEMBLY



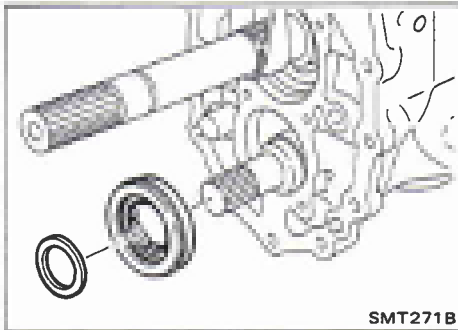
3. Remove transmission case components.
  - a. Remove mainshaft bearing snap ring.
  - b. Pull out mainshaft bearing.



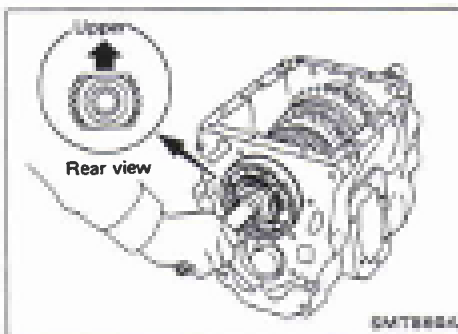
- c. Support mainshaft with hoist.
    - d. Remove bolts securing front cover and then remove front cover.



- e. Remove counter gear front bearing outer race.
        - Tap rear end of counter gear lightly before removing bearing.



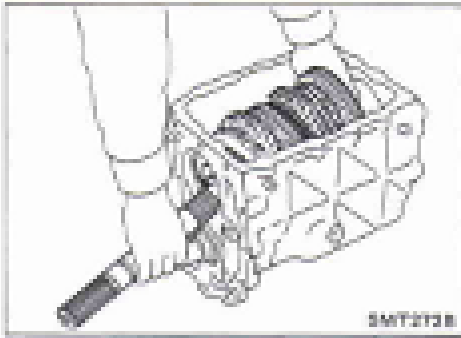
- f. Remove counter gear rear bearing outer race.
          - Tap front end of counter gear lightly before removing bearing.
        - g. Settle counter gear assembly down on bottom of transmission case.



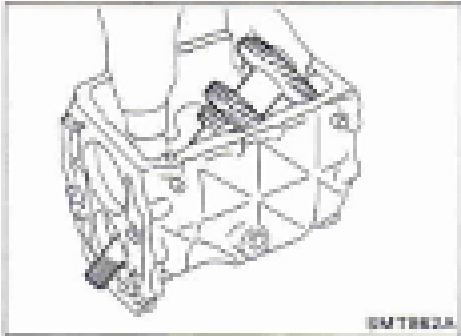
- h. Remove main drive gear assembly.
            - Set cutting portion of clutch gear on main drive gear to upper side.

## DISASSEMBLY

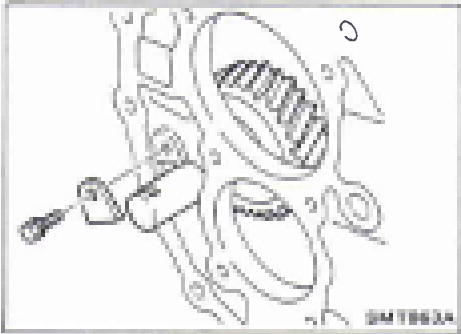
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- i. Remove mainshaft assembly.



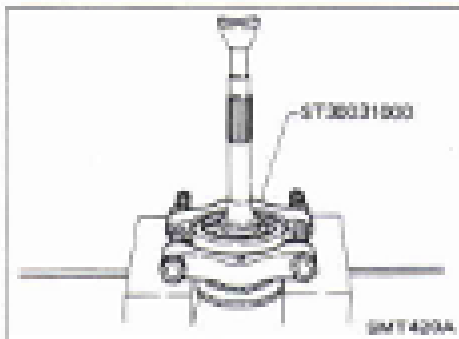
- j. Remove counter gear assembly.



- k. Remove lock plate of reverse idler shaft and then remove reverse idler gear, washers, needle bearings and shaft.

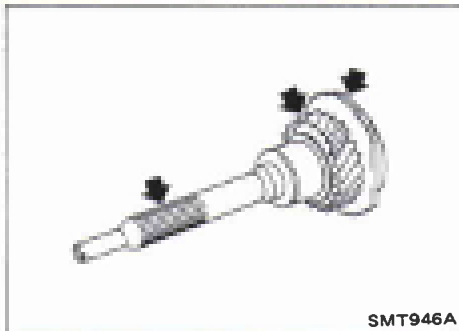


## REPAIR FOR COMPONENT PARTS



### Main Drive Gear DISASSEMBLY

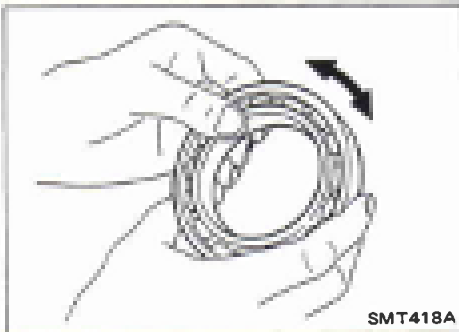
1. Remove main drive gear snap ring and spacer.
2. Press out main drive gear bearing.



### INSPECTION

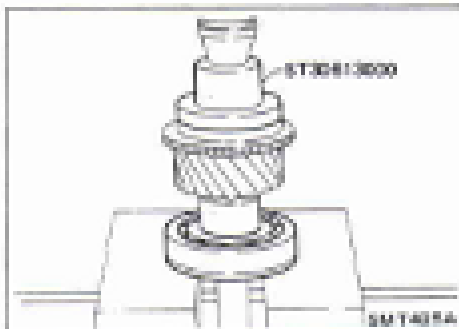
#### Gears and shafts

- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



#### Bearing

- Make sure bearing rolls freely and is free from noise, cracks, pitting or wear.



### ASSEMBLY

1. Press main drive gear bearing in place.
2. Install main drive gear spacer.



3. Select proper main drive gear snap ring to minimize clearance of groove, then install it.

#### Allowable clearance of groove:

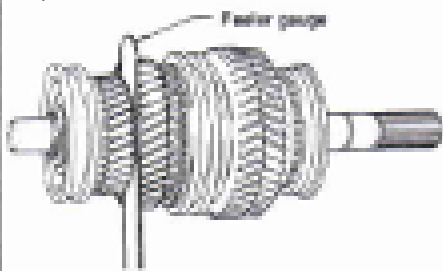
0 - 0.15 mm (0 - 0.0059 in)

#### Main drive gear snap ring:

Refer to S.D.S.

## REPAIR FOR COMPONENT PARTS

1st, 2nd and reverse main gear



SMT273B

### Mainshaft and Gears DISASSEMBLY

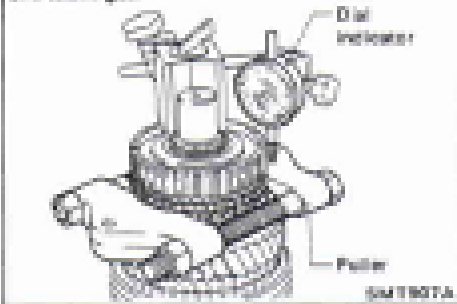
1. Before disassembly, check 1st, 2nd, 3rd and reverse main gear end play.

#### Gear end play

Gears	End play mm (in)
1st main gear	0.20 - 0.48 (0.0079 - 0.0189)
2nd main gear	0.20 - 0.60 (0.0079 - 0.0236)
3rd main gear	0.20 - 0.45 (0.0079 - 0.0177)
Reverse main gear	0.20 - 0.44 (0.0079 - 0.0173)

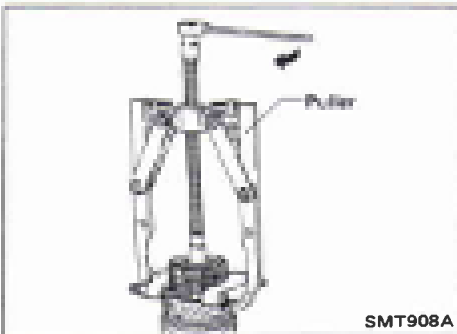
- If not within specification, disassemble and check contact surface of gears to hub, washer, bushing, needle bearing and shaft.

2nd main gear



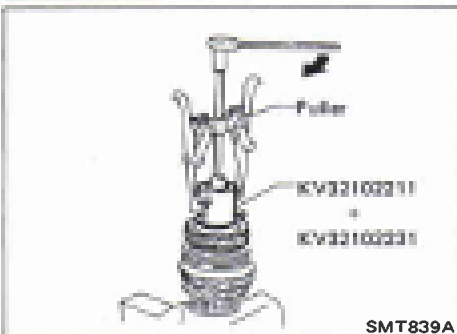
SMT1807A

2. Remove 3rd & 4th hub snap ring.
3. Pull out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.



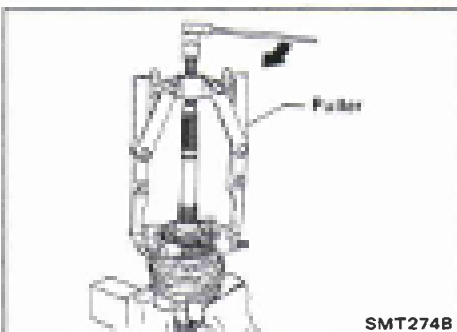
SMT908A

4. Pull out 3rd gear bushing.
5. Remove 2nd main gear and 2nd gear needle bearing.



SMT839A

6. Pull out reverse synchronizer assembly.
7. Remove reverse main gear and reverse gear needle bearing.
8. Remove 1st & 2nd hub snap ring.

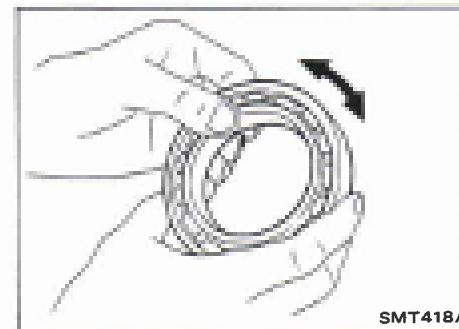
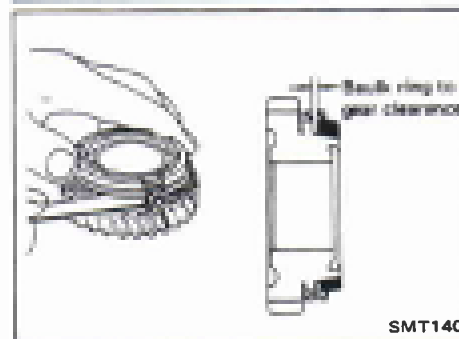
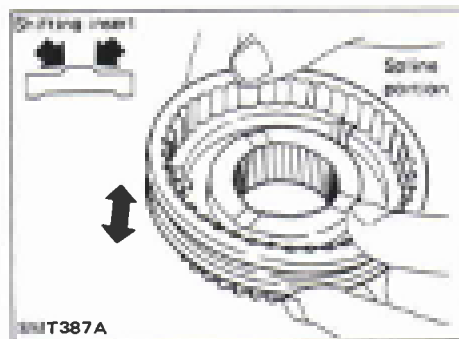
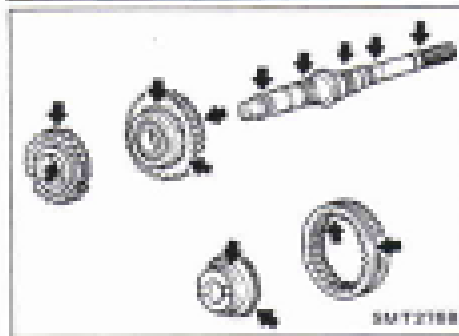


SMT274B

## REPAIR FOR COMPONENT PARTS

### Mainshaft and Gears (Cont'd)

9. Press out 1st main gear together with 1st & 2nd synchronizer assembly.



### INSPECTION

#### Gear and shaft

- Check for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

#### Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.

- Measure clearance between baulk ring and gear.
- Clearance between baulk rings and main gears:**

Unit: mm (in)

	Standard	Wear limit
1st	1.00 - 1.45 (0.0394 - 0.0571)	0.7 (0.028)
2nd	1.1 - 1.5 (0.043 - 0.059)	
3rd & main drive	1.00 - 1.45 (0.0394 - 0.0571)	
Reverse	1.00 - 1.45 (0.0394 - 0.0571)	

#### Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

## REPAIR FOR COMPONENT PARTS

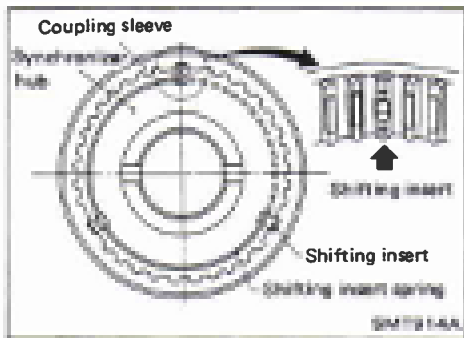
### Mainshaft and Gears (Cont'd)

#### ASSEMBLY

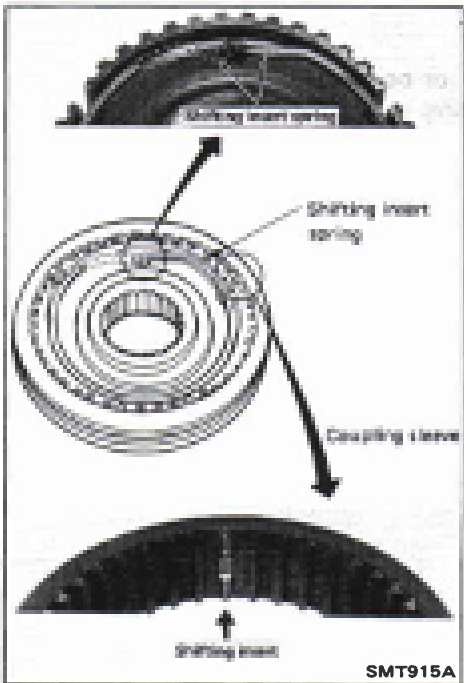
1. Assemble synchronizers.

#### 1st & 2nd synchronizer

- Opening of shifting insert springs must not be aligned with each other.

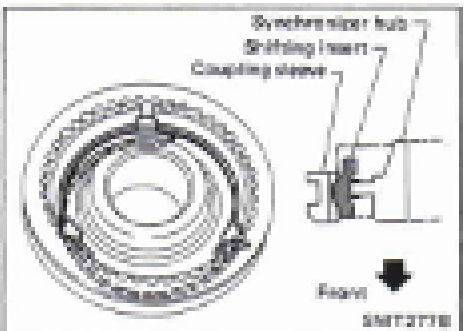


#### 3rd & 4th synchronizer



#### Reverse synchronizer

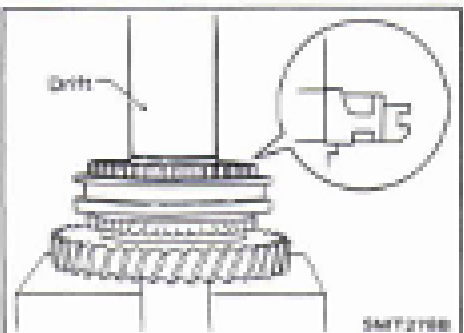
- Pay attention to direction of synchronizer hub, shifting inserts and coupling sleeve.
- Openings of shift insert springs must not be aligned with each other.



2. Press reverse synchronizer assembly together with reverse main gear and reverse gear needle bearing.

- Pay attention to direction of reverse synchronizer hub assembly.

3. Install 1st main gear and 1st gear needle bearing.

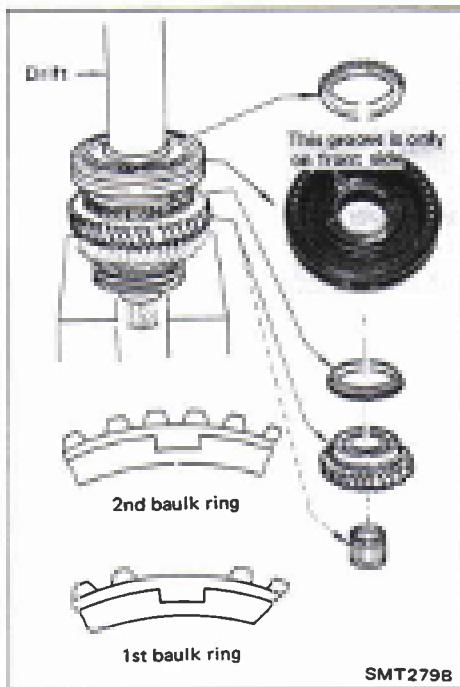


## REPAIR FOR COMPONENT PARTS

### Mainshaft and Gears (Cont'd)

4. Press 1st & 2nd synchronizer assembly.

- 1st baulk ring and 2nd baulk ring are different.



5. Select proper 1st & 2nd hub snap ring to minimize clearance of groove, then install it.

**Allowable clearance of groove:**

**0 - 0.13 mm (0 - 0.0051 in)**

**1st & 2nd hub snap ring:**

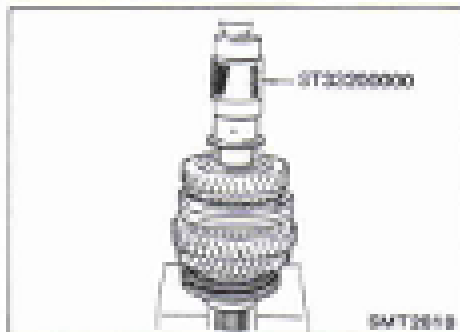
**Refer to S.D.S.**



6. Install 2nd main gear and 2nd gear needle bearing.

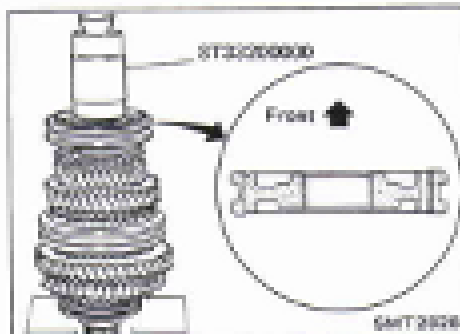
7. Press 3rd gear bushing.

8. Install 3rd main gear and 3rd gear needle bearing.



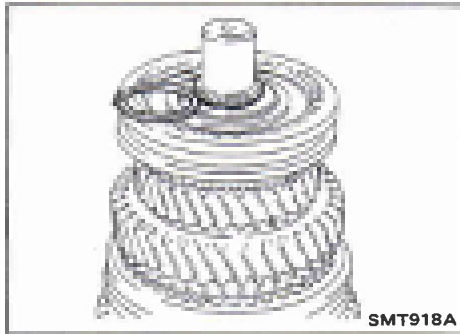
9. Press 3rd & 4th synchronizer assembly.

- Pay attention to direction of synchronizer assembly.



## REPAIR FOR COMPONENT PARTS

### Mainshaft and Gears (Cont'd)



10. Select proper 3rd & 4th hub snap ring to minimize clearance of groove, then install it.

**Allowable clearance of groove:**

0 - 0.1 mm (0 - 0.004 in)

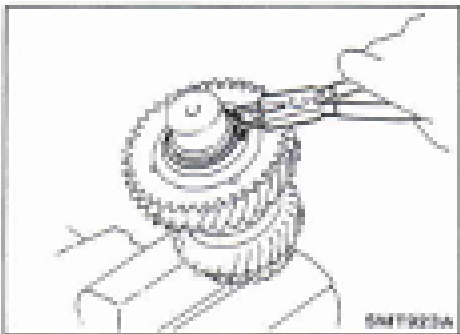
**3rd & 4th hub snap ring:**

Refer to S.D.S.

11. Measure 1st, 2nd, 3rd and reverse main gear end plays as the final check. — Refer to "Disassembly".

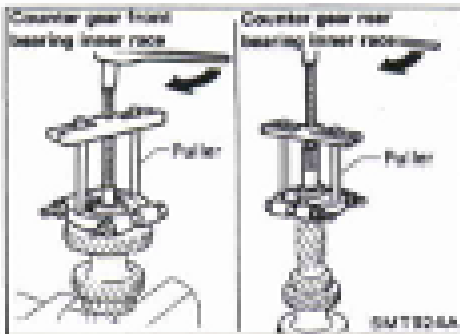
### Counter Gear

#### DISASSEMBLY



1. Remove sub-gear components.
  - a. Remove sub-gear snap ring.
  - b. Remove sub-gear, sub-gear bracket, sub-gear spring and steel ball.

2. Pull out counter gear front and rear bearing inner race.



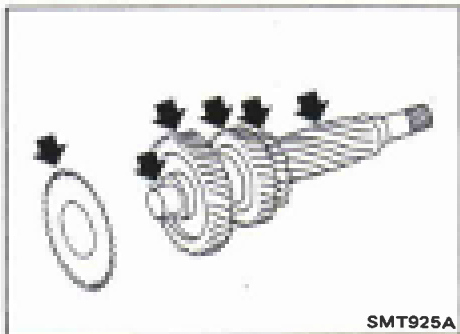
#### INSPECTION

##### Gear and shaft

- Check shaft for cracks or bending.

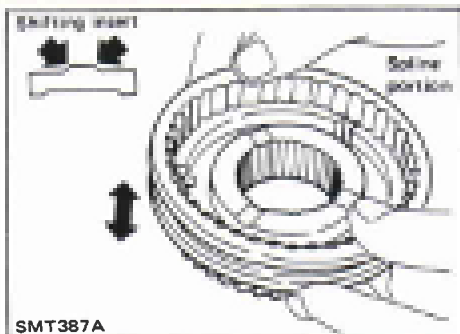
##### Bearing

- Make sure bearing rolls freely and is free from noise.



##### Synchronizer

- Check spline portion of coupling sleeve, hub and gear for wear or cracks.
- Check shifting inserts for wear or deformation.
- Check baulk ring for cracks or deformation.



## REPAIR FOR COMPONENT PARTS

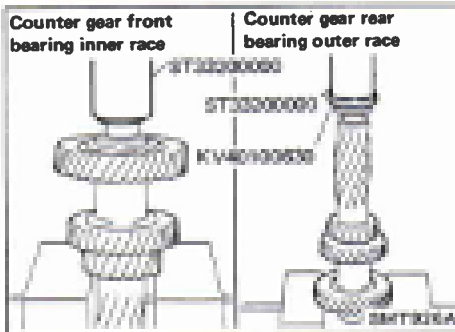
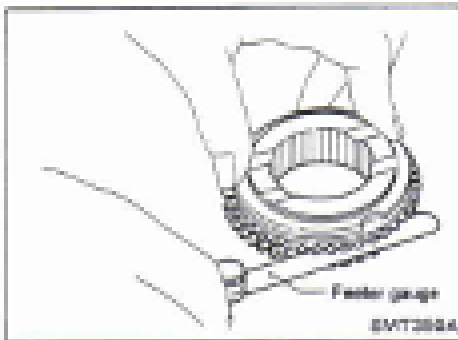
### Counter Gear (Cont'd)

- Measure clearance between baulk ring and synchronizer cone.

#### Clearance between baulk ring and synchronizer cone

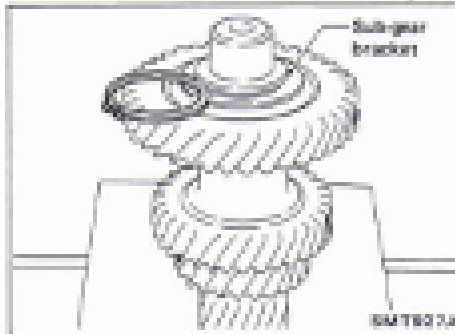
Unit: mm (in)

	Standard	Wear limit
O.D.	1.00 - 1.45 (0.0394 - 0.0571)	0.7 (0.028)



### ASSEMBLY

1. Press on counter gear front and rear bearing inner race.



2. Place sub-gear bracket on counter gear to select proper sub-gear snap ring to minimize clearance of groove.

**Allowable clearance of groove:**

0 - 0.15 mm (0 - 0.0059 in)

**Sub-gear snap ring:**

Refer to S.D.S.



3. Install sub-gear, sub-gear spring, sub-gear bracket, steel ball and selected snap ring, while compressing sub-gear spring.

- Pay attention to direction of sub-gear spring.
- Apply multi-purpose grease to steel ball.



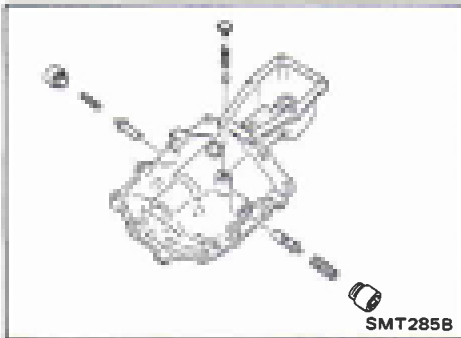
### Shift Control Components

#### DISASSEMBLY

1. Remove and disassemble gear shift housing cover.
  - a. Remove gear shift housing cover assembly from gear shift housing.

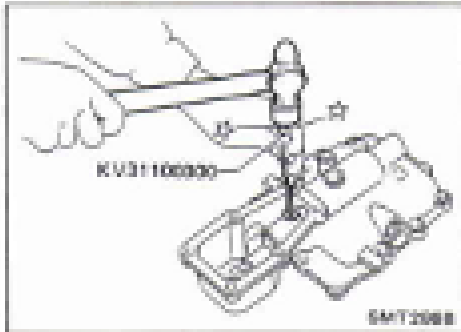
## REPAIR FOR COMPONENT PARTS

### Shift Control Components (Cont'd)

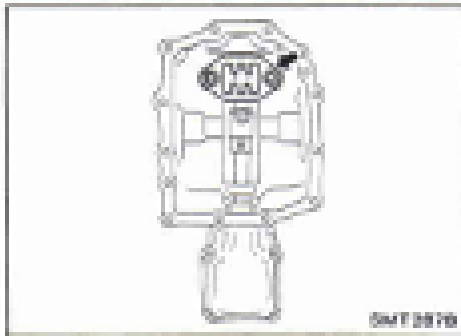


b. Remove the following parts.

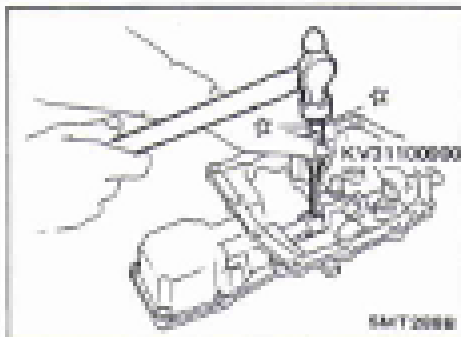
- Select check plunger
- Return spring plugs
- Return springs
- Check balls



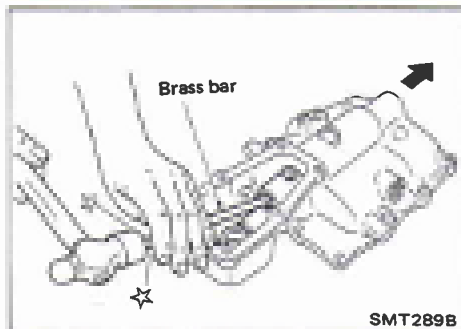
c. Drive out retaining pin from control lever bracket.



d. Remove guide plate.



e. Drive out retaining pin from control arm through plug on housing cover.

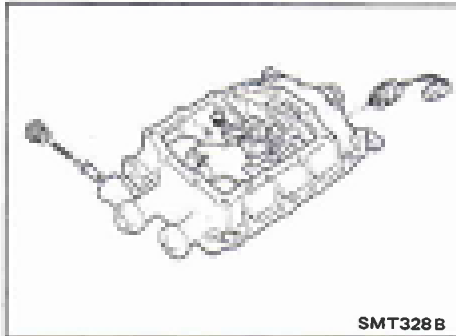


f. Drive out striking rod with brass bar through plug on housing cover.

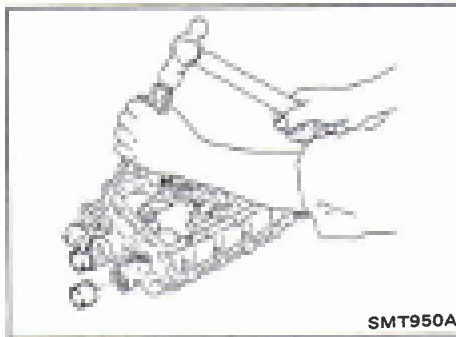


## REPAIR FOR COMPONENT PARTS

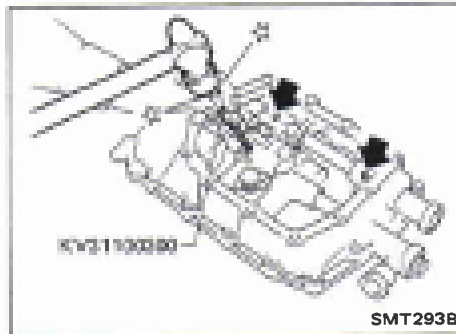
### Shift Control Components (Cont'd)



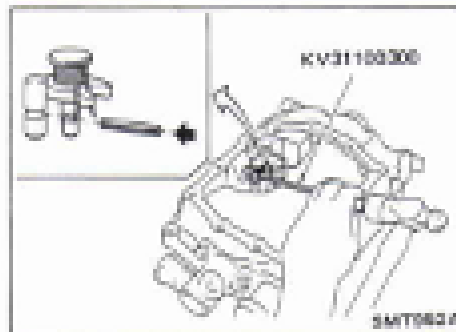
2. Remove and disassemble gear shift housing.
  - a. Remove the following parts.
    - Reverse lamp switch
    - Shift check plug
    - Return spring
    - Check spring guide
    - Check ball



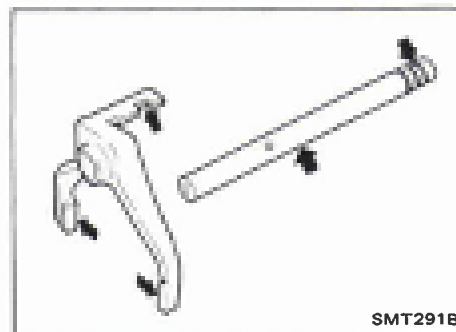
- b. Remove shift rod caps.



- c. Drive out retaining pins from striking lever, reverse shift fork and reverse fork rod bracket.
    - d. While pulling out striking rod and reverse fork rod, remove striking lever, striking interlock, 1st & 2nd, 3rd & 4th and reverse shift fork and reverse fork rod bracket.



- e. Drive out retaining pin from reverse check assembly and then remove reverse check assembly.



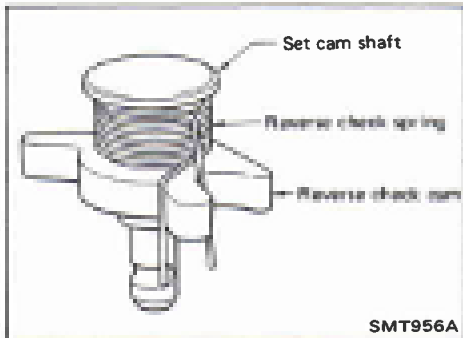
### INSPECTION

- Check contact surface and sliding surface for wear scratches projections or other damage.

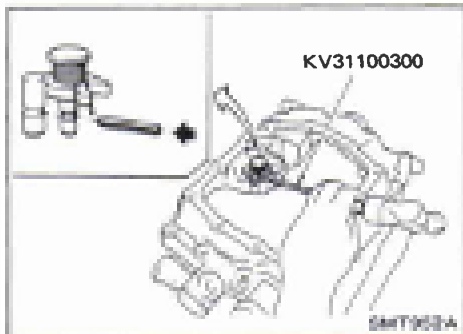
## REPAIR FOR COMPONENT PARTS

### Shift Control Components (Cont'd)

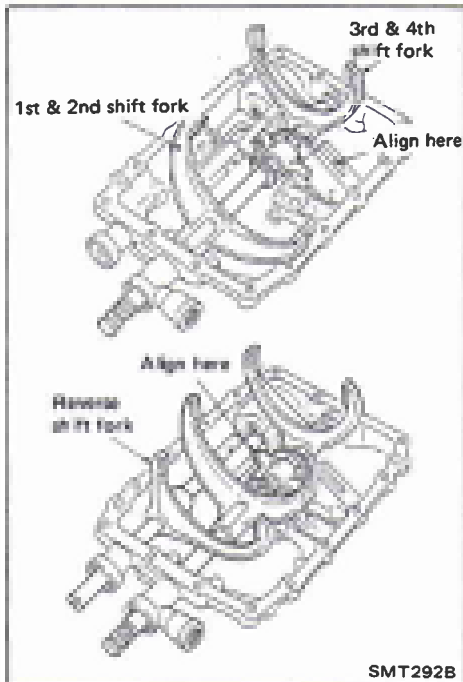
#### ASSEMBLY



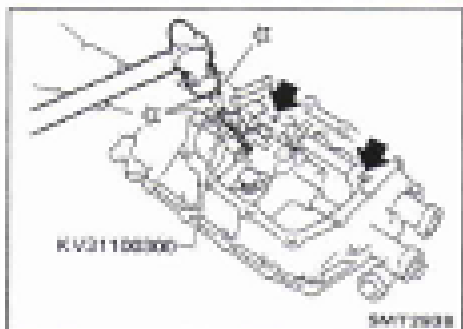
1. Assemble gear shift housing.
- a. Assemble reverse check.



- b. Install reverse check assembly and then install retaining pin.



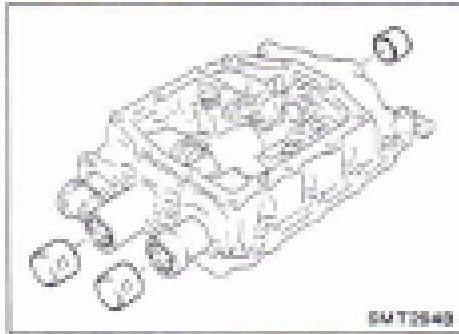
- c. Install striking rod through 1st & 2nd shift fork, striking interlock, striking lever and 3rd & 4th shift fork.
- Pay attention to direction of each part.
- d. Install reverse fork rod through reverse shift fork and reverse fork rod bracket.
- Pay attention to direction of each part.
- e. Align cut out portion of 1st & 2nd shift fork, 3rd & 4th shift fork and reverse fork rod bracket to striking interlock.



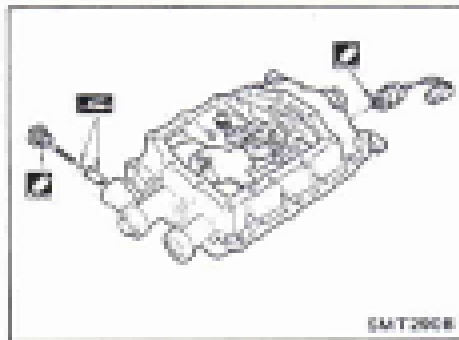
- f. Install retaining pins into striking lever, reverse shift fork and reverse fork rod bracket.

## REPAIR FOR COMPONENT PARTS

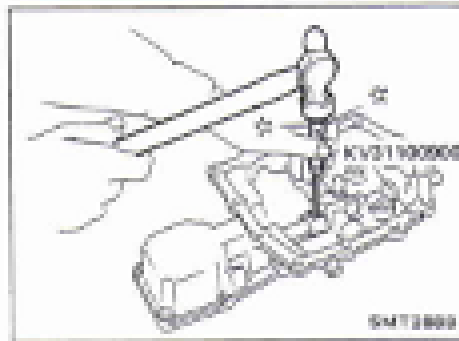
### Shift Control Components (Cont'd)



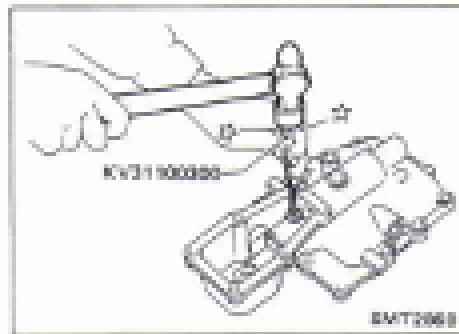
- g. Install shift rod caps by tapping them lightly.
- Apply recommended sealant to mating surface of shift rod caps.



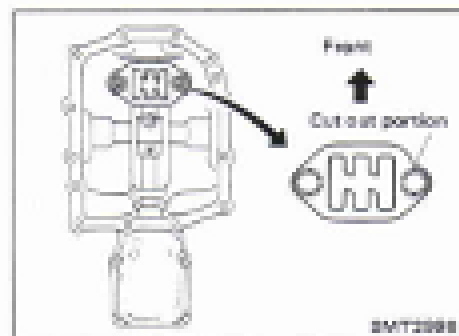
- h. Install the following parts.
- Reverse lamp switch (Apply recommended sealant to thread.)
  - Check ball (Apply multi-purpose grease.)
  - Check spring guide (Apply multi-purpose grease.)
  - Check spring
  - Check plug (Apply recommended sealant to thread.)



2. Assemble gear shift housing cover.
- a. Install control arm, control lever bracket and shift rod onto gear shift housing cover.
- b. Install retaining pin into control arm.



- c. Install retaining pin into control lever bracket.
- d. Install plugs on housing cover.
- Apply recommended sealant to mating surface of plugs.



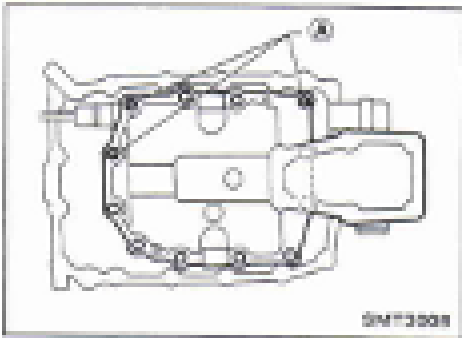
- e. Install guide plate.
- Pay attention to its direction.

## REPAIR FOR COMPONENT PARTS

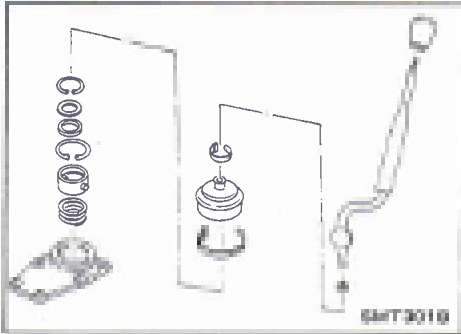
### Shift Control Components (Cont'd)

f. Install gear shift housing cover onto gear shift housing.

- Always use new bolts at portion (A) as they are self sealing bolts.



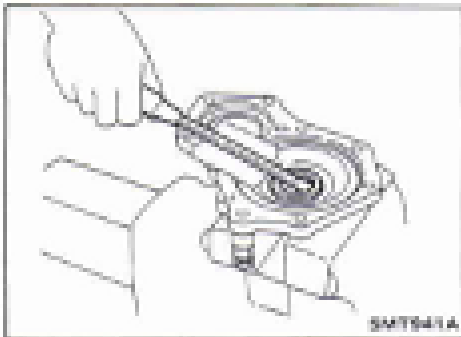
3. Assemble control housing parts as shown on left.



### Case Components

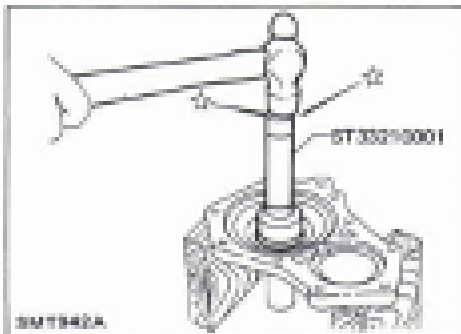
#### FRONT COVER OIL SEAL

##### Removal



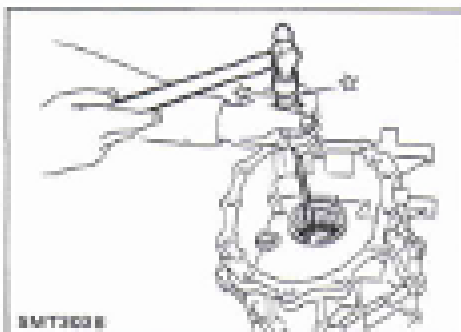
##### Installation

- Apply multi-purpose grease to lip of oil seal before installing.



#### REAR OIL SEAL

##### Removal



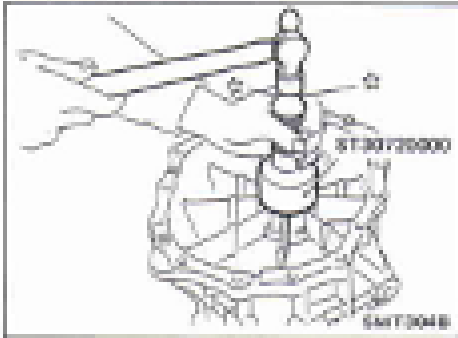
## REPAIR FOR COMPONENT PARTS

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### Case Components (Cont'd)

#### Installation

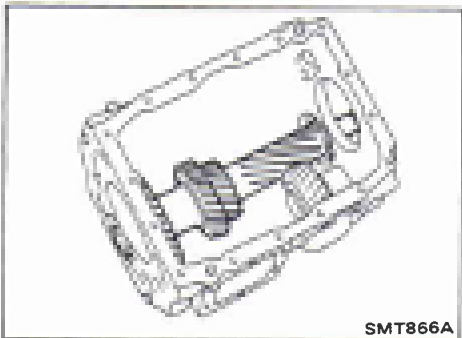
- Apply multi-purpose grease to lip of oil seal before installing.



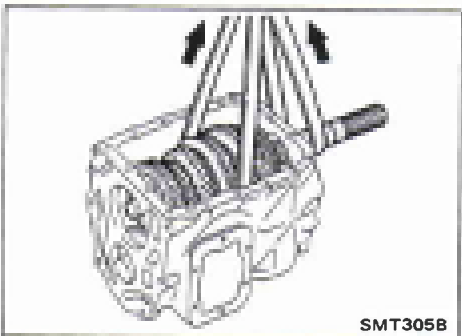
## ASSEMBLY



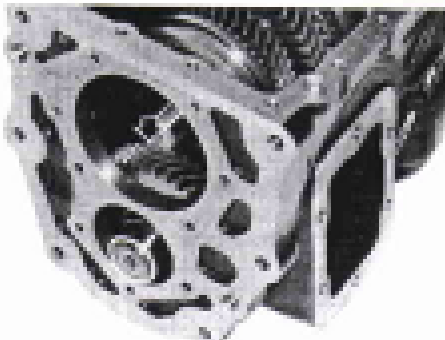
1. Install transmission case components.
  - a. Install reverse idler shaft, thrust washers, needle bearings and gear.
    - **Pay attention to direction of reverse idler gear and washers.**
  - b. Install lock plate of reverse idler shaft.



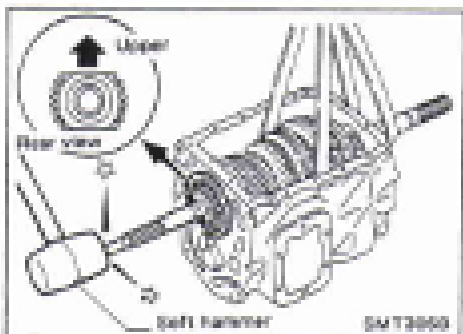
- c. Settle counter gear assembly on bottom of transmission case.



- d. Place mainshaft assembly on top of counter gear assembly and then support it with hoist.

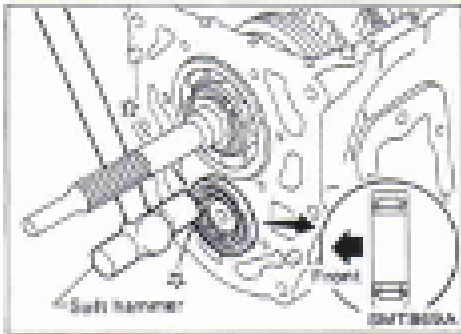


- **Align matching portion of counter gear and sub-gear tooth to upper side.**

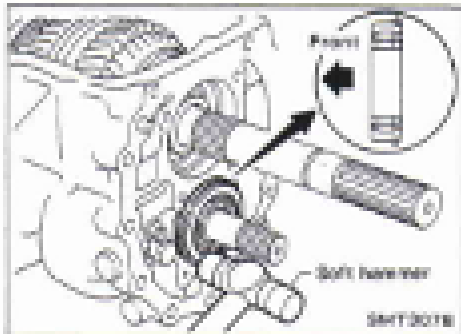


- e. Install main drive gear assembly by tapping front end of it lightly.
    - **Set cutting portion of clutch gear on main drive gear to the upper side.**

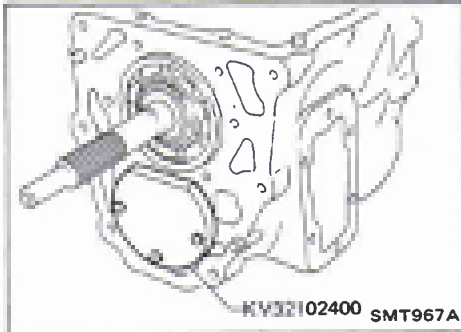
## ASSEMBLY



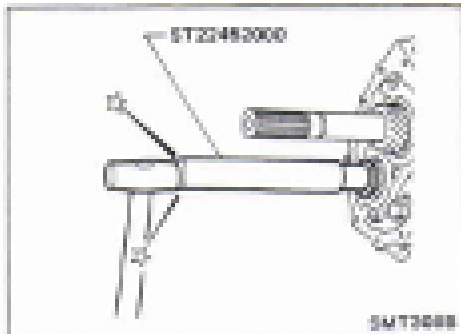
- f. Install counter gear front bearing outer race by tapping it lightly while holding counter gear assembly.  
 ● **Pay attention to direction.**



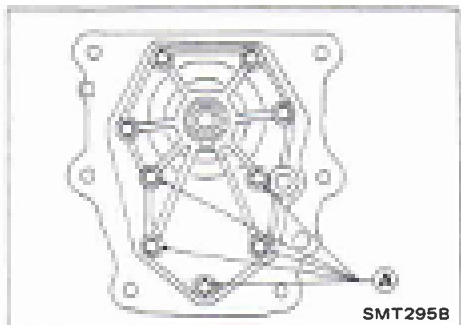
- g. Install counter gear rear bearing outer race by tapping it lightly while holding counter gear assembly.  
 ● **Pay attention to direction.**  
 h. Take off hoist from mainshaft.



2. Install O.D. gear case components.  
 a. Install Tool onto transmission case.

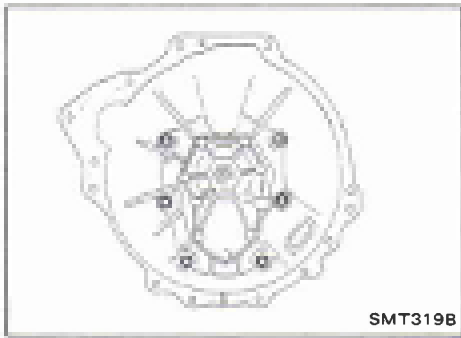


- b. Install O.D. gear bushing.  
 c. Remove KV32102400 (Counter gear stopper).

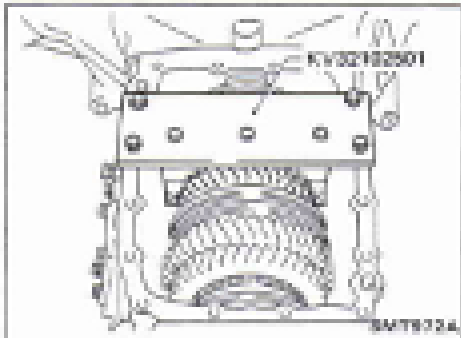


- d. Install front cover.  
 ● **Always use new bolts at portion (A) as they are self sealing bolts.**

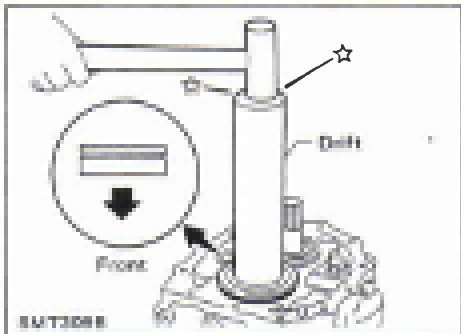
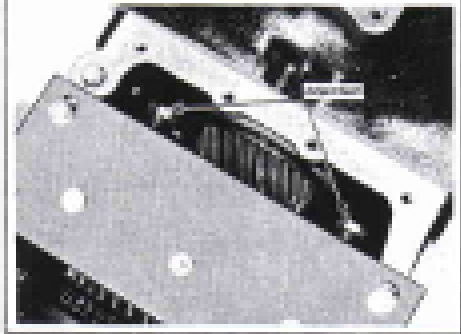
## ASSEMBLY



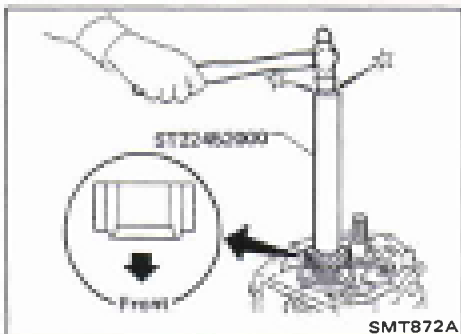
e. Install clutch housing.



f. Install Tool onto transmission case.



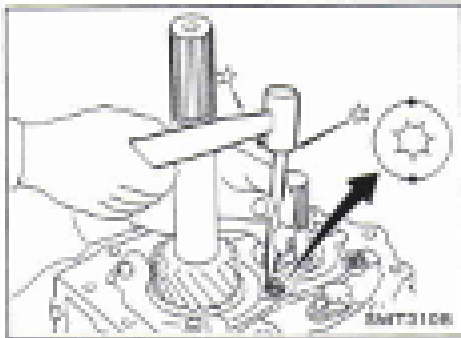
- g. Stand transmission case assembly on two wooden blocks placed under clutch housing.
- h. Install mainshaft bearing without snap ring to prevent it from damaging transmission case.
- **Pay attention to direction.**
  - i. Put snap ring back in place.



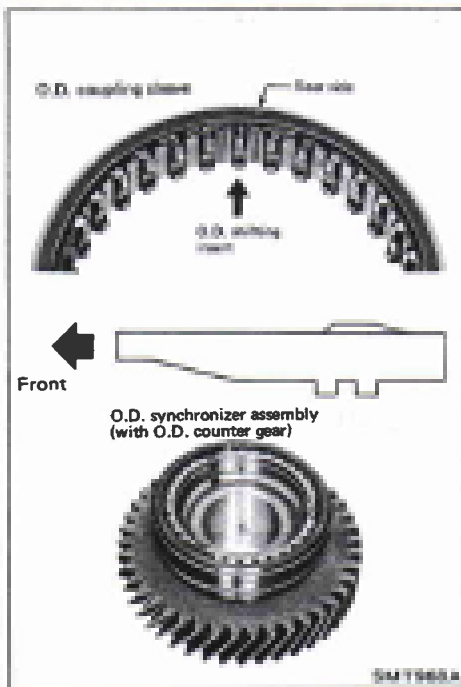
- j. Install O.D. main gear. (FS5R50A only)
- **Pay attention to direction.**
- k. Remove KV32102500 (Mainshaft stopper)



## ASSEMBLY



- l. Install bearing retainer and then stake 4 torx bolts at two points.



- m. Install the following parts.

— **FS5R50A** —

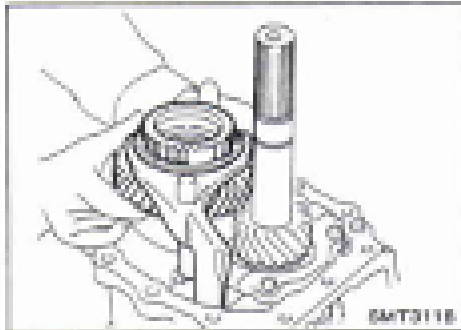
- (1) Assemble O.D. synchronizer onto O.D. counter gear.

- Pay attention to direction of shifting inserts and O.D. coupling sleeve.

- (2) Install O.D. counter gear with O.D. synchronizer assembly, O.D. shift fork and rod.

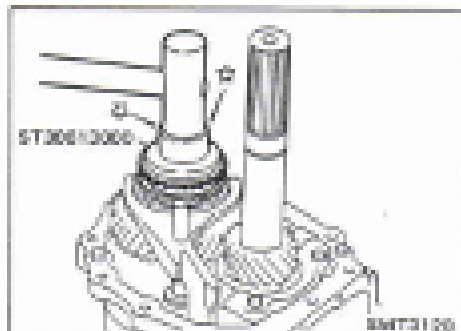
— **FN4R50A** —

- Install O.D. gear bushing.

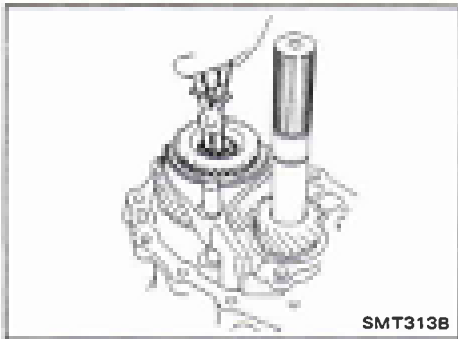


- n. Install O.D. synchronizer cone.

- o. Install O.D. synchronizer cone washer.



## ASSEMBLY



- p. Select proper counter gear rear snap ring to minimize clearance of groove, then install it.

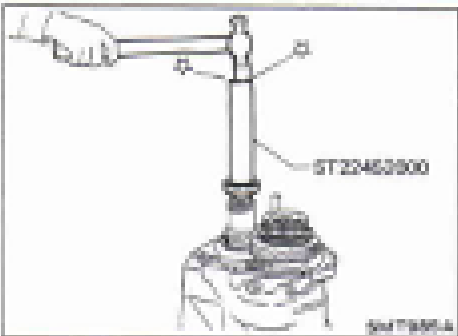
**Allowable clearance of groove:**

**0 - 0.15 mm (0 - 0.0059 in)**

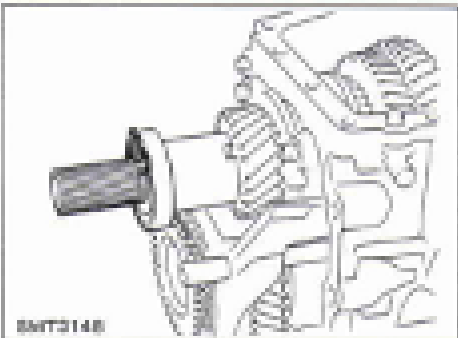
**Counter gear rear snap ring:**

**Refer to S.D.S.**

- q. Measure O.D. counter gear end play as the final check — Refer to "Disassembly". (FS5R50A only)



- r. Install mainshaft spacer and rear end bearing.



- s. Select proper set of C-rings to minimize clearance of groove then install it.

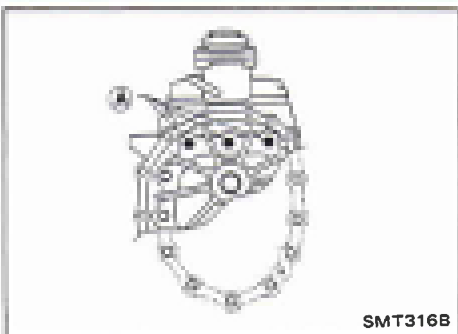
**Allowable clearance of groove:**

**0 - 0.13 mm (0.0051 in)**

**Mainshaft rear C-ring:**

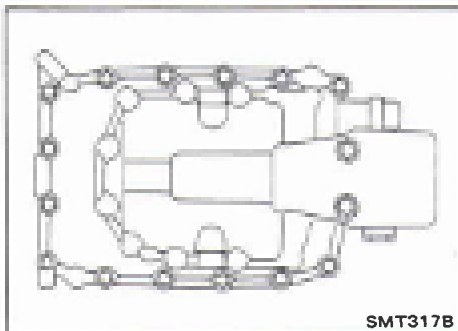
**Refer to S.D.S.**

- t. Install C-ring holder then install mainshaft rear snap ring.



- u. Install O.D. gear case and then tighten fixing bolts.

- Always use new bolts at portion **(A)** as they are self sealing bolts.



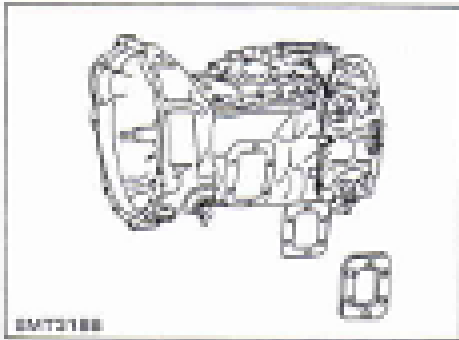
3. Install transmission outer parts.

- a. Install gear shift housing assembly and gasket onto transmission case.

- Always use new bolts at portion **(A)** as they are self sealing bolts.

## ASSEMBLY

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- b. Install P.T.O. cover and gasket.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### General Specifications

Transmission model		FM4R50A	FD5R50A	
Number of speed		4	5	
Synchronmesh type		Wet		
Shift pattern				
Gear ratio		1st 2nd 3rd 4th 5th Rev.	4.556 2.625 1.519 1.000 0.836 4.245	
Number of teeth		Main shaft	Drive 1st 2nd 3rd 5th Rev.	26 44 39 35 23 41
		Counter shaft	Drive 1st 2nd 3rd 5th Rev.	35 13 20 31 37 13
Reverse idler gear		27	27	
Oil capacity		ℓ (Imp pt)	3.9 (6-7/8)	

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment

#### GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.20 - 0.48 (0.0079 - 0.0189)
2nd main gear	0.20 - 0.60 (0.0079 - 0.0236)
3rd main gear	0.20 - 0.45 (0.0079 - 0.0177)
O.D. counter gear (FS5R50A only)	0.20 - 0.47 (0.0079 - 0.0185)
Reverse main gear	0.20 - 0.44 (0.0079 - 0.0173)

#### CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st	1.00 - 1.45 (0.0394 - 0.0571)	0.7 (0.028)
2nd	1.1 - 1.5 (0.043 - 0.059)	
3rd & main drive	1.00 - 1.45 (0.0394 - 0.0571)	
O.D. (FS5R50A only)	1.00 - 1.45 (0.0394 - 0.0571)	
Reverse	1.00 - 1.45 (0.0394 - 0.0571)	

#### AVAILABLE SNAP RING

##### Main drive gear snap ring

Allowable clearance 0 - 0.15 mm (0 - 0.0059 in)

Thickness mm (in)	Part number
1.75 (0.0689)	32204-01T00
1.85 (0.0728)	32204-01T01
1.95 (0.0768)	32204-01T02
2.05 (0.0807)	32204-01T03
2.15 (0.0846)	32204-01T04

##### 3rd & 4th hub snap ring

Allowable clearance 0 - 0.10 mm (0 - 0.0039 in)

Thickness mm (in)	Part number
1.95 (0.0768)	32348-01T10
2.00 (0.0787)	32348-01T11
2.05 (0.0807)	32348-01T12
2.10 (0.0827)	32348-01T13
2.15 (0.0846)	32348-01T14
2.20 (0.0866)	32348-01T15

#### 1st & 2nd hub snap ring

Allowable clearance 0 - 0.13 mm (0 - 0.0051 in)

Thickness mm (in)	Part number
2.05 (0.0807)	32348-01T00
2.15 (0.0846)	32348-01T01

#### Sub-gear snap ring

Allowable clearance 0 - 0.15 mm (0 - 0.0059 in)

Thickness mm (in)	Part number
2.35 (0.0925)	32348-01T20
2.50 (0.0984)	32348-01T21
2.65 (0.1043)	32348-01T22
2.80 (0.1102)	32348-01T23

#### Counter gear rear snap ring

Allowable clearance 0 - 0.15 mm (0 - 0.0059 in)

Thickness mm (in)	Part number
1.35 (0.0531)	32204-01T10
1.45 (0.0571)	32204-01T11
1.55 (0.0610)	32204-01T12
1.65 (0.0650)	32204-01T13
1.75 (0.0689)	32204-01T14
1.85 (0.0728)	32204-01T15

#### AVAILABLE C-RING

##### Mainshaft C-ring

Allowable clearance 0 - 0.13 mm (0 - 0.0051 in)

Thickness mm (in)	Part number
5.02 (0.1976)	32528-02T00
5.10 (0.2008)	32528-02T01
5.18 (0.2039)	32528-02T02
5.26 (0.2071)	32528-02T03
5.34 (0.2102)	32528-02T04
5.42 (0.2134)	32528-02T05
5.50 (0.2165)	32528-02T06
5.58 (0.2197)	32528-02T07
5.66 (0.2228)	32528-02T08
5.74 (0.2260)	32528-02T09

# AUTOMATIC TRANSMISSION

## SECTION **AT**

### CONTENTS

PREPARATION .....	AT- 2
PRECAUTIONS .....	AT- 4
A/T CONTROL DIAGRAM .....	AT- 5
ON-VEHICLE SERVICE .....	AT- 8
TROUBLE-SHOOTING AND DIAGNOSES .....	AT- 11
REMOVAL AND INSTALLATION .....	AT- 78
MAJOR OVERHAUL .....	AT- 80
DISASSEMBLY .....	AT- 84
REPAIR FOR COMPONENT PARTS .....	AT- 94
ASSEMBLY .....	AT-143
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	AT-161

**AT**

# PREPARATION

RE4R03A

## SPECIAL SERVICE TOOLS


\*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST2505S001 Oil pressure gauge set ① ST25051001 Oil pressure gauge ② ST25052000 Hose ③ ST25053000 Joint pipe ④ ST25054000 Adapter ⑤ ST25055000 Adapter		Measuring line pressure
KV31101201 Oil pressure gauge adapter		Measuring line pressure
KV31102100 Torque converter one- way clutch check tool		Checking one-way clutch in torque converter
ST25850000 Sliding hammer		Removing oil pump assembly
KV31102400 Clutch spring compressor		Removing and installing clutch return springs
ST25490000 Socket extension		Removing and installing line pressure plug
ST33200000* Drift	<p style="font-size: small;">                             a: 60 mm (2.36 in) dia.                              b: 44.5 mm (1.752 in) dia.                         </p>	Installing oil pump housing oil seal


# PREPARATION

RE4R03A

\*: Special tool or commercial equivalent

Tool number Tool name	Description
ST30720000* Drift	 <p>a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.</p> <p>Installing rear oil seal</p>

# COMMERCIAL SERVICE TOOL

Tool name	Description
Transmission case stand	 <p>(Make this by bending ST07870000.)</p> <p>Disassembling and assembling A/T</p>



## Service Notice

- Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transmission.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transmission is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during re-assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transmission with new A.T.F.

## Abbreviations and Symbols

- A.T.F. .... Automatic Transmission Fluid
- D<sub>1</sub> ..... Drive range 1st gear
- D<sub>2</sub> ..... Drive range 2nd gear
- D<sub>3</sub> ..... Drive range 3rd gear
- D<sub>4</sub> ..... Drive range 4th gear
- O.D. .... Overdrive
- 2<sub>2</sub> ..... 2nd range 2nd gear
- 2<sub>1</sub> ..... 2nd range 1st gear
- 1<sub>2</sub> ..... 1st range 2nd gear
- 1<sub>1</sub> ..... 1st range 1st gear


 : Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.


 : Apply petroleum jelly.


 : Apply A.T.F.


★ : Select with proper thickness.

☆ : Adjustment is required.

 : Check after disconnecting the connector to be measured.

 : Check after connecting the connector to be measured.


 : Turn ignition switch to "ON" position.

 : Turn ignition switch to "OFF" position.

 : Turn ignition switch to "START" position.

 : Do not start engine.

 : Start engine.

 : Apply parking brake.

 : Release parking brake.

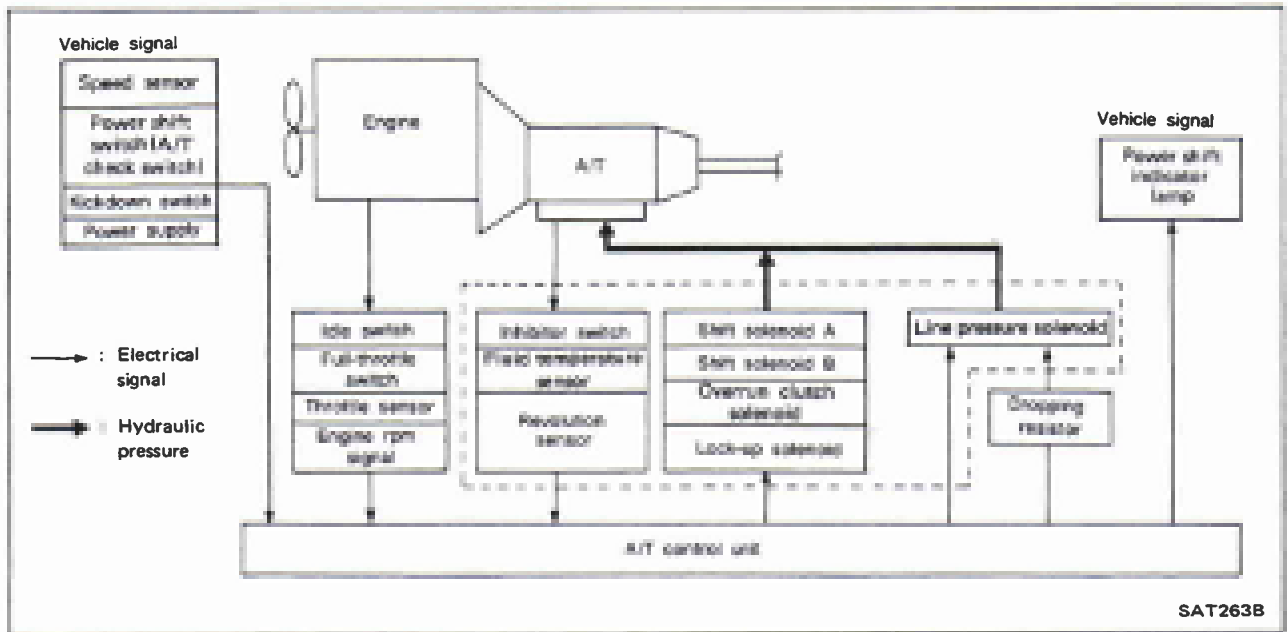
 : Drive vehicle.



# A/T CONTROL DIAGRAM

RE4R001A

## Electrical Control Chart



## Mechanical Operation

Shift position	Reverse clutch	High clutch	Forward clutch	Overrun clutch	Band servo			Forward one-way clutch	Low one-way clutch	Low & reverse brake	Lock-up	Remarks
					2nd apply	3rd release	4th apply					
P												PARK
R	○									○		REVERSE
N												NEUTRAL
D *4	1st		○	●				●	●			Automatic shift 1 → 2 → 3 → 4
	2nd		○	●	○			●				
	3rd		○	○	●	*2 ⊗	⊗	●				
	4th		○	⊗		*3 ⊗	⊗	○			○	
2	1st		○	●				●	●			Automatic shift 1 ↔ 2
	2nd		○	○	○			●				
1	1st		○	○				●		○		Locks (held stationary) in 1st speed 1 ↔ 2
	2nd		○	○	○			●				

\*1. Operates when power shift switch is set in "POWER" position.

\*2. Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, because oil pressure area on the "release" side is greater than that on the "apply" side, brake band does not contract.

\*3. Oil pressure is applied to 4th "apply" side in condition \*2 above, and brake band contracts.

\*4. A/T will not shift to 4th when power shift switch is set in "POWER" position. [Except Gulf standard (Middle East) models]

○ : Operates.

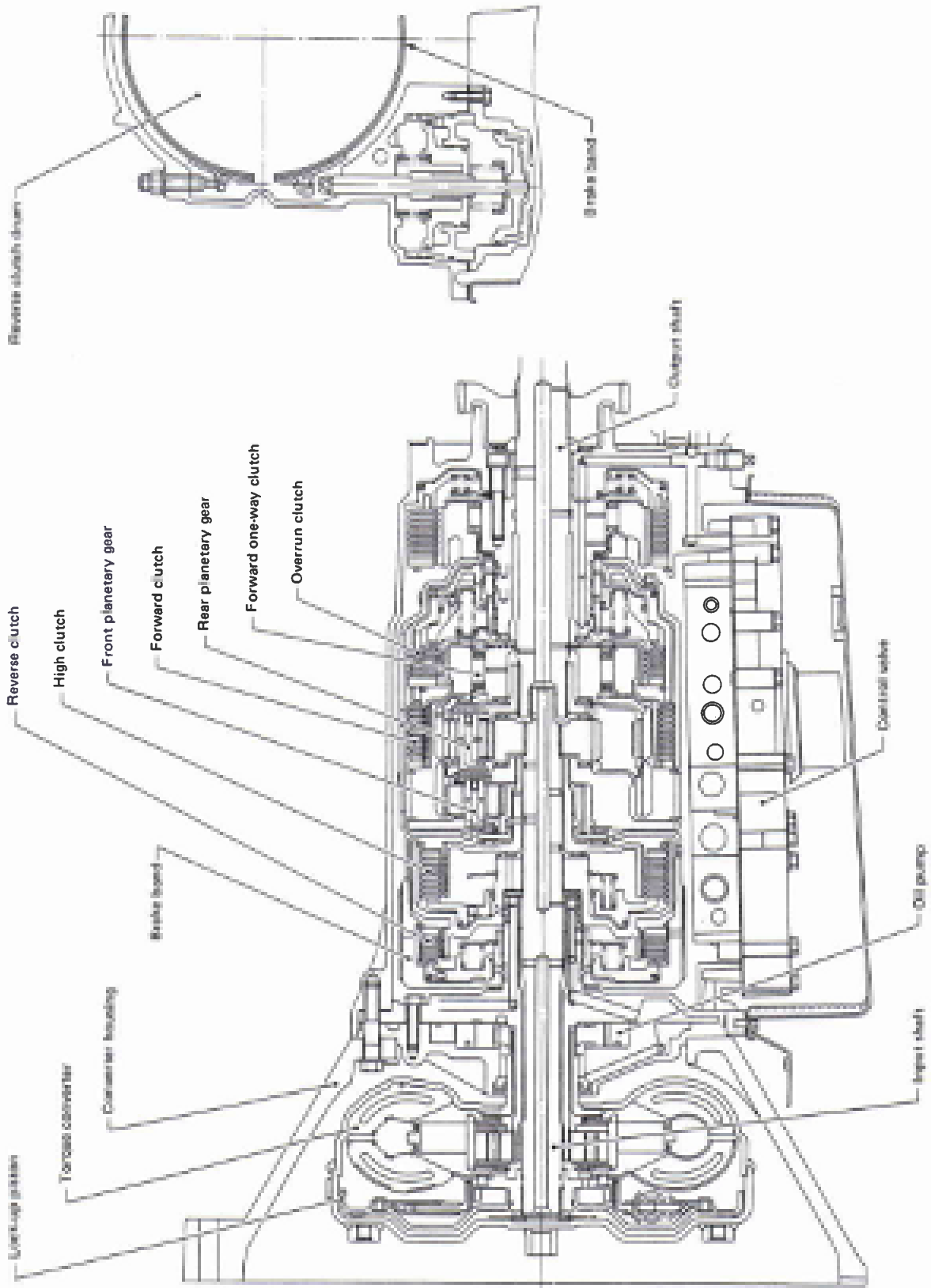
○ (with dot) : Operates when throttle opening is less than 5.5/16. Engine brake activates.

● (with dot) : Operates during "progressive" acceleration.

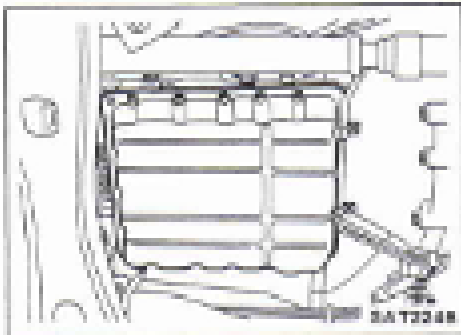
⊗ : Operates but does not affect power transmission.

⊗ (with dot) : Operates when throttle opening is less than 5.5/16 but does not affect engine brake.

Cross-sectional View

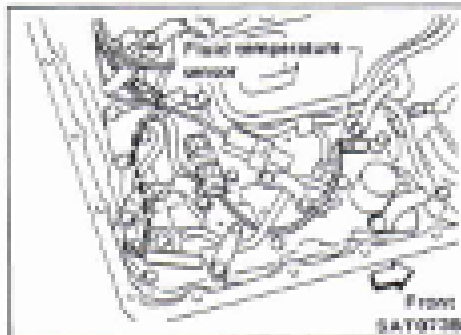


3A7362B



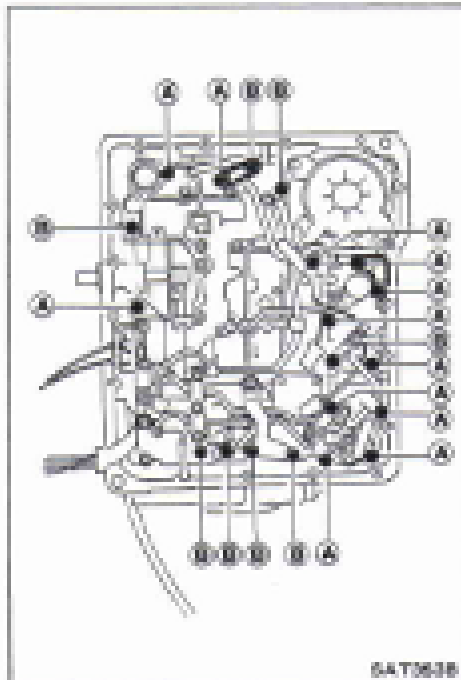
**Control Valve Assembly and Accumulators Inspection**

1. Remove oil pan and gasket and drain A.T.F.



2. Remove fluid temperature sensor if necessary.

3. Remove oil strainer.



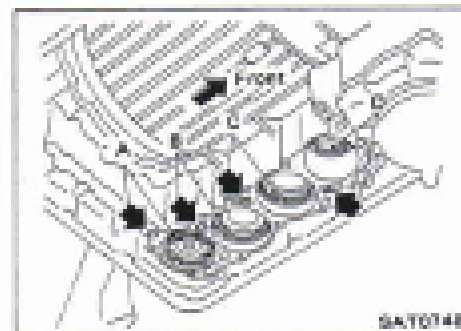
4. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

**Bolt length and location**

Bolt symbol	l mm (in) $\frac{mm}{16}$
A	33 (1.30)
B	45 (1.77)

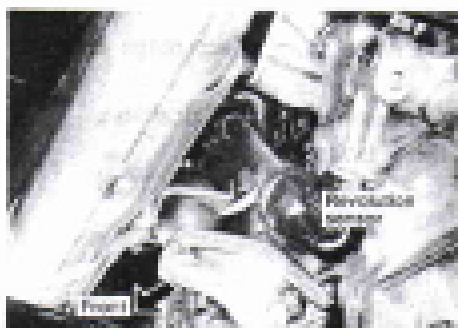
5. Remove solenoids and valves from valve body if necessary.

6. Remove terminal cord assembly if necessary.



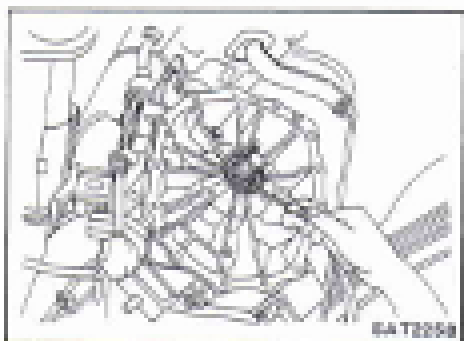
7. Remove accumulator A, B, C and D by applying compressed air if necessary.

- Hold each piston with rag.
- 8. Reinstall any part removed.
- Always use new sealing parts.



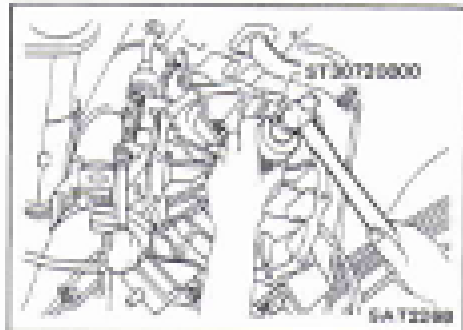
### Revolution Sensor Replacement

- Remove revolution sensor from A/T.
- Always use new sealing parts.

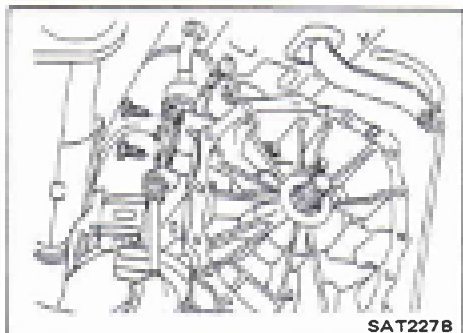


### Rear Oil Seal Replacement

1. Remove transfer case from vehicle. — Refer to section TF.
2. Remove rear oil seal.

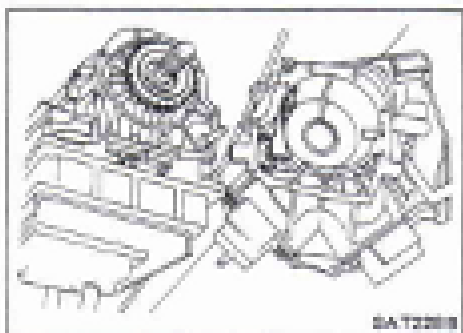


3. Install rear oil seal.
  - Apply A.T.F. before installing.
4. Reinstall any part removed.

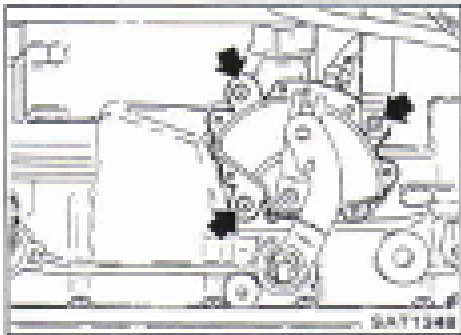


### Parking Components Inspection

1. Remove transfer case from vehicle. — Refer to section TF.
2. Remove transfer control linkage from adapter case.

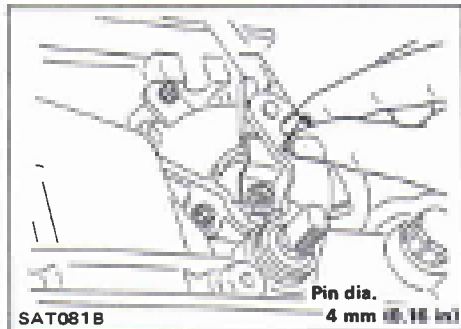


3. Remove adapter case from transmission case.
4. Replace parking components if necessary.
5. Reinstall any part removed.
  - Always use new sealing parts.

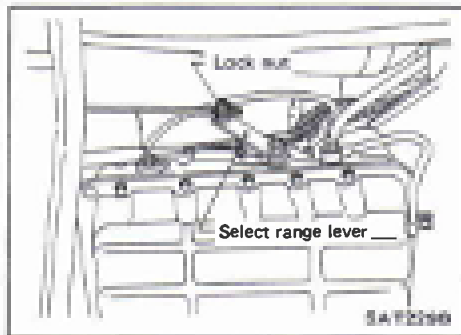


**Inhibitor Switch Adjustment**

1. Remove manual control linkage from select range lever of A/T assembly.
2. Set select range lever of A/T assembly in "N" position.
3. Loosen inhibitor switch fixing bolts.



4. Insert pin into adjustment holes in both inhibitor switch and select range lever of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical System".

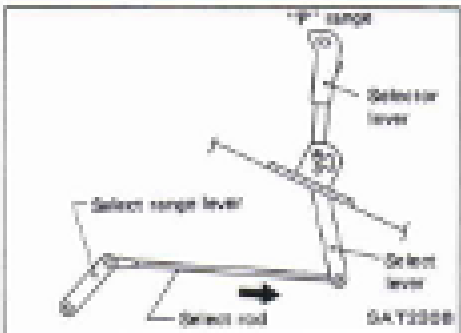


**Manual Control Linkage Adjustment**


Move selector lever from "P" range to "1" range. You should be able to feel the detents in each range.

If the detents cannot be felt or the pointer indicating the range is improperly aligned, the linkage needs adjustment.

1. Place selector lever in "P" range.
2. Loosen lock nut.
3. Confirm that select range lever of A/T assembly is in "P" range.

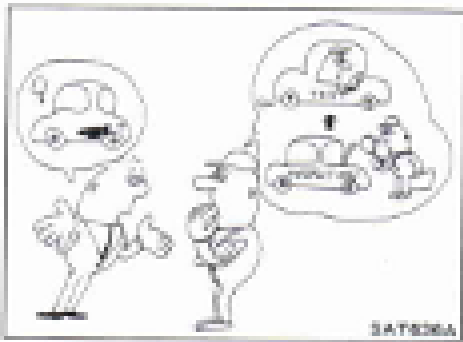


4. Pull select rod backward.
5. Release select rod and confirm that select lever moves forward a little under dead load.
6. Tighten lock nut to the specified torque.

 : Lock nut  
22 - 27 N·m  
(2.2 - 2.8 kg-m, 16 - 20 ft-lb)



7. Confirm that selector lever can move both forward and backward a little without pushing button.
8. Move selector lever from "P" range to "1" range. Make sure that selector lever can move smoothly and that pointer indicating the range is properly aligned.

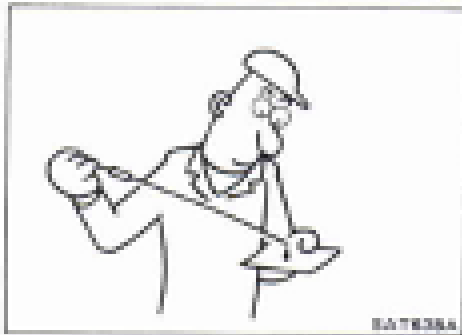


**Diagnostic Procedure**

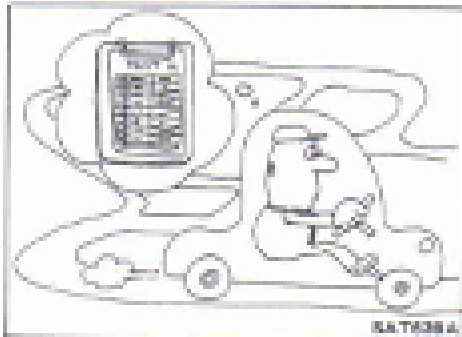
1. Listen to customer's complaint attentively.
  - In most cases, problems related to A/T can be corrected with simple adjustments or repairs. Therefore, be careful not to remove or disassemble A/T prematurely.
- You should drive customer's vehicle with customer as a passenger in order to personally experience the problem.



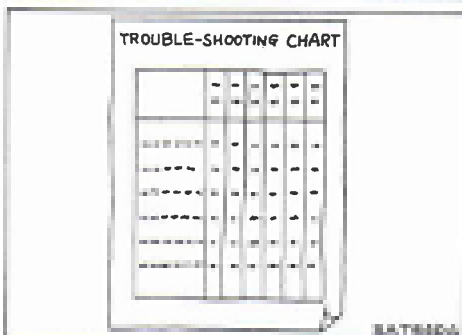
2. Check A/T fluid level and condition. – Refer to A/T FLUID LEVEL CHECK in section MA and following A/T FLUID CHECK section.



3. Perform road test including A/T self-diagnosis and diagnose causes of A/T problem. – Refer to following ROAD TESTING section.



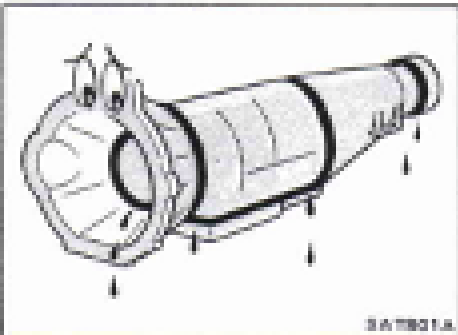
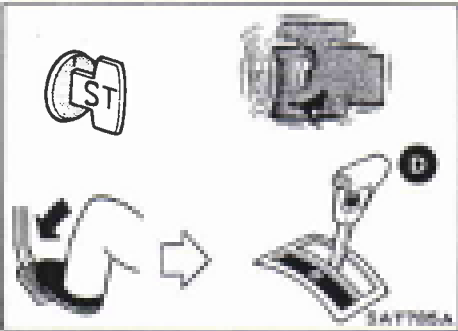
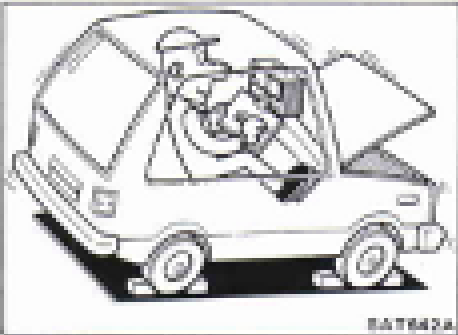
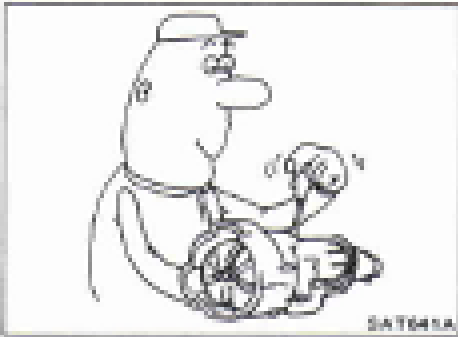
4. If problem is not found during road test, perform general inspection by following TROUBLE-SHOOTING CHART in response to driveability trouble items.





**Diagnostic Procedure (Cont'd)**

5. Repair or replace the necessary parts.



- 6. Perform stall test as a final check. — Refer to following **STALL TESTING** section.
- 7. Perform line pressure test as a final check. — Refer to following **PRESSURE TESTING** section.
- 8. Perform road test as a final check. — Refer to following **ROAD TESTING** section.

**A/T Fluid Check**

**FLUID LEAKAGE CHECK**

- 1. Clean area suspected of leaking, — for example, mating surface of converter housing and transmission case.
- 2. Start engine, apply foot brake, place selector lever in "D" range and wait a few minutes.
- 3. Stop engine.

4. Check for fresh leakage.

**FLUID CONDITION CHECK**

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling — Overheating

**FLUID LEVEL CHECK** — Refer to section **MA**.

## ROAD TEST PROCEDURE

1. Check before engine is started.

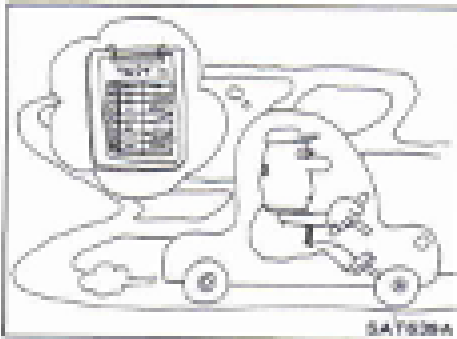


2. Check at idle.

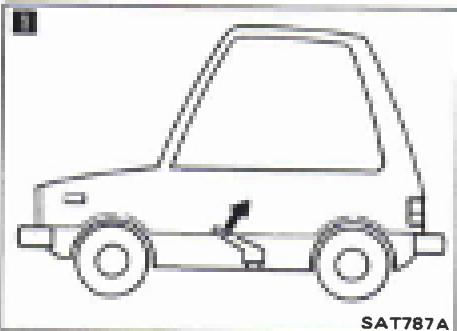


3. Cruise test.

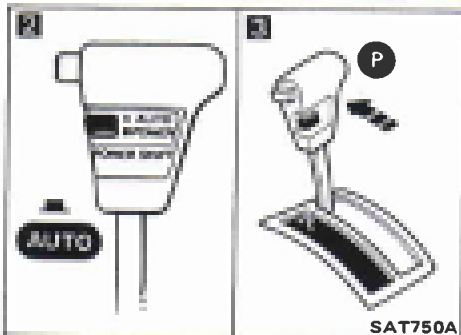
SAT786A



SAT828A



SAT787A



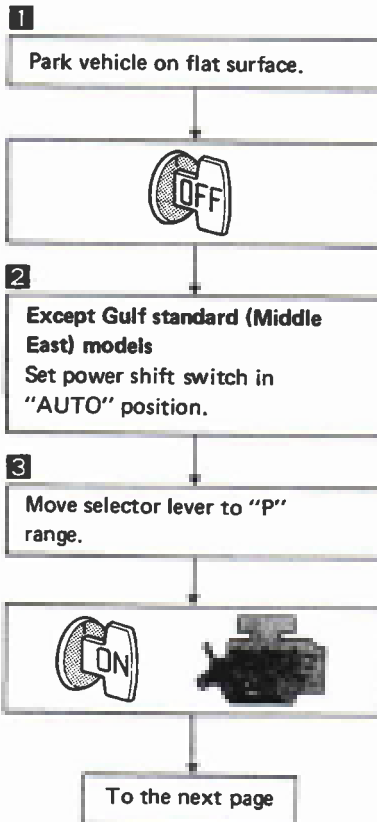
SAT750A

## Road Testing

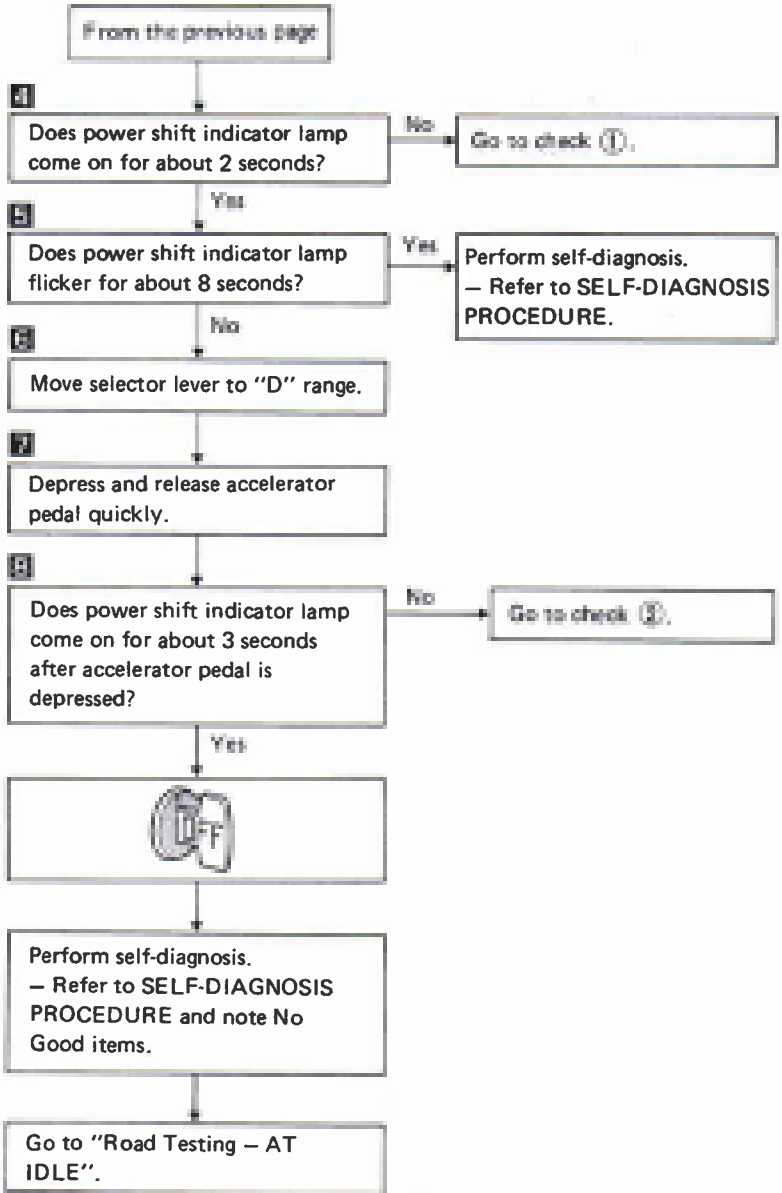
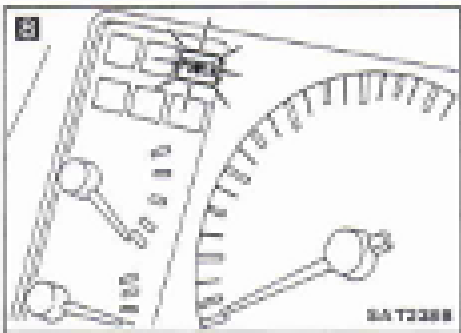
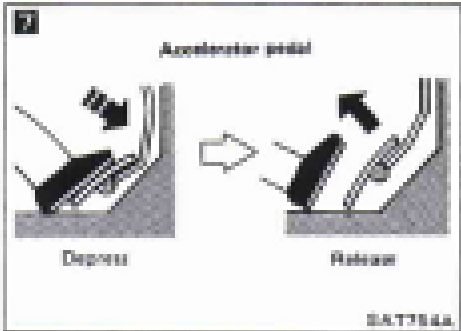
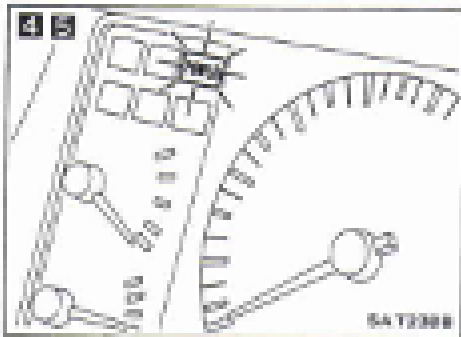
### DESCRIPTION

- The purpose of this road test is to determine overall performance of automatic transmission and analyze causes of problems.
- The road test consists of the following three parts:
  1. Check before engine is started
  2. Check at idle
  3. Cruise test
- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to the "Trouble-shooting".

### 1. CHECK BEFORE ENGINE IS STARTED

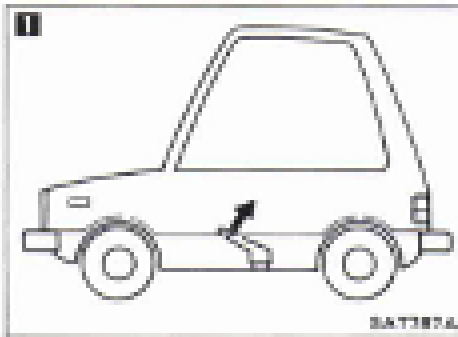


Road Testing (Cont'd)



**Road Testing (Cont'd)**

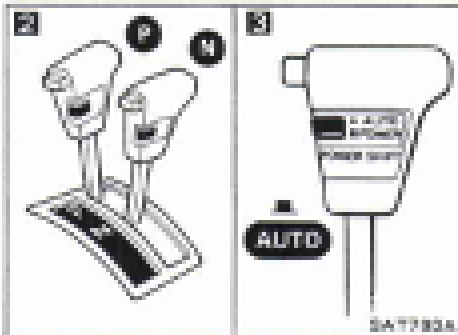
**2. CHECK AT IDLE**



1 Park vehicle on flat surface.



2 Move selector lever to "P" or "N" range.



3 Except Gulf standard (Middle East) models  
Set power shift switch to "AUTO" position.



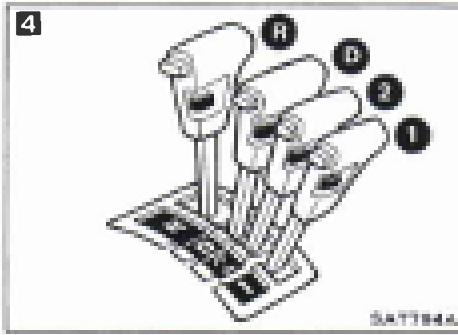
Is engine started? No → Go to check ③.



5 Move selector lever to "D", "1", "2" or "R" range.



Is engine started? Yes → Go to check ③.



8 Move selector lever to "P" range.



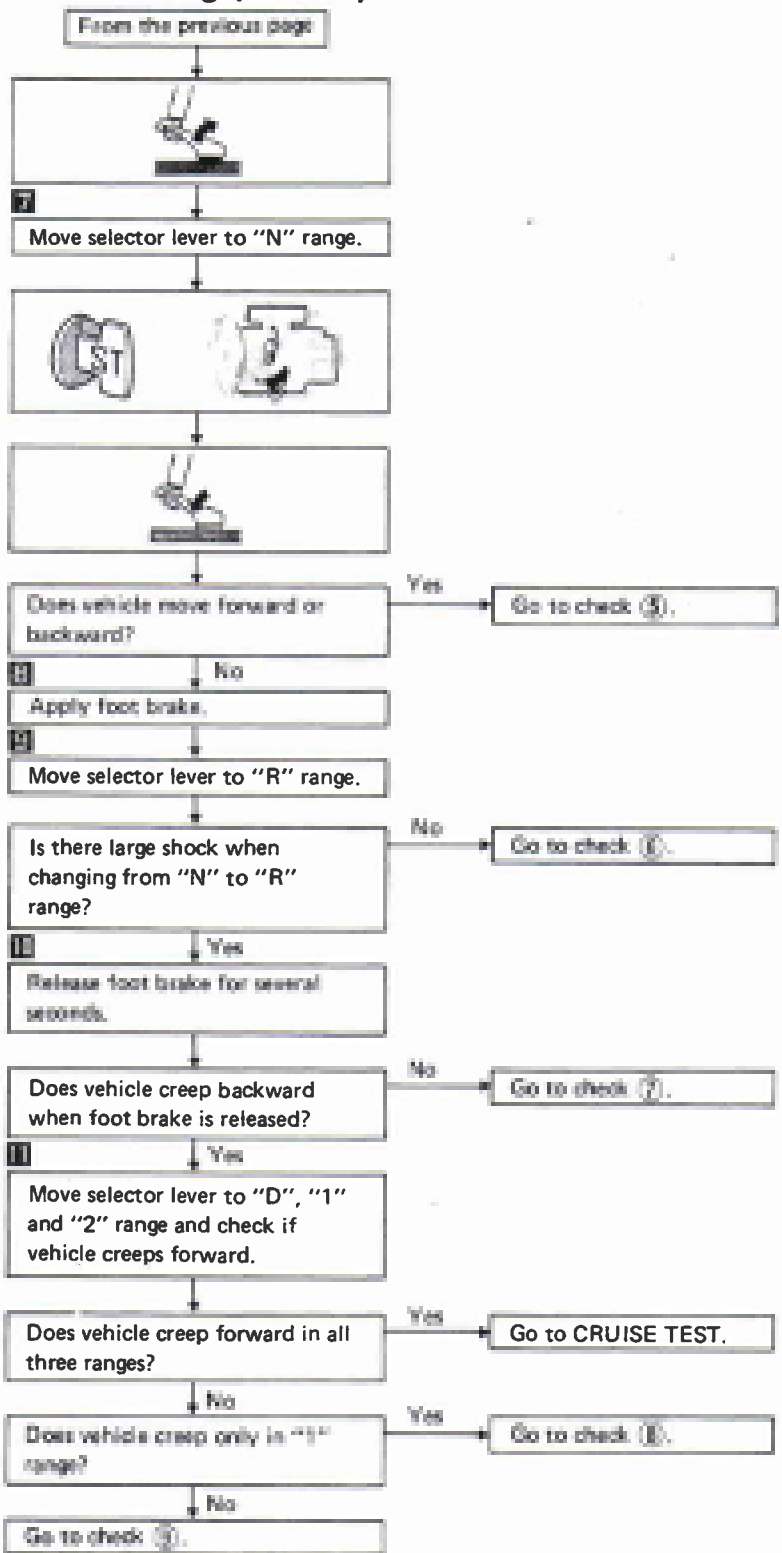
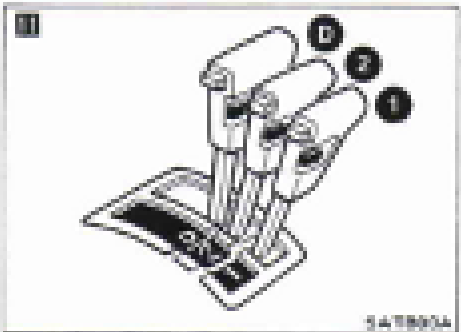
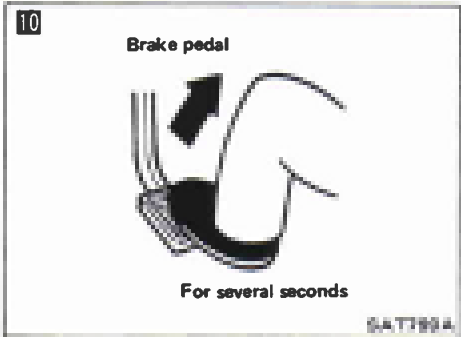
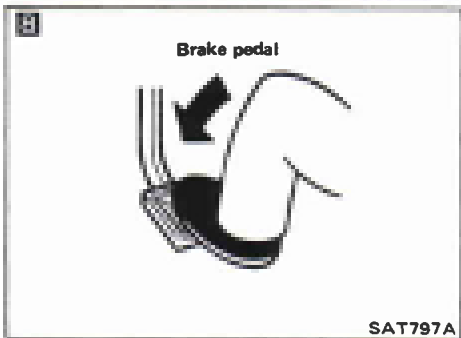
10 Push vehicle forward or backward.

Does vehicle move when it is pushed forward or backward? Yes → Go to check ③.

No  
To the next page



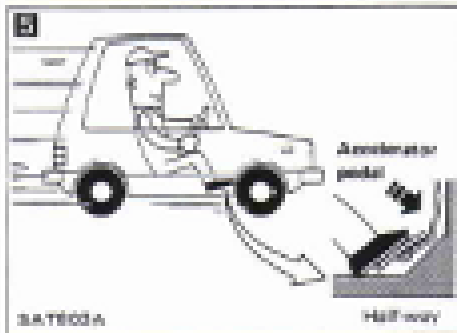
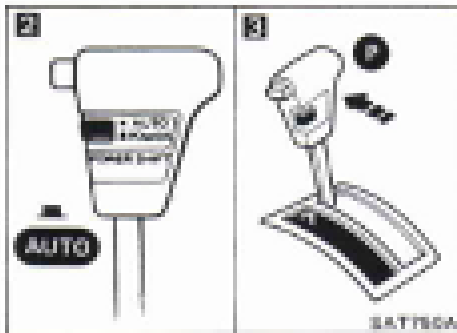
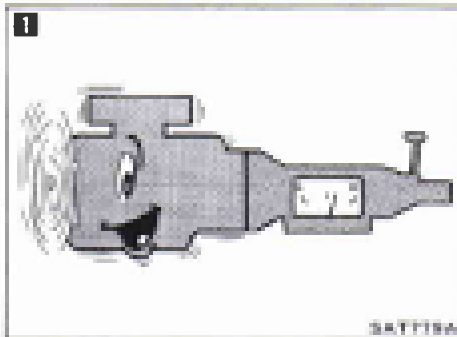
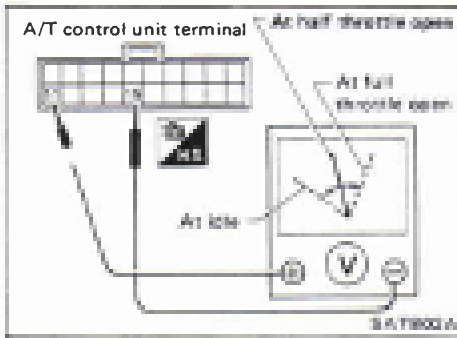
Road Testing (Cont'd)



Road Testing (Cont'd)

3. CRUISE TEST

- Check all items listed in Parts 1 through 3.
- Throttle position can be controlled by voltage across terminals ① and ⑮ of A/T control unit.



CRUISE TEST – Part 1

1 Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.  
**A.T.F. operating temperature:**  
 50 - 80°C (122 - 176°F)

2 Park vehicle on flat surface.

3 Except Gulf standard (Middle East) models  
 Set power shift switch to "AUTO" position.

4 Move selector lever to "P" range.



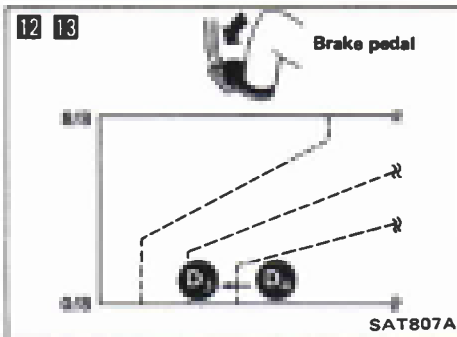
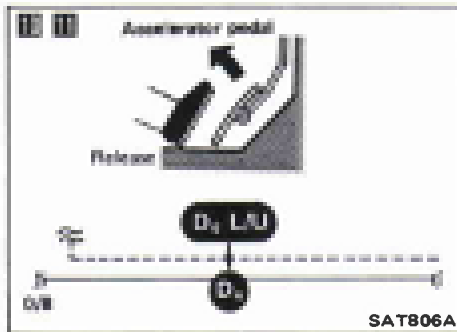
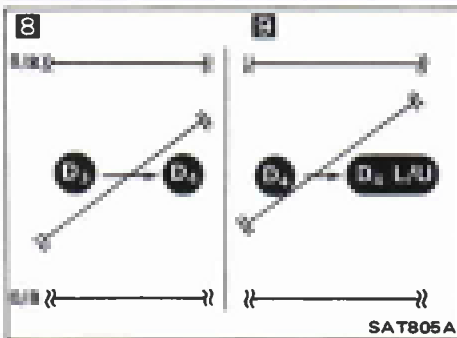
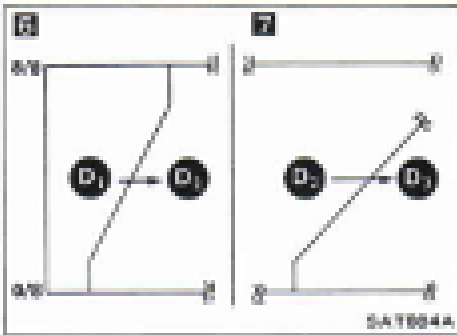
5 Move selector lever to "D" range.

6 Accelerate vehicle by constantly depressing accelerator pedal halfway.

Does vehicle start from D<sub>1</sub>? No → Go to check ⑮

Yes → To the next page

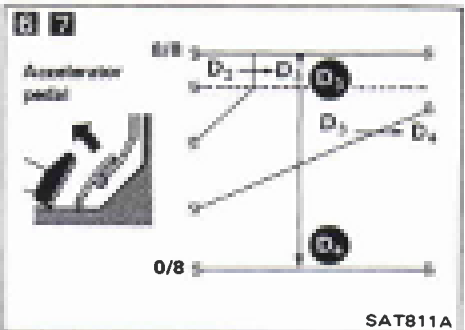
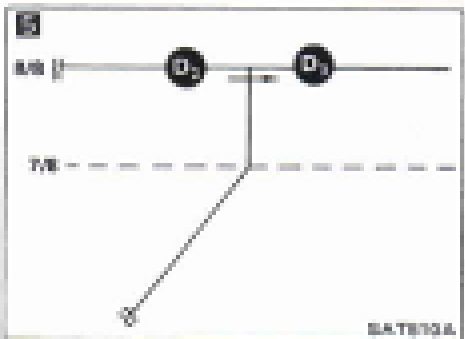
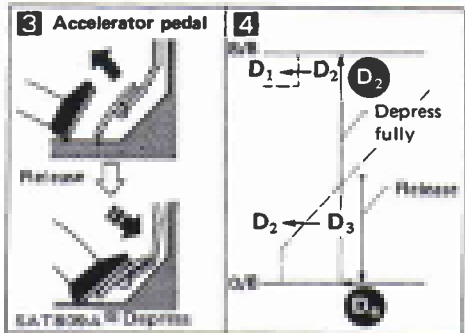
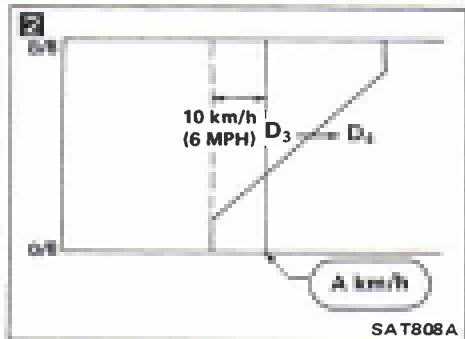
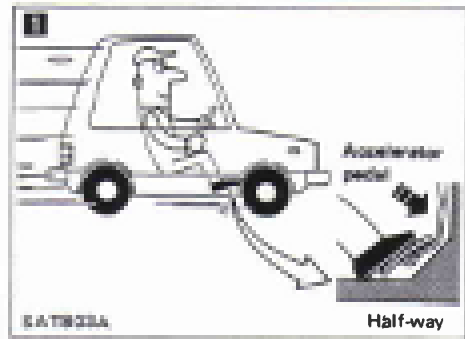
Road Testing (Cont'd)



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    graph TD
      Start[From the previous page] --> Q6{6 Does A/T shift from D1 to D2 at the specified speed?  
Specified speed when shifting from D1 to D2:  
Refer to shift schedule.}
      Q6 -- No --> A6[Go to check ①.]
      Q6 -- Yes --> Q7{7 Does A/T shift from D2 to D3 at the specified speed?  
Specified speed when shifting from D2 to D3:  
Refer to shift schedule.}
      Q7 -- No --> A7[Go to check ②.]
      Q7 -- Yes --> Q8{8 Does A/T shift from D3 to D4 at the specified speed?  
Specified speed when shifting from D3 to D4:  
Refer to shift schedule.}
      Q8 -- No --> A8[Go to check ③.]
      Q8 -- Yes --> Q9{9 Does A/T perform lock-up at the specified speed?  
Specified speed when lock-up occurs:  
Refer to shift schedule.}
      Q9 -- No --> A9[Go to check ④.]
      Q9 -- Yes --> Q10{10 Does A/T hold lock-up condition for more than 30 seconds?}
      Q10 -- No --> A10[Go to check ⑤.]
      Q10 -- Yes --> R10[Release accelerator pedal.]
      R10 --> Q11{11 Is lock-up released when accelerator pedal is released?}
      Q11 -- No --> A11[Go to check ⑥.]
      Q11 -- Yes --> R11[Decelerate vehicle by applying foot brake lightly.]
      R11 --> Q12{12 Does engine speed return to idle smoothly when A/T is shifted from D4 to D3?}
      Q12 -- No --> A12[Go to check ⑦.]
      Q12 -- Yes --> R12[Stop vehicle.]
      R12 --> End[Go to "CRUISE TEST – Part 2".]
  
```

**Road Testing (Cont'd)**  
**CRUISE TEST – Part 2**

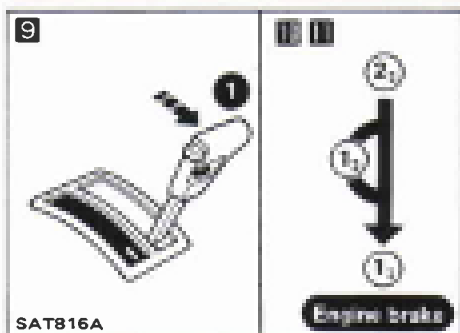
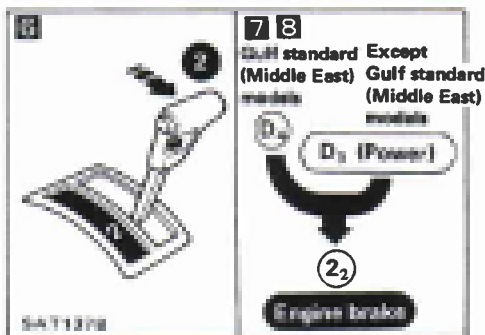
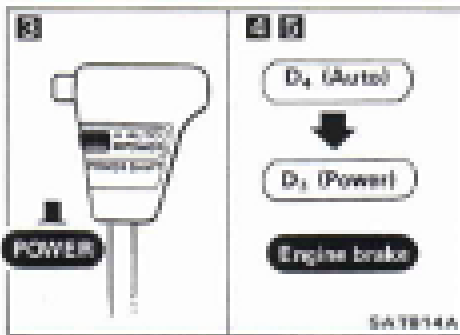
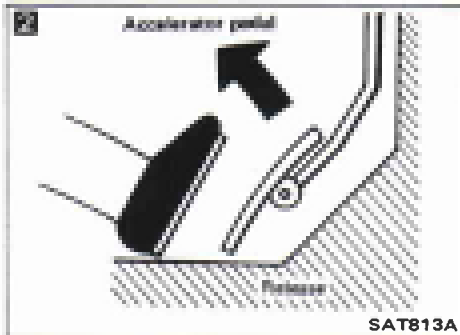
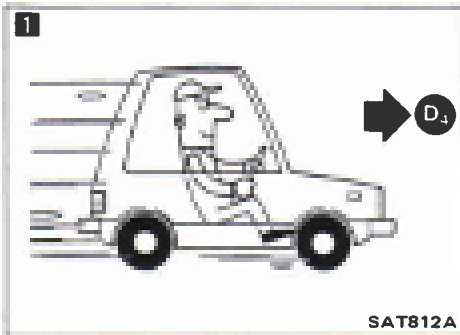


```

    graph TD
      Start[Except Gulf standard (Middle East) models  
Confirm power shift switch is in "AUTO" position.] --> Step1[Confirm selector lever is in "D" range.]
      Step1 --> Step2[Accelerate vehicle by half throttle again.]
      Step2 --> Q1{Does vehicle start from D1?}
      Q1 -- No --> C1[Go to check 10.]
      Q1 -- Yes --> Step3[Accelerate vehicle to A km/h as shown in illustration.]
      Step3 --> Step4[Release accelerator pedal and then quickly depress it fully.]
      Step4 --> Q2{Does A/T shift from D4 to D2 as soon as accelerator pedal is depressed fully?}
      Q2 -- No --> C2[Go to check 11.]
      Q2 -- Yes --> Step5[Does A/T shift from D2 to D3 at the specified speed?  
Specified speed when shifting from D2 to D3:  
Refer to shift schedule.]
      Step5 -- No --> C3[Go to check 12.]
      Step5 -- Yes --> Step6[Release accelerator pedal after shifting from D2 to D3.]
      Step6 --> Q3{Does A/T shift from D3 to D4 and does vehicle decelerate by engine brake?}
      Q3 -- No --> C4[Go to check 13.]
      Q3 -- Yes --> Step7[Stop vehicle.]
      Step7 --> End[Go to "CRUISE TEST – Part 3".]
  
```



**Road Testing (Cont'd)**  
**CRUISE TEST – Part 3**



Except Gulf standard (Middle East) models  
Confirm power shift switch is in "AUTO" position.

Confirm selector lever is in "D" range.

**1** Accelerate vehicle using half-throttle to D<sub>4</sub>.

**2** Release accelerator pedal.

**3** Except Gulf standard (Middle East) models  
Set power shift switch in "POWER" position while driving in D<sub>4</sub> range.

**4** Does A/T shift from D<sub>4</sub> to D<sub>3</sub>?  
No → Go to check ①.

**5** Does vehicle decelerate by engine brake?  
No → Go to check ②.

**6** Move selector lever from "D" to "2" range while driving in D<sub>3</sub> or D<sub>4</sub>.

**7** Does A/T shift from D<sub>3</sub> to 2<sub>2</sub>?  
No → Go to check ③.

**8** Does vehicle decelerate by engine brake?  
No → Go to check ④.

**9** Move selector lever from "2" to "1" range while driving in 2<sub>2</sub>.

**10** Does A/T shift from 2<sub>2</sub> to 1<sub>1</sub> range?  
No → Go to check ⑤.

**11** Does vehicle decelerate by engine brake?  
No → Go to check ⑥.

Stop vehicle.

Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

# TROUBLE-SHOOTING AND DIAGNOSES

RE4R03A

## Road Testing (Cont'd)

### VEHICLE SPEED WHEN SHIFTING GEARS

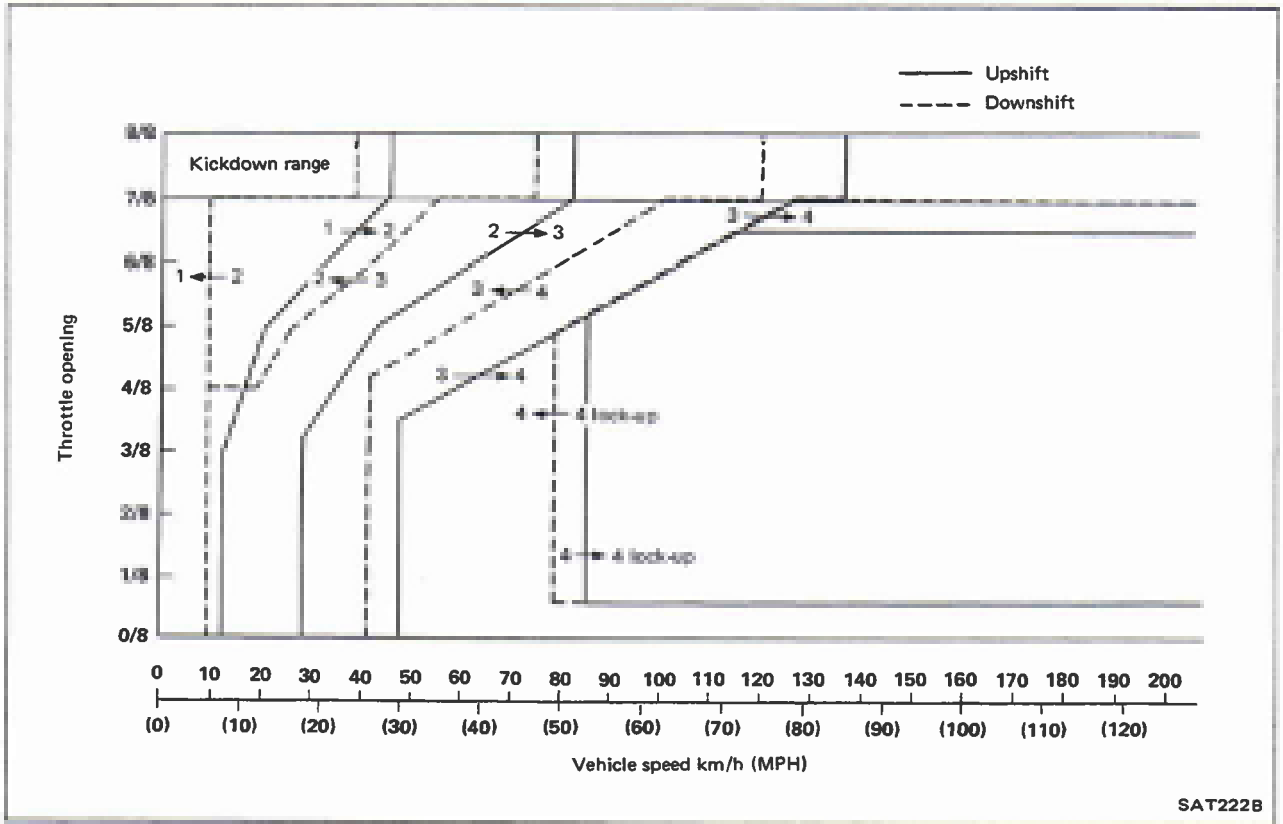
Model	Throttle position	Shift pattern	Vehicle speed km/h (MPH)						
			D <sub>1</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>4</sub>	D <sub>4</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>1</sub>	1 <sub>2</sub> → 1 <sub>1</sub>
TB42	Full throttle	Standard	43 - 47 (27 - 29)	77 - 85 (48 - 53)	119 - 129 (74 - 80)	113 - 123 (70 - 76)	70 - 78 (43 - 48)	36 - 40 (22 - 25)	40 - 44 (25 - 27)
		Power	48 - 52 (30 - 32)	87 - 95 (54 - 59)	138 - 148 (86 - 92)	125 - 135 (78 - 84)	78 - 86 (48 - 53)	41 - 45 (25 - 28)	40 - 44 (25 - 27)
	Half throttle	Standard	14 - 18 (9 - 11)	30 - 38 (19 - 24)	52 - 62 (32 - 39)	36 - 46 (22 - 29)	14 - 22 (9 - 14)	7 - 11 (4 - 7)	40 - 44 (25 - 27)
		Power	25 - 29 (16 - 18)	45 - 53 (28 - 33)	80 - 90 (50 - 56)	45 - 55 (28 - 34)	16 - 24 (10 - 15)	7 - 11 (4 - 7)	40 - 44 (25 - 27)

### VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Model	Throttle position	Shift pattern	D <sub>4</sub>	
			Vehicle speed km/h (MPH)	
			Lock-up "ON"	Lock-up "OFF"
TB42	Full throttle	Standard	—	—
		Power	—	—
	Half throttle	Standard	78 - 88 (48 - 55)	73 - 83 (45 - 52)
		Power	78 - 88 (48 - 55)	73 - 83 (45 - 52)

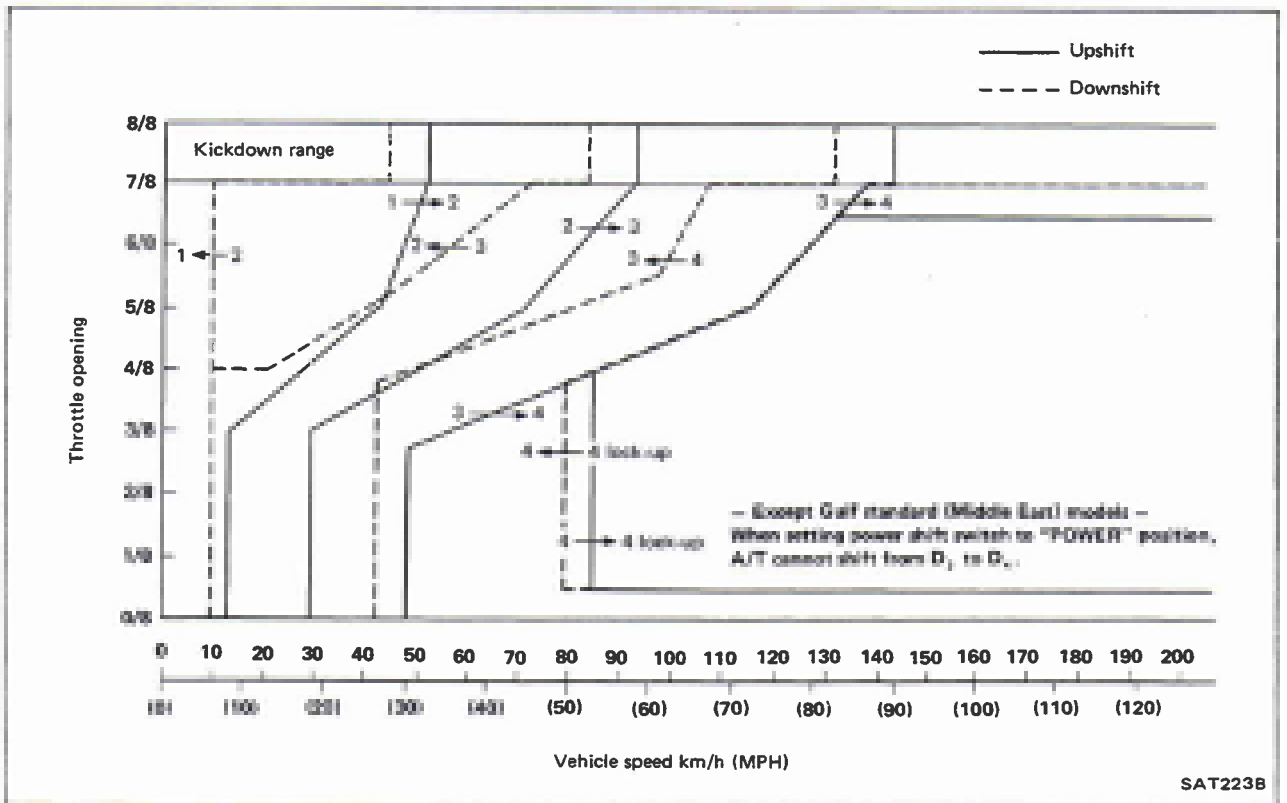
Road Testing (Cont'd)

SHIFT SCHEDULE — Standard Pattern



SAT222B

SHIFT SCHEDULE — Power Pattern



SAT223B

**Trouble-shooting, Electrical System, Stall  
Testing and Line Pressure Testing**

**CONTENTS**

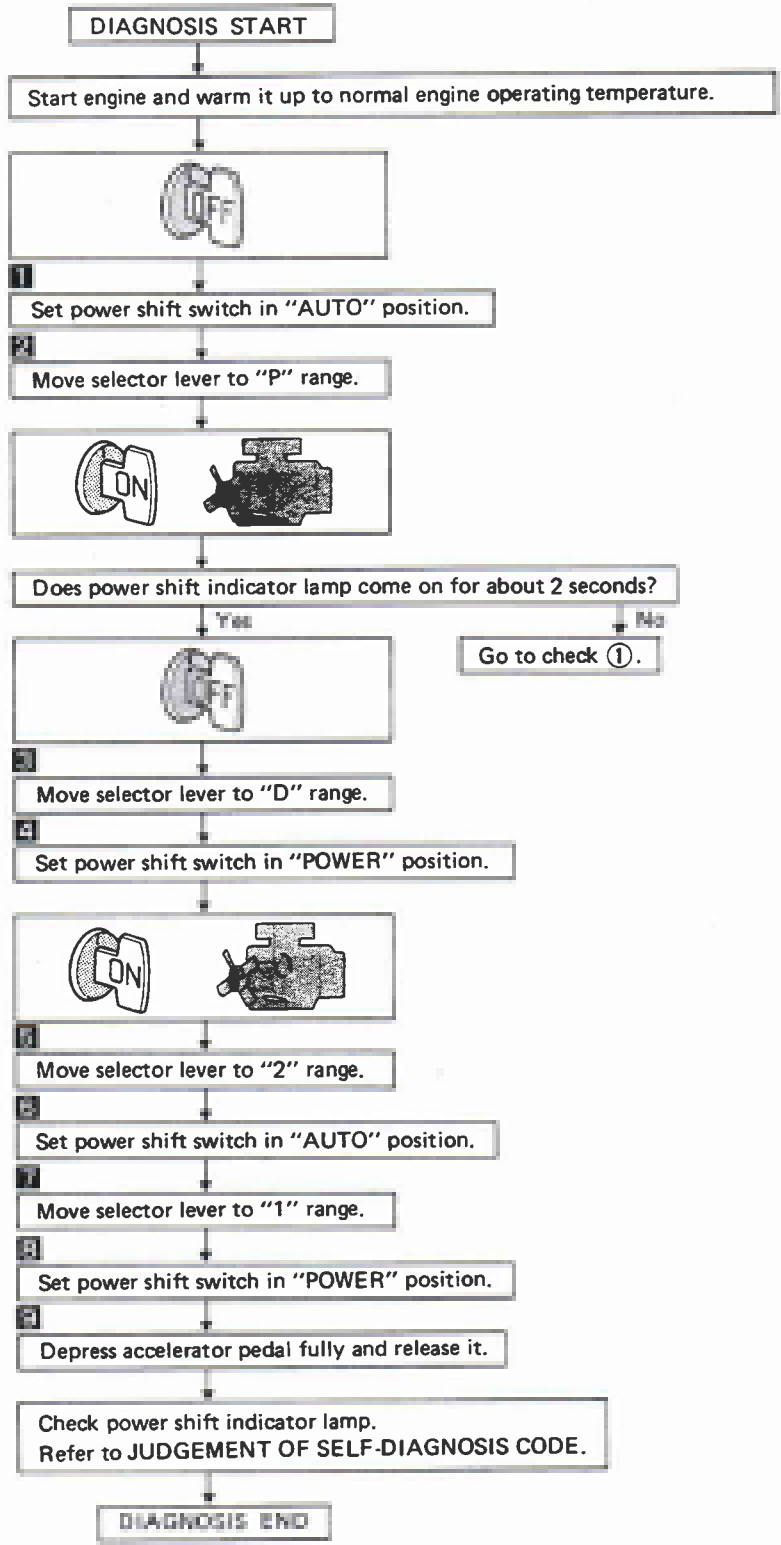
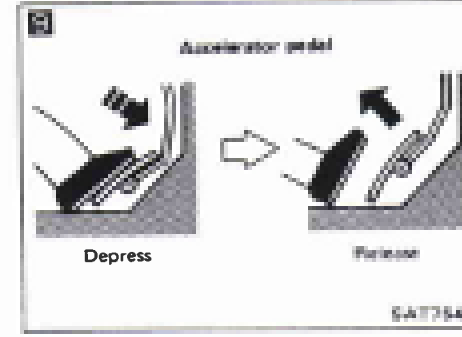
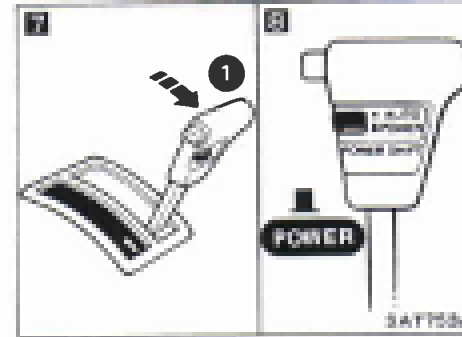
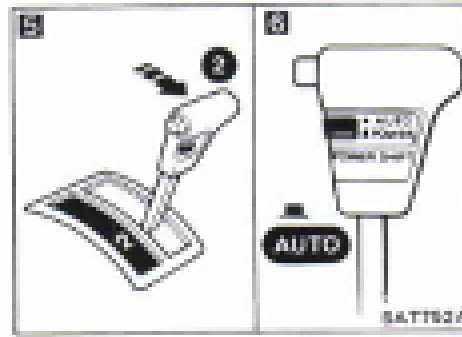
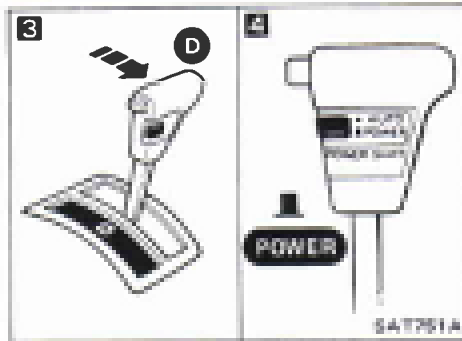
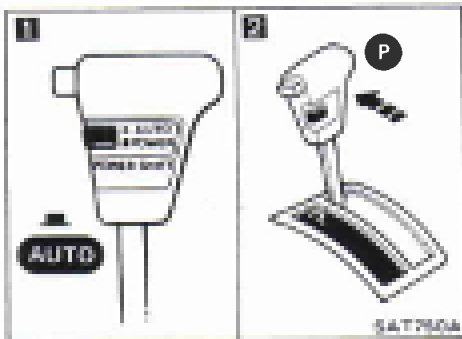
Trouble-shooting — Self-diagnosis .....	AT-25
Self-diagnosis procedure .....	AT-25
Except Gulf standard (Middle East) models .....	AT-25
Gulf standard (Middle East) models .....	AT-26
Judgement of self-diagnosis code .....	AT-27
Revolution sensor circuit check .....	AT-31
Speed sensor circuit check .....	AT-31
Throttle sensor circuit check .....	AT-32
Shift solenoid A circuit check .....	AT-34
Shift solenoid B circuit check .....	AT-35
Overrun clutch solenoid circuit check .....	AT-36
Lock-up solenoid circuit check .....	AT-37
Fluid temperature sensor circuit and A/T control unit power source circuit checks .....	AT-38
Engine revolution signal circuit check .....	AT-39
Line pressure solenoid circuit check .....	AT-40
— Except Gulf standard (Middle East) models —	
Inhibitor, power shift, kickdown and idle switch circuit checks .....	AT-41
— Gulf standard (Middle East) models —	
Inhibitor, A/T check, kickdown and idle switch circuit checks .....	AT-43
Trouble-shooting .....	AT-45
CHECK ① : Power shift indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON". .....	AT-45
CHECK ② : Power shift indicator lamp does not come on for about 3 seconds when depressing and releasing accelerator pedal fully. ....	AT-46
CHECK ③ : Engine cannot be started with selector lever in "P" or "N" range or engine can be started with selector lever in "D", "2", "1" or "R" range. ....	AT-46
CHECK ④ : Vehicle moves when it is pushed forward or backward with selector lever in "P" range. ....	AT-46
CHECK ⑤ : Vehicle moves forward or backward when selecting "N" range. ....	AT-47
CHECK ⑥ : There is large shock when changing from "N" to "R" range. ....	AT-48
CHECK ⑦ : Vehicle does not creep backward when selecting "R" range. ....	AT-49
CHECK ⑧ : Vehicle does not creep forward when selecting "D" and "2" ranges. ....	AT-50
CHECK ⑨ : Vehicle does not creep forward when selecting "D", "2" and "1" ranges. ....	AT-51
CHECK ⑩ : Vehicle cannot be started from D <sub>1</sub> on CRUISE TEST — Part 1. ....	AT-52
CHECK ⑪ : A/T does not shift from D <sub>1</sub> to D <sub>2</sub> at the specified speed. A/T does not shift from D <sub>4</sub> to D <sub>2</sub> when depressing accelerator pedal fully at the specified speed. ....	AT-53
CHECK ⑫ : A/T does not shift from D <sub>2</sub> to D <sub>3</sub> at the specified speed. ....	AT-54
CHECK ⑬ : A/T does not shift from D <sub>3</sub> to D <sub>4</sub> at the specified speed. ....	AT-55
CHECK ⑭ : A/T does not perform lock-up at the specified speed. ....	AT-56
CHECK ⑮ : A/T does not hold lock-up condition for more than 30 seconds. ....	AT-57
CHECK ⑯ : Lock-up is not released when accelerator pedal is released. ....	AT-57

**Trouble-shooting, Electrical System, Stall Testing and Line Pressure Testing (Cont'd)**

CHECK ⑰ :	Engine speed does not return to idle smoothly when A/T is shifted from D <sub>4</sub> to D <sub>3</sub> with accelerator pedal released. Vehicle decelerates by engine brake when setting "POWER" position with accelerator pedal released. Vehicle decelerates by engine brake when moving selector lever from "D" to "2" range with accelerator pedal released. . . . .	AT-58
CHECK ⑱ :	Vehicle does not start from D <sub>1</sub> on CRUISE TEST - Part 2. . . . .	AT-59
CHECK ⑲ :	A/T does not shift from D <sub>4</sub> to D <sub>3</sub> when changing power shift switch to "POWER" position. - Except Gulf standard (Middle East) models - . . . . .	AT-59
CHECK ⑳ :	A/T does not shift from D <sub>3</sub> to 2 <sub>2</sub> when changing selector lever position from "D" to "2" range. . . . .	AT-59
CHECK ㉑ :	A/T does not shift from 2 <sub>2</sub> to 1 <sub>1</sub> when changing selector lever position from "2" to "1" range. . . . .	AT-60
CHECK ㉒ :	Vehicle does not decelerate by engine brake when shifting from 2 <sub>2</sub> (1 <sub>2</sub> ) to 1 <sub>1</sub> . . . . .	AT-60
Electrical system . . . . .		AT-61
A/T electrical parts location . . . . .		AT-61
Schematic . . . . .		AT-62
Wiring diagram . . . . .		AT-63
Inspection of A/T control unit . . . . .		AT-64
A/T control unit inspection table . . . . .		AT-64
Power shift switch - Except Gulf standard (Middle East) models . . . . .		AT-68
A/T check switch - Gulf standard (Middle East) models . . . . .		AT-68
Inhibitor switch . . . . .		AT-68
Revolution sensor . . . . .		AT-69
Fluid temperature sensor . . . . .		AT-69
A/T oil temperature switch . . . . .		AT-69
Lock-up solenoid and line pressure solenoid . . . . .		AT-69
3-unit solenoid assembly . . . . .		AT-70
Dropping resistor . . . . .		AT-70
Stall testing . . . . .		AT-70
Stall test procedure . . . . .		AT-70
Judgement of stall test . . . . .		AT-72
Pressure testing . . . . .		AT-73
Line pressure test procedure . . . . .		AT-73
Judgement of line pressure test . . . . .		AT-74

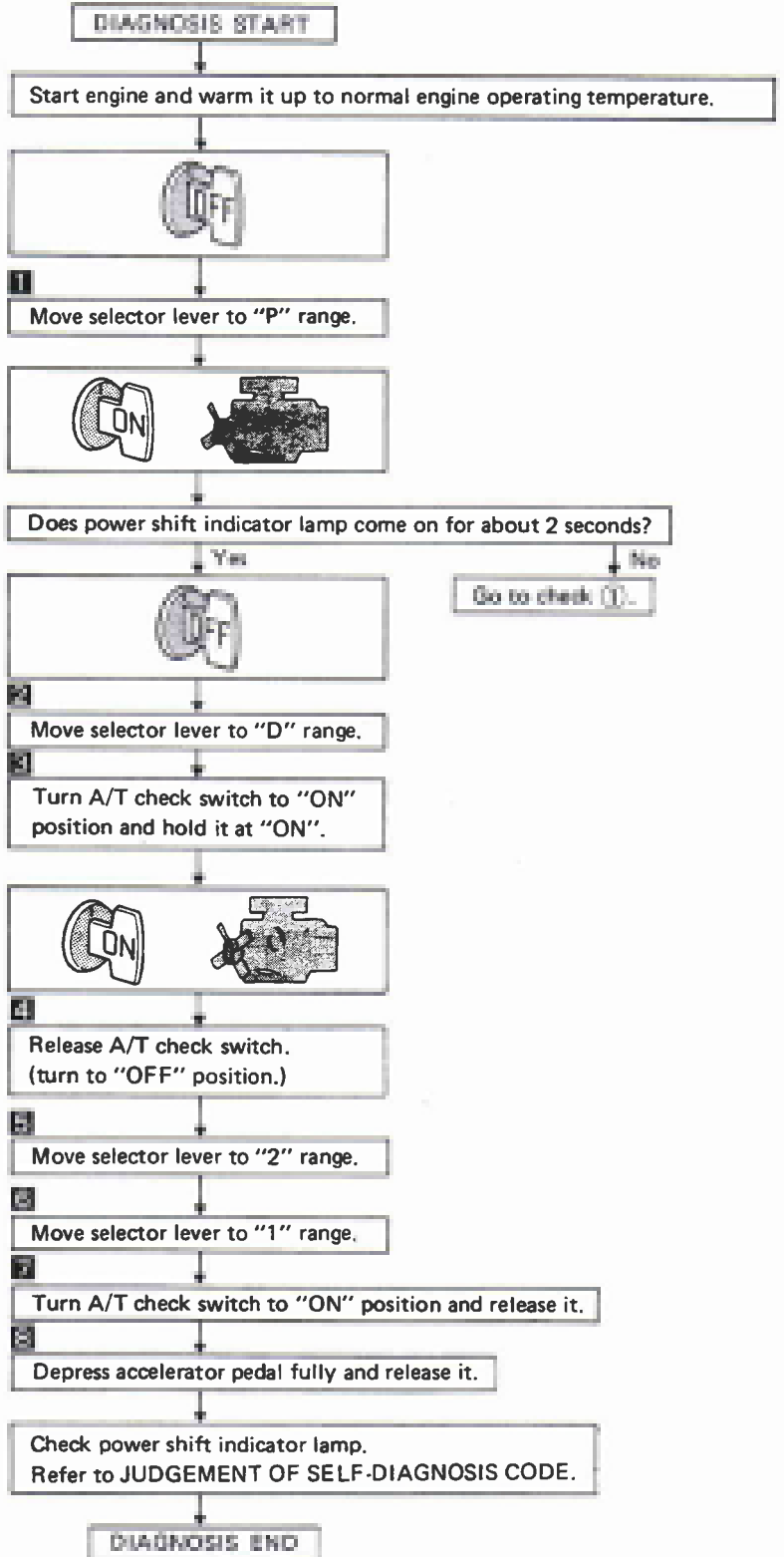
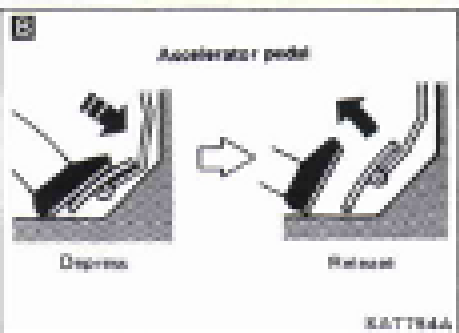
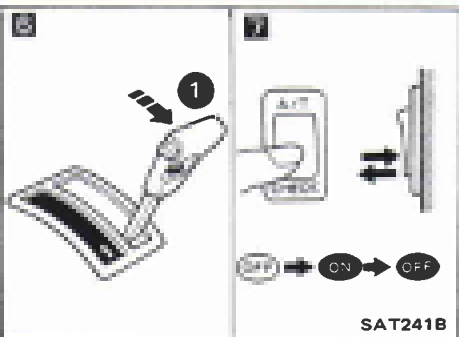
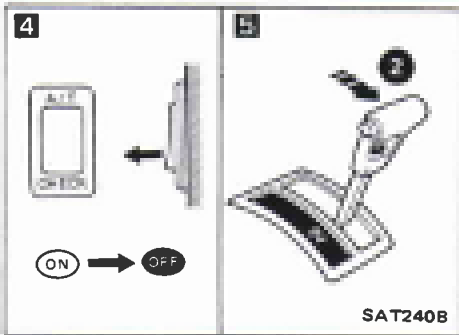
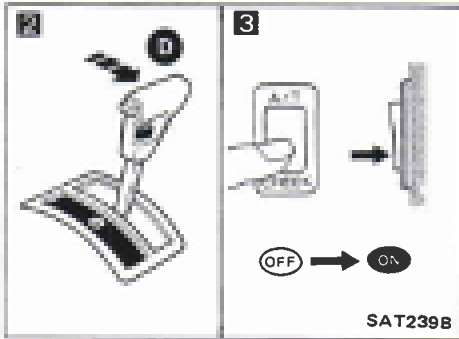
**Trouble-shooting — Self-diagnosis**  
**SELF-DIAGNOSIS PROCEDURE**

Except Gulf standard (Middle East) models



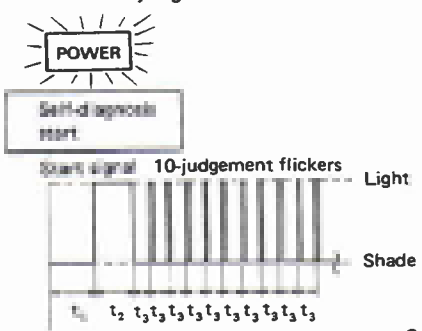
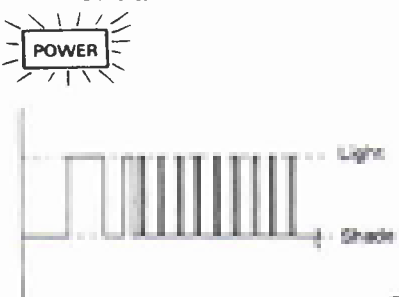
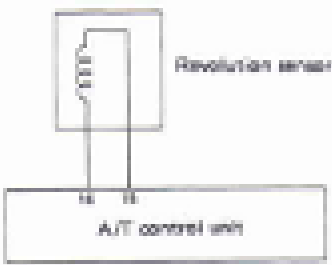

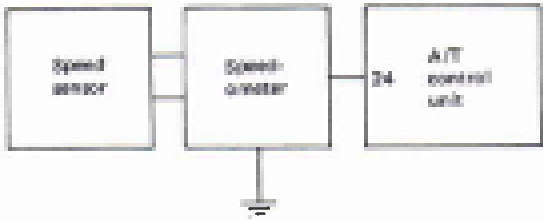
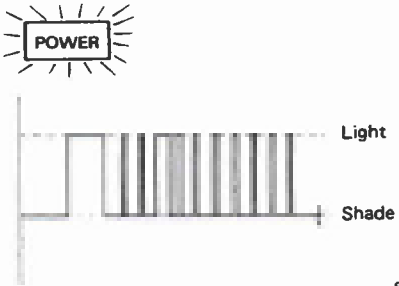
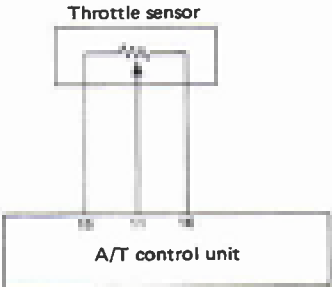
**Trouble-shooting — Self-diagnosis (Cont'd)**  
**SELF-DIAGNOSIS PROCEDURE**

Gulf standard (Middle East) models



Trouble-shooting — Self-diagnosis (Cont'd)

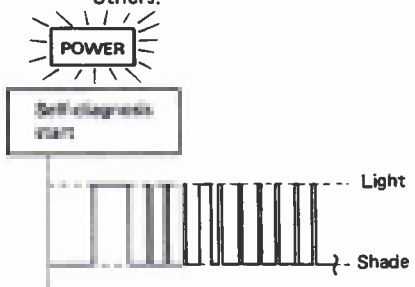
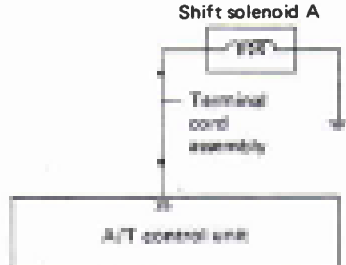
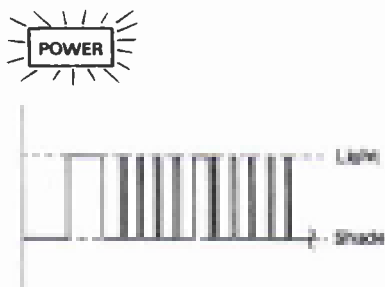
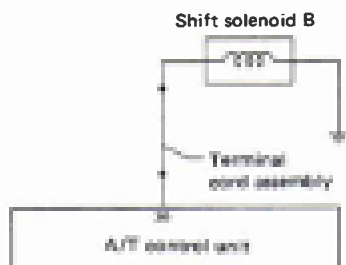
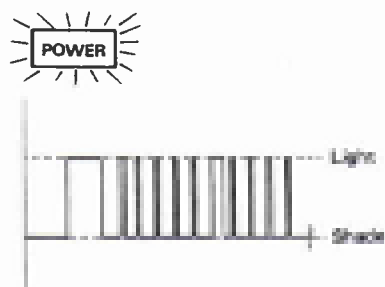
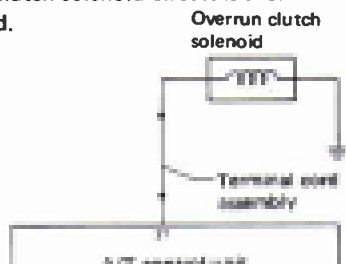
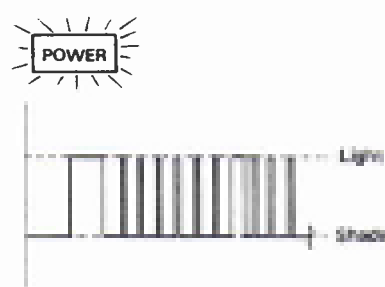
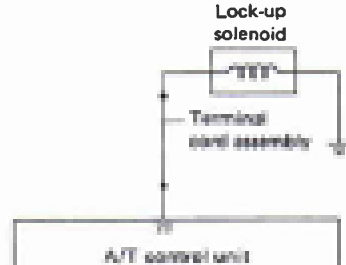
JUDGEMENT OF SELF-DIAGNOSIS CODE

Power shift indicator lamp:	Damaged circuit
<p>All judgement flickers are same.</p>  <p>SAT755A</p>	<p>All circuits that can be confirmed by self-diagnosis are O.K.</p>
<p>1st judgement flicker is longer than others.</p>  <p>SAT756A</p>	<p>Revolution sensor circuit is short-circuited or disconnected.</p>  <p>➡ Go to revolution sensor circuit check. SAT140B</p>
<p>2nd judgement flicker is longer than others.</p>  <p>SAT757A</p>	<p>Speed sensor circuit is short-circuited or disconnected.</p>  <p>➡ Go to speed sensor circuit check. SAT625B</p>
<p>3rd judgement flicker is longer than others.</p>  <p>SAT758A</p>	<p>Throttle sensor circuit is short-circuited or disconnected.</p>  <p>➡ Go to throttle sensor circuit check. SAT142B</p>

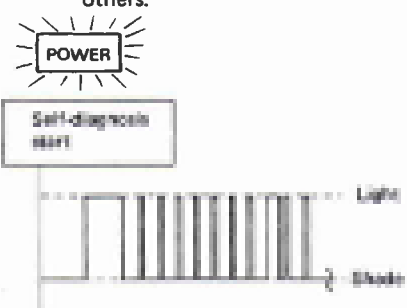
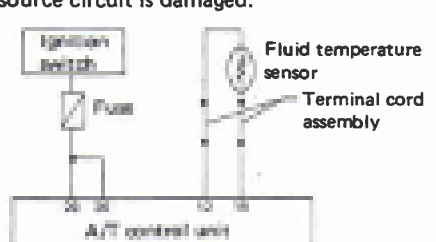
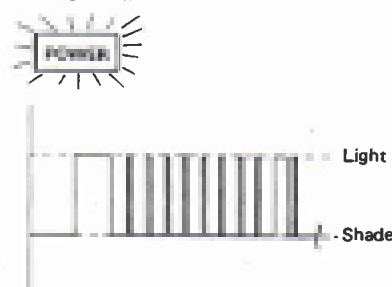
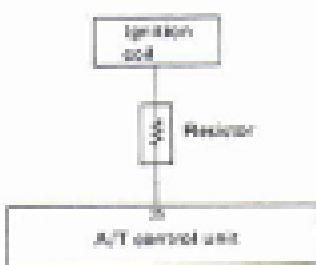
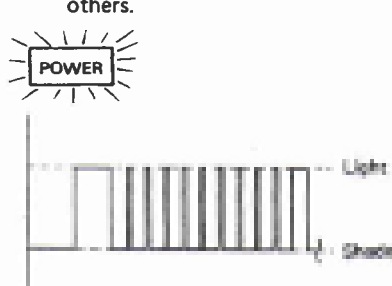
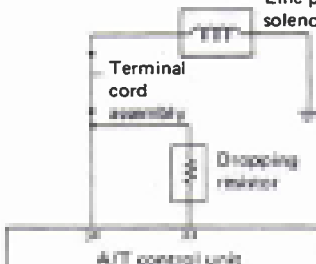
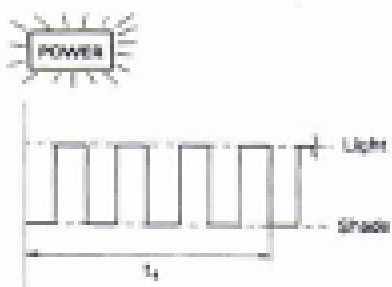
t<sub>1</sub> = 2.5 seconds    t<sub>2</sub> = 2.0 seconds    t<sub>3</sub> = 1.0 second



Trouble-shooting — Self-diagnosis (Cont'd)

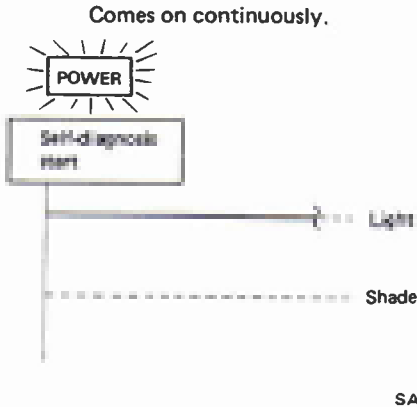
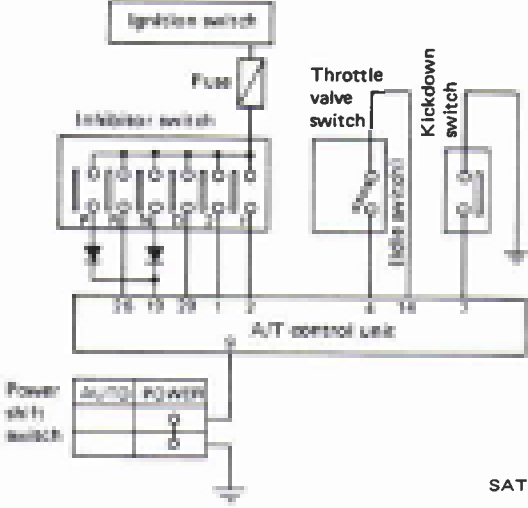
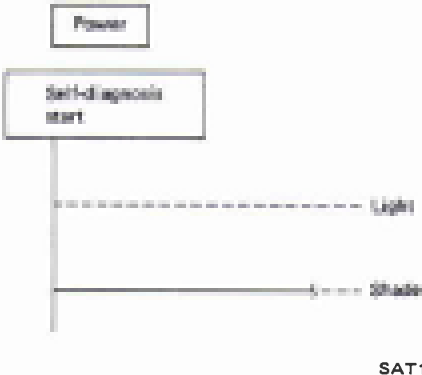
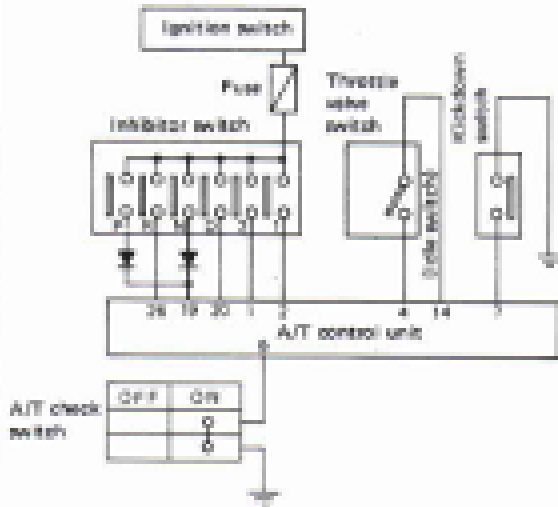
Power shift indicator lamp:	Damaged circuit
<p>4th judgement flicker is longer than others.</p>  <p>SAT762A</p>	<p>Shift solenoid A circuit is short-circuited or disconnected.</p>  <p>➡ Go to shift solenoid A circuit check. SAT766A</p>
<p>5th judgement flicker is longer than others.</p>  <p>SAT763A</p>	<p>Shift solenoid B circuit is short-circuited or disconnected.</p>  <p>➡ Go to shift solenoid B circuit check. SAT767A</p>
<p>6th judgement flicker is longer than others.</p>  <p>SAT764A</p>	<p>Overrun clutch solenoid circuit is short-circuited or disconnected.</p>  <p>➡ Go to overrun clutch solenoid circuit check. SAT768A</p>
<p>7th judgement flicker is longer than others.</p>  <p>SAT765A</p>	<p>Lock-up solenoid circuit is short-circuited or disconnected.</p>  <p>➡ Go to lock-up solenoid circuit check. SAT769A</p>

Trouble-shooting — Self-diagnosis (Cont'd)

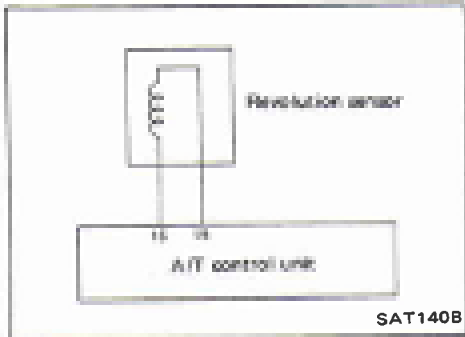
Power shift indicator lamp:	Damaged circuit
<p>8th judgement flicker is longer than others.</p>  <p>SAT770A</p>	<p>Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.</p>  <p>➡ Go to fluid temperature sensor and A/T control unit power source circuit check.</p> <p>SAT143B</p>
<p>9th judgement flicker is longer than others.</p>  <p>SAT771A</p>	<p>Engine revolution signal circuit is short-circuited or disconnected.</p>  <p>➡ Go to engine revolution signal circuit check.</p> <p>SAT624B</p>
<p>10th judgement flicker is longer than others.</p>  <p>SAT772A</p>	<p>Line pressure solenoid circuit is short-circuited or disconnected.</p>  <p>➡ Go to line pressure solenoid circuit check.</p> <p>SAT776A</p>
<p>Flickers as shown below.</p>  <p>SAT773A</p>	<p>Battery power is low.                      Battery has been disconnected for a long time.                      Battery is connected conversely.                      (When reconnecting A/T control unit connectors. — This is not a problem.)</p>

t<sub>4</sub> = 1.0 second

Trouble-shooting — Self-diagnosis (Cont'd)

<p>Except Gulf standard (Middle East) models</p>	<p><b>Power shift indicator lamp:</b></p> <p>Comes on continuously.</p>  <p style="text-align: right;">SAT777A</p>	<p><b>Damaged circuit</b></p> <p>Inhibitor switch, power shift switch, kickdown switch or idle switch circuit is disconnected or A/T control unit is damaged.</p>  <p style="text-align: right;">SAT144B</p> <p>➡ Go to inhibitor, power shift, kickdown and idle switch circuit checks.</p>
<p>Gulf standard (Middle East) models</p>	<p>Does not come on.</p>  <p style="text-align: right;">SAT146B</p>	<p>Inhibitor switch, A/T check switch, kickdown switch or idle switch circuit is disconnected or A/T control unit is damaged.</p>  <p style="text-align: right;">SAT145B</p> <p>➡ Go to inhibitor, A/T check, kickdown and idle switch circuit checks.</p>

**Trouble-shooting — Self-diagnosis (Cont'd)**  
**REVOLUTION SENSOR CIRCUIT CHECK**



**CHECK REVOLUTION SENSOR** — Refer to "Electrical System".

N.G. → Repair or replace revolution sensor.

**A** **CHECK INPUT SIGNAL**

1. N.G. → Check the following items.

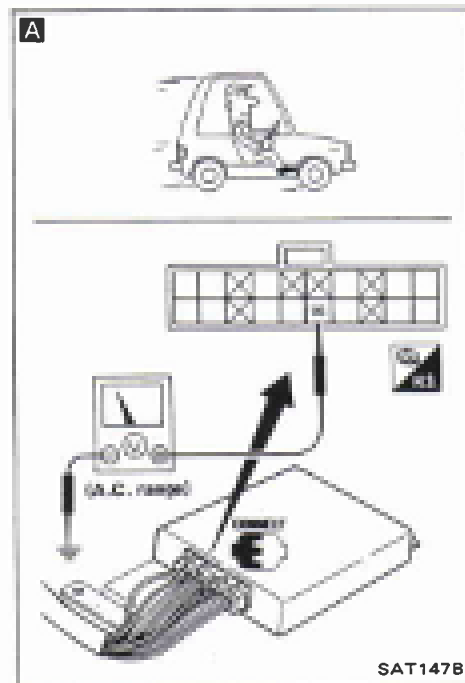
- Harness continuity between A/T control unit and revolution sensor (Main harness)

2. Check voltage between A/T control unit terminal ⑮ and ground while driving. (Measure with A.C. range.)

**Voltage:**

- at 0 km/h (0 MPH): 0V
- at 30 km/h (19 MPH): 1V or more

(Voltage rises gradually in response to vehicle speed)



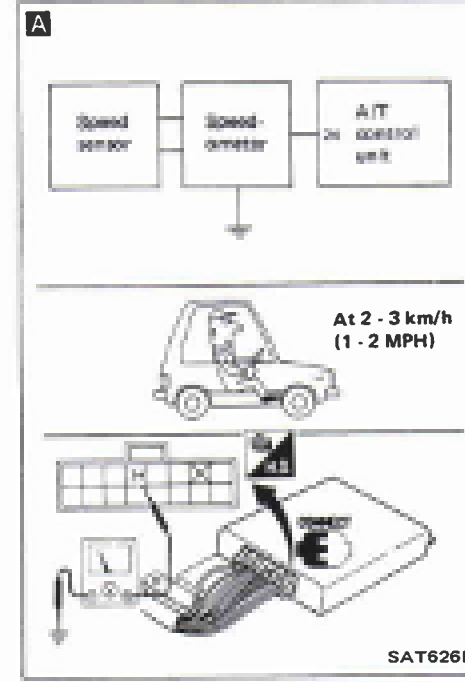
O.K. → Perform self-diagnosis again after driving for a while.

N.G. → 1. Perform A/T control unit input/output signal inspection.

O.K. → **INSPECTION END**

2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

**SPEED SENSOR CIRCUIT CHECK**



**A** **CHECK INPUT SIGNAL**

1. N.G. → Check the following items.

- Speed sensor and ground circuit for speed sensor — Refer to section EL.
- Harness continuity between A/T control unit and speed sensor (Main harness)

2. Check voltage between A/T control unit terminal ⑳ and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.

**Voltage: Varies from 0V to 5V**

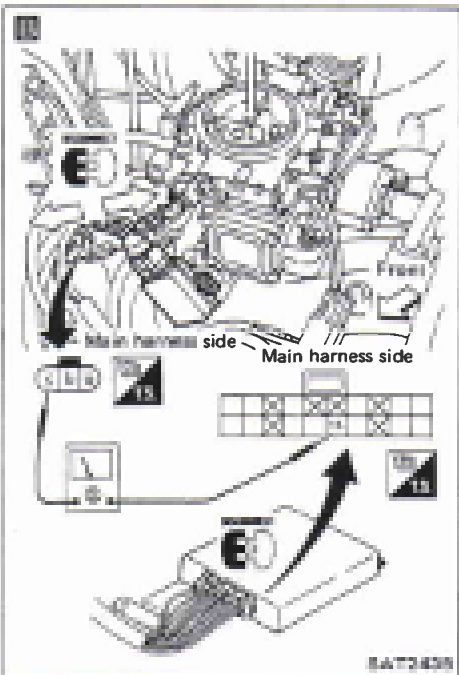
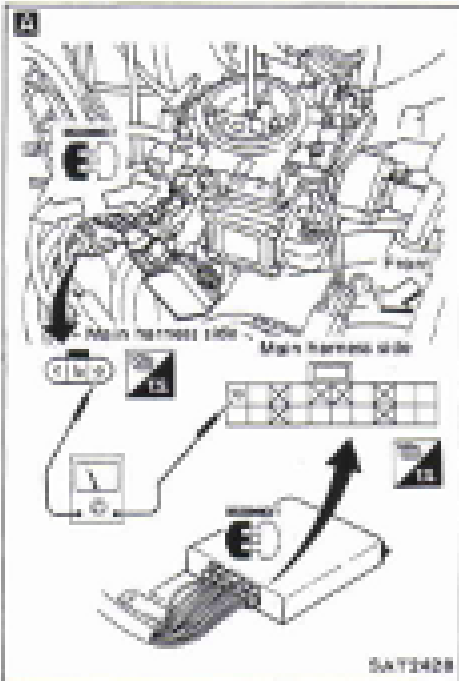
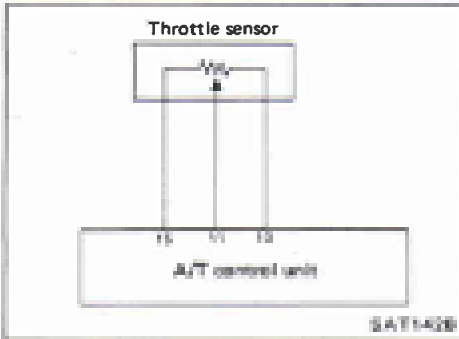
O.K. → Perform self-diagnosis again after driving for a while.

N.G. → 1. Perform A/T control unit input/output signal inspection.

O.K. → **INSPECTION END**

2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

**Trouble-shooting — Self-diagnosis (Cont'd)**  
**THROTTLE SENSOR CIRCUIT CHECK**



**14**

**CHECK POWER SOURCE CIRCUIT**

1.

2. Disconnect throttle sensor harness connector.

3. Disconnect A/T control unit 20-pin connector.

4. Check resistance between terminal ⑩ and A/T control unit terminal ⑩.

Resistance:  
 Approximately 0Ω

N.G. → Repair or replace harness between A/T control unit ⑩ and throttle sensor (Main harness).

**15**

**CHECK GROUND CIRCUIT**

1.

2. Check resistance between terminal ⑮ and A/T control unit terminal ⑮.

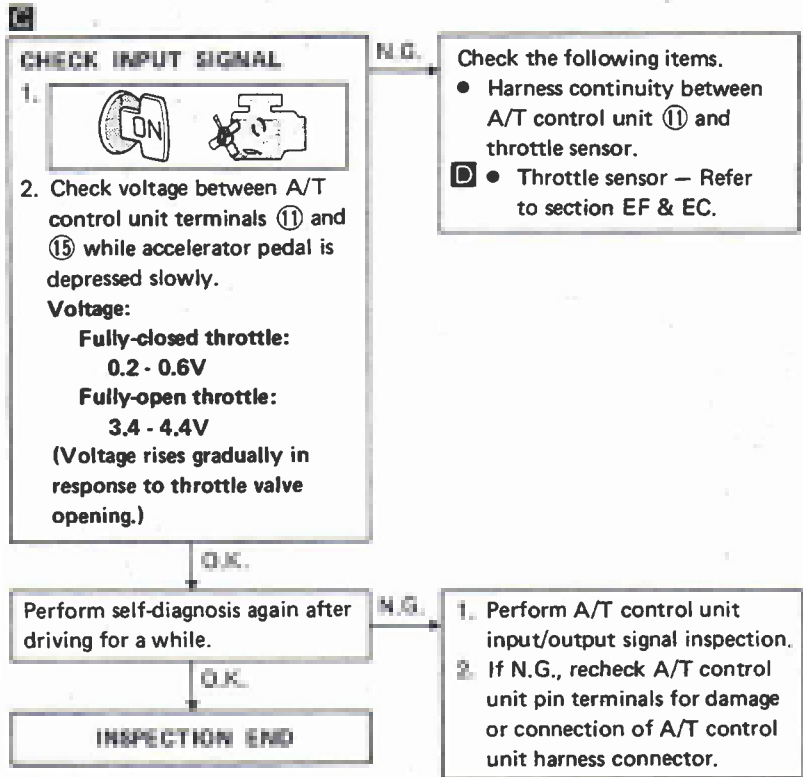
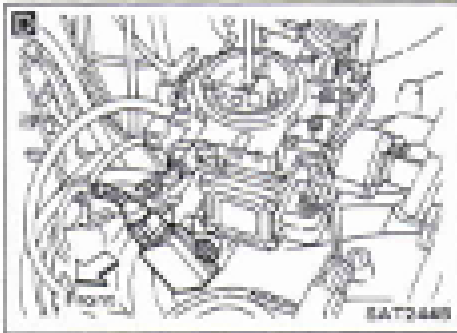
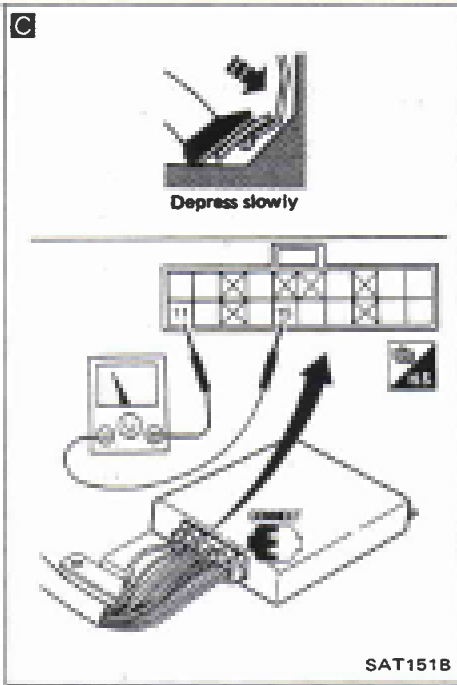
Resistance:  
 Approximately 0Ω

3. Reinstall any part removed.

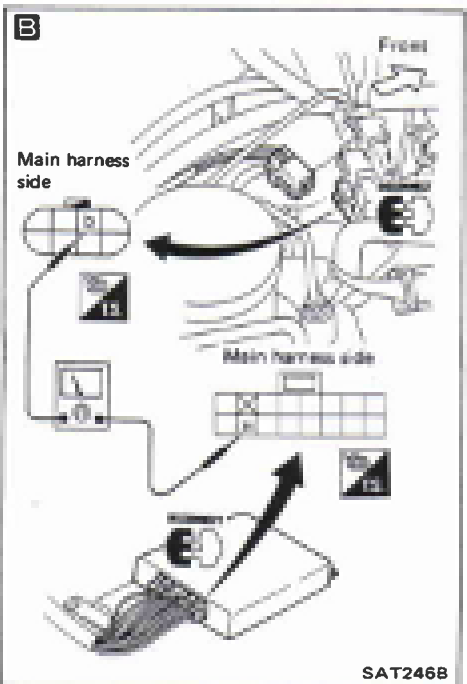
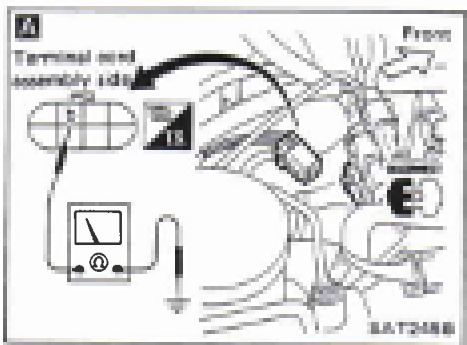
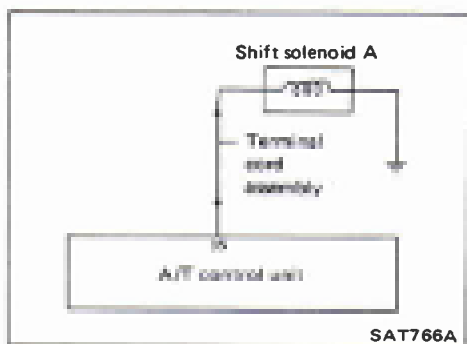
N.G. → Repair or replace harness between A/T control unit ⑮ and throttle sensor (Main harness).

O.K. → To the next page.

Trouble-shooting — Self-diagnosis (Cont'd)



Trouble-shooting — Self-diagnosis (Cont'd)  
SHIFT SOLENOID A CIRCUIT CHECK



**A**

**CHECK GROUND CIRCUIT**

1.

2. Disconnect terminal cord assembly connector in engine compartment.

3. Check resistance between terminal ⑬ and ground.  
Resistance: 20 - 30Ω

N.G.

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Shift solenoid A — Refer to "Electrical System".
  - Harness continuity of terminal cord assembly

O.K.

**B**

**CHECK POWER SOURCE CIRCUIT**

1.

2. Disconnect A/T control unit 16-pin connector.

3. Check resistance between terminal ⑬ and A/T control unit terminal ⑳.  
Resistance:  
Approximately 0Ω

4. Reinstall any part removed.

N.G.

Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K.

Perform self-diagnosis after driving for a while.

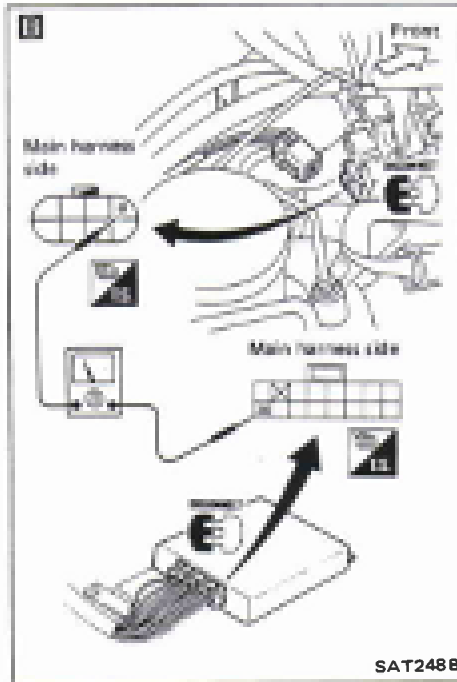
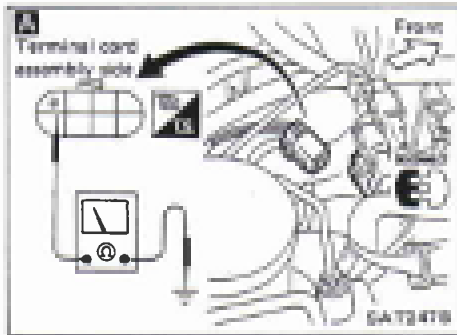
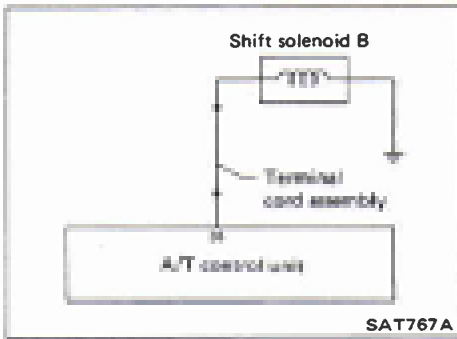
O.K.

**INSPECTION END**

N.G.

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

**Trouble-shooting — Self-diagnosis (Cont'd)**  
**SHIFT SOLENOID B CIRCUIT CHECK**



**A**

**CHECK GROUND CIRCUIT**

1.

2. Disconnect terminal cord assembly connector in engine compartment.

3. Check resistance between terminal ③ and ground.  
 Resistance: 20 - 30Ω

N.G.

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Shift solenoid B — Refer to "Electrical System".
  - Harness continuity of terminal cord assembly

O.K.

**B**

**CHECK POWER SOURCE CIRCUIT**

1.

2. Disconnect A/T control unit 16-pin connector.

3. Check resistance between terminal ③ and A/T control unit terminal ③6.  
 Resistance:  
 Approximately 0Ω

4. Reinstall any part removed.

N.G.

Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K.

Perform self-diagnosis after driving for a while.

O.K.

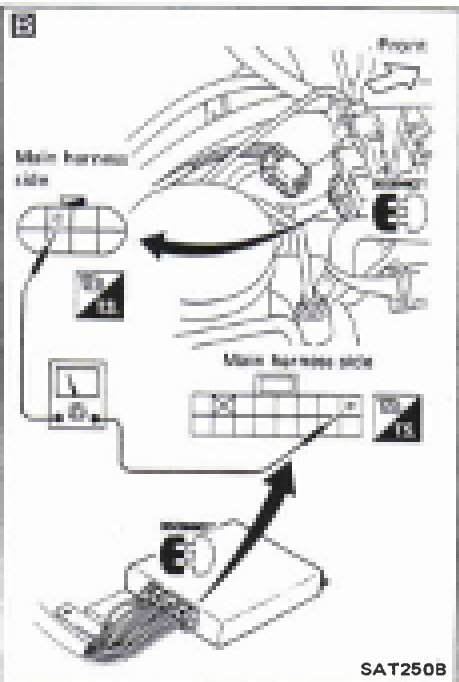
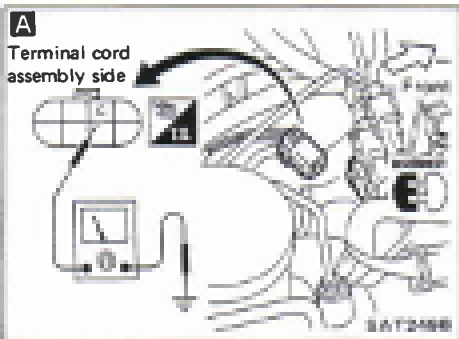
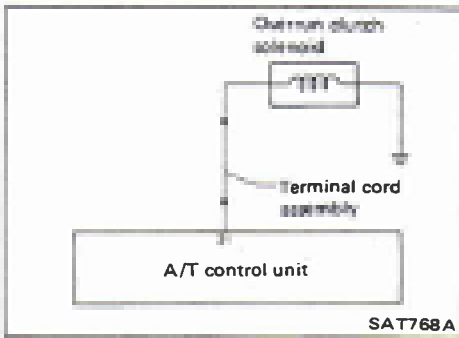
**INSPECTION END**

N.G.

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.



**Trouble-shooting — Self-diagnosis (Cont'd)**  
**OVERRUN CLUTCH SOLENOID CIRCUIT CHECK**



**A**

**CHECK GROUND CIRCUIT**

1.

2. Disconnect terminal cord assembly connector in engine compartment.

3. Check resistance between terminal **C** and ground.  
**Resistance: 20 - 30Ω**

N.G.

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Overrun clutch solenoid. — Refer to "Electrical System".
  - Harness continuity of terminal cord assembly

O.K.

**B**

**CHECK POWER SOURCE CIRCUIT**

1.

2. Disconnect A/T control unit 16-pin connector.

3. Check resistance between terminal **C** and A/T control unit terminal **21**.  
**Resistance: Approximately 0Ω**

4. Reinstall any part removed.

N.G.

Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K.

Perform self-diagnosis after driving for a while.

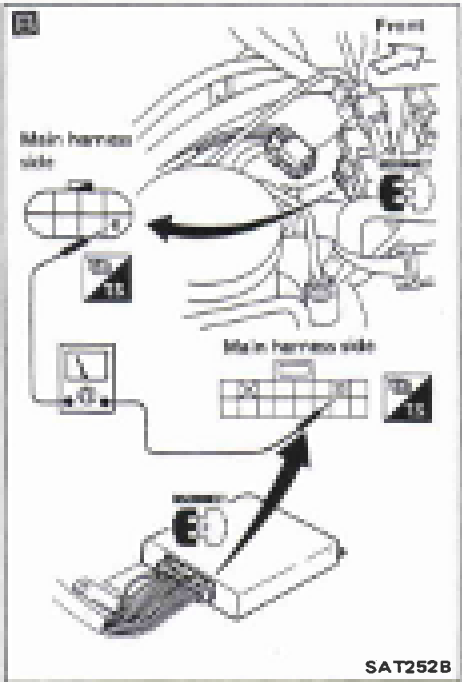
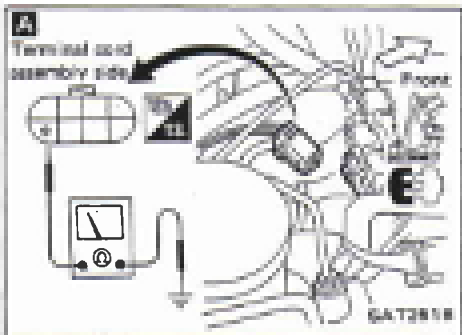
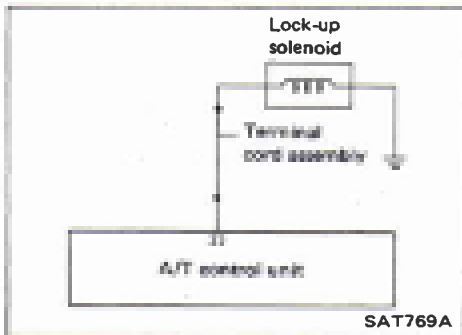
O.K.

**INSPECTION END**

N.G.


1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

**Trouble-shooting — Self-diagnosis (Cont'd)**  
**LOCK-UP SOLENOID CIRCUIT CHECK**



**A**

**CHECK GROUND CIRCUIT**

1. 

2. Disconnect terminal cord assembly connector in engine compartment.


3. Check resistance between terminal ⑨ and ground.  
**Resistance: 10 - 16Ω**

- N.G.
1. Remove oil pan. — Refer to "ON-VEHICLE SERVICE".
  2. Check the following items.
    - Lock-up solenoid — Refer to "Electrical System".
    - Harness continuity of terminal cord assembly

O.K.

**B**

**CHECK POWER SOURCE CIRCUIT**

1. 

2. Disconnect A/T control unit 16-pin connector.

3. Check resistance between terminal ⑨ and A/T control unit terminal ⑫.  
**Resistance: Approximately 0Ω**

4. Reinstall any part removed.

- N.G.
- Repair or replace harness between A/T control unit and terminal cord assembly. (Main harness)

O.K.

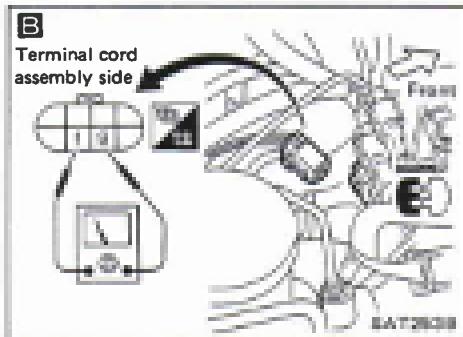
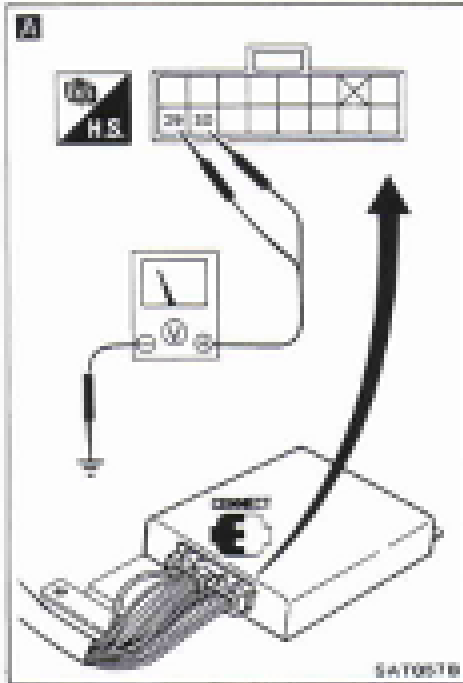
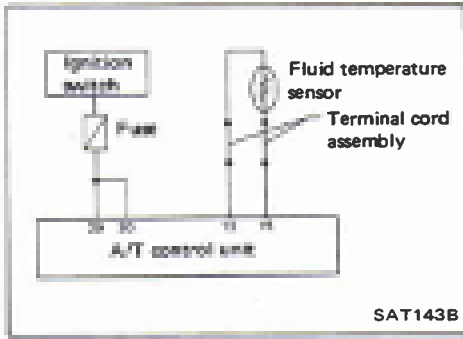
Perform self-diagnosis after driving for a while.

O.K.

**INSPECTION END**

- N.G.
1. Perform A/T control unit input/output signal inspection.
  2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

**Trouble-shooting — Self-diagnosis (Cont'd)**  
**FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS**



**A**

**CHECK A/T CONTROL UNIT POWER SOURCE**

- 
- Check voltage between A/T control unit terminals ⑳, ㉑ and ground.  
**Battery voltage should exist.**

N.G.

Check the following items.

- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch and fuse — Refer to section EL.

D.K.

**B**

**CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY**

- 
- Disconnect terminal cord assembly connector in engine compartment.
- Check resistance between terminal ① and ③ when A/T is cold.  
**Resistance:**  
**Cold [20°C (68°F)]**  
**Approximately 2.5 kΩ**
- Reinstall any part removed.

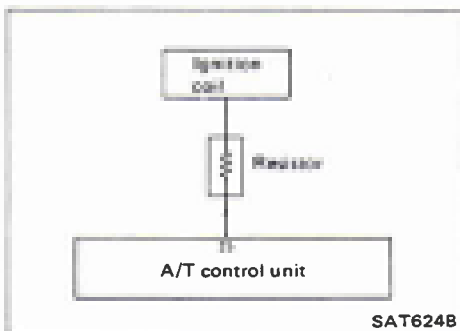
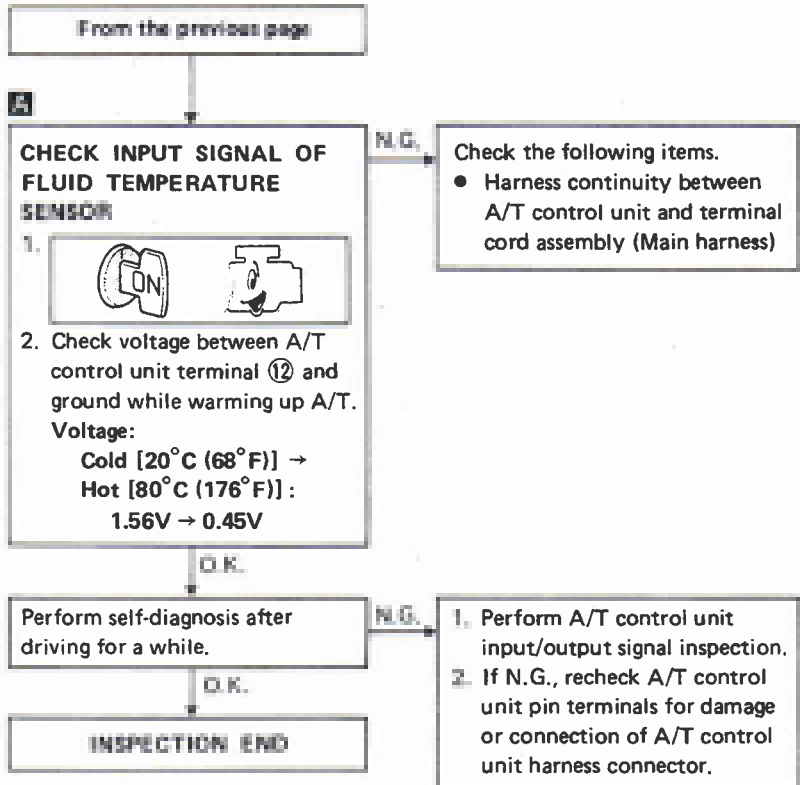
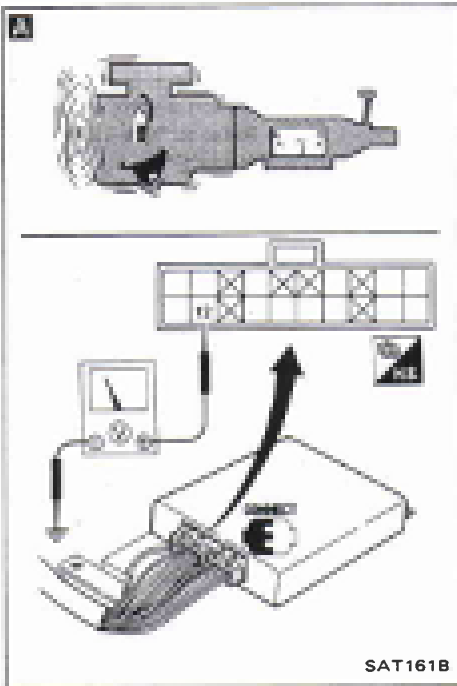
N.O.

1. Remove oil pan.
2. Check the following items.
  - Fluid temperature sensor — Refer to "Electrical System".
  - Harness continuity of terminal cord assembly

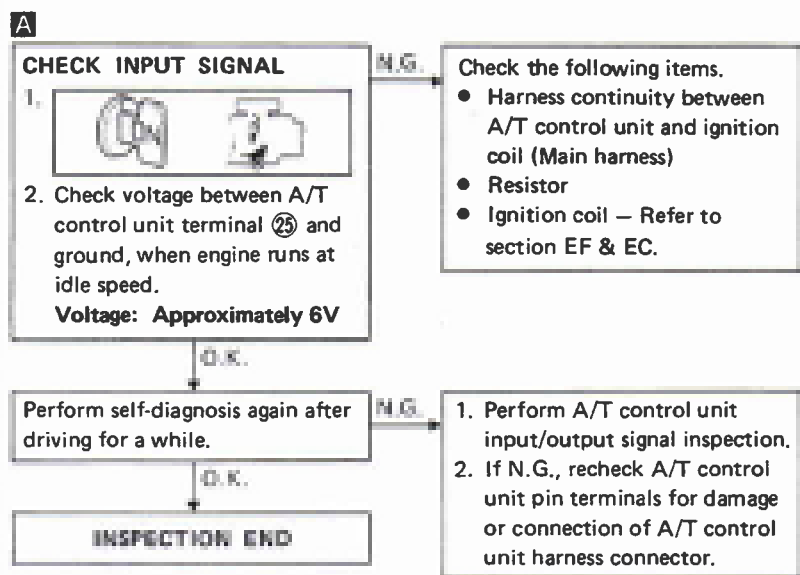
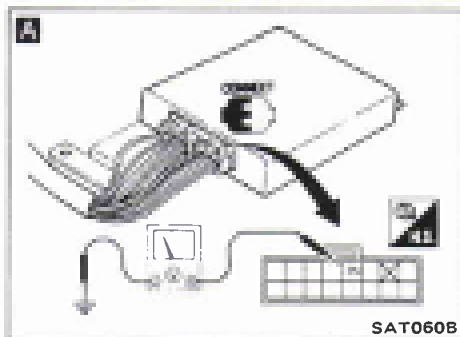
D.K.

**To the next page**

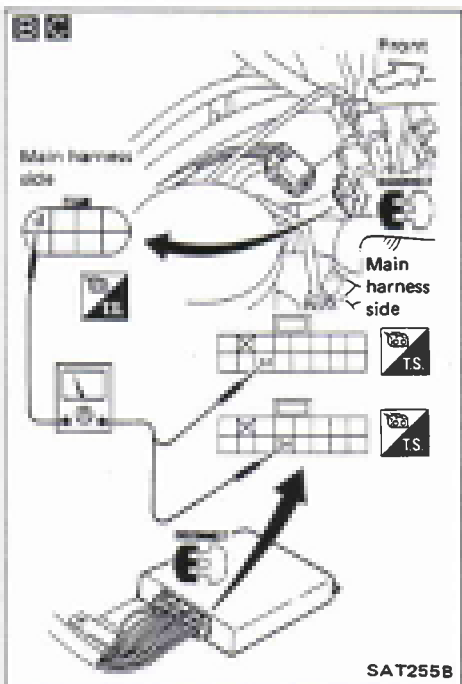
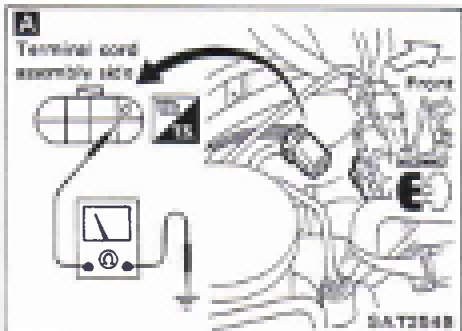
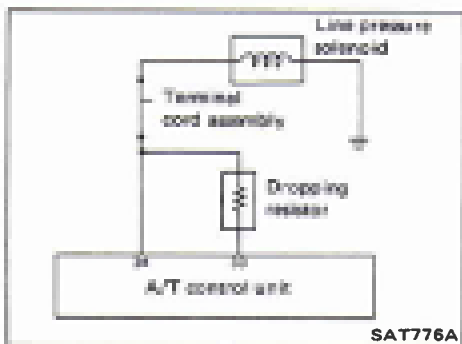
Trouble-shooting — Self-diagnosis (Cont'd)



ENGINE REVOLUTION SIGNAL CIRCUIT CHECK



**Trouble-shooting — Self-diagnosis (Cont'd)**  
**LINE PRESSURE SOLENOID CIRCUIT CHECK**



**A**  
**CHECK GROUND CIRCUIT**

1. Disconnect terminal cord assembly connector in engine compartment.
2. Check resistance between terminal ① and ground.  
Resistance: 2.5 - 5Ω

N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
  - Line pressure solenoid — Refer to "Electrical System".
  - Harness continuity of terminal cord assembly

O.K. ↓  
**B**  
**CHECK POWER SOURCE CIRCUIT**

1. Disconnect A/T control unit 16-pin connector.
2. Check resistance between terminal ① and A/T control unit terminal ③③.  
Resistance: 11.2 - 12.8Ω

N.G. →

Check the following items.

- Dropping resistor — Refer to "Electrical System".
- Harness continuity between A/T control unit ③③ and terminal cord assembly (Main harness)

O.K. ↓  
**C**  
**CHECK POWER SOURCE CIRCUIT**

1. Check resistance between terminal ① and A/T control unit terminal ④④.  
Resistance: Approximately 0Ω
2. Reinstall any part removed.

N.G. →

Repair or replace harness between A/T control unit ④④ and terminal cord assembly.

O.K. ↓  
 Perform self-diagnosis after driving for a while.

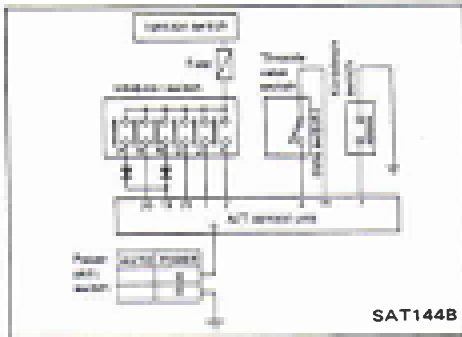
N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

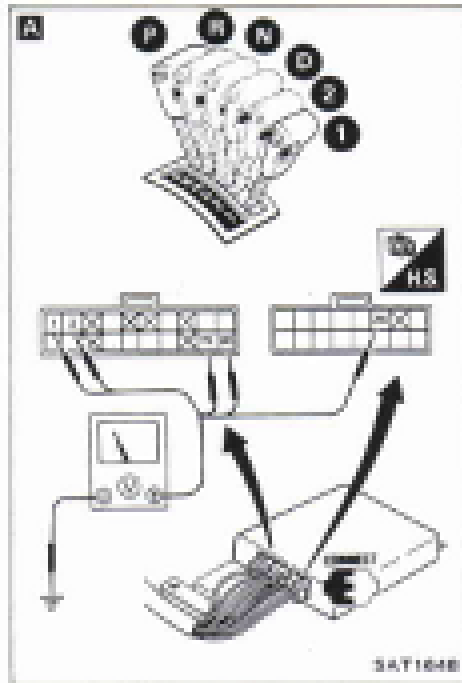
O.K. ↓  
**INSPECTION END**

**Trouble-shooting — Self-diagnosis (Cont'd)**  
**—Except Gulf Standard (Middle East) Models—**

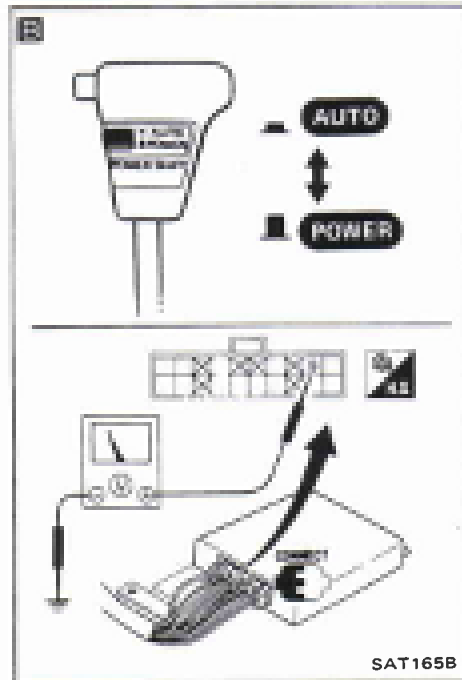
**INHIBITOR, POWER SHIFT, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS**



SAT144B



SAT164B



SAT165B

**A**

**CHECK INHIBITOR SWITCH CIRCUIT**

1.

2. Check voltage between A/T control unit terminals ①, ②, ⑱, ⑳, ㉔ and ground while moving selector lever through each range.

**Voltage:**  
**B: Battery voltage**  
**0: 0V**

Terminal No.	⑱	㉔	⑳	①	②
Lever position					
P, N	B	0	0	0	0
R	0	B	0	0	0
D	0	0	B	0	0
2	0	0	0	B	0
1	0	0	0	0	B

- N.G. →
- Check the following items.
- Inhibitor switch — Refer to "Electrical System".
  - Harness continuity between ignition switch and inhibitor switch (Main harness)
  - Harness continuity between inhibitor switch and A/T control unit (Main harness)

**B**

**CHECK POWER SHIFT SWITCH CIRCUIT**

1.

2. Check voltage between A/T control unit terminal ⑨ and ground when power shift switch is in "AUTO" position and in "POWER" position.

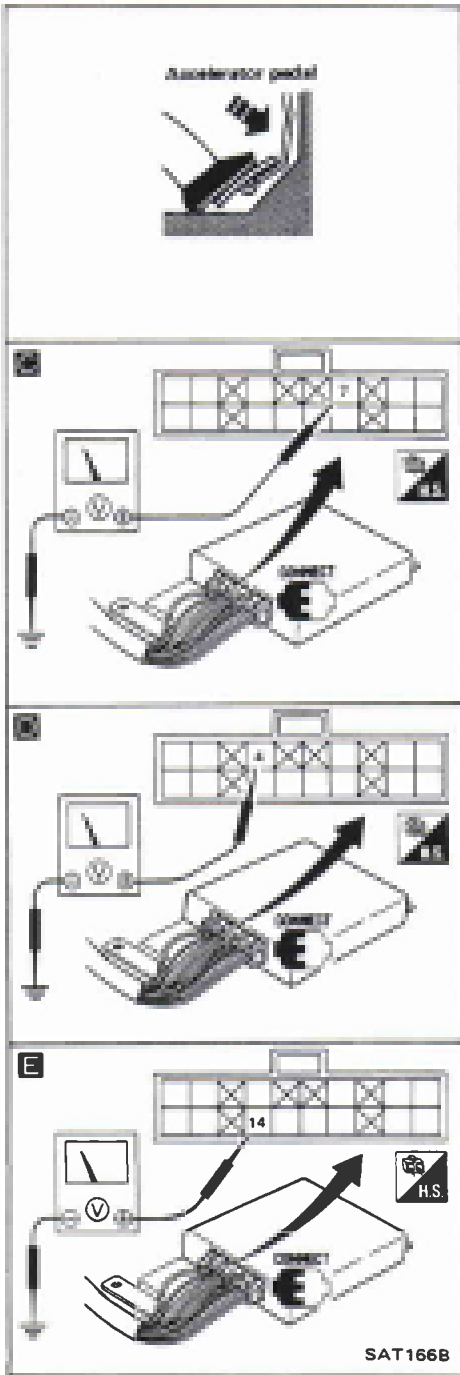
Switch position	Voltage
AUTO	3 - 8V
POWER	1V or less

- N.G. →
- Check the following items.
- Power shift switch — Refer to "Electrical System".
  - Harness continuity between A/T control unit and power shift switch (Main harness)
  - Harness continuity of ground circuit for power shift switch (Main harness)

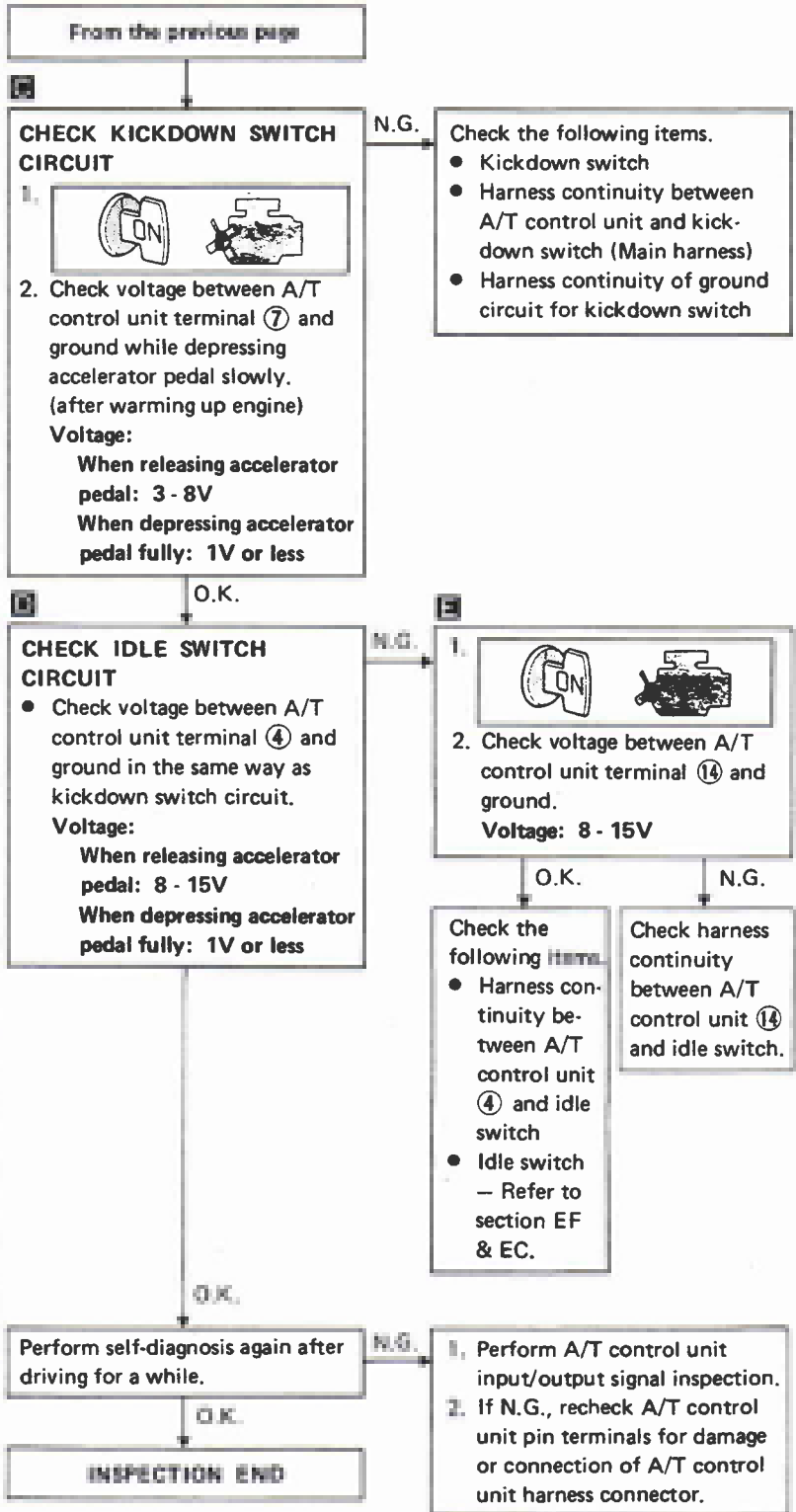
O.K. ↓

To the next page

Trouble-shooting — Self-diagnosis (Cont'd)

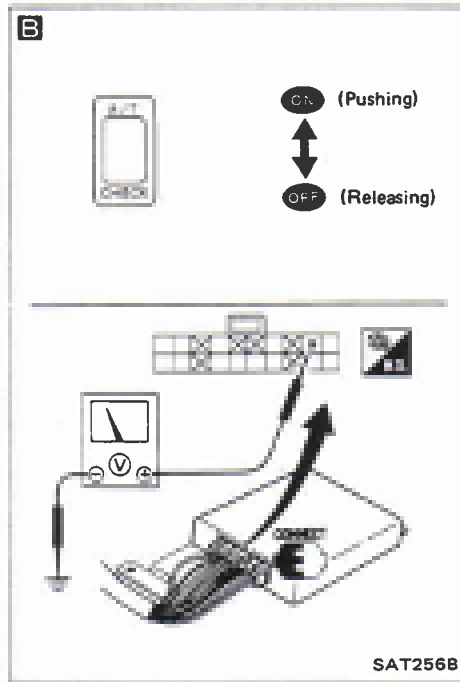
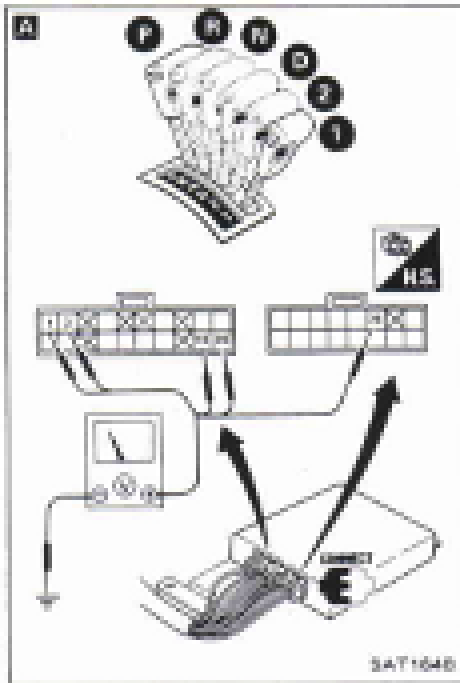
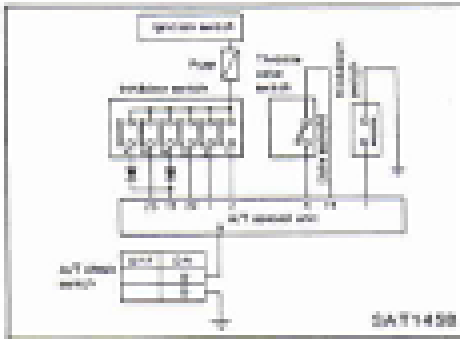


SAT166B



**Trouble-shooting — Self-diagnosis (Cont'd)**  
**—Gulf Standard (Middle East) Models—**

**INHIBITOR, A/T CHECK, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS**



**A**

**CHECK INHIBITOR SWITCH CIRCUIT**

1.

2. Check voltage between A/T control unit terminals ①, ②, ⑱, ⑳, ㉔ and ground while moving selector lever through each range.

**Voltage:**  
**B: Battery voltage**  
**0: 0V**

Terminal No.	⑱	㉔	⑳	①	②
Lever position					
P, N	B	0	0	0	0
R	0	B	0	0	0
D	0	0	B	0	0
2	0	0	0	B	0
1	0	0	0	0	B

- N.G.
- Check the following items.
- Inhibitor switch — Refer to "Electrical System".
  - Harness continuity between ignition switch and inhibitor switch (Main harness)
  - Harness continuity between inhibitor switch and A/T control unit (Main harness)

O.K.

**B**

**CHECK A/T CHECK SWITCH CIRCUIT**

1.

2. Check voltage between A/T control unit terminal ⑨ and ground when A/T check switch is in "ON" position and in "OFF" position.

Switch position	Voltage
OFF	3 - 8V
ON	1V or less

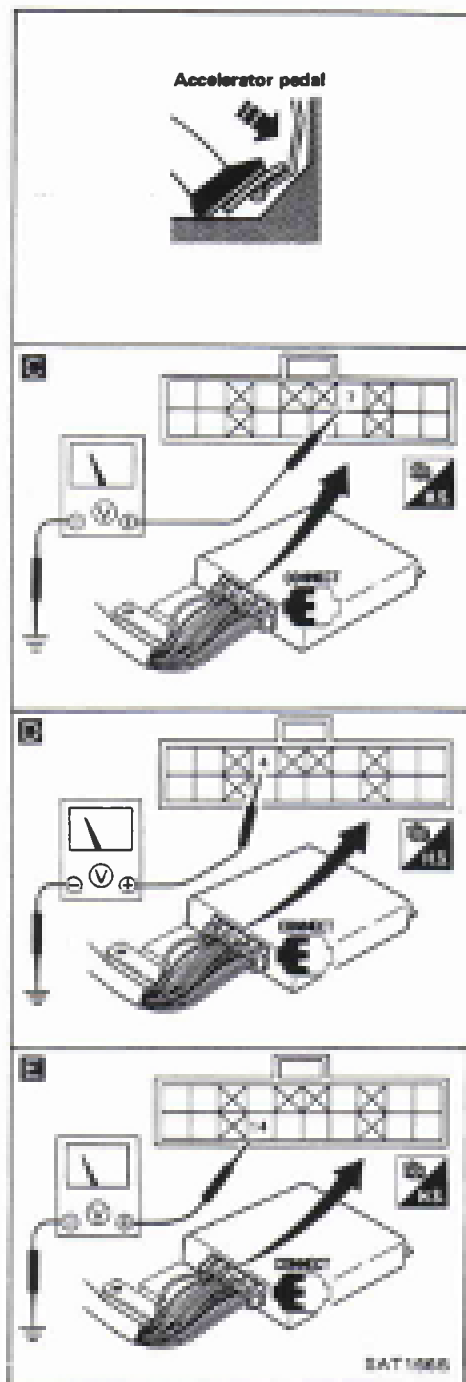
- N.G.
- Check the following items.
- A/T check switch — Refer to "Electrical System".
  - Harness continuity between A/T control unit and A/T check switch (Main harness)
  - Harness continuity of ground circuit for A/T check switch (Main harness)

O.K.

To the next page



Trouble-shooting — Self-diagnosis (Cont'd)



From the previous page

**CHECK KICKDOWN SWITCH CIRCUIT**

- 
- Check voltage between A/T control unit terminal ⑦ and ground while depressing accelerator pedal slowly. (after warming up engine)  
**Voltage:**  
 When releasing accelerator pedal: 3 - 8V  
 When depressing accelerator pedal fully: 1V or less

N.G.

Check the following items.

- Kickdown switch
- Harness continuity between A/T control unit and kickdown switch (Main harness)
- Harness continuity of ground circuit for kickdown switch

O.K.

**CHECK IDLE SWITCH CIRCUIT**

- Check voltage between A/T control unit terminal ④ and ground in the same way as kickdown switch circuit.  
**Voltage:**  
 When releasing accelerator pedal: 8 - 15V  
 When depressing accelerator pedal fully: 1V or less

N.G.

- 
- Check voltage between A/T control unit terminal ⑭ and ground.  
**Voltage: 8 - 15V**

O.K.

Check the following items.

- Harness continuity between A/T control unit ④ and idle switch
- Idle switch — Refer to section EF & EC.

N.G.

Check harness continuity between A/T control unit ⑭ and idle switch.

O.K.

Perform self-diagnosis again after driving for a while.

N.G.

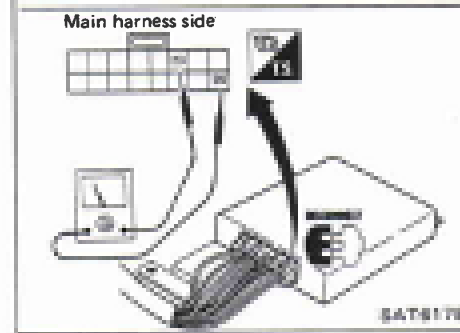
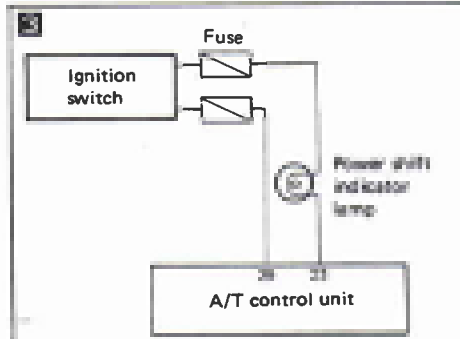
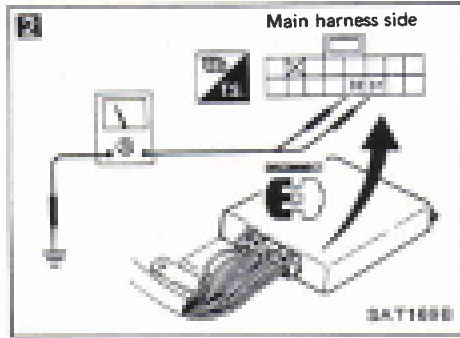
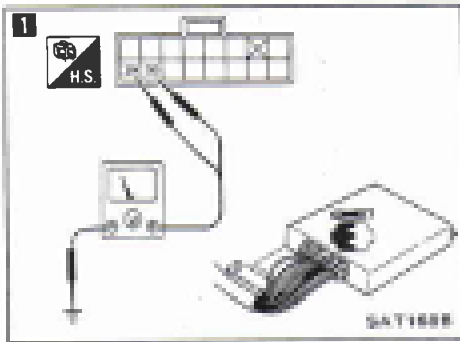
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

**INSPECTION END**

**Trouble-shooting**

**CHECK ① :** Power shift indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".



**1**

**CHECK A/T CONTROL UNIT POWER SOURCE**

1.

2. Check voltage between A/T control unit terminals ⑳, ㉑ and ground. Battery voltage should exist.

N.G.

Check the following items.

- Harness continuity between ignition switch and A/T control unit (Main harness)
- Ignition switch and fuse – Refer to section EL.

**2**

**CHECK A/T CONTROL UNIT GROUND CIRCUIT**

1.

2. Disconnect A/T control unit 16-pin connector.

3. Check resistance between A/T control unit terminals ㉒, ㉓ and ground. Resistance: Approximately 0Ω

N.G.

Check harness continuity between A/T control unit and ground.

**3**

**CHECK LAMP CIRCUIT**

1.

2. Disconnect A/T control unit 16-pin connector.

3. Check resistance between A/T control unit terminals ㉔ and ㉕. Resistance: Approximately 50Ω

4. Reinstall any part removed.

N.G.

Check the following items.

- Power shift indicator lamp – Refer to section EL.
- Harness continuity between ignition switch and power shift indicator lamp (Main harness)
- Harness continuity between power shift indicator lamp and A/T control unit

O.K.

Check age n.

O.K.

**INSPECTION END.**

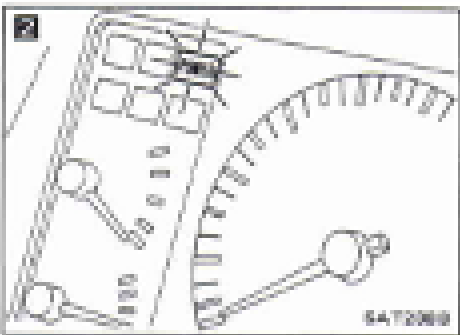
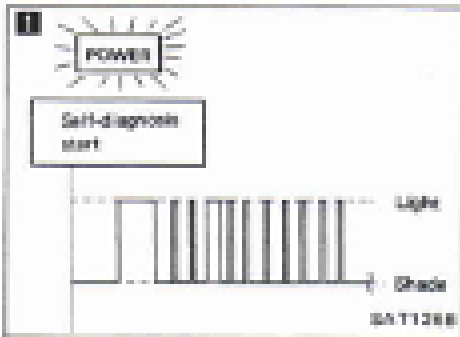
N.G.

1. Perform A/T control unit input/output signal inspection.

2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

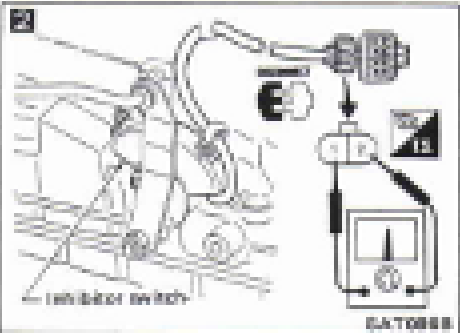
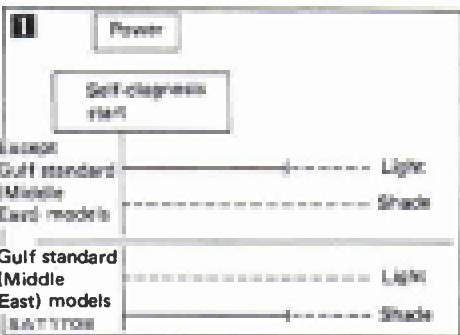
**Trouble-shooting (Cont'd)**

**CHECK ② : Power shift indicator lamp does not come on for about 3 seconds when depressing and releasing accelerator pedal fully.**



```

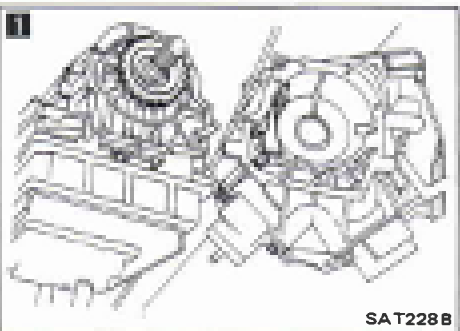
    graph TD
        Q1{Does self-diagnosis show damage to throttle sensor circuit?}
        Q1 -- No --> A1[Check throttle sensor circuit. - Refer to "Self-diagnosis".]
        Q1 -- Yes --> Q2{Check throttle sensor. - Refer to section EF & EC.}
        Q2 -- N.G. --> A2[Repair or replace throttle sensor.]
        Q2 -- O.K. --> Q3{Check condition of power shift indicator lamp again.}
        Q3 -- O.K. --> END1[INSPECTION END]
        Q3 -- N.G. --> A3[1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
    
```



**CHECK ③ : Engine cannot be started with selector lever in "P" or "N" range or engine can be started with selector lever in "D", "2", "1" or "R" range.**

```

    graph TD
        Q1{Does self-diagnosis show damage to inhibitor switch circuit?}
        Q1 -- Yes --> A1[Check inhibitor switch circuit. - Refer to "Self-diagnosis".]
        Q1 -- No --> Q2{Check continuity of inhibitor switch 2-pin connector. - Refer to "Electrical System".}
        Q2 -- N.G. --> A2[Repair or replace inhibitor switch.]
        Q2 -- O.K. --> Q3{Check starting system. - Refer to section EL.}
        Q3 -- N.G. --> A3[Repair or replace damaged parts.]
        Q3 -- O.K. --> END2[INSPECTION END]
    
```



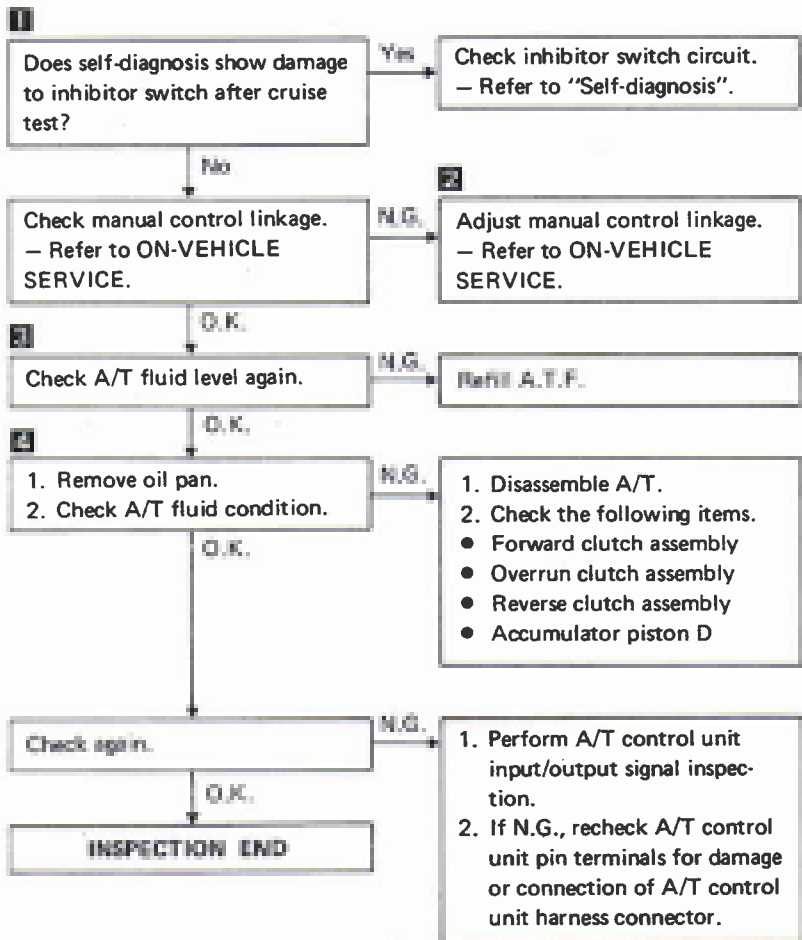
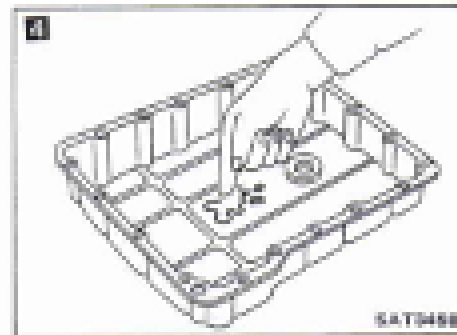
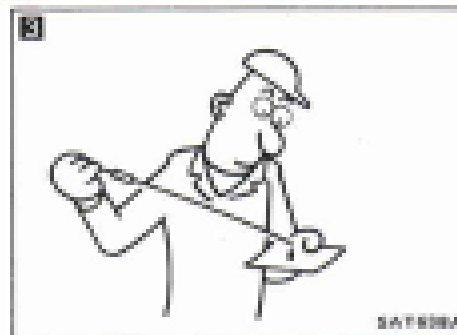
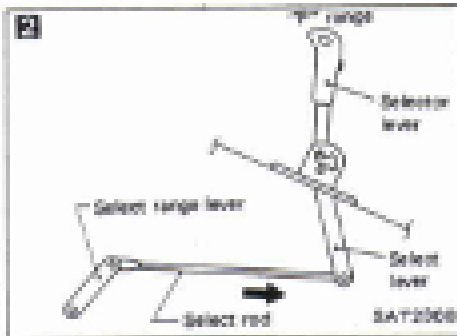
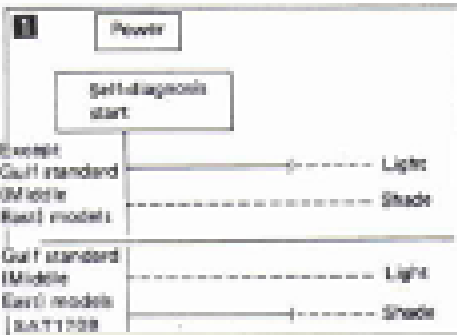
**CHECK ④ : Vehicle moves when it is pushed forward or backward with selector lever in "P" range.**

```

    graph TD
        Q1{Check parking components. - Refer to "ON-VEHICLE SERVICE".}
        Q1 -- N.G. --> A1[Repair or replace damaged parts.]
        Q1 -- O.K. --> END3[INSPECTION END]
    
```

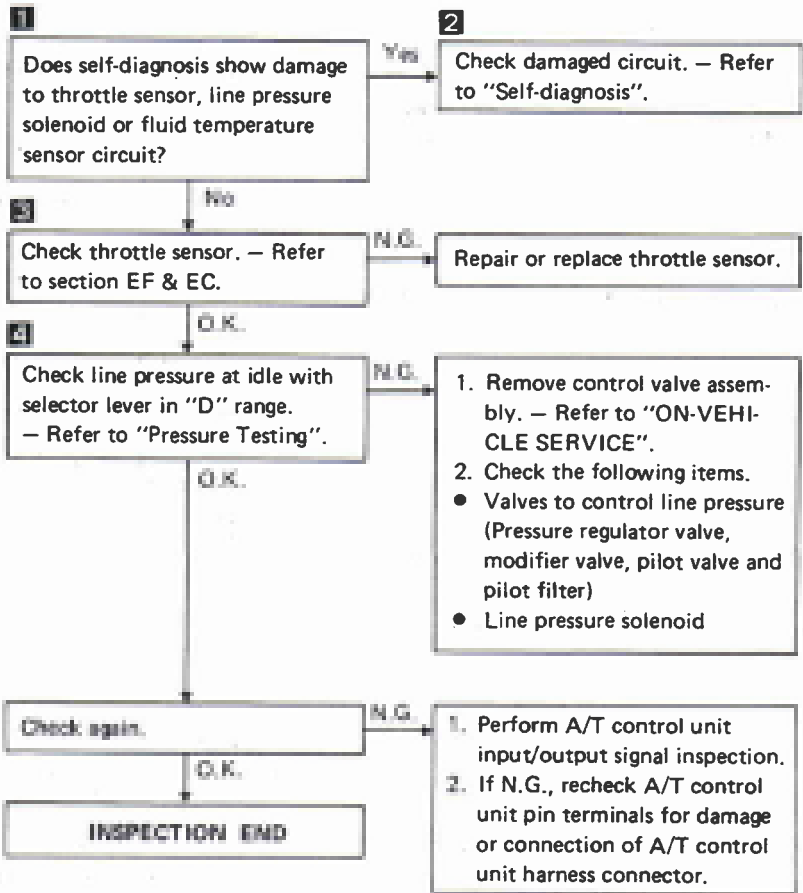
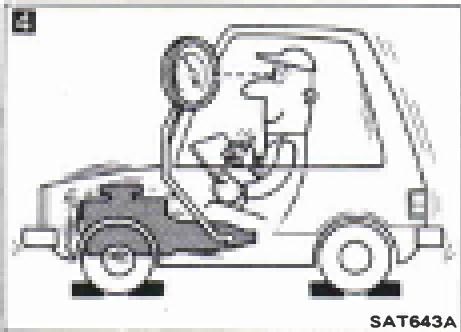
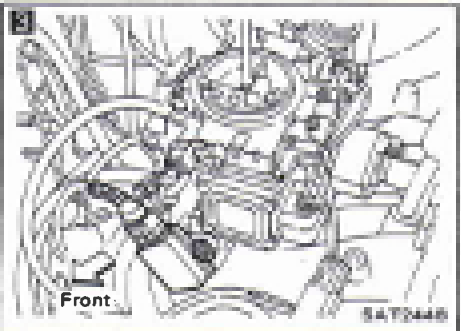
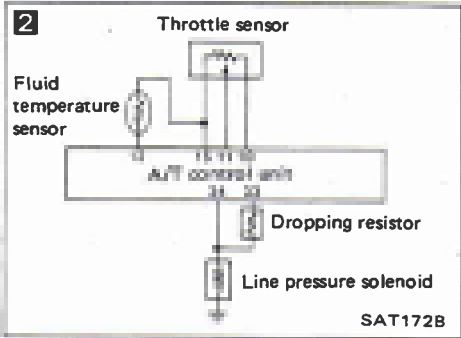
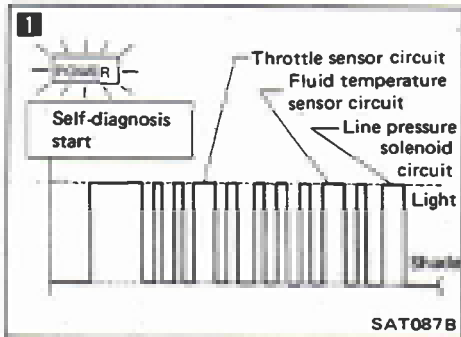
**Trouble-shooting (Cont'd)**

**CHECK ⑤ : Vehicle moves forward or backward when selecting "N" range.**



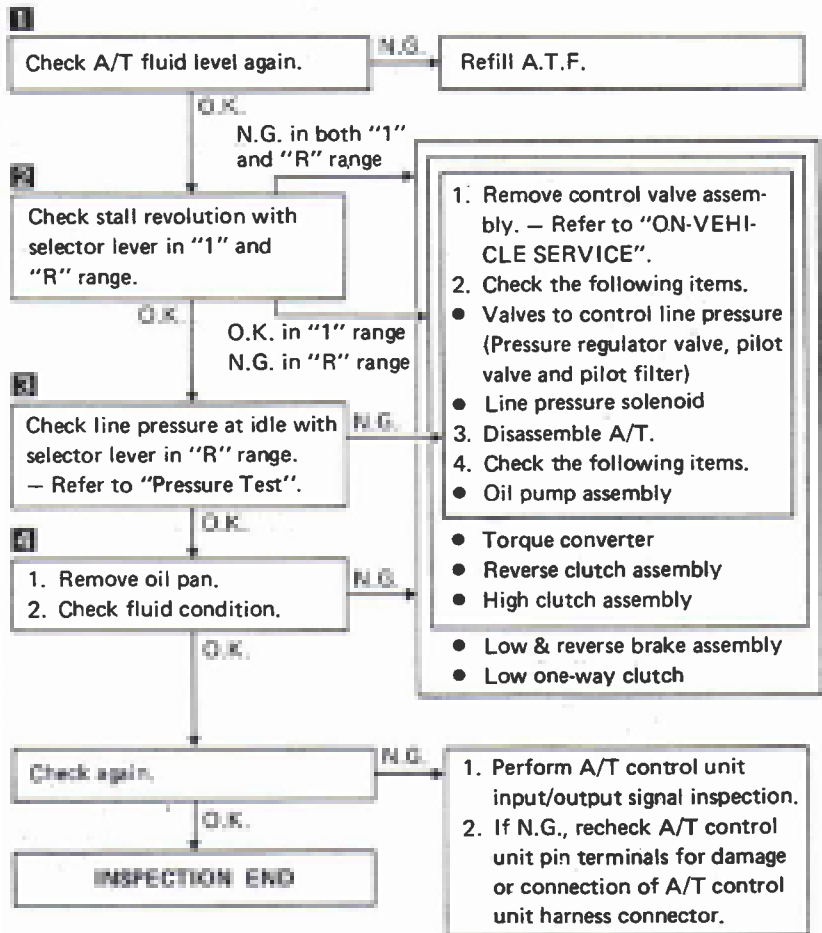
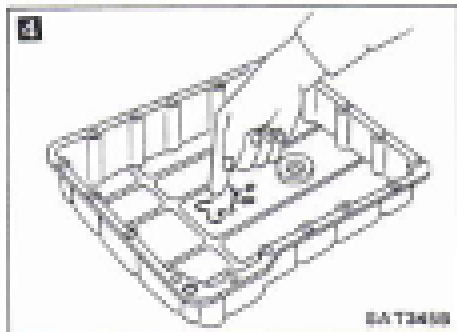
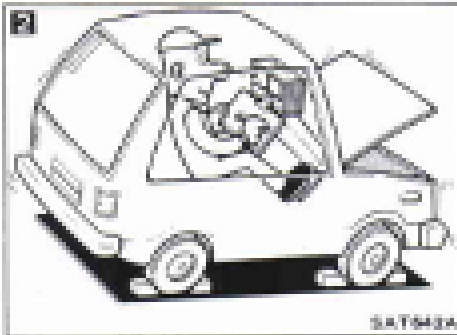
## Trouble-shooting (Cont'd)

**CHECK ⑥ : There is large shock when changing from "N" to "R" range.**



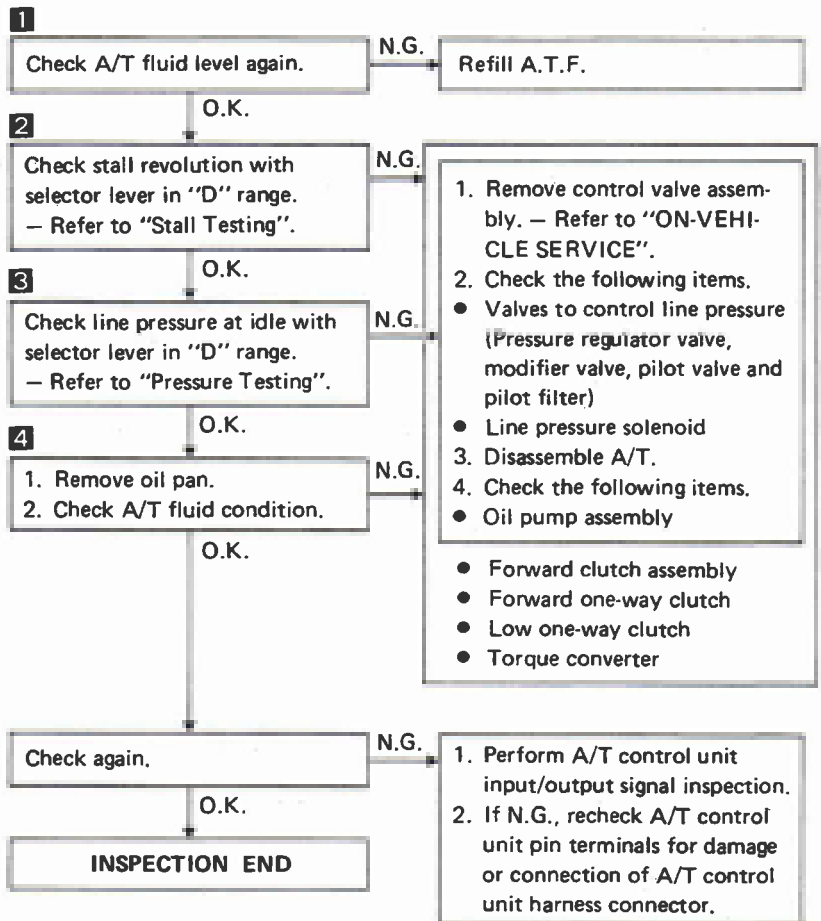
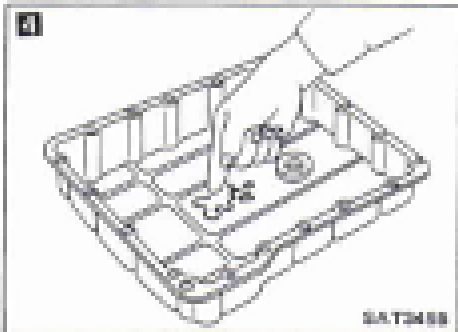
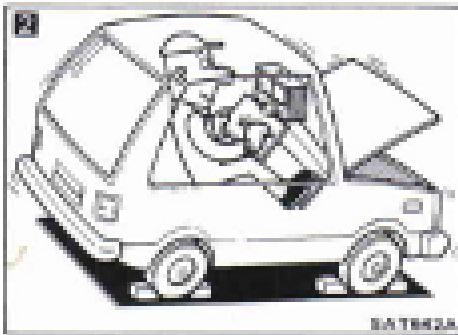
**Trouble-shooting (Cont'd)**

**CHECK ⑦ : Vehicle does not creep backward when selecting "R" range.**



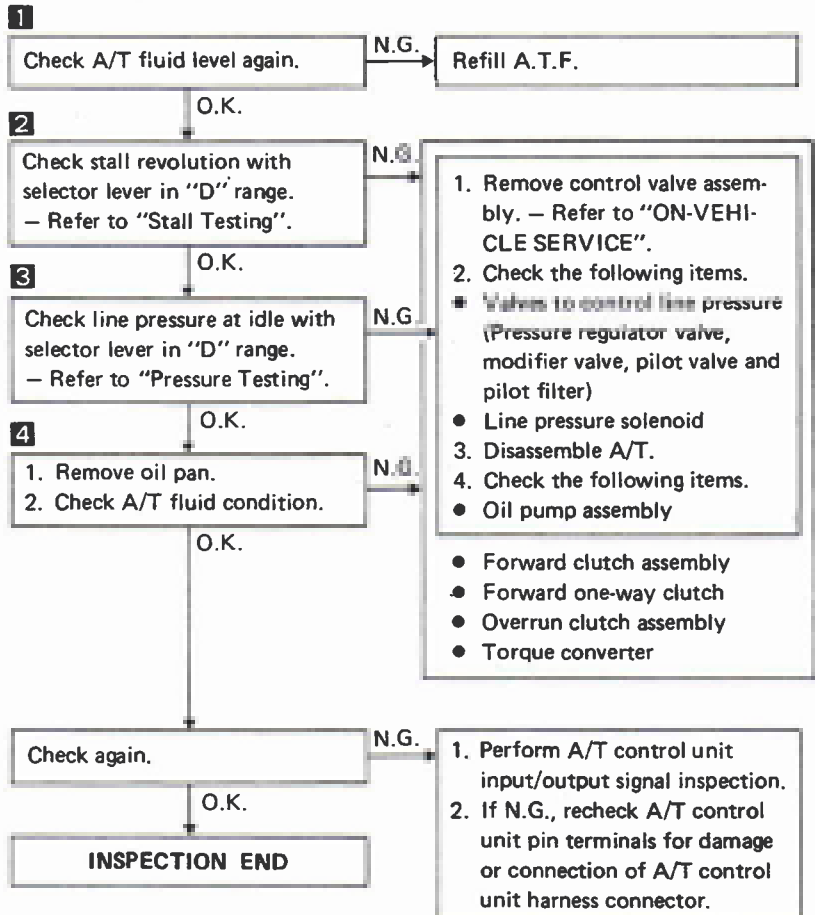
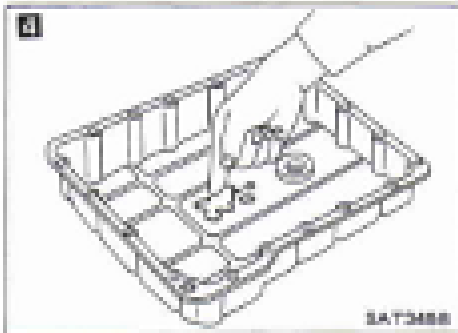
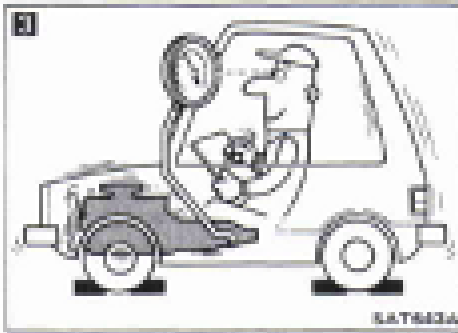
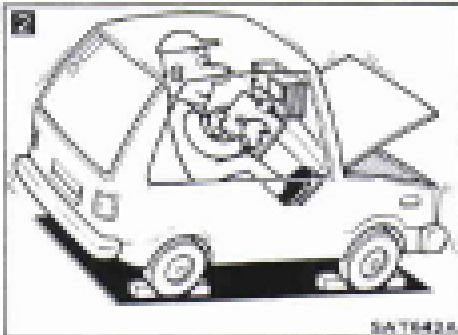
**Trouble-shooting (Cont'd)**

**CHECK ⑧ : Vehicle does not creep forward when selecting "D" and "2" ranges.**



Trouble-shooting (Cont'd)

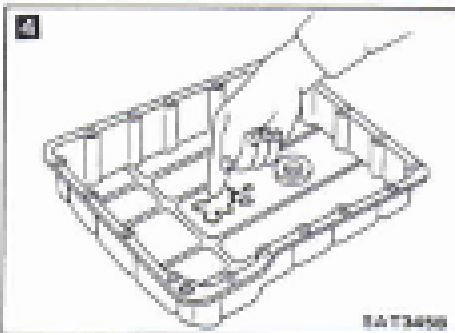
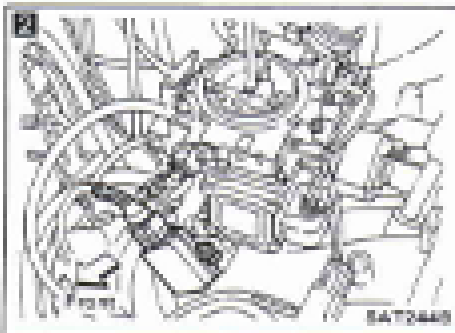
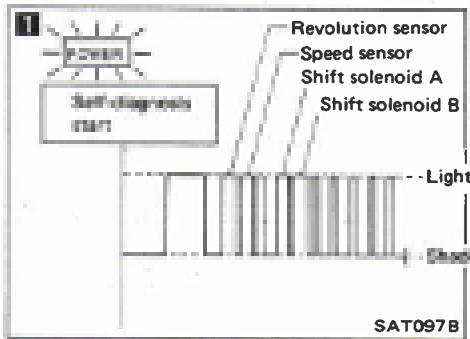
CHECK ⑨ : Vehicle does not creep forward when selecting "D", "2" and "1" ranges.





Trouble-shooting (Cont'd)

CHECK ⑩ : Vehicle cannot be started from D<sub>1</sub> on CRUISE TEST - Part 1.



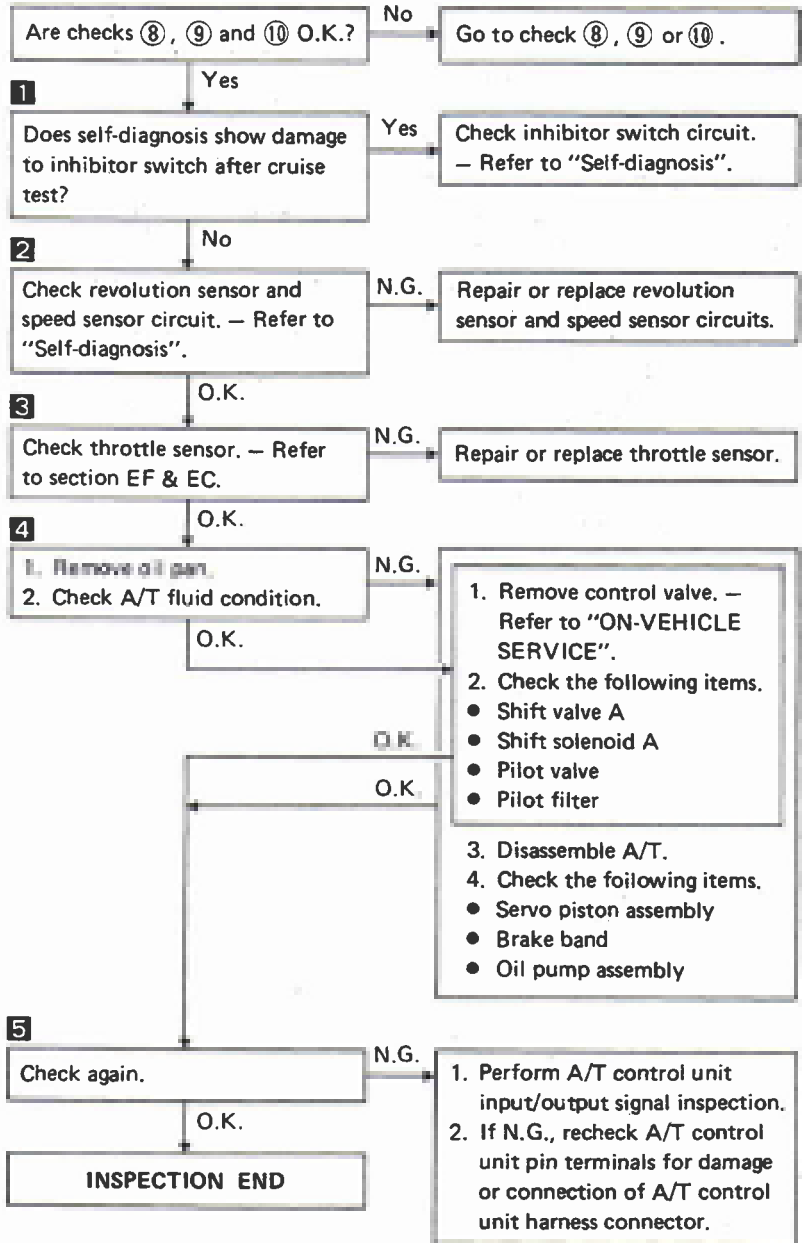
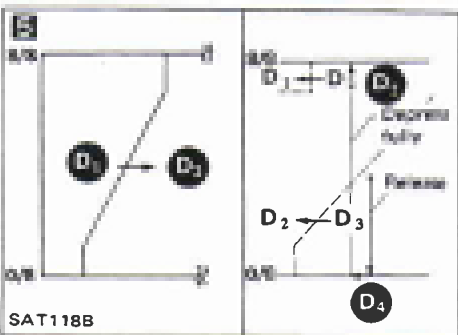
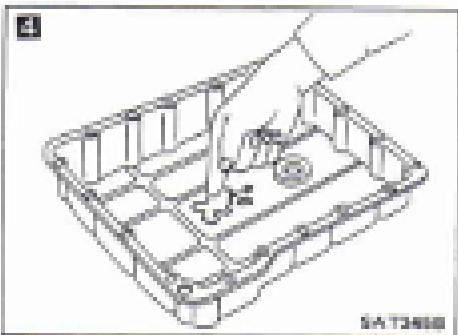
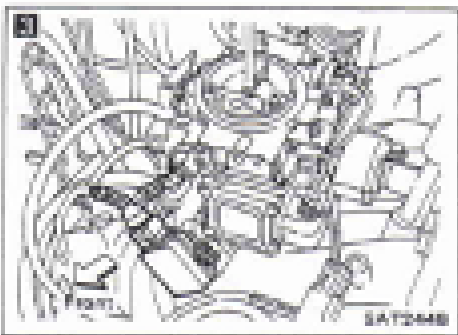
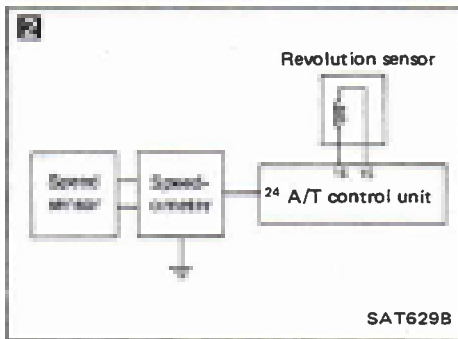
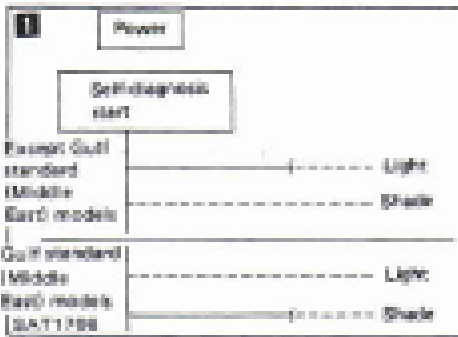
```

    graph TD
        Q1{Are checks ⑧ and ⑨ O.K.?} -- No --> A1[Go to check ⑧ or ⑨.]
        Q1 -- Yes --> Q2{Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid A or B after cruise test?}
        Q2 -- Yes --> A2[Check damaged circuit. - Refer to "Self-diagnosis".]
        Q2 -- No --> Q3{Check throttle sensor. - Refer to section EF & EC.}
        Q3 -- N.G. --> A3[Repair or replace throttle sensor.]
        Q3 -- O.K. --> Q4{Check line pressure at stall point with selector lever in "D" range. - Refer to "Pressure Testing".}
        Q4 -- N.G. --> A4[1. Remove control valve assembly. - Refer to "ON-VEHICLE SERVICE".  
2. Check the following items.  
• Shift valve A  
• Shift valve B  
• Shift solenoid A  
• Shift solenoid B  
• Pilot valve  
• Pilot filter]
        Q4 -- O.K. --> Q5{1. Remove oil pan.  
2. Check A/T fluid condition.}
        Q5 -- N.G. --> A4
        Q5 -- O.K. --> A4
        Q5 -- O.K. --> A5[3. Disassemble A/T.  
4. Check the following items.  
■ Forward clutch assembly  
■ Forward one-way clutch  
■ Low one-way clutch  
■ High clutch assembly  
■ Torque converter  
■ Oil pump assembly]
        A4 --> Q6{Check again.}
        Q6 -- N.G. --> A6[1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
        Q6 -- O.K. --> A7[INSPECTION END]
    
```

**Trouble-shooting (Cont'd)**

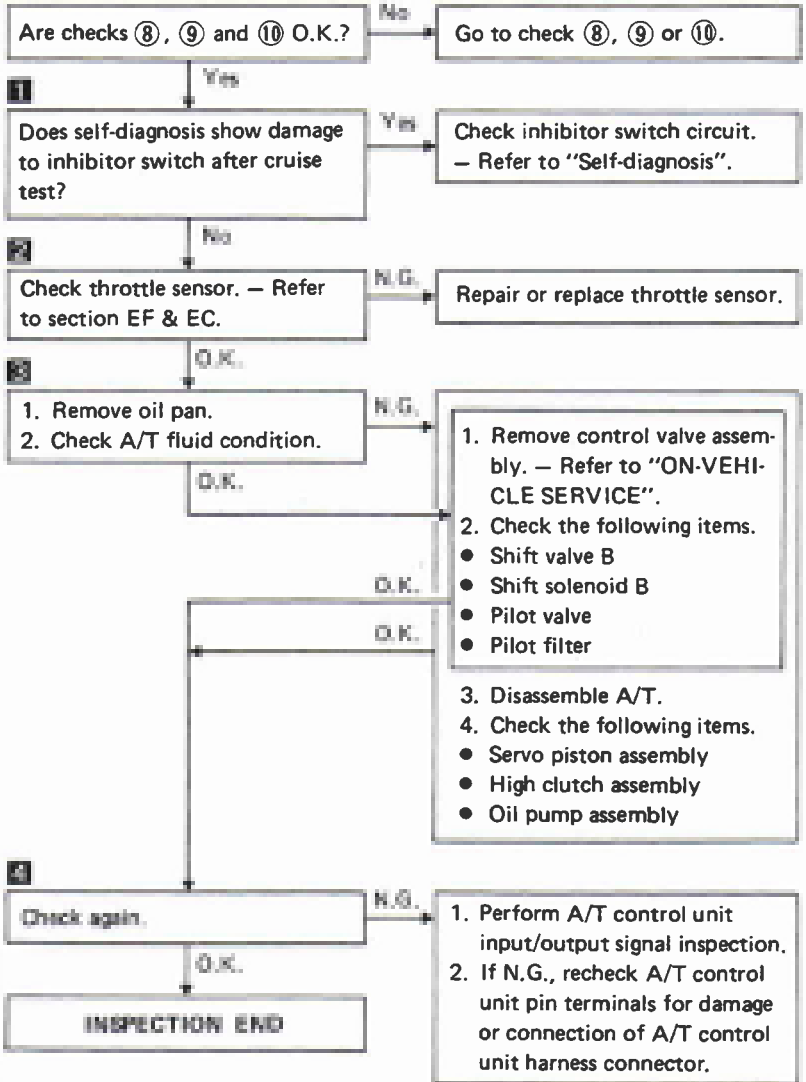
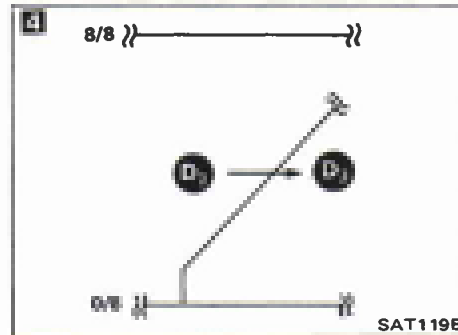
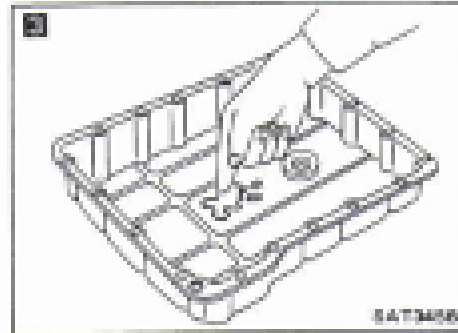
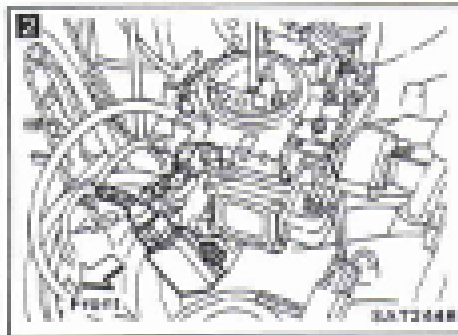
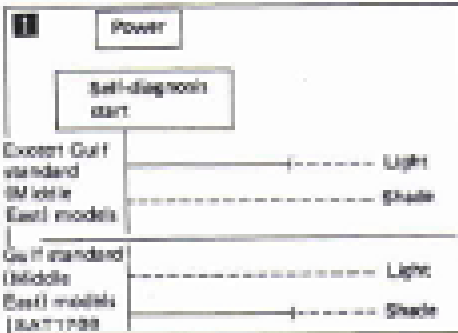
**CHECK ⑪ : A/T does not shift from D<sub>1</sub> to D<sub>2</sub> at the specified speed.**

**A/T does not shift from D<sub>4</sub> to D<sub>2</sub> when depressing accelerator pedal fully at the specified speed.**



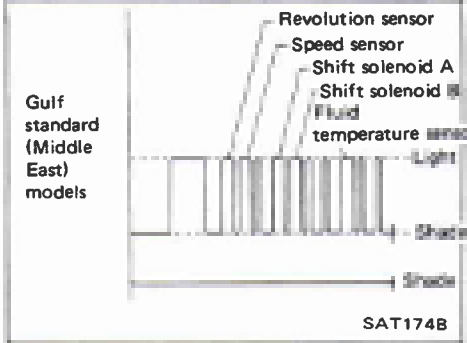
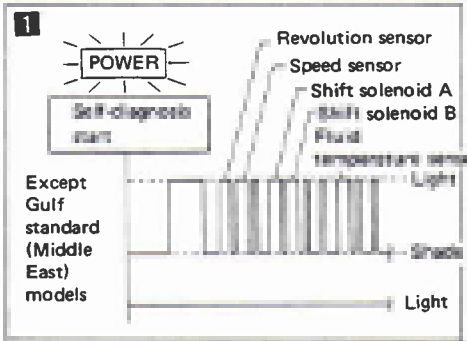
Trouble-shooting (Cont'd)

CHECK 12: A/T does not shift from D<sub>2</sub> to D<sub>3</sub> at the specified speed.

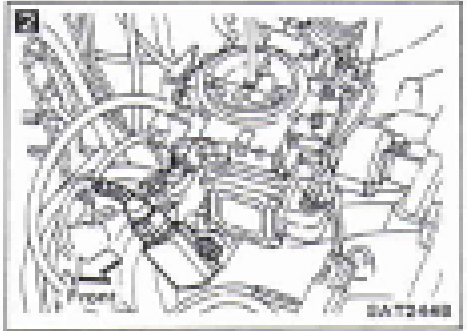


## Trouble-shooting (Cont'd)

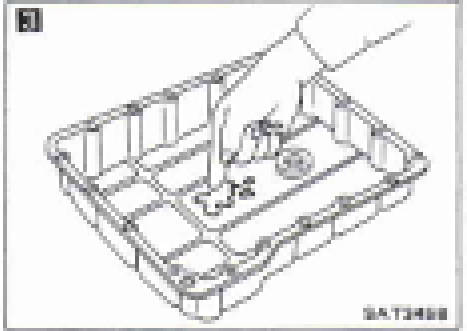
**CHECK ⑬ : A/T does not shift from D<sub>3</sub> to D<sub>4</sub> at the specified speed.**



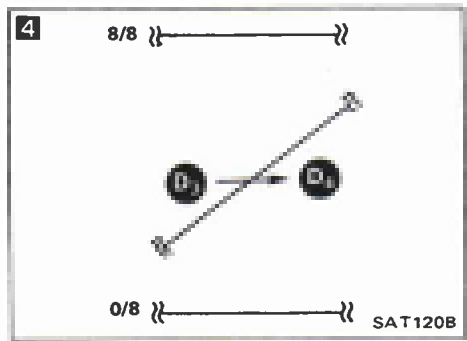
SAT174B



SAT246B



SAT246B



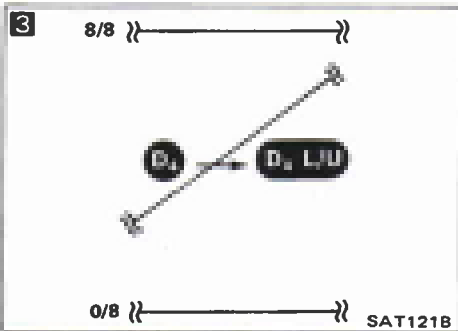
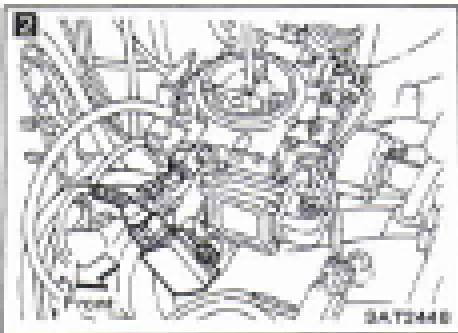
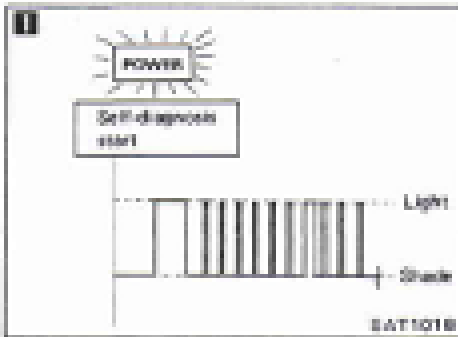
SAT120B

```

    graph TD
        Q1[Are checks ⑧, ⑨ and ⑩ O.K.?] -- No --> A1[Go to check ⑧, ⑨ or ⑩.]
        Q1 -- Yes --> Q2[Does self-diagnosis show damage to inhibitor switch, power shift switch. [Except Gulf standard (Middle East) models], A/T check switch [Gulf standard (Middle East) models], shift solenoid A, B, revolution sensor, speed sensor or fluid temperature sensor circuit after cruise test?]
        
        Q2 -- Yes --> A2[Check damaged circuit. — Refer to "Self-diagnosis".]
        Q2 -- No --> Q3[Check throttle sensor. — Refer to section EF & EC.]
        
        Q3 -- N.G. --> A3[Repair or replace throttle sensor.]
        Q3 -- O.K. --> Q4[1. Remove oil pan.  
2. Check A/T fluid condition.]
        
        Q4 -- N.G. --> A4[1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".  
2. Check the following items.  
• Shift valve B  
• Overrun clutch control valve  
• Shift solenoid B  
• Pilot valve  
• Pilot filter]
        Q4 -- O.K. --> Q5[3. Disassemble A/T.  
4. Check the following items.  
• Servo piston assembly  
• Brake band  
• Torque converter  
• Oil pump assembly]
        
        A4 --> Q5
        Q5 --> Q6[4. Check again.]
        
        Q6 -- N.G. --> A5[1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
        Q6 -- O.K. --> A6[INSPECTION END]
    
```

Trouble-shooting (Cont'd)

CHECK ⑭: A/T does not perform lock-up at the specified speed.

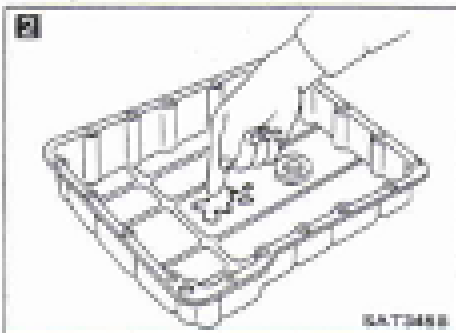
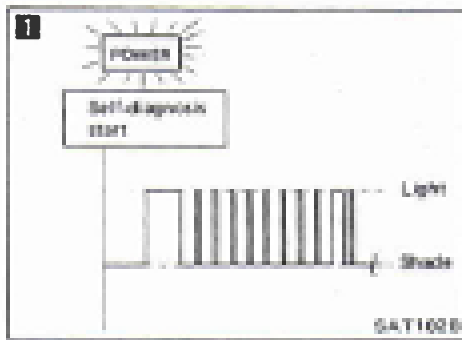


```

    graph TD
        Q1[1 Does self-diagnosis show damage to lock-up solenoid circuit after cruise test?] -- Yes --> A1[Check lock-up solenoid circuit. - Refer to "Self-diagnosis".]
        Q1 -- No --> Q2[2 Check throttle sensor. - Refer to section EF & EC.]
        Q2 -- N.G. --> A2[Repair or replace throttle sensor.]
        Q2 -- O.K. --> Q3[3 1. Remove control valve: - Refer to "ON-VEHICLE SERVICE".  
2. Check following items.  
• Lock-up control valve  
• Shuttle shift valve D  
• Torque converter relief valve  
• Lock-up solenoid  
• Pilot valve  
• Pilot filter]
        Q3 -- N.G. --> A3[Repair or replace damaged parts.]
        Q3 -- O.K. --> Q4[4 Check again.]
        Q4 -- N.G. --> A4[1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
        Q4 -- O.K. --> END[INSPECTION END]
    
```

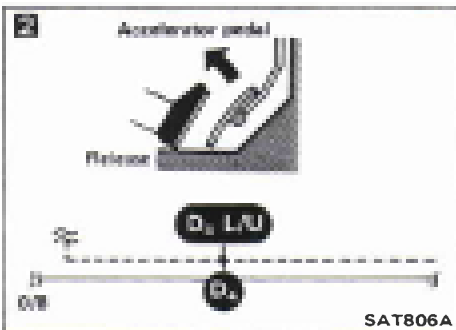
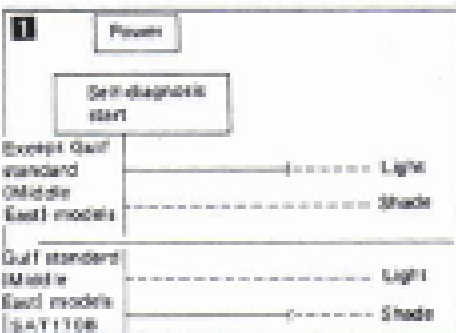
Trouble-shooting (Cont'd)

**CHECK ⑮ : A/T does not hold lock-up condition for more than 30 seconds.**



```

    graph TD
        Q1[1 Does self-diagnosis show damage to engine revolution signal circuit after cruise test?] -- Yes --> A1[Check revolution sensor circuit. - Refer to "Self-diagnosis".]
        Q1 -- No --> Q2[2 1. Remove oil pan. 2. Check A/T fluid condition.]
        Q2 -- N.G. --> A2[1. Remove control valve assembly. - Refer to "ON-VEHICLE SERVICE". 2. Check the following items. • Lock-up control valve • Pilot valve • Pilot filter 3. Disassemble A/T. 4. Check torque converter and oil pump assembly.]
        Q2 -- O.K. --> Q3[Check again.]
        Q3 -- N.G. --> A3[1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
        Q3 -- O.K. --> END[INSPECTION END]
    
```



**CHECK ⑯ : Lock-up is not released when accelerator pedal is released.**

```

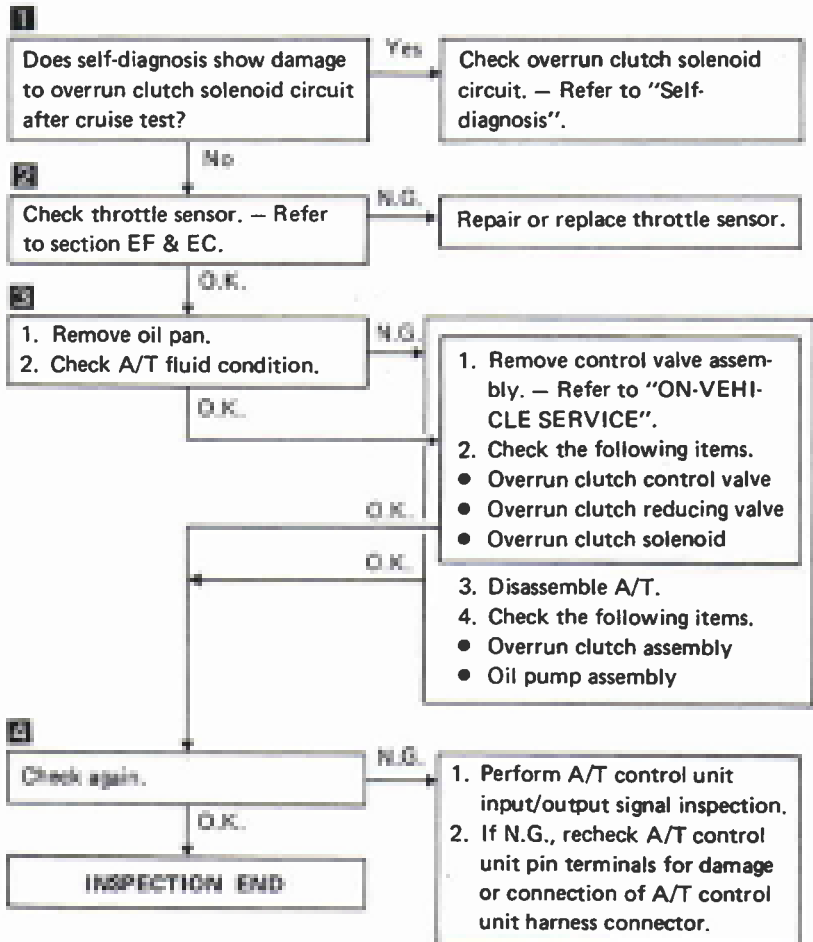
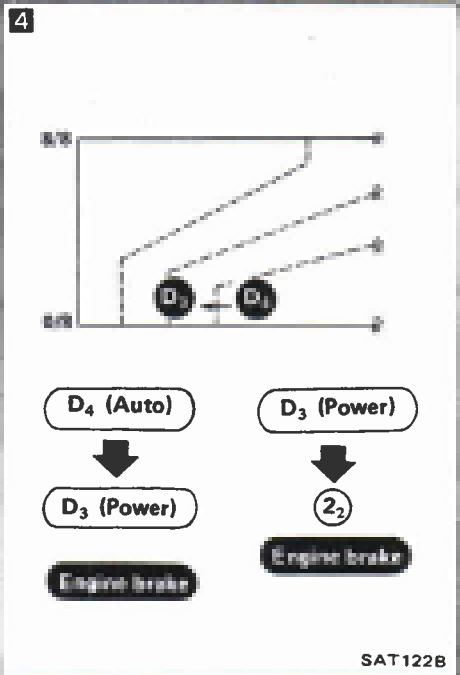
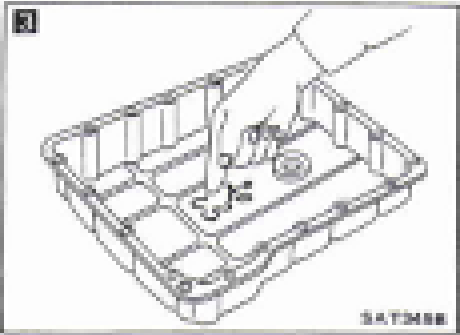
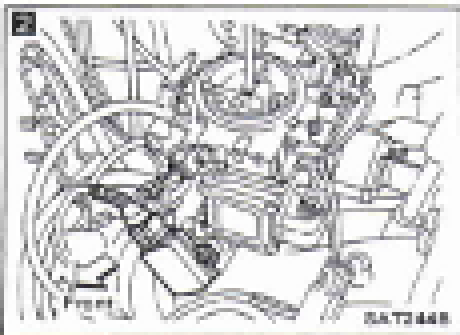
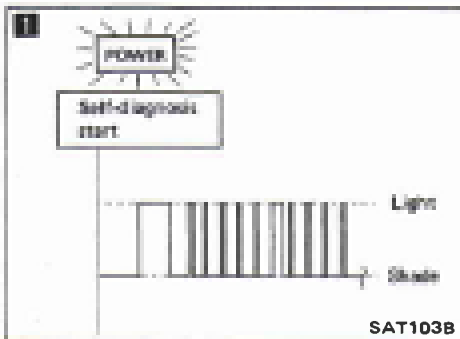
    graph TD
        Q1[1 Does self-diagnosis show damage to idle switch circuit after cruise test?] -- Yes --> A1[Check idle switch circuit. - Refer to "Self-diagnosis".]
        Q1 -- No --> Q2[2 Check again.]
        Q2 -- N.G. --> A2[1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
        Q2 -- O.K. --> END[INSPECTION END]
    
```

Trouble-shooting (Cont'd)

**CHECK ⑰ :** Engine speed does not return to idle smoothly when A/T is shifted from D<sub>4</sub> to D<sub>3</sub> with accelerator pedal released.

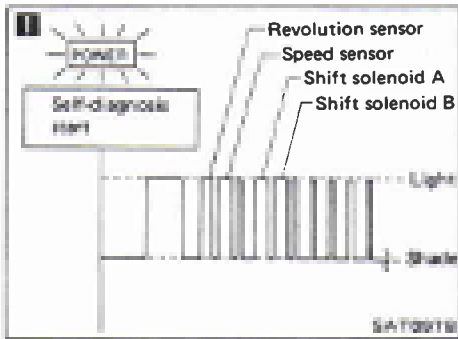
Vehicle does not decelerate by engine brake when setting "POWER" position with accelerator pedal released.

Vehicle does not decelerate by engine brake when moving selector lever from "D" to "2" range with accelerator pedal released.



**Trouble-shooting (Cont'd)**

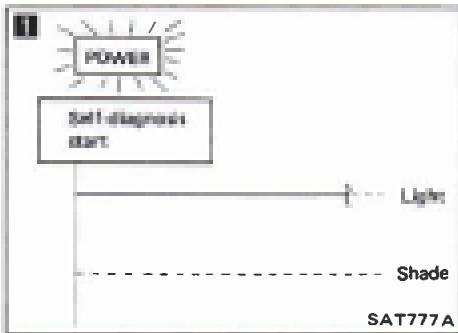
**CHECK 18 : Vehicle does not start from D<sub>1</sub> on CRUISE TEST**  
 – Part 2.



**1**

```

    graph TD
        Q1{Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid A or B after cruise test?}
        Q1 -- Yes --> A1[Check damaged circuit. – Refer to "Self-diagnosis".]
        Q1 -- No --> B1[Check again.]
        B1 -- N.G. --> C1[1. Perform A/T control unit input/output signal inspection.  
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.]
        B1 -- O.K. --> D1[Go to CHECK 19.]
    
