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Section 00

Precautions

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Precautions

Precautions

General Precautions

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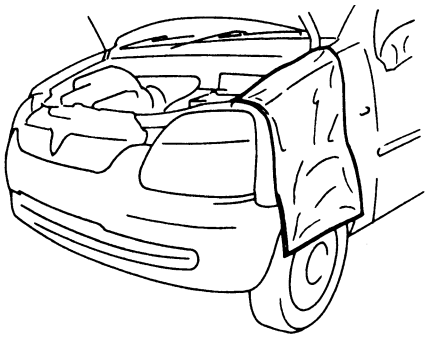
The WARNING and CAUTION describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures, but they will not necessarily be repeated for every procedure to which they apply.

⚠ WARNING

Failure to take proper precautions when servicing a vehicle can cause severe personal injury.

- **Whenever raising a vehicle for service, be sure to follow the instructions under "Vehicle Lifting Points" in Section 0A (Page 0A-7).**
- **If the service work being performed requires running the engine, make sure that the parking brake is fully set, block drive wheels and the transaxle is in "Neutral" or "P" range.**
  Also keep hands, hair, clothing, tools, etc. away from the fan and belts while the engine is running.
- **When running the engine indoors, be sure to provide a means to force exhaust gases outdoors.**
- **Do not perform service work in areas where combustible materials can come into contact with a hot exhaust system component.**
- **Handle toxic or flammable materials (such as gasoline and refrigerant) only in a well-ventilated area.**
- **Keep away from hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler to avoid getting burned.**
- **Avoid contact with new and used engine oil. Prolonged contact with used engine oil has been proven to cause skin cancer in laboratory animals. Brief contact with used oil may irritate the skin. To minimize exposure to used engine oil, wear a long-sleeve shirt and moisture-proof gloves (such as dish washing gloves) when changing engine oil. If engine oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil. Recycle or properly dispose of used oil and filters.**
- **Whenever handling service materials, wear safety glasses to protect your eyes. Any service material getting into your eye may cause inflammation. Also wear moisture-proof gloves to protect your skin.**
- **Do not swallow any service materials. Swallowing them could cause diarrhea, nausea or other health problems. Be especially careful not to allow children and pets to swallow them.**
- **Keep all service materials out of reach of children and pets.**
- **Make sure the hood is fully closed and securely latched before driving the vehicle. If the hood is not fully closed and latched, it can fly up unexpectedly while driving, obstructing the driver's view and leading to an accident.**

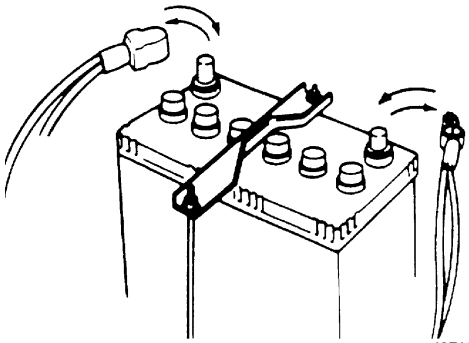
- Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g. buttons) may cause damage to the vehicle's finish.



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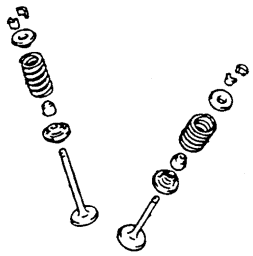
- When performing service to electrical parts that does not require use at battery power, disconnect negative (–) cable at battery.
- Before disconnecting the negative (–) cable at the battery or after connecting the cable to the battery, perform the following.
  - Check and record DTCs in all control modules if necessary before disconnecting the cable.
  - Record displayed contents of the clock, audio system, etc. before disconnecting to be able to restore the original settings after connecting the cable.
  - Perform electric throttle control system calibration referring to "Electric Throttle Control System Calibration" in Section 1C (Page 1C-3) after reconnecting the negative (–) cable at the battery.

- When removing the battery, be sure to disconnect the negative (–) cable first and then the positive (+) cable. When reconnecting the battery, connect the positive (+) cable first and then the negative (–) cable. Reinstall the terminal cover.



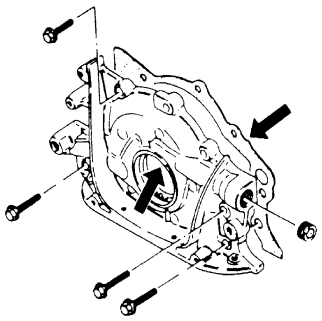
I2RH01010027-01

- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they can be reinstalled in the proper order and into the correct positions.



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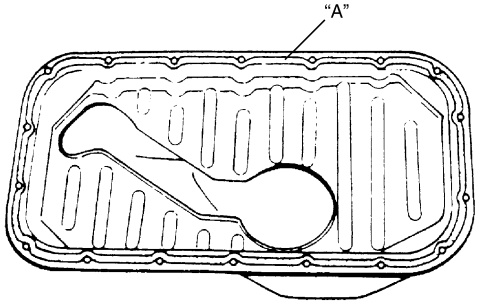
- Do not reuse oil seals, gaskets, packing, O-rings, lock washers, split pins, self-locking nuts, and other specified parts, but use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.



I2RH01010029-01

- Check that all parts used for reassembly are thoroughly clean.
  When the use of a certain type of lubricant, adhesive or sealant is specified, be sure to use only the specified material.

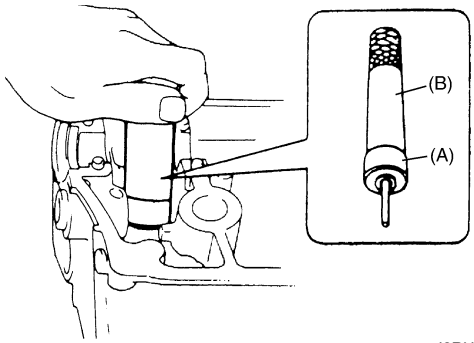
  "A": Sealant 99000–31260 (SUZUKI Bond No.1217G)



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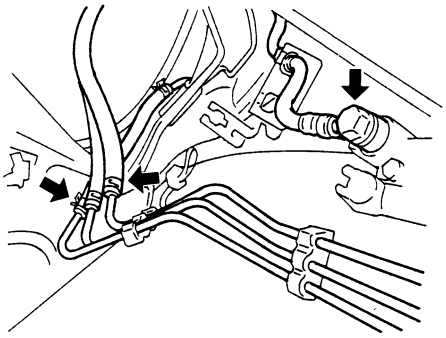
- Be sure to use special tools when instructed.

  Special tool
  (A): 09917M98221
  (B): 09916M58210



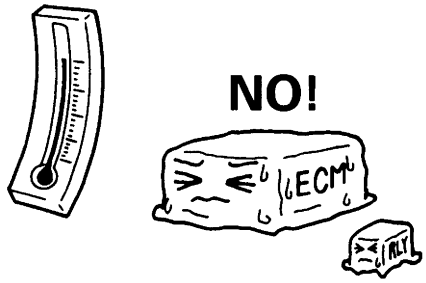
I2RH01010031-01

- After servicing any system that is concerned with fuel, oil, coolant, vacuum, exhaust gases or brakes, check all related lines for leakage.



I2RH01010033-01

- Never disconnect any of the fuel lines between fuel pump and injectors without first releasing the fuel pressure, or fuel can be sprayed out under pressure.
- When performing any work that produces a heat exceeding 80 °C (176 °F) in the vicinity of the electrical parts, remove the heat-sensitive electrical part(s) beforehand.



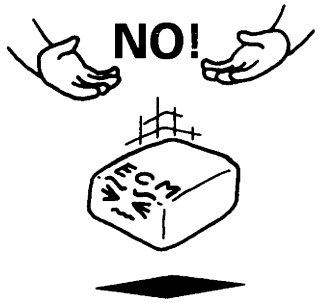
I2RH01010034-01

- Do not expose connectors and electrical parts to water, which will cause trouble to electrical systems.



I2RH01010035-01

- Do not handle electrical components (computers, relays, etc.) in a rough manner or drop them.

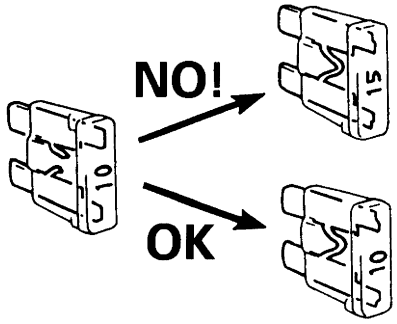


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Precautions for Electrical Circuit Service

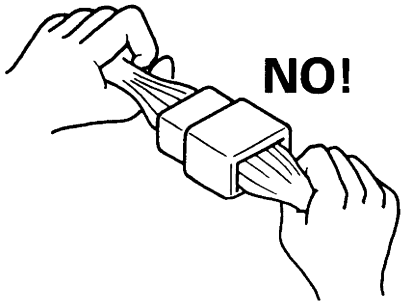
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- When replacing a fuse, make sure to use a fuse of the specified capacity. Use of a fuse with a larger capacity will cause a damage to electrical parts and fire.



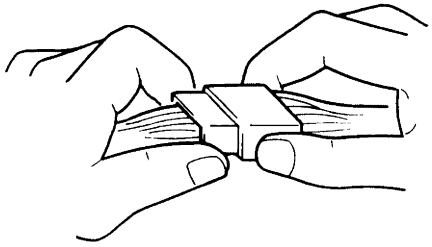
I2RH01010038-01

- Before disconnecting or connecting connectors, be sure to do either of the following depending on the type of power supply. Otherwise, the electrical parts to which the power is supplied may be damaged.
  - Continuous power supply: Disconnect the negative (–) cable at the battery.
  - Ignition power supply: Set ignition OFF.
- When disconnecting connectors, never pull on the wiring harness. Unlock the connector lock first and then pull the male and female connectors apart by holding them.



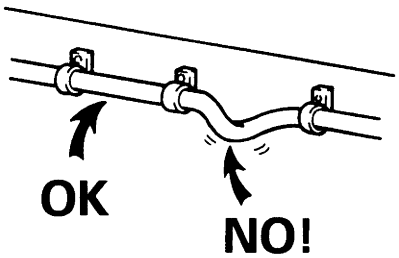
I2RH01010040-01

- When also connecting connectors, hold connectors and put them together until they lock securely (a click is heard).



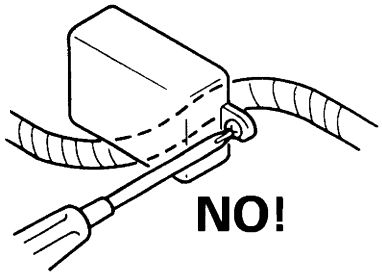
I2RH01010041-01

- When installing a wiring harness, secure it with clamps so that no slack is left.



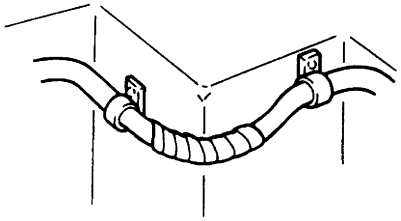
I2RH01010042-01

- When installing vehicle parts, make sure so that they do not interfere with any wiring harness and they do not catch any wiring harness under them.



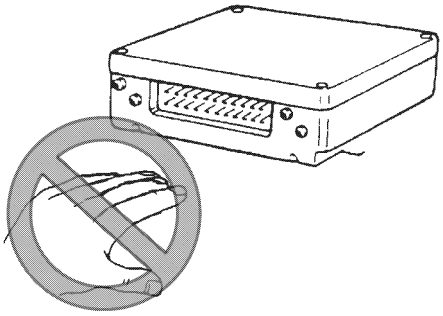
I2RH01010043-01

- Protect the part of harness which may touch any edge by wrapping it with tape or the like.



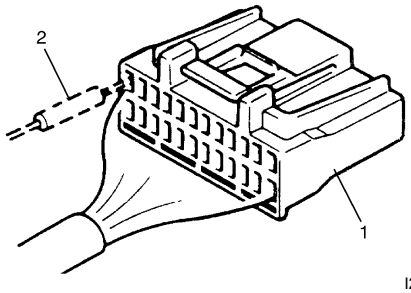
I2RH01010044-01

- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit such as ECM, P/S control module, etc.). The static electricity from your body can damage these parts.



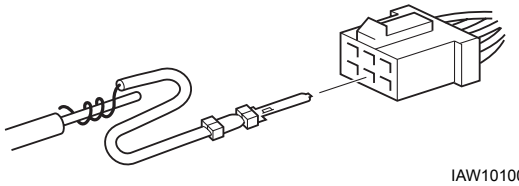
I3RM0A000004-01

- Never connect any tester (voltmeter, ohmmeter or whatever) to terminals of an electronic control unit when its connector is disconnected. Doing so may cause damage to the electronic control unit.
- Never connect an ohmmeter to an electronic control unit with its connector connected to it. Doing so may cause damage to electronic control unit and sensors.
- Be sure to use only the specified voltmeter / ohmmeter. Otherwise, accurate measurements may not be obtained or personal injury may result. Where no voltmeter type is specified, use a voltmeter with high impedance (M Ω/V minimum) or a digital type voltmeter.
- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe (2) from the wire harness side (backside) of the connector (1).



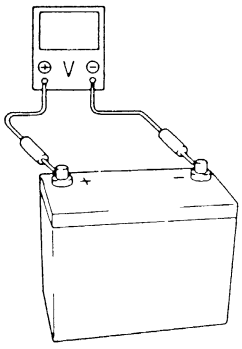
I2RH01010046-01

- When it is impossible to insert a tester probe from the harness side of connector, insert a properly sized male terminal with a lead into the connector and connect the tester probe to the lead as shown. Do not insert the probe directly into the connector, or the female terminal may be deformed.



IAW101000003-01

- When checking connection of terminals, check male terminals for bend, female terminals for excessive opening, and both for locking (looseness), corrosion, dust, etc.
- Before measuring voltage at each terminal, confirm that battery voltage is 12 V or more. Terminal voltage check at low battery voltage will lead to erroneous results.

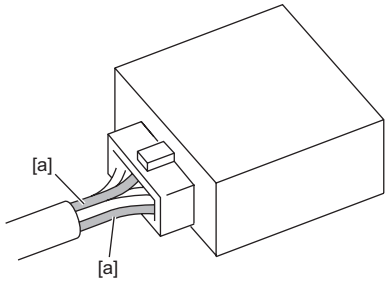


I2RH01010048-01

- For the details of the names and installation positions of relays and circuit fuses described in this manual, refer to:
  – “Fuses and the Protected Parts” in Section 9A (Page 9A-21)
  – “Junction Block (J/B) Connector / Fuse Layout” in Section 9A (Page 9A-24)

Wire Color

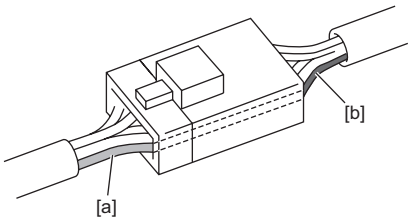
- On some connectors, some different circuits use the same wire color.
  In this case, the circuit cannot be identified by wire color.
  Check the terminal number in the wring diagram to identify the circuit.



IAP70P000002-02

[a]: Identical wire colors.

- Some wire harnesses in the same circuit may have different colors [a] and [b] at both ends of the intermediate connector.
  In this case, the circuit cannot be identified by wire color.
  Check the terminal number in the wring diagram to identify the circuit.



IAP70P000003-01

Terminal Number

With some connectors, the numbers are molded into the connector. However, the numbers may not mean the terminal numbers which represent the terminal position described in this manual.
Do not refer to the numbers on the connector for the terminal numbers.

Fastener Caution

AENDL70A0000003

NOTICE

Failure to use correct fasteners or to properly use fasteners can cause parts or system damage.

- **When fasteners are removed, always reinstall them at the locations from which they were removed.**
- **All fasteners must be replaced with fasteners having the same part number. If a fastener of the correct part number is not available, a fastener of the same size having equal or higher strength may be used.**
- **This manual identifies and indicates special conditions for all non-reusable fasteners and fasteners requiring the use of thread-locking compound. Be sure to follow all instructions, including torque values.**

Precautions for Catalytic Converter

AENDL70A0000004

As this vehicle equipped with a catalytic converter, use only unleaded gasoline and be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged.

- Conduct a spark jump test only when necessary to the shortest possible time without opening the throttle.
- Conduct engine compression checks within the shortest possible time.
- Avoid any situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty.)

Suspension Caution

AENDL70A0000005

⚠ CAUTION

Failure to use proper suspension fasteners or to perform proper maintenance / repair of suspension components can cause unsafe operating conditions.

- **Replace suspension fasteners only with fasteners having the same part number or their equivalent. Do not use replacement parts of lesser quality or substitute design.**
- **Observe the specified torque value for each fastener to assure proper retention of components.**
- **Never try to repair any suspension part using heating, quenching, or straightening. Instead, replace the part with a new one.**

Warning for Wheel (with Tire) Removal

AENDL70A0000006

⚠ CAUTION

A wheel may fall off the axle and cause an injury if all of the wheel bolts or nuts are removed at the same time.
When removing the last wheel bolt or nut, hold the wheel so that it does not fall off the axle.

Wheel and Tire Caution

AENDL70A0000008

⚠ WARNING

Failure to use proper wheel fasteners or to perform proper maintenance / repair of wheels can cause unsafe operating conditions.

- **Replace wheel fasteners only with fasteners having the same part number or their equivalent. Do not use replacement parts of lesser quality or substitute design.**
- **Tighten wheel fasteners to the specified torque value to assure proper retention of wheels.**
- **Never attempt to repair any wheel by welding. Excessive heat caused by welding may damage the wheel.**

Brake Caution

AENDL70A0000009

⚠ WARNING

Failure to use proper brake fasteners or to perform proper maintenance / repair of brake components can cause unsafe operating conditions.

- **Replace brake fasteners only with fasteners having the same part number or their equivalent. Do not use replacement parts of lesser quality or substitute design.**
- **Observe the specified torque values when tightening brake fasteners to assure proper retention of brake parts.**
- **Never attempt to repair any part by welding. Excessive heat caused by welding may damage brake components.**

P/S System Caution

AENDL70A0000010

⚠ WARNING

Failure to use proper steering gear fasteners or to perform proper maintenance / repair of steering components can cause unsafe operating conditions.

- **Replace steering gear fasteners only with fasteners having the same part number or their equivalent. Do not use replacement parts of lesser quality or substitute design.**
- **Observe the specified torque value for each fastener to assure proper retention of components.**

Air Bag Warning

AENDL70A0000012

⚠ WARNING

Failure to take proper precautions when performing service on or around the air bag system components or wiring could cause accidental activation of the air bag system or render the system inoperative. Either of these may lead to personal injury.

- **Only an authorized SUZUKI dealer should perform service on or around the air bag system components or wiring. Refer to "Air Bag System Component, Wiring and Connector Location" in Section 8B (Page 8B-6) in order to confirm whether you are performing service on or near the air bag system components or wiring.**
- **Read and understand all "WARNINGs" and "Precautions for Air Bag System Service" in Section 8B (Page 8B-1) before performing service on or around the air bag system components or wiring.**
- **All service work must be started at least 90 seconds after the ignition has been set OFF and the negative cable has been disconnected from the battery. Otherwise, the air bag system may be activated by reserve energy stored in the Sensing and Diagnostic Module (SDM).**

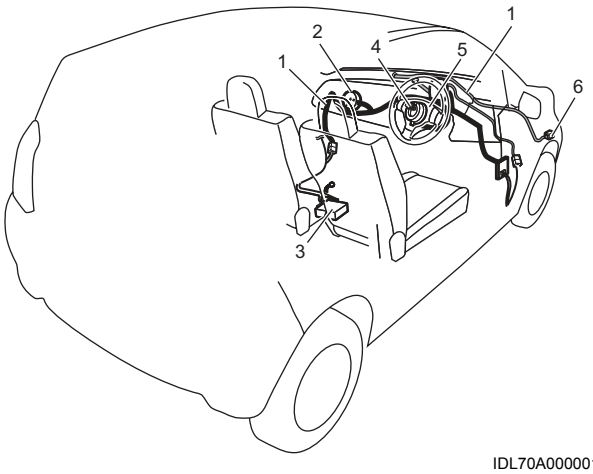
Precautions for Vehicle Equipped with Supplemental Restraint (Air Bag) System

AENDL70A0000013

⚠ WARNING

The figure shows all air bag system components. Failure to follow the proper procedures when servicing (removing, reinstalling and inspecting) any of these components, could result in personal injury due to accidental air bag activation, damage to components, or non-activation of the air bag system in the event of a collision.
When servicing any of the air bag components, be sure to take the following precautions:

- **Be sure to follow the procedures described in "Precautions for Air Bag System Service" in Section 8B (Page 8B-1).**
- **If the air bag system and another vehicle system both require repair, repairing the other system prior to the air bag system may increase the chance of unintended activation of the air bag system and possible personal injury. SUZUKI recommends that the air bag system be repaired first.**
- **Modifying any parts supporting or surrounding the air bag system components can adversely affect the performance of the system and lead to personal injury.**
  Do not modify the steering wheel, dashboard or any other parts that are near the air bag system components.
- **For a vehicle equipped with an advanced air bag system, modifying in any way the driver's and front passenger's seats or adding seat covers or additional cushions to them may prevent the air bag system from working properly, increasing the risk of a personal injury.**
  Do not modify the front seats or add any seat covers or additional cushions to them.
- **High temperatures over 93 °C (200 °F) may activate the air bag system or damage its components.**
  Before performing paint baking or other operations that involve high temperatures, remove the air bag system components from the vehicle and place them in an area away from the area where such operations are to be performed.



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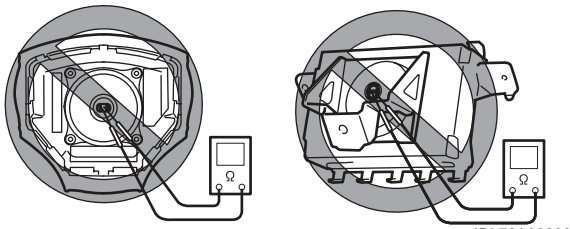
1. Air bag wiring harness	4. Contact coil
2. Passenger air bag (inflator) module	5. Driver air bag (inflator) module
3. SDM	6. Forward impact sensor

Diagnosis

- When troubleshooting the air bag system, be sure to follow "Air Bag Diagnostic System Check" in Section 8B (Page 8B-7). Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect replacement of parts.
- Never use electrical test equipment other than that specified.

⚠ WARNING

Measuring the resistance of any air bag (inflator) module (driver or passenger) with a tester is dangerous, as the electric current from the tester may trigger the air bag.
Never measure the resistance of an air bag (inflator) module.



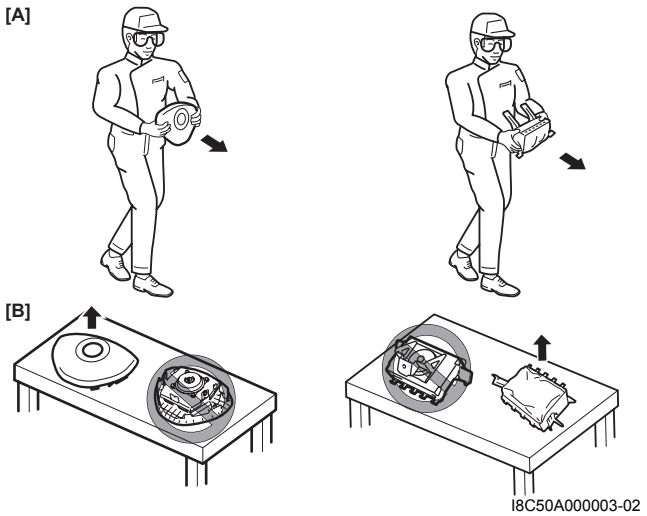
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Servicing and Handling

⚠ WARNING

Failure to take proper precautions when servicing and handling air bag (inflator) modules can cause accidental triggering of the inflator, which can result in severe personal injury.

- **Always disconnect the "A/B" fuse and air bag (inflator) modules from the initiator circuit when instructed in any service procedure.**
- **Handle and store a live (non-deployed) air bag (inflator) module in a dry place where the ambient temperature is below 65 °C (150 °F), and there are no electric noise sources.**
- **Always carry a live air bag (inflator) module with the air bag's opening pointed away from you. Doing so will help reduce the chance of injury in case of an accidental deployment of the air bag.**
- **Never carry a live air bag (inflator) module by its wires or connector.**
- **Always place a live air bag (inflator) module on a bench or other surface with the bag side facing up to keep it away from the surface.**
- **Do not place anything including another (inflator) module on top of an air bag (inflator) module. Allowing for a free space above the module is essential to minimize the risk of personal injury in the event of accidental deployment of the air bag (inflator) module.**
- **Never dispose of any live air bag (inflator) module. Before disposing of any live air bag (inflator) module, be sure to deploy it according to the applicable procedure described in "Air Bag (Inflator) Module Disposal" in Section 8B (Page 8B-53).**
- **The air bag (inflator) module is very hot immediately after deployment. Wait for at least half an hour to let it cool down before proceeding to the next step.**
- **After deployment of an air bag (inflator) module, there will be a powdery substance remaining on its surface. This substance consists primarily of cornstarch that is used to lubricate the bag as it inflates and by-products of a chemical reaction. Like with many other service procedures, gloves and safety glasses should be worn to protect the skin and eyes when handling a deployed air bag (inflator) module.**



I8C50A000003-02

[A]:	Always carry air bag (inflator) module with trim cover (air bag opening) away from body.
[B]:	Always place air bag (inflator) module on workbench with trim cover (air bag opening) up, away from loose objects.

⚠ WARNING

SDM

Failure to take proper precautions when servicing and handling the Sensing and Diagnostic Module (SDM) can cause accidental triggering of the inflator, which can result in severe personal injury.

- **Always disconnect the "A/B" fuse and air bag (inflator) modules from the initiator circuit when instructed in any service procedure.**
- **Handle and store an SDM in a dry place where the ambient temperature is below 65 °C (150 °F), and there are no electric noise sources.**
- **Handle the SDM very carefully during all service procedures. Never strike it with another object or shake it excessively.**
- **Never power the air bag system when the SDM is not rigidly attached to the vehicle. Unless all fasteners of the SDM mounting bracket are firmly tightened and the arrow points toward the front of the vehicle, the SDM could be accidentally activated when the air bag system is powered, possibly causing the air bags to deploy.**

NOTICE

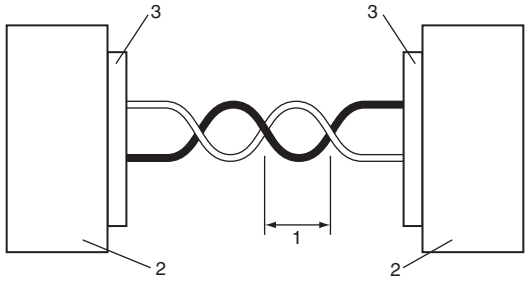
Failure to take proper precautions when servicing the air bag systems may cause faulty operation or damage to components of the systems.

- **After any accident, even if it was not severe enough to cause deployment of the air bags, be sure to inspect the air bag system and other related components according to the instructions under "Repair and Inspection Required after Accident" in Section 8B (Page 8B-45).**
- **If any air bag system component is impacted during service on other components, remove the air bag system component before continuing the service.**
- **Carefully handle the following components so not to drop or otherwise impact them: the driver and passenger air bag (inflator) modules; the forward sensor; and the SDM. If any of these components receives an impact, never try to disassemble and repair it but replace it with a new one.**
- **If any of the following components gets contaminated with such materials as grease, cleaning solvents, oil or water, wipe it clean with a dry cloth: the driver, passenger air bag (inflator) modules.**
- **The air bag harness is part of the main harness, instrument panel harness and floor harness. For easy identification, the connector-side of each air bag harness wire is covered with a yellow protection tube and each connector is yellow in color. Handle the air bag harness wires and connectors very carefully.**
- **When an open wire or damaged connector/terminal is found in the air bag harness, be sure to replace the entire harness rather than replacing only the damaged wire or connector/terminal.**
- **Apply power to the air bag system only when all its components are connected or a diagnostic procedure requires it. Doing otherwise will set a DTC.**
- **Never use air bag system components from another vehicle.**
- **When doing any electric welding, be sure to temporarily disable the air bag system referring to "Disabling Air Bag System" in Section 8B (Page 8B-47).**
- **Never expose the air bag system components to extremely hot air (i.e., placing the vehicle in an oven to dry it after painting).**
- **WARNING / CAUTION labels are affixed to every air bag system component. Be sure to follow the instructions provided on them.**
- **After completing repairs on any air bag system component, be sure to perform the procedures in "Air Bag Diagnostic System Check" in Section 8B (Page 8B-7).**

Precautions for CAN Communication System

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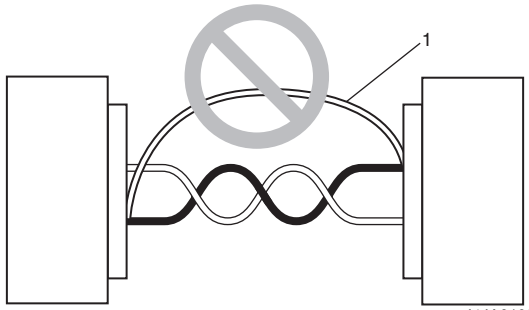
- The length of a loose twist (1) in a twist pair wire harnesses of the CAN lines except around the connector (3) should be within 100 mm (3.9 in.). Refer to the circuit diagram to identify the CAN lines. Excessively loose lines are more susceptible to interference by electric noise.



I4JA01000002-01

2. Control module

- Do not connect CAN line terminals using a bypass wire (1). Doing so makes, the CAN line receive electric noise interference.



I4JA01000003-01

Precautions for Installing Mobile Communication Equipment

AENDL70A0000015

When installing mobile communication equipment such as CB (citizen band) radio or cellular telephone, be sure to observe the following precautions.
Failure to follow these precautions may adversely affect electronic control system.

- Keep the antenna as far away as possible from the vehicle's electronic control unit.
- Keep the antenna feeder more than 20 cm (7.9 in.) away from any electronic control unit and its wire harnesses.
- Do not run the antenna feeder parallel with other wire harnesses.
- Confirm that the antenna and feeder are correctly adjusted.

Repair Instructions

Electrical Circuit Inspection Procedure

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While there are various electrical circuit inspection methods, the following describes the general methods using an ohmmeter and a voltmeter to check open and short circuits.

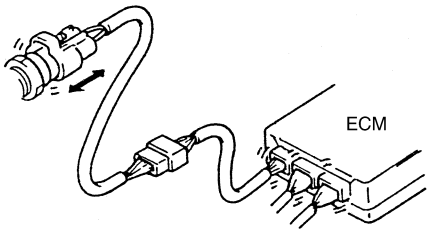
Open Circuit Check

Possible causes for the open circuit are as listed below. As defects in connectors or terminals are most often the causes, they need to be checked particularly carefully.

- Loose connection of connector
- Poor contact of terminal (due to dirt, corrosion or rust on it, poor contact tension, entry of foreign object, etc.)
- Open wire harness

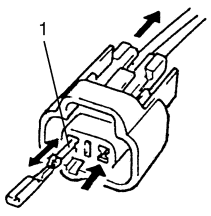
When checking circuits including an electronic control unit such as ECM, TCM etc., it is important to carefully perform check, starting with items which are easiest to check.

1) Disconnect negative (–) cable at battery
2) Check connectors at both ends of the circuit being checked for loose connection. Also check lock condition of connectors if equipped with connector locks.



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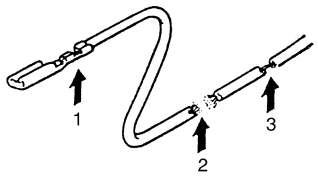
3) Using a male terminal for test use, check terminals on both ends of the circuit being checked for contact tension of female terminals. Check each terminal visually for cause of poor contact (dirt, corrosion, rust, entry of foreign object, etc.). At the same time, check that each terminal is held and locked in connector fully.



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1. Check contact tension by inserting and removing just for once.

4) Perform continuity test or voltage check using the following procedures, to check the wire harness for open circuit and poor connection at its terminals.

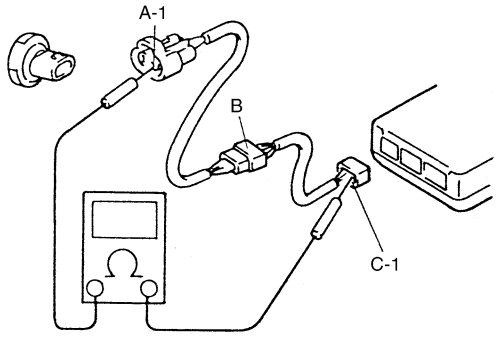


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1. Looseness of crimping	3. Thin wire (single strand of wire)
2. Open	

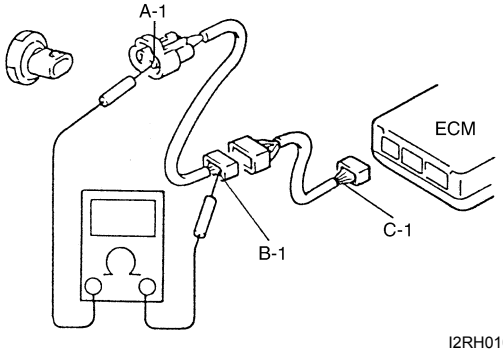
Continuity Test

1) Measure resistance between connector terminals at both ends of the circuit under test (between “A-1” and “C-1” in the figure). If no continuity is indicated (infinity or over limit), that means that the circuit is open between terminals “A-1” and “C-1”.



I2RH01010052-01

2) Disconnect the connector included in the circuit (connector-B in the figure) and measure resistance between terminals “A-1” and “B-1”.
If no continuity is indicated, that means that the circuit is open between terminals “A-1” and “B-1”. If continuity is indicated, there is an open circuit between terminals “B-1” and “C-1” or connector-B is defective.



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Voltage Check

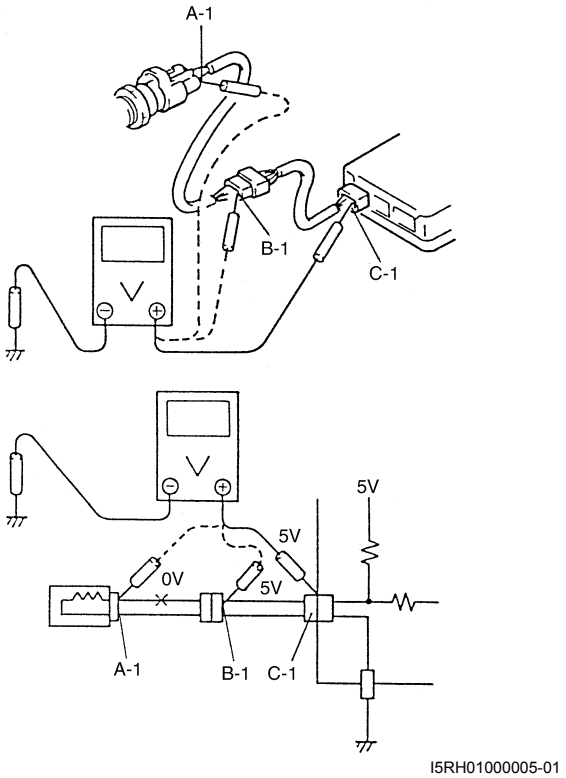
If the circuit being checked is under voltage, voltage check can be used to check the circuit.

1) With all connectors connected and voltage applied to the circuit being checked, measure voltage between each terminal and ground.
   a) If measurements are taken as shown in the figure and results are as listed below, it means that the circuit is open between terminals “B-1” and “A-1”.

      Voltage between
      “C-1” and ground: Approx. 5 V
      “B-1” and ground: Approx. 5 V
      “A-1” and ground: 0 V

   b) If measurements are as listed below, it means that there is an abnormally high resistance causing the indicated voltage drop in the circuit between terminals “A-1” and “B-1”.

      Voltage between
      “C-1” and ground: Approx. 5 V
      “B-1” and ground: Approx. 5 V
      “A-1” and ground: Approx. 3 V



I5RH01000005-01

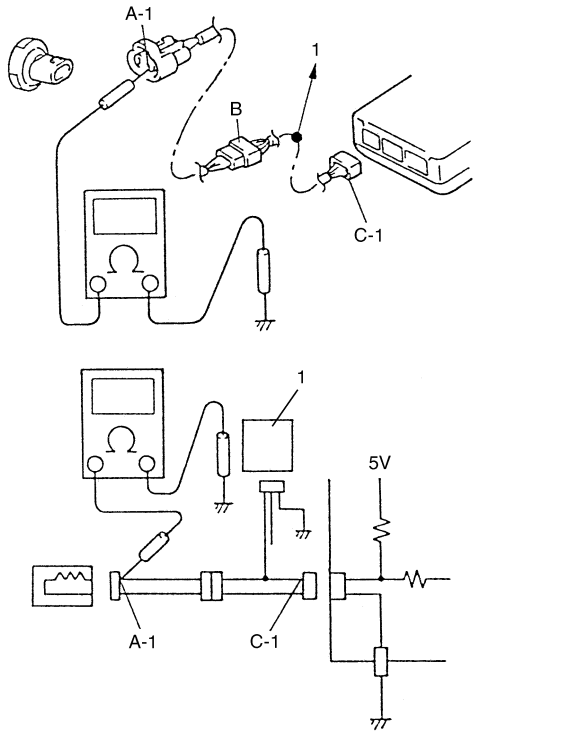
Short Circuit Check (Wire Harness to Ground)

1) Disconnect negative (–) cable at battery.
2) Disconnect connectors at both ends of the circuit to be checked.

NOTE

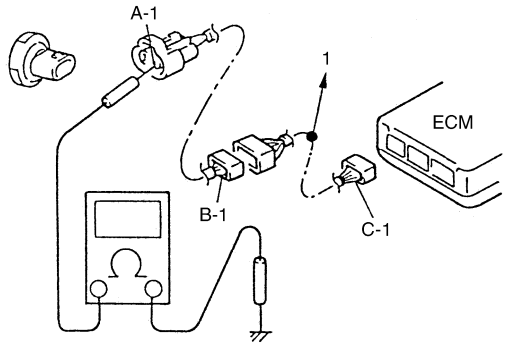
If the circuit to be checked is connected to other parts (1), disconnect all connections to these parts.
This is essential to having correct check results.

3) Measure resistance between the terminal at one end of the circuit (“A-1” terminal in the figure) and ground. If continuity is indicated, it means that the circuit is shorted to ground between terminals “A-1” and “C-1”.



I5RH01000006-01

4) Disconnect the connector included in circuit (connector-B) and measure resistance between “A-1” and ground. If continuity is indicated, the circuit is shorted to ground between terminals “A-1” and “B-1”.



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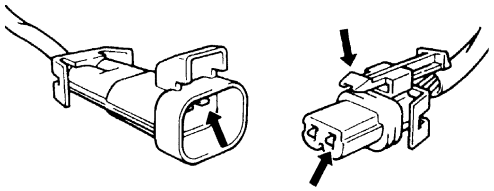
1. To other parts

Intermittent Connection and Poor Contact Inspection

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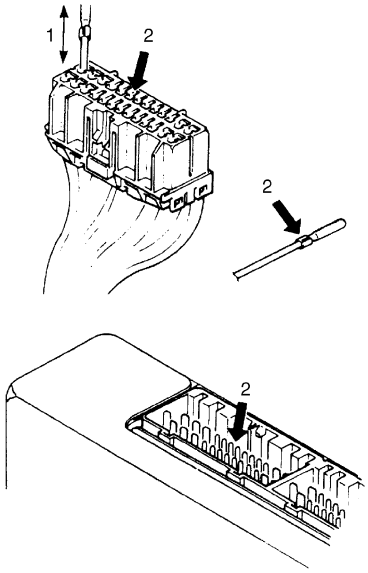
Most intermittent connections are caused by faulty electrical connections or wiring, although a sticking relay or solenoid can occasionally be a cause. When checking connections, perform check of suspect circuit for:

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact. However, cleaning the terminal with a sand paper or the like is prohibited.
- Damaged connector body, terminals exposed to moisture and dirt, misalignment of terminals on component or connector and mating connector.



I2RH01010057-02

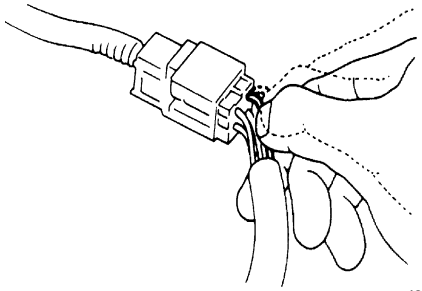
- Improperly formed or damaged terminals.
  Check each connector terminal in circuit with problem for good contact tension using a corresponding test terminal.
  If contact tension is not enough, correct terminal shape to increase contact tension or replace harness.



I5RH01000007-01

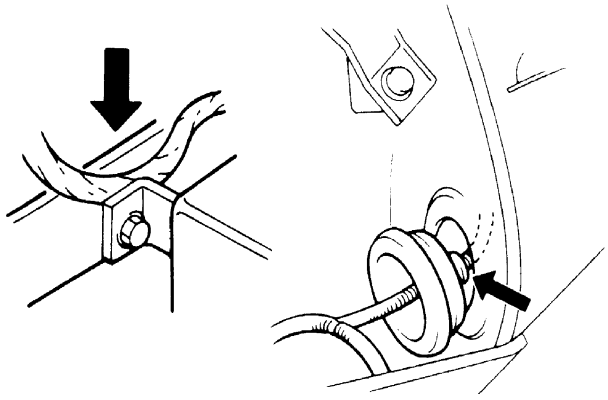
1. Check contact tension by inserting and removing just once.
2. Check each terminal for bend and proper alignment.

- Poor connection of terminal and wire.
  Check each wire harness in circuit with problem for poor connection by shaking it by hand lightly. If any abnormal condition is found, repair or replace harness.



I2RH01010059-01

- Damaged wire insulation, causing intermittent short circuit to other wiring or parts.
- Broken wire inside the insulation. If one or two strands of a multi stranded wire are intact, continuity check will show good circuit, but resistance could be too high. If the resistance is too high, repair or replace the harness.



I2RH01010060-01

Section 0

General Information

0

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General Information

General Description

Abbreviations

AENDL70A0101001

A:
A/B: Air Bag
ABDC: After Bottom Dead Center
ABS: Anti-lock Brake System
AC: Alternating Current
A/C: Air Conditioning
A-ELR: Automatic-Emergency Locking Retractor
A/F: Air Fuel Ratio
ALR: Automatic Locking Retractor
AMT: Automated Manual Transaxle
API: American Petroleum Institute
APP: Accelerator Pedal Position
A/T: Automatic Transmission, Automatic Transaxle
ATDC: After Top Dead Center
ATF: Automatic Transmission Fluid, Automatic Transaxle Fluid
AWD: All Wheel Drive
B:
BARO: Barometric Pressure
BBDC: Before Bottom Dead Center
BCM: Body electrical Control Module
BTDC: Before Top Dead Center
B+: Battery Positive Voltage
BB+: Battery Positive Voltage for Backup
C:
CAN: Controller Area Network
CKP: Crankshaft Position
CMP: Camshaft Position
CO: Carbon Monoxide
CO2: Carbon Dioxide
CPP: Clutch Pedal Position
CPU: Central Processing Unit
CVT: Continuously Variable Transmission, Continuously Variable Transaxle
D:
DC: Direct Current
D/C: Driving Cycle
DLC: Data Link Connector
DOHC: Double Over Head Camshaft
DOJ: Double Offset Joint
DOT: Department of Transportation
DPF®: Diesel Particulate Filter
DRL: Daytime Running Light
DTC: Diagnostic Trouble Code (Diagnostic Code)
E:
EBD: Electronic Brake Force Distribution
ECM: Engine Control Module
ECT: Engine Coolant Temperature
ECU: Electronic Control Unit
EEPROM: Electrically Erasable Programmable Read Only Memory
EFE Heater: Early Fuel Evaporation Heater
EGR: Exhaust Gas Recirculation
EGT: Exhaust Gas Temperature
ELR: Emergency Locking Retractor
ENG A-STOP: Engine Auto Stop and Start
EPS: Electronic Power Steering
ESP®: Electronic Stability Program
EVAP: Evaporative Emission
F:
FWD: Front Wheel Drive
G:
GND: Ground
GPS: Global Positioning System
H:
HVAC: Heating, Ventilating and Air Conditioning
HC: Hydrocarbons
HDD: Hard Disk Drive
HFC: Hydro Fluorocarbon
HI: High
HO2S: Heated Oxygen Sensor
I:
IAC: Idle Air Control
IAT: Intake Air Temperature
IMRC: Intake Manifold Runner Control
IMT: Intake Manifold Tuning
ISC: Idle Speed Control
ISO: International Organization for Standardization
J:
JIS: Japanese Industrial Standards
J/B: Junction Block
J/C: Junction Connector
L:
L: Left
LCD: Liquid Crystal Display
LED: Light Emitting Diode
LHD: Left Hand Drive vehicle
LIN: Local Interconnect Network
LO: Low
LSD: Limited Slip Differential
LSPV: Load Sensing Proportioning Valve
M:
MAF: Mass Air Flow
MAP: Manifold Absolute Pressure
Max: Maximum
MFI: Multiport Fuel Injection
Min: Minimum
MIL: Malfunction Indicator Lamp (“CHECK ENGINE” Light or “SERVICE ENGINE SOON” Light)
M/T: Manual Transmission, Manual Transaxle
N:
NOx: Nitrogen Oxides
O:
OBD: On-Board Diagnostic system
OCM: Occupant Classification Module
OCV: Oil Control Valve
O/D: Overdrive
OHC: Over Head Camshaft
O2S: Oxygen Sensor

P:
PCM: Powertrain Control Module
PCV: Positive Crankcase Ventilation
PM: Particulate Mater
PNP: Park / Neutral Position
P/S: Power Steering
PSP: Power Steering Pressure
R:
R: Right
RAM: Random Access Memory
RHD: Right Hand Drive Vehicle
ROM: Read Only Memory
RPM: Engine Speed
S:
SAE: Society of Automotive Engineers
SDM: Sensing and Diagnostic Module (Air Bag Controller, Air bag Control Module)
SDT: Smart Diagnostic Tester
SFI: Sequential Multiport Fuel Injection
SI: System International
SOHC: Single Over Head Camshaft
SRS: Supplemental Restraint System
T:
TCC: Torque Converter Clutch
TCM: Transmission Control Module
TCSS: Traction Control Support System
TDC: Top Dead Center
TP: Throttle Position
TPMS: Tire Pressure Monitoring System
TWC: Three-Way Catalytic converter
U:
UART: Universal Asynchronous Receiver / Transmitter
USB: Universal Serial Bus
V:
VFD: Vacuum Fluorescent Display
VIN: Vehicle Identification Number
VSS: Vehicle Speed Sensor
VVT: Variable Valve Timing
W:
WU-OC: Warm Up Oxidation Catalytic converter
WU-TWC: Warm Up Three-Way Catalytic converter
Other:
2WD: 2-Wheel Drive
4WD: 4-Wheel Drive

NOTE

- **DPF® is a trademark of HJS Fahrzeugtechnik GmbH & Co KG and Suzuki is the trade mark licensee.**
- **ESP® is a registered trademark of Daimler AG.**

ISO-to-SUZUKI Term

AENDL70A0101002

This table lists ISO (International Organization for Standardization) TR15031 terms and abbreviations which may be used in this manual in compliance with ISO recommendations, as well as their SUZUKI terms.

ISO Term		SUZUKI Term
Full Spelling	**Abbreviation**	
A		
Accelerator Pedal Position	APP	Accelerator Pedal Position (APP)
Air Cleaner	ACL	Air Cleaner
Air Cleaner Element	ACL Element	Air Cleaner Element
Air Cleaner Housing	ACL Housing	Air Cleaner Housing
Air Conditioning	A/C	Air Conditioner (A/C)
Air Conditioning System	A/C System	Air Conditioning System (A/C system)
Air Fuel Ratio Sensor	A/F Sensor	Air Fuel Ratio Sensor (A/F sensor)
Automatic Transaxle, Automatic Transmission	A/T	Automatic Transaxle, Automatic Transmission (A/T)
B		
Barometric Pressure	BARO	Barometric Pressure (BARO)
Barometric Pressure Sensor	BARO Sensor	Barometric Pressure Sensor (BARO sensor)
Battery Positive Voltage	B+	Battery Positive Voltage (B+)
C		
Camshaft Position	CMP	Camshaft Position
Camshaft Position Sensor	CMP Sensor	Camshaft Position Sensor (CMP sensor)
Carbon Monoxide	CO	Carbon Monoxide (CO)
Carbon Dioxide	CO2	Carbon Dioxide (CO2)
Clutch Pedal Position Switch	CPP Switch	Clutch Pedal Position Switch (CPP switch)
Closed Loop	CL	Closed-Loop
Closed Throttle Position	CTP	Closed Throttle Position
Continuously variable transaxle, Continuously variable transmission	CVT	Continuously variable transaxle, Continuously variable transmission (CVT)
Crankshaft Position	CKP	Crankshaft Position (CKP)
Crankshaft Position Sensor	CKP Sensor	Crankshaft Position Sensor (CKP sensor)
D		

ISO Term		SUZUKI Term
Full Spelling	Abbreviation	
Data Link Connector	DLC	Data Link Connector (DLC)
Diagnostic Trouble Code	DTC	Diagnostic Trouble Code (DTC)
E		
Electrically Erasable Programmable Read Only Memory	EEPROM	Electrically Erasable Programmable Read Only Memory (EEPROM)
Engine Control Module	ECM	Engine Control Module (ECM)
Engine Coolant Temperature Sensor	ECT Sensor	Engine Coolant Temperature Sensor (ECT sensor)
Engine Speed	RPM	Engine Speed, RPM, rpm
Evaporative Emission Canister	EVAP Canister	Evaporative Emission Canister (EVAP canister)
Evaporative Emission Canister Purge Valve	EVAP Canister Purge Valve	EVAP canister purge valve
Evaporative Emission System	EVAP System	Evaporative Emission System
Exhaust Gas Re-circulation	EGR	Exhaust Gas Recirculation (EGR)
Exhaust Gas Re-circulation Valve	EGR Valve	Exhaust Gas Recirculation Valve (EGR valve)
F		
Fan Control	FC	Radiator Fan Control
Fan Control Relay	FC Relay:	Radiator cooling fan relay
Four Wheel Drive	4WD	4WD
Fourth Gear	4GR	4th Gear
Front Wheel Drive	FWD	Front Wheel Drive
Fuel Pump	FP	Fuel Pump
Fuel Pump Relay	FP Relay	Fuel Pump Relay
Full Time Four Wheel Drive	F4WD	Full-Time 4WD
G		
Generator	GEN	Generator
Ground	GND	Ground
H		
Heated Oxygen Sensor	HO2S	Heated Oxygen Sensor (HO2S)
Hydrocarbon	HC	Hydrocarbon (HC)
I		
Idle Air Control	IAC	Idle Air Control (IAC)
Idle Speed Control	ISC	Idle Speed Control (ISC)
Intake Air	IA	Intake Air
Intake Air temperature	IAT	Intake Air temperature (IAT)
Intake Air temperature Sensor	IAT Sensor	Intake Air temperature Sensor, IAT Sensor
Input Shaft Speed	ISS	Input Shaft Speed
Inspection and Maintenance	I/M	Inspection and Maintenance
K		
Knock Sensor	KS	Knock Sensor
L		
Calculated Load Value	LORD	Calculated Load Value (CALC)
M		
Mass Airflow	MAF	Mass Airflow (MAF)
Mass Airflow Sensor	MAF Sensor	MAF Sensor
Malfunction Indicator Lamp	MIL	Malfunction Indicator Lamp (MIL)
Manifold Absolute Pressure Sensor	MAP Sensor	Manifold Absolute Pressure Sensor, MAP Sensor
Manual/Transaxle	M/T	Manual Transaxle, M/T
Manual/Transmission	M/T	Manual Transmission, M/T
Multiport Fuel Injection	MFI	Multiport Fuel Injection
N		
Nitrogen Oxides	NOX	Nitrogen Oxides (NOx)
O		
On-Board Diagnostic	OBD	OBD
Open Loop	OL	Open Loop
Output Shaft Speed Sensor	OSS Sensor	Output Shaft Speed Sensor
Oxygen	O2	O2
Oxidation catalytic converter	OC	Oxidation catalytic converter
Oxygen Sensor	O2S	O2 Sensor, O2S

ISO Term		SUZUKI Term
Full Spelling	Abbreviation	
P		
Positive Crankcase Ventilation	PCV	PCV
Positive Crankcase Ventilation Valve	PCV Valve	PCV Valve
Power Steering Pressure Switch	PSP Switch	Power Steering Pressure Switch
Powertrain Control Module	PCM	PCM
R		
Random Access Memory	RAM	RAM
S		
Scan Tool	ST	Scan Tool
Shift Solenoid	SS	Shift Solenoid
Shift Solenoid Valve	SS Valve	Shift Solenoid Valve
T		
Third Gear	3GR	3rd Gear
Three Way Catalytic Converter	TWC	Three-Way Catalytic Converter (TWC)
Throttle Actuator Control	TAC	Throttle Actuator Control
Throttle Body	TB	Throttle body
Throttle Position	TP	Throttle Position, TP
Throttle Position Sensor	TP Sensor	TP Sensor
Torque Converter Clutch	TCC	Torque Converter Clutch
Torque Converter Clutch Pressure	TCCP	Torque Converter Clutch Pressure
Transmission Control Module	TCM	Transmission Control Module (TCM)
Transmission Fluid Temperature Sensor	TFT Sensor	Transmission Fluid Temperature Sensor
Transmission Range	TR	Transmission Range
Transmission Range Sensor	TR Sensor	Transmission Range Sensor
Transmission Range Switch	TR Switch	Transmission Range Switch
V		
Vehicle Identification Number	VIN	Vehicle Identification Number, VIN
Vehicle Speed Sensor	VSS	Vehicle Speed Sensor, VSS
Voltage Regulator	VR	Voltage Regulator
W		
Warm Up Three Way Catalytic Converter	WU-TWC	Warm Up Three-Way Catalytic Converter

Symbols

AENDL70A0101003

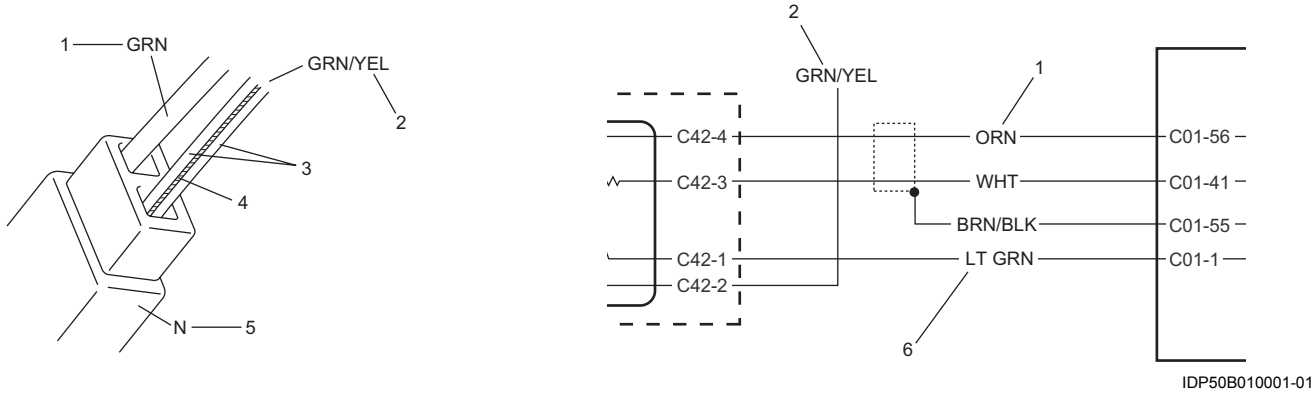
Symbol	Definition	Symbol	Definition
	Tightening torque	1217G	Apply SUZUKI BOND NO. 1217G 99000-31260
OIL	Apply oil (engine, transmission, transfer, differential)	1216B	Apply SUZUKI BOND NO. 1216B 99000-31230
FLD	Apply fluid (brake, power steering or automatic transmission fluid)	1207B	Apply SUZUKI BOND NO. 1207B 99000-31140
A	Apply SUZUKI SUPER GREASE A 99000-25011	Si	Apply SILICONE SEALANT 99000-31120
C	Apply SUZUKI SUPER GREASE C 99000-25030	366E	Apply SEALING COMPOUND 366E 99000-31090
E	Apply SUZUKI SUPER GREASE E 99000-25051	1322	Apply THREAD LOCK 1322 99000-32110
H	Apply SUZUKI SUPER GREASE H 99000-25121	1333B	Apply THREAD LOCK 1333B 99000-32020
I	Apply SUZUKI SUPER GREASE I 99000-25210	1342	Apply THREAD LOCK 1342 99000-32050
1215	Apply SUZUKI BOND NO. 1215 99000-31110		Do not reuse
1207F	Apply SUZUKI BOND NO. 1207F 99000-31250		Note on reassembly

Wire Color Symbols

AENDL70A0101004

Symbol	Wire Color	Symbol	Wire Color
BEG	Beige	LT GRN	Light green
BLK	Black	ORN	Orange
BLU	Blue	RED	Red
BRN	Brown	WHT	White
GRN	Green	YEL	Yellow
GRY	Gray	PNK	Pink
LT BLU	Light blue	PPL	Violet
N	Natural (Plastic material color: Milky white / Light yellow)		

There are two types of colored wire used in this vehicle. One is single-colored type (1) and the other is dual-colored (striped) type (2). The dual-colored type of wire uses two color symbols such as “GRN/YEL”. The first symbol “GRN” represents the base color (3) of the wire and the second symbol “YEL” represents the color of the stripe (4). Also, “LT” (6) or “D” can be shown before the color symbols. They show the color variation of light or dark. “LT” stands for “Light” and “D” stands for “Dark”. For example, “LT GRN” means light green and “D GRY” means dark gray.



IDP50B010001-01

5. Connector color

Ignition Modes and Ignition Switch Positions

AENDL70A0101005

In this manual, each ignition switch position (models with a conventional ignition switch system) and the corresponding ignition mode (models with a keyless push start system) are indicated using the following unified word / acronym preceded by “ignition”: START, ON, ACC or OFF (e.g. “ignition ON”) unless there is need to express it otherwise.

Fasteners Information

AENDL70A0101006

Metric Fasteners

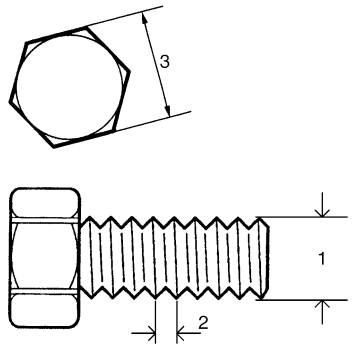
Most of the fasteners used for this vehicle are JIS-defined and ISO-defined metric fasteners. When replacing any fasteners, it is most important that replacement fasteners are of the correct diameter, thread pitch and strength.

NOTICE

Combining male and female fasteners with different thread pitches will damage both fasteners.
It is important to note that, even when the nominal diameter (1) of the threads is the same, JIS-defined and ISO-defined fasteners may be different in thread pitch (2) or width across flats (3). Refer to the JIS-to-ISO Main Fasteners Comparison Table below for these differences.
Before installing a fastener, check it for correct thread pitch and then, screw it in or on the mating fastener by hand. If the fastener is too tight to turn by hand, its thread pitch may be different from that of the mating fastener.

JIS-TO-ISO main fasteners comparison table

		Nominal diameter				
		M6	M8	M10	M12	M14
JIS	Thread pitch	1.0	1.25	1.25	1.25	1.5
	Width across flats	10	12	14	17	19
ISO	Thread pitch	1.0	1.25	1.5	1.5	1.5
	Width across flats	10	13	16	18	21



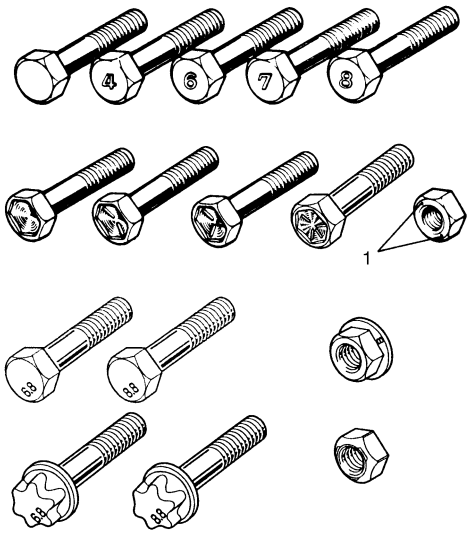
I4RH0A010005-01

Fastener Strength Identification

Most commonly used strength classes of metric fasteners are 4T, 6.8, 7T and 8.8. Strength class is indicated by a number or radial line(s) embossed on the head of each bolt. Some metric nuts have a punched number, 6 or 8 on their end surfaces. Figure shows different strength markings.

When replacing metric fasteners, be sure to use bolts and nuts of the same strength class as or higher class than the original bolts and nuts. It is also important to select replacement fasteners of the correct diameter and thread pitch. Correct replacement bolts and nuts are available as Maruti genuine parts.

Metric bolts and nuts: Strength class numbers or marks (The larger the number, the greater the strength).



I5RH01010001-01

1. Nut strength identification

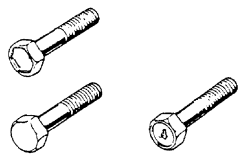
Standard Tightening Torques

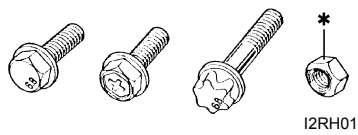
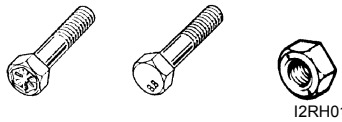
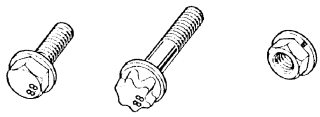
Each fastener should be tightened to the torque specified in each section. If no torque description or specification is provided in the relevant section, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, use the torque specified for the original fastener.

NOTE

- **For flanged bolts, flanged nuts and self-locking nuts of the 4T and 7T strength classes, add 10% to the applicable tightening torques given in the following chart.**
- **The following chart is applicable only where the fastened parts are made of steel or light alloy.**

Tightening torque chart

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
Fastener of strength class equivalent to 4T	N·m	1.5	3.0	5.5	13	29	45	65	105	160
	kgf-m	0.15	0.30	0.55	1.3	2.9	4.5	6.5	10.5	16
 I2RH01010012-01	lbf-ft	1.0	2.5	4.0	9.5	21.0	32.5	47.0	76.0	116.0
Fastener of strength class equivalent to 6.8	N·m	2.4	4.7	8.4	20	42	80	125	193	280
	kgf-m	0.24	0.47	0.84	2.0	4.2	8.0	12.5	19.3	28
 I2RH01010013-01	lbf-ft	2.0	3.5	6.0	14.5	30.5	58.0	90.5	139.5	202.5

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
Flanged fastener of strength class equivalent to 6.8 *: Self-locking nut (6 strength)  I2RH01010014-01	N·m	2.4	4.9	8.8	21	44	84	133	203	298
	kgf-m	0.24	0.49	0.88	2.1	4.4	8.4	13.3	20.3	29.8
	lbf-ft	2.0	3.5	6.5	15.5	32.0	61.0	96.5	147.0	215.5
Fastener of strength class equivalent to 7T  I2RH01010015-01	N·m	2.3	4.5	10	23	50	85	135	210	240
	kgf-m	0.23	0.45	1.0	2.3	5.0	8.5	13.5	21	24
	lbf-ft	2.0	3.5	7.5	17.0	36.5	61.5	98.0	152.0	174.0
Fastener of strength class equivalent to 8.8 (bolt) or 8 (nut)  I2RH01010016-01	N·m	3.1	6.3	11	27	56	105	168	258	373
	kgf-m	0.31	0.63	1.1	2.7	5.6	10.5	16.8	25.8	37.3
	lbf-ft	2.5	4.5	8.0	19.5	40.5	76.0	121.5	187.0	270.0
Flanged fastener of strength class equivalent to 8.8 (bolt) or 8 (nut)  I2RH01010017-01	N·m	3.2	6.5	12	29	59	113	175	270	395
	kgf-m	0.32	0.65	1.2	2.9	5.9	11.3	17.5	27	39.5
	lbf-ft	2.5	5.0	9.0	21.0	43.0	82.0	126.5	195.5	286.0

***: Self-locking nut**

Vehicle Lifting Points

AENDL70A0101007

⚠ WARNING

Improperly lifting the vehicle using a hoist could cause serious personal injury and/or damage to the vehicle.
Be sure to take the following precautions when lifting the vehicle with a hoist:

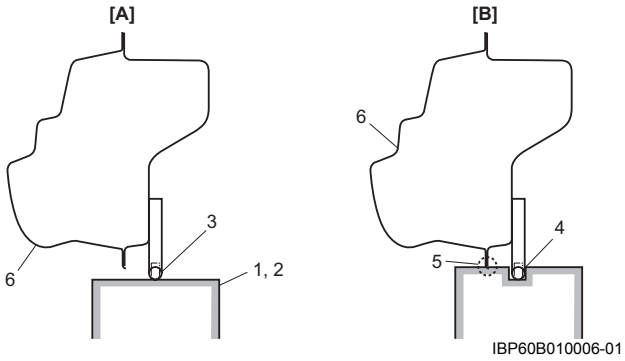
- **Before applying the hoist arms to the underbody, keep in mind how the balance of the vehicle will change when components are removed during the intended service.**
- **Before lifting up the vehicle, make sure that the ends of the hoist arms are not in contact with components such as the brake and fuel lines, and related brackets.**
- **When using a frame contact hoist, apply the right and left arms to the symmetrically located points shown in the figure. Lift up the vehicle until all 4 tires are slightly off the ground and make sure that the vehicle will not fall off the hoist by rocking the vehicle body back and forth.**
  Work should be started only after this confirmation.
- **Make absolutely sure to lock the hoist after the vehicle has been raised up to the desired height.**

NOTICE

Failure to follow the following precautions may cause damage to the vehicle:

- **When lifting up a vehicle, place a pad (1) or attachment (2) on the support position (3).**
- **When using a frame contact hoist or the like, use a pad or attachment without concave groove (4) to avoid interference (5) between the pad or attachment and the vehicle body (6).**

- **When using a pad or attachment with concave groove, change the direction of the pad or attachment so that the support position does not fall into the groove.**

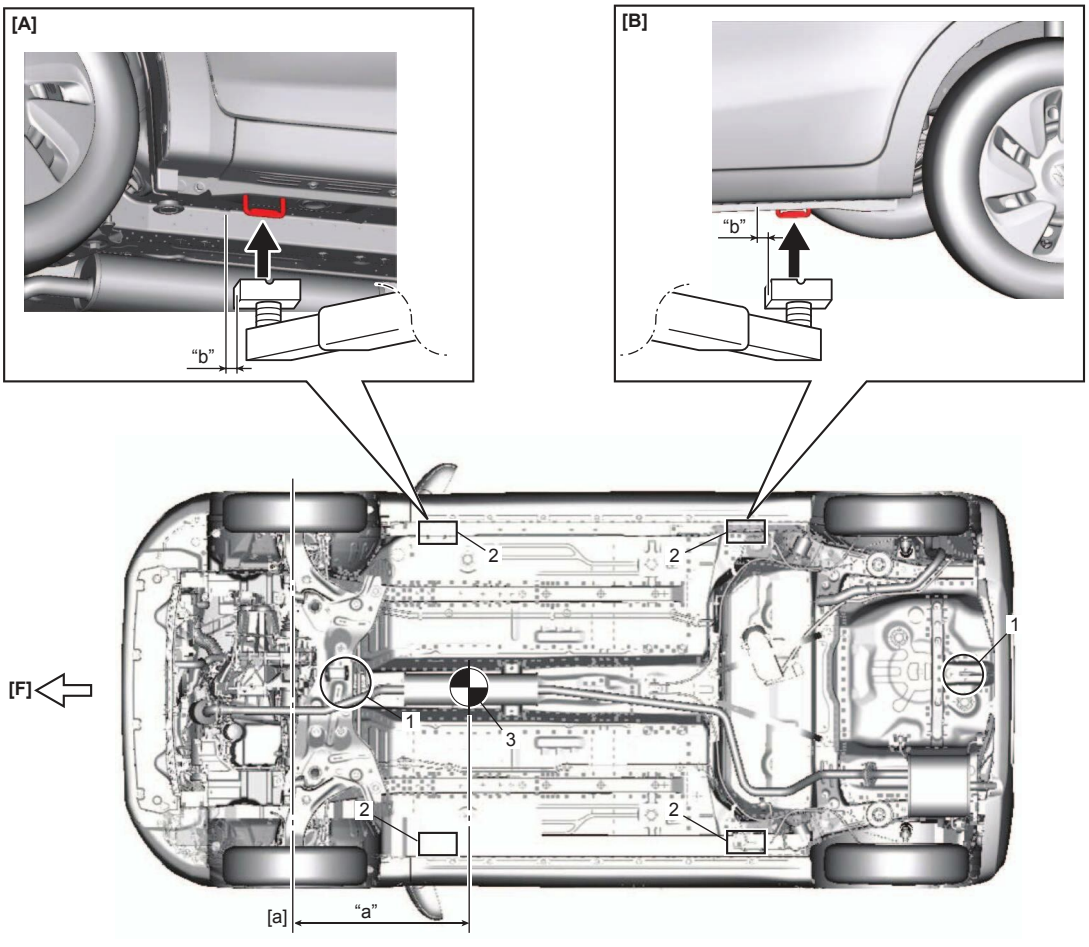


[A]: Proper lifting	[B]: Improper lifting

When Using Frame Contact Hoist

NOTICE

When lifting the vehicle with a hoist, improperly placing the ends of the hoist arms to the vehicle may cause damage to the side sill splash guards.
Before lifting up the vehicle, check the distance "b" between the ends of the hoist arms and the side sill splash guards, and place the ends of the hoist arms properly so that the ends of the hoist arms do not contact the side sill splash guards when the vehicle is lifted up.



[A]: Front side	[a]: Wheel center	2. Support position for frame contact hoist and safety stand
[B]: Rear side	"a": Approx. 389 – 438 mm (Approx. 15.3 – 17.2 in.)	3. Gravity center position without load in vehicle
[F]: Vehicle front	1. Floor jack position	

When Using Floor Jack

⚠ WARNING

Improperly raising only the front or rear of the vehicle with a jack could cause serious personal injury and/or damage to the vehicle.

- **Before jacking up a vehicle only at the front or rear end, be sure to block all the wheels that will remain on the ground.**
- **After the vehicle is jacked up, be sure to support it on safety stands. It is extremely dangerous to do any work on the vehicle supported by a jack alone.**

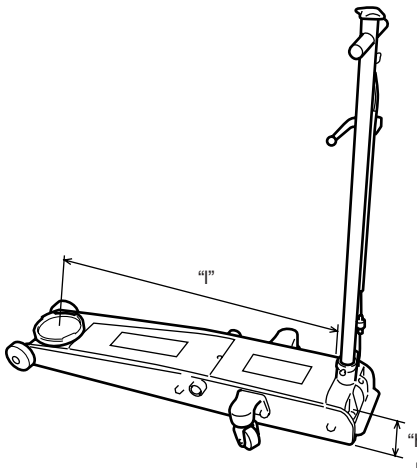
NOTICE

If you apply a jack against rear suspension parts (i.e. torsion beam, etc.) or the vehicle floor, these parts may get deformed. Avoid applying a jack against any rear suspension component or the vehicle floor.

NOTE

When jacking up the front end, the floor jack sizes shown below are appropriate.

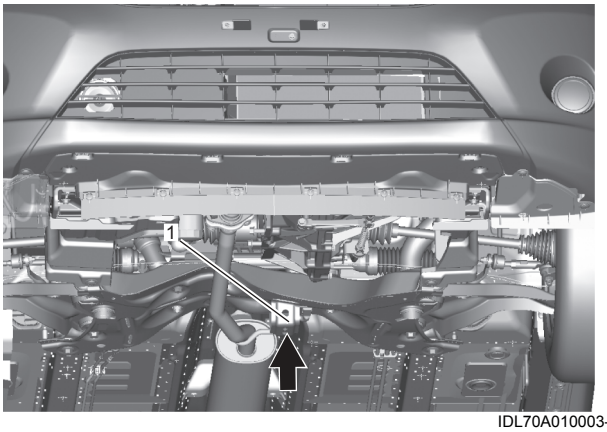
Jack size
Height "h": under 145 mm (under 5.71 in.)
Length "l": above 900 mm (above 35.4 in.)



I4RS0A010002-01

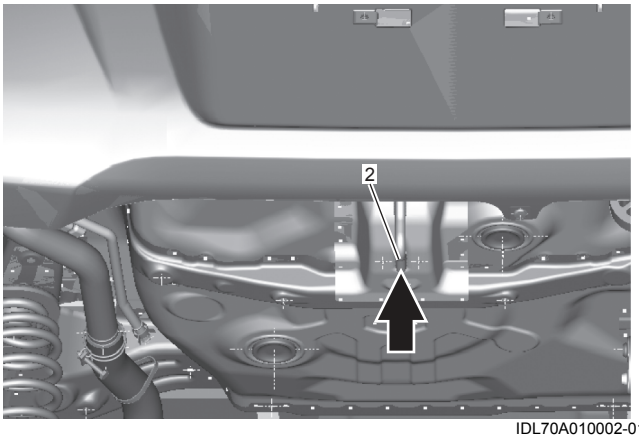
In raising front or rear vehicle end off the floor by jacking, be sure to put the jack against front suspension frame (1) or rear towing hook (2).

Front



IDL70A010003-01

Rear



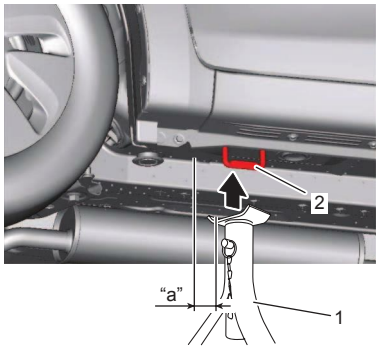
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To perform service with either front or rear vehicle end jacked up, be sure to place safety stands (1) under body mounting stays (2) so that vehicle body is securely supported. Then check to ensure that vehicle body does not slide on safety stands and the vehicle is held stable for safety's sake.

NOTICE

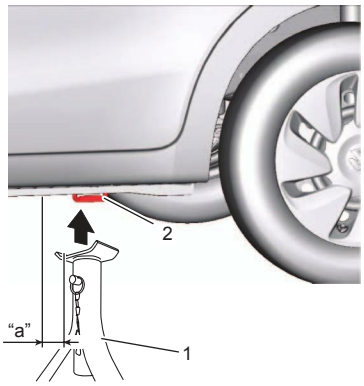
When supporting the vehicle body on the safety stands, improperly placing the safety stands to the vehicle may cause damage to the side sill splash guards.
Before supporting the vehicle body, check the distance "a" between the safety stands and the side sill splash guards, and place the safety stands properly so that the safety stands do not contact the side sill splash guards when the vehicle body is supported.

Front



IDL70A010004-01

Rear

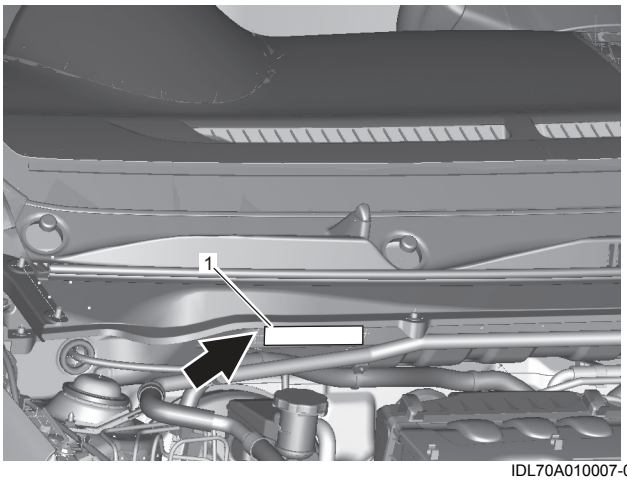


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Vehicle Identification Number

AENDL70A0101008

The vehicle identification number is punched on the cowl top under panel (1).

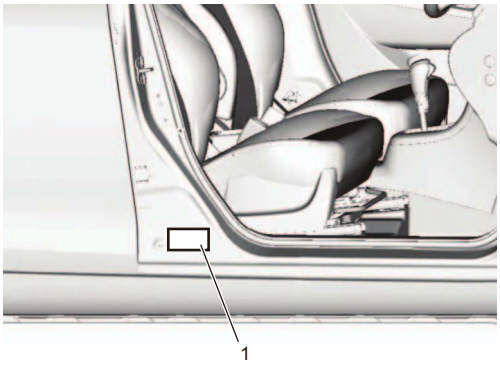


IDL70A010007-02

Identification Plate

AENDL70A0101009

Identification plate (1) is installed at the center pillar lower side on the right side body panel.

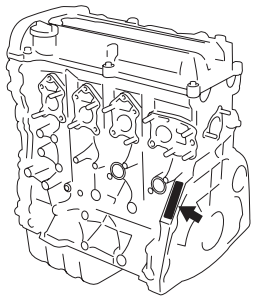


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Engine Identification Number

AENDL70A0101010

The engine identification number is punched on cylinder block.



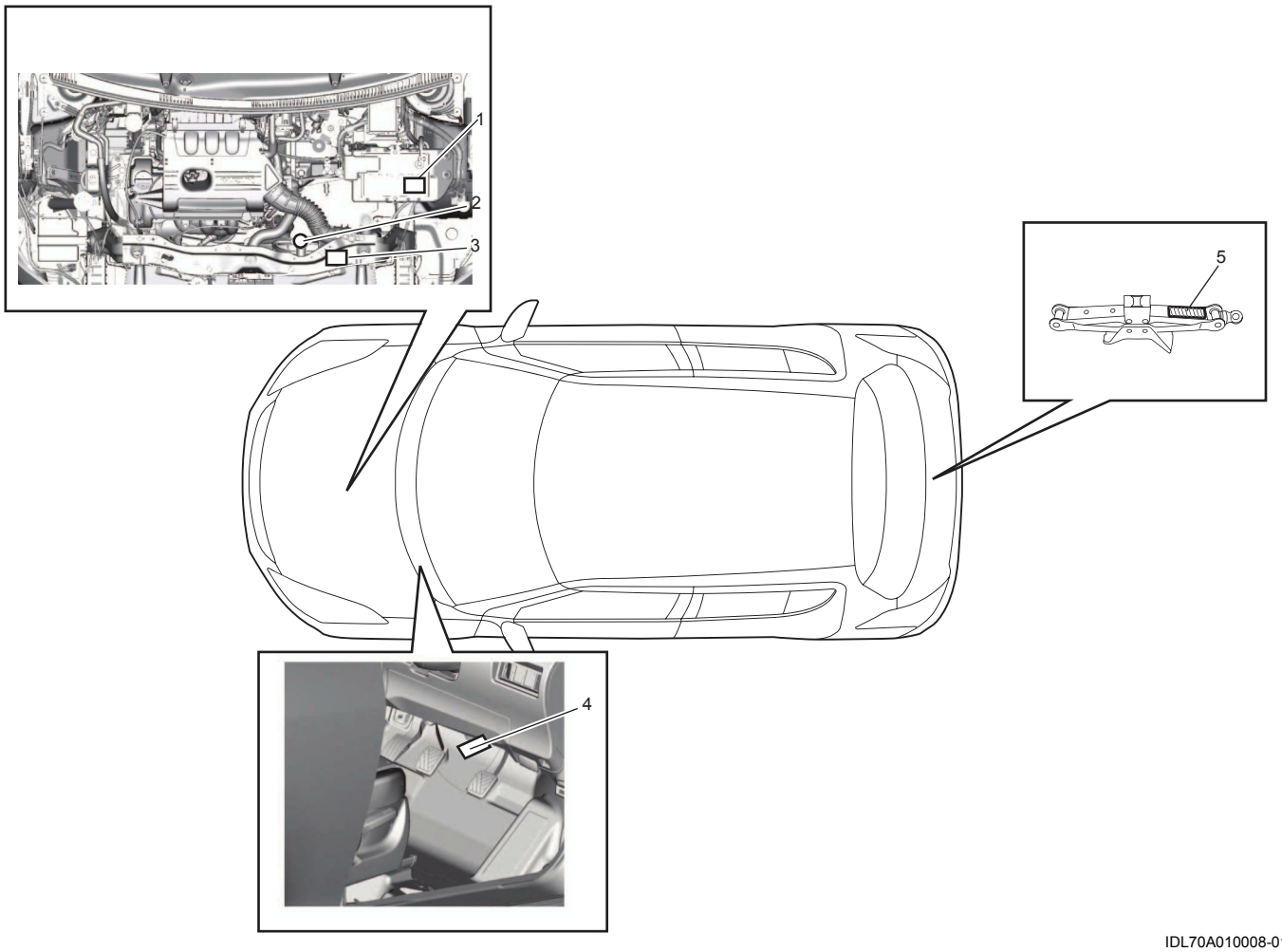
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Component Location

Warning, Caution and Information Labels Location

AENDL70A0103001

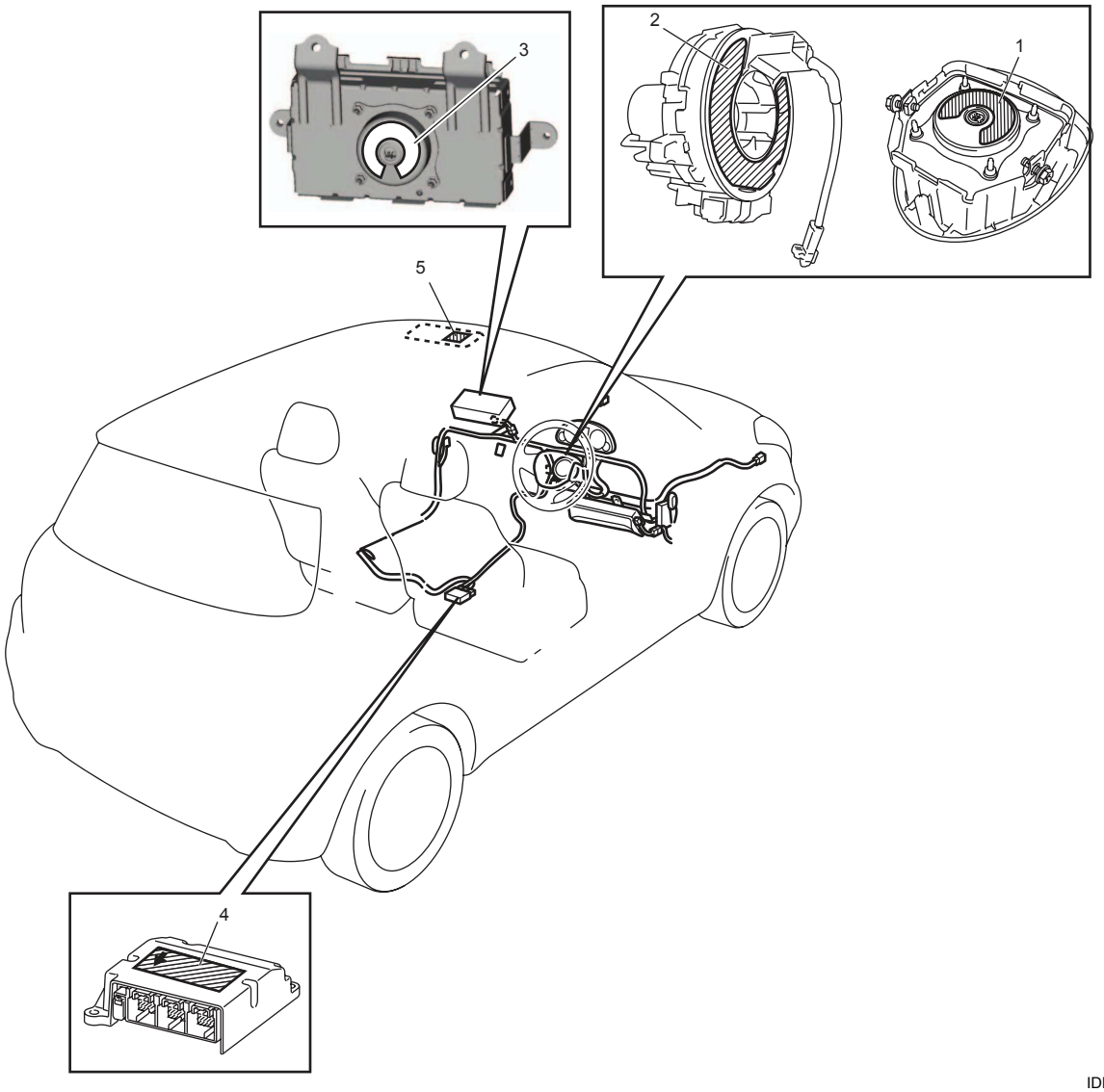
The figure shows main labels among others that are attached to vehicle components.
When servicing and handling components, refer to WARNING / CAUTION instructions printed on labels.
If any WARNING / CAUTION label is found stained or damaged, clean or replace it if necessary.



IDL70A010008-01

1. Battery label	3. Engine cooling fan label	5. Jack label
2. Radiator cap label	4. Steering shaft joint cover label	

[A]



IDL70A010009-02

[A]: These labels are attached on vehicle equipped with air bag system only.	3. Air bag label on passenger air bag (inflator) module
1. Air bag label on driver air bag (inflator) module	4. Air bag label on SDM
2. Air bag label on contact coil assembly	5. Air bag label on sun visor

Maintenance and Lubrication

Scheduled Maintenance

Maintenance Schedule under Normal Driving Conditions

AENDL70A0205001

NOTE

- **This interval should be judged by odometer reading or months, whichever comes first.**
- **This table includes service as scheduled up to 80,000 kms. Beyond 80,000 kms, carry out the same services at the same intervals respectively.**

Interval	Km (x 1,000)	1	5	10	20	30	40	50	60	70	80
	Months	1	6	12	24	36	48	60	72	84	96
Engine											
Water Pump drive belt (Tension, wear) (I: ☞(Page 0B-3), R: ☞(Page 0B-3))		—	—	—	—	—	I	—	—	—	R
Valve lash (clearance) (I: ☞(Page 0B-3))		—	—	—	—	I	—	—	I	—	—
Engine oil and oil filter (R: ☞(Page 0B-3))		—	—	R	R	R	R	R	R	R	R
Engine coolant (R: ☞(Page 0B-3))		I	I	I	R	I	R	I	R	I	R
Cooling system hoses and connections (leakage, damage)		I	I	I	I	I	I	I	I	I	I
Engine bolts (All cylinder head and manifold fixings)		—	—	T	—	T	—	T	—	T	—
Engine mounting (loose, damage)		—	—	T	—	T	—	T	—	T	—
Exhaust system (noise, leakage otherwise defective) (I: ☞(Page 0B-3))		—	I	—	I	—	I	—	I	—	I
PCV valve (Hoses, connections and valve) (I: ☞(Page 0B-5))		—	I	—	I	—	I	—	I	—	I
Ignition system											
Ignition wiring (damage, deterioration)		—	—	—	I	—	I	—	I	—	I
Spark plugs (R: ☞(Page 0B-4))		—	—	—	—	—	R	—	—	—	R
Fuel system											
Air cleaner filter (R: ☞(Page 0B-4), I: ☞(Page 0B-4))	Paved-road	Clean after every 5,000 Kms. Replace after every 40,000 kms									
	Dusty conditions	Clean after every 2,500 Kms. Replace after every 40,000 kms. More frequent replacement if dust condition is severe.									
Fuel tank cap, fuel lines and connections (leakage, damage) (I: ☞(Page 0B-4))		—	I	—	—	—	I	—	—	—	I
Fuel filter (leakage) (R: ☞(Page 0B-4))		—	—	I	I	I	I	I	I	I	R
Clutch and Transmission											
Clutch pedal (play)		I	I	I	I	I	I	I	I	I	I
Clutch slipping (dragging or excessive damage) (I: ☞(Page 0B-6))		I	I	I	I	I	I	I	I	I	I
Transmission Oil (leakage, damage) (R: ☞(Page 0B-8))		I	I	I	I	I	I	I	I	I	I
		Replace at 160,000 Kms or 10 years whichever comes earlier									
Drive Shaft											
Drive shaft boots (Boot cut or damage) (I: ☞(Page 0B-8))		I	I	I	I	I	I	I	I	I	I
Drive shaft (Noise) (I: ☞(Page 0B-8)		I	I	I	I	I	I	I	I	I	I
Brake											
Brake discs and pads (wear) (I: ☞(Page 0B-5))		—	I	I	I	I	I	I	I	I	I
Brake drums and shoes (wear, damage) (I: ☞(Page 0B-5))		—	—	I	I	I	I	I	I	I	I
Master cylinder and wheel cylinder or caliper, Brake hoses and pipes (leakage, damage, clamp) (I: ☞(Page 0B-5))		I	I	I	I	I	I	I	I	I	I
Brake fluid (level, leakage) (R: ☞(Page 0B-6))		I	I	I	R	I	R	I	R	I	R
Brake pedal (pedal-to-wall clearance)		I	I	I	I	I	I	I	I	I	I
Master cylinder sub assembly, wheel cylinder boot kit and caliper seal set		—	—	—	—	—	R	—	—	—	R

Interval	Km (x 1,000)	1	5	10	20	30	40	50	60	70	80
	Months	1	6	12	24	36	48	60	72	84	96
Parking brake lever and cable (damage, play) (I: ☞(Page 0B-6))		I	I	I	I	I	I	I	I	I	I
Wheel											
Tire (air pressure, abnormal wear, crack, rotation) (I: ☞(Page 0B-6))		I	I & O	I & O	I & O	I & O	I & O	I & O	I & O	I & O	I & O
Wheels (damage)		I	I	I	I	I	I	I	I	I	I
Front / Rear wheel bearings (loose, damage)		—	I	I	I	I	I	I	I	I	I
Suspension											
Suspension strut (leakage, damage)		I	I	I	I	I	I	I	I	I	I
Suspension arms and knuckle supports (loose, damage)		—	I	I	I	I	I	I	I	I	I
Rear spring (damage, noise)		—	I	I	I	I	I	I	I	I	I
Shock absorber (oil leakage, damage)		I	I	I	I	I	I	I	I	I	I
All bolts and nuts (loose)		—	T	T	T	T	T	T	T	T	T
Suspension arms and tension rods		—	I	I	I	I	I	I	I	I	I
Steering											
Steering wheel (play, loose)		I	I	I	I	I	I	I	I	I	I
All rods and arms (loose, damage, wear)		I	I	I	I	I	I	I	I	I	I
Electrical											
Battery electrolyte (level, leakage)		I	I	I	I	I	I	I	I	I	I
Wiring harness connection (looseness, damage)		—	I	I	I	I	I	I	I	I	I
Lighting system (operation, stains, damage)		I	I	I	I	I	I	I	I	I	I
Horn (operation)		I	I	I	I	I	I	I	I	I	I
System voltage		I	I	I	I	I	I	I	I	I	I
Body											
All latches, hinges and locks (I: ☞(Page 0B-8))		I	I & L	I & L	I & L	I & L	I & L	I & L	I & L	I & L	I & L
All chassis bolts and nuts (tighten)		—	I	T	T	T	T	T	T	T	T
Road test											
Operation of brakes, gear shifting and speedometer		I	I	I	I	I	I	I	I	I	I
Body and chassis noise		I	I	I	I	I	I	I	I	I	I
Air conditioner											
Check belt tension		I	I	I	I	I	I	I	I	I	I
Tighten compressor mounting bolts		—	T	T	T	T	T	T	T	T	T
Check all hose joints, tighten if necessary		I	I	I	I	I	I	I	I	I	I
Check functioning of Recirculating flap		I	I	I	I	I	I	I	I	I	I
Clean condenser with low pressure water		—	C	C	C	C	C	C	C	C	C
Check belt for frayed edges, change if necessary		—	I	I	I	I	I	I	I	I	I
Check all mounting bolts		—	I	I	I	I	I	I	I	I	I

NOTE

- **"R": Replace or change**
- **"I": Inspect and correct, replace or lubricate if necessary**
- **"C": Clean**
- **"O": Rotate**
- **"T": Tighten to specified torque**
- **"L": Lubricate**

Repair Instructions

Accessory Drive Belt Inspection

AENDL70A0206001

⚠ WARNING

There is a risk of personal injury if the service work described below is performed while the engine is running.
Make sure that the ENGINE IS NOT RUNNING before performing the service work described below.

Inspect belt for cracks, cuts, deformation, wear and contamination. If any defect is found, replace belt.
Check belt for tension.

- Water pump / generator drive belt: ☞(Page 1J-5)
- Compressor drive belt: ☞(Page 7B-36)

Accessory Drive Belt Replacement

AENDL70A0206002

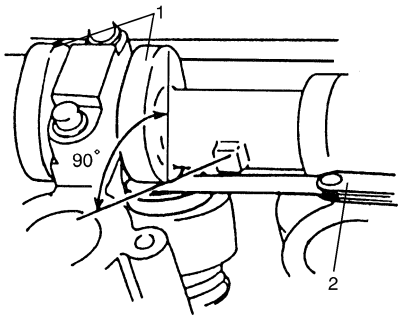
Replace accessory drive belt with new one.

- Water pump / generator drive belt: ☞(Page 1J-6)
- Compressor drive belt: ☞(Page 7B-37)

Valve Lash (Clearance) Inspection

AENDL70A0206003

Inspect intake and exhaust valve lashes. Adjust them if necessary.
Refer to “Valve Lash (Clearance) Inspection and Adjustment” in Section 1D (Page 1D-2) for valve lash inspection and adjustment procedures.



I2RH0B020003-02

1. Camshaft	2. Feeler gauge

Engine Oil and Filter Change

AENDL70A0206004

Replace engine oil and filter. ☞(Page 1E-5)

Cooling System Components, Hose and Connection Inspection

AENDL70A0206005

1) Inspect cooling system components, hoses and connections for leakage, damage and cracks, and clamps for tightness according to “Coolant Level Check” in Section 1F (Page 1F-7).
   Replace all hoses that are leaky or have cracks or other damage. Replace all clamps which cannot maintain proper tightness.
2) Clean frontal area of radiator core.
3) Check coolant level and concentration.
   Add if necessary.
   Refer to “Radiator Cap Removal and Installation” in Section 1F (Page 1F-6) for procedure of level check.

Engine Coolant Change

AENDL70A0206006

Change engine coolant with new one.

- Draining: ☞(Page 1F-7)
- Refilling: ☞(Page 1F-8)

Exhaust System Inspection

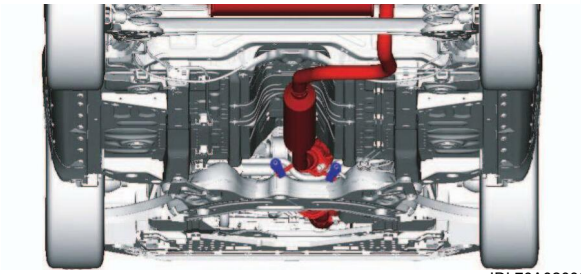
AENDL70A0206007

⚠ CAUTION

Exhaust system components may be hot enough to cause burns.
Make sure all exhaust system components have cooled before performing any service work on the exhaust system.

When carrying out periodic maintenance, or the vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and dislocation.
- Check exhaust system for leakage, loose connections, dents and damages.
  If bolts or nuts are loose, tighten them to specification.
- Check nearby body areas for damaged, missing or ill-placed parts, open seams, holes, loose connections or other defects which could permit exhaust fumes to seep into the vehicle.
- Make sure that exhaust system components have enough clearance from the underbody to avoid overheating and possible damage to floor carpet.



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- Any defects should be fixed at once.

EVAP Canister Replacement

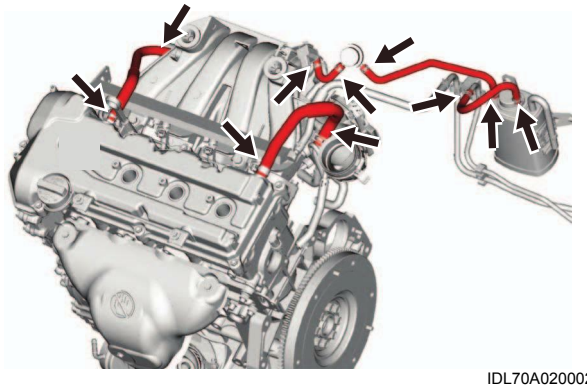
AENDL70A0206008

Replace EVAP canister with new one referring to “EVAP System Components” in Section 1B (Page 1B-2).

Emission-Related Hose and Tube Inspection

AENDL70A0206009

Check each vacuum hose and tube for secure connection.
Also, check that it is free from any bend or damage.
Correct faulty condition, if any.



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Spark Plug Replacement

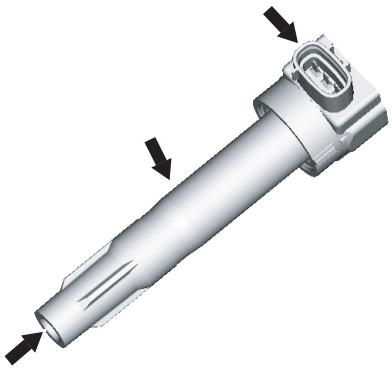
AENDL70A0206010

Replace spark plugs with new ones. ☞(Page 1H-5)

Ignition Coil (Plug Cap) Inspection

AENDL70A0206011

1) Remove ignition coil assemblies. ☞(Page 1H-5)
2) Check ignition coil assembly for damage, deterioration and terminal corrosion.
   If defective condition is found, replace ignition coil assembly.

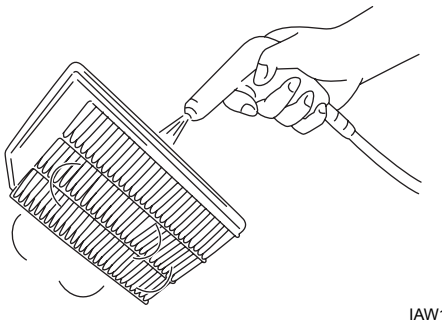


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Air Cleaner Filter Inspection

AENDL70A0206012

1) Remove air cleaner filter. ☞(Page 1D-4)
2) Check that filter is not excessively dirty, damaged or oily. Clean filter with compressed air from air outlet side of filter.



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3) Install air cleaner filter. ☞(Page 1D-4)

Air Cleaner Filter Replacement

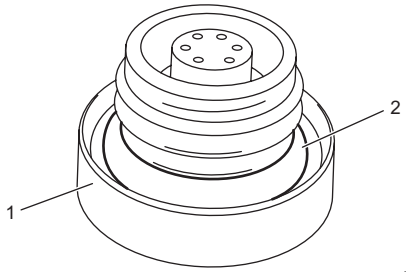
AENDL70A0206013

Replace air cleaner filter with new one. ☞(Page 1D-4)

Fuel Tank, Cap Gasket and Fuel Line Inspection

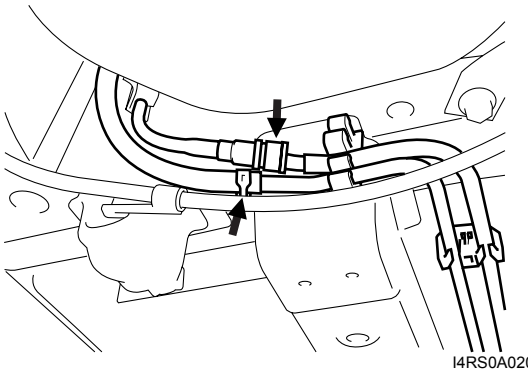
AENDL70A0206014

- Check fuel tank, fuel filler cap (1) and fuel lines for loose connection, deterioration or damage which could cause leakage. Make sure all clamps are secure.
- Check fuel filler cap gasket (2) for an even filler neck imprint or any damage.



I9P60A020002-01

- Replace any damaged or deteriorated parts.
  There should be no sign of fuel leakage or moisture at any fuel connection.



I4RS0A020005-01

Fuel Filter Replacement

AENDL70A0206015

⚠ WARNING

This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).

Fuel filter is installed in fuel pump assembly inside fuel tank.
Replace fuel filter (or fuel pump assembly) with new one periodically. ☞(Page 1G-20)

PCV Valve Inspection

AENDL70A0206016

Check PCV valve and hose.

- PCV valve: ☞(Page 1B-5)
- PCV hose: ☞(Page 1B-5)

Fuel Evaporative Emission Control System Inspection

AENDL70A0206017

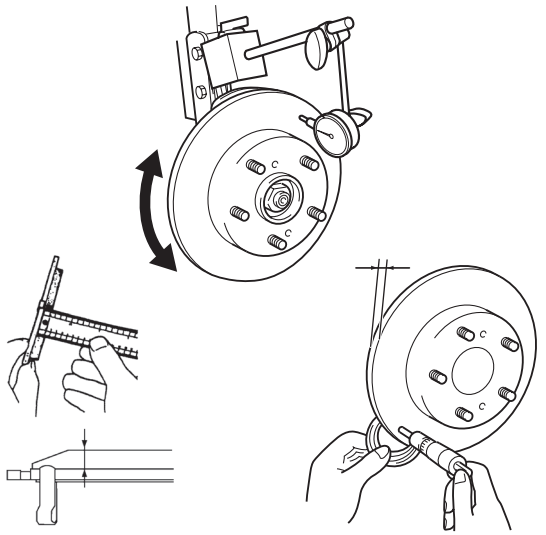
Check EVAP canister and fuel vapor hose.

- EVAP canister: ☞(Page 1B-4)
- EVAP connection hose: ☞(Page 1B-4)

Brake Disc and Pad Inspection

AENDL70A0206018

1) Remove wheel and caliper but do not disconnect brake hose from caliper.
2) Check disc brake pads and discs for excessive wear, damage and deflection. Replace parts if necessary. Be sure to torque caliper pin bolts to specification.
   - Front brake pad: ☞(Page 4B-3)
   - Front brake disc: ☞(Page 4B-4)



IAW101020011-01

Rear Brake Drum and Shoe Inspection

AENDL70A0206043

1) Remove wheel and rear brake drum but do not disconnect brake hose from wheel cylinder.
2) Check drum brake shoe lining and brake drum for excessive wear and damage referring to “Rear Brake Drum and Shoe Inspection” in Section 4C (Page 4C-3).

Brake Hose and Pipe Inspection

AENDL70A0206019

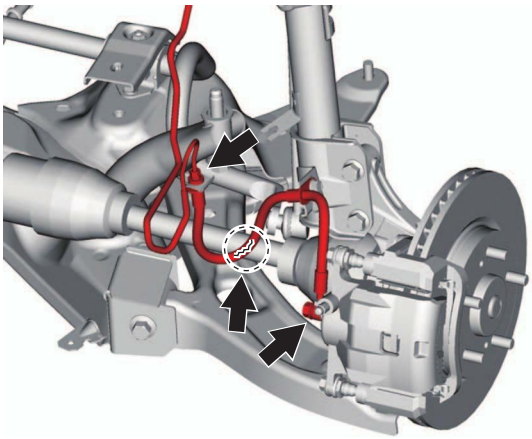
Perform this inspection where there is enough light and use a mirror if necessary.

- Check brake hoses and pipes for improper connections, leaks, cracks, chafing and other damage.
- Check that hoses and pipes are clear of sharp edges and moving parts.

Repair or replace any of these parts if necessary.

NOTICE

Air in the brake system will cause poor braking performance and can lead to an accident.
After servicing the brake system, be sure to completely bleed all air out of the system.



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Brake Fluid Inspection

AENDL70A0206020

1) Check parts around master cylinder and reservoir for fluid leakage. If any sign of leakage is found, correct defects.
2) Check fluid level.
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid.
   For the details, refer to “Brake Fluid Level Inspection” in Section 4A (Page 4A-5).

⚠ CAUTION

Since brake system of this vehicle is factory-filled with brake fluid indicated on reservoir tank cap, do not use or mix different type of fluid when refilling; otherwise serious damage will occur.
Do not use old or used brake fluid, or any fluid from an unsealed container.

Brake fluid
Refer to reservoir cap of brake master cylinder.

Brake Fluid Replacement

AENDL70A0206021

Change brake fluid as follows.
Drain existing fluid from brake system completely, fill system with specified fluid and carry out air purge operation.
For air purging procedure, refer to “Air Bleeding of Brake System” in Section 4A (Page 4A-6).

Brake Pedal Inspection

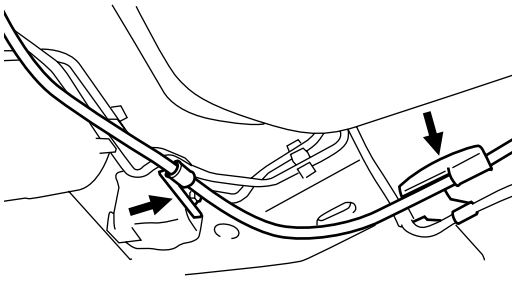
AENDL70A0206022

Check brake pedal travel.
For checking procedure, refer to “Excessive Pedal Travel Inspection” in Section 4A (Page 4A-9).

Brake Lever and Cable Inspection

AENDL70A0206023

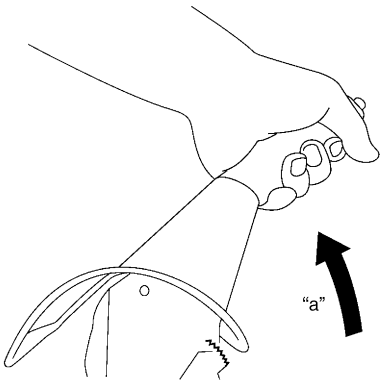
1) Inspect brake cables for damage and check that they move smoothly.
   Replace deteriorated cable(s).



I4RS0A020009-01

2) Check tooth tip of each brake lever ratchet notch for damage or wear. If any damage or wear is found, replace parking brake lever.
3) Check parking brake lever for proper operation and stroke, and adjust it if necessary.
   For checking and adjusting procedures, refer to “Parking Brake Inspection and Adjustment” in Section 4D (Page 4D-2).

Parking brake lever stroke
“a”: 4 – 9 notches (with 200 N (20.4 kgf, 45.0 lbf) of pull pressure)



I7V20A440002-01

Clutch Pedal Inspection (M/T Model)

AENDL70A0206024

Check clutch pedal travel.
For checking procedure, refer to “Clutch Pedal Inspection” in Section 5C (Page 5C-3).

Clutch Slipping (M/T Model)

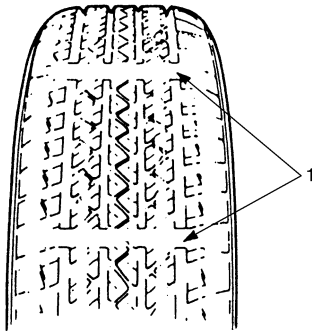
AENDL70A0206041

For checking procedure, refer to “Clutch System Symptom Diagnosis” in Section 5C (Page 5C-2).

Tire Inspection

AENDL70A0206026

1) Check tires for uneven or excessive wear, or damage. If defective, replace tire.
   Refer to “Wheel (with Tire) Removal and Installation” in Section 2D (Page 2D-3) for details.



I2RH01020022-01

1. Wear indicator

2) Check inflation pressure of each tire and adjust pressure to specification if necessary.

NOTE

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure is indicated on the tire placard.**

3) Rotate tires. For details, refer to “Tire Rotation” in Section 2D (Page 2D-4).

Wheel Disc Inspection

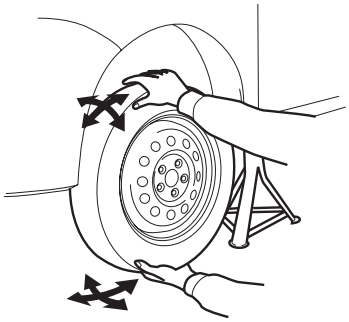
AENDL70A0206027

Inspect each wheel disc for dents, distortion and cracks. Badly damaged wheel disc must be replaced.

Wheel Bearing Inspection

AENDL70A0206028

1) Check front wheel bearings for wear, damage and abnormal noise. For details, refer to “Front Wheel Bearing Check”: Front in Section 3A (Page 3A-12).
2) Check rear wheel bearings for wear, damage and abnormal noise. For details, refer to “Rear Wheel Hub Assembly Removal and Installation”: Rear in Section 3A (Page 3A-14).



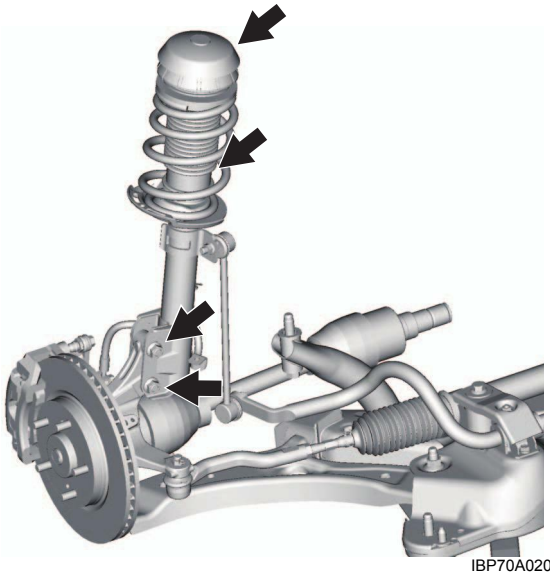
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Suspension System Inspection

AENDL70A0206029

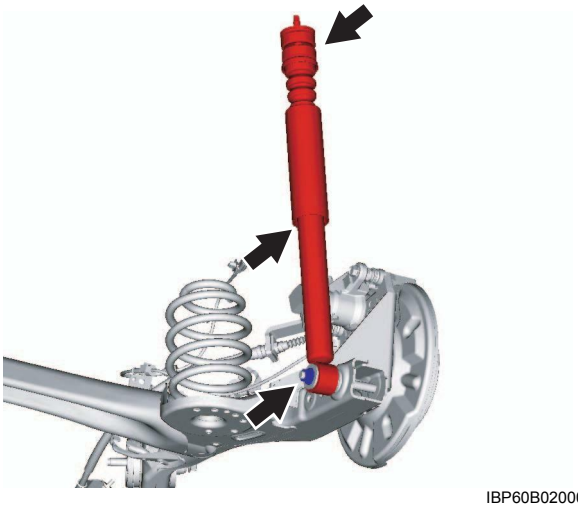
- Inspect front strut assemblies and rear shock absorbers for sign of oil leakage, dents or any other damage on sleeves. Also inspect anchor ends for deterioration.
  Replace defective parts, if any.
- Check front and rear suspension systems for damaged, loose or missing parts. Also check them for parts showing signs of wear or lack of lubrication. Repair or replace defective parts, if any.

Front



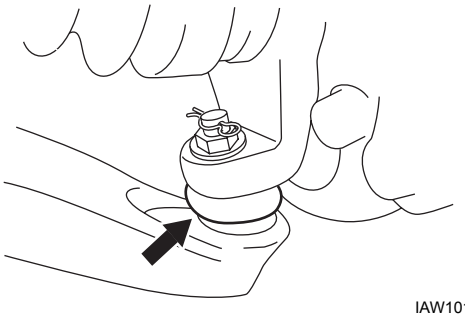
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Rear



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- Check dust covers of front suspension arm ball joints for leakage, detachment, tear or any other damage. Replace defective suspension arm(s) if necessary.



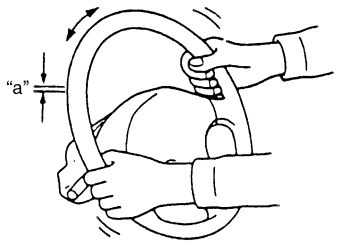
IAW101020014-01

Steering System Inspection

AENDL70A0206030

1) Check steering wheel for play and abnormal noise, holding vehicle straight on ground.

   Steering wheel play
   "a": 0 – 30 mm (0 – 1.2 in.)

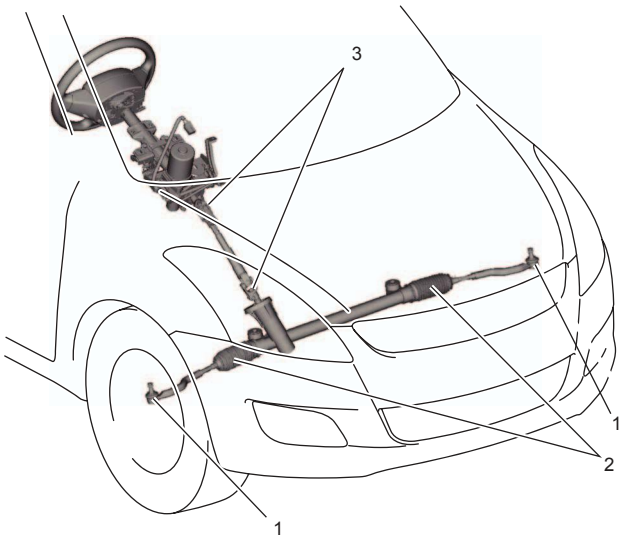


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2) Check bolts and nuts for tightness and retighten them if necessary. Repair or replace defective parts.
3) Check steering linkage for looseness and damage. Repair or replace defective parts.
4) Check boots (1) and (2) of steering linkage and steering gear case for damage (leak, detachment, tear, etc.). Replace defective steering rack boot(s) or tie-rod end(s) with new one(s).

If any dent is found on steering gear case boots, correct it to original shape by turning steering wheel to the right or left as far as it stops and holding it for a few seconds.

5) Check universal joints (3) of steering shaft for abnormal noise and damage. If abnormal noise or damage is detected, replace defective part with new one.



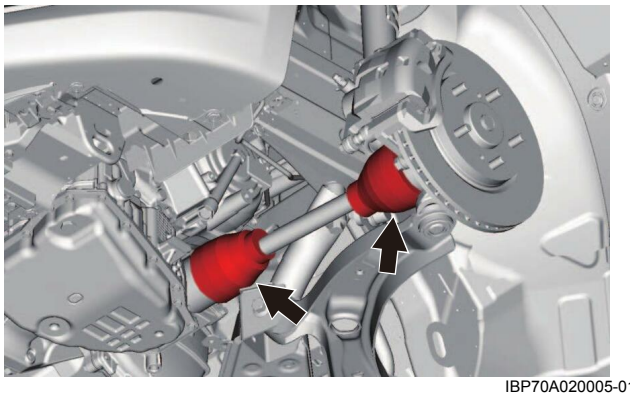
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6) Check that steering wheel can be turned fully to the right and left. Repair or replace defective parts, if any.
7) Check that steering wheel can be turned fully to the right and left with smaller force when engine is running at idle speed than when it is stopped.
8) Check wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment” in Section 2B (Page 2B-1).

Drive Shaft (Axle) Boot Inspection

AENDL70A0206031

Check drive shaft boots (wheel side and differential side) for leaks, detachment, tear or other damage.
Replace defective parts if necessary.



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Drive Shaft Symptom Diagnosis

AENDL70A0206042

Check drive shaft joint (wheel side and differential side) for wear, damage and abnormal noise referring to “Front Drive Shaft Symptom Diagnosis”: Front in Section 3A (Page 3A-1).

Manual Transaxle Oil Inspection (M/T Model)

AENDL70A0206032

Check transaxle oil for leakage, contamination and level. ☞(Page 5B-5)

Manual Transaxle Oil Replacement (M/T Model)

AENDL70A0206033

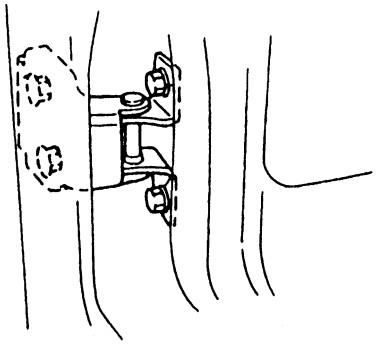
Change transaxle oil with new specified. ☞(Page 5B-5)

All Latches, Hinges and Locks Inspection

AENDL70A0206037

Door

Check that each door opens and closes smoothly and locks securely when closed.
If any malfunction is found, lubricate hinges and latch or repair door lock system.



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Rear End Door

Check that rear end door open and close smoothly and lock securely when closed.
If any malfunction is found, adjust rear end door latch striker.

Hood

Check that secondary latch operates properly (check that secondary latch keeps hood from opening all the way when hood release handle inside vehicle is pulled.) Also check that hood opens and closes smoothly and properly and hood locks securely when closed.
If any malfunction is found, lubricate hinges and latch, or repair hood lock system.

Final Inspection for Maintenance Service

AENDL70A0206040

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.
Select a level road with no traffic to minimize the risk of an accident, and perform the test extremely carefully.

Seat
Check that each front seat slides smoothly and locks securely at any position. Also check that reclining mechanism of each front seat allows the seatback to be locked at any angle.

Seat Belt
Inspect seat belt systems including webbing, buckles, latch plates, retractors and anchors for damage or wear. Check that each seat belt locks securely.

Battery Electrolyte Level Check

- If battery is equipped with electrolyte level check lines on the case, check that the electrolyte level of all battery cells is between the upper and lower level lines.

Accelerator Pedal Operation
Check that accelerator pedal operates smoothly without getting caught by or interfering any other part.

Engine Start
Check the engine starts readily.

⚠ WARNING

If you do not take proper precautions when performing the engine start check as described below, the vehicle could move without warning causing personal injury and/or property damage.
When performing the engine start check as described below, be sure to take the following precautions:

- **Provide adequate space around the vehicle.**
- **Firmly apply both the parking brake and the foot brake.**
- **Do not use the accelerator pedal.**
- **Set ignition OFF immediately if the engine starts.**

On manual transaxle vehicles, place the gearshift lever in “Neutral,” depress clutch pedal halfway and try to start.
On AMT vehicles, try to start the engine in “N” lever position. The starting motor should crank only in “N” range.
Starting motor should crank only when brake pedal is fully depressed.

Exhaust System Check
Check for leakage, cracks or loose supports.

Clutch (M/T Model)
Check for the following points:

- Clutch is completely released when clutch pedal is depressed.
- No slipping clutch occurs when releasing pedal and accelerating.
- Clutch itself is free from any abnormal conditions.

Gearshift or Select Lever
Check gear shift or select lever for smooth movement to all positions and for good and correct response of transaxle in any position.
With AMT equipped vehicles, also check that shift indicator indicates position correctly according to select lever position.

Brake
Foot brake
Check the following points:

- Brake pedal has proper travel.
- Brakes work properly.
- Brakes do not generate abnormal noise.
- Vehicle does not pull to one side when brakes are applied.
- Brakes do not drag.

Parking brake
Check that lever stroke is proper.

⚠ WARNING

If you do not take proper precautions when testing the parking brake on a slope, the vehicle could move unexpectedly, causing personal injury and/or property damage.
When testing the parking brake on a slope, be sure to take the following precautions:

- **Make sure there is nothing in the way in the downhill direction.**
- **Apply the foot brake quickly if the vehicle moves.**

Check that parking brake is fully effective when the vehicle is stopped on a slope by pulling parking brake lever all the way.

Steering

- Check that steering wheel is not instable and has no abnormally large resistance to turn.
- Check that vehicle does not wander or pull to one side.

Engine

- Check that speed changes responsively to accelerator positions.
- Check that engine is free from abnormal noise and abnormal vibration.

Body, Wheel and Power Train Components
Check that body, wheels and power train components are free from any abnormal conditions such as abnormal noise and vibration.

Meter and Gauge
Check that speedometer, odometer, fuel gauge, temperature gauge, etc. are operating accurately.

Light
Check that all lights operate properly.

Windshield Defroster
Periodically check that air comes out from defroster outlet when operating heater or air conditioning.
Set mode control lever to defroster position and fan switch lever to highest position for this check.

Special Tools and Equipment

Recommended Fluids and Lubricants

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Engine oil	Refer to ☞(Page 1E-5)
Engine coolant (Ethylene glycol base coolant)	“Antifreeze/Anticorrosion coolant”
Brake fluid	Refer to reservoir cap of brake master cylinder.
Manual transaxle oil	Refer to ☞(Page 5B-5)
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	Engine oil or water resistance chassis grease
Key lock cylinder	Spray lubricant

Section 1

Engine

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Precautions

Precautions

Precautions for Engine

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Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

Precautions for CAN Communication System
Refer to “Precautions for CAN Communication System” (Page 1-1).

Precautions for Catalytic Converter
Refer to “Precautions for Catalytic Converter” in Section 00 (Page 00-5).

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness.
Otherwise, electrical trouble may occur.

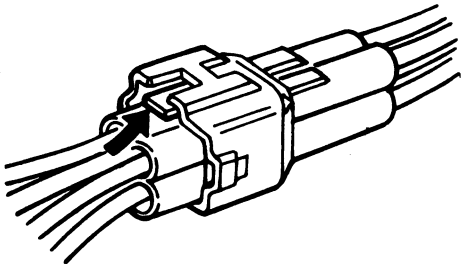
Precautions for Fuel System Service
Refer to “Precautions for Fuel System Service” in Section 1G (Page 1G-1).

Precautions for Engine Service

⚠ CAUTION

The following information on engine service should be noted carefully, as it is important in preventing damage, and in contributing to reliable engine performance.

- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits. When performing any work where electrical terminals could be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.
- When disconnecting connectors, do not pull wire harness but make sure to hold connector itself. With lock type connector, be sure to unlock before disconnection.
  Attempt to disconnect connector without unlocking may result in damage to connector. When connecting lock type connector, insert it till clicking sound is heard and connect it securely.



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Precautions for Diagnosing Trouble

- Diagnostic information stored in ECM memory can be cleared as well as checked using SUZUKI scan tool or CAN communication OBD generic scan tool. Before using scan tool, read its operator’s (instruction) manual carefully to know how to use it.
- MIL is turned on by command not only from ECM but also from TCM (AMT model). It is indistinguishable which module turns on MIL (for details of on-board diagnostic system for AMT model, refer to ☞(Page 5D-7)).
- Therefore, check both ECM and TCM (AMT model) for DTC when MIL lights up.
- When checking ECM for DTC, keep in mind that DTC is displayed differently depending on the scan tool used.
  – SUZUKI SDT-II displays DTC detected by ECM.
  – CAN communication OBD generic scan tool also displays DTC detected by ECM.
- Priorities for diagnosing troubles:

If two or more DTCs are stored, perform DTC troubleshooting for these DTCs beginning with the DTC detected earliest and follow the instructions available in the troubleshooting procedure.
If no instructions are available, troubleshoot DTCs according to the following priorities.

a. DTCs other than DTC P0171 / P0172 (Fuel system too lean/too rich) and DTC P0300 / P0301 / P0302 / P0303 (Misfire detected)
b. DTC P0171 / P0172 (Fuel system too lean/too rich)
c. DTC P0300 / P0301 / P0302 / P0303 (Misfire detected)

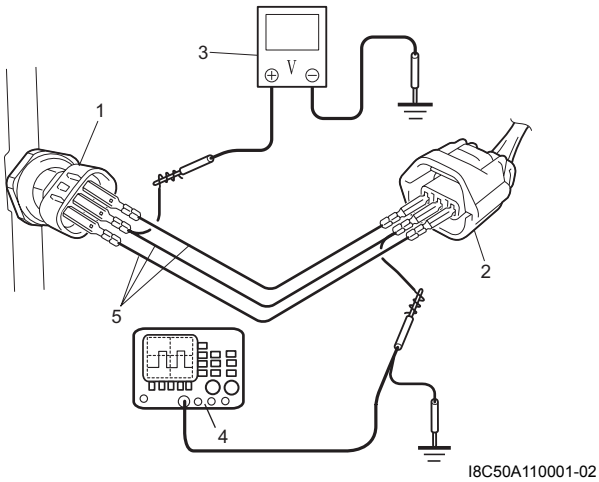
- Be sure to read “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3) before inspection and observe what is written there.
- Communication of ECM and other control module are established via CAN. (For more detail of CAN communication for ECM, refer to “CAN Communication System Description” in Section 10H (Page 10H-1).)
  Therefore, handle CAN communication line with care referring to “Precautions for CAN Communication System” in Section 00 (Page 00-9).
- Before performing troubleshooting, be sure to read the “Precautions for ECM Circuit Inspection” (Page 1-2).
- Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been repaired.

Precautions for Replacing ECM

- Before replacement of the ECM, check for the following conditions. Neglecting this check may cause damage to new ECM.
  – Resistance values of all relays and actuators are as specified.
  – TP sensor, APP sensor, MAP sensor and A/C refrigerant pressure sensor are in good condition and none of their power circuits is shorted to ground.
- Perform “Procedure after ECM Replacement” in Section 1C (Page 1C-1).

Precautions for ECM Circuit Inspection

Do not measure circuit voltage and/or pulse signal of ECM by inserting tester probe into a sealed terminal of ECM.
When measuring circuit voltage and/or pulse signal of ECM, be sure to connect service wires (5) to terminals of each sensor / actuator (1) and sensor / actuator connector (2). Otherwise, sealed terminals, ECM and its circuits may be damaged.



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3. Voltmeter	4. Oscilloscope

Precautions for Electric Throttle Control System Calibration

Completely closed and opened throttle valve position data are stored in ECM. (For details of electric throttle control system calibration, refer to “Description of Electric Throttle Control System Calibration” in Section 1A (Page 1A-5))
After performing any one of the following services, calibrate the completely closed and opened throttle valve position stored in ECM. ☞(Page 1C-3)

- ECM Replacement.
- DTC Clearance.
- Electric throttle body assembly replacement.
- Accelerator pedal assembly replacement.

Precautions for Generator Control System

In connection with generating control of the generator, the engine speed may rise or drop due to such causal factors as described below.

- Battery is undercharged or its service life is used up.
- The power for later added accessories is taken directly from the battery terminal.
- A large amount of electric load is applied.

Engine General Information and Diagnosis

General Description

Statement on Cleanliness and Care

AENDL70A1101001

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are of the order of thousands of a millimeter (ten thousandths of an inch).
Accordingly, when any internal engine parts are serviced, care and cleanliness are important.
It should be understood that proper cleaning and protection of machined surfaces and friction areas is part of the repair procedure. This is considered standard shop practice even if not specifically stated.

- A liberal coating of engine oil should be applied to friction areas during assembly to protect and lubricate the surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order.
  At the time of installation, they should be installed in the original locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine.
  Failure to disconnect cables may result in damage to wire harness or other electrical parts.
- The three cylinders of the engine are identified by numbers; No.1, No.2 and No.3 counted from crankshaft pulley side to flywheel side.

Engine Diagnosis General Description

AENDL70A1101002

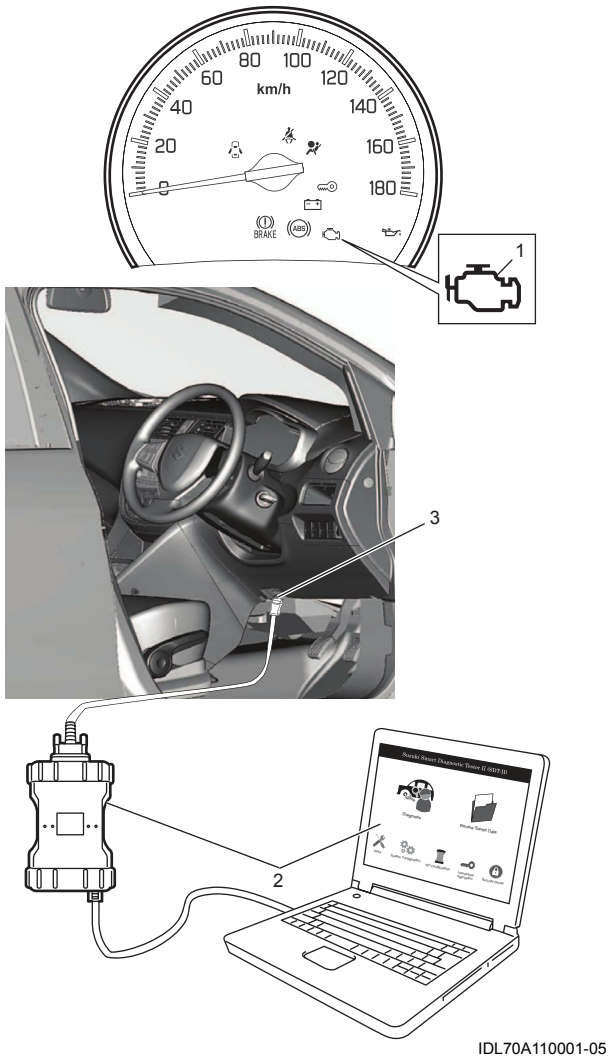
The engine and emission control system in this vehicle are controlled by ECM. ECM has an OBD system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission. When diagnosing engine troubles, be sure to have full understanding of the outline of “OBD System Description” (Page 1A-1) and each item in “Precautions for Diagnosing Trouble” under “Precautions for Engine” in Section 1 (Page 1-1) and execute diagnosis according to “Engine and Emission Control System Check” (Page 1A-16).
There is a close relationship between the engine mechanical, engine cooling system, ignition system, exhaust system, etc. and the engine and emission control system in their structure and operation. In case of an engine trouble, even when the MIL does not turn ON, it should be diagnosed according to “Engine and Emission Control System Check” (Page 1A-16).

OBD System Description

AENDL70A1101003

ECM in this vehicle has the following functions.

- When ignition is “ON” with the engine at a stop, MIL (1) turns ON to check the circuit of the MIL (1).
- When ECM detects a malfunction which gives an adverse effect to vehicle emission while the engine is running, ECM makes the MIL (1) in the combination meter of the instrument panel turn ON or blink (blinking only when detecting a misfire which can cause damage to the catalyst) and stores the malfunction area in its memory.
- For some malfunctions, ECM adopts the 3 driving cycle detection logic (refer to “3 Driving Cycle Detection Logic” (Page 1A-2)) to prevent erroneous detection.
  With this logic, MIL is turned on when the same malfunction is detected in 3 consecutive driving cycles.
  However, if ECM detects a malfunction only in the first driving cycle (refer to “Driving Cycle” (Page 1A-2).) but does not detect the same malfunction in the next 2 consecutive driving cycles, ECM does not turn on MIL (1) although it retains the associated DTC in its memory.
- When a malfunction is detected, engine and driving conditions at the moment the malfunction was detected are stored in ECM memory as freeze frame data. For the details, refer to description on “Freeze frame data clearance:” (Page 1A-3).
- Not only SUZUKI scan tool (2) but also CAN communication OBD generic scan tool can communicate with ECM via DLC (3). Diagnostic information can be accessed using a scan tool.



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Warm-Up Cycle
A “warm-up cycle” means keeping the engine operating after the start until the coolant temperature rises by at least 22 °C (40 °F) or reaches a minimum temperature of 71 °C (160 °F).

Driving Cycle
A “Driving Cycle” is a duration from an engine startup to the following engine shutoff.

3 Driving Cycle Detection Logic
The malfunction detected in the first driving cycle is stored in ECM memory (in the form of pending DTC) but MIL does not light at this time. ECM causes the MIL to light up when it detects third time the same malfunction in the next two driving cycles.

Pending DTC
“Pending DTC” is relevant to those DTCs to which the “3 driving cycle detection logic” is applied. If such a DTC is detected and stored temporarily during the first of three consecutive driving cycles, the DTC is called “pending DTC”.

Freeze Frame Data
ECM stores the engine and driving conditions at the moment of the detection of a malfunction in its memory. This data is called “Freeze frame data”.
Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, whether the vehicle was running or stopped, whether air/fuel mixture was lean or rich) when a malfunction was detected by checking the freeze frame data. Also, ECM has a function to store each freeze frame data for three different malfunctions in the order of their detection. Utilizing this function, it is possible to know the order of detection of these malfunctions. This is helpful when rechecking or diagnosing a problem.
For details of freeze data that can be read from ECM, refer to the table below.

DTC
Fuel System
Calculated Load
ECT
Short Term Fuel Trim
Long Term Fuel Trim
MAP
Engine Speed
Vehicle Speed
Ignition Advance
Intake Air Temperature
Absolute TP 1*
Time Since Engine Start
EVAP Canist Prg Duty
Fuel Tank Level
Barometric Pres
Battery Voltage
Relative TP**
Absolute TP 2*
Absolute APP 1*
Absolute APP 2*
Target Throt Pos

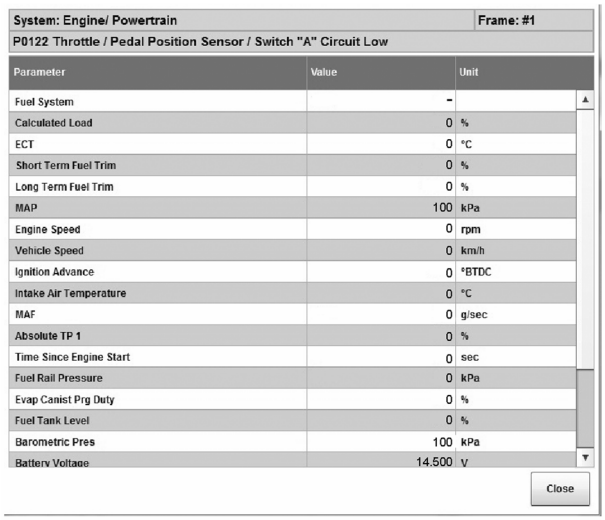
NOTE

- **Freeze frame data with asterisk (*) indicates the ratio of the output voltage to the power supply voltage of related sensor. When power supply voltage is 5.0 V and output voltage is 4.0 V, freeze frame data is displayed as follows.**
  - **For systems where the output is proportional to the input voltage, it displays 80% (= the percent of maximum input reference voltage).**
  - **For systems where the output is inversely proportional to the input voltage, it displays 20% (=100% minus the percent of maximum input reference voltage).**

- **For relative TP with asterisks (**) in above table, it indicates value calculated by formula ((output voltage – output voltage at closed throttle position) / power supply voltage).**
  When power supply voltage is 5.0 V and output voltage at closed throttle position is 1.0 V, freeze frame data is displayed as follows.
  - **At closed throttle position (output voltage = 1.0 V), it displays 0%.**
  - **At wide open throttle position (output voltage = 4.0 V), it displays 60%.**

However, for systems where the output is inversely proportional to the input voltage, it displays 100% minus above mentioned formula.

Freeze frame data (for example)



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Priority of freeze frame data:
ECM has 4 freeze frames from 0 to 3 where freeze frame data can be stored.
Frame 0 is a special frame limited for freeze frame data that MIL turns on.
Frames 1 to 3 are assigned to store DTCs in detected order whether MIL turn on or not.
ECM stores 3 kinds of freeze frame data at a maximum, that is, DTCs are stored in detected order and a DTC that turns on MIL is stored in frame 0 as well.
However, there is an order of priority on these freeze frame data of MIL turning on and P0300 – P0304 (Misfire Detected), P0171 (System Too Lean) and P0172 (System Too Rich) have higher priority than the others. Therefore, if one of the other DTCs is stored in the flame 0, that DTC will be replaced with an above priority DTC at the time it is detected.
If more than 3 DTCs are detected, frames 1 to 3 are occupied with 1st to 3rd DTCs. Therefore, it is not possible to access to the 4th DTC. In this situation, when a malfunction stored in frame 0 to 3 is resolved, the next DTC becomes accessible.

			Frame 0	Frame 1	Frame 2	Frame 3
			Freeze frame data	1st freeze frame data	2nd freeze frame data	3rd freeze frame data
DTC detection order	1	No DTC	—	—	—	—
	2	P0532	—	P0532 data	—	—
	3	P0480	—	P0532 data	P0480 data	—
	4	P0443	P0443 data	P0532 data	P0480 data	P0443 data
	5	P0171	P0171 data	P0532 data	P0480 data	P0443 data
	6	P0112	P0171 data	P0532 data	P0480 data	P0443 data

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—: No freeze frame data

Freeze frame data clearance:
When a DTC is cleared, the freeze frame data for the malfunction represented by this DTC is also cleared.

System Readiness Test
The system readiness test is performed for the purpose of confirming that each of the exhaust-emission-related systems fulfills the conditions that allow ECM to detect a malfunction if it occurs and to set the corresponding DTC. The test is carried out by monitoring the specific items (components) using a scan tool (SUZUKI scan tool or CAN communication OBD generic scan tool). When the test shows that the conditions pre-established for the tested system are met, ECM performs an on-board diagnosis of the system, changes the status of the system readiness test from “Incomplete” to “Complete”, and causes the “Complete” status to be displayed on the scan tool.
The “Complete” status is maintained until DTC clearance operation is performed using the scan tool.

NOTE

- **The system readiness test status may change from "Complete" to "Incomplete" if any of the following service operations is performed.**
  - **– Disconnection of battery negative (–) cable**
  - **– Disconnection of ECM connectors**
  - **– Removal of ECM ground cable**
- **The items (components) indicated in the table below are monitored in the system readiness test to confirm the readiness for detecting the DTCs listed beside each monitoring item.**
- **The "Complete" or "Incomplete" status identified through the system readiness test does NOT mean the "Normal" or "Abnormal" result of the on-board diagnosis.**

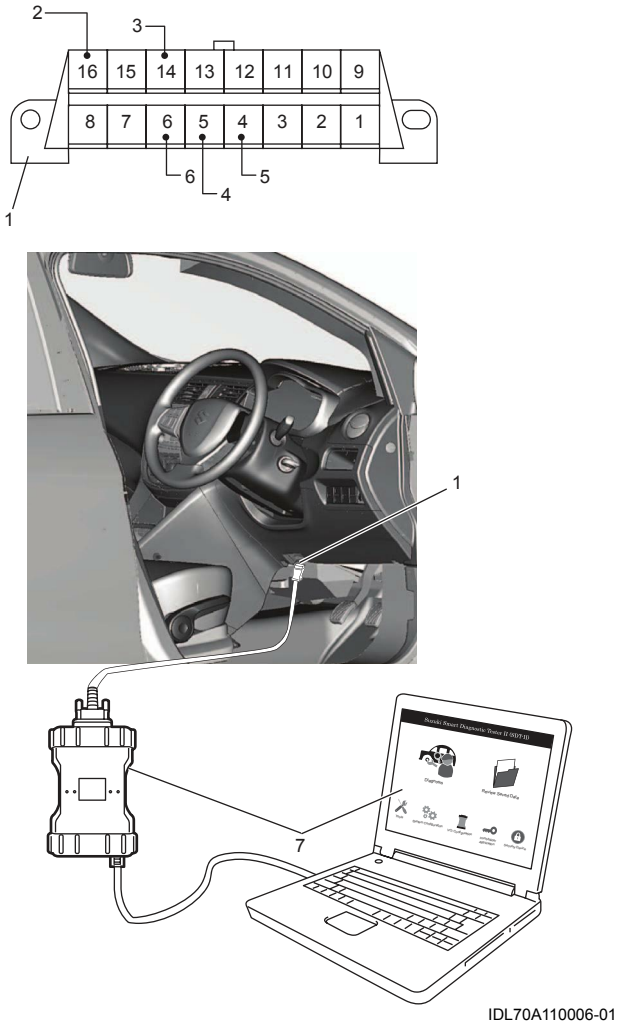
Monitoring item of system readiness test table

Monitoring item	DTC related to monitoring item		
Catalyst	P0420	—	—
O2 Sensor	P0133	—	—
O2 Sensor Heater	—	—	—

DLC Description

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DLC (1) is in compliance with SAE J1962 in the shape of connector and pin assignment.
OBD CAN High line (6) and Low line (3) (CAN line of ISO 15765-4) are used for SUZUKI scan tool (7) or CAN communication OBD generic scan tool to communicate with ECM and other control modules.



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2.	B + (Continuous battery power)
4.	ECM ground (Signal ground)
5.	Ground (Chassis ground)

Engine and Emission Control System Description

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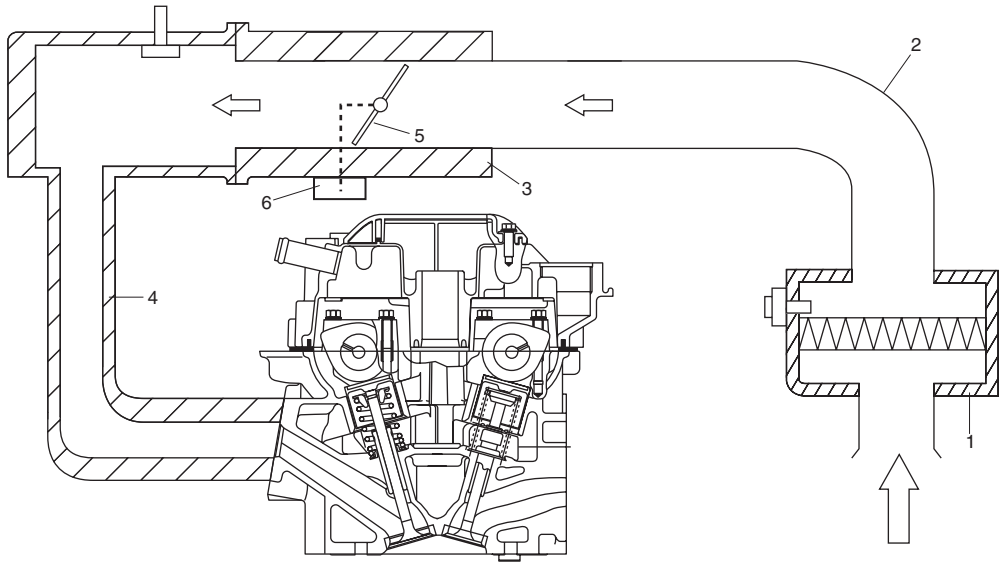
The engine and emission control system is divided into 4 major sub-systems: air intake system, fuel delivery system, electronic control system and emission control system.

Air intake system includes air cleaner, throttle body and intake manifold.
Fuel delivery system includes fuel pump, delivery pipe, etc.
Electronic control system includes ECM, various sensors and controlled devices.
Emission control system includes, EVAP and PCV systems.

Air Intake System Description

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The main components of the air intake system are air cleaner (1), air cleaner outlet hose (2), electric throttle body (3) (For the details, refer to “Electric Throttle Control System Description” (Page 1A-6).) and intake manifold (4).
The air (by the amount corresponding to throttle valve (5) opening and engine speed) is filtered by the air cleaner, distributed by the intake manifold, and finally drawn into each combustion chamber. Electric throttle body is not equipped with IAC valve for idle speed control. Idle speed control is done by the throttle actuator (6) which opens/closes the throttle valve. (For the details, refer to “Electric Throttle Control System Description” (Page 1A-6).)



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Description of Electric Throttle Control System Calibration

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ECM calculates controlled opening of the throttle valve on the basis of the completely closed throttle valve position of the electric throttle control system. The completely closed position data is saved in memory of ECM. However, the completely closed position of the throttle valve of the electric throttle control system (signal voltage from throttle position sensor when throttle is completely closed) differs one from the other depending on individual differences of the throttle valve and throttle position sensor. As such individual differences must be taken into account for controlling the throttle valve, it is necessary to register the completely closed throttle valve position data in ECM. When such data is registered in ECM, it is saved in RAM (memory) of ECM and used as the base data for controlling the throttle valve. This data is cleared, when any of the works described in “Precautions for Electric Throttle Control System Calibration” under “Precautions for Engine” in Section 1 (Page 1-1) is performed.

Also, after replacement of the throttle body and/or accelerator pedal assembly, the completely closed position data in memory of ECM must be cleared once and a new one must be registered, or ECM cannot judge the complete closure position properly.
For the procedure to register such data, refer to “Electric Throttle Control System Calibration” in Section 1C (Page 1C-3). (After the completely closed position data is cleared from ECM, for the first time only, the throttle valve opens and closes for about 60 sec. after ignition is “ON”, for registration of the completely closed throttle valve position. If the engine is started during this registration process, such symptom as “longer cranking time” or “slow rise of engine speed immediately after start-up” may occur. However, set ignition “OFF” once and then restarting the engine will register the position to ECM correctly.)

Electric Throttle Control System Description

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The electric throttle control system consists of the following:

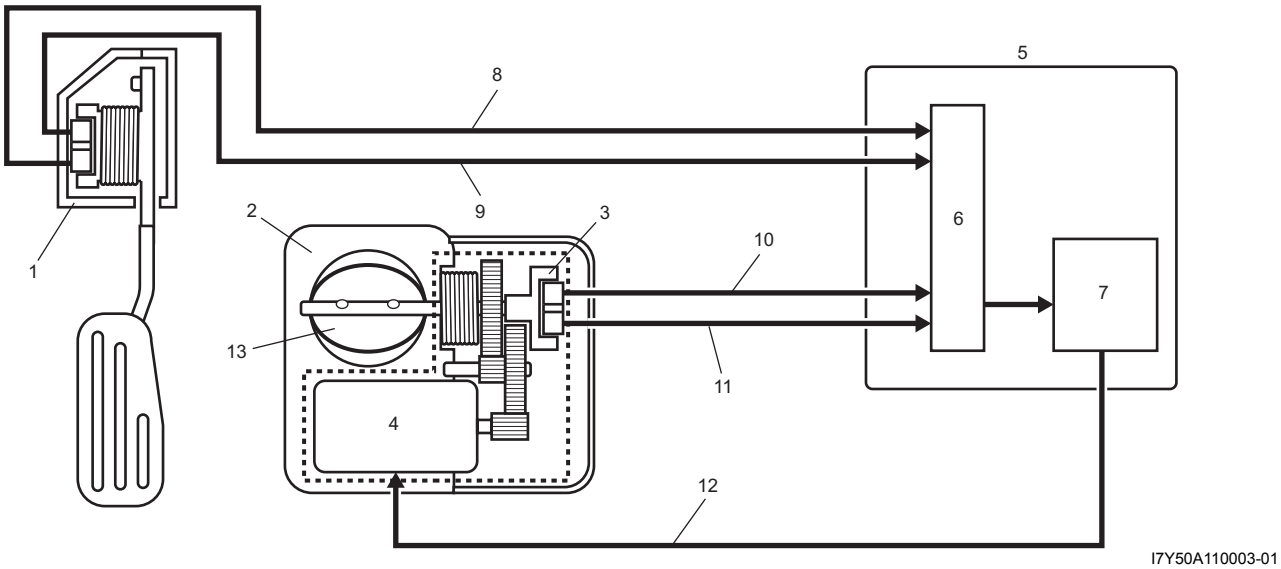
- Electric throttle body incorporating the throttle valve, throttle actuator and TP sensors (main/sub)
- Accelerator pedal assembly incorporating APP sensors (main/sub)
- ECM

Operation Description

ECM (5) detects depressed extent of accelerator pedal based on the signal voltage of the APP sensor (1). Using that data and engine operation condition, ECM calculates the optimum throttle valve opening. On the other hand, it detects the throttle valve opening based on the signal voltage of the TP sensor (3) in the electric throttle body (2) and compares this value with the above calculated optimum throttle valve opening. When there is a difference between them, ECM changes the duty ratio (100% to 0%) of throttle actuator control according to this difference to drive the throttle actuator (4) in the electric throttle body. When there is no difference, ECM fixes the duty ratio to about 15% to maintain the throttle valve opening. In this way, the throttle valve (13) is opened and closed to achieve the optimum throttle valve opening.

In this system, TP sensor and APP sensor have 2 sensors (main and sub) each to assure highly accurate and reliable control and abnormality detection. When ECM detects an abnormality in the system, it stops controlling the throttle actuator.

This throttle body is not equipped with IAC valve for idle speed control. Idle speed control is performed by the throttle actuator by adjusting the throttle valve opening.



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6. CPU	9. APP sensor (sub) signal circuit	12. Drive circuit of throttle actuator
7. Throttle actuator driver	10. TP sensor (main) signal circuit	
8. APP sensor (main) signal circuit	11. TP sensor (sub) signal circuit	

Electronic Control System Description

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The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices. Functionally, the electronic control system is divided into the following sub systems:

- Fuel injection control system
- Ignition control system
- Electric throttle body control system
- Fuel pump control system
- Radiator cooling fan control system
- Evaporative emission control system
- HO2S-1 heater control system
- A/C control system
- Immobilizer control system

• Controller (computer) communication system

ECM uses CAN communication system to communicate with other control modules. For more detail of CAN communication, refer to “CAN Communication System Description” in Section 10H (Page 10H-1).

Engine and Emission Control Input / Output Table

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Function	Output	Input
Injection control	Fuel injector	• Ignition “ON” signal • Ignition “ST” signal • ECT sensor • CKP sensor • CMP sensor • TP sensor • APP sensor • IAT sensor • MAP sensor • HO2S-1 • O2S-2 • Battery voltage • Brake light switch • ABS control module (wheel speed signal) • TCM (Torque request signal and AMT shift position signal (AMT model)) • BCM (A/C ON/OFF request signal)
Ignition control	Ignition coil with igniter	• Ignition “ON” signal • Ignition “ST” signal • ECT sensor • CKP sensor • CMP sensor • TP sensor • APP sensor • IAT sensor • MAP sensor • Knock sensor • Battery voltage • Immobilizer control module • TCM (Torque request signal and AMT shift position signal (AMT model)) • BCM (A/C ON/OFF request signal)

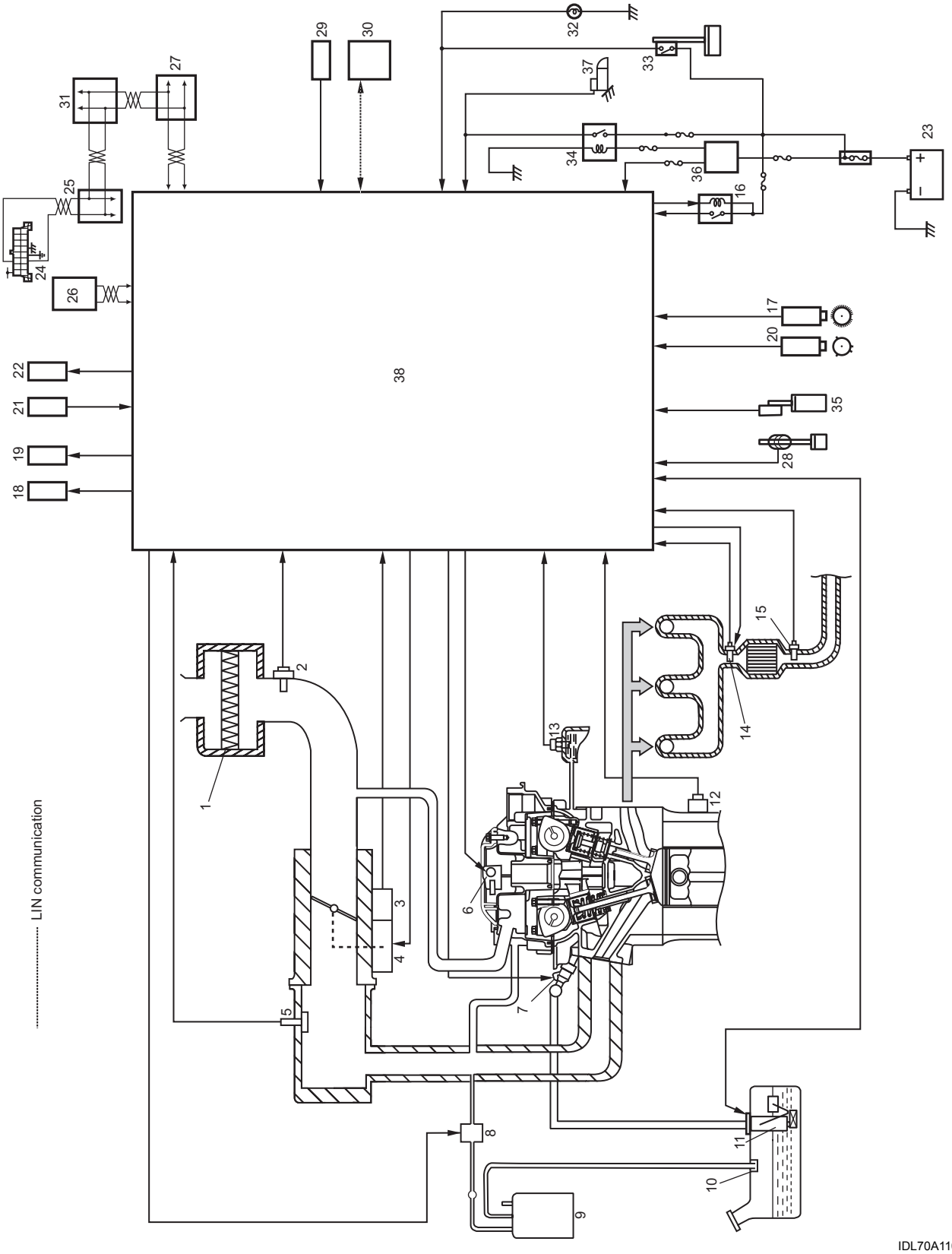
Function	Output	Input
Idle speed control	Throttle actuator	• Ignition “ON” signal • Ignition “ST” signal • ECT sensor • CKP sensor • TP sensor • APP sensor • IAT sensor • MAP sensor • Generator (field coil measured signal) • BCM (electric load signal and A/C ON request signal) • ABS control module (wheel speed signal) • TCM (Torque request signal and AMT shift position signal (AMT model))
Throttle valve control	Throttle actuator	• Ignition “ON” signal • CKP sensor • TP sensor • APP sensor • IAT sensor • A/C refrigerant pressure sensor • BCM (electric load signal and A/C OFF/ON request signal)
HO2S-1 heater control	HO2S-1	• Ignition “ON” signal • ECT sensor • CKP sensor • TP sensor • IAT sensor • Battery voltage • Starter switch
EVAP purge control	EVAP canister purge valve	• Ignition “ON” signal • ECT sensor • CKP sensor • TP sensor • IAT sensor • ABS control module (wheel speed signal) • HO2S-1 • O2S-2 • BCM (A/C ON/OFF request signal)
A/C compressor control	A/C compressor relay	• Ignition “ON” signal • ECT sensor • CKP sensor • TP sensor • APP sensor • A/C refrigerant pressure sensor • BCM (A/C ON request signal) • ABS control module (wheel speed signal)

Function	Output	Input
Radiator cooling fan control	Radiator cooling fan relay	• Ignition “ON” signal • ECT sensor • CKP sensor • A/C refrigerant pressure sensor • ABS control module (wheel speed signal) • BCM (A/C ON/OFF request signal)
Fuel pump control	Fuel pump relay	• Ignition “ON” signal • CKP sensor
Starting motor control relay control	Starting motor control relay	• Ignition “ON” signal • CKP sensor
Main relay control	Main relay	• Ignition “ON” signal

Schematic and Routing Diagram

Engine and Emission Control System Diagram

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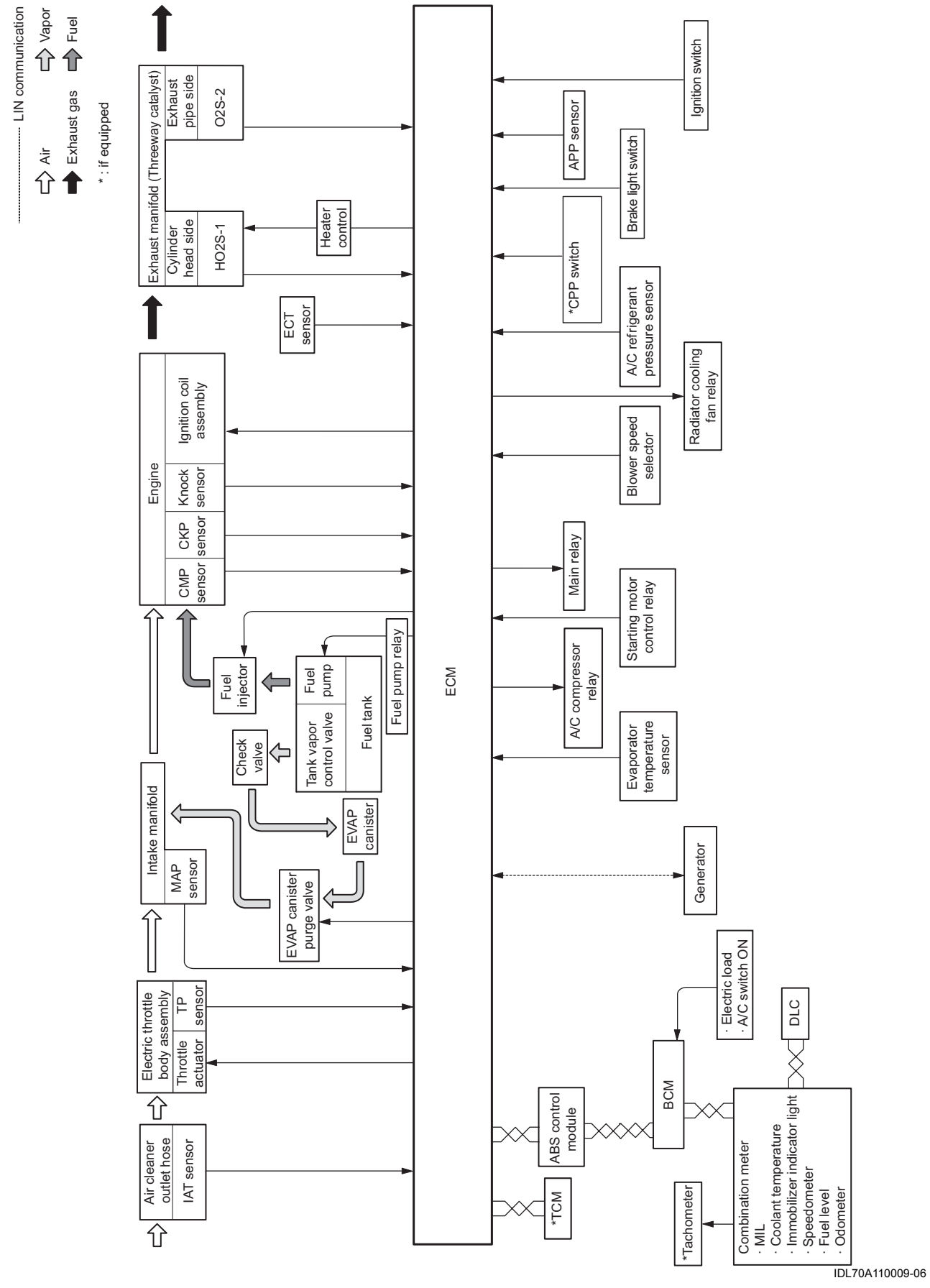


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1. Air cleaner	14. HO2S-1	27. BCM / ABS control module
2. IAT sensor	15. O2S-2	28. CPP switch (M/T model)
3. TP sensor	16. Main relay	29. A/C refrigerant pressure sensor
4. Throttle actuator	17. CKP sensor	30. Generator
5. MAP sensor	18. Radiator cooling fan relay	31. P/S control module
6. Ignition coil assembly	19. A/C compressor relay	32. Brake light
7. Fuel injector	20. CMP sensor	33. Brake light switch
8. EVAP canister purge valve	21. Blower speed selector	34. Starting motor control relay
9. EVAP canister	22. Fuel pump relay	35. APP sensor
10. Tank vapor control valve	23. Battery	36. Ignition switch
11. Fuel pump (with pressure regulator)	24. DLC	37. Starting motor
12. Knock sensor	25. Combination meter	38. ECM
13. ECT sensor	26. TCM	

Engine and Emission Control System Flow Diagram

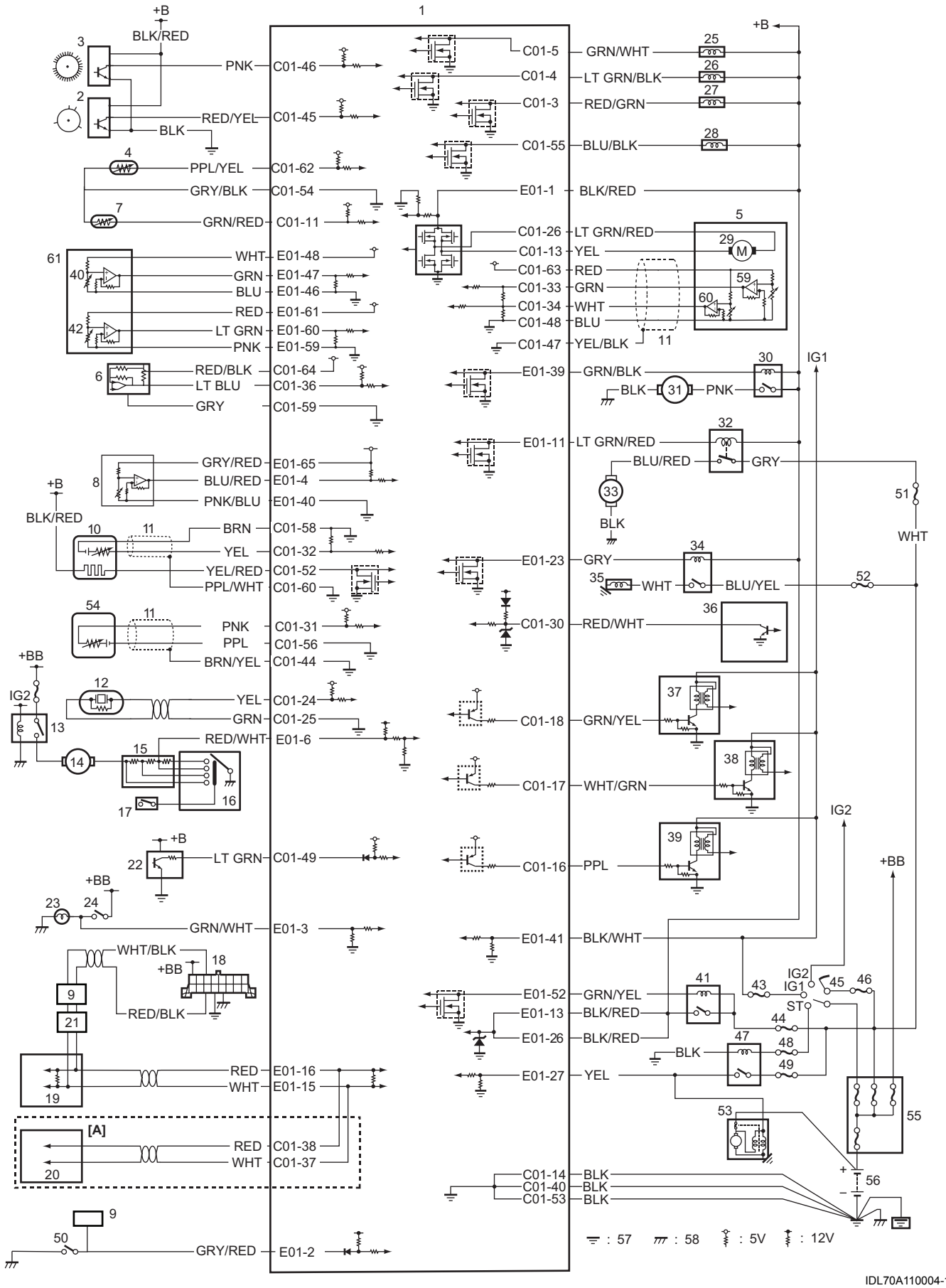
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Electronic Control System Circuit Diagram

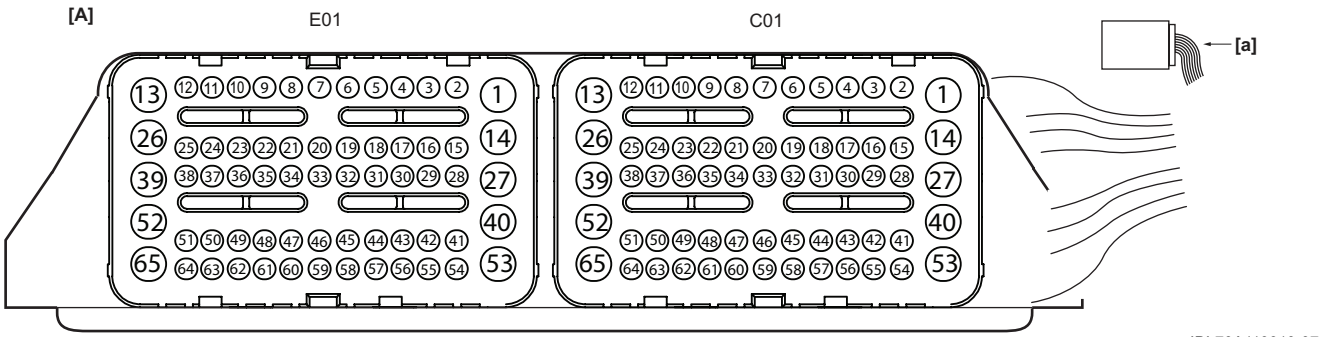
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[A]: AMT model	21. P/S Control module	42. APP sensor (sub)
1. ECM	22. VSS	43. “IG COIL” fuse
2. CMP sensor	23. Brake light	44. “FI” fuse
3. CKP sensor	24. Brake light switch	45. Ignition switch
4. IAT sensor	25. Fuel injector No.1	46. “IGN” fuse
5. Electric throttle body assembly	26. Fuel injector No.2	47. Starting motor control relay
6. MAP sensor	27. Fuel injector No.3	48. “ST SIG” fuse
7. ECT sensor	28. EVAP canister purge valve	49. “ST” fuse
8. A/C refrigerant pressure sensor	29. Throttle motor actuator	50. CPP switch (M/T model)
9. Combination meter	30. Fuel pump relay	51. “RDTR FAN” fuse
10. HO2S-1	31. Fuel pump	52. “A/C CPRSR” fuse
11. Shield wire	32. Radiator cooling fan relay	53. Starting motor
12. Knock sensor	33. Radiator cooling fan motor	54. O2S-2
13. Blower motor relay	34. A/C compressor relay	55. Main fuse box
14. Blower motor	35. A/C compressor magnet clutch	56. Battery
15. Blower speed resistor	36. Generator	57. Engine ground
16. Blower speed selector	37. Ignition coil assembly No.1	58. Body ground
17. A/C switch	38. Ignition coil assembly No.2	59. TP sensor (main)
18. DLC	39. Ignition coil assembly No.3	60. TP sensor (sub)
19. BCM / ABS Control module	40. APP sensor (main)	61. APP sensor
20. TCM	41. Main relay	

Terminal Arrangement of ECM Connector



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[A]: ECM connector (View: [a])

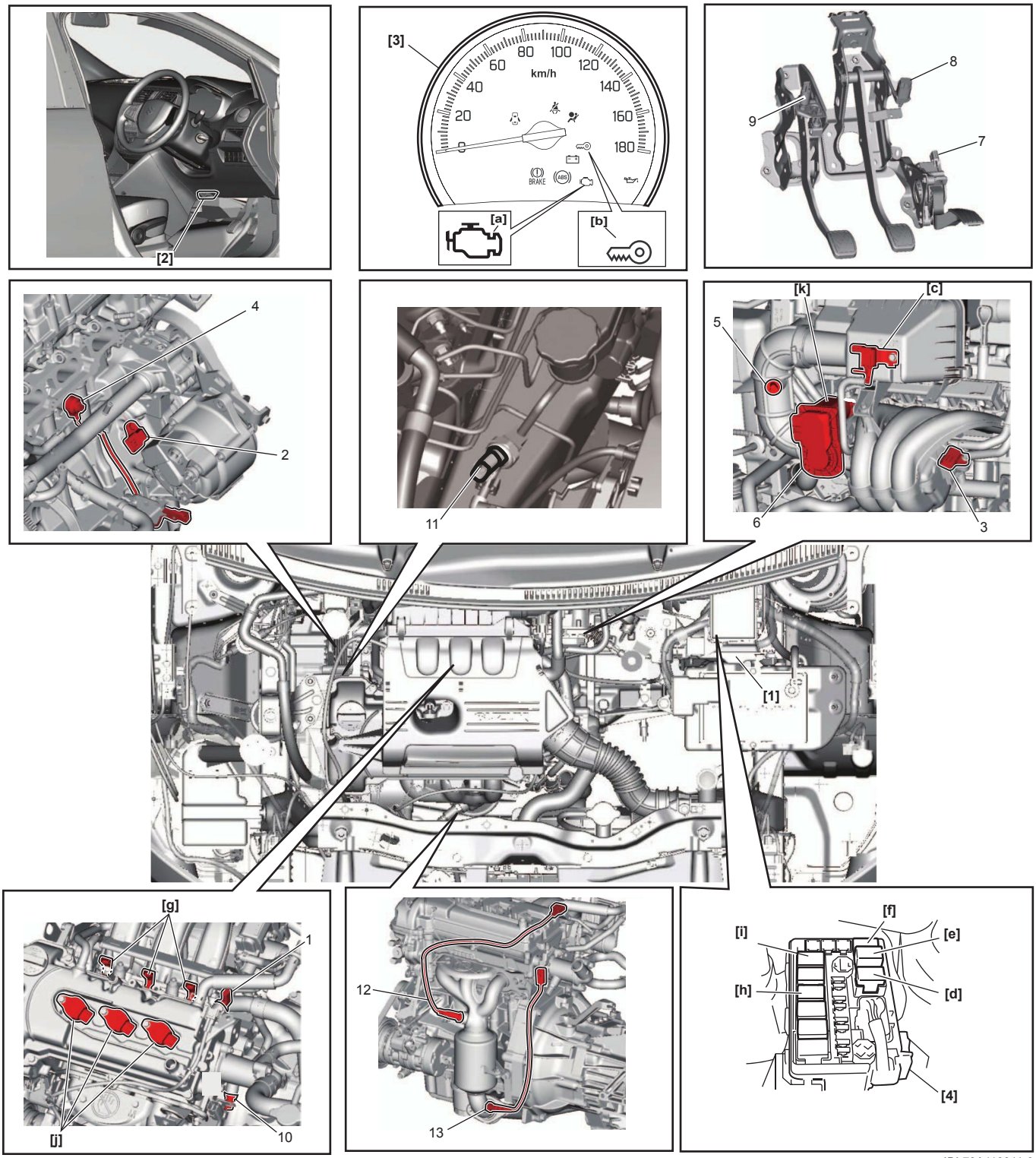
NOTE

For circuit names and terminal voltages, refer to “Inspection of ECM and Its Circuits” (Page 1A-87).

Component Location

Electronic Control System Component Location

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Information sensors	Control devices	Others
1. CMP sensor	[a]: MIL	[1]: ECM
2. CKP sensor	[b]: Immobilizer indicator light	[2]: DLC
3. MAP sensor	[c]: EVAP canister purge valve	[3]: Combination meter
4. Knock sensor	[d]: Main relay	[4]: Individual circuit fuse box No.1
5. IAT sensor	[e]: Starting motor control relay	
6. TP sensor	[f]: Radiator cooling fan relay	

Information sensors	Control devices	Others
7. Accelerator pedal assembly (incorporating APP sensor)	[g]: Fuel injector	
8. Brake light switch	[h]: A/C compressor relay	
9. CPP switch (M/T model)	[i]: Fuel pump relay	
10. ECT sensor	[j]: Ignition coil assembly	
11. A/C refrigerant pressure sensor	[k]: Electric throttle body assembly	
12. HO2S-1		
13. O2S-2		

Diagnostic Information and Procedures

Engine and Emission Control System Check

AENDL70A1104001

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	**Customer complaint analysis** 1) Perform customer complaint analysis referring to “Step 1: Customer Complaint Analysis” (Page 1A-17). *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	**DTC / Freeze frame data check, record and clearance** 1) Check for DTCs (including pending DTCs) referring to “Step 2: DTC / Freeze Frame Data Check, Record and Clearance” (Page 1A-18). *Is there any DTC(s) / Freeze frame data?*	Print DTCs and freeze frame data or write them down and clear them referring to “DTC Clearance” (Page 1A-20), and go to Step 3.	Go to Step 4.
3	**Visual inspection ☞(Page 1A-19)** 1) Perform visual inspection referring to “Visual Inspection” (Page 1A-31). *Is there any faulty condition?*	Repair or replace defective part, and go to Step 11.	Go to Step 5.
4	**Visual inspection ☞(Page 1A-19)** 1) Perform visual inspection referring to “Visual Inspection” (Page 1A-31). *Is there any faulty condition?*	Repair or replace defective part, and go to Step 11.	Go to Step 8.
5	**Trouble symptom confirmation** 1) Confirm trouble symptom referring to “Step 5: Trouble Symptom Confirmation” (Page 1A-19). *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	**Rechecking and recording DTC / Freeze frame data ☞(Page 1A-19)** 1) Recheck for DTC and freeze frame data referring to “DTC Check” (Page 1A-19). *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	**Rechecking and recording DTC / Freeze frame data ☞(Page 1A-19)** 1) Recheck for DTC and freeze frame data referring to “DTC Check” (Page 1A-19). *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	**Engine basic inspection and engine symptom diagnosis ☞(Page 1A-19)** 1) Check and repair according to “Engine Basic Inspection” (Page 1A-32) and “Engine Symptom Diagnosis” (Page 1A-32). *Are check and repair complete?*	Go to Step 11.	Check and repair defective part(s), and go to Step 11.

Step	Action	Yes	No
9	**Troubleshooting for DTC ☞(Page 1A-19)** 1) Check and repair according to applicable DTC troubleshooting. *Are check and repair complete?*	Go to Step 11.	Check and repair defective part(s), and go to Step 11.
10	**Intermittent problems check** 1) Check for intermittent problems referring to “Step 10: Intermittent Problems Check” (Page 1A-19). *Is there any faulty condition?*	Repair or replace defective part(s), and go to Step 11.	Go to Step 11.
11	**Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test referring to “Step 11: Final Confirmation Test” (Page 1A-19). *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 6.	End.

Step 1: Customer Complaint Analysis
Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of an inspection form as shown will facilitate collecting information required for proper analysis and diagnosis.

NOTE

This form is a standard sample. It should be modified according to characteristic of each market.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐ **Difficult Starting** ☐ No cranking ☐ No initial combustion ☐ No combustion ☐ Poor starting when (☐cold ☐warm ☐always) ☐ Other_____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐After fire ☐ Lack of power ☐ Surging ☐ Knocking ☐ Other_____
☐ **Poor Idling** ☐ Poor fast idling ☐ Abnormal idling speed (☐High ☐Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other_____	☐ **Engine Stall** ☐ Immediately after start ☐ When accelerator pedal is depressed ☐ When accelerator pedal is released ☐ When load is applied ☐ A/C ☐Electric load ☐P/S ☐ Other_____ ☐ Other_____
☐ OTHERS:	

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Road	☐Fair ☐Cloudy ☐Rain ☐Snow ☐Always ☐Other_____ ☐Hot ☐Warm ☐Cool ☐Cold (°F/ °C) ☐Always ☐Always ☐Sometimes (times/ day, month) ☐Only once ☐Under certain condition ☐Urban ☐Suburb ☐Highway ☐Mountainous (☐Uphill ☐Downhill) ☐Tarmacadam ☐Gravel ☐Other_____
Vehicle Condition	
Engine condition	☐Cold ☐Warming up phase ☐Warmed up ☐Always ☐Other at starting ☐Immediately after start ☐Racing without load ☐Engine speed (r/min)
Vehicle condition	During driving: ☐Constant speed ☐Accelerating ☐Decelerating ☐Right hand corner ☐Left hand corner ☐When shifting (Lever position) ☐At stop ☐Vehicle speed when problem occurs (km/h, Mile/h) ☐Other

MIL condition	☐Always ON ☐Sometimes ON ☐Always OFF ☐Good condition	
DTC	First check: ☐No DTC ☐ DTC ( )	
	Second check: ☐No DTC ☐ DTC ( )	

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Step 2: DTC / Freeze Frame Data Check, Record and Clearance

First, check DTC (including pending DTC). ☞(Page 1A-19)

If DTC is indicated, print it and freeze frame data or write them down and then clear them. ☞(Page 1A-20)

Steps 3 and 4: Visual Inspection
As a preliminary step, be sure to perform visual check of the items that support proper function of the engine. ☞(Page 1A-31)

Step 5: Trouble Symptom Confirmation
If there is no DTC in Step 2:
Based on information obtained in "Step 1: Customer Complaint Analysis" (Page 1A-17) and "Step 2: DTC / Freeze Frame Data Check, Record and Clearance" (Page 1A-18), confirm trouble symptoms.

If there is any DTC in Step 2:
Recheck DTC according to "DTC Confirmation Procedure" described in each DTC troubleshooting.

Steps 6 and 7: Rechecking and Record in DTC / Freeze Frame Data
Refer to "DTC Check" (Page 1A-19) for checking procedure.

Step 8: Engine Basic Inspection and Engine Symptom Diagnosis
1) Perform basic engine inspection. ☞(Page 1A-32)
2) If there is no faulty part found in inspection procedure of "Engine basic inspection", perform "Engine Symptom Diagnosis" (Page 1A-32) based on symptom found in vehicle checking in the following steps.
   - Customer complaint analysis
   - Trouble symptom confirmation

Step 9: Troubleshooting for DTC
Perform applicable DTC troubleshooting and repair or replace faulty parts.

Step 10: Intermittent Problems Check
If there is no DTC in Step 2:
Check for intermittent problem. ☞(Page 00-11)

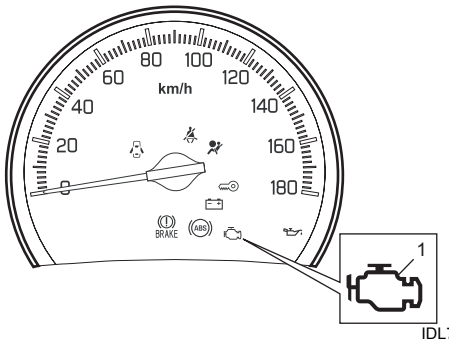
If there is any DTC in Step 2:
Check parts related to detected DTC (e.g., wire harness, connector, etc.).

Step 11: Final Confirmation Test
Confirm that the problem symptom has gone and engine is free from any abnormal conditions. If what has been repaired is related to DTC, clear DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

MIL Check

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1) Set ignition "ON" (with engine at stop) and check that MIL (1) lights.
   If MIL does not light up but engine can be started, go to "MIL Does Not Come ON with Ignition "ON" and Engine Stopped (but Engine Can Be Started)" (Page 1A-39) for troubleshooting.
   If MIL does not light with ignition "ON" and engine does not start though it is cranked, go to "ECM Power Supply and Ground Circuit Check" (Page 1A-97).
2) Start engine and check that MIL turns OFF.
   If MIL remains ON and no DTC is stored in ECM, go to "MIL Remains ON after Engine Starts" (Page 1A-40) for troubleshooting.



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DTC Check

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NOTE

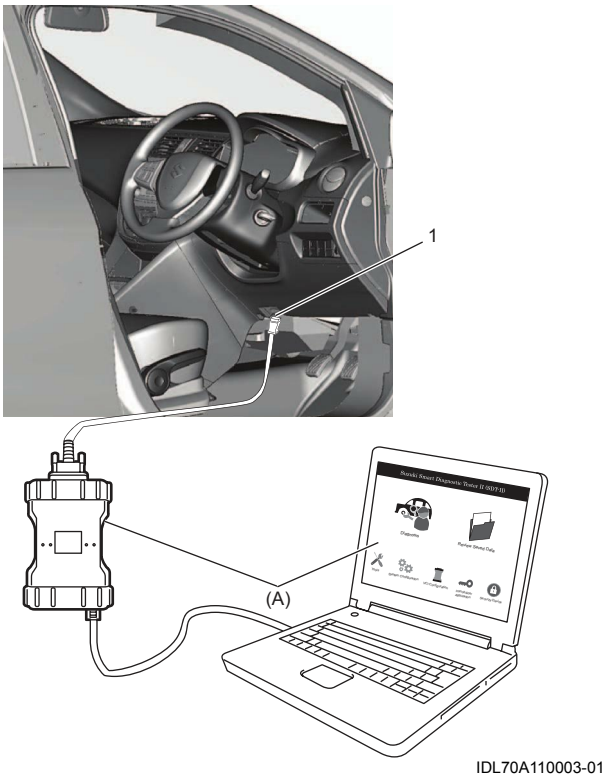
If MIL turns ON, malfunction(s) is detected by either ECM or TCM and the trouble information (DTC, freeze flame data, etc.) is stored in its memory.
According to the scan tool used, check the trouble information as follows.

- **SUZUKI scan tool:**
  Check ECM and TCM separately because the trouble information of both modules cannot be read and displayed simultaneously.
- **Generic scan tool:**
  Check both ECM and TCM simultaneously.

1) Prepare SUZUKI scan tool or CAN communication OBD generic scan tool.

   Special tool
   (A): SUZUKI scan tool (Suzuki SDT-II)

2) With ignition "OFF", connect scan tool to DLC (1).



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3) Set ignition “ON” and confirm that MIL lights up.
4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print them or write them down. Refer to scan tool operator's manual for further details.
If communication between scan tool and ECM is impossible, go to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).
5) After completing the check, set ignition “OFF” and disconnect scan tool from DLC.

DTC Clearance

AENDL70A1104004

1) Set ignition “OFF”.
2) Connect SUZUKI scan tool or CAN communication OBD generic scan tool to DLC (1).

Special tool
SUZUKI scan tool (Suzuki SDT-II)

3) Set ignition “ON”.
4) Clear DTC and pending DTC according to instructions displayed on SUZUKI scan tool and print them or write them down. Refer to Operator's Manual of SUZUKI scan tool for further details.

NOTE

If communication between SUZUKI scan tool and ECM is not possible, perform the following checks:

- **Check communication condition between PC and VCI using SUZUKI scan tool function.**
- **Check DLC power circuit and ground circuit.**
- **Check DLC cable. If necessary, check DLC cable by substituting a known-good DLC cable.**
- **Check CAN communication system. (“Control Module Communication Bus Off” is detected in any control module.) ☞(Page 10H-16)**
- **Check ECM power circuit and ground circuit. “ECM Power Supply and Ground Circuit Check” (Page 1A-97)**

5) After completing the clearance, set ignition “OFF” and disconnect SUZUKI scan tool from DLC.

NOTE

DTC and freeze frame data stored in ECM memory are also cleared in the following case. Be careful not to clear them before keeping their record.

- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles. (See “Warm-Up Cycle” of “OBD System Description” (Page 1A-1).)**

6) Perform electric throttle control system calibration. ☞(Page 1C-3)

DTC Table

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NOTE

- **When DTC P0300 / P0301 / P0302 / P0303 is detected, MIL blinks or lights up according to detecting condition. For details, refer to "DTC P0300 / P0301 / P0302 / P0303" (Page 1A-57).**
- **With the CAN communication generic scan tool, only asterisk (*) marked DTC in the following table can be read.**
- **For "3 D/C / 1 D/C" (DTC detection logic) with asterisk (*) in this table, its operation is different depending on detecting condition.**
  For details of operation, refer to each "DTC Detecting Condition and Trouble Area".
- **For "Light up / off" (MIL operation) with asterisk (*) in this table, its operation is different depending on detecting condition.**
  For details of operation, refer to each "DTC Detecting Condition and Trouble Area".

DTC	DTC name	DTC detecting condition	DTC detection logic	MIL
*P0031 ☞(Page 1A-40)	HO2S Heater Control Circuit Low (Sensor 1)	Output voltage of HO2S-1 heater circuit is lower than specified value for 5 sec. continuously even though control duty output of HO2S-1 heater is less than 90% with engine running.	3 D/C	Lights up
*P0032 ☞(Page 1A-40)	HO2S Heater Control Circuit High (Sensor 1)	Output voltage of HO2S-1 heater circuit is higher than specified value for 5 sec. continuously even though control duty output of HO2S-1 heater is less than 10% with engine running.	3 D/C	Lights up
*P0107 ☞(Page 1A-41)	Manifold Absolute Pressure / Barometric Pressure Circuit Low	Output voltage of MAP sensor signal circuit is lower than 0.35 V for 5 sec.	3 D/C	Lights up
*P0108 ☞(Page 1A-41)	Manifold Absolute Pressure / Barometric Pressure Circuit High	Output voltage of MAP sensor signal circuit is higher than 4.88 V for 5 sec.	3 D/C	Lights up
*P0112 ☞(Page 1A-43)	Intake Air Temperature Sensor 1 Circuit Low	Output voltage of IAT sensor signal circuit is lower than 0.02 V for 5 sec.	3 D/C	Lights up
*P0113 ☞(Page 1A-43)	Intake Air Temperature Sensor 1 Circuit High	Output voltage of IAT sensor signal circuit is higher than 4.98 V for 5 sec.	3 D/C	Lights up
*P0116 ☞(Page 1A-44)	Engine Coolant Temperature Sensor 1 Circuit Range / Performance	Though a specified engine load is applied, output voltage of ECT sensor signal circuit is unchanged for 2 min. when ECT is lower than 70 °C (158 °F).	3 D/C	Lights up
*P0117 ☞(Page 1A-46)	Engine Coolant Temperature Circuit Low	Output voltage of ECT sensor signal circuit is lower than 0.02 V for 5 sec.	3 D/C	Lights up
*P0118 ☞(Page 1A-46)	Engine Coolant Temperature Circuit High	Output voltage of ECT sensor signal circuit is higher than 4.98 V for 5 sec.	3 D/C	Lights up
*P0122 ☞(Page 1A-47)	Throttle / Pedal Position Sensor / Switch "A" Circuit Low	Output voltage of TP sensor (main) signal circuit is lower than 0.26 V.	1 D/C	Lights up
*P0123 ☞(Page 1A-47)	Throttle / Pedal Position Sensor / Switch "A" Circuit High	Output voltage of TP sensor (main) signal circuit is higher than 4.76 V.	1 D/C	Lights up
*P0130 ☞(Page 1A-49)	O2 Sensor Circuit (Sensor 1)	This DTC is detected if any one of the following conditions is met. • Circuit voltage of HO2S-1 is lower than 0.35 V for more than specified time continuously with engine running. • Circuit voltage of HO2S-1 is higher than 4.91 V for more than specified time continuously with engine running.	3 D/C	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	MIL
*P0133 ☞(Page 1A-49)	O2 Sensor Circuit Slow Response (Sensor 1)	This DTC is detected if any one of the following conditions is met while vehicle is driving at constant speed and low engine load after warming up. • Response time of HO2S-1 output signal shifted from rich to lean is longer than specified time. • Response time of HO2S-1 output signal shifted from lean to rich is longer than specified time. • Average response time of HO2S-1 output signal is longer than specified time.	3 D/C	Lights up
*P0138 ☞(Page 1A-51)	O2 Sensor Circuit High Voltage (Sensor 2)	Output voltage of HO2S signal circuit is higher than 4.58 V for 25 sec.	3 D/C	Lights up
*P0171 ☞(Page 1A-53)	System Too Lean	Total fuel trim (short term fuel trim + long term fuel trim) is higher than specified value for 30 sec. when fuel system is closed-loop. 3 to 9 times.	3 D/C	Lights up
*P0172 ☞(Page 1A-53)	System Too Rich	Total fuel trim (short term fuel trim + long term fuel trim) is lower than specified value for 30 sec. when fuel system is closed-loop. 3 to 9 times.	3 D/C	Lights up
*P0222 ☞(Page 1A-55)	Throttle / Pedal Position Sensor / Switch “B” Circuit Low	Output voltage of TP sensor (sub) signal circuit is lower than 0.24 V.	1 D/C	Lights up
*P0223 ☞(Page 1A-55)	Throttle / Pedal Position Sensor / Switch “B” Circuit High	Output voltage of TP sensor (sub) signal circuit is higher than 4.74 V.	1 D/C	Lights up
*P0300 ☞(Page 1A-57)	Random / Multiple Cylinder Misfire Detected	This DTC is detected if any one of the following conditions is met. • Misfire rates at 2 or more cylinders exceed specified misfire rate which causes catalyst to damage. (MIL flashes as long as this misfire occurs continuously.) • Misfire rates at 2 or more cylinders exceed specified misfire rate which affects exhaust emission adversely.	3 D/C	Lights up
*P0301 ☞(Page 1A-57)	Cylinder 1 Misfire Detected	This DTC is detected if any one of the following conditions is met. • Misfire rate at specified cylinder exceeds specified misfire rate which causes catalyst to damage. (MIL flashes as long as this misfire occurs continuously.) • Misfire rate at specified cylinder exceeds specified misfire rate which affects exhaust emission adversely.	3 D/C	Lights up
*P0302 ☞(Page 1A-57)	Cylinder 2 Misfire Detected		3 D/C	Lights up
*P0303 ☞(Page 1A-57)	Cylinder 3 Misfire Detected		3 D/C	Lights up
*P0327 ☞(Page 1A-59)	Knock Sensor 1 Circuit Low	Knock sensor signal is out of specified range for 5 sec. with engine running.	3 D/C	Lights up
*P0335 ☞(Page 1A-60)	Crankshaft Position Sensor “A” Circuit	Even if CMP sensor signal is input, CKP sensor signal is not input for more than 3 sec.	1 D/C	Lights up
*P0336 ☞(Page 1A-60)	Crankshaft Position Sensor “A” Circuit Range / Performance	Output signal pulse of CKP sensor is out of specified pattern more than specified times.	1 D/C	Lights up
*P0340 ☞(Page 1A-62)	Camshaft Position Sensor “A” Circuit	Even if CKP sensor signal is input, CMP sensor signal is not input for more than 3 sec.	3 D/C	Lights up
*P0341 ☞(Page 1A-62)	Camshaft Position Sensor “A” Circuit Range / Performance	Output signal pulse of CMP sensor is out of specified pattern more than specified times.	3 D/C	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	MIL
*P0420 ☞(Page 1A-64)	Catalyst System Efficiency Below Threshold	Shifting cycle delay between rich and lean of O2S-2 signal compared with shifting cycle between rich and lean of fuel system feedback is less than specified time while vehicle is running with constant speed and low engine load after warming up.	3 D/C	Lights up
*P0443 ☞(Page 1A-66)	Evaporative Emission System Purge Control Valve Circuit	Measured signal duty of EVAP canister purge valve control circuit is different from control command duty for 5 sec. (Circuit open or short)	3 D/C	Lights up
P0480 ☞(Page 1A-67)	Fan 1 Control Circuit	Measured voltage of radiator cooling fan relay output is different from its command signal for 5 sec.	3 D/C	Off
*P0500 ☞(Page 1A-69)	Vehicle Speed Sensor “A”	Vehicle speed signal is not input, while fuel is cut at deceleration for 4 sec. continuously with engine speed at 3,600 rpm or less.	3 D/C	Lights up
P0532 ☞(Page 1A-71)	A/C Refrigerant Pressure Sensor “A” Circuit Low	Output voltage of A/C refrigerant pressure sensor signal circuit is lower than 0.15 V for 5 sec.	3 D/C	Off
P0533 ☞(Page 1A-71)	A/C Refrigerant Pressure Sensor “A” Circuit High	Output voltage of A/C refrigerant pressure sensor signal circuit is higher than 4.93 V for 5 sec.	3 D/C	Off
*P0601 ☞(Page 1A-73)	Internal Control Module Memory Check Sum Error	Data write error or check sum error.	3 D/C	Lights up
P0602 ☞(Page 1A-72)	Control Module Programming Error	Data programming error.	1 D/C	Off
P0607 ☞(Page 1A-73)	Control Module Performance	ECM internal failure related to throttle control system.	1 D/C	Lights up
*P0616 ☞(Page 1A-74)	Starter Relay Circuit Low	No starter switch ON signal is input even if engine has been started.	3 D/C	Lights up
*P0617 ☞(Page 1A-74)	Starter Relay Circuit High	Starter switch ON signal is input for more than 180 sec. after engine has been started.	3 D/C	Lights up
P1610	Immobilizer ID Unregistered	Refer to “DTC Table” in Section 10C (Page 10C-4).	1 D/C	Off
P1611	Password Mismatched		1 D/C	Off
P1622	EEPROM Reading / Writing Error		1 D/C	Off
P1642	Immobilizer Communication Line Error		1 D/C	Off
P1644	Immobilizer ID Mismatched		1 D/C	Off
P1645	ID Code Incorrectness		1 D/C	Off
P1646	ID Code Incorrectness		1 D/C	Off
*P2101 ☞(Page 1A-75)	Throttle Actuator “A” Control Motor Circuit Range / Performance	Throttle actuator drive circuit malfunction (open or excess temperature of device) is detected.	1 D/C	Lights up
*P2102 ☞(Page 1A-77)	Throttle Actuator “A” Control Motor Circuit Low	Measured voltage of throttle actuator power supply circuit is lower than 5 V even if throttle actuator control relay is ON.	1 D/C	Lights up
*P2111 ☞(Page 1A-78)	Throttle Actuator Control System Stuck Open	During diagnosing throttle valve with ignition switch “OFF”, throttle valve does not close even if throttle valve is opened at specified value.	1 D/C	Lights up
*P2119 ☞(Page 1A-75)	Throttle Actuator Control Throttle Body Range / Performance	Difference between targeted TP and measured TP is out of specified range.	1 D/C	Lights up
*P2122 ☞(Page 1A-79)	Throttle / Pedal Position Sensor / Switch “D” Circuit Low	Output voltage of APP sensor (main) signal circuit is lower than 0.35 V.	1 D/C	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	MIL
*P2123 ☞(Page 1A-79)	Throttle / Pedal Position Sensor / Switch “D” Circuit High	Output voltage of APP sensor (main) signal circuit is higher than 4.63 V.	1 D/C	Lights up
*P2127 ☞(Page 1A-80)	Throttle / Pedal Position Sensor / Switch “E” Circuit Low	Output voltage of APP sensor (sub) signal circuit is lower than 0.16 V.	1 D/C	Lights up
*P2128 ☞(Page 1A-80)	Throttle / Pedal Position Sensor / Switch “E” Circuit High	Output voltage of APP sensor (sub) signal circuit is higher than 3.53 V.	1 D/C	Lights up
*P2135 ☞(Page 1A-82)	Throttle / Pedal Position Sensor / Switch “A”/”B” Voltage Correlation	Difference between TP (main) and TP (sub) sensor signal is more than specified value for specified time.	1 D/C	Lights up
*P2138 ☞(Page 1A-83)	Throttle / Pedal Position Sensor / Switch “D”/”E” Voltage Correlation	Difference between APP (main) and APP (sub) sensor signal is more than specified value for specified time.	1 D/C	Lights up
U0073 ☞(Page 1A-85)	Control Module Communication Bus Off	Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).	1 D/C	Off
U0101 ☞(Page 1A-85)	Lost Communication With TCM		1 D/C	Lights up
U0121 ☞(Page 1A-85)	Lost Communication With ABS/ESP® Control Module		1 D/C	Lights up
U0131 ☞(Page 1A-85)	Lost Communication With Power Steering Control Module		1 D/C	Off
U0140 ☞(Page 1A-85)	Lost Communication With Body Control Module		1 D/C	Off
U0155 ☞(Page 1A-85)	Lost Communication With Instrument Panel Cluster (IPC) Control Module		1 D/C	Off
U2001 ☞(Page 1A-85)	Lost Communication With LIN (ECM Detection)	ECM cannot receive LIN communication information from generator or abnormality is detected.	1 D/C	Off
U2021 ☞(Page 1A-86)	Lost Communication With LIN (Generator Detection)	Generator judges that LIN communication information from ECM is abnormal, and fault detection information is transmitted to ECM.	1 D/C	Off

Fail-Safe Table

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When any of the following DTCs is detected, ECM control enters the fail-safe mode as long as the failure condition associated with the DTC continues. The fail-safe mode is canceled when ECM detects normal condition.

DTC	DTC name	Fail-safe operation
P0031 ☞(Page 1A-40)	HO2S Heater Control Circuit Low (Sensor 1)	• ECM stops A/F feedback control. • ECM stops HO2S-1 heater control.
P0032 ☞(Page 1A-40)	HO2S Heater Control Circuit High (Sensor 1)	
P0107 ☞(Page 1A-41)	Manifold Absolute Pressure / Barometric Pressure Circuit Low Input	• ECM stops A/F feedback learning control. • ECM stops torque learning control. • ECM stops EVAP canister purge valve control. • ECM presumes manifold absolute pressure / barometric pressure.
P0108 ☞(Page 1A-41)	Manifold Absolute Pressure / Barometric Pressure Circuit High Input	
P0112 ☞(Page 1A-43)	Intake Air Temperature Sensor 1 Circuit Low	• ECM stops A/F feedback learning control. • ECM stops torque learning control. • ECM stops EVAP canister purge valve control. • ECM controls actuators assuming that intake air temperature is 20 °C (68 °F)
P0113 ☞(Page 1A-43)	Intake Air Temperature Sensor 1 Circuit High	

DTC	DTC name	Fail-safe operation
P0116 ☞(Page 1A-44)	Engine Coolant Temperature Sensor 1 Circuit Range / Performance	• ECM stops A/F feedback control. • ECM stops torque learning control. • ECM stops torque control. • ECM stops HO2S-1 heater control. • ECM stops EVAP canister purge valve control.
P0117 ☞(Page 1A-46)	Engine Coolant Temperature Circuit Low	• ECM stops A/F feedback control. • ECM stops torque learning control. • ECM stops torque control. • ECM stops HO2S-1 heater control. • ECM stops EVAP canister purge valve control. • ECM controls actuators assuming that engine coolant temperature is 80 °C (176 °F) • ECM operates radiator cooling fan. (high speed)
P0118 ☞(Page 1A-46)	Engine Coolant Temperature Circuit High	
P0122 ☞(Page 1A-47)	Throttle / Pedal Position Sensor / Switch “A” Circuit Low	• ECM fixes throttle valve at default position (about 8.6 °). • ECM performs fuel cut at specified engine speed. • ECM stops A/F feedback control.
P0123 ☞(Page 1A-47)	Throttle / Pedal Position Sensor / Switch “A” Circuit High	
P0130 ☞(Page 1A-49)	O2 Sensor Circuit (Sensor 1)	• ECM stops A/F feedback control. • ECM stops torque learning control. • ECM stops HO2S-1 heater control. • ECM stops EVAP canister purge valve control.
P0133 ☞(Page 1A-49)	O2 Sensor Circuit Slow Response (Sensor 1)	—
P0138 ☞(Page 1A-51)	O2 Sensor Circuit High Voltage (Sensor 2)	• ECM stops A/F sub feedback control.
P0171 ☞(Page 1A-53)	System Too Lean	• ECM stops torque learning control. • ECM stops EVAP canister purge valve control.
P0172 ☞(Page 1A-53)	System Too Rich	
P0222 ☞(Page 1A-55)	Throttle / Pedal Position Sensor / Switch “B” Circuit Low	• ECM fixes throttle valve at default position (about 8.6 °). • ECM performs fuel cut at specified engine speed. • ECM stops A/F feedback control.
P0223 ☞(Page 1A-55)	Throttle / Pedal Position Sensor / Switch “B” Circuit High	
P0300 ☞(Page 1A-57)	Random / Multiple Cylinder Misfire Detected	• ECM stops A/F feedback control. • ECM stops torque learning control. • ECM performs fuel cut at specified engine speed. • ECM stops EVAP canister purge valve control.
P0301 ☞(Page 1A-57)	Cylinder 1 Misfire Detected	
P0302 ☞(Page 1A-57)	Cylinder 2 Misfire Detected	
P0303 ☞(Page 1A-57)	Cylinder 3 Misfire Detected	
P0327 ☞(Page 1A-59)	Knock Sensor 1 Circuit Low	• ECM stops knock control.
P0335 ☞(Page 1A-60)	Crankshaft Position Sensor “A” Circuit	• ECM performs fuel cut at specified engine speed. • ECM change cylinder identification method.
P0336 ☞(Page 1A-60)	Crankshaft Position Sensor “A” Circuit Range / Performance	
P0340 ☞(Page 1A-62)	Camshaft Position Sensor “A” Circuit	
P0341 ☞(Page 1A-62)	Camshaft Position Sensor “A” Circuit Range / Performance	
P0420 ☞(Page 1A-64)	Catalyst System Efficiency Below Threshold	—

DTC	DTC name	Fail-safe operation
P0443 ☞(Page 1A-66)	Evaporative Emission System Purge Control Valve Circuit	• ECM stops A/F feedback learning control. • ECM stops torque learning control. • ECM stops EVAP canister purge valve control.
P0480 ☞(Page 1A-67)	Fan 1 Control Circuit	—
P0500 ☞(Page 1A-69)	Vehicle Speed Sensor “A”	• ECM stops torque control.
P0532 ☞(Page 1A-71)	A/C Refrigerant Pressure Sensor “A” Circuit Low	• ECM stops torque learning control. • ECM stops A/C control.
P0533 ☞(Page 1A-71)	A/C Refrigerant Pressure Sensor “A” Circuit High	
P0601 ☞(Page 1A-73)	Internal Control Module Memory Check Sum Error	—
P0602 ☞(Page 1A-72)	Control Module Programming error	—
P0607 ☞(Page 1A-73)	Control Module Performance	• ECM fixes throttle valve at default position (about 8.6 °). • ECM performs fuel cut at specified engine speed.
P0616 ☞(Page 1A-74)	Starter Relay Circuit Low	—
P0617 ☞(Page 1A-74)	Starter Relay Circuit High	
P2101 ☞(Page 1A-75)	Throttle Actuator Control Motor Circuit Range / Performance	• ECM fixes throttle valve at default position (about 8.6 °). • ECM performs fuel cut at specified engine speed.
P2102 ☞(Page 1A-77)	Throttle Actuator “A” Control Motor Circuit Low	
P2111 ☞(Page 1A-78)	Throttle Actuator Control System Stuck Open	
P2119 ☞(Page 1A-75)	Throttle Actuator Control Throttle Body Range / Performance	
P2122 ☞(Page 1A-79)	Throttle / Pedal Position Sensor / Switch “D” Circuit Low	• ECM controls actuators lowering upper limit of throttle valve. • ECM controls fuel cut at specified engine speed.
P2123 ☞(Page 1A-79)	Throttle / Pedal Position Sensor / Switch “D” Circuit High	
P2127 ☞(Page 1A-80)	Throttle / Pedal Position Sensor / Switch “E” Circuit Low	
P2128 ☞(Page 1A-80)	Throttle / Pedal Position Sensor / Switch “E” Circuit High	
P2135 ☞(Page 1A-82)	Throttle / Pedal Position Sensor / Switch “A” / “B” Voltage Correlation	• ECM fixes throttle valve at default position (about 8.6 °). • ECM performs fuel cut at specified engine speed.
P2138 ☞(Page 1A-83)	Throttle / Pedal Position Sensor / Switch “D” / “E” Voltage Correlation	
U2001 ☞(Page 1A-85)	Lost Communication With LIN (ECM Detection)	ECM stops generator control.
U2021 ☞(Page 1A-86)	Lost Communication With LIN (Generator Detection)	

Scan Tool Data

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As the data values are standard values estimated on the basis of values obtained from the normally operating vehicles using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made depending on these data alone.

Also, conditions that can be checked by the scan tool are those detected by ECM and output from ECM as commands and there may be cases where the engine or actuator is not operating (in the condition) as indicated by the scan tool. Be sure to use the timing light to check the ignition timing. ☞(Page 1H-5)

NOTE

- **With the generic scan tool, only asterisk (*) marked data in the following table can be read.**
- **When checking data with engine running at idle or racing, be sure to place gear shift lever in "Neutral" for M/T vehicle and "N" position for AMT vehicle and apply parking brake fully. Also, if nothing or "no load" is indicated, turn off A/C, all electric loads, P/S and all the other switches.**

	Scan tool data	Vehicle condition	Normal condition / reference value
*	Fuel System ☞(Page 1A-29)	Open-loop control before satisfaction of closed-loop control conditions (ECT >10 °C, HO2S-1, IAT, TP sensor/ system = OK)	OL (open loop)
		Open-loop control due to driving conditions (Power enrichment, etc.)	OL-Drive (open loop)
		Open-loop control due to system fault detected	OL-Fault (open loop)
		Closed-loop control using HO2S-1 and O2S-2 as feedback sensors for fuel control	CL (closed-loop)
		Closed-loop control due to system fault detected	CL-Fault (closed-loop)
		When engine stops with ignition "ON"	—
*	Short Term Fuel Trim ☞(Page 1A-29)	Engine: Idle speed after warming up	Approx. –20 to 20%
*	Long Term Fuel Trim ☞(Page 1A-29)	Engine: Idle speed after warming up	Approx. –20 to 20%
	Total Fuel Trim ☞(Page 1A-29)	Engine: Idle speed after warming up	Approx. –30 to 30%
	Inj Pulse Width ☞(Page 1A-29)	Engine: Idle speed with no load after warming up	Approx. 1.6 to 4.0 msec
*	Ignition Advance ☞(Page 1A-29)	Engine: Idle speed with no load after warming up	1 to 15° BTDC
*	Calculated Load ☞(Page 1A-29)	Engine: Idle speed with no load after warming up	Approx. 20 to 40%
*	Engine Speed ☞(Page 1A-29)	Engine: Idle speed after warming up Radiator cooling fan: Stopped All electrical equipment: OFF Gear shift lever: Neutral position	650 to 750 rpm
	Desired Idle ☞(Page 1A-29)	Engine: Idle speed after warming up Radiator cooling fan: Stopped All electrical equipment: OFF Gear shift lever: Neutral position	700 rpm
*	Vehicle Speed ☞(Page 1A-29)	Vehicle running	Almost the same as speedometer reading
*	MAP ☞(Page 1A-29)	Engine: Idle speed after warming up	Approx. 20 to 55 kPa
*	ECT ☞(Page 1A-29)	Engine: Idle speed after warming up	Approx. 80 to 105 °C (176 – 221 °F)
*	Intake Air Temperature ☞(Page 1A-29)	Engine: Idle speed after warming up	Ambient air temperature – 5 °C (41 °F) to ambient air temperature +40 °C (104 °F)
*	Barometric Pres ☞(Page 1A-29)	—	Barometric pressure is displayed.
*	EVAP Canist Prg Duty ☞(Page 1A-30)	Engine: Idle speed after warming up	0%
	IAC Throttle Opening ☞(Page 1A-30)	Engine: Idle speed with no load after warming up	Approx. 5 to 25%
		Engine: Idle speed after warming up A/C switch: ON Blower speed selector: Max	Approx. 20 to 50%
	TP Sensor 1 Volt ☞(Page 1A-30)	Ignition: "ON" Accelerator pedal: Released	0.6 to 1.0 V
		Ignition: "ON" Accelerator pedal: Depressed fully	4.1 to 4.5 V

	Scan tool data	Vehicle condition	Normal condition / reference value
	TP Sensor 2 Volt ☞(Page 1A-30)	Ignition: “ON” Accelerator pedal: Released	4.0 to 4.4 V
		Ignition: “ON” Accelerator pedal: Depressed fully	0.5 to 0.9 V
	APP Sensor 1 Volt ☞(Page 1A-30)	Ignition: “ON” Accelerator pedal: Released	0.6 to 0.9 V
		Ignition: “ON” Accelerator pedal: Depressed fully	3.7 to 4.4 V
	APP Sensor 2 Volt ☞(Page 1A-30)	Ignition: “ON” Accelerator pedal: Released	0.3 to 0.5 V
		Ignition: “ON” Accelerator pedal: Depressed fully	1.8 to 2.2 V
*	Accel Position ☞(Page 1A-30)	Ignition: “ON” Accelerator pedal: Released	0 to 2%
		Ignition: “ON” Accelerator pedal: Depressed fully	90 to 100%
*	Throttle Position ☞(Page 1A-30)	Ignition: “ON” Accelerator pedal: Released	0 to 10%
		Ignition: “ON” Accelerator pedal: Depressed fully	90 to 100%
*	Target Throttle Posi ☞(Page 1A-30)	Ignition: “ON” Accelerator pedal: Released	0 to 10%
		Ignition: “ON” Accelerator pedal: Depressed fully	90 to 100%
*	Throttle Motor Volt ☞(Page 1A-30)	Ignition: “ON”	13 to 15 V
*	O2S B1 S1 ☞(Page 1A-30)	Engine: Idle speed for 2 min. after warming up	Approx. 0 to 1.0 V
*	O2S B1 S2 ☞(Page 1A-30)	Engine: 2,000 rpm for 3 min. or more after warming up	Approx. 0 to 1.0 V
*	Battery Voltage ☞(Page 1A-30)	Engine: Idle speed	Approx. 13 to 15 V
*	Fuel Tank Level ☞(Page 1A-30)	Ignition: “ON”	0 to 100%
	A/C Pressure ☞(Page 1A-30)	Engine: Idle speed A/C switch: ON Blower speed selector: MAX	800 to 1,400 kPa
	Generator Field Duty ☞(Page 1A-30)	Engine: Idle speed after warming up	Approx. 20 to 100%
	Generator Reg Volt (Com) ☞(Page 1A-30)	Engine: Idle speed after warming up	Approx. 10.7 V to 16.0 V
	Radiator Fan ☞(Page 1A-30)	Radiator cooling fan: OFF	OFF
		Radiator cooling fan: ON	ON
	A/C Comp Relay ☞(Page 1A-30)	A/C switch: ON Blower speed selector: ON	ON
		Other than above condition	OFF
	Fuel Pump ☞(Page 1A-30)	Engine running	ON
		Other than above condition	OFF
	Starter SW ☞(Page 1A-30)	Ignition: “ST” (engine cranking)	ON
		Other than above condition	OFF
	A/C Switch ☞(Page 1A-30)	A/C switch: ON	ON
		Other than above condition	OFF
	Blower Fan ☞(Page 1A-30)	2nd or higher speed position	ON
		Other than above condition	OFF
	Brake Switch ☞(Page 1A-30)	Brake pedal: Depressed	ON
		Brake pedal: Released	OFF
	Electric Load ☞(Page 1A-30)	Headlight switch: ON	ON
		Headlight switch: OFF	OFF

	Scan tool data	Vehicle condition	Normal condition / reference value
	PNP Signal ☞(Page 1A-31)	Shift select lever: Other than “N” position	D
		Shift select lever: “N” position	P/N
	Clutch SW ☞(Page 1A-31)	Clutch pedal: Depressed fully	Declutch
		Clutch pedal: Released	Clutched
	Fuel Cut ☞(Page 1A-31)	Engine: Idle speed after warming up	OFF
		Accelerator pedal: Released Engine condition: 2,000 rpm or more after warming up	ON
	Closed Throttle Pos ☞(Page 1A-31)	Ignition: “ON” Accelerator pedal: Released	ON
		Ignition: “ON” Accelerator pedal: Depressed fully	OFF
	O2S B1 S1 Act ☞(Page 1A-31)	Engine: Idle speed after warming up	Active
	O2S B1 S2 Act ☞(Page 1A-31)	Engine: Idle speed after warming up	Active

Scan Tool Data Definitions

Fuel System (Fuel system status):
A/F ratio feedback loop status is displayed as follows.
OL: Open-loop control before satisfaction of closed-loop control conditions (ECT > 10 °C, IAT, TP sensor/system = OK).
CL: Closed-loop control using oxygen sensor(s) as feedback sensor(s).
OL-DRIVE: Open-loop control due to driving requirement (power-up enrichment etc.).
OL-FAULT: Open-loop control due to system fault detected.
CL-FAULT: Closed-loop control due to system fault detected.

Short Term Fuel Trim (%):
Short term fuel trim value represents short term corrections to air/fuel mixture. 0 (zero) indicates no correction, a value greater than 0 indicates enrichment correction, and a value less than 0 indicates enleanment correction.

Long Term Fuel Trim (%):
Long term fuel trim value represents long term corrections to air/fuel mixture. 0 (zero) indicates no correction, a value greater than 0 indicates enrichment correction, and a value less than 0 indicates enleanment correction.

Total Fuel Trim (%):
Total Fuel Trim is calculated from Short Term Fuel Trim and Long Term Fuel Trim. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

Inj Pulse Width (Fuel injection pulse width, msec.):
This parameter indicates the injector drive pulse width (time) during which the injector valve stays open as commanded by ECM. (For multipoint fuel injection, the injector drive time means that of the No. 1 cylinder.)

Ignition Advance (Ignition timing advance for No.1 cylinder, ° BTDC):
This parameter indicates the ignition timing of No.1 cylinder commanded by ECM. The actual ignition timing should be checked using a timing light.

Calculated Load (Calculated load value, %):
This parameter indicates calculated engine load in percent. The load is calculated based on input signals to ECM from various engine sensors.

Engine Speed (rpm):
The engine speed is calculated from reference pulses from the camshaft position sensor.

Desired Idle (Desired idle speed, rpm):
The Desired Idle Speed is an ECM internal parameter which indicates idle speed requested by ECM. If the engine is not running, this number is not valid.

Vehicle Speed (km/h, mph):
The vehicle speed is calculated based on pulse signals from wheel speed sensors.

MAP (Manifold absolute pressure, kPa, mmHg, inHg, psi, inH2O):
This parameter indicates the calculated manifold pressure based on MAP sensor signal.

ECT (Engine coolant temperature, °C, °F):
It is detected by engine coolant temperature sensor.

Intake Air Temperature. (°C, °F):
It is detected by intake air temperature sensor.

Barometric Pres (Barometric pressure, kPa, mmHg, inHg, psi, inH2O):
This parameter represents barometric air pressure measurement and is used for altitude correction of the fuel injection rate.

EVAP Canist Prg Duty (EVAP canister purge flow duty, %):
This parameter indicates valve ON (valve open) time rate within a certain set cycle of EVAP canister purge valve which controls the amount of EVAP purge.

IAC Throttle Opening (Idle air throttle valve opening, %):
This parameter indicates throttle valve opening of idle air control in % (100% indicates the maximum idle air flow).

TP Sensor 1 Volt (TP sensor (main) output voltage, V):
TP sensor (main) data provides throttle valve opening information in the form of voltage.

TP Sensor 2 Volt (TP sensor (sub) output voltage, V):
TP sensor (sub) data provides throttle valve opening information in the form of voltage.

APP Sensor 1 Volt (APP sensor (main) output voltage, V):
APP sensor (main) data provides accelerator pedal position information in the form of voltage.

APP Sensor 2 Volt (APP sensor (sub) output voltage, V):
APP sensor (sub) data provides accelerator pedal position information in the form of voltage.

Accel Position (Absolute accelerator pedal position, %):
This parameter indicates calculated accelerator pedal position in percent based on input from accelerator pedal position sensor.

Throttle Position (Absolute throttle position, %):
This parameter indicates calculated throttle opening in percent based on input from throttle position sensor.

Target Throttle Posi (Target throttle valve position, %):
Target throttle valve position is an ECM internal parameter which indicates throttle valve position requested by ECM.

Throttle Motor Volt (Throttle motor voltage, V):
Target throttle valve position is an ECM internal parameter which indicates throttle valve position requested by ECM.

O2S B1 S1 (HO2S-1, V):
This parameter indicates output voltage of HO2S-1 installed on exhaust manifold (pre-TWC).

O2S B1 S2 (O2S-2, V):
This parameter indicates output voltage of O2S-2 installed on exhaust manifold (post-TWC). It is used to detect catalyst deterioration.

Battery Voltage (V):
This parameter indicates battery voltage inputted from main relay to ECM.

Fuel Tank Level:
This parameter indicates approximate fuel level in fuel tank. Detectable range of fuel level sensor is set as 0 to 100%.

A/C Pressure (A/C refrigerant absolute pressure, kPa, mmHg, inHg, psi, inH2O):
This parameter indicates A/C refrigerant absolute pressure calculated by A/C refrigerant pressure sensor.

Generator Field Duty (%):
This parameter indicates operating rate (status of output) of the generator by field coil duty ratio.
100%: Maximum operation.
0%: Minimum operation.

Generator Reg Voltage (%):
This parameter indicates commanded generator regulated voltage.

Radiator Fan (Radiator Cooling Fan Control Relay, ON/OFF):
ON: ON command is being output to radiator cooling fan relay.
OFF: No command is being output.

A/C Comp Relay (A/C compressor relay, ON/OFF):
This parameter indicates the state of the A/C compressor relay.

Fuel Pump (ON/OFF):
ON is displayed when ECM activates the fuel pump via the fuel pump relay switch.

Starter SW (Starter switch, ON/OFF):
This parameter indicates state of starting motor control relay output.
ON: Starting motor control relay is ON.
OFF: Starting motor control relay is OFF.

A/C Switch (ON/OFF):
ON: Command for A/C operation is being output from BCM to ECM.
OFF: Command for A/C operation is not being output.

Blower Fan (ON/OFF):
This parameter indicates the state of the blower speed selector.

Brake Switch (ON/OFF):
This parameter indicates the state of the brake switch.

Electric Load (ON/OFF):
ON: ON signal of headlight or clearance lights is input.
OFF: Above electric loads all turned off.

PNP Signal (N or D range) (AMT model):
Whether the transmission range switch is in “N” range or other ranges is displayed. If it is in “N” range, “N” is displayed and if it is in other than “N” range, “D” is displayed.

Clutch SW (Declutch / Clutched):
Declutch: Clutch pedal is fully depressed.
Clutched: Clutch pedal is released.

Fuel Cut (ON/OFF):
ON: Fuel injection is cut (output signal to injector is stopped).
OFF: Fuel injection is not cut.

Closed Throttle Pos (Closed throttle position, ON/OFF):
This parameter is ON when throttle valve is fully closed and OFF when the valve is not fully closed.

O2S B1 S1 Act (HO2S-1, Active / Inactive):
This parameter indicates the activation condition of HO2S-1.
ACTIVE: The sensor is activated.
INACTIVE: The sensor is being warmed up or not activated.

O2S B1 S2 Act (O2S-2, Active / Inactive):
This parameter indicates the activation condition of O2S-2.
ACTIVE: The sensor is activated.
INACTIVE: The sensor is being warmed up or not activated.

Visual Inspection

AENDL70A1104008

Visually check the following parts and systems.

Inspection Item		Referring section
Engine oil	Level	☞(Page 0B-3)
	Leakage	—
Engine coolant	Level	“Coolant Level Check” in Section 1F (Page 1F-7)
	Leakage	“Engine Cooling System Inspection” in Section 1F (Page 1F-7)
Fuel	Level	—
	Leakage	“Fuel Leakage Check Procedure” in Section 1G (Page 1G-13)
Manual transaxle oil	Level	“Manual Transaxle Oil Level Check” in Section 5B (Page 5B-5)
	Leakage	—
Air cleaner filter	Dirt	“Air Cleaner Filter Inspection and Cleaning” in Section 1D (Page 1D-5)
	Clogging	
Battery	Corrosion of terminal	“Battery Inspection” in Section 1J (Page 1J-3)
Accessory drive belt	Tension	“Water Pump / Generator Drive Belt Tension Inspection and Adjustment” in Section 1J (Page 1J-5)
	Damage	
Throttle valve	Operating sound	—
Vacuum hoses of air intake system	Disconnection	—
	Looseness	—
	Deterioration	—
	Bend	—
Connectors of electric wire harness	Disconnection	—
	Friction / pinch	—
Fuses	Blown	—
Parts	Installation	—
	Deformation	—
Bolt	Looseness	—

Additionally check the following items at engine start, if possible.

Inspection Item		Referring section
MIL	Operation	“MIL Check” (Page 1A-19)
Charging light	Operation	“Generator Symptom Diagnosis” in Section 1J (Page 1J-3)

Inspection Item		Referring section
Engine oil pressure light	Operation	“Oil Pressure Switch Inspection” in Section 1E (Page 1E-3)
Engine coolant temperature warning light	Operation	“ECT Sensor Inspection” in Section 1C (Page 1C-6)
Fuel level sensor	Operation	“Fuel Pump Inspection” in Section 1G (Page 1G-24)
Tachometer (if equipped)	Operation	“Combination Meter diagnosis” in Section 9C (Page 9C-4)
Exhaust system	Leakage of exhaust gas, noise	“Exhaust System Check” in Section 1K (Page 1K-1)
Abnormal air being inhaled at air intake system		—
Other parts that can be checked visually		—

Engine Basic Inspection

AENDL70A1104009

This check is very important for troubleshooting when ECM has detected no DTC and no abnormality has been found in “Visual Inspection” (Page 1A-31).
Follow the flow carefully.

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check” (Page 1A-16).
2	**Check battery voltage** *Is it 12 V or more?*	Go to Step 3.	Charge or replace battery.
3	*Can engine be cranked?*	Go to Step 4.	Go to “Cranking System Symptom Diagnosis” in Section 1I (Page 1I-2).
4	*Does engine start?*	Go to Step 5.	Go to Step 7.
5	**Check idle speed** 1) Check engine idle speed. ☞(Page 1A-99) *Is check result OK?*	Go to Step 6.	Go to “Engine Symptom Diagnosis” (Page 1A-32).
6	**Check ignition system** 1) Check ignition system. ☞(Page 1H-3) *Is check result OK?*	Go to “Engine Symptom Diagnosis” (Page 1A-32).	Repair or replace defective parts.
7	**Check immobilizer system for operation** 1) Check immobilizer control system. ☞(Page 10C-3) *Is check result OK?*	Go to Step 8.	Immobilizer control system malfunction.
8	**Check fuel supply** 1) Check fuel supply. ☞(Page 1G-21) *Is check result OK?*	Go to Step 9.	Repair or replace defective parts.
9	**Check fuel injector circuit** 1) Check fuel injector circuit referring to “Fuel Injector Circuit Check” in Section 1G (Page 1G-5). *Is check result OK?*	Go to “Engine Symptom Diagnosis” (Page 1A-32).	Go to “Fuel Injector Circuit Check” in Section 1G (Page 1G-5).

Engine Symptom Diagnosis

AENDL70A1104010

Perform troubleshooting referring to the following points when ECM has detected no DTC and no abnormality has been found in “Visual Inspection” (Page 1A-31) and “Engine Basic Inspection” (Page 1A-32).

Condition	Possible cause	Correction / Reference Item
Hard starting (Engine can be cranked)	Faulty spark plug	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	Faulty ignition coil	*"Ignition Coil Assembly Inspection" in Section 1H (Page 1H-5)*
	Dirty or clogged fuel hoses or pipes	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Malfunctioning fuel pump	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Air drawn in through intake manifold gasket or throttle body gasket	*Check air intake system.*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*
	Faulty ECT sensor or MAP sensor	*"ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Low compression	*"Compression Check" in Section 1D (Page 1D-1)*
	Poor spark plug tightening or faulty gasket	*"Spark Plug Removal and Installation" in Section 1H (Page 1H-5)*
	Compression leak from valve seat	*"Valve and Valve Guide Inspection" in Section 1D (Page 1D-33)*
	Sticky valve stem	*"Valve and Valve Guide Inspection" in Section 1D (Page 1D-33)*
	Weak or damaged valve springs	*"Valve Spring Inspection" in Section 1D (Page 1D-36)*
	Compression leak at cylinder head gasket	*"Cylinder Head Inspection" in Section 1D (Page 1D-35)*
	Sticking or damaged piston ring	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39)*
	Worn piston, piston ring or cylinder	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39)*
	Malfunctioning PCV valve	*"PCV Valve Inspection" in Section 1B (Page 1B-5)*
Low oil pressure	Improper oil viscosity	*"Engine Oil and Filter Change" in Section 0B (Page 0B-3)*
	Malfunctioning oil pressure switch	*"Oil Pressure Switch Inspection" in Section 1E (Page 1E-3)*
	Clogged oil strainer	*Check oil strainer for clog.*
	Functional deterioration of oil pump	*"Oil Pump Inspection" in Section 1E (Page 1E-8)*
	Worn oil pump relief valve	*"Oil Pump Inspection" in Section 1E (Page 1E-8)*
	Excessive clearance in various sliding parts	—

Condition	Possible cause	Correction / Reference Item
Engine noise – Valve noise ***NOTE*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Improper valve lash	*"Camshaft and Tappet Inspection" in Section 1D (Page 1D-14)*
	Worn valve stem and guide	*"Valve and Valve Guide Inspection" in Section 1D (Page 1D-33)*
	Weak or broken valve spring	*"Valve Spring Inspection" in Section 1D (Page 1D-36)*
	Warped or bent valve	*"Valve and Valve Guide Inspection" in Section 1D (Page 1D-33)*
Engine noise – Piston, piston ring and cylinder noise ***NOTE*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, piston ring and cylinder bore	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39)*
Engine noise – Connecting rod noise ***NOTE*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, piston ring and cylinder bore	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39)*
	Worn connecting rod bearing	*"Crank Pin and Connecting Rod Bearing Inspection" in Section 1D (Page 1D-42)*
	Worn crankshaft pin	*"Crank Pin and Connecting Rod Bearing Inspection" in Section 1D (Page 1D-42)*
	Loose connecting rod bolts	*"Piston, Piston Ring, Connecting Rod and Cylinder Removal and Installation" in Section 1D (Page 1D-37)*
	Low oil pressure	*Condition "Low oil pressure"*
Engine noise – Crankshaft noise ***NOTE*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Low oil pressure	*Condition "Low oil pressure"*
	Worn main bearing	*"Main Bearing Inspection" in Section 1D (Page 1D-49)*
	Worn crankshaft journal	*"Crankshaft Inspection" in Section 1D (Page 1D-48)*
	Loose bearing cap bolts	*"Main Bearing Inspection" in Section 1D (Page 1D-49)*
	Excessive crankshaft thrust play	*"Crankshaft Inspection" in Section 1D (Page 1D-48)*

Condition	Possible cause	Correction / Reference Item
Engine overheating	Inoperative thermostat	*"Thermostat Inspection" in Section 1F (Page 1F-10)*
	Poor water pump performance	*"Water Pump Inspection" in Section 1F (Page 1F-13)*
	Clogged or leaky radiator	*"Radiator On-Vehicle Inspection and Cleaning" in Section 1F (Page 1F-12)*
	Improper engine oil grade	*"Engine Oil and Filter Change" in Section 0B (Page 0B-3)*
	Clogged oil filter or oil strainer	*"Oil Pressure Check" in Section 1E (Page 1E-1)*
	Poor oil pump performance	*"Oil Pressure Check" in Section 1E (Page 1E-1)*
	Faulty radiator cooling fan control system	*"Radiator Cooling Fan Control System Check" in Section 1F (Page 1F-4)*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis" in Section 4A (Page 4A-2)*
	Slipping clutch (M/T model)	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis" in Section 5C (Page 5C-2)*
	Blown cylinder head gasket	*"Cylinder Head Inspection" in Section 1D (Page 1D-35)*
	Air mixed in cooling system	*"Cooling System Refilling" in Section 1F (Page 1F-9)*
Poor fuel mileage	Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	High idle speed	*Condition "Improper engine idling or engine fails to idle"*
	Poor performance of ECT sensor or MAP sensor	*"ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Low compression	*"Compression Check" in Section 1D (Page 1D-1)*
	Poor valve seating	*"Valve and Valve Guide Inspection" in Section 1D (Page 1D-33)*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis" in Section 4A (Page 4A-2)*
	Slipping clutch (M/T model)	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis" in Section 5C (Page 5C-2)*
	Thermostat out of order	*"Thermostat Inspection" in Section 1F (Page 1F-10)*
	Improper tire pressure	*"Tire Description" in Section 2D (Page 2D-1)*

Condition	Possible cause	Correction / Reference Item
Excessive engine oil consumption – Oil leakage	Broken cylinder head gasket	*"Cylinder Head Inspection" in Section 1D (Page 1D-35)*
	Leaky crankshaft pulley oil seal	*"Camshaft and Tappet Inspection" in Section 1D (Page 1D-14)*
	Leaky crankshaft rear oil seal	*"Rear Oil Seal Inspection" in Section 1D (Page 1D-54)*
	Leaky cylinder head cover gasket	*"Cylinder Head Cover Components" in Section 1D (Page 1D-8)*
Excessive engine oil consumption – Oil entering combustion chamber	Sticky piston ring	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39)*
	Worn piston and cylinder	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39)*
	Worn piston ring groove and ring	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39)*
	Improper location of piston ring gap	*"Piston, Piston Ring, Connecting Rod and Cylinder Disassembly and Reassembly" in Section 1D (Page 1D-38)*
	Worn or damaged valve stem seal	*"Valve and Valve Guide Inspection" in Section 1D (Page 1D-33)*
	Worn valve stem	*"Valve and Valve Guide Inspection" in Section 1D (Page 1D-33)*
Engine hesitates – Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually severest when moving out from a stop at stop signal etc.	Spark plug faulty or plug gap out of adjustment	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	Fuel pressure out of specification	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Poor performance of ECT sensor or MAP sensor	*"ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*
	Faulty fuel injector	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check" in Section 1D (Page 1D-1)*
Surge – Engine power variation under steady throttle or cruise. Vehicle speed changes up and down with no change in accelerator pedal position.	Faulty spark plug (excessive carbon deposits, improper gap, burned electrodes, etc.)	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	Variable fuel pressure	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Kinky or damaged fuel lines	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Faulty fuel pump (clogged fuel filter)	*"Fuel Pump and Its Circuit Check" in Section 1G (Page 1G-6)*
	Poor performance of MAP sensor	*"MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty fuel injector	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*

Condition	Possible cause	Correction / Reference Item
Excessive detonation – Engine continuously generates sharp, metallic knocking sound that changes with throttle opening.	Faulty spark plug	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	Engine overheating	*Condition "Engine overheating"*
	Clogged fuel filter (faulty fuel pump) or fuel lines	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9) or "Fuel Pump and Its Circuit Check" in Section 1G (Page 1G-6)*
	Air drawn in through intake manifold or throttle body gasket	*Check air intake system.*
	Poor performance of knock sensor, ECT sensor or MAP sensor	*"Knock Sensor On-Vehicle Inspection" in Section 1C (Page 1C-9), "ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5) or "Fuel Injector Inspection" in Section 1G (Page 1G-16)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Excessive combustion chamber deposits	*"Cylinder, Piston and Piston Ring Inspection" in Section 1D (Page 1D-39) and/or "Piston Pin and Connecting Rod Inspection" in Section 1D (Page 1D-41)*
Poor engine power	Faulty spark plug	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly Inspection" in Section 1H (Page 1H-5)*
	Faulty knock sensor	*"Knock Sensor On-Vehicle Inspection" in Section 1C (Page 1C-9)*
	Clogged fuel hoses or pipes	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Malfunctioning fuel pump	*"Fuel Pump and Its Circuit Check" in Section 1G (Page 1G-6)*
	Air drawn in through intake manifold gasket or throttle body gasket	*Check air intake system.*
	Engine overheating	*Condition "Engine overheating"*
	Poor performance of ECT sensor or MAP sensor	*"ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5) or "Fuel Injector Inspection" in Section 1G (Page 1G-16)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis" in Section 4A (Page 4A-2)*
	Slipping clutch (M/T model)	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis" in Section 5C (Page 5C-2)*
	Low compression	*"Compression Check" in Section 1D (Page 1D-1)*

Condition	Possible cause	Correction / Reference Item
Improper engine idling or engine fails to idle	Faulty spark plug	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly Inspection" in Section 1H (Page 1H-5)*
	Fuel pressure out of specification	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Leaky manifold, throttle body, or cylinder head gasket	*Check air intake system.*
	Faulty evaporative emission control system	*"EVAP Canister Purge Valve Inspection" in Section 1B (Page 1B-3)*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5) or "Fuel Injector Inspection" in Section 1G (Page 1G-16)*
	Poor performance of ECT sensor or MAP sensor	*"ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Loose connection or disconnection of vacuum hoses	*Check connection of vacuum hoses.*
	Malfunctioning PCV valve	*"PCV Valve Inspection" in Section 1B (Page 1B-5)*
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check" in Section 1D (Page 1D-1)*
	Faulty generator and/or its circuit	*"Generator Test" in Section 1J (Page 1J-4)*

Condition	Possible cause	Correction / Reference Item
Excessive hydrocarbon (HC) emission or carbon monoxide (CO) emission	Faulty spark plug	*"Spark Plug Inspection" in Section 1H (Page 1H-5)*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly Inspection" in Section 1H (Page 1H-5)*
	Low compression	*"Compression Check" in Section 1D (Page 1D-1)*
	Lead contamination of three-way catalytic converter	*Check for absence of filler neck restrictor.*
	Faulty evaporative emission control system	*"EVAP Canister Purge System Inspection" in Section 1B (Page 1B-1)*
	Fuel pressure out of specification	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Faulty closed-loop system (A/F feedback compensation) (Poor performance of ECT sensor or MAP sensor)	*"ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*
	Faulty injector(s)	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*
	Engine not at normal operating temperature	—
	Clogged air cleaner	*"Air Cleaner Filter Inspection and Cleaning" in Section 1D (Page 1D-5)*
	Vacuum leaks	*"Engine Vacuum Check" in Section 1D (Page 1D-2)*
Excessive nitrogen oxides (NOx) emission	Improper ignition timing	*"Ignition Timing Inspection" in Section 1H (Page 1H-5)*
	Lead contamination of catalytic converter	*Check for absence of filler neck restrictor.*
	Fuel pressure out of specification	*"Fuel Pressure Basic Check" in Section 1G (Page 1G-9)*
	Faulty closed-loop system (A/F feedback compensation) (Poor performance of ECT sensor or MAP sensor)	*"ECT Sensor Inspection" in Section 1C (Page 1C-6) or "MAP Sensor Inspection" in Section 1C (Page 1C-6)*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2)*
	Faulty APP sensor	*"APP Sensor Inspection" in Section 1C (Page 1C-5)*
	Faulty injector(s)	*"Fuel Injector Circuit Check" in Section 1G (Page 1G-5) or "Fuel Injector Inspection" in Section 1G (Page 1G-16)*
	Faulty ECM	*"Inspection of ECM and Its Circuits" (Page 1A-87)*

MIL Does Not Come ON with Ignition "ON" and Engine Stopped (but Engine Can Be Started)

AENDL70A1104011

Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC related to CAN communication. *Is there any CAN-DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.

Step	Action	Yes	No
2	**DTC check** 1) Check combination meter for DTC. *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace ECM and recheck MIL operation. ☞(Page 1C-1)

MIL Remains ON after Engine Starts

AENDL70A1104012

Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Start engine and recheck DTC of ECM while engine running. *Is there any DTC(s)?*	Go to troubleshooting for applicable DTC.	Replace combination meter and recheck MIL operation. ☞(Page 9C-11) If MIL still remains ON, replace ECM and recheck MIL operation. ☞(Page 1C-1)

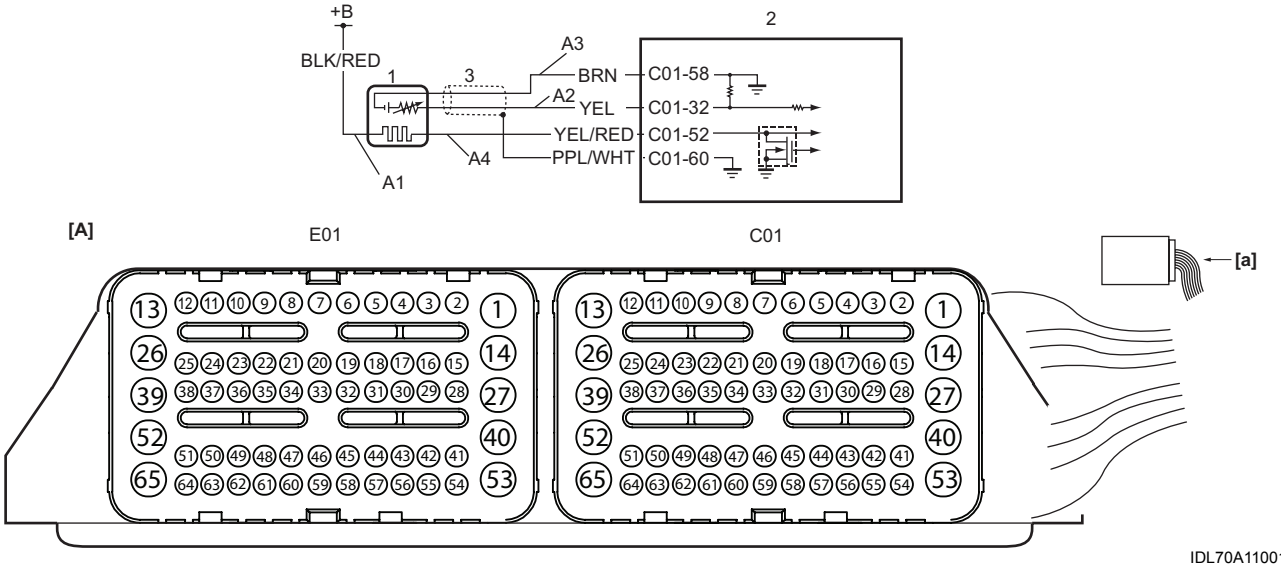
DTC P0031 / P0032

AENDL70A1104015

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0031: HO2S Heater Control Circuit Low (Sensor 1) Output voltage of HO2S-1 heater circuit is lower than specified value for 5 sec. continuously even though control duty output of HO2S-1 heater is less than 90% with engine running. (Heater control duty pulse is not detected in its circuit of ECM) (3 D/C detection logic)	• HO2S-1 heater and/or its circuit • ECM
P0032: HO2S Heater Control Circuit High (Sensor 1) Output voltage of HO2S-1 heater circuit is higher than specified value for 5 sec. continuously even though control duty output of HO2S-1 heater is less than 10% with engine running. (Heater control duty pulse is not detected in its circuit of ECM) (3 D/C detection logic)	

Circuit Diagram



IDL70A110012-03

[A]: ECM connector (View: [a])	A3: HO2S-1 ground circuit	2. ECM
A1: HO2S-1 heater power supply circuit	A4: HO2S-1 heater drive circuit	3. Shield wire
A2: HO2S-1 signal circuit	1. HO2S-1	

DTC Confirmation Procedure

NOTE

Confirm that the following condition is met in this "DTC Confirmation Procedure".

- **15 V > Battery voltage > 10.7 V**

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**HO2S-1 heater power supply circuit check** 1) When ignition is "OFF", disconnect connector from HO2S-1. 2) Check for proper terminal connection to HO2S-1 connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "A1" circuit and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Replace defective wiring harness.
3	**HO2S heater drive circuit check** 1) When ignition is "OFF", disconnect "C01" and "E01" connectors from ECM. 2) Check for proper terminal connection to "C01" and "E01" connectors. 3) If connections are OK, check the following points. • Resistance of "A4" circuit: less than 1Ω • Resistance between "A4" circuit and ground: infinity • Resistance between "A4" circuit terminal and other terminal at HO2S-1 connector: infinity • Voltage of "A4" circuit: 0 to 1 V (When ignition is "ON") *Is check result OK?*	Go to Step 4.	Replace defective wiring harness.
4	**HO2S-1 heater check** 1) Check HO2S-1 heater. ☞(Page 1C-7) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace HO2S-1.

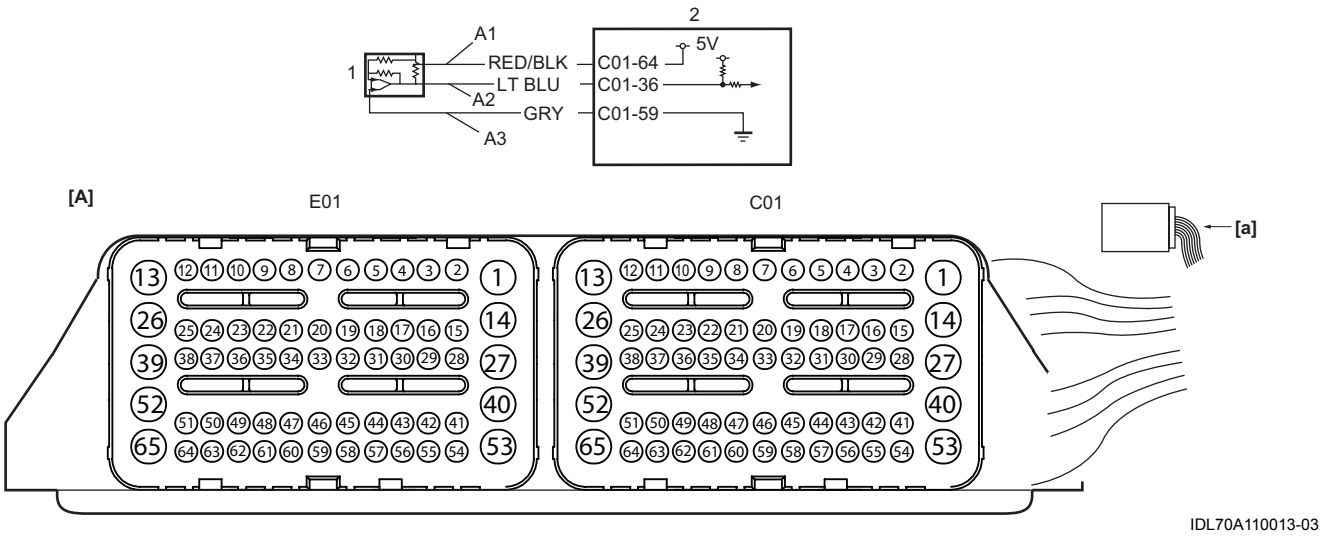
DTC P0107 / P0108

AENDL70A1104017

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0107: Manifold Absolute Pressure / Barometric Pressure Circuit Low Output voltage of MAP sensor signal circuit is lower than 0.35 V for 5 sec. (3 D/C detection logic)	• MAP sensor and/or its circuit • ECM
P0108: Manifold Absolute Pressure / Barometric Pressure Circuit High Output voltage of MAP sensor signal circuit is higher than 4.88 V for 5 sec. (3 D/C detection logic)	

Circuit Diagram



[A]: ECM connector (View: [a])	A2: MAP sensor signal circuit	1. MAP sensor
A1: MAP sensor power supply circuit	A3: MAP sensor ground circuit	2. ECM

DTC Confirmation Procedure

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**MAP sensor power supply circuit check** 1) When ignition is "OFF", disconnect MAP sensor connector. 2) Check for proper terminal connection to MAP sensor connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "A1" and "A3" is approx. 5 V. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**MAP sensor ground circuit check** 1) Check that voltage between "A1" and ground is approx. 5 V. *Is check result OK?*	Repair "A3" circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair "A1" circuit.

Step	Action	Yes	No
4	**MAP sensor signal circuit check** 1) When ignition is OFF, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “A2” circuit: less than 1Ω • Resistance between “A2” circuit and ground: infinity • Resistance between “A2” circuit terminal and other terminal at MAP sensor connector: infinity • Voltage of “A2” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 5.	Replace defective wiring harness.
5	**MAP sensor check** 1) Check MAP sensor. ☞(Page 1C-6) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace MAP sensor.

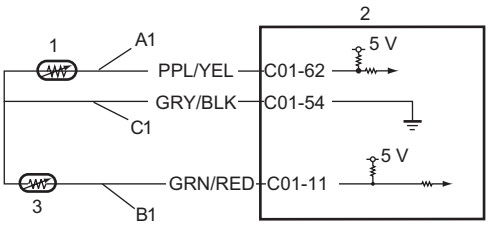
DTC P0112 / P0113

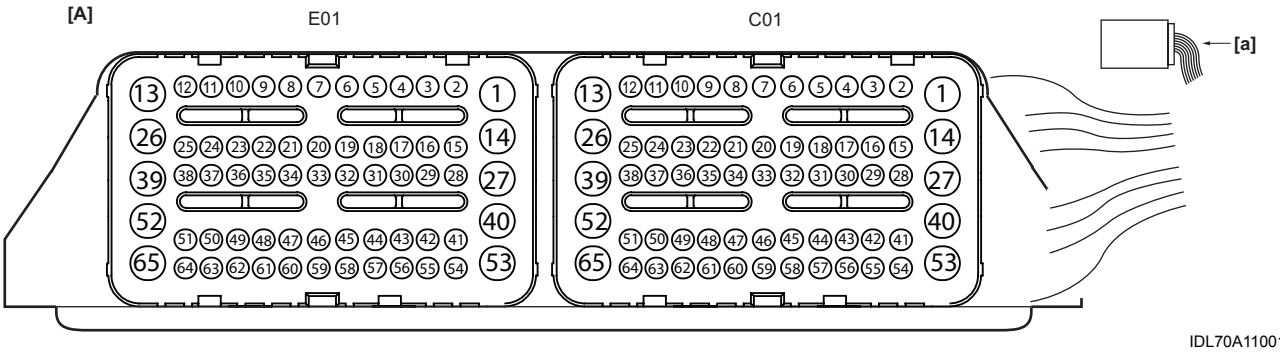
AENDL70A1104018

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0112: Intake Air Temperature Sensor 1 Circuit Low Output voltage of IAT sensor signal circuit is lower than 0.02 V for 5 sec. (3 D/C detection logic)	• IAT sensor and/or its circuit • ECM
P0113: Intake Air Temperature Sensor 1 Circuit High Output voltage of IAT sensor signal circuit is higher than 4.98 V for 5 sec. (3 D/C detection logic)	

Circuit Diagram





IDL70A110014-06

[A]: ECM connector (View: [a])	C1: IAT and ECT sensor ground circuit	2. ECM
A1: IAT sensor signal circuit	1. IAT sensor	3. ECT sensor

DTC Confirmation Procedure

1) Run engine at idle for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**IAT sensor signal circuit and ground circuit check** 1) When ignition is "OFF", disconnect "C01" and "E01" connectors of ECM and IAT sensor connector. 2) Check for proper terminal connection to "C01" and "E01" connectors and IAT sensor connector. 3) If connections are OK, check the following points. • Resistance of "A1" and "C1" circuits: less than 1Ω • Resistance between each of "A1" and "C1" circuits and ground: infinity • Resistance between "A1" circuit terminal and "C1" circuit terminal at IAT sensor connector: infinity • Voltage of "A1" and "C1" circuits: 0 to 1 V (When ignition is "ON") *Is check result OK?*	Go to Step 3.	Replace defective wire harness.
3	**IAT sensor check** 1) Check IAT sensor. ☞(Page 1C-10) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace IAT sensor.

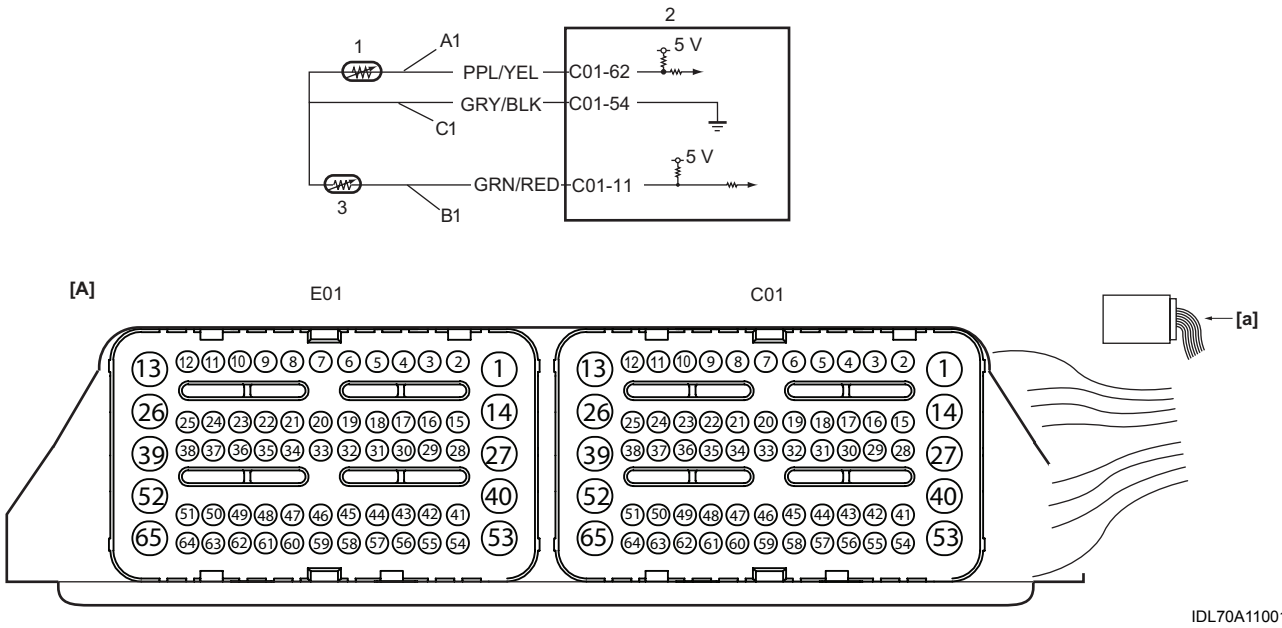
DTC P0116

AENDL70A1104019

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0116: Engine Coolant Temperature Sensor 1 Circuit Range / Performance Though a specified engine load is applied, output voltage of ECT sensor signal circuit is unchanged for 2 min. when ECT is lower than 70 °C (158 °F). (3 D/C detection logic)	• ECT sensor and/or its circuit • Thermostat • Cooling system • ECM

Circuit Diagram



[A]: ECM connector (View: [a])	C1: IAT and ECT sensor ground circuit	2. ECM
B1: ECT sensor signal circuit	1. IAT sensor	3. ECT sensor

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **DTC P0117 and P0118 are not detected.**

1) Warm up engine to normal operating temperature.
2) Drive vehicle at 60 – 80 km/h (37 – 50 mile/h) for 5 min. or more.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Coolant level check** 1) Check coolant level. ☞(Page 1F-7) *Is check result OK?*	Go to Step 3.	Add coolant and recheck DTC.
3	**ECT sensor circuit check** 1) Check ECT sensor circuits according to Step 2 under "DTC P0117 / P0118" (Page 1A-46). *Is check result OK?*	Go to Step 4.	Repair defective wire harness.
4	**ECT sensor check** 1) Check ECT sensor. ☞(Page 1C-6) *Is check result OK?*	Go to Step 5.	Replace ECT sensor.
5	**Thermostat check** 1) Check thermostat assembly. ☞(Page 1F-10) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace thermostat assembly.

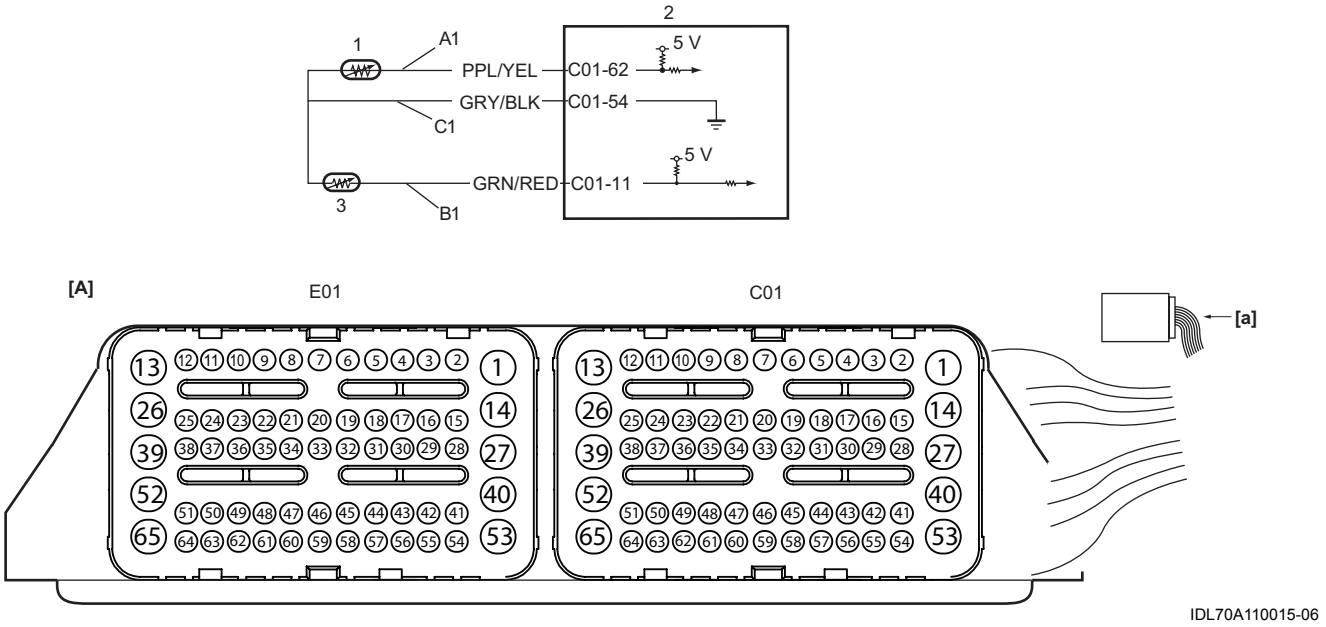
DTC P0117 / P0118

AENDL70A1104020

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0117: Engine Coolant Temperature Sensor 1 Circuit Low Output voltage of ECT sensor signal circuit is lower than 0.02 V for 5 sec. (3 D/C detection logic)	• ECT sensor and/or its circuit • ECM
P0118: Engine Coolant Temperature Sensor 1 Circuit High Output voltage of ECT sensor signal circuit is higher than 4.98 V for 5 sec. (3 D/C detection logic)	

Circuit Diagram



IDL70A110015-06

[A]: ECM connector (View: [a])	C1: IAT and ECT sensor ground circuit	2. ECM
B1: ECT sensor signal circuit	1. IAT sensor	3. ECT sensor

DTC Confirmation Procedure

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).

Step	Action	Yes	No
2	**ECT sensor signal circuit and ground circuit check** 1) When ignition is “OFF”, disconnect “C01” and “E01” connectors of ECM and ECT sensor connector. 2) Check for proper terminal connection to “C01” and “E01” connectors and ECT sensor connector. 3) If connections are OK, check the following points. • Resistance of “B1” and “C1” circuits: less than 1Ω • Resistance between each of “B1” and “C1” circuits and ground: infinity • Resistance between “B1” circuit terminal and other terminal at ECT sensor connector: infinity • Voltage of “B1” and “C1” circuits: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 3.	Repair defective wire harness.
3	**ECT sensor check** 1) Check ECT sensor. ☞(Page 1C-6) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace ECT sensor.

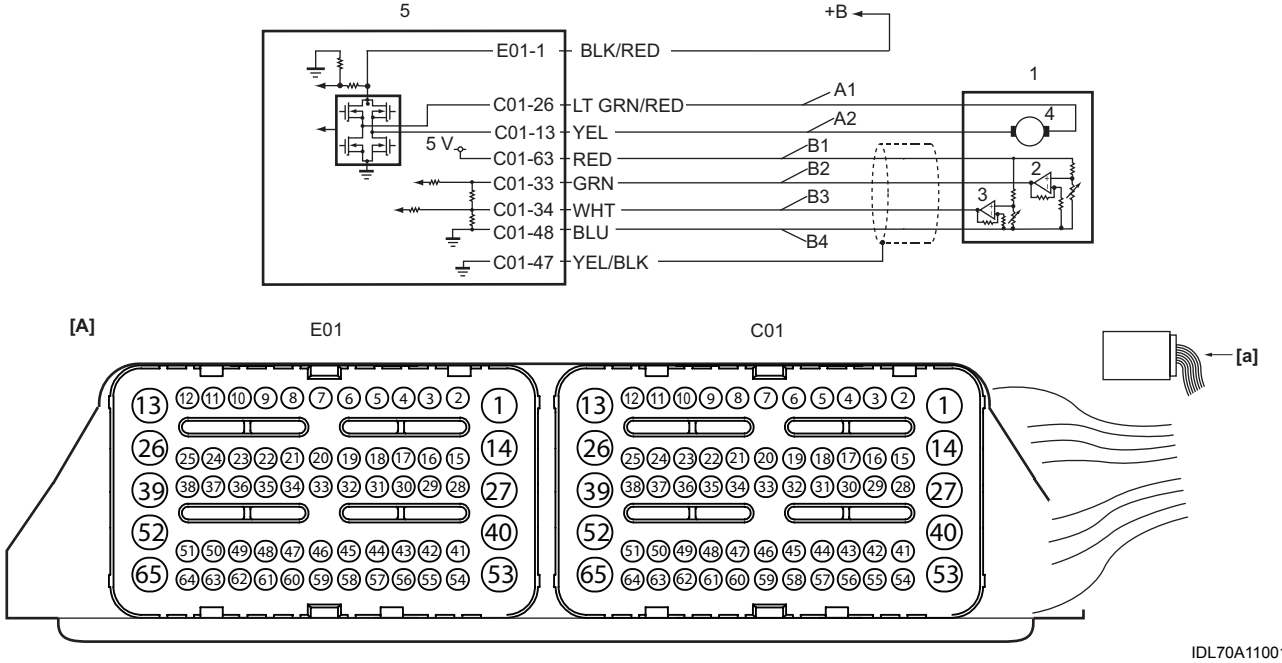
DTC P0122 / P0123

AENDL70A1104021

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0122: Throttle / Pedal Position Sensor / Switch “A” Circuit Low Output voltage of TP sensor (main) signal circuit is lower than 0.26 V. (1 D/C detection logic)	• TP sensor (main) and/or its circuit • ECM
P0123: Throttle / Pedal Position Sensor / Switch “A” Circuit High Output voltage of TP sensor (main) signal circuit is higher than 4.76 V. (1 D/C detection logic)	

Circuit Diagram



IDL70A110016-04

[A]: ECM connector (View: [a])	B2: TP sensor (main) signal circuit	2. TP sensor (main)
A1: Throttle actuator control circuit (close)	B3: TP sensor (sub) signal circuit	3. TP sensor (sub)
A2: Throttle actuator control circuit (open)	B4: TP sensor ground circuit	4. Throttle actuator
B1: TP sensor power supply circuit	1. Electric throttle body assembly	5. ECM

DTC Confirmation Procedure
P0122

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **DTC P0123, P0222, P0223 and P2135 are not detected.**

1) Run engine at idle speed for 1 min.

P0123

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **DTC P0122, P0222, P0223 and P2135 are not detected.**

1) Run engine at idle for 10 sec.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**TP sensor power supply circuit check** 1) When ignition is "OFF", disconnect TP sensor connector. 2) Check for proper terminal connection to TP sensor connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "B1" and "B4" is approx. 5 V. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**TP sensor ground circuit check** 1) Check that voltage between "B1" and ground is approx. 5 V. *Is check result OK?*	Repair "B4" circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair "B1" circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)
4	**TP sensor (main) signal circuit check** 1) When ignition is "OFF", disconnect "C01" and "E01" connectors from ECM. 2) Check for proper terminal connection to "C01" and "E01" connectors. 3) If connections are OK, check the following points. • Resistance of "B2" circuit: less than 1 Ω • Resistance between "B2" circuit and ground: infinity • Resistance between "B2" circuit terminal and other terminal at TP sensor connector: infinity • Voltage of "B2" circuit: 0 to 1 V (When ignition is "ON") *Is check result OK?*	Go to Step 5.	Repair or replace TP sensor (main) signal circuit.

Step	Action	Yes	No
5	**TP sensor check** 1) Check TP sensor referring to “Throttle Position Sensor Performance Check” under “Electric Throttle Body Assembly On-Vehicle Inspection” in Section 1C (Page 1C-2). *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace electric throttle body assembly. ☞(Page 1D-6)

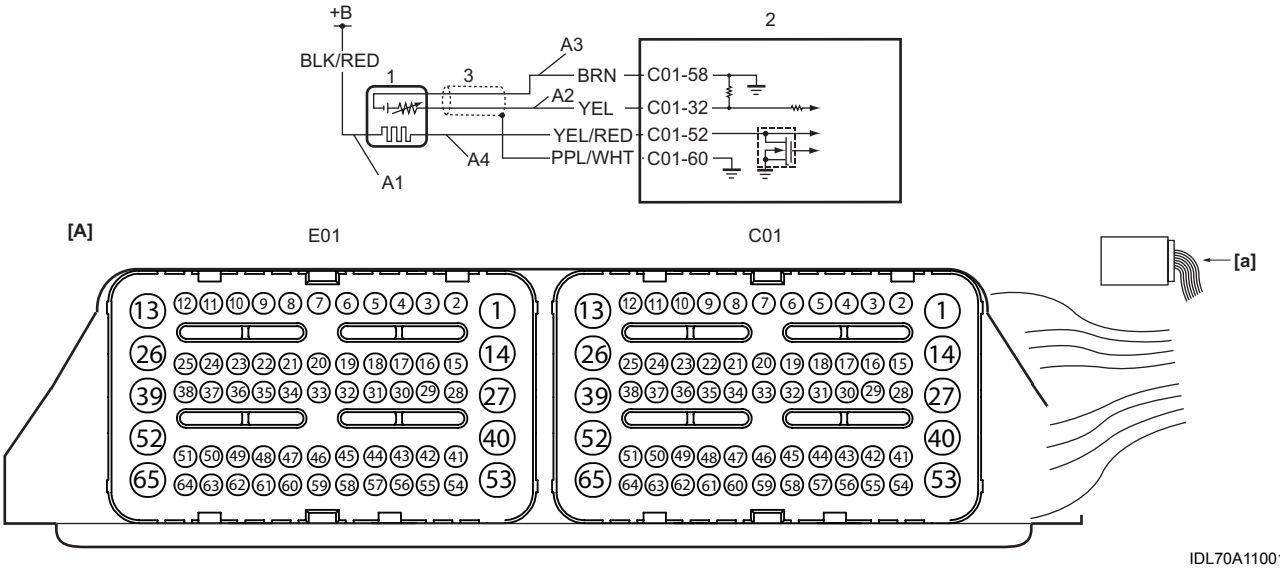
DTC P0130 / P0133

AENDL70A1104022

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0130: O2 Sensor Circuit (Sensor 1) This DTC is detected if any one of the following conditions is met. • Circuit voltage of HO2S-1 is lower than 0.35 V for more than specified time continuously with engine running. • Circuit voltage of HO2S-1 is higher than 4.91 V for more than specified time continuously with engine running. (3 D/C detection logic)	• HO2S-1 and/or its circuit • HO2S-1 heater and/or its circuit • Air intake system • Exhaust system • Fuel system • ECM
P0133: O2 Sensor Circuit Slow Response (Sensor 1) This DTC is detected if any one of the following conditions is met while vehicle is driving at constant speed and low engine load after warming up. • Response time of HO2S-1 output signal shifted from rich to lean is longer than specified time. • Response time of HO2S-1 output signal shifted from lean to rich is longer than specified time. • Average response time of HO2S-1 output signal is longer than specified time. (3 D/C detection logic)	

Circuit Diagram



IDL70A110012-03

[A]: ECM connector (View: [a])	A3: HO2S-1 ground circuit	2. ECM
A1: HO2S-1 heater power supply circuit	A4: HO2S-1 heater drive circuit	3. Shield wire
A2: HO2S-1 signal circuit	1. HO2S-1	

DTC Confirmation Procedure
P0130

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following conditions are met in this "DTC Confirmation Procedure".**
  - **Battery voltage > 10.6 V**
  - **DTC P0138 is not detected.**

1) Start engine and warm up to normal operating temperature.
2) Run engine at idle speed for 5 min.

P0133

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following conditions are met in this "DTC Confirmation Procedure".**
  - **DTC P0031, P0032, P0130, P0171, P0172, P0300, P0420 and P0443 are not detected.**

1) Start engine and warm up to normal operating temperature.
2) Drive vehicle at 60 – 80 km/h (37 – 50 mile/h) for 5 min. or more. (Keep throttle valve opening constant in this step.)
3) Check whether O2 sensor readiness / monitoring test has completed or not by using scan tool. If O2 sensor readiness / mounting test has not completed, check vehicle conditions (environmental) and repeat Step 2.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**DTC check** *Is there any DTC(s) other than P0130 and P0133?*	Go to troubleshooting for applicable DTC.	Go to Step 3.
3	**Exhaust system and air intake system check** 1) Check exhaust system and air intake system for clogging or leakage. *Is check result OK?*	Go to Step 4.	Repair or replace defective part.
4	**Fuel system inspection** 1) Check the following points related to fuel system. • Fuel pressure: ☞(Page 1G-8) • Fuel injector circuit: ☞(Page 1G-5) • Fuel injector: ☞(Page 1G-16) *Is check result OK?*	Go to Step 5.	Repair or replace defective part.

Step	Action	Yes	No
5	**HO2S-1 signal circuit check** 1) When ignition is “OFF”, disconnect “C01” and “E01” connectors of ECM and HO2S-1 connector. 2) Check for proper terminal connection to “C01” and “E01” connectors and HO2S-1 connector. 3) If connections are OK, check the following points. • Resistance of “A2” circuit: less than 1 Ω • Resistance between “A2” circuit and ground: infinity • Resistance between “A2” circuit terminal and other terminal at HO2S-1 connector: infinity • Voltage of “A2” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 6.	Repair or replace defective wiring harness.
6	**HO2S-1 ground circuit check** 1) When ignition if “OFF”, check the following points. • Resistance of “A3” circuit: less than 1 Ω • Resistance between “A3” circuit and ground: infinity • Resistance between “A3” circuit terminal and other terminal at HO2S-1 connector: infinity • Voltage of “A3” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 7.	Repair or replace defective wiring harness.
7	**HO2S-1 heater check** 1) Check HO2S-1 heater. ☞(Page 1C-7) *Is check result OK?*	Go to Step 7.	Replace HO2S-1.
8	**DTC recheck** 1) Replace HO2S-1. ☞(Page 1C-7) 2) Perform DTC confirmation procedure and check DTC. *Is DTC P0130 and P0133 still detected?*	Replace ECM and recheck DTC.	End.

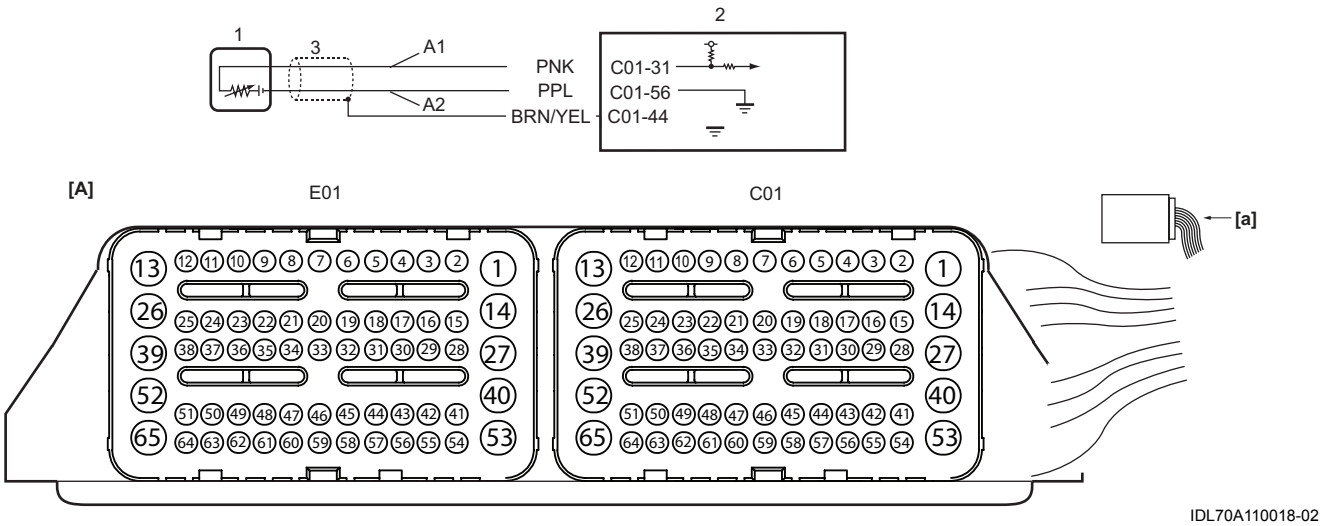
DTC P0138

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0138: O2 Sensor Circuit High Voltage (Sensor 2) Output voltage of O2S-2 signal circuit is higher than 4.58 V for 25 sec. (3 D/C detection logic)	• O2S-2 and/or its circuit • Exhaust system • Air intake system • Fuel system • ECM

Circuit Diagram



[A]: ECM connector (View: [a])	1. O2S-2
A1: O2S-2 signal circuit	2. ECM
A2: O2S-2 ground circuit	3. Shield wire

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **Battery voltage > 10.6 V**

1) Start engine and warm it up to normal operating temperature.
2) Drive vehicle at 60 – 80 km/h (37 – 50 mile/h) for 5 min. or more. (Keep throttle valve opening constant in this step.)

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**DTC check** *Is there any DTC(s) other than P0138?*	Go to troubleshooting for applicable DTC.	Go to Step 3.

Step	Action	Yes	No
3	**O2S-2 signal circuit and ground circuit check** 1) When ignition is “OFF”, disconnect “C01” and “E01” connectors of ECM and O2S-2 connector. 2) Check for proper terminal connection to “C01” and “E01” connectors and O2S-2 connector. 3) If connections are OK, check the following points. • Resistance of “A1” and “A2” circuits: less than 1 Ω • Resistance between each of “A1” and “A2” circuits and ground: infinity • Resistance between “A1” circuit terminal and other terminal at O2S-2 connector: infinity • Resistance between “A2” circuit terminal and other terminal at O2S-2 connector: infinity • Voltage of “A1”/”A2” circuits: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 4.	Replace defective wiring harness.
4	**Exhaust system and air intake system check** 1) Check exhaust system and air intake system for clog or leak. *Is check result OK?*	Go to Step 5.	Repair or replace defective part.
5	**Fuel injector and its circuit check** 1) Check fuel injector circuit. ☞(Page 1G-5) 2) Check fuel injector. ☞(Page 1G-16) *Is check result OK?*	Go to Step 6.	Faulty injector(s) or its circuit.
6	**DTC recheck** 1) Replace O2S-2. ☞(Page 1C-7) 2) Perform DTC confirmation procedure to check for DTCs. *Is DTC P0138 still detected?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	End.

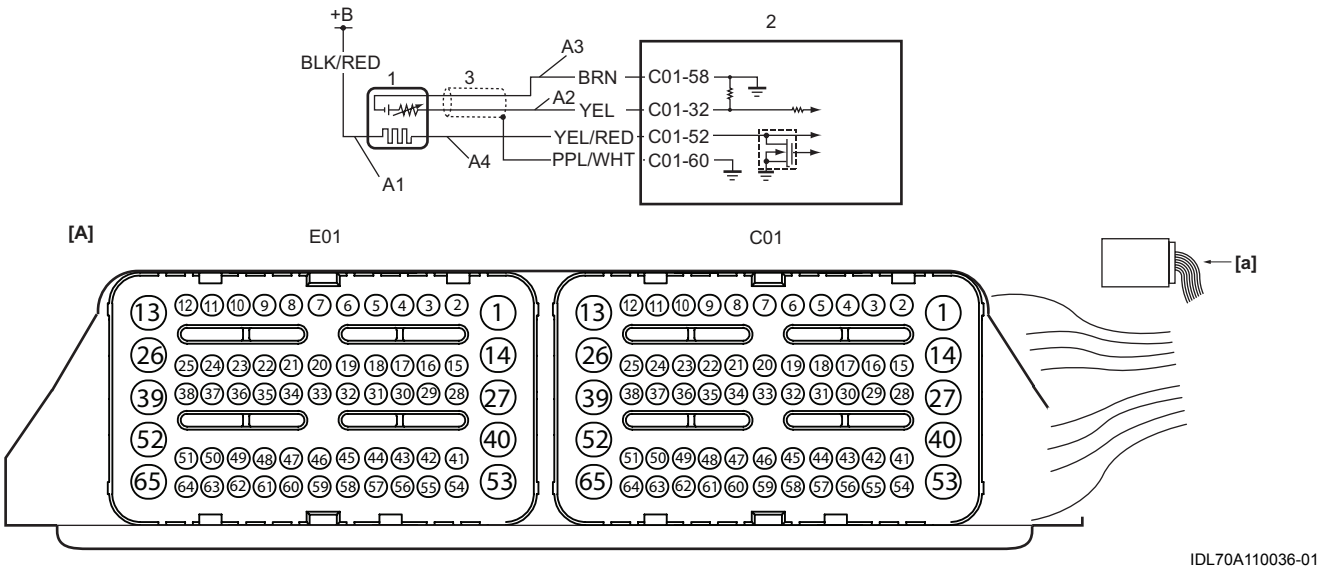
DTC P0171 / P0172

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0171: System Too Lean Total fuel trim (short term fuel trim + long term fuel trim) is higher than specified value for 30 sec. when fuel system is closed-loop. 3 to 9 times. (3 D/C detection logic)	• Fuel system • Air intake system • Exhaust system • HO2S-1 and/or its circuit • Emission control system • ECM
P0172: System Too Rich Total fuel trim (short term fuel trim + long term fuel trim) is lower than specified value for 30 sec. when fuel system is closed-loop. 3 to 9 times. (3 D/C detection logic)	

Circuit Diagram



[A]: ECM connector (View: [a])	A3: HO2S-1 ground circuit	2. ECM
A1: HO2S-1 heater power supply circuit	A4: HO2S-1 heater drive circuit	3. Shield wire
A2: HO2S-1 signal circuit	1. HO2S-1	

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following conditions are met in this "DTC Confirmation Procedure".**
  - **A/F feedback (closed-loop) control is activated.**
  - **DTC P0116, P0118, P0122, P0123, P0222, P0223, P0300, P0301, P0302, P0303, P0443 and P2135 are not detected.**

1) Start engine and warm it up to normal operating temperature.
2) Drive vehicle at 60 – 80 km/h (37 – 50 mile/h) for 5 min. or more. (Keep throttle valve opening constant in this step.)

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**DTC check** *Is there any DTC(s) other than P0171 and P0172?*	Go to troubleshooting for applicable DTC.	Go to Step 3.

Step	Action	Yes	No
3	**Fuel system and emission system check** 1) Check the following points related to fuel and emission control systems. • Fuel pressure: ☞(Page 1G-9) • Fuel injector circuit: ☞(Page 1G-5) • Fuel injector: ☞(Page 1G-16) • MAP sensor: ☞(Page 1C-6) • EVAP canister purge valve: ☞(Page 1B-3) • PCV valve: ☞(Page 1B-5) *Is check result OK?*	Go to Step 4.	Repair or replace defective parts.
4	**Exhaust system and air intake system check** 1) Check exhaust system and air intake system for clogging or leakage. *Is check result OK?*	Go to Step 5.	Repair or replace defective part.
5	**HO2S-1 signal circuit check** 1) Check HO2S-1 signal circuits according to Step 5 under "DTC P0130 / P0133" (Page 1A-49). *Is check result OK?*	Go to Step 6.	Repair defective wire harness.
6	**DTC recheck** 1) Replace HO2S-1. ☞(Page 1C-7) 2) Perform DTC confirmation procedure and check DTC. *Is DTC P0171 or P0172 still detected?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	End.

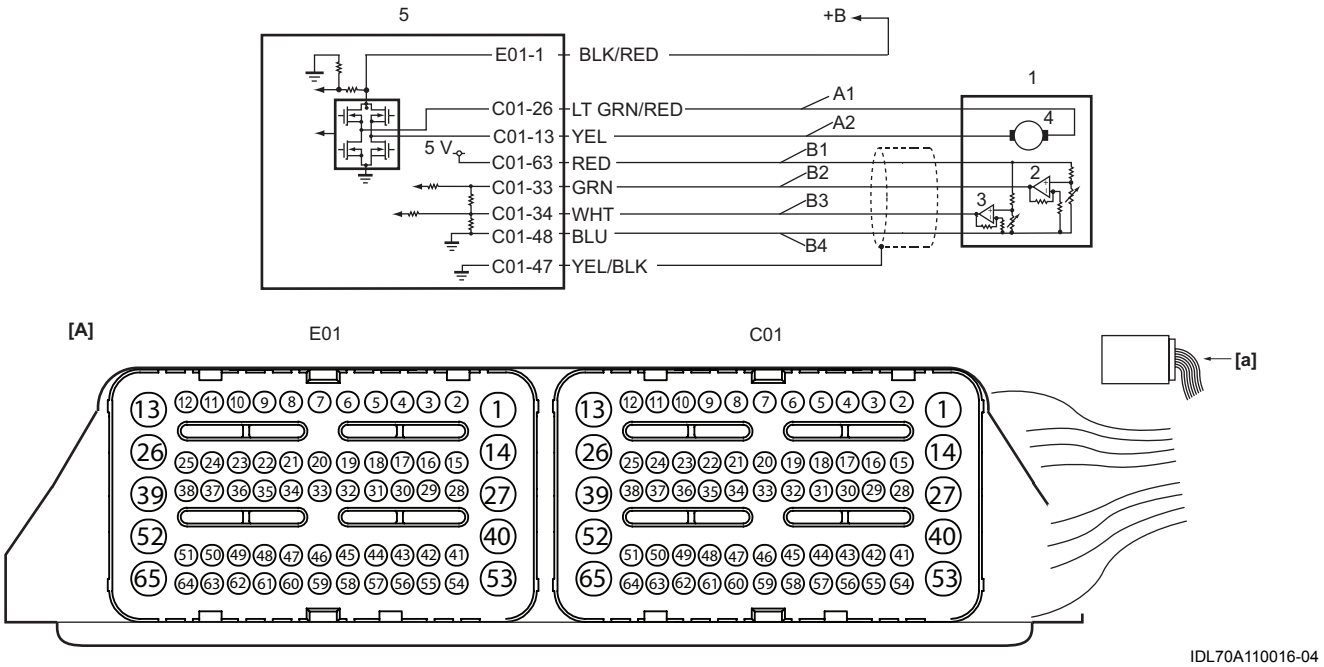
DTC P0222 / P0223

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0222: Throttle / Pedal Position Sensor / Switch "B" Circuit Low Output voltage of TP sensor (sub) signal circuit is lower than 0.24 V. (1 D/C detection logic)	• TP sensor (sub) and/or its circuit • ECM
P0223: Throttle / Pedal Position Sensor / Switch "B" Circuit High Output voltage of TP sensor (sub) signal circuit is higher than 4.74 V. (1 D/C detection logic)	

Circuit Diagram



IDL70A110016-04

[A]: ECM connector (View: [a])	B2: TP sensor (main) signal circuit	2. TP sensor (main)
A1: Throttle actuator control circuit (close)	B3: TP sensor (sub) signal circuit	3. TP sensor (sub)
A2: Throttle actuator control circuit (open)	B4: TP sensor ground circuit	4. Throttle actuator
B1: TP sensor power supply circuit	1. Electric throttle body assembly	5. ECM

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **P0222:**
    DTC P0122, P0123, P0223 and P2135 are not detected.
  - **P0223:**
    DTC P0122, P0123, P0222 and P2135 are not detected.

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**TP sensor power supply circuit check** 1) When ignition is "OFF", disconnect TP sensor connector. 2) Check for proper terminal connection to TP sensor connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "B1" and "B4" is approx. 5 V. *Is check result OK?*	Go to Step 4.	Go to Step 3.

Step	Action	Yes	No
3	**TP sensor ground circuit check** 1) Check that voltage between “B1” and ground is approx. 5 V. *Is check result OK?*	Repair “B4” circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair “B1” circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)
4	**TP sensor (sub) signal circuit check** 1) When ignition is “OFF”, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “B3” circuit: less than 1 Ω • Resistance between “B3” circuit and ground: infinity • Resistance between “B3” circuit terminal and other terminal at TP sensor connector: infinity • Voltage of “B3” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 5.	Repair “B3” circuit.
5	**TP sensor check** 1) Check TP sensor for performance. ☞(Page 1C-2) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace electric throttle body assembly.

DTC P0300 / P0301 / P0302 / P0303

AENDL70A1104028

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0300: Random / Multiple Cylinder Misfire Detected This DTC is detected if any one of the following conditions is met. • Misfire rates at 2 or more cylinders exceed specified misfire rate which causes catalyst to damage. (MIL flashes as long as this misfire occurs continuously.) • Misfire rates at 2 or more cylinders exceed specified misfire rate which affects exhaust emission adversely. (3 D/C detection logic)	• Exhaust system • Air intake system • Ignition system • Fuel system • Engine compression • Valve clearance • Valve timing • ECM
P0301: Cylinder 1 Misfire Detected **P0302: Cylinder 2 Misfire Detected** **P0303: Cylinder 3 Misfire Detected** This DTC is detected if any one of the following conditions is met. • Misfire rate at specified cylinder exceeds specified misfire rate which causes catalyst to damage. (MIL flashes as long as this misfire occurs continuously.) • Misfire rate at specified cylinder exceeds specified misfire rate which affects exhaust emission adversely. (3 D/C detection logic)	• Ignition system • Engine compression • Valve clearance • Fuel injector and/or its circuit • ECM

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following conditions are met in this "DTC Confirmation Procedure".**
  - **DTC P0122, P0123, P0222, P0223, P0335, P0336 and P2135 are not detected.**

1) Warm up engine to normal operating temperature.
2) Drive vehicle at 60 – 80 km/h (37 – 50 mile/h) for 5 min. or more. (Keep throttle valve opening constant in this step.)

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Fuel level check** 1) Check fuel level by fuel level meter. *Does it indicate "E" level (empty)?*	Add fuel and recheck DTC.	Go to Step 3.
3	**Fuel quality check** 1) Is correct type fuel used? *Is check result OK?*	Go to Step 4.	Replace fuel with correct type fuel and recheck DTC.
4	**Air intake system and exhaust system inspection** 1) Check exhaust system and air intake system for clogging or leakage. *Is check result OK?*	Go to Step 5.	Repair or replace defective parts.
5	**Ignition system check** 1) Check ignition system. ☞(Page 1H-3) *Is check result OK?*	Go to Step 6.	Repair or replace defective parts.
6	**Fuel system inspection** 1) Check the following points related to fuel system. • Fuel pressure: ☞(Page 1G-9) • Fuel injector circuit: ☞(Page 1G-5) • Fuel injector: ☞(Page 1G-16) *Is check result OK?*	Go to Step 7.	Repair or replace defective parts.

Step	Action	Yes	No
7	**Engine mechanical system check** 1) Check the following points which can be cause of rough idling or poor performance. • Engine compression: ☞(Page 1D-1) • Valve clearance: ☞(Page 1D-2) • Valve timing: ☞(Page 1D-25) *Is check result OK?*	Check ECM power supply and ground circuit. ☞(Page 1A-97) If circuit is OK, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair or replace defective parts.

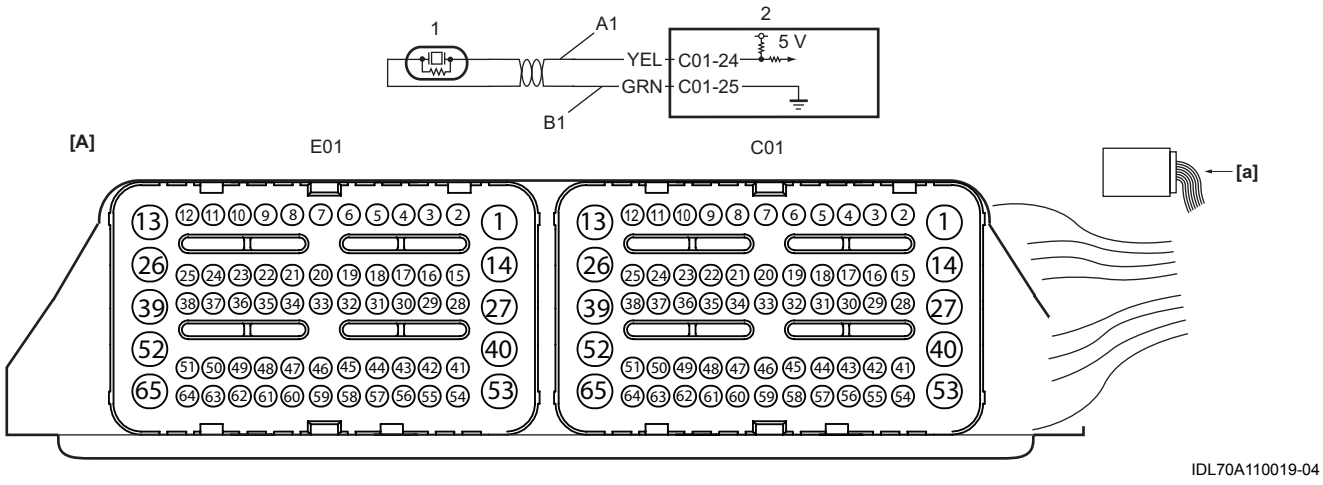
DTC P0327

AENDL70A1104029

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0327: Knock Sensor 1 Circuit Low Knock sensor signal is out of specified range for 5 sec. with engine running. (3 D/C detection logic)	• Knock sensor and/or its circuit • ECM

Circuit Diagram



IDL70A110019-04

[A]: ECM connector (View: [a])	1. Knock sensor
A1: Knock sensor signal circuit 1	2. ECM
B1: Knock sensor ground circuit	

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **DTC P0335 and P0336 are not detected.**

1) Warm up engine to normal operating temperature.
2) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Knock sensor signal circuit check** 1) When ignition is "OFF", disconnect "C01" and "E01" connectors of ECM and knock sensor connector. 2) Check for proper terminal connection to "C01" and "E01" connectors and knock sensor connector. 3) If connections are OK, check the following points. • Resistance of "A1" and "B1" circuits: less than 1 Ω • Resistance between each of "A1" and "B1" circuits and ground: infinity • Resistance between "A1" circuit terminal and other terminal at knock sensor connector: infinity • Voltage of "A1" and "B1" circuits: 0 to 1 V (When ignition is "ON") *Is check result OK?*	Go to Step 3.	Repair defective wire harness.
3	**Knock sensor check** 1) Check knock sensor. ☞(Page 1C-9) *Is check result OK?*	Go to Step 4.	Replace knock sensor.
4	**Troubleshooting of other DTC(s) at the same time** *Is other DTC(s) detected together?*	Go to troubleshooting for applicable DTC.	Replace ECM and recheck DTC. ☞(Page 1C-1)

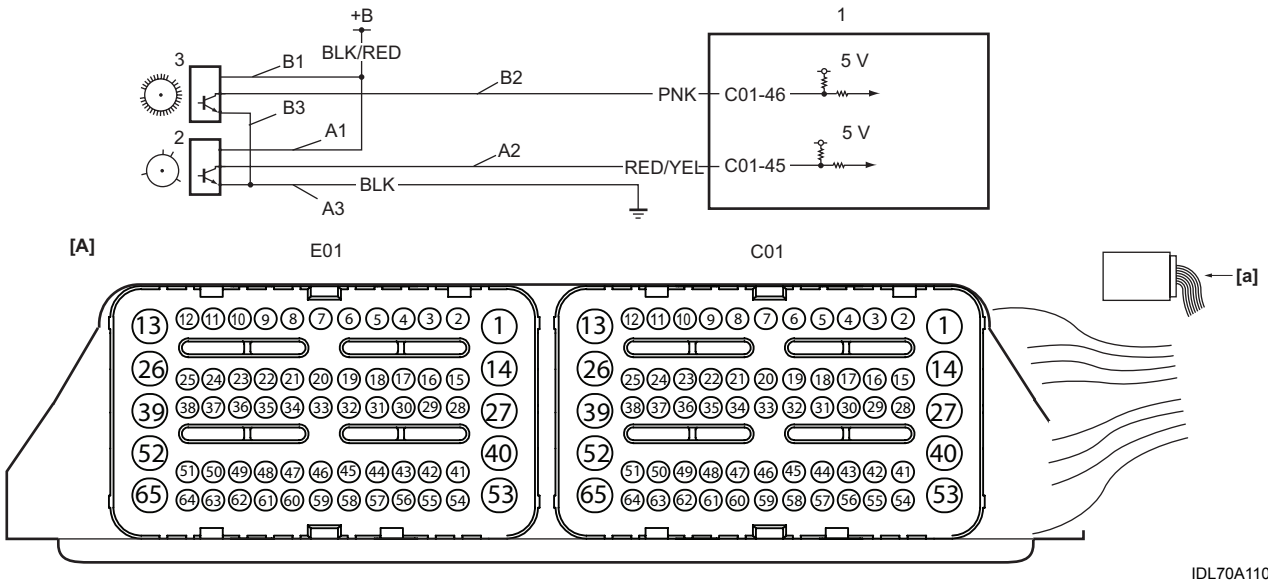
DTC P0335 / P0336

AENDL70A1104030

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0335: Crankshaft Position Sensor "A" Circuit Even if CMP sensor signal is input, CKP sensor signal is not input for more than 3 sec. (1 D/C detection logic)	• CKP sensor and/or its circuit • Sensor plate • ECM
P0336: Crankshaft Position Sensor "A" Circuit Range / Performance Output signal pulse of CKP sensor is out of specified pattern more than specified times. (1 D/C detection logic)	

Circuit Diagram



[A]: ECM connector (View: [a])	B1: CKP sensor power supply circuit	2. CMP sensor
A1: CMP sensor power supply circuit	B2: CKP sensor signal circuit	3. CKP sensor
A2: CMP sensor signal circuit	B3: CKP sensor ground circuit	
A3: CMP sensor ground circuit	1. ECM	

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **P0336:**
    DTC P0335 is not detected.

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**CKP sensor power supply circuit check** 1) When ignition is "OFF", disconnect CKP sensor connector. 2) Check for proper terminal connection to CKP sensor connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "B1" and "B3" is battery voltage. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**CKP sensor ground circuit check** 1) Check that voltage between "B1" and ground is battery voltage. *Is check result OK?*	Repair "B3" circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair "B1" circuit.

Step	Action	Yes	No
4	**CKP sensor signal circuit check** 1) When ignition is OFF, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “B2” circuit: less than 1 Ω • Resistance between “B2” circuit and ground: infinity • Resistance between “B2” circuit terminal and other terminal at CKP sensor connector: infinity • Voltage of “B2” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 5.	Replace defective wire harness.
5	**CKP sensor and sensor plate check** 1) Check CKP sensor and sensor plate. • CKP sensor ☞(Page 1C-9) • Sensor plate ☞(Page 1D-54) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Repair or replace defective parts.

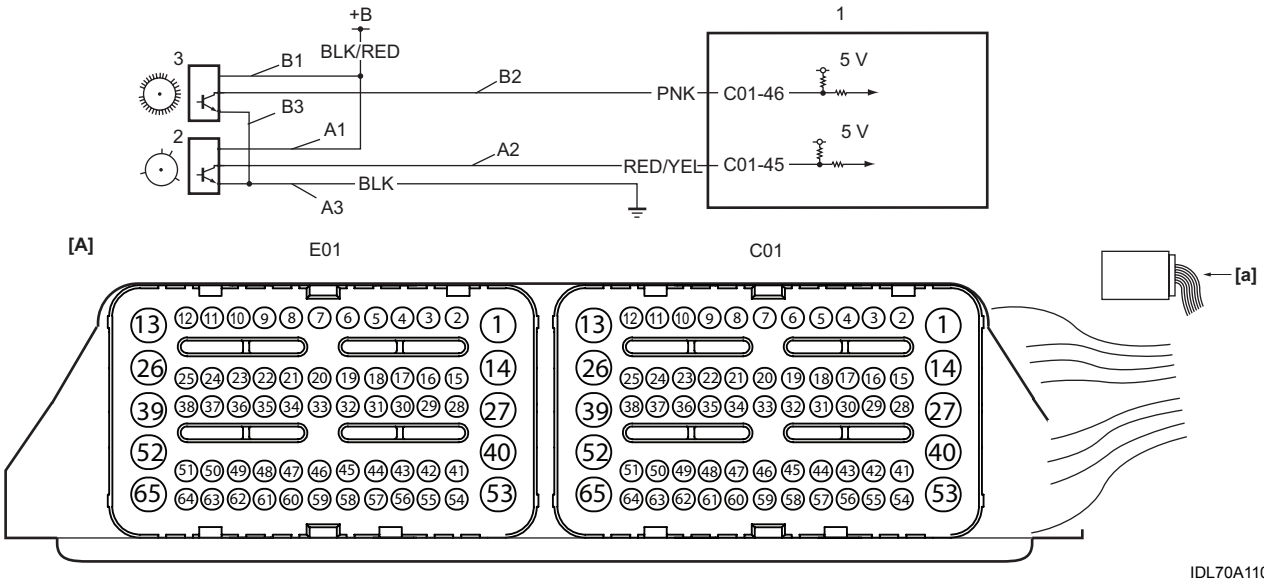
DTC P0340 / P0341

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0340: Camshaft Position Sensor “A” Circuit Even if CKP sensor signal is input, CMP sensor signal is not input for more than 3 sec. (3 D/C detection logic)	• CMP sensor and/or its circuit • Signal rotor • ECM
P0341: Camshaft Position Sensor “A” Circuit Range / Performance Output signal pulse of CMP sensor is out of specified pattern more than specified times. (3 D/C detection logic)	

Circuit Diagram



IDL70A110020-06

[A]: ECM connector (View: [a])	C1: CKP sensor power supply circuit	2. CMP sensor
A1: CMP sensor power supply circuit	C2: CKP sensor signal circuit	3. CKP sensor
A2: CMP sensor signal circuit	C3: CKP sensor ground circuit	
A3: CMP sensor ground circuit	1. ECM	

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **DTC P0107, P0108, P0112, P0113, P0116, P0117, P0118, P0122, P0123, P0171, P0172, P0222, P0223, P0300, P0335, P0336, P0607, P2101, P2119, P2122, P2123, P2127, P2128, P2135 and P2138 are not detected.**

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**CMP sensor power supply circuit check** 1) When ignition is "OFF", disconnect CMP sensor connector. 2) Check for proper terminal connection to CMP sensor connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "A1" and "A3" is battery voltage. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**CMP sensor ground circuit check** 1) Check that voltage between "A1" and ground is battery voltage. *Is check result OK?*	Repair "A3" circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair "A1" circuit or replace defective wiring harness.
4	**CMP sensor signal circuit check** 1) When ignition is "OFF", disconnect "C01" and "E01" connectors from ECM. 2) Check for proper terminal connection to "C01" and "E01" connectors. 3) If connections are OK, check the following points. • Resistance of "A2" circuit: less than 1 Ω • Resistance between "A2" circuit and ground: infinity • Resistance between "A2" circuit terminal and other terminal at CMP sensor connector: infinity • Voltage of "A2" circuit: 0 to 1 V (When ignition is "ON") *Is check result OK?*	Go to Step 5.	Replace defective wire harness.
5	**CMP sensor and signal rotor check** 1) Check the following: • CMP sensor ☞(Page 1C-8) • Signal rotor ☞(Page 1D-14) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Repair or replace defective parts.

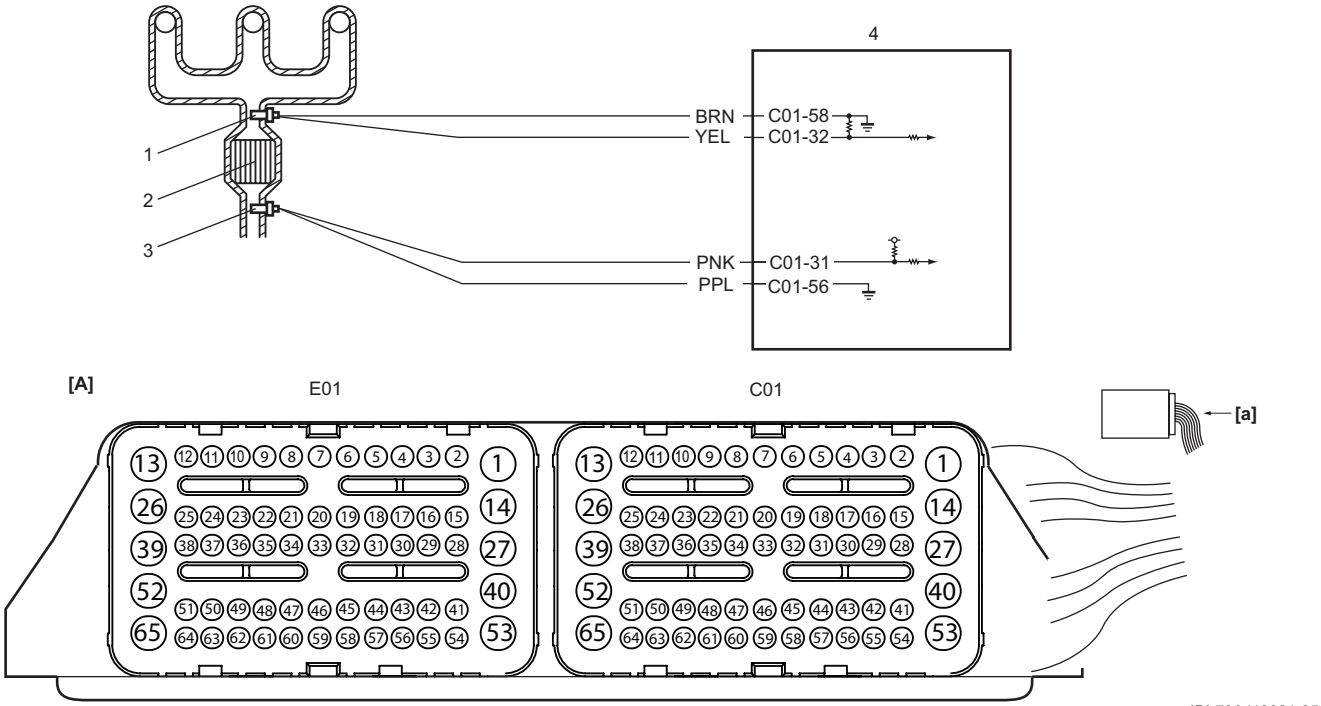
DTC P0420

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0420: Catalyst System Efficiency Below Threshold Shifting cycle delay between rich and lean of HO2S-2 signal compared with shifting cycle between rich and lean of fuel system feedback is less than specified time while vehicle is running with constant speed and low engine load after warming up. (3 D/C detection logic)	• Exhaust system • HO2S-1 and/or its circuit • O2S-2 and/or its circuit • TWC • ECM

Circuit Diagram



IDL70A110021-05

[A]: ECM connector (View: [a])	2. TWC	4. ECM
1. HO2S-1	3. O2S-2	

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following DTCs are not detected in this "DTC Confirmation Procedure".**
  - **TP sensor (P0122 / P0123 / P0222 / P0223 / P2135)**
  - **Fuel trim system (P0171 / P0172)**
  - **O2S-2 (P0138)**
  - **HO2S-1 (P0031 / P0032 / P0130 / P0133)**
  - **MAP sensor (P0107 / P0108)**
  - **Cylinder misfire detected (P0300 / P0301 / P0302 / P0303)**
  - **EVAP canister purge valve (P0443)**
  - **ECT sensor (P0116 / P0117 / P0118)**
  - **Wheel speed sensor (P0500)**

1) Warm up engine to normal operating temperature.
2) Drive vehicle at 80 – 100 km/h (37 – 50 mile/h) for 5 min. or more. (Keep throttle valve opening constant in this step.)
3) Check whether catalyst readiness / monitoring test has completed or not using scan tool. If catalyst readiness / monitoring test has not completed, check vehicle conditions (environment) and repeat Step 2.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**DTC check** 1) Check DTC. *Is there DTC(s) detected other than P0420?*	Go to troubleshooting for applicable DTC.	Go to Step 3.
3	**Exhaust system inspection** 1) Check exhaust system for leakage, damage and looseness. *Is check result OK?*	Go to Step 4.	Repair or replace defective parts.
4	**O2S-2 circuit check** 1) Check O2S-2 signal and ground circuits according to Step 3 under "DTC P0138" (Page 1A-51). *Is check result OK?*	Go to Step 5.	Replace defective wire harness.
5	**HO2S-1 signal circuit check** 1) Check HO2S-1 signal and ground circuit according to Step 5 and 6 under "DTC P0130 / P0133" (Page 1A-49). *Is check result OK?*	Go to Step 6.	Replace defective wire harness.
6	**DTC recheck** 1) Replace exhaust manifold (built in TWC). ☞(Page 1K-3) 2) Perform DTC confirmation procedure. *Is DTC P0420 still detected?*	Go to Step 7.	End.
7	**DTC recheck** 1) Replace O2S-2. ☞(Page 1C-7) 2) Check DTC. *Is DTC P0420 still detected?*	Go to Step 8.	End.

Step	Action	Yes	No
8	**DTC recheck** 1) Replace HO2S-1. ☞(Page 1C-7) 2) Check DTC. *Is DTC P0420 still detected?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	End.

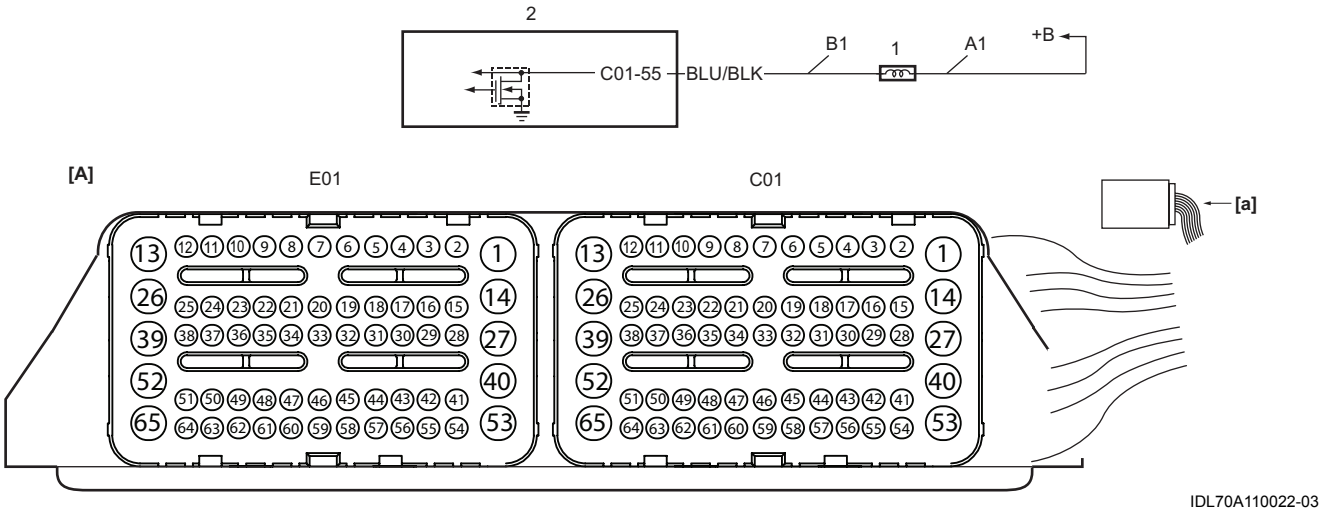
DTC P0443

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0443: Evaporative Emission System Purge Control Valve Circuit Duty pulse measured signal of EVAP canister purge valve control circuit is different from control command duty for 5 sec. (Circuit open or short) (3 D/C detection logic)	• EVAP canister purge valve and/or its circuit • ECM

Circuit Diagram



IDL70A110022-03

[A]: ECM connector (View: [a])	B1: EVAP canister purge valve drive circuit	2. ECM
A1: EVAP canister purge valve power supply circuit	1. EVAP canister purge valve	

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **Battery voltage > 10.7 V**

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).

Step	Action	Yes	No
2	**EVAP canister purge valve power supply circuit check** 1) When ignition is “OFF”, disconnect EVAP canister purge valve connector. 2) Check for proper terminal connection to EVAP canister purge valve connector. 3) If connections are OK, set ignition “ON”. 4) Check that voltage between “A1” and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Repair defective wire harness.
3	**EVAP canister purge valve drive circuit check** 1) When ignition is “OFF”, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors and EVAP canister purge valve connector. 3) If connections are OK, check the following points. • Resistance of “B1” circuit: less than 1 Ω • Resistance between “B1” circuit and ground: infinity • Resistance between “B1” circuit terminal and other terminal at EVAP canister purge valve connector: infinity • Voltage of “B1” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 4.	Repair defective wire harness.
4	**EVAP canister purge valve check** 1) Check EVAP canister purge valve for resistance. ☞(Page 1B-3) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace EVAP canister purge valve.

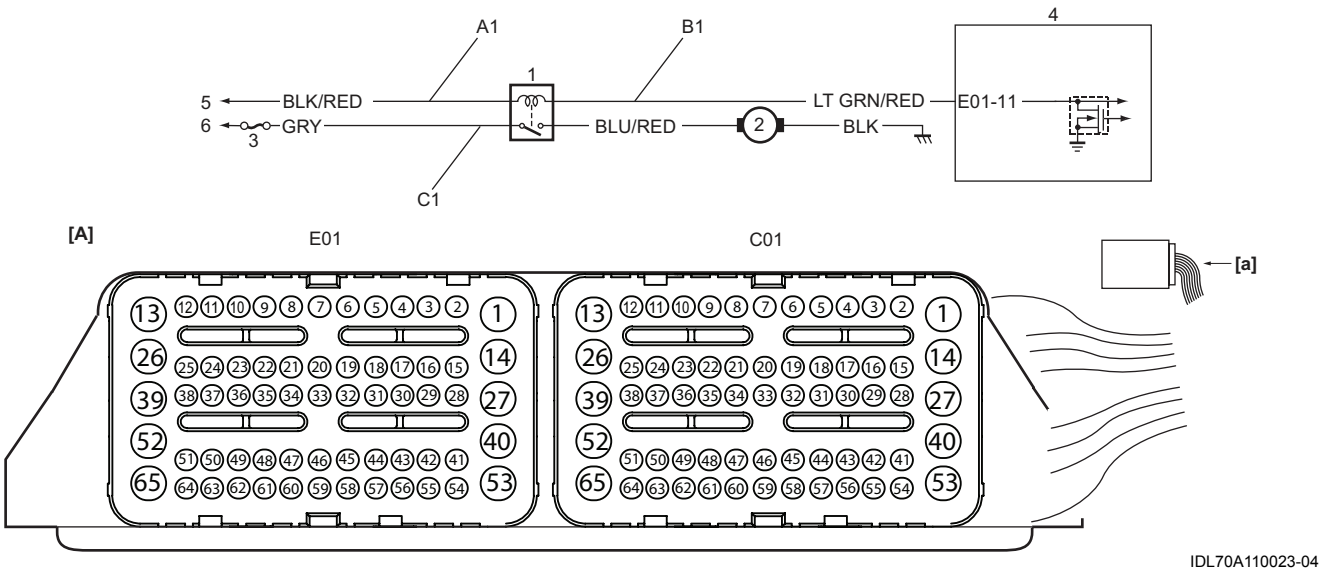
DTC P0480

AENDL70A1104035

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0480: Fan 1 Control Circuit Measured voltage of radiator cooling fan relay output is different from its command signal for 5 sec. (3 D/C detection logic but MIL does not light up)	• Radiator cooling fan relay and/or its circuit • ECM

Circuit Diagram



[A]: ECM connector (View: [a])	1. Radiator cooling fan relay	5. To main relay
A1: Radiator cooling fan relay power supply circuit (coil side)	2. Radiator cooling fan motor	6. To main fuse box
B1: Radiator cooling fan relay drive circuit	3. "RDTR" fuse	
C1: Radiator cooling fan relay power supply circuit (switch side)	4. ECM	

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following conditions are met in this "DTC Confirmation Procedure".**
  - **Battery voltage > 10.7 V**
  - **Battery voltage is lower than 18 V when vehicle speed is more than 20 km/h (12 mile/h)**

1) Start engine and warm it up engine until engine coolant temperature reaches 97 °C (207 °F) or more.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Radiator cooling fan relay power supply circuit (coil side) check** 1) When ignition is "OFF", remove radiator cooling fan relay. 2) Check for proper terminal connection to radiator cooling fan relay connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "A1" and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Replace defective wire harness.
3	**Radiator cooling fan relay check** 1) Check radiator cooling fan relay. ☞(Page 1F-11) *Is check result OK?*	Go to Step 4.	Replace radiator cooling fan relay.

Step	Action	Yes	No
4	**Radiator cooling fan relay drive circuit check** 1) When ignition is “OFF”, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “B1” circuit: less than 1 Ω • Resistance between “B1” circuit and ground: infinity • Resistance between “B1” circuit terminal and other terminal at radiator cooling fan relay connector: infinity • Voltage of “B1” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace defective wire harness.

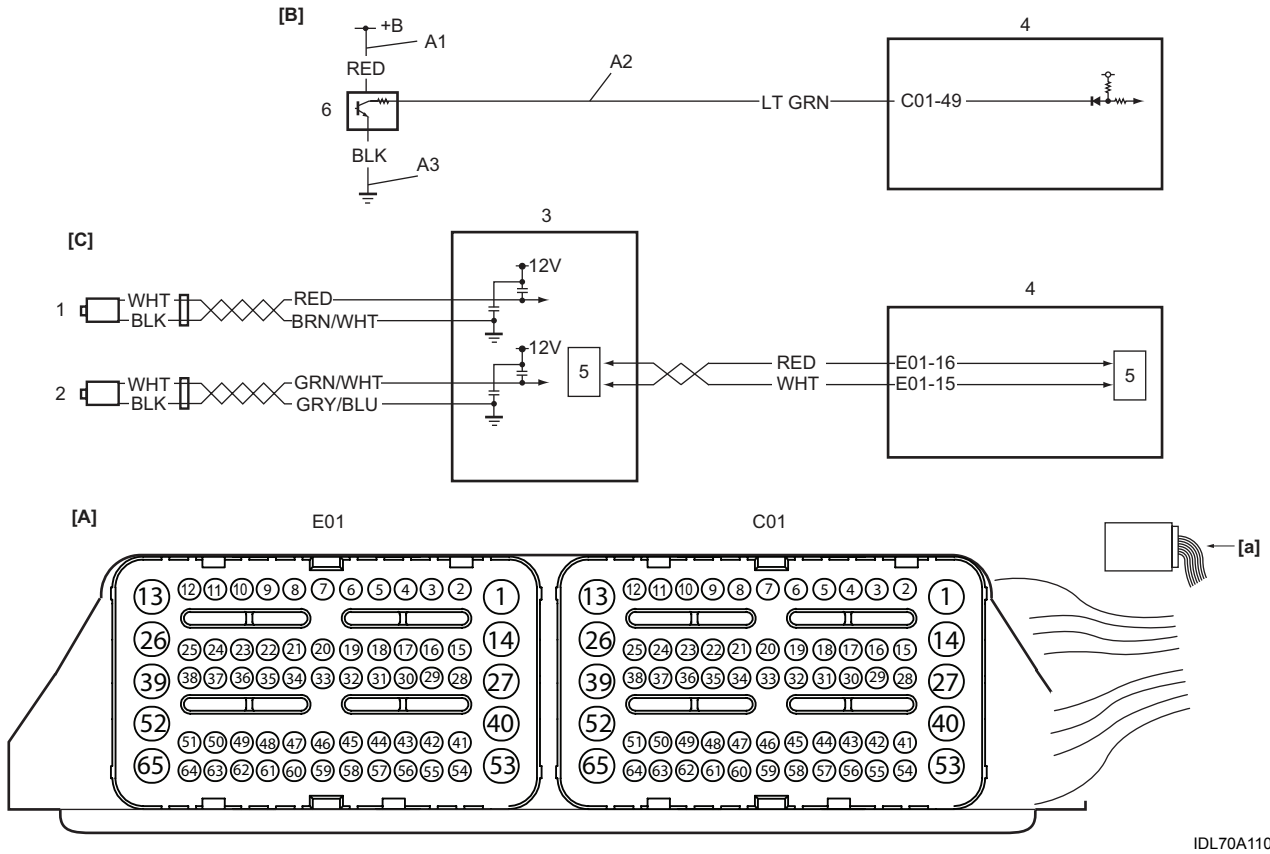
DTC P0500

AENDL70A1104037

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0500: Vehicle Speed Sensor “A” Vehicle speed signal is not input, while fuel is cut at deceleration for 4 sec. continuously with engine speed at 3,600 rpm or less. (3 D/C detection logic)	• CAN communication line • Wheel speed sensor • ABS control module • VSS • ECM

Circuit Diagram



IDL70A110024-04

[A]: ECM connector (View: [a])	A2. VSS signal circuit	3. ABS control module
[B]: Non-ABS model	A3. VSS ground circuit	4. ECM
[C]: ABS model	1. Left-front wheel speed sensor	5. CAN driver
A1. VSS power supply circuit	2. Right-front wheel speed sensor	6. VSS

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **DTC P0107, P0108, P0116, P0117, P0118, P0335, P0336 and U0121 are not detected.**

1) Warm up engine to normal operating temperature.
2) Drive vehicle at 3,600 rpm (engine speed) for 4 sec. or more.
3) Release accelerator pedal, and keep vehicle coasting for 10 sec. with engine brakes applied. (fuel cut condition)

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	ABS model: Go to Step 2. Non-ABS model: Go to Step 4.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**DTC check** *Is there any CAN-DTC detected?*	Go to troubleshooting for CAN-DTC. ☞(Page 10H-8)	Go to Step 3.
3	**DTC check** 1) Check ABS control module for DTC. *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace ECM and recheck DTC. ☞(Page 1C-1)
4	**VSS power supply circuit check** 1) With ignition is "OFF", disconnect VSS connector. 2) Check for proper terminal connection to VSS connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "A1" and "A3" is battery voltage. *Is check result OK?*	Go to Step 6.	Go to Step 5.
5	**VSS ground circuit check** 1) Check that voltage between "A" and ground is battery voltage. *Is check result OK?*	Repair "A3" circuit or replace defective wiring harness.	Repair "A1" circuit or replace defective wiring harness.