```

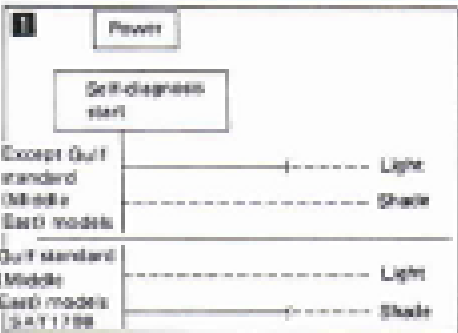


**CHECK 19 : A/T does not shift from D<sub>4</sub> to D<sub>3</sub> when changing power shift switch to "POWER" position.**  
 – Except Gulf standard (Middle East) models –

**1**

```

    graph TD
        Q2{Does self-diagnosis show damage to power shift switch circuit after cruise test?}
        Q2 -- Yes --> A2[Check power shift switch circuit. – Refer to "Self-diagnosis".]
        Q2 -- No --> B2[Go to CHECK 20.]
    
```



**CHECK 20 : A/T does not shift from D<sub>3</sub> to 2<sub>2</sub> when changing selector lever position from "D" to "2" range.**

**1**

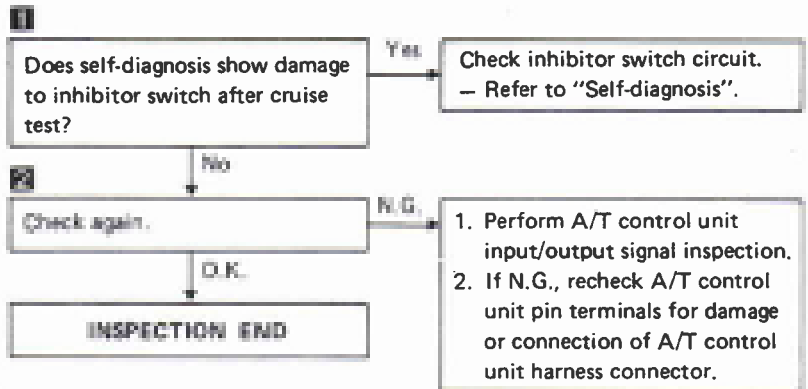
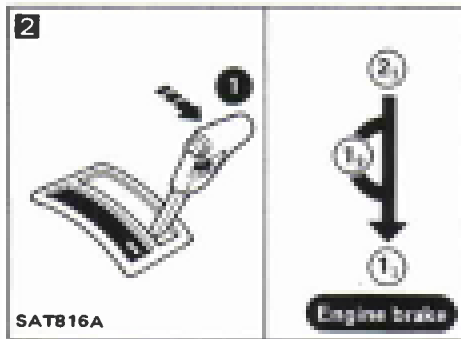
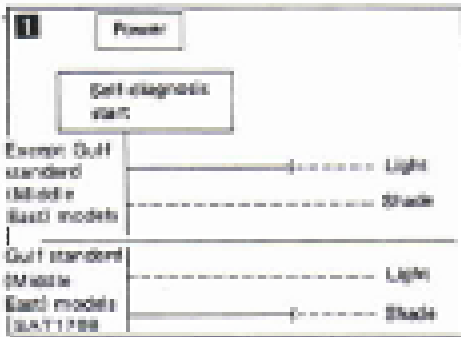
```

    graph TD
        Q3{Does self-diagnosis show damage to inhibitor switch circuit after cruise test?}
        Q3 -- Yes --> A3[Check inhibitor switch circuit. – Refer to "Self-diagnosis".]
        Q3 -- No --> B3[Go to CHECK 21.]
    