Step	Action	Yes	No
6	**VSS signal circuit check** 1) With ignition is “OFF”, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “A2” circuit: less than 1 Ω. • Resistance between “A2” circuit and ground: infinity. • Resistance between “A2” circuit terminal and other terminal at VSS connector: infinity • Voltage of “A2” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 7.	Repair or replace defective wire harness.
7	**VSS check** 1) Check VSS. ☞(Page 5B-10) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace VSS.

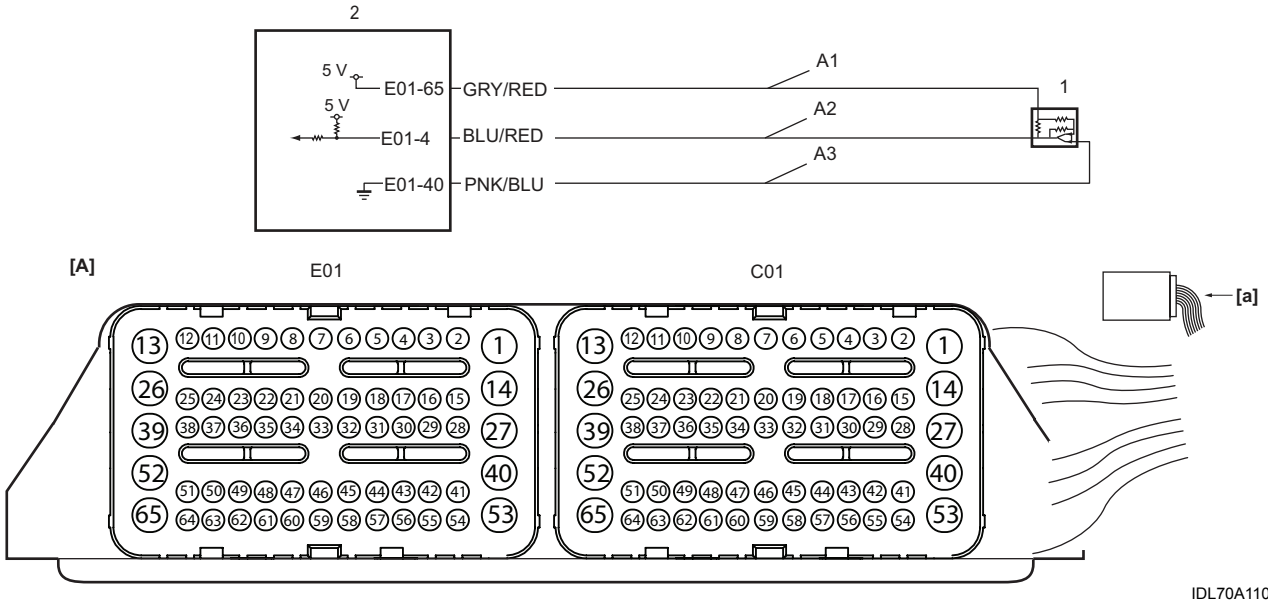
DTC P0532 / P0533

AENDL70A1104039

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0532: A/C Refrigerant Pressure Sensor “A” Circuit Low Output voltage of A/C refrigerant pressure sensor signal circuit is lower than 0.15 V for 5 sec. (3 D/C detection logic but MIL does not light up)	• A/C refrigerant pressure sensor and/or its circuit • ECM
P0533: A/C Refrigerant Pressure Sensor “A” Circuit High Output voltage of A/C refrigerant pressure sensor signal circuit is higher than 4.93 V for 5 sec. (3 D/C detection logic but MIL does not light up)	

Circuit Diagram



IDL70A110025-02

[A]: ECM connector (View: [a])	A3: A/C refrigerant pressure sensor ground circuit
A1: A/C refrigerant pressure sensor power supply circuit	1. A/C refrigerant pressure sensor
A2: A/C refrigerant pressure sensor signal circuit	2. ECM

DTC Confirmation Procedure

1) Start engine and operate A/C system for 1 min. or more.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**A/C refrigerant pressure sensor power supply circuit check** 1) When ignition is "OFF", disconnect A/C refrigerant pressure sensor connector. 2) Check for proper terminal connection to A/C refrigerant pressure sensor connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "A1" and "A3" is approx. 5 V. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**A/C refrigerant pressure sensor ground circuit check** 1) Check that voltage between "A1" and ground is approx. 5 V. *Is check result OK?*	Repair "A3" circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair "A1" circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)
4	**A/C refrigerant pressure sensor signal circuit check** 1) When ignition is OFF, disconnect "C01" and "E01" connectors from ECM. 2) Check for proper terminal connection to "C01" and "E01" connectors. 3) If connections are OK, check the following points. • Resistance of "A2" circuit: less than 1 Ω • Resistance between "A2" circuit and ground: infinity • Resistance between "A2" circuit terminal and other terminal at A/C refrigerant pressure sensor connector: infinity • Voltage of "A2" circuit: 0 to 1 V (When ignition is "ON") *Is check result OK?*	Go to Step 5.	Replace defective wire harness.
5	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor. ☞(Page 7B-34) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace A/C refrigerant pressure sensor. ☞(Page 7B-35)

DTC P0602

AENDL70A1104042

DTC Detecting Condition and Trouble Area

NOTE

After reprogramming of ECM is executed, if DTC P0602 is indicated, it is possible that the reprogramming of ECM is not completed correctly.

DTC detecting condition	Trouble area
P0602: Control Module Programming Error Data programming error. (1 D/C detection logic but MIL does not light up)	• ECM power supply circuit and/or ground circuit • ECM • Reprogramming failure of ECM

DTC Confirmation Procedure

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC. ☞(Page 1A-20) 2) Set ignition “OFF”. 3) Perform DTC confirmation procedure and check DTC. *Is DTC P0602 still detected?*	Go to Step 2.	Check for intermittent trouble. ☞(Page 00-11)
2	**ECM reprogramming check** *Was reprogramming of ECM executed?*	Execute reprogramming of ECM correctly once again.	Go to Step 3.
3	**ECM power supply and ground circuit check** 1) Check ECM power supply and ground circuits. ☞(Page 1A-97) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Repair or replace defective wire harness.

DTC P0601 / P0607

AENDL70A1104043

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0601: Internal Control Module Memory Check Sum Error Data write error or check sum error. (3 D/C detection logic)	• ECM power supply circuit and/or ground circuit • ECM
P0607: Control Module Performance ECM internal failure related to throttle control system. (1 D/C detection logic)	

DTC Confirmation Procedure

1) Set ignition “ON”.
2) Start engine, if possible.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC. ☞(Page 1A-20) 2) Set ignition “OFF”. 3) Perform DTC confirmation procedure and check DTC. *Is DTC P0601 or P0607 still detected?*	Go to Step 2.	Check for intermittent trouble. ☞(Page 00-11)
2	**ECM power supply and ground circuit check** 1) Check ECM power supply and ground circuit. ☞(Page 1A-97) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Repair defective wire harness.

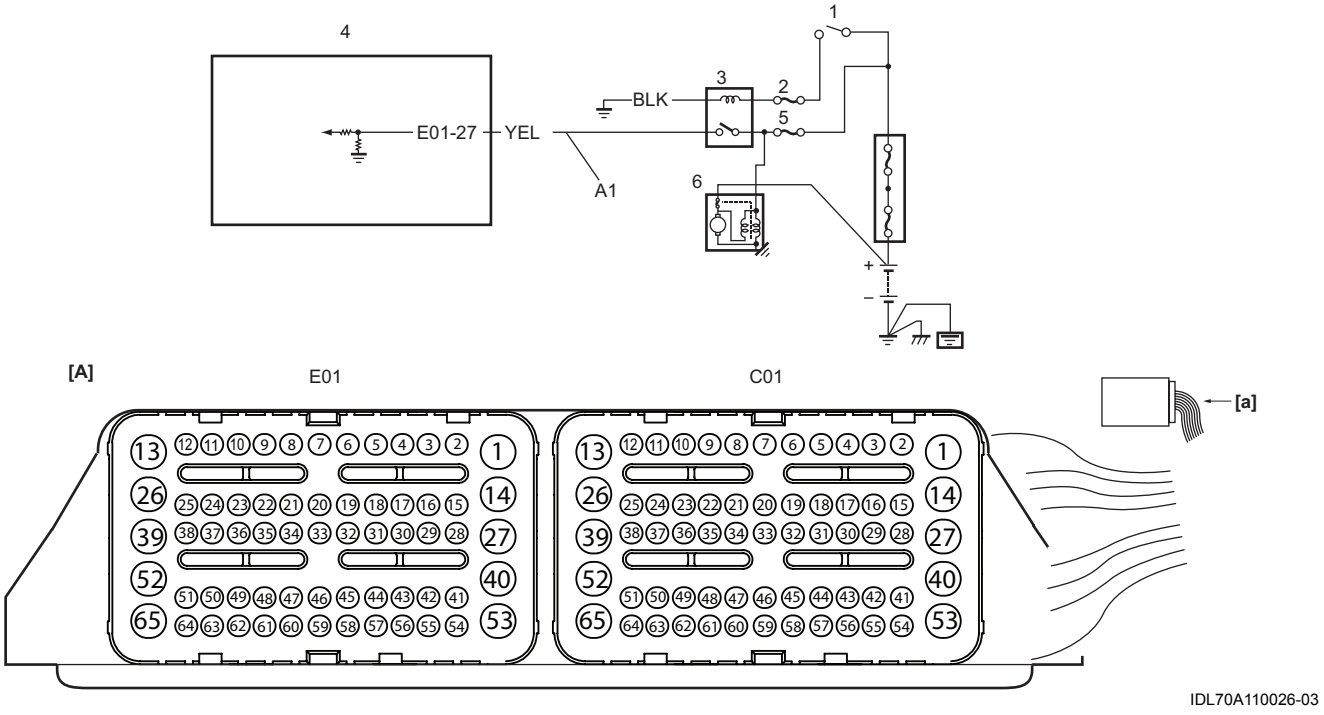
DTC P0616 / P0617

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0616: Generator Control Circuit No starter switch ON signal is input even if engine has been started. (3 D/C detection logic)	• Starting motor control relay and/or its circuit • ECM
P0617: Generator Control Circuit Starter switch ON signal is input for more than 180 sec. after engine has been started. (3 D/C detection logic)	

Circuit Diagram



IDL70A110026-03

[A]: ECM connector (View: [a])	2. "ST SIG" fuse	5. "ST" fuse
A1: Starting motor control relay signal circuit	3. Starting motor control relay	6. Starting motor
1. Ignition switch	4. ECM	

DTC Confirmation Procedure

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Starting motor control relay check** 1) With ignition is "OFF", remove starting motor control relay. 2) Check for proper terminal connection to starting motor control relay connector. 3) If connections are OK, check starting motor control relay. ☞(Page 1I-9) *Is check result OK?*	Go to Step 3.	Replace starting motor control relay.

Step	Action	Yes	No
3	**Starting motor relay signal circuit check** 1) Disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “A1” circuit: less than 1 Ω • Resistance between “A1” circuit and ground: infinity • resistance between “A1” circuit terminal and other terminal at starting motor control relay connector: infinity • Voltage of “A1” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Repair or replace defective wire harness.

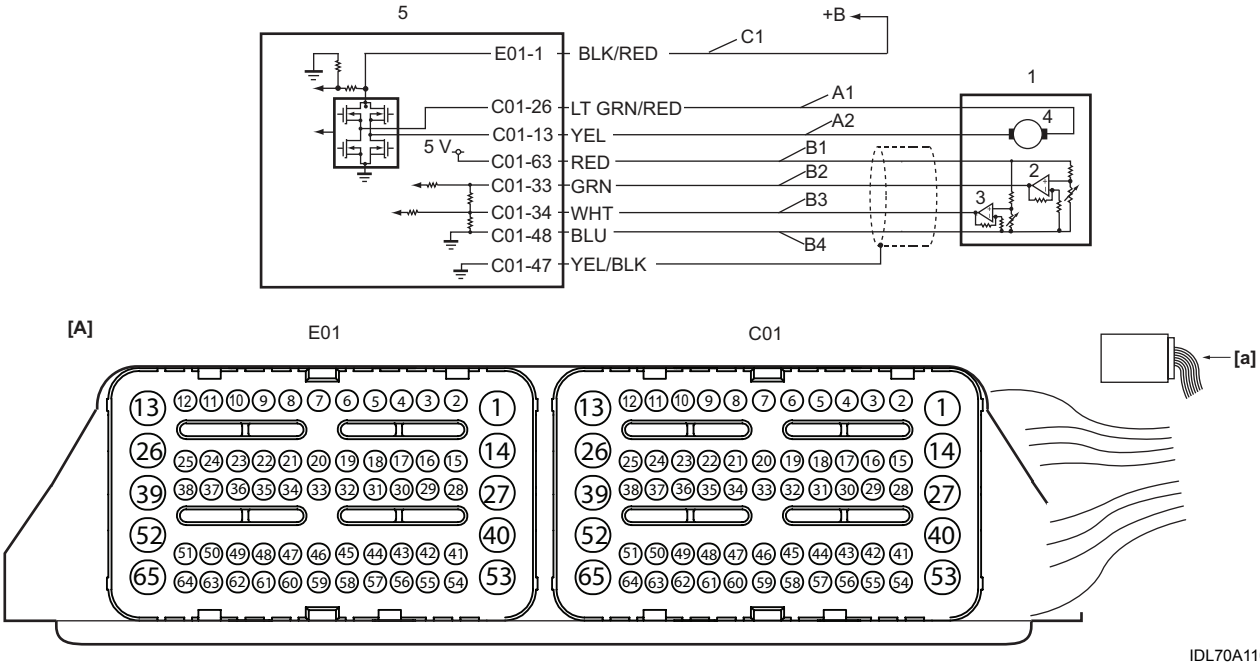
DTC P2101 / P2119

AENDL70A1104050

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2101: Throttle Actuator “A” Control Motor Circuit Range / Performance Throttle actuator drive circuit malfunction (open or excess temperature of device) is detected. (1 D/C detection logic)	• Throttle actuator and/or its circuit • TP sensor and/or its circuit • Electric throttle body assembly • ECM
P2119: Throttle Actuator Control Throttle Body Range / Performance Difference between targeted TP and measured TP is out of specified range. (1 D/C detection logic)	

Circuit Diagram



IDL70A110037-03

[A]: ECM connector (View: [a])	B3: TP sensor (sub) signal circuit	3. TP sensor (sub)
A1: Throttle actuator control circuit (close)	B4: TP sensor ground circuit	4. Throttle actuator
A2: Throttle actuator control circuit (open)	C1: Throttle actuator power supply circuit	5. ECM
B1: TP sensor power supply circuit	1. Electric throttle body assembly	
B2: TP sensor (main) signal circuit	2. TP sensor (main)	

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following conditions are met in this "DTC Confirmation Procedure".**
  - **Battery voltage > 10 V**
  - **P2119:**
    ECT > 5 °C
    IAT > 5 °C
    DTC P0122, P0123, P0223, P2101 and P2135 are not detected.

1) Warm up engine to normal operating temperature.
2) Stop engine and then set ignition "ON".
3) Keep accelerator pedal at fully depressed position for 1 min.
4) Release accelerator pedal for 1 min.
5) Set engine "OFF" for 1 min. and then "ON".

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**DTC recheck** 1) Clear DTC. 2) Perform electric throttle control system calibration. ☞(Page 1C-3) 3) Recheck DTC. *Is DTC P2101 or P2119 still detected?*	Go to Step 3.	End.
3	**Throttle actuator control circuit check** 1) When ignition is OFF, disconnect "C01" and "E01" connectors of ECM and throttle body assembly connector. 2) Check for proper terminal connection to "C01" and "E01" connectors and throttle body assembly connector. 3) If connections are OK, check the following points. • Resistance of "A1" and "A2" circuits: less than 1 Ω • Resistance between each of "A1" and "A2" circuits and ground: infinity • Resistance between "A1" circuit terminal and other terminal at throttle body assembly connector: infinity • Resistance between "A2" circuit terminal and other terminal at throttle body assembly connector: infinity • Voltage of "A1" and "A2" circuits: 0 to 1 V (When ignition is "ON") *Is check result OK?*	Go to Step 4.	Repair defective wire harness.
4	**Electric throttle body assembly check** 1) Check electric throttle body for performance. ☞(Page 1C-2) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace electric throttle body assembly.

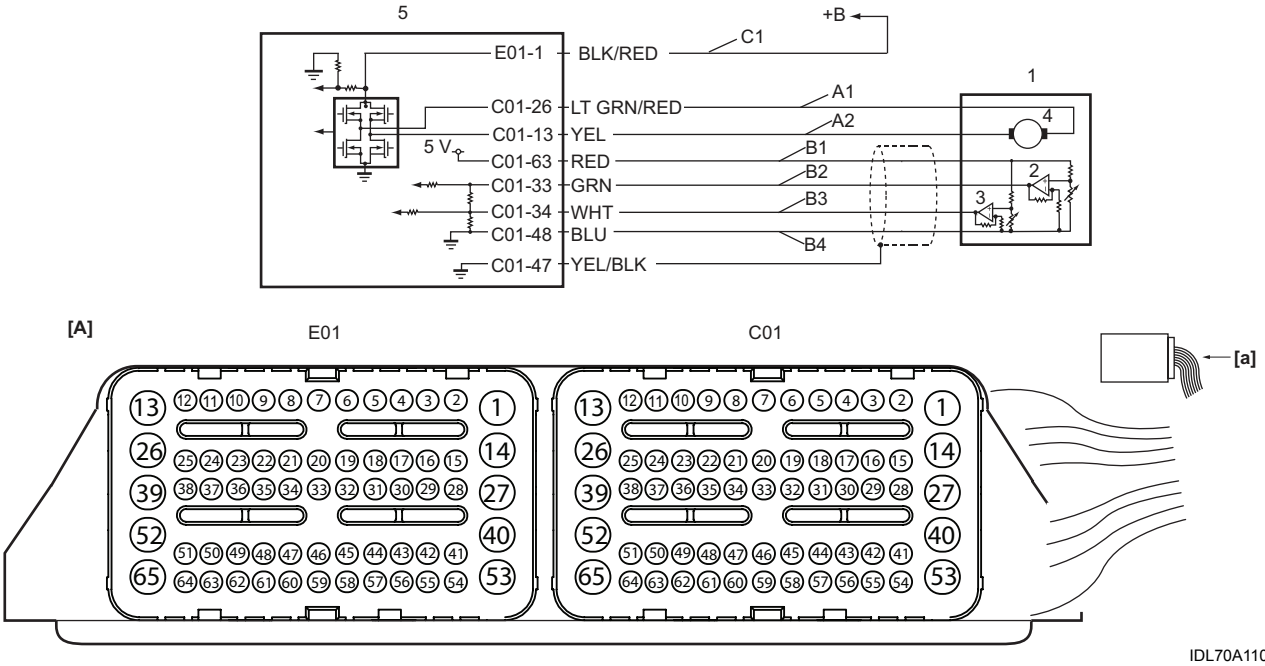
DTC P2102

AENDL70A1104070

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2102: Throttle Actuator "A" Control Motor Circuit Low Measured voltage of throttle actuator power supply circuit is lower than 5 V even if throttle actuator control relay is ON. (1 D/C detection logic)	• Throttle actuator power supply circuit • ECM

Circuit Diagram



IDL70A110037-03

[A]: ECM connector (View: [a])	B3: TP sensor (sub) signal circuit	3. TP sensor (sub)
A1: Throttle actuator control circuit (close)	B4: TP sensor ground circuit	4. Throttle actuator
A2: Throttle actuator control circuit (open)	C1: Throttle actuator power supply circuit	5. ECM
B1: TP sensor power supply circuit	1. Electric throttle body assembly	
B2: TP sensor (main) signal circuit	2. TP sensor (main)	

DTC Confirmation Procedure

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Throttle actuator control circuit check** 1) When ignition is OFF, disconnect electric throttle body assembly connector. 2) Check for proper terminal connection to electric throttle body assembly connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "C1" and ground is battery voltage. *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Repair or replace defective wire harness.

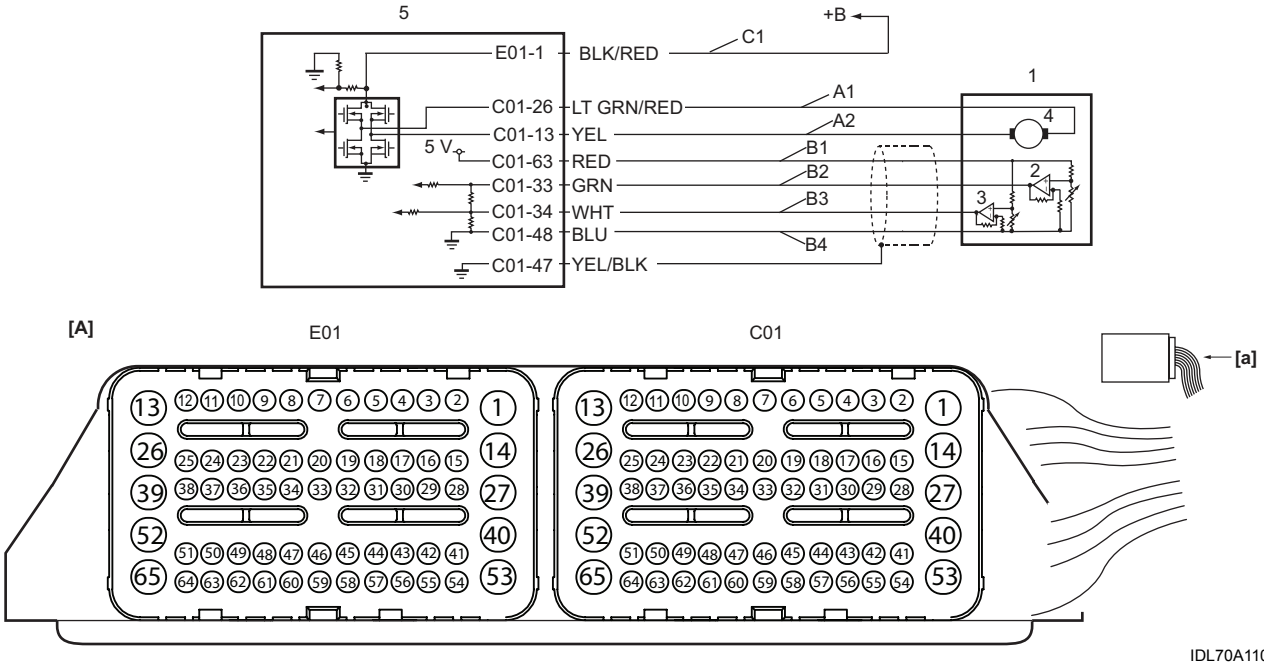
DTC P2111

AENDL70A1104071

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2111: Throttle Actuator Control System Stuck Open When diagnosing throttle valve with ignition switch “OFF”, throttle valve does not close even if throttle valve is opened at specified value. (1 D/C detection logic)	• Throttle actuator • ECM

Circuit Diagram



IDL70A110037-03

[A]: ECM connector (View: [a])	B3: TP sensor (sub) signal circuit	3. TP sensor (sub)
A1: Throttle actuator control circuit (close)	B4: TP sensor ground circuit	4. Throttle actuator
A2: Throttle actuator control circuit (open)	C1: Throttle actuator power supply circuit	5. ECM
B1: TP sensor power supply circuit	1. Electric throttle body assembly	
B2: TP sensor (main) signal circuit	2. TP sensor (main)	

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in “DTC Confirmation Procedure”.**

1) Set ignition “ON”.
2) Set ignition “OFF” for 1 min.
3) Repeat Step 1) - 2) 3 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check” (Page 1A-16).
2	**DTC check** *Is there DTC(s) other than P2111?*	Go to troubleshooting for applicable DTC.	Go to Step 3.

Step	Action	Yes	No
3	**Electric throttle body assembly check** 1) Check electric throttle body for performance. ☞(Page 1C-2) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace electric throttle body assembly.

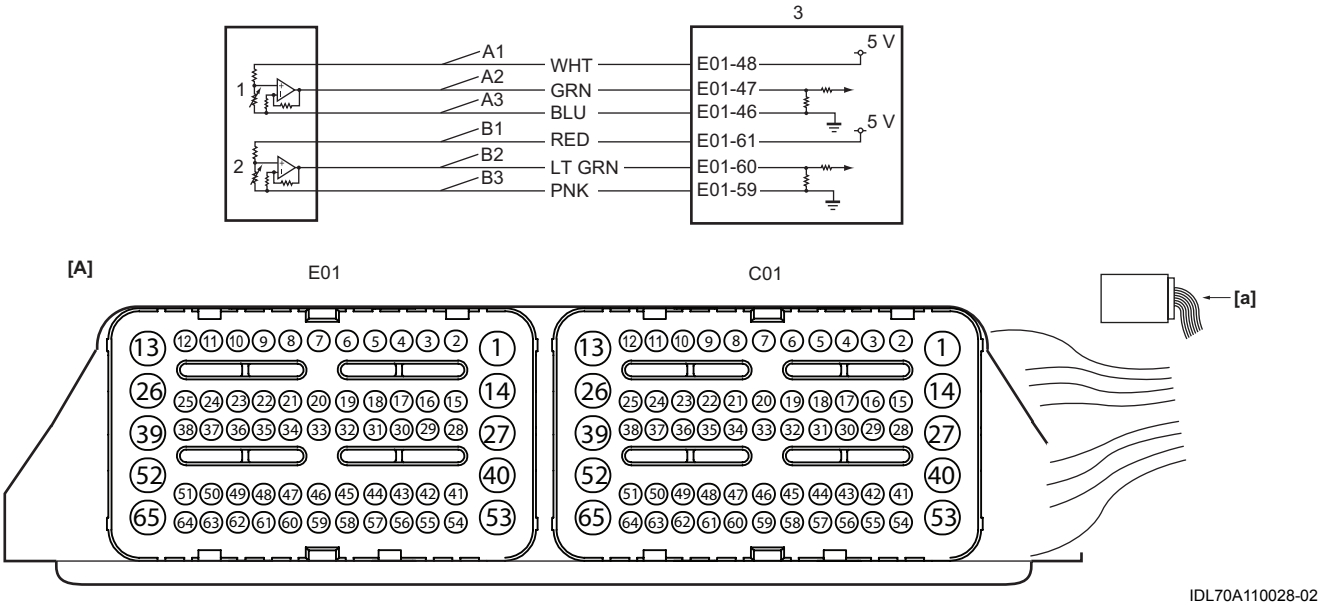
DTC P2122 / P2123

AENDL70A1104051

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2122: Throttle / Pedal Position Sensor / Switch "D" Circuit Low Output voltage of APP sensor (main) signal circuit is lower than 0.35 V. (1 D/C detection logic)	• APP sensor (main) and/or its circuit • ECM
P2123: Throttle / Pedal Position Sensor / Switch "D" Circuit High Output voltage of APP sensor (main) signal circuit is higher than 4.63 V. (1 D/C detection logic)	

Circuit Diagram



IDL70A110028-02

[A]: ECM connector (View: [a])	B1: APP sensor (sub) power supply circuit	2. APP sensor (sub)
A1: APP sensor (main) power supply circuit	B2: APP sensor (sub) signal circuit	3. ECM
A2: APP sensor (main) signal circuit	B3: APP sensor (sub) ground circuit	
A3: APP sensor (main) ground circuit	1. APP sensor (main)	

DTC Confirmation Procedure

NOTE

Confirm that the following condition is met in this "DTC Confirmation Procedure".

- **Battery voltage > 8 V**

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).

Step	Action	Yes	No
2	**Accelerator pedal assembly (incorporating APP sensor) mounting check** 1) Check that accelerator pedal assembly (incorporating APP sensor) has been mounted to vehicle body properly (no pinched floor carpet, etc.). *Is check result OK?*	Go to Step 3.	Reinstall accelerator pedal assembly (incorporating APP sensor) properly. ☞(Page 1C-4)
3	**APP sensor (main) power supply circuit check** 1) When ignition is “OFF”, disconnect APP sensor connector. 2) Check for proper terminal connection to APP sensor connector. 3) If connections are OK, set ignition “ON”. 4) Check that voltage between “A1” and “A3” is approx. 5 V. *Is check result OK?*	Go to Step 5.	Go to Step 4.
4	**APP sensor (main) ground circuit check** 1) Check that voltage between “A1” and ground is approx. 5 V. *Is check result OK?*	Repair “A3” circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair “A1” circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)
5	**APP sensor (main) signal circuit check** 1) When ignition is OFF, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “A2” circuit: less than 1Ω • Resistance between “A2” circuit and ground: infinity • Resistance between “A2” circuit terminal and other terminal at APP sensor connector: infinity • Voltage of “A2” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 6.	Repair APP sensor (main) signal circuit.
6	**APP sensor check** 1) Check APP sensor. ☞(Page 1C-5) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace accelerator pedal assembly (incorporating APP sensor).

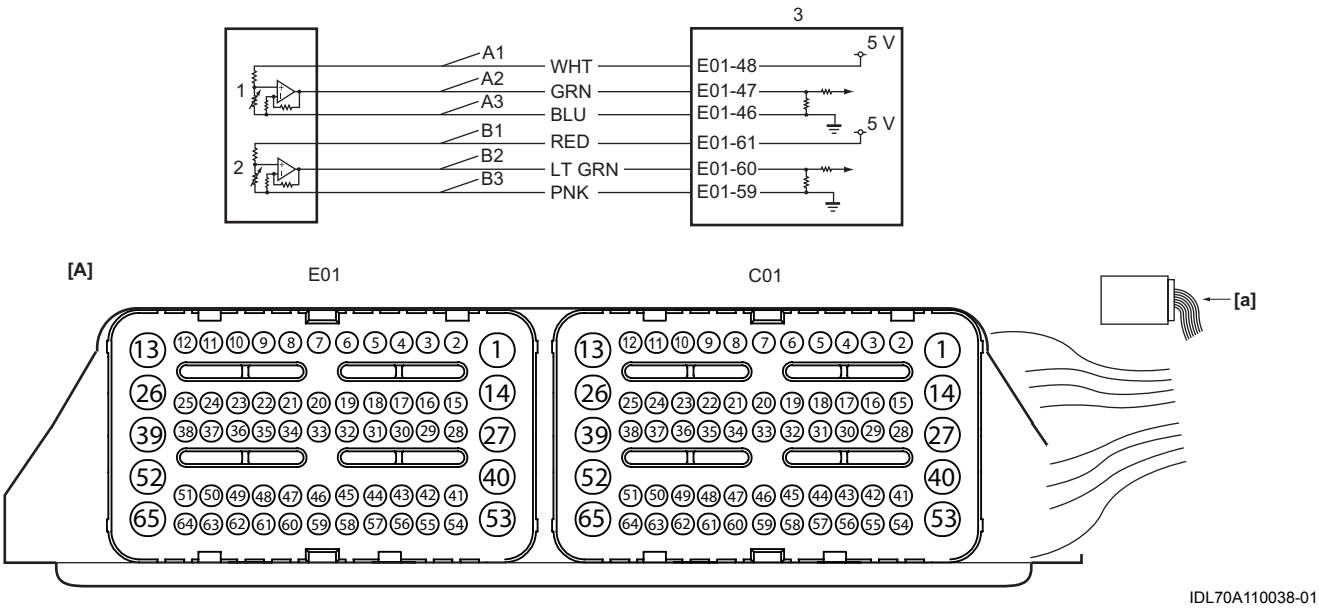
DTC P2127 / P2128

AENDL70A1104052

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2127: Throttle / Pedal Position Sensor / Switch “E” Circuit Low Output voltage of APP sensor (sub) signal circuit is lower than 0.16 V. (1 D/C detection logic)	• APP sensor (sub) and/or its circuit • ECM
P2128: Throttle / Pedal Position Sensor / Switch “E” Circuit High Output voltage of APP sensor (sub) signal circuit is higher than 3.53 V. (1 D/C detection logic)	

Circuit Diagram



[A]: ECM connector (View: [a])	B1: APP sensor (sub) power supply circuit	2. APP sensor (sub)
A1: APP sensor (main) power supply circuit	B2: APP sensor (sub) signal circuit	3. ECM
A2: APP sensor (main) signal circuit	B3: APP sensor (sub) ground circuit	
A3: APP sensor (main) ground circuit	1. APP sensor (main)	

DTC Confirmation Procedure

NOTE

Confirm that the following condition is met in this "DTC Confirmation Procedure".

- **Battery voltage > 8 V**

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Accelerator pedal assembly (incorporating APP sensor) mounting check** 1) Check that accelerator pedal assembly (incorporating APP sensor) has been mounted to vehicle body properly (no pinched floor carpet, etc.). *Is check result OK?*	Go to Step 3.	Reinstall accelerator pedal assembly (incorporating APP sensor) properly. ☞(Page 1C-4)
3	**APP sensor (sub) power supply circuit check** 1) When ignition is "OFF", disconnect APP sensor connector. 2) Check for proper terminal connection to APP sensor connector. 3) If connections are OK, set ignition "ON". 4) Check that voltage between "B1" and "B3" is approx. 5 V. *Is check result OK?*	Go to Step 5.	Go to Step 4.

Step	Action	Yes	No
4	**APP sensor (sub) ground circuit check** 1) Check that voltage between “B1” and ground is approx. 5 V. *Is check result OK?*	Repair “B3” circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)	Repair “B1” circuit and recheck DTC. If this DTC is detected again, replace ECM and recheck DTC. ☞(Page 1C-1)
5	**APP sensor (sub) signal circuit check** 1) When ignition is OFF, disconnect “C01” and “E01” connectors from ECM. 2) Check for proper terminal connection to “C01” and “E01” connectors. 3) If connections are OK, check the following points. • Resistance of “B2” circuit: less than 1 Ω • Resistance between “B2” circuit and ground: infinity • Resistance between “B2” circuit terminal and other terminal at APP sensor connector: infinity • Voltage of “B2” circuit: 0 to 1 V (When ignition is “ON”) *Is check result OK?*	Go to Step 6.	Repair APP sensor (sub) signal circuit.
6	**APP sensor check** 1) Check APP sensor. ☞(Page 1C-5) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace accelerator pedal assembly (incorporating APP sensor). ☞(Page 1C-4)

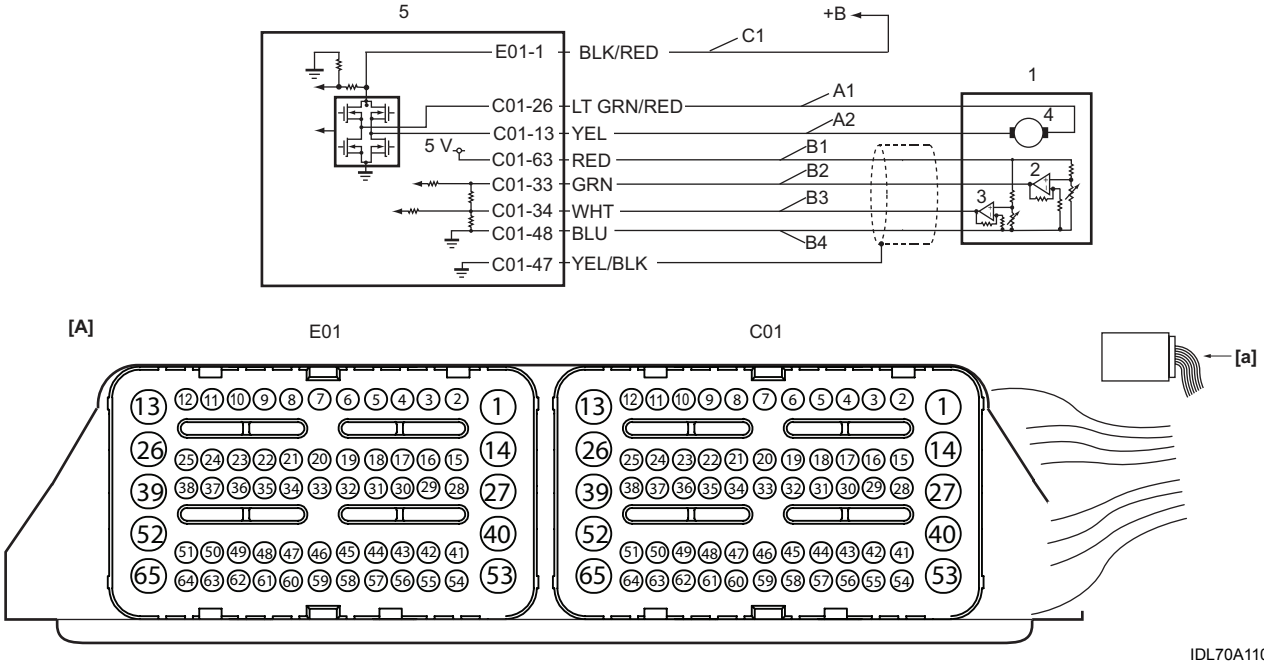
DTC P2135

AENDL70A1104053

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2135: Throttle / Pedal Position Sensor / Switch “A”/“B” Voltage Correlation Difference between TP (main) and TP (sub) sensor signal is more than specified value for specified time. (1 D/C detection logic)	• TP sensor and/or its circuit • ECM

Circuit Diagram



IDL70A110037-03

[A]: ECM connector (View: [a])	B2: TP sensor (main) signal circuit	2. TP sensor (main)
A1: Throttle actuator control circuit (close)	B3: TP sensor (sub) signal circuit	3. TP sensor (sub)
A2: Throttle actuator control circuit (open)	B4: TP sensor ground circuit	4. Throttle actuator
B1: TP sensor power supply circuit	1. Electric throttle body assembly	5. ECM

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following condition is met in this "DTC Confirmation Procedure".**
  - **DTC P0122, P0123, P0222, P0223 and P0607 are not detected.**

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Wire harness check** 1) Check the following points. • "B2" circuit: Refer to Step 2 through 4 under "DTC P0122 / P0123" (Page 1A-47). • "B3" circuit: Refer to Step 2 through 4 under "DTC P0222 / P0223" (Page 1A-55). *Is check result OK?*	Go to Step 3.	Repair defective wire harness.
3	**TP sensor check** 1) Check TP sensor for performance referring to "Throttle Position (TP) Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection" in Section 1C (Page 1C-2). *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace electric throttle body assembly.

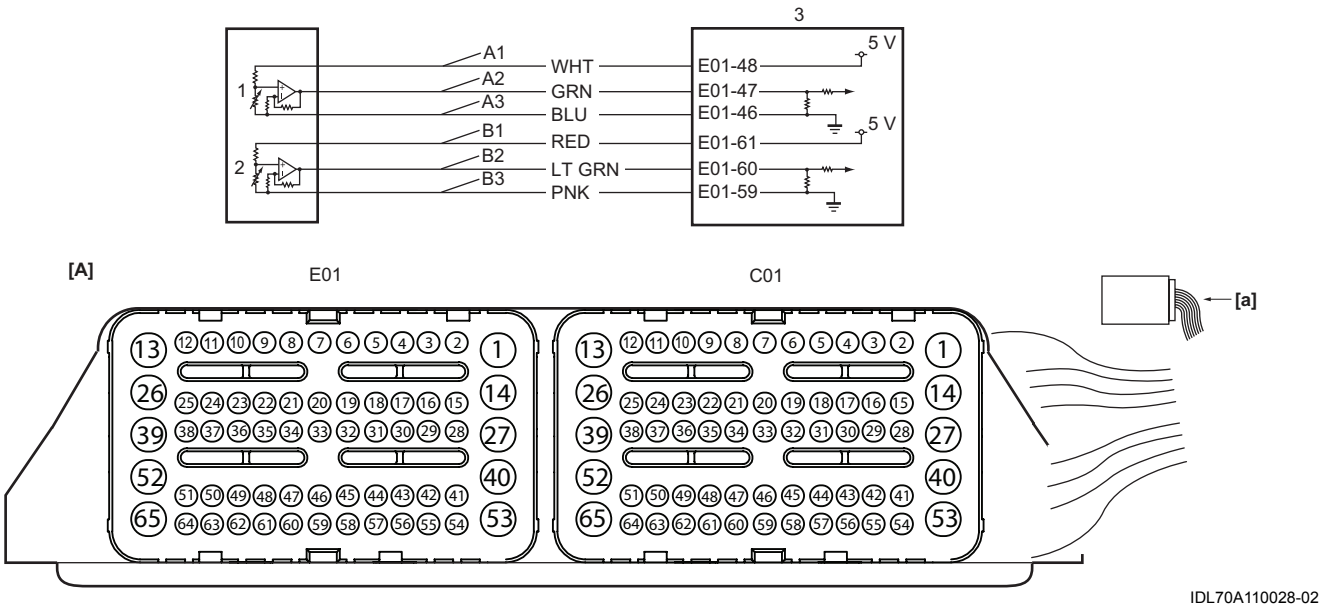
DTC P2138

AENDL70A1104054

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2138: Throttle / Pedal Position Sensor / Switch "D"/"E" Voltage Correlation Difference between APP (main) and APP (sub) sensor signal is more than specified value for specified time. (1 D/C detection logic)	• APP sensor and/or its circuit • ECM

Circuit Diagram



[A]: ECM connector (View: [a])	B1: APP sensor (sub) power supply circuit	2. APP sensor (sub)
A1: APP sensor (main) power supply circuit	B2: APP sensor (sub) signal circuit	3. ECM
A2: APP sensor (main) signal circuit	B3: APP sensor (sub) ground circuit	
A3: APP sensor (main) ground circuit	1. APP sensor (main)	

DTC Confirmation Procedure

NOTE

- **Be sure to troubleshoot first unexpected DTCs previously detected in "DTC Confirmation Procedure".**
- **Confirm that the following conditions are met in this "DTC Confirmation Procedure".**
  - **System voltage > 8 V**
  - **DTC P2122, P2123, P2127 and P2128 are not detected.**

1) Set ignition "ON".
2) Keep accelerator pedal at fully depressed position for 10 sec.
3) Keep accelerator pedal at released position for 10 sec.
4) Repeat Step 2) - 3) 3 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Wire harness check** 1) Check the following points. • "A1", "A2" and "A3" circuits: Refer to Step 3 through 5 under "DTC P2122 / P2123" (Page 1A-79). • "B1", "B2" and "B3" circuits: Refer to Step 3 through 5 under "DTC P2127 / P2128" (Page 1A-80). *Is check result OK?*	Go to Step 3.	Repair defective wire harness.
3	**APP sensor check** 1) Check APP sensor for performance. ☞(Page 1C-4) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace accelerator pedal assembly.

DTC U0073

AENDL70A1104057

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).
Refer to “Troubleshooting for Lost Communication” in Section 10H (Page 10H-10).

DTC U0101

AENDL70A1104068

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

DTC U0121

AENDL70A1104059

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

DTC U0131

AENDL70A1104065

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

DTC U0140

AENDL70A1104060

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

DTC U0155

AENDL70A1104061

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

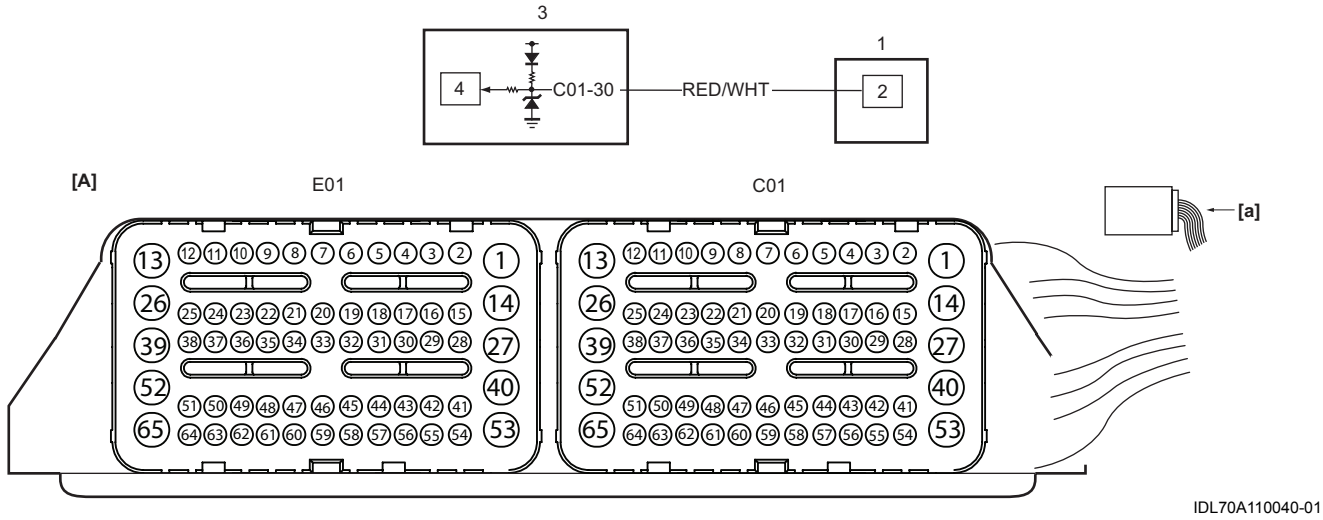
DTC U2001

AENDL70A1104062

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2001: LIN Lost Communication with Generator Received data from generator via LIN is faulty. (1 D/C detection logic but MIL does not light up)	• Generator LIN communication circuit • Regulator (coil assembly) • ECM

Circuit Diagram



IDL70A110040-01

[A]: ECM connector (View: [a])	1. Generator	3. ECM
A1: Generator LIN communication circuit	2. Regulator	4. LIN driver

DTC Confirmation Procedure

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" (Page 1A-16).
2	**Generator LIN communication circuit check** 1) When ignition is "OFF", disconnect "C01" and "E01" connectors of ECM and generator connector. 2) Check for proper terminal connection to "C01" and "E01" connectors and generator connector. 3) If connections are OK, check the following points. • Resistance of "A1" circuit: less than 1 Ω. • Resistance between "A1" circuit and ground: infinity. • Resistance between "A1" circuit terminal and other terminal at ECM connector: infinity. • Voltage of "A1" circuit: 0 to 1 V (When ignition is "ON"). *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**DTC recheck** 1) Replace coil assembly. ☞(Page 1J-8) 2) Perform DTC confirmation procedure and recheck DTC. *Is DTC U2001 still detected?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	End.

DTC U2021

AENDL70A1104067

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2021: LIN Invalid Data from ECM to Generator Transmitted data from ECM to generator via LIN is faulty. (1 D/C detection logic but MIL does not light up)	• ECM power supply circuit and/or ground circuit • ECM

DTC Confirmation Procedure

1) Run engine at idle speed for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC. "DTC Clearance" (Page 1A-20) 2) Set ignition "OFF". 3) Perform DTC confirmation procedure and check DTC. *Is DTC U2021 still detected?*	Go to Step 2.	Check for intermittent trouble. ☞(Page 00-11)
2	**ECM power supply and ground circuit check** 1) Check ECM power supply and ground circuits. "ECM Power Supply and Ground Circuit Check" (Page 1A-97) *Is check result OK?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Repair ECM power supply and ground circuits.

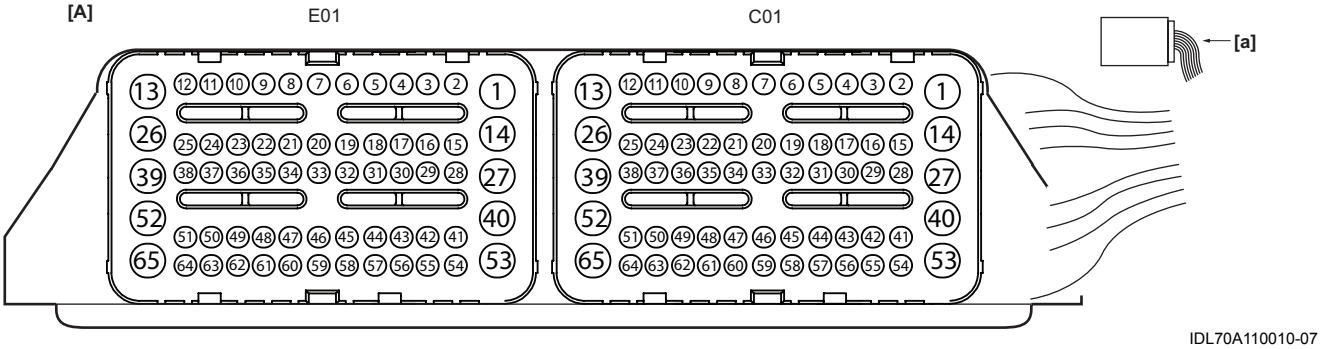
Inspection of ECM and Its Circuits

AENDL70A1104063

Voltage Check

NOTE

- **As each terminal voltage is affected by battery voltage, confirm that it is 12 V or more when ignition is "ON".**
- **Voltage of terminals with asterisk (*) cannot be measured with voltmeter because it is pulse signal. Use oscilloscope for its check.**
- **Before performing this inspection, be sure to read "Precautions for ECM Circuit Inspection" under "Precautions for Engine" in Section 1 (Page 1-1).**



IDL70A110010-07

[A]: ECM connector (View: [a])

Terminal No.	Wire color	Circuit	Normal voltage	Condition
C01-1	—	—	—	—
C01-2	—	—	—	—
C01-3*	RED/GRN	Fuel injector No.3 drive circuit	10 to 14 V	Ignition: "ON"
			Refer to reference waveform. • "Fuel injector signal" (Page 1A-92) • "Fuel injector No.3 signal and ignition coil No.3 signal" (Page 1A-93)	
C01-4*	LT GRN/BLK	Fuel injector No.2 drive circuit	10 to 14 V	Ignition: "ON"
			Refer to reference waveform. • "Fuel injector signal" (Page 1A-92) • "Fuel injector No.2 signal and ignition coil No.2 signal" (Page 1A-92)	
C01-5*	GRN/WHT	Fuel injector No.1 drive circuit	10 to 14 V	Ignition: "ON"
			Refer to reference waveform. • "Fuel injector signal" (Page 1A-92) • "Fuel injector No.1 signal and ignition coil No.1 signal" (Page 1A-92)	
C01-6	—	—	—	—
C01-7	—	—	—	—
C01-8	—	—	—	—
C01-9	—	—	—	—
C01-10	—	—	—	—
C01-11	GRN/RED	ECT sensor signal circuit	3.2 to 3.6 V	Ignition: "ON" ECT: 0 °C (32 °F)
			1.0 to 1.4 V	Ignition: "ON" ECT: 50 °C (122 °F)
			0.2 to 0.5 V	Ignition: "ON" ECT: 100 °C (212 °F)
C01-12	—	—	—	—
C01-13*	YEL	Throttle actuator control circuit (open)	Refer to reference waveform. "Throttle actuator signal" (Page 1A-95)	

Terminal No.	Wire color	Circuit	Normal voltage	Condition
C01-14	BLK	ECM ground circuit 1	Below 0.3 V	Ignition: “ON”
C01-15	—	—	—	—
C01-16*	PPL	Ignition coil No.3 drive circuit	0 to 1 V	Ignition: “ON”
			Refer to reference waveform. • “Ignition coil signal” (Page 1A-94) • “Fuel injector No.3 signal and ignition coil No.3 signal” (Page 1A-93)	
C01-17*	WHT/GRN	Ignition coil No.2 drive circuit	0 to 1 V	Ignition: “ON”
			Refer to reference waveform. • “Ignition coil signal” (Page 1A-94) • “Fuel injector No.2 signal and ignition coil No.2 signal” (Page 1A-92)	
C01-18*	GRN/YEL	Ignition coil No.1 drive circuit	0 to 1 V	Ignition: “ON”
			Refer to reference waveform. • “Ignition coil signal” (Page 1A-94) • “Fuel injector No.1 signal and ignition coil No.1 signal” (Page 1A-92)	
C01-19	—	—	—	—
C01-20	—	—	—	—
C01-21	—	—	—	—
C01-22	—	—	—	—
C01-23	—	—	—	—
C01-24*	YEL	Knock sensor signal circuit 1	1 to 2 V	Ignition: “ON”
			Refer to reference waveform. “Knock sensor signal” (Page 1A-95)	
C01-25	GRN	Knock sensor ground circuit	Below 0.3 V	Ignition: “ON”
C01-26*	LT GRN/RED	Throttle actuator control circuit (close)	Refer to reference waveform. “Throttle actuator signal” (Page 1A-95)	
C01-27	—	—	—	—
C01-28	—	—	—	—
C01-29	—	—	—	—
C01-30*	RED/WHT	Generator LIN communication circuit	Refer to reference waveform. “Generator LIN communication signal” (Page 1A-95)	
C01-31	PNK	O2S-2 signal circuit	Refer to reference waveform. “O2S-2 signal” (Page 1A-94)	
C01-32	YEL	HO2S-1 signal circuit	Refer to reference waveform. “HO2S-1 signal and HO2S-1 heater signal” (Page 1A-93)	
C01-33	GRN	TP sensor (main) signal circuit	0.7 to 1.0 V	Ignition: “ON” Accelerator pedal: Not depressed
			4.3 to 4.7 V	Ignition: “ON” Accelerator pedal: Fully depressed
C01-34	WHT	TP sensor (sub) signal circuit	4.0 to 4.4 V	Ignition: “ON” Accelerator pedal: Not depressed
			0.3 to 0.8 V	Ignition: “ON” Accelerator pedal: Fully depressed
C01-35	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition
C01-36	LT BLU	MAP sensor signal circuit	4.0 to 5.5 V	Ignition: “ON”
			1.5 to 1.8 V	Engine: Idle speed after warming up Barometric pressure: 100 kPa, 760 mmHg.
			Refer to reference waveform. “MAP sensor signal” (Page 1A-94)	
C01-37	WHT	CAN low communication to TCM (AMT model)	Refer to reference waveform. “CAN communication signal” (Page 1A-96)	
C01-38	RED	CAN low communication to TCM (AMT model)	Refer to reference waveform. “CAN communication signal” (Page 1A-96)	
C01-39	—	—	—	—
C01-40	BLK	ECM ground circuit 2	Below 0.3 V	Ignition: “ON”
C01-41	—	—	—	—
C01-42	—	—	—	—
C01-43	—	—	—	—
C01-44	BRN/YEL	O2S-2 shield ground circuit	Below 0.3 V	Ignition: “ON”
C01-45*	RED/YEL	CMP sensor signal circuit	0 to 1 V or 4 to 5 V	Ignition: “ON”
			Refer to reference waveform. “CKP sensor signal and CMP sensor signal” (Page 1A-95)	
C01-46*	PNK	CKP sensor signal circuit	0 to 1 V or 4 to 5 V	Ignition: “ON”
			Refer to reference waveform. “CKP sensor signal and CMP sensor signal” (Page 1A-95)	
C01-47	YEL/BLK	TP sensor shield ground circuit	Below 0.3 V	Ignition: “ON”
C01-48	BLU	TP sensor ground circuit	Below 0.3 V	Ignition: “ON”
C01-49	LT GRN	VSS signal circuit	0 - 1 V or 4 - 5 V	Ignition: “ON”
			0 - 1 V or 4 - 6 V “VSS signal” (Page 1A-94)	Vehicle: Running
C01-50	—	—	—	—
C01-51	—	—	—	—
C01-52*	YEL/RED	HO2S-1 heater drive circuit	10 to 14 V	Ignition: “ON”
			Refer to reference waveform. “HO2S-1 signal and HO2S-1 heater signal” (Page 1A-93)	
C01-53	BLK	ECM ground circuit 3	Below 0.3 V	Ignition: “ON”
C01-54	GRY/BLK	ECT sensor and IAT sensor ground circuit	Below 0.3 V	Ignition: “ON”
C01-55*	BLU/BLK	EVAP canister purge valve drive circuit	10 to 14 V	Ignition: “ON”
			Refer to reference waveform. “EVAP canister purge valve signal” (Page 1A-94)	
C01-56	PPL	O2S-2 ground circuit	Below 0.3 V	Ignition: “ON”
C01-57	—	—	—	—
C01-58	BRN	HO2S-1 ground circuit	Below 0.3 V	Ignition: “ON”
C01-59	GRY	MAP sensor ground circuit	Below 0.3 V	Ignition: “ON”
C01-60	PPL/WHT	HO2S-1 shield ground circuit	Below 0.3 V	Ignition: “ON”
C01-61	—	—	—	—
C01-62	PPL/YEL	IAT sensor signal circuit	4.2 to 4.6 V	Ignition: “ON” IAT: –20 °C (–4 °F)
			2.3 to 2.7 V	Ignition: “ON” IAT: 20 °C (68 °F)
			0.4 to 0.8 V	Ignition: “ON” IAT: 80 °C (176 °F)

Terminal No.	Wire color	Circuit	Normal voltage	Condition
C01-63	RED	TP sensor power supply circuit	4.5 to 5.5 V	Ignition: “ON”
C01-64	RED/BLK	MAP sensor power supply circuit	4.5 to 5.5 V	Ignition: “ON”
C01-65	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition
E01-1	BLK/RED	Throttle actuator power supply circuit	10 to 14 V	Ignition: “ON”
E01-2	GRY/RED	CPP switch signal circuit (M/T model)	10 to 14 V	Ignition: “ON” Clutch pedal: Not depressed
			0 to 1 V	Ignition: “ON” Clutch pedal: Fully depressed
E01-3	GRN/WHT	Brake light switch signal circuit	0 to 1 V	Brake pedal: Not depressed
			10 to 14 V	Brake pedal: Fully depressed
E01-4	BLU/RED	A/C refrigerant pressure sensor signal circuit	0.9 to 1.3 V	Engine: Running A/C compressor: Not operated
			1.3 to 2.2 V	Engine: Running A/C compressor: Operated
E01-5	—	—	—	—
E01-6	RED/WHT	Blower motor signal circuit	0 to 1 V	Ignition: “ON” Blower speed selector: 2nd or more
			4 to 7 V	Ignition: “ON” Blower speed selector: 1st position
			10 to 14 V	Ignition: “ON” Blower speed selector: “OFF”
E01-7	—	—	—	—
E01-8	—	—	—	—
E01-9	—	—	—	—
E01-10	—	—	—	—
E01-11	LT GRN/RED	Radiator cooling fan relay drive circuit	10 to 14 V	Ignition: “ON” ECT < 95 °C (203 °F) and A/C switch is OFF.
			0 to 1 V	Ignition: “ON” ECT > 97 °C (206.6 °F) or A/C switch and blower speed selector are ON.
E01-12	—	—	—	—
E01-13	BLK/RED	Main power supply circuit 1	10 to 14 V	Ignition: “ON”
E01-14	—	—	—	—
E01-15*	WHT	CAN (low) communication circuit to ABS control module/BCM	Refer to reference waveform. “CAN communication signal” (Page 1A-96)	
E01-16*	RED	CAN (high) communication circuit to ABS control module/BCM	Refer to reference waveform. “CAN communication signal” (Page 1A-96)	
E01-17	—	—	—	—
E01-18	—	—	—	—
E01-19	—	—	—	—
E01-20	—	—	—	—
E01-21	—	—	—	—
E01-22	—	—	—	—
E01-23	GRY	A/C compressor relay drive circuit	10 to 15 V	A/C compressor: Not operated
			0 to 1 V	A/C compressor: Operated
E01-24	—	—	—	—

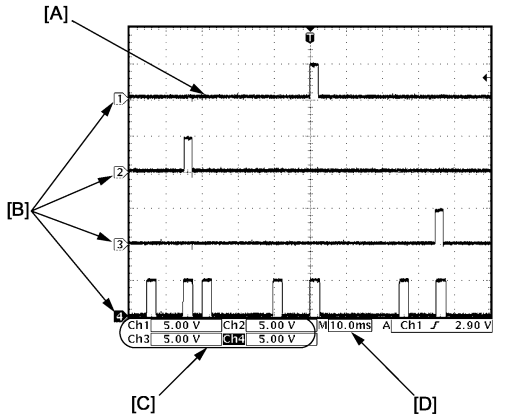
Terminal No.	Wire color	Circuit	Normal voltage	Condition
E01-25	—	—	—	—
E01-26	BLK/RED	Main power supply circuit 2	10 to 14 V	Ignition: “ON”
E01-27	YEL	Starting motor control relay signal circuit	0 to 1 V	Ignition: “ON”
			6 to 12 V	Ignition: “START”
E01-28	—	—	—	—
E01-29	—	—	—	—
E01-30	—	—	—	—
E01-31	—	—	—	—
E01-32	—	—	—	—
E01-33	—	—	—	—
E01-34	—	—	—	—
E01-35	—	—	—	—
E01-36	—	—	—	—
E01-37	—	—	—	—
E01-38	—	—	—	—
E01-39	GRN/BLK	Fuel pump relay drive circuit	Refer to reference waveform. “Fuel pump relay signal” (Page 1A-96)	
E01-40	PNK/BLU	A/C refrigerant pressure sensor ground circuit	Below 0.3 V	Ignition: “ON”
E01-41	BLK/WHT	Ignition signal circuit	0 to 1 V	Ignition: “OFF”, “ACC”
			10 to 14 V	Ignition: “ON”
E01-42	—	—	—	—
E01-43	—	—	—	—
E01-44	—	—	—	—
E01-45	—	—	—	—
E01-46	BLU	APP sensor (main) ground circuit	Below 0.3 V	Ignition: “ON”
E01-47	GRN	APP sensor (main) signal circuit	0.6 to 0.9 V	Ignition: “ON” Accelerator pedal: Not depressed
			3.7 to 4.4 V	Ignition: “ON” Accelerator pedal: Fully depressed
E01-48	WHT	APP sensor (main) power supply circuit	4.5 to 5.5 V	Ignition: “ON”
E01-49	—	—	—	—
E01-50	—	—	—	—
E01-51	—	—	—	—
E01-52	GRN/YEL	Main relay drive circuit	0 to 1 V	Ignition: “ON”
			10 to 14 V	Ignition: 30 sec. after ignition “OFF”
E01-53	—	—	—	—
E01-54	—	—	—	—
E01-55	—	—	—	—
E01-56	—	—	—	—
E01-57	—	—	—	—
E01-58	—	—	—	—
E01-59	PNK	APP sensor (sub) ground circuit	Below 0.3 V	Ignition: “ON”
E01-60	LT GRN	APP sensor (sub) signal circuit	0.2 to 0.5 V	Ignition: “ON” Accelerator pedal: Not depressed
			1.8 to 2.2 V	Ignition: “ON” Accelerator pedal: Fully depressed
E01-61	RED	APP sensor (sub) power supply circuit	4.5 to 5.5 V	Ignition: “ON”
E01-57	—	—	—	—
E01-58	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition
E01-62	—	—	—	—
E01-63	—	—	—	—
E01-64	—	—	—	—
E01-65	GRY/RED	A/C refrigerant pressure sensor power supply circuit	4.5 to 5.5 V	Ignition: “ON”

Reference Waveform

NOTE

- **How to read waveforms is shown below.**



IBP80A111034-01

[A]: Waveform of channel 1	[C]: VOLT/DIV of each channel
[B]: Ground level of each channel	[D]: TIME/DIV

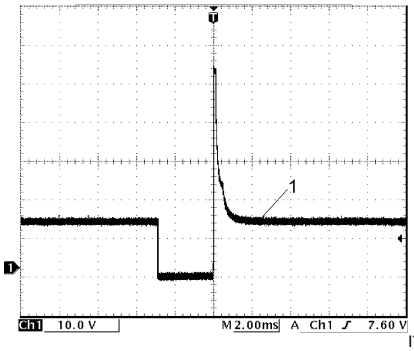
- **Waveform may vary with measurement condition and vehicle specifications.**

Fuel injector signal

Channel	Probe	Terminal No.
1	+	C01-5 (No.1)
		C01-4 (No.2)
		C01-3 (No.3)
	–	C01-14

Measurement condition

- Engine: Idle speed after warming up



I7V20A111014-02

1. Fuel injector signal

Fuel injector No.1 signal and ignition coil No.1 signal

Fuel injector No.1 signal (1):

Channel	Probe	Terminal No.
1	+	C01-5
	–	C01-14

Ignition coil No.1 signal (2):

Channel	Probe	Terminal No.
2	+	C01-18
	–	C01-14

CMP sensor signal (3):

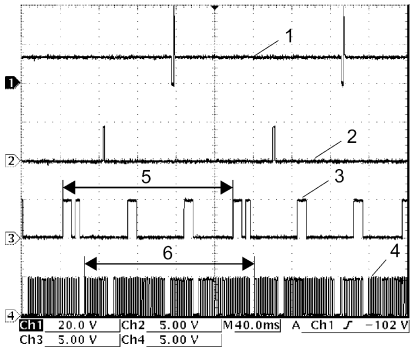
Channel	Probe	Terminal No.
3	+	C01-45
	–	C01-14

CKP sensor signal (4):

Channel	Probe	Terminal No.
4	+	C01-46
	–	C01-14

Measurement condition

- Engine: Idle speed after warming up



I7V10A111011-05

5. Camshaft 360° angle	6. Crankshaft 720° angle

Fuel injector No.2 signal and ignition coil No.2 signal

Fuel injector No.2 signal (1):

Channel	Probe	Terminal No.
1	+	C01-4
	–	C01-14

Ignition coil No.2 signal (2):

Channel	Probe	Terminal No.
2	+	C01-17
	–	C01-14

CMP sensor signal (3):

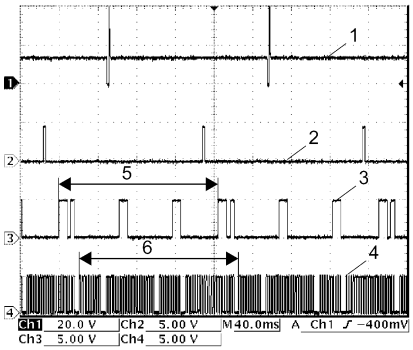
Channel	Probe	Terminal No.
3	+	C01-45
	–	C01-14

CKP sensor signal (4):

Channel	Probe	Terminal No.
4	+	C01-46
	–	C01-14

Measurement condition

- Engine: Idle speed after warming up



I7V10A111015-01

5. Camshaft 360° angle	6. Crankshaft 720° angle

Fuel injector No.3 signal and ignition coil No.3 signal

Fuel injector No.3 signal (1):

Channel	Probe	Terminal No.
1	+	C01-3
	–	C01-14

Ignition coil No.3 signal (2):

Channel	Probe	Terminal No.
2	+	C01-16
	–	C01-14

CMP sensor signal (3):

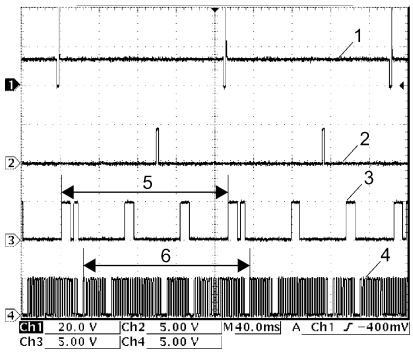
Channel	Probe	Terminal No.
3	+	C01-45
	–	C01-14

CKP sensor signal (4):

Channel	Probe	Terminal No.
4	+	C01-46
	–	C01-14

Measurement condition

- Engine: Idle speed after warming up



I7V10A111016-01

5. Camshaft 360° angle	6. Crankshaft 720° angle

HO2S-1 signal and HO2S-1 heater signal

HO2S-1 signal (1)

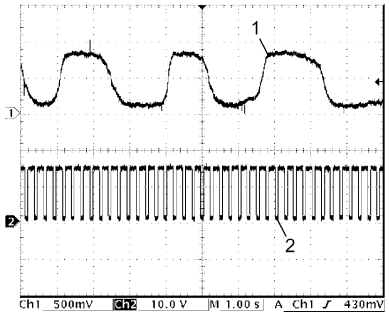
Channel	Probe	Terminal No.
1	+	C01-32
	–	C01-14

HO2S-1 heater signal (2)

Channel	Probe	Terminal No.
2	+	C01-52
	–	C01-14

Measurement condition

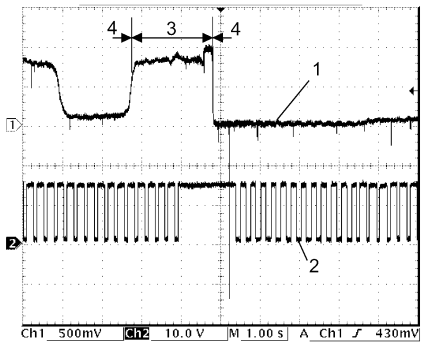
- Engine: Idle speed after warm up



I9L60A110032-01

Measurement condition

- Engine: Racing after warm up



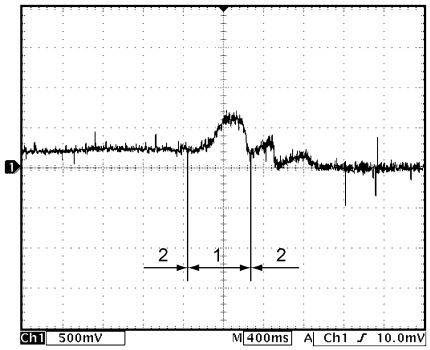
I9L60A110033-01

O2S-2 signal

Channel	Probe	Terminal No.
1	+	C01-31
	–	C01-14

Measurement condition

- Engine: Racing after warming up



IBV10A111021-01

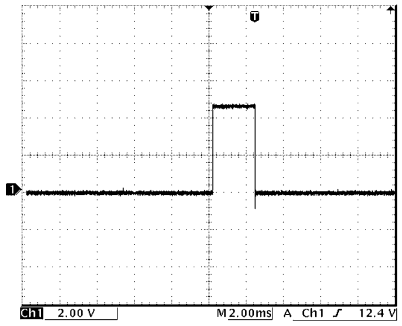
1. Engine: Racing	2. Engine: Idle speed

Ignition coil signal

Channel	Probe	Terminal No.
1	+	C01-18 (No.1)
		C01-17 (No.2)
		C01-16 (No.3)
	–	C01-14

Measurement condition

- Engine: Idle speed after warming up



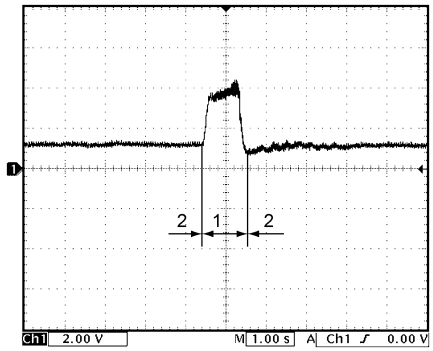
I8T401112041-01

MAP sensor signal

Channel	Probe	Terminal No.
1	+	C01-36
	–	C01-14

Measurement condition

- Engine: Racing after warming up



IBV10A111022-01

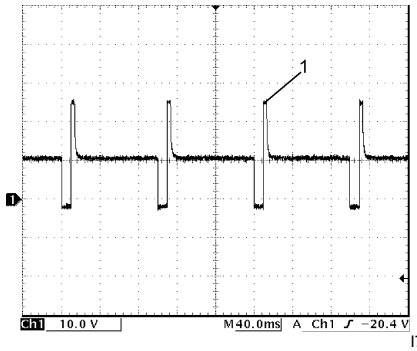
1. Engine: Racing	2. Engine: Idle speed

EVAP canister purge valve signal

Channel	Probe	Terminal No.
1	+	C01-55
	–	C01-14

Measurement condition

- EVAP canister purge valve: 10% open (using “Active Test” of SUZUKI scan tool)



I7V20A111065-02

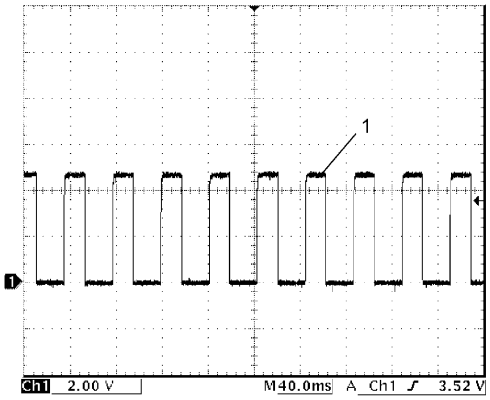
VSS signal

VSS signal (1)

Channel	Probe	Terminal No.
1	+	C01-49
	–	C01-14

Measurement condition

- Ignition: “ON”
- Lift up vehicle until all 4 tires rotate smoothly and rotate tire by hand.



I9R90A111017-03

Throttle actuator signal

Throttle actuator signal (Open) (1):

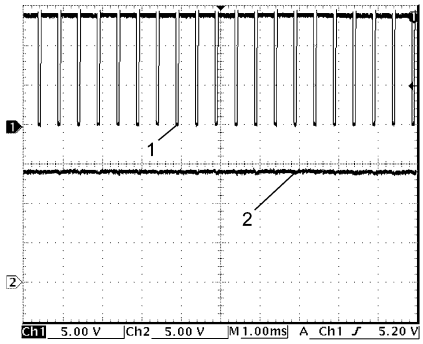
Channel	Probe	Terminal No.
1	+	C01-13
	–	C01-14

Throttle actuator signal (Close) (2):

Channel	Probe	Terminal No.
2	+	C01-26
	–	C01-14

Measurement condition

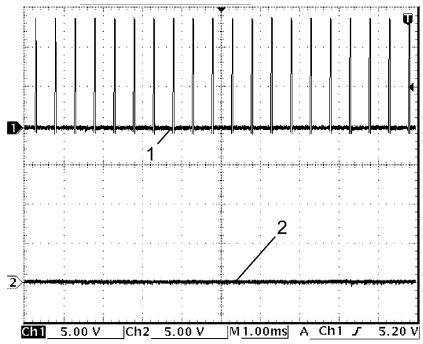
- Engine: Idle speed after warming up



IAV10A112025-01

Measurement condition

- Engine: Racing after warming up (Momentarily at accelerator pedal depressed)



IAV10A112026-01

CKP sensor signal and CMP sensor signal

CMP sensor signal (1):

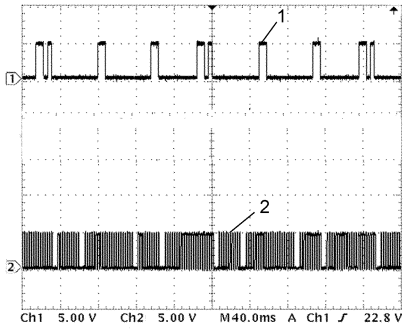
Channel	Probe	Terminal No.
1	+	C01-45
	–	C01-14

CKP sensor signal (3):

Channel	Probe	Terminal No.
2	+	C01-46
	–	C01-14

Measurement condition

- Engine: Idle speed after warming up



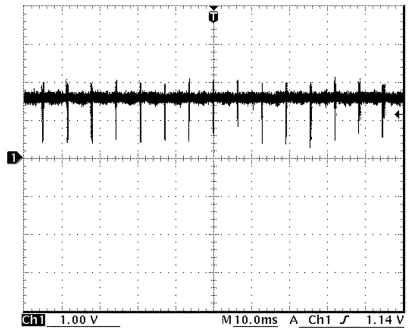
IDL70A110041-02

Knock sensor signal

Channel	Probe	Terminal No.
1	+	C01-24
	–	C01-14

Measurement condition

- Engine: Running at 4,000 rpm after warming up



I9P60A111041-01

Generator LIN communication signal

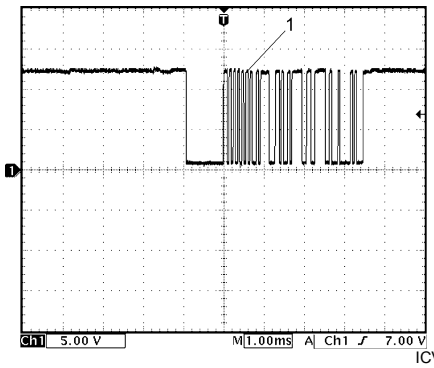
Generator LIN communication signal (1)

Channel	Probe	Terminal No.
1	+	C01-30
	–	C01-14

Measurement condition

- Engine: Idle speed after warming up
- Lighting switch: OFF
- A/C switch: OFF

- Blower speed selector: OFF
- Rear defogger switch: OFF
- Hazard switch: OFF



ICV00P111021-02

Fuel pump relay signal

Fuel pump relay signal (1)

Channel	Probe	Terminal No.
1	+	E01-39
	–	C01-14

Ignition signal (2)

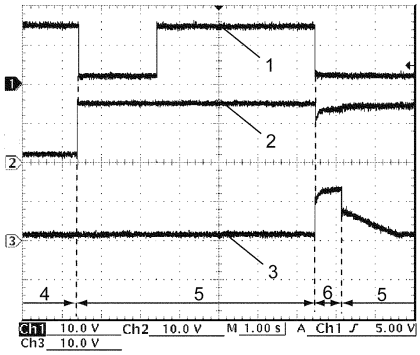
Channel	Probe	Terminal No.
2	+	E01-41
	–	C01-14

Starting motor control relay signal (3)

Channel	Probe	Terminal No.
3	+	E01-27
	–	C01-14

Measurement condition

- Ignition: “OFF” → “ON” → “START”



IAV10A112027-01

4. Ignition: OFF	6. Ignition: START
5. Ignition: ON	

CAN communication signal

CAN communication signal (High) (1):

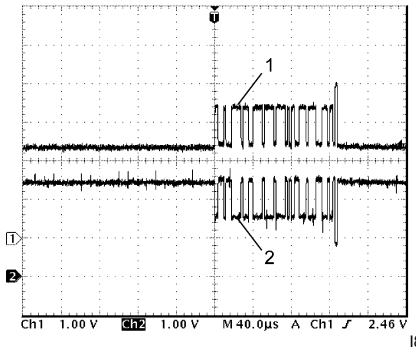
Channel	Probe	Terminal No.
1	+	E01-16
	+	C01-38
	–	C01-14

CAN communication signal (Low) (2):

Channel	Probe	Terminal No.
2	+	E01-15
	+	C01-37
	–	C01-14

Measurement condition

- Engine: Stop
- Ignition: “ON”

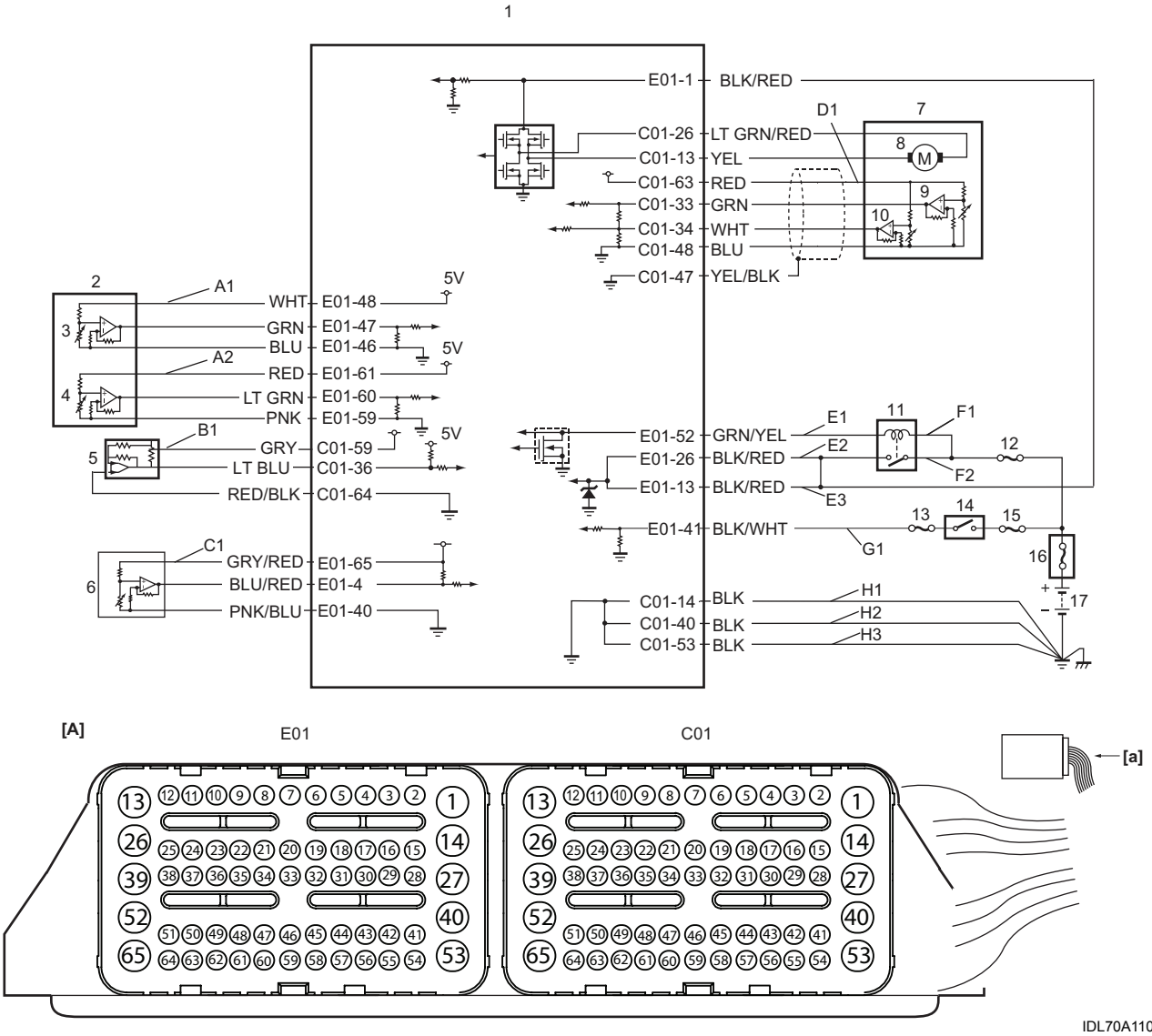


I8C50B111041-01

ECM Power Supply and Ground Circuit Check

AENDL70A1104064

Circuit Diagram



IDL70A110032-03

[A]: ECM connector (View: [a])	G1: Ignition “ON” signal circuit	8. Throttle actuator
A1: APP sensor (main) power supply circuit	H1: ECM ground circuit 1	9. TP sensor (main)
A2: APP sensor (sub) power supply circuit	H2: ECM ground circuit 2	10. TP sensor (sub)
B1: MAP sensor power supply circuit	H3: ECM ground circuit 3	11. Main relay
C1: A/C refrigerant pressure sensor power supply circuit	1. ECM	12. “FI” fuse
D1: TP sensor power supply circuit	2. APP sensor	13. “IG COIL” fuse
E1: Main relay drive circuit	3. APP sensor (main)	14. Ignition switch
E2: Main power supply circuit 2	4. APP sensor (sub)	15. “IGN” fuse
E3: Main power supply circuit 1	5. MAP sensor	16. Main fuse box
F1: Main relay power supply circuit (coil side)	6. A/C refrigerant pressure sensor	17. Battery
F2: Main relay power supply circuit (switch side)	7. Throttle body assembly	

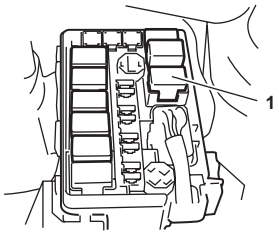
Circuit Description

When ignition is set to “ON”, the main relay turns ON (contacts close) and the main power is supplied to ECM. ECM then supplies 5 V power to the following sensors: A/C refrigerant pressure sensor, APP sensor, TP sensor and MAP sensor.

Troubleshooting

NOTE

- **Before troubleshooting, be sure to read “Precautions for ECM Circuit Inspection” under “Precautions for Engine” in Section 1 (Page 1-1).**
- **Before performing, be sure to confirm that related fuses of ECM power circuit have not blown out. If any fuse has blown out, replace the fuse and check circuits connected to the blown fuse for short circuit to ground.**

Step	Action	Yes	No
1	**Battery check** 1) Check that battery voltage is 12 V or more. *Is check result OK?*	Go to Step 2.	Check battery and generator referring to “Battery Inspection” in Section 1J (Page 1J-3) and “Generator Test” in Section 1J (Page 1J-4).
2	**Main relay power supply check** 1) With ignition “OFF”, remove main relay (1) from individual circuit fuse box No.1.  IDL70A110034-01 2) Check for proper terminal connection to main relay connector. 3) If connections are OK, set ignition “ON”. 4) Check that voltage between “F1” and “F2” circuit and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Check that “FI” fuse has not blown. If check result is OK, repair or replace defective wire harness.
3	**Main relay check** 1) Check main relay. ☞(Page 1C-10) *Is check result OK?*	Go to Step 4.	Replace main relay.
4	**Ignition switch circuit check** 1) When ignition is “OFF”, install main relay to individual circuit fuse box No.1. 2) Disconnect “C01” and “E01” connectors from ECM. 3) Check for proper terminal connection to “C01” and “E01” connectors. 4) If connections are OK, set ignition “ON”. 5) Check that voltage between “G1” and ground is battery voltage. *Is check result OK?*	Go to Step 5.	Check that “IG COIL” fuse has not blown. If check result is OK, replace defective wire harness.
5	**Main relay drive circuit check** 1) Set ignition “OFF”. 2) Check that voltage between “E1” and ground is battery voltage. *Is check result OK?*	Go to Step 6.	Repair or replace defective wire harness.

Step	Action	Yes	No
6	**Main power supply circuit check** 1) Using service wire, ground “E1”. 2) Set ignition “ON”. 3) Check that voltage between each of “E2” and “E3” circuit and ground is battery voltage. *Is check result OK?*	Go to Step 7.	Repair defective wire harness.
7	**ECM ground circuit check** 1) Set ignition “OFF”. 2) Check that resistance between each of “H1”, “H2” and “H3” circuit and ground is less than 1 Ω. *Is check result OK?*	Go to Step 8.	Repair defective wire harness.
8	**Sensor power supply circuit check** 1) When ignition is “OFF”, connect “C01” and “E01” connectors from ECM. 2) Disconnect connectors from APP sensor, MAP sensor, electric load current sensor, throttle body assembly and A/C refrigerant pressure sensor. 3) Check for proper terminal connection to each sensor connector. 4) If connections are OK, set ignition “ON”. 5) Check that voltage between each of the following circuits and ground is approx. 5 V. • A1 • A2 • B1 • C1 • D1 *Is check result OK?*	ECM power supply and ground circuit is in good condition.	Check wiring harness for open, short circuit to battery and short circuit to ground. If wiring harness is in good condition, replace ECM and recheck ECM power supply and ground circuit. ☞(Page 1C-1)

Repair Instructions

Idle Speed and IAC Throttle Valve Opening Inspection

AENDL70A1106001

Before idle speed check, make sure of the following.

- Lead wires and hoses of electronic fuel injection and engine and emission control systems are connected securely.
- Valve lash is checked according to maintenance schedule.
- Ignition timing is within specification.
- All electrical systems (wipers, heater, lights, A/C, etc.) are OFF.
- Air cleaner has been properly installed and is in good condition.
- There is no air abnormally drawn in from air intake system.
- There is no obstruction in PCV valve or its hoses.
- There are no DTCs in ECM.
- The following items are turned OFF as checked using “Data List” mode of scan tool.
  - A/C Comp Relay
  - A/C Switch
  - Blower Fan
  - Brake Switch
  - Electric Load

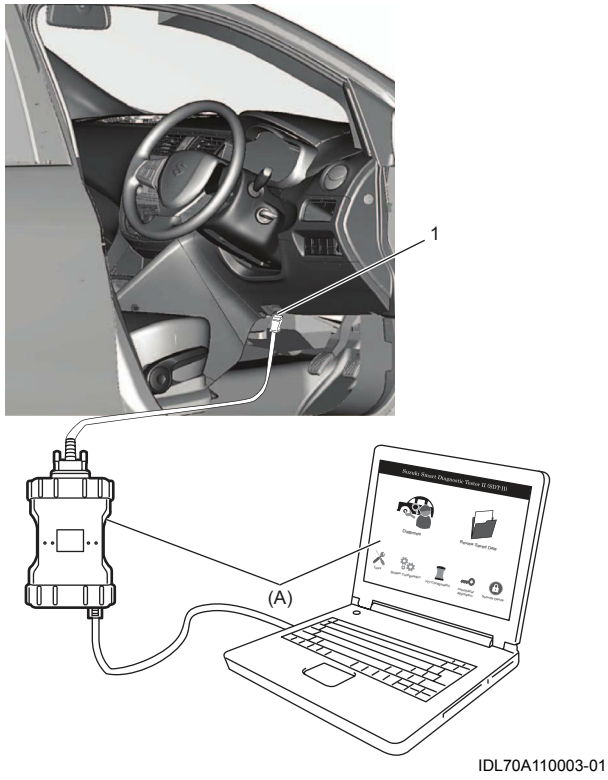
After confirming all items, check idle speed and IAC throttle opening as follows.

NOTE

Before starting engine, place gearshift lever in “Neutral” for M/T and AMT vehicles, apply parking brake and block drive wheels.

1) With ignition “OFF”, connect SUZUKI scan tool to DLC (1).

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70A110003-01

2) Warm up engine to normal operating temperature.
3) Check engine idle speed and “IAC throttle opening” using “Data List” mode on scan tool.
4) If check result is not as specified, check engine idle speed referring to “Improper engine idling or engine fails to idle” under “Engine Symptom Diagnosis” (Page 1A-32).

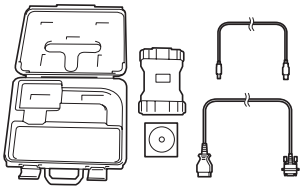
Engine idle speed
M/T model:
- **A/C OFF: 650 to 750 rpm (IAC throttle opening: around 20%)**
- **A/C ON: 800 to 900 rpm (IAC throttle opening: around 20%)**

AMT model:
- **A/C OFF: 650 to 750 rpm (IAC throttle opening: around 20%)**
- **A/C ON: 800 to 900 rpm (IAC throttle opening: around 20%)**

Special Tools and Equipment

Special Tool

AENDL70A1108001

SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 1A-19) / ☞(Page 1A-20) / ☞(Page 1A-100)		

Aux. Emission Control Devices

Diagnostic Information and Procedures

EVAP Canister Purge System Inspection

AENDL70A1204001

⚠ WARNING

Do not use mouth to apply vacuum to EVAP canister purge valve. Fuel vapor is harmful. Use a hand vacuum pump to apply vacuum.

NOTICE

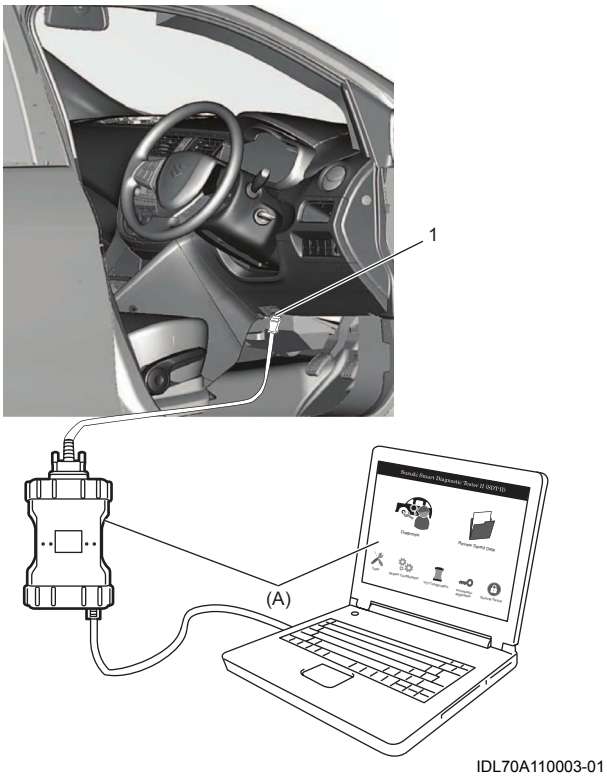
If excessive vacuum is applied, the EVAP canister purge valve may be damaged. Do not exceed a vacuum of –66 kPa (–0.67 kgf/cm^2, –9.57 psi, –0.66 bar).

1) Prepare to operate EVAP canister purge valve as follows.
   - Using SUZUKI scan tool:
     a. Connect SUZUKI scan tool to DLC (1) with ignition “OFF”.
     b. With ignition “ON”, clear DTC and select “Engine / Active Test” mode on SUZUKI scan tool.

        Special tool
        (A): SUZUKI scan tool (Suzuki SDT-II)

NOTE

EVAP canister purge valve is operated using scan tool as follows.
- **EVAP canister purge valve is OFF: 0%**
- **EVAP canister purge valve is ON: 100%**

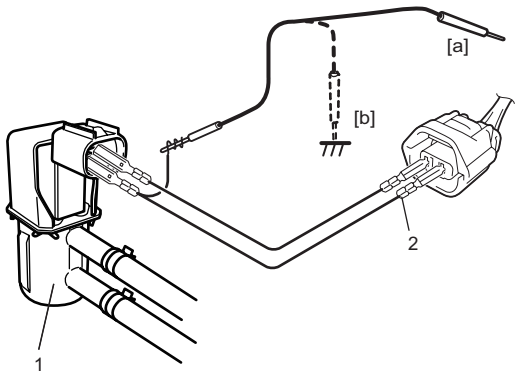


IDL70A110003-01

   - Using service wire:
     a. Connect service wire (2) between EVAP canister purge valve and EVAP canister purge valve connector with ignition “OFF”.
     b. Set ignition “ON”.

NOTE

EVAP canister purge valve (1) is operated using service wire as follows.
- **EVAP canister purge valve is OFF: [a]: Unground “BLU/BLK” harness side terminal of EVAP canister purge valve.**
- **EVAP canister purge valve is ON: [b]: Ground “BLU/BLK” harness side terminal of EVAP canister purge valve.**

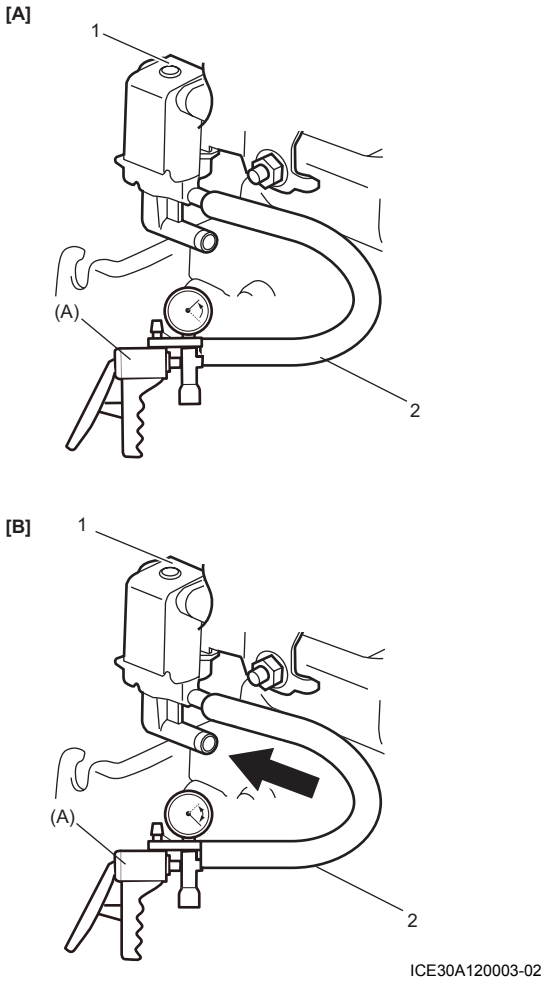


I8C50A120003-01

2) Set ignition “OFF”.
3) Disconnect vacuum hose (2) from intake manifold and purge hose from EVAP canister purge valve (1).
4) Install special tool to vacuum hose.

Special tool
(A): 09917M47011

5) Set ignition “ON”.
6) Check EVAP canister purge valve operation as follows.
   a) Check that vacuum of –60 kPa (–0.6 kgf/cm^2, –8.7 psi, –0.6 bar) can be applied when EVAP canister purge valve is turned OFF [A].
   b) Check that no vacuum can be applied when EVAP canister purge valve is turned ON [B].
7) If faulty condition is found, check the following items.
   - Wire harness and connections
   - EVAP canister purge valve: ☞(Page 1B-3)
   - Vacuum hoses: ☞(Page 1B-4)

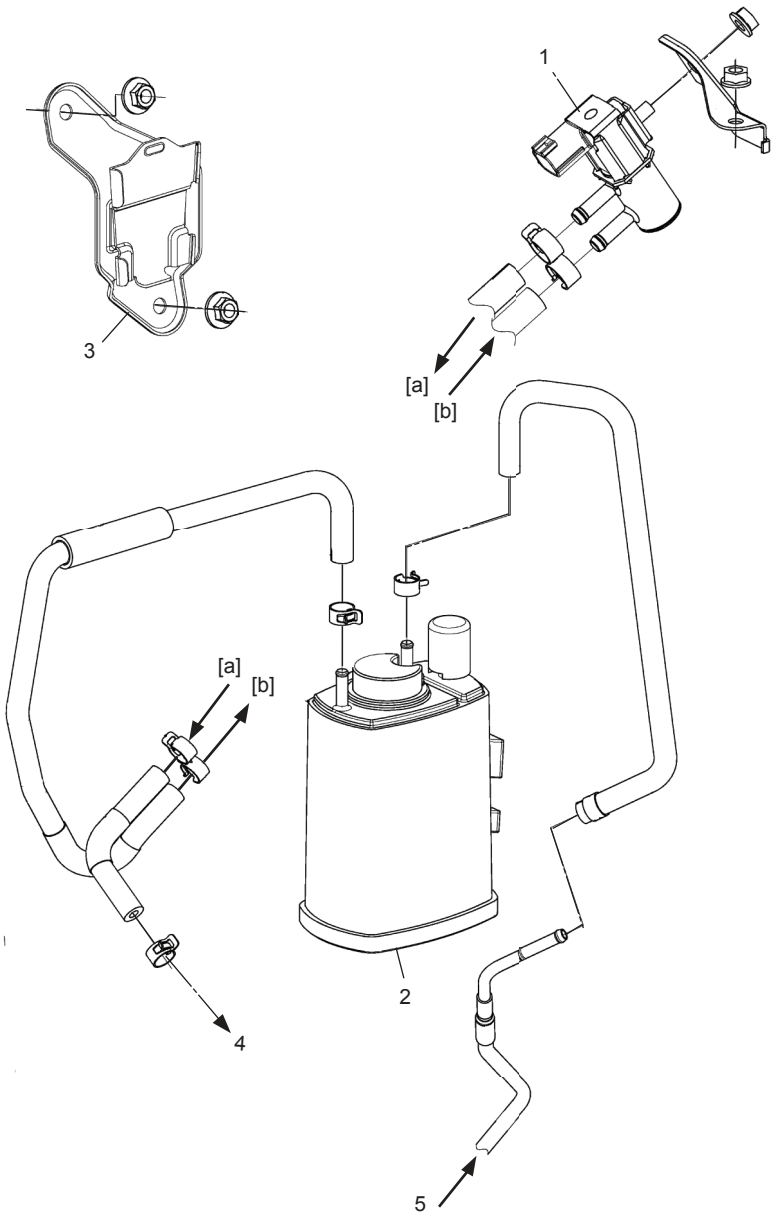


ICE30A120003-02

Repair Instructions

EVAP System Components

AENDL70A1206001



IDL70A120001-03

[a]: Hose (Purge valve to Intake manifold)	2. EVAP canister	5. From fuel tank
[b]: Hose (Canister to Purge valve)	3. EVAP canister bracket	
1. EVAP canister purge valve	4. To intake manifold	

EVAP Canister Purge Valve Inspection

AENDL70A1206002

⚠ WARNING

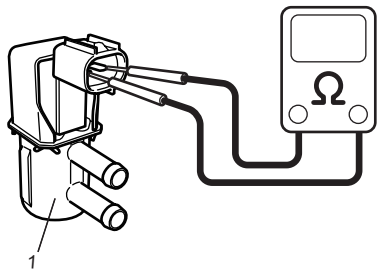
Do not use mouth to apply vacuum to EVAP canister purge valve. Fuel vapor is harmful. Use a hand vacuum pump to apply vacuum.

NOTICE

If excessive vacuum is applied, the EVAP canister purge valve may be damaged. Do not exceed a vacuum of –66 kPa (–0.67 kgf/cm², –9.57 psi, –0.66 bar).

1) With ignition "OFF", disconnect connector and vacuum hoses from EVAP canister purge valve (1).
2) Remove purge valve from air cleaner assembly.
3) Check resistance between two terminals of purge valve.
   If faulty condition is found, replace purge valve.

EVAP canister resistance
30 – 34 Ω at 20 °C (68 °F)

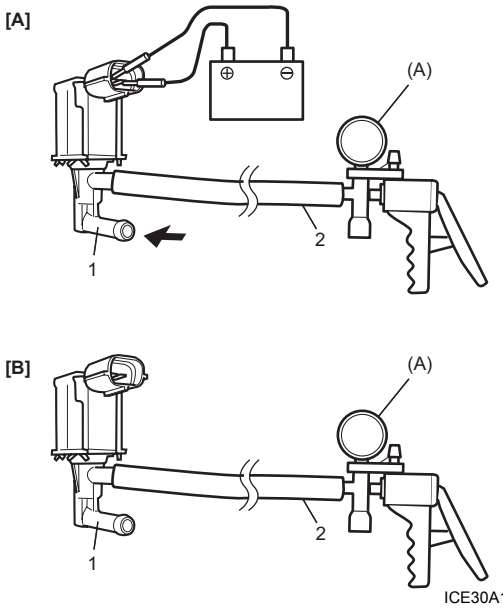


I8T401122005-01

4) Check purge valve operation as follows.
If faulty condition is found, replace purge valve.
   a) Install special tool and vacuum hose (2) to purge valve (1).

      Special tool
      (A): 09917M47011

   b) When connecting 12 V battery to purge valve terminals, check that vacuum (–60 kPa, –0.6 kgf/cm^2, –8.7 psi, –0.6 bar) cannot be applied to purge valve.
   c) When not connecting 12 V battery to purge valve terminals, check that vacuum (–60 kPa, –0.6 kgf/cm^2, –8.7 psi, –0.6 bar) can be applied to purge valve.



ICE30A120004-01

[A]: Purge valve ON	[B]: Purge valve OFF

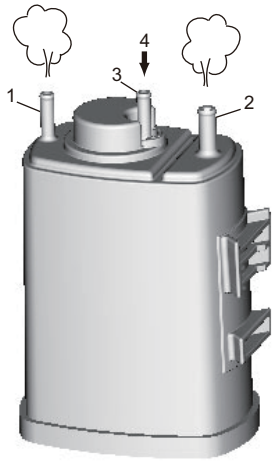
EVAP Canister Inspection

AENDL70A1206003

⚠ WARNING

If you suck at the nozzle on the EVAP canister by mistake, you will inhale harmful fuel vapor that may be present inside the canister.
Never suck at any of the nozzles on the EVAP canister.

1) Check outside of EVAP canister visually.
2) Disconnect vacuum hoses from EVAP canister.
3) Check that there is no restriction of flow through purge port (1) and air port (2) when air is blown (4) into tank port (3).



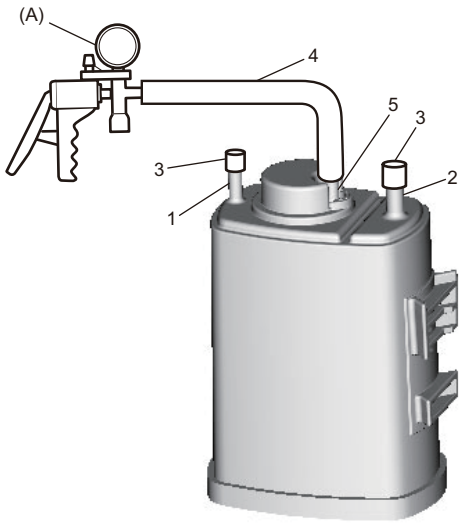
I9P60A121003-01

4) Check EVAP canister for air leaks according to the following procedure.
   a) Plug purge port (1) and air port (2) using rubber plug (3).
   b) Install hose (4) and special tool to tank port (5).

      Special tool
      (A): 09917M47011

   c) Using special tool, apply specified vacuum pressure to EVAP canister for one minute.

      EVAP canister holding vacuum pressure
      10 kPa (0.1 kgf/cm^2, 1.45 psi, 0.1 bar)



I9P60A121005-01

If faulty condition is found, replace EVAP canister.

EVAP Connection Hose Inspection

AENDL70A1206004

Check hoses for connection, leakage, clogging and deterioration.
Replace hose if defective.

PCV Hose Inspection

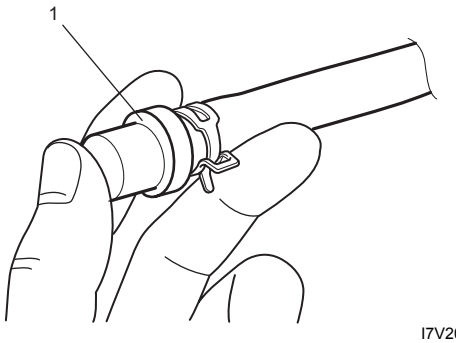
AENDL70A1206005

Check hoses for connection, leakage, clogging and deterioration.
Replace hose if defective.

PCV Valve Inspection

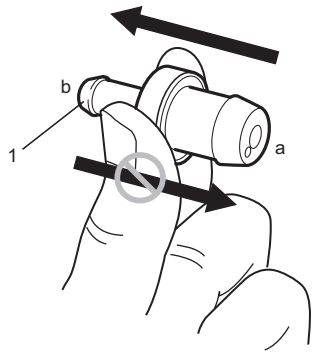
AENDL70A1206006

1) Disconnect PCV valve from cylinder head cover and install plug to head cover hole.
2) Run engine at idle.
3) Place your finger over end of PCV valve (1) to check for vacuum.
   If no vacuum is felt, check valve for clogging.
   Replace PCV valve if defective.



I7V20A121009-01

4) Stop engine and remove PCV valve (1).
   Install clean hose to valve and check that there is air flow when blowing air into hose from “a” to “b” and that there is no air flow when blowing air into hose from “b” to “a” as shown in figure.
   If faulty condition is found, replace PCV valve.

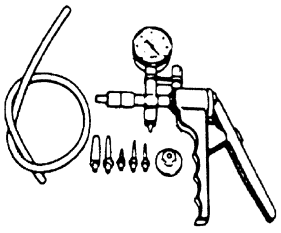
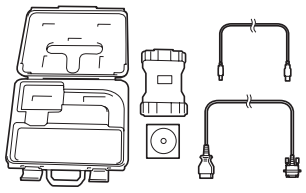


I7V10A121002-01

Special Tools and Equipment

Special Tool

AENDL70A1208001

09917M47011 Vacuum pump gauge ☞(Page 1B-2) / ☞(Page 1B-4) / ☞(Page 1B-4)		SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 1B-1)	

Engine Electrical Devices

Repair Instructions

ECM Removal and Installation

AENDL70A1306001

NOTICE

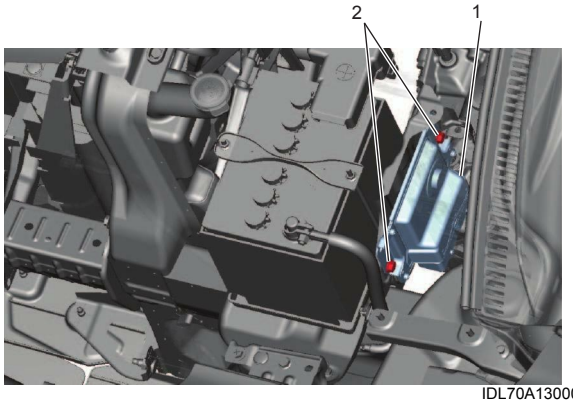
The ECM is a precision unit and can be easily damaged.
Handle the ECM carefully and do not expose it to large shock.

NOTE

After ECM is replaced with new one, perform "Procedure after ECM Replacement" (Page 1C-1).

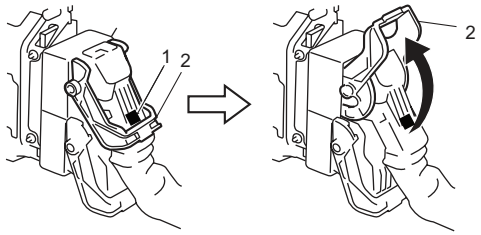
Removal

1) Disconnect negative (–) cable at battery.
2) Remove ECM (1) from battery bracket by removing mounting bolts (2).



IDL70A130001-02

3) Press lug (1) and turn lock lever (2) in direction of arrow until it stops.
Then, disconnect connectors from ECM.

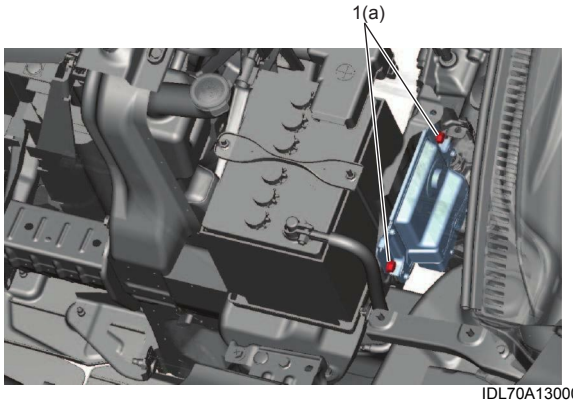


IDL70A130003-01

Installation

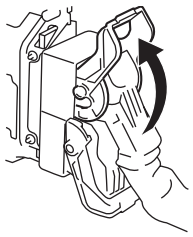
Reverse removal procedure noting the following points.

- Tighten ECM mounting bolts.



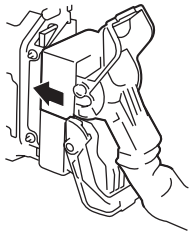
IDL70A130002-01

- Connect connectors to ECM as follows:
  a. Make sure that lock lever of ECM connectors is in unlock position.



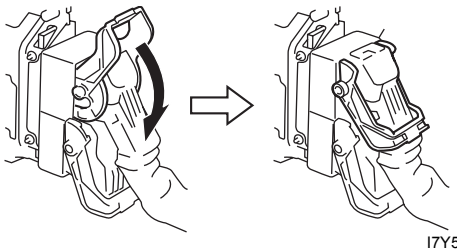
I7Y50A130004-01

  b. Insert ECM connectors to ECM until they stop with lock lever in unlocked position.



I7Y50A130005-01

  c. Pull lock lever down to lock ECM connectors securely.



I7Y50A130006-01

Procedure after ECM Replacement

AENDL70A1306002

After ECM is replaced with new one, perform the following procedure:

1) Perform "Immobilizer key Registration" mode of SUZUKI scan tool.

Refer to “SUZUKI Immobilizer Control System Operator’s Manual”.

2) Perform control system calibration. ☞(Page 1C-3)

Electric Throttle Body Assembly On-Vehicle Inspection

AENDL70A1306003

⚠ CAUTION

If you touch the throttle valve with finger when the ignition is “ON” and the accelerator pedal is depressed, finger may be pinched in the gap between the throttle valve and throttle body housing if the accelerator pedal is released.
Never touch throttle valve with finger when the ignition is “ON” and accelerator pedal is depressed.

NOTICE

Failure to take proper precautions when handling the electric throttle body assembly may lead to malfunction of the electric throttle body assembly or damage to its components.

- **Do not disassemble electric throttle body assembly.**
- **Do not drop or otherwise expose the electric throttle body assembly to large shock. Any electric throttle body that has received large shock should be replaced.**
- **Keep the throttle body housing and/or throttle valve free of dust, metallic particles or other foreign materials.**
- **Do not apply undue forces to throttle valve when checking operation of throttle valve or performance of TP sensor; otherwise the plastic gears in the throttle valve actuator will be damaged.**

NOTE

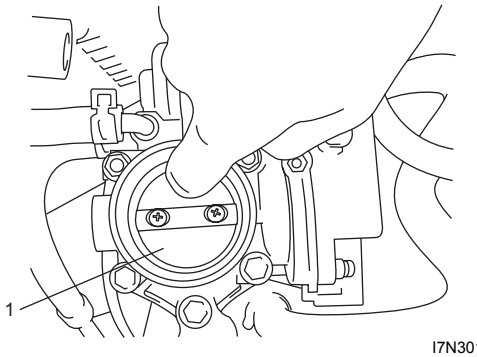
After replacing electric throttle body assembly, calibration of throttle valve position is required. ☞(Page 1C-3)

Throttle Valve Visual Check

1) Set ignition “OFF”.
2) Remove air cleaner assembly. ☞(Page 1D-5)
3) Check that there is no foreign material caught between throttle valve and throttle body housing. If foreign materials are present, remove throttle body and clean its inside thoroughly. ☞(Page 1D-6)

Throttle Valve Operation Check

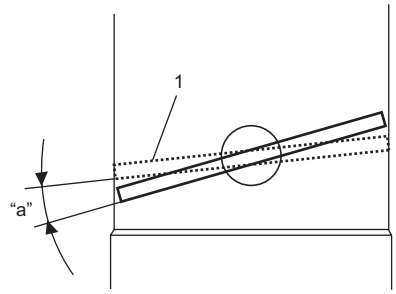
1) Set ignition “OFF”.
2) Remove air cleaner assembly. ☞(Page 1D-5)
3) Check throttle valve operation as follows.
   If faulty condition is found, replace throttle body. ☞(Page 1D-6)
   a) Check that throttle valve (1) moves smoothly to both fully closed position and fully open position when pressed manually.



I7N301132006-01

   b) Check throttle valve returns to default position when finger pressure on throttle valve is released at both fully closed position and fully open position.

Throttle valve default position “a”:
8.6° from fully closed position (1)

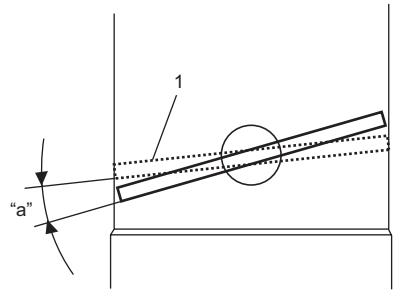


I7V20A131002-04

Electric Throttle Body System Operation Check

1) Remove air cleaner assembly. ☞(Page 1D-5)
2) Set ignition “ON”.
3) Check electric throttle body system as follows. If faulty condition is found, go to Step 4).
   a) Depress accelerator pedal gradually and check that throttle valve moves smoothly until it opens fully.
   b) Release accelerator pedal and check that throttle valve moves back to applicable position.

Throttle valve opening angle “a”:
3 to 15° from completely closed position (1)



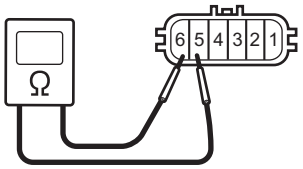
I7V20A131002-04

4) Check the following points.
If check results are satisfactory, replace electric throttle body assembly.
- Wire harness and connections
- APP sensor ☞(Page 1C-4)
- TP sensor: “TP Sensor Performance Check” (Page 1C-3).
- Throttle motor: “Throttle Motor Check” (Page 1C-3).

Throttle Motor Check

1) Set ignition “OFF”.
2) Disconnect connector from electric throttle body assembly.
3) Measure resistance between terminal “5” and terminal “6” of electric throttle body assembly.
If faulty condition is found, replace electric throttle body assembly. ☞(Page 1D-6)

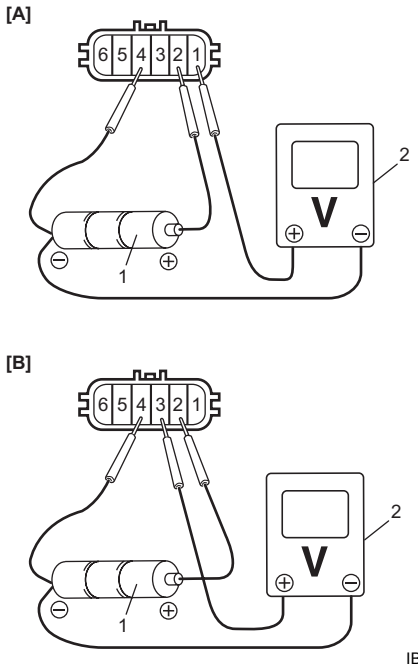
Throttle motor resistance
0.3 to 100 Ω at 20 °C (68 °F)



IA1J0P130058-01

TP Sensor Performance Check

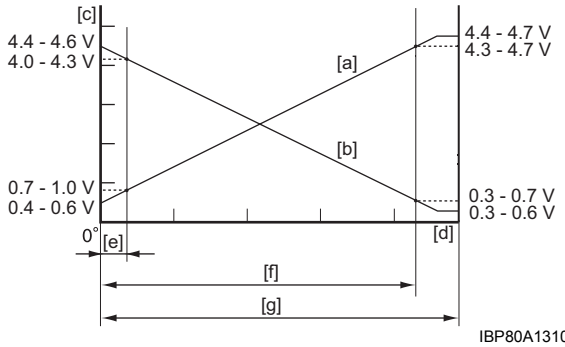
1) Set ignition “OFF”.
2) Remove air cleaner assembly. ☞(Page 1D-5)
3) Disconnect connector from electric throttle body assembly.
4) Check output voltage of TP sensor main and sub signals as follows.
If faulty condition is found, replace electric throttle body. ☞(Page 1D-6)
   a) Arrange 3 new 1.5 V batteries (1) in series, and check that total voltage is 4.5 to 5.0 V.
   b) Connect voltmeter (2) and batteries to TP sensor as shown in figure.



IBV10A131001-01

[A]: TP sensor (main)	[B]: TP sensor (sub)

   c) Check that voltage varies depending on throttle opening angle as the following graph while throttle valve is opened and closed manually.



IBP80A131003-01

[a]:	TP sensor (main) voltage
[b]:	TP sensor (sub) voltage
[c]:	TP sensor output voltage
[d]:	Throttle valve opening
[e]:	Position where throttle valve is open by 8.6° from fully closed position (default position)
[f]:	Angle obtained when accelerator pedal is depressed fully (86°)
[g]:	Angle obtained when throttle valve is fully opened manually (98°)

Electric Throttle Control System Calibration

AENDL70A1306004

NOTE

If the service described under “Description of Electric Throttle Control System Calibration” in Section 1A (Page 1A-5) is performed, calibrate electric throttle control system as follows.

1) It is necessary to perform calibration when carrying out any of the “job details” listed below. The calibration procedures differ depending on the job

being carried out. Select the proper calibration procedure from the table below and then perform calibration.

Job details	Procedure
• ECM replacement • Clearance of DTC(s) related to ECM • Electric throttle body assembly replacement.	[A]
• Accelerator pedal assembly (incorporating APP sensor) replacement.	[B]

2) Perform selected calibration procedure as follows.
Calibration procedure [A]:
   a) Set ignition “ON” for 5 sec. or more.
   b) Start engine.
   c) Turn off A/C and all electrical loads.
   d) Warm up engine at idle speed to normal operating temperature.

Calibration procedure [B]:
   a) Clear DTC. ☞(Page 1A-20)
   b) Set ignition “OFF”.
   c) Set ignition “ON” for 5 sec. or more.
   d) Start engine.
   e) Turn off A/C and all electrical loads.
   f) Warm up engine at idle speed to normal operating temperature.

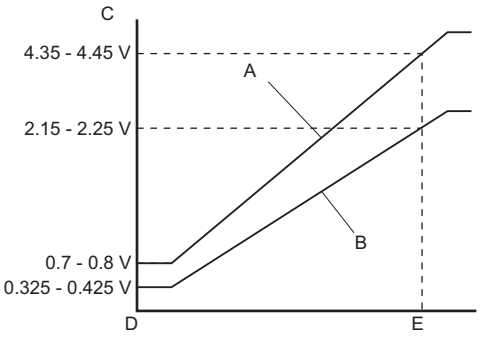
APP Sensor On-Vehicle Inspection

AENDL70A1306005

NOTE

- **After replacing accelerator pedal assembly (incorporating APP sensor), calibrate throttle valve position. ☞(Page 1C-3)**

1) Check that accelerator pedal assembly (incorporating APP sensor) has been mounted to vehicle body properly (no pinched floor carpet, etc.). If mounting is improper, reinstall accelerator pedal assembly (incorporating APP sensor). ☞(Page 1C-4)
2) Connect scan tool to DLC with ignition switch turned OFF.
3) Display “Data List” mode.
4) Check that voltage varies depending on accelerator position as the following graph.
If faulty condition is found, check the following items.
   - Wire harness and connections
   - APP sensor ☞(Page 1C-5)



IDL70A130011-02

A:	APP sensor (main) voltage
B:	APP sensor (sub) voltage
C:	Voltage
D:	Idle position of accelerator pedal
E:	Fully depressed position of accelerator pedal

Accelerator Pedal Assembly (Incorporating APP Sensor) Removal and Installation

AENDL70A1306006

NOTICE

Failure to take proper precautions when handling the APP sensor assembly may lead to malfunction of the APP sensor.

- **Do not drop or otherwise expose APP sensor assembly to large shock. Any APP sensor assembly that has received large shock must be replaced.**
- **Keep the sensor section of the APP sensor assembly away from water.**

NOTE

- **After replacing accelerator pedal assembly (incorporating APP sensor), calibrate throttle valve position. ☞(Page 1C-3)**

Removal

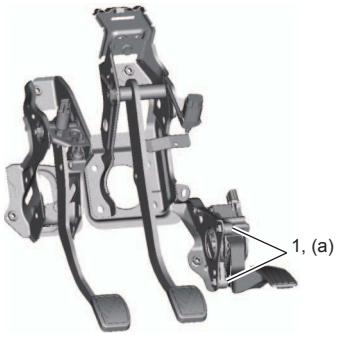
1) Disconnect negative (–) cable at battery.
2) Disconnect connector from accelerator pedal assembly (incorporating APP sensor).
3) Remove accelerator pedal assembly (incorporating APP sensor) from its bracket.

Installation

Reverse removal procedure for installation noting the following.

- Tighten accelerator pedal assembly bolts (1) to specified torque.

Tightening torque
Accelerator pedal assembly bolt (a): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)



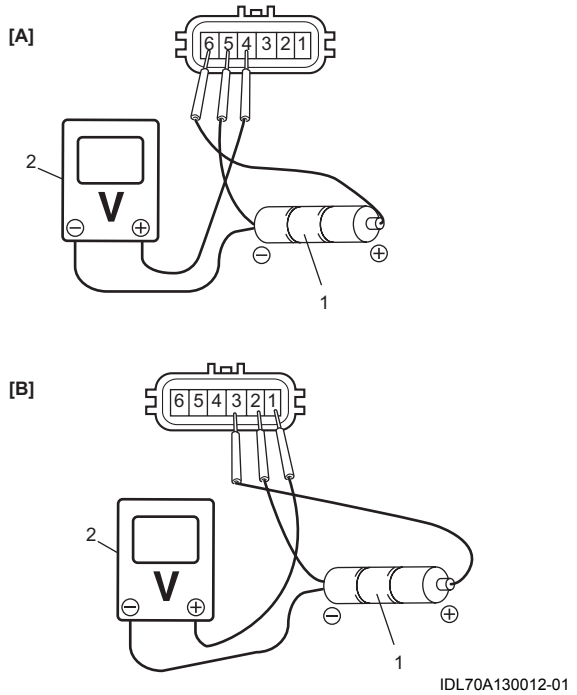
IDL70A130005-01

- Connect connector to accelerator pedal assembly (incorporating APP sensor) securely.

APP Sensor Inspection

AENDL70A1306007

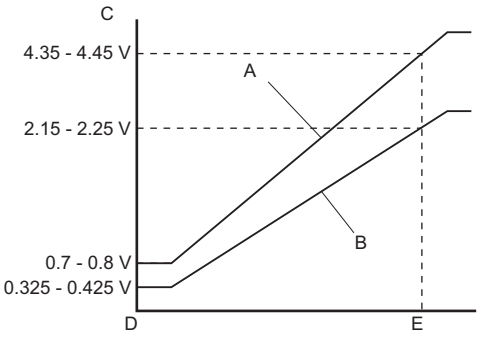
1) Remove accelerator pedal assembly (incorporating APP sensor). ☞(Page 1C-4)
2) Check APP sensor output voltage as follows. If faulty condition is found, replace accelerator pedal assembly (incorporating APP sensor). ☞(Page 1C-4)
   a) Arrange 3 new 1.5 V batteries (1) in series, and check that total voltage is 4.5 – 5.0 V.
   b) Connect voltmeter (2) and batteries to APP sensor as shown in figure.



IDL70A130012-01

[A]: APP sensor (main)	[B]: APP sensor (sub)

   c) Check that voltage varies depending on accelerator pedal stroke as the following graph.



IDL70A130011-02

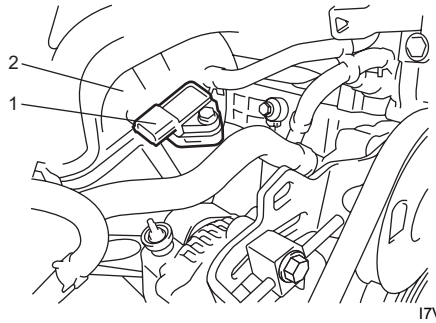
A:	APP sensor (main) voltage
B:	APP sensor (sub) voltage
C:	Voltage
D:	Accelerator pedal: Idle position
E:	Accelerator pedal: Fully depressed position

MAP Sensor Removal and Installation

AENDL70A1306008

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect connector of MAP sensor (1).
3) Remove MAP sensor from intake manifold (2).



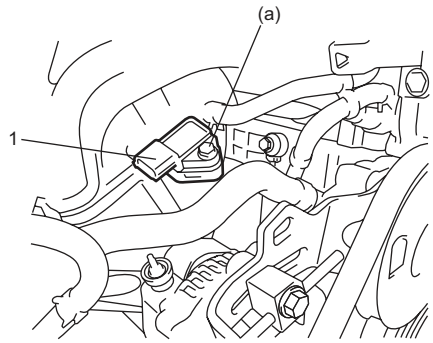
I7V20A131008-01

Installation

Reverse removal procedure noting the following point.

- Check that O-ring is free from damage.
- Tighten MAP sensor (1) to specified torque.

Tightening torque
MAP sensor (a): 11 N·m (1.2 kgf-m, 8.1 lbf-ft)



IDL70A130013-01

MAP Sensor Inspection

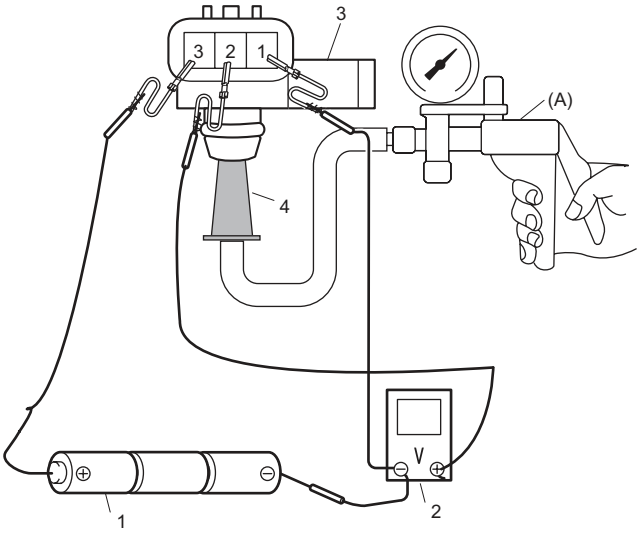
AENDL70A1306009

⚠ CAUTION

Applying more vacuum than –60 kPa (–0.6 kgf/cm², –8.7 psi, –0.6 bar) will damage MAP sensor.

1) Remove MAP sensor. ☞(Page 1C-5)
2) Check MAP sensor output voltage as follows. If faulty condition is found, replace MAP sensor. ☞(Page 1C-5)
   a) Arrange 3 new 1.5 V batteries (1) in series, and check that total voltage is 4.5 to 5.0 V.
   b) Connect voltmeter (2), special tool and batteries to MAP sensor (3) as shown in figure.

      Special tool
      (A): 09917M47011



IDL70A130004-01

4. Adapter included in special tool.

   c) Check that voltage drops gradually when vacuum is gradually applied with special tool.

NOTE

Environmental condition affects output voltage largely.
The sensor voltage below is reference value as measured under the following conditions.

- **Power supply voltage: 5 V**
- **Ambient temperature: 25 °C (77 °F)**
- **Atmospheric pressure: 115.0 kPa (1.17 kgf/cm², 14.7 psi, 1.01 bar)**

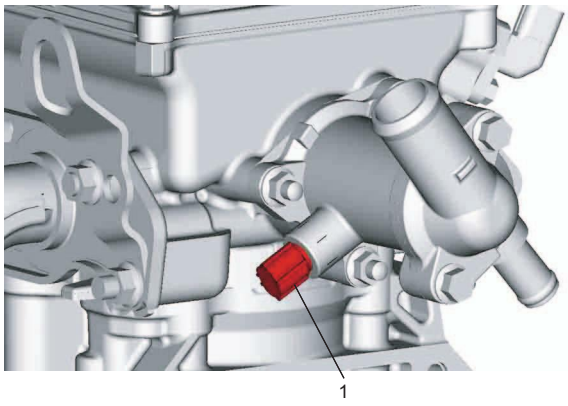
MAP sensor reference voltage
Atmospheric pressure: Approx. 4.5 V
Vacuum of –30 kPa (–0.3 kgf/cm², –4.35 psi, –0.3 bar): Approx. 3.3 V
Vacuum of –60 kPa (–0.6 kgf/cm², –8.70 psi, –0.6 bar): Approx. 2.2 V

ECT Sensor Removal and Installation

AENDL70A1306010

Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant. ☞(Page 1F-8)
3) Disconnect connector from ECT sensor.
4) Remove ECT sensor (1).



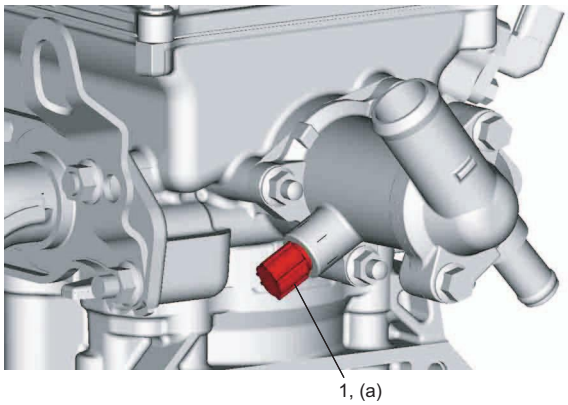
I8C50A130010-01

Installation

Reverse removal procedure noting the following.

- Check O-ring for damage and replace ECT sensor.
- Tighten ECT sensor (1) to specified torque.

Tightening torque
ECT sensor (a): 12 N·m (1.2 kgf-m, 9.0 lbf-ft)



I8C50A130011-01

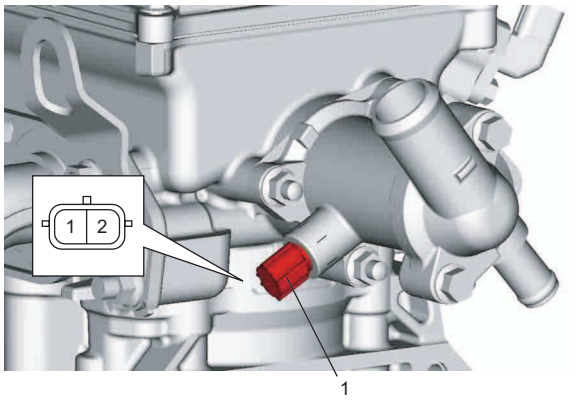
- Connect connector to ECT sensor.
- Refill cooling system. ☞(Page 1F-9)
- Check for coolant leakage. ☞(Page 1F-7)

ECT Sensor Inspection

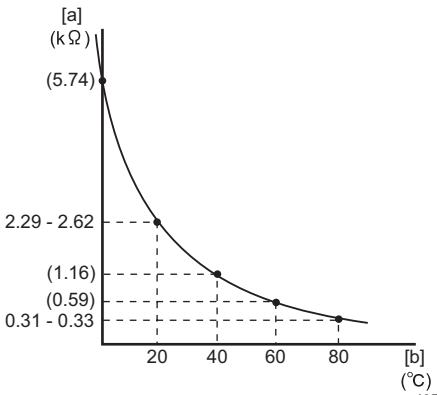
AENDL70A1306011

Using ohmmeter, check that resistance between terminals “1” and “2” varies depending on engine coolant temperature and check coolant temperature using Suzuki scan tool or CAN communication OBD generic scan tool.
If faulty condition is found, replace ECT sensor (1).

Special tool
: SUZUKI scan tool (Suzuki SDT-II)



I8C50A130012-01



I9P60A131005-04

[a]: Resistance	[b]: Temperature

HO2S-1 On-Vehicle Inspection

AENDL70A1306012

HO2S-1 Heater

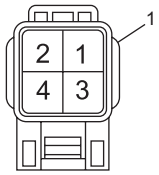
1) Disconnect HO2S-1 connector with ignition “OFF”.
2) Using ohmmeter, measure resistance of HO2S-1 connector (sensor side) of sensor heater between terminals “3” and “4” at sensor connector.
If faulty condition is found, replace HO2S-1. ☞(Page 1C-7)

NOTE

Temperature of sensor affects resistance value largely. Make sure that sensor heater is at specified temperature.

HO2S-1 heater resistance
5.0 to 6.4 Ω at 20 °C (68 °F)

HO2S-1



IBV10A131003-01

1. HO2S-1 connector (viewed from terminal side)

O2S-2 On-Vehicle Inspection

AENDL70A1306025

Inspect O2S-2 referring ☞(Page 1A-51)

HO2S-1 and O2S-2 Removal and Installation

AENDL70A1306013

Removal

⚠ WARNING

Touching exhaust system components when they are still hot may cause burns.
Check that the exhaust system has cooled down before removing the HO2S-1 or O2S-2.

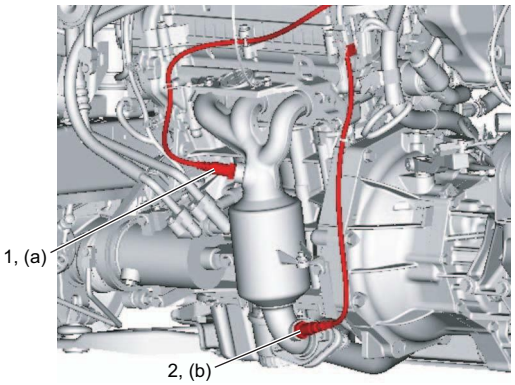
1) Disconnect negative (–) cable at battery.
2) Disconnect connector of HO2S-1 or O2S-2.
3) Remove HO2S-1 (1) or O2S-2 (2) from exhaust manifold.

Installation

Reverse removal procedure noting the following points.

- Tighten HO2S-1 (1) or O2S-2 (2) to specified torque.

Tightening torque
HO2S-1 (a): 45 N·m (4.5 kgf-m, 33.5 lbf-ft)
O2S-2 (b): 45 N·m (4.5 kgf-m, 33.5 lbf-ft)



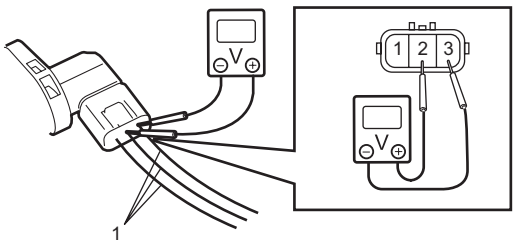
IBV10A131004-01

- After installation, check exhaust leakage from sensor with engine running.

CMP Sensor On-Vehicle Inspection

AENDL70A1306014

1) With ignition “OFF”, disconnect CMP sensor connector.
2) Connect service wires (1) between CMP sensor and CMP sensor connector as shown in figure.



IBC50A130003-01

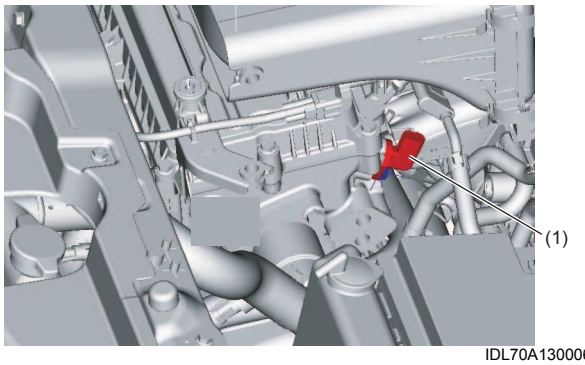
3) Set ignition “ON” and check that output voltage alternates between approx. 0 V and 5 V while turning crankshaft.

CMP Sensor Removal and Installation

AENDL70A1306015

Removal

1) Disconnect negative (–) cable at battery.
2) Remove air intake resonator No.1 and No.2. ☞(Page 1D-4)
3) Disconnect connector from intake CMP sensor (1).
4) Remove intake CMP sensor (1) from cylinder head.



IDL70A130006-01

Installation

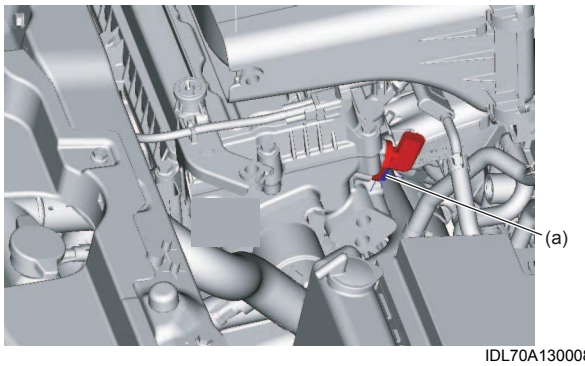
Reverse removal procedure noting the following points.

- Apply engine oil to O-ring of sensor.
- Tighten CMP sensor bolt to specified torque.

NOTE

The CMP sensor bolt is pre-coated with adhesive. If the bolt is reused, it may work loose.
Replace the CMP sensor bolt with a new one.

Tightening torque
CMP sensor bolt (a): 9.8 N·m (1.0 kgf-m, 7.2 lbf-ft)

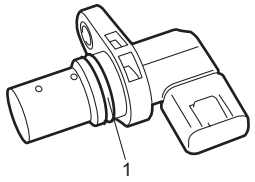


IDL70A130008-01

CMP Sensor Inspection

AENDL70A1306016

1) Remove intake CMP sensor and exhaust CMP sensor. ☞(Page 1C-8)
2) Check the following points.
   - O-ring (1) is free from damage.
   - End face of sensor and signal rotor teeth are free from any metal particles and damage.



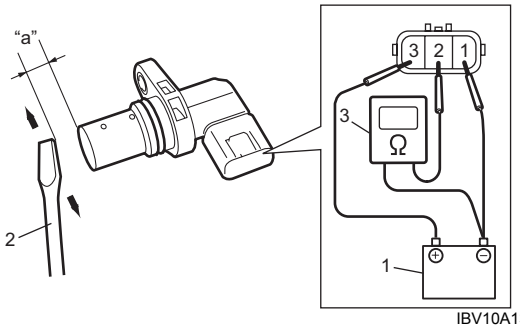
I7N301132017-01

3) Check CMP sensor as follows.
   If faulty condition is found, replace CMP sensor. ☞(Page 1C-8)
   a) Connect battery (1) and ohmmeter (3) to CMP sensor as shown in figure.
   b) Check that CMP sensor resistance varies as specified below by passing ferromagnetic material (iron) (2) in front of CMP sensor.

NOTE

Keep approximately 1 mm (0.03 in) gap “a” between ferromagnetic material (iron) and end face of CMP sensor.

CMP sensor resistance
Resistance alternates between 220 Ω or smaller (ON) and infinity (OFF)



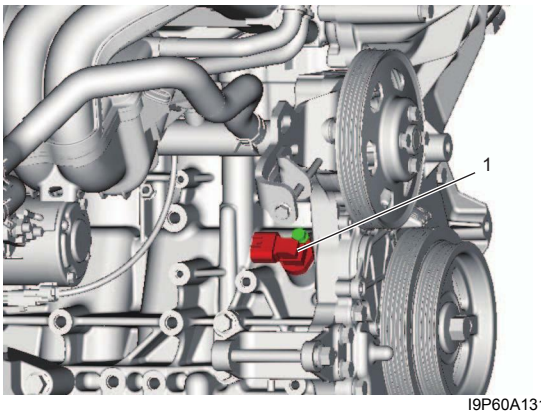
IBV10A131007-01

CKP Sensor Removal and Installation

AENDL70A1306017

Removal

1) Disconnect negative (–) cable at battery.
2) Remove generator. ☞(Page 1J-6)
3) Disconnect connector from CKP sensor.
4) Remove CKP sensor (1) from cylinder block.



I9P60A131017-01

Installation

Reverse removal procedure noting the following points.

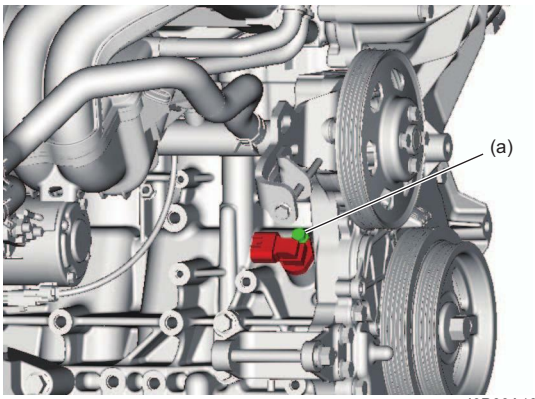
- Apply engine oil to O-ring of sensor.
- Tighten CKP sensor bolt to specified torque.

⚠ CAUTION

Be sure to use new bolts with pre-coated adhesive. Otherwise, bolts may loosen.

Tightening torque

CKP sensor bolt (a): 9.8 N·m (1.0 kgf-m, 7.2 lbf-ft)



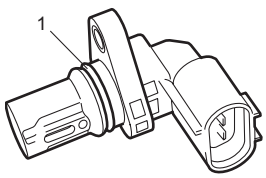
I9P60A131008-01

- Connect connector and fix wire harness with clamp securely.

CKP Sensor Inspection

AENDL70A1306018

1) Remove CKP sensor. ☞(Page 1C-8)
2) Check the following points.
   - O-ring (1) is free from damage.
   - End face of sensor and sensor plate teeth are free from any metal particles and damage.



I7N301132020-01

3) Check CKP sensor as follows.

If faulty condition is found, replace CKP sensor. ☞(Page 1C-8)

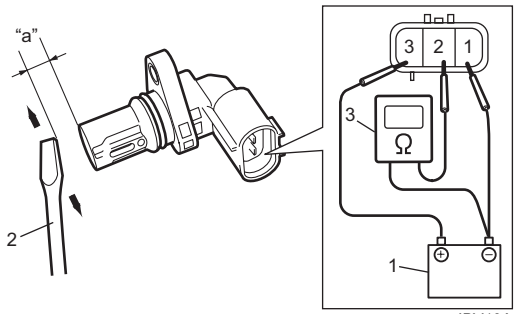
a) Connect battery (1) and ohmmeter (3) to CKP sensor as shown in figure.
b) Check that CKP sensor resistance varies as specified below by passing ferromagnetic material (iron) (2).

NOTE

Be sure to keep approximately 1 mm (0.03 in) gap "a" between ferromagnetic material (iron) and end face of CKP sensor.

CKP sensor resistance

Resistance alternates between 220 Ω or smaller (ON) and infinity (OFF)

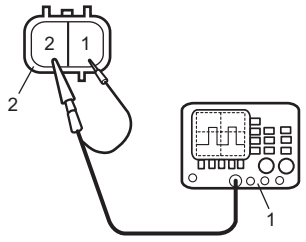


IBV10A131008-01

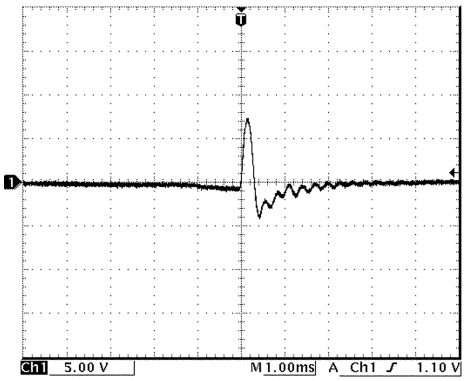
Knock Sensor On-Vehicle Inspection

AENDL70A1306019

1) Disconnect connector from knock sensor.
2) Connect oscilloscope (1) to knock sensor connector (2) as shown in figure.
3) Check that oscilloscope displays waveform like a one shown below when cylinder block is given a shock by plastic hammer.
   If faulty condition is found, replace knock sensor. ☞(Page 1C-10)



IBV10A131009-01



I9P60A131019-02

Knock Sensor Removal and Installation

AENDL70A1306020

Removal

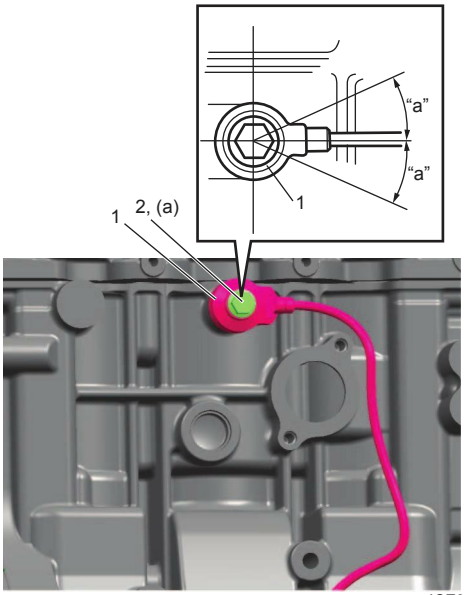
1) Disconnect negative (–) cable at battery.
2) Remove intake manifold. ☞(Page 1D-7)
3) Disconnect knock sensor connector.
4) Remove knock sensor (1) from cylinder block.

Installation

Reverse removal procedure noting the following point.

- Tighten knock sensor bolt (2) to specified torque.

Tightening torque
Knock sensor bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



ICE30A130025-05

"a" 22.5°

Engine and Emission Control System Relay Inspection

AENDL70A1306021

Refer to "Control Relay Inspection" in Section 10B (Page 10B-32).

IAT Sensor On-Vehicle Inspection

AENDL70A1306022

NOTE

Before performing this inspection, be sure to read "Precautions for ECM Circuit Inspection" under "Precautions for Engine" in Section 1 (Page 1-1).

Check that IAT sensor signal is outputted properly. ☞(Page 1A-87)
If faulty condition is found, check the following points.

- Wire harness and connections
- IAT sensor ☞(Page 1C-10)

IAT Sensor Removal and Installation

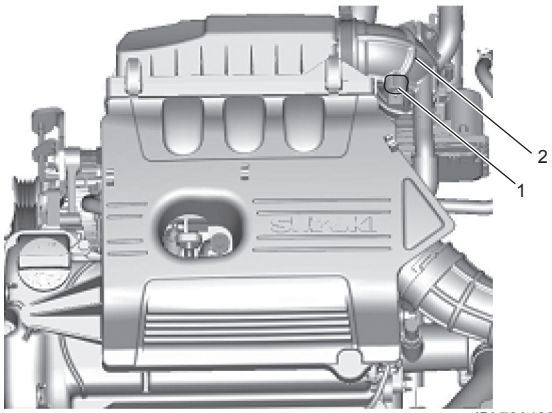
AENDL70A1306023

⚠ CAUTION

The IAT sensor is a precision components and can be easily damaged.
Handle the IAT sensor carefully and do not expose it to large shock.

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect IAT sensor connector.
3) Remove IAT sensor (1) from air cleaner outlet hose (2).



IDL70A130009-01

Installation

Reverse removal procedure.

IAT Sensor Inspection

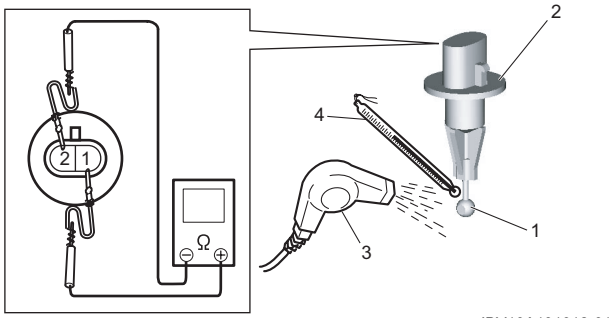
AENDL70A1306024

⚠ CAUTION

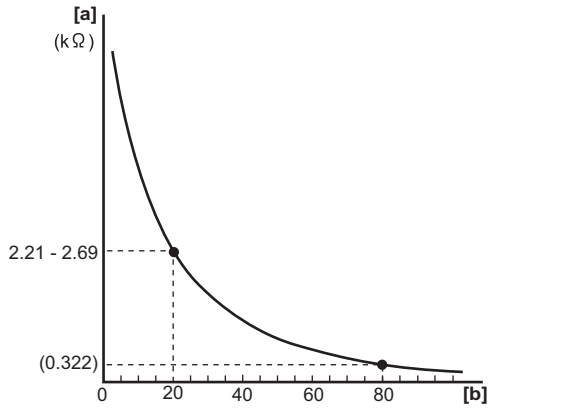
Do not heat IAT sensor to temperature higher than 100 °C (212 °F). IAT sensor will be damaged if heated to higher temperatures.

1) Remove IAT sensor. ☞(Page 1C-10)
2) Check that resistance between sensor terminals varies depending on temperature while blowing hot air to temperature sensing part (1) of IAT sensor (2) using hot air drier (3).

If faulty condition is found, replace IAT sensor.
☞(Page 1C-10)



IBV10A131012-01



IBV10A131013-01

[a]: Resistance	4. Temperature gauge
[b]: Temperature	

Specifications

Tightening Torque Specifications

AENDL70A1307001

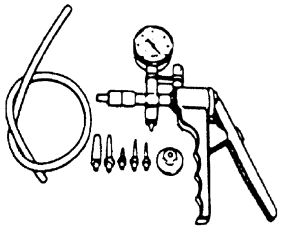
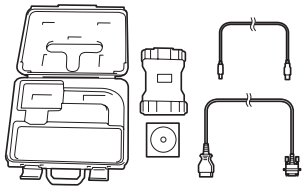
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Accelerator pedal assembly bolt	5.5	0.56	4.0	☞(Page 1C-4)
MAP sensor	11	1.2	8.1	☞(Page 1C-5)
ECT sensor	12	1.2	9.0	☞(Page 1C-6)
HO2S-1	45	4.5	33.5	☞(Page 1C-7)
O2S-2	45	4.5	33.5	☞(Page 1C-7)
CMP sensor bolt	9.8	1.0	7.2	☞(Page 1C-8)
CKP sensor bolt	9.8	1.0	7.2	☞(Page 1C-9)
Knock sensor bolt	23	2.3	17.0	☞(Page 1C-10)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Special Tool

AENDL70A1308001

09917M47011 Vacuum pump gauge ☞(Page 1C-6)		SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 1C-6)	

Engine Mechanical

General Description

Engine Construction Description

AENDL70A1401001

The engine is a water-cooled, in line 3 cylinders unit with a DOHC valve mechanism arranged in a “V” type configuration and has 12 valves (4 valves / one cylinder). The camshafts mounted over the cylinder head are driven by a crankshaft with a timing chain.

Diagnostic Information and Procedures

Compression Check

AENDL70A1404001

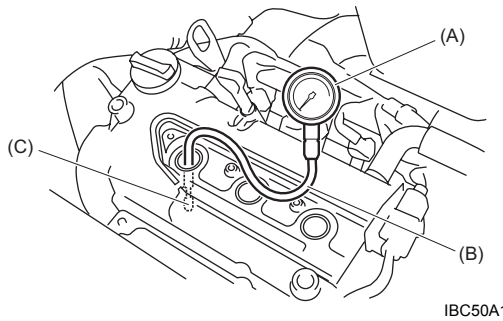
1) Warm up engine to normal operating temperature.
2) Stop engine after warming up.

NOTE

After warming up engine, place transmission gear shift lever in “Neutral” and set parking brake and block drive wheels.

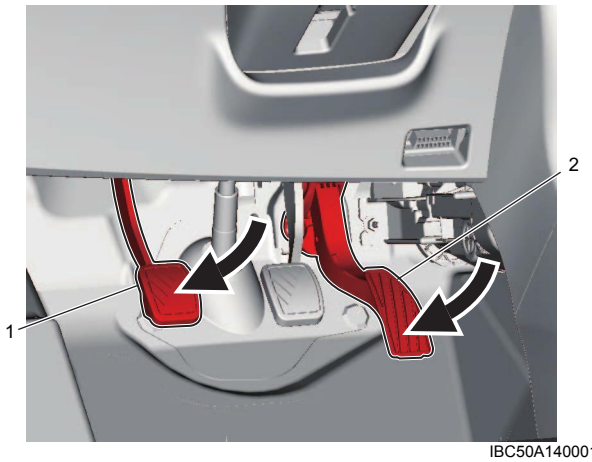
3) Remove air cleaner assembly with air suction hose. ☞(Page 1D-5)
4) Remove ignition coil assemblies and all spark plugs. ☞(Page 1H-5)
5) Disconnect all fuel injector connectors.
6) Install special tools into spark plug hole.

Special tool
(A): 09915M64512
(B): 09915M64530
(C): 09915M64550



IBC50A140039-01

7) Disengage clutch (1) (to lighten starting load on engine), and depress accelerator pedal (2) all the way to make throttle fully open.



IBC50A140001-01

8) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE

- **For measuring compression pressure, crank engine at least 200 rpm by using fully charged battery.**
- **If measured compression pressure is lower than limit value, check installation condition of special tool. If it is properly installed, possibility is compression pressure leakage from piston ring and valve seat.**

Compression pressure
Standard: 1,300 kPa (13.3 kgf/cm^2, 189 psi)
Limit: 1,000 kPa (10.2 kgf/cm^2, 145 psi)
Max. difference between any two cylinders: 100 kPa (1.02 kgf/cm^2, 14.5 psi)

9) Carry out Steps 6) through 8) on each cylinder to obtain 3 readings.
10) After checking, install spark plugs and ignition coil assemblies. ☞(Page 1H-5)
11) Connect fuel injector connector.
12) Install air cleaner assembly with air suction hose. ☞(Page 1D-5)

Engine Vacuum Check

AENDL70A1404002

The engine vacuum that develops in the intake line is a good indicator of the condition of the engine.