```

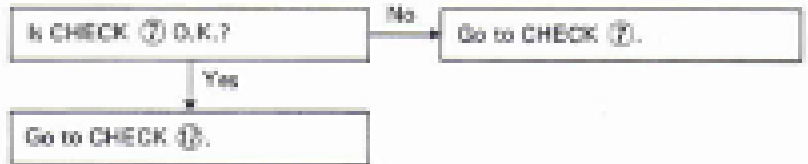


**Trouble-shooting (Cont'd)**

**CHECK ⑳** : A/T does not shift from 2<sub>2</sub> to 1<sub>1</sub>, when changing selector lever position from "2" to "1" range.



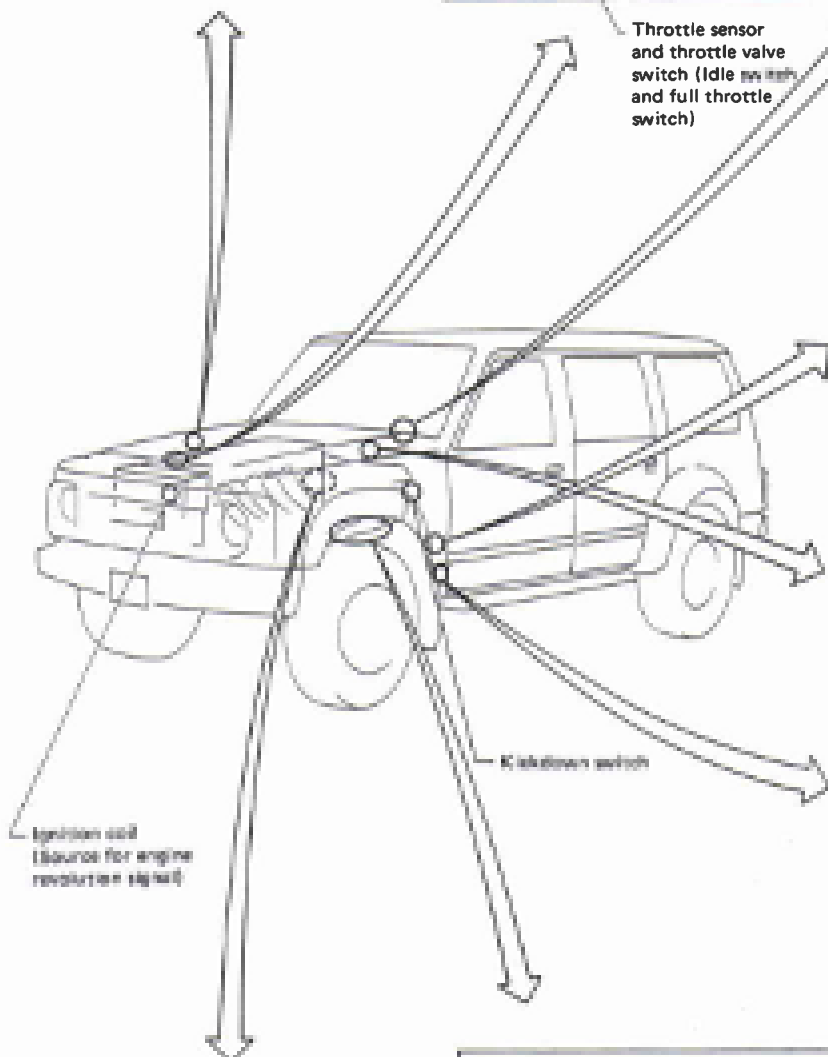
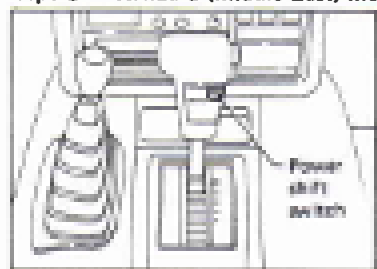
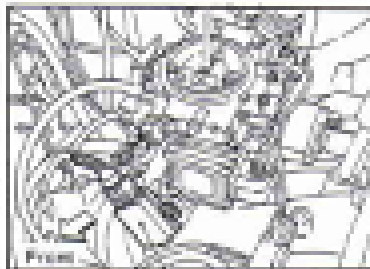
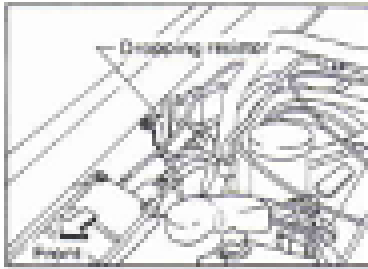
**CHECK ㉑** : Vehicle does not decelerate by engine brake when shifting from 2<sub>2</sub> (1<sub>2</sub>) to 1<sub>1</sub>.



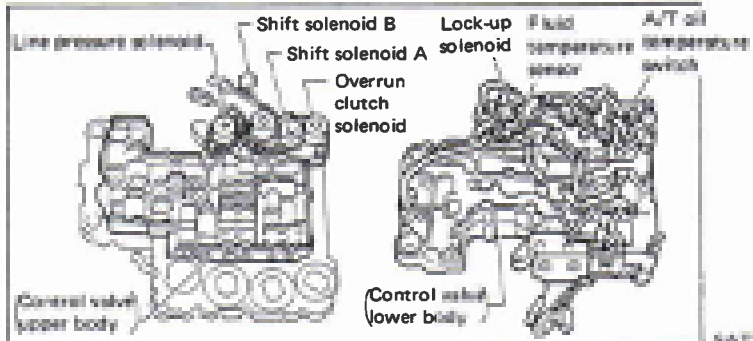
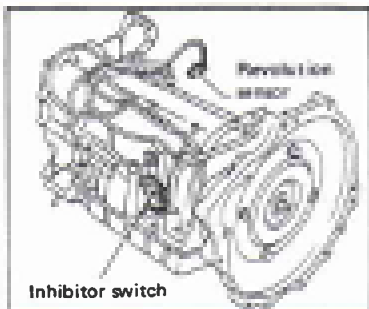
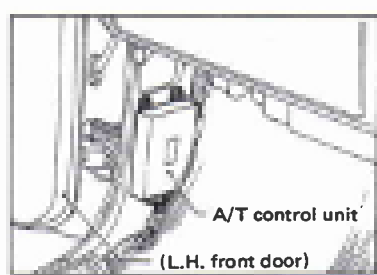
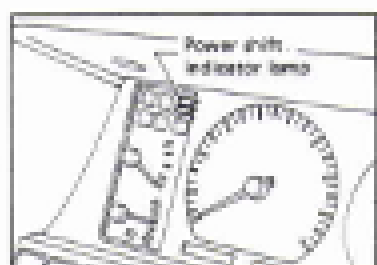
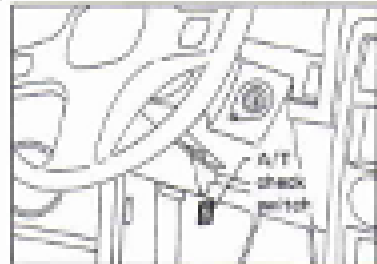
Electrical System

A/T ELECTRICAL PARTS LOCATION

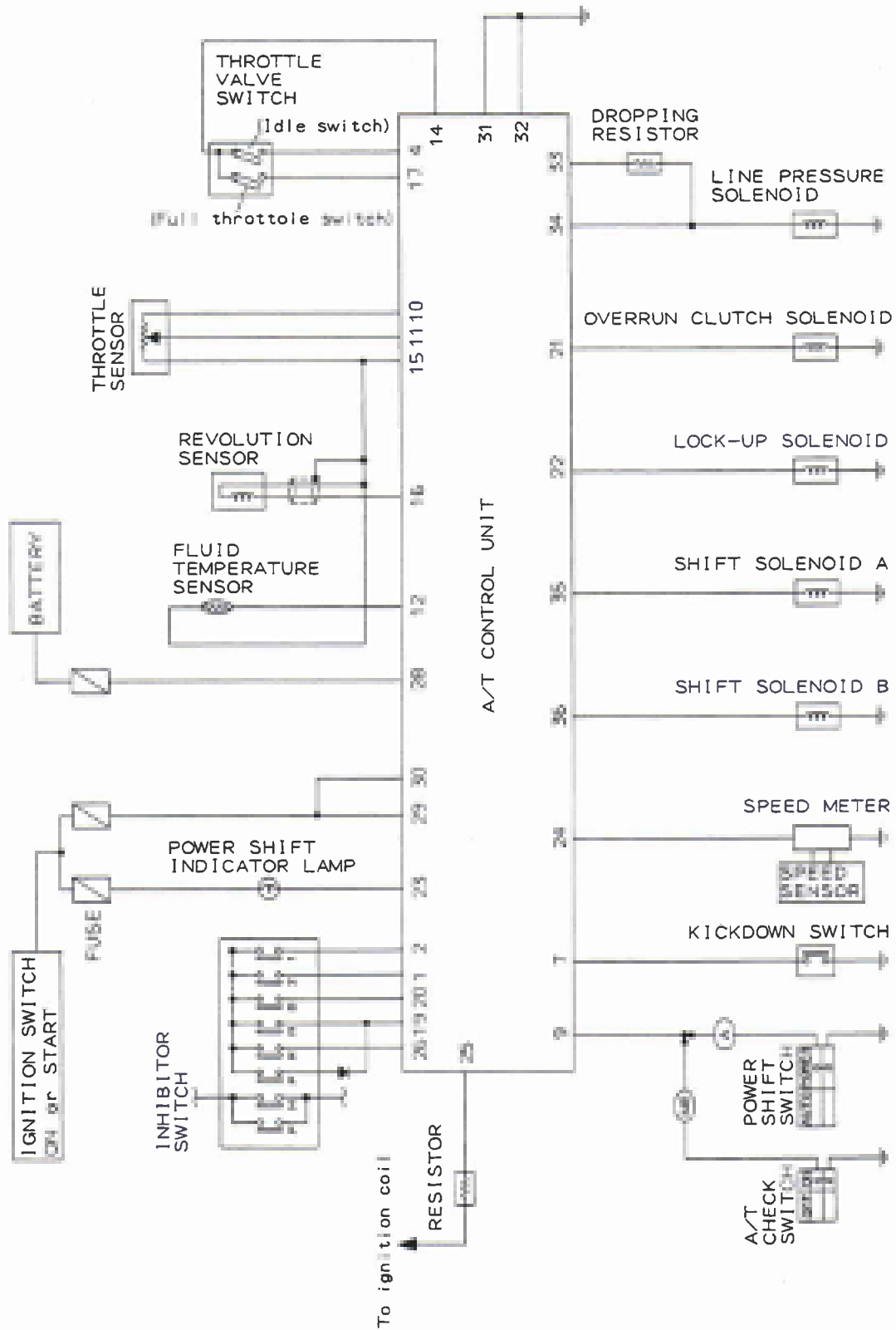
Except Gulf standard (Middle East) models



Gulf standard (Middle East) models

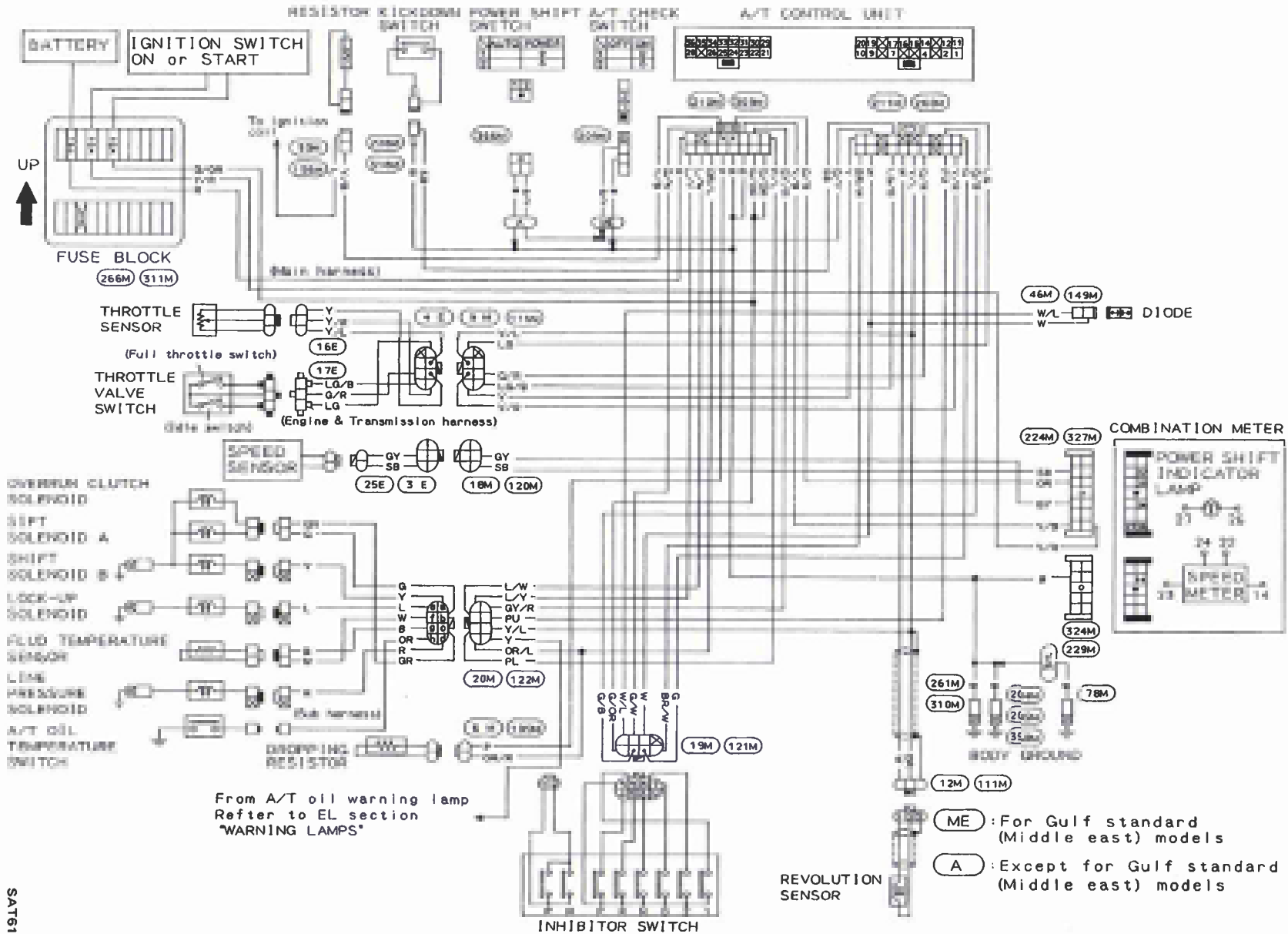


Electrical System (Cont'd)  
SCHEMATIC



(ME) For Gulf standard (Middle east) models  
(A) Except for Gulf standard (Middle east) models

Electrical System (Cont'd)  
WIRING DIAGRAM



From A/T oil warning lamp  
Refer to EL section  
"WARNING LAMPS"

- (ME) : For Gulf standard (Middle east) models
- (A) : Except for Gulf standard (Middle east) models

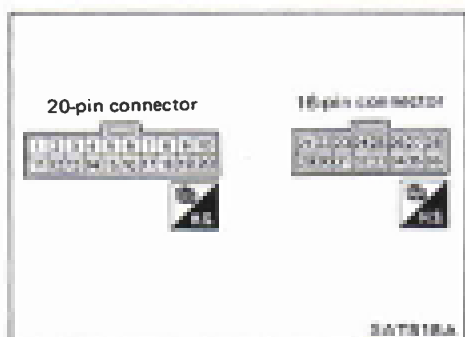
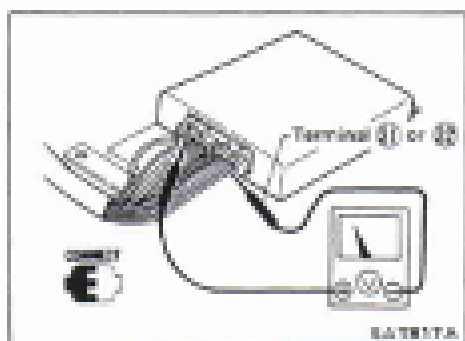
AT-63

SAT615B

## Electrical System (Cont'd)

### INSPECTION OF A/T CONTROL UNIT



- Measure voltage between each terminal and terminal ① or ② by following "A/T control unit inspection table".



- Pin connector terminal layout.

### A/T CONTROL UNIT INSPECTION TABLE






(Data are reference values.)

Terminal No.	Item		Condition	Judgement standard
1	Inhibitor "2" range switch		When setting selector lever to "2" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
2	Inhibitor "1" range switch		When setting selector lever to "1" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
3	-		-	-
4	Idle switch (in throttle valve switch)		When releasing accelerator pedal after warming up engine.	8 - 15V
			When depressing accelerator pedal after warming up engine.	1V or less
5	-		-	-
6	-		-	-

# TROUBLE-SHOOTING AND DIAGNOSES

RE4R03A






## Electrical System (Cont'd)

Terminal No.	Item		Condition	Judgement standard
7	Kickdown switch		When releasing accelerator pedal after warming up engine.	3 - 8V
			When depressing accelerator pedal fully after warming up engine.	1V or less
8	-		-	-
9	Gulf standard (Middle East) models Power shift switch		When setting power shift switch in "AUTO" position.	3 - 8V
			When setting power shift switch in "POWER" position.	1V or less
	Except Gulf standard (Middle East) models A/T check switch		When turning A/T check switch to "OFF" position.	3 - 8V
			When turning A/T check switch to "ON" position.	1V or less
10	Throttle sensor (Power source)		-	4.5 - 5.5V
11	Throttle sensor		When depressing accelerator pedal slowly after warming up engine.  Voltage rises gradually in response to throttle opening angle.	Fully-closed throttle: 0.2 - 0.6V Fully-open throttle: 3.4 - 4.4V
12	Fluid temperature sensor		When A.T.F. temperature is 20°C (68°F).	1.56V
			When A.T.F. temperature is 80°C (176°F).	0.45V
13	-		-	-
14	Throttle valve switch (Power source)	 	When turning ignition switch to "ON" position.	8 - 15V
			When turning ignition switch to "OFF" position.	1V or less
15	Throttle sensor (Ground)		-	-
16	Revolution sensor (Measure in AC range)		When vehicle cruises at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle parks.	0V

## TROUBLE-SHOOTING AND DIAGNOSES

RE4R03A


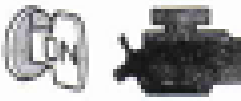






### Electrical System (Cont'd)

Terminal No.	Item		Condition	Judgement standard
17	Full throttle switch		When depressing accelerator pedal more than half-way after warming up engine.	8 - 15V
			When releasing accelerator pedal after warming up engine.	1V or less
18	-		-	-
19	Inhibitor "N" and "P" range switch		When setting selector lever to "N" or "P" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
20	Inhibitor "D" range switch		When setting selector lever to "D" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
21	Overrun clutch solenoid		When overrun clutch solenoid operates. [Ex: When driving at 50 km/h (31 MPH) in "D" range and AUTO mode with depressing accelerator pedal half-way.]	Battery voltage
			When overrun clutch solenoid does not operate. [Ex: When driving in "D" range and POWER mode with releasing accelerator pedal.]	1V or less
22	Lock-up solenoid		When A/T performs lock-up.	8 - 15V
			When A/T does not perform lock-up.	1V or less
23	Power shift indicator lamp		<b>Except Gulf standard (Middle East) models</b> When setting power shift switch to "AUTO" position.	Battery voltage
			When setting power shift switch to "POWER" position.	1V or less
			<b>Gulf standard (Middle East) models</b> When turning A/T check switch to "OFF" position.	Battery voltage
			When turning A/T check switch to "ON" position.	1V or less
24	Speed sensor		When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Vary from 0 to 5V

## TROUBLE-SHOOTING AND DIAGNOSES

RE4R03A

### Electrical System (Cont'd)

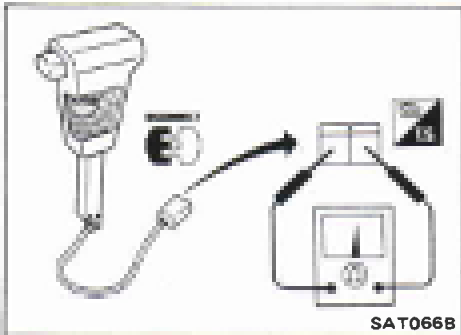
Terminal No.	Item	Condition	Judgement standard	
25	Engine revolution signal		When engine runs at idle speed.	Approximately 6V
			When engine runs at 2,500 rpm.	Approximately 7.5V
26	Inhibitor "R" range switch		When setting selector lever to "R" range.	Battery voltage
			When setting selector lever to other ranges.	1V or less
27	-	-	-	
28	Power source (Back-up)		When turning ignition switch to "OFF".	Battery voltage
			When turning ignition switch to "ON".	Battery voltage
29 30	Power source		When turning ignition switch to "ON".	Battery voltage
			When turning ignition switch to "OFF".	1V or less
31 32	Ground	-	-	
33	Line pressure solenoid (with dropping resistor)		When releasing accelerator pedal after warming up engine.	5 - 14V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
34	Line pressure solenoid		When releasing accelerator pedal after warming up engine.	1.5 - 2.5V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
35	Shift solenoid A		When shift solenoid A operates. (When driving in "D <sub>1</sub> " or "D <sub>4</sub> ".)	Battery voltage
			When shift solenoid A does not operate. (When driving in "D <sub>2</sub> " or "D <sub>3</sub> ".)	1V or less
36	Shift solenoid B		When shift solenoid B operates. (When driving in "D <sub>1</sub> " or "D <sub>2</sub> ".)	Battery voltage
			When shift solenoid B does not operate. (When driving in "D <sub>3</sub> " or "D <sub>4</sub> ".)	1V or less



**Electrical System (Cont'd)**

**POWER SHIFT SWITCH – Except Gulf standard (Middle East) models**

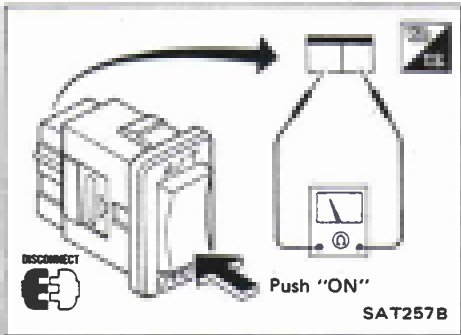
- Check continuity between two terminals.



Switch position	Continuity
AUTO	No
POWER	Yes

**A/T CHECK SWITCH – Gulf standard (Middle East) models**

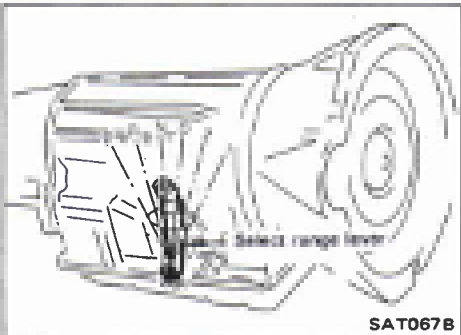
- Check continuity between two terminals.



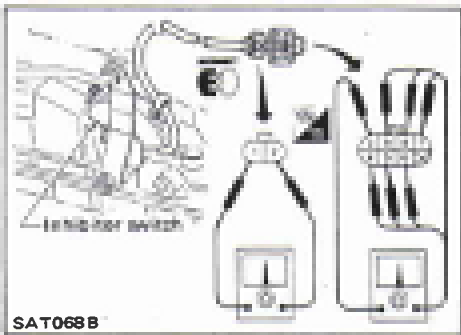
Switch position	Continuity
ON	Yes
OFF	No

**INHIBITOR SWITCH**

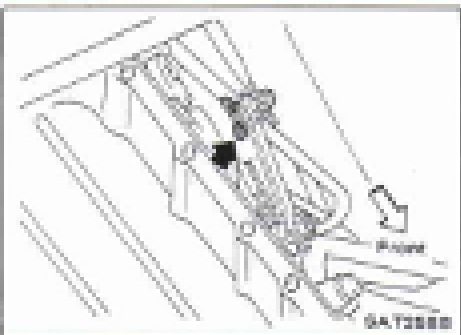
1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving select range lever through each range.



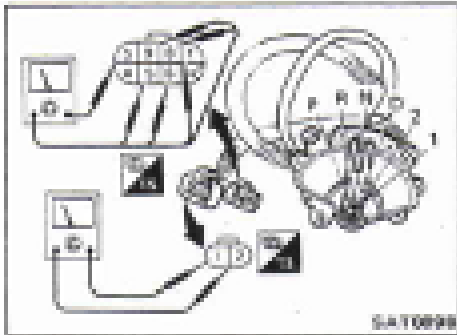
Terminal No.	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Lever position									
P	○—○		○—○						
R			○—○	○—○					
N	○—○		○—○		○—○				
D			○—○			○—○			
2			○—○				○—○		
1			○—○						○—○



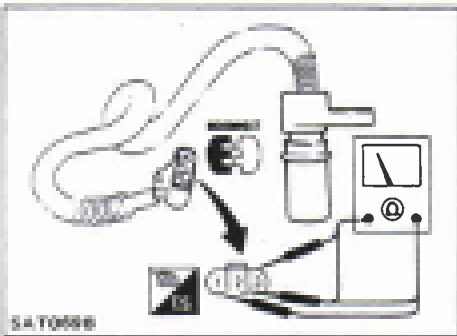
2. If N.G., check again with manual control linkage disconnected from select range lever of A/T assembly. — Refer to step 1.
3. If O.K. on step 2, adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".



**Electrical System (Cont'd)**



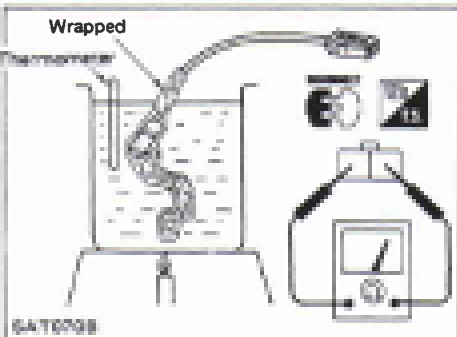
4. If N.G. on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminal. – Refer to step 1.
5. If O.K. on step 4, adjust inhibitor switch. – Refer to “ON-VEHICLE SERVICE”.
6. If N.G. on step 4, replace inhibitor switch.



**REVOLUTION SENSOR**

- For removal and installation, refer to “ON-VEHICLE SERVICE”.
- Check resistance between terminals ①, ② and ③.

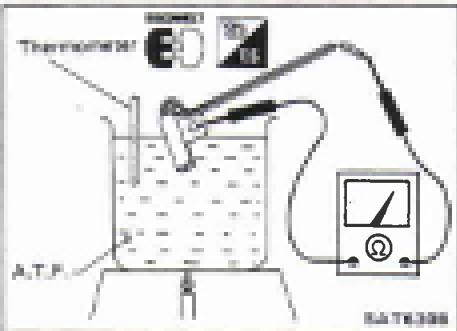
Terminal No.		Resistance
①	②	500 - 650Ω
②	③	No continuity
①	③	No continuity



**FLUID TEMPERATURE SENSOR**

- For removal and installation, refer to “ON-VEHICLE SERVICE”.
- Check resistance between two terminals while changing temperature as shown at left.

Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ



**A/T OIL TEMPERATURE SWITCH**

- For removal and installation, refer to “ON-VEHICLE SERVICE”.
- Check continuity.

Temperature °C (°F)	Continuity
150 (302) or more	Yes
145 (293) or less	No

- Do not reuse boiled A.T.F.

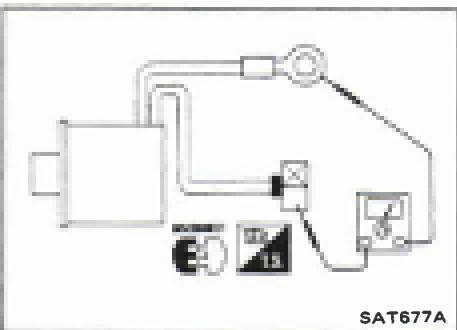
**LOCK-UP SOLENOID AND LINE PRESSURE SOLENOID**

- For removal and installation, refer to “ON-VEHICLE SERVICE”.
- Check resistance between two terminals.

**Resistance:**

Lock-up solenoid: 10 - 16Ω

Line pressure solenoid: 2.5 - 5Ω

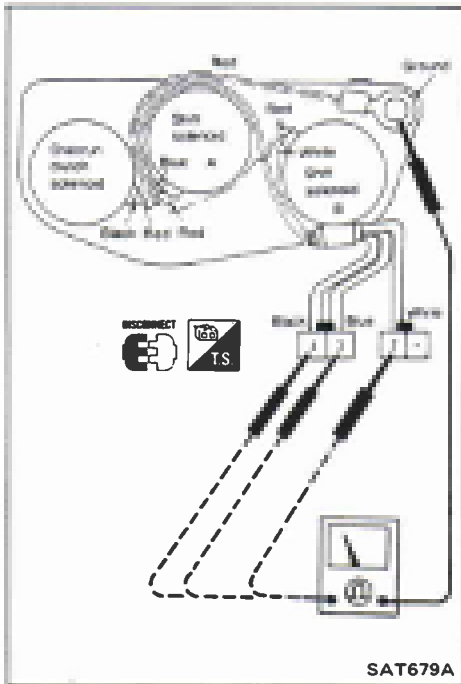


**Electrical System (Cont'd)**

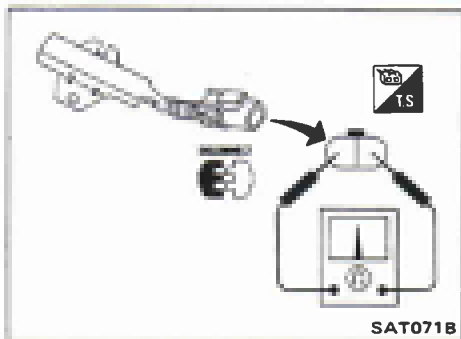
**3-UNIT SOLENOID ASSEMBLY**

(Shift solenoid A, B and overrun clutch solenoid)

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.

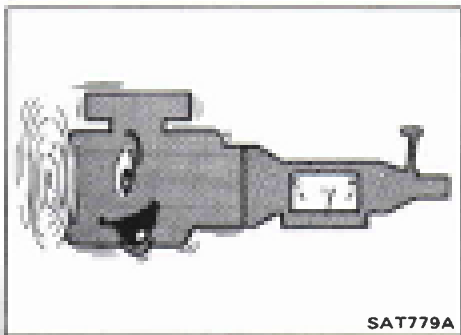


Solenoid	Terminal No.	Resistance
Shift solenoid A	①	20 - 30Ω
Shift solenoid B	②	
Overrun clutch solenoid	③	



**DROPPING RESISTOR**

- Check resistance between two terminals.  
**Resistance: 11.2 - 12.8Ω**



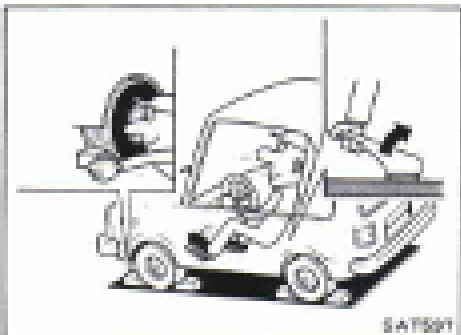
**Stall Testing**

**STALL TEST PROCEDURE**

1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

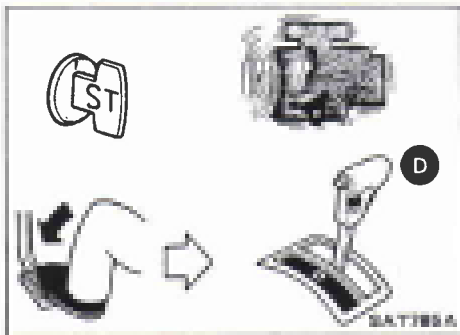
**A.T.F. operating temperature:**

**50 - 80°C (122 - 176°F)**

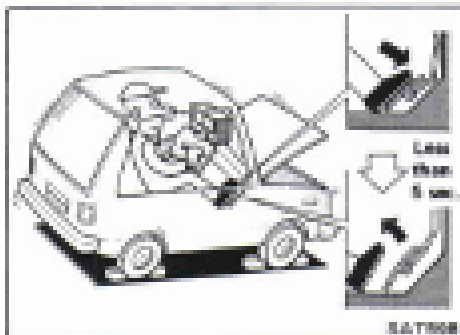


3. Set parking brake and block wheels.
  4. Install a tachometer where it can be seen by driver during test.
- It is good practice to put a mark on point of specified engine rpm on indicator.

**Stall Testing (Cont'd)**



5. Start engine, apply foot brake, and place selector lever in "D" range.



6. Accelerate to wide-open throttle gradually while applying foot brake.

7. Quickly note the engine stall revolution and immediately release throttle.

■ During test, never hold throttle wide-open for more than 5 seconds.

Stall revolution:  
2,090 - 2,390 rpm



8. Shift selector lever to "N".

9. Cool off A.T.F.

● Run engine at idle for at least one minute.

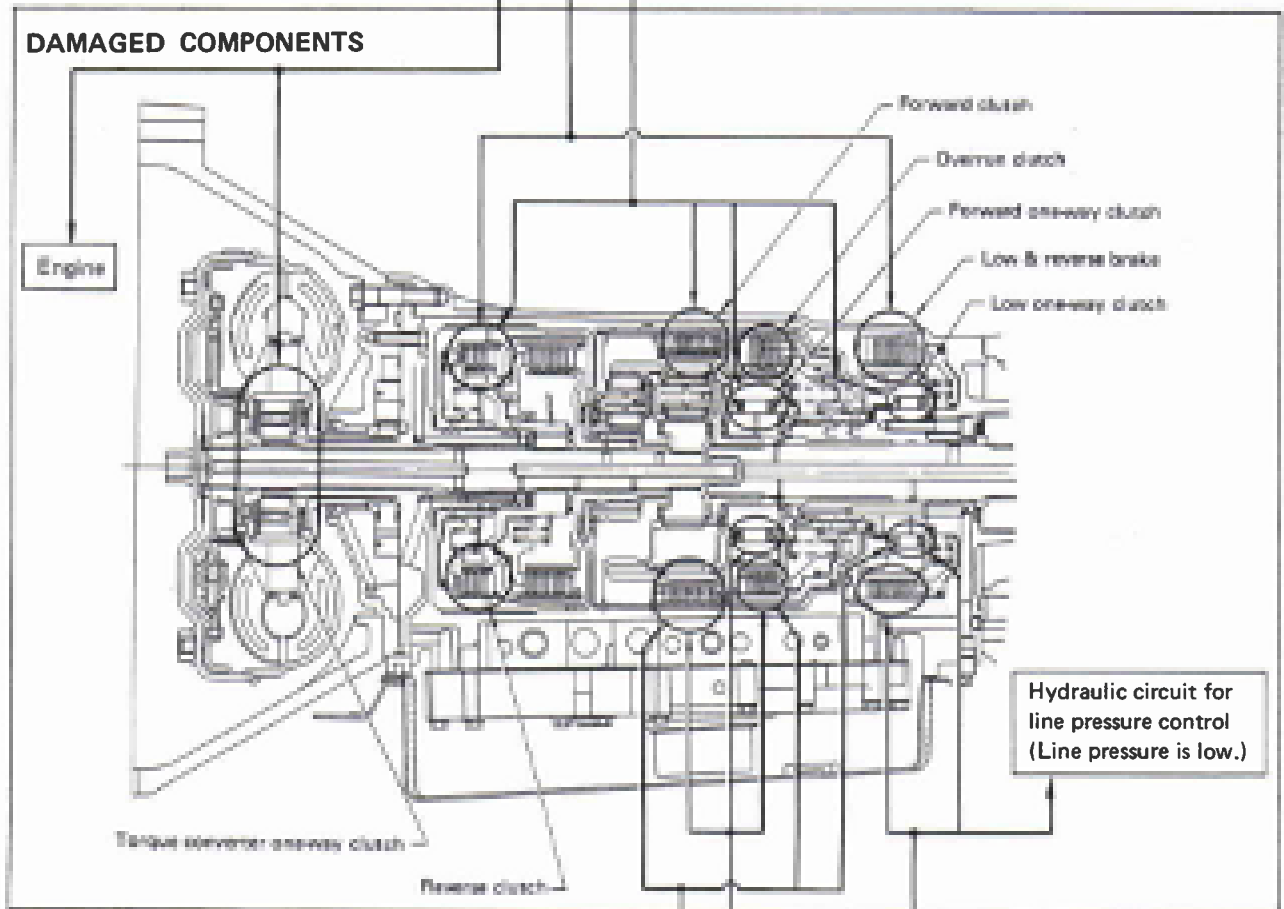
10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

Stall Testing (Cont'd)

JUDGEMENT OF STALL TEST

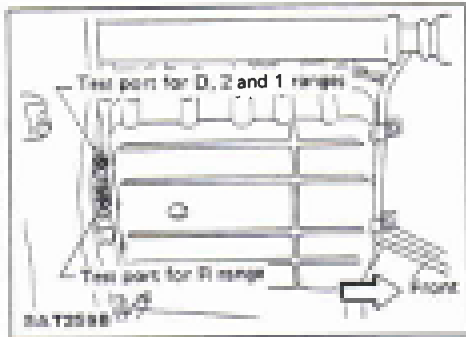
Selector lever position	Judgement		
	L	O	H
D	L	O	H
2	L	O	H
1	L	O	O
R	L	H	H

- O : Stall revolution is normal.
- H : Stall revolution is higher than specified.
- L : Stall revolution is lower than specified.



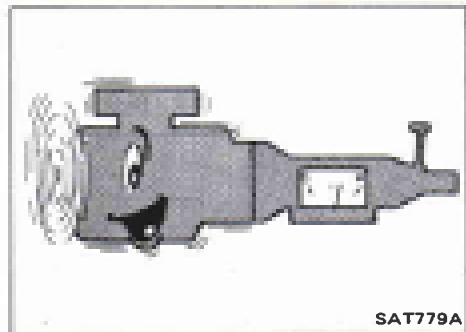
Clutches and brakes except high clutch and brake band are O.K. (Condition of high clutch and brake band cannot be confirmed by stall test.)

D	H	H	H	O
2	H	H	H	O
1	O	H	H	O
R	O	O	H	O
Selector lever position	Judgement			



**Pressure Testing**

- Location of line pressure test port
- Use Tool (ST25490000) when removing and installing line pressure plug.
- Always replace line pressure plugs as they are self-sealing bolts.

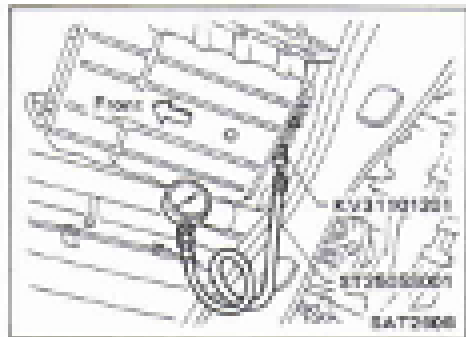


**LINE PRESSURE TEST PROCEDURE**

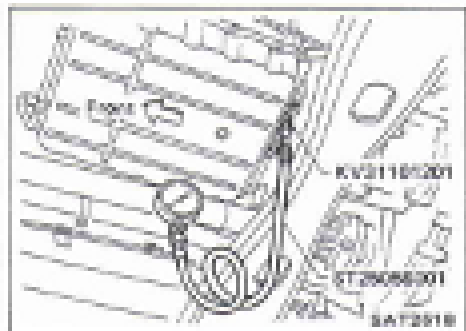
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

**A.T.F. operating temperature:**

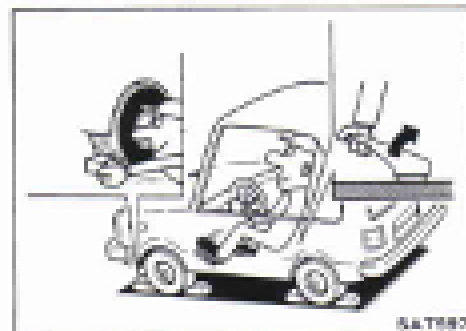
**50 - 80° C (122 - 176° F)**



3. Install pressure gauge to line pressure port.  
 – D, 2 and 1 ranges –



– R range –



4. Set parking brake and block wheels.
- Continue to depress brake pedal fully while line pressure test at stall speed is performed.



### Pressure Testing (Cont'd)

5. Start engine and measure line pressure at idle and stall speed.
  - When measuring line pressure at stall speed, follow the stall test procedure.

#### Line pressure

Model	Engine speed rpm	Line pressure kPa (bar, kg/cm <sup>2</sup> , psi)	
		D, 2 and 1 ranges	R range
TB42	Idle	392 - 471 (3.92 - 4.71, 4.0 - 4.8, 57 - 68)	667 - 706 (6.67 - 7.06, 6.8 - 7.2, 97 - 102)
	Stall	883 - 961 (8.83 - 9.61, 9.0 - 9.8, 128 - 139)	1,393 - 1,471 (13.93 - 14.71, 14.2 - 15.0, 202 - 213)

### JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all ranges.	<ul style="list-style-type: none"> <li>• Oil pump wear</li> <li>• Control piston damage</li> <li>• Pressure regulator valve or plug sticking</li> <li>• Spring for pressure regulator valve damaged</li> <li>• Fluid pressure leakage between oil strainer and pressure regulator valve</li> </ul>
	Line pressure is low in particular range.	<ul style="list-style-type: none"> <li>• Fluid pressure leakage between manual valve and particular clutch.</li> <li>• For example; If line pressure is low in "R" and "1" ranges but is normal in "D" and "2" range, fluid leakage exists at or around low &amp; reverse brake circuit.</li> </ul>
	Line pressure is high.	<ul style="list-style-type: none"> <li>• Mal-adjustment of throttle sensor</li> <li>• Fluid temperature sensor damaged</li> <li>• Line pressure solenoid sticking</li> <li>• Short circuit of line pressure solenoid circuit</li> <li>• Pressure modifier valve sticking</li> <li>• Pressure regulator valve or plug sticking</li> </ul>
At stall speed	Line pressure is low.	<ul style="list-style-type: none"> <li>• Mal-adjustment of throttle sensor</li> <li>• Control piston damaged</li> <li>• Line pressure solenoid sticking</li> <li>• Short-circuit of line pressure solenoid circuit</li> <li>• Pressure regulator valve or plug sticking</li> <li>• Pressure modifier valve sticking</li> <li>• Pilot valve sticking</li> </ul>

Trouble-shooting Chart

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle.

	ON vehicle													OFF vehicle															
	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Overrun clutch solenoid	Fluid temperature sensor	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse brake	Brake band
Engine does not start in "N", "P" ranges.	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
Engine starts in range other than "N" and "P".	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
Transmission noise in "P" and "N" ranges.	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
Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	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
Vehicle runs in "N" range.	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
Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	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
Vehicle braked when shifting into "R" range.	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
Sharp shock in shifting from "N" to "D" range.	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
Vehicle will not run in "D" and "2" ranges (but runs in "1" and "R" range).	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
Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	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
Clutches or brakes slip somewhat in starting.	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
Excessive creep.	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
No creep at all.	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
Failure to change gear from "D <sub>1</sub> " to "D <sub>3</sub> ".	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
Failure to change gear from "D <sub>2</sub> " to "D <sub>3</sub> ".	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
Failure to change gear from "D <sub>3</sub> " to "D <sub>4</sub> ".	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
Too high a gear change point from "D <sub>1</sub> " to "D <sub>2</sub> ", from "D <sub>2</sub> " to "D <sub>3</sub> ", from "D <sub>3</sub> " to "D <sub>4</sub> ".	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
Gear change directly from "D <sub>1</sub> " to "D <sub>3</sub> " occurs.	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
Engine stops when shifting lever into "R", "D", "2" and "1".	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
Too sharp a shock in change from "D <sub>1</sub> " to "D <sub>3</sub> ".	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
Too sharp a shock in change from "D <sub>2</sub> " to "D <sub>3</sub> ".	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



# TROUBLE-SHOOTING AND DIAGNOSES

RE4R03A

## Trouble-shooting Chart (Cont'd)

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle.

	ON vehicle													OFF vehicle																	
	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Overrun clutch solenoid	Fluid temperature sensor	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse brake	Brake band	Parking components
Too sharp a shock in change from "D <sub>3</sub> " to "D <sub>4</sub> ".	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	4	.	5	.	.
Almost no shock or clutches slipping in change from "D <sub>1</sub> " to "D <sub>2</sub> ".	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	6
Almost no shock or slipping in change from "D <sub>2</sub> " to "D <sub>3</sub> ".	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	1	.	.	.	.	.	.	.	7
Almost no shock or slipping in change from "D <sub>3</sub> " to "D <sub>4</sub> ".	1	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	1	.	.	.	.	.	.	.	8
Vehicle braked by gear change from "D <sub>1</sub> " to "D <sub>2</sub> ".	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	3	.	.	.	.	4	5	.	.
Vehicle braked by gear change from "D <sub>2</sub> " to "D <sub>3</sub> ".	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vehicle braked by gear change from "D <sub>3</sub> " to "D <sub>4</sub> ".	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	3	.	4	5	.	.	.	.	.
Maximum speed not attained. Acceleration poor.	1	2	.	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	1	2	3	.	.	.	.	.	4	5	.
Failure to change gear from "D <sub>4</sub> " to "D <sub>3</sub> ".	1	.	.	2	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Failure to change gear from "D <sub>3</sub> " to "D <sub>2</sub> " or from "D <sub>4</sub> " to "D <sub>1</sub> ".	1	.	.	2	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Failure to change gear from "D <sub>2</sub> " to "D <sub>1</sub> " or from "D <sub>3</sub> " to "D <sub>1</sub> ".	1	.	.	2	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Gear change shock felt during deceleration by releasing accelerator pedal.	.	.	1	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Too high a change point from "D <sub>4</sub> " to "D <sub>3</sub> ", from "D <sub>3</sub> " to "D <sub>2</sub> ", from "D <sub>2</sub> " to "D <sub>1</sub> ".	.	.	1	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Kickdown does not operate when depressing pedal in "D <sub>4</sub> " with in kickdown vehicle speed.	.	.	1	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Kickdown operates or engine overruns when depressing pedal in "D <sub>4</sub> " beyond kickdown vehicle speed limit.	.	.	1	.	.	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>3</sub> " when depressing pedal.	1	.	2	.	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.
Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>2</sub> " when depressing pedal.	1	.	2	.	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Races extremely fast or slips in changing from "D <sub>3</sub> " to "D <sub>2</sub> " when depressing pedal.	1	.	2	.	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	.	1	2	.	.	.	.	.	.	.
Races extremely fast or slips in changing from "D <sub>4</sub> " or "D <sub>3</sub> " to "D <sub>1</sub> " when depressing pedal.	1	.	2	.	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	.	1	2	3	.	.	.	.	.	.
Vehicle will not run in any range.	1	2	.	.	.	.	.	.	3	4	.	.	.	.	.	.	.	.	.	.	.	1	2	3	4	5	6	7	8	9	10
Transmission noise in "D", "2", "1" and "R" ranges.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.

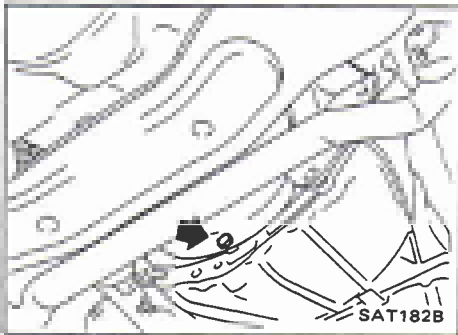
# TROUBLE-SHOOTING AND DIAGNOSES

RE4R03A

## Trouble-shooting Chart (Cont'd)

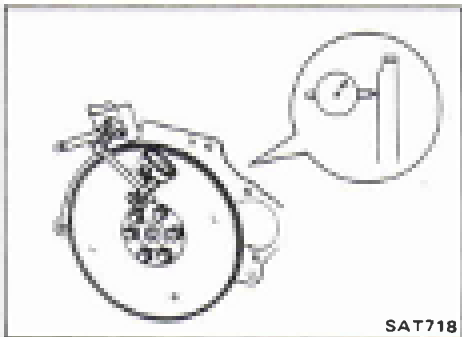
Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle.

	ON vehicle										OFF vehicle																			
	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Overrun clutch solenoid	Fluid temperature sensor	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse brake	Brake band
Failure to change from "D <sub>3</sub> " to "2" when changing lever into "2" range.			1	2				3	4																		5		6	
Gear change from "2 <sub>1</sub> " to "2 <sub>2</sub> " in "2" range.			1																											
Engine brake does not operate in "1" range.		1	2	3	4			5	6																		7	8		
Gear change from "1 <sub>1</sub> " to "1 <sub>2</sub> " in "1" range.		1	2																											
Does not change from "1 <sub>1</sub> " to "1 <sub>2</sub> " in "1" range.		1	2	3				4	5																		6	7		
Large shock changing from "1 <sub>1</sub> " to "1 <sub>2</sub> " in "1" range.								1																				2		
Transmission overheats.	1	2	3				4	5	6											7	8	9	10			11	12	13	14	
A.T.F. shoots out during operation. White smoke emitted from exhaust pipe during operation.	1																					1	2	3			4	5	6	
Offensive smell at fluid charging pipe.	1																				1	2	3	4			5	6	7	
Torque converter is not locked up.		1	2	3	4			5				6	7	8							1									
Lock-up piston slip	1		2					3	4			5	6								1									
Lock-up point is extremely high or low.			1	2								3																		
A/T does not shift to "D <sub>4</sub> " when driving in "AUTO" mode.			1	2				3	4			5	6														7	8		
Engine is stopped at "R", "D", "2" and "1" ranges.	1							2	3			4																		



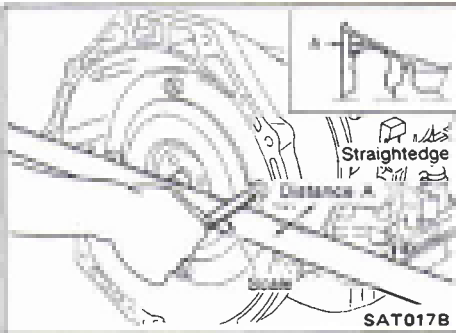
## Removal

- Remove bolts securing torque converter to drive plate.
- Remove those bolts by turning crankshaft.
- Plug up opening such as oil charging pipe hole, etc.



## Installation

- Drive plate runout
  - Maximum allowable runout:**  
0.5 mm (0.020 in)
- If this runout is out of allowance, replace drive plate with ring gear.

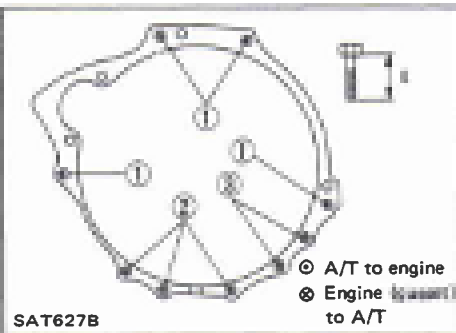


- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.

**Distance "A":**

**26 mm (1.02 in) or more**

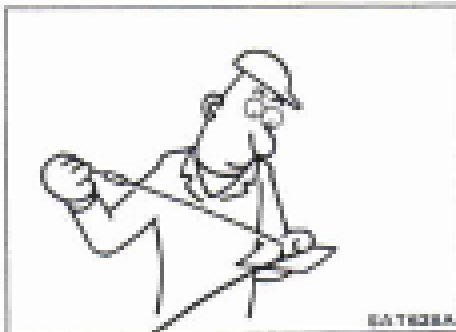
- Install converter to drive plate.
- After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.



- Tighten bolts securing transmission.
- TB42 engine models

Bolt No.	Tightening torque N-m (kg-m, ft-lb)	ℓ mm (in)
1	83 - 113 (8.5 - 11.5, 61 - 83)	65 (2.56)
2	29 - 39 (3.0 - 4.0, 22 - 29)	65 (2.56)
3	29 - 39 (3.0 - 4.0, 22 - 29)	35 (1.38)
Gear to engine	29 - 39 (3.0 - 4.0, 22 - 29)	50 (1.97) 35 (1.38)

- Reinstall any part removed.



- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly.
 

With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. — Refer to "Road Testing".

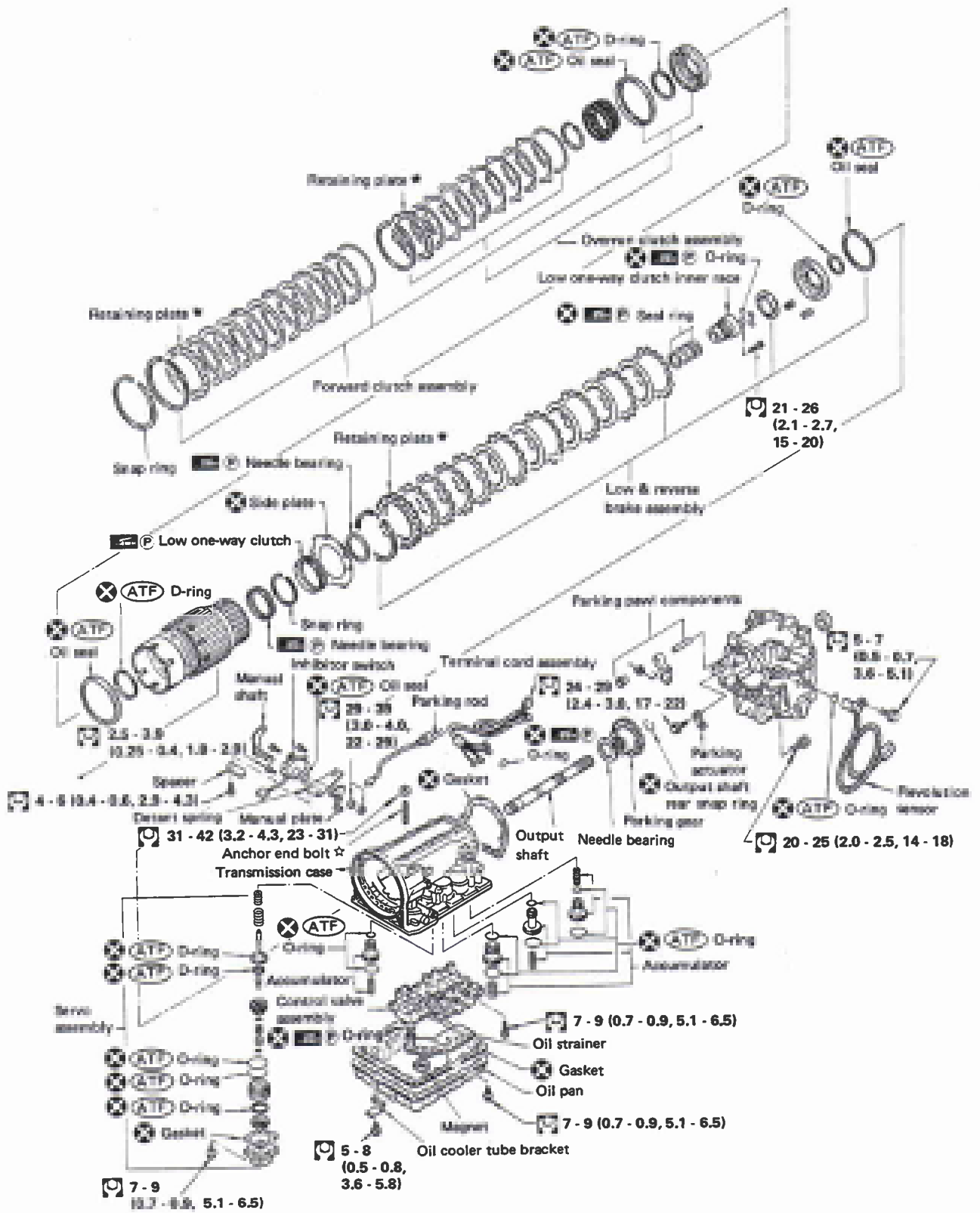
## REMOVAL AND INSTALLATION

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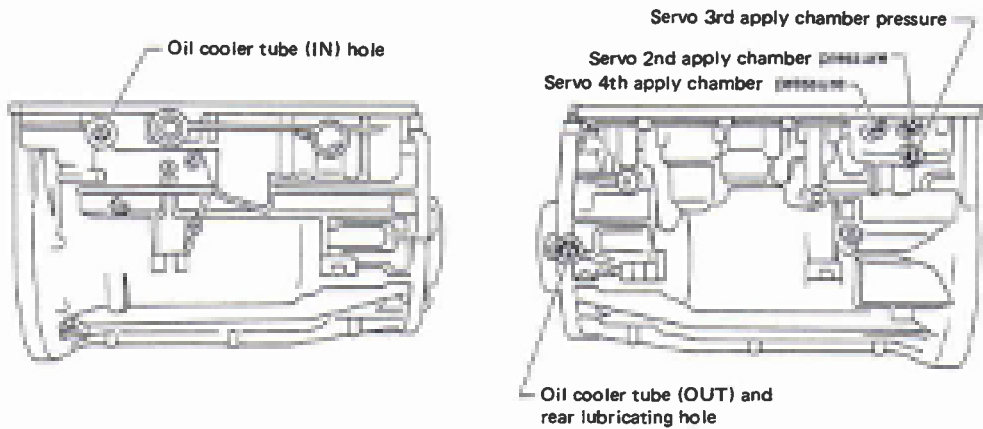
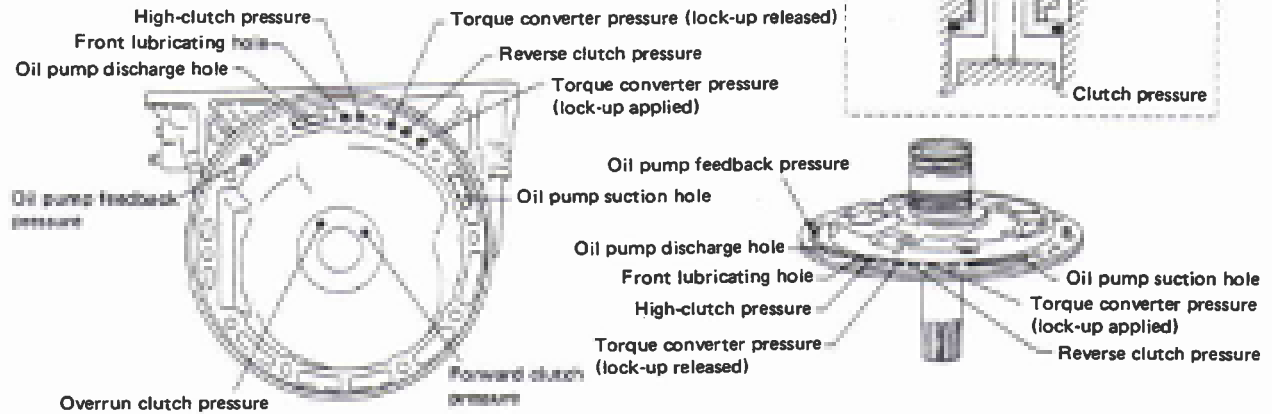
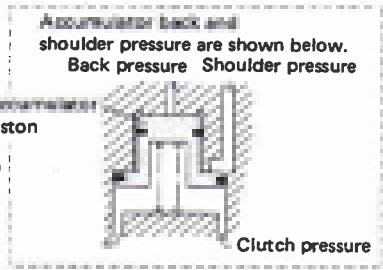
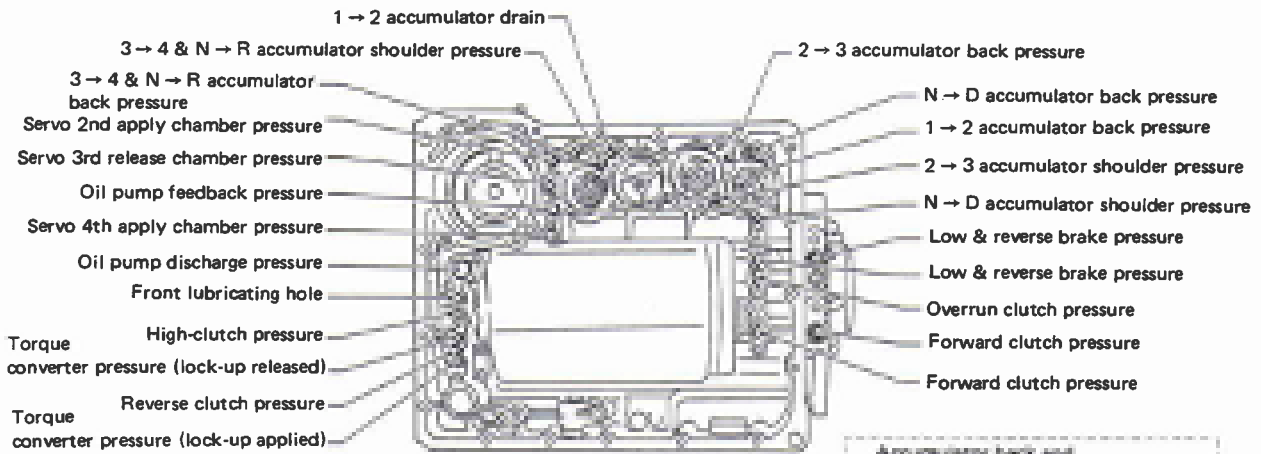
RE4R03A

Note:

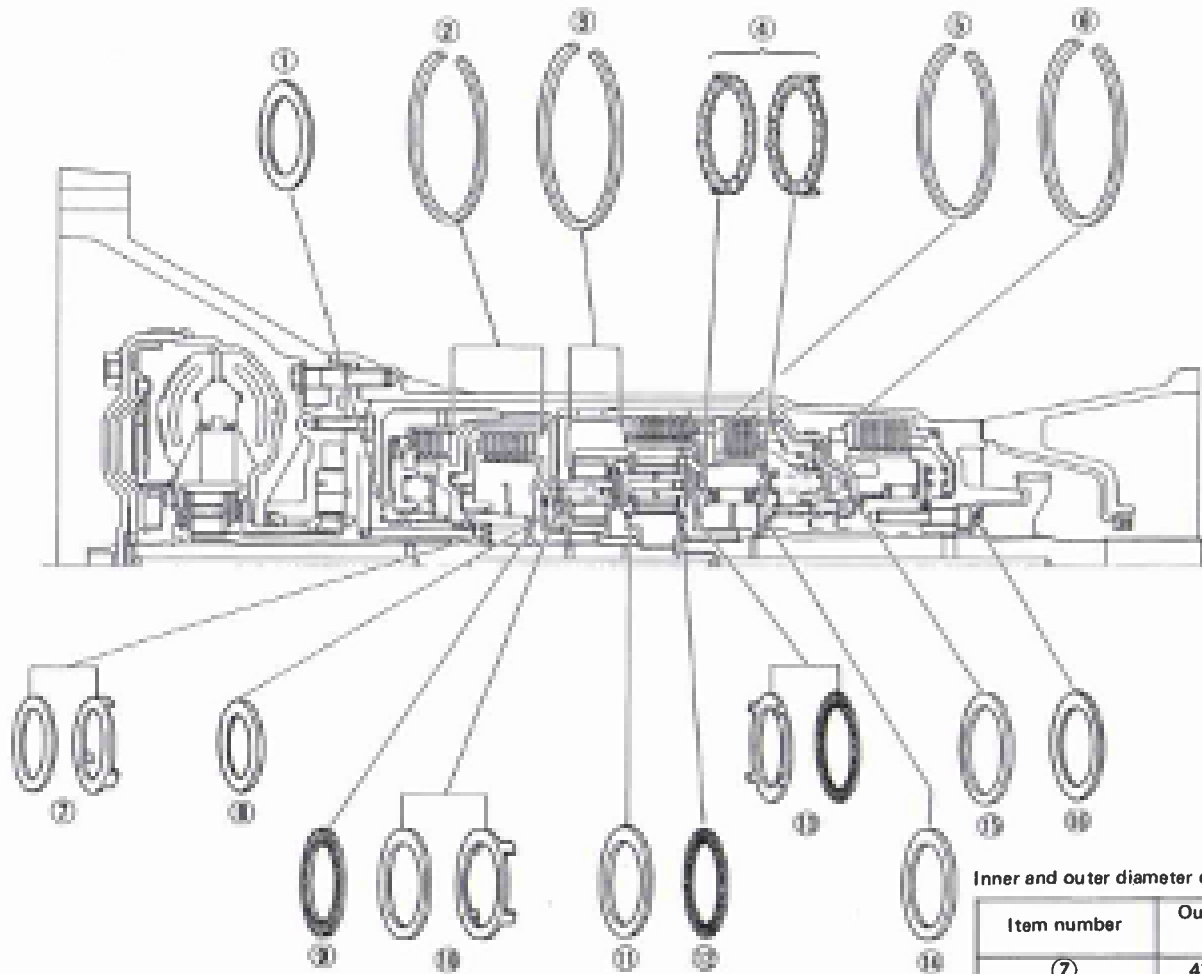




Oil Channel



Locations of Needle Bearings, Thrust Washers and Snap Rings



Outer diameter of snap rings

Item number	Outer diameter mm (in)
②, ⑤	164.0 (6.46)
③	176.0 (6.93)
⑥	172.0 (6.77)

Thrust washers

Item number	Color
①	Black
④	White

Outer diameter of bearing races

Item number	Outer diameter mm (in)
⑦	43.5 (1.713)
⑩	82.0 (3.228)
⑬	63.2 (2.488)

Installation of one-piece bearings

Item number	Bearing race (black) location
⑮	Rear side
⑯	Rear side

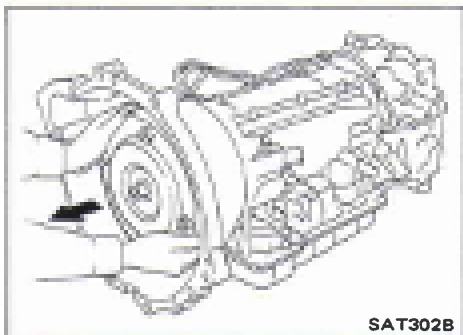
Inner and outer diameter of needle bearings

Item number	Outer diameter mm (in)	Inner diameter mm (in)	Number of needles
⑦	47.0 (1.850)	30.0 (1.181)	-
⑧	53.0 (2.087)	35.1 (1.382)	-
⑨, ⑩	85.0 (3.346)	62.7 (2.468)	-
⑪, ⑫	64.0 (2.520)	45.0 (1.772)	52
⑬	64.0 (2.520)	45.0 (1.772)	50
⑭	64.0 (2.520)	44.0 (1.732)	34
⑮	78.1 (3.075)	-	-
⑯	64.0 (2.520)	-	-

AT-83

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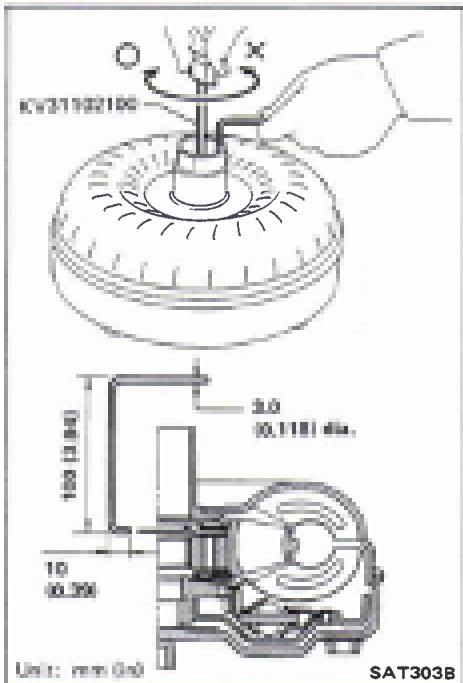




SAT302B

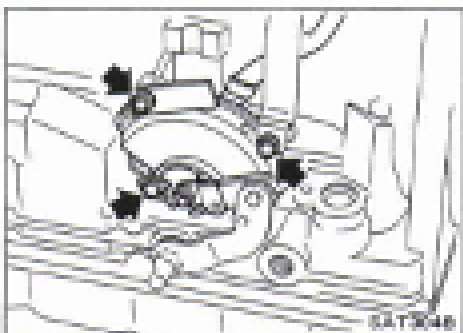
### Disassembly

1. Remove torque converter by holding it firmly and turning while pulling straight out.



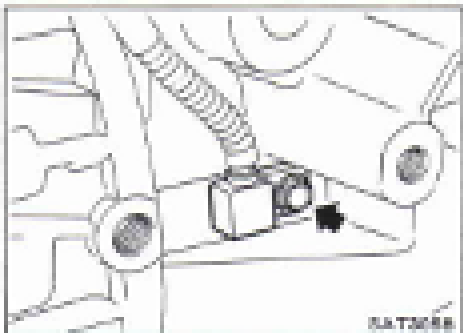
SAT303B

2. Check torque converter one-way clutch.
  - a. Insert Tool into spline of one-way clutch inner race.
  - b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
  - c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.



SAT304B

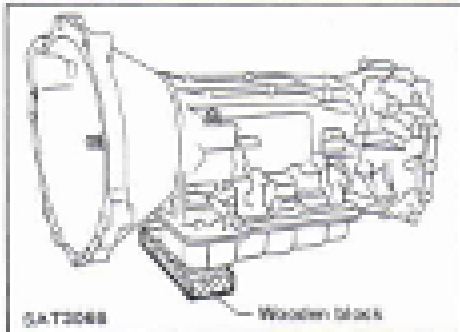
3. Remove inhibitor switch and revolution sensor.
  - a. Remove inhibitor switch from transmission case.



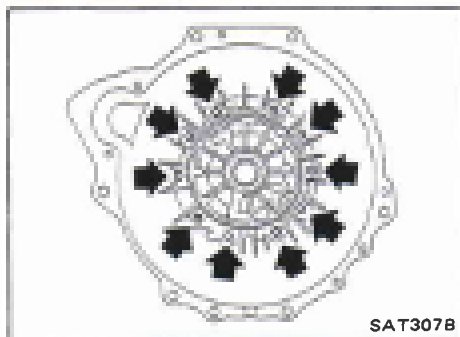
SAT305B

- b. Remove revolution sensor from adapter case.
  - c. Remove O-ring from revolution sensor.

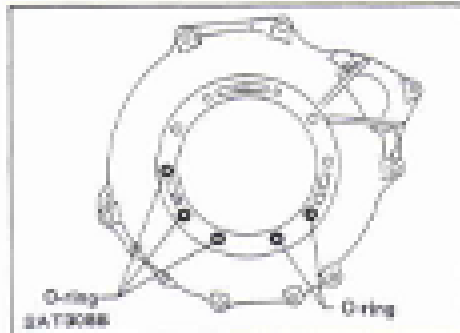
## Disassembly (Cont'd)



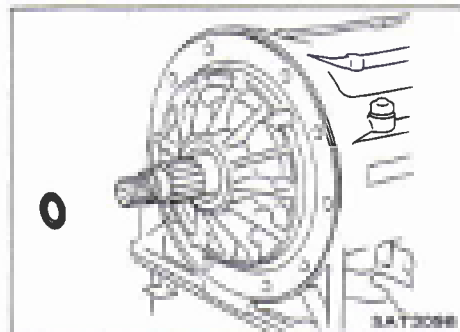
4. Remove converter housing.
  - a. Place wooden block under front end of oil pan to remove converter housing.



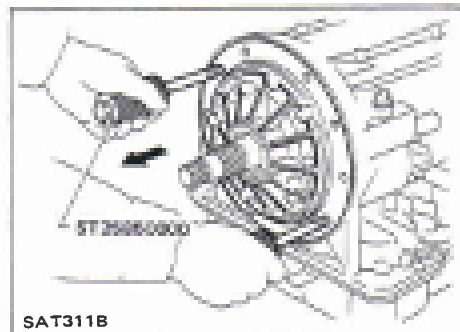
- b. Remove converter housing from transmission case.



- c. Remove O-rings from converter housing.
  - d. Remove traces of sealant.
    - **Be careful not to scratch converter housing.**



5. Remove oil pump assembly.
  - a. Remove O-ring from input shaft.



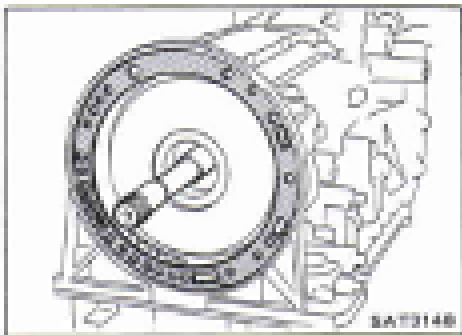
- b. Attach Tool to oil pump assembly and extract it evenly from transmission case.
  - c. Remove traces of sealant from oil pump housing.
    - **Be careful not to scratch pump housing.**

**Disassembly (Cont'd)**

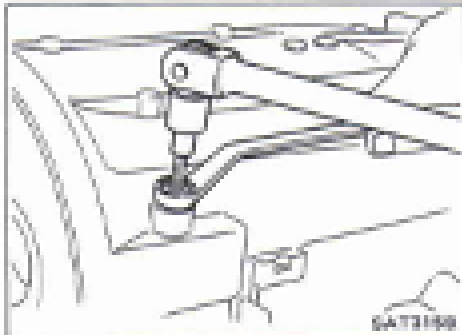
- d. Remove needle bearing and thrust washer from oil pump assembly.



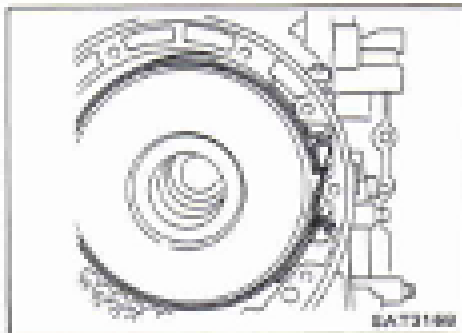
- 6. Remove input shaft and oil pump gasket.



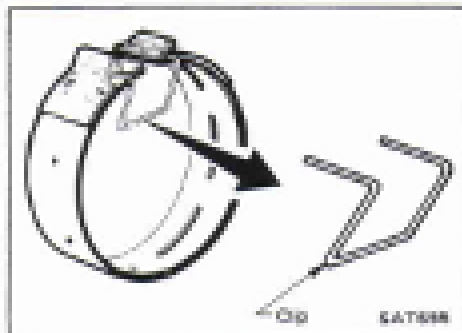
- 7. Remove brake band and band strut.
  - a. Loosen lock nut and remove band servo anchor end pin from transmission case.



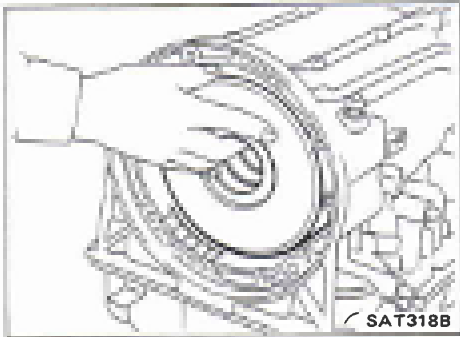
- b. Remove brake band and band strut from transmission case.



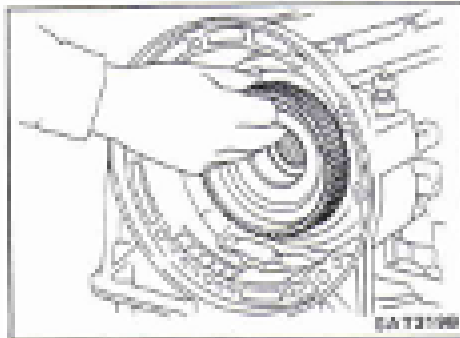
- c. Hold brake band in a circular shape with clip.



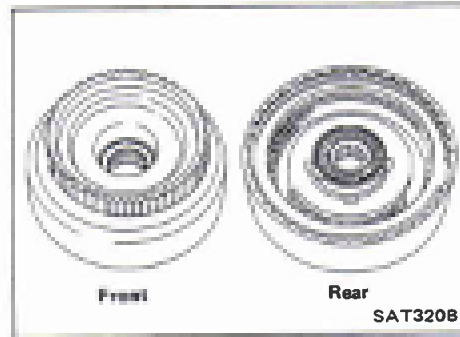
**Disassembly (Cont'd)**



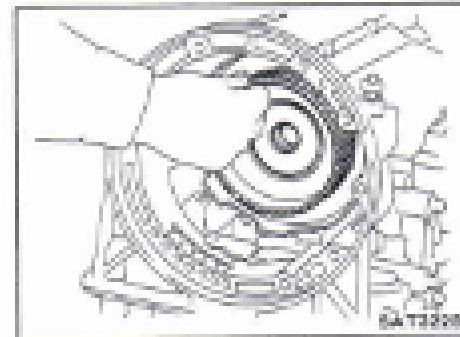
- 8. Remove front side clutch and gear components.
- a. Remove reverse clutch assembly from transmission case.



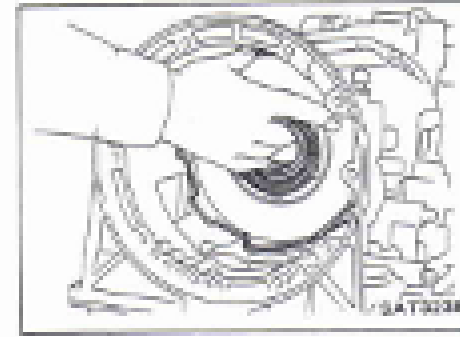
- b. Remove high clutch assembly from transmission case.



- c. Remove front bearing race from high clutch assembly.
- d. Remove rear needle bearing from high clutch assembly.

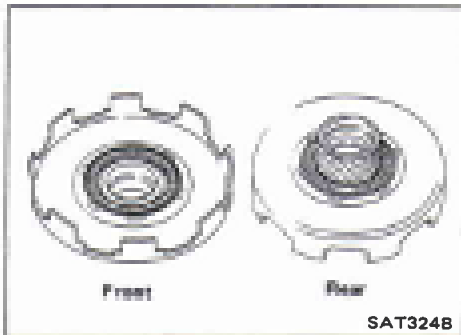


- e. Remove high clutch hub from transmission case.

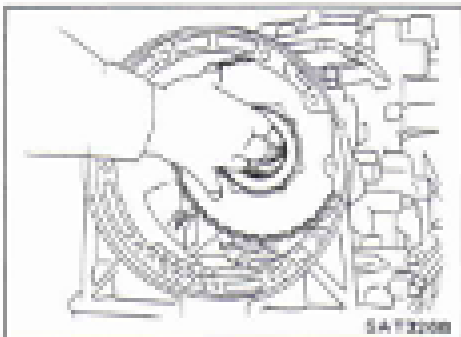


- f. Remove front sun gear from transmission case.

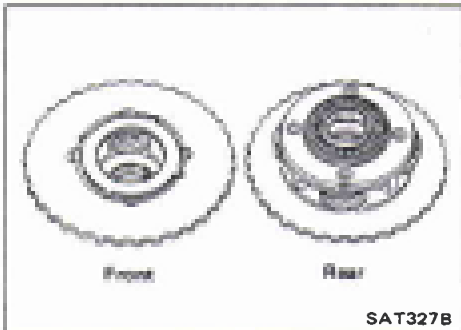
**Disassembly (Cont'd)**



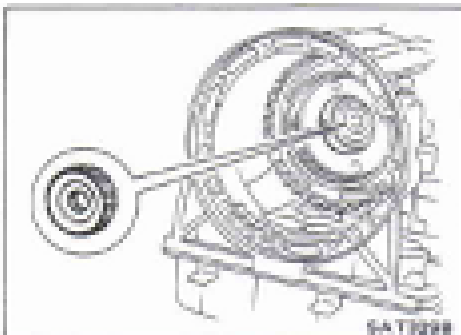
- g. Remove front needle bearing from front sun gear.
- h. Remove rear needle bearing from front sun gear.



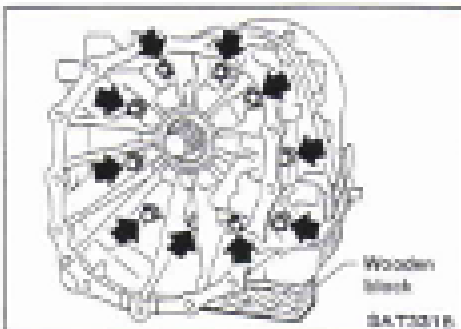
- i. Remove front planetary carrier from transmission case.



- j. Remove front bearing race from front planetary carrier.
- k. Remove rear needle bearing from front planetary carrier.



- l. Remove rear sun gear from transmission case.



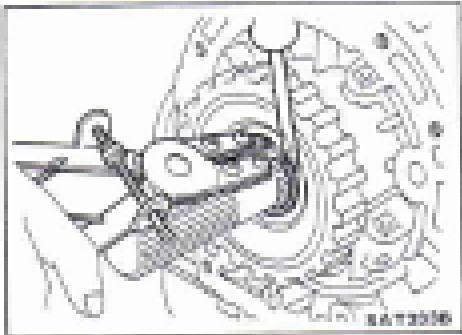
- 9. Remove adapter case.
  - a. Remove adapter case from transmission case.
  - b. Remove adapter case gasket from transmission case.

## DISASSEMBLY

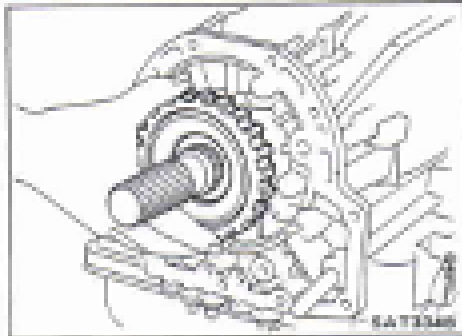
RE4R03A

### Disassembly (Cont'd)

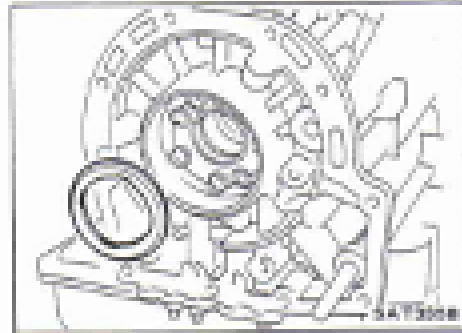
10. Remove output shaft and parking gear.  
a. Remove rear snap ring from output shaft.



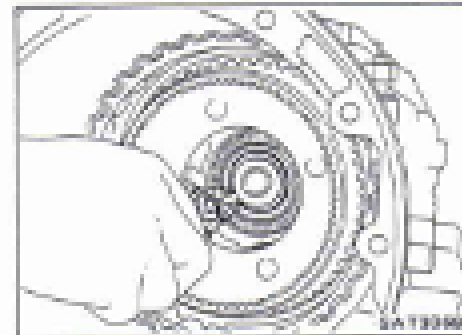
- b. Remove parking gear from transmission case.



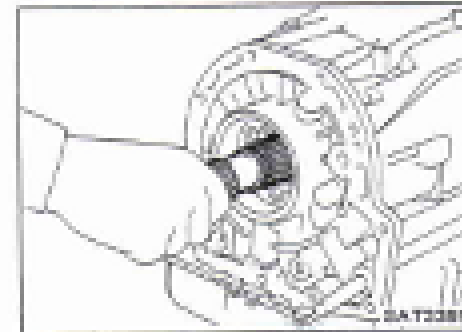
- c. Remove needle bearing from transmission case.



- d. Slowly push output shaft all the way forward.  
● Do not use excessive force.  
e. Remove snap ring from output shaft.

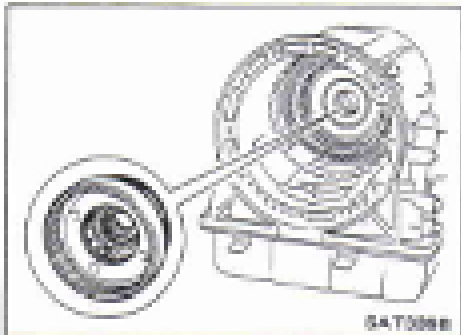


- f. Remove output shaft from transmission case.

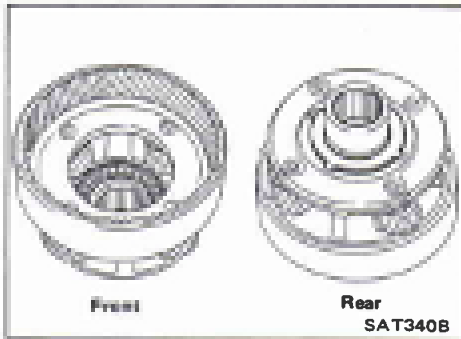


**Disassembly (Cont'd)**

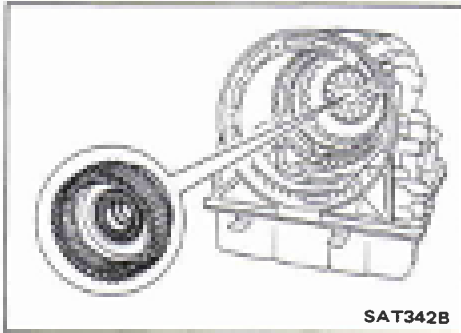
11. Remove rear side clutch and gear components.
  - a. Remove front internal gear.



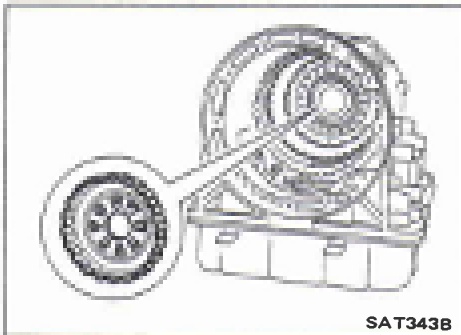
- b. Remove front needle bearing from front internal gear.
  - c. Remove rear bearing race from front internal gear.



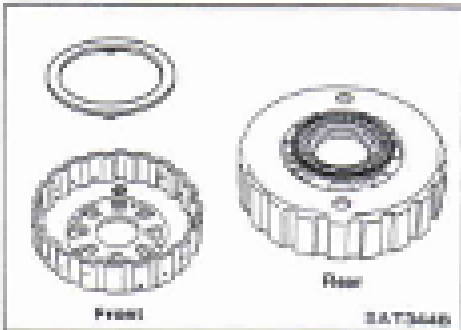
- d. Remove rear internal gear and forward clutch hub as a set from transmission case.



- e. Remove overrun clutch hub from transmission case.



- f. Remove thrust washer from overrun clutch hub.
  - g. Remove needle bearing from overrun clutch hub.

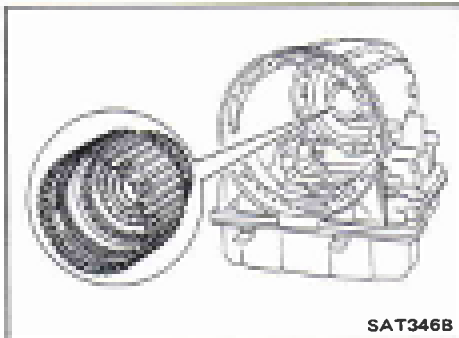


## DISASSEMBLY

RE4R03A

### Disassembly (Cont'd)

h. Remove forward clutch assembly from transmission case.

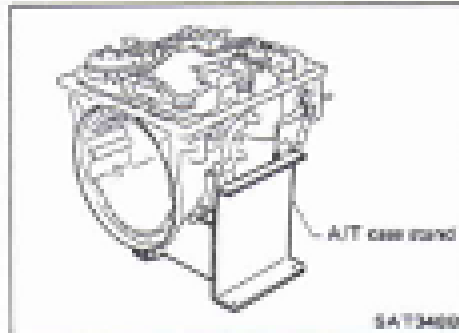


12. Remove oil pan.

- Separate the oil pan and transmission case.
- **Always place oil pan straight down so that foreign particles inside will not move.**



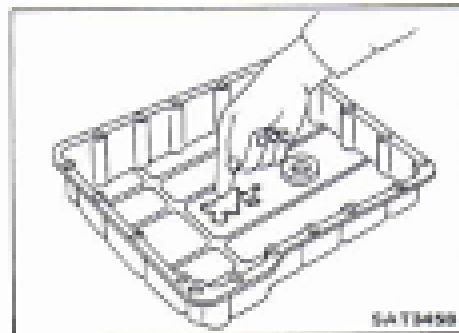
13. Place transmission case on transmission case stand with the control valve facing up.



14. Check oil pan and oil strainer for accumulation of foreign particles.

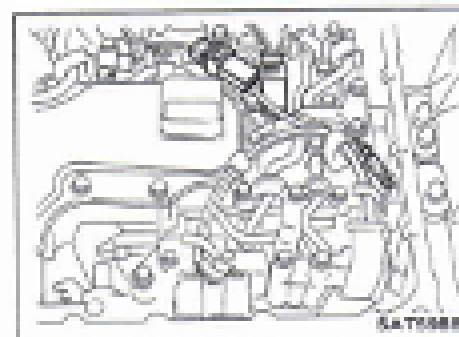
- If materials of clutch facing are found, clutch plates may be worn.
- If metal filings are found, clutch plates, brake bands, etc. may be worn.
- If aluminum filings are found, bushings or aluminum cast parts may be worn.

In above cases, replace torque converter and check unit for cause of particle accumulation.



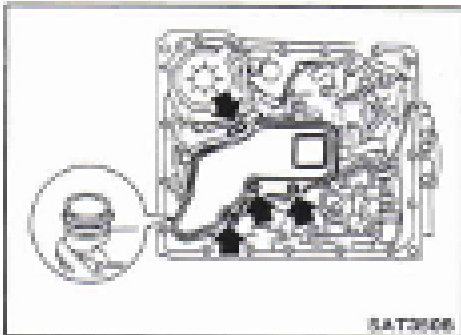
15. Remove lock-up solenoid, fluid temperature sensor and A/T oil temperature switch connectors.

- **Be careful not to damage connector.**

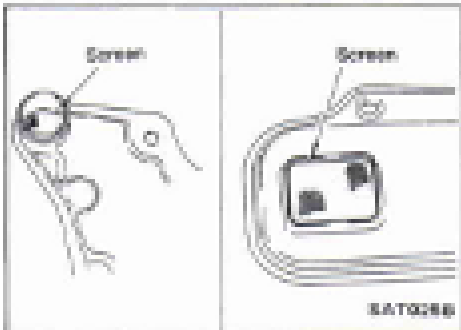




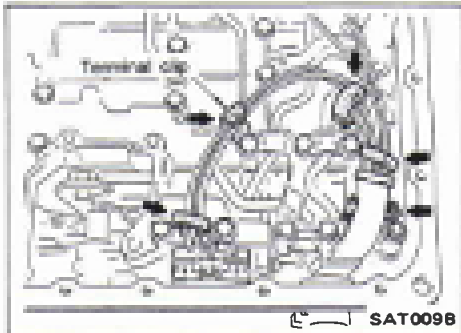
Disassembly (Cont'd)



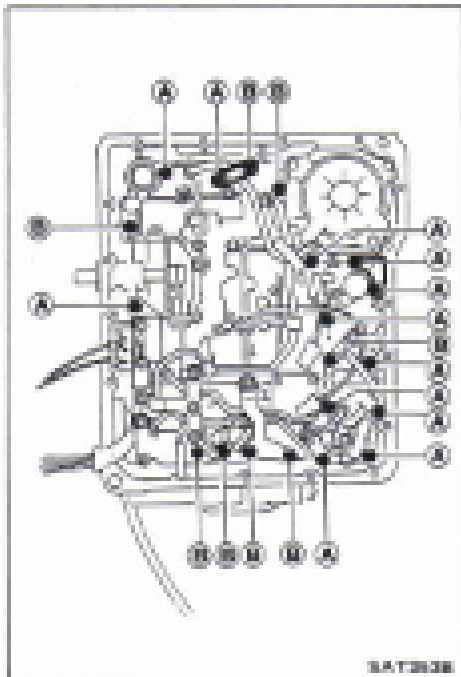
16. Remove oil strainer.  
 a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.



- b. Check oil strainer screen for damage.



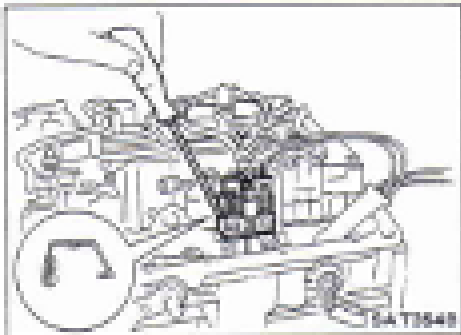
17. Remove control valve assembly.  
 a. Straighten terminal clips to free terminal cords then remove terminal clips.



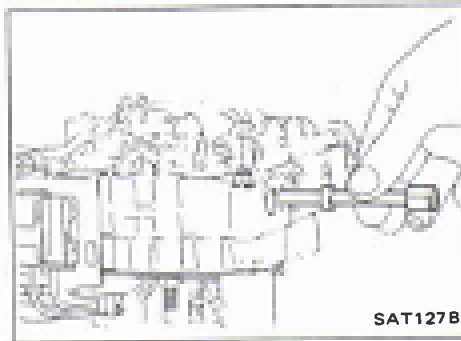
- b. Remove bolts **A** and **B**, and remove control valve assembly from transmission.

Bolt symbol	ℓ mm (in)  ℓ
<b>A</b>	33 (1.30)
<b>B</b>	45 (1.77)

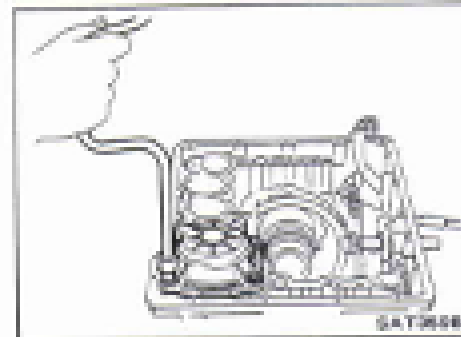
Disassembly (Cont'd)



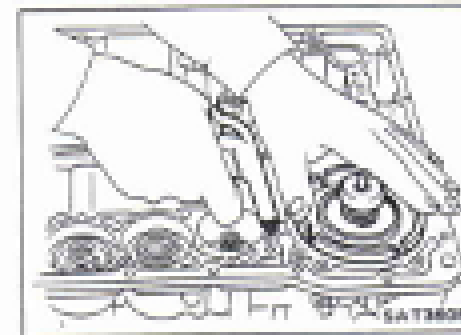
- c. Remove solenoid connector.
- Be careful not to damage connector.



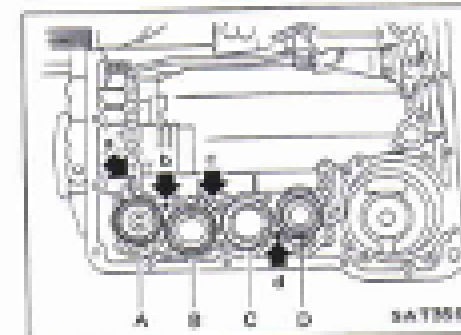
- d. Remove manual valve from control valve assembly.



- 18. Remove band servo and accumulator components.
- a. Remove band servo retainer from transmission case.



- b. Apply compressed air to oil hole until band servo piston comes out of transmission case.
- Hold piston with a rag and gradually direct air to oil hole.
- c. Remove return springs.

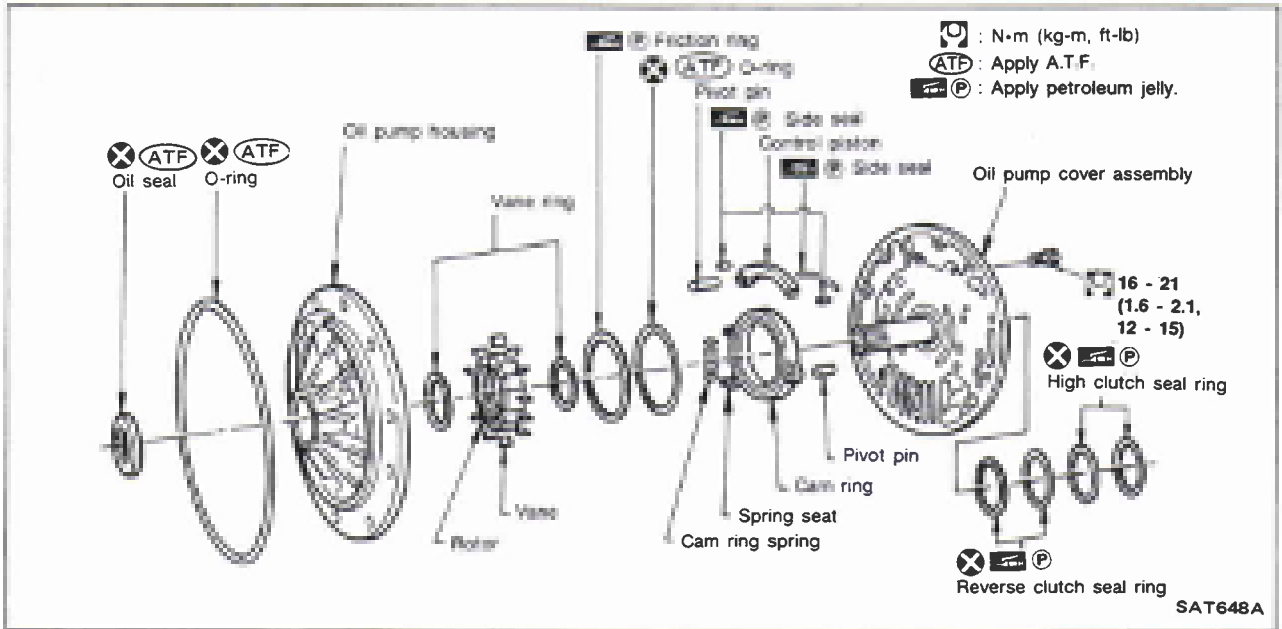


- d. Remove springs from accumulator pistons B, C and D.
- e. Apply compressed air to each oil hole until piston comes out.
- Hold piston with a rag and gradually direct air to oil hole.

Identification of accumulator pistons	A	B	C	D
Identification of oil holes	a	b	c	d

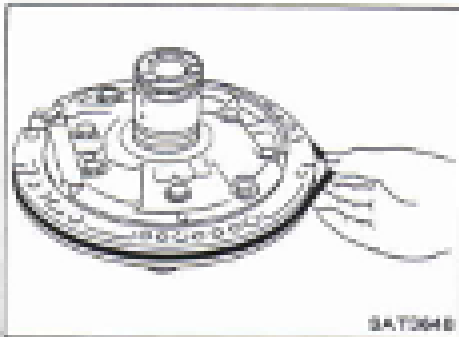
- f. Remove O-ring from each piston.

Oil Pump

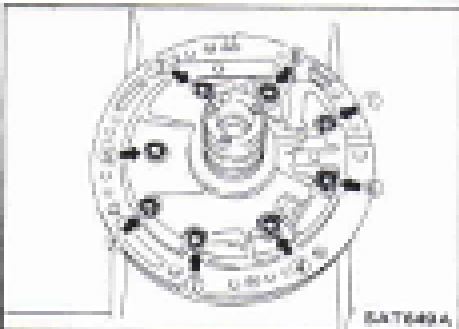


DISASSEMBLY

1. Remove O-ring from oil pump assembly.



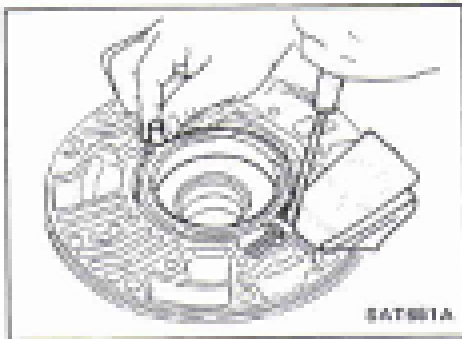
2. Loosen bolts in numerical order and remove oil pump cover.



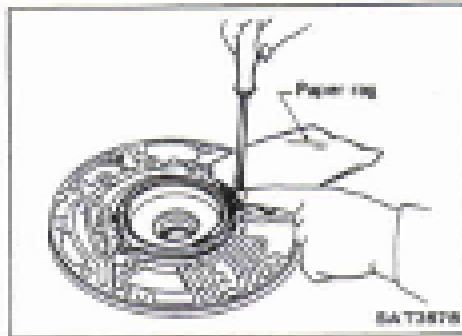
3. Remove rotor, vane rings and vanes.



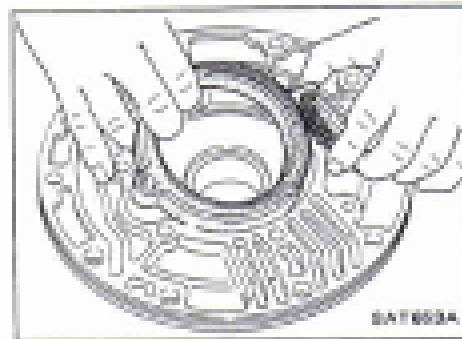
**Oil Pump (Cont'd)**



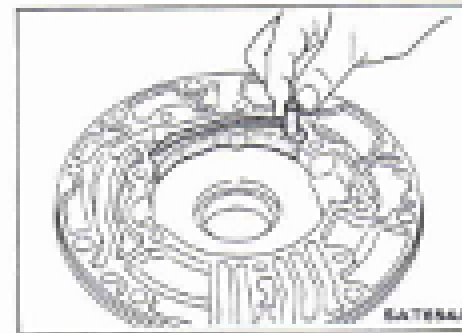
4. While pushing on cam ring remove pivot pin.  
 ● Be careful not to scratch oil pump housing.



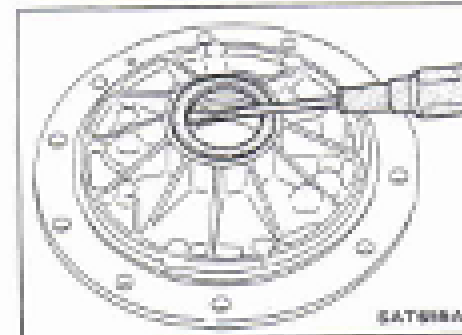
5. While holding cam ring and spring lift out cam ring spring.  
 ● Be careful not to damage oil pump housing.  
 ● Hold cam ring spring to prevent it from jumping.



6. Remove cam ring from oil pump housing.



7. Remove pivot pin from control piston and remove control piston assembly.



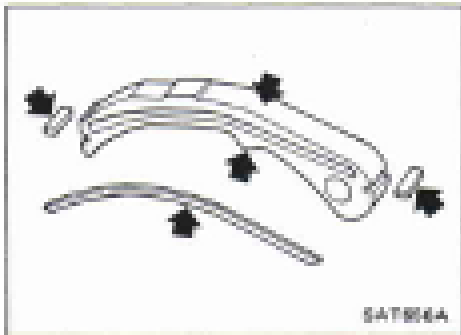
8. Remove oil seal from oil pump housing.  
 ● Be careful not to scratch oil pump housing.

**Oil Pump (Cont'd)**

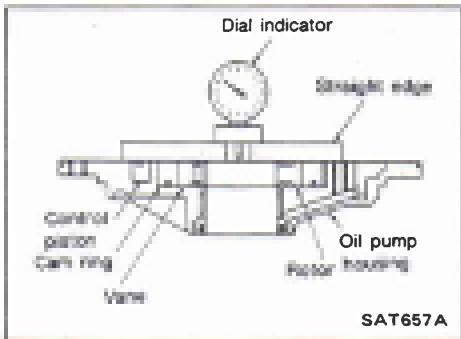
**INSPECTION**

Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

- Check for wear or damage.



SAT656A



SAT657A

**Side clearances**

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston in at least four places along their circumferences. Maximum measured values should be within specified ranges.
- Before measuring side clearance, check that friction rings, O-ring, control piston side seals and cam ring spring are removed.

**Standard clearance:**

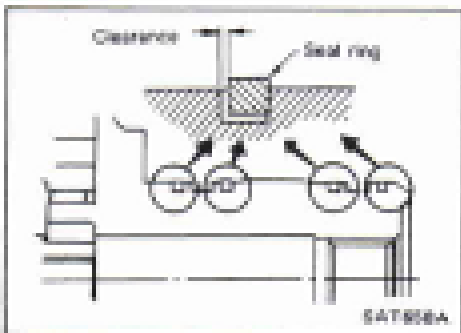
**Cam ring**

0.01 - 0.024 mm (0.0004 - 0.0009 in)

**Rotor, vanes, control piston**

0.03 - 0.044 mm (0.0012 - 0.0017 in)

- If not within standard clearance, replace oil pump assembly except oil pump cover assembly.



SAT658A

**Seal ring clearance**

- Measure clearance between seal ring and ring groove.

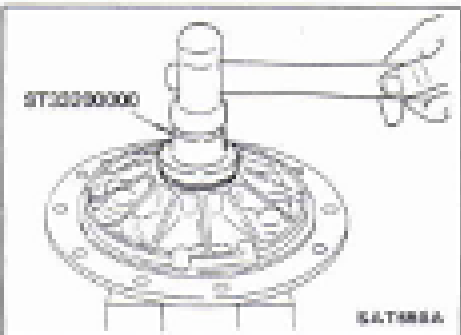
**Standard clearance:**

0.10 - 0.25 mm (0.0039 - 0.0098 in)

**Wear limit:**

0.25 mm (0.0098 in)

- If not within wear limit, replace oil pump cover assembly.

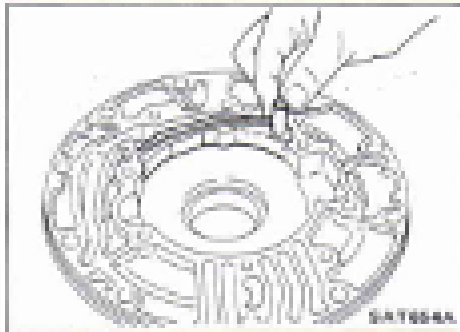


SAT659A

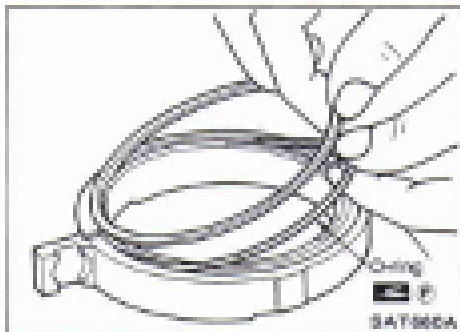
**ASSEMBLY**

1. Drive oil seal into oil pump housing.
- Apply A.T.F. to outer periphery and lip surface.

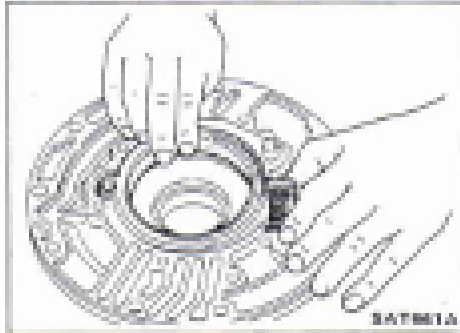
**Oil Pump (Cont'd)**



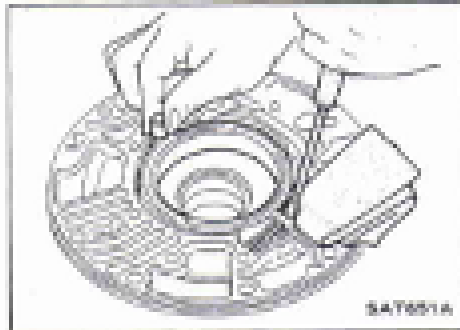
2. Install cam ring in oil pump housing by the following steps.
  - a. Install side seal on control piston.
    - Pay attention to its direction. — Black surface goes toward control piston.
    - Apply petroleum jelly to side seal.
  - b. Install control piston on oil pump.



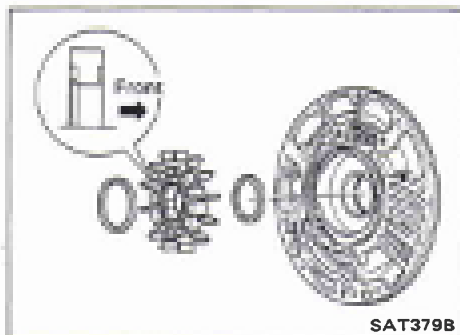
- c. Install O-ring and friction ring on cam ring.
    - Apply petroleum jelly to O-ring.



- d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.

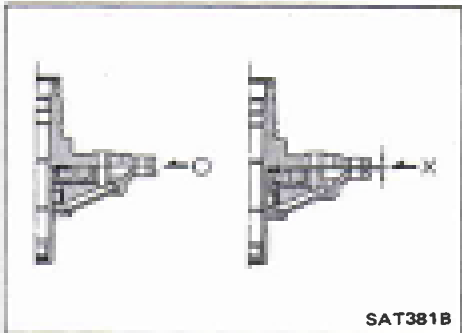


- e. While pushing on cam ring install pivot pin.

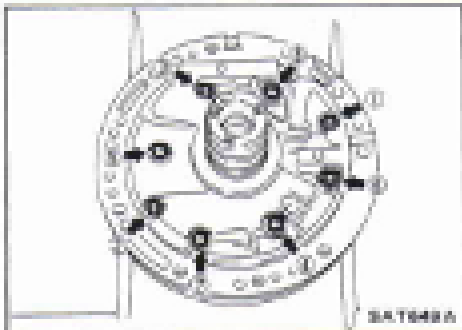


3. Install rotor, vanes and vane rings.
  - Pay attention to direction of rotor.

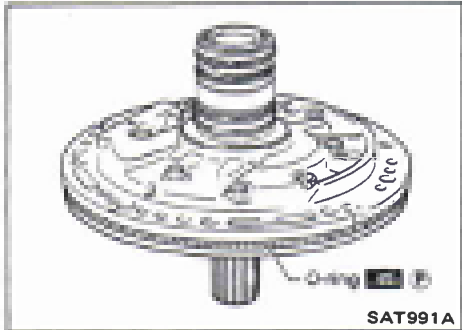
**Oil Pump (Cont'd)**



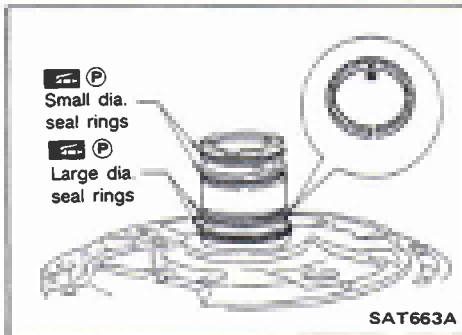
4. Install oil pump housing and oil pump cover.
  - a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.
    - **Make sure that oil pump cover assembly is assembled on oil pump housing assembly correctly.**



- b. Tighten bolts in a criss-cross pattern.

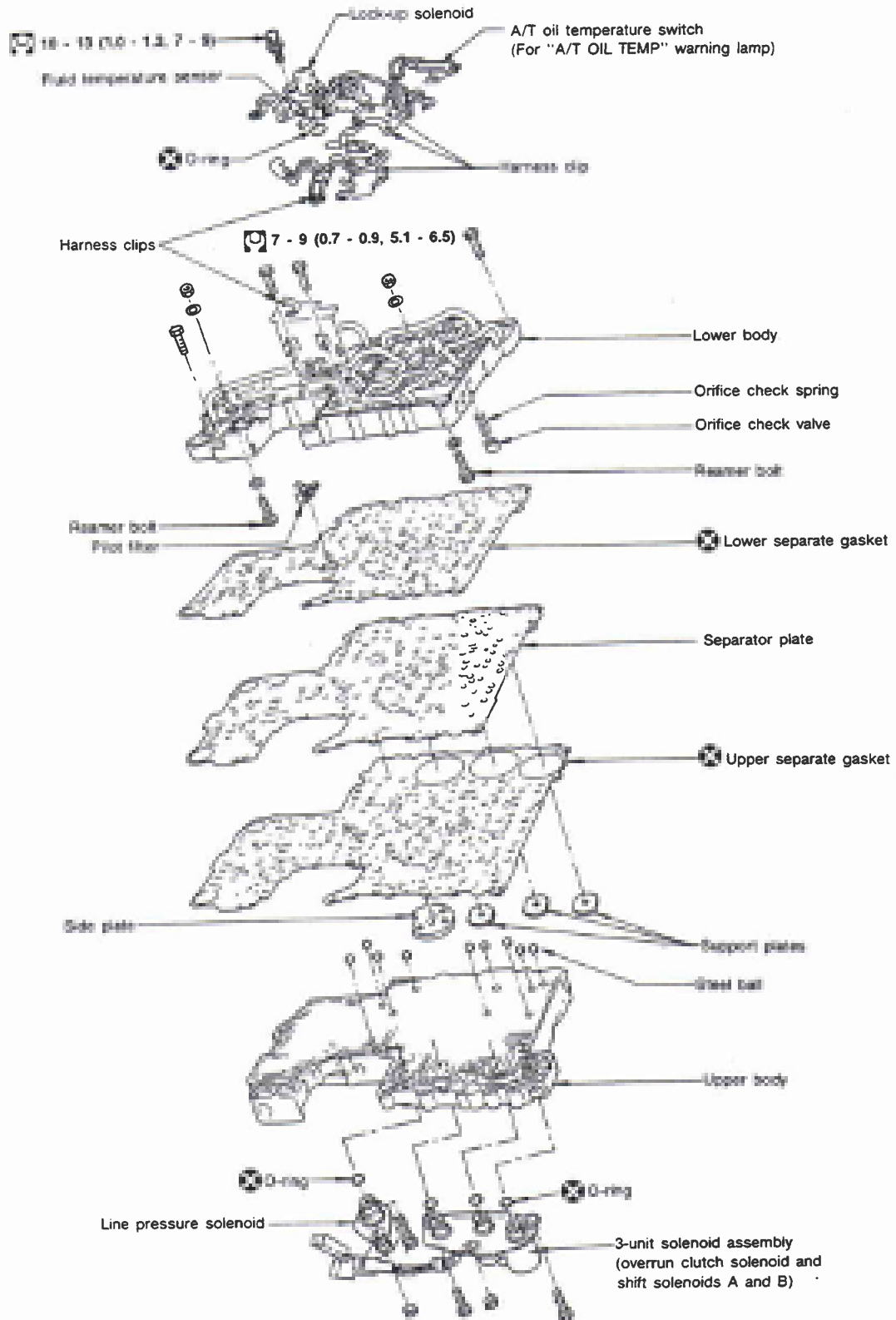


5. Install O-ring on oil pump assembly.
  - **Apply petroleum jelly to O-ring.**



6. Install seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.
  - **Seal rings come in two different diameters. Check fit carefully in each groove.**
    - Small dia. seal ring:**  
No mark
    - Large dia. seal ring:**  
Yellow mark in area shown by arrow
  - **Do not spread gap of seal ring excessively while installing. It may deform ring.**

Control Valve Assembly



: N·m (kg-m, ft-lb)

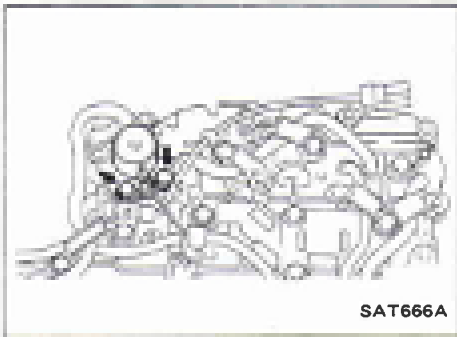
SAT665A



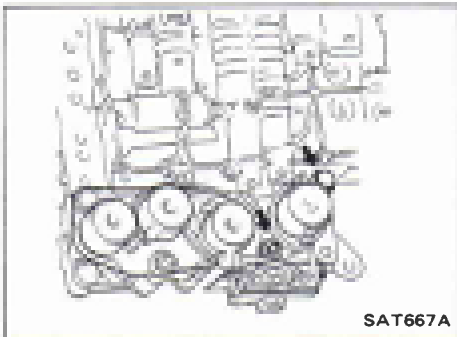
Control Valve Assembly (Cont'd)

DISASSEMBLY

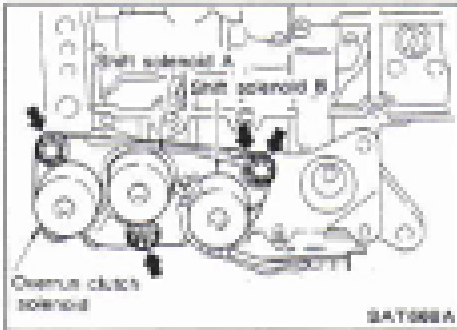
1. Remove solenoids.
  - a. Remove lock-up solenoid and side plate from lower body.
  - b. Remove O-ring from solenoid.



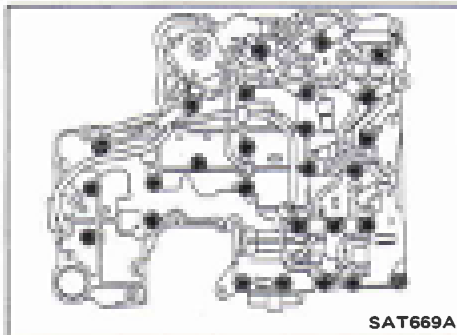
- c. Remove line pressure solenoid from upper body.
  - d. Remove O-ring from solenoid.



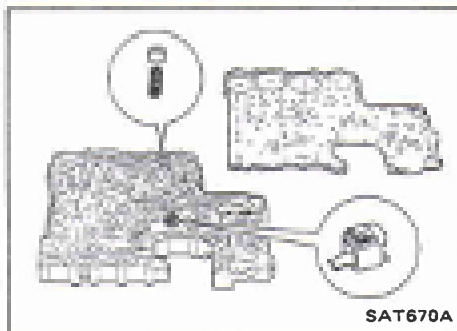
- e. Remove 3-unit solenoid assembly from upper body.
  - f. Remove O-rings from solenoids.



2. Disassemble upper and lower bodies.
  - a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
  - b. Remove lower body, separator plate and separate gasket as a unit from upper body.
  - **Be careful not to drop pilot filter, orifice check valve, spring and steel balls.**

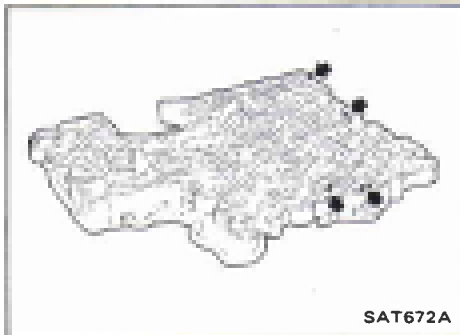
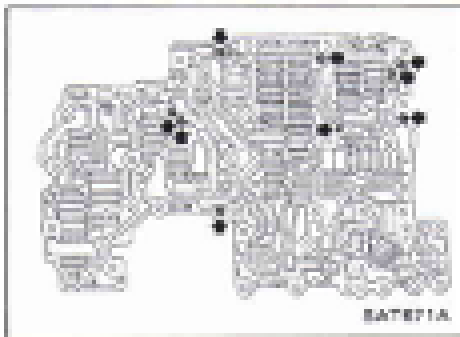


- c. Place lower body facedown, and remove separate gasket and separator plate.
  - d. Remove pilot filter, orifice check valve and orifice check spring.



**Control Valve Assembly (Cont'd)**

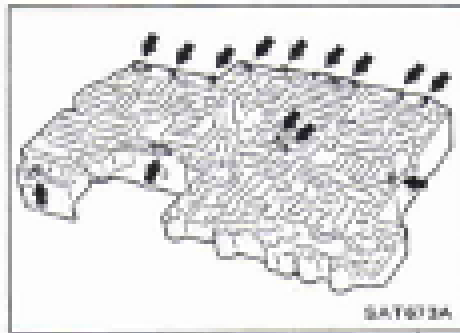
- e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.



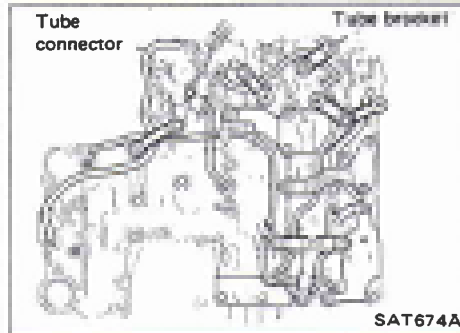
**INSPECTION**

**Lower and upper bodies**

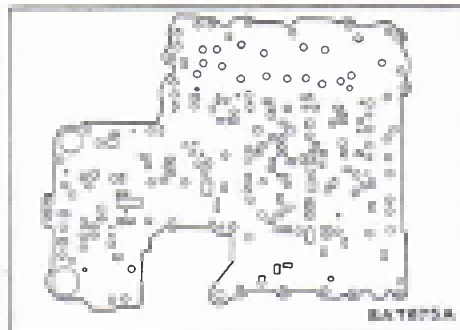
- Check to see that there are pins and retainer plates in lower body.



- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**



- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.



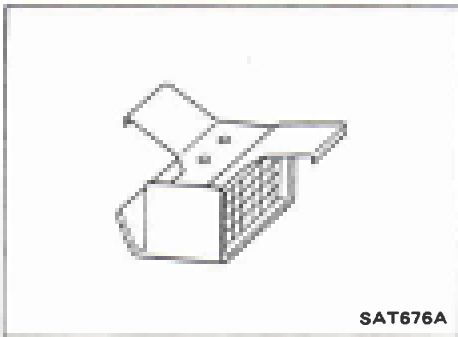
**Separator plates**

- Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

**Control Valve Assembly (Cont'd)**

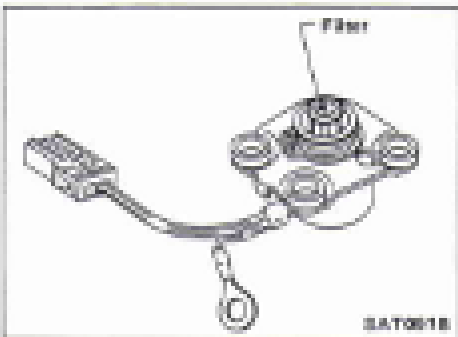
**Pilot filter**

- Check to make sure that filter is not clogged or damaged.



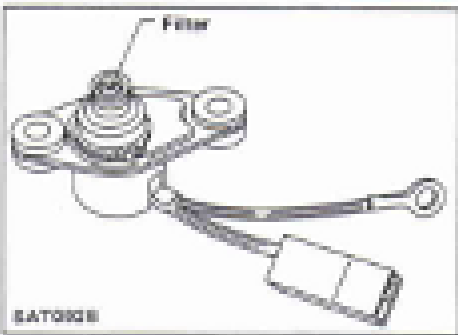
**Lock-up solenoid**

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to “Electrical System”.



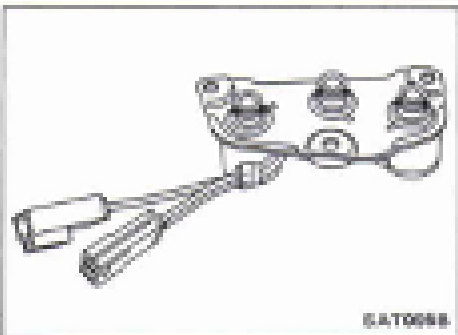
**Line pressure solenoid**

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to “Electrical System”.



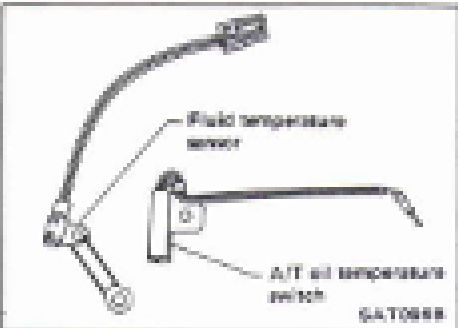
**3-unit solenoid assembly (Overrun clutch solenoid and shift solenoids A and B)**

- Measure resistance of each solenoid. — Refer to “Electrical System”.



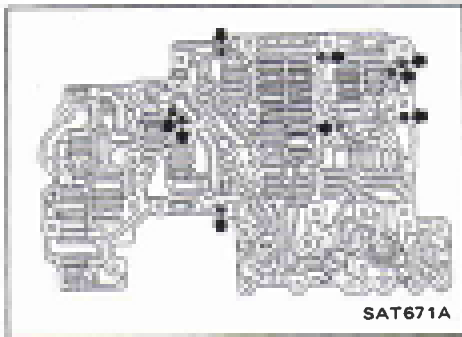
**Fluid temperature sensor and A/T oil temperature switch**

- Measure resistance. — Refer to “Electrical System”.

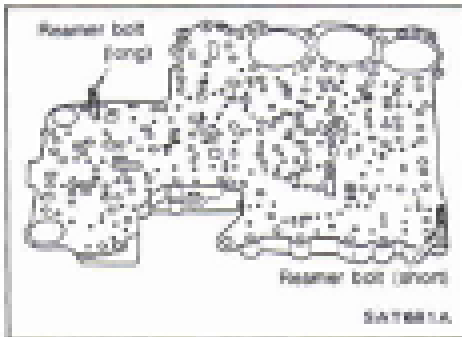


**Control Valve Assembly (Cont'd)**

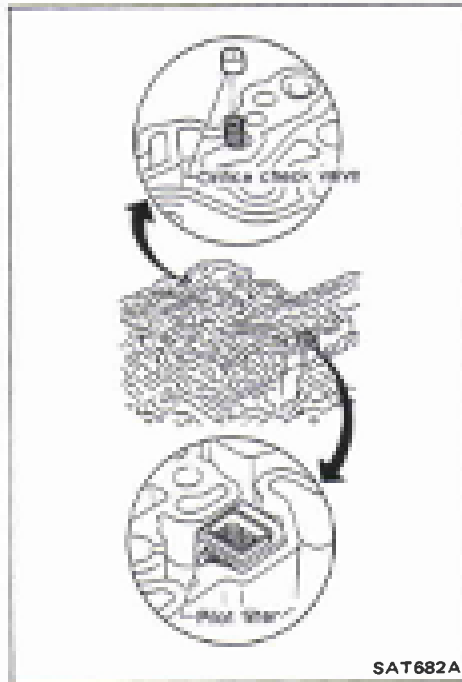
**ASSEMBLY**



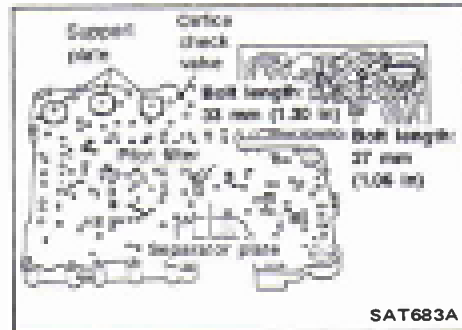
1. Install upper and lower bodies.
  - a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



- b. Install reamer bolts from bottom of upper body and install separate gaskets.

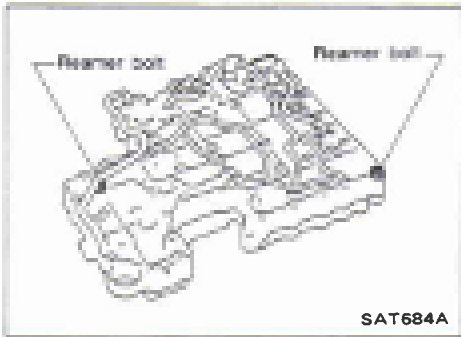


- c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.

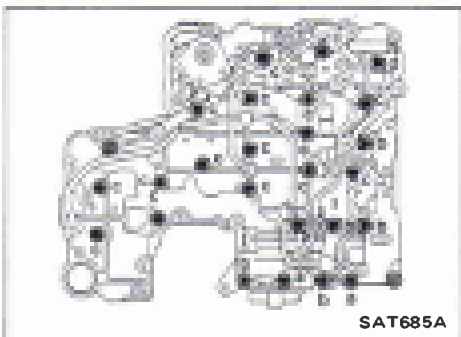


- d. Install lower separate gaskets and separator plates on lower body.
  - e. Install and temporarily tighten support plates, A/T oil temperature switch and tube brackets.

**Control Valve Assembly (Cont'd)**



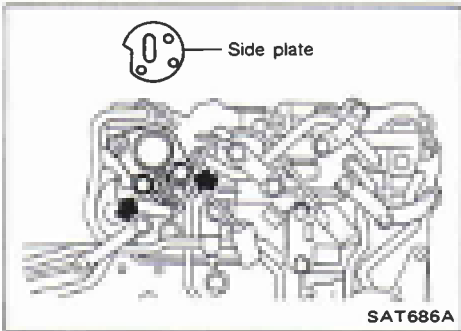
- f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.
- **Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.**



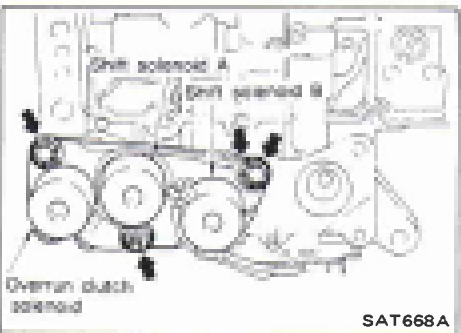
- g. Install and temporarily tighten bolts and tube brackets in their proper locations.

**Bolt length and location**

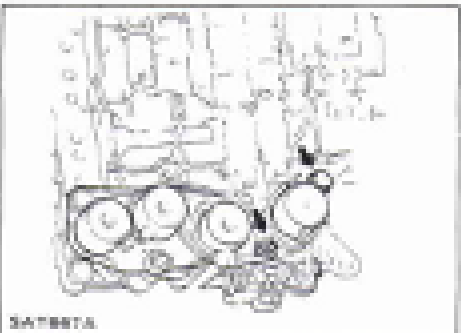
Bolt symbol		a	b	c	d
Item					
Bolt length	mm (in)	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)



- 2. Install solenoids.
- a. Attach O-ring and install lock-up solenoid and side plates onto lower body.



- b. Attach O-rings and install 3-unit solenoids assembly onto upper body.

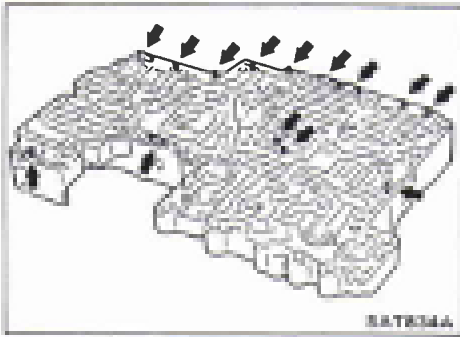


- c. Attach O-ring and install line pressure solenoid onto upper body.
- 3. Tighten all bolts.

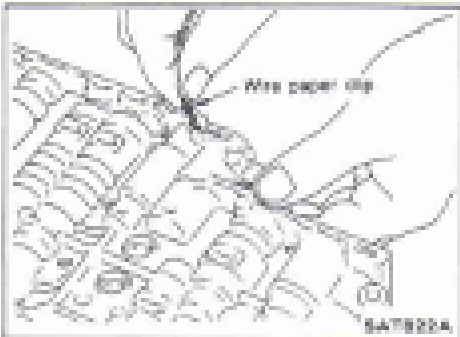


**Control Valve Upper Body (Cont'd)  
DISASSEMBLY**

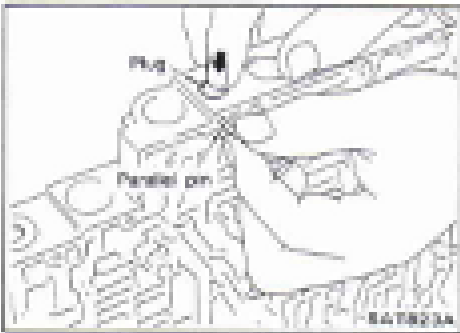
1. Remove valves at parallel pins.
  - Do not use a magnetic hand.



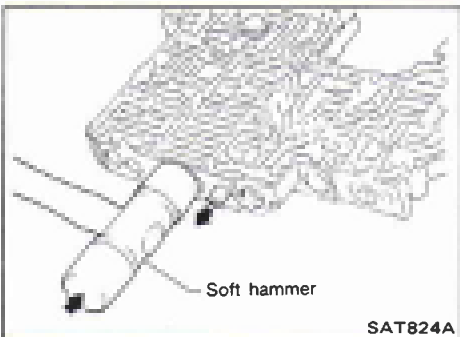
- a. Use a wire paper clip to push out parallel pins.



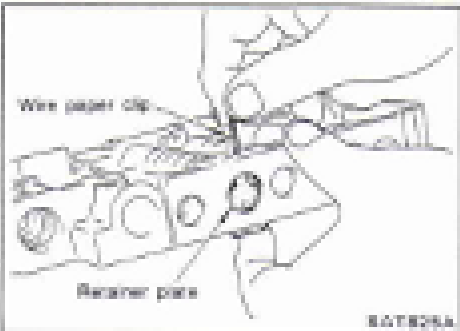
- b. Remove parallel pins while pressing their corresponding plugs and sleeves.
  - Remove plug slowly to prevent internal parts from jumping out.



- c. Place mating surface of valve facedown, and remove internal parts.
  - If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.
  - Be careful not to drop or damage valves and sleeves.

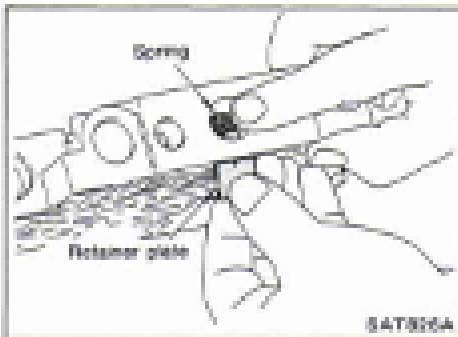


2. Remove valves at retainer plates.
  - a. Pry out retainer plate with wire paper clip.



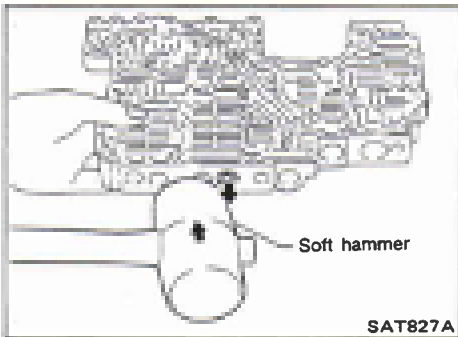
**Control Valve Upper Body (Cont'd)**

b. Remove retainer plates while holding spring.



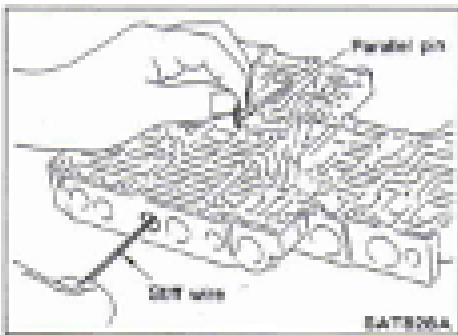
c. Place mating surface of valve facedown, and remove internal parts.

- If a valve is hard to remove, lightly tap valve body with a soft hammer.
- Be careful not to drop or damage valves, sleeves, etc.



■ 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.

- Be careful not to scratch sliding surface of valve with wire.

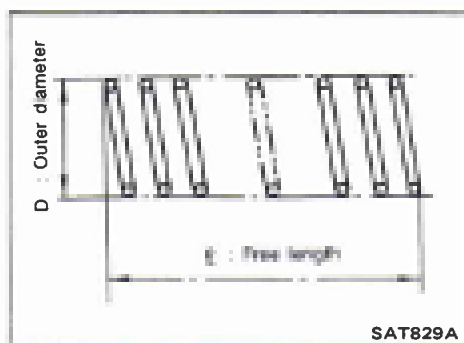




**Control Valve Upper Body (Cont'd)  
INSPECTION**

**Valve springs**

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-105.



**Inspection standard**

Unit: mm (in)

Parts	Item	Part No.	ℓ	D
①	Torque converter relief valve spring	31742-41X18	32.3 (1.272)	9.0 (0.354)
②	Pressure regulator valve spring	31742-41X16	61.5 (2.421)	8.9 (0.350)
③	Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
④	Accumulator control plug spring	31742-41X17	27.5 (1.083)	6.6 (0.260)
⑤	Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
⑥	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑦	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑧	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑨	Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑩	Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
⑪	Overrun clutch reducing valve spring	31742-41X14	38.9 (1.531)	7.0 (0.276)
⑫	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
⑬	Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
⑭	Lock-up control valve spring	31742-41X21	33.0 (1.299)	6.5 (0.256)

- Replace valve springs if deformed or fatigued.

**Control valves**

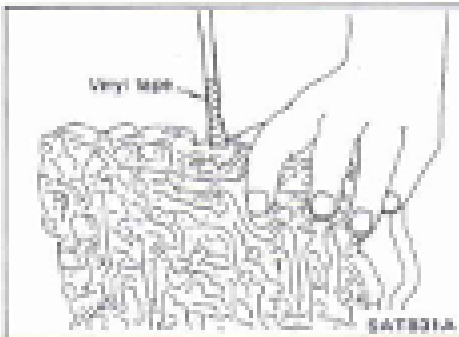
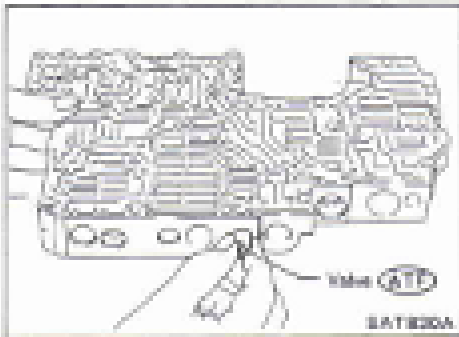
- Check sliding surfaces of valves, sleeves and plugs.

**Control Valve Upper Body (Cont'd)**

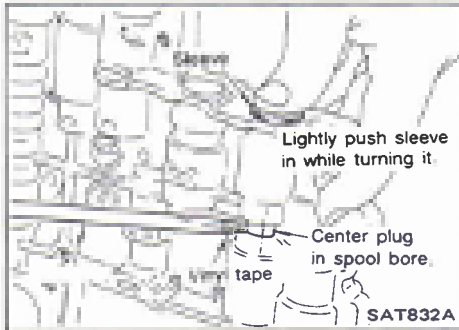
**ASSEMBLY**

1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

- Be careful not to scratch or damage valve body.

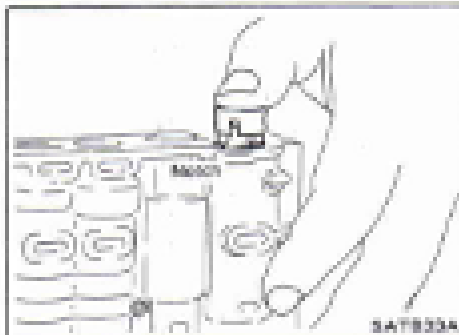


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



**Pressure regulator valve**

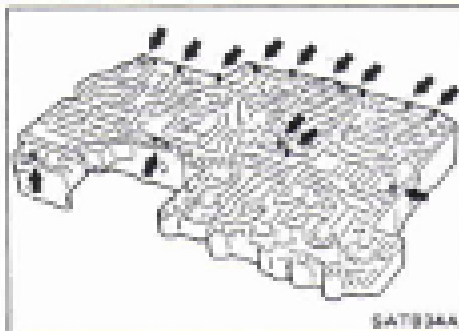
- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body. If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.



**Accumulator control plug**

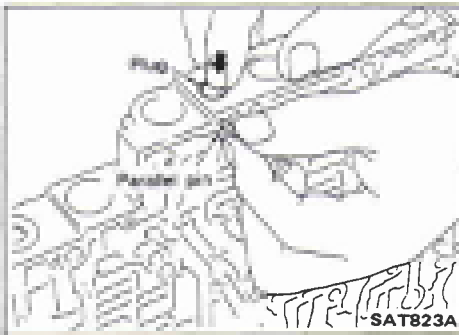
- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.

2. Install parallel pins and retainer plates.



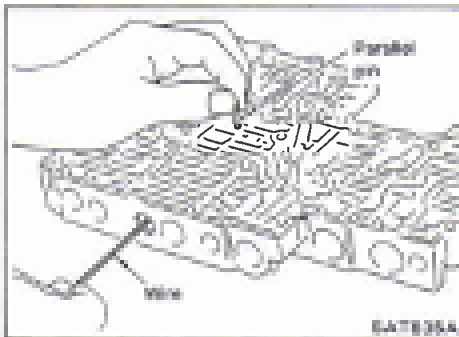
**Control Valve Upper Body (Cont'd)**

- While pushing plug, install parallel pin.

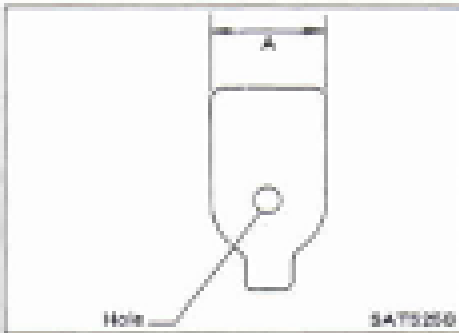
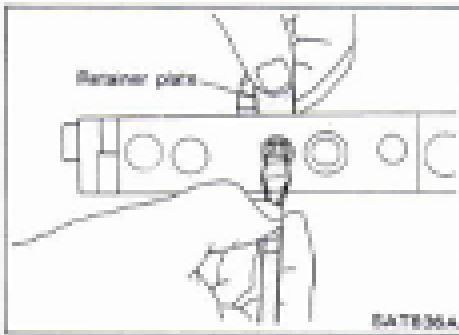


**4-2 sequence valve and relay valve**

- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.



- Insert retainer plate while pushing spring.

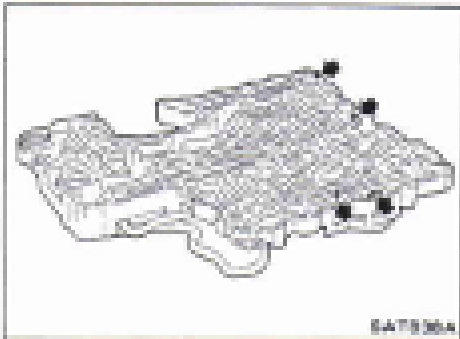


**Retainer plate**

Parts	A mm (in)
Shift valve A	15 (0.59)
Shift valve B	17 (0.67)
Pilot valve	13 (0.51)
Torque converter relief valve	13 (0.51)



**Control Valve Lower Body (Cont'd)  
DISASSEMBLY**

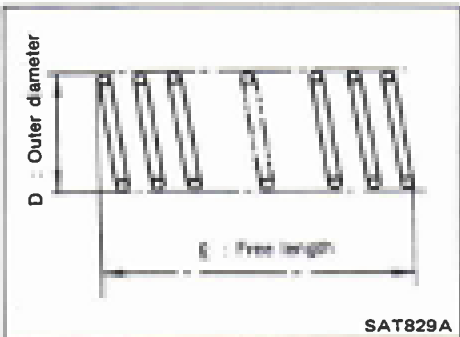


1. Remove valves at parallel pins.
2. Remove valves at retainer plates.  
For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.

**INSPECTION**

**Valve springs**

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-111.



**Inspection standard**

Unit: mm (in)

Parts	Item	Part No.	ℓ	D
①	Modifier accumulator piston spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
②	1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
③	3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
④	Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)

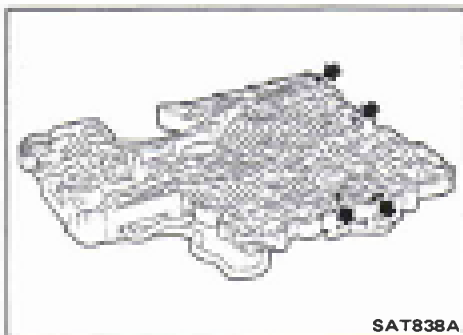
- Replace valve springs if deformed or fatigued.

**Control valves**

- Check sliding surfaces of control valves, sleeves and plugs for damage.

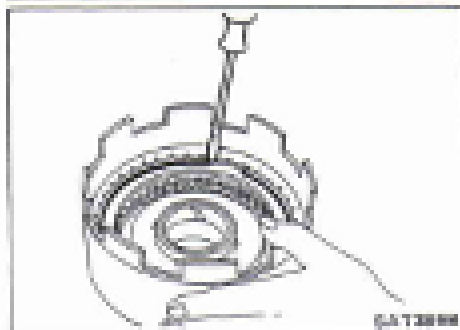
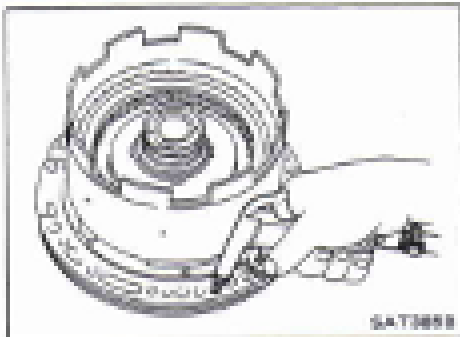
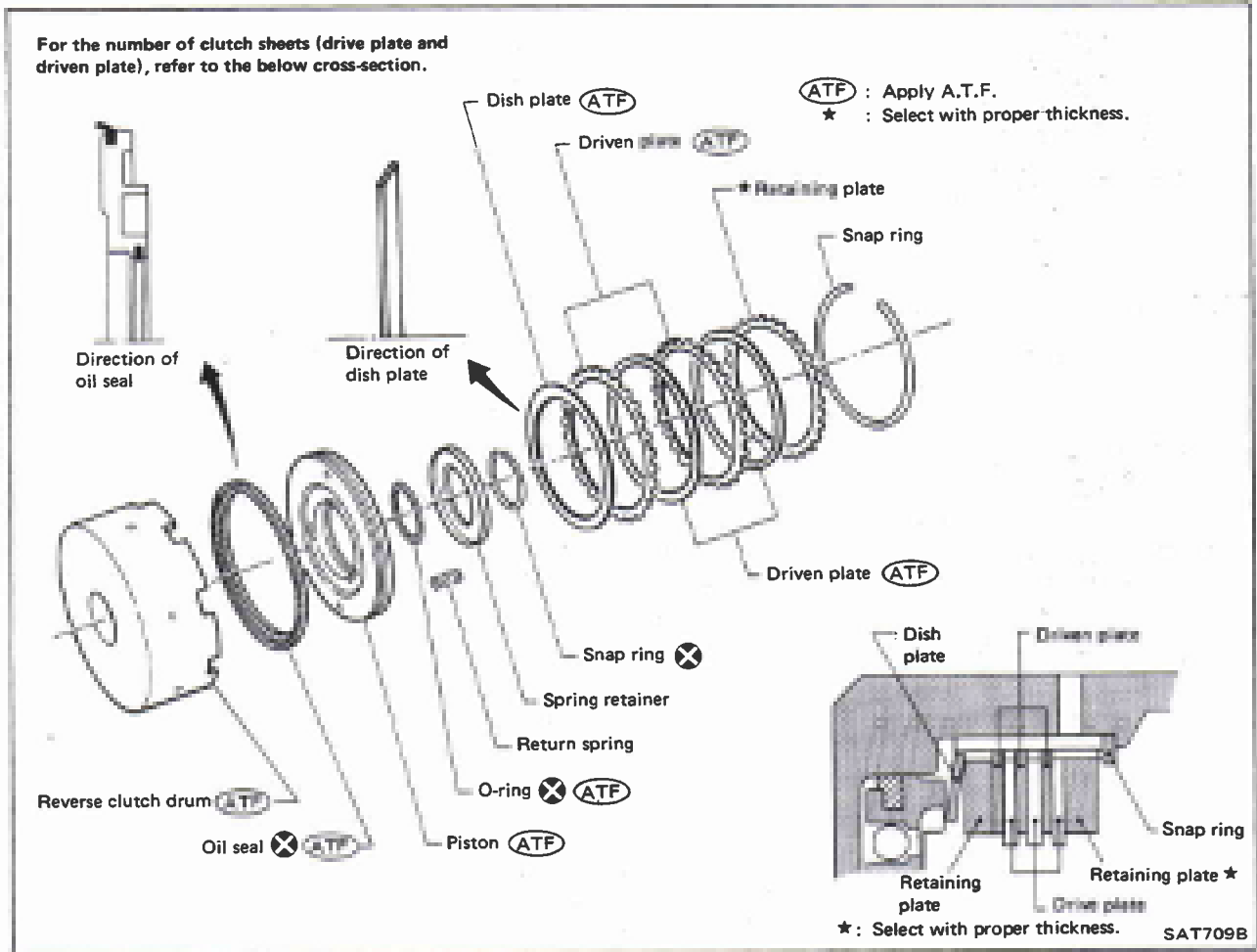
**ASSEMBLY**

- Install control valves.  
For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.



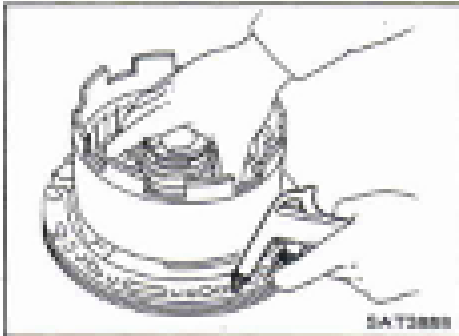
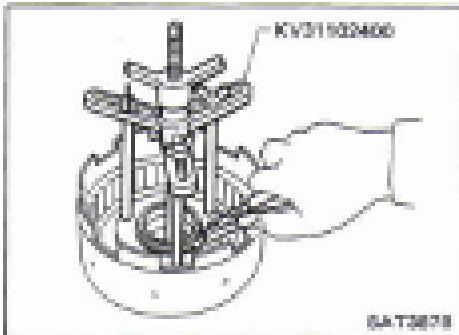
Reverse Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



DISASSEMBLY

1. Check operation of reverse clutch.
  - a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
  - b. Check to see that retaining plate moves to snap ring.
  - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
2. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.



**Reverse Clutch (Cont'd)**

3. Remove snap ring from clutch drum while compressing clutch springs.
  - Do not expand snap ring excessively.
4. Remove spring retainer and return spring.

5. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
  - Do not apply compressed air abruptly.
6. Remove D-ring and oil seal from piston.

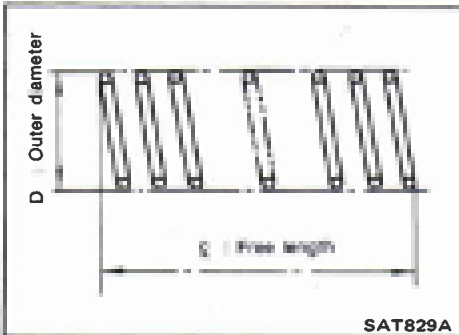
**INSPECTION**

**Reverse clutch snap ring and spring retainer**

- Check for deformation, fatigue or damage.

**Reverse clutch return springs**

- Check for deformation or damage. Also measure free length and outside diameter.



**Inspection standard**

Unit: mm (in)

Part No.	L	D
31505-51X00	37.18 (1.4638)	14.8 (0.583)

**Reverse clutch drive plates**

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

**Thickness of drive plate:**

**Standard value**  
2.0 mm (0.079 in)

**Wear limit**  
1.8 mm (0.071 in)

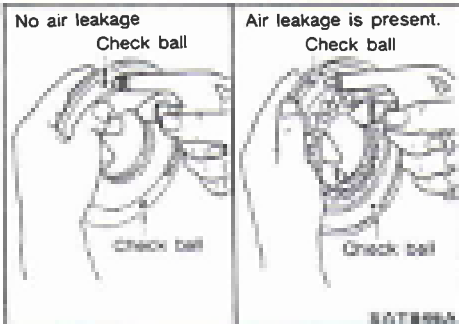
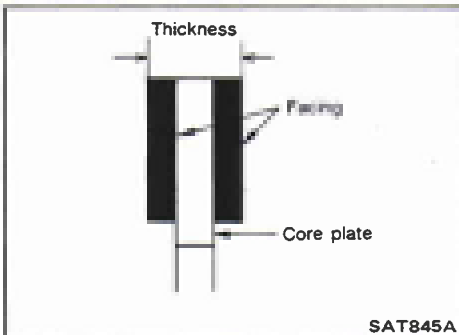
- If not within wear limit, replace.

**Reverse clutch dish plate**

- Check for deformation or damage.

**Reverse clutch piston**

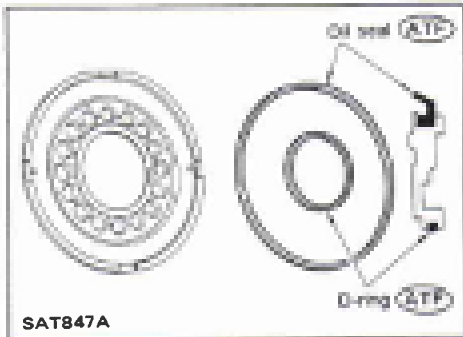
- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.



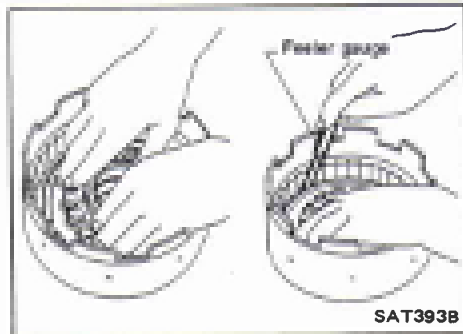
**Reverse Clutch (Cont'd)**

**ASSEMBLY**

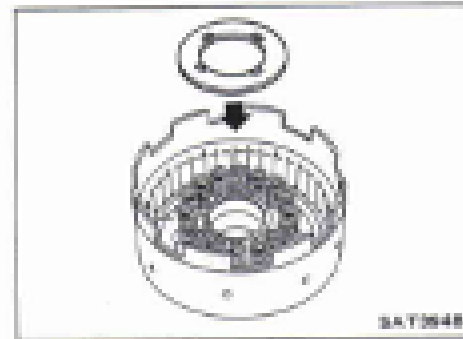
1. Install D-ring and oil seal on piston.
  - Apply A.T.F. to both parts.



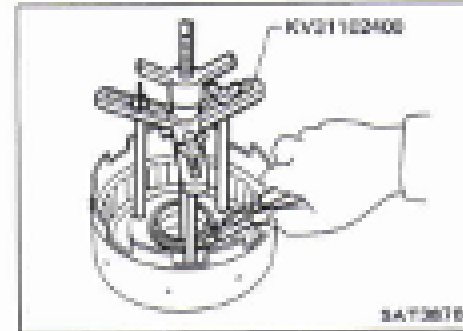
2. Install piston assembly by turning it slowly and evenly.
  - Apply A.T.F. to inner surface of drum.
  - Use feeler gauge, that will not damage lip seal, to make sure lip seal goes into place.



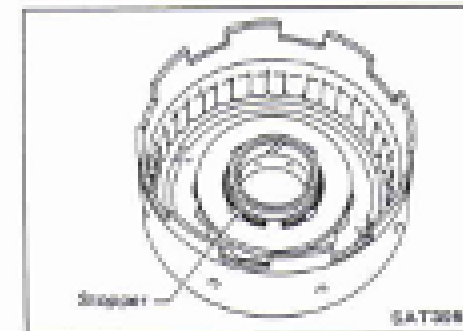
3. Install return springs and spring retainer.



4. Install snap ring while compressing clutch springs.

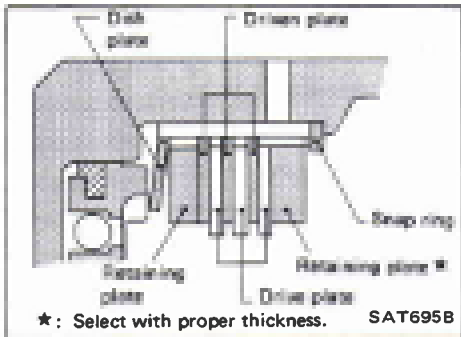


- Do not align snap ring gap with spring retainer stopper.

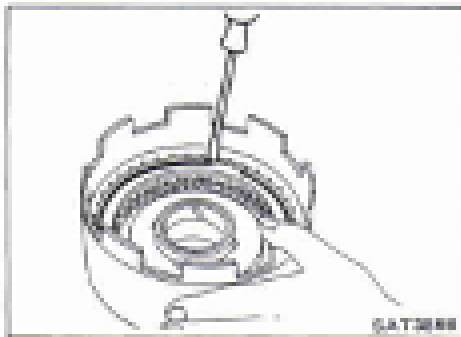




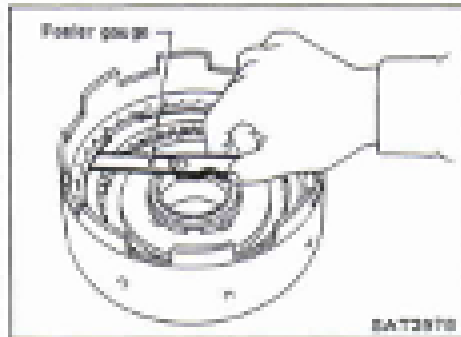
**Reverse Clutch (Cont'd)**



5. Install drive plates, driven plates, retaining plate and dish plate.



6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

**Specified clearance:**

**Standard**

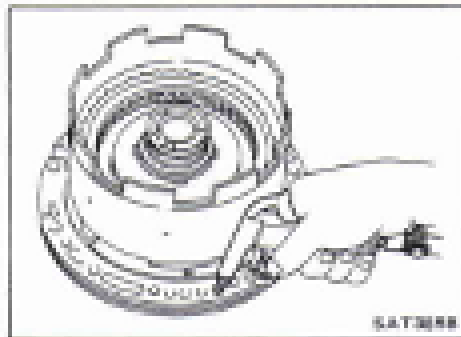
0.5 - 0.8 mm (0.020 - 0.031 in)

**Allowable limit**

1.4 mm (0.055 in)

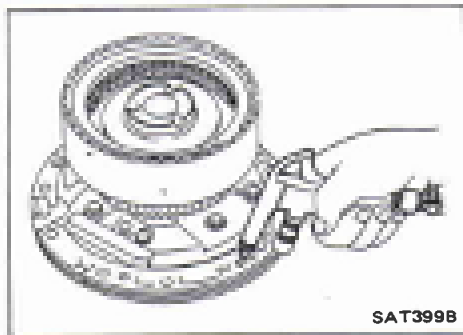
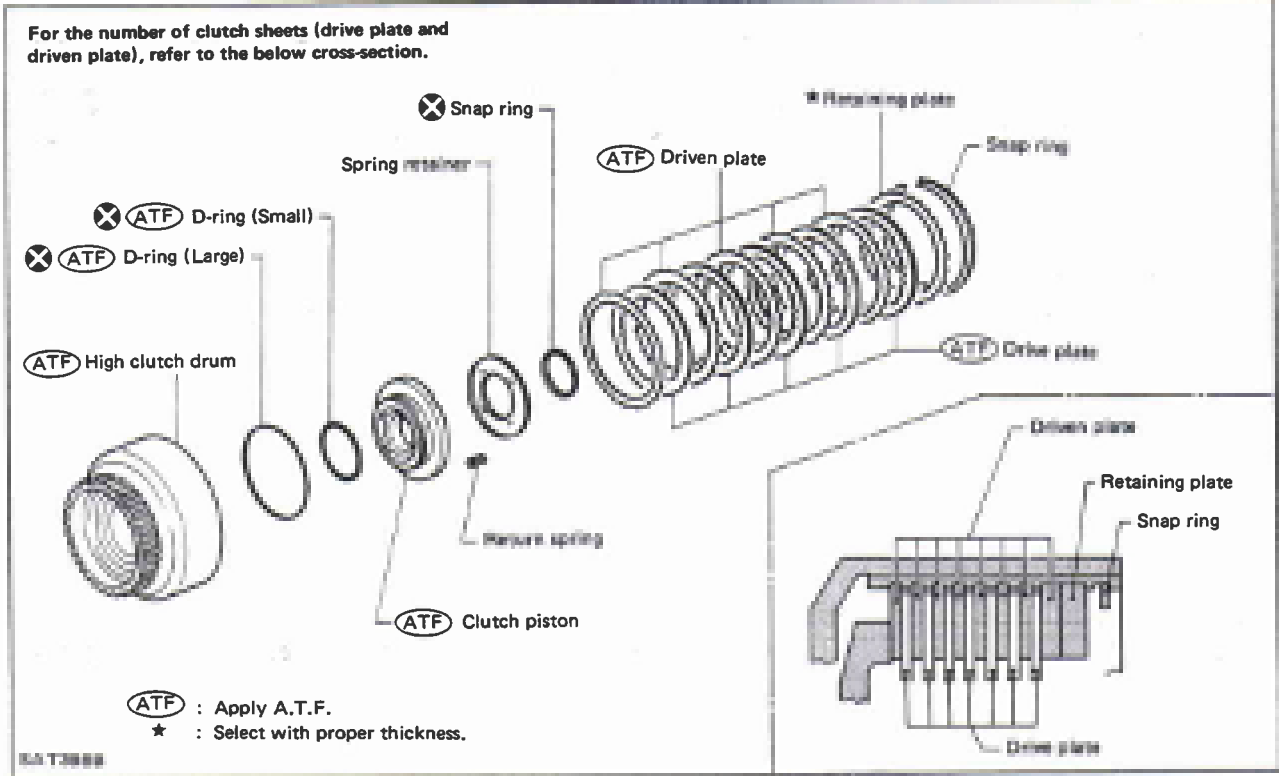
**Retaining plate:**

Refer to S.D.S.



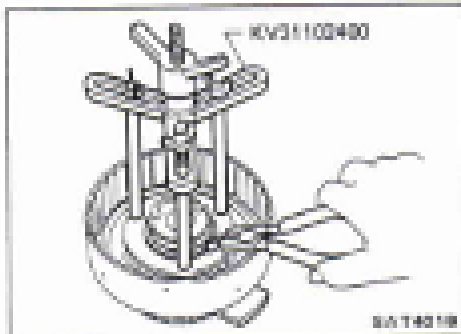
8. Check operation of reverse clutch.  
Refer to "DISASSEMBLY" of Reverse Clutch.

High Clutch



Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

- Check of high clutch operation



- Removal and installation of return spring

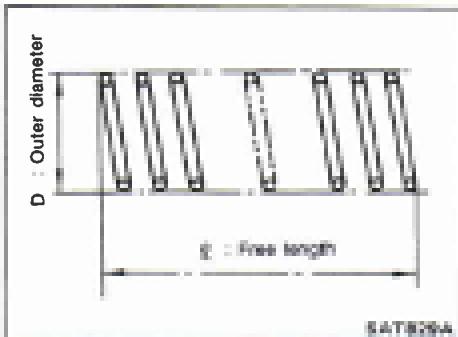
**High Clutch (Cont'd)**

- Inspection of high clutch return springs

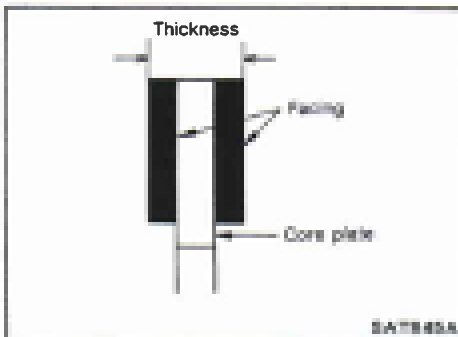
**Inspection standard**

Unit: mm (in)

Part No.	ℓ	∅
31505-21X03	22.06 (0.8685)	11.6 (0.457)



SA7B29A



SA7B45A

- Inspection of high clutch drive plate

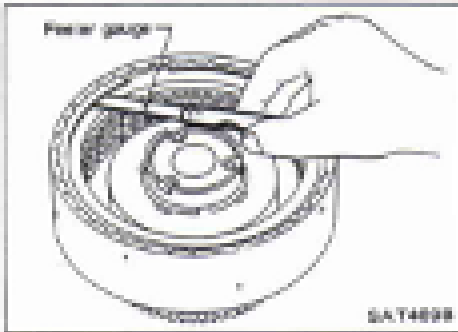
**Thickness of drive plate:**

**Standard**

1.6 mm (0.063 in)

**Wear limit**

1.4 mm (0.055 in)



SA7489B

- Measurement of clearance between retaining plate and snap ring

**Specified clearance:**

**Standard**

1.8 - 2.2 mm (0.071 - 0.087 in)

**Allowable limit**

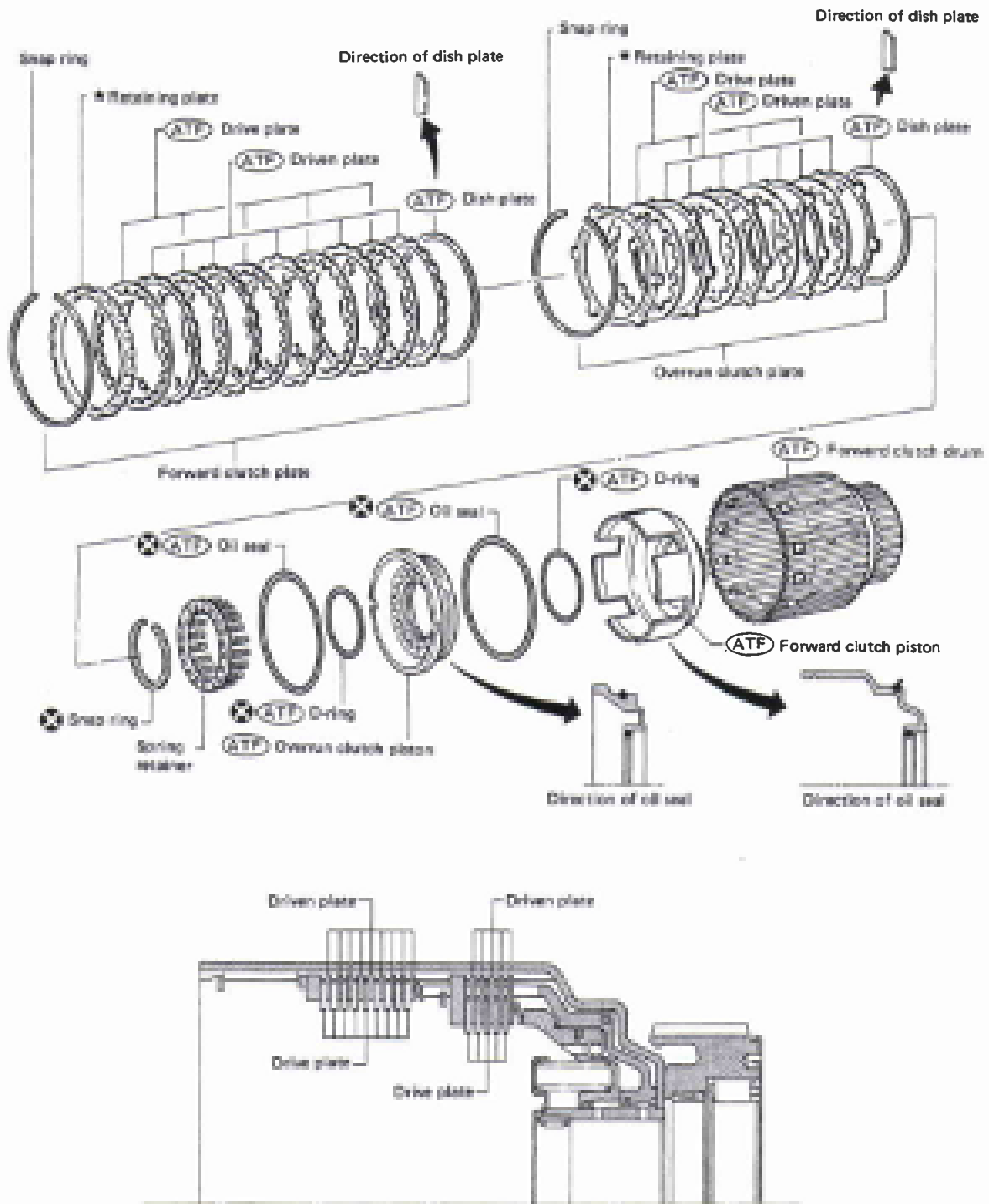
3.6 mm (0.142 in)

**Retaining plate:**

Refer to S.D.S.

Forward and Overrun Clutches

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

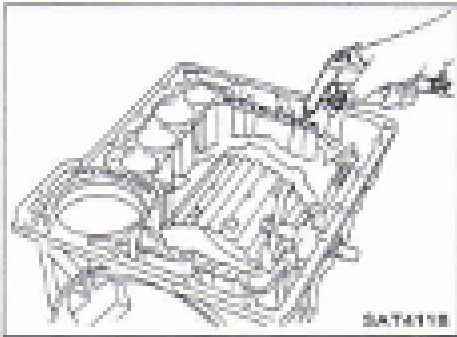


(ATF) : Apply A.T.F.  
 ★ : Select with proper thickness.

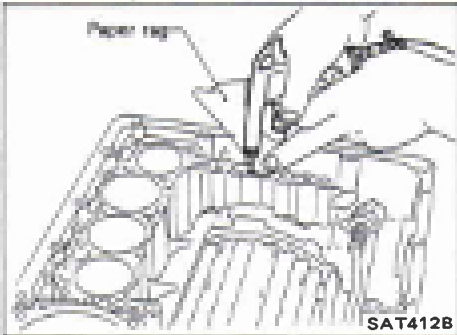
**Forward and Overrun Clutches (Cont'd)**

Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

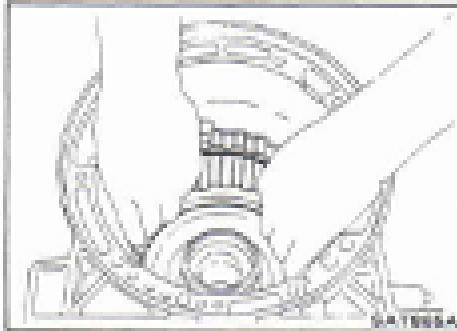
- Check of forward clutch operation



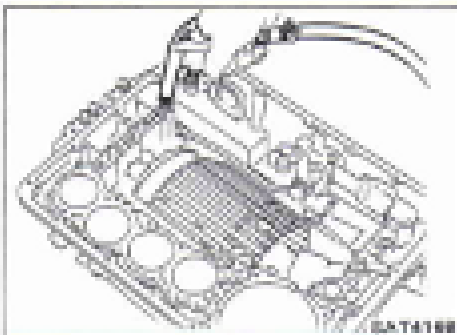
- Check of overrun clutch operation



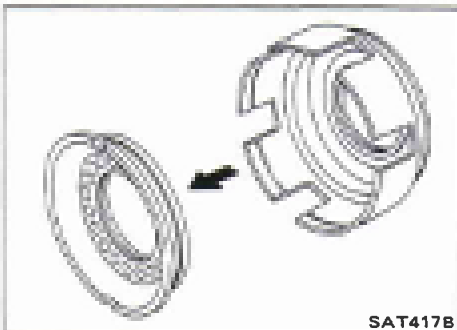
- Removal of forward clutch drum  
Remove forward clutch drum from transmission case by holding snap ring.



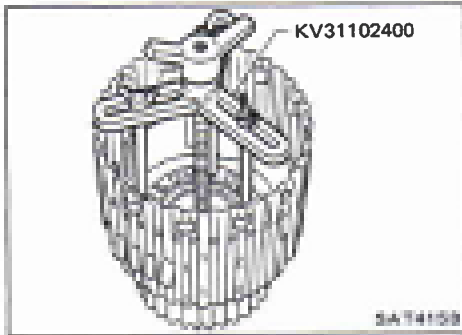
- Removal of forward clutch and overrun clutch pistons  
1. While holding overrun clutch piston, gradually apply compressed air to oil hole.



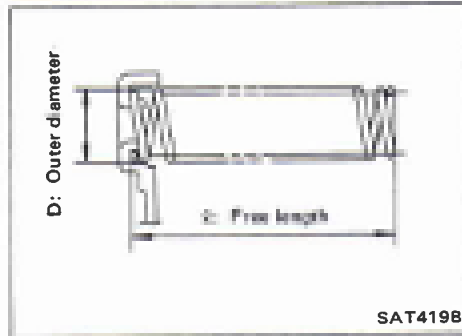
- 2. Remove overrun clutch from forward clutch.



Forward and Overrun Clutches (Cont'd)



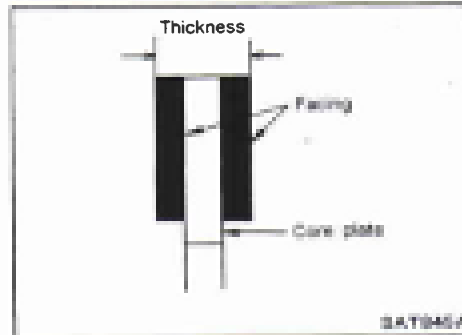
- Removal and installation of return springs



- Inspection of forward clutch and overrun clutch return springs

Inspection standard

Part No.	Unit: mm (in)	
	L	Ø
31505-51X04	36.03 (1.41500)	9.8 (0.386)



- Inspection of forward clutch drive plates

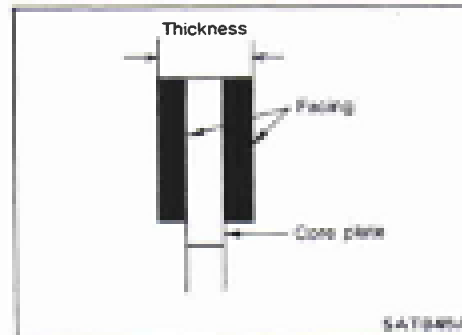
Thickness of drive plate:

Standard

2.0 mm (0.079 in)

Wear limit

1.8 mm (0.071 in)



- Inspection of high clutch drive plate

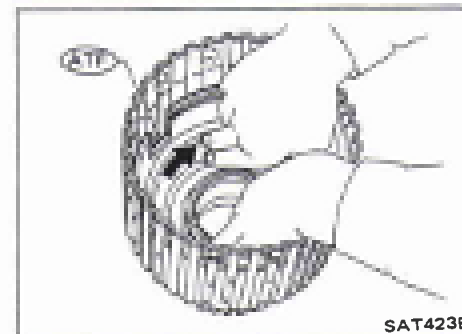
Thickness of drive plate:

Standard

2.0 mm (0.079 in)

Wear limit

1.8 mm (0.071 in)

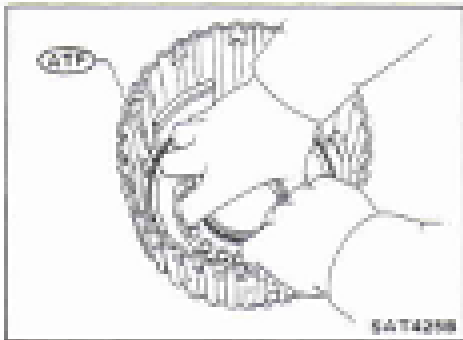


- Installation of forward clutch piston and overrun clutch piston

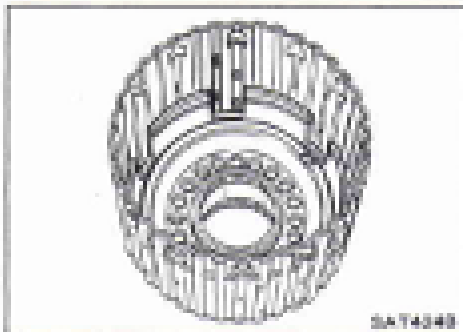
1. Install forward clutch piston by turning it slowly and evenly.
- Apply A.T.F. to inner surface of clutch drum.

**Forward and Overrun Clutches (Cont'd)**

2. Install overrun clutch by turning it slowly and evenly.
  - Apply A.T.F. to inner surface of forward clutch piston.



- Align notch in forward clutch piston with groove in forward clutch drum.



- Measurement of clearance between retaining plate and snap ring of overrun clutch

**Specified clearance:**

**Standard**

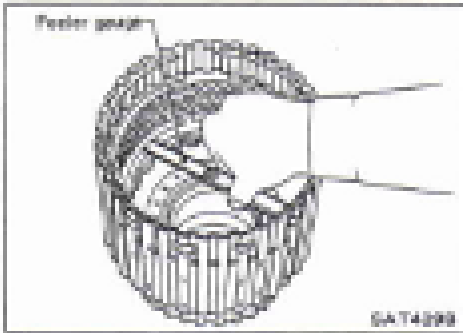
1.0 - 1.4 mm (0.039 - 0.055 in)

**Allowable limit**

2.4 mm (0.094 in)

**Retaining plate:**

Refer to S.D.S.



- Measurement of clearance between retaining plate and snap ring of forward clutch

**Specified clearance:**

**Standard**

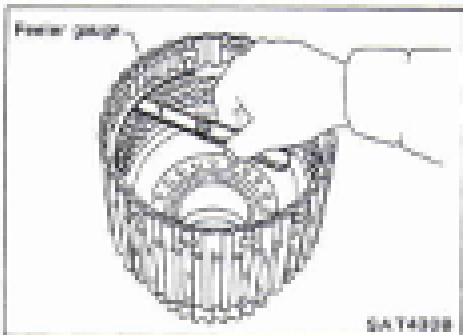
0.45 - 0.85 mm (0.0177 - 0.0335 in)

**Allowable limit**

2.65 mm (0.1043 in)

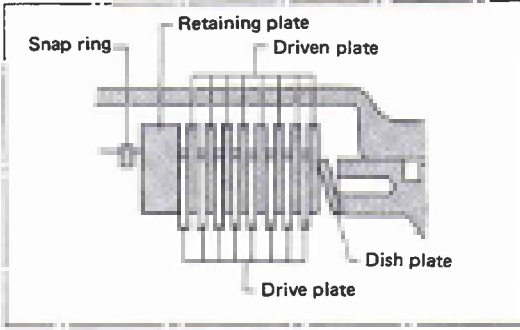
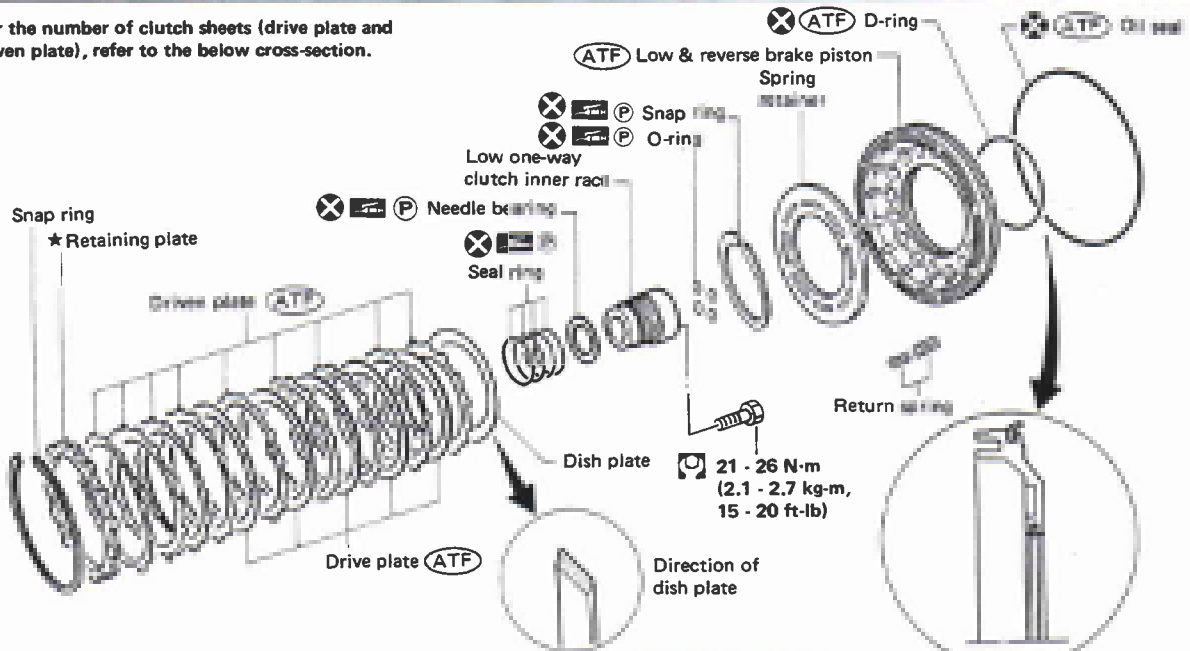
**Retaining plate:**

Refer to S.D.S.



Low & Reverse Brake

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

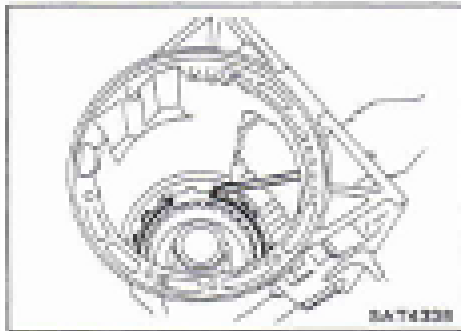
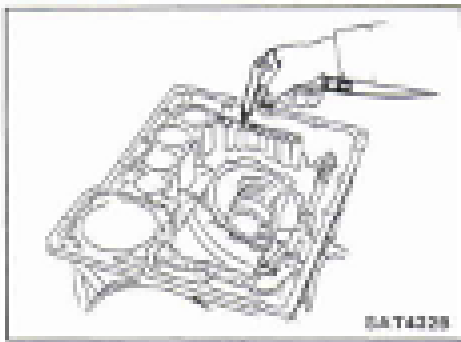


- (ATF) : Apply A.T.F.
- Ⓟ : Apply petroleum jelly.
- ★ : Select with proper thickness.

SAT431B

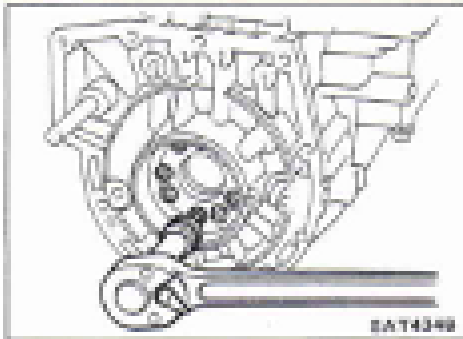
DISASSEMBLY

1. Check operation of low & reverse brake.
  - a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
  - b. Check to see that retaining plate moves to snap ring.
  - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
2. Remove snap ring, low & reverse brake drive plates, driven plates and dish plate.





**Low & Reverse Brake (Cont'd)**



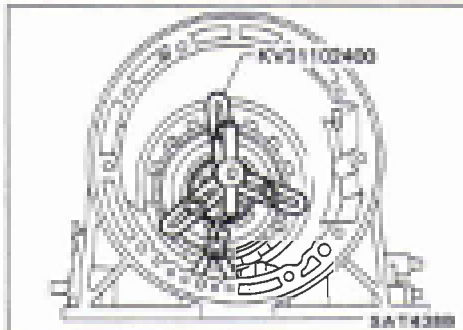
3. Remove low one-way clutch inner race from transmission case.



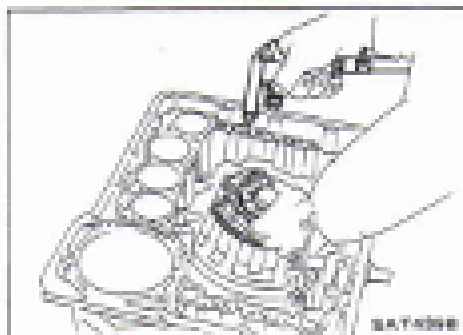
4. Remove O-rings from low one-way clutch inner race.



5. Remove seal rings from low one-way clutch inner race.
6. Remove needle bearing from low one-way clutch inner race.



7. Remove snap ring from transmission case while compressing clutch springs.
  - Do not expand snap ring excessively.



8. Remove low & reverse brake piston using compressed air.
9. Remove oil seal and D-ring from piston.

**INSPECTION**

**Low & reverse brake snap ring and spring retainer**

- Check for deformation, or damage.

**Low & Reverse Brake (Cont'd)**

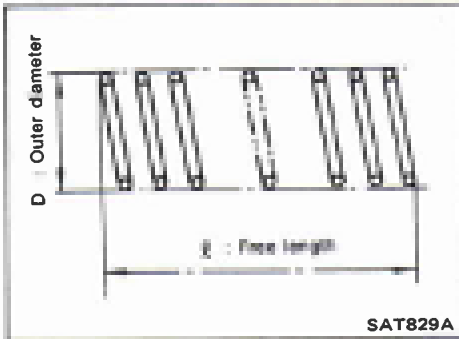
**Low & reverse brake return springs**

- Check for deformation or damage. Also measure free length and outside diameter.

**Inspection standard**

Unit: mm (in)

Parts	Part No.	ℓ	D
Inner spring	31505-51X03	15.71 (0.6185)	8.9 (0.350)
Outer spring	31505-51X02	18.75 (0.7382)	11.6 (0.457)



**Low & reverse brake drive plates**

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

**Thickness of drive plate:**

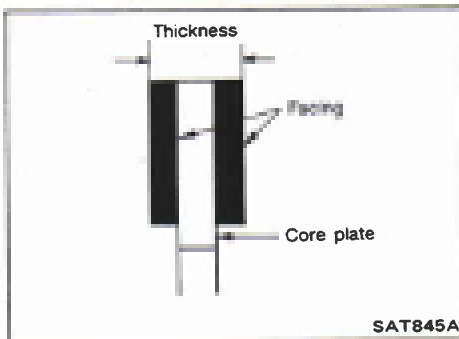
**Standard value**

1.6 mm (0.063 in)

**Wear limit**

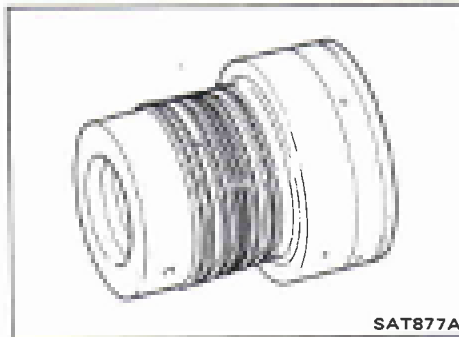
1.4 mm (0.055 in)

- If not within wear limit, replace.



**Low one-way clutch inner race**

- Check frictional surface of inner race for wear or damage.



- Install new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.

**Inspection standard:**

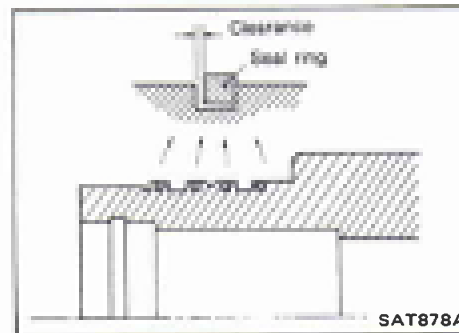
**Standard value**

0.10 - 0.25 mm (0.0039 - 0.0098 in)

**Allowable limit**

0.25 mm (0.0098 in)

- If not within allowable limit, replace low one-way clutch inner race.

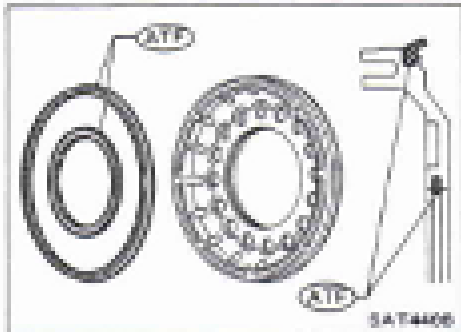


**ASSEMBLY**

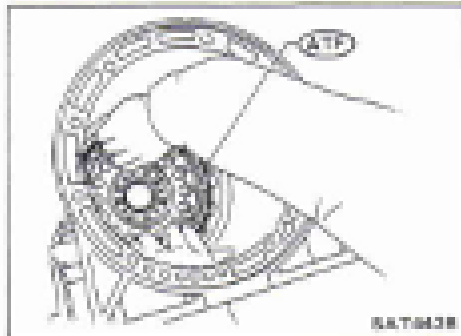
1. Install bearing onto one-way clutch inner race.
  - Pay attention to its direction. — **Black surface goes to rear side.**
  - Apply petroleum jelly to needle bearing.



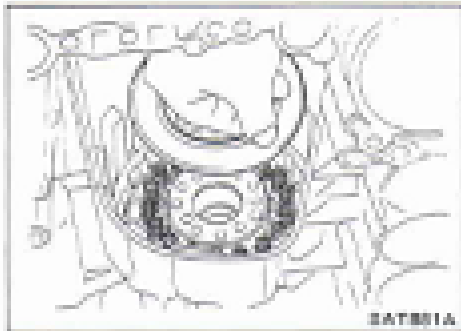
**Low & Reverse Brake (Cont'd)**



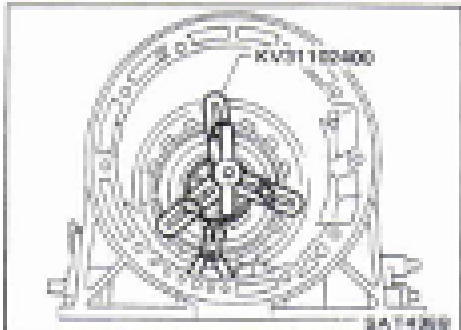
2. Install oil seal and D-ring onto piston.
  - **Apply A.T.F. to oil seal and D-ring.**



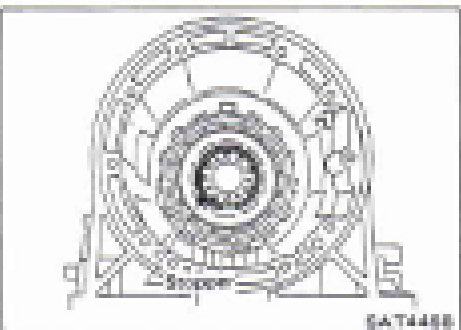
3. Install piston by rotating it slowly and evenly.
  - **Apply A.T.F. to inner surface of transmission case.**



4. Install return springs and spring retainer onto transmission case.

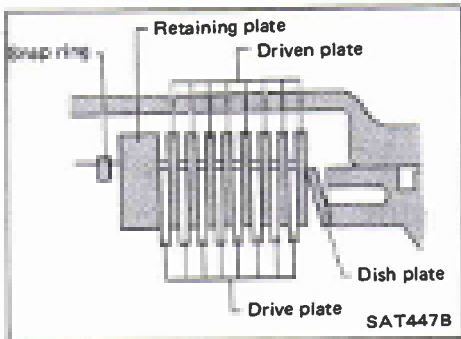


5. Install snap ring while compressing clutch springs.

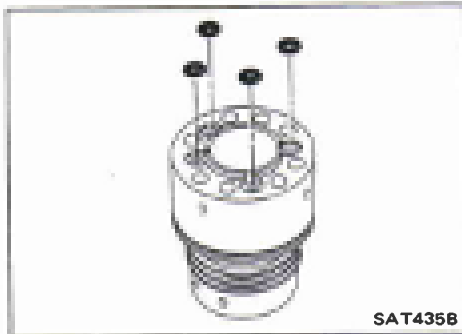


- **Do not align snap ring gap with spring retainer stopper.**

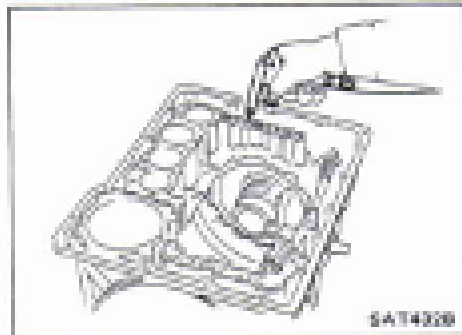
Low & Reverse Brake (Cont'd)



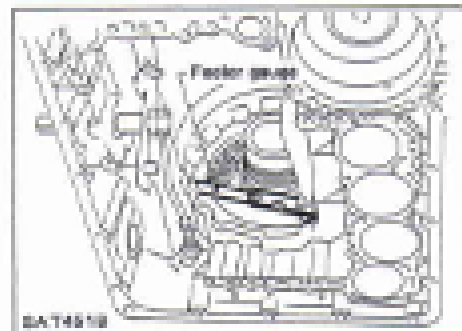
6. Install dish plate low & reverse brake drive plates, driven plates and retaining plate.
7. Install snap ring on transmission case.



8. Install O-rings on low one-way clutch inner race.
  - Apply petroleum jelly to O-rings.
9. Install low one-way clutch inner race on transmission case.



10. Check operation of low & reverse brake clutch piston. Refer to "DISASSEMBLY".



11. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

**Specified clearance:**

**Standard**

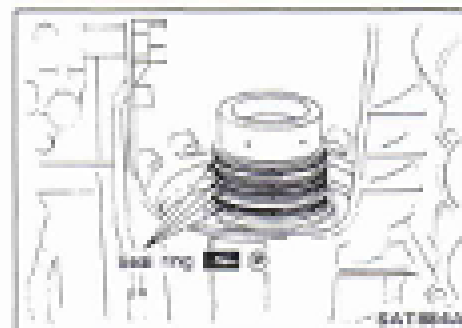
0.5 - 0.8 mm (0.020 - 0.031 in)

**Allowable limit**

2.4 mm (0.094 in)

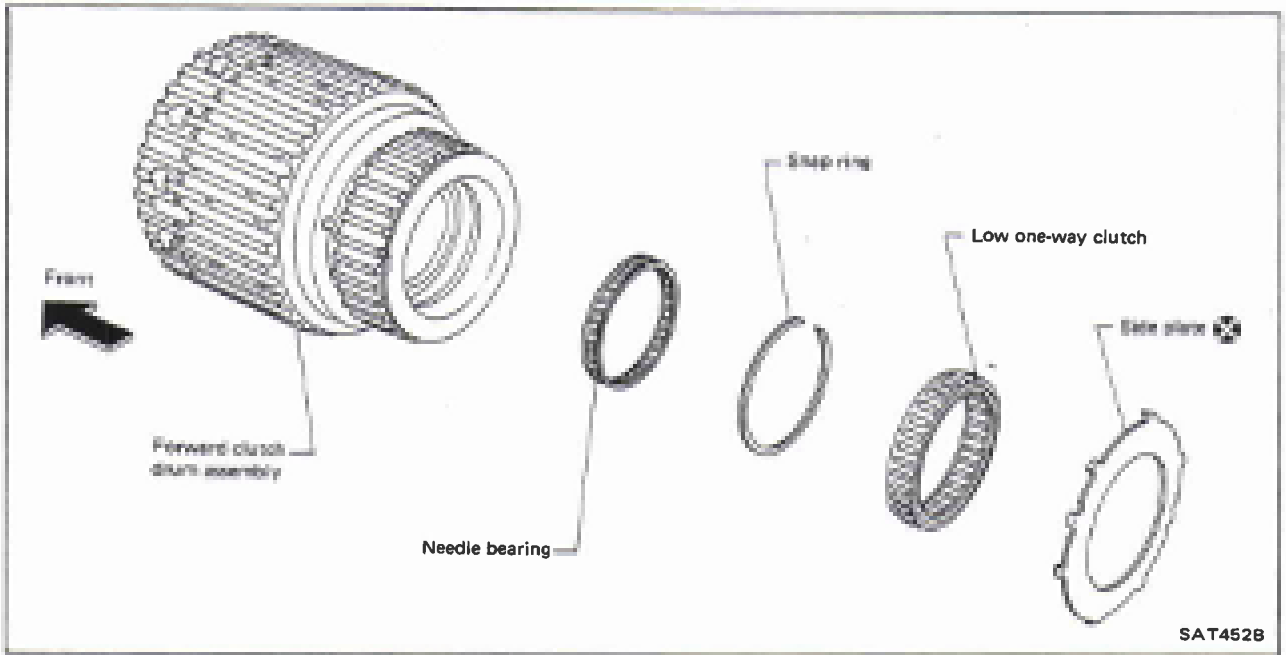
**Retaining plate:**

Refer to S.D.S.



12. Install low one-way clutch inner race seal ring.
  - Apply petroleum jelly to seal ring.
  - Make sure seal rings are pressed firmly into place and held by petroleum jelly.

Forward Clutch Drum Assembly



**DISASSEMBLY**

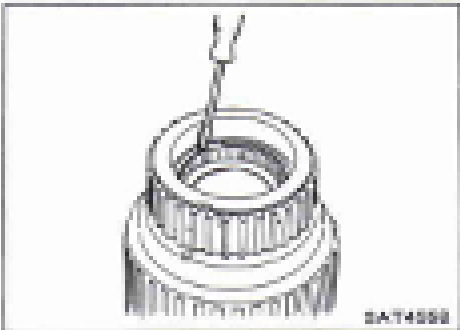
1. Remove side plate from forward clutch drum.



2. Remove low one-way clutch from forward clutch drum.



3. Remove snap ring from forward clutch drum.



**Forward Clutch Drum Assembly (Cont'd)**

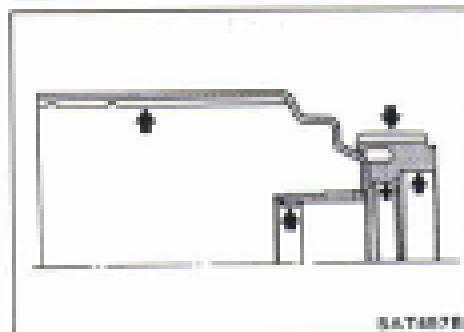
4. Remove needle bearing from forward clutch drum.



**INSPECTION**

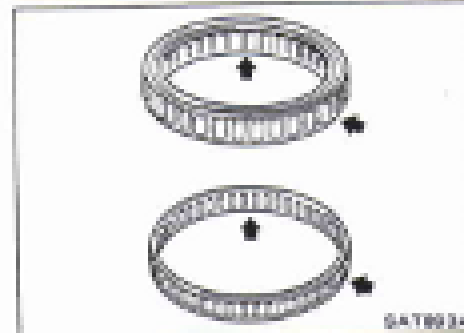
**Forward clutch drum**

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.



**Needle bearing and low one-way clutch**

- Check frictional surface for wear or damage.

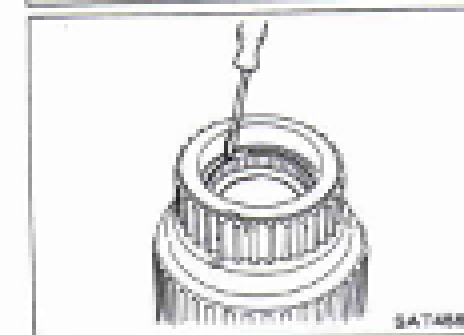


**ASSEMBLY**

1. Install needle bearing in forward clutch drum.



2. Install snap ring onto forward clutch drum.

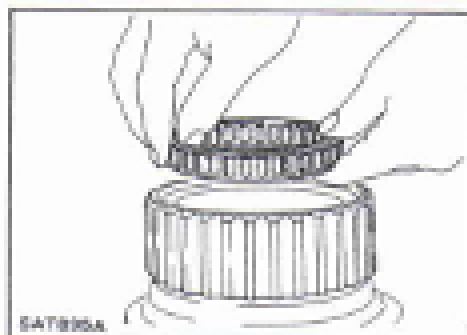


**Forward Clutch Drum Assembly (Cont'd)**

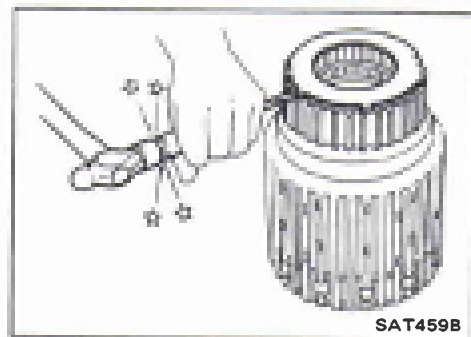
3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.



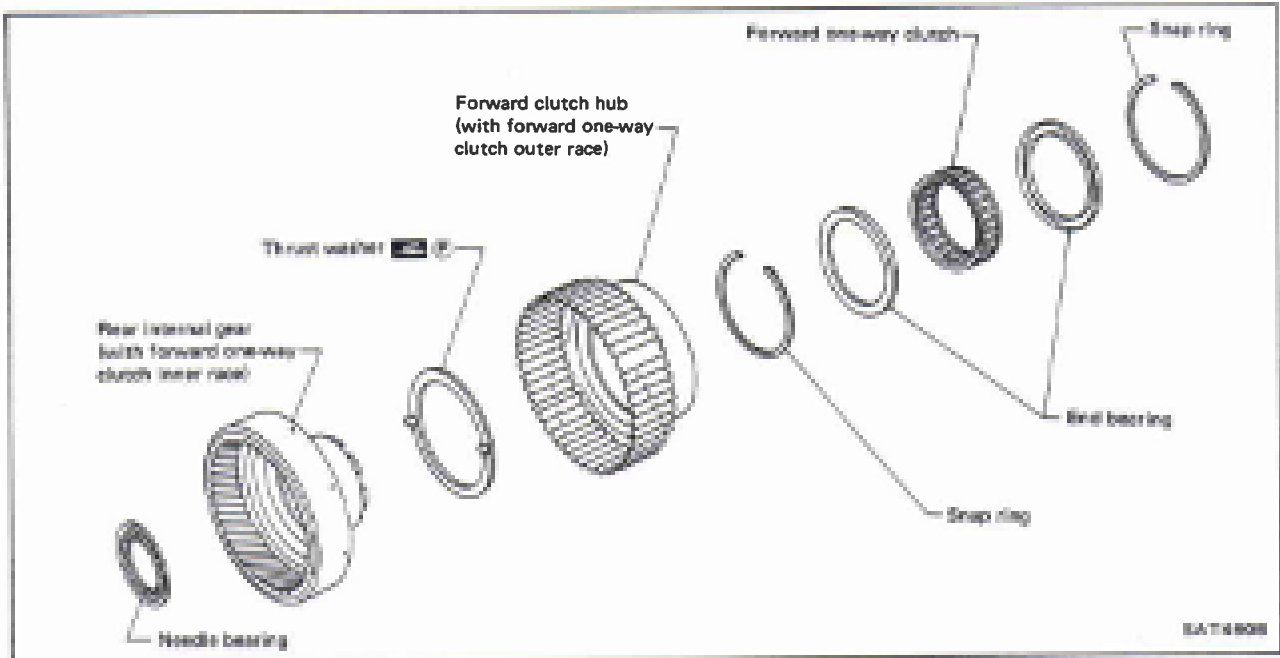
- Install low one-way clutch with flange facing rearward.



4. Install side plate onto forward clutch drum.

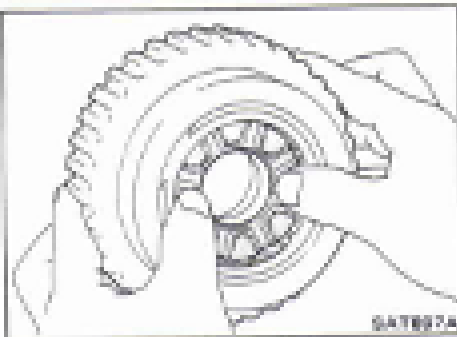


Rear Internal Gear and Forward Clutch Hub

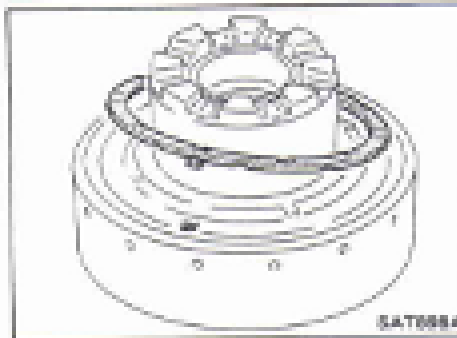


**DISASSEMBLY**

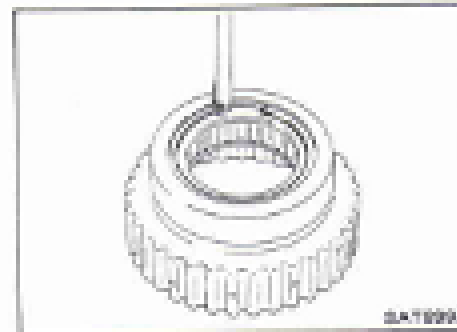
1. Remove needle bearing from rear internal gear.
2. Remove rear internal gear by pushing forward clutch hub forward.



3. Remove thrust washer from rear internal gear.



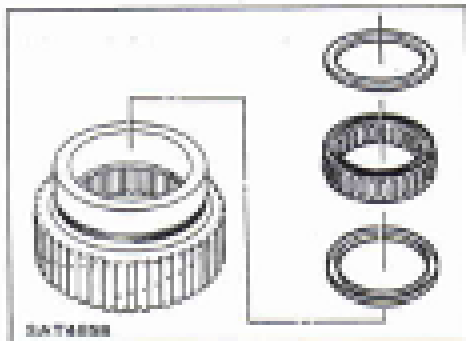
4. Remove snap ring from forward clutch hub.





**Rear Internal Gear and Forward Clutch Hub (Cont'd)**

5. Remove end bearings and forward one-way clutch.



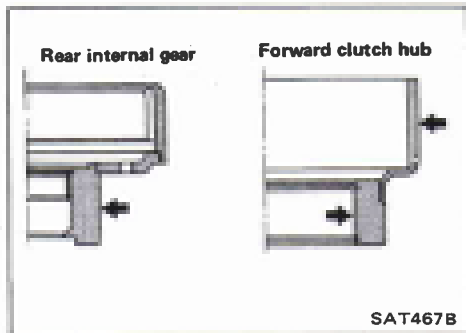
6. Remove snap ring from forward clutch hub.



**INSPECTION**

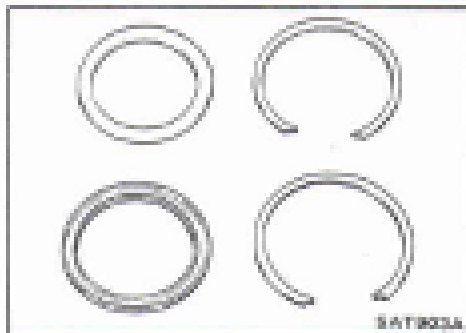
**Rear internal gear and forward clutch hub**

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.



**Snap ring and end bearing**

- Check for deformation or damage.

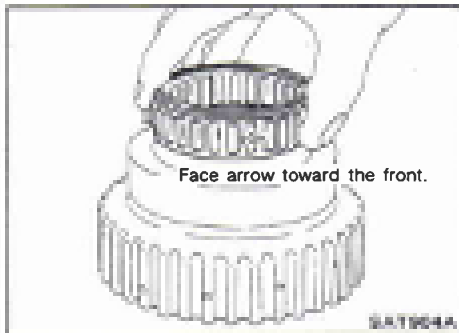


**ASSEMBLY**

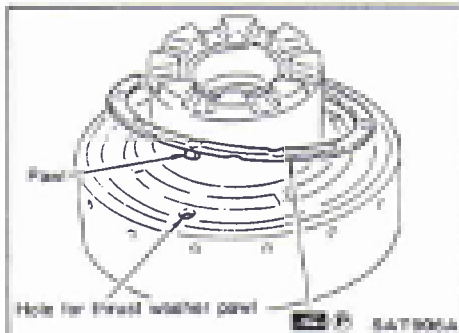
1. Install snap ring onto forward clutch hub.
2. Install end bearing



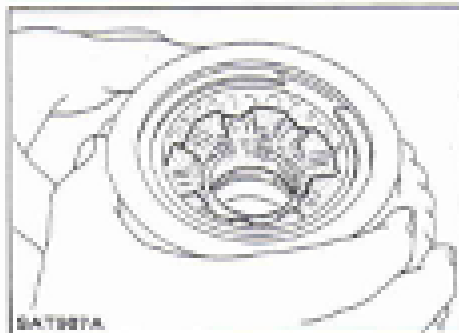
**Rear Internal Gear and Forward Clutch Hub  
(Cont'd)**



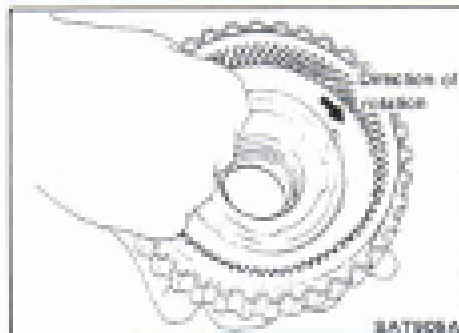
3. Install forward one-way clutch onto clutch hub.
  - Install forward one-way clutch with flange facing rearward.
4. Install end bearing.
5. Install snap ring onto forward clutch hub.



6. Install thrust washer onto rear internal gear.
  - Apply petroleum jelly to thrust washer.
  - Securely insert pawls of thrust washer into holes in rear internal gear.



7. Position forward clutch hub in rear internal gear.

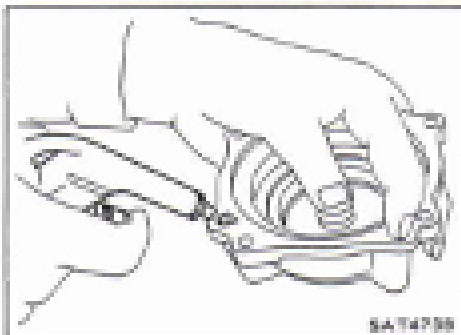
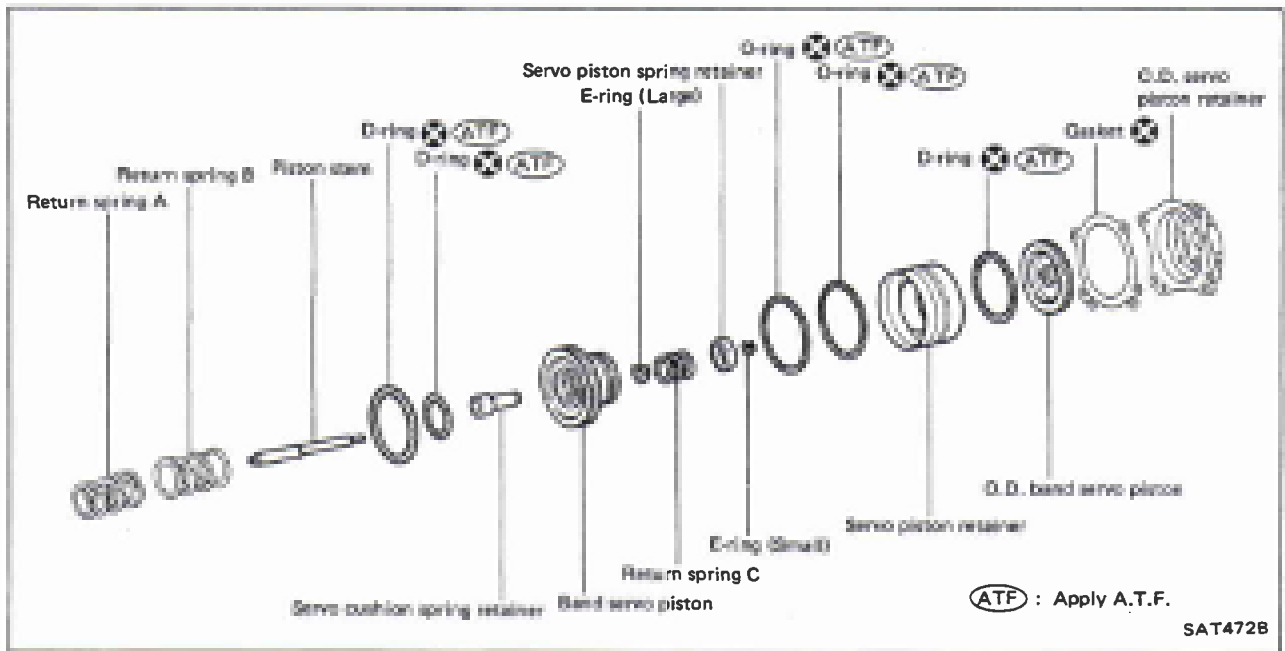


8. After installing, check to assure that rear internal gear rotates clockwise.



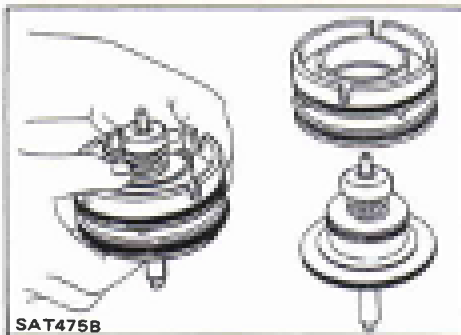
9. Install needle bearing on rear internal gear.
  - Apply petroleum jelly to needle bearing.

**Band Servo Piston Assembly**

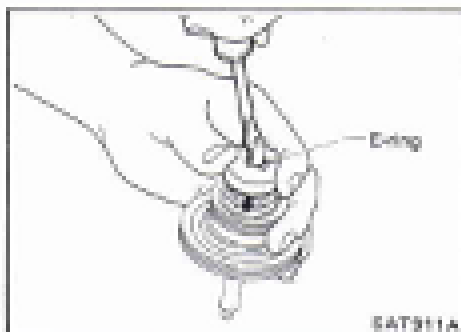


**DISASSEMBLY**

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.

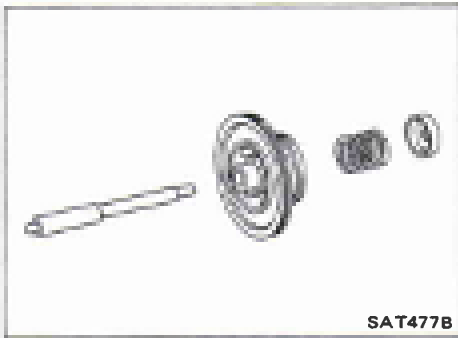


4. Remove band servo piston assembly from servo piston retainer by pushing it forward.

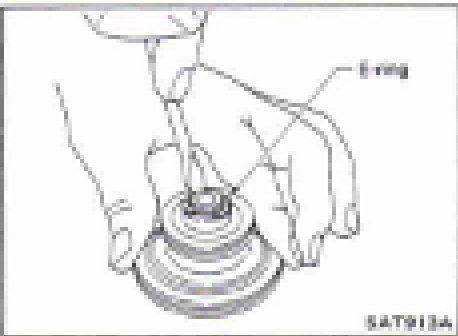


5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

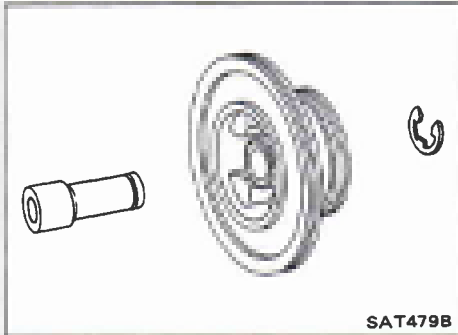
**Band Servo Piston Assembly (Cont'd)**



6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.



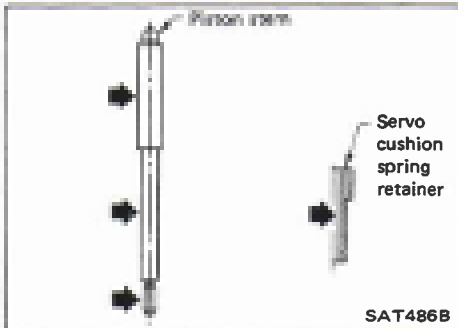
7. Remove E-ring from band servo piston.



8. Remove servo cushion spring retainer from band servo piston.

9. Remove D-rings from band servo piston.

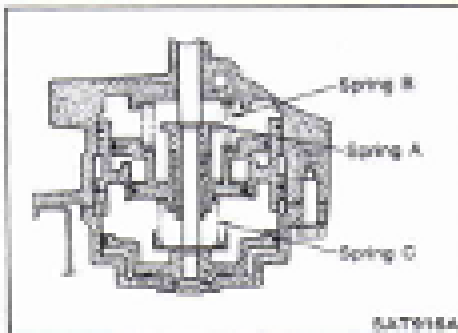
10. Remove O-rings from servo piston retainer.



**INSPECTION**

**Pistons, retainers and piston stem**

- Check frictional surfaces for abnormal wear or damage.



**Return springs**

- Check for deformation or damage. Measure free length and outer diameter.

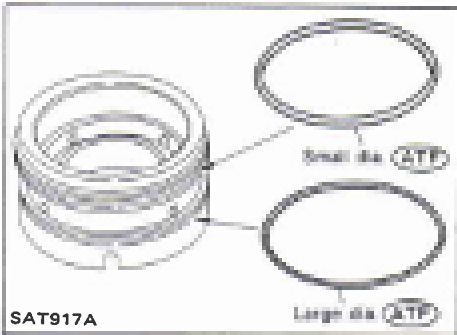
**Inspection standard**

Unit: mm (in)

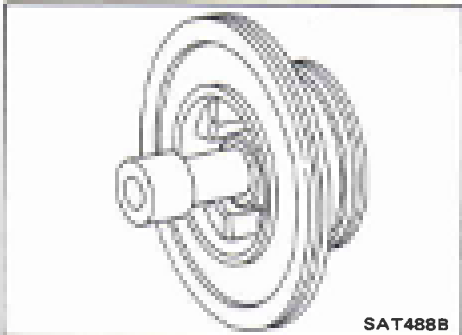
Parts	Free length	Outer diameter
Spring A	45.6 (1.795)	34.3 (1.350)
Spring B	53.8 (2.118)	40.3 (1.587)
Spring C	29.7 (1.169)	27.8 (1.094)

**Band Servo Piston Assembly (Cont'd)  
ASSEMBLY**

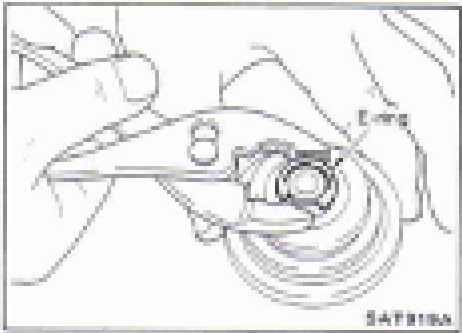
1. Install O-rings onto servo piston retainer.
  - Apply A.T.F. to O-rings.
  - Pay attention to position of each O-ring.



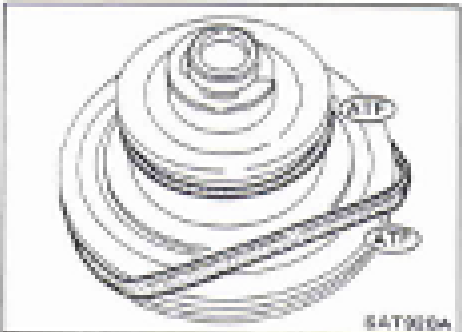
2. Install servo cushion spring retainer onto band servo piston.



3. Install E-ring onto servo cushion spring retainer.



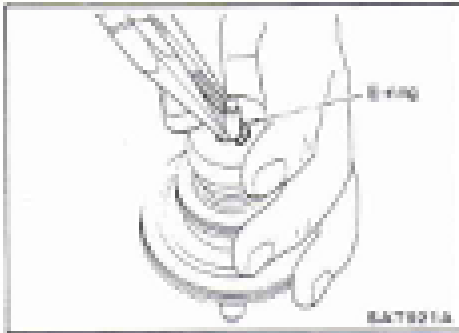
4. Install D-rings onto band servo piston.
  - Apply A.T.F. to D-rings.



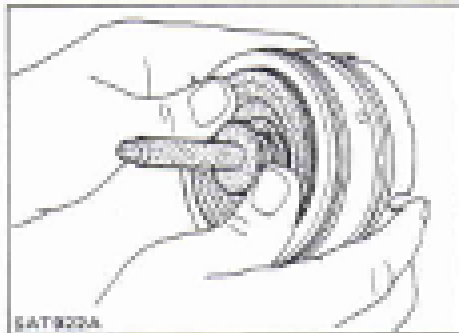
5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.



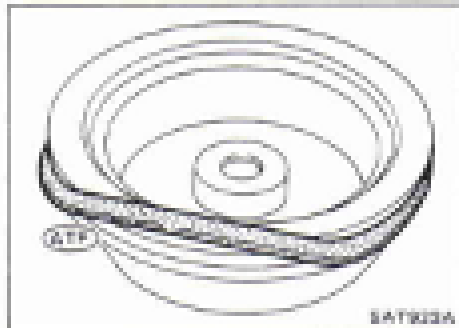
**Band Servo Piston Assembly (Cont'd)**



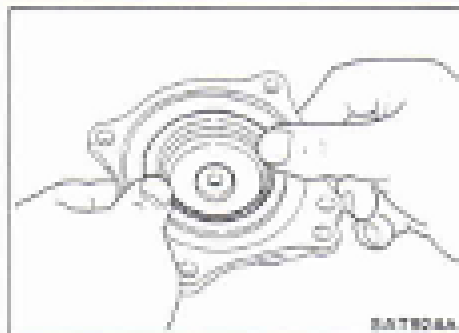
6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



7. Install band servo piston assembly onto servo piston retainer by pushing it inward.

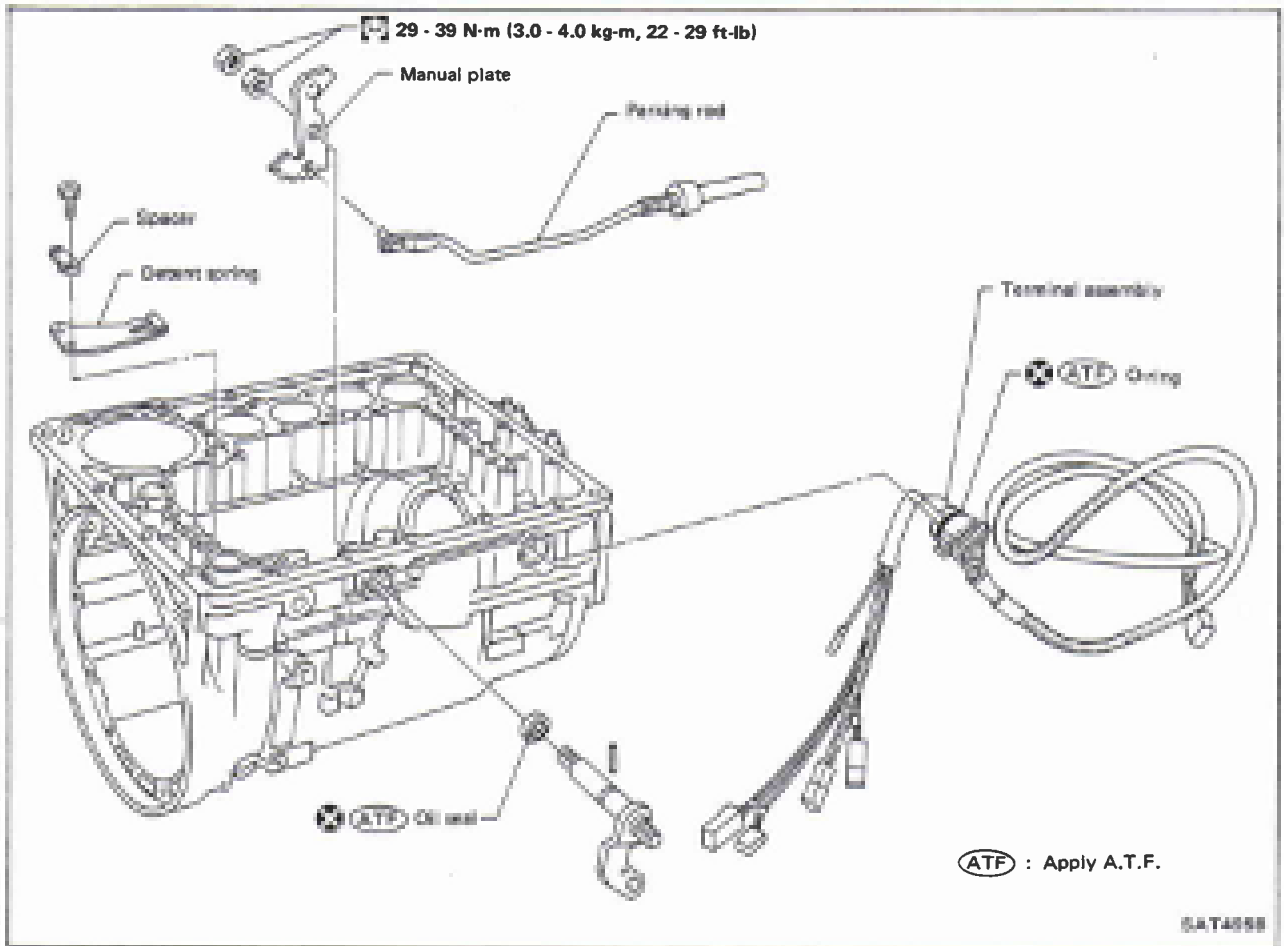


8. Install D-ring on O.D. band servo piston.  
 ● **Apply A.T.F. to D-ring.**



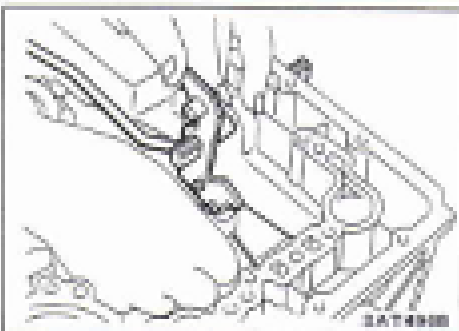
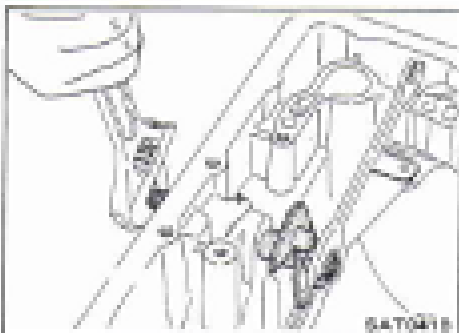
9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.

Manual Shaft Components and Terminal Assembly

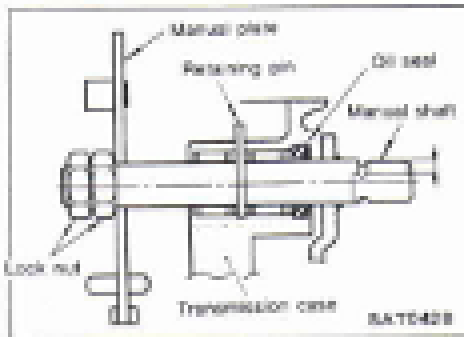


**DISASSEMBLY**

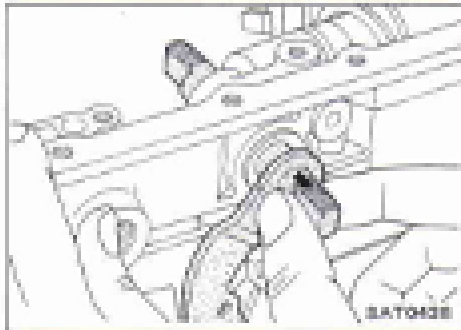
1. Remove manual plate.
  - a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.
  - b. While pushing detent spring down, remove manual plate and parking rod from transmission case.



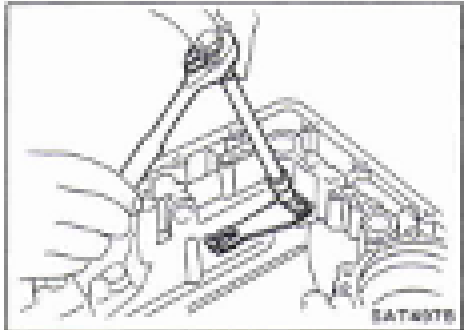
**Manual Shaft Components and Terminal Assembly (Cont'd)**



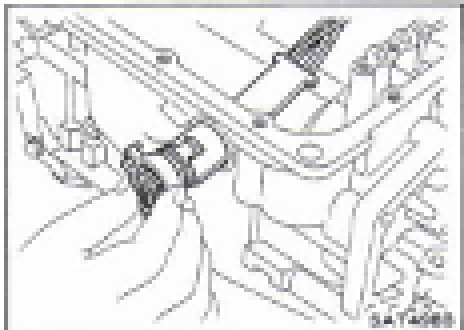
2. Remove manual shaft.
  - a. Remove retaining pin from transmission case.



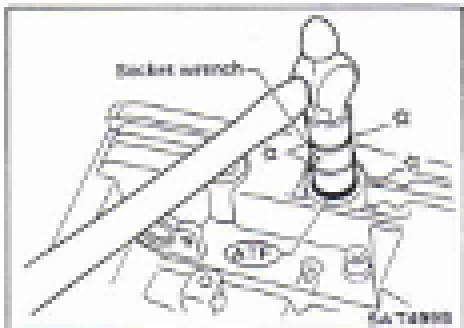
- b. Remove manual shaft from transmission case.



- c. Remove spacer and detent spring from transmission case.
  - d. Remove oil seal from transmission case.



3. Remove terminal cord assembly from transmission case while pushing on stopper.
  - Be careful not to damage cord.
  - Do not remove terminal cord assembly unless it is damaged.

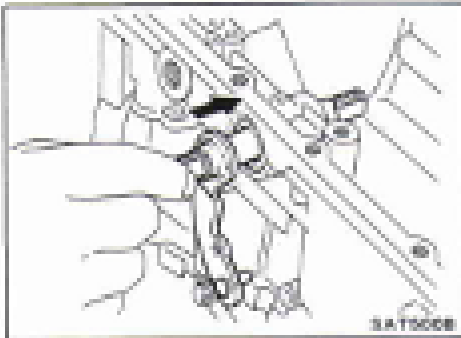


**ASSEMBLY**

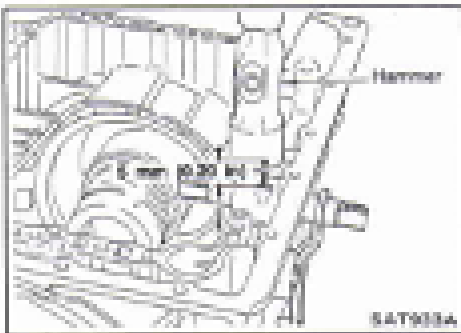
1. Install manual shaft.
  - a. Install oil seal on transmission case.
    - Apply A.T.F. to oil seal.
  - b. Install detent spring and spacer.



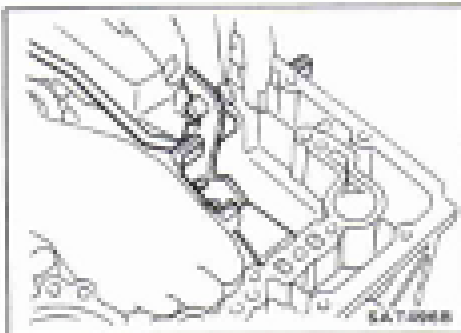
**Manual Shaft Components and Terminal Assembly (Cont'd)**



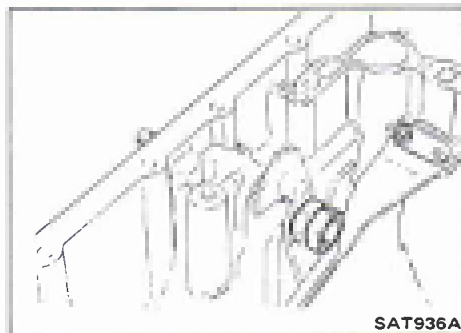
c. Install manual shaft into oil seal.



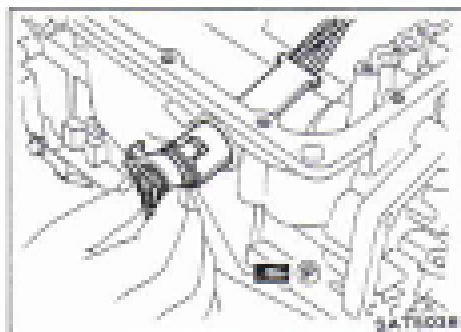
d. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.



2. Install manual plate.  
a. While pushing detent spring down, install manual plate onto manual shaft.

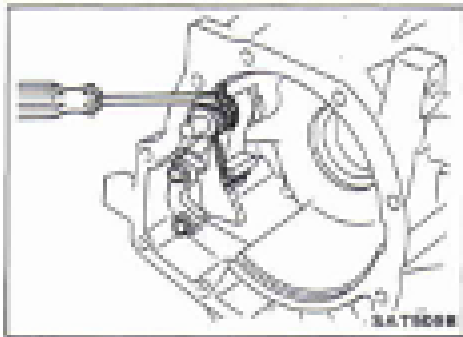
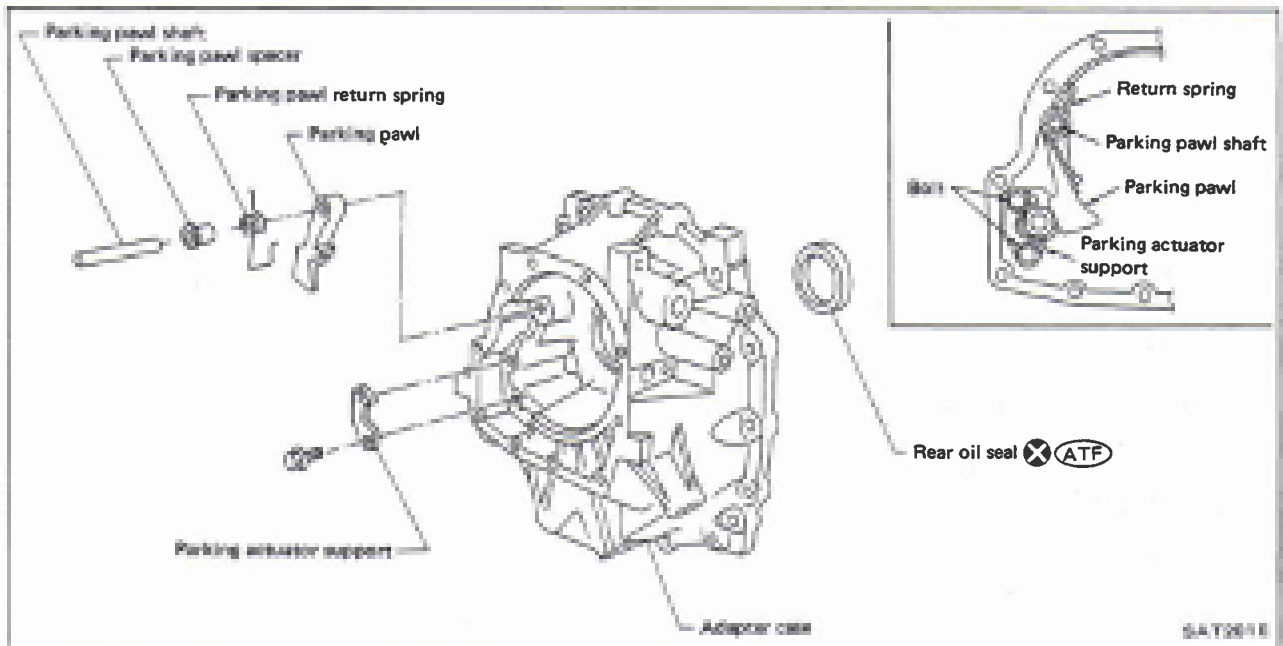


b. Install lock nuts onto manual shaft.



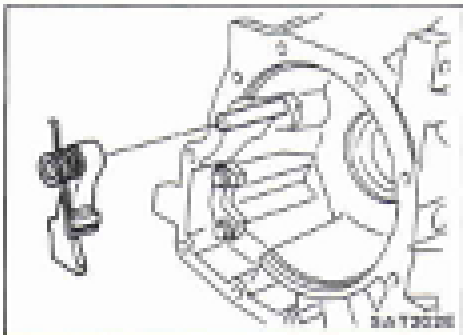
3. Install terminal cord assembly.  
a. Install O-ring on terminal cord assembly.  
● **Apply petroleum jelly to O-ring.**  
b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.

Parking Pawl Components

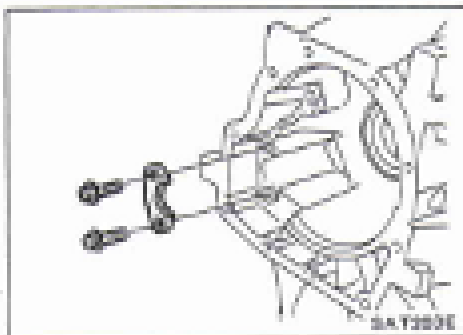


DISASSEMBLY

1. Slide return spring to the front of adapter case flange.



2. Remove return spring, pawl spacer and parking pawl from adapter case.
3. Remove parking pawl shaft from adapter case.



4. Remove parking actuator support from adapter case.
5. Remove rear oil seal.

**Parking Pawl Components (Cont'd)**

**INSPECTION**

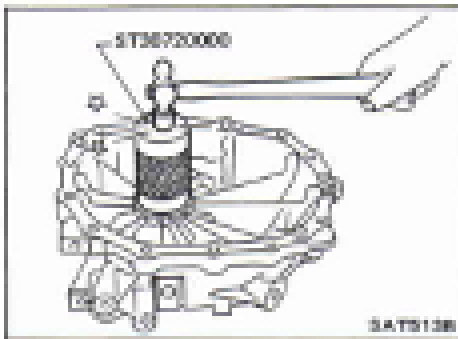
**Parking pawl and parking actuator support**

- Check contact surface of parking rod for wear.

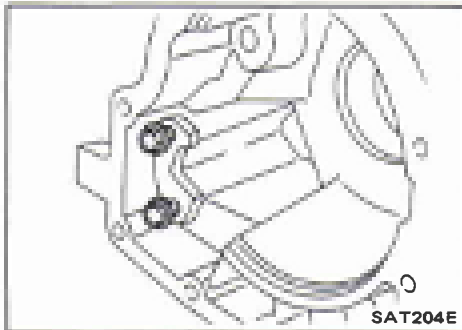


**ASSEMBLY**

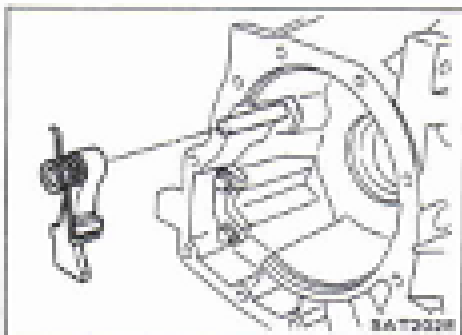
1. Install rear oil seal.



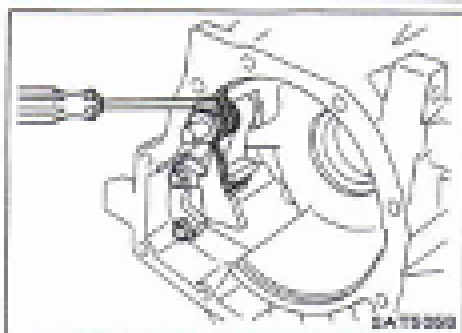
2. Install parking actuator support onto adapter case.
3. Insert parking pawl shaft into adapter case.

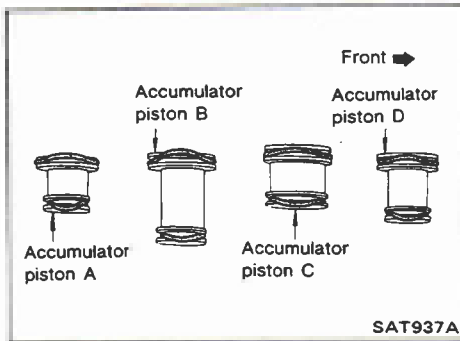


4. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.



5. Bend return spring upward and install it onto adapter case.





## Assembly

1. Install accumulator piston.
  - a. Install O-rings onto accumulator piston.
    - **Apply A.T.F. to O-rings.**

### Accumulator piston O-rings

Unit: mm (in)

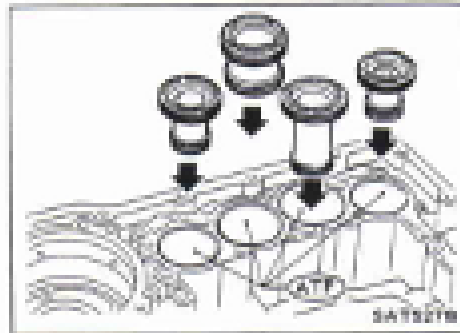
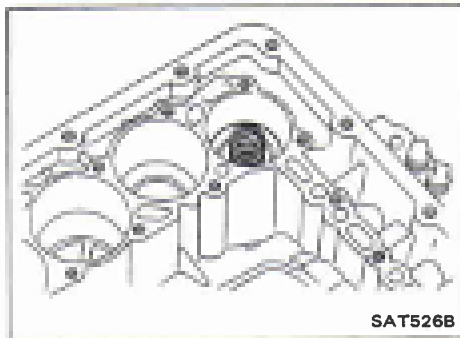
Accumulator	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

- b. Install return spring for accumulator A onto transmission case.

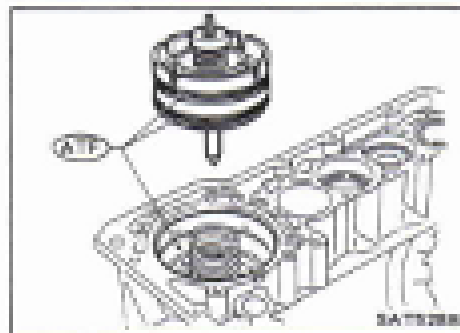
### Free length of return spring

Unit: mm (in)

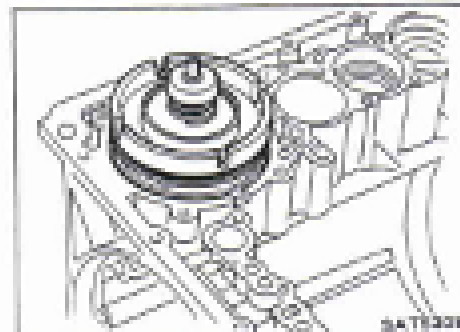
Accumulator	A
Free length	43 (1.69)



- c. Install accumulator pistons A, B, C and D.
        - **Apply A.T.F. to transmission case.**

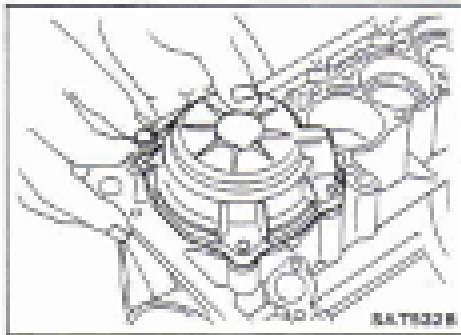


2. Install band servo piston.
  - a. Install return springs onto transmission case.
    - **Apply A.T.F. to O-rings of band servo piston and transmission case.**

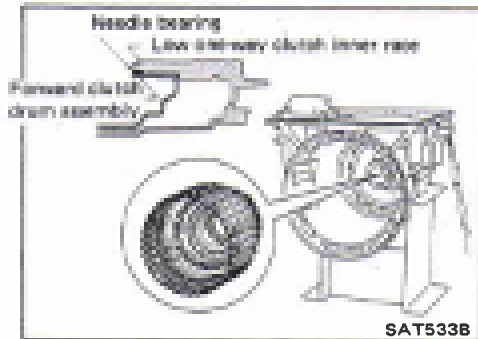


- b. Install band servo piston onto transmission case.
      - c. Install gasket for band servo onto transmission case.

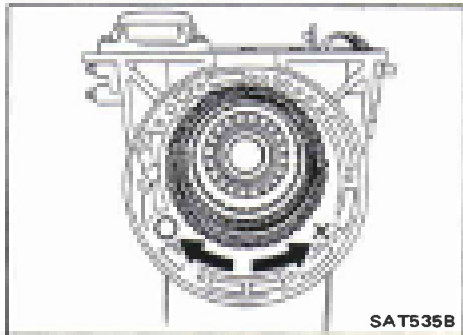
## Assembly (Cont'd)



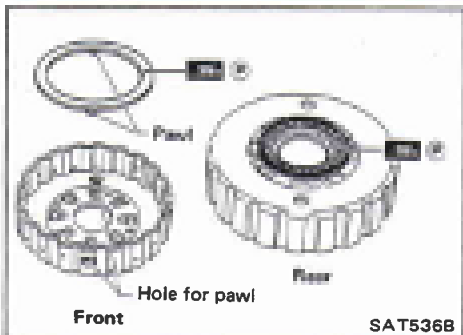
- d. Install band servo retainer onto transmission case.



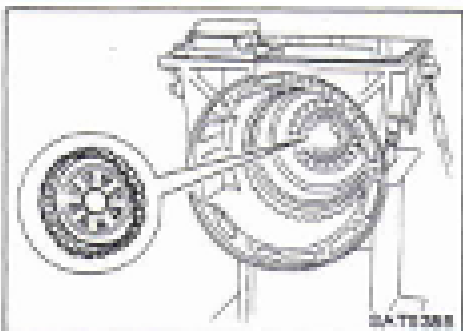
3. Install rear side clutch and gear components.
- a. Place transmission case in horizontal position.
  - b. Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.



- c. Check to be sure that rotation direction of forward clutch assembly is correct.

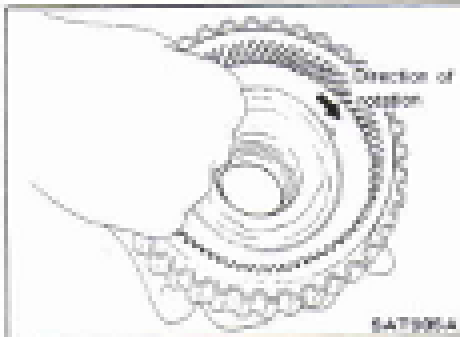


- d. Install thrust washer onto front of overrun clutch hub.
  - **Apply petroleum jelly to the thrust washer.**
  - **Insert pawls of thrust washer securely into holes in overrun clutch hub.**
- e. Install needle bearing onto rear of overrun clutch hub.
  - **Apply petroleum jelly to needle bearing.**

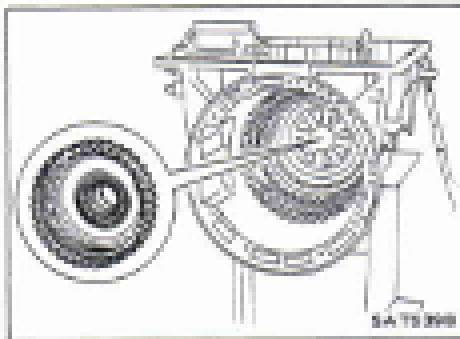


- f. Install overrun clutch hub onto transmission case while rotating it slowly.

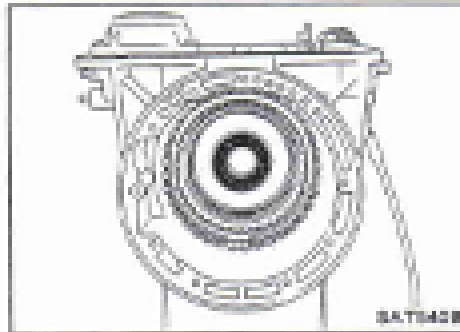
## Assembly (Cont'd)



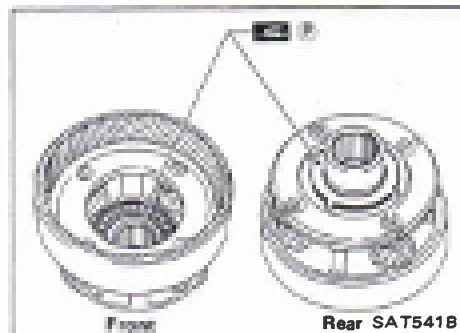
- g. Check that rear internal gear rotates as shown while holding forward clutch hub.



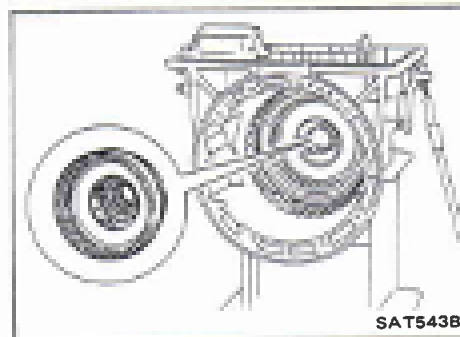
- h. Install rear internal gear and forward clutch hub as a unit onto transmission case.



- i. Install needle bearing onto rear internal gear.  
 ● **Apply petroleum jelly to needle bearing.**



- j. Install needle bearing onto front of front internal gear.  
 ● **Apply petroleum jelly to needle bearing.**  
 k. Install bearing race onto rear of front internal gear.  
 ● **Apply petroleum jelly to bearing race.**  
 ● **Securely engage pawls of bearing race with holes in front internal gear.**

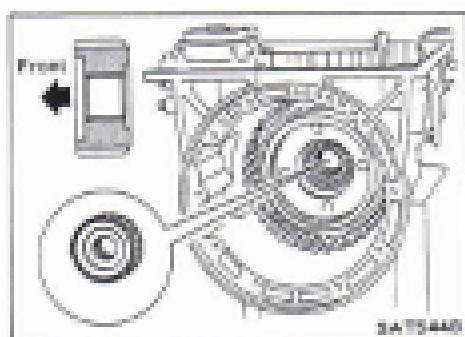


- l. Install front internal gear on transmission case.

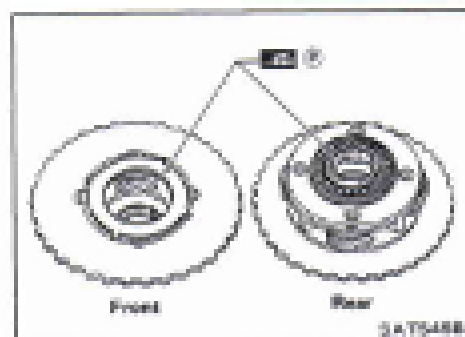
## Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

Part name \ Item	Total end play	Reverse clutch end play
Transmission case	●	●
Low one-way clutch inner race	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	—	●



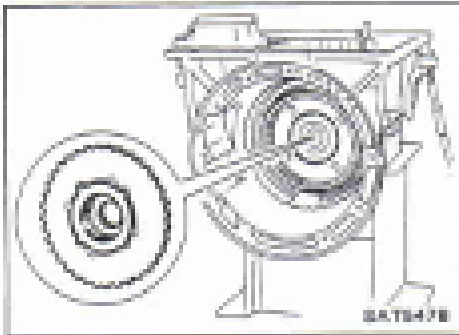
1. Install front side clutch and gear component.
  - a. Install rear sun gear on transmission case.
    - **Pay attention to its direction.**



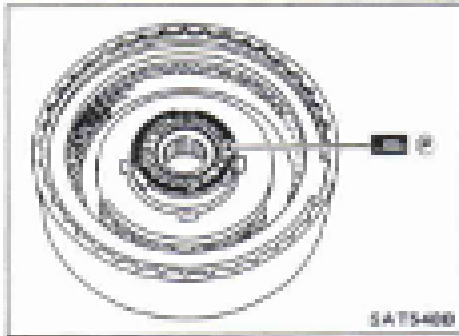
- b. Install bearing race on front of front planetary carrier.
  - **Apply petroleum jelly to needle bearing.**
  - **Securely engage pawls of bearing race with holes in carrier.**
- c. Install needle bearing on rear of front planetary carrier.
  - **Apply petroleum jelly to bearing.**

**Adjustment (Cont'd)**

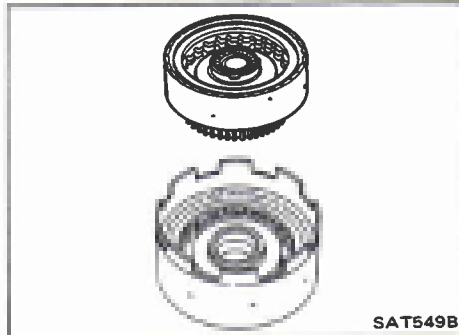
- d. Install front planetary carrier on forward clutch drum.



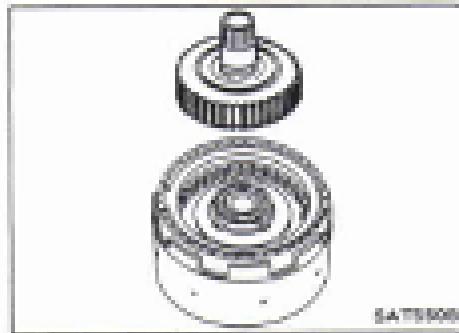
- e. Install needle bearing on rear of high clutch.  
 ● Apply petroleum jelly to bearing.



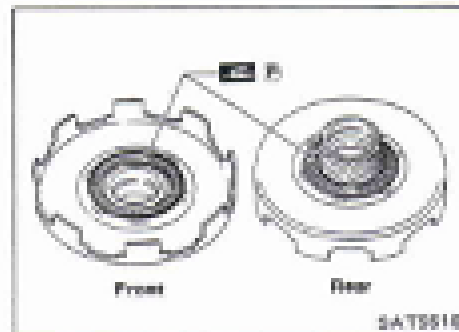
- f. Install high clutch assembly onto reverse clutch assembly.



- g. Install high clutch hub onto high clutch assembly.

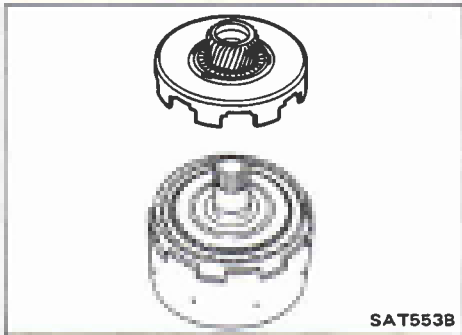


- h. Install needle bearings onto front sun gear.  
 ● Apply petroleum jelly to needle bearings.

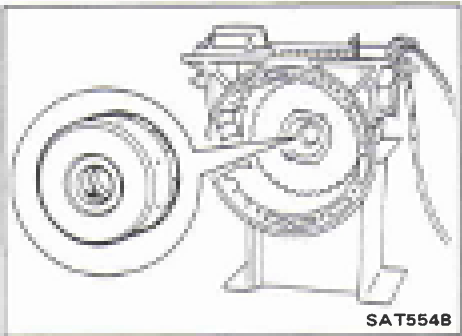




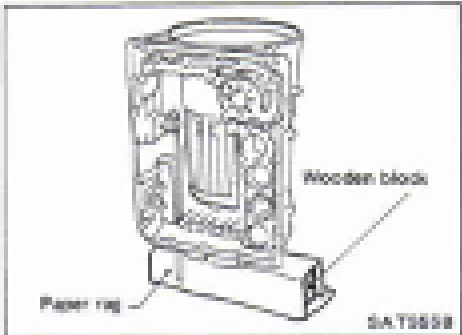
## Adjustment (Cont'd)



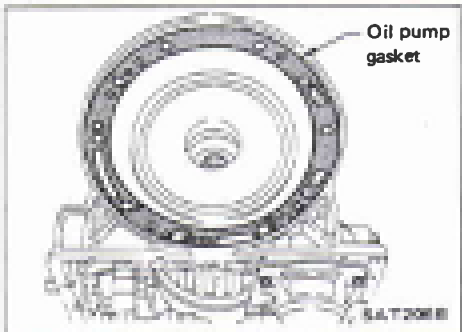
i. Install front sun gear onto reverse clutch assembly.



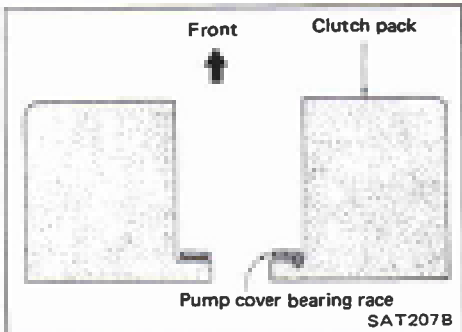
j. Install clutch pack into transmission case.



k. Place transmission case in vertical position.

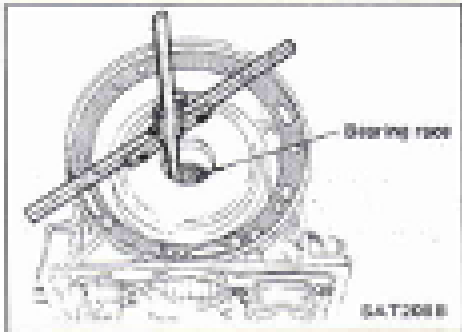


2. Adjust total end play.  
a. Install new oil pump gasket on transmission case.

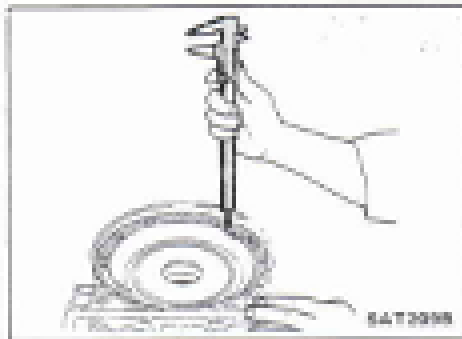


b. Install pump cover bearing race on clutch pack.

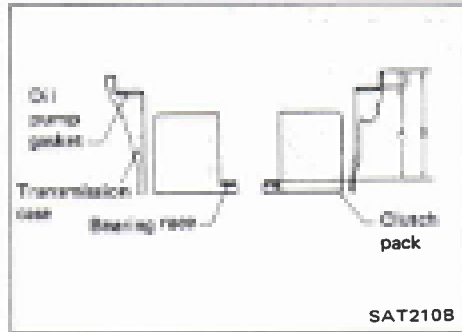
**Adjustment (Cont'd)**



- c. Measure distance "B" between front end of transmission case and oil pump cover bearing race.

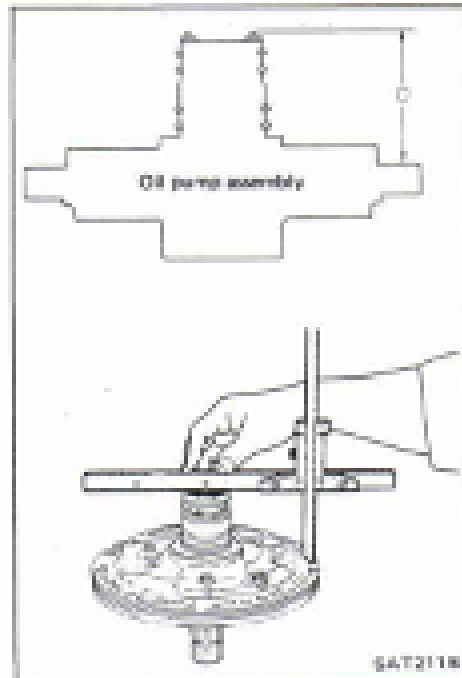


- d. Measure distance "C" between front end of transmission case and oil pump gasket.



- e. Determine dimension "A" by using the following equation.  

$$A = B - C$$



- f. Install needle bearing on oil pump assembly.
- g. Measure distance "D" between needle bearing and machined surface of oil pump cover assembly.

**Adjustment (Cont'd)**

- h. Determine total end play "T<sub>1</sub>" by using the following equation.

$$T_1 = A - D - 0.1$$

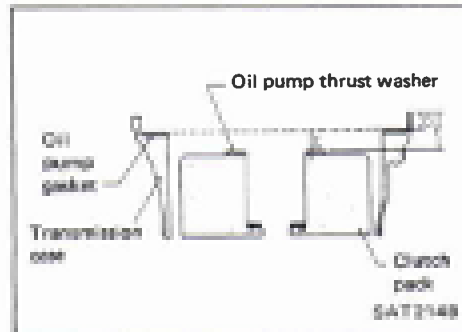
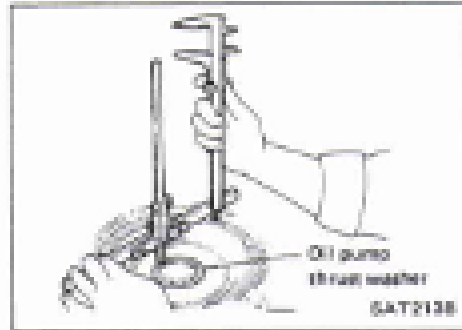
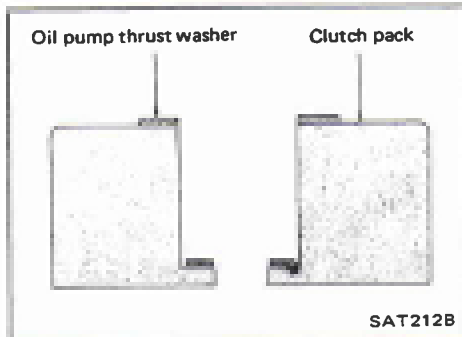
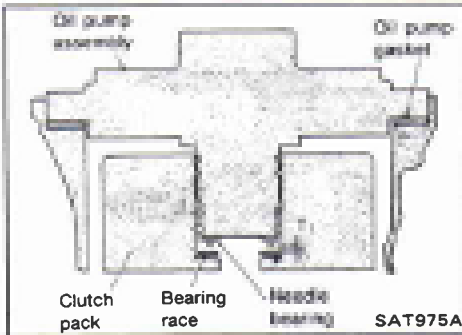
**Total end play "T<sub>1</sub>":**

**0.25 - 0.55 mm (0.0098 - 0.0217 in)**

- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

**Available oil pump cover bearing race:**

**Refer to S.D.S.**



3. Adjust reverse clutch drum end play.

- a. Install oil pump thrust washer on clutch pack.

- b. Measure distance "F" between front end of transmission case and oil pump thrust washer.

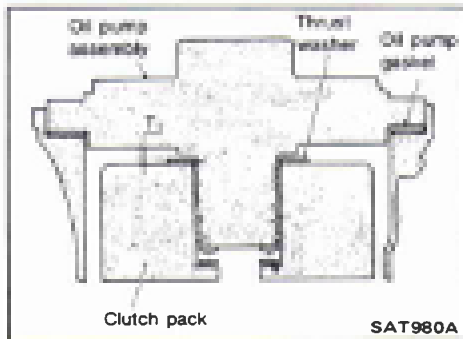
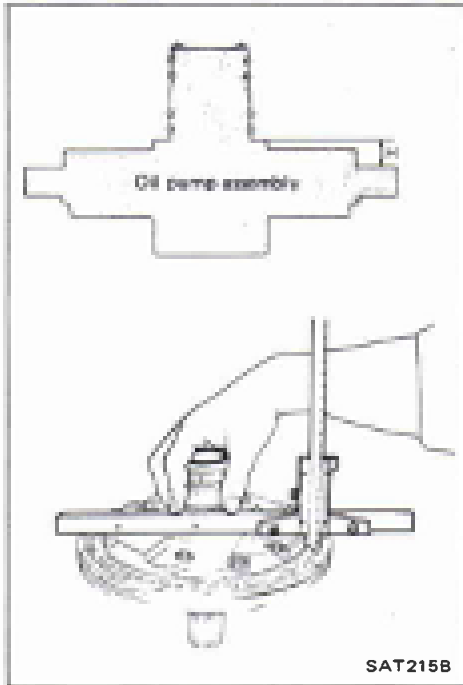
- c. Measure distance "G" between front end of transmission case and gasket.

- d. Determine dimension "E" by using the following equation.

$$E = F - G$$

## Adjustment (Cont'd)

e. Measure distance "H".



f. Determine reverse clutch drum end play "T<sub>2</sub>" by using the following equation.

$$T_2 = E - H - 0.1$$

Reverse clutch drum end play "T<sub>2</sub>":

0.55 - 0.90 mm (0.0217 - 0.0354 in)

- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.

Available oil pump thrust washer:

Refer to S.D.S.

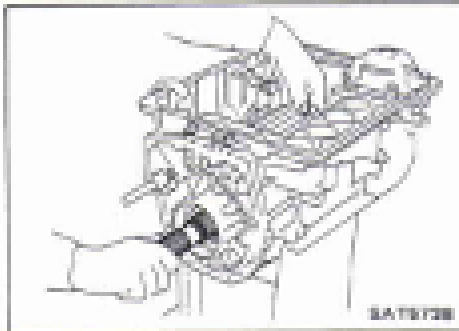
4. Remove any part installed to adjust end plays.

## Assembly

1. Install output shaft and parking gear.

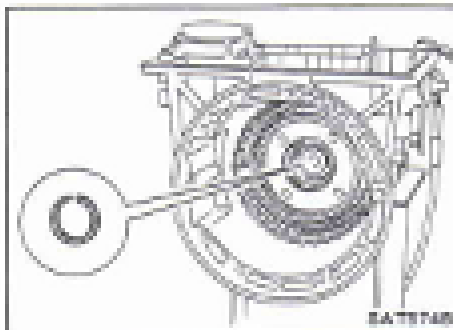
a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.

- Do not force output shaft against front of transmission case.

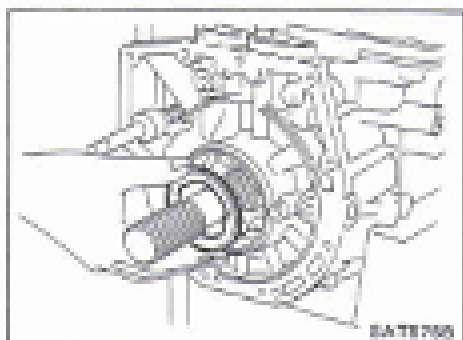


b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.

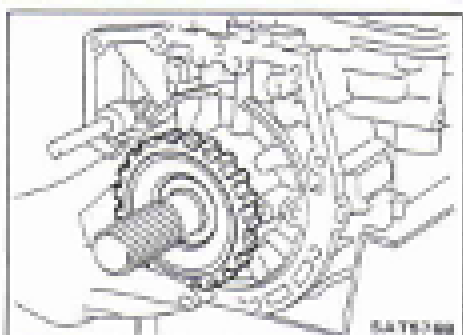
- Check to be sure output shaft cannot be removed in rear direction.



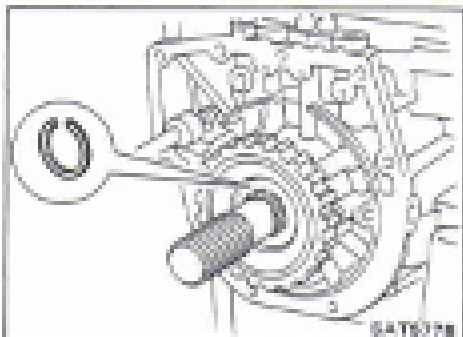
## Assembly (Cont'd)



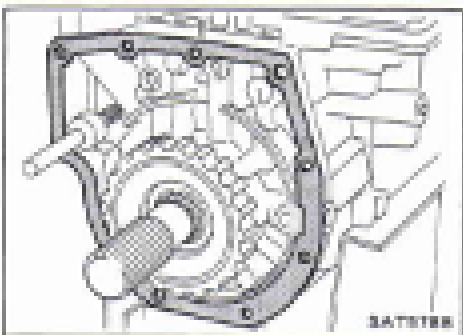
- c. Install needle bearing on transmission case.
  - Pay attention to its direction. — Black side goes to rear.
  - Apply petroleum jelly to needle bearing.



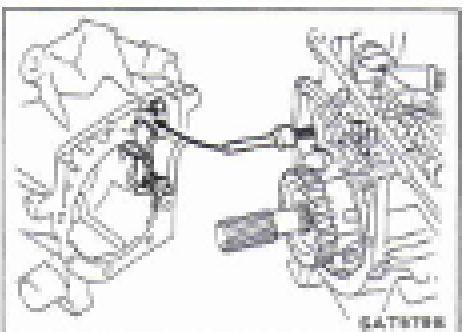
- d. Install parking gear on transmission case.



- e. Install snap ring on rear of output shaft.
  - Check to be sure output shaft cannot be removed in forward direction.



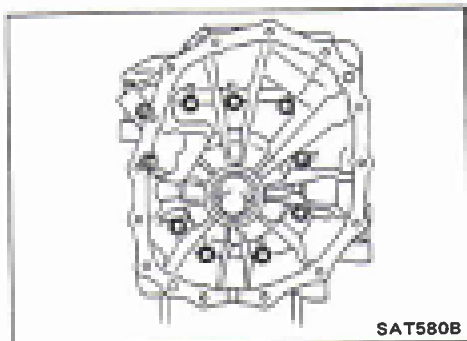
- 2. Install adapter case.
  - a. Install adapter case gasket on transmission case.



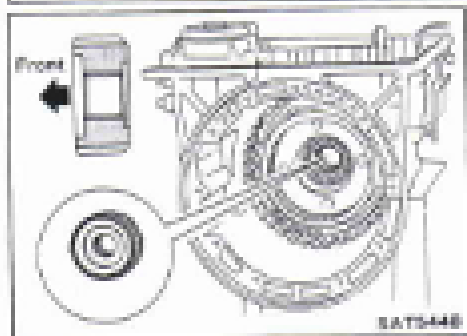
- b. Install parking rod on adapter case.

### ASSEMBLY

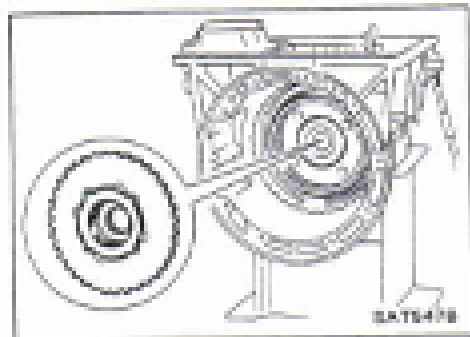
#### Assembly (Cont'd)



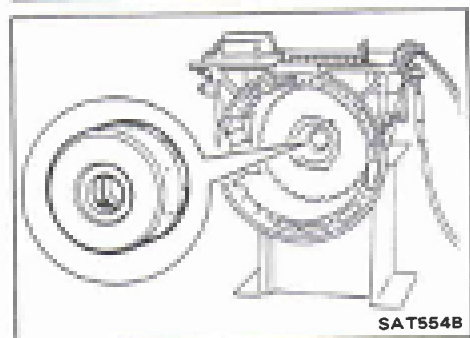
c. Install adapter case on transmission case.



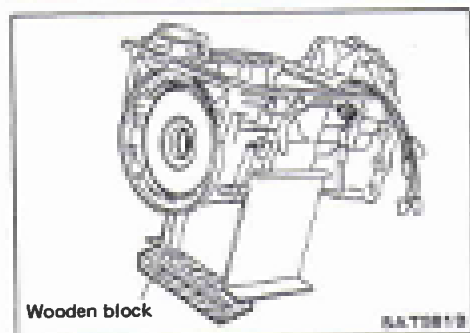
- 3. Install front side clutch and gear components.
- a. Install rear sun gear on transmission case.
- Pay attention to its direction.



- b. Make sure bearing race and needle bearings are in proper position on front planetary carrier.
- e. Install front planetary carrier on forward clutch drum.

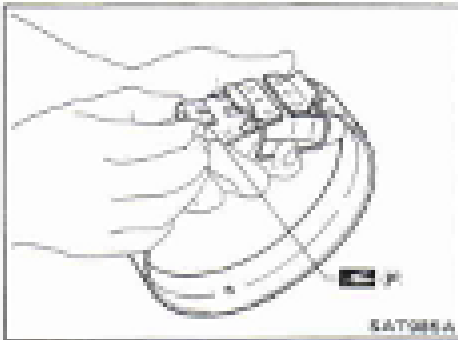


- d. Make sure needle bearings and selected bearing race are in proper position on clutch pack.
- e. Install clutch pack onto transmission case.

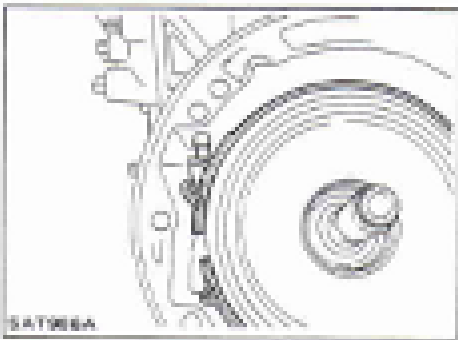


4. Tilt transmission case with wooden block.

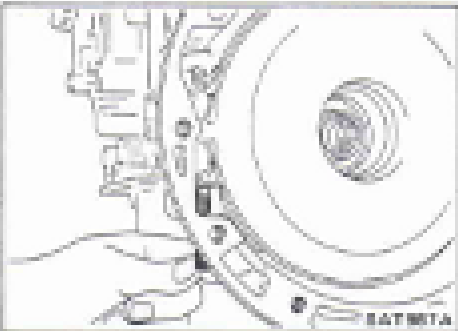
## Assembly (Cont'd)



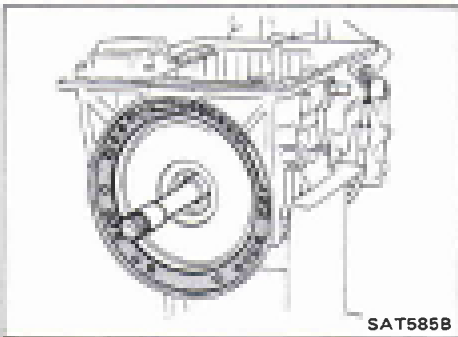
5. Install brake band and band strut.
  - a. Install band strut on brake band.
    - **Apply petroleum jelly to band strut.**



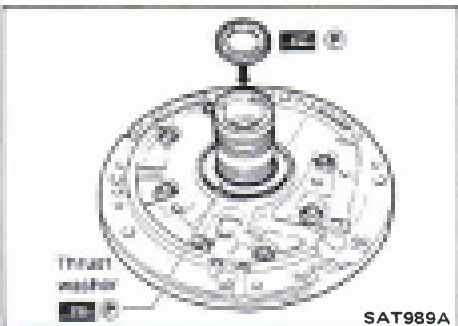
- b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.



- c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.



6. Install input shaft on transmission case.
  - **Pay attention to its direction. — O-ring groove side is front.**
7. Install gasket on transmission case.

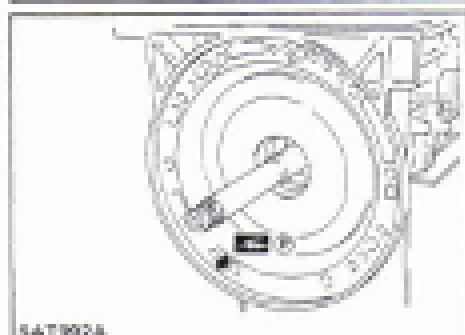


8. Install oil pump assembly.
  - a. Install needle bearing on oil pump assembly.
    - **Apply petroleum jelly to the needle bearing.**
  - b. Install selected thrust washer on oil pump assembly.
    - **Apply petroleum jelly to thrust washer.**

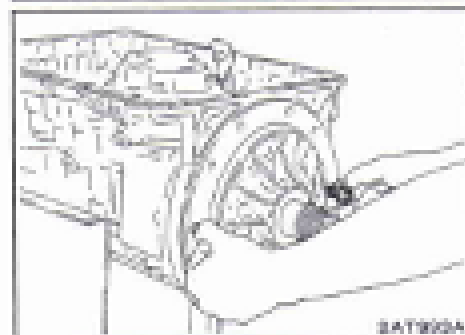
## Assembly (Cont'd)



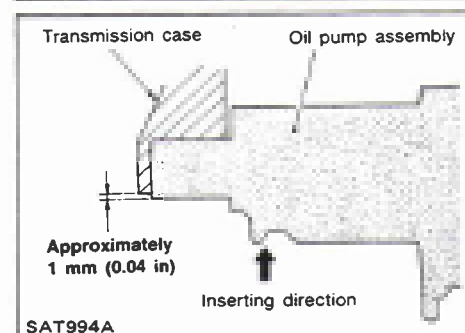
c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.



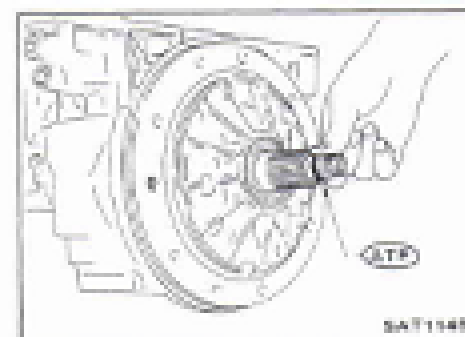
d. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.



e. Install oil pump assembly.  
 ● Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.



■ Insert oil pump assembly to the specified position in transmission, as shown at left.

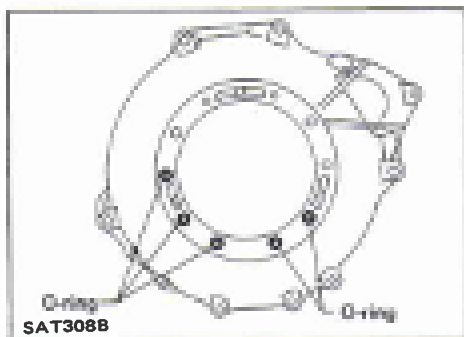


9. Install O-ring on input shaft.  
 ● Apply A.T.F. to O-rings.

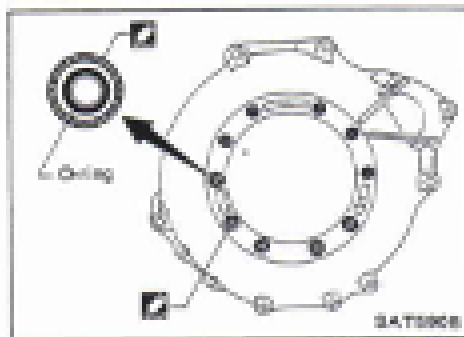


## Assembly (Cont'd)

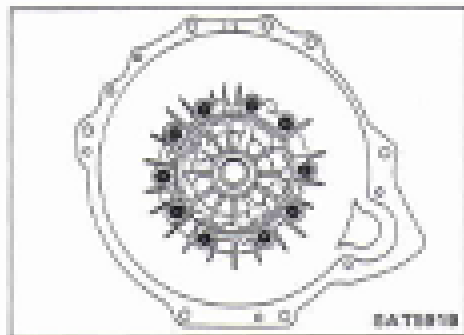
10. Install converter housing.
- Install O-rings on converter housing.



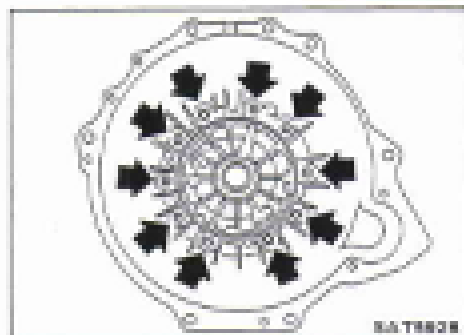
- Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.
  - Do not apply too much sealant.



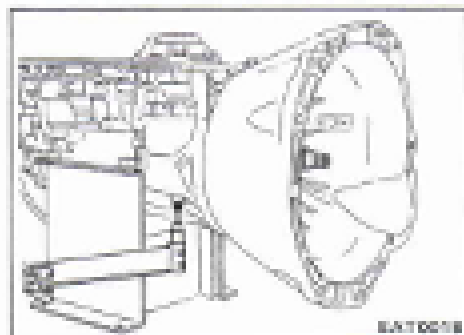
- Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.



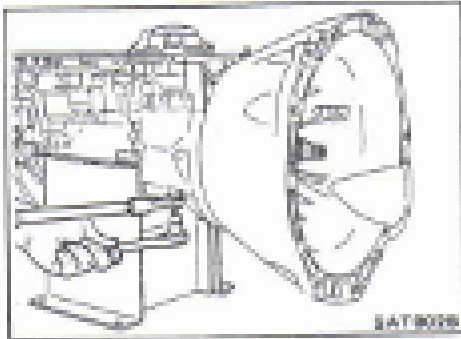
- Install converter housing on transmission case.



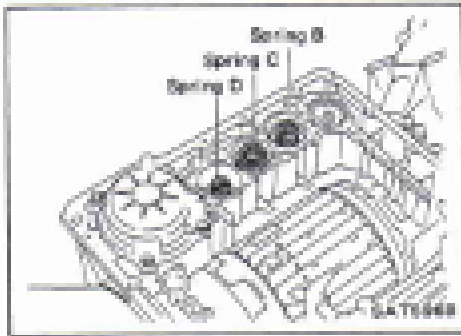
11. Adjust brake band.
- Tighten anchor end bolt to specified torque.
    - ☐: Anchor end bolt
    - 4 - 6 N·m
    - (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)
  - Back off anchor end bolt two and a half turns.



**Assembly (Cont'd)**



c. While holding anchor end bolt, tighten lock nut.



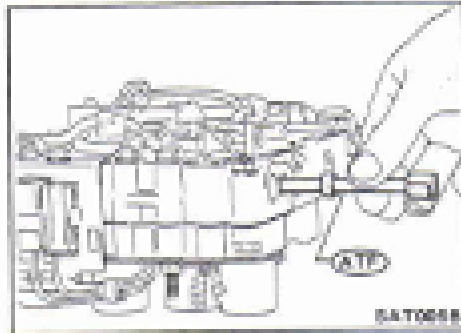
12. Install control valve assembly.

a. Install accumulator piston return springs B, C and D.

**Free length of return springs**

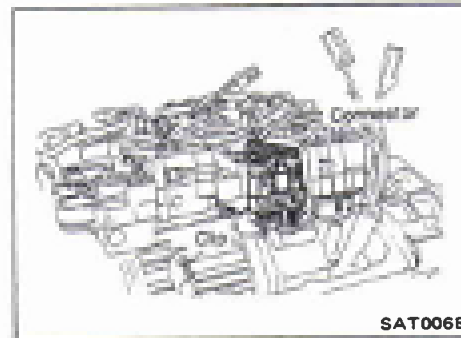
Unit: mm (in)

Item	Accumulator	B	C	D
Free length		66 (2.60)	45 (1.77)	58.4 (2.299)



b. Install manual valve on control valve.

● **Apply A.T.F. to manual valve.**




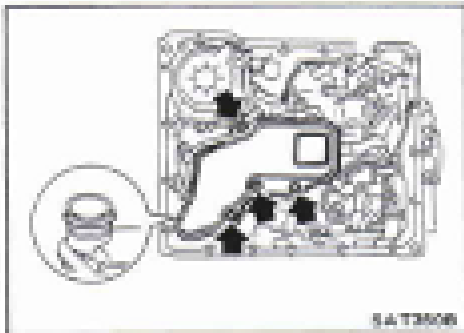
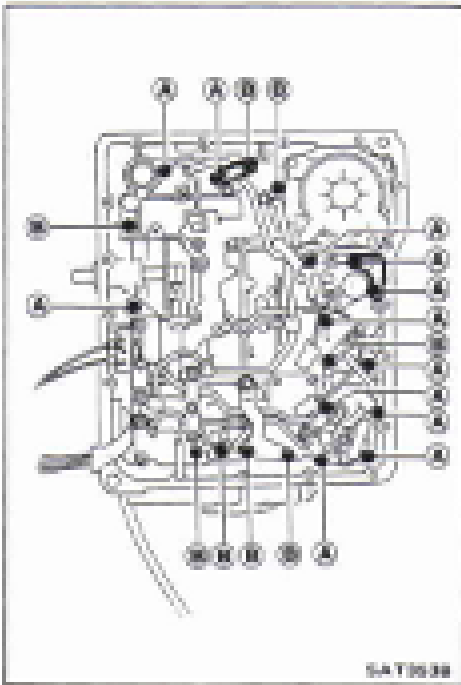
c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.

d. Install connector clip.

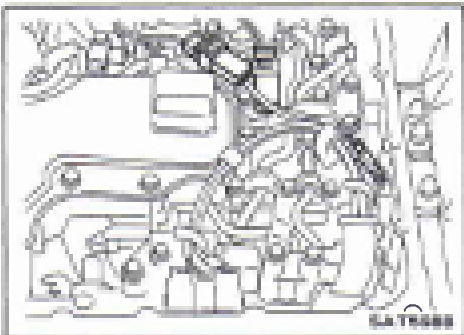
## Assembly (Cont'd)

- e. Install control valve assembly on transmission case.
- f. Install connector tube brackets and tighten bolts **(A)** and **(B)**.
- **Check that terminal assembly harness does not catch.**

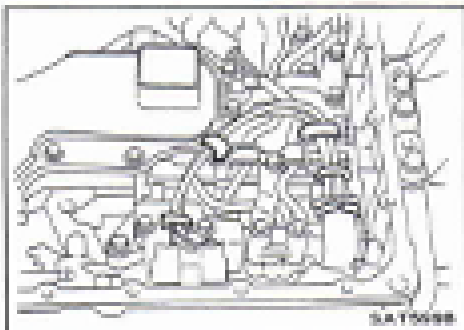
Bolt symbol	ℓ mm (in)	
<b>(A)</b>	33 (1.30)	
<b>(B)</b>	45 (1.77)	



- g. Install O-ring on oil strainer.
- **Apply petroleum jelly to O-ring.**
- h. Install oil strainer on control valve.



- i. Install lock-up solenoid, fluid temperature sensor and A/T oil temperature switch connectors.

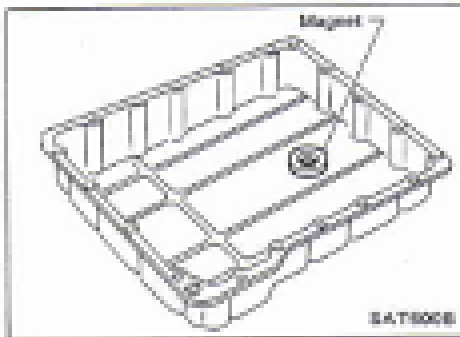


- j. Securely fasten terminal harness with clips.

## Assembly (Cont'd)

13. Install oil pan.

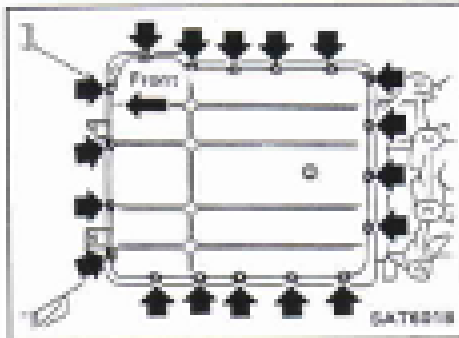
a. Attach a magnet to oil pan.



b. Install oil pan gasket on transmission case.

c. Install oil pan and bracket on transmission case.

● **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

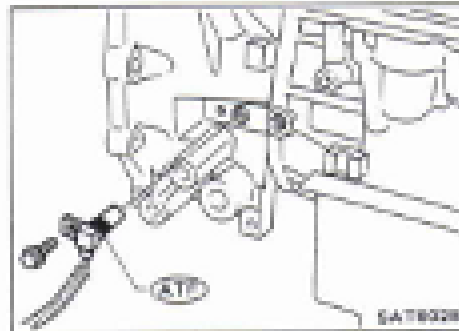


14. Install revolution sensor.

a. Install O-ring on revolution sensor.

● **Apply A.T.F. to O-ring.**

b. Install revolution sensor on adapter case.

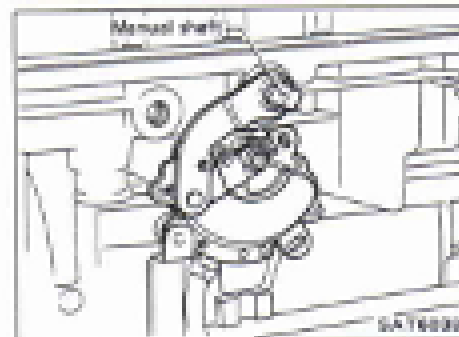


15. Install inhibitor switch.

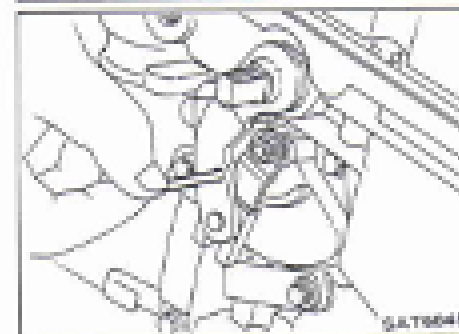
a. Check that manual shaft is in "1" range.

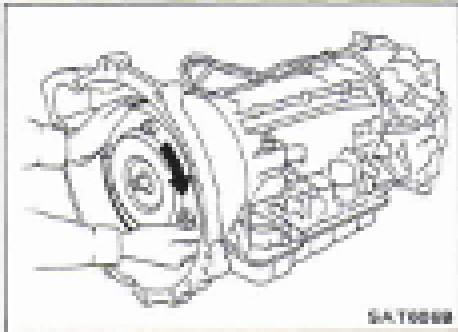
b. Temporarily install inhibitor switch on manual shaft.

c. Move manual shaft to "N".



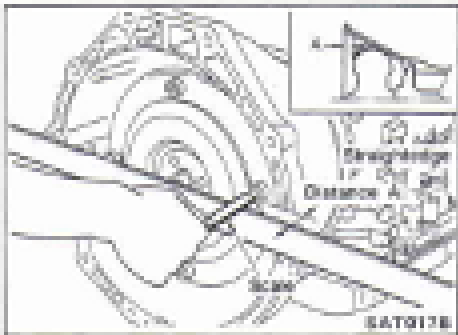
d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.



**Assembly (Cont'd)**

16. Install torque converter.

- a. Install torque converter while aligning notches and oil pump.



- b. Measure distance A to check that torque converter is in proper position.

**Distance "A":**

**26.0 mm (1.024 in) or more**

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

RE4R03A

## General Specifications

Applied model	TB42
Automatic transmission model	RE4R03A
Transmission model code number	51X01
Stall torque ratio	2.275
Transmission gear ratio	
1st	2.784
2nd	1.544
Top	1.000
O.D.	0.694
Reverse	2.275
Recommended oil	Automatic transmission fluid Type DEXRON™
Oil capacity	8 (Imp qt)
	8.5 (7-1/2)

## Specifications and Adjustment

### VEHICLE SPEED WHEN SHIFTING GEARS

Model	Throttle position	Shift pattern	Vehicle speed km/h (MPH)						
			D <sub>1</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>4</sub>	D <sub>4</sub> → D <sub>3</sub>	D <sub>3</sub> → D <sub>2</sub>	D <sub>2</sub> → D <sub>1</sub>	1 <sub>2</sub> → 1 <sub>1</sub>
TB42	Full throttle	Standard	43 - 47 (27 - 29)	77 - 85 (48 - 53)	119 - 129 (74 - 80)	113 - 123 (70 - 76)	70 - 78 (43 - 48)	36 - 40 (22 - 25)	40 - 44 (25 - 27)
		Power	48 - 52 (30 - 32)	87 - 95 (54 - 59)	138 - 148 (86 - 92)	125 - 135 (78 - 84)	78 - 86 (48 - 53)	41 - 45 (25 - 28)	40 - 44 (25 - 27)
	Half throttle	Standard	14 - 18 (9 - 11)	30 - 38 (19 - 24)	52 - 62 (32 - 39)	36 - 46 (22 - 29)	14 - 22 (9 - 14)	7 - 11 (4 - 7)	40 - 44 (25 - 27)
		Power	25 - 29 (16 - 18)	45 - 53 (28 - 33)	80 - 90 (50 - 56)	45 - 55 (28 - 34)	16 - 24 (10 - 15)	7 - 11 (4 - 7)	40 - 44 (25 - 27)

### VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Model	Throttle position	Shift pattern	D <sub>4</sub>	
			Vehicle speed km/h (MPH)	
			Lock-up "ON"	Lock-up "OFF"
TB42	Full throttle	Standard	—	—
		Power	—	—
	Half throttle	Standard	78 - 88 (48 - 55)	73 - 83 (45 - 52)
		Power	78 - 88 (48 - 55)	73 - 83 (45 - 52)

### STALL REVOLUTION

Model	Stall revolution rpm
TB42	2,000 - 2,300

### LINE PRESSURE

Model	Engine speed rpm	Line pressure kPa (bar, kg/cm <sup>2</sup> , psi)	
		D, 2 and 1 ranges	R range
TB42	Idle	392 - 471 (3.92 - 4.71, 4.0 - 4.8, 57 - 68)	667 - 706 (6.67 - 7.06, 6.8 - 7.2, 97 - 102)
	Stall	883 - 961 (8.83 - 9.61, 9.0 - 9.8, 128 - 139)	1,393 - 1,471 (13.93 - 14.71, 14.2 - 15.0, 202 - 213)

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

RE4R03A

## Specifications and Adjustment (Cont'd)

### RETURN SPRINGS

Unit: mm (in)

Parts	Item	Part No.	Free length	Outer diameter
Control valve	Torque converter relief valve spring	31742-41X18	32.3 (1.272)	9.0 (0.354)
	Pressure regulator valve spring	31742-41X16	61.5 (2.421)	8.9 (0.350)
	Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
	Accumulator control plug spring	31742-41X17	27.5 (1.083)	6.6 (0.260)
	Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
	Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
	Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
	Overrun clutch reducing valve spring	31742-41X14	38.9 (1.531)	7.0 (0.276)
	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
	Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
	Lock-up control valve spring	31742-41X21	33.0 (1.299)	6.5 (0.256)
	Modifier accumulator piston spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
	1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
	3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
	Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)
Reverse clutch	16 pcs	31505-51X00	37.18 (1.4638)	14.8 (0.583)
High clutch	16 pcs	31505-21X03	22.06 (0.8685)	11.6 (0.457)
Forward clutch (Overrun clutch)	20 pcs	31505-51X04	36.83 (1.4500)	9.8 (0.386)
Low & reverse brake	Inner spring	16 pcs	31505-51X03	15.71 (0.6185)
	Outer spring	16 pcs	31505-51X02	18.75 (0.7382)
Band servo	Spring A	31605-41X05	45.6 (1.795)	34.3 (1.350)
	Spring B	31605-41X00	53.8 (2.118)	40.3 (1.587)
	Spring C	31605-41X01	29.0 (1.142)	27.6 (1.087)
Accumulator	Accumulator A	31605-41X02	43.0 (1.693)	
	Accumulator B	31605-41X03	66.0 (2.598)	
	Accumulator C	31605-41X09	45.0 (1.772)	
	Accumulator D	31605-41X06	58.4 (2.299)	

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

RE4R03A

## Specifications and Adjustment (Cont'd)

### ACCUMULATOR O-RING

Accumulator	Diameter mm (in)			
	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

### CLUTCHES AND BRAKES

<b>Forward clutch</b>		
Number of drive plates	3	
Number of driven plates	3	
Thickness of drive plate mm (in)	2.0 (0.079) 1.8 (0.071)	
Standard Wear limit		
Clearance mm (in)	0.5 - 0.8 (0.020 - 0.031) 1.4 (0.055)	
Standard Allowable limit		
Thickness of retaining plate	Thickness mm (in)	Part number
	4.4 (0.173)	31537-51X61
	4.6 (0.181)	31537-51X00
	4.8 (0.189)	31537-51X01
	5.0 (0.197)	31537-51X02
	5.2 (0.205)	31537-51X03
	5.4 (0.213)	31537-51X04
<b>High clutch</b>		
Number of drive plates	7	
Number of driven plates	8	
Thickness of drive plate mm (in)	1.6 (0.063) 1.4 (0.055)	
Standard Wear limit		
Clearance mm (in)	1.8 - 2.2 (0.071 - 0.087) 3.6 (0.142)	
Standard Allowable limit		
Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-51X19
	4.2 (0.165)	31537-51X60
	4.4 (0.173)	31537-51X61
	4.6 (0.181)	31537-51X00
	4.8 (0.189)	31537-51X01
	5.0 (0.197)	31537-51X02

<b>Forward clutch</b>		
Number of drive plates	3	
Number of driven plates	3	
Thickness of drive plate mm (in)	2.0 (0.079) 1.8 (0.071)	
Standard Wear limit		
Clearance mm (in)	0.45 - 0.85 (0.0177 - 0.0335) 2.65 (0.1043)	
Standard Allowable limit		
Thickness of retaining plate	Thickness mm (in)	Part number
	4.4 (0.173)	31537-51X05
	4.6 (0.181)	31537-51X06
	4.8 (0.189)	31537-51X07
	5.0 (0.197)	31537-51X08
	5.2 (0.205)	31537-51X09
	5.4 (0.213)	31537-51X10
<b>Overrun clutch</b>		
Number of drive plates	3	
Number of driven plates	3	
Thickness of drive plate mm (in)	2.0 (0.079) 1.8 (0.071)	
Standard Wear limit		
Clearance mm (in)	1.0 - 1.4 (0.039 - 0.055) 2.4 (0.094)	
Standard Allowable limit		
Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-51X12
	4.2 (0.165)	31537-51X13
	4.4 (0.173)	31537-51X14
	4.6 (0.181)	31537-51X15
	4.8 (0.189)	31537-51X64
	5.0 (0.197)	31537-51X65
5.2 (0.205)	31537-51X66	



# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

RE4R03A

## Specifications and Adjustment (Cont'd)

<b>Low &amp; reverse brake</b>		
Number of drive plates		3
Number of driven plates		3
Thickness of drive plate mm (in)		
Standard		1.6 (0.063)
Wear limit		1.4 (0.055)
Clearance mm (in)		
Standard		0.5 - 0.8 (0.020 - 0.031)
Allowable limit		2.4 (0.094)
Thickness of retaining plate	Thickness mm (in)	Part number
	0.0 (0.000)	31667-51X03
	0.2 (0.008)	31667-51X04
	0.4 (0.016)	31667-51X05
	0.6 (0.024)	31667-51X06
	0.8 (0.032)	31667-51X07
	0.0 (0.000)	31667-51X08
0.2 (0.008)	31667-51X09	
<b>Brake band</b>		
Anchor end bolt tightening torque N-m (kg-m, ft-lb)		4 - 6 (0.4 - 0.6, 2.9 - 4.3)
Number of returning revolutions for anchor end bolt		2.5

## REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T <sub>2</sub> "	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
Thickness of oil pump thrust washer	Thickness mm (in)	Part number
	0.7 (0.028)	31528-21X00
	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06	

## REMOVAL AND INSTALLATION

Manual control linkage Number of returning revolutions for lock nut	
Lock nut tightening torque	22 - 27 N-m (2.2 - 2.8 kg-m, 16 - 20 ft-lb)
Distance between end of clutch housing and torque converter	26.0 mm (1.024 in) or more
Drive plate runout limit	0.8 mm (0.031 in)

## OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	
Cam ring — oil pump housing Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

## TOTAL END PLAY

Total end play "T <sub>1</sub> "	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	0.8 (0.031)	31429-21X00
	1.0 (0.039)	31429-21X01
	1.2 (0.047)	31429-21X02
	1.4 (0.055)	31429-21X03
	1.6 (0.063)	31429-21X04
	1.8 (0.071)	31429-21X05
2.0 (0.079)	31429-21X06	

# TRANSFER

## SECTION **TF**

### CONTENTS


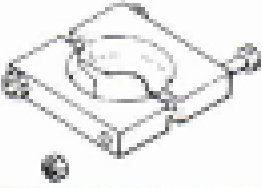
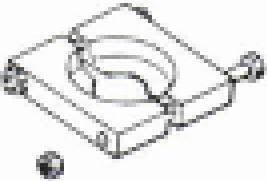

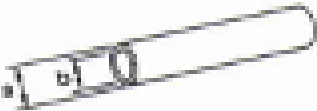




PREPARATION .....	TF- 2
ON-VEHICLE SERVICE .....	TF- 4
REMOVAL AND INSTALLATION .....	TF- 7
TRANSFER GEAR CONTROL .....	TF- 8
MAJOR OVERHAUL .....	TF- 9
DISASSEMBLY .....	TF-12
REPAIR FOR COMPONENT PARTS .....	TF-18
ASSEMBLY .....	TF-27
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	TF-33

**TF**

# PREPARATION

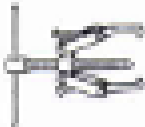




## SPECIAL SERVICE TOOLS

\*: Special tool or commercial equivalent

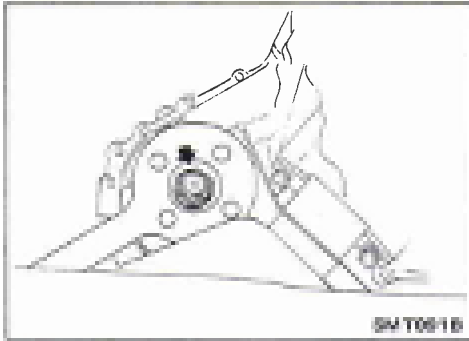
Tool number Tool name	Description
KV38104700* Flange wrench	 <p>Removing front companion flange nut Installing front companion flange nut</p>
ST30021000* Puller	 <p>Removing counter gear front bearing</p>
ST30031000* Puller	 <p>Removing counter gear rear bearing</p>
ST33290001* Puller	 <p>Removing center case oil seal Removing rear oil seal</p>
ST22452000* Drift	 <p>Installing mainshaft rear bearing</p> <p>a = 45 mm (1.77 in) dia. b = 36 mm (1.42 in) dia.</p>
ST33061000* Drift	 <p>Removing main gear bearing</p> <p>a: 28.5 mm (1.122 in) dia. b: 38 mm (1.50 in) dia.</p>
ST30613000* Drift	 <p>Installing counter gear rear bearing Installing main gear bearing Installing cover oil seal</p> <p>a: 72 mm (2.83 in) dia. b: 48 mm (1.89 in) dia.</p>
ST33200000* Drift	 <p>Installing counter gear front bearing Removing cover oil seal</p> <p>a = 60 mm (2.36 in) dia. b = 44.5 mm (1.752 in) dia.</p>
ST30720000* Drift	 <p>Installing center case oil seal</p> <p>a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.</p>

# PREPARATION

## COMMERCIAL SERVICE TOOLS

Tool name	Description
Puller	 <p>Removing front and rear companion flanges            Removing mainshaft rear bearing and clutch gear            Removing L&amp;H hub            Removing front drive shaft front bearing            Removing front drive shaft rear bearing            Removing main gear bearing</p>
Drift	 <p>Installing shift shaft oil seal</p> <p>a = 26 mm (1.02 in) dia.            b = 20 mm (0.79 in) dia.            c = 40 mm (1.57 in)</p>
Drift	 <p>Installing L &amp; H hub</p> <p>a = 60 mm (2.36 in) dia.            b = 50 mm (1.97 in) dia.            c = 60 mm (2.36 in)</p>
Drift	 <p>Installing clutch gear</p> <p>a = 55 mm (2.17 in) dia.            b = 45 mm (1.77 in) dia.            c = 160 mm (6.30 in)</p>
Drift	 <p>Installing rear oil seal</p> <p>a = 75 mm (2.95 in) dia.            b = 67 mm (2.64 in) dia.            c = 60 mm (2.36 in)</p>

## ON-VEHICLE SERVICE



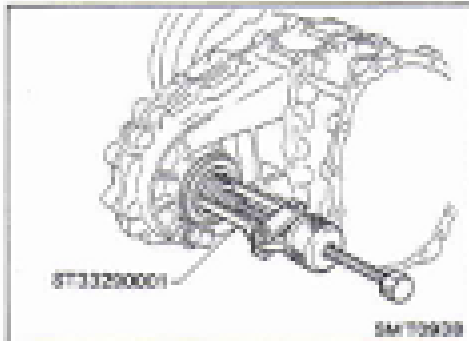
### Replacing Oil Seal

#### CENTER CASE OIL SEAL

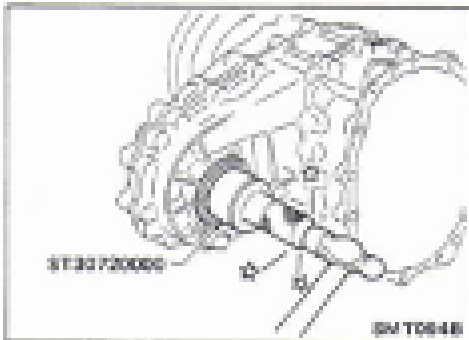
1. Remove front propeller shaft. — Refer to section PD.
2. Remove companion flange nut.



3. Remove front companion flange.



4. Remove center case oil seal.



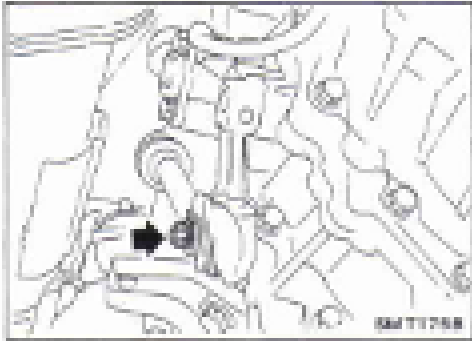
5. Install center case oil seal.
  - **Before installing, apply multi-purpose grease to seal lip.**
6. Reinstall any part removed.

## ON-VEHICLE SERVICE

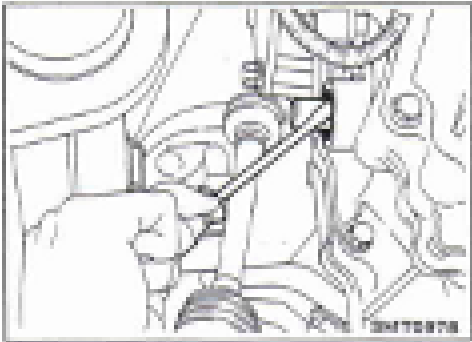
### Replacing Oil Seal (Cont'd)

#### SHIFT SHAFT OIL SEAL

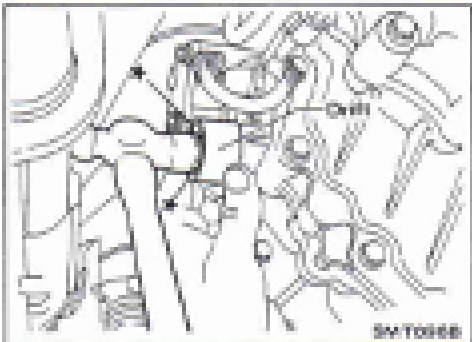
1. Remove transfer control lever from transfer outer shift lever.  
Then remove outer shift lever.



2. Remove shift shaft oil seal.
  - Be careful not to damage inner shift lever.

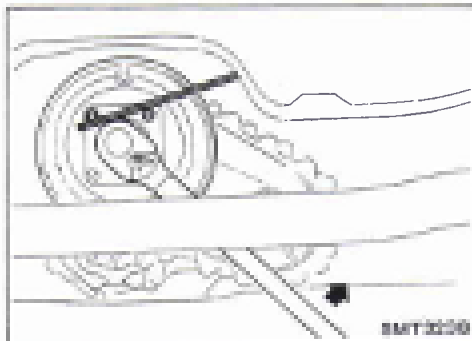


3. Install shift shaft oil seal.
  - Before installing, apply multi-purpose grease to seal lip.
4. Install transfer control linkage.

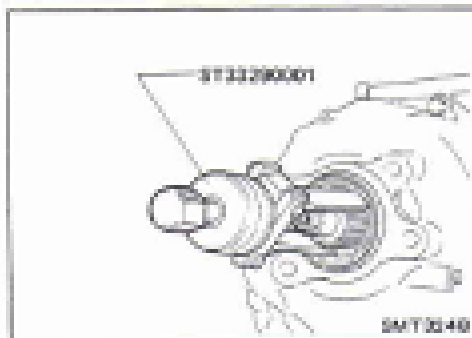


#### REAR OIL SEAL

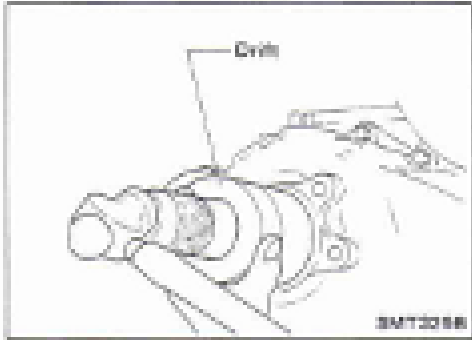
1. Remove rear propeller shaft. — Refer to section PD.
2. Remove brake drum.
3. Remove companion flange nut.
4. Remove rear companion flange.
5. Remove center brake assembly.



6. Remove rear oil seal.

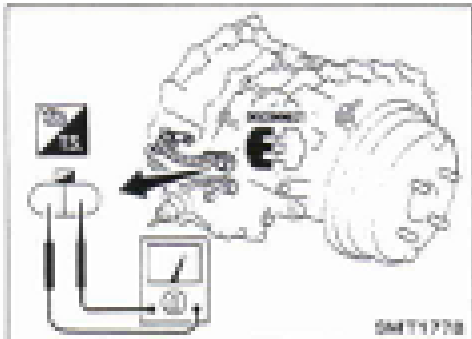


## ON-VEHICLE SERVICE



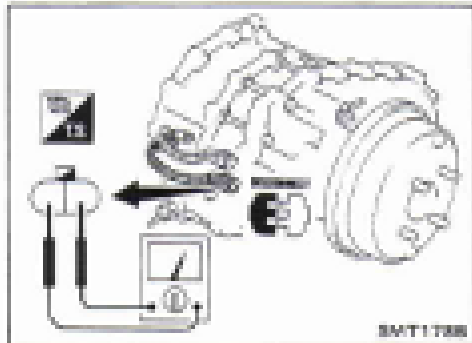
### Replacing Oil Seal (Cont'd)

7. Install rear oil seal.
  - **Before installing, apply multi-purpose grease to seal lip.**
8. Reinstall any part removed.



### Checking Position Switch 4WD SWITCH

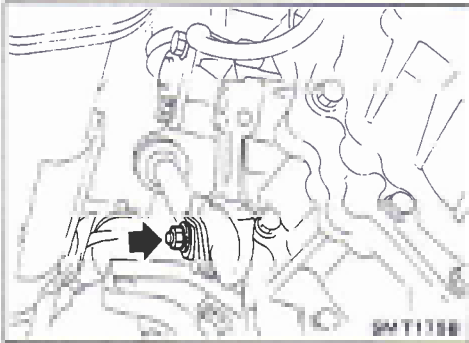
Transfer control lever position	Continuity
4H, 4L	Yes
Except above	No



### NEUTRAL SWITCH (A/T models only)

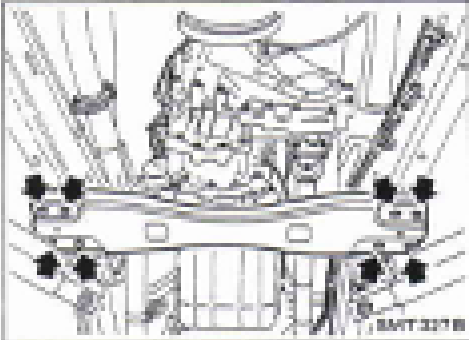
Transfer control lever position	Continuity
Between 4H and 4L ("PUSH" position)	Yes
Except above	No

## REMOVAL AND INSTALLATION

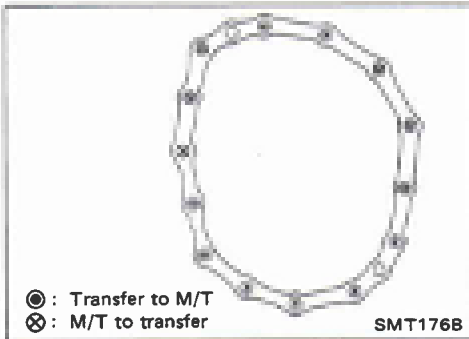


### Removal

- Drain oil from transfer and transmission.
- Remove front and rear propeller shafts. — Refer to section PD.
- Remove transfer control lever from transfer outer shift lever.



- Remove rear engine mounting member from side member.
- Lower transmission and transfer assembly as much as possible.
- Remove transfer from transmission.

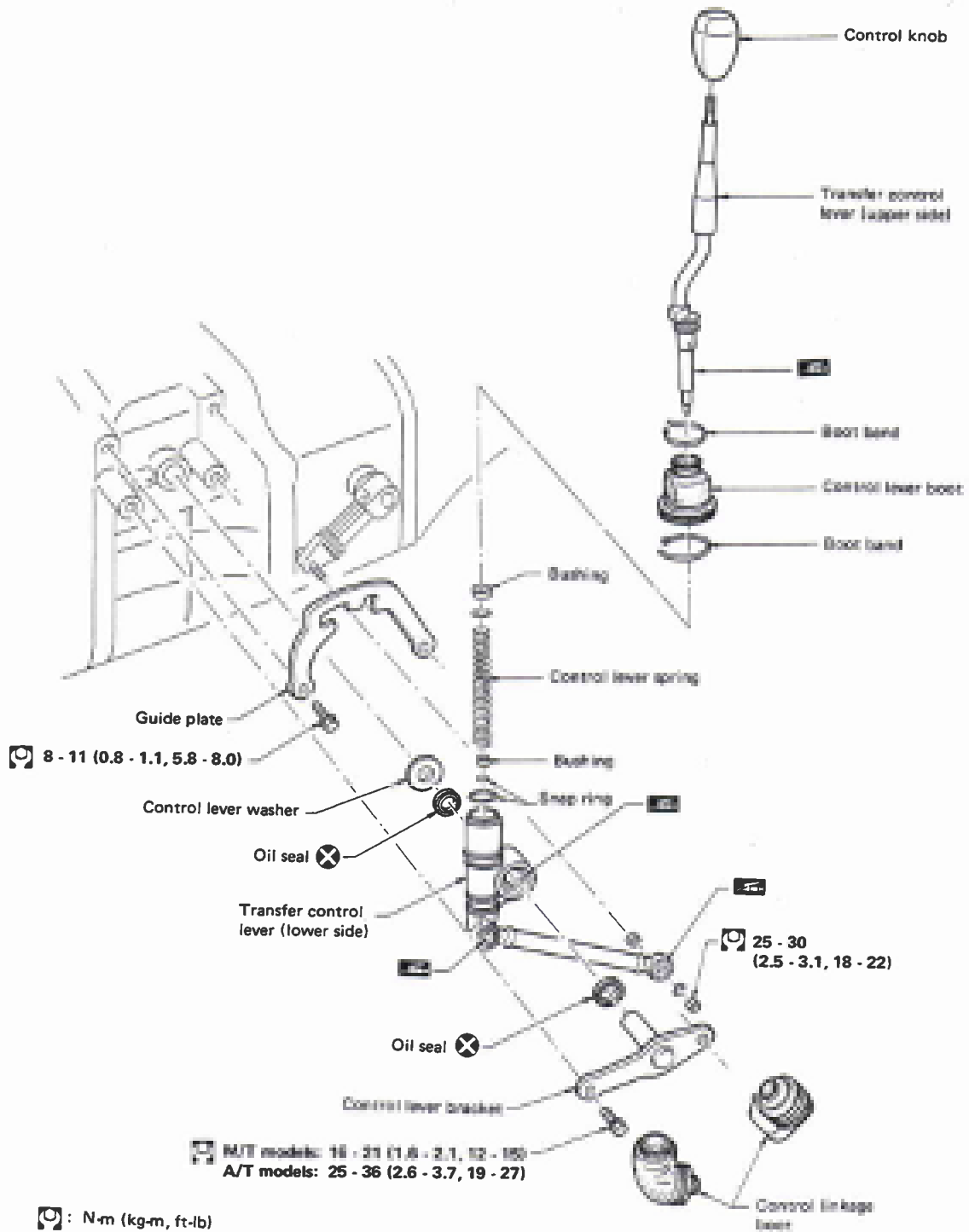


### Installation

- Tighten transfer bolts.  
**Transfer fixing bolts:**  
⊗: 32 - 42 N·m (3.3 - 4.3 kg-m, 24 - 31 ft-lb)



# TRANSFER GEAR CONTROL

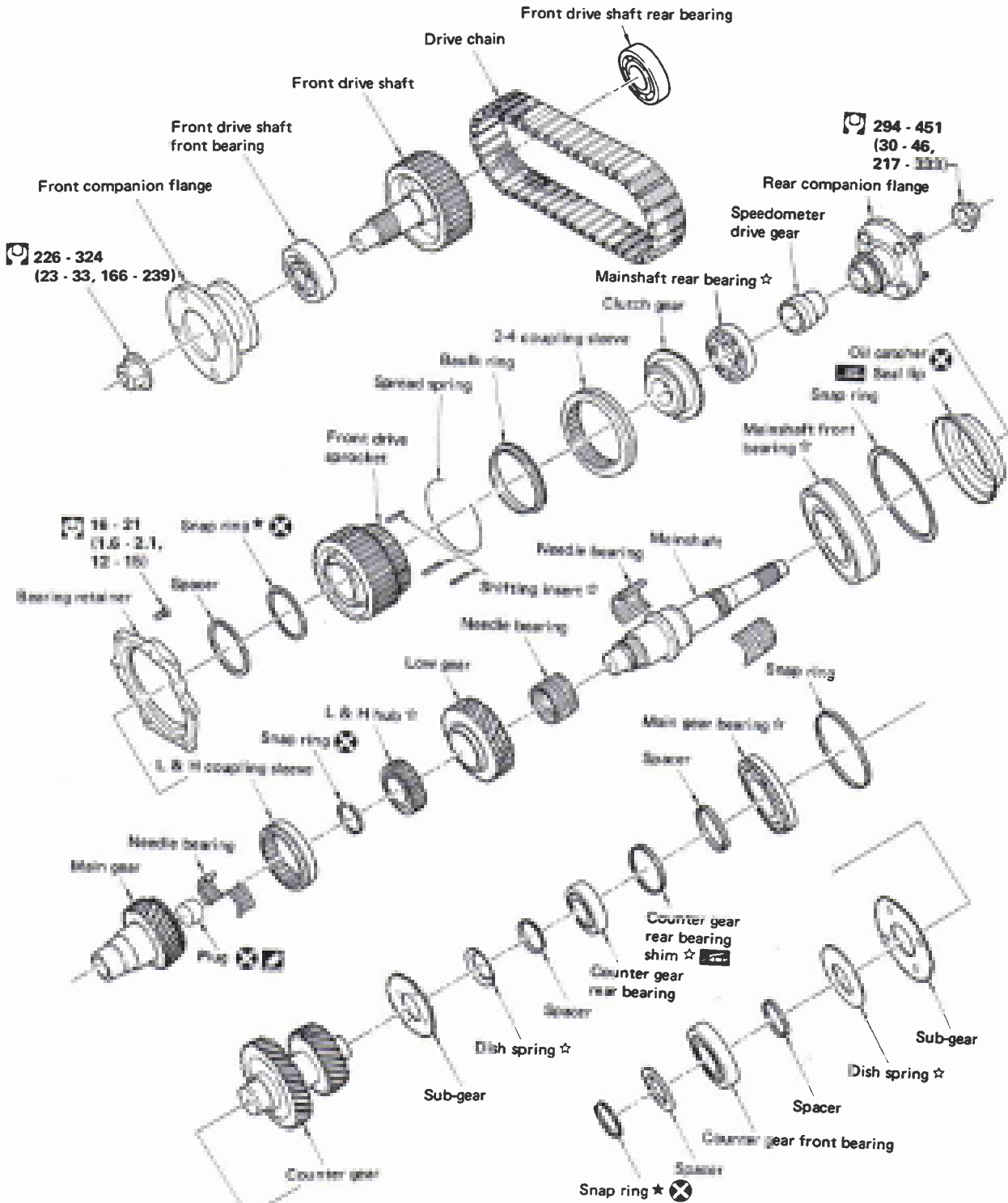


SMT098B



# MAJOR OVERHAUL

## Gear Components



Apply gear oil to gears, shafts, synchronizers and bearings when assembling.

★ : Select with proper thickness.

☆ : Pay attention to its direction.

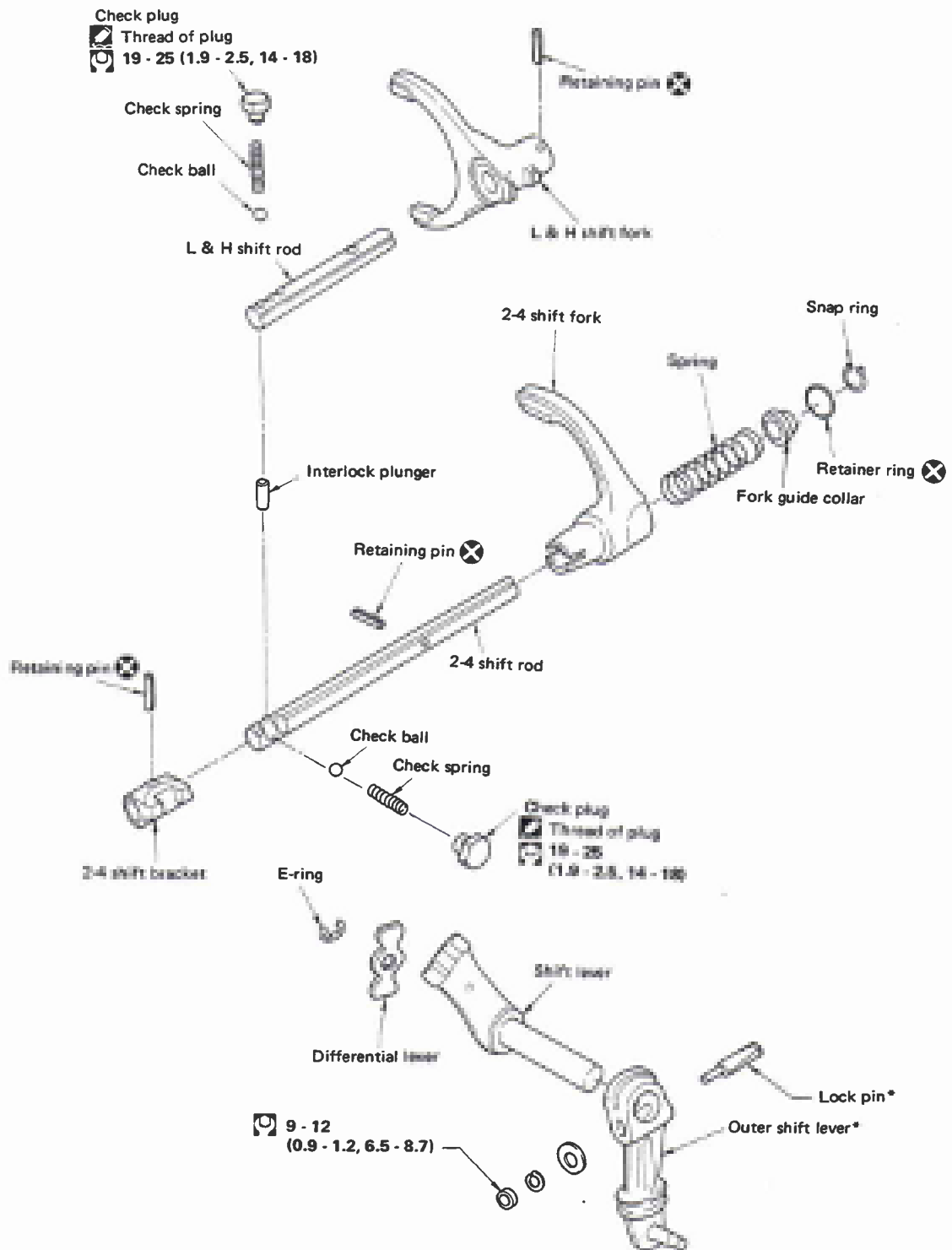
⊗ : N·m (kg·m, ft·lb)




⊠ : Apply recommended sealant (Nissan genuine part: KP210-00200) or equivalent.

SMT100B

# MAJOR OVERHAUL

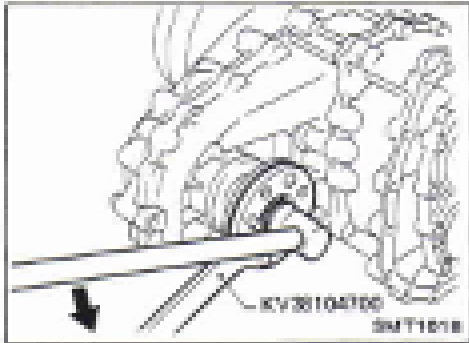
## Shift Control Components



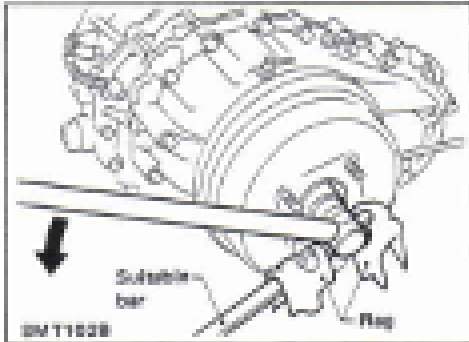
-  : If these parts require to be replaced, replace them as a set.
-  : N-m (kg-m, ft-lb)
-  : Apply recommended sealant (Nissan genuine part: KP210-00200) or equivalent.

SMT179B

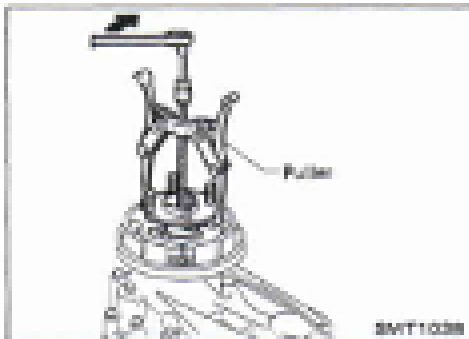
## DISASSEMBLY



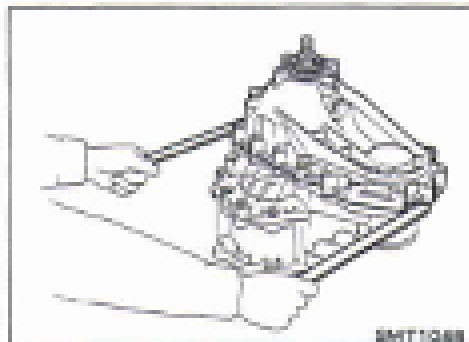
1. Remove nut of front companion flange.



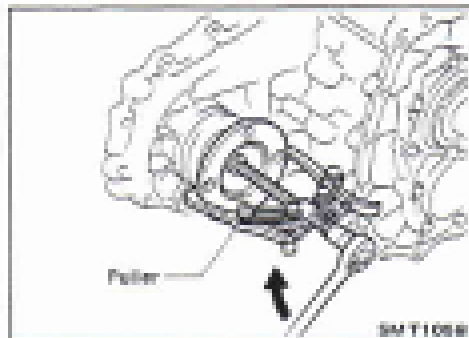
2. Remove center brake components.
  - a. Remove rear companion flange nut.
  - b. Remove brake drum.



- c. Remove rear companion flange.
- d. Remove center brake components.



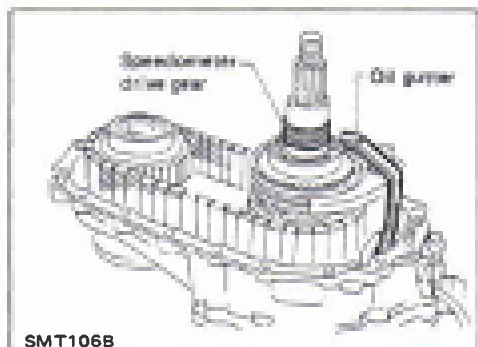
3. Remove rear case.
  - Be careful not to damage the mating surface.



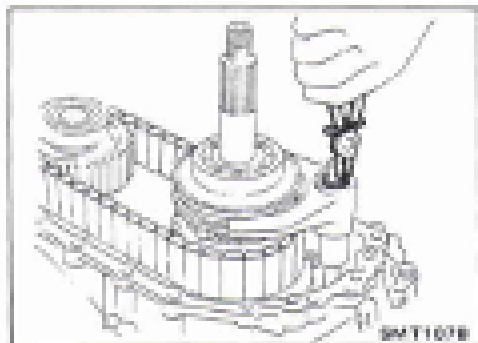
4. Remove front companion flange.

## DISASSEMBLY

5. Remove speedometer drive gear and oil gutter.



6. Remove snap ring from 2-4 shift rod.

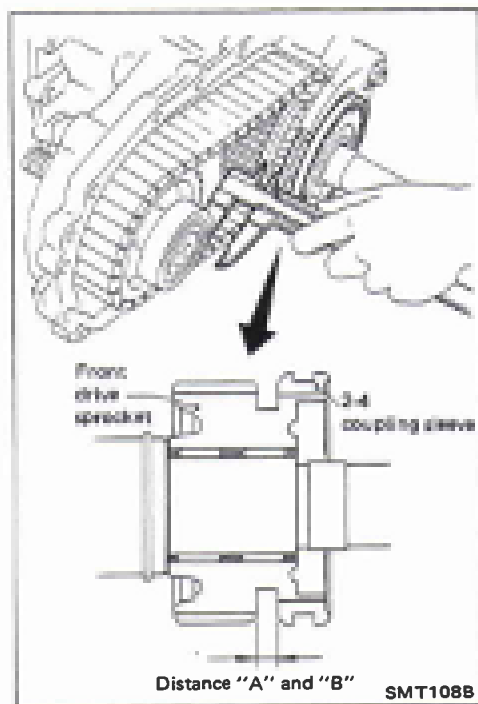


7. Check front drive sprocket end play.
- While holding front drive sprocket forward as far as it will go, measure distance "A" between rear surface of front drive sprocket and front surface of 2-4 coupling sleeve.
  - While holding front drive sprocket back as far as it will go, measure distance "B" as same as step a.
  - Determine front drive sprocket end play to be used by the following equation.

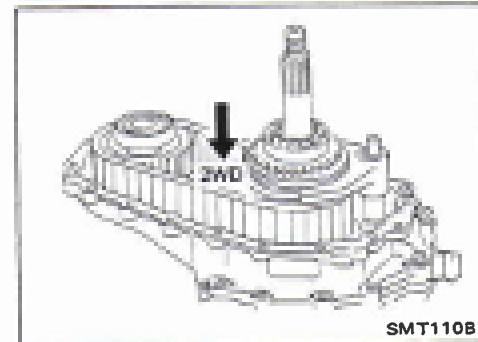
$$\text{Front drive sprocket end play} = A - B$$

**Standard: 0.20 - 0.35 mm (0.0079 - 0.0138 in)**

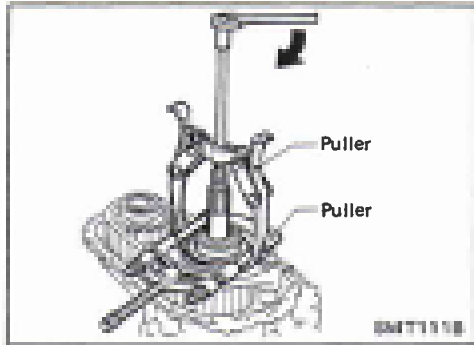
- If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.



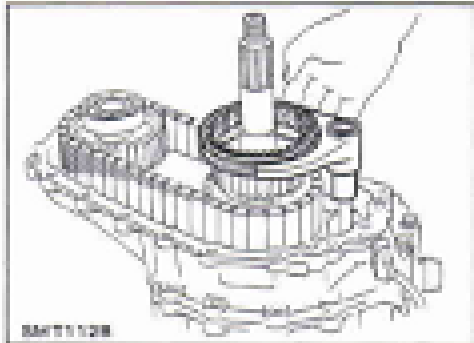
8. Shift 2-4 coupling sleeve to 2WD position.



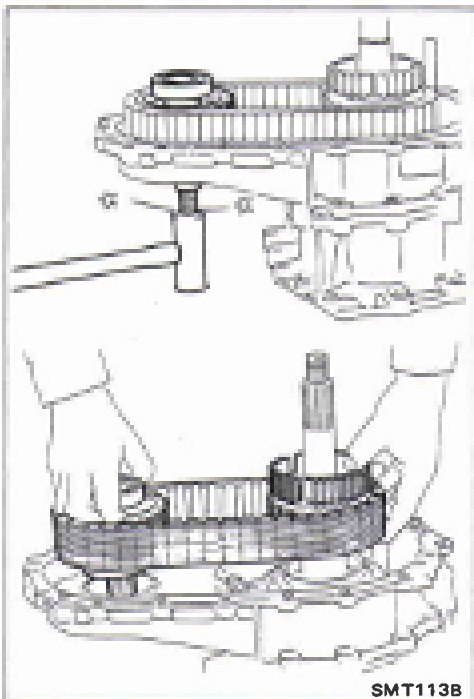
## DISASSEMBLY



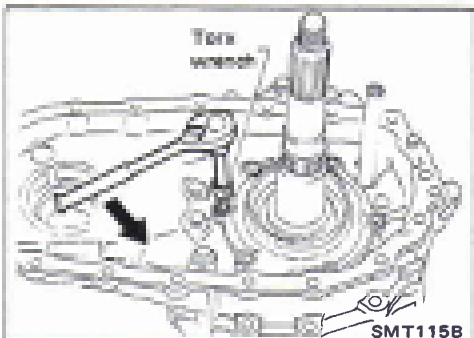
9. Pull out clutch gear and mainshaft rear bearing.



10. Remove 2-4 coupling sleeve with 2-4 shift fork.

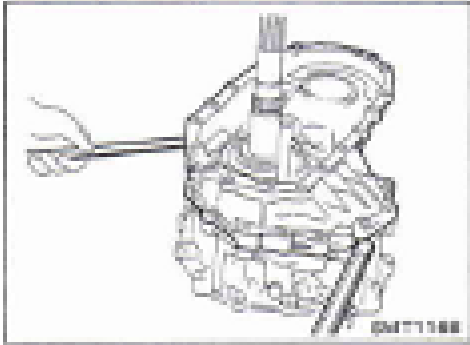


11. Remove front drive shaft assembly, drive chain and front drive sprocket by tapping front end of front drive shaft.

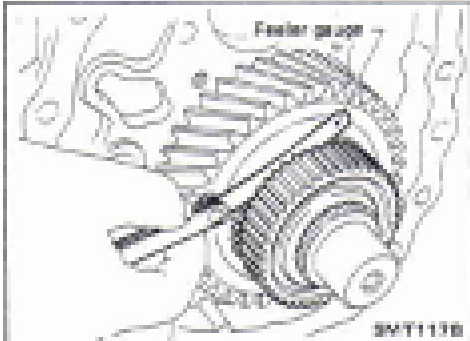


12. Remove bolts securing bearing retainer and then remove bearing retainer.

## DISASSEMBLY



13. Remove bolts securing center case to front case and then separate center case and front case.

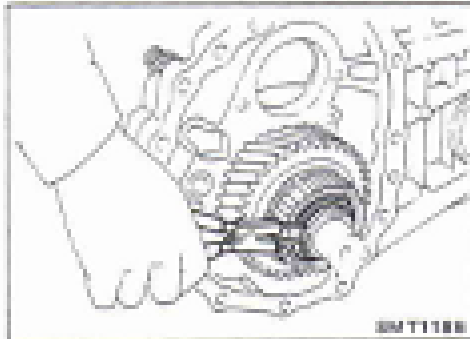


14. Measure end play of low gear.

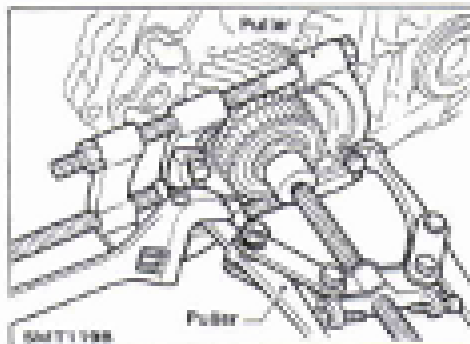
**Standard:**

**0.20 - 0.35 mm (0.0079 - 0.0138 in)**

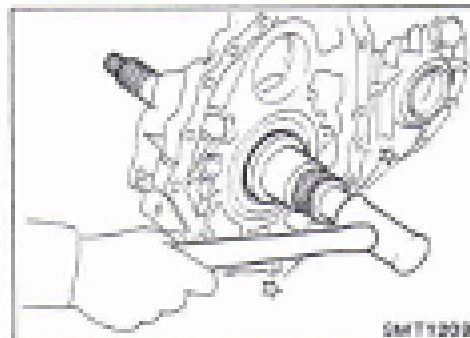
- If end play is beyond the maximum value, check low gear and L & H hub for wear.



15. Disassemble center case assembly.  
a. Remove snap ring from mainshaft.



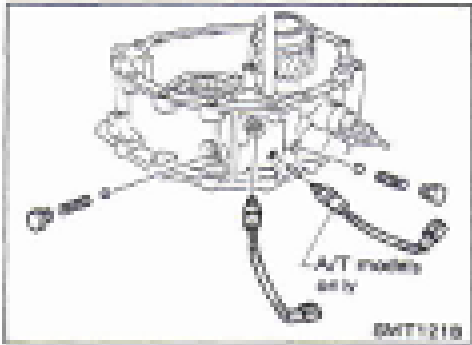
- b. Pull out low gear with L & H hub.



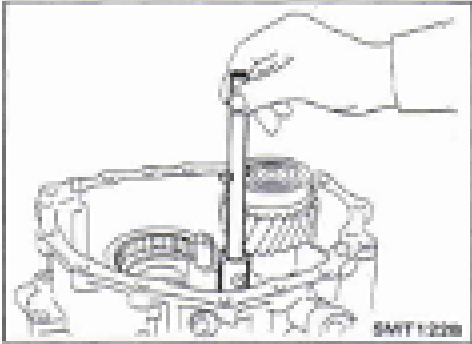
- c. Remove mainshaft by tapping front end of mainshaft.



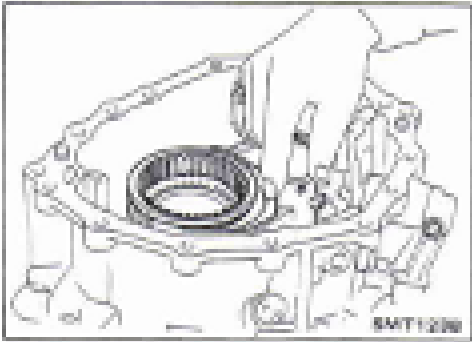
## DISASSEMBLY



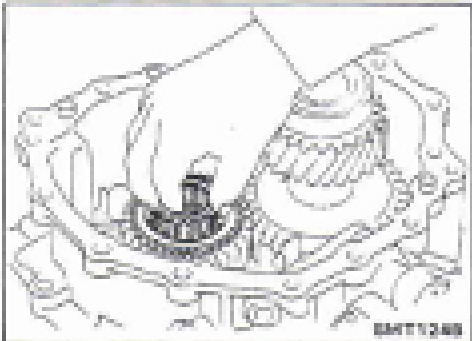
16. Disassemble front case assembly.
- a. Remove the following parts.
- 4WD switch
  - Neutral switch (A/T models only)
  - Check plugs
  - Check springs
  - Check balls



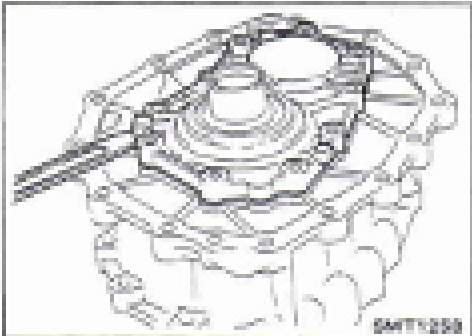
- b. Remove 2-4 shift rod.



- c. Remove L & H shift rod and fork assembly with coupling sleeve.

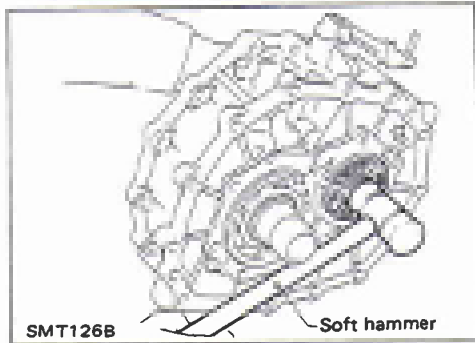


- d. Remove needle bearing from main gear.

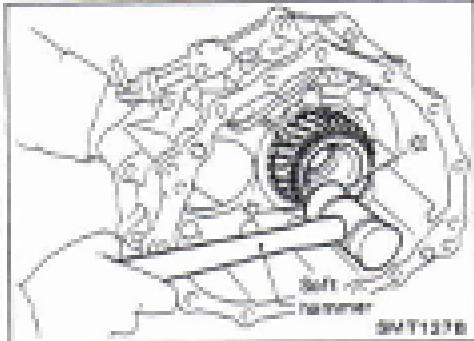


- e. Remove bolts securing front case cover and then remove it.

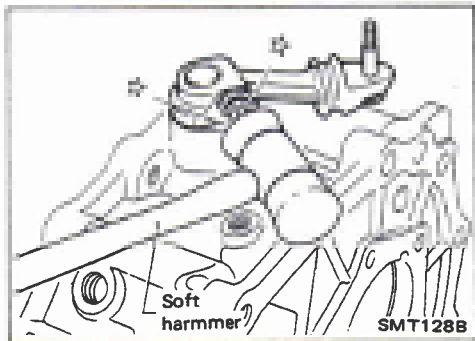
## DISASSEMBLY



- f. Remove counter gear by tapping it lightly with a soft hammer.

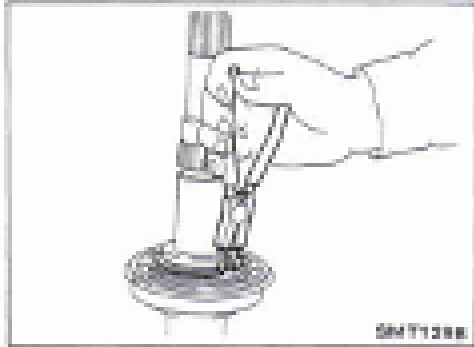


- g. Remove main gear by tapping it lightly with a soft hammer.



17. Remove inner and outer shift levers.

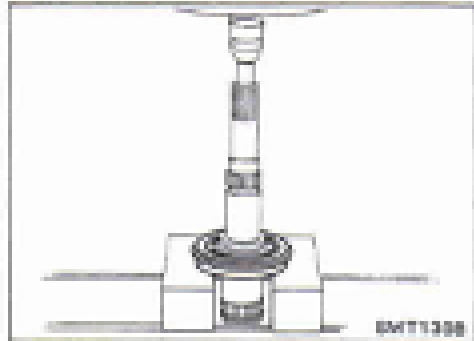
## REPAIR FOR COMPONENT PARTS



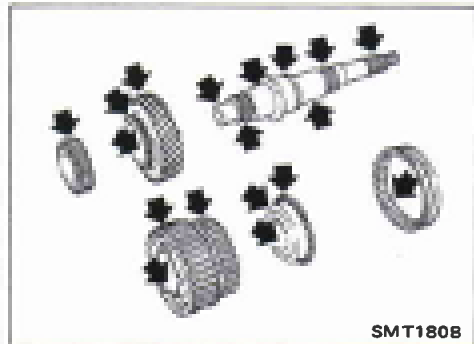
### Mainshaft

#### DISASSEMBLY

1. Remove snap ring and spacer.



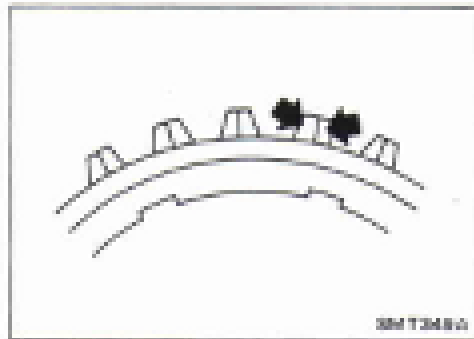
2. Press out mainshaft front bearing from mainshaft.



#### INSPECTION

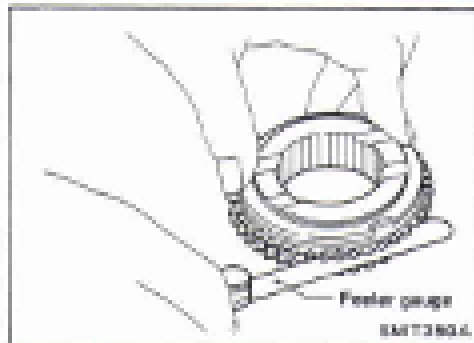
##### Gear and shaft

- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks, wear or bending.
- Check coupling sleeve for wear or damage.



##### Baulk ring

- Check baulk ring for cracks or deformation.



- Measure clearance between baulk ring and gear.

##### Baulk ring to gear clearance:

Unit: mm (in)

Standard	Wear limit
1.0 - 1.5 (0.039 - 0.059)	0.5 (0.020)

- If not within wear limit, replace baulk ring.

## REPAIR FOR COMPONENT PARTS

### Mainshaft (Cont'd)

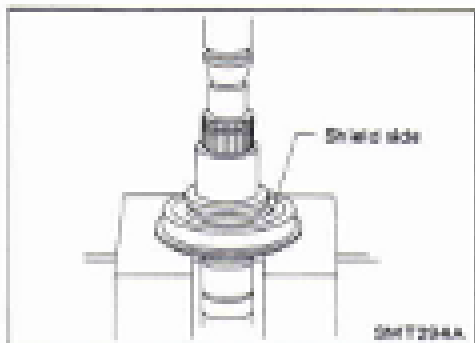
#### Bearing

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

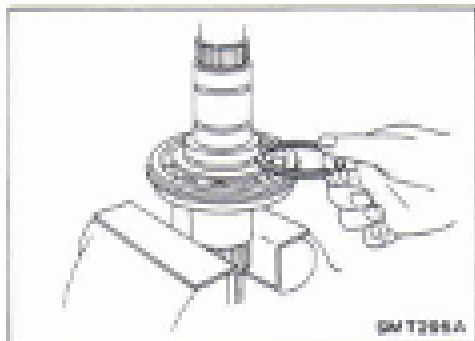


#### ASSEMBLY

1. Press mainshaft front bearing onto mainshaft.
- Pay special attention to its direction.



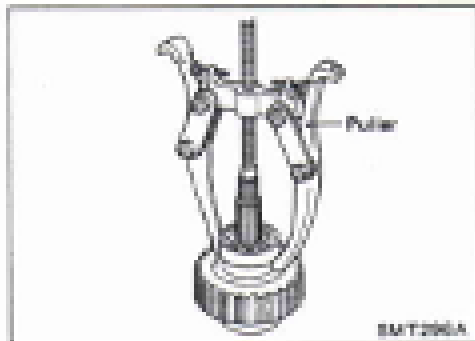
2. Install spacer.
  3. Select snap ring with proper thickness and install it.
- Allowable clearance between snap ring and groove:**  
0 - 0.15 mm (0 - 0.0059 in)
- Available snap ring:**  
Refer to S.D.S.



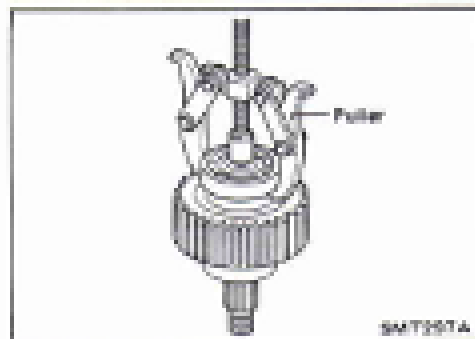
### Front Drive Shaft

#### DISASSEMBLY

- Front drive shaft front bearing



- Front drive shaft rear bearing



## REPAIR FOR COMPONENT PARTS

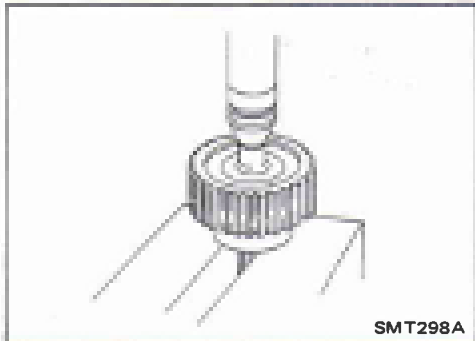
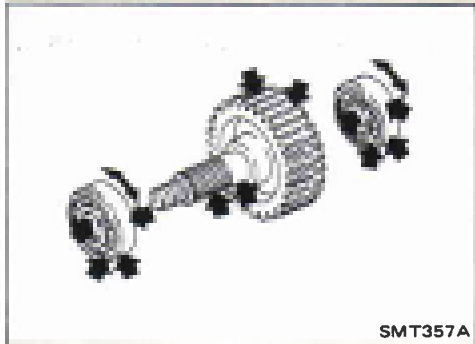
### Front Drive Shaft (Cont'd) INSPECTION

#### Sprocket and shaft

- Check sprocket for excessive wear, chips or cracks.
- Check shaft for cracks or wear.

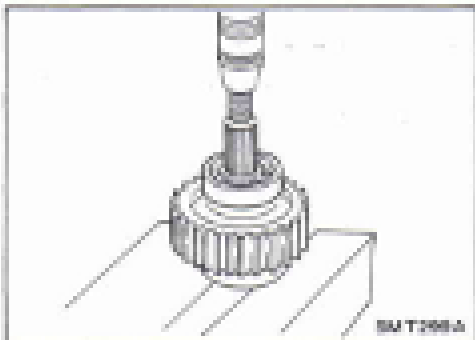
#### Bearing

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

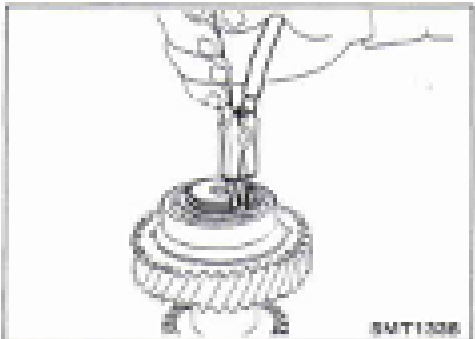


### ASSEMBLY

- Press front drive shaft front bearing.

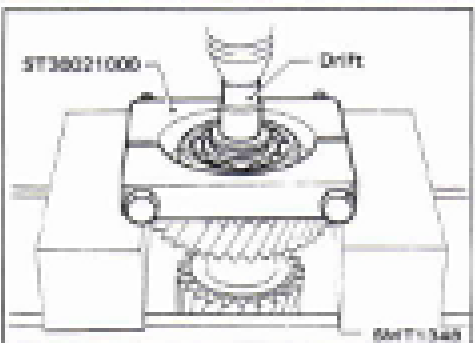


- Press front drive shaft rear bearing.



### Counter Gear DISASSEMBLY

1. Remove snap ring and spacer from counter gear.

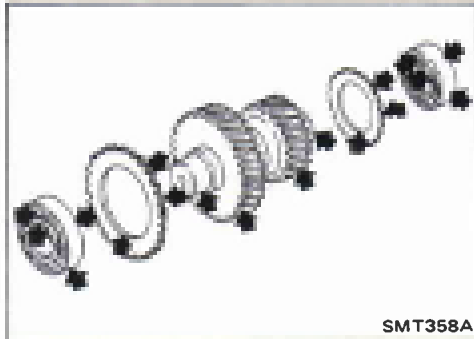
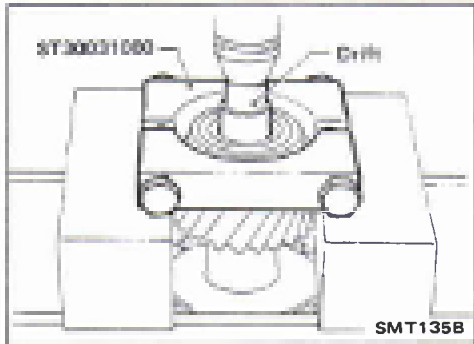


2. Press out counter gear front bearing and then remove front sub-gear, spacer and dish spring.

## REPAIR FOR COMPONENT PARTS

### Counter Gear (Cont'd)

3. Press out counter gear rear bearing and then remove rear sub-gear, spacer and dish spring.



### INSPECTION

#### Gear and shaft

- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks or wear.

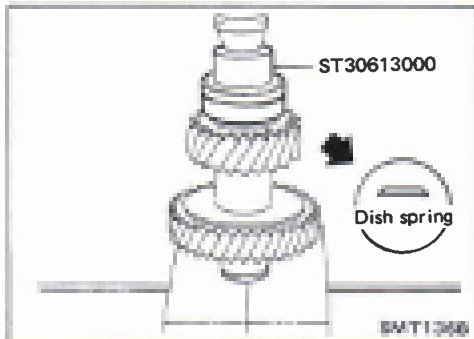
#### Bearing

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

### ASSEMBLY

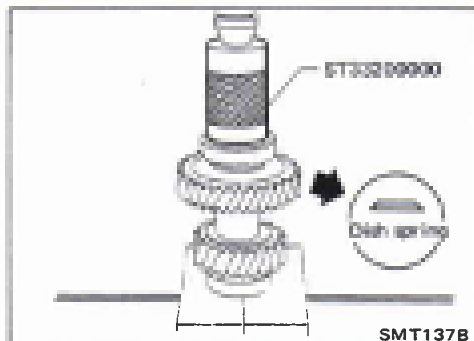
1. Install rear sub-gear, dish spring and spacer, and then press on counter gear rear bearing.

- Pay attention to direction of dish spring.



2. Install front sub-gear, dish spring and spacer, and then press on counter gear front bearing.

- Pay attention to direction of dish spring.



3. Install spacer.

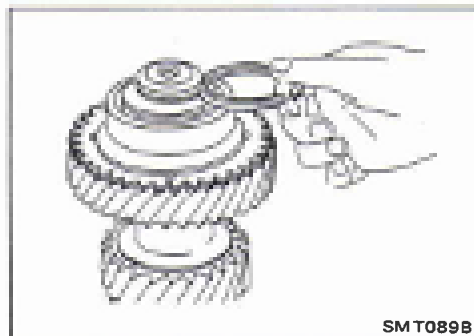
4. Select snap ring with proper thickness and install it.

**Allowable clearance between snap ring and groove:**

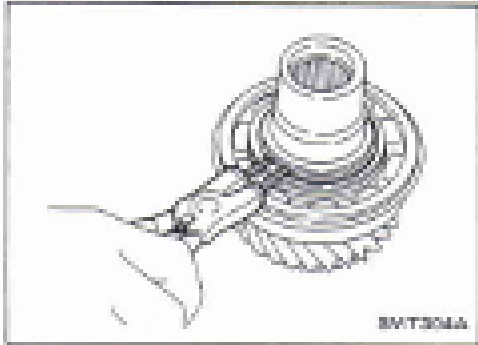
**0 - 0.15 mm (0 - 0.0059 in)**

**Available snap ring:**

**Refer to S.D.S.**



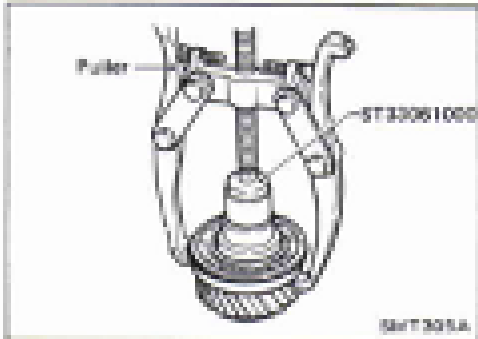
## REPAIR FOR COMPONENT PARTS



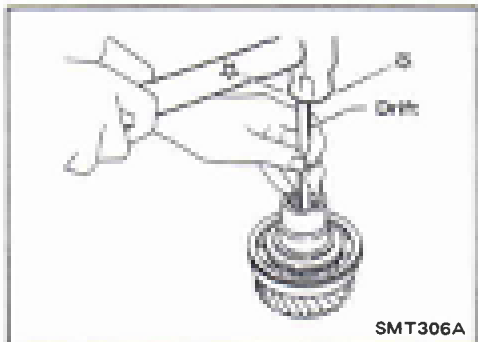
### Main Gear DISASSEMBLY

#### Main gear bearing

1. Remove snap ring and spacer.



2. Pull out main gear bearing.



#### Plug

● Always replace it with new one whenever it is removed.



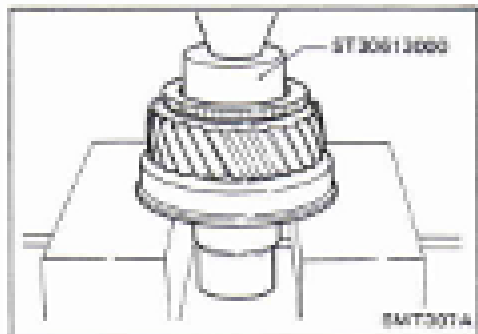
### INSPECTION

#### Gear and shaft

- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks or wear.

#### Bearing

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.



### ASSEMBLY

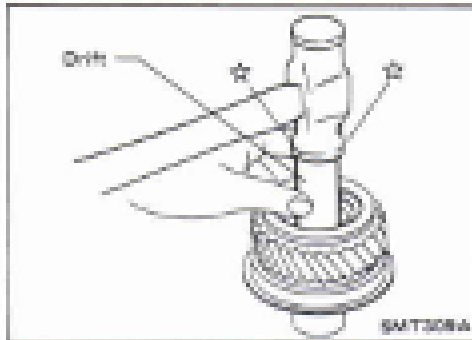
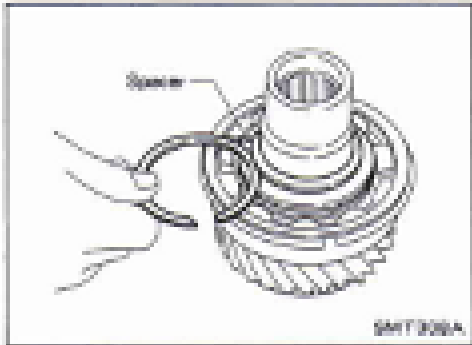
#### Main gear bearing

1. Press on main gear bearing.
  - Pay attention to its direction.
2. Install spacer.

## REPAIR FOR COMPONENT PARTS

### Main Gear (Cont'd)

3. Select snap ring with proper thickness and install it.  
**Allowable clearance between snap ring and groove:**  
0 - 0.15 mm (0 - 0.0059 in)  
**Available snap ring:**  
Refer to S.D.S.

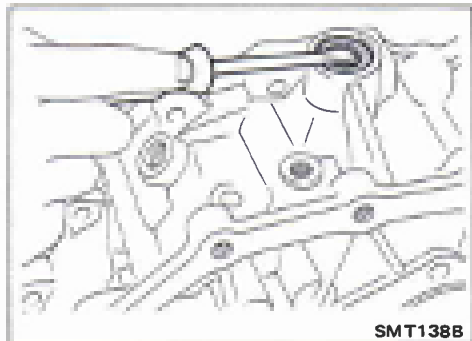


### Plug

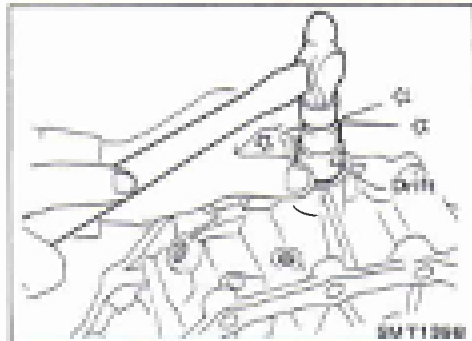
- Apply sealant to plug and install it.

### Front Case SHIFT SHAFT OIL SEAL

#### Removal

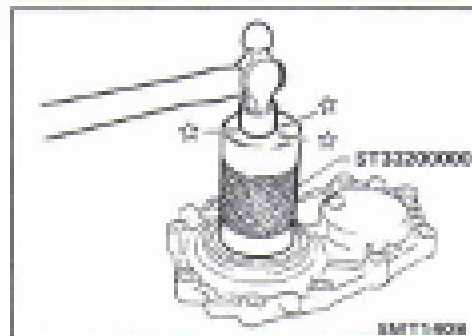


#### Installation



### Front Case Cover COVER OIL SEAL

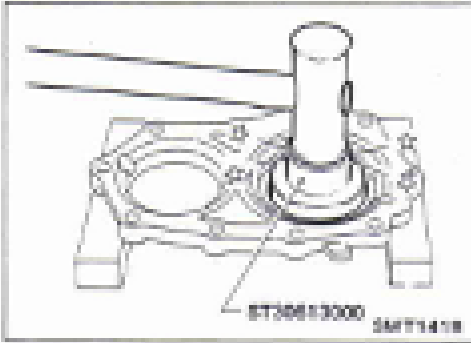
#### Removal



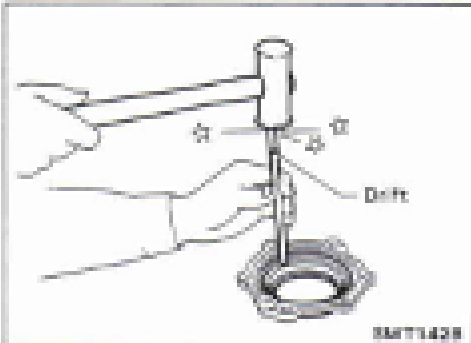


## REPAIR FOR COMPONENT PARTS

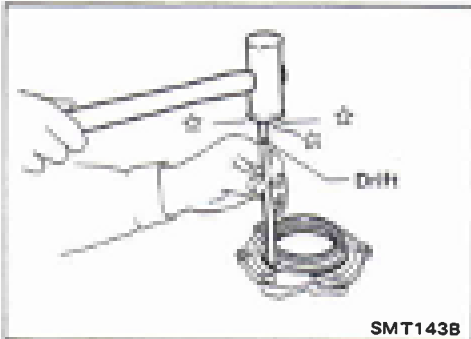
### Front Case Cover (Cont'd) Installation



### Bearing Retainer OIL CATCHER Removal



### Installation



### Center Case CENTER CASE OIL SEAL Removal



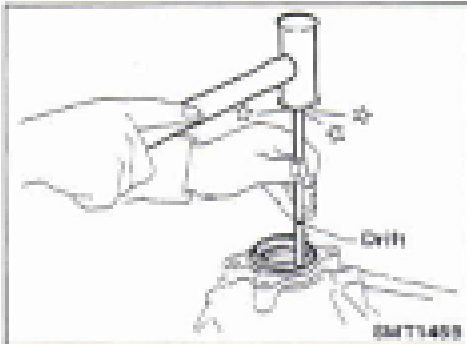
### Installation



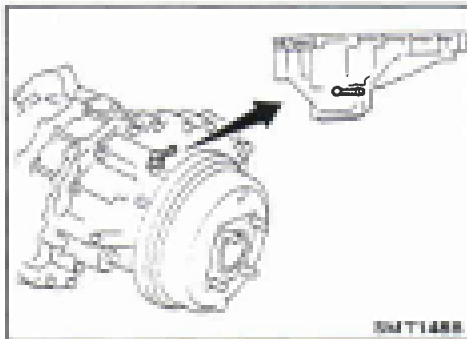
## REPAIR FOR COMPONENT PARTS



### Rear Case REAR OIL SEAL Removal

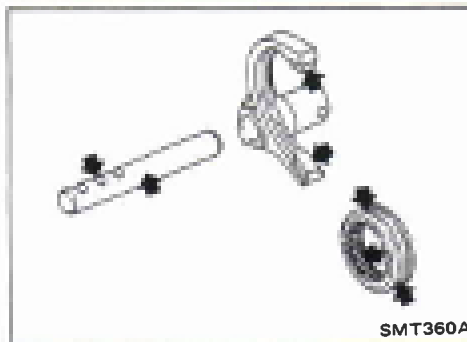


### Installation



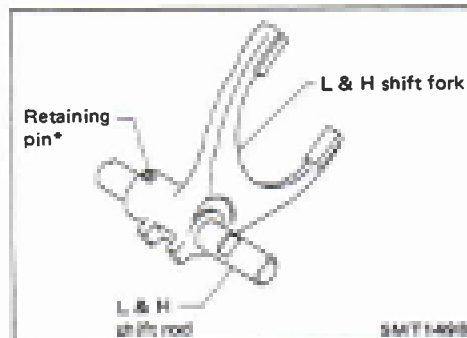
### AIR BREATHER

- Install as shown in illustration.



### Shift Control Components INSPECTION

- Check contact surface and sliding surface for wear, scratches, projections or other faulty conditions.



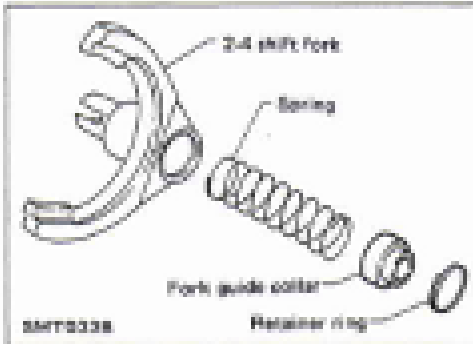
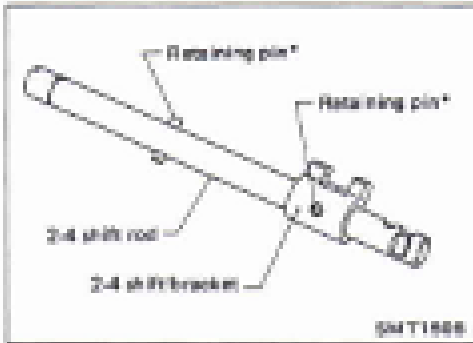
### L & H SHIFT ROD & FORK

- Assemble as shown in illustration.
- \* This pin is the same size as the one for 2-4 shift rod.

## REPAIR FOR COMPONENT PARTS

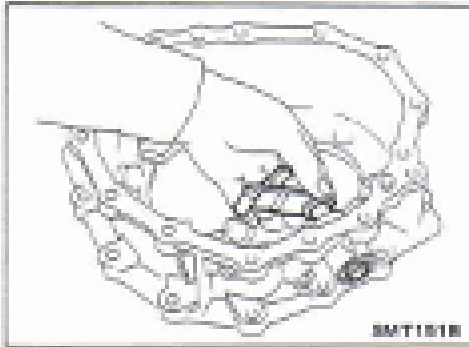
### Shift Control Components (Cont'd) 2-4 SHIFT ROD & FORK

- Assemble as shown in illustration.
- \* These pins are the same size.

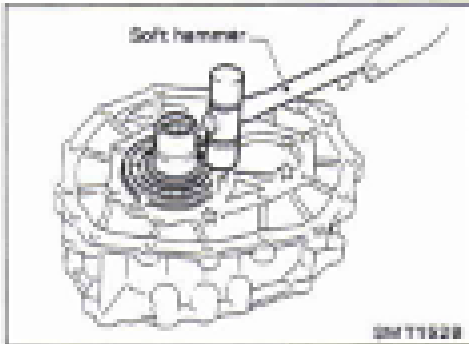


- Pay attention to the direction of fork guide collar.

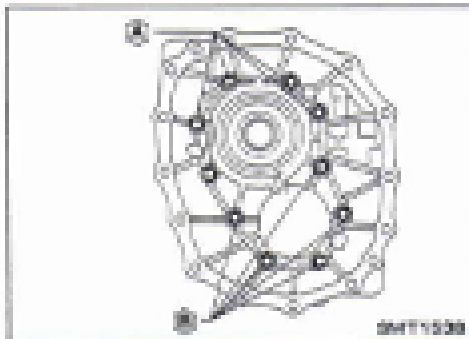
## ASSEMBLY



1. Install inner and outer shift levers.



2. Assemble front case.
  - a. Install main gear assembly by tapping it lightly with a soft hammer.

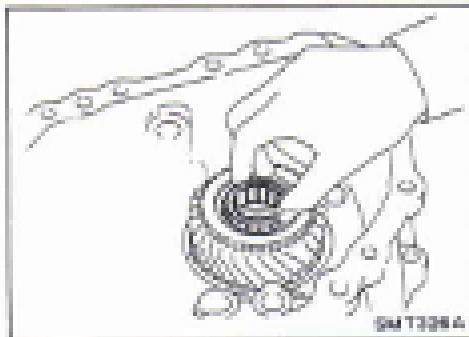


- b. Apply sealant to the mating surface and bolts of front case cover and install it on front case.

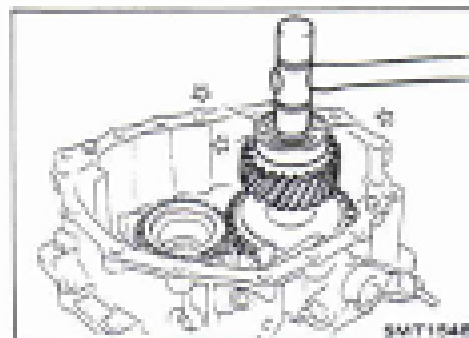
- Apply recommended sealant to these ten bolts

- Tightening torque

- Ⓐ : 16 - 21 N·m  
(1.6 - 2.1 kg-m, 12 - 15 ft-lb)
- Ⓑ : 19 - 24 N·m  
(1.9 - 2.4 kg-m, 14 - 17 ft-lb)

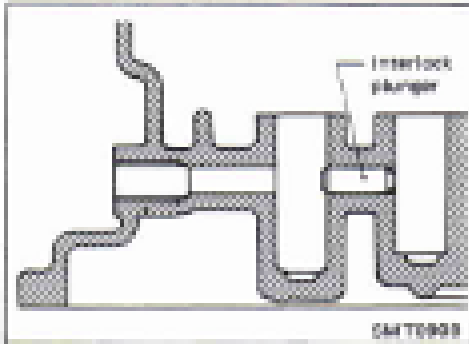


- c. Apply gear oil to needle bearing and install it into main gear.

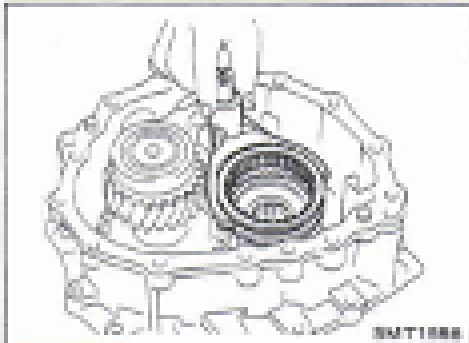


- d. Install counter gear assembly by tapping it lightly with a soft hammer.

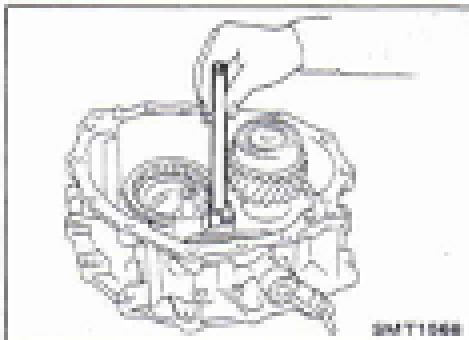
## ASSEMBLY



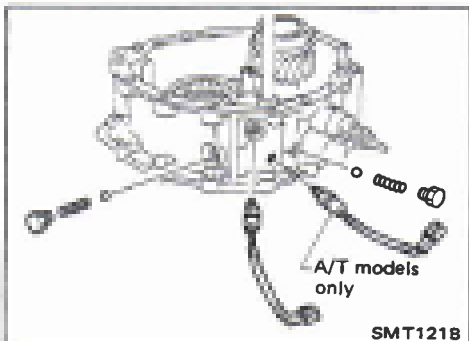
e. Insert interlock plunger into front case.



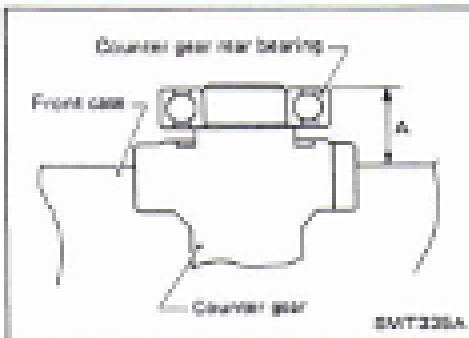
f. Install L & H shift rod and fork assembly with coupling sleeve.



g. Install 2-4 shift rod.



h. Install switches, check balls, check springs and plugs.  
 ● **Apply sealant to switches and plugs.**



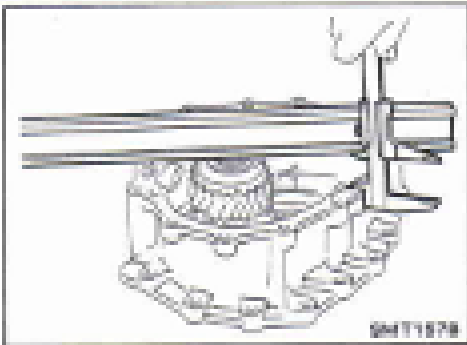
3. Select counter gear rear bearing shim.

**Counter gear end play:**

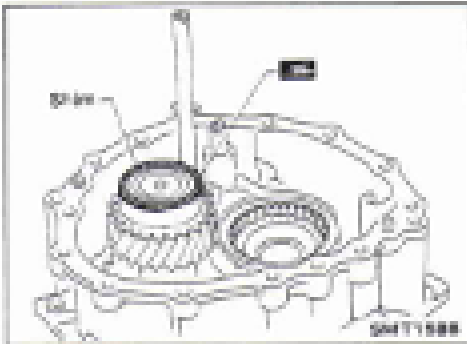
**0 - 0.2 mm (0 - 0.008 in)**

4. Measure distance "A" between upper surface of counter gear rear bearing and mating surface of front case.

## ASSEMBLY

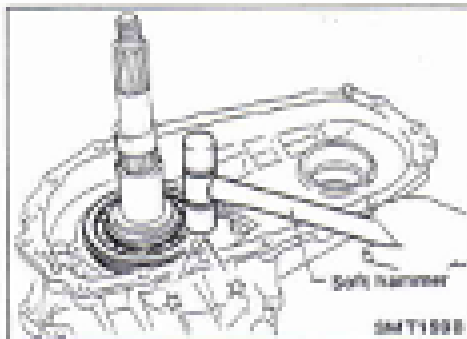


- b. Select suitable shim using S.D.S. table as a guide.



4. Place suitable shim on counter gear rear bearing with grease.

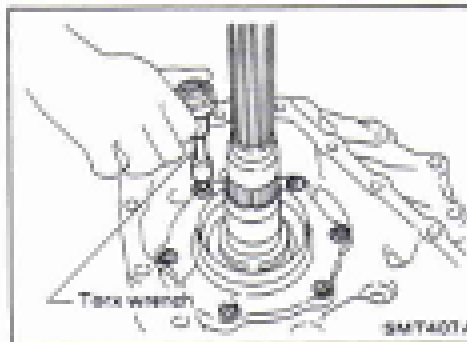
5. Apply gear oil to each part in front case.



6. Install mainshaft on center case.

- a. Install mainshaft on center case by tapping it lightly.

- **Apply gear oil to mainshaft front bearing.**



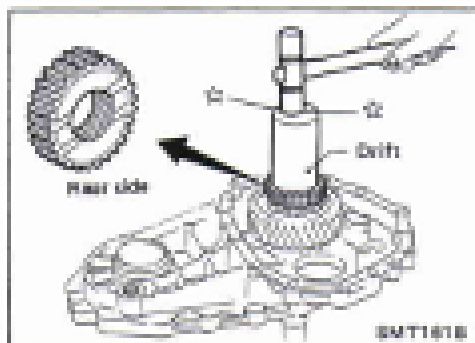
- b. Install bearing retainer.



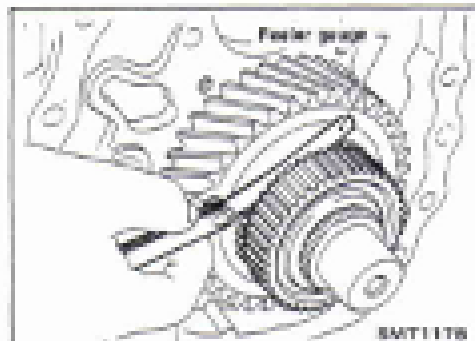
- c. Install low gear and its bearing to mainshaft.

- **Apply gear oil to needle bearing.**

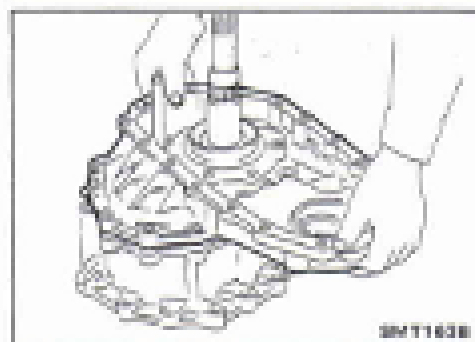
## ASSEMBLY



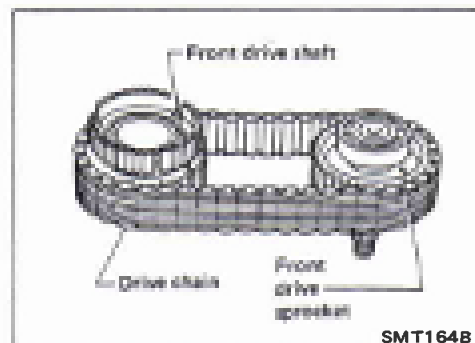
- d. Install L & H hub and snap ring to mainshaft.
- Pay attention to direction of L & H hub.



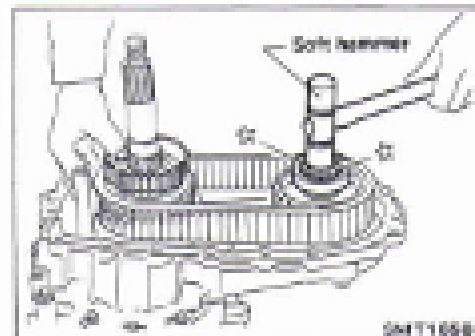
- e. Measure end play of low gear.  
Standard: 0.20 - 0.35 mm (0.0079 - 0.0138 in)



7. Apply sealant to mating surface and put center case assembly onto front case and tighten bolts.

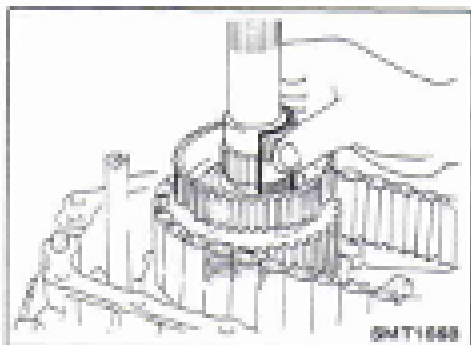


8. Assemble center case assembly.
- a. Put drive chain onto front drive sprocket and front drive shaft, and then put them in center case.



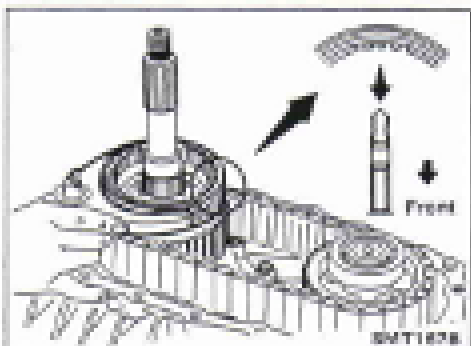
- b. Install front drive shaft by tapping it lightly with a soft hammer.
- Make sure shafts are lined up in case.

## ASSEMBLY



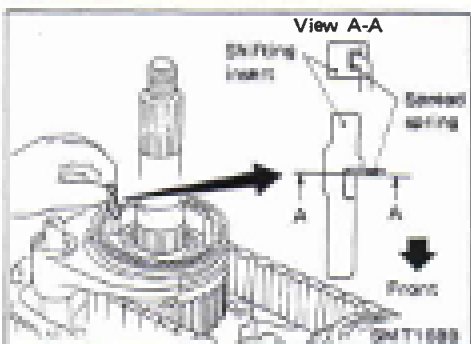
c. Apply gear oil to needle bearings and install them into front drive sprocket.

- **These needle bearings can be easily installed if front drive sprocket is rotated during their installation.**



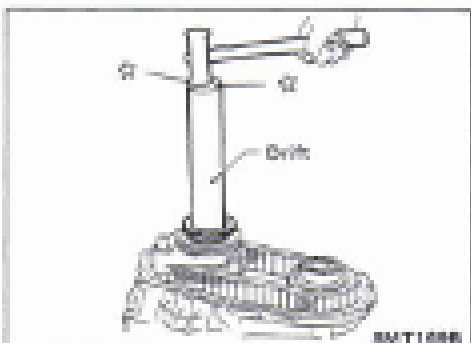
d. Install 2-4 coupling sleeve with 2-4 shift fork.

- **Pay attention to direction of coupling sleeve.**

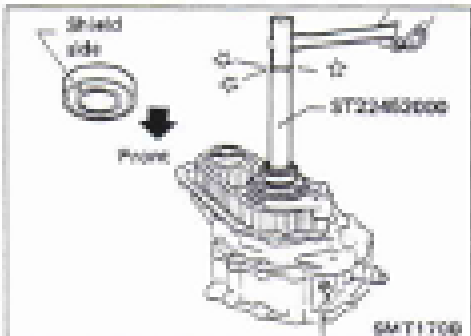


e. Install shifting inserts and spread spring.

- **Pay attention to direction of shifting inserts.**



f. Install baulk ring and then install clutch gear.

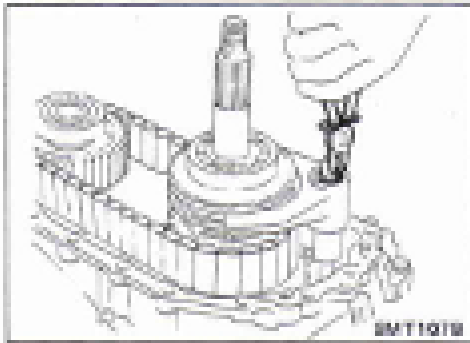


g. Install mainshaft rear bearing.

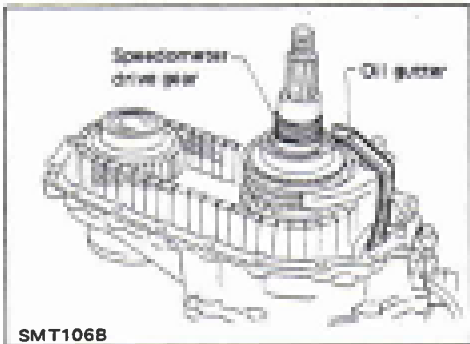
- **Pay attention to its direction.**



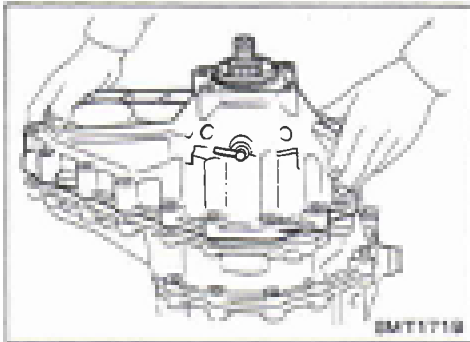
## ASSEMBLY



- h. Install snap ring to 2-4 shift rod.



- i. Install speedometer drive gear and oil gutter.
- j. Apply gear oil to each part in center case.



9. Apply sealant to mating surface. Set center case assembly onto front case, then tighten bolts.
10. Install front and rear companion flanges and center brake components.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### General Specifications

Transfer model		TX12A	
Gear ratio	High	1.000	
	Low	2.020	
Number of teeth	Main gear	29	
	Low gear	37	
	Counter gear	High	38
		Low	24
	Front drive sprocket	41	
Front drive shaft	41		
Oil capacity	liters (Imp qt)	2.2 (2)	

### Inspection and Adjustment

#### GEAR END PLAY

	mm (in)
Front drive sprocket	0.20 - 0.35 (0.0079 - 0.0138)
Low gear	0.20 - 0.35 (0.0079 - 0.0138)
Counter gear	0 - 0.2 (0 - 0.008)

#### CLEARANCE BETWEEN BAULK RING AND CLUTCH GEAR

	mm (in)
Standard	1.0 - 1.5 (0.039 - 0.059)
Wear limit	0.5 (0.020)

#### AVAILABLE SNAP RING Mainshaft front bearing

Allowable clearance		0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number	
3.1 (0.122)	33138-33G10	
3.2 (0.126)	33138-33G11	
3.3 (0.130)	33138-33G12	
3.4 (0.134)	33138-33G13	

#### Counter gear front bearing

Allowable clearance		0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number	
1.8 (0.071)	33138-33G20	
1.9 (0.075)	33138-33G21	
2.0 (0.079)	33138-33G22	
2.1 (0.083)	33138-33G23	
2.2 (0.087)	33138-33G24	

#### Main gear bearing

Allowable clearance		0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number	
2.6 (0.102)	33114-33G00	
2.7 (0.106)	33114-33G01	
2.8 (0.110)	33114-33G02	
2.9 (0.114)	33114-33G03	

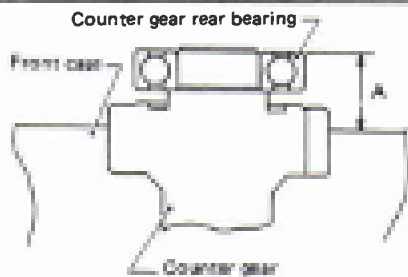
## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment (Cont'd)

#### AVAILABLE SHIM

#### Counter gear rear bearing

Distance "A" mm (in)	Shims	
	Thickness mm (in)	Part number
40.6 - 40.5 (1.598 - 1.594)	Not necessary	
40.5 - 40.4 (1.589 - 1.585)	0.1 (0.004)	33113-C8900
40.4 - 40.3 (1.581 - 1.587)	0.2 (0.008)	33113-C8901
40.3 - 40.2 (1.587 - 1.583)	0.3 (0.012)	33113-C8902
40.2 - 40.1 (1.583 - 1.579)	0.4 (0.016)	33113-C8903
40.1 - 40.0 (1.579 - 1.575)	0.5 (0.020)	33113-33G60
40.0 - 39.9 (1.575 - 1.571)	0.6 (0.024)	33113-33G61



SMT335A

# PROPELLER SHAFT & DIFFERENTIAL CARRIER

## SECTION **PD**

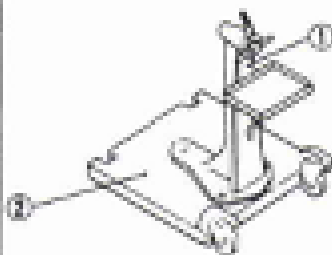





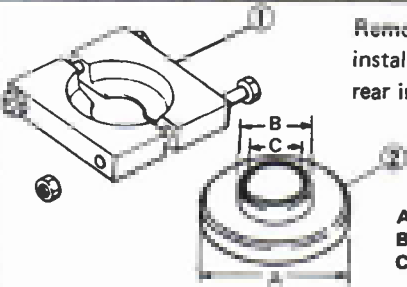
### CONTENTS

PREPARATION .....	PD- 2
PROPELLER SHAFT .....	PD- 6
ON-VEHICLE SERVICE (Final Drive) .....	PD-11
REMOVAL AND INSTALLATION .....	PD-12
FINAL DRIVE .....	PD-13
DISASSEMBLY .....	PD-14
INSPECTION .....	PD-19
ADJUSTMENT .....	PD-20
ASSEMBLY .....	PD-23
LIMITED SLIP DIFFERENTIAL (For H260) .....	PD-29
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	PD-35

## PREPARATION

### SPECIAL SERVICE TOOLS

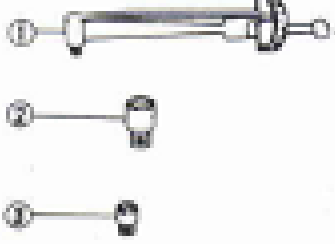
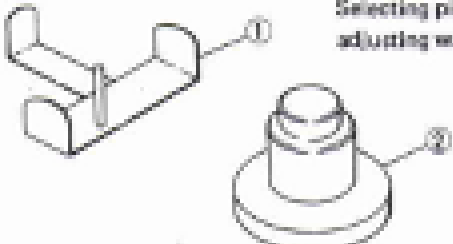
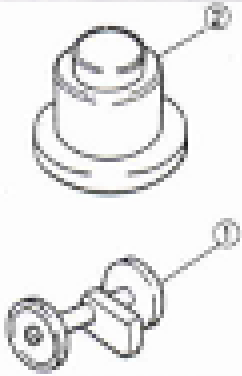
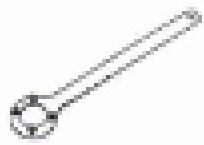
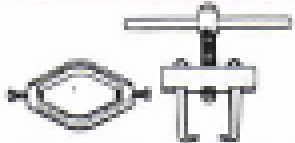

\*: Special tool or commercial equivalent

Tool number Tool name	Description	Unit application		
		H260	H233B	
ST0501S000 Engine stand ① ST05011000 Engine stand ② ST05012000 Base		Mounting differential attachment	X	X
ST06340000 Differential attachment		Mounting final drive	-	X
ST06350000 Differential attachment		Mounting final drive	X	-
ST30611000* Drive pinion bearing outer race drift bar		Installing pinion rear bearing outer race	X	X
ST30613000* Drive pinion front bearing outer race drift		Installing pinion front bearing outer race  A: 71.5 mm (2.815 in) dia. B: 47.5 mm (1.870 in) dia.	-	X
ST30621000* Drive pinion rear bearing outer race drift		Installing pinion rear bearing outer race  A: 79 mm (3.11 in) dia. B: 59 mm (2.32 in) dia.	-	X**
ST3090S000 Drive pinion rear bearing inner race puller set ① ST30031000 Puller ② ST30911000 Base		Removing and installing drive pinion rear inner race  A: 79 mm (3.11 in) dia. B: 45 mm (1.77 in) dia. C: 35 mm (1.38 in) dia.	X	X

\*\* : For front differential carrier only


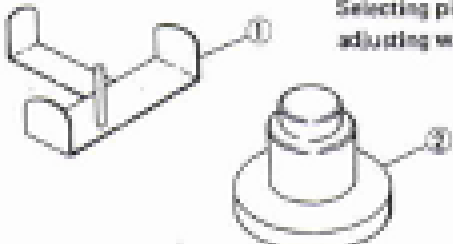
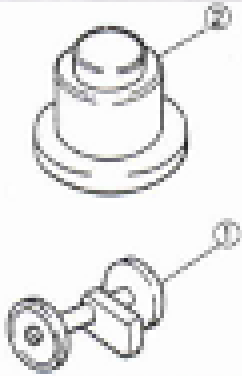
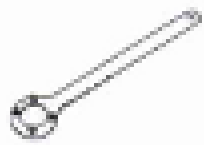
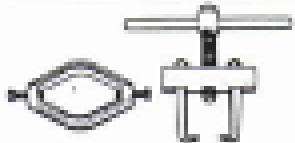

## PREPARATION

\*: Special tool or commercial equivalent

Tool number Tool name	Description	Unit application	
		H260	H233B
<b>ST3127S000</b> Preload gauge ① GG91030000 Torque wrench ② HT62900000 Socket adapter (1/2") ③ HT62940000 Socket adapter (3/8")	 <p style="text-align: center;">Measuring pinion bearing preload and total preload</p>	X	X
<b>ST3124S000</b> Drive pinion setting gauge set ① ST31130000 Height gauge ② ST31241000 Dummy shaft	 <p style="text-align: center;">Selecting pinion height adjusting washer</p>	X	-
<b>ST3125S000</b> Drive pinion setting gauge set ① ST31251000 Drive pinion height gauge ② ST31181001 Dummy shaft	 <p style="text-align: center;">Selecting pinion height adjusting washer</p>	-	X
<b>KV38104700</b> Drive pinion flange wrench		X	-
<b>KV40104000</b>		-	X
<b>ST33051001*</b> Diff. side bearing puller	 <p style="text-align: center;">Removing side bearing inner race</p>	X	X
<b>ST02371000*</b> Adapter	 <p style="text-align: center;">Installing side bearing inner race</p> <p style="text-align: center;">A: 50 mm (1.97 in) dia. B: 40 mm (1.57 in) dia.</p>	X	-




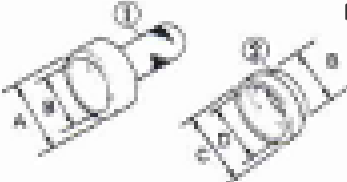



## PREPARATION

\*: Special tool or commercial equivalent

Tool number Tool name	Description	Unit application	
		H260	H233B
<b>ST3127S000</b> Preload gauge ① GG91030000 Torque wrench ② HT62900000 Socket adapter (1/2") ③ HT62940000 Socket adapter (3/8")	 <p style="text-align: center;"><b>Measuring pinion bearing preload and total preload</b></p>	X	X
<b>ST3124S000</b> Drive pinion setting gauge set ① ST31130000 Height gauge ② ST31241000 Dummy shaft	 <p style="text-align: center;"><b>Selecting pinion height adjusting washer</b></p>	X	-
<b>ST3125S000</b> Drive pinion setting gauge set ① ST31251000 Drive pinion height gauge ② ST31181001 Dummy shaft	 <p style="text-align: center;"><b>Selecting pinion height adjusting washer</b></p>	-	X
<b>KV38104700</b> Drive pinion flange wrench		X	-
<b>KV40104000</b>		-	X
<b>ST33051001*</b> Diff. side bearing puller	 <p style="text-align: center;"><b>Removing side bearing inner race</b></p>	X	X
<b>ST02371000*</b> Adapter	 <p style="text-align: center;"><b>Installing side bearing inner race</b></p> <p style="text-align: center;">A: 80 mm (3.15 in) dia. B: 40 mm (1.57 in) dia.</p>	X	-

## PREPARATION

\*: Special tool or commercial equivalent


Tool number Tool name	Description	Unit application	
		H260	H233B
ST33081000* Adapter	 <p>Installing side bearing inner race</p> <p>A: 43 mm (1.69 in) dia. B: 33.5 mm (1.319 in) dia.</p>	-	X
ST33230000* Diff. side bearing drift	 <p>Installing side bearing inner race</p> <p>A: 51 mm (2.01 in) dia. B: 28.5 mm (1.122 in) dia.</p>	-	X
KV31100300 Fork rod pin punch		X	X
KV381025S0* Oil seal fitting tool ① ST30720000 Drift bar ② KV38102510 Drift	 <p>Installing front oil seal</p> <p>A: 77 mm (3.03 in) dia. B: 55 mm (2.17 in) dia. C: 71 mm (2.80 in) dia. D: 65 mm (2.56 in) dia.</p>	X	X
ST32580000 Diff. side bearing adjusting nut wrench	 <p>Adjusting side bearing preload and backlash (ring gear-drive pinion)</p>	-	X
ST32530000 Diff. side bearing adjusting nut wrench		X	-
KV38106400 Rear axle shaft dummy (Use 2 pieces per unit)	 <p>Checking differential torque on limited slip differential</p>	X	-
KV38106900		X**	-

\*\* : Pickup model destined for Middle East



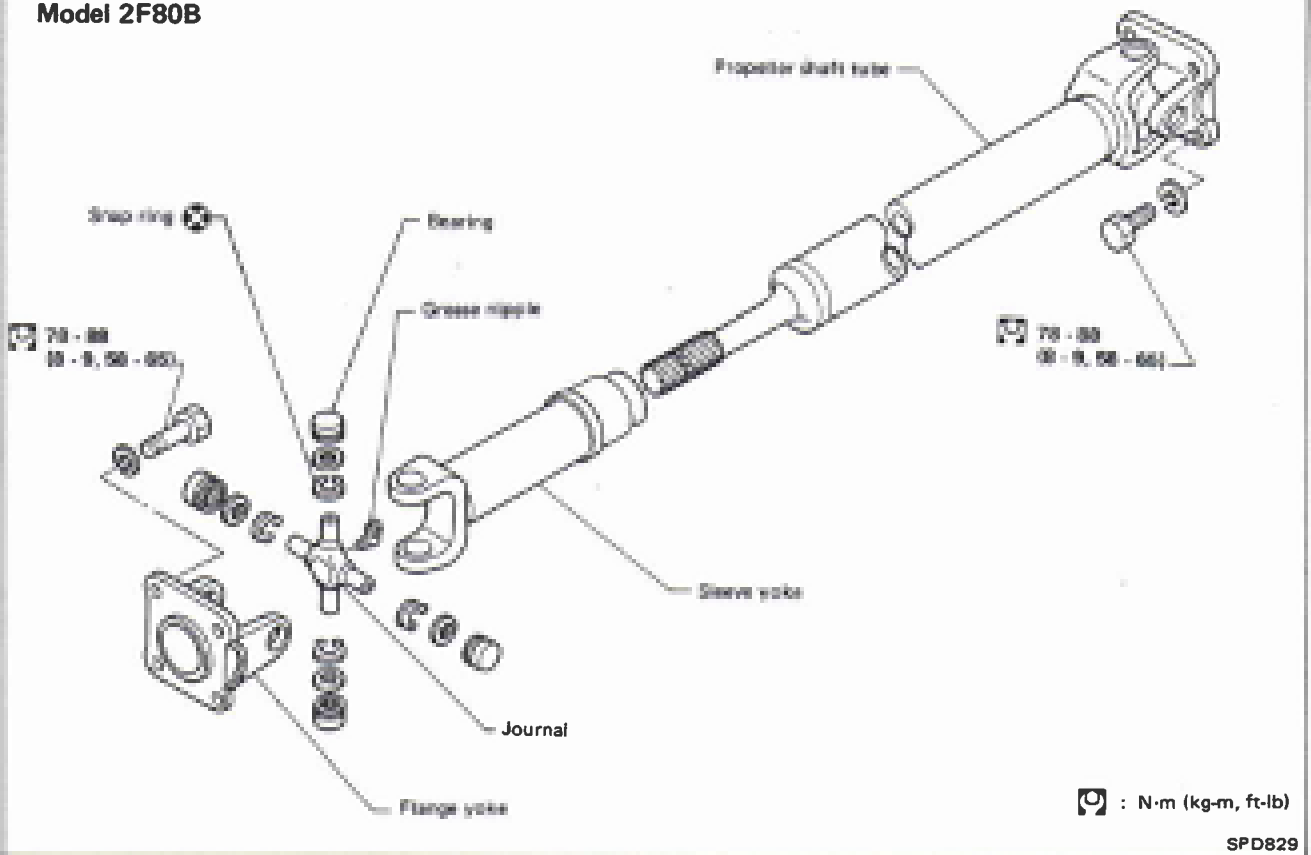
# PREPARATION

## COMMERCIAL SERVICE TOOL

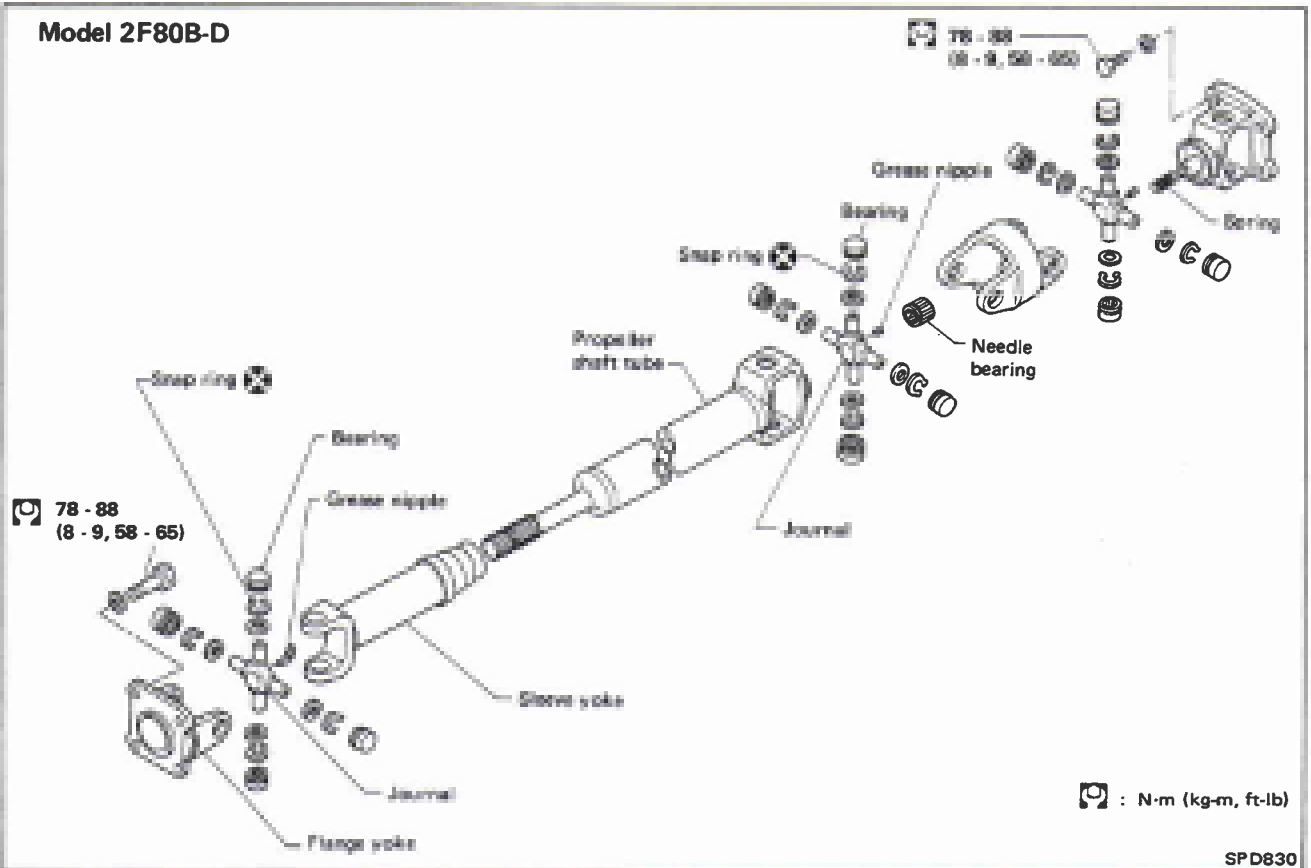
Tool name	Description	Unit application	
		H260	H233B
Drift	 <p>Installing side bearing</p> <p>a = 64 mm (2.52 in) dia. b = 56 mm (2.20 in) dia. c = 160 mm (6.30 in)</p>	X	-

# PROPELLER SHAFT

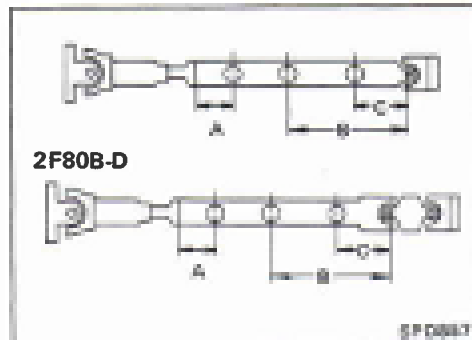
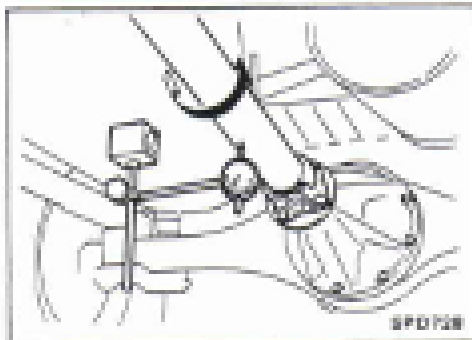
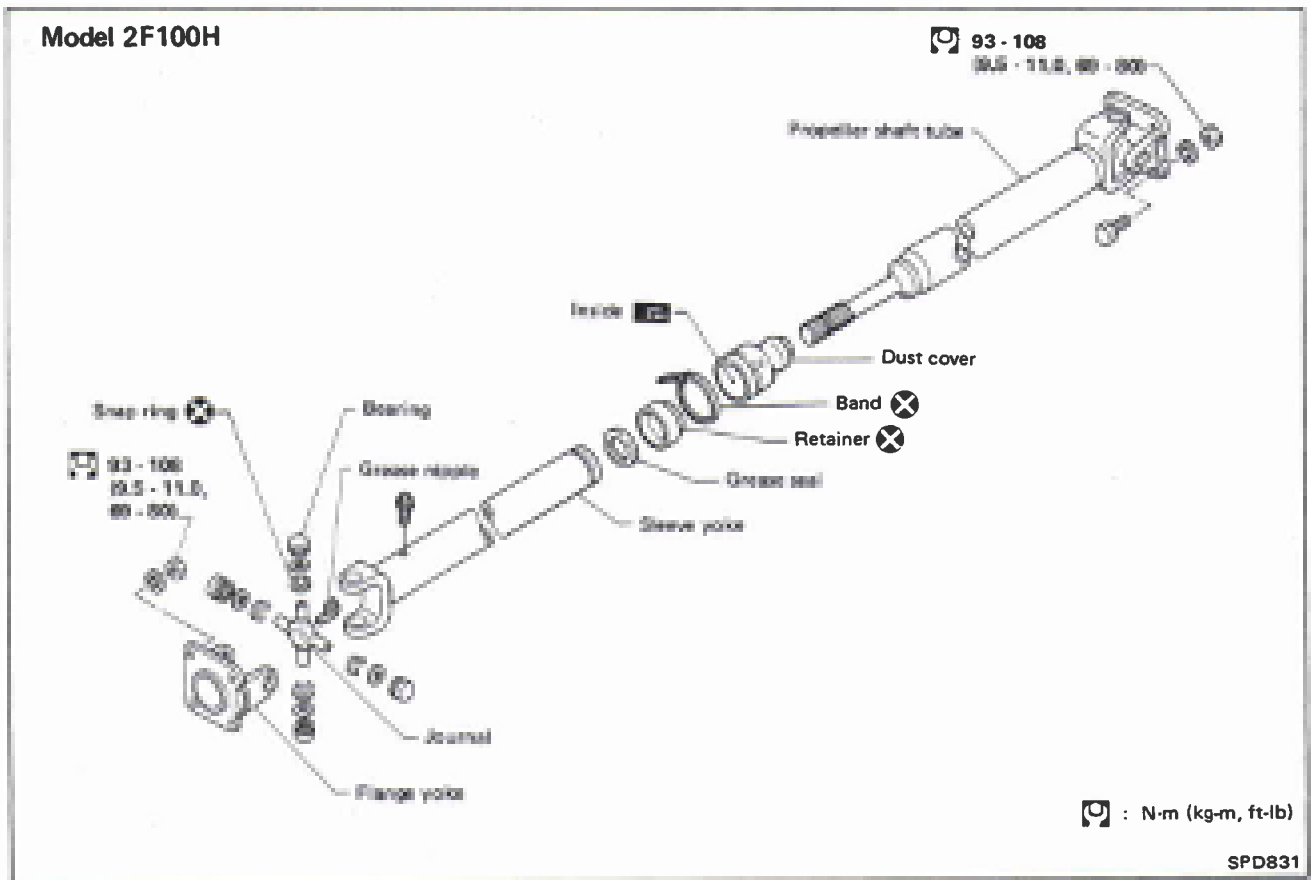
## Model 2F80B



## Model 2F80B-D



# PROPELLER SHAFT



## On-vehicle Service

### PROPELLER SHAFT VIBRATION

If vibration is present at high speed, inspect propeller shaft runout first.

1. Raise front and rear wheels.
2. Measure propeller shaft runout at several points by rotating final drive companion flange with hands.

**Runout limit: 0.6 mm (0.024 in)**

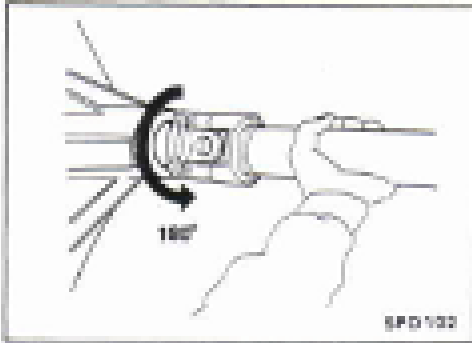
Unit: mm (in)

Model	2F80B	2F80B-D	Vehicle		
			Pickup	Wagon	Hardtop
Distance	2F100H				
A	140 (5.51)	70 (2.76)	70 (2.76)	70 (2.76)	-
B	314 (12.36)	455 (17.91)	372.5 (14.67)	367.5 (14.47)	85.0 (3.346)
C	180 (7.09)	170 (6.69)	200 (7.87)	240 (9.45)	-

## PROPELLER SHAFT

### On-vehicle Service (Cont'd)

3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange; then rotate companion flange 180 degrees and reconnect propeller shaft.
4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road tests.

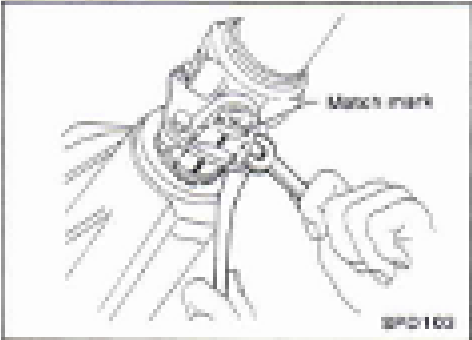


### APPEARANCE CHECKING

- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.

### Removal and Installation

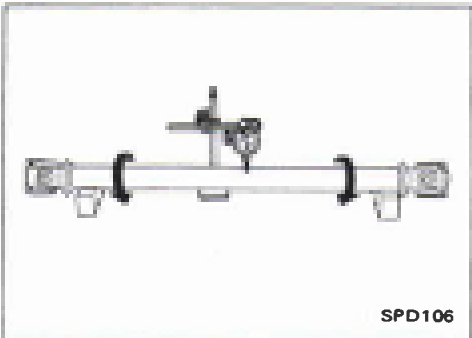
- Put match marks on flanges and separate propeller shaft from final drive.



### Inspection

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.

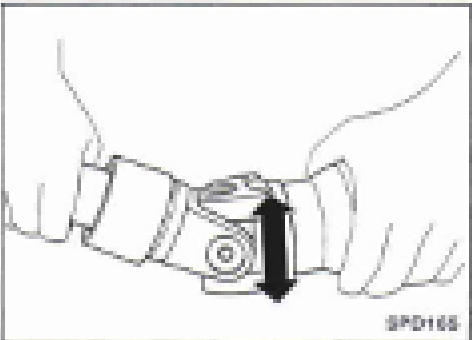
**Runout limit: 0.6 mm (0.024 in)**



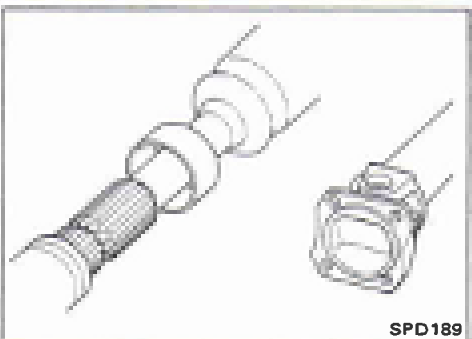
- Inspect journal axial play. If the play exceeds specifications, replace propeller shaft assembly.

**Journal axial play:**

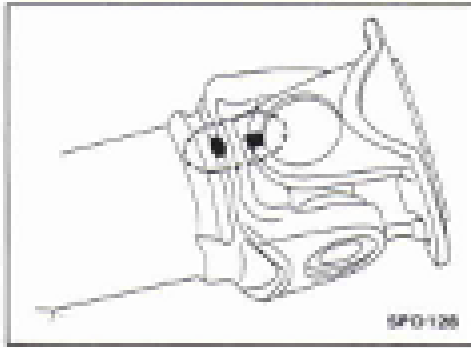
**0.02 mm (0.0008 in) or less**



- Check flange yoke and sleeve yoke for damage or wear. Replace if necessary.

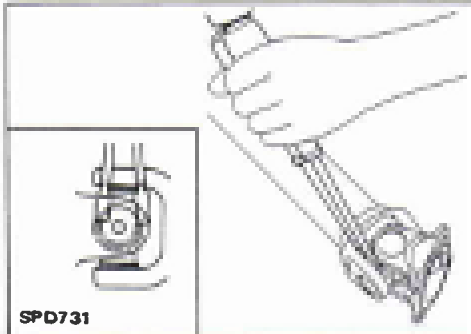


## PROPELLER SHAFT

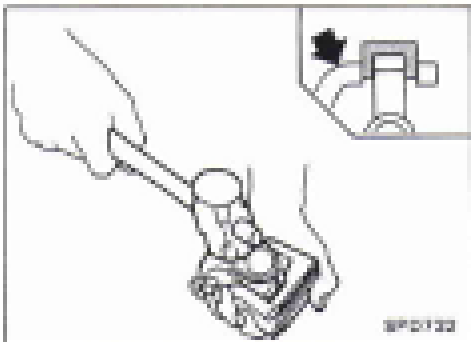


### Disassembly JOURNAL

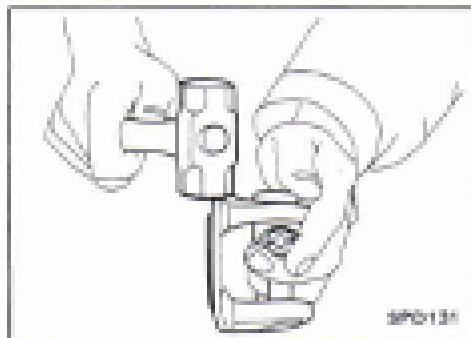
1. Put match marks on shaft and flange or yoke.



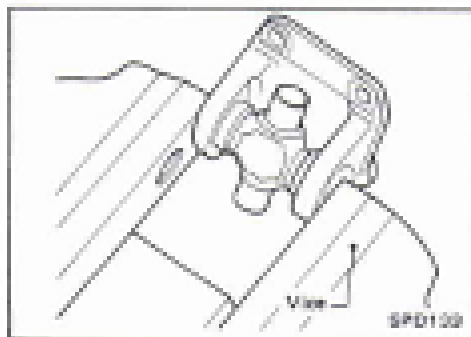
2. Remove snap ring.



3. Remove pushed out journal bearing by lightly tapping yoke with a hammer, taking care not to damage journal and yoke hole.



4. Remove bearing at opposite side in above operation. Put marks on disassembled parts so that they can be reinstalled in their original positions from which they were removed.



### Assembly

#### JOURNAL (80B, 80B-D and 100H)

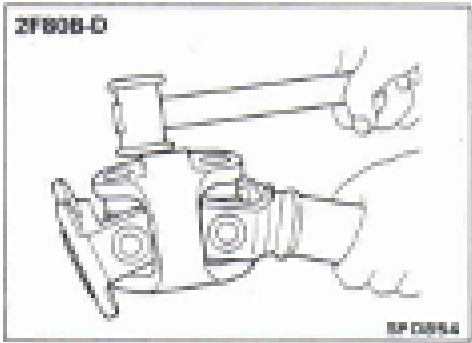
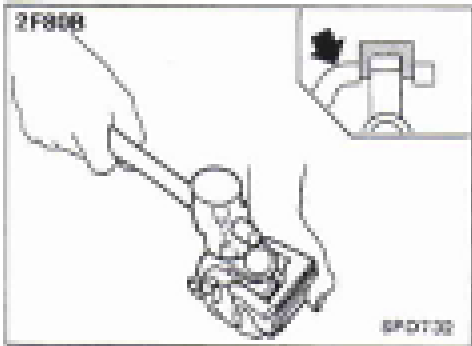
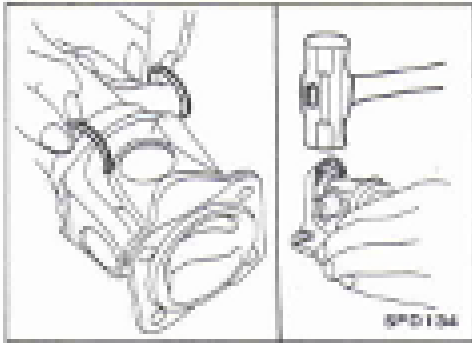
1. Assemble journal bearing. Apply recommended multi-purpose grease on bearing inner surface. When assembling, be careful that needle bearing does not fall down.

## PROPELLER SHAFT

### Assembly (Cont'd)

2. Select snap ring that will provide specified play in axial direction of journal, and install them. (Refer to S.D.S.)

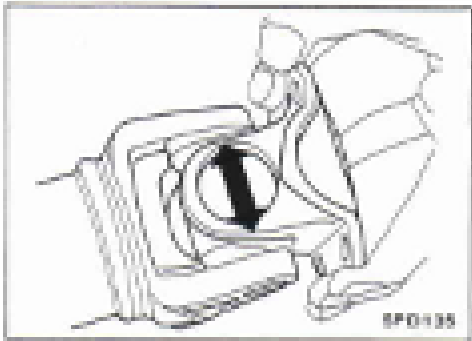
**Select snap rings with a difference in thickness at both sides within 0.06 mm (0.0024 in).**



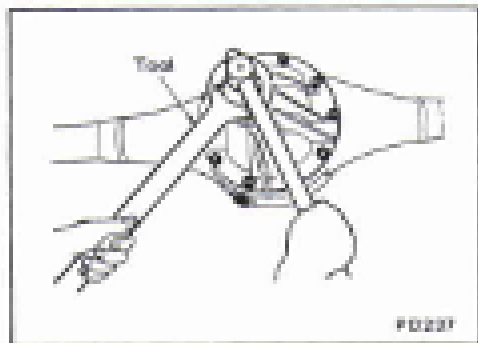
3. Adjust thrust clearance between bearing and snap ring to zero by tapping yoke.

4. Check to see that journal moves smoothly and check for axial play.

**Axial play: 0.02 mm (0.0008 in) or less**



## ON-VEHICLE SERVICE (Final Drive)



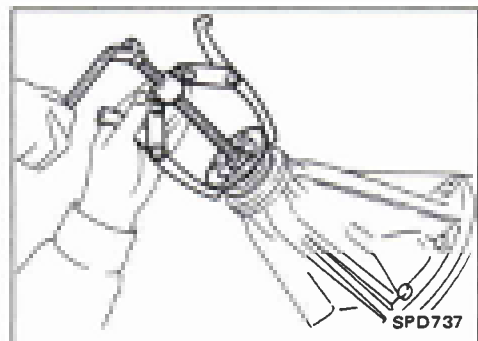
### Front Oil Seal Replacement

1. Remove propeller shaft.
2. Loosen drive pinion nut.

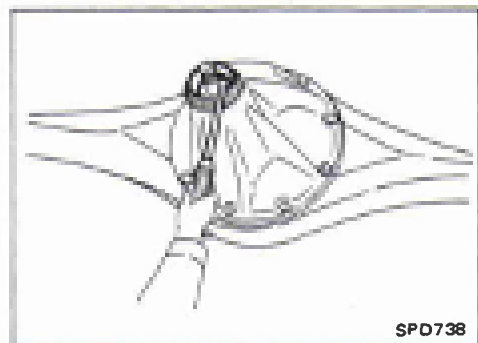
**Tool number:**

**H233B KV40104000**

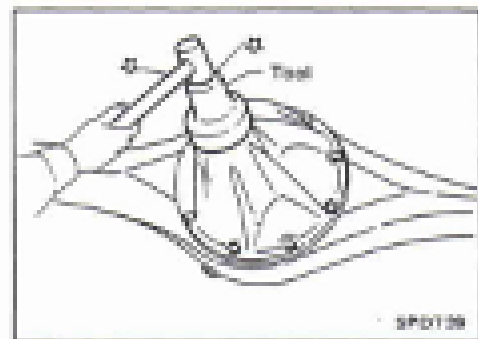
**H260 KV38104700**



3. Remove companion flange.



4. Remove front oil seal.



5. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.

**Tool number: KV381025S0**

## REMOVAL AND INSTALLATION

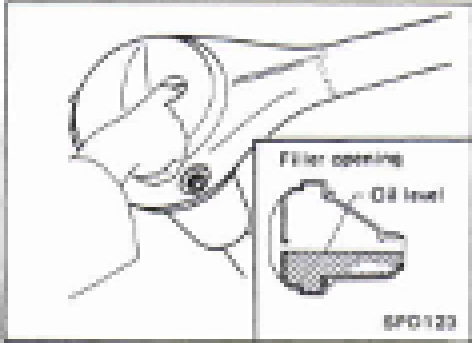


### Removal

- Remove propeller shaft.
- Remove axle shaft.  
Refer to RA section.

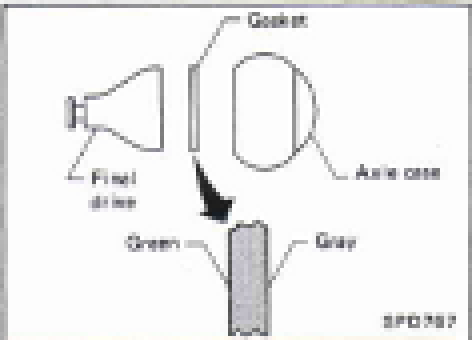
### CAUTION:

- Be careful not to damage spline, sleeve yoke and front oil seal when removing propeller shaft.



### Installation

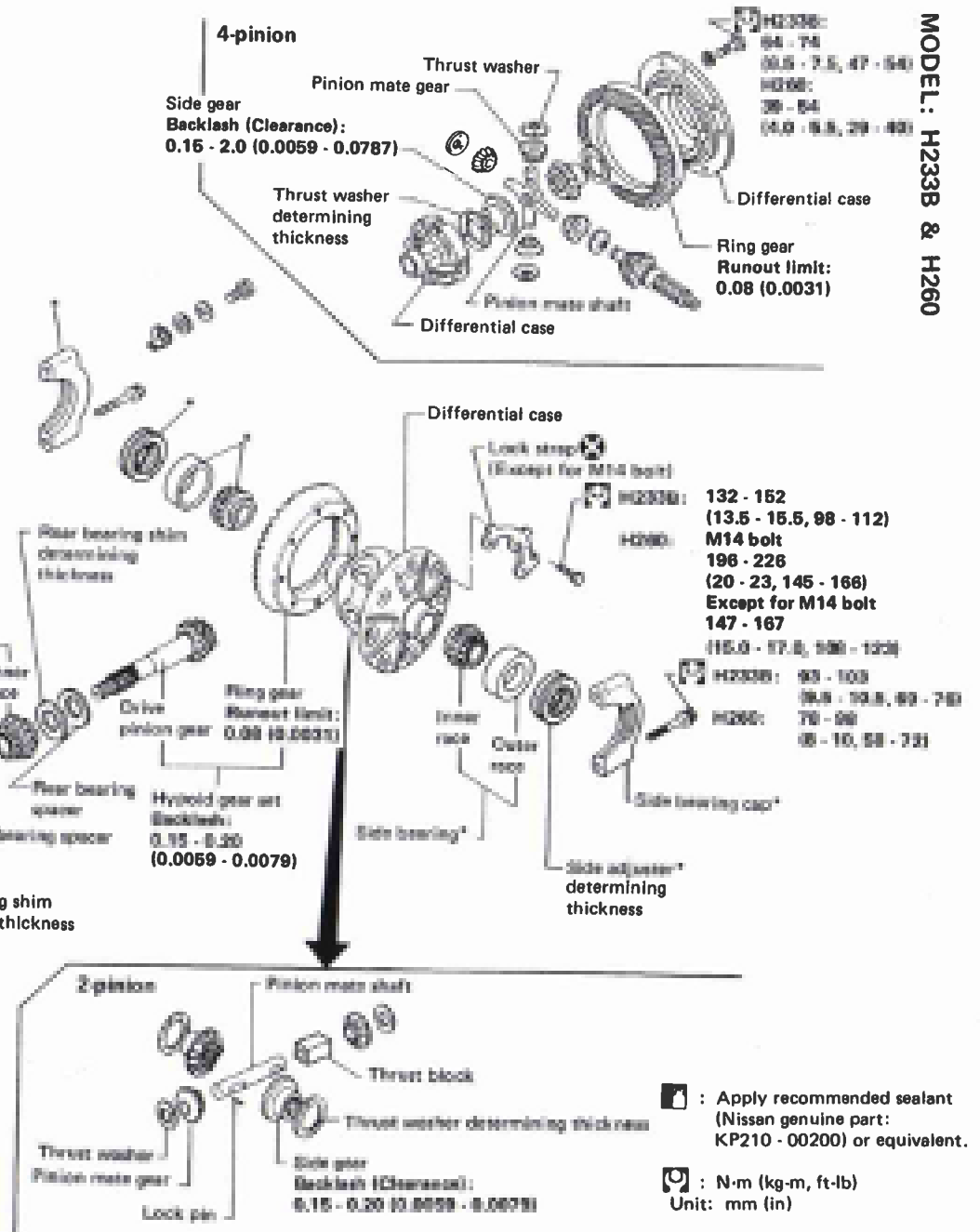
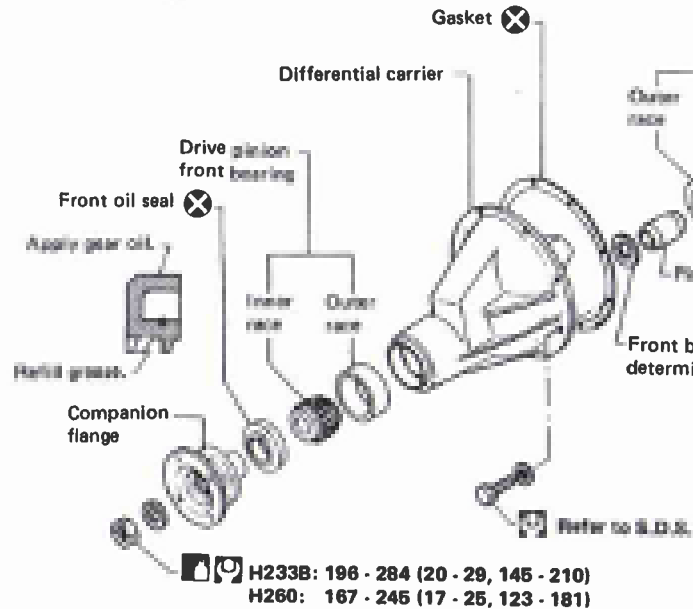
- Fill final drive with recommended gear oil.



- Pay attention to the direction of gasket (H233B only).



- \*: Do not interchange these left side parts with right side parts during assembly.
- When replacing tapered roller bearing, use new outer race and inner race as a set.
- Drive pinion preload:
  - H233B: 0.5 - 1.0 N·m  
(5 - 10 kg-cm, 4.3 - 8.7 in-lb)
  - H260: 1.5 - 1.7 N·m  
(15 - 17 kg-cm, 13 - 15 in-lb)
- Total preload:
  - H233B: 1.0 - 2.0 N·m  
(10 - 20 kg-cm, 8.7 - 17.4 in-lb)
  - H260: 1.7 - 2.5 N·m  
(17 - 25 kg-cm, 15 - 22 in-lb)



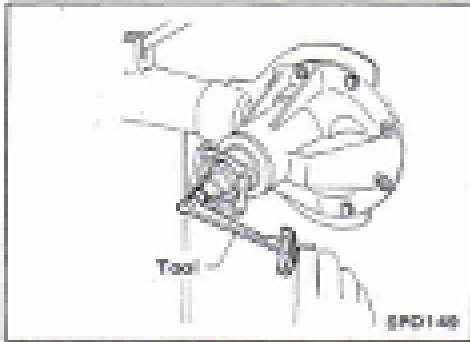
MODEL: H233B & H260

FINAL DRIVE

PD-13

SPD333

## DISASSEMBLY



### Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload
  - 1) Turn drive pinion in both directions several times to set bearing rollers.

- 2) Check total preload with Tool.

**Tool number: ST3127S000**

**Total preload:**

**H233B**

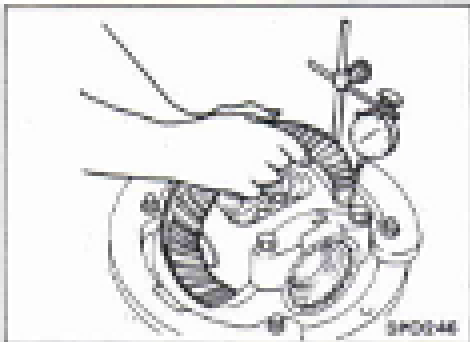
**1.8 - 2.5 N·m**

**(18 - 25 kg-cm, 16 - 22 in-lb)**

**H260**

**1.7 - 2.5 N·m**

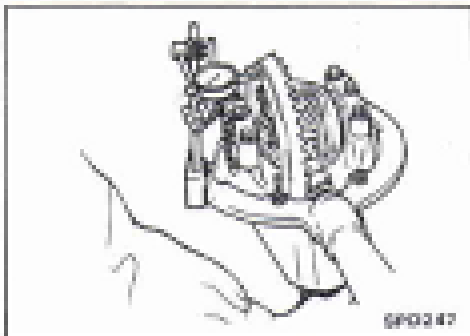
**(17 - 25 kg-cm, 15 - 22 in-lb)**



- Ring gear to drive pinion backlash  
Check ring gear-to-drive pinion backlash with a dial indicator at several points.

**Ring gear-to-drive pinion backlash:**

**0.15 - 0.20 mm (0.0059 - 0.0079 in)**

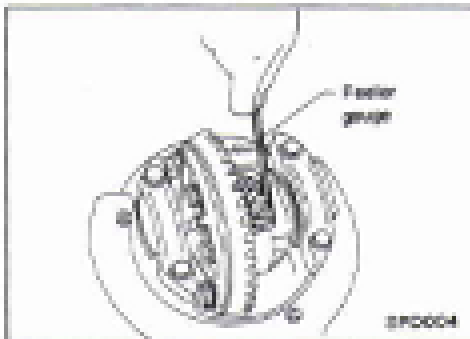


- Ring gear runout  
Check runout of ring gear with a dial indicator.

**Runout limit:**

**0.08 mm (0.0031 in)**

- Tooth contact  
Check tooth contact. (Refer to Adjustment.)

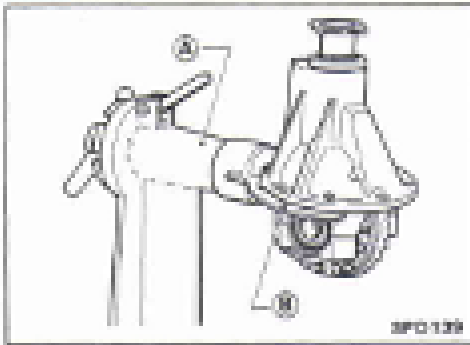


- Side gear to pinion mate gear backlash  
Measure clearance between side gear thrust washer and differential case with a feeler gauge.

**Clearance between side gear thrust washer and differential case:**

**0.15 - 0.20 mm (0.0059 - 0.0079 in)**

## DISASSEMBLY

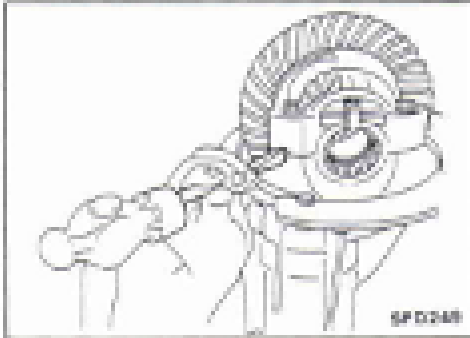


### Differential Carrier

1. Mount differential carrier on Tools.

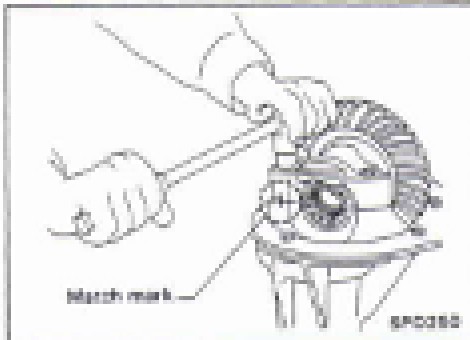
Tool number:

- Ⓐ ST0501S000
- Ⓑ H233B: ST06340000
- H260: ST06350000

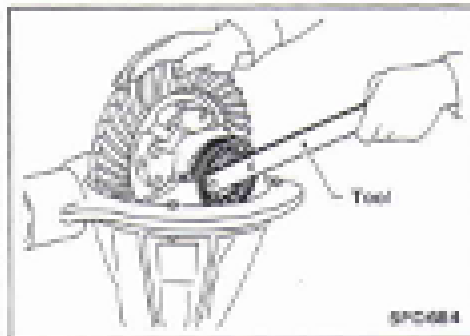


2. Paint or punch match marks on one side of the side bearing cap so it can be properly reinstalled.

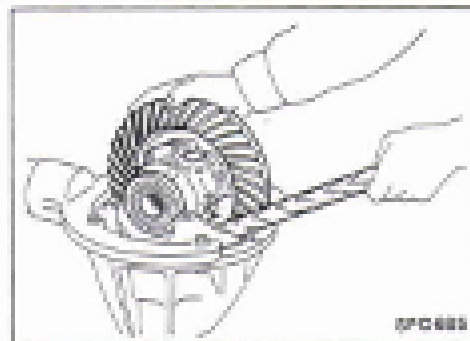
**Bearing caps are line-bored during manufacture. Replace them in their proper positions.**



3. Remove side lock fingers and side bearing caps.



4. Remove side bearing adjuster with Tool.  
Tool number: ST32580000

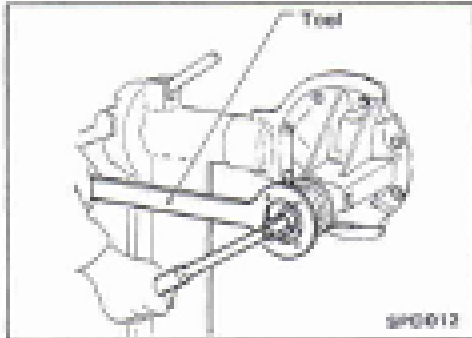
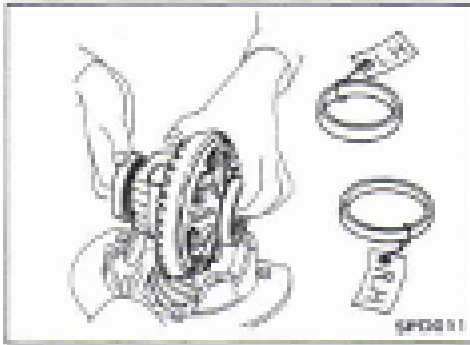


5. Remove differential case assembly with a pry bar.

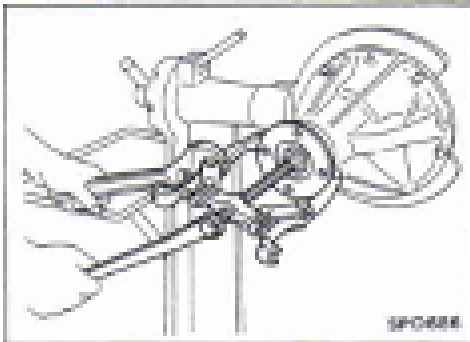
## DISASSEMBLY

### Differential Carrier (Cont'd)

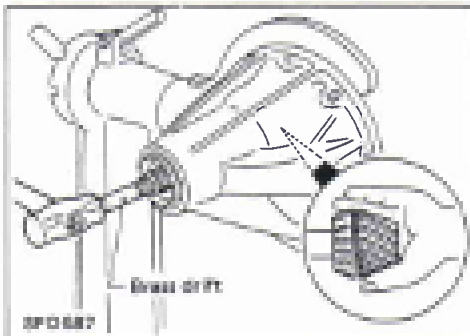
Be careful to keep the side bearing outer races together with their respective inner races — do not mix them up.



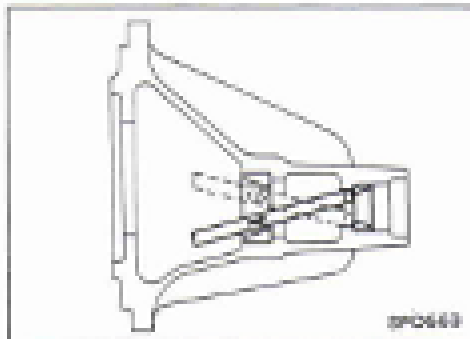
6. Loosen drive pinion nut with Tool.  
Tool number: KV38104700



7. Remove companion flange with puller.



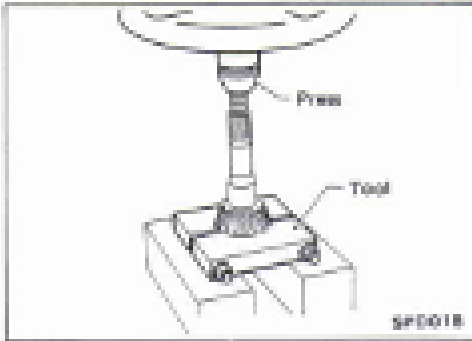
8. Take out drive pinion together with pinion rear bearing inner races, pinion bearing spacer and pinion bearing adjusting shim with soft hammer.



9. Remove front oil seal and pinion front bearing inner races.
10. Remove pinion front and rear bearing outer races with a brass drift.

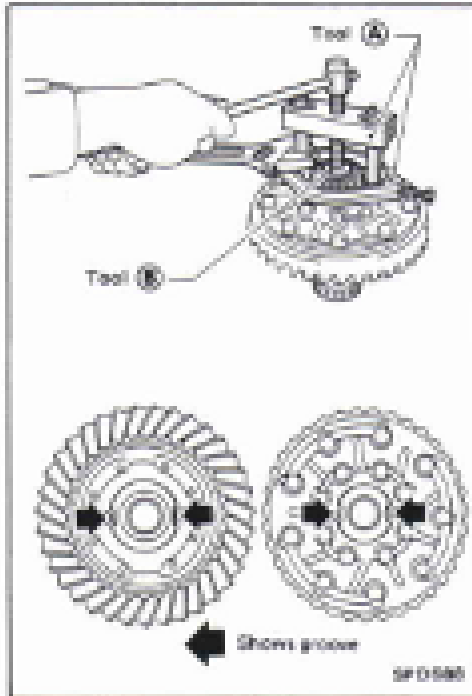
## DISASSEMBLY

### Differential Carrier (Cont'd)



11. Remove pinion rear bearing inner races and drive pinion height adjusting washer with press and Tool.  
Tool number: ST30031000

### Differential Case



1. Remove side bearing inner races.  
To prevent damage to bearing, engage puller jaws in groove.  
Tool number:

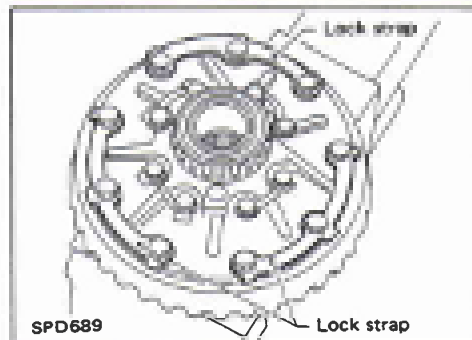
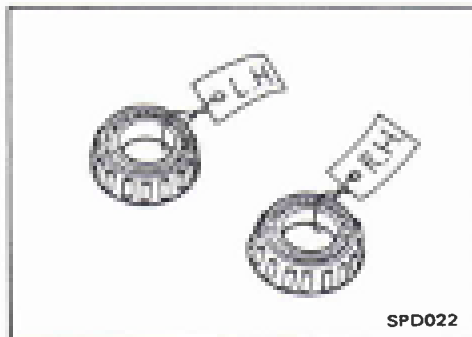
H233B: (A) ST33051001

(B) ST02371000

H260: (A) ST33051001

(B) ST02371000

Be careful not to confuse left and right hand parts.

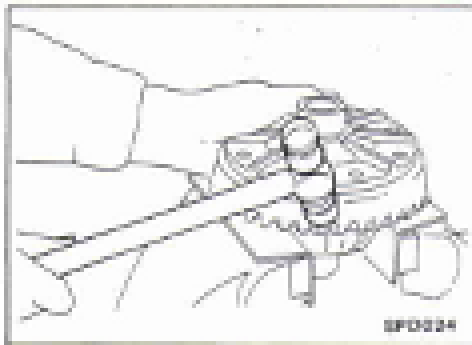


2. Spread out lock straps and loosen ring gear bolts in a criss-cross fashion.

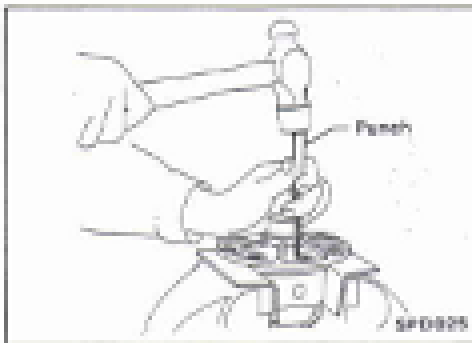
## DISASSEMBLY

### Differential Case (Cont'd)

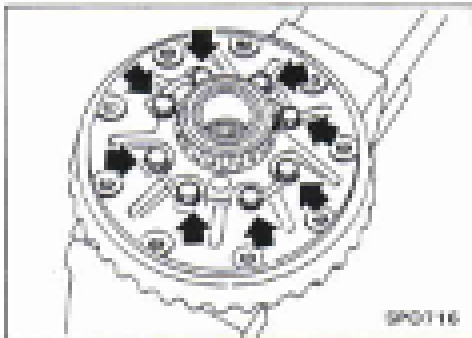
3. Tap ring gear off differential case with a soft hammer.  
**Tap evenly all around to keep ring gear from binding.**



4. Drive out pinion mate shaft lock pin, with Tool from ring gear side (2-pinion type differential case).  
**Lock pin is calked at pin hole mouth on differential case.**



5. Separate differential case L.H. and R.H. (4-pinion type differential case).  
**Put match marks on both differential case L.H. and R.H. sides prior to separating them.**

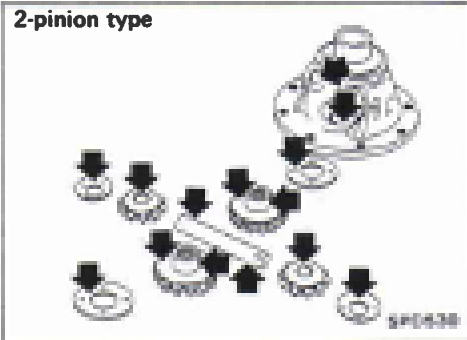


## INSPECTION

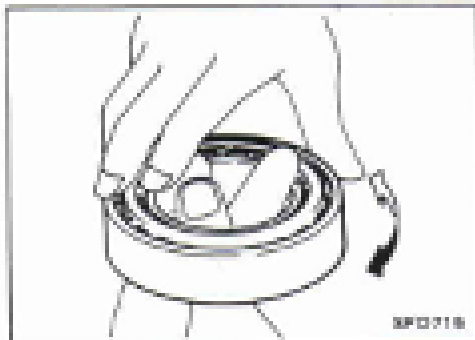
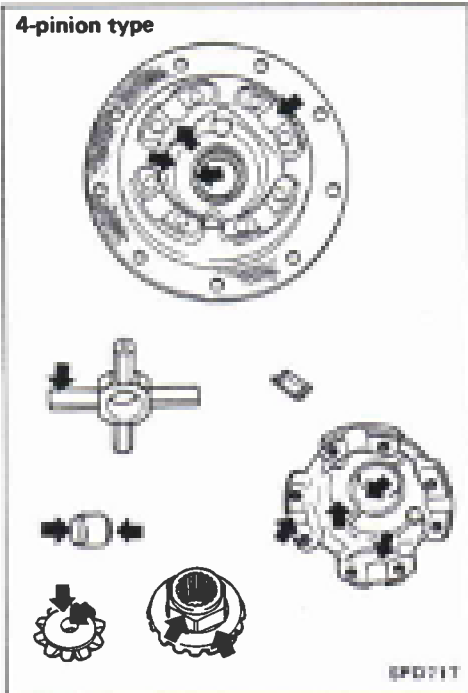
### Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping. If any part is damaged, replace ring gear and drive pinion as a set (hypoid gear set).

2-pinion type



4-pinion type



### Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, thrust block and thrust washers.

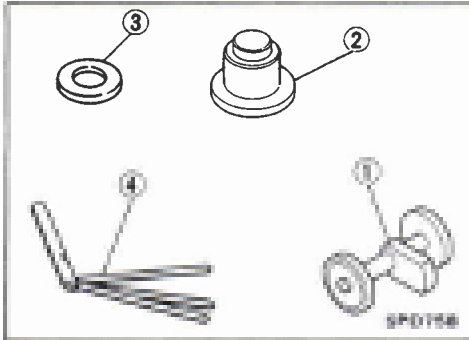
### Bearing

1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking. Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner race as a set.

## ADJUSTMENT

For quiet and reliable final drive operation, the following five adjustments must be made correctly:

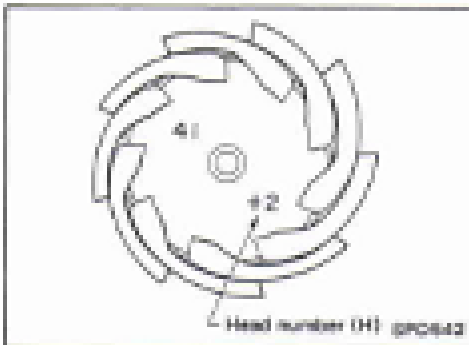
1. Side bearing preload. (Refer to ASSEMBLY.)
2. Pinion gear height.
3. Pinion bearing preload.
4. Ring gear-to-pinion backlash. (Refer to ASSEMBLY.)
5. Ring and pinion gear tooth contact pattern.



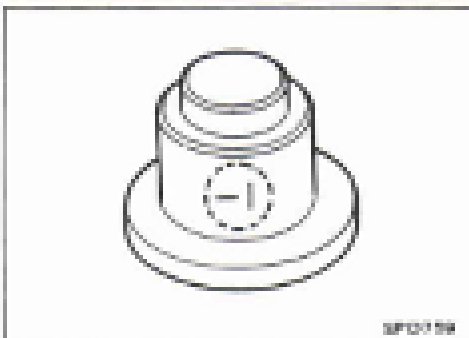
### Drive Pinion Height

1. First prepare Tools for pinion height adjustment.
  - H233B: ① Height gauge (ST31251000)
  - ② Dummy shaft (ST31181001)
  - ③ Spacer [thickness: 2.50 mm (0.0984 in)]
  - ④ Feeler gauge
  - H260: ① Height gauge (ST31130000)
  - ② Dummy shaft (ST31241000)
  - ④ Feeler gauge
2. To simplify the job, make a chart, like the one below, to organize your calculations.

LETTERS	HUNDREDTHS OF A MILLIMETER
H: Head number	
D': Figure marked on dummy shaft	
S: Figure marked on height gauge	
N: Measuring clearance	



3. Write the following numbers down the chart.
  - H: Head number



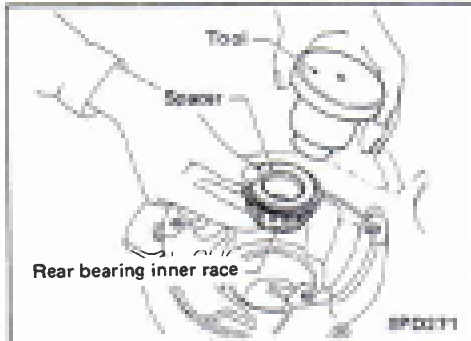
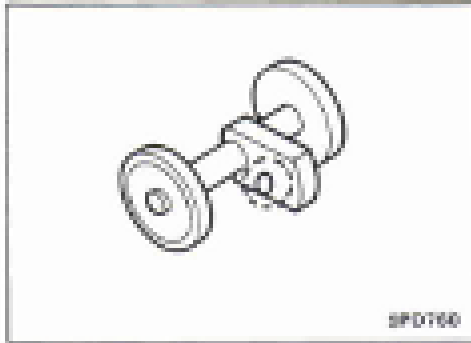
- D': Figure marked on dummy shaft.



## ADJUSTMENT

### Drive Pinion Height (Cont'd)

S: Figure marked on height gauge.

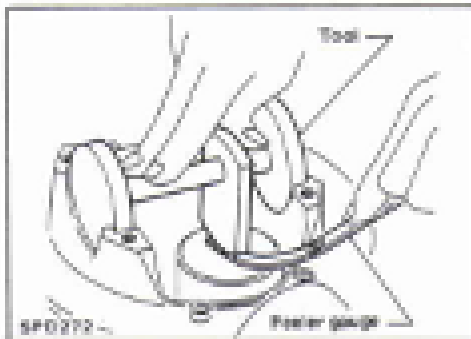


4. Place pinion rear bearing inner race and Tools on gear carrier.

**Tool number:**

**H233B: ST31181001**

**H260: ST31241000**

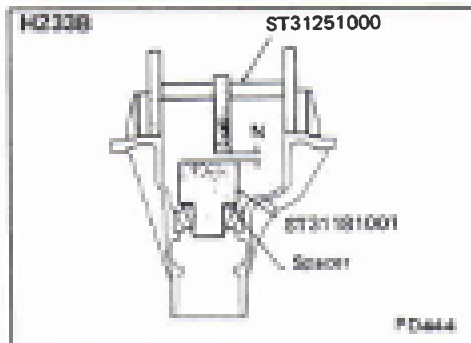


5. Attach Tool (Height gauge) to gear carrier, and measure the clearance between the height gauge and the dummy shaft face.

**Tool number:**

**H233B: ST31251000**

**H260: ST31130000**



6. Substitute these values into the equation to calculate the thickness of the washer.

**If values signifying H, D' and S are not given, regard them as zero and calculate.**

H233B:

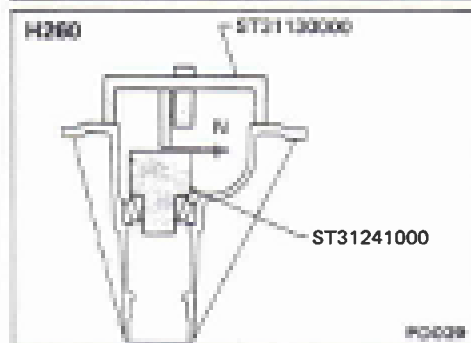
T (Thickness of washer)

$$= N - [(H - D' - S) \times 0.01] + 3.05$$

H260:

T (Thickness of washer)

$$= N - [(H - D' - S) \times 0.01] + 2.55$$

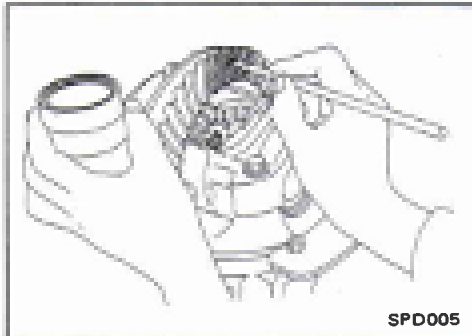


# ADJUSTMENT

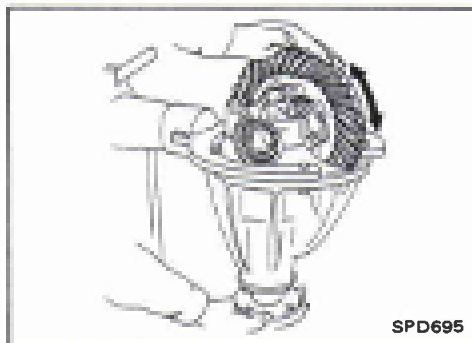
## Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.

Hypoid gear sets which are not positioned properly may be noisy, or have short life, or both. Low noise and a long life can be assured with a pattern check.

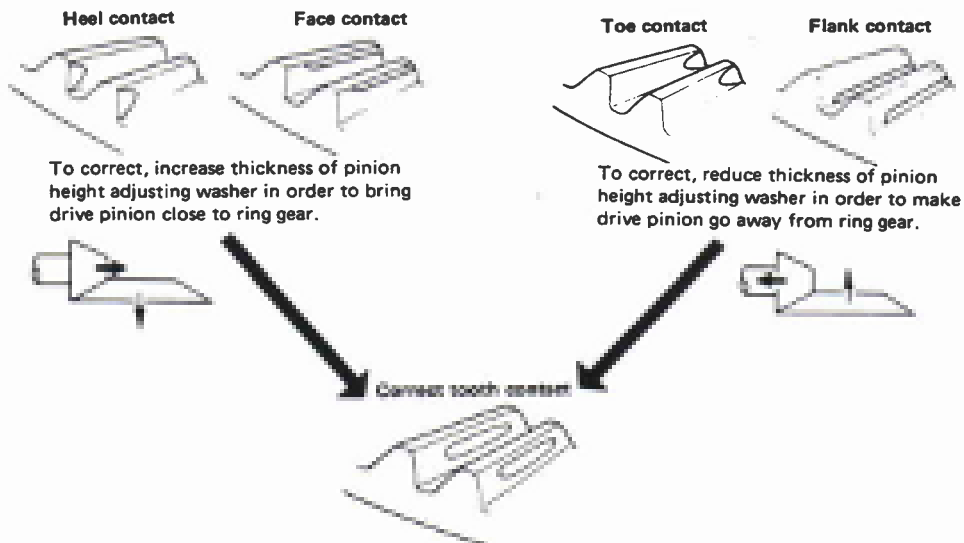


1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.



3. Hold companion flange steady and turn the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct. However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern. The tooth pattern is the best indication of how well a differential has been set up.



SPD007

## ASSEMBLY

### Differential Case — 4-pinion type —

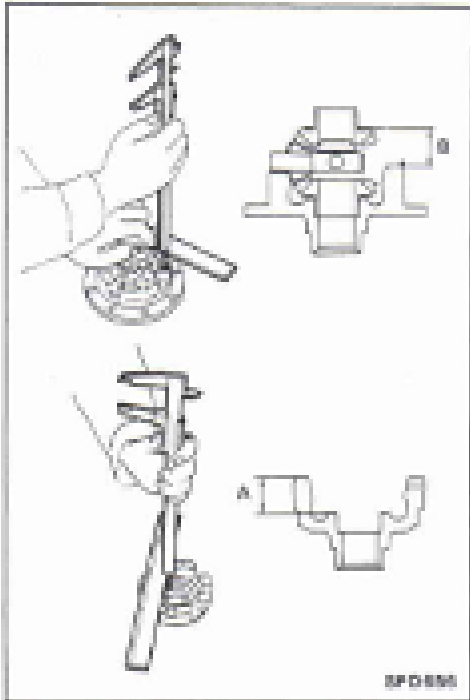
1. Measure clearance between side gear thrust washer and differential case.

**Clearance between side gear thrust washer and differential case (A - B):**

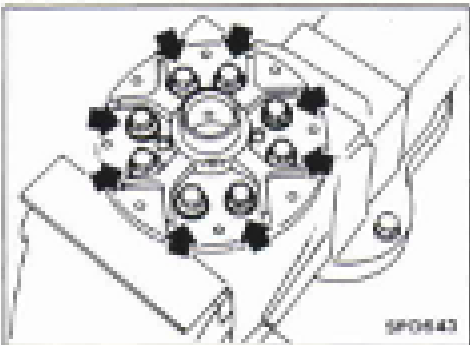
**0.15 - 0.20 mm (0.0059 - 0.0079 in)**

The clearance can be adjusted with side gear thrust washer. Refer to S.D.S.

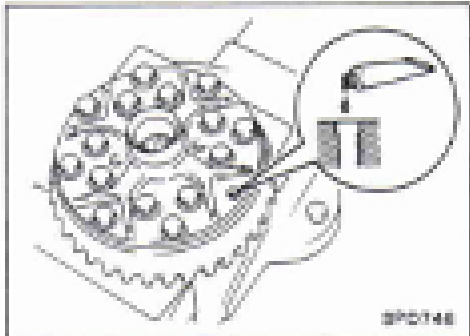
2. Apply oil to gear tooth surfaces and thrust surfaces and check that they turn properly.



3. Install differential case L.H. and R.H.



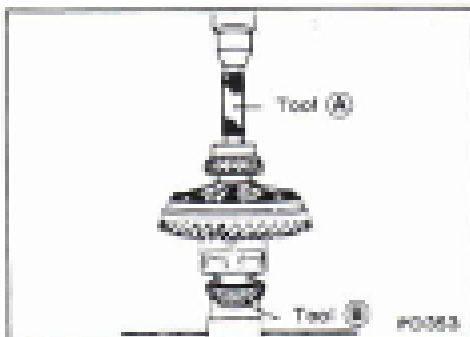
4. Place differential case on ring gear.
5. Apply locking sealer to ring gear bolts, and install them. **Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.**



6. Press-fit side bearing inner races on differential case with Tool.

**Tool number:**

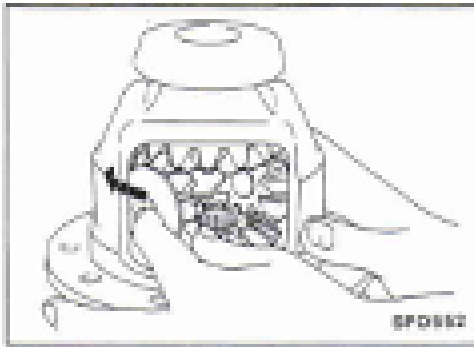
- Ⓐ H233B: ST33190000  
H260: Drift
- Ⓑ H233B: ST02371000  
H260: Drift



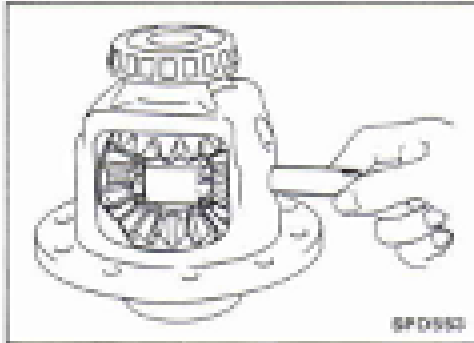
## ASSEMBLY

### Differential Case — 2-pinion type —

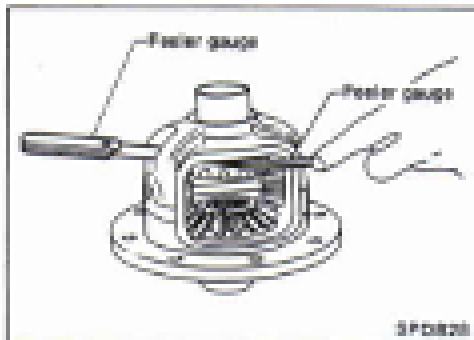
1. Install side gears, pinion mate gears, thrust washers and thrust block into differential case.



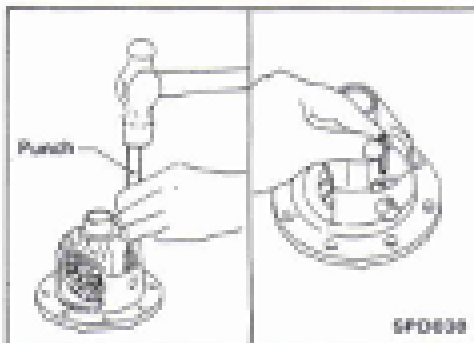
2. Fit pinion mate shaft to differential case so that it meets lock pin holes.



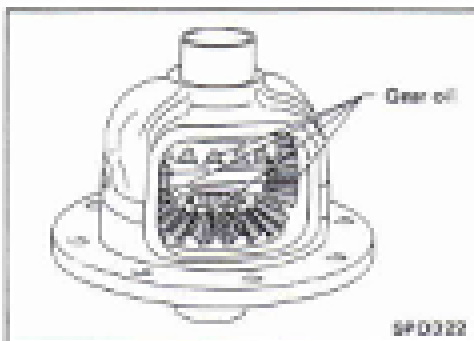
3. Adjust clearance between rear face of side gear and thrust washer by selecting side gear thrust washer. Refer to S.D.S. **Clearance between side gear thrust washer and differential case:**  
**0.15 - 0.20 mm (0.0059 - 0.0079 in)**



4. Install pinion mate shaft lock pin with a punch. **Make sure lock pin is flush with case.**

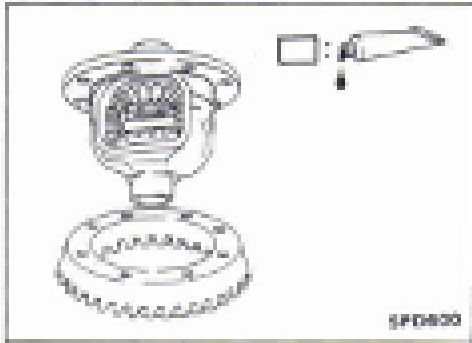


5. Apply oil to gear tooth surfaces and thrust surfaces and check that they turn properly.

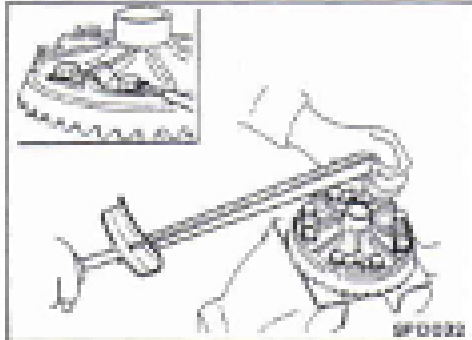


## ASSEMBLY

### Differential Case — 2-pinion type — (Cont'd)



6. Apply locking sealer to contacting surfaces of ring gear and differential case, then place differential case on ring gear.



7. Apply locking sealer to ring gear bolts.
8. Install new lock straps and ring gear bolts.
  - Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.
    - Ⓜ: 78 - 93 N·m  
(8.0 - 9.5 kg-m, 58 - 69 ft-lb)
  - Then bend up lock straps to lock the bolts in place.



9. Press-fit side bearing inner races on differential case with Tool.

Tool number:

- Ⓐ ST33190000
- Ⓑ ST02371000

### Differential Carrier

1. Press-fit front and rear bearing outer races with Tools.

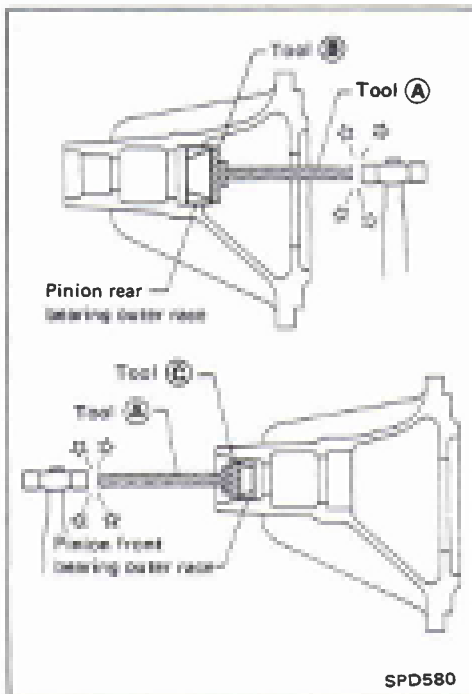
Tool number:

- Ⓐ ST30611000
- Ⓑ ST30621000 (front differential)  
or suitable pipe
- Ⓒ ST30701000 (H233B)  
For H260, use suitable pipe.

#### CAUTION:

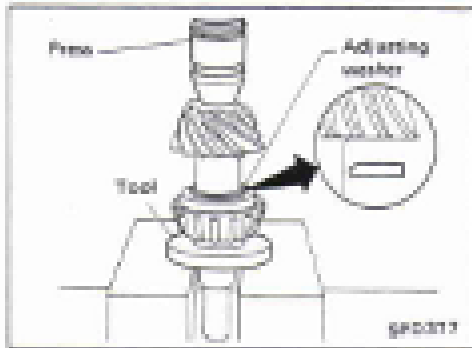
Do not damage roller side face.

2. Select pinion bearing adjusting washer and drive pinion bearing spacer, referring to Adjustment.



## ASSEMBLY

### Differential Carrier (Cont'd)

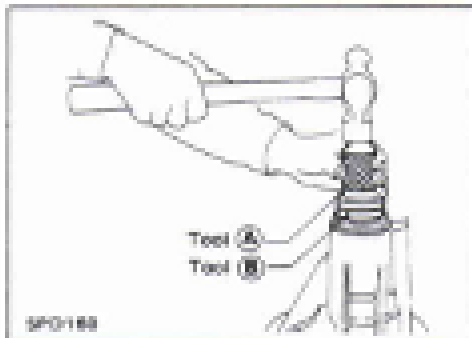


3. Install drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner race in it, using press and Tool.

Tool number: ST30911000



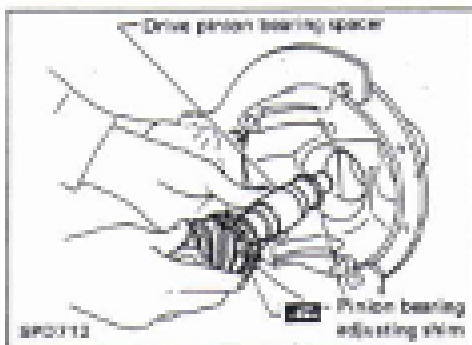
4. Place pinion front bearing inner race in final drive housing.



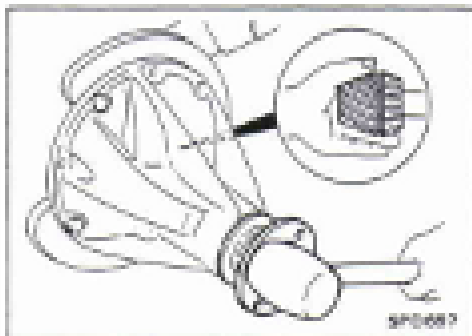
5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.

Tool number:

- (A) ST30720000
- (B) KV38102510



6. Install drive pinion bearing spacer, pinion bearing adjusting shim and drive pinion in gear carrier.



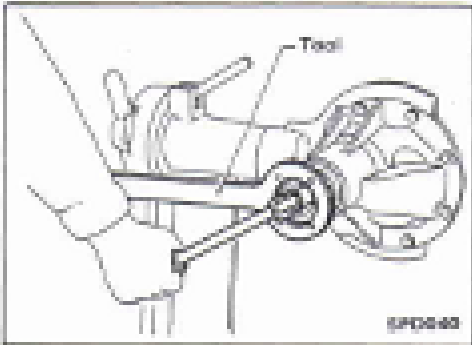
7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.

## ASSEMBLY

### Differential Carrier (Cont'd)

8. Tighten pinion nut to the specified torque.  
**The threaded portion of drive pinion and pinion nut should be free from oil or grease.**

**Tool number: KV38104700**



9. Turn drive pinion in both directions several times, and measure pinion bearing preload.

**Tool number: ST3127S000**

**Pinion bearing preload:**

**H233B**

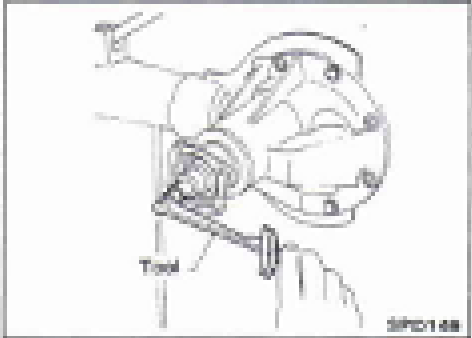
**1.3 - 1.6 N·m**

**(13 - 16 kg-cm, 11 - 14 in-lb)**

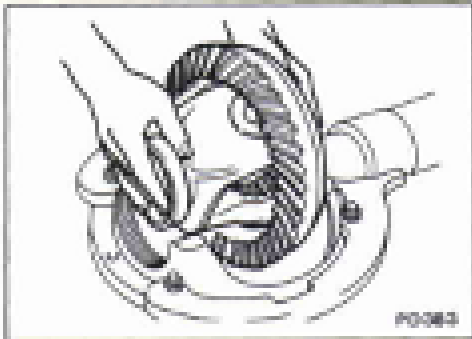
**H260**

**1.5 - 1.7 N·m**

**(15 - 17 kg-cm, 13 - 15 in-lb)**



10. Install differential case assembly with side bearing outer races into gear carrier.

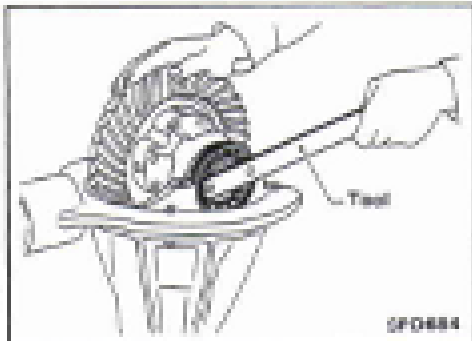


11. Position side bearing adjusters on gear carrier with threads properly engaged; screw in adjusters lightly at this stage of assembly.

**Tool number:**

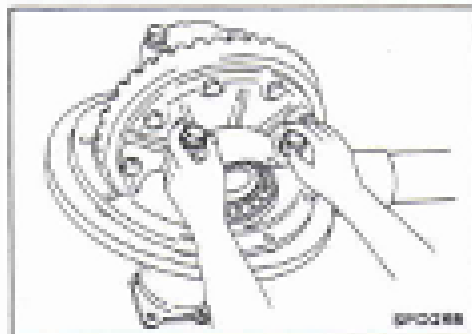
**H233B: ST32580000**

**H260: ST32530000**



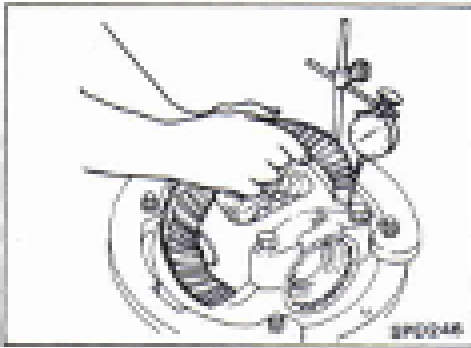
12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.

- Do not tighten at this point to allow further tightening of side bearing adjusters.



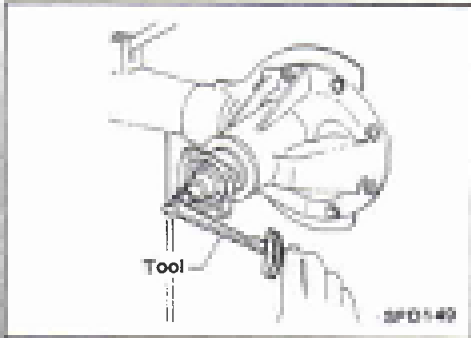
## ASSEMBLY

### Differential Carrier (Cont'd)



13. Tighten both right and left side bearing adjusters alternately and measure ring gear backlash and total preload at the same time. Adjust right and left side bearing adjusters by tightening them alternately so that proper ring gear backlash and total preload can be obtained.

**Ring gear-to-drive pinion backlash:**  
0.15 - 0.20 mm (0.0059 - 0.0079 in)



- When checking preload, turn drive pinion in both directions several times to set bearing rollers.

**Tool number: ST3127S000**

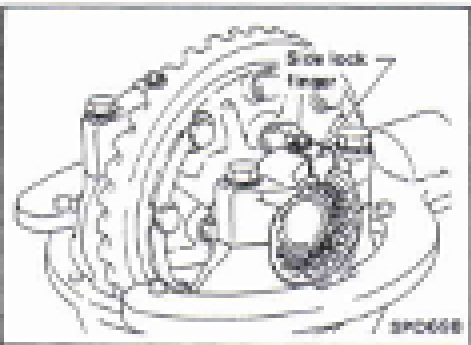
**Total preload:**

**H233B**

1.8 - 2.5 N·m  
(18 - 25 kg-cm, 16 - 22 in-lb)

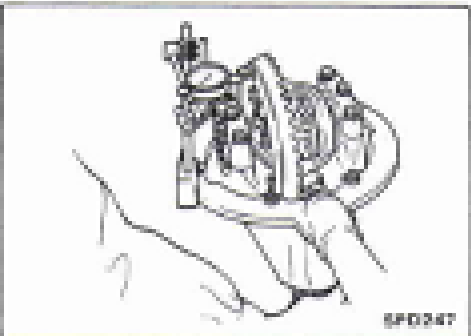
**H260**

1.7 - 2.5 N·m  
(17 - 25 kg-cm, 15 - 22 in-lb)



14. Tighten side bearing cap bolts.

15. Install side lock finger in place to prevent rotation during operation.



16. Check runout of ring gear with a dial indicator.

**Runout limit: 0.08 mm (0.0031 in)**

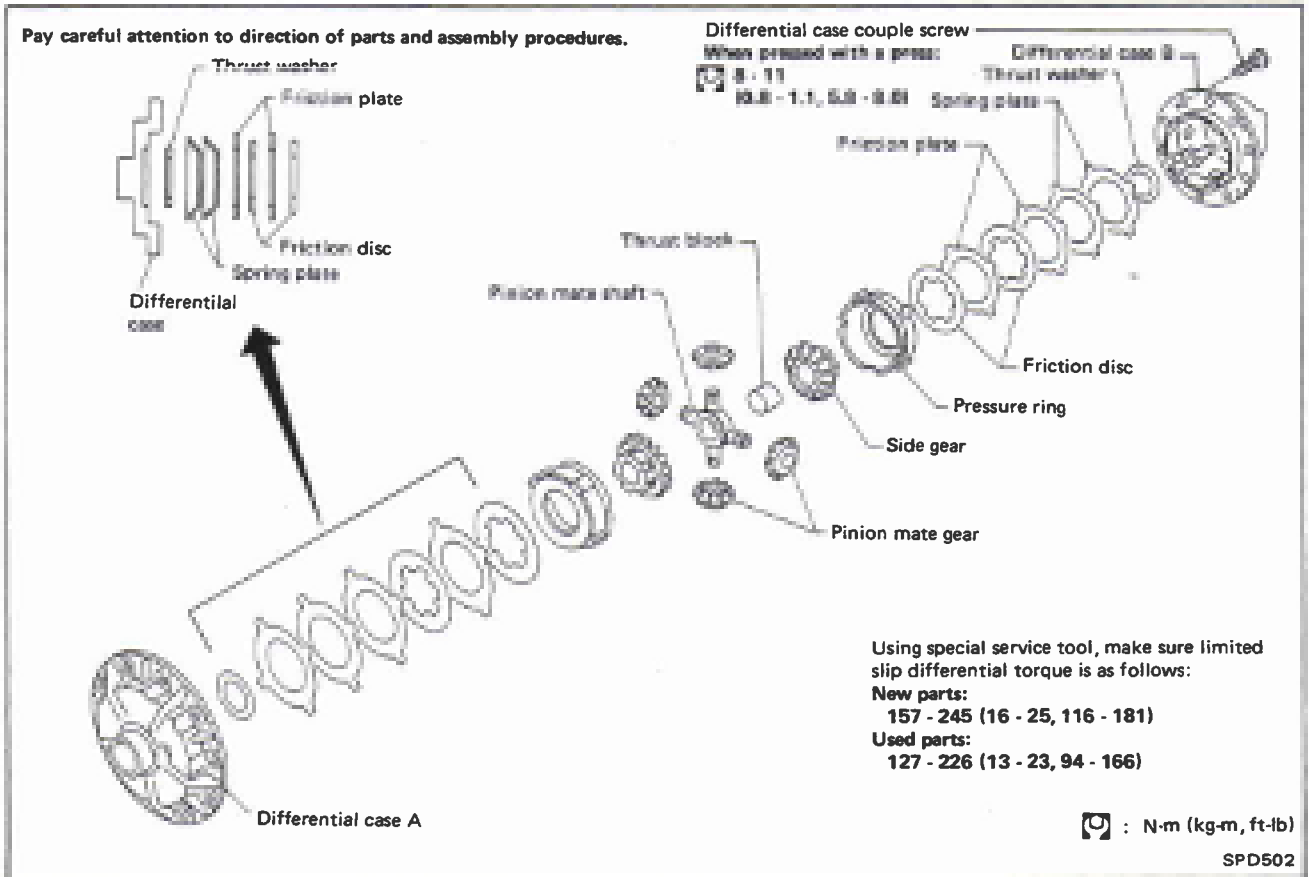
- If backlash varies excessively in different places, foreign matter may be caught between the ring gear and the differential case.

- If the backlash varies greatly when the ring gear runout is within a specified range, replace the hypoid gear set or differential case.

17. Check tooth contact. (Refer to Adjustment.)



## LIMITED SLIP DIFFERENTIAL (For H260)



### CAUTION:

Do not run engine when one wheel (rear) is off the ground.

### Preparation for Disassembly

#### CHECKING DIFFERENTIAL TORQUE

Measure differential torque and ensure that it is in the specified range.

#### Differential torque:

##### New parts

157 - 245 N·m (16 - 25 kg·m, 116 - 181 ft·lb)

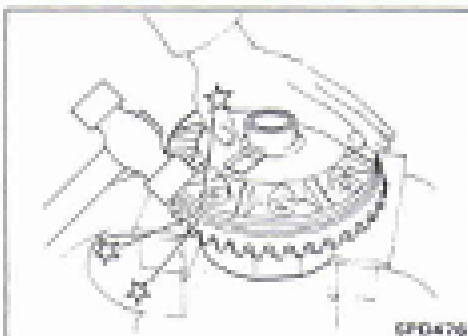
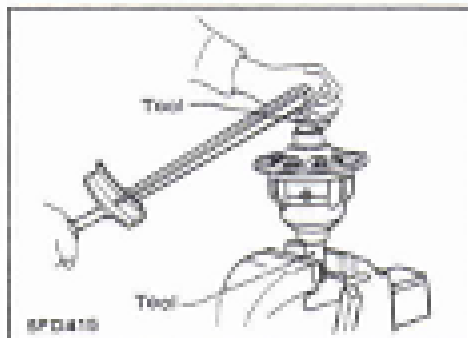
##### Used parts

127 - 226 N·m (13 - 23 kg·m, 94 - 166 ft·lb)

##### Tool number:

KV38106400 (Except for Middle East)

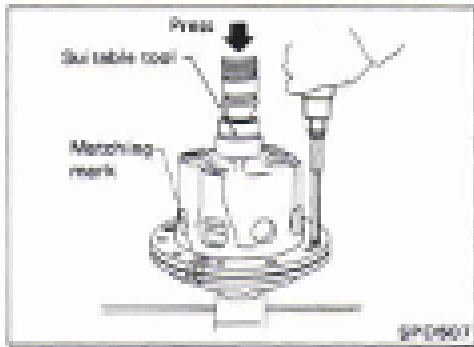
KV38107100 (Middle East)



### Disassembly

1. Remove side bearing inner race with Tool.
  2. Loosen ring gear bolts in a criss-cross fashion.
  3. Tap ring gear off gear case using a soft hammer.
- Tap evenly all around to keep ring gear from binding.

## LIMITED SLIP DIFFERENTIAL (For H260)



### Disassembly (Cont'd)

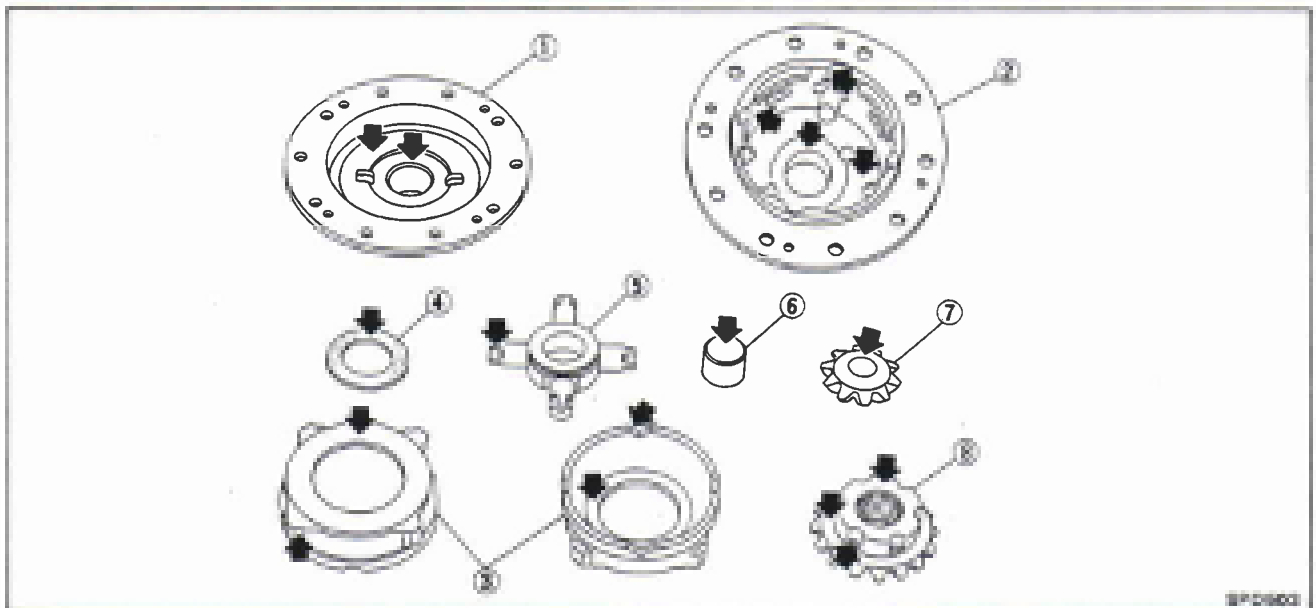
4. Loosen screws on differential cases A and B using a press.
5. Separate differential cases A and B. Draw out component parts (discs and plates, etc.).

Put marks on gears, discs and plates so that they can be reinstalled in their original positions from which they were removed.

### Inspection

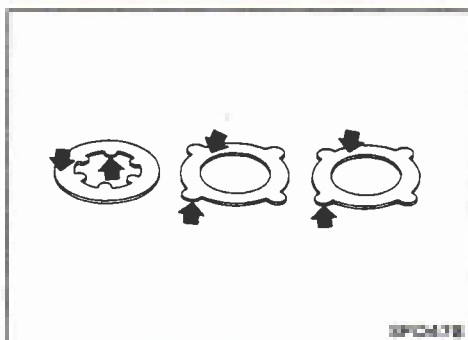
#### CONTACT SURFACES

1. Clean the disassembled parts in suitable solvent and blow dry with compressed air.
2. If following surfaces are found with burrs or scratches, smooth with oil stone.
  - ① Differential case A
  - ② Differential case B
  - ③ Pressure ring
  - ④ Thrust washer
  - ⑤ Pinion mate shaft
  - ⑥ Thrust block
  - ⑦ Pinion mate gear
  - ⑧ Side gear



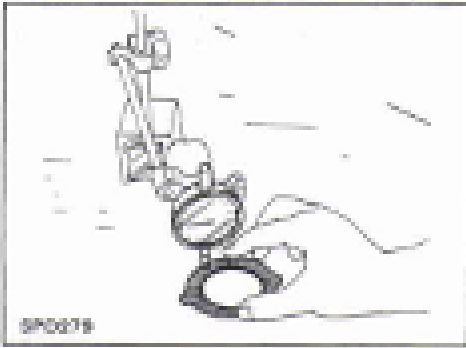
#### DISC AND PLATE

1. Clean the discs and plates in suitable solvent and blow dry with compressed air.
2. Inspect discs and plates for wear, nicks and burrs.



## LIMITED SLIP DIFFERENTIAL (For H260)

### Inspection (Cont'd)

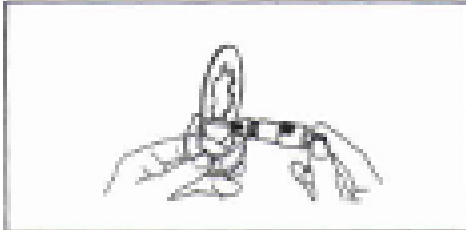


3. To test if friction disc or plate is not distorted, place it on a surface plate and rotate it by hand with indicating finger of dial gauge resting against disc or plate surface.

Maximum allowable warpage:

0.08 mm (0.0031 in)

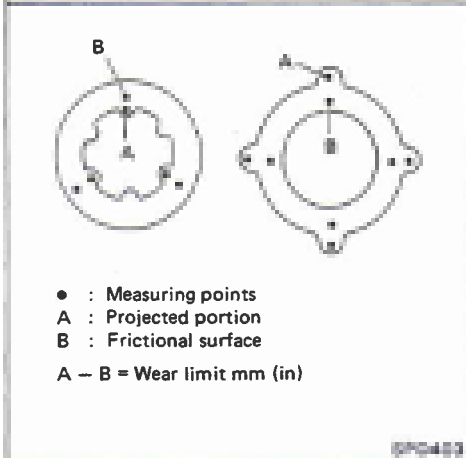
If it exceeds limits, replace with a new plate to eliminate possibility of clutch slippage or sticking.



4. Measure frictional surfaces and projected portions of friction disc, friction plate, spring plate, and determine each part's differences to see if the specified wear limit has been exceeded. If any part has worn beyond the wear limit, replace it with a new one that is the same thickness as the projected portion.

Wear limit:

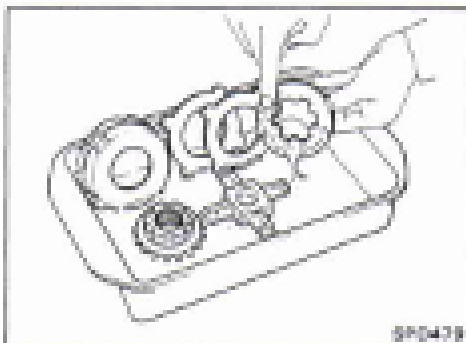
0.1 mm (0.004 in) or less



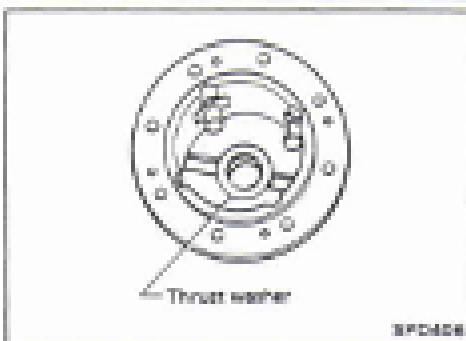
### Assembly

Assemble differential case in the reverse order of disassembly, observing the following.

1. As an aid to installation, apply sufficient amounts of recommended limited slip differential gear oil (refer to MA section) to the faces of pressure rings, discs and plates to be assembled together.



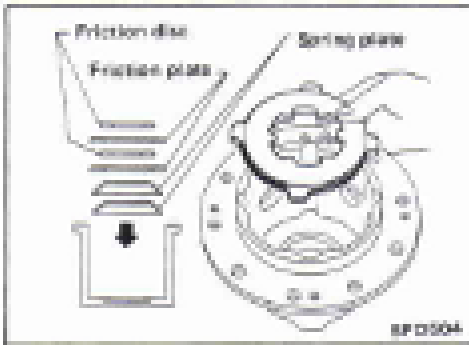
2. Place differential case B on a level surface, then install thrust washer.



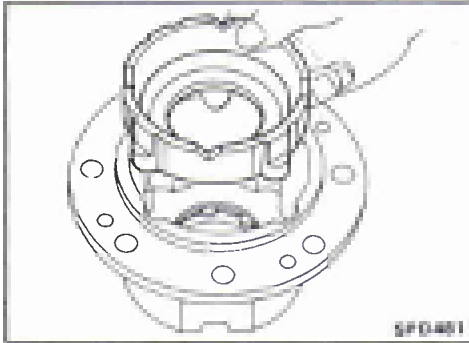
## LIMITED SLIP DIFFERENTIAL (For H260)

### Assembly (Cont'd)

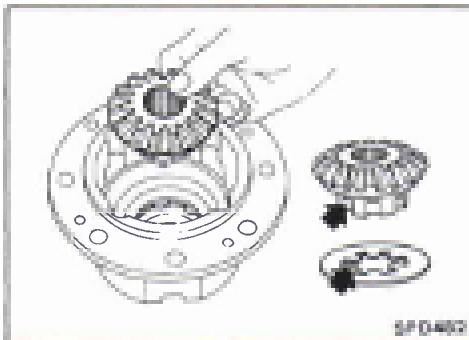
3. Install spring plates, friction plates and friction discs. **Pay particular attention to the direction of clutch plates and their assembly sequence.**



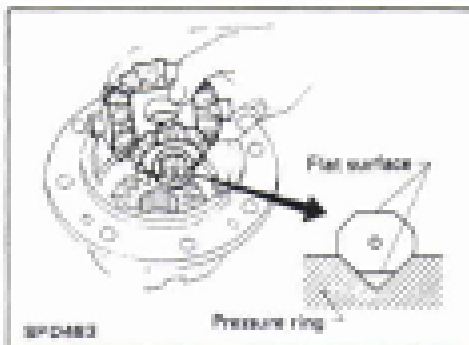
4. Install pressure ring.



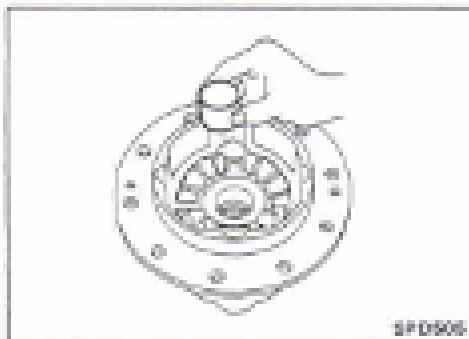
5. Install side gear by inserting projected portion of disc.



6. Install pinion mate gears and shaft. **Always attach pinion mate shaft to "V" groove in pressure ring with flat surfaces facing up and down.**

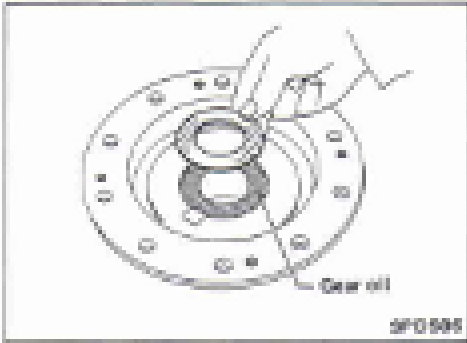


7. Install thrust block.

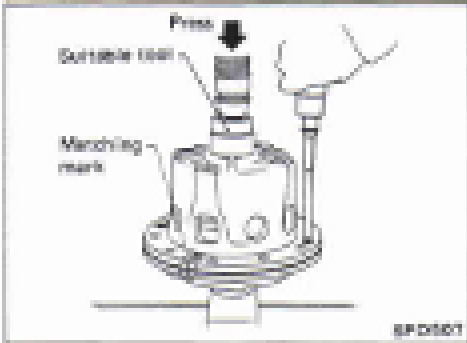


## LIMITED SLIP DIFFERENTIAL (For H260)

### Assembly (Cont'd)



8. Install differential case A side components in the opposite way of differential case B components.
9. Apply gear oil to differential case A, and attach thrust washer to it.

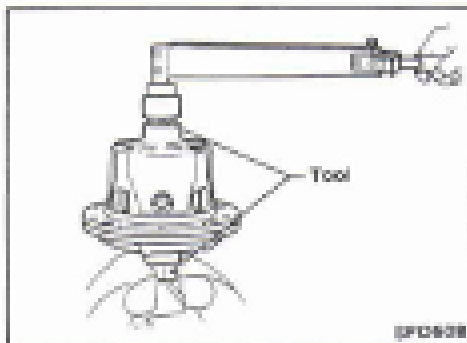


10. Install differential case A on differential case B. Align the matching marks on the cases, then install screws while pushing differential case down using a press.

#### Press force:

**7,846 N (800 kg, 1,764 lb)**

11. After all parts have been assembled, check and adjust the following:



#### Differential torque inspection:

- a. Place side gear in a vise with Tool into the gear splines.
- b. Turn side gear several times, then measure the differential torque after side gear begins to rotate in order to determine whether it is within the specified range. If it is not, adjust it by selecting a friction disc. (Refer to S.D.S. for adjustment parts.)

#### Differential torque:

##### New parts

**157 - 245 N·m (16 - 25 kg-m, 116 - 181 ft-lb)**

##### Used parts

**127 - 226 N·m (13 - 23 kg-m, 94 - 166 ft-lb)**

#### Tool number:

**KV38106400 (Except for Middle East)**

**KV38107100 (Middle East)**

## LIMITED SLIP DIFFERENTIAL (For H260)

### Assembly (Cont'd)

#### Side gear backlash inspection:

Check backlash of side gear on both sides. Using a thickness gauge, measure clearance between side gear and thrust washer. If it is not within specifications, adjust it by selecting a thrust washer. (Refer to S.D.S.)

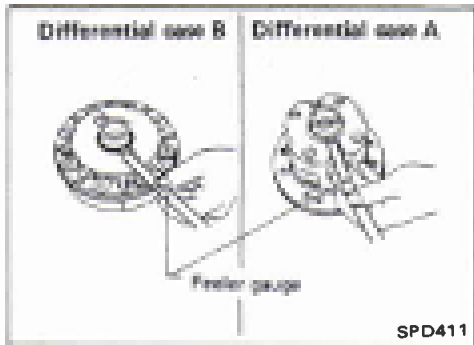
#### Side gear backlash:

##### Differential case A side

0.05 - 0.20 mm (0.0020 - 0.0079 in)

##### Differential case B side

0.05 - 0.20 mm (0.0020 - 0.0079 in)



12. After checking and adjusting, tighten ring gear bolts in criss-cross fashion.
13. Bend up lock straps to lock bolts in place.
14. Install side bearing inner race with Tool.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Propeller Shaft

#### GENERAL SPECIFICATIONS

Item	Applied model	Hardtop	Wagon	Pickup
Propeller shaft model				
Front		2F80B		2F80B-D
Rear		2F100H		
Number of joints		2		
Type of journal bearings		Solid (Disassembly type)		
Coupling type with transmission		Flange		
Distance between yokes				
Front	mm (in)	86 (3.34)		
Rear	mm (in)	100.0 (4.25)		
Shaft length (Solder-to-solder)				
Front	mm (in)	810.0 (31.89)		810.0 (31.89)
Rear	mm (in)	460.0 (18.11)	1,025.0 (40.35)	875.0 (34.45)
Shaft outer diameter				
Front	mm (in)	50.8 (2.000)		
Rear	mm (in)	52.8 (2.082)		

#### SERVICE DATA

Propeller shaft model	2F80B, 2F80B-D, 2F100H	
Propeller shaft runout limit	mm (in)	0.5 (0.024)
Journal axial play	mm (in)	0.02 (0.0008)

#### AVAILABLE SNAP RINGS 2F80B, 2F80B-D

Thickness mm (in)	Color	Part number
1.49 (0.0587)	White	39646-21001
1.52 (0.0598)	Yellow	39647-21001
1.55 (0.0610)	Red	39648-21001
1.58 (0.0622)	Green	39649-21001
1.61 (0.0634)	Blue	39646-21002
1.64 (0.0646)	Brown	39647-21002
1.67 (0.0657)	Black	39648-21002

#### 2F100H

Thickness mm (in)	Color	Part number