Using SUZUKI Scan Tool

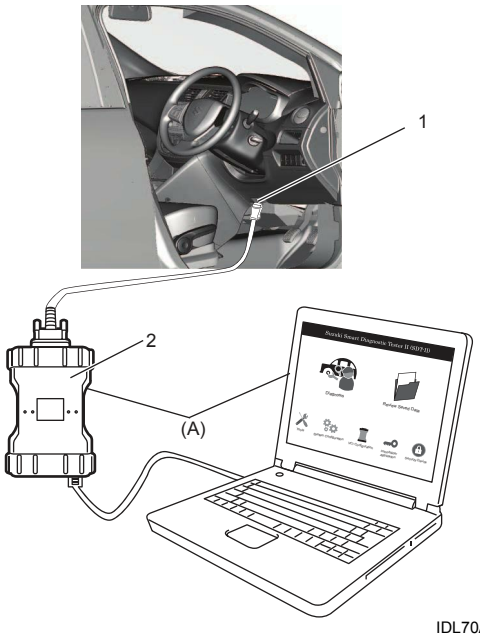
1) Warm up engine to normal operating temperature.

NOTE

After warming up engine, place transmission gear shift lever in "Neutral" and set parking brake and block drive wheels.

2) Stop engine and turn off all electric switches.
3) Connect SUZUKI scan tool (PC and VCI(2)) to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

4) Run engine at specified idle speed, and then select "MAP" under "Data List" mode on scan tool. Manifold absolute pressure should be within specification.

Manifold absolute pressure specification (at sea level)
50 kPa (0.51 kgf/cm², 7.25 psi, 0.50 bar) or less at specified idle speed

Not Using SUZUKI Scan Tool

1) Warm up engine to normal operating temperature.

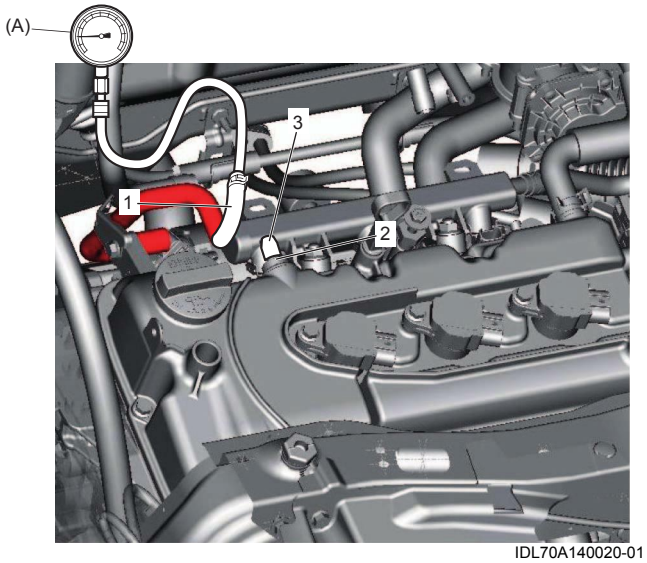
NOTE

After warming up engine, place transmission gear shift lever in "Neutral" and set parking brake and block drive wheels.

2) Stop engine and turn off all electric switches.
3) Remove air cleaner assembly with air suction pipe. ☞(Page 1D-5)
4) Remove PCV hose (1) from PCV valve (2).
5) Connect special tool to PCV hose (1).

Special tool
(A): 09915M67311

6) Blind PCV valve (2) using tape (3) or the like.



IDL70A140020-01

7) Install air cleaner assembly with air suction pipe. ☞(Page 1D-5)
8) Run engine at specified idle speed and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (at sea level)
–50 kPa (–0.51 kgf/cm², –7.25 psi, –0.5 bar) or less at specified idle speed

9) After checking, disconnect special tool from PCV hose.
10) Detach blind cap from PCV valve.
11) Install air cleaner assembly with air suction pipe. ☞(Page 1D-5)

Valve Lash (Clearance) Inspection and Adjustment

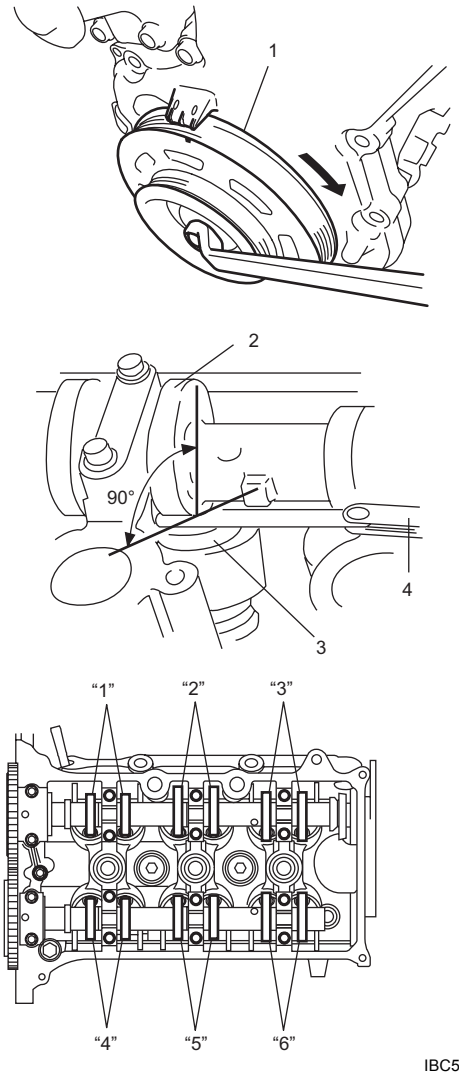
AENDL70A1404003

Inspection

1) Disconnect negative (–) cable at battery.
2) Remove cylinder head cover. ☞(Page 1D-9)
3) Remove right side engine undercover, if necessary.
4) Using 17 mm wrench, turn crankshaft pulley (1) clockwise until cam lobes (2) become perpendicular to tappet faces (3) at valves "1" and "4" as shown in figure.
5) Check valve clearance with thickness gauge (4) as follows.
   a) Check valve lashes at valves "1" and "4".
   b) Turn camshafts by 120° (by turning crankshaft with wrench).

c) Make sure that cam lobes are perpendicular to tappet faces at valves to be checked (in this case, “3” and “6”), if not, adjust them by turning crankshaft.
Check valve lashes.

d) In the same manner as b) – c), check valve lashes at valves “2” and “5”.



IBC50A140002-01

If valve clearance is out of specification, record valve clearance and adjust it to specification. ☞(Page 1D-3)

Valve clearance specification

When cold (ECT: 15 – 25 °C (59 – 77 °F)):
- **Intake: 0.14 – 0.23 mm (0.0055 – 0.0091 in.)**
- **Exhaust: 0.30 – 0.40 mm (0.0118 – 0.0157 in.)**

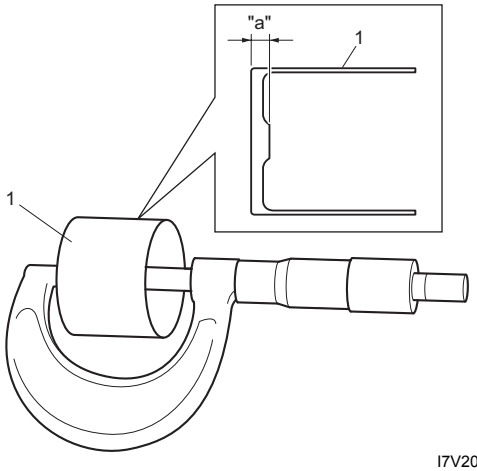
Adjustment

1) Remove tappet to be replaced. ☞(Page 1D-11)
2) Select proper size tappet as follows to adjust valve lash to specified valve.
   a) Using a micrometer, measure the thickness of the removed tappet (1).
   b) Calculate the thickness of new tappet by formula below.
   c) Select new tappet closest to calculated value from available size as a spare part.

NOTE

When number at second places of decimal point A is odd number, use (A – 0.01) tappet.

Intake side:
A = B + C – 0.19 mm (0.0075 in.)
Exhaust side:
A = B + C – 0.35 mm (0.0138 in.)
A: Thickness “a” of new tappet
B: Thickness “a” of removed tappet
C: Measured valve clearance



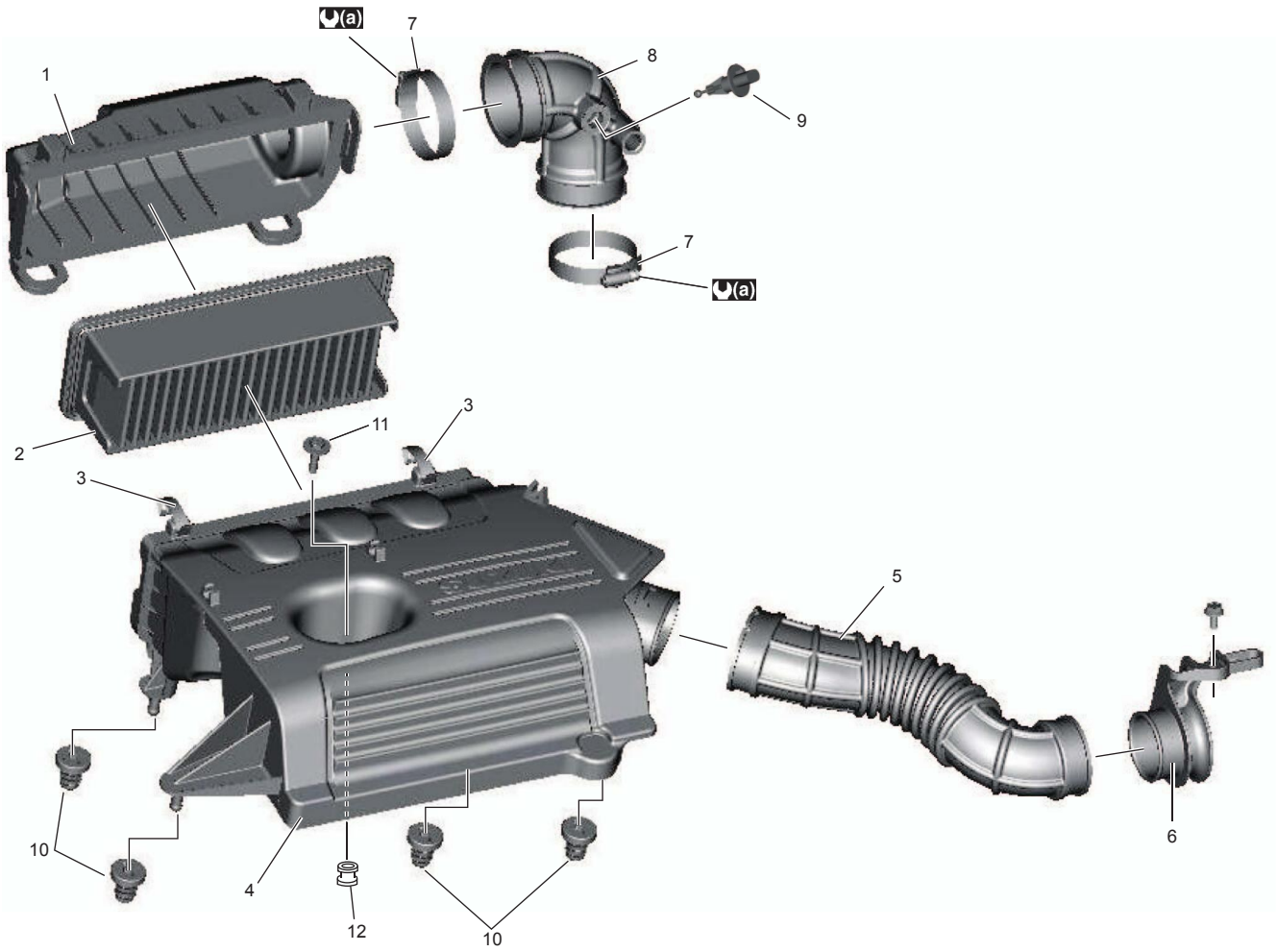
I7V20A141015-01

3) Install camshaft and tappet. ☞(Page 1D-11)

Repair Instructions

Air Cleaner Components

AENDL70A1406001



IDL70A140001-05

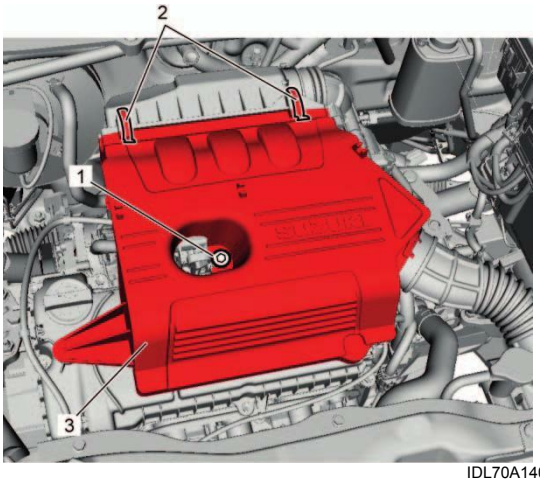
1. Air cleaner cover	5. Air suction hose	9. IAT sensor	(a) 1.0 N·m (0.1 kgf-m, 0.8 lbf-ft)
2. Air cleaner element	6. Air suction pipe	10. Air cleaner lower cover grommet	
3. Air cleaner clamp	7. Clamp	11. Air cleaner bolt	
4. Air cleaner lower cover	8. Air cleaner outlet hose	12. Air cleaner center grommet	

Air Cleaner Filter Removal and Installation

AENDL70A1406002

Removal

1) Remove air cleaner bolt (1).
2) Unhook air cleaner housing clamps (2).
3) Pull up air cleaner housing (3).

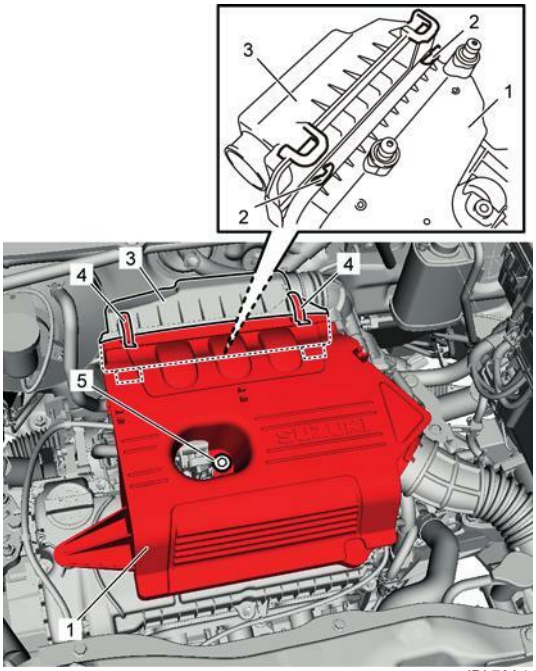


IDL70A140003-03

4) Remove air cleaner filter from case.

Installation

1) Install air cleaner filter to air cleaner housing.
2) Fit dabs (2) of the housing with hooks of the lower side cover. And join air cleaner housing (1) with air cleaner housing cover (3).
3) Hook air cleaner housing clamps (4).
4) Install air cleaner assembly by pressing it until two grommets fit completely into intake manifold and cylinder head cover respectively.
5) Tighten air cleaner bolt (5) securely.



IDL70A140031-01

Air Cleaner Filter Inspection and Cleaning

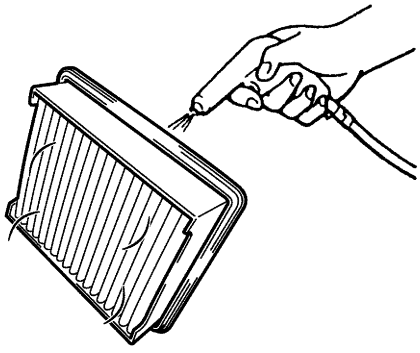
AENDL70A1406003

Inspection

Check air cleaner filter for dirt. Replace excessively dirty filter.

Cleaning

Blow off dust by compressed air from air outlet side of filter.



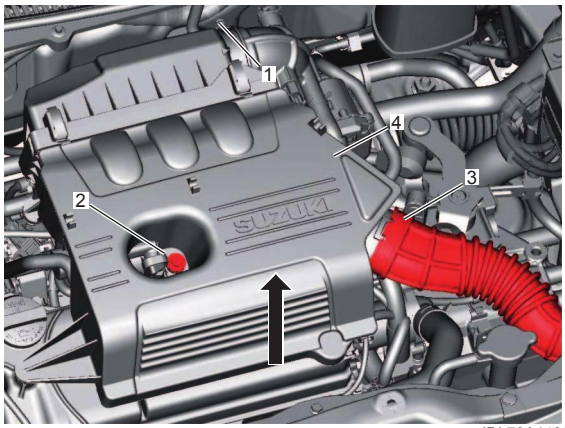
I2RH0B140150-01

Air Cleaner Assembly Removal and Installation

AENDL70A1406004

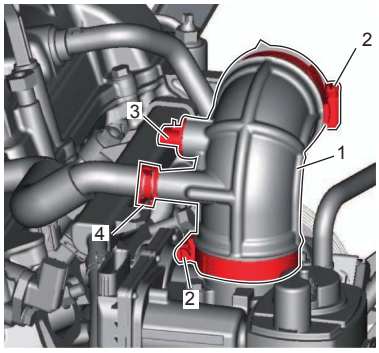
Removal

1) Disconnect negative (–) cable at battery.
2) Loosen air cleaner outlet hose clamp (1).
3) Remove air cleaner bolt (2)
4) Remove air cleaner suction hose (3).
5) Pull air cleaner assembly (4) as shown.



IDL70A140019-01

6) Remove air cleaner outlet hose (1) according to the following procedure if necessary.
   a) Disconnect connector from IAT sensor (3).
   b) Remove breather hose (4) from air cleaner outlet hose.
   c) Loosen air cleaner hose clamps (2) and remove air cleaner outlet hose.



IDL70A140005-01

Installation

NOTE

Check that air intake grommets and air cleaner center grommet are fitted to air cleaner housing. If the grommets are disconnected, fit them to air cleaner housing before installing air cleaner assembly.

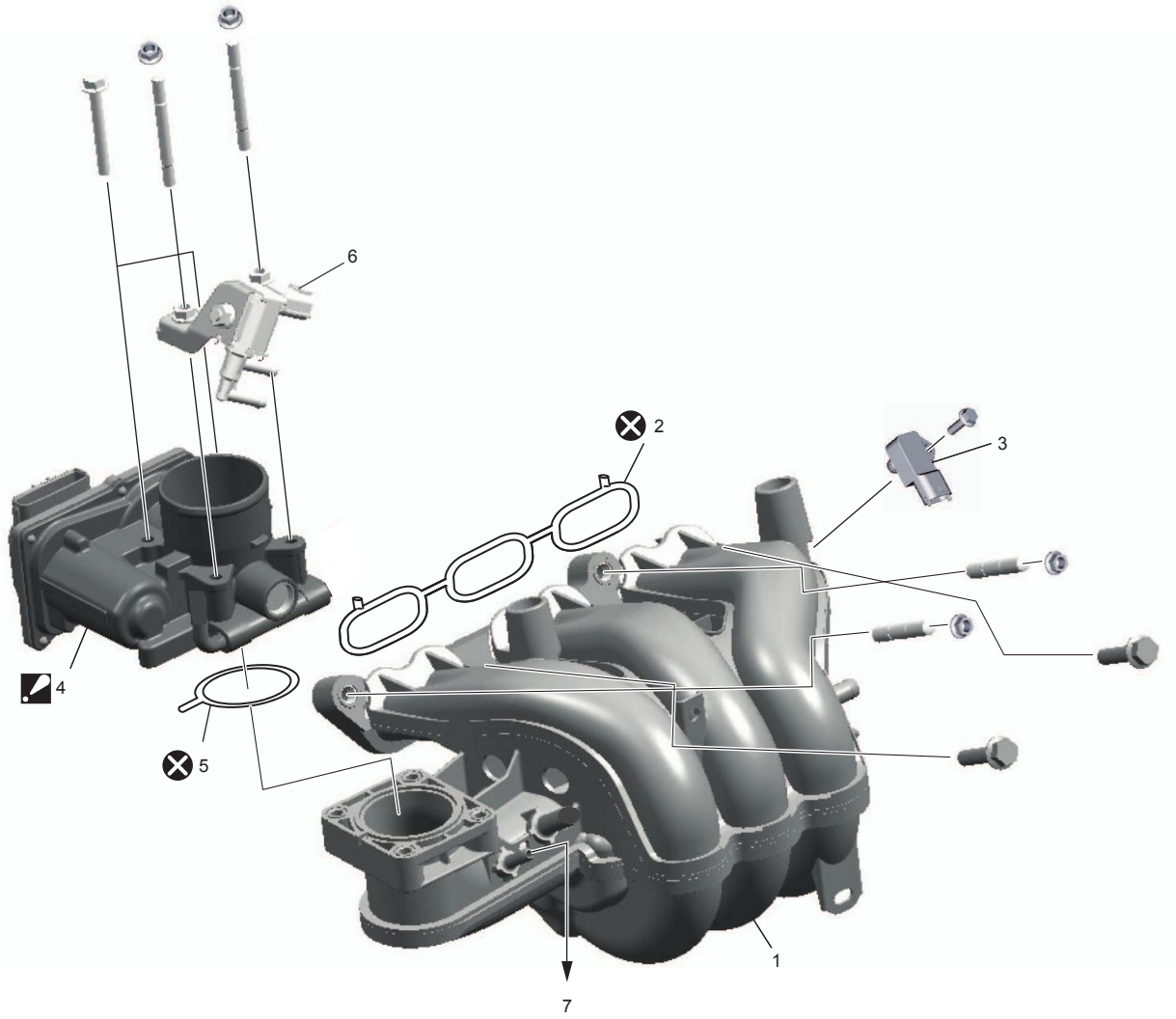
Reverse removal procedure noting the following points.

- Tighten the air cleaner outlet hose clamp to specified torque.
- Insert air intake grommets fully to holes on intake manifold and cylinder head cover.

- Tighten air cleaner bolt so that air cleaner center grommet under the bolt is properly seated on air cleaner stud bolt.

Throttle Body and Intake Manifold Components

AENDL70A1406046



IDL70A140002-01

1. Intake manifold	3. MAP sensor	5. Gasket
2. Intake manifold gasket	4. Throttle body assembly : Do not disassemble.	: Do not reuse.

Throttle Body On-Vehicle Inspection

AENDL70A1406005

Check electric throttle body assembly. ☞(Page 1C-2)

Electric Throttle Body Assembly Removal and Installation

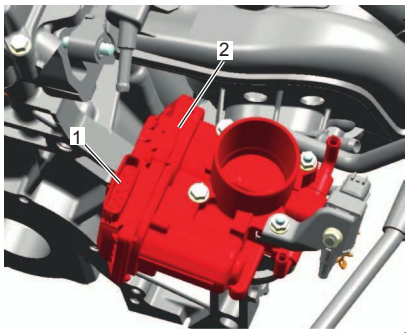
AENDL70A1406006

NOTICE

Never disassemble electric throttle body. Disassembly will spoil its original performance. If faulty condition is found, replace it with new one as an assembly.

Removal

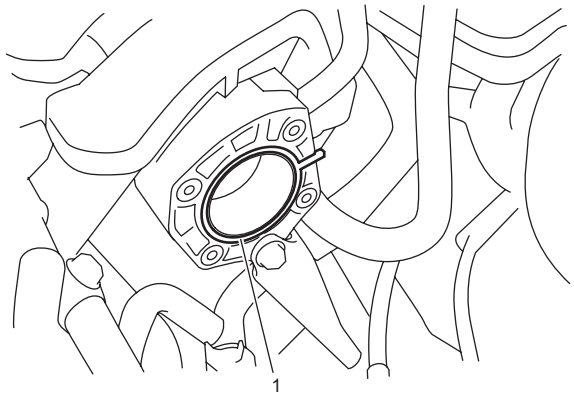
1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly. ☞(Page 1D-5)
3) Disconnect connector (1) from electric throttle body assembly (2).
4) Remove electric throttle body assembly from intake manifold.



IDL70A140006-01

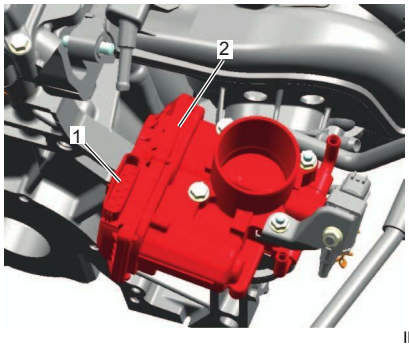
Installation

1) Clean mating surfaces and install new throttle body gasket (1) to intake manifold.



I7V20A141038-01

2) Install electric throttle body assembly (3) to intake manifold.
3) Connect connector (1) to electric throttle body assembly (2) securely.



IDL70A140006-01

4) Install air cleaner assembly. ☞(Page 1D-5)
5) Connect negative (–) cable at battery.

Throttle Body Cleaning

AENDL70A1406007

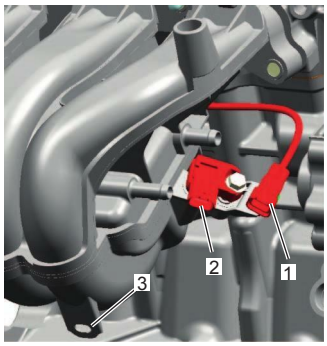
Clean electric throttle body assembly referring to “Throttle Valve Visual Check” under “Electric Throttle Body Assembly On-Vehicle Inspection” in Section 1C (Page 1C-2).

Intake Manifold Removal and Installation

AENDL70A1406008

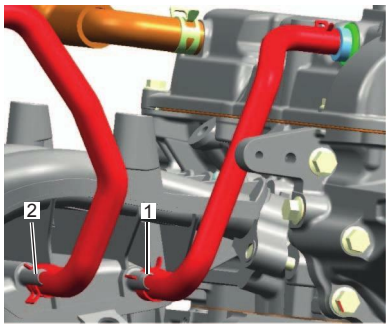
Removal

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly and air cleaner outlet hose.☞(Page 1D-5)
3) Remove electric throttle body assembly.☞(Page 1D-6)
4) Disconnect following connectors and clamps:
   - MAP sensor connector (2)
   - Knock sensor connector (1)
   - Engine harness clamp (3).



IDL70A140007-02

5) Disconnect following hoses:
   - Brake booster hose (2) and breather hose (1)



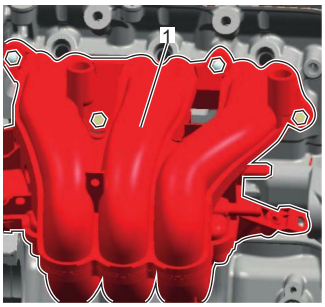
IDL70A140008-01

   - PCV hose (1) from intake manifold



IDL70A140009-01

6) Remove intake manifold (1) from cylinder head, and then remove its gasket.



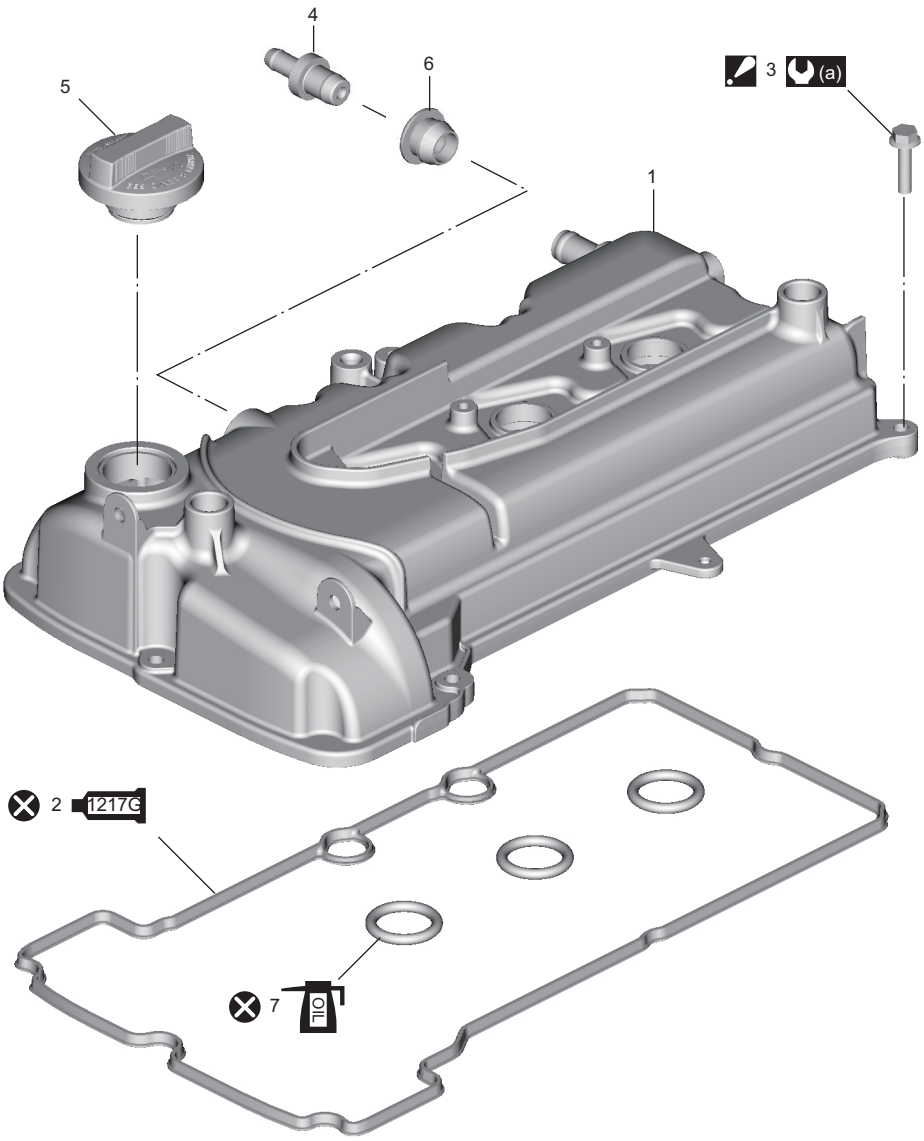
IDL70A140010-01

- Use new gasket.
- Check that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.

Installation
Reverse removal procedure noting the following.

Cylinder Head Cover Components

AENDL70A1406009



IBC50A140012-01

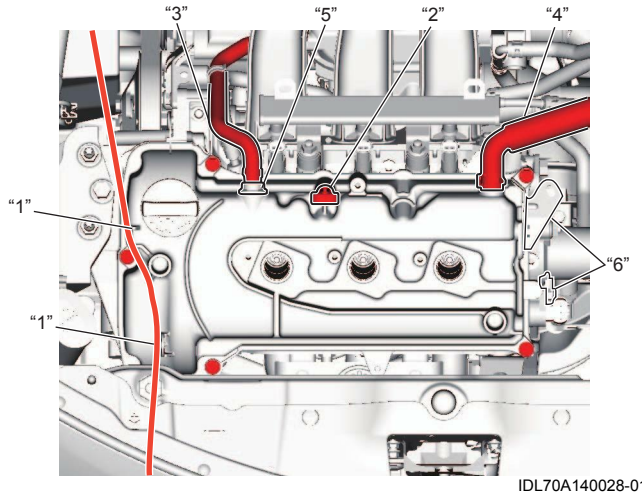
	1.	Cylinder head cover	6. PCV valve grommet
1217G	2.	Cylinder head cover gasket : Apply sealant 99000-31260 referring to “Cylinder Head Cover Removal and Installation” (Page 1D-9).	7. O-ring
	3.	Cylinder head cover bolt : For tightening order, refer to “Cylinder Head Cover Removal and Installation” (Page 1D-9).	(a) : 5.0 N·m → 8.0 N·m → 11 N·m (0.51 kgf-m → 0.82 kgf-m → 1.1 kgf-m, 4.0 lbf-ft → 6.0 lbf-ft → 8.5 lbf-ft)
	4.	PCV valve	: Do not reuse.
	5.	Oil filler cap	

Cylinder Head Cover Removal and Installation

AENDL70A1406010

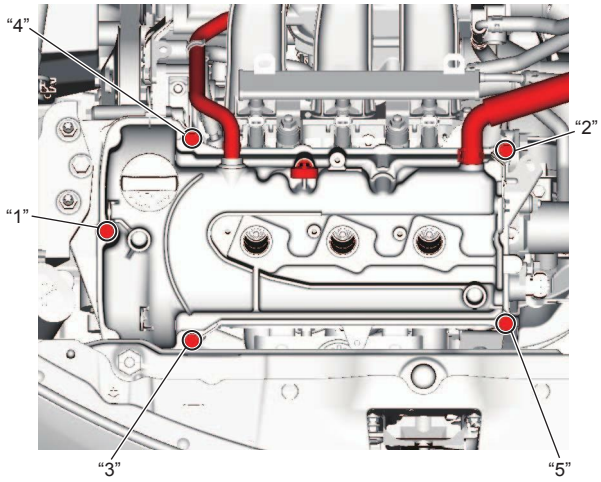
Removal

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly with air suction pipe. ☞(Page 1D-5)
3) Remove ignition coil assemblies from cylinder head cover. ☞(Page 1H-5)
4) Disconnect engine harness clamps “1”.
5) Remove oil level gauge “2”.
6) Disconnect PCV hose “3” from PCV valve.
7) Disconnect breather hose “4” from cylinder head cover.
8) Remove PCV valve “5” from cylinder head cover, if necessary.
9) Remove engine harness brackets “6”.



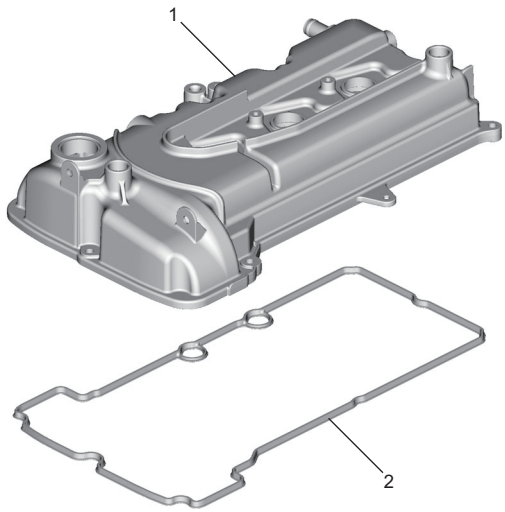
IDL70A140028-01

10) Loosen cylinder head cover mounting bolts in numerical order “1” through “5” as shown in figure a little at time.



IDL70A140021-02

11) Remove cylinder head cover (1) and cylinder head cover gasket (2).

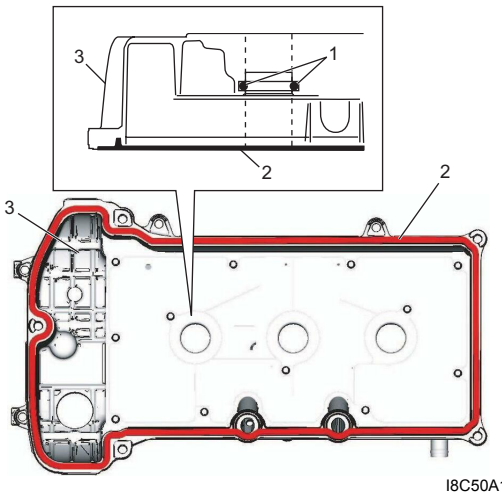


IBC50A140014-01

12) Remove spark plug hole gaskets.

Installation

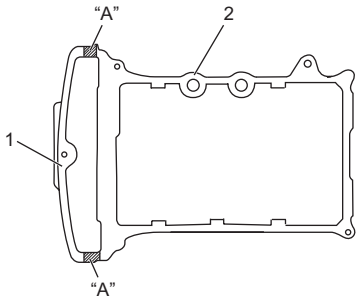
1) Remove oil, old sealant, and dust from sealing surfaces on cylinder head and cover.
Install new spark plug hole gaskets (1) and new cylinder head cover gasket (2) to cylinder head cover (3) as shown in figure.



I8C50A140024-01

2) After cleaning, apply sealant “A” to the designated area in figure.

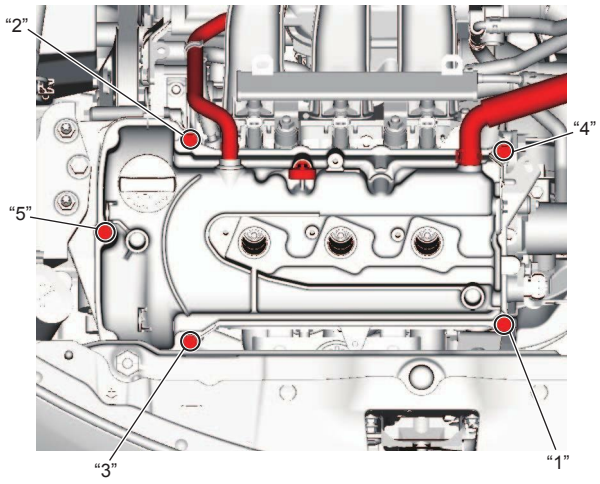
“A”: Sealant 99000–31260 (SUZUKI Bond No.1217G)



I8C50A140025-01

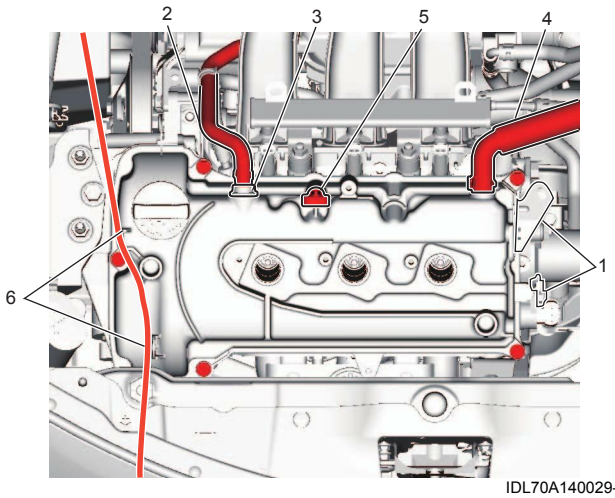
3) Install cylinder head cover to cylinder head.
4) Tighten head cover bolts according to the following procedure.
   a) Tighten cylinder head cover bolts to 5.0 N·m (0.51 kgf-m, 4.0 lbf-ft) in numerical order (“1” – “5”) evenly and gradually.
   b) In the same manner as Step a), retighten them to 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft).
   c) In the same manner as Step a), retighten them to 11 N·m (1.1 kgf-m, 8.5 lbf-ft).

Tightening torque
Cylinder head cover bolt* (a): 5.0 N·m → 8.0 N·m → 11 N·m (0.51 kgf-m → 0.82 kgf-m → 1.1 kgf-m, 4.0 lbf-ft → 6.0 lbf-ft → 8.5 lbf-ft)



IDL70A140022-02

5) Install engine harness brackets (1).
6) Install PCV valve (3) to cylinder head cover, if removed.
7) Connect PCV hose (2) to PCV valve (3).
8) Connect breather hose (4) to cylinder head cover.
9) Install oil level gauge (5).
10) Install ignition coil assemblies to cylinder head cover. ☞(Page 1H-5)
11) Connect engine harness clamps (6).

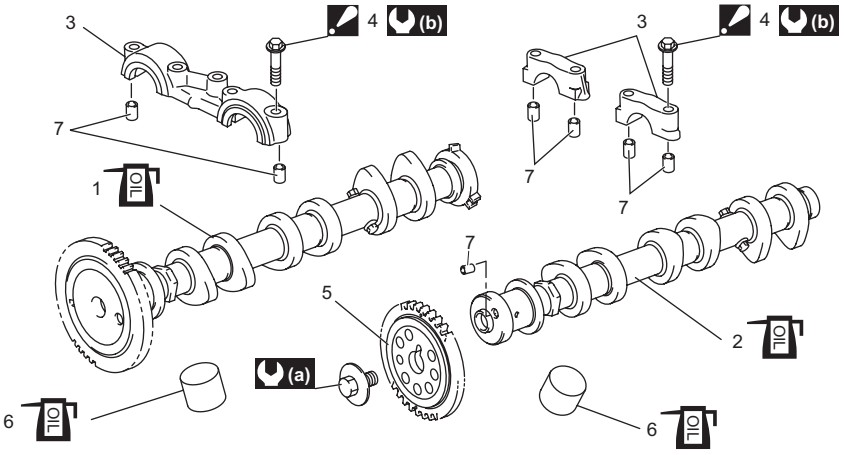


IDL70A140029-01

12) Install air cleaner assembly with air suction pipe. ☞(Page 1D-5)
13) Connect negative (–) cable at battery.

Camshaft and Tappet Components

AENDL70A1406011



I8C50B140015-01

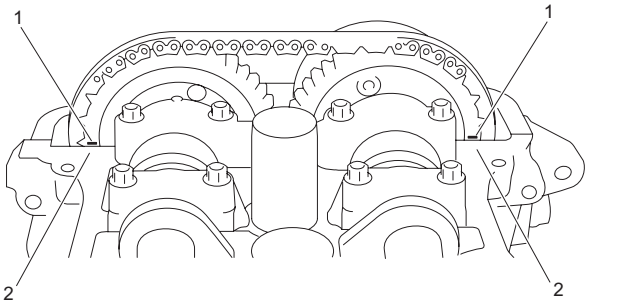
1. Intake camshaft : Apply engine oil to sliding surface.	4. Camshaft housing bolt : For tightening order, refer to “Camshaft and Tappet Removal and Installation” (Page 1D-11).	7. Dowel pin
2. Exhaust camshaft : Apply engine oil to sliding surface.	5. Exhaust camshaft timing sprocket	(a) : 60 N·m (6.1 kgf-m, 44.5 lbf-ft)
3. Camshaft housing	6. Tappet : Apply engine oil to sliding surface.	(b) : 5.0 N·m → 8.0 N·m → 11 N·m (0.51 kgf-m → 0.82 kgf-m → 1.1 kgf-m, 4.0 lbf-ft → 6.0 lbf-ft → 8.5 lbf-ft)

Camshaft and Tappet Removal and Installation

AENDL70A1406012

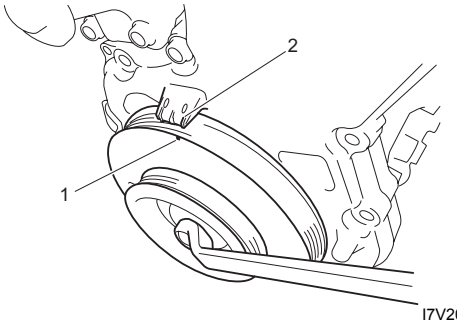
Removal

1) Remove cylinder head cover. ☞(Page 1D-9)
2) Turn crankshaft clockwise with wrench, and position piston No.1 at TDC on the compression stroke.
   a) Align both intake and exhaust camshaft timing sprocket marks (1) with surface of cylinder head (2) respectively.



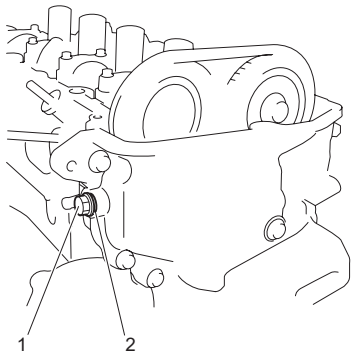
I7V20A141006-01

   b) Confirm notch (1) on crankshaft pulley with “0” indication on timing chain cover (2).



I7V20A141007-01

3) Remove timing chain cover plug (1) and gasket (2).

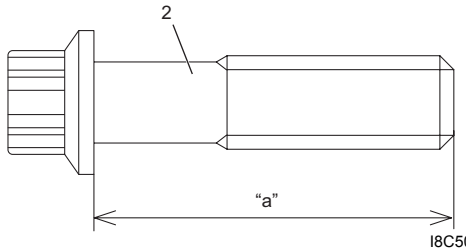


I7V20A141008-01

4) Fix timing chain tensioner (1).

NOTICE

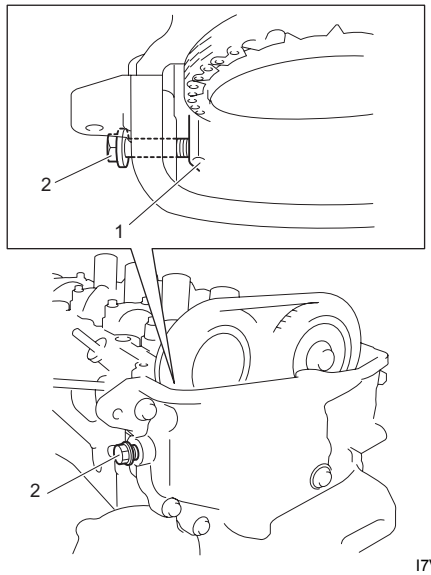
- **Be sure to use bolt (2) of M8 size and 1.25 mm (0.049 in.) pitch to fix tensioner.**
- **Do not use wrench when tightening bolt (2) to avoid damage of timing chain tensioner.**



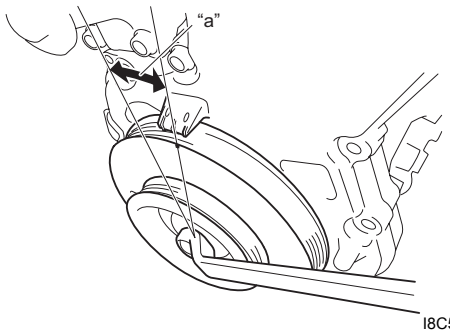
I8C50A140087-01

"a": 30 mm (1.1811 in.)

a) Tighten 8 mm bolt (2) by hand to fix timing chain tensioner (1).
b) While turning crankshaft 20° ("a") counterclockwise, tighten bolt (2) by hand again.
c) While turning crankshaft 20° ("a") clockwise this time, tighten bolt (2) by hand again.



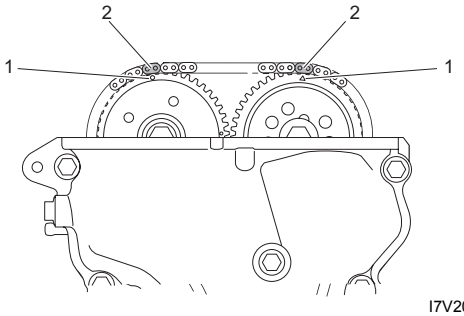
I7V20A141010-01



I8C50A140028-02

"a": 20°

5) Put colored marks (2) on timing chain matching with intake and exhaust camshaft timing sprocket marks (1).

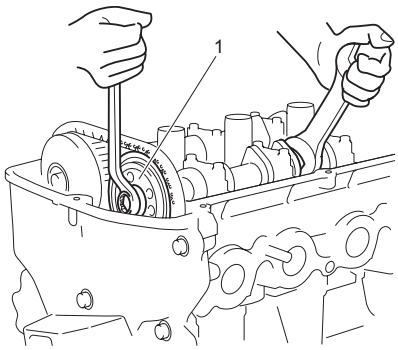


I7V20A141012-04

6) With hexagonal section of exhaust camshaft held stationary with spanner or adjustable wrench, loosen mounting bolt of exhaust camshaft timing sprocket (1) and remove camshaft timing sprocket (1).

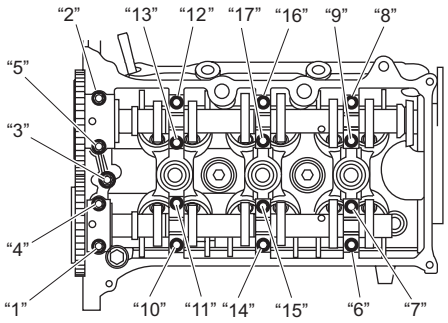
NOTICE

Do not turn camshaft after removing exhaust cam timing sprocket.



I7V20A141013-01

7) Loosen intake and exhaust camshaft housing bolts in numerical order as indicated in figure, and remove intake camshaft and exhaust camshaft.

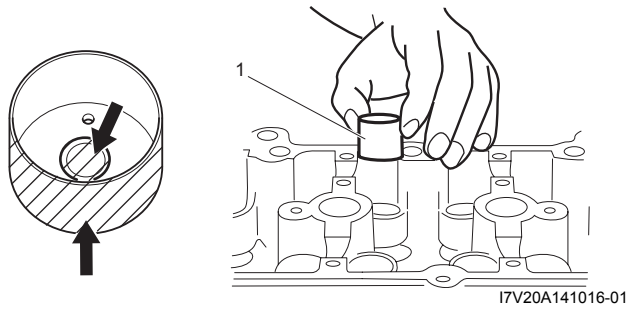


I8C50A140029-01

8) Remove tappet, if necessary.

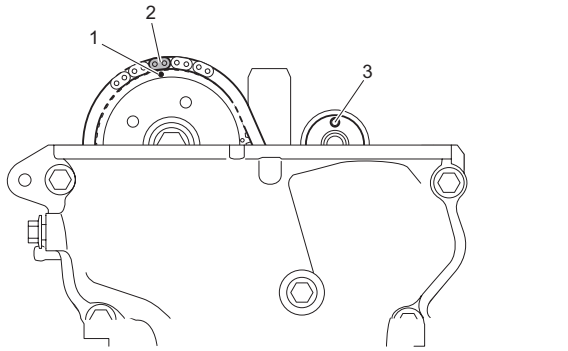
Installation

1) Apply engine oil to contact surface of tappets (shaded area), and then install tappet (1) to cylinder head.



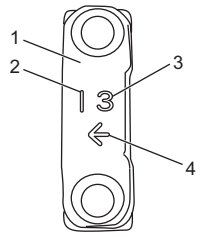
I7V20A141016-01

2) Apply engine oil to sliding part of camshaft, and set camshaft to cylinder head.
   a) Align match mark (1) on intake camshaft sprocket with colored mark (2) on timing chain.
   b) Install exhaust camshaft and position dowel pin (3) of exhaust camshaft upward.



I7V20A141017-01

3) Install camshaft housings (1) to specified places indicated by character (2), number (3) and arrow direction (4) on each camshaft housing.

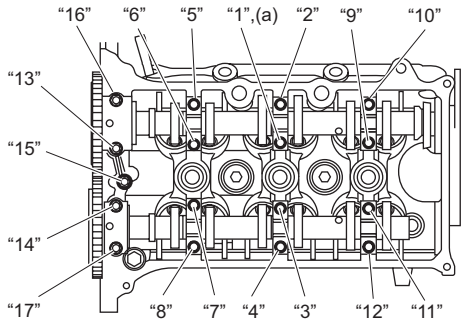


I8C50A140081-01

2.	I: Intake camshaft housing E: Exhaust camshaft housing
3.	Position from timing chain side
4.	Point arrowhead to timing chain side

4) Tighten camshaft housing bolts.
   a) Apply engine oil to bolt thread and seat of camshaft housing bolts.
   b) Tighten camshaft housing bolts to 5.0 N·m (0.51 kgf-m, 4.0 lbf-ft) in numerical order (“1” – “17”) evenly and gradually.
   c) In the same manner as Step b), retighten them to 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft).
   d) In the same manner as Step b), retighten them to 11 N·m (1.1 kgf-m, 8.5 lbf-ft).

Tightening torque
Camshaft housing bolt* (a): 5.0 N·m → 8.0 N·m → 11 N·m (0.51 kgf-m → 0.82 kgf-m → 1.1 kgf-m, 4.0 lbf-ft → 6.0 lbf-ft → 8.5 lbf-ft)

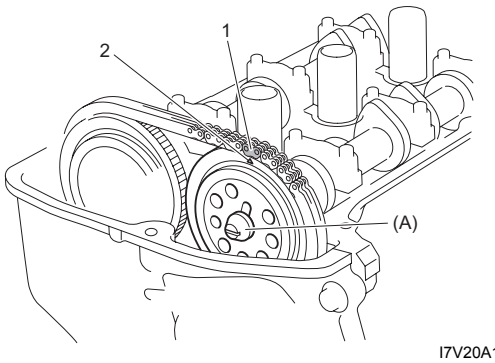


I8C50A140030-01

5) Install exhaust camshaft timing sprocket to camshaft.
   a) Install special tool (A) to exhaust camshaft.

   Special tool
   (A): 09914M06310

   b) Fit timing chain by aligning its colored mark (1) on timing chain with match mark (2) on exhaust camshaft timing sprocket.
   c) Install exhaust camshaft timing sprocket to exhaust camshaft.



I7V20A141020-01

6) With hexagonal section of exhaust camshaft held stationary with spanner or adjustable wrench, tighten exhaust camshaft timing sprocket bolt (1) to specified torque by using special tool.

Special tool
(A): 09911M05120

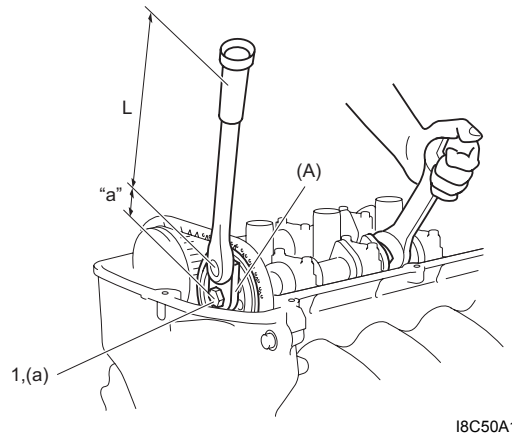
Tightening torque
Exhaust camshaft timing sprocket bolt (a): 60 N·m (6.1 kgf-m, 44.5 lbf-ft)

NOTICE

In case of extension special tool combined with torque wrench, reading value of torque wrench is smaller than specified tightening torque. When using extension special tool, reading value should be calculated according to formula below.

M = T X L / (L + “a”)

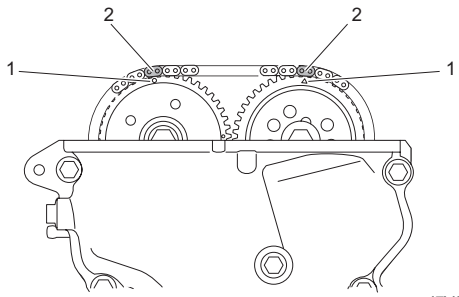
- M: Reading value using extension special tool
- T: Specified torque
- L: Torque wench length
- “a”: Dimension of special tool



I8C50A140080-01

“a”: 50 mm (1.97 in.)

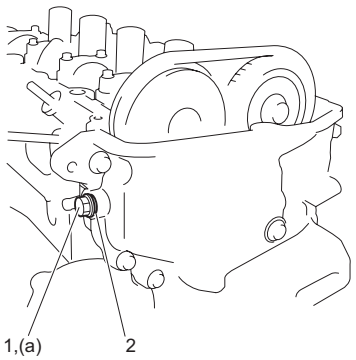
7) Confirm that colored marks (2) are aligned with timing marks (1) on intake and exhaust camshaft timing sprocket.



I7V20A141022-04

8) Remove timing chain tensioner fixing bolt from timing chain cover.
9) Install timing chain cover plug (1) with new gasket (2), and tighten timing chain cover plug to specified torque.

Tightening torque
Timing chain cover plug (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)

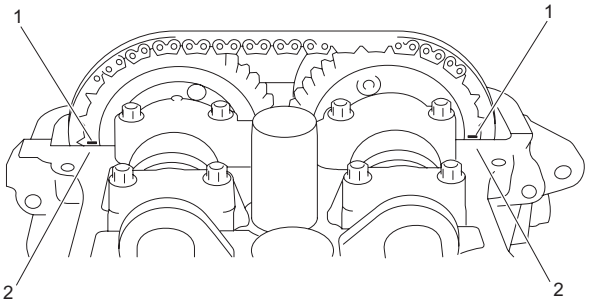


I7V20A141023-01

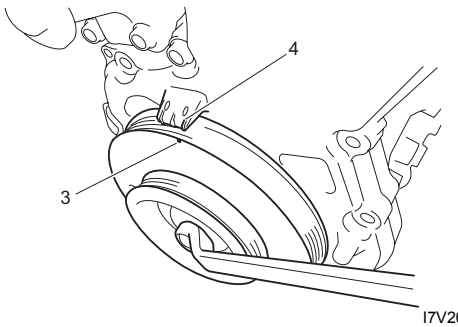
10) Check that camshaft and timing chain are installed properly.
    a) Check that marks (1) on intake and exhaust camshaft timing sprocket are aligned with top face of cylinder head (2).
    b) Check that marks (3) on crankshaft pulley is aligned with “0” of timing chain cover (4).
    c) Turn crankshaft clockwise fully twice and check again that match marks are aligned.

NOTE

- **Be sure to turn crankshaft fully twice. If it is turned only one rotation, intake and exhaust camshaft timing sprocket marks will not align.**
- **When turning crankshaft fully twice, colored marks are not aligned with the timing marks on the intake and exhaust camshaft timing sprocket, but it is normal.**



I7V20A141024-01



I7V20A141025-01

11) Check valve clearance. ☞(Page 1D-2)
12) Install cylinder head cover. ☞(Page 1D-9)

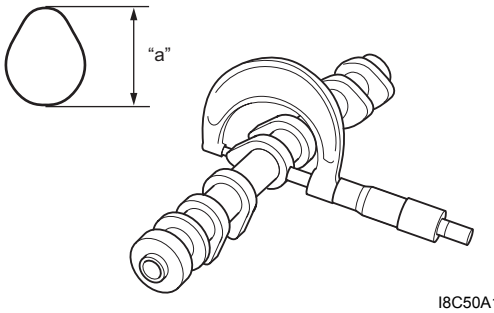
Camshaft and Tappet Inspection

AENDL70A1406013

Cam Wear
Using a micrometer, measure cam height “a”. If measured height underruns its limit, replace camshaft.

Cam height “a” of camshaft

Camshaft	Standard	Limit
Intake	44.520 – 44.680 mm (1.7528 – 1.7591 in.)	44.420 mm (1.7488 in.)
Exhaust	45.388 – 45.548 mm (1.7869 – 1.7932 in.)	45.288 mm (1.7830 in.)

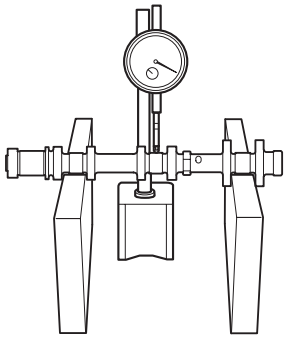


I8C50A140031-01

Camshaft Runout

Set camshaft between two "V" blocks, and measure its runout by using a dial gauge.
If measured runout exceeds limit, replace camshaft.

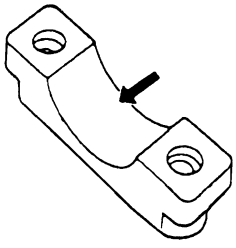
Camshaft runout limit
0.015 mm (0.0006 in.)



I8C50A140032-01

Camshaft Journal Wear

- Check camshaft journals and camshaft housings for pitting, scratches, wear or damage.
  If any malcondition is found, replace camshaft or cylinder head with housing. Never replace cylinder head without replacing housings.

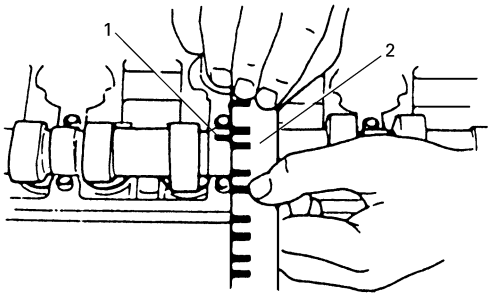


I2RH0B140082-01

- Check clearance by using gauging plastic as follows.
  1) Clean housings and camshaft journals.
  2) Remove all tappets.
  3) Install camshafts to cylinder head.
  4) Place a piece of gauging plastic to full width of journal of camshaft (parallel to camshaft).
  5) Install camshaft housing. ☞(Page 1D-11)
  6) Remove housing, and using scale (2) on gauging plastic envelop, measure gauging plastic (1) width at its widest point.

Camshaft journal clearance

Item	Standard	Limit
Camshaft housing No.1	0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.10 mm (0.00394 in.)
Others	0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.10 mm (0.00394 in.)



I2RH0B140083-01

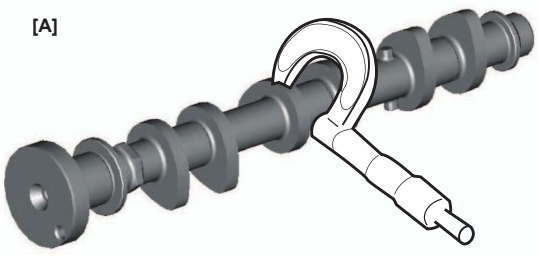
7) If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Camshaft journal diameter [A]

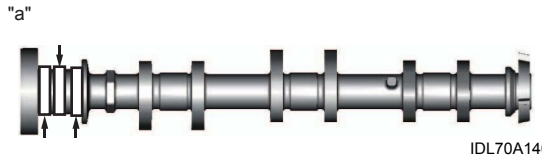
Item	Standard
Intake and Exhaust No.1 housing "a"	26.934 – 26.955 mm (1.0604 – 1.0612 in.)
Others	22.934 – 22.955 mm (0.9029 – 0.9037 in.)

Camshaft journal housing bore [B]

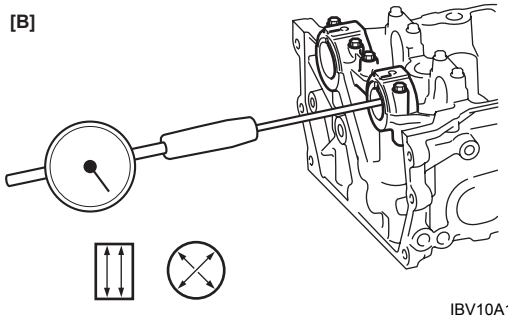
Item	Standard
Intake and Exhaust No.1 housing	27.000 – 27.021 mm (1.0629 – 1.0638 in.)
Others	23.000 – 23.021 mm (0.9055 – 0.9063 in.)



IDL70A140023-01



IDL70A140024-01

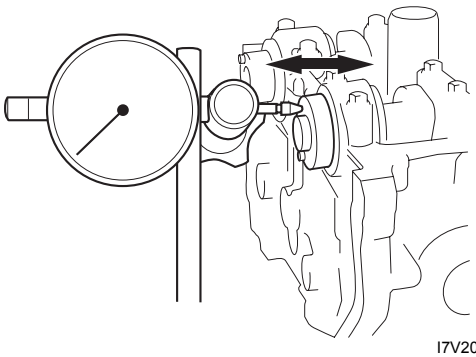


IBV10A140018-01

8) Install intake and exhaust camshafts without tappet, measure intake and exhaust camshaft housing thrust clearance by using a dial gauge.
If measured clearance exceeds limit, replace camshaft or cylinder head.

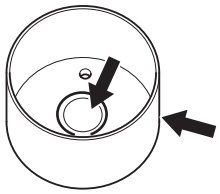
Camshaft housing thrust clearance

	Camshaft housing thrust clearance
Standard	**0.10 – 0.35 mm (0.0039 – 0.0138 in.)**
Limit	**0.50 mm (0.0020 in.)**



I7V20A141074-01

Wear of Tappet
Check tappet for pitting, scratches, or damage.
If any defect is found, replace.



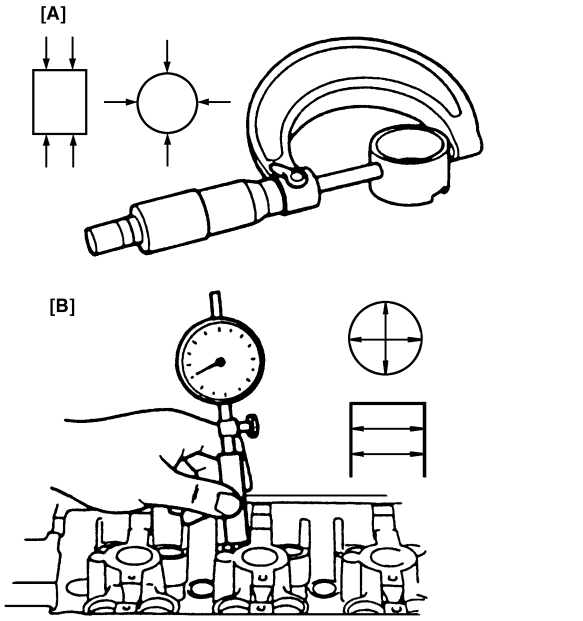
I7V20A141075-01

Measure cylinder head bore and tappet outside diameter to determine cylinder head-to-tappet clearance. If clearance exceeds limit, replace tappet or cylinder head.

Cylinder head to tappet clearance
Standard: 0.025 – 0.062 mm (0.0010 – 0.0024 in.)
Limit: 0.10 mm (0.0039 in.)

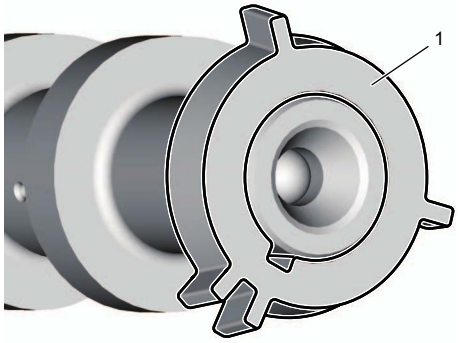
Tappet outside diameter [A]
Standard: 27.959 – 27.975 mm (1.1007 – 1.1014 in.)

Cylinder head tappet bore [B]
Standard: 28.000 – 28.021 mm (1.1024 – 1.1032 in.)



I2RH0B140086-01

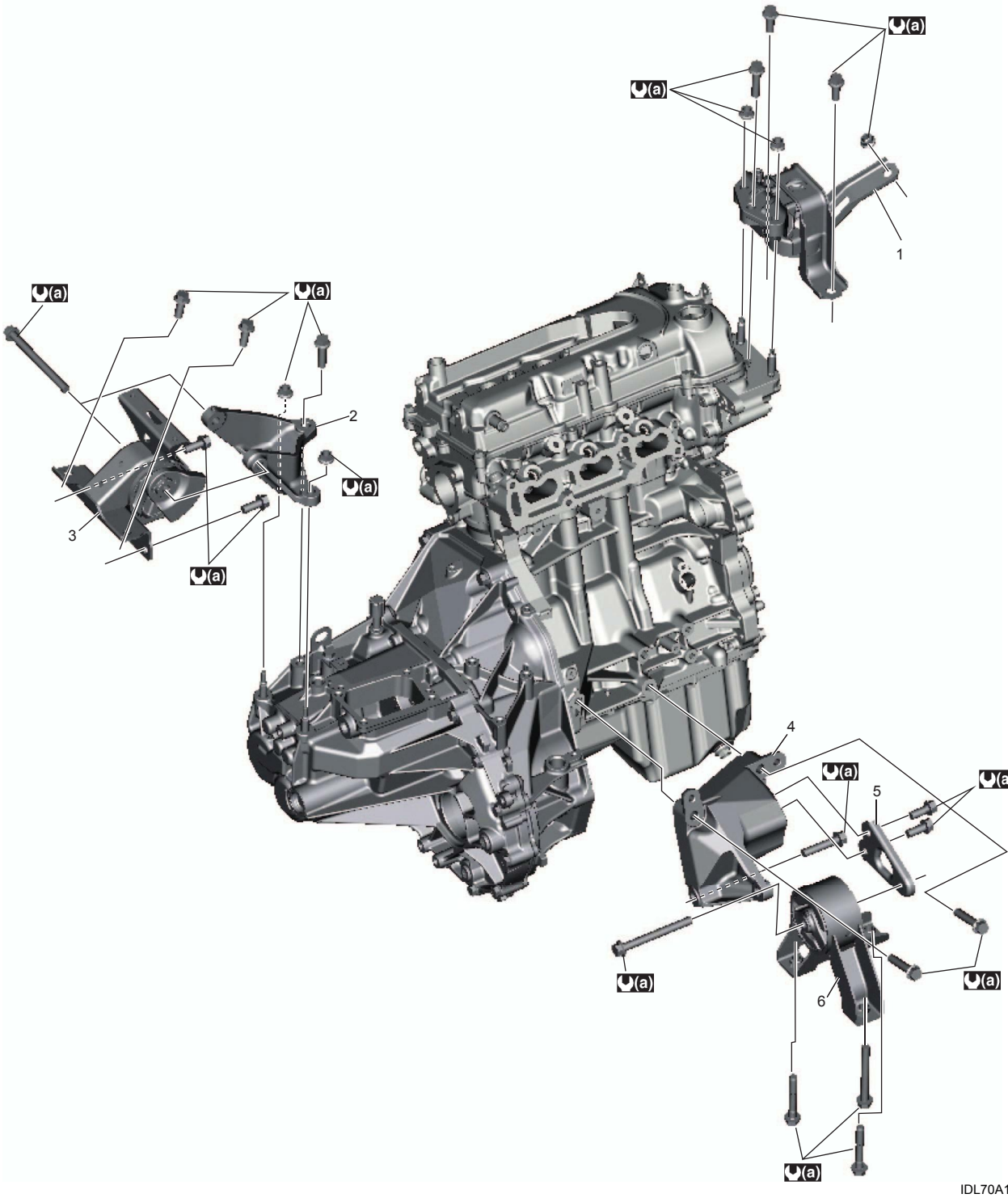
Signal Rotor
Check signal rotor (1) for crack and damage. If any defect is found, replace camshaft.



IAP70P140037-01

Engine Mounting Components

AENDL70A1406014



IDL70A140012-01

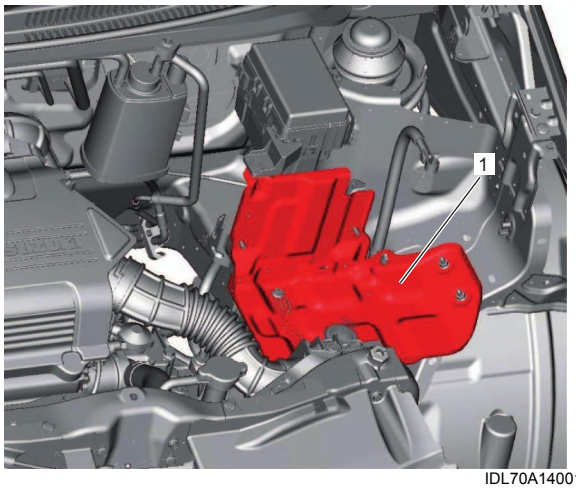
1. Engine right mounting	4. Engine rear mounting bracket	(a) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
2. Engine left mounting bracket	5. Engine rear mounting bracket component	
3. Engine left mounting	6. Engine rear mounting bracket	

Engine Assembly Removal and Installation

AENDL70A1406015

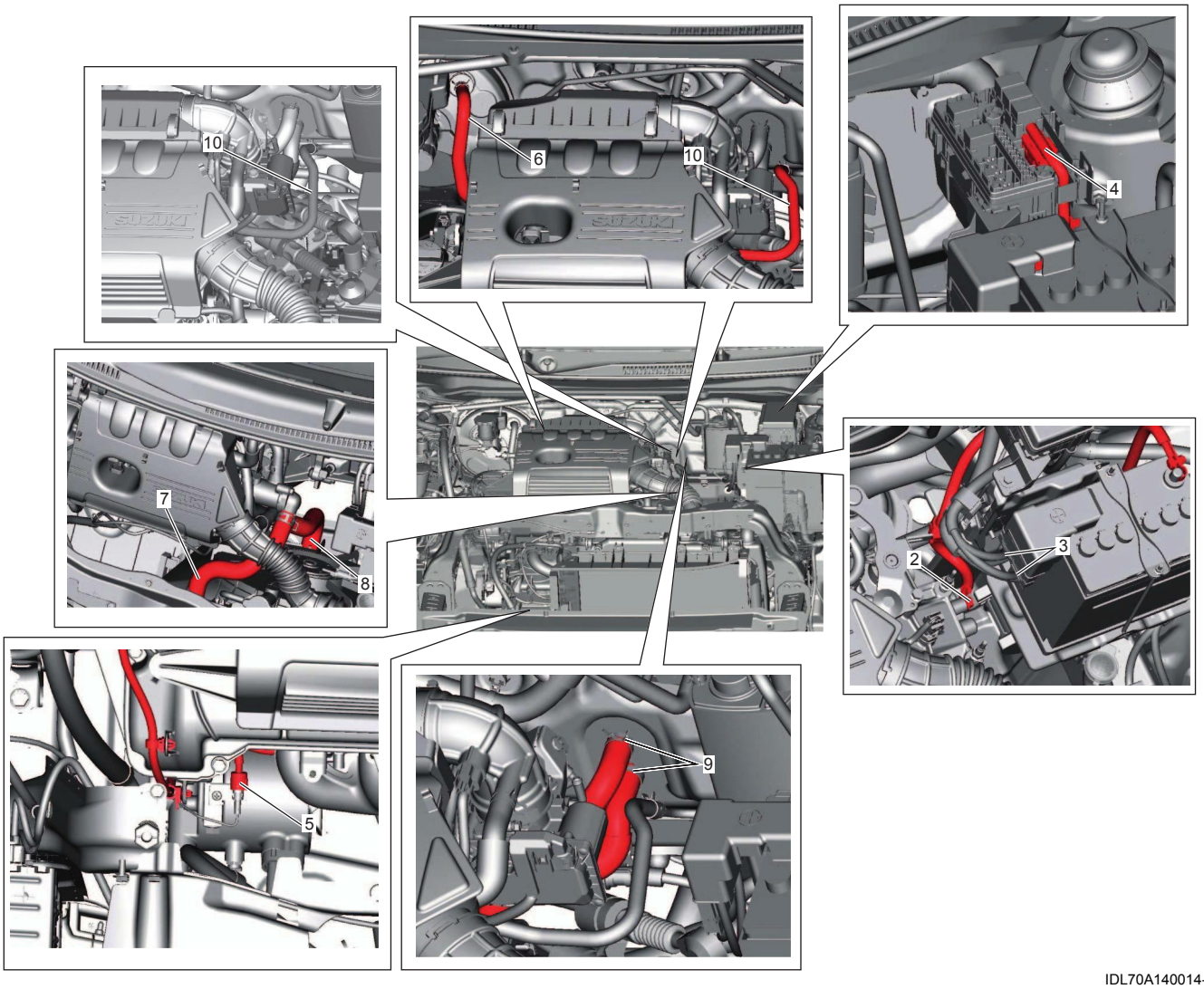
Removal

1) Relieve fuel pressure in fuel feed line. ☞(Page 1G-13)
2) Remove battery. ☞(Page 1J-5)
3) Remove ECM. ☞(Page 1C-1)
4) For AMT vehicle, remove AMT actuator.☞(Page 5D-87)
5) Remove battery tray (1).



IDL70A140013-02

6) Drain the following oils if necessary.
   - Engine oil: ☞(Page 1E-2)
   - Transaxle oil: ☞(Page 5B-5)
7) Drain coolant. ☞(Page 1F-8)
8) Remove air cleaner assembly. ☞(Page 1D-5)
9) Remove front bumper. ☞(Page 9H-1)
10) Remove right and left side splash covers.☞(Page 9J-3)
11) Disconnect the following electric wires and connectors.
   - Battery ground cable (2)
   - Connectors (3) in battery positive terminal
   - Connector (4) in relay box
   - A/C compressor magnet clutch connector (5) if equipped
12) Disconnect the following hoses.
   - Brake booster hose (6)
   - Radiator inlet hose (7)
   - Radiator outlet hose (8)
   - Heater inlet and outlet hoses (9)
   - Fuel hose (10)



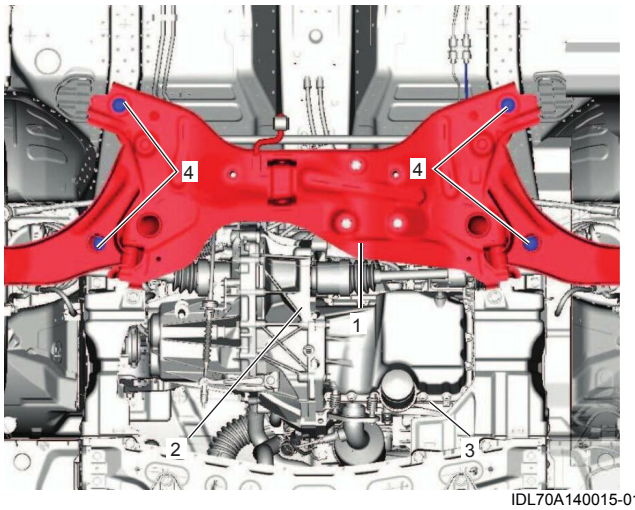
IDL70A140014-02

13) Remove engine harness clamps.
14) With A/C hoses connected, remove A/C compressor from its bracket if equipped. ☞(Page 7B-37)

NOTICE

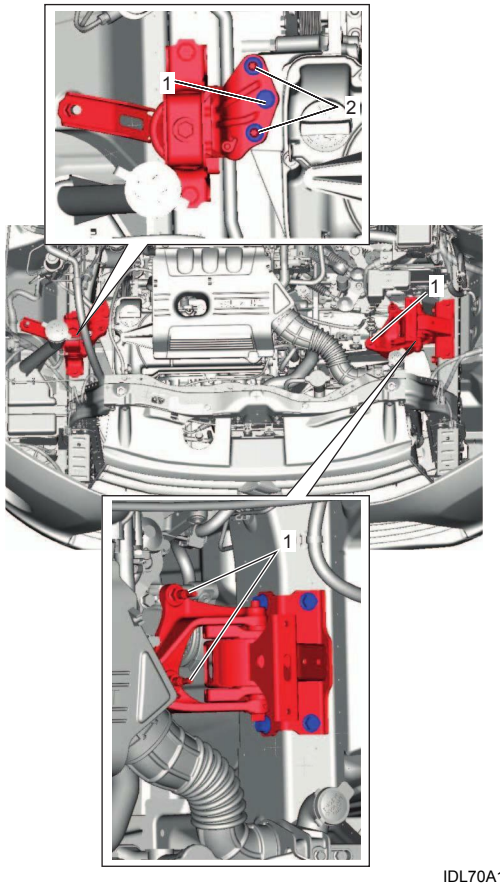
Hold removed A/C compressor at a place where no damage will be caused during removal and installation of engine assembly.

15) Remove clutch cable from clutch release arm. ☞(Page 5C-5)
16) Disconnect gear shift control cable from transaxle. ☞(Page 5B-8)
17) Remove radiator support lower member and radiator. ☞(Page 1F-12)
18) Remove exhaust pipe. ☞(Page 1K-1)
19) Disconnect steering lower shaft from pinion shaft. ☞(Page 6B-11)
20) Remove stabilizer bar joints from stabilizer bar. ☞(Page 2B-12)
21) Remove front brake discs and calipers. ☞(Page 4B-3)
22) Remove front strut bracket bolts and nuts. ☞(Page 2B-4)
23) Remove front wheel speed sensors (if equipped). ☞(Page 4E-35)
24) Support front suspension frame (1), transaxle left and right case (2) and cylinder block (3) using jack.
25) Remove front suspension frame bolts (4).



IDL70A140015-01

26) Remove engine right and left mounting bracket bolts (1) and nuts (2).



IDL70A140016-02

27) Before removing engine, make sure that all hoses, electric wires and cables are disconnected from engine.
28) Lower engine assembly with transaxle, front suspension frame, drive shafts, P/S gear case all together.

NOTICE

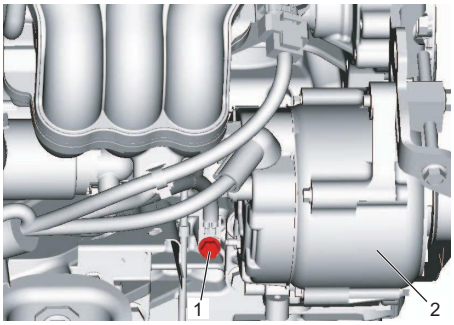
While lowering engine assembly, keep clearance with removed A/C compressor in order to avoid damage to A/C compressor if equipped.

29) Remove front suspension frame if necessary.
    a) Remove front drive shaft assembly. ☞(Page 3A-2)
    b) Remove front suspension frame from engine rear mounting.
30) Remove engine mountings, engine mounting brackets, and engine mounting bracket components if necessary.
31) Remove following components from engine assembly if necessary.
    a) Engine harness
    b) Transaxle: ☞(Page 5B-11)
    c) Clutch cover and disc: ☞(Page 5C-9)
    d) Flywheel: ☞(Page 1D-23)

Installation

1) Install following components to engine assembly if removed.
   a) Flywheel: ☞(Page 1D-23)
   b) Clutch cover and clutch disc: ☞(Page 5C-9)
   c) Transaxle ☞(Page 5B-11)
   d) Engine harness
2) Install front suspension frame, engine mountings, engine mounting brackets and engine mounting bracket components, and then tighten bolts to specified torque, if removed. ☞(Page 1D-17)
   Tighten engine harness ground bolt (1) with engine harness ground cable to specified torque.

   Tightening torque
   Engine harness ground bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



I8C50A140039-01

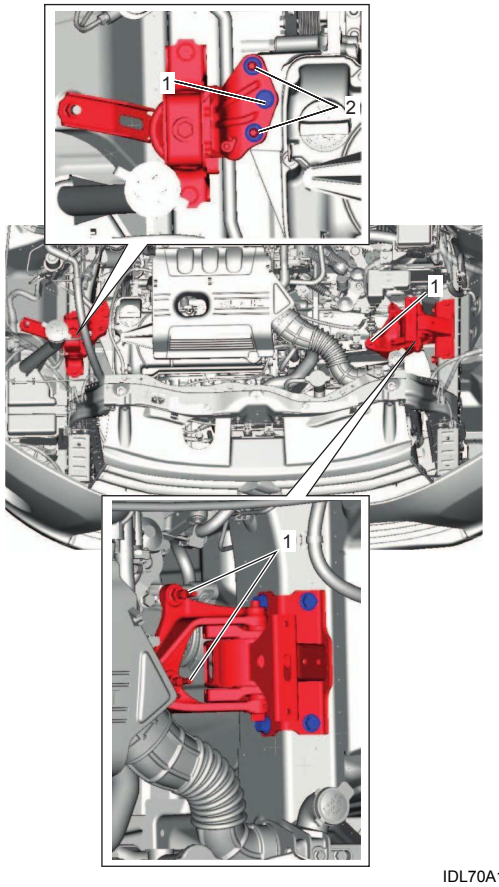
2. Generator

3) Lift engine assembly with transaxle, front suspension frame, drive shafts and P/S gear case all together using jack.

NOTICE

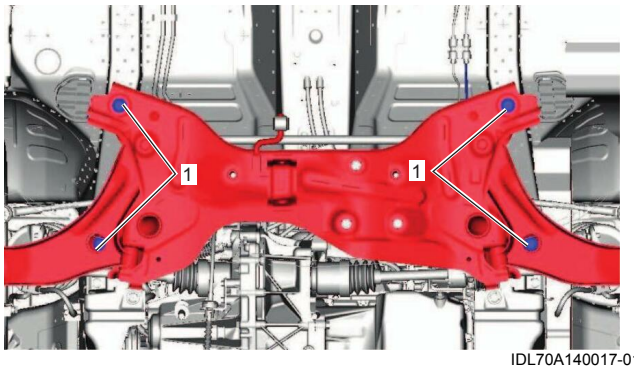
While lifting engine assembly, keep clearance with removed A/C compressor in order to avoid damage to A/C compressor if equipped.

4) Tighten engine right and left mounting bracket bolts (1) and nuts (2) to specified torque. ☞(Page 1D-17)



IDL70A140016-02

5) Tighten front suspension frame bolts (1) to specified torque. ☞(Page 2B-12)



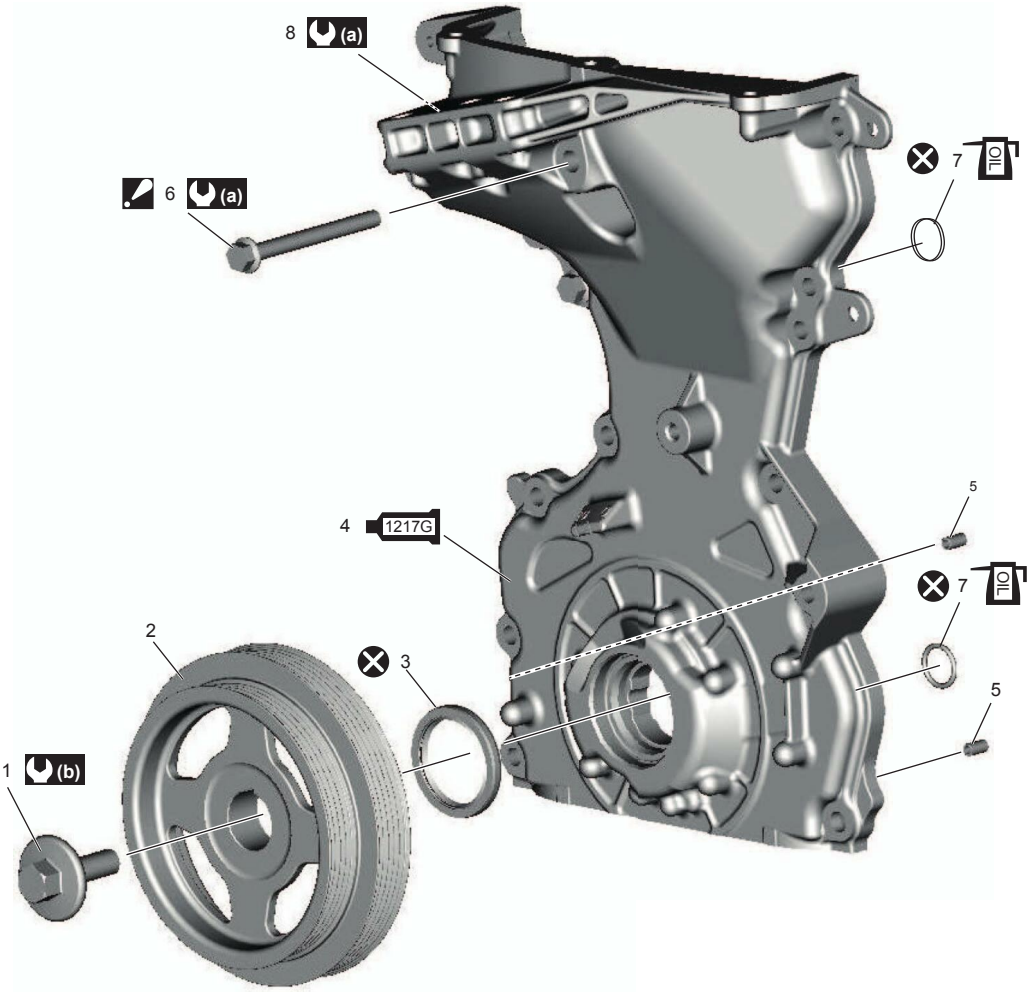
IDL70A140017-01

6) Remove jack.
7) Install front wheel speed sensors (if equipped). ☞(Page 4E-35)
8) Install front strut bracket bolts and nuts. ☞(Page 2B-4)
9) Install stabilizer bar joints to stabilizer bar. ☞(Page 2B-12)
10) Install front brake discs and calipers. ☞(Page 4B-3)
11) Connect steering lower shaft to pinion shaft. ☞(Page 6B-11)
12) Install exhaust pipe. ☞(Page 1K-1)
13) Install front lower cross member and radiator. ☞(Page 1F-12)

14) Connect gear shift control cable to transaxle. ☞(Page 5B-8)
15) Install clutch cable to clutch release arm. ☞(Page 5C-5)
16) Install A/C compressor to its bracket, if equipped. ☞(Page 7B-37)
17) Install engine harness clamps.
18) Install all other removed electric wires, connectors and hoses to original locations.
19) Connect battery ground cable to transaxle case. Tighten clutch cable bracket bolt to specified torque. ☞(Page 5C-5)
20) Install right and left side splash covers.☞(Page 9J-3)
21) Install front bumper. ☞(Page 9H-1)
22) Install air cleaner assembly. ☞(Page 1D-5)
23) Make sure that all electric wires and connectors are installed at original locations.
24) Make sure that all removed components are installed at original locations.
25) Refill the following oils.
    - Engine oil: ☞(Page 1E-2)
    - Manual transaxle oil (M/T model): ☞(Page 5B-5)
26) For AMT vehicle, install AMT actuator unit. ☞(Page 5D-87)
27) Install battery tray.
28) Install battery. ☞(Page 1J-5)
29) Refill cooling system with coolant. ☞(Page 1F-9)
30) Check any leakage of coolant, oil, fuel and exhaust.
    - Fuel leak: ☞(Page 1G-13)
    - Coolant leak: ☞(Page 1F-7)
31) Check the front wheel alignment. ☞(Page 2B-1)
32) Check the Confirm following items. If any defective condition is found, check installed correctly.
    - Engine starts normally.
    - A/C (if equipped) and other system operation normally.

Timing Chain Cover Components

AENDL70A1406016



IDL70A140018-02

1. Crankshaft pulley bolt	5. Dowel Pin	(a) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)

2. Crankshaft pulley	6. Timing chain cover bolts For tightening order, refer to "Timing Chain Cover Removal and Installation" (Page 1D-22).	(b) : 150 N·m (15.3 kgf-m, 111.0 lbf-ft)
3. Oil seal : Apply engine oil to oil seal lip.	7. O-ring : Apply engine oil.	: Do not reuse.
1217G 4. Timing chain cover : Apply sealant 99000-31260. For details, refer to Step 6) of "Installation" under "Timing Chain Cover Removal and Installation" (Page 1D-22).	8. Timing chain cover plug	

Timing Chain Cover Removal and Installation

AENDL70A1406017

NOTICE

- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

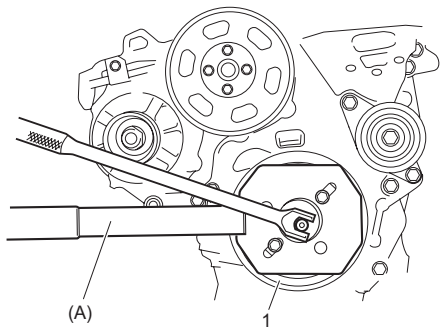
Removal

1) Remove engine assembly from vehicle. ☞(Page 1D-17)
2) Remove water pump / generator drive belt. ☞(Page 1J-6)
3) Remove crankshaft pulley bolt.
   To lock crankshaft pulley (1), use special tool as shown in figure.

NOTICE

Use special tool to prevent unnecessary load on timing chain, sprockets and any other related parts.

Special tool
(A): 09917M68221



I7V20A141049-01

4) Remove crankshaft pulley.
5) Remove cylinder head cover. ☞(Page 1D-9)
6) Remove oil pan. ☞(Page 1E-5)
7) Remove water pump pulley.
8) Remove timing chain cover.
9) Remove crankshaft oil seal from timing chain cover using flat-bladed screwdriver or the like, if necessary.
10) Remove oil pump from timing chain cover, if necessary. ☞(Page 1E-8)

Installation

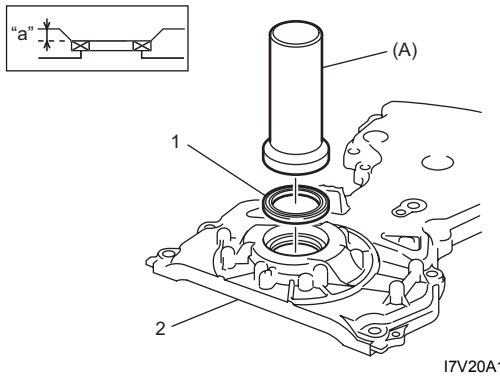
1) Clean sealing surface on timing chain cover, cylinder block and cylinder head.
   Remove oil, old sealant and dust from sealing surface.
2) Install oil pump, if removed. ☞(Page 1E-8)
3) Check oil seal (1) lip for fault or other damage. Replace oil seal, if necessary.

NOTE

When installing new oil seal, press fit to timing chain cover (2) by using special tool (A) as shown in figure.

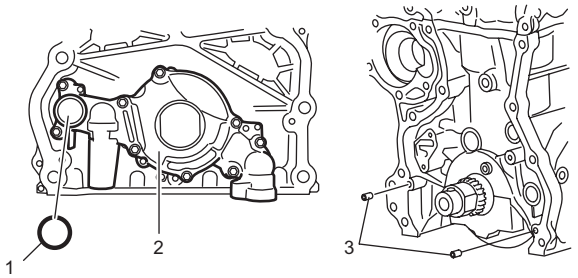
Depth
"a": 1.5 mm (0.06 in.)

Special tool
(A): 09913M75810



I7V20A141050-01

4) Install new O-ring (1) to oil pump (2).
5) Install dowel pins (3) to cylinder block if removed.

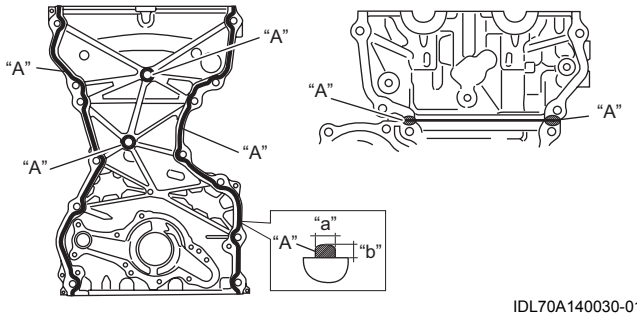


I7V20A141051-01

6) Apply sealant "A" to mating surface of cylinder block & cylinder head and timing chain cover as shown in figure.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant bead size for timing chain cover
Width "a": 3 mm (0.12 in.)
Height "b": 2 mm (0.08 in.)



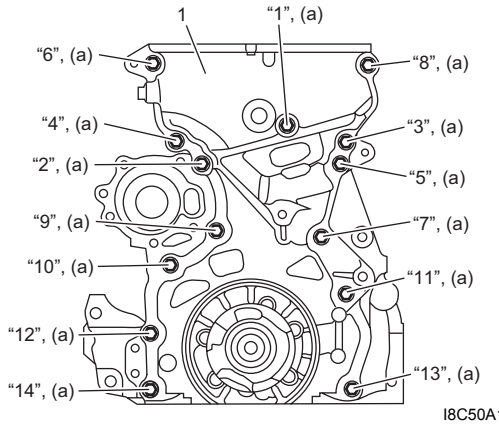
IDL70A140030-01

7) Apply engine oil to oil seal lip, then install timing chain cover (1). Tighten timing chain cover bolts to specified torque in numerical order ("1" – "14") evenly and gradually.

NOTE

Before installing timing chain cover, check that dowel pins are securely fitted.

Tightening torque
Timing chain cover bolt* (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



I8C50A140082-01

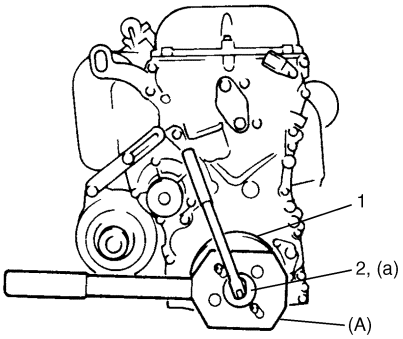
8) Install water pump pulley.
9) Install cylinder head cover. ☞(Page 1D-9)
10) Install oil pan. ☞(Page 1E-5)
11) Install crankshaft pulley (1). Tighten bolt (2) to specified torque. To lock crankshaft pulley, use special tool as shown in figure.

NOTICE

Use special tool to prevent unnecessary load on timing chain, sprockets and any other related parts.

Special tool
(A): 09917M68221

Tightening torque
Crankshaft pulley bolt (a): 150 N·m (15.3 kgf-m, 111.0 lbf-ft)



I2RH0B140056-01

12) Install water pump / generator drive belt. ☞(Page 1J-6)
13) Install engine assembly to vehicle. ☞(Page 1D-17)

Timing Chain Cover Inspection

AENDL70A1406018

Oil Seal
Check oil seal lip for fault or other damage. Replace as necessary.

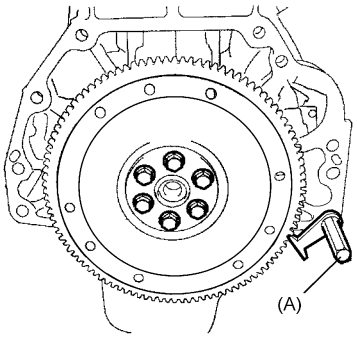
Flywheel Removal and Installation

AENDL70A1406020

Removal

1) Remove engine assembly. ☞(Page 1D-17)
2) Remove clutch cover, clutch disc and flywheel.

Special tool
(A): 09924M17811



I8C50A140045-01

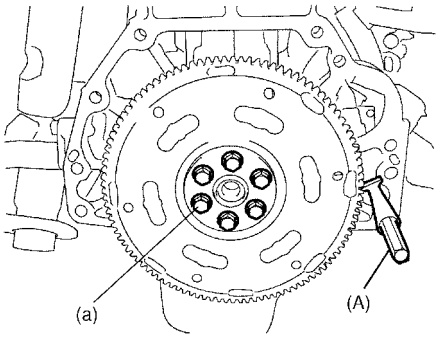
Installation
Reverse removal procedure for installation noting the following.

- Install new flywheel bolts.
- Install special tool in ring gear teeth to lock flywheel.

Special tool
(A): 09924M17811

- Tighten flywheel bolts to specified torque.

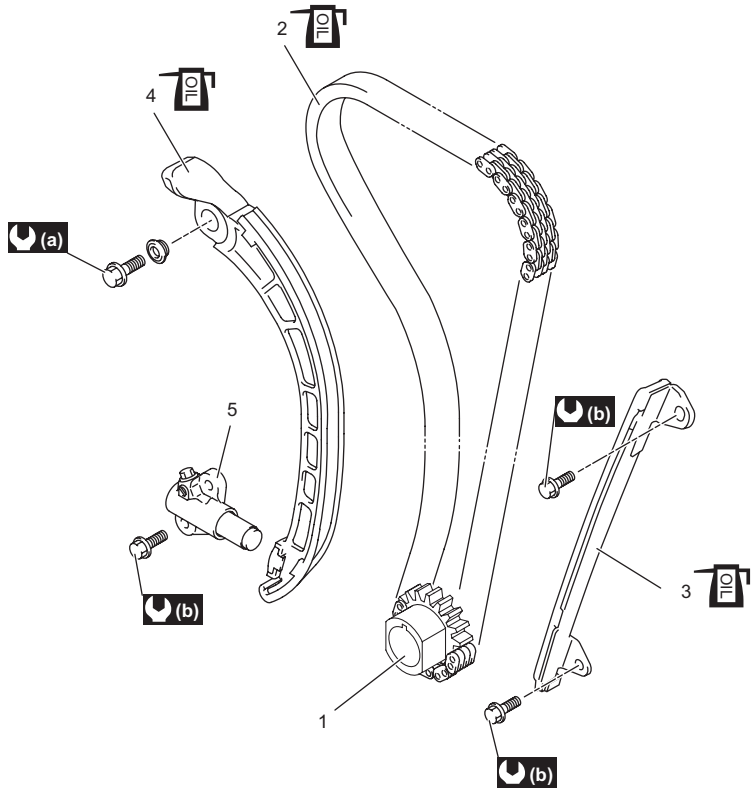
Tightening torque
Flywheel or drive plate bolt (a): 70 N·m (7.1 kgf-m, 52.0 lbf-ft)



I7V20A141055-01

Timing Chain and Chain Tensioner Components

AENDL70A1406021



I7V20A141056-01

1. Crankshaft timing sprocket	4. Timing chain tensioner : Apply engine oil to sliding surface.	(b) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
2. Timing chain : Apply engine oil.	5. Timing chain tensioner adjuster	
3. Timing chain guide : Apply engine oil to sliding surface.	(a) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)	

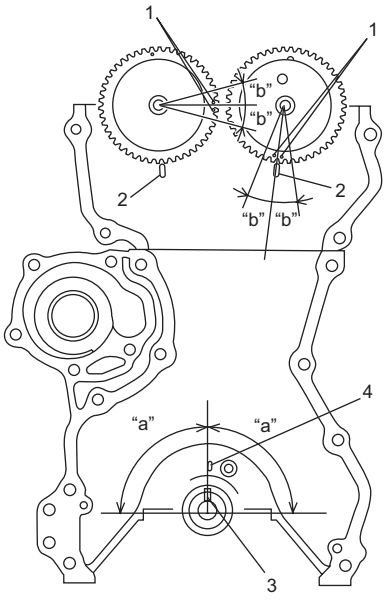
Timing Chain and Chain Tensioner Removal and Installation

AENDL70A1406022

Removal

NOTICE

After timing chain is removed, never turn crankshaft and camshafts independently more than specified range (“a” and “b”) as shown in figure.
If either of those shafts is turned, interference may occur between pistons and valves and valves themselves, and parts related to piston and valves may be damaged.

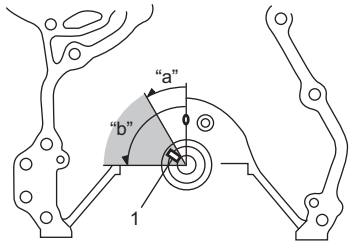


IDL70A140025-01

1. Timing mark on camshaft sprockets	4. Notch on cylinder block
2. Notch on cylinder head	“a”: 90°
3. Key	“b”: 15°

NOTE

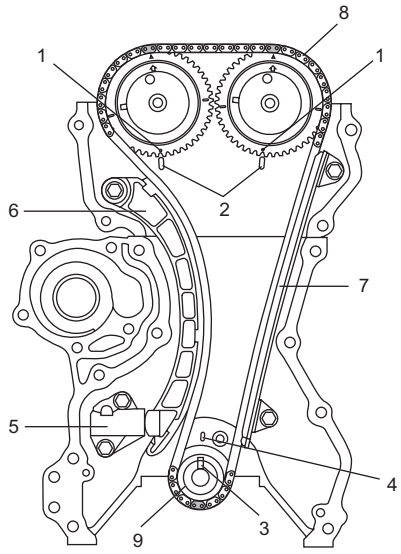
If it is necessary to rotate the camshaft with the timing chain removed, rotate the camshaft after turning crankshaft counterclockwise 30 – 90° as shown in figure.



I7V20A141058-01

“a”: 30°	“b”: 90°	1. Key

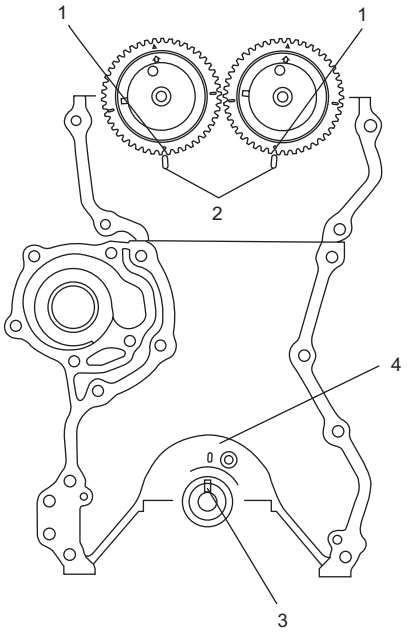
1) Remove timing chain cover. ☞(Page 1D-22)
2) By turning crankshaft, align camshafts and crankshaft at specific position.
   a) Align both intake and exhaust camshaft timing sprocket marks (1) with notches (2) on cylinder head respectively.
   b) Position crankshaft sprocket key (3) with notch on cylinder block (4).
3) Remove timing chain tensioner adjuster (5).
4) Remove timing chain tensioner (6).
5) Remove timing chain guide (7).
6) Remove timing chain (8) and crankshaft timing sprocket (9).



I7V20A141059-01

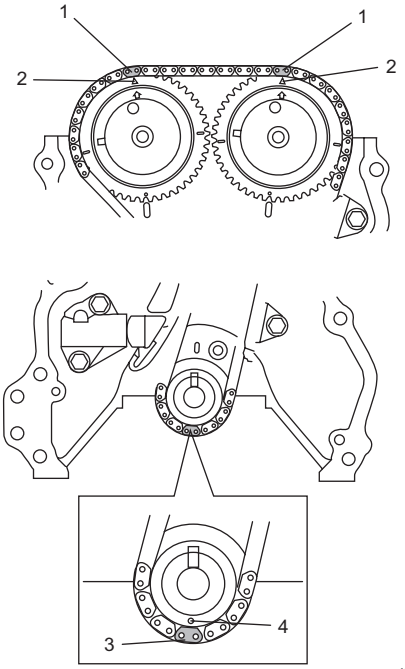
Installation

1) Install timing chain cover. ☞(Page 1D-22)
2) Align timing marks (1) on intake and exhaust camshaft timing sprockets with notches (2) on cylinder head.
3) Set key (3) and align crankshaft sprocket key (3) with notch (4) on cylinder block by turning crankshaft.



I7V20A141060-01

4) Install crankshaft timing sprocket.
5) Install timing chain while aligning two colored marks (1) of timing chain with timing marks (2) on camshaft timing sprockets.
6) Install timing chain while aligning colored mark (3) of timing chain with timing mark (4) on crankshaft timing sprocket.



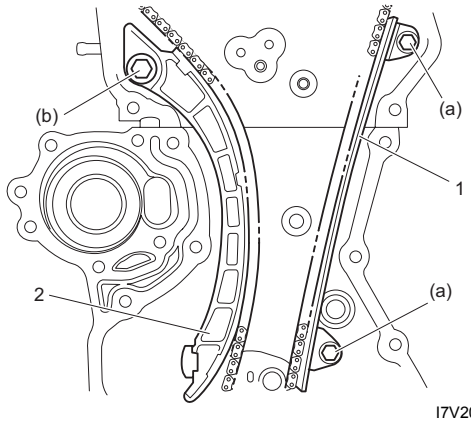
I7V20A141061-01

7) Apply engine oil to sliding surface of timing chain guide (1).
8) Install timing chain guide (1) and tighten guide bolts to specified torque.

Tightening torque
Timing chain guide bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

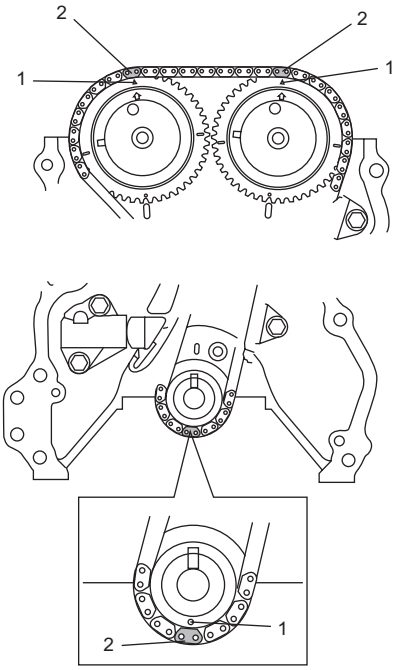
9) Apply engine oil to sliding surface of timing chain tensioner (2).
10) Install timing chain tensioner (2) and tighten tensioner bolt to specified torque.

Tightening torque
Timing chain tensioner bolt (b): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



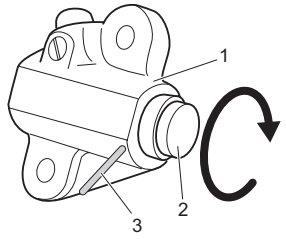
I7V20A141062-03

11) Make sure all colored marks (2) on timing chain are aligned with timing marks (1) on corresponding timing sprockets.



I8C50A140083-01

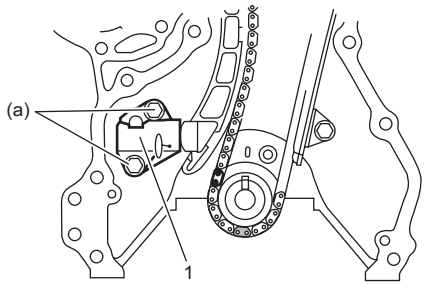
12) Screw in plunger (2) of timing chain tensioner adjuster (1) clockwise and install a retainer (3) (1.4 mm-diameter wire or the like) to hold plunger in place.



I8T401142078-01

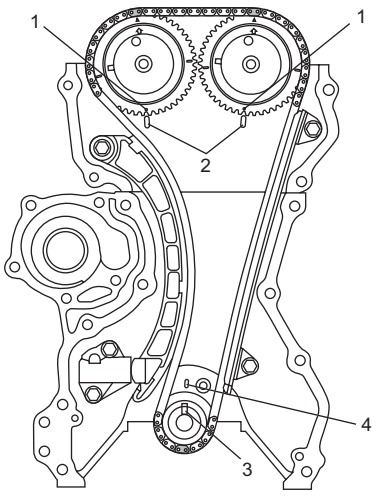
13) Install timing chain tensioner adjuster (1) with a retainer.
Tighten timing chain tensioner adjuster bolts to specified torque, and then remove a retainer from timing chain tensioner adjuster.

Tightening torque
Timing chain tensioner adjuster bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



I8C50B140030-01

14) Apply engine oil to timing chain, and then turn crankshaft clockwise fully twice, and make sure following items.
- Timing marks (1) on intake and exhaust camshaft timing sprockets are aligned with match marks (2) on cylinder head.
- Crankshaft sprocket key (3) is aligned with match mark (4) on cylinder block.



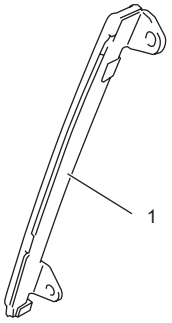
I7V20A141065-01

15) Perform Steps 10) to 15) of “Installation” under “Timing Chain Cover Removal and Installation” (Page 1D-22).

Timing Chain and Chain Tensioner Inspection

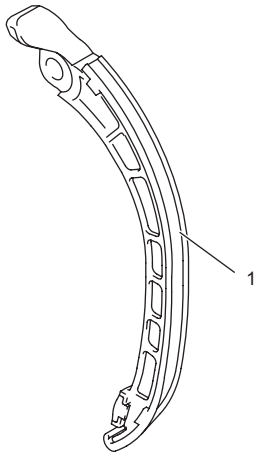
AENDL70A1406023

Timing Chain Guide
Check shoe (1) for wear or damage.



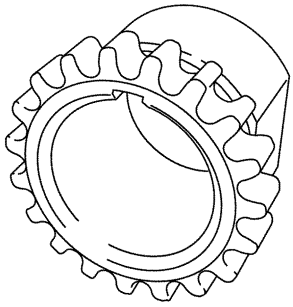
I7V20A141066-01

Timing Chain Tensioner
Check shoe (1) for wear or damage.



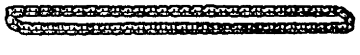
I7V20A141067-01

Crankshaft Timing Sprocket
Check teeth of sprocket for wear or damage.



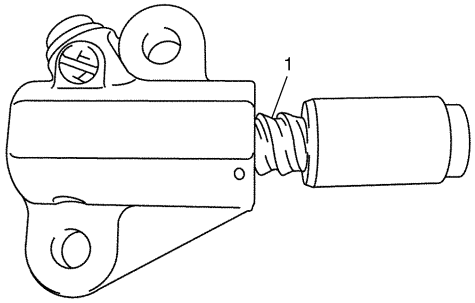
I2RH0B140070-01

Timing Chain
Check timing chain for wear or damage.



I2RH01140077-01

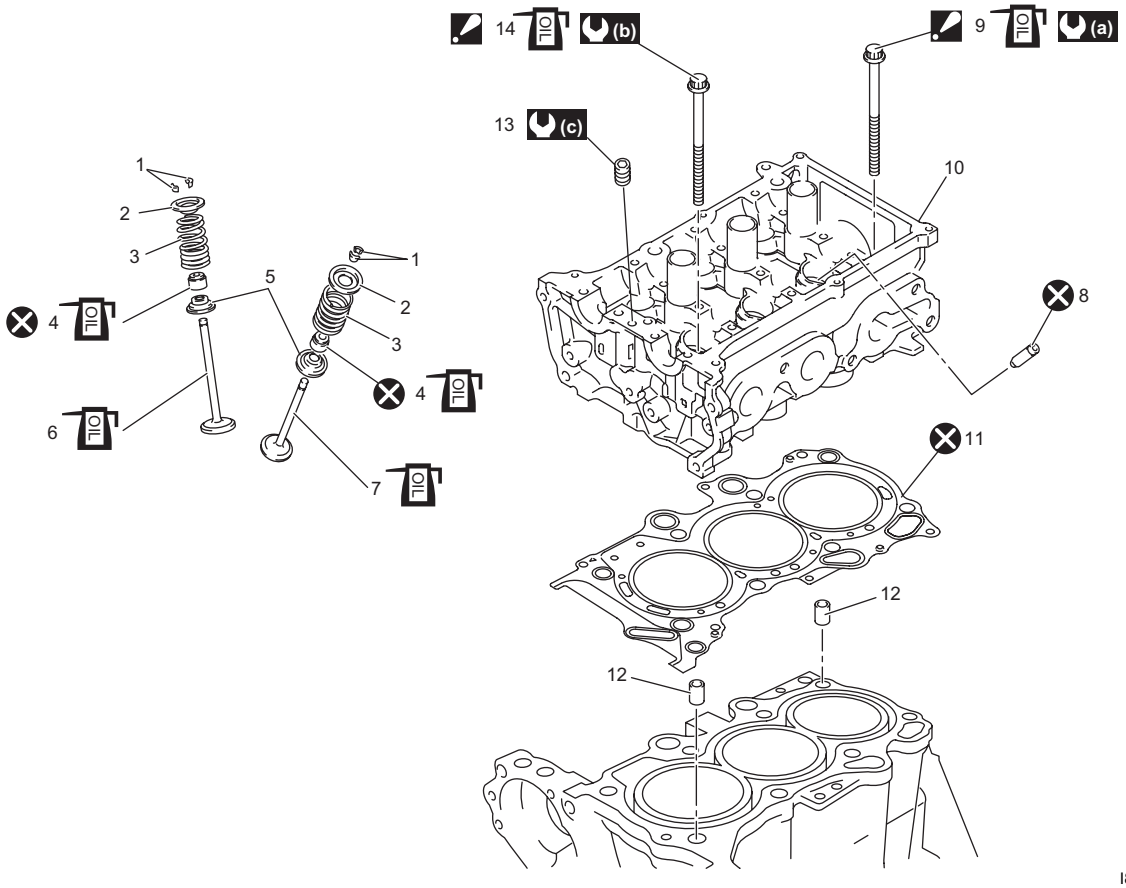
Timing Chain Tensioner Adjuster
Check that thread surface (1) is free from damage.



I2RH0B140071-01

Valve and Cylinder Head Components

AENDL70A1406024



I8C50A140047-01

1. Valve cotter	8. Valve guide	(a) : Tighten 20 N·m → 40 N·m → +60° → +60° (2.0 kgf-m → 4.1 kgf-m → +60° → +60°, 15.0 lbf-ft → 29.5 lbf-ft → +60° → +60°)
2. Valve spring retainer	9. Cylinder head bolt : When reusing, check cylinder head bolt for deformation. ☞(Page 1D-36) : For tightening order, refer to "Valve and Cylinder Head Removal and Installation" (Page 1D-28).	(b) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
3. Valve spring	10. Cylinder head	(c) : 3.5 N·m (0.36 kgf-m, 2.5 lbf-ft)
4. Valve stem seal	11. Cylinder head gasket	: Do not reuse.
5. Valve spring seat	12. Dowel pin	OIL : Apply engine oil to sliding surface of each part.
6. Intake valve	13. Venturi plug	
7. Exhaust valve	14. Cylinder head bolt (M8) : To tighten cylinder heat bolt (M8), refer to "Valve and Cylinder Head Removal and Installation" (Page 1D-28).	

Valve and Cylinder Head Removal and Installation

AENDL70A1406025

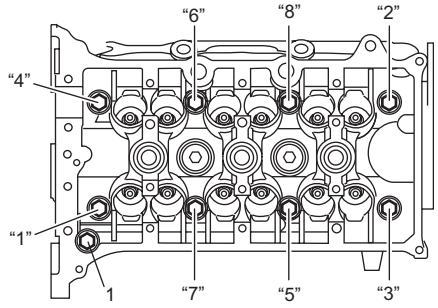
Removal

1) Remove engine assembly from vehicle. ☞(Page 1D-17)

2) Remove Intake manifold. ☞(Page 1D-7)
3) Remove cooling water pipe. ☞(Page 1F-9)
4) Remove oil pan. ☞(Page 1E-5)
5) Remove cylinder head cover. ☞(Page 1D-9)
6) Remove timing chain cover. ☞(Page 1D-22)
7) Remove timing chain. ☞(Page 1D-25)
8) Remove camshafts and tappets. ☞(Page 1D-11)
9) Loosen cylinder head bolts in such order as indicated in figure by using a 12 corner socket wrench and remove them.

NOTE

Be sure to remove cylinder head bolt (M8) (1) as shown in figure.

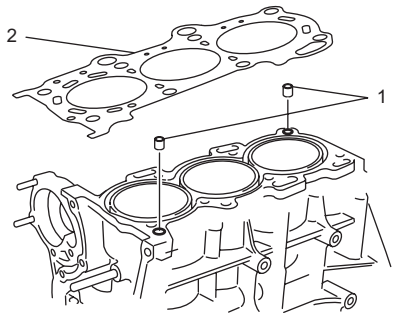


IBC50A140026-01

10) Check all around cylinder head for any other parts required to be removed or disconnected and remove or disconnect whatever necessary.
11) Remove the following components from cylinder head if necessary.
    - Exhaust manifold: ☞(Page 1K-3)
    - Fuel injector: ☞(Page 1G-15)
    - Venturi plug: ☞(Page 1D-30)
    - Thermostat assembly: ☞(Page 1F-9)
12) Remove cylinder head and cylinder head gasket. Use lifting device, if necessary.

Installation

1) Clean mating surface of cylinder head and cylinder block. Remove oil, old gasket and dust from mating surface.
2) Install venturi plug if removed. ☞(Page 1D-30)
3) Install dowel pins (1) to cylinder block.
4) Install new cylinder head gasket (2) to cylinder block.

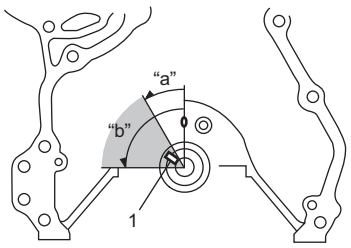


IBC50A140027-01

5) Install cylinder head to cylinder block as follows.

NOTE

- **Before putting cylinder head, position crankshaft within "a" range indicated in figure.**
- **Before tightening cylinder head bolts, turning crankshaft counterclockwise 30 – 90° as shown in figure.**
- **If cylinder head bolt is reused, check bolt for deformation. ☞(Page 1D-36)**

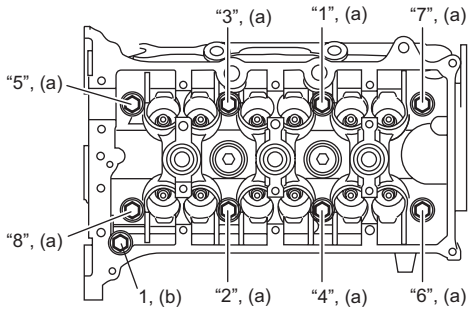


I7V20A141058-01

"a": 30°	"b": 90°	1. Key

a) Apply engine oil to new cylinder head bolts.
b) Tighten cylinder head bolts ("1" – "8") to 20 N·m (2.0 kgf-m, 15.0 lbf-ft) according to numerical order as shown by using a 12 corner socket wrench.
c) In the same manner as in Step b), tighten them to 40 N·m (4.1 kgf-m, 29.5 lbf-ft).
d) Turn all bolts 60° according to numerical order in figure.
e) Repeat Step d).
f) Tighten cylinder head bolt (M8) (1) to specified torque after performing above steps a) to e).

Tightening torque
Cylinder head bolt (M10)* (a): 20 N·m → 40 N·m → +60° → +60° (2.0 kgf-m → 4.1 kgf-m → +60° → +60°, 15.0 lbf-ft → 29.5 lbf-ft → +60° →+60°)
Cylinder head bolt (M8)* (b): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



IBC50A140028-01

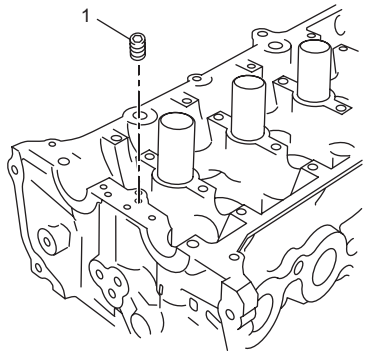
6) Install camshafts and tappets. ☞(Page 1D-11)
7) Install timing chain. ☞(Page 1D-25)
8) Install cooling water pipe. ☞(Page 1F-9)
9) Install timing chain cover. ☞(Page 1D-22)
10) Install cylinder head cover. ☞(Page 1D-9)
11) Install oil pan. ☞(Page 1E-5)
12) Install intake manifold. ☞(Page 1D-7)
13) Install exhaust manifold if removed. ☞(Page 1K-3)
14) Install fuel injector if removed. ☞(Page 1G-15)
15) Install Thermostat assembly if removed. ☞(Page 1F-9)
16) Install engine assembly. ☞(Page 1D-17)

Valve and Cylinder Head Disassembly and Reassembly

AENDL70A1406026

Disassembly

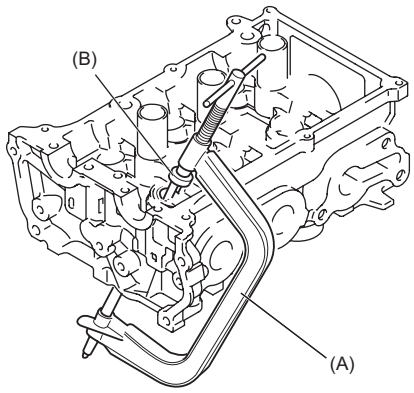
1) Remove venturi plug (1).



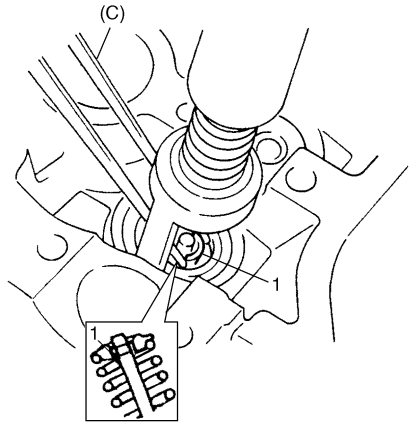
I9R90A140030-01

2) Place disassembled parts except valve stem seal and valve guide in order so that they can be installed in their original position.
3) To facilitate in servicing cylinder head, remove intake manifold, injectors and exhaust manifold from cylinder head.
4) Using special tools, compress valve spring and then remove valve cotters (1) also by using special tool.

Special tool
(A): 09916M14510
(B): 09916M14522
(C): 09916M84511



I8C50A140051-01

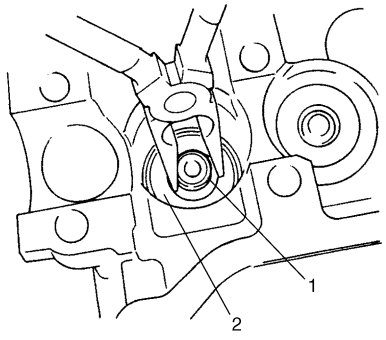


IBC50A140029-01

5) Release special tools, and remove spring retainer and valve spring.
6) Remove valve from combustion chamber side.
7) Remove valve stem seal (1) and valve spring seat (2).

NOTE

Do not reuse valve stem seal once disassembled. Be sure to use new seal when assembling.



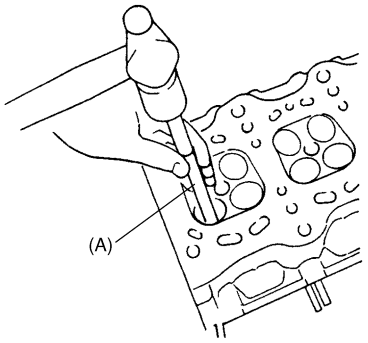
I2RH0B140094-01

8) Using special tool, drive out valve guide from combustion chamber side to valve spring side.

NOTE

- **Do not reuse valve guide once disassembled. Be sure to use new valve guide (oversize) when assembling.**
- **Heat and detach valve guide, if necessary.**

Special tool
(A): 09916M44310

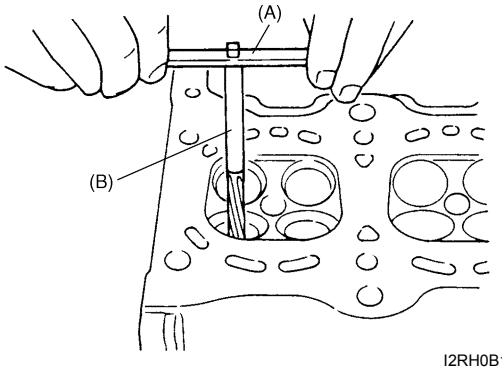


I2RH0B140095-01

Reassembly

1) Before installing valve guide into cylinder head, ream guide hole with special tool so as to remove burrs and make it truly round.

Special tool
(A): 09916M34542
(B): 09916M37320



I2RH0B140096-01

2) Using special tools, install new valve guide to cylinder head as follows.

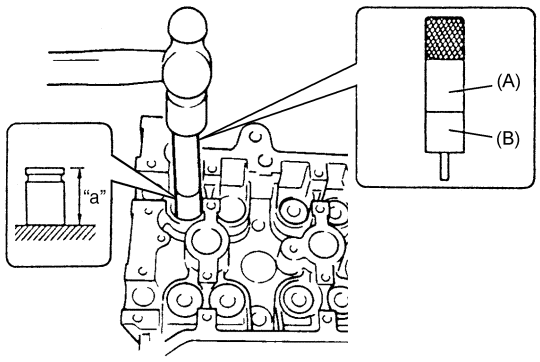
Special tool
(A): 09916M57330
(B): 09916M56011

NOTE

- **Never reuse valve guide once disassembled. Make sure to install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

a) Heat cylinder head uniformly to a temperature of 80 to 100 °C (176 to 212 °F) so that head will not be distorted, and drive new valve guide into hole with special tools.
b) Drive in new valve guide until special tool contacts cylinder head.
After installing, make sure that valve guide protrudes by specified dimension “a” from cylinder head.

Valve guide protrusion (In and Ex)
“a”: 11.1 – 11.5 mm (0.4370 – 0.4528 in.)



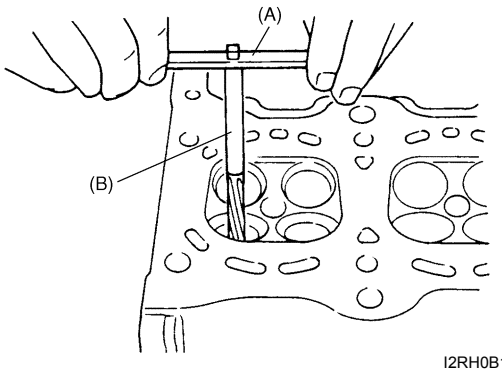
I8C50A140052-01

3) Ream valve guide bore with special tool.

NOTE

After reaming, clean bore.

Special tool
(A): 09916M34542
(B): 09916M37320



I2RH0B140096-01

4) Install valve spring seat to cylinder head.
5) Install new valve stem seal (1) to valve guide.
6) After applying engine oil to seal and spindle of special tool, fit valve stem seal to spindle, and then install seal to valve guide by pushing special tool by hand.

After installing, check that seal is properly fixed to valve guide.

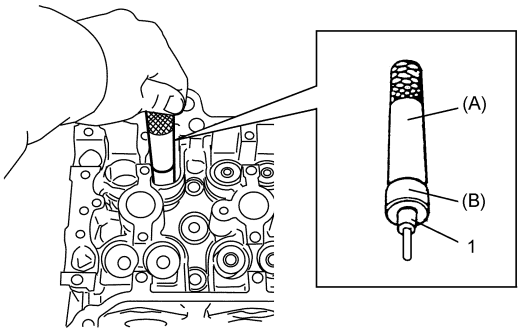
NOTICE

When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.

NOTE

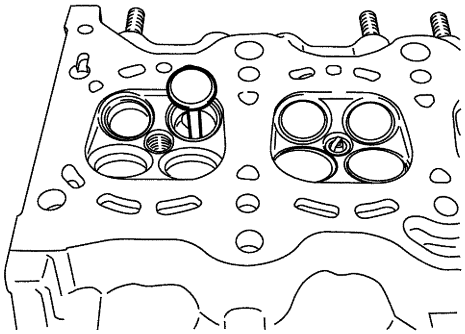
Do not reuse seal once disassembled. Be sure to install new seal.

Special tool
(A): 09917M98221
(B): 09916M57330



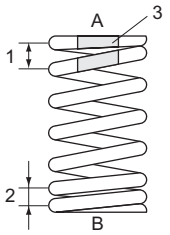
I8C50A140053-01

7) Apply engine oil to stem seal, valve guide bore and valve stem.
8) Install valve to valve guide.



I2RH0B140099-01

9) Install valve spring and spring retainer.
Each valve spring has top end (large-pitch end (1)) and bottom end (small-pitch end (2)). Be sure to position spring in place with its bottom end (small-pitch end) facing the bottom (valve spring seat side).



I7V20A141081-01

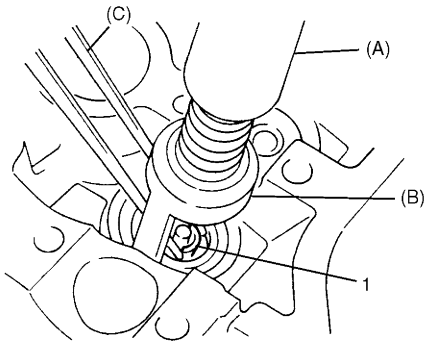
A: Valve spring retainer side	B: Valve spring seat side
3. Paint mark	

10) Using special tools, compress valve spring and fit two valve cotters (1) into groove in valve stem.

NOTE

When compressing the valve spring, be careful not to damage inside face of tappet installing hole.

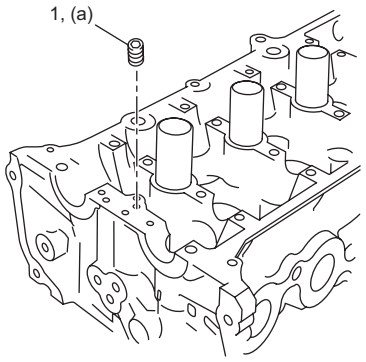
Special tool
(A): 09916M14510
(B): 09916M14522
(C): 09916M84511



I2RH0B140101-01

11) Install venturi plug and tighten venturi plug to specified torque.

Tightening torque
Venturi plug (a): 3.5 N·m (0.36 kgf-m, 2.5 lbf-ft)



I7V20A141078-01

12) Install intake manifold. ☞(Page 1D-7)
13) Install fuel injectors. ☞(Page 1G-15)
14) Install exhaust manifold. ☞(Page 1K-3)

Valve and Valve Guide Inspection

AENDL70A1406027

Valve Guide

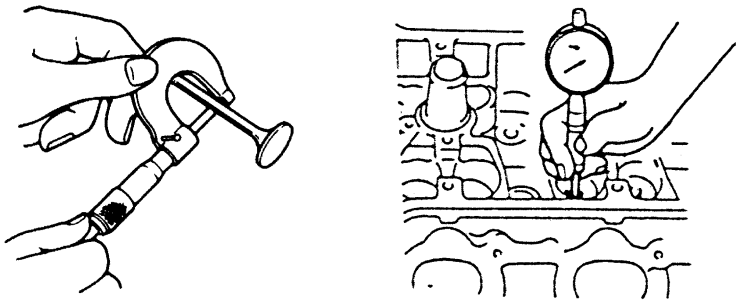
Valve stem-to-guide clearance

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance.
Be sure to take reading at more than one place along the length of each stem and guide.
If clearance exceeds limit, replace valve and valve guide.

Valve stem and valve guide specification

Item		Standard	Limit
Valve stem diameter [A]	In	4.965 – 4.980 mm (0.1955 – 0.1961 in.)	—
	Ex	4.940 – 4.955 mm (0.1945 – 0.1951 in.)	—
Valve guide bore [B]	In & Ex	5.000 – 5.012 mm (0.1969 – 0.1973 in.)	—
Stem-to-guide clearance	In	0.020 – 0.047 mm (0.0008 – 0.0019 in.)	0.070 mm (0.0028 in.)
	Ex	0.045 – 0.072 mm (0.0018 – 0.0028 in.)	0.090 mm (0.0035 in.)

[A] [B]

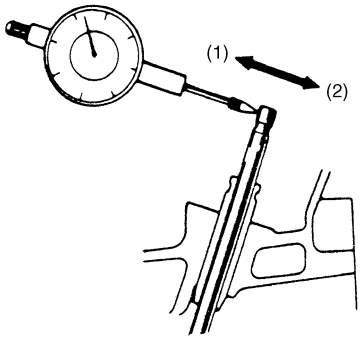


I4RS0B140016-01

Valve stem end deflection

If bore gauge is not available, check end deflection of valve stem with a dial gauge instead.
Move stem end in directions (1) and (2) to measure end deflection.
If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit
In: 0.14 mm (0.0055 in.)
Ex: 0.18 mm (0.0071 in.)



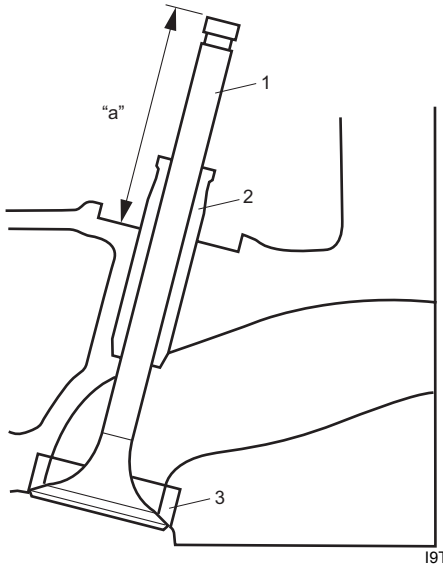
IYSQ01141096-01

Valve

Visual inspection

- Remove all carbon from valves (1).
- Inspect each valve for wear, burn or distortion at its face and stem end, as necessary, replace it.
- Measure valve protrusion “a”.
  If measured length is out of standard value, replace valve.

  Valve protrusion “a” standard
  In: 34.7 – 35.3 mm (1.366 – 1.390 in.)
  Ex: 34.6 – 35.2 mm (1.362 – 1.386 in.)



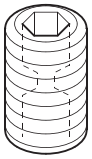
I9T401142024-01

2. Valve guide	3. Valve seat

Venturi plug inspection

Check that venturi plug passage is not clogged.

If venturi plug passage is clogged, clean or replace venturi plug.

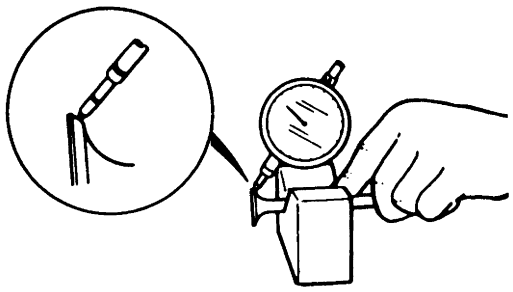


I7V20A141083-03

Valve head radial runout
Check each valve for radial runout with a dial gauge and "V" block. To check runout, rotate valve slowly. If runout exceeds its limit, replace valve.

Valve head radial runout

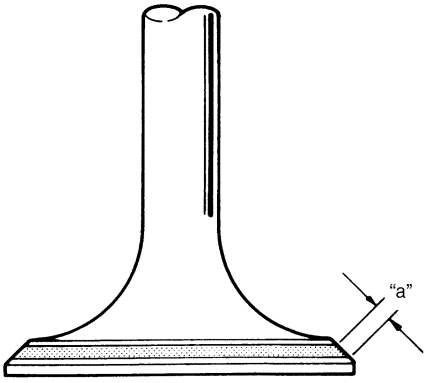
Item	Standard	Limit
In:	0 – 0.05 mm (0 – 0.0020 in.)	0.08 mm (0.0031 in.)
Ex:	0 – 0.03 mm (0 – 0.0012 in.)	0.08 mm (0.0031 in.)



I2RH01140136-01

Seating contact width
Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and by rotating and tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.
Pattern produced on seating face of valve must be a continuous ring without any break, and the width of pattern must be within specified range.

Standard seating width "a" revealed by contact pattern on valve face
Intake: 1.0 – 1.1 mm (0.0394 – 0.0433 in.)
Exhaust: 1.0 – 1.3 mm (0.0394 – 0.0512 in.)



I2RH0B140103-01

Valve seat repair
A valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.

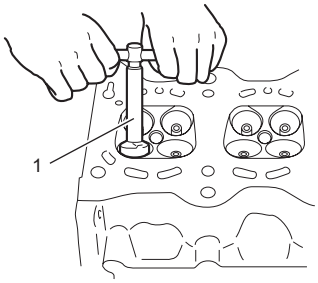
1) **Intake valve seat:**
Use valve seat cutters (1) to make three cuts as illustrated in figure. Three cutters must be used: the 1st for making 30° angle, the 2nd for making 70° angle, and 3rd for making 45° angle. The 3rd cut (45°) must be made to produce desired seat width.

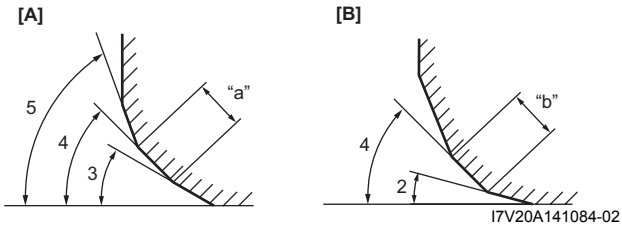
Seat width for intake valve seat
"a": 1.0 – 1.1 mm (0.0394 – 0.0433 in.)

2) **Exhaust valve seat:**
Use valve seat cutters (1) to make two cuts as illustrated in figure. Two cutters must be used: the first for making 20° angle, and the second for making 45° angle. The second cut must be made to produce desired seat width.

Seat width for exhaust valve seat
"b": 1.0 – 1.3 mm (0.0394 – 0.0512 in.)

3) **Valve lapping:**
Lap valve on seat in two steps, first with coarse size lapping compound applied to face and the second with fine-size compound, each time using valve lapper according to usual lapping method.





I7V20A141084-02

[A]: Intake	2. 15°	4. 45°
[B]: Exhaust	3. 30°	5. 70°

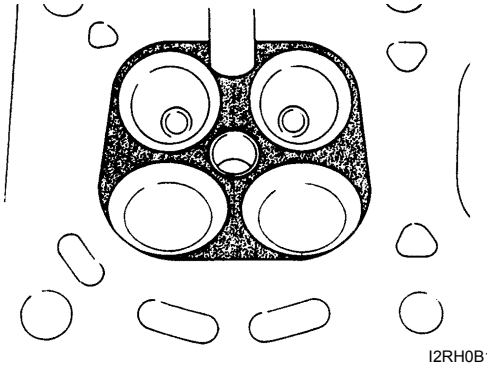
Cylinder Head Inspection

AENDL70A1406028

- Remove all carbon deposits from combustion chambers.

NOTE

Do not use any sharp-edged tool to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when removing carbon deposits. The same applies to valves and valve seats, too.

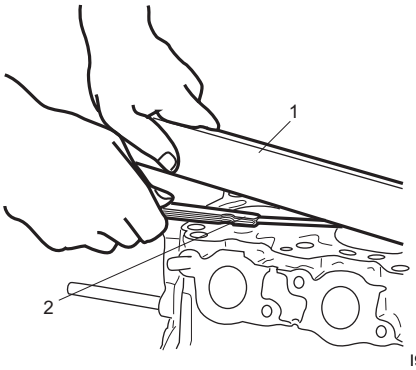


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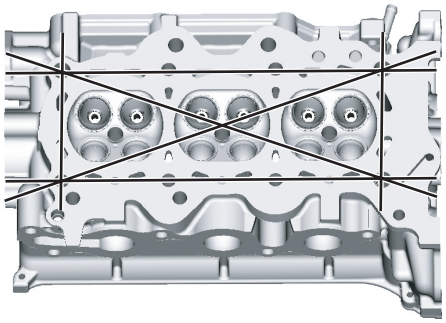
- Check cylinder head for cracks on intake and exhaust ports, combustion chambers and head surface.
- Using a straightedge (1) and feeler gauge (2), check flatness of cylinder head mating surface at a total of 6 locations. If distortion of cylinder head mating surface exceeds limit, correct cylinder head mating surface with a surface plate and abrasive paper of about #400 (Waterproof silicon carbide abrasive paper): place abrasive paper on and over surface plate, and rub cylinder head mating surface against paper to grind off high spots. If it is impossible to correct cylinder head distortion, replace cylinder head.

Distorted mating surface of cylinder head and cylinder head gasket causes combustion gas and/or check cooling system for leakage, overheating and reduced power output.

Distortion for cylinder head surface on piston side
Limit: 0.03 mm (0.0012 in.)



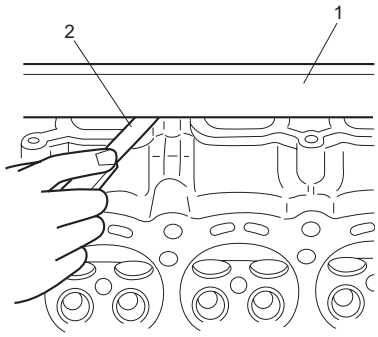
I9T401142027-01



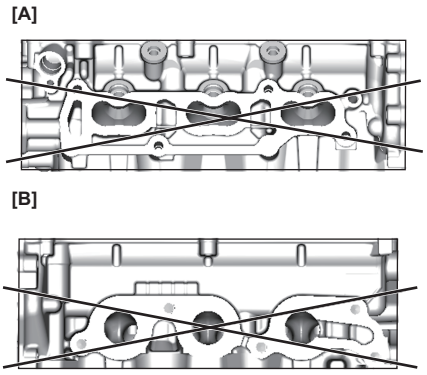
I8C50A140057-01

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using a straightedge (1) and thickness gauge (2), in order to determine whether these faces should be corrected or cylinder head replaced.

Distortion for cylinder head surface on intake and exhaust manifold
Limit: 0.05 mm (0.0020 in.)



I8C50A140059-01



IBC50A140031-01

[A]: Intake side	[B]: Exhaust side

Cylinder Head Bolt Inspection

AENDL70A1406029

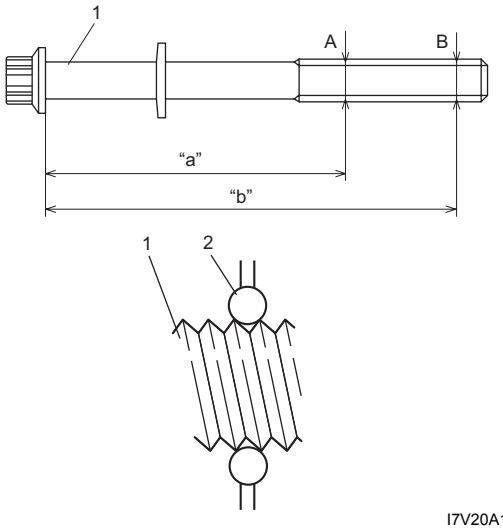
NOTE

If cylinder head bolt (1) is reused, check its thread diameter for deformation as follows and replace it with new one if thread diameter difference exceeds limit.

Measure each thread diameter of cylinder head bolt (1) at “A” on 70.0 mm (2.7559 in.) from seat side of flange bolt and “B” on 105 mm (4.1339 in.) from seat side of flange bolt by using micrometer (2).
Then calculate difference in diameters (A – B).
If it exceeds limit, replace with new one.

Cylinder head bolt diameter measurement points
“a”: 70.0 mm (2.76 in.)
“b”: 105 mm (4.13 in.)

Cylinder head bolt diameter difference (deformation)
Limit (A – B): 0.2 mm (0.0079 in.)



I7V20A141086-01

Valve Spring Inspection

AENDL70A1406030

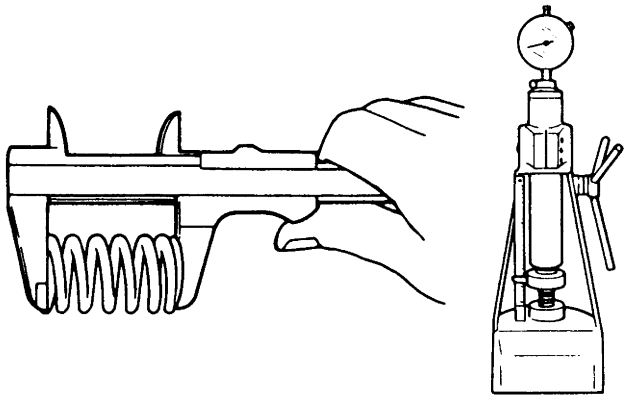
Valve Spring Free Length and Preload
Referring to data, check that each spring is in sound condition and free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Valve spring free length

Standard	**42.87 mm (1.6878 in.)**
Limit	**—**

Valve spring preload

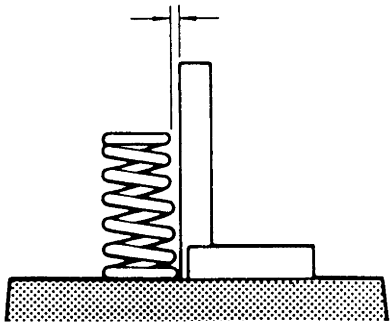
Standard	**104 – 120 N (10.6 – 12.2 kgf, 23.4 – 27.0 lbf) for 28.9 mm (1.1378 in.)**
Limit	**94 N (9.6 kgf, 21.1 lbf) for 28.9 mm (1.1378 in.)**



I2RH01140143-01

Spring Squareness
Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit must be replaced.

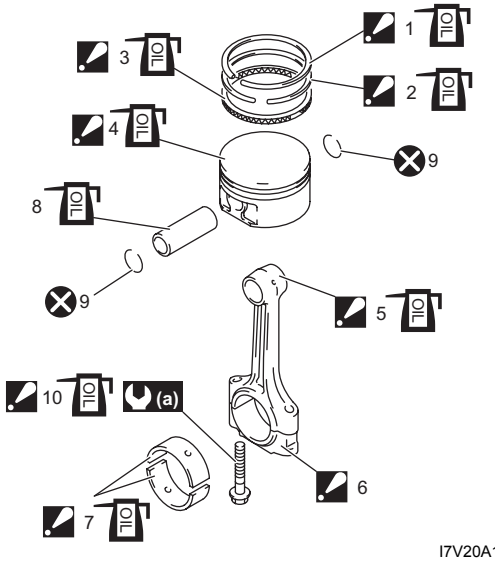
Valve spring squareness
Limit: 1.9 mm (0.0748 in.)



I2RH01140144-01

Piston, Piston Ring, Connecting Rod and Cylinder Components

AENDL70A1406031



I7V20A141087-02

1. 1st ring : For assembly, refer to “Piston, Piston Ring, Connecting Rod and Cylinder Disassembly and Reassembly” (Page 1D-38).	8. Piston pin
2. 2nd ring : For assembly, refer to “Piston, Piston Ring, Connecting Rod and Cylinder Disassembly and Reassembly” (Page 1D-38).	9. Piston pin circlip
3. Oil ring : For assembly, refer to “Piston, Piston Ring, Connecting Rod and Cylinder Disassembly and Reassembly” (Page 1D-38).	10. Connecting rod bolt : When reusing, check connecting rod bolt for deformation. ☞(Page 1D-41)
4. Piston	(a) : Tighten 15 N·m → +65° (1.5 kgf-m → +65°, 11.0 lbf-ft → +65°).
5. Connecting rod : Apply engine oil to sliding surface except inner surface of big end and rod bolts.	OIL : Apply engine oil to sliding surface of each part.
6. Connecting rod bearing cap : Point arrow mark on cap to crankshaft pulley side. Do not apply engine oil to inner surface of bearing cap.	: Do not reuse.
7. Connecting rod bearing : Do not apply engine oil between connecting rod big end and bearing, between bearing cap and bearing.	

Piston, Piston Ring, Connecting Rod and Cylinder Removal and Installation

AENDL70A1406032

Removal

1) Remove engine assembly from vehicle. ☞(Page 1D-17)
2) Remove cylinder head. ☞(Page 1D-28)
3) Mark cylinder number on all pistons, connecting rods and connecting rod caps using silver pencil or quick drying paint.
4) Remove connecting rod bearing caps.
5) Remove carbon deposits from top of cylinder bore before removing piston from cylinder.
6) Push piston and connecting rod assembly out through the top of cylinder bore.
7) Remove connecting rod bearings from connecting rod and connecting rod bearing cap, if necessary.

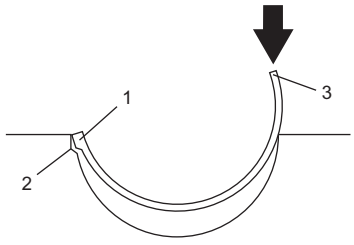
Installation

1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crank pins.

NOTE

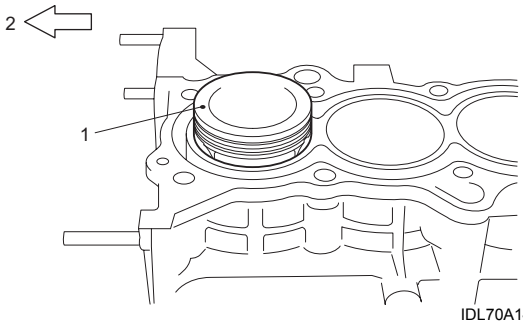
Do not apply oil between connecting rod and bearing or between bearing cap and bearing.

2) Install connecting rod bearing to connecting rod bearing cap and connecting rod as follows, if removed.
   a) Fit tab (1) of connecting rod bearing to groove (2) of connecting rod and bearing cap.
   b) Press bearing end (3) until it becomes flush with connecting rod or connecting rod bearing cap mating surface.



I7V20A141088-01

3) When installing piston and connecting rod assembly into cylinder bore, point front mark (1) on piston head to crankshaft pulley side.

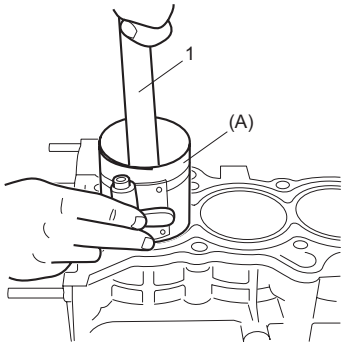


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2: Crankshaft pulley side

4) Install piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft.
Using a hammer handle (1), tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

Special tool
(A): 09916M77310



I7V20A141090-01

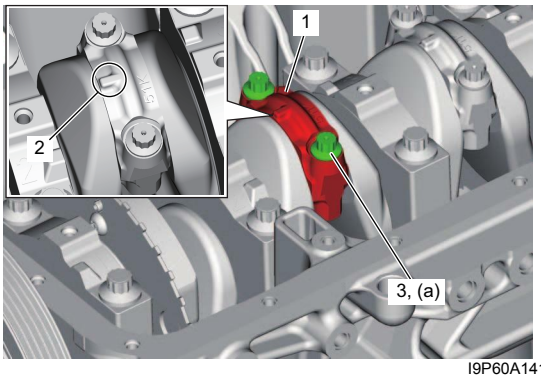
5) Install bearing cap (1) as follows.

NOTE

- **Before installing bearing cap, check connecting rod bolt for deformation. Refer to "Connecting rod bolt deformation" under "Piston Pin and Connecting Rod Inspection" (Page 1D-41).**
- **Tighten connecting rod bolt (3) gradually till they are tightened to specified torque.**

a) Point arrow mark (2) on cap to crankshaft pulley side.
b) Apply engine oil to connecting rod bolts.
c) Tighten all connecting rod bolts to 15 N·m (1.5 kgf-m, 11.0 lbf-ft).
d) Retighten them to 65°.

Tightening torque
Connecting rod bolt*: 15 N·m → +65° (1.5 kgf-m → +65°, 11.0 lbf-ft → +65°)



I9P60A141072-02

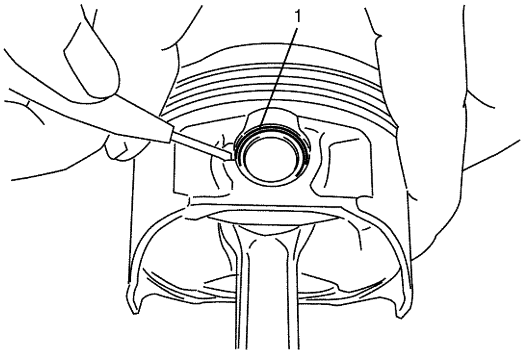
6) Install cylinder head. ☞(Page 1D-28)
7) Install engine assembly. ☞(Page 1D-17)

Piston, Piston Ring, Connecting Rod and Cylinder Disassembly and Reassembly

AENDL70A1406033

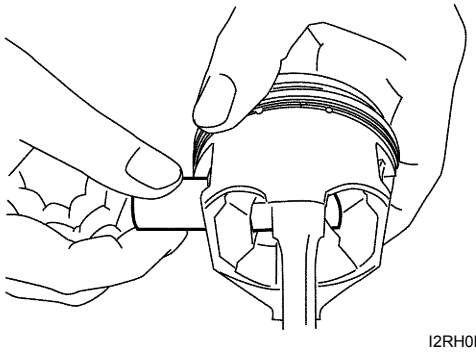
Disassembly

1) Using piston ring expander, remove two compression rings (1st and 2nd) and oil ring from piston.
2) Remove piston pin from connecting rod as follows.
   a) Ease out piston pin circlips (1), as shown.



I2RH0B140113-01

   b) Remove piston pin out.



I2RH0B140114-01

Reassembly

1) Remove carbon deposits from piston head and ring grooves using a suitable tool.

2) Install piston pin to piston (1) and connecting rod (2) as follows.
   a) Apply engine oil to piston pin and piston pin holes in piston and connecting rod.
   b) Fit connecting rod as shown in figure.

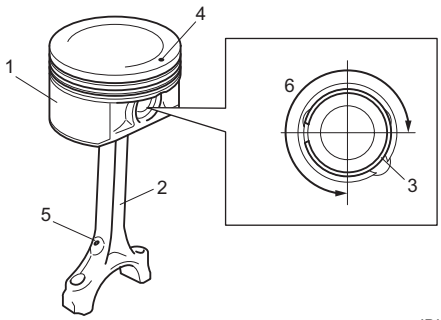
NOTE

Be sure to position front mark (4) on piston and oil hole (5) of connecting rod at specified position as shown in figure.

   c) Insert piston pin to piston and connecting rod.
   d) Install new piston pin circlips (3).

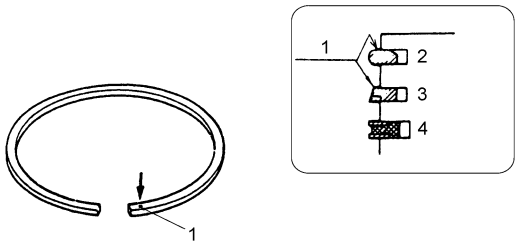
NOTE

Circlip should be installed with its cut part facing as shown in figure. Install so that circlip end gap comes within such range as indicated by arrow (6).



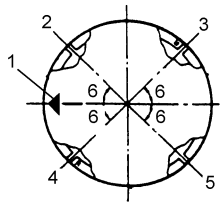
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3) Install piston rings to piston noting the following.
   - As indicated in figure, 1st and 2nd rings have discrimination mark (1) respectively. When installing these piston rings to piston, direct discrimination mark side of each ring toward top of piston.
   - 1st ring (2) differs from 2nd ring (3) in thickness, shape and color of surface contacting cylinder wall.
     Distinguish 1st ring from 2nd ring by referring to the figure.
   - When installing oil ring (4), install spacer first and then two rails.



I7V20A141093-01

4) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in figure.



I7V20A141094-01

1. Front mark	4. 2nd ring end gap and oil ring spacer gap
2. Oil ring upper rail gap	5. Oil ring lower rail gap
3. 1st ring end gap	6. 45°

Cylinder, Piston and Piston Ring Inspection

AENDL70A1406034

Cylinder

Visual inspection

Inspect cylinder walls for scratches, roughness or ridges which indicate excessive wear. If cylinder bore is very rough, deeply scratched or ridged, replace cylinder block, piston rings and/or pistons.