1.95 (0.0768)	White	37146-61501
2.00 (0.0787)	Yellow	37147-61501
2.05 (0.0807)	Red	37148-61501
2.10 (0.0827)	Green	37149-61501
2.15 (0.0846)	Blue	37150-61501

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Differential Carrier

#### GENERAL SPECIFICATIONS

##### Hardtop and Wagon

Applied model Item	Except models listed on the right	Deluxe models with T842 engine and M/T, for Australia		
Final drive model	H233B			
Front	H233B			
Rear	H233B			
Number of pinions	3			
Front	3			
Rear	4			
Gear ratio	Standard	Option *1, *2	Standard	Option*3
	4.111	3.900	3.900	4.111
Number of teeth Ring gear	37	39	39	37
Drive pinion	9	10	10	9
Oil capacity (Approx.)	5.4 (5-3/4)			
Front ℓ (Imp qt)	5.4 (5-3/4)			
Rear ℓ (Imp qt)	2.1 (1-7/8)			

\*1: Except for deluxe models with TD42 engine and M/T, and Hardtop models without rear seat

\*2: For Gulf standard A/T models

\*3: For Australia Wagon models only

##### Pickup

Applied engine	T842	TD42
Final drive model	H233B	
Front	H233B	
Rear	H233B	
Number of pinions	4	
Front	4	
Rear	4	
Gear ratio	4.111	4.375
Number of teeth Ring gear	37	38
Drive pinion	9	9
Oil capacity (Approx.)	4.5 (5-1/4)	
Front ℓ (Imp qt)	4.5 (5-1/4)	
Rear ℓ (Imp qt)	4.7 (4-1/8)	

### Differential Carrier — H233B

#### SERVICE DATA

Drive pinion bearing adjusting method	Pinion bearing adjusting washer
Backlash of pinion and ring gear mm (in)	0.15 - 0.20 (0.0059 - 0.0079)
Drive pinion preload N-m (kg-cm, in-lb)	
Without front oil seal	1.2 - 1.5 (12 - 15, 10 - 13)
With front oil seal	1.3 - 1.6 (13 - 16, 11 - 14)
Side bearing adjusting method	Side adjuster
Backlash of side gear and pinion main gear mm (in)	0.15 - 0.20 (0.0059 - 0.0079)
Ring gear runout limit mm (in)	0.08 (0.0031)
Total preload N-m (kg-cm, in-lb)	1.8 - 2.5 (18 - 25, 16 - 22)



## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Differential Carrier — H233B (Cont'd)

#### AVAILABLE WASHERS

##### Pinion height adjusting washer

Thickness mm (in)	Part number
2.58 (0.1016)	38151-01J00
2.61 (0.1028)	38151-01J01
2.64 (0.1039)	38151-01J02
2.67 (0.1051)	38151-01J03
2.70 (0.1063)	38151-01J04
2.73 (0.1075)	38151-01J05
2.76 (0.1087)	38151-01J06
2.79 (0.1098)	38151-01J07
2.82 (0.1110)	38151-01J08
2.85 (0.1122)	38151-01J09
2.88 (0.1134)	38151-01J10
2.91 (0.1146)	38151-01J11
2.94 (0.1157)	38151-01J12
2.97 (0.1169)	38151-01J13
3.00 (0.1181)	38151-01J14
3.03 (0.1193)	38151-01J15
3.06 (0.1205)	38151-01J16
3.09 (0.1217)	38151-01J17
3.12 (0.1228)	38151-01J18
3.15 (0.1240)	38151-01J19
3.18 (0.1252)	38151-01J60
3.21 (0.1264)	38151-01J61
3.24 (0.1276)	38151-01J62
3.27 (0.1287)	38151-01J63
3.30 (0.1299)	38151-01J64
3.33 (0.1311)	38151-01J65
3.36 (0.1323)	38151-01J66
3.39 (0.1335)	38151-01J67
3.42 (0.1346)	38151-01J68
3.45 (0.1358)	38151-01J69
3.48 (0.1370)	38151-01J70
3.51 (0.1382)	38151-01J71
3.54 (0.1394)	38151-01J72
3.57 (0.1406)	38151-01J73
3.60 (0.1417)	38151-01J74
3.63 (0.1429)	38151-01J75
3.66 (0.1441)	38151-01J76

##### Pinion bearing adjusting washer

Thickness mm (in)	Part number
0.40 (0.0157)	24127-4301P
0.45 (0.0177)	24127-4302P
0.50 (0.0197)	24127-4303P
0.55 (0.0217)	24127-4304P
0.60 (0.0236)	24127-4305P
0.65 (0.0256)	24127-4306P
0.70 (0.0276)	24127-4307P
0.75 (0.0295)	24127-4308P

##### Side gear thrust washer

Thickness mm (in)	Part number
1.75 (0.0689)	38424-T5000
1.80 (0.0709)	38424-T5001
1.85 (0.0728)	38424-T5002

#### TIGHTENING TORQUE

Unit	N-m	kg-m	ft-lb
<b>Rear differential carrier to axle case</b>			
Wagon and Hardtop	54 - 64	5.5 - 6.5	40 - 47
Pickup	33 - 40	3.4 - 4.1	25 - 30
<b>Front differential carrier to axle case</b>			
	54 - 64	5.5 - 6.5	40 - 47

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Differential Carrier — H260

#### SERVICE DATA

Drive pinion bearing adjusting method	Pinion bearing adjusting washer
Backlash of pinion and ring gear mm (in)	0.15 - 0.20 (0.0059 - 0.0079)
Drive pinion preload N·m (kg-cm, in-lb)	
Without front oil seal	1.2 - 1.5 (12 - 15, 10 - 13)
With front oil seal	1.8 - 1.7 (18 - 17, 13 - 15)
Side bearing adjusting method	Side adjuster
Backlash of side gear and pinion mate gear mm (in)	0.15 - 0.20 (0.0059 - 0.0079)
Ring gear runout limit mm (in)	0.08 (0.0031)
Total preload N·m (kg-cm, in-lb)	1.7 - 2.5 (17 - 25, 15 - 22)

#### For limited slip differential model

The differences between limited slip differential model and conventional model are shown below.

Side gear backlash (Clearance between side gear and thrust washer) mm (in)	0.05 - 0.30 (0.0020 - 0.0118)
Differential torque N·m (kg-cm, ft-lb)	
New parts	157 - 245 (16 - 25, 116 - 181)
Used parts	127 - 226 (13 - 23, 94 - 166)
Allowable warpage for friction discs and plates mm (in)	0.08 (0.0031)
Wear limit for discs and plates mm (in)	0.1 (0.004)
Wear limit for thrust washers mm (in)	0.1 (0.004)

#### AVAILABLE WASHERS

##### Pinion height adjusting washer

Thickness mm (in)	Part number
2.60 (0.1024)	38153-82101
2.63 (0.1035)	38153-82102
2.66 (0.1047)	38153-82103
2.69 (0.1059)	38153-82104
2.72 (0.1071)	38153-82105
2.75 (0.1083)	38153-82106
2.78 (0.1094)	38153-82107
2.81 (0.1106)	38153-82108
2.84 (0.1118)	38153-82109
2.87 (0.1130)	38153-82110
2.90 (0.1142)	38153-82111
2.93 (0.1154)	38153-82112
2.96 (0.1165)	38153-82113
2.99 (0.1177)	38153-82114
3.02 (0.1189)	38153-82115
3.05 (0.1201)	38153-82116
3.08 (0.1213)	38153-82117
3.11 (0.1224)	38153-82118
3.14 (0.1236)	38153-82119
3.17 (0.1248)	38153-82120

##### Pinion bearing adjusting washer

Thickness mm (in)	Part number
2.31 (0.0909)	38125-82100
2.33 (0.0917)	38126-82100
2.35 (0.0925)	38127-82100
2.37 (0.0933)	38128-82100
2.39 (0.0941)	38129-82100
2.41 (0.0949)	38130-82100
2.43 (0.0957)	38131-82100
2.45 (0.0965)	38132-82100
2.47 (0.0972)	38133-82100
2.49 (0.0980)	98134-82100
2.51 (0.0988)	38135-82100
2.53 (0.0996)	38136-82100
2.55 (0.1004)	38137-82100
2.57 (0.1012)	38138-82100
2.59 (0.1020)	38139-82100

##### Pinion bearing adjusting spacer

Thickness mm (in)	Part number
4.50 (0.1772)	38185-78000
4.75 (0.1870)	38186-78000
5.00 (0.1969)	38187-78000

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Differential Carrier — H260 (Cont'd)

#### Side gear thrust washer

##### Conventional model

Thickness mm (in)	Part number
1.55 (0.0610)	38424-61500
1.60 (0.0630)	38424-61501
1.65 (0.0650)	38424-61502

##### Limited slip differential model

Thickness mm (in)	Color	Part number
1.55 - 1.65 (0.0610 - 0.0630)	—	38434-38010
1.43 - 1.47 (0.0563 - 0.0579)	White	38434-C8700
1.73 - 1.77 (0.0681 - 0.0697)	Yellow	38434-C8701

#### AVAILABLE DISCS AND PLATES FOR LIMITED SLIP DIFFERENTIAL

Part name	Thickness mm (in)	Part number
Friction disc	2.38 - 2.42 (0.0937 - 0.0953)	38433-C8700
	2.38 - 2.42 (0.0937 - 0.0953)	38432-C8700
Friction plate	2.48 - 2.52 (0.0976 - 0.0992)	38432-C8701
	2.38 - 2.42 (0.0937 - 0.0953)	38435-76010
Spring plate	2.38 - 2.42 (0.0937 - 0.0953)	38435-76010

#### TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Differential carrier to axle case	27 - 36	2.8 - 3.7	20 - 27

# FRONT AXLE & FRONT SUSPENSION

## SECTION **FA**

### CONTENTS

PRECAUTION .....	FA- 2
PREPARATION .....	FA- 3
FRONT AXLE AND FRONT SUSPENSION .....	FA- 4
CHECK AND ADJUSTMENT — On-vehicle .....	FA- 6
FRONT AXLE — Drive-flange and Free-running Hub .....	FA-13
FRONT AXLE — Manual-lock Free-running Hub .....	FA-14
FRONT AXLE — Auto-lock Free-running Hub .....	FA-16
FRONT AXLE — Wheel Hub and Rotor Disc .....	FA-18
FRONT AXLE — Knuckle Flange .....	FA-21
FRONT AXLE — Axle Shaft .....	FA-27
FRONT SUSPENSION — Leaf Spring Type .....	FA-28
FRONT SUSPENSION — Coil Spring Type .....	FA-29
FRONT SUSPENSION — Leaf Spring Type .....	FA-30
FRONT SUSPENSION — Coil Spring Type .....	FA-32
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	FA-34

## PRECAUTION

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- When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.
  - \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Use Tool when removing or installing brake tubes.

# PREPARATION

## SPECIAL SERVICE TOOLS

\*: Special tool or commercial equivalent

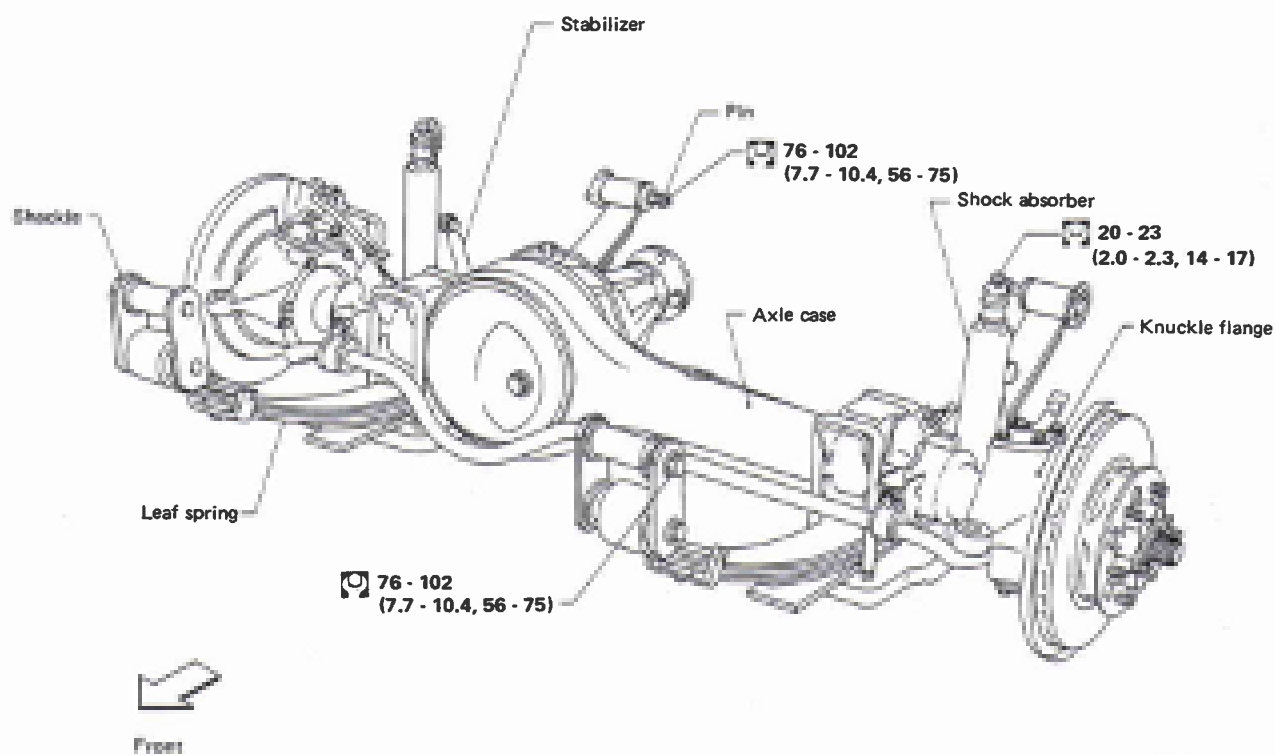
Tool number Tool name	Description	
<p>KV401021S0* Bearing outer race drift</p> <p>① ST35325000* Drift bar</p> <p>② KV40102110* Drift (A)</p> <p>③ KV40102120* Drift (B)</p> <p>④ KV40102130* Screw (A)</p> <p>⑤ KV40102140* Screw (B)</p> <p>⑥ KV40102150* Screw (C)</p>		<p>Installing wheel bearing outer race</p>
<p>KV40105400 Wheel bearing lock nut wrench</p>		<p>Removing or installing wheel bearing lock nut</p>
<p>GG94310000* Flare nut torque wrench</p>		<p>Removing and installing brake piping</p>

## FRONT AXLE AND FRONT SUSPENSION

### LEAF SPRING TYPE

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

\* Fuel, radiator coolant and engine oil full.  
Spare tire, jack, hand tools and mats in designated positions.



 : N·m (kg·m, ft·lb)

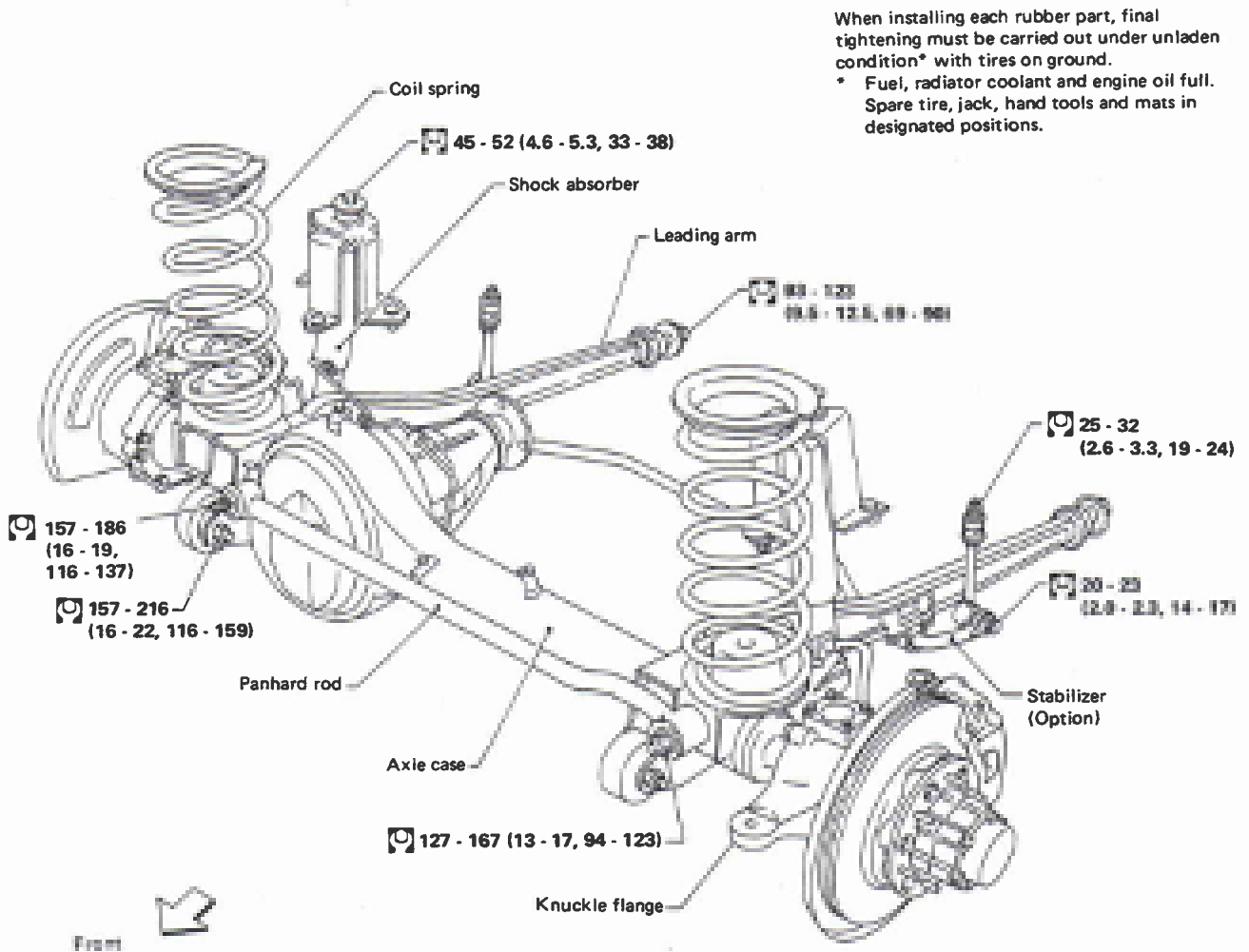
#### Wheel bearing

- Axial end play:  
0 - 0.08 mm (0 - 0.0031 in)
- Tightening torque:  
Refer to FA-7 and 8.
- Wheel bearing preload  
(As measured at wheel hub bolt):  
0 - 18.6 N (0 - 1.9 kg, 0 - 4.2 lb)
- When measuring preload, do not include  
"dragging" resistance with brake pads.
- Wheel alignment:  
Refer to S.D.S.

SFA410A

# FRONT AXLE AND FRONT SUSPENSION

## COIL SPRING TYPE



When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

\* Fuel, radiator coolant and engine oil full.  
Spare tire, jack, hand tools and mats in designated positions.

: N·m (kg·m, ft·lb)

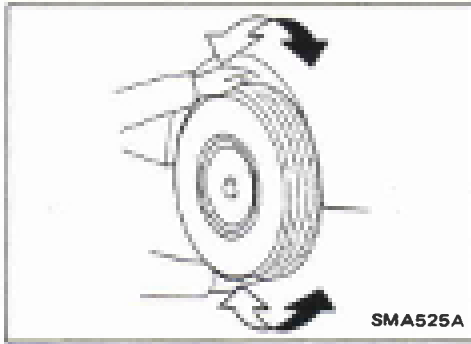
### Wheel bearing

- Axial end play:  
0 - 0.08 mm (0 - 0.0031 in)
- Tightening torque:  
Refer to FA-7 and 8.
- Wheel bearing preload  
(As measured at wheel hub bolt):  
0 - 18.6 N (0 - 1.9 kg, 0 - 4.2 lb)
- When measuring preload, do not include "dragging" resistance with brake pads.
- Wheel alignment:  
Refer to S.D.S.

SFA411A

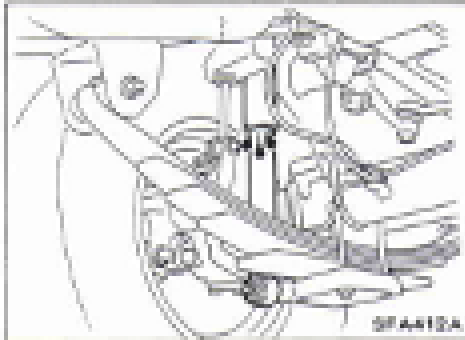


## CHECK AND ADJUSTMENT — On-vehicle

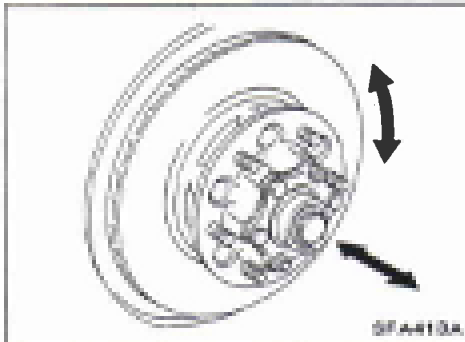


### Front Axle and Front Suspension Parts

- Check front axle and front suspension parts for looseness, cracks, wear or other damage.
- (1) Shake each front wheel.
  - (2) Make sure that cotter pin is inserted.
  - (3) Retighten all nuts and bolts to the specified torque.  
**Tightening torque: Refer to FA-28 and FA-29.**
  - (4) Check front axle and front suspension parts for wear, cracks or other damage.



- Check shock absorber for oil leakage or other damage.



### Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.

#### Axial end play:

0 - 0.08 mm (0 - 0.0031 in)

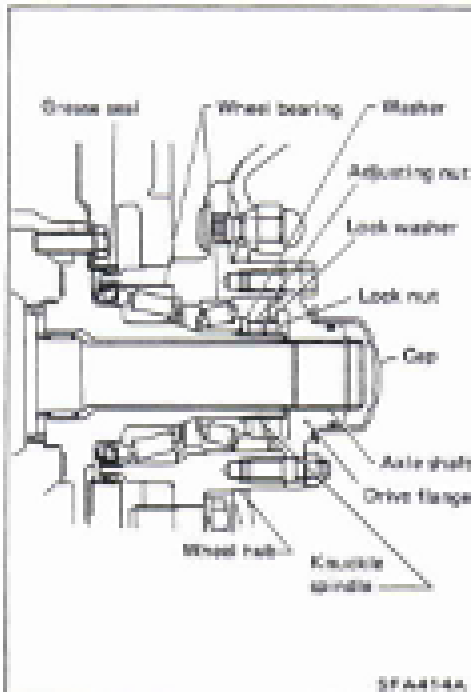
- Adjust wheel bearing preload if there is any axial end play or wheel bearing does not turn smoothly.

### PRELOAD ADJUSTMENT

**Adjust wheel bearing preload after wheel bearing has been replaced or front axle has been reassembled.**

Adjust wheel bearing preload as follows:

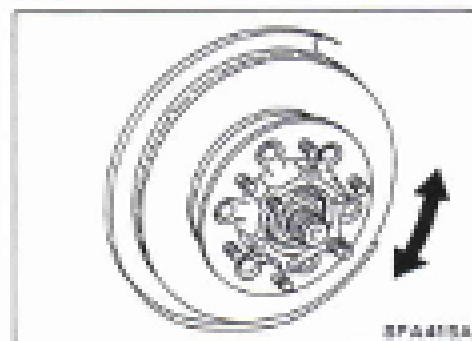
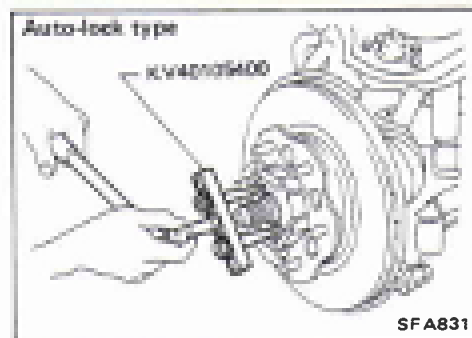
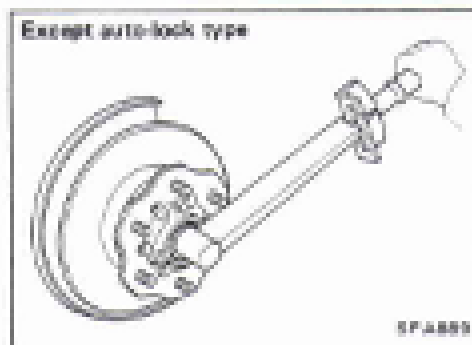
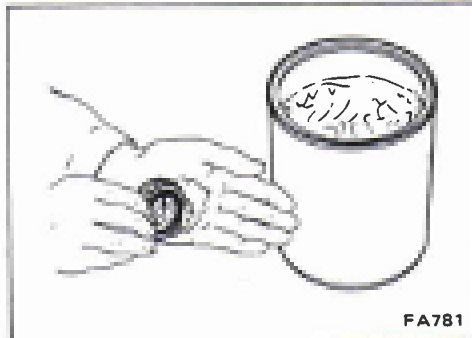
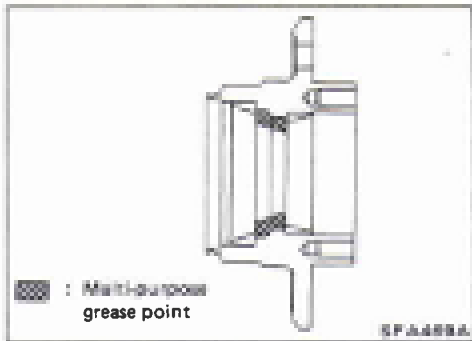
1. Before adjustment, thoroughly clean all parts to prevent dirt entry.



## CHECK AND ADJUSTMENT — On-vehicle

### Front Wheel Bearing (Cont'd)

2. Apply multi-purpose grease sparingly to the following parts.
  - Wheel hub



- Wheel bearing

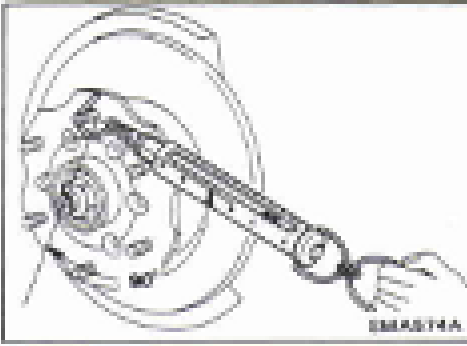
- Grease seal lip
  - Contact surface of adjusting nut
3. Tighten wheel bearing adjusting nut with tool.
    - : 167 - 196 N·m  
(17 - 20 kg-m, 123 - 145 ft-lb)
  4. Turn wheel hub several times in both directions.
  5. Loosen wheel bearing adjusting nut so that torque becomes 0 N·m (0 kg-m, 0 ft-lb).
  6. Retighten wheel bearing adjusting nut with tool.
    - : 3 - 5 N·m  
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

7. Turn wheel hub several times in both directions.
8. Retighten wheel bearing adjusting nut with tool.
  - : 3 - 5 N·m  
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)
9. Again turn wheel hub several times in both directions.

## CHECK AND ADJUSTMENT — On-vehicle

### Front Wheel Bearing (Cont'd)

10. Measure starting force "A" at wheel hub bolt.



11. Turn adjusting nut in tightening direction and measure starting force "B".

12. Wheel bearing preload "C" can be calculated as shown below.

$$C = B - A$$

Wheel bearing preload "C":

0 - 18.6 N

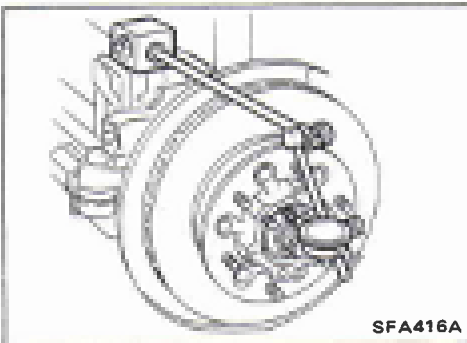
(0 - 1.9 kg, 0 - 4.2 lb)

13. If B - A exceeds 18.6 N (1.9 kg, 4.2 lb), loosen adjusting nut and adjust wheel bearing preload "C" to 0 to 18.6 N (0 to 1.9 kg, 0 to 4.2 lb) range.

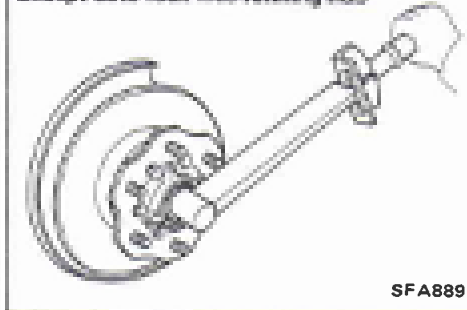
14. Measure wheel bearing axial end play.

Axial end play:

0 - 0.08 mm (0 - 0.0031 in)



Except auto-lock free-running hub

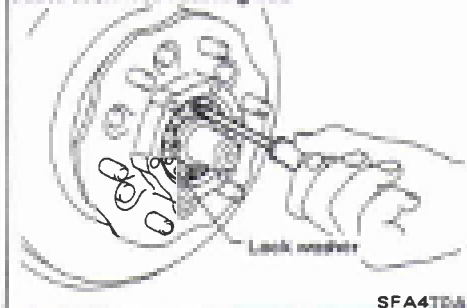


Except auto-lock free-running hub type

15. Install lock washer and lock nut.

$\square$ : 167 - 196 N·m (17 - 20 kg-m, 123 - 145 ft-lb)

Auto-lock free-running hub



Auto-lock free-running hub

● Tighten screw.

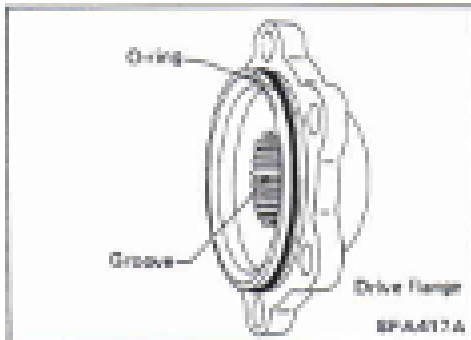
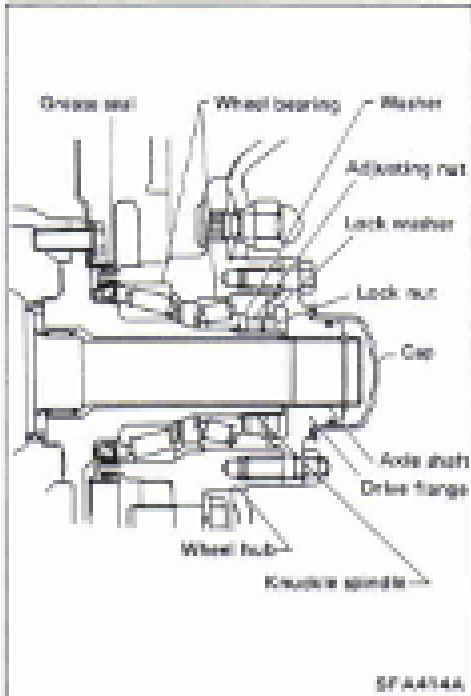
$\square$ : 1.2 - 1.6 N·m (0.12 - 0.16 kg-m, 0.9 - 1.2 ft-lb)

## CHECK AND ADJUSTMENT — On-vehicle

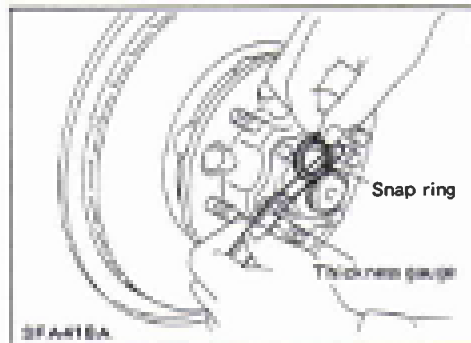
### Front Wheel Bearing (Cont'd)

#### Except auto-lock free-running hub type

16. After ensuring that wheel bearing preload and axial end play are within specified ranges (see steps 12 through 14 above), firmly bend lock washers at two places (approx. 180° apart).
17. Recheck to ensure that wheel bearing preload and axial end play are within specified ranges.



18. Pack drive flange groove with grease, apply grease to O-ring and mating surface of drive flange, and install flange.



19. Place snap ring in axle shaft groove. Choose snap ring so that the gap between groove and snap ring is 0 to 0.2 mm (0 to 0.008 in).

**Refer to S.D.S. for selection of snap ring.**

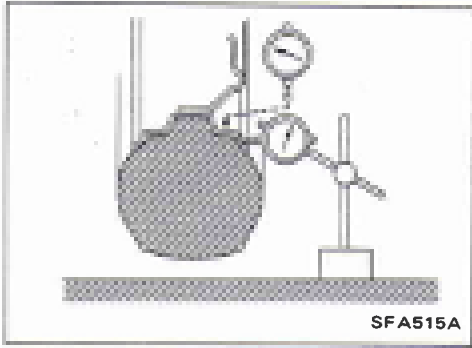
### Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection.

#### PRELIMINARY INSPECTION

1. Check the tires for wear and proper inflation.

## CHECK AND ADJUSTMENT — On-vehicle



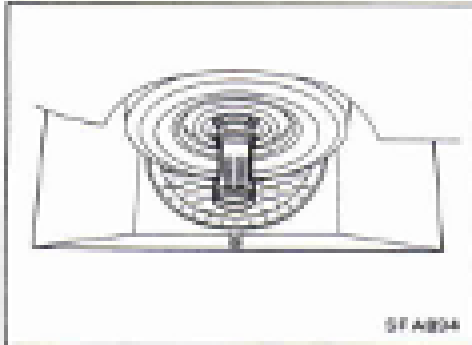
### Front Wheel Alignment (Cont'd)

2. Check the wheel runout.

**Radial and lateral runout:**

**Refer to S.D.S.**

3. Check the front wheel bearings for looseness.
4. Check the front suspension for looseness.
5. Check the steering linkage for looseness.
6. Check that the front shock absorbers work properly by using the standard bounce test.

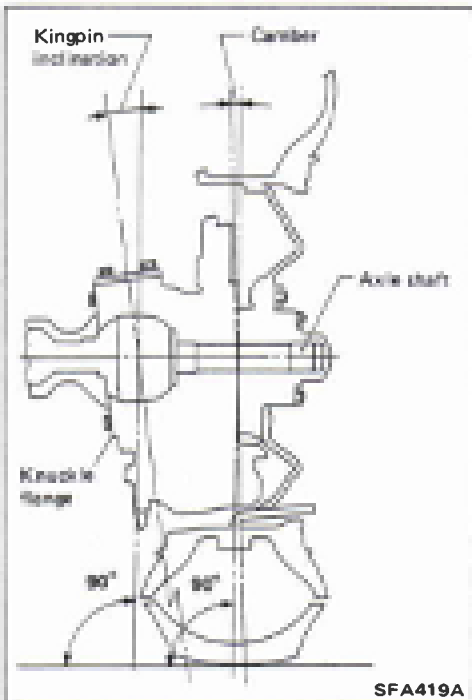


### CAMBER, CASTER AND KINGPIN INCLINATION

Before checking camber, caster or kingpin inclination, move vehicle up and down on turning radius gauge to minimize friction. Ensure that vehicle is in correct posture.

- Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.

**Camber, caster and kingpin inclination cannot be adjusted.**



#### Camber (Unladen)

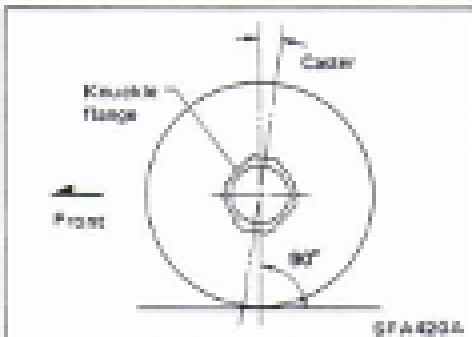
0° - 1°

- If measured value is not within above range, replace front axle case.

#### Kingpin inclination (Unladen)

7° - 8°

- If measured value is not within above range, replace front case, and upper and lower knuckle flange inner bearings.



#### Caster (Unladen)

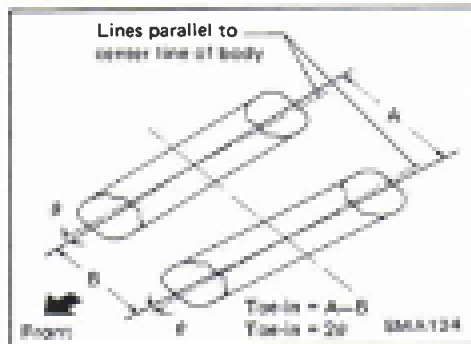
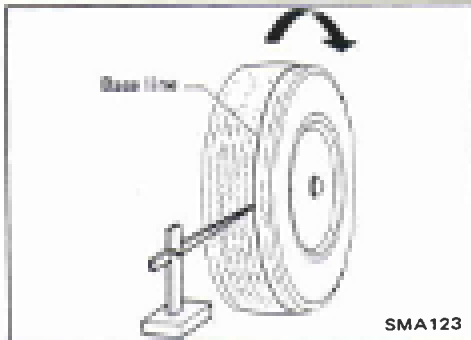
Pickup	2°50' - 3°50'
Hardtop	2°20' - 3°20'
Station Wagon	2°05' - 3°05'

If measured values are not within specified ranges indicated above, replace parts listed in table as follows.

## CHECK AND ADJUSTMENT — On-vehicle

### Front Wheel Alignment (Cont'd)

Suspension type	Parts to be replaced
Leaf spring	Leaf spring and upper and lower knuckle flange inner bearings
Coil spring	Leading arm and upper and lower knuckle flange inner bearings



#### TOE-IN

1. Mark a base line across the tread.

After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight ahead position.

2. Measure toe-in.

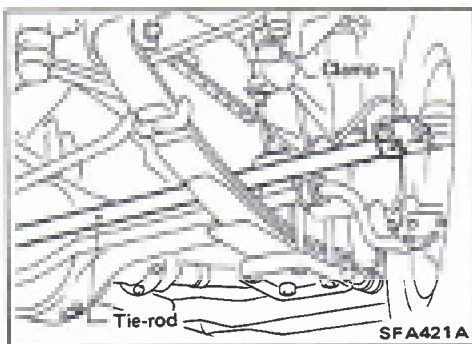
Measure distance "A" and "B" at the same height as hub center.

#### Toe-in (Unladen):

Toe-in is determined as shown below.

$$A - B \text{ mm (in)} / 2 \theta \text{ degree}$$

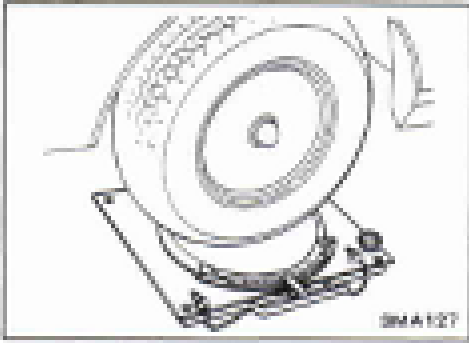
Tire type	Tire size	Pickup	Hardtop & Station Wagon
Radial	10R15 - 6PRLT	-	-2 to 0 (-0.08 to 0)/ -9' to 0'
	215/80R16 107Q 7.50R16	0 - 2	(0 - 0.08)/0' - 9'
Bias	-	1 - 3	(0.04 - 0.12)/9' - 18'



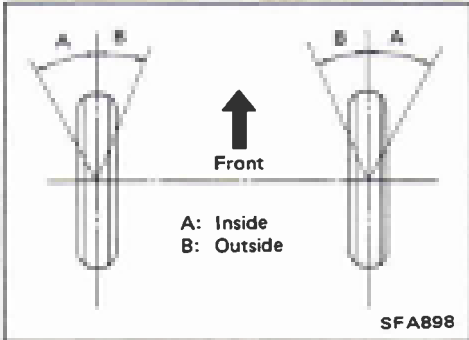
3. Adjust toe-in by varying the length of steering tie-rod.
4. Loosen clamp bolts.
5. Adjust toe-in by turning tie-rod back and forth.
6. Tighten clamp bolts and torque them.

## CHECK AND ADJUSTMENT — On-vehicle

### Front Wheel Alignment (Cont'd) WHEEL TURNING ANGLE



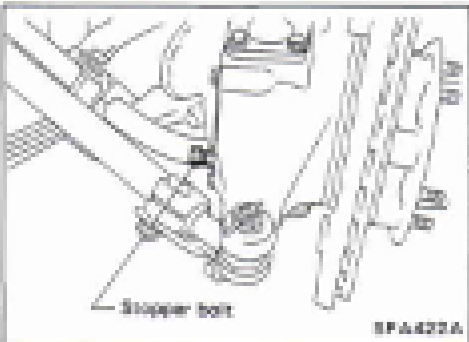
1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.



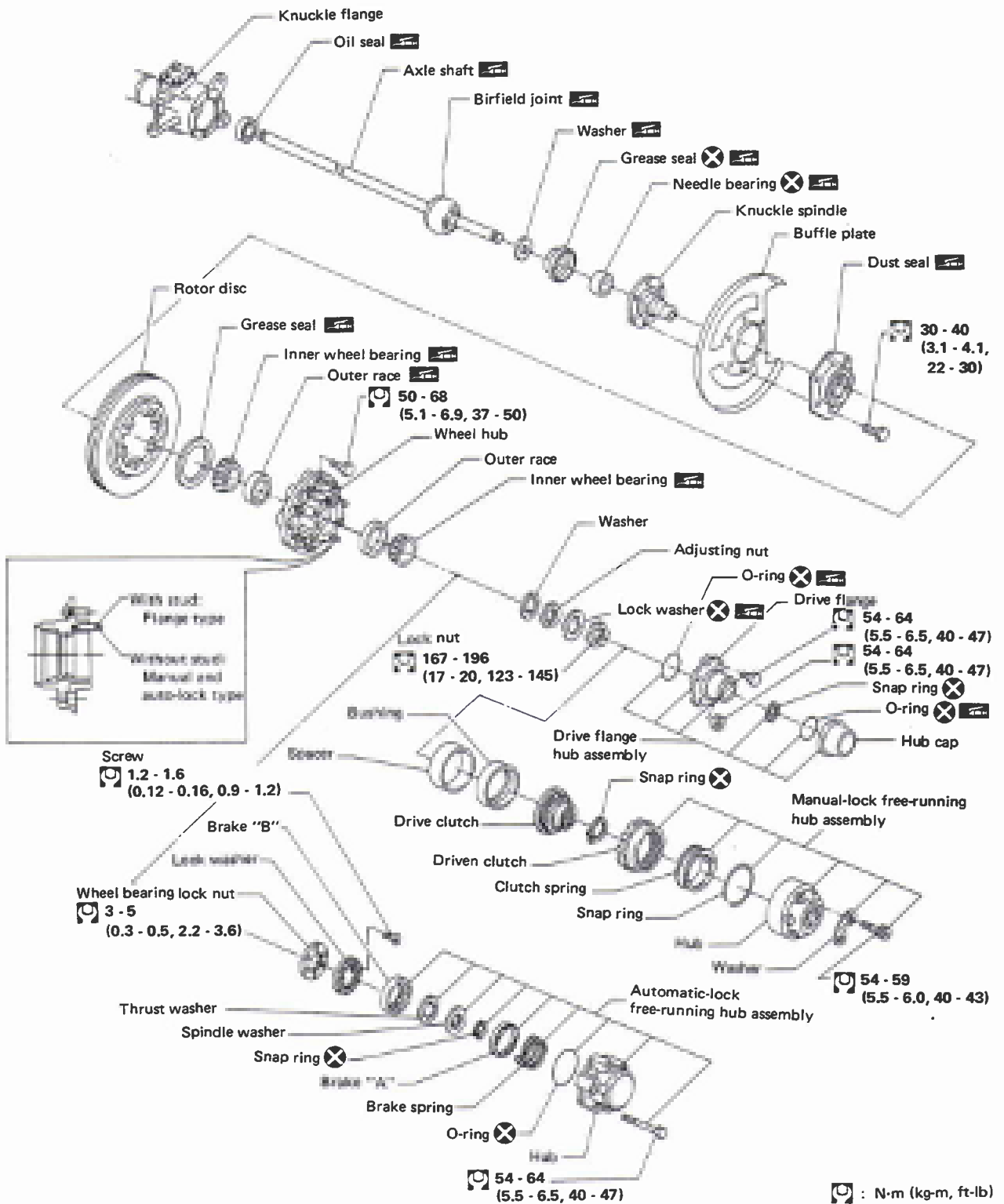
2. Rotate steering wheel all the way right and left; measure turning angle.

Wheel	Pickup	Hardtop & Station Wagon
Inside	28° - 30°	30° - 32°
Outside	28° - 30°	27° - 29°

3. Adjust by stopper bolt if necessary.  
⌘: 23 - 26 N·m  
(2.3 - 2.7 kg-m, 17 - 20 ft-lb)



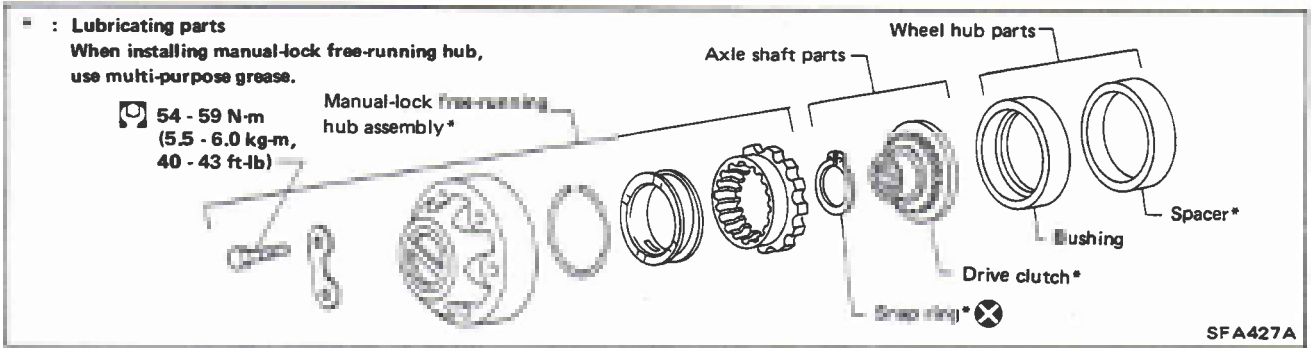
# FRONT AXLE — Drive-flange and Free-running Hub



SFA423A

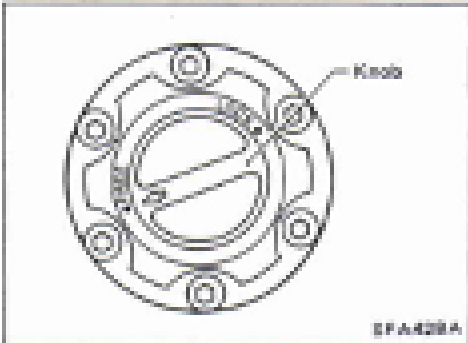


## FRONT AXLE — Manual-lock Free-running Hub

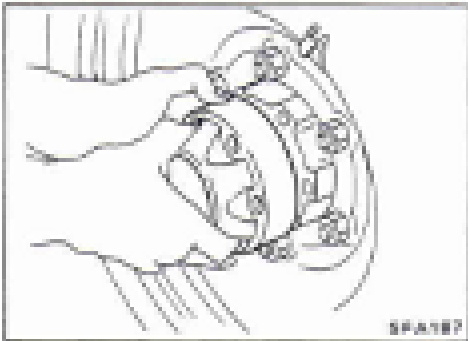


### Removal and Installation

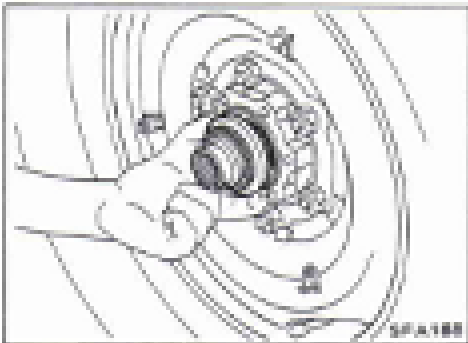
1. Set knob of manual-lock free-running hub to the "FREE" position.



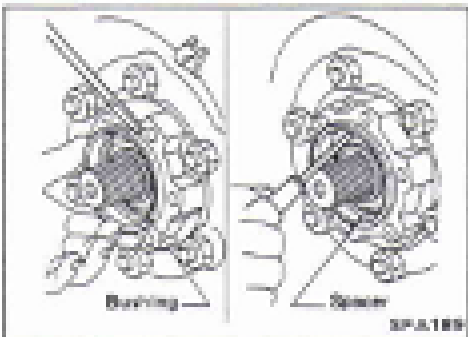
2. Loosen bolts and remove free-running hub assembly.



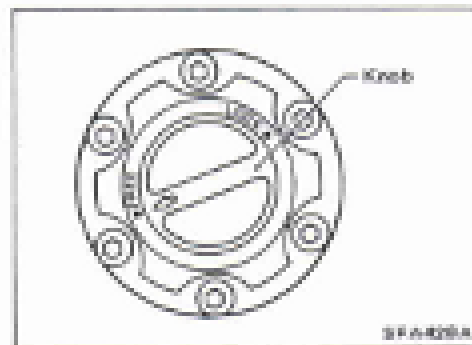
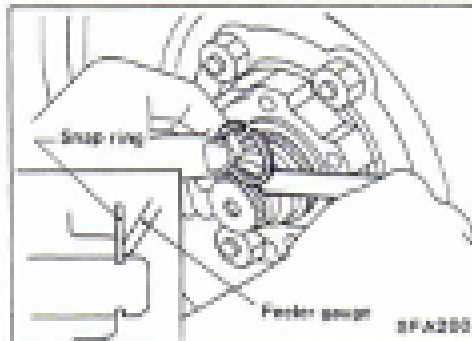
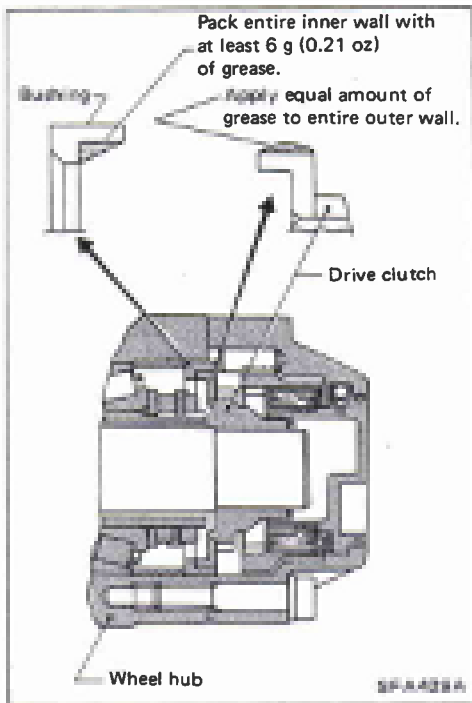
3. Remove snap ring and take off drive clutch.



4. Take out bushing and spacer from wheel hub.



## FRONT AXLE — Manual-lock Free-running Hub



### Installation

Install free-running hub in the reverse order of removal.

**Apply multi-purpose grease to bushing and drive clutch before installing on wheel hub and axle shaft, respectively.**

- Install drive clutch.
- Place snap ring in axle shaft groove.

**Axial end play:**  
0 - 0.2 mm (0 - 0.008 in)

**Snap ring size:**  
Refer to S.D.S.

- When installing manual-lock free-running hub, make sure the position "FREE".

**Apply multi-purpose grease to drive shaft end.**

- Check operation of manual-lock free-running hub after install it.

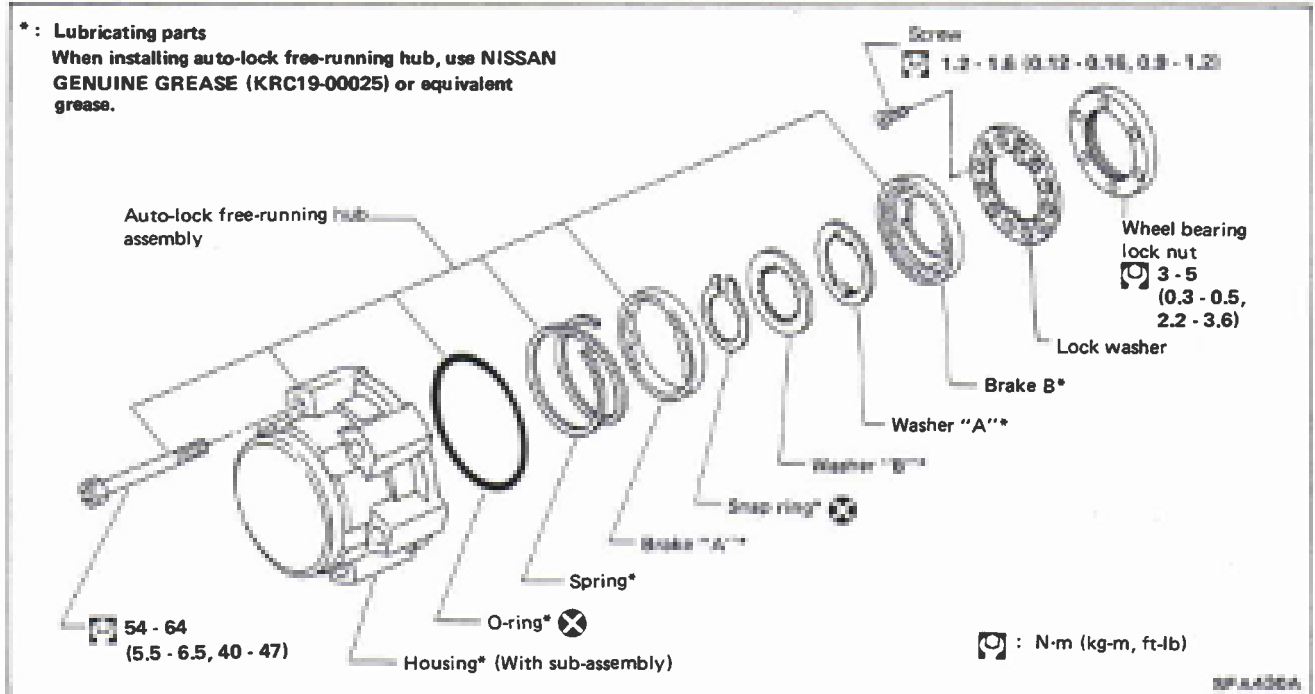
### Inspection

- Check that hub moves smoothly and freely.
- Check that clutch moves smoothly in the body.

## FRONT AXLE — Auto-lock Free-running Hub

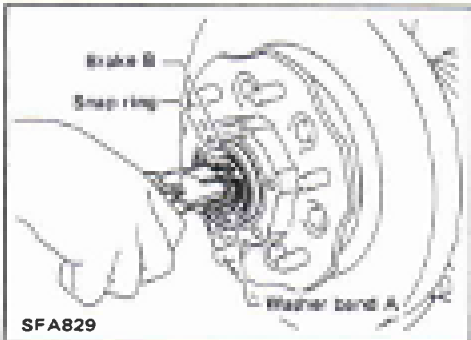
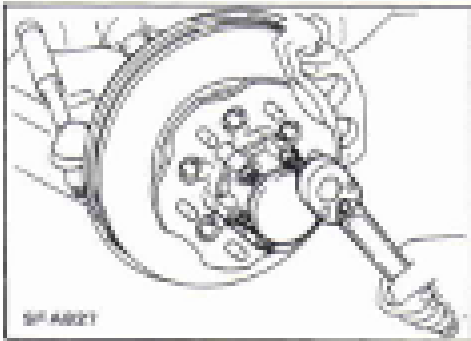
### \* : Lubricating parts

When installing auto-lock free-running hub, use NISSAN GENUINE GREASE (KRC19-00025) or equivalent grease.



### Removal and Installation

- Set the auto-lock free-running hub at the condition "FREE".



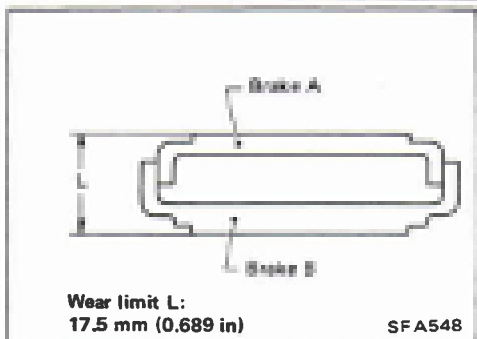
- Remove snap ring.
  - Remove washer B, washer A and brake B.
  - After installing auto-lock free-running hub, check operation it.
- When installing it, apply recommended grease to drive shaft end.**

### Inspection

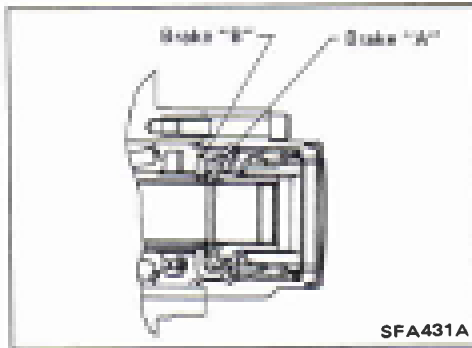
Thoroughly clean parts and dry with compressed air.

#### Brake "A" and "B"

Measure the thickness "L" of brake "A" and "B". If thickness is less than the specified limit, replace brake "A" and "B" as a set.

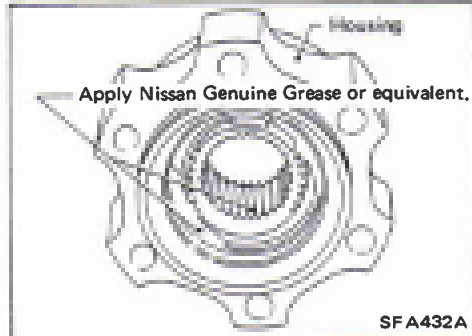


## FRONT AXLE — Auto-lock Free-running Hub

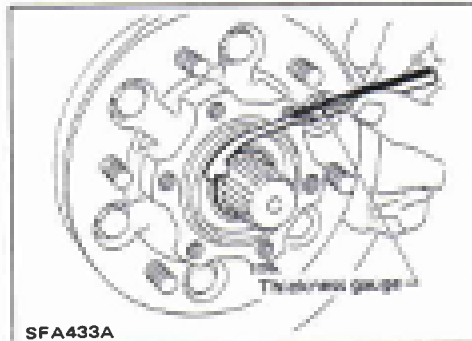


### Installation

Install free-running hub in the reverse order of removal. Pack shaded areas (shown in figure at left) with Nissan Genuine Grease or equivalent.



- Apply a coat of Nissan Genuine Grease or equivalent to inner wall and end face of housing.



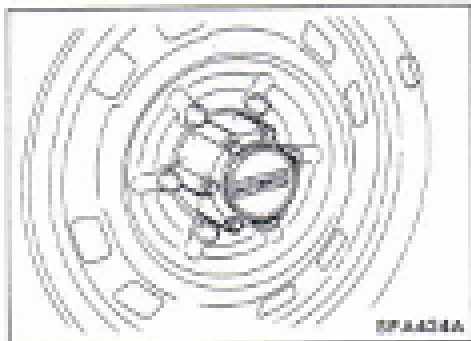
- When installing hub's mating parts (such as brake "B" and washers "A" and "B") on axle shaft, select suitable snap ring so that end play between axle shaft and its mating parts is within specifications.

#### Axial end play:

0 - 0.2 mm (0 - 0.008 in)

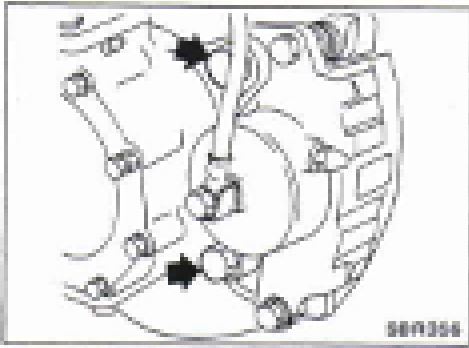
Snap ring size: Refer to S.D.S.

SFA433A



- Install auto-lock free-running hub to wheel hub.

## FRONT AXLE — Wheel Hub and Rotor Disc



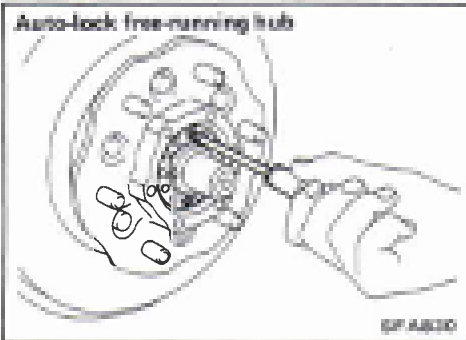
### Removal and Installation

- Remove free-running hub assembly.  
Refer to FRONT AXLE Auto-lock or Manual-lock Free-running Hub.

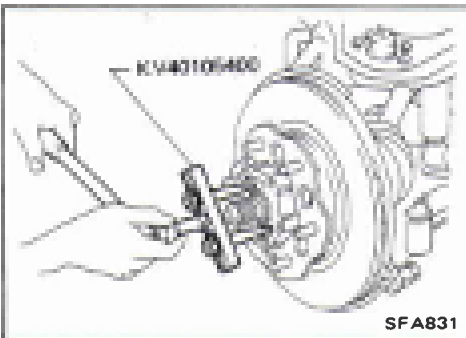
- Remove brake caliper assembly.

**Brake hose does not need to be disconnected from brake caliper.**

**Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.**



- Remove lock washer.



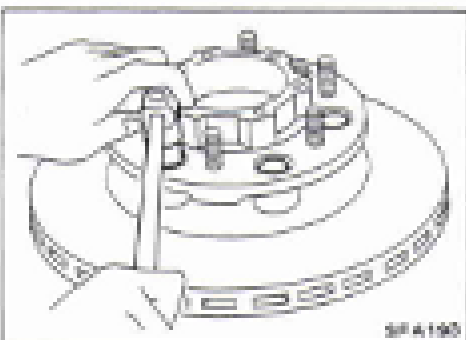
- Remove wheel bearing lock nut with Tool.



- Remove wheel hub and wheel bearing.

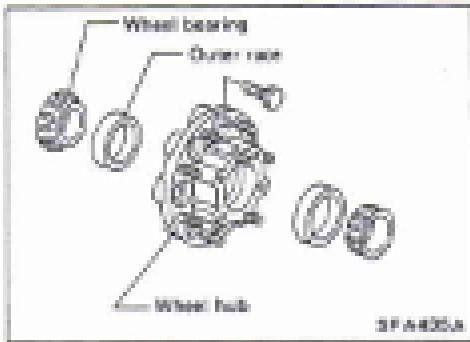
**Be careful not to drop outer bearing.**

- After installing wheel hub and wheel bearing, adjust wheel bearing preload.  
Refer to Preload Adjustment of Wheel Bearing for CHECK AND ADJUSTMENT — On-vehicle.



- Separate brake disc to hub.

## FRONT AXLE — Wheel Hub and Rotor Disc



### Inspection

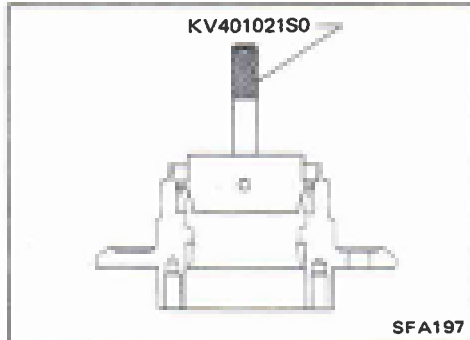
Thoroughly clean wheel bearings and wheel hub.

#### WHEEL BEARING

- Make sure wheel bearing rolls freely and is free from noise, crack, pitting or wear.

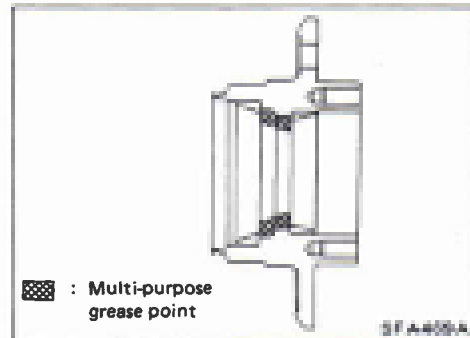
#### WHEEL HUB

- Check wheel hub for crack by using a magnetic exploration or dyeing test.

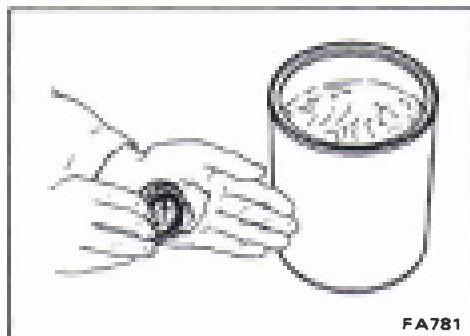


### Assembly

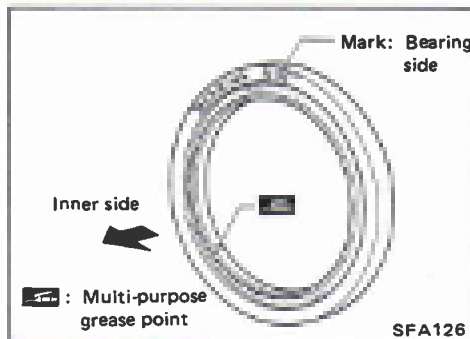
- Install bearing outer race with Tool until it seats in hub.



- Pack multi-purpose grease to hub and hub cap.



- Apply multi-purpose grease to each bearing cone.




- Pack grease seal lip with multi-purpose grease, then install it into wheel hub with suitable drift.

## FRONT AXLE — Wheel Hub and Rotor Disc

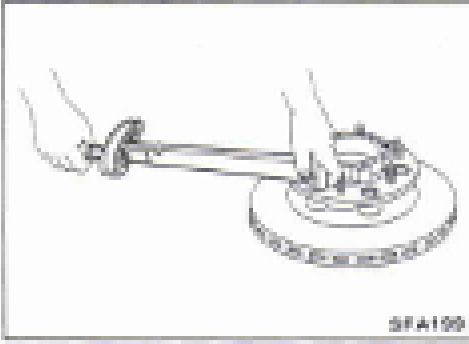
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### Assembly (Cont'd)

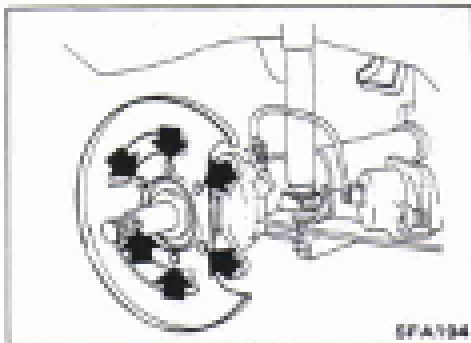
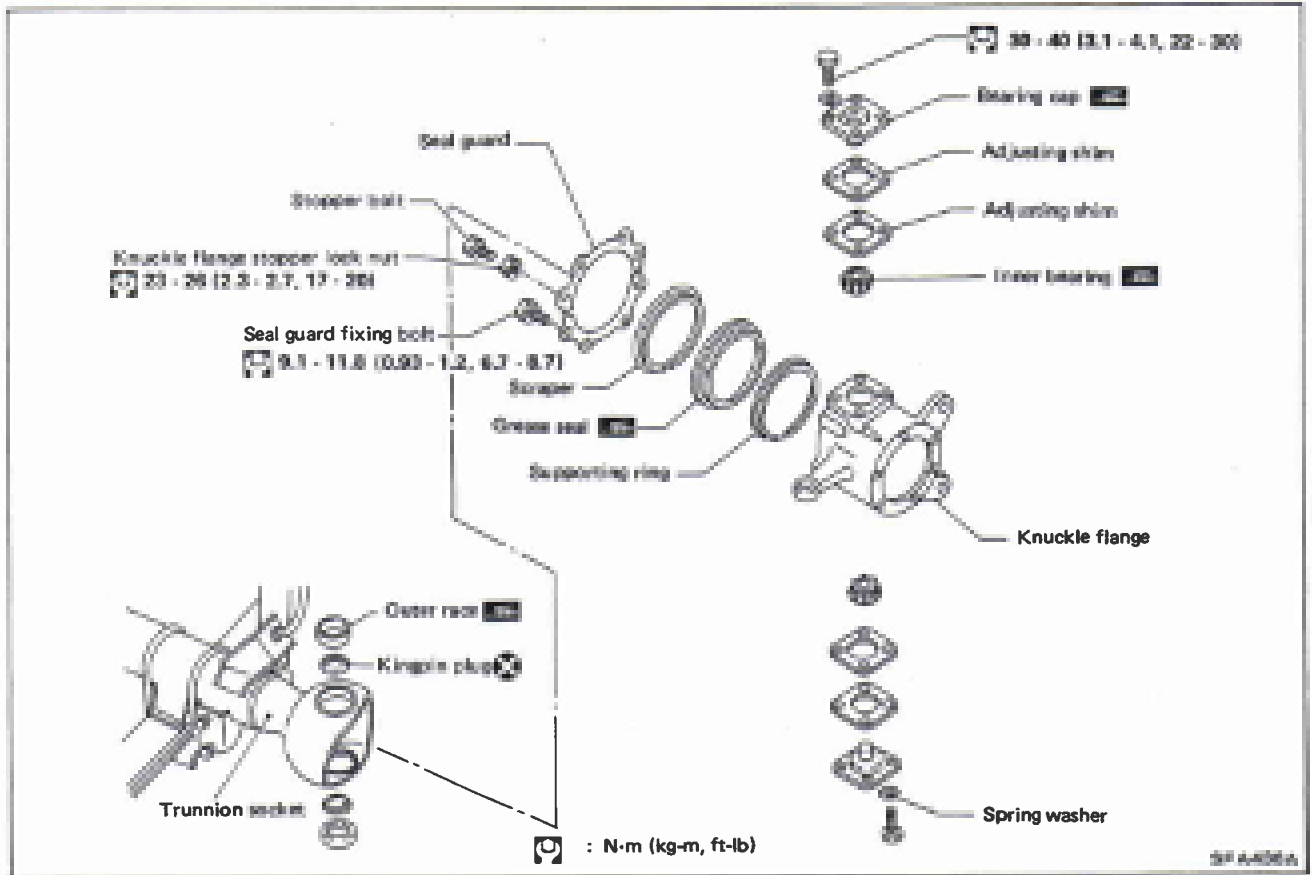
- Install hub to brake rotor.

: 50 - 68 N·m

(5.1 - 6.9 kg-m, 37 - 50 ft-lb)



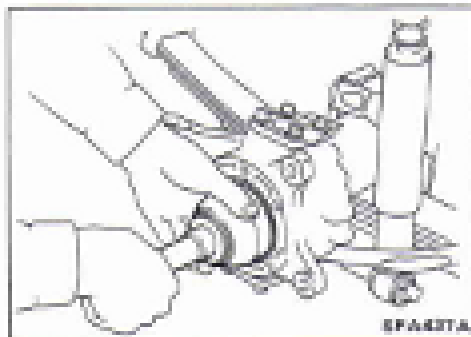
## FRONT AXLE — Knuckle Flange



### Removal

**Drain differential oil completely prior to removal.**

1. Remove baffle plate.



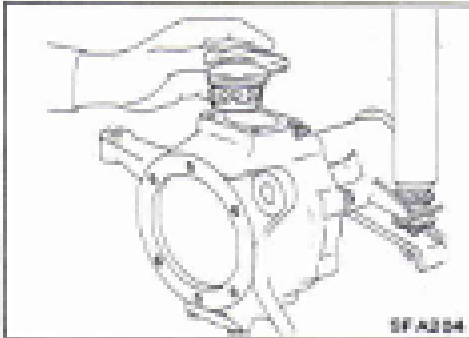
2. Draw out axle shaft.



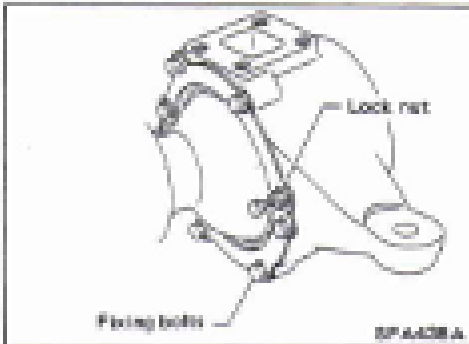
## FRONT AXLE — Knuckle Flange

### Removal (Cont'd)

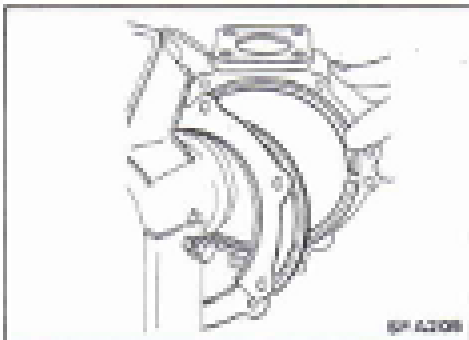
3. Disconnect tie-rod ends.  
Refer to section ST.



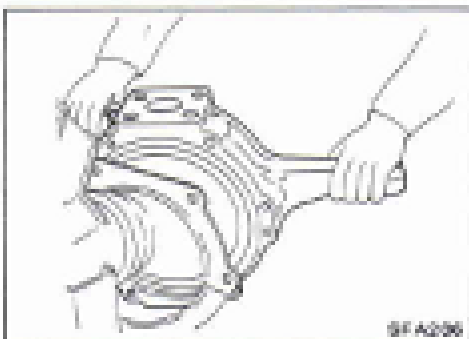
4. Remove upper and lower bearing caps with inner bearing and O-ring.



5. Remove seal guard fixing bolts.



6. Separate seal guard, scraper, grease seal and supporting ring from knuckle flange.



7. Remove knuckle flange, seal guard, scraper, grease seal and supporting ring from axle case.

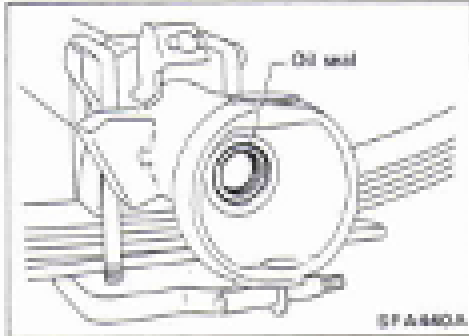
## FRONT AXLE — Knuckle Flange

### Removal (Cont'd)

8. Remove bearing outer race and kingpin plug.



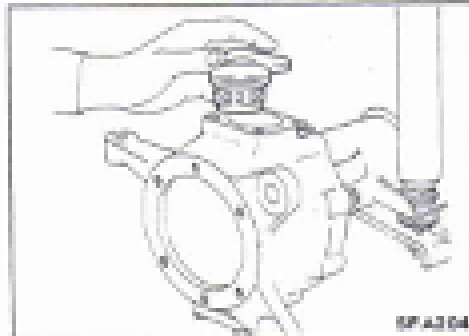
9. Remove oil seal from axle shaft.



### Inspection

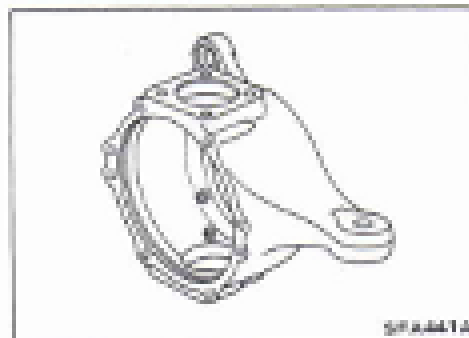
#### KNUCKLE FLANGE BEARING CAP

Replace knuckle flange bearing if it is worn, pitted or corroded.



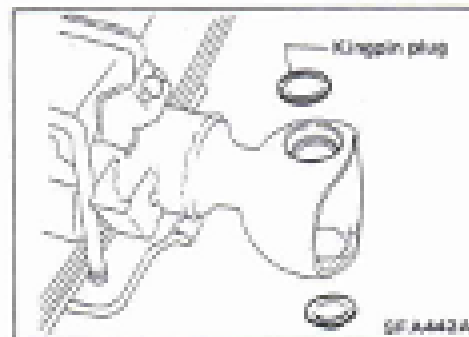
#### KNUCKLE FLANGE

Replace knuckle flange if it is cracked.



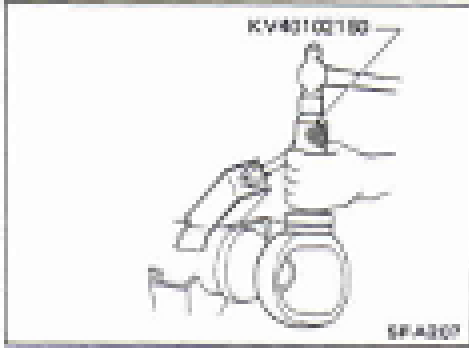
### Installation

1. Check kingpin plug for damage before installing. If damaged, use a new one.

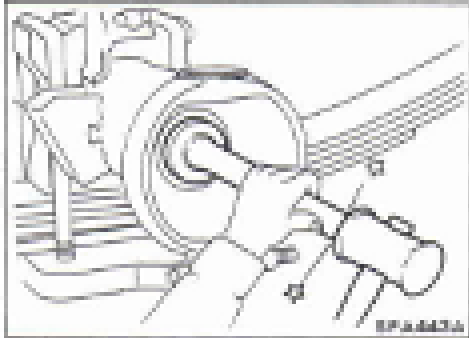


## FRONT AXLE — Knuckle Flange

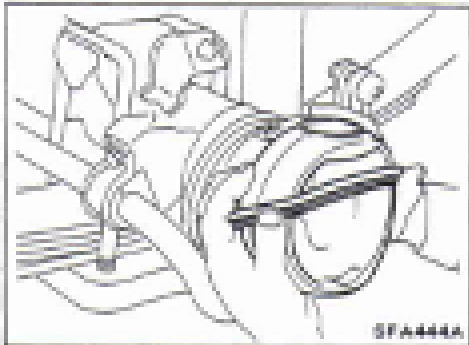
### Installation (Cont'd)



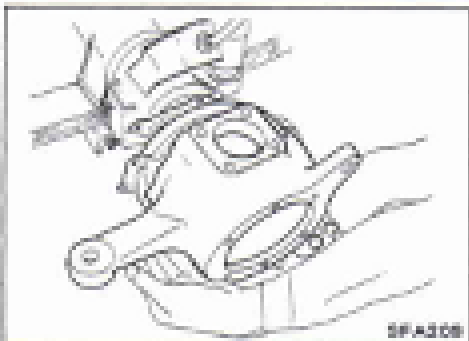
2. Using Tool, place bearing outer race in trunnion socket.



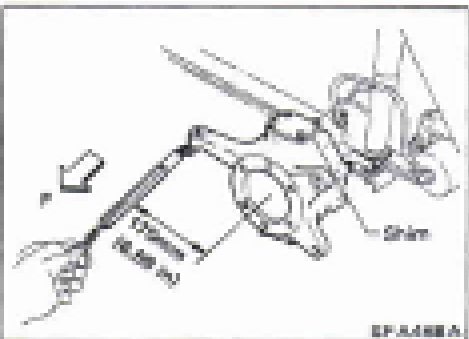
3. Install oil seal with tool.



4. Place grease seal guard, scraper and grease seal in axle case. Grease lip and circumference seals in axle case.



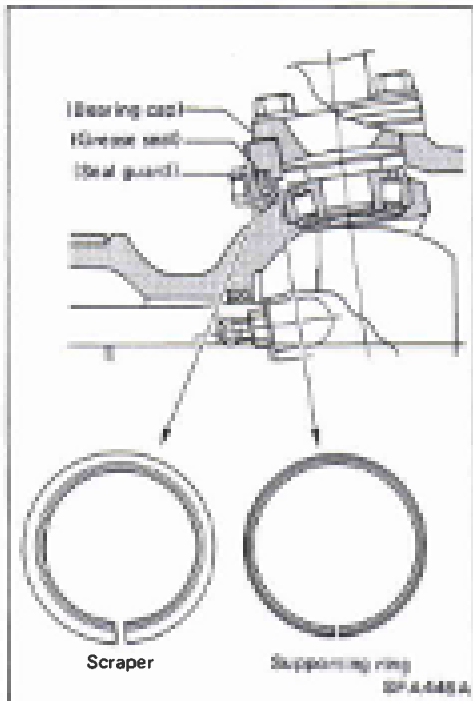
5. Apply recommended grease around trunnion socket spherical area, then place knuckle flange in trunnion socket.



6. Adjust rotating force of knuckle flange (at hinge pin) to 5.88 to 17.16 N (0.6 to 1.75 kg, 1.32 to 3.86 lb) range by adding or removing upper and lower shims of same thickness. This adjustment must be made without installing oil seal and birfield joint.

**Shim thicknesses: Refer to S.D.S.**

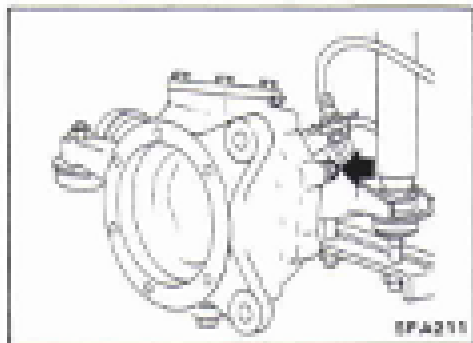
## FRONT AXLE — Knuckle Flange



### Installation (Cont'd)

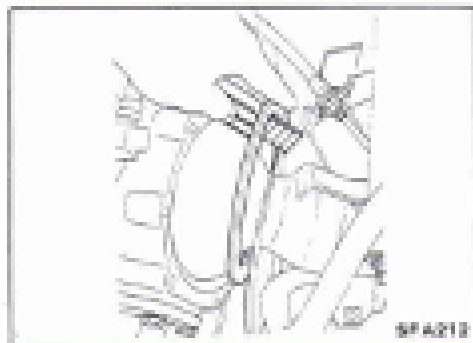
7. Install bearing cap with inner bearing and adjusting shim. Before installing seal guard, scraper, grease seal and supporting ring (as a unit), apply approx. 50 g (1.76 oz) of wheel bearing grease to perimeters shown in figure at left.

**Slits located in scraper and supporting ring should point straight downward when installed.**



**Install knuckle flange stopper bolt and nut on stopper side of axle case.**

**After installing tie rod, adjust it to specified steering angle using turning radius gauge, then tighten with lock nut.**



### Knuckle Flange Grease Seal

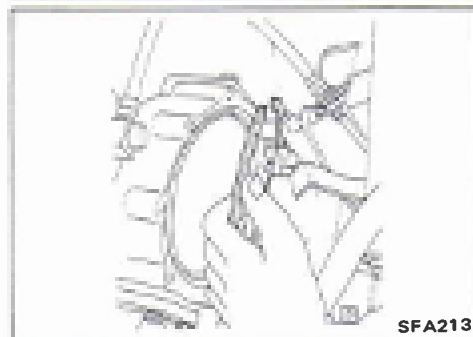
To replace only knuckle flange grease seal, proceed as follows.

#### REMOVAL

1. Turn steering wheel to both the extreme right and left, and remove grease seal guard from knuckle flange.
2. Extract grease seal and remove it by cutting it from axle case.

#### INSTALLATION

1. Cut off a part of new grease seal and fill lip portion with grease. Then insert grease seal into axle case. **Cut grease seal so that cut surface is straight.**

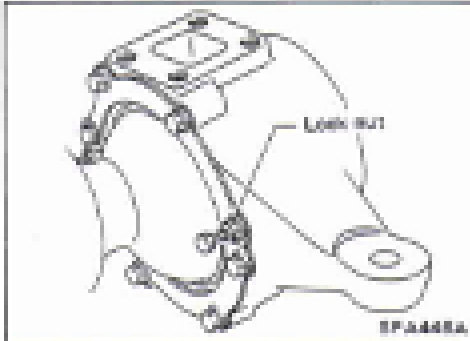
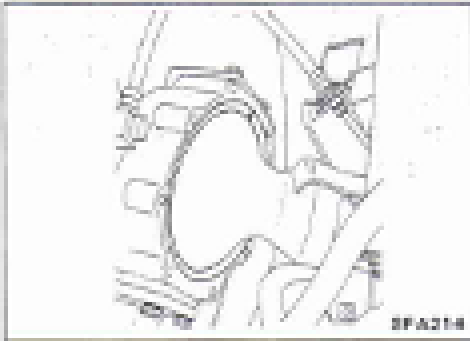


## FRONT AXLE — Knuckle Flange

### Knuckle Flange Grease Seal (Cont'd)

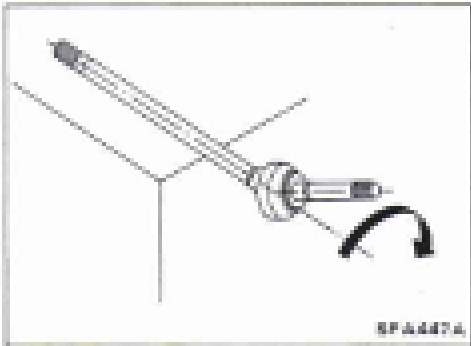
2. Apply adhesive to cut surface of grease seal.  
Install grease seal so that its cut surface is above knuckle flange.

**Be sure not to allow adhesive to protrude beyond cut surface of grease seal.**



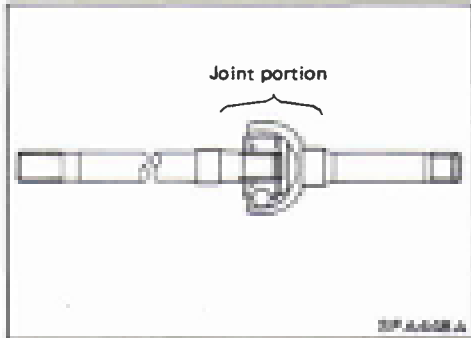
3. Install scraper and grease seal guard on knuckle flange.  
**After replacing grease seal, adjust steering wheel to specified turning angle with a turning radius gauge. Then tighten lock nut.**

## FRONT AXLE — Axle Shaft



### Inspection

Check wheel shaft for signs of binding when turned in a twisting motion. Also check for cracks or damage.

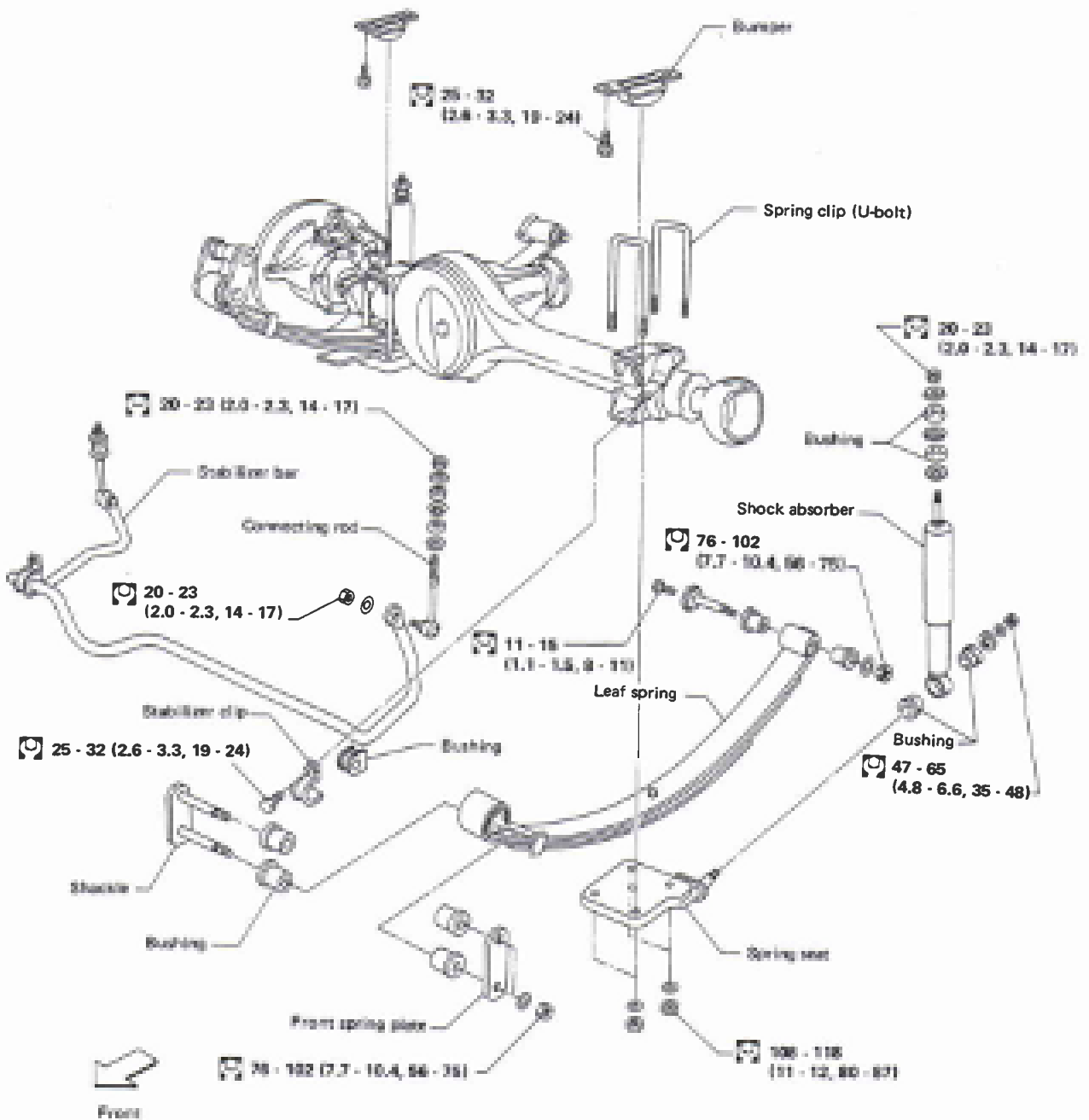


### Installation

Before positioning axle shaft in axle case, pack shaft joint with recommended grease\*.

\* Molybdenum disulphide lithium soap base, NLGI No. 2.  
**Refer to page MA-8.**

# FRONT SUSPENSION — Leaf Spring Type

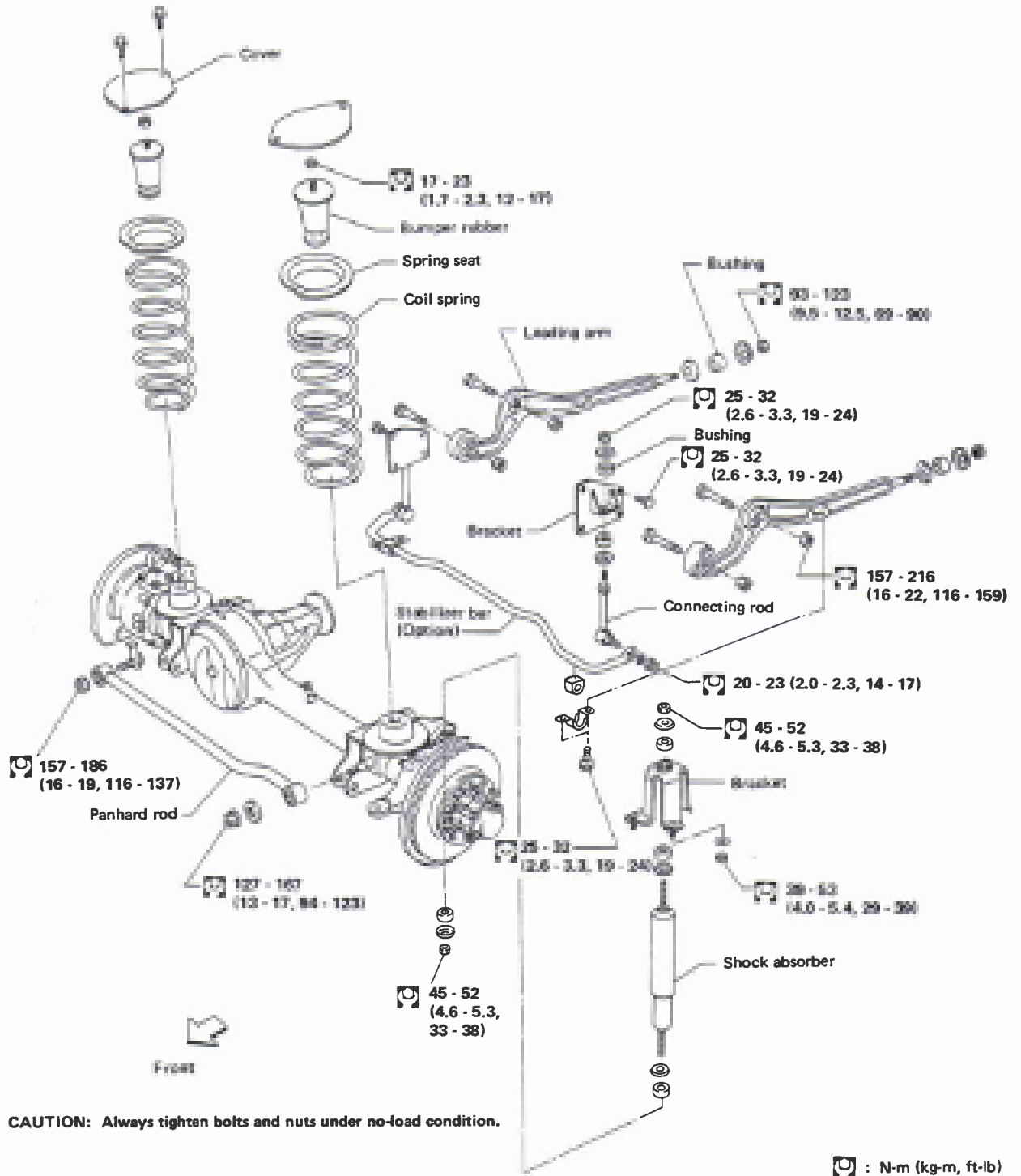


**CAUTION:** Always tighten bolts and nuts under no-load condition.

: N·m (kg·m, ft·lb)

SP5A42A

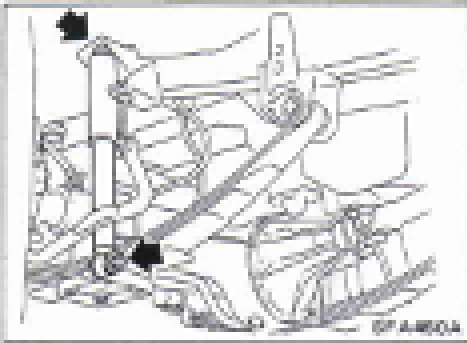
# FRONT SUSPENSION — Coil Spring Type



SFA456A



## FRONT SUSPENSION — Leaf Spring Type



### Shock Absorber

#### REMOVAL AND INSTALLATION

1. Disconnect both upper and lower sides fixing nuts.

2. Install shock absorber.

**Do not allow oil or grease to come into contact with rubber parts.**



#### INSPECTION

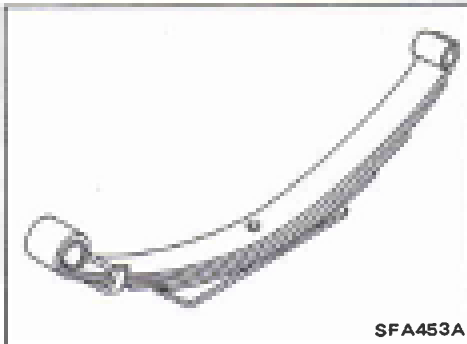
- Check for oil leakage and cracks. Replace if necessary.
- Check piston rod for smooth operation. Replace if necessary.
- Check all rubber parts for wear, cracks, damage or deformation. Replace if necessary.

### Leaf Spring

#### INSPECTION

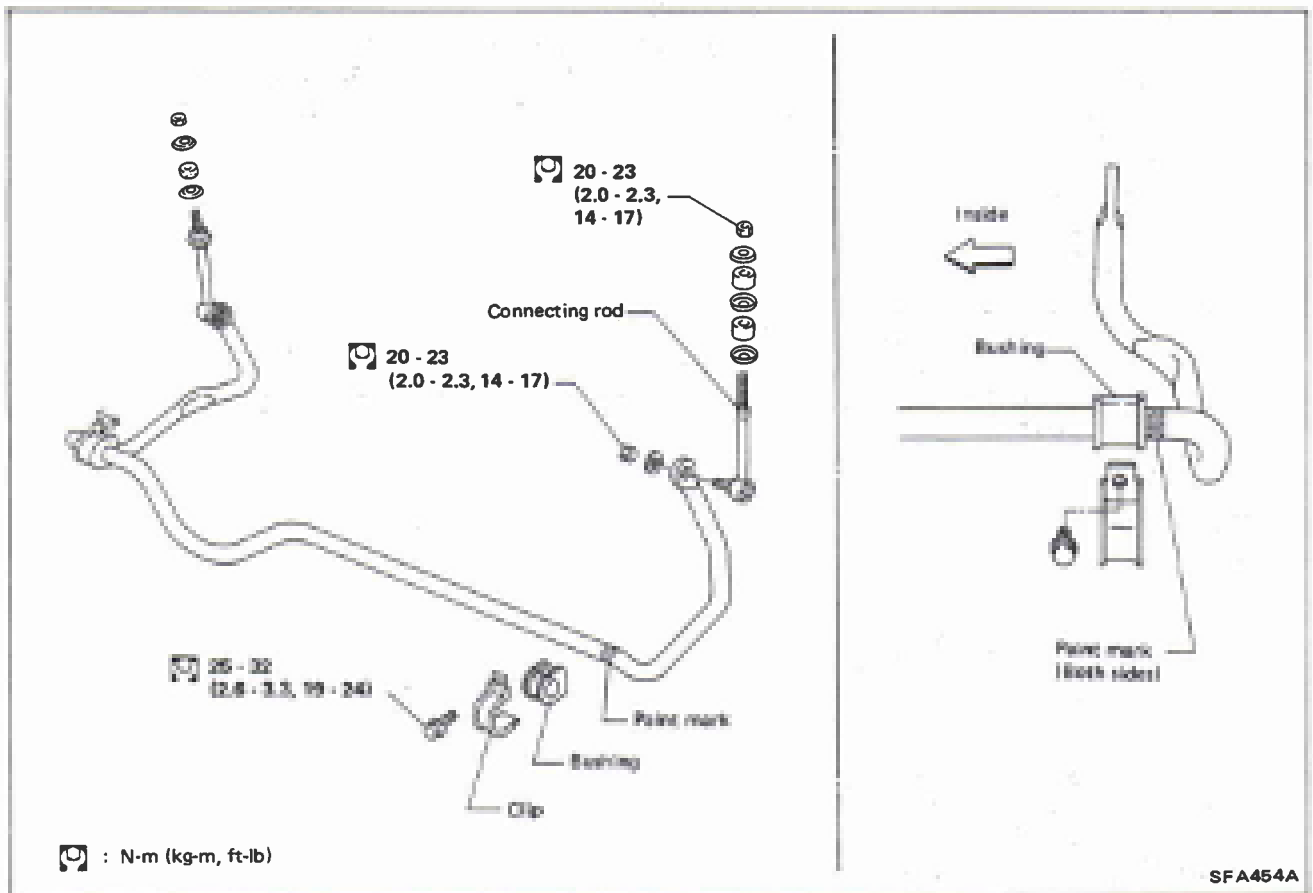
Clean all rust and dirt from spring leaves, using a wire brush if necessary.

1. Examine spring leaves for fractures or cracks.
2. Check rear bracket and pin, shackle, U-bolts and spring seat for wear, cracks, straightness or damaged threads. If faulty parts are found, replace with new ones.
3. Inspect all rubber parts for wear, damage, separation or deformation. Replace if necessary.



## FRONT SUSPENSION — Leaf Spring Type

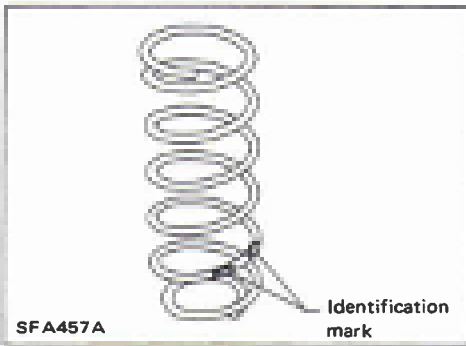
### Stabilizer Bar



### INSPECTION

1. Check stabilizer for twist and deformation. Replace if necessary.
2. Check each rubber bushing for cracks, wear, and deterioration. Replace if necessary.

## FRONT SUSPENSION — Coil Spring Type

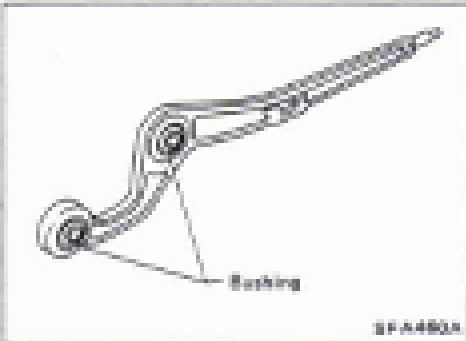


### Coil Spring

#### INSPECTION

Visually check for cracks or damage. If faulty, replace.

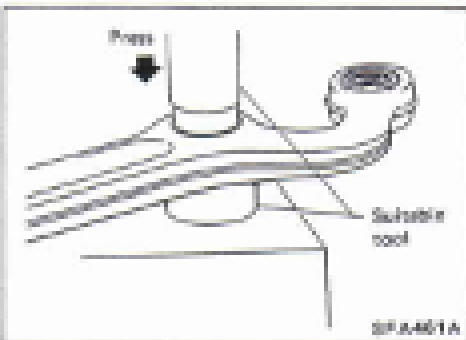
**Ensure that springs are installed correctly. Incorrect installation will cause vehicle not set in horizontal posture.**



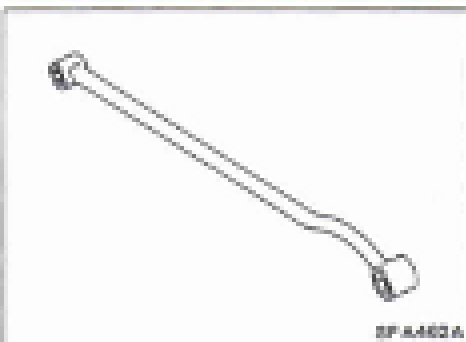
### Leading Arm

#### INSPECTION

Check for cracks, bends or damage. Also check bushing.



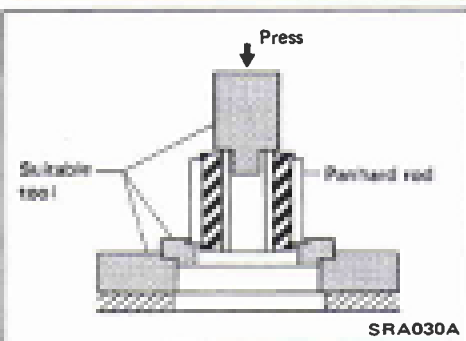
If bushing is faulty, replace it using suitable tool.



### Panhard Rod

#### INSPECTION

- Check for cracks or other damage. Replace if necessary.



### Panhard rod bushing

#### Removal

- Using a press and suitable tool as shown in figure at left, remove bushing from vehicle side.
- Using a flat-bladed screwdriver, pry bushing out of axle case.

## FRONT SUSPENSION — Coil Spring Type

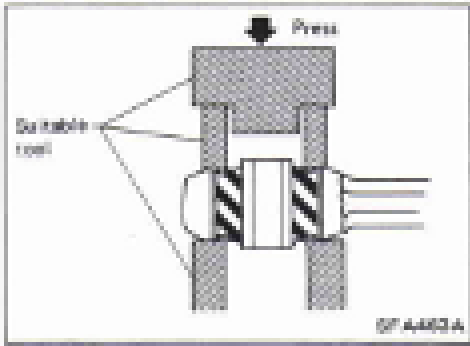
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### Panhard Rod (Cont'd)

#### Installation

- Using suitable tool shown in figure at left, gradually press bushing into place.

**Always install new bushing. Do not tap end face of bushing directly with a hammer. Apply soap water to outer wall of bushing before installation.**



## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### General Specifications

#### COIL SPRING AND STABILIZER BAR (Hardtop and Station Wagon, R.H.D.)

Applied model		Hardtop	Hardtop with winch	Station Wagon		Station Wagon with winch	
Engine		All		TB42	TD42	TB42	TD42
Wire diameter	mm (in)						
	R.H.	14.6 (0.575)	15.3 (0.602)	15.7 (0.618)		16.0 (0.630)	
	L.H.	14.3 (0.563)	15.0 (0.591)	15.3 (0.602)		15.7 (0.618)	
Coil diameter	mm (in)						
	R.H.	140.6 (5.54)	141.3 (5.56)	141.7 (5.58)		142.0 (5.59)	
	L.H.	140.3 (5.52)	141.0 (5.55)	141.3 (5.56)		141.7 (5.58)	
Free length	mm (in)						
	R.H.	401.0 (15.79)	391.5 (15.41)	391.0 (15.39)		392.5 (15.45)	
	L.H.	400.0 (15.75)	388.0 (15.28)	391.5 (15.41)		391.0 (15.39)	
Spring constant N/mm (kg/mm, lb/in)							
	R.H.	28.9 (2.95, 165.2)	33.8 (3.45, 193.2)	36.3 (3.70, 207.2)		38.2 (3.90, 218.4)	
	L.H.	27.0 (2.75, 154.0)	32.4 (3.30, 184.8)	33.8 (3.45, 193.2)		36.3 (3.70, 207.2)	
Identification color	R.H.	White, Yellow	Purple, Pink	Yellow, Pink		Yellow, Blue	
	L.H.	White, Purple	Purple, Orange	Purple, Pink		Yellow, Pink	
Stabilizer bar diameter (Option)	mm (in)	15 (0.59)					

#### COIL SPRING AND STABILIZER BAR (Hardtop and Station Wagon, L.H.D.)

Applied model		Hardtop	Hardtop with winch and Station Wagon	Hardtop	Hardtop with winch and Station Wagon	Station Wagon with winch
Engine		TB42		TD42		All
Wire diameter	mm (in)	14.3 (0.563)	15.0 (0.591)	14.6 (0.575)	15.3 (0.602)	15.7 (0.618)
Coil diameter	mm (in)	140.3 (5.52)	141.0 (5.55)	140.6 (5.54)	141.3 (5.56)	141.7 (5.58)
Free length	mm (in)	400.0 (15.75)	388.0 (15.28)	401.0 (15.79)	391.5 (15.41)	391.0 (15.39)
Spring constant N/mm (kg/mm, lb/in)		27.0 (2.75, 154.0)	32.4 (3.30, 184.8)	28.9 (2.95, 165.2)	33.8 (3.45, 193.2)	36.3 (3.70, 207.2)
Identification color		White, Purple	Purple, Orange	White, Yellow	Purple, Pink	Yellow, Pink
Stabilizer bar diameter (Option)	mm (in)	15 (0.59)				

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### General Specifications (Cont'd)

#### LEAF SPRING

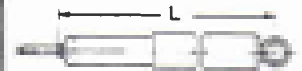
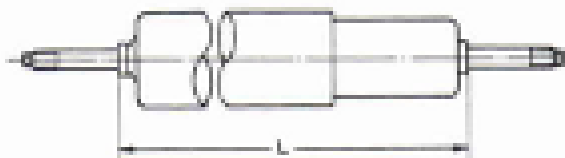
Applied model		Pickup
Suspension type		Semi-elliptic leaf spring
Spring dimension Length x width x thickness — number of leaves	mm (in)	
Main		1,100 x 70 x 6 — 5 (43.31 x 2.76 x 0.24 — 5)
Helper		450 x 70 x 14 — 1 (17.72 x 2.76 x 0.55 — 1)
Free camber "C"	mm (in)	
R.H.D.		144 (5.67)
L.H.D.		144 (5.67)
Spring constant N/mm (kg/mm, lb/in)		57.9 - 87.3 (5.9 - 8.9, 330 - 498)
Stabilizer bar diameter	mm (in)	24 (0.94)



SFA230

#### SHOCK ABSORBER

Applied model		Hardtop	Series Major	Pickup
Shock absorber type		Double acting hydraulic		
Piston rod diameter	mm (in)	12.5 (0.492)		
Stroke	mm (in)	191 (7.53)		193 (7.60)
Maximum length "L"	mm (in)	460 (18.10)		495 (19.49)
Damping force [at 0.3 m (1.0 ft)/sec.]	N(kg, lb)			
Expansion		2,158 - 2,844 (220 - 290, 485 - 639)	1,844 - 2,432 (188 - 248, 415 - 547)	1,500 - 1,991 (153 - 203, 337 - 448)
Compression		1,069 - 1,520 (109 - 155, 240 - 342)	853 - 1,226 (87 - 125, 192 - 276)	834 - 1,206 (85 - 123, 187 - 271)



SFA230

SRA112

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment

#### WHEEL ALIGNMENT (Unladen\*1)

Applied model		Hardtop	Station Wagon	Pickup
Camber	degree	0° - 1°		
Caster	degree	2° 20' - 3° 20'	2° 05' - 3° 05'	2° 50' - 3° 50'
Kingpin inclination	degree	7° - 8°		
Toe-in/total toe-in (angle)	mm (in)/degree	-2 to 0 (-0.08 to 0)/-9' to 0'		
Radial tire 10R15LT				
215/80R16 7.50R16		0 - 2 (0 - 0.08)/0' - 9'		
Bias tire		1 - 3 (0.04 - 0.12)/9' - 18'		
Turning angle	degree	36° - 36° 15' / 36° - 36°		
Full turn Inside/outside				

\*1: Tankful of fuel, radiator coolant and engine oil full.  
Spare tire, jack, hand tools and mats in designated positions.

#### WHEEL RUNOUT (Radial and lateral)

Wheel runout	mm (in)	2.0 (0.079)		1.5 (0.059)	
Road wheel Size		5.50F-16SDC	5.50F-15SDC	6JJ-16	7JJ-15
Offset	mm (in)	30 (1.18)	-5 (-0.20)	30 (1.18)	5 (0.20)
Tire size		6.50-16-6PRLT 7.00-16-6PRLT (Front) 7.00-16-10PRLT (Rear) 7.50-16-6PRLT 7.50-16-8PRLT 7.50R16-6PRLT 7.50R16-8PRLT	9.00-15-6PR	215/80R16 107Q	10R15-6PRLT

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment (Cont'd)

#### WHEEL BEARING

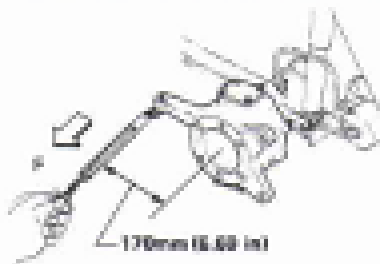
Wheel bearing axial end play mm (in)	0 - 0.08 (0 - 0.0031)
Wheel bearing lock nuts Tightening torque N-m (kg-m, ft-lb)	167 - 196 (17 - 20, 123 - 145)
Retightening torque after untightened N-m (kg-m, ft-lb)	3 - 5 (0.3 - 0.5, 2.2 - 3.6)
Measured starting force At wheel hub bolt N (kg, lb)	A
Turning adjusting nut in tight- ening direction and measuring starting force At wheel hub bolt N (kg, lb)	B
Calculated wheel bearing preload; B - A At wheel hub bolt N (kg, lb)	0 - 18.6 (0 - 1.9, 0 - 4.2)

#### DRIVE SHAFT

Birfield joint axial end play mm (in)	0 (0)	
Grease Type	Multi-purpose grease	
Capacity g (oz)	50 - 60 (1.76 - 2.12)	
Drive shaft axial end play mm (in)	0 - 0.2 (0 - 0.008)	
Adjusting snap rings mm (in)	Thickness	Part number
	1.1 (0.043)	39253-01J00
	1.3 (0.051)	39253-01J01
	1.5 (0.059)	39253-01J02
	1.7 (0.067)	39253-01J03
	1.9 (0.075)	39253-01J04
2.1 (0.083)	39253-01J05	

#### KNUCKLE FLANGE BEARING

Flange turning torque (Without trunnion seal and drive shaft) N-m (kg-m, ft-lb)	1 - 3 (0.1 - 0.3, 0.7 - 2.2)	
At knuckle arm "F" N (kg, lb)	5.88 - 17.16 (0.6 - 1.75, 1.32 - 3.86)	
Adjusting shims mm (in)	Thickness	Part number
	0.075 (0.0030)	40605-44000
	0.125 (0.0050)	40605-44000
	0.254 (0.0100)	40604-44000
	0.762 (0.0300)	40603-44000



SFA471A



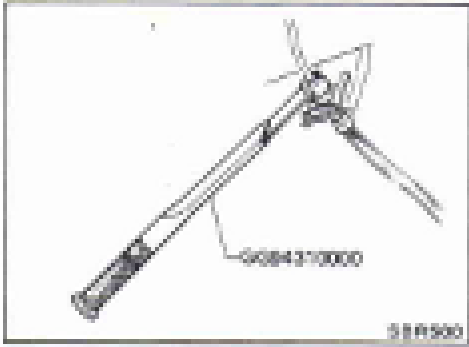
# REAR AXLE & REAR SUSPENSION

## SECTION **RA**

### CONTENTS

PRECAUTIONS AND PREPARATION .....	RA- 2
REAR AXLE AND REAR SUSPENSION .....	RA- 3
CHECK AND ADJUSTMENT — On-vehicle .....	RA- 5
REAR AXLE — Semi-floating Type .....	RA- 9
REAR AXLE — Full-floating Type .....	RA-16
REAR SUSPENSION — Leaf Spring Type .....	RA-20
REAR SUSPENSION — Coil Spring Type .....	RA-23
STABILIZER RELEASE DEVICE .....	RA-27
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	RA-29

## PRECAUTIONS AND PREPARATION



### Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.
  - \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, and mats in designated positions.
- Use Tool when removing or installing brake tubes.
- When removing each suspension part, check wheel alignment and adjust if necessary.

### Preparation

#### SPECIAL SERVICE TOOLS

\*: Special tool or commercial equivalent

Tool number Tool name	Description	
GG94310000* Flare nut torque wrench		Removing or installing brake piping
KV40101000* Axle stand		Removing rear axle shaft
ST36230000* Sliding hammer		Removing rear axle shaft
KV40104600 Rear wheel bearing lock nut wrench		Removing or installing wheel bearing lock nut
HT72480000 Rear axle shaft bearing puller		Removing wheel bearing
ST37840000 Rear axle shaft guide		Installing rear axle shaft
<b>COMMERCIAL SERVICE TOOL</b>		
Rear axle oil seal drift	<p>A: 74 mm (2.91 in) dia. B: 68 mm (2.68 in) dia. C: 10 mm (0.39 in)</p>	Installing oil seal

## REAR AXLE AND REAR SUSPENSION

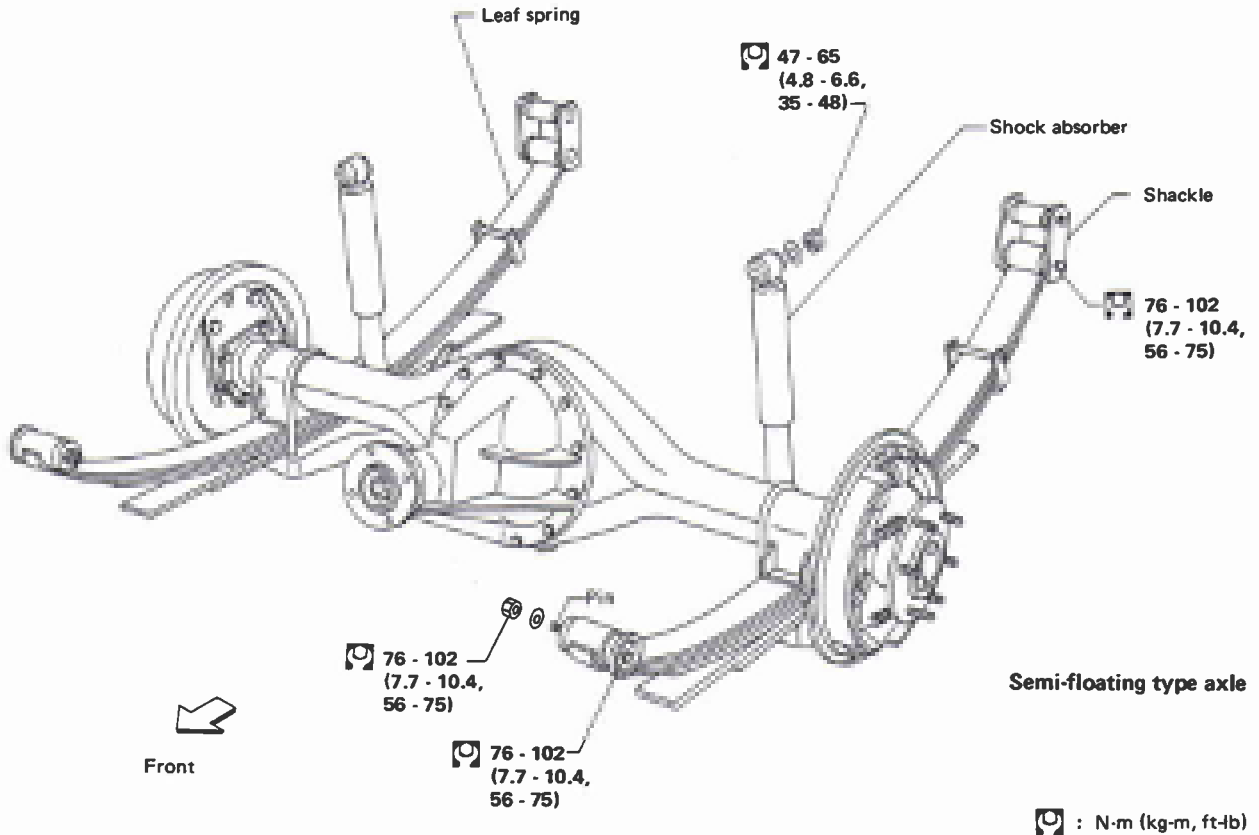
### LEAF SPRING TYPE

#### Wheel bearing

- Axial end play: 0.02 - 0.15 mm (0.0008 - 0.0059 in)
- Tightening torque: 441 - 490 N·m (45 - 50 kg·m, 325 - 362 ft·lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.

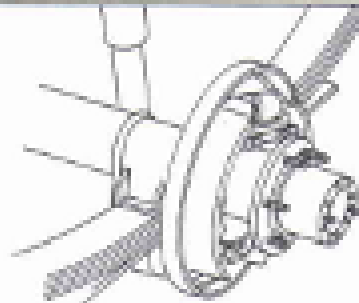
When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

- \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



#### Wheel bearing

- Axial end play: 0 mm (0 in)
- Tightening torque: 167 - 196 N·m (17 - 20 kg·m, 123 - 145 ft·lb)
- Wheel bearing preload (As measured at wheel hub bolt): 0 - 12.55 N (0 - 1.28 kg, 0 - 2.82 lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.



Full-floating type axle

SRA033A

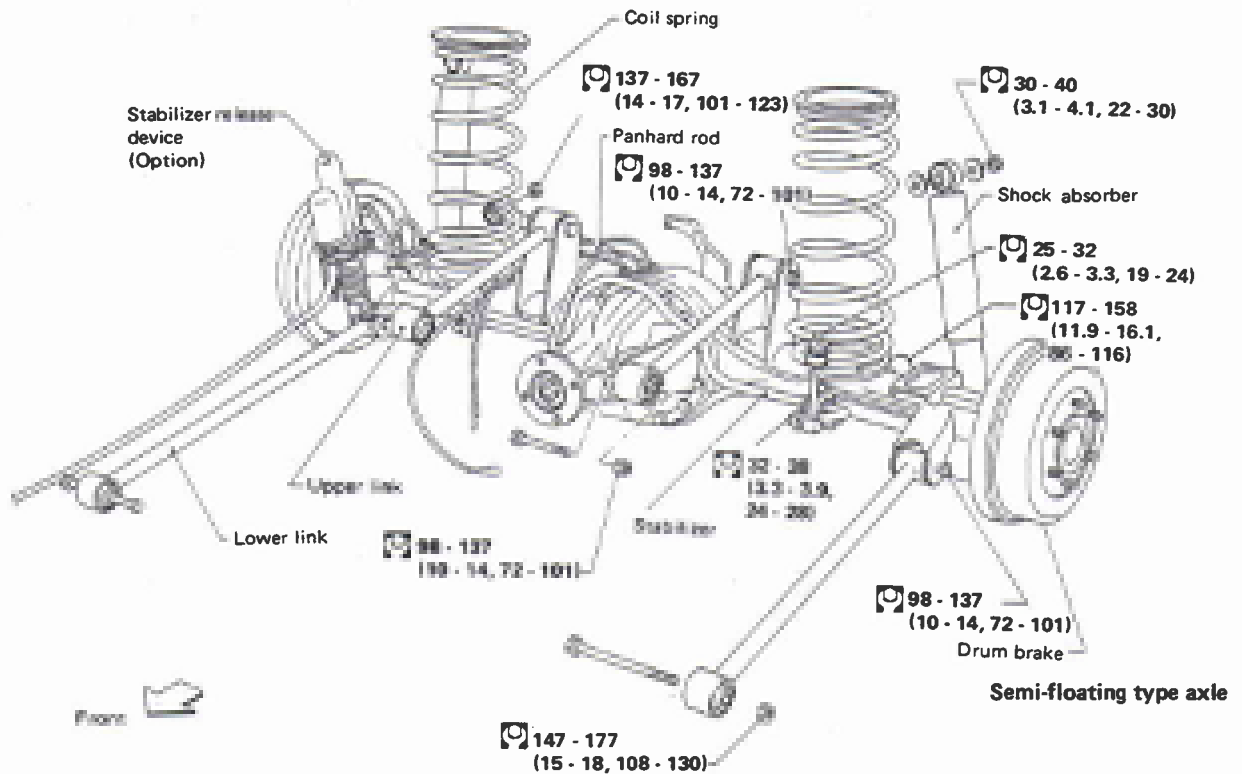
# REAR AXLE AND REAR SUSPENSION

## COIL SPRING TYPE

### Wheel bearing

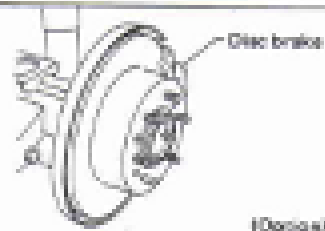
- Axial end play: 0.02 - 0.15 mm (0.0008 - 0.0059 in)
- Tightening torque: 441 - 490 N·m (45 - 50 kg·m, 325 - 362 ft·lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.  
 \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



### Wheel bearing

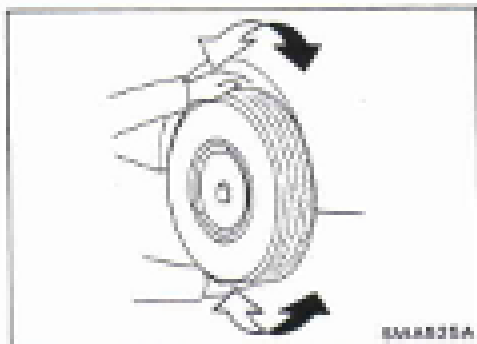
- Axial end play: 0 mm (0 in)
- Tightening torque: 441 - 490 N·m (45 - 50 kg·m, 325 - 362 ft·lb)
- Wheel bearing preload (As measured at wheel hub bolt): 8.8 - 42.2 N (0.9 - 4.3 kg, 2.0 - 9.5 lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.



(Optional)

Semi-floating type axle

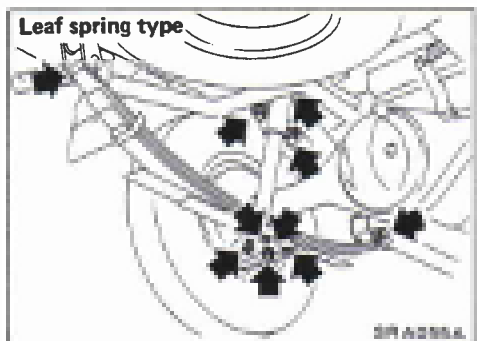
: N·m (kg·m, ft·lb)



### Rear Axle and Rear Suspension Parts

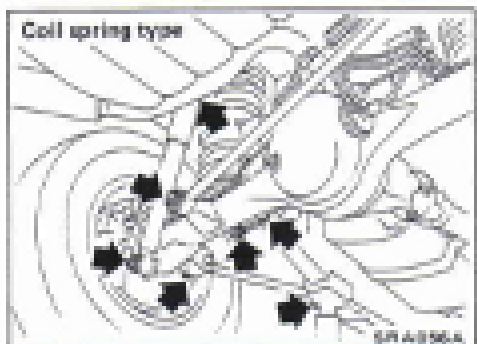
- Check rear axle and rear suspension parts for looseness, wear or damage.

(1) Shake each rear wheel.

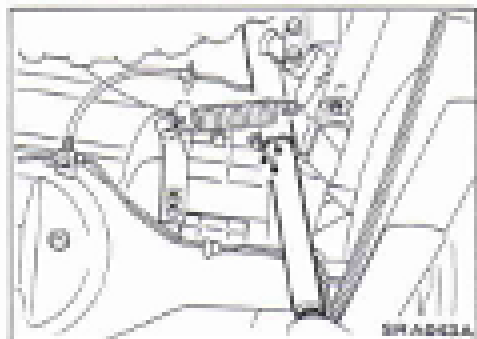


(2) Retighten all nuts and bolts to the specified torque.

**Tightening torque: Refer to page RA-3, 4.**



(3) Check shock absorber for oil leakage or other damage.



### Rear Wheel Bearing

#### SEMI-FLOATING TYPE

- Check that wheel bearings operate smoothly.
- Check axial end play.

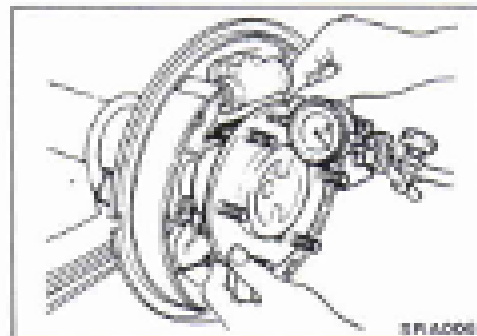
**Axial end play:**

**Drum brake type**

0.02 - 0.15 mm (0.0008 - 0.0059 in)

**Disc brake type**

0 mm (0 in)



## CHECK AND ADJUSTMENT — On-vehicle

### Rear Wheel Bearing (Cont'd)

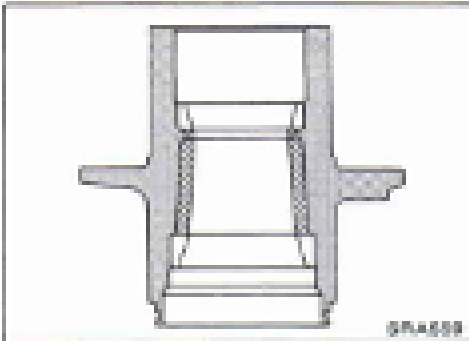
#### FULL-FLOATING TYPE

##### Preload adjustment

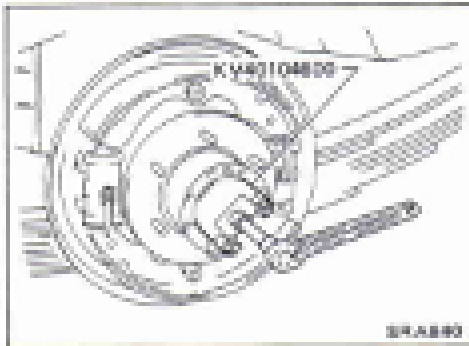
**Adjust wheel bearing preload after wheel bearing has been replaced or rear axle has been reassembled.**

Adjust wheel bearing preload as follows:

1. Before adjustment, thoroughly clean all parts to prevent dirt entry.

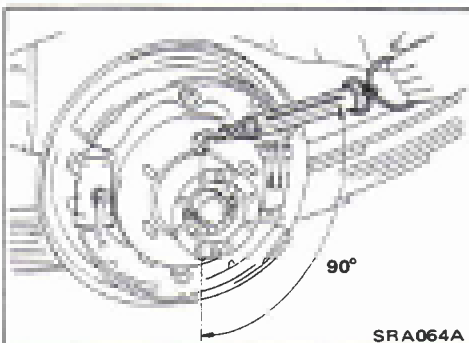


2. Apply multi-purpose grease sparingly to the following parts:
  - Threaded portion of spindle
  - Contact surface between wheel bearing washer and outer wheel bearing
  - Grease seal lip
  - Bearing housing



3. Tighten wheel bearing lock nut with Tool.  
⌚: 167 - 196 N·m  
(17 - 20 kg-m, 123 - 145 ft-lb)
4. Turn wheel hub several times in both directions.

5. Loosen wheel bearing lock nut and then tighten it.  
⌚: 3 - 5 N·m  
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)
6. Turn wheel hub several times in both directions.
7. Then retighten wheel bearing lock nut.  
⌚: 3 - 5 N·m  
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

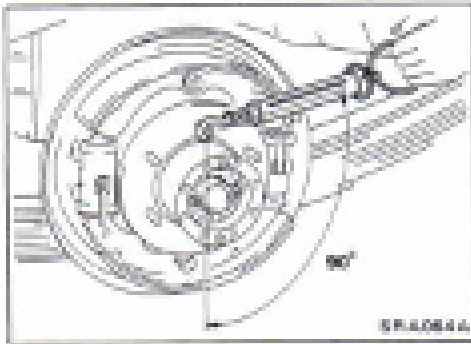


8. Measure rotating force (Fi). (as measured at wheel hub bolt)

## CHECK AND ADJUSTMENT — On-vehicle

### Rear Wheel Bearing (Cont'd)

- Turn wheel bearing nut 0 to 22.5° in the direction to tighten and temporarily tighten lock washer with bolt.



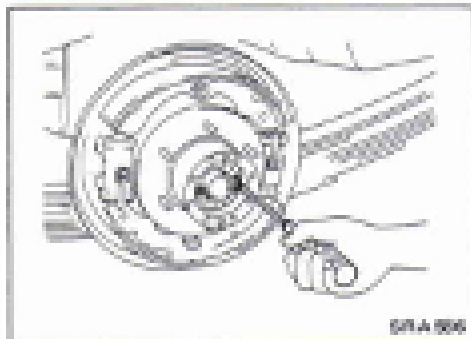
- Turn wheel hub several times in both directions.
- Measure rotating force ( $F_2$ ). (as measured at wheel hub bolt)

- Calculate rotating force by subtracting  $F_1$  from  $F_2$ .

$$F_2 - F_1:$$

$$0 - 12.55 \text{ N (0 - 1.28 kg, 0 - 2.82 lb)}$$

If it is not within specification, readjust.



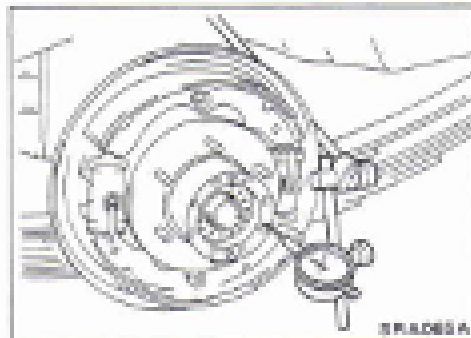
- Tighten the screws.

$$\square: 4 - 5 \text{ N}\cdot\text{m (0.4 - 0.5 kg}\cdot\text{m, 2.9 - 3.6 ft}\cdot\text{lb)}$$

- Measure wheel bearing axial end play.

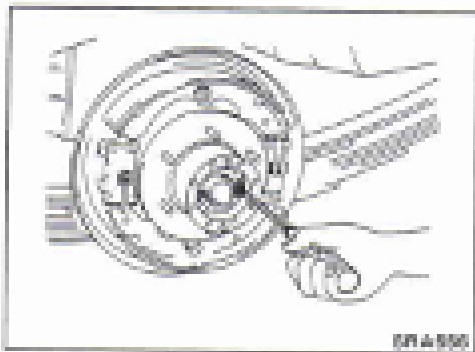
**Axial end play:**

$$0 \text{ mm (0 in)}$$



## CHECK AND ADJUSTMENT — On-vehicle

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### Rear Wheel Bearing (Cont'd)

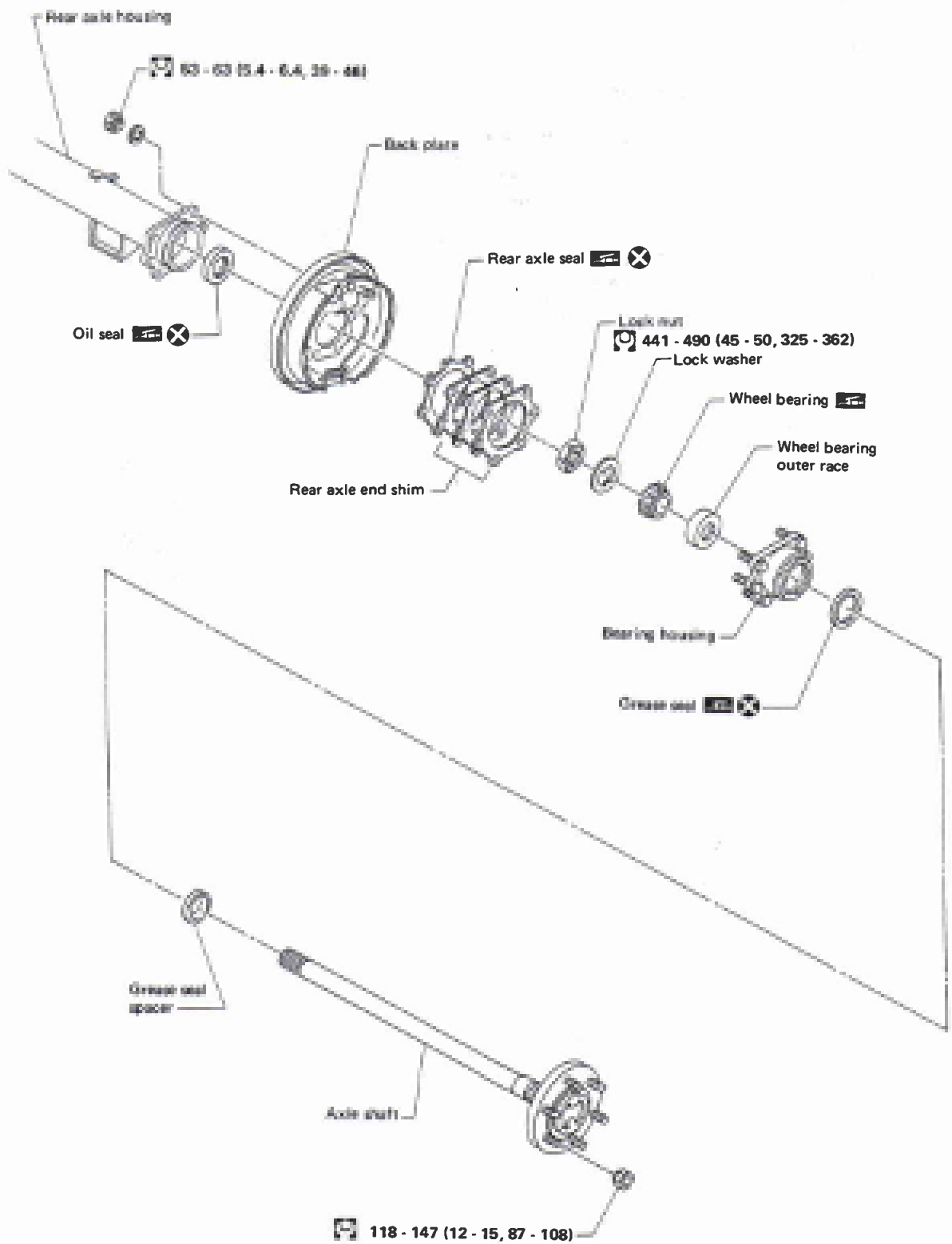
15. Install lock washer.
16. Recheck wheel bearing preload.
17. Repeat above procedures until correct axial end play and wheel bearing preload are obtained.
18. Install rear axle shaft.

**When inserting rear axle shaft, be careful not to damage oil seal.**



# REAR AXLE — Semi-floating Type

## DRUM BRAKE TYPE

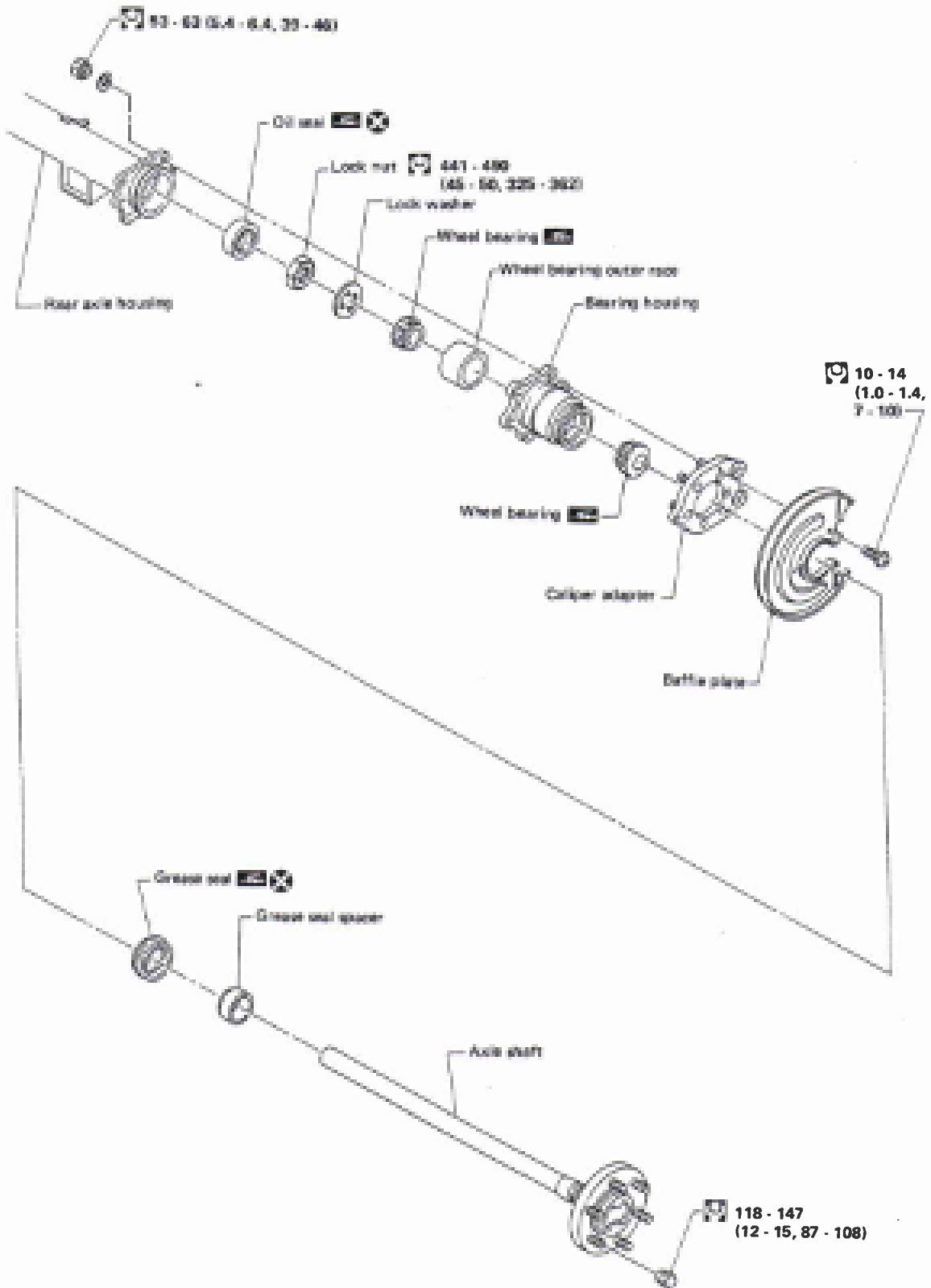


: N-m (kg-m, ft-lb)

SRA045A

# REAR AXLE — Semi-floating Type

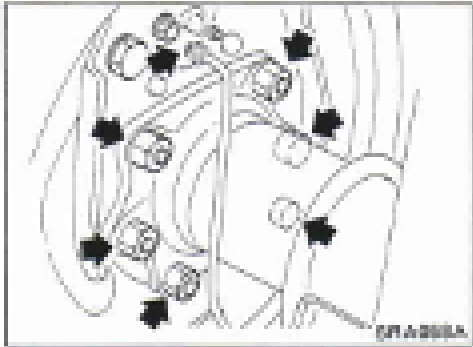
## DISC BRAKE TYPE



: N·m (kg·m, ft·lb)

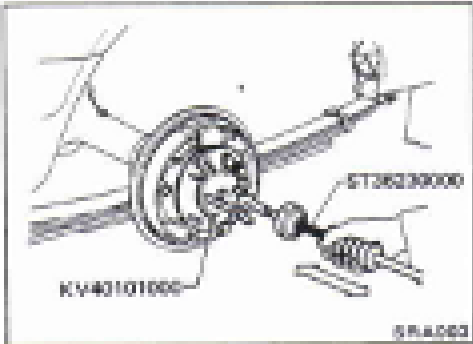
SRA047A

## REAR AXLE — Semi-floating Type

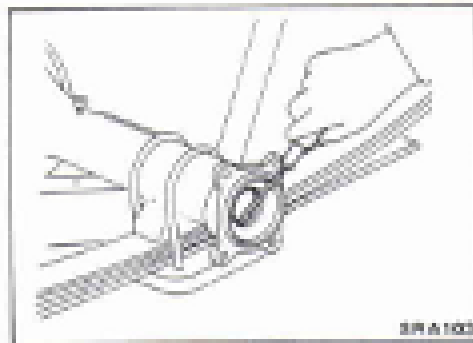


### Removal

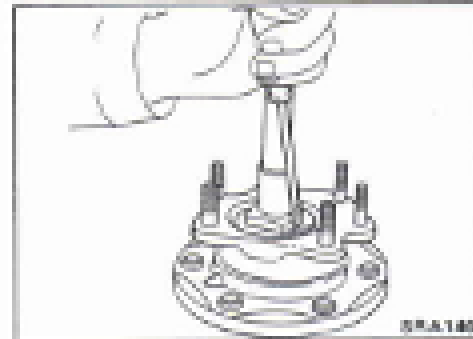
- Disconnect parking brake cable and brake tube.
- Remove nuts securing wheel bearing cage with baffle plate.



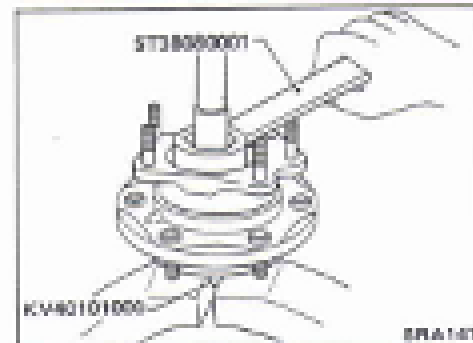
- Draw out axle shaft with Tool.
- When drawing out axle shaft, be **careful** not to damage oil seal.



- Remove oil seal.
- Do not reuse oil seal once it is removed. Always install new one.



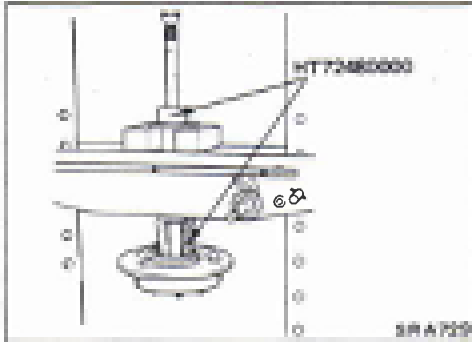
- Unbend lock washer with a screwdriver.
- Do not reuse once removed lock washer. Always install new one.



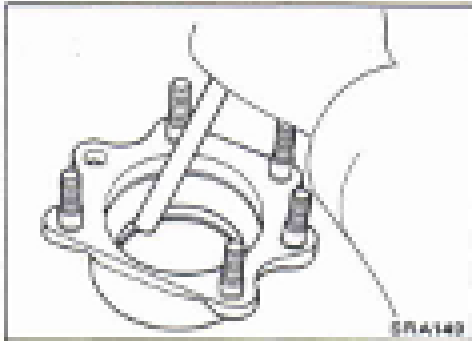
- Remove bearing lock nut with Tool.

## REAR AXLE — Semi-floating Type

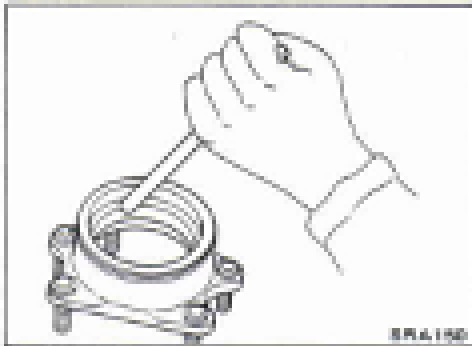
### Removal (Cont'd)



- Remove wheel bearing together with bearing housing and baffle plate from axle shaft.



- Remove grease seal in bearing housing with suitable bar.



- Remove wheel bearing outer race with a brass drift.

### Inspection

#### AXLE SHAFT

- Check axle shaft for straightness, cracks, damage, wear or distortion. Replace if necessary.

#### WHEEL BEARING

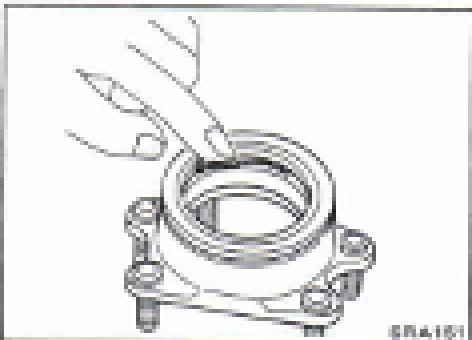
- Make sure wheel bearing rolls freely and is free from noise, crack, pitting or wear.

#### AXLE CASE

- Check axle case for yield, deformation or cracks. Replace if necessary.

### Installation — Models with drum brake

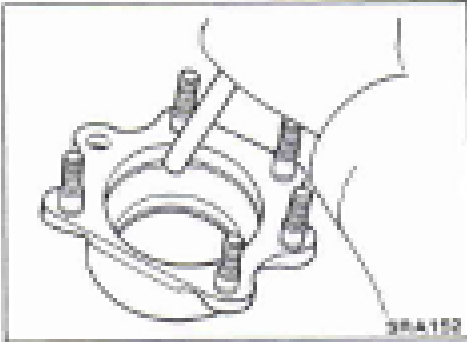
- Install a new grease seal in bearing housing. Lubricate cavity between seal lips after fitting seal.



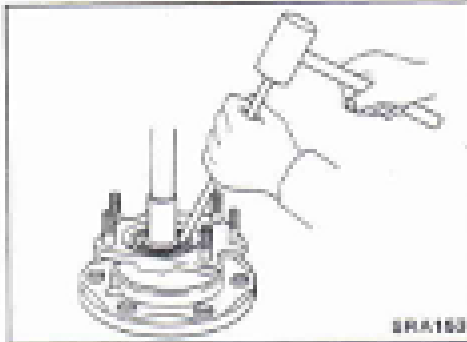
## REAR AXLE — Semi-floating Type

### Installation — Models with drum brake (Cont'd)

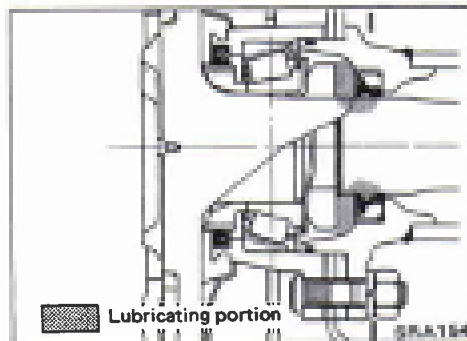
- Install wheel bearing outer race using a brass drift.



- Install wheel bearing inner race with a brass drift.

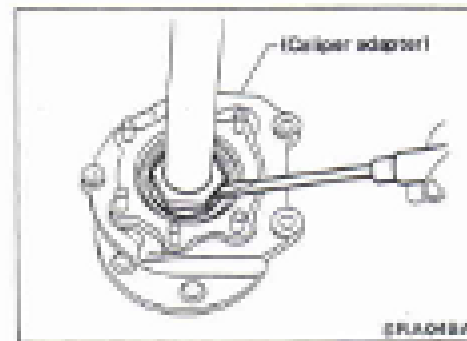


- Before installing wheel bearing, fill races and gap between rollers with wheel bearing grease. Also apply a coat of grease to seat of lock nut before installing lock washer.



- After tightening lock nut to specified torque, bend one portion of lock washer to lock the nut.

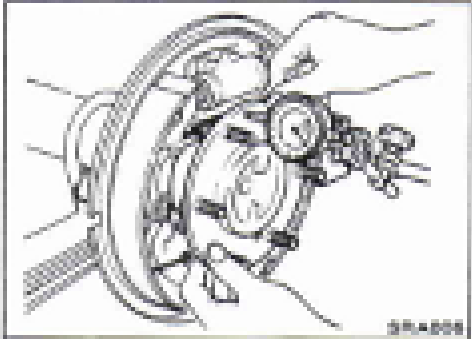
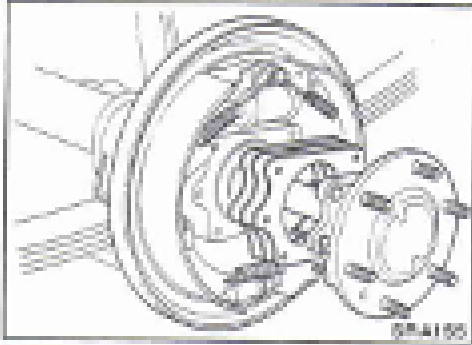
$\square$ : 441 - 490 N·m  
(45 - 50 kg-m, 325 - 362 ft-lb)



- Install a new oil seal to axle housing case using a suitable tool.

After installing new oil seal, coat sealing lip with multi-purpose grease.

## REAR AXLE — Semi-floating Type



### Installation — Models with drum brake (Cont'd)

- (1) Position one (left or right) axle shaft in axle housing.
- (2) Select end shims.

**Standard thickness: 1.6 mm (0.063 in)**

**Axle case end shim: Refer to S.D.S.**

**Do not insert end shims between rear axle seal and bearing housing.**

- (3) Position the other axle shaft in axle housing. Adjust end play of both axle shaft.

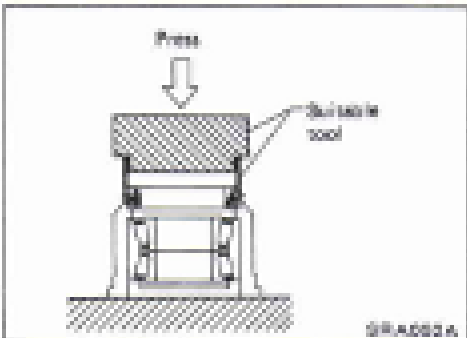
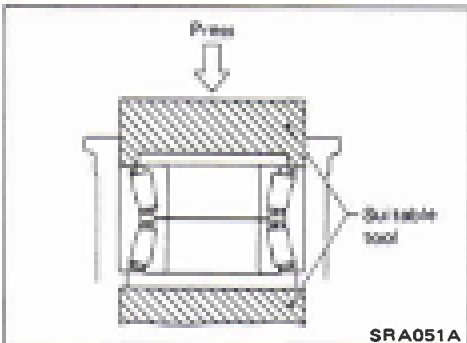
**Axial end play:**

**0.02 - 0.15 mm (0.0008 - 0.0059 in)**

**If difference in left and right shim thicknesses exceeds 1 mm (0.04 in), add or remove shim on the side of shaft which was first positioned in axle housing so that difference is less than 1 mm (0.04 in).**

- (4) If axial end play is not within the specified limit, reselect axle case end shims.

**While adjusting axial end play, be careful not to damage oil seal.**



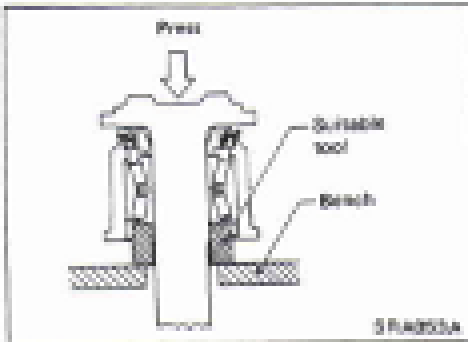
### Installation — Models with disc brake

- Press wheel bearing until it bottoms end face of bearing housing.

**Always press outer race of wheel bearing during installation.**

- Press grease seal until it bottoms end face of bearing housing.

## REAR AXLE — Semi-floating Type



### Installation — Models with disc brake (Cont'd)

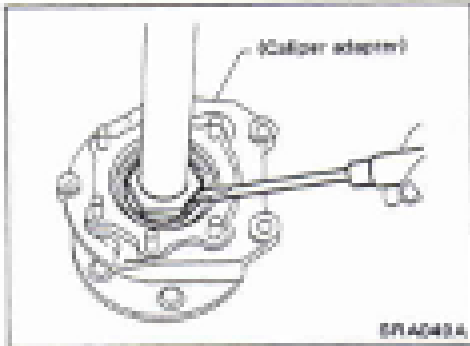
- Install spacer over axle shaft and press axle shaft into inner race of wheel bearing.

**Be careful not to damage or deform grease seal. Fill gap between grease seal lip and spacer with wheel bearing grease.**

- Before installing lock nut, apply a coat of wheel bearing grease to its seat. Tighten lock nut to specified torque.

☞: 441 - 490 N·m

(45 - 50 kg-m, 325 - 362 ft-lb)

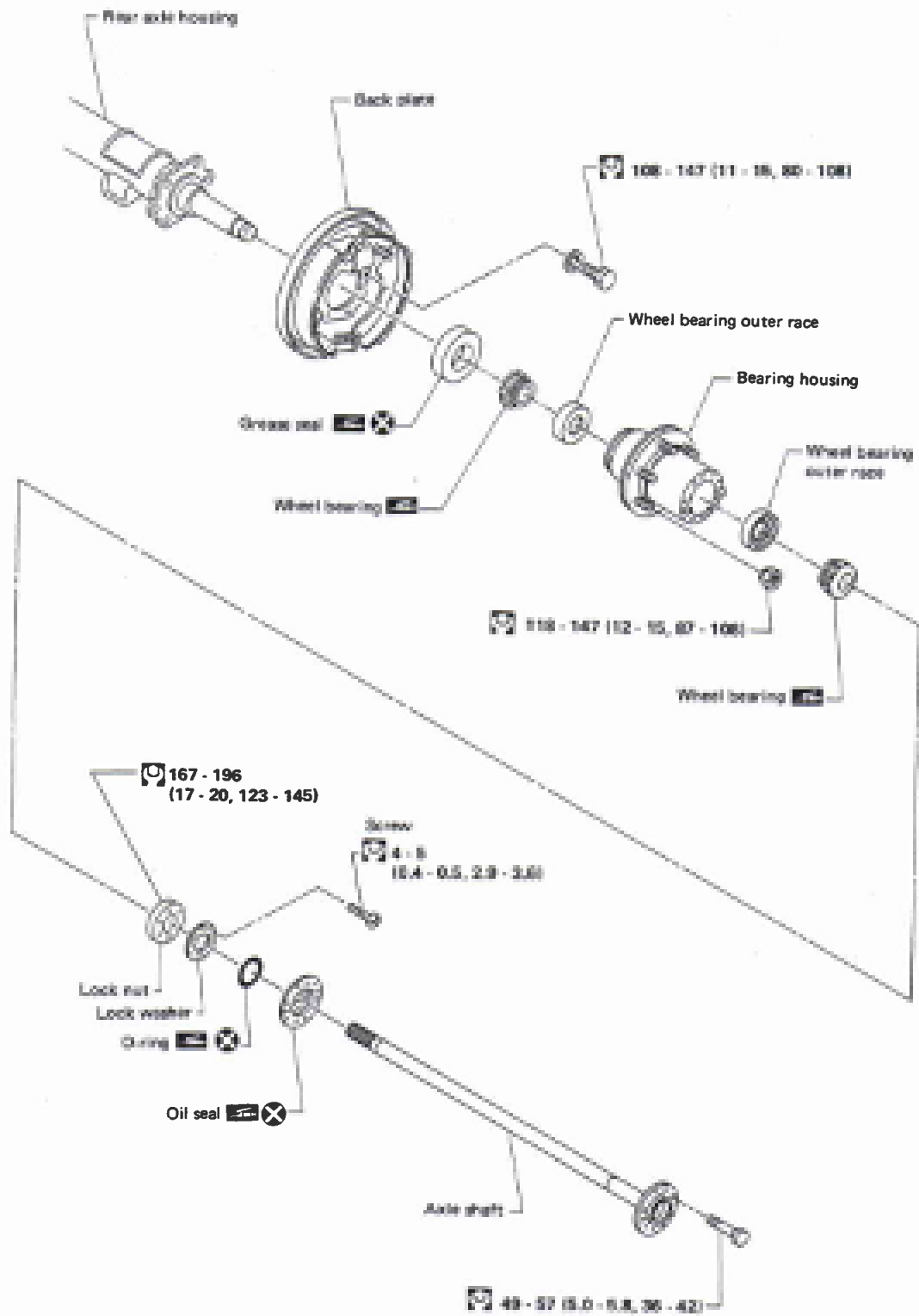


- Lock lock nut by bending one portion of lock washer.
- Turn bearing housing (with respect to axle shaft) two or three times. It must turn smoothly.
- Position axle shafts in axle housing.

**Be careful not to damage oil seal.**

# REAR AXLE — Full-floating Type

## DRUM BRAKE TYPE

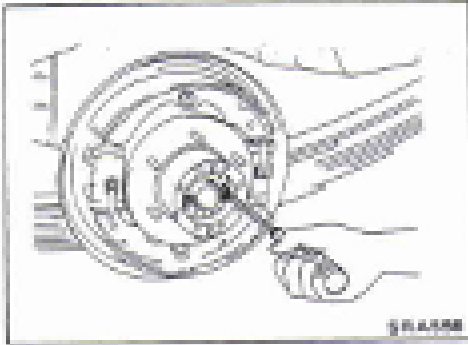


: N·m (kg·m, ft·lb)

SRA046A

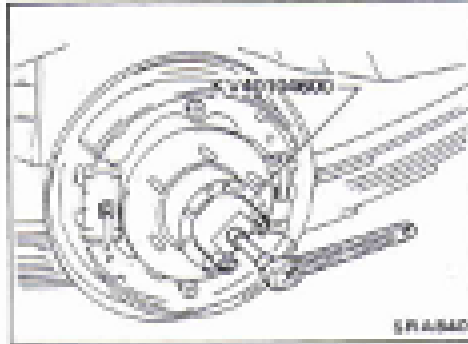


## REAR AXLE — Full-floating Type

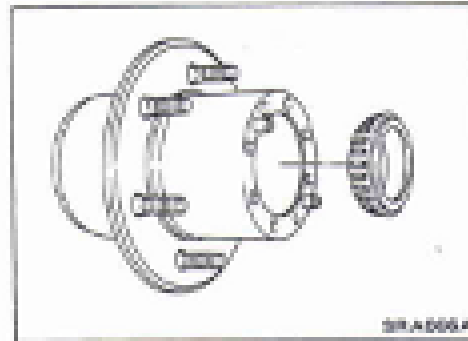


### Removal and Installation

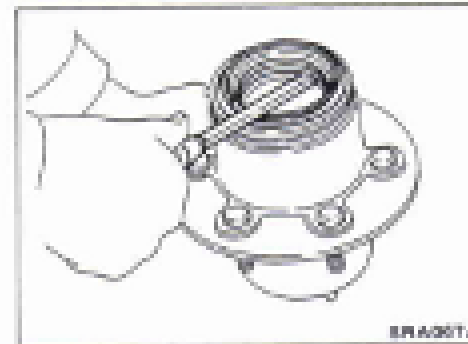
- Remove axle shaft.
- Remove oil seal and O-ring.
- Remove lock washer.



- Remove wheel bearing lock nut with Tool.



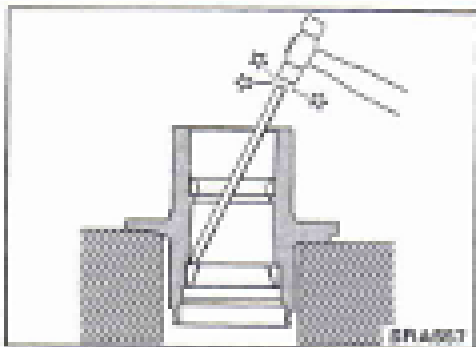
- Remove wheel bearing and wheel hub.  
**Be careful not to drop outer bearing.**



- Remove inside wheel bearing outer race, grease seal and outside wheel bearing race.  
**Do not reuse oil seal once it is removed.  
Always install new one.**

- When adjusting wheel bearing preload, refer to Preload Adjustment of Wheel Bearing in CHECK AND ADJUSTMENT — On-vehicle.

## REAR AXLE — Full-floating Type



### Disassembly

- Remove bearing outer races with suitable brass bar.

### Inspection

#### AXLE SHAFT

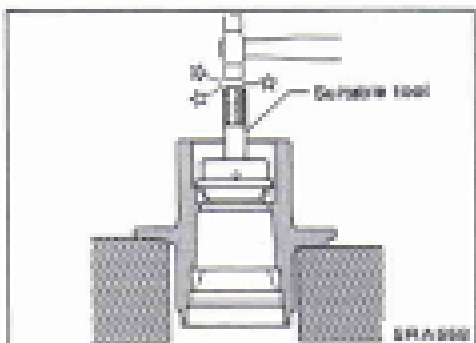
- Check axle shaft for straightness, cracks, damage, wear or distortion. Replace if necessary.

#### WHEEL BEARING

- Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

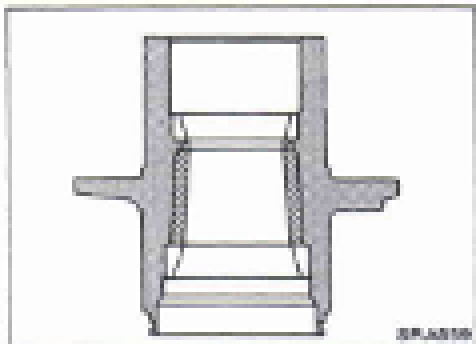
#### AXLE CASE

- Check axle case for yield, deformation or cracks. Replace if necessary.

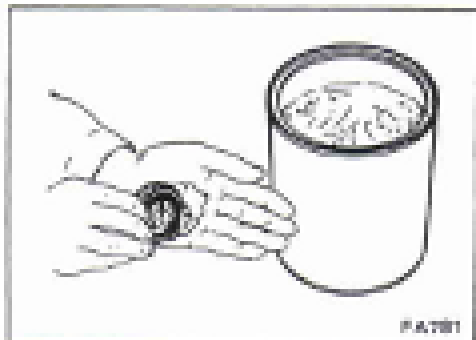


### Assembly

- Install bearing outer race with tool until it seats in hub.

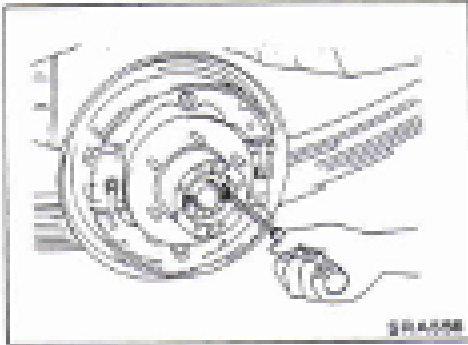


- Pack hub with multi-purpose grease.



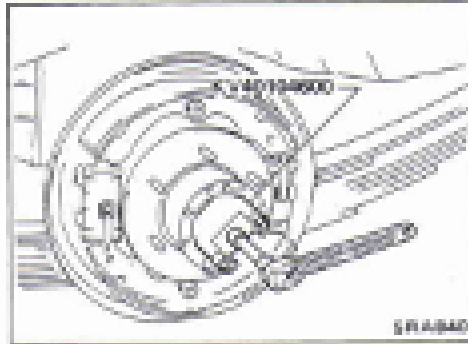
- Coat each bearing cone with multi-purpose grease.

## REAR AXLE — Full-floating Type

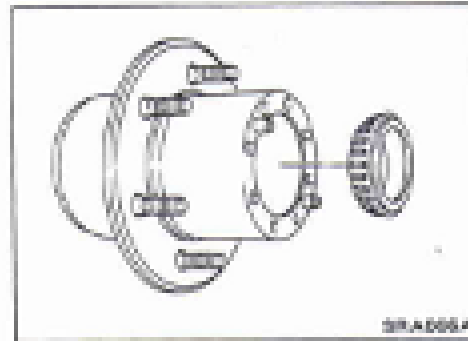


### Removal and Installation

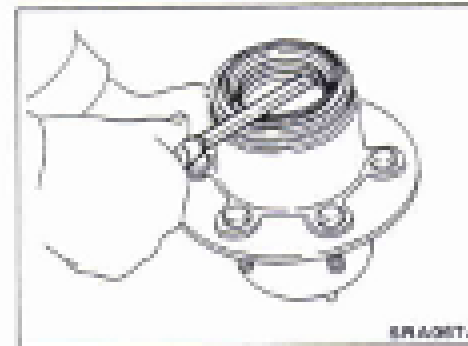
- Remove axle shaft.
- Remove oil seal and O-ring.
- Remove lock washer.



- Remove wheel bearing lock nut with Tool.



- Remove wheel bearing and wheel hub.  
**Be careful not to drop outer bearing.**



- Remove inside wheel bearing outer race, grease seal and outside wheel bearing race.  
**Do not reuse oil seal once it is removed.  
Always install new one.**

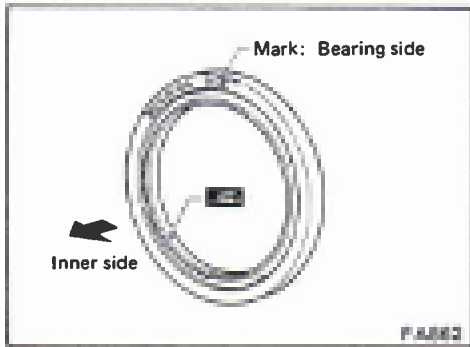
- When adjusting wheel bearing preload, refer to Preload Adjustment of Wheel Bearing in CHECK AND ADJUSTMENT — On-vehicle.

## REAR AXLE — Full-floating Type

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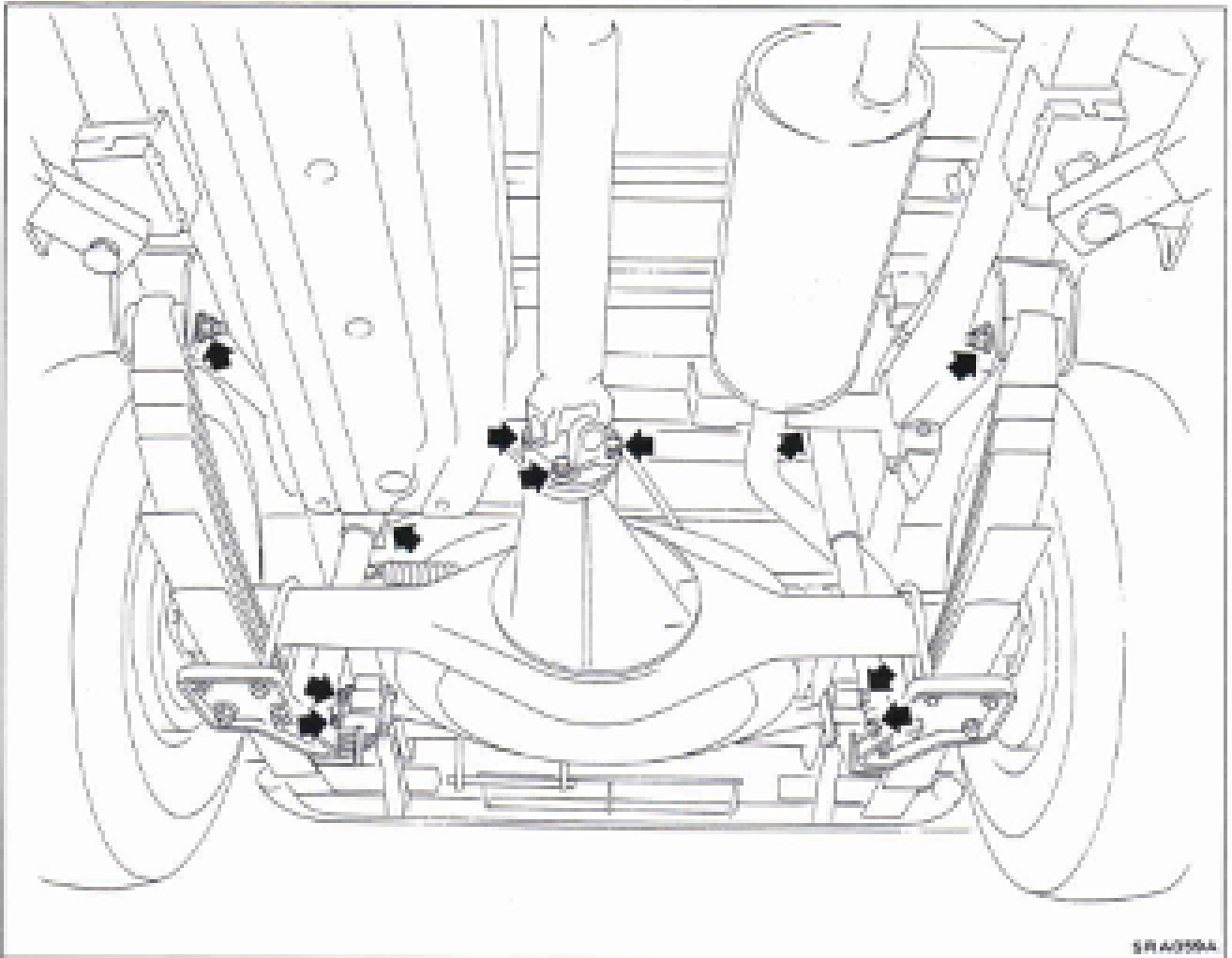
### Assembly (Cont'd)

- Pack grease seal lip with multi-purpose grease, then install it into wheel hub with suitable drift.



## REAR SUSPENSION — Leaf Spring Type

### Removal and Installation

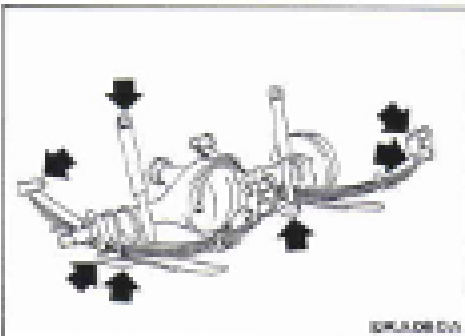


- Disconnect brake hydraulic line and parking brake cable.

#### **CAUTION:**

**Use Tool when removing or installing brake tubes.**

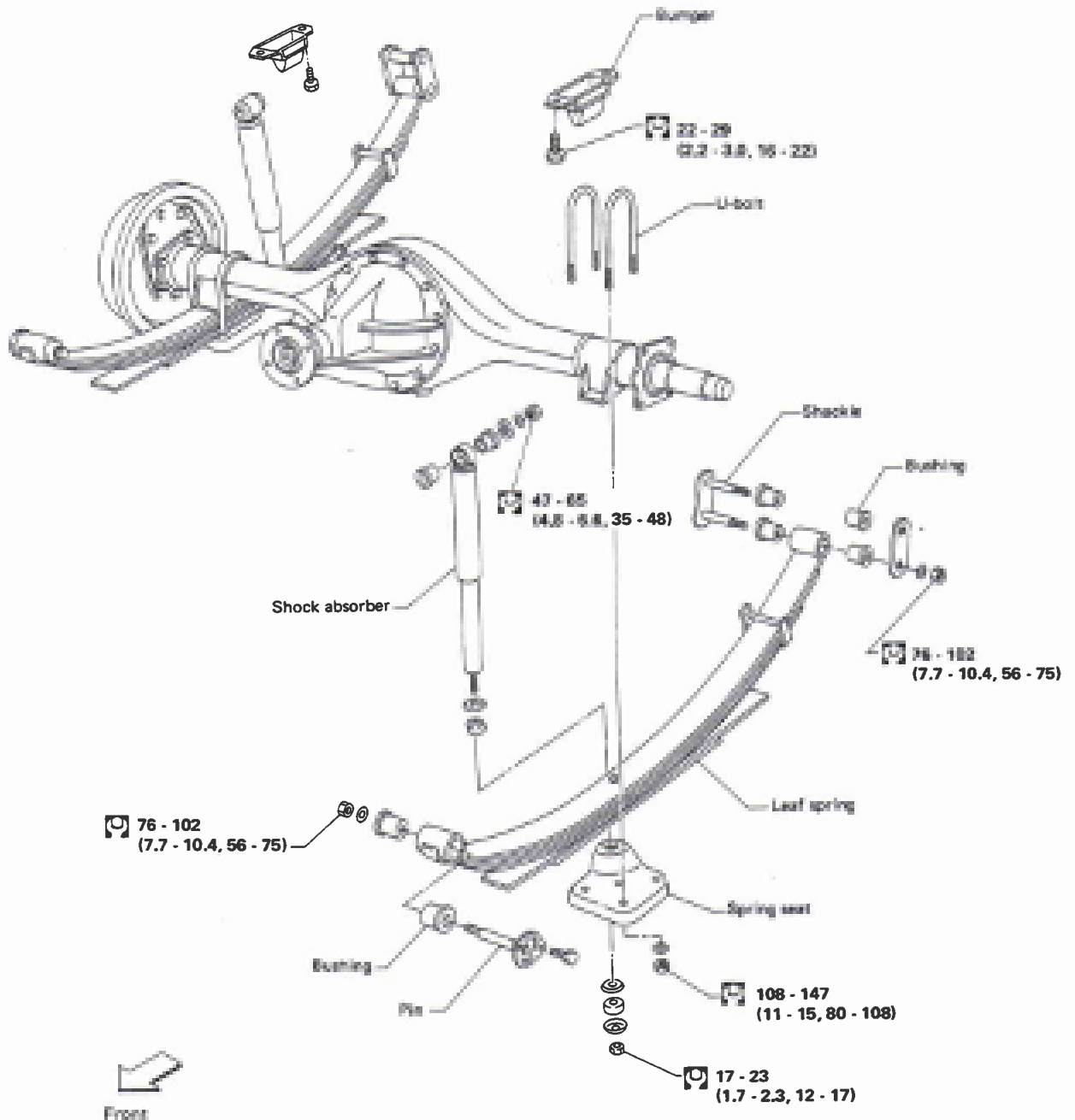
- Remove leaf spring from body.
- Remove propeller shaft. Refer to section PD.
- Remove upper end nuts of shock absorber.



**Final tightening for rubber parts requires to be carried out under unladen condition with tires on ground.**

# REAR SUSPENSION — Leaf Spring Type

## Components



When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

\* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

 : N·m (kg·m, ft·lb)

SPRAC225A

## REAR SUSPENSION — Leaf Spring Type

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### Shock Absorber

- Check shock absorber for oil leakage, cracks or deformation. Replace if necessary.
- Check rubber bushings for cracks. Replace if necessary.

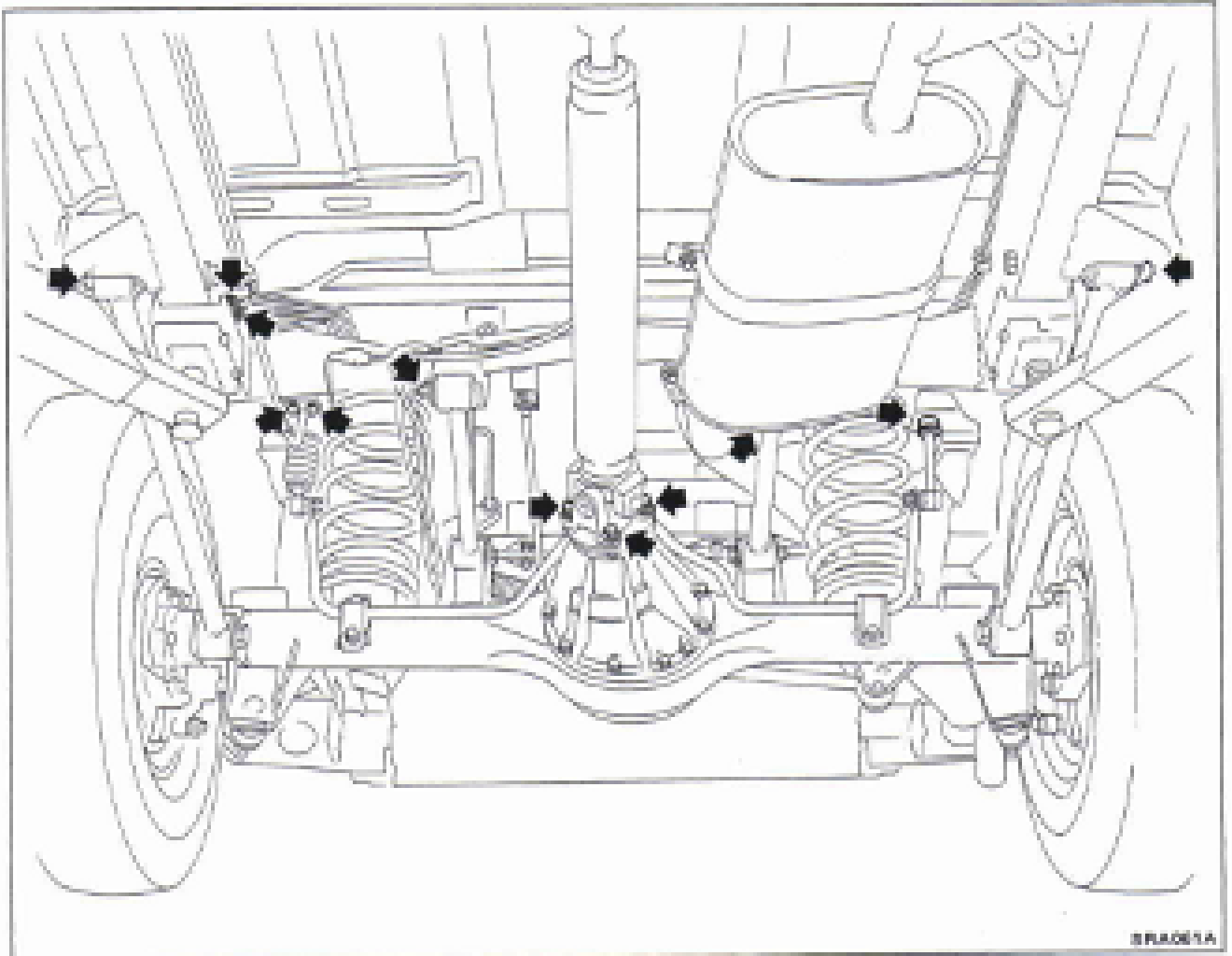
### Leaf Spring

#### INSPECTION

- Check leaf spring for cracks. Replace if necessary.
- Check front bracket and pin, shackle, U-bolts and spring pad for wear, cracks, straightness or damaged threads. Replace if necessary.
- Check all bushings for deformation or cracks. Replace if necessary.

## REAR SUSPENSION — Coil Spring Type

### Removal and Installation



3 P14061A



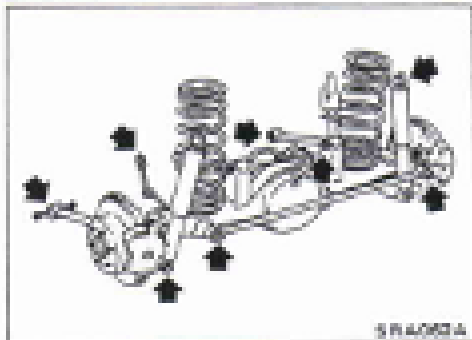
3 P14061A

- Disconnect brake hydraulic line.

#### CAUTION:

**Use Tool when removing or installing brake tubes.**

- Remove stabilizer bar from body.
- Remove upper links and lower links from body.
- Remove panhard rod from body.
- Disconnect propeller shaft. Refer to section PD.
- Remove upper end nuts of shock absorber.



3 P14061A

**Final tightening for rubber parts requires to be carried out under unladen condition with tires on ground.**





## REAR SUSPENSION — Coil Spring Type

### Coil Spring and Shock Absorber

#### REMOVAL AND INSTALLATION

- Refer to Removal and Installation of REAR SUSPENSION — Coil Spring Type.

When installing coil spring and lower spring seat, pay attention to its direction.

Be sure spring rubber seat is not twisted and has not slipped off when installing coil spring.

#### INSPECTION

- Check coil spring for yield, deformation or cracks.
- Check coil spring specifications. Refer to S.D.S.
- Check shock absorber for oil leakage, cracks or deformation.
- Check shock absorber specifications. Refer to S.D.S.
- Check all rubber parts for wear, cracks or deformation. Replace if necessary.

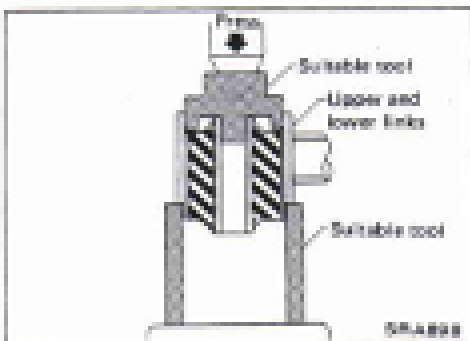
### Upper Link, Lower Link and Panhard Rod

#### INSPECTION

Check for cracks, distortion or other damage. Replace if necessary.

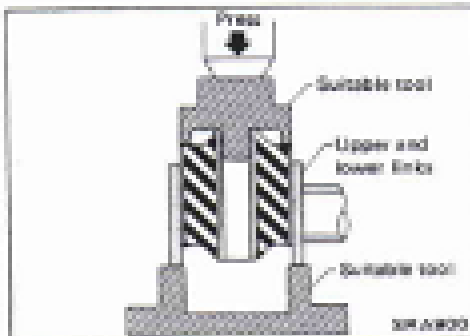
#### BUSHING REPLACEMENT

Check for cracks or other damage. Replace with suitable tool if necessary.



#### Upper and lower links bushing

- Remove upper and lower links bushing with suitable tool.



When installing upper and lower links bushing, apply a coating of 1% soap water to outer wall of bushing.

Always install new bushing.

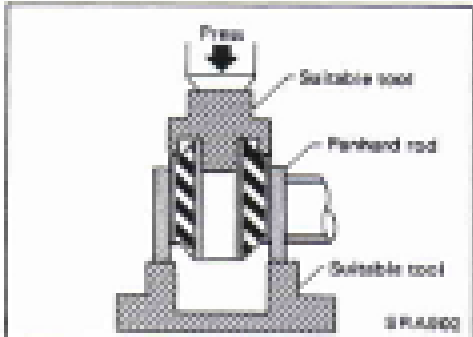
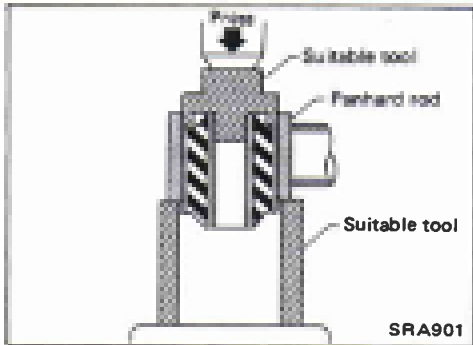
Do not tap end face of bushing directly with a hammer.

## REAR SUSPENSION — Coil Spring Type

### Upper Link, Lower Link and Panhard Rod (Cont'd)

#### Panhard rod bushing

- Remove panhard rod bushing with suitable tool.



When installing panhard rod bushing, apply a coating of 1% soap water to outer wall of bushing.

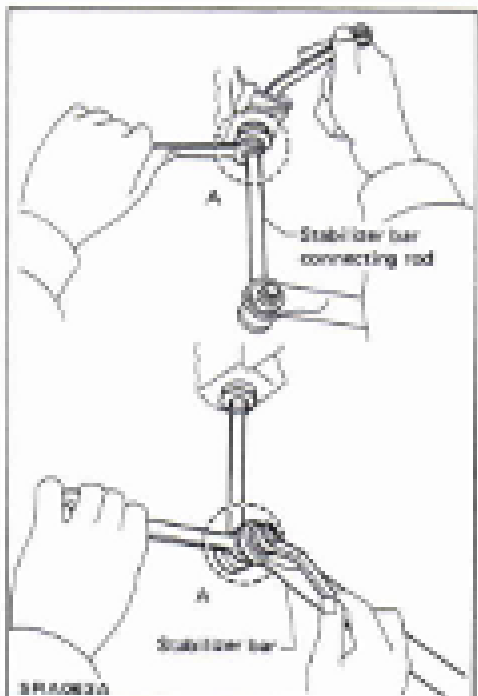
Always install new bushing.

Do not tap end face of bushing directly with a hammer.

#### INSTALLATION

When installing each link, pay attention to direction of bolts and nuts.

When installing each rubber part, final tightening must be carried out under unladen condition with tires on ground.



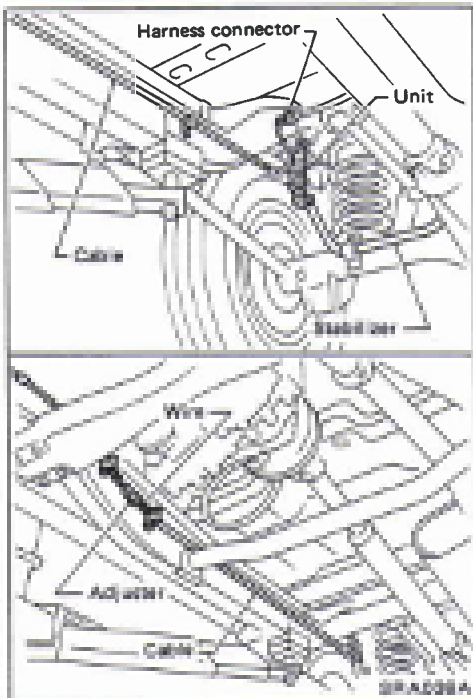
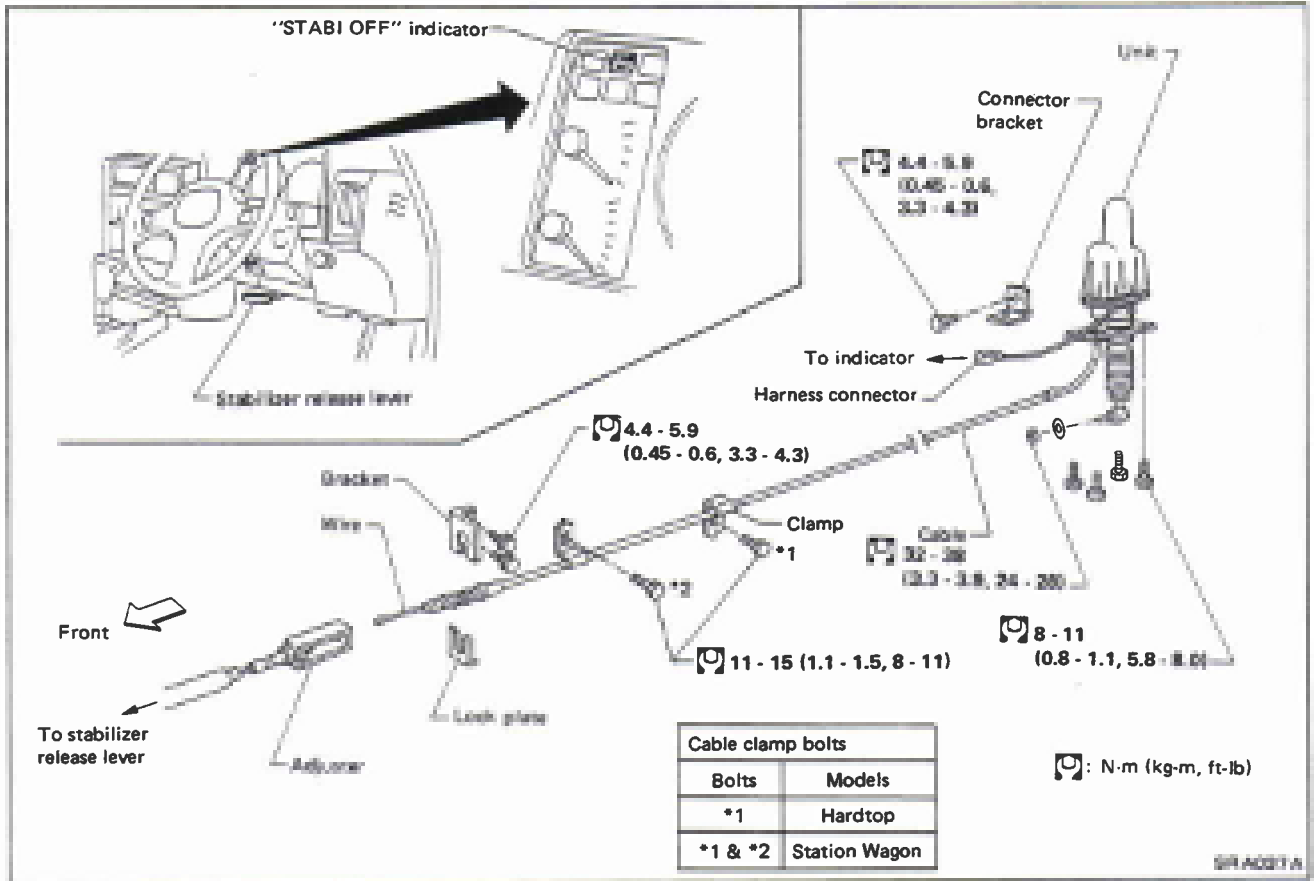
#### Stabilizer Bar

#### REMOVAL AND INSTALLATION

- When removing and installing stabilizer bar, fix portion A.

# STABILIZER RELEASE DEVICE

## Removal and Installation



1. Loosen release lever.
2. Separate unit and stabilizer.
3. Disconnect indicator harness connector.
4. Disengage adjuster from cable.

### CAUTION:

- Be careful not to damage cable.
- Make sure there is no free play after installation.

## STABILIZER RELEASE DEVICE

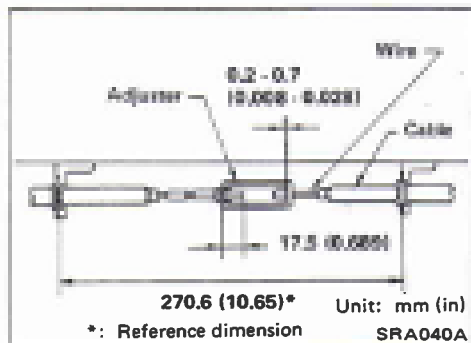
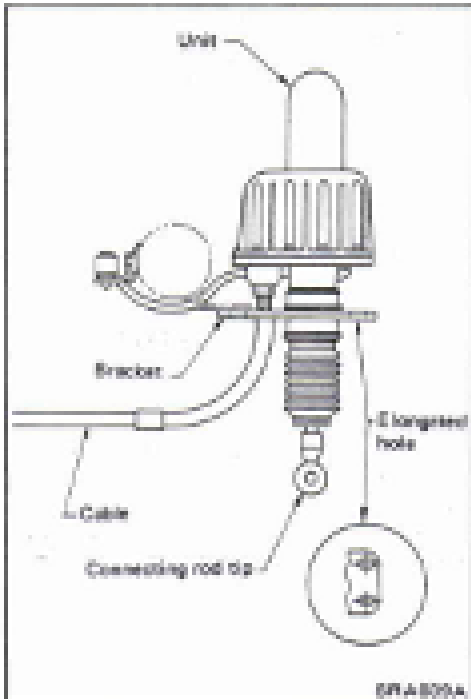
### Inspection

1. Check control release lever for wear or other damage. Replace if necessary.
2. Check cables for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp. Replace if necessary. Refer to EL section.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.

### Adjustment

Adjust control lever stroke as follows.

1. Loosen stabilizer release lever.
2. Check that unit is locked properly by moving end of connecting rod or by moving stabilizer arm up and down.



3. Adjust cable length using adjuster.

#### Cable elongation:

**0.2 - 0.7 mm (0.008 - 0.028 in)**

4. After temporarily adjusting cable length, pull adjuster back with hand to release unit. Relock unit and properly adjust cable length. Then lock adjuster.
5. Connect indicator harness connector.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

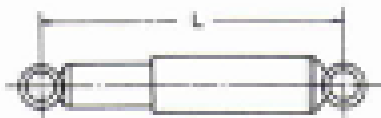
### General Specifications (Leaf Spring Type)

#### LEAF SPRING AND SHOCK ABSORBER

Item	Model	Pickup	
		L.H.D.	R.H.D.
<b>Leaf spring</b>			
Length x width x thickness – number of leaves mm (in)			
Main		$1,420 \times 70 \times 7 - 1$ $8 - 1$ $7 - 3$ $(55.91 \times 2.76 \times 0.28 - 1)$ $0.24 - 1$ $0.28 - 3$	
Helper		$575 \times 70 \times 14 - 1$ $(22.64 \times 2.76 \times 0.55 - 1)$	
Free camber "S"	mm (in)	182.8 (7.20)	182.8 (6.41)
Spring constant	N/mm (kg/mm, lb/in)	$44.6 - 115.7$ $(4.55 - 11.8, 254.8 - 660.8)$	
<b>Shock absorber</b>			
Maximum length "L"	mm (in)	613 (24.13)	
Stroke	mm (in)	352 (13.82)	
Damping force [at 0.3 m (1.0 ft)/sec.]	N (kg, lb)	941 (96, 212)	
Expansion		432 (43, 950)	
Compression		432 (43, 950)	



SRA111



RA380

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

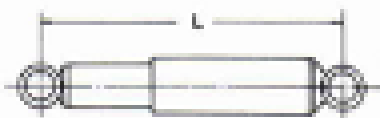
### General Specifications (Coil Spring Type)

#### COIL SPRING AND STABILIZER BAR

Item	Model	Station Wagon		Hardtop	Station Wagon	Hardtop
		DX	STD		With high-roof	
<b>Coil spring</b>						
Wire diameter	mm (in)	15.2 - 17.2 (0.598 - 0.677)	15.2 - 17.1 (0.598 - 0.673)	15.0 - 16.2 (0.591 - 0.638)	15.1 - 17.4 (0.594 - 0.685)	15.7 - 17.2 (0.618 - 0.677)
Coil inside diameter	mm (in)	140 (5.51)				
Free length	mm (in)	454 (17.87)	444 (17.48)	450.5 (17.74)	443.5 (17.46)	429.5 (16.91)
Spring constant	N/mm (kg/mm, lb/in)	30.4 - 53.9 (3.1 - 5.5, 174 - 308)	30.5 - 53.9 (3.11 - 5.5, 174.2 - 308.0)	26.2 - 46.0 (2.67 - 4.69, 149.5 - 262.6)	32.6 - 54.9 (3.32 - 5.6, 185.9 - 313.6)	30.4 - 55.9 (3.1 - 5.7, 174 - 319)
Identification color		Yellow x 1 White x 1	Yellow x 1	Blue x 1	Pink x 1	Yellow green x 1
Stabilizer bar diameter	mm (in)	17 (0.67)				

#### SHOCK ABSORBER

Suspension type		B-link
Shock absorber type		Non-adjustable
Stroke	mm (in)	234 (9.21)
Maximum length "L"	mm (in)	619 (24.37)
Damping force (at 0.3 m (1.0 ft/sec.))	N (kg, lb)	
Expansion		1,550 (158, 348)
Compression		618 (62, 139)



PA280

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment

#### SEMI-FLOATING TYPE (Pickup)

Unit: mm (in)

Total end play	0.02 - 0.15 (0.0008 - 0.0059)	
Rear axle case end shim	<del>Thin Shim</del>	Part No.
	0.10 (0.0039)	43036-C8000
	0.20 (0.0079)	43089-T0400
	0.25 (0.0098)	43088-T0400
	0.50 (0.0197)	43087-T0400
	1.00 (0.0394)	43086-T0400

#### FULL-FLOATING TYPE (Pickup)

Wheel bearing lock nut Tightening torque N-m (kg-m, ft-lb)	107 - 126 (17 - 20, 133 - 148)
Retightening torque after loosening wheel bearing lock nut N-m (kg-m, ft-lb)	3 - 5 (0.3 - 0.5, 2.2 - 3.6)
Axial end play mm (in)	0 (0)
Starting force at wheel hub bolt N (kg, lb)	A
Starting force at wheel hub bolt N (kg, lb)	B
Wheel bearing preload at wheel hub bolt N (kg, lb) B - A	0 - 12.55 (0 - 1.28, 0 - 2.82)

#### STABILIZER RELEASE DEVICE

Cable free play (at adjuster) mm (in)	0.2 - 0.7 (0.008 - 0.028)
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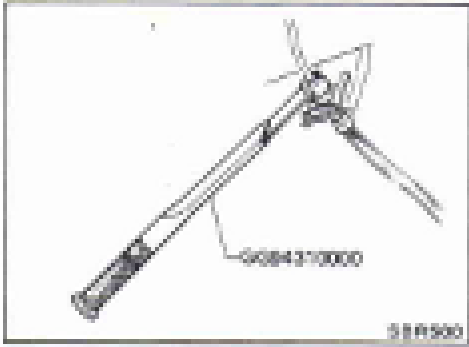
# REAR AXLE & REAR SUSPENSION

## SECTION **RA**

### CONTENTS

PRECAUTIONS AND PREPARATION .....	RA- 2
REAR AXLE AND REAR SUSPENSION .....	RA- 3
CHECK AND ADJUSTMENT — On-vehicle .....	RA- 5
REAR AXLE — Semi-floating Type .....	RA- 9
REAR AXLE — Full-floating Type .....	RA-16
REAR SUSPENSION — Leaf Spring Type .....	RA-20
REAR SUSPENSION — Coil Spring Type .....	RA-23
STABILIZER RELEASE DEVICE .....	RA-27
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	RA-29

## PRECAUTIONS AND PREPARATION



### Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.
  - \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, and mats in designated positions.
- Use Tool when removing or installing brake tubes.
- When removing each suspension part, check wheel alignment and adjust if necessary.

### Preparation

#### SPECIAL SERVICE TOOLS

\*: Special tool or commercial equivalent

Tool number Tool name	Description	
GG94310000* Flare nut torque wrench		Removing or installing brake piping
KV40101000* Axle stand		Removing rear axle shaft
ST36230000* Sliding hammer		Removing rear axle shaft
KV40104600 Rear wheel bearing lock nut wrench		Removing or installing wheel bearing lock nut
HT72480000 Rear axle shaft bearing puller		Removing wheel bearing
ST37840000 Rear axle shaft guide		Installing rear axle shaft
<b>COMMERCIAL SERVICE TOOL</b>		
Rear axle oil seal drift	<p style="margin-left: 20px;">                     A: 74 mm (2.91 in) dia.                      B: 68 mm (2.68 in) dia.                      C: 10 mm (0.39 in)                 </p>	Installing oil seal

## REAR AXLE AND REAR SUSPENSION

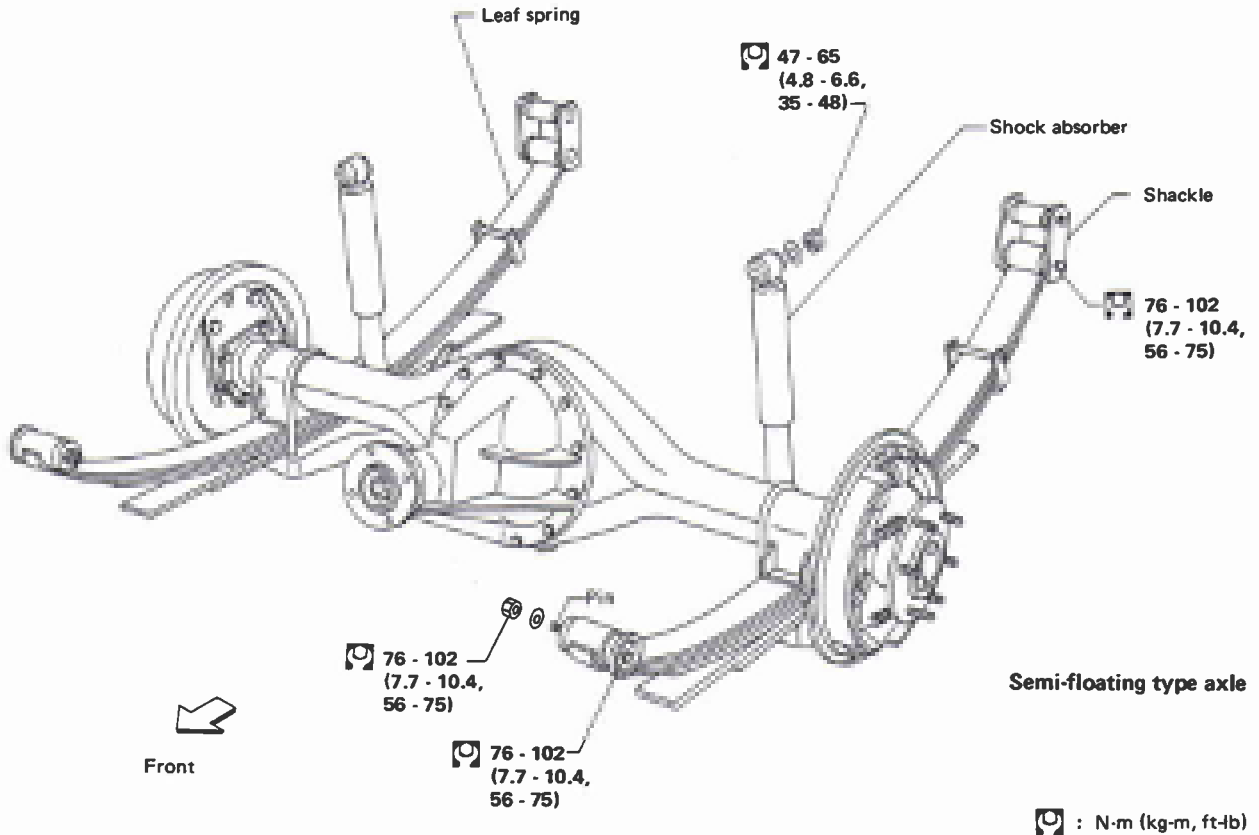
### LEAF SPRING TYPE

#### Wheel bearing

- Axial end play: 0.02 - 0.15 mm (0.0008 - 0.0059 in)
- Tightening torque: 441 - 490 N·m (45 - 50 kg·m, 325 - 362 ft·lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.

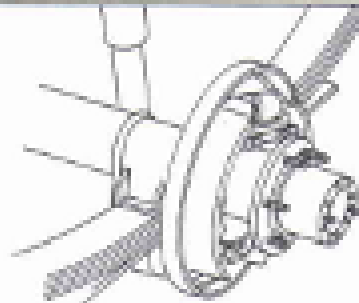
When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

- \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



#### Wheel bearing

- Axial end play: 0 mm (0 in)
- Tightening torque: 167 - 196 N·m (17 - 20 kg·m, 123 - 145 ft·lb)
- Wheel bearing preload (As measured at wheel hub bolt): 0 - 12.55 N (0 - 1.28 kg, 0 - 2.82 lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.



Full-floating type axle

SRA033A

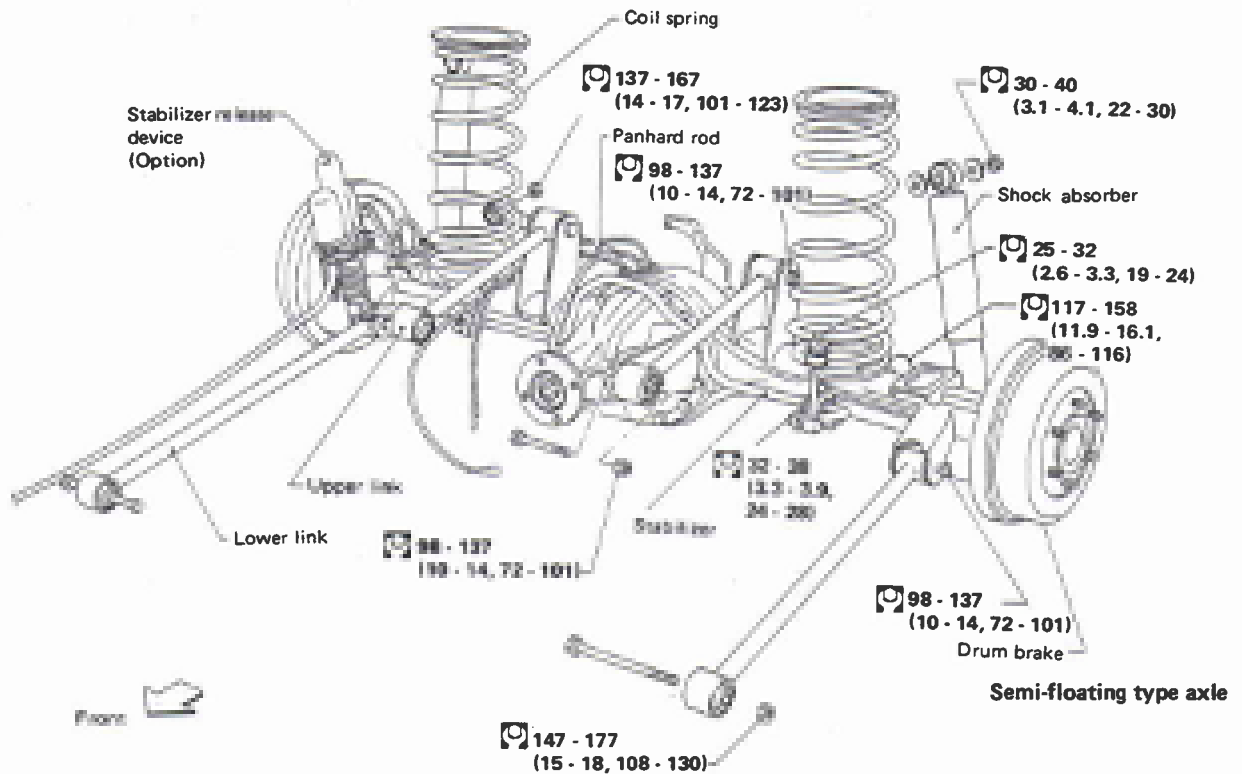
# REAR AXLE AND REAR SUSPENSION

## COIL SPRING TYPE

### Wheel bearing

- Axial end play: 0.02 - 0.15 mm (0.0008 - 0.0059 in)
- Tightening torque: 441 - 490 N·m (45 - 50 kg·m, 325 - 362 ft·lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.

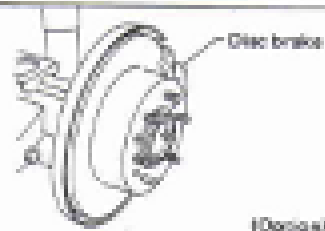
When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.  
 \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



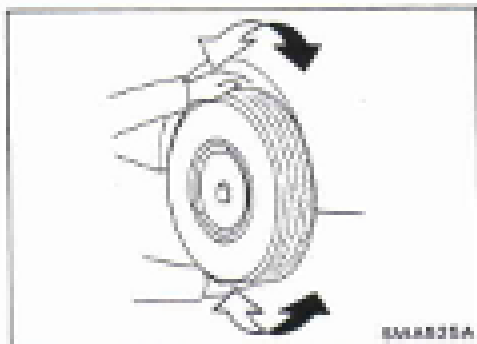
: N·m (kg·m, ft·lb)

### Wheel bearing

- Axial end play: 0 mm (0 in)
- Tightening torque: 441 - 490 N·m (45 - 50 kg·m, 325 - 362 ft·lb)
- Wheel bearing preload (As measured at wheel hub bolt): 8.8 - 42.2 N (0.9 - 4.3 kg, 2.0 - 9.5 lb)
- When measuring preload, do not include "dragging" resistance with brake shoes.



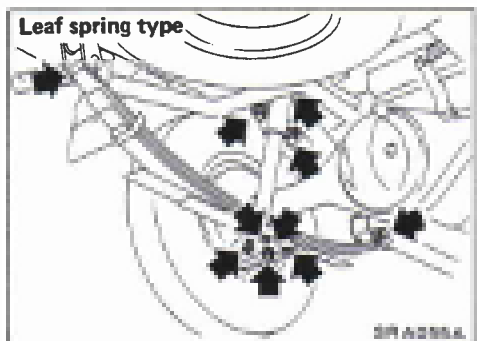
Semi-floating type axle



### Rear Axle and Rear Suspension Parts

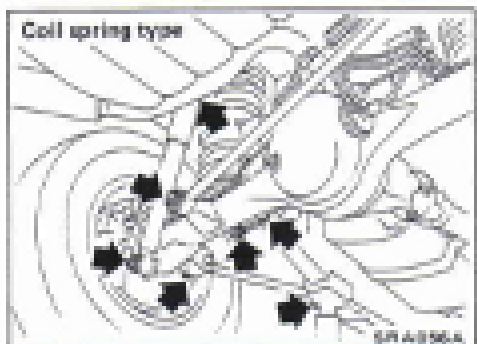
- Check rear axle and rear suspension parts for looseness, wear or damage.

(1) Shake each rear wheel.

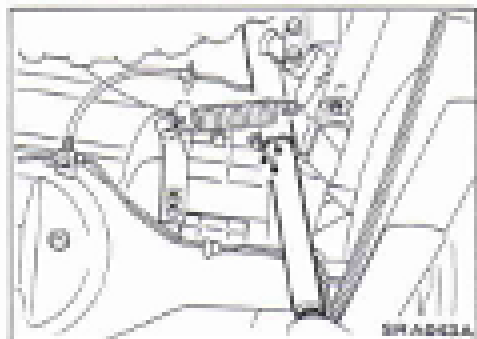


(2) Retighten all nuts and bolts to the specified torque.

**Tightening torque: Refer to page RA-3, 4.**



(3) Check shock absorber for oil leakage or other damage.



### Rear Wheel Bearing

#### SEMI-FLOATING TYPE

- Check that wheel bearings operate smoothly.
- Check axial end play.

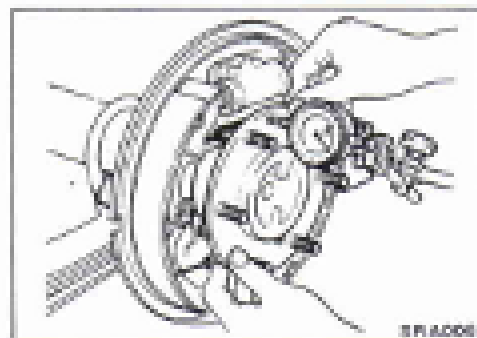
**Axial end play:**

**Drum brake type**

**0.02 - 0.15 mm (0.0008 - 0.0059 in)**

**Disc brake type**

**0 mm (0 in)**



## CHECK AND ADJUSTMENT — On-vehicle

### Rear Wheel Bearing (Cont'd)

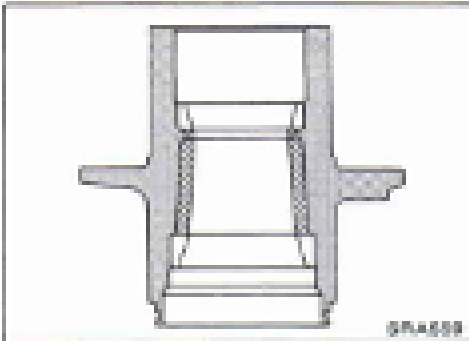
#### FULL-FLOATING TYPE

##### Preload adjustment

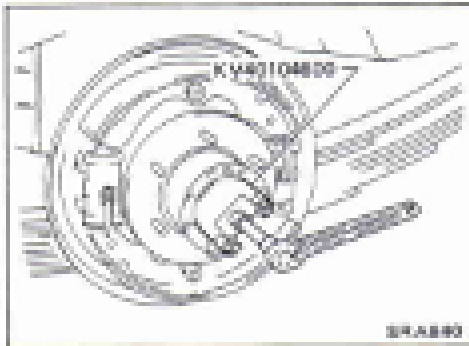
Adjust wheel bearing preload after wheel bearing has been replaced or rear axle has been reassembled.

Adjust wheel bearing preload as follows:

1. Before adjustment, thoroughly clean all parts to prevent dirt entry.

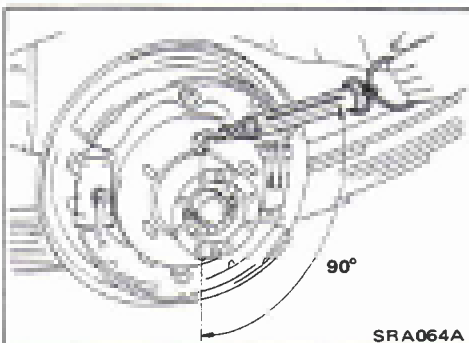


2. Apply multi-purpose grease sparingly to the following parts:
  - Threaded portion of spindle
  - Contact surface between wheel bearing washer and outer wheel bearing
  - Grease seal lip
  - Bearing housing



3. Tighten wheel bearing lock nut with Tool.  
Ⓜ: 167 - 196 N·m  
(17 - 20 kg-m, 123 - 145 ft-lb)
4. Turn wheel hub several times in both directions.

5. Loosen wheel bearing lock nut and then tighten it.  
Ⓜ: 3 - 5 N·m  
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)
6. Turn wheel hub several times in both directions.
7. Then retighten wheel bearing lock nut.  
Ⓜ: 3 - 5 N·m  
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

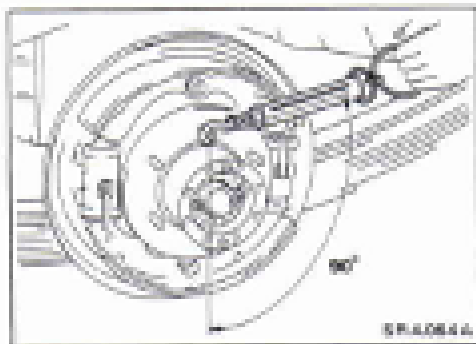


8. Measure rotating force (Fi). (as measured at wheel hub bolt)

## CHECK AND ADJUSTMENT — On-vehicle

### Rear Wheel Bearing (Cont'd)

9. Turn wheel bearing nut 0 to 22.5° in the direction to tighten and temporarily tighten lock washer with bolt.



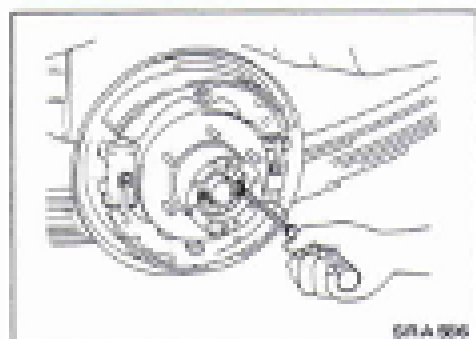
10. Turn wheel hub several times in both directions.  
11. Measure rotating force ( $F_2$ ). (as measured at wheel hub bolt)

12. Calculate rotating force by subtracting  $F_1$  from  $F_2$ .

$$F_2 - F_1:$$

$$0 - 12.55 \text{ N (0 - 1.28 kg, 0 - 2.82 lb)}$$

If it is not within specification, readjust.



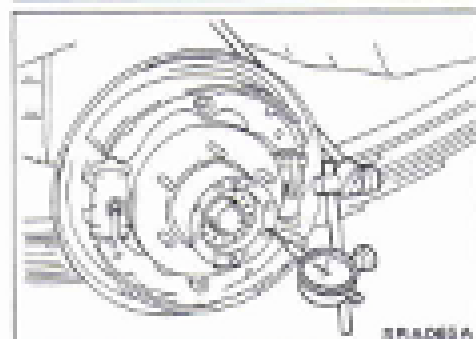
13. Tighten the screws.

$$\text{[Q]}: 4 - 5 \text{ N}\cdot\text{m (0.4 - 0.5 kg}\cdot\text{m, 2.9 - 3.6 ft}\cdot\text{lb)}$$

14. Measure wheel bearing axial end play.

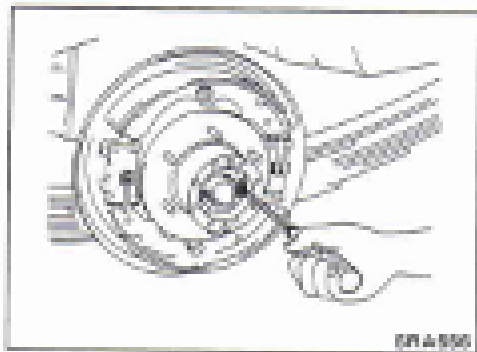
**Axial end play:**

$$0 \text{ mm (0 in)}$$



## CHECK AND ADJUSTMENT — On-vehicle

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### Rear Wheel Bearing (Cont'd)

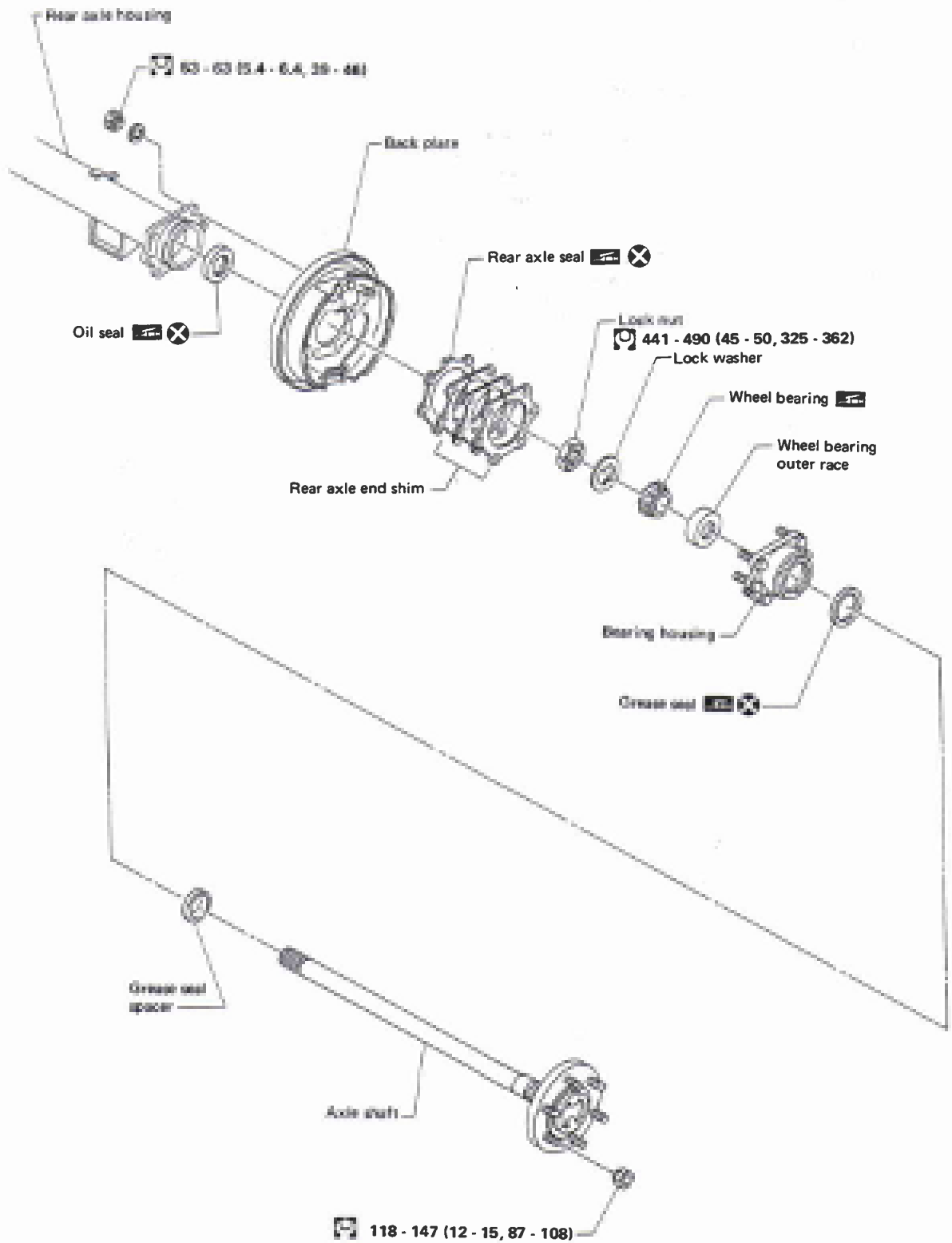
15. Install lock washer.
16. Recheck wheel bearing preload.
17. Repeat above procedures until correct axial end play and wheel bearing preload are obtained.
18. Install rear axle shaft.

**When inserting rear axle shaft, be careful not to damage oil seal.**



# REAR AXLE — Semi-floating Type

## DRUM BRAKE TYPE

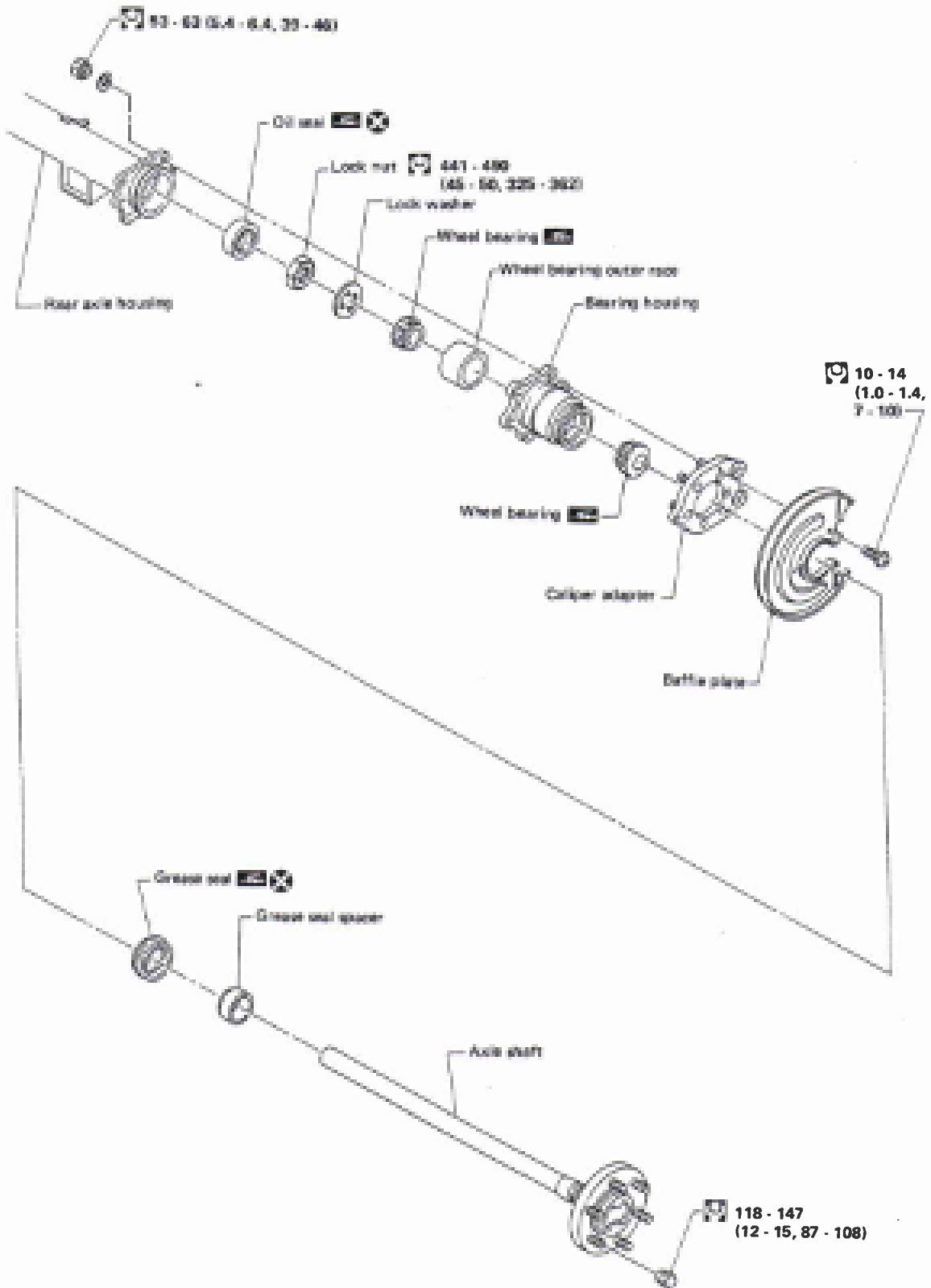


 : N-m (kg-m, ft-lb)

SRA045A

# REAR AXLE — Semi-floating Type

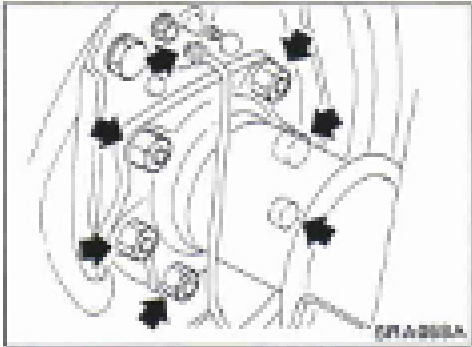
## DISC BRAKE TYPE



: N·m (kg·m, ft·lb)

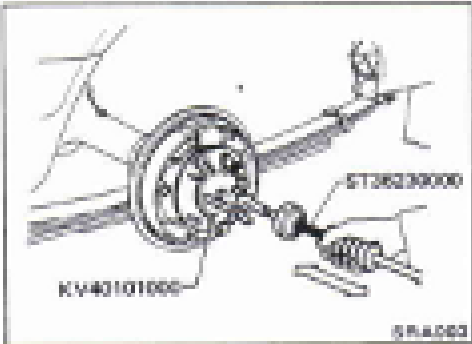
SRA047A

## REAR AXLE — Semi-floating Type

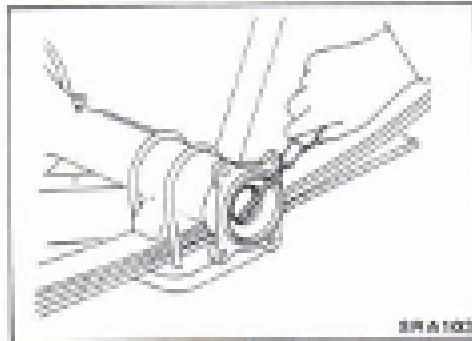


### Removal

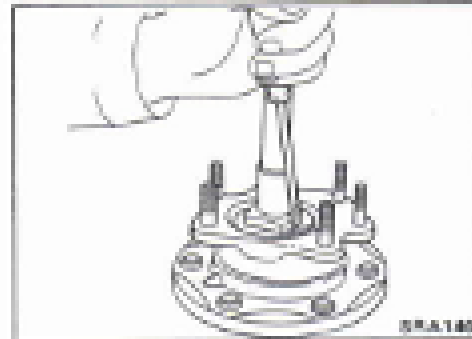
- Disconnect parking brake cable and brake tube.
- Remove nuts securing wheel bearing cage with baffle plate.



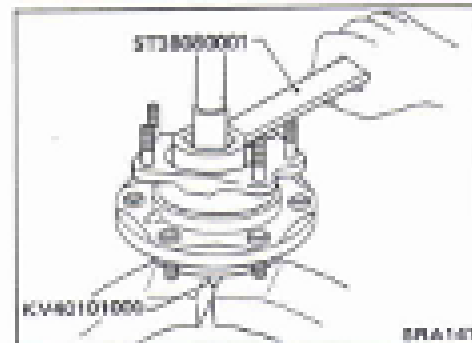
- Draw out axle shaft with Tool.
- When drawing out axle shaft, be **careful** not to damage oil seal.



- Remove oil seal.
- Do not reuse oil seal once it is removed. Always install new one.



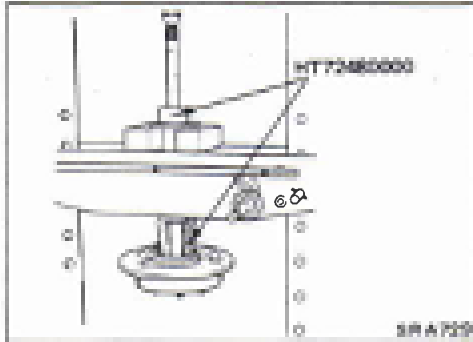
- Unbend lock washer with a screwdriver.
- Do not reuse once removed lock washer. Always install new one.



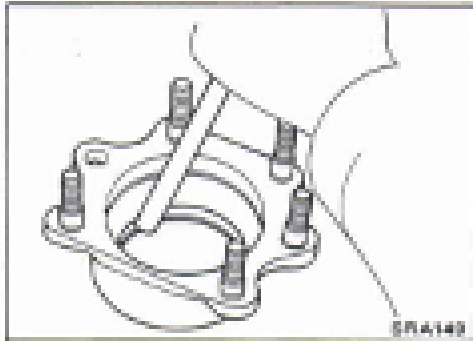
- Remove bearing lock nut with Tool.

## REAR AXLE — Semi-floating Type

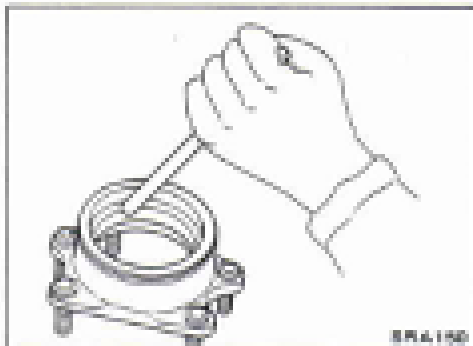
### Removal (Cont'd)



- Remove wheel bearing together with bearing housing and baffle plate from axle shaft.



- Remove grease seal in bearing housing with suitable bar.



- Remove wheel bearing outer race with a brass drift.

### Inspection

#### AXLE SHAFT

- Check axle shaft for straightness, cracks, damage, wear or distortion. Replace if necessary.

#### WHEEL BEARING

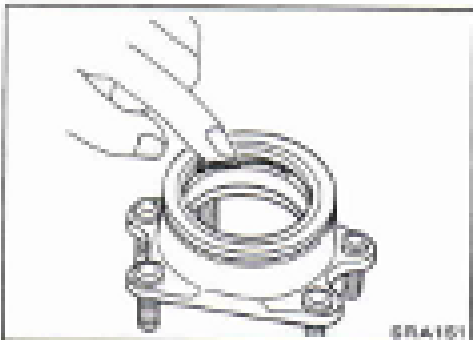
- Make sure wheel bearing rolls freely and is free from noise, crack, pitting or wear.

#### AXLE CASE

- Check axle case for yield, deformation or cracks. Replace if necessary.

### Installation — Models with drum brake

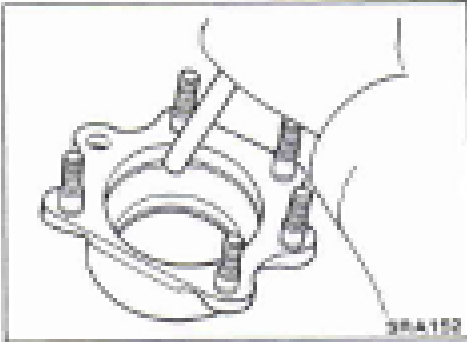
- Install a new grease seal in bearing housing. Lubricate cavity between seal lips after fitting seal.



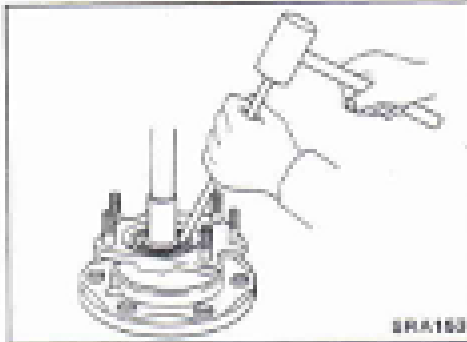
## REAR AXLE — Semi-floating Type

### Installation — Models with drum brake (Cont'd)

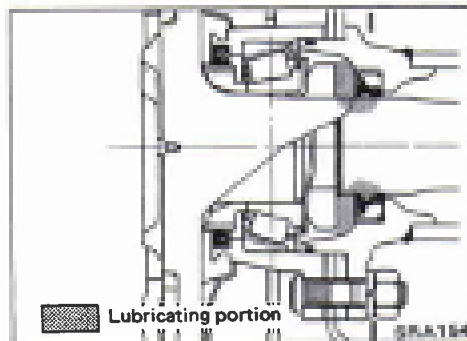
- Install wheel bearing outer race using a brass drift.



- Install wheel bearing inner race with a brass drift.

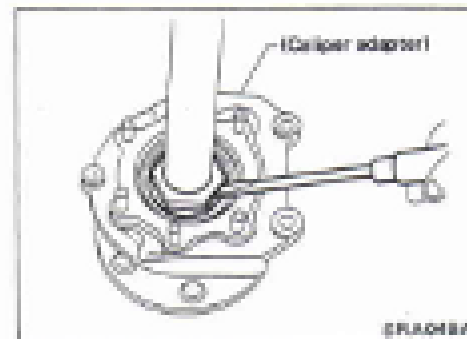


- Before installing wheel bearing, fill races and gap between rollers with wheel bearing grease. Also apply a coat of grease to seat of lock nut before installing lock washer.



- After tightening lock nut to specified torque, bend one portion of lock washer to lock the nut.

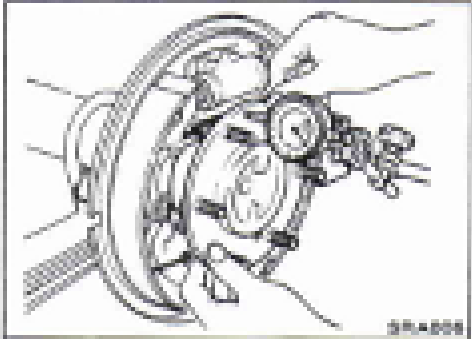
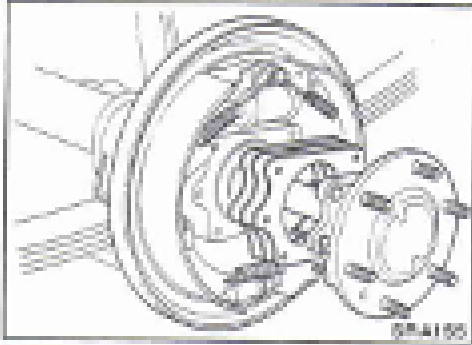
**Ⓢ: 441 - 490 N·m  
(45 - 50 kg-m, 325 - 362 ft-lb)**



- Install a new oil seal to axle housing case using a suitable tool.

**After installing new oil seal, coat sealing lip with multi-purpose grease.**

## REAR AXLE — Semi-floating Type



### Installation — Models with drum brake (Cont'd)

- (1) Position one (left or right) axle shaft in axle housing.
- (2) Select end shims.

**Standard thickness: 1.6 mm (0.063 in)**

**Axle case end shim: Refer to S.D.S.**

**Do not insert end shims between rear axle seal and bearing housing.**

- (3) Position the other axle shaft in axle housing. Adjust end play of both axle shaft.

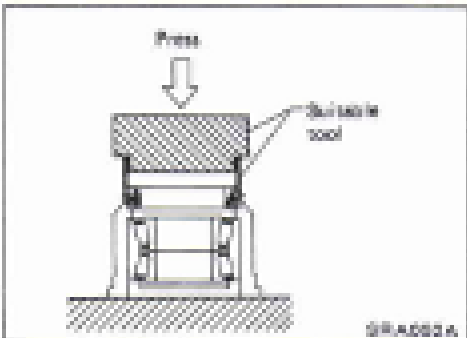
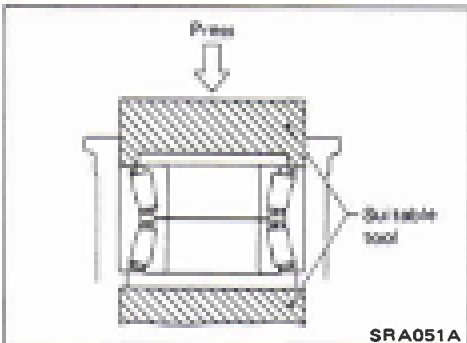
**Axial end play:**

**0.02 - 0.15 mm (0.0008 - 0.0059 in)**

**If difference in left and right shim thicknesses exceeds 1 mm (0.04 in), add or remove shim on the side of shaft which was first positioned in axle housing so that difference is less than 1 mm (0.04 in).**

- (4) If axial end play is not within the specified limit, reselect axle case end shims.

**While adjusting axial end play, be careful not to damage oil seal.**



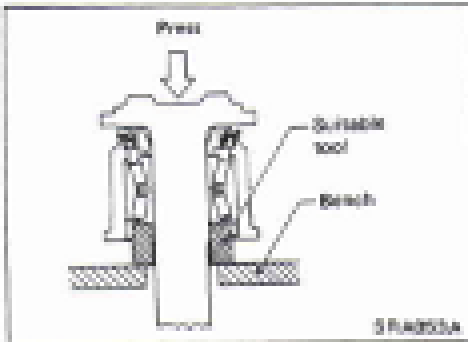
### Installation — Models with disc brake

- Press wheel bearing until it bottoms end face of bearing housing.

**Always press outer race of wheel bearing during installation.**

- Press grease seal until it bottoms end face of bearing housing.

## REAR AXLE — Semi-floating Type



### Installation — Models with disc brake (Cont'd)

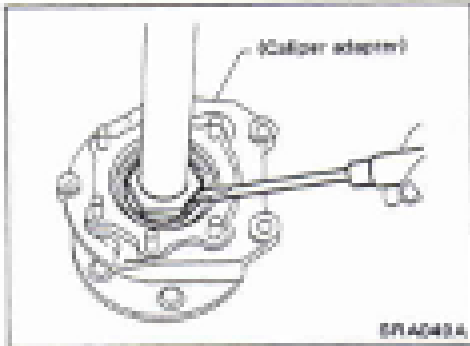
- Install spacer over axle shaft and press axle shaft into inner race of wheel bearing.

**Be careful not to damage or deform grease seal. Fill gap between grease seal lip and spacer with wheel bearing grease.**

- Before installing lock nut, apply a coat of wheel bearing grease to its seat. Tighten lock nut to specified torque.

☞: 441 - 490 N·m

(45 - 50 kg-m, 325 - 362 ft-lb)

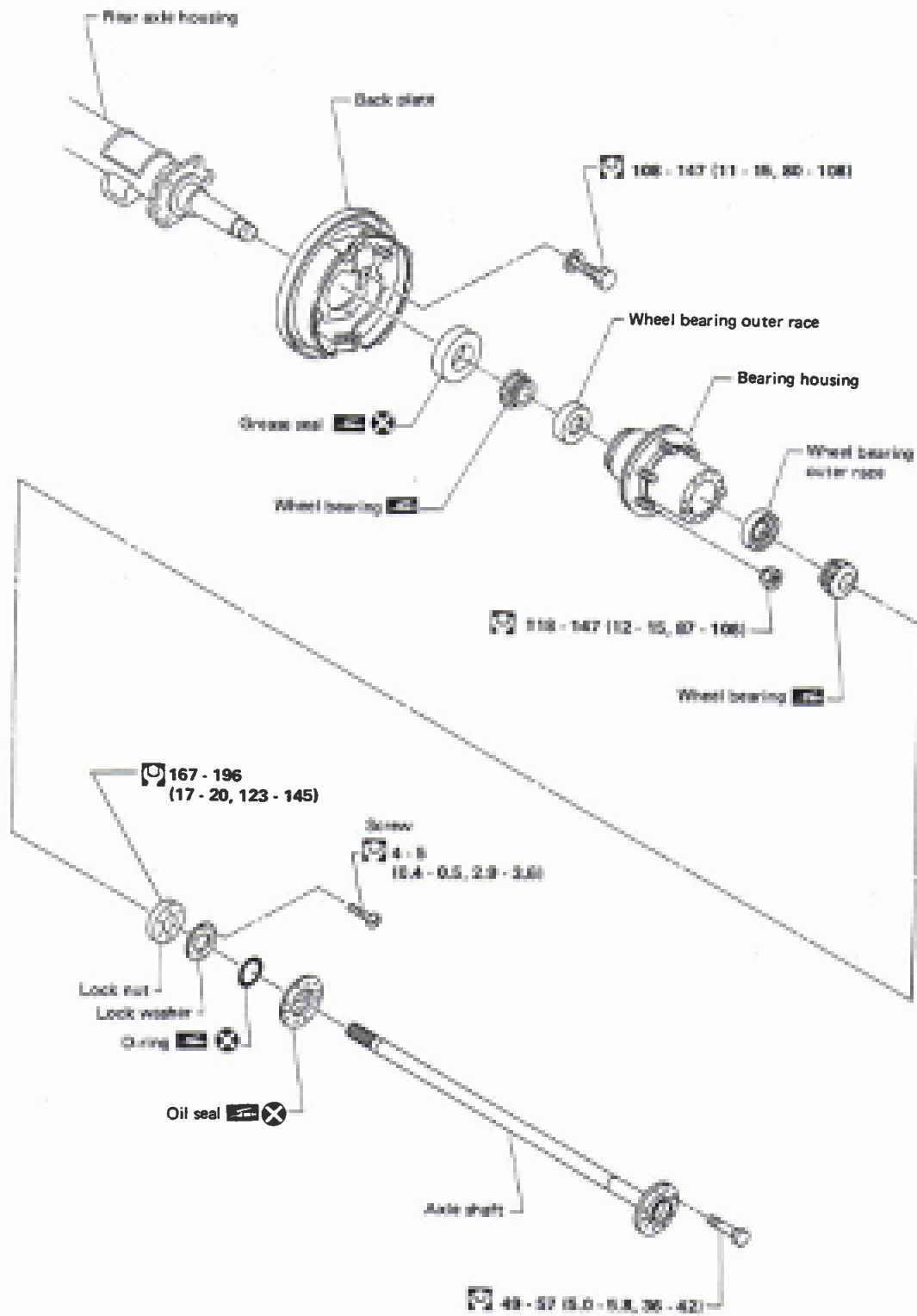


- Lock lock nut by bending one portion of lock washer.
- Turn bearing housing (with respect to axle shaft) two or three times. It must turn smoothly.
- Position axle shafts in axle housing.

**Be careful not to damage oil seal.**

# REAR AXLE — Full-floating Type

## DRUM BRAKE TYPE



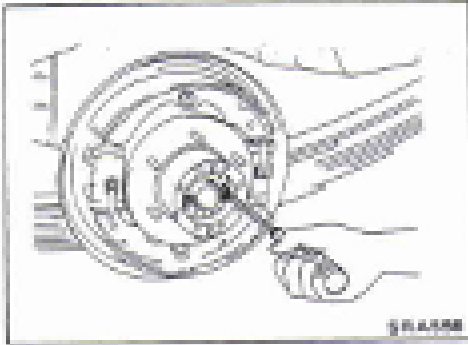
: N-m (kg-m, ft-lb)

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RA-16

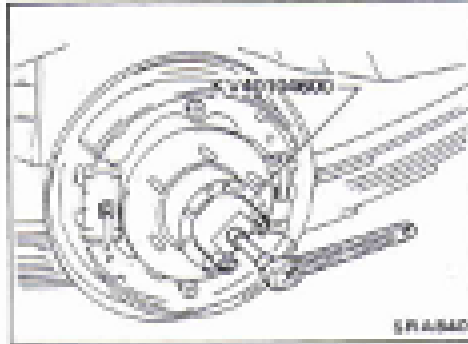