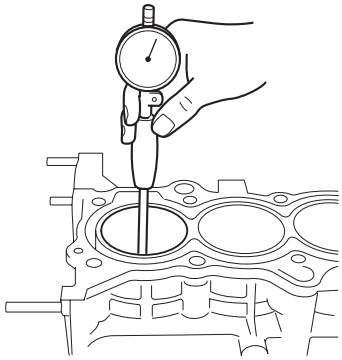
Cylinder bore diameter, taper and out-of-round

Using a cylinder gauge (1), measure cylinder bore in thrust and axial directions at two positions (“a” and “b”) and cylinder taper (“A” and “B”) as shown in figure.
If any of the following conditions is noted, replace cylinder block.

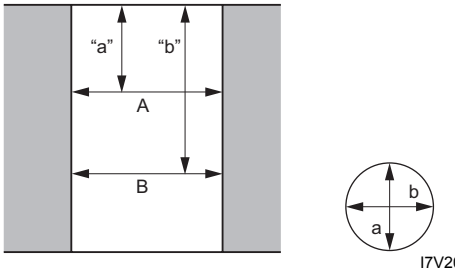
- Cylinder bore dia. exceeds limit.
- Difference of measurements at two positions exceeds taper limit.
- Difference between thrust and axial measurements exceeds out-of-round limit.

<u>Cylinder bore diameter</u>
Standard: 73.000 – 73.014 mm (2.8740 – 2.8746 in.)
Limit: 73.050 mm (2.876 in.)

<u>Cylinder taper and out-of-round</u>
Limit: 0.010 mm (0.0004 in.)



I7V20A141095-01



I7V20A141127-01

"a": 50 mm (1.97 in.)	"b": 100 mm (3.94 in.)

Piston

Visual inspection

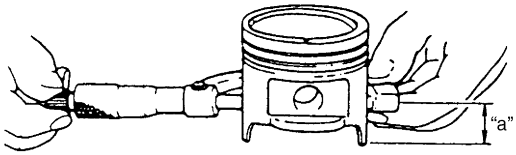
Inspect piston for faults, cracks or other damages. Damaged or faulty piston should be replaced.

Piston diameter

As indicated in figure, piston diameter should be measured at specified position 9.0 mm (0.3543) ("a") from piston skirt end in the direction perpendicular to piston pin.

Piston diameter specification

Standard size (used piston): 72.975 – 72.990 mm (2.8730 – 2.8736 in.)
Standard size (new piston without coating): 72.978 – 72.990 mm (2.8731 – 2.8744 in.)



I2RH01140157-01

"a": 9.0 mm (0.3543 in.)

Piston clearance

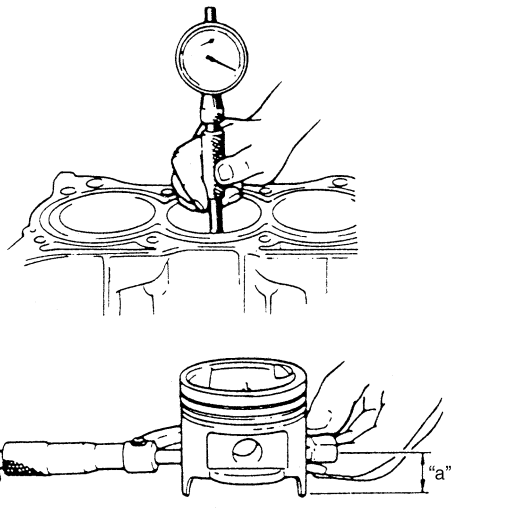
Measure cylinder bore diameter and piston diameter to find their difference called piston clearance. Piston clearance should be within specification. If it is out of specification, replace cylinder block, piston rings and/or pistons.

NOTE

Cylinder bore diameters used here are measured in thrust direction at two positions.

Piston clearance

Limit: 0.139 mm (0.0055 in.)



I4RS0A140022-01

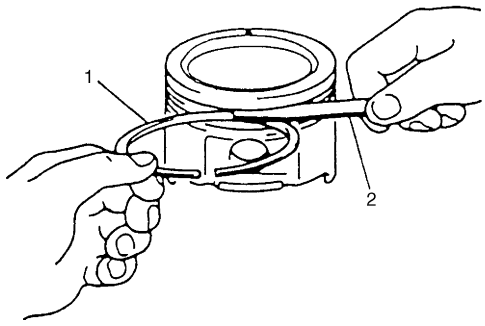
"a": 9.0 mm (0.3543 in.)

Ring groove clearance

Before checking, piston grooves must be clean, dry and free of carbon deposits.
Fit new piston ring (1) into piston groove, and measure clearance between ring and ring land by using filler gauge (2). If clearance is out of limit, replace piston.

Ring groove clearance

	Standard	Limit
1st ring	0.03 – 0.07 mm (0.0012 – 0.0028 in.)	0.12 mm (0.0047 in.)
2nd ring	0.02 – 0.06 mm (0.0008 – 0.0024 in.)	0.10 mm (0.0039 in.)
Oil ring	0.04 – 0.12 mm (0.0016 – 0.0047 in.)	—



I2RH01140159-01

Piston Ring

Piston ring end gap

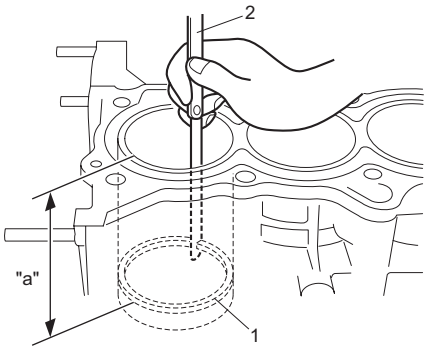
To measure end gap, insert piston ring (1) into cylinder bore and then measure the gap by using thickness gauge (2).
If measured gap exceeds limit, replace ring.

NOTE

Remove carbon deposits from top of cylinder bore before inserting piston ring.

Piston ring end gap

Item	Standard	Limit
Top ring	0.15 – 0.28 mm (0.0059 – 0.0110 in.)	0.7 mm (0.0276 in.)
2nd ring	0.28 – 0.41 mm (0.0110 – 0.0161 in.)	1.0 mm (0.0394 in.)
Oil ring	0.20 – 0.50 mm (0.0079 – 0.0197 in.)	1.2 mm (0.0472 in.)



I7V20A141096-02

"a". 50 mm (1.9685 in.)

Piston Pin and Connecting Rod Inspection

AENDL70A1406035

Piston Pin

Visual inspection

Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bushing. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod and/or piston.

Piston pin clearance

Check piston pin clearance in small end and piston. Replace connecting rod and/or piston if its small end is badly worn or damaged or if measured clearance exceeds limit.

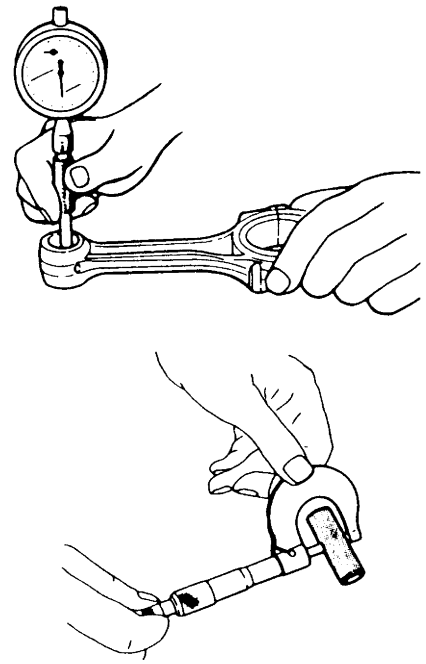
Piston pin clearance in connecting rod small end
Standard: 0.003 – 0.018 mm (0.0001 – 0.0007 in.)
Limit: 0.018 mm (0.0007 in.)

Piston pin clearance in piston
Standard: 0.006 – 0.016 mm (0.00023 – 0.00063 in.)
Limit: 0.016 mm (0.00063 in.)

Small-end bore
18.003 – 18.013 mm (0.7088 – 0.7092 in.)

Piston pin diameter
17.995 – 18.0000 mm (0.70846 – 0.70866 in.)

Piston bore
18.006 – 18.011mm (0.70889 – 0.70909 in.)



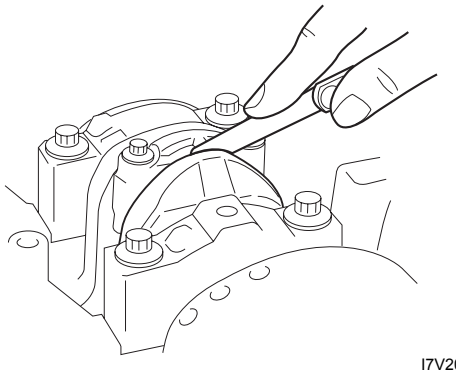
I4RS0A140023-01

Connecting Rod

Big-end side clearance

Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in a normal manner. If measured clearance exceeds its limit, replace connecting rod.

Big-end side clearance
Standard: 0.1 – 0.3 mm (0.0039 – 0.0118 in.)
Limit: 0.55 mm (0.0217 in.)

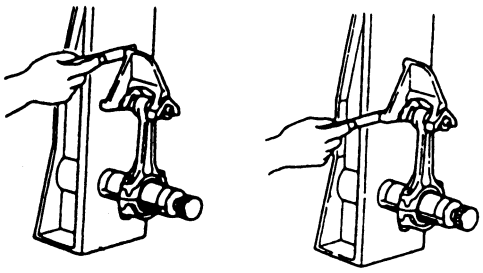


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Connecting rod alignment

Mount connecting rod on aligner to check it for bow and twist. If measured value exceeds the limit, replace it.

Connecting rod alignment
Limit on bow: 0.05 mm (0.0020 in.)
Limit on twist: 0.10 mm (0.0039 in.)

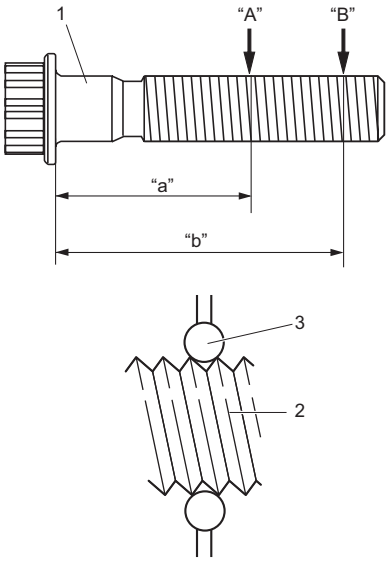


I4RH01140053-01

Connecting rod bolt deformation
Measure each thread diameter of connecting rod bolt (2) at “A” on 12 mm (0.47 in.) from bolt mounting surface and “B” on 32 mm (1.26 in.) from bolt mounting surface by using a micrometer (3).
Calculate difference in diameters (“A” – “B”). If it exceeds limit, replace connecting rod (1).

Connecting rod bolt measurement points
“a”: 12 mm (0.47 in.)
“b”: 32 mm (1.26 in.)

Connecting rod bolt diameter difference
Limit (“A” – “B”): 0.05 mm (0.002 in.)



I7V20A141098-02

Crank Pin and Connecting Rod Bearing Inspection

AENDL70A1406036

Crank Pin Diameter
Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged or out-of round or taper is out of limit, replace crankshaft or regrind crank pin to undersize and use undersize bearing.

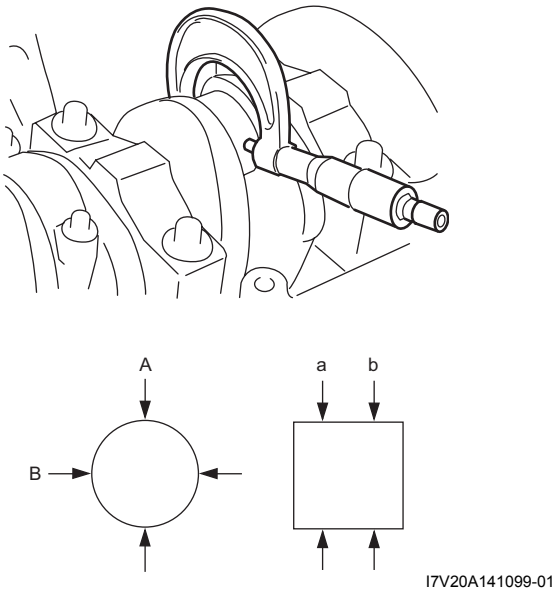
NOTE

When regrinding crank pin to undersize, use undersize connecting rod bearing.

Crank pin diameter

Connecting rod bearing size	Crank pin diameter
Standard	37.982 – 38.000 mm (1.4954 – 1.4961 in.)
0.25 mm (0.0098 in.) undersize	37.732 – 37.750 mm (1.4855 – 1.4862 in.)

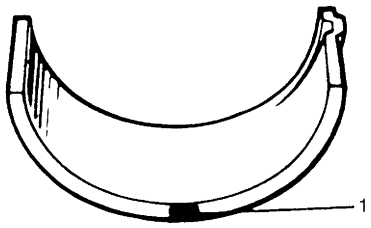
Crank pin taper (a, b) and out-of-round (A – B)
Limit: 0.01 mm (0.0004 in.)



I7V20A141099-01

Connecting Rod Bearing General Information

- Service connecting rod bearings are available in standard size and 0.25 mm undersize bearing, and standard size bearing has 5 kinds of bearings differing in tolerance.
- For identification of undersize bearing, it is painted red at the position indicated in figure. Center thickness of undersize bearing is 1.605 – 1.615 mm (0.0632 – 0.0636 in.).



I2RH01140164-01

1. Painting

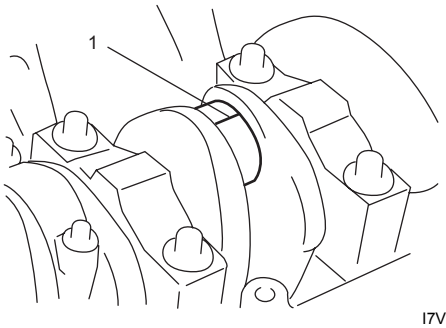
Connecting Rod Bearing Visual Inspection
Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Connecting Rod Bearing Clearance

NOTE

After checking connecting rod bearing clearance, check connecting rod bolt for deformation referring to "Connecting rod deformation" under "Piston Pin and Connecting Rod Inspection" (Page 1D-41).

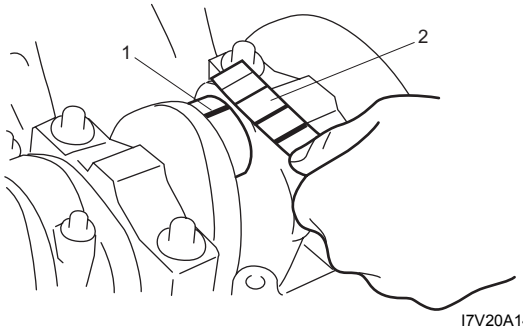
1) Clean bearing and crank pin.
2) Place a piece of gauging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



I7V20A141100-01

3) Install connecting rod bearing and its cap. ☞(Page 1D-37)
4) After three minutes has elapsed, remove cap and using a scale (2) on gauging plastic envelope, measure gauging plastic (1) thickness at the thickest point (clearance).
If clearance exceeds its limit, select a new standard size bearing. ☞(Page 1D-43)
After selecting new bearing, recheck clearance.

Connecting rod bearing clearance
Standard: 0.031 – 0.049 mm (0.0012 – 0.0019 in.)
Limit: 0.065 mm (0.0026 in.)



I7V20A141101-01

5) If clearance cannot be brought to its limit even by using a new standard size bearing, use next thicker bearing and recheck clearance or regrind crank pin to undersize and use 0.25 mm undersize bearing.

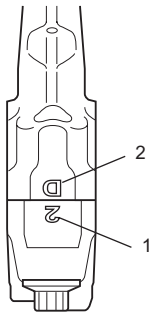
Selection of Connecting Rod Bearing
If engine is under the following conditions, select a new standard bearing as follows, and install it.

- Bearing is defective.
- Bearing clearance is out of specification.
- Crankshaft or connecting rod is replaced.

1) Check stamped numbers on connecting rod and its cap as shown.
Three kinds of numbers ("1", "2" and "3") represent the following connecting rod big end inside diameters.
For example, stamped number "1" indicates that corresponding connecting rod big end inside diameter is 41.0000 – 41.0060 mm (1.61417 – 1.61440 in.).

Connecting rod big end inside diameter

Stamped number	Connecting rod big end inside diameter
1	41.0000 – 41.0060 mm (1.61417 – 1.61440 in.)
2	41.0061 – 41.0120 mm (1.61441 – 1.61464 in.)
3	41.0121 – 41.0180 mm (1.61465 – 1.61488 in.)



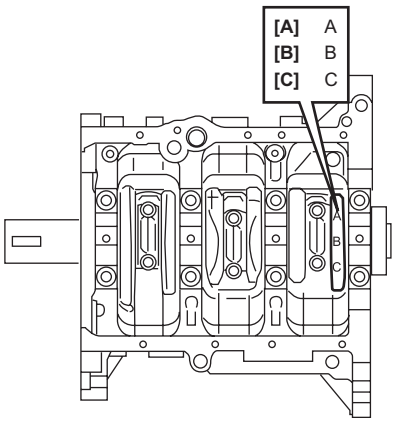
I8T401142106-02

1.	Connecting rod big end inside diameter number
2.	Weight indication mark

2) Check crankshaft pin diameter. On crank web No.6, three alphabets are stamped as shown in figure.
Three kinds of alphabet ("A", "B" and "C") represent the following crankshaft pin diameter respectively.
For example, stamped "A" indicates that corresponding crankshaft pin diameter is 37.9940 – 38.0000 mm (1.49582 – 1.49606 in.).

Crankshaft pin outer diameter

Stamped alphabet	Crankshaft pin diameter
A	37.9940 – 38.0000 mm (1.49582 – 1.49606 in.)
B	37.9880 – 37.9939 mm (1.49559 – 1.49581 in.)
C	37.9820 – 37.9879 mm (1.49535 – 1.49558 in.)



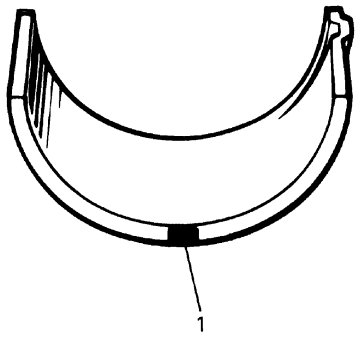
IBC50A140032-01

[A]:	Crankshaft pin diameter for No.1 cylinder
[B]:	Crankshaft pin diameter for No.2 cylinder
[C]:	Crankshaft pin diameter for No.3 cylinder

3) There are five kinds of standard connecting rod bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in figure.
Each color indicates the following thickness at the center of bearing.

Standard size connecting rod bearing thickness

Color painted	Bearing thickness
Blue	1.4981 – 1.5010 mm (0.05898 – 0.05909 in.)
Yellow	1.4951 – 1.4980 mm (0.05886 – 0.05897 in.)
Nothing	1.4921 – 1.4950 mm (0.05875 – 0.05885 in.)
Black	1.4891 – 1.4920 mm (0.05863 – 0.05874 in.)
Green	1.4860 – 1.4890 mm (0.05850 – 0.05862 in.)



I3RH0A140019-01

1.	Paint

4) From number stamped on connecting rod and its cap and alphabets stamped on crank web No.6, determine new standard bearing to be installed to connecting rod big end inside, by referring to the table.
For example, if number stamped on connecting rod and its cap is “1” and alphabet stamped on crank web No.6 is “B”, install a new standard bearing painted in “Black” to its connecting rod big end inside.

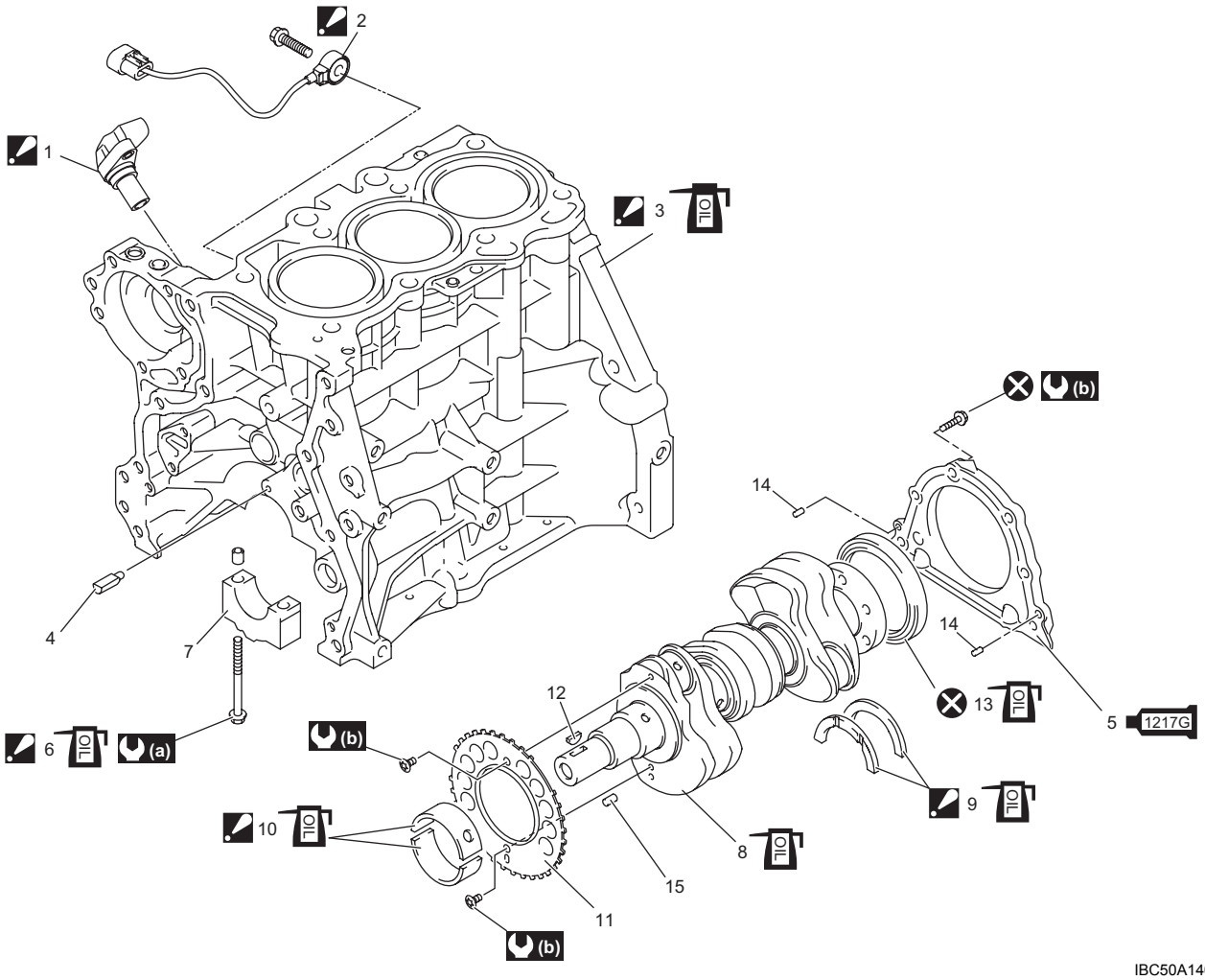
Connecting rod bearing cross-reference selection table (standard size)

		Stamped mark for Crankshaft pin diameter		
		1	2	3
Stamped mark for connecting rod big end inside diameter	A	Green	Black	Nothing
	B	Black	Nothing	Yellow
	C	Nothing	Yellow	Blue

5) Check bearing clearance with newly selected standard bearing referring to “Connecting Rod Bearing Clearance” (Page 1D-43).
If clearance still exceeds its limit, use next thicker bearing and recheck clearance.

Main Bearing, Crankshaft and Cylinder Block Components

AENDL70A1406037



IBC50A140033-01

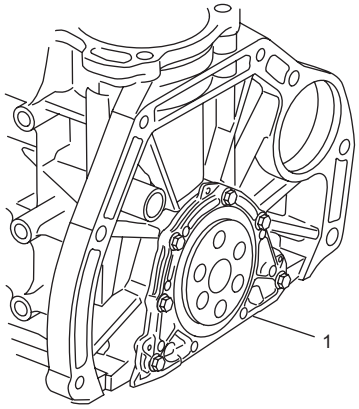
1. CKP sensor : For removal and installation of CKP sensor, refer to “CKP Sensor Removal and Installation” in Section 1C (Page 1C-8).	7. Main bearing cap	13. Rear oil seal : Apply engine oil to oil seal lip.
2. Knock sensor : For removal and installation of knock sensor, refer to “Knock Sensor Removal and Installation” in Section 1C (Page 1C-10).	8. Crankshaft : Apply engine oil to sliding surface	14. Dowel pin
3. Cylinder block : Do not apply engine oil to main bearing seating face. : Apply engine oil to sliding surface	9. Thrust bearing : Install thrust bearing with oil grooves facing out. : Apply engine oil to sliding surface.	15. Spring pin
4. Timing chain oil jet	10. Main bearing : For applying engine oil, refer to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation” (Page 1D-46).	(a) : 20 N·m → 40 N·m → +60° (2.0 kgf-m → 4.1 kgf-m → +60°, 15.0 lbf-ft → 29.5 lbf-ft → +60°)
1217G 5. Engine rear crankshaft oil seal housing : Apply sealant 99000-31260 referring to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation” (Page 1D-46).	11. Sensor plate	(b) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
6. Main bearing cap bolt : Check main bearing cap bolt No.1 for deformation to reuse. ☞(Page 1D-49) : Apply engine oil to bolt thread and seat.: For tightening order, refer to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation” (Page 1D-46).	12. Crankshaft timing sprocket key	: Do not reuse.

Main Bearing, Crankshaft and Cylinder Block Removal and Installation

AENDL70A1406038

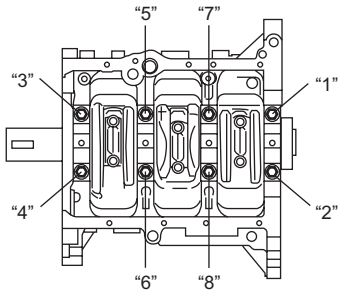
Removal

1) Remove engine assembly from vehicle. ☞(Page 1D-17)
2) Remove flywheel. ☞(Page 1D-23)
3) Remove piston and connecting rod. ☞(Page 1D-37)
4) Remove engine rear crankshaft oil seal housing (1).



I7V20A141105-01

5) Remove main bearing cap bolts in numerical order gradually as indicated in figure.



IBC50A140034-01

6) Remove crankshaft from cylinder block.
7) Remove sensor plate from crankshaft, if necessary.
8) Remove main bearings from cylinder block and main bearing caps.

Installation

NOTICE

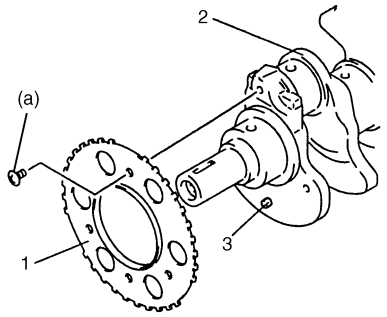
- **Apply engine oil to the following parts:**
  - **Crankshaft journal**
  - **Cylinder block**
  - **Main bearing**
  - **Thrust bearing**
- **Do not apply engine oil to the following spots:**
  - **Mating surfaces between main bearing and cylinder block**
  - **Mating surfaces between main bearing and main bearing cap**
  - **Mating surfaces between connecting rod bearing and connecting rod**
  - **Mating surfaces between connecting rod bearing and connecting rod cap**
- **Install the following parts in the position where they were:**
  - **Main bearing**
  - **Thrust bearing**

1) Install sensor plate (1) to crankshaft (2) and tighten bolts to specified torque, if removed.

NOTE

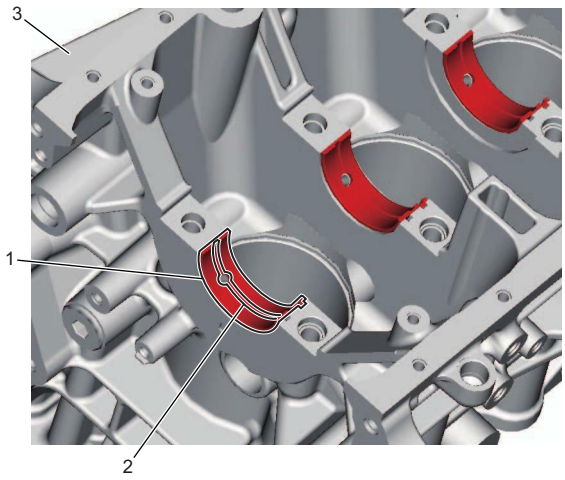
When installing sensor plate, align spring pin (3) on crankshaft and hole of sensor plate.

Tightening torque
Sensor plate bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



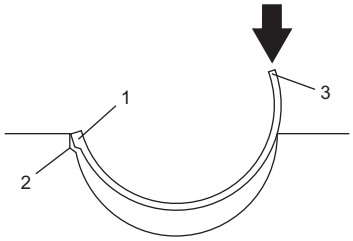
I2RH0B140128-01

2) Install main bearings to cylinder block.
Upper half of bearing (1) has an oil groove (2). Install it to cylinder block (3), and the other half without oil groove to bearing cap as follows.



IBC50A140035-01

a) Fit tab (1) of crankshaft upper and lower bearing to groove (2) of cylinder block or bearing cap.
b) Press bearing end (3) until bearing end surface becomes flush with surface of cylinder block or bearing cap.



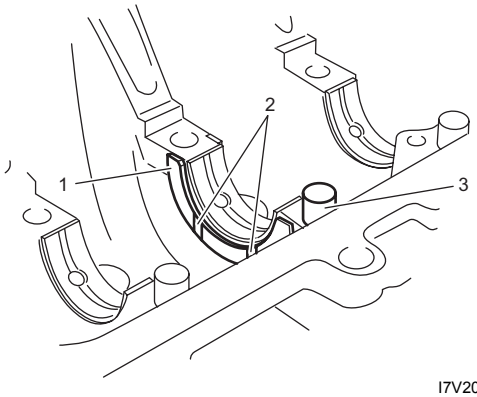
I7V20A141088-01

3) Install thrust bearings (1) to cylinder block between No.2 and No.3 cylinders.

NOTE

Be sure to face oil groove (2) side to crank web.

4) Confirm that dowel pins (3) are installed to intake side of each journal.



I7V20A141108-01

5) Install crankshaft to cylinder block.
6) Install bearing cap to cylinder block, making sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and “R”, starting from pulley side.
7) After applying engine oil to main bearing cap bolts (“1” through “8”), tighten them as follows.

NOTE

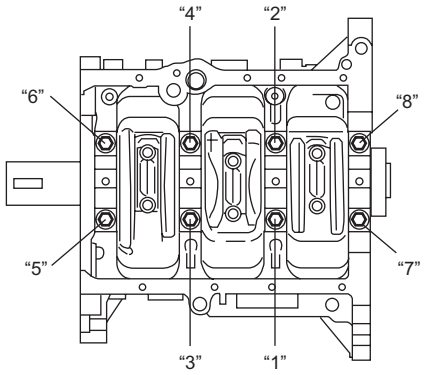
- **If main bearing cap bolt is reused, make sure to check main bearing cap bolt for deformation referring to “Main bearing cap bolt” under “Main Bearing Inspection” (Page 1D-49).**

a) Tighten bolts to 20 N·m (2.0 kgf-m, 15.0 lbf-ft) according to numerical order as shown in figure by using a 12 corner socket wrench.
b) In the same manner as Step a), tighten them to 40 N·m (4.1 kgf-m, 29.5 lbf-ft).
c) In the same manner as Step a), retighten them to 60°.

Tightening torque
Main bearing cap bolt*: 20 N·m → 40 N·m → +60° (2.0 kgf-m → 4.1 kgf-m →+60°, 15.0 lbf-ft → 29.5 lbf-ft →+60°)

NOTICE

After tightening cap bolts, check that crankshaft rotates smoothly when turning it by 12 N·m (1.2 kgf-m, 9.0 lbf-ft) torque or below.

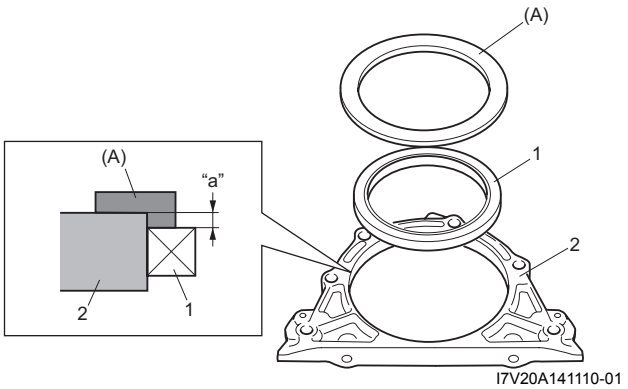


IBC50A140036-01

8) Clean sealing surface between oil seal housing (2) and cylinder block.
9) If necessary, press-fit new rear oil seal (1) to oil seal housing (2) by using special tool as shown in figure.

Special tool
(A): 09911M16300

Engine rear crankshaft oil seal installing position (depth)
“a”: 2 mm (0.08 in.)

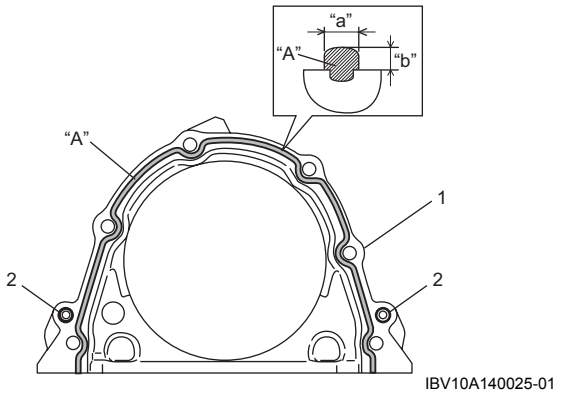


I7V20A141110-01

10) Install dowel pin (2) to rear oil seal housing (1) as shown in figure.
11) Apply sealant to mating surface of rear oil seal housing (1).

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant amount for rear oil seal housing
Width: "a": 3 mm (0.12 in.)
Height "b": 2 mm (0.08 in.)



IBV10A140025-01

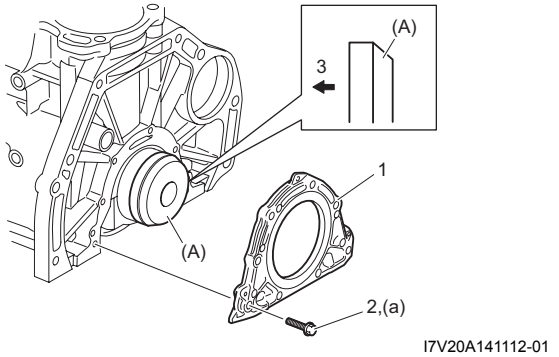
12) Apply engine oil to oil seal lip, then install engine rear crankshaft oil seal housing (1) using special tool.
13) Tighten new engine rear crankshaft oil seal housing bolts (2) to specified torque by using special tool.

NOTE

Confirm that engine rear crankshaft oil seal lip is not turned over after engine rear crankshaft oil seal housing is installed.

Special tool
(A): 09911M97720

Tightening torque
Engine rear crankshaft oil seal housing bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



I7V20A141112-01

3: Crankshaft side

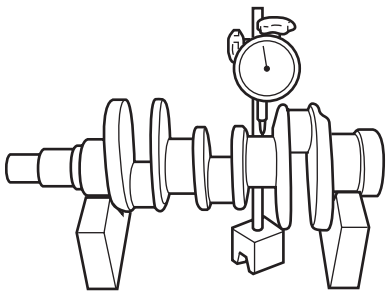
14) Install flywheel. ☞(Page 1D-23)
15) Install piston and connecting rod. ☞(Page 1D-37)
16) Install cylinder head. ☞(Page 1D-28)
17) Install camshafts and tappets. ☞(Page 1D-11)
18) Install timing chain. ☞(Page 1D-25)
19) Install timing chain cover. ☞(Page 1D-22)
20) Install cylinder head cover. ☞(Page 1D-9)
21) Install oil pan. ☞(Page 1E-5)
22) Install engine assembly to vehicle. ☞(Page 1D-17)

Crankshaft Inspection

AENDL70A1406039

Crankshaft Runout
Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

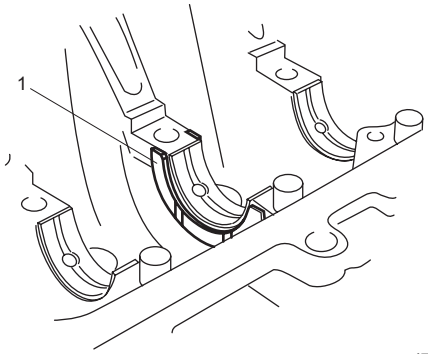
Crankshaft runout
Limit: 0.02 mm (0.0008 in.)


I8C50A140073-02

Crankshaft Thrust Play

1) Assemble crankshaft, main bearings, thrust bearings (1) and main bearing caps.

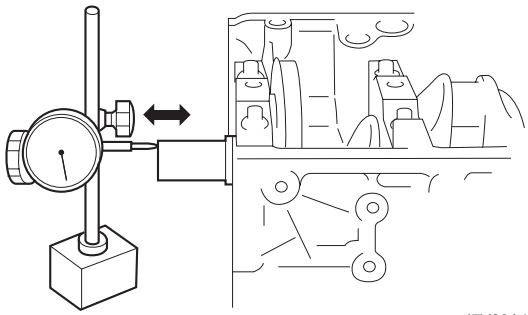
Thickness of crankshaft thrust bearing
Standard: 2.470 – 2.520 mm (0.0972 – 0.0992 in.)
Oversize (0.125 mm): 2.533 – 2.583 mm (0.0997 – 0.1017 in.)



I7V20A141114-01

2) Tighten main bearing cap bolts referring to steps 4) through 7) of “Installation” under “Main Bearing, Crankshaft and Cylinder Block Removal and Installation” (Page 1D-46).
3) Using a dial gauge, measure crankshaft thrust play as shown in figure.
If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

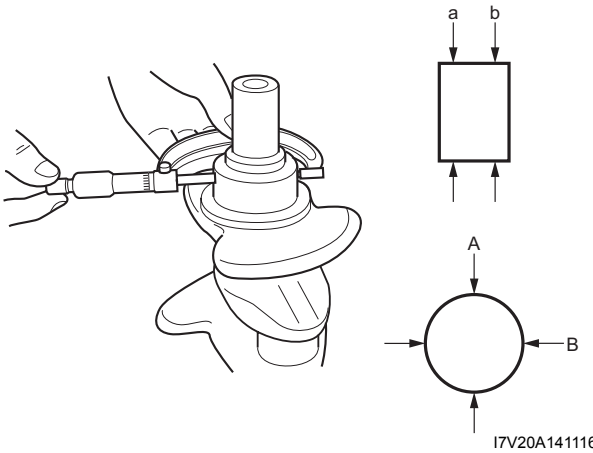
Crankshaft thrust play
Standard: 0.11 – 0.31 mm (0.0043 – 0.0122 in.)
Limit: 0.35 mm (0.0138 in.)



I7V20A141115-01

Out-of-Round and Taper (Uneven Wear) of Journal
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings. If any one of journals is badly damaged or uneven wear exceeds its limit, regrind or replace crankshaft.

Crankshaft out-of-round (A – B) and taper (a – b)
Limit: 0.01 mm (0.0004 in.)



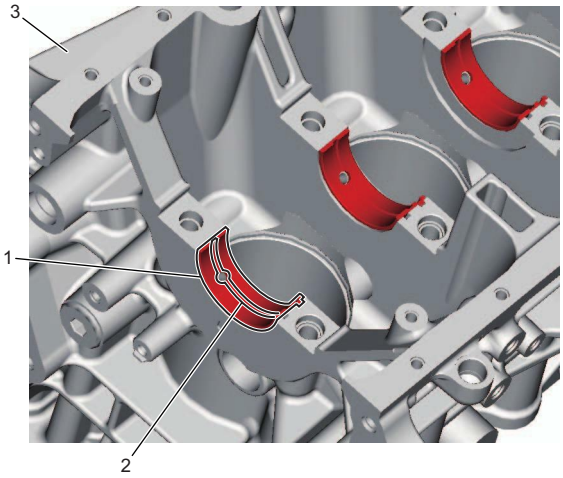
I7V20A141116-01

Main Bearing Inspection

AENDL70A1406040

General Information

- Service main bearings are available in standard size and 0.25 mm undersize, and each of them has 5 kinds of bearings differing in tolerance.
- Upper half of bearing (1) has oil groove (2) as shown in figure.
  Install this half with oil groove to cylinder block (3).
- Lower half of bearing does not have an oil groove.



IBC50A140035-01

Visual Inspection
Check bearings for pitting, scratches, wear or damage. If any defect is found, replace both upper and lower halves. Never replace either half without replacing the other half.

Main Bearing Clearance

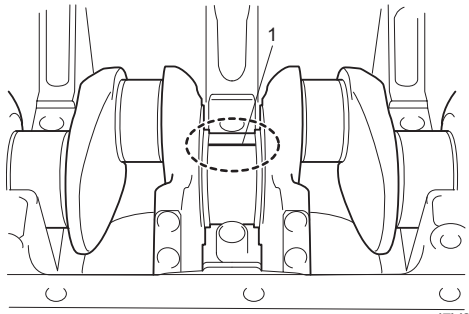
NOTE

Do not rotate crankshaft while gauging plastic is fitted.

Check clearance by using gauging plastic according to the following procedure.

1) Remove bearing caps.

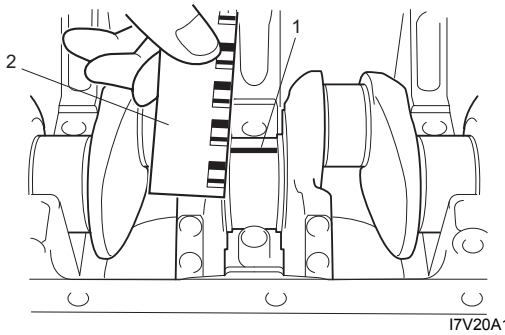
2) Clean bearings and main journals.
3) Place a piece of gauging plastic (1) to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



I7V20A141118-01

4) Install main bearing cap referring to steps 4) through 7) of "Installation" under "Main Bearing, Crankshaft and Cylinder Block Removal and Installation" (Page 1D-46).
5) Remove bearing caps and using scale (2) on gauging plastic envelop (1), measure gauging plastic width at its widest point.
If clearance exceeds its limit, replace bearing.
Always replace both upper and lower inserts as a unit.
A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
After selecting new bearing, recheck clearance.

Main bearing clearance
Standard: 0.019 – 0.031 mm (0.0007 – 0.0012 in.)
Limit: 0.050 mm (0.0020 in.)



I7V20A141119-01

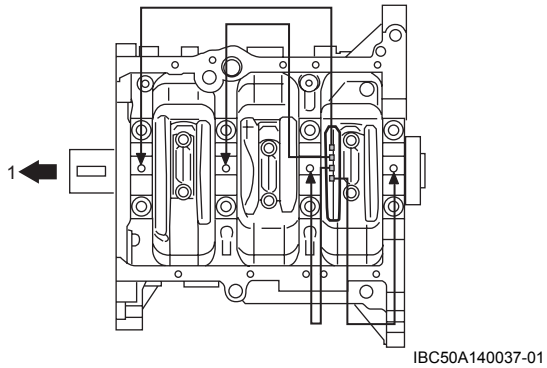
Selection of Main Bearing
Standard size bearing
If engine is under one of the following conditions, select a new standard bearing as follows, and install it.

- Bearing is in defective.
- Bearing clearance is out of specification.
- Crankshaft or cylinder block is replaced.

1) First check journal diameter. As shown in figure, crank web No.5 has stamped numbers.
Six kinds of numbers ("1" through "6") represent the following journal diameters.
Stamped numbers on crank web No.5 represent diameters of journal indicated with an arrow in figure respectively.
For example, stamped number "1" indicates that corresponding journal diameter is 45.015 – 45.018 mm (1.7722 – 1.7723 in.).

Crankshaft journal diameter

Stamped numbers	Journal diameter
1	45.0150 – 45.0180 mm (1.77224 – 1.77236 in.)
2	45.0120 – 45.0149 mm (1.77213 – 1.77224 in.)
3	45.0090 – 45.0119 mm (1.77201 – 1.77212 in.)
4	45.0060 – 45.0089 mm (1.77189 – 1.77200 in.)
5	45.0030 – 45.0059 mm (1.77177 – 1.77189 in.)
6	45.0000 – 45.0029 mm (1.77165 – 1.77177 in.)



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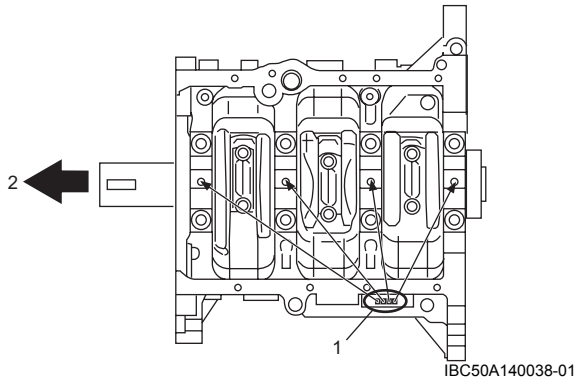
1. Crankshaft pulley side

2) Check bearing cap bore diameter without bearing.
On mating surface of cylinder block, five alphabets are stamped as shown in figure (1).
Six kinds of alphabets ("A" through "F") or numbers ("1" through "6") represent the following cap bore diameters.
Stamped alphabets or numbers on cylinder block represent bearing cap bore diameter marked with an arrow in figure respectively.
For example, stamped "A" or "1" indicates that corresponding bearing cap bore diameter is 49.0000 – 49.0030 mm (1.92913 – 1.92925 in.).

Crankshaft bearing cap bore

Stamped number	Bearing cap bore diameter (without bearing)
A or 1	49.0000 – 49.0030 mm (1.92913 – 1.92925 in.)
B or 2	49.0030 – 49.0060 mm (1.92925 – 1.92937 in.)
C or 3	49.0060 – 49.0090 mm (1.92937 – 1.92948 in.)

Stamped number	Bearing cap bore diameter (without bearing)
D or 4	49.0090 – 49.0120 mm (1.92948 – 1.92960 in.)
E or 5	49.0120 – 49.0150 mm (1.92960 – 1.92972 in.)
F or 6	49.0150 – 49.0180 mm (1.92972 – 1.92984 in.)



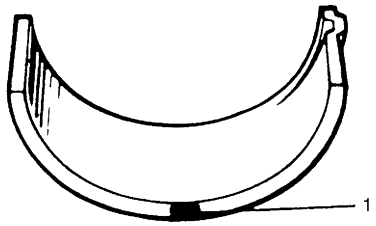
2. Crankshaft pulley side

3) There are 5 kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in figure.

Each color indicates the following thickness at the center of bearing.

Standard size crankshaft main bearing thickness

Color painted	Bearing thickness
Pink	1.9900 – 1.9930 mm (0.07835 – 0.07846 in.)
Purple	1.9930 – 1.9960 mm (0.07846 – 0.07858 in.)
Brown	1.9960 – 1.9990 mm (0.07858 – 0.07870 in.)
Green	1.9990 – 2.0020 mm (0.07870 – 0.07881 in.)
Black	2.0020 – 2.0050 mm (0.07881 – 0.07894 in.)



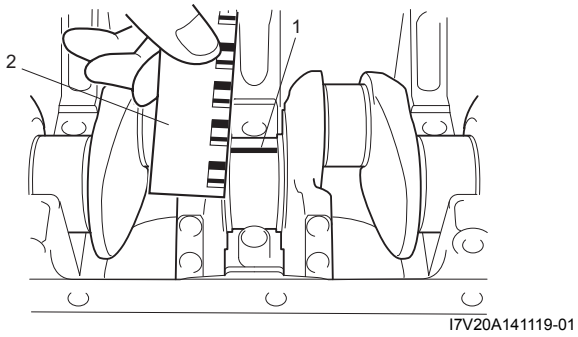
1. Paint

4) From number stamped on crank web No.5 and alphabets stamped on cylinder block, determine new standard bearing to be installed to journal, by referring to the table shown.
For example, if number stamped on crank web No.5 is “1” and alphabet stamped on cylinder block is “B”, install a new standard bearing painted in “Pink” to its journal.

Main bearing cross – reference selection table C standard size)

			Number stamped on crank web No.5					
			1	2	3	4	5	6
Alphabet or number stamped on cylinder block	A or 1	Upper	Pink	Pink	Pink	Purple	Purple	Brown
		Lower	Pink	Pink	Purple	Purple	Brown	Brown
	B or 2	Upper	Pink	Pink	Purple	Purple	Brown	Brown
		Lower	Pink	Purple	Purple	Brown	Brown	Green
	C or 3	Upper	Pink	Purple	Purple	Brown	Brown	Green
		Lower	Purple	Purple	Brown	Brown	Green	Green
	D or 4	Upper	Purple	Purple	Brown	Brown	Green	Green
		Lower	Purple	Brown	Brown	Green	Green	Black
	E or 5	Upper	Purple	Brown	Brown	Green	Green	Black
		Lower	Brown	Brown	Green	Green	Black	Black
	F or 6	Upper	Brown	Brown	Green	Green	Black	Black
		Lower	Brown	Green	Green	Black	Black	Black

5) Using scale (2) on gauging plastic (1), check bearing clearance with newly selected standard bearing.
If clearance still exceeds its limit, use next thicker bearing and recheck clearance, referring to “Main Bearing Clearance” (Page 1D-49).



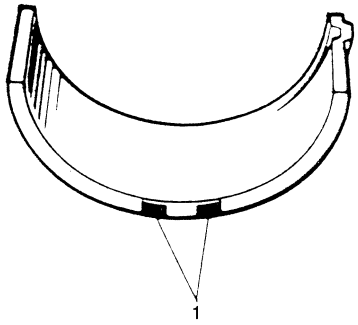
I7V20A141119-01

Undersize bearing (0.25 mm)

- 0.25 mm undersize bearing is available, in five kinds varying in thickness.
  To distinguish them, each bearing is painted in the following colors at such position as indicated in figure.
  Each color represents the following thickness at the center of bearing.

Undersize of crankshaft main bearing thickness

Color painted	Bearing thickness
Red & Pink	2.1150 – 2.1180 mm (0.08327 – 0.08339 in.)
Red & Purple	2.1180 – 2.1210 mm (0.08339 – 0.08350 in.)
Red & Brown	2.1210 – 2.1240 mm (0.08350 – 0.08362 in.)
Red & Green	2.1240 – 2.1270 mm (0.08362 – 0.08374 in.)
Red & Black	2.1270 – 2.1300 mm (0.08374 – 0.08386 in.)



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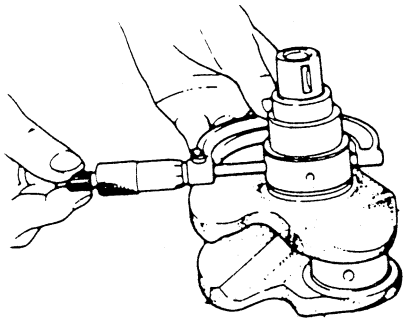
1. Paint

- If necessary, regrind crankshaft journal and select undersize bearing to use with crankshaft as follows.

1) Regrind journal to the following finished diameter.

Finished journal diameter
44.750 – 44.768 mm (1.76181– 1.76252 in.)

2) Using micrometer, measure reground journal diameter.
   Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
3) Using journal diameter measured above and alphabets stamped on cylinder block, select an undersize bearing by referring to the following table.
   Check bearing clearance with newly selected undersize bearing.



I2RH0B140144-01

Main bearing cross – reference table (undersize)

			Measured journal diameter					
			44.765 – 44.768 mm (1.76240 – 1.76252 in.)	44.762 – 44.765 mm (1.76228 – 1.76240 in.)	44.759 – 44.762 mm (1.76217 – 1.76228 in.)	44.756 – 44.759 mm (1.76205 – 1.76217 in.)	44.753 – 44.756 mm (1.76193 – 1.76205 in.)	44.750 – 44.753 mm (1.76181 – 1.76193 in.)
Alphabet or number stamped on cylinder block	A or 1	Upper	Red & Pink	Red & Pink	Red & Pink	Red & Purple	Red & Purple	Red & Brown
		Lower	Red & Pink	Red & Pink	Red & Purple	Red & Purple	Red & Brown	Red & Brown
	B or 2	Upper	Red & Pink	Red & Pink	Red & Purple	Red & Purple	Red & Brown	Red & Brown
		Lower	Red & Pink	Red & Purple	Red & Purple	Red & Brown	Red & Brown	Red & Green
	C or 3	Upper	Red & Pink	Red & Purple	Red & Purple	Red & Brown	Red & Brown	Red & Green
		Lower	Red & Purple	Red & Purple	Red & Brown	Red & Brown	Red & Green	Red & Green
	D or 4	Upper	Red & Purple	Red & Purple	Red & Brown	Red & Brown	Red & Green	Red & Green
		Lower	Red & Purple	Red & Brown	Red & Brown	Red & Green	Red & Green	Red & Black
	E or 5	Upper	Red & Purple	Red & Brown	Red & Brown	Red & Green	Red & Green	Red & Black
		Lower	Red & Brown	Red & Brown	Red & Green	Red & Green	Red & Black	Red & Black
	F or 6	Upper	Red & Brown	Red & Brown	Red & Green	Red & Green	Red & Black	Red & Black
		Lower	Red & Brown	Red & Green	Red & Green	Red & Black	Red & Black	Red & Black

Main Bearing Cap Bolt

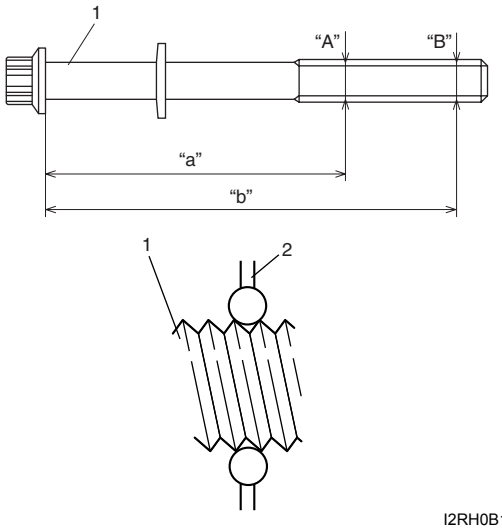
Measure each thread diameter at specified points on main bearing cap bolts (1) by using a micrometer (2).
Calculate difference in diameters (“A” – “B”).
If it exceeds limit, replace with new one.

Main bearing cap bolt diameter measurement points

“a”: 40 mm (1.57 in.)
“b”: 64 mm (2.52 in.)

Main bearing cap bolt diameter difference

Limit (“A” – “B”): 0.2 mm (0.008 in.)

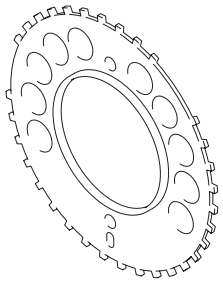


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Sensor Plate Inspection

AENDL70A1406041

Check sensor plate for crack or damage.
If defect is found, replace it.

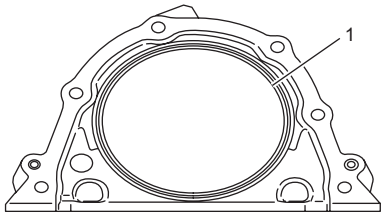


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Rear Oil Seal Inspection

AENDL70A1406042

Carefully inspect oil seal (1) for wear or damage. If its lip is worn or damaged, replace it.

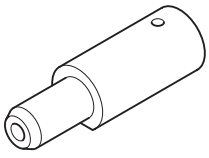


I7V20A141123-01

Timing Chain Jet Inspection

AENDL70A1406043

Check that there is no blocking in the timing chain jet passage.
If venturi plug passage is blocked, clean or replace timing chain jet plug.



I7V20A141124-01

Flywheel Inspection

AENDL70A1406044

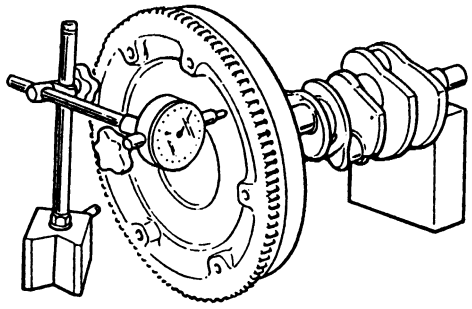
Visual Inspection

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.

Flywheel Face Runout

Check flywheel face runout with a dial gauge.
If runout exceeds its limit, replace flywheel.

Flywheel / drive plate face runout
Limit: 0.2 mm (0.0079 in.)



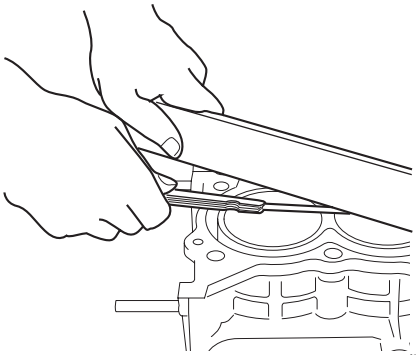
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Cylinder Block Inspection

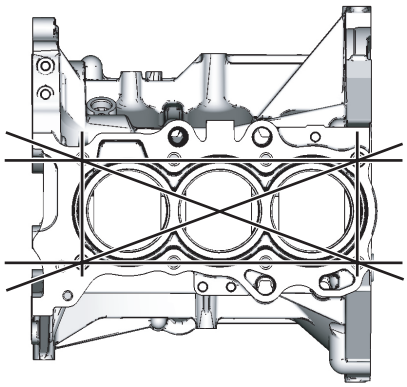
AENDL70A1406045

Using straightedge and thickness gauge, check gasket surface for distortion and, if flatness exceeds its limit, correct It.

Cylinder block flatness
Limit: 0.03 mm (0.0012 in.)



I7V20A141125-01



I8C50A140079-01

Specifications

Tightening Torque Specifications

AENDL70A1407001

NOTE

For fastener(s) with * (asterisk) below, refer to the specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Cylinder head cover bolt*	5.0 N·m → 8.0 N·m → 11 N·m (0.51 kgf-m → 0.82 kgf-m → 1.1 kgf-m, 4.0 lbf-ft → 6.0 lbf-ft → 8.5 lbf-ft)			☞(Page 1D-10)
Camshaft housing bolt*	5.0 N·m → 8.0 N·m → 11 N·m (0.51 kgf-m → 0.82 kgf-m → 1.1 kgf-m, 4.0 lbf-ft → 6.0 lbf-ft → 8.5 lbf-ft)			☞(Page 1D-13)
Exhaust camshaft timing sprocket bolt	60	6.1	44.5	☞(Page 1D-13)
Timing chain cover plug	25	2.5	18.5	☞(Page 1D-14)
Engine harness ground bolt	11	1.1	8.5	☞(Page 1D-20)
Timing chain cover bolt*	25	2.5	18.5	☞(Page 1D-23)
Crankshaft pulley bolt	150	15.3	111.0	☞(Page 1D-23)
Flywheel or drive plate bolt	70	7.1	52.0	☞(Page 1D-23)
Timing chain guide bolt	11	1.1	8.5	☞(Page 1D-26)
Timing chain tensioner bolt	25	2.5	18.5	☞(Page 1D-26)
Timing chain tensioner adjuster bolt	11	1.1	8.5	☞(Page 1D-27)
Cylinder head bolt (M10)*	20 N·m → 40 N·m → +60° → +60° (2.0 kgf-m → 4.1 kgf-m → +60° → +60°, 15.0 lbf-ft → 29.5 lbf-ft → +60° →+60°)			☞(Page 1D-29)
Cylinder head bolt (M8)*	25	2.5	18.5	☞(Page 1D-29)
Venturi plug	3.5	0.36	2.5	☞(Page 1D-32)
Connecting rod bolt*	15 N·m → +65° (1.5 kgf-m → +65°, 11.0 lbf-ft → +65°)			☞(Page 1D-38)
Sensor plate bolt	11	1.1	8.5	☞(Page 1D-46)
Main bearing cap bolt*	20 N·m → 40 N·m → +60° (2.0 kgf-m → 4.1 kgf-m →+60°, 15.0 lbf-ft → 29.5 lbf-ft →+60°)			☞(Page 1D-47)
Engine rear crankshaft oil seal housing bolt	11	1.1	8.5	☞(Page 1D-48)

Reference:

For the tightening torques of fasteners not specified in this page, refer to:

"Air Cleaner Components" (Page 1D-4)
"Cylinder Head Cover Components" (Page 1D-8)
"Camshaft and Tappet Components" (Page 1D-11)
"Engine Mounting Components" (Page 1D-17)
"Timing Chain Cover Components" (Page 1D-21)

“Timing Chain and Chain Tensioner Components” (Page 1D-24)
“Valve and Cylinder Head Components” (Page 1D-28)
“Piston, Piston Ring, Connecting Rod and Cylinder Components” (Page 1D-37)
“Main Bearing, Crankshaft and Cylinder Block Components” (Page 1D-45)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A1408001

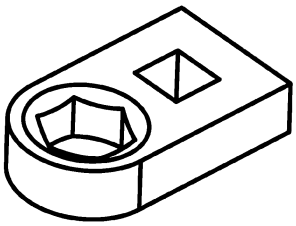
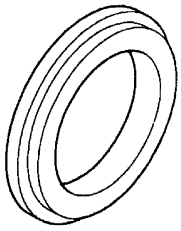
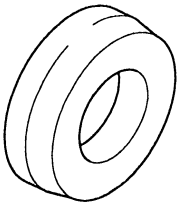
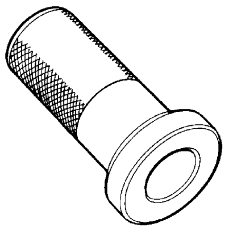
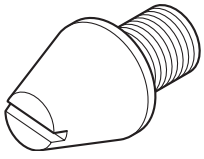
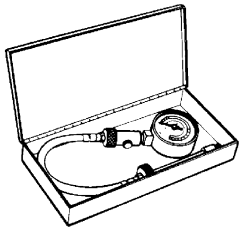
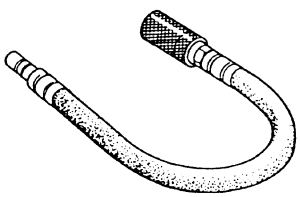
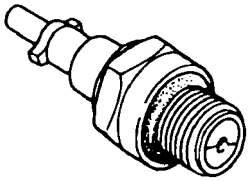
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞(Page 1D-10) / ☞(Page 1D-22) / ☞(Page 1D-48)

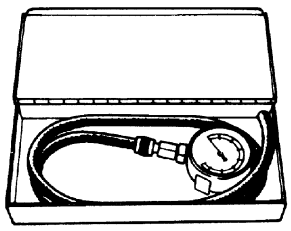
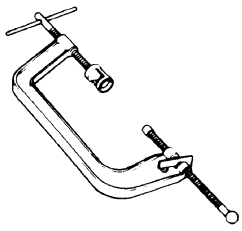
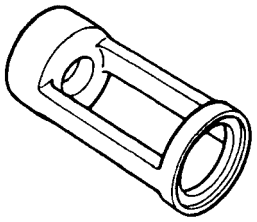
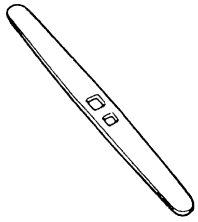
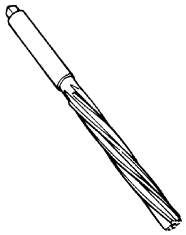
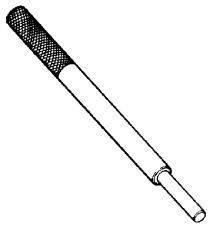
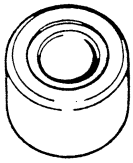
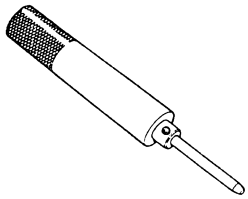
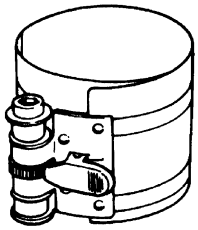
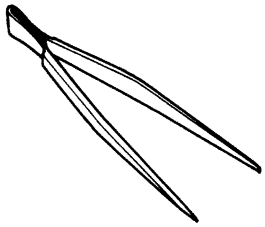
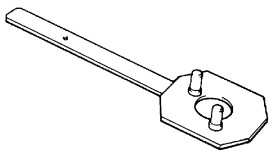
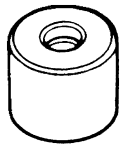
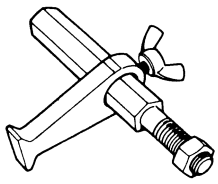
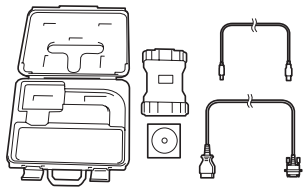
NOTE

Required service materials are also described in:
“Cylinder Head Cover Components” (Page 1D-8)
“Camshaft and Tappet Components” (Page 1D-11)
“Timing Chain Cover Components” (Page 1D-21)
“Timing Chain and Chain Tensioner Components” (Page 1D-24)
“Valve and Cylinder Head Components” (Page 1D-28)
“Piston, Piston Ring, Connecting Rod and Cylinder Components” (Page 1D-37)
“Main Bearing, Crankshaft and Cylinder Block Components” (Page 1D-45)

Special Tool

AENDL70A1408002

09911M05120 Box end wrench (14 mm) ☞(Page 1D-13)		09911M16300 Oil seal installer ☞(Page 1D-47)	
09911M97720 Oil seal installer ☞(Page 1D-48)		09913M75810 Bearing installer ☞(Page 1D-22)	
09914M06310 Guide, camshaft sprocket ☞(Page 1D-13)		09915M64512 Compression gauge ☞(Page 1D-1)	
09915M64530 Compression gauge hose ☞(Page 1D-1)		09915M64550 Compression gauge attachment (B) ☞(Page 1D-1)	

09915M67311 Vacuum gauge ☞(Page 1D-2) 	09916M14510 Valve lifter ☞(Page 1D-30) / ☞(Page 1D-32) 
09916M14522 Valve spring compressor attachment ☞(Page 1D-30) / ☞(Page 1D-32) 	09916M34542 Reamer handle ☞(Page 1D-31) / ☞(Page 1D-31) 
09916M37320 Valve guide outer reamer (10.5 mm) ☞(Page 1D-31) / ☞(Page 1D-31) 	09916M44310 Valve guide remover (5 mm) ☞(Page 1D-31) 
09916M56011 Valve guide installer attachment (protrusion: 11.5 mm) ☞(Page 1D-31) 	09916M57330 Valve guide installer handle ☞(Page 1D-31) / ☞(Page 1D-32) 
09916M77310 Piston ring compressor (50 - 125 mm) ☞(Page 1D-38) 	09916M84511 Forceps ☞(Page 1D-30) / ☞(Page 1D-32) 
09917M68221 Camshaft pulley holder ☞(Page 1D-22) / ☞(Page 1D-23) 	09917M98221 Valve guide stem attachment ☞(Page 1D-32) 
09924M17811 Flywheel holder ☞(Page 1D-23) / ☞(Page 1D-23) 	SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 1D-2) 

Engine Lubrication System

General Description

Engine Lubrication Description

AENDL70A1501001

The oil pump is of a trochoid type, and rotates with the crankshaft. The pump draws up oil from the oil pan through the oil pump strainer. The oil delivered from the pump flows through the oil filter.
The filtered oil flows into two paths in cylinder block.
In one path, oil reaches the crankshaft main bearings. Oil from the crankshaft main bearings is supplied to the connecting rod bearings by means of intersecting passages drilled in the crankshaft, and then injected from the big end of connecting rod to lubricate piston, piston rings and cylinder wall.
In the other path, oil goes up to the cylinder head and lubricates valves and camshafts, etc., after passing through the internal oil path of camshafts.
An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure exceeds specified value.

Diagnostic Information and Procedures

Oil Pressure Check

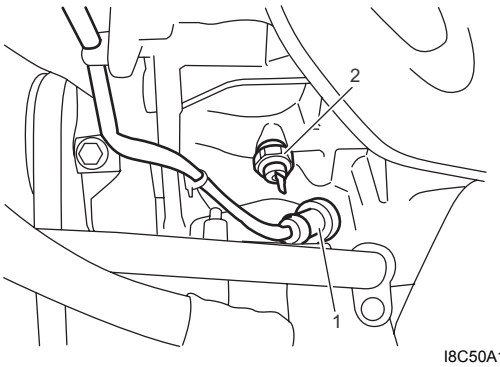
AENDL70A1504001

NOTE

Prior to checking oil pressure, check the following.

- **Oil level in oil pan**
  If oil level is too low, add oil up to full level mark (hole) on oil level gauge. ☞(Page 1E-2)
- **Oil quality**
  If oil is discolored or deteriorated, change it. ☞(Page 1E-2)
- **Oil leaks**
  If leak is found, repair it.

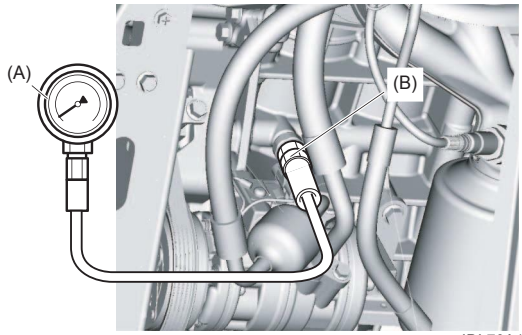
1) For M/T model, place gear shift lever in “Neutral” and apply parking brake.
   For AMT model, place select lever in “P” and apply parking brake.
2) Remove front bumper. ☞(Page 9H-1)
3) Disconnect oil pressure switch lead wire (1).
4) Remove oil pressure switch (2) from cylinder block.



I8C50A150001-01

5) Install special tools to threaded hole where oil pressure switch was removed.

Special tool
(A): 09915M77311
(B): 09915M78211



IDL70A150001-01

6) Warm up engine to normal operating temperature.
7) After warming up, raise engine speed to 4,000 rpm and measure oil pressure.

Oil pressure specification
300 – 500 kPa (3.1 – 5.1 kgf/cm², 43.5 – 72.5 psi) at 4,000 rpm.

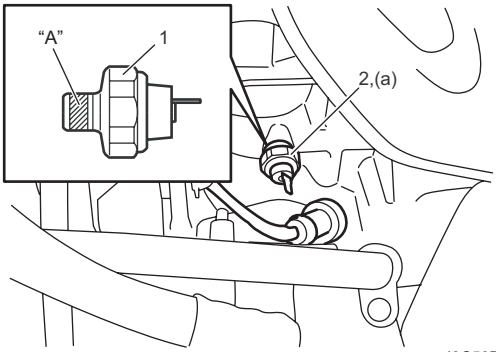
8) After checking oil pressure, stop engine and remove special tools.
9) Apply sealant to thread portion of oil pressure switch (1), and then tighten to specified torque.

⚠ CAUTION

Do not apply sealant to oil pressure switch hole.

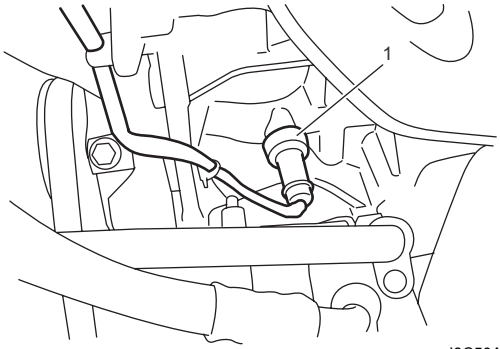
“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Oil pressure switch (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



I8C50B150001-01

10) Connect oil pressure switch lead wire (1).



I8C50A150004-01

11) Start engine and check oil pressure switch for oil leakage. If oil leakage is found, repair it.
12) Check DTC referring to "DTC Check" in Section 1A (Page 1A-19). If any DTC is displayed, clear it referring to "DTC Clearance" in Section 1A (Page 1A-20).

Repair Instructions

Engine Oil and Filter Change

AENDL70A1506001

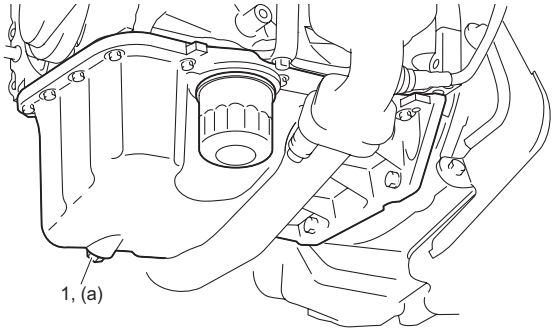
⚠ WARNING

- **Engine oil can be hazardous. Be sure to read "General Precautions" in Section 00 (Page 00-1) and observe what is written there.**
- **Steps 1) – 10) must be performed with engine stop. For Step 11), be sure to have adequate ventilation while engine is running.**

Before draining engine oil, check engine for oil leakage. If any sign of leakage is found, make sure to correct defective part before proceeding to the following procedure.

1) Drain engine oil by removing drain plug (1).
2) Remove drain plug gasket.
3) Wipe drain plug and its mounting surface clean.
4) Reinstall drain plug as follows.
   a) Make sure drain plug and oil pan drain hole are wet with oil.
   b) Reinstall drain plug with new gasket.
   c) Tighten drain plug to specified torque.

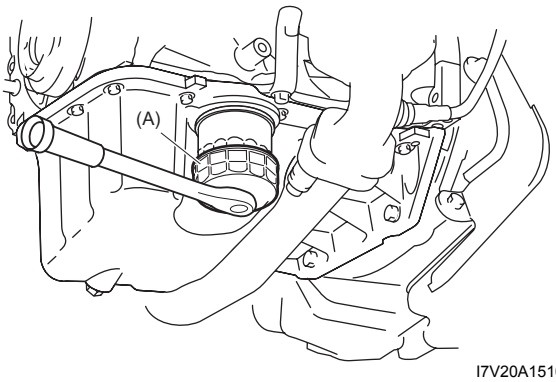
Tightening torque
Engine oil drain plug (a): 35 N·m (3.6 kgf-m, 26.0 lbf-ft)



I8C50B150002-01

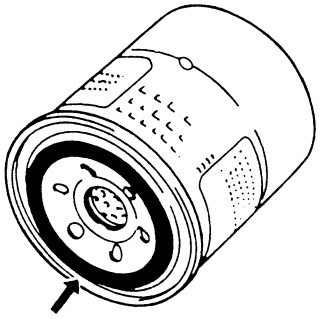
5) Loosen oil filter using special tool and remove oil filter.

Special tool
(A): 09915M47341



I7V20A151009-02

6) Wipe oil filter mounting surface of oil pan clean.
7) Apply engine oil to new oil filter gasket.

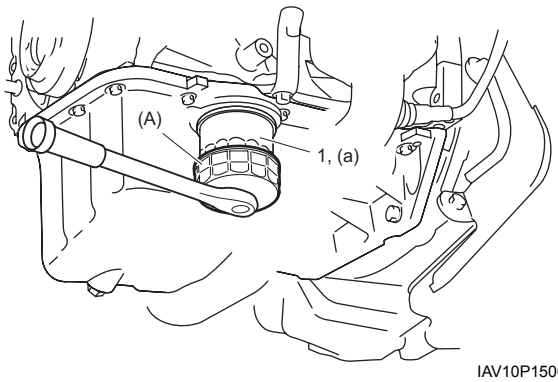


IYSQ01020009-01

8) Install the oil filter in the following manner.
Using a torque wrench
a) Fit the oil filter (1) with the oil pan, and then tighten it to the specified torque using the special tool.

Special tool
(A): 09915M47341

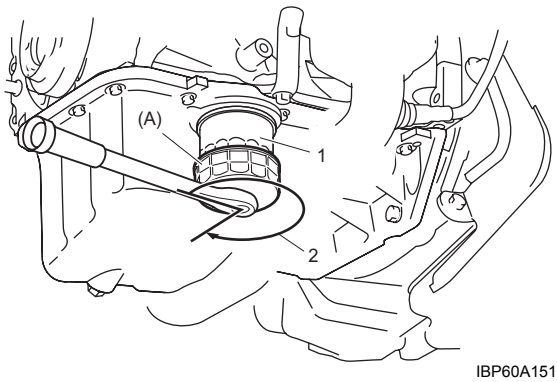
Tightening torque
Oil filter (a): 14 N·m (1.4 kgf-m, 10.5 lbf-ft)



IAV10P150001-01

Not using a torque wrench
a) Tighten the oil filter (1) by hand until its gasket touches the oil pan.
b) Using the special tool, rotate the oil filter three-quarters of one turn (2) to tighten it.

Special tool
(A): 09915M47341



IBP60A151001-01

9) Add oil up to FULL level mark (hole) on oil level gauge (oil pan and oil filter capacity). The filler inlet is at top of cylinder head cover.

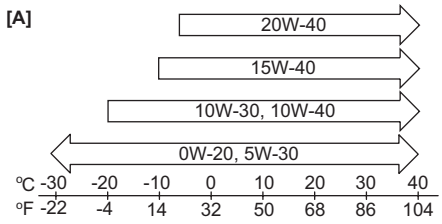
Use only engine oil of SG, SH, SJ, SL or SM grade. Select the appropriate oil viscosity according to the chart [A].
SAE 0W-20 oil is the best choice for good fuel economy, and good starting in cold weather.

NOTE

- **Engine oil capacity is specified below. However, note that the amount of oil required when actually changing oil may somewhat differ from the data depending on various conditions (temperature, viscosity, etc.).**
- **The specified engine oil and "proper engine oil viscosity chart [A]" included in this manual are given as typical ones. For the specific information on the engine oil and proper engine oil viscosity, refer to "Engine Oil and Filter" section of the Owner's Manual.**

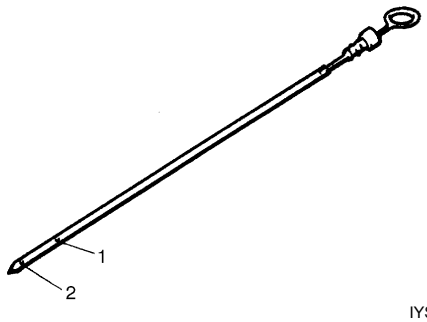
Engine oil specifications
Oil pan capacity: About 2.7 liters (5.71 US pt. / 4.75 Imp pt.)
Oil filter capacity: About 0.2 liters (0.42 US pt. / 0.35 Imp pt.)
Others: About 0.2 liters (0.42 US pt. / 0.35 Imp pt.)
Total: About 3.1 liters (6.55 US pt. / 5.46 Imp pt.)

Proper engine oil viscosity chart



IBC50A150001-01

10) Start engine and run it for 3 min. Stop it and wait 5 min. before checking oil level. If necessary, add oil up to FULL level mark (hole) (1) on oil level gauge.
11) Check oil filter and drain plug for oil leakage.



IYSQ01020012-01

2. Low level mark (hole)

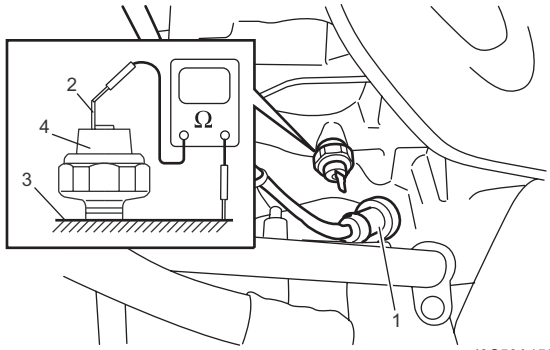
Oil Pressure Switch Inspection

AENDL70A1506002

1) Disconnect oil pressure switch lead wire (1).

2) Check for continuity between oil pressure switch terminal (2) and cylinder block (3) as shown. If check result is not as specified, replace oil pressure switch (4).

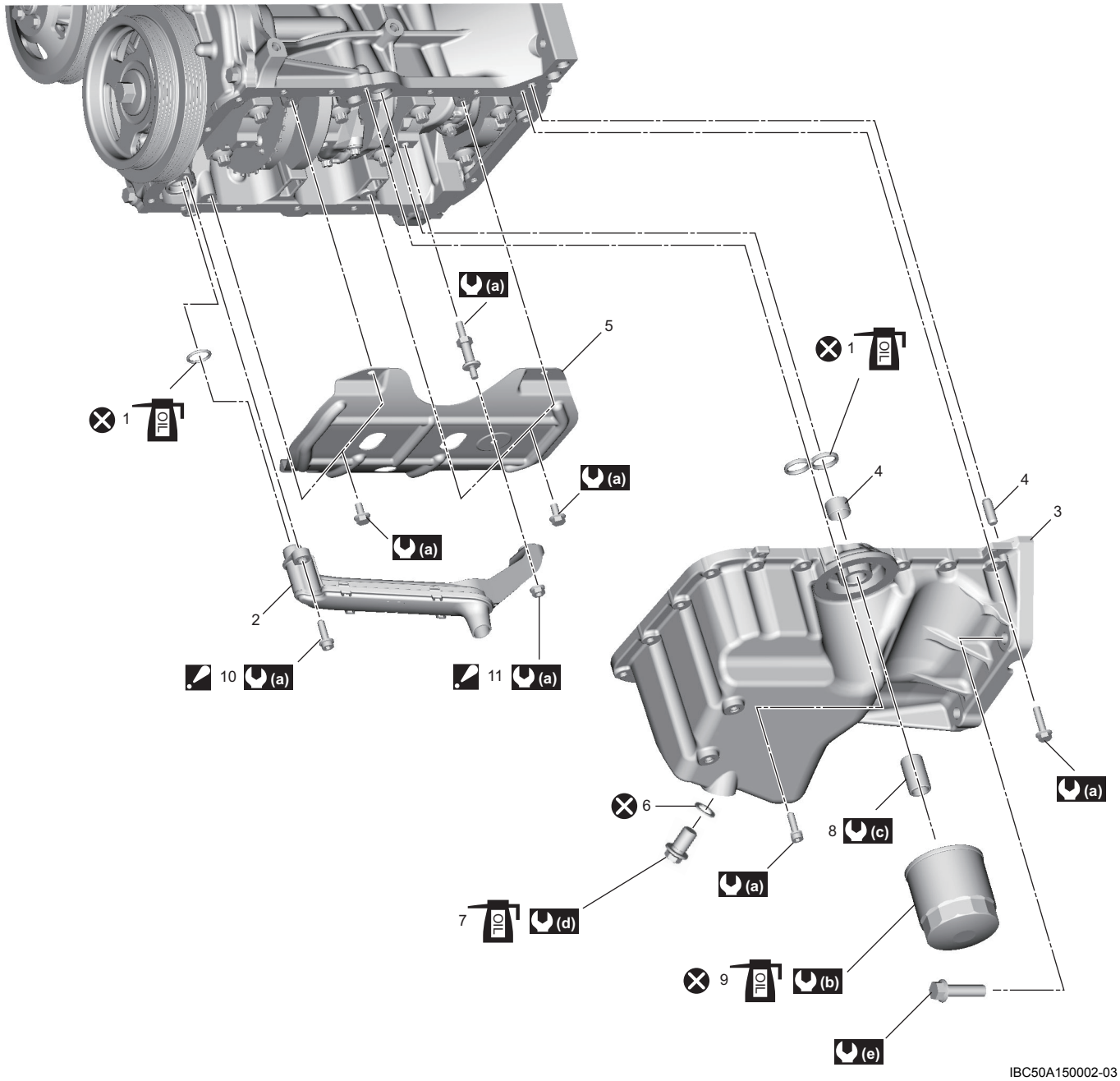
Oil pressure switch specification
During engine running: No continuity
At engine stop: Continuity



I8C50A150005-01

Oil Pan and Oil Pump Strainer Components

AENDL70A1506003



IBC50A150002-03

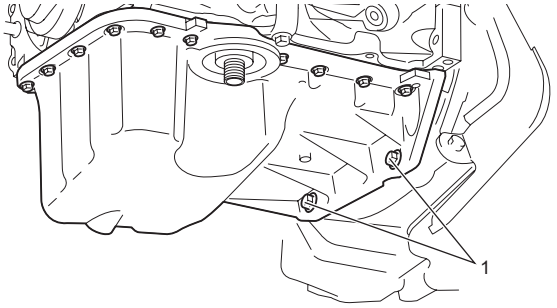
1. O-ring : Apply engine oil.	7. Drain plug : Apply engine oil to mating surface.	(b) : 14 N·m (1.4 kgf-m, 10.5 lbf-ft)
2. Strainer	8. Oil filter stand	(c) : 18 N·m (1.8 kgf-m, 13.5 lbf-ft)
1217G 3. Oil pan : Apply sealant 99000-31260 to mating surface.	9. Oil filter : For tightening order, refer to “Engine Oil and Filter Change” (Page 1E-2). : Apply engine oil to oil filter gasket.	(d) : 35 N·m (3.6 kgf-m, 26.0 lbf-ft)
4. Dowel pin	10. Oil pump strainer bolt : For tightening order, refer to “Oil Pan and Oil Pump Strainer Removal and Installation” (Page 1E-5).	(e) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
5. Oil pan baffle plate	11. Oil pump strainer bracket nut : For tightening order, refer to “Oil Pan and Oil Pump Strainer Removal and Installation” (Page 1E-5).	: Do not reuse.
6. Gasket	(a) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)	

Oil Pan and Oil Pump Strainer Removal and Installation

AENDL70A1506004

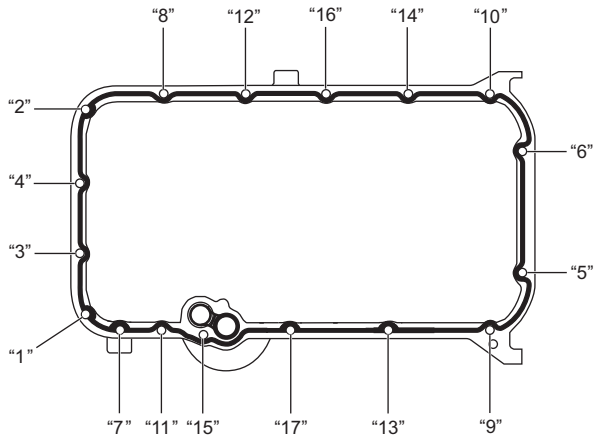
Removal

1) Remove oil level gauge.
2) Remove right side engine undercover, if necessary.
3) Drain engine oil. ☞(Page 1E-2)
4) Remove exhaust pipe. ☞(Page 1K-1)
5) Remove oil filter. ☞(Page 1E-2)
6) Remove transaxle bolts (1).



I8C50B150007-01

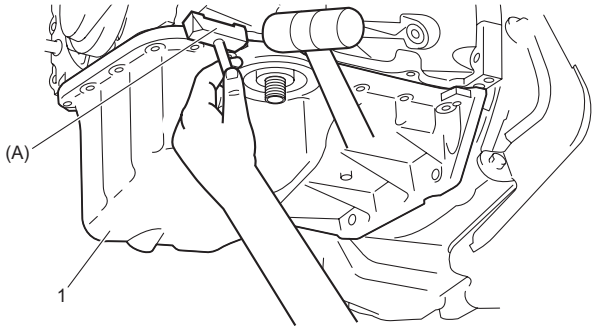
7) Loosen oil pan bolts in numerical order (“1” – “17”) evenly and gradually.



I8C50A150013-02

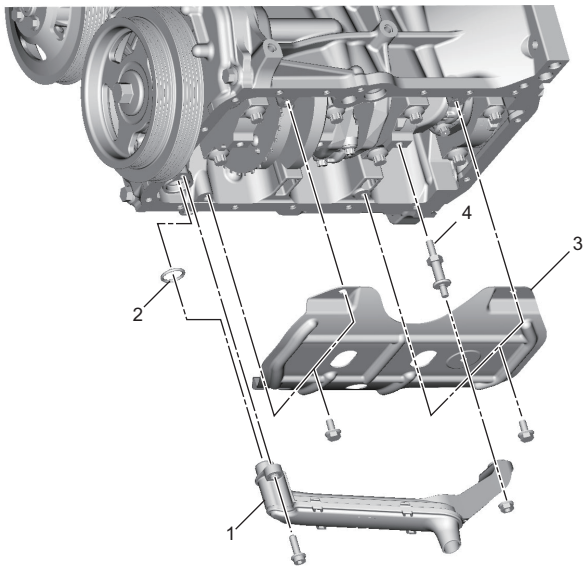
8) Remove oil pan (1) from cylinder block by using special tool and hammer.

Special tool
(A): 09921M96510



I8C50A150014-01

9) Remove oil pump strainer (1) with O-ring (2) from cylinder block.
10) Remove oil pan baffle plate (3) from cylinder block.
11) Remove stud bolt (4) from cylinder block, if necessary.



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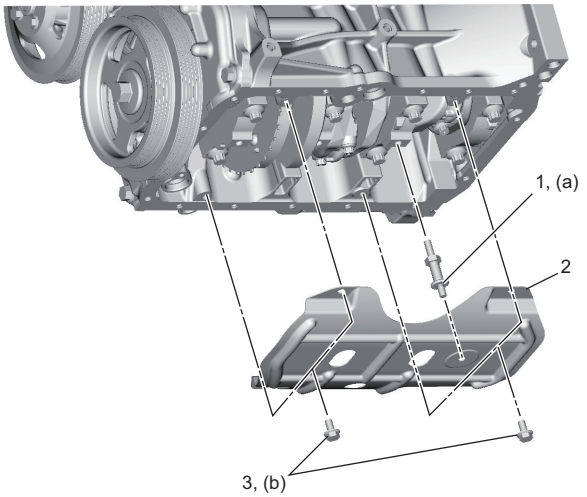
Installation

1) Install oil pan baffle plate stud bolt (1) if removed and then tighten oil pan baffle plate stud bolt to specified torque.

Tightening torque
Oil pan baffle plate stud bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

2) Install oil pan baffle plate (2) and then tighten oil pan baffle plate bolts (3) to specified torque.

Tightening torque
Oil pan baffle plate bolt (b): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

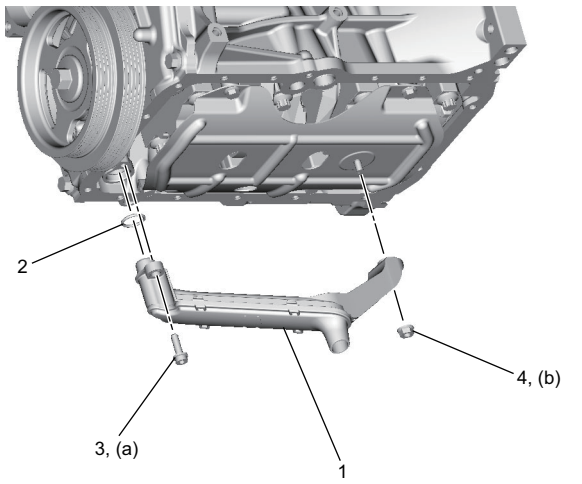


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3) Apply engine oil to new O-ring (2) and then install O-ring to oil pump strainer (1).

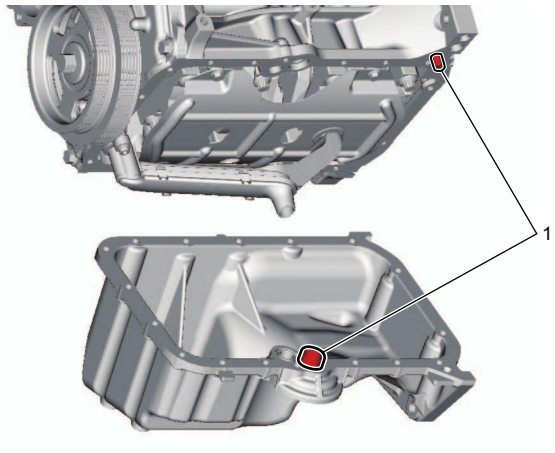
4) Install oil pump strainer with O-ring to oil pump and tighten bolt (3) first and nut (4) to specified torque.

Tightening torque
Oil pump strainer bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
Oil pump strainer bracket nut (b): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



IBC50A150006-01

5) Install dowel pins (1) to oil pan and cylinder block.



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6) Apply engine oil to new O-ring (1) and then install O-ring to position as shown in figure.

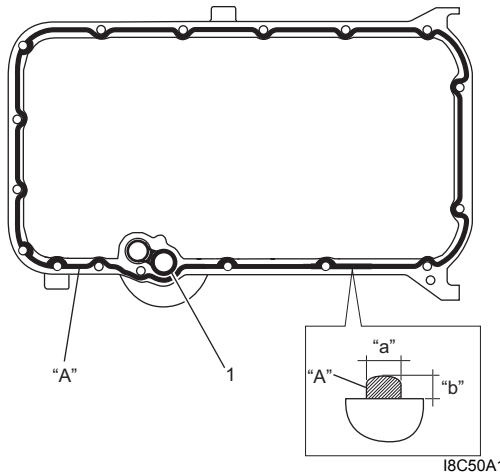
7) Apply sealant to oil pan mating surface as shown in figure.

NOTE

- **Before applying sealant, check that mating surfaces are clean and dry.**
- **Wipe off excessive sealant.**
- **Install oil pan within 2 minutes after applying sealant.**

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

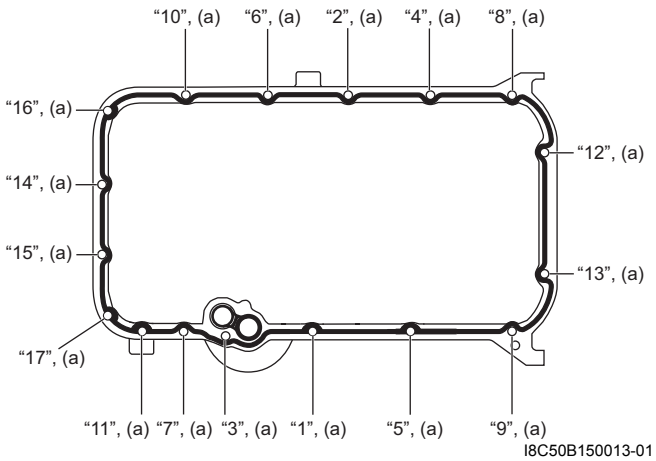
Sealant amount for oil pan
Width: "a": 3 mm (0.12 in.)
Height "b": 2 mm (0.08 in.)



I8C50A150019-01

8) Install oil pan to cylinder block and then tighten oil pan bolts in numerical order ("1" – "17") evenly and gradually to specified torque.

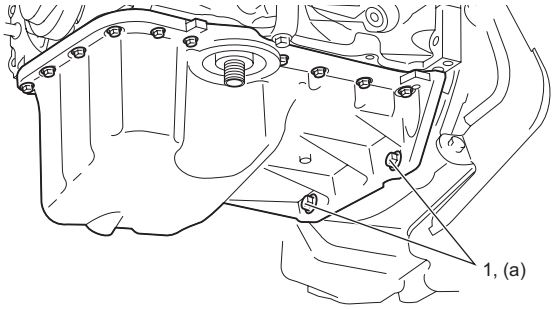
Tightening torque
Oil pan bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



I8C50B150013-01

9) Tighten transaxle bolts (1) to specified torque.

Tightening torque
Transaxle bolt (a): 55 N·m (5.6 kgf-m, 40.5 lbf-ft)

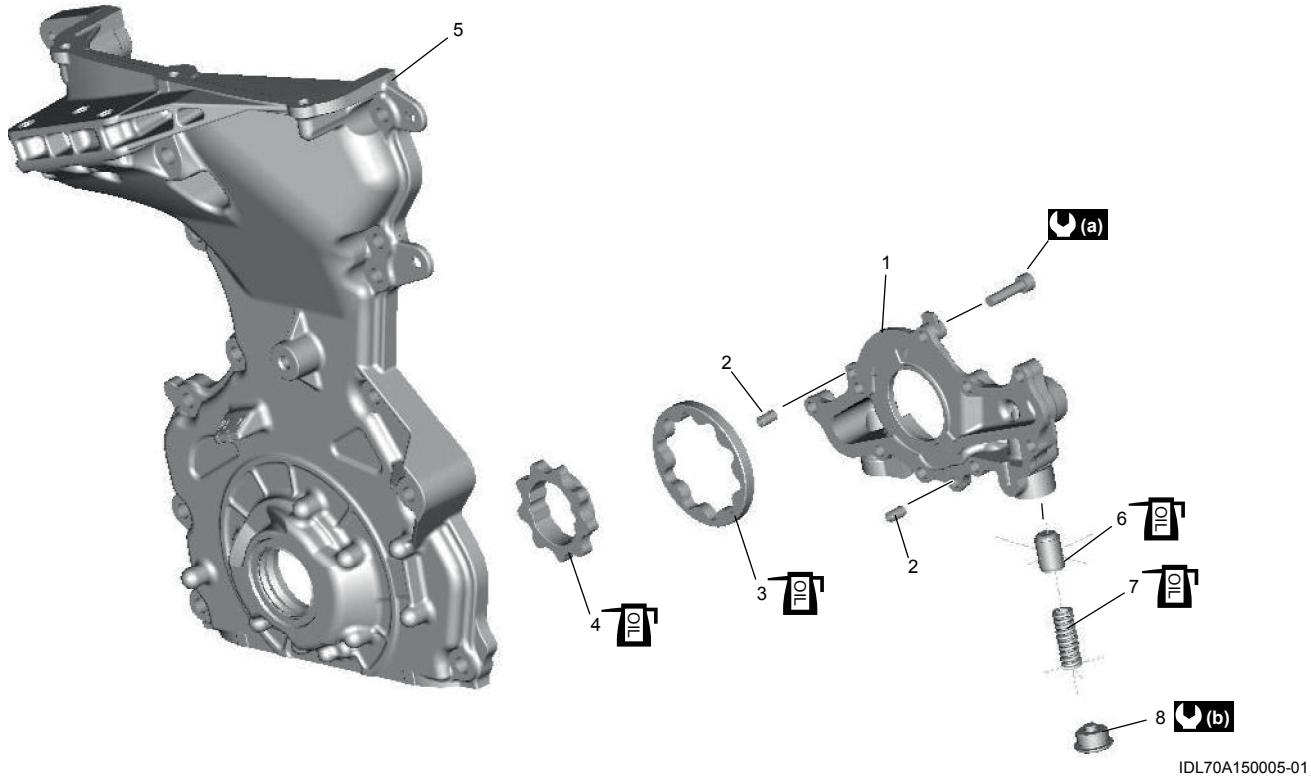


I8C50B150010-01

10) Install oil filter. ☞(Page 1E-2)
11) Install exhaust pipe. ☞(Page 1K-1)
12) Install right side engine undercover, if removed.
13) Install oil level gauge.
14) Install drain plug and refill engine with engine oil. ☞(Page 1E-2)
15) Verify that there is no engine oil leakage and exhaust gas leakage.

Oil Pump Assembly Components

AENDL70A1506005



IDL70A150005-01

1. Rotor plate	5. Timing chain cover	(a) : 11 N·m (1.1 kgf-m 8.5 lbf-ft)
2. Dowel pin	OIL 6. Relief valve	(b) : 28 N·m (2.9 kgf-m 21.0 lbf-ft)
OIL 3. Outer rotor	OIL 7. Spring	OIL : Apply thin coat of engine oil to sliding surface.
OIL 4. Inner rotor	8. Retainer	

Oil Pump Assembly Removal and Installation

AENDL70A1506006

Oil pump is incorporated in timing chain cover.

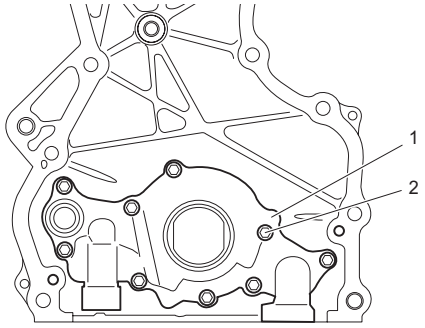
For removal and installation, refer to "Timing Chain Cover Removal and Installation" in Section 1D (Page 1D-22).

Oil Pump Assembly Disassembly and Reassembly

AENDL70A1506007

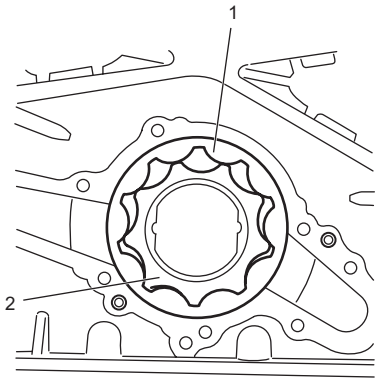
Disassembly

1) Remove rotor plate (1) by removing its mounting bolts (2).



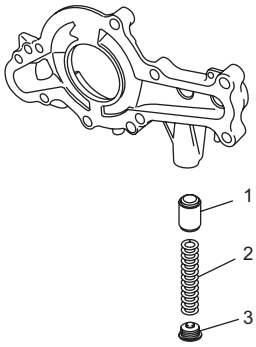
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2) Remove outer rotor (1) and inner rotor (2).



IDL70A150002-01

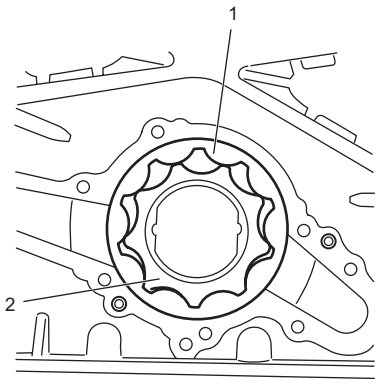
3) Remove relief valve (1) and spring (2) by removing retainer (3).



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Reassembly

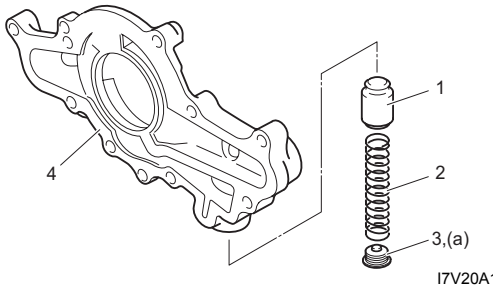
1) Wash, clean and then dry all disassembled parts.
2) Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, inside surfaces of oil pump case and plate.
3) Install outer (1) and inner rotors (2) to oil pump case.



IDL70A150002-01

4) Apply engine oil to relief valve (1) and spring (2), and install them to rotor plate (4).
5) Tighten retainer (3) to specified torque.

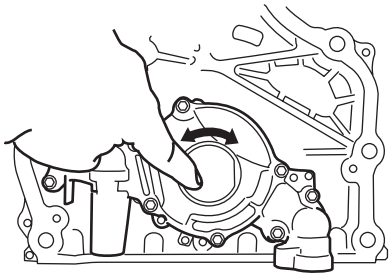
Tightening torque
Oil relief valve retainer (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)



I7V20A151023-01

6) Install rotor plate and tighten all bolts to specified torque. After installing plate, check that rotors turn smoothly by hand (Torque: 0.3 N·m (0.03 kgf-m, 0.25 lbf-ft) or less).

Tightening torque
Oil pump rotor plate bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



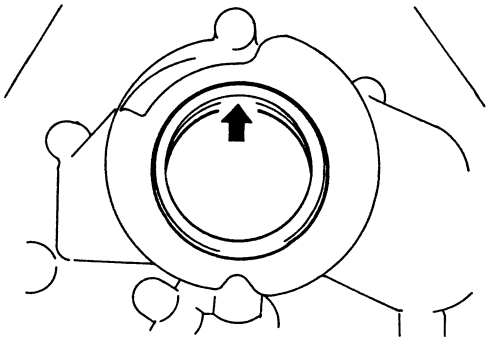
I7V20A151024-01

Oil Pump Inspection

AENDL70A1506008

Oil Seal

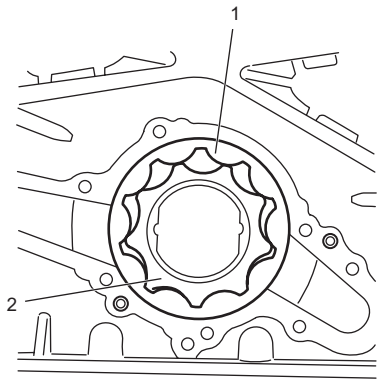
Check oil seal lip for excessive wear or damage. Replace as necessary.



I2RH0B150023-01

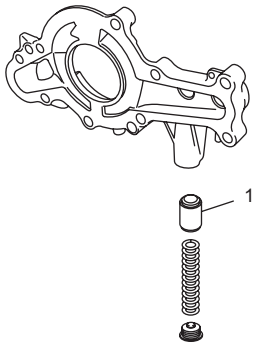
Oil Pump

- Check outer (1) and inner rotors (2), rotor plate and oil pump case for excessive wear or damage.



IDL70A150002-01

- Check that relief valve (1) is not excessively worn or damaged and operates smoothly.



I7V20A151025-01

Radial clearance

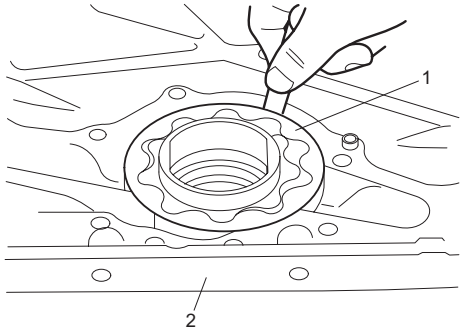
Check radial clearance between outer rotor (1) and case (2) using thickness gauge.

If clearance is out of specification, replace outer rotor or case.

Radial clearance between outer rotor and case for oil pump

Standard: 0.120 – 0.190 mm (0.0047 – 0.0075 in.)

Limit: 0.210 mm (0.0083 in.)



I7V20A151026-01

Side clearance

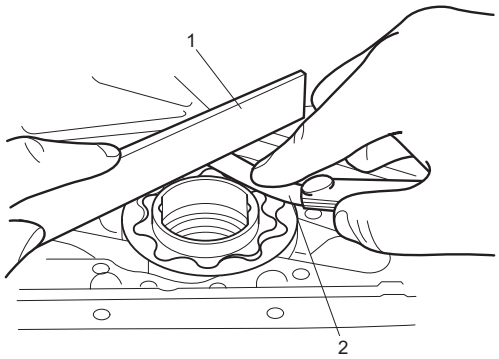
Using straightedge (1) and thickness gauge (2), measure side clearance.

If side clearance is out of specification, replace oil pump assembly.

Side clearance for oil pump inner rotor

Standard: 0.045 – 0.100 mm (0.0018 – 0.0039 in.)

Limit: 0.120 mm (0.0047 in.)



IDL70A150003-01

Rotor plate clearance

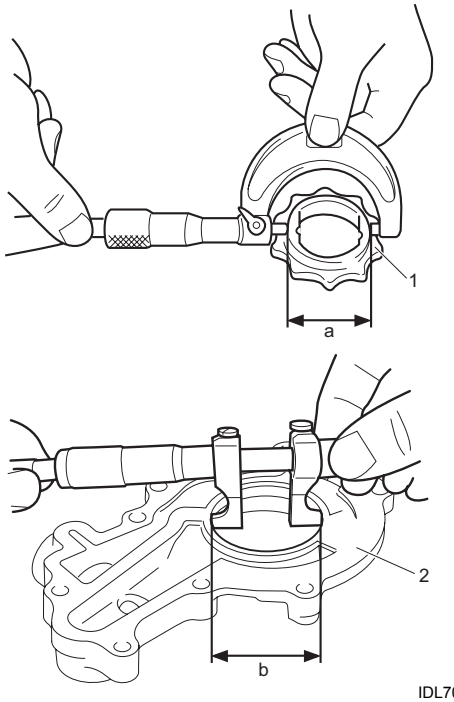
Check rotor plate clearance between inner rotor (1) and rotor plate (2) as follows.

1) Measure outside diameter “a” of inner rotor (1) by using micrometer.
2) Measure inside diameter “b” of rotor plate (2) by using micrometer.
3) Calculate difference in diameters in Step 2) and Step 1).

If clearance is out of specification, replace inner rotor or rotor plate.

Rotor plate clearance

	Standard
Inner rotor outside diameter “a”	42.920 – 42.950 mm (1.6898 – 1.6909 in.)
Rotor plate inside diameter “b”	43.000 – 43.030 mm (1.6929 – 1.6941 in.)
Clearance “b” – “a”	0.050 – 0.110 mm (0.0020 – 0.0043 in.)

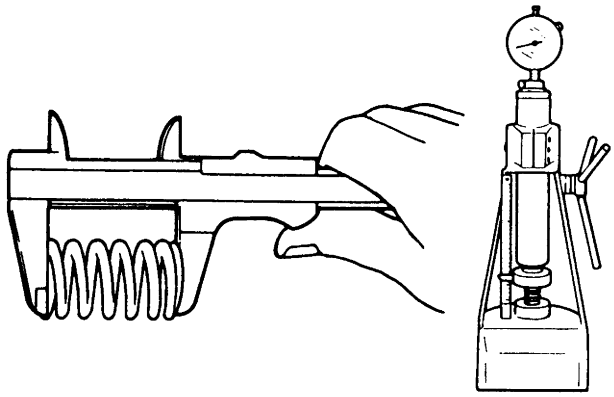


IDL70A150004-01

Relief valve spring free length and load
Check relief valve spring free length and load as shown in figure. If measured valve spring length is lower than specification, replace relief valve spring.

Relief valve spring free length and load

	Standard	Limit
Free length	**32.7 mm (1.29 in.)**	**—**
Load at spring length 26.0 mm (1.02 in.)	**54.5 N (5.6 kgf, 12.3 lbf)**	**48.3 N (4.9 kgf, 10.9 lbf)**



I2RH01150023-01

Specifications

Tightening Torque Specifications

AENDL70A1507001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Oil pressure switch	13	1.3	9.5	☞(Page 1E-1)
Engine oil drain plug	35	3.6	26.0	☞(Page 1E-2)
Oil filter	14	1.4	10.5	☞(Page 1E-3)
Oil pan baffle plate stud bolt	11	1.1	8.5	☞(Page 1E-5)
Oil pan baffle plate bolt	11	1.1	8.5	☞(Page 1E-6)
Oil pump strainer bolt	11	1.1	8.5	☞(Page 1E-6)
Oil pump strainer bracket nut	11	1.1	8.5	☞(Page 1E-6)
Oil pan bolt	11	1.1	8.5	☞(Page 1E-6)
Transaxle bolt	55	5.6	40.5	☞(Page 1E-7)
Oil relief valve retainer	28	2.9	21.0	☞(Page 1E-8)
Oil pump rotor plate bolt	11	1.1	8.5	☞(Page 1E-8)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Oil Pan and Oil Pump Strainer Components” (Page 1E-4)
“Oil Pump Assembly Components” (Page 1E-7)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A1508001

Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞(Page 1E-6)

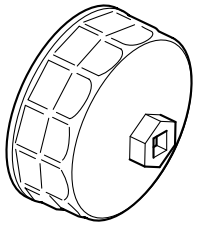
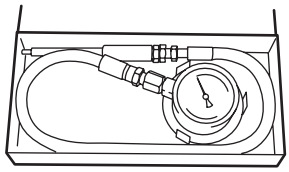
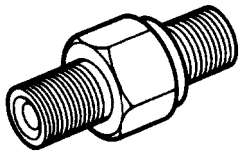
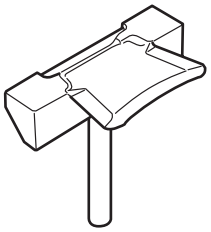
Material	SUZUKI recommended product or Specification		Note
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞(Page 1E-1)

NOTE

Required service materials are also described in:
“Oil Pan and Oil Pump Strainer Components” (Page 1E-4)
“Oil Pump Assembly Components” (Page 1E-7)

Special Tool

AENDL70A1508002

09915M47341 Oil filter wrench socket ☞(Page 1E-2) / ☞(Page 1E-3) / ☞(Page 1E-3)		09915M77311 Oil pressure gauge ☞(Page 1E-1)	
09915M78211 Oil pressure gauge attachment ☞(Page 1E-1)		09921M96510 Oil pan seal cutter ☞(Page 1E-5)	

Engine Cooling System

General Description

Cooling System Description

AENDL70A1601001

⚠ WARNING

- **Be sure to check coolant level only on coolant reservoir (a translucent container) and add coolant only into the reservoir when replenishment is needed. Never remove radiator cap to check coolant level or add coolant, as doing so is very dangerous for the following reasons:**
  - **– Coolant in cooling system may be extremely high in temperature, even exceeding the boiling point as it is under pressure. If radiator cap is removed in this condition, high-temperature and high-pressure coolant will instantaneously boil up and gush out; you could then be seriously scalded by hot coolant and steam. Furthermore, as coolant contains flammable anti-freeze material, coolant splashing over engine and fenders can start fire.**
- **Be sure to check that engine coolant is cold before removing any part of cooling system.**
- **Be sure to disconnect negative (–) cable at battery before removing any part of cooling system.**

The cooling system consists of a radiator, coolant reservoir, water pump, cooling fan and thermostat. The radiator is of a tube-and-fin type.

Coolant Description

AENDL70A1601002

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the coolant is overflowed to the reservoir.
When the system cools down, the coolant is drawn back into the radiator.
The cooling system has been filled with a quality coolant that is a 70/30 mixture of water and ethylene glycol antifreeze.
This 70/30 mixture coolant solution provides freezing protection to –15 °C (5 °F).

- Maintain cooling system freeze protection at –15 °C (5 °F) to ensure protection against corrosion and loss of coolant from boiling. This should be done even if freezing temperatures are not expected.
- Add ethylene glycol base coolant when coolant has to be added because of coolant loss or to provide added protection against freezing at temperature lower than –15 °C (5 °F).

⚠ CAUTION

- **Do not use ethanol or methanol base coolant or plain water alone; otherwise the cooling system will be damaged.**
- **Use demineralized water or distilled water for mixing with the antifreeze.**

Antifreeze concentration table

Freeze protection temperature	**°C**	**–15**
	°F	**5**
Concentration	**%**	**30**
Quantity	**liter**	**1.32**
	US pt.	**2.79**
	Imp pt.	**2.32**

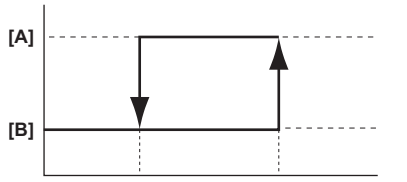
Coolant capacity
Engine, radiator and heater: 2.7 liters (5.70/4.75 US/Imp pt.)
Reservoir: 0.6 liters (1.27/1.06 US/Imp pt.)
Total: 3.3 liters (6.97/5.81 US/Imp pt.)

Cooling Fan Operation Description

AENDL70A1601003

Radiator cooling fan motor is controlled by ECM.

A/C switch: OFF



I8C50A160001-01

[A]: ON	[B]: OFF

A/C switch: ON
Vehicle speed is less than 20 km/h (12 mile/h):
Cooling fan operates.

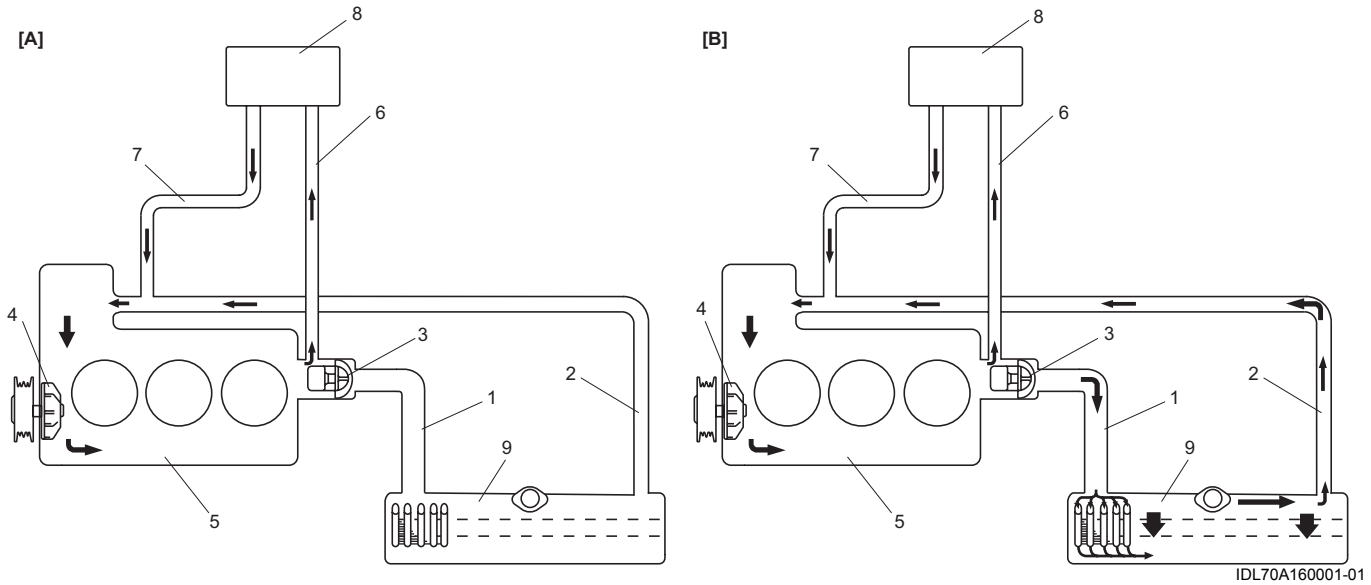
Vehicle speed is more than 30 km/h (18 mile/h):
Vehicle speed decreases to 20 km/h (12 mile/h) or less after reaching 30 km/h (18 mile/h):
Cooling fan operates when A/C refrigerant pressure is more than 1.1 MPa (11.2 kgf/cm^2, 160 psi) or engine coolant temperature is more than 97 °C (206.6 °F).

Fail-safe
Cooling fan operates when malfunction is detected in ECT sensor.

Schematic and Routing Diagram

Coolant Circulation

AENDL70A1602001

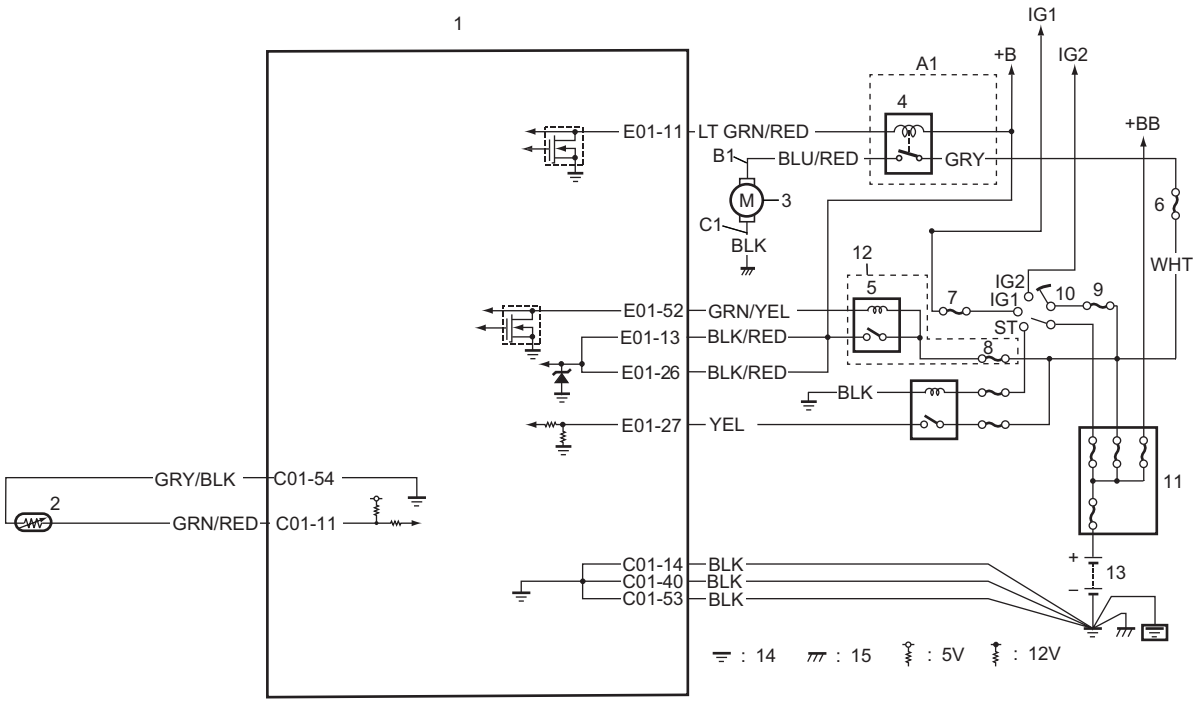


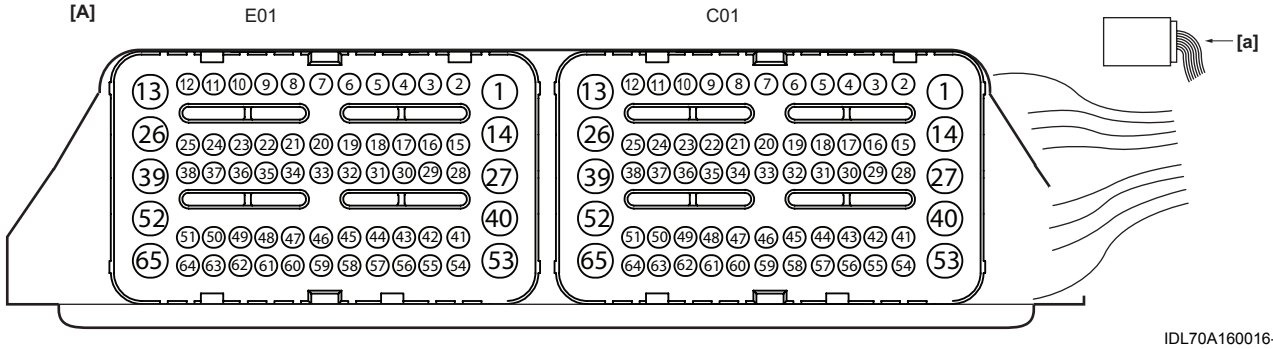
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[A]: Engine is cool (thermostat closed)	3. Thermostat	7. Heater core outlet hose
[B]: Engine is at normal operating temperature (thermostat open)	4. Water pump	8. Heater core
1. Radiator inlet hose	5. Engine	9. Radiator
2. Radiator outlet hose	6. Heater core inlet hose	

Radiator Cooling Fan Control System Circuit Diagram

AENDL70A1602002





IDL70A160016-01

[A]: ECM connector (View: [a])	4. Radiator cooling fan relay No.1	11. Main fuse box
A1: Radiator cooling fan relay No.1 power supply circuit (contact side)	5. Main relay	12. Individual circuit fuse box No.1
B1: Radiator cooling fan motor drive circuit	6. “RDTR” fuse	13. Battery
C1: Radiator cooling fan motor ground circuit	7. “IG COIL” fuse	14. Engine ground
1. ECM	8. “FI” fuse	15. Body ground
2. ECT sensor	9. “ACC” fuse	
3. Radiator cooling fan motor	10. Ignition switch	

Diagnostic Information and Procedures

Engine Cooling System Symptom Diagnosis

AENDL70A1604001

Condition	Possible cause	Correction / Reference Item
Engine overheats (Radiator fan operates)	Loose or broken water pump / generator drive belt	*Check water pump / generator drive belt. ☞(Page 1J-5)*
	Not enough coolant	*Check coolant level and add as necessary. ☞(Page 1F-7)*
	Faulty thermostat	*Check thermostat. ☞(Page 1F-10)*
	Faulty water pump	*Check water pump. ☞(Page 1F-13)*
	Dirty or bent radiator fins	*Clean or remedy. ☞(Page 1F-12)*
	Coolant leakage on cooling system	*Check cooling system for leakage. ☞(Page 1F-7)*
	Clogged radiator	*Replace radiator. ☞(Page 1F-12)*
	Faulty radiator cap	*Check radiator cap. ☞(Page 1F-7)*
	Dragging brakes	*Check brake. ☞(Page 4A-2)*
	Slipping clutch	*Check clutch. ☞(Page 5C-2)*
	Poorly charged battery	*Check battery. ☞(Page 1J-3)*
	Poor electricity generated by generator	*Check generator. ☞(Page 1J-4)*
	ECT sensor faulty	*Check ECT sensor. ☞(Page 1C-6)*
	Radiator cooling fan motor faulty	*Check radiator cooling fan motor. ☞(Page 1F-10)*
	Wiring or grounding faulty	*Repair wiring.*
	Equipped with too many additional electrical part(s)	*Dismount them.*
Engine overheats (Radiator fan does not operate)	Fuse blown	*Check fuse.*
	Radiator cooling fan relay faulty	*Check radiator cooling fan relay. ☞(Page 1F-11)*
	ECT sensor faulty	*Check ECT sensor. ☞(Page 1C-6)*
	Radiator cooling fan motor faulty	*Check radiator cooling fan motor. ☞(Page 1F-10)*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM faulty	*Check ECM and its circuit. ☞(Page 1A-87)*

Radiator Cooling Fan Control System Check

AENDL70A1604002

Circuit Diagram

Refer to “Radiator Cooling Fan Control System Circuit Diagram” (Page 1F-3).

Troubleshooting

⚠ WARNING

Keep hands, tools, and clothing away from radiator cooling fan to prevent personal injury. This fan is driven by electric motor that can turn on whether or not the engine is running. The fan motor can start automatically in response to ECT sensor signal if ignition switch is at “ON” position.

NOTE

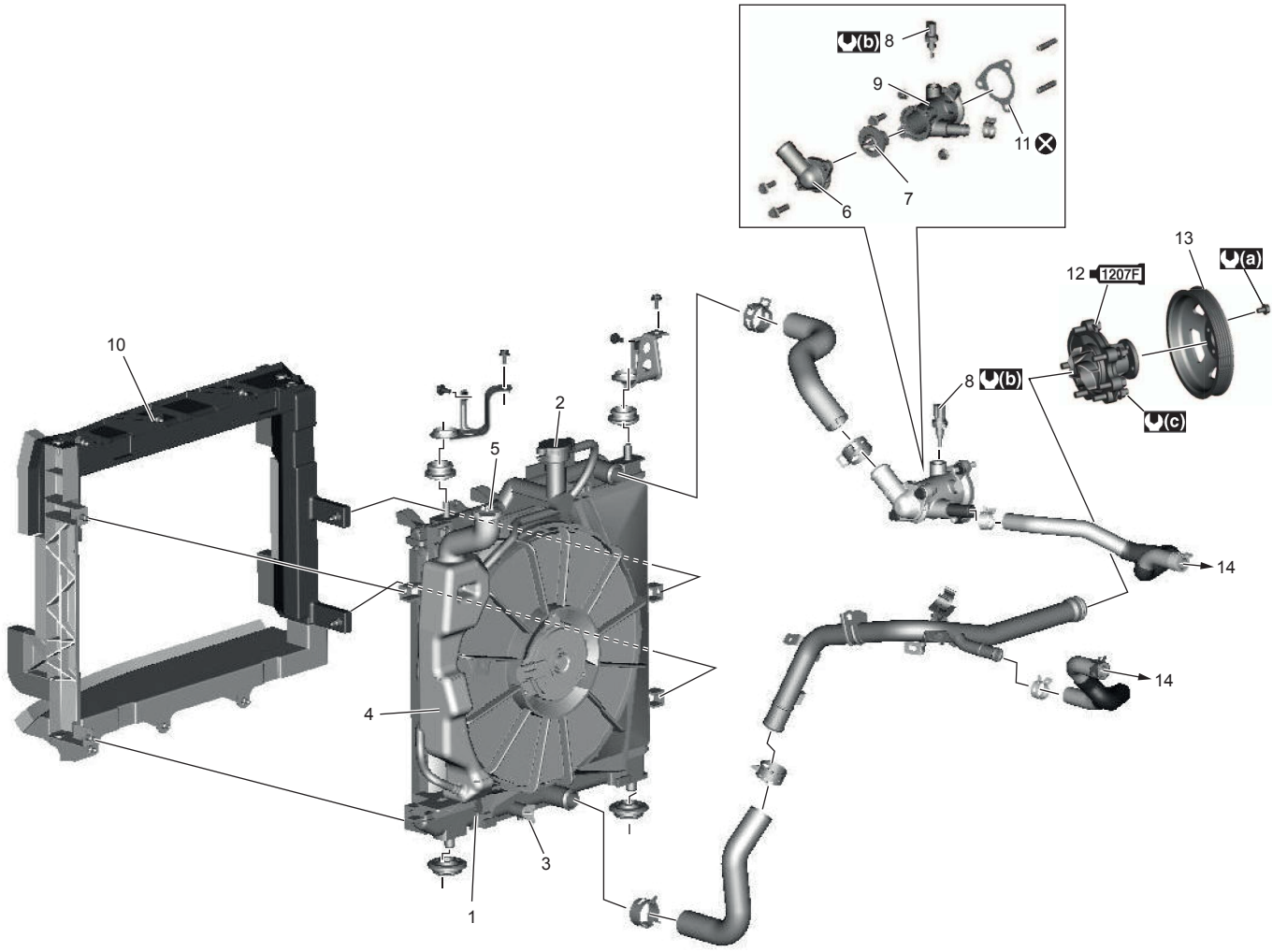
- **For details about engine cooling fan operation, refer to “Cooling Fan Operation Description” (Page 1F-1).**
- **Before beginning troubleshooting, be sure to read “Precautions for Engine” in Section 1 (Page 1-1).**
- **When measuring circuit voltage, resistance and/or pulse signal of ECM, refer to “Inspection of ECM and Its Circuits” in Section 1A (Page 1A-87).**

Step	Action	Yes	No
1	**DTC check** 1) Turn OFF ignition switch and connect SUZUKI scan tool to DLC. 2) Turn ignition switch to ON position and check DTC. *Is there DTC(s)?*	Go to applicable DTC troubleshooting and recheck DTC.	Go to Step 2.
2	**Radiator cooling fan operation check** 1) Check radiator cooling fan operation. ☞(Page 1F-10) *Is check result OK?*	Radiator cooling fan control system is in good condition.	Go to Step 3.
3	**Radiator cooling fan relay No.1 power supply circuit (contact side) check** 1) Turn OFF ignition switch and remove radiator cooling fan relay No.1 from individual circuit fuse box No.1. 2) Check for proper connection to radiator cooling fan relay No.1 at each terminal. 3) If OK, measure voltage between “A1” circuit and ground. *Is it 10 – 14 V?*	Go to Step 4.	Repair “A1” circuit.
4	**Radiator cooling fan relay No.1 check** 1) Check radiator cooling fan relay No.1. ☞(Page 1F-11) *Is check result OK?*	Go to Step 5.	Replace faulty radiator cooling fan relay No.1.
5	**Radiator cooling fan motor drive circuit check** 1) Turin OFF ignition switch and disconnect radiator cooling fan motor connector. 2) Check for proper connection to radiator cooling fan motor at each terminal. 3) If OK, check the following points. • Resistance of “B1” circuit: 1 Ω or less • Resistance between “B1” circuit and ground: infinity • Voltage of “B1” circuit: 0 – 1 V (with ignition ON) *Is check result OK?*	Go to Step 6.	Repair “B1” circuit.
6	**Radiator cooling fan motor ground circuit check** 1) Measure resistance between “C1” circuit and ground at its fan motor connector. *Is resistance 1 Ω or less?*	Go to Step 7.	Repair or replace radiator cooling fan motor ground circuit.
7	**Radiator cooling fan motor check** 1) Check radiator cooling fan motor. ☞(Page 1F-10) *Is check result OK?*	Substitute a known-good ECM and recheck.	Replace radiator cooling fan motor. ☞(Page 1F-11)

Repair Instructions

Cooling System Components

AENDL70A1606001



IDL70A160002-01

1. Radiator fan assembly	7. Thermostat : For installation, refer to "Thermostat Removal and Installation" (Page 1F-9).	13. Water pump pulley
2. Radiator cap	8. ECT sensor	14. To throttle body
3. Drain plug	9. Thermostat case	(a) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
4. Reservoir	10. Radiator cover	(b) : 12 N·m (1.2 kgf-m, 9.0 lbf-ft)
5. Reservoir cap	11. Gasket	(c) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
6. Thermostat cap	1207F 12. Water pump assembly : Apply sealant 99000-31250 referring to "Water Pump Removal and Installation" (Page 1F-13).	: Do not reuse.

Radiator Cap Removal and Installation

AENDL70A1606002

⚠ WARNING

To avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if radiator cap is taken off too soon.

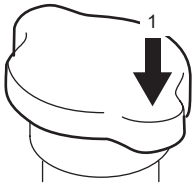
Removal

1) Turn radiator cap counterclockwise until it stops.

⚠ CAUTION

Do not push down radiator cap while turning it.

2) Push mate position (1) of radiator cap and wait until pressure is relieved (hissing sound is gone).



I8C50B160004-01

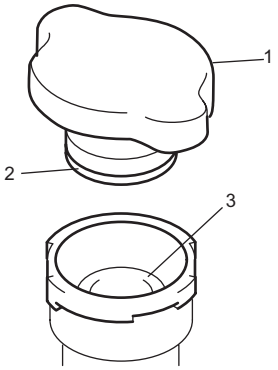
3) Push down radiator cap and continue to turn it counterclockwise.
4) Remove radiator cap.

Installation

1) Put radiator cap (1) on water filler.
2) Push down radiator cap and turn it clockwise until it fully stops.

⚠ CAUTION

Push radiator cap until its gasket (2) contacts with water filler port (3).



I8T401162029-01

3) Check for coolant leaks. ☞(Page 1F-7)

Coolant Level Check

AENDL70A1606003

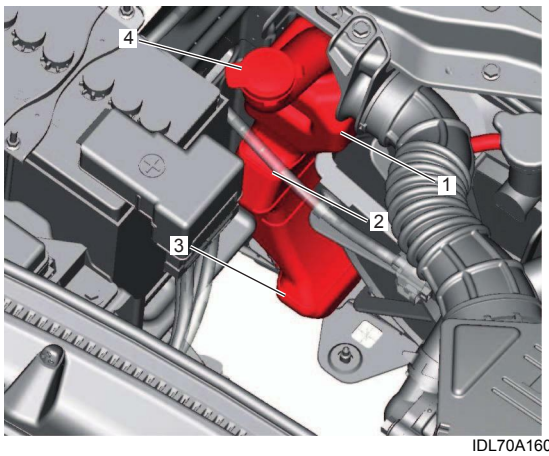
⚠ WARNING

To avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if radiator cap is taken off too soon.

To check level, lift hood and look at translucent reservoir. It is not necessary to remove radiator cap to check coolant level.
When engine is cool, check coolant level in reservoir (1). Normal coolant level should be between “FULL” level mark (2) and “LOW” level mark (3) on reservoir (1).
If coolant level is below “LOW” level mark (3), remove reservoir cap (4) and add proper coolant to reservoir to bring coolant level up to “FULL” level mark (2).

NOTE

If proper quality antifreeze is used, there is no need to add extra rust inhibitors or other additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.



IDL70A160003-01

Engine Cooling System Inspection

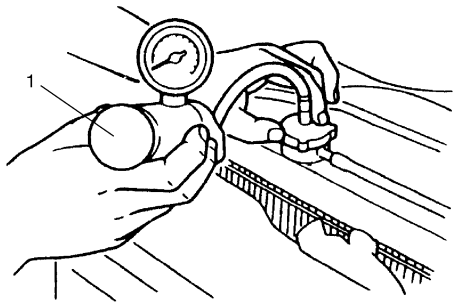
AENDL70A1606004

⚠ WARNING

To avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if cap is taken off too soon.

1) Check cooling system for leakage or damage.
2) Remove radiator cap. ☞(Page 1F-6)
3) Check coolant for proper level and freeze protection.
4) Check coolant leaks from cooling system according to the following procedure.
   a) Attach pressure tester (1) to water filler, and then apply specified pressure to cooling system.

      Cooling system holding pressure
      108 kPa (1.1 kgf/cm², 15.6 psi)

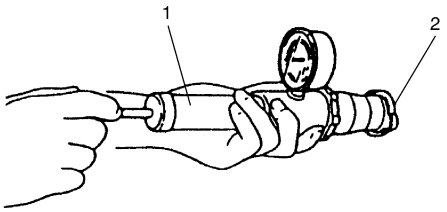


I8T401162005-01

   b) Check that cooling system holds the pressure. If cooling system does not hold applied pressure, Check cooling system for coolant leaks.

5) Check radiator cap according to the following procedure.
   a) Attach pressure tester (1) to radiator cap (2), and then apply specified pressure.

      Radiator cap regulating pressure
      94 – 122 kPa (1.0 – 1.2 kgf/cm², 13.6 – 17.7 psi)



I8T401162006-01

   b) Check that maximum pressure is with in specification.
      If out of specification, replace radiator cap.
6) Detach pressure tester and rinse off spilled coolant.
7) Install radiator cap on water filler. ☞(Page 1F-6)

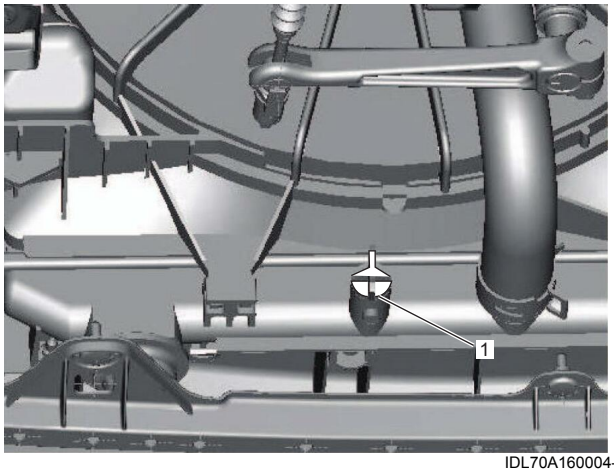
Cooling System Draining

AENDL70A1606005

⚠ WARNING

To avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

1) Remove radiator cap. ☞(Page 1F-6)
2) Drain coolant from radiator drain plug (1).
3) After draining coolant, tighten drain plug (1) securely.



IDL70A160004-01

Cooling System Flushing

AENDL70A1606006

⚠ WARNING

To avoid getting burned, do not remove radiator cap and radiator drain plug while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if cap is taken off too soon.

NOTE

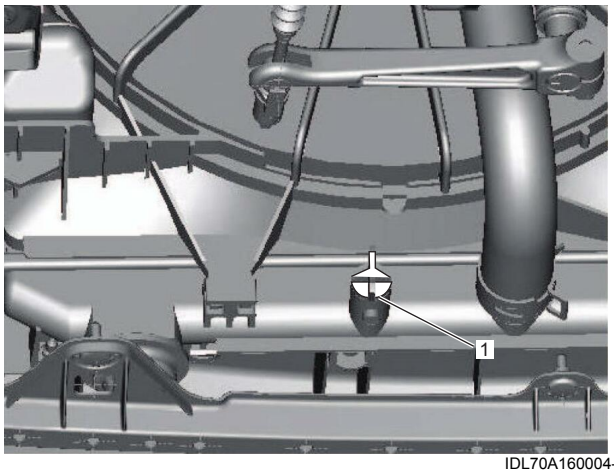
For detail of coolant specification, refer to "Coolant Description" (Page 1F-1).

1) Remove radiator cap. ☞(Page 1F-6)
2) With radiator cap removed, run engine until upper radiator hose becomes warm.

NOTE

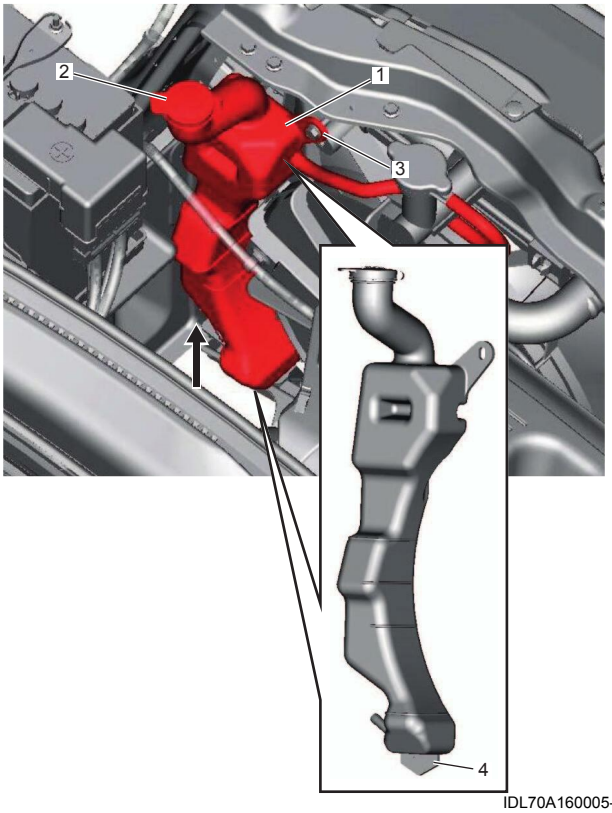
Warm upper hose indicates that thermostat is open and coolant is circulating in the cooling system including radiator.

3) Stop engine and drain coolant from radiator drain plug (1).
4) Tighten radiator drain plug (1). Fill system with water and run engine until upper radiator hose becomes warm again.
5) Repeat Steps 3) and 4) several times until drained liquid is nearly colorless.
6) Tighten radiator drain plug (1) tightly.



IDL70A160004-01

7) Remove reservoir cap (1) and reservoir (2) by removing the bolt (3) and pulling the reservoir up after removing the clamp (4).



IDL70A160005-01

8) Empty reservoir of fluid and scrub its inside using soap and water.
Flush reservoir well with clean water and reinstall it.

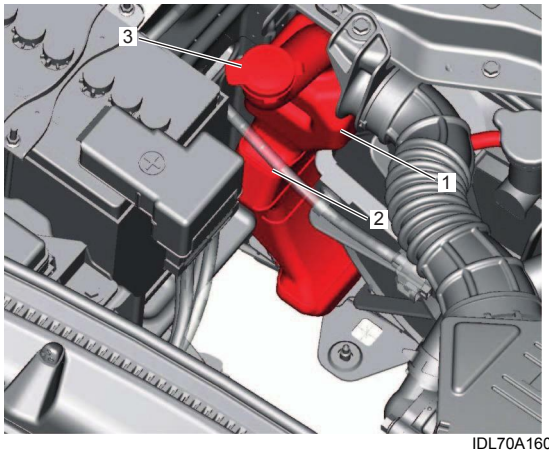
Cooling System Refilling

AENDL70A1606007

⚠ WARNING

To avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if cap is taken off too soon.

1) Fill reservoir (1) with coolant up to “FULL” level mark (2).
2) Install reservoir cap (3) on reservoir (1).



IDL70A160006-01

3) Fill radiator with coolant up to bottom of radiator filler neck and install radiator cap. ☞(Page 1F-6)

Coolant specification
Freezing temperature: –15 °C (5 °F)
Antifreeze / anti-corrosion coolant concentration: 30%

Coolant capacity
Engine, radiator and heater: 2.7 liters (5.70/4.75 US/Imp pt.)
Reservoir: 0.6 liters (1.27/1.06 US/Imp pt.)
Total: 3.3 liters (6.97/5.81 US/Imp pt.)

4) Run engine at idle speed until radiator fan motor is operated.
5) Stop engine and wait until engine comes cooled down to avoid getting burned.
6) Add coolant to radiator up to bottom of radiator filler neck, and install radiator cap. ☞(Page 1F-6)
7) Repeat Step 4) through 6) several times.
8) Confirm that coolant level in reservoir is at “FULL” level mark. If coolant is insufficient, add coolant.
9) Check for coolant leaks. ☞(Page 1F-7)

Cooling Water Pipe or Hose Removal and Installation

AENDL70A1606008

Removal

1) Drain coolant. ☞(Page 1F-8)
2) To remove cooling water pipes or hoses, loosen clamp on each hose and pull hose end off.

Installation

Reverse removal procedure noting the following.

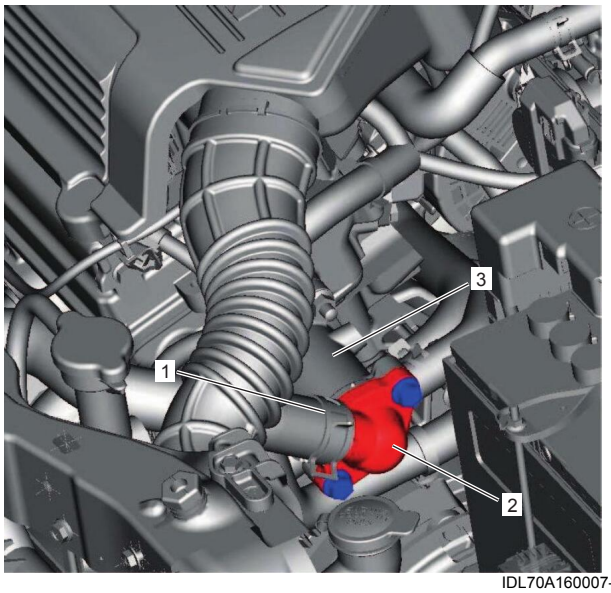
- Tighten each clamp securely with its fastener in proper direction. ☞(Page 1F-6)
- Refill cooling system. ☞(Page 1F-9).
- Check for coolant leaks. ☞(Page 1F-7)

Thermostat Removal and Installation

AENDL70A1606009

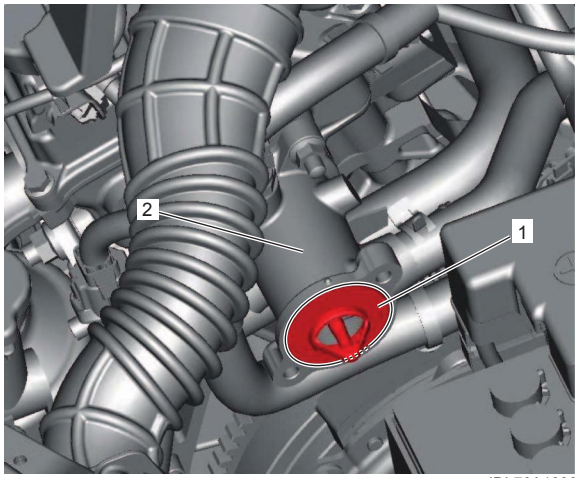
Removal

1) Drain coolant. ☞(Page 1F-8)
2) Disconnect radiator inlet hose (1) from thermostat cap (2).
3) Remove thermostat cap (2) from thermostat case (3).



IDL70A160007-01

4) Remove thermostat (1) from thermostat case (2).

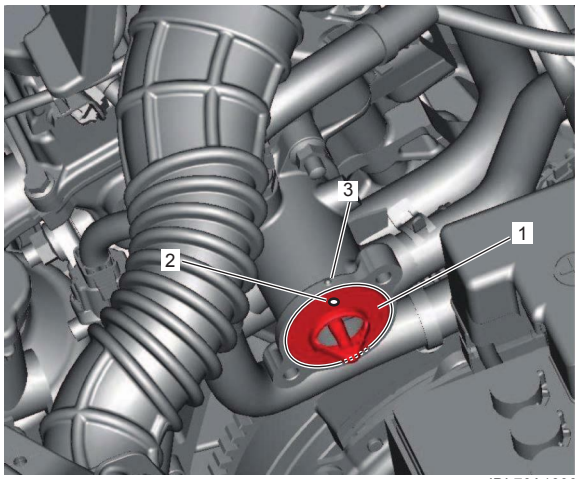


IDL70A160008-01

Installation

Reverse removal procedure noting the following.

- Position thermostat (1) on thermostat case so that air bleed valve (2) is aligned with mark (3).



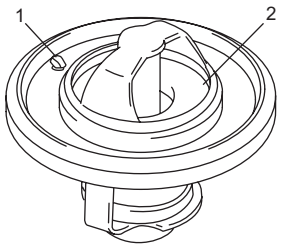
IDL70A160009-01

- Refill cooling system. ☞(Page 1F-9)
- Verify that there is no coolant leakage at each connection. ☞(Page 1F-7)

Thermostat Inspection

AENDL70A1606010

- Check that air bleed valve (1) of thermostat is clean.
- Check that valve seat (2) is free from foreign matters which would prevent valve from seating tight.



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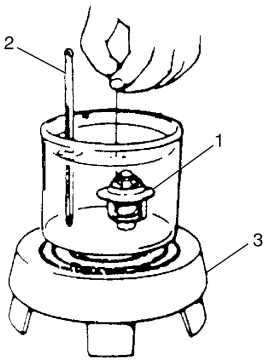
- Check that wax pellet moves as follows:
  a. Immerse thermostat (1) in water, and heat water gradually.
  b. Check that valve starts opening at specific temperature.

Temperature at which valve starts to open
86.5 – 89.5 °C (187.7 – 193.1 °F)

Temperature at which valve becomes fully open
100 °C (212 °F)

Thermostat valve lift
More than 8 mm (0.3 in) at 100 °C (212 °F)

If thermostat does not open as specified above, or sticks in any position, replace it. Such a unit, if reused, will cause overcooling or overheating tendency.



I2RH01160012-01

2. Thermometer	3. Heater

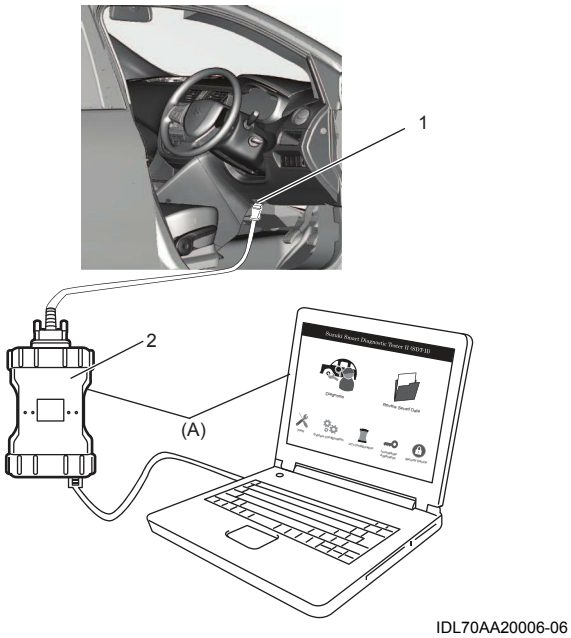
Radiator Cooling Fan Assembly On-Vehicle Inspection

AENDL70A1606011

Radiator Cooling Fan Operation Check

1) Connect scan tool (PC and VCI (2)) to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)

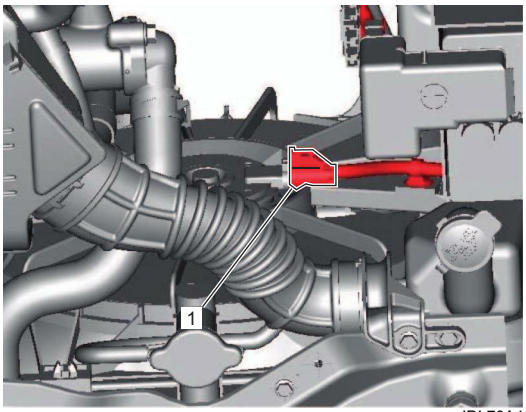


IDL70AA20006-06

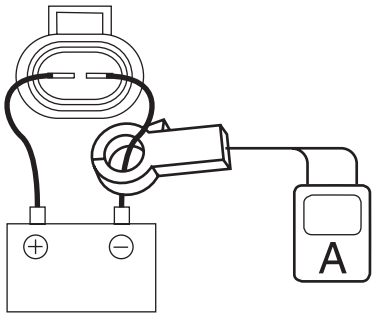
2) Turn ignition switch to ON position and clear DTC. ☞(Page 1A-20)
3) Select the “Radiator Fan” function in “Active Test”.
4) Check radiator cooling fan operation.
If radiator cooling fan does not operate, check cooling fan control system.☞(Page 1F-4)

Radiator Cooling Fan Motor Check

1) Disconnect radiator cooling fan motor connector (1).
2) Using service wire, connect radiator cooling fan motor and battery as shown in figure.



IDL70A160010-01



I8C50B160016-01

3) Check that radiator cooling fan motor rotates smoothly and properly.
If any abnormality is found, replace radiator cooling fan motor.

Reference: Radiator cooling fan motor specified current at 12 V
: 9.4 ± 1.5 A

Radiator Cooling Fan Relay Inspection

AENDL70A1606012

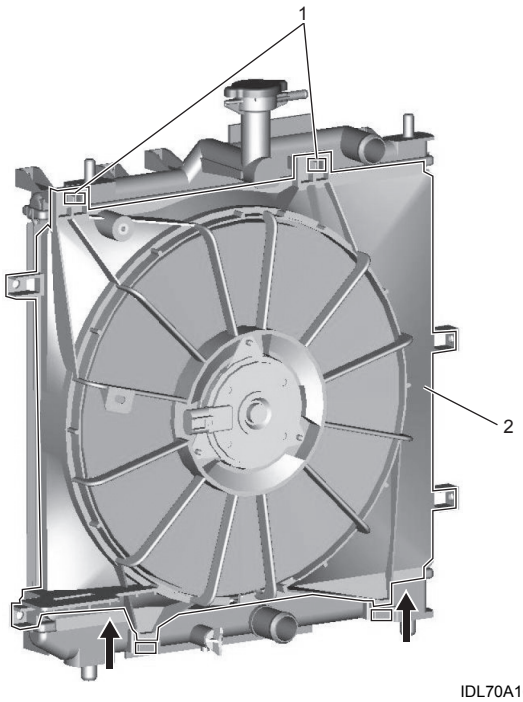
Refer to “Control Relay Inspection” in Section 10B (Page 10B-32).

Radiator Cooling Fan Assembly Removal and Installation

AENDL70A1606013

Removal

1) Remove radiator. ☞(Page 1F-12)
2) Unclip radiator cooling fan mounting clips (1).
3) Remove radiator cooling fan assembly (2) from radiator.



IDL70A160011-01

Installation

Reverse removal procedure noting the following.

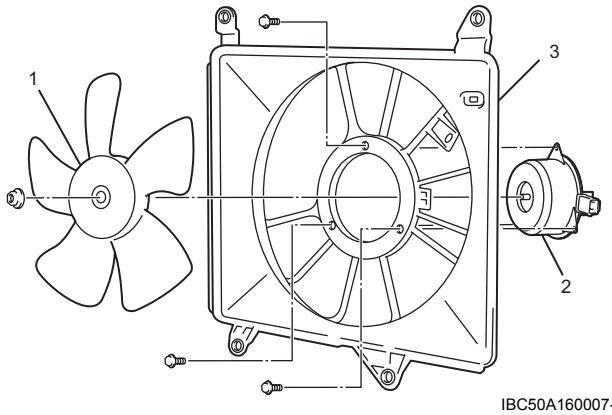
- Tighten radiator cooling fan mounting bolts to specified torque. ☞(Page 1F-6)
- Refill cooling system. ☞(Page 1F-9)
- After installation, verify there is no coolant leakage at each connection. ☞(Page 1F-7)

Radiator Cooling Fan Disassembly and Reassembly

AENDL70A1606014

Disassembly

1) Remove fan (1) from cooling fan motor (2).
2) Remove fan motor (2) from cooling fan shroud (3).



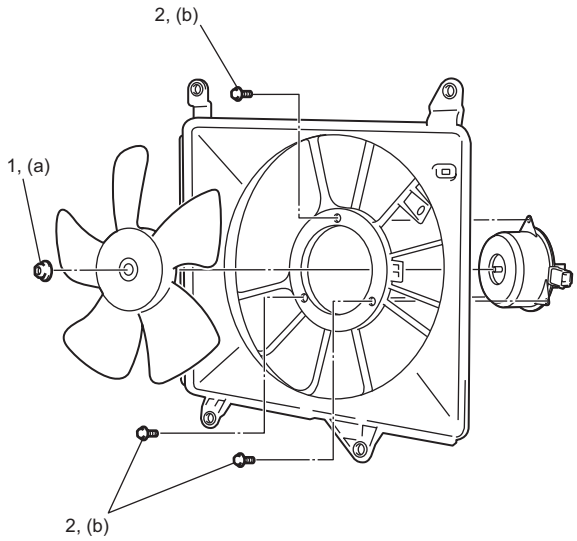
IBC50A160007-01

Reassembly

Reverse disassembly procedure noting the following.

- Tighten fan nut (1) and radiator cooling fan motor bolts (2) to specified torque.

Tightening torque
Fan nut (a): 6 N·m (0.61 kgf-m, 4.5 lbf-ft)
Radiator cooling fan motor bolt (b): 4 N·m (0.41 kgf-m, 3.0 lbf-ft)



IBC50A160006-01

Radiator On-Vehicle Inspection and Cleaning

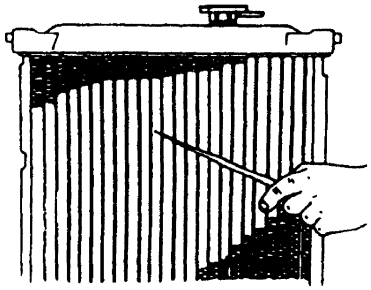
AENDL70A1606015

Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.

Cleaning

Clean front area of radiator cores.



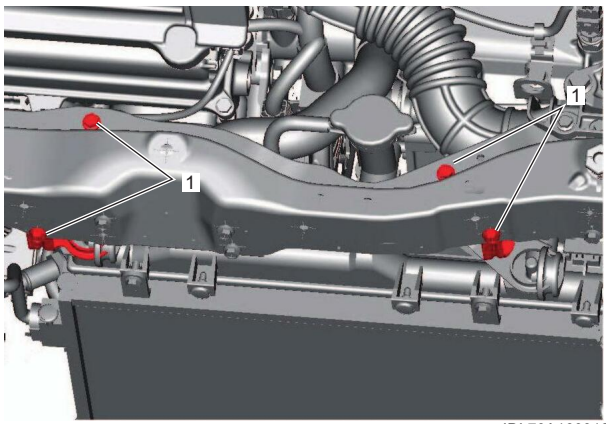
I2RH01160014-01

Radiator Removal and Installation

AENDL70A1606016

Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant. ☞(Page 1F-8)
3) Remove front bumper. ☞(Page 9H-1)
4) Remove right and left side engine undercovers.
5) Remove inlet and outlet hoses from radiator.
6) With hose and pipe connected, detach condenser from radiator assembly (if equipped). ☞(Page 7B-27)
7) Remove hood lock brace bolts (1).

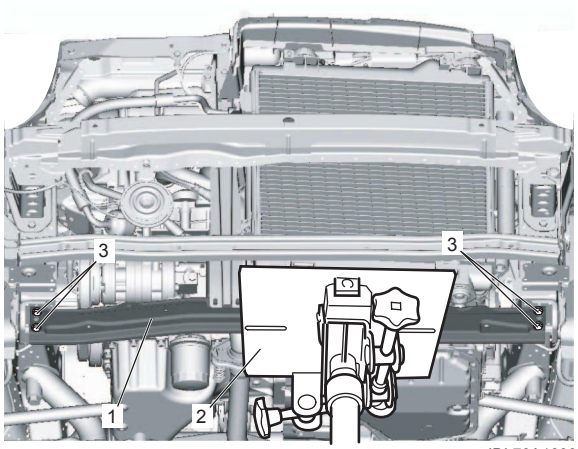


IDL70A160012-01

8) Support radiator support lower member (1) with high-lift jack (2).
9) Remove radiator support lower member bolts (3), and then lower high-lift jack and remove radiator assembly with radiator support lower member.

⚠ CAUTION

Before lowering radiator assembly, make clearance with removed condenser in order to avoid damage to them.



IDL70A160013-01

10) Remove radiator from radiator support lower member.
11) Remove radiator cooling fan assembly from radiator. ☞(Page 1F-11)

Installation

Reverse removal procedures noting the following.

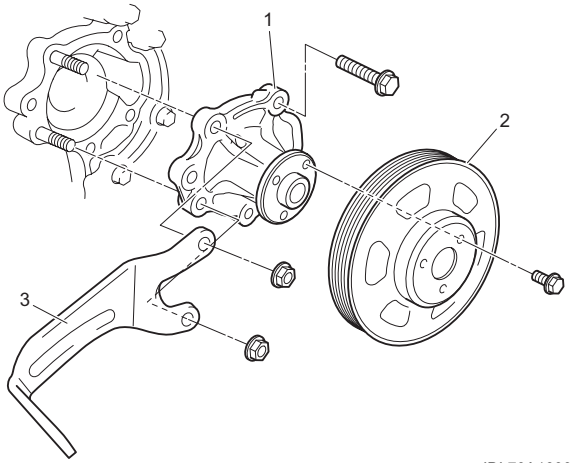
- Refill cooling system referring to “Cooling System Refilling” (Page 1F-9).
- After installation, verify that there is no coolant leakage at each connection.

Water Pump Removal and Installation

AENDL70A1606017

Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant. ☞(Page 1F-8)
3) Loosen water pump pulley bolts.
4) Remove water pump / generator drive belt. ☞(Page 1J-6)
5) Remove water pump pulley (2).
6) Remove generator bracket (3).
7) Remove water pump assembly (1) from cylinder block.

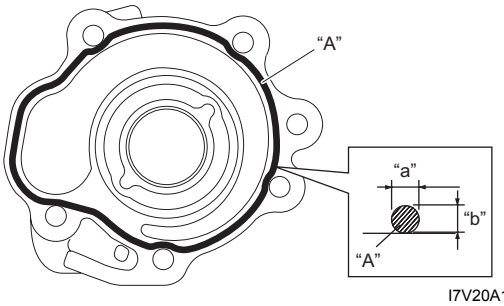


IDL70A160014-01

Installation

1) Apply sealant to mating surface of water pump as shown in figure.

“A”: Sealant 99000–31250 (SUZUKI Bond No.1207F)



I7V20A161015-01

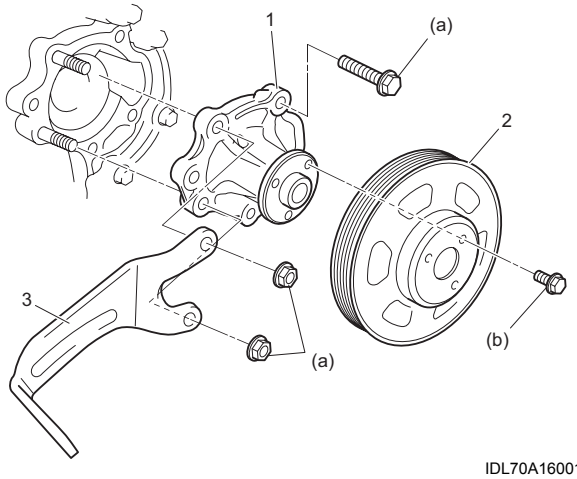
“a”: 3 mm (0.12 in.)	“b”: 2 mm (0.08 in.)

2) Install water pump assembly (1) with generator bracket (3) to cylinder block and tighten bolts and nut to specified torque.

Tightening torque
Water pump bolt and nut (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)

3) Install water pump pulley (2) and tighten bolts by hand.
4) Install water pump / generator drive belt. ☞(Page 1J-6)
5) Tighten water pump pulley bolts to specified torque.

Tightening torque
Water pump pulley bolt (b): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



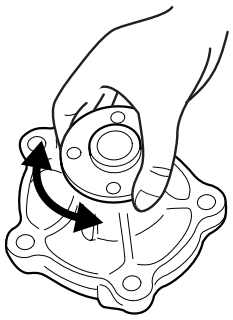
IDL70A160015-01

6) Refill cooling system. ☞(Page 1F-9)
7) Connect negative (–) cable at battery.
8) Check for coolant leaks. ☞(Page 1F-7)

Water Pump Inspection

AENDL70A1606018

Rotate water pump by hand and check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.



I2RH0B160019-01

Specifications

Tightening Torque Specifications

AENDL70A1607001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Fan nut	6	0.61	4.5	☞(Page 1F-12)
Radiator cooling fan motor bolt	4	0.41	3.0	☞(Page 1F-12)
Water pump bolt and nut	25	2.5	18.5	☞(Page 1F-13)
Water pump pulley bolt	11	1.1	8.5	☞(Page 1F-13)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Cooling System Components” (Page 1F-6)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A1608001

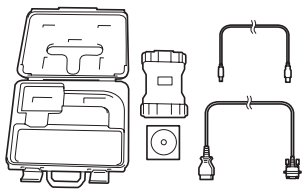
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞(Page 1F-13)

NOTE

Required service materials are also described in:
“Cooling System Components” (Page 1F-6)

Special Tool

AENDL70A1608002

SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 1F-10)		

Fuel System

Precautions

Precautions for Fuel System Service

AENDL70A1700001

⚠ WARNING

When performing the service of any type on fuel system, the following should be always observed in order to reduce the risk of fire and personal injury.

- **Disconnect negative (–) cable at battery.**
- **Do not smoke, and place no smoking signs near working area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas heater).**
- **Wear safety glasses.**
- **To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.**
- **As fuel feed line is still under high fuel pressure even after stopping engine, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure. ☞(Page 1G-13)**
- **A small amount of fuel may be released when the fuel line is disconnected. In order to reduce the risk of personal injury, cover the fitting to be disconnected with shop cloth.**
- **Never perform service work when engine and exhaust system are hot.**
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly. ☞(Page 1G-12)**
  After connecting, make sure that it has no twist or kink.
- **When installing injector or fuel feed pipe, lubricate its new O-ring with gasoline.**
- **When servicing fuel tank, it should be treated carefully. Pay attention not to contact it with sharp edges or hot surfaces. In addition, fuel tank should not be dropped since fuel tank, fuel pump and other components can be damaged by impact. If dropped, all components should be replaced because there is a risk of damage.**

General Description

Fuel System Description

AENDL70A1701001

⚠ CAUTION

Use unleaded fuel only.
The leaded or low lead fuel can result in engine damage and reduce the effectiveness of the emission control system.

The main components of the fuel system are fuel tank, fuel pump assembly (with filter, fuel level sensor and fuel pressure regulator), fuel feed line and fuel vapor line.
For the details of fuel flow, refer to “Fuel Delivery System Diagram” (Page 1G-2).

Fuel Delivery System Description

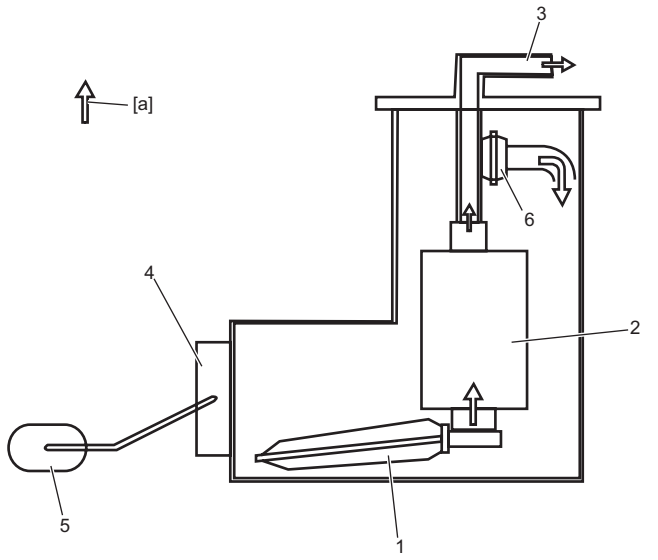
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The fuel delivery system consists of the fuel tank, fuel pump assembly (with built-in fuel filter and fuel pressure regulator), delivery pipe, injectors and fuel feed line.
The fuel in the fuel tank is pumped up by the fuel pump, sent into delivery pipe and injected by the injectors.
As the fuel pump assembly is equipped with built-in fuel filter and fuel pressure regulator, the fuel is filtered by the fuel filter and its pressure is regulated before being sent to the feed pipe.
The excess fuel at fuel pressure regulation process is directly returned back into the fuel tank.
Also, fuel vapor generated in fuel tank is led through the fuel vapor line into the EVAP canister.
For system diagram, refer to “Fuel Delivery System Diagram” (Page 1G-2).

Fuel Pump Description

AENDL70A1701003

The fuel pump assembly is an in-tank type electric pump. Incorporated in the pump assembly are;
a fuel filter (1), a fuel pressure regulator (6) and a fuel level sensor (4).



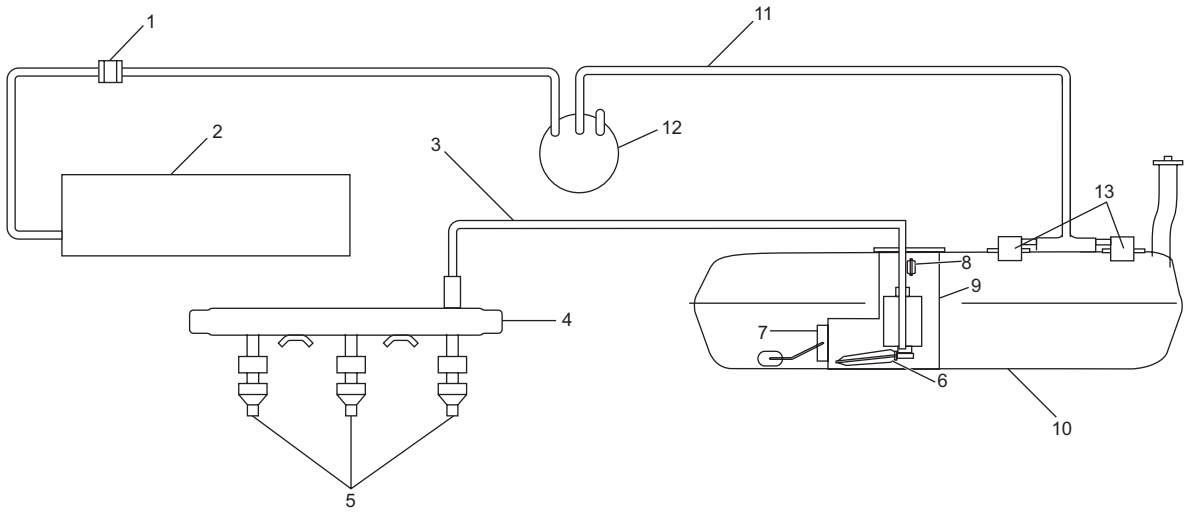
IDL70A170013-01

[a] Fuel flow direction	3. Feed pipe	6. Fuel pressure regulator
1. Fuel filter	4. Fuel level sensor	
2. Fuel pump	5. Float	

Schematic and Routing Diagram

Fuel Delivery System Diagram

AENDL70A1702001

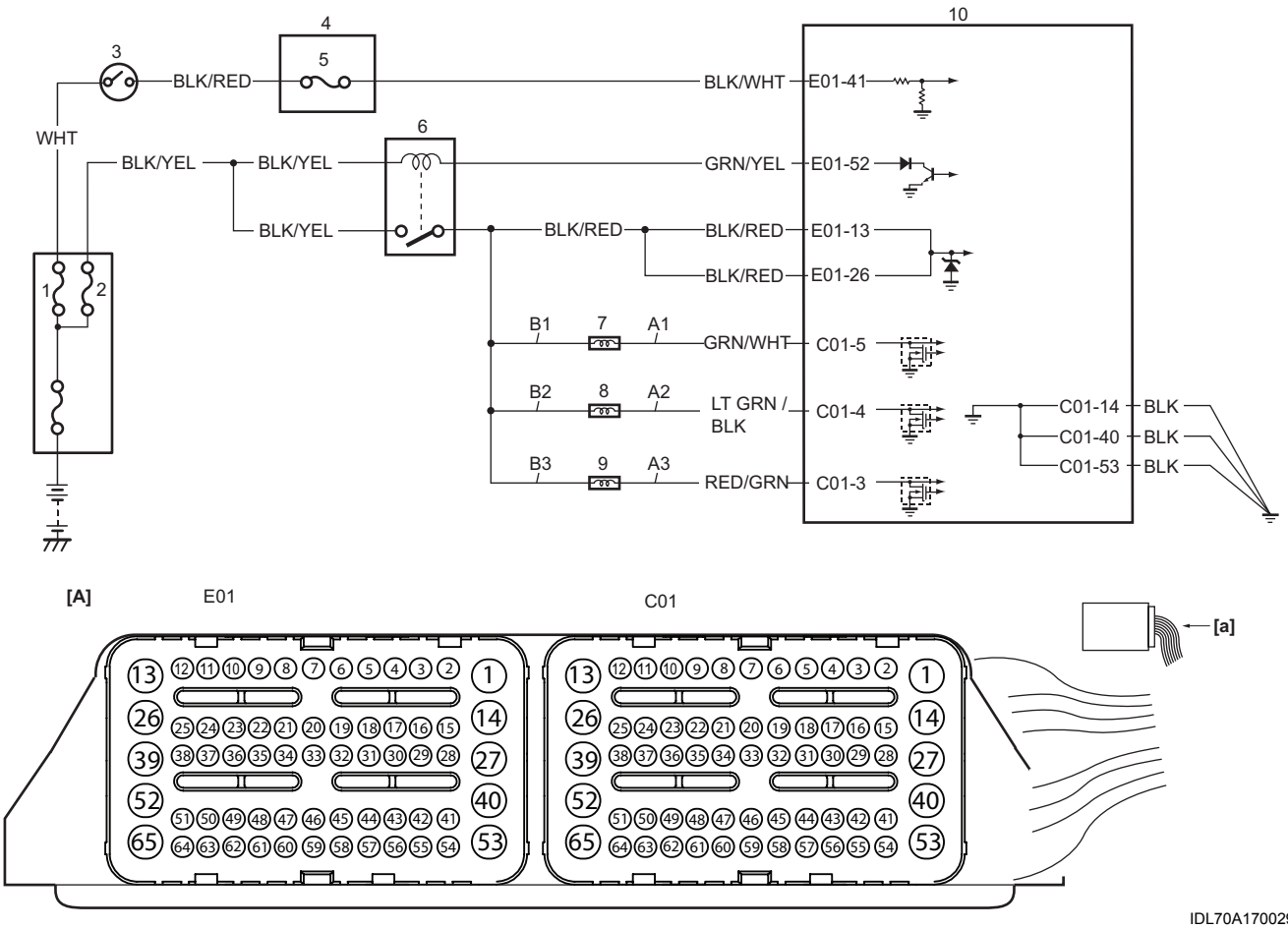


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1. EVAP canister purge valve	5. Fuel injector	9. Fuel pump assembly	13. Vapor control valve
2. Intake manifold	6. Fuel filter	10. Fuel tank	
3. Fuel feed line	7. Fuel level sensor	11. Fuel vapor line	
4. Fuel delivery pipe	8. Fuel pressure regulator	12. EVAP canister	

Fuel Injector Control System Circuit Diagram

AENDL70A1702002

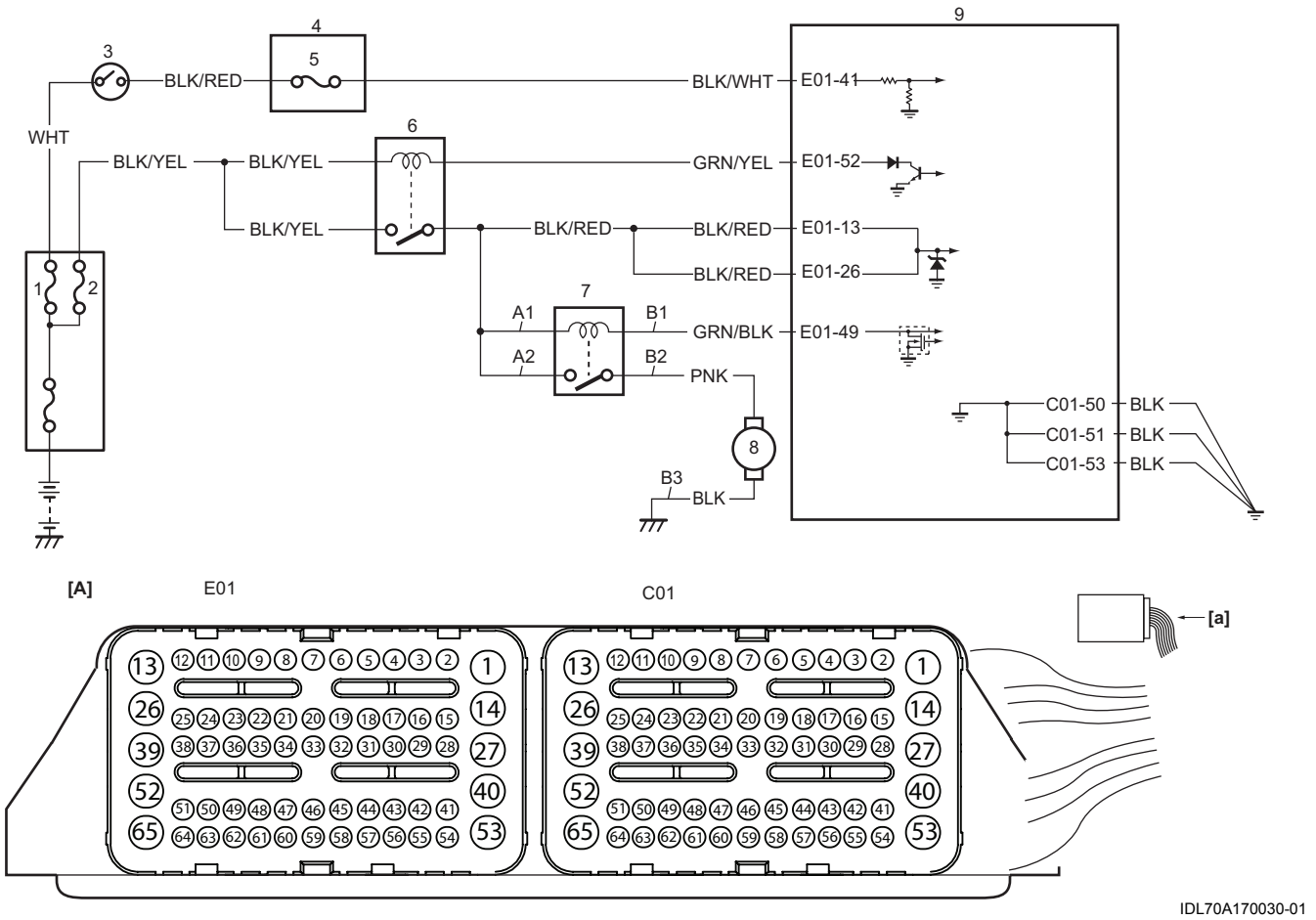


IDL70A170029-01

[A]: ECM connector (View: [a])	B2: Fuel injector No.2 power supply circuit	4. Junction block	9. Fuel injector No.3
A1: Fuel injector No.1 drive circuit	B3: Fuel injector No.3 power supply circuit	5. “IG COIL” fuse	10. ECM
A2: Fuel injector No.2 drive circuit	1. “ACC” fuse	6. Main relay	
A3: Fuel injector No.3 drive circuit	2. “FI” fuse	7. Fuel injector No.1	
B1: Fuel injector No.1 power supply circuit	3. Ignition switch	8. Fuel injector No.2	

Fuel Pump Control System Circuit Diagram

AENDL70A1702003



IDL70A170030-01

[A]: ECM connector (View: [a])	B2: Fuel pump power supply circuit	3. Ignition switch	7. Fuel pump relay
A1: Fuel pump relay power supply circuit (coil side)	B3: Fuel pump ground circuit	4. Junction block	8. Fuel pump
A2: Fuel pump relay power supply circuit (switch side)	1. “ACC” fuse	5. “IG COIL” fuse	9. ECM
B1: Fuel pump relay drive circuit	2. “FI” fuse	6. Main relay	

Diagnostic Information and Procedures

Fuel System Inspection

AENDL70A1704001

⚠ WARNING

When performing the following procedure, be sure to observe “Precautions for Fuel System Service” (Page 1G-1) in order to reduce the risk of fire and personal injury.

Troubleshooting

Step	Action	Yes	No
1	**Fuel pump inspection** 1) Remove fuel filler cap and turn ignition switch to ON position. 2) Confirm that fuel pump operating sound is heard from fuel filler port for about 2 sec. and then it stops. *Is it in good condition?*	Go to Step 2.	Check fuel pump circuit. ☞(Page 1G-6)

Step	Action	Yes	No
2	**Fuel pressure check** 1) Check fuel pressure. ☞(Page 1G-8) *Is it in good condition?*	Go to Step 3.	Repair or replace defective part.
3	**Power balance test** 1) Check power balance. ☞(Page 1G-5) *Is it in good condition?*	Fuel system is in good condition.	Go to Step 4.
4	**Fuel injector circuit check** 1) Check fuel injector circuit. ☞(Page 1G-5) *Is it in good condition?*	Go to Step 5.	Repair or replace defective part.
5	**Fuel injector check** 1) Check fuel injector. ☞(Page 1G-16) *Is it in good condition?*	Substitute a known-good ECM and recheck. ☞(Page 1C-1)	Replace fuel injector.

Power Balance Test

AENDL70A1704002

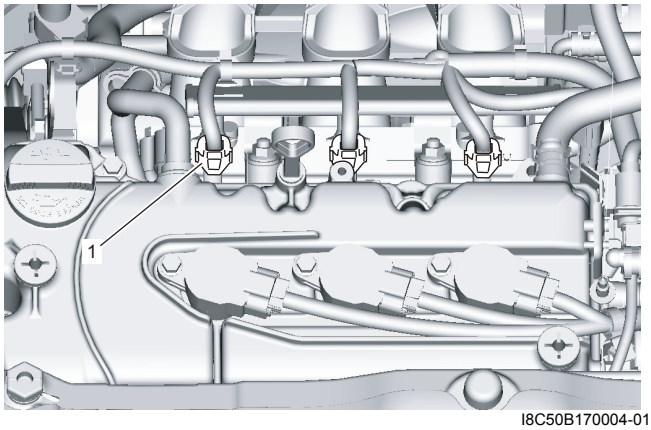
⚠ CAUTION

- **When performing power balance test, do not increase engine speed higher than set idling speed. Doing so may damage engine.**
- **Be careful not to accumulate foreign materials (like dust and metallic particle) to engine. It could damage the engine.**

NOTE

For identification of each cylinder, refer to "Statement on Cleanliness and Care" in Section 1A (Page 1A-1).

1) For AMT model, place select lever in "N" and apply parking brake.
   For M/T model, place gear shift lever in "Neutral" and apply parking brake.
2) Start engine and warm it up to normal operating temperature.
3) Remove air cleaner assembly. ☞(Page 1D-5)
4) Disconnect fuel injector connector (1) for cylinder No.1.



I8C50B170004-01

5) Check that engine speed decreases from specified idle speed.
6) Repeat Step 4) and Step 5) for all cylinders, compare rates of engine speed decrease.
7) If rates of engine speed decrease are not in scale, check the following items.
   - Fuel injector circuit ☞(Page 1G-5)
   - Fuel injector ☞(Page 1G-16)
   - Spark plug ☞(Page 1H-5)
   - Ignition coil circuit ☞(Page 1H-3)
   - Ignition coil ☞(Page 1H-5)
8) Clear DTC. ☞(Page 1A-20)
9) Install air cleaner assembly. ☞(Page 1D-5)

Fuel Injector Circuit Check

AENDL70A1704003

NOTE

For identification of each cylinder, refer to "Statement on Cleanliness and Care" in Section 1A (Page 1A-1).

Circuit Diagram

Refer to "Fuel Injector Control System Circuit Diagram" (Page 1G-3).

Troubleshooting

NOTE

- **Before troubleshooting, be sure to read "Precautions for Fuel System Service" (Page 1G-1).**
- **When measuring circuit voltage and/or pulse signal at ECM connector, connect service wire to fuel injector and fuel injector connectors.**

Step	Action	Yes	No
1	**Fuel injector check for operating sound** 1) Using sound scope, check each injector for operating sound with engine cranking. *Do all injectors make operating sound?*	Fuel injector circuit is in good condition.	Go to Step 2.
2	**Fuel injector resistance check** 1) Turn OFF ignition switch and disconnect connectors from fuel injector. 2) Check for proper connection to fuel injector at each terminal. 3) If OK, check all fuel injectors for resistance. ☞(Page 1G-14) *Are all injectors in good condition?*	Go to Step 3.	Replace fuel injector. ☞(Page 1G-15)
3	**Fuel injector insulation resistance check** 1) Check that insulation resistance is infinity between each fuel injector terminal and engine ground. *Is it in good condition?*	Go to Step 4.	Replace fuel injector. ☞(Page 1G-15)
4	**Fuel injector power supply circuit check** 1) Check that voltage between each fuel injector power supply circuit (B1, B2, B3) and engine ground is battery voltage with ignition switch in ON position. *Is it in good condition?*	Go to Step 5.	Repair or replace fuel injector power supply circuit.
5	**Fuel injector drive circuit check** 1) Turn OFF ignition switch and disconnect connectors from ECM. 2) Check that fuel injector drive circuits (A1, A2, A3) are as follows. • Wiring harness resistance of each fuel injector drive circuit is less than 3 Ω. • Insulation resistance between each fuel injector drive circuit and ground is infinity. • Circuit voltage of each fuel injector drive circuit is 0 – 1 V with ignition switch in ON position. *Are they in good condition?*	Go to Step 6.	Repair or replace fuel injector drive circuit.
6	**Fuel injector check** 1) Check fuel injector. ☞(Page 1G-16) *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace fuel injector. ☞(Page 1G-15)

Fuel Pump and Its Circuit Check

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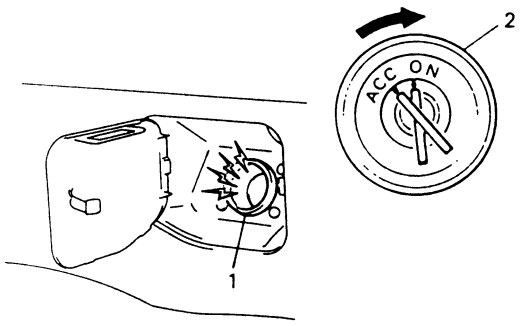
Circuit Diagram

Refer to "Fuel Pump Control System Circuit Diagram" (Page 1G-4).

Troubleshooting

NOTE

- **Before troubleshooting, be sure to read "Precautions for Engine" in Section 1 (Page 1-1).**
- **When measuring circuit voltage and/or pulse signal at ECM connector, connect service wire to fuel pump and fuel pump connectors.**

Step	Action	Yes	No
1	**Fuel pump control system check for operation** 1) Remove fuel filler cap and turn ignition switch (2) to ON position. 2) Confirm that fuel pump operating sound is heard from fuel filler (1) for about 2 seconds and then it stops. 3) Reinstall fuel filler cap after checking. *Is it in good condition?*  IVSY01170013-01	Fuel pump circuit is in good condition.	Go to Step 2.
2	**Fuel pump relay power supply check** 1) Turn OFF ignition switch and remove fuel pump relay from individual circuit fuse box No.1. ☞(Page 1G-13) 2) Turn ignition switch to ON position, check that voltage between each fuel pump relay power supply circuit (A1 – A2) and engine ground is battery voltage. *Is it in good condition?*	Go to Step 3.	Repair or replace fuel pump relay power supply circuit.
3	**Fuel pump relay check** 1) Check fuel pump relay. ☞(Page 1G-21) *Is relay in good condition?*	Go to Step 4.	Replace fuel pump relay.
4	**Fuel pump relay drive circuit check** 1) Turn OFF ignition switch and disconnect connector from ECM. 2) Check for proper terminal connection to ECM connectors. 3) Check that fuel pump relay drive circuit (B1) is as follows. • Wiring harness resistance of fuel pump relay drive circuit is less than 3 Ω. • Insulation resistance between fuel pump relay drive circuit (B1) and ground is infinity. • Circuit voltage of fuel pump relay drive circuit (B1) is 0 – 1 V with ignition switch ON. *Are they in good condition?*	Go to Step 5.	Repair or replace fuel pump relay drive circuit.

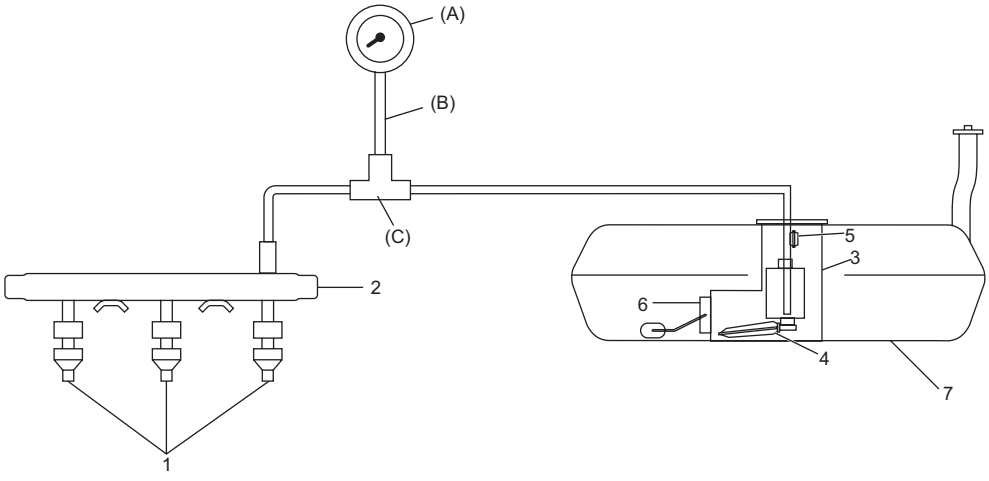
Step	Action	Yes	No
5	**Fuel pump relay drive signal check** 1) Turn OFF ignition switch. 2) Install fuel pump relay to individual circuit fuse box No.1 and connect connector to ECM. 3) Check that voltage between fuel pump relay drive circuit (B1) and ground is 0 – 1 V for 2 sec. after ignition switch to ON position. *Is it in good condition?*	Go to Step 6.	Substitute a known-good ECM and recheck.
6	**Fuel pump power supply circuit check** 1) Turn OFF ignition switch. 2) Detach fuel tank. ☞(Page 1G-19) 3) Disconnect connector from fuel pump. 4) Check that resistance between fuel pump power supply circuit (B2) and ground is infinity. *Is it in good condition?*	Go to Step 7.	Repair or replace fuel pump power supply circuit.
7	**Fuel pump power supply circuit check** 1) Connect service wire between fuel pump relay drive circuit (B1) and ground. 2) With ignition switch in ON position, check that voltage between fuel pump power supply circuit (B2) and ground is battery voltage. *Is it in good condition?*	Go to Step 8.	Repair or replace fuel pump power supply circuit.
8	**Fuel pump ground circuit check** 1) Turn OFF ignition switch. 2) Check that resistance between fuel pump ground circuit (B3) and ground is less than 3 Ω. *Is it in good condition?*	Replace fuel pump. ☞(Page 1G-21)	Repair or replace fuel pump ground circuit.

Fuel Pressure Check

AENDL70A1704005

System Diagram

Special tool
(A): 09912M58442
(B): 09912M58432
(C): 09912M58490



IDL70A170015-01

1. Fuel injector	4. Fuel filter	7. Fuel tank
2. Fuel delivery pipe	5. Fuel pressure regulator	
3. Fuel pump assembly	6. Fuel level sensor	

Troubleshooting

NOTE

Before using the following flow, check that battery voltage is higher than 12 V. If it is lower, fuel pressure becomes lower than specification even if fuel pump and line are in good condition.

Step	Action	Yes	No
1	*Was "Fuel Pump and Its Circuit Check" performed?*	Go to Step 2.	Go to "Fuel Pump and Its Circuit Check" (Page 1G-6).
2	**Fuel pressure check 1** 1) Check fuel pressure. ☞(Page 1G-9) *Is check result satisfactory?*	Go to Step 3.	Go to Step 6.
3	**Fuel pressure check 2** 1) Warm up engine to normal operating temperature. 2) Keep engine speed at 4,000 rpm. *Does fuel pressure show about same value as Step 2?*	Go to Step 4.	Go to Step 6.
4	**Fuel line check 1** 1) Check fuel pipe, fuel hose and joint for fuel leakage. *Are they in good condition?*	Go to Step 5.	Repair or replace defective part.
5	**Fuel line check 2** 1) Check fuel pipe, fuel hose and joint for damage or deformation. *Are they in good condition?*	Fuel system is in good condition.	Repair or replace defective part.
6	*Was fuel pressure higher than specification in Step 2?*	Fuel pressure regulator is in faulty condition, replace fuel pump assembly.	Go to Step 7.
7	**Fuel line check 3** 1) Check fuel pipe, fuel hose and joint for damage or deformation. *Are they in good condition?*	Clogged fuel filter, faulty fuel pump, faulty fuel pressure regulator or fuel leakage from hose connection in fuel tank, replace fuel pump assembly.	Repair or replace defective part.

Fuel Pressure Basic Check

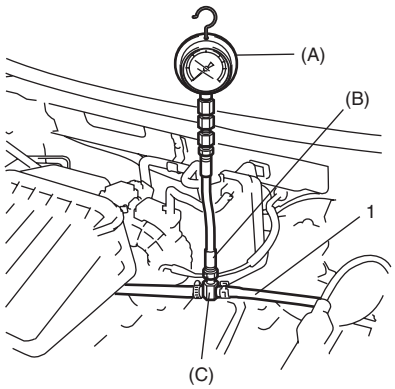
AENDL70A1704006

⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

1) Relieve fuel pressure in fuel feed line. ☞(Page 1G-13)
2) Disconnect fuel feed hose from fuel delivery pipe.
3) Connect special tools between fuel feed hose (1) and fuel delivery pipe as shown in figure, and clamp hoses securely to ensure that no leaks occur during checking.

Special tool
(A): 09912M58442
(B): 09912M58432
(C): 09912M58490



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4) Check that battery voltage is 12 V or more.
5) Measure fuel pressure as follows.
   If measured pressure is out of specification, repair or replace defective part.
   a) Turn ignition switch to ON position to operate fuel pump.
   b) After 2 sec., turn ignition switch OFF.
   c) Repeat Step a) and b) three or four times, and then check fuel pressure.

      Fuel pressure specification
      Standard: 375 – 385 kPa (3.8 – 3.9 kgf/cm², 54.4 – 55.8 psi)
      (With fuel pump operating and engine stopped)

   d) Warm up engine to normal operating temperature, and measure fuel pressure at idling.

      Fuel pressure specification
      At specified idle speed: 375 – 385 kPa (3.8 – 3.9 kg/cm², 54.4 – 55.8 psi)

   e) Stop engine, and measure fuel pressure at one minute after stopping.

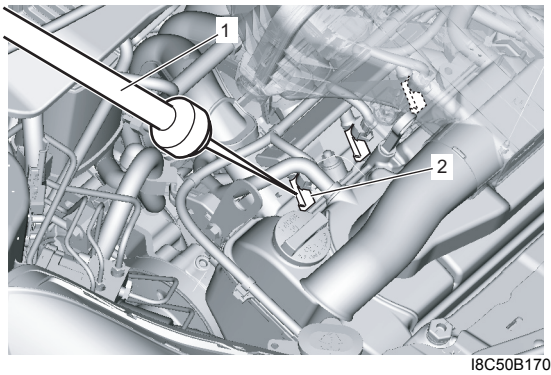
      Fuel pressure specification
      With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes): Over 250 kPa (2.5 kgf/cm², 36.3 psi)

6) Relieve fuel pressure. ☞(Page 1G-13)
7) Remove special tools from fuel delivery pipe and fuel feed hose.
8) Connect fuel feed hose to fuel delivery pipe and clamp it securely.
9) With engine stationary and ignition switch in ON position, check for fuel leaks. ☞(Page 1G-13)

Fuel Cut Operation Check

AENDL70A1704007

1) For AMT model, place select lever “N” and apply parking brake.
   For M/T model, place gear shift lever in “Neutral” and apply parking brake.
2) Warm up engine to normal operating temperature.
3) While listening to sound of injector (2) by using sound scope (1) or the like, increase engine speed to higher than 3,000 rpm.



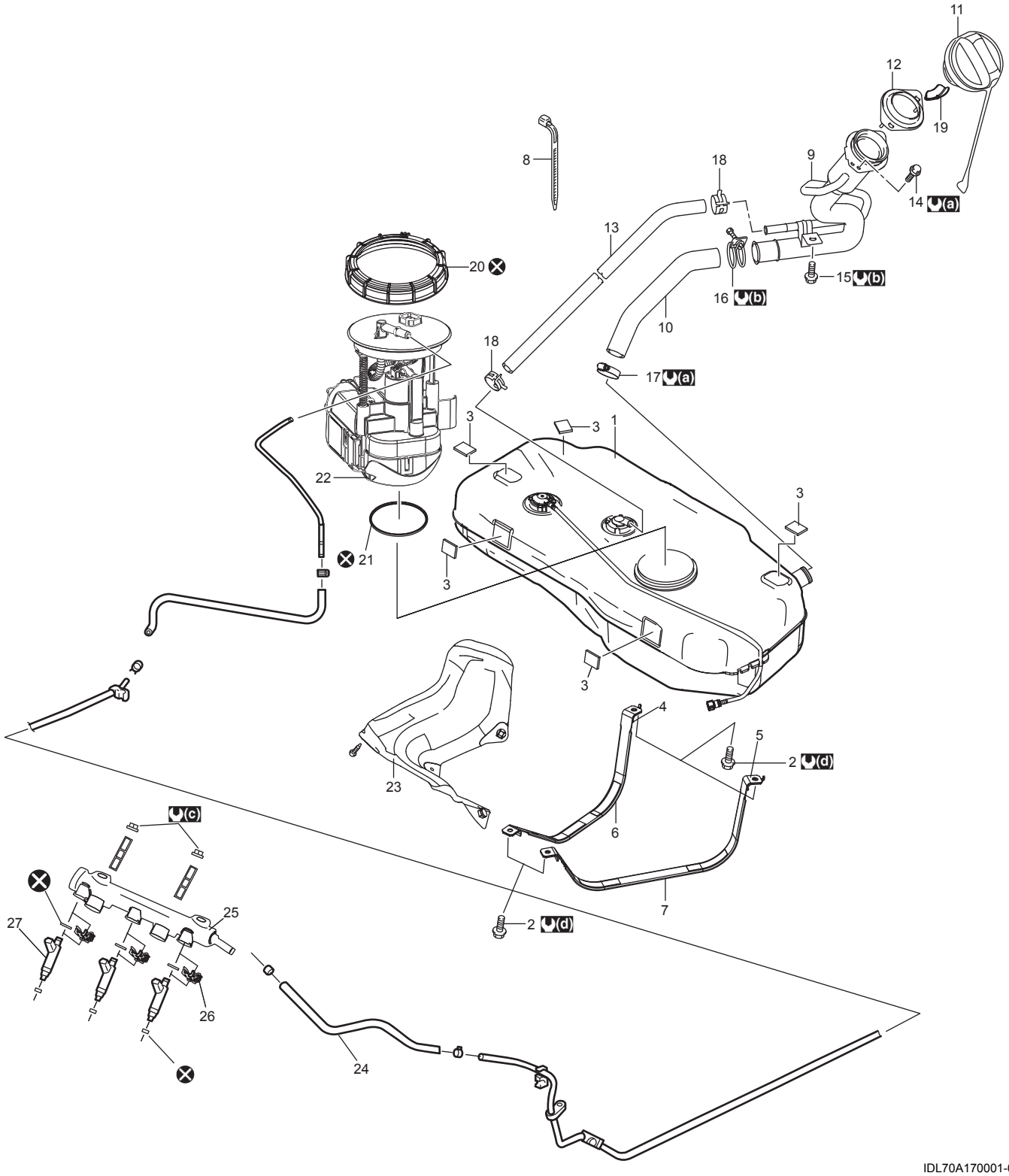
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4) Check that injector operation sound stops when throttle valve is closed instantly and it is heard again when engine speed is reduced to approx. 2,000 rpm or less.
5) If injector sound is not heard, perform “Fuel Injector Circuit Check” (Page 1G-5).

Repair Instructions

Fuel System Components

AENDL70A1706001



IDL70A170001-03

1. Fuel tank assembly	9. Fuel filler neck assembly	17. Fuel filler hose clamp	25. Fuel delivery pipe
2. Fuel tank belt bolt	10. Fuel filler hose	18. Clip	26. Fuel injector clamp
3. Fuel tank pad	11. Fuel filler cap assembly	19. Fuel filler neck cover	27. Fuel injector
4. Fuel tank fixer belt RH	12. Fuel filler packing	20. Fuel pump locking cap	(a) : 3.0 N·m (0.31kgf-m, 2.2 lbf-ft)
5. Fuel tank fixer belt LH	13. Fuel tank breather hose	21. Fuel pump O-ring	(b) : 5.5 N·m (0.56 kgf-m, 4.1 lbf-ft)
6. Fuel tank belt pad RH	14. Fuel filler neck packing bolt	22. Fuel pump	(c) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
7. Fuel tank belt pad LH	15. Fuel filler mounting bolt	23. Heat insulator	(d) : 31 N·m (3.2 kgf-m, 23.0 lbf-ft)
8. Clamp	16. Fuel filler neck clamp	24. Fuel feed line	⊗ : Do not reuse.

Fuel Hose Disconnection and Reconnection

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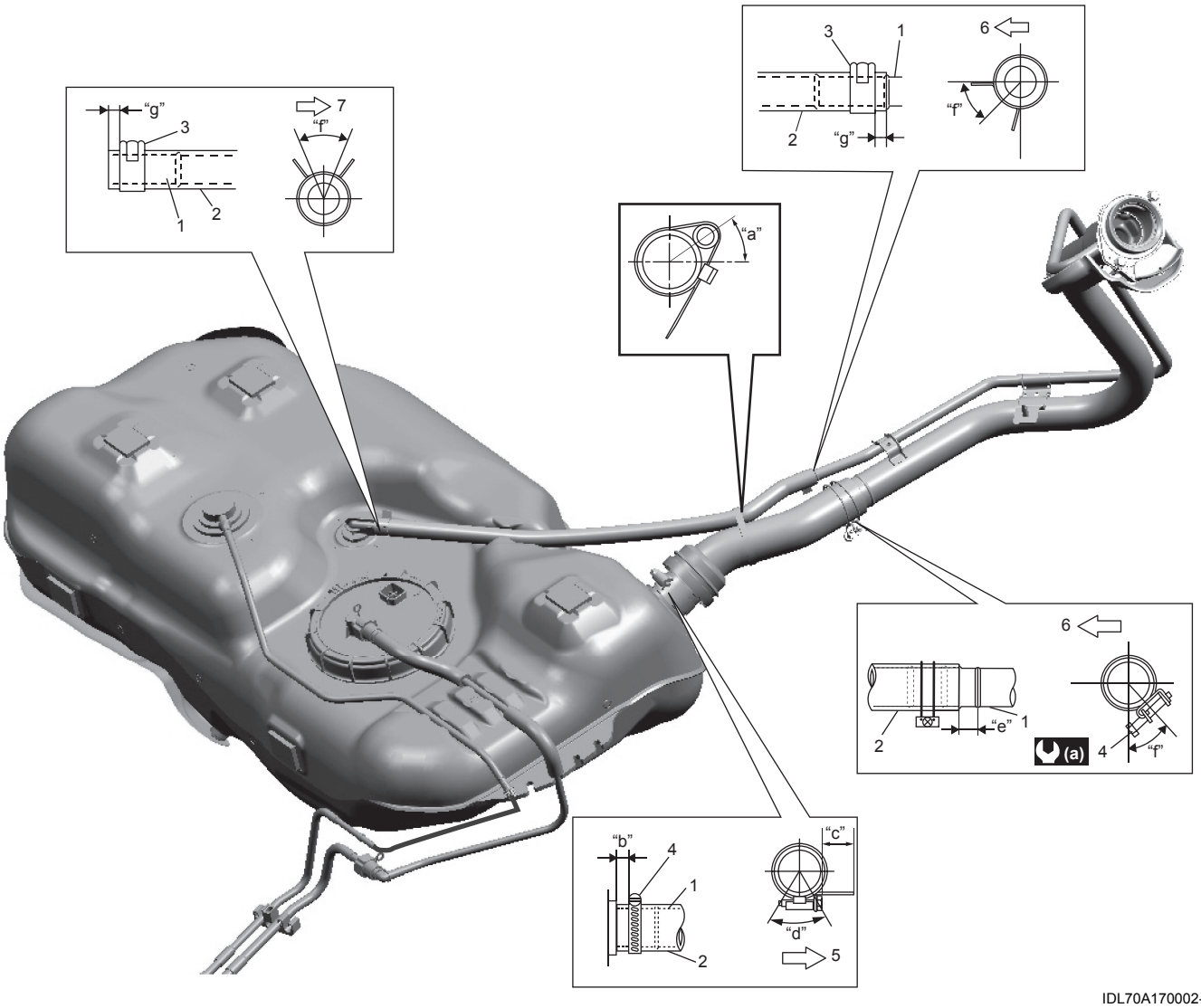
⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

For Connection other than Quick Joint
Clamp around fuel tank

NOTE

Be sure to contact fuel-hose-end to spool on fuel pipe or to the end of pipe joint when connecting fuel hose and pipe.



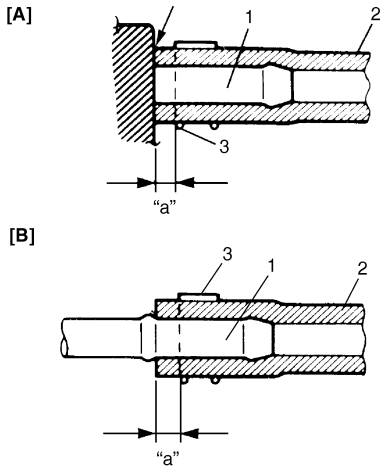
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“a”: 45°± 15°	“f”: 0°– 45°	4. Fuel filter hose clamp screw
“b”: 5 – 10 mm (0.20 – 0.39 in.)	“g”: 3 – 7 mm (0.12 – 0.27 in.)	5. Vehicle leftward
“c”: 13 – 17 mm (0.51 – 0.67 in.)	1. Pipe	6. Vehicle rightward
“d”: 45°	2. Hose	7. Vehicle backward
“e”: 0 – 8 mm (1.66 – 1.88 in.)	3. Clamp	: (a) : 1.5 N·m (0.15 kgf-m, 1.5 lbf-ft)

Clamp other than around fuel tank

NOTE

Contact fuel-hose-end to spool on fuel pipe or to the end of pipe joint, when connecting fuel hose and pipe.



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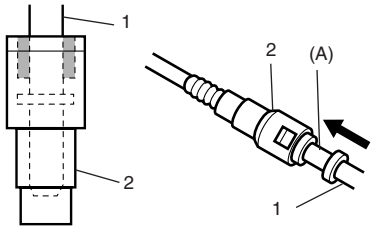
1.	Pipe
2.	Hose
3.	Clamp
[A]:	On short pipe, fit hose as far as it reaches the end of pipe joint as shown.
[B]:	On the following type pipe, fit hose as far as it reaches spool on fuel pipe.
“a”:	3 – 7 mm (0.12 – 0.27 in.)

For Quick Joint (other than Fuel Vapor Line)
Disconnection

1) Remove mud, dust and foreign material between pipe (1) and quick joint (fuel pipe) (2) by blowing compressed air.
2) Unlock joint lock by inserting special tool between pipe and quick joint.

Special tool
(A): 09919M47020

3) Disconnect quick joint from pipe.



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Reconnection

Insert quick joint (fuel pipe) to fuel pipe until they lock securely (a click is heard), and confirm that quick joint (fuel pipe) is not disconnected by hand.

Fuel Pressure Relief Procedure

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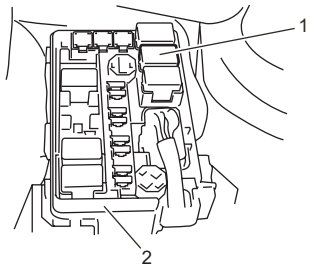
⚠ CAUTION

Never perform this work when engine is hot. Doing so may cause adverse effect to catalyst.

NOTE

If ECM detects DTC(s) after servicing, clear DTC(s). ☞(Page 1A-20)

1) Make sure that engine is cold.
2) For AMT model, place selector at “N” and apply parking brake and block drive wheels.
   For M/T model, place gear shift lever in “Neutral”, apply parking brake and block drive wheels.
3) Disconnect fuel pump relay (1) from main fuse box (2).
4) Remove fuel filler cap to release fuel vapor pressure in fuel tank, and then reinstall it.
5) Start engine and run it until engine stops for lack of fuel. Repeat cranking engine 2 – 3 times for about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
6) After servicing, connect fuel pump relay (1) to main fuse box and install individual circuit fuse box No.1 cover.



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Fuel Leakage Check Procedure

AENDL70A1706004

After performing any service on fuel system, check that there is no fuel leakage as follows.

1) Apply fuel pressure to fuel feed line.
   a) Turn ignition switch to ON position to operate fuel pump.
   b) After 2 sec., turn ignition switch OFF.

c) Repeat Step a) and b) three or four times.
d) Make sure that fuel pressure is applied to fuel line by placing hand on fuel feed hose and feel fuel pressure.

2) Check that there is no fuel leakage from any part of fuel system.

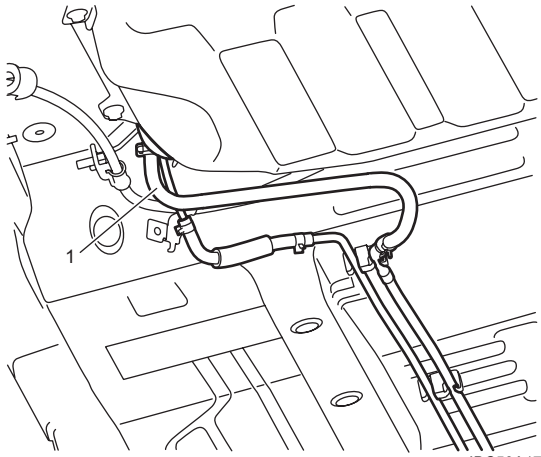
Fuel Line On-Vehicle Inspection

AENDL70A1706005

⚠ CAUTION

As feed line (1) is under high pressure, use special care when servicing it.

Visually inspect fuel lines for evidence of fuel leakage, hose (1) crack, deterioration and damage.
Make sure all clamps are secure.
Replace parts as needed.



IBC50A170007-01

Fuel Pipe Removal and Installation

AENDL70A1706006

⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

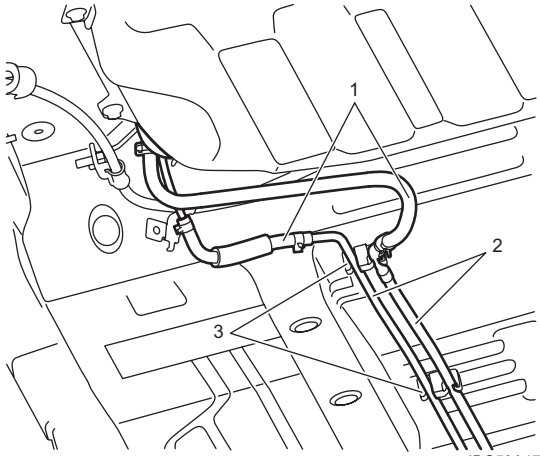
Removal

1) Relieve fuel pressure in fuel feed line. ☞(Page 1G-13)
2) Disconnect negative (–) cable at battery.
3) Disconnect fuel hose (1) from fuel pipe (2) at front and rear of each fuel pipe. ☞(Page 1G-12)
4) Mark location of clamps (3) on fuel pipes (2), so that clamps can be reinstalled to where they were.
5) Remove fuel pipes (2) from clamps (3).

⚠ CAUTION

Be careful not to bend and damage fuel pipes when removing pipe from clamp.

6) Remove fuel pipe (2).



IBC50A170008-01

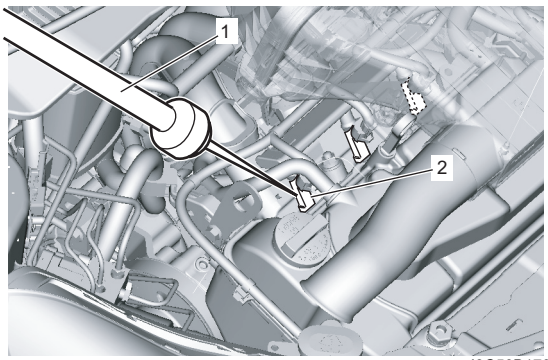
Installation

1) Connect fuel hoses and pipes. ☞(Page 1G-12)
2) Install pipes with hoses to clamps aligned with pipe marking. If clamp is deformed, its claw is bent or broken, replace it with new one.
3) Connect negative (–) cable at battery.
4) With engine stationary, turn ignition switch to ON position and check for fuel leaks. ☞(Page 1G-13)

Fuel Injector On-Vehicle Inspection

AENDL70A1706007

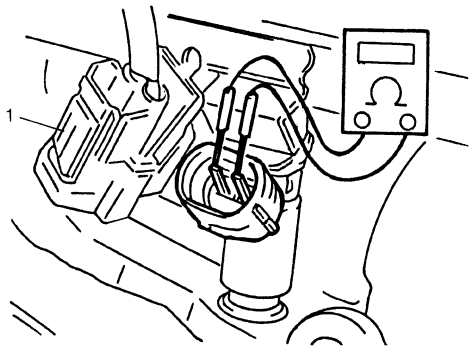
1) Using sound scope (1) or the like, check operating sound of injector (2) when engine is running or cranking.
Cycle of operating sound should vary according to engine speed.
If no sound or unusual sound is heard, check injector circuit (wire or connector) and/or injector.



I8C50B170008-01

2) Disconnect connector (1) from injector, connect ohmmeter between terminals of injector and check resistance.
If resistance is out of reference value greatly, replace fuel injector.

Reference resistance of fuel injector
11.6 – 12.4 Ω at 20 °C, 68 °F



I2RH0B170008-01

3) Connect connector to injector securely.

Fuel Injector Removal and Installation

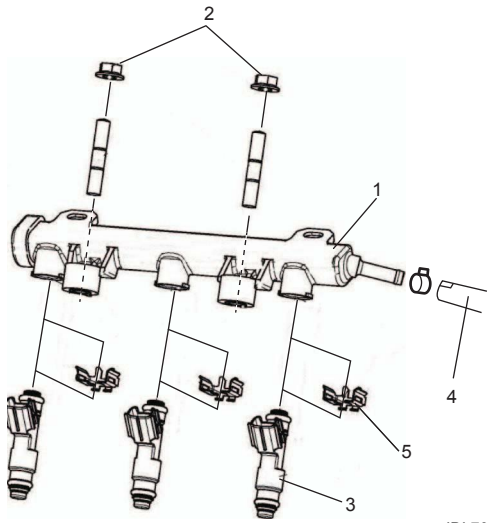
AENDL70A1706008

⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

Removal

1) Relieve fuel pressure. ☞(Page 1G-13)
2) Disconnect negative (–) cable at battery.
3) Remove air cleaner assembly. ☞(Page 1D-5)
4) Disconnect fuel injector connectors.
5) Disconnect fuel feed hose (4) from fuel delivery pipe (1).
6) Remove fuel delivery pipe by removing nuts (2).
7) Remove fuel injector(s) (3) after pulling fuel injector clamp(s) (5).



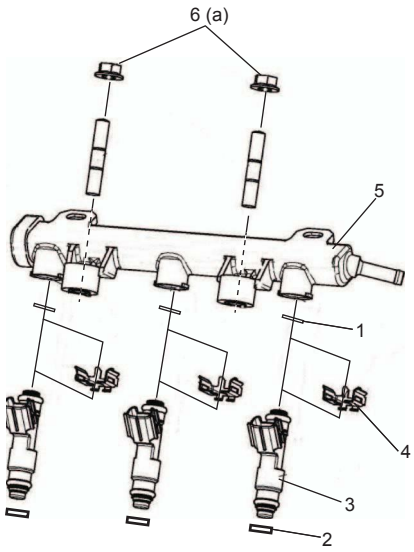
IDL70A170003-01

Installation

Reverse removal procedure noting the following.

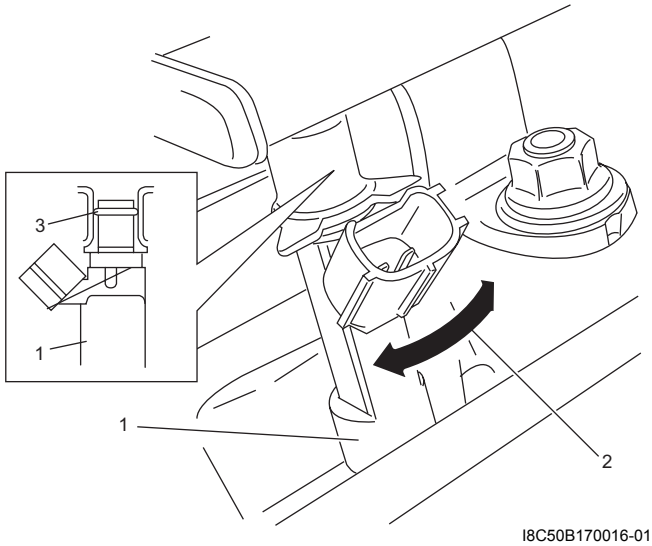
- Replace injector O-ring (1) and cushion (2) with new ones using care not to damage them.
- Apply thin coat of fuel to O-rings (1), and then install injectors (3) with injector clamps (4) into fuel delivery pipe (5) and cylinder head.
- Tighten fuel delivery pipe nuts (6) to specified torque.

Tightening torque
Fuel delivery pipe nut (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



IDL70A170004-01

- Make sure that injectors (1) rotate smoothly (2). If not, probable cause is incorrect installation of O-ring (3). Replace O-ring with new one.



I8C50B170016-01

- After installation, with engine stationary and ignition switch in ON position, check for fuel leaks around fuel line connection. ☞(Page 1G-13)

Fuel Injector Inspection

AENDL70A1706009

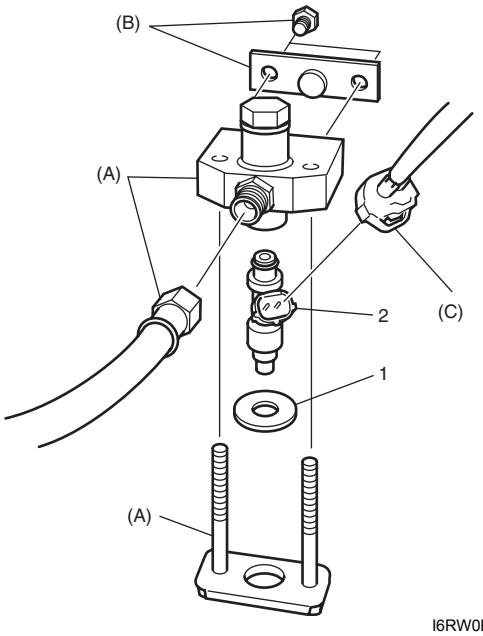
⚠ WARNING

- **When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.**
- **Put injector and battery as far away as possible to reduce risk of fire and personal injury when connecting/disconnecting test harness to/from battery.**

1) Remove fuel injector(s). ☞(Page 1G-15)
2) Set special tools to injector as follows.

Special tool
(A): 09912M58421
(B): 09912M57610
(C): 09930M86310

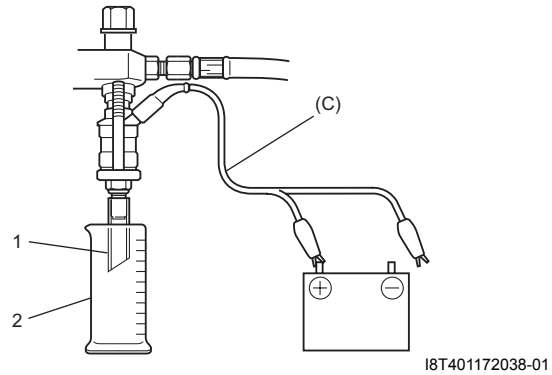
a) Fit washer (1) (inside diameter 13.5 – 14.5 mm (0.532 – 0.570 in.)) to injector (2), and then install injector to special tool (A).
b) Connect special tool (C) to injector.
c) Install special tool (B) to special tool (A).
d) Connect fuel feed hose to special tool (A).



I6RW0B170014-01

3) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
4) Put graduated cylinder (2) under injector.
5) Connect one of terminal of special tool (c) to battery positive (+) terminal.

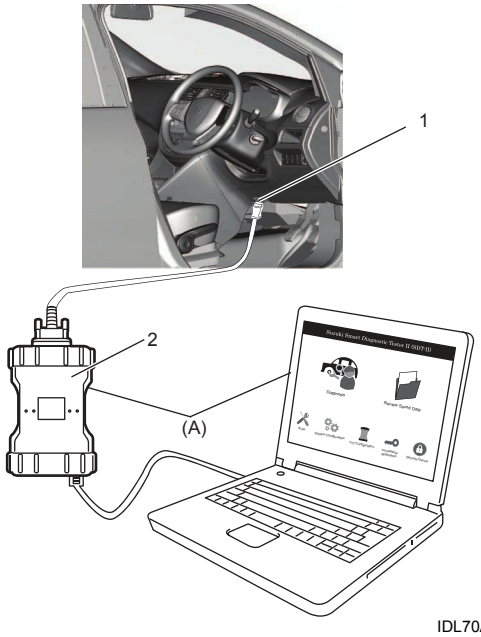
Special tool
(C): 09930M86310



I8T401172038-01

6) Operate fuel pump and apply fuel pressure to injector as follows:
When using scan tool:
a) Connect scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



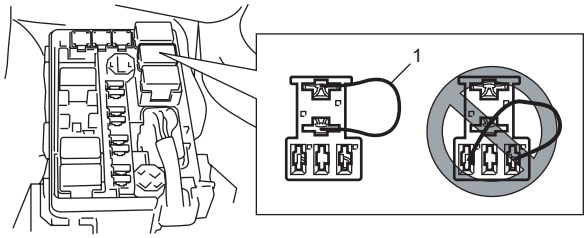
IDL70AA20006-06

b) Turn ignition switch to ON position, clear DTC and select "ACTIVE TEST" mode on scan tool. ☞(Page 1A-20)
c) Turn on fuel pump using scan tool.

When not using scan tool:
a) Remove fuel pump relay from individual circuit fuse box No.1.
b) Connect two terminals of relay using service wire (1) as shown in figure.

⚠ CAUTION

Check that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.

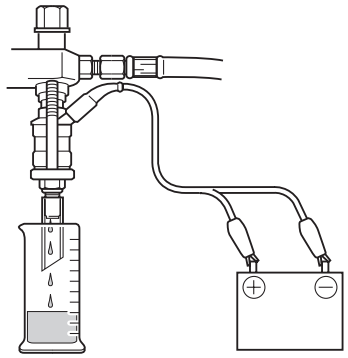


I8C50B170018-01

c) Turn ignition switch to ON position.

7) Apply battery voltage to injector (1) for 15 seconds and measure injected fuel volume with graduated cylinder. Test each injector two or three times. If injected volume is out of reference value greatly, replace injector.

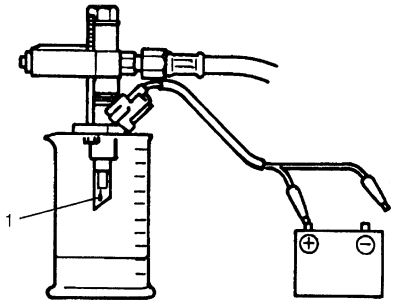
Reference injected fuel volume
56 – 58 cm^3/15 sec. (0.118/0.099 – 0.122/0.102 US/Imp pt/15 sec.)



I8T401172039-01

8) Check fuel leakage from injector nozzle. Do not operate injector for this check (but fuel pump should be at work). If fuel leaks (1) more than the following specifications, replace injector.

Fuel leakage
Less than 1 drop/min.



I2RH0B170013-01

9) Remove injector from special tool (A) and disconnect special tool (C) from injector.

⚠ WARNING

As fuel feed line is still under high fuel pressure even after inspection, removing injector immediately may cause dangerous spout of fuel. Before removing injector, make sure to relieve fuel pressure as follows.

1. **Stop operation of fuel pump.**
2. **Put graduated cylinder under injector.**
3. **Apply battery voltage to injector until no fuel is injected from injector.**

10) Carry out Steps 3) through 10) on each injector to obtain three readings.

11) After checking, remove special tools from fuel injector and fuel feed hose.

12) Connect fuel feed hose to fuel delivery pipe.

13) Install fuel injectors to cylinder head. ☞(Page 1G-15)

14) Check for fuel leaks. ☞(Page 1G-13)

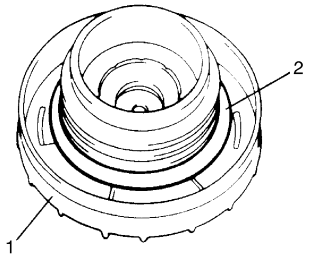
Fuel Filler Cap Inspection

AENDL70A1706010

⚠ WARNING

- **When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.**
- **If cap requires replacement, only a cap with genuine SUZUKI parts should be used. Failure to use correct cap can result in fire and personal injury.**

Remove cap (1), and check gasket (2) for even filler neck imprint, and deterioration or any damage. If gasket is defective, replace cap.



I2RH01170008-01

Fuel Tank Inlet Valve Removal and Installation

AENDL70A1706011

⚠ WARNING

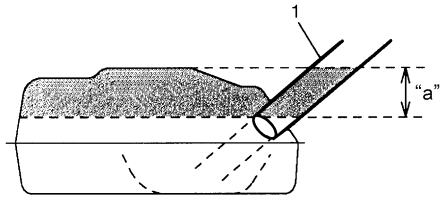
- **When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.**
- **Store drained fuel in an airtight container to reduce the risk of fire and personal injury.**

Removal

1) Remove fuel filler cap.
2) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "a" shown in figure.

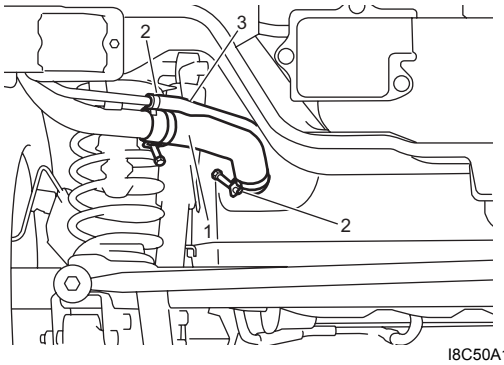
⚠ CAUTION

Do not force pump hose into fuel tank.



I8C50A170021-01

3) Hoist vehicle, and remove clamps (2).
4) Remove fuel filler hose (1) from fuel tank.
5) Remove breather hose (3) from fuel filler neck.

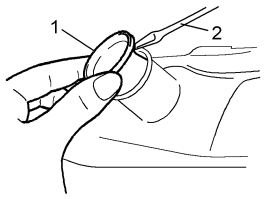


I8C50A170044-01

6) Remove fuel tank inlet valve (1) using a flat-bladed screwdriver (2) or the like.

⚠ CAUTION

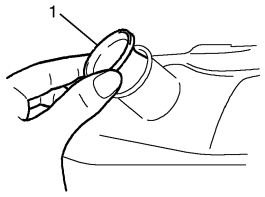
Be careful not to damage fuel tank inlet valve (1) with a flat-bladed screwdriver (2) or the like.



I8C50A170049-02

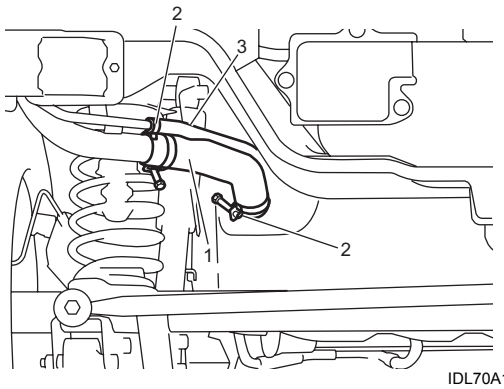
Installation

1) Install fuel tank inlet valve (1) to fuel tank.



I8T401172018-01

2) Install breather hose (3) and fuel filler hose (1) to fuel filler neck and fuel tank and secure them with clamps (2).
For proper installation, refer to "Fuel Hose Disconnection and Reconnection" (Page 1G-12).



IDL70A170028-01

3) Lower vehicle and install fuel filler cap.

Fuel Tank Inlet Valve Inspection

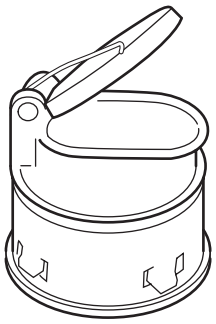
AENDL70A1706012

⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

Check fuel tank inlet valve for the following.
If any damage or malfunction is found, replace fuel tank inlet valve.

- Damage
- Smooth opening and closing



I8T401172016-01

Fuel Tank Removal and Installation

AENDL70A1706013

⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

Removal

1) Relieve fuel pressure in fuel feed line. ☞(Page 1G-13)
2) Disconnect negative (–) cable at battery.
3) Remove fuel filler / breather hoses and fuel tank inlet valve. ☞(Page 1G-18)
4) Drain fuel tank by pumping fuel out through fuel tank filler.
   Use hand operated pump to drain fuel tank.

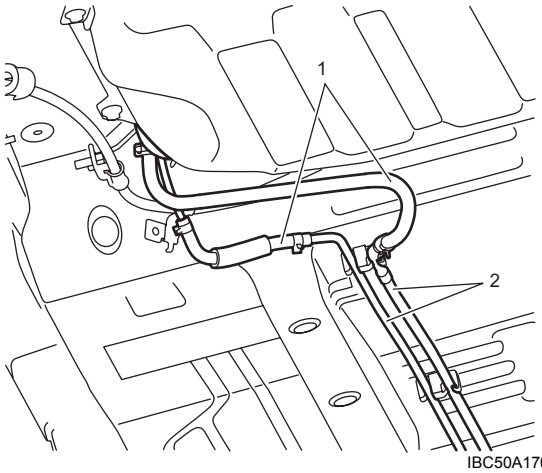
⚠ WARNING

Never store fuel in an open container due to possibility of fire or explosion.

⚠ CAUTION

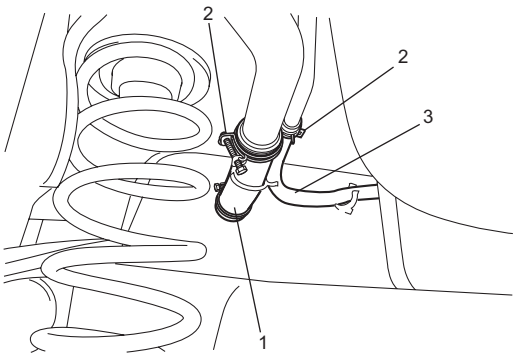
Do not force pump hose into fuel tank.

5) Disconnect fuel hoses (1) from fuel pipes (2).



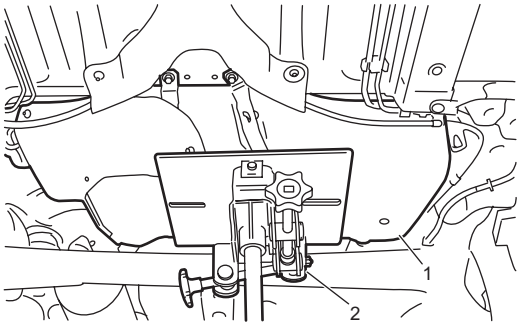
IBC50A170009-01

6) Hoist vehicle, and remove clamps (2), fuel filler hose (1) and breather hose (3) from fuel filler neck.



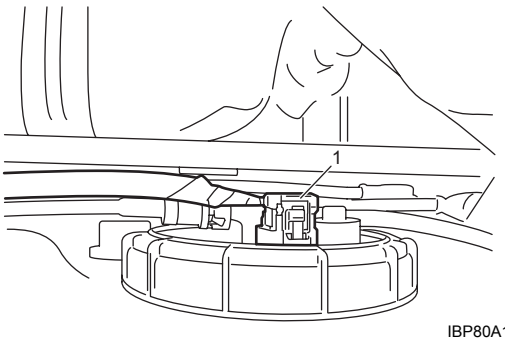
IBP80A171011-01

7) Remove exhaust center pipe.
8) Support fuel tank (1) with jack (2) and remove its mounting bolts.



IBP80A171013-01

9) Lower fuel tank a little to disconnect wire harness at connector (1), then remove fuel tank.



IBP80A171014-01

Installation

⚠ CAUTION

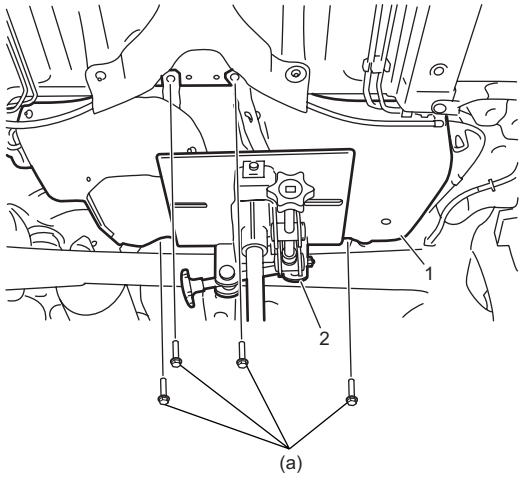
When connecting joint, clean outside surfaces of pipe where joint is to be installed, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.

1) If any parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
2) Install fuel tank to vehicle and tighten new fuel tank bolts to specified torque.

⚠ CAUTION

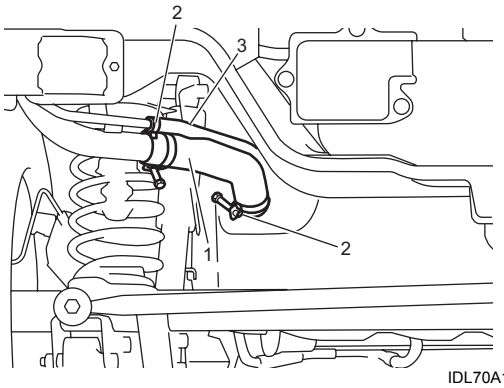
Fuel tank bolts are precoated with friction stabilizer. Never reuse removed bolts, otherwise bolts may loosen.

Tightening torque
Fuel tank bolt (a): 31 N·m (3.2 kgf-m, 23.0 lbf-ft)



IBP80A171015-01

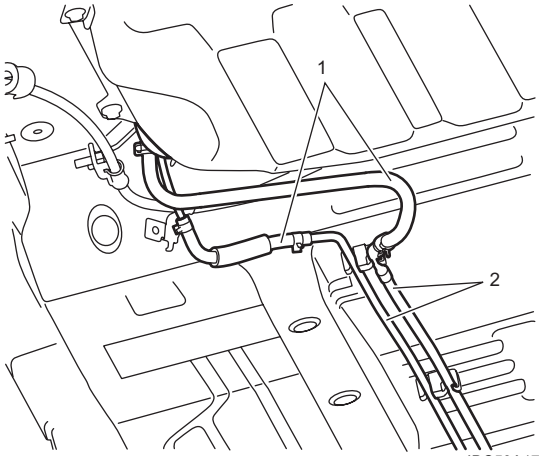
3) Connect fuel filler hose (1) and breather hose (3) as shown in figure, and clamp hoses securely. ☞(Page 1G-12)



IDL70A170028-01

2. Clamp

4) Connect fuel hoses (1) to each pipe (2) as shown in figure, and clamp them securely. ☞(Page 1G-12)



IBC50A170009-01

5) Connect negative (–) cable to battery.
6) With engine stationary, turn ignition switch to ON position and check for fuel leaks. ☞(Page 1G-13)

Fuel Tank Inspection

AENDL70A1706014

⚠ WARNING

Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

- Check fuel tank for cracks, deformation or damage. If faulty condition is found, replace fuel tank.
- Check fuel tank inlet valve for damage, smooth opening and closing.
- Check fuel pump O-ring for fuel leaks. If faulty condition is found, replace O-ring and fuel pump lock nut.
- Check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. If faulty condition is found, replace hoses, pipes and/or tank.

Fuel Tank Flushing Procedure

AENDL70A1706015

⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

⚠ CAUTION

Never leave water in fuel tank after washing. Water may cause corrosion inside fuel tank.

1) After removing fuel tank, remove all hoses, pipes and fuel pump assembly from fuel tank.
2) Drain all remaining fuel from tank.
3) Place fuel tank to flushing area.

4) Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean.
5) Completely flush out remaining water after washing.
6) Be sure to dry fuel tank assembly thoroughly in a place free of direct sunlight.

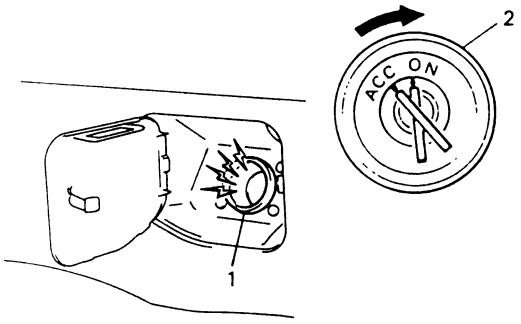
Fuel Pump On-Vehicle Inspection

AENDL70A1706016

⚠ WARNING

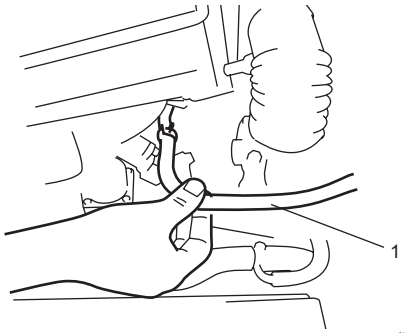
When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

1) Remove fuel filler cap and turn ignition switch (2) to ON position. Then fuel pump operating sound should be heard from fuel filler (1) for about 2 seconds. Be sure to reinstall fuel filler cap after checking.
If check result is not satisfactory, go to "Fuel Pump and Its Circuit Check" (Page 1G-6).



IVSY01170013-01

2) Turn OFF ignition switch and leave it for 10 min. as it is.
3) Fuel pressure should be felt at fuel feed hose (1) for about 2 seconds after turning ignition switch to ON position.
If fuel pressure is not felt, go to "Fuel Pressure Basic Check" (Page 1G-9).



I7V20A171014-01

Fuel Pump Relay Inspection

AENDL70A1706017

Refer to "Control Relay Inspection" in Section 10B (Page 10B-32).

Fuel Pump Assembly Removal and Installation

AENDL70A1706018

⚠ WARNING

When performing the following procedure, be sure to observe "Precautions for Fuel System Service" (Page 1G-1) to reduce the risk of fire and personal injury.

⚠ CAUTION

- **Never disassemble fuel pump assembly except fuel level sensor. If faulty condition is found, replace it with new one.**
- **Use only new fuel pump lock nut. Reusing removed fuel pump lock nut may result in fuel leakage.**

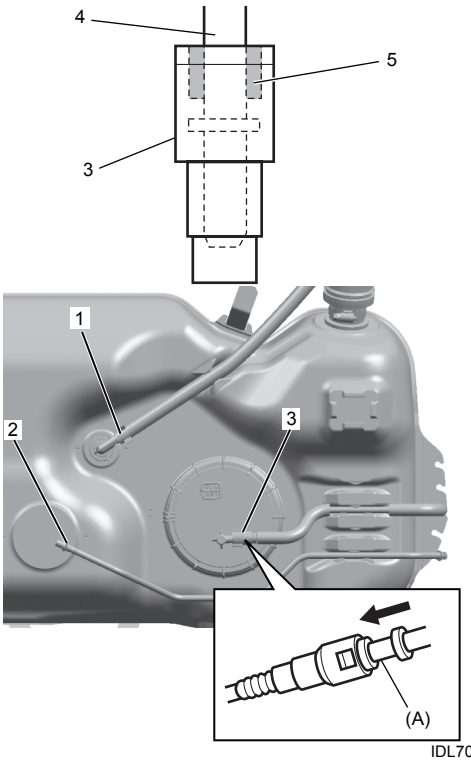
NOTE

Without installation of lock nut, threaded portion of the tank may swell and this swelling causes difficulty of the nut tightening. Therefore, install lock nut right after removal of fuel pump assembly. In spite of that, time taken in removal and reinstallation of fuel pump should be within 12 min.

Removal

1) Remove fuel tank from vehicle. ☞(Page 1G-19)
2) Disconnect fuel breather hose (1) and fuel vapor hose (2) from fuel pump assembly. ☞(Page 1G-12) When disconnecting joint (3) of fuel feed line from fuel pipe (4), unlock joint by inserting special tool (A) between pipe and joint lock first.

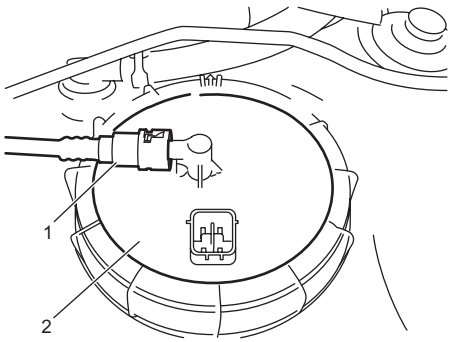
Special tool
(A): 09919M47020



IDL70A170016-01

5. Before disconnecting, blow off dust etc. of this portion with compressed air.

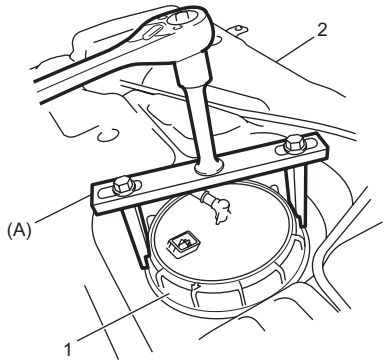
3) Disconnect fuel pipes (1) from fuel pump assembly (2).



IDL70A170005-01

4) Remove fuel pump lock nut (1) from fuel tank (2) using special tool.

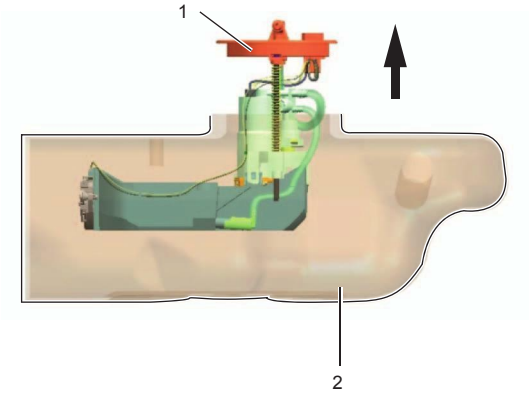
Special tool
(A): 09941M51012



IDL70A170006-00

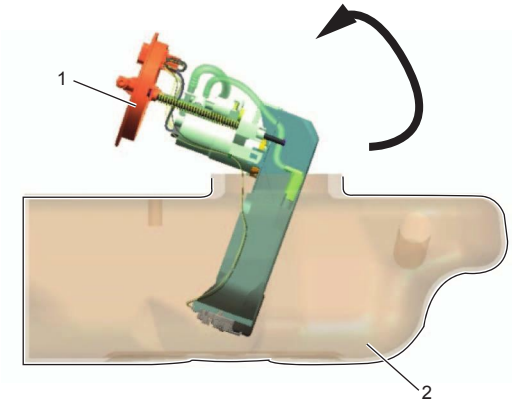
5) Remove fuel pump assembly (1) and O-ring from fuel tank (2) as per the following steps.

a) Pull up the fuel pump assembly till it just touches the fuel tank.



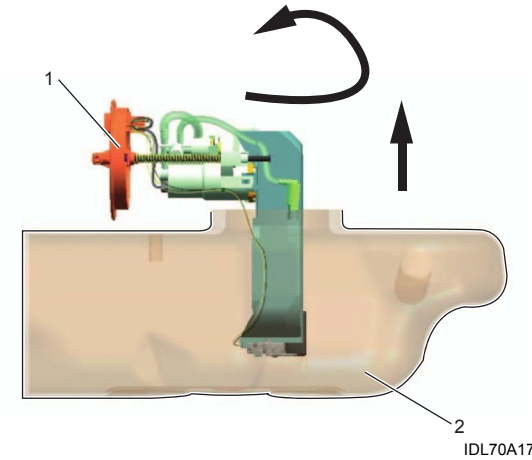
IDL70A170017-01

b) Rotate the fuel pump assembly by 90°, keeping the fuel pump (1) orientation with respect to fuel tank (2) as shown in the figure.



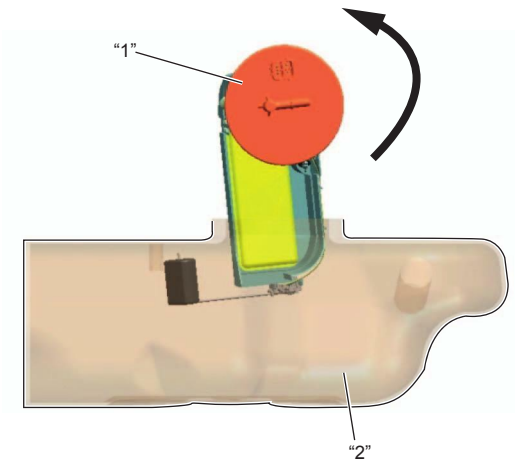
IDL70A170018-01

c) Pull up the fuel pump (1) till it just touches the fuel tank (2), then rotate the fuel pump in anti clock wise so as to turn the face of fuel tank as shown in figure and take out the fuel pump body from the fuel tank.



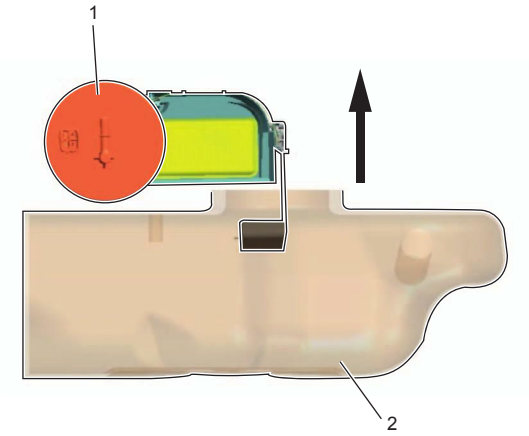
IDL70A170019-01

d) Pull up the fuel pump (1) and rotate it in anti clock wise direction as shown.



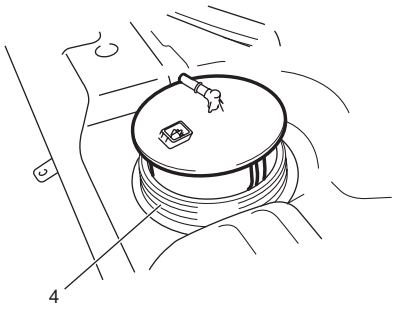
IDL70A170020-02

e) Remove the fuel pump "2" from fuel tank "1".



IDL70A170021-01

6) Clean thread portion (4) of fuel tank.



IDL70A170007-03

7) Right after removal of fuel pump assembly, install new fuel pump lock nut and tighten it by hand temporarily.

NOTE

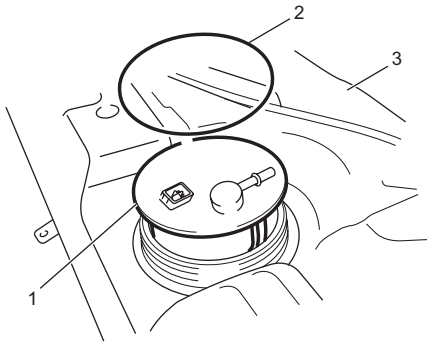
Without installation of lock nut, threaded portion of the tank may swell and this swelling causes difficulty of the nut tightening. Therefore, install lock nut right after removal of fuel pump assembly. In spite of that, time taken in removal and reinstallation of fuel pump should be within 12 min.

Installation

⚠ CAUTION

When connecting joint, clean outside surface of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.

1) Clean mating surface of fuel pump assembly (1) and fuel tank.
2) Remove new fuel pump lock nut which is temporarily installed to fuel tank.
3) Clean mating surface of fuel pump assembly.
4) Inset the fuel pump into the fuel pump in the reverse order of removal process.
5) Install fuel pump assembly (1) and new O-ring (2) to fuel tank (3) as shown in figure.



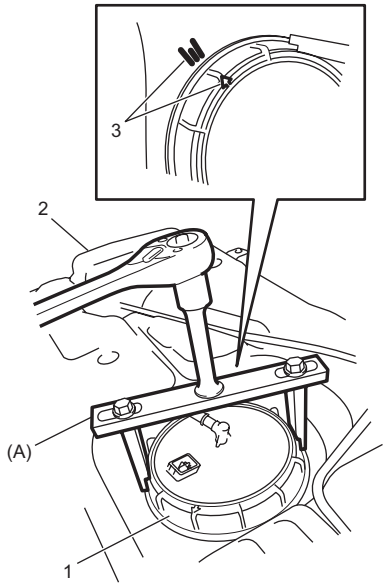
IDL70A170008-02

6) Install new fuel pump lock nut (1) removed in above step 1), to fuel tank (2) as follows:
   a) Tighten fuel pump lock nut by hand while pressing straight on fuel pump so that it will not tilt.
   b) Using special tool, tighten fuel pump lock nut until indexes (3) of fuel pump lock nut and fuel tank are aligned.

NOTE

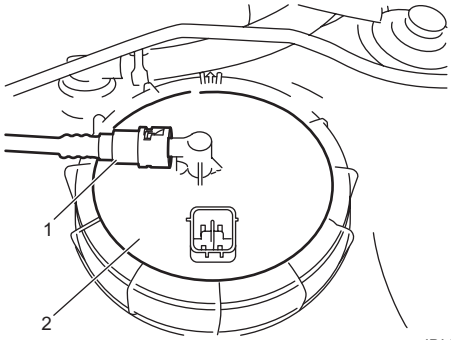
Indexes are aligned when fuel pump lock nut is tightened by approx. 1 and 1/3 rotations.

Special tool
(A): 09941M51012



IDL70A170009-01

7) Connect fuel pipes (1) to fuel pump assembly (2) as follows:
   a) Clean outside surface of pipe where joint is to be installed.
   b) Push joint into pipe until joint lock clicks.
   c) Check that each pipe is connected securely.



IDL70A170010-01

8) Install fuel tank to vehicle. ☞(Page 1G-19)

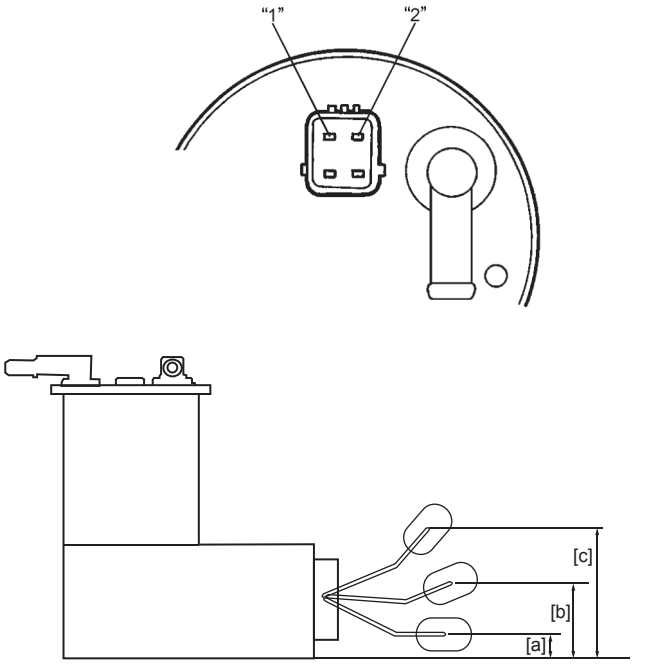
Fuel Pump Inspection

AENDL70A1706019

- Check fuel pump assembly for damage.
- Check fuel pump suction filter for evidence of dirt and contamination.
  If filter is faulty, clean fuel pump filter or replace fuel pump assembly and check for presence of dirt in fuel tank.
- Check that resistance between terminals “1” and “2” of fuel level sensor changes depending on float position.
- Check resistance between terminals “1” and “2” at each float position [a], [b] and [c].
  If measured resistance is out of specification, replace fuel pump assembly.

Fuel level sensor specifications

Float Position		Resistance (Ω)
“a”	11.0 mm (0.433 in.)	280 ± 3.3
“b”	75.0 mm (2.953 in.)	160 ± 10
“c”	139.4 mm (5.488 in.)	40 ± 2



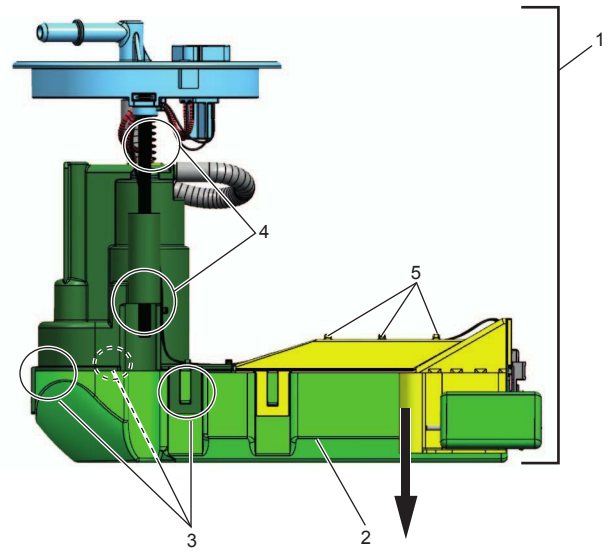
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Fuel Filter Removal and Installation

AENDL70A1706020

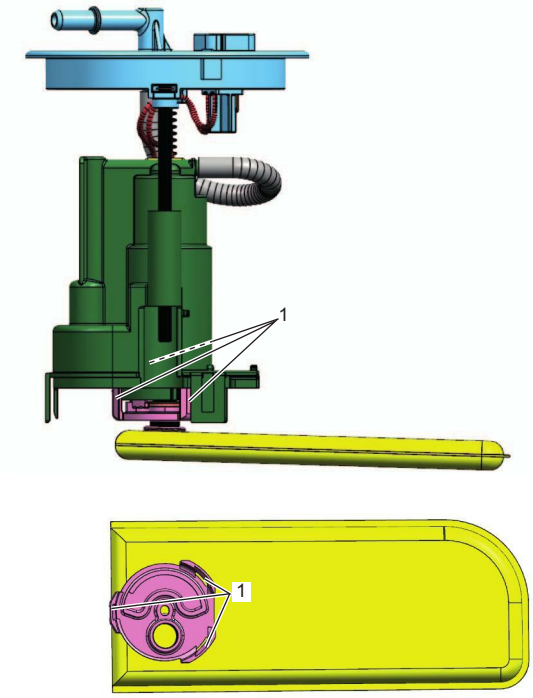
Removal

1) Remove fuel pump assembly from fuel tank. ☞(Page 1G-21)
2) Remove the wire clamp flange and supporter (4).
3) Remove snap fits (3) of integrated filter (1).
4) Remove fuel level gauge wire from the routing clamps and pull down the sub tank (2) from fuel filter assembly (1).



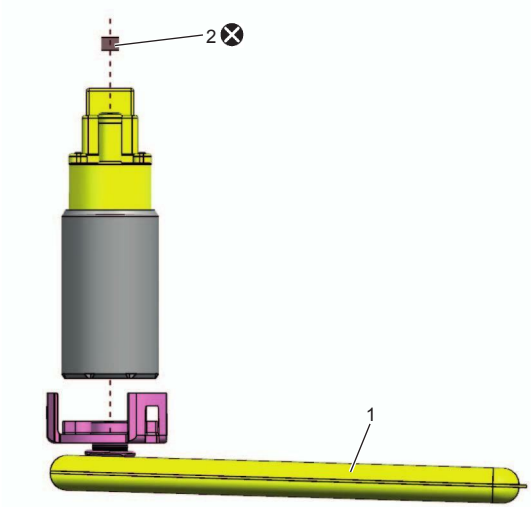
IDL70A170022-02

5) Remove snap fit (1) at 3 locations of integrated filter and supporter.



IDL70A170023-02

6) Remove filter (1) and O-ring (2) from fuel pump assembly.



IDL70A170024-02

⊗ : Do not re use

Installation

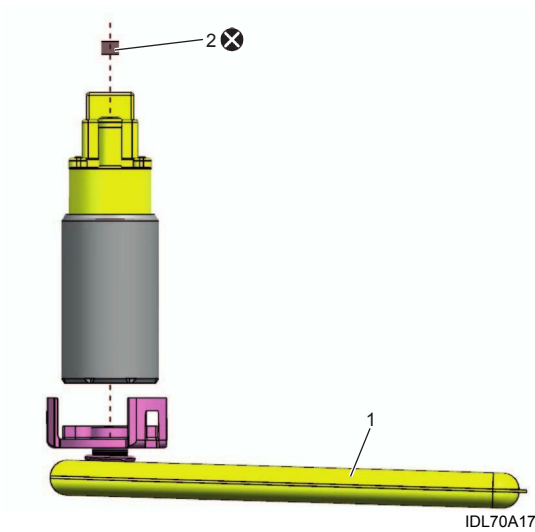
NOTE

Assemble with no contamination in pump discharge port, suction port and mating component.

1) Install O-ring (2), fuel filter (1).

NOTE

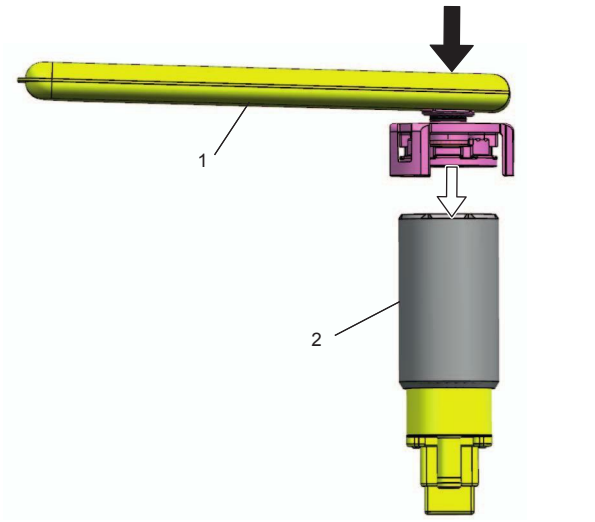
Do not reuse the O-ring (2) if removed from the fuel filter (1).
While assembling the fuel filter (1) ensure that the fuel pump O-ring is seated at its original position and is not bent / twisted.



IDL70A170024-02

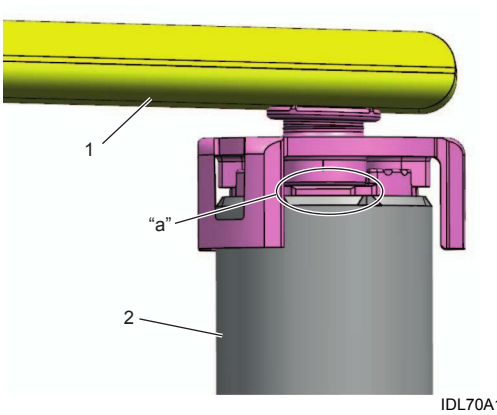
⊗ : Do not re use

2) Install the filter (1) by aligning the filter hole on pump inlet (2) and securely pressing in the direction as shown by hand.



IDL70A170025-01

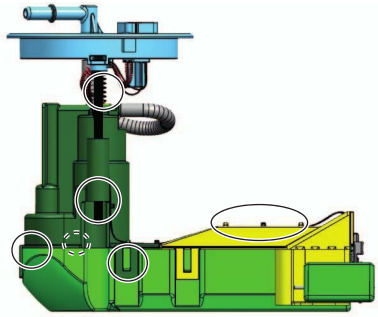
3) Check the clearance “a” between filter (1) and pump inlet (2).



IDL70A170026-01

“a”: 0.00 mm.(0.00 in)

4) Reverse the removal procedure to assemble fuel pump assembly. Check that there should be no abnormality in snap fits and connectors.



IDL70A170027-01

Specifications

Tightening Torque Specifications

AENDL70A1707001

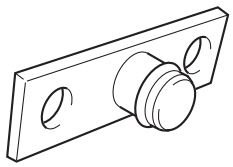
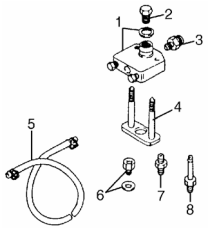
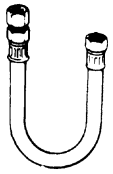
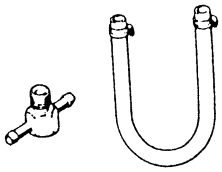
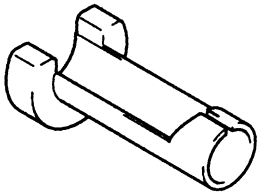
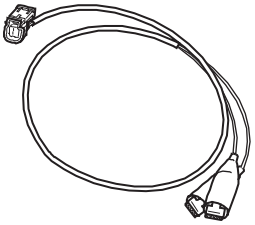
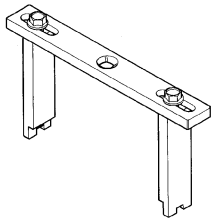
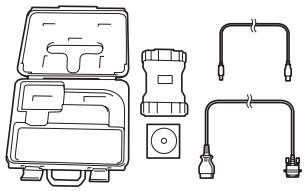
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Fuel delivery pipe nut	25	2.5	18.5	☞(Page 1G-15)
Fuel tank bolt	31	3.2	23.0	☞(Page 1G-20)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Fuel System Components” (Page 1G-11)
“Fuel Hose Disconnection and Reconnection” (Page 1G-12)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Special Tool

AENDL70A1708001

09912M57610 Injector checking tool plate ☞(Page 1G-16) 	09912M58421 Checking tool set This kit includes the following items. 1. Tool body and washer 2. Body plug 3. Body attachment-1 4. Holder 5. Return hose and clamp 6. Body attachment-2 and washer 7. Hose attachment-1, 8. Hose attachment-2 ☞(Page 1G-16) 
09912M58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413). ☞(Page 1G-8) / ☞(Page 1G-9) 	09912M58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413). ☞(Page 1G-8) / ☞(Page 1G-9) 
09912M58490 3-way joint & hose ☞(Page 1G-8) / ☞(Page 1G-9) 	09919M47020 Quick joint remover ☞(Page 1G-13) / ☞(Page 1G-21) 
09930M86310 Injector test harness ☞(Page 1G-16) / ☞(Page 1G-16) 	09941M51012 Lock ring wrench ☞(Page 1G-22) / ☞(Page 1G-23) 
SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 1G-16) 	

Ignition System

General Description

Ignition System Description

AENDL70A1801001

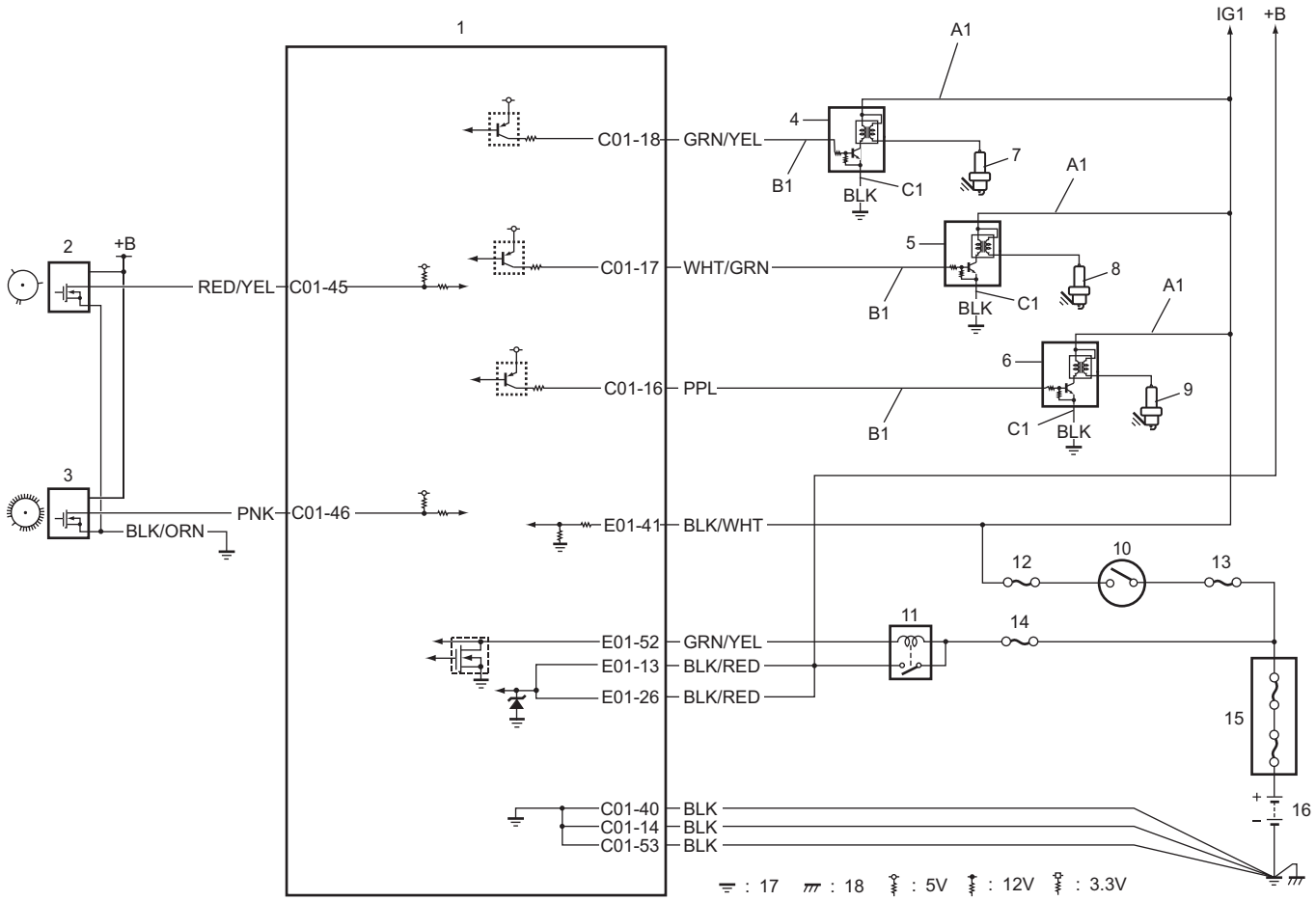
The ignition system is of an electronic ignition type which consists of the following components.

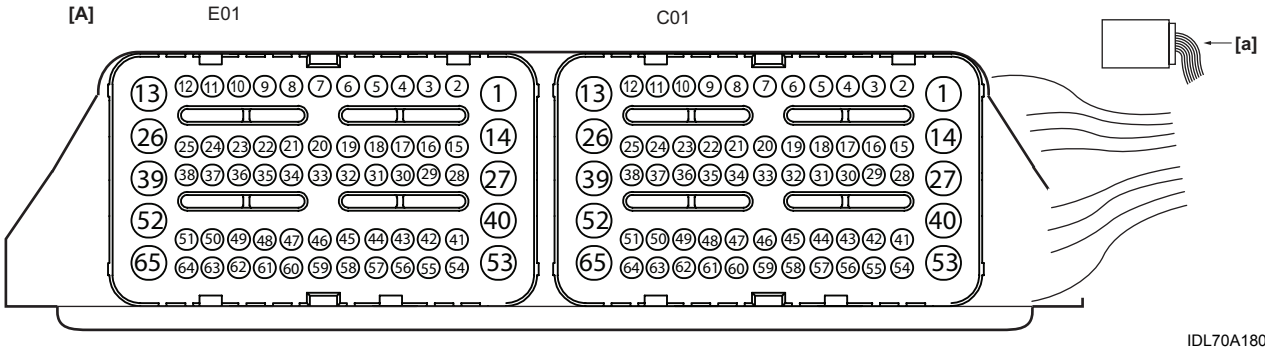
- **ECM**
  It monitors the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and duration and sends a signal to the ignition coil assembly.
- **Ignition coil assembly**
  One ignition coil assembly is provided for each cylinder.
  The ignition coil assembly turns ON and OFF the current to the primary coil according to the signal from ECM.
  When the current flow to the primary coil is turned OFF, a high voltage is induced in the secondary coil.
- **Spark plugs**
- **CMP sensor and CKP sensor**
  Using signals from these sensors, ECM identifies the specific cylinder whose piston is in the compression stroke, detects the crank angle and adjusts initial ignition timing automatically.
- **TP sensor, ECT sensor, MAP sensor, IAT sensor, Knock sensor and other sensors / switches**
  Using signals from these sensors / switches, the ECM corrects the initial ignition timing and sets the optimum timing according to the engine conditions.

Schematic and Routing Diagram

Ignition System Circuit Diagram

AENDL70A1802001





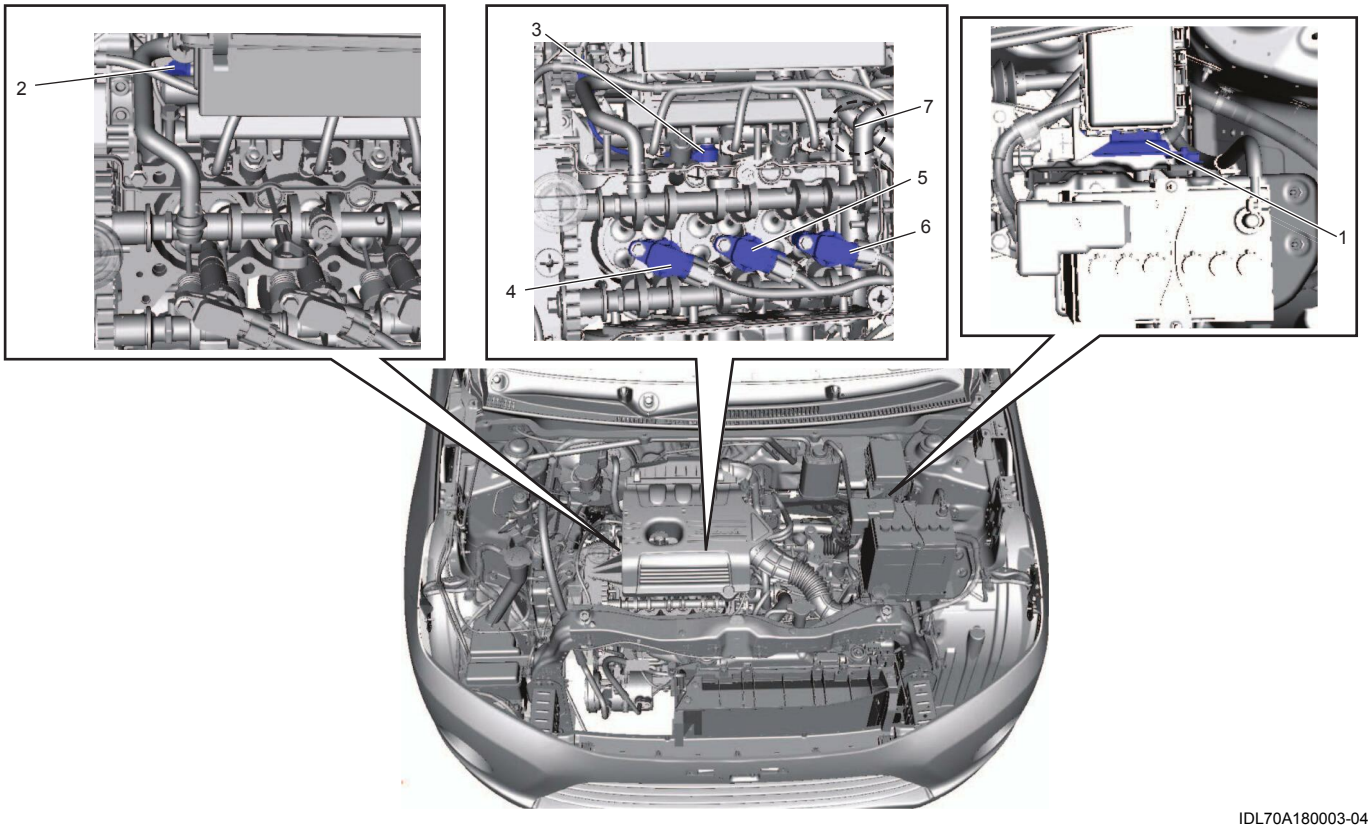
IDL70A180001-03

[A]: ECM connector (View: [a])	5. Ignition coil assembly No.2	13. "ACC" fuse
A1: Power supply circuit for ignition coil assembly	6. Ignition coil assembly No.3	14. "FI" fuse
B1: Drive circuit for ignition coil assembly	7. Spark plug No.1	15. Main fuse box
C1: Ground circuit for ignition coil assembly	8. Spark plug No.2	16. Battery
1. ECM	9. Spark plug No.3	17. Engine ground
2. CMP sensor	10. Ignition switch	18. Body ground
3. CKP sensor	11. Main relay	
4. Ignition coil assembly No.1	12. "IG COIL" fuse	

Component Location

Ignition System Component Location

AENDL70A1803001



IDL70A180003-04

1. ECM	3. Knock sensor	5. Ignition coil assembly No.2	7. CMP sensor
2. CKP sensor	4. Ignition coil assembly No.1	6. Ignition coil assembly No.3	

Diagnostic Information and Procedures

Ignition System Check

AENDL70A1804001

Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check" in Section 1A (Page 1A-16).
2	**Ignition spark test 1** 1) Perform ignition spark test. ☞(Page 1H-4) *Is test result OK?*	Go to Step 3.	Go to Step 4.
3	**Ignition timing check** 1) Check ignition timing. ☞(Page 1H-5) *Is check result OK?*	Ignition system is in good condition.	Repair or replace defective part.
4	**Confirmation of malfunctioning cylinder** 1) Confirm cylinder that failed in ignition spark test. *Are there malfunctions in all cylinders?*	Go to Step 8.	Go to Step 5.

Step	Action	Yes	No
5	**Ignition spark test 2** 1) Replace spark plug in malfunctioning cylinder with spark plug of normal cylinder. 2) Perform ignition spark test on spark plug newly installed in malfunctioning cylinder. ☞(Page 1H-4) *Is test result OK?*	Replace spark plug in malfunctioning cylinder. ☞(Page 1H-5)	Go to Step 6.
6	**Ignition spark test 3** 1) Replace ignition coil assembly of malfunctioning cylinder with the ignition coil assembly of normal cylinder. 2) Perform ignition spark test on spark plug in malfunctioning cylinder. ☞(Page 1H-4) *Is test result OK?*	Replace ignition coil in malfunctioning cylinder. ☞(Page 1H-5)	Go to Step 7.
7	**Ignition coil assembly drive circuit check** 1) Check drive circuits of each ignition coil assembly for open, short and poor connection. *Are circuits in good condition?*	Go to Step 8.	Repair or replace defective part.
8	**Ignition coil assembly power supply and ground circuit check** 1) Check power supply and ground circuits of ignition coil assembly for open, short and poor connection. *Are circuits in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace defective part.

Ignition Spark Test

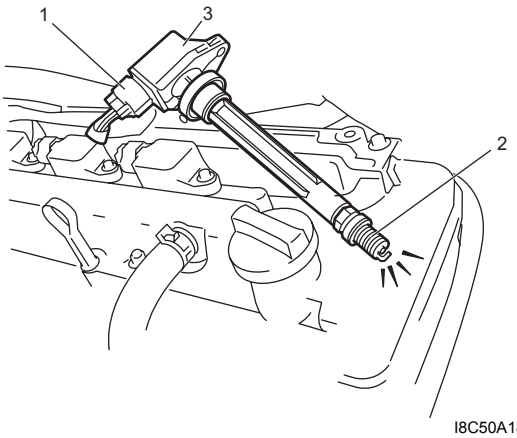
AENDL70A1804002

1) Remove spark all plugs. ☞(Page 1H-5)
2) Inspect all spark plugs. ☞(Page 1H-5)

⚠ WARNING

Be sure to disconnect injector connectors. Without disconnection of injector connectors, combustible gas may come out from spark plug holes during this test and may get ignited in engine compartment.

3) Disconnect all injector connectors.
4) Connect one ignition coil connector (1) to one ignition coil (3).
5) Connect one spark plug (2) to one ignition coil (3), and ground spark plug.
6) Crank engine and check if spark plug produces sparks. Also other cylinder inspect.



I8C50A180004-01

7) If any spark plug does not produce sparks, check ignition system. ☞(Page 1H-3)

Repair Instructions

Spark Plug Removal and Installation

AENDL70A1806001

Removal

1) Remove ignition coil assemblies. ☞(Page 1H-5)
2) Remove spark plugs from cylinder head.

Installation

1) Tighten spark plugs to specified torque.

Tightening torque
Spark plug: 18 N·m (1.8 kgf-m, 13.5 lbf-ft)

2) Install ignition coil assemblies. ☞(Page 1H-5)

Spark Plug Inspection

AENDL70A1806002

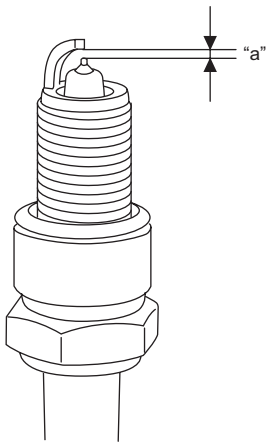
Check spark plug for:

- Electrode wear
- Carbon deposits
- Insulator damage

Check spark plug air gap “a” using wire type plug gap gauge.
If any abnormality is found for nickel spark plugs, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

Spark plug type
NGK: KR6A-10

Spark plug air gap “a”
: 0.95 – 1.05 mm (0.096 – 0.107 in.)



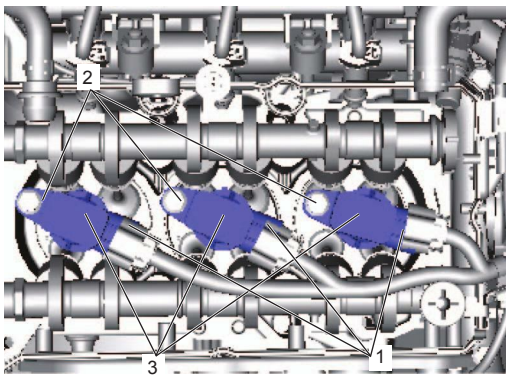
I8T401182005-01

Ignition Coil Assembly Removal and Installation

AENDL70A1806003

Removal

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly. ☞(Page 1D-5)
3) Disconnect ignition coil connectors (1).
4) Remove ignition coil bolts (2).
5) Remove ignition coil assembly (3).



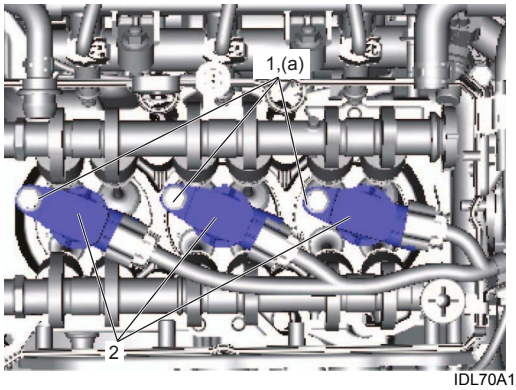
IDL70A180004-01

Installation

Reverse removal procedure noting the following.

- Tighten ignition coil bolts (1) to specified torque.

Tightening torque
Ignition coil bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



IDL70A180005-01

2. Ignition coil assembly

Ignition Coil Assembly Inspection

AENDL70A1806004

Check ignition coil assembly for the following:

- Damage
- Deterioration
- Corrosion of terminal

If any abnormality is found, replace ignition coil assembly. ☞(Page 1H-5)

Ignition Timing Inspection

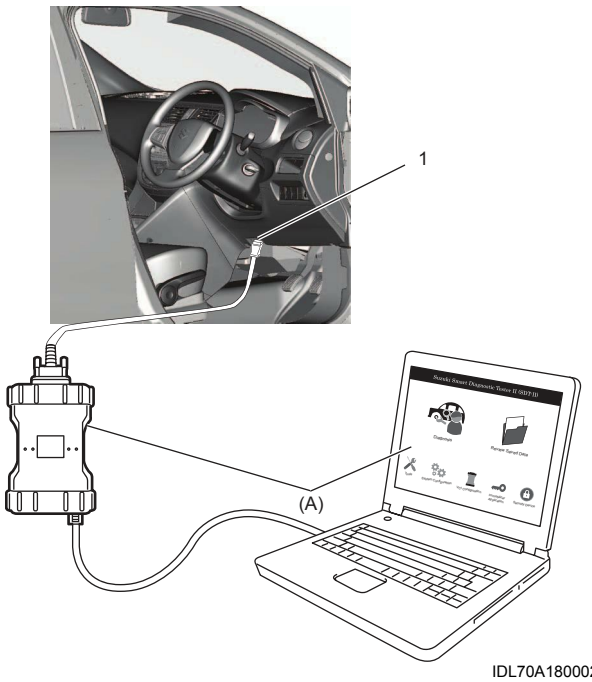
AENDL70A1806005

NOTE

- **Ignition timing is not adjustable. If ignition timing is not as specified, check components related to ignition system.**
- **For identification of each cylinder, refer to “Statement on Cleanliness and Care” in Section 1A (Page 1A-1).**

1) Connect scan tool to DLC (1) with ignition “OFF”.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



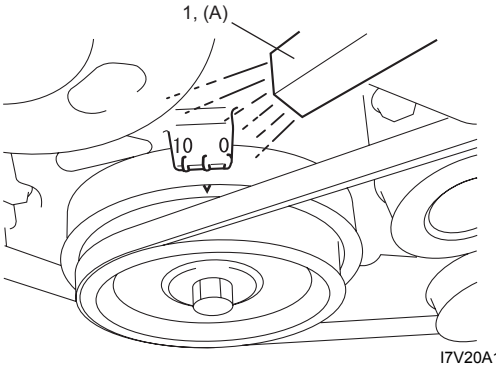
IDL70A180002-01

2) Start engine and warm it up to normal operating temperature.
3) Make sure that all electrical loads except ignition system are switched off.
4) Check that idle speed is within specification. ☞(Page 1A-99)
5) Fix ignition timing using “Fixed Spark” in “Active Test” mode on SUZUKI scan tool.
6) Set timing light (1) to ignition coil harness for No.1 cylinder and check that ignition timing is within specification.

Ignition timing
Fixed with SUZUKI scan tool: 10 ± 7° BTDC (at specified idle speed)

Ignition order
1–3–2

Special tool
(A): 09930M76420



I7V20A180007-01

7) If either of check result is out of specification, check the following points.
   - CKP sensor
   - CKP sensor plate
   - ECM and its circuit
   - CMP sensor
   - CMP sensor rotor teeth of camshaft
   - Crankshaft
   - Crankshaft pulley
   - Crankshaft pulley key
8) After checking initial ignition timing, release ignition timing fixation using SUZUKI scan tool.
9) With engine idling, check that increasing engine speed advances ignition timing.
   If the check result is not OK, check the following points.
   - ECM and its circuit ☞(Page 1A-87)
   - TP sensor ☞(Page 1C-2)
   - APP sensor ☞(Page 1C-4)

Specifications

Tightening Torque Specifications

AENDL70A1807001

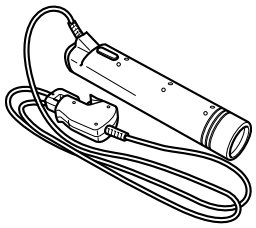
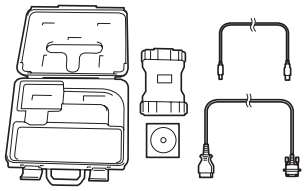
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Spark plug	18	1.8	13.5	☞(Page 1H-5)
Ignition coil bolt	11	1.1	8.5	☞(Page 1H-5)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Special Tool

AENDL70A1808001

09930M76420 Timing light (dry cell type) ☞(Page 1H-6)		SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 1H-6)	

Starting System

General Description

Cranking System Description

AENDL70A1901001

Cranking Circuit

The cranking circuit consists of the battery, starting motor, ignition switch and related electrical wiring. These components are connected electrically.

Starting Motor Circuit

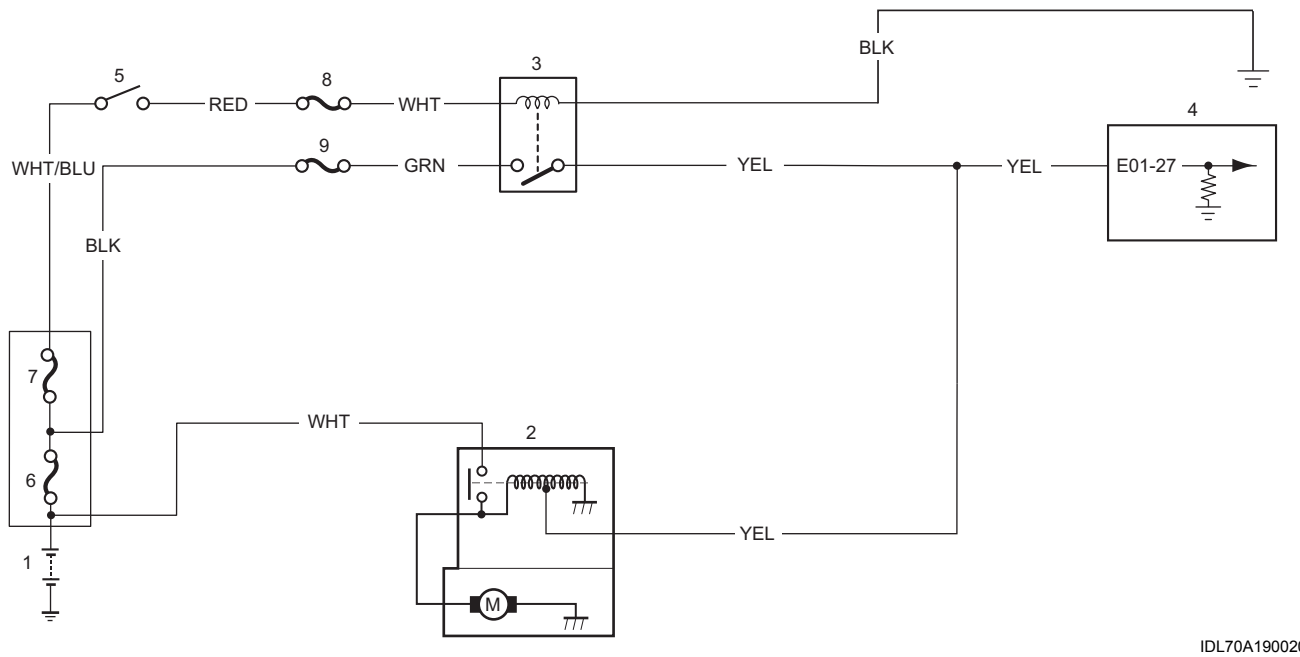
In the circuit shown in “Cranking System Circuit Diagram” (Page 1I-1), the coil of the magnetic switch in starting motor is energized when the ignition switch is turned to “START” position. The resulting movement of the plunger and pinion drive lever causes the pinion to engage with engine flywheel, while closing the contacts of the magnetic switch. This causes the starting motor to rotate to crank the engine.

When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.

Schematic and Routing Diagram

Cranking System Circuit Diagram

AENDL70A1902001



IDL70A190020-02

1. Battery	4. ECM	7. “IGN” fuse
2. Starting motor	5. Ignition switch (starter switch)	8. “ST SIG” fuse
3. Starting motor control relay	6. Main fuse	9. “ST” fuse

Diagnostic Information and Procedures

Cranking System Symptom Diagnosis

AENDL70A1904001

Possible symptoms due to starting system trouble would be as follows:

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine in which of the battery, wiring harness, starting motor (including magnetic switch) and engine the cause of each trouble lies.
Before removing the starting motor, check the following items to identify most possible cause of trouble.

1) Condition of trouble
2) Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals
3) Discharge of battery
4) Mounting of starting motor

Condition	Possible cause	Correction / Reference Item
Starting motor not running (No operating sound of magnetic switch)	Battery run down	*Recharge battery.*
	Battery voltage too low	*Replace battery. ☞(Page 1J-5)*
	Poor contact in battery terminal connection	*Retighten or replace. ☞(Page 1J-5)*
	Loose grounding cable connection	*Retighten.*
	Blown fuse	*Replace fuse.*
	Faulty ignition switch and magnetic switch	*Replace ignition switch and/or magnetic switch.* • *Ignition switch: ☞(Page 6B-10)* • *Magnetic switch:☞(Page 1I-4)*
	Lead wire coupler loose in place	*Retighten.*
	Open circuit between ignition switch and magnetic switch	*Repair or replace.*
	Open circuit in pull-in coil	*Replace magnetic switch.☞(Page 1I-4)*
	Poor sliding of plunger and/or pinion	*Repair or replace.*
	Faulty starting motor control relay	*Replace starting motor control relay. ☞(Page 10B-32)*
Starting motor not running (Operating sound of magnetic switch heard)	Battery run down	*Recharge battery.*
	Battery voltage too low	*Replace battery. ☞(Page 1J-5)*
	Worn internal gear and/or planetary gear	*Replace internal gear.☞(Page 1I-4)*
	Loose battery cable connections	*Retighten.*
	Burnt main contact point, or poor contacting action of magnetic switch	*Replace magnetic switch.☞(Page 1I-4)*
	Brushes are seating poorly or worn down	*Replace brush holder assembly.☞(Page 1I-4)*
	Weakened brush springs	*Replace brush holder assembly.☞(Page 1I-4)*
	Burnt commutator	*Replace armature.☞(Page 1I-4)*
	Layer short circuit of armature	*Replace armature.☞(Page 1I-4)*
	Crankshaft rotation obstructed	*Repair.*
Starting motor running but too slow (small torque) (If battery and wiring are satisfactory, inspect starting motor)	Insufficient contact of magnetic switch main contacts	*Replace magnetic switch.☞(Page 1I-4)*
	Layer short-circuit of armature	*Replace armature.☞(Page 1I-4)*
	Disconnected, burnt or worn commutator	*Repair or replace armature.☞(Page 1I-4)*
	Worn brushes	*Replace brush holder assembly.☞(Page 1I-4)*
	Weakened brush springs	*Replace brush holder assembly.☞(Page 1I-4)*
	Burnt or abnormally worn end bushing	*Replace rear bushing.☞(Page 1I-4)*
Starting motor running, but not cranking engine	Worn pinion tip	*Replace overrunning clutch.☞(Page 1I-4)*
	Overrunning clutch slipping	*Replace overrunning clutch.☞(Page 1I-4)*
	Worn teeth of ring gear	*Replace flywheel. ☞(Page 1D-23)*

Condition	Possible cause	Correction / Reference Item
Noise	Abnormally worn bearing	*Replace end housing and/or armature housing. ☞(Page 1I-4)*
	Worn pinion or worn teeth of ring gear	*Replace overrunning clutch, flywheel. ☞(Page 1I-4)* • *Flywheel: ☞(Page 1D-23)*

Repair Instructions

Starting Motor Removal and Installation

AENDL70A1906001

Removal

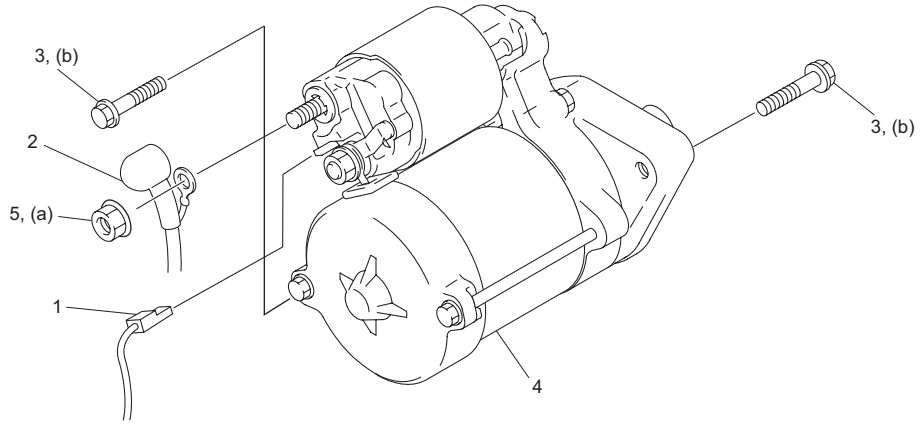
1) Disconnect negative (–) cable at battery.
2) Remove intake manifold. ☞(Page 1D-7)
3) Disconnect magnetic switch lead wire (1) and starting motor cable (2) from starting motor terminals.
4) Remove starting motor mounting bolts (3).
5) Remove starting motor (4).

Installation

Reverse removal procedure noting the following.

- Tighten starting motor mounting bolts (3) and starting motor cable nut (5) to specified torque.

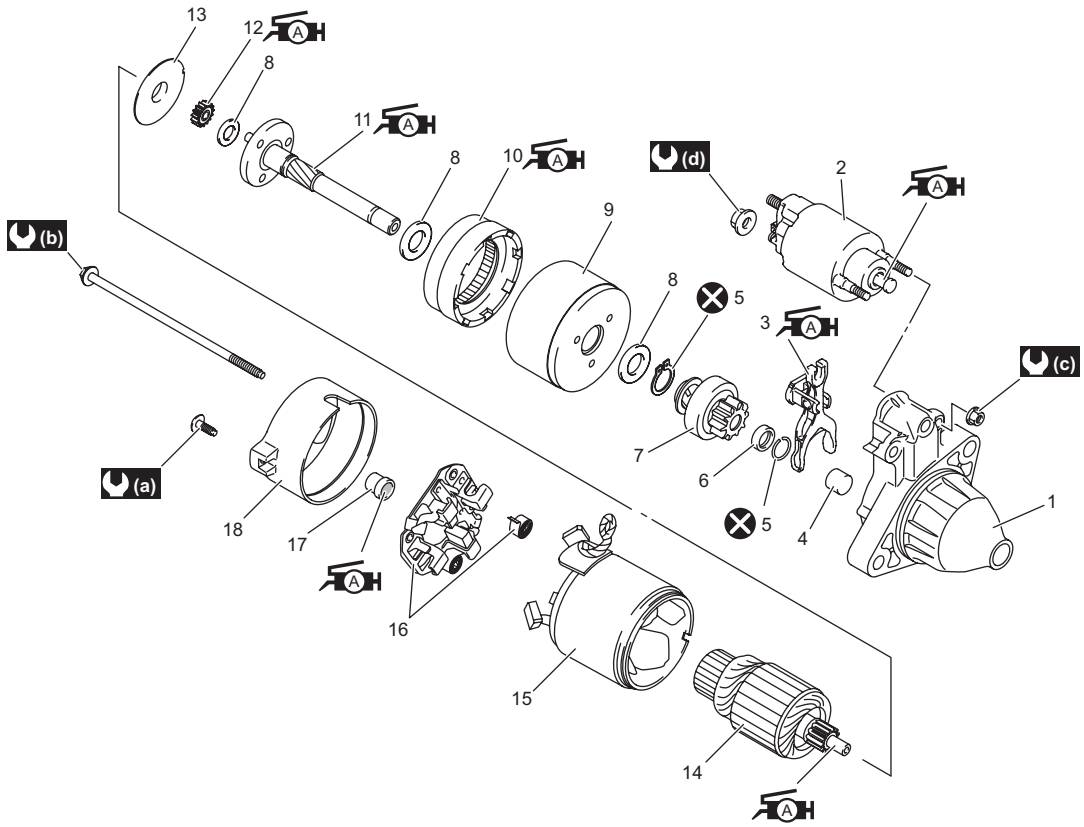
Tightening torque
Starting motor cable nut (a): 10.8 N·m (1.10 kgf-m, 8.0 lbf-ft)
Starting motor mounting bolt (b): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)



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Starting Motor Components

AENDL70A1906003



I9P60A191005-01

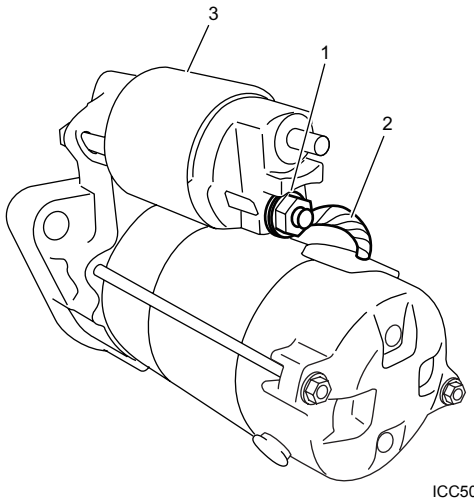
1. Armature housing	9. Planetary gear case	17. Bushing
2. Magnetic switch	10. Internal gear	18. End housing
3. Drive lever	11. Planetary carrier shaft	(a) : 1.5 N·m (0.15 kgf-m, 1.5 lbf-ft)
4. Needle bearing	12. Planetary gear	(b) : 6.0 N·m (0.61 kgf-m, 4.5 lbf-ft)
5. Snap ring	13. Plate	(c) : 8.5 N·m (0.87 kgf-m, 6.5 lbf-ft)
6. Pinion stop ring	14. Armature	(d) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
7. Overrunning clutch	15. Yoke	: Do not reuse.
8. Washer	16. Brush holder assembly	: Apply grease 99000-25011 to sliding surface of each part.

Starting Motor Disassembly and Reassembly

AENDL70A1906005

Disassembly

1) Remove lead wire nut (1) and disconnect lead wire (2) from magnetic switch (3).

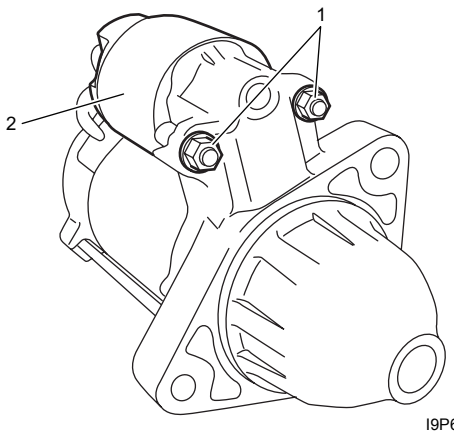


ICC50A190001-01

2) Remove magnetic switch nuts (1) and remove magnetic switch (2) by pulling up its rear portion to unhook plunger from drive lever.

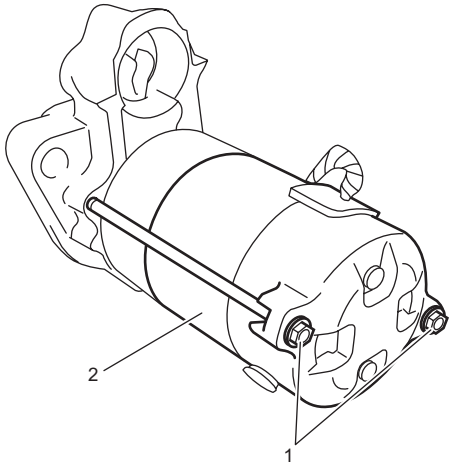
NOTE

Do not disassemble magnetic switch. Replace it as assembly, if defective.



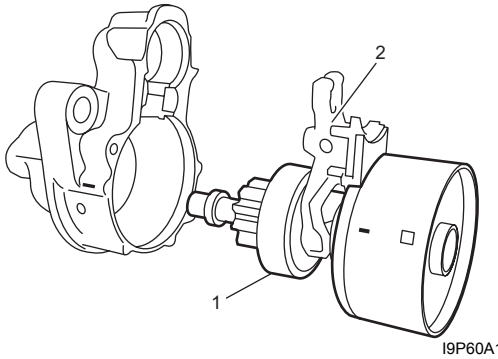
I9P60A191021-01

3) Remove end housing bolts (1) and remove yoke assembly (2).



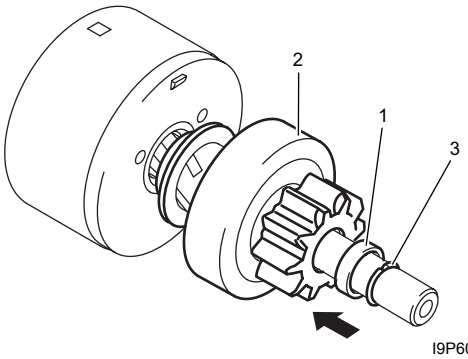
I9P60A191022-01

4) Remove shaft assembly (1) together with drive lever (2).



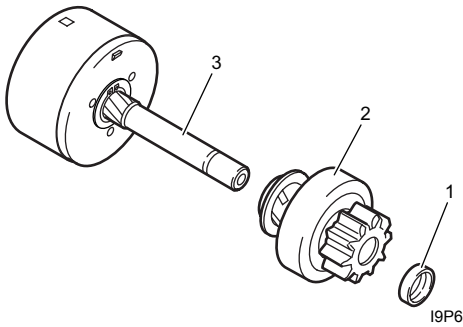
I9P60A191023-01

5) With pinion stop ring (1) moved to overrunning clutch (2) side (in arrow direction), remove snap ring (3) using snap ring pliers.



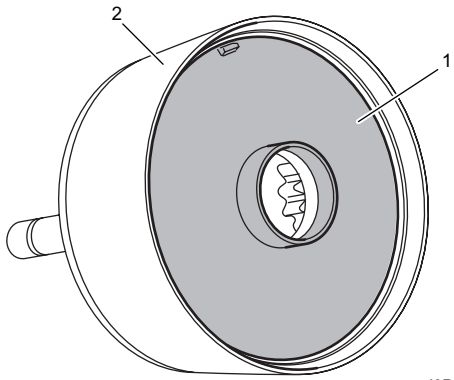
I9P60A191024-01

6) Remove pinion stop ring (1) and overrunning clutch (2) from planetary carrier shaft (3).



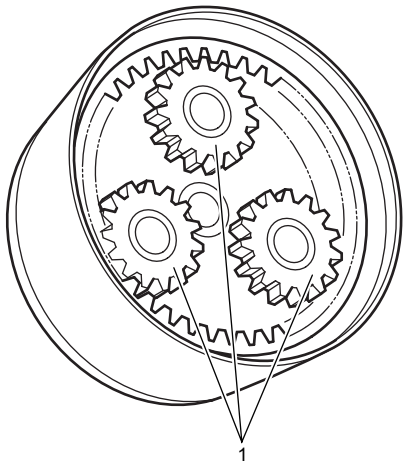
I9P60A191025-01

7) Remove plate (1) from planetary gear case (2).



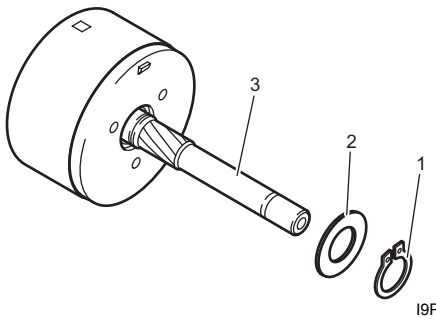
I9P60A191026-01

8) Remove planetary gears (1).



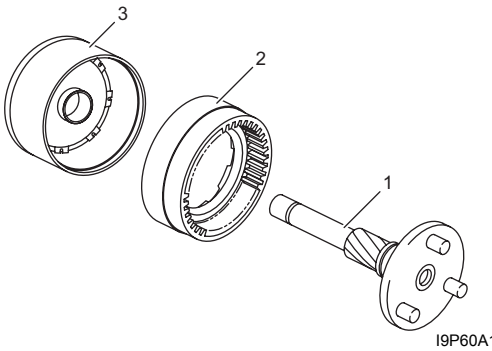
I9P60A191027-01

9) Remove snap ring (1) and washer (2) from planetary carrier shaft (3).



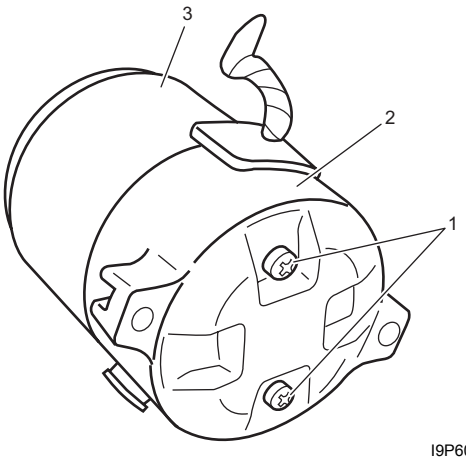
I9P60A191028-01

10) Remove planetary carrier shaft (1) and internal gear (2) from planetary gear case (3).



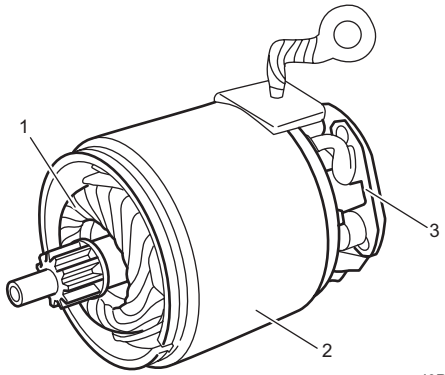
I9P60A191029-01

11) Remove screws (1), separate end housing (2) from yoke (3).



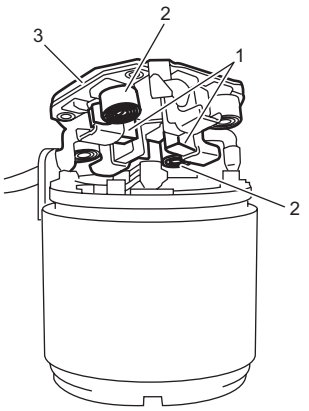
I9P60A191030-01

12) Remove armature (1) from yoke (2) and brush holder assembly (3).



I9P60A191031-01

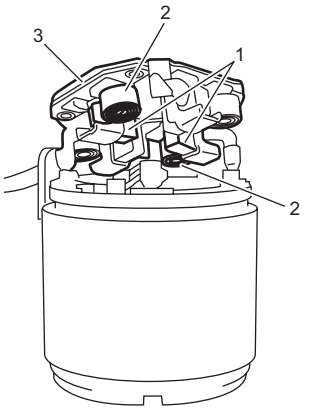
13) Remove brush springs (2) and brushes (1) from brush holder assembly (3).



I9P60A191033-01

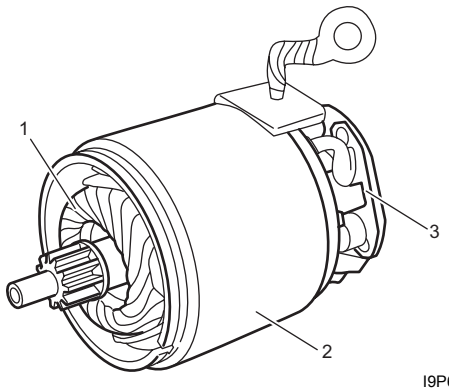
Reassembly

1) Install brushes (1) and brush springs (2) to brush holder assembly (3).



I9P60A191033-01

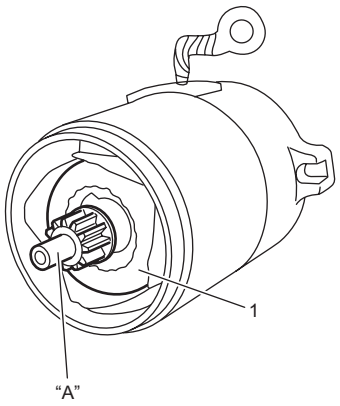
2) Install armature (1) to yoke (2) and to brush holder assembly (3) while pushing 4 brushes outward.



I9P60A191031-01

3) Apply grease to armature (1).

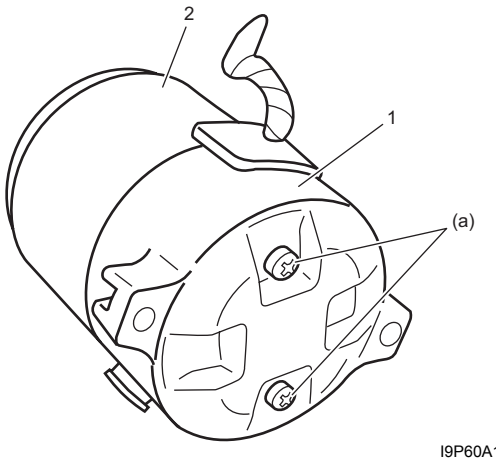
"A": Grease 99000–25011 (SUZUKI Super Grease A)



I9P60A191045-02

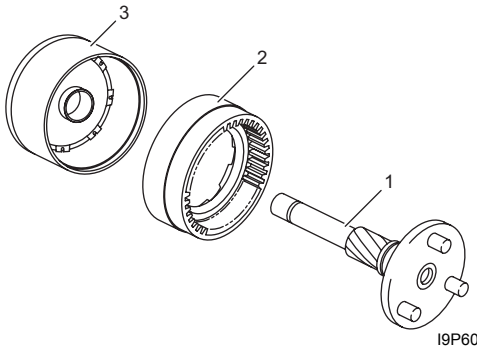
4) Install end housing (1) to yoke (2), and tighten brush holder screws to specified torque.

Tightening torque
Brush holder screw (a): 1.5 N·m (0.15 kgf-m, 1.5 lbf-ft)



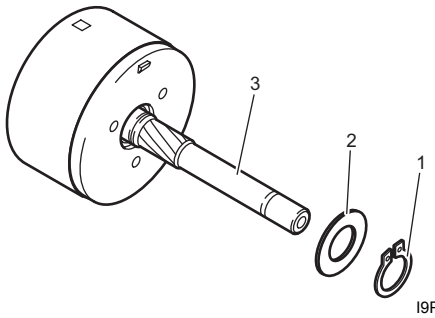
I9P60A191034-01

5) Install internal gear (2) and planetary carrier shaft (1) to planetary gear case (3).



I9P60A191029-01

6) Install washer (2) and new snap ring (1) to planetary carrier shaft (3).

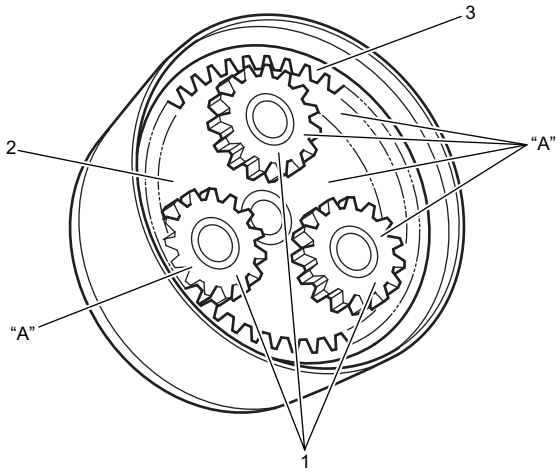


I9P60A191028-01

7) Before installing planetary gears (1), apply grease to planetary gears, planetary carrier shaft (2) and internal gear (3).

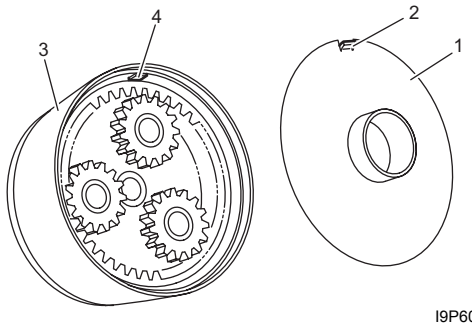
"A": Grease 99000–25011 (SUZUKI Super Grease A)

8) Install planetary gears.



I9P60A191035-01

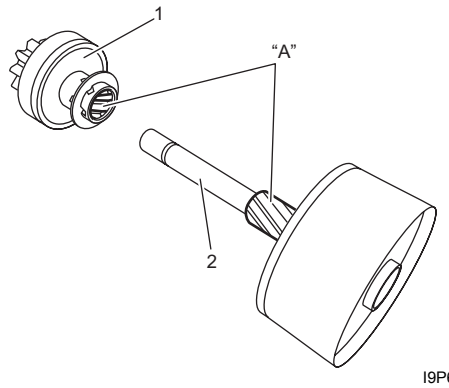
9) Aligning notch (2) on plate (1) with the projection (4) on planetary gear case (3), install plate to planetary gear case.