## REAR AXLE — Full-floating Type

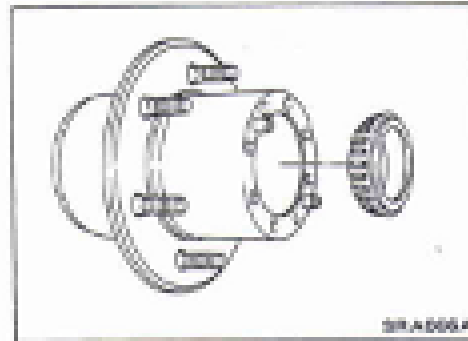


### Removal and Installation

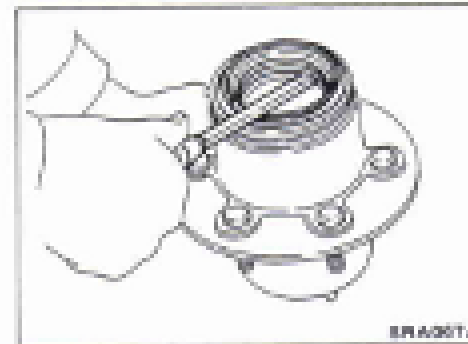
- Remove axle shaft.
- Remove oil seal and O-ring.
- Remove lock washer.



- Remove wheel bearing lock nut with Tool.



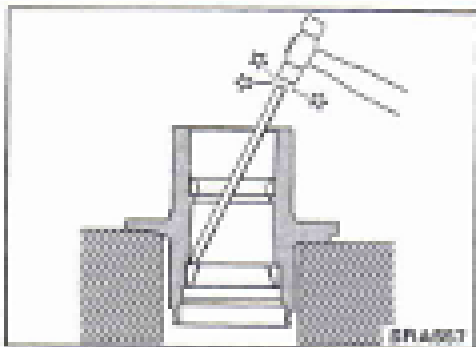
- Remove wheel bearing and wheel hub.  
**Be careful not to drop outer bearing.**



- Remove inside wheel bearing outer race, grease seal and outside wheel bearing race.  
**Do not reuse oil seal once it is removed.  
Always install new one.**

- When adjusting wheel bearing preload, refer to Preload Adjustment of Wheel Bearing in CHECK AND ADJUSTMENT — On-vehicle.

## REAR AXLE — Full-floating Type



### Disassembly

- Remove bearing outer races with suitable brass bar.

### Inspection

#### AXLE SHAFT

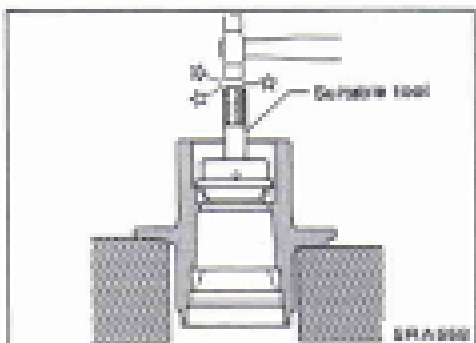
- Check axle shaft for straightness, cracks, damage, wear or distortion. Replace if necessary.

#### WHEEL BEARING

- Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

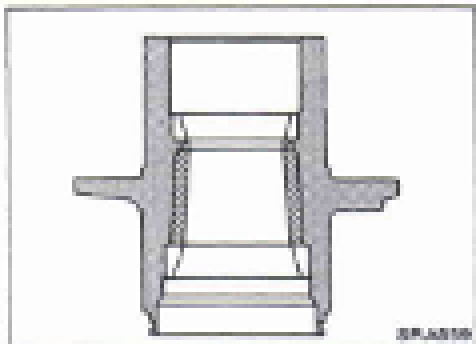
#### AXLE CASE

- Check axle case for yield, deformation or cracks. Replace if necessary.

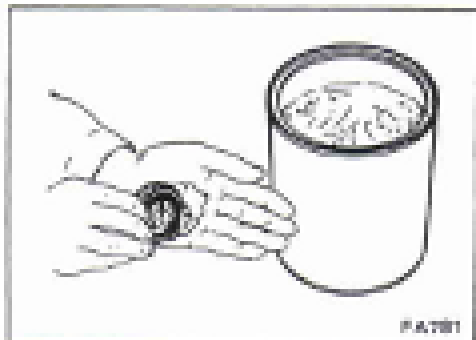


### Assembly

- Install bearing outer race with tool until it seats in hub.

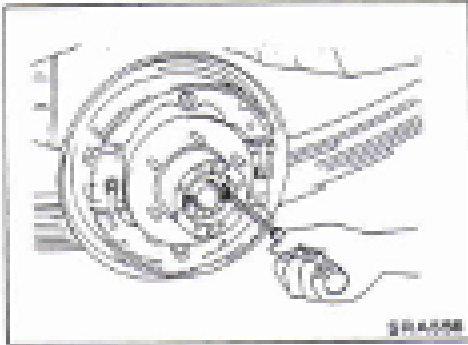


- Pack hub with multi-purpose grease.



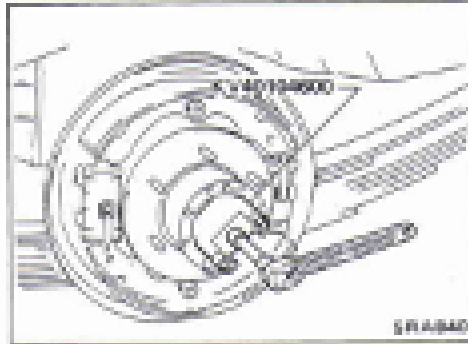
- Coat each bearing cone with multi-purpose grease.

## REAR AXLE — Full-floating Type

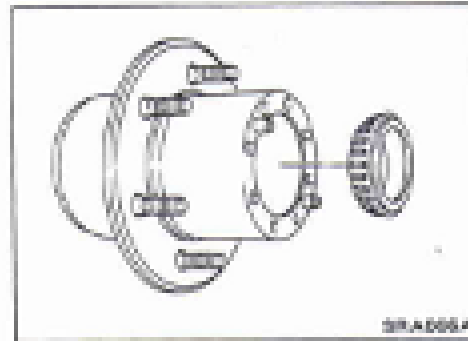


### Removal and Installation

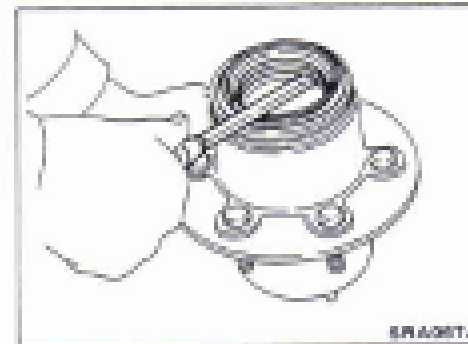
- Remove axle shaft.
- Remove oil seal and O-ring.
- Remove lock washer.



- Remove wheel bearing lock nut with Tool.



- Remove wheel bearing and wheel hub.  
**Be careful not to drop outer bearing.**



- Remove inside wheel bearing outer race, grease seal and outside wheel bearing race.  
**Do not reuse oil seal once it is removed.  
Always install new one.**

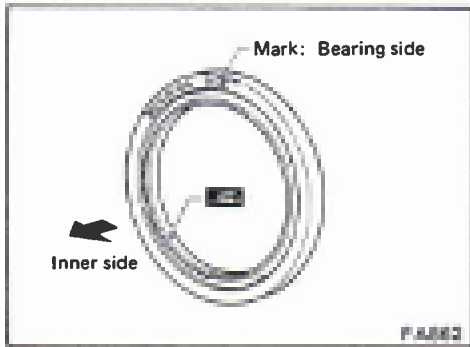
- When adjusting wheel bearing preload, refer to Preload Adjustment of Wheel Bearing in CHECK AND ADJUSTMENT — On-vehicle.

## REAR AXLE — Full-floating Type

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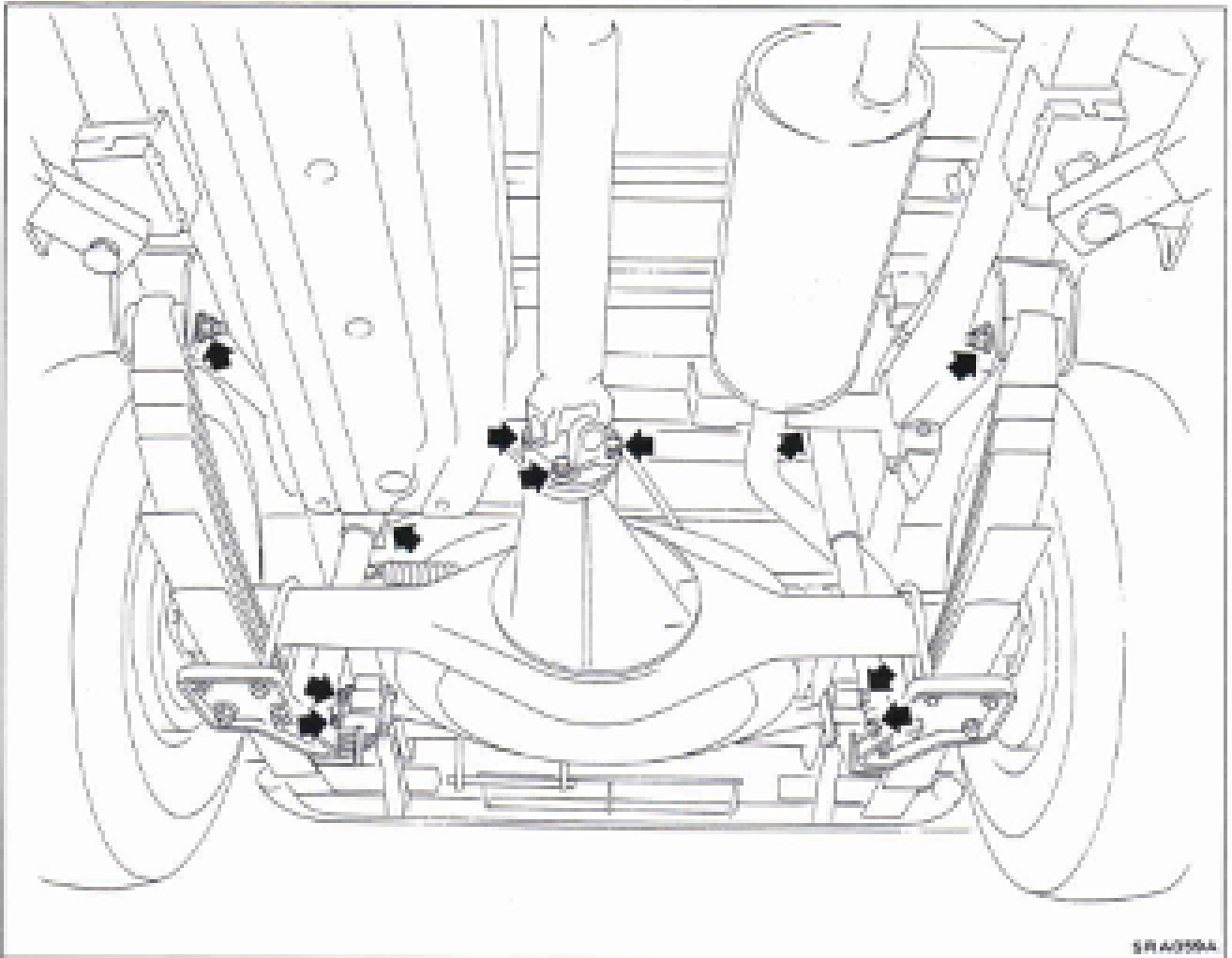
### Assembly (Cont'd)

- Pack grease seal lip with multi-purpose grease, then install it into wheel hub with suitable drift.



## REAR SUSPENSION — Leaf Spring Type

### Removal and Installation

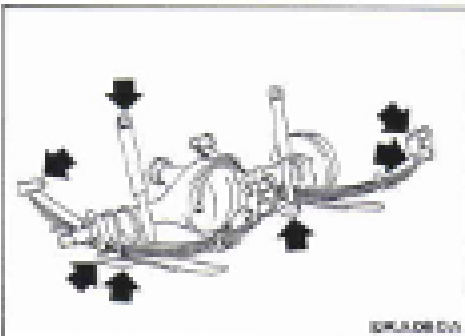


- Disconnect brake hydraulic line and parking brake cable.

#### **CAUTION:**

**Use Tool when removing or installing brake tubes.**

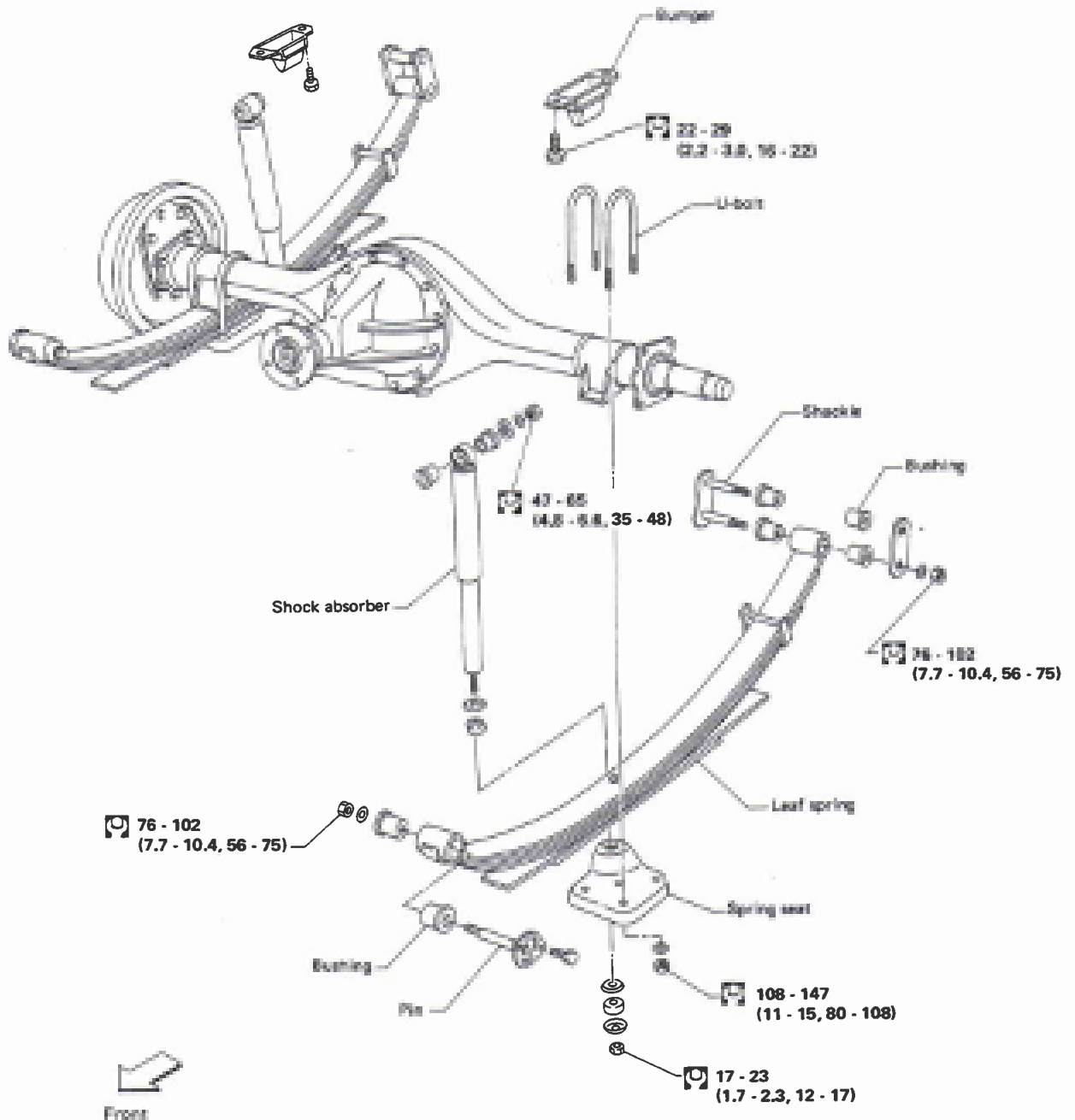
- Remove leaf spring from body.
- Remove propeller shaft. Refer to section PD.
- Remove upper end nuts of shock absorber.



**Final tightening for rubber parts requires to be carried out under unladen condition with tires on ground.**

# REAR SUSPENSION — Leaf Spring Type

## Components



When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

\* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

 : N·m (kg·m, ft·lb)

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## **REAR SUSPENSION — Leaf Spring Type**

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### **Shock Absorber**

- Check shock absorber for oil leakage, cracks or deformation. Replace if necessary.
- Check rubber bushings for cracks. Replace if necessary.

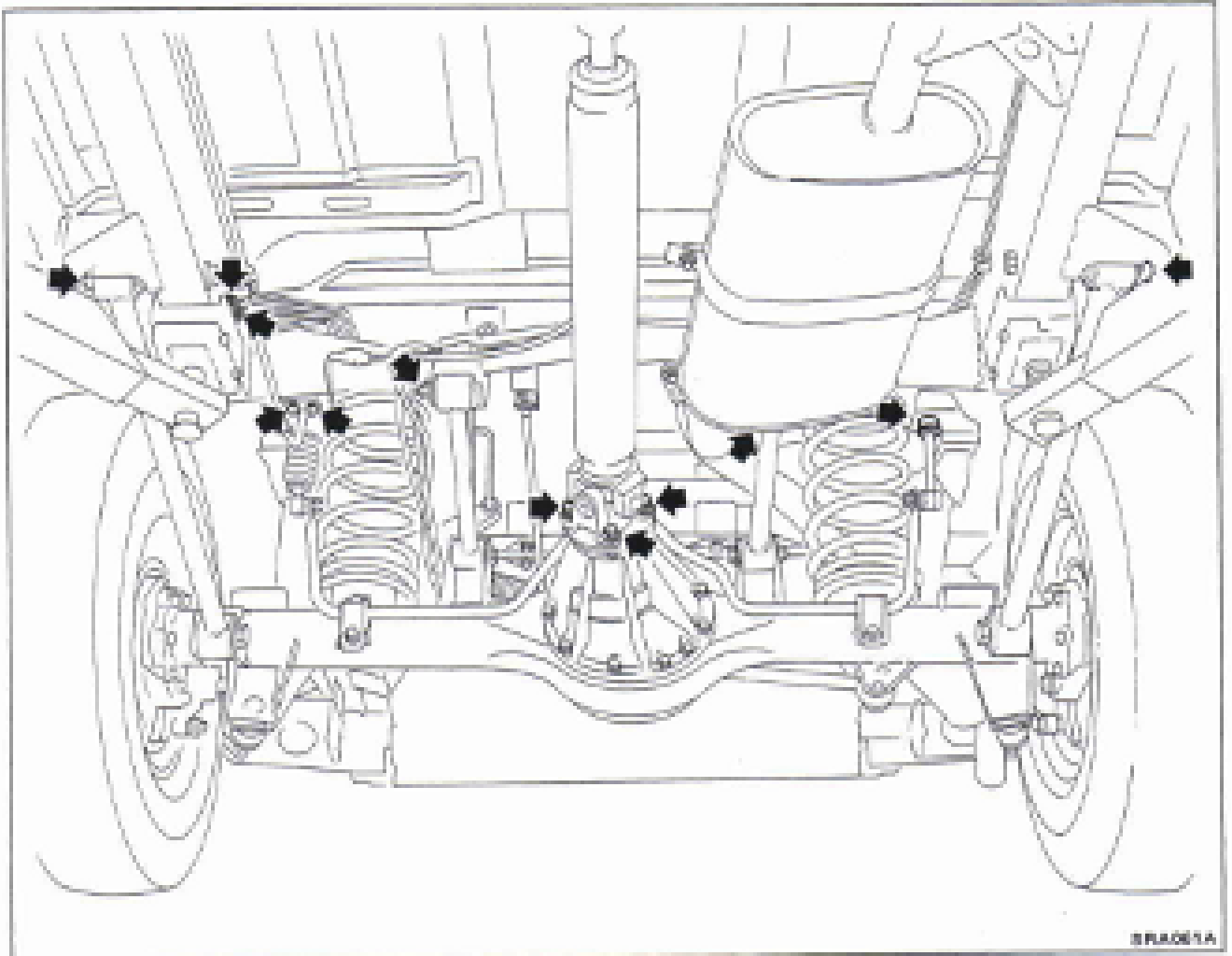
### **Leaf Spring**

#### **INSPECTION**

- Check leaf spring for cracks. Replace if necessary.
- Check front bracket and pin, shackle, U-bolts and spring pad for wear, cracks, straightness or damaged threads. Replace if necessary.
- Check all bushings for deformation or cracks. Replace if necessary.

## REAR SUSPENSION — Coil Spring Type

### Removal and Installation

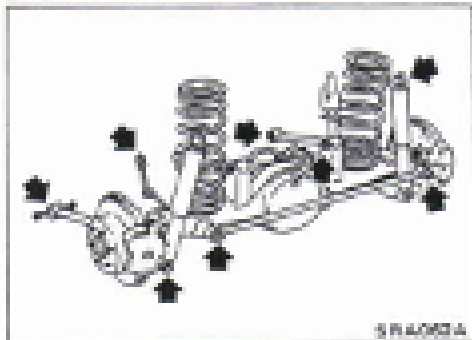


- Disconnect brake hydraulic line.

#### CAUTION:

**Use Tool when removing or installing brake tubes.**

- Remove stabilizer bar from body.
- Remove upper links and lower links from body.
- Remove panhard rod from body.
- Disconnect propeller shaft. Refer to section PD.
- Remove upper end nuts of shock absorber.

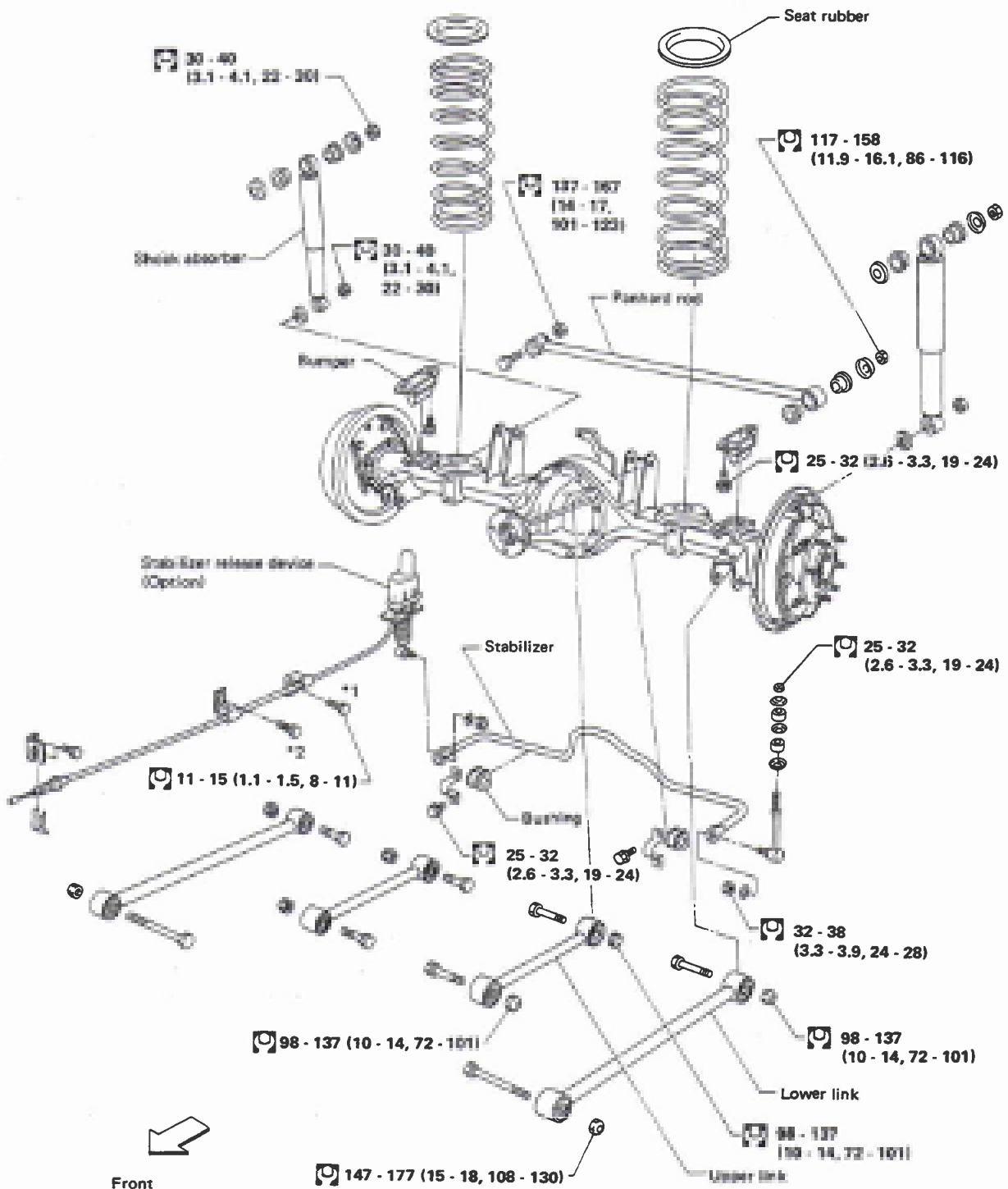


**Final tightening for rubber parts requires to be carried out under unladen condition with tires on ground.**



# REAR SUSPENSION — Coil Spring Type

## Components



Cable clamp bolts	
Bolts	Models
*1	Hardtop
*1 & *2	Station Wagon

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.  
 \* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

: N·m (kg·m, ft·lb)

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## REAR SUSPENSION — Coil Spring Type

### Coil Spring and Shock Absorber

#### REMOVAL AND INSTALLATION

- Refer to Removal and Installation of REAR SUSPENSION — Coil Spring Type.

When installing coil spring and lower spring seat, pay attention to its direction.

Be sure spring rubber seat is not twisted and has not slipped off when installing coil spring.

#### INSPECTION

- Check coil spring for yield, deformation or cracks.
- Check coil spring specifications. Refer to S.D.S.
- Check shock absorber for oil leakage, cracks or deformation.
- Check shock absorber specifications. Refer to S.D.S.
- Check all rubber parts for wear, cracks or deformation. Replace if necessary.

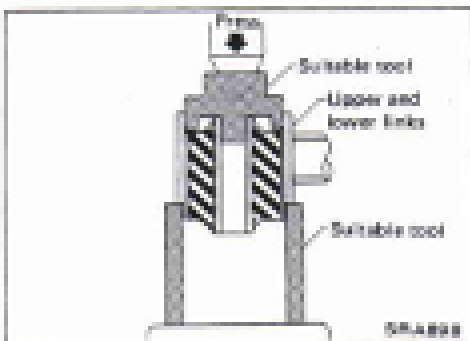
### Upper Link, Lower Link and Panhard Rod

#### INSPECTION

Check for cracks, distortion or other damage. Replace if necessary.

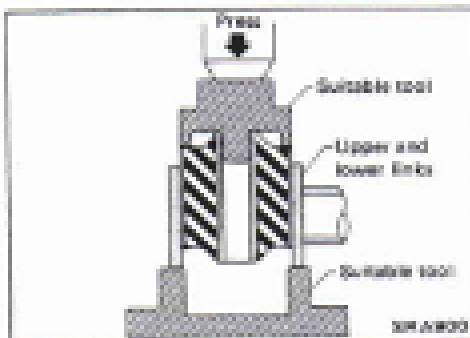
#### BUSHING REPLACEMENT

Check for cracks or other damage. Replace with suitable tool if necessary.



#### Upper and lower links bushing

- Remove upper and lower links bushing with suitable tool.



When installing upper and lower links bushing, apply a coating of 1% soap water to outer wall of bushing.

Always install new bushing.

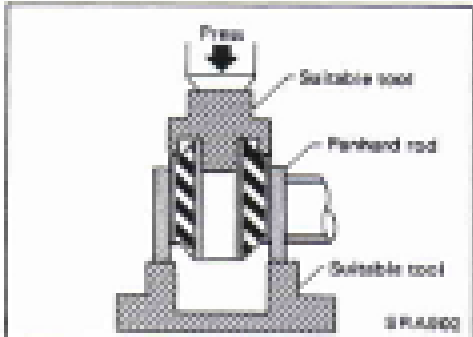
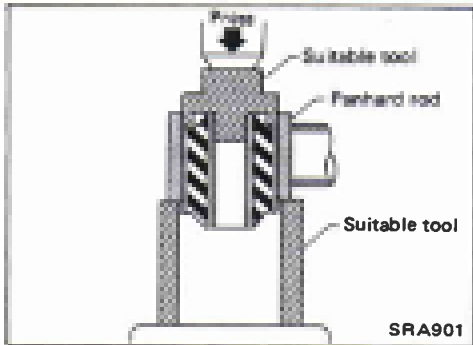
Do not tap end face of bushing directly with a hammer.

## REAR SUSPENSION — Coil Spring Type

### Upper Link, Lower Link and Panhard Rod (Cont'd)

#### Panhard rod bushing

- Remove panhard rod bushing with suitable tool.



When installing panhard rod bushing, apply a coating of 1% soap water to outer wall of bushing.

Always install new bushing.

Do not tap end face of bushing directly with a hammer.

#### INSTALLATION

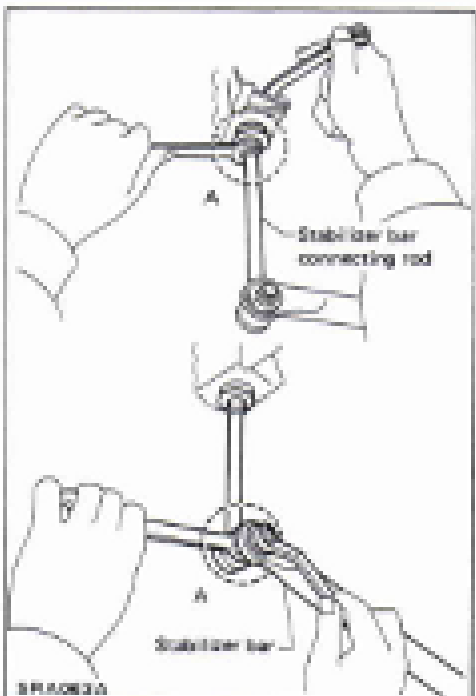
When installing each link, pay attention to direction of bolts and nuts.

When installing each rubber part, final tightening must be carried out under unladen condition with tires on ground.

#### Stabilizer Bar

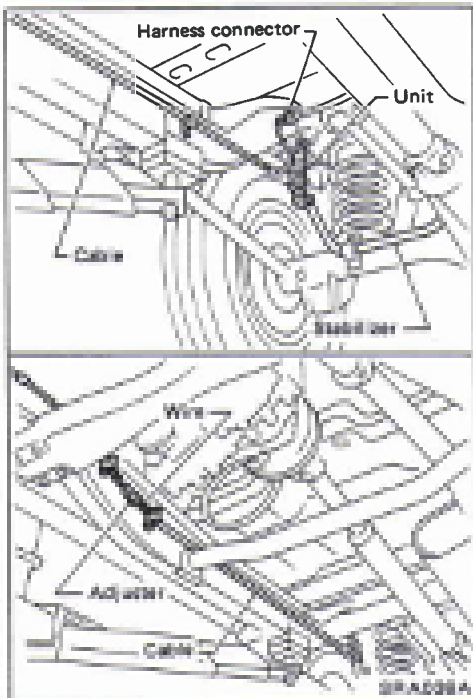
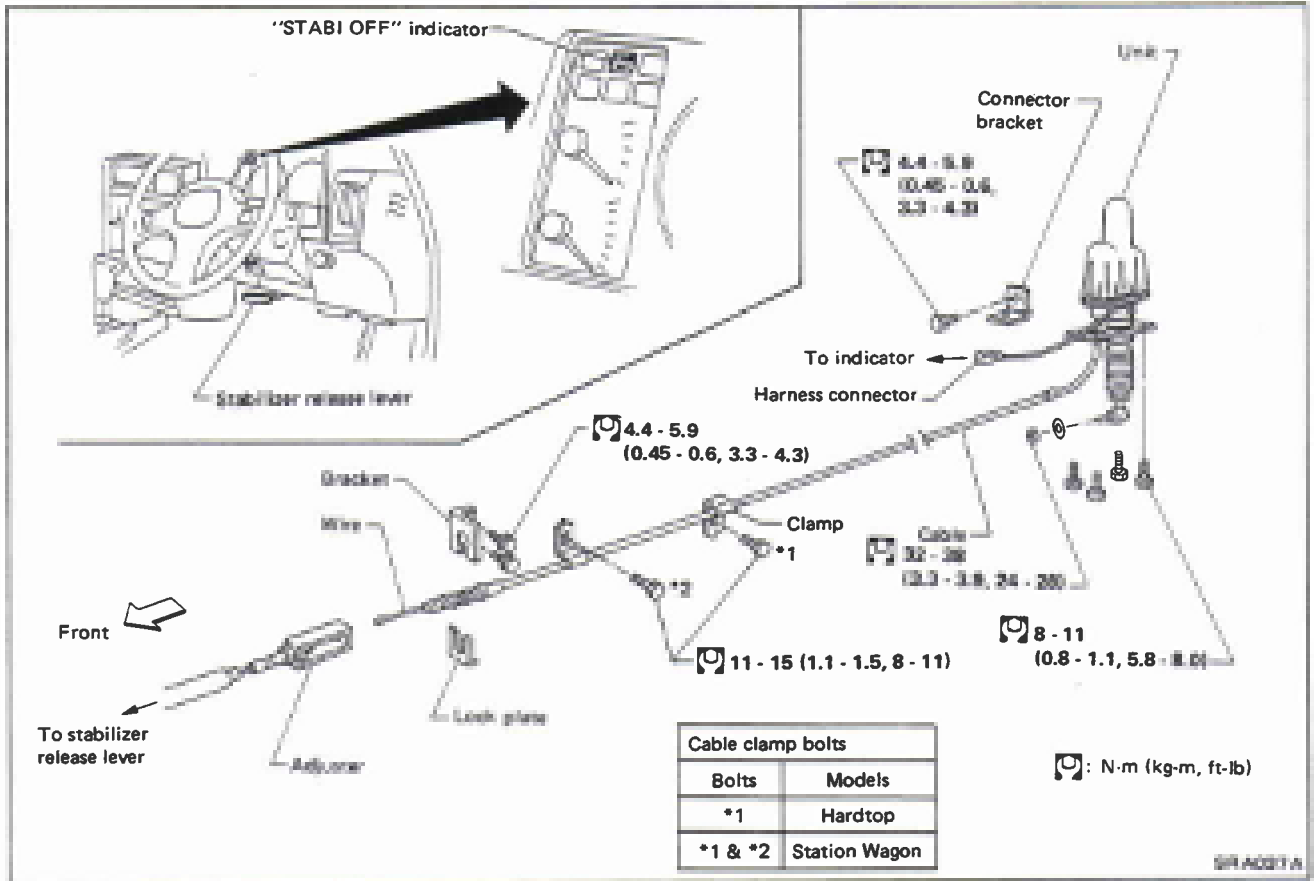
##### REMOVAL AND INSTALLATION

- When removing and installing stabilizer bar, fix portion A.



# STABILIZER RELEASE DEVICE

## Removal and Installation



1. Loosen release lever.
2. Separate unit and stabilizer.
3. Disconnect indicator harness connector.
4. Disengage adjuster from cable.

### CAUTION:

- Be careful not to damage cable.
- Make sure there is no free play after installation.

## STABILIZER RELEASE DEVICE

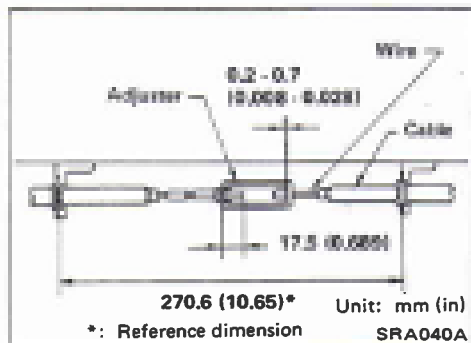
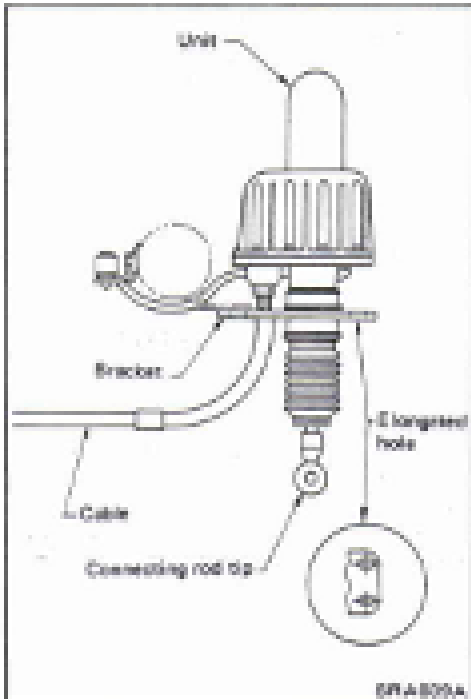
### Inspection

1. Check control release lever for wear or other damage. Replace if necessary.
2. Check cables for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp. Replace if necessary. Refer to EL section.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.

### Adjustment

Adjust control lever stroke as follows.

1. Loosen stabilizer release lever.
2. Check that unit is locked properly by moving end of connecting rod or by moving stabilizer arm up and down.



3. Adjust cable length using adjuster.

#### Cable elongation:

**0.2 - 0.7 mm (0.008 - 0.028 in)**

4. After temporarily adjusting cable length, pull adjuster back with hand to release unit. Relock unit and properly adjust cable length. Then lock adjuster.
5. Connect indicator harness connector.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

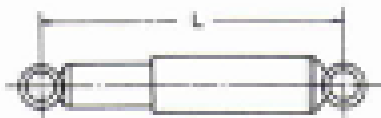
### General Specifications (Leaf Spring Type)

#### LEAF SPRING AND SHOCK ABSORBER

Item	Model	Pickup	
		L.H.D.	R.H.D.
<b>Leaf spring</b>			
Length x width x thickness – number of leaves mm (in)			
Main		$1,420 \times 70 \times 7 - 1$ $8 - 1$ $7 - 3$ $(55.91 \times 2.76 \times 0.28 - 1)$ $0.24 - 1$ $0.28 - 3$	
Helper		$575 \times 70 \times 14 - 1$ $(22.64 \times 2.76 \times 0.55 - 1)$	
Free camber "S"	mm (in)	182.8 (7.20)	182.8 (6.41)
Spring constant	N/mm (kg/mm, lb/in)	$44.6 - 115.7$ $(4.55 - 11.8, 254.8 - 660.8)$	
<b>Shock absorber</b>			
Maximum length "L"	mm (in)	613 (24.13)	
Stroke	mm (in)	352 (13.82)	
Damping force [at 0.3 m (1.0 ft)/sec.]	N (kg, lb)	941 (96, 212)	
Expansion		432 (43, 950)	
Compression		432 (43, 950)	



SRA111



RA380

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

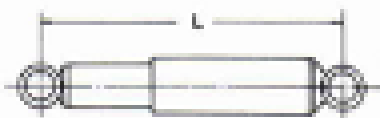
### General Specifications (Coil Spring Type)

#### COIL SPRING AND STABILIZER BAR

Item	Model	Station Wagon		Hardtop	Station Wagon	Hardtop
		DX	STD		With high-roof	
<b>Coil spring</b>						
Wire diameter	mm (in)	15.2 - 17.2 (0.598 - 0.677)	15.2 - 17.1 (0.598 - 0.673)	15.0 - 16.2 (0.591 - 0.638)	15.1 - 17.4 (0.594 - 0.685)	15.7 - 17.2 (0.618 - 0.677)
Coil inside diameter	mm (in)	140 (5.51)				
Free length	mm (in)	454 (17.87)	444 (17.48)	450.5 (17.74)	443.5 (17.46)	429.5 (16.91)
Spring constant	N/mm (kg/mm, lb/in)	30.4 - 53.9 (3.1 - 5.5, 174 - 308)	30.5 - 53.9 (3.11 - 5.5, 174.2 - 308.0)	26.2 - 46.0 (2.67 - 4.69, 149.5 - 262.6)	32.6 - 54.9 (3.32 - 5.6, 185.9 - 313.6)	30.4 - 55.9 (3.1 - 5.7, 174 - 319)
Identification color		Yellow x 1 White x 1	Yellow x 1	Blue x 1	Pink x 1	Yellow green x 1
Stabilizer bar diameter	mm (in)	17 (0.67)				

#### SHOCK ABSORBER

Suspension type		B-link
Shock absorber type		Non-adjustable
Stroke	mm (in)	234 (9.21)
Maximum length "L"	mm (in)	619 (24.37)
Damping force (at 0.3 m (1.0 ft/sec.))	N (kg, lb)	
Expansion		1,550 (158, 348)
Compression		618 (62, 139)



PA280

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment

#### SEMI-FLOATING TYPE (Pickup)

Unit: mm (in)

Total end play	0.02 - 0.15 (0.0008 - 0.0059)	
Rear axle case end shim	<del>Thin Shim</del>	Part No.
	0.10 (0.0039)	43036-C8000
	0.20 (0.0079)	43089-T0400
	0.25 (0.0098)	43088-T0400
	0.50 (0.0197)	43087-T0400
	1.00 (0.0394)	43086-T0400

#### FULL-FLOATING TYPE (Pickup)

Wheel bearing lock nut Tightening torque N-m (kg-m, ft-lb)	107 - 126 (17 - 20, 133 - 148)
Retightening torque after loosening wheel bearing lock nut N-m (kg-m, ft-lb)	3 - 5 (0.3 - 0.5, 2.2 - 3.6)
Axial end play mm (in)	0 (0)
Starting force at wheel hub bolt N (kg, lb)	A
Starting force at wheel hub bolt N (kg, lb)	B
Wheel bearing preload at wheel hub bolt N (kg, lb) B - A	0 - 12.55 (0 - 1.28, 0 - 2.82)

#### STABILIZER RELEASE DEVICE

Cable free play (at adjuster) mm (in)	0.2 - 0.7 (0.008 - 0.028)
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# BRAKE SYSTEM

## SECTION **BR**

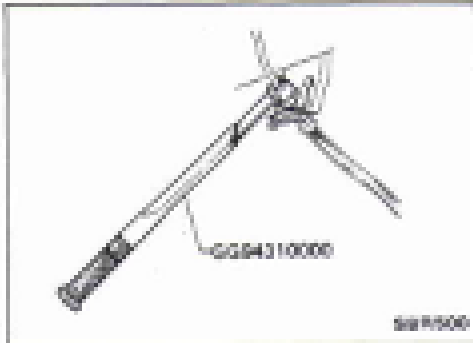
### CONTENTS

PRECAUTIONS AND PREPARATION .....	BR- 2
CHECK AND ADJUSTMENT .....	BR- 3
BRAKE HYDRAULIC LINE .....	BR- 4
BRAKE PEDAL AND BRACKET .....	BR- 7
BRAKE BOOSTER .....	BR- 9
VACUUM PIPING .....	BR-11
VACUUM PUMP (Diesel engine model) .....	BR-15
MASTER CYLINDER .....	BR-17
LOAD SENSING VALVE (L.S.V.) — Linkage type .....	BR-18
FRONT DISC BRAKE (CL36VA) — Caliper .....	BR-21
FRONT DISC BRAKE (CL36VA) — Rotor .....	BR-24
REAR DRUM BRAKE (LT30) .....	BR-25
REAR DISC BRAKE (AD20VC) — Caliper .....	BR-27
REAR DISC BRAKE (AD20VC) — Rotor .....	BR-30
PARKING BRAKE CONTROL .....	BR-31
CENTER BRAKE .....	BR-33
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	BR-35

## PRECAUTIONS AND PREPARATION

### Precautions

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of the hydraulic system.



- Use Tool when removing and installing brake tube.

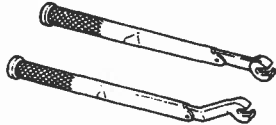
### WARNING:

- Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.

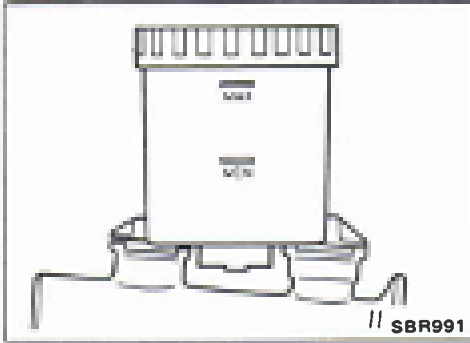
### Preparation

#### SPECIAL SERVICE TOOL

\*: Special tool or commercial equivalent

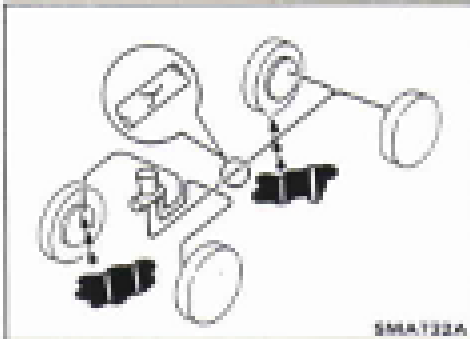
Tool number Tool name	Description
GG94310000* Flare nut torque wrench	 <p>Removing and installing each brake piping</p>

## CHECK AND ADJUSTMENT



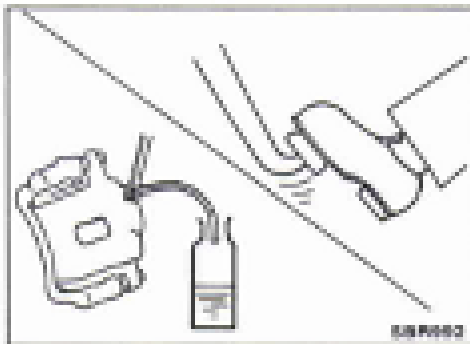
### Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.



### Checking Brake System

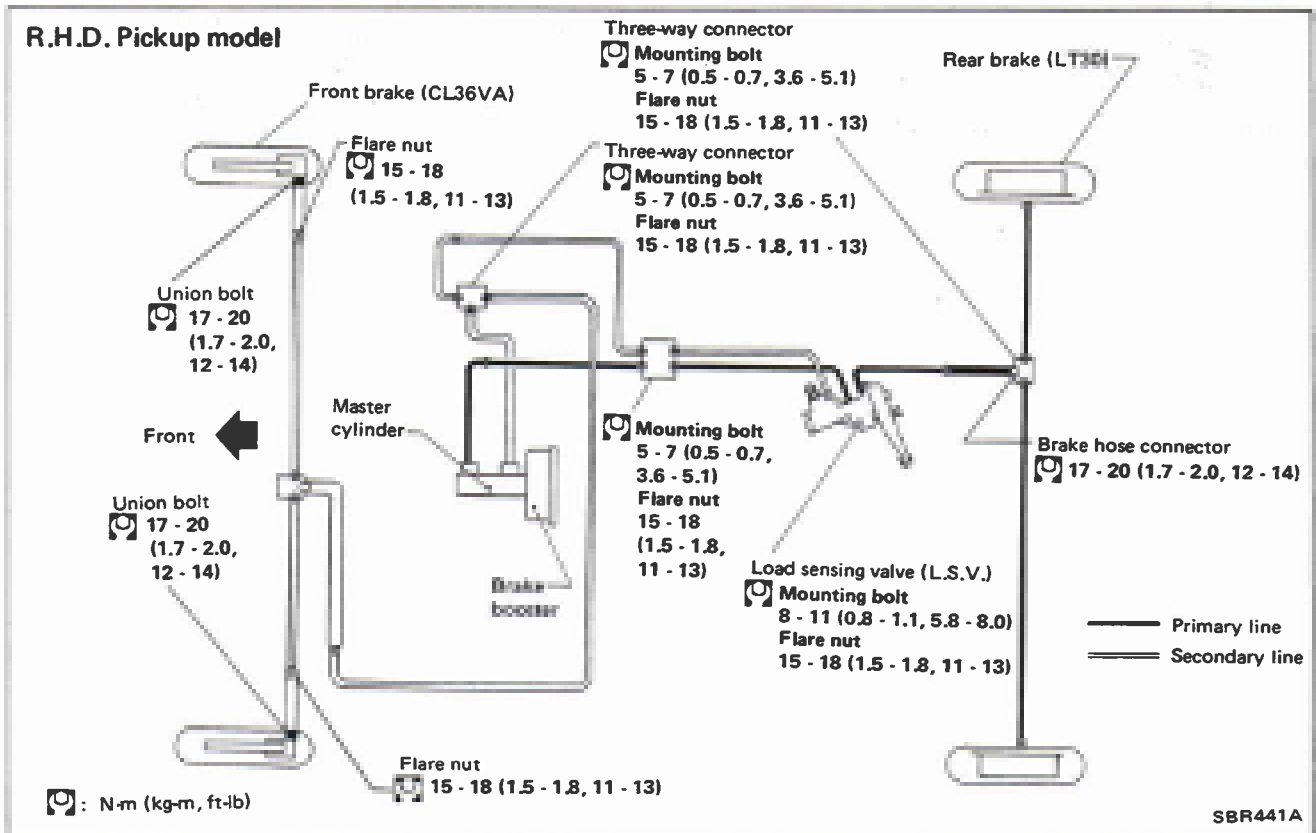
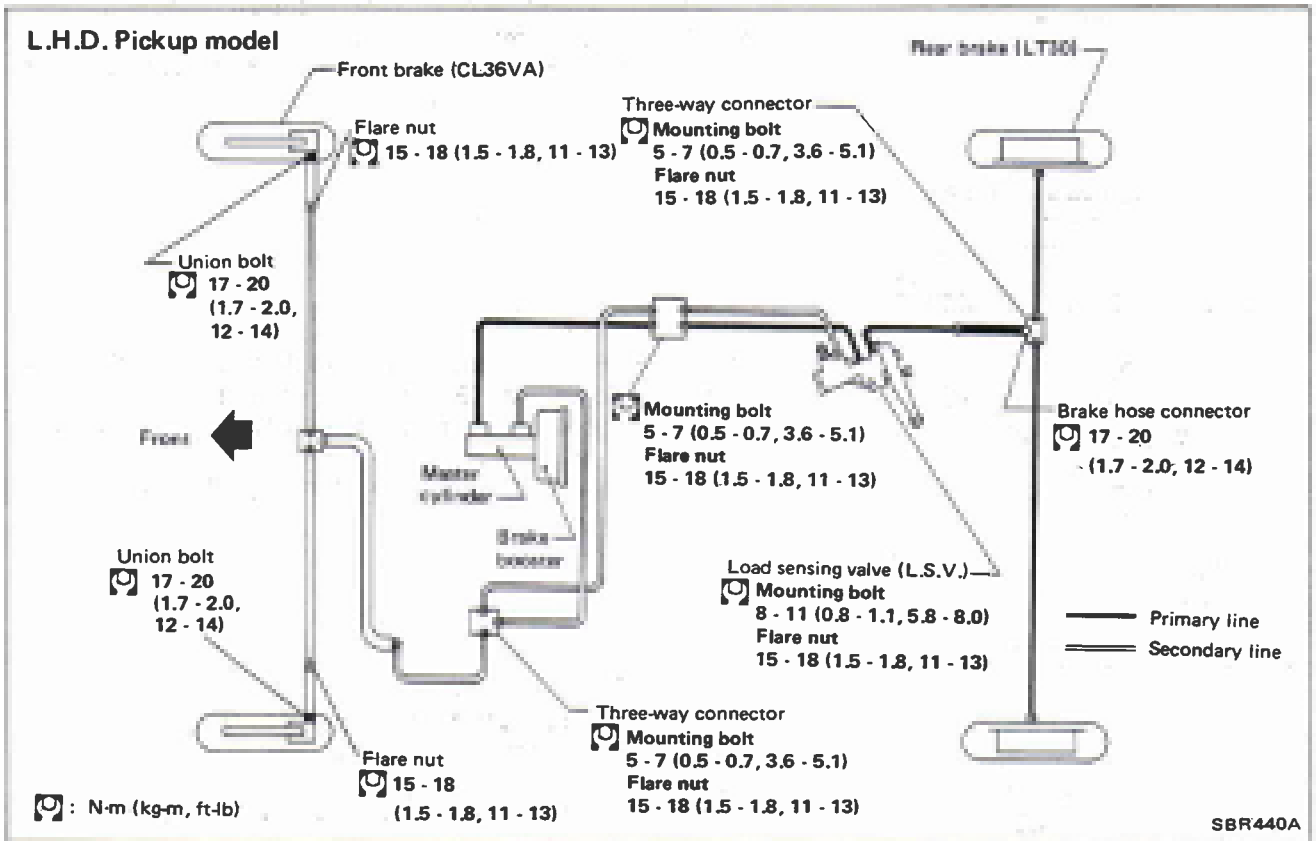
- Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts. If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.



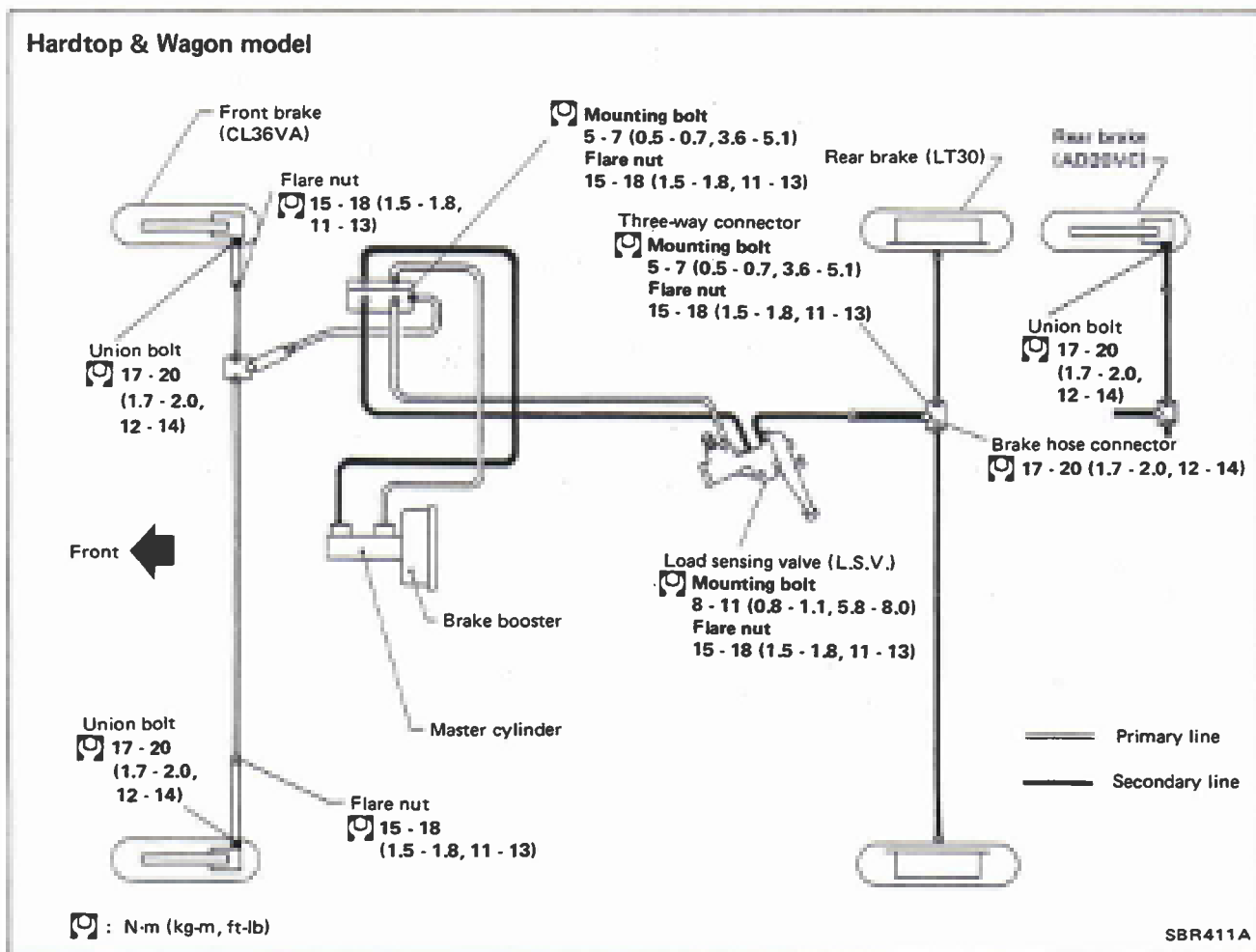
### Changing Brake Fluid

1. Drain brake fluid from each air bleeder valve.
  2. Refill until new brake fluid comes out of each air bleeder valve.
- Use same procedure as in bleeding hydraulic system to refill brake fluid.  
Refer to Bleeding Procedure.
- Refill with recommended brake fluid "DOT 3".
  - Never reuse drained brake fluid.
  - Be careful not to splash brake fluid on painted areas.

# BRAKE HYDRAULIC LINE



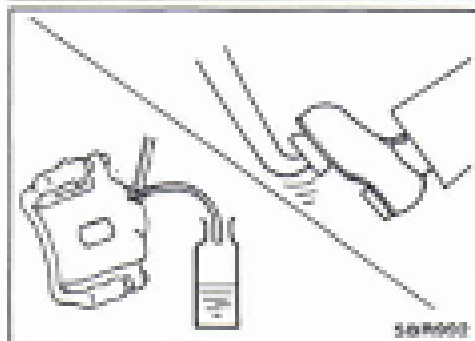
## BRAKE HYDRAULIC LINE



### Bleeding Procedure

#### CAUTION:

- Carefully monitor brake fluid level at master cylinder during bleeding operation.
- Fill reservoir with recommended brake fluid. Make sure it is full at all times while bleeding air out of system.



- Bleed air according to the following procedure:  
L.S.V. air bleeder → Left rear wheel cylinder → Right rear wheel cylinder → Left front caliper → Right front caliper

## BRAKE HYDRAULIC LINE

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### Bleeding Procedure (Cont'd)

- To bleed air from lines, wheel cylinders and calipers, use the following procedure.
- 1) Connect a transparent vinyl tube to air bleeder valve.
  - 2) Fully depress brake pedal several times.
  - 3) With brake pedal depressed, open air bleeder valve to release air.
  - 4) Close air bleeder valve.
  - 5) Release brake pedal slowly.
  - 6) Repeat steps 2) through 5) until clear brake fluid comes out of air bleeder valve.



### Removal and Installation

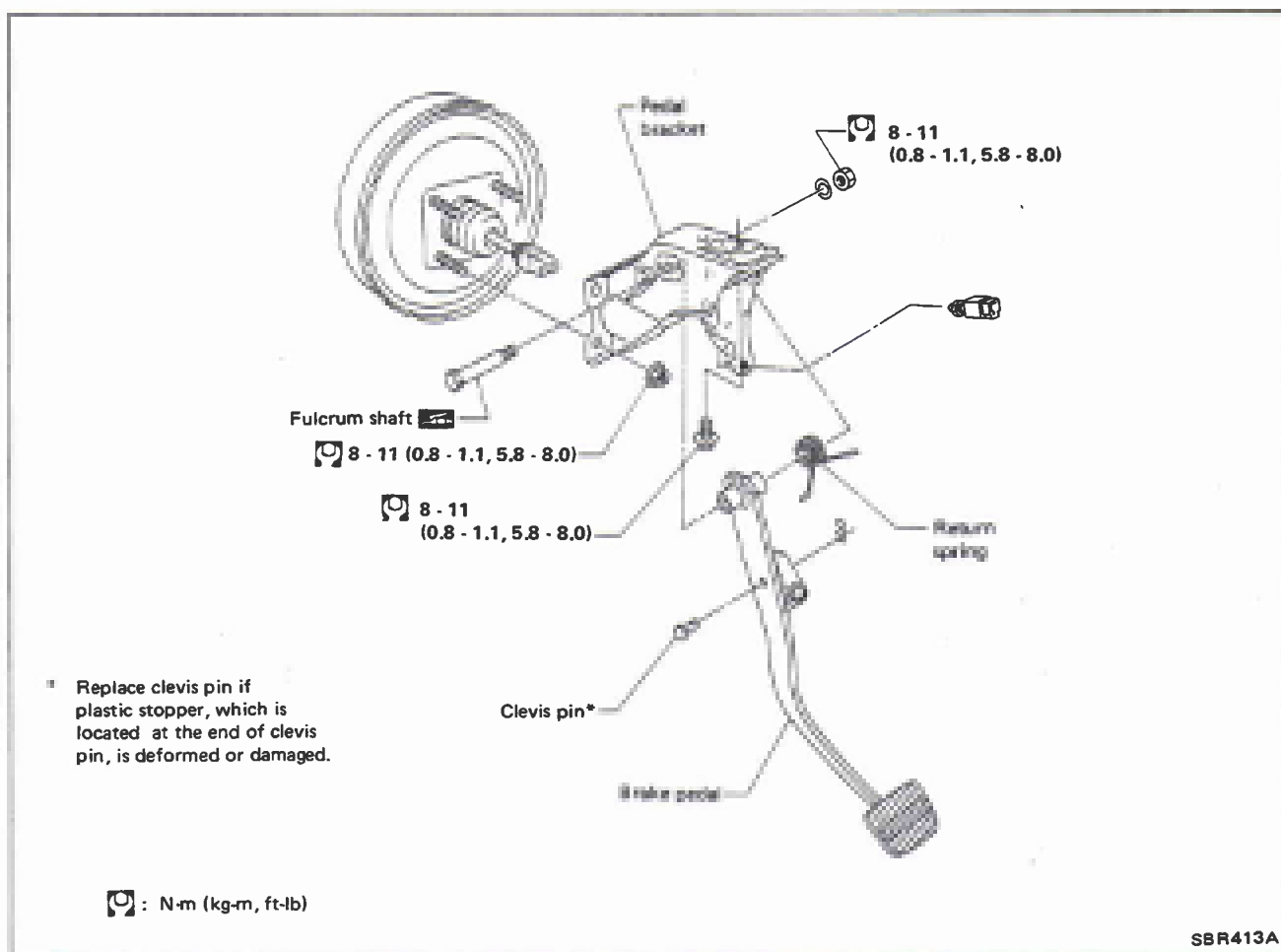
1. To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring.
2. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
3. All hoses must be free from excessive bending, twisting and pulling.
4. After installing brake lines, check for oil leakage by fully depressing brake pedal.

### Inspection

Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts. If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

# BRAKE PEDAL AND BRACKET

## Removal and Installation

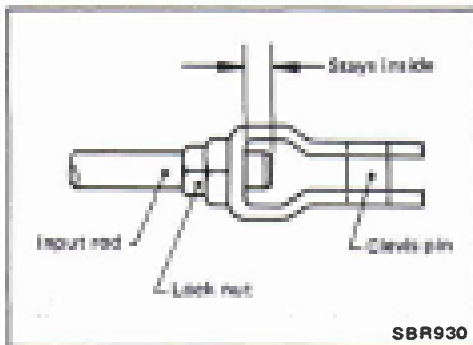
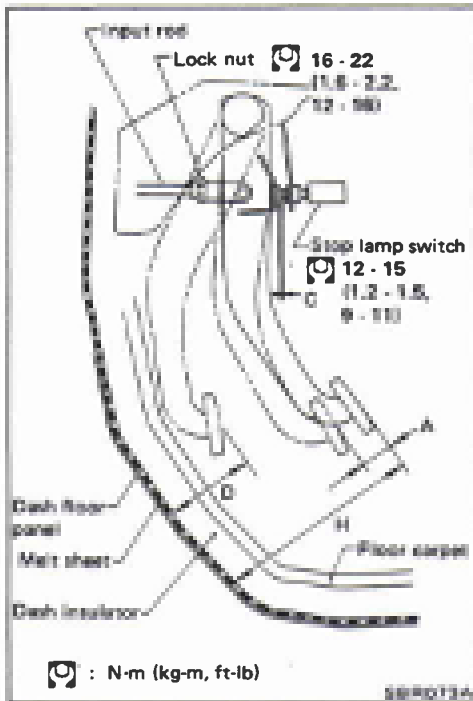


### Inspection

Check brake pedal for the following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion

## BRAKE PEDAL AND BRACKET



### Adjustment

Check brake pedal free height from melt sheet. Adjust if necessary.

- H: Free height  
Refer to S.D.S.
- D: Depressed height  
Refer to S.D.S.  
Under force of 490 N (50 kg, 110 lb)  
with engine running
- C: Clearance between pedal stopper and threaded end of stop lamp switch  
0.3 - 1.0 mm (0.012 - 0.039 in)
- A: Pedal free play  
1 - 3 mm (0.04 - 0.12 in)

1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

**Make sure that tip of input rod stays inside.**

2. Adjust clearance "C" with stop lamp switch. Then tighten lock nut.
3. Check pedal free play.

**Make sure that stop lamp is off when pedal is released.**

4. Check brake pedal's depressed height while engine is running.

If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.



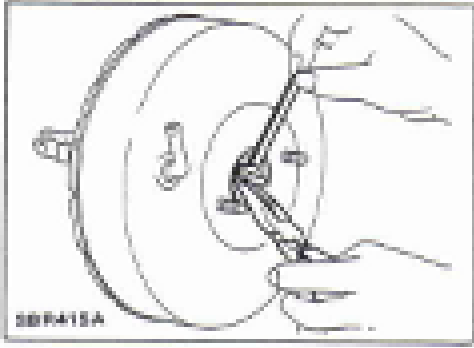


## BRAKE BOOSTER

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### Inspection (Cont'd)

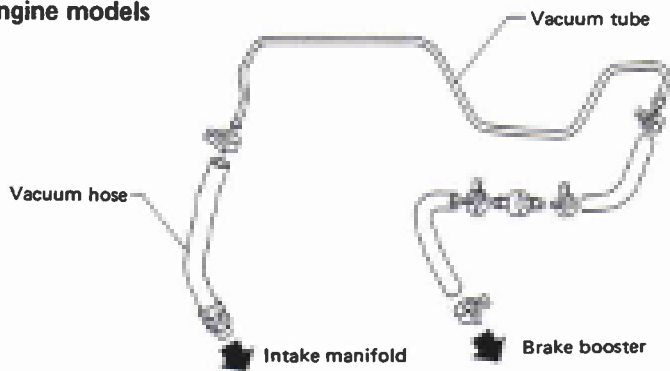
3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.



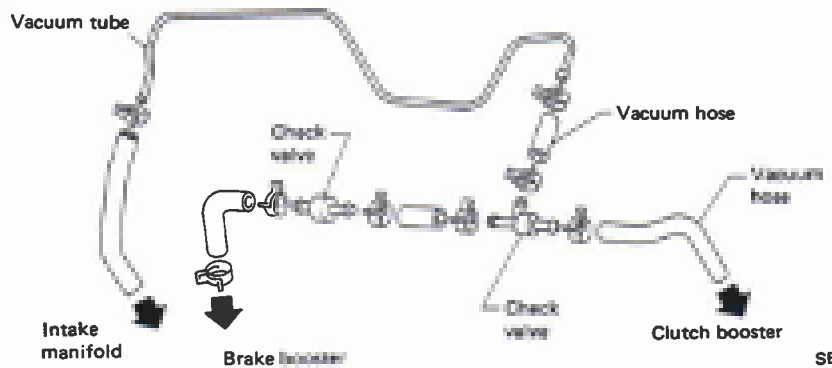
# VACUUM PIPING

## Removal and Installation

### Gasoline engine models



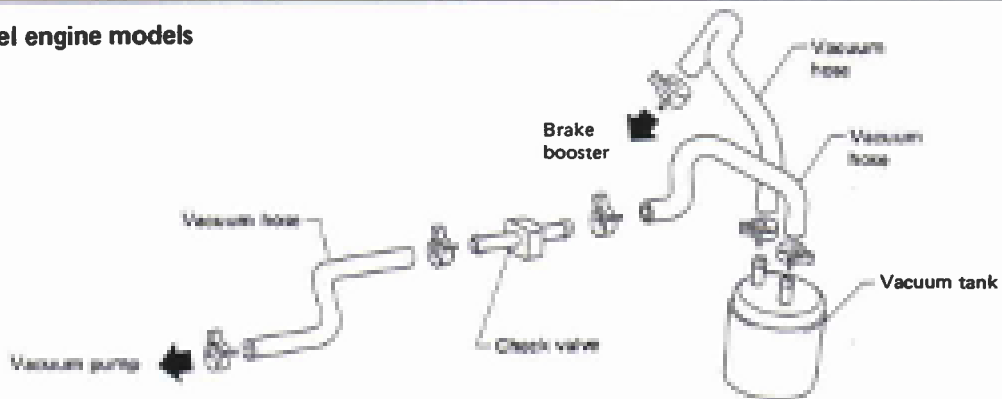
### With clutch booster



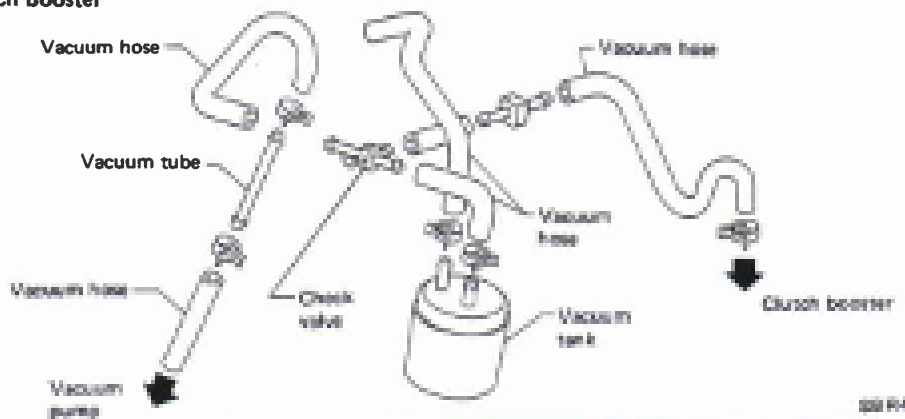
**CAUTION:**  
Do not apply any oil or lubricants to vacuum hoses and check valve.

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### Diesel engine models



### L.H.D. with clutch booster



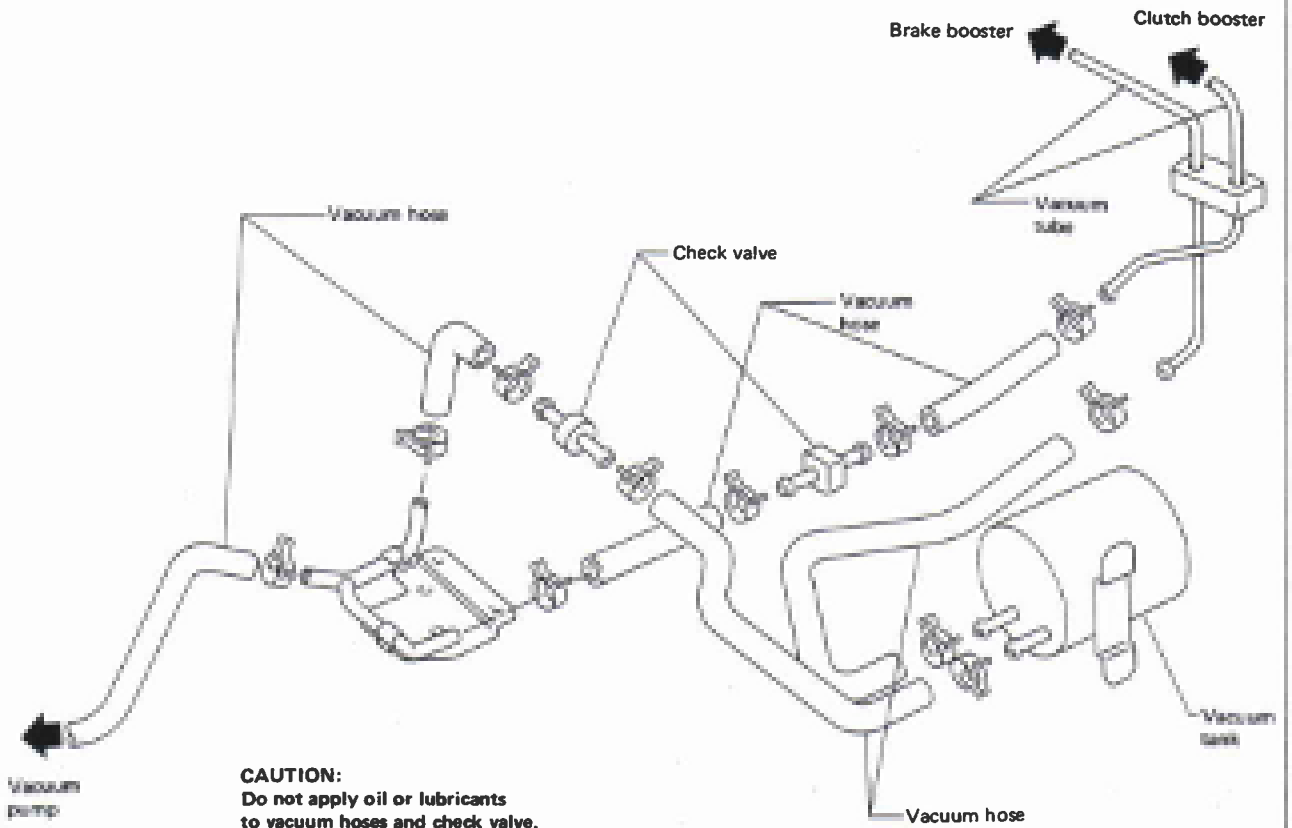
**CAUTION:**  
Do not apply any oil or lubricants to vacuum hoses and check valve.

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# VACUUM PIPING

## Removal and Installation (Cont'd)

R.H.D. with clutch booster



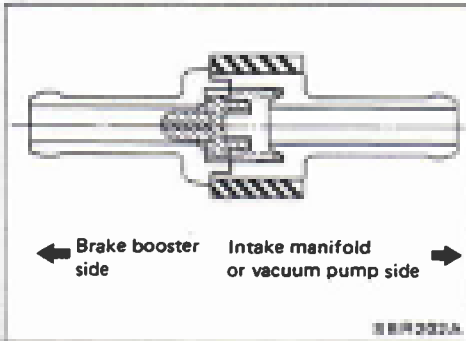
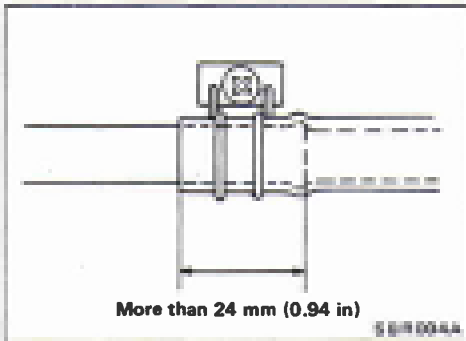
**CAUTION:**  
Do not apply oil or lubricants  
to vacuum hoses and check valve.

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## VACUUM PIPING

### Removal and Installation (Cont'd)

- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).

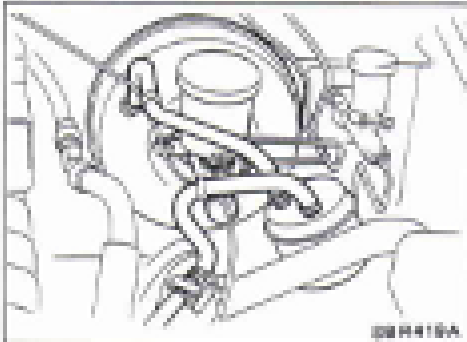


- Install check valve, paying attention to its direction.

### Inspection

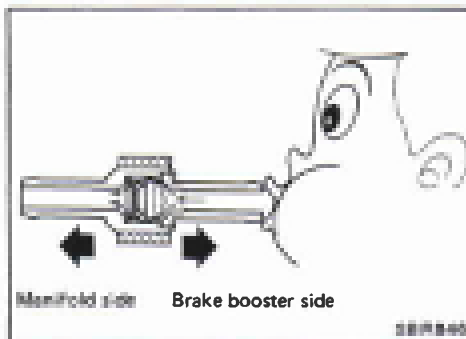
#### HOSES AND CONNECTORS

- Check vacuum lines, connections and check valve using for air tightness, chafing and deterioration.



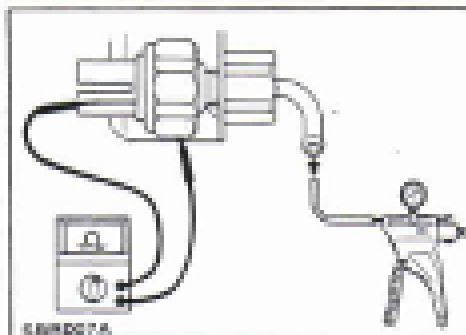
#### CHECK VALVE

- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.



#### VACUUM WARNING SWITCH\*

- Test continuity through vacuum warning switch with an ohmmeter and vacuum pump.



Vacuum	Less than 26.7 kPa (207 mbar, 200 mmHg, 7.87 inHg)	OK
	33.3 kPa (333 mbar, 250 mmHg, 9.84 inHg) or more	NG

\* Except for Australia

## VACUUM PIPING

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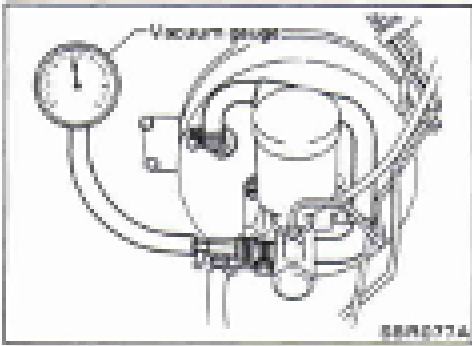
### Inspection (Cont'd)

#### VACUUM PUMP

1. Install vacuum gauge.
2. Run engine at 1,000 rpm or more.
3. Check vacuum.

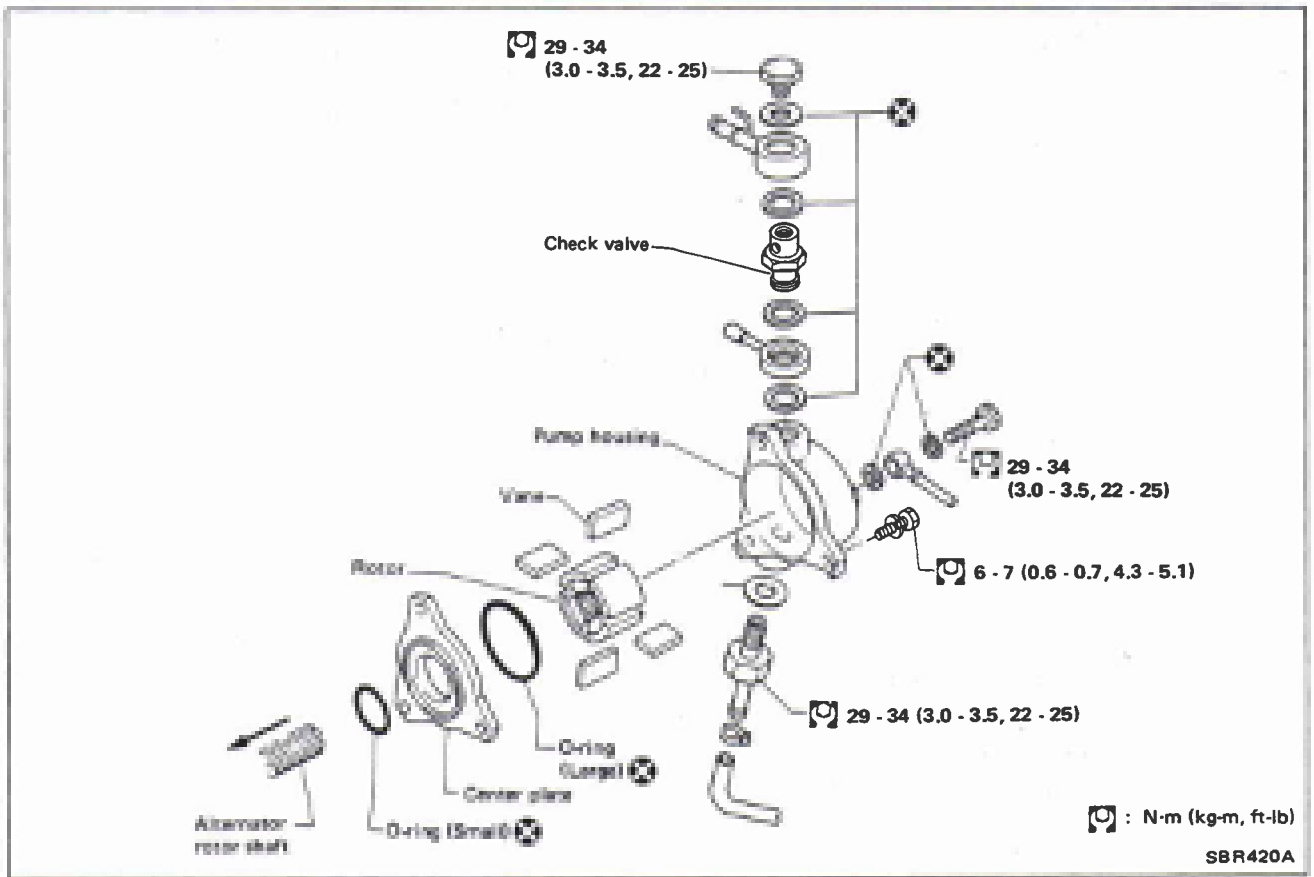
#### Specified vacuum:

**93.3 kPa (933 mbar, 700 mmHg, 27.56 inHg) or more**

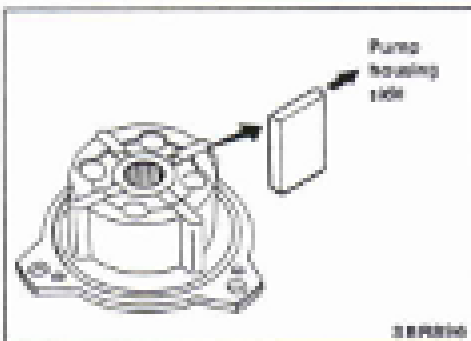


# VACUUM PUMP (Diesel engine model)

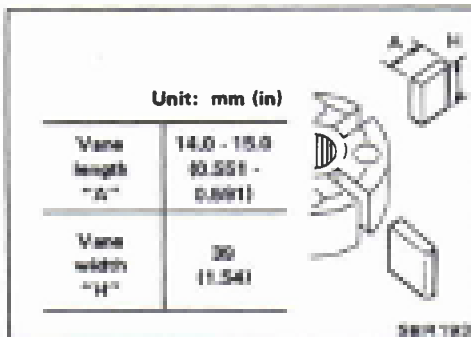
## Removal and Installation



- Drain oil from vacuum pump before removal. **Manually rotate fan belt clockwise to discharge any oil which may have accumulated in vacuum pump.**



- Install vane so that its round surface faces pump housing.
- After installing vacuum pump assembly on alternator, apply 5 mℓ (0.2 Imp fl oz) of engine oil into vacuum pump assembly. Then, make sure that pulley of alternator can be smoothly rotated by hand.

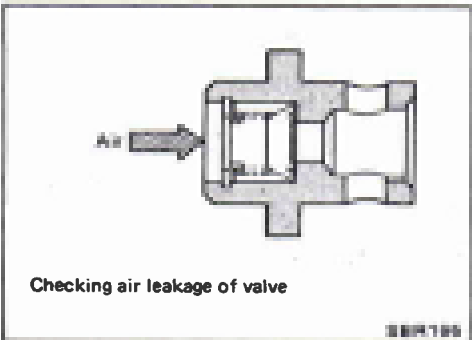
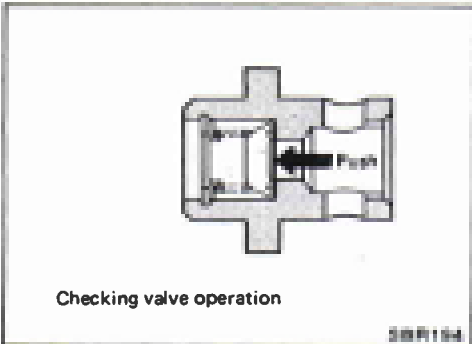
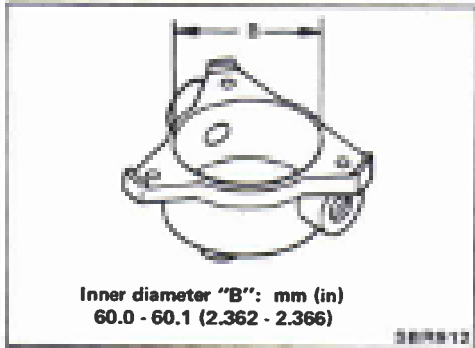


## Inspection

**Clean all parts and check them as follows:**

- Check for wear or scratches on mating surfaces of rotor and vacuum pump housing and of rotor and center plate. If wear or scratches are noted, replace those parts.
- Check for wear or scratches on vanes. If necessary, replace.

## VACUUM PUMP (Diesel engine model)



### Inspection (Cont'd)

- Check inner wall of vacuum pump housing for wear. If necessary, replace.
- Check rotor shaft for wear. If necessary, replace.
- Check valve locations and copper washers for bends or deformation. If necessary, replace.

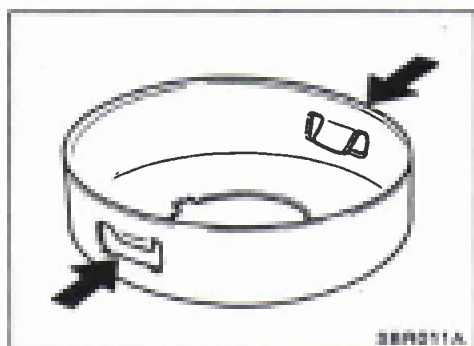
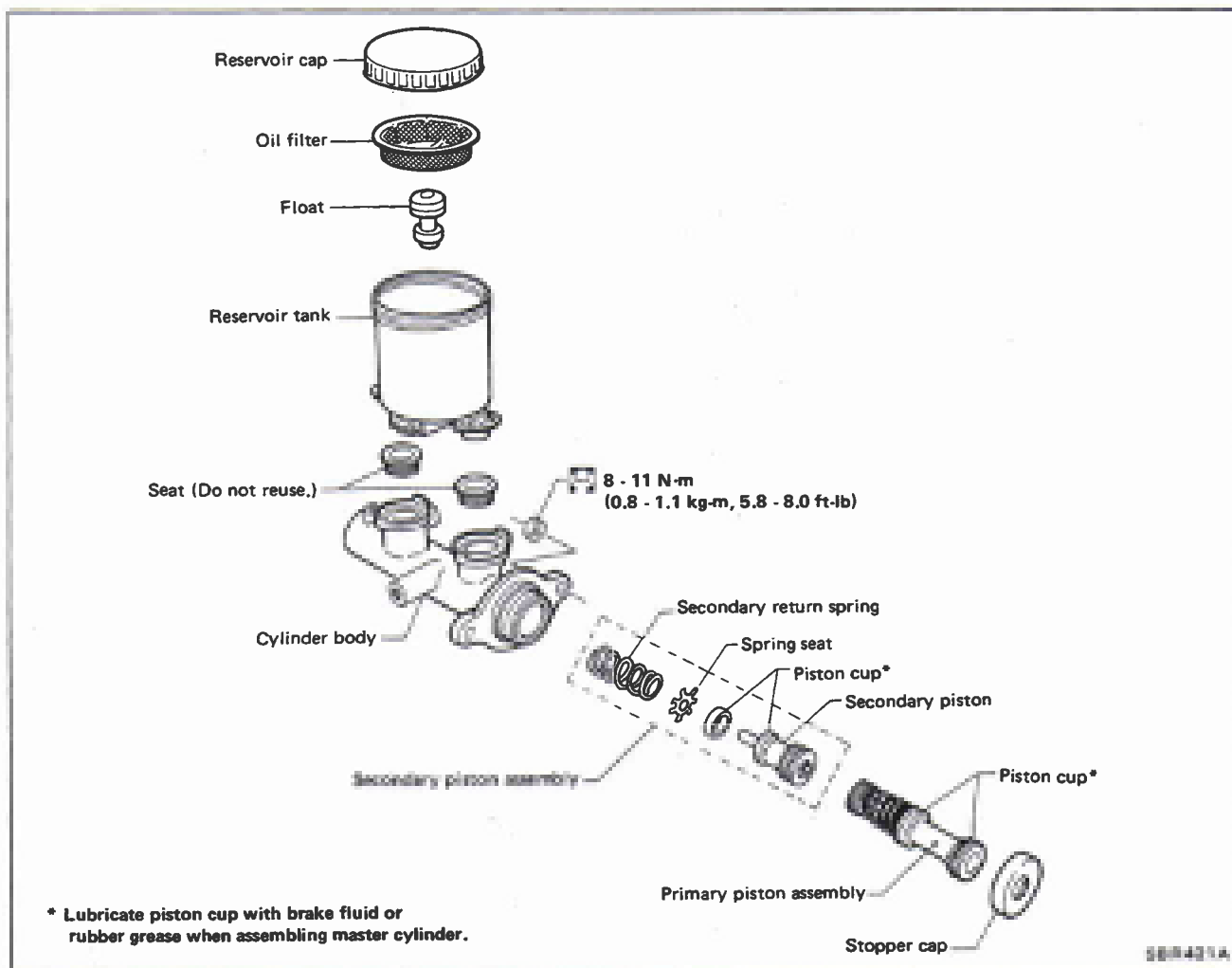
- Check that valve operates smoothly when slightly pushed. Replace if necessary.

Check for air leakage with 98 to 490 kPa (1.0 to 4.9 bar, 1 to 5 kg/cm<sup>2</sup>, 14 to 71 psi) of air pressure. Replace if necessary.

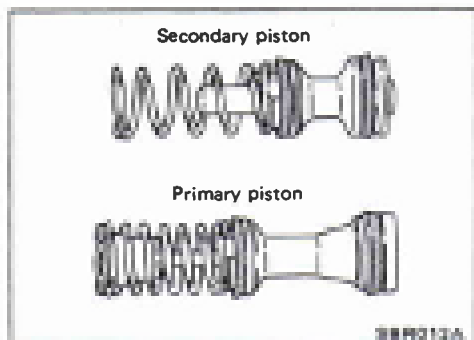


# MASTER CYLINDER

## Removal and Installation



- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.

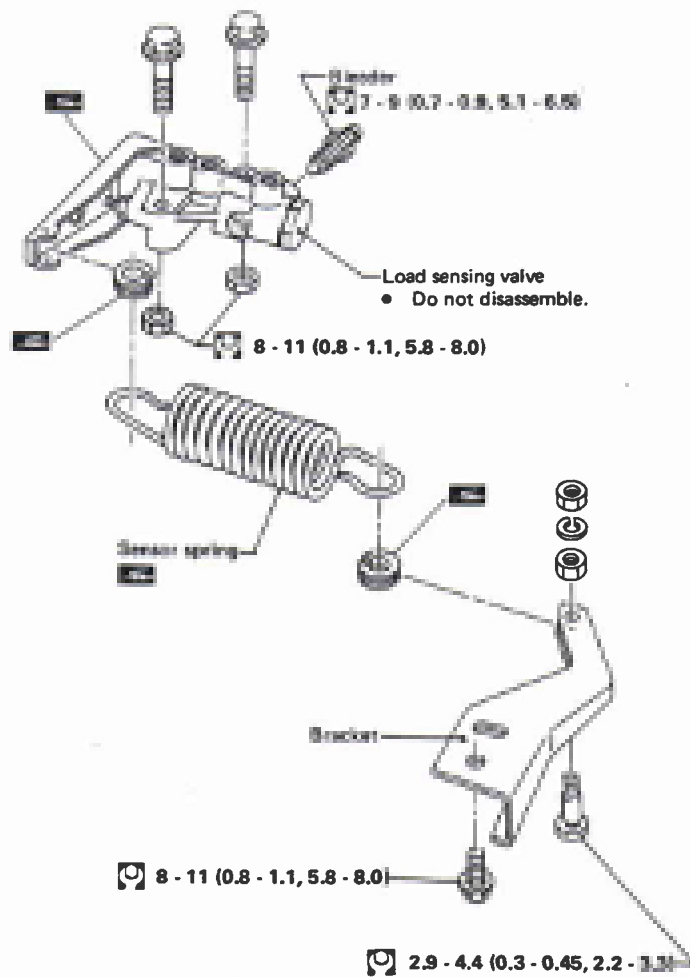


- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.

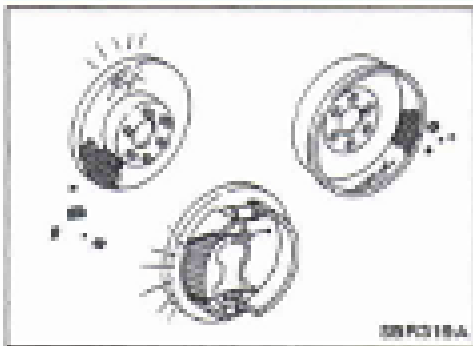
# LOAD SENSING VALVE (L.S.V.) — Linkage type

## Removal and Installation

### Load sensing valve

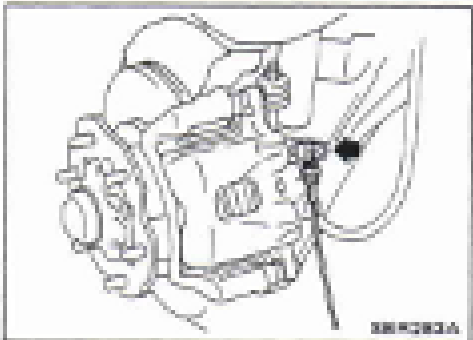


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### Inspection

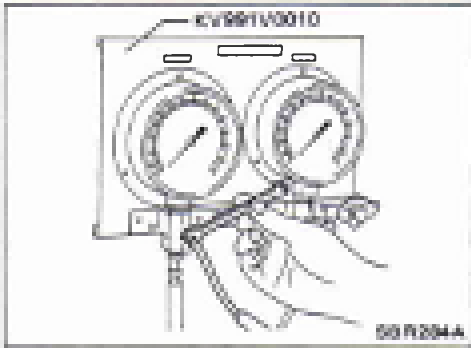
1. Before checking load sensing valve, inspect front and rear brake shoes and pads for abnormal wear and improper installation.
2. Remove air bleeder on front brake wheel cylinder/caliper, and install pressure gauge into air bleed hole.



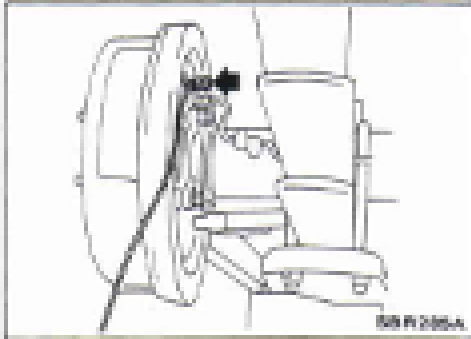
## LOAD SENSING VALVE (L.S.V.) — Linkage type

### Inspection (Cont'd)

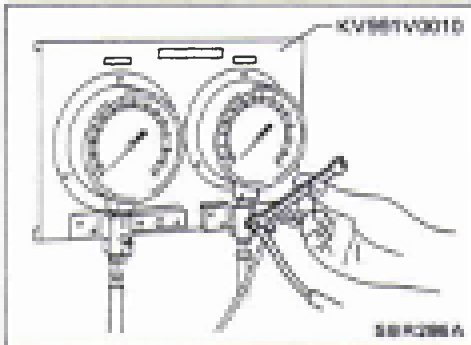
3. Bleed air from front brake line.



4. Remove air bleeder on rear brake wheel cylinder/caliper, and install pressure gauges into air bleed holes.

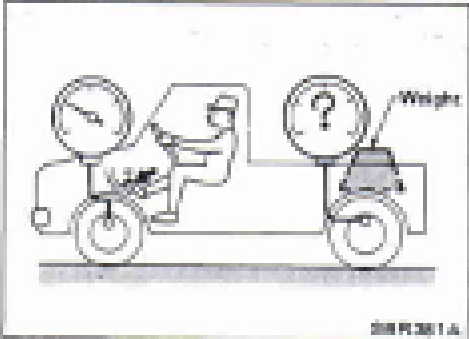
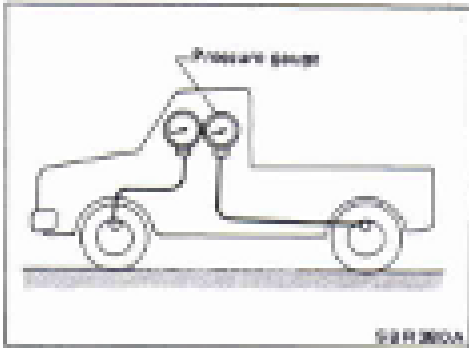


5. Bleed air from rear brake line.



## LOAD SENSING VALVE (L.S.V.) — Linkage type

### Inspection (Cont'd)



A linkage type L.S.V. (load sensing valve) is located in front of the rear axle. To properly adjust L.S.V., proceed as follows:

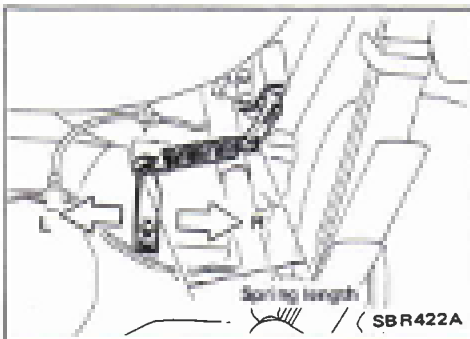
6. With someone in the driver's seat, have a helper ride on rear center of deck and then slowly get off.
7. Depress brake pedal. While depressing brake pedal, measure length of sensor spring to ensure it is as indicated below.

**Sensor spring length: 207 mm (8.15 in)**

8. If spring length is not as specified, loosen and move bracket until specified spring length is obtained.
9. Slowly depress brake pedal.
10. Ensure the relationship between master cylinder pressure and rear wheel cylinder pressure is within specified range. Refer to specified range as shown in table below.
11. Place a suitable weight on rear center of deck, above rear axle, so that spring length is 220 mm (8.66 in) when brake pedal is depressed.
12. Recheck that the relationship between master cylinder pressure and rear wheel cylinder pressure is within specified range as shown in table below.

Unit: kPa (bar, kg/cm<sup>2</sup>, psi)

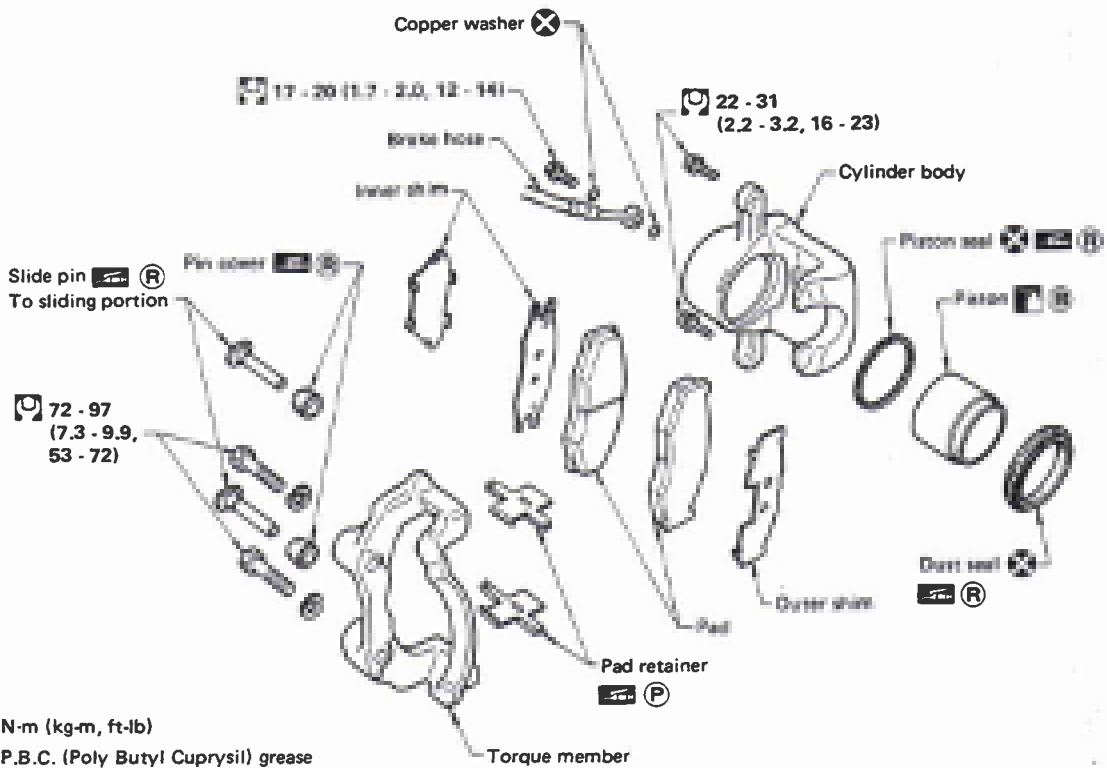
Master cylinder pressure	Rear wheel cylinder pressure			
	Pickup model		Except for Pickup model	
	Spring length 207 mm (8.15 in)	Spring length 220 mm (8.66 in)	Spring length 207 mm (8.15 in)	Spring length 220 mm (8.66 in)
4,904 (49.0, 50, 711)	981 - 1,961 (9.8 - 19.6, 10 - 20, 142 - 284)	4,413 - 5,394 (44.1 - 53.9, 45 - 55, 640 - 782)	1,569 - 2,550 (15.7 - 25.5, 16 - 26, 228 - 370)	3,629 - 4,609 (36.3 - 46.1, 37 - 47, 526 - 668)
9,807 (98.1, 100, 1,422)	1,863 - 3,236 (18.6 - 32.4, 19 - 33, 270 - 469)	6,473 - 7,846 (64.7 - 78.5, 66 - 80, 939 - 1,138)	2,452 - 3,825 (24.5 - 38.2, 25 - 39, 356 - 555)	4,609 - 5,982 (46.1 - 59.8, 47 - 61, 668 - 867)



13. If pressure is outside specified range after spring length is adjusted, replace L.S.V. assembly.

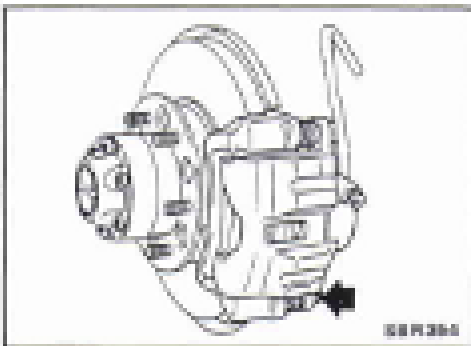
# FRONT DISC BRAKE (CL36VA) — Caliper

CL36VA



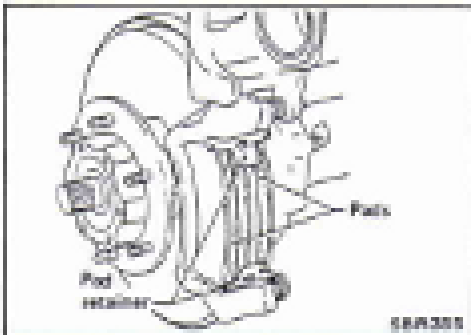
- : N-m (kg-m, ft-lb)
- (P): P.B.C. (Poly Butyl Cuprysil) grease or silicon-based grease point
- (R): Rubber grease point
- (B): Lubricate with brake fluid.

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## Pad Replacement

1. Remove pin bolt.

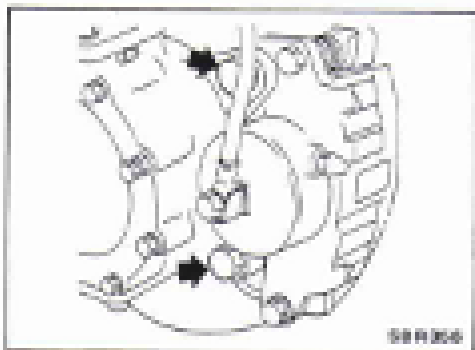


2. Swing cylinder body upward. Then remove pad retainer, and inner and outer shims.

### CAUTION:

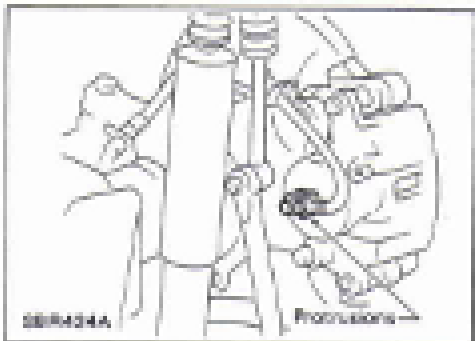
- When cylinder body is swung up, do not depress brake pedal because piston will pop out.
- Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.

## FRONT DISC BRAKE (CL36VA) — Caliper

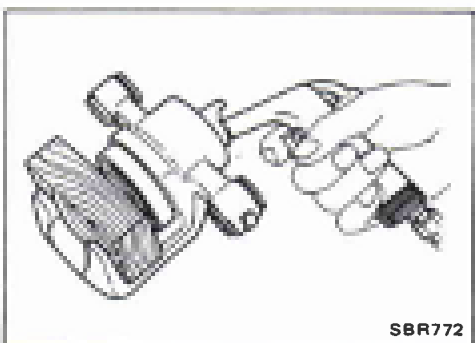


### Removal and Installation

- Remove torque member fixing bolts and union bolt.

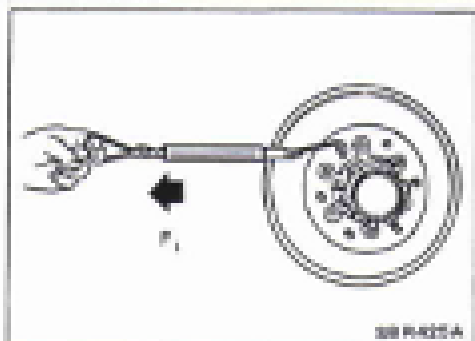


- Install brake hose to caliper at protrusions securely.



### Disassembly

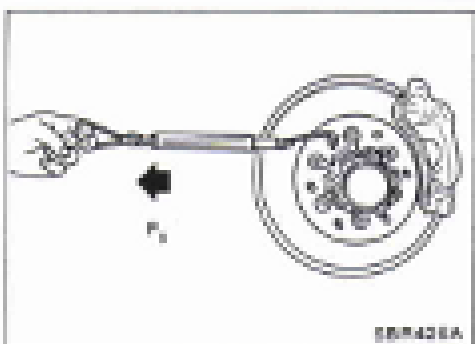
Push out piston with dust seal using compressed air.



### Inspection

#### INSPECTION OF BRAKE DRAG FORCE

- (1) Swing cylinder body upward.
- (2) Make sure that wheel bearing is adjusted properly. Refer to section FA.
- (3) Measure rotating force ( $F_1$ ).



- (4) Install caliper with pads to the original position.
- (5) Depress brake pedal for 5 seconds.
- (6) Release brake pedal and rotate disc rotor 10 revolutions.
- (7) Measure rotating force ( $F_2$ ).
- (8) Calculate brake drag force by subtracting  $F_1$  from  $F_2$ .

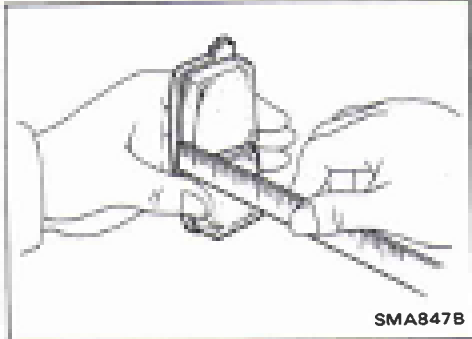
**Maximum brake drag force ( $F_2 - F_1$ ):**

**70.6 N (7.2 kg, 15.9 lb)**

## FRONT DISC BRAKE (CL36VA) — Caliper

### Inspection (Cont'd)

If it is not within specification, check main pins and retainer boots in caliper.



### DISC PAD

Check disc pad for wear or damage.

**Pad standard thickness (A):**

**11.5 mm (0.453 in)**

**Pad wear limit (A):**

**2.0 mm (0.079 in)**

### CYLINDER BODY

- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. Replace if any such condition exists.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper.

#### CAUTION:

Use brake fluid to clean.

### PISTON

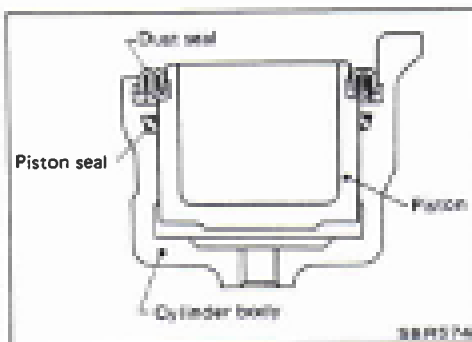
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

#### CAUTION:

**Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.**

### PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any condition exists.



### Assembly

- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

#### CAUTION:

- **Secure dust seal properly.**

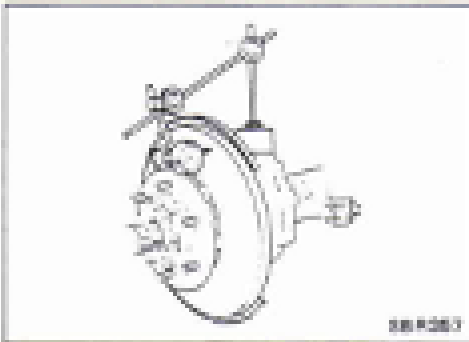
## FRONT DISC BRAKE (CL36VA) — Rotor

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### Inspection

#### RUBBING SURFACE

Check rotor for roughness, cracks or chips.



#### RUNOUT

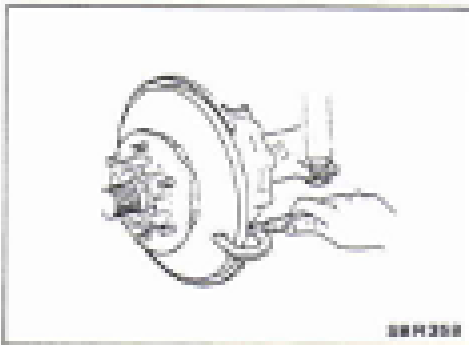
Adjust wheel bearing preload. Check runout using a dial indicator.

##### Rotor repair limit:

##### Maximum runout

(Total indicator reading at center of rotor pad contact surface)

0.07 mm (0.0028 in)



#### THICKNESS

##### Rotor repair limit:

##### Standard thickness

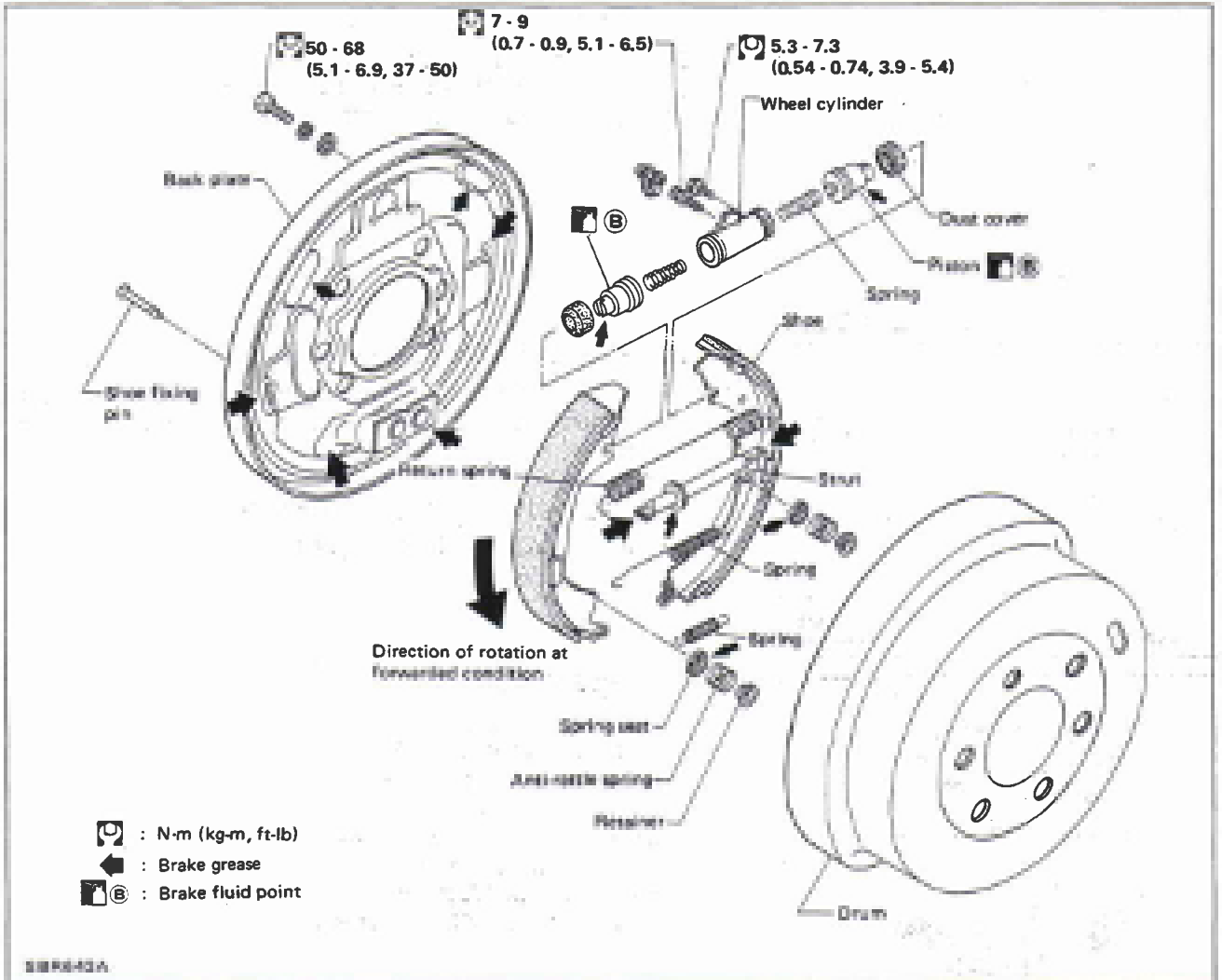
20 mm (0.79 in)

##### Minimum thickness

18 mm (0.71 in)

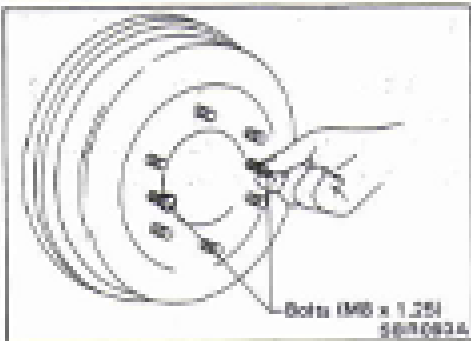


## REAR DRUM BRAKE (LT30)



### Brake Drum Removal

- Tighten two bolts gradually if brake drum is hard to remove.

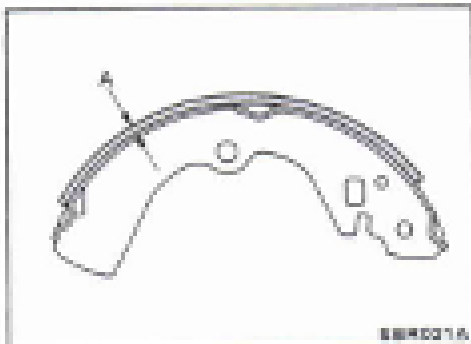


### Shoe Replacement

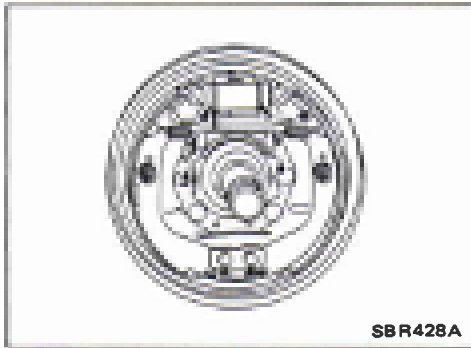
- Measure lining thickness.  
**Standard thickness:**  
 6.1 mm (0.240 in)  
**Lining wear limit (A):**  
 1.5 mm (0.059 in)

Before installing new shoes, rotate nut until adjuster rod is at its shortest point.

After installation, adjust shoe-to-drum clearance. Refer to Removal and Installation.



## REAR DRUM BRAKE (LT30)



### Wheel Cylinder Inspection

- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions.  
Replace if any condition exists.

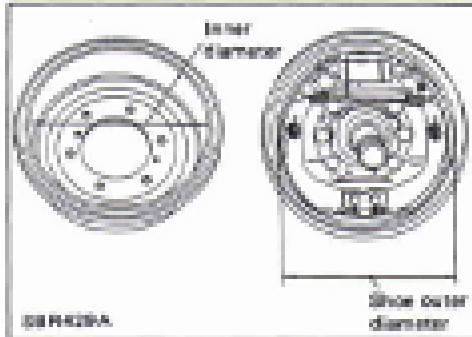
### Removal and Installation

When installing, measure brake drum inside diameter and diameter of brake shoes. Check that difference between diameters is correct shoe clearance.

#### Shoe clearance:

**0.25 - 0.4 mm (0.0098 - 0.0157 in)**

If necessary, adjust by rotating adjuster.



### Drum Inspection

#### Standard inner diameter:

**295.0 mm (11.61 in)**

#### Maximum inner diameter:

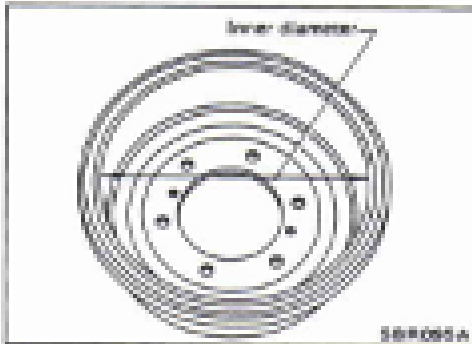
**296.5 mm (11.67 in)**

#### Out-of-roundness (Ellipticity):

**0.03 mm (0.0012 in) or less**

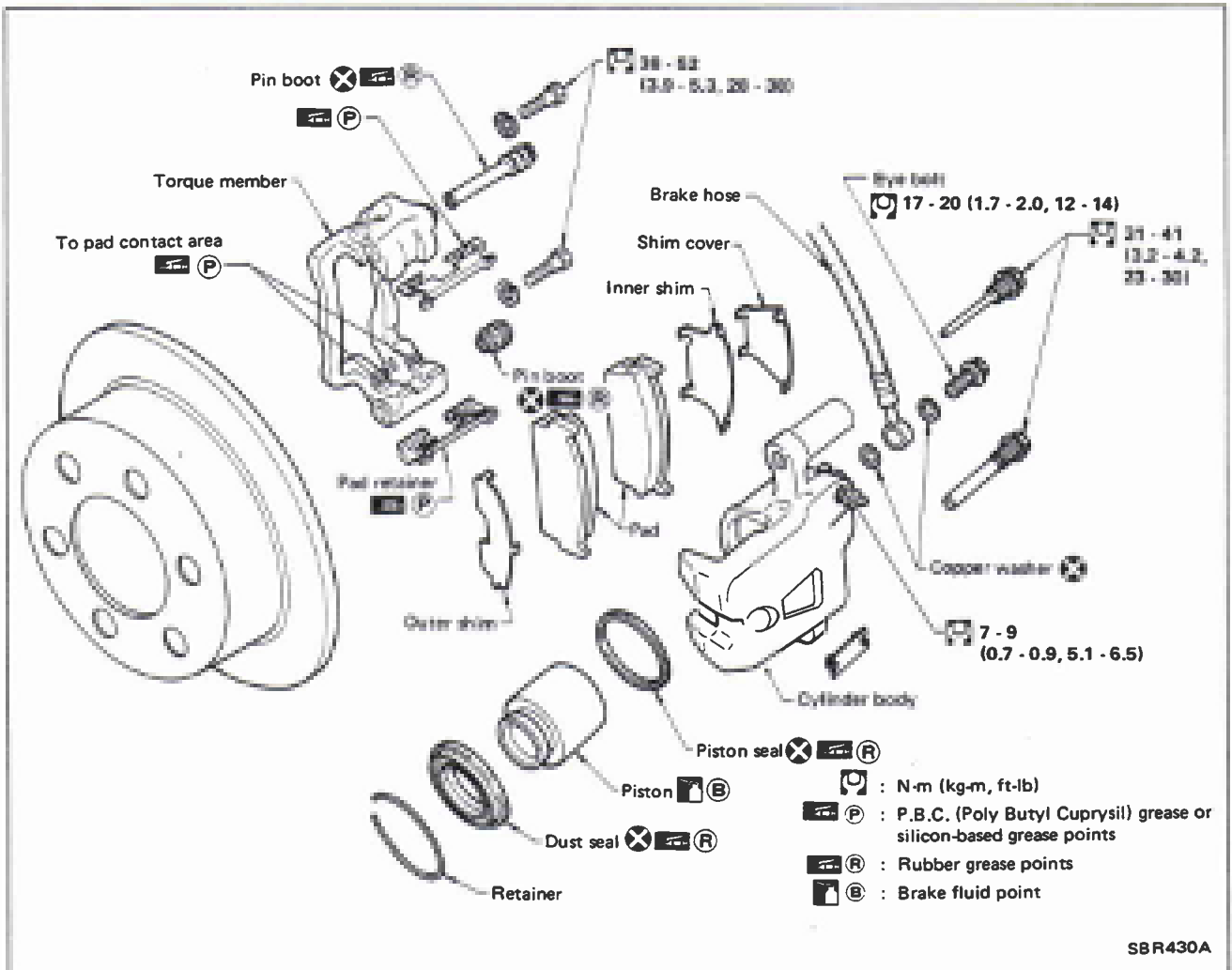
#### Radial runout (Total indicator reading):

**0.05 mm (0.0020 in) or less**



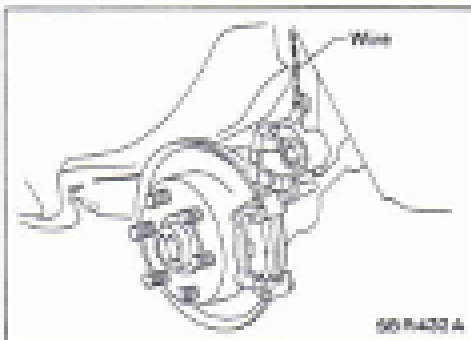
- Contact surface should be finefinished with No. 120 to 150 emery paper.
- Using a drum lathe, lathe brake drum if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.

## REAR DISC BRAKE (AD20VC) — Caliper



### Pad Replacement

1. Remove guide pin.



2. Swing cylinder body upward. Then remove pad retainer and inner and outer shims.

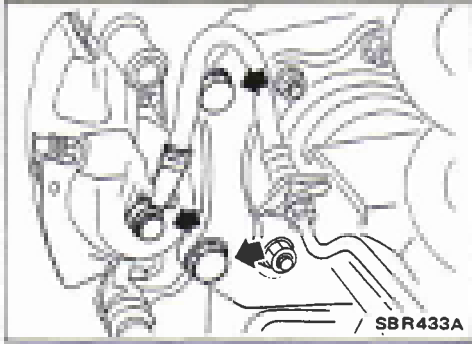
#### CAUTION:

- When cylinder body is swung up, do not depress brake pedal because piston will pop out.
- Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.

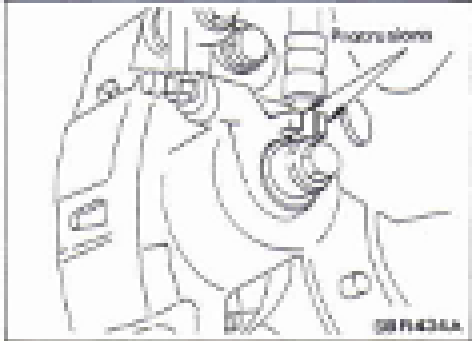
## REAR DISC BRAKE (AD20VC) — Caliper

### Removal and Installation

- Remove torque member fixing bolts and union bolt.

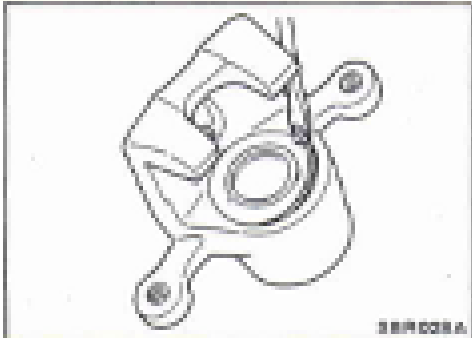


- Install brake hose to caliper at protrusions securely.

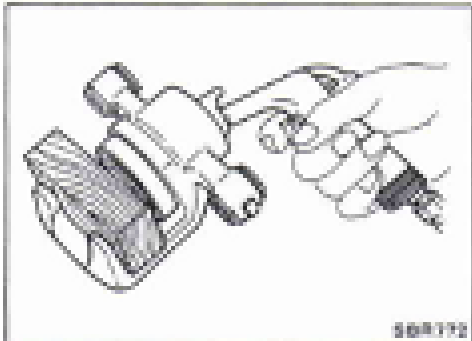


### Disassembly

- Remove dust cover retainer with a screwdriver.



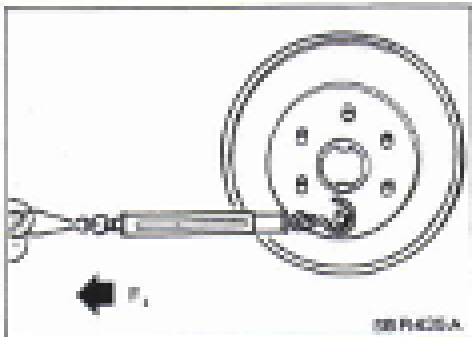
- Push out piston with dust seal using compressed air.



### Inspection

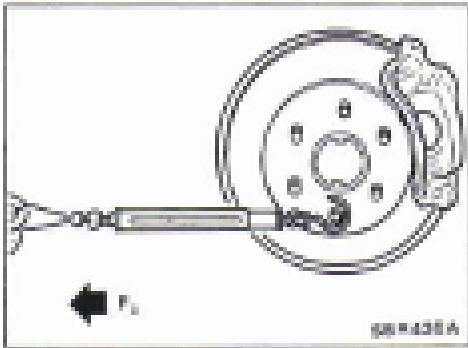
#### INSPECTION OF BRAKE DRAG FORCE

- (1) Swing cylinder body upward.
- (2) Make sure that wheel bearing is adjusted properly. Refer to section RA.
- (3) Measure rotating force ( $F_1$ ).



## REAR DISC BRAKE (AD20VC) — Caliper

### Inspection (Cont'd)



- (4) Install caliper with pads to the original position.
- (5) Depress brake pedal for 5 seconds.
- (6) Release brake pedal, rotate disc rotor 10 revolutions.
- (7) Measure rotating force ( $F_2$ ).
- (8) Calculate brake drag force by subtracting  $F_1$  from  $F_2$ .

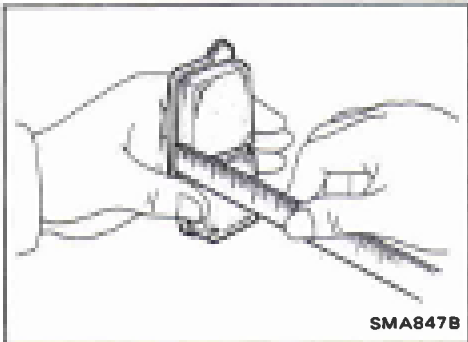
**Maximum brake drag force ( $F_2 - F_1$ ):**

**55.9 N (5.7 kg, 12.6 lb)**



If it is not within specification, check pins and pin cover in caliper.

- Make sure that wheel bearing is adjusted properly.
- Disc pads and disc rotor must be dried.



### DISC PAD

Check disc pad for wear or damage.

**Pad standard thickness (A):**

**11 mm (0.43 in)**

**Pad wear limit (A):**

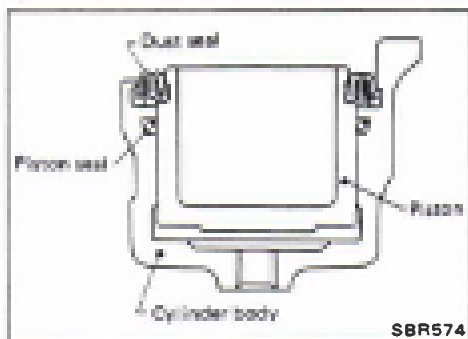
**2.0 mm (0.079 in)**

### CYLINDER BODY

- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. If any such condition exists, replace cylinder body.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper. Replace cylinder body if necessary.

### CAUTION:

Use brake fluid to clean.



### Assembly

- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

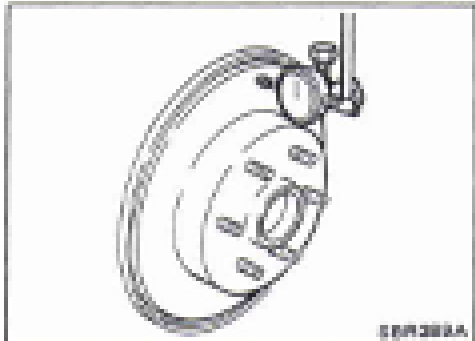
### CAUTION:

- Secure dust seal properly.

**Inspection**

**RUBBING SURFACE**

Check rotor for roughness, cracks or chips.



**RUNOUT**

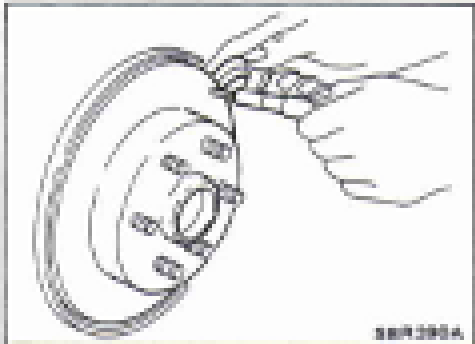
Adjust wheel bearing preload.  
Check runout using a dial indicator.  
Refer to section RA.

**Rotor repair limit:**

**Maximum runout**

**(Total indicator reading at center of rotor pad  
contact surface)**

**0.07 mm (0.0028 in)**



**THICKNESS**

**Rotor repair limit:**

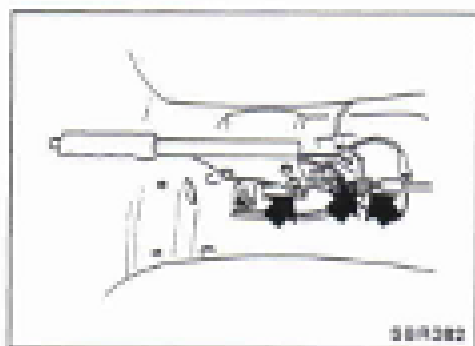
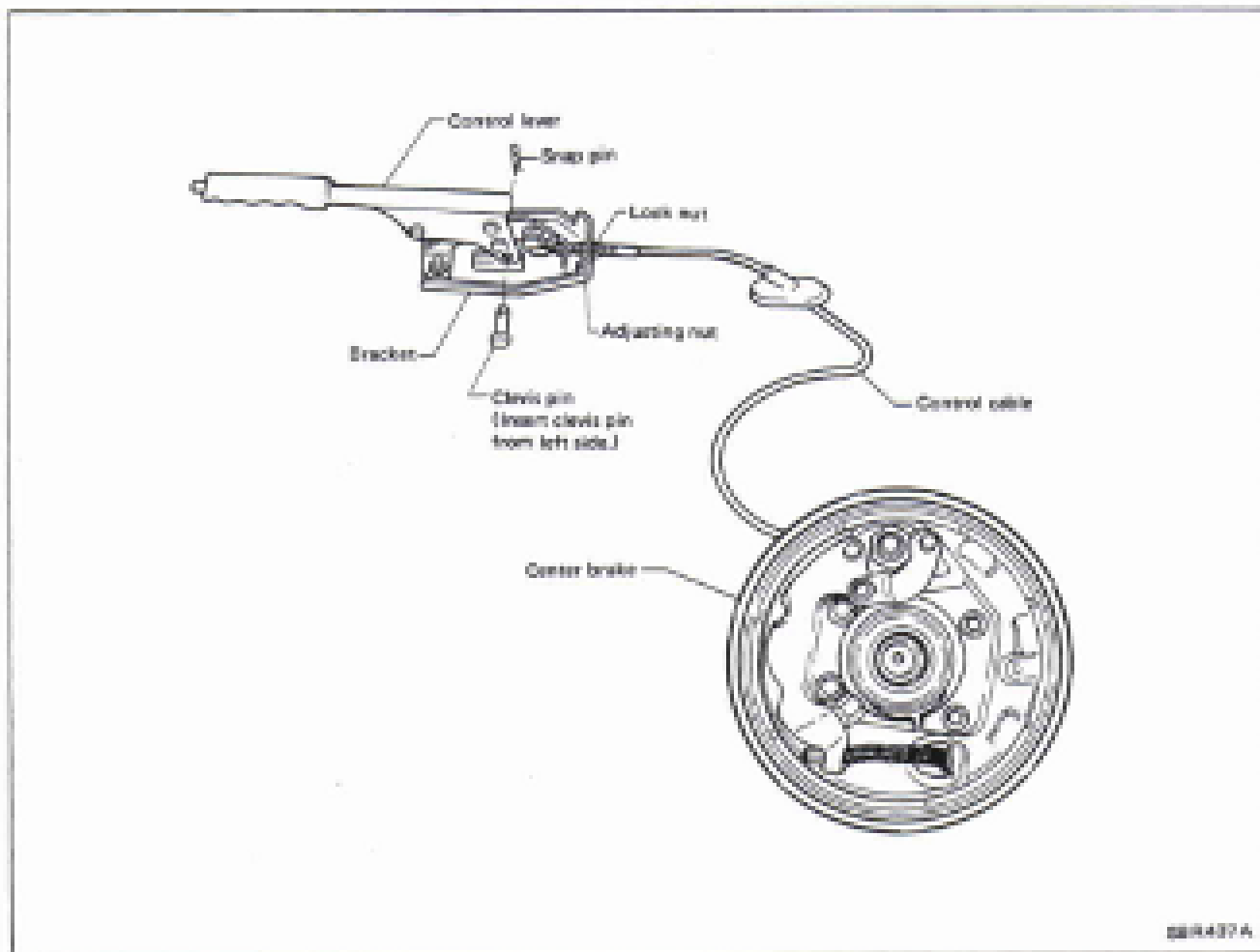
**Standard thickness**

**18.0 mm (0.709 in)**

**Minimum thickness**

**16.0 mm (0.630 in)**

## PARKING BRAKE CONTROL



### Removal

1. Disconnect harness connector.
2. Disconnect control cable from control lever and bracket.
3. Remove control lever and bracket.
4. Disconnect control cable from center brake and remove control cable.  
Refer to Center Brake.

## PARKING BRAKE CONTROL

### Inspection

1. Check control lever and ratchet for evidence of wear or other damage.
2. Check wires for evidence of discontinuity or other deterioration.
3. Check parts at each connection for deformation or damage.

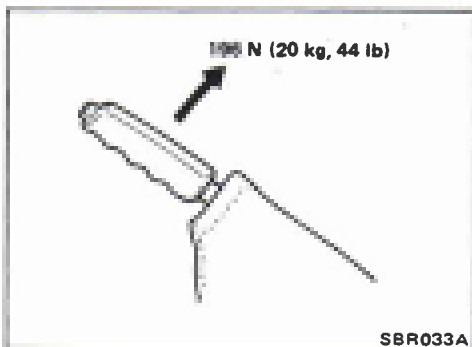
### Installation

1. Apply a coating of grease to sliding contact surfaces.
2. Insert clevis pin from left side.
3. After installation is completed, adjust entire system.

### Adjustment

1. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.

**Number of notches: 7 - 9**

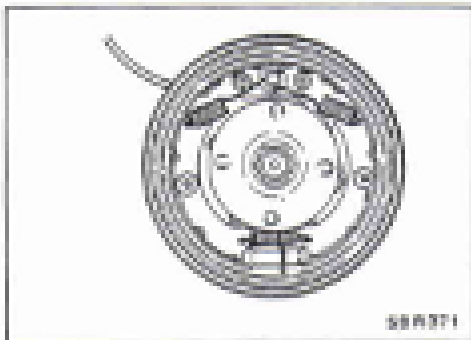
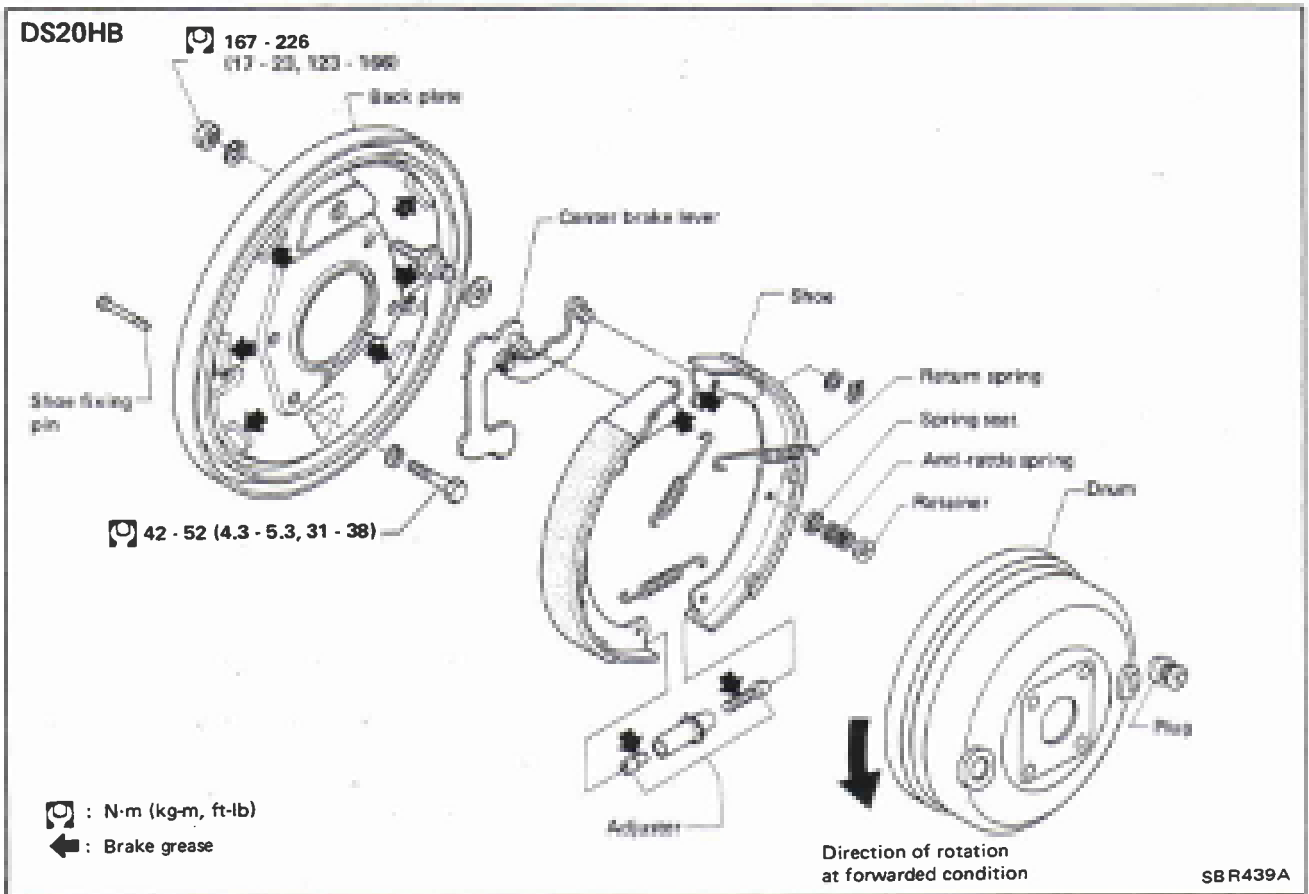


2. Bend parking brake warning lamp switchplate so that brake warning lamp comes on when ratchet at parking brake lever is pulled notches and goes out when fully released.

**Number of notches: 2**

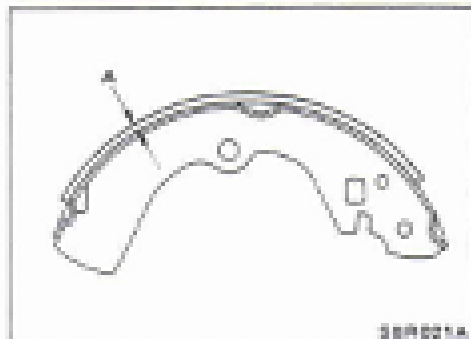


## CENTER BRAKE



### Brake Drum Removal

- Release parking brake control lever fully.
- Remove propeller shaft and drum.



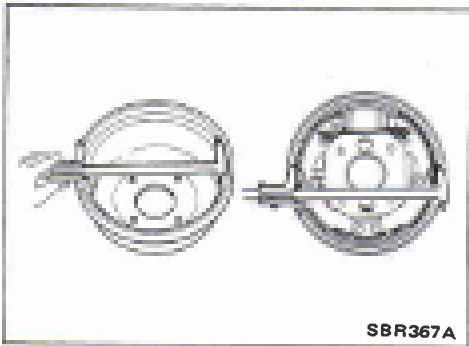
### Shoe Replacement

- Measure lining thickness.
  - Lining wear limit:**  
1.5 mm (0.059 in)
  - Lining standard thickness:**  
5.1 mm (0.201 in)

Before installing new shoes, rotate nut until adjuster rod is at its shortest point.

After installation, adjust shoe-to-drum clearance. Refer to Removal and Installation.

## CENTER BRAKE



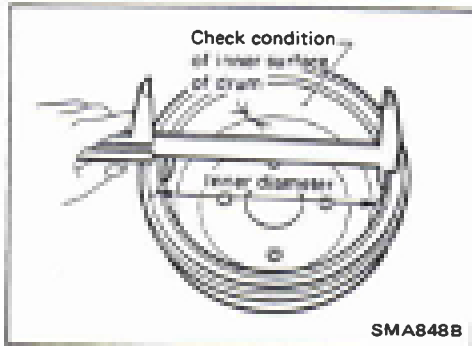
### Removal and Installation

When installing, measure brake drum inside diameter and diameter of brake shoes. Check that the difference between diameters is the correct shoe clearance.

#### Shoe clearance:

**0.25 - 0.4 mm (0.0098 - 0.0157 in)**

If necessary, adjust by rotating adjuster.



### Drum Inspection

#### Standard inner diameter:

**203.2 mm (8 in)**

#### Maximum inner diameter:

**204.5 mm (8.05 in)**

#### Out-of-roundness (Ellipticity):

**0.03 mm (0.0012 in) or less**

#### Radial runout (Total indicator reading):

**0.05 mm (0.0020 in) or less**

- Contact surface should be fininished with No. 120 to 150 emery paper.
- Using a drum lathe, lathe brake drum if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## General Specifications

Item	Applied model	All	Optional for Australia
<b>Front brake</b>			
Brake model		CL36VA disc brake	
Cylinder bore diameter mm (in)		68.1 (2.681)	
Pad dimensions Length x width x thickness mm (in)		130 x 52 x 11.5 (5.12 x 2.05 x 0.453)	
Disc rotor outer diameter x thickness mm (in)		295 x 20 (11.61 x 0.79)	
<b>Rear brake</b>			
Model	LT30 drum brake	AD30HC disc brake	
Cylinder bore diameter mm (in)	25.40 (1.0)	51.1 (2.012)	
Lining or pad dimensions Length x width x thickness mm (in)	296 x 60 x 6.1 (11.65 x 2.36 x 0.240)	112.8 x 46.7 x 11 (4.44 x 1.839 x 0.43)	
Drum inside diameter mm (in)	295.0 (11.61)	—	
Disc rotor outer diameter x thickness mm (in)	—	316 x 18.0 (12.44 x 0.709)	

Item	Applied model	All	Optional for Australia
<b>Master cylinder</b>			
Cylinder model		M23AS	
Bore diameter mm (in)		25.40 (1.0)	26.99 (1.071)
<b>Control valve</b>			
Valve type		Load sensing valve	
Split point x reducing ratio kPa (bar, kg/cm <sup>2</sup> , psi) x ratio		Variable x 0.23	
<b>Brake booster</b>			
Booster model		G22 or M22	M20, M23
Diaphragm diameter mm (in)		230 (9.09)	Primary: 230 (9.09) Secondary: 205 (8.07)
<b>Parking brake</b>			
Brake model		G620HB	
Drum inside diameter mm (in)		202.2 (8.0)	
Lining dimensions Length x width x thickness mm (in)		195 x 45 x 5.1 (7.68 x 1.77 x 0.201)	

## Inspection and Adjustment

### BRAKE PEDAL

Transition type	A/T	M/T
Free height "H" mm (in)	202 - 212 (7.95 - 8.35)	192 - 202 (7.56 - 7.95)
Depressed height [Applied 490 N (50 kg, 110 lb) or pressure with engine running] mm (in)	120 (4.72) or more	
Pedal free play mm (in)	1.0 - 3.0 (0.04 - 0.12)	
Clearance between pedal stopper and threaded end of stop lamp assembly mm (in)	0.3 - 1.0 (0.012 - 0.039)	

### PARKING BRAKE CONTROL

Control type	Center lever
Number of notches when warning lamp comes on	3
Number of notches [Applied 196 N (20 kg, 44 lb) of pressure]	7 - 8

### DISC BRAKE

Brake model	CL36VA	AD30HC
Pad lining wear limit Minimum thickness mm (in)	3.0 (0.079)	
Rotor repair limit Minimum thickness mm (in)	16.0 (0.630)	16.0 (0.630)
Maximum runout mm (in)	0.07 (0.0028)	

### DRUM BRAKE

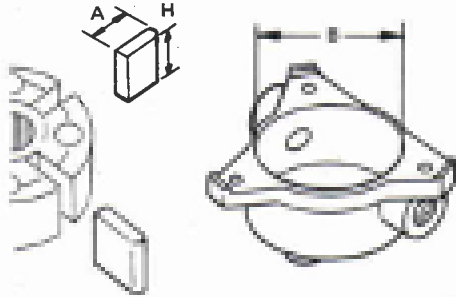
Brake model	LT30	G620HB
Lining wear limit Minimum thickness mm (in)	1.8 (0.071)	
Drum repair limit Maximum inside diameter mm (in)	296.5 (11.67)	204.8 (8.06)
Maximum out-of-round mm (in)	0.03 (0.0012)	
Maximum runout mm (in)	0.05 (0.0020)	

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment (Cont'd)

#### VACUUM PUMP

Pump vane length "A" mm (in)	14.0 - 15.0 (0.551 - 0.591)
Pump vane width "H" mm (in)	39 (1.54)
Vacuum pump housing inner diameter "B" mm (in)	60.0 - 60.1 (2.362 - 2.366)



68930A

# STEERING SYSTEM

## SECTION **ST**

### CONTENTS

PRECAUTIONS .....	ST- 2
PREPARATION .....	ST- 3
ON-VEHICLE INSPECTION .....	ST- 5
ON-VEHICLE INSPECTION (Power Steering) .....	ST- 6
STEERING WHEEL AND STEERING COLUMN .....	ST- 8
MANUAL STEERING GEAR (Model: VB70S) .....	ST-12
POWER STEERING GEAR (Model: PB56SC) .....	ST-18
POWER STEERING OIL PUMP .....	ST-25
STEERING LINKAGE .....	ST-29
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	ST-31

## PRECAUTIONS

---

- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order in a parts rack so they can be reinstalled in their proper positions.
- Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.
- Replace all gaskets, seals and O-rings.  
Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.
- Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.

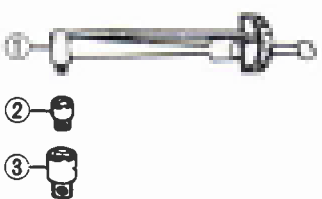
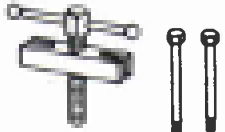
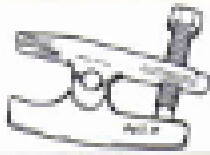





For power steering:

- Before assembly, apply a coat of recommended A.T.F.★ to hydraulic parts.  
Vaseline may be applied to O-rings and seals.  
Do not use any grease.
- ★: Automatic transmission fluid

## PREPARATION


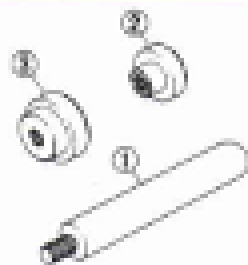
### SPECIAL SERVICE TOOLS

\*: Special tool or commercial equivalent

Tool number Tool name	Description	Unit application	
		Manual steering	Power steering
ST3127S000* ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter	 <p style="text-align: center;">Measuring turning torque</p>	X	X
ST27180001* Steering wheel puller	 <p style="text-align: center;">Removing steering wheel</p>	X	X
HT72520000* Ball joint remover	 <p style="text-align: center;">Removing ball joint</p>	X	X
ST29020001* Steering gear arm puller	 <p style="text-align: center;">Removing pitman arm</p>	X	X
KV48101500 Lock nut wrench		X	-
ST33210000 Gear carrier side bearing drift		X	-
KV48100301* Strut and steering gearbox attachment	 <p style="text-align: center;">Attaching steering gear</p>	X	X
KV48100700 Torque adapter		X	X

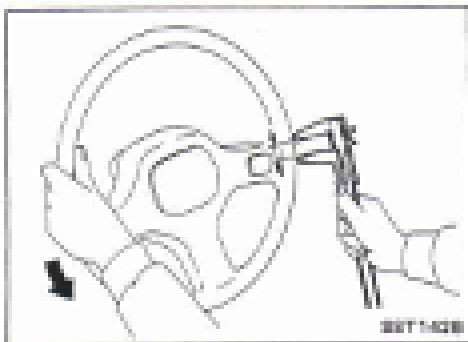
## PREPARATION

☐ Special tool or commercial equivalent

Tool number Tool name	Description	Unit application		
		Manual steering	Power steering	
ST27091000* Pressure gauge		Measuring oil pressure	-	X
KV481009S0 Oil seal drift set ① KV48100910 Drift ② KV48100920 Adapter ③ KV48100930 Adapter		Installing oil seal	-	X



## ON-VEHICLE INSPECTION



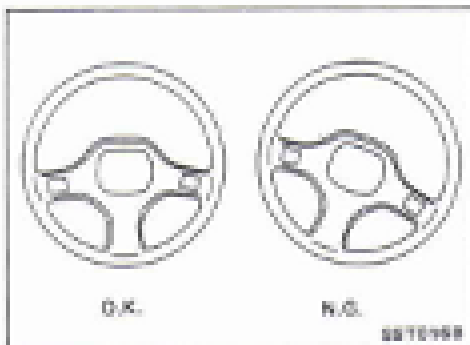
### Checking Steering Wheel Play

- With wheels in a straight-ahead position, check steering wheel play.

#### Steering wheel play:

**35 mm (1.38 in) or less**

- If it is not within specification, check tie-rod outer and inner ball joints.



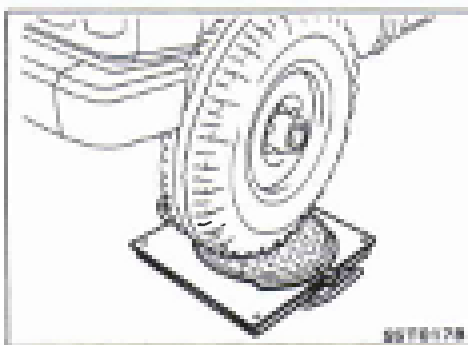
### Checking Neutral Position on Steering Wheel

#### Pre-checking

- Verify that the steering gear is centered before removing the steering wheel.

#### Checking

- Check that the steering wheel is in the neutral position when driving straight ahead.
- If it is not in the neutral position, remove the steering wheel and re-install it correctly.
- If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.



### Checking Front Wheel Turning Angle

- Rotate steering wheel all the way right and left; measure turning angle.

#### Turning angle:

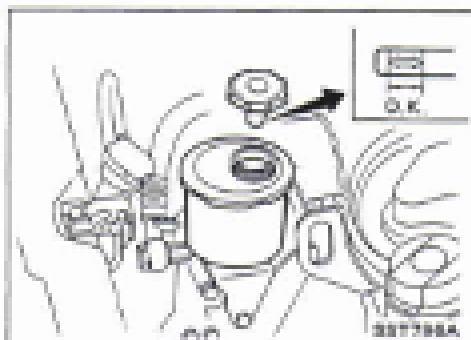
**Full turns and toe-out turn**

**Refer to section FA for S.D.S.**

## ON-VEHICLE INSPECTION (Power Steering)

### Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.

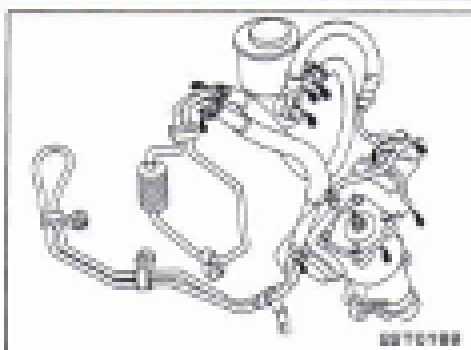


### Checking Fluid Level

Check the level when the fluid is cold.

#### CAUTION:

- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid "Dexron Type".



### Checking Fluid Leakage

Check the lines for improper attachment and for leaks, cracks, damage, loose connections, chafing or deterioration.

1. Run engine at idle speed or 1,000 rpm.

**Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).**

2. Turn steering wheel right-to-left several times.

3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

#### CAUTION:

**Do not hold the steering wheel in a locked position for more than 15 seconds.**

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

**Do not overtighten connector as this can damage O-ring, washer and connector.**

### Bleeding Hydraulic System

1. Raise front end of vehicle until wheels clear ground.

2. Add fluid into oil tank. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers. Repeat above operation until fluid level no longer decreases.

3. Start engine.

Repeat step 2 above.

- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

- ① Generation of air bubbles in oil tank
- ② Generation of clicking noise in oil pump
- ③ Excessive buzzing in oil pump

## ON-VEHICLE INSPECTION (Power Steering)

### Bleeding Hydraulic System (Cont'd)

While the vehicle is stationary or while moving the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.

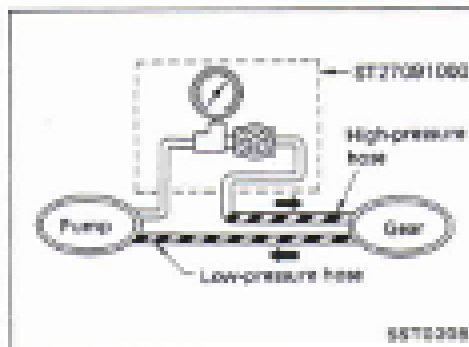
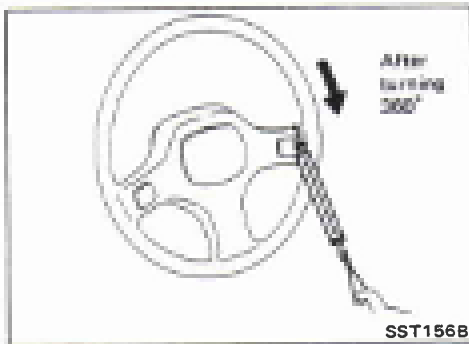
### Checking Steering Wheel Turning Force

1. Park vehicle on a level, dry surface and set parking brake.
2. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

**Tires need to be inflated to normal pressure.**

3. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

**Steering wheel turning force:**  
39 N (4 kg, 9 lb) or less



### Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

**Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).**

**WARNING:**

**Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.**

3. Check pressure with steering wheel fully turned to left and right positions.

**CAUTION:**

**Do not hold the steering wheel in a locked position for more than 15 seconds.**

**Oil pump standard pressure:**

8,630 - 9,219 kPa

(86.3 - 92.2 bar, 88 - 94 kg/cm<sup>2</sup>, 1,251 - 1,337 psi)

**at idling**

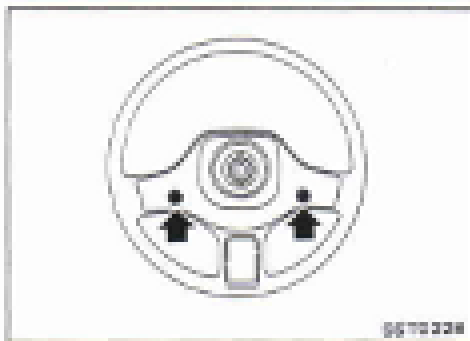
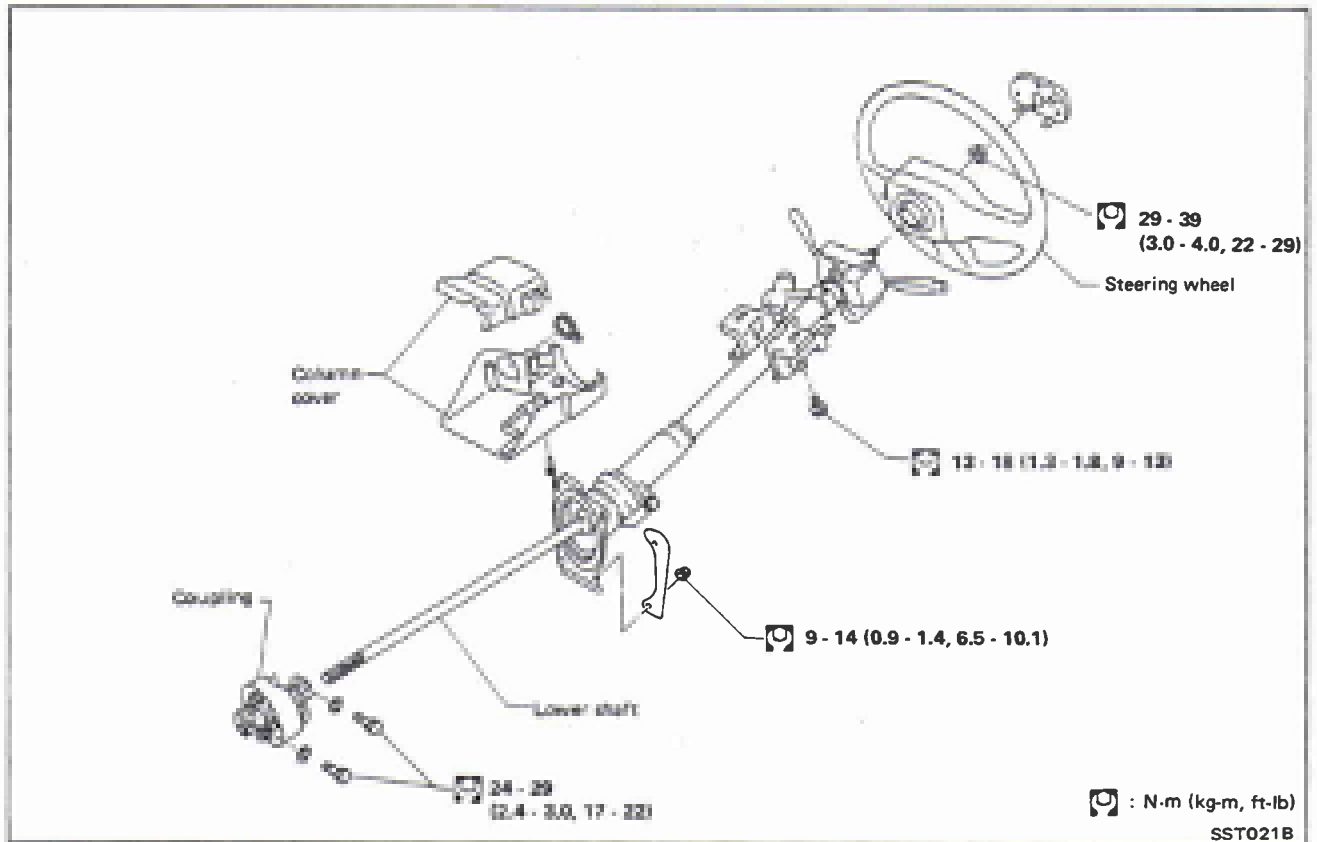
4. If oil pressure is below the standard level, slowly close shut-off valve and check pressure.
  - When pressure reaches standard level, gear is damaged.
  - When pressure remains below standard level, pump is damaged.
5. If oil pressure is higher than the standard level, pump is damaged.

**CAUTION:**

**Do not close shut-off valve for more than fifteen seconds.**

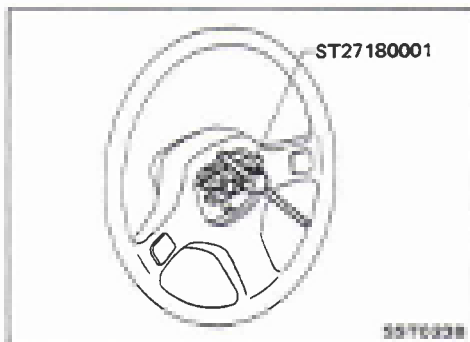
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

## STEERING WHEEL AND STEERING COLUMN



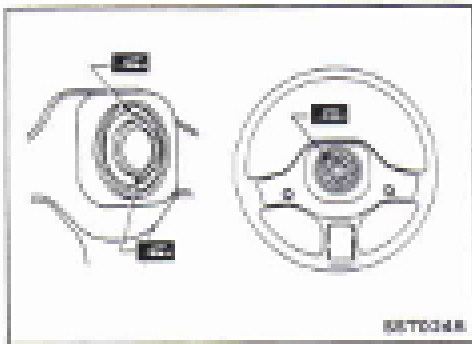
### Removal STEERING WHEEL

- Remove two screws from the rear of steering wheel.



- Remove steering wheel with Tool.

## STEERING WHEEL AND STEERING COLUMN



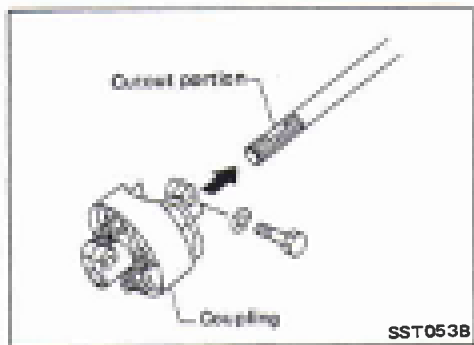
### Installation

#### STEERING WHEEL

- When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.

#### STEERING COLUMN

- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.



- When attaching coupling, be sure tightening bolt faces cutout portion.

#### CAUTION:

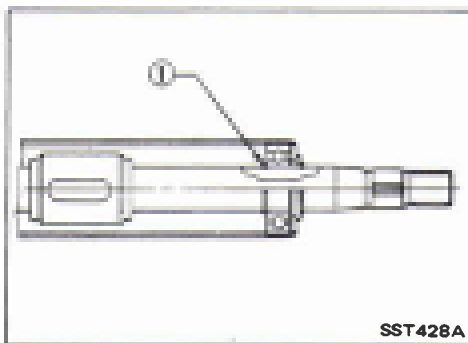
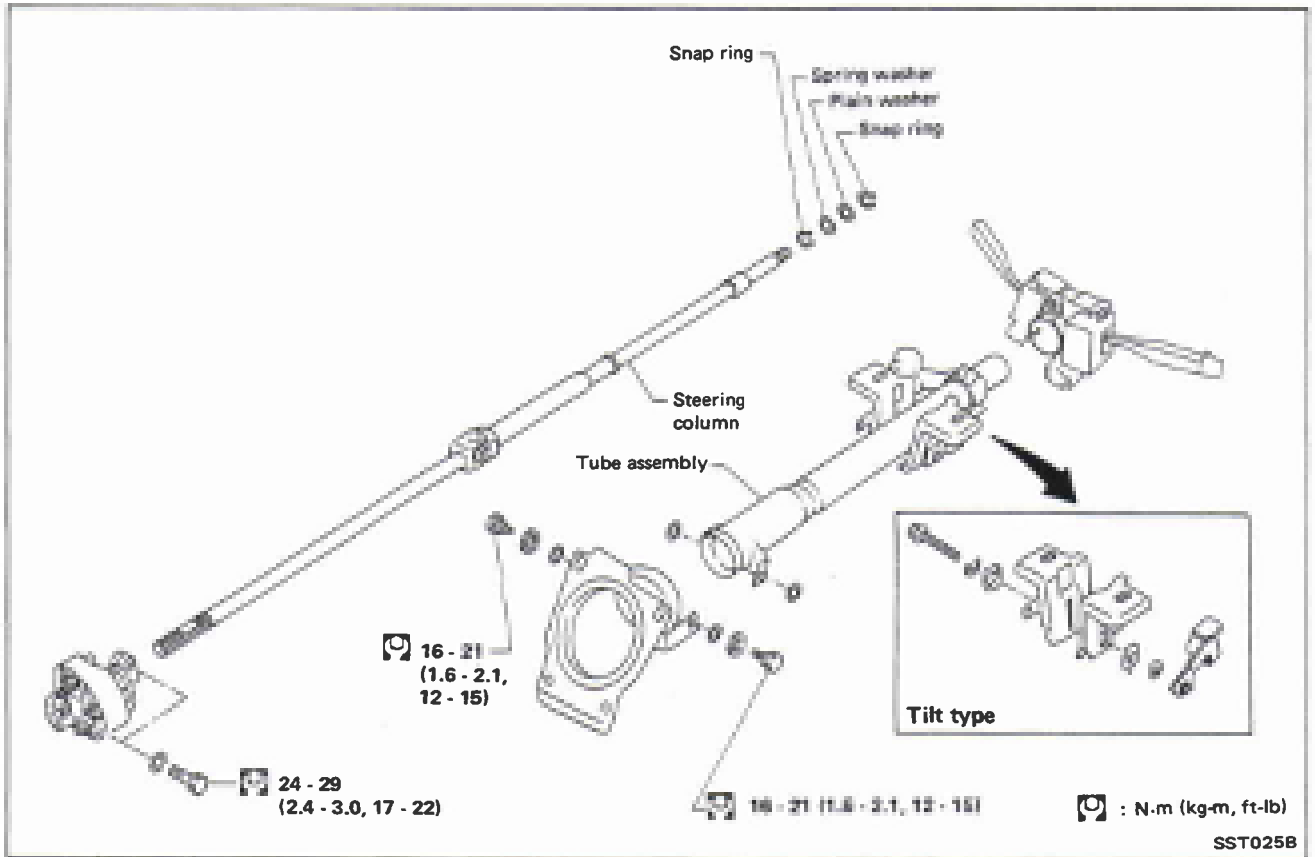
After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.

# STEERING WHEEL AND STEERING COLUMN

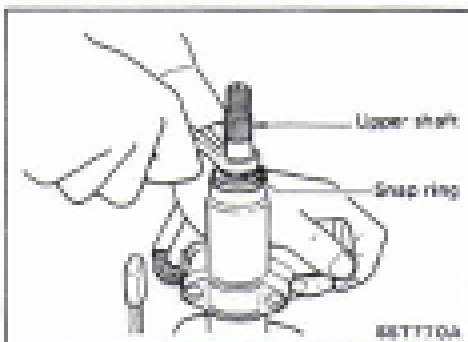
## Disassembly and Assembly

### CAUTION:

After installing, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal.



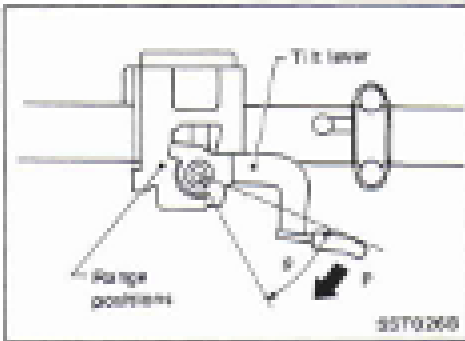
- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring ① before inserting shaft into jacket tube.



- Install snap ring on upper shaft with box wrench.

## STEERING WHEEL AND STEERING COLUMN

### Disassembly and Assembly (Cont'd)

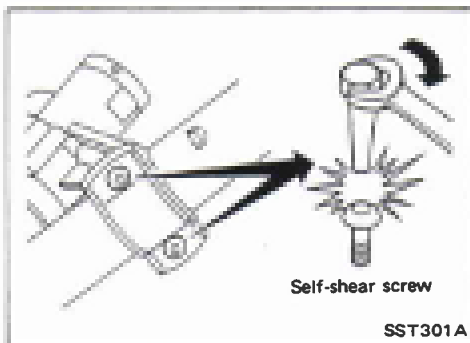


- Adjust tilt lever as follows.

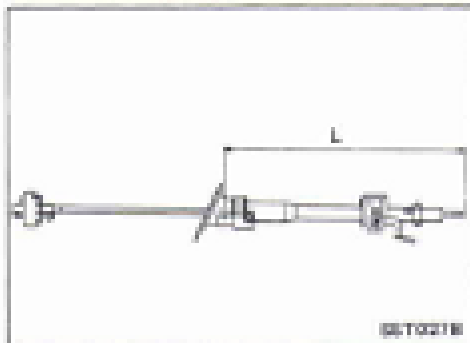
- (1) When tilt lever contacts flange portion, tighten adjusting bolt.
- (2) Turn tilt lever by  $90^\circ$  ( $\theta$ ) in direction "P" to check that steering column moves smoothly without binding.
- (3) Return tilt lever to position  $\theta$ . Make sure there is no free play (=0) of steering column when steering wheel is pushed down by force.

- Steering lock

- a) Break self-shear type screws with a drill or other appropriate tool.



- b) Install self-shear type screws and then cut off self-shear type screw heads.



### Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.
- (1) Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
  - (2) Check jacket tube for deformation or breakage. Replace if necessary.
- When the vehicle is involved in a light collision, check dimension "L". If it is not within specifications, replace steering column as an assembly.\*

**Column length "L":**

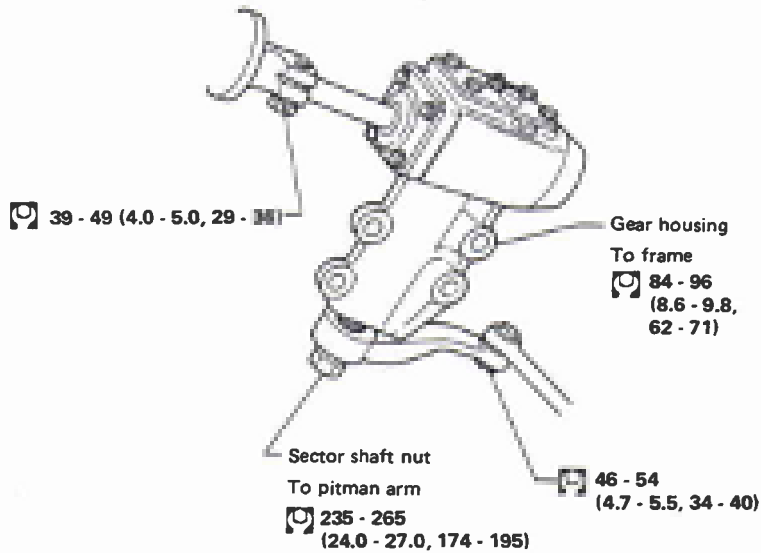
$$L = 681.6 - 683.2 \text{ mm (26.83 - 26.90 in)}$$

\*: **Models for only Middle East  
Except for Pickup model**

# MANUAL STEERING GEAR (Model: VB70S)

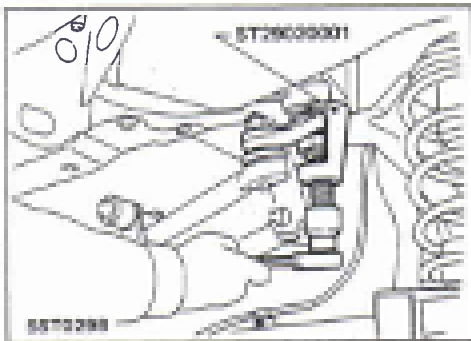
## Removal and Installation

VB70S



: N·m (kg-m, ft-lb)

5570288

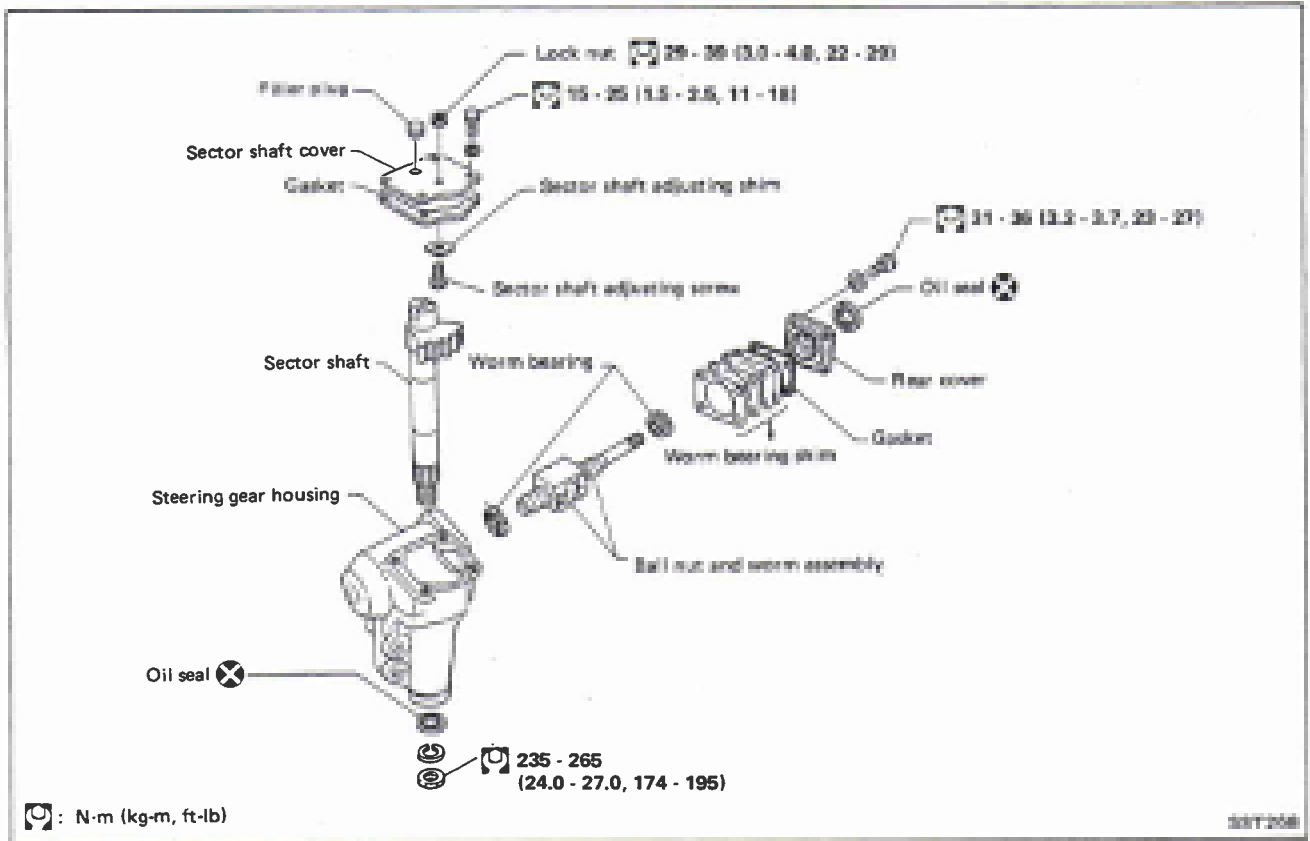


- Remove pitman arm with Tool.
- When installing, align four grooves of gear serrations with four projections of sector shaft serrations. When fitting steering lower joint, be sure tightening bolt faces cutout portion perfectly.



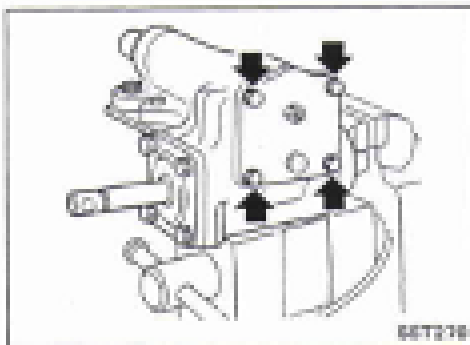
# MANUAL STEERING GEAR (Model: VB70S)

## Disassembly

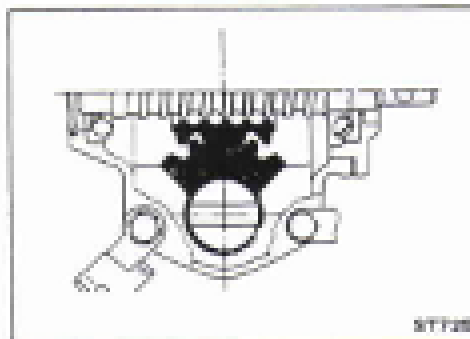


### CAUTION:

Thoroughly drain oil by removing filler plug.



1. Place steering gear in a vise with Tool in place.
- Remove sector shaft cover fixing bolts.



- Set worm gear in a straight-ahead position.

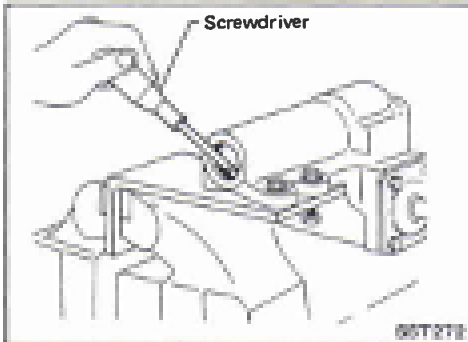
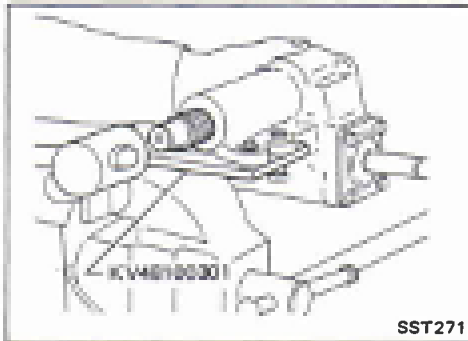
## MANUAL STEERING GEAR (Model: VB70S)

### Disassembly (Cont'd)

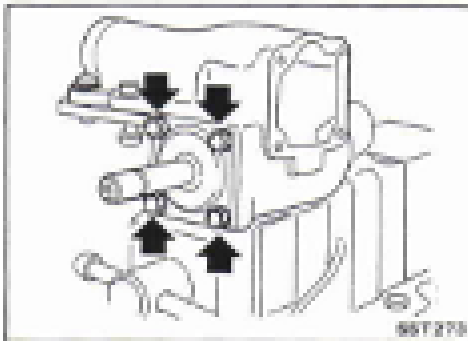
- Remove sector shaft with sector shaft cover.

#### CAUTION:

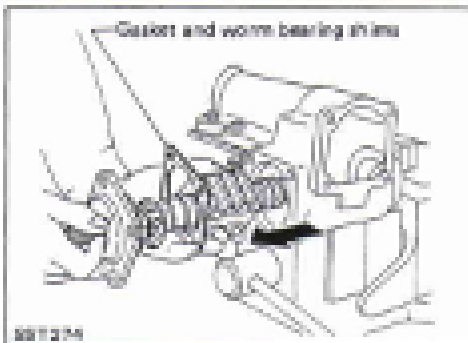
- When pulling sector shaft out, be careful not to damage oil seal or associated parts.
- Set worm gear in a straight-ahead position.



- Remove sector shaft oil seal, if necessary.



2. Remove rear cover.



3. Draw out worm gear with worm bearing.

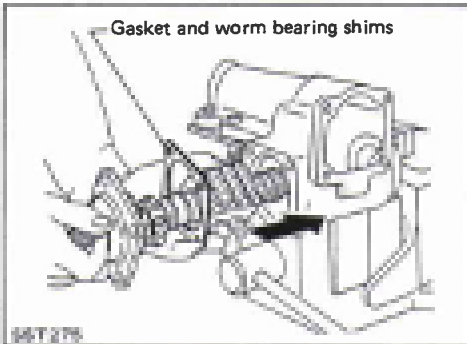
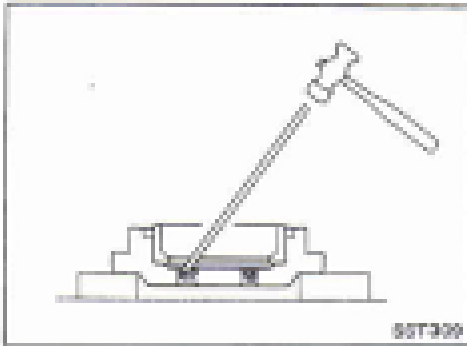
#### CAUTION:

- Be careful not to allow ball nut to run down to either end of worm.  
Ends of ball guides will be damaged if nut is rotated until it stops at end of worm.
- Do not detach ball nut from worm shaft assembly.  
If necessary, replace entire unit as an assembly.
- Do not remove sector shaft needle bearings from steering gear housing.  
If necessary, replace entire gear housing as an assembly.

## MANUAL STEERING GEAR (Model: VB70S)

### Disassembly (Cont'd)

- Remove oil seal from rear cover.



### Assembly and Adjustment

Fill space sealing lips of new sector shaft and rear cover oil seals with multi-purpose grease.

#### Worm bearing preload

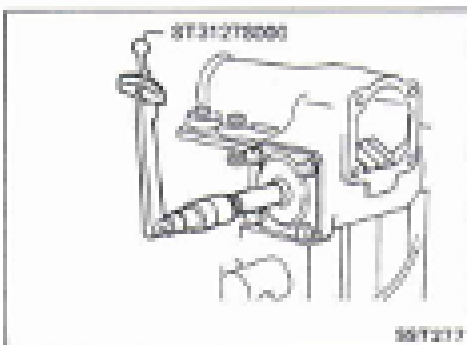
1. Fit worm gear assembly with worm bearing in gear housing.
2. Install rear cover on gear housing with gasket and worm bearing shims.

**Standard shim thickness:**

1.0 mm (0.039 in)

**Available worm bearing shims:**

Refer to S.D.S.



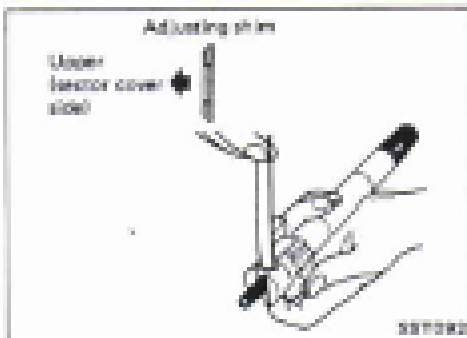
3. Adjust worm bearing preload with Tools.

#### CAUTION:

- Rotate worm shaft a few turns in both directions to correctly settle worm bearing and measure preload.
- When adjusting worm bearing preload, add or remove shims until correct adjustment is achieved.
- After correct adjustment is achieved, install oil seal in rear cover.

**Worm bearing preload (With oil seal):**

0.39 - 0.59 N·m (4.0 - 6.0 kg-cm, 3.5 - 5.2 in-lb)



#### SECTOR SHAFT END PLAY

Select suitable adjusting shim and adjust end play between sector shaft and adjusting screw.

**Sector shaft end play:**

0.01 - 0.03 mm (0.0004 - 0.0012 in)

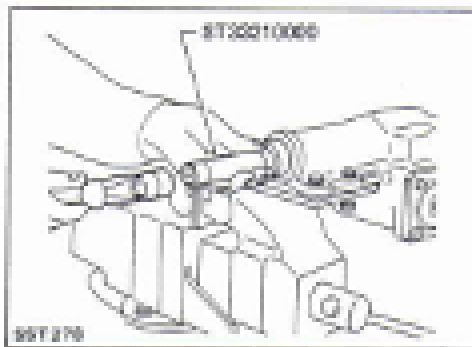
**Sector shaft adjusting screw shims:**

Refer to S.D.S.

## MANUAL STEERING GEAR (Model: VB70S)

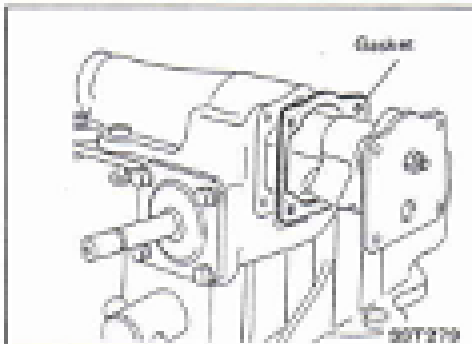
### Assembly and Adjustment (Cont'd) STEERING GEAR PRELOAD AND BACKLASH

1. Press oil seal to steering gear housing using Tool.  
**Before pressing oil seal, coat seal contacting face of oil seal with gear fluid.**

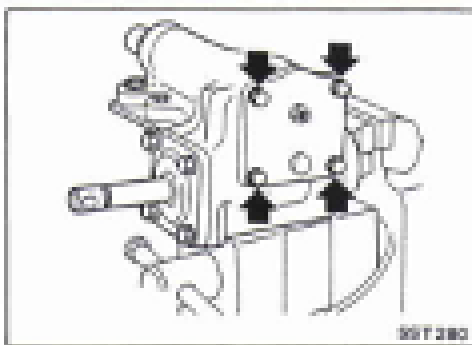


2. Install sector cover on adjusting screw with sector shaft.  
3. Set worm gear in a straight-ahead position.  
4. Insert sector shaft and sector cover assembly with gasket into gear housing.

**Carefully insert sector shaft in place, using care not to scratch oil seal.**

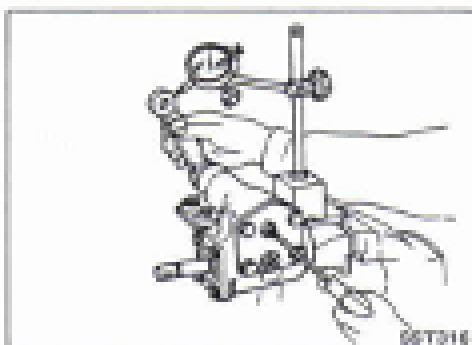


5. Tighten sector cover to gear housing.



6. Adjust backlash as shown in figure.  
**Rotate worm gear a few turns in both directions to settle down steering gear and in straight-ahead position, and then measure backlash at pitman arm top end.**

**Backlash (In straight-ahead position):**  
0 - 0.1 mm (0 - 0.004 in)



7. Measure total preload.

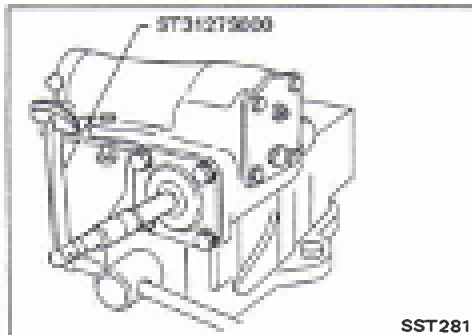
**Steering gear total preload (With oil seals):**

**New parts**

0.83 - 1.23 N·m (8.5 - 12.5 kg-cm, 7.4 - 10.9 in-lb)

**Used parts**

0.59 - 0.98 N·m (6.0 - 10.0 kg-cm, 5.2 - 8.7 in-lb)



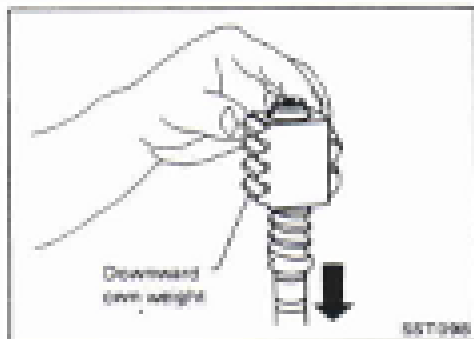
## MANUAL STEERING GEAR (Model: VB70S)

### Inspection

Clean all parts in solvent, then check their condition.

#### SECTOR SHAFT

1. Check gear tooth surface for pitting, burrs, cracks or any other damage, and replace if necessary.
2. Check sector shaft for distortion on its serration, and replace if necessary. Also check gear housing for deformation.



#### STEERING WORM ASSEMBLY

1. Inspect ball nut gear tooth surface, and replace if pitting, burrs, wear or any other damage is found.
2. Ball nut must rotate smoothly on worm gear. If found too tight, assembly should be replaced. Check rotation of ball nut as follows:
  - (1) Move ball nut to either end of worm gear, and gradually stand worm shaft and ball nut assembly until ball nut moves downward on worm gear under its own weight.
  - (2) If ball nut does not move freely over entire stroke, replace assembly.

**Be careful not to damage ball nut guide tube while check is being made.**

#### CAUTION:

**Be careful not to allow ball nut to run down to either end of worm.**

#### BEARING

1. Check worm bearing to see that it rolls freely and is free from noise, cracks, pitting or wear.

**When replacing worm bearing, replace it as a set of bearing and outer race.**

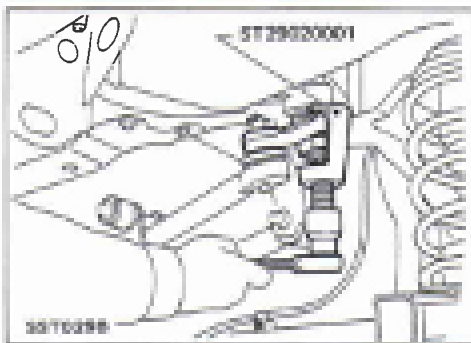
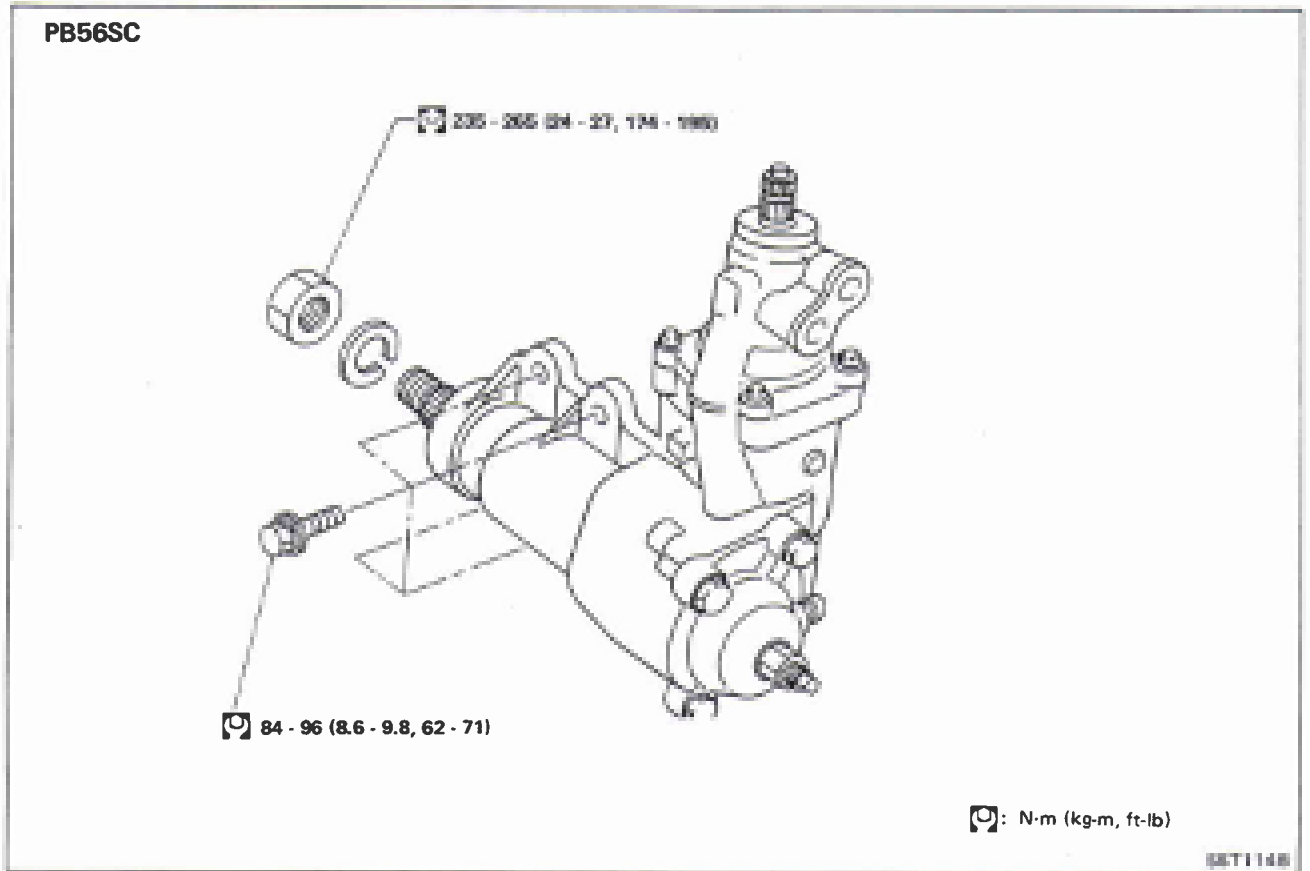
2. If sector shaft needle bearings are worn or damaged, replace as an assembly of gear housing and bearings.

#### OIL SEALS

- Discard any oil seal which has once been removed.
- Replace oil seal if sealing lip is deformed or cracked.
- Discard oil seal if spring is fatigued or dislocated.

## POWER STEERING GEAR (Model: PB56SC)

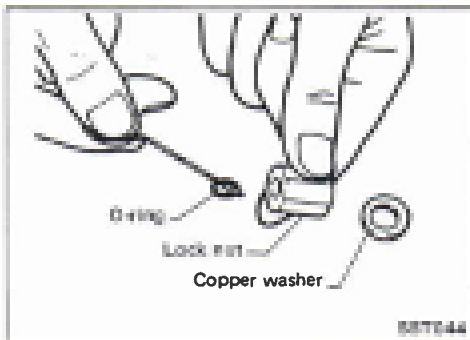
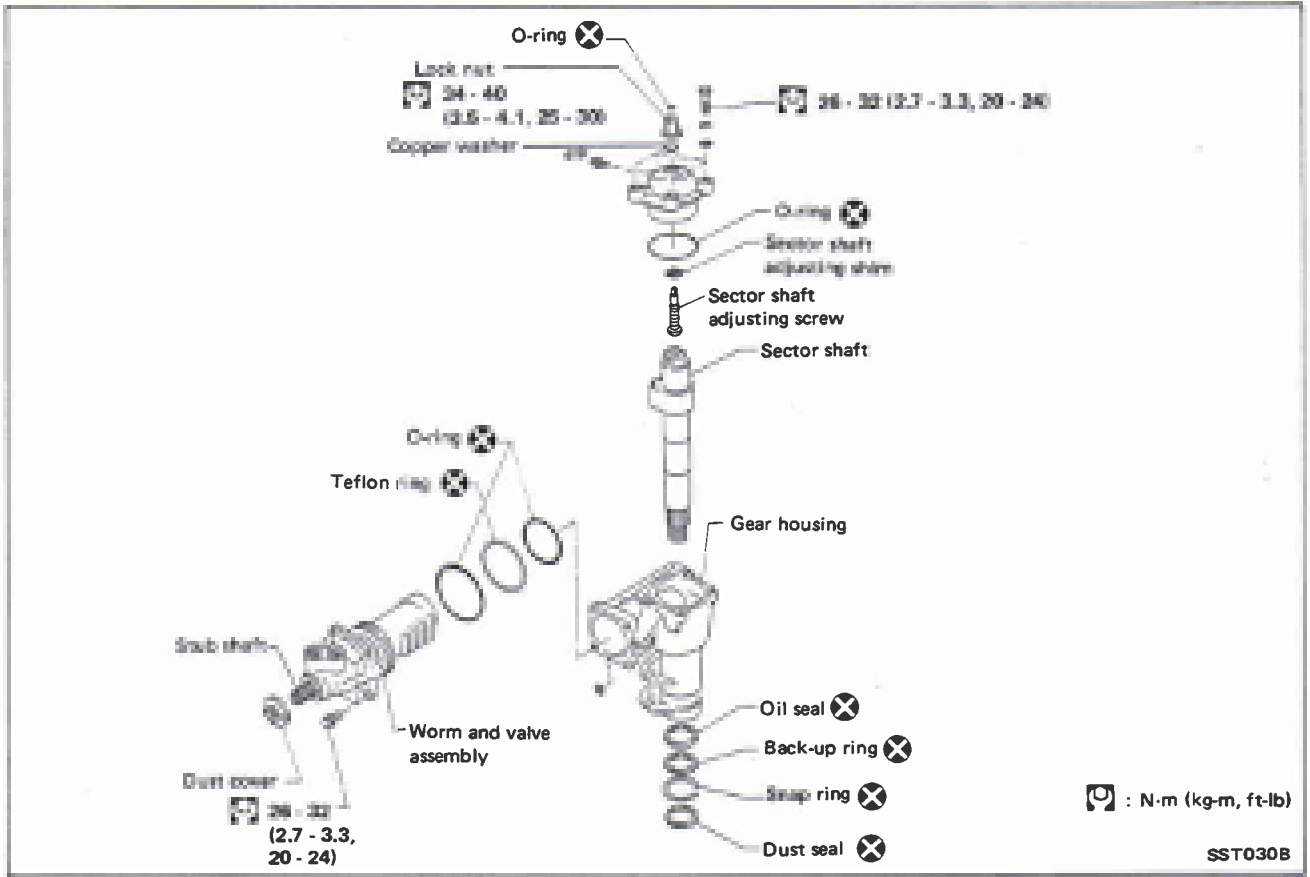
### Removal and Installation



- Remove pitman arm with Tool.
- When installing, align four grooves of gear serrations with four projections of sector shaft serrations.

- Before removing, clean exteriors of gear housing and oil pump with steam and dry with compressed air.

## POWER STEERING GEAR (Model: PB56SC)



### Disassembly

#### ADJUSTING SCREW LOCK NUT O-RING

Remove adjusting screw lock nut, and replace O-ring.

#### SECTOR SHAFT OIL SEAL AND DUST SEAL

1. Set stub shaft in a straight-ahead position.

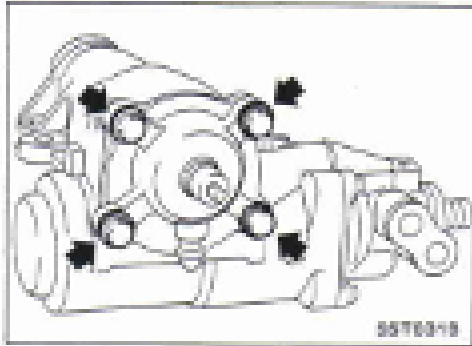
**Straight-ahead position is a position where stub shaft is turned 1.85 turns (one full turn and 306°) from lock position.**

## POWER STEERING GEAR (Model: PB56SC)

### Disassembly (Cont'd)

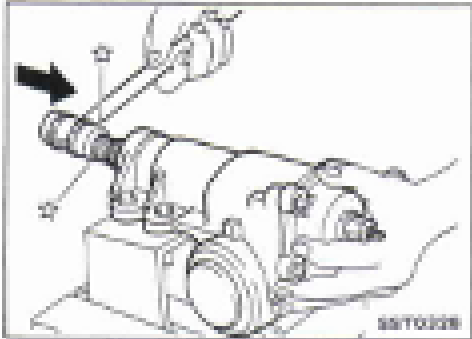
2. Disconnect sector shaft cover bolt.

**Do not turn lock nut unless necessary; otherwise it will damage O-ring, resulting in an oil leak.**



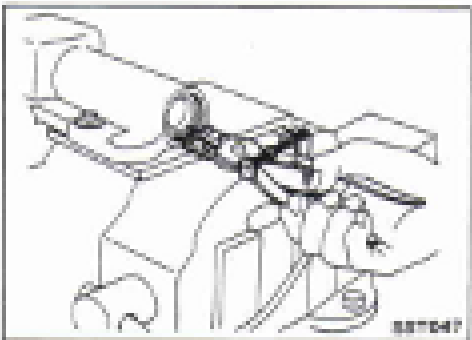
3. Draw out sector shaft.

**Knock out end of sector shaft approximately 20 mm (0.79 in).**



4. Pull out sector shaft by hand.

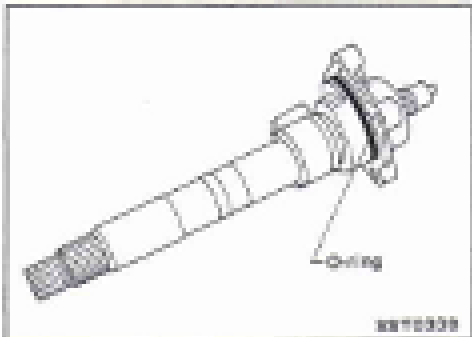
**Attach plastic film to two bearings located inside gear housing while simultaneously pulling out sector shaft so that bearings will not drop into housing.**



5. Remove gear housing dust seal.

6. Remove snap ring.

7. Remove back-up ring and oil seal.

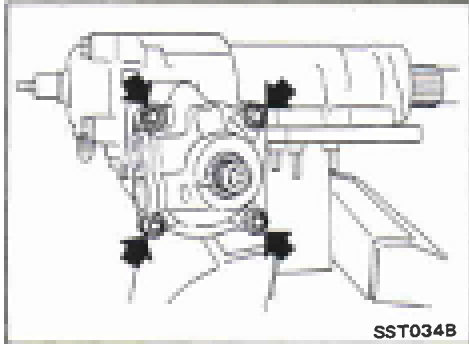


8. Remove O-ring.

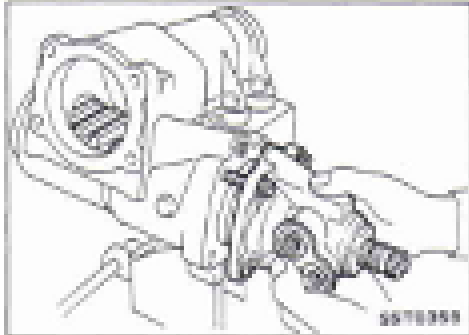


## POWER STEERING GEAR (Model: PB56SC)

### Disassembly (Cont'd) REAR HOUSING O-RING



1. Remove sector shaft.
2. Loosen (do not remove) rear housing bolts.



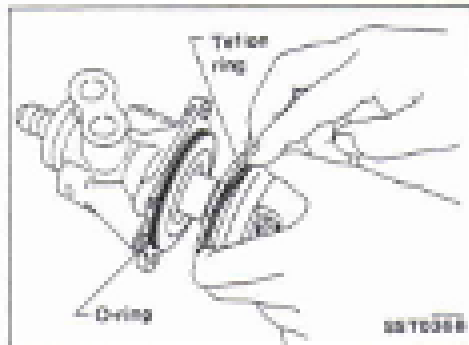
3. Remove rear housing together with worm gear assembly.

#### CAUTION:

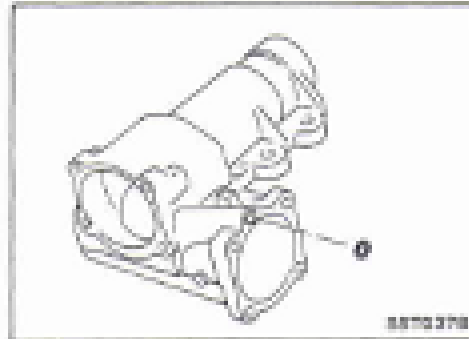
- a. When worm assembly is removed, piston may turn and come off under its own weight. Hold piston to prevent it from turning.

If piston-to-rear housing clearance exceeds 22 mm (0.87 in) by loosening, recirculating ball will be out of groove of worm; do not reinstall piston but replace the entire assembly.

- b. Take care not to damage teflon ring at piston end when removing.



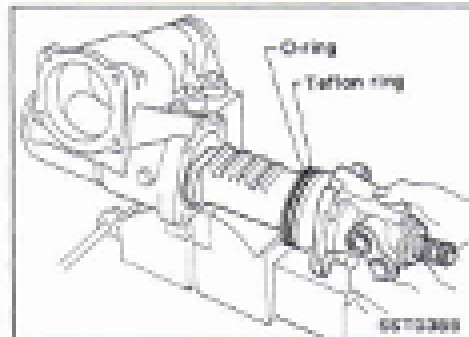
4. Remove Teflon ring and O-ring on worm and valve assembly.



### Assembly

1. Install new O-rings on gear housing.

- Apply a thin coat of vaseline to new O-rings prior to their installation.
- Be careful not to install wrong O-rings as some of them resemble in size.
- Be careful not to separate worm and stub shaft.



2. Install worm gear assembly with rear housing into gear housing.

#### CAUTION:

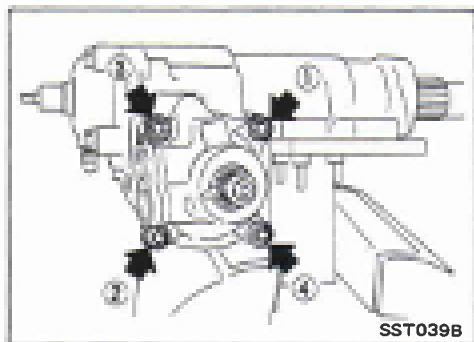
- Be careful that teflon ring on piston is not damaged during insertion of gear housing.
- When worm assembly is halfway inserted, teflon ring is deflected.
- Take care not to damage teflon ring on corner of sector hole.

Be sure that teflon ring settles in its correct position.

## POWER STEERING GEAR (Model: PB56SC)

### Assembly (Cont'd)

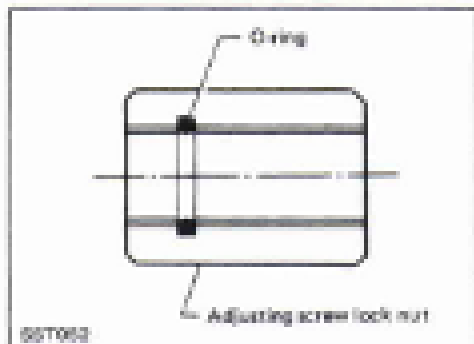
3. Gradually tighten rear housing bolts in a criss-cross fashion.



### ADJUSTING SCREW LOCK NUT O-RING

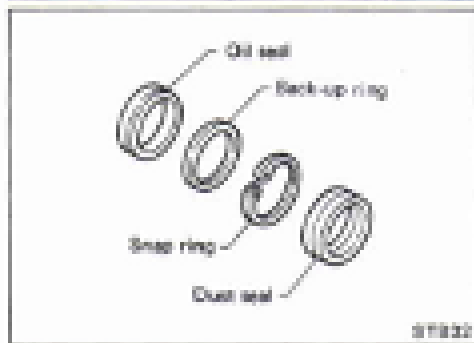
Insert new O-ring into adjusting screw lock nut.

- Before inserting, apply a thin coat of vaseline to O-ring.
- Insert O-ring to make sure it fits into groove.

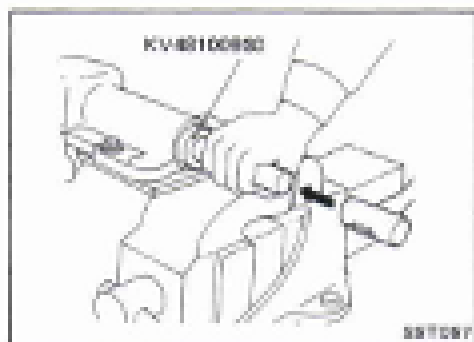


### SECTOR SHAFT OIL SEAL

- When installing, be sure to use new oil seal, dust seal, back-up ring and snap ring.
- Before installing, apply a thin coat of vaseline to new oil seal and dust seal.



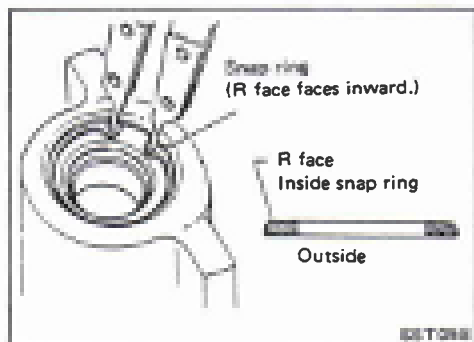
1. Press new oil seal and then install back-up ring with tool.



2. Install a new snap ring into gear housing.

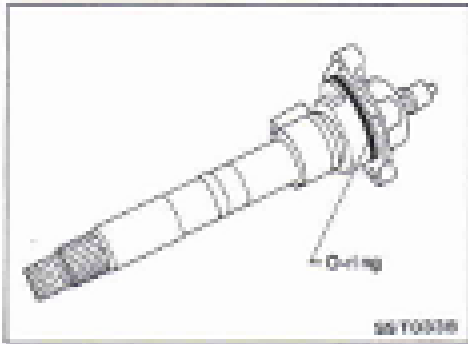
#### CAUTION:

- a. Turn snap ring to make sure it fits into groove.
- b. Always install snap ring with R face facing inward.



## POWER STEERING GEAR (Model: PB56SC)

### Assembly (Cont'd)



3. Fit new O-ring into sector shaft cover.

- Before installing, apply a thin coat of vaseline to O-ring.
- Make certain that O-ring is installed properly, and not damaged by sector shaft.

### SECTOR SHAFT

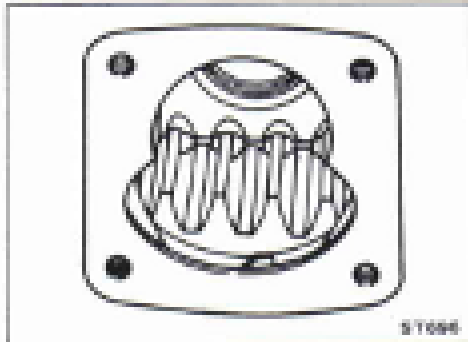
1. Set piston rack at straight-ahead position.

Turn piston rack about 10° to 15° toward yourself with your finger.

This is for smooth insertion of sector gear.

2. Gradually insert sector shaft into gear housing.

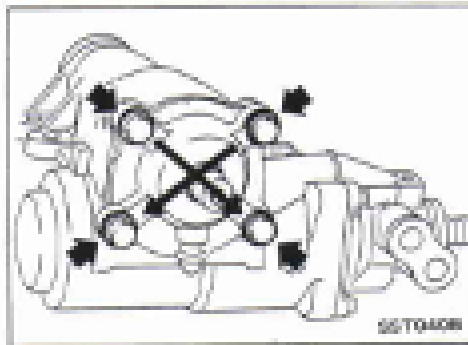
When inserting sector shaft, simultaneously pull out plastic film so that bearings will not drop into housing.



3. Tighten sector shaft cover bolts.

4. Check turning torque and steering gear preload.

Refer to Inspection and Adjustment.



### Inspection and Adjustment

Before disassembling power steering gear component parts, make sure there is no oil leakage around sealing portion and check steering turning torque as follows.

Check sealing portion.

- Adjusting screw nut O-ring
- Sector shaft cover O-ring
- Sector shaft oil seal
- Rear cover oil seal and O-ring
- Rear housing O-ring
- Gear housing O-ring

Discard oil seal and O-ring which have once been removed.

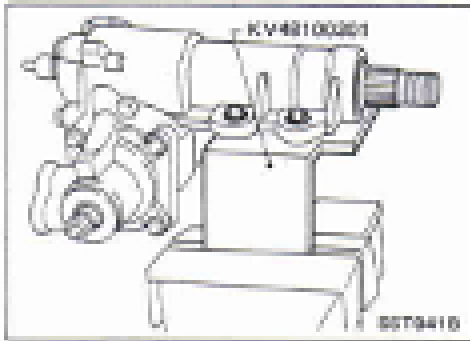
Replace oil seal and O-ring if sealing is deformed or cracked.

## POWER STEERING GEAR (Model: PB56SC)

### Inspection and Adjustment (Cont'd)

#### TURNING TORQUE MEASUREMENT

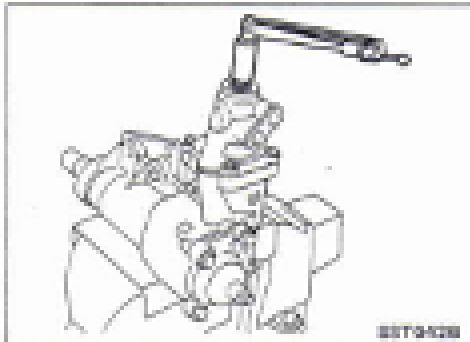
1. Measure turning torque at 360° position.  
(1) Install steering gear on Tool.



- (2) Turn stub shaft all the way to right and left several times.
- (3) Measure turning torque at 360° position from straight-ahead position with Tools.

#### Turning torque at 360°:

0.39 - 0.94 N·m (4 - 9.6 kg-cm, 3.5 - 8.3 in-lb)



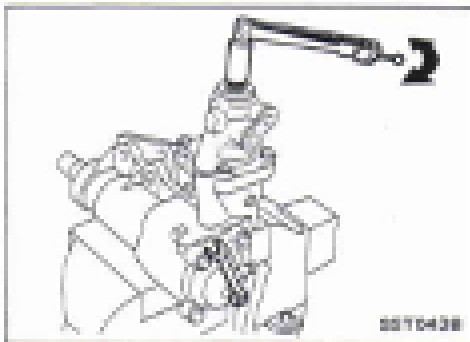
- (4) Measure turning torque at straight-ahead position.  
**Straight-ahead position is a position where stub shaft is turned 2.14 turns (two-full turns and 50°) from lock position.**

#### Turning torque at straight-ahead position:

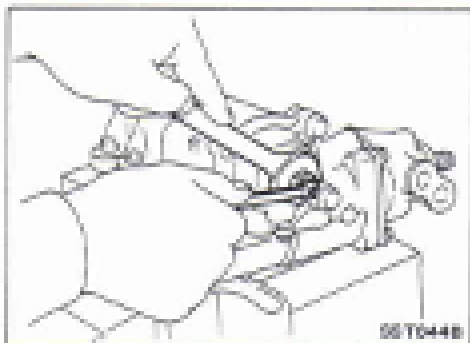
0.2 - 0.4 N·m

(2 - 4 kg-cm, 1.7 - 3.5 in-lb) higher than at 360°

If they are not within specifications, adjust turning torque by turning sector shaft adjusting screw.

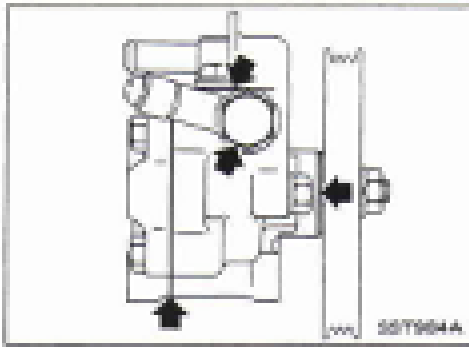


2. Tighten adjusting screw lock nut with tools.





## POWER STEERING OIL PUMP



### Pre-disassembly Inspection

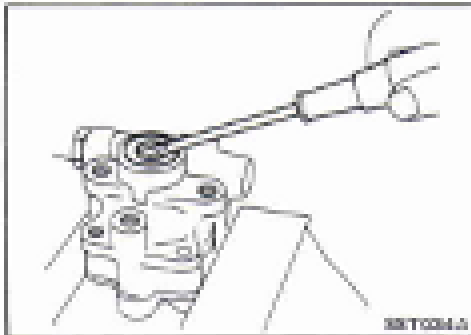
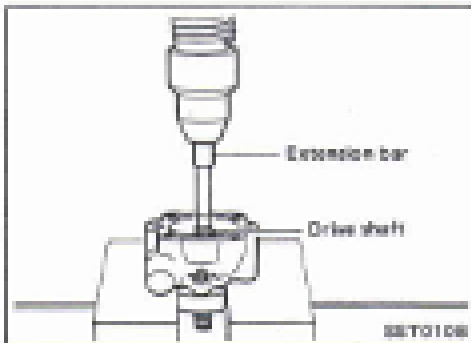
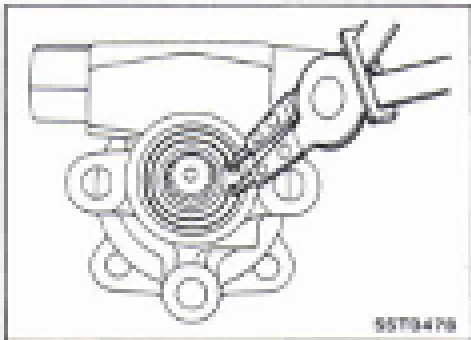
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.

### Disassembly

#### CAUTION:

- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign matter enter or contact the parts.
- Remove snap ring, then draw pulley shaft out. Be careful not to drop pulley shaft.

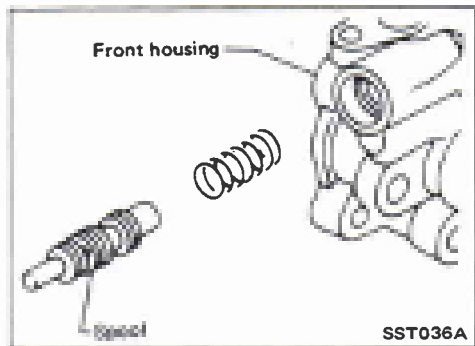


- Remove oil seal. Be careful not to damage front housing.

## POWER STEERING OIL PUMP

### Disassembly (Cont'd)

- Remove connector.
- Be careful not to drop spool.**



### Inspection

#### PULLEY AND PULLEY SHAFT

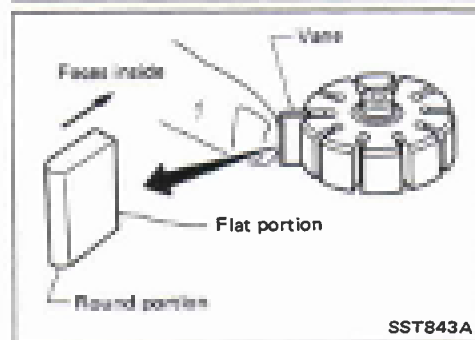
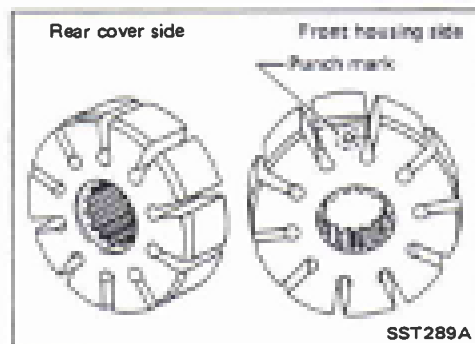
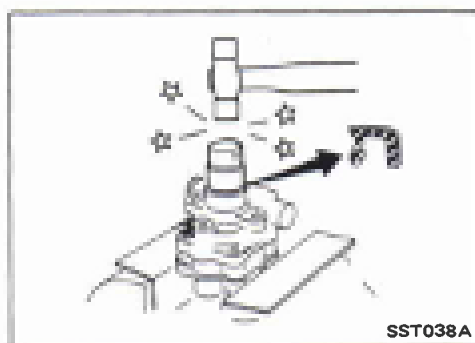
- If pulley is cracked or deformed, replace it.
- If an oil leak is found around pulley shaft oil seal, replace the seal.
- If serration of pulley or pulley shaft is deformed or worn, replace it.

### Assembly

Assemble oil pump in the reverse order of disassembly, noting the following instructions.

- Before installation, coat the O-rings and oil seal with A.T.F.\*
  - Make sure O-rings and oil seal are properly installed.
  - When assembling vanes to rotor, rounded surfaces of vanes must face cam case side.
  - Always install new O-rings and oil seal.
  - Be careful of oil seal direction.
- \*: Automatic Transmission Fluid

- Pay attention to the direction of rotor.



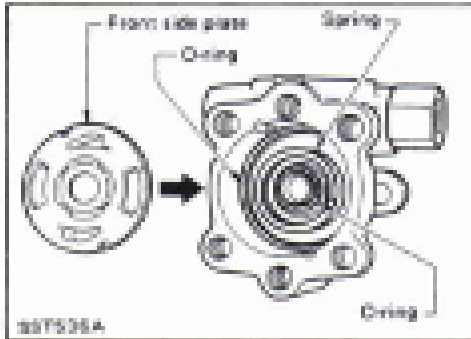
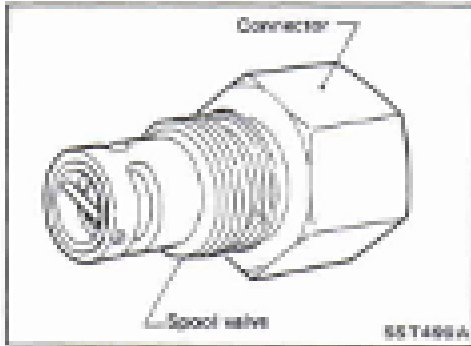
- Install vanes properly.

## POWER STEERING OIL PUMP

### Assembly (Cont'd)

**CAUTION:**

Do not remove spool valve from connector or connector bolt.

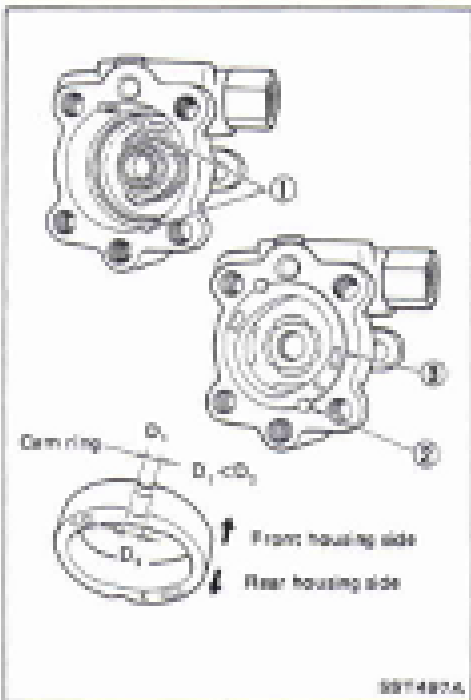


**Model equipped with gasoline engine**

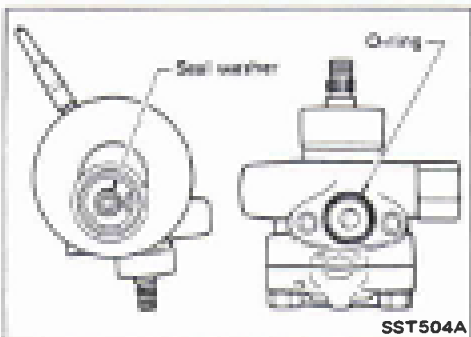
- Apply A.T.F.\* to O-ring.

\*: Automatic Transmission Fluid

- Insert pin ② into pin groove ① of front housing and rotor. Then install cam ring ③ as shown at left.



- Apply a coat of A.T.F. to O-ring.
- Be sure to install seal washer in its proper position.

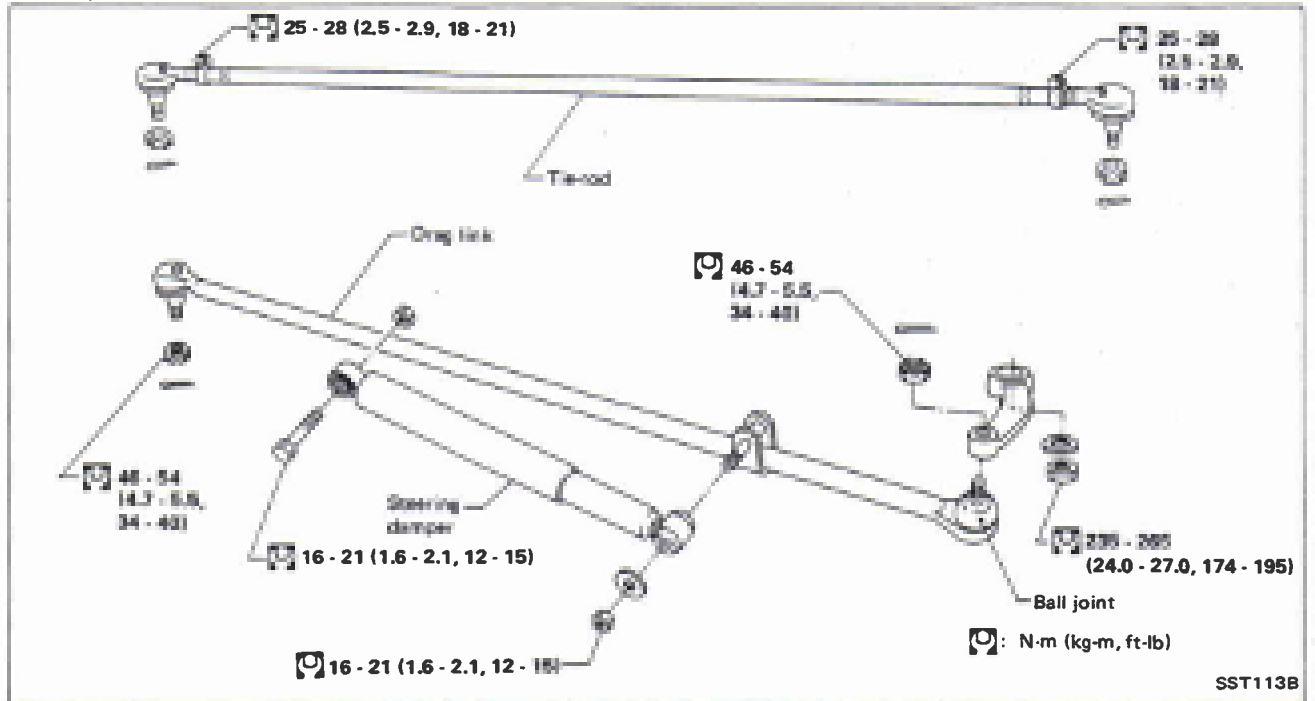




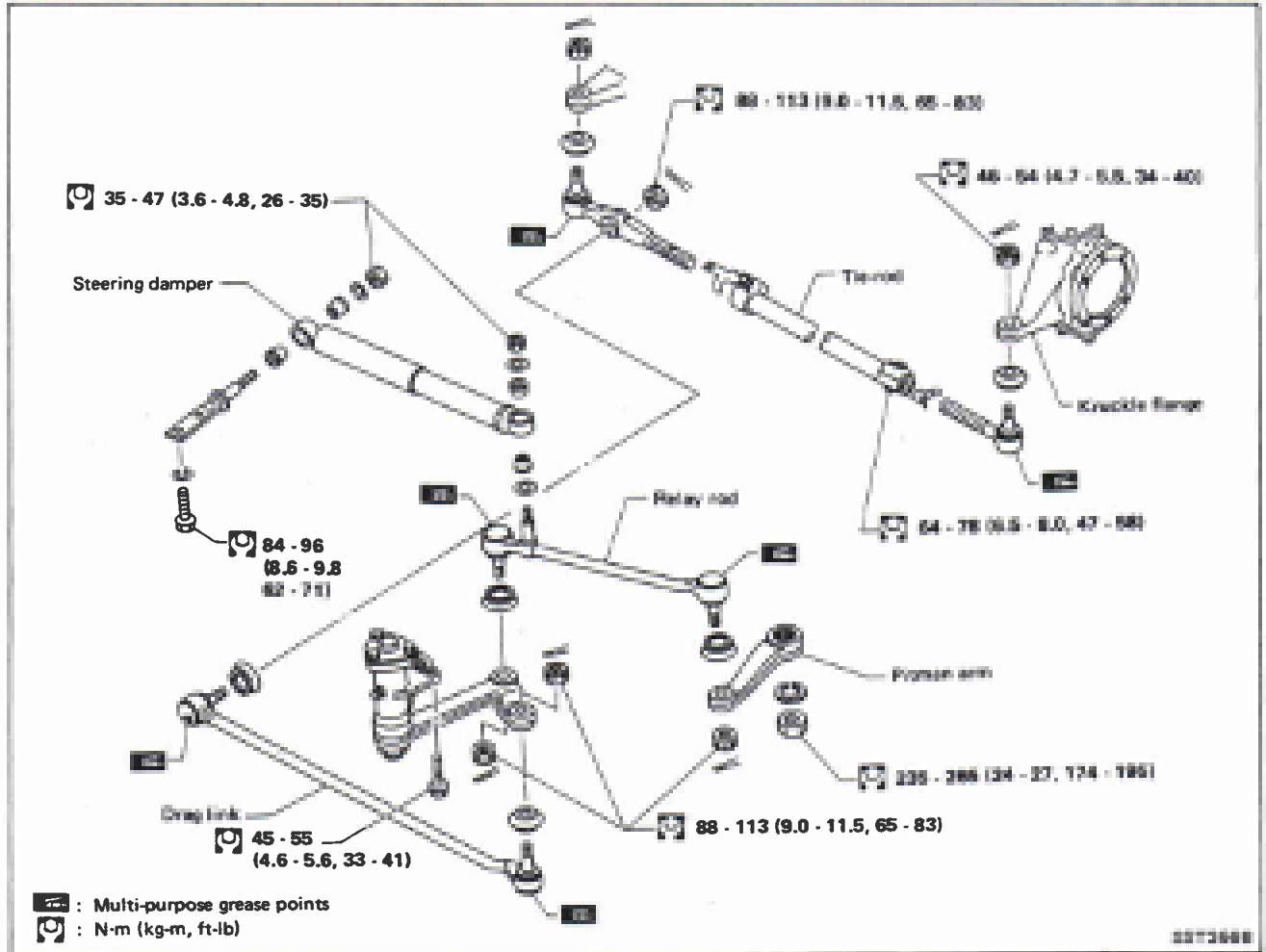
# STEERING LINKAGE

Hardtop & Wagon model

## Removal and Installation

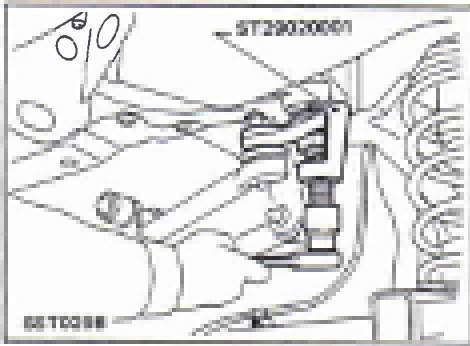


Pickup model

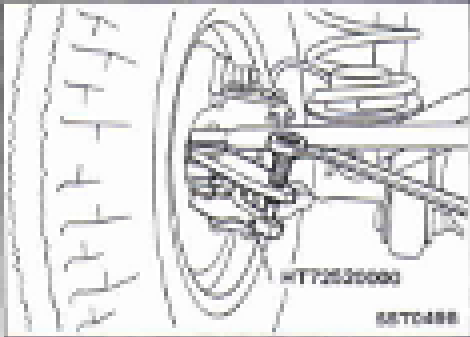


## STEERING LINKAGE

### Removal and Installation (Cont'd)



- Remove pitman arm with Tool.



- Remove tie-rod with Tool.

### Inspection

1. Check ball joint for play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

#### Swinging torque:

1.0 - 4.9 N·m

(10 - 50 kg-cm, 8.7 - 43.4 in-lb)

#### Rotating torque:

1.0 - 4.9 N·m

(10 - 50 kg-cm, 8.7 - 43.4 in-lb)

#### Axial end play:

1.3 mm (0.051 in) or less

2. Check condition of dust cover. If cracked excessively, replace it.
  - When replacing dust cover, be careful not to damage it.
  - Lubricate ball joint with multi-purpose grease, if necessary.

### STEERING DAMPER

Check for oil leakage and measure damping force. Replace if necessary.

#### Damping force:

at 0.3 m (1.0 ft)/sec

3,629 N (370 kg, 816 lb)

... Extended direction

2,844 N (290 kg, 639 lb)

... Compressed direction

### FIXING LOCATION

- Check nuts and cotter pins for looseness, play or breaks.
- When looseness or play is found, check for wear on tapered portion of ball stud.
- When reassembling each ball joint, use new cotter pins.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### General Specifications

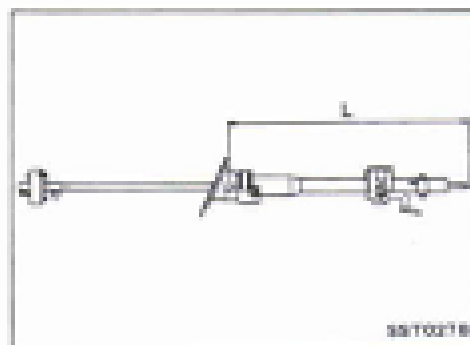
Steering gear type	Manual steering		Power steering	
	VB70S		PB56SC	
Model	Wagon and Hardtop	Pickup	Wagon and Hardtop	Pickup
Turns of steering wheel on the vehicle (Lock-to-lock)	5.2	5.0	3.7	3.6
Steering gear ratio	24.4 - 26.8		17.0	
Steering damper [at 0.3 m (1.0 ft)/sec.] N (kg, lb)	3,629 (370, 816) ... Extended direction 2,844 (290, 639) ... Compressed direction			
Steering wheel axial play mm (in)	0 (0)			
Steering wheel play mm (in)	35 (1.38) or less			

### Inspection and Adjustment

#### STEERING COLUMN

Destination	Middle East		Australia and general areas	
	Pickup			
Grade	DX	STD	DX	STD
Column type	Collapsible		Conventional	
	Tilt	Non-tilt	Tilt*	Non-tilt
Dimension "L" mm (in)	681.6 - 683.2 (26.83 - 26.90)		-	

\*: Option for Australia Pickup model



## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### Inspection and Adjustment (Cont'd)

#### MANUAL STEERING GEAR (Model: VB70S)

Worm bearing preload (Without oil seal) N-m (kg-cm, in-lb)	0.39 - 0.59 (4.0 - 6.0, 3.5 - 5.2)	
Steering gear preload (With oil seal) N-m (kg-cm, in-lb) New parts	0.83 - 1.23 (8.5 - 12.5, 7.4 - 10.9)	
Used parts	0.59 - 0.98 (6.0 - 10.0, 5.2 - 8.7)	
Backlash at pitman arm top end (in a straight- ahead position) mm (in) New gear	0 - 0.1 (0 - 0.004)	
Used gear	0 - 0.3 (0 - 0.012)	
End play (Between sector shaft and adjusting screw) mm (in)	0.01 - 0.03 (0.0004 - 0.0012)	
Adjusting shim thickness	Thickness mm (in)	Part number
	1.575 - 1.600 (0.0620 - 0.0630)	48213-B0100
	1.550 - 1.575 (0.0610 - 0.0620)	48214-B0100
	1.525 - 1.550 (0.0600 - 0.0610)	48215-B0100
	1.500 - 1.525 (0.0591 - 0.0600)	48216-B0100
	1.475 - 1.500 (0.0581 - 0.0591)	48217-B0100
	1.450 - 1.475 (0.0571 - 0.0581)	48218-B0100
Worm bearing shim thickness	Thickness mm (in)	Part number
	0.5 (0.020)	48273-82100
	0.2 (0.008)	48274-82100
	0.1 (0.004)	48275-82100
	0.075 (0.0030)	48276-82100
	0.05 (0.0020)	48277-82100
Oil capacity ℓ (Imp pt)	Approx. 0.5 (7/8)	

#### POWER STEERING SYSTEM (Model: PB56SC)

Steering wheel turning force (at 360° from neutral position and circumference of steering wheel) N (kg, lb)	39 (4, 9) or less	
Oil pump pressure kPa (bar, kg/cm <sup>2</sup> , psi)	8,630 - 9,219 (86.3 - 92.2, 88 - 94, 1,251 - 1,337) at idling	
Fluid capacity mℓ (Imp fl oz)	Approx. 900 - 1,000 (31.7 - 35.2)	
Normal operating temperature °C (°F)	60 - 80 (140 - 176)	
Steering gear turning torque N-m (kg-cm, in-lb) 360° position from straight-ahead position	0.39 - 0.94 (4 - 9.6, 3.5 - 8.3)	
Straight-ahead position (As compared with steering wheel turned 360°)	0.2 - 0.4 (2 - 4, 1.7 - 3.5) higher	
Backlash at pitman arm top end (in a straight- ahead position) mm (in)	0 - 0.1 (0 - 0.004)	
End play (Between sector shaft and adjusting screw) mm (in)	0.01 - 0.05 (0.0004 - 0.0020)	
Adjusting shim thickness	Thickness mm (in)	Part number
	1.575 - 1.600 (0.0620 - 0.0630)	48213-B0100
	1.550 - 1.575 (0.0610 - 0.0620)	48214-B0100
	1.525 - 1.550 (0.0600 - 0.0610)	48215-B0100
	1.500 - 1.525 (0.0591 - 0.0600)	48216-B0100
	1.475 - 1.500 (0.0581 - 0.0591)	48217-B0100
	1.450 - 1.475 (0.0571 - 0.0581)	48218-B0100

#### STEERING LINKAGE

Ball joint swinging force* N (kg, lb)	98 - 490 (10 - 50, 22 - 110)
Standard tie-rod length mm (in)	Approx. 1,275 (50.00)

\*Measuring point: Cotter pin hole

**SECTION BF****CONTENTS**

GENERAL SERVICING (Including all clips and fasteners) .....	BF- 2
BODY END .....	BF- 6
DOOR (Including "Power Window" & "Power Door Lock") .....	BF-12
INSTRUMENT PANEL .....	BF-22
INTERIOR AND EXTERIOR (In EXTERIOR, including "Weatherstrips") .....	BF-23
SEAT .....	BF-33
WINDSHIELD AND WINDOWS .....	BF-38
SUN ROOF .....	BF-39
REAR COMBINATION LAMP .....	BF-44
CAB AND REAR BODY .....	BF-45
BODY ALIGNMENT .....	BF-50

★ For seat belt, refer to MA section.

★ For winch, refer to SE section.

**When you read wiring diagrams:**

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.







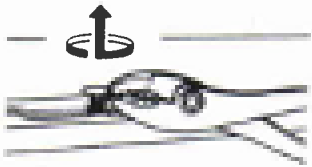





## GENERAL SERVICING

### Precautions

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.






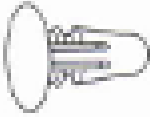
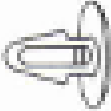
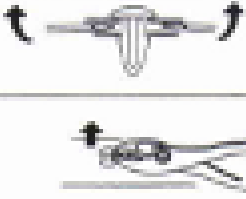



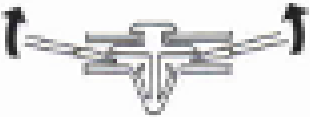




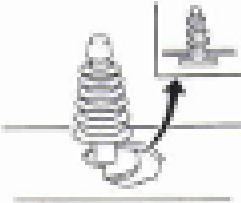

### Clip and Fastener

- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

No.	Symbol	Shape	Removal & Installation
C101			<p><b>Removal:</b> Remove by bending up with a flat-bladed screwdriver.</p> 
	SBF002B	SBF100B	SBF002B
C102		 SBF114B  SBF137B	 <p><b>Removal:</b> Pull up by rotating</p>
	SBF113B		SBF115B
C103		 SBF110B  SBF112B	<p><b>Removal:</b> Remove with flat-bladed screwdrivers or pliers.</p>  
	SBF110B		SBF112B


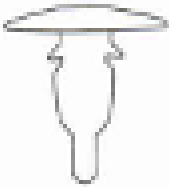
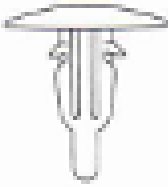
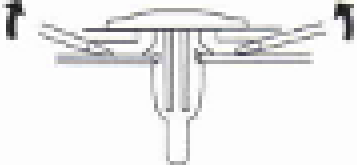





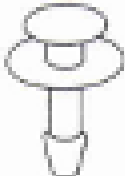

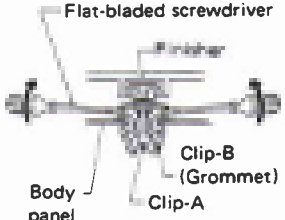


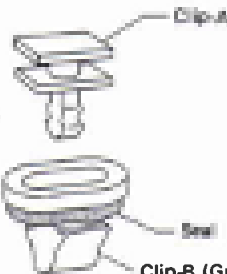
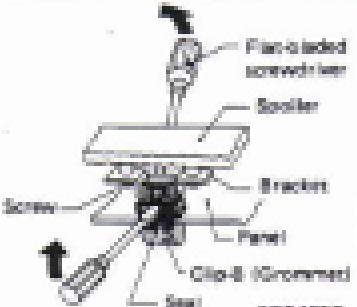


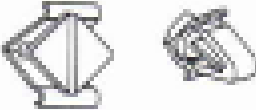



# GENERAL SERVICING

## Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
C105	 <p style="text-align: right;">SBF141B</p>	 <p style="text-align: right;">SBF142B</p>	<p><b>Removal:</b> Tilt clip as indicated by arrow, then draw out.</p>  <p style="text-align: right;">SBF143B</p>
C106	 <p style="text-align: right;">SBF095B</p>	   <p style="text-align: right;">SBF090B</p>	<p><b>Removal:</b> Remove with flat-bladed screwdrivers or pliers.</p>  <p style="text-align: right;">SBF091B</p>
C107	 <p style="text-align: right;">SBF355B</p>	  <p style="text-align: right;">SBF358B</p>	<p><b>Removal:</b> Remove by bending up with flat-bladed screwdrivers.</p>  <p style="text-align: right;">SBF357B</p>
C205	 <p style="text-align: right;">SBF636C</p>	 <p style="text-align: right;">SBF637C</p>	<p><b>Removal:</b></p>  <p style="text-align: right;">SBF638C</p>
CE103	 <p style="text-align: right;">SBF103B</p>	 <p style="text-align: right;">SBF104B</p>	<p><b>Removal:</b></p>  <p style="text-align: right;">SBF147B</p>

# GENERAL SERVICING

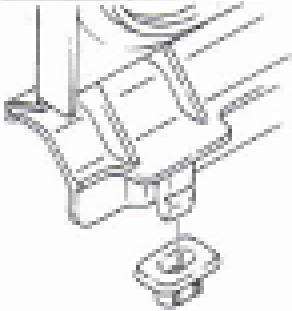
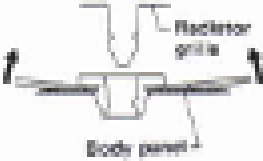




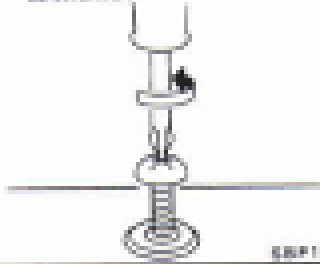
## Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
	 <p style="text-align: right;">SBF173D</p>	 <p style="text-align: right;">SBF173D</p>	<p><b>Removal:</b> Remove with flat-bladed screwdrivers or pliers.</p>  <p style="text-align: right;">SBF173D</p>
	 <p style="text-align: right;">SBF371B</p>	 <p style="text-align: right;">SBF372B</p>	<p><b>Removal:</b></p>  <p style="text-align: right;">SBF372B</p>
	 <p style="text-align: right;">SBF036C</p>	 <p style="text-align: right;">SBF036C</p> <p style="text-align: right;">Clip-B (Grommet)</p>	<p><b>Removal:</b></p>  <p style="text-align: right;">SBF036C</p>
	 <p style="text-align: right;">SBF433D</p>	 <p style="text-align: right;">SBF434D</p> <p style="text-align: right;">Clip-B (Grommet)</p>	 <p style="text-align: right;">SBF433D</p>
	 <p style="text-align: right;">SBF144B</p>	 <p style="text-align: right;">SBF144B</p>	<p><b>Removal</b></p>  <p>Rotate 45° to remove.</p> <p><b>Installation</b></p>  <p><b>Removal</b></p>  <p style="text-align: right;">SBF144B</p>



# GENERAL SERVICING

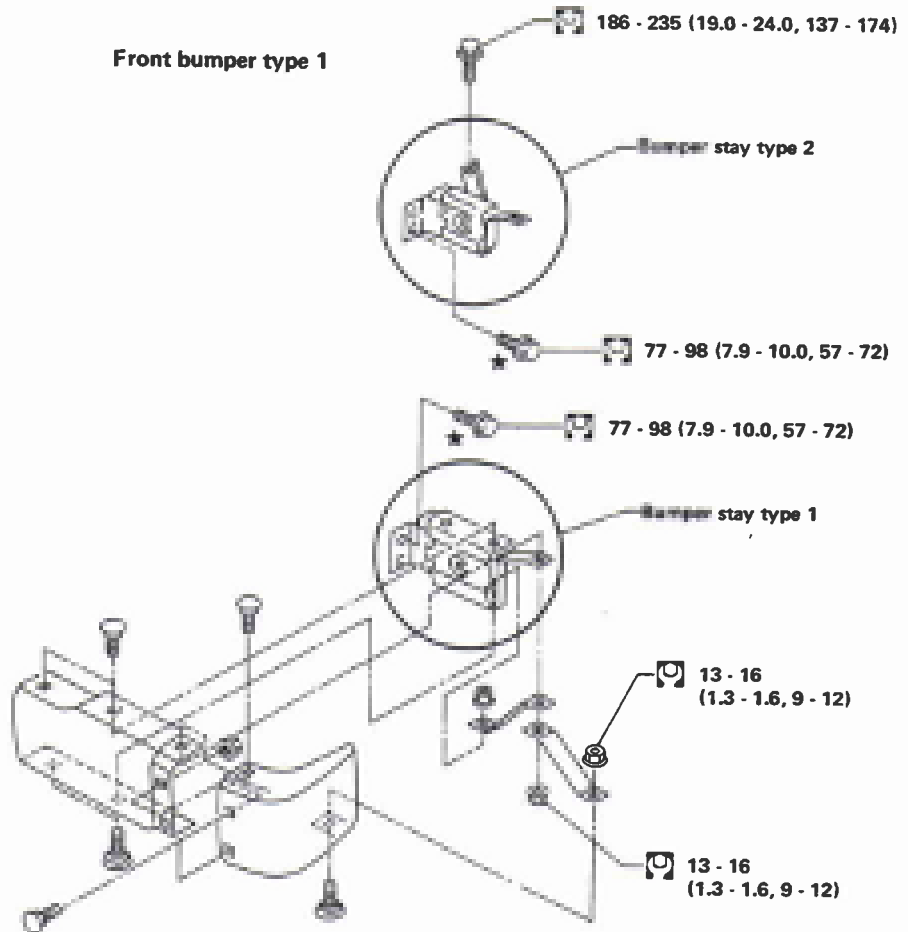
## Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
<p style="text-align: center;">CG104</p>		<p style="text-align: right;">SBF351C</p>	<p><b>Removal:</b> Remove by bending up with flat-bladed screwdrivers.</p>  <p style="text-align: right;">SBF189C</p>
<p style="text-align: center;">CR103</p>		<p style="text-align: right;">SBF768B</p>	<p><b>Removal:</b> Holder portion of clip must be spread out to remove rod.</p>  <p style="text-align: right;">SBF770B</p>