I9P60A191036-01

10) Before installing overrunning clutch (1) to planetary carrier shaft (2), apply grease to spline.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

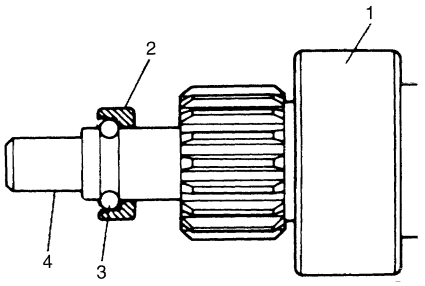


I9P60A191037-01

11) Install overrunning clutch (1) to planetary carrier shaft (4) with new snap ring (3) and pinion stop ring (2).

NOTE

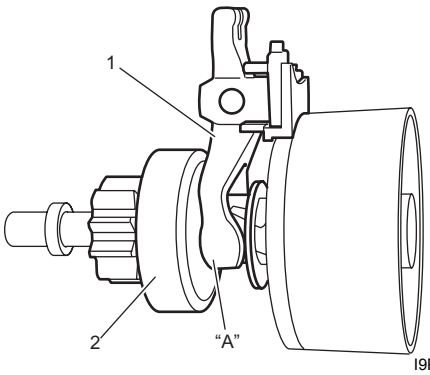
Install pinion stop ring in the direction and position as shown in figure.



IYSQ01190024-01

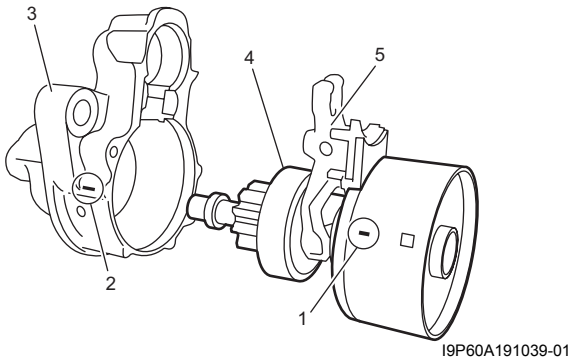
12) Apply grease to drive lever (1) and set drive lever to overrunning clutch (2) as shown in figure.

"A": Grease 99000–25011 (SUZUKI Super Grease A)



I9P60A191038-01

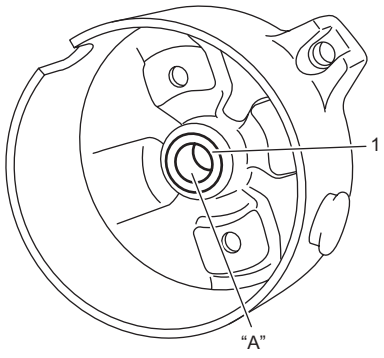
13) Aligning match mark (1) on planetary gear case with match mark (2) on armature housing (3), set shaft assembly (4) and drive lever (5) in armature housing.



I9P60A191039-01

14) Apply grease to bushing (1).

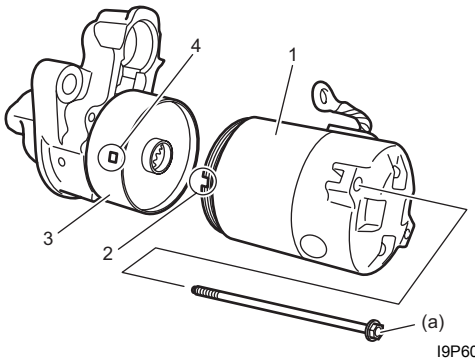
"A": Grease 99000–25011 (SUZUKI Super Grease A)



I9P60A191046-01

15) Aligning notch (2) on yoke (1) with dent (4) on planetary gear case (3), fit yoke assembly to planetary gear case. Tighten end housing bolts to specified torques.

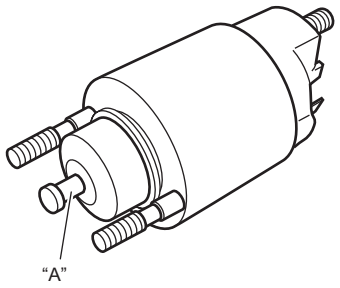
Tightening torque
End housing bolt (a): 6.0 N·m (0.61 kgf-m, 4.5 lbf-ft)



I9P60A191040-01

16) Apply grease to magnetic switch plunger.

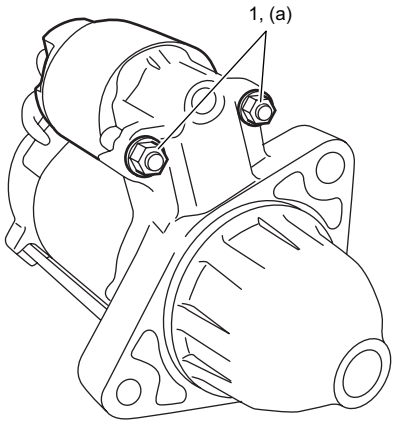
"A": Grease 99000–25011 (SUZUKI Super Grease A)



I9P60A191041-01

17) Hook magnetic switch plunger with drive lever and tighten magnetic switch nuts (1) to specified torque.

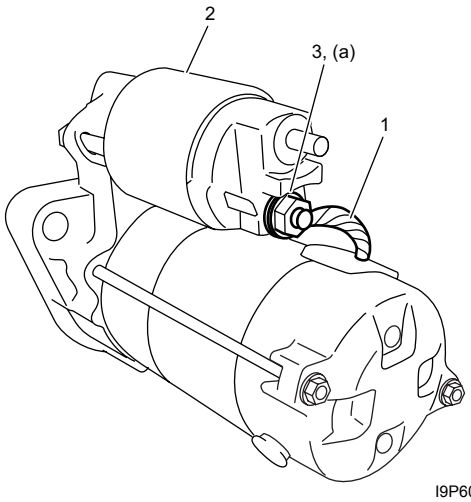
Tightening torque
Magnetic switch nut (a): 8.5 N·m (0.87 kgf-m, 6.5 lbf-ft)



I9P60A191042-01

18) Connect lead wire (1) to magnetic switch (2) and tighten lead wire nut (3) to specified torque.

Tightening torque
Lead wire nut (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I9P60A191043-01

Starting Motor Inspection

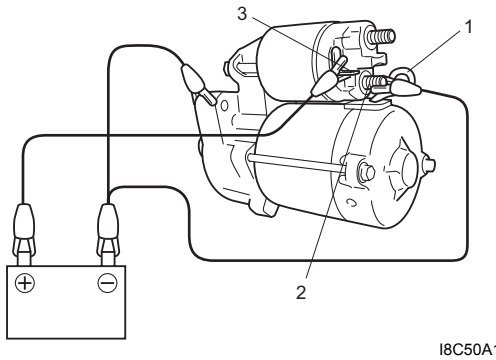
AENDL70A1906006

Starting Motor Operation Check

⚠ CAUTION

- **When connecting cables to battery for operation check, be careful enough not to cause accidental short circuit.**
- **Each test must be performed within 3 – 5 seconds to avoid coil from burning.**

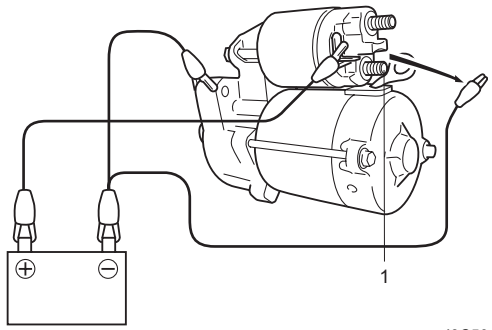
1) Perform pull-in test as follows.
   a) Disconnect lead wire (1) from terminal "M" (2).
   b) Connect battery to the magnetic switch as shown in figure.
   c) Check that plunger and pinion move outward. If plunger and pinion do not move, replace magnetic switch.



I8C50A190024-01

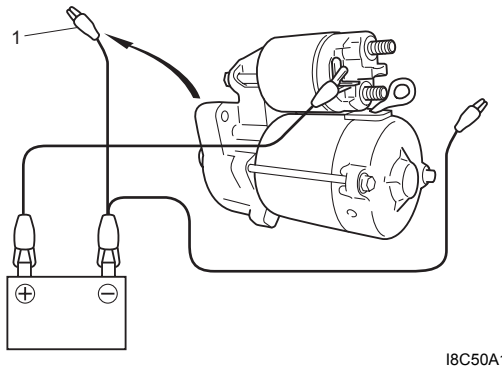
3. Terminal "S"

2) Perform hold-in test as follows.
   a) From the state of Step 1) with plunger and pinion in "out" position, disconnect negative lead from terminal "M" (1).
   b) Check that plunger and pinion remain out. If plunger and pinion return inward, replace magnetic switch.



I8C50A190025-01

3) Perform plunger and pinion return test as follows.
   a) From the state of Step 2) with plunger and pinion in “out” position, disconnect negative (–) lead (1) from starting motor body.
   b) Check that plunger and pinion return inward. If plunger and pinion do not return, replace magnetic switch.

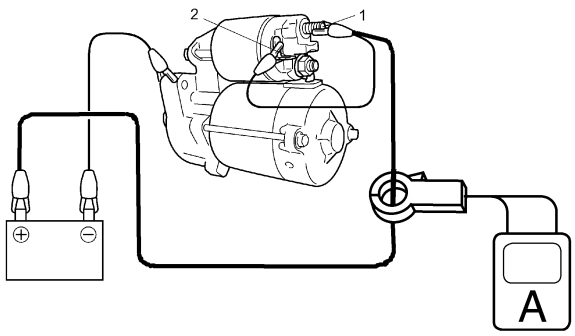


I8C50A190026-01

4) No-load performance test as follows.
   a) Fix starting motor with vice or the like.
   b) Connect battery and ammeter to starting motor as shown in figure.
   c) Check that starting motor rotates smoothly and steadily with pinion moving out.
   d) Check that ammeter indicates specified current. If check result is not satisfactory, repair or replace starting motor.

Specified current (No-load performance test)

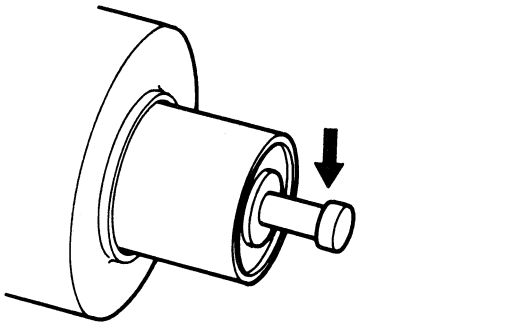
- **90 A MAX. at 11.5 V**



I8C50A190034-01

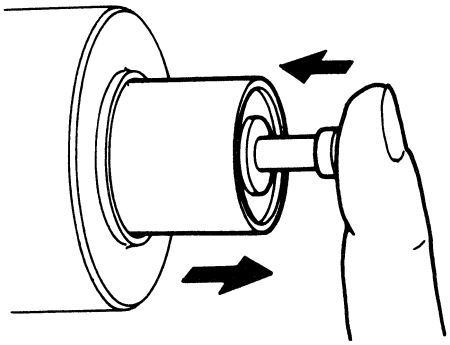
1. Terminal “B”	2. Terminal “S”

Plunger
Check plunger for wear. Replace magnetic switch, if necessary.



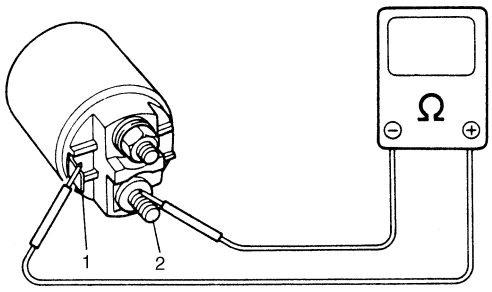
I2RH01190008-01

Magnetic Switch
Push in plunger and release it. The plunger should return quickly to its original position. If faulty condition is found, replace magnetic switch.



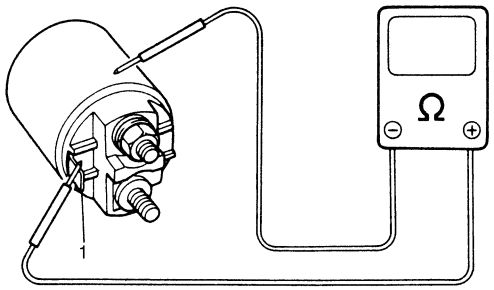
I2RH01190009-01

Pull-in coil open circuit test
Check for continuity between magnetic switch “S” terminal (1) and “M” terminal (2). If there is no continuity, replace magnetic switch.



I2RH01190010-01

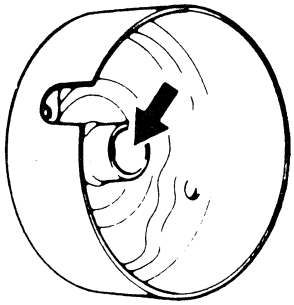
Hold-in coil open circuit test
Check for continuity between magnetic switch “S” terminal (1) and coil case. If there is no continuity, replace magnetic switch.



I2RH01190011-01

End Housing Bushing

Check end housing bushing for wear or damage. Replace bushing if defective.



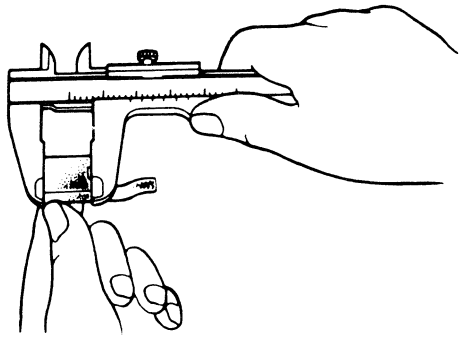
I2RH01190012-01

Brush

- Check brushes for wear.
  Measure length of brushes and if below the limit, replace brush holder assembly.

  Brush length

  - **Standard: 14.0 mm (0.551 in.)**
  - **Limit: 9.0 mm (0.354 in.)**



I2RH01190013-01

- Install brushes to each brush holder and check for smooth movement.

Spring

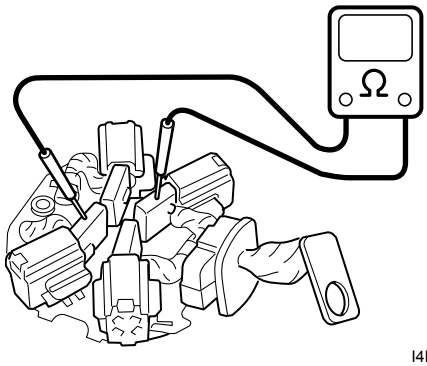
Check brush springs for wear, damage or other abnormal conditions. If faulty condition is found, replace brush holder assembly.

Brush spring tension

- **Standard: 1.6 kgf (3.53 lbf)**
- **Limit: 0.9 kgf (1.98 lbf)**

Brush Holder

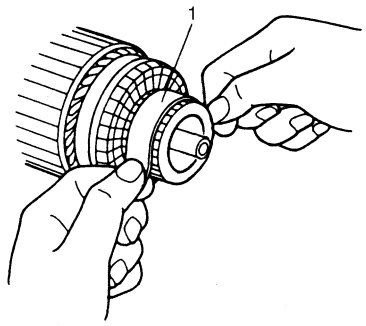
- Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.
  Clean or correct as necessary.
- Check for continuity between brush positive terminal (1) and grounded brush holder (2).
  If continuity exists, brush holder is grounded due to defective insulation and should be replaced.



I4RS0A190004-01

Armature

- Check commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.



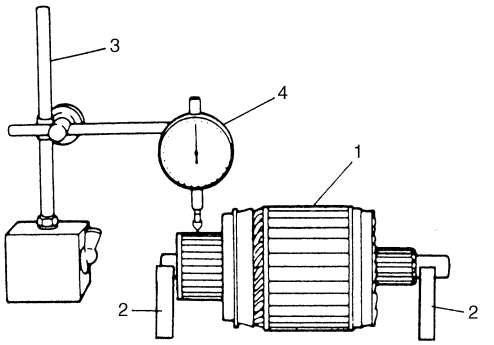
I7RW01190005-02

1. Sandpaper of #300 – 400

- Check commutator for uneven wear with armature (1) supported on V-blocks (2). If deflection of dial gauge (4) pointer exceeds limit, repair or replace.

  Commutator out of round

  - **Standard: 0.02 mm (0.0007 in.) or less**
  - **Limit: 0.05 mm (0.002 in.)**



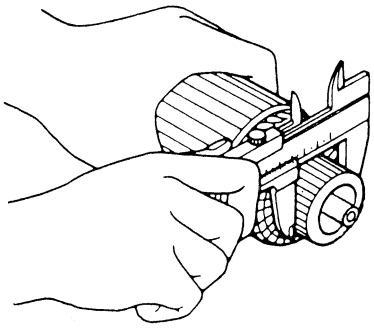
I2RH01190016-01

3. Magnetic stand

- Check commutator for wear. If diameter is below limit, replace armature.

Commutator outside diameter

- **Standard: 28.0 mm (1.10 in.)**
- **Limit: 27.0 mm (1.06 in.)**

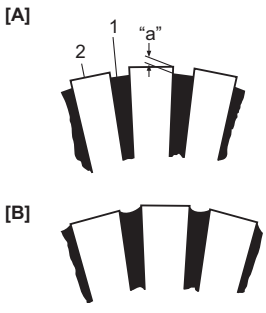


I2RH01190017-01

- Check commutator (2) for insulator (1) depth. Correct or replace if below limit.

Commutator insulator depth “a”

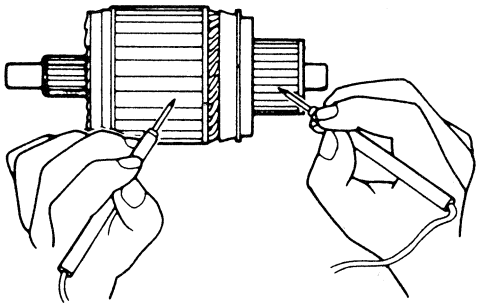
- **Standard: 0.5 mm (0.019 in.)**
- **Limit: 0.2 mm (0.008 in.)**



I8T201190008-01

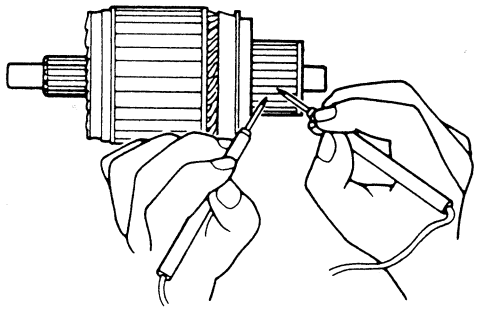
[A]: Correct
[B]: Incorrect

- Check for continuity commutator and armature core. If there is continuity, armature is faulty insulating and must be replaced.



I2RH01190019-01

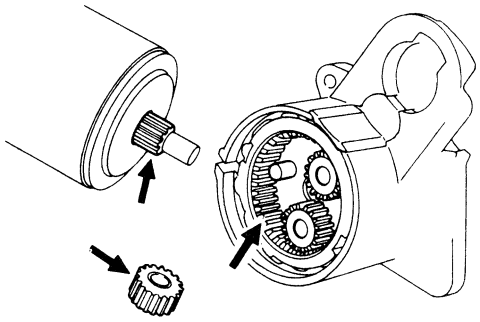
- Check for continuity between each commutator segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.



I2RH01190020-01

Gear

Check internal gear and planetary gears for wear, damage or other abnormal conditions. If faulty condition is found, replace internal gear and planetary gears.

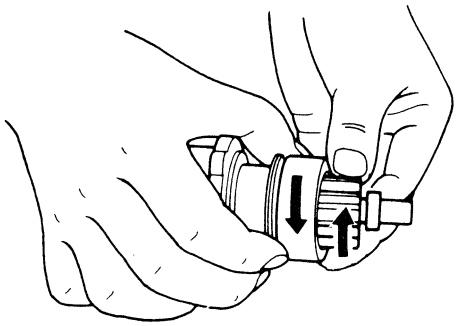


I2RH01190021-01

Pinion and Overrunning Clutch

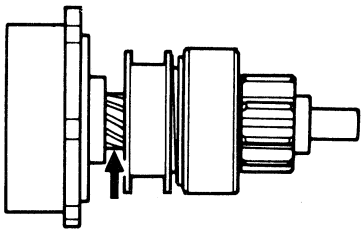
- Check pinion for wear, damage or other abnormal conditions.

- Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction. If faulty condition is found, replace overrunning clutch.



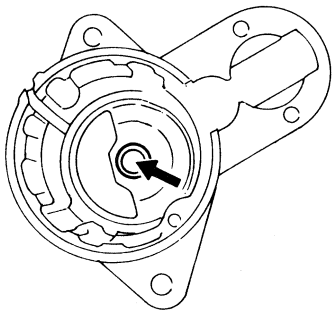
I2RH01190022-01

- Check spline teeth for wear or damage. Replace if necessary.
- Check pinion for smooth movement.



I2RH01190023-01

Armature Housing Needle Bearing
Check needle bearing for wear and damage. Replace needle bearing if defective.



I2RH01190024-01

Specifications

Cranking System Specifications

AENDL70A1907001

DENSO 0.8 kW type

Voltage		12 V			
Output		0.8 kW			
Rating		30 seconds			
Direction of rotation		Clockwise as viewed from pinion side			
Number of pinion teeth		10			
Performance		Voltage	Current	Torque	Revolution speed
At around 20 °C (68 °F)	No-load characteristic	11.5 V	90 A MAX.	—	3,000 rpm MIN.
	Loaded characteristic	8 V	200 A	4.71 N·m (0.48 kgf-m, 3.5 lbf-ft) MIN.	1,240 rpm MIN.
	Locked characteristic	2.5 V	260 A MAX.	4.91 N·m (0.5 kgf-m, 4.0 lbf-ft) MIN.	—
	Magnetic switch operating voltage	8 V MIN.			

Tightening Torque Specifications

AENDL70A1907002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Starting motor cable nut	10.8	1.10	8.0	☞(Page 1I-3)
Starting motor mounting bolt	45	4.6	33.5	☞(Page 1I-3)
Brush holder screw	1.5	0.15	1.5	☞(Page 1I-7)
End housing bolt	6.0	0.61	4.5	☞(Page 1I-8)
Magnetic switch nut	8.5	0.87	6.5	☞(Page 1I-9)
Lead wire nut	10	1.0	7.5	☞(Page 1I-9)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Starting Motor Components” (Page 1I-4)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A1908001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 1I-6) / ☞(Page 1I-7) / ☞(Page 1I-7) / ☞(Page 1I-8) / ☞(Page 1I-8) / ☞(Page 1I-8)

NOTE

Required service materials are also described in:
“Starting Motor Components” (Page 1I-4)

Charging System

Precautions

Precautions for Handling Battery

AENDL70A1A00001

⚠ WARNING

- **Battery produces hydrogen gas. Never expose battery to open flame or electric spark because hydrogen gas produced by battery is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics or painted surfaces as fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly.**
- **Batteries should always be kept out of reach of children.**

1) The battery is a very reliable component, but needs periodical attentions.
   - Keep battery carrier clean.
   - Prevent rust formation on the terminal posts.
   - Keep electrolyte up to upper level uniformly in all cells (If cell caps are equipped).
   - When keeping battery on vehicle over a long period of time, follow instructions given below.
     – Weekly, start the engine and run it until it reaches normal operating temperature with engine speed of 2,000 to 3,000 rpm. Check that all electric switches are turned off before storing the vehicle.
     – The battery discharges even if it is not used, while vehicles are stored. Battery electrolyte can freeze and battery case can crack in cold ambient condition if the battery is not properly charged.
2) Keep the battery cable connections clean.
   The cable connections, particularly at the positive (+) terminal post, tend to corrode. The corrosion or rust on the mating faces of conductors resists the flow of current.
   Clean the terminals and fittings periodically to check good metal-to-metal contact.
3) Periodically check the state of charge of battery. The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an instrument for measuring the specific gravity of the battery electrolyte. The specific gravity of the electrolyte is indicative of the state of charge. ☞(Page 1J-3)

General Description

Battery Description

AENDL70A1A01001

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking engine.
- It acts as a voltage stabilizer for the electrical system.
- It can, for a limited time, provide energy when the electrical load exceeds the output of generator.

Carrier and Hold-Down Clamp

The battery carrier should be in good condition so that it supports the battery securely and keeps it level. Before installing battery, the battery carrier and hold-down clamp should be clean and free from corrosion and check that there are no foreign matter in carrier.
To prevent battery from shaking in its carrier, the hold-down bolts should be tight enough but not over-tightened.

Electrolyte Freezing

The freezing point of electrolyte depends on its specific gravity. Since freezing may ruin a battery, it should be protected against freezing by keeping it in a fully charged condition. If a battery freezes accidentally, it should not be charged until it is warmed.

Sulfation

If battery is left for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. “Sulfation” means the result as well as the process of that reaction. Such a battery can be revived by very slow charging and may be restored to usable condition but its capacity is lower than before.

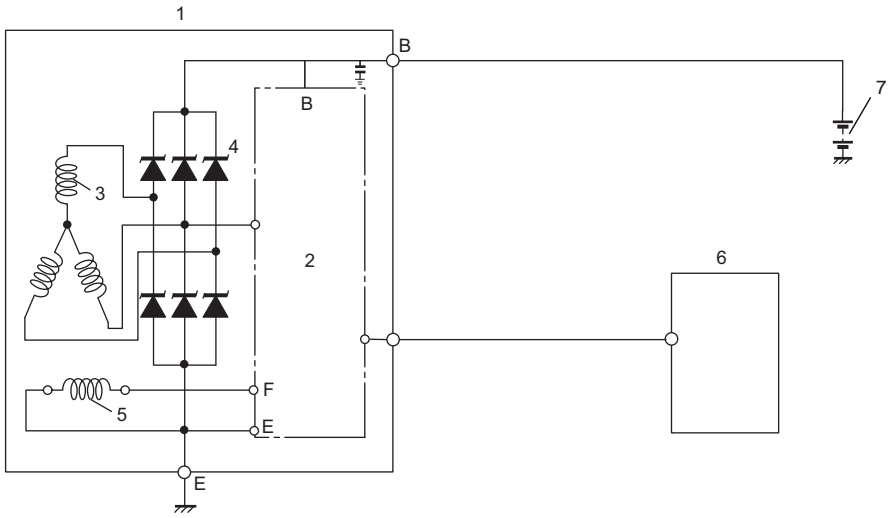
Generator Description

AENDL70A1A01002

The generator is of a small and high performance type with an IC regulator incorporated. The internal components are connected electrically as shown in figure.

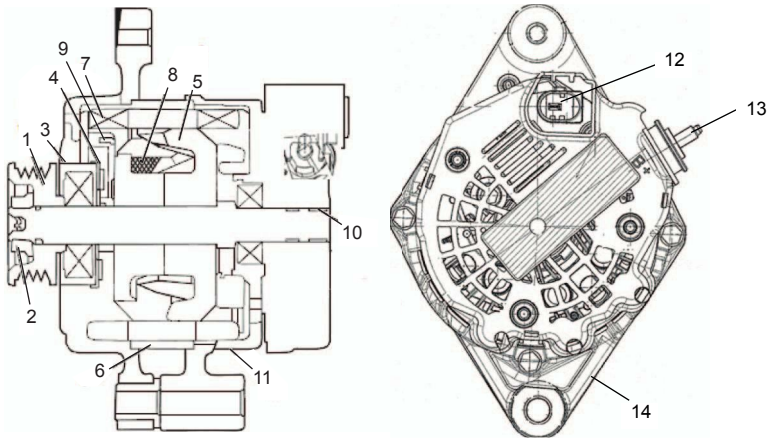
The generator features are as follows:

- Solid state regulator is mounted inside the generator.
- All regulator components are enclosed into a solid mold.
- This unit along with the brush holder assembly is attached to the rear end frame.
- The IC regulator uses integrated circuits and controls the voltage produced by the generator, and the voltage setting cannot be adjusted.
- The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions they will provide long period of attention-free service.
- The stator windings are assembled on the inside of a laminated core that forms part of the generator frame.



IDL70A1A0001-01

1. Generator	4. Zener diode	7. Battery
2. IC regulator	5. Field coil (rotor coil)	
3. Stator coil	6. ECM	



IDL70A1A0002-02

1. Pulley	5. Rotor	9. Slip ring	13. Generator output (B terminal)
2. Pulley nut	6. Stator	10. Brush	14. Ground
3. Drive frame	7. Stator coil	11. Rear end frame	
4. Retainer plate	8. Field coil	12. LIN terminal	

Diagnostic Information and Procedures

Battery Inspection

AENDL70A1A04001

Common Causes of Failure

Shown below are causes for the fall of battery function.

- Accessories left on overnight or for an extended period without the generator operating.
- Frequent driving at low speed for short periods.
- Electrical load exceeding generator output particularly with addition of aftermarket equipment.
- Defects in charging system. ☞(Page 1J-3)
- Battery abuse, including failure to keep battery cable terminals clean and tight or loose battery hold-down clamps.
- Mechanical problems in electrical system such as shorted or pinched wires.
- Deterioration of the battery due to long-term use or storage.

Visual Inspection

Check for obvious damage, such as cracked or broken case or cover, that could lead to loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

Generator Symptom Diagnosis

AENDL70A1A04002

Trouble in charging system will show up as one or more of the following conditions.

Charge Warning Light Operation

Condition	Possible cause	Correction / Reference Item
Charge warning light does not light with ignition ON and engine off	Blown fuse	*Replace fuse.*
	Faulty combination meter	*Replace combination meter. ☞(Page 9C-11)*
	Faulty ECM	*Check ECM. ☞(Page 1A-97)*
	Faulty wiring	*Repair wiring.*
	Faulty IC regulator	*Replace IC regulator. ☞(Page 1J-8)*
Charge warning light does not go out with engine running (battery requires frequent recharging)	Loose or worn generator drive belt	*Adjust or replace generator drive belt. ☞(Page 1J-5)*
	Faulty combination meter	*Replace combination meter. ☞(Page 9C-11)*
	Faulty wiring	*Repair or replace wiring.*
	Faulty generator	*Perform "Generator Test" (Page 1J-4) and replace faulty parts. ☞(Page 1J-8)*

Battery Charge Failure

Condition	Possible cause	Correction / Reference Item
Undercharged battery	Loose or worn generator drive belt	*Adjust or replace generator drive belt. ☞(Page 1J-5)*
	Loose or faulty battery terminal	*Tighten battery terminal or replace battery. ☞(Page 1J-5)*
	Faulty generator	*Perform "Generator Test" (Page 1J-4) and replace faulty parts. ☞(Page 1J-8)*
	Electric load (after market accessories) other than original equipment directly connected to battery	*Disconnect electrical load (after market accessories) other than original equipment. (for vehicle with electric load current sensor: See NOTE)*
Overcharged battery	Generator faulty	*Replace IC regulator. ☞(Page 1J-8)*

Noise

Condition	Possible cause	Correction / Reference Item
Noisy generator	Loose mounting bolts	*Tighten mounting bolts. ☞(Page 1J-6)*
	Dirty, worn and/or faulty bearings	*Clean or replace bearing. ☞(Page 1J-8)*
	Faulty rotor, diode and/or stator	*Repair or replace faulty parts. ☞(Page 1J-8)*

Generator Test

AENDL70A1A04003

This condition, as evidenced by slow cranking or low specific gravity can be caused by one or more of the following conditions even though charge warning light operates normally. The following procedure also applies to cars with voltmeter and ammeter.

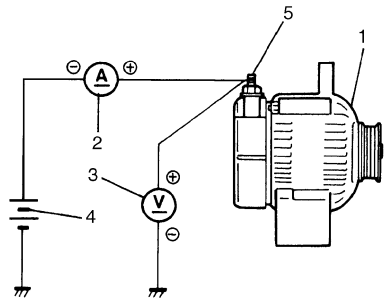
- Check that undercharged condition has not been caused by accessories left on for an extended period time.
- Check generator drive belt for proper tension.
- If battery defect is suspected, refer to “Battery Description” (Page 1J-1).
- Check wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor and ignition ground cable.

No-Load Check

1) Confirm that no DTC is detected. ☞(Page 1A-19)
2) Connect voltmeter and ammeter as shown in figure.

NOTE

Use fully charged battery.



I7V20A1A1003-01

1.	Generator
2.	Ammeter (between generator “B” terminal and battery (+) terminal)
3.	Voltmeter (between generator “B” terminal and ground)
4.	Battery
5.	“B” terminal

3) Run engine at 2,000 rpm with all electrical accessories turned off and read meters.

Specification for no-load check

- **Current: 10 A**
- **Voltage: 11.7 – 15.3 V (at 25 °C, 77 °F)**

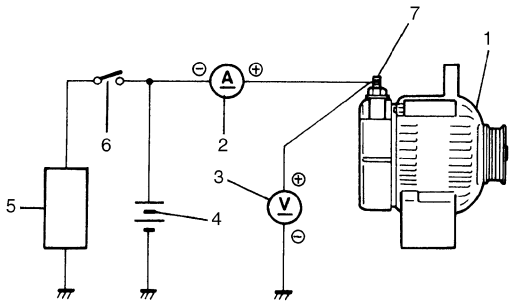
If voltage is higher than standard value, replace following parts.
IC regulator: ☞(Page 1J-8)
If voltage is lower than standard value, inspect rotor, stator, brush, bushing, rectifier and/or IC regulator. ☞(Page 1J-11)

Load Check

1) Confirm that no DTC is detected. ☞(Page 1A-19)
2) Connect voltmeter and ammeter as shown in figure.

NOTE

Use fully charged battery.



I8C50B1A0001-01

1.	Generator
2.	Ammeter (between generator “B” terminal and battery (+) terminal)
3.	Voltmeter (between generator “B” terminal and ground)
4.	Battery
5.	Load (head light and blower motor)
6.	Switch
7.	“B” terminal

3) Run engine at 2,000 rpm and turn on head light, and turn on blower motor at Max speed.
4) In this state, check that ammeter indicates more than 20 A. If not, inspect rotor, stator, brush, bushing, rectifier and/or IC regulator. If found faulty, repair or replace them. ☞(Page 1J-11)

Repair Instructions

Jump Starting in Case of Emergency

AENDL70A1A06001

With Auxiliary (Booster) Battery

⚠ CAUTION

If vehicle has a catalytic converter, do not push or tow it to start. Damage to its emission system and/or to other parts may result.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow the procedure outlined as follows, being careful not to cause sparks.

⚠ WARNING

- **Departure from these conditions or procedure described as follows could result in:**
  - **– Serious personal injury (particularly to eyes) or property damage by battery explosion, battery acid or electrical burns.**
  - **– Damage to electronic components of vehicle.**
- **Remove rings, watches and other jewelry. Be sure to wear approved eye protector.**
- **Be careful so that metal tools or jumper cables do not contact positive (+) battery terminal (or metal in contact with it) and any other metal on vehicle, because a short circuit could occur.**
- **Do not connect negative (-) directly to negative (-) terminal.**

1) Set parking brake and place gear shift lever in "NEUTRAL" position. Turn off ignition switch, lights and all other electrical loads.
2) Check electrolyte level. If it is below low level line, add distilled water.
3) Attach end of one jumper cable to positive terminal of booster battery and other end of same cable to positive terminal of discharged battery (Use 12-volt battery only to jump start engine).
4) Attach one end of the remaining negative (-) cable to negative (-) terminal of booster battery, and other end to solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.
5) Start engine with booster battery and turn off electrical accessories. Then start engine with discharged battery.
6) Disconnect jumper cables in exact reverse order.

With Charging Equipment

⚠ CAUTION

When jump starting engine with charging equipment, check that the equipment uses 12-volt and negative (-) ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.

Battery Removal and Installation

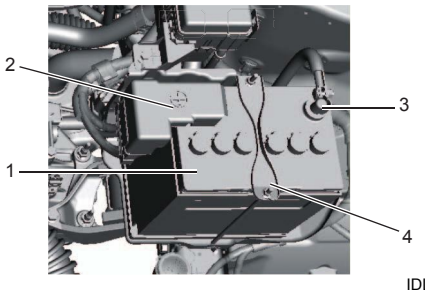
AENDL70A1A06002

⚠ WARNING

- **Hydrogen gas is produced by battery. A flame or spark near battery may cause the gas to ignite.**
- **Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately.**

Removal

1) Disconnect negative (–) cable (3).
2) Disconnect positive (+) cable (2).
3) Remove retainer (4).
4) Remove battery (1).



IDL70A1A0003-02

Installation

Reverse removal procedure noting the following.

- Tighten battery cables securely.

NOTE

Check that ground cable end and positive cable end are inserted up to the bottom of the terminals, and then tighten terminal nuts.

Water Pump / Generator Drive Belt Tension Inspection and Adjustment

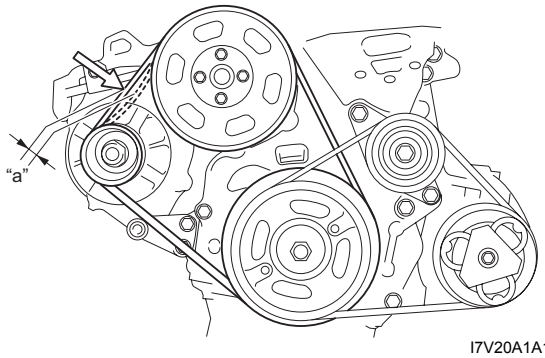
AENDL70A1A06003

⚠ WARNING

- **Disconnect negative (–) cable at battery before checking and adjusting belt tension.**
- **To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

1) Check belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to "Water Pump / Generator Drive Belt Removal and Installation" (Page 1J-6).
2) Check belt for tension. Belt is in proper tension when it deflects as follows under thumb pressure (about 100 N (98.07 kgf, 22.05 lbf).).
   If belt tension is out of specification, go to next steps.

Water pump / generator drive belt tension “a”
Existing belt: 4.0 – 4.5 mm (0.16 – 0.18 in.) as deflection / 100 N (10.2 kgf, 22.5 lbf)
New belt: 3.0 – 3.5 mm (0.12 – 0.14 in.) as deflection / 100 N (10.2 kgf, 22.5 lbf)

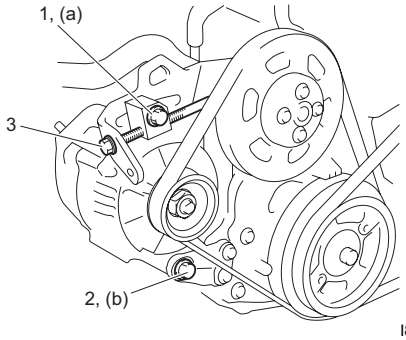


I7V20A1A1006-01

3) Loosen generator bolt (1) and pivot bolt (2), and then adjust belt tension to specification described as in step 2) by loosening / tightening generator adjusting bolt (3).
4) Tighten generator bolt and pivot bolt to specified torque.

Tightening torque
Generator bolt (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
Generator pivot bolt (b): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)

5) Check belt tension for specification after turning crankshaft two revolutions clockwise.



I8C50A1A0006-01

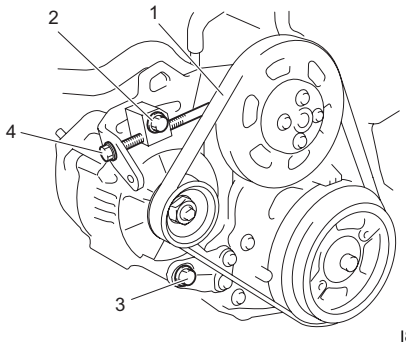
6) Connect negative (–) cable at battery.

Water Pump / Generator Drive Belt Removal and Installation

AENDL70A1A06004

Removal

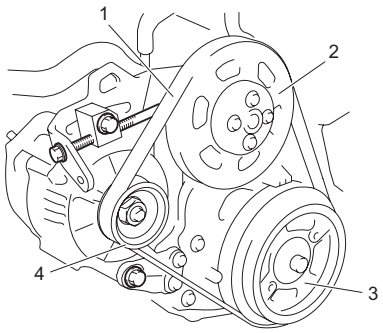
1) Disconnect negative (–) cable at battery.
2) Remove compressor drive belt before removing water pump / generator drive belt (1). ☞(Page 7B-37)
3) Loosen generator bolt (2) and generator pivot bolt (3).
4) Loosen generator adjusting bolt (4), and then remove water pump / generator drive belt.



I8C50A1A0005-01

Installation

1) Install water pump / generator drive belt (1) to water pump pulley (2), crankshaft pulley (3) and generator pulley (4).
2) Adjust belt tension. ☞(Page 1J-5)
3) Install compressor drive belt. ☞(Page 7B-37)



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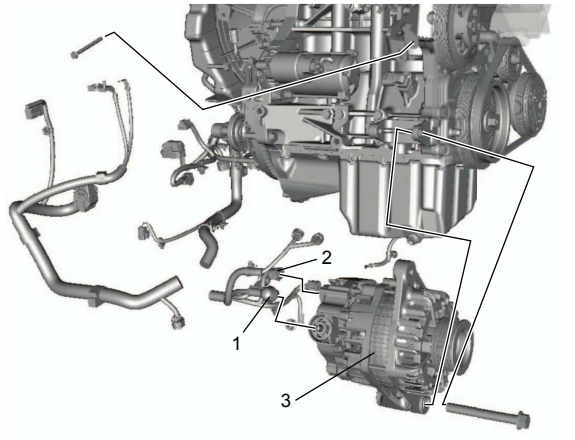
4) Connect negative (–) cable at battery.

Generator Removal and Installation

AENDL70A1A06005

Removal

1) Disconnect negative (–) cable at battery.
2) Remove intake manifold. ☞(Page 1D-7)
3) Remove right engine undercover.
4) Remove generator drive belt. ☞(Page 1J-6)
5) Disconnect “B” terminal wire (1) and connector (2) from generator (3).
6) Remove generator.



IDL70A1A0015-03

Installation

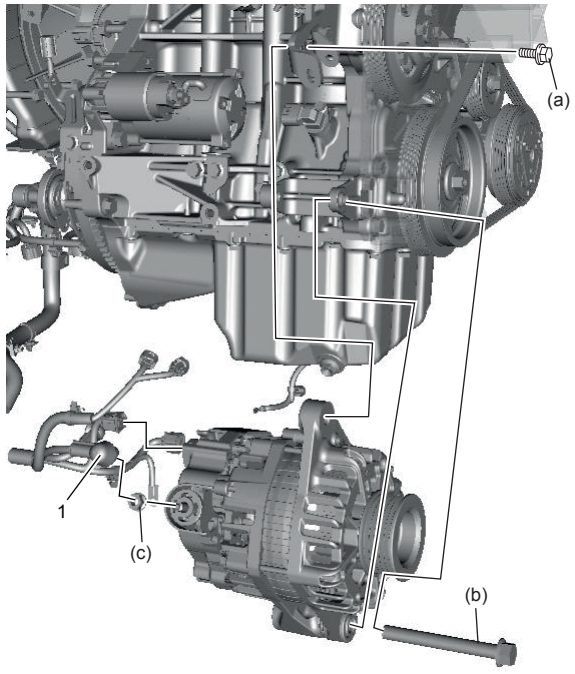
Reverse removal procedure noting the following points.

- Tighten generator bolt and generator pivot bolt to specified torque.

  Tightening torque
  Generator bolt (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
  Generator pivot bolt (b): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)

- Connect “B” terminal wire (1) to generator as shown in figure, and tighten “B” terminal nut to specified torque.

  Tightening torque
  “B” terminal nut (c): 7.9 N·m (0.81 kgf-m, 6.0 lbf-ft)



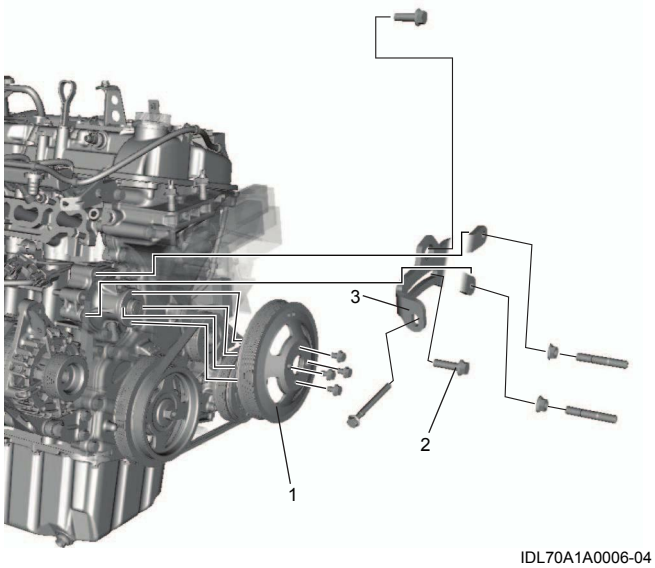
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Generator Bracket Removal and Installation

AENDL70A1A06006

Removal

1) Disconnect negative (–) cable at battery.
2) Remove right engine undercover.
3) Remove water pump / generator drive belt. ☞(Page 1J-6)
4) Remove water pump pulley (1). ☞(Page 1F-13)
5) Remove generator bolt (2).
6) Remove generator bracket (3).

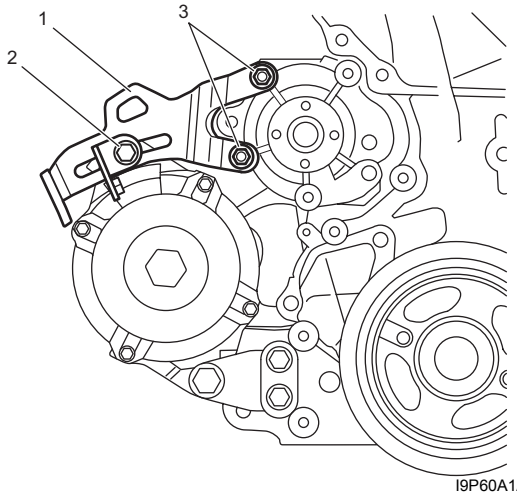


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Installation

Reverse removal procedure noting the following point.

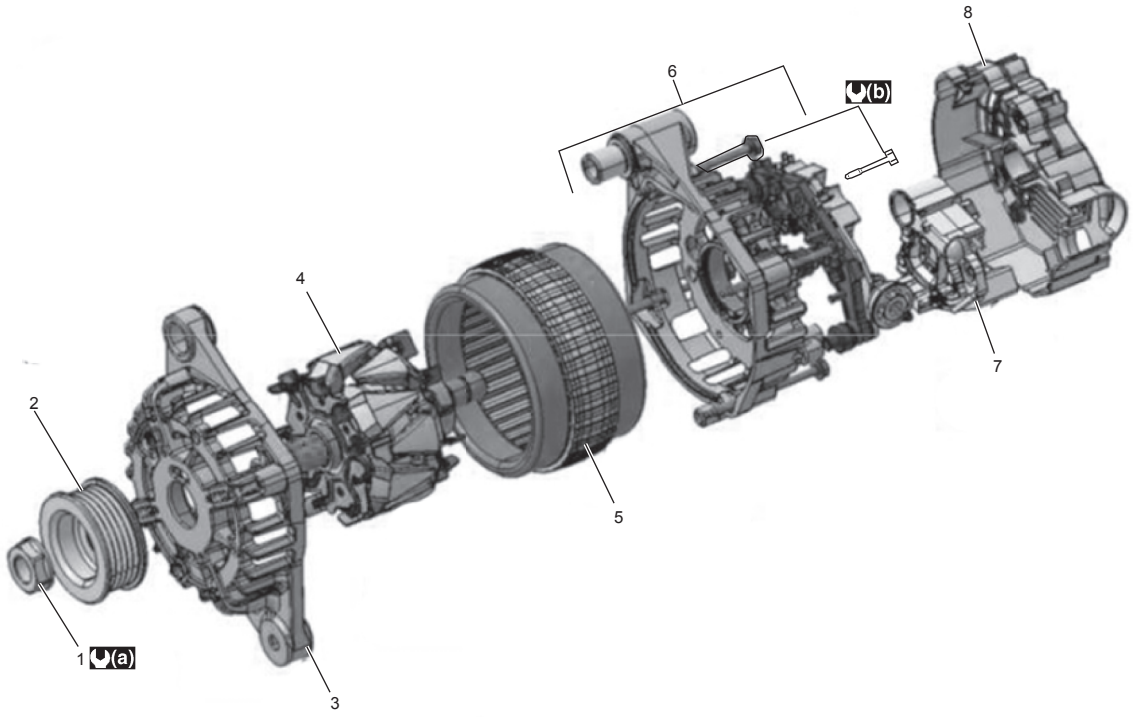
- Install generator bracket in the following procedure.
  a. Position the generator bracket (1).
  b. Loosely tighten generator bolt (2).
  c. Tighten generator bracket nuts (3) to specified torque. ☞(Page 1F-13)



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Generator Components

AENDL70A1A06007



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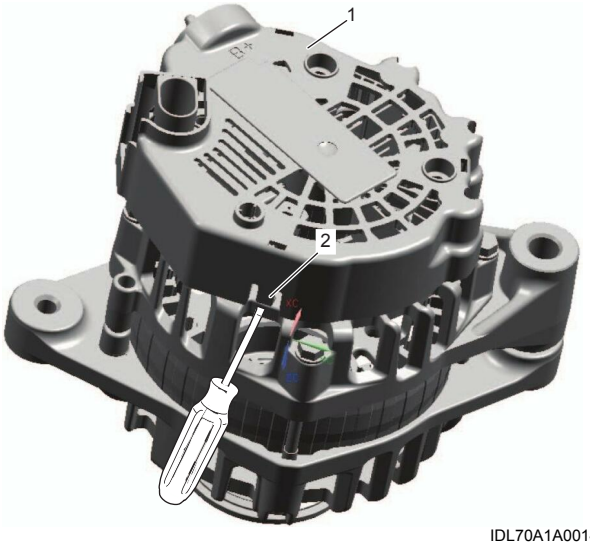
1. Pulley nut	4. Rotor assembly	7. Regulator assembly	(b) : 5.0 N·m (0.51 kgf-m, 0.07 lbf-ft)
2. Pulley	5. Stator assembly	8. Rear end cover	
3. Front bracket	6. Rectifier assembly	(a) : 82.0 N·m (8.37 kgf-m, 1.12 lbf-ft)	

Generator Disassembly and Reassembly

AENDL70A1A06009

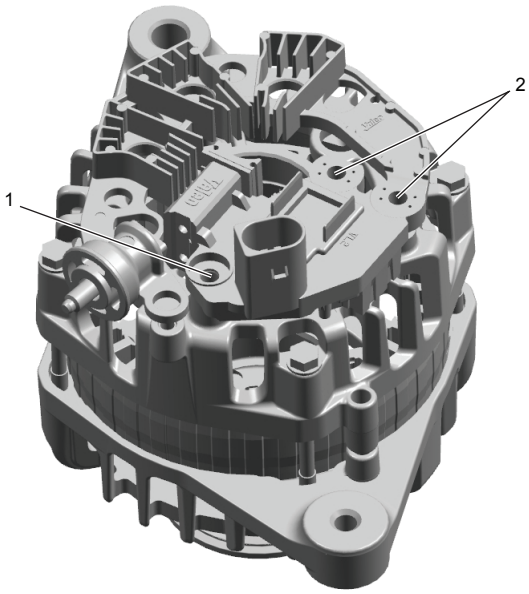
Disassembly

1) Remove rear end cover (1) by pry opening lugs (2) as shown in figure:



IDL70A1A0014-02

2) Remove stud (1) and bolts (2) as shown and remove regulator assembly.



IDL70A1A0011-03

NOTE

These screws are different in type. When assembling, fit them to original position.

3) Remove rear end frame (with rectifier) as follows:

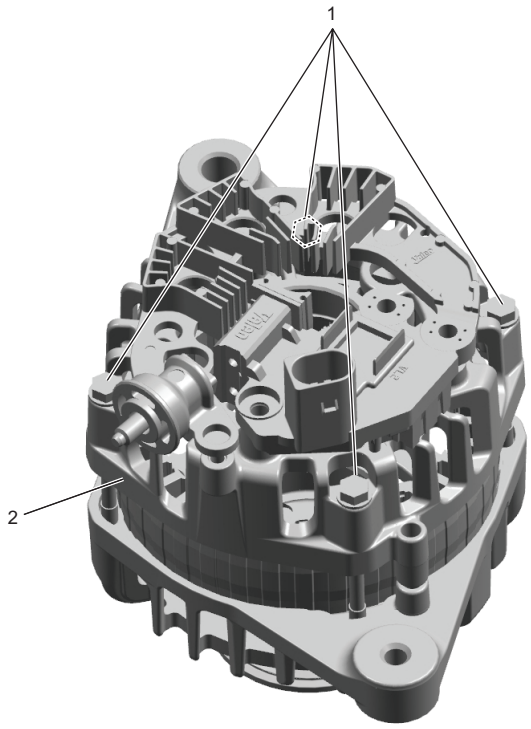
NOTE

Do not remove rectifier assembly and regulator from stator.

a) Remove through bolts (1) and drive out rear end frame (2) with rotor by tapping shaft lightly using plastic hammer.
b) Separate rear end frame from rotor evenly by using plastic hammer.

⚠ CAUTION

Do not hit shaft at slip ring side when separating rotor and rear end frame.

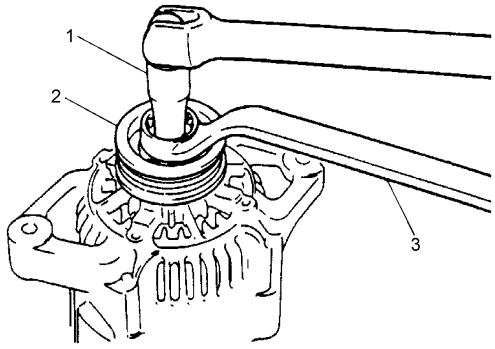


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4) Hold shaft by using hexagonal box wrench (1), remove pulley nut, and then pull out pulley (2).

⚠ CAUTION

- **To hold shaft, use a hexagonal box wrench (3). A 12-point box wrench may cause slipping and consequential shaft or tool damage.**
- **Do not attempt to hold pulley by using vise or pipe wrench so as not to distort it.**



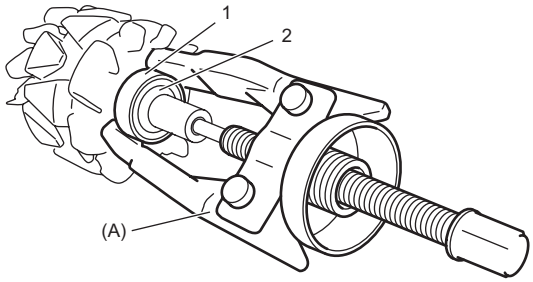
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5) Remove rear end bearing (1) and bearing cover (2) by using special tool, if necessary.

⚠ CAUTION

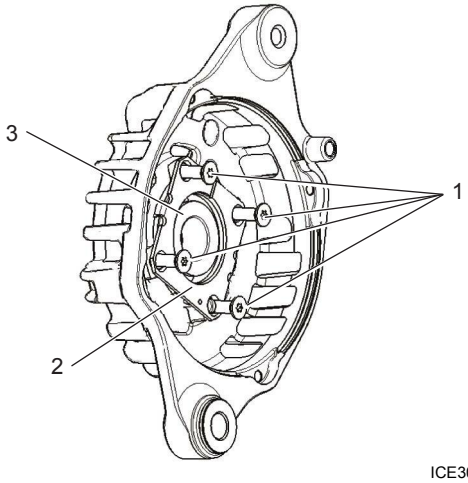
- **Do not distort cooling fan blade while applying puller.**
- **Be sure to use new bearing. Otherwise, bearing may damage.**

Special tool
(A): 09913M66710



ICE30A1A0009-01

6) Remove screws (1), retainer plate (2) and then drive out drive end bearing (3), if necessary.



ICE30A1A0061-01

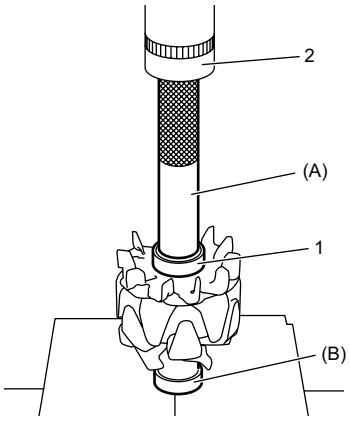
Reassembly

1) Install new rear end bearing (1) and bearing covers using special tools and hydraulic press (2), if removed.

⚠ CAUTION

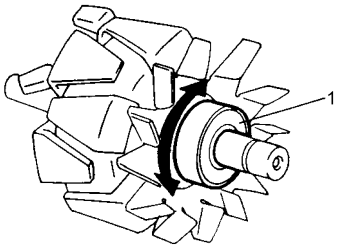
- **Do not push the outer race of bearing while installing it.**
- **Do not reuse rear end bearing.**

Special tool
(A): 09925M96710
(B): 09924M74590



ICE30A1A0011-01

2) Check that rear end bearing (1) turns smoothly.



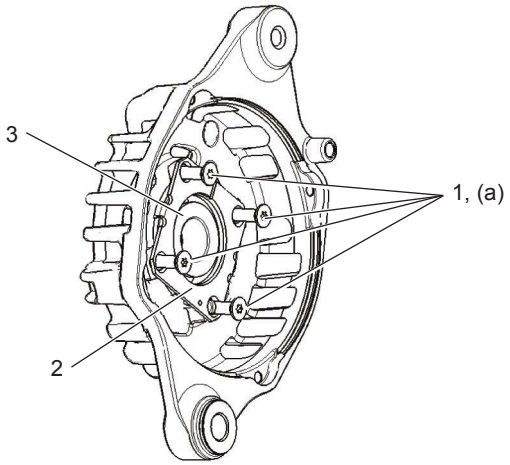
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3) Install drive end bearing (3), if removed.
Install retainer plate (2) and tighten screws (1) to specified torque.

⚠ CAUTION

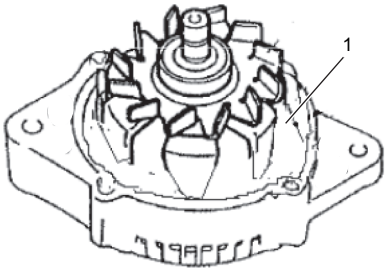
Do not push the inner race of bearing when installing.

Tightening torque
Bearing retainer screw (a): 4.5 N·m (0.5 kgf-m, 3.3 lbf-ft)



ICE30A1A0062-01

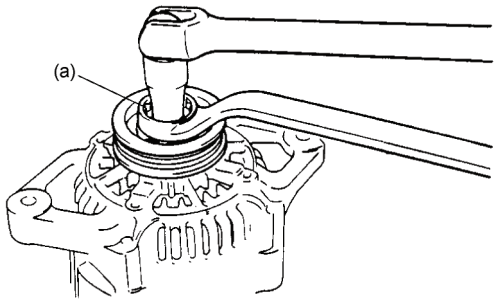
4) Check that drive end bearing turns smoothly.
5) Install pulley as follows:
   a) Install rotor (1) to drive end frame.



ICE30A1A0064-01

   b) Install pulley to rotor.
   c) Tighten pulley nut to specified torque holding shaft and using hexagonal box wrench.

Tightening torque
Pulley nut (a): 82 N·m (8.37 kgf-m, 1.12 lbf-ft)



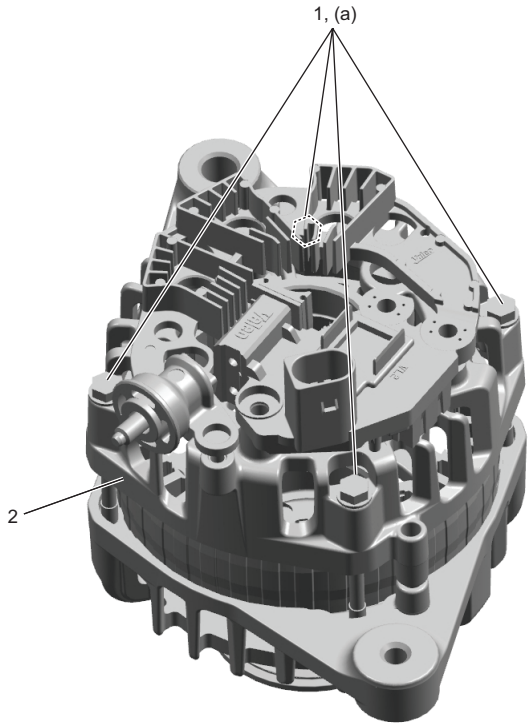
ICE30A1A0014-01

6) Install rear end frame (2) to drive end frame and tighten through bolt (1) to specified torque.

⚠ CAUTION

When installing rear frame assembly, check that stator leads have enough clearance with cooling fan blades.

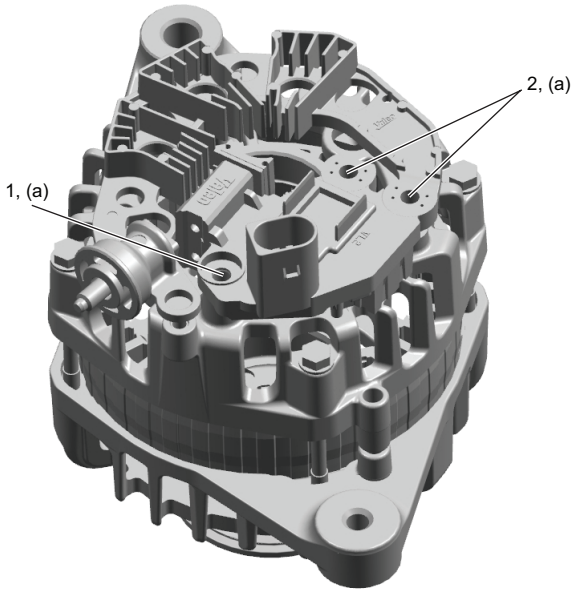
Tightening torque
Bolt (a): 5.0 N·m (0.5 kgf-m, 3.7 lbf-ft)



IDL70A1A0022-01

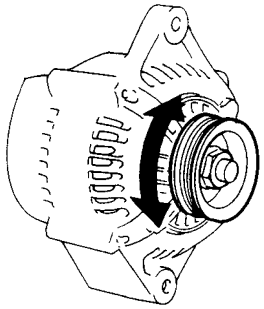
7) Install regulator assembly and tighten stud (1) and bolts (2) to specified torque.

Tightening torque
Brush holder screw (a): 1.8 N·m (0.17 kgf-m, 1.3 lbf-ft)



IDL70A1A0020-01

8) Install rear end cover by fixing lugs.
9) Check that rotor turns smoothly.



I8C50A1A0027-01

Generator Inspection

AENDL70A1A06011

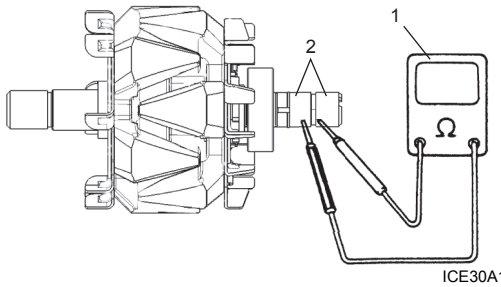
NOTE

Clean slip ring surface with fine piece of cloth and check that the surface is smooth.

Rotor

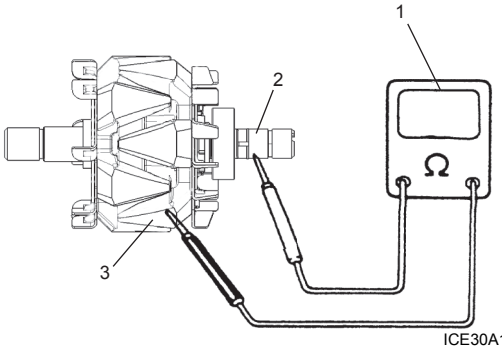
1) Using ohmmeter (1), check for continuity between slip rings (2) of rotor. If there is no continuity, replace rotor.

Standard resistance between slip rings of rotor
Approx. 2.2 Ω at 20 – 25 °C (68 °F – 77 °F)



ICE30A1A0052-01

2) Using ohmmeter (1), check that there is no continuity between slip ring (2) and rotor core (3). If there is continuity, replace rotor.



ICE30A1A0053-01

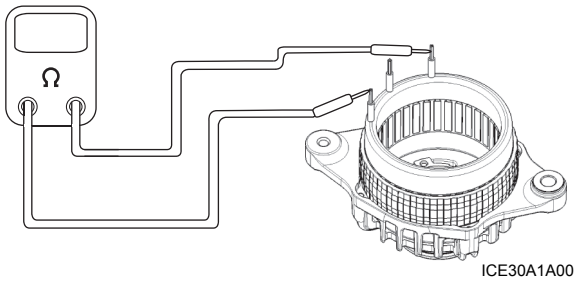
3) Check slip rings for roughness or scoring. If they are rough or scored, replace rotor.

Bearing

Check bearing for smooth rotation.
If abnormality is found, replace it.

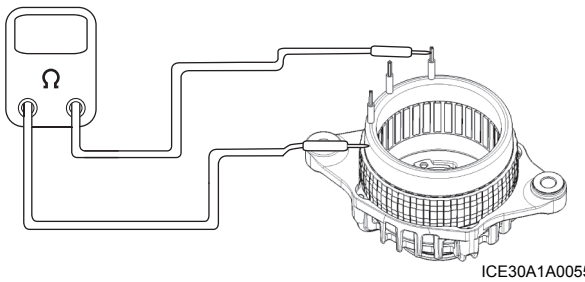
Stator

1) Using ohmmeter, check all leads for continuity. If there is no continuity, replace stator.



ICE30A1A0054-01

2) Using ohmmeter, check that there is no continuity between coil leads and stator core. If there is continuity, replace stator.



ICE30A1A0055-01

Brush

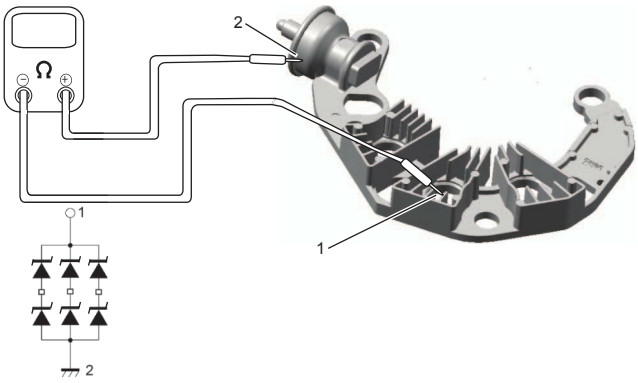
Check each brush for wear by measuring its length as shown. If brush is found worn, replace regulator assembly.

Rectifier

NOTE

Initially cut stator wire and regulator terminal from rectifier.

1) Using ohmmeter, connect one tester probe to B terminal (2) and the other to each rectifier terminal (1).



IDL70A1A0013-01

2) Reverse the polarity of tester probes and repeat step 1).
3) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace rectifier holder.
4) Using ohmmeter, connect one tester probe to each negative (-) terminal and the other to each rectifier terminal.
5) Reverse the polarity of tester probes and repeat step 4).
6) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace rectifier holder.

Specifications

Charging System Specifications

AENDL70A1A07001

Battery

Battery specification
: 34B20LMF(33AH/20HR, 27AH/5HR), 12 V

Generator

Type	70 A, LIN.
Rated voltage	12 V
Nominal output	70 A
Permissible max. speed	18,000 rpm
No-load speed	1,200 rpm
Regulated voltage	13.9 V at 25 °C (77 °F)
Permissible ambient temperature	–30 to 120 °C (–22 to 248°F)
Polarity	Negative ground
Rotation	Clockwise viewed from pulley side

Tightening Torque Specifications

AENDL70A1A07002

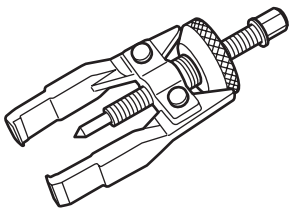
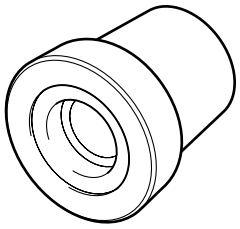
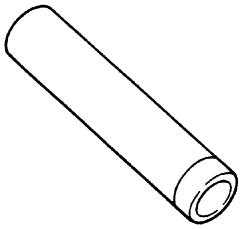
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Generator bolt	25	2.5	18.5	☞(Page 1J-6) / ☞(Page 1J-7)
Generator pivot bolt	45	4.6	33.5	☞(Page 1J-6) / ☞(Page 1J-7)
“B” terminal nut	7.9	0.81	6.0	☞(Page 1J-7)
Bearing retainer screw	4.5	0.5	3.3	☞(Page 1J-10)
Pulley nut	82	8.37	1.12	☞(Page 1J-10)
Bolt	5.0	0.5	3.7	☞(Page 1J-10)
Brush holder screw	1.8	0.17	1.3	☞(Page 1J-11)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Generator Components” (Page 1J-8)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Special Tool

AENDL70A1A08001

09913M66710 Bearing puller ☞(Page 1J-9)		09924M74590 Input shaft oil seal installer attachment ☞(Page 1J-10)	
09925M96710 Bearing installer ☞(Page 1J-10)			

Exhaust System

General Description

Exhaust System Description

AENDL70A1B01001

The exhaust system consists of exhaust manifold, TWC (three-way catalytic converter) in the exhaust manifold, exhaust pipes, a muffler, seals, gaskets, etc.
The TWC can reduce HC (hydrocarbon), CO (carbon monoxide) and NOx (oxides of nitrogen) in exhaust gases simultaneously.

Diagnostic Information and Procedures

Exhaust System Check

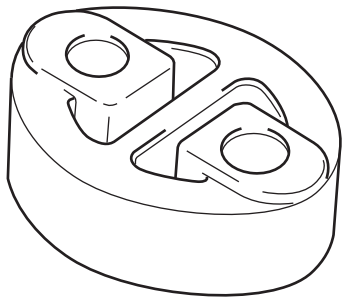
AENDL70A1B04001

⚠ WARNING

To avoid getting burned, do not work on exhaust system when it is hot. Exhaust system must be completely cool before beginning any service on it.

At every periodical vehicle inspection, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.



I8C50B1B0001-01

- Check distortion of exhaust manifold seating surface of cylinder head.
- Check exhaust system for exhaust fume leakage, loose connection, dent and damage.
- If bolts or nuts are loosened, tighten bolts and nuts to specified torque.
- Check any damages, holes or cracks which may permit exhaust fumes to enter the vehicle.
- Check that exhaust system components have enough clearance from underbody components to avoid overheating and possible damage to these components.
- Any defect should be fixed at once whenever it is found.

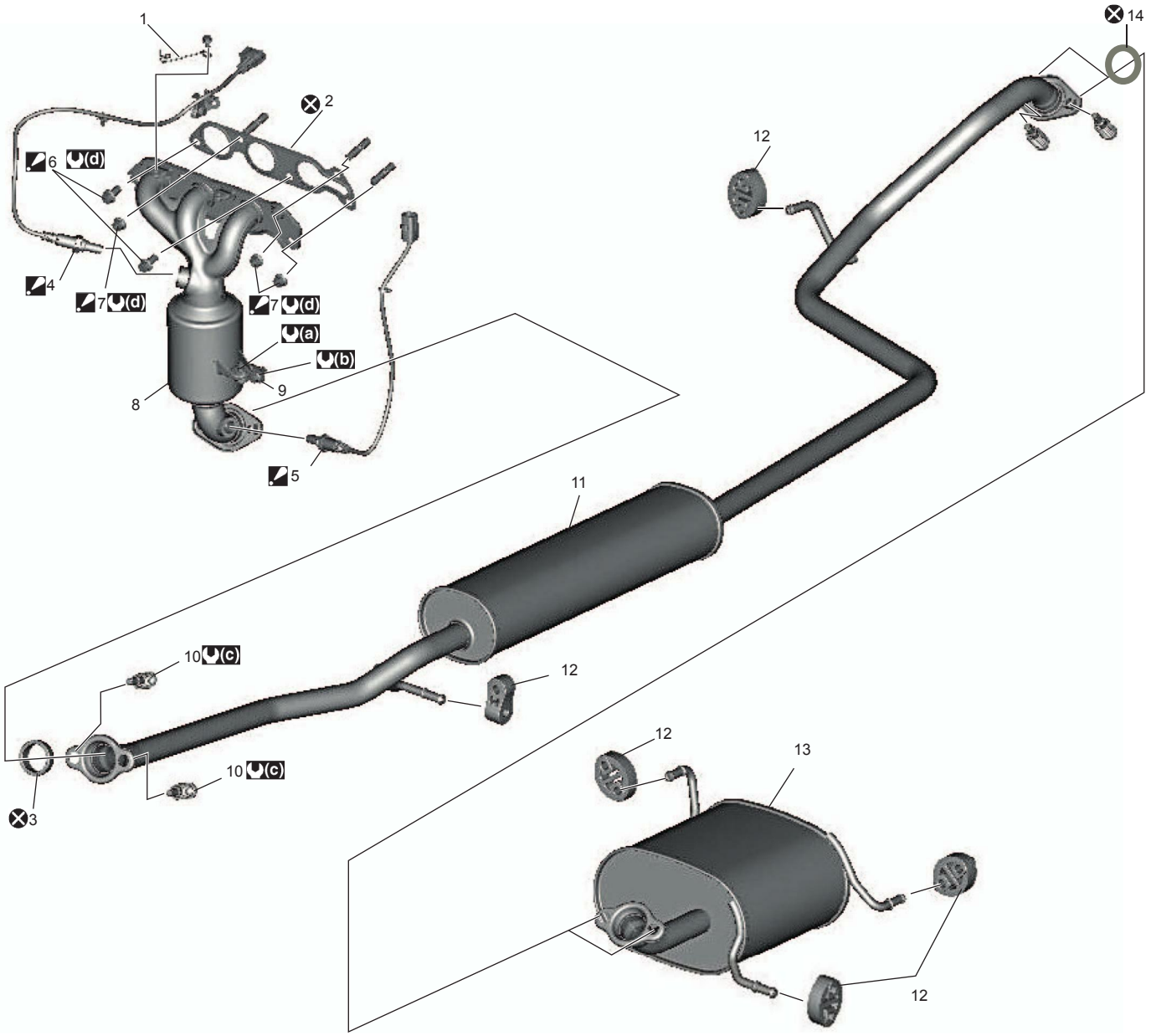
Repair Instructions

Exhaust System Components

AENDL70A1B06001

⚠ WARNING

To avoid getting burned, do not work on exhaust system when it is hot. Exhaust system must be completely cool before beginning any service on it.



IDL70A1B0001-02

1. Sensor clamp	8. Exhaust manifold	(a) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
2. Exhaust manifold gasket	9. Exhaust manifold stiffener	(b) : 35 N·m (3.6 kgf-m, 26.0 lbf-ft)
3. Seal ring	10. Exhaust pipe spring	(c) : 43 N·m (4.4 kgf-m, 32.0 lbf-ft)
4. HO2S-1 : For tightening torque, refer to “HO2S-1 and O2S-2 Removal and Installation” in Section 1C (Page 1C-7).	11. Exhaust pipe	(d) : 60 N·m (6.1 kgf-m, 44.5 lbf-ft)
5. O2S-2 : For tightening torque, refer to “HO2S-1 and O2S-2 Removal and Installation” in Section 1C (Page 1C-7).	12. Mounting	: Do not reuse.
6. Exhaust manifold bolt : For tightening order, refer to “Exhaust Manifold Removal and Installation” (Page 1K-3).	13. Muffler	
7. Exhaust manifold nut : For tightening order, refer to “Exhaust Manifold Removal and Installation” (Page 1K-3).	14. Gasket	

Exhaust Manifold Removal and Installation

AENDL70A1B06002

Removal

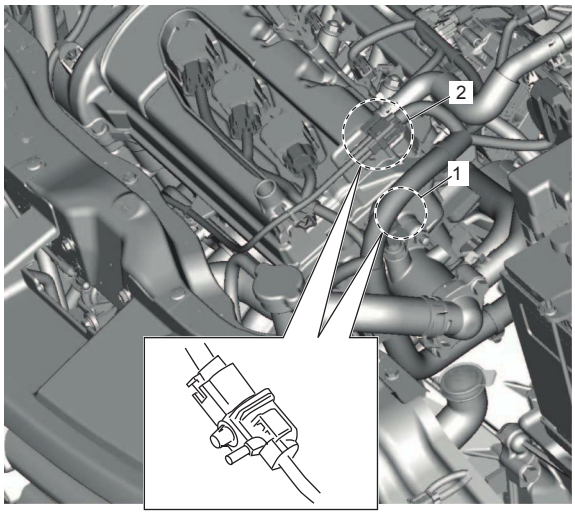
⚠ WARNING

To avoid getting burned, do not work on exhaust system when it is hot. Exhaust system must be completely cool before beginning any service on it.

⚠ CAUTION

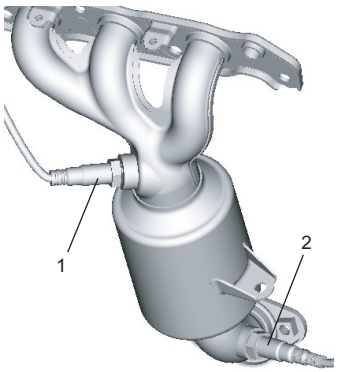
Exhaust manifold has three-way catalytic converter which reduces harmful exhaust emissions.
Be careful not to drop exhaust manifold. If it is dropped, inside catalytic converter may be damaged on impact.

1) Turn off ignition switch.
2) Remove engine front cover.
3) Disconnect HO2S-1 connector (2) and O2S-2 connector (1) and then detach connector and lead wire.



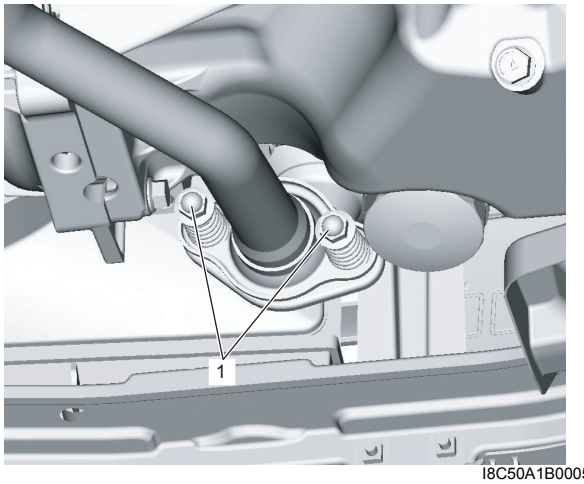
IDL70A1B0002-01

4) Remove HO2S-1 (1) and O2S-2 (2) if necessary.



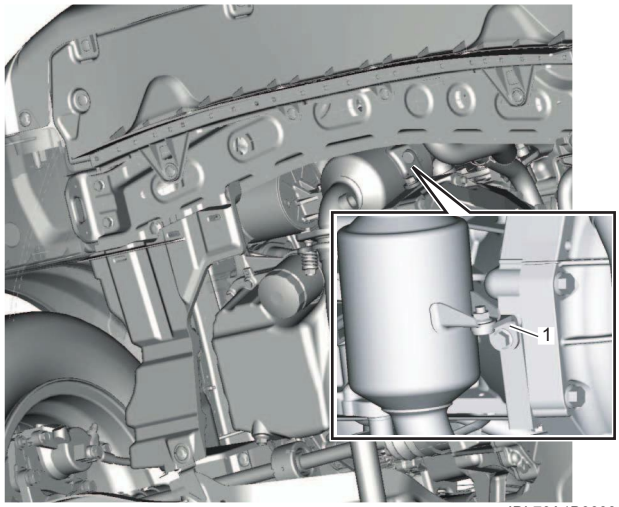
IBC50A1B0002-01

5) Remove exhaust pipe bolts (1).



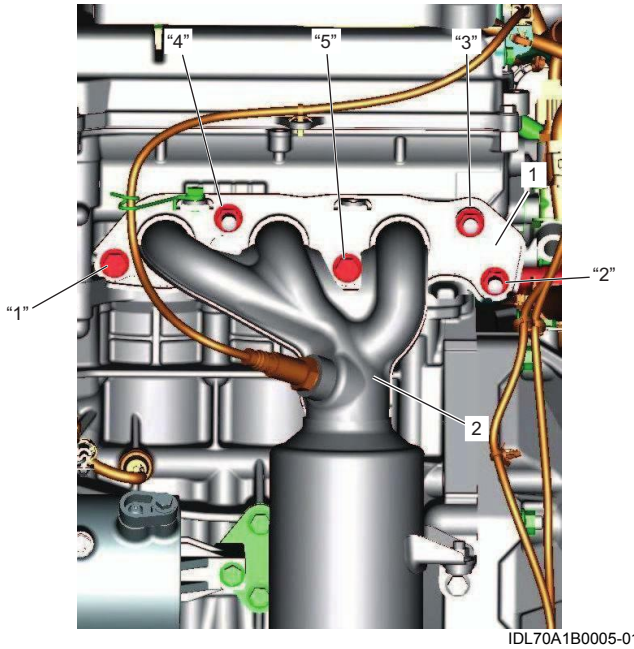
I8C50A1B0005-01

6) Remove exhaust manifold stiffener (1).



IDL70A1B0003-01

7) Remove exhaust manifold (2) in sequence as shown below.

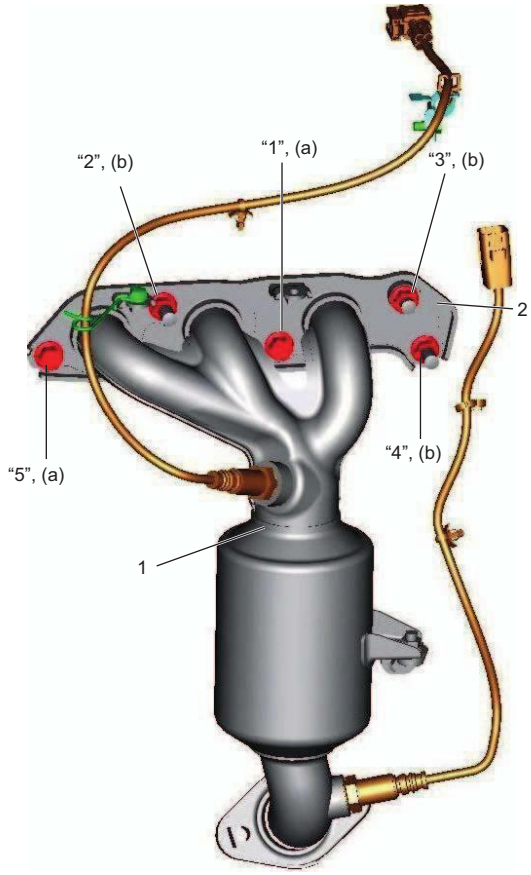


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Installation

1) Install exhaust manifold (1) with new gasket to cylinder head.
2) Retighten exhaust manifold bolts and nuts to specified torque.

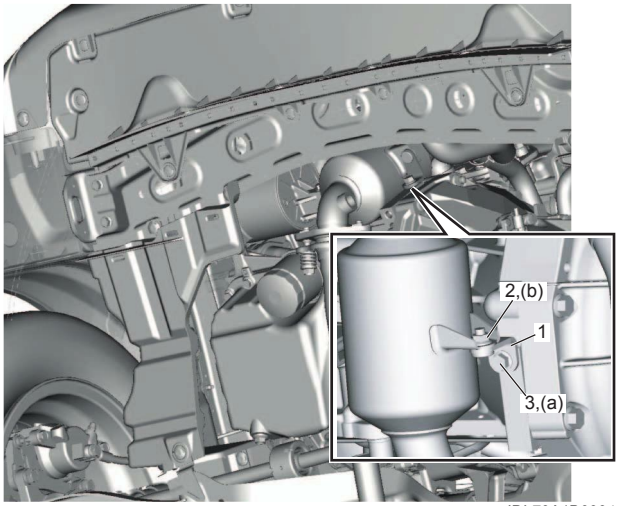
Tightening torque
Exhaust manifold bolt (a): 60 N·m (6.1 kgf-m, 44.5 lbf-ft)
Exhaust manifold nut (b): 60 N·m (6.1 kgf-m, 44.5 lbf-ft)



IDL70A1B0006-01

3) Install exhaust manifold stiffener (1), then tighten exhaust manifold stiffener nut (2) by hand.
4) Tighten exhaust manifold stiffener bolt (3) to specified torque, then tighten exhaust manifold nut (2) to specified torque.

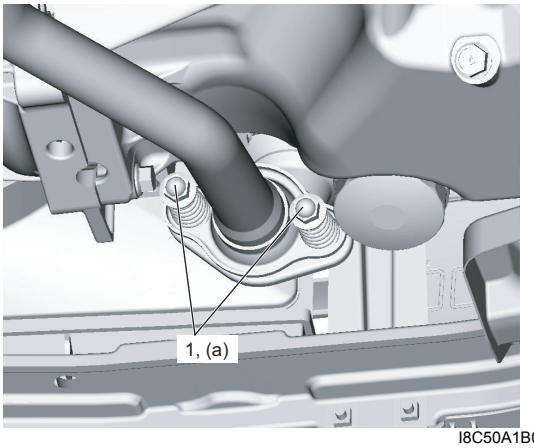
Tightening torque
Exhaust manifold stiffener bolt (a): 35 N·m (3.6 kgf-m, 26.0 lbf-ft)
Exhaust manifold stiffener nut (b): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



IDL70A1B0004-01

5) Tighten exhaust pipe bolts (1) to specified torque.

Tightening torque
Exhaust pipe bolt (a): 43 N·m (4.4 kgf-m, 32.0 lbf-ft)



I8C50A1B0010-01

6) Install HO2S-1 and O2S-2 to exhaust manifold if removed. ☞(Page 1C-7)
7) Connect HO2S-1 connector and O2S-2 connector.
8) Install engine front cover.
9) Run engine and check exhaust leaks.

Exhaust Pipe and Muffler Removal and Installation

AENDL70A1B06003

For replacement of exhaust pipe and muffler, refer to "Exhaust System Components" (Page 1K-1) and the following.

- Tighten bolts and nuts to specified torques when reassembling exhaust pipes and muffler. ☞(Page 1K-1)
- Run engine and check for exhaust leaks.

Specifications

Tightening Torque Specifications

AENDL70A1B07001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Exhaust manifold bolt	60	6.1	44.5	☞(Page 1K-4)
Exhaust manifold nut	60	6.1	44.5	☞(Page 1K-4)
Exhaust manifold stiffener bolt	35	3.6	26.0	☞(Page 1K-4)
Exhaust manifold stiffener nut	25	2.5	18.5	☞(Page 1K-4)
Exhaust pipe bolt	43	4.4	32.0	☞(Page 1K-4)

Reference:

For the tightening torques of fasteners not specified in this page, refer to:

“Exhaust System Components” (Page 1K-1)

“Fasteners Information” in Section 0A (Page 0A-5)

Section 2

Suspension

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Precautions

Precautions

Precautions on Suspension

AENDL70A2000001

Suspension Caution
Refer to “Suspension Caution” in Section 00 (Page 00-5).

Wheels and Tires Caution
Refer to “Wheel and Tire Caution” in Section 00 (Page 00-6).

General Precautions
Refer to “General Precautions” in Section 00 (Page 00-1).

Vehicle Lifting Points
Refer to “Vehicle Lifting Points” in Section 0A (Page 0A-7).

Fastener Caution
Refer to “Fastener Caution” in Section 00 (Page 00-5).

Fasteners Information
Refer to “Fasteners Information” in Section 0A (Page 0A-5).

Brake Caution
Refer to “Brake Caution” in Section 00 (Page 00-6).

Suspension General Diagnosis

Diagnostic Information and Procedures

Suspension, Wheel and Tire Symptom Diagnosis

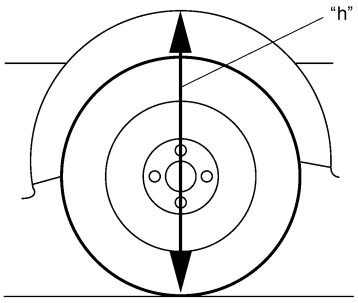
AENDL70A2104001

Condition	Possible cause	Correction / Reference Item
Vehicle pulls (Leads)	Mismatched or uneven tires	*Replace tires.*
	Tires not adequately inflated	*Adjust tire pressure.*
	Broken or sagging coil springs	*Replace coil springs.* • *Front: ☞(Page 2B-6)* • *Rear: ☞(Page 2C-4)*
	Radial tire abnormal lateral force	*Check and replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment. ☞(Page 2B-1)*
	Brake dragging in one road wheel	*Repair brake.*
	Loose, bent or broken front or rear suspension parts	*Tighten or replace related suspension parts.*
Excessive tire wear	Broken or sagging coil spring	*Replace coil springs.* • *Front: ☞(Page 2B-6)* • *Rear: ☞(Page 2C-4)*
	Wheel out of balance	*Adjust balance or replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment. ☞(Page 2B-1)*
	Faulty front strut assembly (shock absorber)	*Replace front strut assembly (shock absorber). ☞(Page 2B-4)*
	Hard driving	*Replace tires.*
	Overloaded vehicle	*Replace tires.*
	Not rotated tires	*Replace or rotate tires.*
	Worn or loose wheel bearing	*Replace wheel bearing. ☞(Page 3A-8)*
	Wheel or tire wobbles	*Replace wheel or tire.*
	Tires not adequately inflated	*Adjust tire pressure.*
Wheel tramp	Blister or bump on tire	*Replace tire.*
	Improper front strut assembly (shock absorber) action	*Replace front strut assembly (shock absorber). ☞(Page 2B-4)*
Shimmy, shake or vibration	Wheel out of balance	*Balance wheel or replace tire and/or wheel.*
	Loose wheel bearings	*Replace wheel bearings. ☞(Page 3A-8)*
	Worn tie-rod ends	*Replace tie-rod ends. ☞(Page 6C-25)*
	Worn suspension arm joints	*Replace suspension arm. ☞(Page 2B-8)*
	Excessive tire or wheel run-out	*Repair or replace wheel and/or tire.*
	Blister or bump on tire	*Replace tire.*
	Excessively loaded radial run-out of tire / wheel assembly	*Replace tire or wheel.*
	Disturbed wheel alignment	*Check and adjust wheel alignment. ☞(Page 2B-1)*
	Loose or worn steering linkage	*Tighten or replace steering linkage. ☞(Page 6A-2)*
	Loose steering gear case bolts	*Tighten steering gear case bolts. ☞(Page 6C-26)*

Condition	Possible cause	Correction / Reference Item
Abnormal noise, front end	Worn, sticky or loose tie-rod ends, suspension arm joints, tie-rod inside ball joints or drive shaft joints	*Replace tie-rod end, suspension arm, tie-rod or drive shaft joint.*
	Damaged front strut assembly or mountings	*Repair or replace front strut assembly or mountings. ☞(Page 2B-4)*
	Worn suspension arm bushings	*Replace suspension arm bushings. ☞(Page 2B-11)*
	Loose stabilizer bar	*Tighten bolts or nuts and/or replace bushings. ☞(Page 2B-12)*
	Loose wheel nuts	*Tighten wheel nuts. ☞(Page 2D-3)*
	Loose suspension bolts or nuts	*Tighten suspension bolts or nuts.*
	Broken or damaged wheel bearings	*Replace wheel bearings. ☞(Page 3A-8)*
	Broken coil springs	*Replace coil springs.* • *Front: ☞(Page 2B-6)* • *Rear: ☞(Page 2C-4)*
	Poorly lubricated or worn strut bearings	*Replace strut bearings. ☞(Page 2B-6)*
	Power steering system malfunction	*Check and correct malfunction. ☞(Page 6C-5)*
Low or uneven trim height See NOTE *1.	Broken or sagging coil springs	*Replace coil springs.* • *Front: ☞(Page 2B-6)* • *Rear: ☞(Page 2C-4)*
	Imbalanced loading or overloading	*Check loading.*
	Incorrect coil springs	*Replace coil springs.* • *Front: ☞(Page 2B-6)* • *Rear: ☞(Page 2C-4)*
	Tires not adequately inflated	*Adjust tire pressure.*
Too soft ride	Faulty front strut assembly (shock absorber)	*Replace front strut assembly (shock absorber). ☞(Page 2B-4)*
	Faulty rear shock absorber	*Replace rear shock absorber. ☞(Page 2C-2)*
Suspension bottoms	Overloading	*Check loading.*
	Faulty front strut assembly (shock absorber)	*Replace front strut assembly (shock absorber). ☞(Page 2B-4)*
	Faulty rear shock absorber	*Replace rear shock absorber. ☞(Page 2C-2)*
	Incorrect, broken or sagging coil springs	*Replace coil springs.* • *Front: ☞(Page 2B-6)* • *Rear: ☞(Page 2C-4)*
Body leans or sways in corners	Loose stabilizer bar	*Tighten stabilizer bar bolts or nuts, or replace bushings. ☞(Page 2B-12)*
	Faulty front strut assembly (shock absorber) or mounting	*Replace front strut assembly (shock absorber) or tighten mounting. ☞(Page 2B-4)*
	Faulty rear shock absorber	*Replace rear shock absorber. ☞(Page 2C-2)*
	Broken or sagging coil springs	*Replace coil springs.* • *Front: ☞(Page 2B-6)* • *Rear: ☞(Page 2C-4)*
	Overloading	*Check loading.*
Cupped tires	Disturbed wheel alignment	*Check and adjust wheel alignment. ☞(Page 2B-1)*
	Faulty front strut assembly (shock absorber)	*Replace front strut assembly (shock absorber). ☞(Page 2B-4)*
	Faulty rear shock absorber	*Replace rear shock absorber. ☞(Page 2C-2)*
	Worn wheel bearings	*Replace wheel bearings. ☞(Page 3A-8)*
	Excessive tire or wheel run-out	*Repair or replace tire and/or wheel.*
	Worn suspension arm joints	*Replace suspension arm. ☞(Page 2B-8)*
	Wheel out of balance	*Adjust balance or replace tire.*

NOTE

***1: Right-to-left trim height ("h") difference should be within 15 mm (0.6 in.) with curb weight. This applies to both front and rear axles.**



I8C50A210002-01

Repair Instructions

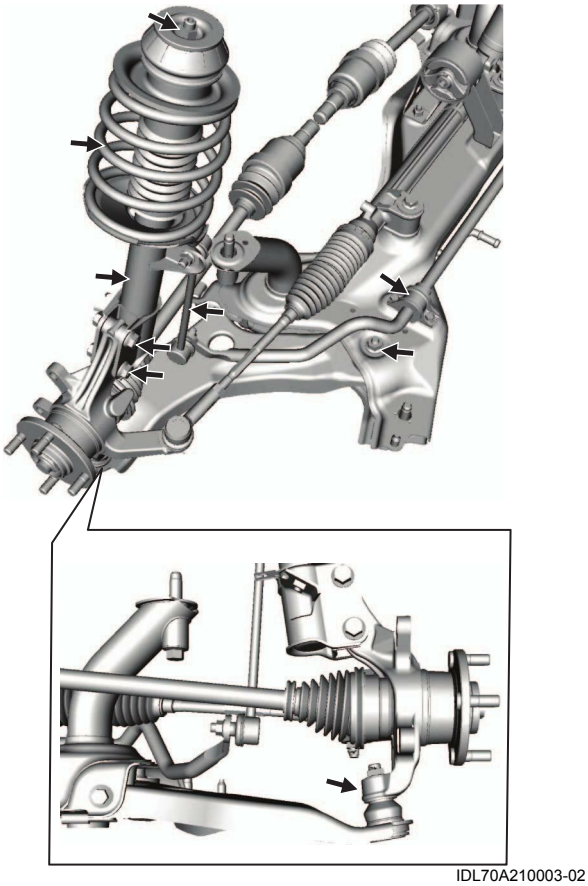
Suspension System Inspection

AENDL70A2106001

Hoist vehicle and check the following parts. Retighten, repair or replace with new one if necessary.

Front Suspension

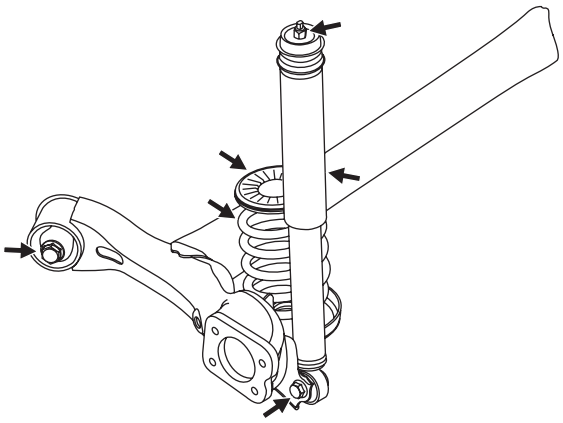
- Front suspension frame: ☞(Page 2B-15)
- Front suspension arm: ☞(Page 2B-9).
- Front strut assembly: ☞(Page 2B-7)
- Coil spring, strut bearing and strut support: ☞(Page 2B-7)
- Front stabilizer bar and joint: ☞(Page 2B-16)



IDL70A210003-02

Rear Suspension

- Rear axle: ☞(Page 2C-7)
- Rear shock absorber: ☞(Page 2C-4)
- Rear coil spring, spring lower seat and spring upper seat: ☞(Page 2C-5)



IDL70A210006-01

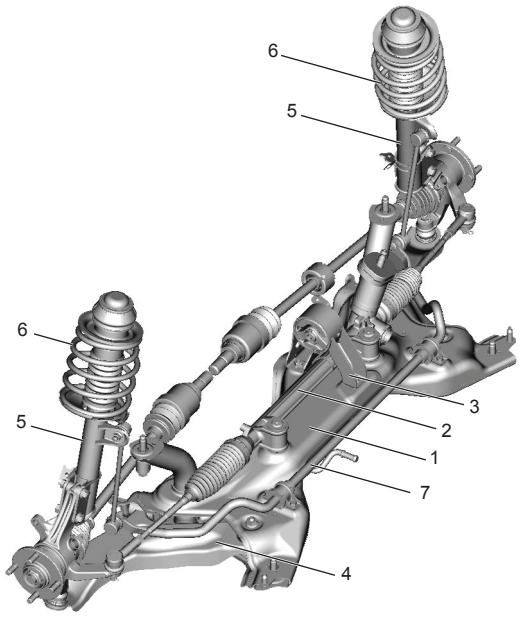
Front Suspension

General Description

Front Suspension Description

AENDL70A2201001

- Front suspension employs McPherson type strut and suspension frame (1).
- Steering gear case assembly (2), engine rear mounting (3) and suspension arm (4) are mounted on suspension frame to reduce vehicle vibration.
- Front strut assembly consists of front strut (5) of high-pressure gas sealed type and offset coil spring (6).
- All models employ stabilizer bar (7) to improve anti-roll performance of vehicle.



IDL70A220011-02

Front Wheel Alignment Construction

AENDL70A2201002

Among factors for front wheel alignment, only toe setting can be adjusted. Camber and caster cannot be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined. If body is damaged, it should be repaired. If suspension is damaged, it suspension should be replaced.

Repair Instructions

Front Wheel Alignment Inspection and Adjustment

AENDL70A2206001

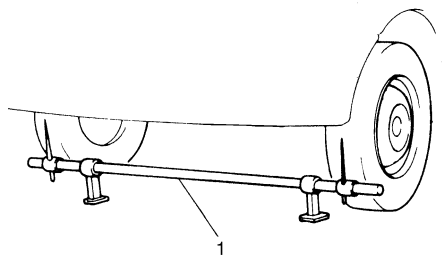
Preparation for Front Wheel Alignment Inspection and Adjustment

Perform the following items before inspecting and adjusting front wheel alignment.

- Check each tire as follows:
  - Check that tire is of specified size. Replace tire with correct one if necessary.
  - Check that tire is inflated correctly. Adjust pressure if necessary.
  - Check that tire does not have abnormal wear and is not worn more than the other tires. Replace tire with proper one if necessary.
  - Check that tire is of the same brand as the other tires. Replace tire with one of correct brand if necessary.
- Check that wheel bearing is not damaged. Replace wheel bearing if defective.
- Check wheel (with tire) for deflection. If necessary, repair or replace.
- Check if each suspension part is installed properly. If defective, repair or replace.
- Check that each suspension part is free from bend, dent, wear or damage.
- Place vehicle in non-loaded state on level surface.
- Set steering wheel in straight ahead position.
- Bounce vehicle up and down several times to stabilize suspension.
- Check that ground clearance at the right and left is almost the same.

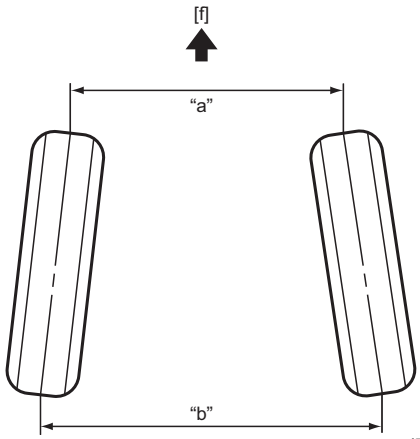
Toe Inspection

Measure toe with toe-in gauge (1).
If toe is not out of specification, adjust it at the tie-rod.



I6RS0C220007-01

Front toe (total) “b” – “a”
: IN 0 ± 1 mm (IN 0 ± 0.04 in.)



I7V10A220002-02

[f]: Forward

Toe Adjustment

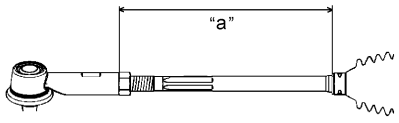
NOTICE

Check that rack boot is not twisted. Otherwise, rack boot may be broken.

NOTE

Never adjust only right or left side tie-rod. Adjust both tie-rods by same amount.

1) Loosen tie-rod end lock nuts.
2) Tighten or loosen right and left tie-rods by same amount to align toe to specification.
3) Check that length “a” of right and left tie-rods are equal. If they are not equal, readjust.



I7V10A220003-01

4) Tighten tie-rod end lock nuts to specified torque. ☞(Page 6C-24)

Reference Information

Side slip

Reference side slip when measured with side slip tester, is as follows.

Side slip (On one person)
: 0 to IN 3 mm/m (0 to IN 0.12 in./3.3 ft.)

If side slip differs greatly, front wheel alignment may be out of specification.

Toe angle

When checked front toe angle with total wheel alignment tester or the like, refer to the following specification.

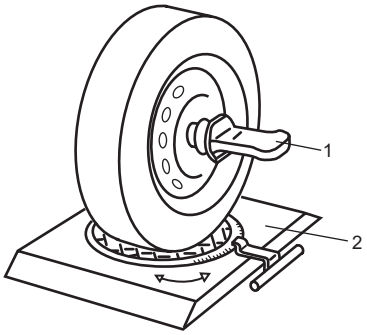
Front toe angle (Each wheel)
: OUT 0° 06’ ~ IN 0° 06’

If front toe angle is out of specification, adjust it at the tie-rod.

Camber, Caster and Kingpin Inclination Angle Inspection

Check camber, caster and kingpin inclination angle by camber caster kingpin gauge (1) and turning radius gauge (2). If measured value is out of specification, check the following items for damage, deformation and crack. If defective is found, repair or replace defective item.

- Strut assembly and component
- Suspension arm and bushing
- Front suspension frame
- Front wheel hub, steering knuckle or wheel bearing
- Vehicle body



I7RS0A220003-01

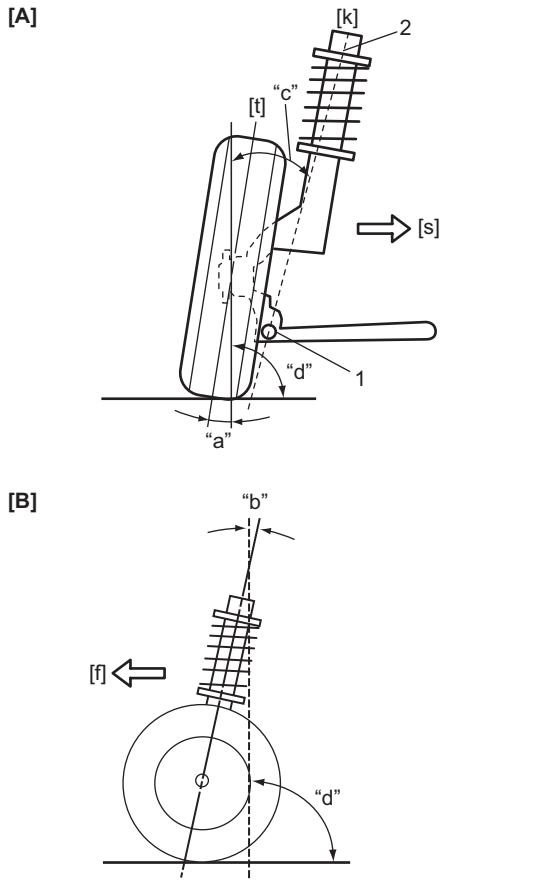
Front camber “a”
155/80R13: 0° 30’
165/70R14: 0° 18’

Front caster “b”
155/80R13: 3° 14’
165/70R14: 3° 17’

Front kingpin inclination angle “c”
155/80R13: 12° 03’
165/70R14: 12° 14’

NOTE

Camber, caster and kingpin inclination angle are not adjustable. If they are out of specification, repair vehicle body or replace related part.



I7V10A220004-02

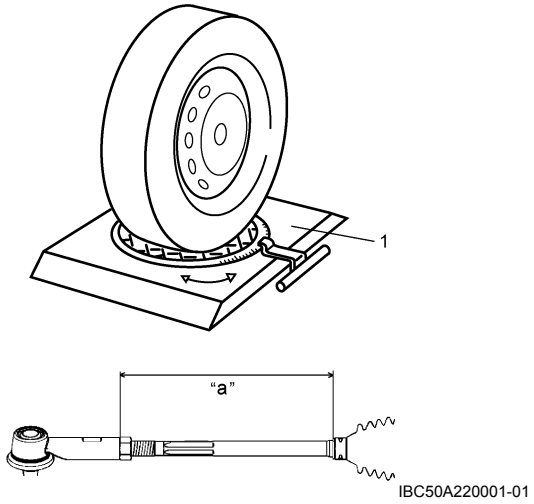
[A]: Camber and kingpin inclination angle (Front view)	[f]: Forward
[B]: Caster (Side view)	[k]: Center line of kingpin
"d": 90°	[s]: Vehicle body center
1. Suspension arm joint	[t]: Center line of wheel
2. Strut support	

Steering Angle Inspection and Adjustment

When tie-rod or tie-rod end is replaced, check toe and then also steering angle with turning radius gauge (1). If measured value is out of specified value, check if right and left tie rods are equal in length "a".

NOTE

If tie-rod length "a" is changed to adjust steering angle, recheck toe.



IBC50A220001-01

Inside steering angle

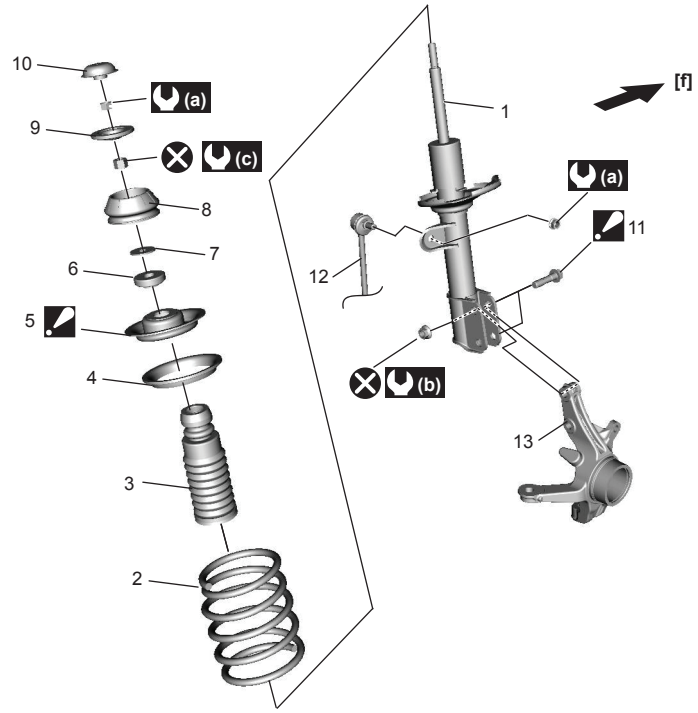
155/80R13: 39° 30' ± 2° 00'
165/70R14: 39° 12' ± 2° 00'

Outside steering angle

155/80R13: 34° 00' ± 2° 00'
165/70R14: 33° 54' ± 2° 00'

Front Strut Assembly Components

AENDL70A2206002



IDL70A220012-01

[f]: Forward	6. Strut bearing	12. Stabilizer joint
1. Front strut	7. Strut bearing plate	13. Steering knuckle
2. Coil spring	8. Strut support	(a) : 50 N·m (5.1 kgf-m, 37.0 lbf-ft)
3. Bump stopper	9. Rebound stopper	(b) : 80 N·m (8.2 kgf-m, 59.0 lbf-ft)
4. Coil spring rubber seat	10. Strut rod cap	(c) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
5. Coil spring upper seat : Align “out” mark on coil spring upper seat with center of strut bracket.	11. Strut bracket bolt : Insert from vehicle front side.	: Do not reuse.

Front Strut Assembly Removal and Installation

AENDL70A2206003

NOTICE

Strut bracket nut is pre-coated with friction stabilizer. Never reuse nut. Otherwise, nut may loosen.

Removal

NOTE

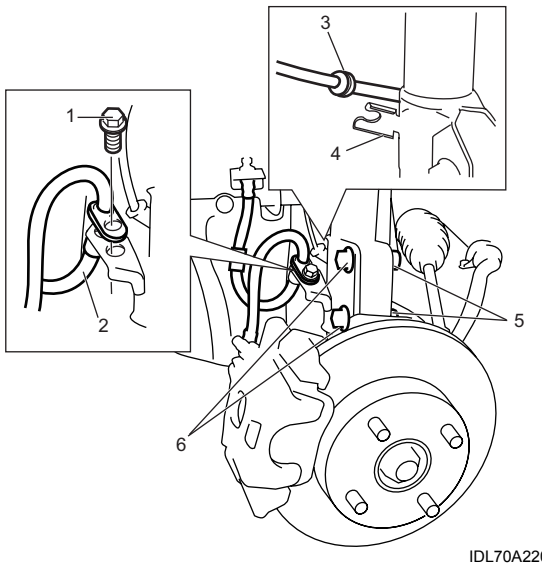
Pulling steering knuckle outward with drive shaft fixed to steering knuckle could cause drive shaft to be removed from transaxle.
Do not pull steering knuckle outward.
If drive shaft is removed, replace drive shaft circlip with new one.

1) Remove strut rod cap.

NOTE

When servicing strut assembly components, loosen strut support upper nut a little before removing strut assembly. This will facilitate service work. Note that the nut must not be removed at this point.

2) Hoist vehicle, allowing front suspension to be free of vehicle weight.
3) Remove front wheel. ☞(Page 2D-3)
4) Remove stabilizer joint nut by holding stud with hexagon wrench (2) and then disconnect stabilizer upper joint (1) from front strut (3).
5) Remove brake hose mounting bolt (1) to detach brake hose (2) and front wheel speed sensor harness (ABS model) (3) from front strut (4) as shown in figure.
6) Remove strut bracket nuts (5) and bolts (6).

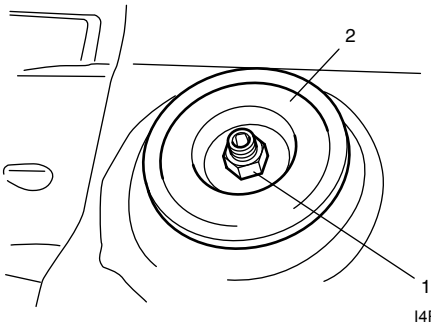


IDL70A220021-01

7) Remove strut support upper nut (1) and rebound stopper (2), and then remove strut assembly from vehicle.

NOTE

Hold strut by hand so that it will not fall off.



I4RS0A220006-01

Installation

Reverse removal procedure noting the following points.

- Insert strut bracket bolts (1) in such direction as shown in figure.
- Use new strut bracket nuts (4).
- Tighten all fasteners to specified torque.

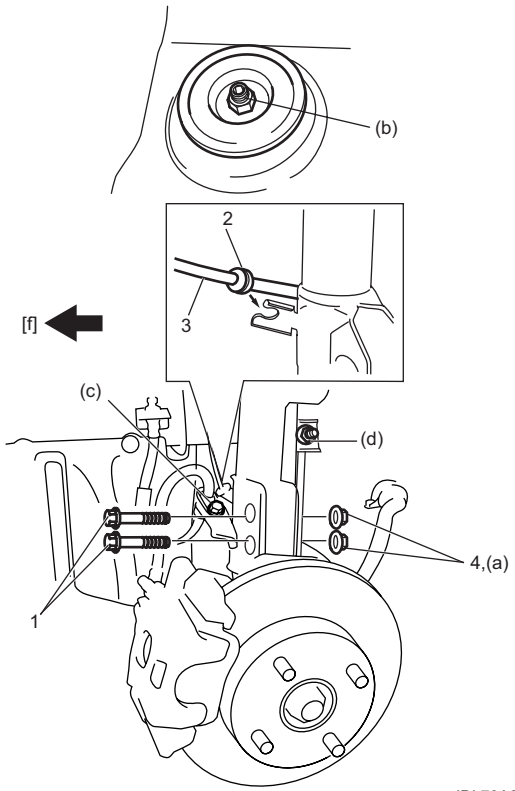
Tightening torque
Strut bracket nut (a): 80 N·m (8.2 kgf-m, 59.0 lbf-ft)
Brake hose mounting bolt (c): 26 N·m (2.7 kgf-m, 19.5 lbf-ft)
Stabilizer joint nut (d): 50 N·m (5.1 kgf-m, 37.0 lbf-ft)

NOTE

- **Don't twist brake hose and front wheel speed sensor harness (ABS model) when installing them.**
- **For ABS model, install front wheel speed sensor harness (2) so that its marking (3) in figure is directed toward the vehicle forward.**

- Tighten wheel nuts to specified torque. ☞(Page 2D-3)
- Lower hoist with vehicle in unloaded condition, tighten strut support upper nut to specified torque.

Tightening torque
Strut support upper nut (b): 50 N·m (5.1 kgf-m, 37.0 lbf-ft)



IDL70A220022-01

[f]: Forward

- After completing installation, confirm front wheel alignment. ☞(Page 2B-1)

Front Strut Assembly Disassembly and Reassembly

AENDL70A2206004

⚠ WARNING

When compressing coil spring, observe the following points to avoid personal injury.

- **Attach spring compressor to coil spring securely.**
- **Do not use impact wrench for compressing it.**
- **Use a commercially available spring compressor strictly following manufacture's instructions.**

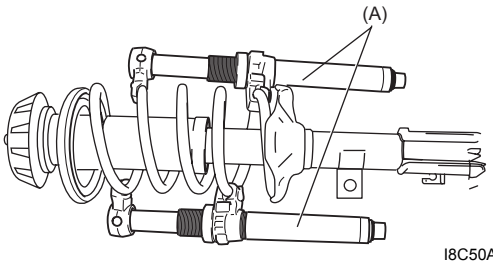
NOTICE

Strut support lower nut is pre-coated with friction stabilizer. Never reuse nut. Otherwise, nut may loosen.

Disassembly

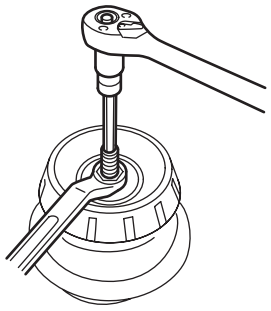
1) Attach special tool (A) to coil spring as shown. Turn special tool bolts alternately until coil spring tension is released. Rotate the strut around its axis to confirm that the strut is free of coil spring tension. Total length of compressed coil spring is about 260 mm (10.2 in.)

Special tool
(A): 09943M25010



I8C50A220006-02

2) While keeping coil spring compressed with special tools, remove strut support lower nut with hexagon wrench as shown in figure.



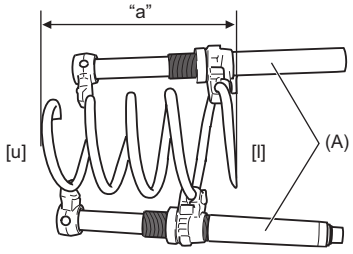
I5RW0A220008-01

3) Disassemble front strut assembly. ☞(Page 2B-4)

Reassembly

1) Compress coil spring using special tool (A) until total length "a" becomes about 260 mm (10.2 in.) as shown.

Special tool
(A): 09943M25010



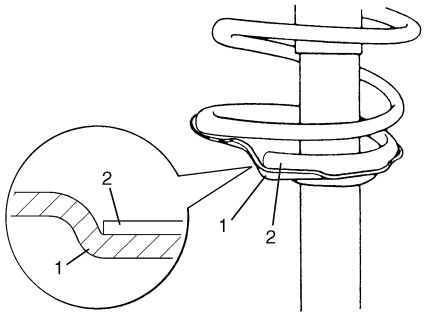
I7V10A220008-03

[u]:	Upper side (small diameter)
[l]:	Lower side (large diameter)

2) Install compressed coil spring to front strut, by fitting coil spring end (2) to spring lower seat.

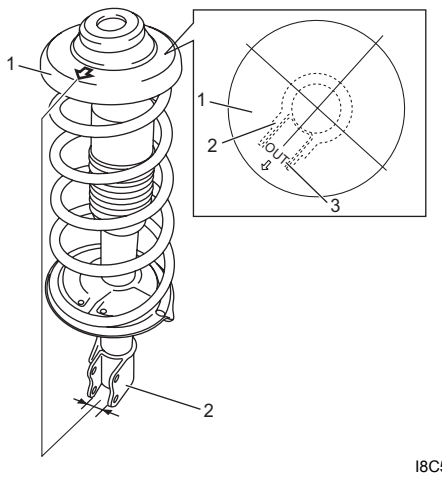
NOTE

Coil spring end should not ride on step in spring lower seat.



I7V10A220001-01

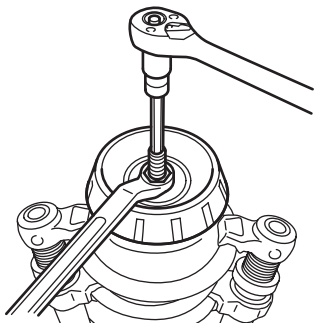
3) Install bump stopper onto strut rod. For installing direction, refer to the figure in "Front Strut Assembly Components" (Page 2B-4).
4) Pull strut rod as far up as possible and use care not to allow it to retract into strut.
5) Install coil spring rubber seat and coil spring upper seat (1) on the coil spring align its "OUT" mark (3) with center of the strut bracket (2).



I8C50A220008-02

6) Install strut bearing, strut support and new strut support lower nut in this sequence. ☞(Page 2B-4) Then tighten strut support lower nut to specified torque.
When tightening strut support lower nut, hold stud with hexagon wrench.

Tightening torque
Strut support lower nut (a): 55 N·m (5.6 kgf-m, 40.5 lbf-ft)



I7V20A220008-01

7) Remove special tool (spring compressor) from coil spring. Then, check that coil spring end does not ride on step in spring lower seat.

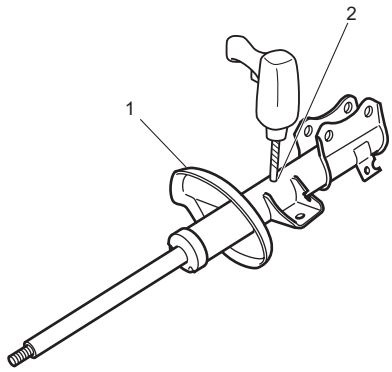
Front Strut Inspection

AENDL70A2206005

⚠ WARNING

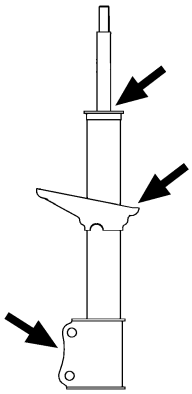
When handling front strut (1) in which high-pressure gas and oil are sealed, observe the following precautions.

- **Do not disassemble it.**
- **Do not put it into fire.**
- **Do not store it where it gets hot.**
- **Before disposing it, drill a hole (approximately 3 mm (0.1 in.) diameter) (2) in it where shown in the figure and let high-pressure gas and oil out. Wear eye shield to protect eyes from metal chips produced by drilling a hole, although the gas itself is harmless.**



IDL70A220015-01

- Check front strut for oil leakage, damage or deformation. If defect is found, replace front strut as an assembly unit, because it cannot be disassembled.



I8C50A220007-02

- Check front strut function as follows. If defect is found, replace front strut as an assembly unit, because it cannot be disassembled.
  a. Check and adjust tire pressures as specified.
  b. Bounce vehicle body up and down 3 or 4 times continuously by pushing front end of the vehicle side body to check strut.
     Also, note how many times vehicle body rebounds to stop after force application.
  c. Repeat the same procedure to the other strut to confirm that the both side struts equally respond. If conditions of struts are in doubt, compare them with known-good vehicle or strut.

Coil Spring, Strut Bearing and Strut Support Check

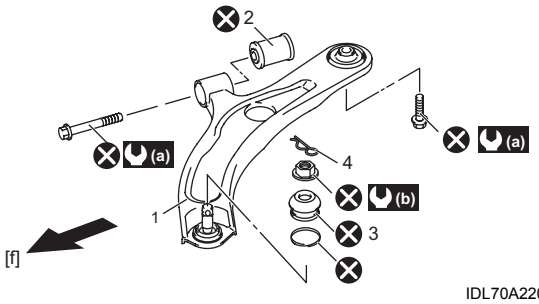
AENDL70A2206006

- Check coil spring for weakening, crack, deformation and damage.
- Check bump stopper, coil spring rubber seat, coil spring upper seat and strut support for crack, deformation and damage.
- Check strut bearing for wear, abnormal noise and damage.

If defect is found, replace it with new one.

Suspension Arm Components

AENDL70A2206007



IDL70A220007-02

[f]: Forward	4. Clip
1. Suspension arm	(a) : 80 N·m (8.2 kgf-m, 59.0 lbf-ft)
2. Suspension arm bushing	(b) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
3. Suspension arm joint dust cover	: Do not reuse.

Suspension Arm Removal and Installation

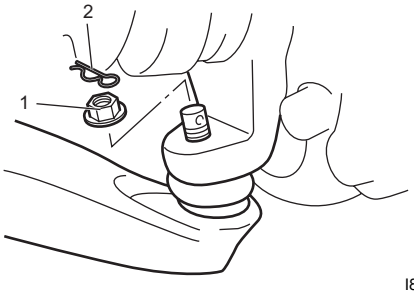
AENDL70A2206008

NOTICE

- **When removing and installing suspension arm, be careful not to damage dust cover of suspension arm joint. Otherwise, grease of arm joint flows out, resulting in damage to suspension arm joint.**
- **Suspension arm front bolt and suspension arm rear bolt are pre-coated with friction stabilizer. Never reuse bolts. Otherwise, bolts may loosen.**

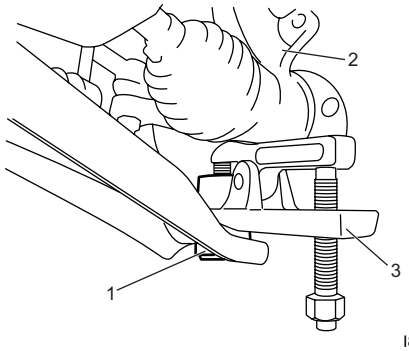
Removal

1) Hoist vehicle and remove front wheel. ☞(Page 2D-3)
2) Remove engine under cover.
3) Remove clip (2).
4) Loosen suspension arm joint nut (1) until the nut end is flush with stud end.



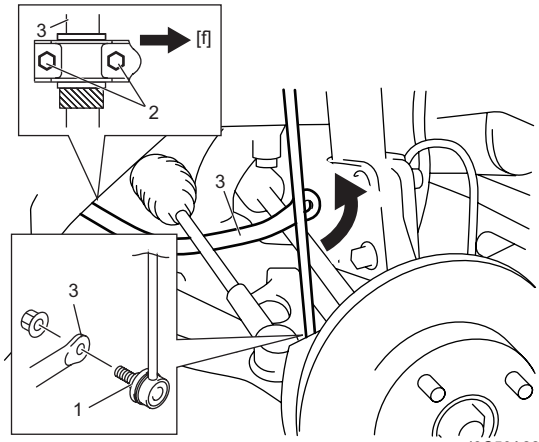
I8C50A220010-02

5) Disconnect suspension arm joint (1) from steering knuckle (2) by using puller (3).



I8C50A220011-02

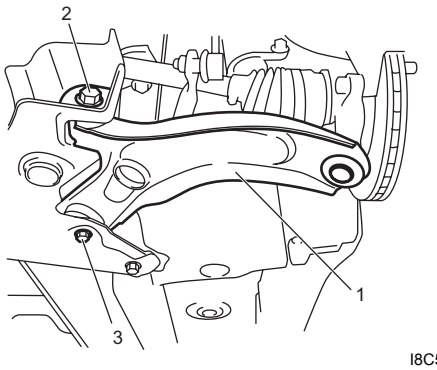
6) Remove stabilizer joints (lower side) (1) from stabilizer (3).
7) Loosen stabilizer bar mounting bracket bolts (2) and then rotate stabilizer bar (3) as shown in figure.



I8C50A220012-02

[f]: Forward

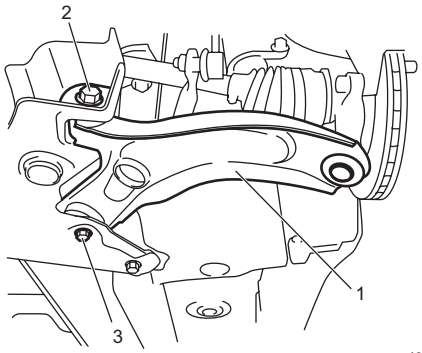
8) Remove suspension arm front bolt (2) and rear bolt (3), then remove suspension arm (1).



I8C50A220024-03

Installation

1) Install suspension arm (1) and tighten new suspension arm front bolt (2) and rear bolt (3) temporarily by hand.



I8C50A220024-03

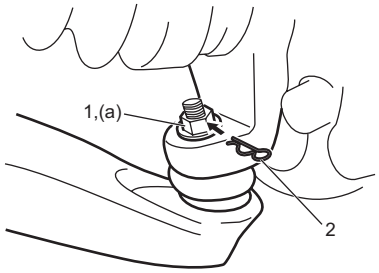
2) Install stabilizer joints to stabilizer, (lower side). ☞(Page 2B-12)
3) Tighten stabilizer bar mounting bracket bolts to specified torque. ☞(Page 2B-12)
4) Connect suspension arm joint to steering knuckle and then tighten new suspension arm joint nut (1) to specified torque.

Tightening torque
Suspension arm joint nut (a): 55 N·m (5.6 kgf-m, 40.5 lbf-ft)

NOTE

In case of grease stuck on taper surface for suspension arm joint and knuckle, remove the grease before connecting.

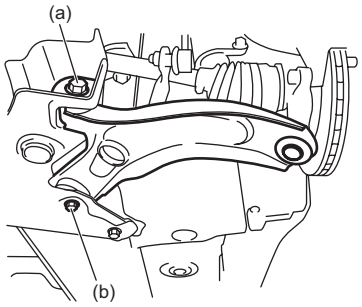
5) Insert clip (2) to suspension arm joint (Direction of clip insertion is free).



IDL70A220014-01

6) Install front wheel and tighten wheel nuts to specified torque. ☞(Page 2D-3)
7) Lower hoist and bounce vehicle up and down several times to stabilize suspension. And then, tighten suspension arm front bolt and rear bolt to specified torque.

Tightening torque
Suspension arm front bolt (a): 80 N·m (8.2 kgf-m, 59.0 lbf-ft)
Suspension arm rear bolt (b): 80 N·m (8.2 kgf-m, 59.0 lbf-ft)



I8C50A220015-02

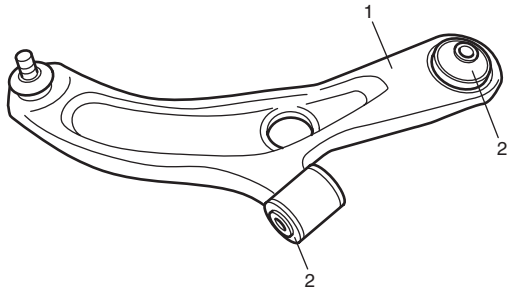
8) Hoist vehicle again and install engine undercover.
9) Lower hoist and check front wheel alignment. ☞(Page 2B-1)

Suspension Arm Check

AENDL70A2206009

Arm
Inspect arm (body) (1) for damage and deterioration. If defective is found, replace with new one.

Bushing
Inspect bushing (2) for damage, wear and deterioration. If defective is found, replace bushing or suspension arm assembly with new one.

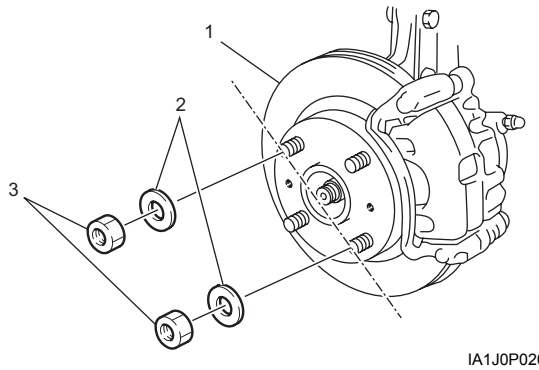


I7V20A220014-01

Joint
1) Remove front wheel. ☞(Page 2D-3)
2) Using washers (2) and other nuts (3) than the wheel nut, fix front brake disc (1) at diagonally opposing two studs.

NOTICE

If the wheel nut is used to fix the front brake disc, the tapered end of the wheel nut may damage.
Do not use wheel nut for the brake disc fixation in this step.



IA1J0P020018-01

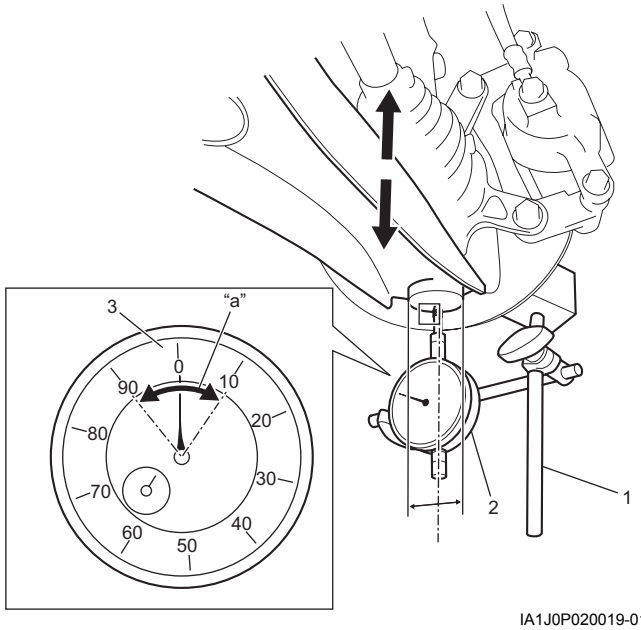
3) Set dial gauge (2) using magnetic stand (1) placed on front brake disc.

NOTE

Apply measuring tip of dial gauge perpendicular to bottom center surface of ball joint as much as possible.

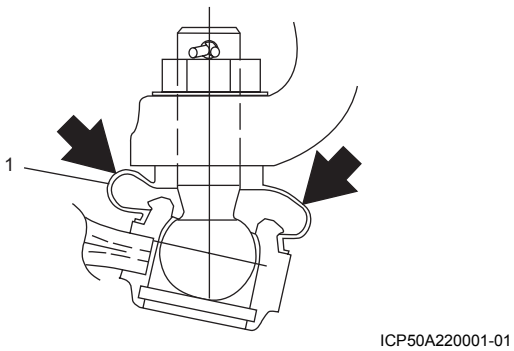
4) Set pointer to “0” (zero) by turning dial (3).
5) Push suspension arm up at near ball joint by hand with force of about 20 to 30 N (2.0 to 3.1 kgf) and hold this state for 2 to 3 seconds, and then read dial gauge.
6) Reversing direction of force, pull suspension arm down at near ball joint by hand with force of about 20 to 30 N (2.0 to 3.1 kgf) and hold this state for 2 to 3 seconds, and then read dial gauge.
7) Check total “a” of readings in steps 5) and 6), amount of looseness.
   If measured looseness exceeds specified range below, replace suspension arm.

Amount of looseness in suspension arm ball joint
“a”: less than 0.2 mm (0.008 in.)



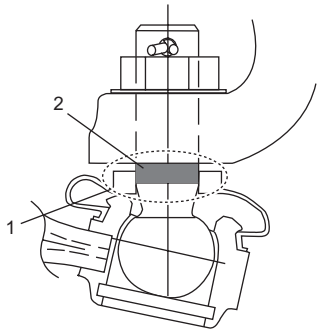
IA1J0P020019-01

8) Lightly push ball joint dust cover (1) with fingers to check whether there is water inside.
   If water is found to come out, replace suspension arm.



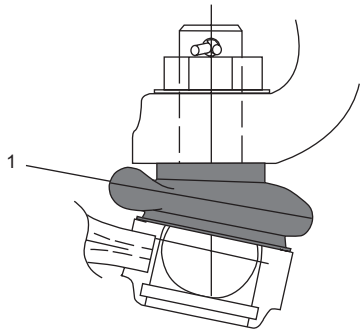
ICP50A220001-01

9) Push top end (1) of ball joint dust cover down to check for rust on ball joint stud’s surface (2) in contact with dust cover.
   If surface is found rusted, replace suspension arm.



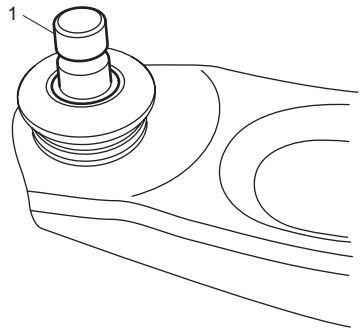
ICP50A220002-01

10) Move top end of ball joint dust cover back to original position.
11) Check ball joint dust cover (1) for cracks and damage.
    If it is cracked or otherwise damaged, replace ball joint dust cover.



ICP50A220003-01

12) Detach ball joint stud from steering knuckle. ☞(Page 2B-8)
13) Check that ball joint stud (1) moves without sticking.
    If not, replace suspension arm.



ICC50A220002-02

14) Connect ball joint stud to steering knuckle. ☞(Page 2B-8)
15) Remove nuts and washers holding the front brake disc.
16) Install front wheel and tighten wheel nuts to specified torque. ☞(Page 2D-3)

Suspension Arm Bushing Removal and Installation

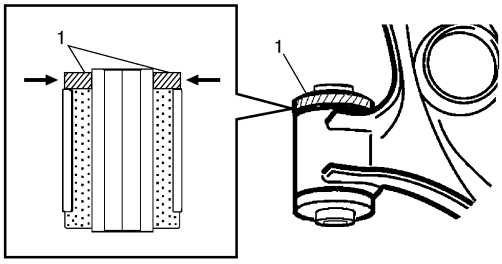
AENDL70A2206010

NOTE

Suspension arm rear bushing is not individually replaceable. If the bushing is defective, replace suspension arm with new one.

Removal

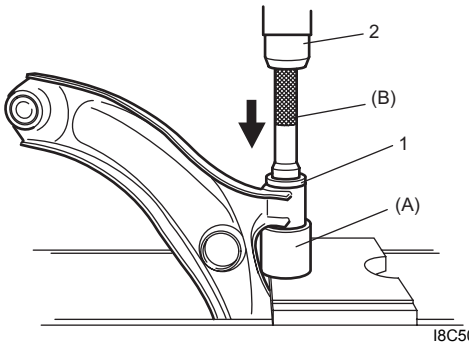
1) Cut off front bushing flange (rubber) (1) with knife.



I4RS0A220029-01

2) Push out front bushing (1) by using hydraulic press (2) and special tools.

Special tool
(A): 09943M77910



I8C50A220027-01

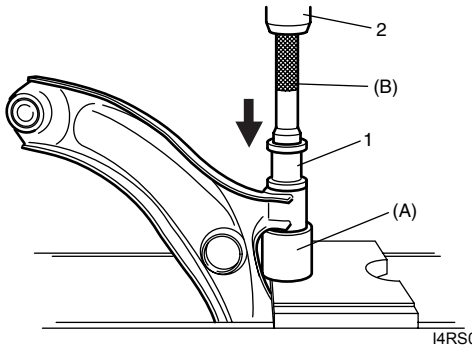
Installation

1) Press-fit front bushing (1) by using special tools and hydraulic press (2).

Special tool
(A): 09943M77910

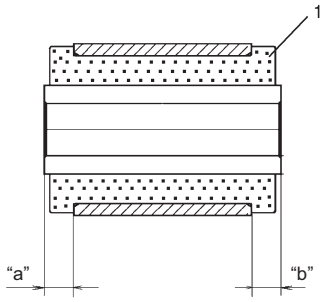
NOTE

Before installing bushing, apply soap water on its circumference to facilitate bushing installation.



I4RS0A220032-01

2) Press-fit front bushing (1) so that dimensions “a” and “b” in figure become equal.



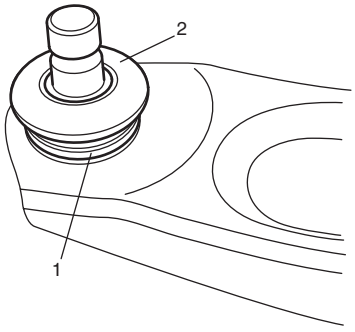
I7V10A220012-01

Suspension Arm Joint Dust Cover Removal and Installation

AENDL70A2206011

Removal

1) Remove suspension arm joint dust cover ring (1).
2) Remove suspension arm joint dust cover (2) with flat-bladed screwdriver or the like.



I7V20A220016-01

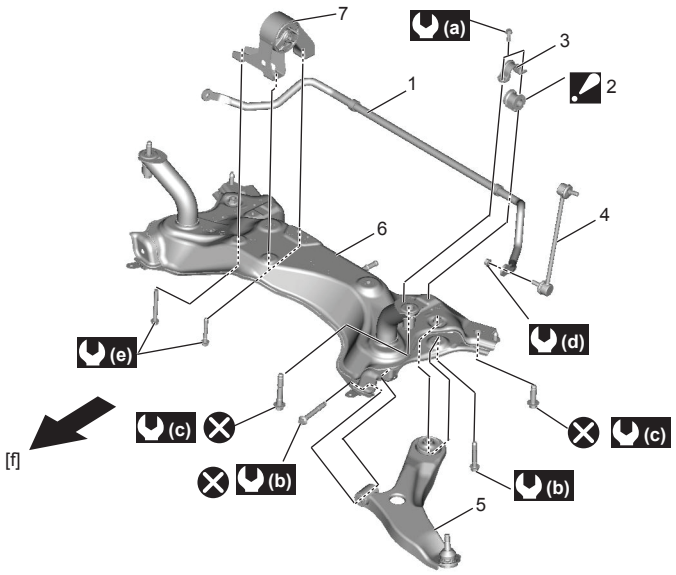
Installation
Assemble suspension arm joint dust cover by reversing disassembling procedure, noting the following point.

- If grease is stuck on suspension arm joint, remove it before installing them.
- If suspension arm joint dust cover is replaced, apply a defined amount of grease (included in suspension arm joint dust cover set) to suspension arm joint and inside of suspension arm joint dust cover.
- Fill ration of grease.

Grease quantity
7~9 g

Front Suspension Frame and Stabilizer Bar

AENDL70A2206012



IDL70A220008-02

[f]: Forward	5. Suspension arm	(c) : 95 N·m (9.7 kgf-m, 70.0 lbf-ft)
1. Stabilizer bar	6. Front suspension frame	(d) : 50 N·m (5.1 kgf-m, 37.0 lbf-ft)
2. Stabilizer bushing : For correct installing direction of stabilizer bushing, refer to "Front Suspension Frame, Stabilizer Bar and Bushing Removal and Installation" (Page 2B-12).	7. Engine rear mounting	(e) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
3. Stabilizer mounting bracket	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)	⊗ : Do not reuse.
4. Stabilizer joint	(b) : 80 N·m (8.2 kgf-m, 59.0 lbf-ft)	

Front Suspension Frame, Stabilizer Bar and Bushing Removal and Installation

AENDL70A2206013

⚠ CAUTION

- **If the front suspension frame is not stably supported on a transmission jack or other supporting equipment during its removal and installation, the frame could drop and cause personal injury.**
  Check that the weight of the front suspension frame is supported at the frame's center and that the frame is well balanced on the support.
- **To avoid danger of being burned, do not touch exhaust system when it is still hot. Any service on exhaust system should be performed when it is cool.**

NOTICE

The front suspension frame mounting bolts are pre-coated with friction stabilizer. If these bolts are reused, they may work loose. Never reuse the front suspension frame mounting bolts.

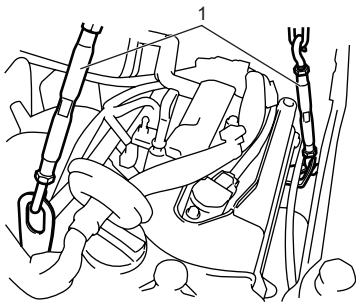
Removal

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly. ☞(Page 1D-5)
3) Disconnect steering lower shaft from pinion shaft. ☞(Page 6B-11)
4) Hoist vehicle and remove front wheels. ☞(Page 2D-3)
5) Remove engine undercover.
6) Remove exhaust pipes. ☞(Page 1K-1)
7) Disconnect stabilizer joint from front strut assembly. ☞(Page 2B-4)

8) Disconnect tie-rod end from steering knuckle. ☞(Page 6C-25)
9) Remove suspension arm. ☞(Page 2B-8)
10) Support engine assembly by using chain hoist (1) or engine crane.

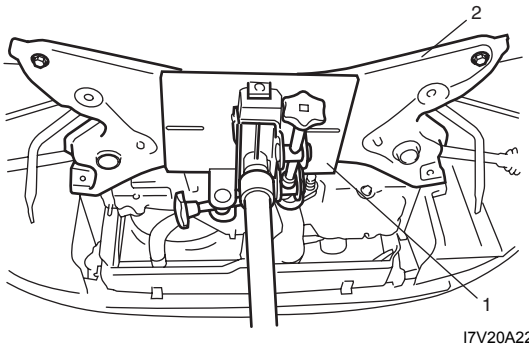
NOTE

Remove hood if necessary. ☞(Page 9J-1)



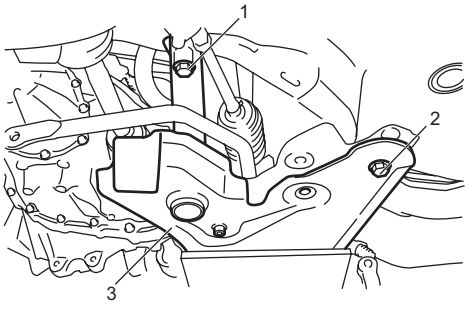
I8C50A220026-01

11) Remove engine rear mounting from engine rear mounting bracket. ☞(Page 1D-17)
12) Support front suspension frame (2) with transmission jack (1).



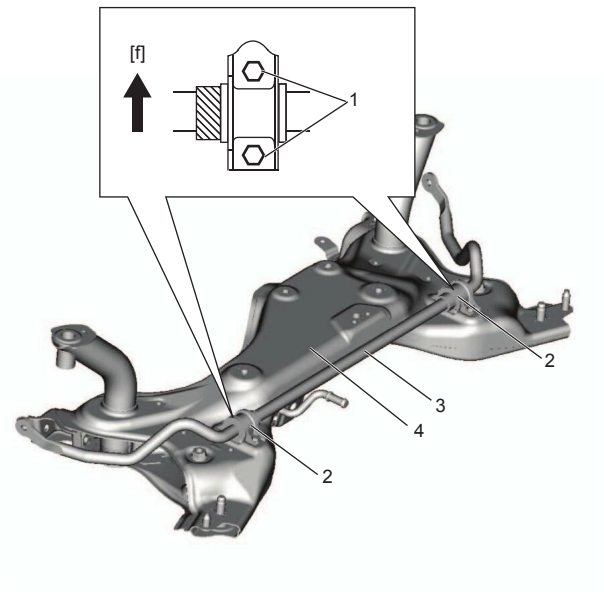
I7V20A220019-01

13) Remove suspension frame mounting No.1 bolt (1) and No.2 bolt (2), and then lower transmission jack and remove suspension frame (3) with stabilizer bar and steering gear case from vehicle body.



IDL70A220016-01

14) Remove engine rear mounting from front suspension frame. ☞(Page 2B-12)
15) Remove steering gear case assembly from front suspension frame. ☞(Page 6C-26)
16) Remove stabilizer bar mounting bracket bolts (1) to remove stabilizer bar mounting bracket (2).
17) Remove stabilizer bar (3) and bushing from front suspension frame (4).



IDL70A220005-02

[f] Forward

Installation

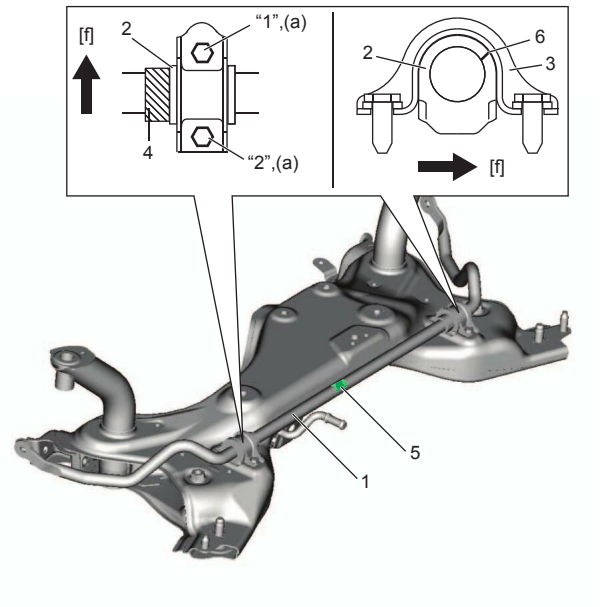
1) Install stabilizer bar (1), bushing (2) and stabilizer bar mounting bracket (3) to front suspension frame as shown in figure.

NOTE

- **Install stabilizer bar (1) with identification painting (5) facing upward direction.**
- **Install stabilizer bushing (2) with its end aligned to ring (4) of stabilizer bar.**
- **Install stabilizer bushing (2) with its slit (6) located towards vehicle forward direction.**
- **Install stabilizer bar mounting bracket (3) with its straight shaped end surface towards the rear end of the vehicle.**

2) Tighten stabilizer bar mounting bracket bolts to specified torque in numerical order of (“1” and “2”) as shown in figure.

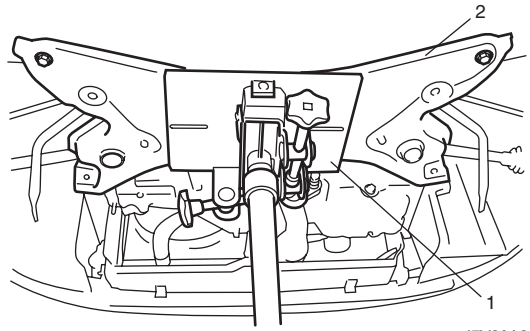
Tightening torque
Stabilizer bar mounting bracket bolt* (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A220006-02

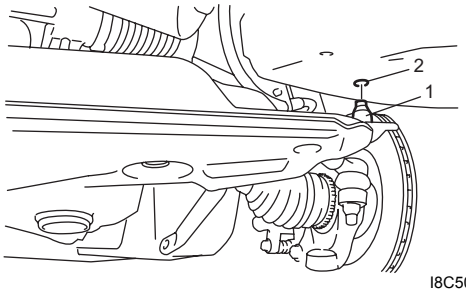
[f] Forward

3) Install steering gear case assembly to front suspension frame. ☞(Page 6C-26)
4) Install engine rear mounting to front suspension frame. ☞(Page 2B-12)
5) Put front suspension frame (2) on transmission jack (1) and raise the jack.



I7V20A220021-01

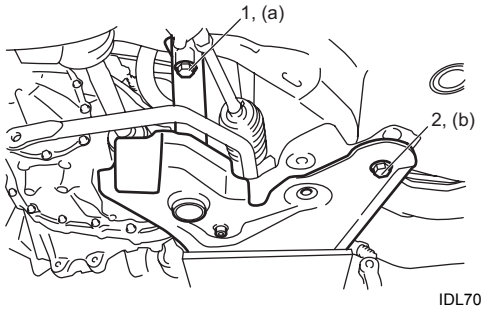
6) Align bosses (1) (right and left) of front suspension frame with holes (2) in vehicle body respectively.



I8C50A220021-02

7) Install new suspension frame mounting No.1 bolt (1) and No.2 bolt (2) and tighten them to specified torque.

Tightening torque
Suspension frame mounting No. 1 bolt (a): 95 N·m (9.7 kgf-m, 70.0 lbf-ft)
Suspension frame mounting No. 2 bolt (b): 95 N·m (9.7 kgf-m, 70.0 lbf-ft)



IDL70A220017-01

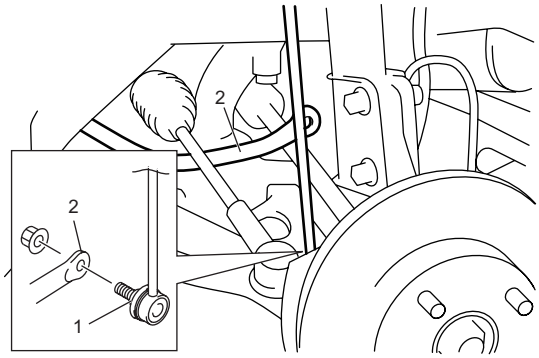
8) Connect engine rear mounting to engine rear mounting bracket and tighten bolt. ☞(Page 1D-17)
9) Lower the transmission jack.
10) Install suspension arm to front suspension frame, and then tighten new suspension arm front bolt and rear bolt temporarily by hand. ☞(Page 2B-8)
11) Connect suspension arm joint to steering knuckle. ☞(Page 2B-8)
12) Connect tie-rod end to steering knuckle. ☞(Page 6C-25)
13) Connect stabilizer joint to front strut. ☞(Page 2B-4)
14) Install exhaust pipes. ☞(Page 1K-1)
15) Install engine undercover.
16) Install front wheels and tighten wheel nuts to specified torque. ☞(Page 2D-3)
17) Install air cleaner assembly. ☞(Page 1D-5)
18) Install hood if removed. ☞(Page 9J-1)
19) Connect steering lower shaft to pinion shaft. ☞(Page 6B-11)
20) Lower hoist and bounce vehicle up and down several times to stabilize suspension. And then, tighten suspension arm front bolt and rear bolt to specified torque. ☞(Page 2B-8)
21) Connect negative (–) cable at battery.
22) Check front wheel alignment. ☞(Page 2B-1)

Stabilizer Bar Bushing Removal and Installation

AENDL70A2206017

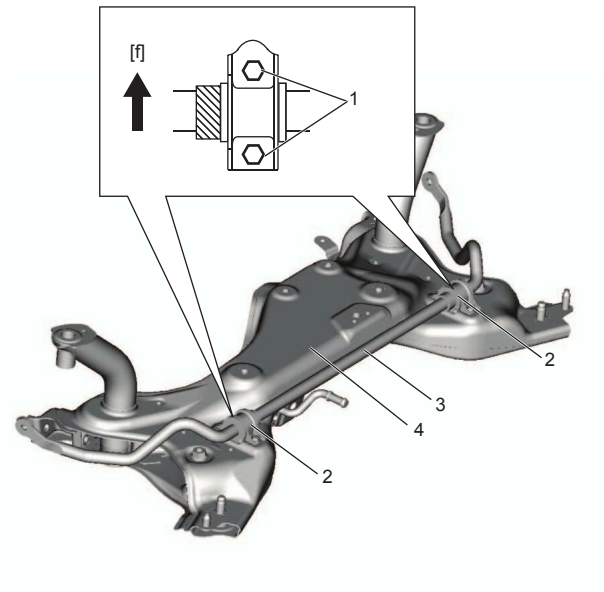
Removal

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle and remove front wheels. ☞(Page 2D-3)
3) Remove engine undercover.
4) Remove stabilizer joints (lower side) (1) from stabilizer bar (2).



IDL70A220018-02

5) Remove stabilizer bar mounting bracket bolts (1) to remove stabilizer bar mounting bracket (2).
6) Remove stabilizer bar (3) and bushing from front suspension frame (4).



IDL70A220005-02

[f] Forward

Installation

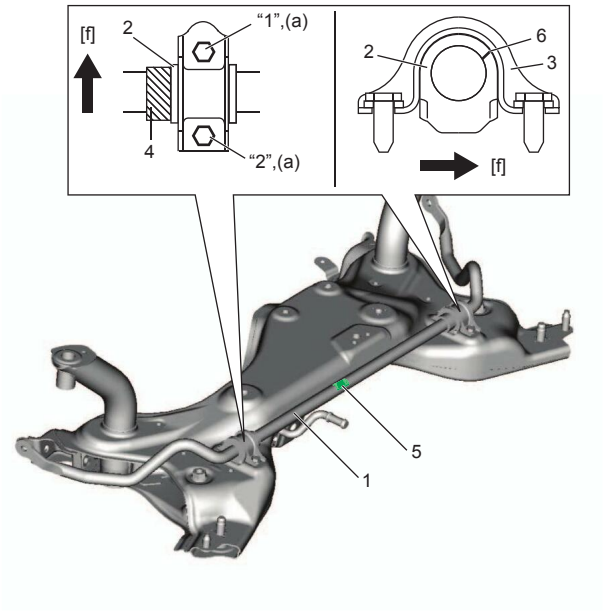
1) Install stabilizer bar (1), bushing (2) and stabilizer bar mounting bracket (3) to front suspension frame as shown in figure.

NOTE

- **Install stabilizer bar (1) with identification painting (5) facing upward direction.**
- **Install stabilizer bushing (2) with its end aligned to ring (4) of stabilizer bar.**
- **Install stabilizer bushing (2) with its slit (6) located towards vehicle forward direction.**
- **Install stabilizer bar mounting bracket (3) with its straight shaped end surface towards the rear end of the vehicle.**

2) Tighten stabilizer bar mounting bracket bolts to specified torque in numerical order of (“1” and “2”) as shown in figure.

Tightening torque
Stabilizer bar mounting bracket bolt* (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

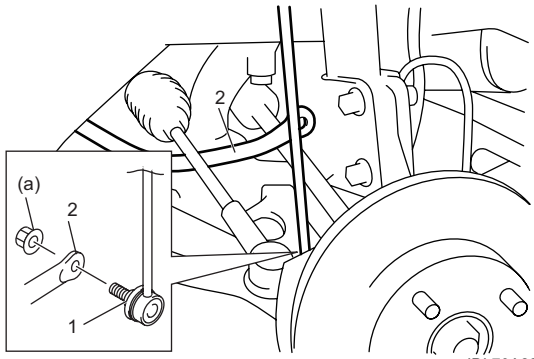


IDL70A220006-02

[f] Forward

3) Install stabilizer joints (lower side) (1) with stabilizer bar (2) and tighter the stabilizer joint nut (lower side).