<p style="text-align: center;">CS102</p>	 <p style="text-align: right;">SBF1388</p>	 <p style="text-align: right;">SBF139B</p>	<p><b>Removal:</b> Screw out with a Phillips screwdriver.</p>  <p style="text-align: right;">SBF1408B</p>

# BODY END

## Front End

- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood lock engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.
- Front grille: It is made of plastic, so do not use excessive force and take care to keep oil away from it.

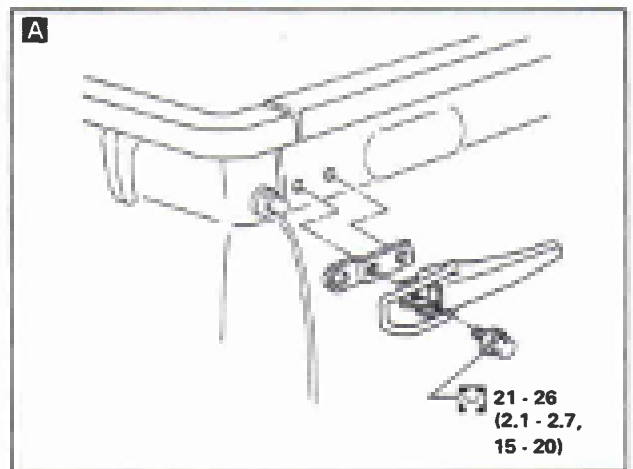
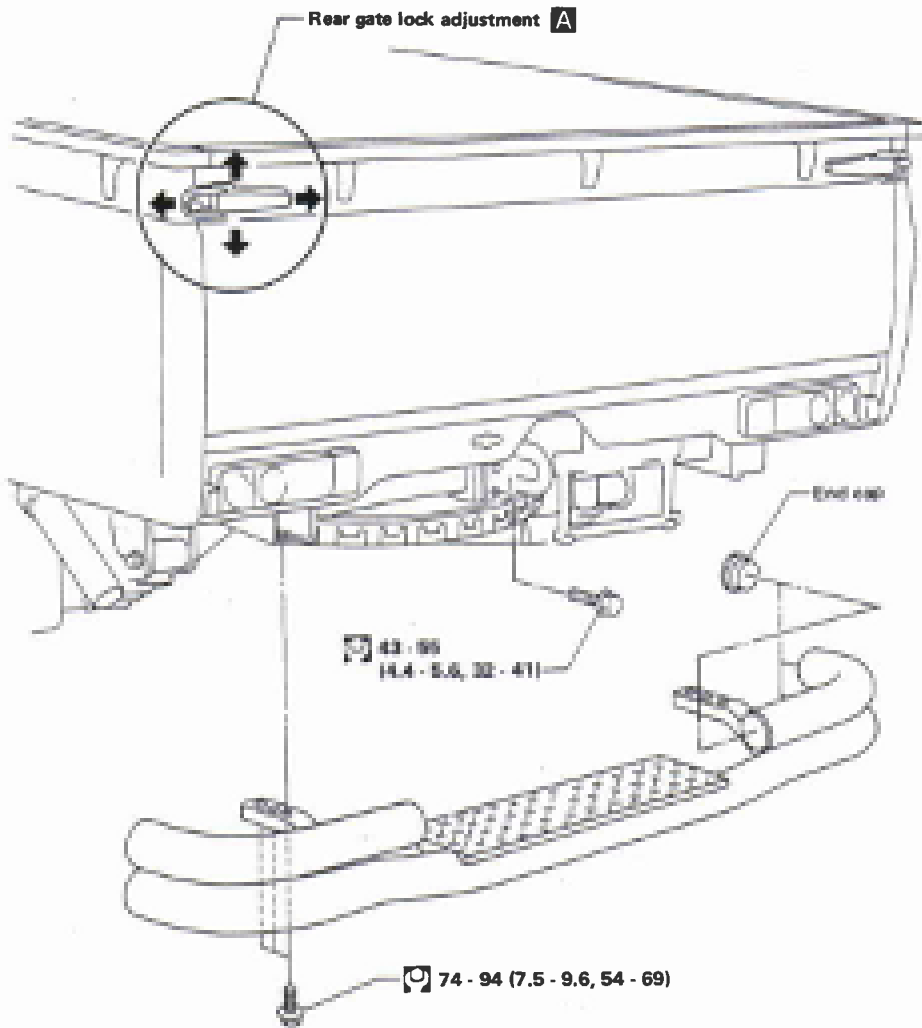





# BODY END

## Rear End

PICKUP



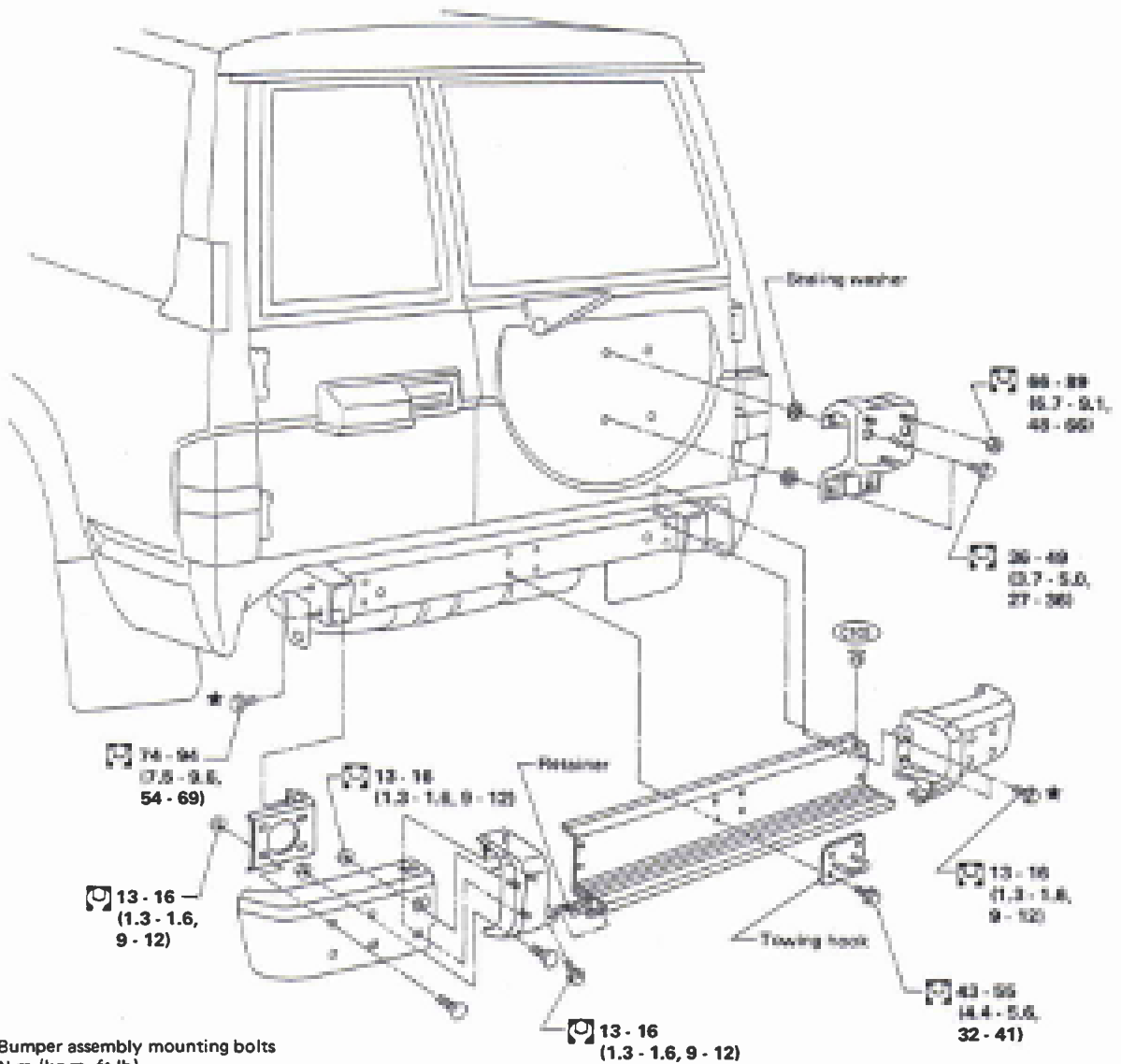
 : N-m (kg-m, ft-lb)  
SBF945D

**BF-8**

# BODY END

## Rear End (Cont'd)

### WAGON AND HARDTOP

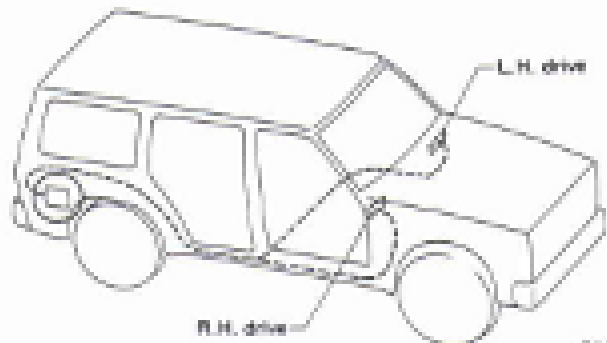
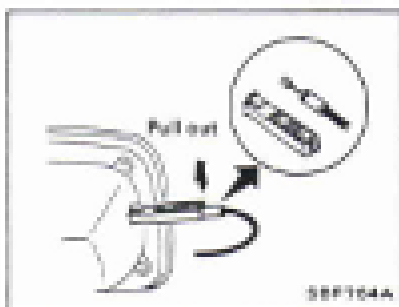


★ : Bumper assembly mounting bolts

Ⓜ : N·m (kg·m, ft·lb)

#### Fuel filler lid opener

- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that fuel filler lid open smoothly.

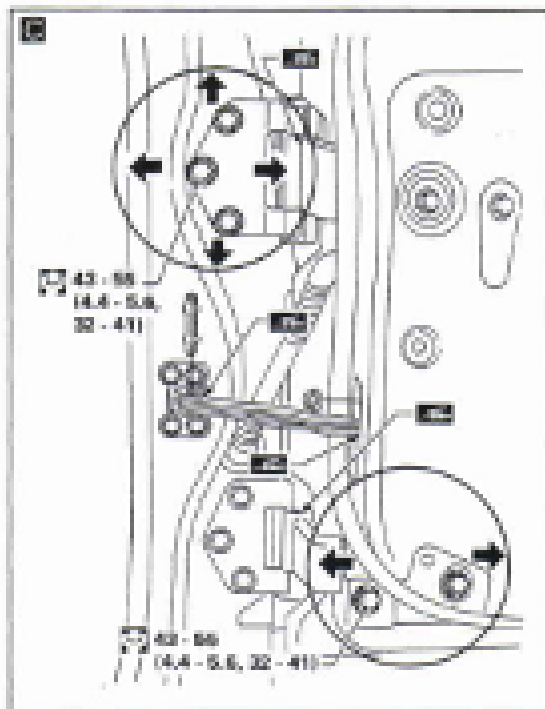
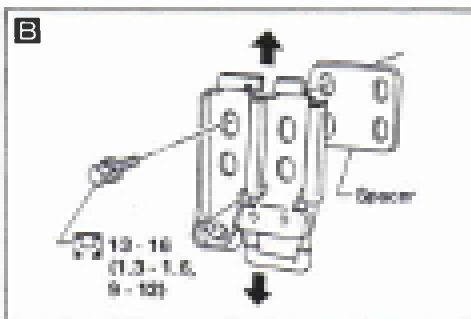
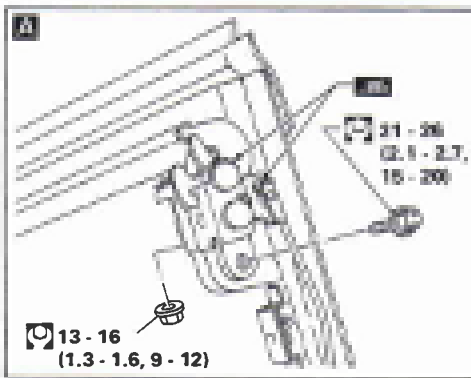
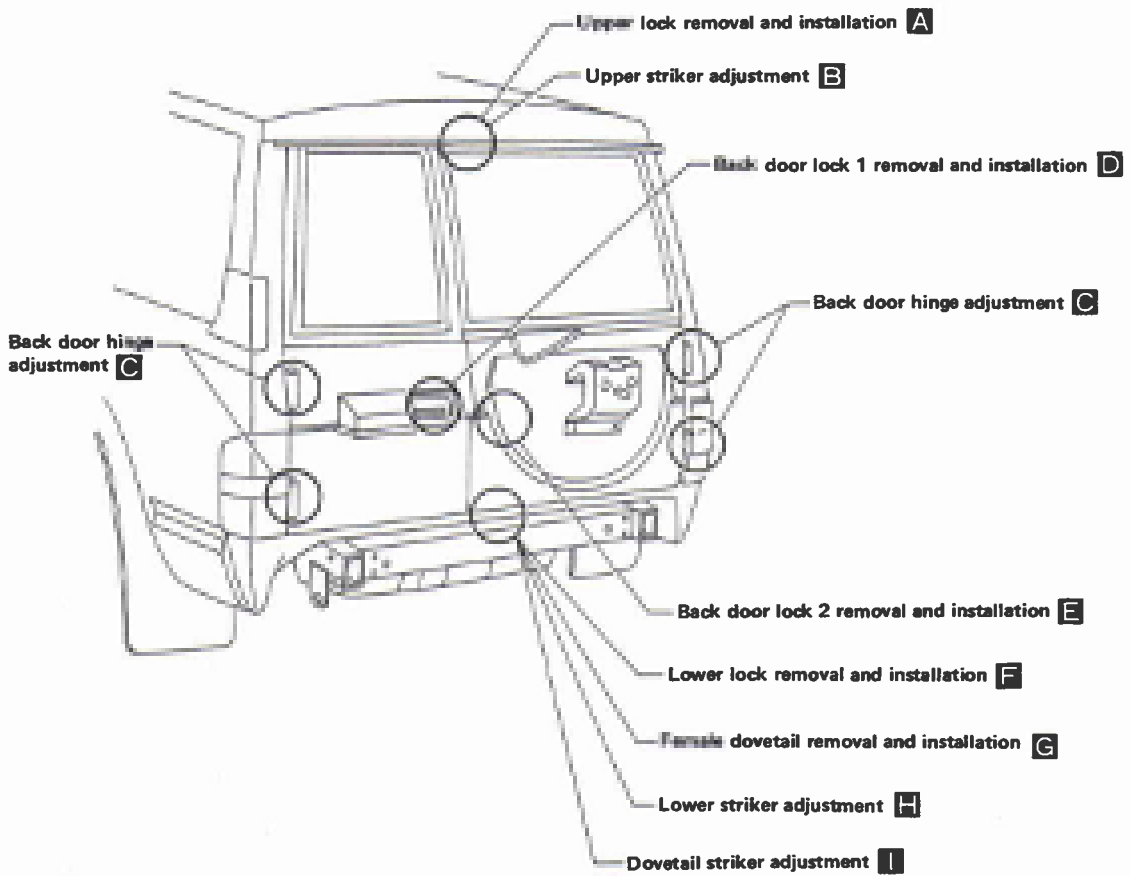


SBF944D

# BODY END

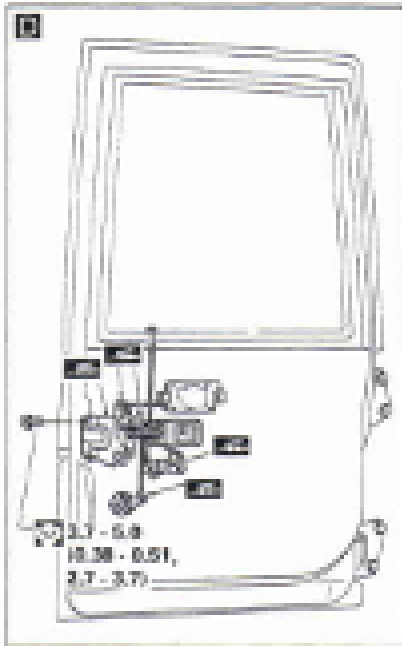
## Rear End (Cont'd)

- Back door lock system adjustment: Adjust lock so that it is in the center of the striker. After adjusting, check back door lock operation.

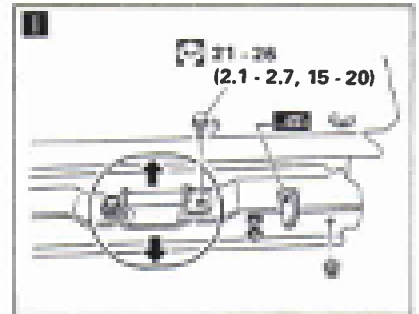
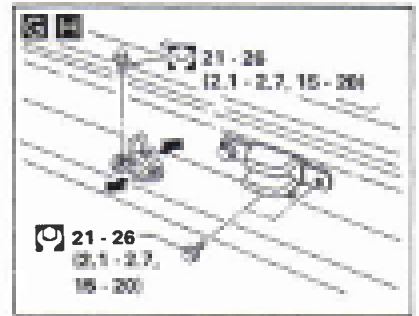
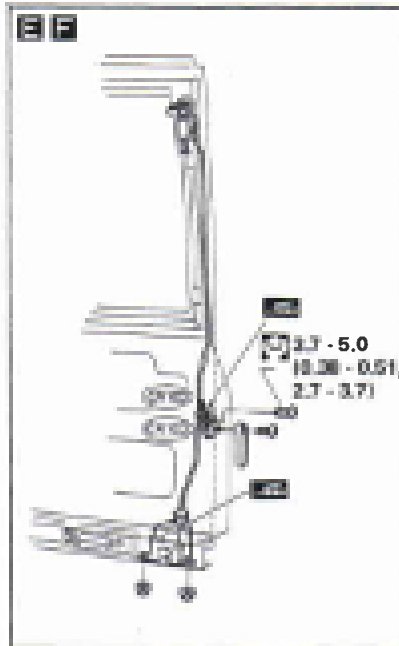
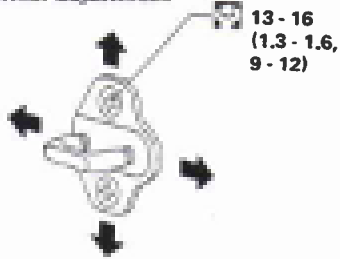


# BODY END

## Rear End (Cont'd)



Striker adjustment



 N·m (kg·m, ft·lb)

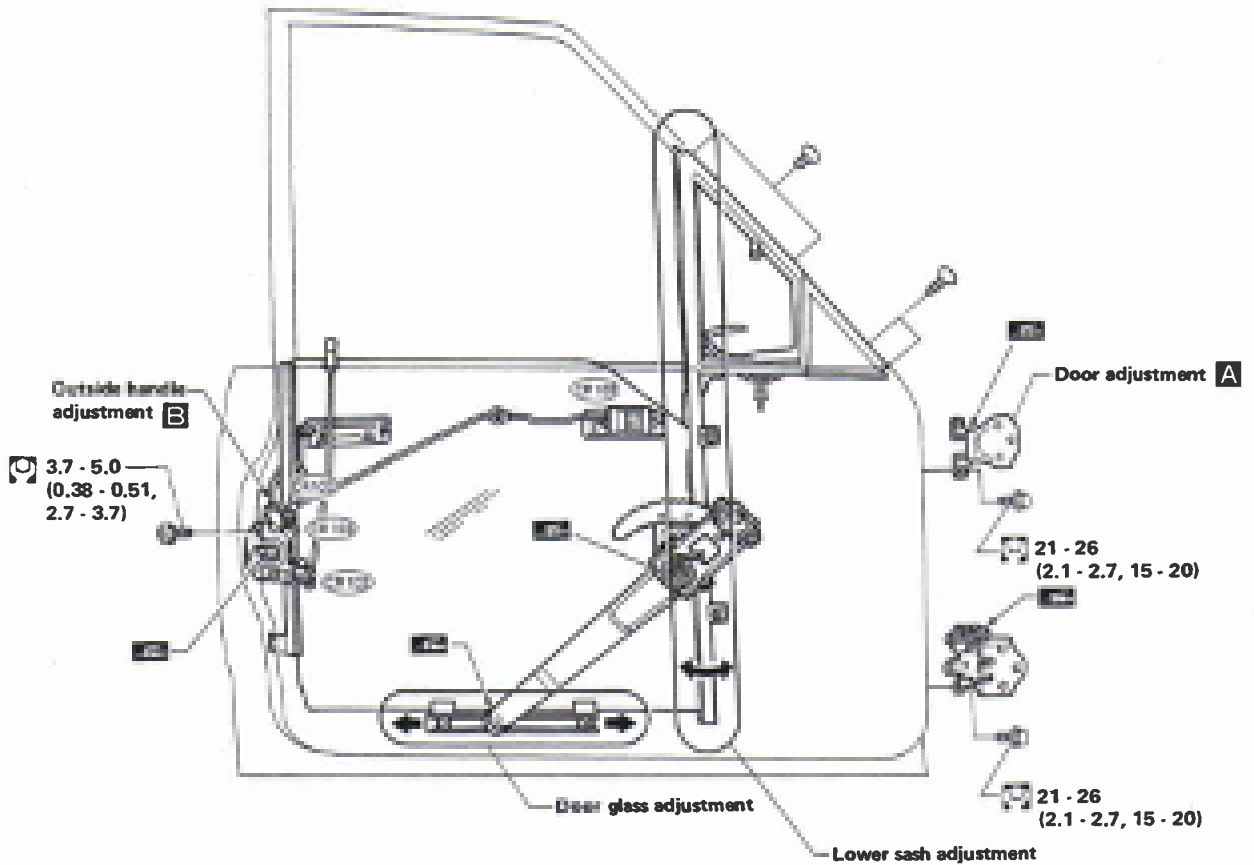
ENF880

# DOOR

- When removing or adjusting door, remove fender protector first.
- After adjusting door or door lock, check door lock operation.

## Front Door

TYPE 1



: N·m (kg·m, ft·lb)

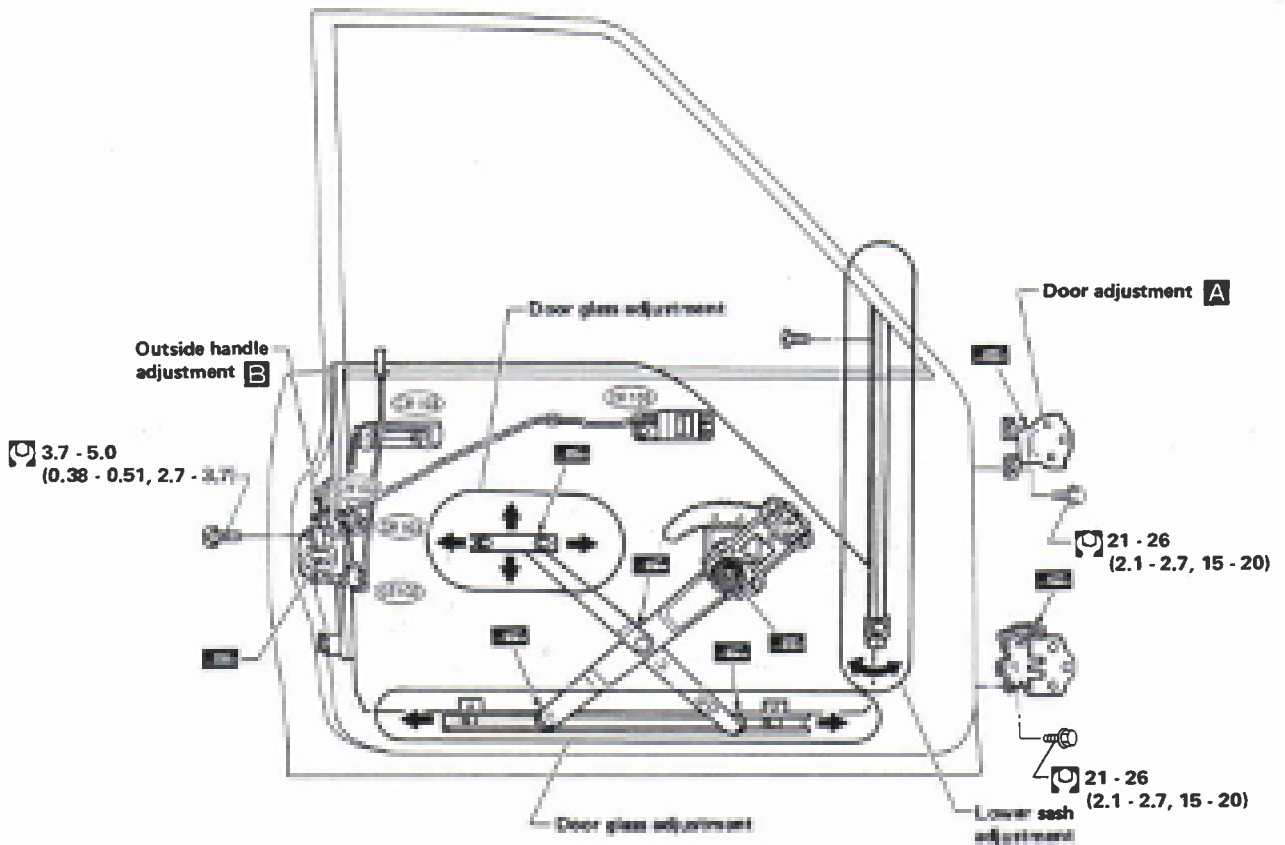
SBF948D



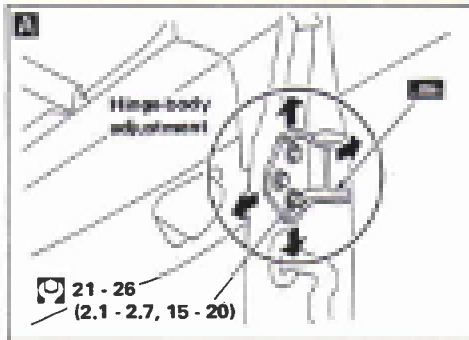
# DOOR

## Front Door (Cont'd)

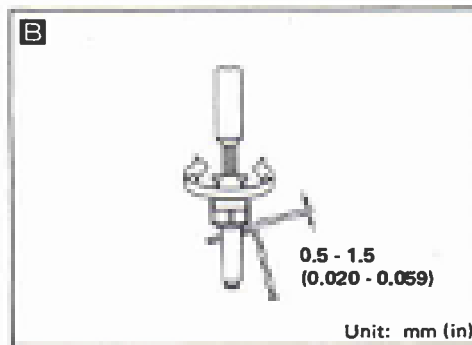
TYPE 2



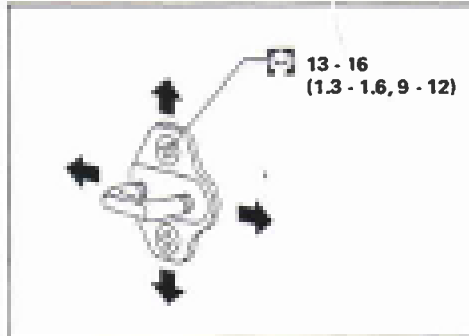
### Door adjustment



### Outside handle adjustment



### Striker adjustment

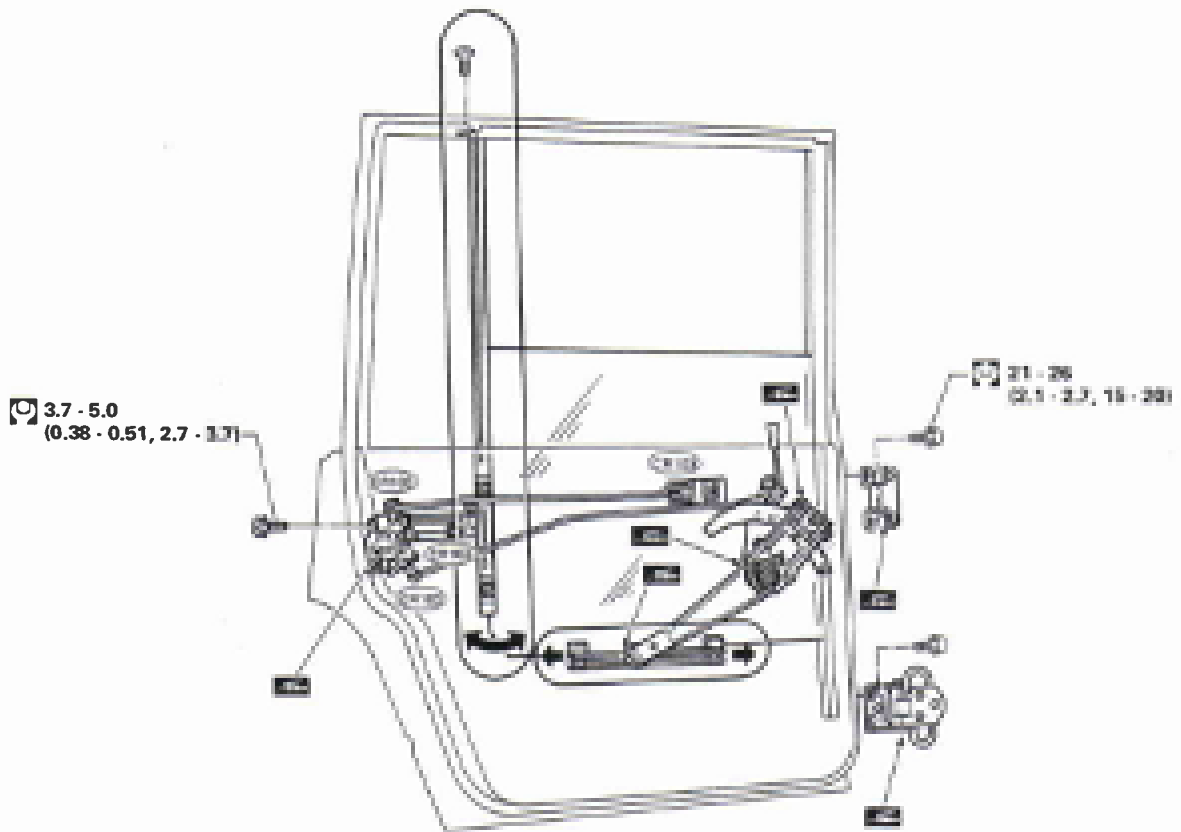


: N·m (kg·m, ft·lb)

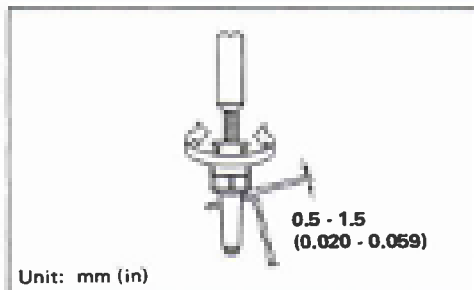
SBF949D

# DOOR

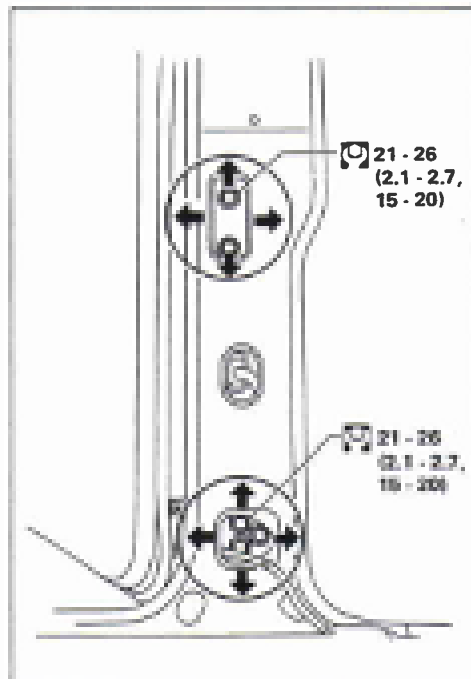
## Rear Door



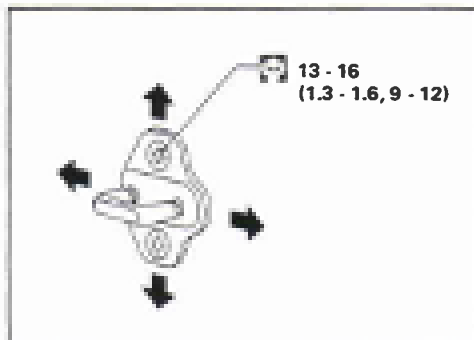
### Outside handle adjustment



### Door adjustment



### Striker adjustment



 : N·m (kg·m, ft·lb)

SBF9500

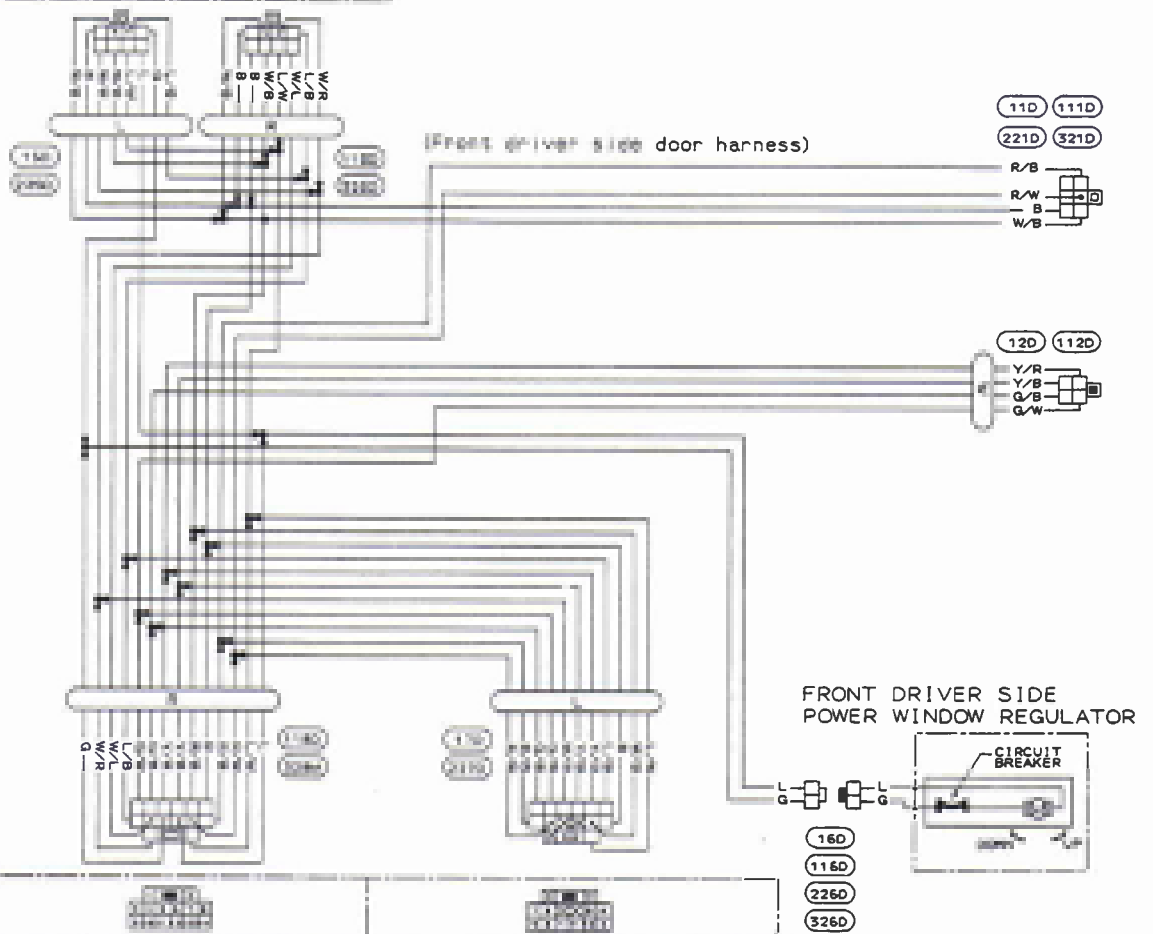
# DOOR

## Power Window

### WIRING DIAGRAM

POWER WINDOW AMP. -Front driver side door (inside of trim)

REMARKS	
51	Power source (IGN)
52	Ground
53	Ignition switch condition
54	Input For detecting AUTO signal
55	Input For detecting UP signal
56	Input For detecting DOWN signal
57	Output Window upward power source
58	Output Window downward power source



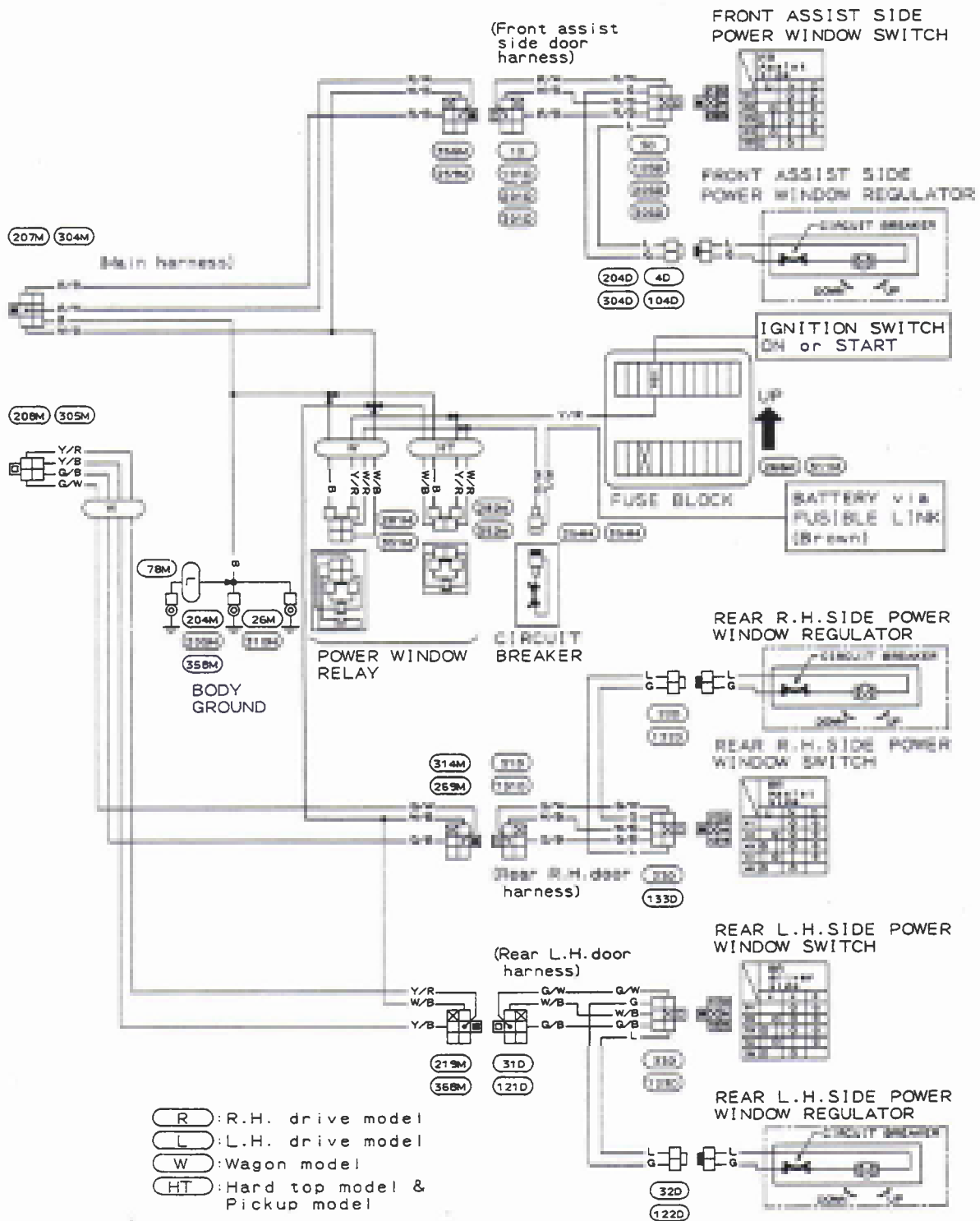
FRONT DRIVER SIDE POWER WINDOW SWITCH					FRONT DRIVER SIDE POWER WINDOW REGULATOR				
WIRING POINT	WIRING POINT	WIRING POINT	WIRING POINT	WIRING POINT	WIRING POINT	WIRING POINT	WIRING POINT	WIRING POINT	WIRING POINT
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

WAGON model

WAGON model

# DOOR

## Power Window (Cont'd)



SEF602E

# DOOR

## Power Window (Cont'd)

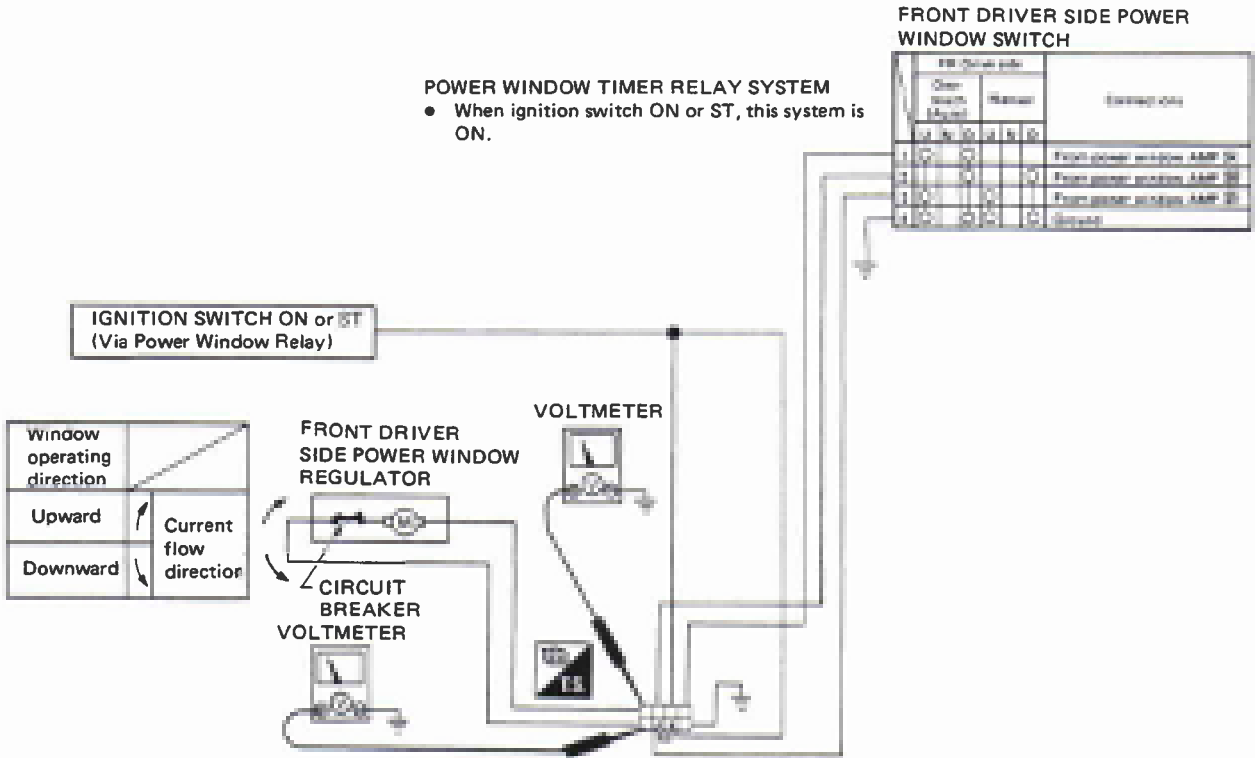
### ONE-TOUCHE (Auto) OPERATION

Power window system is designed to fully open or close the driver's window automatically by one-touch (Auto) operation of driver's door window switch. Stopping the window at the fully open or closed position is done by power window AMP. operation.

### POWER WINDOW AMP. INSPECTION (L.H.D. model)

#### POWER WINDOW TIMER RELAY SYSTEM

- When ignition switch ON or ST, this system is ON.



AMP. OPERATION									
Input signal	Connections	Operations							
		Manual operation				One-touch (Auto) Operation			
		12V	12V	12V	12V	12V	12V	12V	12V
1	Power source (IGN)	12V	12V	12V	12V	12V	12V	12V	12V
2	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground
3	From ignition SW (ON or ST)	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST
4	To FR driver side power window SW (AUTO) (1)	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
5	To FR driver side power window SW (UP) (3)	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
6	To FR driver side power window SW (DOWN) (2)	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
7	FR driver side regulator (Upward power source)	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. over 9V	Approx. 0V	Approx. 0V
8	FR driver side regulator (Downward power source)	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. over 9V
Regulator Operating Condition		Stop	Upward operation	Downward operation	Stop	Starting	Keeping operation until fully closed, then stops automatically.	Starting	Keeping operation until fully open, then stops automatically.
						Upward operation		Downward operation	

Carry out this operation check in this chart from left to right continuously.

POWER WINDOW AMP. – Front driver side door (Behind door trim)

SBF058E

When current flows excessively, circuit breaker will cut off current to prevent damage to the system.

# DOOR

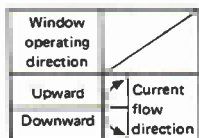
## Power Window (Cont'd)

### POWER WINDOW AMP. INSPECTION (R.H.D. model)

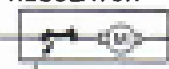
#### POWER WINDOW TIMER RELAY SYSTEM

- When ignition switch ON or ST, this system is ON.

IGNITION SWITCH ON or ST  
(Via Power Window Relay)



FRONT DRIVER SIDE POWER WINDOW REGULATOR



CIRCUIT BREAKER

VOLTMETER



VOLTMETER



#### DRIVER'S WINDOW SWITCH

Terminal	Auto			Manual			Connection
	U	D	G	U	D	G	
1	○						Power window AMP. ⑤
2		○					Power window AMP. ⑥
1B	○		○				Ground
1C				○		○	Power source
3							Power window AMP. ⑤
4				○	○	○	Power window AMP. ⑥
5							Upward power source
6							Downward (Auto) source

#### AMP. OPERATION

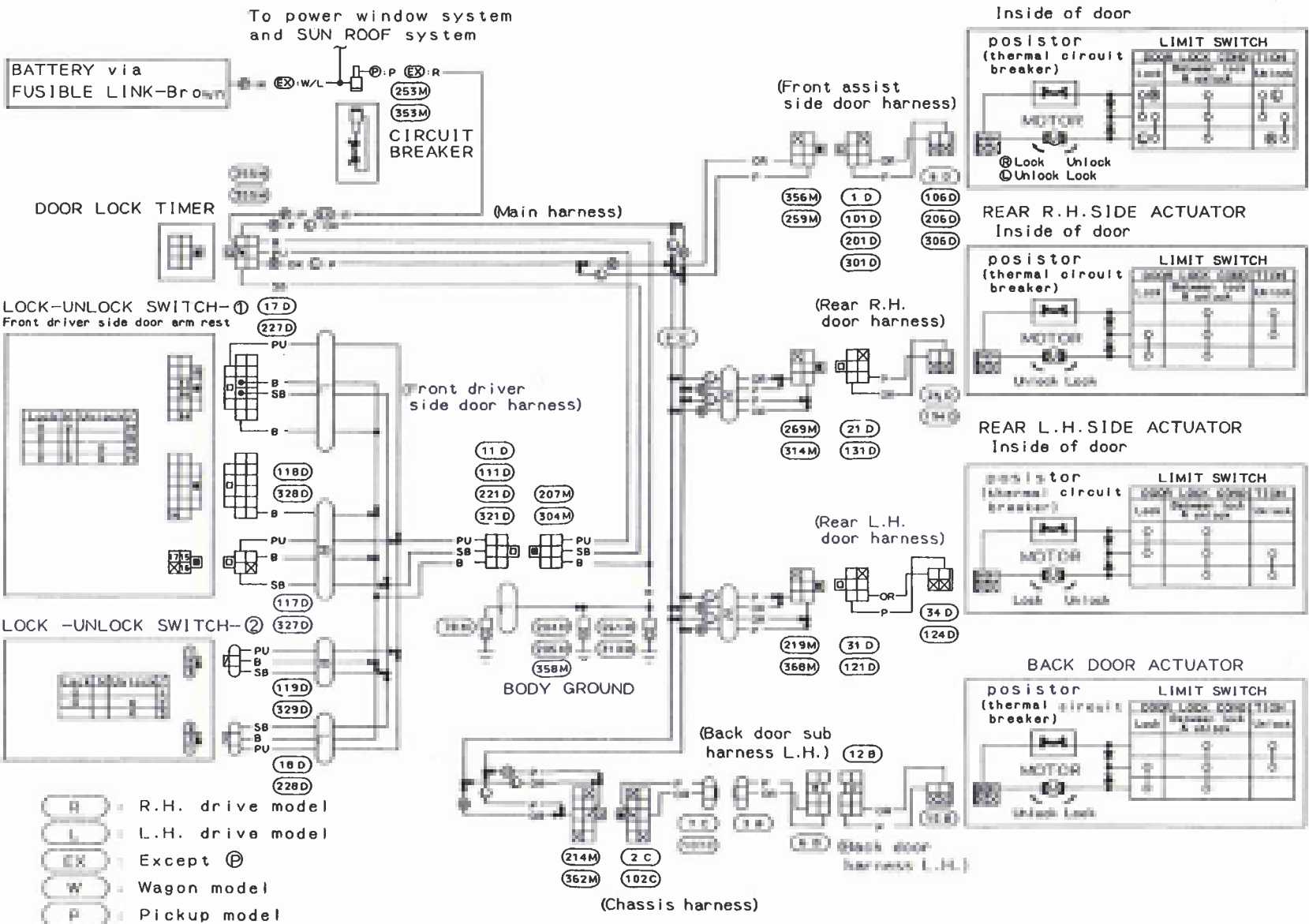
No.	Connections		Operations				
			One-touch (Auto) Operation				
			12V	12V	12V	12V	12V
51	Power source ignition SW (ON or ST)		12V	12V	12V	12V	12V
52	Ground		Ground	Ground	Ground	Ground	Ground
53	Power source ignition SW (ON or ST)		12V	12V	12V	12V	12V
54	Ground		Ground	Ground	Ground	Ground	Ground
55	Input signal	Driver's window SW ① (AUTO UP)	OFF	ON	OFF	OFF	OFF
56		Driver's window SW ② (AUTO DOWN)	OFF	OFF	OFF	ON	OFF
57	Output signal	Driver's window SW ③ (AUTO UP power source)	Approx. 0V	Approx. over 9V	Approx. over 9V	Approx. 0V	Approx. 0V
58		Driver's window SW ④ (AUTO DOWN power source)	Approx. 0V	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. over 9V

Regulation operation	Stop	Starting	Keeping operation until fully closed, then stops automatically.	Starting	Keeping operation until fully open, then stops automatically.
		Upward operation		Downward operation	

Carry out this operation check in this chart from left to right continuously.

POWER WINDOW AMP. – Front driver side door (Behind door trim)

SBF059E



- (R) = R.H. drive model
- (L) = L.H. drive model
- (EX) = Except (P)
- (W) = Wagon model
- (P) = Pickup model

BF-20

SEP600E

# DOOR

## Power Door Lock (Cont'd)

### DOOR LOCK TIMER INSPECTION

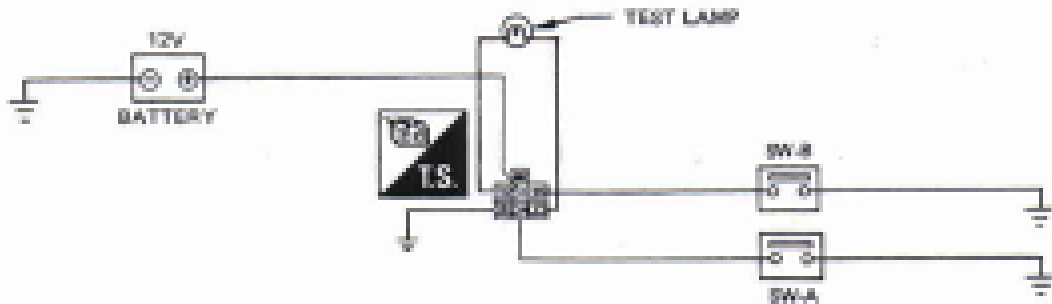
#### TESTING OPERATION

Input signal	SW-A operation	OFF	Turns ON	ON	Turns OFF	OFF	OFF	OFF	Turns ON	Turns OFF
	SW-B operation	OFF	OFF	OFF	OFF	Turns ON	ON	Turns OFF	After SW-A operation, immediately turns ON	Turns OFF
Output signal	Test lamp operation	OFF	ON (Approx. 1.0 sec.) → OFF	OFF	OFF	ON (Approx. 1.0 sec.) → OFF	OFF	OFF	ON → OFF → ON → OFF	OFF

- Carry out the complete inspection in this chart from left to right.
- Do not carry out any switch operations that are not described in the above chart so as to avoid breaking the door lock timer.

Lighting period of test lamp differs according to SW-B operation. Moreover, test lamp may come on once or it may not come on at all. If this occurs, do not judge it faulty solely from this step.

#### INSPECTION CIRCUIT (This test circuit must be wired by the technician.)



#### DOOR LOCK TIMER

	CIRCUIT CONNECTIONS
31	Power source (BAT)
32	To/From actuators (Lock power source & Unlock ground)
33	To/From actuators (Lock ground & Unlock power source)
34	To lock-unlock switches (Input signal for lock)
35	Ground
39	To lock-unlock switches (Input signal for unlock)

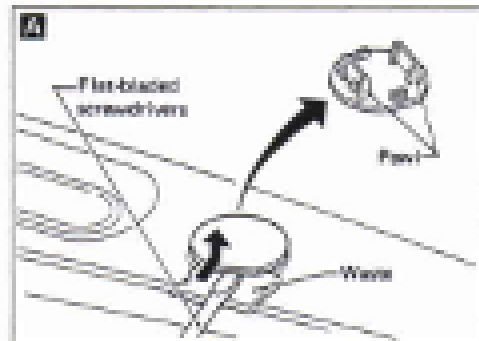
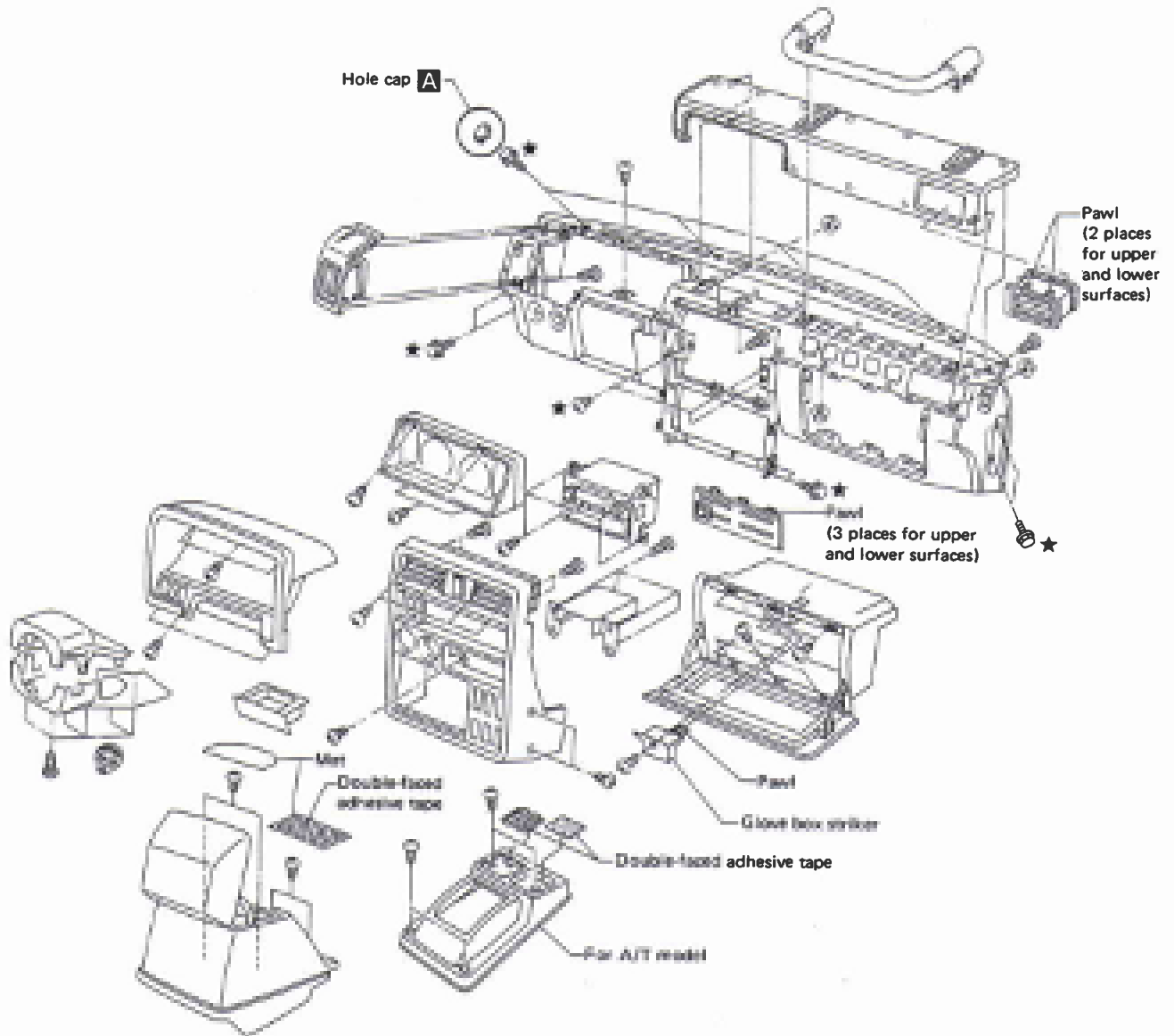
50F0210

When current flows excessively, circuit breaker will cut off current to prevent damage to the system.



# INSTRUMENT PANEL

- These parts are made of plastic, so do not use excessive force and be careful not to damage them.



★ : Instrument assembly mounting bolts and screws

SBF951D

# INTERIOR AND EXTERIOR

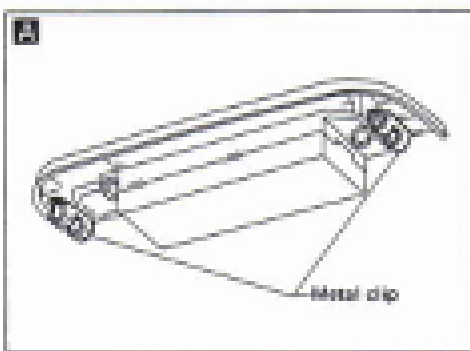
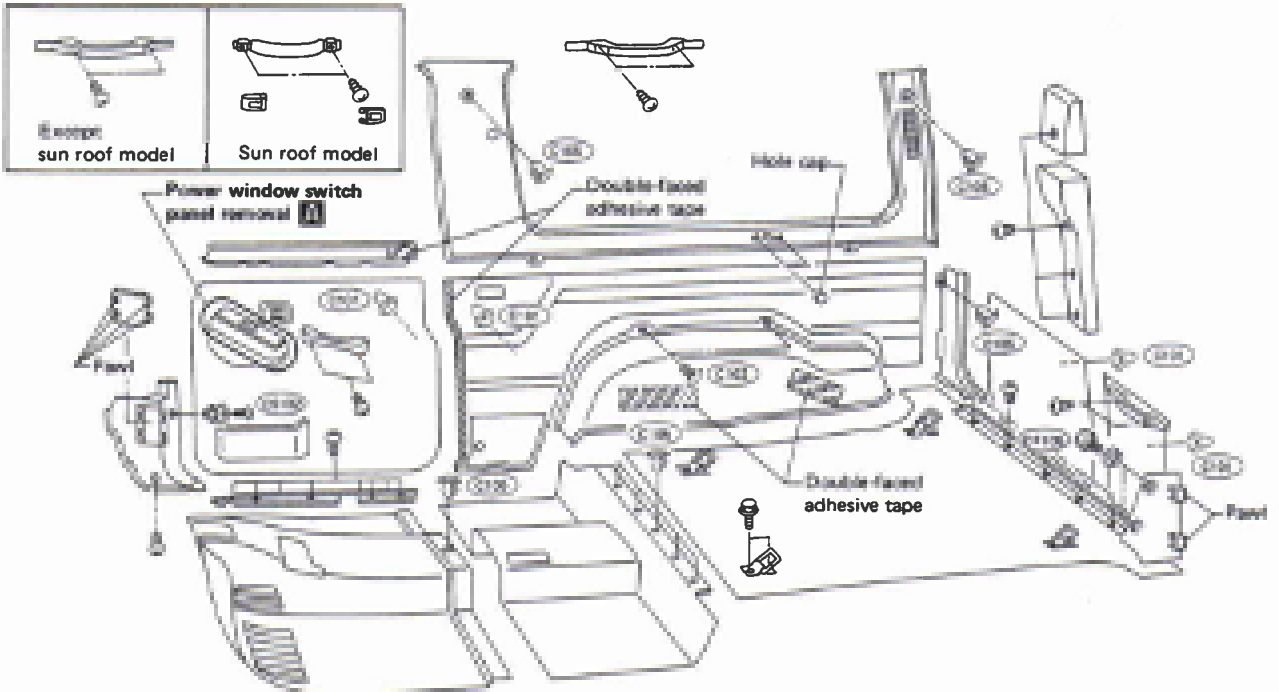
- When handling interior or exterior, do not use excessive force and take care not to damage them.
- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.

## Interior

### SIDE AND FLOOR TRIM – Passenger room

#### Hardtop

##### Assist grip



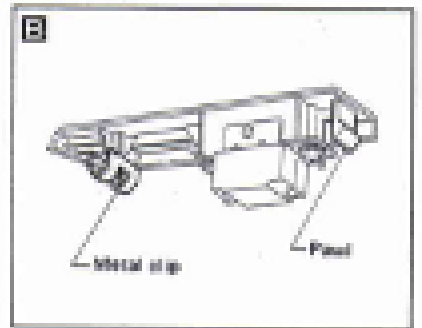
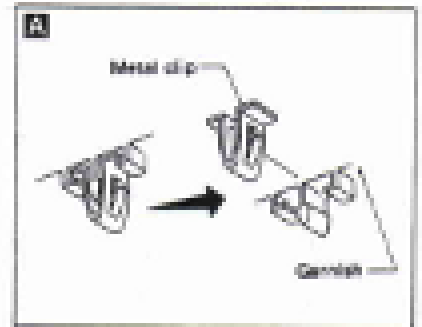
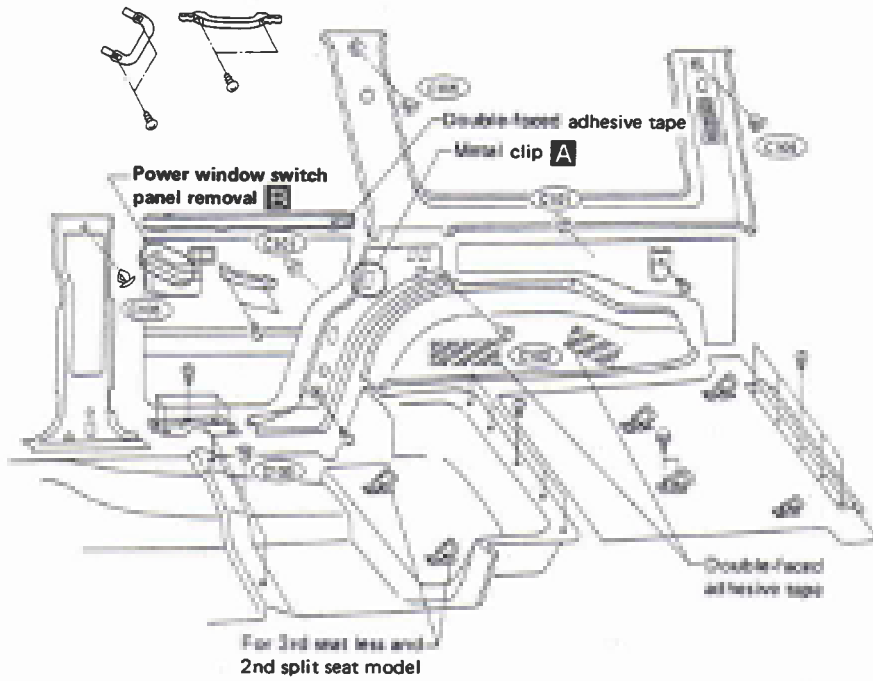
58F062D

# INTERIOR AND EXTERIOR

## Interior (Cont'd)

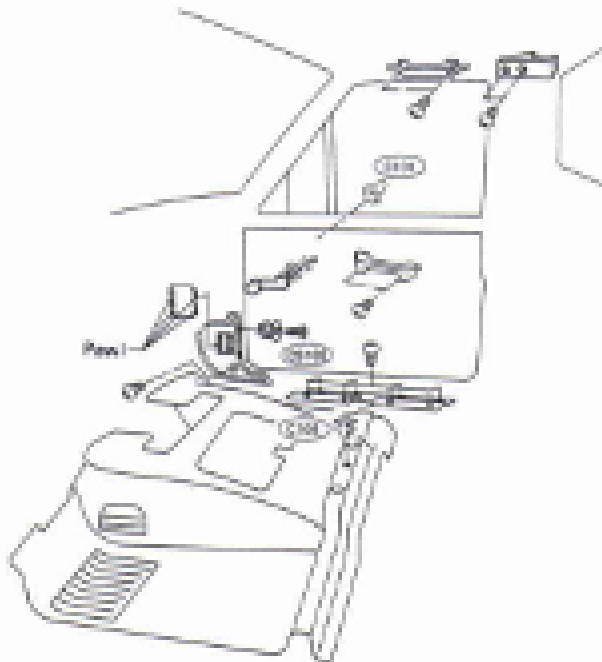
### Wagon

- Basically same as Hardtop for front portion.



88F663C

### Pickup

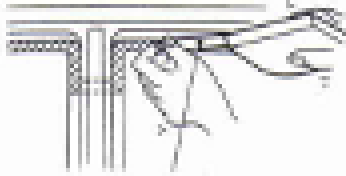


88F664C

# INTERIOR AND EXTERIOR

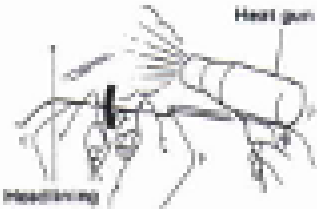
## Interior (Cont'd)

### Roof trim installation



Double-faced adhesive tape  
Affix double-faced adhesive tape to  
body flange and install securely.

SBF996A

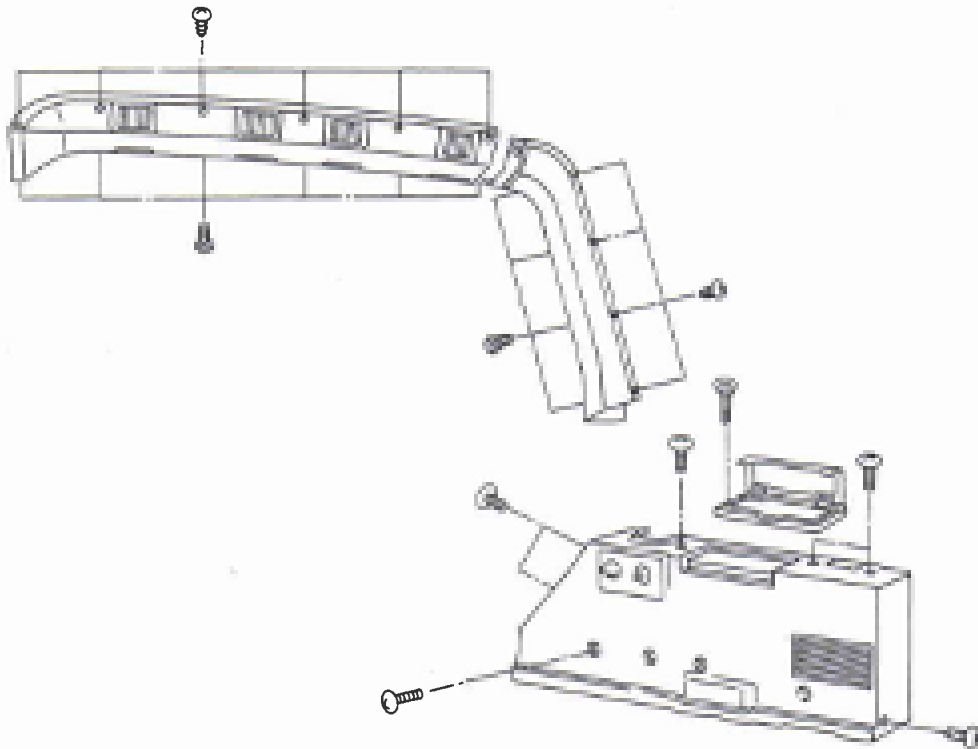


Affix headlining to body flange  
starting from corner portion.

SBF001B

### ROOF TRIM & SIDE TRIM

#### Type 1

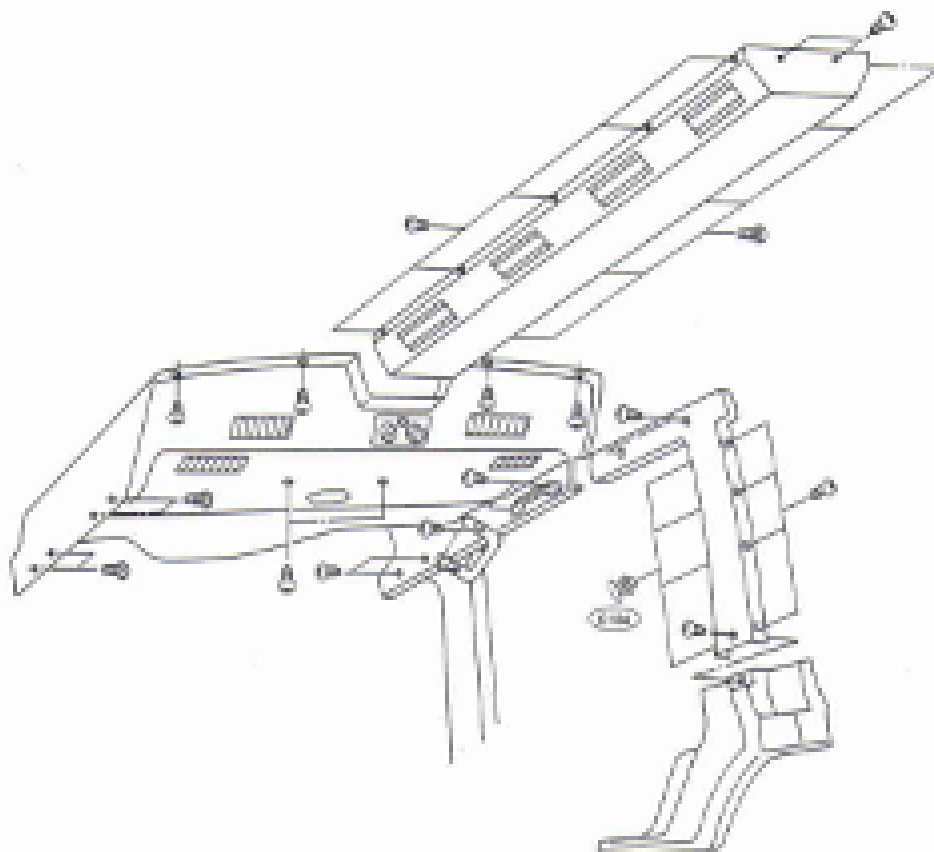


SBF007C

# INTERIOR AND EXTERIOR

## Interior (Cont'd)

Type 2

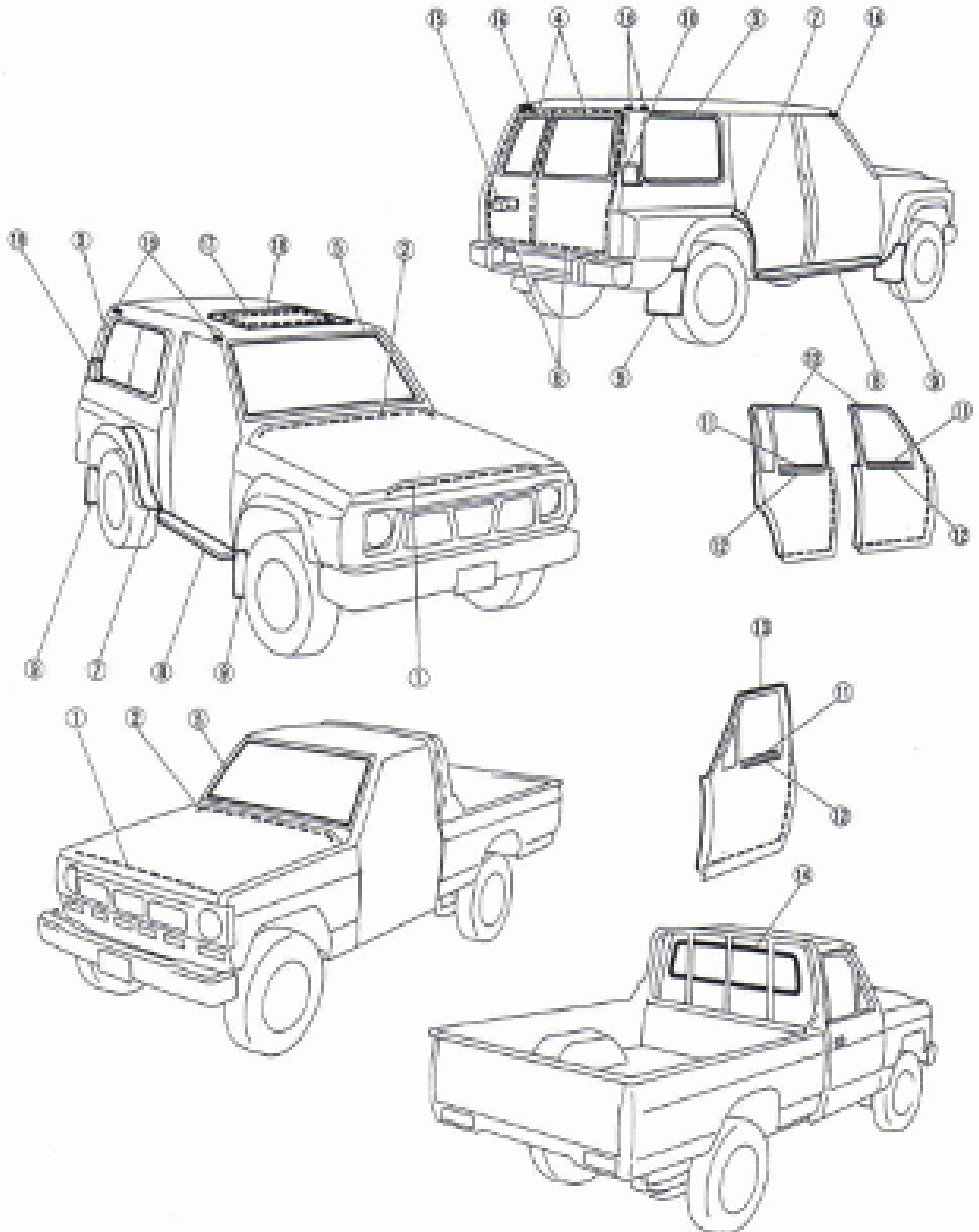


SBF060E

## INTERIOR AND EXTERIOR

### Exterior

- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.

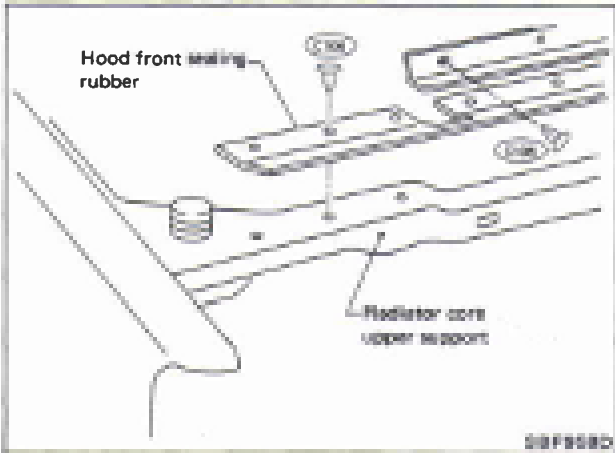


3870550

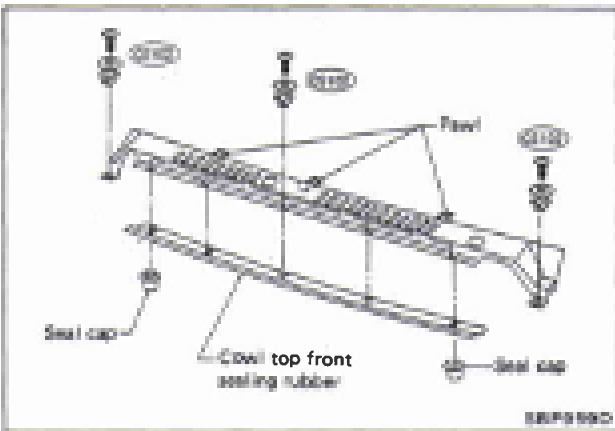
# INTERIOR AND EXTERIOR

## Exterior (Cont'd)

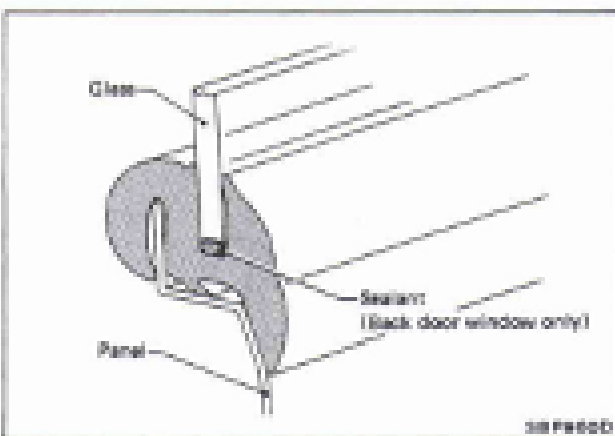
### ① Hood front sealing rubber



### ② Cowl top sealing rubber



### ③ ④ Rear side window and back door window weatherstrip

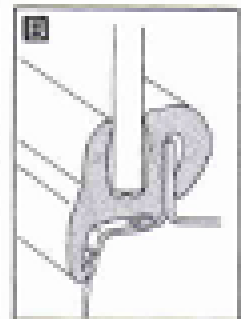
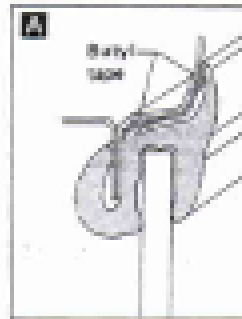
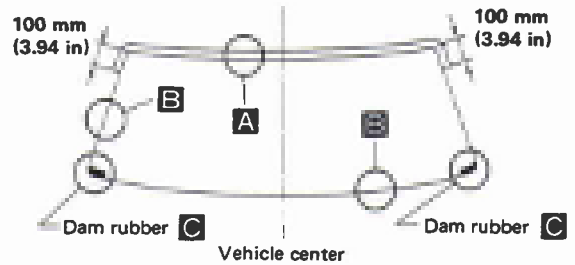


### ③ Slide window

Refer to "Rear Side Slide Window" of WINDSHIELD AND WINDOWS.

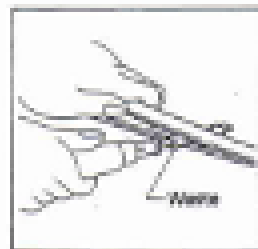
### ⑤ Windshield weatherstrip

#### Butyl tape portion

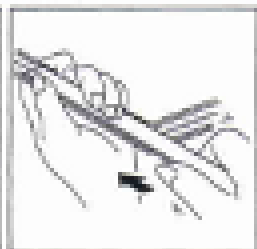


- Equipped with windshield molding type

#### Removal



#### Installation



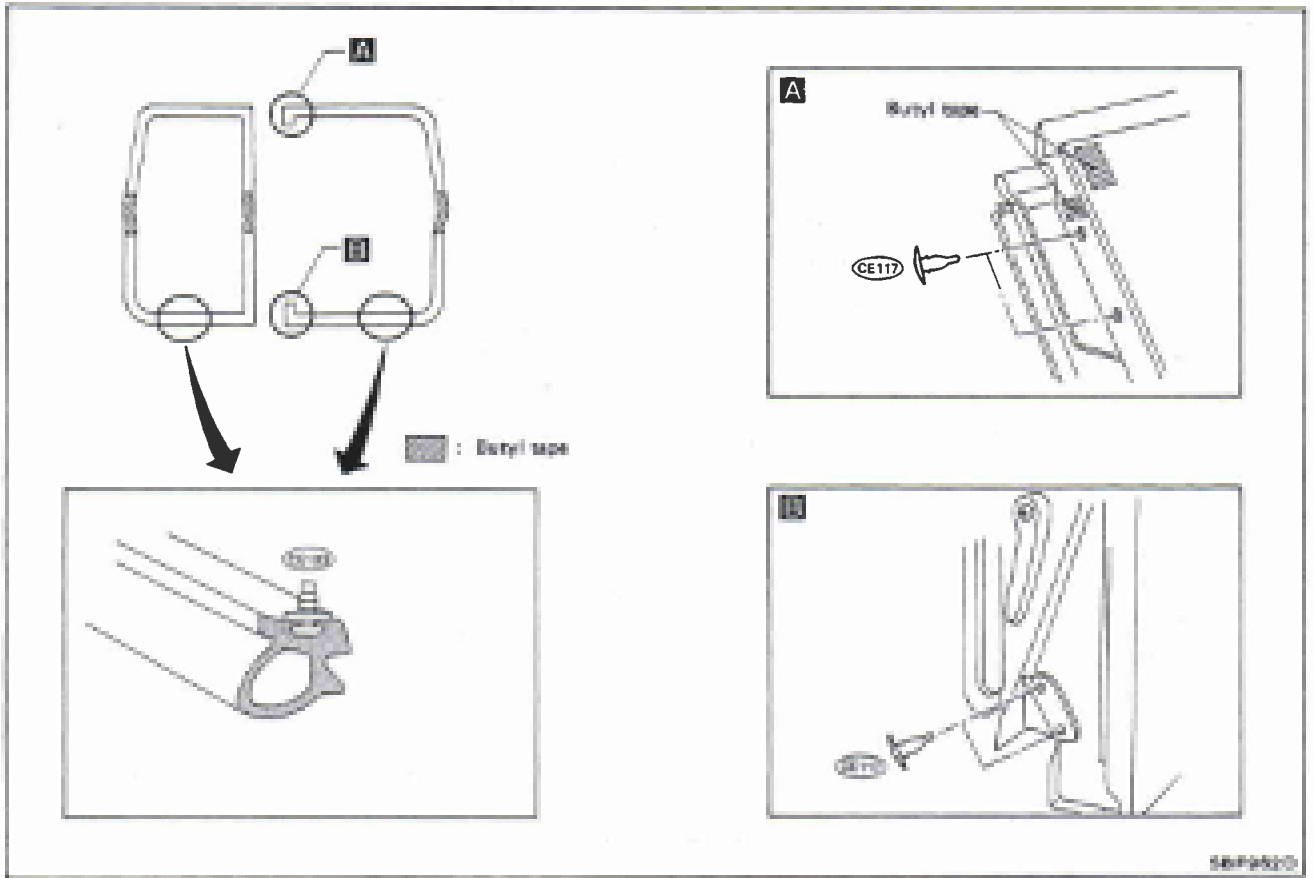
- It is better to install glass after mounting molding on weatherstrip.
- When replacing molding without removing glass, be careful not to deform molding or scratch weatherstrip.
- To make installation easier, apply soapy water to the groove in the weatherstrip molding.

SEPR980C

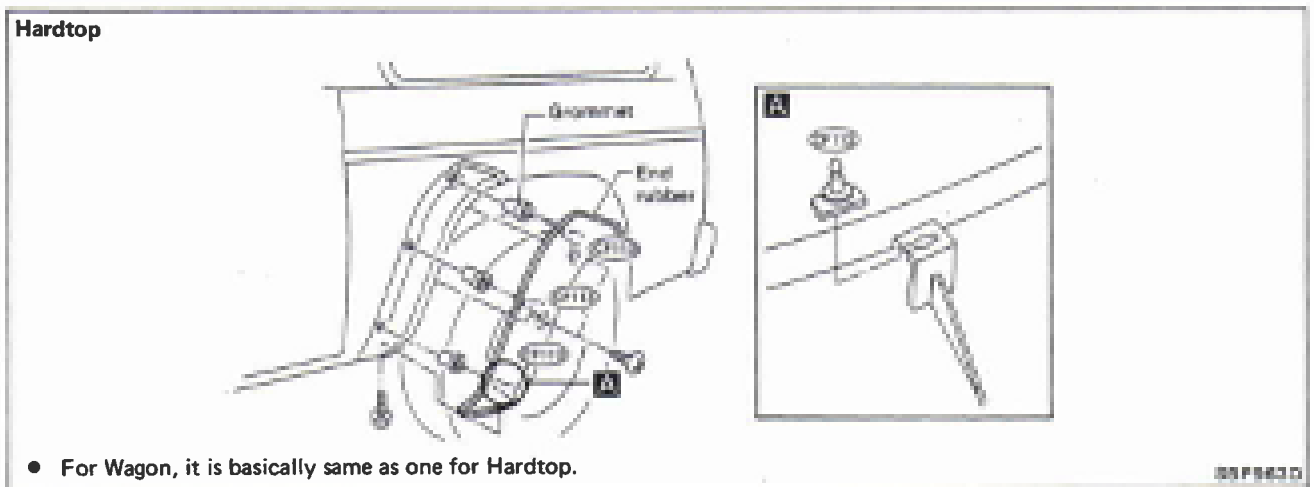
# INTERIOR AND EXTERIOR

## Exterior (Cont'd)

### ⑥ Back door weatherstrip



### ⑦ Fillet molding

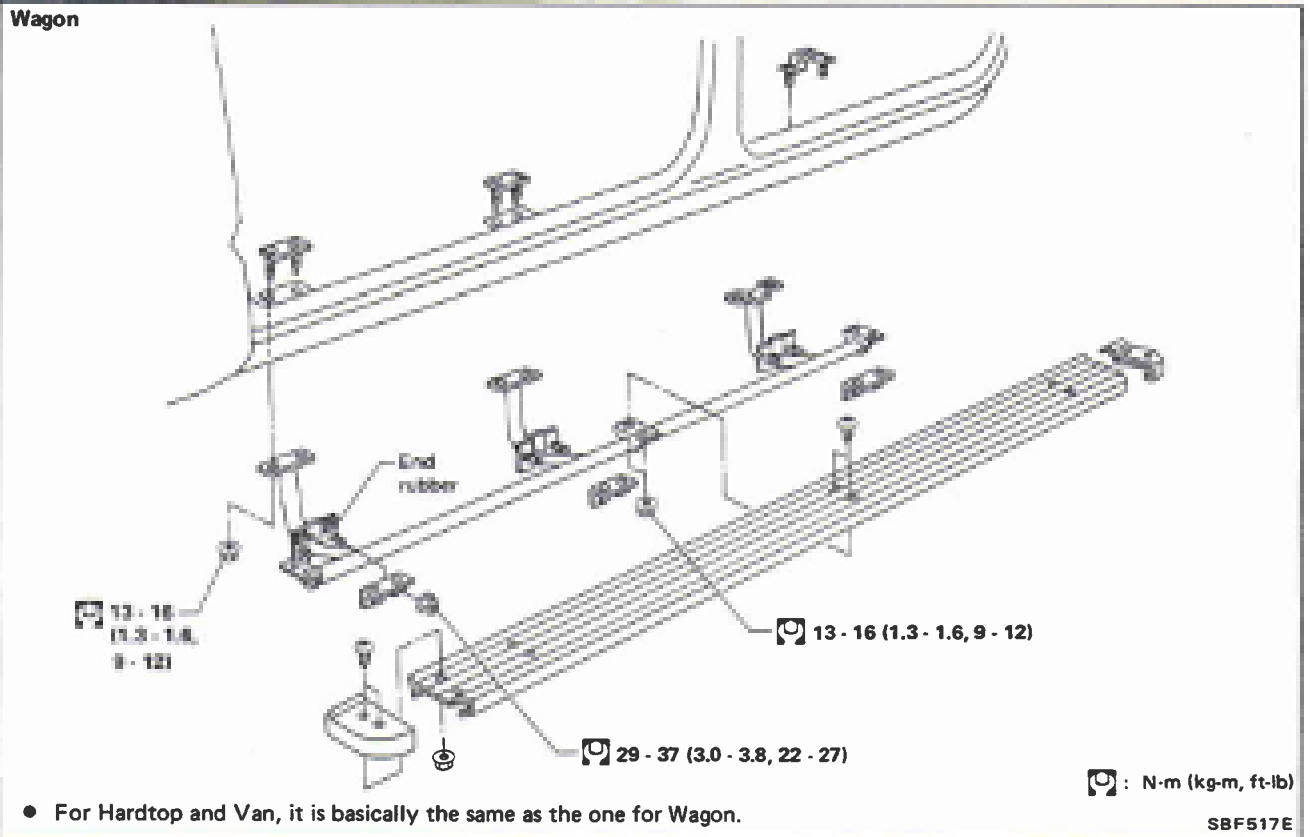




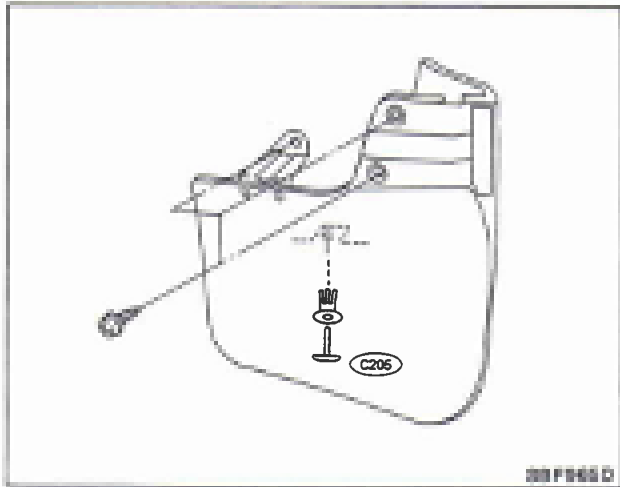
# INTERIOR AND EXTERIOR

## Exterior (Cont'd)

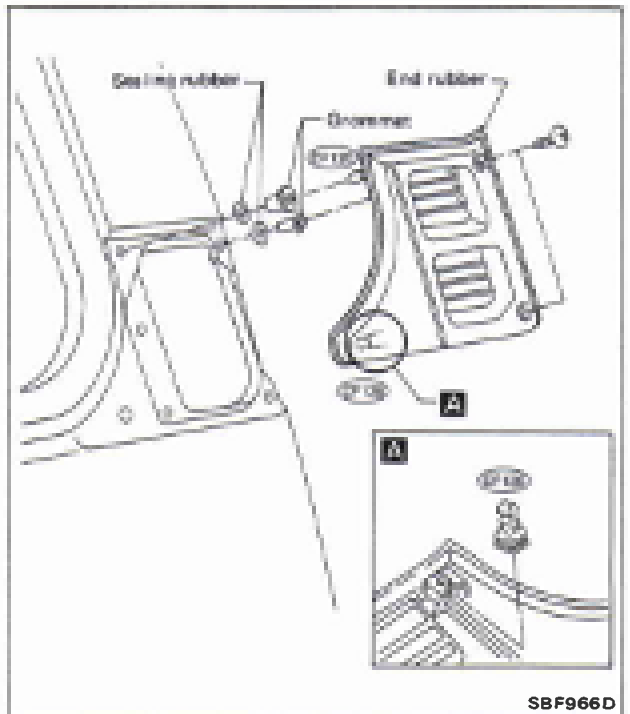
### ⑧ Side step



### ⑨ Mud guard



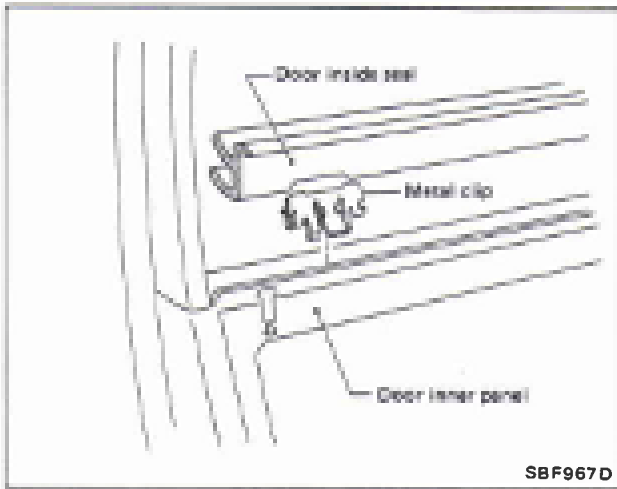
### ⑩ Air outlet grille



# INTERIOR AND EXTERIOR

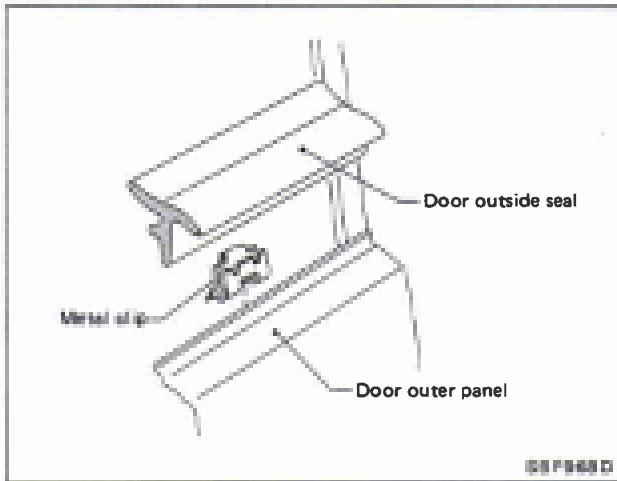
## Exterior (Cont'd)

### ⑪ Door inside seal



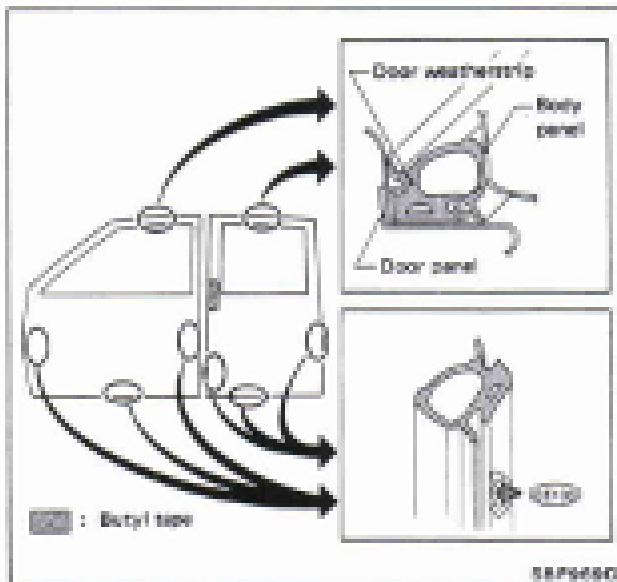
SBF967D

### ⑫ Door outside seal



SBF968D

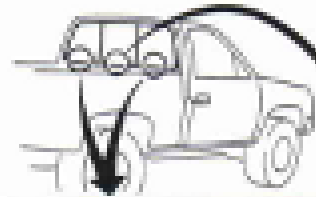
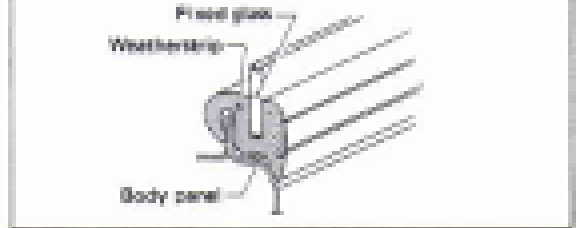
### ⑬ Door weatherstrip



SBF969D

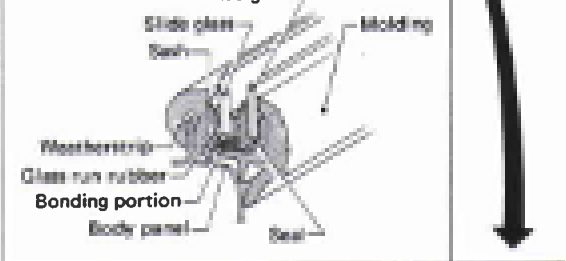
### ⑭ Back window

#### I Fixed glass type

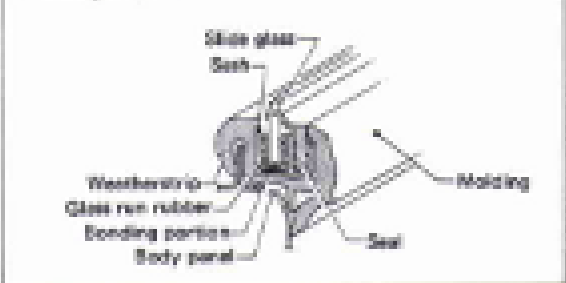


#### II Slide glass type

##### • Fixed glass part

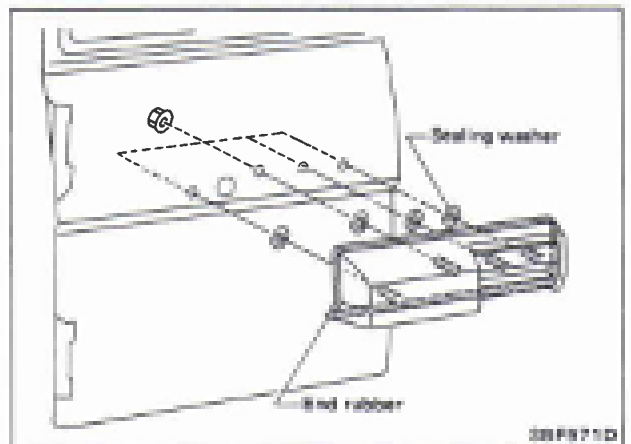


##### ■ Slide glass part



SBF970D

### ⑮ Back door finisher



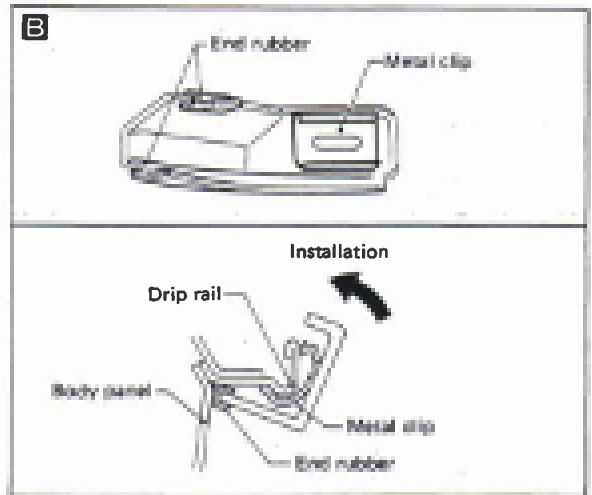
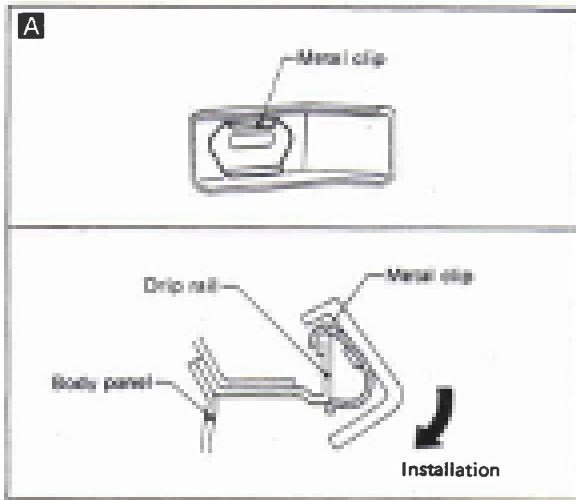
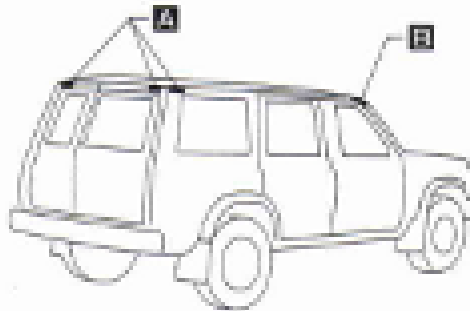
SBF971D

# INTERIOR AND EXTERIOR

## Exterior (Cont'd)

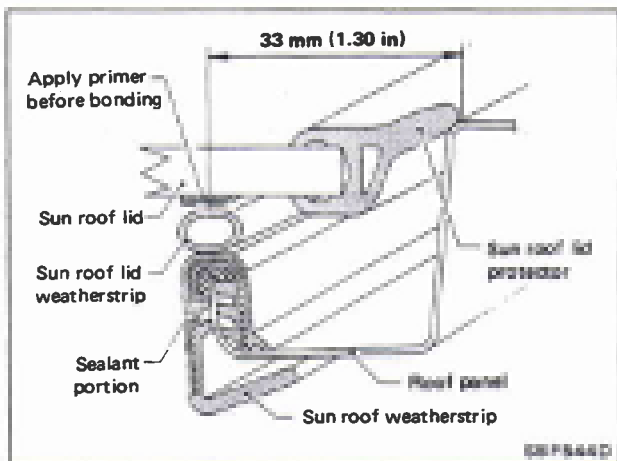
### 16 Drip end cap

For Australia



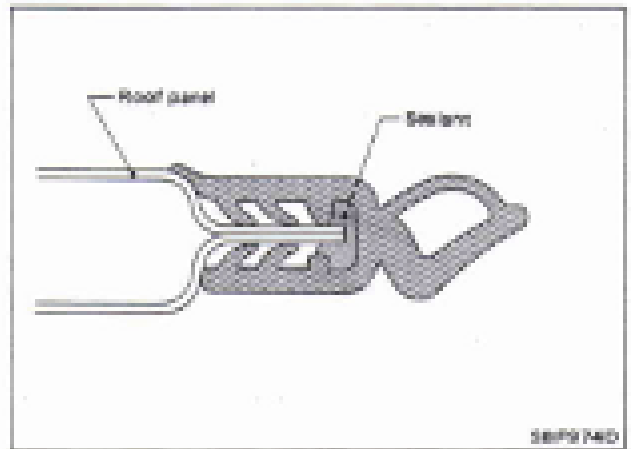
SBF972D

### 17 18 Sun roof weatherstrip & lid weatherstrip (Manual model)



SBF944D

### 18 Sun roof weatherstrip (Electrical model)

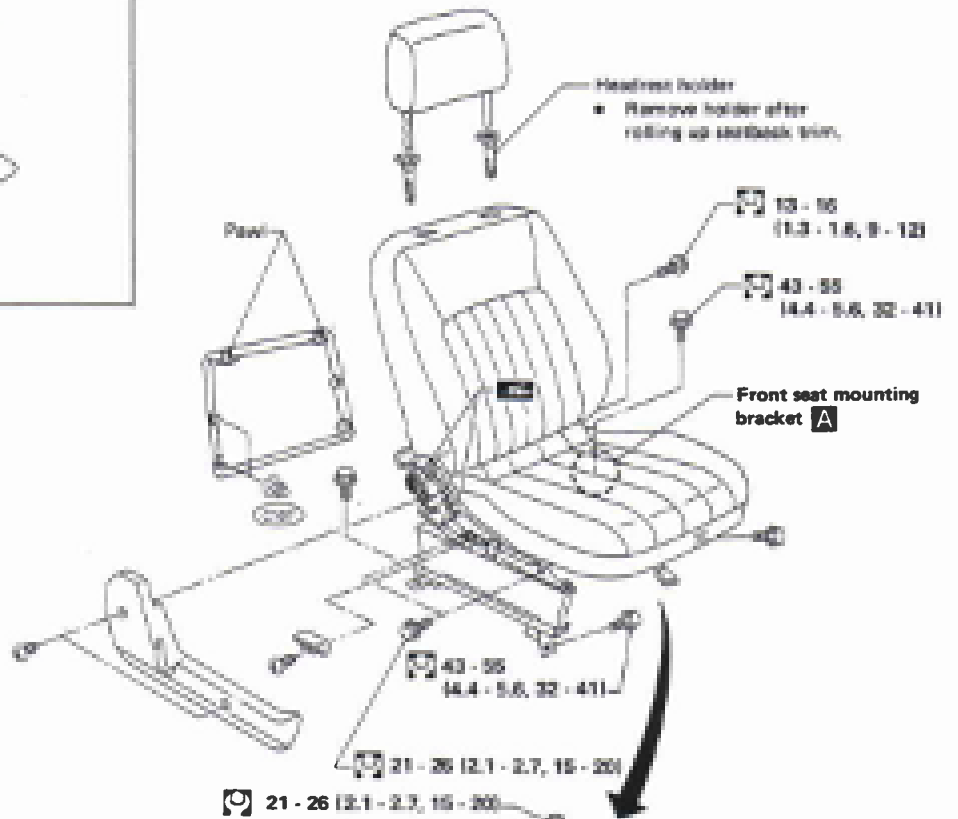
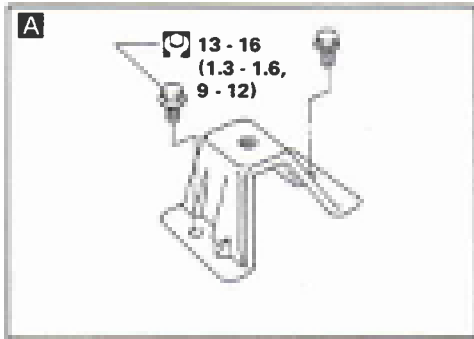


SBF974D

# SEAT

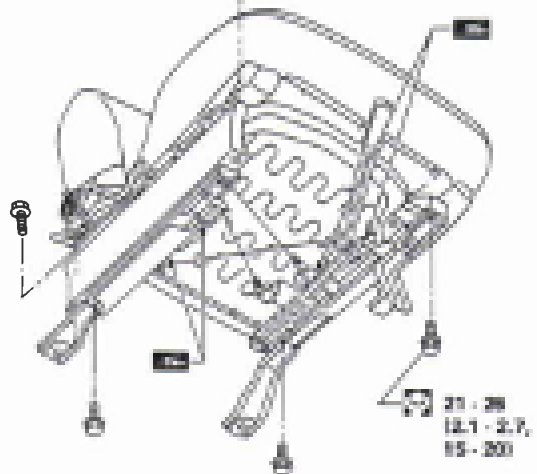
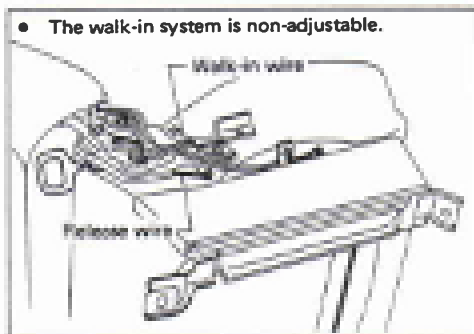
- When removing or installing the seat trim, handle it carefully to keep dirt out and avoid damage.

## Front Separate Seat



### Walk-in device

- The walk-in system is non-adjustable.

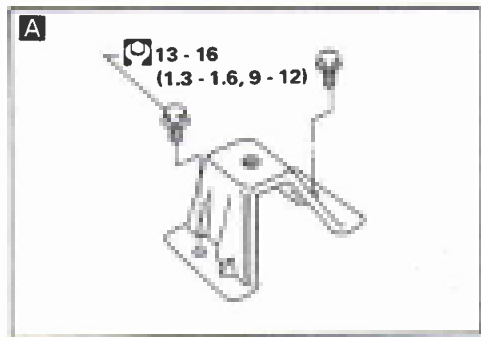
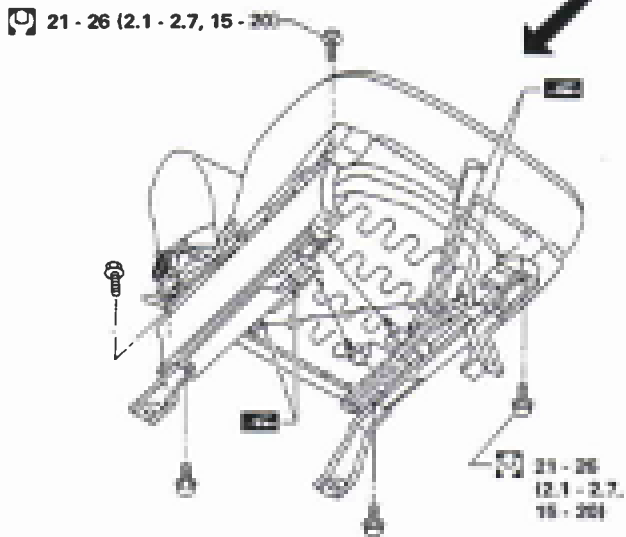
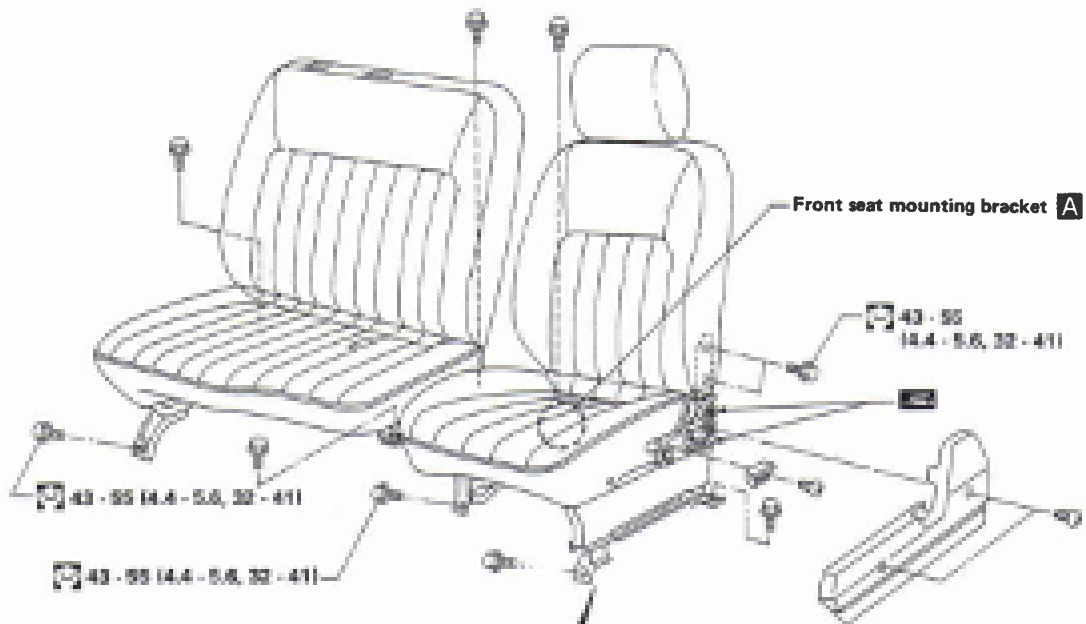


: N·m (kg·m, ft·lb)

SBF975D

# SEAT

## Front Split Seat



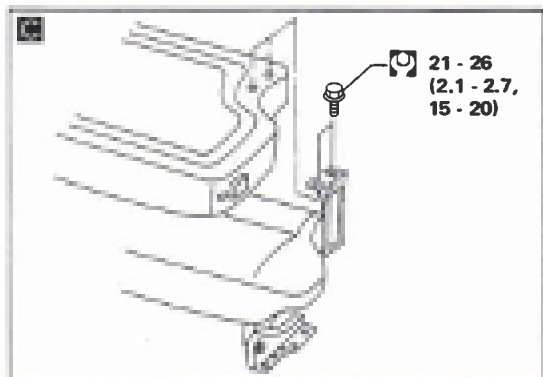
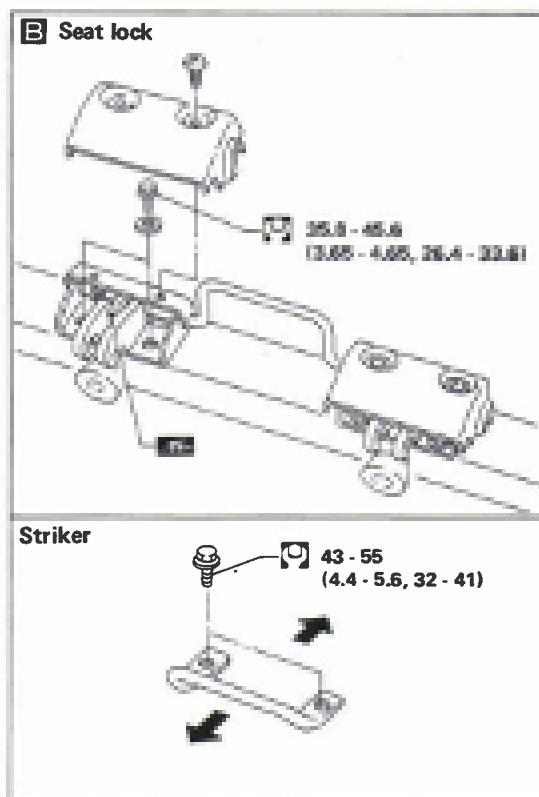
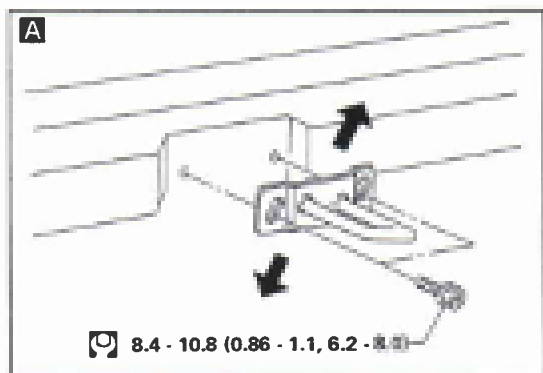
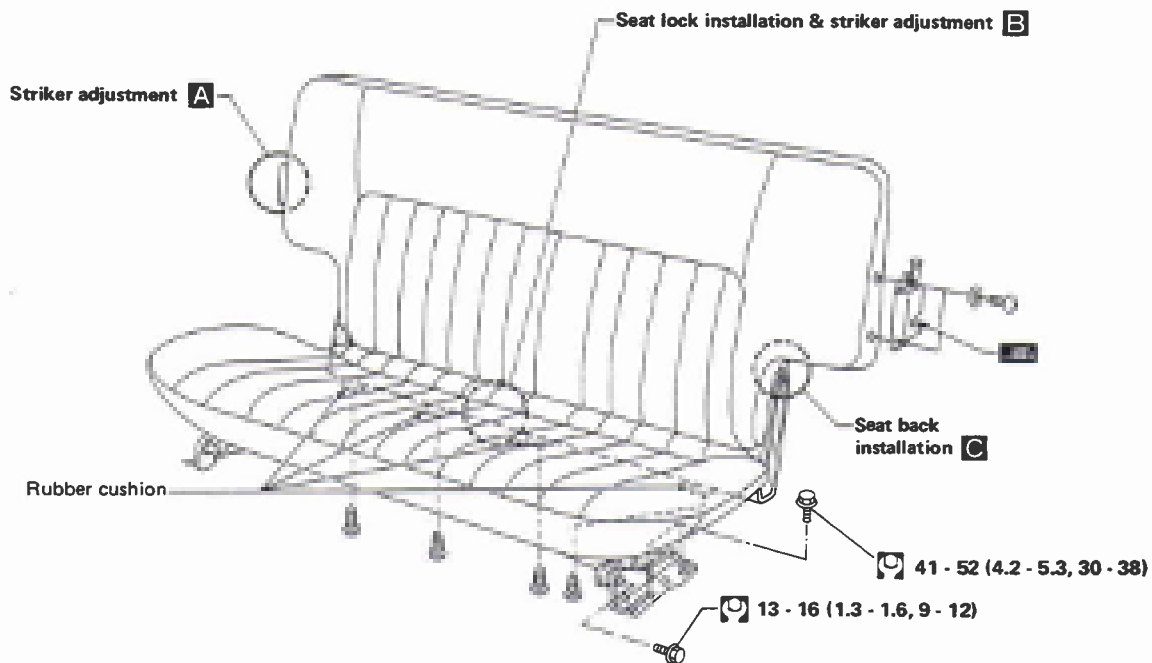
 : N·m (kg·m, ft·lb)

SBF976D

# SEAT

## 2nd Seat

TYPE 1



: N·m (kg·m, ft·lb)

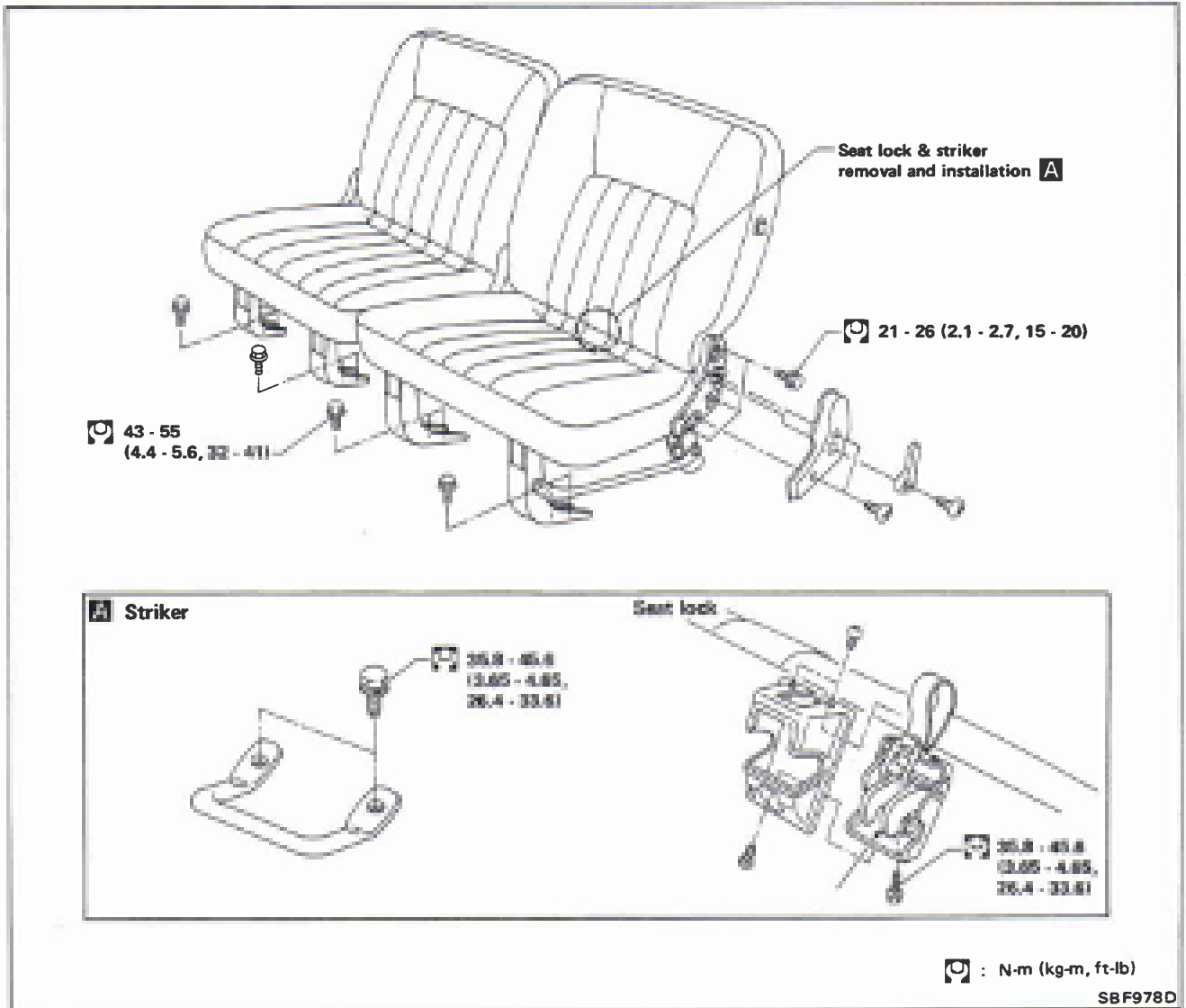
SBF977D

BF-35

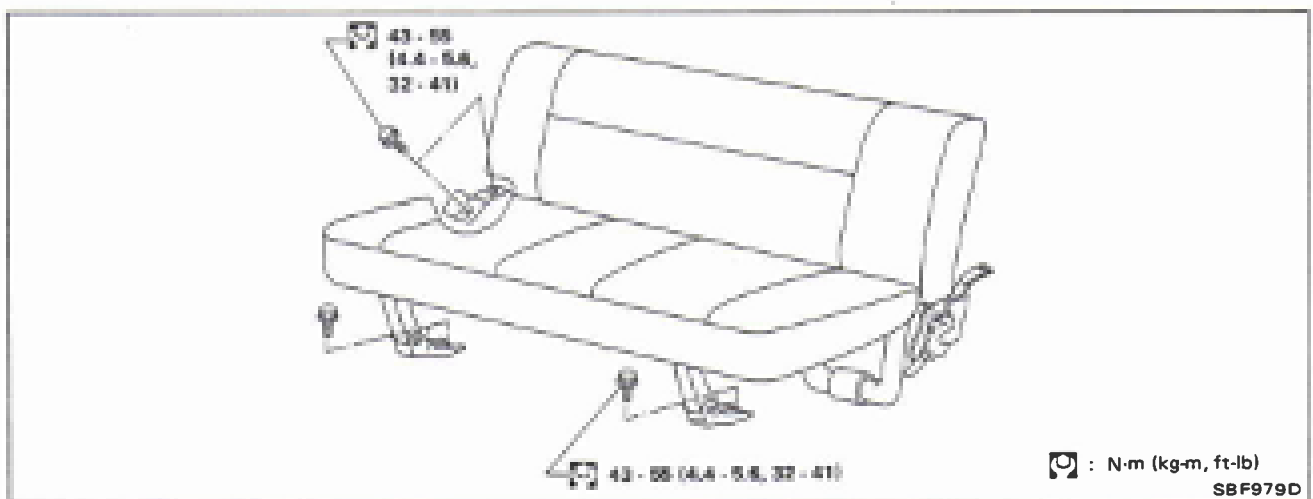
# SEAT

## 2nd Seat (Cont'd)

### TYPE 2



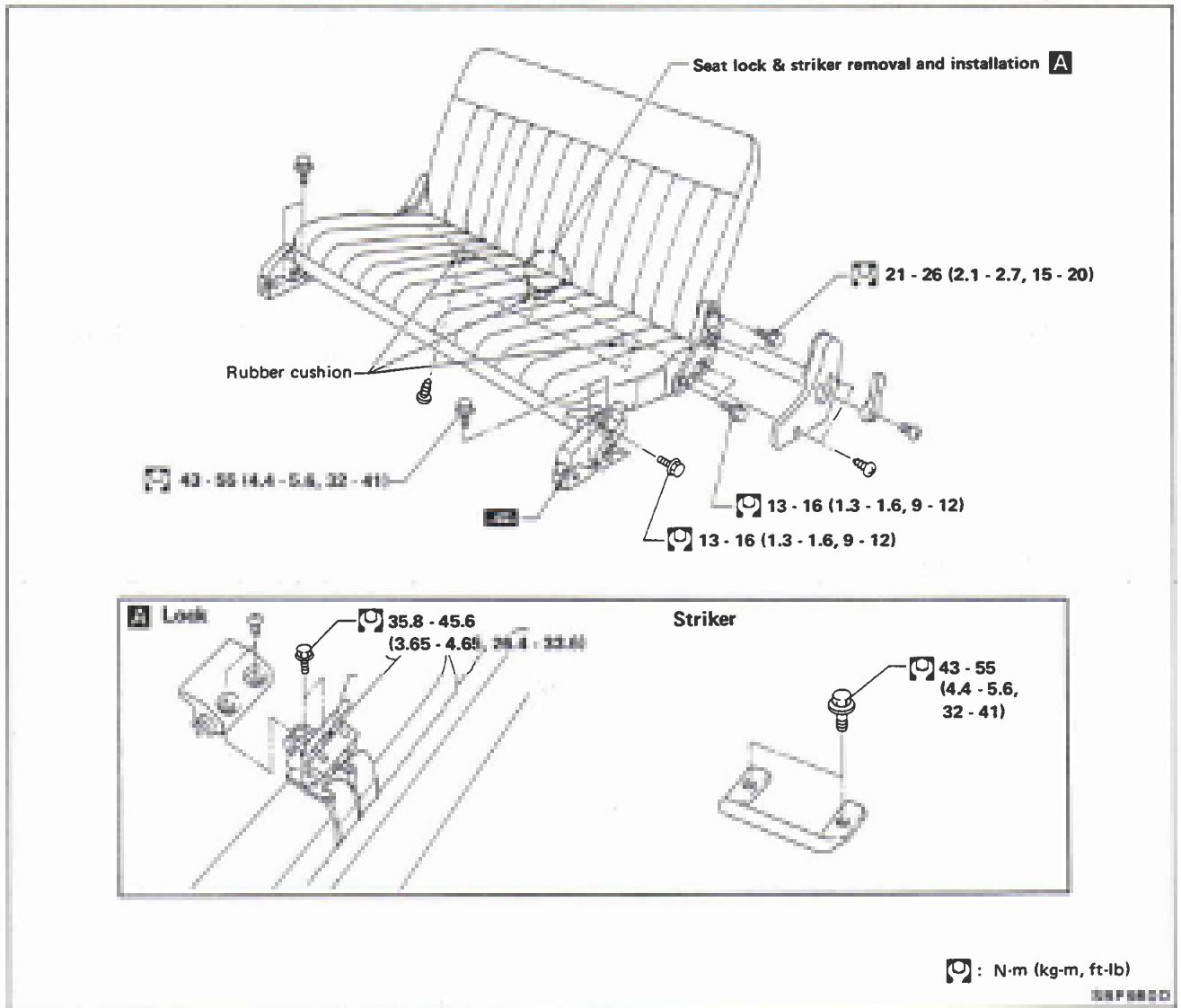
### TYPE 3



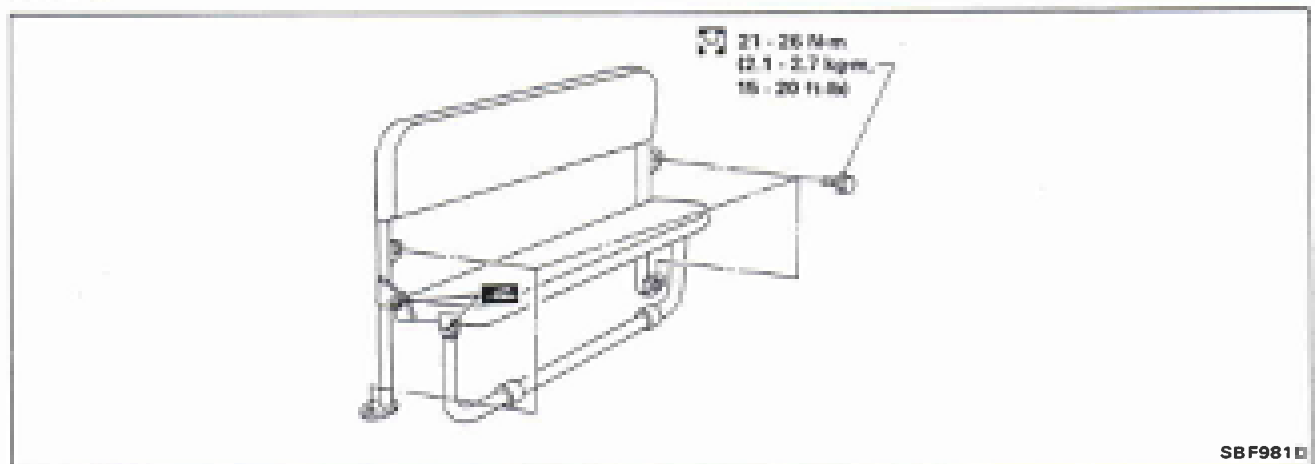
# SEAT

## 3rd Seat

### TYPE 1



### TYPE 2





## WINDSHIELD AND WINDOWS

### Windshield

A weatherstrip type mounting method has been adopted for mounting the windshield. Refer to Exterior ⑤ in INTERIOR AND EXTERIOR.

### Back Door Window

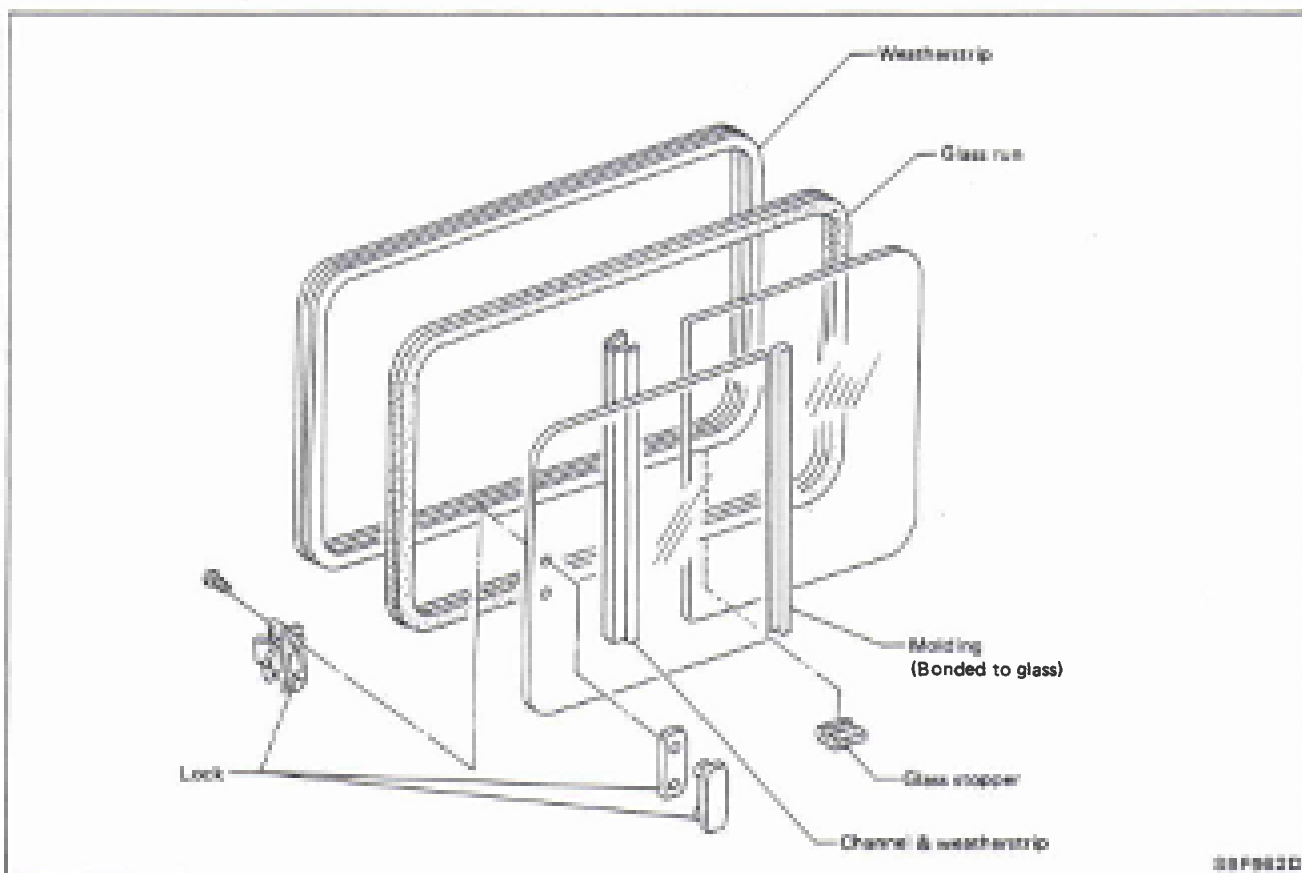
A weatherstrip type mounting method has been adopted for mounting the back door window. Refer to Exterior ⑥ in INTERIOR AND EXTERIOR.

### Rear Side Window

A weatherstrip type mounting method has been adopted for mounting the side window. Refer to Exterior ③ ④ in INTERIOR AND EXTERIOR.

### Rear Side Slide Window

#### REMOVAL AND INSTALLATION

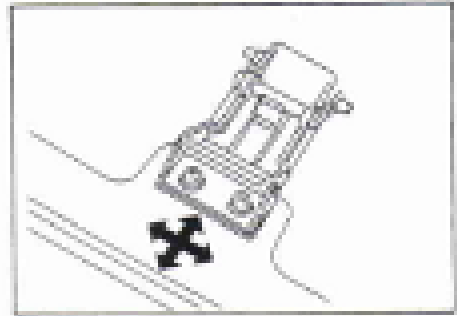


# SUN ROOF

## Manual Sun Roof

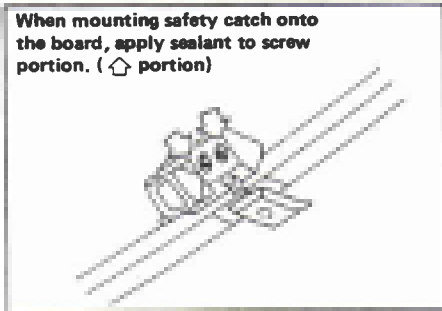
- Handle finisher plate and glass lid with care so as not to damage it.

Handle (Male side) adjustment



Safety catch installation

When mounting safety catch onto the board, apply sealant to screw portion. (△ portion)



Safety catch

Hinge

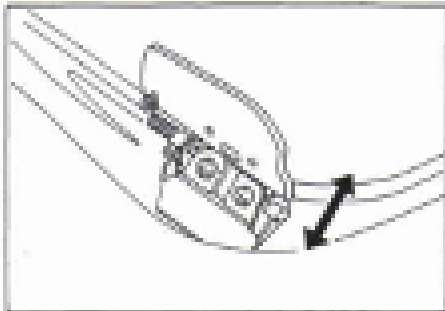
Hinge

Air deflector

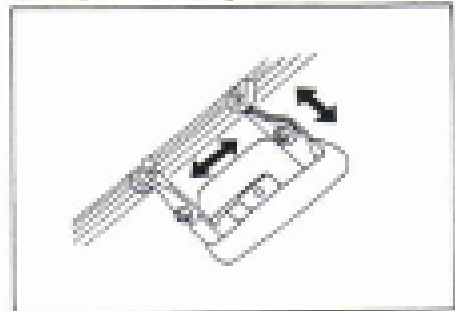
Handle base

Drain hose

Deflector adjustment



Handle (Female side) adjustment

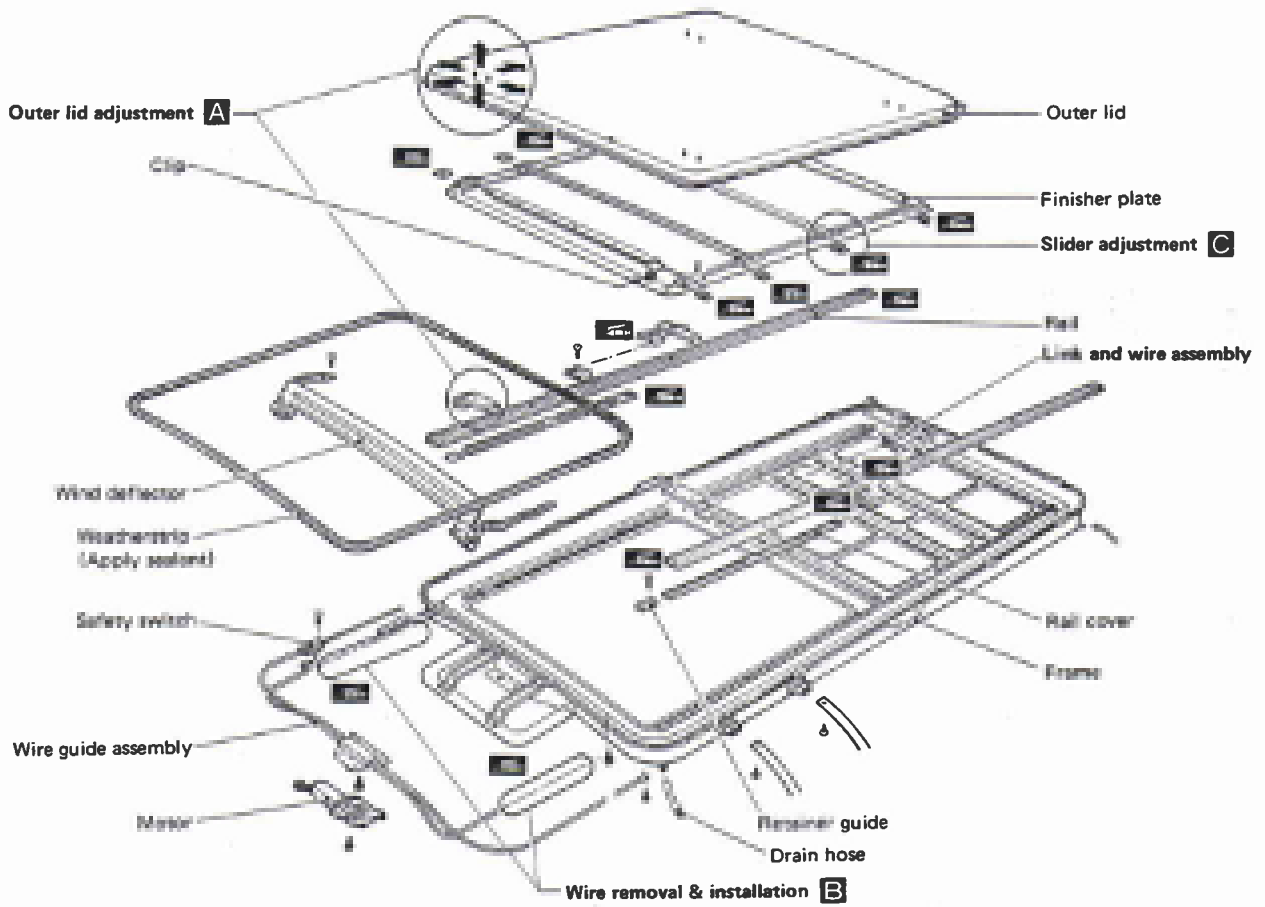


SBF523D

# SUN ROOF

## Electric Sun Roof

- Do not move or remove limit switch unless it is necessary.
- After adjustment, check sun roof operation and lid alignment.
- For easier installation, mark each point before removal.

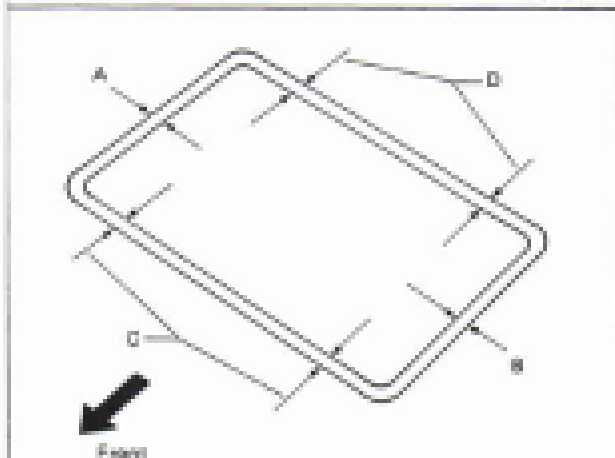
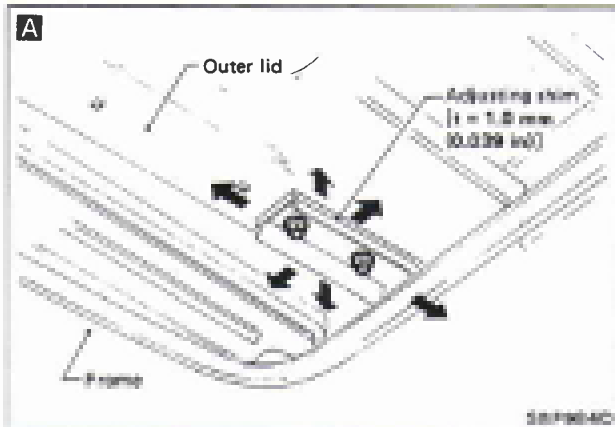


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# SUN ROOF

## Electric Sun Roof (Cont'd)

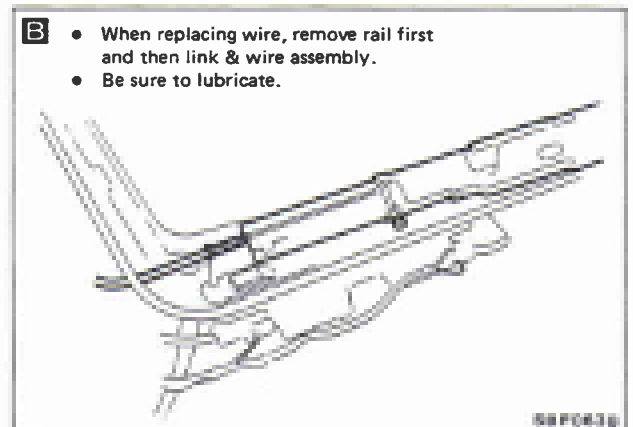
### Outer lid adjustment



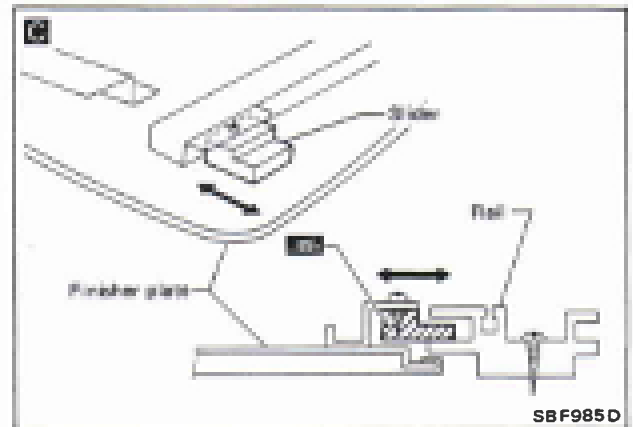
Adjust clearances (A) and (B) between outer lid and roof so they are equal. To close outer lid properly, adjust clearance (D) slightly wider than (C).  
 Make outer lid flush with roof within a tolerance of  
 $+2$  mm ( $+0.08$  in).  
 $-1$  mm ( $-0.04$  in).

SBF285B

### Wire removal & installation

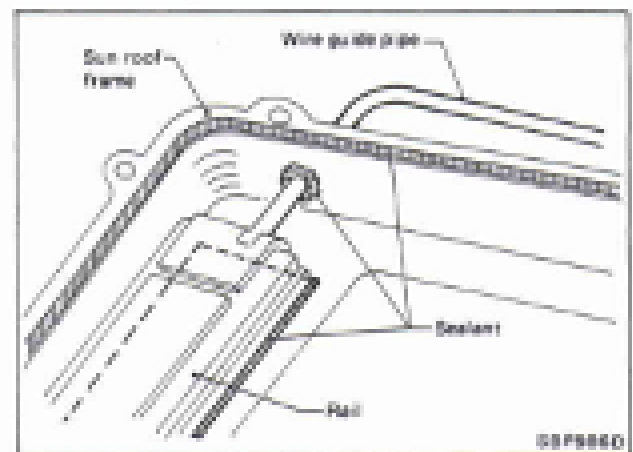


### Slider adjustment



SBF985D

### Apply sealant

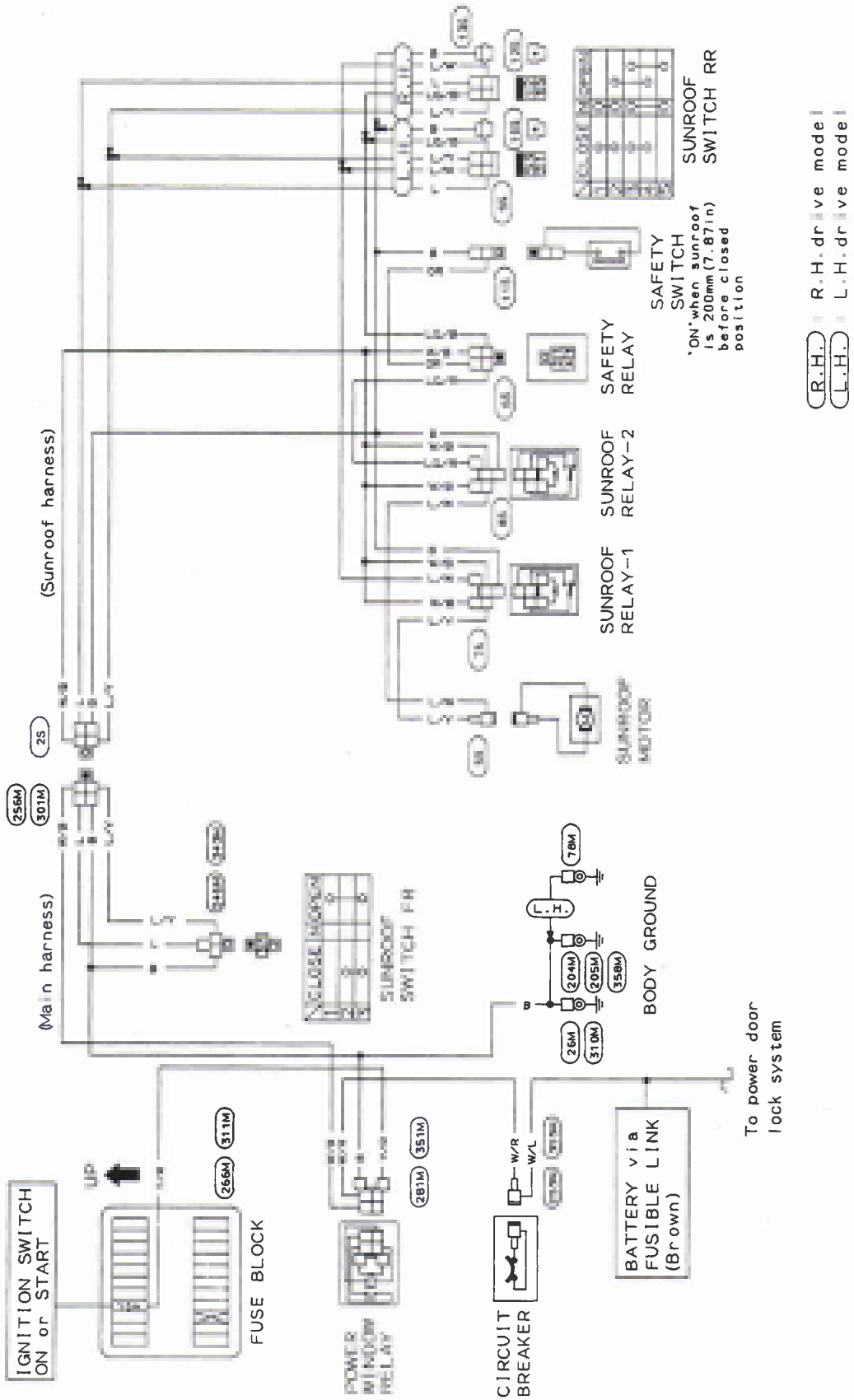


SBF986D

# SUN ROOF

## Electric Sun Roof (Cont'd)

### WIRING DIAGRAM



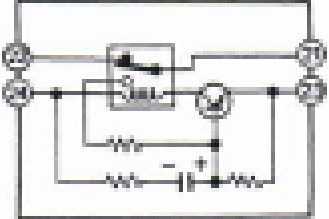
# SUN ROOF

## Electric Sun Roof (Cont'd)

### SAFETY RELAY INSPECTION

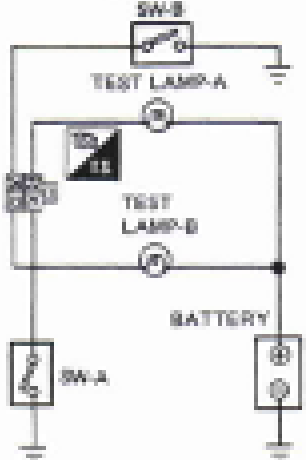
**SAFETY RELAY**

REMARKS	
Connections	Harness color
21 To sun roof SW ③ (Close)	L/Y
22 From slide relay-close	Y/B
23 Power source (IGN)	W/R
24 To safety limit SW ①	L/W



Internal modelized circuit

**INSPECTION CIRCUIT**  
(This test circuit must be made by the technician.)



**Safety relay operation**

SW-A operating condition	OFF	Turn ON	ON	Turn OFF	Turn ON
SW-B operating condition	OFF	OFF	Turn ON	ON	ON
Safety relay operation					
Test lamp-A	OFF	Turn ON	Turn OFF	OFF	Turn ON
Test lamp-B	OFF	OFF	Turn ON	Turn OFF	OFF

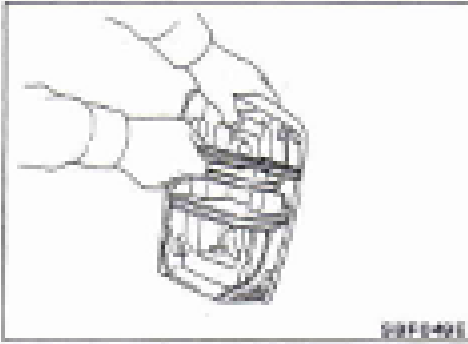
Carry out this inspection in this chart from left to right continuously.

When current flows excessively, circuit breaker will cut off current to prevent damage to the system.

## REAR COMBINATION LAMP

### Rear Combination Lamp Lens Installation

Remove fragments of rear combination lamp lens using pliers.

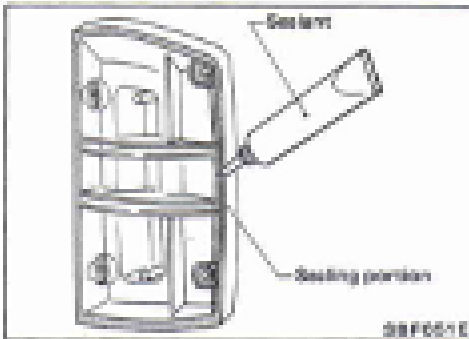


Remove remaining sealant using soldering iron.

Soldering iron should be hot enough to melt lens fragments.



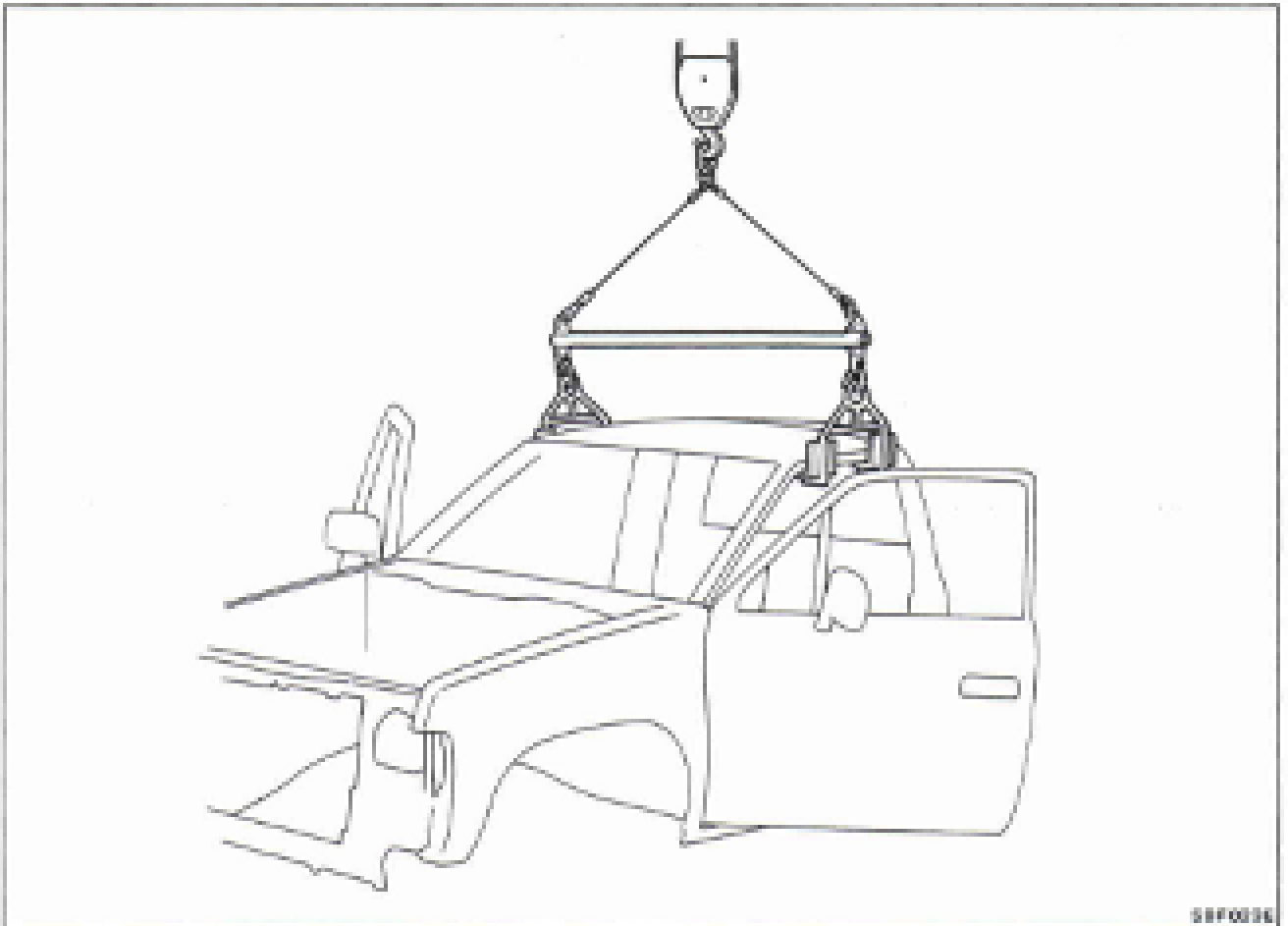
Apply Nissan Genuine Sealant (Part No. B6553-89985) or equivalent. Then fit housing with lens.



## CAB AND REAR BODY

### Cab Body — PICKUP

- Remove following parts in engine room at least.
  - (1) Main harness and other wiring harness
- Disconnect brake and clutch line in engine compartment.
- Remove following parts under body at least.
  - (1) Transmission and transfer control levers
  - (2) Hand brake control lever and cable
  - (3) Main harness and other wiring harness



88F0236

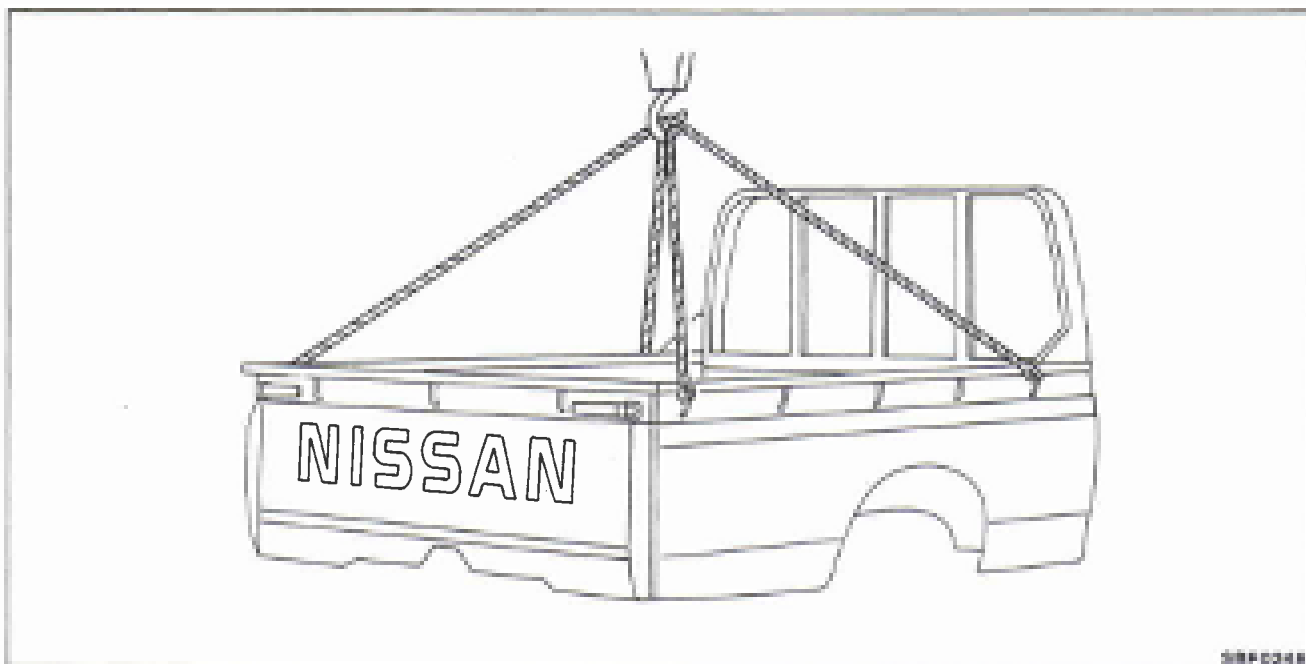


## CAB AND REAR BODY

---

### Rear Body — PICKUP

- Remove following parts at least.
  - (1) Rear combination lamp and license plate lamp harness.
  - (2) Fuel filler tube fixing screws.



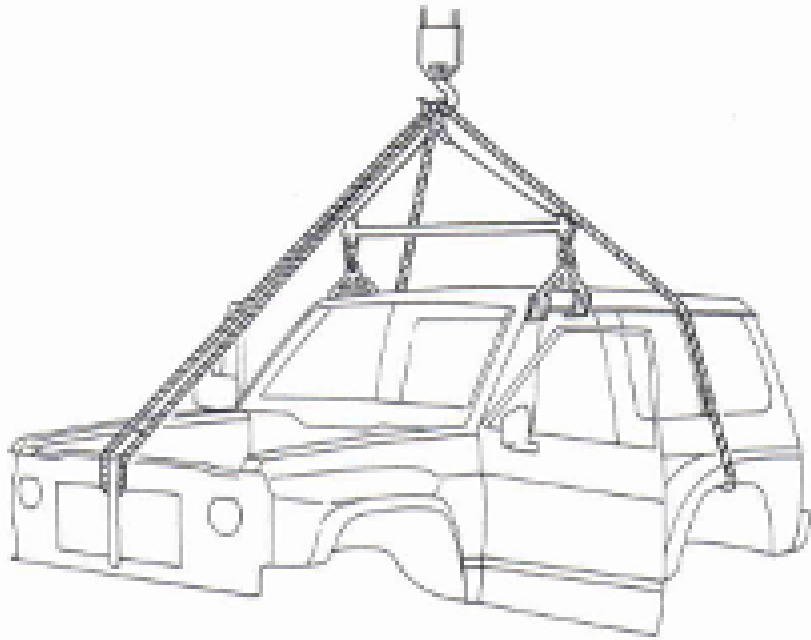
28P0088

## CAB AND REAR BODY

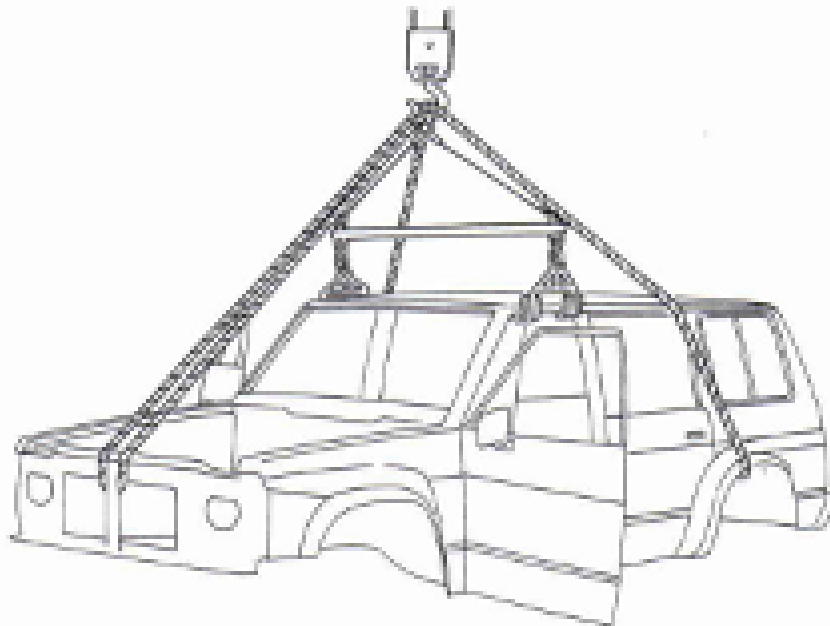
### Cab Body — WAGON & HARDTOP

- Remove following parts in engine room at least.
  - (1) Main harness and other wiring harness
- Disconnect brake and clutch line in engine compartment.
- Remove following parts under body at least.
  - (1) Transmission and transfer control levers
  - (2) Hand brake control lever and cable
  - (3) Main harness and other wiring harness
- Remove seat belt anchor bolt.

Hardtop model



Wagon model

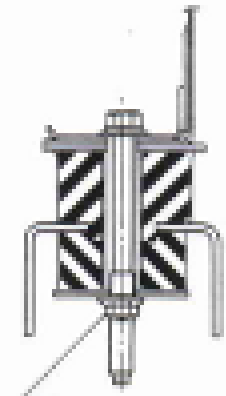
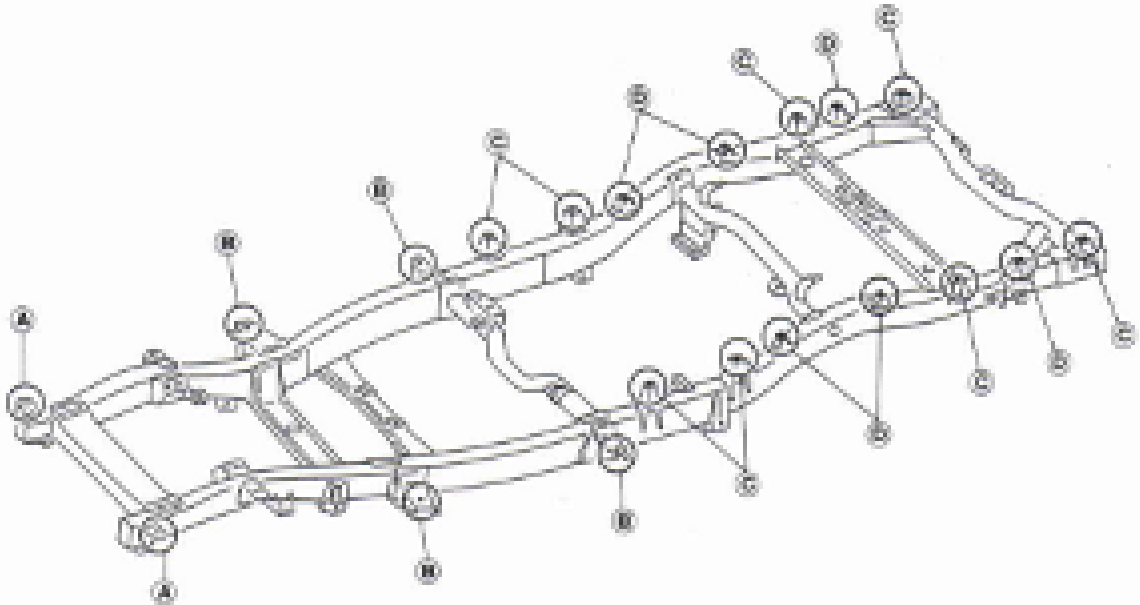


38F0288

# CAB AND REAR BODY

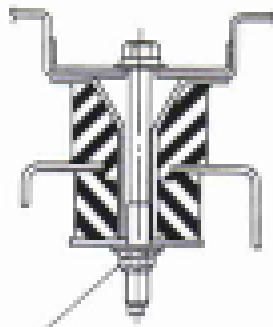
## Body Mounting — PICKUP

When removing, be sure to replace bolts and nuts (sealant applied bolts or self-lock nuts are used for all mounting).



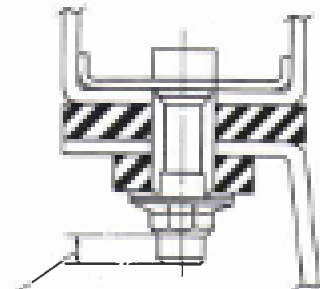
43 - 55  
(4.4 - 5.6, 32 - 41)

Section (A)



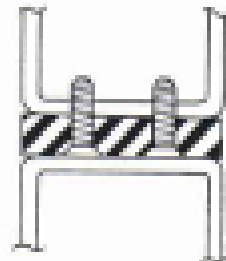
43 - 55  
(4.4 - 5.6, 32 - 41)

Section (B)



Tighten nut until bolt thread  
protrudes 3 to 3.5 mm (0.118 to 0.138 in).

Section (C)



Section (D)

 : N-m (kg-m, ft-lb)

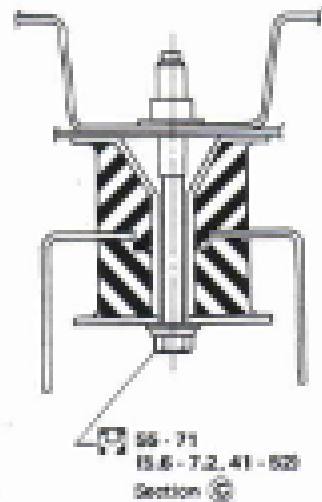
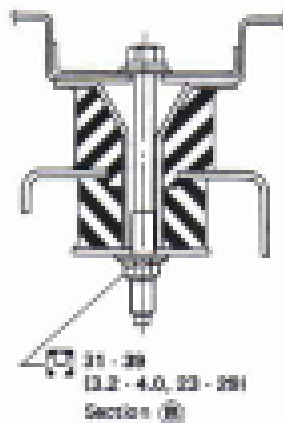
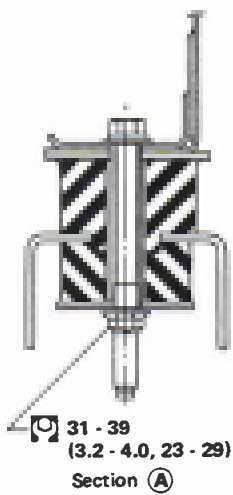
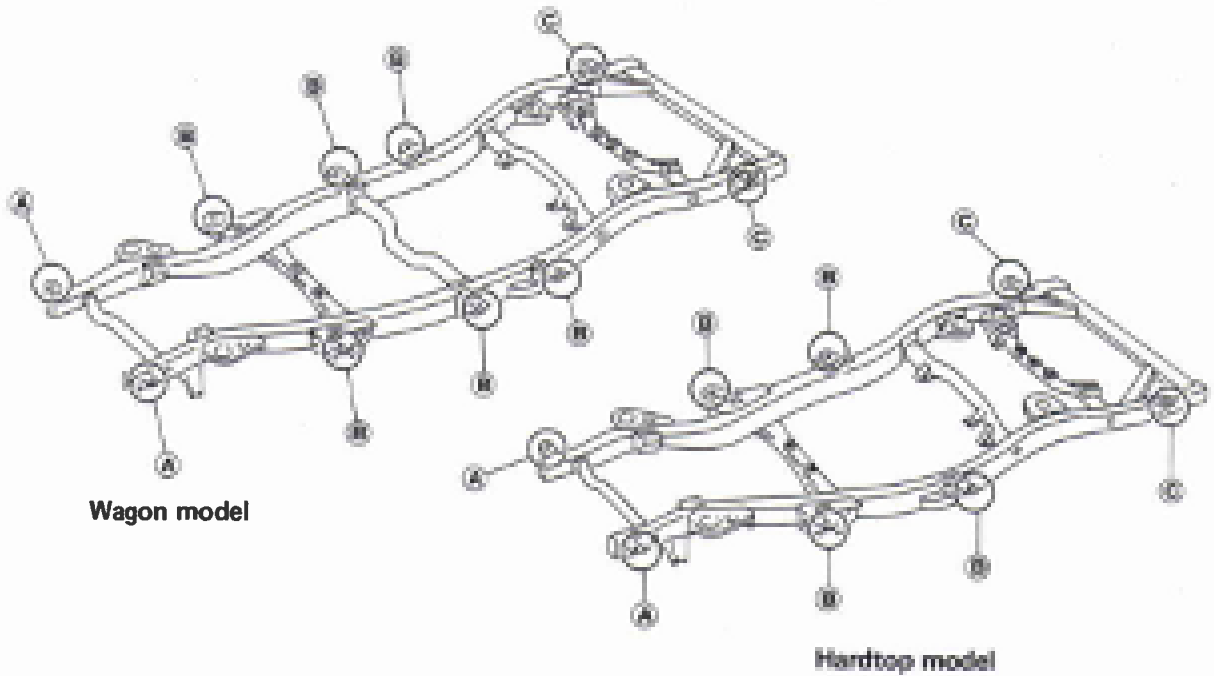
SBF002E

BF-48

# CAB AND REAR BODY

## Body Mounting — WAGON & HARDTOP

When removing, be sure to replace bolts and nuts (sealant applied bolts or self-lock nuts are used for all mounting).



 : N-m (kg-m, ft-lb)

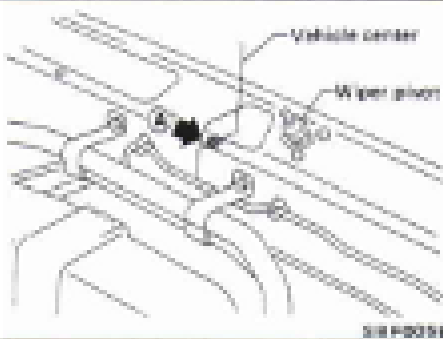
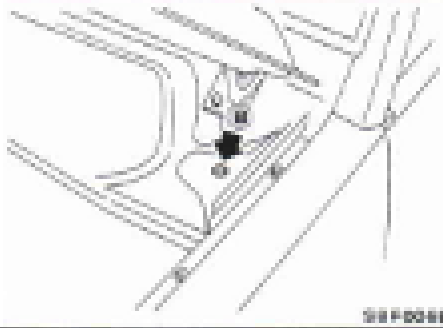
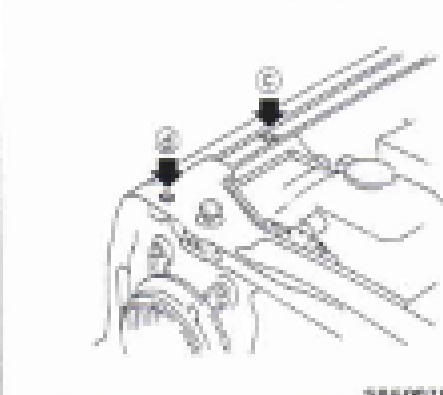
SBF003E



## BODY ALIGNMENT

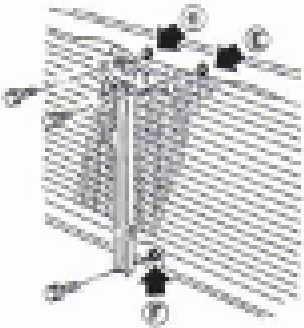

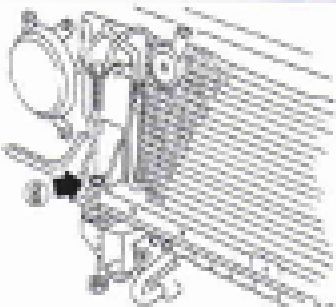
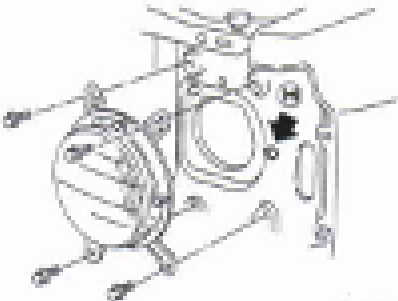
### Engine Compartment (Cont'd)

#### DETAILED MEASUREMENT POINTS

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"X"	"Y"	"Z"
Ⓐ	6 (0.24)		Cowl top clip mounting hole at vehicle center	0.0 (0.00)	<b>MH:</b> 530.5 (20.89) <b>P:</b> 630.5 (24.82)	1,001.6 (39.43)
Ⓑ Ⓑ	16 (0.63)		Cowl top side hole	650 (25.59)	<b>MH:</b> 480 (18.90) <b>P:</b> 580 (22.83)	904.8 (35.62)
Ⓒ Ⓒ	6 (0.24)		Front fender mounting hole	721.0 (28.39)	<b>MH:</b> -320 (-12.60) <b>P:</b> -220 (-8.66)	857.0 (33.74)
Ⓓ Ⓓ	6 (0.24)			701.5 (27.62)	<b>MH:</b> -535 (-21.06) <b>P:</b> -420 (-16.54)	839.2 (33.04)

## BODY ALIGNMENT

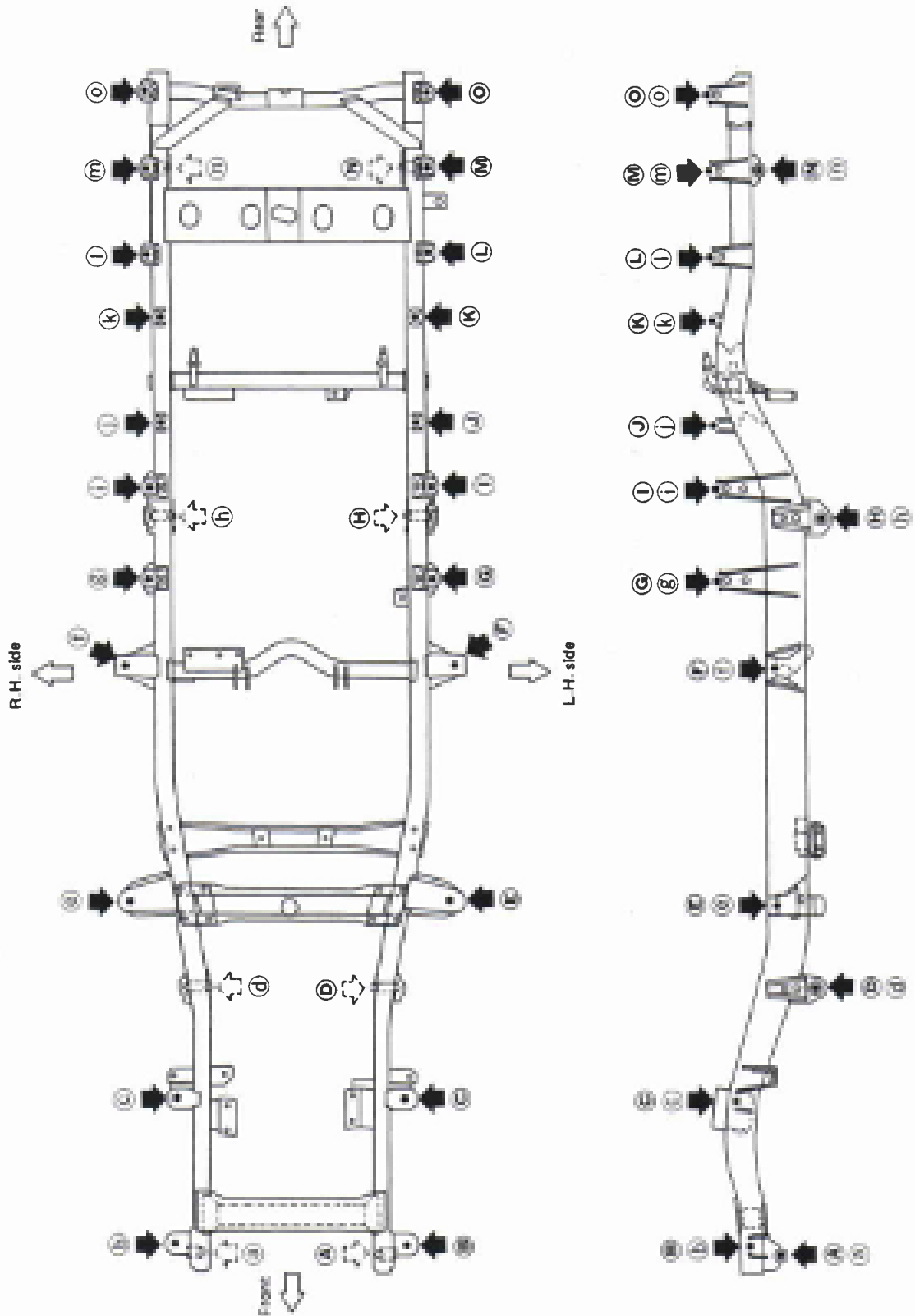
### Engine Compartment (Cont'd)

Points	Hole dia. mm (in)	Detailed points	Coordinates mm (in)			
			"X"	"Y"	"Z"	
E e	12 (0.47)		Hood lock stay mounting hole on radiator core upper support	64.5 (2.54)	<b>WH</b> : -557.2 (-21.94) <b>P</b> : -457.2 (-18.00)	818.5 (32.22)
			F	6 (0.24)		Hood lock stay mounting hole at radiator core lower support
G g	30 (1.18)		First body mounting hole	455 (17.91)	<b>WH</b> : -575 (-22.64) <b>P</b> : -475 (-18.70)	434.4 (17.10)
H h	<b>WH</b> : 14 (0.55) <b>P</b> : 15 (0.59)		Headlamp adjusting screw hole on radiator core support	<b>WH</b> : 720 (28.35) <b>P</b> : 748 (29.45)	<b>WH</b> : -545 (-21.46) <b>P</b> : -445 (-17.52)	<b>WH</b> : 651 (25.63) <b>P</b> : 676 (26.61)

# BODY ALIGNMENT

## Underbody — PICKUP

### MEASUREMENT POINTS



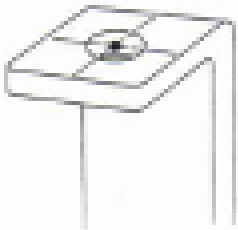




## BODY ALIGNMENT

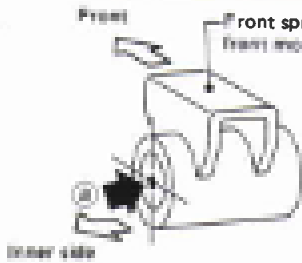


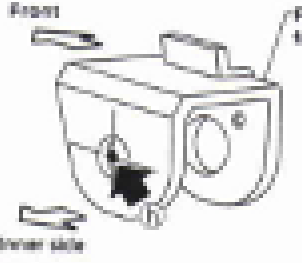
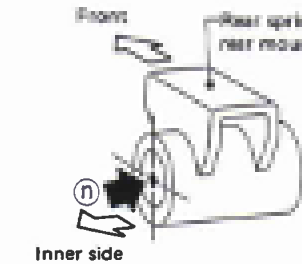
### Underbody — PICKUP (Cont'd)

#### DETAILED MEASUREMENT POINTS

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"X"	"Y"	"Z"
Ⓑ ⓑ	32 (1.26)	 <p style="text-align: center;">SBF274B</p>	Cab body or rear body mounting hole	455 (17.91)	-475 (-18.70)	344 (13.54)
Ⓔ ⓔ	32 (1.26)			630 (24.80)	885 (34.84)	213.1 (8.39)
Ⓕ ⓕ	32 (1.26)			654 (25.75)	1,800 (70.87)	215.4 (8.48)
Ⓖ ⓖ	15 x 23 (0.59 x 0.91)			560 (22.05)	2,138 (84.17)	434 (17.09)
Ⓘ ⓓ	15 x 23 (0.59 x 0.91)			560 (22.05)	2,505 (98.62)	434 (17.09)
Ⓙ ⓙ	12 (0.47)			505 (19.88)	2,760 (108.66)	434 (17.09)
Ⓚ ⓚ	12 (0.47)			505 (19.88)	3,172 (124.88)	434 (17.09)
Ⓛ ⓗ	15 x 23 (0.59 x 0.91)			560 (22.05)	3,424 (134.80)	434 (17.09)
Ⓜ Ⓣ	15 x 23 (0.59 x 0.91)			560 (22.05)	3,755 (147.83)	434 (17.09)
ⓐ ⓞ	15 (0.59)			560 (22.05)	4,057 (159.72)	434 (17.09)

# BODY ALIGNMENT

## Underbody — PICKUP (Cont'd)

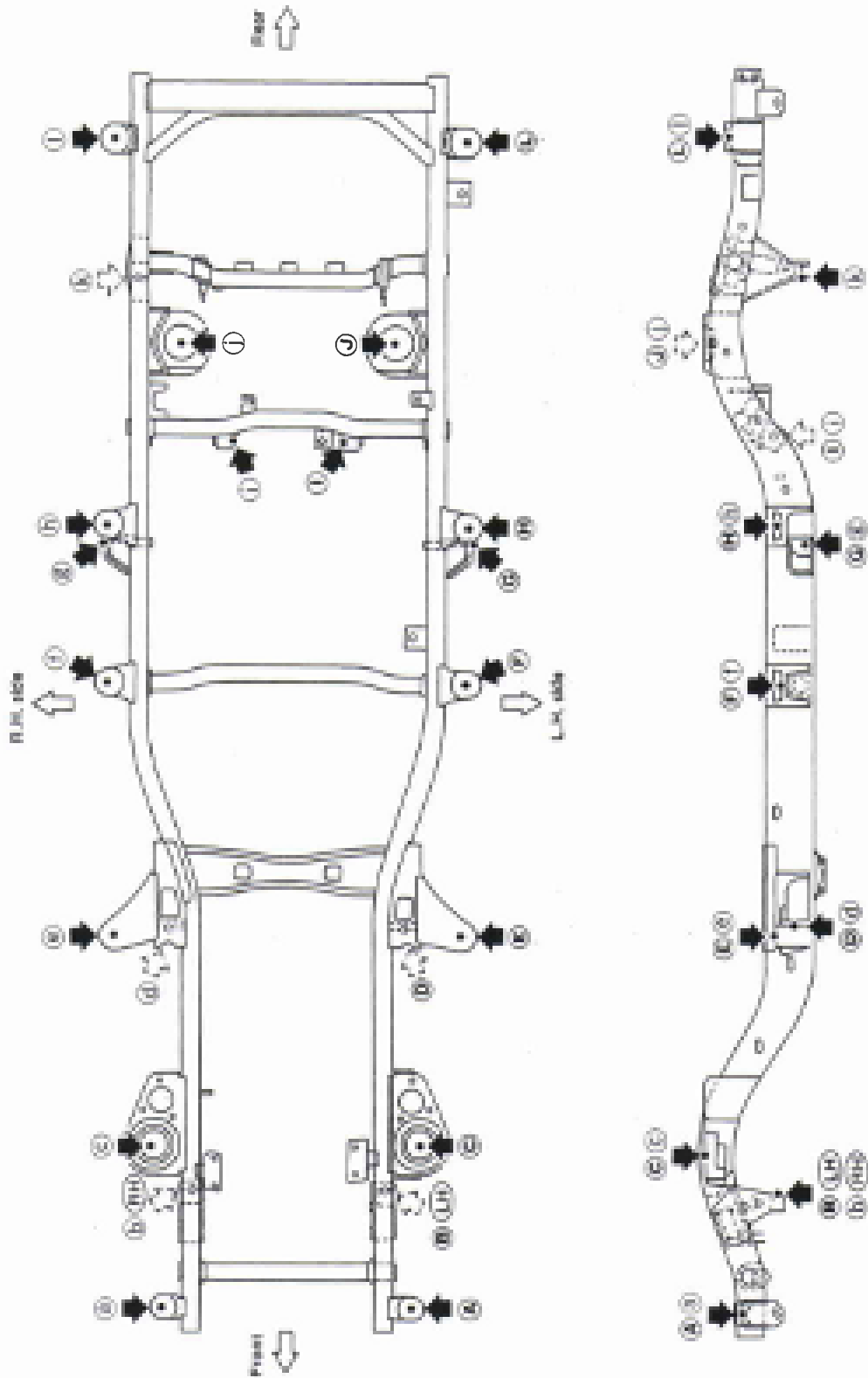
Points	Hole dia. mm (in)	Detailed points	Coordinates mm (in)			
			"X"	"Y"	"Z"	
Ⓐ ⓐ	35 (1.38)	 <p>Front Front spring front mounting Inner side</p> <p style="text-align: right;">SBF670C</p>	Front spring front mounting hole	342 (13.46)	-510 (-20.08)	209 (8.23)
Ⓒ Ⓒ	15.3 (0.602)	 <p>Front shock absorber mounting</p> <p style="text-align: right;">SBF670C</p>	Front shock absorber mounting hole	457 (17.99)	106 (4.17)	385 (15.16)
Ⓓ Ⓓ	14 (0.55)	 <p>Front Front spring rear mounting Inner side</p> <p style="text-align: right;">SBF669C</p>	Front spring rear mounting hole	330 (12.99)	542 (21.34)	67 (2.64)
Ⓗ Ⓗ	14 (0.55)	 <p>Front Rear spring front mounting Inner side</p> <p style="text-align: right;">SBF669C</p>	Rear spring front mounting hole	463 (18.23)	2,386 (93.94)	30 (1.18)
Ⓔ Ⓝ	35 (1.38)	 <p>Front Rear spring rear mounting Inner side</p> <p style="text-align: right;">SBF670C</p>	Rear spring rear mounting hole	475 (18.70)	3,755 (147.83)	243 (9.57)

# BODY ALIGNMENT

## Underbody — WAGON & HARDTOP

### MEASUREMENT POINTS

Wagon model



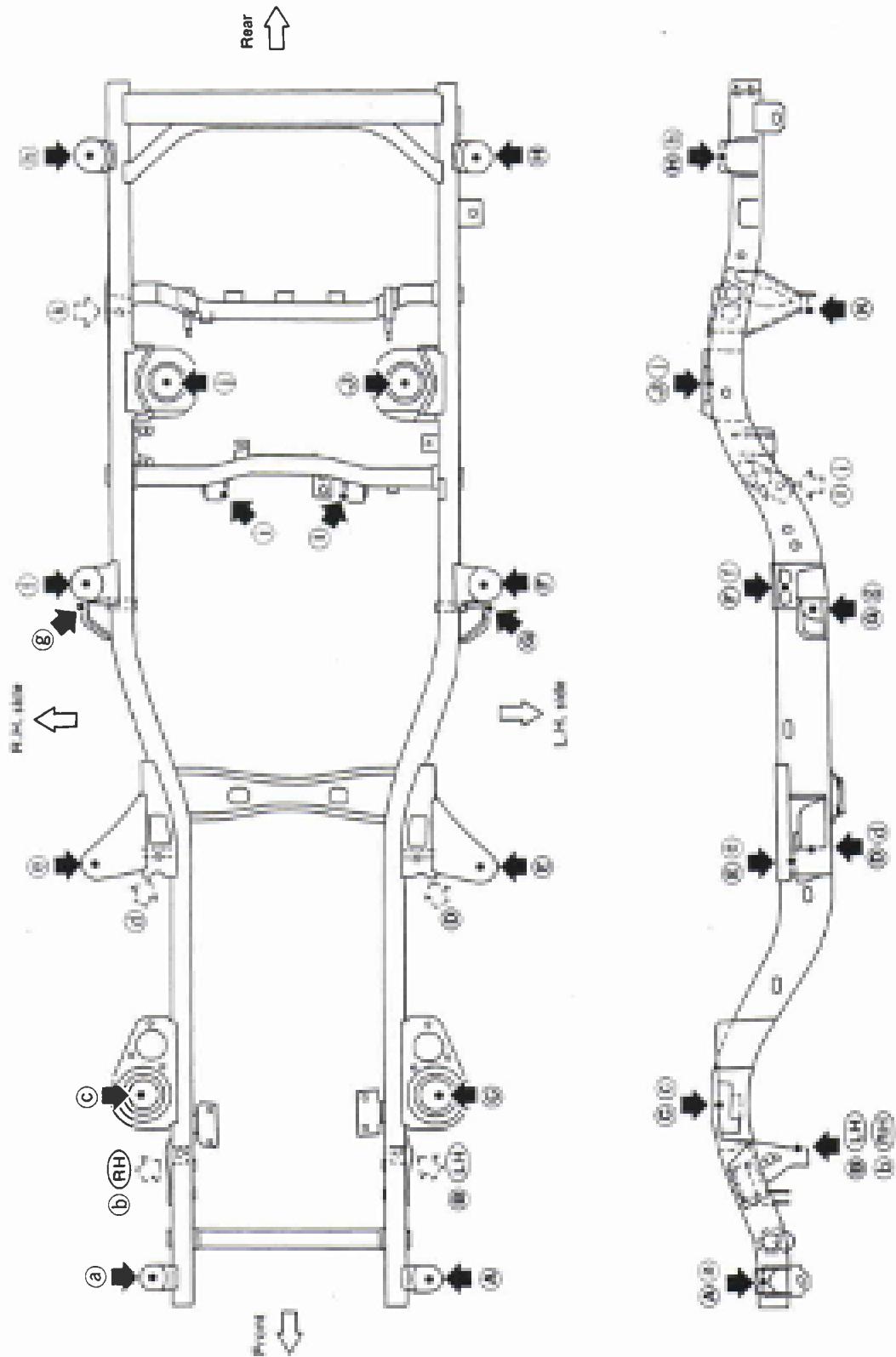


# BODY ALIGNMENT

## Underbody — WAGON & HARDTOP (Cont'd)

### MEASUREMENT POINTS

Hardtop model



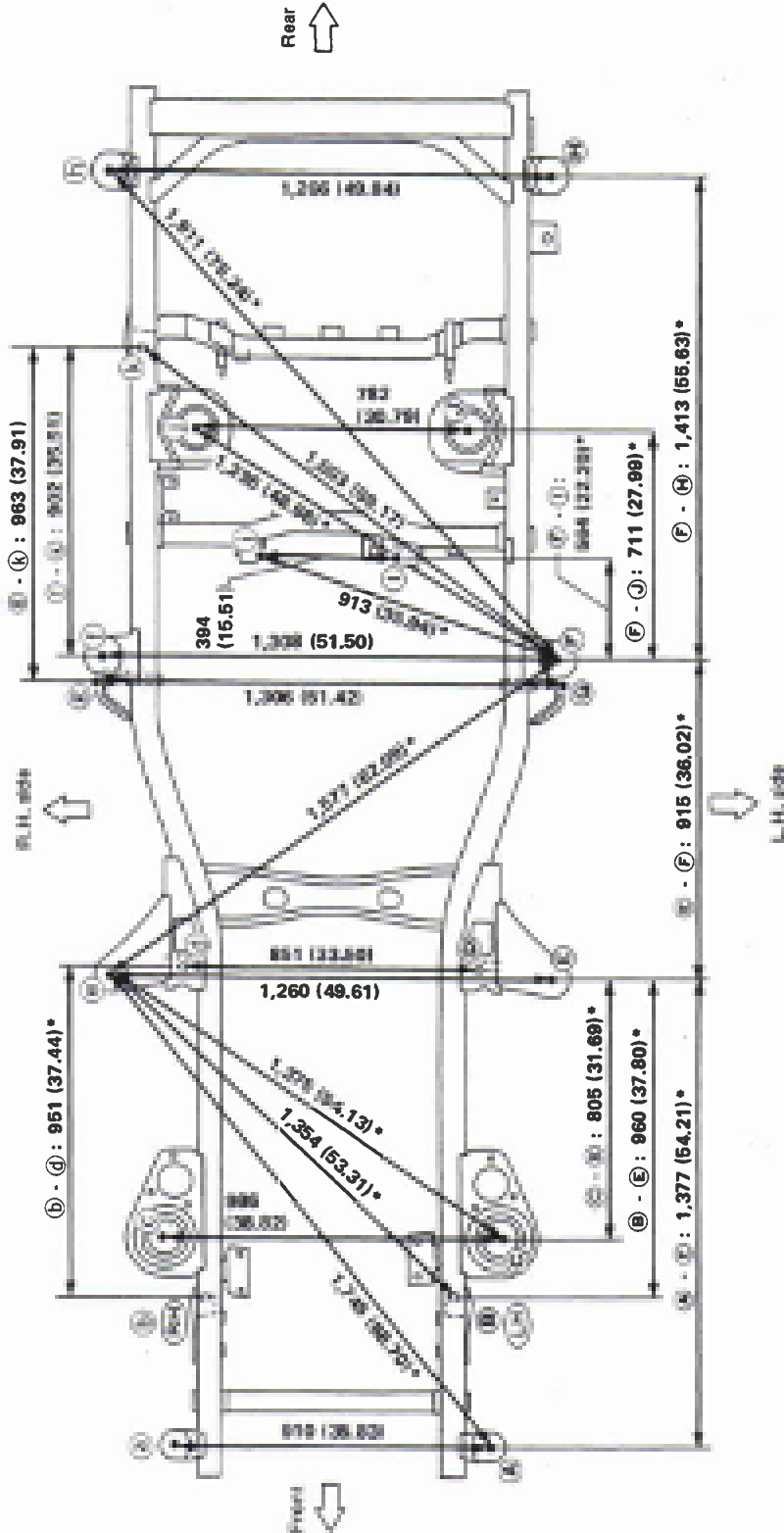
# BODY ALIGNMENT

## Underbody — WAGON & HARDTOP (Cont'd)

### MEASUREMENT

#### Hardtop model

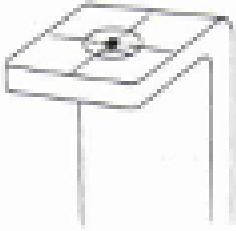
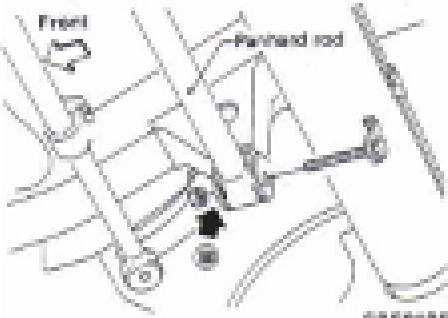
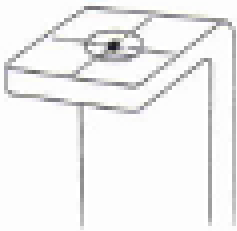
- For L.H. drive model, it is basically same as one for R.H. drive model.



## BODY ALIGNMENT

### Underbody — WAGON & HARDTOP (Cont'd)


#### DETAILED MEASUREMENT POINTS

Points	Hole dia. mm (in)	Detailed points	Coordinates mm (in)		
			"X"	"Y"	"Z"
Ⓐ ⓐ	34 (1.34)	 <p style="text-align: right;">88P2148</p>	455 (17.91)	-575 (-22.64)	343.8 (13.54)
Ⓔ ⓔ	34 (1.34)		630 (24.80)	785 (30.91)	215.4 (8.48)
Ⓕ ⓕ	32 (1.26)		654 (25.75)	1,700 (66.93)	213.4 (8.40)
Ⓗ ⓗ	32 (1.26)		Ⓜ : 654 (25.75) ⓗ : 633 (24.92)	Ⓜ : 2,270 (89.37) ⓗ : 3,097 (121.93)	Ⓜ : 213.4 (8.40) ⓗ : 422.6 (16.64)
Ⓛ ⓘ	32 (1.26)		Ⓜ : 633 (24.92)	Ⓜ : 3,667 (144.37)	Ⓜ : 422.6 (16.64)
Ⓑ Ⓛⓗ ⓓ Ⓡⓗ	14 (0.55)	 <p style="text-align: right;">88P2188</p>	361.4 (14.23)	-137.1 (-5.40)	215 (8.46)
Ⓒ Ⓒ	11 (0.43)	 <p style="text-align: right;">88P2188</p>	493 (19.41)	25.5 (1.004)	443.6 (17.46)



## BODY ALIGNMENT

### Underbody — WAGON & HARDTOP (Cont'd)

Points	Hole dia. mm (in)	Detailed points	Coordinates mm (in)			
			"X"	"Y"	"Z"	
Ⓚ	14.5 (0.571)		Rear panhard rod mounting hole	552.4 (21.75)	W : 3,164.1 (124.57) H : 2,594 (102.13)	148 (5.83)

# HEATER & AIR CONDITIONER

## SECTION **HA**

### CONTENTS

AIR FLOW AND COMPONENT LAYOUT .....	HA- 2
DOOR CONTROL .....	HA- 6
HEATER ELECTRICAL CIRCUIT .....	HA- 9
PRECAUTIONS .....	HA-11
PRECAUTIONS FOR REFRIGERANT CONNECTION .....	HA-12
PREPARATION .....	HA-13
DISCHARGING, EVACUATING, CHARGING AND CHECKING .....	HA-16
SERVICE PROCEDURES .....	HA-22
DESCRIPTION OF AIR CONDITIONER .....	HA-32
A/C PERFORMANCE TEST .....	HA-34
COMPRESSOR OIL – For DKS-16H (DIESEL-KIKI make) .....	HA-41
COMPRESSOR – Model DKS-16H (DIESEL-KIKI make) .....	HA-43
A/C ELECTRICAL CIRCUIT .....	HA-51
A/C ELECTRICAL COMPONENTS .....	HA-54
A/C COMPONENT LAYOUT .....	HA-58
TROUBLE DIAGNOSES .....	HA-60
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	HA-77

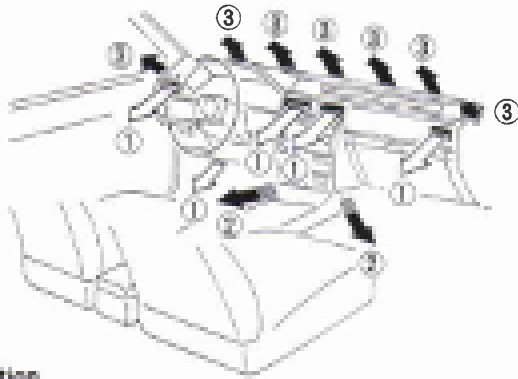
**When you read wiring diagrams:**

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

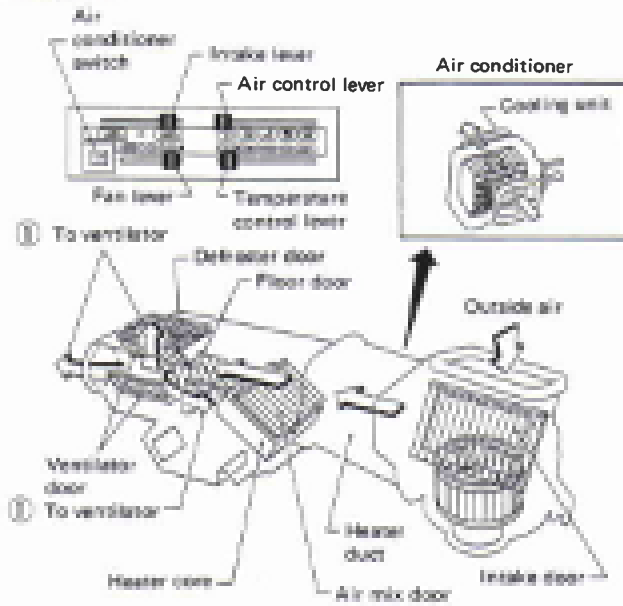
# AIR FLOW AND COMPONENT LAYOUT

## Air Flow

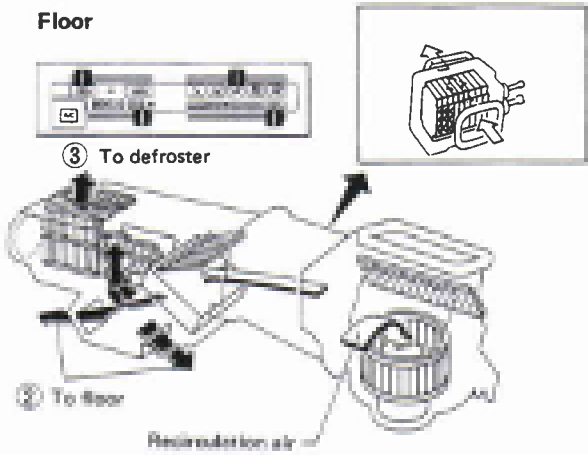
### FOR L.H. DRIVE MODEL



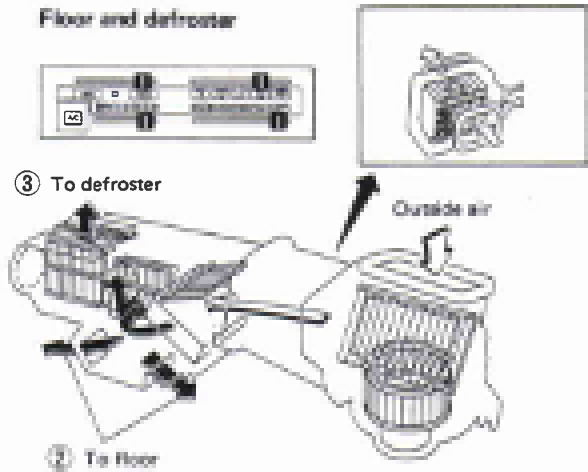
#### Ventilation



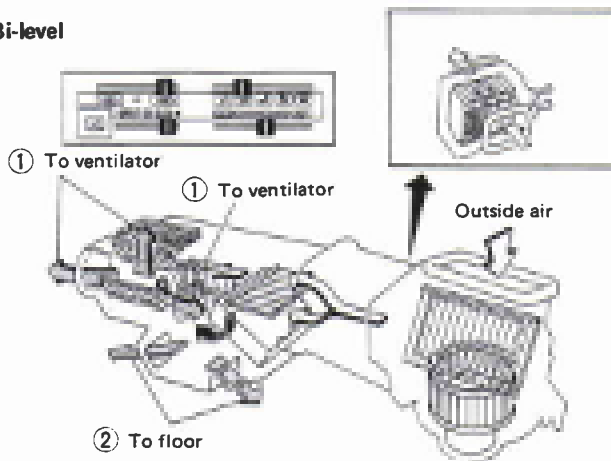
#### Floor



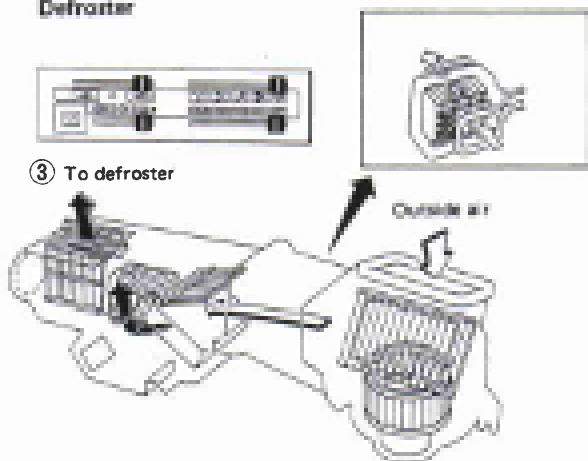
#### Floor and defroster



#### Bi-level



#### Defroster



← : Air passed through heater core

← + ← : Mixed air ( ← + ← )

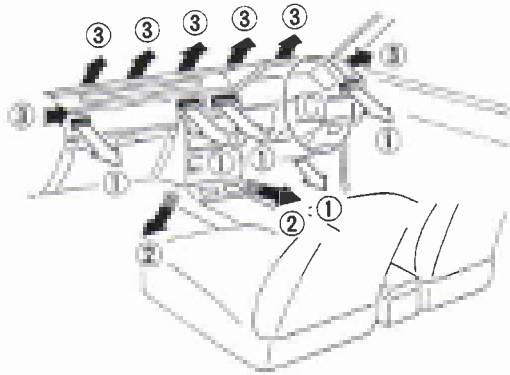
← : Air not passed through heater core

RHA052A

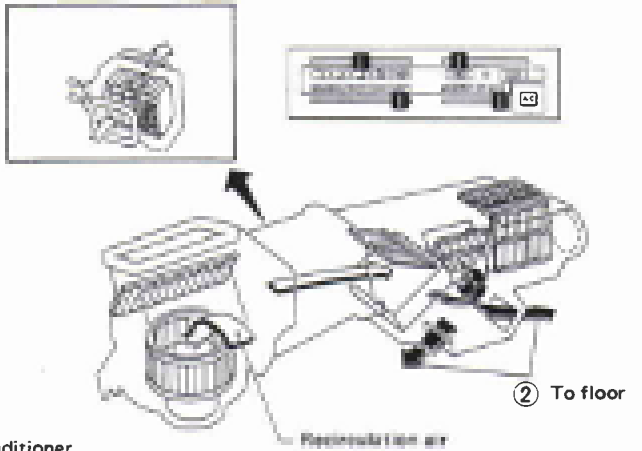
# AIR FLOW AND COMPONENT LAYOUT

## Air Flow (Cont'd)

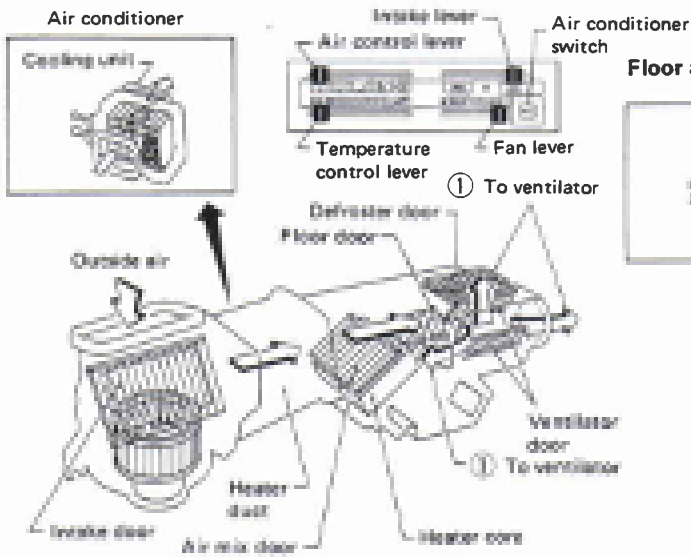
### FOR R.H. DRIVE MODEL



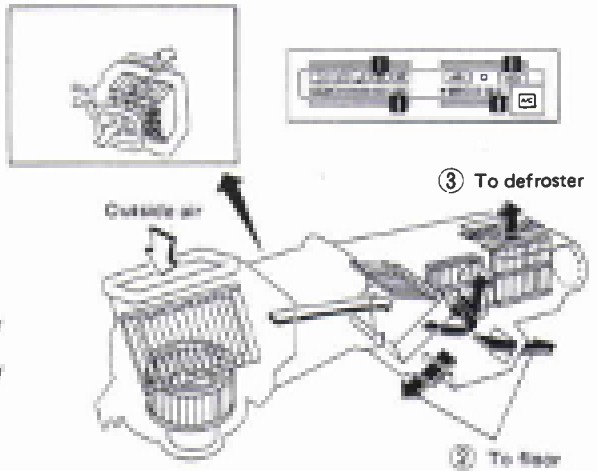
#### Floor



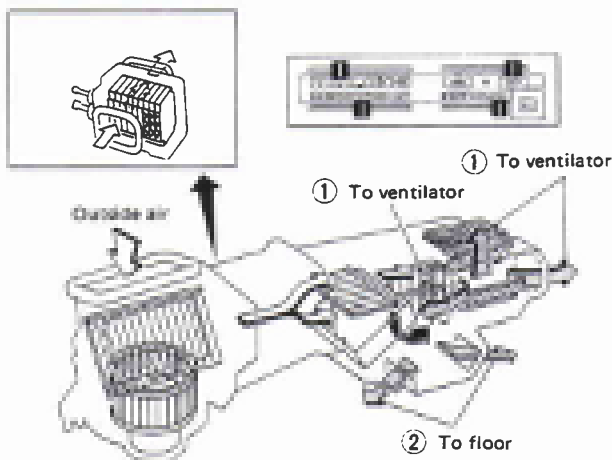
#### Ventilation



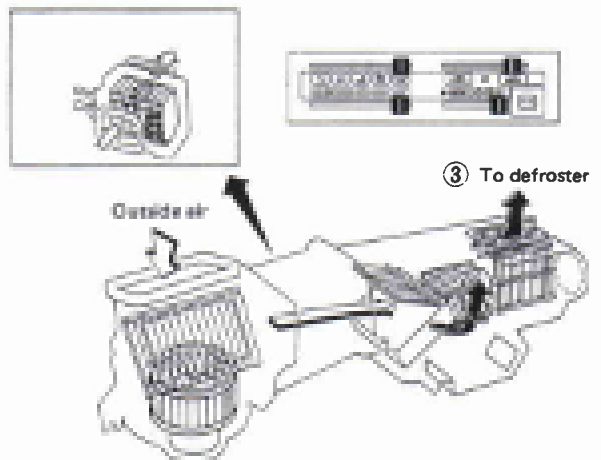
#### Floor and defroster



#### Bi-level



#### Defroster



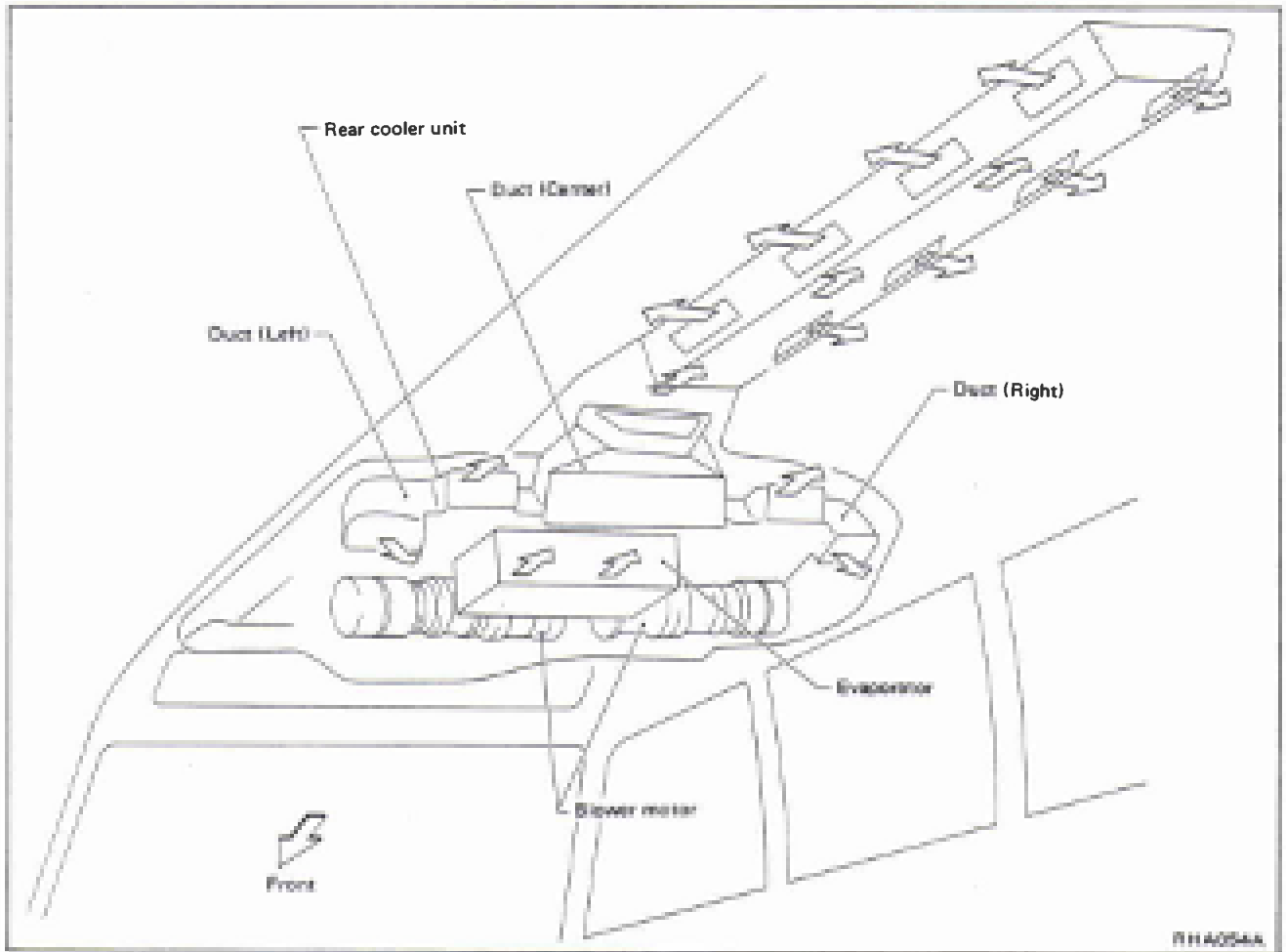
- ← : Air passed through heater core
- ↔ : Mixed air ( ← + → )
- ⇐ : Air not passed through heater core

RHA053A

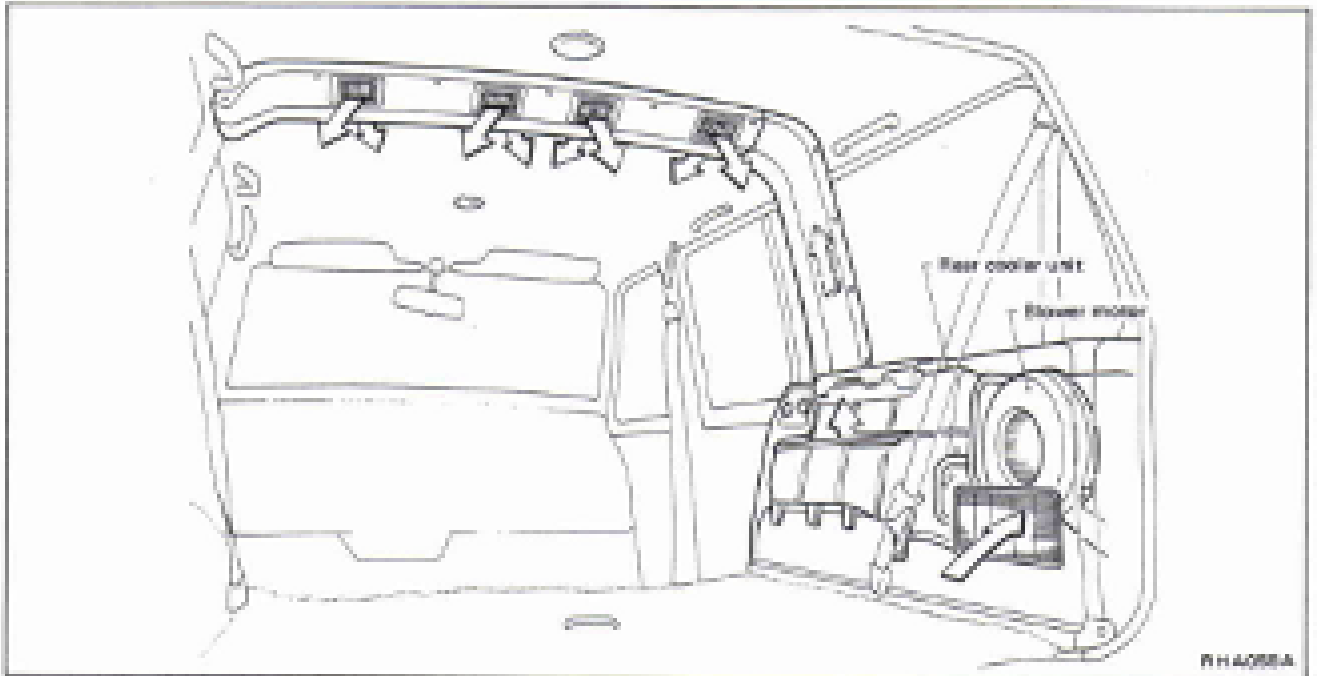
# AIR FLOW AND COMPONENT LAYOUT

## Air Flow (Cont'd)

### OVERHEAD TYPE REAR COOLING UNIT (Type 1)

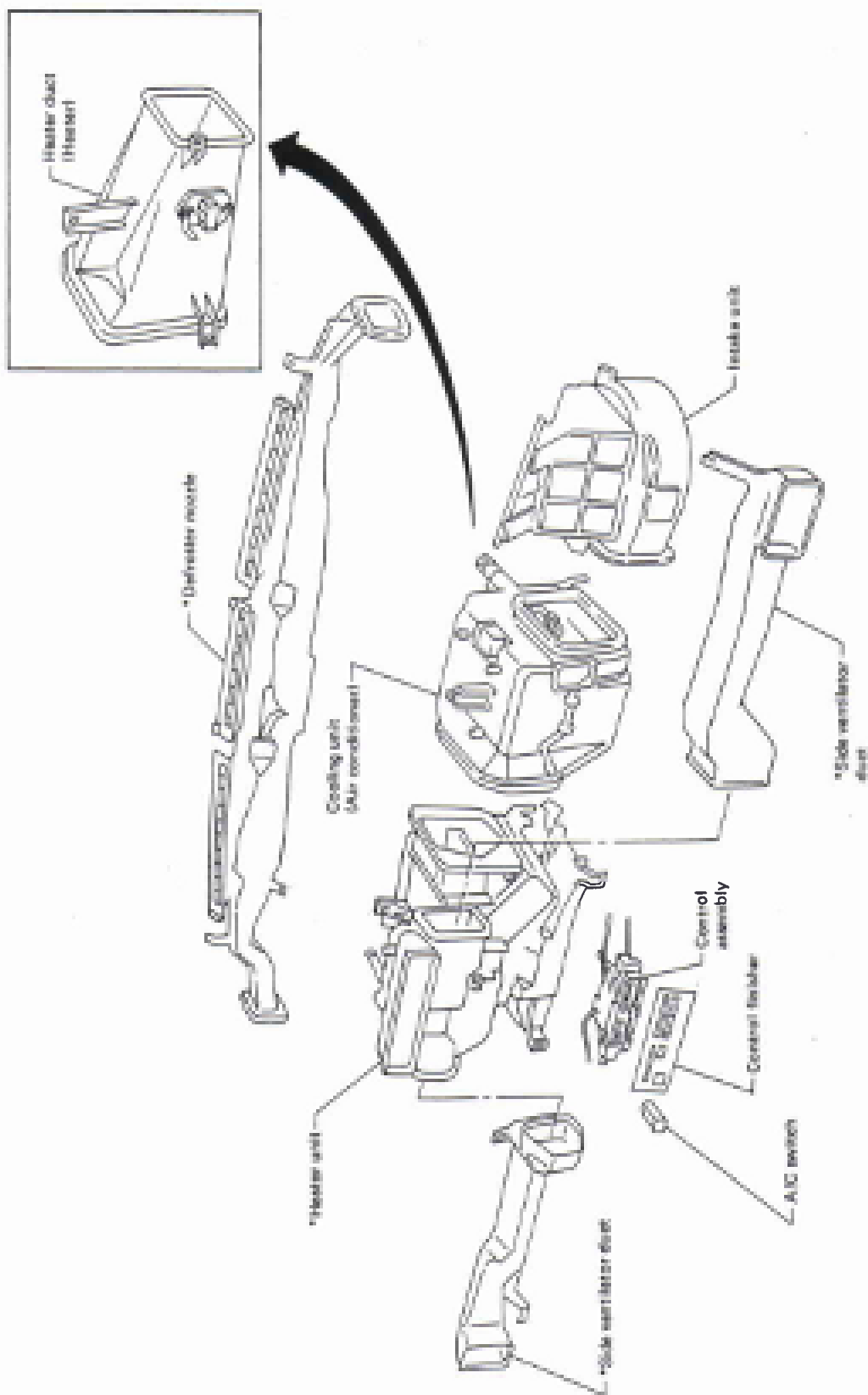


### REAR COOLING UNIT (Type 2)



# AIR FLOW AND COMPONENT LAYOUT

## Component Layout

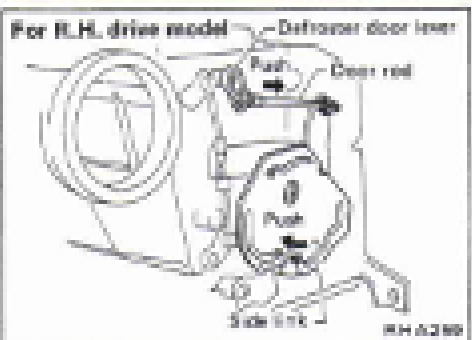
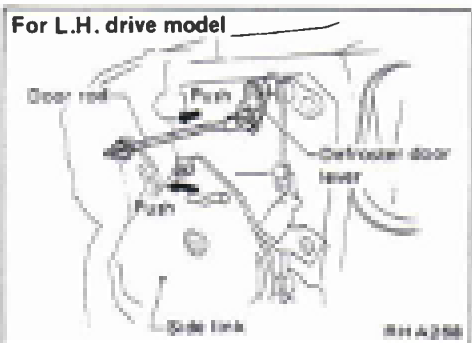
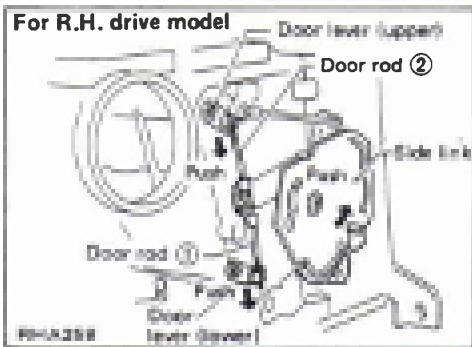
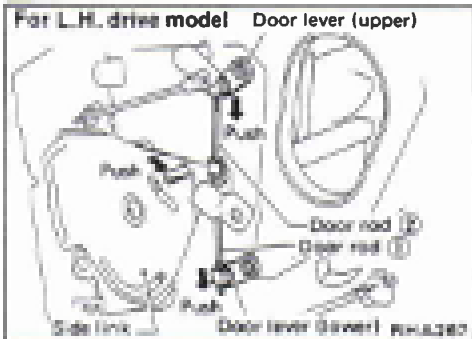


\* For removal, it is necessary to remove instrument assembly.

## DOOR CONTROL

### Control Cable and Rod Adjustment

- When adjusting ventilator door rod and defroster door rod, first disconnect air control cable from side link. Reconnect and readjust air control cable.



### VENTILATOR DOOR CONTROL ROD

1. Move side link in direction of arrow.
2. With upper and lower ventilator door levers held in the direction of the arrow as shown in the figure at left, connect rods ① and ② to their corresponding ventilator door levers, in that order.

### DEFROSTER DOOR CONTROL ROD

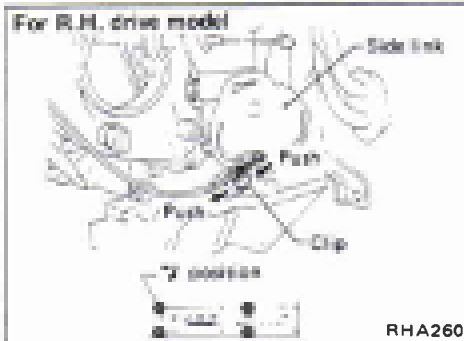
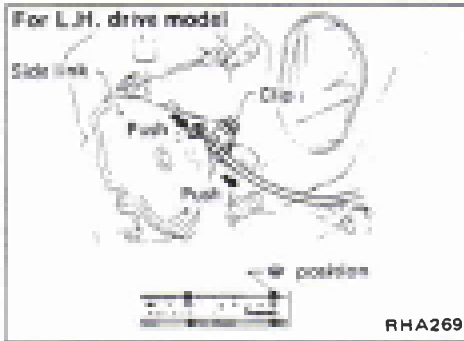
1. Move side link in direction of arrow.
2. Connect rod to side link while pushing defroster door lever in direction of arrow.

## DOOR CONTROL

### Control Cable and Rod Adjustment (Cont'd)

#### AIR CONTROL CABLE

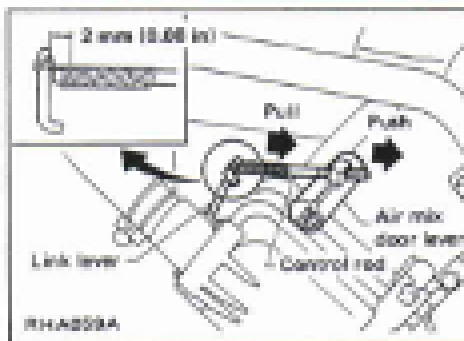
- Clamp the cable while pushing cable outer and side link in direction of arrow.



#### WATER COCK CONTROL ROD

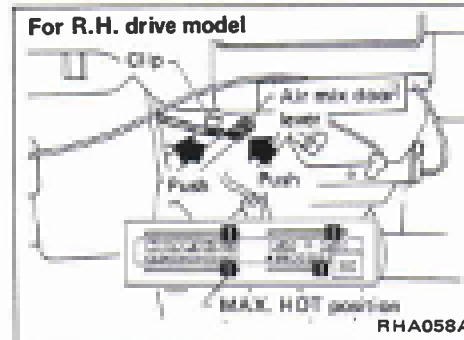
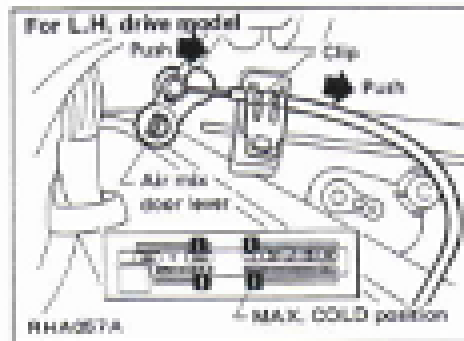
- When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever. Reconnect and readjust temperature control cable.

1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.



#### TEMPERATURE CONTROL CABLE

- Clamp the cable while pushing cable outer and air mix door lever in direction of arrow.



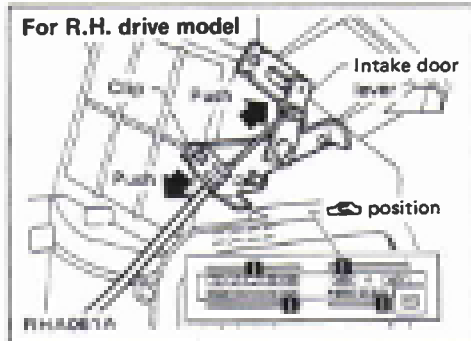
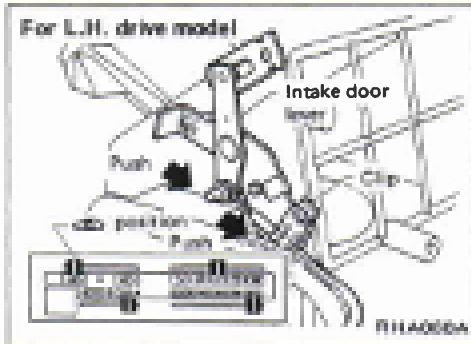


## DOOR CONTROL

### Control Cable and Rod Adjustment (Cont'd)

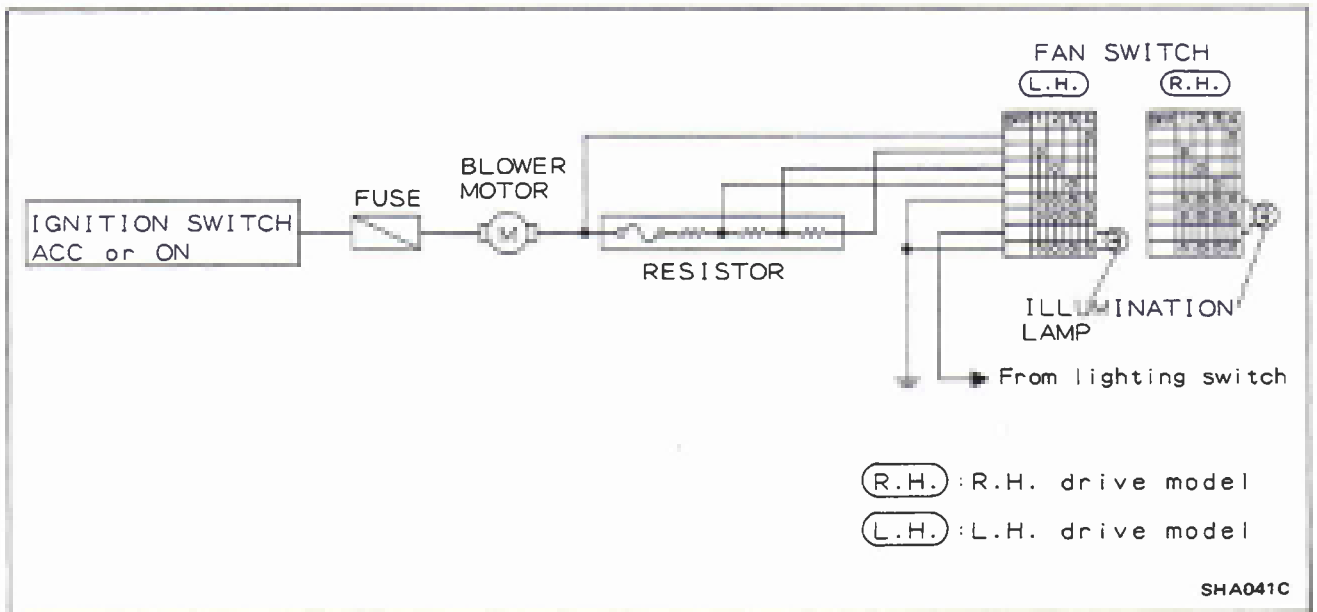
#### INTAKE DOOR CONTROL CABLE

- Clamp the cable while pushing cable outer and intake door lever in direction of arrow.

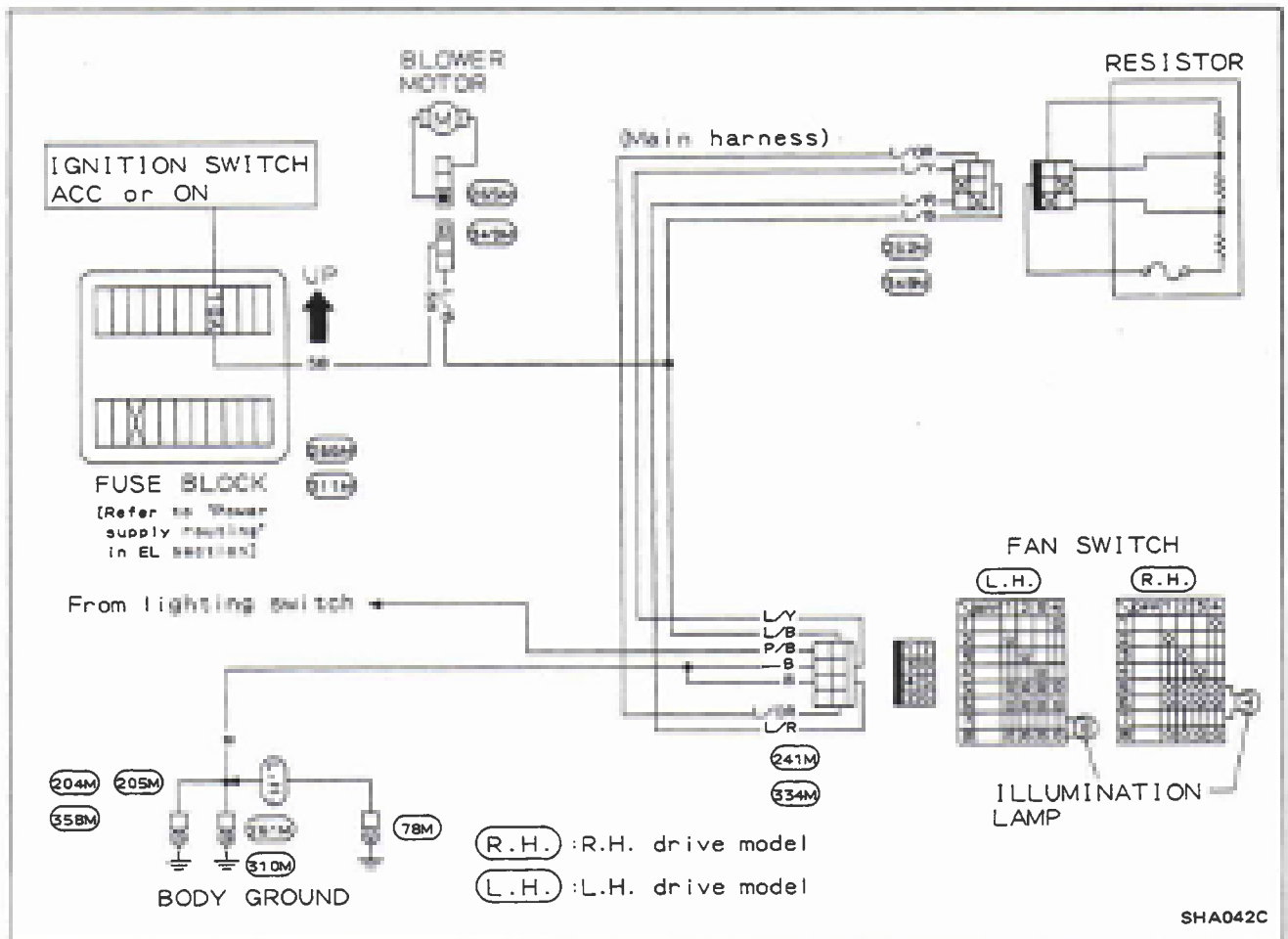


# HEATER ELECTRICAL CIRCUIT

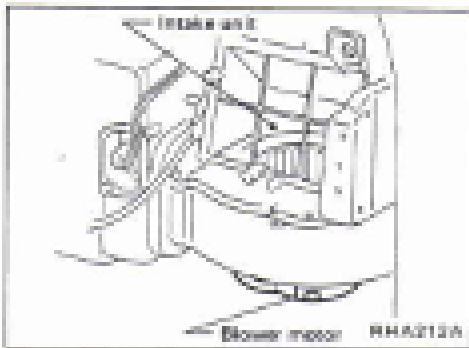
## Schematic



## Wiring Diagram



# HEATER ELECTRICAL CIRCUIT

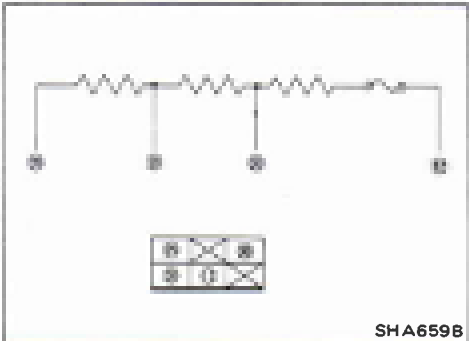


## Inspection

### FRONT BLOWER MOTOR

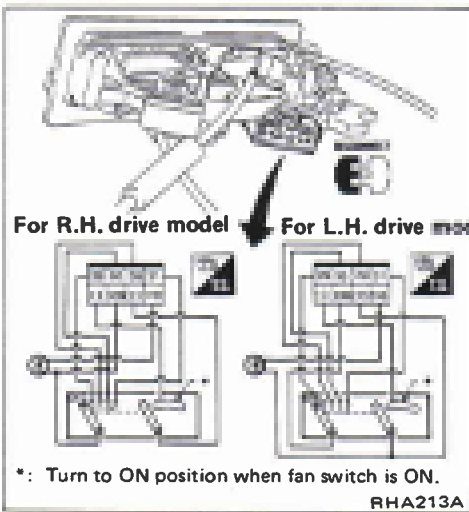
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.
- If the blower does not rotate, refer to TROUBLE-SHOOTING PROCEDURE 2.



### FRONT BLOWER RESISTOR

Check continuity between terminals.



### FRONT FAN SWITCH

Check continuity between terminals at each lever position shown in the table.

#### L.H. drive model

Lever position	OFF	1	2	3	4
Terminal					
31					○
28		○			○
29		○	○		
30			○	○	○
109		○	○	○	○
13		○	○	○	○
110		○	○	○	○
33		○	○	○	○



#### R.H. drive model

Lever position	OFF	1	2	3	4
Terminal					
31					○
28		○			○
29		○	○		
30			○	○	○
109		○	○	○	○
13		○	○	○	○
110		○	○	○	○
33		○	○	○	○



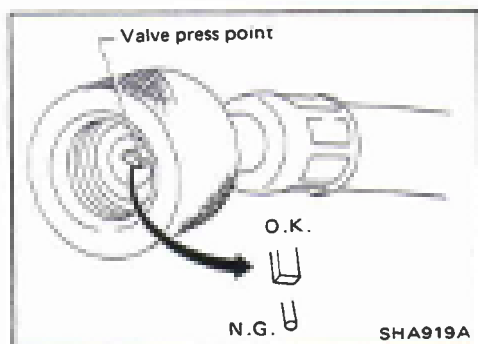
## PRECAUTIONS

### WARNING:

- Always wear eye protection when working around the system.
- Always be careful that refrigerant does not come in contact with your skin.
- Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.
- Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.
- Keep refrigerant away from open flames because poisonous gas will be produced if it burns.
- Do not increase can temperature beyond 40°C (104°F) in charging.
- Do not heat refrigerant can with an open flame. There is danger that can will explode.

### CAUTION

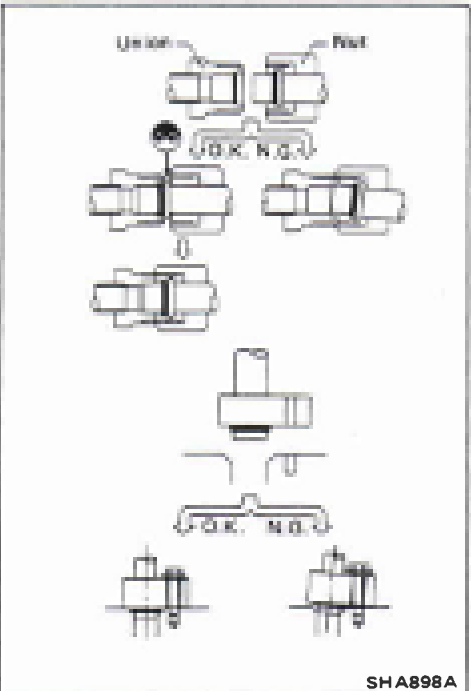
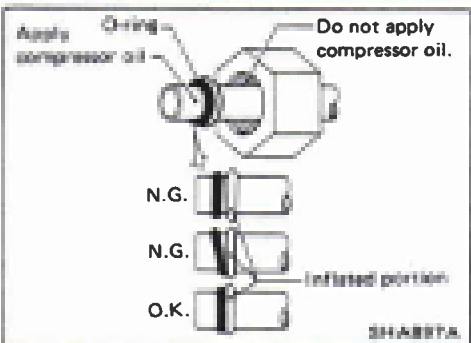
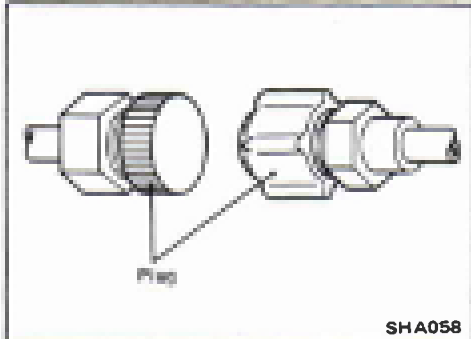
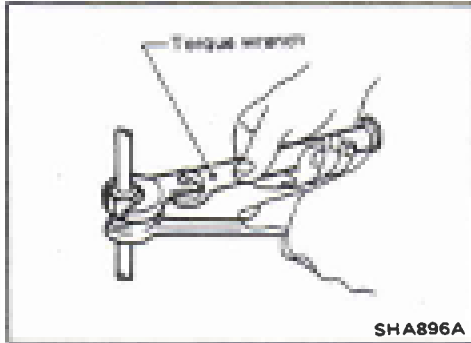
- Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.
- Compressed air must never be used to clean a dirty line. Clean with refrigerant gas.



- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

## PRECAUTIONS FOR REFRIGERANT CONNECTION



### WARNING:

Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

### CAUTION:

When replacing or cleaning refrigerant cycle components, observe the following.

- Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.
- When connecting tubes, always use a torque wrench.

- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.

- Always replace used O-rings.
- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.



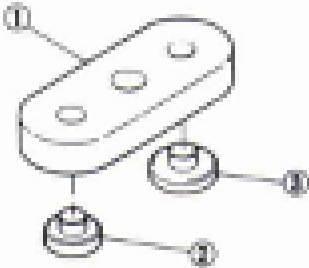



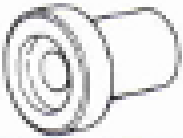
- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.

## PREPARATION

### SPECIAL SERVICE TOOLS



**DKS-16H model**

\*: Special tool or commercial equivalent

Tool number Tool name	Description	
KV99232022 Clutch disc puller		Removing clutch disc
KV99235140 Shaft seal remover and installer		Removing and installing shaft seal.
KV99241420 Blind cover set ① KV99241400 ② KV99211100 ③ KV99211300		Blind cover
KV994C1552 Charge nozzle		Using charge refrigerant
KV99231010* Clutch disc wrench		Removing shaft nut and clutch disc
KV99233040* Puller pilot		Removing pulley
KV99234160* Pulley installer		Installing pulley






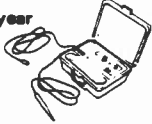
## PREPARATION

\*: Special tool or commercial equivalent

Tool number Tool name	Description
KV99267420* Shaft seal guide	 Installing shaft seal
KV99235160* Nut wrench	 Removing lock nut

## PREPARATION

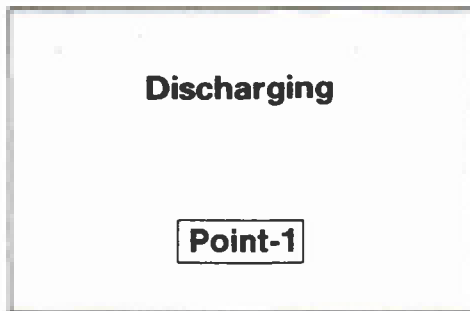
### SERVICE TOOLS

Tool name	Description
Manifold gauge	 <p data-bbox="967 384 1409 436">Using discharge and charge refrigerant into system</p>
Charging hose	 <p data-bbox="967 546 1409 598">Using discharge and evacuate, charge refrigerant into system</p>
Charge valve	 <p data-bbox="967 707 1409 760">Using discharge and charge refrigerant into system</p>
Thermometer	 <p data-bbox="967 869 1409 899">Using check temperature</p>
Vacuum pump	 <p data-bbox="967 1022 1409 1052">Using evacuate refrigerant system</p>
Electric leak-detector	<p data-bbox="365 1174 635 1218"><b>Nominal sensitivity:</b> 15 - 25 g (0.53 - 0.88 oz)/year</p>  <p data-bbox="967 1183 1409 1214">Using check refrigerant leaks</p>

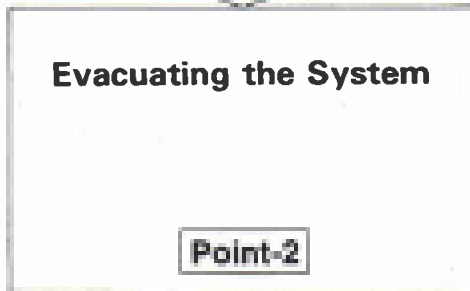


## DISCHARGING, EVACUATING, CHARGING AND CHECKING

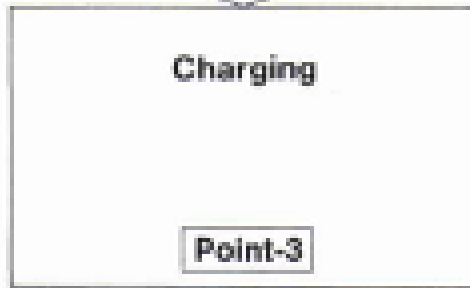
---



Discharge refrigerant system.

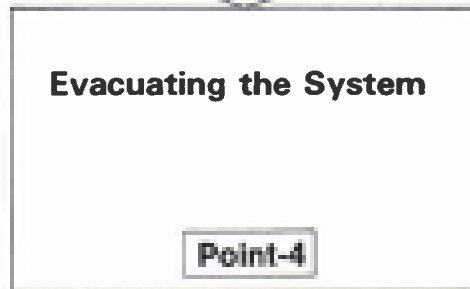


Run pump for 5 minutes.

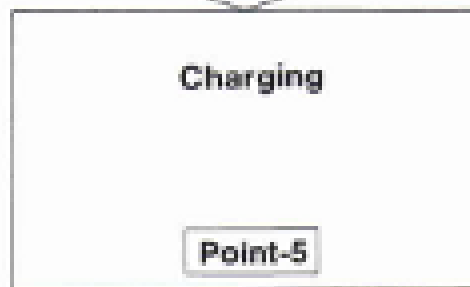


Charge refrigerant into system.

When low-pressure gauge reading is 98 kPa (0.98 bar, 1.0 kg/cm<sup>2</sup>, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.

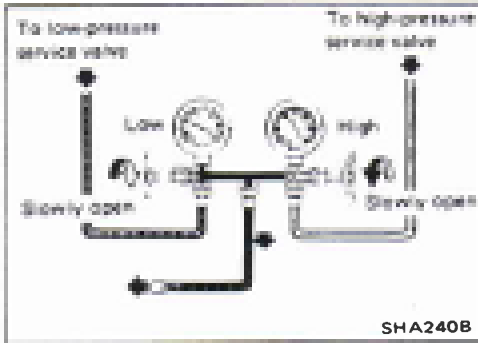


Run pump for 20 minutes.



Charge the specified amount of refrigerant into system.

# DISCHARGING, EVACUATING, CHARGING AND CHECKING



## Discharging—Point-1

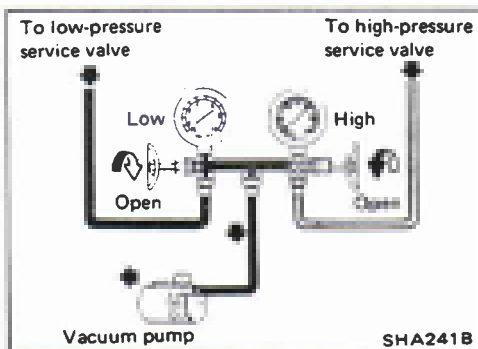
Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.

### CAUTION:

#### Rear cooler equipped model

On rear cooler equipped model, do the following procedures.

- Ignition switch "ON"
- Front fan switch "ON"
- Front A/C and rear cooler switches "ON"
- Rear cooler temp. switch "Max. COLD"



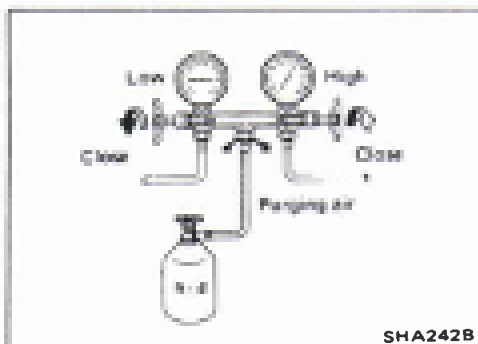
## Evacuating the System—Point-2

Refer to "CAUTION: Rear cooler equipped model".

1. Start pump, then open both valves and run pump for about 5 minutes.
2. When low gauge has reached approx. 101.3 kPa (1,013 mbar, 760 mmHg, 29.92 inHg), completely close both valves of gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.
  - a. The low-pressure gauge reads lower by 3.3 kPa (33 mbar, 25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.
  - b. The rate ascension of the low-pressure gauge should be less than 3.3 kPa (33 mbar, 25 mmHg, 0.98 inHg) in 5 minutes.

Elevation m (ft)	Vacuum of system* kPa (mbar, mmHg, inHg)
0 (0)	101.3 (1,013, 760, 29.92)
300 (1,000)	98.0 (980, 735, 28.94)
600 (2,000)	94.6 (946, 710, 27.95)
900 (3,000)	91.3 (913, 685, 26.97)

\*: Values show reading of the low-pressure gauge.



## Charging—Point-3

1. Evacuate refrigerant system.

Refer to "Point-2"

2. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
3. Purge air from center charging hose.
  - 1) Connect center charging hose to refrigerant can through charge valve.
  - 2) Break seal of refrigerant can and purge air.

## DISCHARGING, EVACUATING, CHARGING AND CHECKING

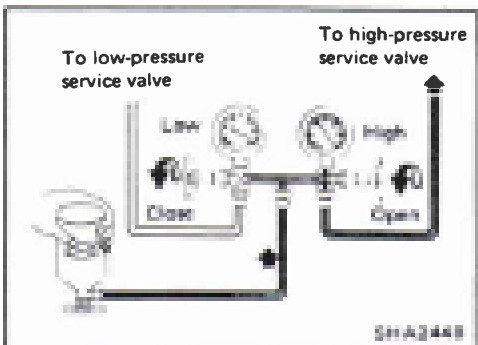
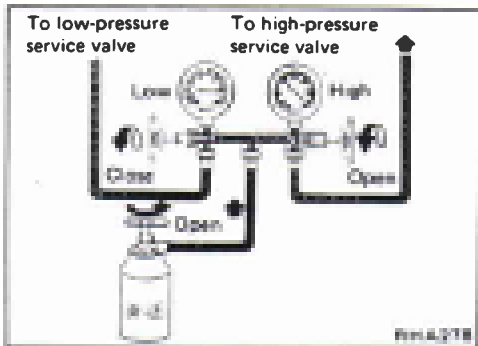
### Charging—**Point-3** (Cont'd)

4. Charge refrigerant into system.

#### WARNING:

Ensure that engine is off.

- 1) Open high-pressure valve of manifold gauge and charge refrigerant into system.



#### CAUTION:

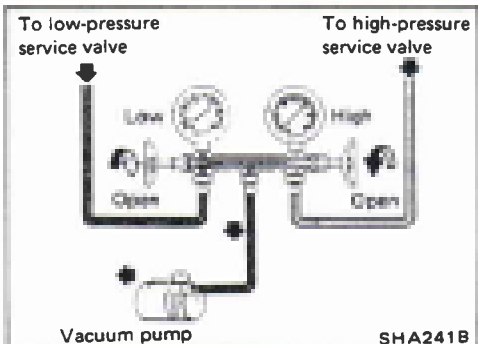
If charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high-pressure (discharge) service valve. After charging, the compressor should always be turned several times manually.

- 2) When low-pressure gauge reading is 98 kPa (0.98 bar, 1.0 kg/cm<sup>2</sup>, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.

### Evacuating the System—**Point-4**

Refer to “CAUTION: Rear cooler equipped model”.

1. Close manifold gauge valve securely and disconnect charging hose from refrigerant can.
2. Connect center charging hose to vacuum pump.
3. Start pump, then open both valves and run pump for about 20 minutes.



### Charging—**Point-5**

Perform “**Point-3** (No. 2—)”.

Refer to “CAUTION: Rear cooler equipped model”.

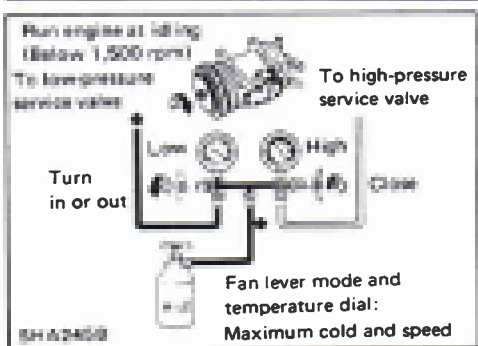
1. Charge refrigerant into system.

#### WARNING:

Ensure that engine is off.

- 1) Open low-pressure valve of manifold gauge and charge refrigerant into system.
2. When refrigerant charging speed slows down, close high-pressure valve of manifold gauge and open low-pressure valve of manifold gauge and charge it while running the compressor for ease of charging.
3. Start engine — Air conditioning system ON, maximum temperature set, maximum blower speed. Open low-pressure valve on gauge set, with can in upright position, and monitor sight glass. Charge is complete when sight glass is clear.

Cycling clutch systems will produce bubbles in sight glass when clutch engages. Therefore, allow 5 seconds after clutch engages to determine if bubbles continue, and, if so, add refrigerant to clear sight glass.



## DISCHARGING, EVACUATING, CHARGING AND CHECKING

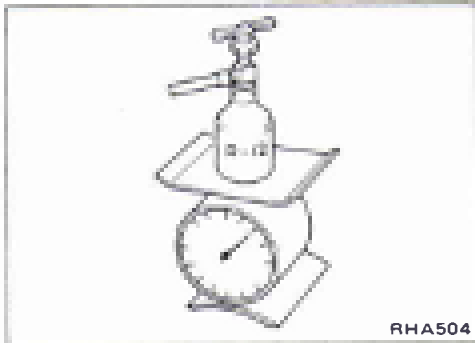
### Charging—**Point-5** (Cont'd)

#### WARNING:

Never charge refrigerant through high-pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and can may explode.

4. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.75 bar, 2.8 kg/cm<sup>2</sup>, 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- Be sure to purge air from charging hose when replacing can with a new one.



5. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

#### Refrigerant amount:

##### Front A/C

0.9 - 1.1 kg (2.0 - 2.4 lb)

##### Front A/C & overhead type rear cooler (Type 1)

1.3 - 1.5 kg (2.9 - 3.3 lb)

##### Front A/C & rear cooler (Type 2)

1.1 - 1.3 kg (2.4 - 2.9 lb)

The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure.

6. After charging, be sure to install valve cap on service valve.  
7. Confirm that there are no leaks in system by checking with a leak detector.

- When refrigerant charging is performed with a charging cylinder, charging station, or automatic charging equipment, engine off, charge only through high side, after specified refrigerant amount has entered the system, close high-pressure valve on gauge set. Start engine return to idle speed, operate A/C at maximum temperature setting, high blower. Observe sight glass to confirm complete charge.

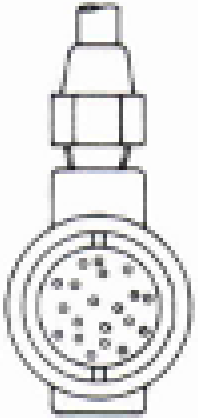
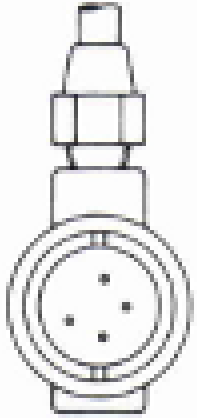
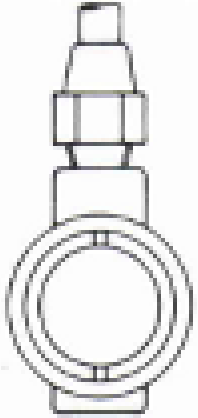
**Overcharging will result in increased high pressures, and reduced performance.**

# DISCHARGING, EVACUATING, CHARGING AND CHECKING

## Checking Refrigerant Level

### CONDITION

- Door window: Open
- A/C switch: ON
- Rear cooler switch  
(Rear cooler equipped model): ON
- TEMP. lever position: Max. COLD
- Rear cooler temp. switch  
(Rear cooler equipped model): Max. COLD
- FAN lever position: 4
- Rear cooler fan switch  
(Rear cooler equipped model): HI
- Check sight glass after a lapse of about five minutes.

Amount of refrigerant	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Check item				
Temperature of high-pressure and low-pressure lines.	Almost no difference between high-pressure and low-pressure side temperature.	High-pressure side is warm and low-pressure side is fairly cold.	High-pressure side is hot and low-pressure side is cold.	High-pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.  AC256	The bubbles are seen at intervals of 1 - 2 seconds.  AC257	Almost transparent. Bubbles may appear when engine speed is raised and lowered. No clear difference exists between these two conditions.  AC258	No bubbles can be seen.
Pressure of system	High-pressure side is abnormally low.	Both pressures on high and low-pressure sides are slightly low.	Both pressures on high and low-pressure sides are normal.	Both pressures on high and low-pressure sides are abnormally high.
Repair.	Stop compressor immediately and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low pressure side.

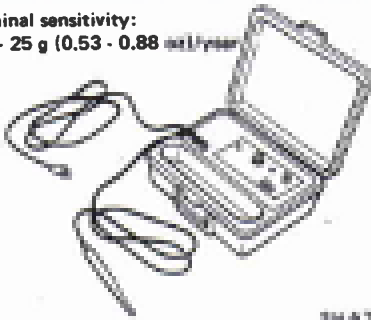
a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Recheck the amount when it

exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

## DISCHARGING, EVACUATING, CHARGING AND CHECKING

Nominal sensitivity:  
15 - 25 g (0.53 - 0.88 oz)/year



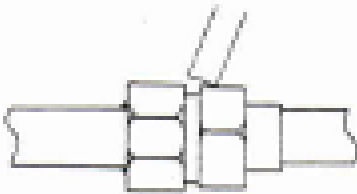
### Checking Refrigerant Leaks

#### ELECTRIC LEAK DETECTOR

The leak detector is a delicate device that detects small amounts of halogen.

To use the device properly, read the manufacturer's manuals. Also perform the specified maintenance and inspections.

#### UNION TYPE



#### GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

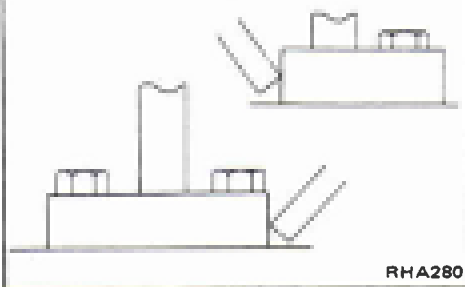
Place the probe on connection fitting and wait for 5 seconds or more.

To check cooling unit, wait for 10 seconds or more.

#### WARNING:

Keep the probe as still as possible for one more minute.

#### PLATE TYPE



- When testing single-bolt flange, place the probe on the opposite side of the fitting.

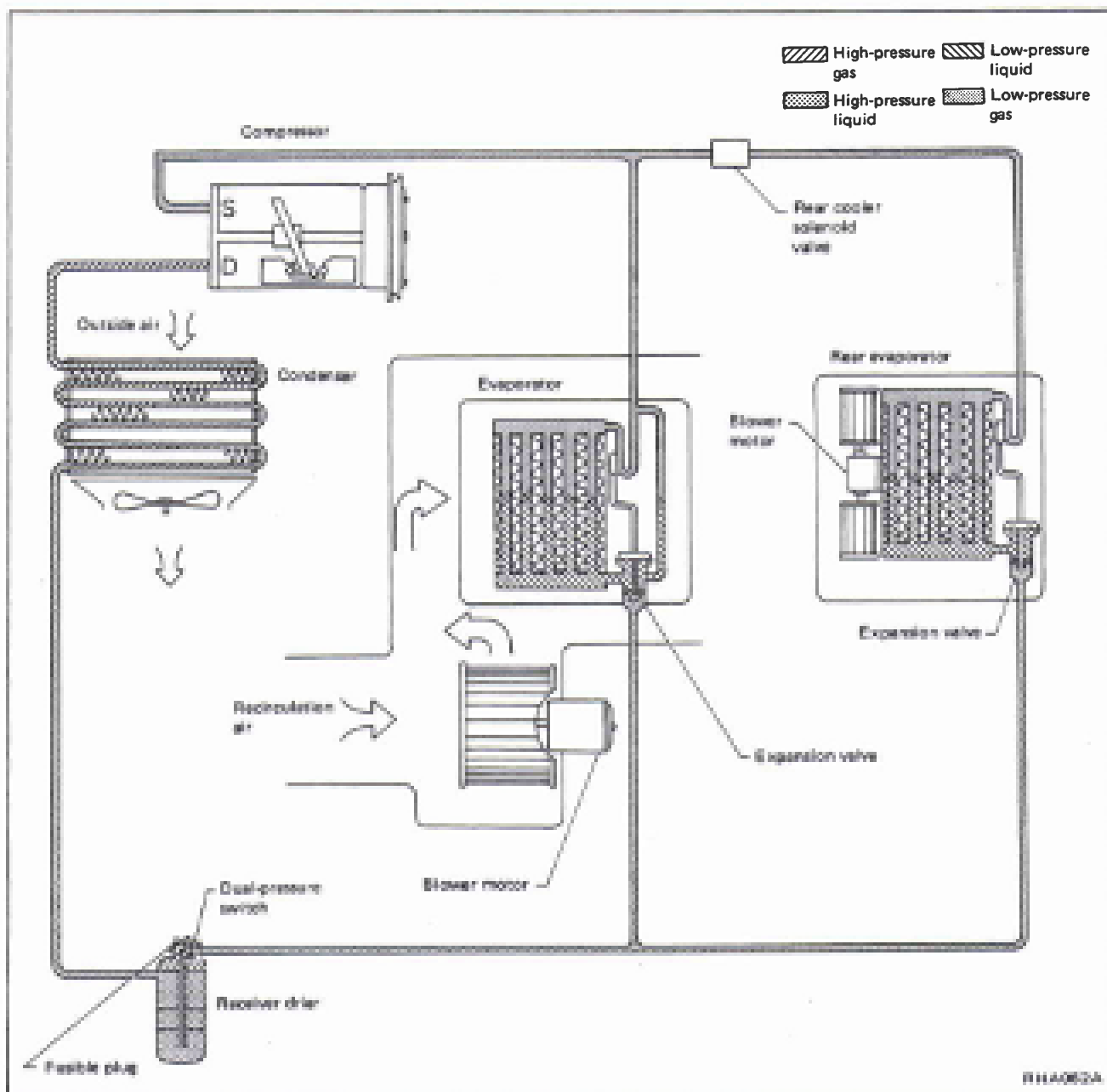
#### MEASUREMENT STANDARD

If any leak is noted with a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that leak must be repaired.

- The nominal sensitivity of the detector is determined under the assumption that all the leaking gas is collected by the detector. Accordingly, the quantity of gas actually leaking can amount to five to ten times the indicated value. Generally speaking, leakage of 150 to 200 g (5.29 to 7.05 oz) of refrigerant can cause insufficient cooling.
- Oil deposited during assembling must be wiped off before inspection. Refrigerant easily dissolves in oil, and the presence of oil can cause an error in measurement. This precaution is important when checking a used car for refrigerant leakage.
- If oil is noted at or around connections, it indicates that refrigerant is leaking.

## SERVICE PROCEDURES

### Refrigeration Cycle



#### REFRIGERANT FLOW

This system has two evaporators; a front evaporator and a rear evaporator. The system design is such that there are the following possibilities for the refrigerant flow path:

- Flow path #1 — through the front evaporator only
- Flow path #2 — through the front and rear evaporators

## SERVICE PROCEDURES

### Refrigeration Cycle (Cont'd)

**Flow path #1** —The front A/C switch is on, the rear cooler switch is off. The rear cooler solenoid valve is closed.

**Flow path #2** —The rear cooler switch is on, the front A/C switch is on. The rear cooler solenoid valve is open.

#### **FREEZE PROTECTION — Compressor control**

The compressor cycles on and off to maintain the front and rear evaporator temperature within a specified range.

The front A/C thermo control amp. controls the compressor clutch (A/C relay) and the rear cooler solenoid valve (rear cooler relay), and the rear cooler thermo control amp. controls the rear cooler solenoid valve (rear cooler relay) according to the following operating conditions:

#### **Front A/C and rear cooler thermo control amp. function**

Operating condition	Function
Front A/C: on Rear cooler: off	The front thermo control amp. disengages the compressor clutch when the front evaporator gets too cold.
Front A/C: on Rear cooler: on	The rear cooler thermo control amp. closes the rear cooler solenoid valve when the rear evaporator gets too cold. The front A/C thermo control amp. disengages the compressor clutch and closes the rear cooler solenoid valve when the front evaporator gets too cold.

The rear evaporator thermo control setting is controlled by the temperature control knob located on the rear cooler control panel, and the front evaporator thermo control setting is pre-set and non-adjustable.

#### **REFRIGERANT SYSTEM PROTECTION**

##### **Dual-pressure switch**

The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

##### **Fusible plug**

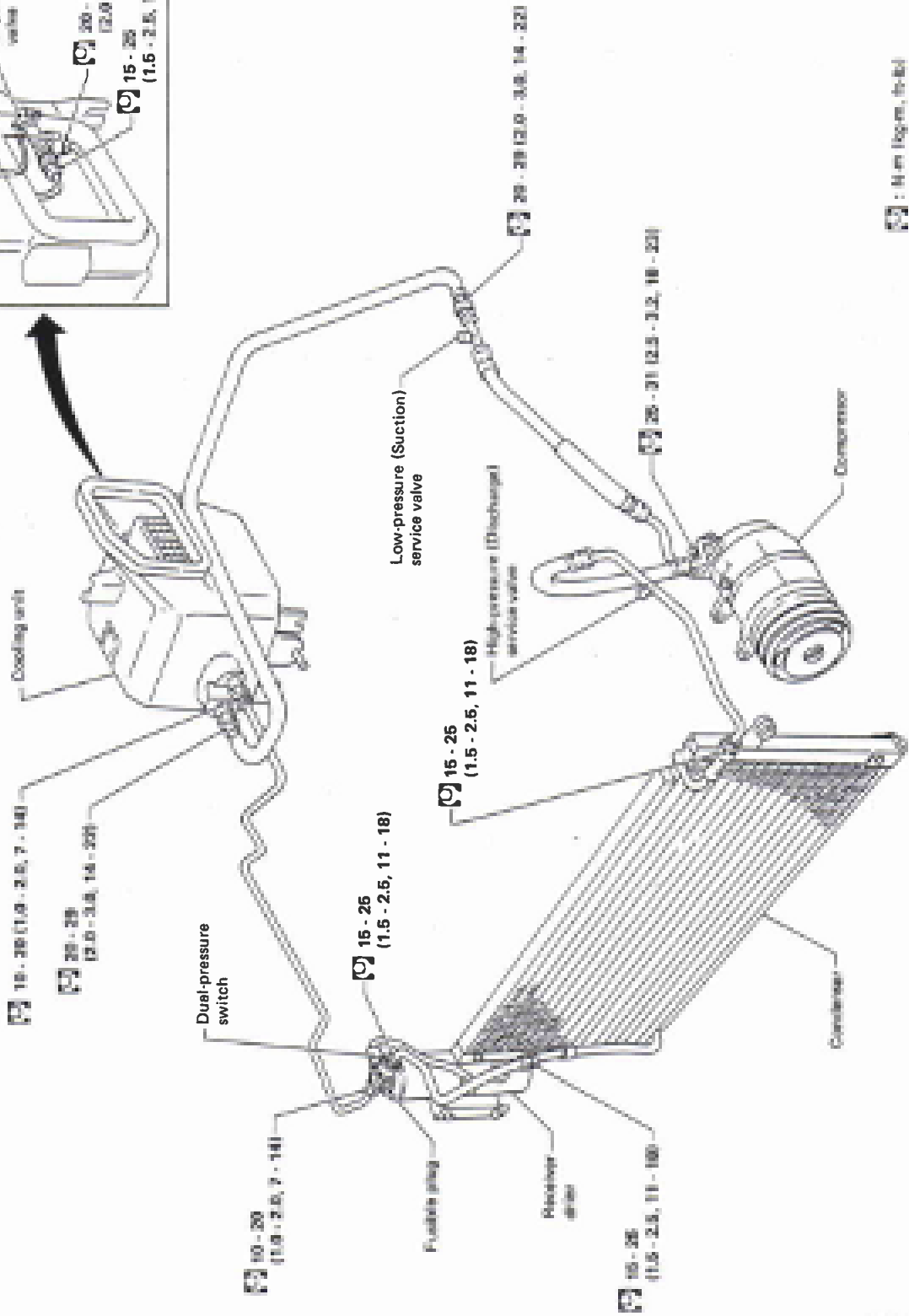
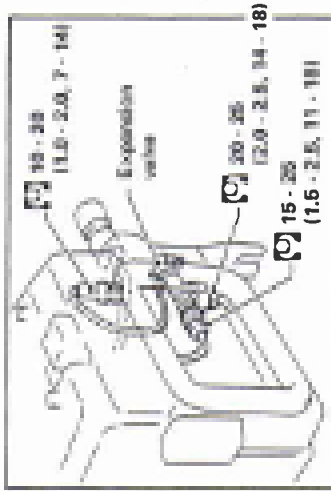
Open at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace receiver drier.



# SERVICE PROCEDURES

## Refrigeration Cycle (Cont'd)

### FRONT A/C L.H. DRIVE MODEL



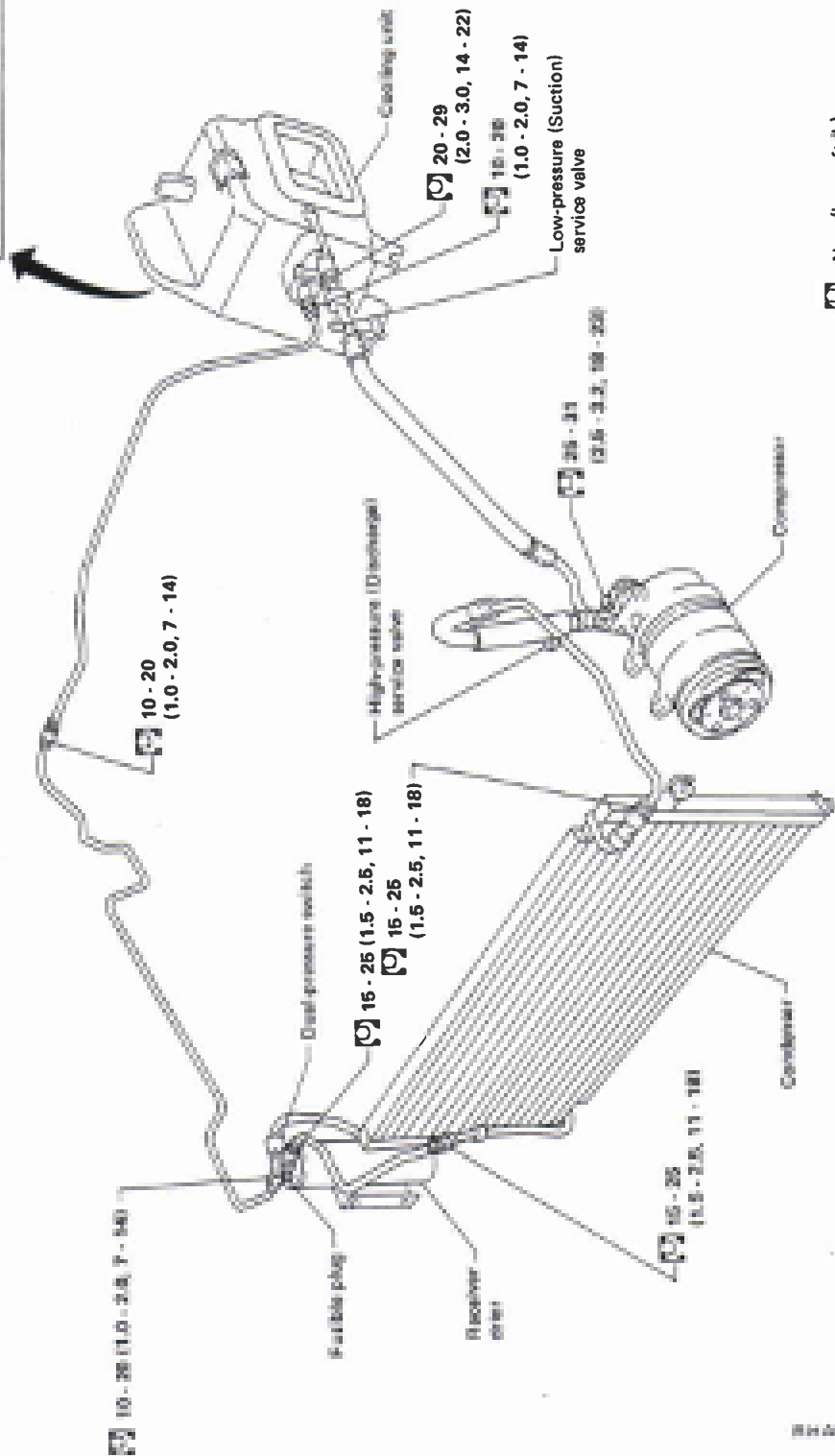
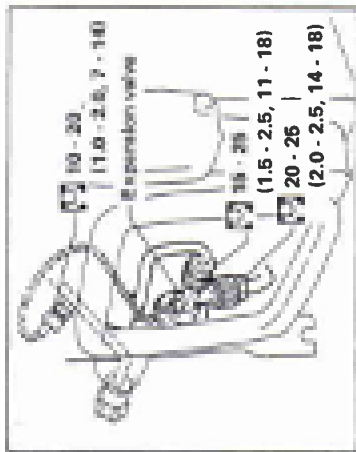
☞ : Non Regm. (R-134a)

RHA023A

# SERVICE PROCEDURES

## Refrigeration Cycle (Cont'd)

### FRONT A/C R.H. DRIVE MODEL

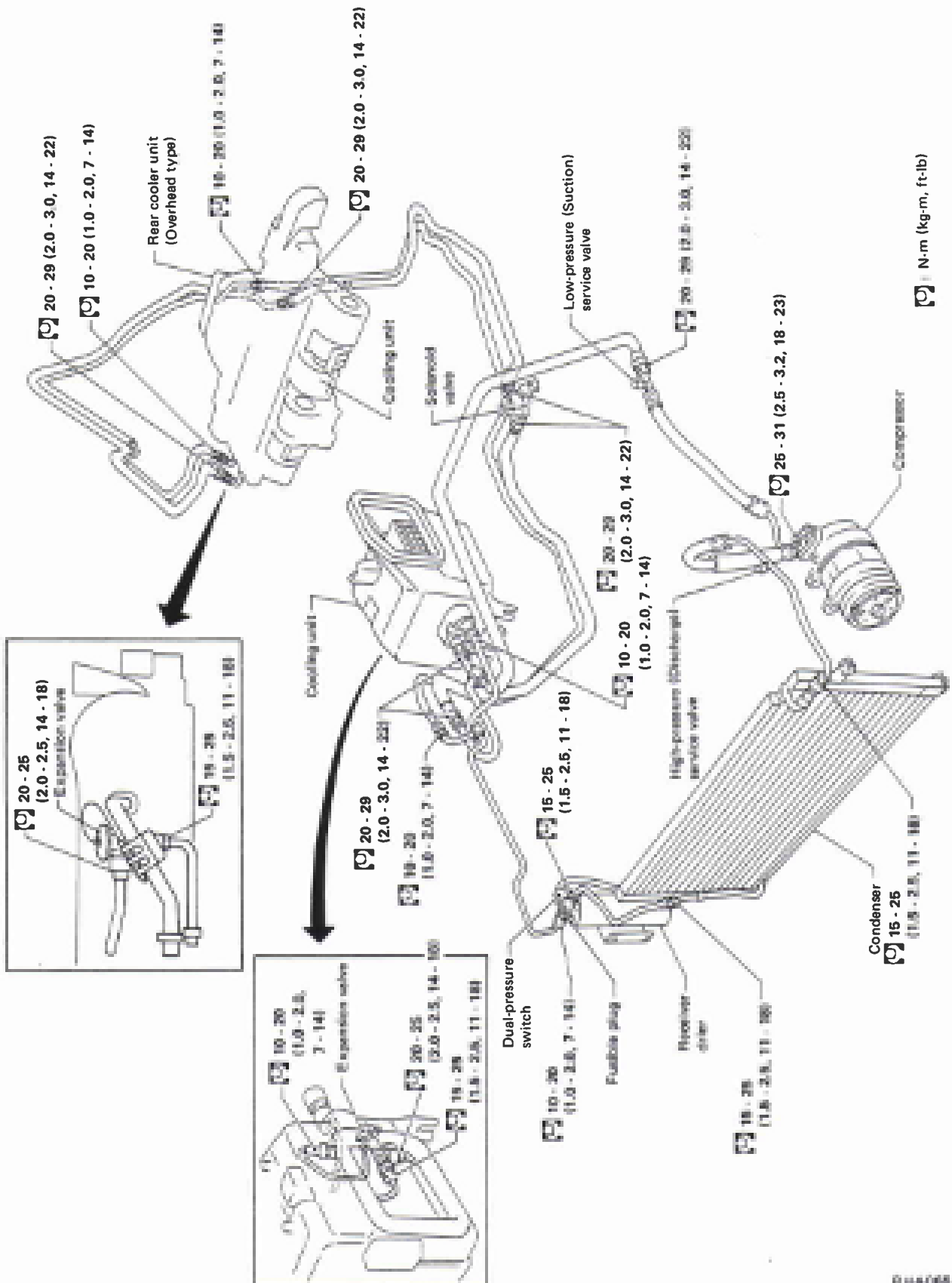


☐ : N·m (kg·m, ft·lb)

# SERVICE PROCEDURES

## Refrigeration Cycle (Cont'd)

### FRONT A/C & OVERHEAD TYPE REAR COOLER (Type 1) L.H. DRIVE MODEL



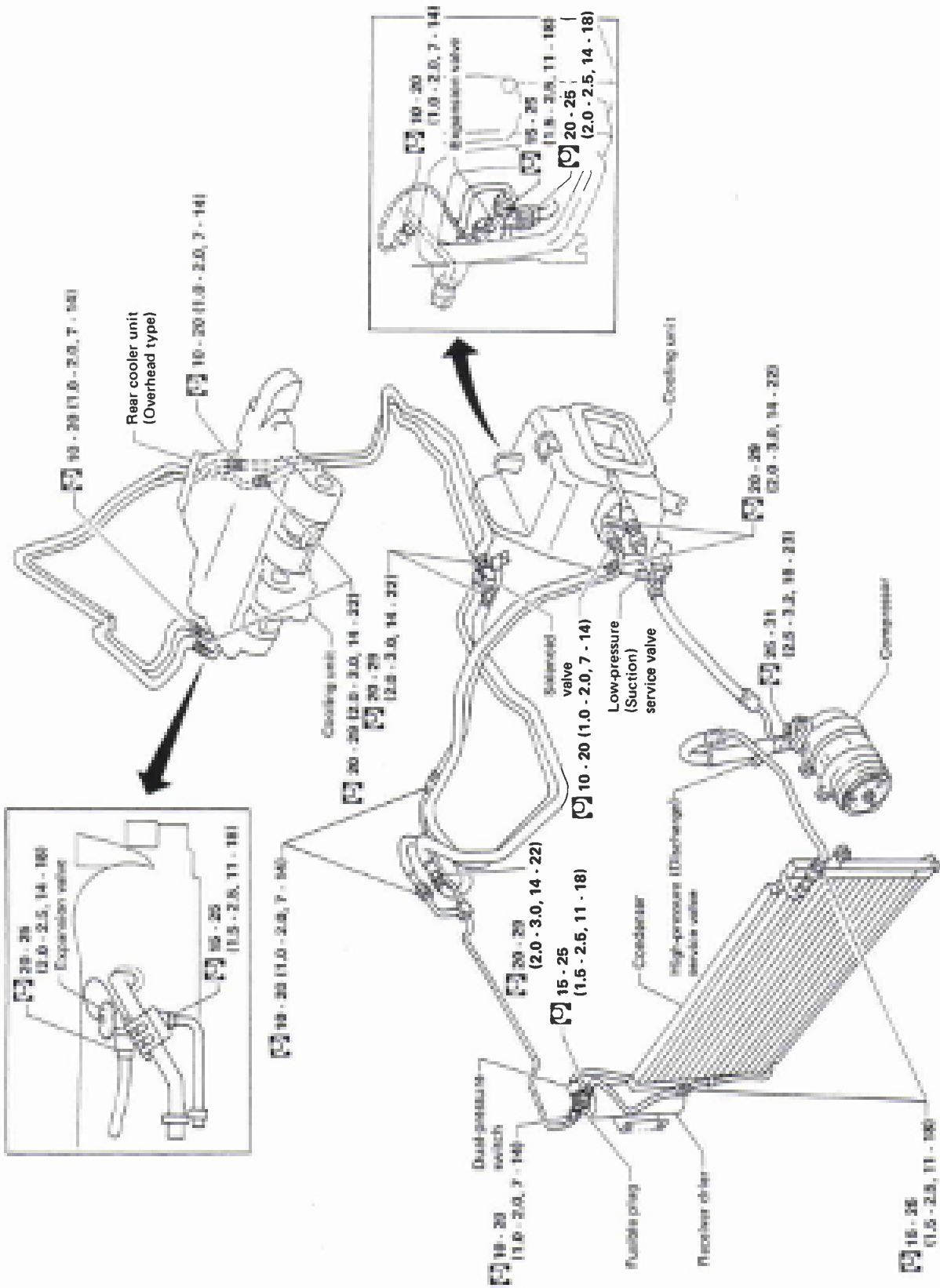
N·m (kg·m, ft·lb)

RHA068A

# SERVICE PROCEDURES

## Refrigeration Cycle (Cont'd)

### FRONT A/C & OVERHEAD TYPE REAR COOLER (Type 1) R.H. DRIVE MODEL

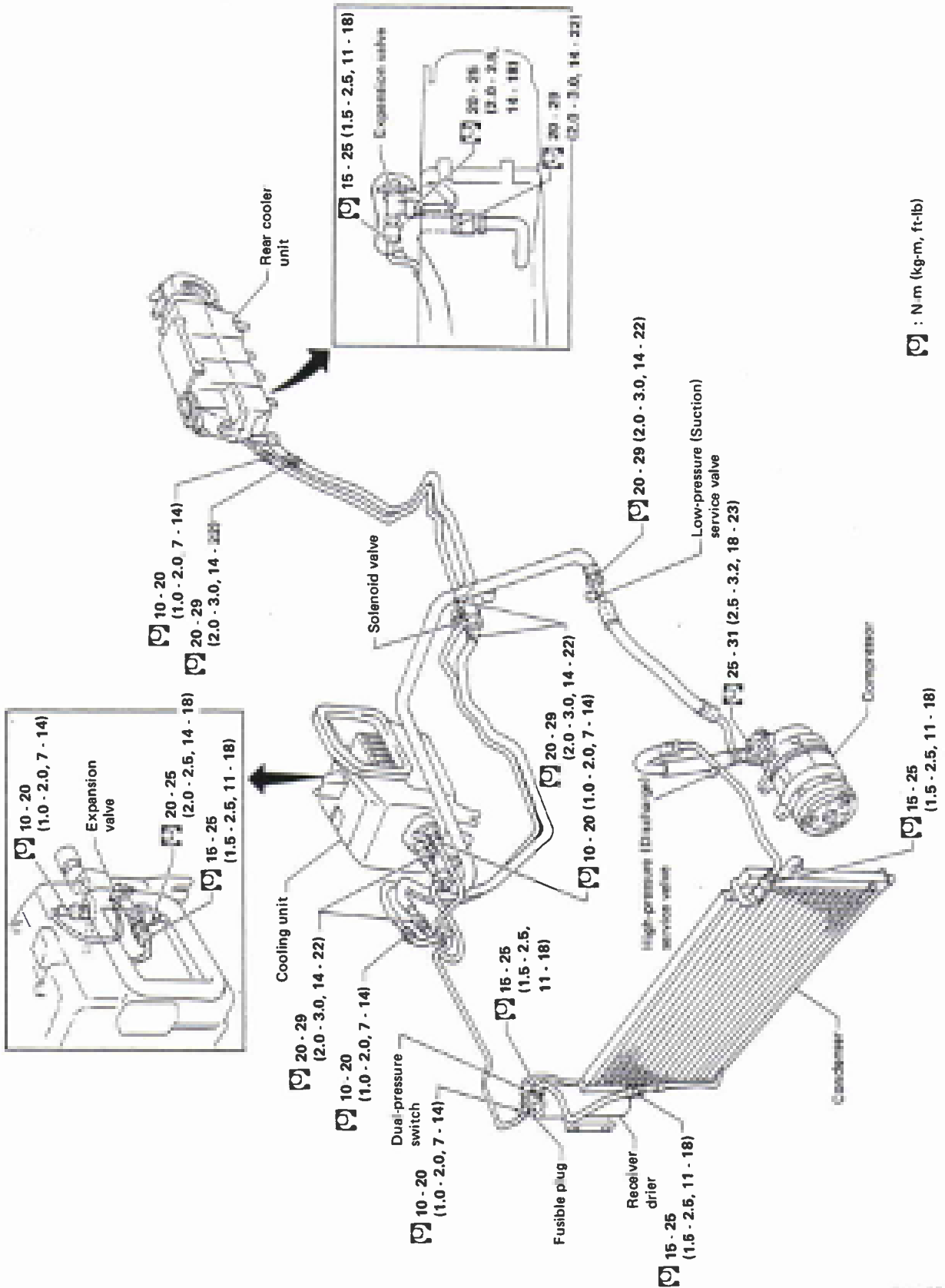


Ⓜ : N·m (kg-m, ft-lb)

# SERVICE PROCEDURES

## Refrigeration Cycle (Cont'd)

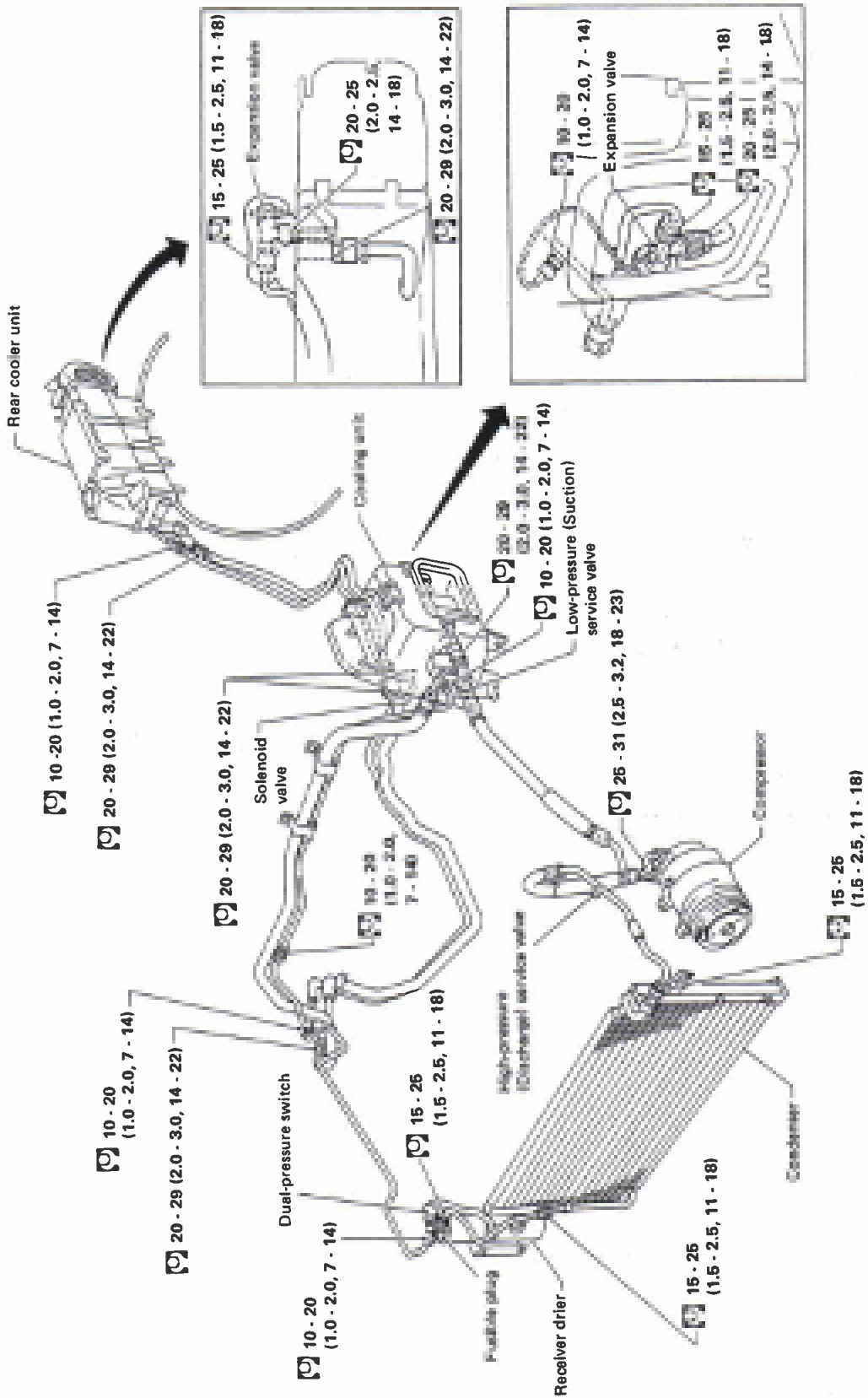
### FRONT A/C & REAR COOLER (Type 2) L.H. DRIVE MODEL



# SERVICE PROCEDURES

## Refrigeration Cycle (Cont'd)

### FRONT A/C & REAR COOLER (Type 2) R.H. DRIVE MODEL

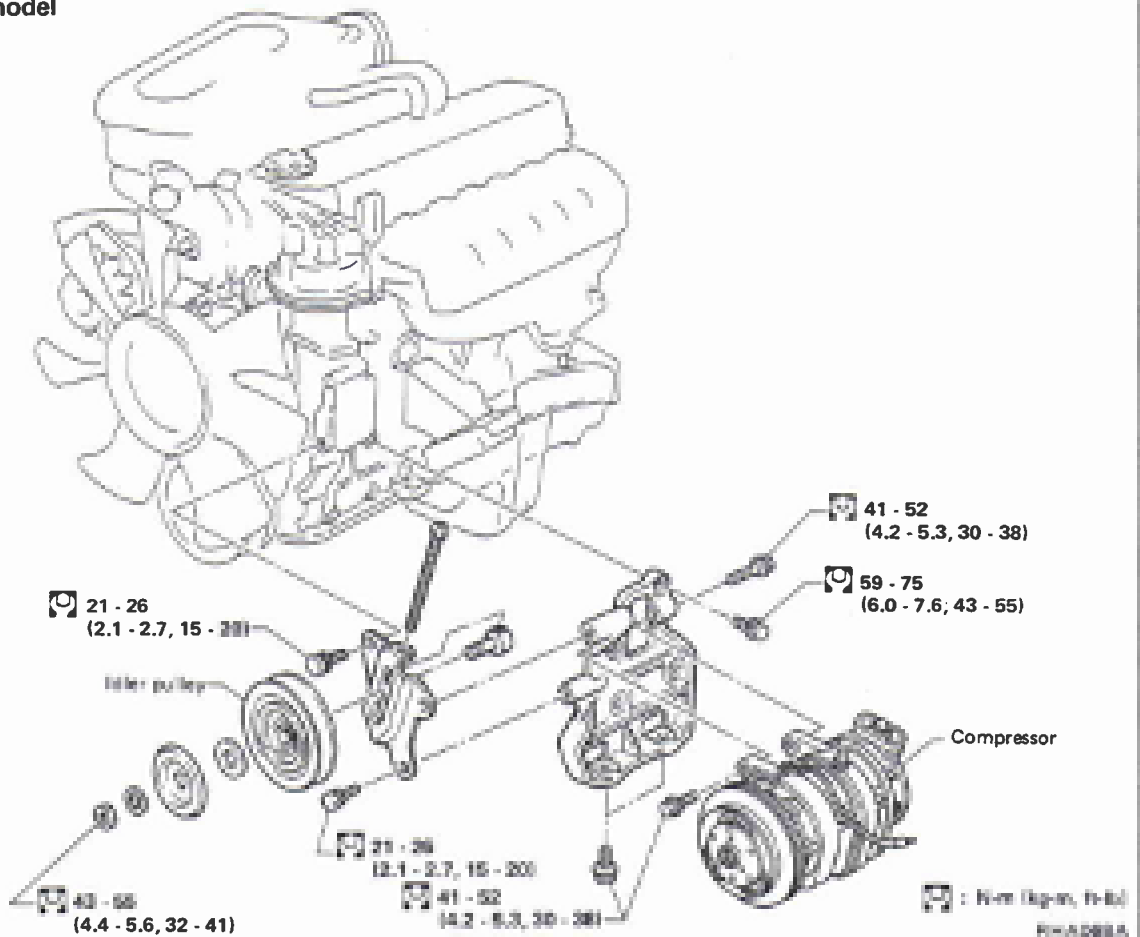


: N·m (kg·m, ft·lb)

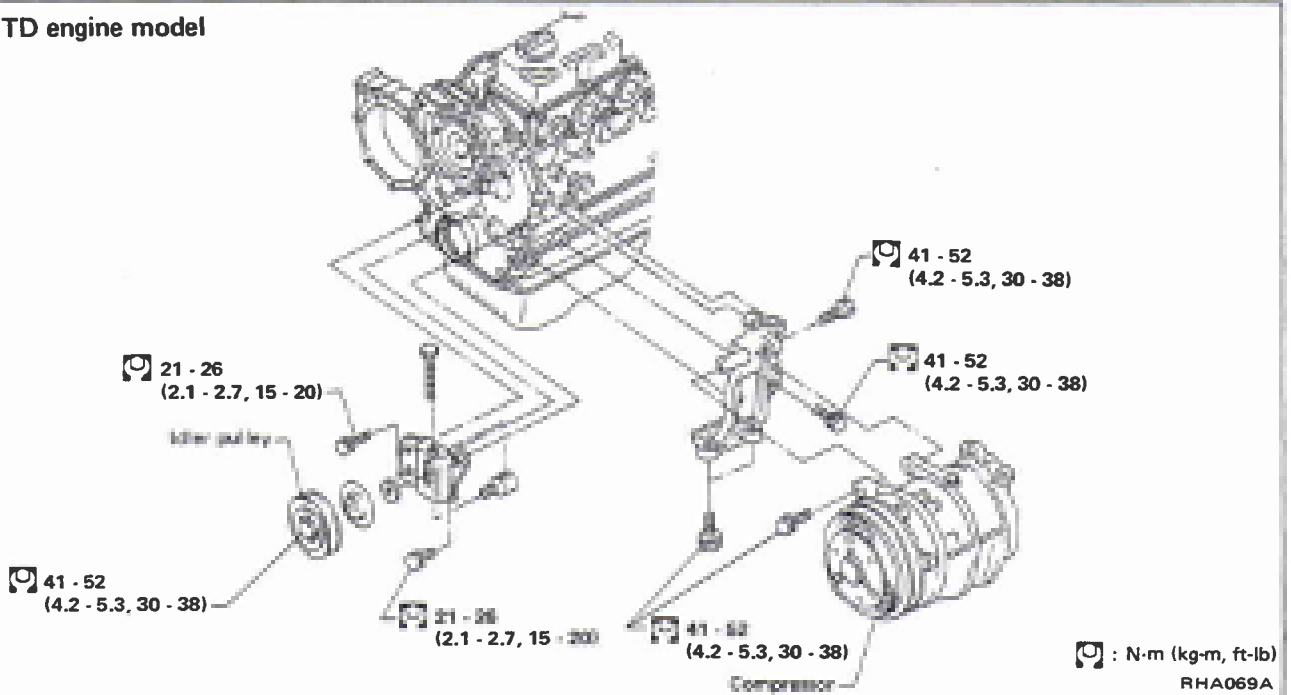
# SERVICE PROCEDURES

## Compressor Mounting

TB engine model



TD engine model



## **SERVICE PROCEDURES**

---

### **Belt Tension**

- Refer to MA section.

### **Fast Idle Control Device (F.I.C.D.)**

- For TB engine model, refer to EF & EC section.
- For TD engine model, refer to MA section.



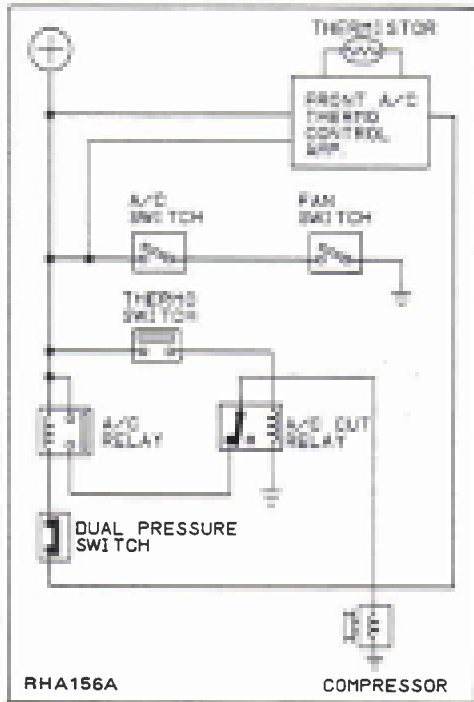
## DESCRIPTION OF AIR CONDITIONER

### A/C Cut System

**For Australia A/T models, Gulf standard (Middle East) models, Hardtop and Wagon models with TD engine except for Australia**

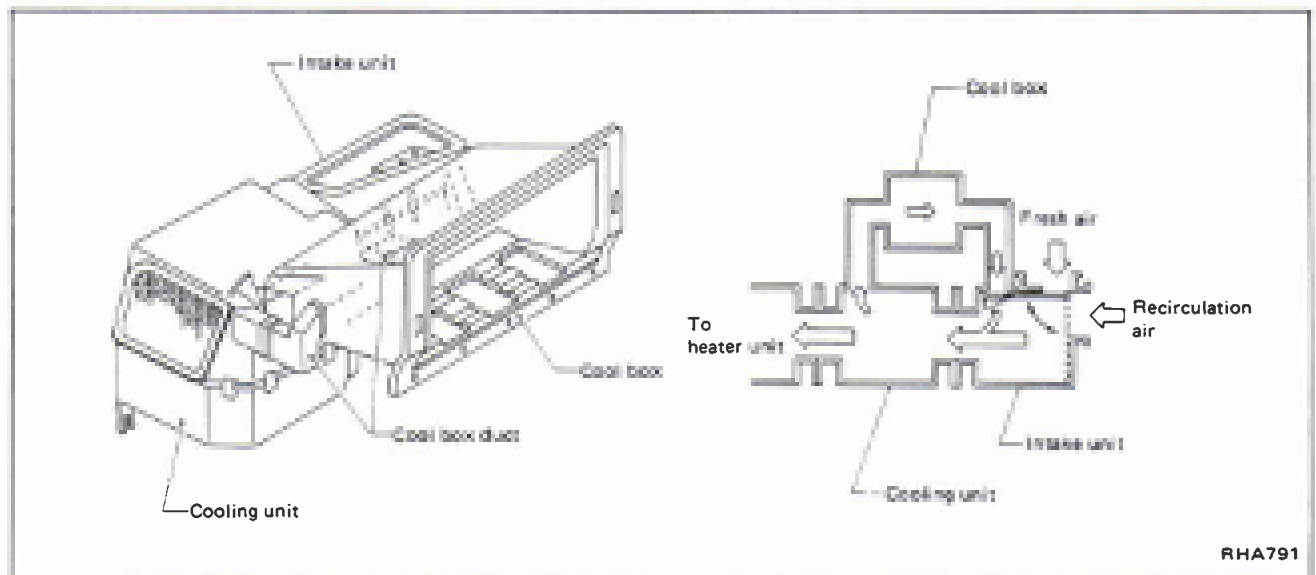
This system is used to monitor the temperature of coolant for engine. When the engine is heavily overloaded, the compressor is turned off to reduce the overloading by the function of the thermo switch located at radiator.

The thermo switch turns ON when the temperature of coolant for engine increases approx. 107°C (225°F), then A/C cut relay stays in open position to cut power source for compressor.



### Cool Box System — Front

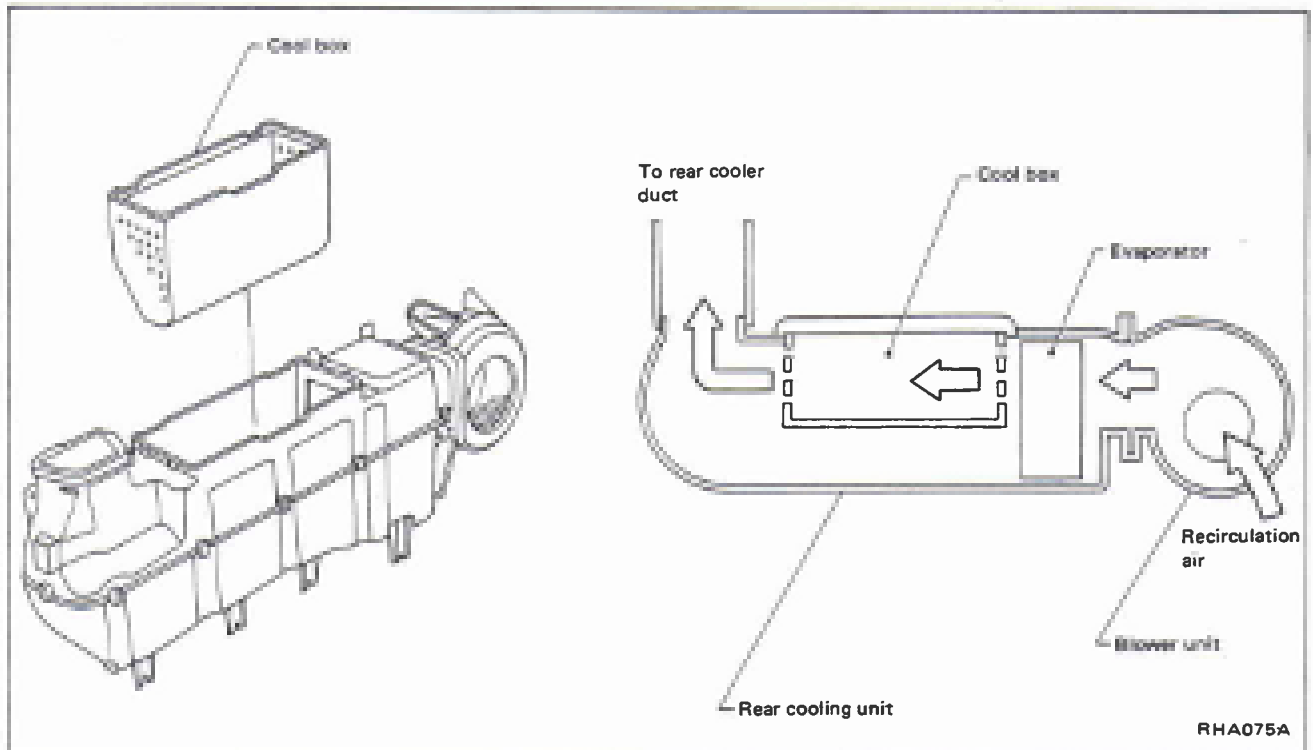
- This system uses cool air from the cooling unit to make it possible to refrigerate.



## DESCRIPTION OF AIR CONDITIONER

### Cool Box System — Rear

- This system uses cool air from the cooling unit to make it possible to refrigerate.



## A/C PERFORMANCE TEST

### Performance Chart

#### TEST CONDITION

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)

Doors: Closed


Door window: Open

Hood: Open

TEMP. lever position: Max. COLD.

Rear cooler temp. switch\*: Max. COLD

Air control lever position:  (Ventilation)

INTAKE lever position:  (Recirculation)

FAN lever and switch\* position: Max. position

Engine speed: 1,500 rpm

Time required before starting testing after air conditioner starts operating: More than 10 minutes

Rear cooler: ON\*

\*: For rear cooler equipped model only

#### TEST READING

##### Single A/C equipped model

###### Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	25 (77)	6.0 - 8.5 (43 - 47)
	30 (86)	11.0 - 14.0 (52 - 57)
	35 (95)	15.5 - 18.5 (60 - 65)
	40 (104)	20.5 - 23.5 (69 - 74)
60 - 70	25 (77)	8.5 - 11.0 (47 - 52)
	30 (86)	14.0 - 17.0 (57 - 63)
	35 (95)	18.5 - 22.0 (65 - 72)
	40 (104)	23.5 - 28.0 (74 - 82)

###### Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm <sup>2</sup> , psi)	Low-pressure (Suction side) kPa (bar, kg/cm <sup>2</sup> , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	25 (77)	981 - 1,226 (9.81 - 12.26, 10.0 - 12.5, 142 - 178)	118 - 196 (1.18 - 1.96, 1.2 - 2.0, 17 - 28)
	30 (86)	1,177 - 1,373 (11.77 - 13.73, 12.0 - 14.0, 171 - 199)	137 - 206 (1.37 - 2.06, 1.4 - 2.1, 20 - 30)
	35 (95)	1,324 - 1,569 (13.24 - 15.69, 13.5 - 16.0, 192 - 228)	157 - 235 (1.57 - 2.35, 1.6 - 2.4, 23 - 34)
	40 (104)	1,520 - 1,765 (15.20 - 17.65, 15.5 - 18.0, 220 - 256)	196 - 275 (1.96 - 2.75, 2.0 - 2.8, 28 - 40)

## A/C PERFORMANCE TEST

### Performance Chart (Cont'd)

#### Overhead type rear cooler (Type 1) equipped model

**Recirculating-to-discharge air temperature table**

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	25 (77)	9.0 - 11.5 (48 - 53)
	30 (86)	13.5 - 16.0 (56 - 61)
	35 (95)	18.0 - 20.0 (64 - 68)
	40 (104)	22.0 - 24.5 (72 - 76)
60 - 70	25 (77)	11.5 - 13.5 (53 - 56)
	30 (86)	16.0 - 18.0 (61 - 64)
	35 (95)	20.0 - 22.5 (68 - 73)
	40 (104)	24.5 - 27.0 (76 - 81)

**Ambient air temperature-to-compressor pressure table**

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm <sup>2</sup> , psi)	Low-pressure (Suction side) kPa (bar, kg/cm <sup>2</sup> , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	25 (77)	1,373 - 1,520 (13.73 - 15.20, 14.0 - 15.5, 199 - 220)	167 - 226 (1.67 - 2.26, 1.7 - 2.3, 24 - 33)
	30 (86)	1,569 - 1,716 (15.69 - 17.16, 16.0 - 17.5, 228 - 249)	216 - 265 (2.16 - 2.65, 2.2 - 2.7, 31 - 38)
	35 (95)	1,814 - 1,961 (18.14 - 19.61, 18.5 - 20.0, 263 - 284)	245 - 314 (2.45 - 3.14, 2.5 - 3.2, 36 - 46)
	40 (104)	2,059 - 2,354 (20.59 - 23.54, 21.0 - 24.0, 299 - 341)	294 - 373 (2.94 - 3.73, 3.0 - 3.8, 43 - 54)

## A/C PERFORMANCE TEST

### Performance Chart (Cont'd)

#### Rear cooler (Type 2) equipped model

##### Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	35 (77)	7.0 - 9.0 (45 - 48)
	30 (86)	11.5 - 14.0 (53 - 57)
	35 (95)	16.0 - 18.5 (61 - 65)
	40 (104)	20.5 - 23.0 (69 - 73)
60 - 70	25 (77)	9.0 - 12.0 (48 - 54)
	30 (86)	14.0 - 16.5 (57 - 62)
	35 (95)	18.5 - 21.0 (65 - 70)
	40 (104)	23.0 - 25.5 (73 - 78)

##### Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm <sup>2</sup> , psi)	Low-pressure (Suction side) kPa (bar, kg/cm <sup>2</sup> , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	25 (77)	1,177 - 1,324 (11.77 - 13.24, 12.0 - 13.5, 171 - 192)	167 - 226 (1.67 - 2.26, 1.7 - 2.3, 24 - 33)
	30 (86)	1,422 - 1,569 (14.22 - 15.69, 14.5 - 16.0, 206 - 228)	216 - 275 (2.16 - 2.75, 2.2 - 2.8, 31 - 40)
	35 (95)	1,618 - 1,765 (16.18 - 17.65, 16.5 - 18.0, 235 - 256)	255 - 314 (2.55 - 3.14, 2.6 - 3.2, 37 - 46)
	40 (104)	1,863 - 2,059 (18.63 - 20.59, 19.0 - 21.0, 270 - 299)	304 - 363 (3.04 - 3.63, 3.1 - 3.7, 44 - 53)

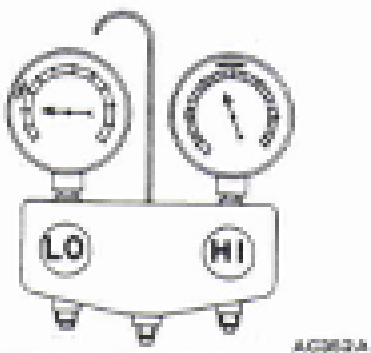
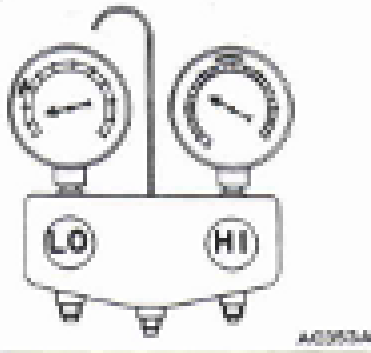
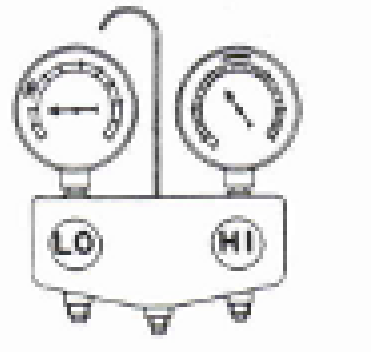
## A/C PERFORMANCE TEST

### Performance Test Diagnoses

Characteristics revealed by the manifold gauge readings for the air conditioning system are shown in the following.

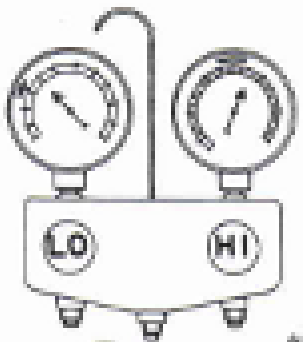
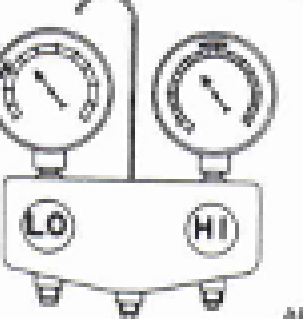
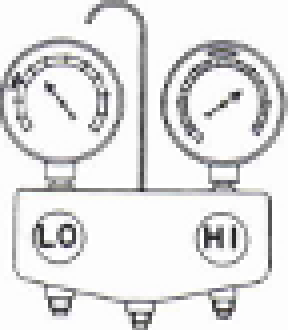
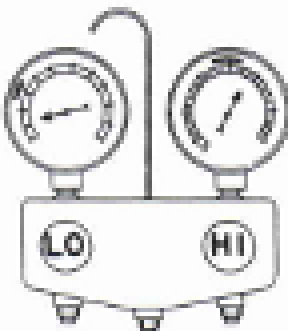
For how to do the performance test, refer to the item "Performance Chart".

In the following table, the portion smeared with ink on each gauge scale indicates the range showing that the air conditioning system is in good order. This range is described in Performance Chart.

Condition	Probable cause	Corrective action
<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"><b>INSUFFICIENT REFRIGERANT CHARGE</b></div>  <p style="font-size: small;">AC382A</p>	<p>Insufficient cooling. Bubbles appear in sight glass.</p> <p>Refrigerant is low, or leaking slightly.</p>	<ol style="list-style-type: none"> <li>1. Leak test.</li> <li>2. Repair leak.</li> <li>3. Charge system.</li> </ol> <p><b>Evacuate, as necessary, and recharge system.</b></p>
<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"><b>ALMOST NO REFRIGERANT</b></div>  <p style="font-size: small;">AC383A</p>	<p>No cooling action. A lot of bubbles or something like mist appears in sight glass.</p> <p>Serious refrigerant leak.</p>	<p><b>Stop compressor immediately.</b></p> <ol style="list-style-type: none"> <li>1. Leak test.</li> <li>2. Discharge system.</li> <li>3. Repair leak(s).</li> <li>4. Replace receiver drier if necessary.</li> <li>5. Check oil level.</li> <li>6. Evacuate and recharge system.</li> </ol>
<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"><b>FAULTY EXPANSION VALVE</b></div>  <p style="font-size: small;">AC384A</p>	<p>Slight cooling. Sweat or frosting on expansion valve inlet.</p> <p>Expansion valve restricts refrigerant flow.</p> <ul style="list-style-type: none"> <li>● Expansion valve is clogged.</li> <li>● Expansion valve is inoperative. <ul style="list-style-type: none"> <li>Valve stuck closed.</li> <li>Thermal bulb has lost charge.</li> </ul> </li> </ul>	<p>If valve inlet reveals sweat or frost:</p> <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Remove valve and clean it. Replace it if necessary.</li> <li>3. Evacuate system.</li> <li>4. Charge system.</li> </ol> <p>If valve does not operate:</p> <ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace valve.</li> <li>3. Evacuate and charge system.</li> </ol>

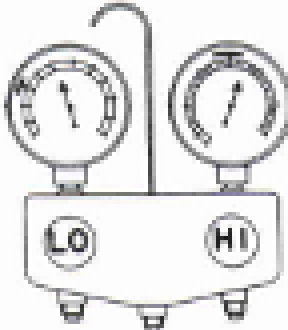
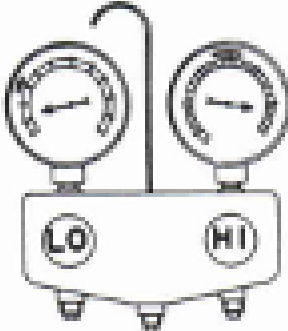
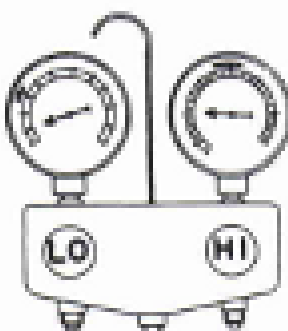
# A/C PERFORMANCE TEST

## Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action
 <p data-bbox="393 622 468 644">AC055A</p> <p data-bbox="491 294 725 360">Insufficient cooling. Sweat on suction line.</p>  <p data-bbox="393 950 468 971">AC055A</p> <p data-bbox="491 600 725 698">No cooling. Sweat or frosting on suction line.</p>	<p data-bbox="793 294 1081 382">Expansion valve allows too much refrigerant through evaporator.</p> <p data-bbox="793 600 1043 622">Faulty expansion valve.</p>	<p data-bbox="1096 294 1383 414">Check valve for operation. If suction side does not show a pressure decrease, replace valve.</p> <ol data-bbox="1096 600 1383 720" style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace valve.</li> <li>3. Evacuate and replace system.</li> </ol>
<p data-bbox="113 993 309 1026"><b>AIR IN SYSTEM</b></p>  <p data-bbox="393 1430 468 1452">AC055A</p> <p data-bbox="491 1059 771 1157">Insufficient cooling. Sight glass shows occasional bubbles.</p>	<p data-bbox="793 1059 1073 1124">Air mixed with refrigerant in system.</p>	<ol data-bbox="1096 1059 1383 1179" style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace receiver drier.</li> <li>3. Evacuate and charge system.</li> </ol>
<p data-bbox="113 1474 393 1506"><b>MOISTURE IN SYSTEM</b></p>  <p data-bbox="393 1954 468 1976">AC055A</p> <p data-bbox="491 1539 771 1812">After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading vibrates around 39 kPa (0.39 bar, 0.4 kg/cm<sup>2</sup>, 6 psi).</p>	<p data-bbox="793 1539 1081 1692">Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.</p>	<ol data-bbox="1096 1539 1383 1779" style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Replace receiver drier (twice if necessary).</li> <li>3. Evacuate system completely. (Repeat 30-minutes evacuating three times.)</li> <li>4. Recharge system.</li> </ol>

## A/C PERFORMANCE TEST

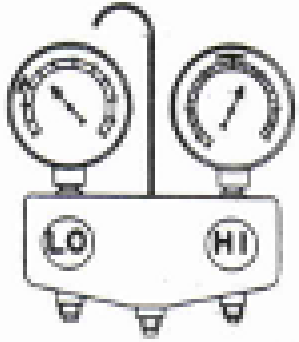
### Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin-bottom: 10px;"><b>FAULTY CONDENSER</b></div>  <p style="text-align: center; font-size: small;">AC381A</p>	<p>No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.</p> <p>Usually a malfunctioning condenser.</p>	<ul style="list-style-type: none"> <li>● Check fan belt and fluid coupling</li> <li>● Check condenser for dirt accumulation.</li> <li>● Check engine cooling system for overheating.</li> <li>● Check for refrigerant overcharging.</li> </ul> <p><b>If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.</b></p>
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin-bottom: 10px;"><b>HIGH PRESSURE LINE BLOCKED</b></div>  <p style="text-align: center; font-size: small;">AC382A</p>	<p>Insufficient cooling. Frosted high pressure liquid line.</p> <p>Drier clogged, or restriction in high pressure line.</p>	<ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Remove receiver drier or strainer and replace it.</li> <li>3. Evacuate and charge system.</li> </ol>
<div style="border: 1px solid black; padding: 2px; width: fit-content; margin-bottom: 10px;"><b>FAULTY COMPRESSOR</b></div>  <p style="text-align: center; font-size: small;">AC383A</p>	<p>Insufficient cooling.</p> <p>Internal problem in compressor, or damaged gasket and valve.</p>	<ol style="list-style-type: none"> <li>1. Discharge system.</li> <li>2. Remove and check compressor.</li> <li>3. Repair or replace compressor.</li> <li>4. Check oil level.</li> <li>5. Replace receiver drier.</li> <li>6. Evacuate and charge system.</li> </ol>



# A/C PERFORMANCE TEST

## Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action	
<p data-bbox="107 316 340 382"><b>TOO MUCH OIL IN SYSTEM (Excessive)</b></p>  <p data-bbox="385 797 461 819">AC3888</p>	<p data-bbox="491 316 703 349">Insufficient cooling.</p>	<p data-bbox="793 316 1073 447">Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.</p>	<p data-bbox="1096 316 1406 382">Refer to <b>COMPRESSOR OIL</b> for correcting oil level.</p>

## COMPRESSOR OIL — For DKS-16H (DIESEL-KIKI make)

### Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.

Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

#### OIL CAPACITY

Unit: mℓ (Imp fl oz)

Applied model	Without rear cooler model	With rear cooler model
Capacity		
Total in system	200 (7.0)	250 (8.8)
Amount of oil which can be drained	110 (3.9)*	
Compressor (Service parts) charging amount	200 (7.0)	

\*: All oil cannot be drained from system.

#### OIL RETURN OPERATION

Before checking and adjusting oil level, operate compressor at engine idling speed, with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return oil to compressor.

#### CHECKING AND ADJUSTING FOR USED COMPRESSOR

1. After oil return operation, stop the engine and discharge refrigerant and then remove compressor from the vehicle.
2. Remove oil drain plug, drain compressor oil from compressor oil sump and measure the amount.

**Oil is sometimes hard to extract when compressor is cooled. Remove oil while compressor is warm [maintained to 40 to 50°C (104 to 122°F)].**

3. If the amount is less than 110 mℓ (3.9 Imp fl oz), some refrigerant may have leaked out. Conduct leak tests on connections of each system, and if necessary, repair or replace faulty parts.

4. Check the purity of the oil and then adjust oil level following the procedure below.

(a) When oil is clean;

Unit: mℓ (Imp fl oz)

Amount of oil drained	Adjusting procedure
Above 110 (3.9)*	Oil level is right. Pour in same amount of oil as was drained out.
Below 110 (3.9)	Oil level may be low. Pour in 110 mℓ (3.9 Imp fl oz) of oil.

\*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then pour in 200 mℓ (7.0 Imp fl oz) of oil into air conditioner system.

- (b) When oil contains chips or foreign material;  
After air conditioner system has been flushed with refrigerant, replace receiver drier. Then pour in 200 mℓ (7.0 Imp fl oz) of oil into air conditioner system.

#### CHECKING AND ADJUSTING FOR COMPRESSOR REPLACEMENT

200 mℓ (7.0 Imp fl oz) of oil is charged in compressor (service parts). So it is necessary to drain the proper amount of oil from new compressor. Follow the procedure below.

1. After oil return operation, drain compressor oil from used compressor and measure the amount.  
(It is the same procedure as CHECKING AND ADJUSTING FOR USED COMPRESSOR.)

## COMPRESSOR OIL — For DKS-16H (DIESEL-KIKI make)

### Checking and Adjusting (Cont'd)

2. Check the purity of the oil and then adjust oil level following the procedure below.

(a) Oil is clean;

Unit: mL (Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
Above 110 (3.9)*	200 (7.0) – [Amount of oil drained + 25 (0.9)]
Below 110 (3.9)	110 (3.9)

\*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then install new compressor [200 mL (7.0 Imp fl oz) of oil is changed compressor service parts.]

Example:

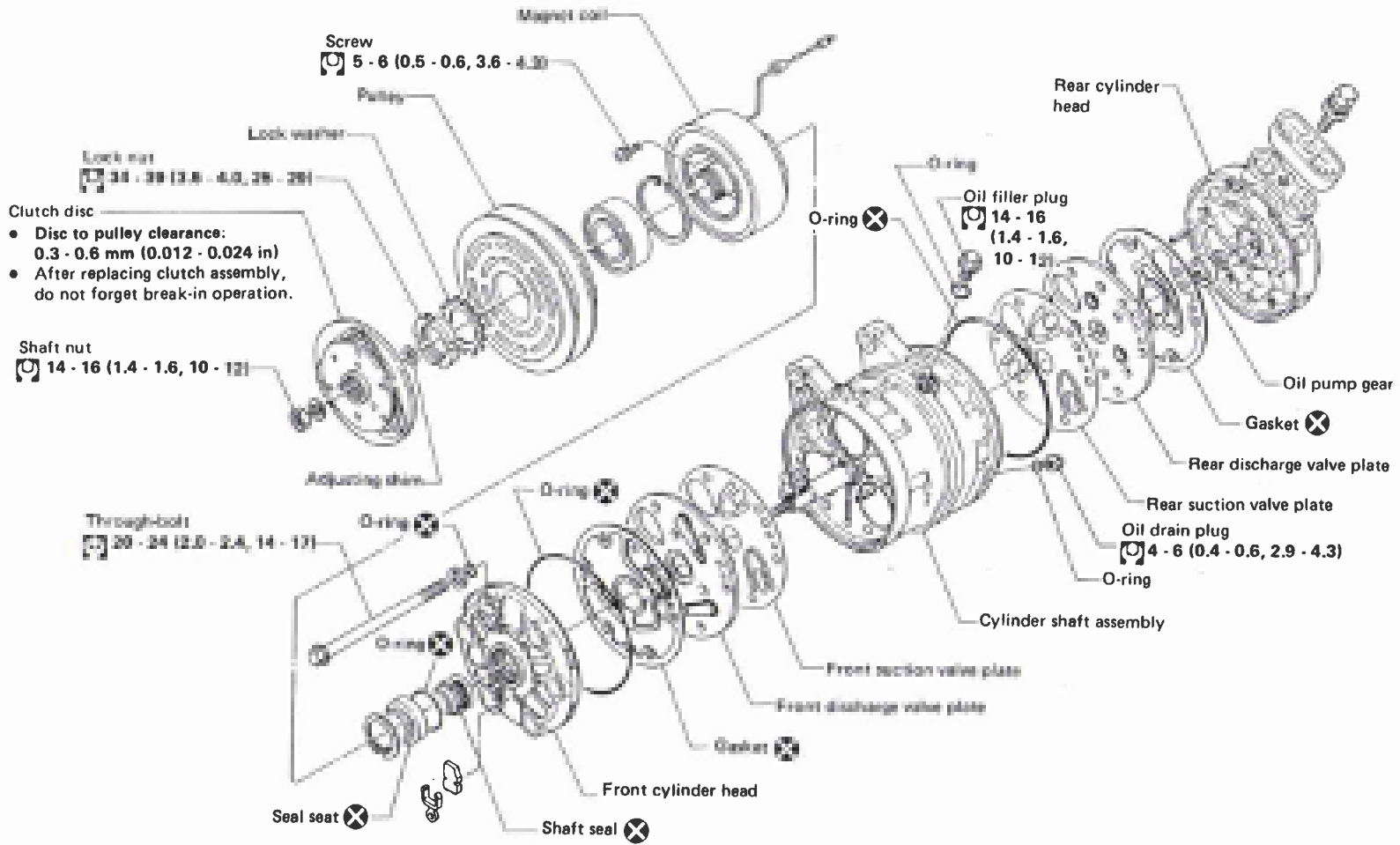
Unit: mL (Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
135 (4.8)	90 (3.2)
95 (3.3)	110 (3.9)

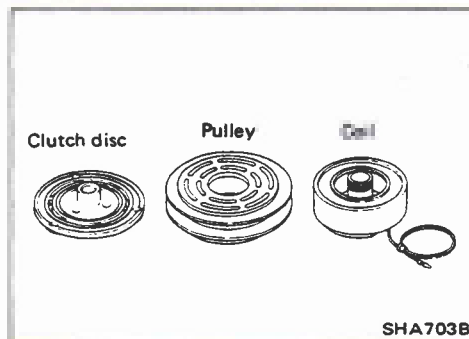
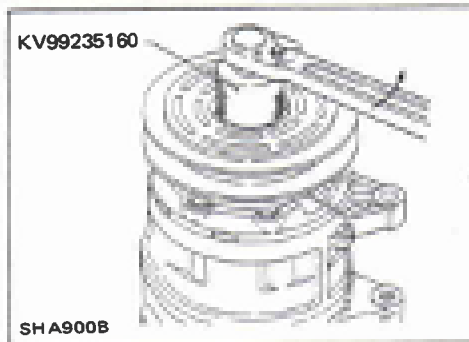
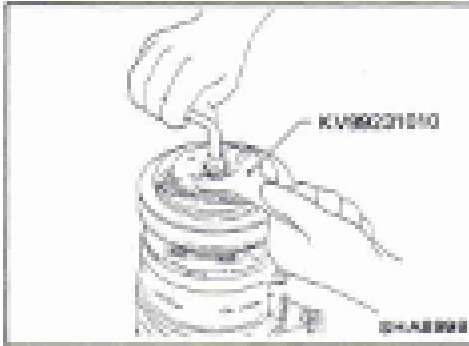
- (b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor. [200 mL (7.0 Imp fl oz) of oil is charged in compressor service parts.]

### Precautions

- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.
  
- Replace shaft seal, seal seat, oil seal and O-ring as a set.
- When installing shaft seal, seal seat, oil seal, O-ring and gaskets, apply compressor oil sparingly to the contact surface. Do not reuse them.
- After replacement or repairs, conduct a Leak Test.



☞ : N·m (kg·m, ft·lb)



**Compressor Clutch  
REMOVAL**

- When removing shaft nut, hold clutch disc with clutch disc wrench.

- Using clutch disc puller, clutch disc can be removed easily.

- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

- Remove the pulley by hand. If difficult, use puller pilot.

**INSPECTION**

**Clutch disc**

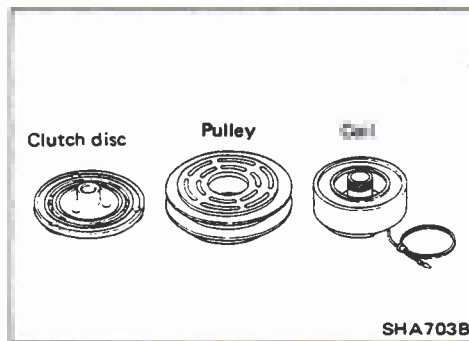
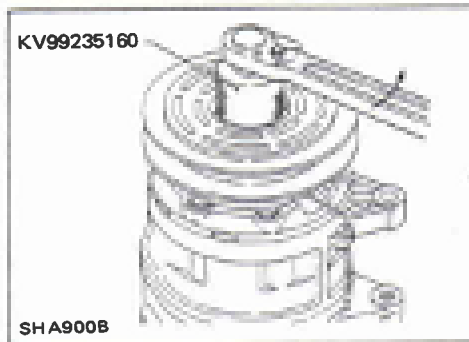
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

**Pulley**

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

**Coil**

Check coil for loose connection or cracked insulation.



**Compressor Clutch  
REMOVAL**

- When removing shaft nut, hold clutch disc with clutch disc wrench.

- Using clutch disc puller, clutch disc can be removed easily.

- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

- Remove the pulley by hand. If difficult, use puller pilot.

**INSPECTION**

**Clutch disc**

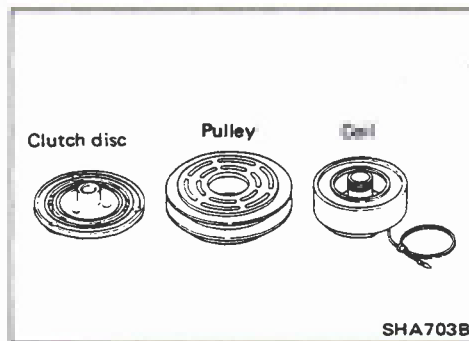
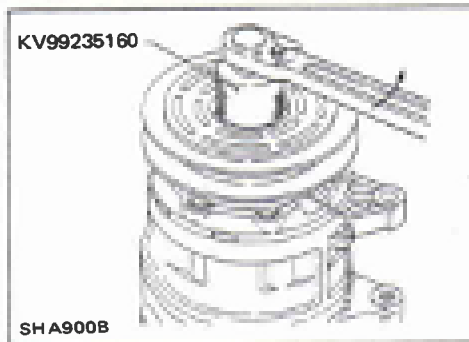
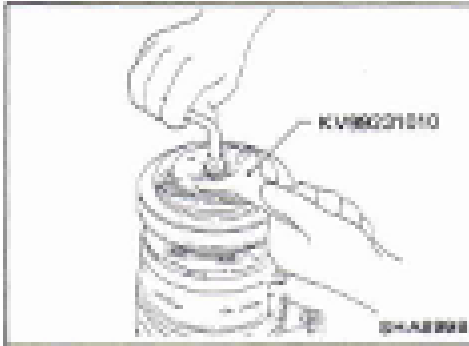
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

**Pulley**

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

**Coil**

Check coil for loose connection or cracked insulation.



**Compressor Clutch  
REMOVAL**

- When removing shaft nut, hold clutch disc with clutch disc wrench.

- Using clutch disc puller, clutch disc can be removed easily.

- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

- Remove the pulley by hand. If difficult, use puller pilot.

**INSPECTION**

**Clutch disc**

If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

**Pulley**

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

**Coil**

Check coil for loose connection or cracked insulation.

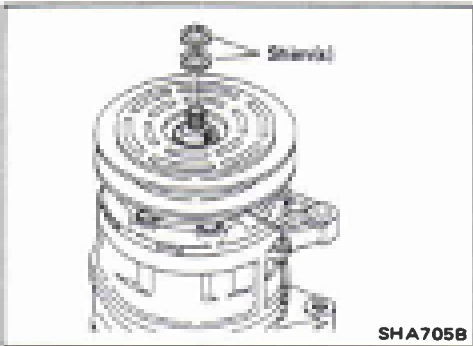


## COMPRESSOR — Model DKS-16H (DIESEL-KIKI make)

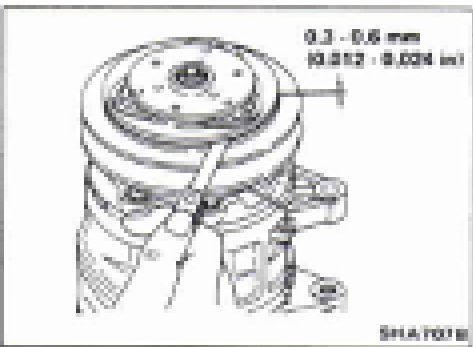
### Compressor Clutch (Cont'd)

#### INSTALLATION

- Install the key in the keyway on the compressor drive shaft.
- Install the coil to compressor (lead wire up) and tighten the mounting screws.
- Install the lead wire with its holder into the hold.



- Install lock washer and nut with nut wrench.
- Bend one pawl of the lock washer up against the nut to prevent the nut from loosening.



- Check to ensure that the clutch clearance is between 0.3 to 0.6 mm (0.012 to 0.024 in). Adjust the clearance using shim(s) as necessary.

#### BREAK-IN OPERATION

When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.

Break-in operation raises the level of transmitted torque.

#### Shaft Seal Assembly

The shaft seal assembly is a precision-part, with it's critical parts finished to extremely close tolerances and, as such, must be handled with great care. Its slip face demands particularly careful handling.

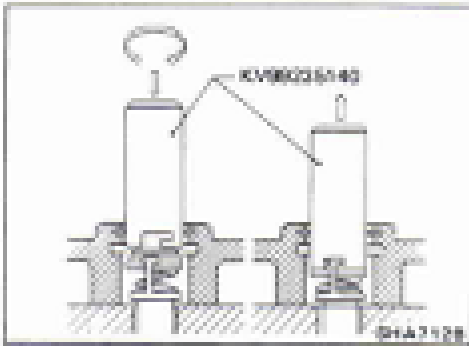
#### REMOVAL

- Remove the magnetic clutch assembly, as outlined in "Compressor Clutch-REMOVAL".
- Using Internal Snap Ring Pliers, remove the seal seat/compressor snap ring.
- Remove and discard seal seat.
- Using a suitable piece of wire, remove the O-ring from the inside groove of the shaft seal housing. Discard the O-ring.



## COMPRESSOR — Model DKS-16H (DIESEL-KIKI make)

### Shaft Seal Assembly (Cont'd)

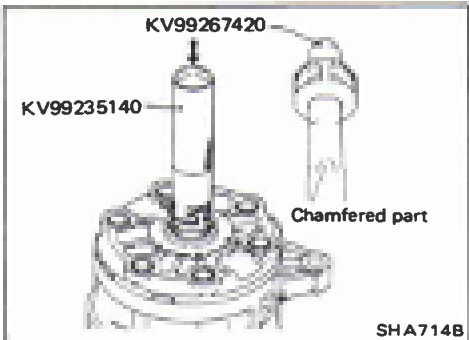


- Remove the shaft seal as follows. Turning clockwise, engage the remover hook with the shaft seal hook, and slowly draw out the seal. Discard the shaft seal.
- Check the shaft and inside of the compressor neck for dirt of foreign material and ensure these areas are perfectly clean before installing new shaft seal.



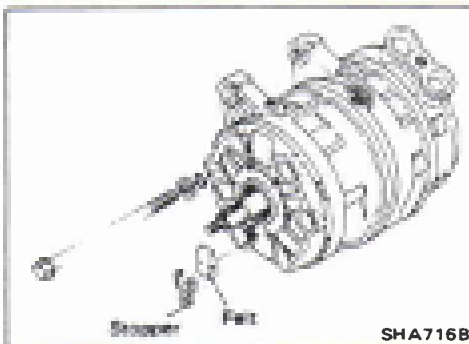
### INSPECTION

- Shaft seal assembly should not be reused. Always use a new shaft seal kit on reassembling the compressor. Be extremely careful to ensure that the face of the shaft of the shaft seal to be installed is not scratched or damaged in anyway. Make sure the seal seat and shaft seal are free of lint and dirt that could damage the shaft seal surface.



### INSTALLATION

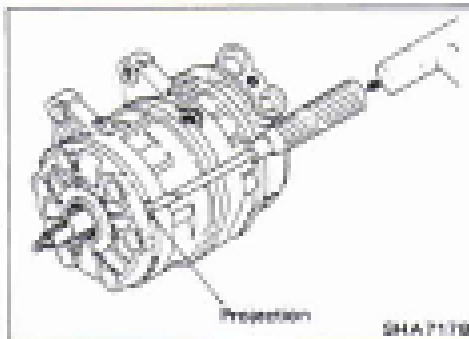
Clean the sealed section of the compressor. Apply clean compressor oil to the new shaft seal and the drive shaft. If the slip faces are dirty, clean them with thinners and after drying the cleaned faces, apply clean compressor oil. Fit the new O-ring with clean compressor oil to the groove inside the compressor neck. Apply clean compressor oil to the seal seat.



### Cylinder Heads (Front & Rear)

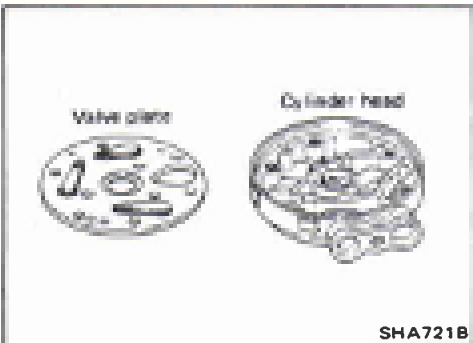
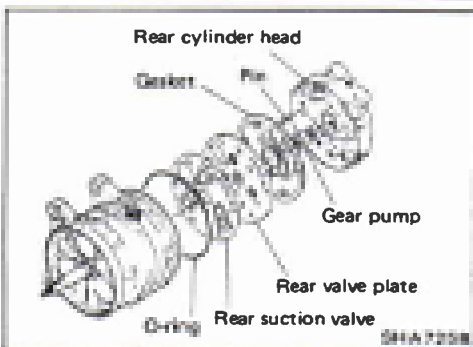
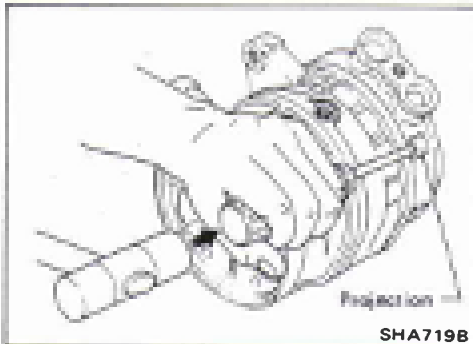
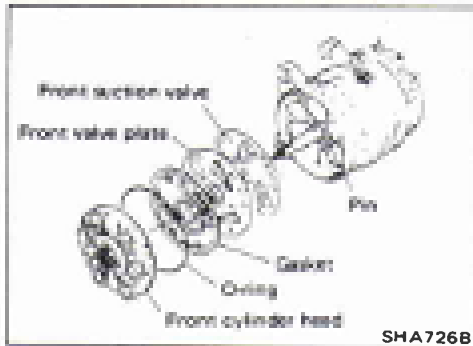
#### DISASSEMBLY

- Remove the compressor clutch assembly, as outlined in “Compressor Clutch-REMOVAL”.
- Remove the oil filler plug and drain plug, and then draw out the oil.
- Remove the shaft seal assembly, as outlined in “Shaft Seal Assembly-REMOVAL”.
- Remove the felt, stopper and six through-bolts securing the head, using a wrench.
- Alternately tap four projections on the circumference of the front head with a screwdriver and a plastic mallet, and remove the front cylinder head.



## COMPRESSOR — Model DKS-16H (DIESEL-KIKI make)

### Cylinder Heads (Front & Rear)(Cont'd)



- Remove and discard the O-ring from the front cylinder head.
- Remove all gasket material from the front cylinder head and front valve plate.

- Alternately tap four projections on the circumference of the rear head with a screwdriver and a plastic mallet, and remove the rear cylinder head.

- Remove the gear pump from the rear cylinder head or drive shaft end. Remove all gasket material from the rear cylinder head and rear valve plate. Remove and discard the O-ring from the rear side of the cylinder shaft assembly.

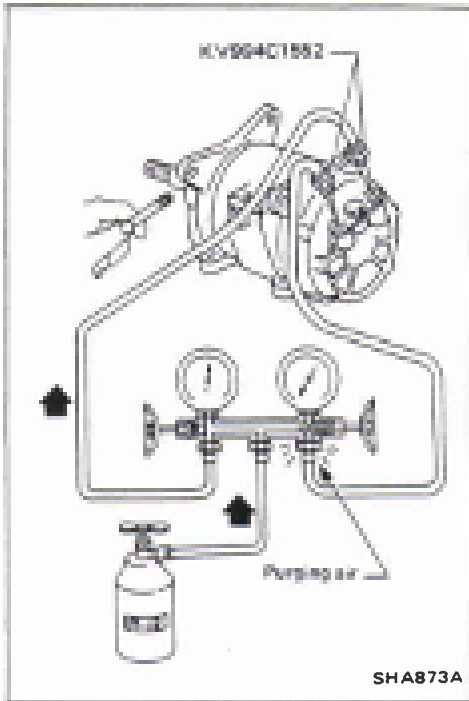
### INSPECTION

Check the front and rear valve plates for scratched, bent or otherwise damaged parts. Inspect both cylinder heads and both valve plate assemblies for nicks or burrs on the sealing surfaces. Clean, or replace if badly damaged. Make sure that all passages in the valve plate are unobstructed. If either the cylinder head or valve plate is cracked, it must be replaced.

### INSTALLATION

- Installation is the reverse of removal.
- Tighten bolts or plugs to specified torques.

## COMPRESSOR — Model DKS-16H (DIESEL-KIKI make)



### Leak Test

- Charge refrigerant from suction side and evacuate air from discharge side. Then conduct leak test.

**COMPRESSOR — Model DKS-16H (DIESEL-KIKI make)**

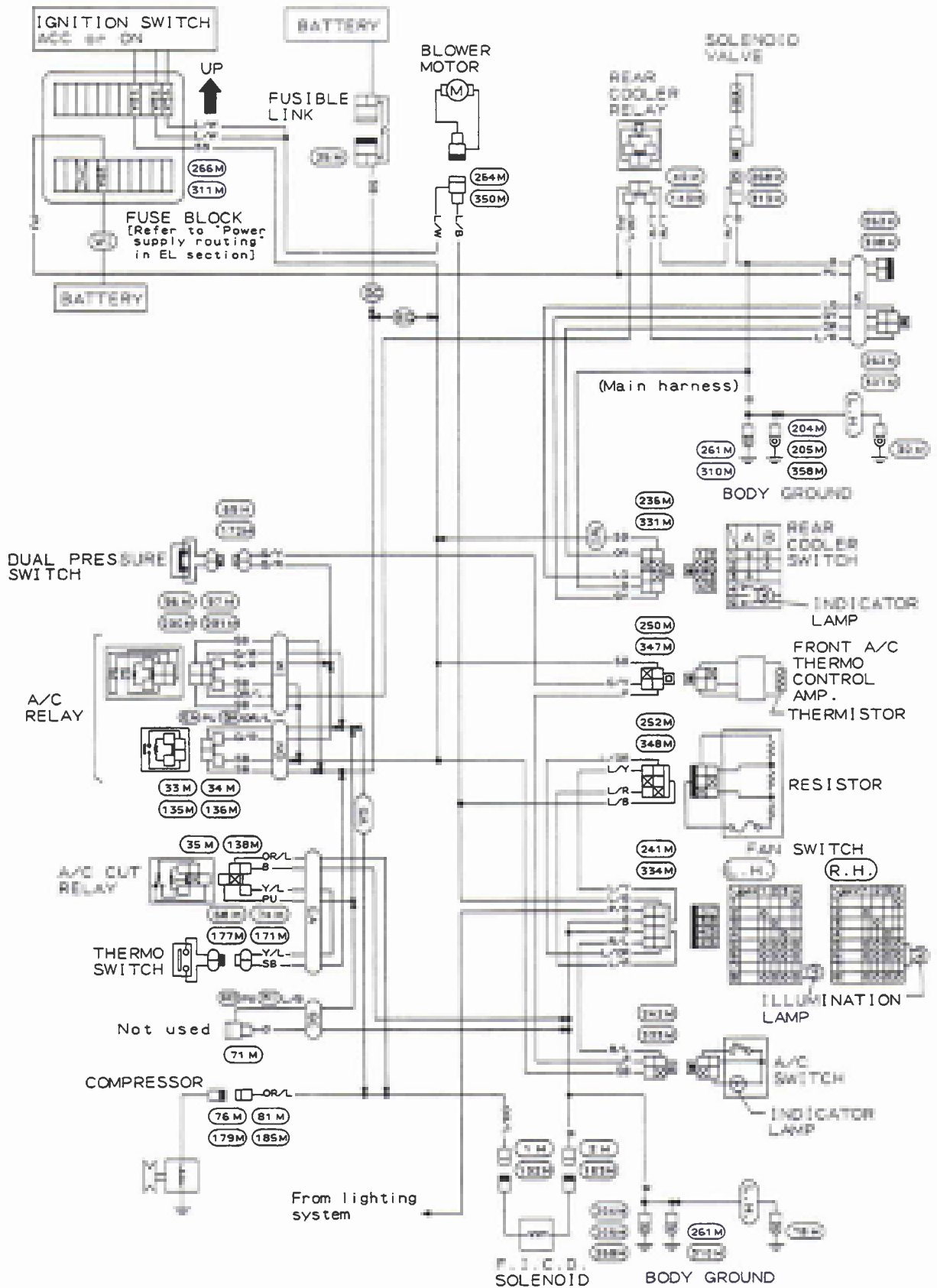
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**Note:**



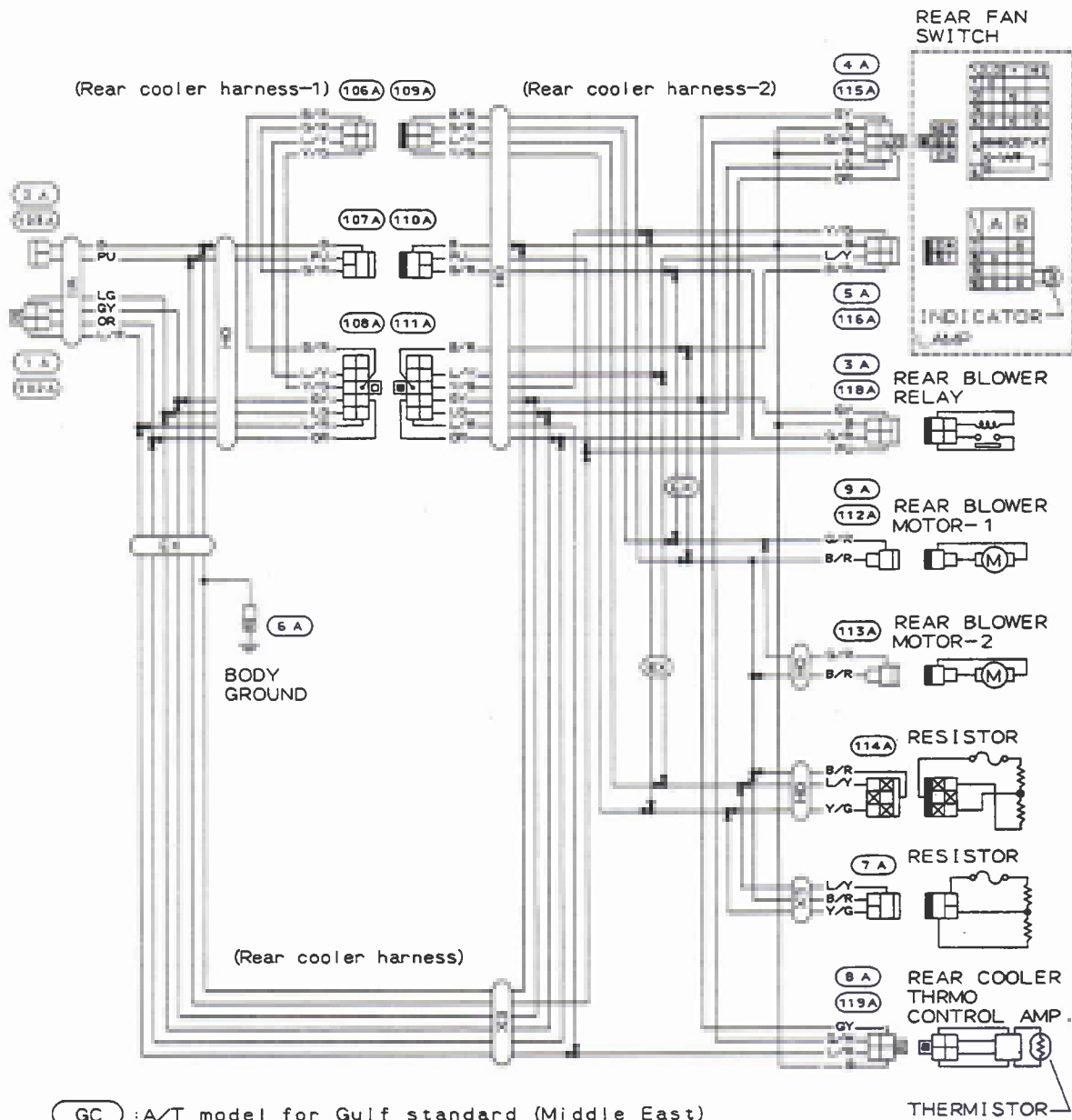
# A/C ELECTRICAL CIRCUIT

## Wiring Diagram



# A/C ELECTRICAL CIRCUIT

## Wiring Diagram (Cont'd)

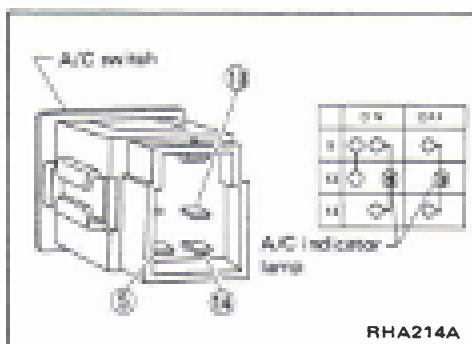


- (GC) : A/T model for Gulf standard (Middle East)
- (EG) : Except A/T model for Gulf standard (Middle East)
- (GA) : Except (EA)
- (EA) : For Australia A/T models, Gulf standard models (Middle East), Hard top & Wagon models with TD engine except for Australia
- (WI) : With rear cooler model
- (NO) : Without rear cooler model
- (OH) : Over head cooler model (Type 1)
- (EX) : Except Over head cooler model (Type 2)
- (R.H.) : R.H. drive model
- (L.H.) : L.H. drive model

SHA043C



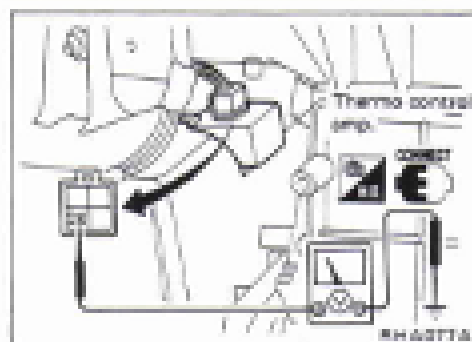
## A/C ELECTRICAL COMPONENTS



### Inspection

#### FRONT A/C SWITCH

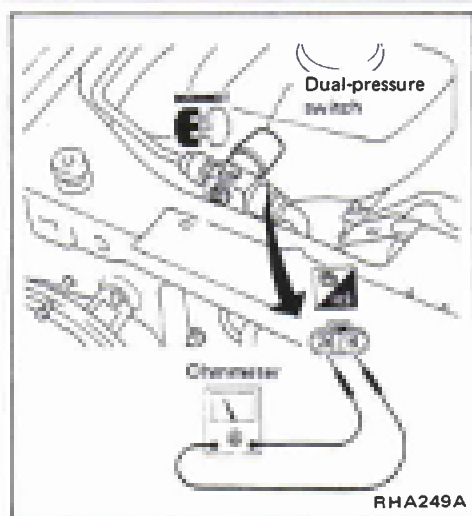
Check continuity between terminals at each switch position shown in the table.



#### FRONT A/C THERMO CONTROL AMP.

1. Run engine, and operate front A/C system.
2. Connect the voltmeter from harness side.
3. Check front A/C thermo control amp. operation shown in the table.

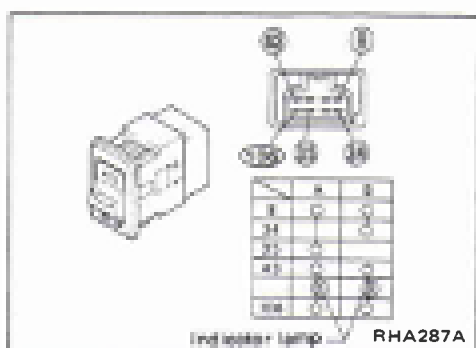
Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 0.1 - 0.9 (32 - 34)	Turn OFF	Approx. 12V
Increasing to 2.5 - 3.5 (37 - 38)	Turn ON	Approx. 0V



#### DUAL-PRESSURE SWITCH

Check continuity between terminals after disconnecting dual-pressure switch connector.

High-pressure side line pressure kPa (bar, kg/cm <sup>2</sup> , psi)	Operation	Continuity
<ul style="list-style-type: none"> <li>■ Decreasing to 177 - 216 (1.77 - 2.16, 1.8 - 2.2, 26 - 31)</li> <li>■ Increasing to 2,452 - 2,844 (24.5 - 28.4, 25 - 29, 356 - 412)</li> </ul>	Turn OFF	Not exist
<ul style="list-style-type: none"> <li>■ Increasing to 177 - 235 (1.77 - 2.35, 1.8 - 2.4, 26 - 34)</li> <li>■ Decreasing to 1,863 - 2,256 (18.6 - 22.6, 19 - 23, 270 - 327)</li> </ul>	Turn ON	Exists



#### REAR COOLER SWITCH

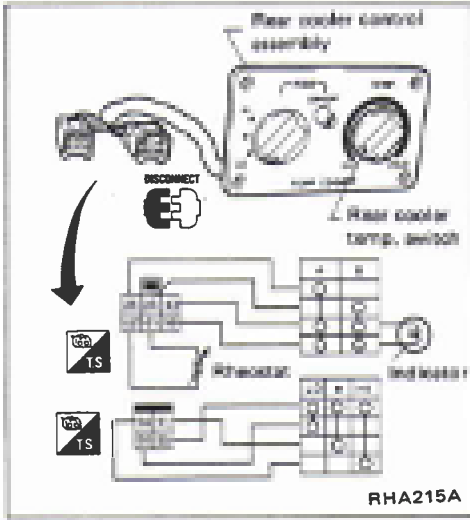
Check continuity between terminals at each switch position shown in the table.

## A/C ELECTRICAL COMPONENTS

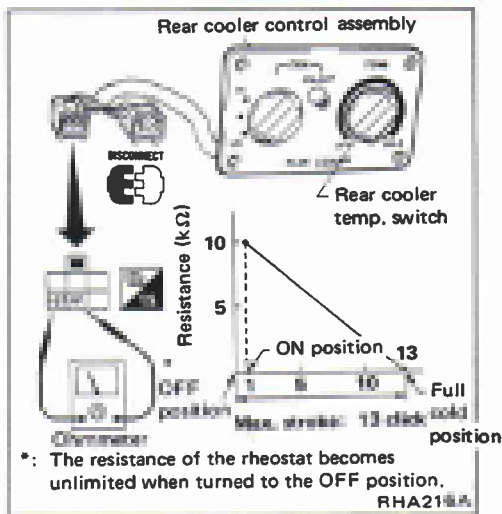
### Inspection (Cont'd)

#### REAR COOLER CONTROL ASSEMBLY

1. Check continuity between terminals at each switch position shown in the table.



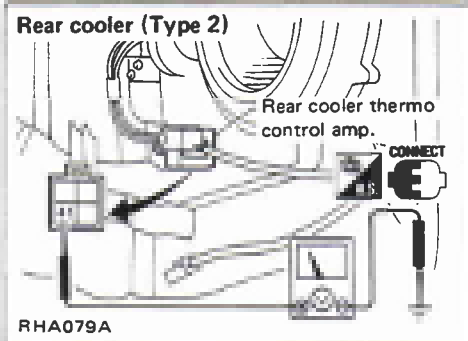
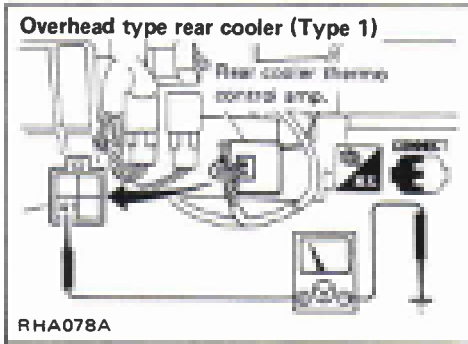
2. Check rheostat.
  - Confirm smooth rotation of the rear cooler temperature control knob.
  - Using an ohmmeter, check the rheostat values.



Rear cooler temp. switch	OFF	ON	ON: MAX. COLD
Terminal			
⑥1 - ⑩7	Continuity: Not exist	Approx. 10 kΩ ↔ Approx. 0Ω	

## A/C ELECTRICAL COMPONENTS

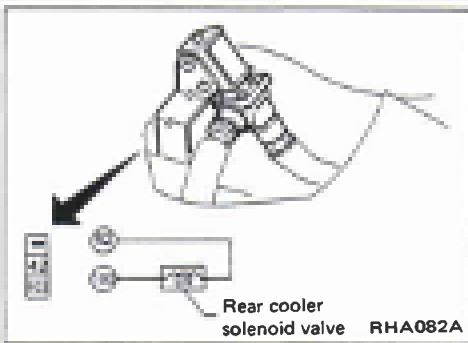
### Inspection (Cont'd)



### REAR COOLER THERMO CONTROL AMP.

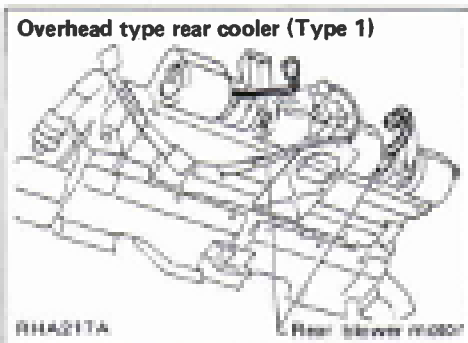
1. Start engine, and operate front A/C and rear cooler system.
2. Connect voltmeter from harness side.
3. Check rear cooler thermo control amp. operation shown in the table.

Rear temp. control position	Evaporator outlet air temperature °C (°F)	Operation	Voltage
MAX. COLD	Decreasing to -1.5 to 0.5 (29 - 33)	Turn OFF	Approx. 12V
	Increasing to 2.5 - 4.5 (37 - 40)	Turn ON	Approx. 0V
MAX. HOT	Decreasing to 13.5 - 15.5 (56 - 60)	Turn OFF	Approx. 12V
	Increasing to 6.5 - 20.5 (44 - 69)	Turn ON	Approx. 0V



### REAR COOLER SOLENOID VALVE

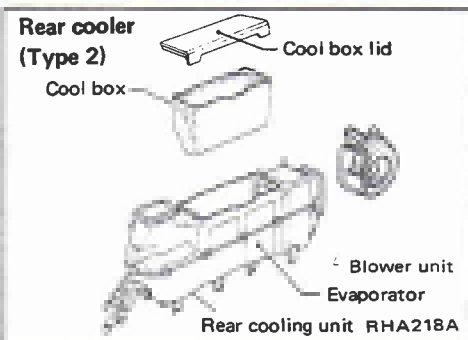
Check continuity between terminals.



### REAR BLOWER MOTOR

Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the blower unit.
- If the blower does not rotate, refer to TROUBLE-SHOOTING PROCEDURE 3.

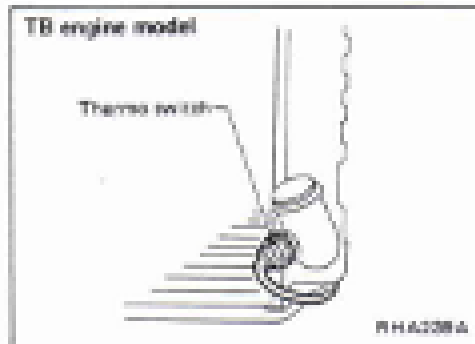
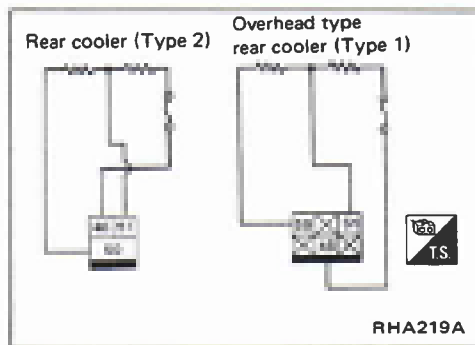


## A/C ELECTRICAL COMPONENTS

### Inspection (Cont'd)

#### REAR BLOWER RESISTOR

Check continuity between terminals.

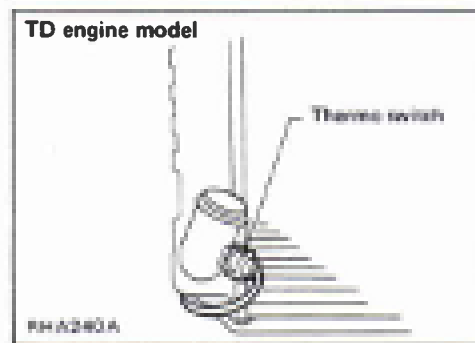


#### THERMO SWITCH

For Australia A/T models, Gulf standard (Middle East) models, Hardtop and Wagon models with TD engine except for Australia

Engine coolant temperature °C (°F)	Operation
Increasing to 107 (225)	ON
Decreasing to 103 (217)	OFF

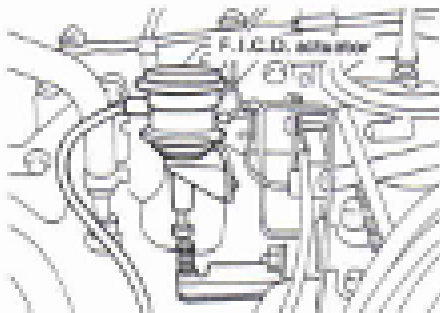
Refer to LC section.



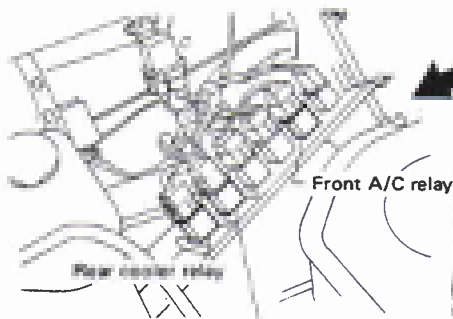
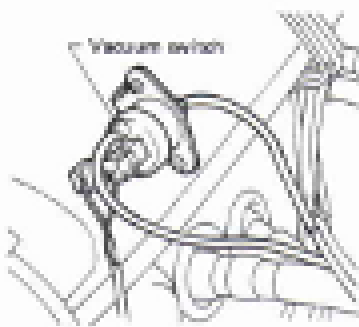
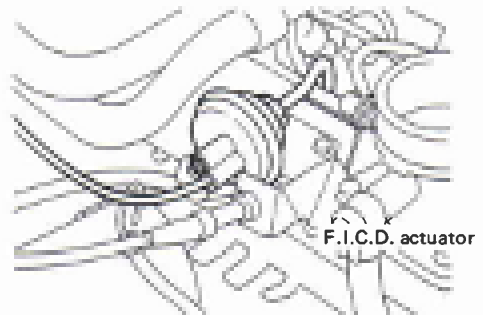
# A/C COMPONENT LAYOUT

## ENGINE COMPARTMENT

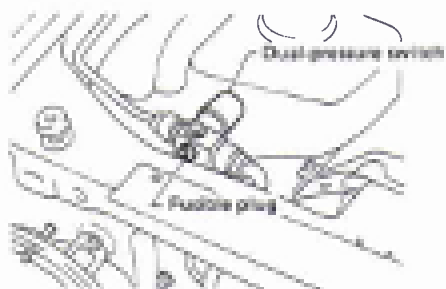
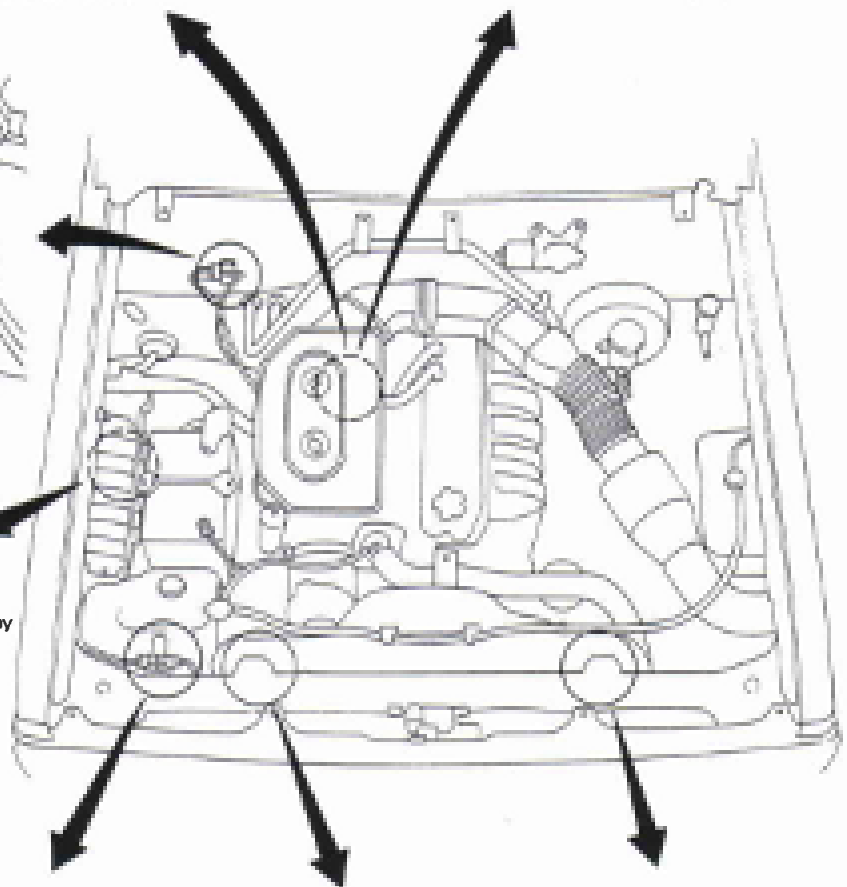
TB42 engine model



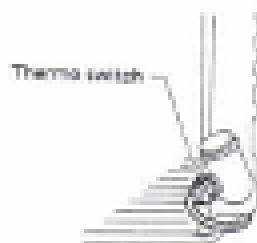
TD42 engine model



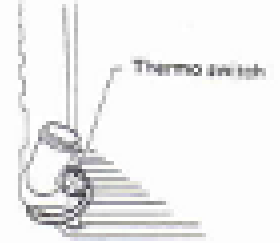
A/C cut relay  
 [For Australia A/T models, Gulf standard models  
 (Middle East), Hardtop and Wagon models with  
 TD engine except for Australia]



TB engine model



TD engine model

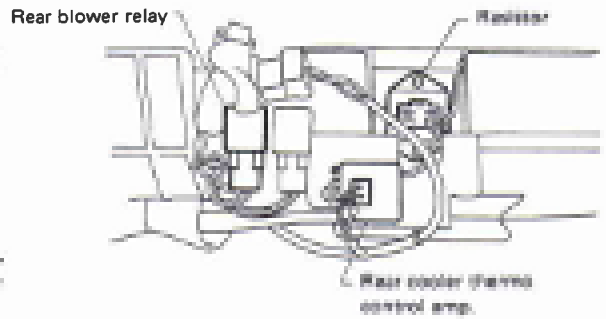
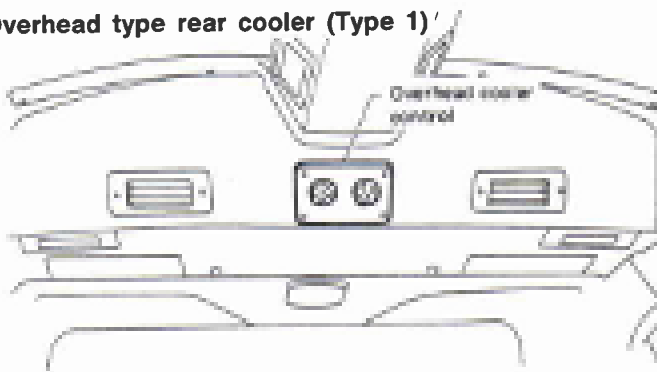


RHACBDA

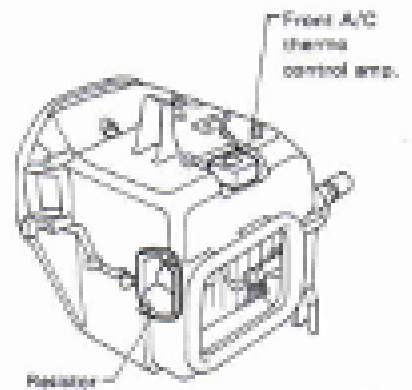
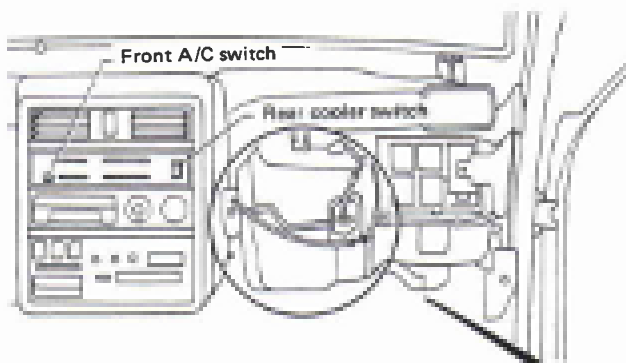
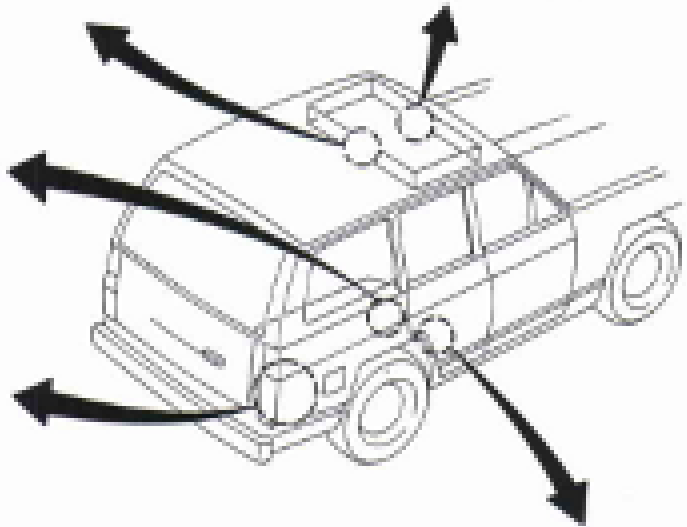
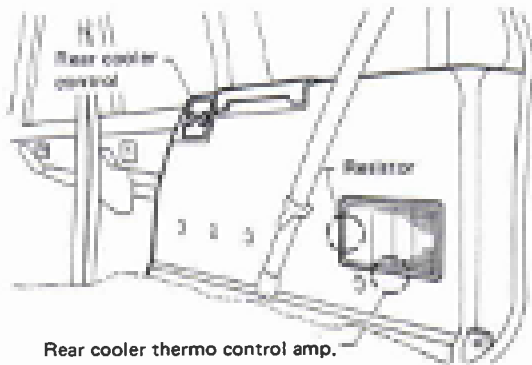
# A/C COMPONENT LAYOUT

## PASSENGER COMPARTMENT

### Overhead type rear cooler (Type 1)



### Rear cooler (Type 2)



RHA281A

# TROUBLE DIAGNOSES

## Trouble-shooting

### INSPECTION TABLE

No.	INCIDENT	"HOW TO REPAIR"	INSPECTION PORTION																							
			100A Fuse #1	15A Fuse #1	20A Fuse #1	Fusible link (Green) *1	Front blower motor	Rear blower motor	Front switch	Rear switch	Front A/C switch	Front fan switch	Rear cooler switch	High switch	Blow switch (except)	A/C relay	A/C cut relay *1	Rear cooler relay	Rear blower relay	Front A/C thermo control amp.	Rear cooler thermo control amp.	Dual pressure switch	Pressure switch *1	Compressor (Magnet start)	Solenoid valve	Harman
1	Magnet clutch does not operate.	Go to TROUBLE-SHOOTING PROCEDURE 1.																								
2	Front blower motor does not rotate.	Go to TROUBLE-SHOOTING PROCEDURE 2.																								
3	Rear blower motor(s) does not rotate.	Go to TROUBLE-SHOOTING PROCEDURE 3.																								
4	Rear cooler solenoid valve does not operate.	Go to TROUBLE-SHOOTING PROCEDURE 4.																								

This table indicates the inspection portion for each type of incident.

\*1: For location, refer to PRELIMINARY CHECK.

\*2: For Australia A/T models, Gulf standard models (Middle East), Hardtop and Wagon models with TD engine except for Australia

### PRELIMINARY CHECK

#### Compressor belt tension check

Check compressor belt deflection.

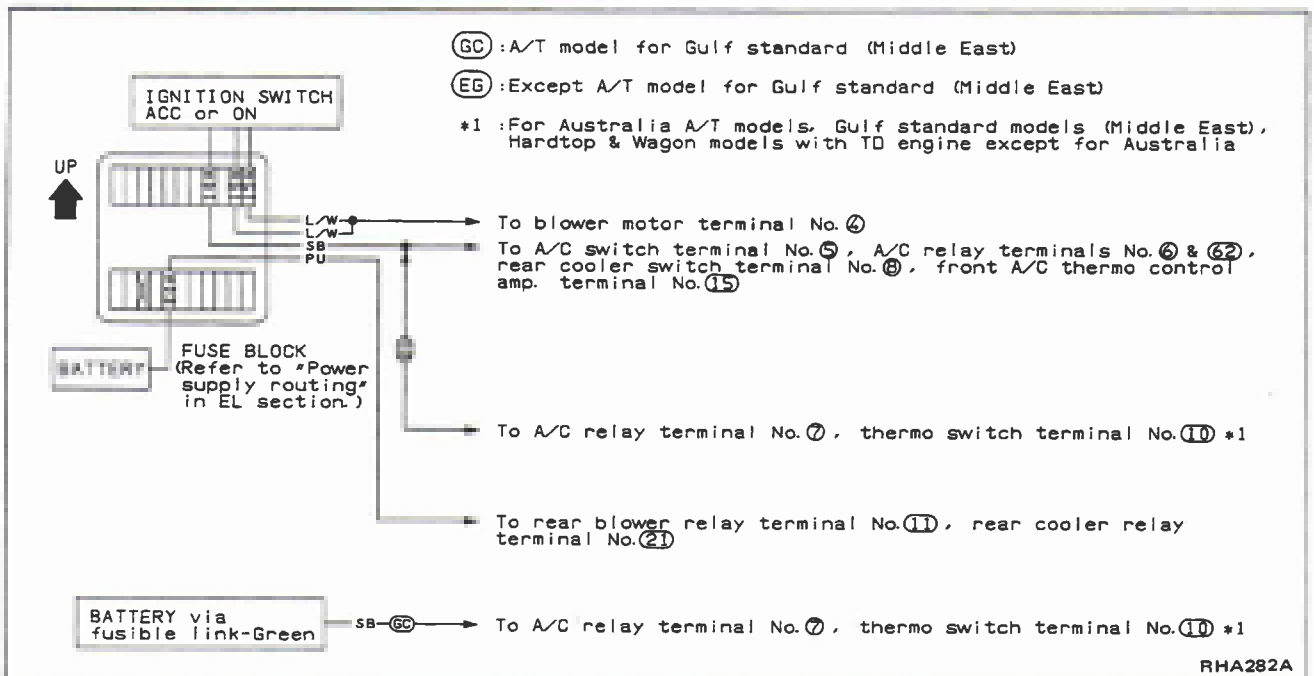
Adjust belt deflection if it exceeds the limit.

Refer to "Checking Drive Belts" in MA section.

#### Power supply circuit check for air conditioning system

Check power supply circuit for air conditioning system.

Refer to "Power Supply Routing" in EL section and A/C ELECTRICAL CIRCUIT.



## TROUBLE DIAGNOSES

### Trouble-shooting (Cont'd)

#### Front A/C thermo control amp. check

Check power supply and body ground circuit for front A/C thermo control amp. with ignition switch ON.

1. Disconnect front A/C thermo control amp. connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑬ and body ground.

Voltmeter terminal		Voltage
⊕	⊖	
⑬	Body ground	Approx. 12V

4. Switch to ignition switch OFF, A/C switch ON and front fan switch ON.
5. Connect ohmmeter from harness side.
6. Check continuity between terminal No. ⑭ and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
⑭	Body ground	Yes

#### Rear cooler thermo control amp. check

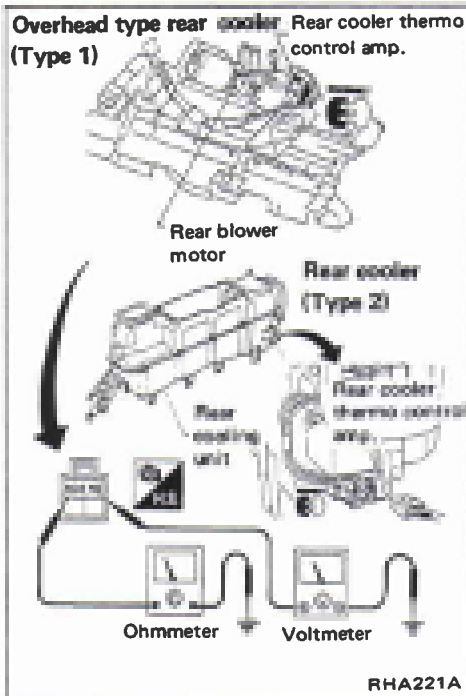
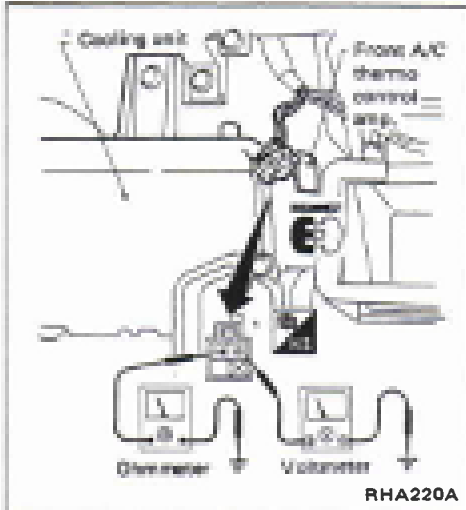
Check power supply and body ground circuit for rear cooler thermo control amp. with ignition switch ON, front A/C ON and rear cooler ON.

1. Disconnect rear cooler thermo control amp. connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑳ and body ground.

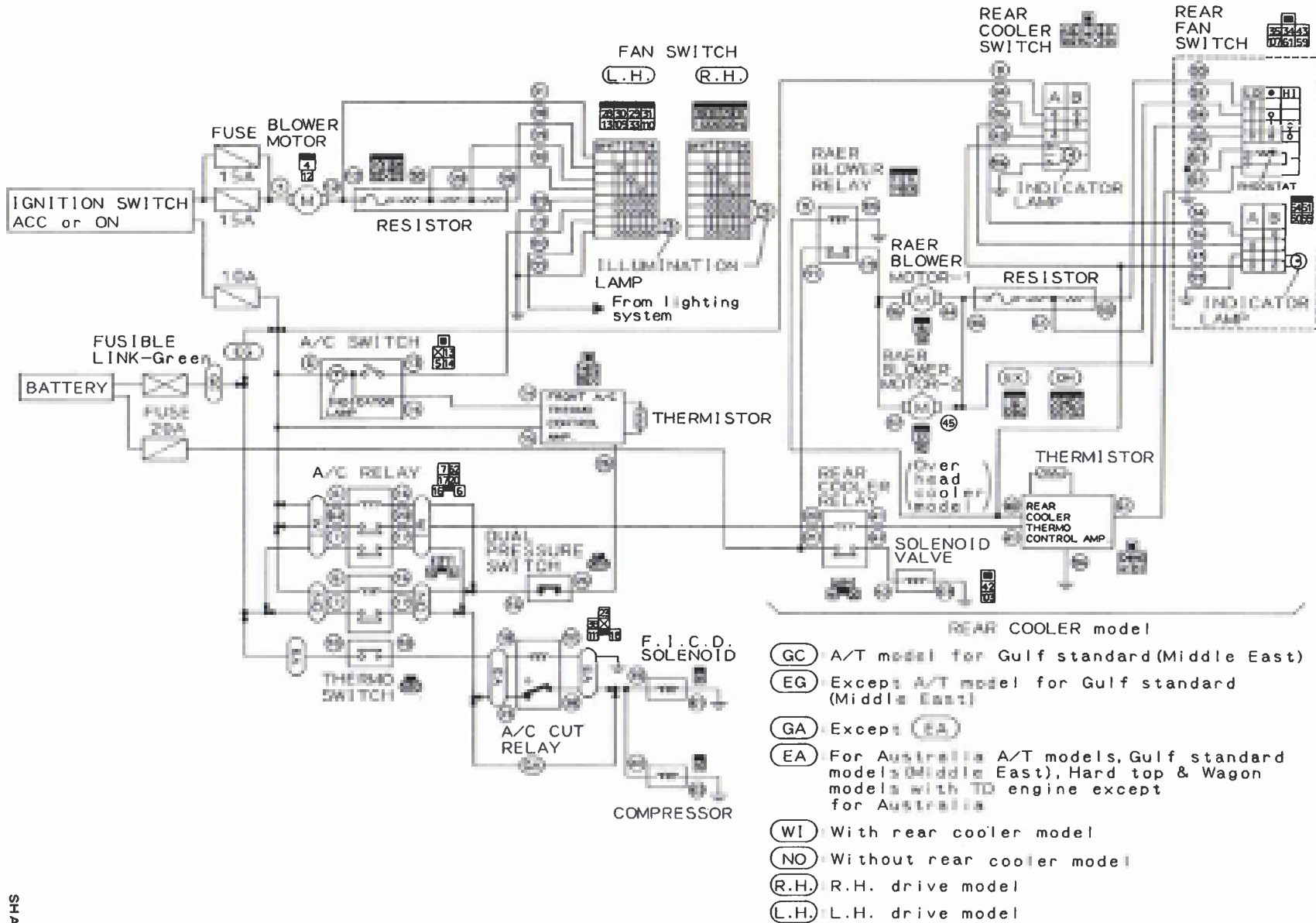
Voltmeter terminal		Voltage
⊕	⊖	
⑳	Body ground	Approx. 12V

4. Switch to ignition switch OFF.
5. Connect ohmmeter from harness side.
6. Check continuity between terminal No. ⑩④ and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
⑩④	Body ground	Yes







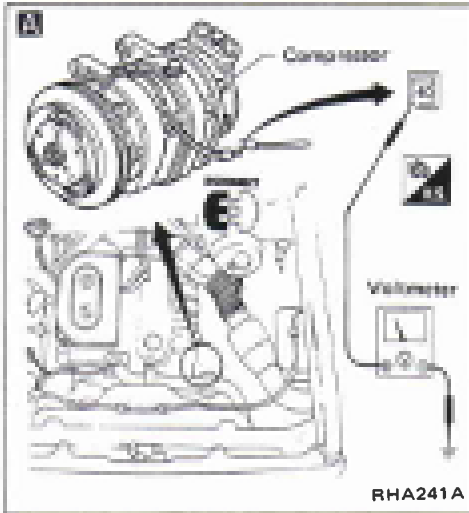
# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)

### TROUBLE-SHOOTING PROCEDURE 1

**INCIDENT: Magnet clutch does not operate.**

- Perform preliminary check before referring to the following flowchart.



**A**  
Check power supply for compressor with ignition switch ON, A/C switch ON and fan switch ON.  
Do approx. 12 volts exist between compressor harness terminal No. 40 and body ground?

N.G.

Check the system according to each below-listed flowchart.

Model	Flow-chart
With A/C cut system*1	1
Without A/C cut system*2	2

1

2

O.K.

Check magnet clutch coil.

Make the engine coolant go down sufficiently.

**B**  
Check A/C cut relay operation with ignition switch ON, A/C switch ON and fan switch ON.  
Do approx. 12 volts exist between A/C cut relay harness terminal No. 38 and body ground?

N.G.

**C**  
Check power supply for switch side circuit of A/C cut relay with ignition switch ON, A/C switch ON and fan switch ON.  
Do approx. 12 volts exist between A/C out relay harness terminal No. 23 and body ground?

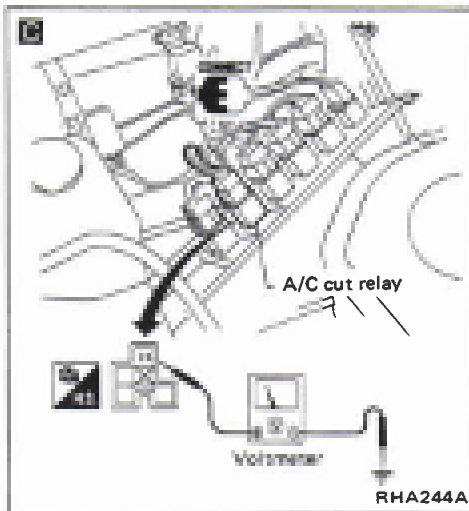
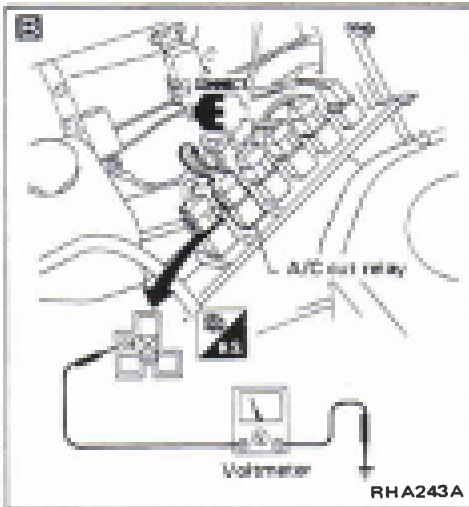
O.K.

N.G.

O.K.

Note

Disconnect A/C cut relay. Check circuit continuity between A/C cut relay harness terminal No. 38 and compressor harness terminal No. 40 with ignition switch OFF.



**Note:**

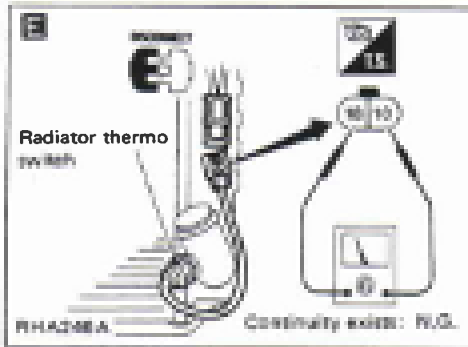
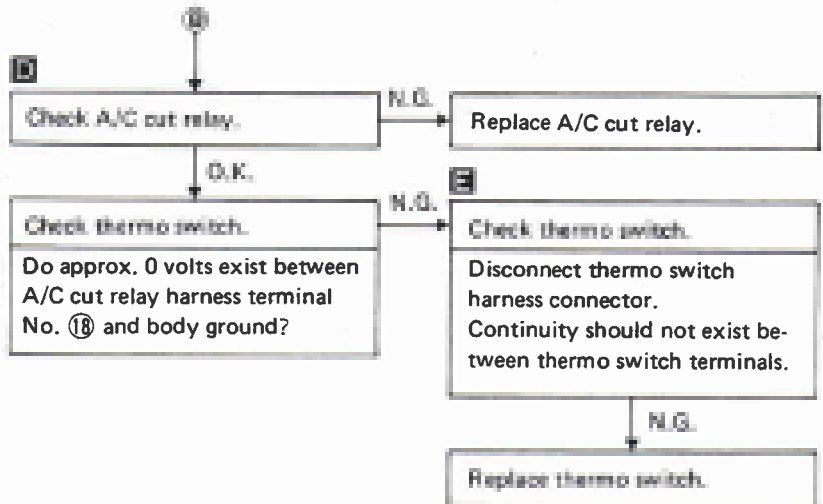
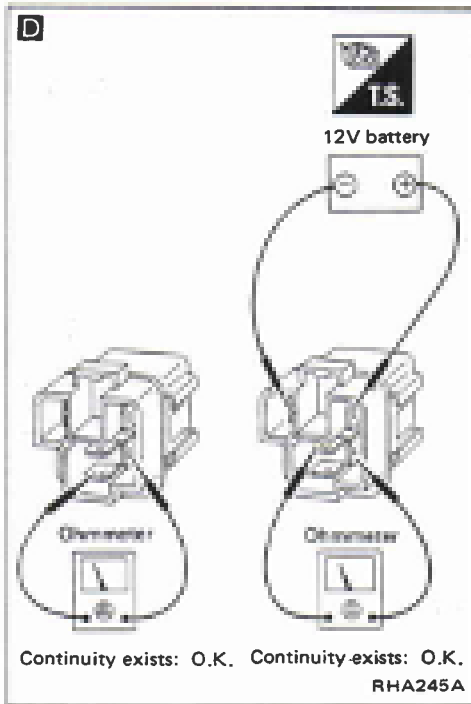
If the result is N.G. after checking circuit continuity, repair harness or connector.

\*1: For Australia A/T models, Gulf standard models (Middle East), Hardtop and Wagon models with TD engine except for Australia

\*2: Except for \*1

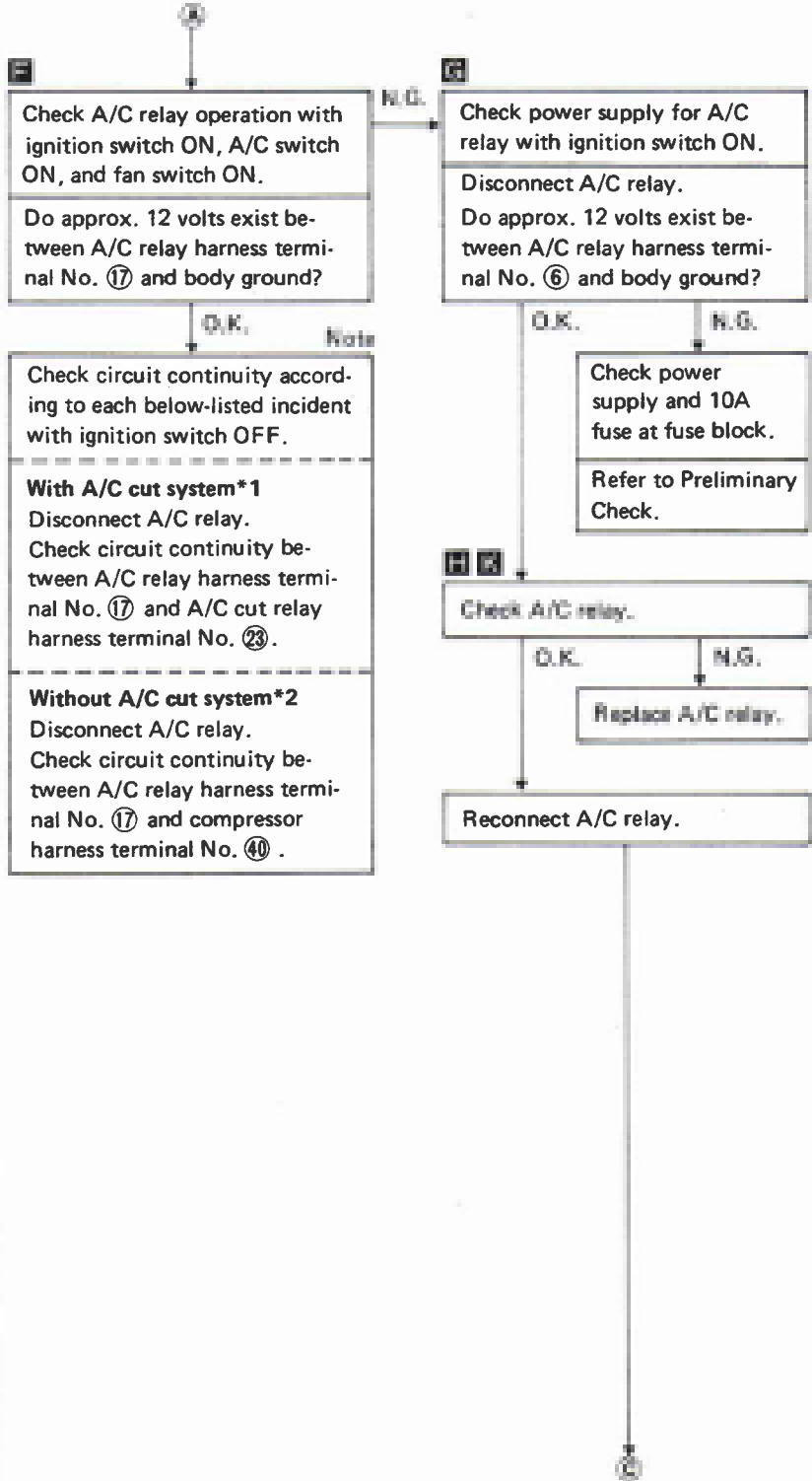
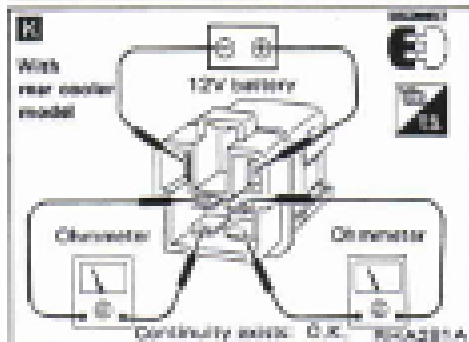
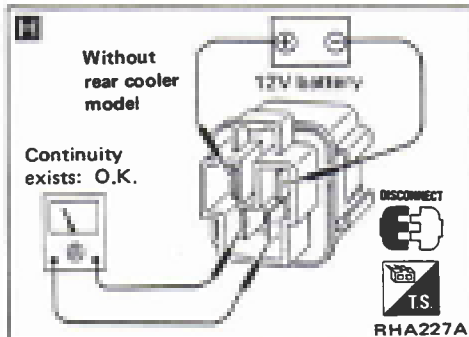
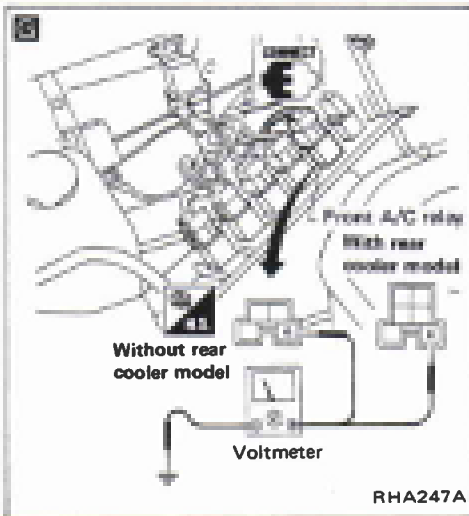
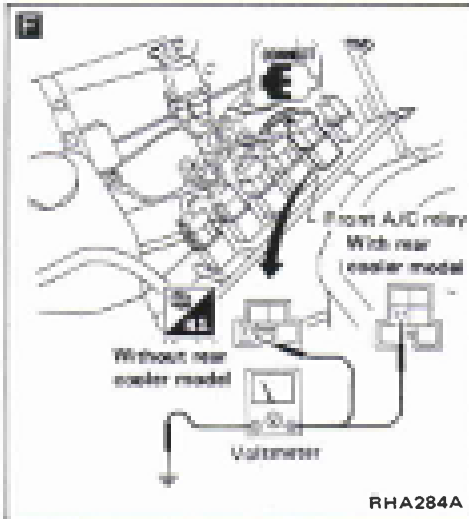
# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



**Note:**

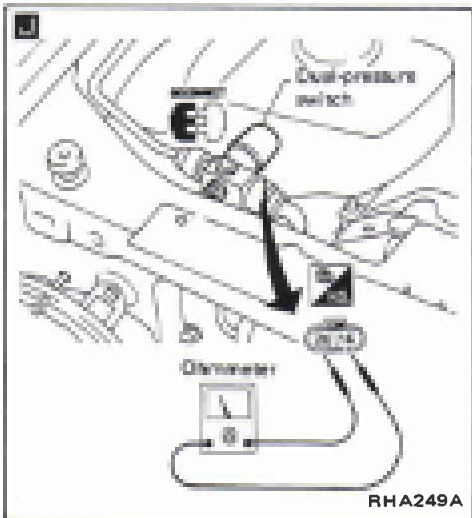
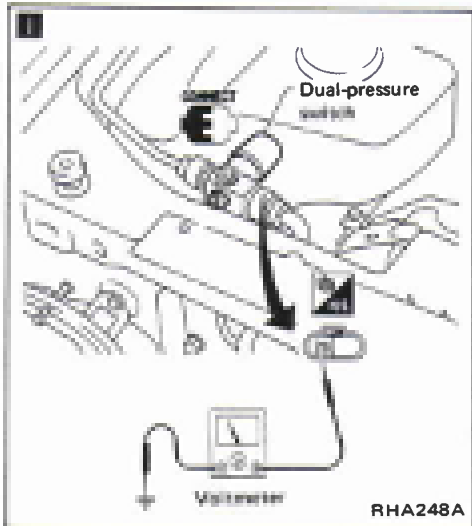
If the result is N.G. after checking circuit continuity, repair harness or connector.

\*1: For Australia A/T models, Gulf standard models (Middle East), Hardtop and Wagon models with TD engine except for Australia

\*2: Except for \*1

# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



**I**

Check coil side circuit of A/C relay with ignition switch ON and A/C switch OFF.

Do approx. 12 volts exist between dual-pressure switch harness terminal No. ⑫ and body ground?

Check voltage for front A/C thermo control amp. with ignition switch ON and A/C switch OFF.

Do approx. 12 volts exist between front A/C thermo control amp. harness terminal No. ⑫ and body ground?

Check power supply for front A/C thermo control amp. with ignition switch ON.

Go to Preliminary Check.

Check body ground circuit for front A/C thermo control amp.

Go to Preliminary Check.

Replace front A/C thermo control amp.

N.G.

Disconnect dual-pressure switch harness connector.

Check circuit continuity between A/C relay harness terminal No. ⑫ and dual-pressure switch harness terminal No. ⑫ with ignition switch OFF.

N.G.

Check dual-pressure switch.

Does continuity exist between dual-pressure switch terminals?

N.G.

Check refrigerant.

Connect manifold gauge, then check system pressure. (Refer to A/C performance test.)

D.K.

N.G.

Check refrigerant leaks.

Replace dual-pressure switch.

N.G.

Check circuit continuity between front A/C thermo control amp. and dual-pressure switch with ignition switch OFF.

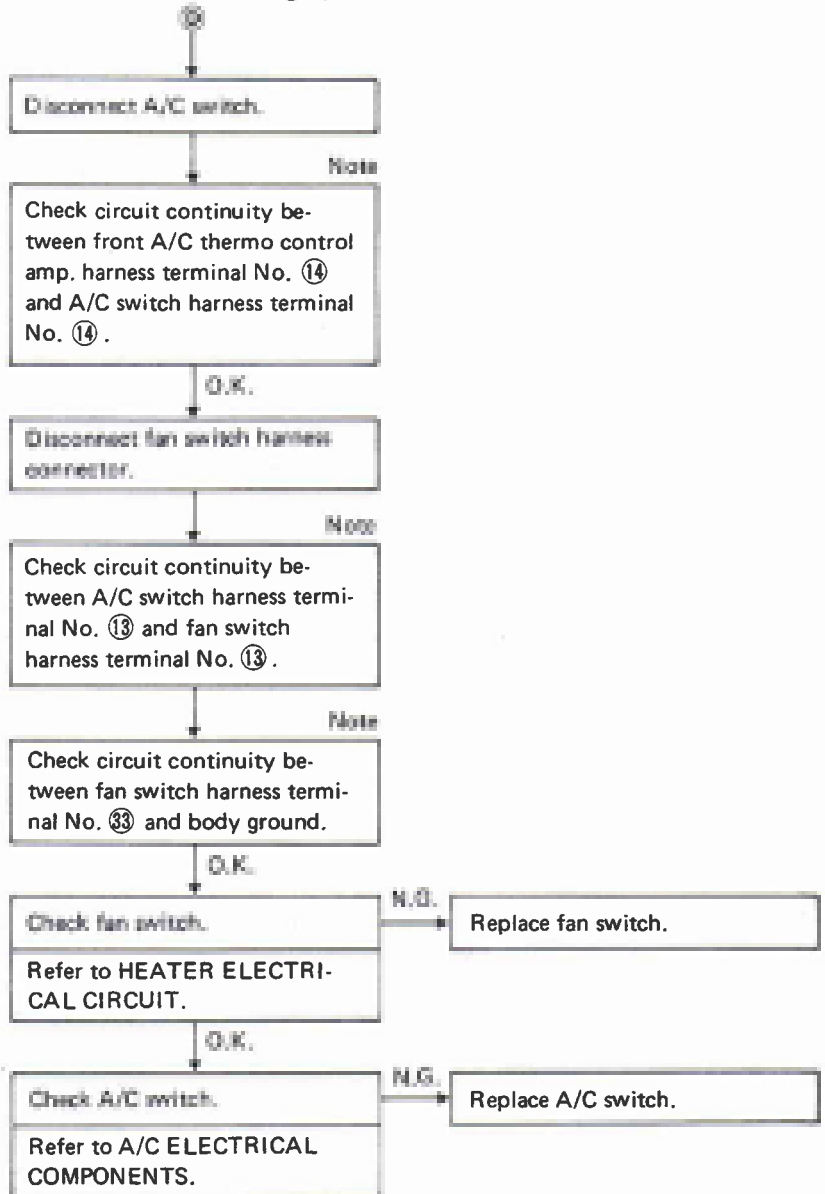
Disconnect front A/C thermo control amp. and dual-pressure switch harness connectors. Does continuity exist between front A/C thermo control amp. harness terminal No. ⑫ and dual-pressure switch harness terminal No. ⑫ .

**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

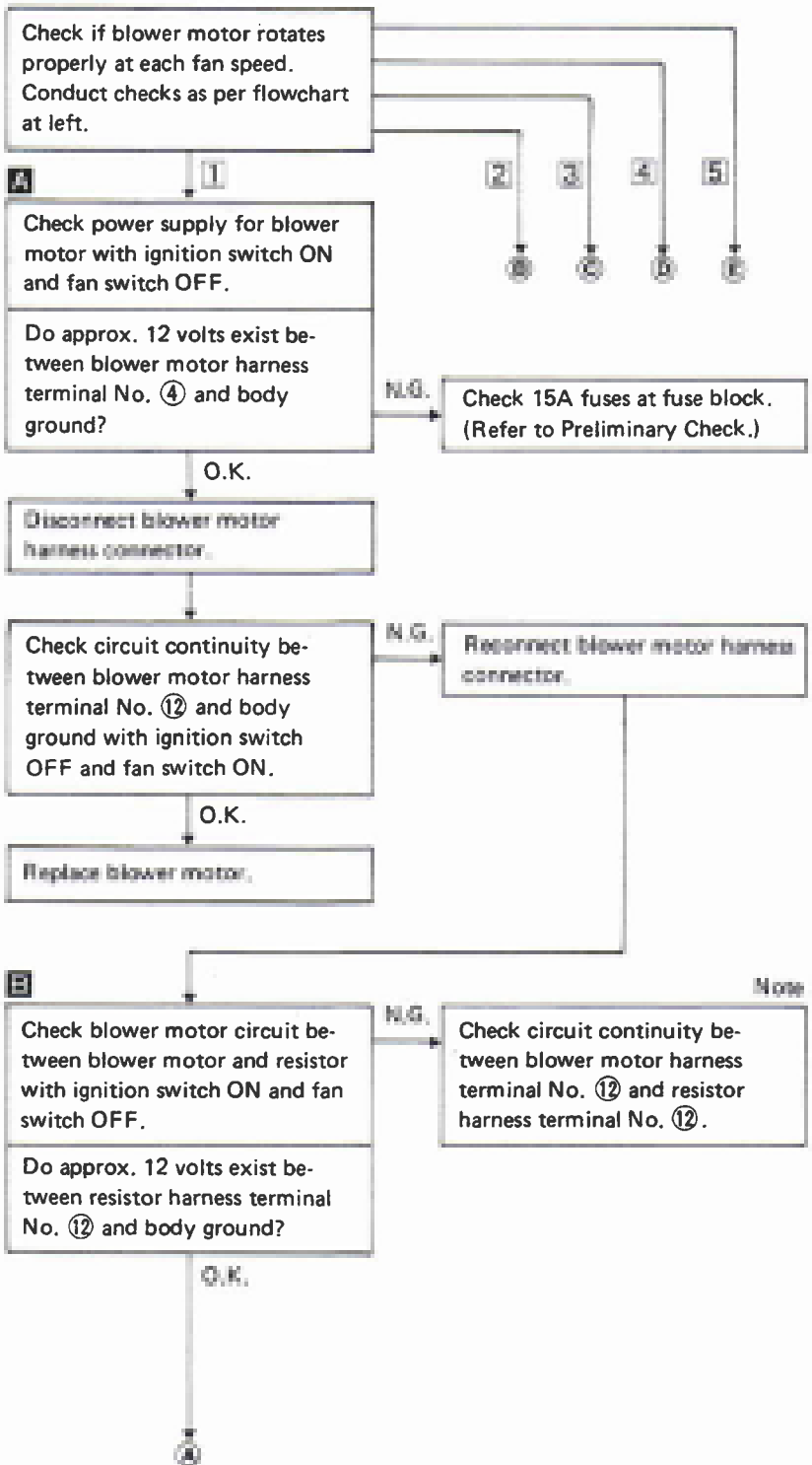
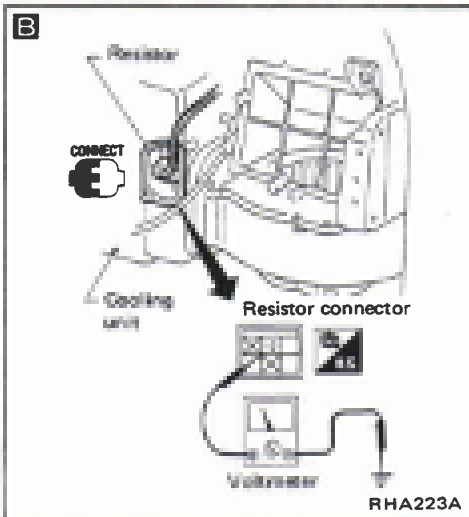
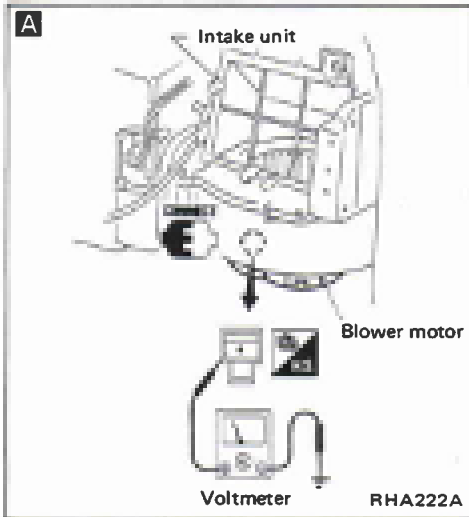
	INCIDENT	Flowchart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	5

## Trouble-shooting (Cont'd)

### TROUBLE-SHOOTING PROCEDURE 2

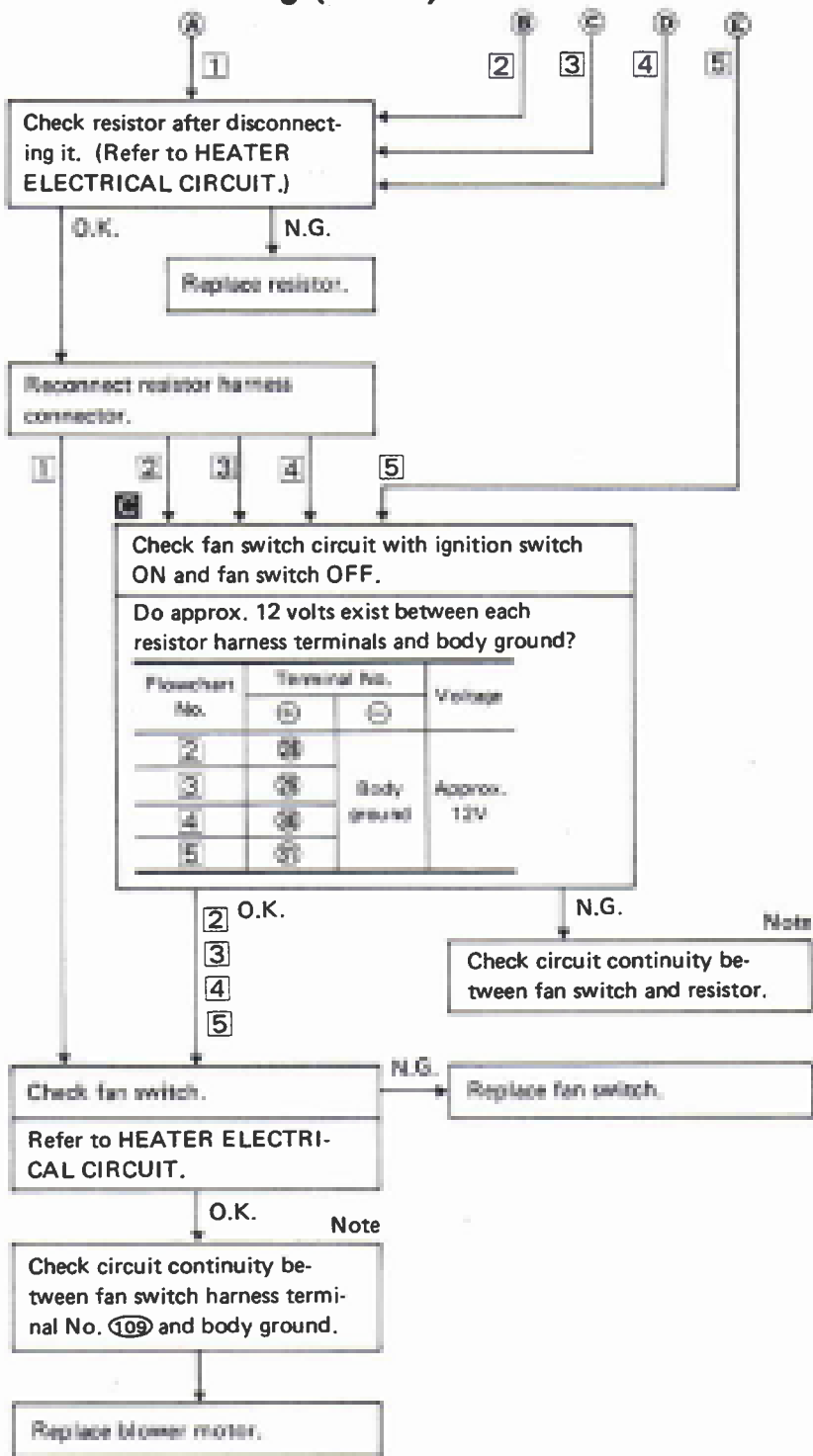
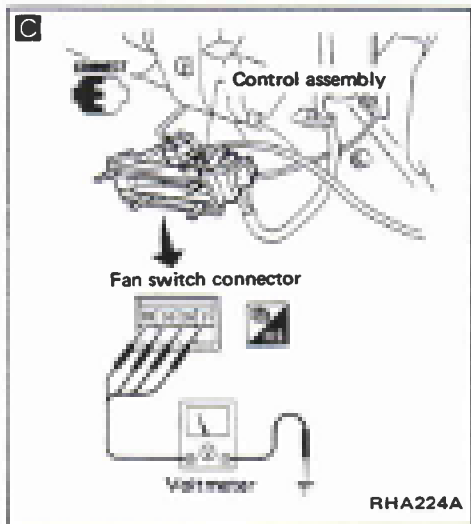
**INCIDENT:** Front blower motor does not rotate.

- Perform preliminary check before referring to the following flowchart.



# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.



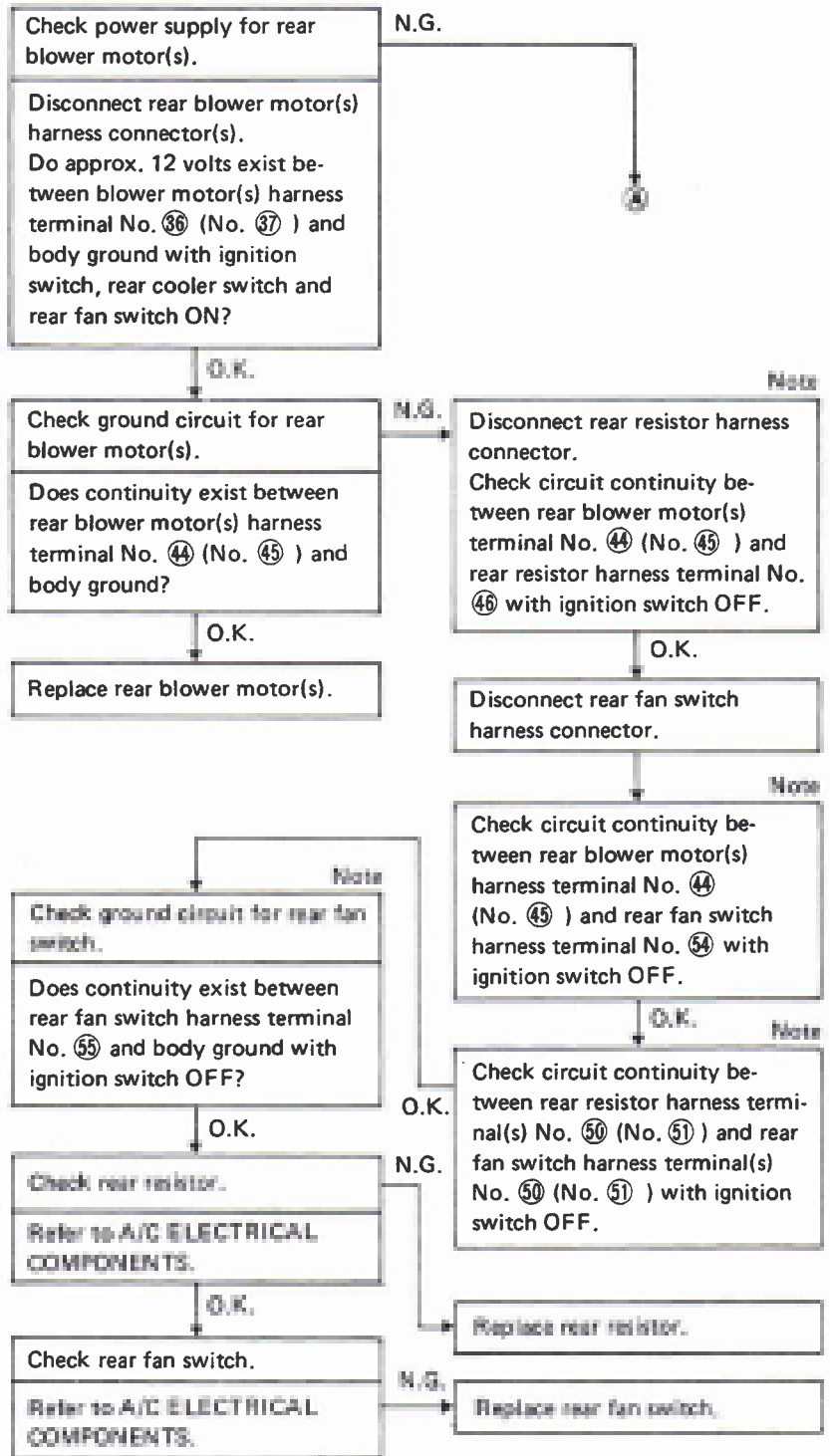
# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)

### TROUBLE-SHOOTING PROCEDURE 3

**INCIDENT: Rear blower motor does not rotate.**

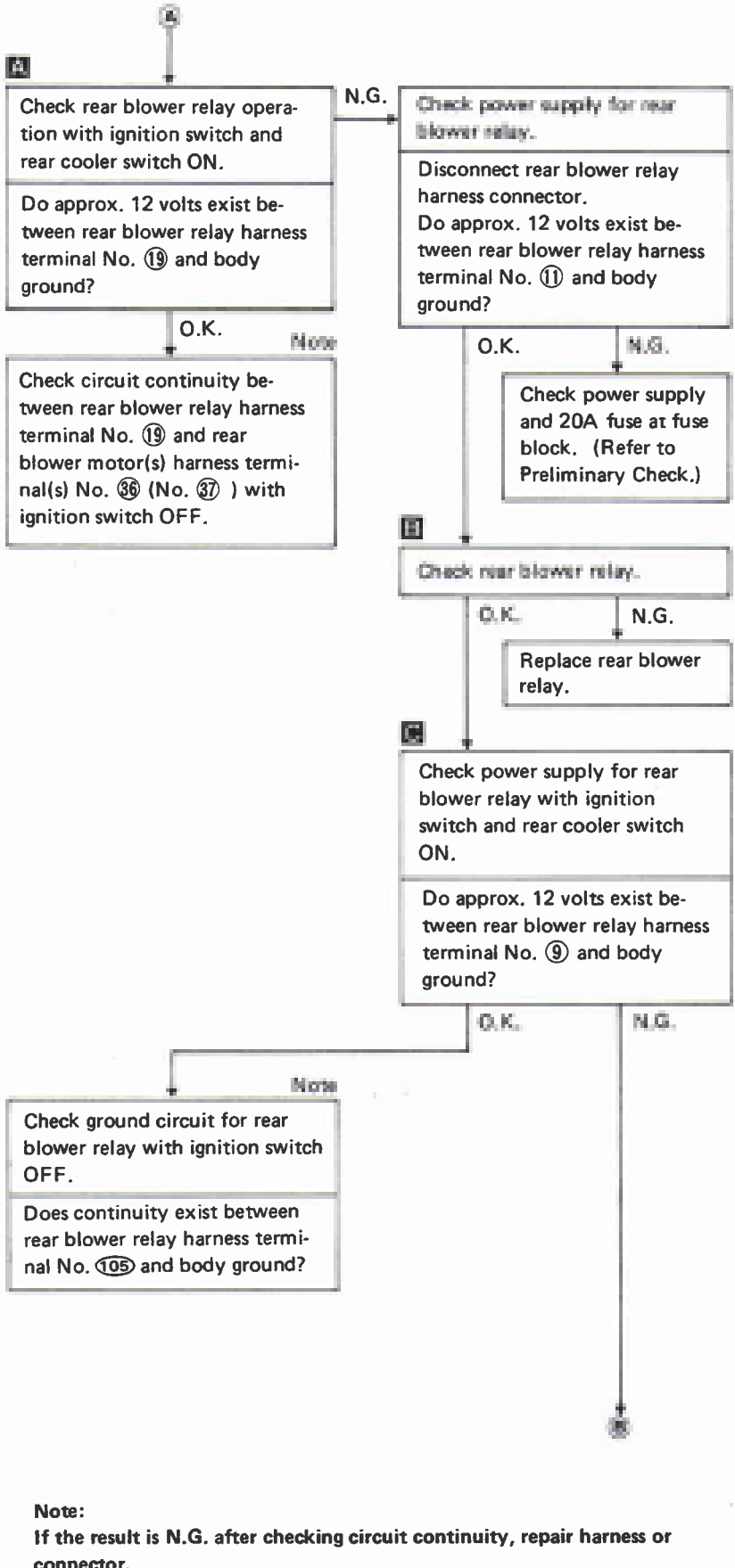
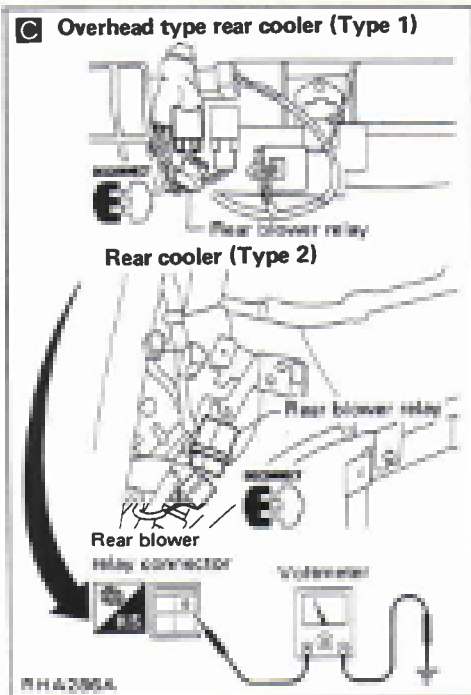
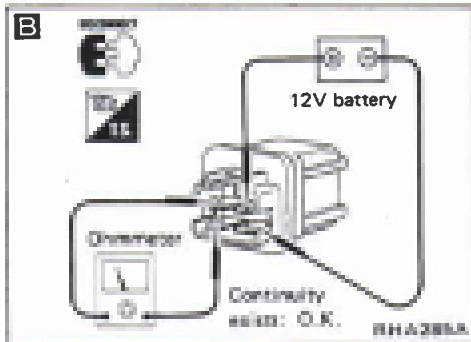
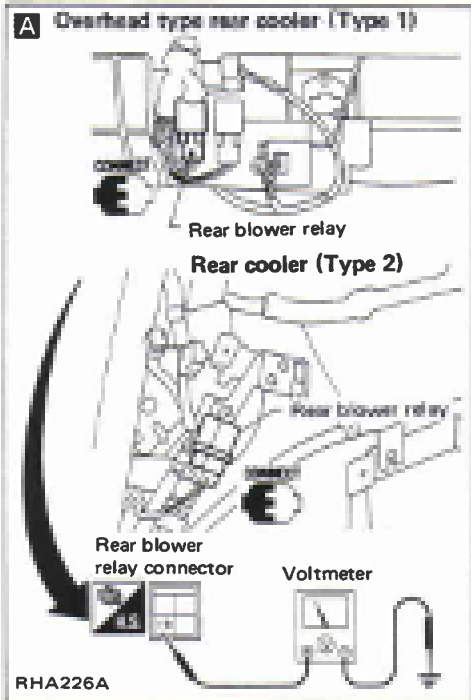
- Perform preliminary check before referring to the following flowchart.



**Note:**  
If the result is N.G. after checking circuit continuity, repair harness or connector.

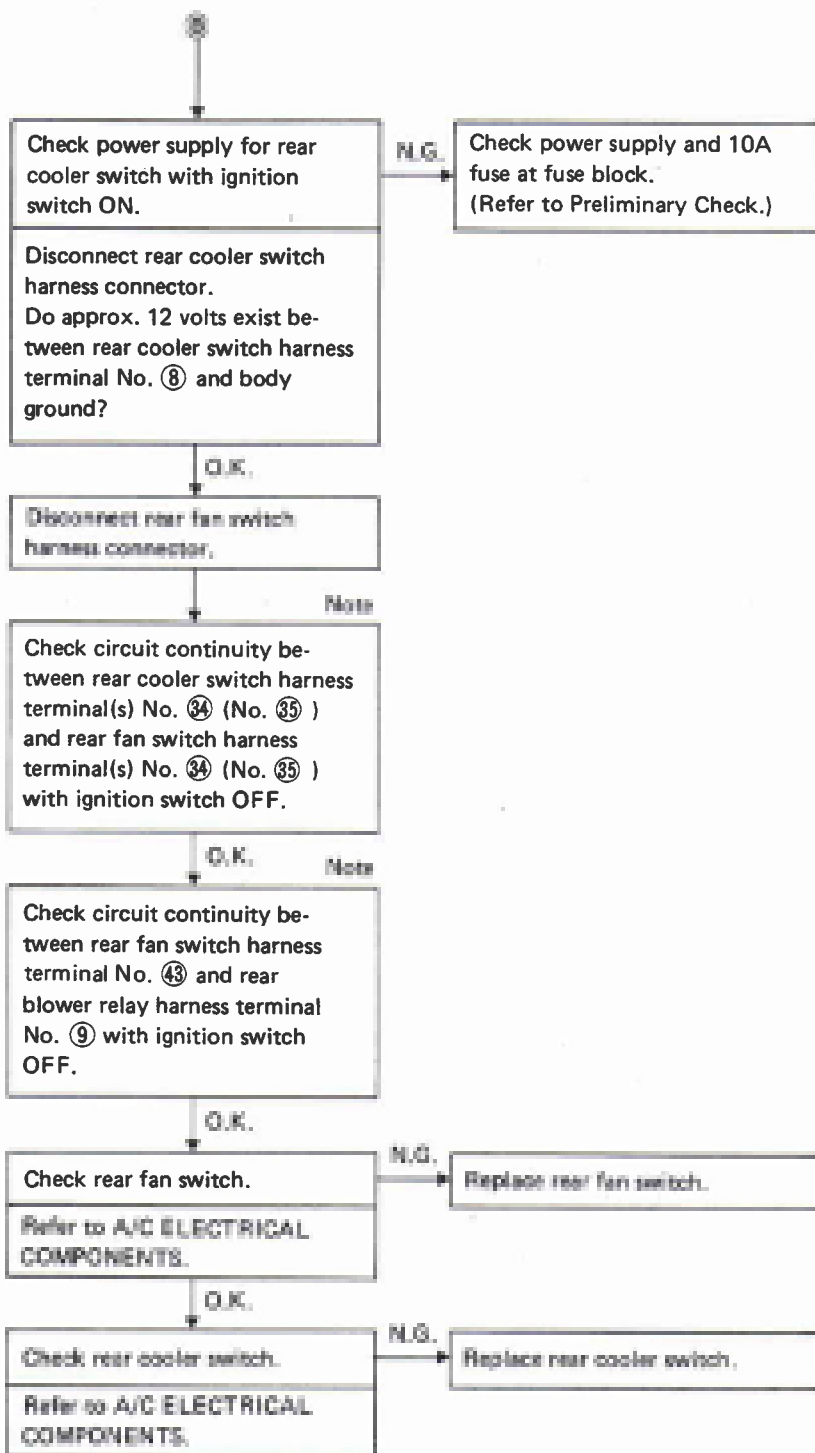
# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



## TROUBLE DIAGNOSES

### Trouble-shooting (Cont'd)



**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

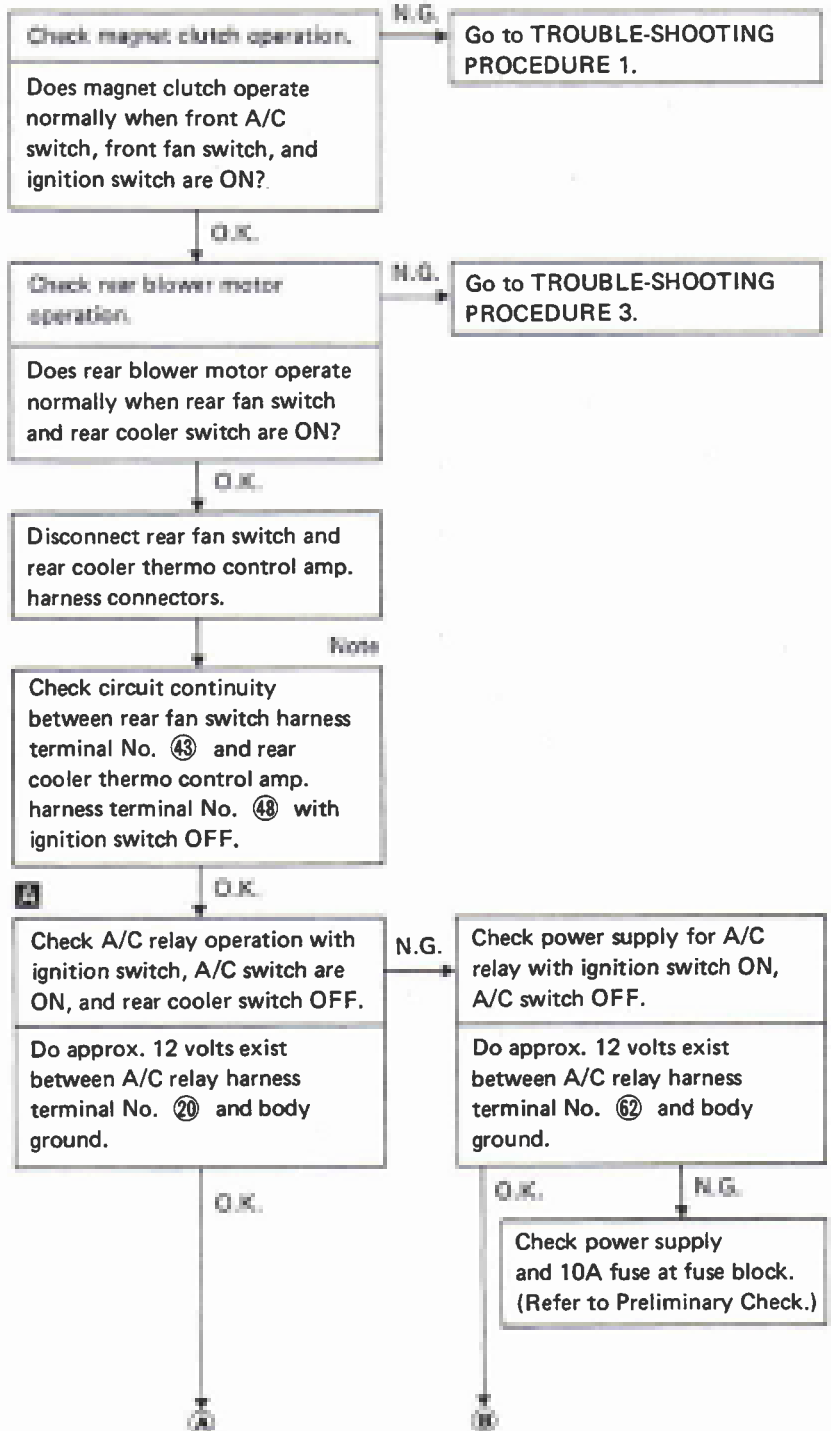
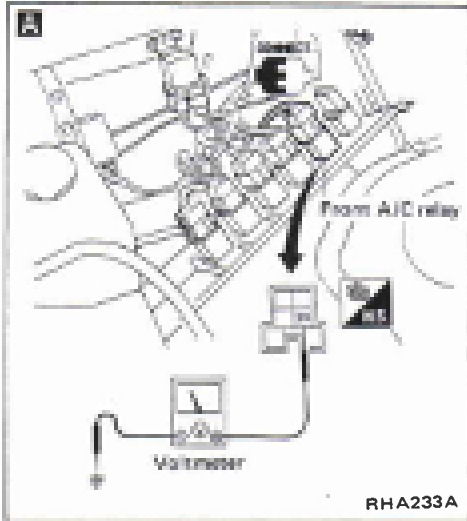
## TROUBLE DIAGNOSES

### Trouble-shooting (Cont'd)

#### TROUBLE-SHOOTING PROCEDURE 4

**INCIDENT:** Rear cooler solenoid valve does not operate.

- Perform preliminary check before referring to the following flowchart.

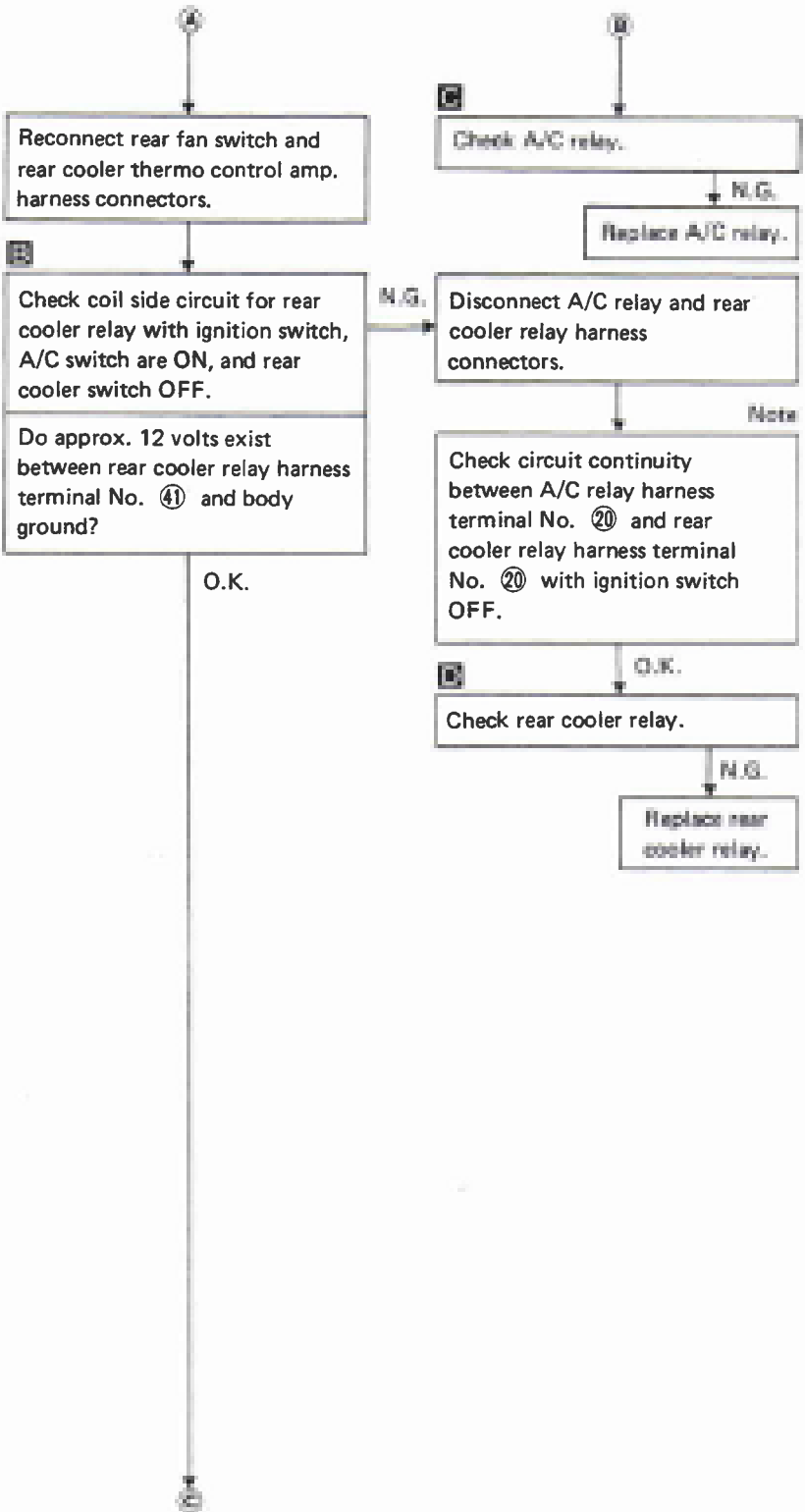
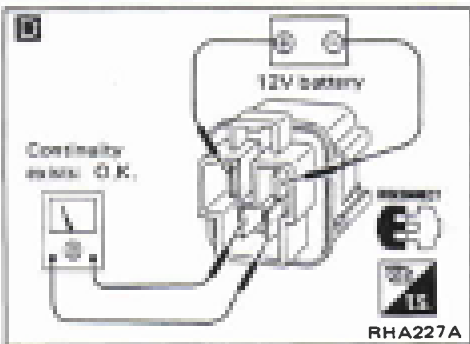
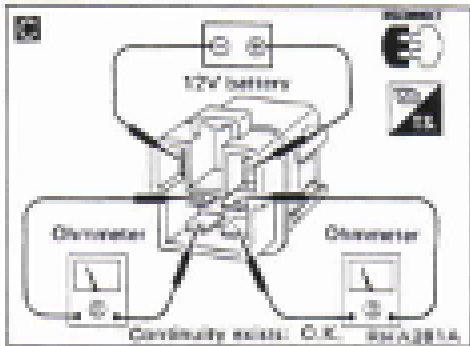
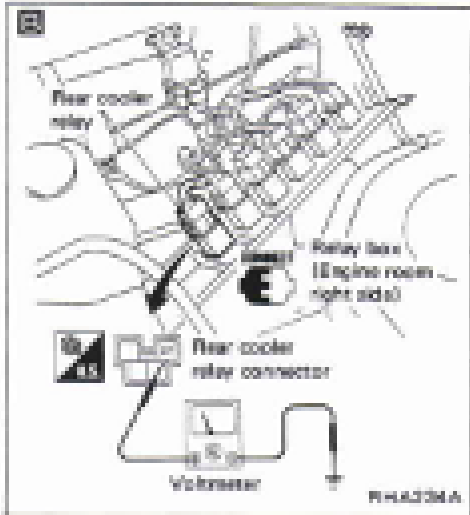


**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

# TROUBLE DIAGNOSES

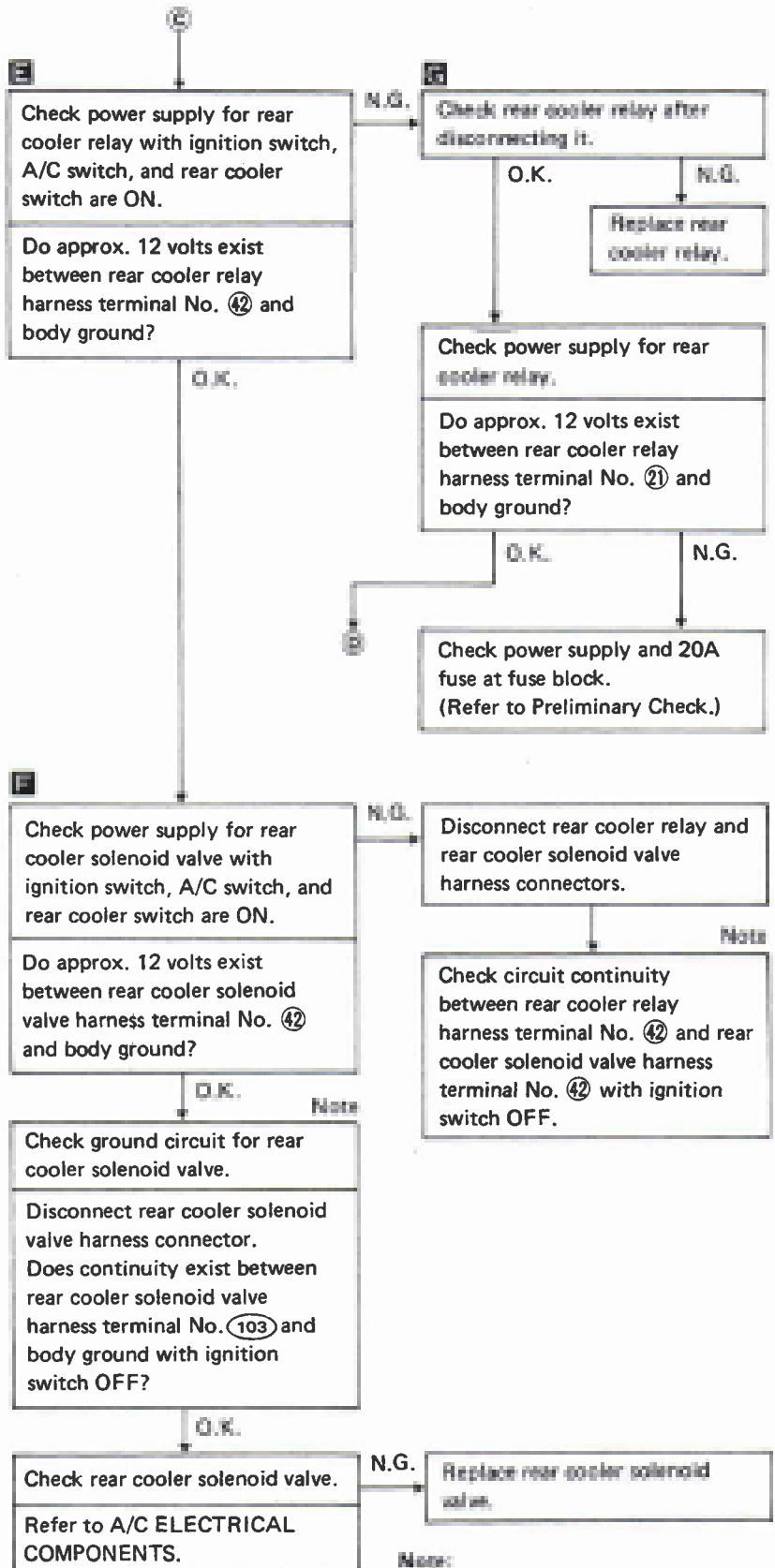
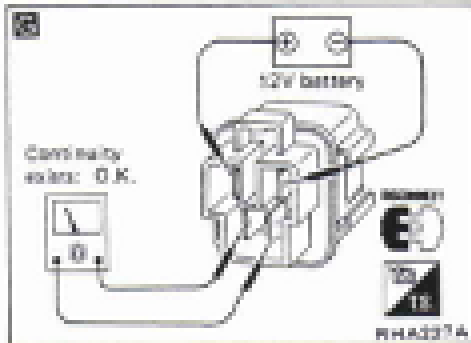
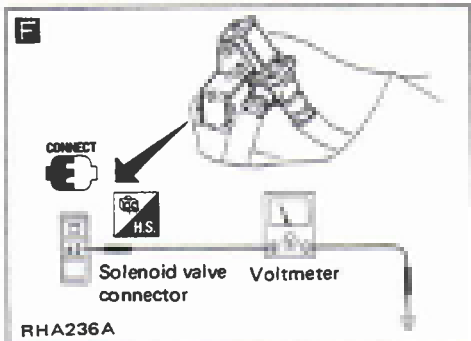
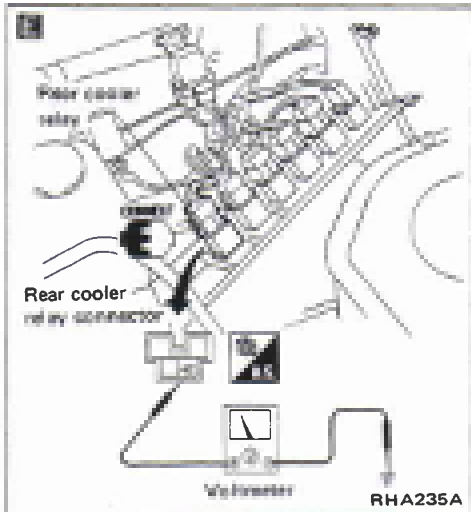
## Trouble-shooting (Cont'd)



**Note:**  
If the result is N.G. after checking circuit continuity, repair harness or connector.

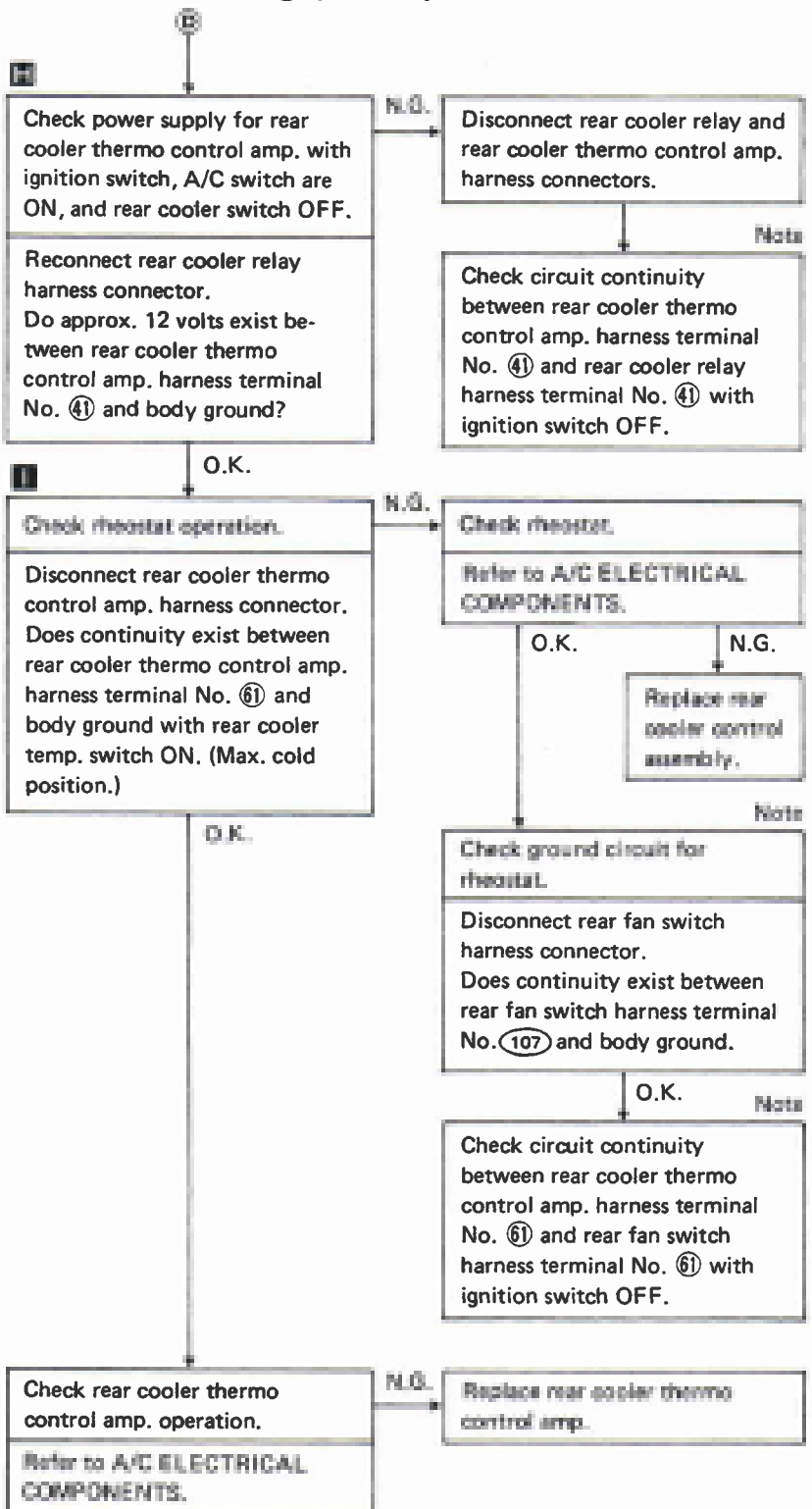
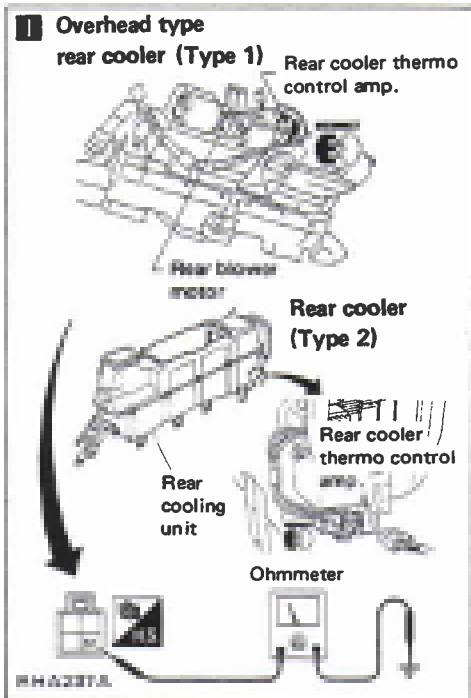
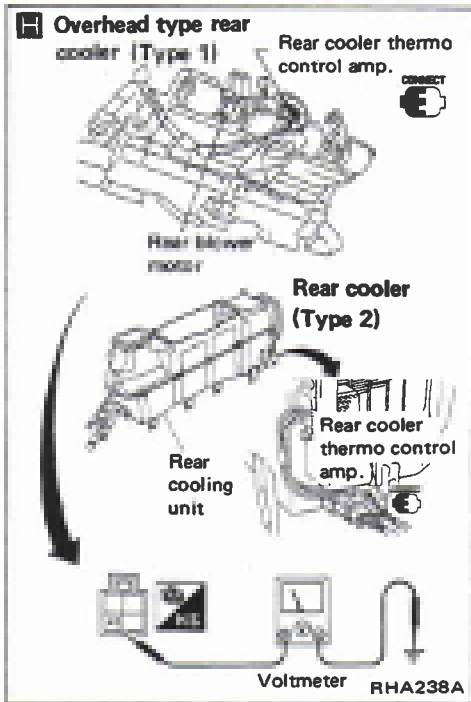
# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



# TROUBLE DIAGNOSES

## Trouble-shooting (Cont'd)



**Note:**

If the result is N.G. after checking circuit continuity, repair harness or connector.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

### General Specifications

#### COMPRESSOR

Model	DIESEL-KIKI make DKS-16H	
Type	Swash plate	
Displacement	cm <sup>3</sup> (cu. in./Rev.)	167 (10.19)
Cylinder bore x stroke	mm (in.)	37.0 x 25.8 (1.457 x 1.016)
Direction of rotation	Clockwise (viewed from drive end)	
Drive belt	A type	

#### LUBRICATION OIL

Model	Without rear cooler model	With rear cooler model
	DIESEL-KIKI make DKS-16H	
Type	SUNISO 505	
Capacity	ml (Imp fl oz)	
Total in system	260 (7.0)	260 (9.0)
Remaining oil in system after oil return operation and draining it	Approx. 90 (3.2)	Approx. 140 (4.9)
Compressor (Service parts) charging amount	260 (7.0)	

#### REFRIGERANT

Type	R-12	
Capacity	kg (lb)	
Front A/C	0.9 - 1.1 (2.0 - 2.4)	
Front A/C & overhead type rear cooler (Type 1)	1.3 - 1.5 (2.9 - 3.3)	
Front A/C & rear cooler (Type 2)	1.1 - 1.3 (2.4 - 2.9)	

### Inspection and Adjustment

#### ENGINE IDLING SPEED

- For TB engine model, refer to EF & EC section.
- For TD engine model, refer to MA section.

#### BELT TENSION

- Refer to MA section

#### COMPRESSOR

Model	DKS-16H	
Clutch hub to pulley clearance	mm (in)	0.3 - 0.6 (0.012 - 0.024)



# ELECTRICAL SYSTEM

## SECTION **EL**

When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".

## CONTENTS

HARNESS CONNECTOR .....	EL- 2
STANDARDIZED RELAY .....	EL- 3
POWER SUPPLY ROUTING .....	EL- 5
BATTERY .....	EL- 9
STARTING SYSTEM .....	EL-17
STARTING SYSTEM – Starter – .....	EL-20
CHARGING SYSTEM .....	EL-27
CHARGING SYSTEM – Alternator – .....	EL-28
COMBINATION SWITCH .....	EL-37
HEADLAMP .....	EL-39
EXTERIOR LAMP .....	EL-42
INTERIOR LAMP .....	EL-46
METER AND GAUGES .....	EL-48
WARNING LAMPS AND CHIME .....	EL-55
WIPER AND WASHER .....	EL-59
HORN, CIGARETTE LIGHTER AND CLOCK .....	EL-64
REAR WINDOW DEFOGGER .....	EL-65
AUDIO .....	EL-68
LOCATION OF ELECTRICAL UNITS .....	EL-70
HARNESS LAYOUT .....	EL-75

### WIRING DIAGRAM REFERENCE CHART

Engine control system .....	EF & EC SECTION
Ignition system .....	EF & EC SECTION
Quick-glow system .....	EF & EC SECTION
Injection pump control system . . .	EF & EC SECTION
A/T control system .....	AT SECTION
Power window and power door lock . . .	BF SECTION
Heater and air conditioner .....	HA SECTION
Electrical sun roof .....	BF SECTION
Electrical winch .....	SE SECTION

# HARNESS CONNECTOR

## Description

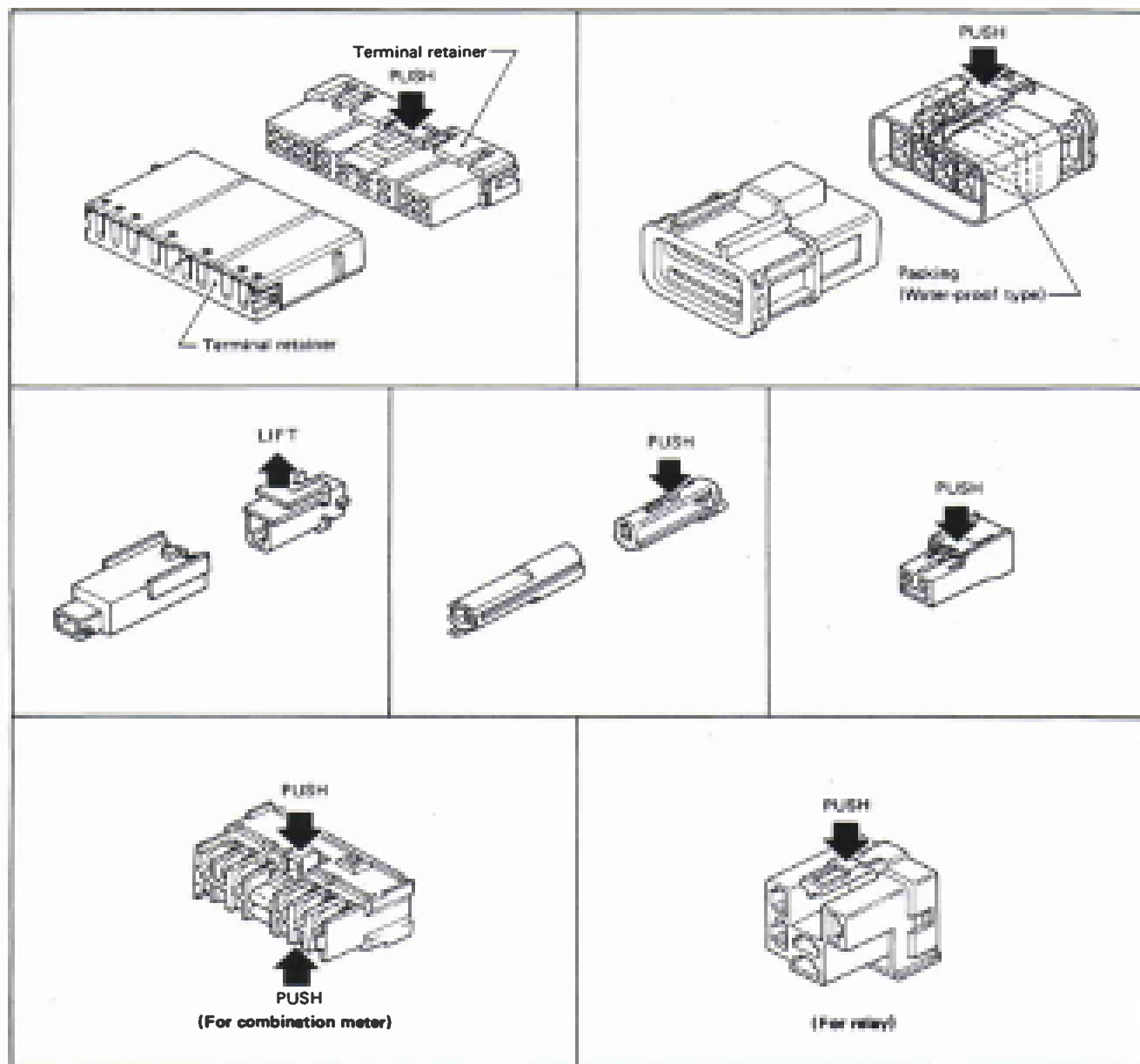
### HARNESS CONNECTOR

- All harness connectors prevent accidental looseness or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

#### CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]

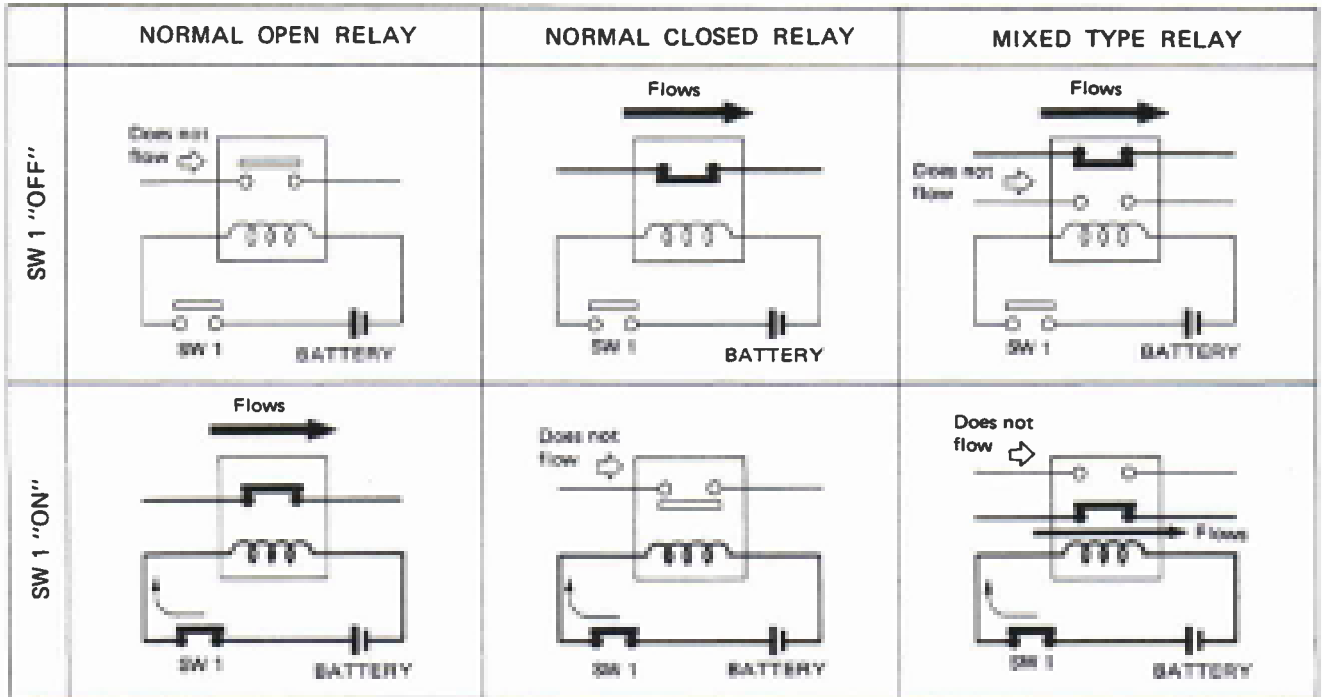


SEL769D

## STANDARDIZED RELAY

### Normal Open, Normal Closed and Mixed Type Relays

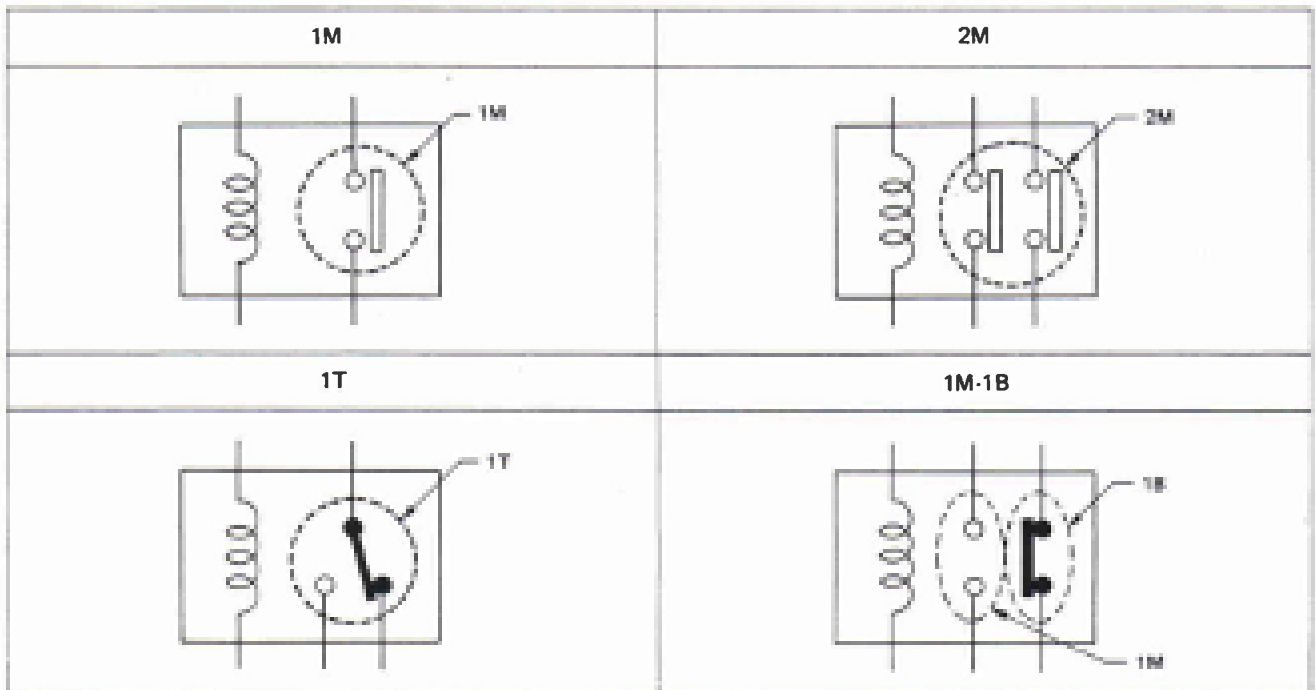
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

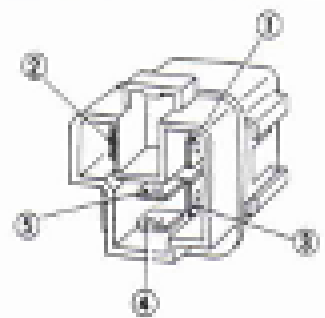
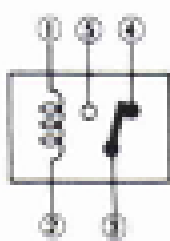
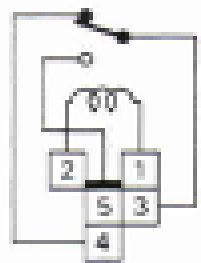
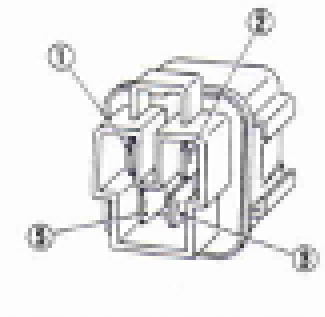
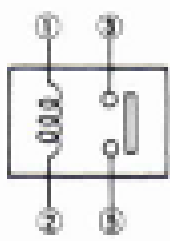
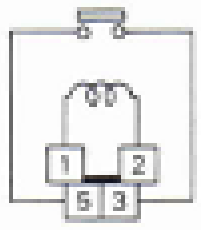
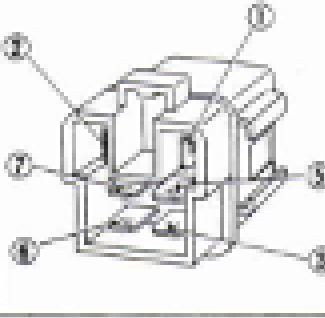
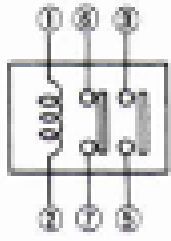
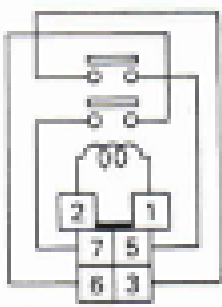
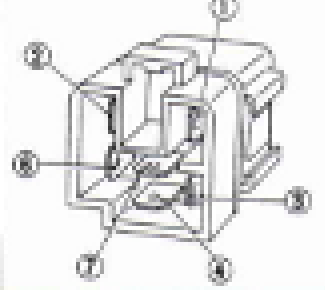
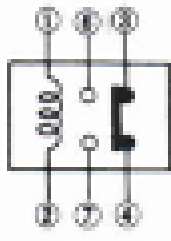
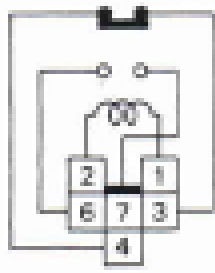
### Type of Standardized Relays

1M ..... 1 Make            2M ..... 2 Make  
 1T ..... 1 Transfer        1M-1B ..... 1 Make 1 Break



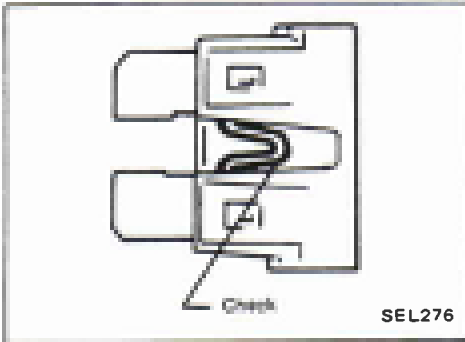
SEL882H

## STANDARDIZED RELAY

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE
2M				BROWN
1M-1B				GRAY

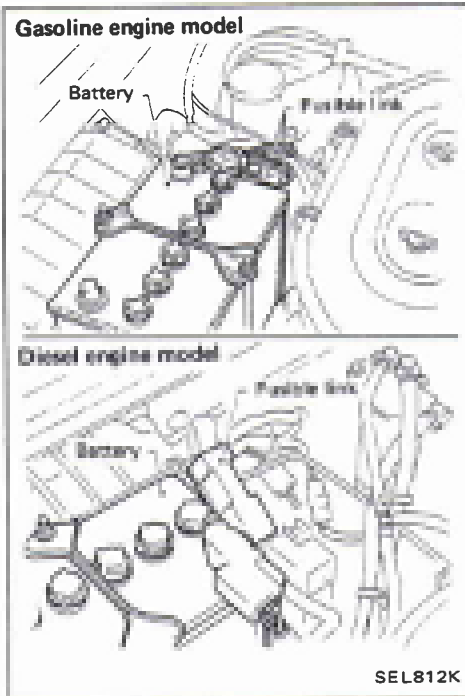
SEL 683H

## POWER SUPPLY ROUTING



### Fuse

- If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not install fuse in oblique direction; always insert it into fuse holder properly.
- Remove fuse for clock if vehicle is not used for a long period of time.



### Fusible Link

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

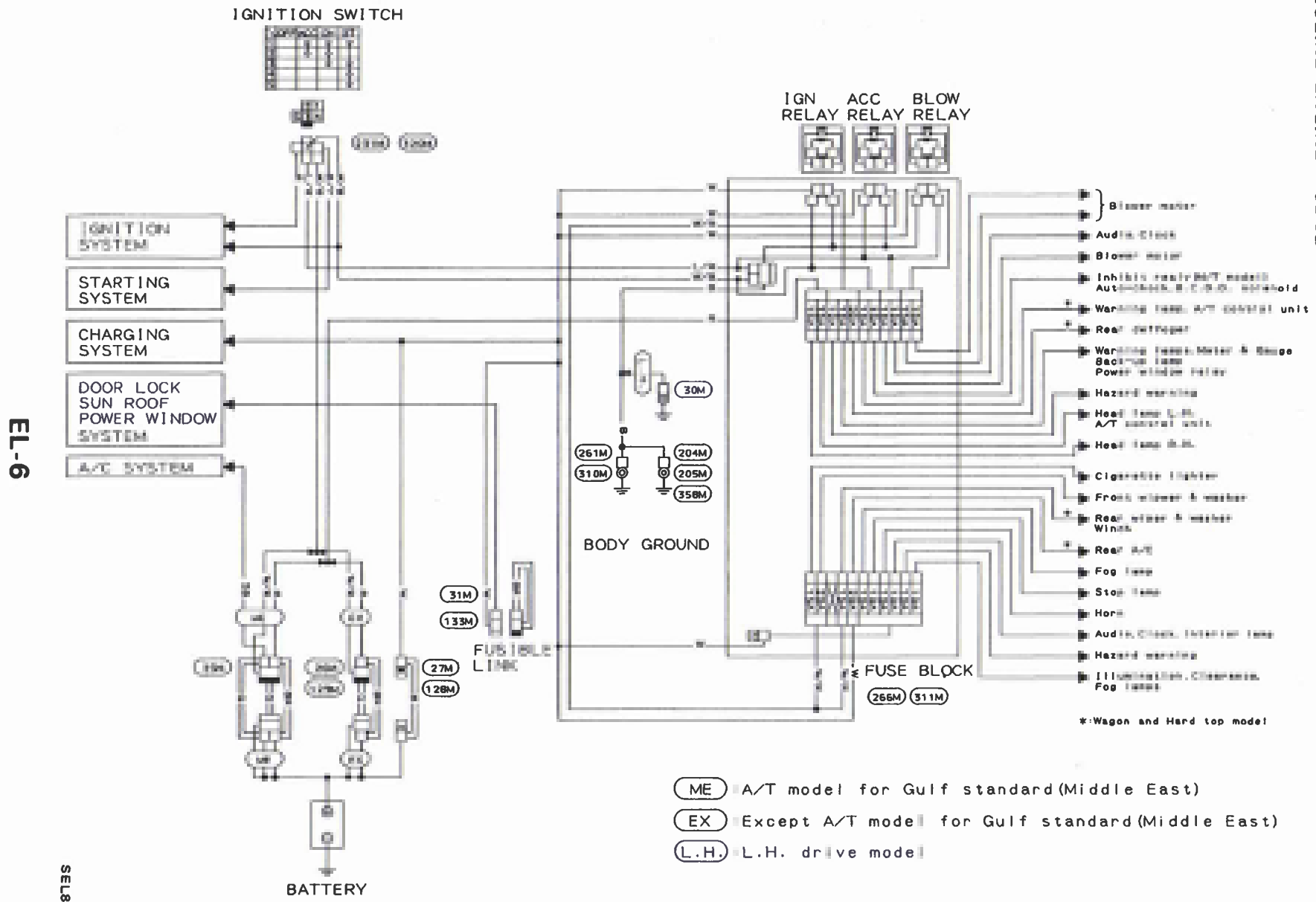
#### CAUTION:

- If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
- Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.

# POWER SUPPLY ROUTING

## GASOLINE ENGINE MODEL

### Wiring Diagram



- (ME) A/T model for Gulf standard (Middle East)
- (EX) Except A/T model for Gulf standard (Middle East)
- (L.H.) L.H. drive model

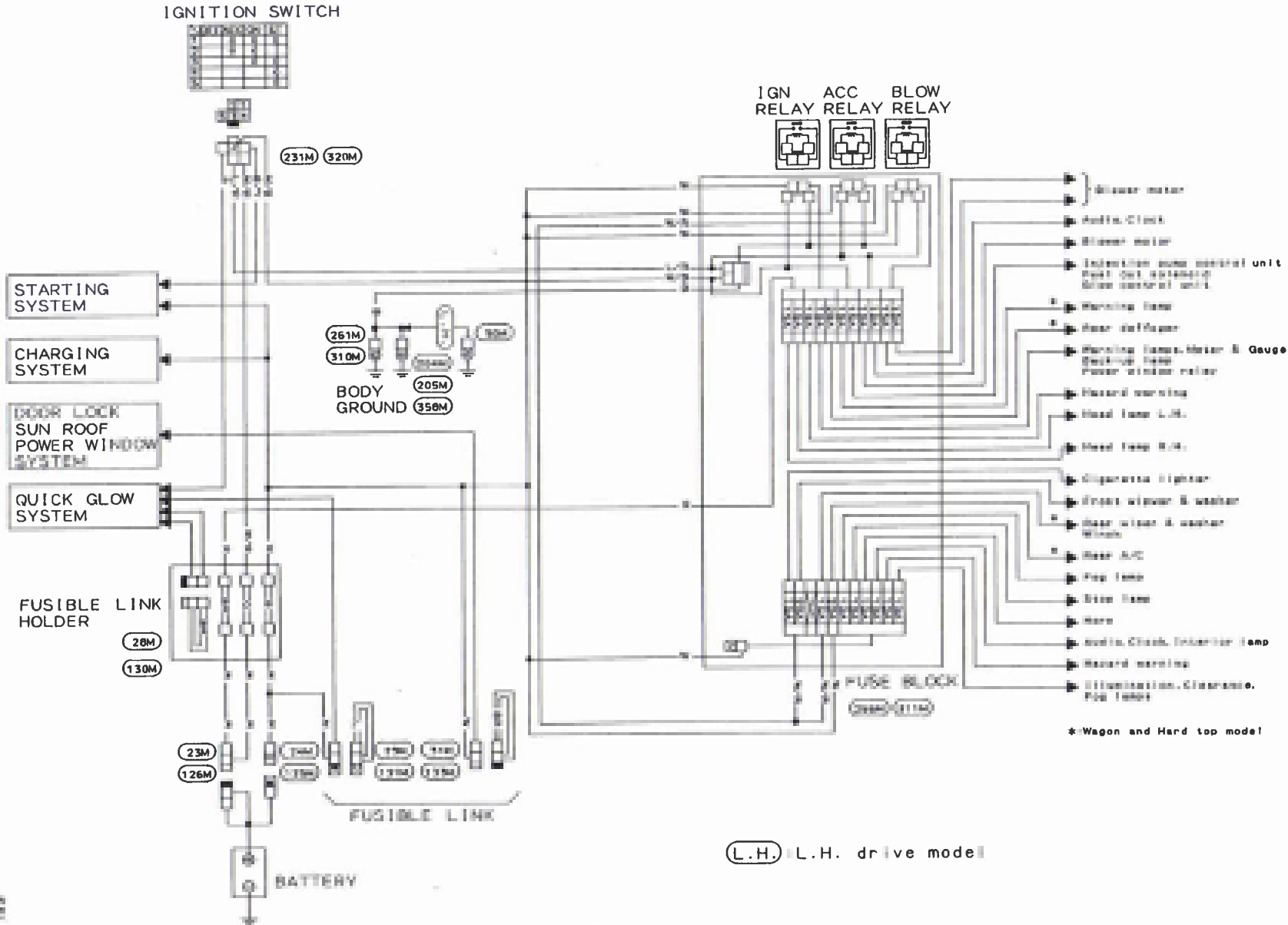
EL-6

SEL849K

**POWER SUPPLY ROUTING**

**DIESEL ENGINE MODEL**

**Wiring Diagram (Cont'd)**



(L.H.) L.H. drive model

\* Wagon and Hard top model

**EL-7**

## POWER SUPPLY ROUTING

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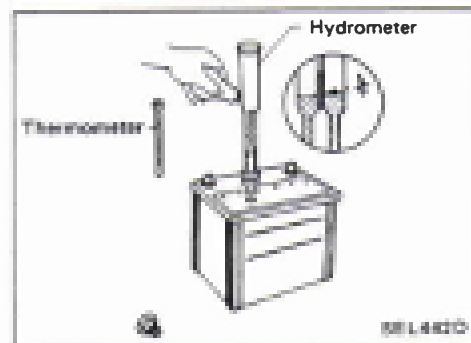
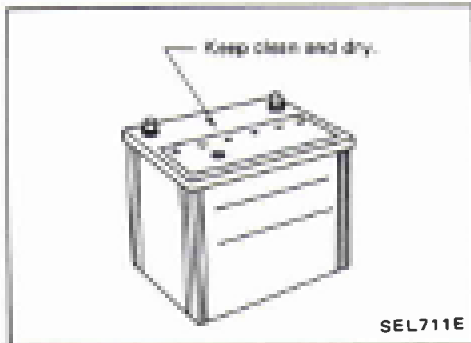
Note:



## BATTERY

### CAUTION:

- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.



### How to Handle Battery

#### METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.  
If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.

- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)

- Check the charge condition of the battery.  
Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

## BATTERY

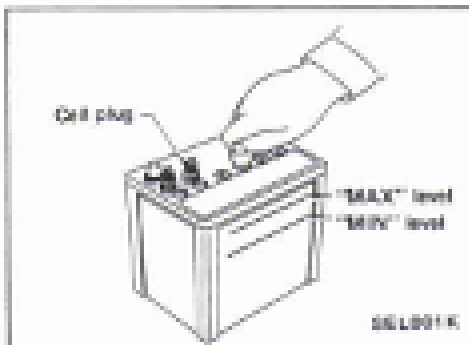
### How to Handle Battery (Cont'd)

#### CHECKING ELECTROLYTE LEVEL

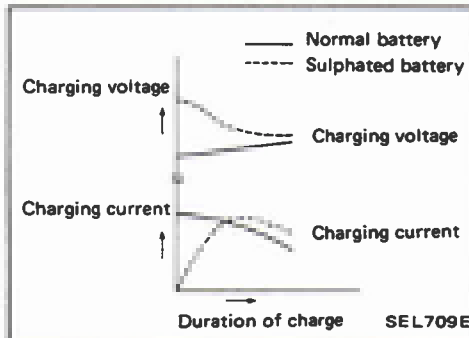
##### WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.



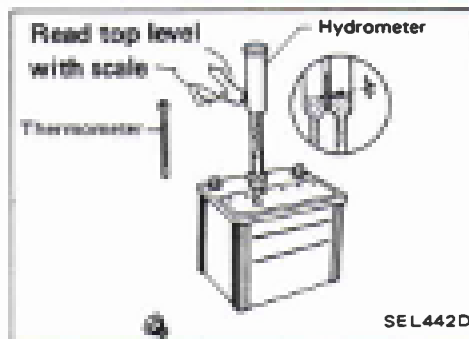
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



#### SULPHATION

When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.

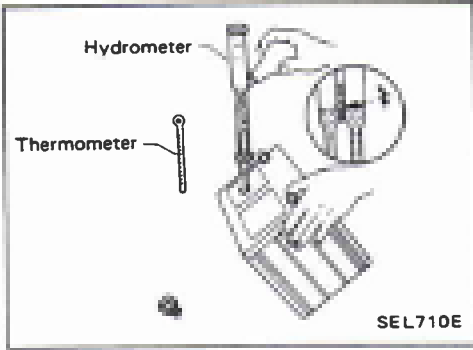


#### SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.

# BATTERY

## How to Handle Battery (Cont'd)

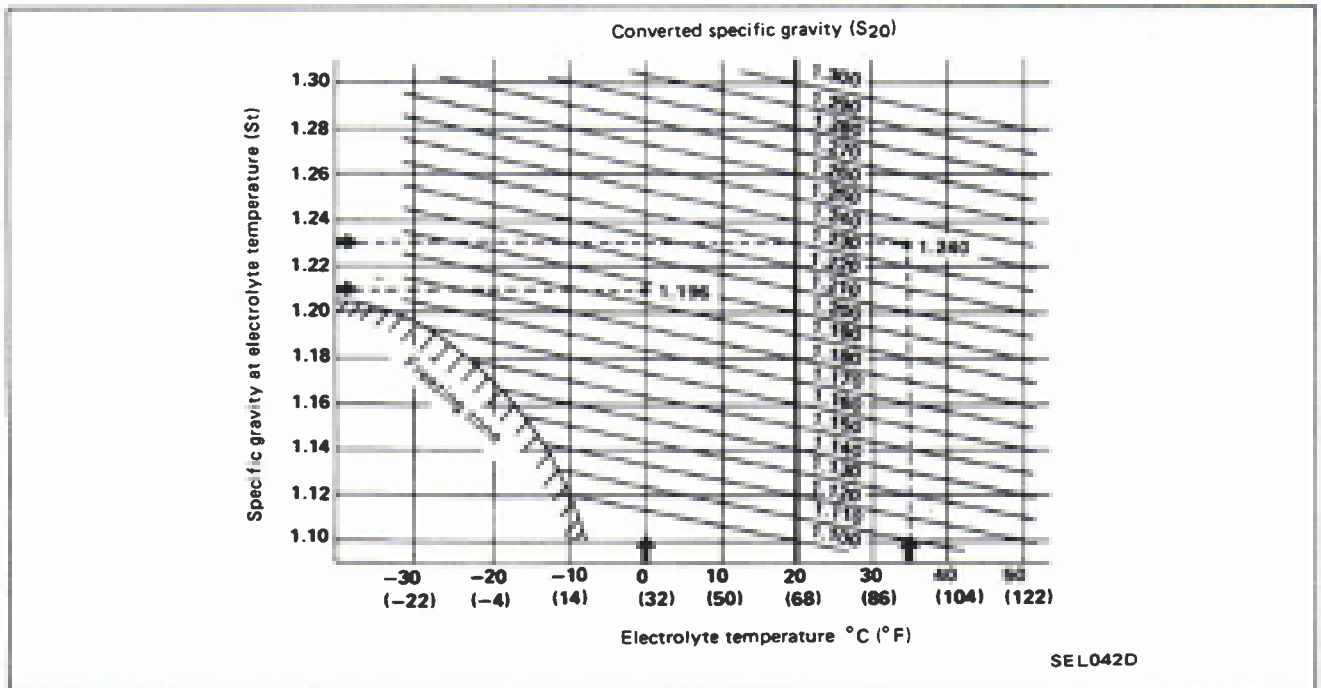


- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

2. Convert into specific gravity at 20°C (68°F).

Example:

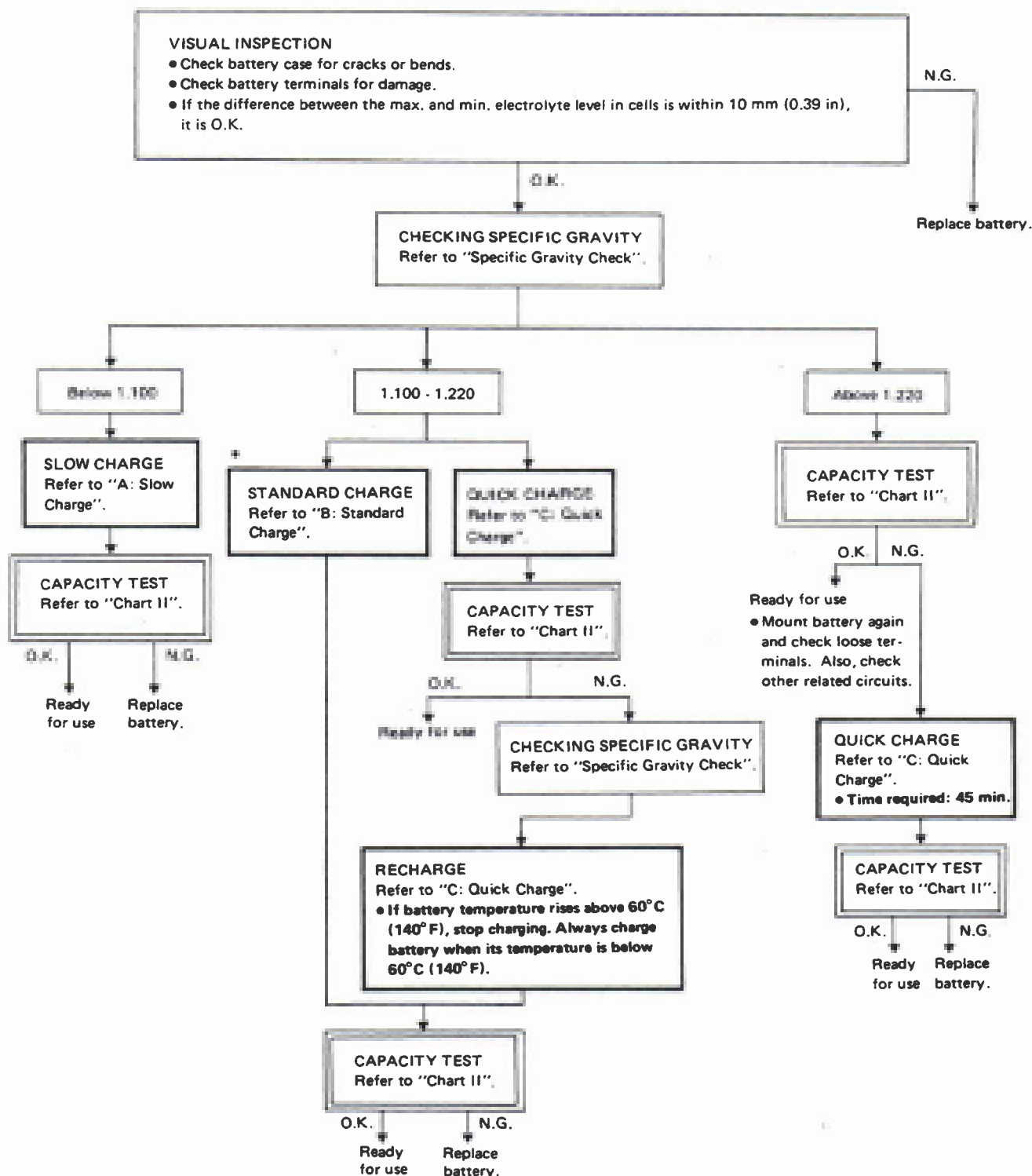
- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



# BATTERY

## Battery Test and Charging Chart

Chart I

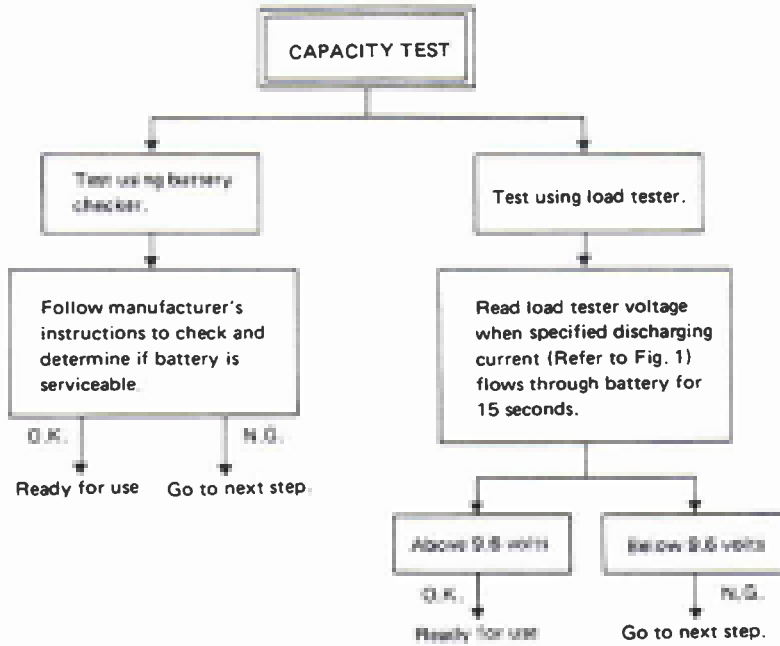


\* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

# BATTERY

## Battery Test and Charging Chart (Cont'd)

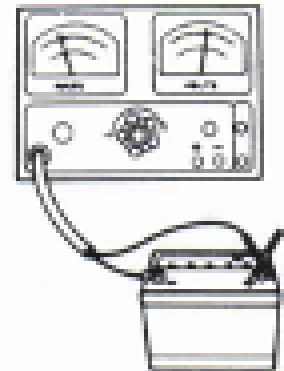
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
95E41R(L)	300
130E41R(L)	330



SEL697B

# BATTERY

## Battery Test and Charging Chart (Cont'd)

### A: SLOW CHARGE

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

BATTERY TYPE CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
Below 1.100	4.0 (A)	5.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	14.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

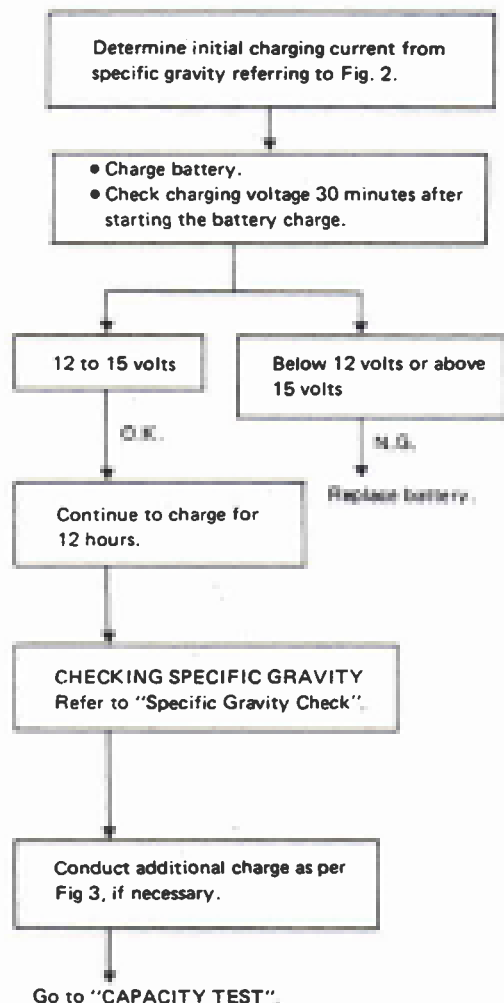
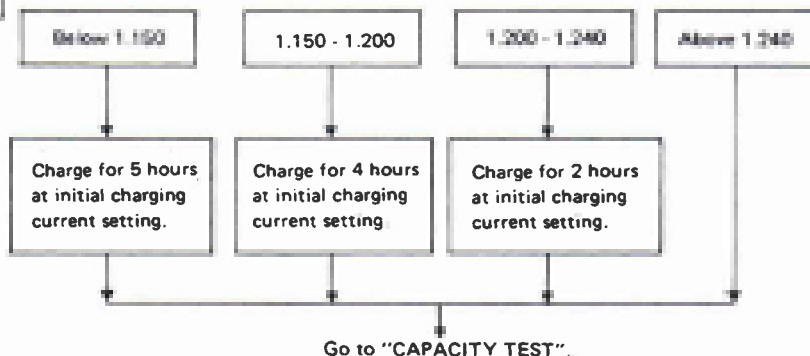


Fig. 3 ADDITIONAL CHARGE (Slow charge)



### CAUTION:

- a. Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- b. Keep battery away from open flame while it is being charged.
- c. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- d. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

# BATTERY

## Battery Test and Charging Chart (Cont'd)

### B: STANDARD CHARGE

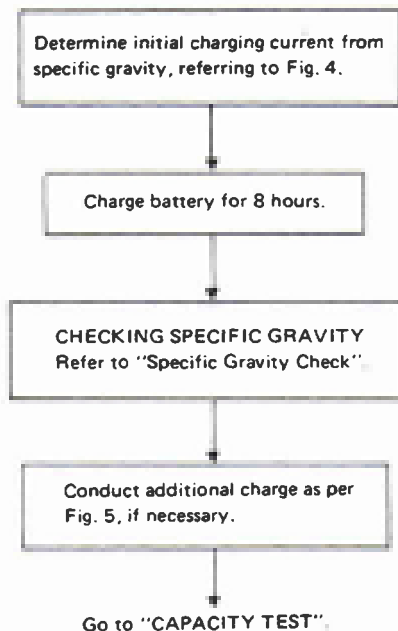
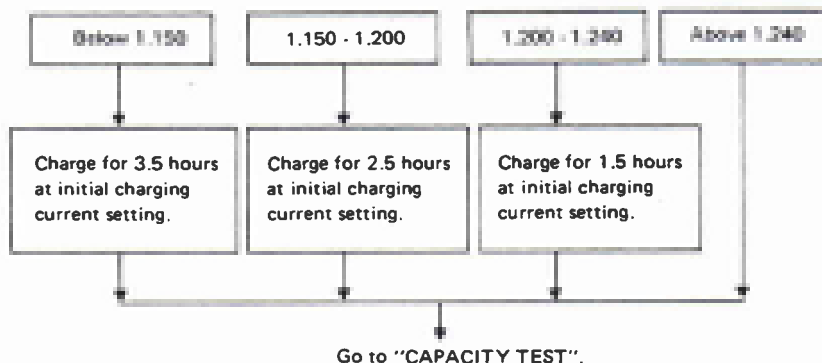


Fig. 4 INITIAL CHARGING CURRENT SETTING  
(Standard charge)

BATTERY TYPE CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)		46B24R(L) 55B24R(L)		50D23R(L) 55D23R(L)		65D26R(L) 80D26R(L)		75D31R(L)	95D31R(L) 95E41R(L)		130E41R(L)
	1.100 - 1.130	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	13.0 (A)				
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	11.0 (A)					
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	9.0 (A)					
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)	7.0 (A)					

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)



### CAUTION:

- Do not use standard charge method on a battery whose specific gravity is less than 1.100.
- Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

# BATTERY

## Battery Test and Charging Chart (Cont'd)

### C: QUICK CHARGE

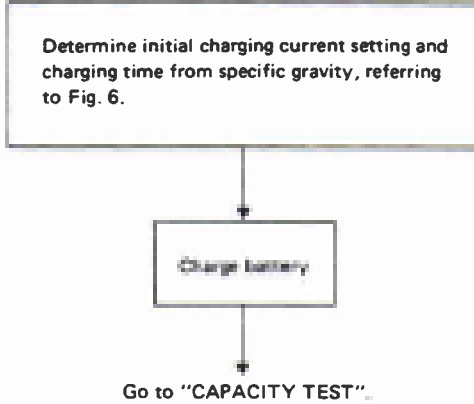


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

BATTERY TYPE CONVERTED SPECIFIC GRAVITY	CURRENT (A)		CURRENT (A)		CURRENT (A)	
	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L)	55D23R(L) 65D26R(L)	80D26R(L)	75D31R(L) 95D31R(L) 95E41R(L)
	10 (A)	15 (A)	20 (A)	30 (A)	40 (A)	
1.100 - 1.130	2.5 hours					
1.130 - 1.160	2.0 hours					
1.160 - 1.190	1.5 hours					
1.190 - 1.220	1.0 hours					
Above 1.220	0.75 hours (45 min.)					

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

### CAUTION:

- Do not use quick charge method on a battery whose specific gravity is less than 1.100.
- Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.  
If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
- Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.

## Service Data and Specifications (S.D.S.)

Applied area	All	Except Australia and Middle East	Middle East	All
Applied model	Gasoline engine model			Diesel engine model
	Standard	Option		Optional for side facing rear seat model
Type	48D26L	55D23L	80D26L	95D31L
Capacity	V-AH 12-50	12-60	12-65	12-80

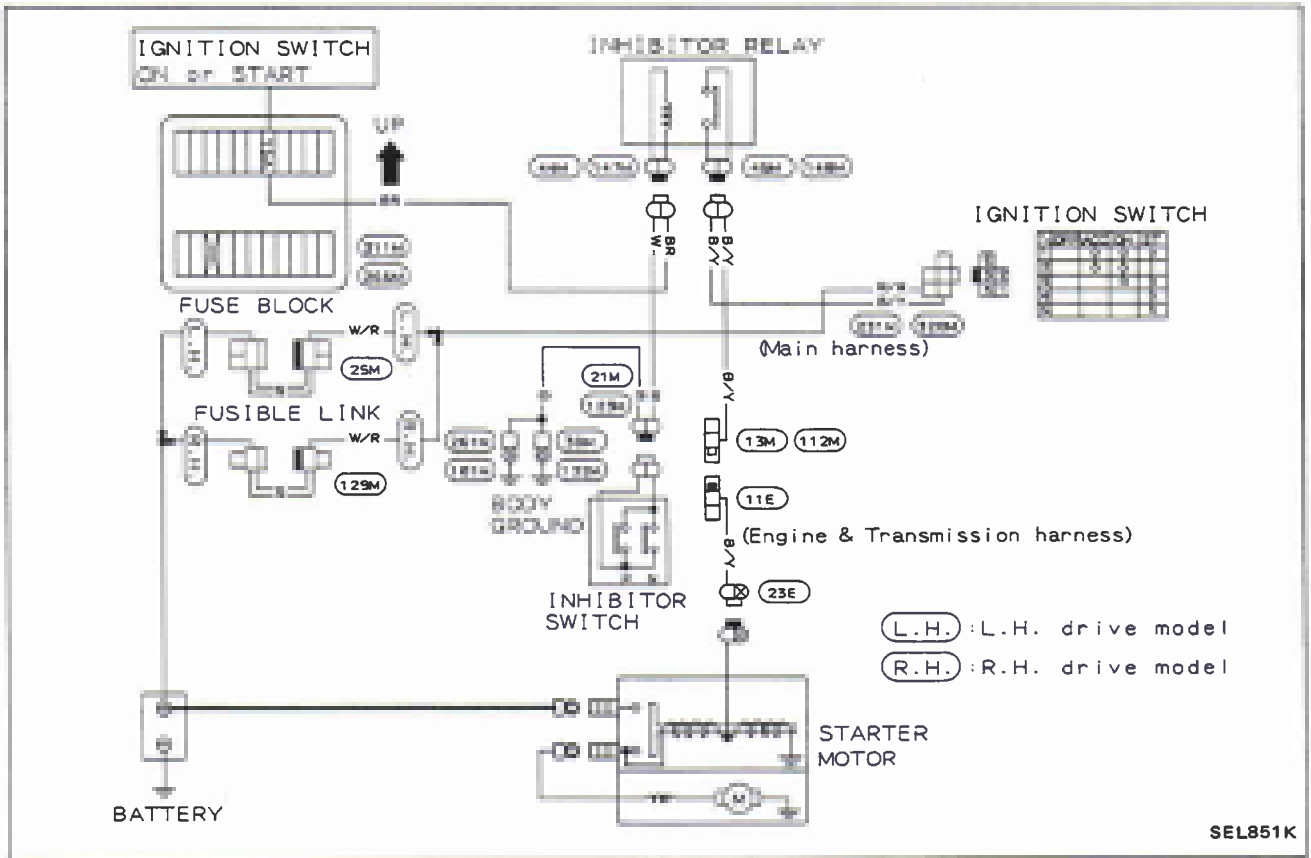


# STARTING SYSTEM

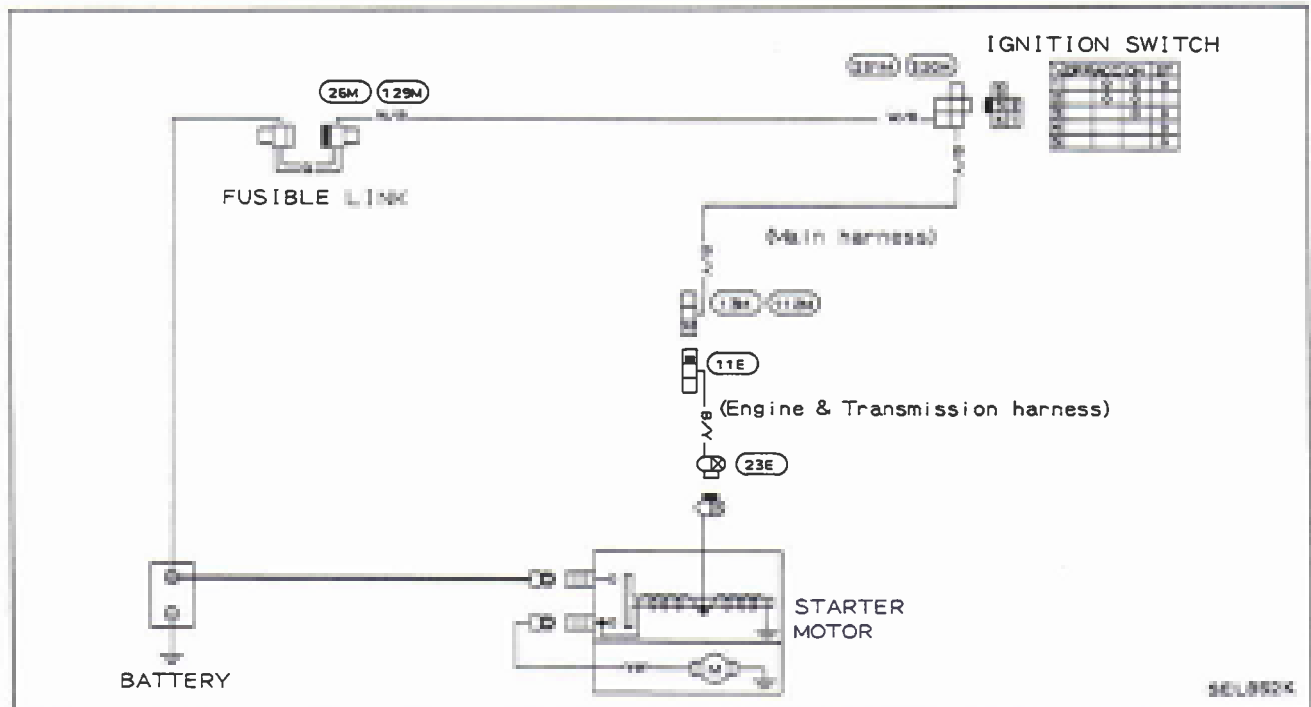
## Wiring Diagram

### GASOLINE ENGINE MODEL

#### A/T model



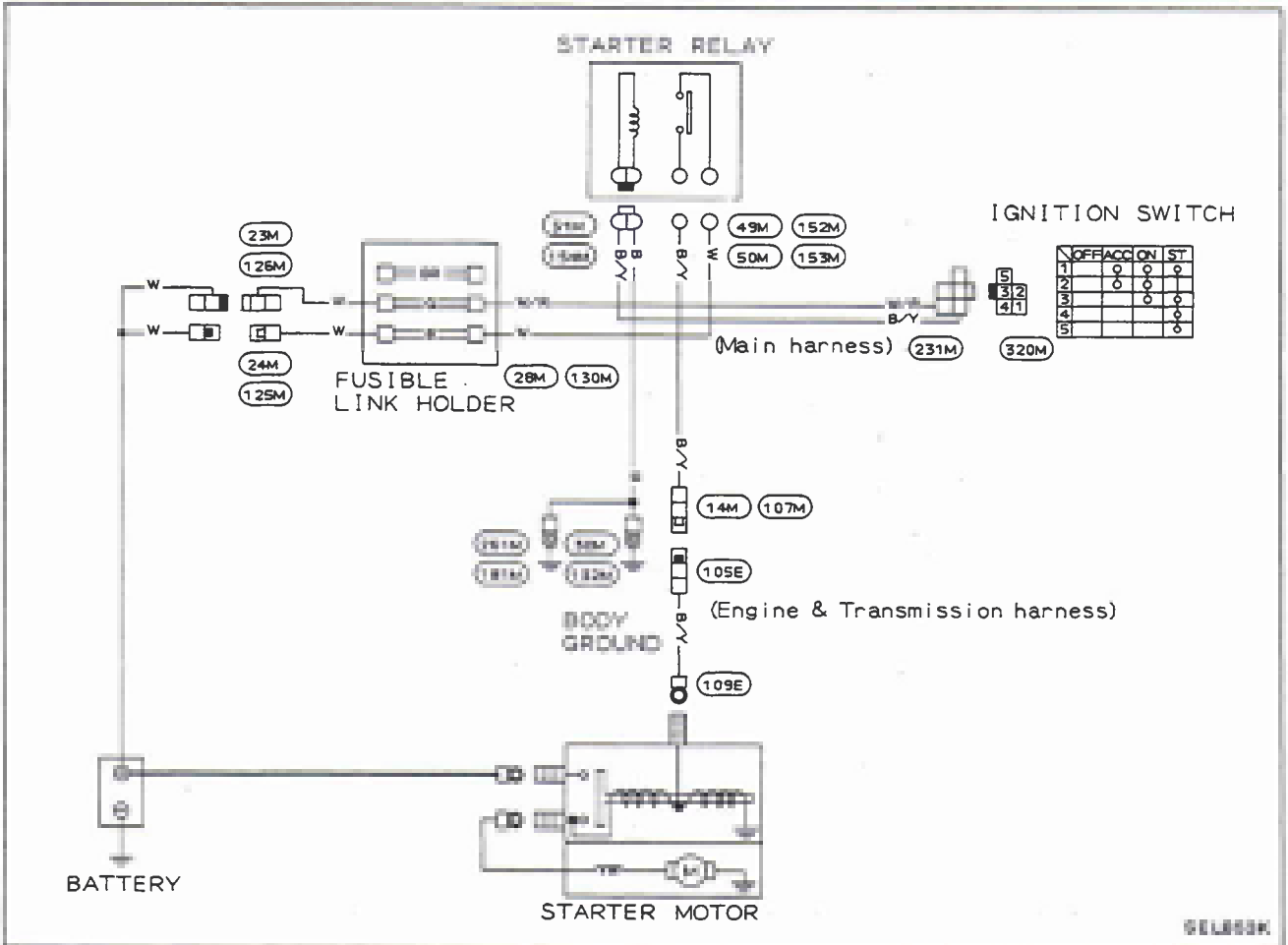
#### M/T model



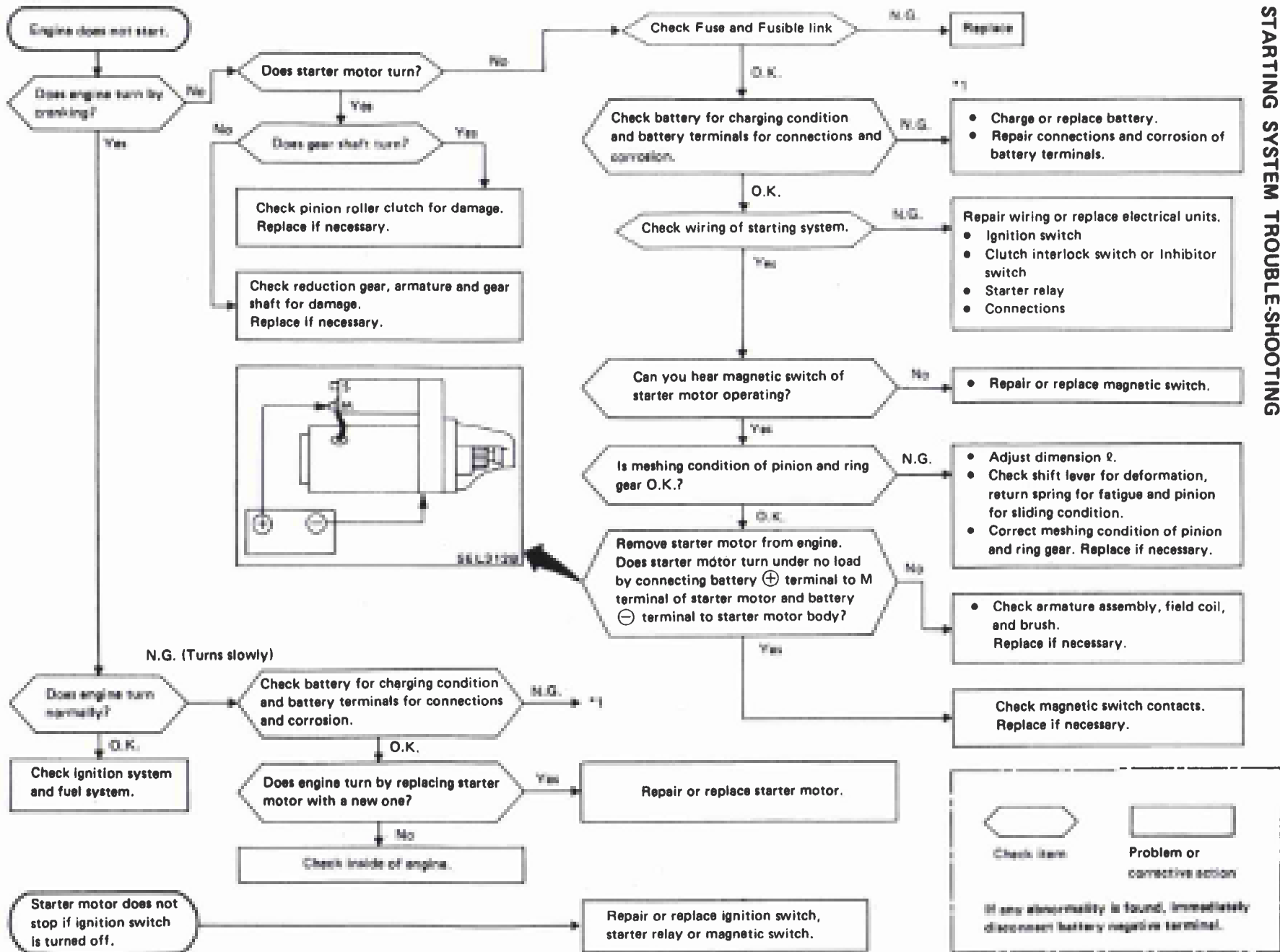
# STARTING SYSTEM

## Wiring Diagram (Cont'd)

DIESEL ENGINE MODEL



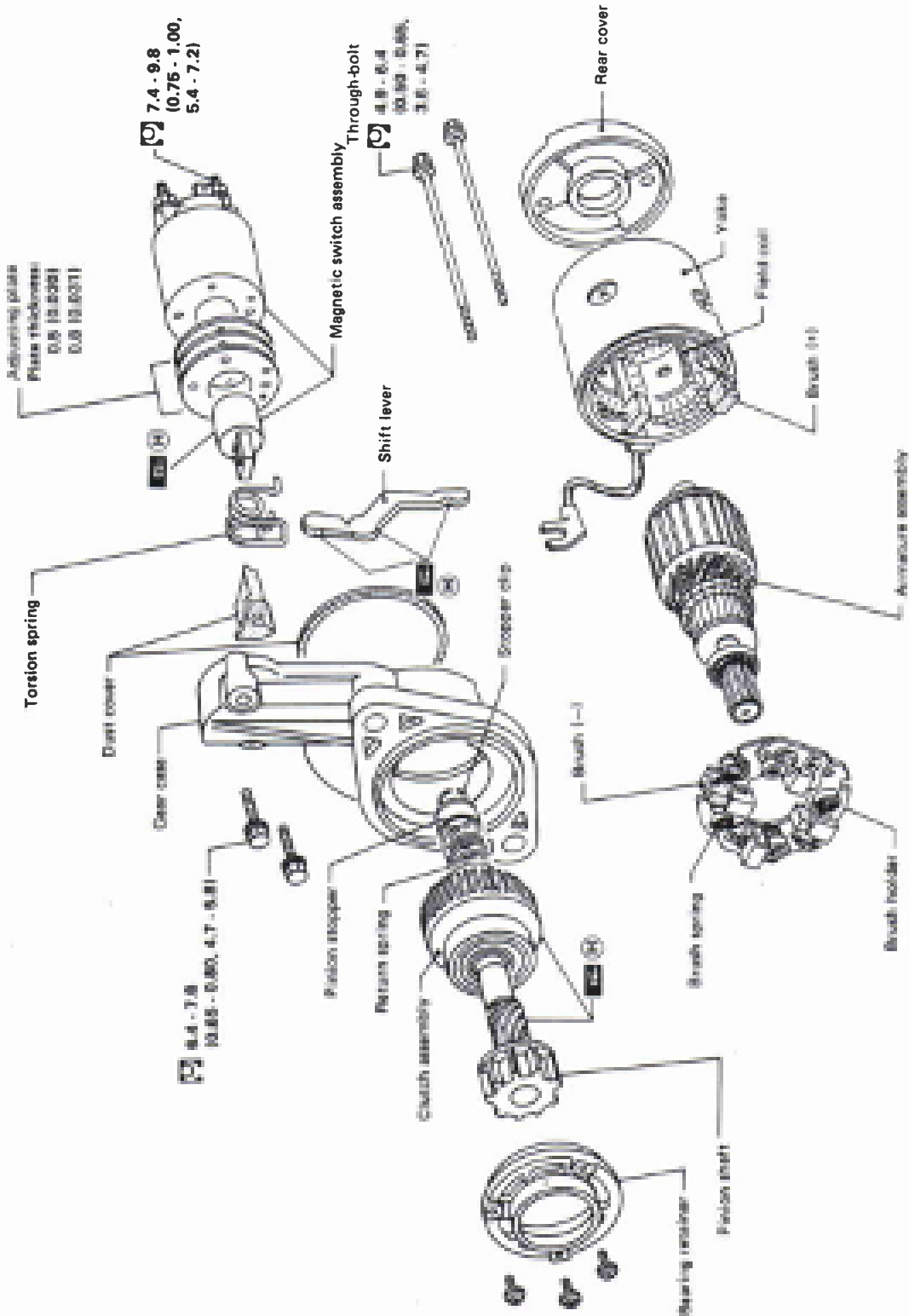
EL-19



# STARTING SYSTEM —Starter—

## Construction

S114-471, 472



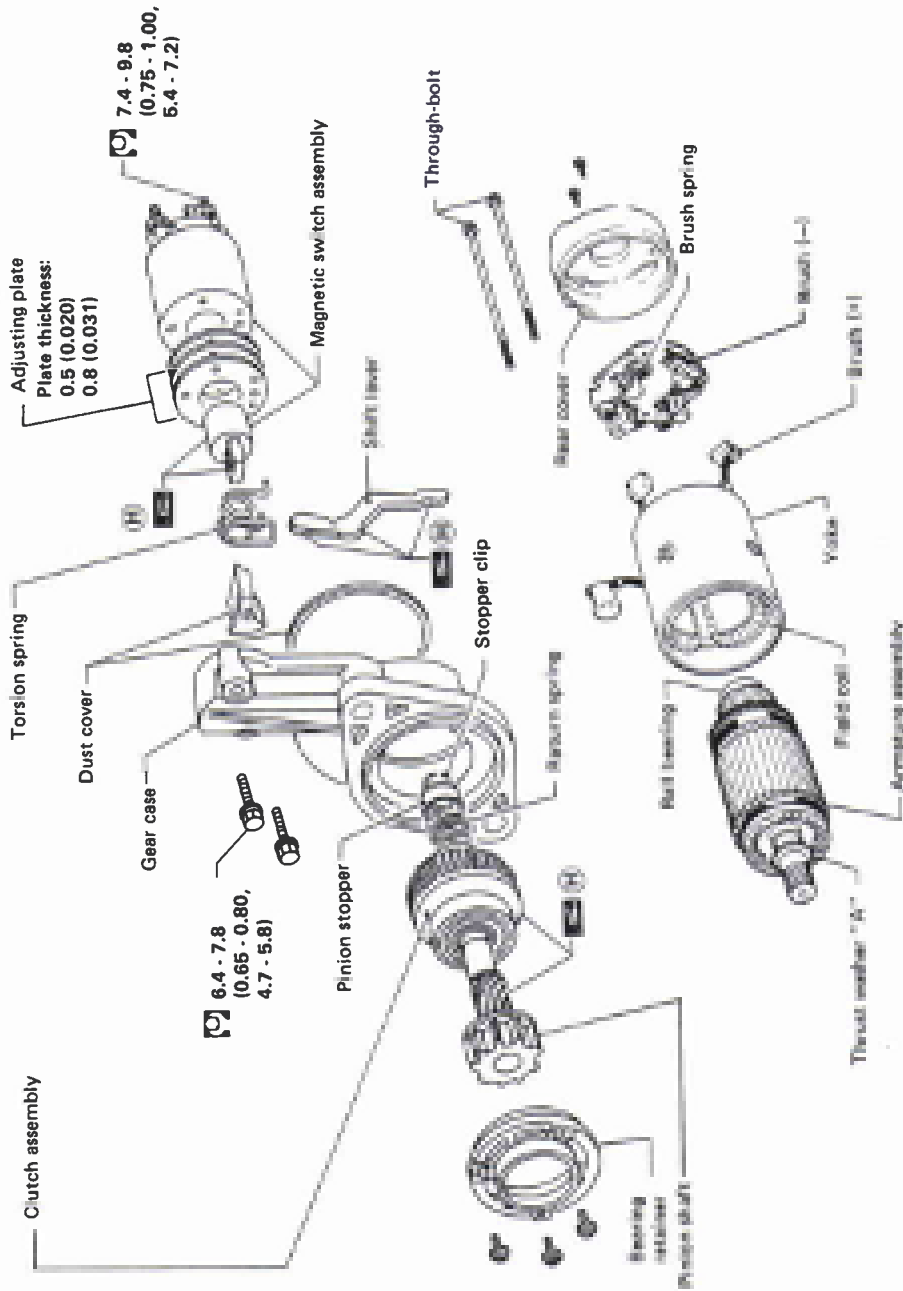
Unit: mm (in)  
 [ ] : N·m (kg·m, ft·lb)  
 [ ] : High-temperature grease point

SEL557B

# STARTING SYSTEM —Starter—

## Construction (Cont'd)

S13-118



Unit: mm (in)  
 ( ) : N-m (kg-m, ft-lb)

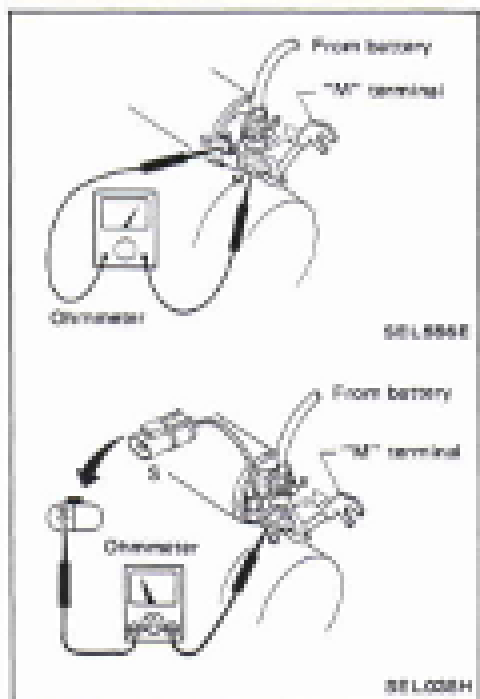
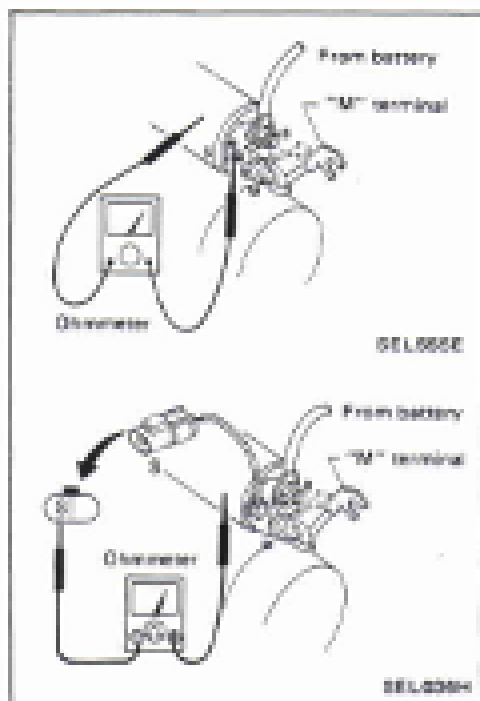
(H) : High-temperature grease points

89L109D

## STARTING SYSTEM —Starter—

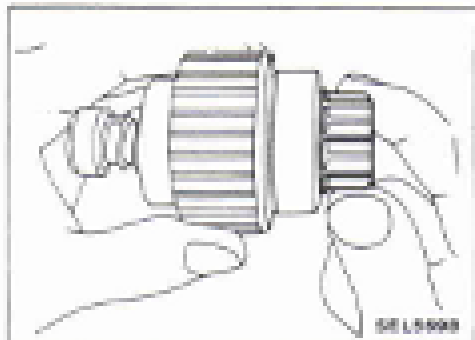
### Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
  - Disconnect "M" terminal of starter motor.
1. Continuity test (between "S" terminal and switch body).
  - No continuity ... Replace.



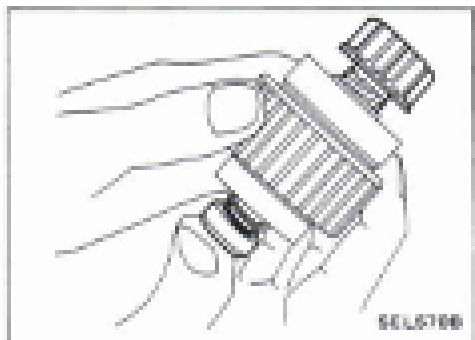
2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.

## STARTING SYSTEM — Starter—

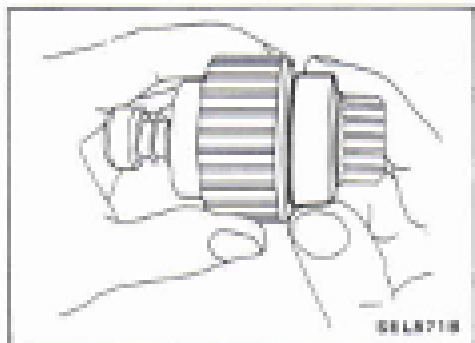


### Pinion/Clutch Check

1. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
  - If it does not lock (or locks) in either direction or unusual resistance is evident ... Replace.



2. Check pinion movement.
  - If it is hard to move, apply grease or, if necessary, replace.



3. Check ball bearing.

Spin outer race of ball bearing to ensure that it turns smoothly without binding.

  - Abnormal resistance ... Replace.
4. Inspect pinion teeth.
  - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
5. Inspect reduction gear teeth.
  - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)

### Brush Check

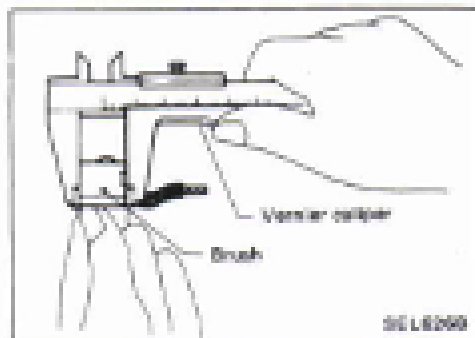
#### BRUSH

Check wear of brush.

Wear limit length:

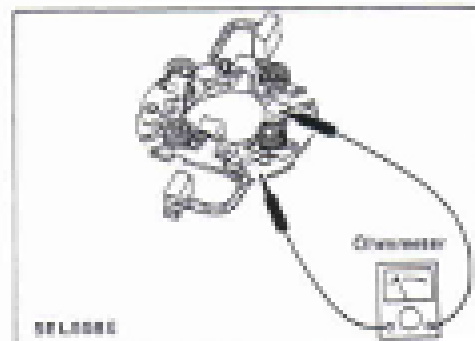
Refer to "Service Data and Specifications."

- Excessive wear ... Replace.

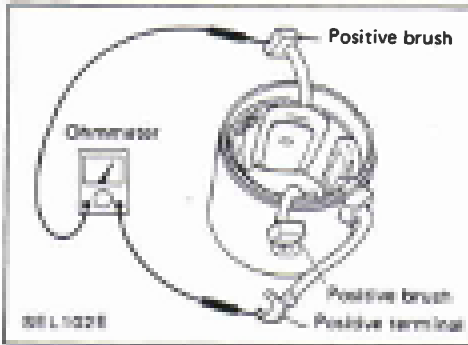


#### BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).
  - Continuity exists ... Replace.
2. Check brush to see if it moves smoothly.
  - If brush holder is bent, replace it; if sliding surface is dirty, clean.



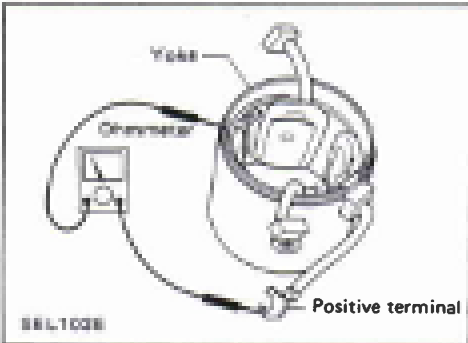
## STARTING SYSTEM — Starter—



### Field Coil Check

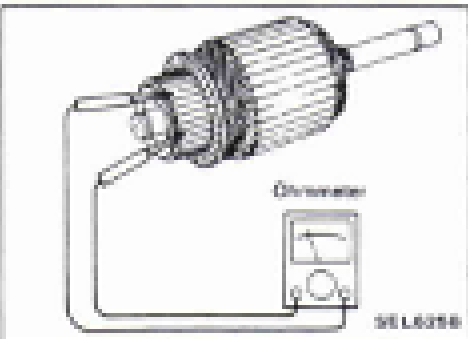
1. Continuity test (between field coil positive terminal and positive brushes).

- No continuity ... Replace field coil.



2. Insulation test (between field coil positive terminal and yoke).

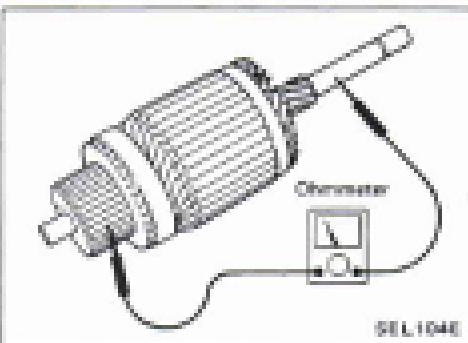
- Continuity exists ... Replace field coil.



### Armature Check

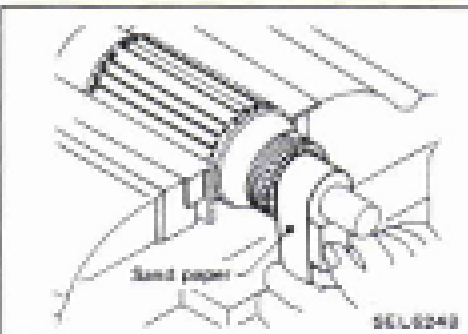
1. Continuity test (between two segments side by side).

- No continuity ... Replace.



2. Insulation test (between each commutator and shaft).

- Continuity exists ... Replace.

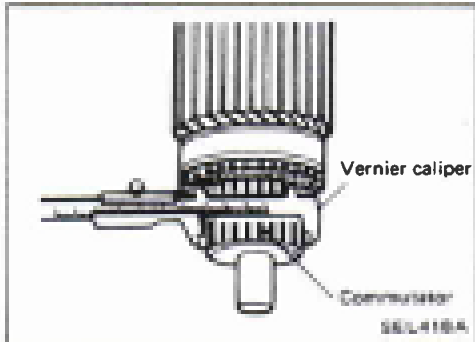


3. Check commutator surface.

- Rough ... Sand lightly with No. 500 - 600 sandpaper.



## STARTING SYSTEM —Starter—



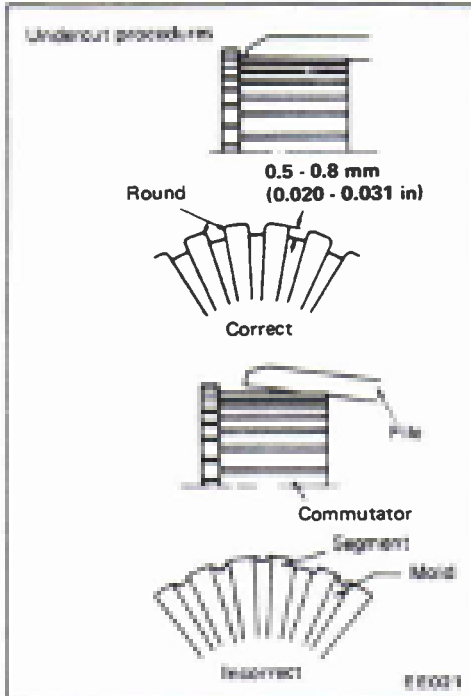
### Armature Check (Cont'd)

4. Check diameter of commutator.

Commutator minimum diameter:

Refer to "Service Data and Specifications."

- Less than specified value ... Replace.



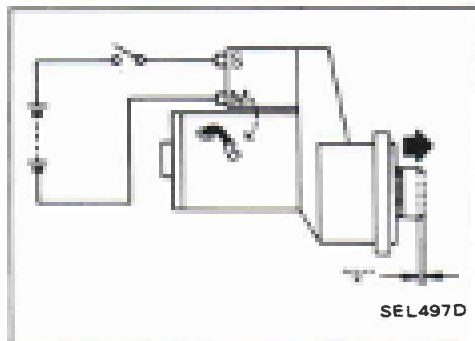
5. Check depth of insulating mold from commutator surface.
  - Less than 0.2 mm (0.008 in) ... Undercut to 0.5 - 0.8 mm (0.020 - 0.031 in)

### Assembly

Carefully observe the following instructions.

#### HIGH TEMPERATURE GREASE POINT

- Frictional surface of pinion
- Moving portion of shift lever
- Plunger of magnetic switch



#### PINION PROTRUSION LENGTH ADJUSTMENT

Measure movement "l" in height of pinion when pinion is pushed out with magnetic switch energized and when pinion is pulled out by hand until it touches stopper.

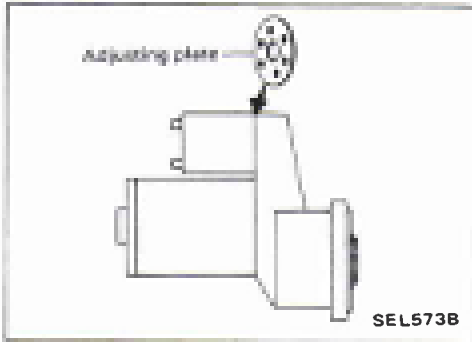
Movement "l":

Refer to "Service Data and Specifications."

## STARTING SYSTEM —Starter—

### Assembly (Cont'd)

- Not in the specified value ... Adjust by adjusting plate.



### Service Data and Specifications (S.D.S.)

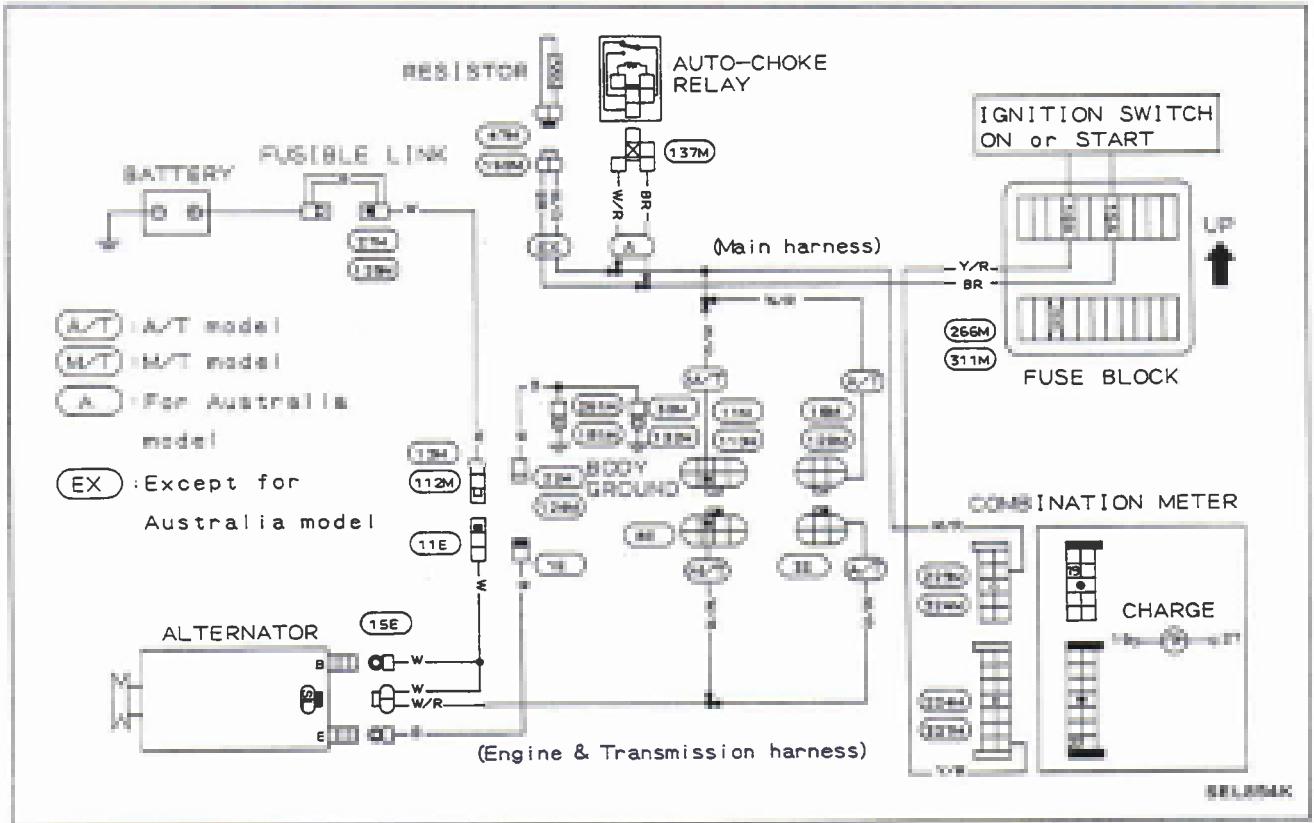
#### STARTER

Type	S114-471		S114-472		S13-118	
	Reduction gear type					
Applied model	Gasoline engine		Optional for gasoline engine		Diesel engine	
System voltage	V		12			
No-load						
Terminal voltage	V		11.0			
Current	A		Less than 100		Less than 160	
Revolution	rpm		More than 3,900			
Outer diameter of commutator	mm (in)		More than 29.0 (1.142)		More than 35.5 (1.398)	
Minimum length of brush	mm (in)		11.8 (0.463)		9.0 (0.354)	
Brush spring tension	N (kg, lb)		15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)		26.5 - 32.4 (2.7 - 3.3, 6.0 - 7.3)	
Clearance of bearing metal and armature shaft	mm (in)		Less than 0.2 (0.008)		—	
Movement "Q" in height of pinion assembly	mm (in)		0.3 - 1.5 (0.012 - 0.059)			

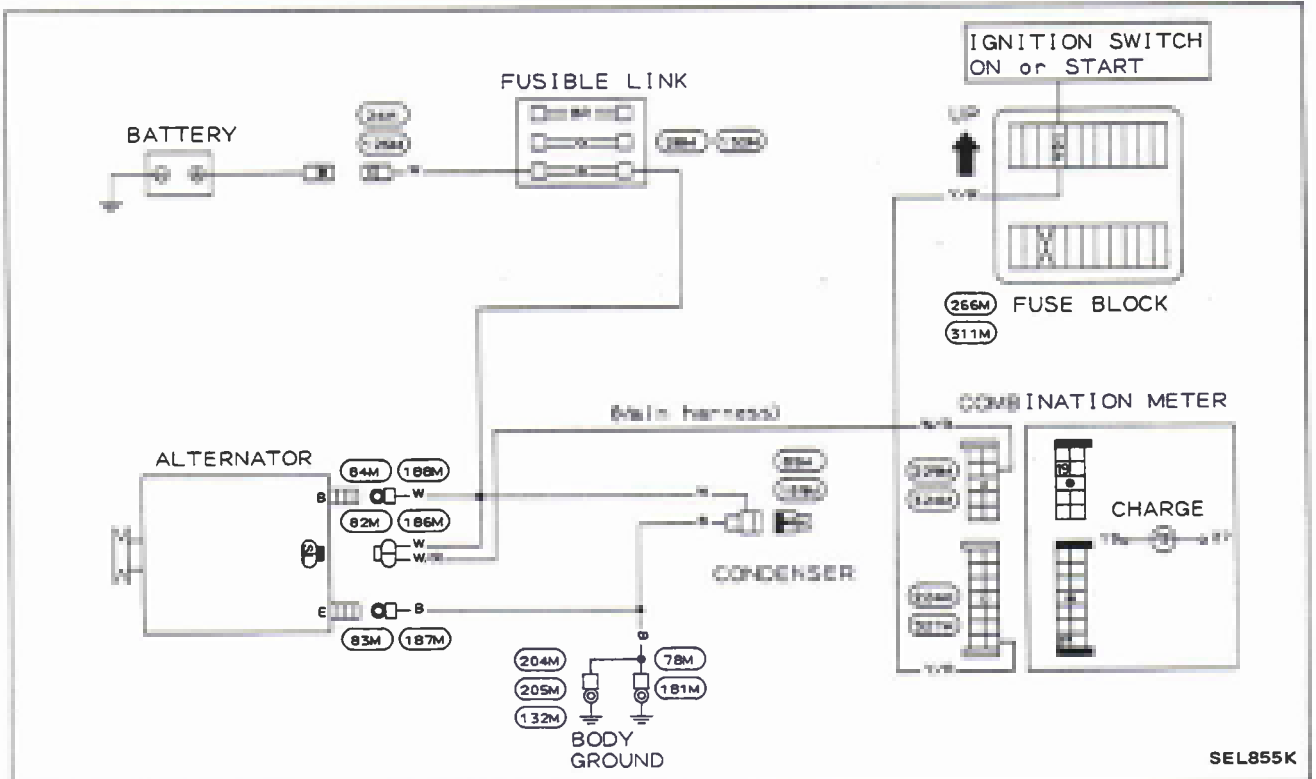
# CHARGING SYSTEM

## Wiring Diagram

### GASOLINE ENGINE MODEL



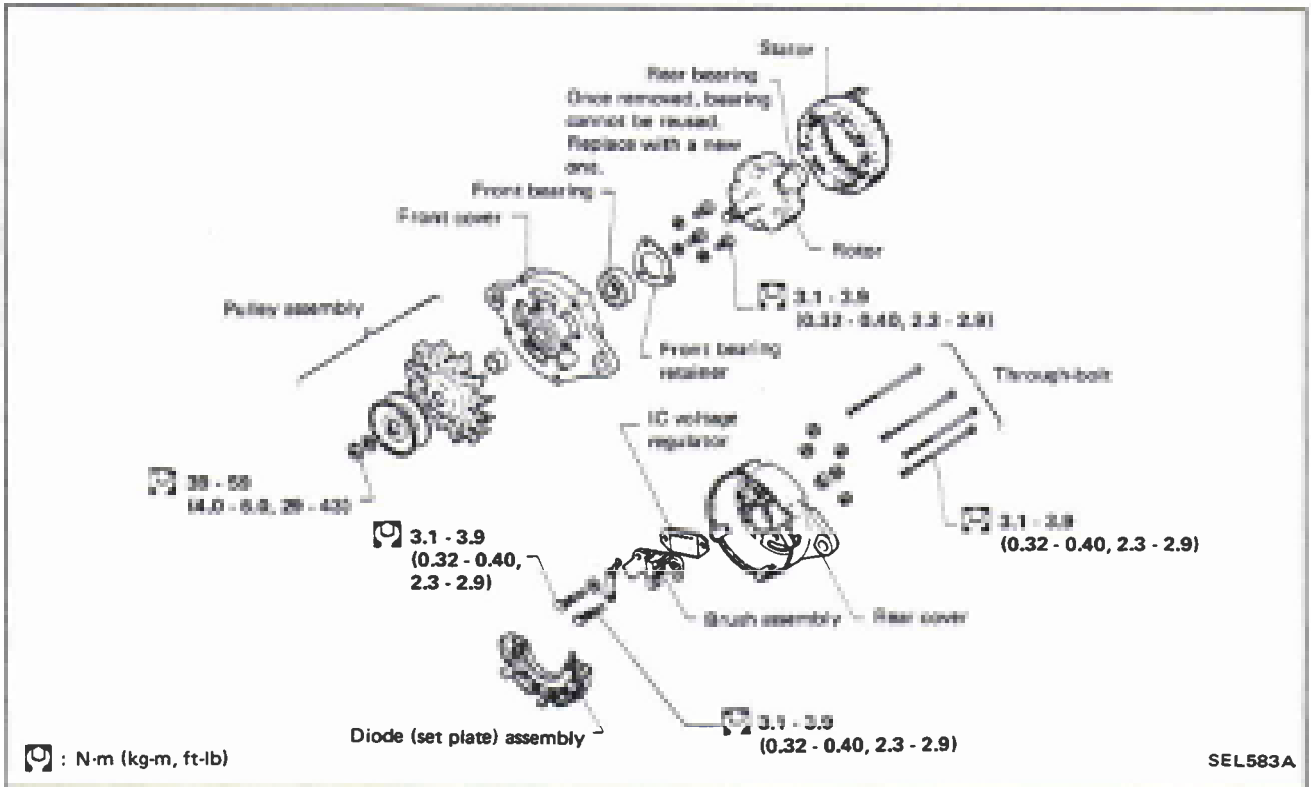
### DIESEL ENGINE MODEL



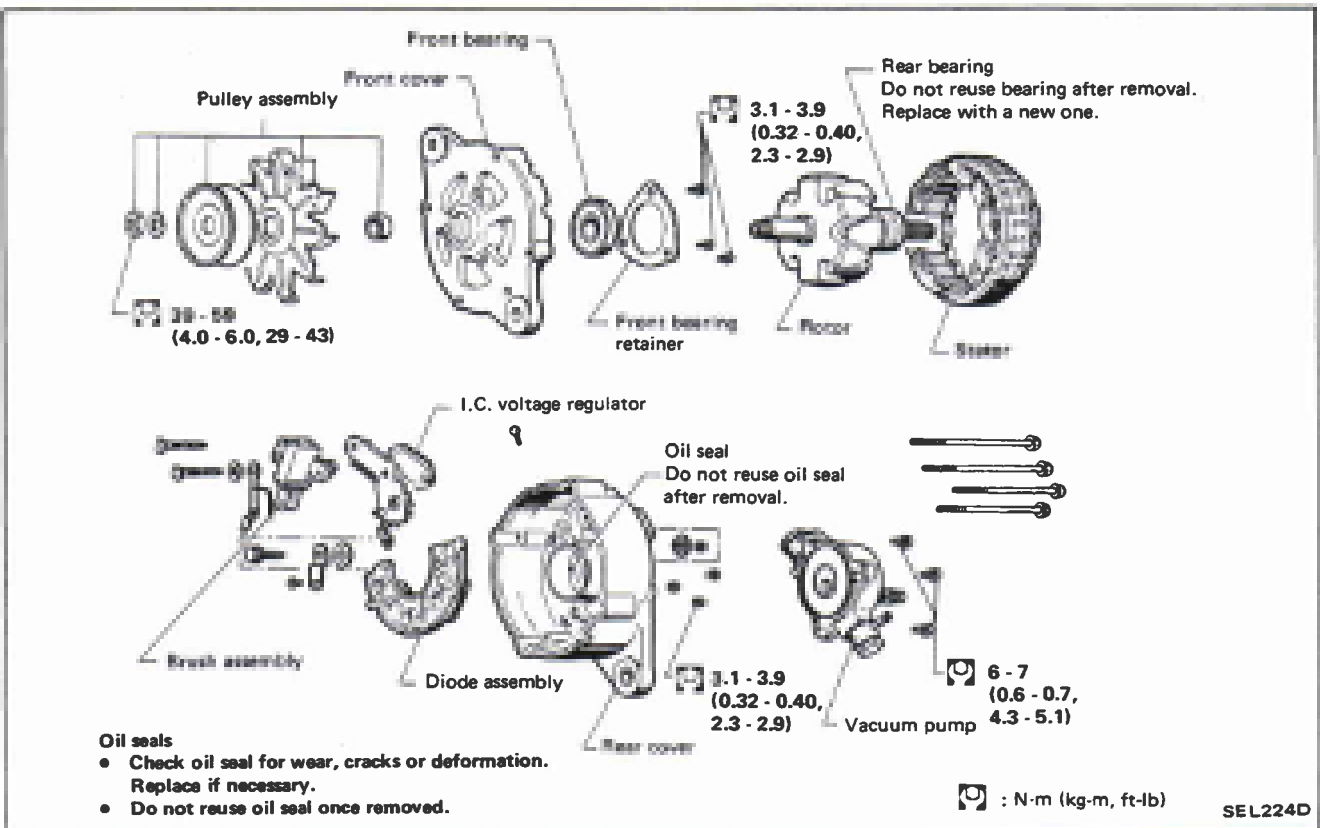
# CHARGING SYSTEM —Alternator—

## Construction

LR150-218, LR160-165



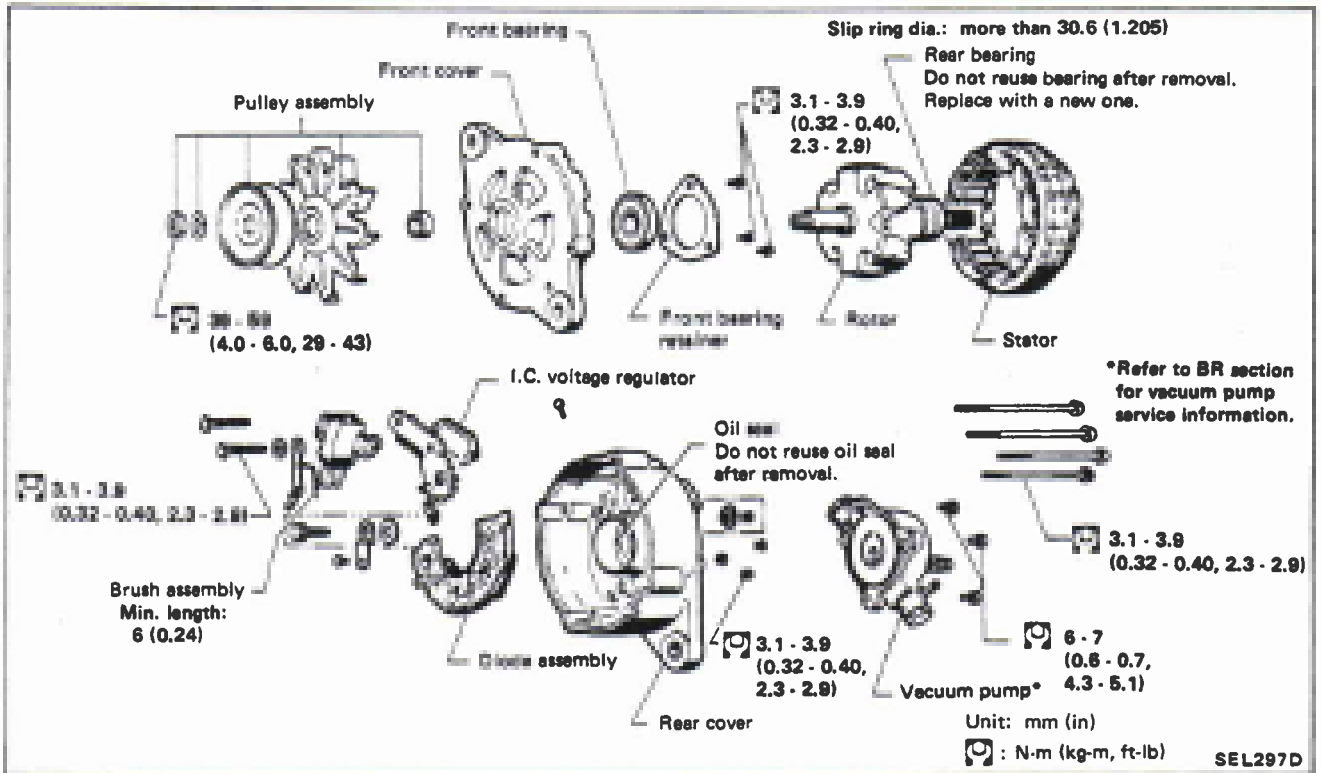
LR160-437, LR160-426E



# CHARGING SYSTEM —Alternator—

## Construction (Cont'd)

LR150-428E



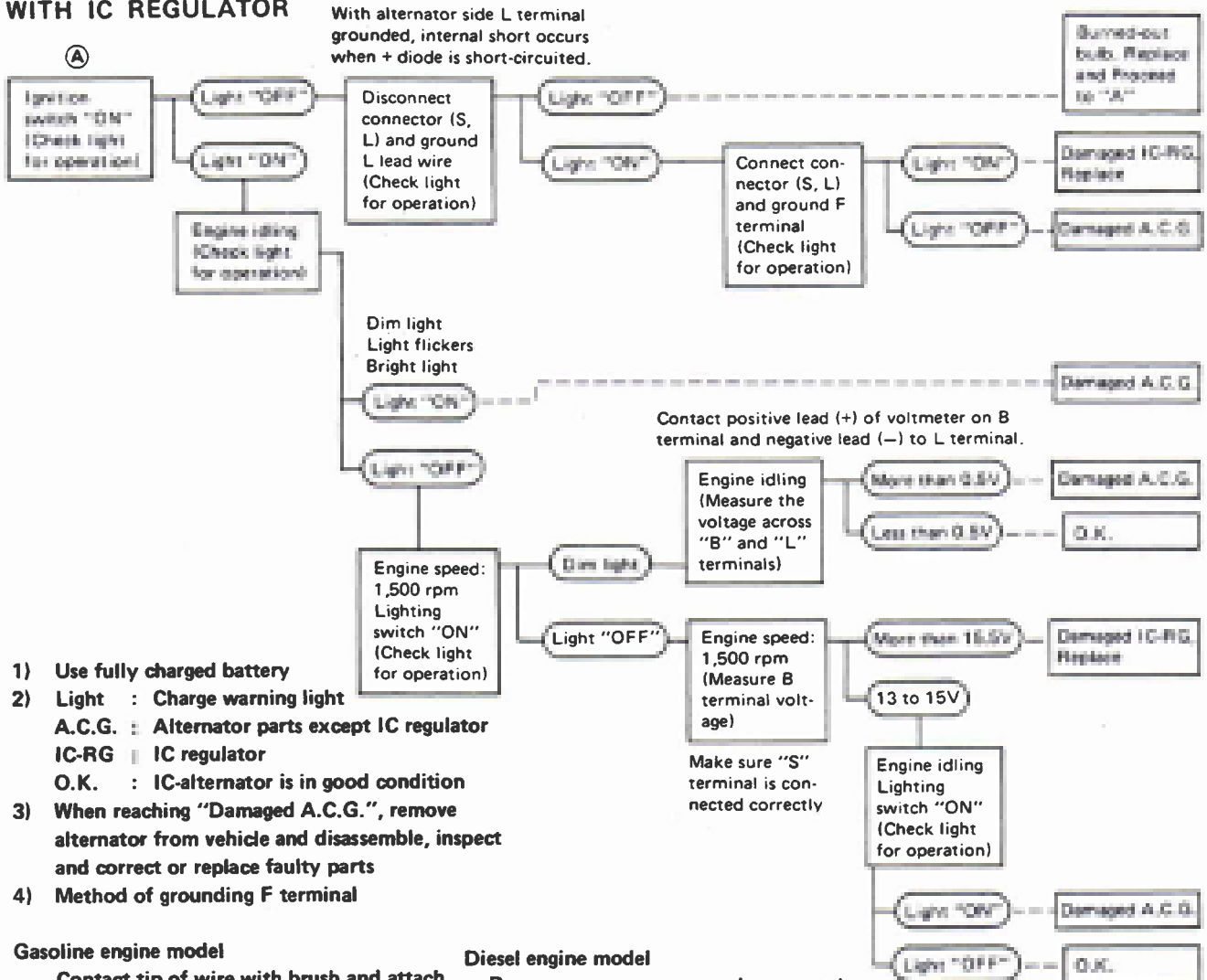
# CHARGING SYSTEM —Alternator—

## Trouble-shooting

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

Before starting trouble-shooting, inspect the fusible link.

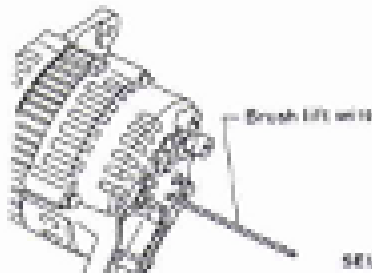
### WITH IC REGULATOR



- 1) Use fully charged battery
- 2) Light : Charge warning light  
A.C.G. : Alternator parts except IC regulator  
IC-RG : IC regulator  
O.K. : IC-alternator is in good condition
- 3) When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts
- 4) Method of grounding F terminal

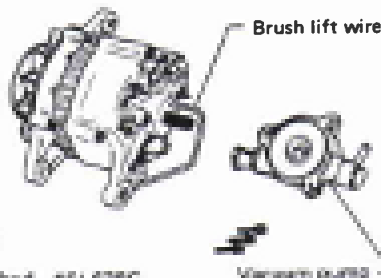
### Gasoline engine model

Contact tip of wire with brush and attach wire to alternator body.



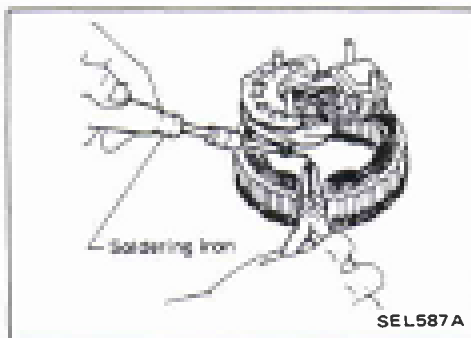
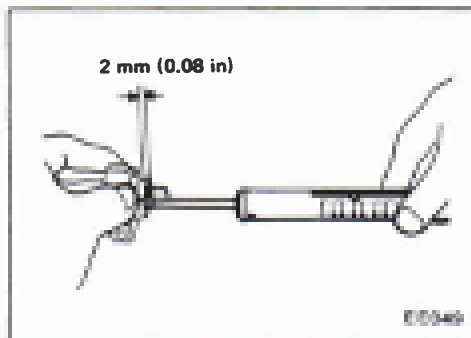
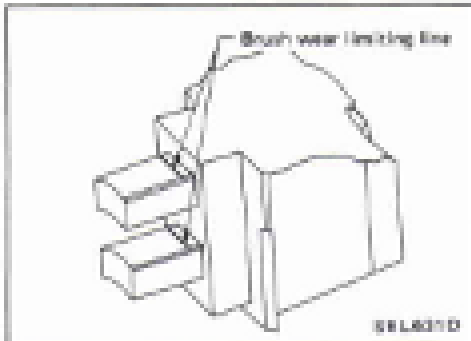
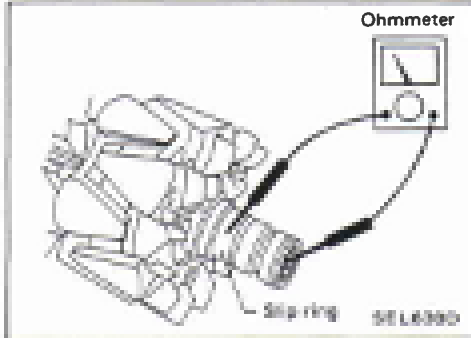
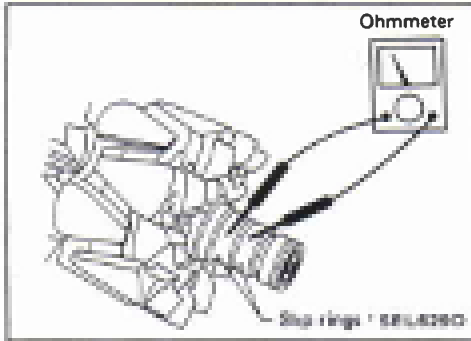
### Diesel engine model

Remove vacuum pump and connect tip of wire with brush and attach wire to alternator body.



- 5) Terminals "S", "L", "BAT" and "E" are marked on rear cover of alternator.

## CHARGING SYSTEM —Alternator—



### Disassembly

#### ROTOR SLIP RING CHECK

1. Continuity test
  - No continuity ... Replace rotor.

2. Insulator test
  - Continuity exists ... Replace rotor.
3. Check slip ring for wear.

Slip ring minimum outer diameter:

Refer to "Service Data and Specifications."

#### BRUSH CHECK

1. Check smooth movement of brush.
  - Not smooth ... Check brush holder and clean.
2. Check brush for wear.
  - Replace brush if it is worn down to the limit line.

3. Check brush lead wire for damage.
  - Damaged ... Replace.
4. Check brush spring pressure.

Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

Spring pressure:

Refer to "Service Data and Specifications."

- Not within the specified values ... Replace.

#### STATOR CHECK

To test the stator or diode, you must separate them by unsoldering the connecting wires.

#### CAUTION:

Use only as much heat as required to melt solder.

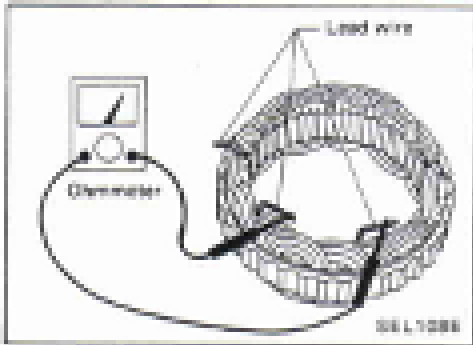
Diodes will be damaged by excessive heat.

## CHARGING SYSTEM —Alternator—

### Disassembly (Cont'd)

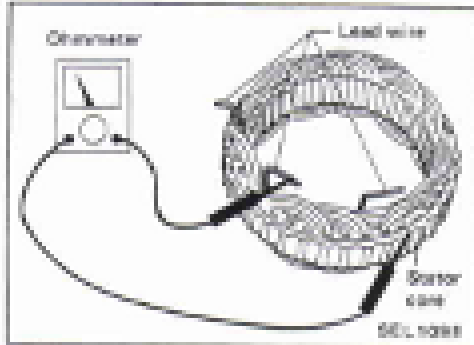
#### 1. Continuity test

- No continuity ... Replace stator.



#### 2. Ground test

- Continuity exists ... Replace stator.





# CHARGING SYSTEM —Alternator—

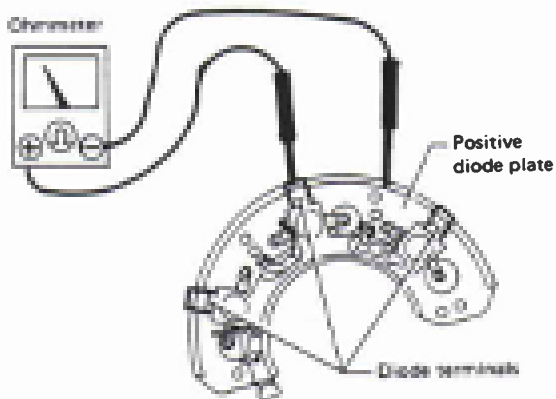
## Diode Check

### MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below.
- If any of the test results are not satisfactory, replace diode assembly.

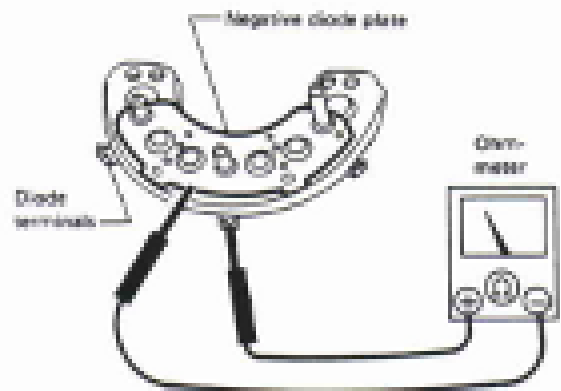
	Ohmmeter probes		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes

Positive side

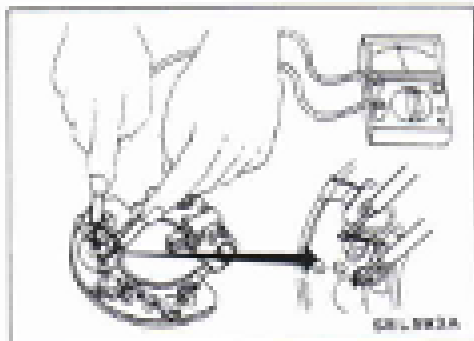


SEL319E

Negative side



SEL320E



### SUB-DIODES

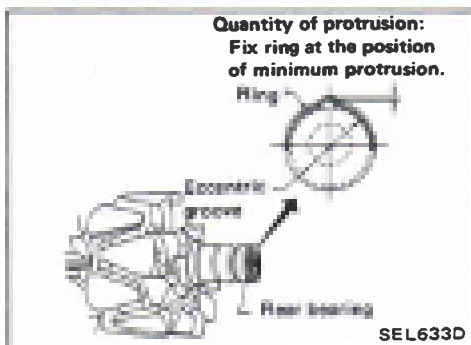
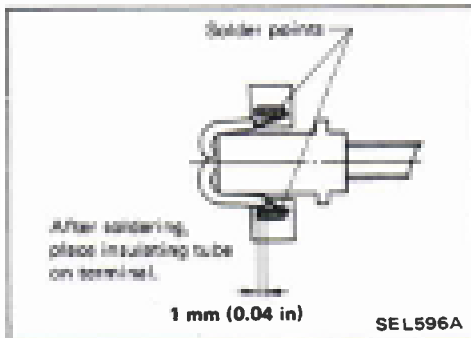
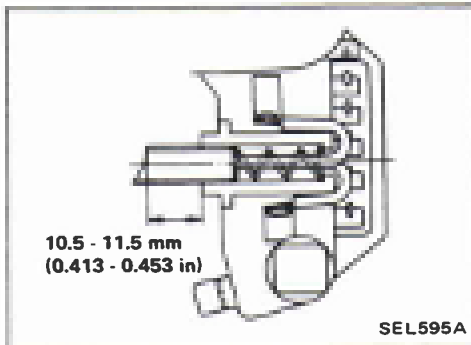
- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

## CHARGING SYSTEM —Alternator—

### Assembly

Carefully observe the following instructions.

- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.



### WHEN SOLDERING BRUSH LEAD WIRE

- (1) Position brush so that it extends 10.5 to 11.5 mm (0.413 to 0.453 in) from brush holder.

- (2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.

### RING FITTING IN REAR BEARING

- Fit ring into groove in rear bearing so that it is as close to the adjacent area as possible.

## CHARGING SYSTEM —Alternator—

### Assembly (Cont'd)

#### REAR COVER INSTALLATION

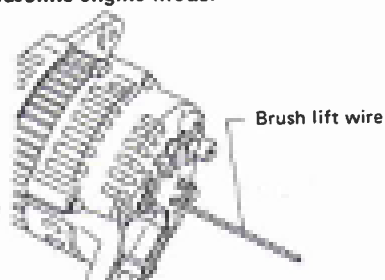
(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush, by inserting brush lift into brush lift hole from outside.

After installing, remove wire for brush lift.

(2) After installing front and rear sides of alternator, pull brush lift by pushing toward center.

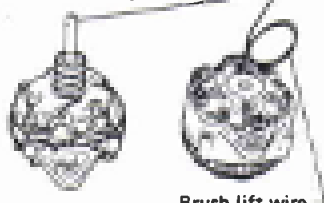
**Do not pull brush lift by pushing toward outside of cover as it will damage slip ring sliding surface.**

Gasoline engine model



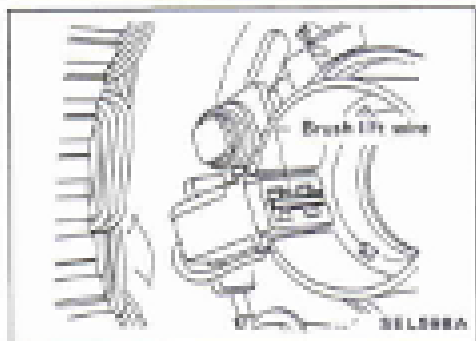
Diesel engine model

Use serration cap (Attach vinyl tape) to prevent scratching oil seal



Brush lift wire

SEL8400



Brush lift wire

SEL8400

## CHARGING SYSTEM —Alternator—

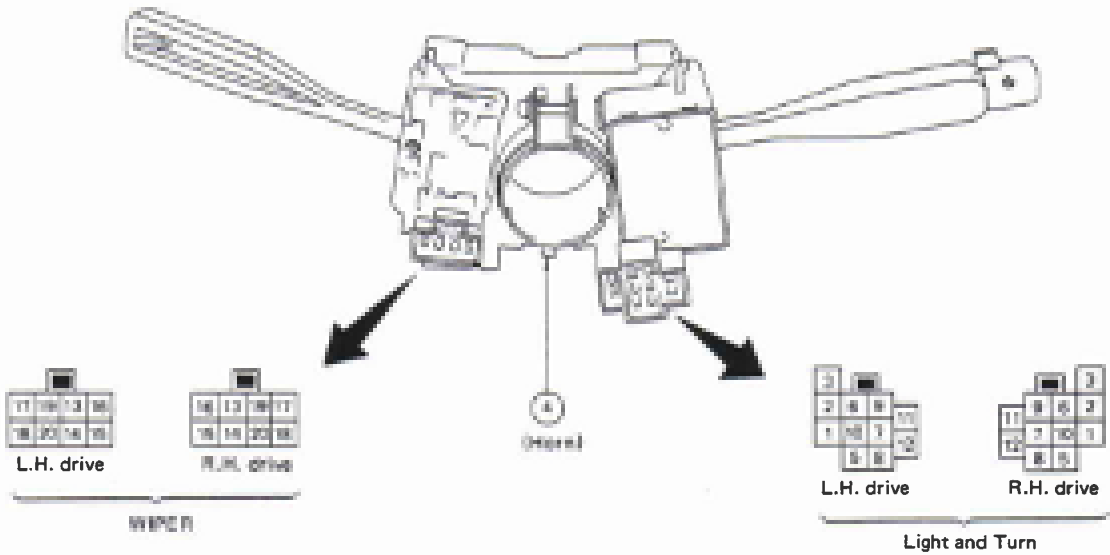
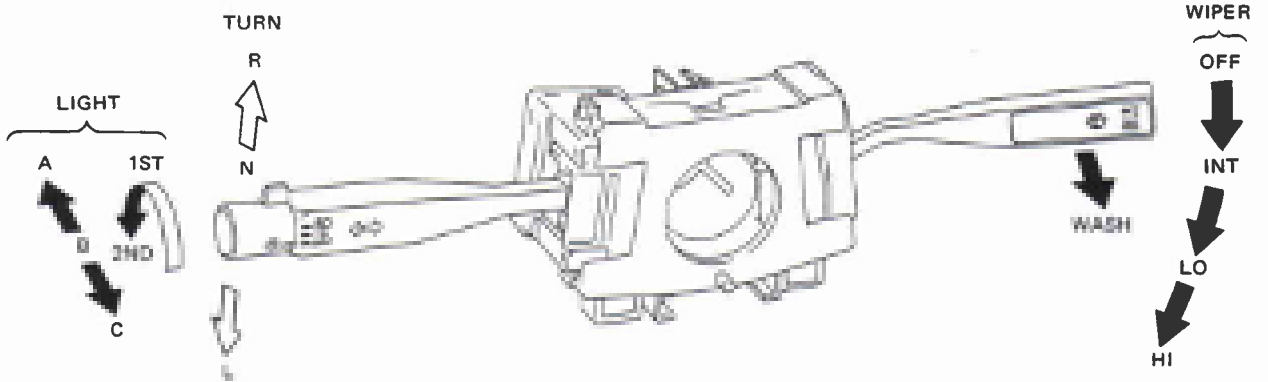
### Service Data and Specifications (S.D.S.)

#### ALTERNATOR

Type		LR150-218	LR160-165	LR160-437	LR150-428E	LR160-426E
Applied model		Gasoline engine	Optional for gasoline engine	Diesel engine		
				Australia	Except Australia	Optional for except Australia
Nominal rating	V-A	12-50	12-60		12-50	12-60
Ground polarity		Negative				
Minimum revolution under no-load (When 14 volts is applied)	rpm	Less than 1,000	Less than 900	Less than 1,000		
Hot output current	A/rpm	More than 40/2,500 More than 50/5,000	More than 26/1,300 More than 52/2,500 More than 60/5,000	More than 26/1,300 More than 50/2,500 More than 58/5,000	More than 16/1,300 More than 42/2,500 More than 50/5,000	More than 26/1,300 More than 50/2,500 More than 58/5,000
Regulated output voltage	V	14.1 - 14.7		14.4 - 15.0		
Minimum length of brush	mm (in)	6.0 (0.236)				
Brush spring pressure	N (g, oz)	2.305 - 3.383 (235 - 345, 8.29 - 12.17)		1.569 - 3.334 (160 - 340, 5.64 - 11.99)	2.501 - 3.383 (255 - 345, 8.99 - 12.17)	1.569 - 3.334 (160 - 340, 5.64 - 11.99)
Slip ring outer diameter	mm (in)	30.6 (1.205)		33.6 (1.323)	30.6 (1.205)	

# COMBINATION SWITCH

## Check



### WIPER SWITCH

#### LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

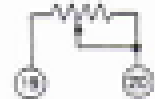
#### Without intermittent wiper

	OFF	LO	HI	WASH
13	○			
14	○	○		
15				
16			○	
17		○	○	○
18				○

#### With intermittent wiper

	OFF	INT	LO	HI	WASH
13	○	○			
14	○	○	○		
15		○			
16				○	
17		○	○	○	○
18					○

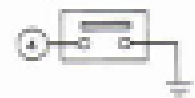
#### INTERMITTENT WIPER VOLUME



#### TURN SIGNAL SWITCH

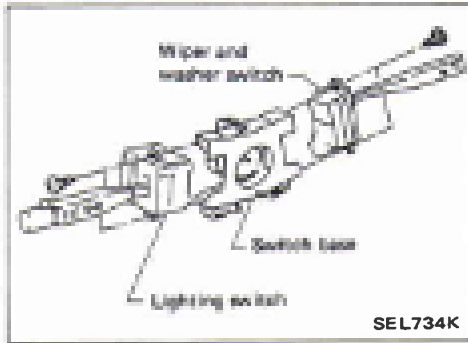
	R	N	L
1	○		
2	○		
3			○

#### HORN SWITCH



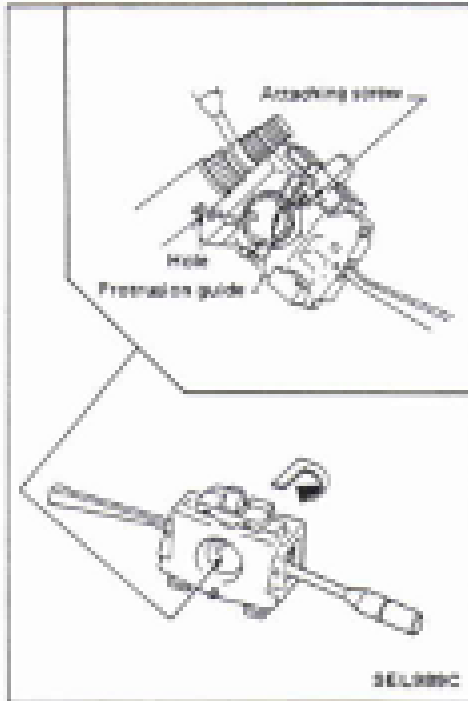
SEL813K

## COMBINATION SWITCH



### Replacement

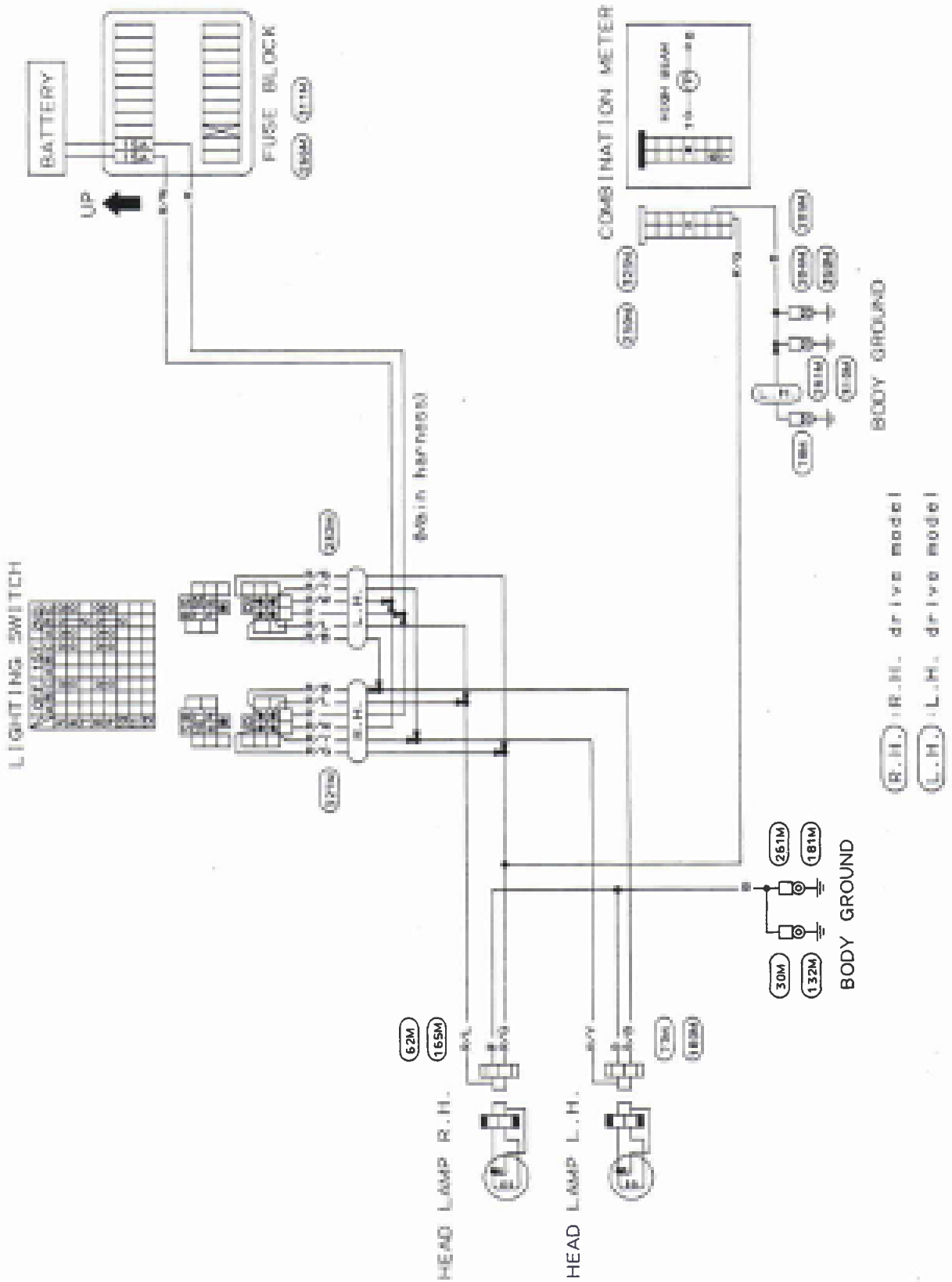
- Lighting switch and wiper & washer switch can be replaced without removing combination switch hose.



- To remove combination switch base, remove base attaching screw and turn after pushing on it.

# HEADLAMP

## Wiring Diagram



# HEADLAMP

## Aiming Adjustment

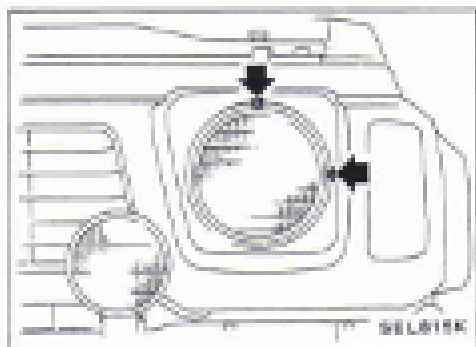
When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

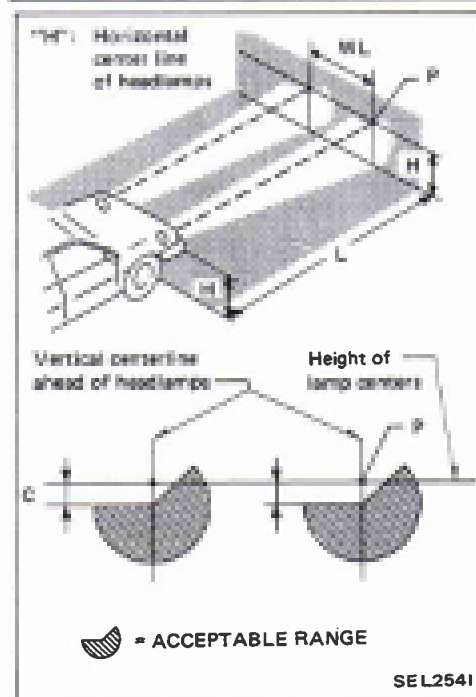
### CAUTION:

- Keep all tires inflated to correct pressures.
- Place vehicle and tester on one and same flat surface.
- See that there is no load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).



### LOW BEAM

- Turn headlamp low beam on.
  - Use adjusting screws to perform aiming adjustment.
- First tighten the adjust screw all the way and then make adjustment by loosening the screw.



- Adjust headlamps so that main axis of light is parallel to center line of body and is aligned with point P shown in illustration.
- Figure to the left shows headlamp aiming pattern for driving on right side of road; for driving on left side of road, aiming pattern is reversed.

- Dotted lines in illustration show center of headlamp.

"H": Horizontal center line of headlamps

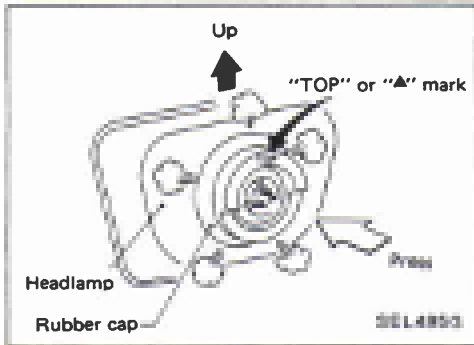
"WL": Distance between each headlamp center

"L": 5,000 mm (196.85 in)

"C": 50 mm (1.97 in)

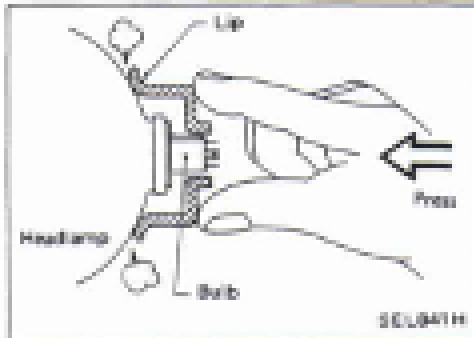


## HEADLAMP



### Installing Headlamp Rubber Cap

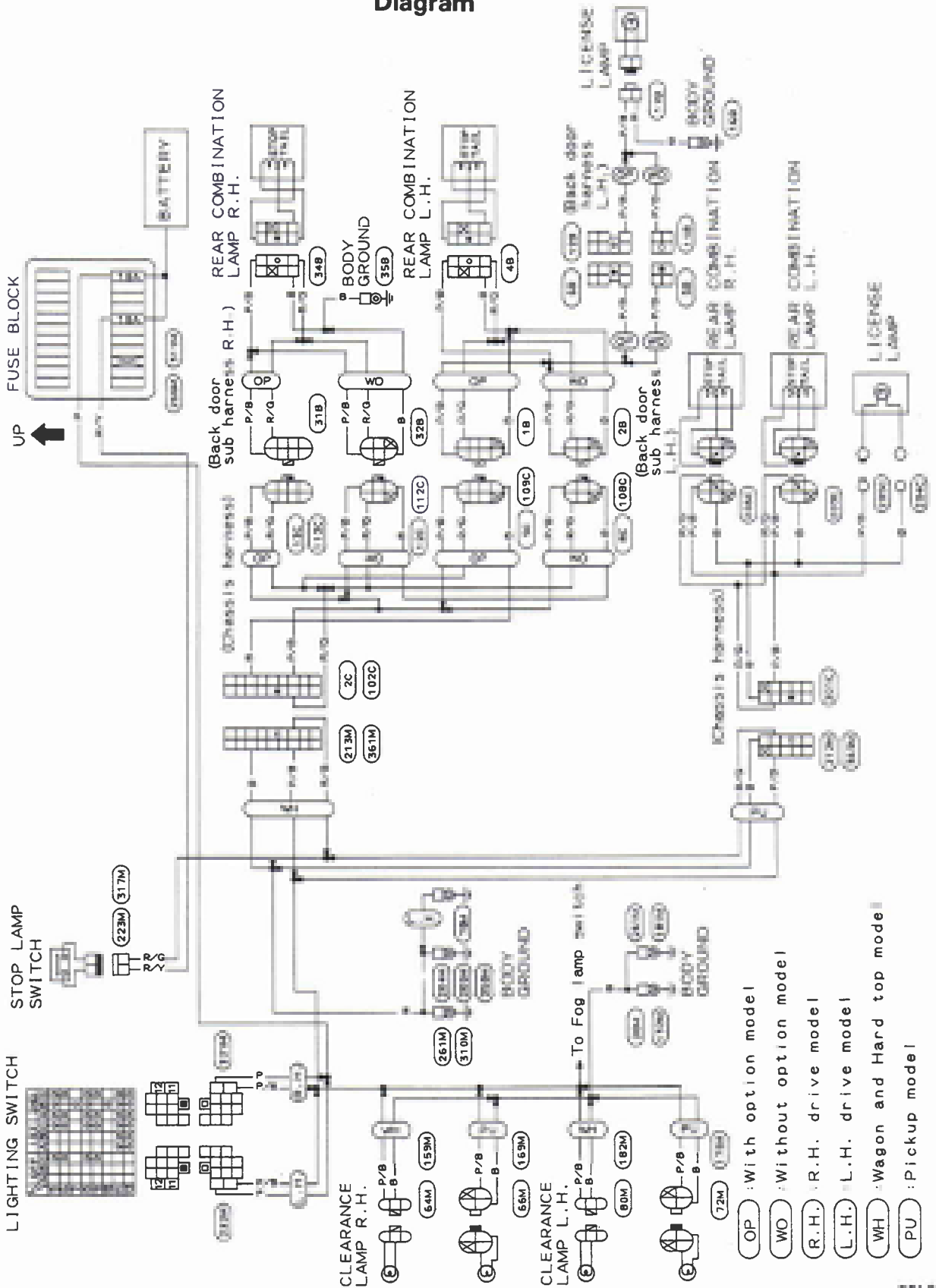
When installing the rubber cap, set the "TOP" or "▲" mark so it is facing up.



Press the rubber cap firmly so the lip makes contact with the headlamp body.

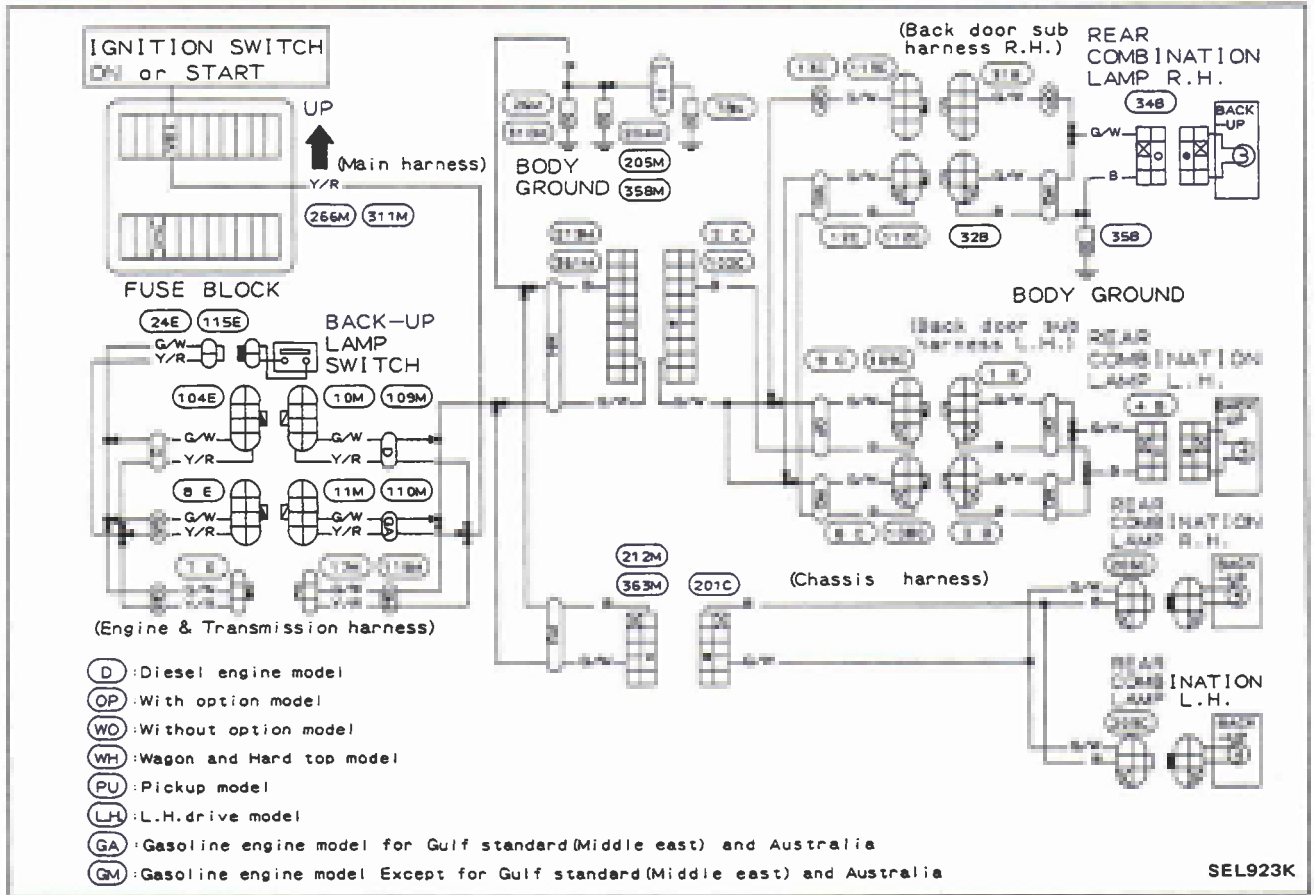
# EXTERIOR LAMP

## Clearance, License, Tail and Stop Lamps/Wiring Diagram

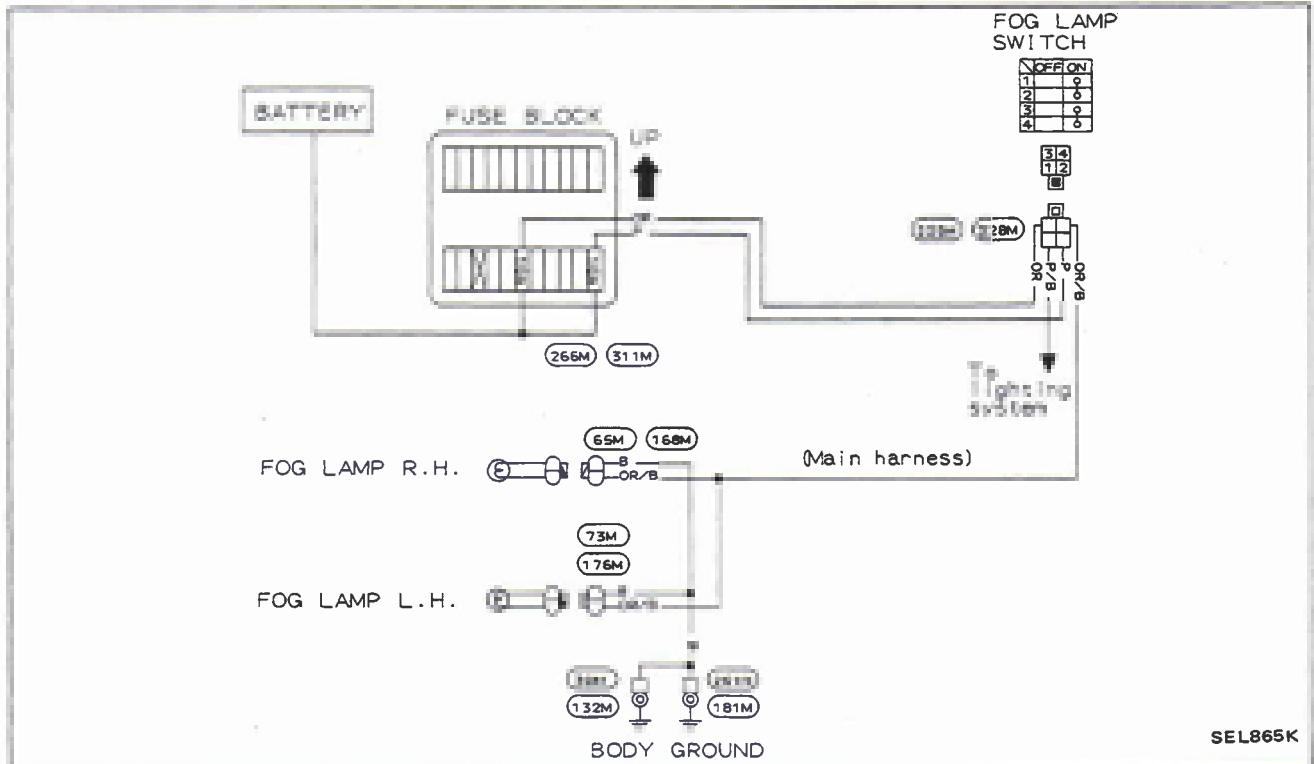


# EXTERIOR LAMP

## Back-up Lamp/Wiring Diagram

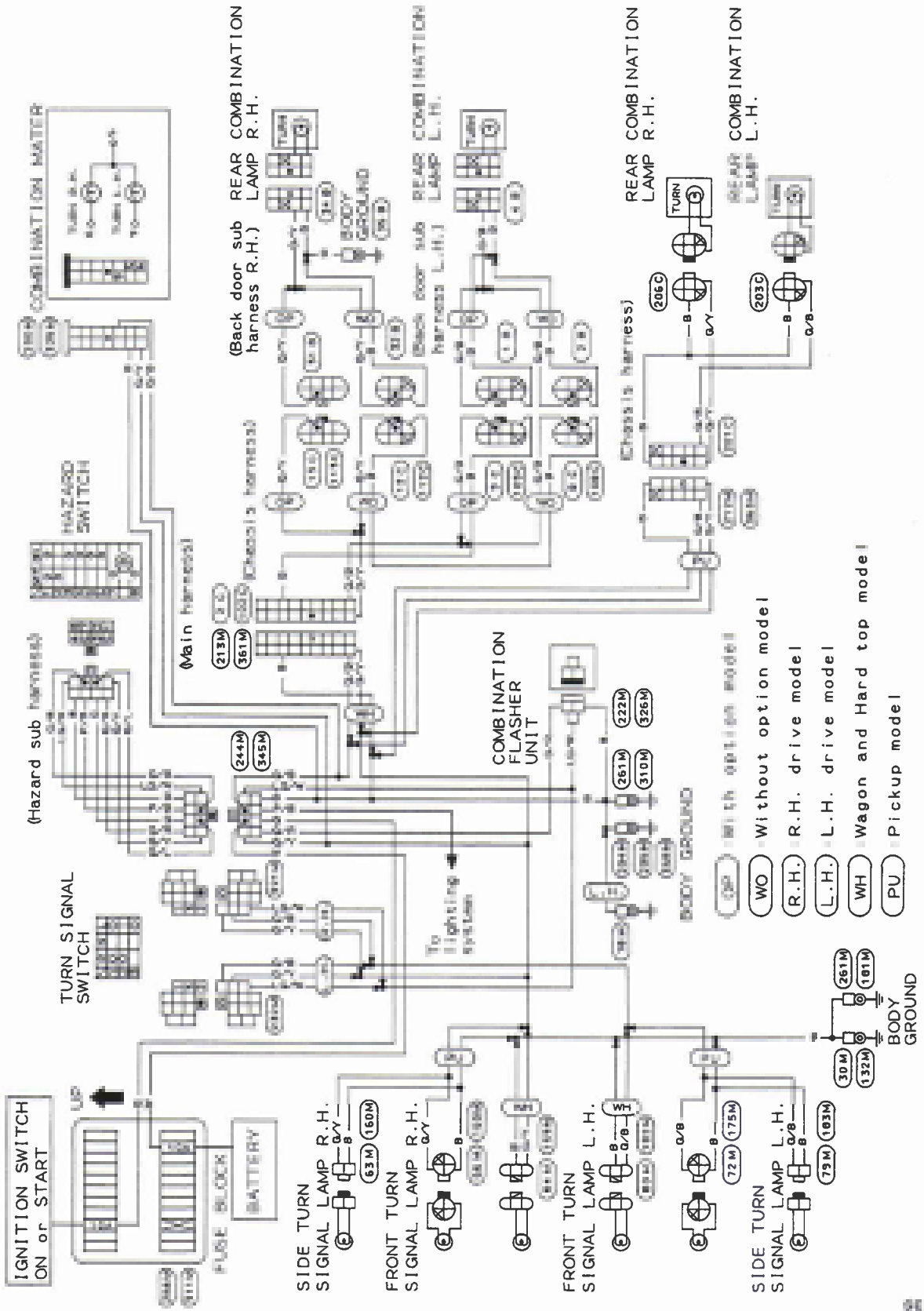


## Fog Lamp/Wiring Diagram

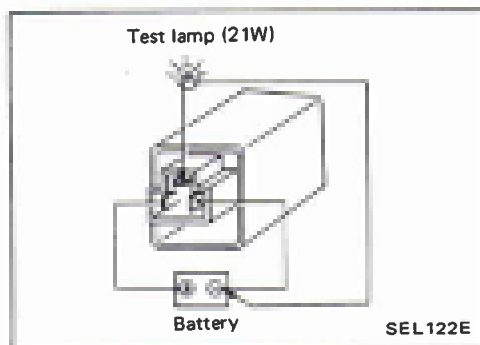


# EXTERIOR LAMP

## Turn Signal and Hazard Warning Lamps/Wiring Diagram



## EXTERIOR LAMP



### Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

### Bulb Specifications

#### HEADLAMPS

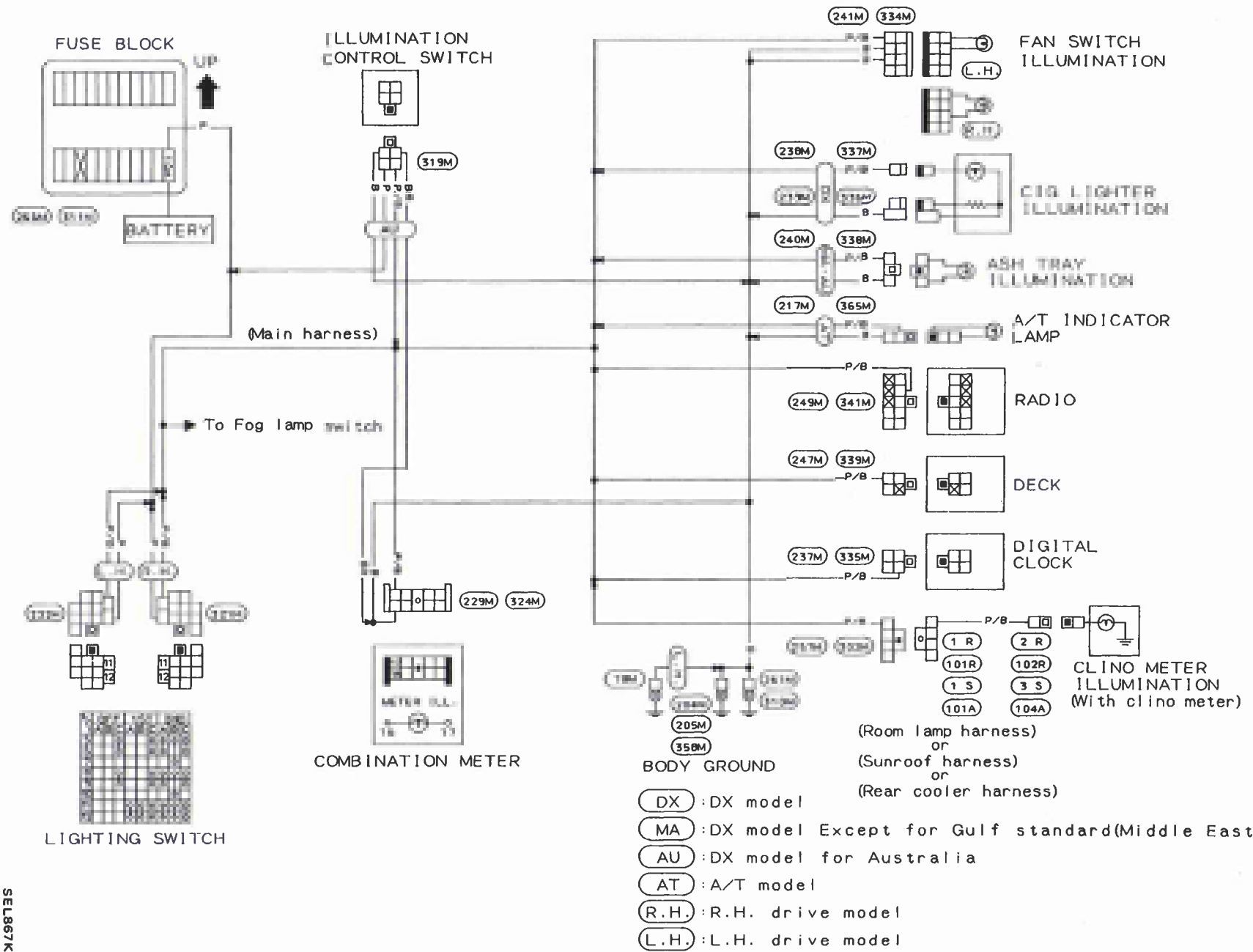
	Wattage (W)
Sealed beam type	50/40, 45/40 (Yellow type)
Semi-sealed beam type	40/55

#### OTHER LAMPS

	Wattage (W)
Front turn signal light	21
Front clearance light	5
Side turn signal light (Pickup)	5
Rear combination light	
Turn signal	21
Stop/Tail	21/5
Back-up	21
License plate light	10
Interior light	10
Fog light (H3 type halogen)	35

Illumination/Wiring Diagram

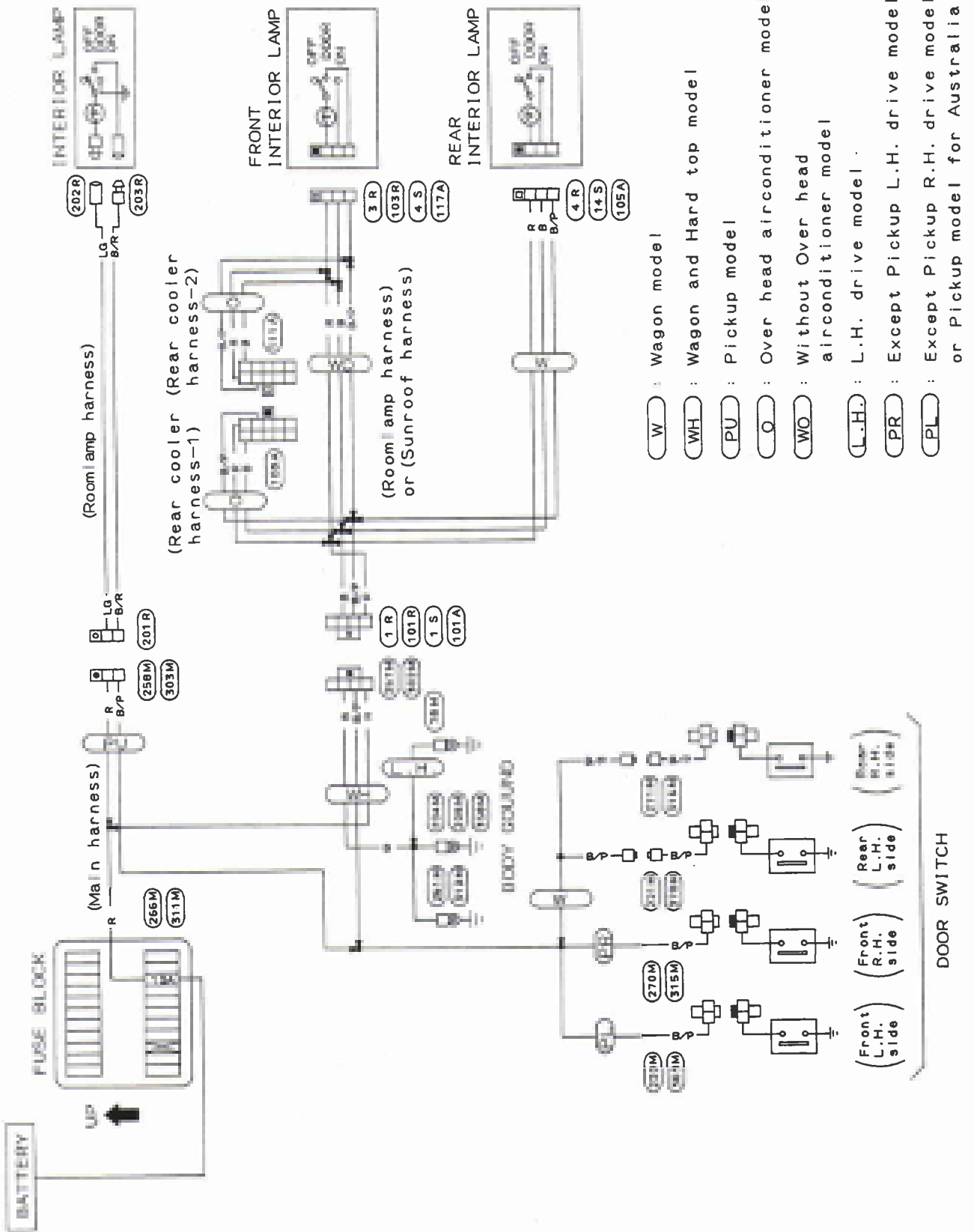
EL-46



- (DX) : DX model
- (MA) : DX model Except for Gulf standard(Middle East)
- (AU) : DX model for Australia
- (AT) : A/T model
- (R.H.) : R.H. drive model
- (L.H.) : L.H. drive model

# INTERIOR LAMP

## Interior Lamp/Wiring Diagram

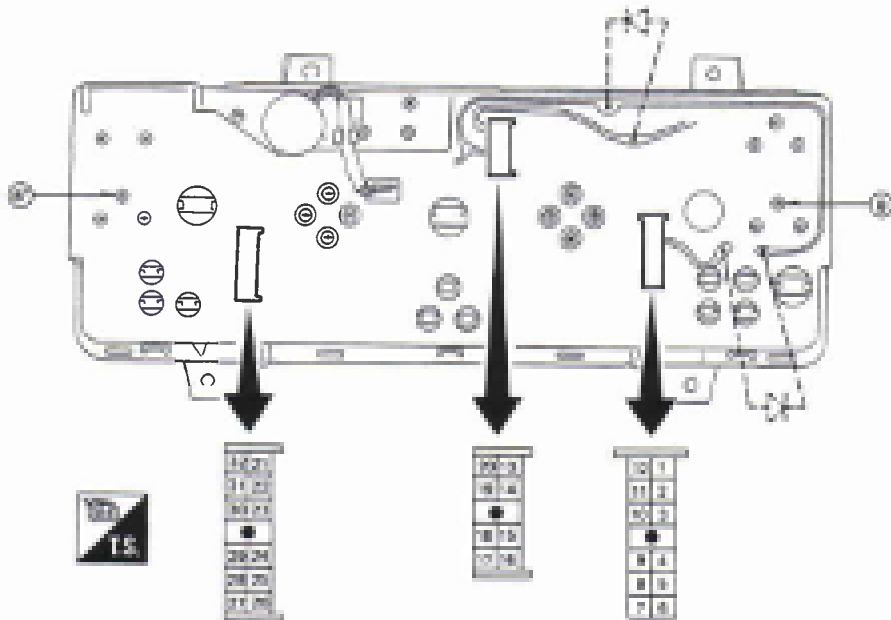
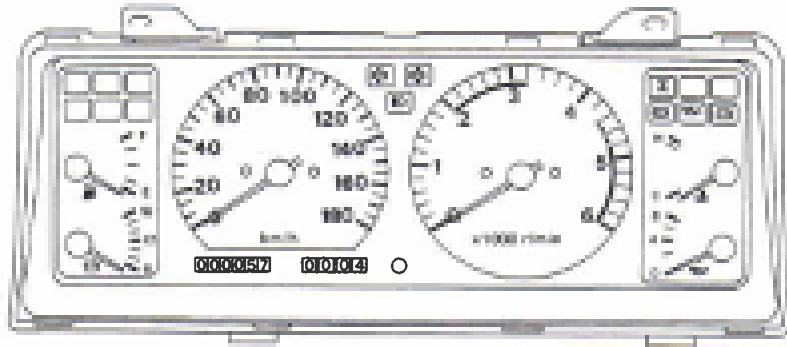


- W : Wagon model
- WH : Wagon and Hard top model
- PU : Pickup model
- Q : Over head air conditioner model
- WO : Without Over head air conditioner model
- L.H. : L.H. drive model
- PR : Except Pickup L.H. drive model
- PL : Except Pickup R.H. drive model or Pickup model for Australia

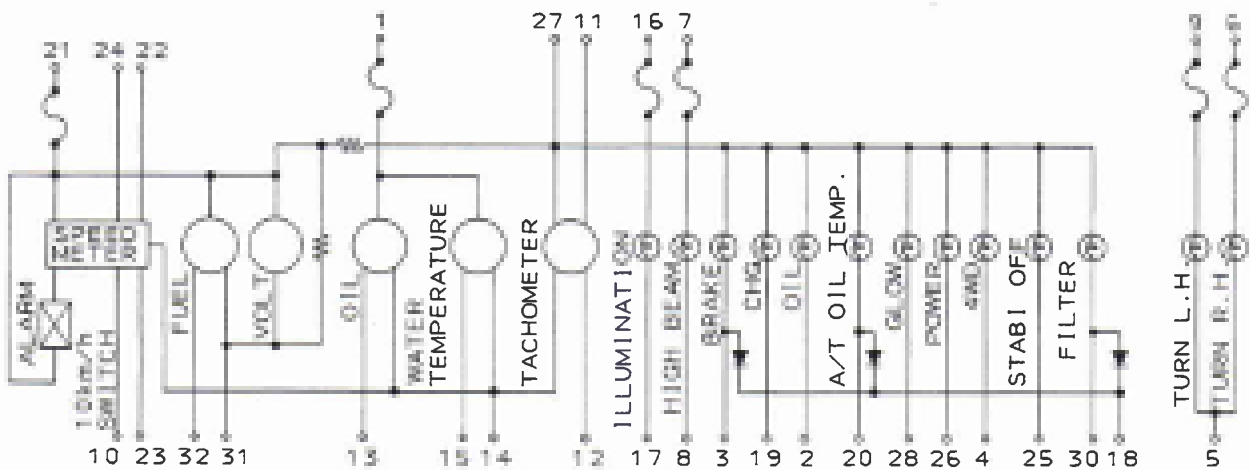
# METER AND GAUGES

## Combination Meter

TYPE A



SEL816K



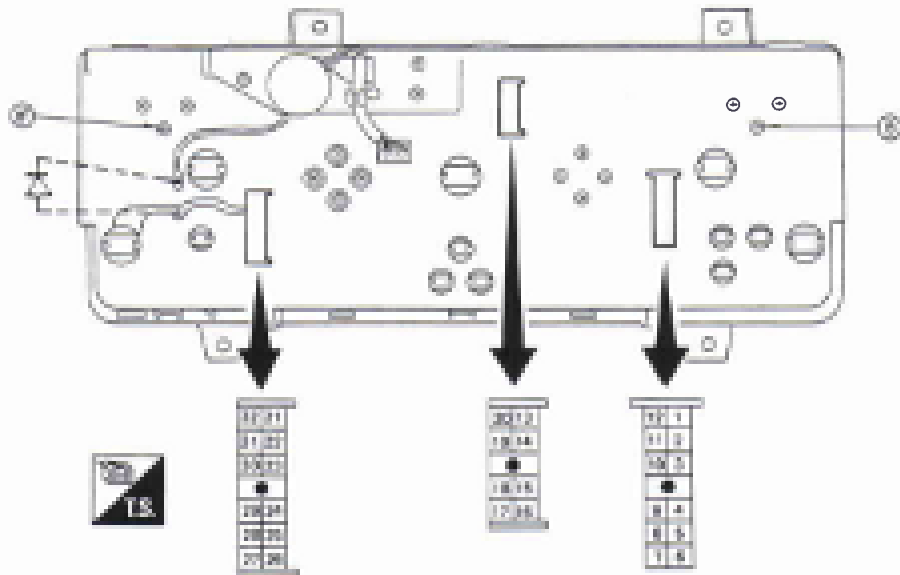
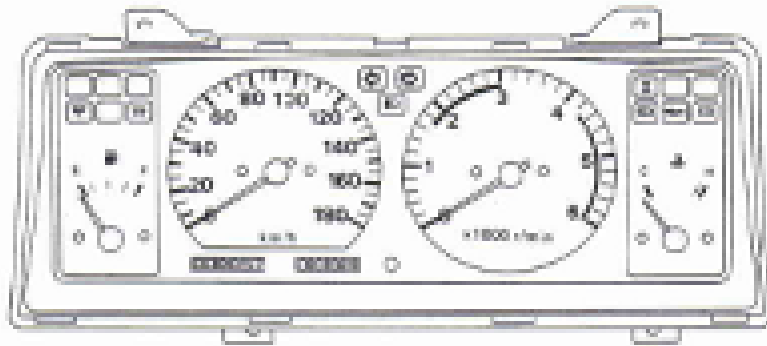
SEL890K



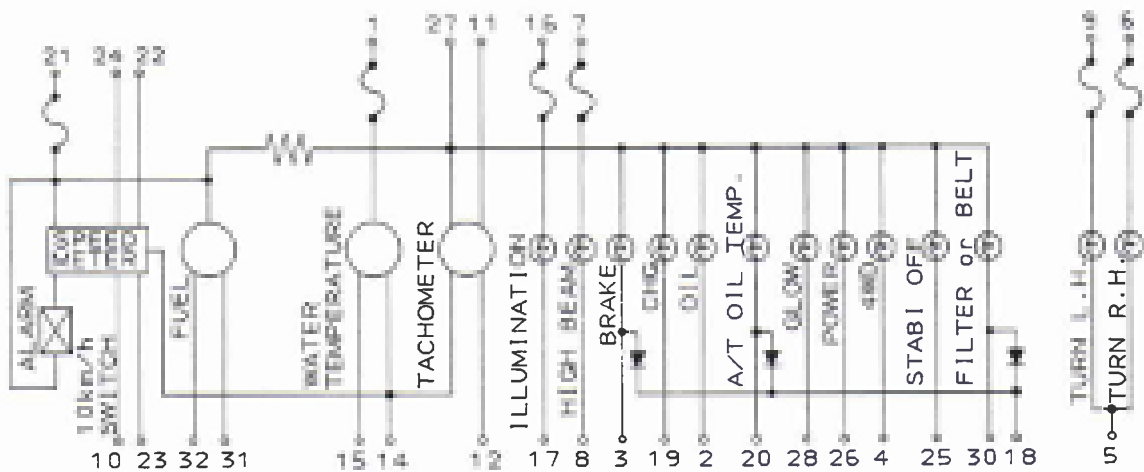
# METER AND GAUGES

## Combination Meter (Cont'd)

TYPE B



88L617K

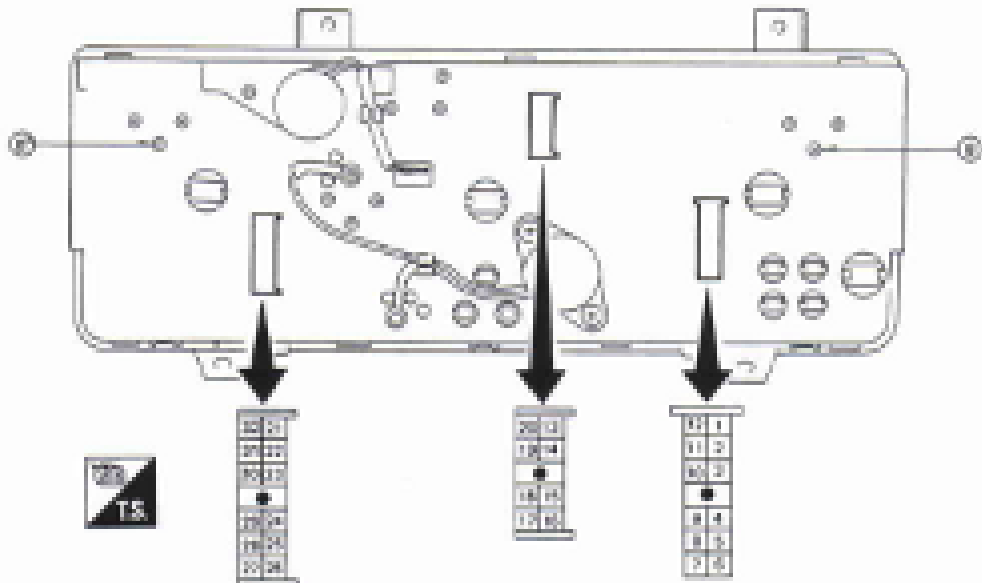
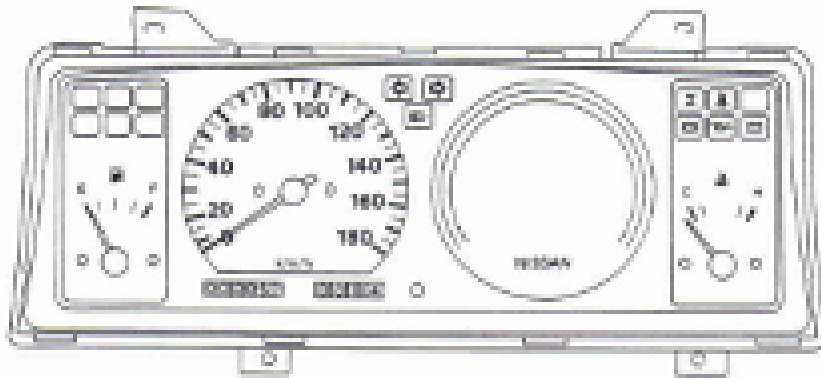


88L618K

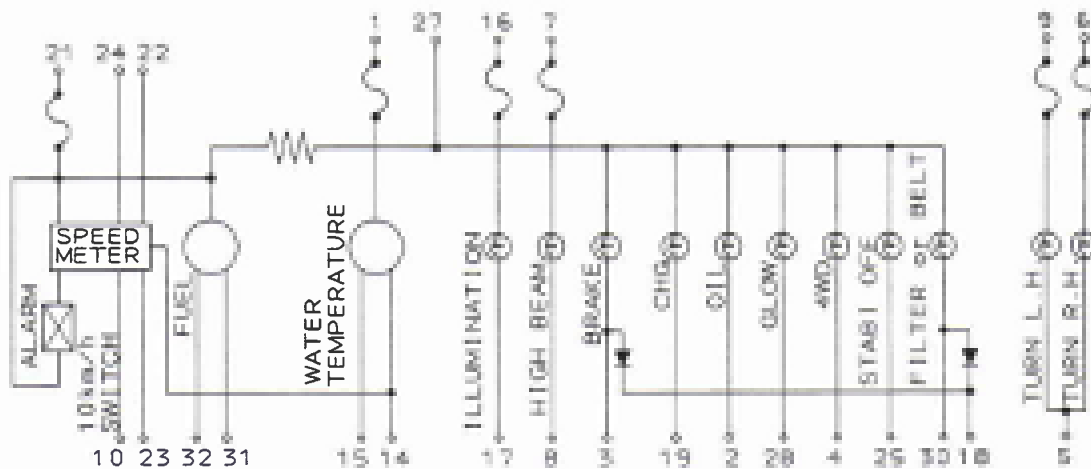
# METER AND GAUGES

## Combination Meter (Cont'd)

TYPE C



SEL019K

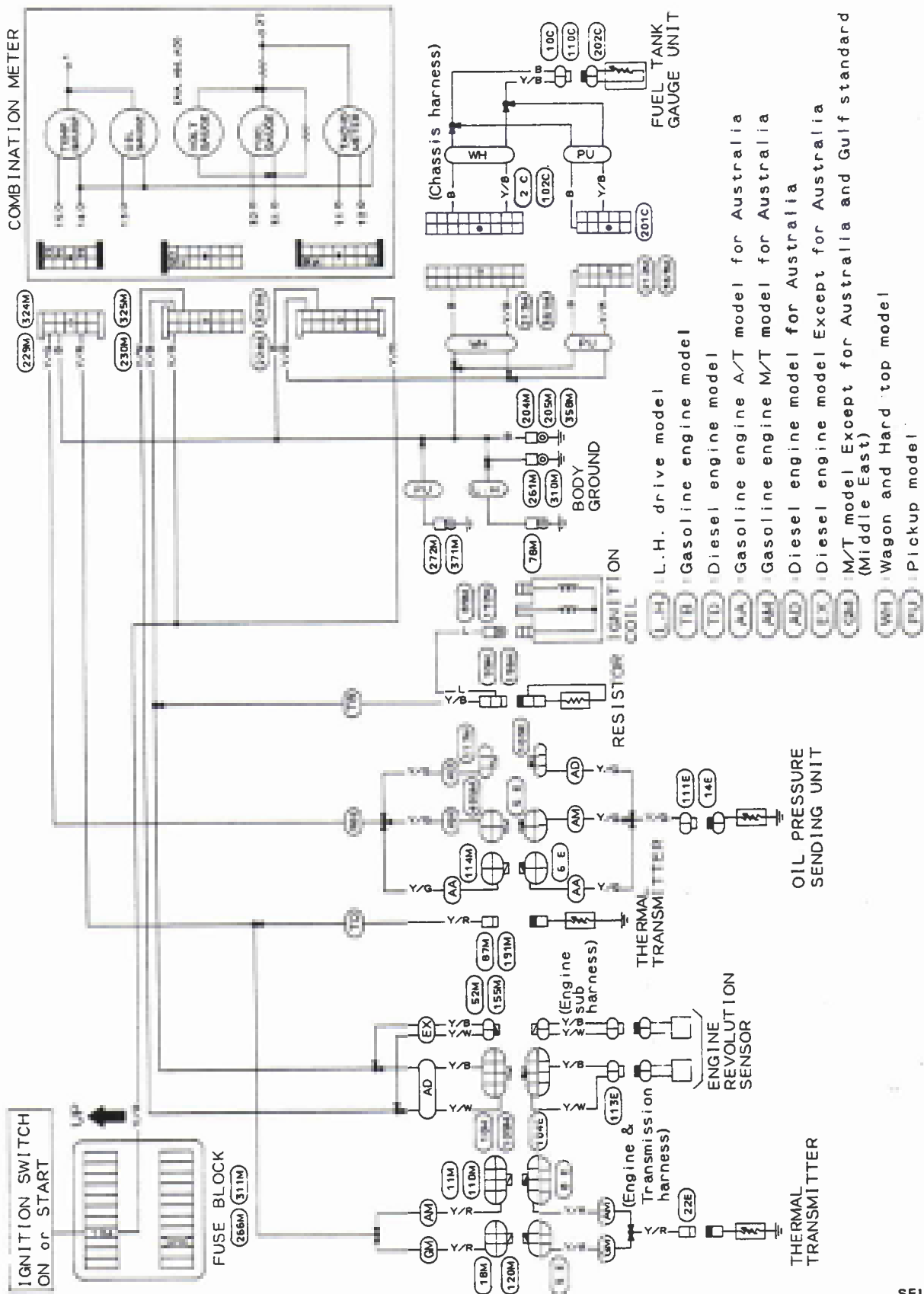


SEL066K

EL-50

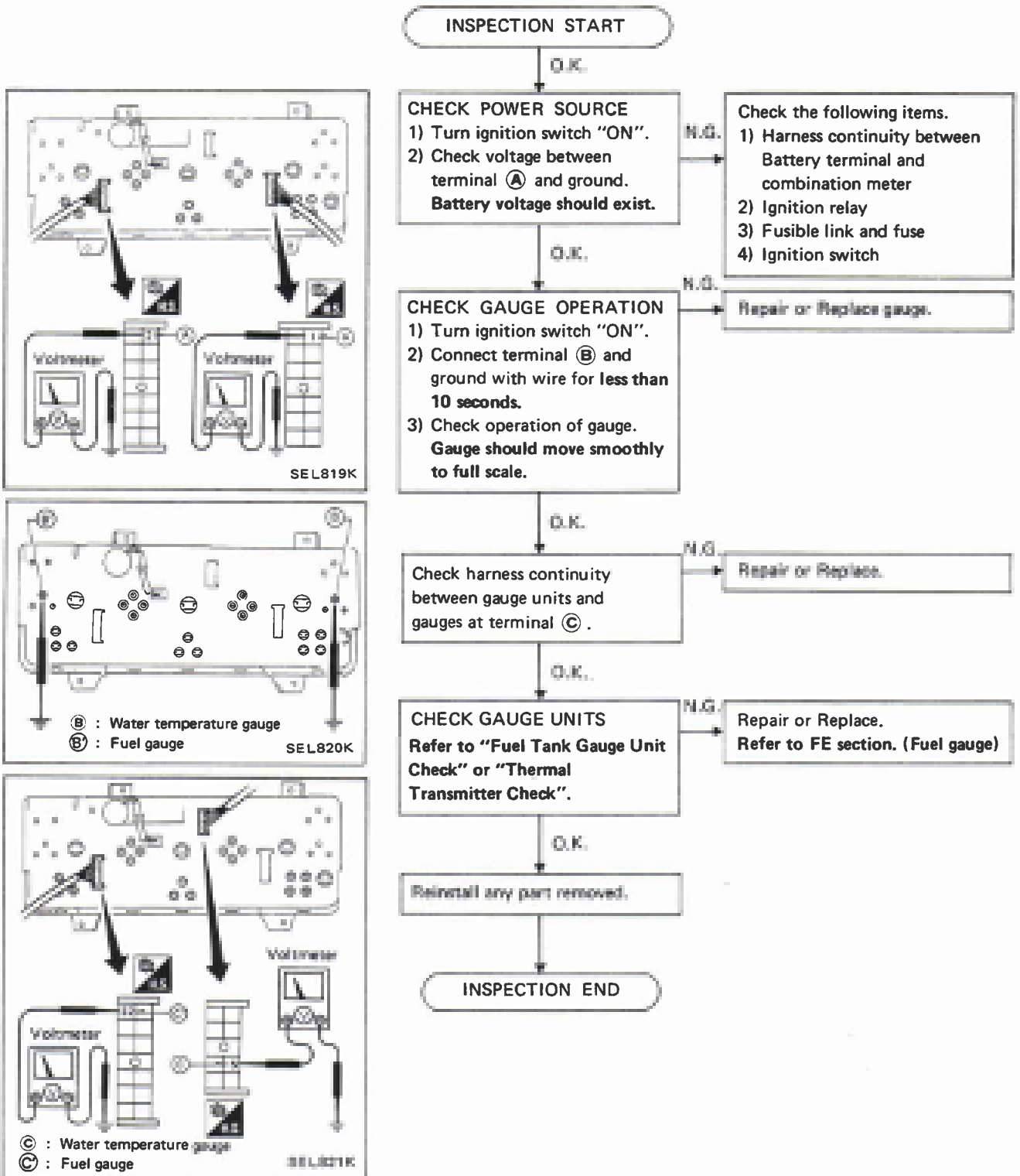
# METER AND GAUGES

## Wiring Diagram



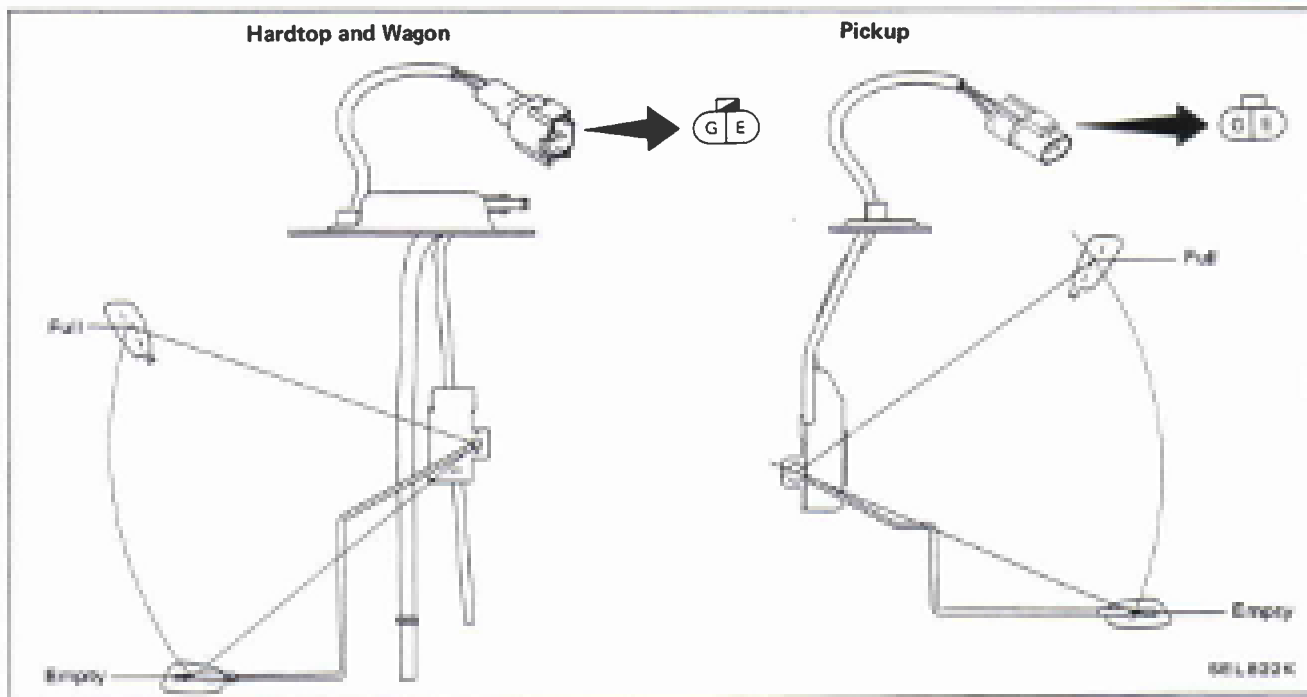
# METER AND GAUGES

## Inspection/Fuel Gauge and Water Temperature Gauge

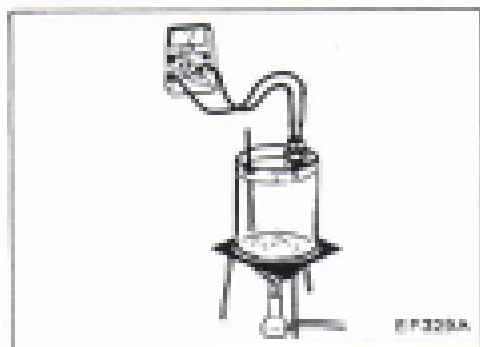


# METER AND GAUGES

## Fuel Tank Gauge Unit Check



Ohmmeter		Float position	Resistance value
(+)	(-)		
G	E	Full	Approx. 4.3 - 5.7Ω
		Empty	Approx. 74.3 - 84.8Ω

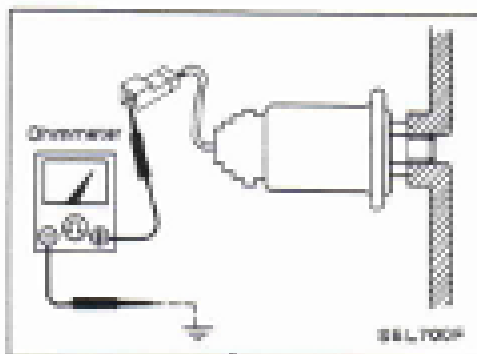


## Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω

## METER AND GAUGES



### Oil Pressure Sending Unit Check

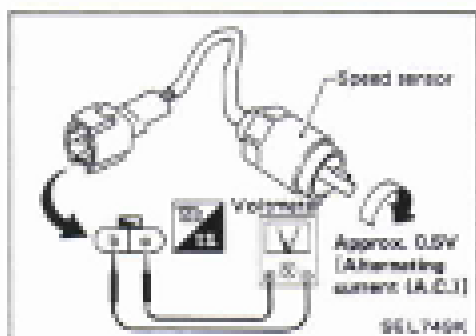
Check the resistance between the terminals of oil pressure sending unit and body ground.

Oil pressure kPa (bar, kg/cm <sup>2</sup> , psi)	Resistance value
0 (0, 0, 0) (Engine is stopped.)	71 - 74Ω
392 (3.9, 4, 57)	34 - 31Ω
588 (5.9, 6, 85)	13 - 20Ω

### Oil Pressure Switch Check

Check the continuity between the terminals of oil pressure switch and body ground.

	Oil pressure kPa (bar, kg/cm <sup>2</sup> , psi)	Continuity
Engine running	More than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	NO
Engine stopped	Less than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	YES

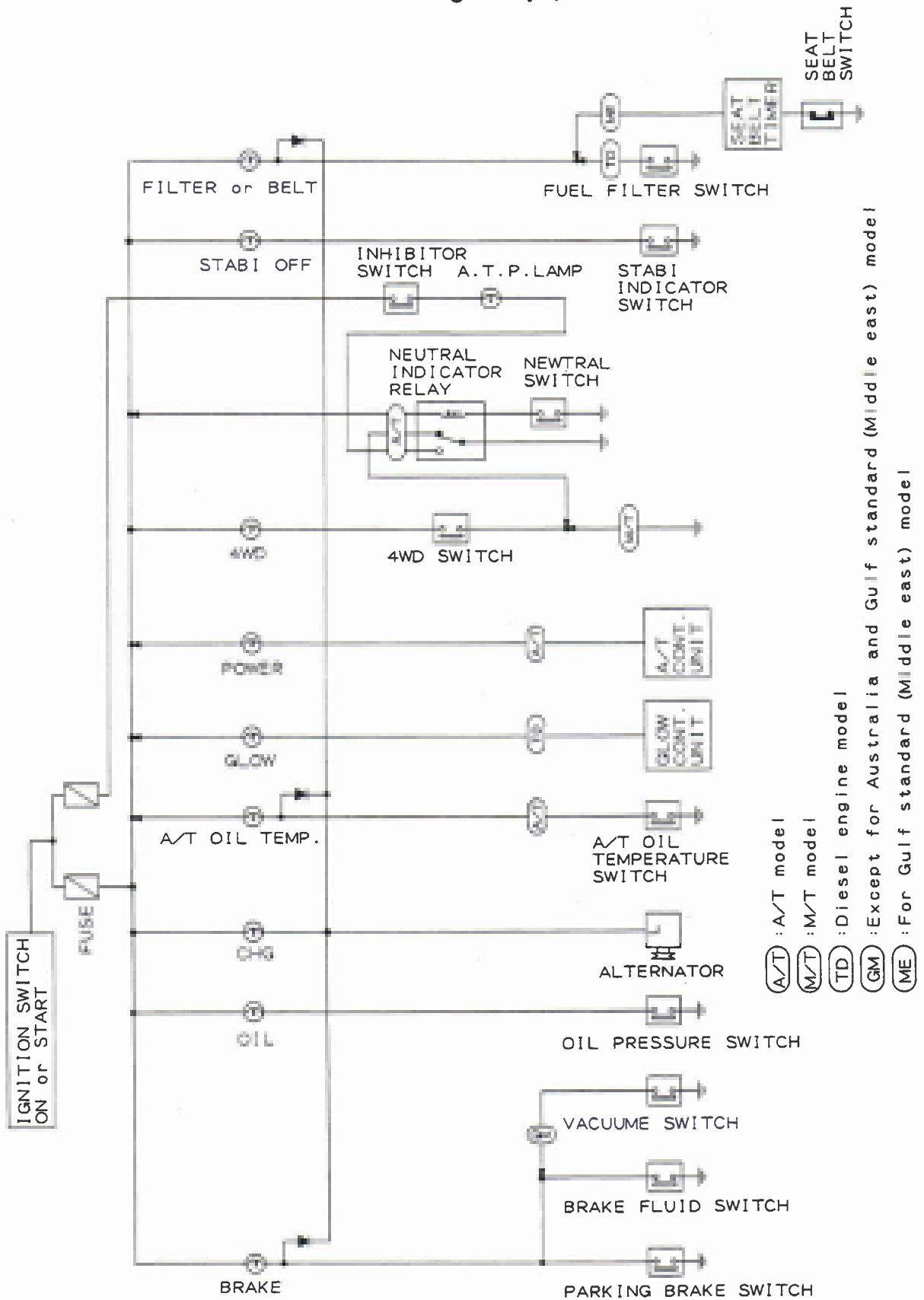


### Speed Sensor Signal Check

1. Remove speed sensor from transmission.  
Location: Refer to "Location of Electrical Units".
2. Turn speedometer pinion quickly and measure voltage across (a) and (b).

# WARNING LAMPS AND CHIME

## Warning Lamps/Schematic



SEL871K

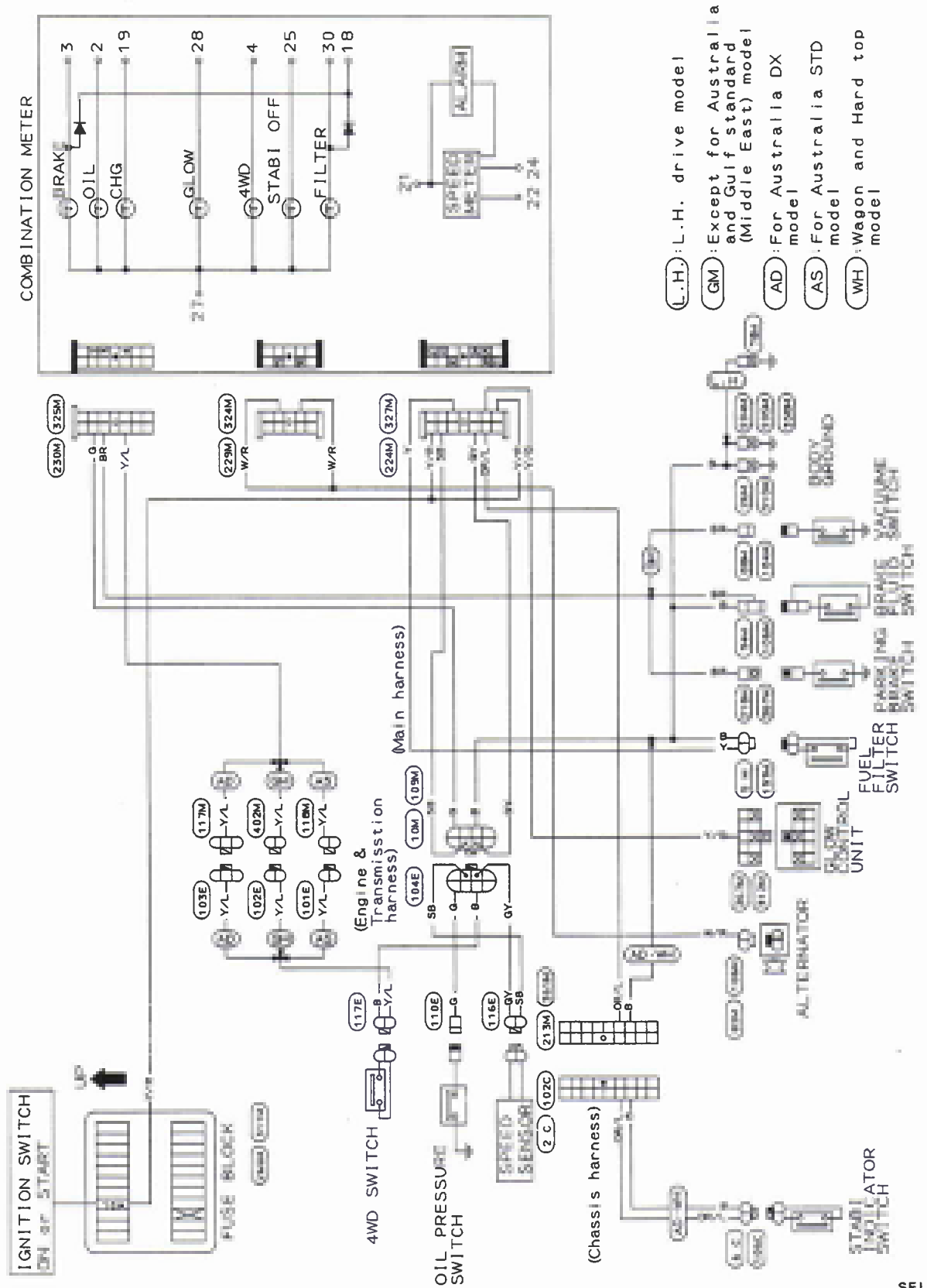




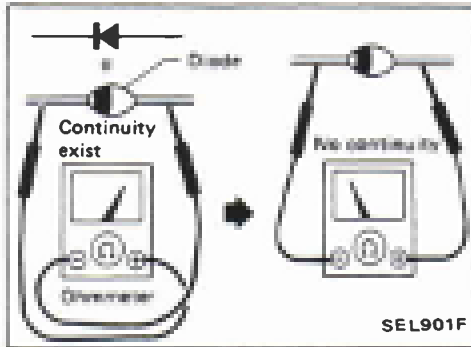
# WARNING LAMPS AND CHIME

## Warning Lamps/Wiring Diagram (Cont'd)

DIESEL ENGINE MODEL

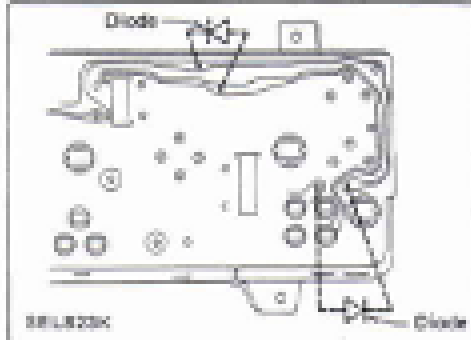


## WARNING LAMPS AND CHIME

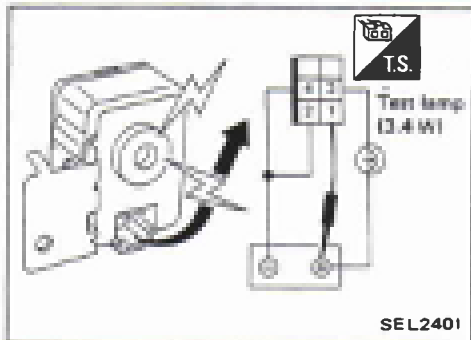


### Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure on the left.



- Diodes for warning lamps are built into the combination meter printed circuit.  
(Refer to "Combination Meter".)



### Seat Belt Timer Check

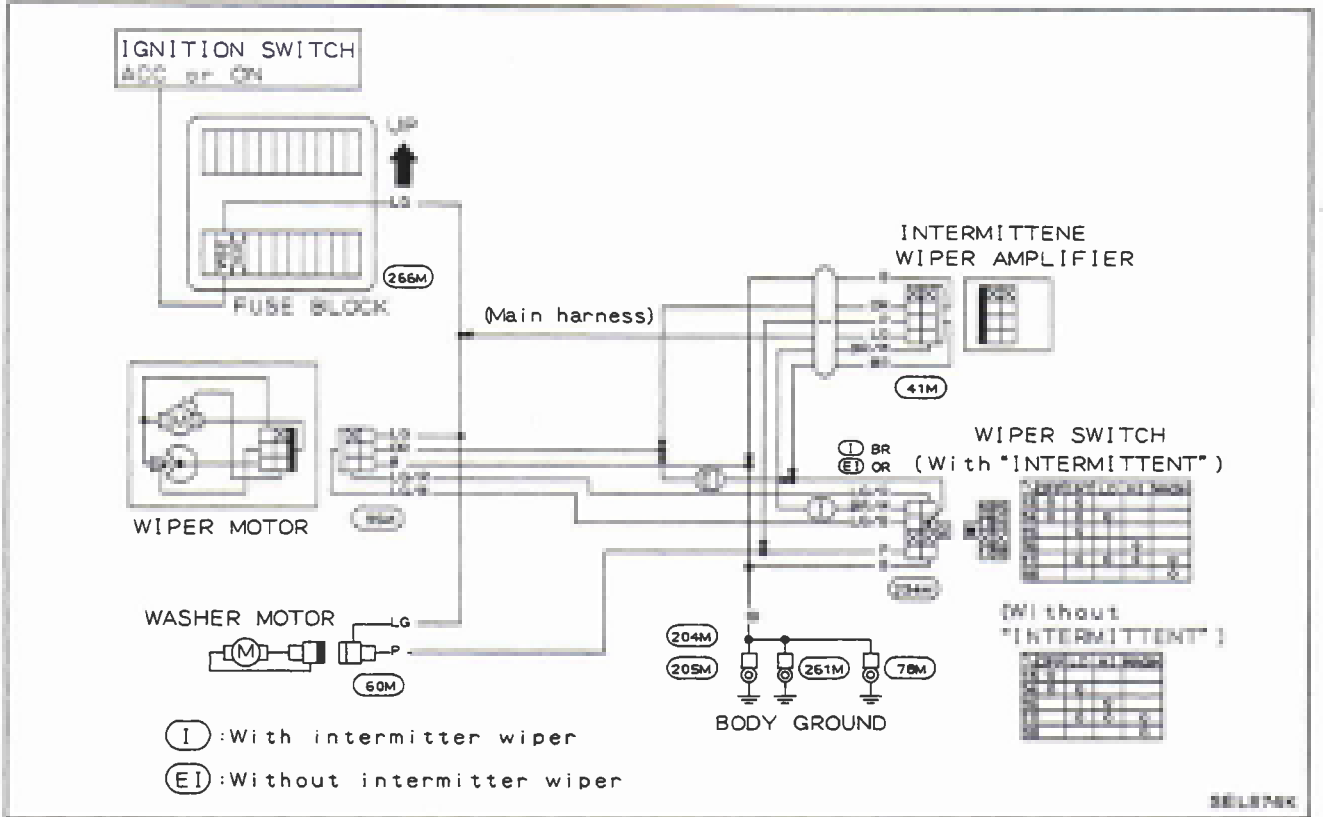
Connect as shown in the figure to the left.

If chime and test lamp come on for 4-8 seconds when connecting terminal ① to battery ⊕ terminal, seat belt timer is normal.

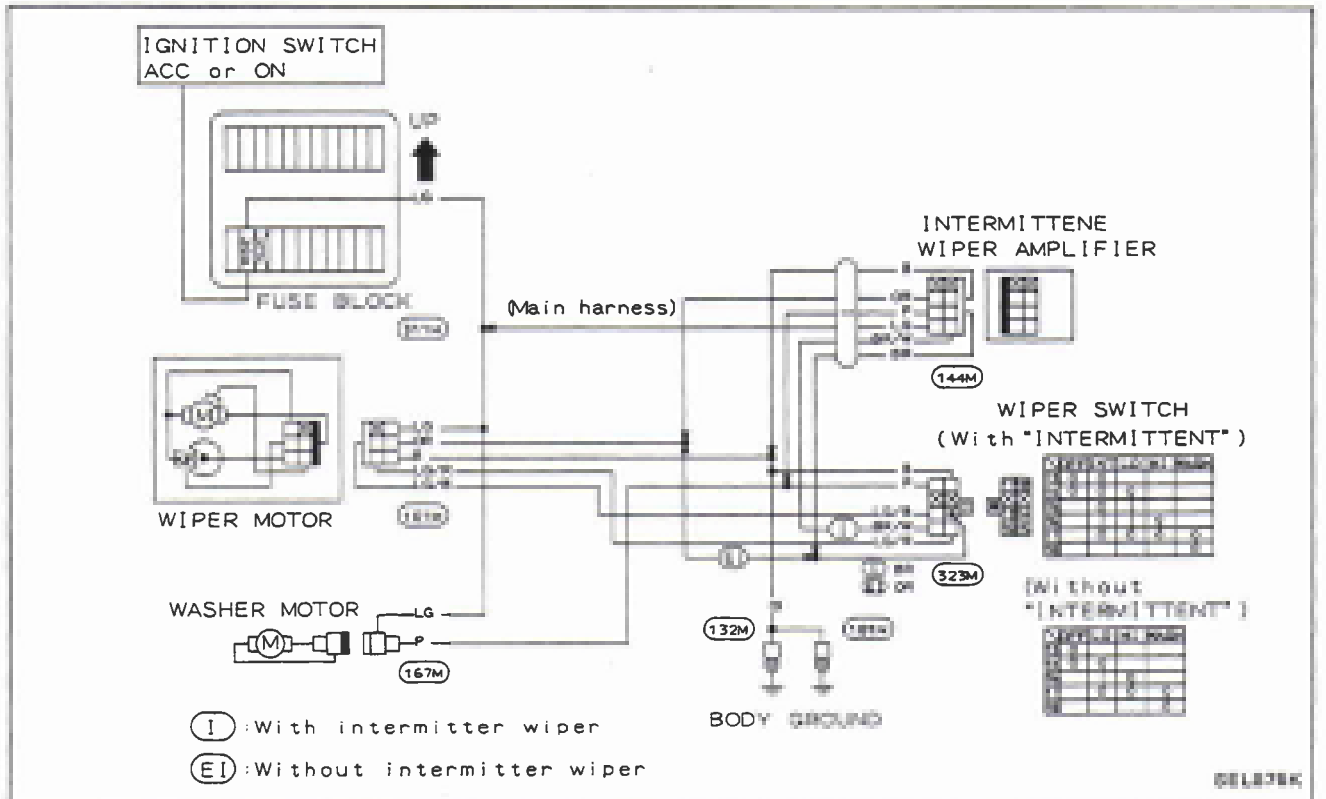
# WIPER AND WASHER

## Front Wiper and Washer/Wiring Diagram

### L.H. DRIVE MODEL

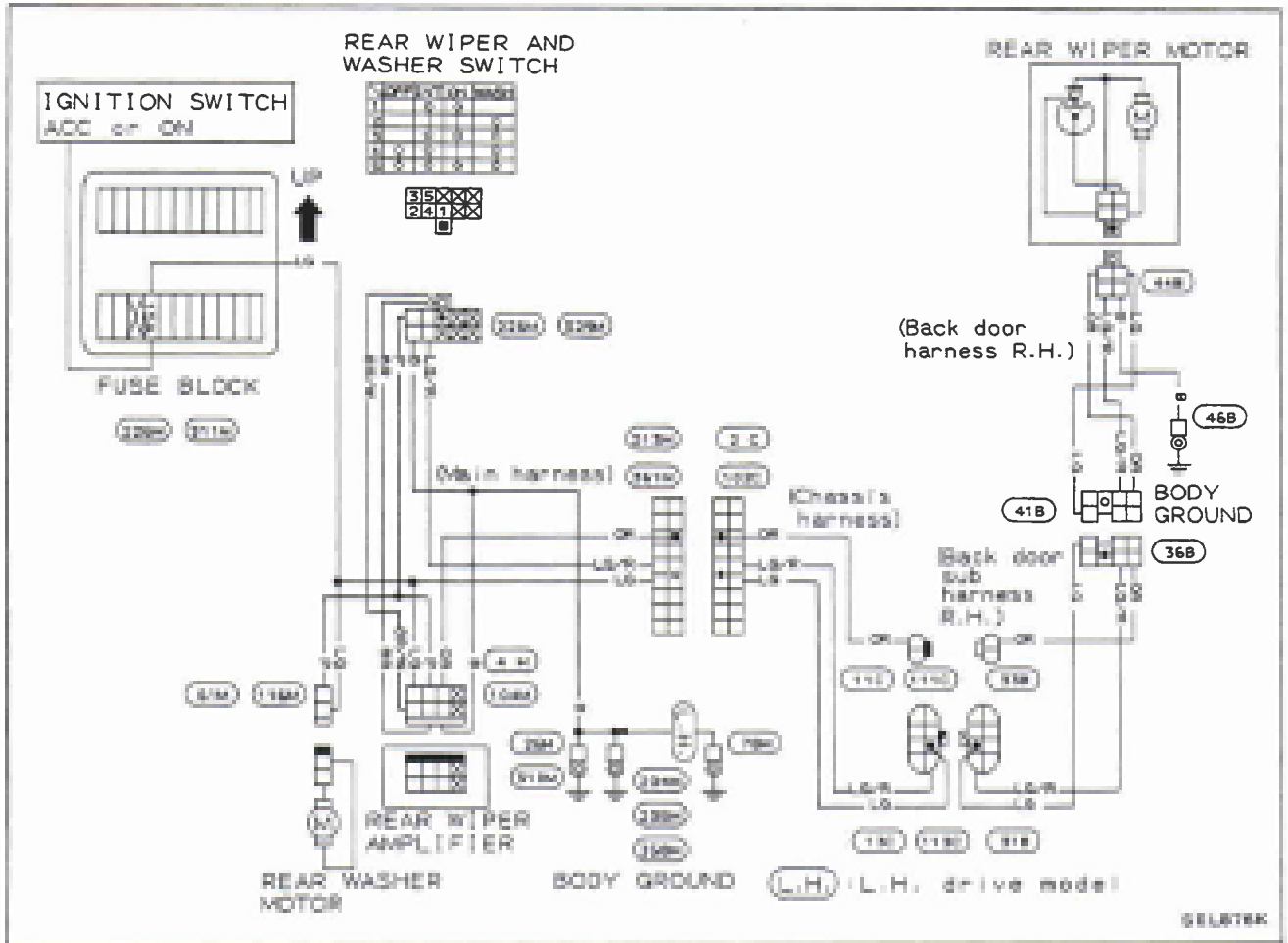


### R.H. DRIVE MODEL



# WIPER AND WASHER

## Rear Wiper and Washer/Wiring Diagram



# WIPER AND WASHER

## Windshield Wiper Installation

### Adjustment

1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "C" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "C".

Clearance "C": 20 - 30 mm (0.79 - 1.18 in)

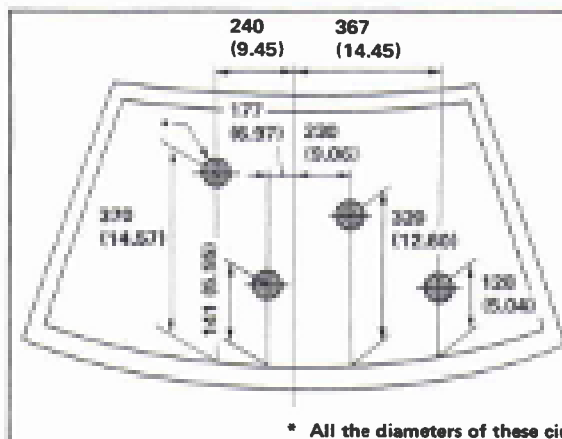
### Installation

- Tighten windshield wiper arm nuts to specified torque.

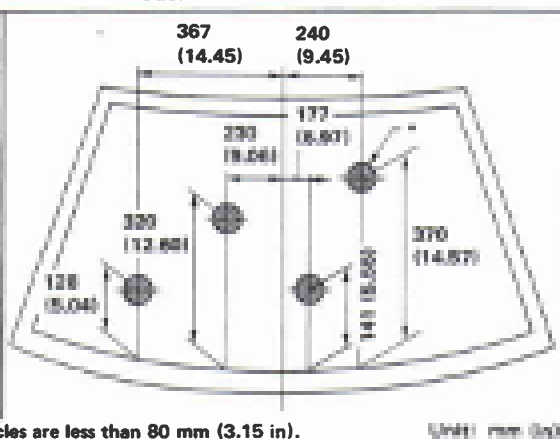
 13 - 18 N·m (1.3 - 1.8 kg-m, 9 - 13 ft-lb)

### Windshield wiper and washer

L.H. drive model

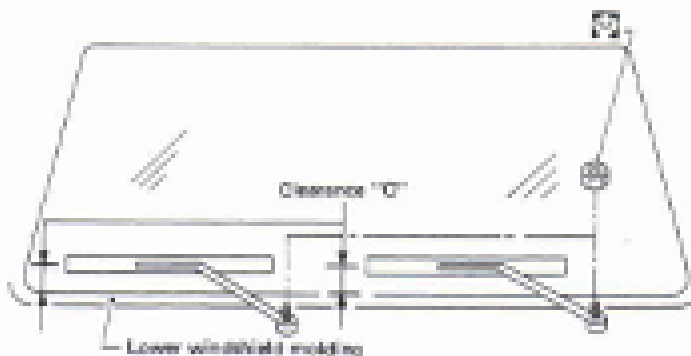


R.H. drive model



\* All the diameters of these circles are less than 80 mm (3.15 in).

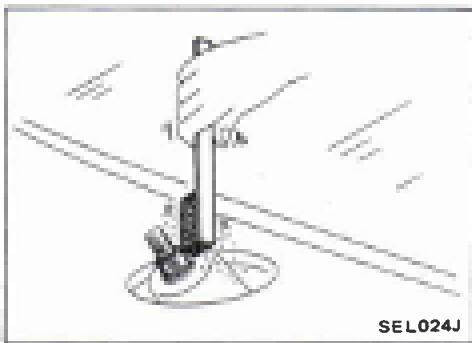
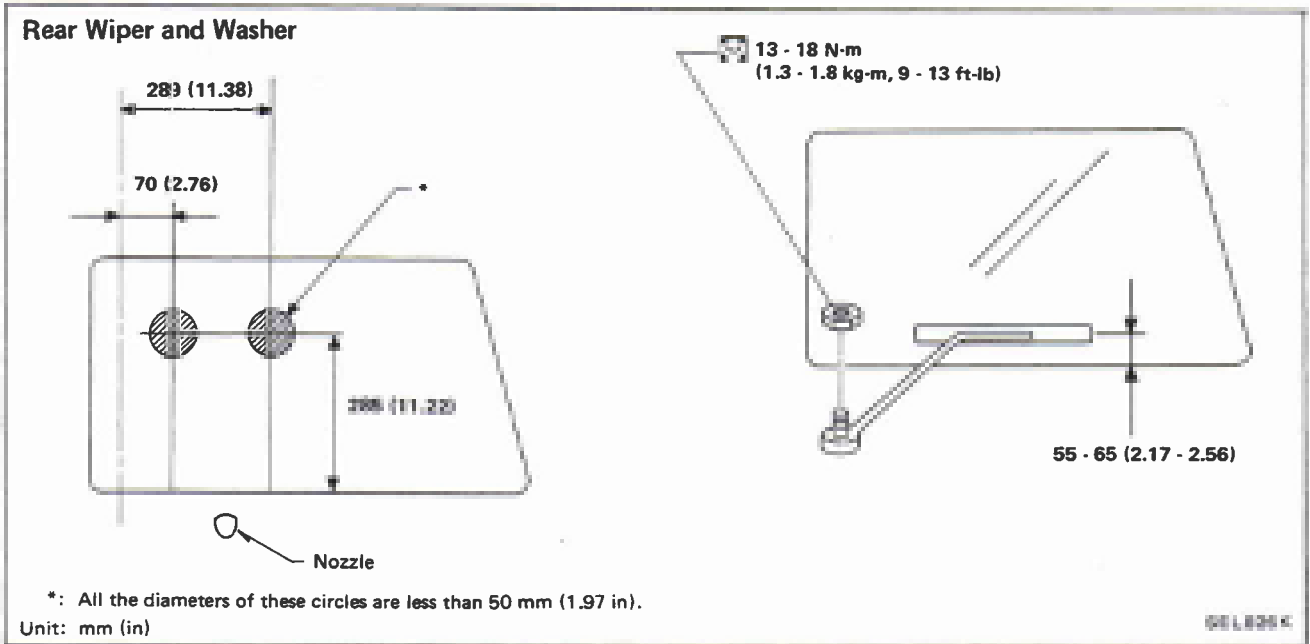
Unit: mm (in)



SEL825K

# WIPER AND WASHER

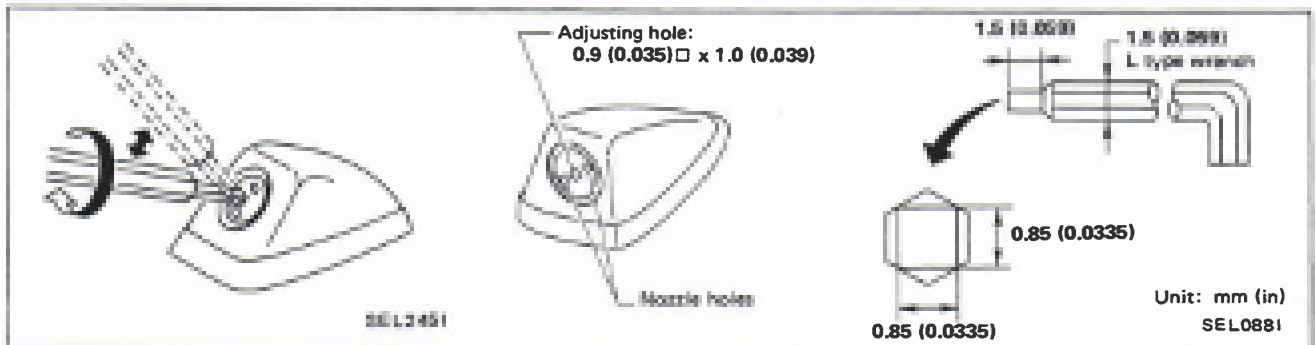
## Windshield Wiper Installation (Cont'd)



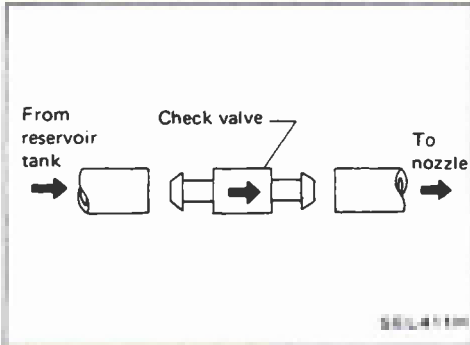
- Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

### Washer Nozzle Adjustment

- Adjust washer nozzle with suitable tool as in the figure below.  
Details of tool are shown below.

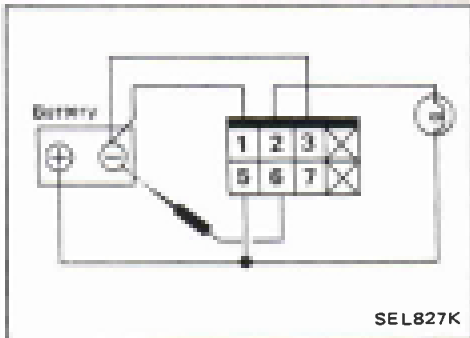


## WIPER AND WASHER



### Check Valve

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

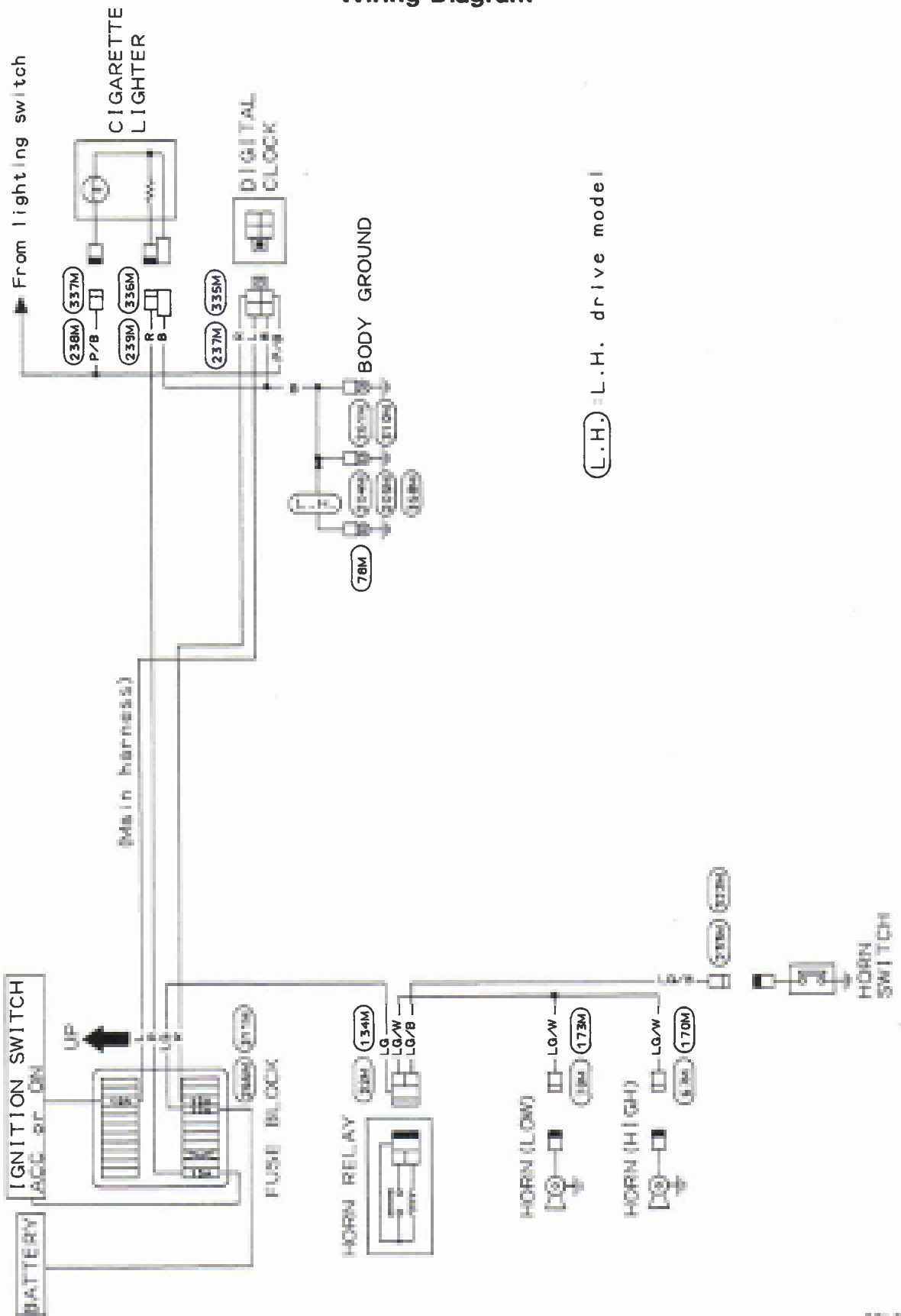


### Wiper Relay Check

1. Connect as shown in the figure to the left.
2. If test lamp comes on when connect to terminal ⑥ and battery ground, wiper relay is normal.

# HORN, CIGARETTE LIGHTER AND CLOCK

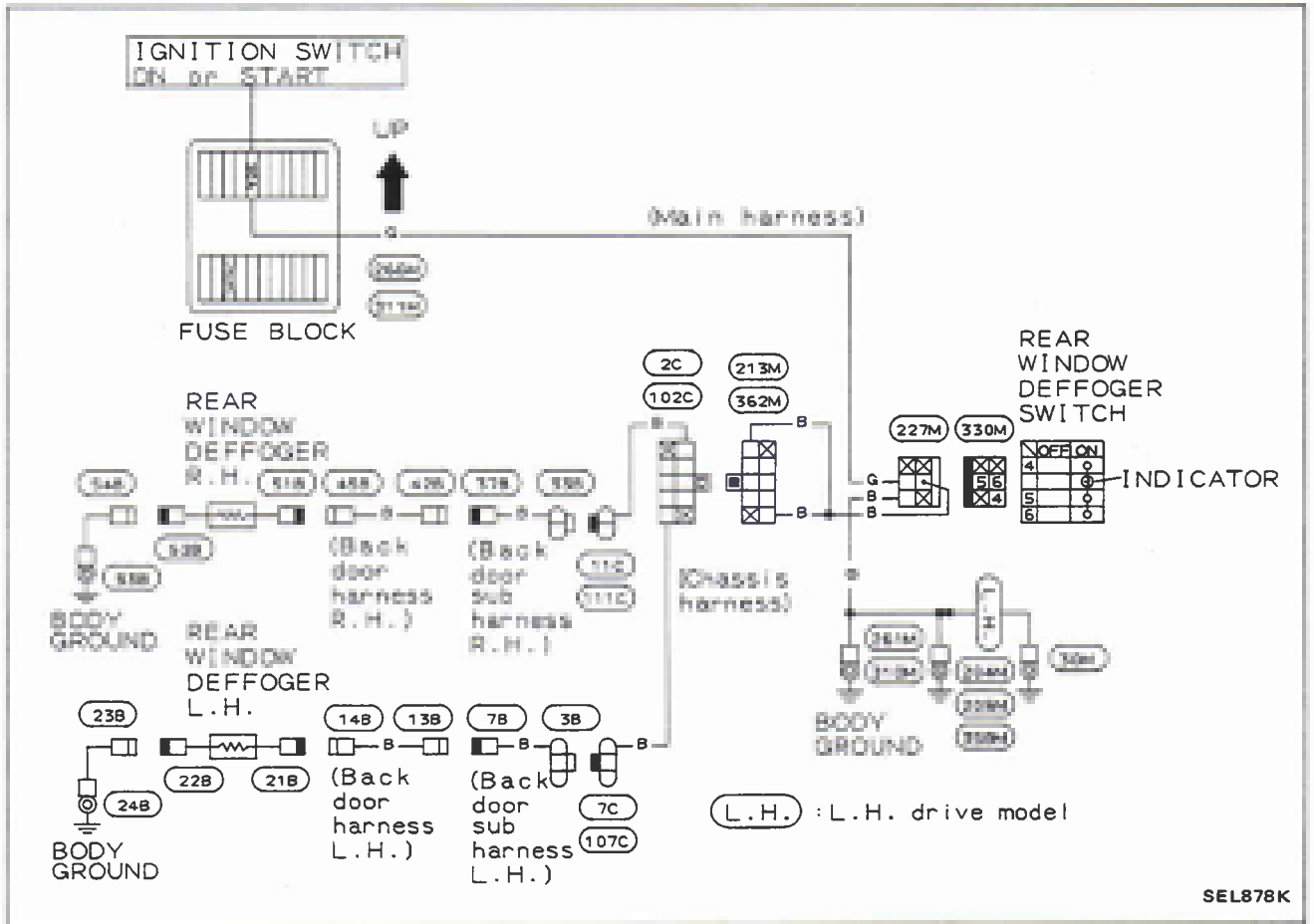
## Wiring Diagram





# REAR WINDOW DEFOGGER

## Wiring Diagram

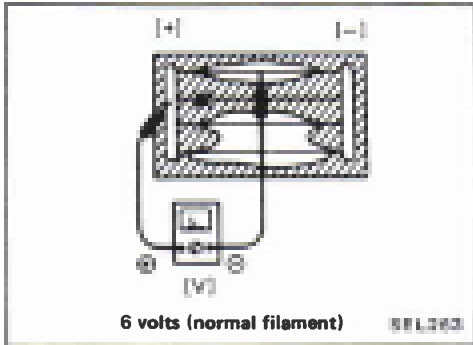


SEL878K

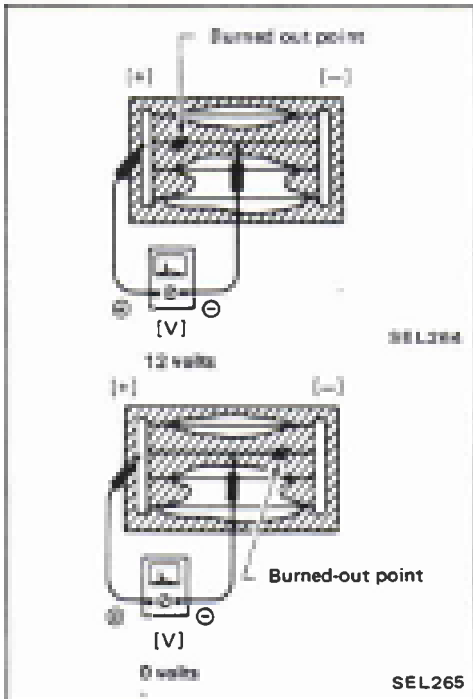
## REAR WINDOW DEFOGGER

### Filament Check

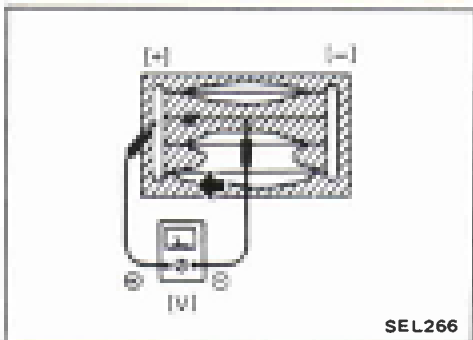
1. Attach probe circuit tester (in volt range) to middle portion of each filament.



2. If a filament is burned out, circuit tester registers 0 or 12 volts.



3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.



## REAR WINDOW DEFOGGER

### Filament Repair

#### REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

#### REPAIRING PROCEDURE

1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

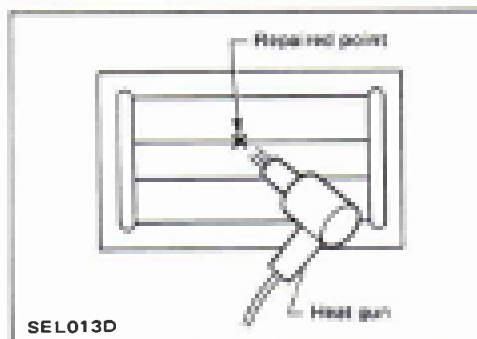
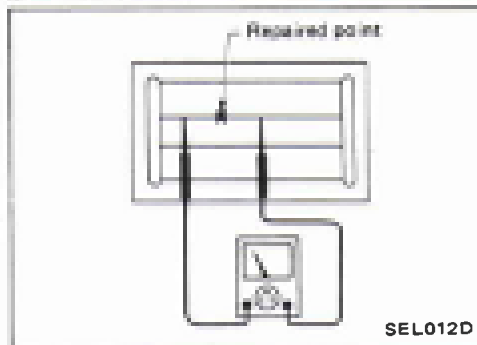
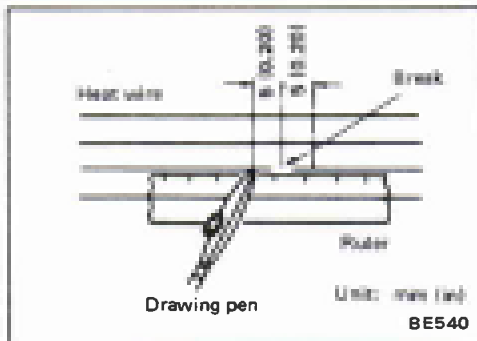
**Shake silver composition container before use.**

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.

4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

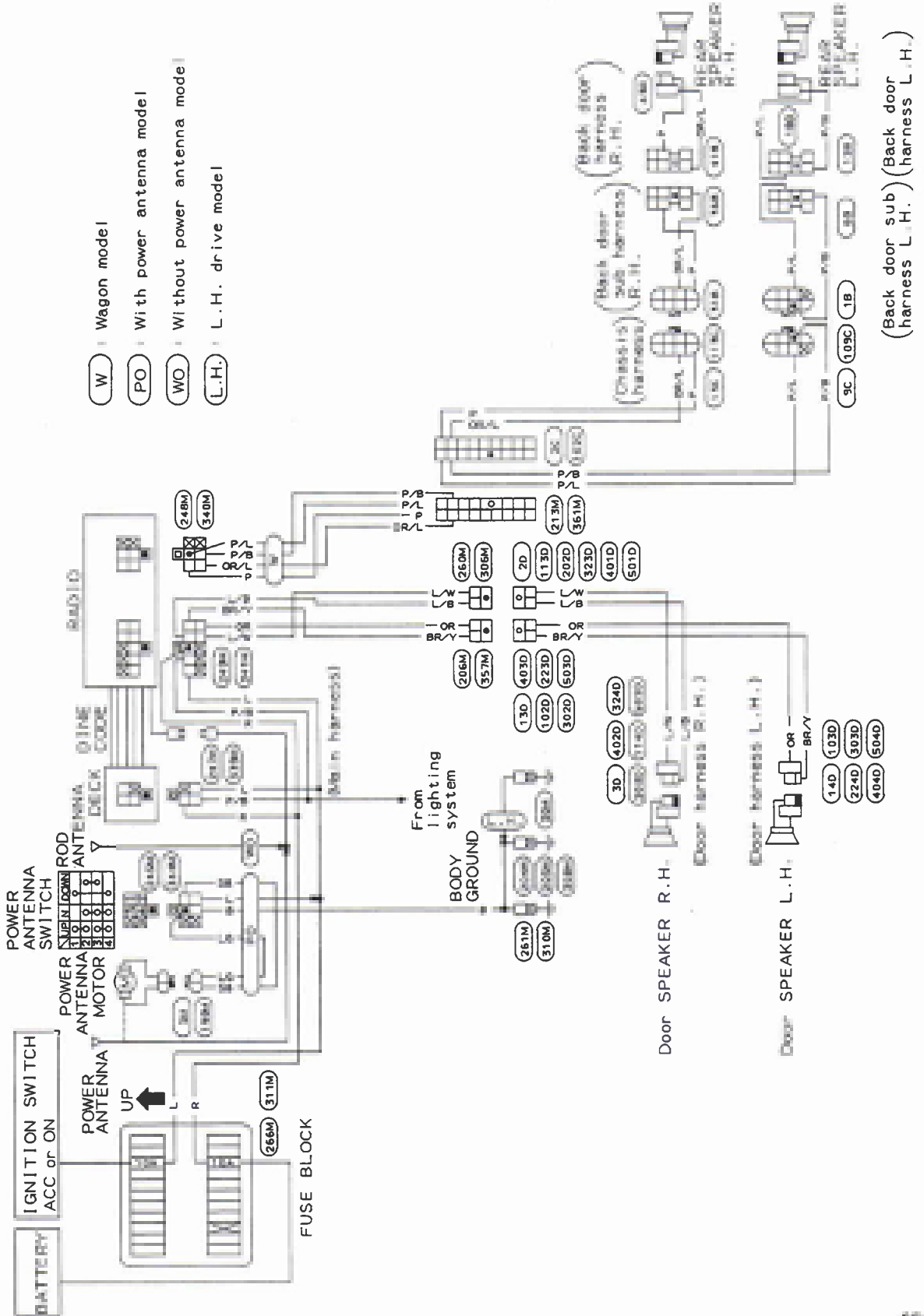
**Do not touch repaired area while test is being conducted.**

5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.



# AUDIO

## Audio/Wiring Diagram

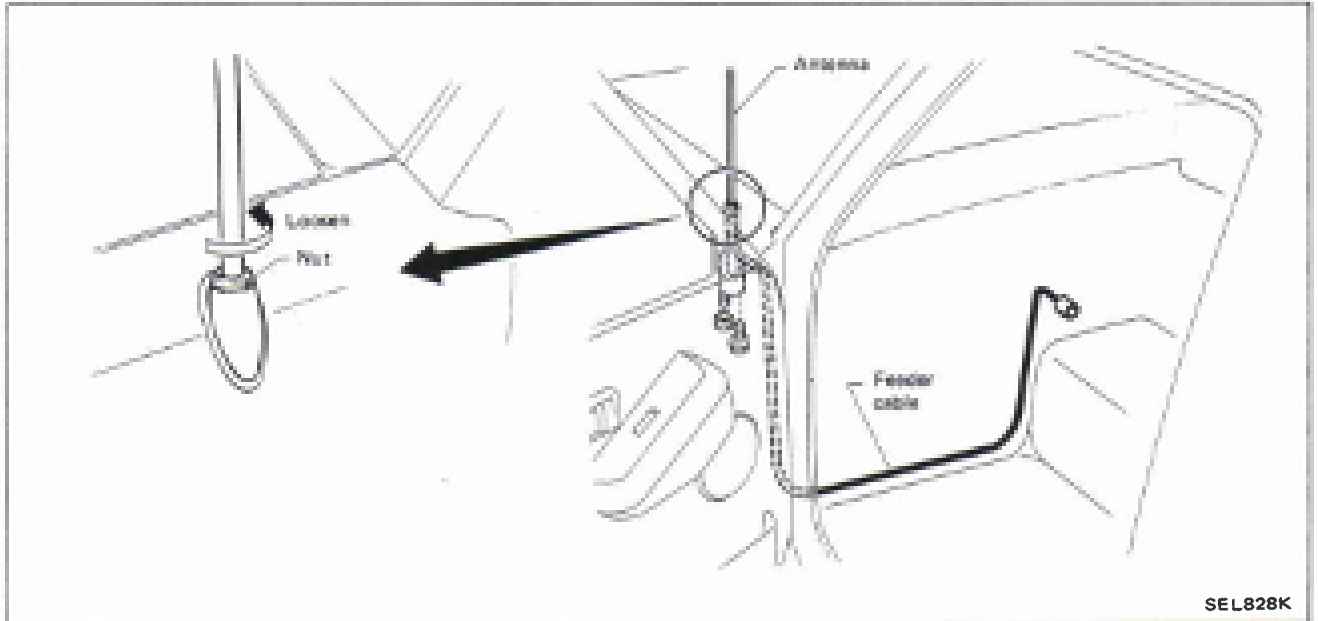


- (W) : Wagon model
- (PO) : With power antenna model
- (WO) : Without power antenna model
- (L.H.) : L.H. drive model

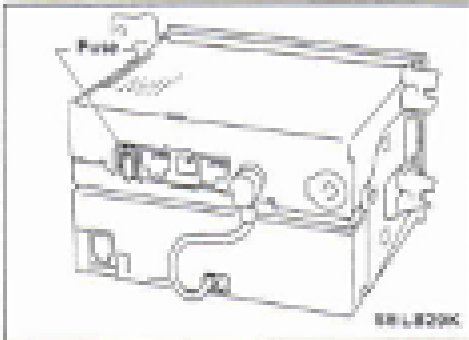
(Back door sub harness L.H.) (Back door harness L.H.)

## AUDIO

### Location of Antenna



### Radio Fuse Check



### Antenna Trimmer Adjustment

The antenna trimmer should be adjusted in the following cases:

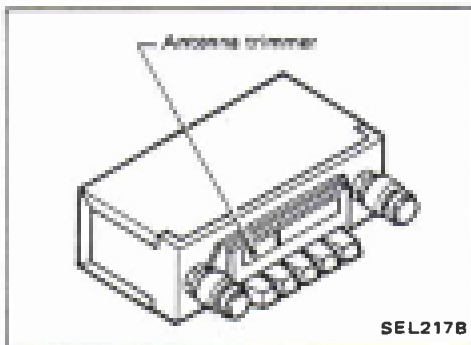
- Fading and weak MW (AM) reception.
- After installation of new antenna, feeder cable or radio receiver.

**Before adjusting, be sure to check harness and antenna feeder cable connectors for proper connection.**

1. Extend antenna completely.
2. Turn radio on, and turn volume control to increase speaker volume.
3. Tune in the weakest station (barely audible) on dial at the range around 14 (1,400 kHz).
4. Turn antenna trimmer to left or right slowly, and set it in the position where reception is strongest.

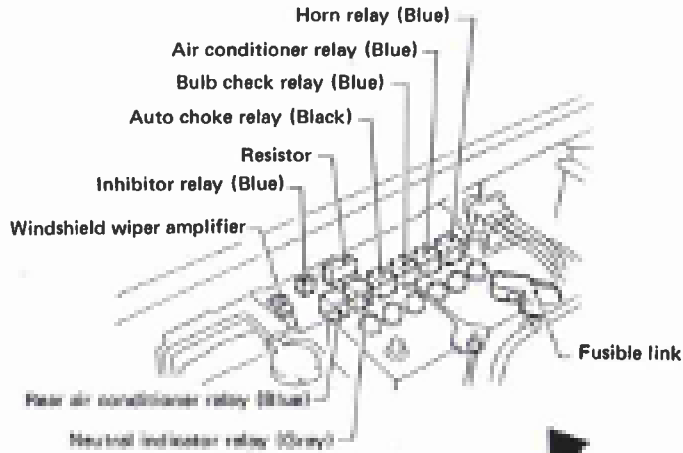
**CAUTION:**

**Do not turn antenna trimmer more than one-half turn.**

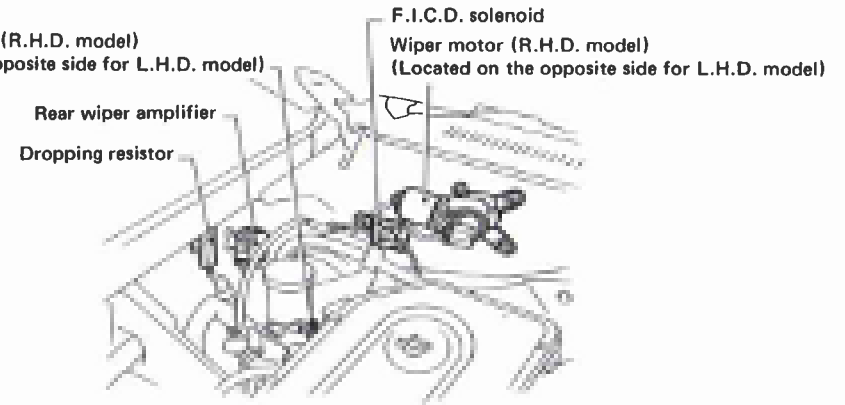


Engine Compartment

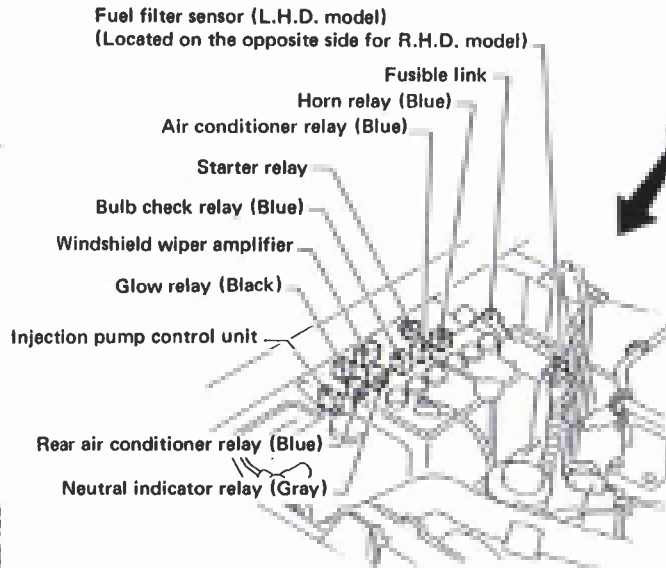
Gasoline engine model



Brake fluid switch (R.H.D. model)  
(Located on the opposite side for L.H.D. model)



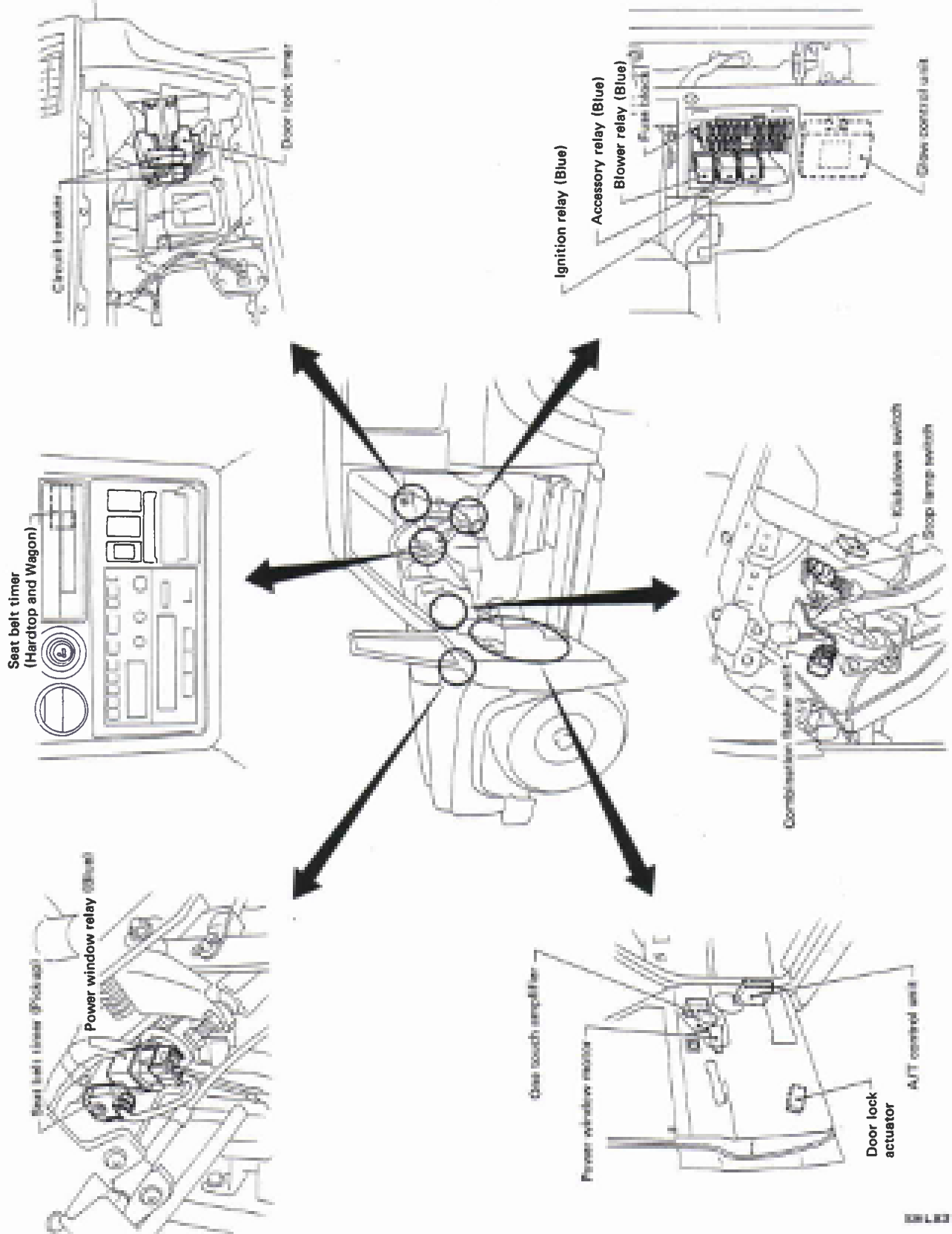
Diesel engine model



# LOCATION OF ELECTRICAL UNITS

## Passenger Compartment

L.H. DRIVE MODEL

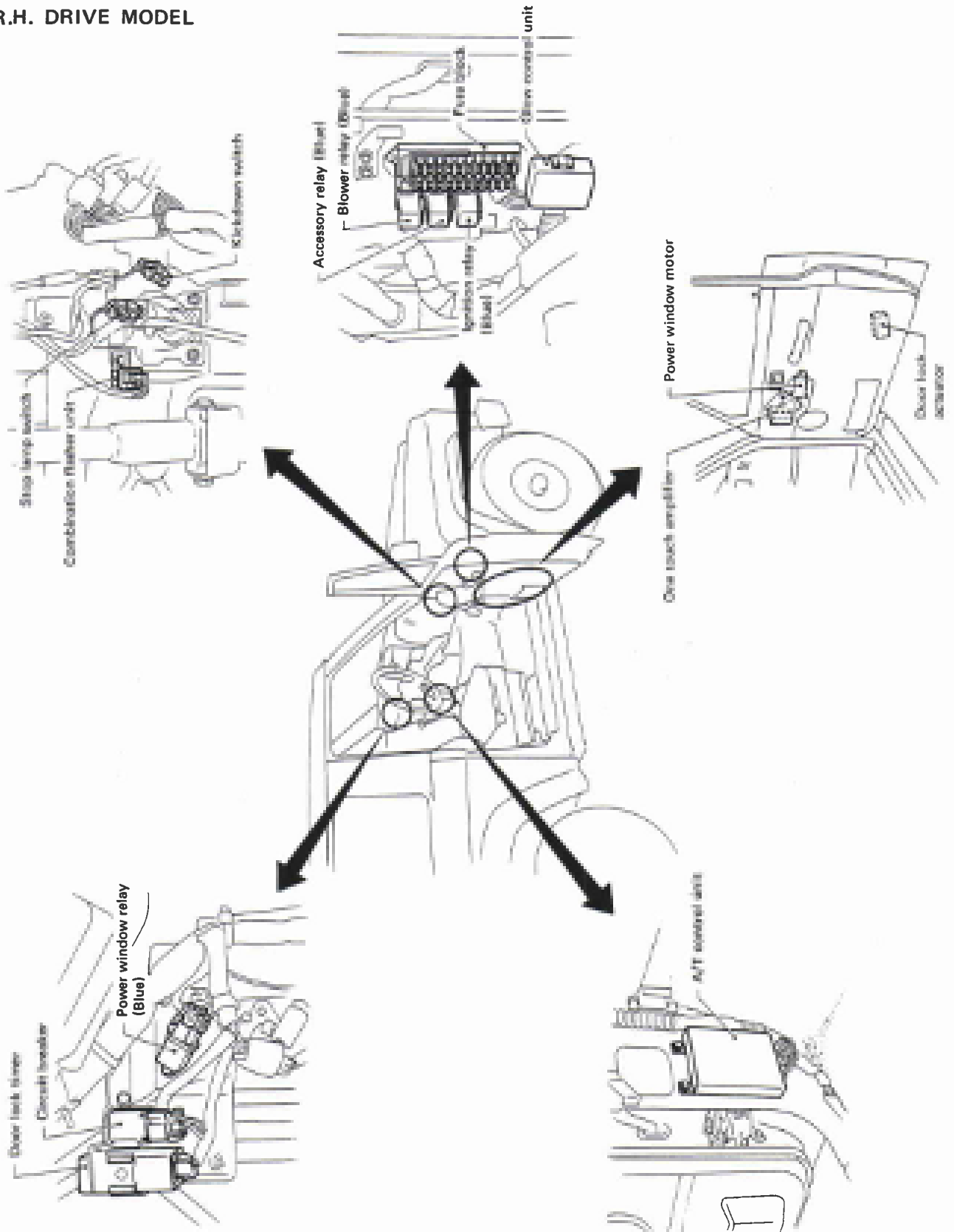


DELTA

# LOCATION OF ELECTRICAL UNITS

## Passenger Compartment (Cont'd)

R.H. DRIVE MODEL



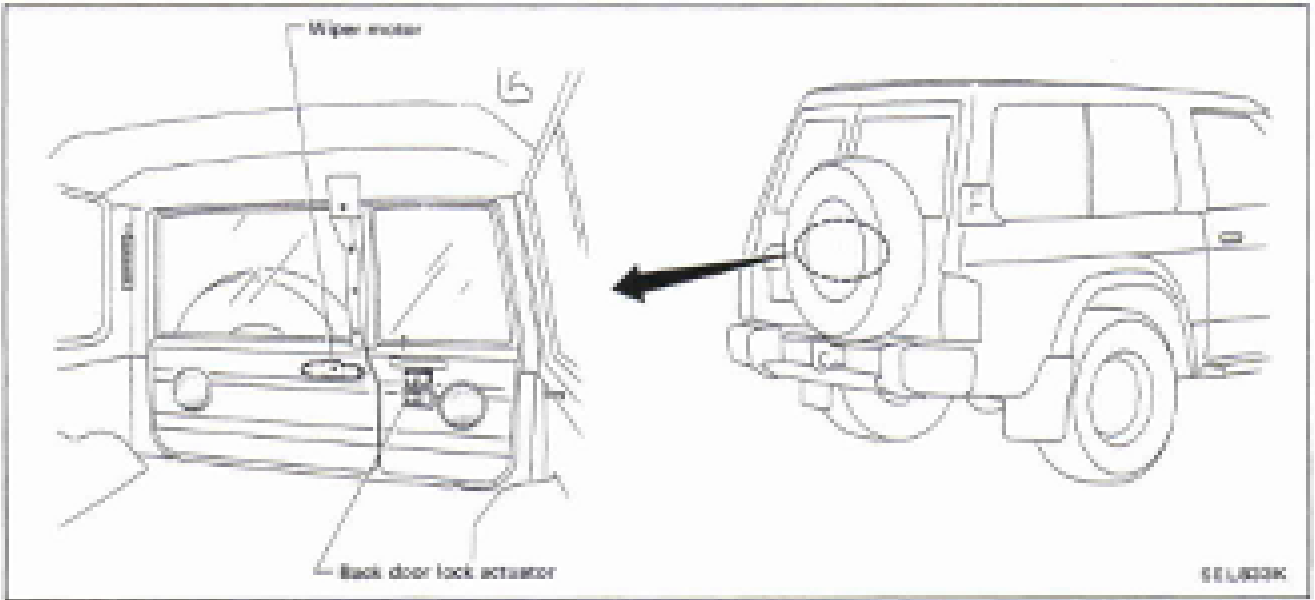
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## LOCATION OF ELECTRICAL UNITS

### Passenger Compartment (Cont'd)

#### HARDTOP AND WAGON



## LOCATION OF ELECTRICAL UNITS

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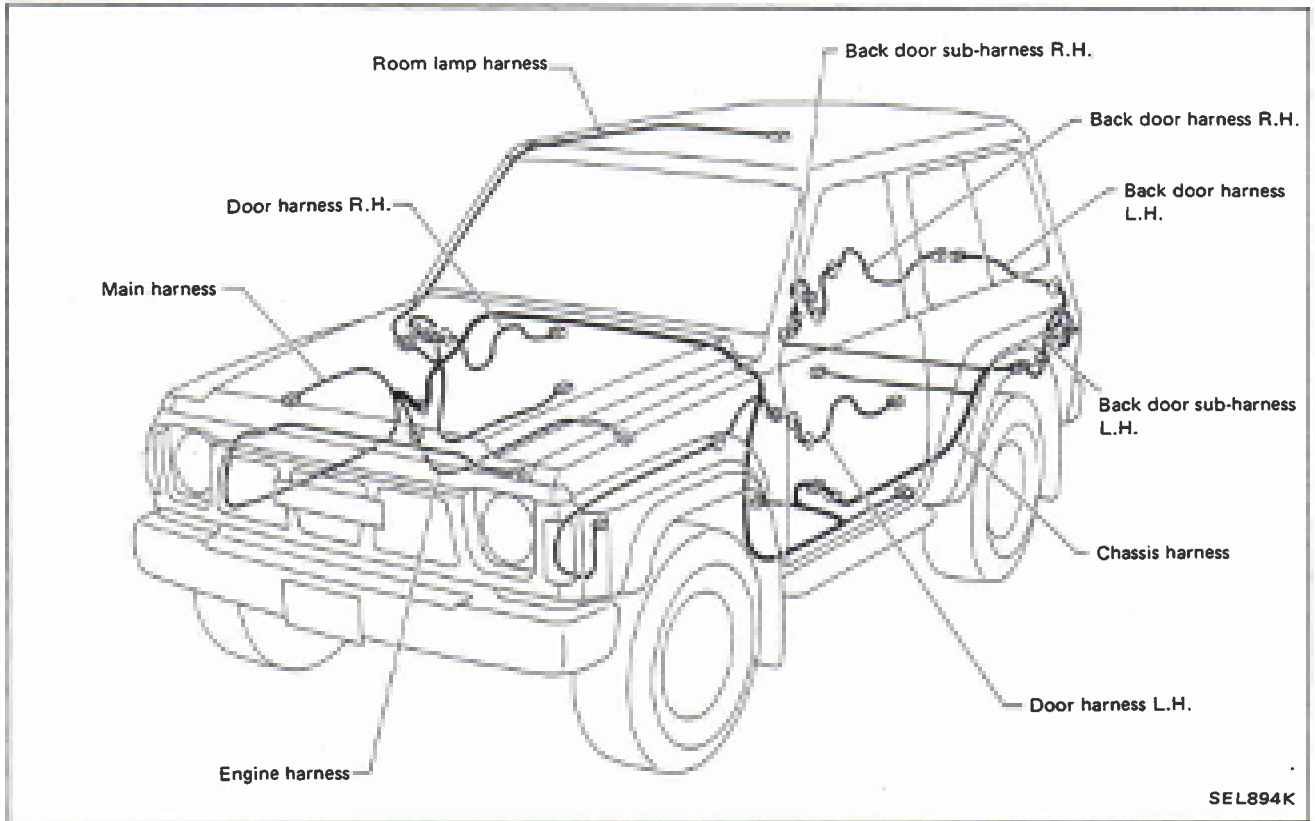
Note:

# HARNES LAYOUT

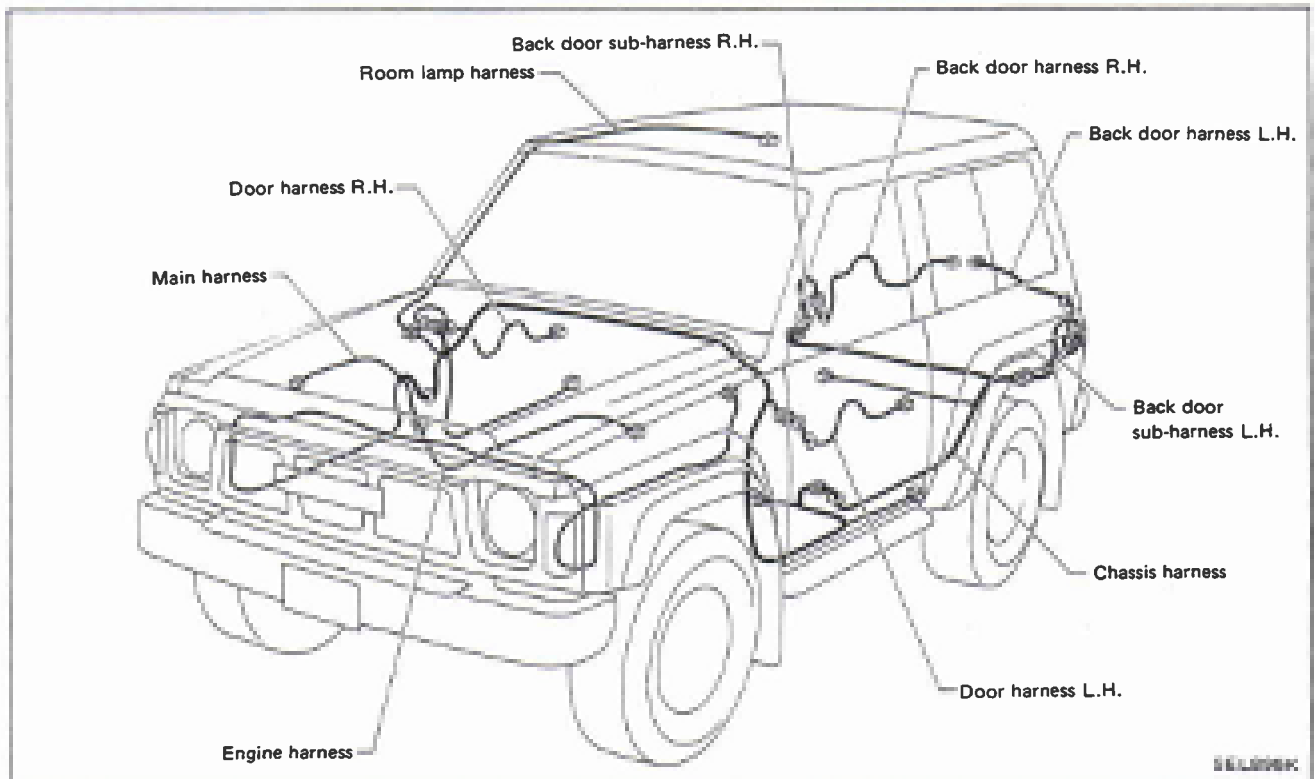
## Outline

**HARDTOP**

**L.H. drive model**



**R.H. drive model**

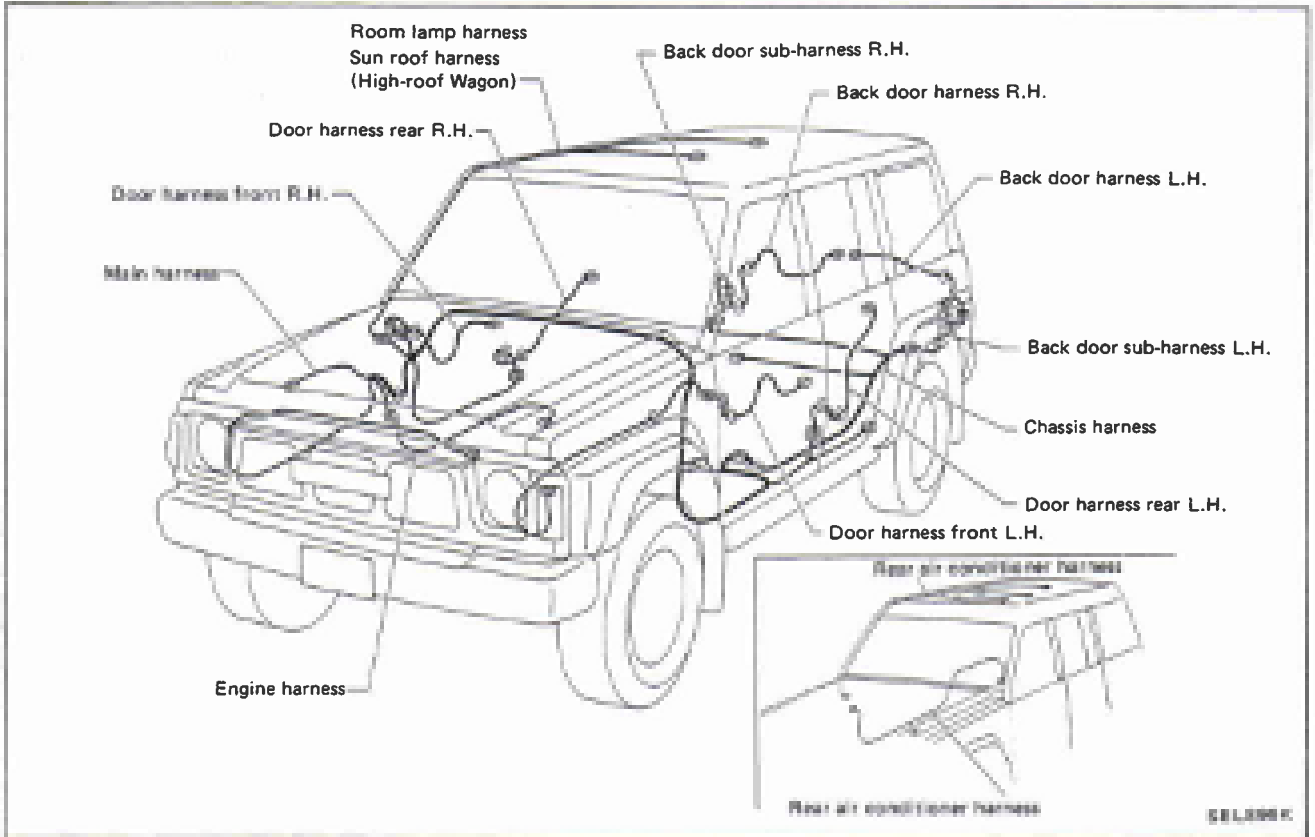


# HARNESSES LAYOUT

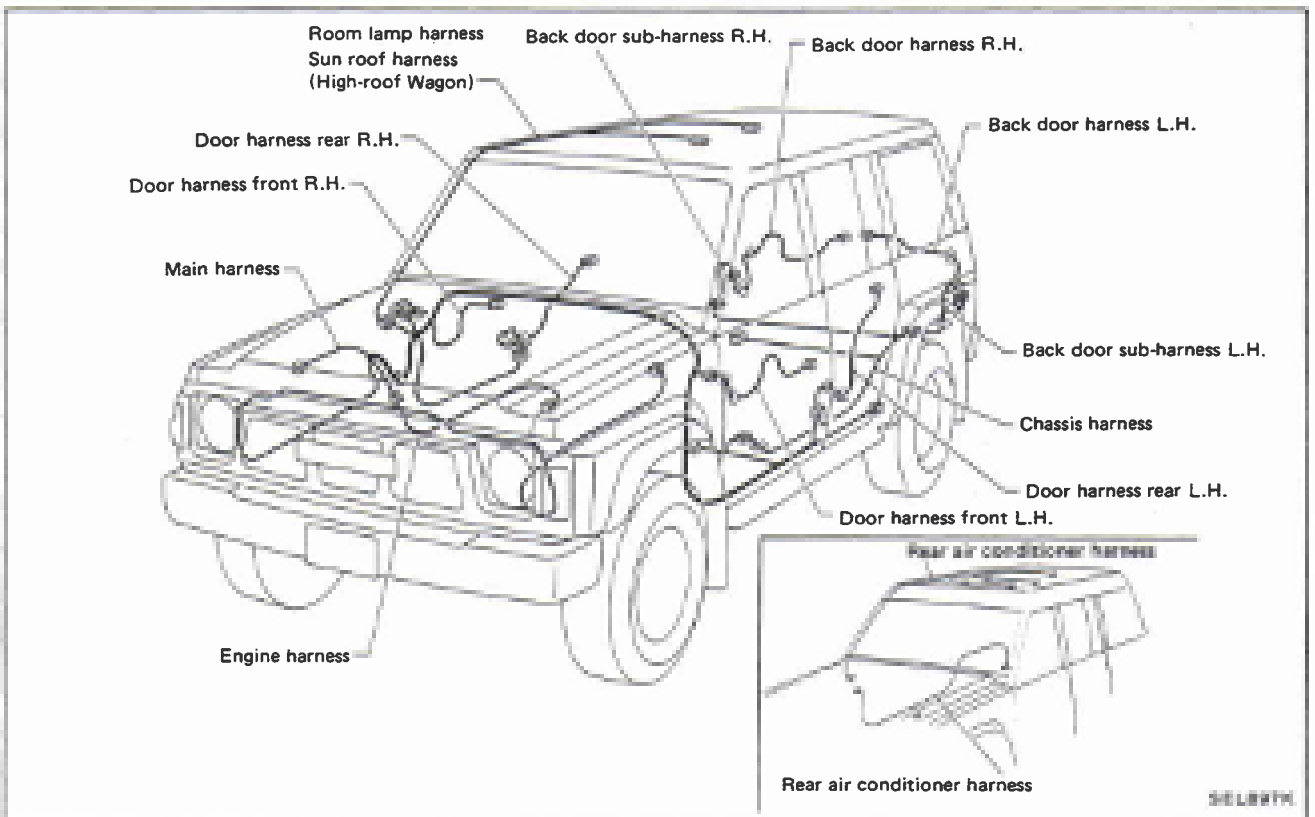
## Outline (Cont'd)

### WAGON

#### L.H. drive model



#### R.H. drive model

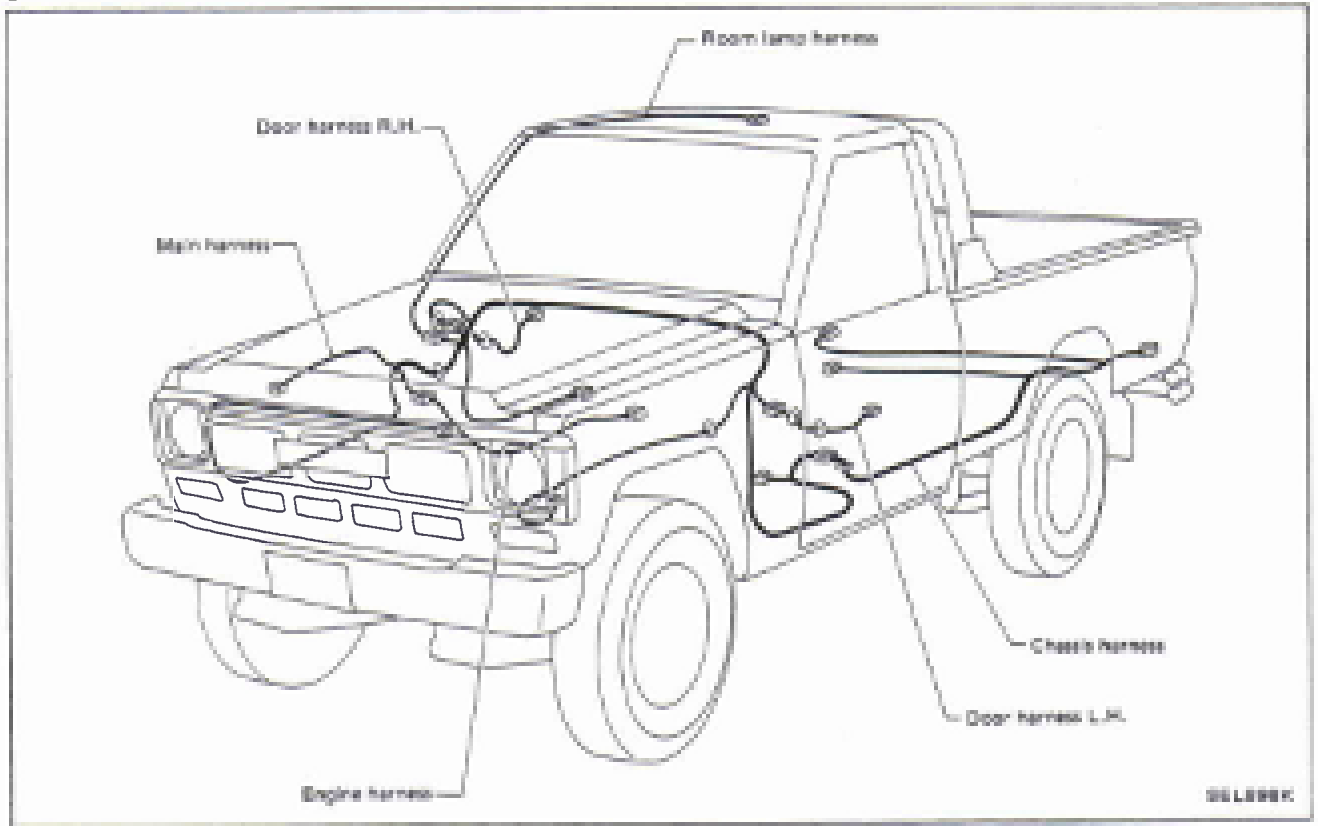


# HARNESSES LAYOUT

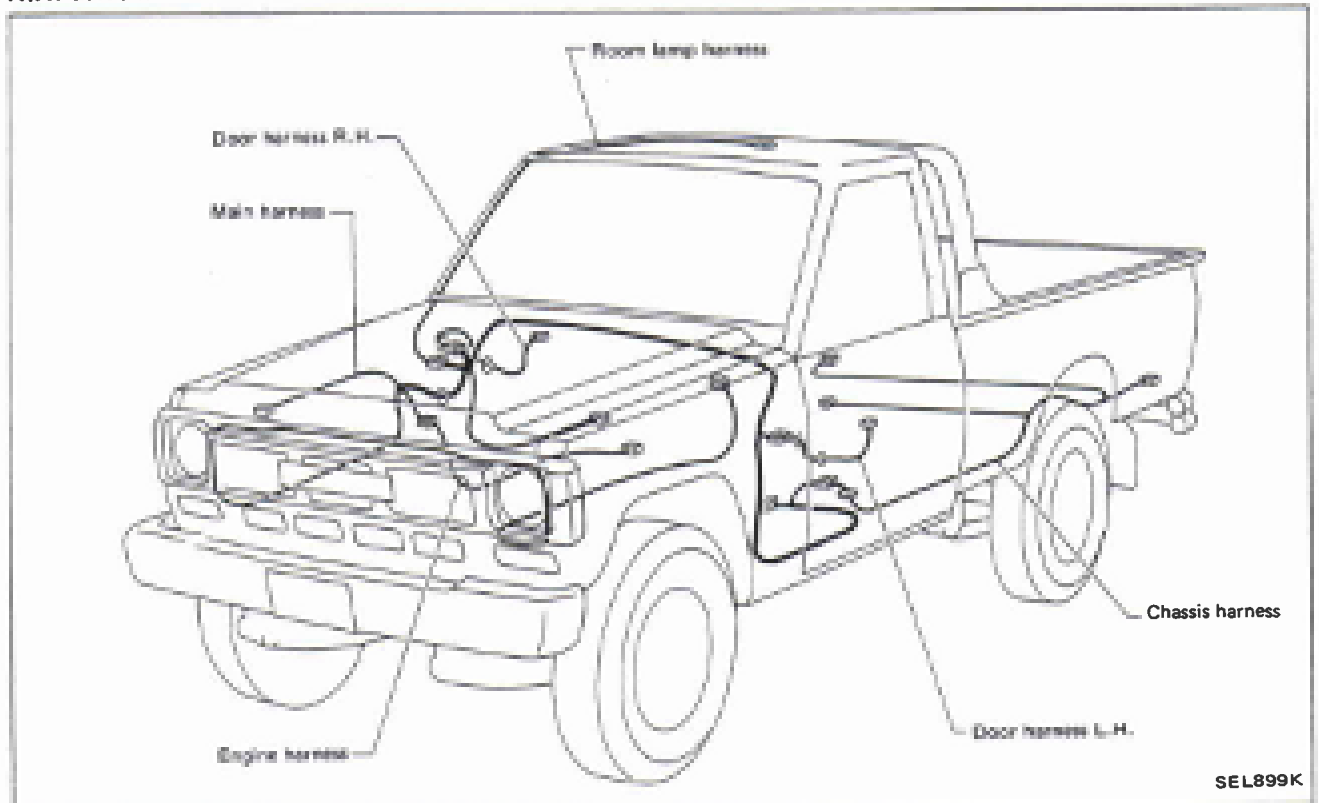
## Outline (Cont'd)

PICKUP

L.H. drive model



R.H. drive model





1M : F.I.C.D. solenoid  
 2M : F.I.C.D. solenoid  
 3M : Power antenna motor  
 4M : Rear wiper amplifier  
 5M : Fuel filter switch  
 6M : Dropping resistor  
 7M : To 9E  
 8M : To 10E  
 9M : To 4E  
 10M : To 104E  
 11M : To 8E  
 12M : Revolution sensor  
 13M : To 11E  
 14M : To 109E  
 15M : To 100E  
 16M : To 101E  
 17M : To 7E  
 18M : To 3E  
 19M : Inhibitor switch  
 20M : A/T oil temperature switch,  
 overrun clutch,  
 shift solenoid-A,  
 shift solenoid-B,  
 lock-up solenoid,  
 fluid temperature sensor,  
 line pressure solenoid  
 21M : Inhibitor switch  
 22M : To 1E  
 23M : Battery  
 24M : Battery  
 25M : Fusible link holder  
 26M : Fusible link holder  
 27M : Fusible link holder

28M : Fusible link holder  
 29M : Fusible link holder  
 30M : Body ground  
 31M : Fusible link holder  
 32M : Horn relay  
 33M : A/C relay  
 34M : A/C relay  
 35M : A/C cut relay  
 36M : Glow relay  
 37M : Glow relay  
 38M : Glow relay  
 39M : Inhibitor relay  
 40M : Rear cooler relay  
 41M : Rear wiper amplifier  
 42M : Injection pump control unit  
 43M : injection pump control unit  
 44M : Inhibitor relay  
 45M : Inhibitor relay  
 46M : Diode  
 47M : Resistor  
 48M : Starter relay  
 49M : Starter relay  
 50M : Starter relay  
 51M : Starter relay  
 52M : Engine sub-harness  
 53M : Engine sub-harness  
 56M : To 67M  
 57M : To 66M  
 58M : Winch relay  
 59M : Winch unit  
 60M : Front washer motor  
 61M : Rear washer motor  
 62M : Headlamp R.H.  
 63M : Side turn signal lamp R.H.

64M : Front combination lamp R.H.  
 65M : Fog lamp R.H.  
 66M : Winch relay sub-harness  
 67M : Horn (High)  
 68M : Thermo switch  
 69M : Low-pressure switch  
 70M : Horn (Low)  
 71M : Not used  
 72M : Front combination lamp L.H.  
 73M : Fog lamp L.H.  
 74M : Thermo switch  
 75M : Distributor  
 76M : Compressor  
 77M : Headlamp L.H.  
 78M : Body ground  
 79M : Side turn signal lamp L.H.  
 80M : Front combination lamp L.H.  
 81M : Compressor  
 82M : Alternator  
 83M : Alternator  
 84M : Alternator  
 85M : Condenser  
 86M : Water temperature switch  
 87M : Thermal transmitter  
 88M : Vacuum switch  
 89M : Ignition coil  
 90M : Ignition coil  
 91M : Resistor  
 92M : Resistor  
 93M : Resistor  
 94M : Brake fluid LEVEL switch  
 95M : Wiper motor  
 96M : A/C relay  
 97M : A/C relay





- (101M) : Wiper motor
- (102M) : F.I.C.D. solenoid
- (103M) : F.I.C.D. solenoid
- (104M) : Rear wiper amplifier
- (105M) : Dropping resistor
- (106M) : Brake fluid switch
- (107M) : To (105E)
- (108M) : To (106E)
- (109M) : To (104E)
- (110M) : To (8E)
- (111M) : Revolution sensor
- (112M) : To (11E)
- (114M) : To (6E)
- (115M) : To (7E)
- (116M) : To (4E)
- (117M) : To (103E)
- (118M) : To (101E)
- (119M) : To (2E)
- (120M) : To (3E)
- (121M) : Inhibitor switch
- (122M) : A/T oil temperature switch
- (123M) : A/T oil temperature switch
- (124M) : To (1E)
- (125M) : Battery
- (126M) : Battery
- (128M) : Fusible link holder
- (129M) : Fusible link holder
- (130M) : Fusible link holder
- (131M) : Fusible link holder
- (132M) : Body ground
- (133M) : Fusible link
- (134M) : Horn relay
- (135M) : A/C relay
- (136M) : A/C relay
- (137M) : Auto-choke relay
- (138M) : A/C relay
- (139M) : Glow relay
- (140M) : Glow relay
- (141M) : Glow relay
- (142M) : Inhibitor relay
- (143M) : Rear cooler relay
- (144M) : Wiper amplifier
- (145M) : Injection pump control unit
- (146M) : Injection pump control unit
- (147M) : Inhibitor relay
- (148M) : Inhibitor relay
- (149M) : Diode
- (150M) : Resistor
- (151M) : Not used
- (152M) : Starter relay
- (153M) : Starter relay
- (154M) : Starter relay
- (155M) : Engine sub-harness
- (156M) : Engine sub-harness
- (156M) : Not used
- (159M) : Not used
- (160M) : Not used
- (161M) : Winch unit
- (162M) : To (163M)
- (163M) : To (162M)
- (164M) : Winch relay
- (165M) : Headlamp R.H.
- (166M) : Rear washer motor
- (167M) : Front washer motor
- (168M) : Low-pressure switch
- (169M) : Front combination lamp R.H.
- (170M) : Horn (High)
- (171M) : Thermo switch
- (172M) : Fog lamp R.H.
- (173M) : Horn (Low)
- (174M) : Not used
- (175M) : Front combination lamp L.H.
- (176M) : Fog lamp L.H.
- (177M) : Thermo switch
- (178M) : Distributor
- (179M) : Compressor
- (180M) : Headlamp L.H.
- (181M) : Body ground
- (183M) : Side turn signal lamp L.H
- (184M) : Vacuum switch
- (185M) : Compressor
- (186M) : Alternator
- (187M) : Alternator
- (188M) : Alternator
- (189M) : Condenser
- (190M) : Water temperature sensor
- (191M) : Thermal transmitter
- (192M) : Ignition coil
- (193M) : Ignition coil
- (194M) : Resistor
- (195M) : Resistor
- (196M) : Resistor
- (197M) : Fuel filter sensor
- (198M) : Power antenna motor
- (200M) : A/C relay
- (201M) : A/C relay
- (402M) : To (102E)
- (405M) : To (5E)



203M : Check connector  
 204M : Body ground  
 205M : Body ground  
 206M : To 13D  
           To 223D  
           To 403D  
 207M : To 11D  
           To 221D  
 208M : To 12D  
           To 222D  
 209M : A/T check switch  
 210M : A/T control unit  
 211M : A/T control unit  
 212M : To 201C  
 213M : To 2C  
           To 102C  
 214M : To 1C  
           To 101C  
 215M : Seat belt switch  
 216M : A.T.P. lamp  
 217M : A/T indicator lamp  
 218M : Parking brake switch  
 219M : To 31D  
 220M : Door switch (Front L.H.)  
 221M : Door switch (Front R.H. Wagon model)  
 222M : Combination flasher unit  
 223M : Stop lamp switch  
 224M : Combination meter

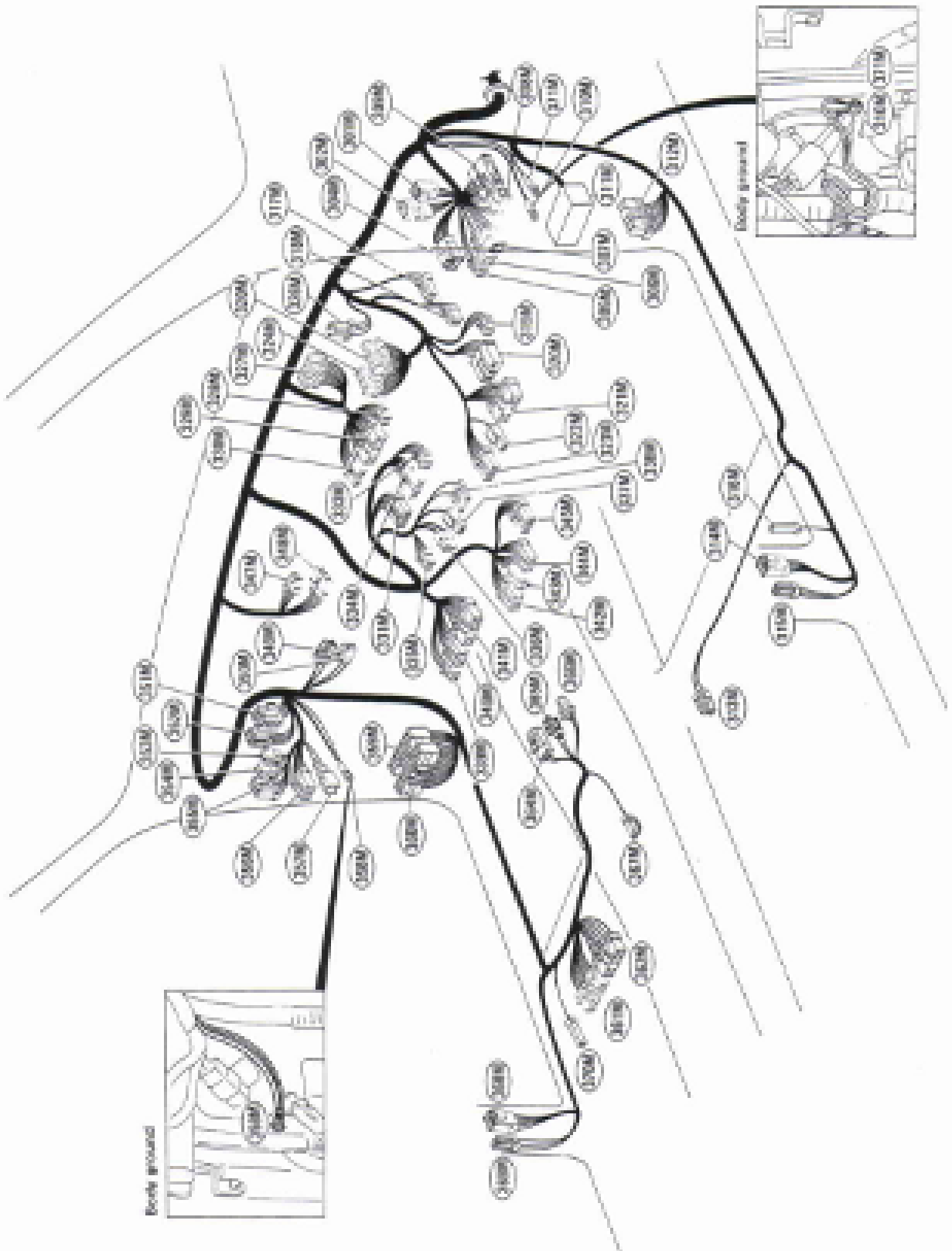
225M : Fog lamp switch  
 226M : Rear wiper and washer switch  
 227M : Rear defogger switch  
 228M : Kickdown switch  
 228M : Combination meter  
 230M : Combination meter  
 231M : Ignition switch  
 232M : Combination switch  
 233M : Horn switch  
 234M : Wiper switch  
 235M : Wiper switch  
 236M : Rear cooler switch  
 237M : A/C switch  
 238M : Cigarette lighter  
 239M : Cigarette lighter  
 240M : Ash tray illumination  
 241M : Fan switch  
 242M : Digital clock  
 243M : Seat belt timer  
 244M : Hazard switch  
 245M : Power antenna switch  
 246M : Front sun roof switch  
 247M : Cassette deck  
 248M : Radio  
 249M : Radio  
 250M : A/C thermo control amp.  
 252M : Resistor  
 253M : Circuit breaker

254M : Circuit breaker  
 255M : Door lock timer  
 256M : To 2S  
 257M : To 1R (Wagon model)  
           To 101R (Hardtop model)  
           To 1S (Sun roof)  
 258M : To 201R (Pickup model)  
 259M : To 1D (Wagon model)  
           To 201D (Hardtop model)  
 260M : To 2D (Wagon model)  
           To 202D (Hardtop model)  
 261M : Body ground  
 262M : To 102A (High-roof model)  
           To 1A (Standard roof model)  
 263M : To 103A (High-roof model)  
           To 2A (Standard roof model)  
 264M : Blower motor  
 265M : Blower motor  
 266M : Fuse block  
 267M : Glow control unit  
 268M : Solenoid valve  
 269M : To 21D (Wagon model)  
 270M : Front R.H. door switch  
 271M : Rear R.H. door switch (Wagon model)  
 272M : Body ground  
 281M : Power window relay  
 282M : Power window relay

# HARNESS LAYOUT

## Main Harness (Cont'd)

R.H. DRIVE MODEL



# HARNES LAYOUT

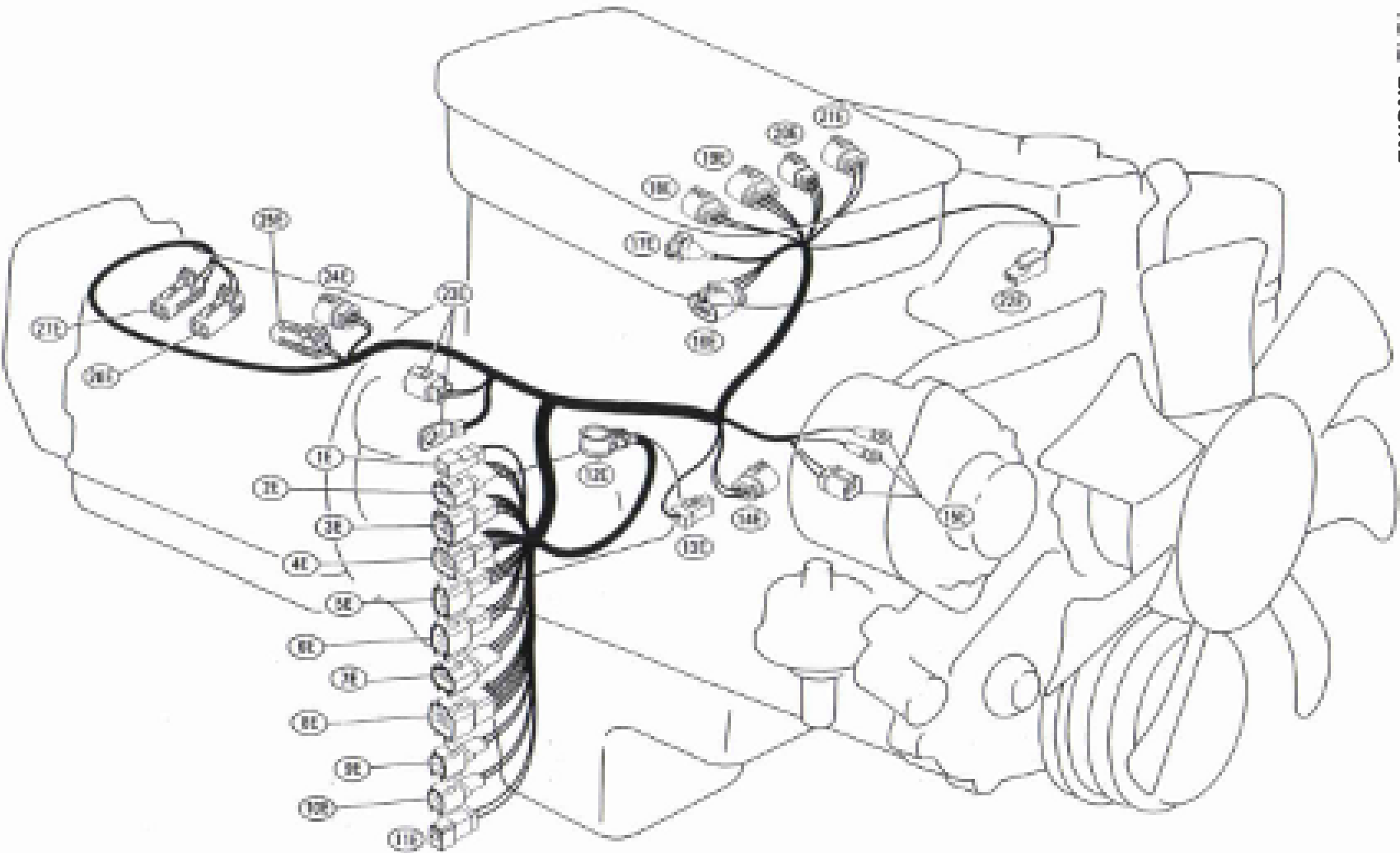
## Main Harness (Cont'd)

- 301M : To 2S  
 302M : To 1R (Hardtop model)  
 : To 1R (Wagon model)  
 : To 101R (Passup model)  
 : To 201R (Wagon model)  
 304M : To 111D  
 305M : To 321D (Hardtop model)  
 : To 322D (Wagon model)  
 306M : To 113D (Wagon model)  
 : To 323D (Hardtop model)  
 : To 324D (Passup model)  
 307M : To 115D (High-roof model)  
 : To 325D (Standard roof model)  
 308M : To 115D (High-roof model)  
 : To 325D (Standard roof model)  
 309M : Check connector  
 310M : Body ground  
 311M : Fuse block  
 312M : Glow control unit  
 313M : Solenoid valve  
 314M : To 102D (Wagon model)  
 315M : Front L.H. door switch  
 316M : Rear R.H. door switch  
 317M : Stop lamp switch  
 318M : Kickdown switch  
 319M : Illuminator control switch  
 320M : Ignition switch  
 321M : Lighting switch  
 322M : Horn switch  
 323M : Wiper switch  
 324M : Combination switch  
 325M : Combination switch  
 326M : Combination flasher unit  
 327M : Combination meter  
 328M : Fog lamp switch  
 329M : Rear wiper switch  
 330M : Rear defogger switch  
 331M : Rear wiper switch  
 332M : A/C switch  
 333M : Fan switch  
 334M : Digital clock  
 335M : Cigarette lighter  
 336M : Cigarette lighter  
 337M : Ash tray illumination  
 338M : Cigarette dock  
 339M : Radio  
 340M : Radio  
 341M : Not used  
 342M : Sun roof switch  
 343M : Power antenna switch  
 344M : Hazard switch  
 345M : A/C thermo control amp.  
 346M : Resistor  
 347M : Blower motor  
 350M : Blower motor  
 351M : Power window relay  
 352M : Power window relay  
 353M : Circuit breaker  
 354M : Circuit breaker  
 355M : Door lock timer  
 356M : To 102D (Wagon model)  
 : To 102D (Hardtop model)  
 : To 102D (Wagon model)  
 : To 102D (Hardtop model)  
 : To 102D (Passup model)  
 358M : Body ground  
 359M : A/T control unit  
 360M : A/T control unit  
 361M : To 102D (Wagon Model)  
 : To 102D (Hardtop model)  
 : To 102D (Wagon model)  
 : To 102D (Passup model)  
 363M : To 102D (Passup model)  
 364M : A.T.F. lamp  
 365M : A/T indicator lamp  
 366M : Power shift switch  
 367M : Parking lamp switch  
 368M : To 102D (Wagon model)  
 369M : Front L.H. door switch  
 370M : Rear L.H. door switch  
 371M : Body ground

# HARNES LAYOUT

## Engine Harness

TB41Z ENGINE



- 1E : To 22M (L.H. drive model)  
To 124M (R.H. drive model)
- 2E : To 119M (R.H. drive model)
- 3E : To 100M (L.H. drive model)  
To 120M (R.H. drive model)
- 4E : To 9M (L.H. drive model)  
To 116M (R.H. drive model)
- 5E : To 905M (R.H. drive model)
- 6E : To 114M (R.H. drive model)

- 7E : To 17M (L.H. drive model)  
To 115M (R.H. drive model)
- 8E : To 111M (L.H. drive model)  
To 110M (R.H. drive model)
- 9E : To 7M (L.H. drive model)
- 10E : To 8M (L.H. drive model)
- 11E : To 13M (L.H. drive model)  
To 112M (R.H. drive model)
- 12E : Battery

- 13E : Oil pressure switch
- 14E : Oil pressure sending unit
- 15E : Alternator
- 16E : Throttle sensor
- 17E : Throttle valve switch
- 18E : Auto-choke heater,  
fuel cut solenoid
- 19E : B.C.D.D. solenoid

- 20E : Fuel cut solenoid,  
auto-choke heater,  
B.C.D.D. solenoid
- 21E : Fuel cut solenoid
- 22E : Thermal transmitter
- 23E : Starter motor
- 24E : Back-up lamp switch (M/T model)
- 25E : Speed sensor
- 26E : Neutral switch (A/T model)
- 27E : 4WD switch

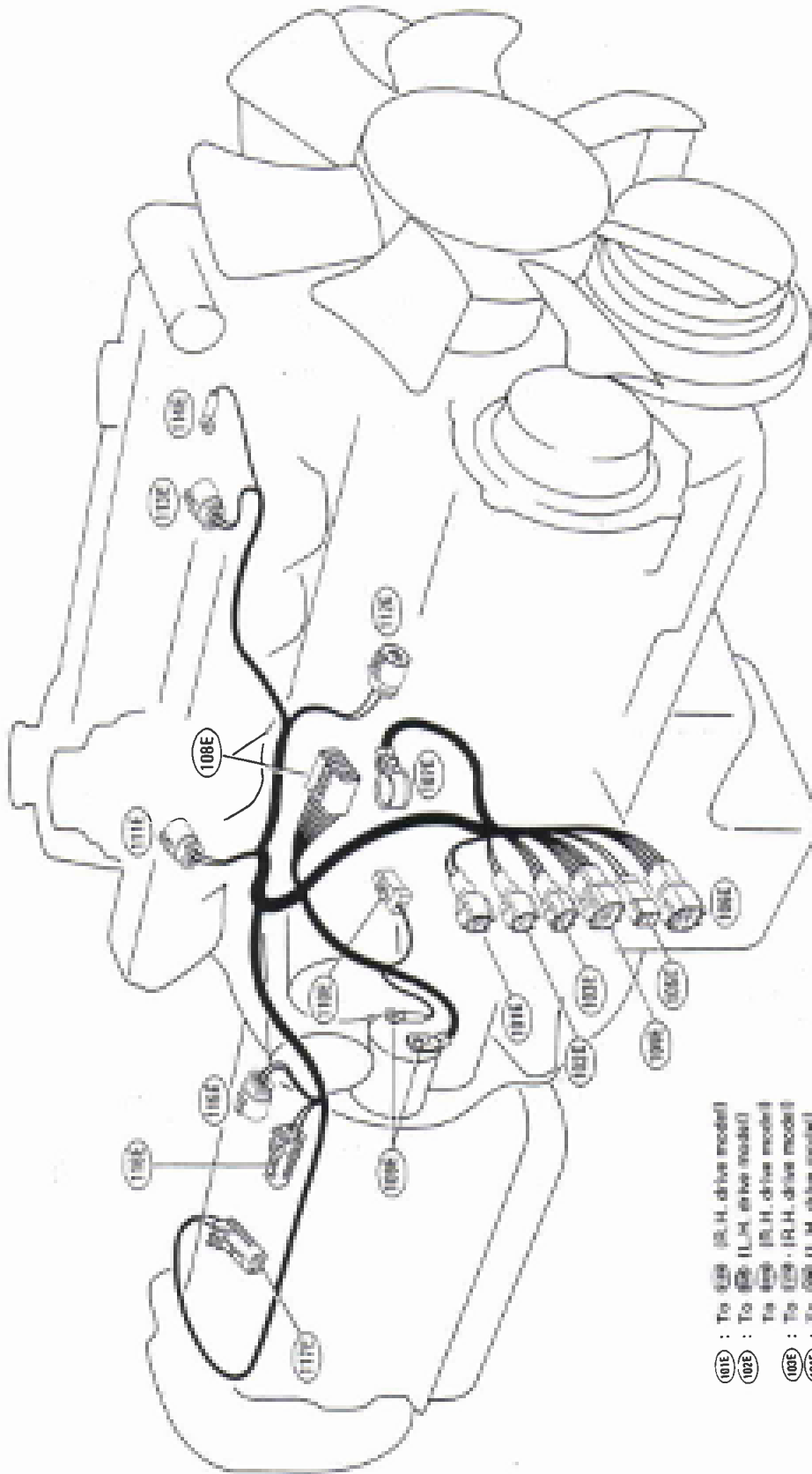
EL-86

SEL905K

# HARNES LAYOUT

## Engine Harness (Cont'd)

TD42 ENGINE

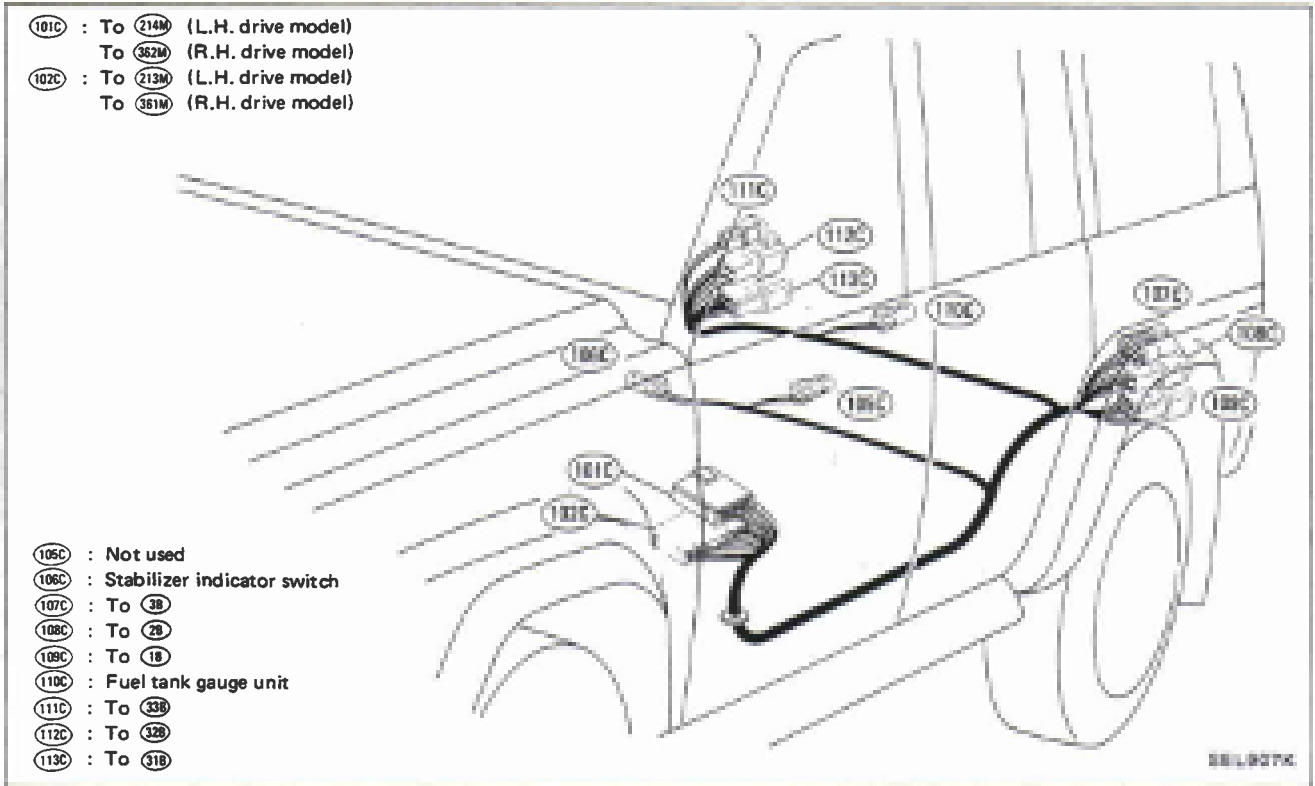


- ⑩①E : To ⑩② (L.H. drive model)
- ⑩②E : To ⑩③ (L.H. drive model)
- ⑩③E : To ⑩④ (R.H. drive model)
- ⑩④E : To ⑩⑤ (R.H. drive model)
- ⑩⑤E : To ⑩⑥ (L.H. drive model)
- ⑩⑥E : To ⑩⑦ (R.H. drive model)
- ⑩⑦E : To ⑩⑧ (L.H. drive model)
- ⑩⑧E : To ⑩⑨ (R.H. drive model)
- ⑩⑦E : Battery
- ⑩⑧E : Ignition pump control unit
- ⑩⑨E : Starter motor
- ⑩⑩E : Oil pressure switch
- ⑩⑪E : Oil pressure sending unit
- ⑩⑫E : Fuel jet solenoid
- ⑩⑬E : Engine speed sensor
- ⑩⑭E : Engine sub-harness
- ⑩⑮E : Back-up lamp switch (BA/T model)
- ⑩⑯E : Speed sensor
- ⑩⑰E : 4WD switch

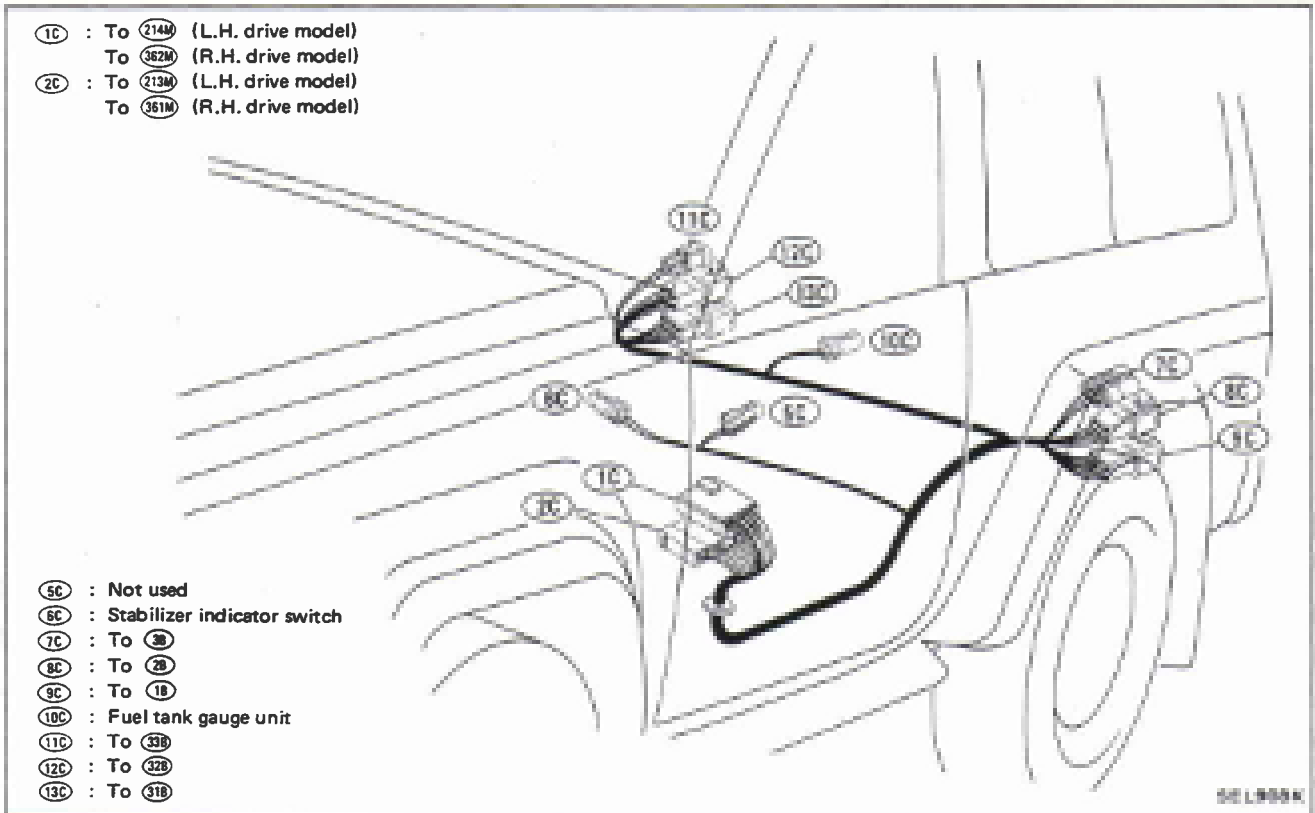
# HARNES LAYOUT

## Chassis Harress

### WAGON MODEL



### HARDTOP MODEL



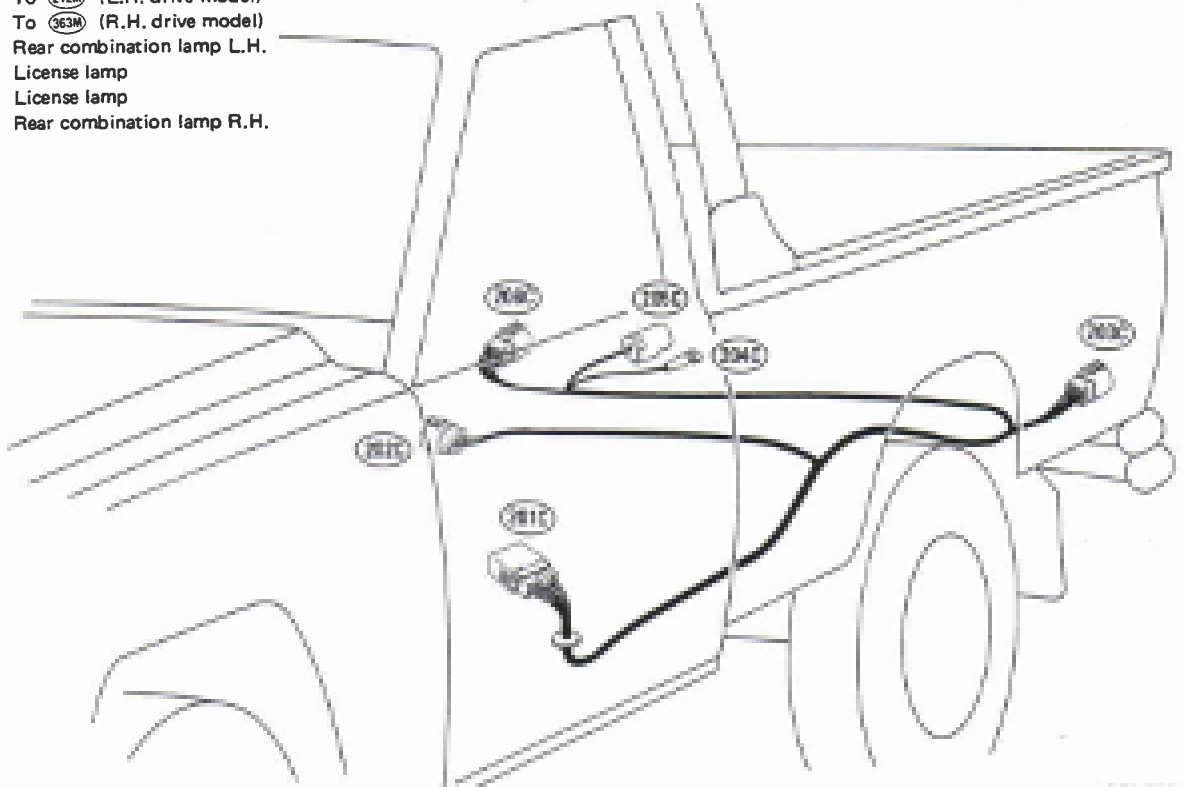


# HARNES LAYOUT

## Chassis Harress (Cont'd)

### PICKUP MODEL

- ②01C : To ②12M (L.H. drive model)
- ②02C : To ③63M (R.H. drive model)
- ②03C : Rear combination lamp L.H.
- ②04C : License lamp
- ②05C : License lamp
- ②06C : Rear combination lamp R.H.

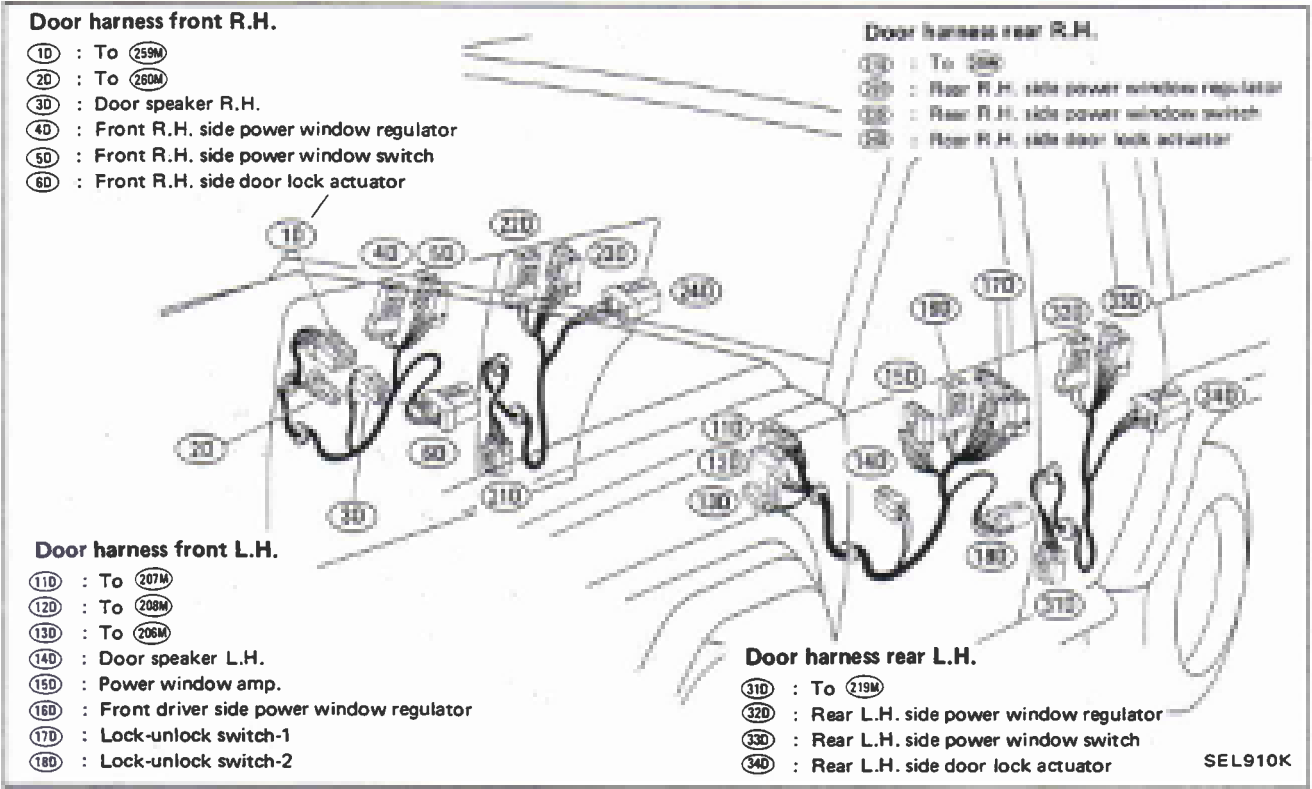


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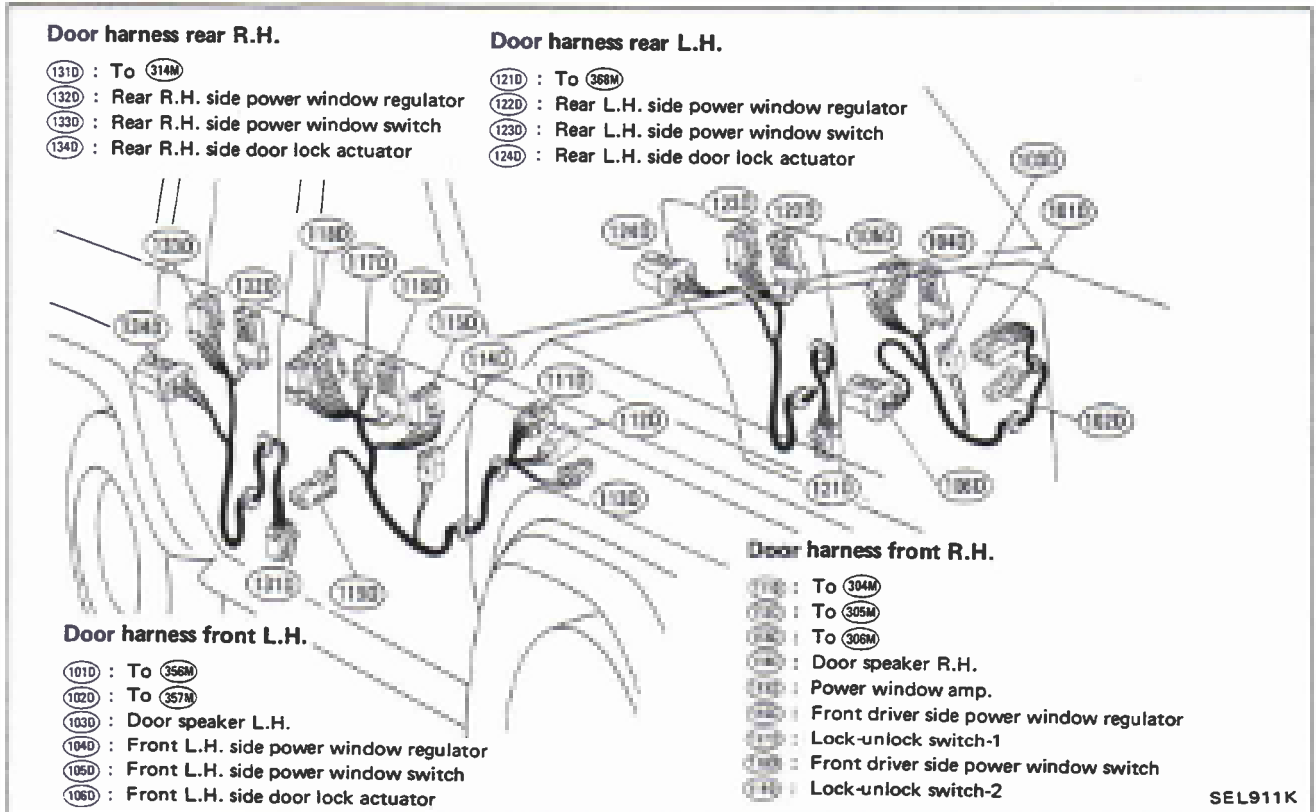
# HARNES LAYOUT

## Door Harness

### WAGON L.H. DRIVE MODEL



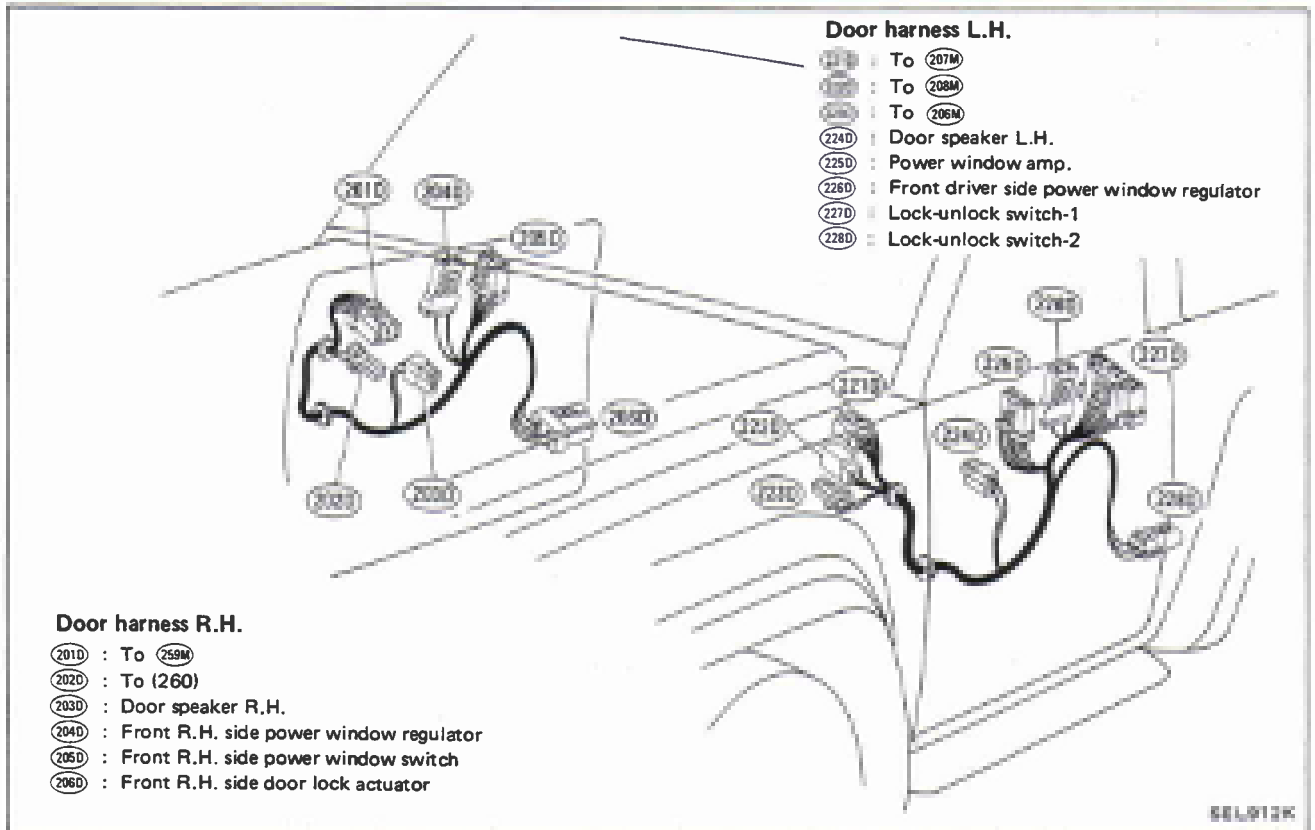
### WAGON R.H. DRIVE MODEL



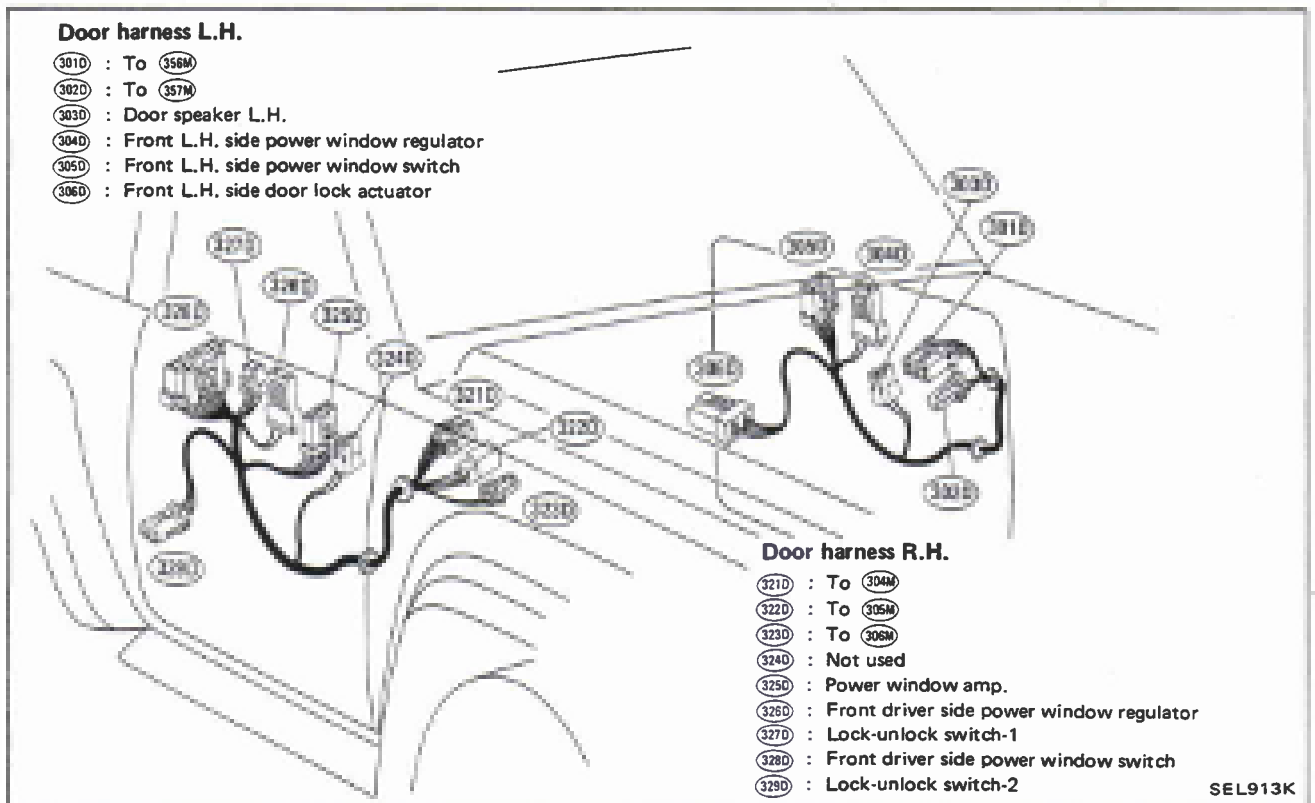
# HARNESS LAYOUT

## Door Harness (Cont'd)

### HARDTOP L.H. DRIVE MODEL



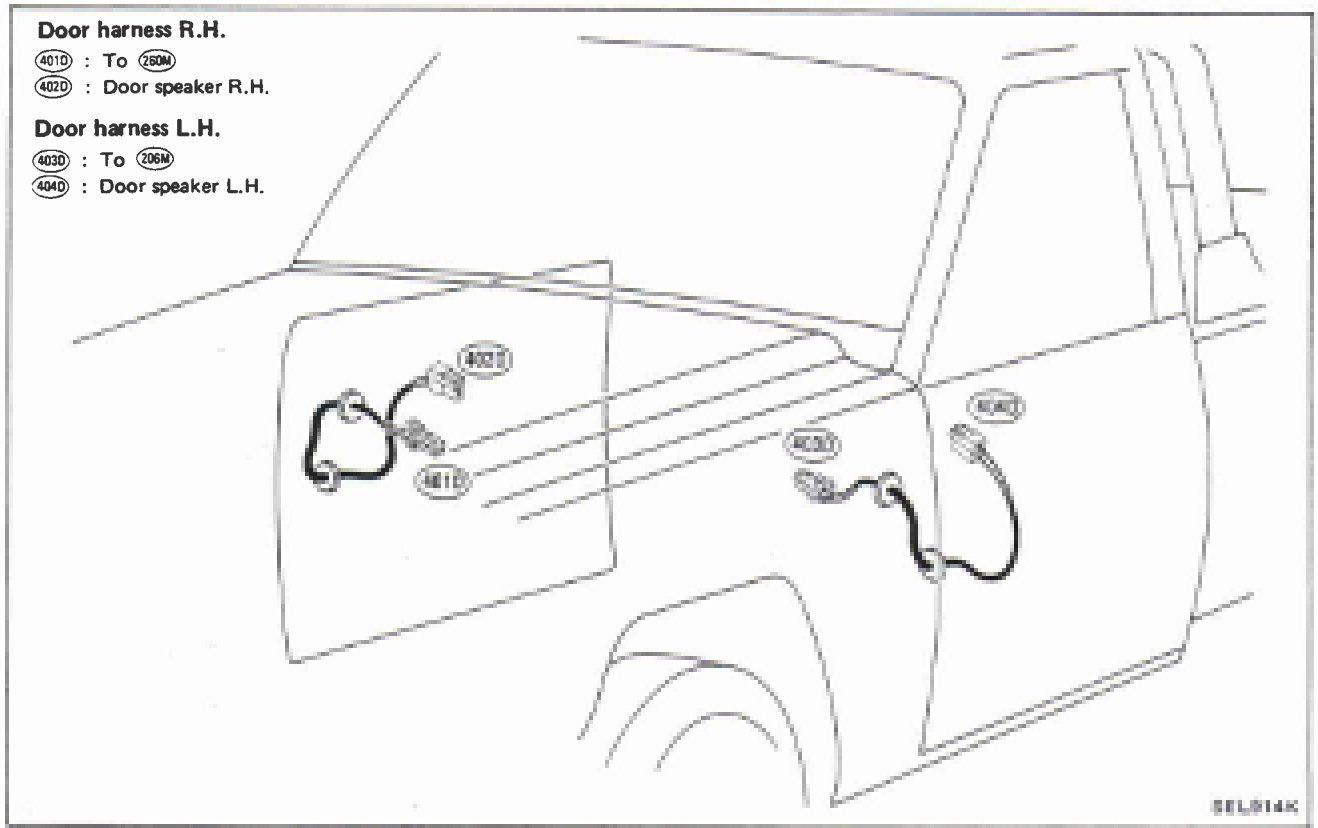
### HARDTOP R.H. DRIVE MODEL



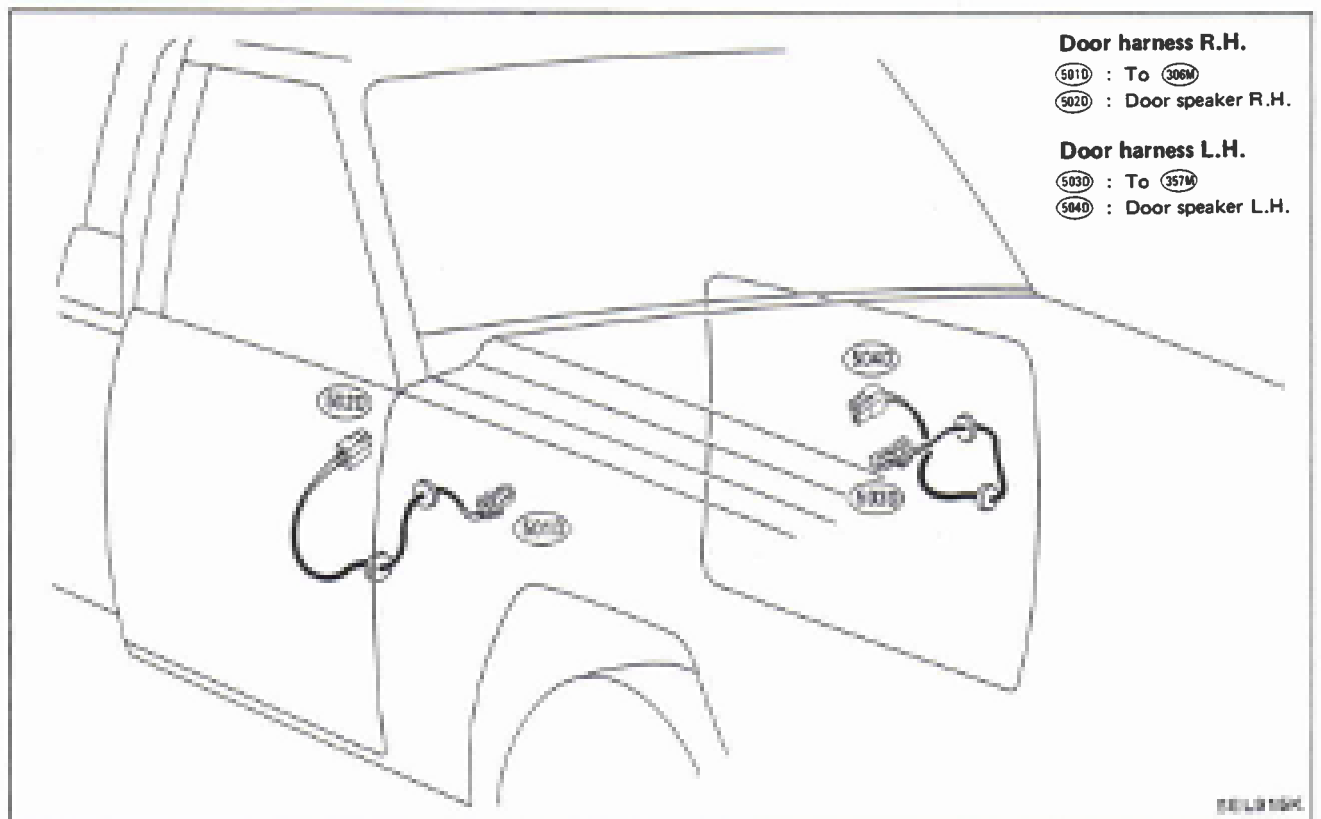
# HARNES LAYOUT

## Door Harness (Cont'd)

### PICKUP L.H. DRIVE MODEL



### PICKUP R.H. DRIVE MODEL



**Back door L.H. sub-harness**

- 1B : To 9C (Wagon model)  
To 109C (Hardtop model)
- 2B : To 8C (Wagon model)  
To 108C (Hardtop model)
- 3B : To 7C (Wagon model)  
To 107C (Hardtop model)
- 4B : Rear combination lamp L.H.
- 6B : To 11B
- 6B : To 12B
- 7B : To 13B

**Back door L.H. harness**

- 11B : To 6B
- 12B : To 6B
- 13B : To 7B
- 14B : To 21B
- 16B : Back door actuator
- 16B : Body ground
- 17B : License lamp
- 18B : Rear speaker L.H.

**Rear defogger harness L.H.**

- 21B : To 14B
- 22B : Rear defogger L.H.
- 23B : Rear defogger L.H.
- 24B : Body ground

**Back door R.H. sub-harness**

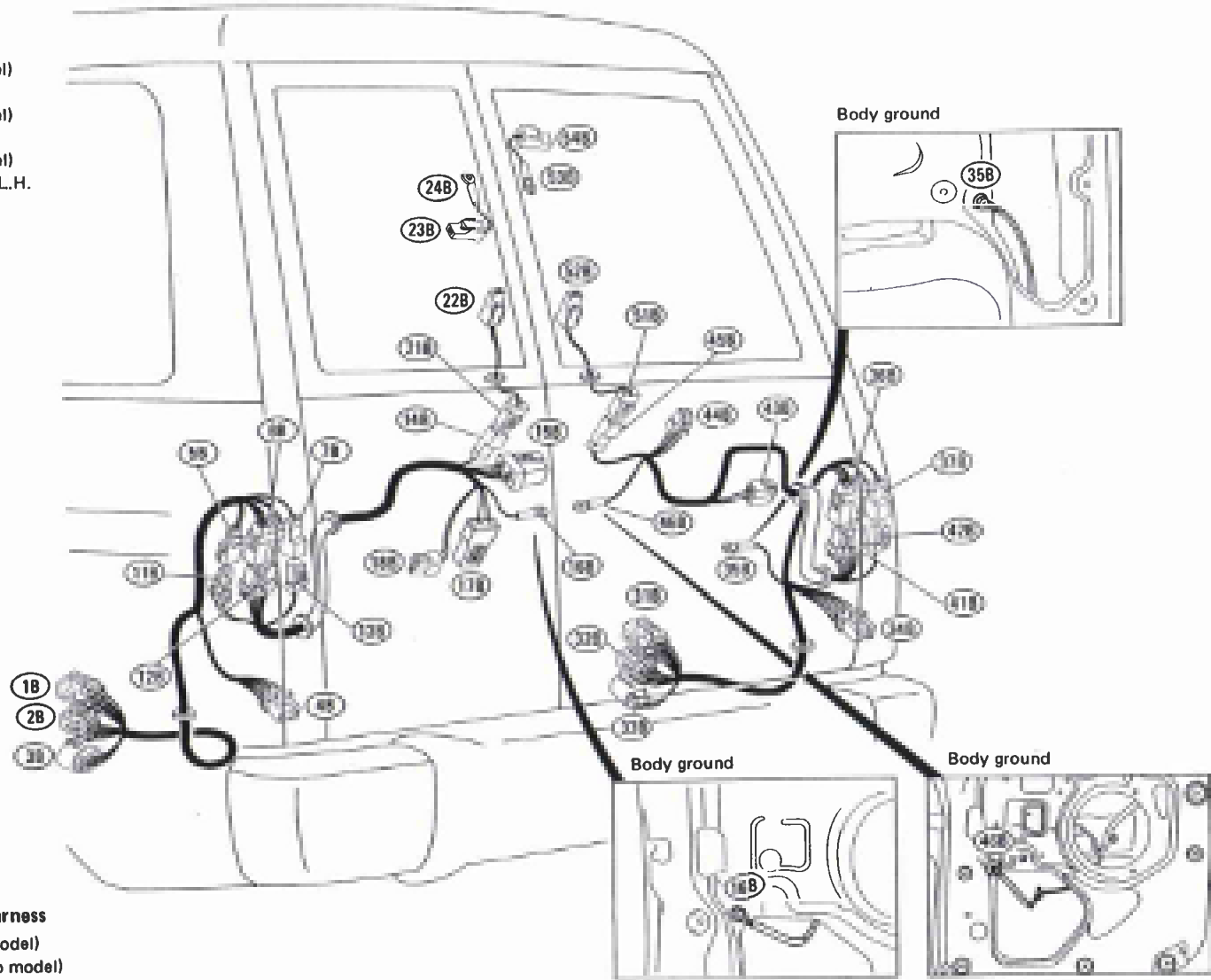
- 31B : To 13C (Wagon model)  
To 113C (Hardtop model)
- 32B : To 12C (Wagon model)  
To 112C (Hardtop model)
- 33B : To 11C (Wagon model)  
To 111C (Hardtop model)
- 34B : Rear combination lamp R.H.
- 35B : Body ground
- 36B : To 41B
- 37B : To 42B

**Back door R.H. harness**

- 41B : To 36B
- 42B : To 37B
- 43B : Rear speaker R.H.
- 44B : Rear wiper motor
- 45B : To 51B
- 46B : Body ground

**Rear defogger harness L.H.**

- 51B : To 45B
- 52B : Rear defogger R.H.
- 53B : Body ground
- 54B : Rear defogger R.H.



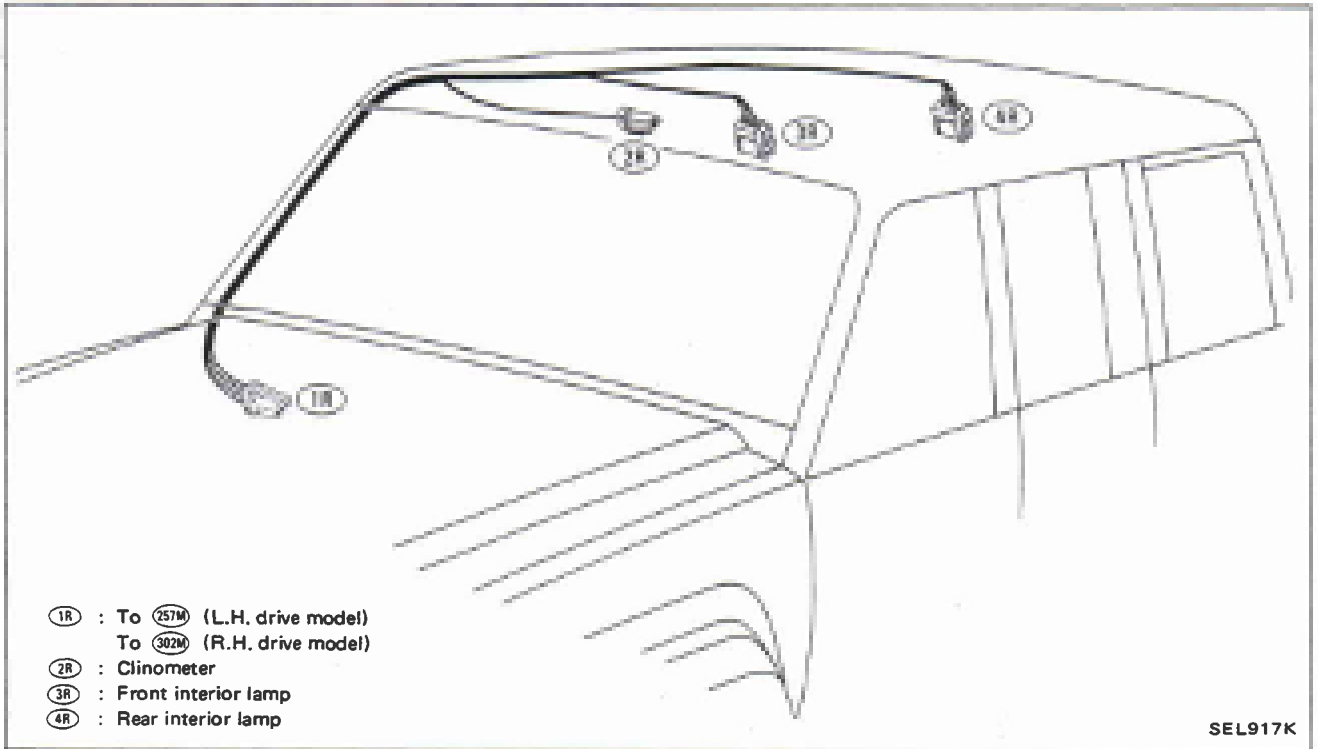
EL-93

SEL916K

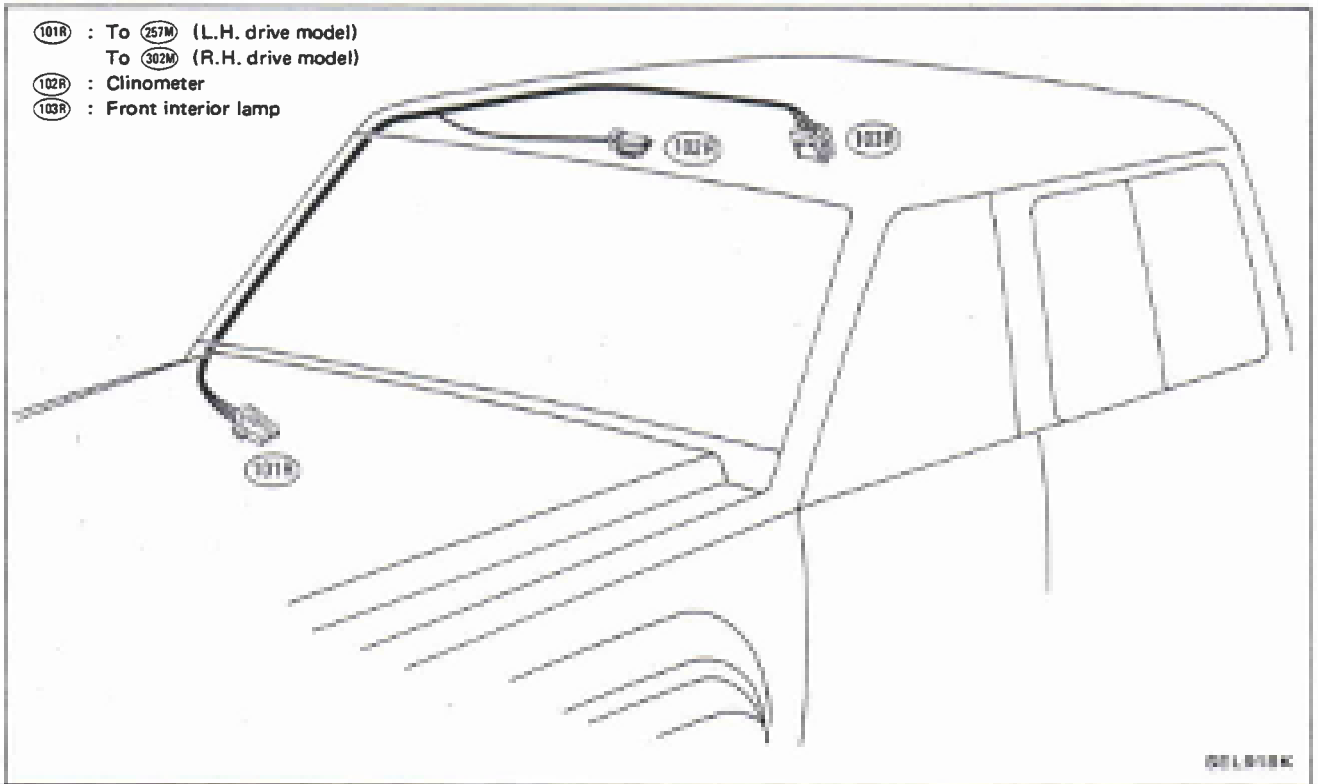
# HARNES LAYOUT

## Room Lamp Harness

### WAGON MODEL



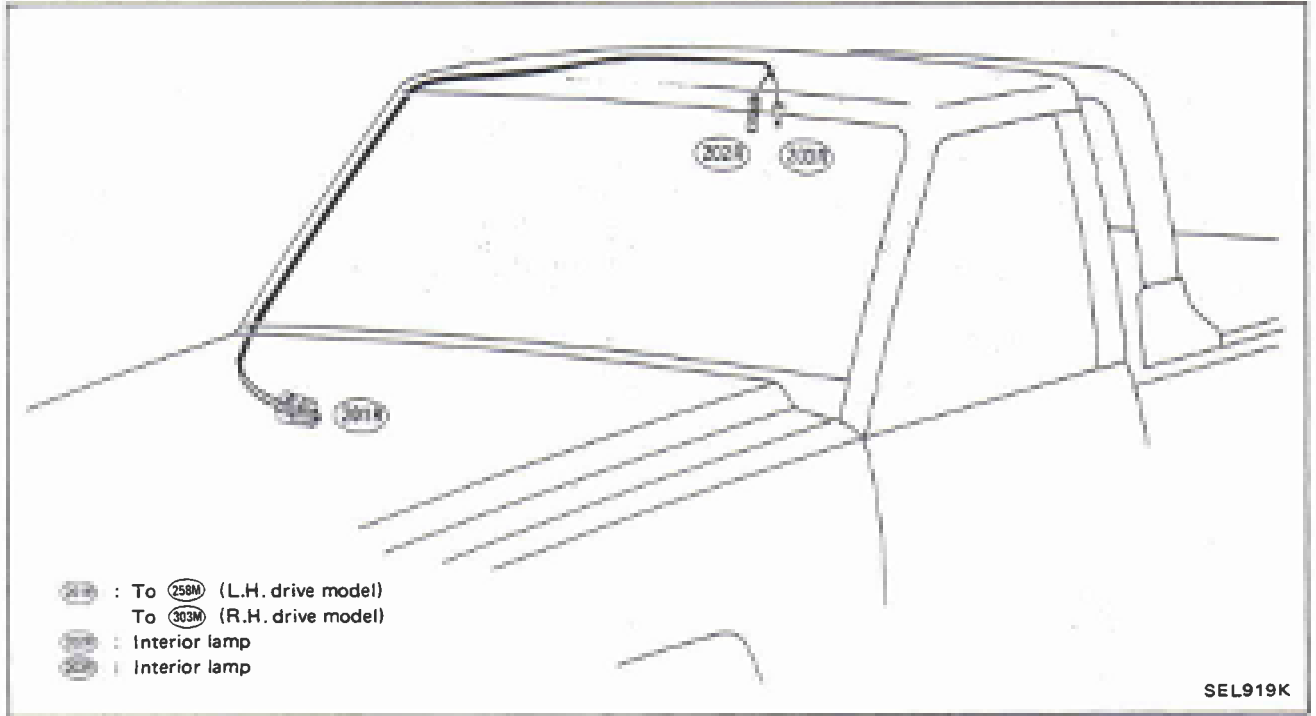
### HARDTOP MODEL



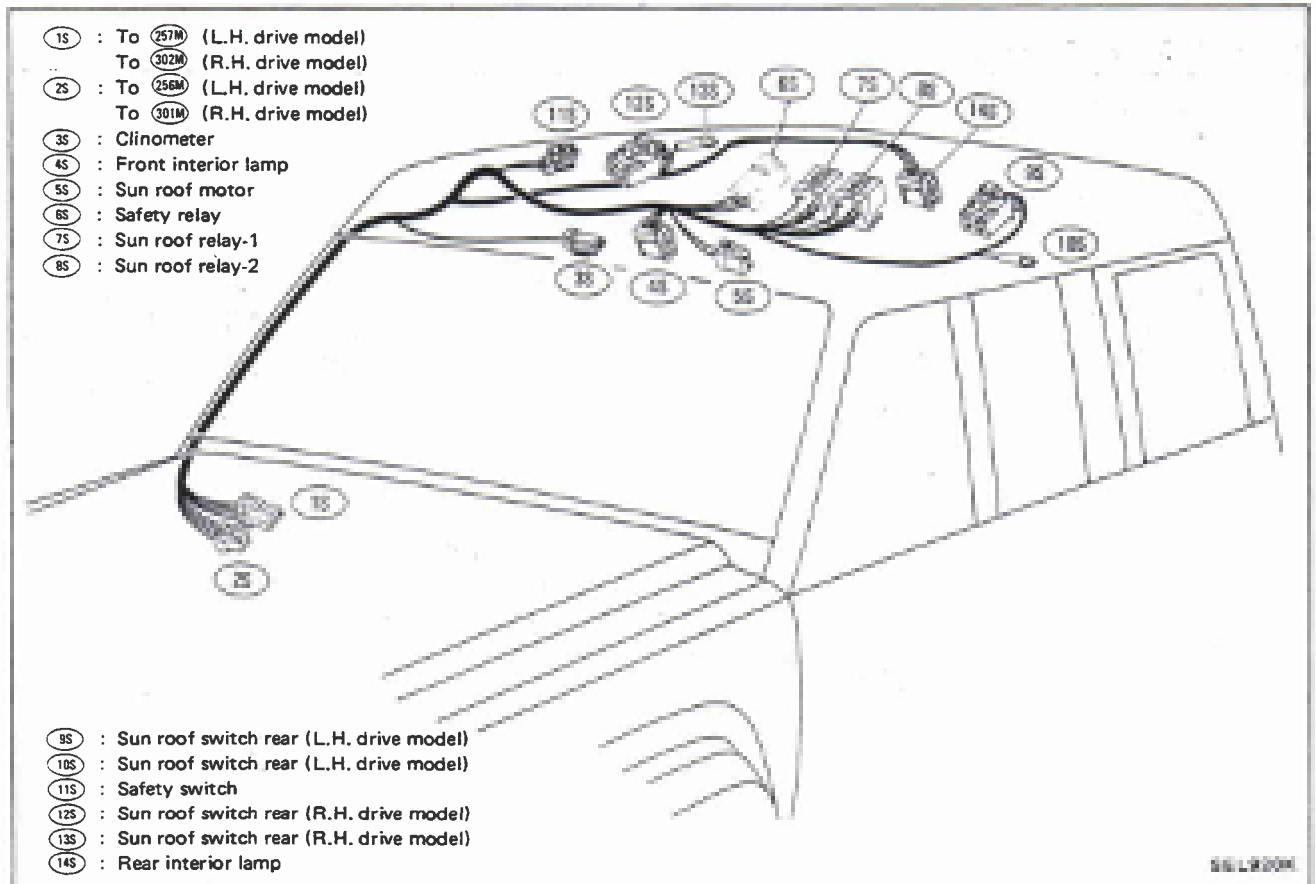
# HARNES LAYOUT

## Room Lamp and Sun Roof Harness

### PICKUP MODEL (Room lamp harness)



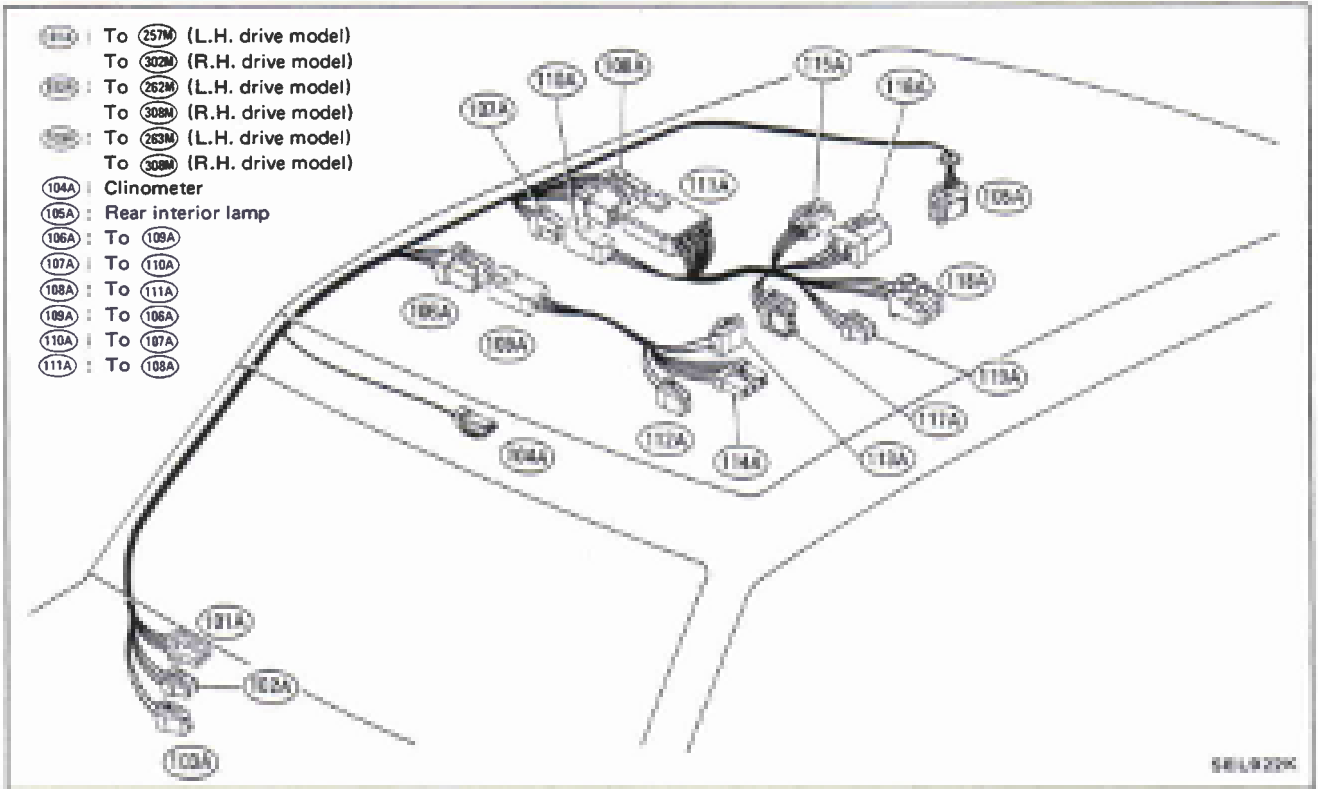
### HI-ROOF WAGON (Sun roof harness)



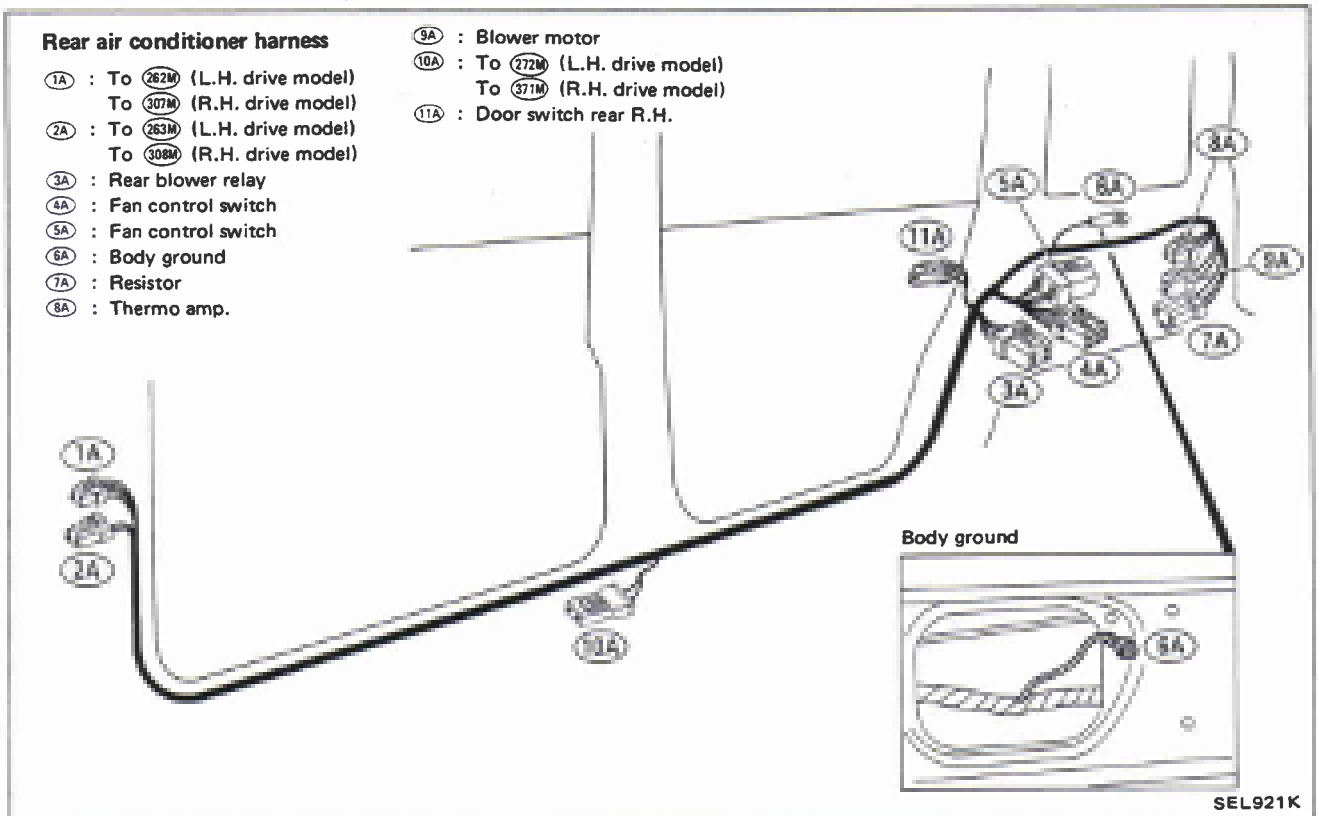
# HARNES LAYOUT

## Rear Air Conditioner Harness

### OVERHEAD TYPE REAR COOLER (TYPE 1)



### REAR COOLER (TYPE 2)





# SPECIAL EQUIPMENT

## SECTION **SE**


### CONTENTS

<hr/>	
<b>Mechanical winch</b>	
<hr/>	
PREPARATION .....	SE- 2
POWER TAKE OFF (P.T.O.) .....	SE- 3
CONTROL CABLE .....	SE- 8
DRIVE SHAFT .....	SE- 9
WINCH ASSEMBLY .....	SE-10
GEAR BOX ASSEMBLY .....	SE-11
WINCH DRUM .....	SE-14
FREE-RUNNING HUB .....	SE-16
<hr/>	
<b>Electrical winch</b>	
<hr/>	
ELECTRICAL WINCH .....	SE-18
<hr/>	
<b>Mechanical and electrical winches</b>	
<hr/>	
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .....	SE-20



## PREPARATION

### SPECIAL SERVICE TOOL

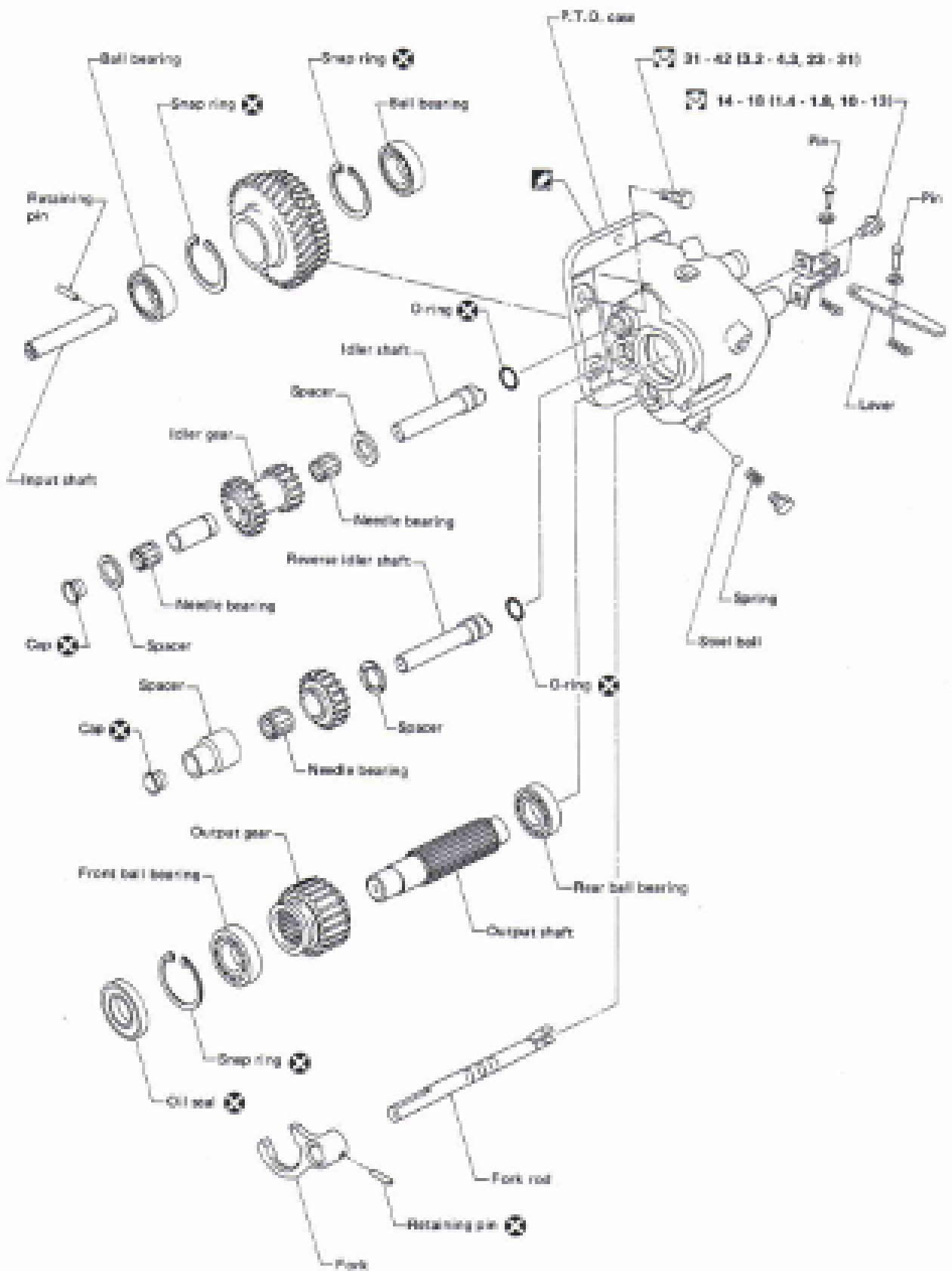
\*: Special tool or commercial equivalent

Tool number Tool name	Description
ST3127S000* ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter	 <p>Measuring turning torque</p>

### COMMERCIAL SERVICE TOOLS

Tool name	Description
Drift	 <p>a: 44 mm (1.73 in) dia. b: 22 mm (0.87 in) dia.</p> <p style="text-align: right;">Installing oil seal</p>
Drift	 <p>a = 23 mm (0.91 in) dia. b = 19 mm (0.75 in) dia. c = 90 mm (3.54 in)</p> <p style="text-align: right;">Installing output shaft</p>

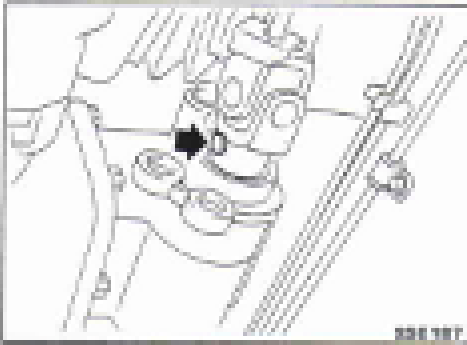
# POWER TAKE OFF (P.T.O.)



: N·m (kg·m, ft·lb)

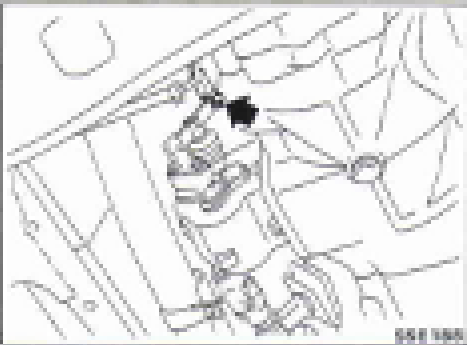
SSE186

## POWER TAKE OFF (P.T.O.)

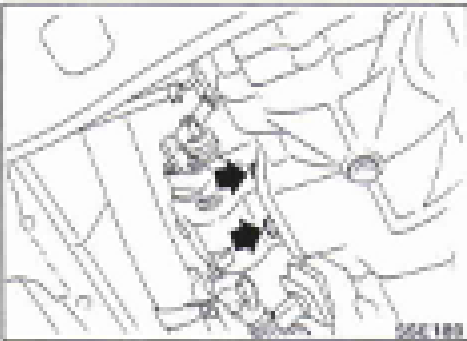


### Removal

1. Drain oil from transmission case.
2. Remove pin from drive shaft.



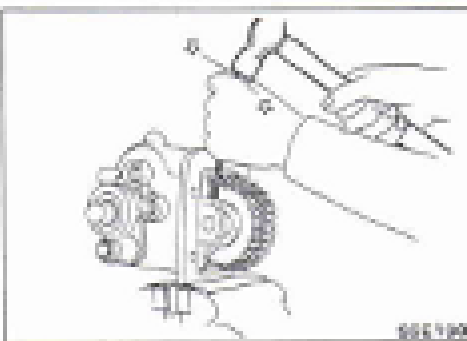
3. Remove P.T.O. control cable.



4. Remove P.T.O. unit.

### Installation

- Before installing, clean mating surfaces of P.T.O. case and transmission case.
- Remove filler plug and fill transmission with recommended gear oil.
- Apply sealant to threads of filler plug, and install P.T.O. unit to transmission case.  
Refer to MT section.



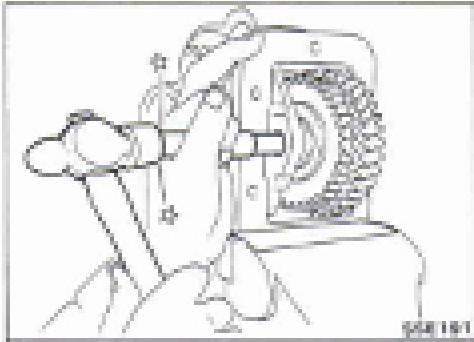
### Disassembly

1. Remove retaining pin.

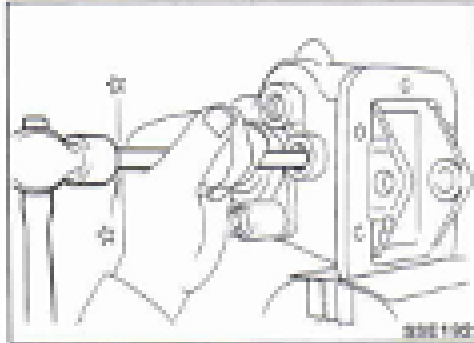
## POWER TAKE OFF (P.T.O.)

### Disassembly (Cont'd)

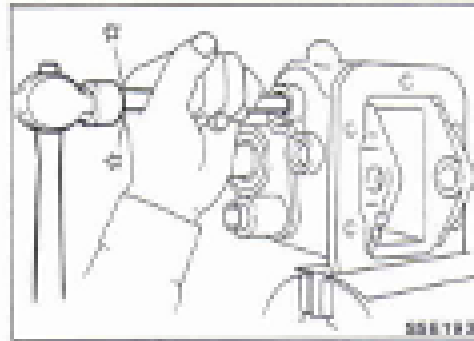
2. Remove input shaft.



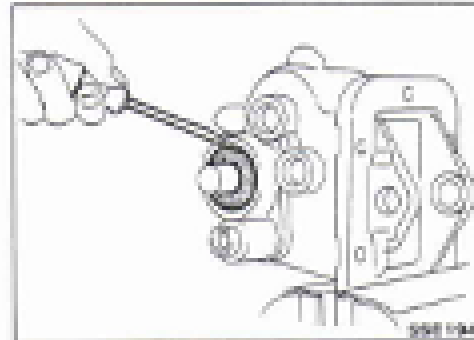
3. Remove idler shaft.



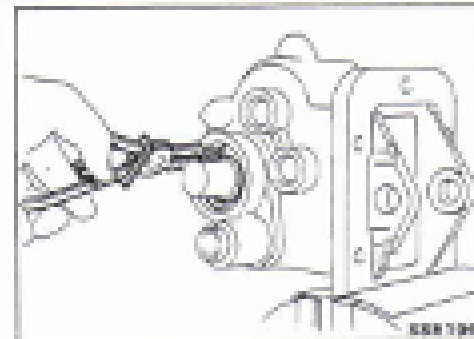
4. Remove reverse idler shaft.



5. Remove oil seal.

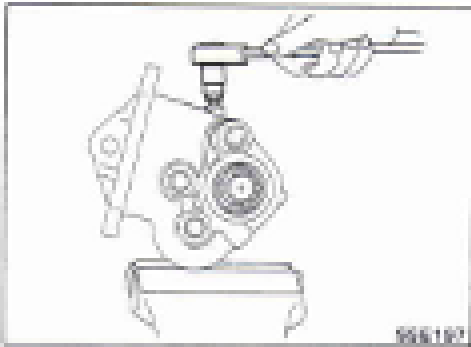


6. Remove snap ring.

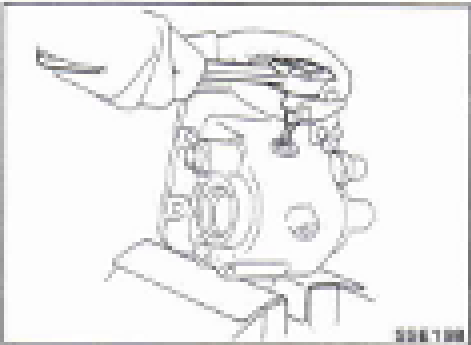


## POWER TAKE OFF (P.T.O.)

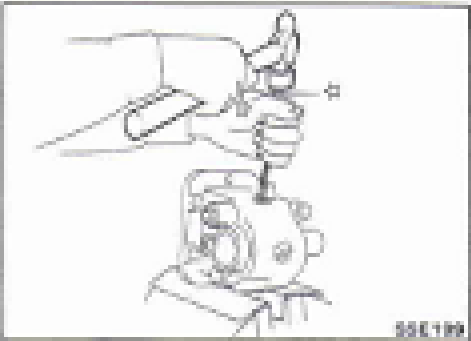
### Disassembly (Cont'd)



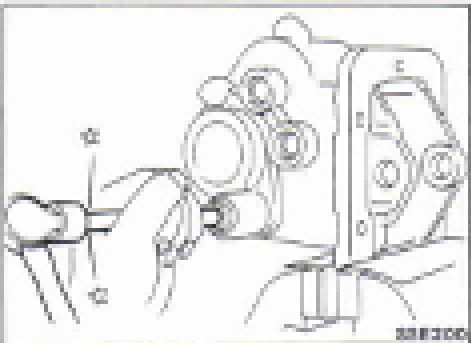
7. Remove screw.
8. Remove output shaft.



9. Remove screw.



10. Remove pin.



11. Remove lever.

### Inspection

#### P.T.O. CASE

- Clean with solvent and check for cracks or chips.
- Check mating surface of P.T.O. case for small nicks or projection.  
Replace if necessary.

#### GEARS AND SHAFTS

- Check all gears for excessive wear, chips or cracks.  
Replace if necessary.
- Check shaft for bending, cracks, wear, and worn splines.  
Replace if necessary.

## POWER TAKE OFF (P.T.O.)

### Inspection (Cont'd)

#### END PLAY

- After assembling P.T.O. unit, check idler gear and reverse gear end plays.

#### Standard end play:

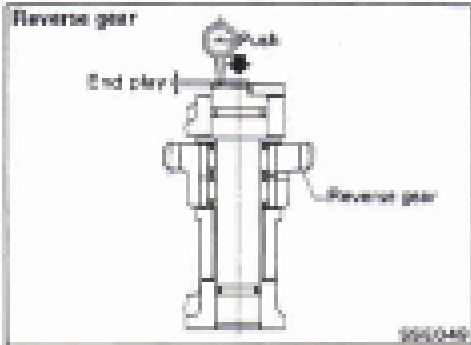
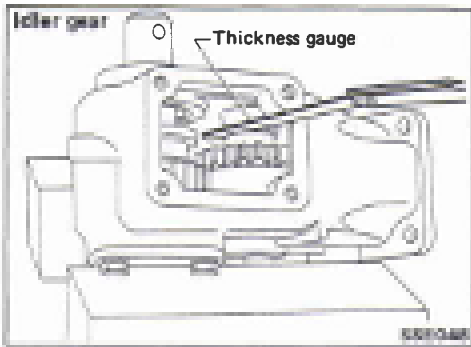
##### Reverse gear

0.02 - 0.50 mm (0.0008 - 0.0197 in)

##### Idler gear

0.02 - 0.50 mm (0.0008 - 0.0197 in)

- If end play is out of specified limit, disassemble and check parts for condition.  
Replace if necessary.



#### BEARINGS

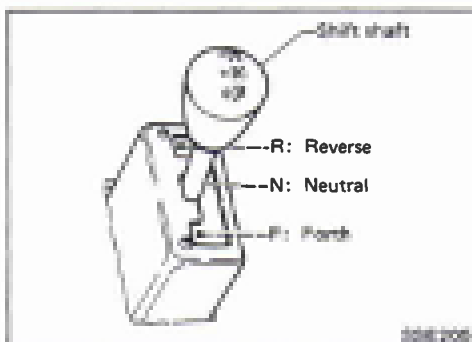
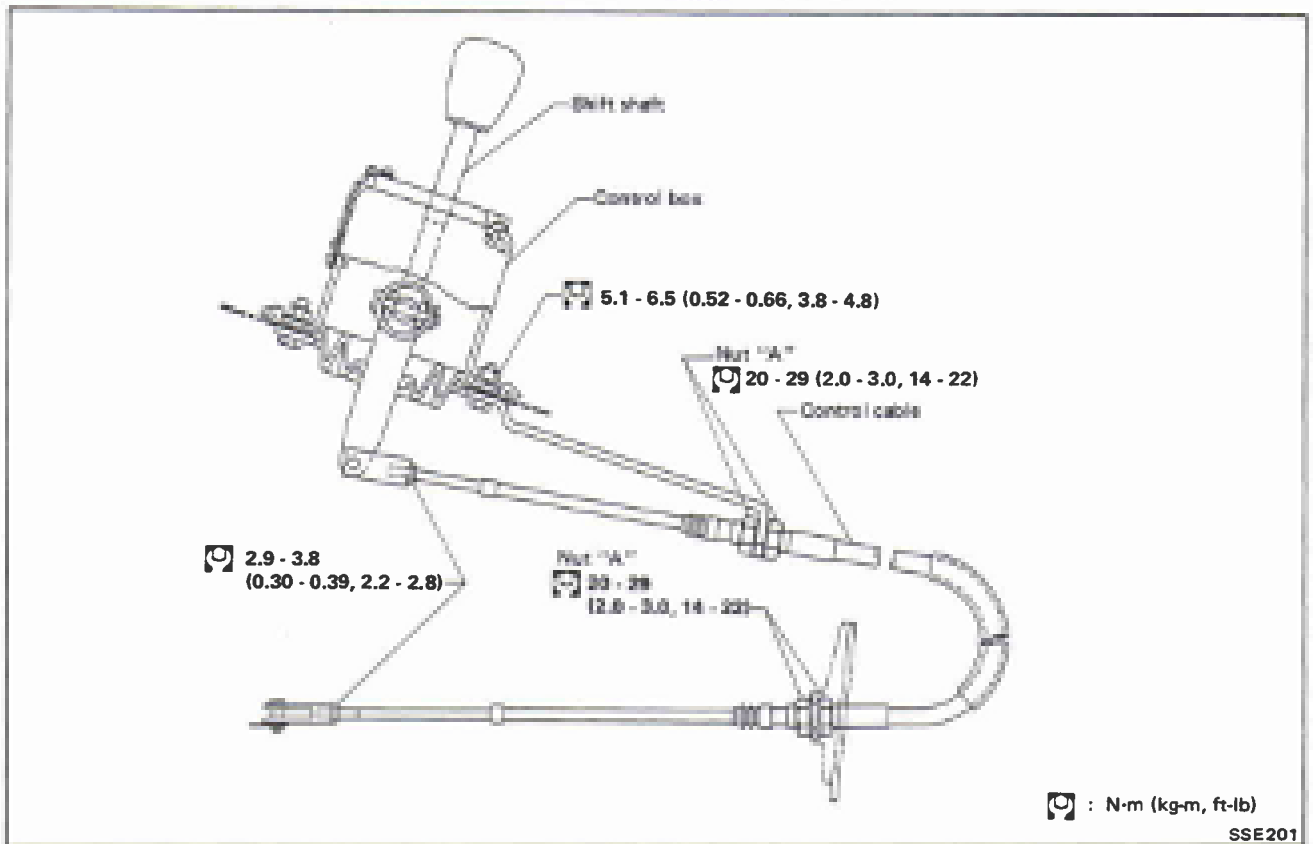
- Check race and ball surfaces for worn or rough.
- Check needle bearing for worn or damaged.  
Replace bearing if necessary.

#### OIL SEALS

- Check oil seal lip contacting with shaft.  
Replace if necessary.

# CONTROL CABLE

## Removal and Installation



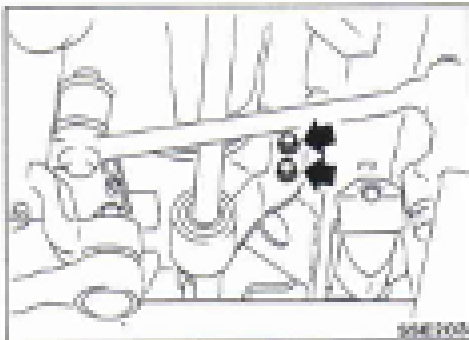
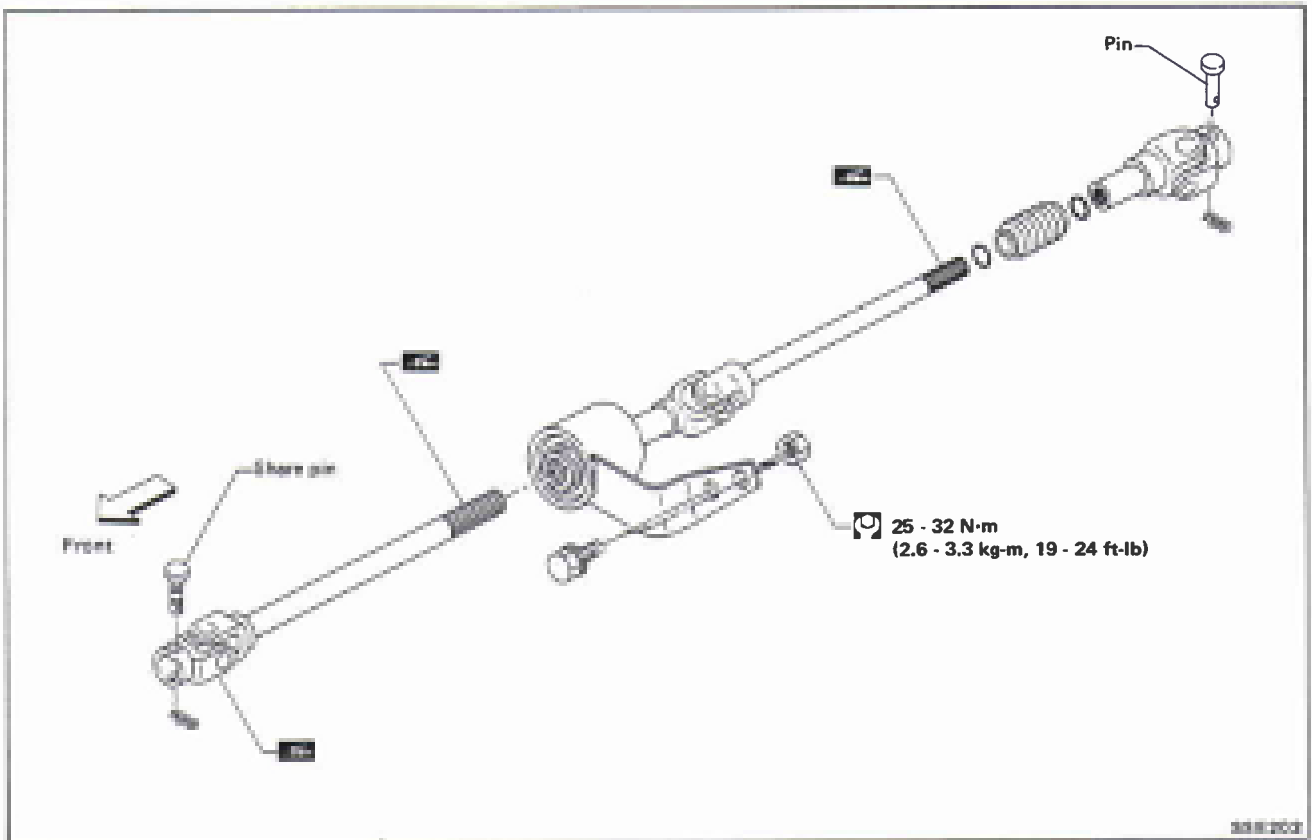
## Adjustment

1. Set shift shaft at "F" position.
2. Loosen nuts "A" and set them in middle portion of threads.
3. Tighten nuts "A".
4. Make sure that shift shaft can be shifted at all positions and moves smoothly.



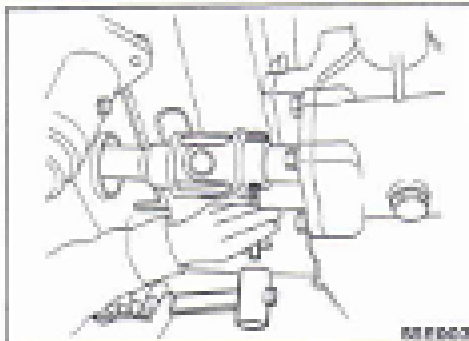
## DRIVE SHAFT

### Removal and Installation



### Removal

1. Remove center bearing bracket securing bolts.

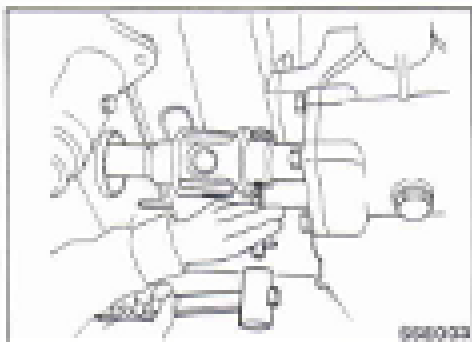
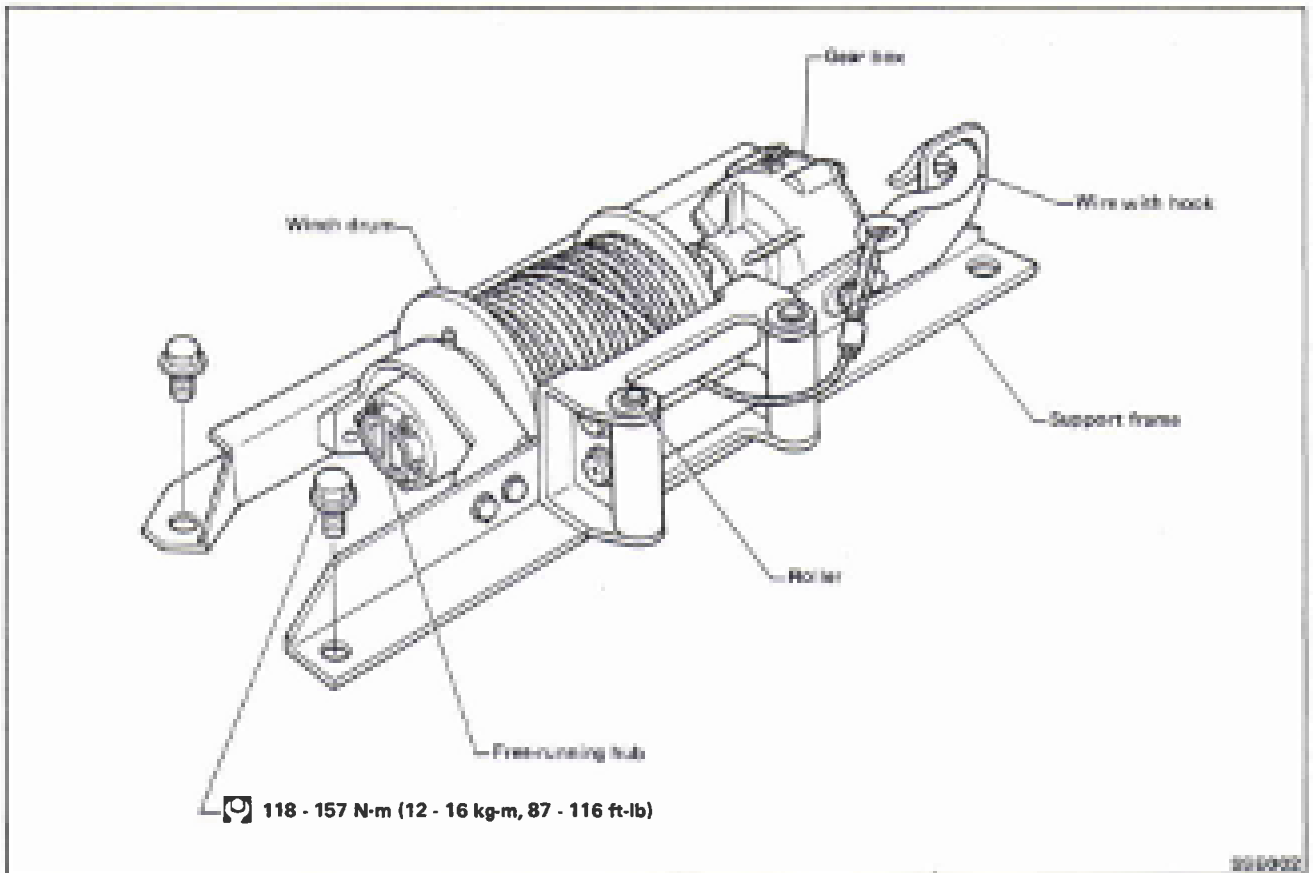


2. Disconnect share pin on winch side. If it proves difficult to remove, knock it out with a suitable tool.

### Inspection

- Check splined shaft for excessive play, wear or damage and replace as an assembly if required.
- Check joint and shear pin for any bends or deformation.

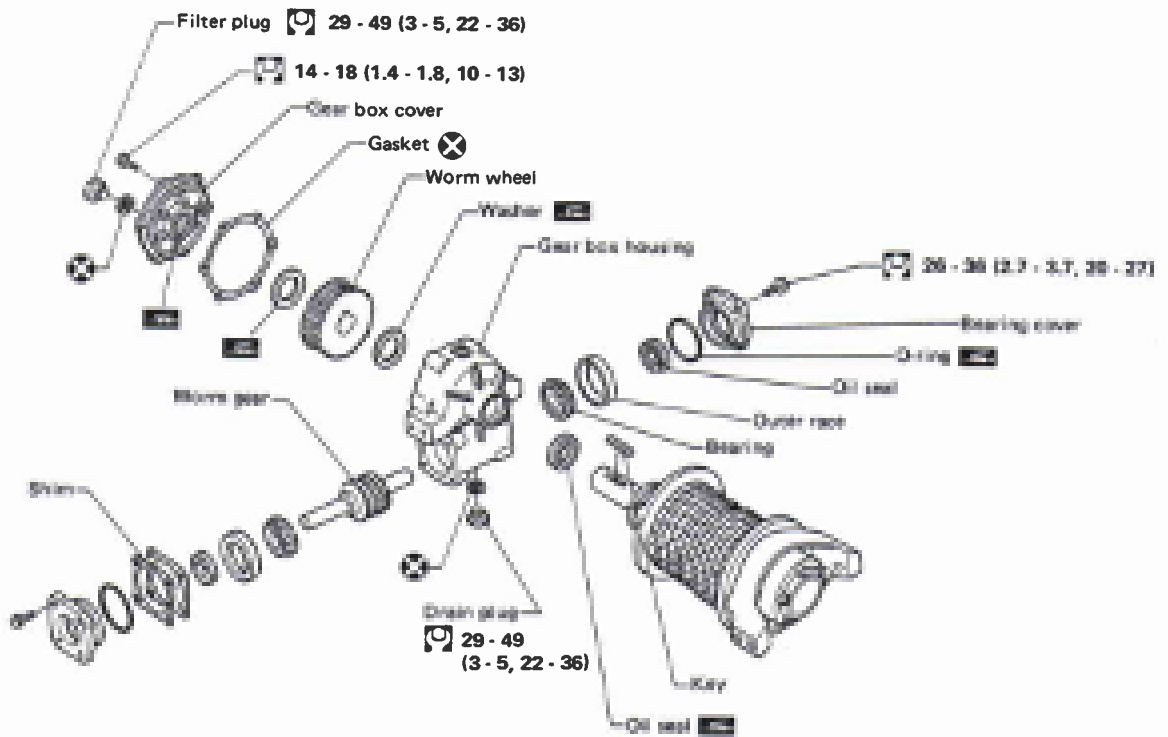
## WINCH ASSEMBLY



### Removal

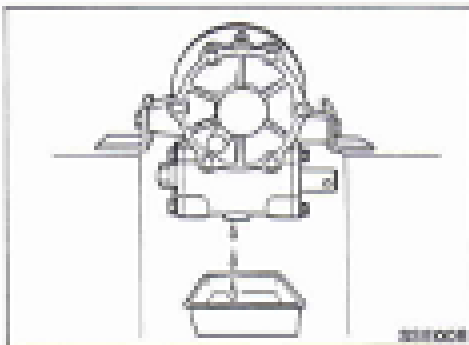
1. Remove shear pin with a suitable tool.
2. Remove bumper assembly.  
**Refer to BF section.**

# GEAR BOX ASSEMBLY



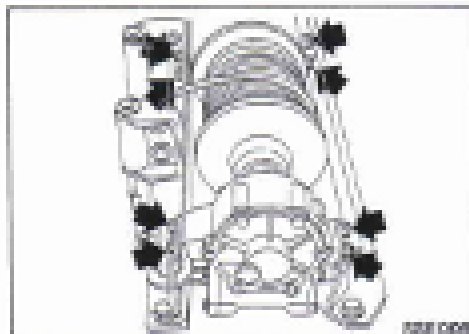
: N·m (kg·m, ft·lb)

ISEE 000



## Disassembly

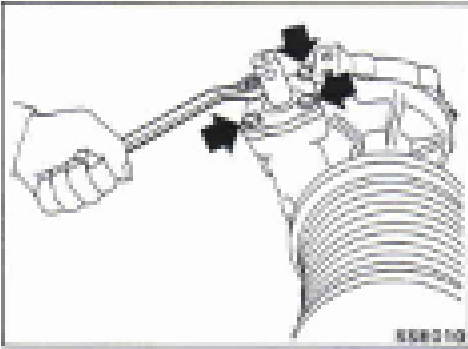
1. Drain gear box oil.



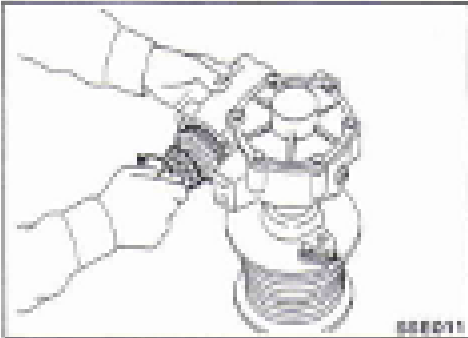
2. Remove support frame.

## GEAR BOX ASSEMBLY

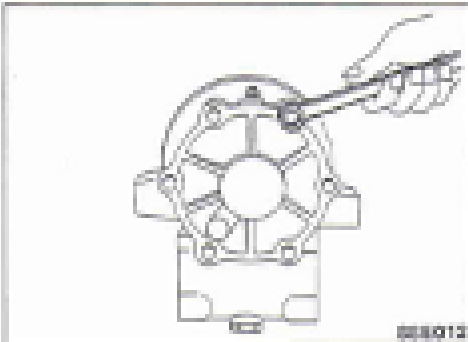
### Disassembly (Cont'd)



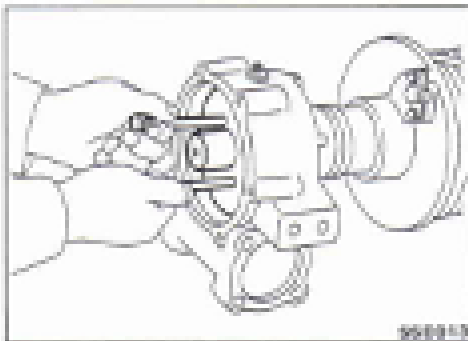
3. Remove both side bearing covers.



4. Turn worm gear counterclockwise to remove it.



5. Remove gear box cover.



6. Remove worm wheel, key and washer.

7. Remove gear box housing.

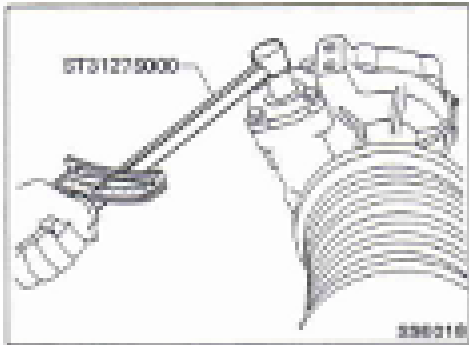
### Inspection

Check the following parts for excessive wear, chips or cracks.

- Support frame
- Worm gear
- Gear box cover
- Bearing cover
- Gear box housing
- Oil seal

Replace if necessary.

## GEAR BOX ASSEMBLY

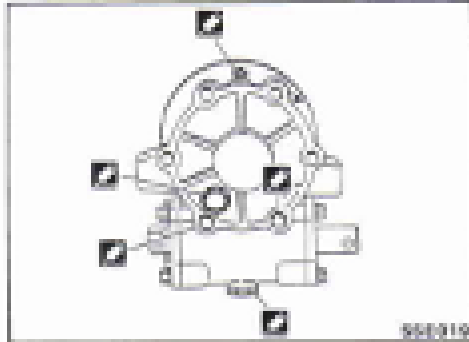


### Assembly

1. After worm gear, bearings and bearing covers have been installed, check preload to determine the required number of shims to be used.

#### Turning torque:

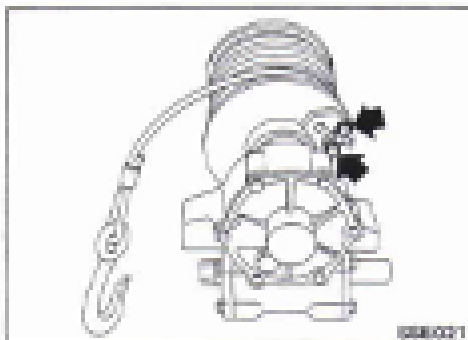
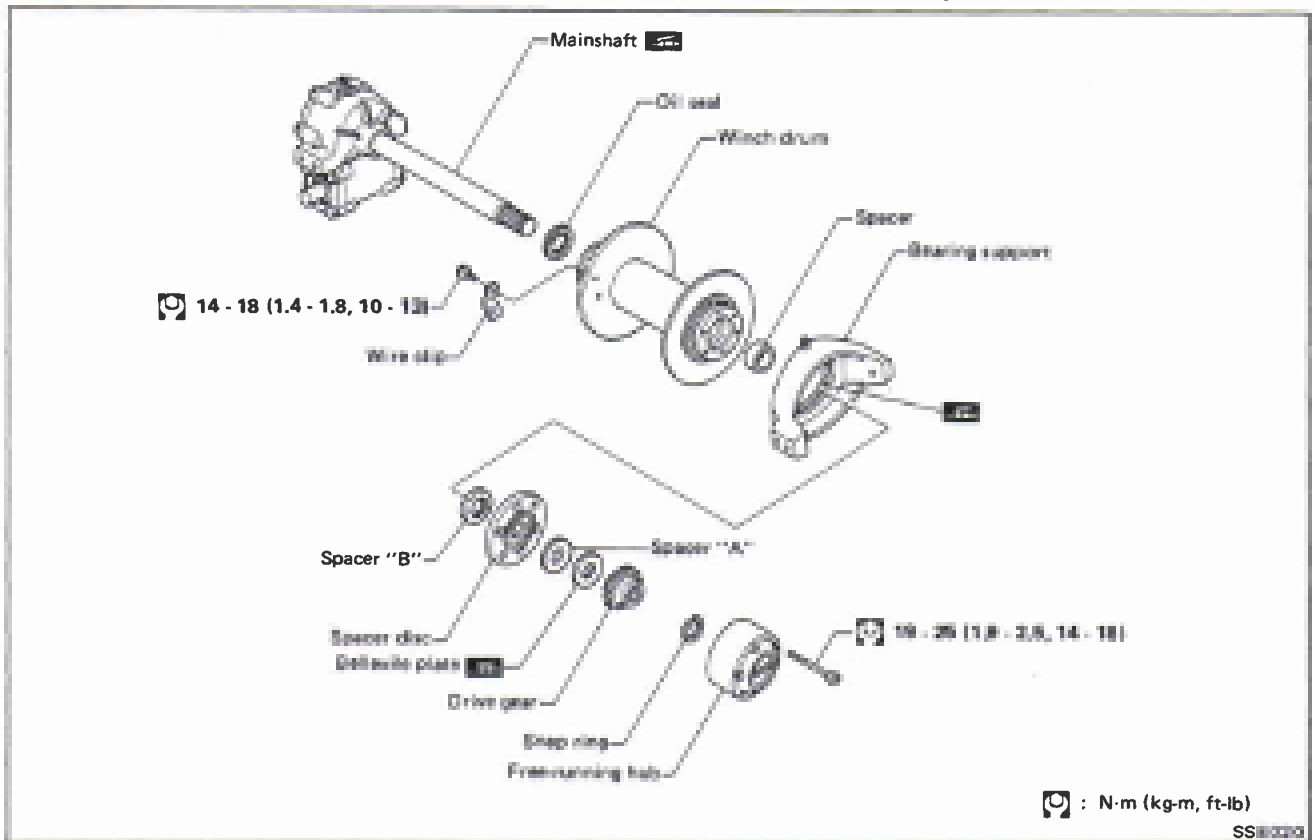
1 - 3 N·m (0.1 - 0.3 kg-m, 0.7 - 2.2 ft-lb)



2. Apply sealant to points indicated in the figure at left.

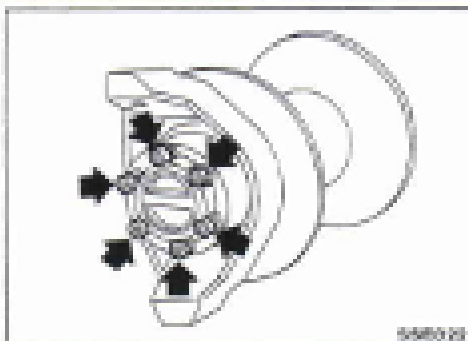
# WINCH DRUM

## Disassembly and Assembly



### Disassembly

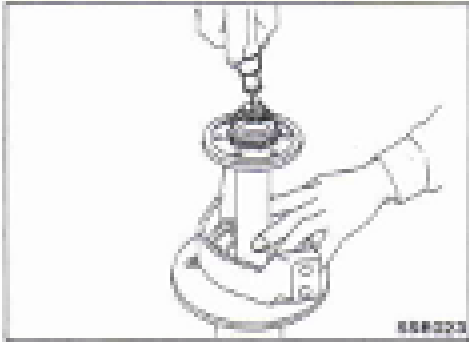
1. Remove wire (Free-running hub in "FREE" position).



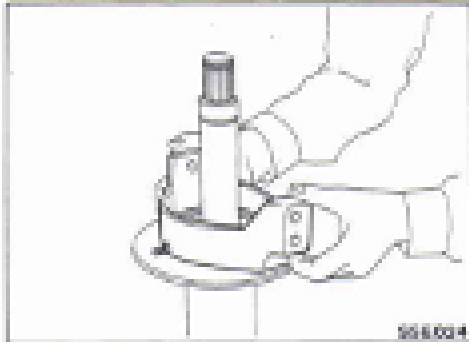
2. Remove free-running hub assembly.

## WINCH DRUM

### Disassembly (Cont'd)



3. Remove snap ring, drive gear and spacer "A".



4. Remove spacer disc and bearing support.

5. Remove spacer "B" and winch drum.

### Inspection

Check the following parts for cracks and deformation.

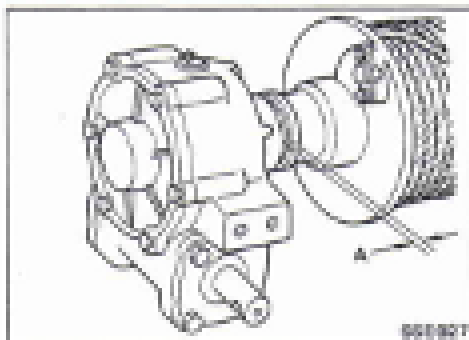
- Bearing support
- Winch drum
- Drive gear
- Free-running hub
- Wire
- Oil seal

### Assembly

1. After winch drum has been installed, check clearance "A".

**Clearance "A":**

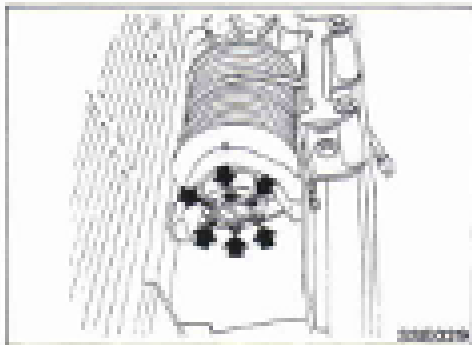
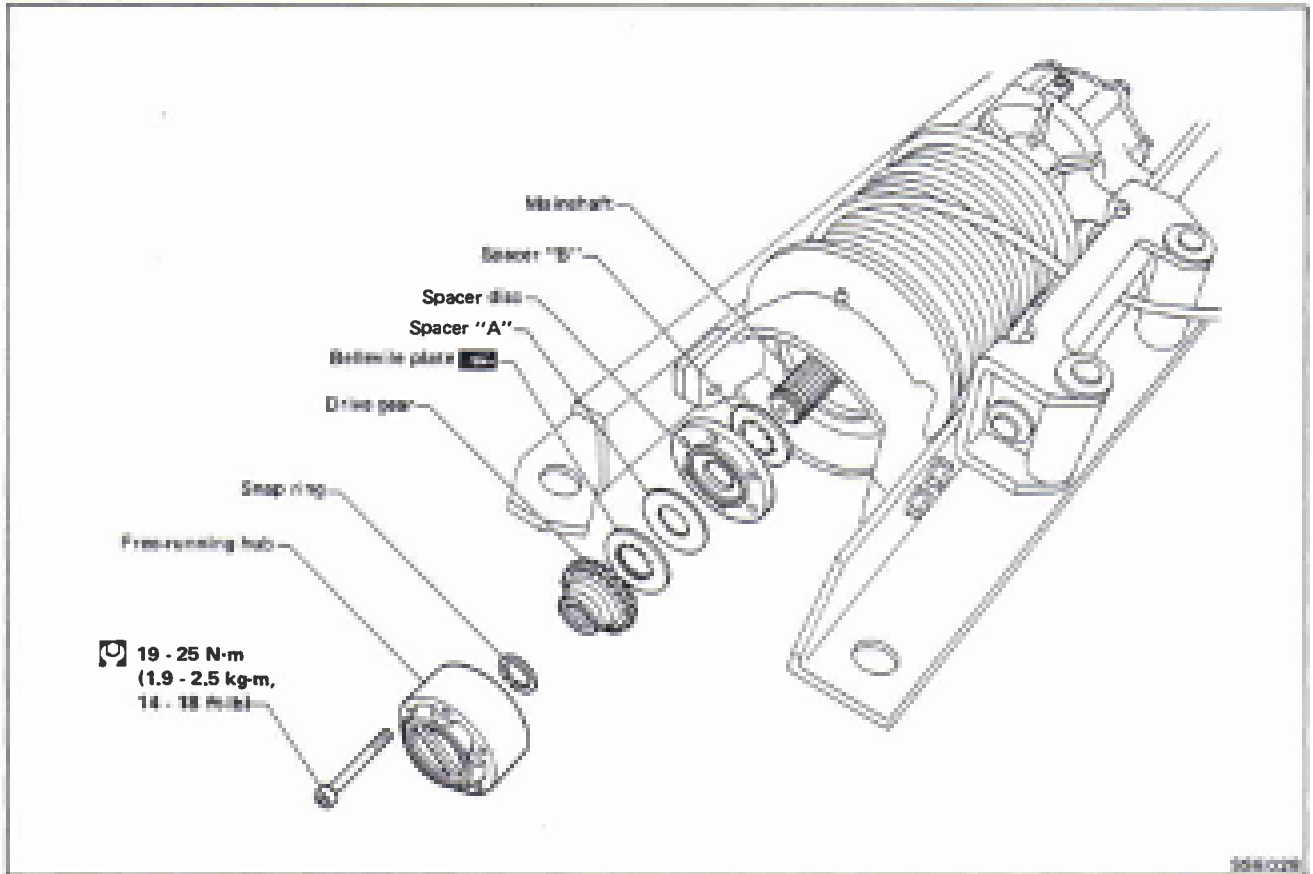
**1 mm (0.04 in) or more**



2. Make sure that winch drum and free-running hub **knob** rotate smoothly.

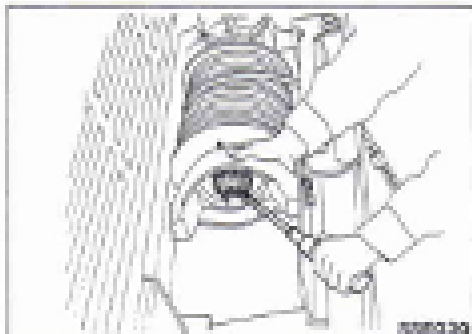
3. Always wind wire on the drum neatly.

## FREE-RUNNING HUB



### Removal

1. Remove free-running hub.



2. Remove snap ring and drive gear.



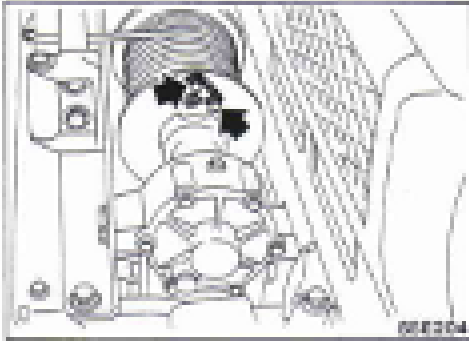
## FREE-RUNNING HUB

### Inspection

Check the following parts for excessive wear, chips or cracks.

- Free-running hub
- Drive gear

Replace if necessary.

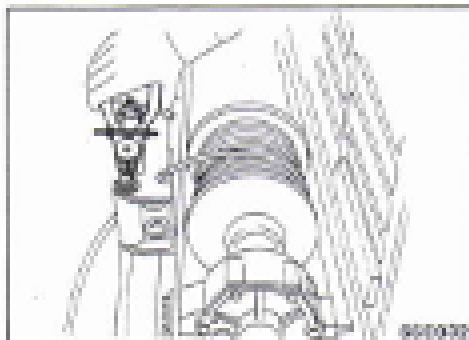


### WIRE REPLACEMENT (On-vehicle)

1. Remove wire clamp and wire.

2. Install new wire.

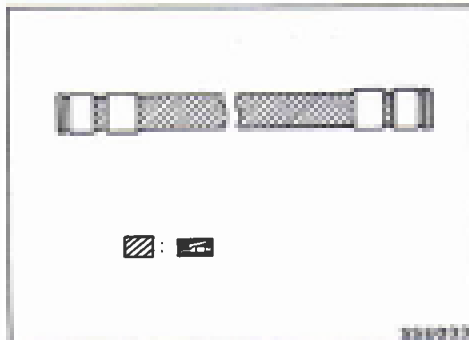
**Always wind wire on the drum neatly.**



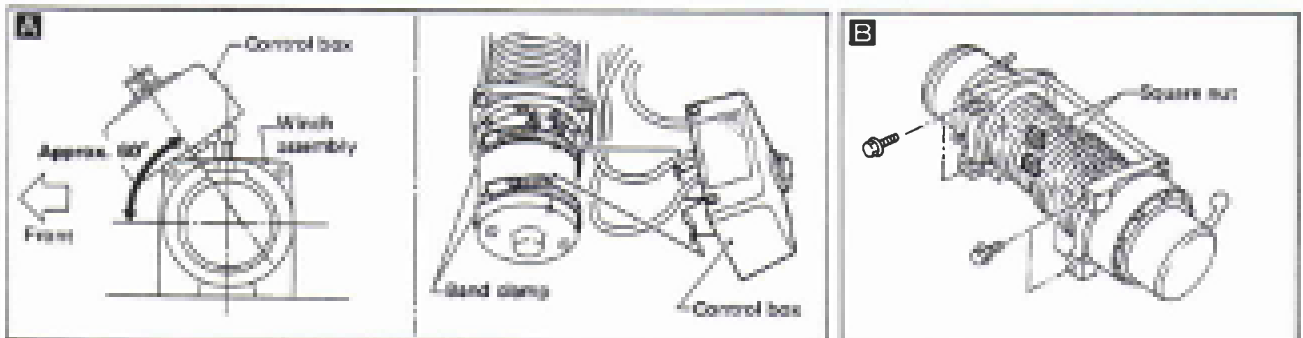
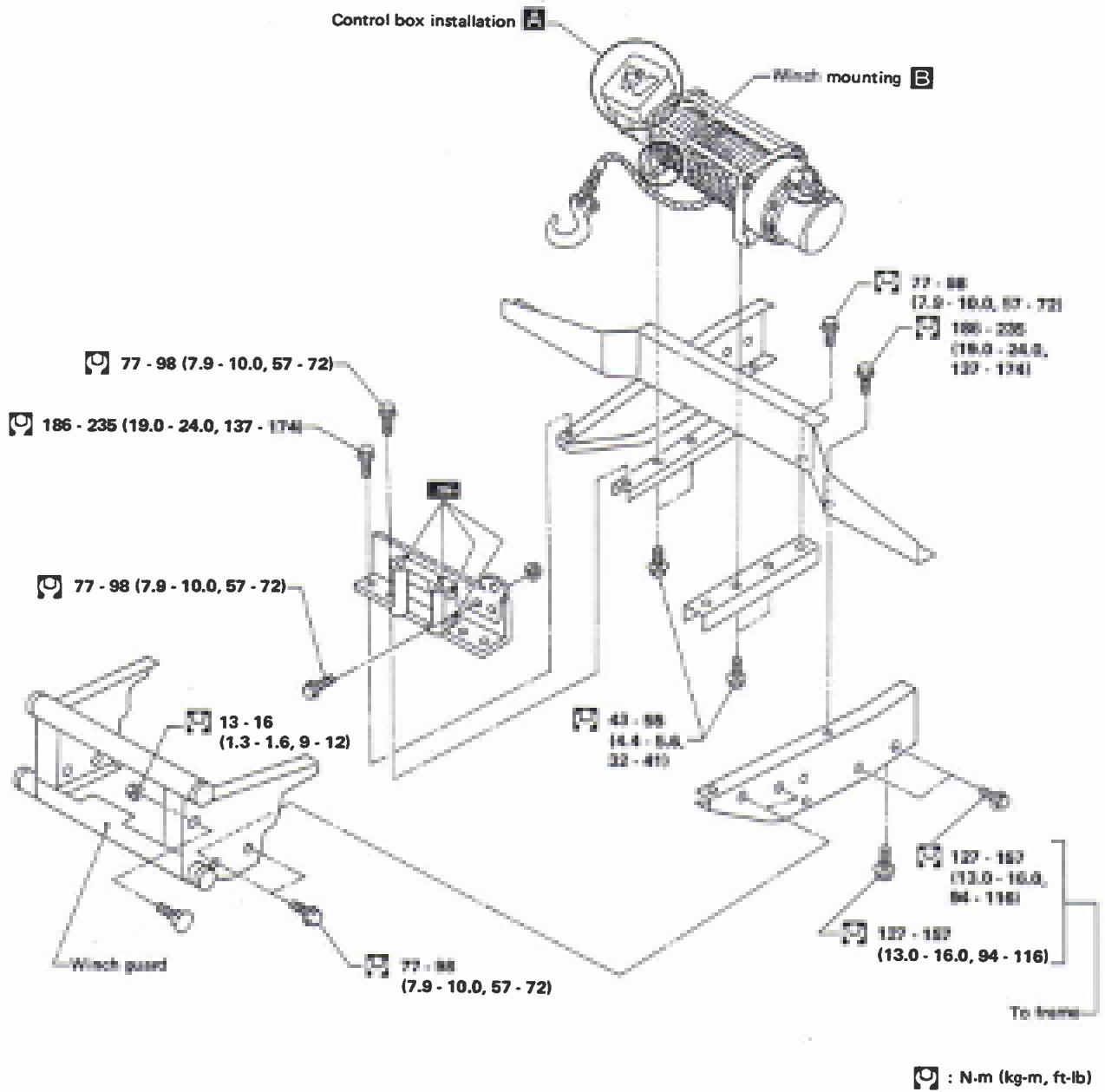
### ROLLER REPLACEMENT (On-vehicle)

1. Remove roller shaft snap ring, then roller shaft and roller.

2. Apply grease to roller shaft surface.



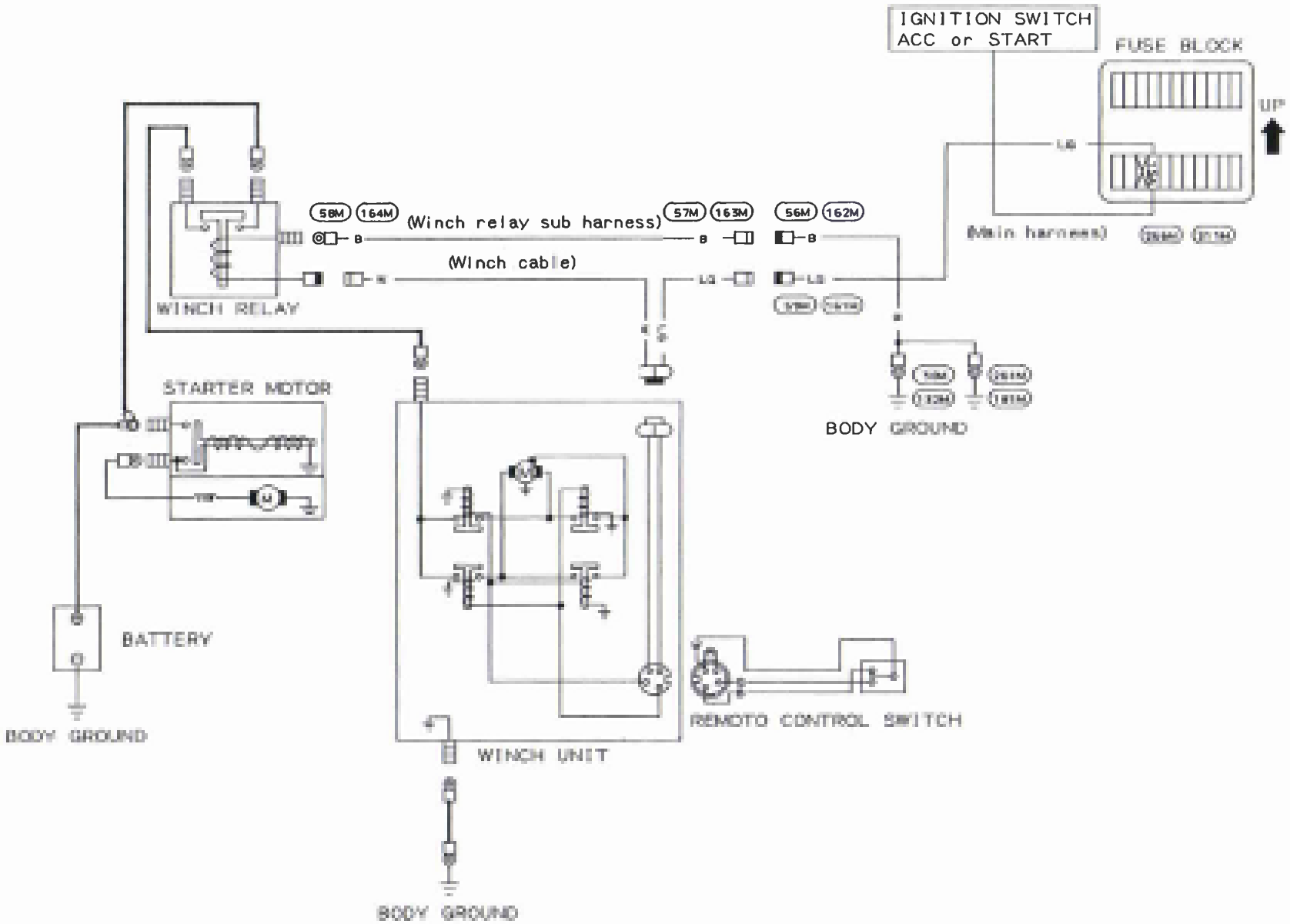
# ELECTRICAL WINCH



888 184

ELECTRICAL WINCH

Wiring Diagram



SE-19

5/21/88

# SERVICE DATA AND SPECIFICATIONS (S.D.S.)

## General Specifications

### POWER TAKE OFF

Gear ratio Forth	0.928
Reverse	1.188

### WINCH SYSTEM (MECHANICAL)

Capacity	14,711 N (1,500 kg, 3,308 lb)
Wire size (diameter x length)	8 mm x 40 m (0.31 in x 131 ft)
Wire winding speed/ Engine speed	10 m (33 ft)/min./ 1,000 rpm
Type of winch oil	Mobile cylinder oil 680W or equivalent
Oil capacity	0.46 (2 1/4 imp pt)

### WINCH SYSTEM (ELECTRICAL)

Capacity	9,807 N (1,000 kg, 2,205 lb)
Time limit	2.5 sec.
Wire winding speed	6.6 m (21.7 ft)/min.
Wire size (diameter x length)	8 mm x 24 m (0.31 in x 79 ft)

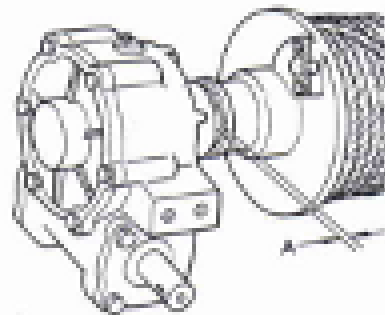
## Inspection and Adjustment

### POWER TAKE OFF

End play	mm (in)	
Reverse gear		0.02 - 0.50 (0.0008 - 0.0197)
Idler gear		0.02 - 0.50 (0.0008 - 0.0197)

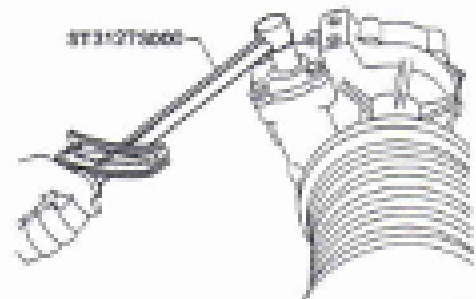
### WINCH ASSEMBLY

Winch drum and gear box clearance	1 mm (0.04 in) or more
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SSE027

Worm gear turning torque	1 - 3 N·m (0.1 - 0.3 kg·m, 0.7 - 2.2 ft·lb)
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SSE018