Tightening torque
Stabilizer joint nut (a): 50 N·m (5.6 kgf-m, 40.5 lbf-ft)



IDL70A220019-01

4) Install engine undercover.
5) Install front wheels and tighten wheel nuts to specified torque. ☞(Page 2D-3)
6) Lower hoist and bounce vehicle up and down several times to stabilize suspension.
7) Connect negative (–) cable at battery.
8) Check front wheel alignment. ☞(Page 2B-1)

Front Suspension Frame Check

AENDL70A2206014

Check front suspension frame for crack, deformation and damage. If defective, replace with new one. ☞(Page 9K-21)



IDL70A220010-01

Front Stabilizer Bar, Bushing and Joint Check

AENDL70A2206015

Stabilizer Bar

Check stabilizer bar for damage and deformation. If defective, replace it with new one.

Stabilizer Bushing

Check stabilizer bushing for damage and deterioration. If defective, replace it with new one.

Stabilizer Joint

- Check ball stud for smooth movement.
- Check ball stud for loosen.
- Check dust cover for damage and crack.
- Check rod for damage and deformation.

NOTE

Stabilizer joint cannot be disassembled.

If check result is not OK, replace stabilizer joint assembly.

Front Suspension Fasteners Check

AENDL70A2206016

Check bolts and nuts fastening suspension parts for tightness. Tighten loose one, if any, to specified torque. For specified torque, refer to:

- “Front Strut Assembly Components” (Page 2B-4)
- “Suspension Arm Components” (Page 2B-8)
- “Front Suspension Frame and Stabilizer Bar” (Page 2B-12)

Specifications

Tightening Torque Specifications

AENDL70A2207001

NOTE

For fastener(s) with * (asterisk) below, refer to the specified procedure in “Repair Instructions”.

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Strut bracket nut	80	8.2	59.0	☞(Page 2B-5)
Brake hose mounting bolt	26	2.7	19.5	☞(Page 2B-5)
Stabilizer joint nut	50	5.1	37.0	☞(Page 2B-5)
Strut support upper nut	50	5.1	37.0	☞(Page 2B-5)
Strut support lower nut	55	5.6	40.5	☞(Page 2B-7)
Suspension arm joint nut	55	5.6	40.5	☞(Page 2B-9)
Suspension arm front bolt	80	8.2	59.0	☞(Page 2B-9)
Suspension arm rear bolt	80	8.2	59.0	☞(Page 2B-9)
Stabilizer bar mounting bracket bolt*	23	2.3	17.0	☞(Page 2B-13) / ☞(Page 2B-15)
Suspension frame mounting No. 1 bolt	95	9.7	70.0	☞(Page 2B-14)
Suspension frame mounting No. 2 bolt	95	9.7	70.0	☞(Page 2B-14)
Stabilizer joint nut	50	5.6	40.5	☞(Page 2B-15)

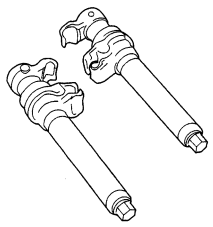
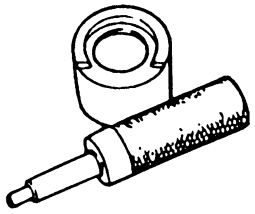
Reference:

For the tightening torques of fasteners not specified in this page, refer to:
“Front Strut Assembly Components” (Page 2B-4)
“Suspension Arm Components” (Page 2B-8)
“Front Suspension Frame and Stabilizer Bar” (Page 2B-12)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Special Tool

AENDL70A2208001

09943M25010 Spring compressor ☞(Page 2B-6) / ☞(Page 2B-6)		09943M77910 Suspension lower arm bush remover ☞(Page 2B-11) / ☞(Page 2B-11)	

Rear Suspension

General Description

Rear Suspension Description

AENDL70A2301001

Rear suspension is of a torsion beam type having rear axle connected with torsion beam.

Repair Instructions

Rear Wheel Alignment Inspection

AENDL70A2306001

Preparation

Before inspecting rear wheel alignment, perform the following items.

- Empty luggage compartment.
- Check tires for specified size.
  If not, replace tires with those of the specified size.
- Check that inflation pressure of each tire is adjusted properly. If necessary, adjust tire pressure, repair or replace tire.
- Check all tires for even wear and that they are of the same brand. Replace tire(s) if necessary.
- Check that wheel bearing is not damaged. Replace wheel bearing if defective.
- Check each wheel (with tire) for deflection. If necessary, repair or replace wheel.
- Check that each suspension part is installed properly. If defective, repair or replace part.
- Check that each suspension part is free from bend, dent, wear or damage.
- Place vehicle in non-loaded state on level surface.
- Bounce vehicle up and down several times to stabilize suspension.
- Check that ground clearance at the right and left is almost the same.

Inspection

Measure toe and camber. ☞(Page 2B-1)

> **NOTE**
>
> **Rear toe and camber are not adjustable. If they are out of specification, replace reference part.**

Rear toe (total)
155/80R13: In 4.0 ± 4.0 mm
165/70R14: In 4.1 ± 4.0 mm

Rear camber
: – 1° 00’

If measured value is out of specified value, check the following items for damage, deformation and crack. If defective is found, repair or replace defective part,

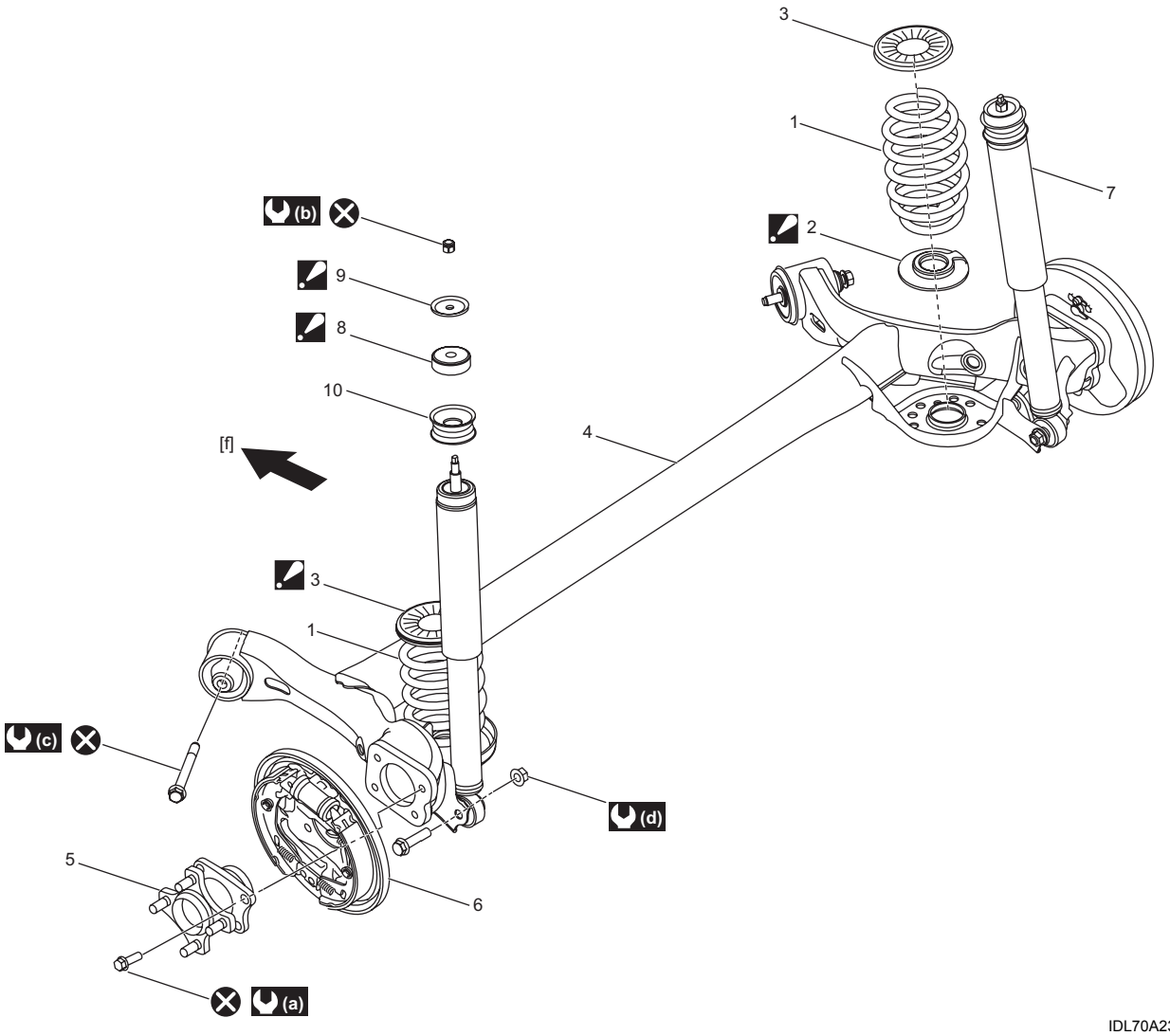
- Rear axle
- Wheel hub or wheel bearing
- Vehicle body

Reference Information
Toe angle

Rear toe angle (total)
: IN 0° 12’

Rear Suspension Components

AENDL70A2306014



IDL70A230001-03

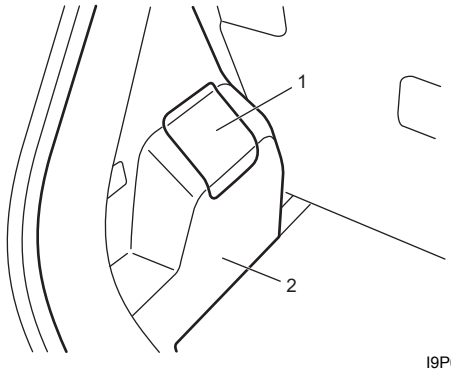
1. Rear coil spring	7. Rear shock absorber	(c) : 78 N·m (8.0 kgf-m, 57.5 lbf-ft)
2. Rear spring lower seat : For installing direction of rear spring lower seat. ☞(Page 2C-4)	8. Shock absorber upper bushing : For installing direction of shock absorber upper bushings. ☞(Page 2C-2)	(d) : 90 N·m (9.2 kgf-m, 66.5 lbf-ft)
3. Rear spring upper seat : ☞(Page 2C-4)	9. Shock absorber upper washer : For installing direction of shock absorber upper washer. ☞(Page 2C-2)	: Do not reuse.
4. Rear axle	10. Mounting bracket	[f]: Forward
5. Wheel hub assembly	(a) : 70 N·m (7.1 kgf-m, 51.6 lbf-ft)	
6. Brake back plate	(b) : 28 N·m (2.9 kgf-m, 21.0 lbf-ft)	

Rear Shock Absorber Removal and Installation

AENDL70A2306015

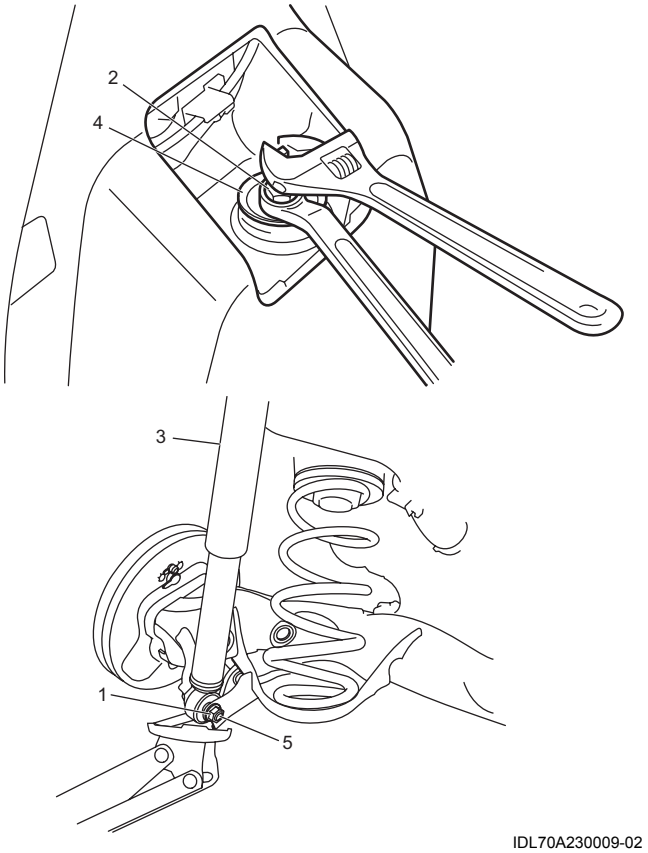
Removal

1) Hoist vehicle and remove rear wheels. ☞(Page 2D-3)
2) Remove access hole cover (1) in quarter inner trim (2).



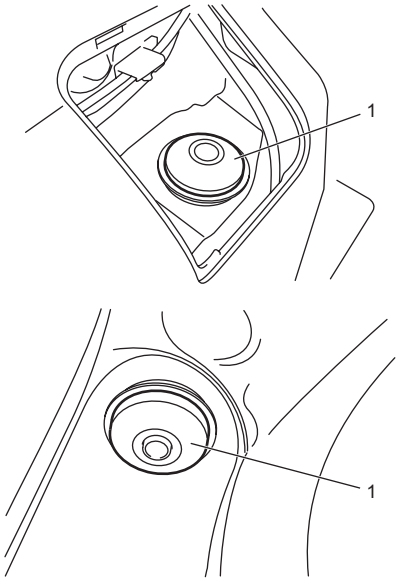
I9P60A230002-01

3) Support rear axle using floor jack to prevent it from lowering.
4) Remove rear shock absorber lower nut (1) and bolt (5).
5) Remove rear shock absorber upper nut (2), shock absorber (3) and shock absorber upper washer (4).



IDL70A230009-02

6) Remove shock absorber upper bushings (1).



I9P60A230004-01

Installation

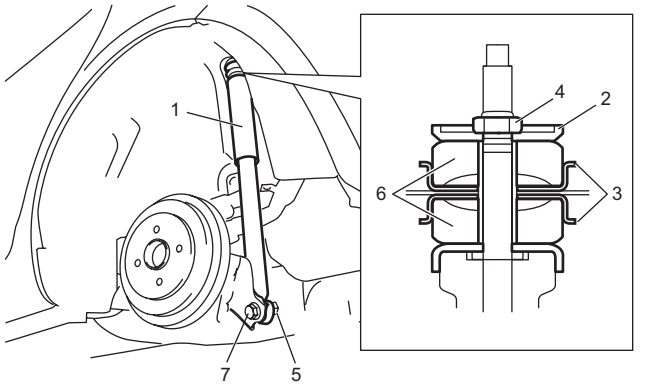
NOTICE

Rear shock absorber upper nut is self-locking nut. Do not reuse nut. Otherwise, nut may loosen.

1) Install shock absorber upper bushings (6), shock absorber (1) and shock absorber upper washer (2) as shown in figure.
Tighten new shock absorber upper nut (4) and lower nut (5) and bolt (7) temporarily at this step.

NOTE

Refer to the following figure for installing direction of shock absorber upper bushings and washer (2).

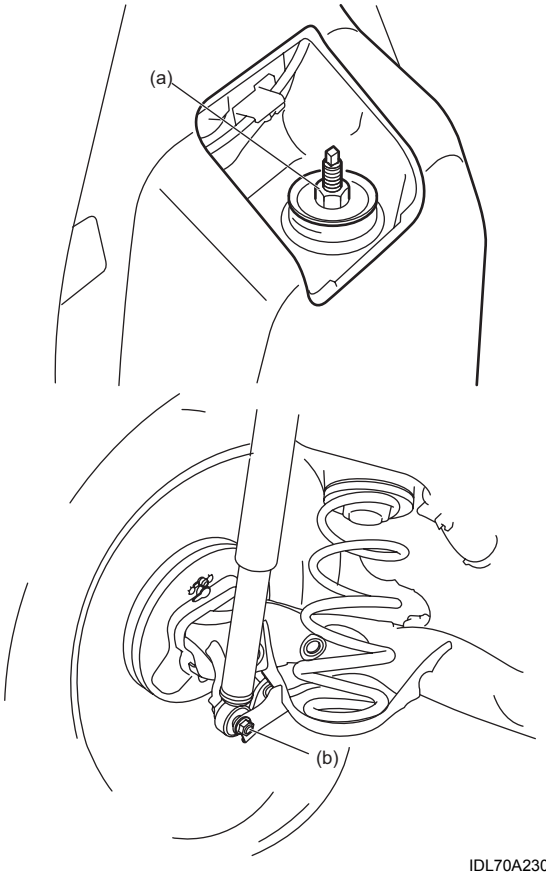


IDL70A230004-05

3. Body panel

2) Remove floor jack from rear axle.
3) Install rear wheels. ☞(Page 2D-3)
4) Lower hoist. With vehicle in unloaded condition, tighten rear shock absorber upper nuts and lower nuts to specified torques.

Tightening torque
Rear shock absorber upper nut (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)
Rear shock absorber lower nut (b): 90 N·m (9.2 kgf-m, 66.5 lbf-ft)



IDL70A230007-01

5) Install access hole cover in quarter inner trim.

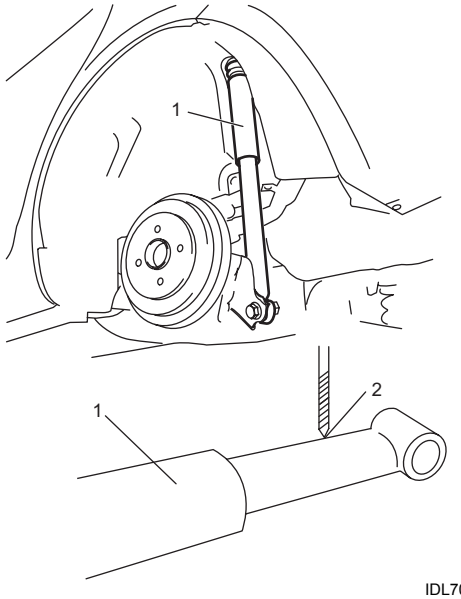
Rear Shock Absorber Inspection

AENDL70A2306005

⚠ WARNING

Since high-pressure gas is sealed inside rear shock absorber (1), there is risk of personal injury if it is handled without observing the following precautions.

- **Do not disassemble rear shock absorber.**
- **Do not put rear shock absorber into fire.**
- **Do not store rear shock absorber where it gets hot.**
- **Before disposing of rear shock absorber, drill an approximately 3 mm (0.1 in.) diameter hole (2) in it at point indicated in the figure to let gas out of shock absorber together with oil. Wear eye shield when drilling hole because metal chips produced by drilling can injure your eyes although the gas itself is harmless.**



IDL70A230008-01

- Inspect shock absorber for deformation or damage.
- Inspect shock absorber upper bushing for wear or damage.
- Inspect shock absorber for evidence of oil leakage.
- Inspect shock absorber for deterioration.

If check result is not OK, replace shock absorber with new one.

Rear Coil Spring and Spring Seat Removal and Installation

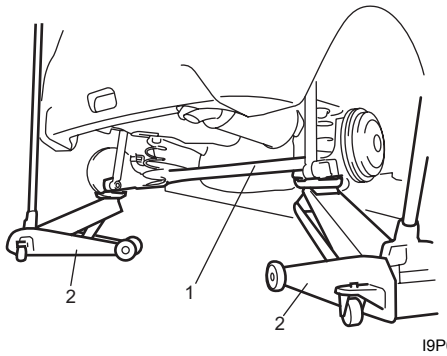
AENDL70A2306016

NOTICE

Be careful not to let rear axle down too much. It may cause damage to brake flexible hose, wheel speed sensor lead (with ABS) and parking brake cable.

Removal

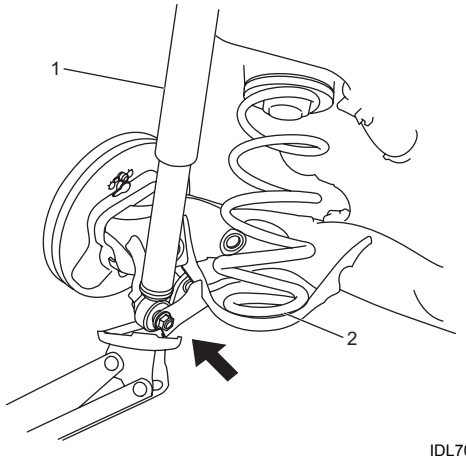
1) Hoist vehicle and remove rear wheels. ☞(Page 2D-3)
2) Support both ends of rear axle (1) using two floor jacks (2) to prevent it from lowering.



I9P60A230009-02

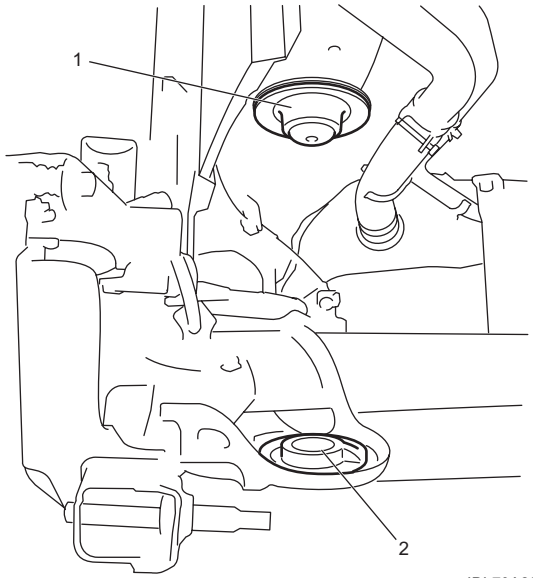
3) Remove rear shock absorber lower nuts and bolts. ☞(Page 2C-2)

4) Detach lower end of shock absorber (1) from rear axle.
5) Lower rear axle gradually as far down if necessary for removing coil spring (2).
6) Remove coil spring.



IDL70A230002-02

7) Remove spring upper seat (1) from vehicle body and spring lower seat (2) from rear axle.



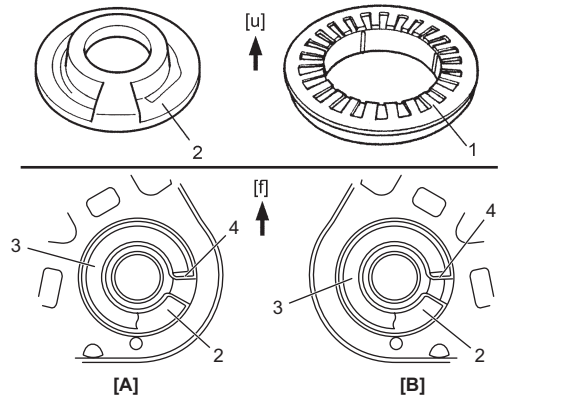
IDL70A230011-01

Installation

NOTE

Install spring seat in specified direction. Otherwise, noise may occur from coil spring while vehicle is moving.

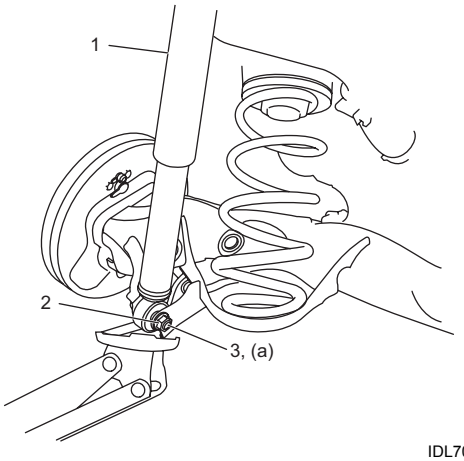
1) Install spring upper seat (1) to vehicle body and spring lower seat (2) to rear axle.
2) Install coil spring (3) on spring lower seat of rear axle. Place contact coil spring end (4) with protrusion of spring lower seat as shown in figure.



I9P60A230012-02

[A]: Left side	[u]: Upward
[B]: Right side	[f]: Forward

3) Jack up rear axle and then install shock absorber (1) lower end to rear axle.
Install lower bolt (3) and tighten shock absorber lower nut (2) temporarily by hand.



IDL70A230010-02

4) Remove floor jacks from rear axle.
5) Install rear wheels. ☞(Page 2D-3)
6) Lower hoist and bounce vehicle up and down several times to stabilize suspension.
7) Tighten shock absorber lower nuts to specified torque.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.2 kgf-m, 66.5 lbf-ft)

Rear Coil Spring and Spring Seat Check

AENDL70A2306018

- Check rear coil spring for crack, damage and deformation.
- Check spring seat for crack, damage and deformation.

If check result is not OK, replace rear coil spring and/or spring seat with new one.

Rear Axle Removal and Installation

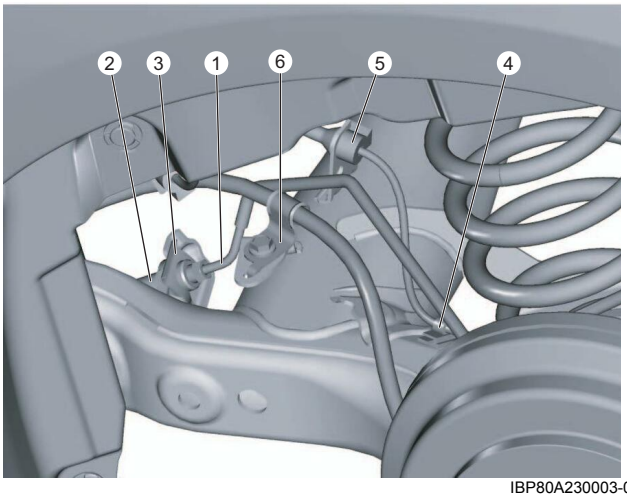
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NOTICE

- **Brake fluid is extremely damaging to painted surfaces. If brake fluid contacts painted surface, immediately wipe it off and flush the surface with water thoroughly.**
- **Rear axle bolts are pre-coated with friction stabilizer. Do not reuse rear axle bolts, otherwise bolts may loosen.**

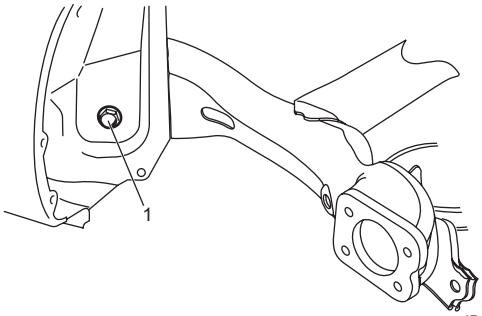
Removal

1) Hoist vehicle and remove rear wheels. ☞(Page 2D-3)
2) Remove wheel speed sensor clamp (4) (with ABS), rear wheel speed sensor harness (5) (with ABS) and parking brake cable clamp (6) from each of both right and left sides of rear axle.
3) Remove parking brake cable for each of right and left rear wheels. ☞(Page 4D-2)
4) Disconnect brake pipe (1) from brake hose (2), and then remove E-ring (3) at both sides as shown.



IBP80A230003-02

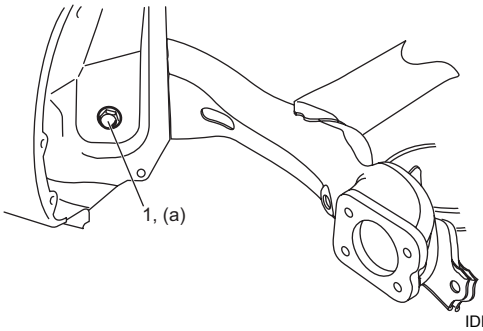
5) Remove rear brake back plate for each of right and left rear wheels. ☞(Page 4C-5)
6) Disconnect shock absorber lower end from rear axle and remove coil spring at both sides. ☞(Page 2C-4)
7) Remove rear fender lining at both sides.
8) While supporting rear axle at both ends, remove rear axle bolts (1), and then remove rear axle from vehicle body by lowering floor jack gradually.



IDL70A230012-02

Installation

1) Place rear axle on floor jacks.
   Then install rear axle with new right and left rear axle bolts (1) and tighten bolts temporarily by hand.



IDL70A230013-02

2) Install coil spring and connect shock absorber lower end to rear axle at each of both sides. ☞(Page 2C-4)
3) Install rear brake back plate for each of right and left rear wheels. ☞(Page 4C-5)
4) Connect brake pipes to brake hoses, and then install E-rings. Tighten rear brake pipe flare nuts to specified torque. ☞(Page 4A-11)
5) Install wheel speed sensor clamps (with ABS) and parking brake cable clamps to rear axle.
6) Install parking brake cable for each of right and left rear wheels. ☞(Page 4D-2)
7) After installing brake parts, bleed air from brake system. ☞(Page 4A-6)
8) Adjust parking brake. ☞(Page 4D-2)
9) Install rear wheels. ☞(Page 2D-3)
10) Lower hoist and bounce vehicle up and down several times to stabilize suspension.
11) Tighten shock absorber lower nuts to specified torque. ☞(Page 2C-2)
12) Tighten rear axle bolts to specified torque.

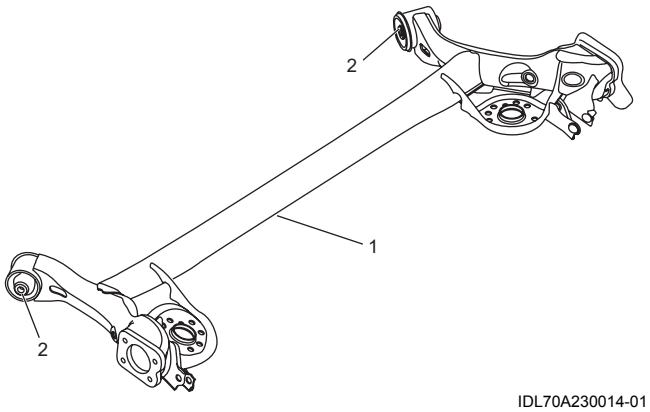
    Tightening torque
    Rear axle bolt (a): 78 N·m (8.0 kgf-m, 57.5 lbf-ft)

13) Install rear fender lining at each of both sides.
14) Check that rear brakes are free from dragging and proper braking is obtained.
15) Check all installed parts for brake fluid leakage.

Rear Axle Check

AENDL70A2306017

- Inspect rear axle (1) for deformation and damage.
- Inspect rear axle bushings (2) for crack, deformation and damage. If check result is not OK, replace rear axle assembly with new one.



IDL70A230014-01

Rear Suspension Fasteners Inspection

AENDL70A2306013

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque. ☞(Page 2C-2)

Specifications

Tightening Torque Specifications

AENDL70A2307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Rear shock absorber upper nut	28	2.9	21.0	☞(Page 2C-3)
Rear shock absorber lower nut	90	9.2	66.5	☞(Page 2C-3) / ☞(Page 2C-5)
Rear axle bolt	78	8.0	57.5	☞(Page 2C-6)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Rear Suspension Components” (Page 2C-2)
“Fasteners Information” in Section 0A (Page 0A-5)

Wheels and Tires

Precautions

Precautions for Wheel and Tire Servicing

AENDL70A2400001

⚠ WARNING

When replacing the tires, do not mix different types of tires on the same vehicle such as radial / bias and bias-belted tires except in emergencies, because handling may be seriously affected and may result in loss of control.

Wheel repairs that use welding, heating, or peeling are not approved. All damaged wheels should be replaced.

General Description

Tire Description

AENDL70A2401001

Tire

The tires are of a tubeless type. The tires are designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressure.
Correct tire pressures and driving habits have an important influence on tire life. Hard cornering, excessively rapid acceleration, and unnecessary hard braking increase tire wear.

Tire Placard

The “Tire Placard” is located on the center pillar of driver side door. The placard lists the maximum load, tire size and cold tire pressure.

NOTE

Whether rim size and/or maximum load are listed or not depends on regulations of each country.

Inflation of Tire

The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises. Tire pressure, with tires cold, (after vehicle has set for 3 hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Adjust tire pressure to the specifications on the “Tire Placard”. It is normal for tire pressure to increase when the tires become hot during driving. Do not bleed or reduce tire pressure after driving. Bleeding reduces the cold inflation pressure.

Replacement Tire

Refer to the “Tire Placard”. Replacement tires should be of the same size, load range and construction as those originally installed on the vehicle. Using tires in different size or type may affect ride, handling, speedometer / odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.

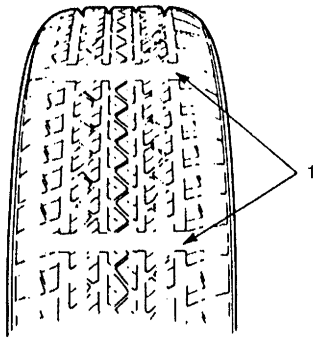
It is recommended that new tires be installed in pairs on the same axle. If replacing only one tire is unavoidable, it should be paired with the tire of the best tread condition to equalize tire-road friction during braking.
The tire inflation pressure is indicated in kilo-pascal (kPa) while it is also indicated in kgf/cm^2 and psi on the Tire Placard. Metric tire gauges are available from tool suppliers. The table below shows unit conversion for commonly used inflation pressures.

	kPa	kgf/cm^2	psi
Conversion:	160	1.6	23
1 psi = 6.895 kPa	180	1.8	26
1 kgf/cm^2 = 98.066 kPa	200	2.0	29
	220	2.2	32
	240	2.4	35
	260	2.6	38
	280	2.8	41
	300	3.0	44

Wear Indicator

Originally installed tires have built-in tread wear indicators (1).
These indicators appear as 10 mm (0.39 in) wide bands when the tire tread depth becomes 1.6 mm (0.063 in). If the indicators (1) appear in 3 or more tread grooves at 6 locations, replacement of the tire is recommended.

Tire wear limit
limit: 1.6 mm (0.063 in.)



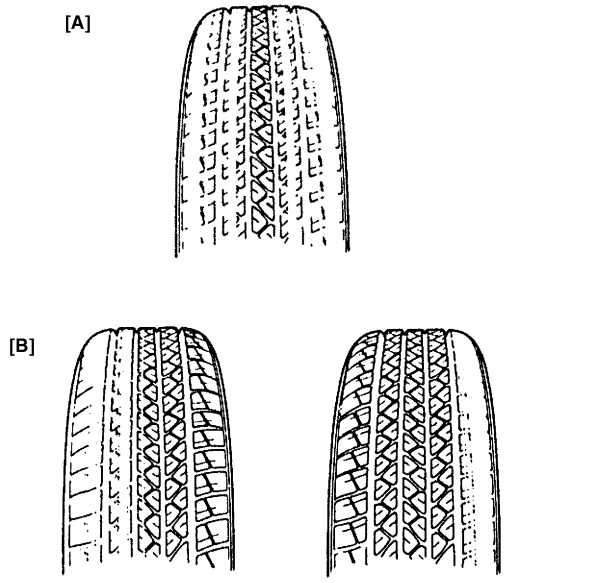
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Irregular and/or Premature Wear
Irregular and/or premature wear has many causes. Some causes are as follows: incorrect inflation pressures, lack of tire rotation, rough driving and improper alignment. If one of the following conditions is noted, rotation is necessary.

- Front tires wear differently from rear tires.
- Uneven wear between both sides of tread on the same tire.
- Both front tires wear unevenly.
- Both rear tires wear unevenly.
- Abnormal wear such as cupping and flat spotting is noted.

Wheel alignment should be checked if one of the following conditions is noted.

- Front tires wear unevenly.
- Uneven wear between both sides of tread on the same front tire.
- Front tire treads show scuffs with “feather” edges on one side of tread ribs or blocks.



I3RH0A240002-01

[A]:	Hard cornering, under inflation or lack of tire rotation
[B]:	Incorrect wheel alignment, irregular tire construction or wheel heavy acceleration

Wheel Description

AENDL70A2401002

Wheel Maintenance
Wheel repairs that use welding, heating or peening are not approved. All damaged wheels should be replaced.

Replacement Wheel
Wheels must be replaced if they have any of the following conditions: bends, dents, excessive lateral or radial runout, air leaks through welds, elongated bolt holes, failure of lug nuts to stay tight, heavy rusts. Wheels with great runout will cause objectionable vibrations.

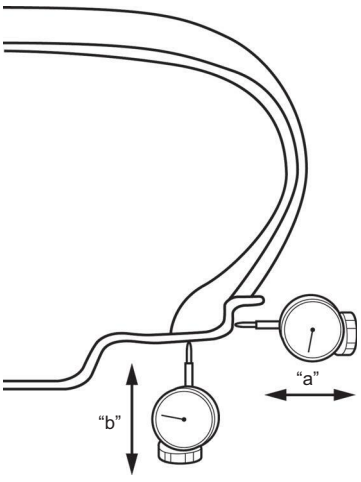
Replacement wheels must be equivalent to the originally installed wheels in load capacity, diameter, rim width, offset and mounting configuration.
Using wheel in improper size or type may affect wheel and bearing life, brake cooling performance, speedometer / odometer calibration, ground clearance and clearance to the body and chassis.

Wheel Runout Inspection

1) Install wheel (either with or without tire) on wheel balancer or other appropriate equipment.
2) Set dial gage applying its plunger to wheel at angles “a” and “b” as shown in figure.
3) Give wheel a full turn slowly and record the maximum dial gauge reading for each of the angle “a” (lateral runout) measurement and the angle “b” (radial runout) measurement.
4) Replace wheel if either or both of the recorded dial gauge readings exceed the following limits.

Wheel runout

		Lateral runout limit “a”	Radial runout limit “b”
Steel wheel	13 x 4 1/2J	0.90 mm (0.035 in.)	0.70 mm (0.027 in.)
	14 x 5J	0.70 mm (0.027 in.)	0.50 mm (0.020 in.)
Aluminum wheel		0.30 mm (0.012 in.)	0.30 mm (0.012 in.)



IAW101240001-02

Repair Instructions

Wheel (with Tire) Removal and Installation

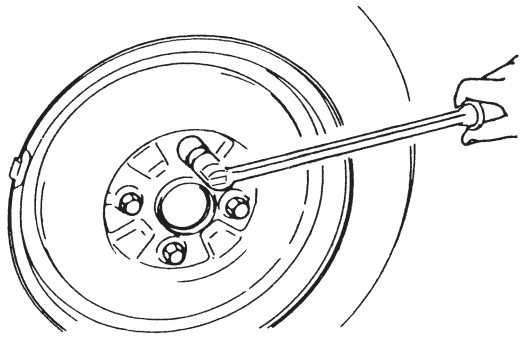
AENDL70A2406001

NOTICE

Never use heat to loosen tight wheel nut because application of heat to wheel can shorten life of wheel and damage wheel bearings.

Removal

1) Loosen wheel nuts by approximately 180° (half-turn).
2) Hoist vehicle and remove wheel.



I7V10A240001-01

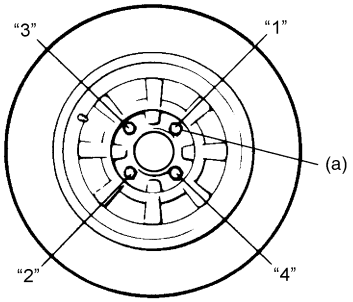
Installation

Reverse removal procedure noting the following points.

- Check for buildup of corrosion / foreign matter on mating surfaces of wheel and brake disc / drum, and remove any buildup if any.
- Check for roughness, scoring or stepped wear on seat of wheel holes and on nut taper surfaces, and if any abnormality is found, repair or replace nut and/or wheel.
- Make sure that any foreign matter, rust, oil and grease are removed from thread part of hub bolt and nut.
- Install each wheel nut by hand and if it is not screwed until nut comes in contact with seat of wheel hole or any abnormality is found, replace wheel nut and/or bolt.
- Tighten wheel nuts in sequence as shown in figure and to specified torque

Tightening order
“1” – “2” – “3” – “4”

Tightening torque
Wheel nut (a): 85 N·m (8.7 kgf-m, 63.0 lbf-ft)



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Tire Balance Procedures

AENDL70A2406004

⚠ WARNING

Stones should be removed from the tread in order to avoid operator injury during spin balancing and to obtain good balance.

Deposits of mud, etc. must be cleaned from inside of rim. Each tire should be inspected for any damage, and then balanced according to equipment manufacturer’s recommendation.

Off-Vehicle Balancing

Most electronic off-vehicle balancers are more accurate than the on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

On-Vehicle Balancing

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer’s instructions during balancing operation.

⚠ WARNING

Wheel spin should be limited to 55 km/h (34 mile/h) as indicated on speedometer. This limit is necessary because speedometer only indicates one-half of actual wheel speed when one drive wheel is spinning and the other drive wheel is stopped. Unless care is taken in limiting drive wheel spin, spinning wheel can reach excessive speeds. This can result in possible tire disintegration or differential failure, which could cause serious personal injury or extensive vehicle damage.

⚠ CAUTION

For vehicle equipped with ABS, using on-vehicle balancing method with ignition switch ON may set malfunction diagnostic trouble code (DTC) of ABS even when system is in good condition.
Never turn ignition switch ON while spinning wheel.

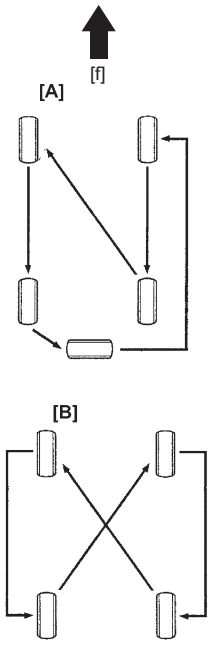
Tire Rotation

AENDL70A2406005

To equalize wear, rotate tires according to the figure. Tires should be rotated periodically.

NOTE

Due to their design, radial tires tend to wear fast in the shoulder area, particularly in front positions. This makes regular rotation especially necessary.



IDL70A240001-01

[f]: Forward	[B]: 4-tire rotation
[A]: 5-tire rotation	

Tire Mounting and Dismounting

AENDL70A2406006

⚠ WARNING

Failure to take proper precautions when inflating a tire can result in severe personal injury.

- **Do not stand over a tire being inflated. The tire's bead may break if it snaps over the rim's safety hump, possibly causing personal injury.**
- **Do not inflate the tire to a pressure exceeding the specified value. If specified pressure does not seat beads, deflate, re-lubricate and reinflate. Over-inflation may cause the bead to break, causing personal injury.**

⚠ CAUTION

Do not try to change tires using hand tools or tire irons alone, as doing so may damage tire beads or wheel rim.

Dismount and mount tire using a tire changing machine, noting the following points:

- Follow equipment manufacturer's instructions.
- Rim bead seats should be cleaned using wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or dismounting tire, bead area should be well lubricated with approved tire lubricant.
- After mounting tire, inflate it to pressure a little smaller than specified value so that beads are completely seated. Then adjust pressure to specification indicated on tire placard.
- Valve caps should always be installed on valves to keep dust and water out.

Tire Repair

AENDL70A2406007

There are many different materials and techniques on the market to repair tires. As not all of these works on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from each tire manufacturer.

Specifications

Wheel and Tire Specifications

AENDL70A2407001

Tire specification (Standard)
: 155 / 80 R13 79S, 165 / 70 R14 81S

Wheel specification (Standard)
: 13 x 4 1/2J
: 14 x 5J

NOTE

- **Tire inflation pressure should be checked when tires are cool.**
- **Specified tire inflation pressure should be found on tire placard or in owner's manual which comes with the vehicle.**

Tightening Torque Specifications

AENDL70A2407002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Wheel nut	85	8.7	63.0	☞(Page 2D-3)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Fasteners Information” in Section 0A (Page 0A-5)

Section 3

Driveline / Axle

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Precautions

Precautions

Precautions on Driveline / Axle

AENDL70A3000001

General Precautions
Refer to “General Precautions” in Section 00 (Page 00-1).

Suspension Caution
Refer to “Suspension Caution” in Section 00 (Page 00-5).

Warning for Wheel (with Tire) Removal
Refer to “Warning for Wheel (with Tire) Removal” in Section 00 (Page 00-5).

Fastener Caution
Refer to “Fastener Caution” in Section 00 (Page 00-5).

Fastener Information
Refer to “Fasteners Information” in Section 0A (Page 0A-5).

Vehicle Lifting Points
Refer to “Vehicle Lifting Points” in Section 0A (Page 0A-7).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness. Otherwise, electrical trouble may occur.

Drive Shaft / Axle

Front

General Description

Front Drive Shaft Construction

AENDL70A3111001

A constant velocity ball joint is used on the wheel side of both right and left side drive shaft assemblies. A tripod type constant velocity joint is used on the differential side. The tripod joint allows each drive shaft to slide in the extension/ contraction direction.

Diagnostic Information and Procedures

Front Drive Shaft Symptom Diagnosis

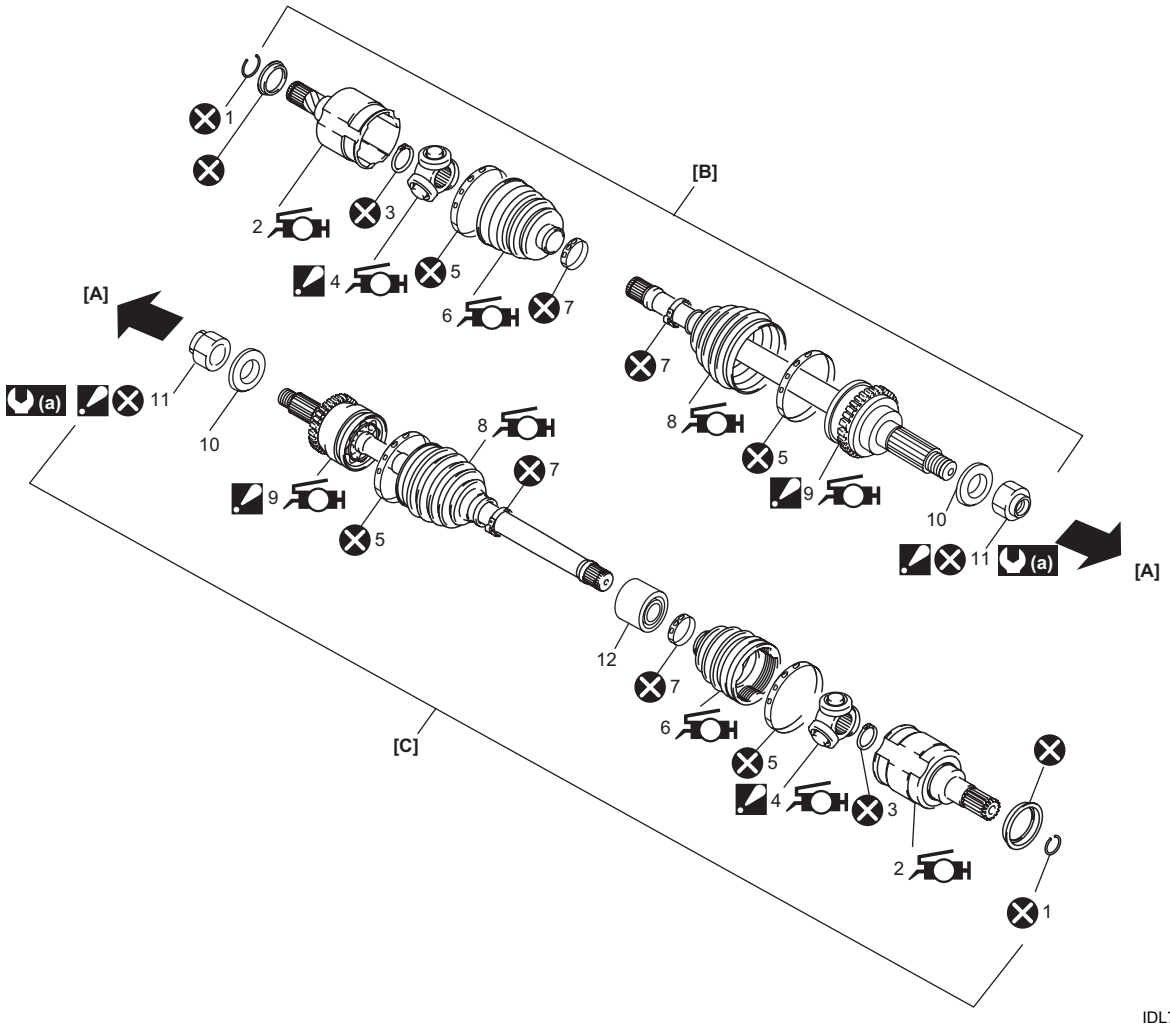
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Condition	Possible cause	Correction / Reference Item
Abnormal noise	Worn or broken drive shaft joint	*Replace.*

Repair Instructions

Front Drive Shaft Components

AENDL70A3116001



IDL70A311004-05

[A]: Wheel side	7. Boot band (small)
[B]: Left side	8. Boot (wheel side) : NKG814: Apply yellow grease 55 - 75 g included in spare part.
[C]: Right side	9. Wheel side joint assembly (constant velocity ball joint) : Never disassemble wheel side joint. : NKG814: Apply yellow grease included in spare part.
1. Circlip	10. Drive shaft washer
2. Differential side joint housing (constant velocity tripod joint) : NKG814: Apply yellow grease 55 - 75 g included in spare part.	11. Front drive shaft nut : After tightening nut to specified torque, caulk nut securely.
3. Snap ring	12. Damper (right side drive shaft only)
4. Tripod joint : Never disassemble. : NKG814: Apply yellow grease included in spare part.	(a) : 175 N·m (17.8 kgf-m, 129.0 lbf-ft)
5. Boot band (big)	: Do not reuse.
6. Boot (differential side) : NKG814: Apply yellow grease 55 - 75 g included in spare part.	

Front Drive Shaft Assembly On-Vehicle Inspection

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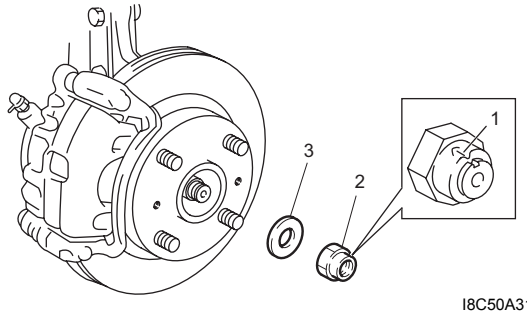
- Check boots for grease leakage, tear or deterioration.
- Check boot bands for looseness, crack or damage.
- Check drive shafts for damage.
- Check wheel side joint for rattle or smooth rotation.
- Check differential side joint for smooth rotation.
  If any abnormality is found, replace.

Front Drive Shaft Assembly Removal and Installation

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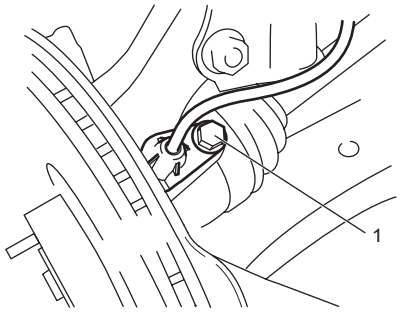
Removal

1) Hoist vehicle and remove front wheel. ☞(Page 2D-3)
2) Undo caulking (1) and remove drive shaft nut (2) and drive shaft washer (3) with brake pedal depressed.



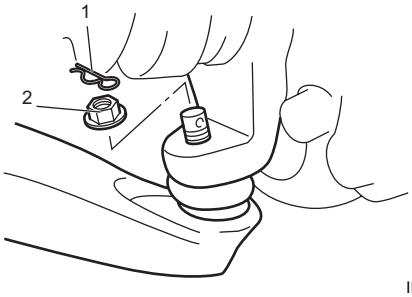
I8C50A311026-01

3) Drain transaxle oil.
   M/T model: ☞(Page 5B-5)
   Automated Manual Transaxle model: ☞(Page 5D-82)
4) For ABS model, remove wheel speed sensor bolt (1) and detach sensor from steering knuckle.



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5) Remove clip (1) and nut (2) from suspension arm ball joint.

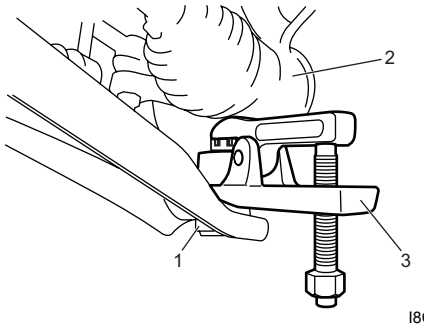


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6) Disconnect ball joint (1) from steering knuckle (2) by using joint separator (3).

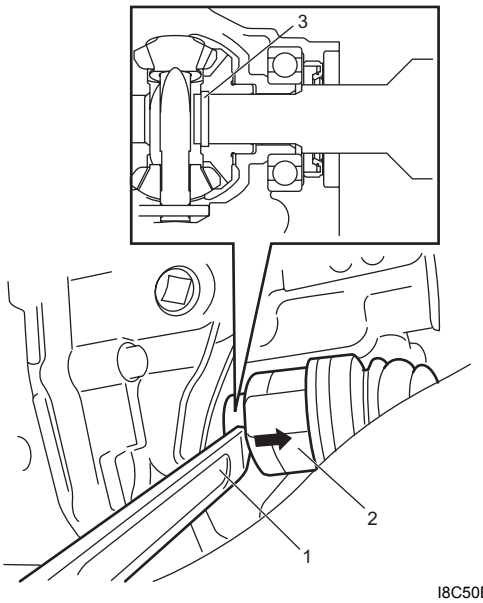
NOTE

- **When joint separator is applied, leave nut on top of ball joint thread to prevent thread from being damaged.**
- **Care should be taken to avoid damage of ball joint dust seal.**



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7) Using tire lever (1) or the like, pull out drive shaft joint (2) while turning drive shaft joint in parallel with transaxle case so as to release circlip (3) fitting of joint spline at differential side.



I8C50B311002-01

8) Remove drive shaft assembly.

Installation

NOTE

- **Be careful not to damage oil seals and boots when installing drive shaft.**
- **Do not hit joint boot with hammer. Inserting joint only by hands is allowed.**
- **Make sure that differential side joint is inserted fully and its circlip is seated as it was installed.**

Reverse removal procedure noting the following points.

- Use new differential side joint circlip.
- Apply grease to spline of wheel side joint.

: Grease 99000–25011 (SUZUKI Super Grease A)

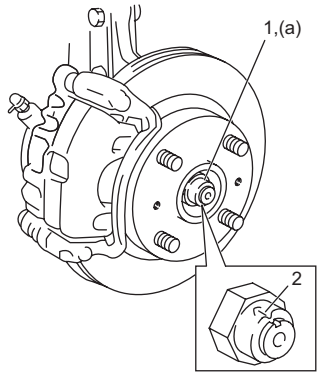
- Tighten suspension arm nut to specified torque. ☞(Page 2B-8)
- Tighten wheel speed sensor bolt to specified torque. ☞(Page 4E-35)
- Tighten new drive shaft nut (1) to specified torque.

Tightening torque
Drive shaft nut (a): 175 N·m (17.8 kgf-m, 129 lbf-ft)

- Caulk drive shaft nut (1) as shown.

NOTE

If caulking part of nut cracks while caulking (2), replace nut with new one.



I8C50A311031-01

- Install wheel. ☞(Page 2D-3)
- Fill transaxle with transaxle oil as specified.
  Manual Transaxle model: ☞(Page 5B-5)
  Automated Manual Transaxle model: ☞(Page 5D-82)

Front Drive Shaft Disassembly and Reassembly

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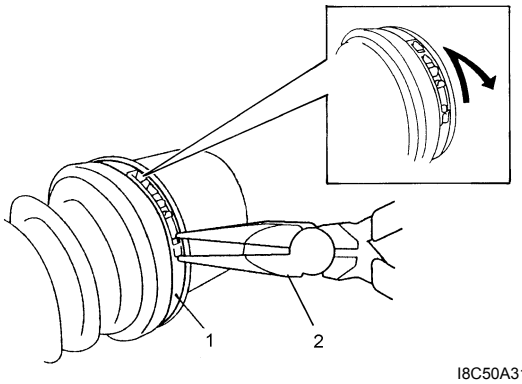
Disassembly

NOTE

- **Disassembly of wheel side joint is not allowed. If any noise or damage exists, replace it as assembly.**
- **Do not disassemble tripod joint. If any defect is found, replace it as differential side joint assembly.**

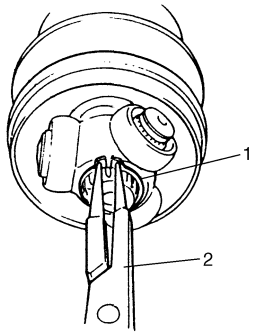
Differential side joint

1) Using nose pliers (2), disengage hooks of boot band (big) (1) and remove band.



I8C50A311001-03

2) Remove joint housing from boot.
3) Wipe off grease from shaft and take off snap ring (1) using snap ring pliers (2).

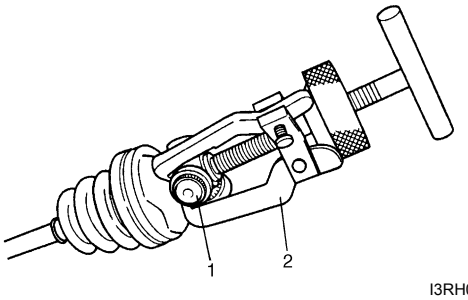


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4) Remove tripod joint (1) using 3-arm puller (2).

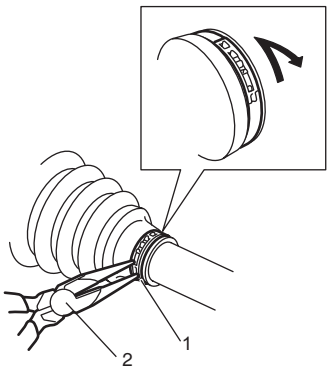
NOTE

To prevent any problem caused by washing solution, do not wash tripod joint except its housing. Degreasing of tripod joint with cloth is allowed.



I3RH0A311004-01

5) Using nose pliers (2), disengage hooks of boot band (small) (1) and remove band.

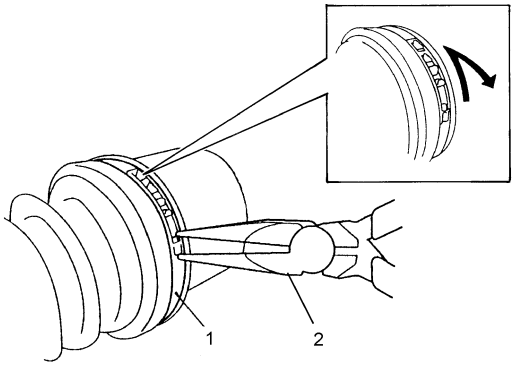


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6) Pull out differential side boot from shaft.
7) Remove damper from shaft, if equipped.

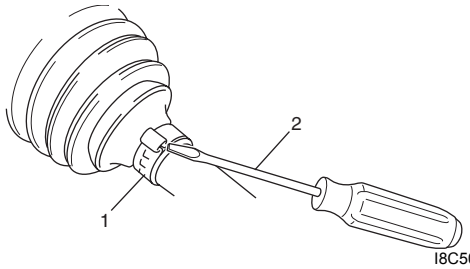
Wheel side joint

1) Using nose pliers (2), disengage hooks of boot band (big) (1) and remove band.



I8C50A311001-03

2) Remove boot band (small) (1) using flat-bladed screwdriver or the like (2).



I8C50A311033-01

3) Pull out boot from shaft.

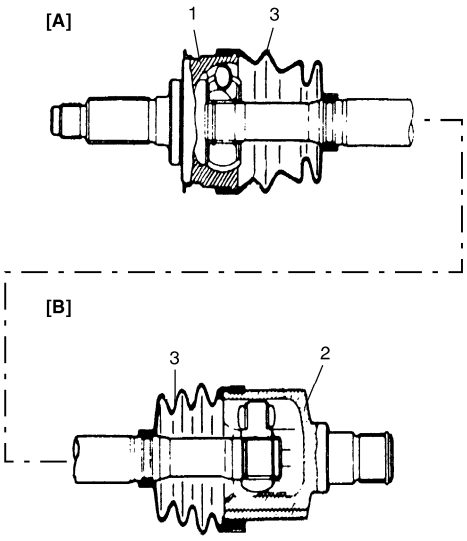
Reassembly

NOTE

- **Do not wash boots (3) with degreaser such as gasoline or kerosene, etc. Washing in degreaser causes deterioration of boot.**
- **To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified amount of grease to respective joint according to the following procedures.**

NOTE

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Make sure that wheel side joint assembly (1) and differential side joint housing (2) are washed thoroughly and air dried.



I4RS0A310007-01

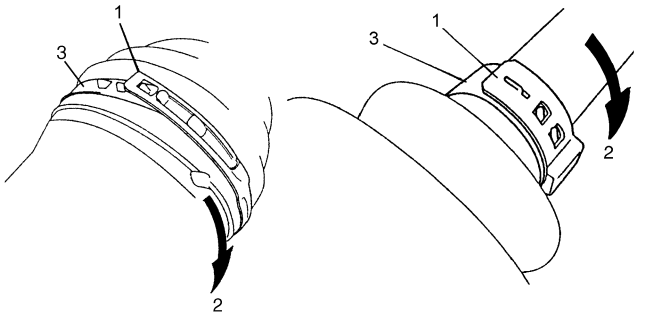
[A]:	Wheel side
[B]:	Differential side

Wheel side joint

1) Place new boot bands (3) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.

NOTE

Be sure to use new boot bands.

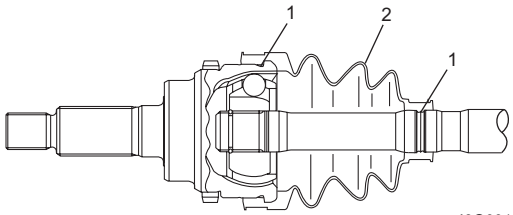


I8C50A311003-03

2) Install new boot bands and boot to shaft temporarily.
3) Using specified grease included in spare parts, apply grease to wheel side joint and boot.

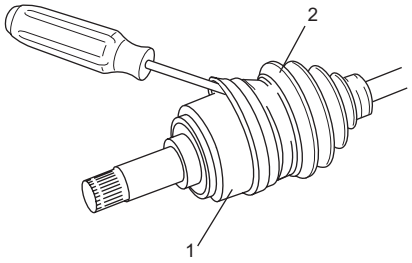
Grease specification for front drive shaft wheel side joint
NKG814: Color: Yellow
Amount: 55 - 75 g (1.94 - 2.65 oz)

4) Fit boot (2) to grooves (1) of shaft and wheel side joint.



I8G001311011-01

5) Insert screw driver or the like into boot (2) and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.



I8G001311012-01

1.	Wheel side joint

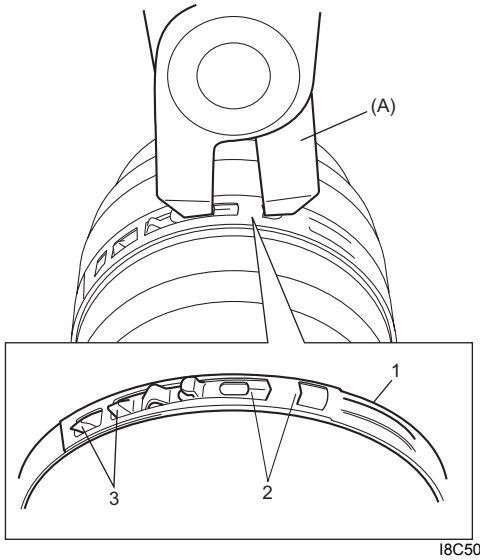
6) Fasten boot band noting the following points.

NOTE

Do not squeeze or distort boot when fastening it with boot bands. Squeezing boot to force air out may distort boot and reduce its durability.

a) Fasten boot band (big) (1) by drawing hooks (2) with special tool and engage hooks (3) as shown in figure.

Special tool
(A): 09943M57021

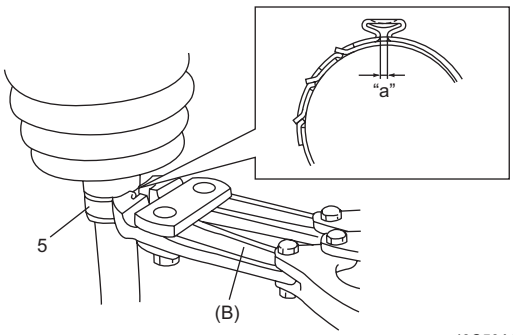


I8C50A311034-01

b) Fasten boot band (small) (5) using special tool as shown in figure

Boot band (small) fastening distance "a"
: 2.6 ± 1.4 mm (0.102 ± 0.055 in.)

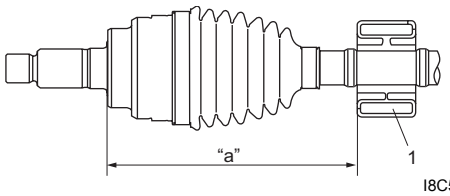
Special tool
(B): 09943M57010



I8C50A311004-02

7) Install damper (1) to specified position on right side drive shaft.

Right side drive shaft damper installing position "a": 385 mm (15.1 in.)



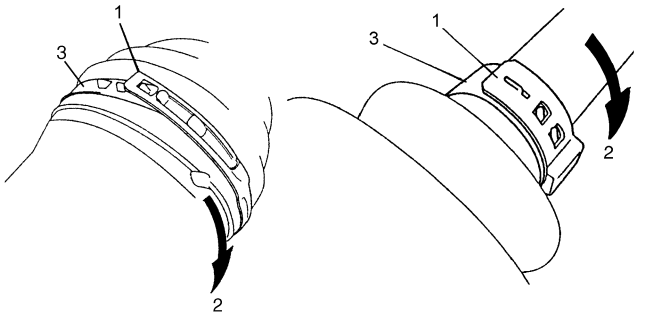
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Differential side joint

1) Place new boot bands (3) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.

NOTE

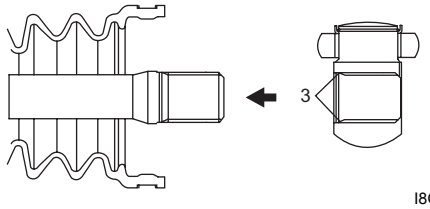
Be sure to use new boot bands.



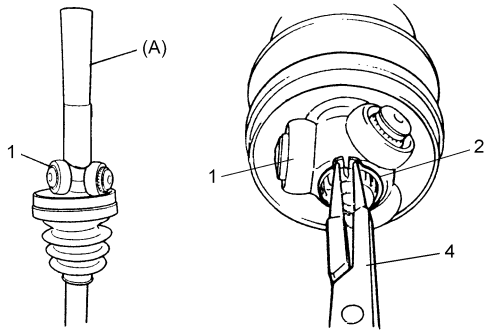
I8C50A311003-03

2) Install new boot bands and boot to shaft temporarily.
3) Install tripod joint (1) on shaft using special tool with hammer, directing its chamfered spline (3) toward wheel side, and then fasten it with new snap ring (2) using snap ring pliers (4).

Special tool
(A): 09925M98221



I8G001311014-01

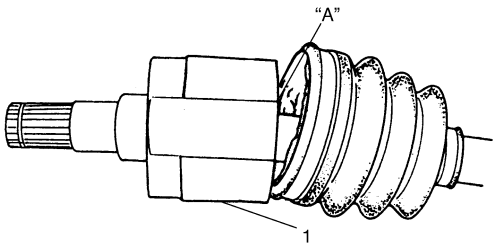


I8C50A311007-01

4) Using specified grease included in spare parts, apply grease to tripod joint, differential side joint housing (1) and boot.

Grease specification for front drive shaft differential side joint "A"
NKG814: Color: Yellow
Amount:

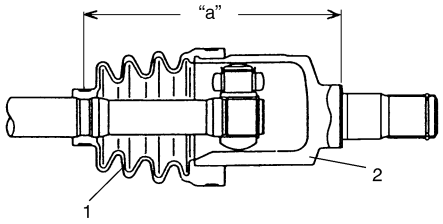
- **Right side: 55 - 75 g (1.94 - 2.65 oz)**
- **Left side: 55 - 75 g (1.94 - 2.65 oz)**



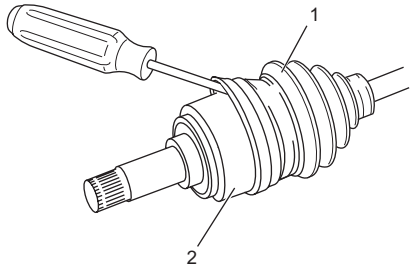
I4RS0B310003-01

5) Fit boot (1) to grooves of shaft and differential side joint housing (2).
6) Insert a screwdriver or the like into boot (1) and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

Front drive shaft boot differential side joint fixing position "a"
Right side drive shaft: 136.4 mm (5.37 in.)
Left side drive shaft: 136.4 mm (5.37 in.)



I7V20A311008-01



I8C50A311008-01

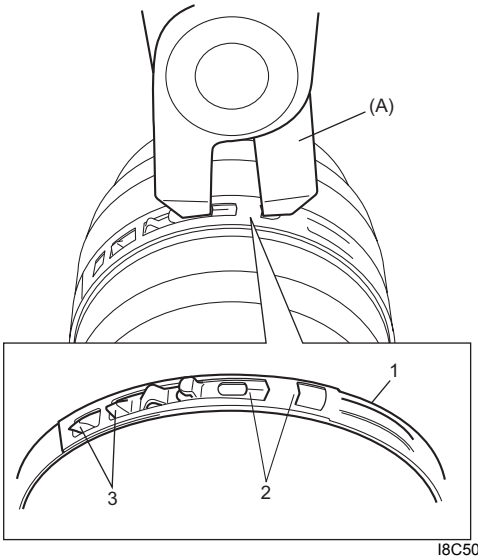
7) Fasten boot band noting the following points.

NOTICE

Do not squeeze or distort boot when fastening it with boot bands. Squeezing boot to force air out may distort boot and reduce its durability.

Fasten boot band (big and small) (1) by drawing hooks (2) with special tool and engage hooks (3) as shown in figure.

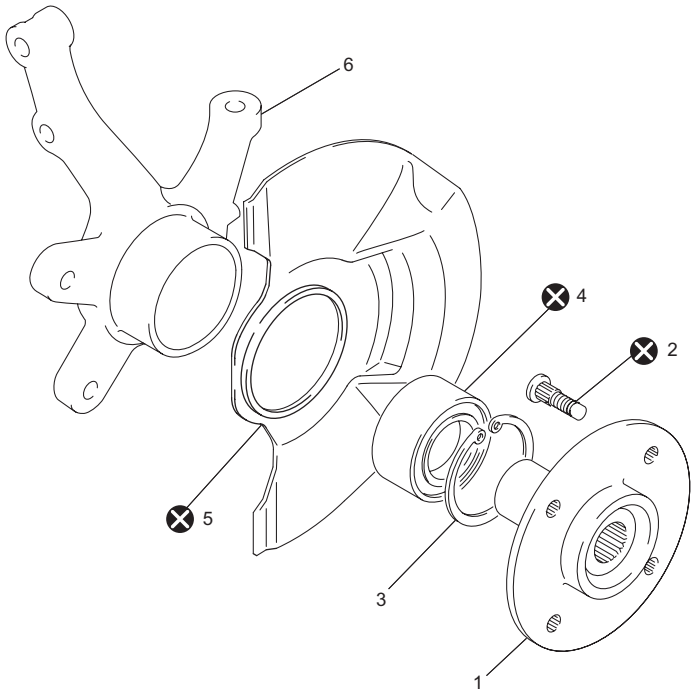
Special tool
(A): 09943M57021



I8C50A311034-01

Front Wheel Hub and Steering Knuckle Components

AENDL70A3116005



I8C50A311010-03

1. Front wheel hub	5. Dust cover
2. Hub bolt	6. Steering knuckle
3. Circlip	⊗ : Do not reuse.
4. Wheel bearing	

Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation

AENDL70A3116006

NOTE

When removing and installing steering knuckle assembly, be careful not to damage dust cover of suspension arm joint.

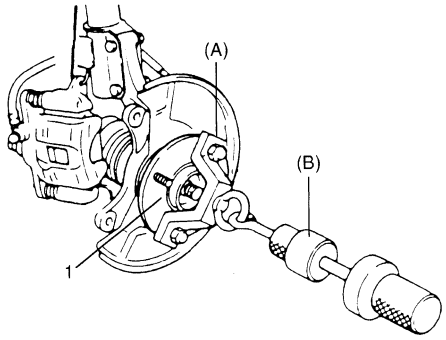
Removal

1) Hoist vehicle and remove front wheel. ☞(Page 2D-3)
2) Uncaulk drive shaft nut, and then remove drive shaft nut and drive shaft washer. ☞(Page 3A-2)
3) Remove brake disc. ☞(Page 4B-3)
4) Pull out wheel hub (1) with special tools.

NOTE

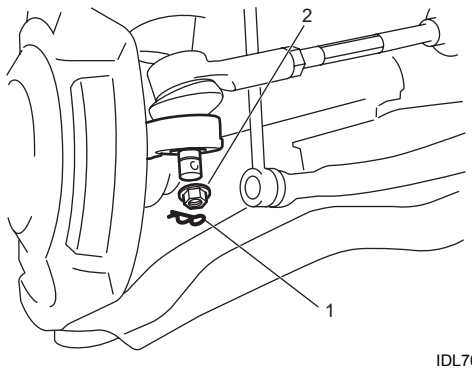
Outer side of wheel bearing inner race comes out together with wheel hub.

Special tool
(A): 09943M17912
(B): 09942M15511



I2RH01220028-01

5) Remove clip (1) and tie-rod end nut (2) from tie-rod end.

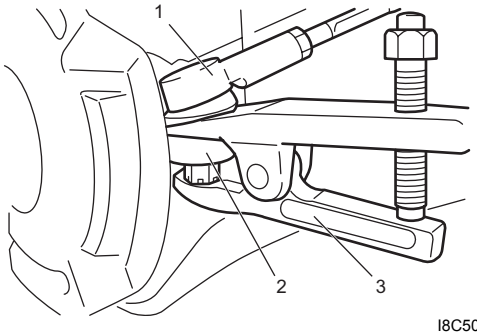


IDL70A311008-01

6) Disconnect tie-rod end (1) from steering knuckle (2) by using joint separator (3).

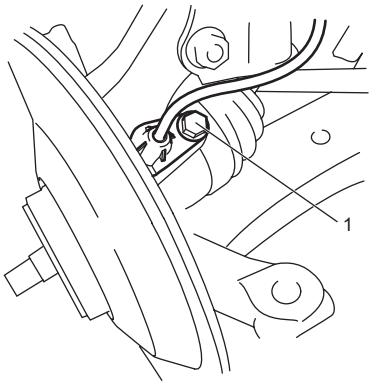
NOTE

- **When joint separator is applied, leave nut on top of tie-rod end thread to prevent thread from being damaged.**
- **Care should be taken to avoid damage of tie-rod end boot.**



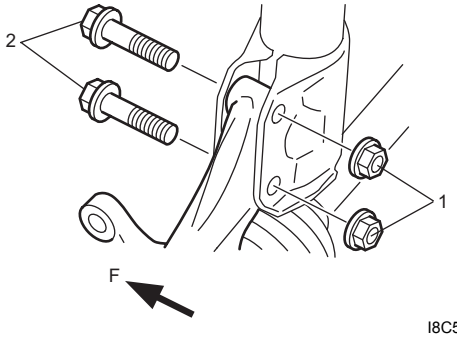
I8C50A311012-01

7) For ABS model, remove wheel speed sensor bolt (1) and detach sensor from steering knuckle.



I8C50A311013-01

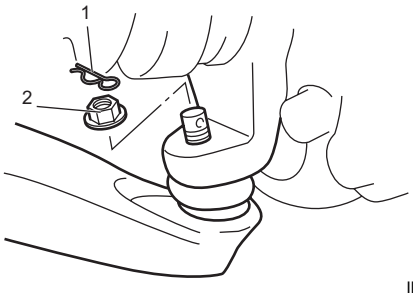
8) Remove strut bracket nuts (1) and bolts (2).



I8C50A311014-01

F: Forward

9) Remove clip (1) and nut (2) from suspension arm ball joint.

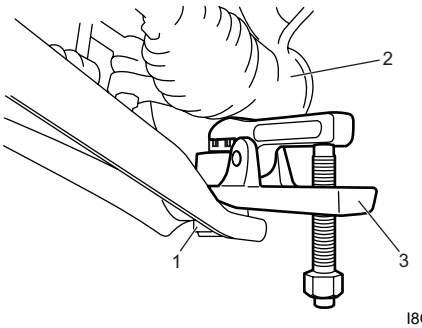


IDL70A311007-02

10) Disconnect ball joint (1) from steering knuckle (2) by using joint separator (3), and then remove knuckle assembly.

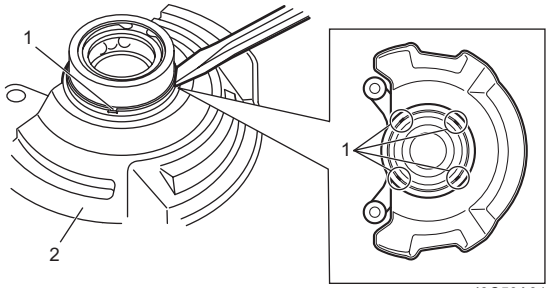
NOTE

- **When joint separator is applied, leave nut on top of ball joint thread to prevent thread from being damaged.**
- **Care should be taken to avoid damage of ball joint dust seal.**



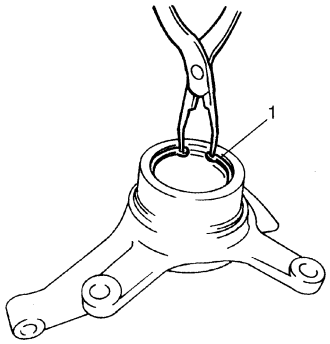
I8C50A311016-01

11) Uncaulk 4 caulking points (1) with a chisel or the like.
12) Remove dust cover (2).



I8C50A311017-01

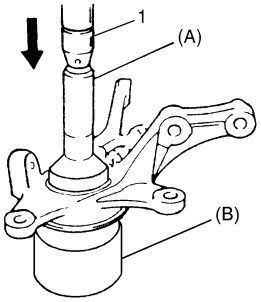
13) Remove circlip (1) from steering knuckle.



I2RH01220037-01

14) Using hydraulic press (1) and special tools, push out wheel bearing.

Special tool
(A): 09913M75810
(B): 09951M18211

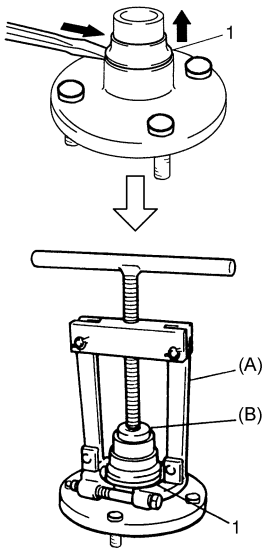


I8C50A311018-02

15) Pry wheel bearing outside inner race (1) a little using chisel or the like.

16) Remove wheel bearing outside inner race (1) from wheel hub using special tools as shown in figure.

Special tool
(A): 09913M65810
(B): 09926M37610M003

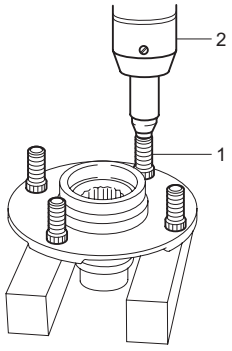


I8C50A311019-02

17) Push out hub bolts (1) with hydraulic press (2) or copper hammer.

NOTE

- **Do not remove bolt unless replacement is necessary.**
- **When hub bolt is removed, replace it with new one.**



I8C50A311020-01

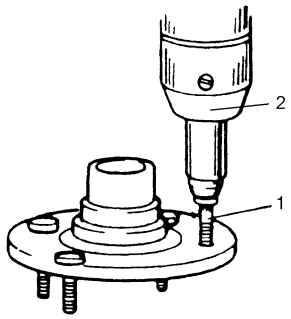
Installation

1) Insert new hub bolts (1) in hub hole. Rotate hub bolts slowly to assure that serrations are aligned with those made by original bolts.

2) Drive in hub bolts (1) in hub hole with hydraulic press (2) or copper hammer.

NOTE

Do not reuse hub bolt.



I8C50B311001-01

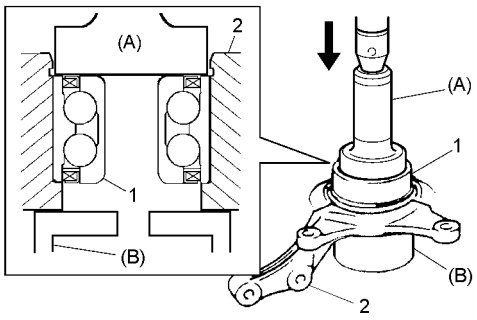
3) Put new wheel bearing (1) on steering knuckle (2).

NOTE

Do not reuse wheel bearing to avoid noise or sticking.

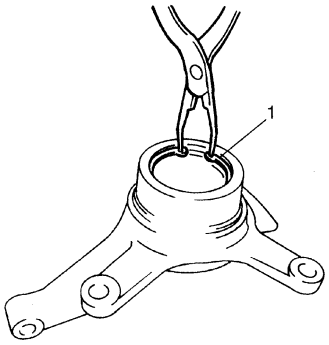
4) Press-fit wheel bearing into steering knuckle (2) using special tools as shown in figure.

Special tool
(A): 09913M75520
(B): 09951M18211



I8C50A311021-03

5) Install circlip (1).



I2RH01220037-01

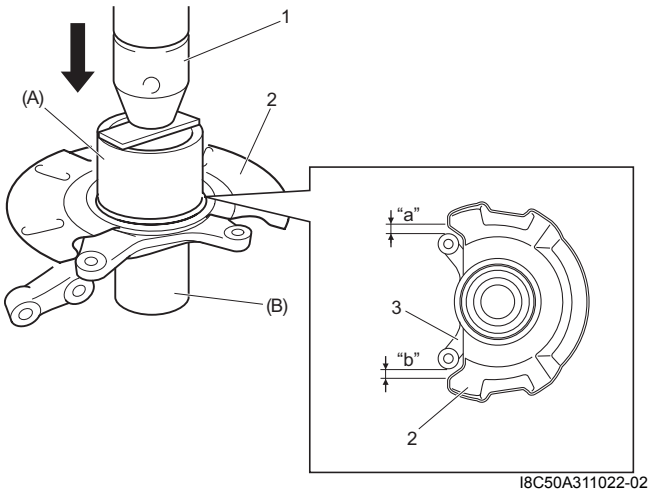
6) Set new dust cover so that dimensions “a” and “b” become equal as shown in figure.

NOTE

- **When driving in dust cover, do not deform it.**
- **When installing dust cover, use new one.**

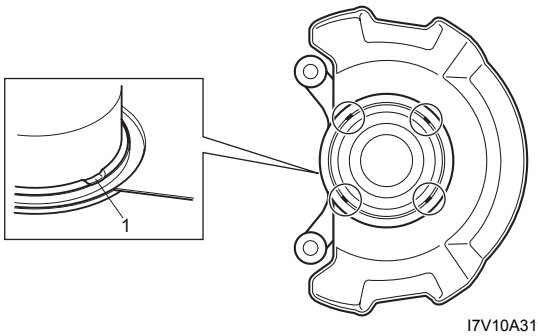
7) Press-fit new dust cover (2) into steering knuckle (3) using hydraulic press (1) and special tools.

Special tool
(A): 09951M17010
(B): 09951M18211



I8C50A311022-02

8) Caulk more than 4 places with a small with a punch or the like.

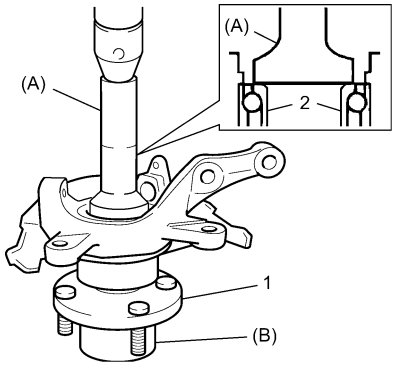


I7V10A311008-01

1. Caulking	

9) Using special tools and hydraulic press, press-fit wheel hub (1) into wheel bearing (2).

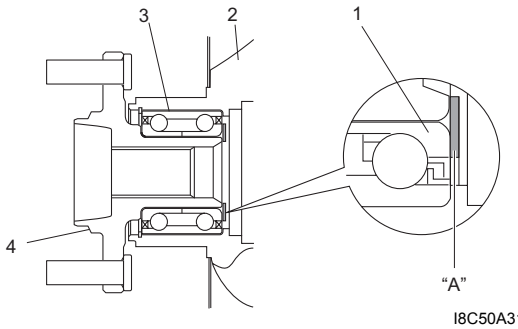
Special tool
(A): 09913M75810
(B): 09951M18211



I8C50A311035-01

10) Apply grease lightly to end face of wheel bearing inner ring (1).

“A”: Grease 99000–25011 (SUZUKI Super Grease A)



I8C50A311024-01

2. Steering knuckle	4. Front wheel hub
3. Wheel bearing	

11) Connect steering knuckle to suspension arm ball joint and tighten suspension arm nut to specified torque. ☞(Page 2B-8)
12) Install strut bracket bolts and nuts, then tighten nuts to specified torque. ☞(Page 2B-4)
13) Connect tie-rod end to knuckle and tighten tie-rod end castle nut to specified torque. ☞(Page 6C-25)

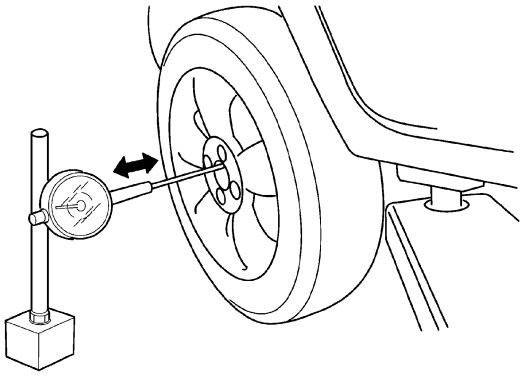
14) Install wheel speed sensor, then tighten bolt to specified torque. ☞(Page 4E-35)
15) Install brake disc and brake caliper. ☞(Page 4B-3)
16) Tighten new drive shaft nut to specified torque. ☞(Page 3A-2)
17) Install wheel and tighten wheel nuts to specified torque. ☞(Page 2D-3)
18) Confirm front wheel alignment. ☞(Page 2B-1)

Front Wheel Bearing Check

AENDL70A3116007

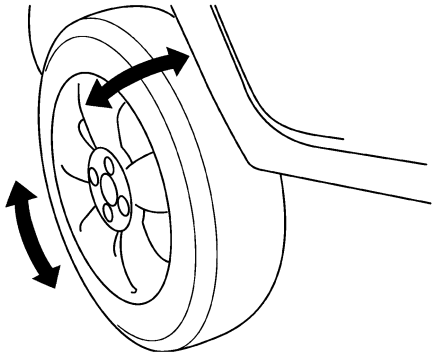
1) Confirm tightness of wheel nuts and, if necessary, retighten them to specified torque. ☞(Page 2D-3)
2) Hoist vehicle.
3) Check wear of wheel bearing. When measuring thrust play, apply a dial gauge to front wheel as shown in figure.
   If defective, replace bearing.

   Front wheel bearing thrust play
   Limit: 0.1 mm (0.004 in.)



I3RM0A230049-01

4) Check wheel bearing noise and smooth wheel rotation by rotating wheel.
   If defective, replace bearing.



I3RM0A230050-01

Specifications

Tightening Torque Specifications

AENDL70A3117001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Drive shaft nut	175	17.8	129	☞(Page 3A-3)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Front Drive Shaft Components”: Front (Page 3A-1)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A3118001

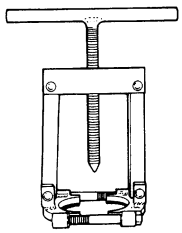
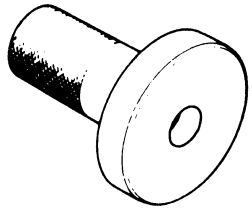
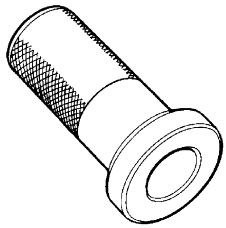
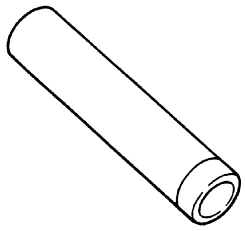
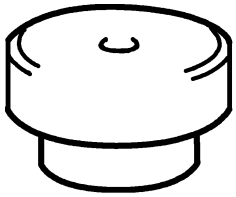
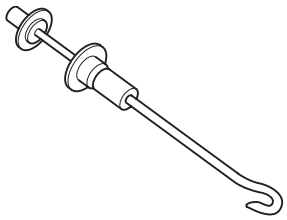
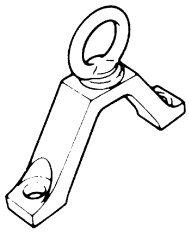
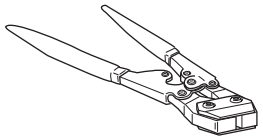
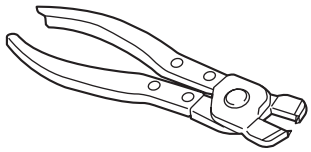
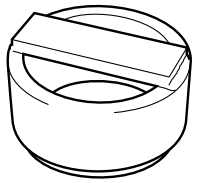
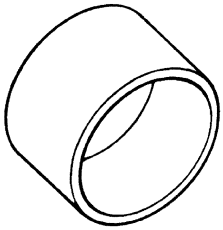
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 3A-3) / ☞(Page 3A-11)

NOTE

Required service materials are also described in:
“Front Drive Shaft Components”: Front (Page 3A-1)

Special Tool

AENDL70A3118002

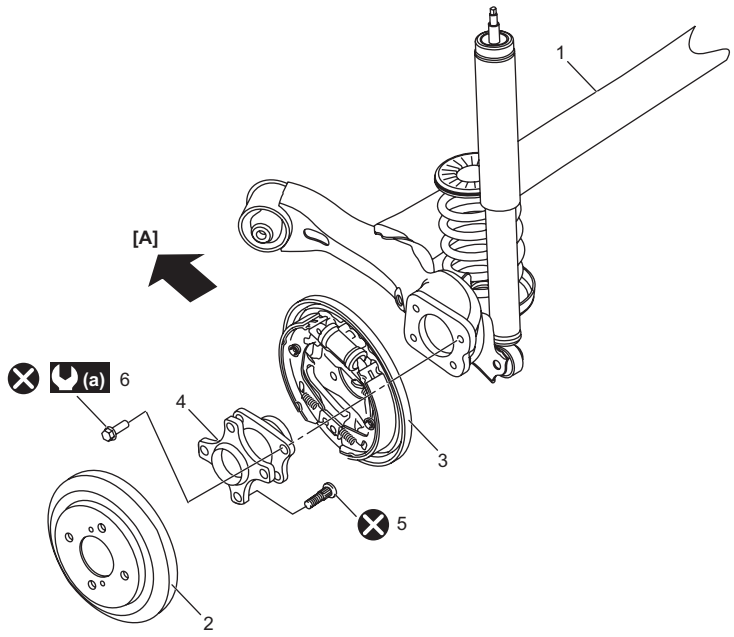
09913M65810 Crankshaft bearing puller ☞(Page 3A-10) 	09913M75520 Bearing installer ☞(Page 3A-10) 
09913M75810 Bearing installer ☞(Page 3A-10) / ☞(Page 3A-11) 	09925M98221 Bearing installer ☞(Page 3A-6) 
09926M37610M003 Bearing remover attachment ☞(Page 3A-10) 	09942M15511 Sliding hammer ☞(Page 3A-8) 
09943M17912 Wheel hub remover ☞(Page 3A-8) 	09943M57010 Band compressor ☞(Page 3A-6) 
09943M57021 Low-profile clamp pliers ☞(Page 3A-6) / ☞(Page 3A-7) 	09951M17010 Brake disk dust cover installer ☞(Page 3A-11) 
09951M18211 Oil seal remover & installer No. 2 ☞(Page 3A-10) / ☞(Page 3A-10) / ☞(Page 3A-11) / ☞(Page 3A-11) 	

Rear

Repair Instructions

Rear Axle Components

AENDL70A3126001



IDL70A312002-01

[A]: Vehicle forward	4. Rear wheel hub assembly
1. Trailing arm	5. Hub bolt
2. Rear brake drum	6. Rear wheel hub bolt
3. Rear drum brake assembly	(a): 70 N·m (7.1 kgf-m, 51.6 lbf-ft)

Rear Wheel Bearing Check

AENDL70A3126004

Check rear wheel bearing in the same manner as front wheel bearing. Refer to “Front Wheel Bearing Check”: Front (Page 3A-12)

Rear wheel bearing thrust play
Limit: 0.1 mm (0.004 in.)

Rear Wheel Hub Assembly Removal and Installation

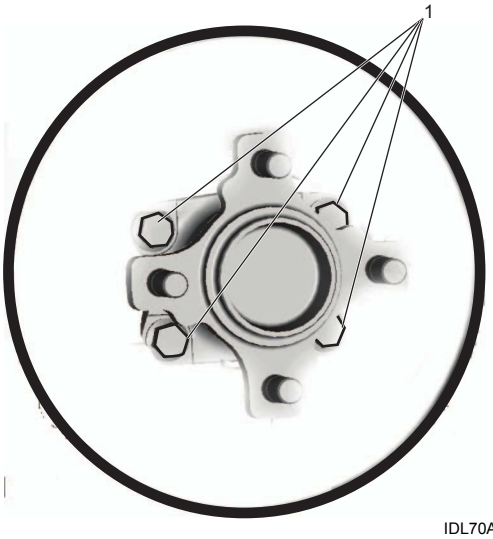
AENDL70A3126002

Removal

1) Hoist vehicle and remove rear wheel. ☞(Page 2D-3)
2) Remove rear brake drum. ☞(Page 4C-2)
3) Remove rear brake shoe. ☞(Page 4C-3)
4) Remove rear wheel hub bolts (1), then remove rear wheel hub assembly.

NOTE

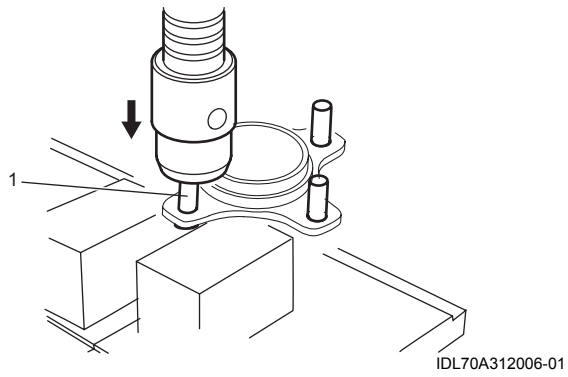
To prevent deformation of brake pipe, hang removed rear drum brake assembly using wire.



IDL70A312005-01

5) For vehicle with ABS, remove rear wheel speed sensor from rear wheel hub assembly. ☞(Page 4E-35)

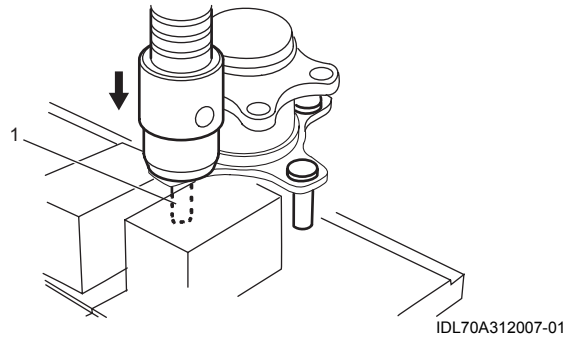
6) Remove hub bolts (1) with copper hammer or hydraulic press, if necessary.



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Installation

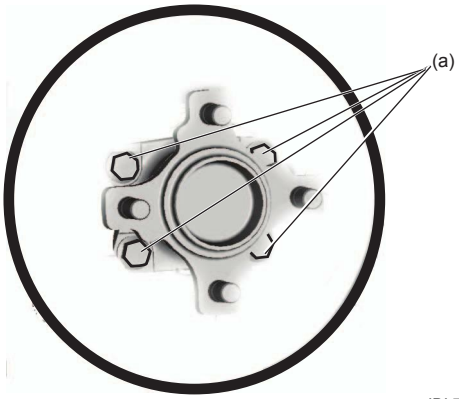
1) Insert new hub bolt (1) in hub hole. Rotate hub bolt slowly to assure that serrations are aligned with those made by original bolt and then press-fit, if necessary.



IDL70A312007-01

2) For vehicle with ABS, install rear wheel speed sensor. ☞(Page 4E-35)
3) Install rear wheel hub assembly and tighten new rear wheel hub bolts to specified torque.

Tightening torque
Wheel hub bolt (a): 70 N·m (7.1 kgf-m, 51.6 lbf-ft)



IDL70A312004-02

4) Install rear brake shoe. ☞(Page 4C-3)
5) Install rear brake drum. ☞(Page 4C-2)
6) Install rear wheel. ☞(Page 2D-3)
7) Confirm rear wheel alignment. ☞(Page 2C-1)

Specifications

Tightening Torque Specifications

AENDL70A3127001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Wheel hub bolt	70	7.1	51.6	☞(Page 3A-15)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Rear Axle Components”: Rear (Page 3A-14)
“Fasteners Information” in Section 0A (Page 0A-5)

Section 4

Brakes

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Precautions

Precautions

Precautions for Brakes

AENDL70A4000001

Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

Suspension Caution
Refer to “Suspension Caution” in Section 00 (Page 00-5).

Wheel and Tire Caution
Refer to “Wheel and Tire Caution” in Section 00 (Page 00-6).

Brake Caution
Refer to “Brake Caution” in Section 00 (Page 00-6).

General Precautions
Refer to “General Precautions” in Section 00 (Page 00-1).

Vehicle Lifting Points
Refer to “Vehicle Lifting Points” in Section 0A (Page 0A-7).

Fasteners Caution
Refer to “Fastener Caution” in Section 00 (Page 00-5).

Fastener Information
Refer to “Fasteners Information” in Section 0A (Page 0A-5).

Precautions for CAN Communication System
Refer to “Precautions for CAN Communication System” in Section 00 (Page 00-9).

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness.
Otherwise, electrical trouble may occur.

Brake Control System and Diagnosis

Precautions

Precautions for Brake Service

AENDL70A4100001

Air Bag Warning
Refer to ☞(Page 00-6).

Brakes Diagnosis Note
Road test

NOTE

Brakes should be tested on dry, clean, reasonably level, and smooth roadway. Road test brakes by applying brake with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively. Also drive vehicle to see if it pulls to one side without brake application. If it does, check the tire pressure, front wheel alignment and installing condition of front suspensions. See diagnosis table for other causes.

Brake fluid leaks

NOTE

Check the brake fluid level. Although a slight drop results from normal lining wear, an abnormally low level indicates a leak of brake fluid. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

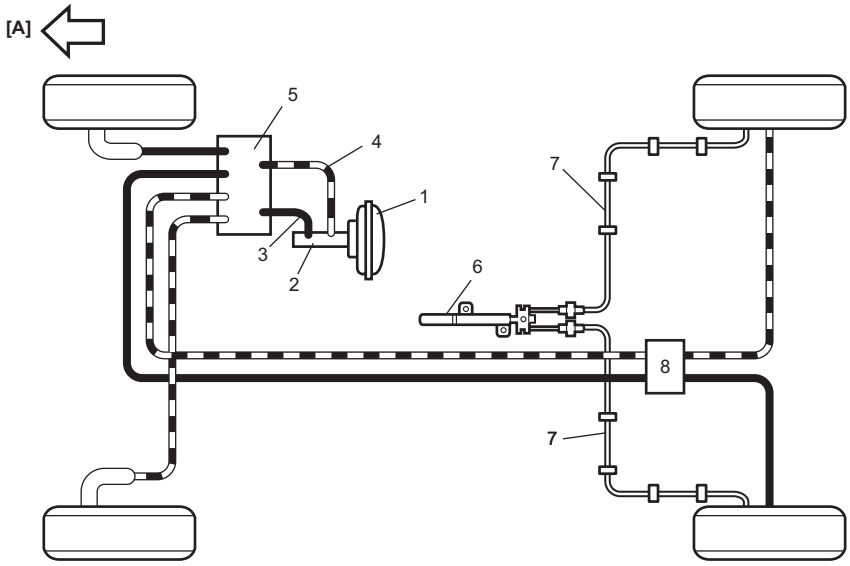
Substandard or contaminated brake fluid
Substandard or contaminated brake fluid with mineral oil or moisture will lower fade resistance or deteriorate rubber parts resulting in the leakage of brake fluid.
In case improper brake fluid as mentioned above is mixed into brake system, or in case such doubt exists, replace the parts as an assembly if they cannot be disassembled. If the parts can be disassembled, disassemble and clean them with brake cleaner or parts cleaner. Rubber parts should be replaced with new ones. Brake hose should also be replaced with new one.

General Description

Brake System Description

AENDL70A4101001

When the foot brake pedal is depressed, hydraulic pressure is developed in the brake master cylinder to actuate pistons (two in front and four in rear).
The brake master cylinder is a tandem master cylinder. Brake pipes are connected to the brake master cylinder and they make two independent circuits. One connects front right and rear left brakes and the other connects front left and rear right brakes.



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[A]: Vehicle forward	3. Secondary side	6. Parking brake lever
1. Brake booster	4. Primary side	7. Parking brake cable
2. Brake master cylinder	5. ABS hydraulic unit / control module assembly or proportioning valve.	8. 4-way joint

Diagnostic Information and Procedures

Brakes Symptom Diagnosis

AENDL70A4104001

Condition	Possible cause	Correction / Reference Item
Not enough braking force	Brake fluid leakage from brake lines	*Locate leaking point, repair and bleed air.*
	Brake disc or pads stained with fluid, grease or other oil	*Clean or replace.*
	Overheated brakes	*Determine cause and repair.*
	Poor contact of shoes on brake drum	*Repair for proper contact.*
	Brake drum and shoe stained with brake fluid or wet with water	*Clean or replace.*
	Badly worn brake pad and/or shoe	*Replace.*
	Defective wheel cylinders	*Repair or replace.*
	Malfunctioning brake caliper assembly	*Repair or replace.*
	Malfunctioning brake booster	*Check system and replace as necessary.*
	Malfunctioning brake master cylinder	*Check system and replace as necessary.*
	Air in system	*Bleed air from brake system.*
	Negative pressure for brake booster is inadequate	*Check engine condition and vacuum hose.*
	Malfunctioning ABS/ Proportioning valve	*Check system and replace as necessary.*
	Malfunctioning proportioning valve	*Repair or replace.*

Condition	Possible cause	Correction / Reference Item
Vehicle pulls to one side (Brakes not working uniformly)	Pad, disc, shoe and/or brake drum are wet with water or stained with brake fluid in some brakes	*Clean or replace.*
	Drum-to-shoe clearance out of adjustment in some brakes (Malfunctioning auto adjusting mechanism)	*Check for inoperative auto adjusting mechanism.*
	Disc and/or drum are out of round in some brakes	*Replace.*
	Tires are inflated unequally	*Inflate equally.*
	Malfunction in wheel cylinders	*Repair or replace.*
	Disturbed front wheel alignment	*Adjust as prescribed.*
	Unmatched tires on the same axle	*Tires with approximately the same amount of tread should be used on the same axle.*
	Restricted brake pipes or hoses	*Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.*
	Malfunctioning caliper assembly	*Check for stuck or sluggish pistons and proper lubrication of caliper slide pin.*
	Loose suspension parts	*Check all suspension mountings.*
	Loose calipers	*Check and tighten bolts to specifications.*
	Malfunctioning master cylinder	*Replace.*
	Malfunctioning proportioning valve	*Repair or replace.*
Noise (High pitched squeak without brake applied)	Worn rear brake shoe	*Replace brake shoe.*
Excessive pedal travel (Pedal stroke too large)	Partial brake system failure	*Check brake systems and repair as necessary.*
	Leaking brake fluid	*Repair the leaking point, and bleed air.*
	Air in system (soft / spongy pedal)	*Bleed air from brake system.*
	Rear brake system not adjusted (malfunctioning auto adjusting mechanism)	*Repair auto adjusting mechanism.*
	Bent brake shoes	*Replace brake shoes.*
Brake locked	Malfunctioning ABS / Proportioning valve	*Check ABS / P-valve system.* *ABS: ☞(Page 4E-7)*
	Malfunctioning proportioning valve	*Repair or replace.*
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released. This condition is normal)	Brake master cylinder pistons not returning correctly	*Replace brake master cylinder.*
	Restricted brake pipes or hoses	*Check for soft hoses or damaged pipes and replace with new hoses and/or new brake piping.*
	Incorrect parking brake adjustment on rear brakes	*Check and adjust to correct specifications.*
	Weakened or broken return springs in the brake	*Replace.*
	Sluggish parking brake cables or linkage	*Repair or replace.*
	Wheel cylinder or caliper piston sticking	*Repair as necessary.*
	Badly worn piston seal in caliper	*Replace piston seal.*
	Improper brake pedal free height	*Check brake pedal free height.*
Pedal pulsation (Pedal pulsates when depressed for braking)	Damaged or loose wheel bearings	*Replace wheel bearings.*
	Distorted steering knuckle or spindle	*Replace knuckle or spindle.*
	Excessive disc lateral runout	*Check as per instructions. If not within specifications, replace disc.*
	Parallelism between pad and disc not within specifications	*Check per instructions. If not within specifications, replace disc.*
	Rear drums out of round	*Check runout.* *Replace drum as necessary.*

Condition	Possible cause	Correction / Reference Item
Braking noise	Glazed brake pad and/or brake shoe	*Replace brake pad and/or brake shoe.*
	Worn or distorted brake shoe	*Replace brake shoe.*
	Loose front wheel bearings	*Replace wheel bearings.*
	Distorted backing plates or loose mounting bolts	*Replace or retighten securing bolts.*
ABS warning light turns ON after ignition switch has turned ON for 2 sec.	Malfunctioning ABS function	*Perform ABS check: ☞(Page 4E-7)*
	ABS control module power supply and ground circuit faulty	*Check ABS control module power supply and ground circuit: ☞(Page 4E-29)*
	Malfunctioning CAN communication system function	*Check CAN communication system. ☞(Page 10H-8)*
	Combination meter faulty	*Replace combination meter. ☞(Page 9C-11)*
	ABS hydraulic unit / control module assembly faulty	*Replace ABS hydraulic unit / control module assembly: ☞(Page 4E-33)*
ABS warning light does not turn ON for 2 sec. after ignition switch has turned ON	Combination meter power supply and ground circuit faulty	*Check combination meter and its circuit. ☞(Page 9C-9)*
	Malfunctioning CAN communication system function	*Check CAN communication system. ☞(Page 10H-8)*
	Combination meter faulty	*Replace combination meter. ☞(Page 9C-11)*
	ABS hydraulic unit / control module assembly faulty	*Replace ABS hydraulic unit / control module assembly: ☞(Page 4E-33)*
Brake warning light remains ON for more than 2 sec. after ignition switch has turned ON.	Parking brake applied	*Release parking brake and check that EBD warning light (brake warning light) turns OFF.*
	Insufficient amount of brake fluid	*Check brake fluid level. ☞(Page 4A-5)*
	Parking brake switch circuit and/or brake fluid level switch circuit faulty	*Check combination meter and its circuit. ☞(Page 9C-9)*
	Parking brake switch and/or brake fluid level switch faulty	*Check parking brake switch and/or brake fluid level switch.* *Parking brake switch: ☞(Page 4D-3)* *Brake fluid level switch: ☞(Page 4A-5)*
	Malfunctioning EBD function	*Perform ABS check: ☞(Page 4E-7)*
	ABS control module power supply and ground circuit faulty	*Check ABS control module power supply and ground circuit: ☞(Page 4E-29)*
	Malfunctioning CAN communication system function	*Check CAN communication system. ☞(Page 10H-8)*
	Combination meter faulty	*Replace combination meter. ☞(Page 9C-11)*
	ABS hydraulic unit / control module assembly faulty	*Replace ABS hydraulic unit / control module assembly: ☞(Page 4E-33)*
Brake warning light (Brake warning light) does not turn ON for 2 sec. after ignition switch has turned ON	Combination meter power supply and ground circuit faulty	*Check combination meter and its circuit. ☞(Page 9C-9)*
	Combination meter faulty	*Replace combination meter. ☞(Page 9C-11)*
	ABS hydraulic unit / control module assembly faulty	*Replace ABS hydraulic unit / control module assembly: ☞(Page 4E-33)*

Repair Instructions

Brake Fluid Level Inspection

AENDL70A4106001

NOTICE

- **Never use brake fluid other than specified. Otherwise, brake hose and rubber parts may get damaged or brake system may not operate normally.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.**

- Be sure to use brake fluid indicated on brake master cylinder reservoir cap (of the vehicle) or in owner's manual.
- Check that brake fluid level is between MAX and MIN marks on reservoir of brake master cylinder.

NOTE

If brake warning light comes on during driving or brake fluid level on brake master cylinder reservoir is "MIN" or lower, check the following points:

- **Thickness of front brake pads and rear brake shoes**
- **Fluid leakage from piston seal of front brake caliper**
- **Fluid leakage from rear brake wheel cylinder**
- **Cracks or damage to brake hoses and brake pipes**
- **Fluid leakage from brake master cylinder and reservoir**

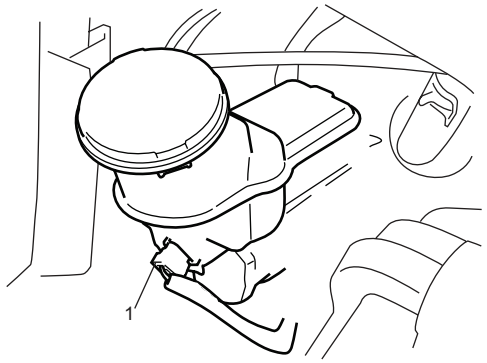
In case any abnormality is found, repair or replace such parts.
After the check and repair are completed, replenish brake fluid so that fluid level should fall between "MAX" and "MIN" marks on brake master cylinder reservoir.

Brake Fluid Level Switch Inspection

AENDL70A4106002

Check for continuity between terminals of brake fluid level switch connector (1). If found defective, replace reservoir.

Brake fluid level switch specification
OFF position (float up): No continuity
ON position (float down): Continuity



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Brake Fluid Replacement

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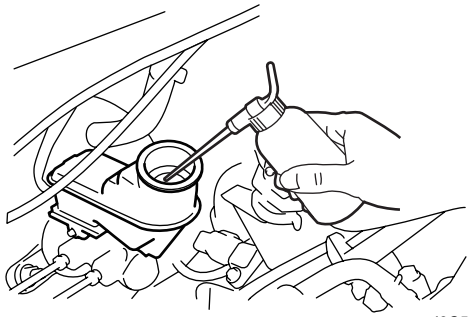
NOTICE

- **Never use brake fluid other than specified. Otherwise, brake hose and rubber parts may get damaged or brake system may not operate normally.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.**

NOTE

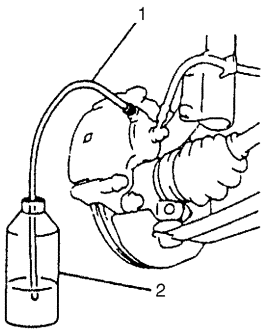
- **When replacing brake fluid, start with the brake closest from the brake master cylinder.**
- **To prevent air getting into reservoir, be careful not to lose fluid in the reservoir while operating brake pedal.**

1) Using a dropper or the like, extract some brake fluid from reservoir of brake master cylinder.



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2) Add new brake fluid to reservoir of brake master cylinder.
3) Remove bleeder plug cap. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



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4) Depress brake pedal several times with bleeder plug loosened.
5) If new brake fluid starts coming out, tighten bleeder plug to specified torque.
   - Front: ☞(Page 4B-1)
   - Rear: ☞(Page 4C-1)
6) Carry out Steps 3) – 5) for remaining wheels as well.
7) If necessary, bleed air from brake system. ☞(Page 4A-6)

Air Bleeding of Brake System

AENDL70A4106004

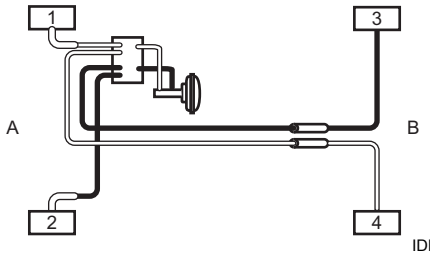
NOTICE

- **Never use brake fluid other than specified. Otherwise, brake hose and rubber parts may get damaged or brake system may not operate normally.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.**

Bleeding operation is necessary to remove air whenever it enters hydraulic brake system.
Hydraulic lines of brake system are based on the diagonal split system.
If a brake pipe or hose is disconnected at the wheel, bleed the hydraulic line at both ends of the line of the removed pipe or hose.
If any joint part or any the brake master cylinder or any other joint between the brake master cylinder and any brake (wheel) is removed, bleed the hydraulic brake system at all 4 wheel brakes.

NOTE

Perform bleeding operation starting from the wheel cylinder farthest from brake master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.

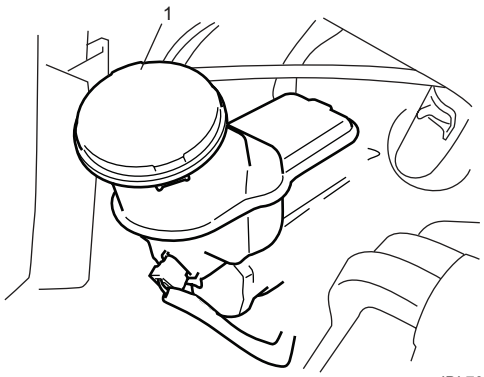


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1. Right brake caliper	4. Left wheel cylinder
2. Left brake caliper	A: Front
3. Right wheel cylinder	B: Rear

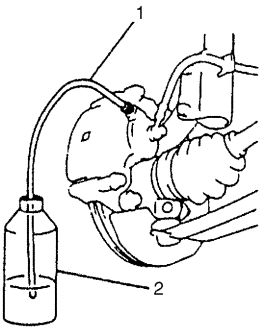
1) Fill brake master cylinder reservoir with new brake fluid and keep the reservoir at least one-half full of fluid during bleeding operation.

Brake fluid specification
: Refer to reservoir cap (1)



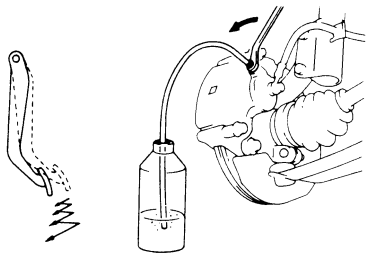
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2) Remove bleeder plug cap. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



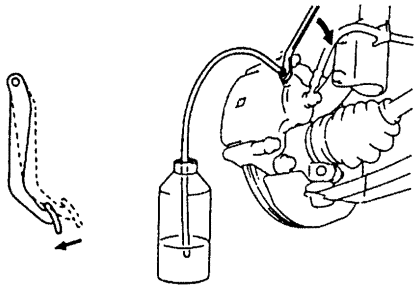
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3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half a turn.
4) When fluid pressure in cylinder is completely released, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.



I2RH01410016-01

6) When air bubbles disappear from fluid flowing into container, depress and hold brake pedal and tighten bleeder plug.
   - Front: ☞(Page 4B-1)
   - Rear: ☞(Page 4C-1)

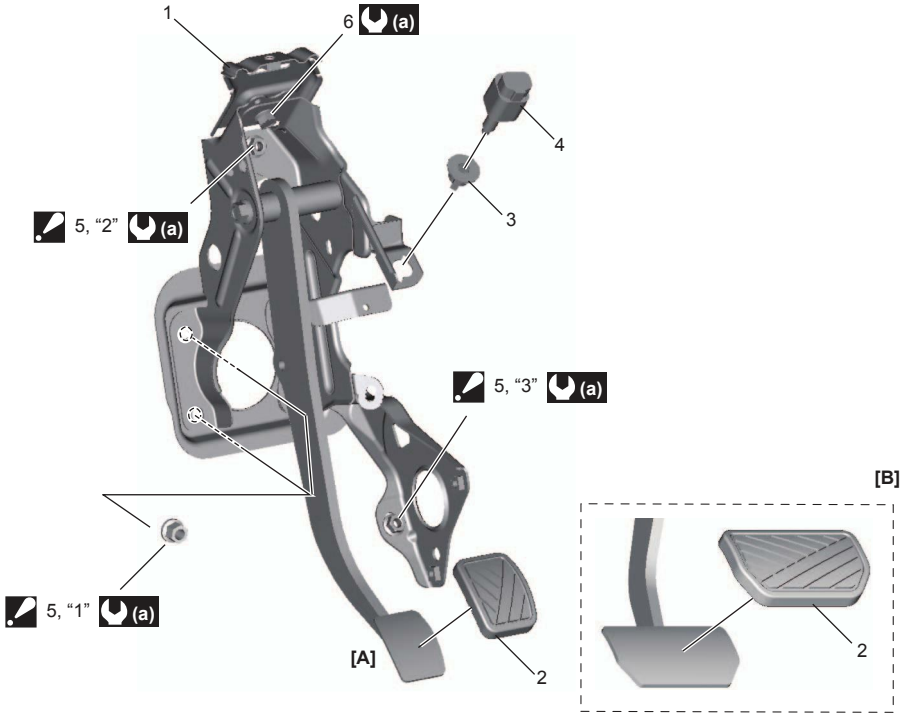


I2RH01410017-01

7) Attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to brake lines and check for leakage.
9) Replenish new fluid into reservoir up to specified level. ☞(Page 4A-5)
10) Check brake pedal for operation. If spongy condition is felt, repeat entire procedure of bleeding.

Brake Pedal Components

AENDL70A4106005



IDL70A410004-03

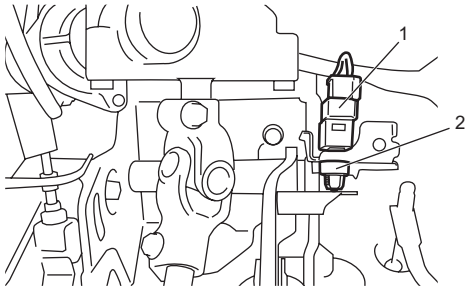
[A]: M/T model	2. Pedal pad	5. Brake pedal bracket nut : Tighten brake pedal nuts in numerical order ("1" → "2" → "3")
[B]: AMT model	3. Bushing	6. Brake pedal bracket bolt
1. Brake pedal assembly	4. Brake light switch	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)

Brake Pedal Assembly Removal and Installation

AENDL70A4106006

Removal

1) Remove steering column hole cover. ☞(Page 6B-6)
2) Disconnect connector of brake light switch (1) and remove brake light switch (2).



IDL70A410014-01

3) Disconnect connector of accelerator pedal position sensor from accelerator pedal assembly (incorporating APP sensor). Refer ☞(Page 1C-4).
4) Remove clevis pin and clip. ☞(Page 4A-19)
5) Remove steering lower shaft. ☞(Page 6B-11)
6) Remove brake pedal bracket bolt and nuts.
7) Remove brake pedal assembly with accelerator pedal assembly.
8) Remove accelerator pedal assembly from brake pedal assembly if necessary. Refer ☞(Page 1C-4).

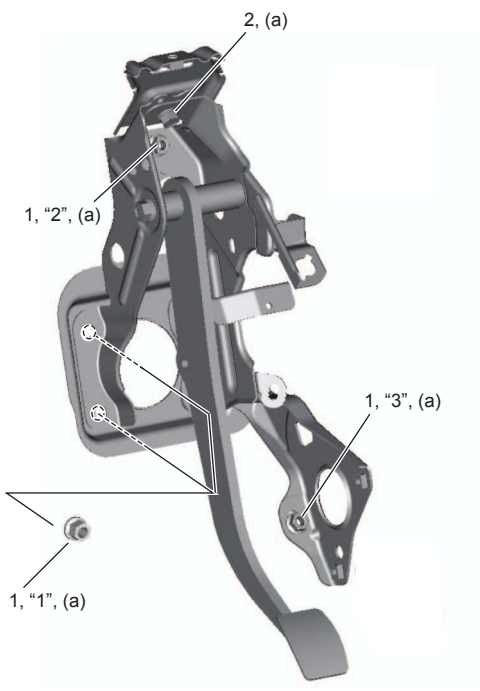
Installation

1) Install accelerator pedal assembly on brake pedal assembly (if removed). Refer ☞(Page 1C-4).
2) Install brake pedal assembly on vehicle.
3) Install brake booster.
4) Tighten brake pedal bracket nuts (1) bracket nuts to specified torque in numerical order (“1” – “3”).

   Tightening torque
   Brake pedal bracket nut (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)

5) Tighten brake pedal bracket bolt (2) to specified torque.

   Tightening torque
   Brake pedal bracket bolt (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



IDL70A410005-02

6) Insert steering lower shaft. ☞(Page 6B-11)
7) Bleed brake system. ☞(Page 4A-6)
8) Check brake pedal free height and play.
   - Brake pedal free height: ☞(Page 4A-8)
   - Brake pedal play: ☞(Page 4A-9)
9) Install and adjust brake light switch. ☞(Page 4A-10)
10) Connect connector of brake light switch and accelerator pedal position sensor of accelerator pedal assembly.
11) Check installed part for fluid leakage and make sure that brake system is operating properly.
12) Install steering column hole cover. ☞(Page 6B-6)

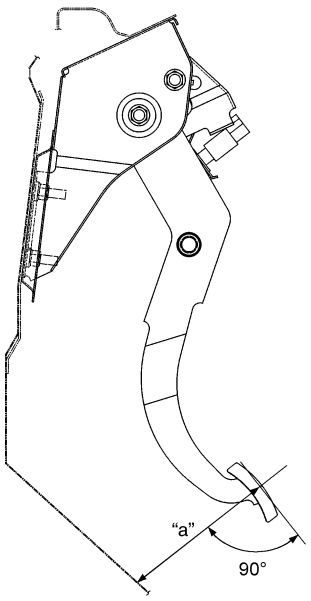
Brake Pedal Free Height Inspection

AENDL70A4106007

Check brake pedal free height. If it is not within specification, check and adjust following item.

- Check brake light switch position. Adjust it if it is out of specification.
- Check pedal for dent.
- Check brake booster for installation.
- Check brake booster push rod for length.

Brake pedal free height “a” from carpet
: 118.8 mm (4.68 in.)



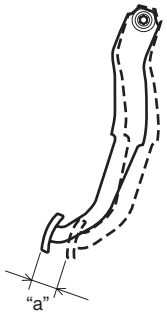
I7V20A410012-01

Brake Pedal Play Inspection

AENDL70A4106008

Pedal play should be within the following specification. If out of specification, check brake light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and booster clevis pin installation for looseness and replace if defective.

Brake pedal play "a"
: 0 – 7 mm (0.0 – 0.28 in.)



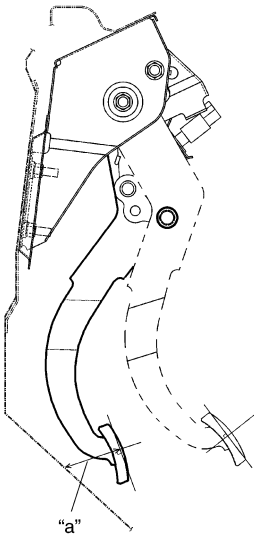
I3RH0A410010-01

Excessive Pedal Travel Inspection

AENDL70A4106009

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with force of about 300 N (30.6 kgf, 67.4 lbf), measure clearance "a" between brake pedal and carpet. If clearance "a" is less than specification, probable reason is air in brake line. If clearance "a" remains less than specification even after bleeding of system, other possible but infrequent reason is that booster push rod length is out of specification.
   - Bleed brake system. ☞(Page 4A-6)
   - Inspect rear brake shoe adjuster. ☞(Page 4C-4)

Brake pedal arm to carpet clearance "a"
When pedal is depressed at 300 N (30.6 kgf, 67.4 lbf):
: over 66 mm (2.6 in.)



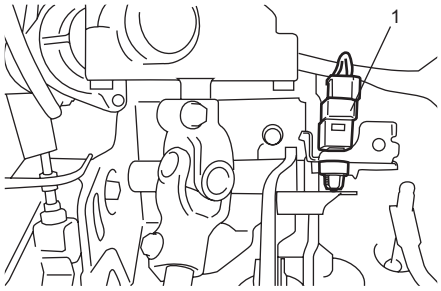
I4RS0A410005-01

Brake Light Switch Removal and Installation

AENDL70A4106010

Removal

1) Remove steering column hole cover. ☞(Page 6B-6)
2) Disconnect connector of brake light switch (1).
3) Remove brake light switch (1) from brake pedal assembly.



I8C50A410007-01

Installation

Reverse removal procedure noting the following.

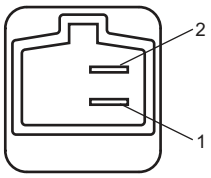
- Adjust brake light switch. ☞(Page 4A-10)

Brake Light Switch Inspection

AENDL70A4106011

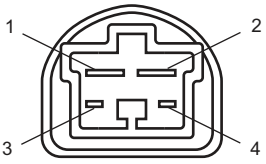
Check brake light switch for continuity between terminals at each switch position.
If check result is not as specified, replace switch.

[A]



[D] \ [C]	1	2
FREE	○—○	
PUSH		

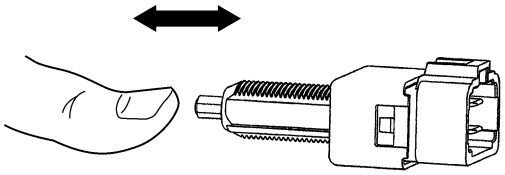
[B]



[D] \ [C]	1	2	3	4
FREE	○—○			
PUSH			○—○	

IDL70A410006-01

[A]: M/T model	[C]: Terminal
[B]: AMT model	[D]: Shaft condition



I8C50A410013-01

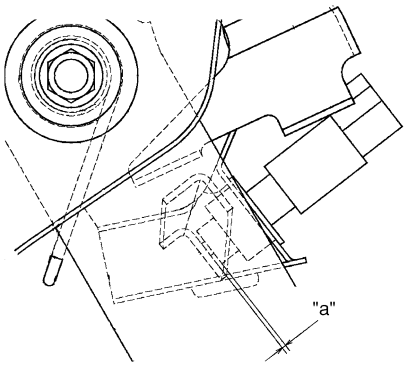
Brake Light Switch Adjustment

AENDL70A4106012

Adjust brake light switch as follows. Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between end of thread and brake pedal is as specified. Then lock brake light switch by turning it clockwise.

Clearance between brake pedal and brake light switch

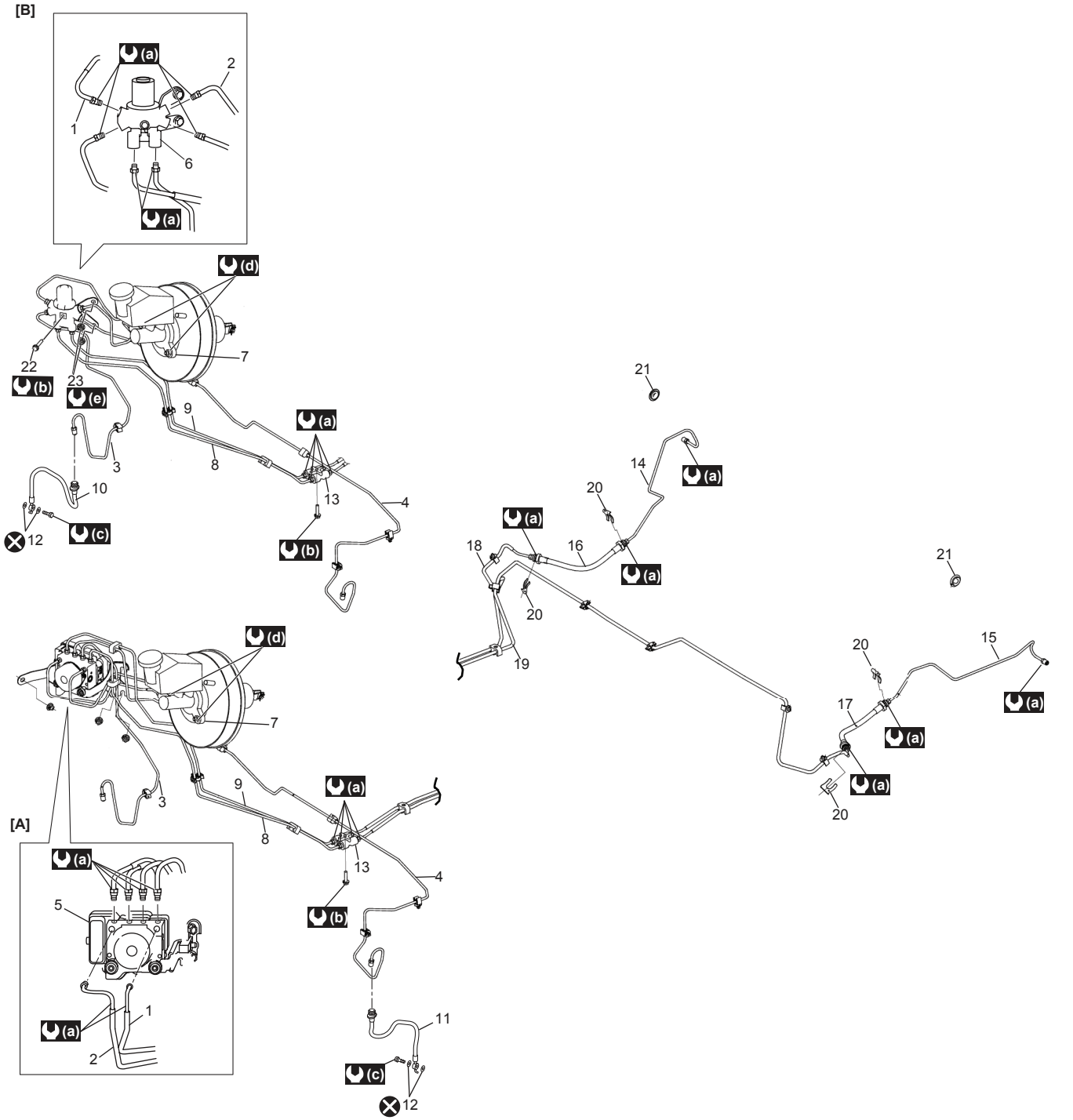
"a": 1.0 – 2.0 mm (0.039 – 0.079 in.)



I4RS0A410007-01

Brake Hose and Pipe Components

AENDL70A4106013



IDL70A410001-05

[A]: ABS model	15. Rear left brake flexible hose to rear left brake
[B]: Non-ABS model	16. Rear right brake flexible hose
1. From brake master cylinder primary to ABS hydraulic unit / Proportioning valve	17. Rear left brake flexible hose
2. From brake master cylinder secondary to ABS hydraulic unit / Proportioning valve	18. From brake 4-way joint to rear right brake flexible hose
3. From ABS hydraulic unit / Proportioning valve to front right brake	19. From brake 4-way joint to rear left brake flexible hose
4. From ABS hydraulic unit / Proportioning valve to front left brake	20. E-ring
5. ABS hydraulic unit	21. ABS sensor hole plug (Non-ABS model)
6. Proportioning valve	22. Proportioning valve bolt
7. Brake master cylinder	23. Proportioning valve bracket nuts
8. From ABS hydraulic unit / Proportioning valve to brake 4-way joint (rear left brake)	(a) : 16 N·m (1.6 kgf-m, 12.0 lbf-ft)
9. From ABS hydraulic unit / Proportioning valve to brake 4-way joint (rear right brake)	(b) : 11 N·m (1.1 kgf-m, 8.1 lbf-ft)
10. Front right brake flexible hose	(c) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
11. Front left brake flexible hose	(d) : 13 N·m (1.3 kgf-m, 9.6 lbf-ft)
12. Washer	(e) : 26 N·m (2.7 kgf-m, 19.2 lbf-ft)
13. Brake 4-way joint	: Do not reuse.
14. Rear right brake flexible hose to rear right brake	

Brake Hose and Pipe Removal and Installation

AENDL70A4106014

NOTICE

Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.

Removal

1) Hoist vehicle and remove wheel. ☞(Page 2D-3)

NOTE

This operation is not necessary when removing pipes connecting with brake master cylinder.

2) Clean dirt and foreign material from fittings at both flexible hose end and pipe end.
3) Drain brake fluid in reservoir. ☞(Page 4A-5)
4) Remove brake flexible hose or pipe.

Installation

Reverse removal procedure, noting the following.

- Install brake pipe clamps properly. ☞(Page 4A-11)
- Make sure that steering wheel is in straight-forward position and flexible hose is not twisted or kinked.
- Make sure that flexible hose is not in contact with contact any part of suspension.
- Bleed brake system. ☞(Page 4A-6)
- Make sure that brake system operates properly and there is no fluid leakage.

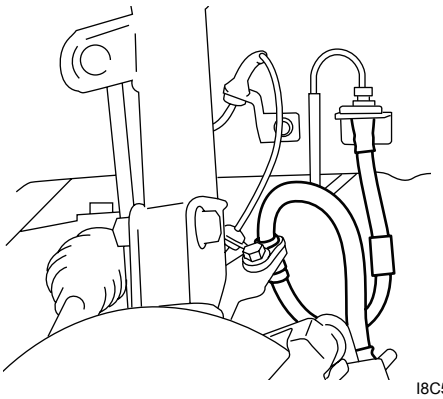
Brake Hose and Pipe Inspection

AENDL70A4106015

Hose

Check the following items. If any defect is found, replace brake hose.

- Connection for leakage and other damage.
- Blister, cracks and other damage.



I8C50A410015-01

Pipe

Check brake pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.

Brake Master Cylinder Components

AENDL70A4106016

⚠ CAUTION

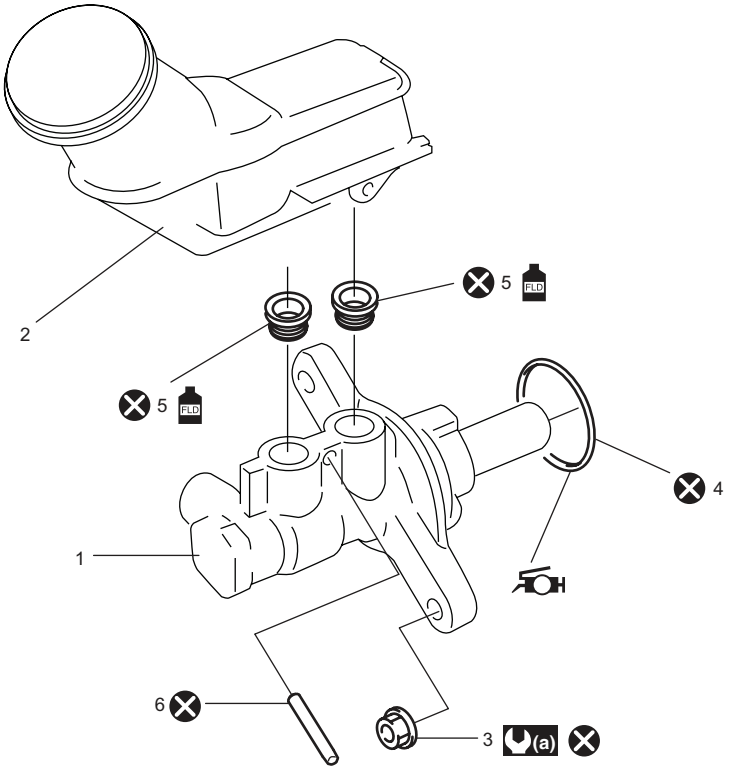
**Never disassemble brake master cylinder. Disassembly will spoil its original performance.
If faulty condition is observed, replace it with a new assembly.**

NOTICE

- **Observe the following cautions as master cylinder piston may fall out easily. If the piston falls out, do not re-insert the piston. Instead, change the master cylinder assembly with a new one.**

1. **Do not take off the piston cover until master cylinder is ready to assemble on the brake booster.**
2. **While handling, keep the piston upward.**
3. **While removing the master cylinder from brake booster, depress the brake pedal a few times with the engine stopped to make sure that no vacuum is left in the brake booster.**

- **Take care not to scratch or dent the outer surface of the piston. Any action in order to damage the piston, such as hitting or scratching must be avoided.**
- **Do not touch the piston directly. Hold the master cylinder body or reservoir while handling.**
- **Make sure no contamination is stuck to the piston. If contamination is found, remove it with a new dry cloth using caution not to pull out the piston. Do not use water or cleaner.**



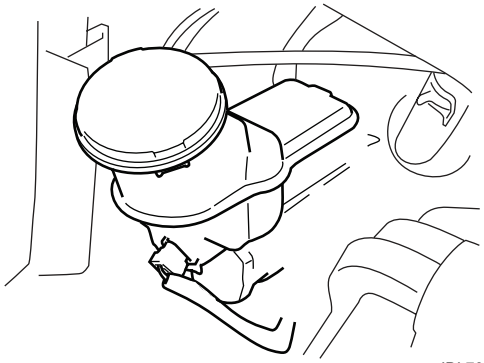
IDL70A410007-03

1. Brake master cylinder	4. O-ring	(a) : 13 N·m (1.3 kgf-m, 9.6 lbf-ft)
2. Reservoir	FLD 5. Grommet : Apply brake fluid.	: Apply grease to O-ring and brake booster (Grease included in spare parts to brake master cylinder or brake booster)
3. Brake master cylinder fixing nut	6. Reservoir connect pin	: Do not reuse.

Brake Master Cylinder Assembly On-Vehicle Inspection

AENDL70A4106017

Check brake master cylinder and reservoir for crack, damage and brake fluid leakage. If any faulty condition exists, replace.



IDL70A410008-01

Brake Master Cylinder Assembly Removal and Installation

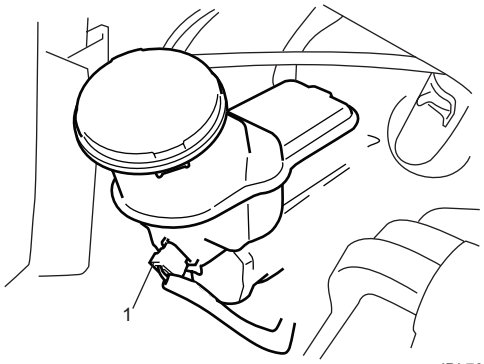
AENDL70A4106018

NOTICE

- **Never disassemble brake master cylinder. Disassembly will spoil its original performance.**
  If faulty condition is observed, replace it with a new assembly.
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.**

Removal

1) Clean external area of brake master cylinder.
2) Disconnect fluid level switch connector (1) on reservoir.

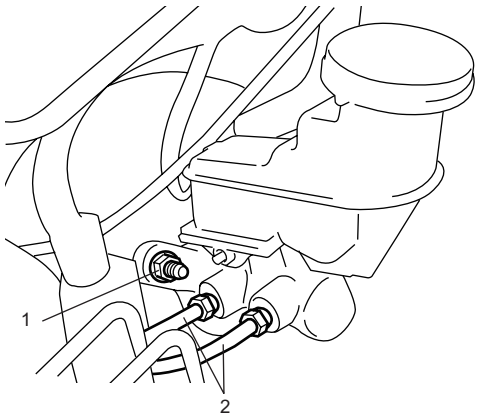


IDL70A410002-05

3) Drain brake fluid in reservoir. ☞(Page 4A-5)
4) Using special tool, loosen flare nuts and disconnect brake pipes (2) from brake master cylinder.

Special tool
: 09950M78220

5) Remove brake master cylinder fixing nuts (1).



I8C50A410019-01

6) Remove brake master cylinder and O-ring.

NOTICE

- **Observe the following cautions as master cylinder piston may fall out easily. If the piston falls out, do not re-insert the piston. Instead, change the master cylinder assembly with a new one.**
  1. **Do not take off the piston cover until master cylinder is ready to assemble on the brake booster.**
  2. **While handling, keep the piston upward.**
  3. **While removing the master cylinder from brake booster, depress the brake pedal a few times with the engine stopped to make sure that no vacuum is left in the brake booster.**
- **Take care not to scratch or dent the outer surface of the piston. Any action in order to damage the piston, such as hitting or scratching must be avoided.**
- **Do not touch the piston directly. Hold the master cylinder body or reservoir while handling.**
- **Make sure no contamination is stuck to the piston. If contamination is found, remove it with a new dry cloth using caution not to pull out the piston. Do not use water or cleaner.**

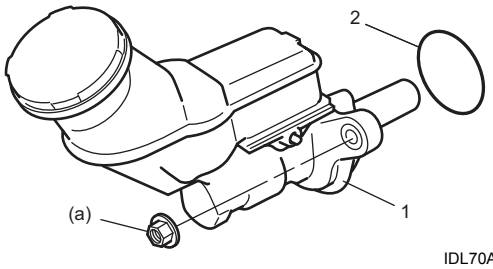
Installation

1) Install new O-ring (2) to brake master cylinder assembly (1).
2) Apply grease to O-ring.
3) Adjust booster head rod distance.

Special tool
: 09952M16021

4) Install brake master cylinder to brake booster.
5) Tighten new brake master cylinder fixing nuts to specified torque.

Tightening torque
Brake master cylinder fixing nut (a): 13 N·m (1.3 kgf-m, 9.6 lbf-ft)

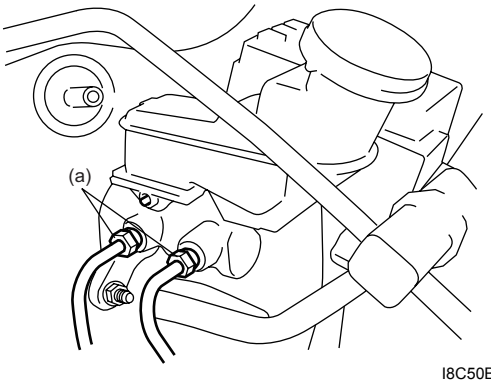


IDL70A410009-01

6) Connect brake pipe to brake master cylinder and tighten flare nuts using special tool.

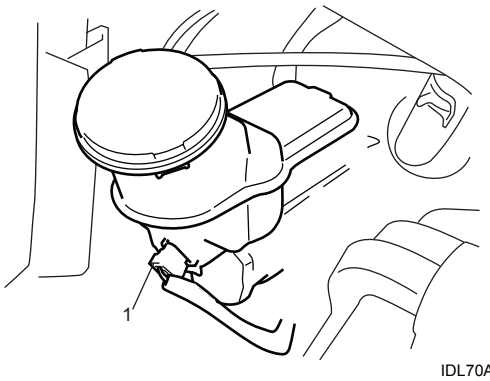
Special tool
: 09950M78220

Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 12.0 lbf-ft)



I8C50B410013-01

7) Connect fluid level switch connector (1).



IDL70A410002-05

8) After installation, bleed brake system. ☞(Page 4A-6)
9) Check installed parts for fluid leakage.
10) Check brake pedal for play. ☞(Page 4A-9)
11) Make sure that brake system is operating properly and check fluid leakage.

Brake Master Cylinder Reservoir Removal and Installation

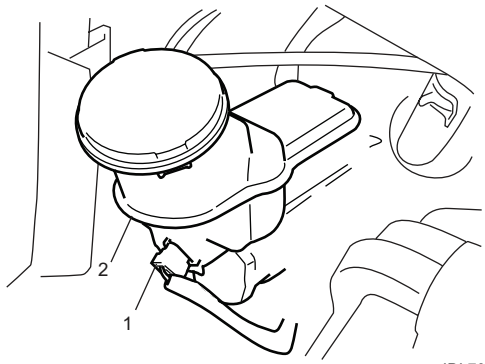
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NOTICE

Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.

Removal

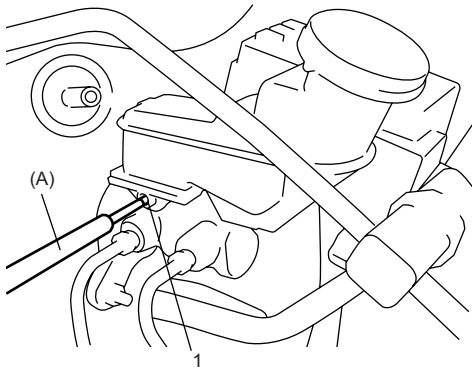
1) Clean external area of reservoir and brake master cylinder.
2) Disconnect fluid level switch connector (1) from reservoir (2).



IDL70A410010-01

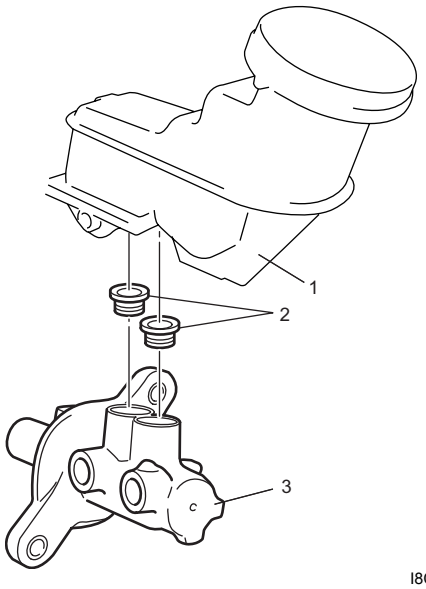
3) Drain brake fluid in reservoir. ☞(Page 4A-5)
4) Remove reservoir connector pin (1) by using special tool and then reservoir.

Special tool
(A): 09916M44310



I8C50A410023-01

5) Remove reservoir (1) and grommets (2) from brake master cylinder (3).

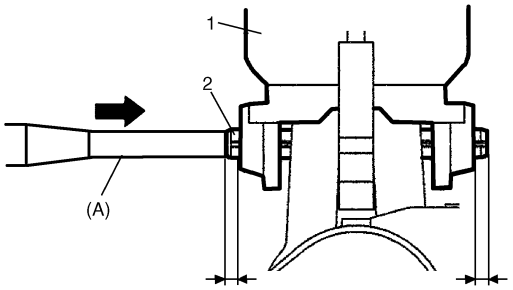


I8C50A410024-01

Installation

1) Lubricate new grommets with the same fluid as the one used to fill reservoir. Then press-fit grommets to brake master cylinder.
2) Install reservoir to brake master cylinder.
3) Drive in new reservoir connector pin (2) by using special tool till both of its ends at the right and left of reservoir (1) becomes the same length.

Special tool
(A): 09916M44310



I8C50A410025-01

4) Connect fluid level switch connector to reservoir.
5) Bleed brake system. ☞(Page 4A-6)
6) Check installed parts for fluid leakage.
7) Check that brake system is operating properly and check fluid leakage.

Brake Master Cylinder Assembly Inspection

AENDL70A4106020

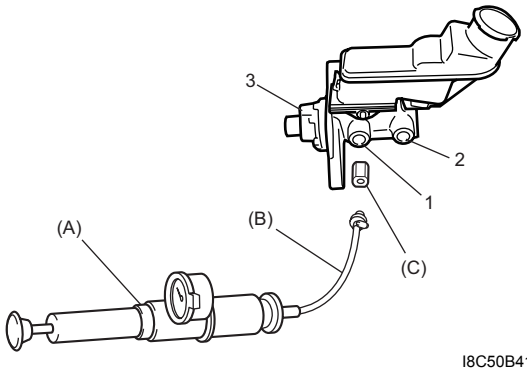
⚠ CAUTION

After inspection, be sure to wash brake fluid off from special tool. Otherwise, brake fluid remaining on special tool may cause damage to it.

No-Load Inspection

1) Fit special tool to port of primary side (1) as shown below.

Special tool
(A): 09918M78211
(B): 09952M46010



I8C50B410015-01

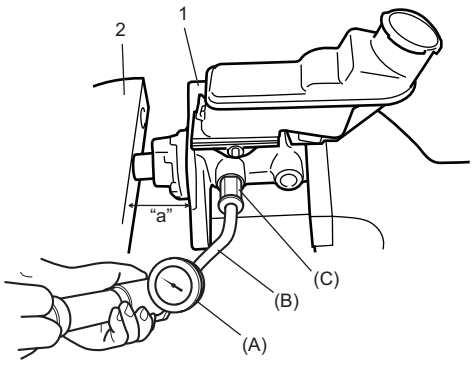
2. Secondary side
3. Brake master cylinder assembly

2) Apply pressure to brake master cylinder assembly with special tool (A) and confirm that pressure does not build up in cylinder.
If pressure builds up, brake master cylinder assembly is defective and must be replaced.
3) Repeat Steps 1) and 2) for port of secondary side as well.

Air Tightness Inspection

1) With brake master cylinder assembly (1) fixed on vise (2) as shown below, fit special tool to port of primary side.

Special tool
(A): 09918M78211
(B): 09952M46010



I8C50B410016-01

"a": 50 mm (2.0 in.)

2) With special tool check that 50 kPa (0.5 kgf/cm^2, 7.25 psi, 0.5 bar) pressure is applied to brake master cylinder assembly.
If above specified pressure is not applied, it means an abnormality in brake master cylinder assembly. In such case, replace brake master cylinder assembly.

3) Repeat Steps 1) and 2) for port in brake master cylinder assembly on secondary side as well.

Brake Booster Components

AENDL70A4106021

⚠ CAUTION

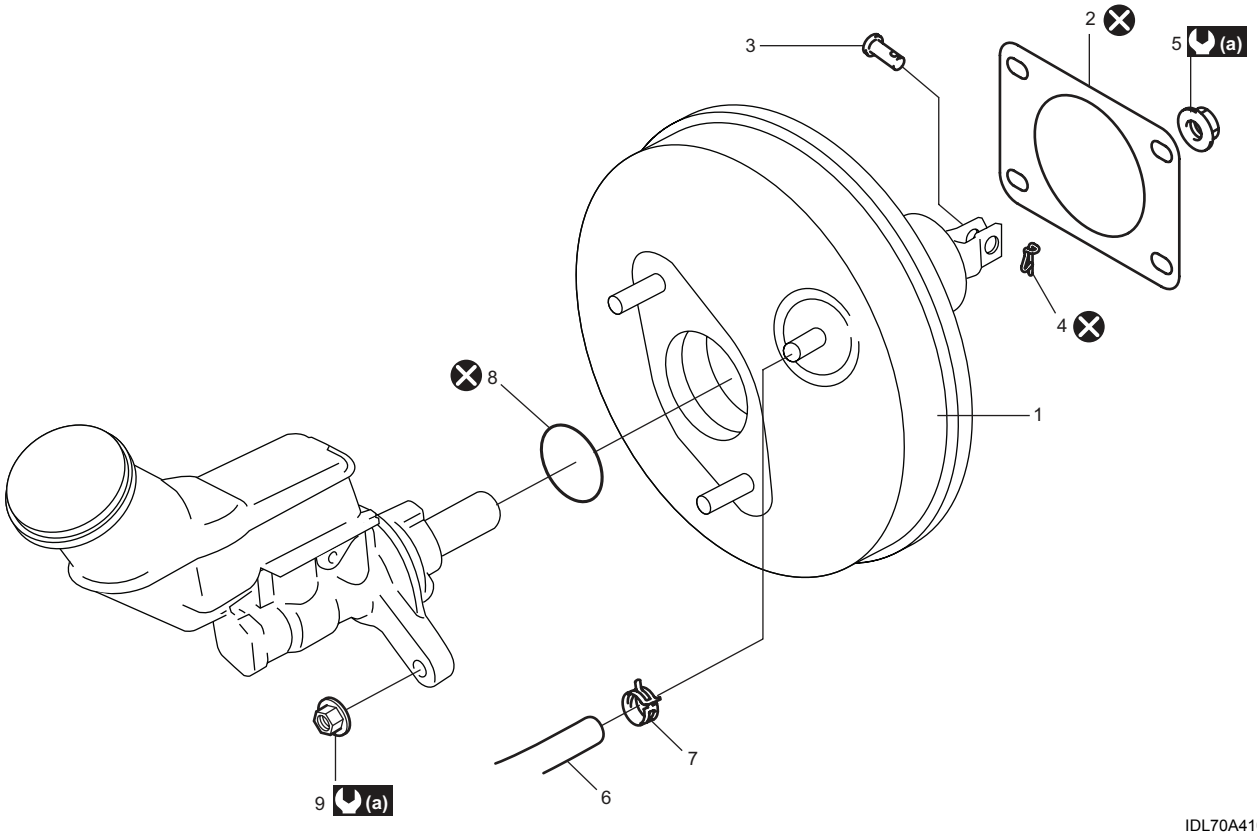
Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is observed, replace it with a new assembly.

NOTICE

- **Observe the following cautions as master cylinder piston may fall out easily. If the piston falls out, do not re-insert the piston. Instead, change the master cylinder assembly with a new one.**

1. **Do not take off the piston cover until master cylinder is ready to assemble on the brake booster.**
2. **While handling, keep the piston upward.**
3. **While removing the master cylinder from brake booster, depress the brake pedal a few times with the engine stopped to make sure that no vacuum is left in the brake booster.**

- **Take care not to scratch or dent the outer surface of the piston. Any action in order to damage the piston, such as hitting or scratching must be avoided.**
- **Do not touch the piston directly. Hold the master cylinder body or reservoir while handling.**
- **Make sure no contamination is stuck to the piston. If contamination is found, remove it with a new dry cloth using caution not to pull out the piston. Do not use water or cleaner.**



IDL70A410011-02

1. Brake booster	5. Brake booster nut	9. Brake master cylinder fixing nut
2. Gasket	6. Vacuum hose	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
3. Clevis pin	7. Hose clamp	⊗ : Do not reuse.
4. Clip	8. O-ring	

Brake Booster Function Check

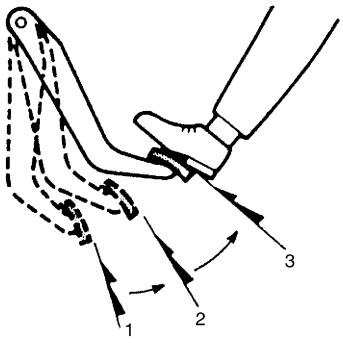
AENDL70A4106022

NOTE

Make sure that no air is in hydraulic line before this check.

Air Tightness Check

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.
3) Depress brake pedal several times with the same force as in ordinary braking to see how pedal travel changes.
   Brake booster is air tight if pedal travel decreases every time the pedal is depressed.



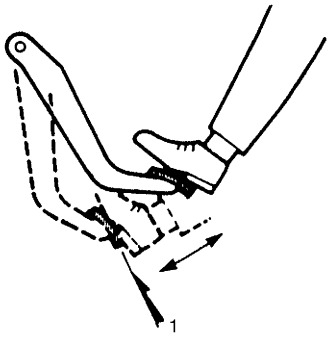
I2RH01410005-01

1. 1st	2. 2nd	3. 3rd

4) If pedal travel does not change, brake booster is defective in air tightness.

NOTE

If defective, inspect vacuum lines and sealing parts, and replace the faulty part. After this repeat the entire test.

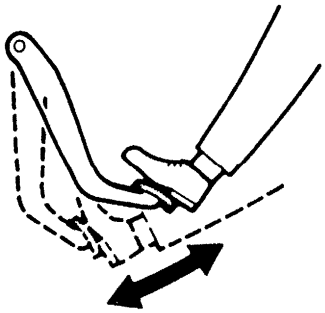


I2RH01410006-01

1. 1st, 2nd, 3rd

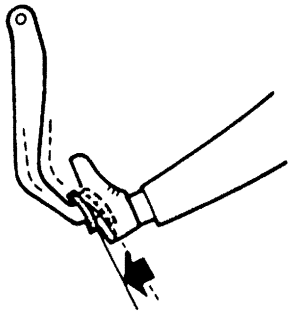
Operation Check

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel does not change.



I2RH01410007-01

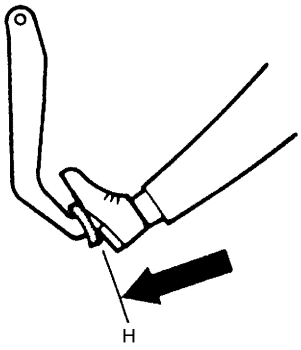
2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.



I2RH01410008-01

Air Tightness Check under Loaded Condition

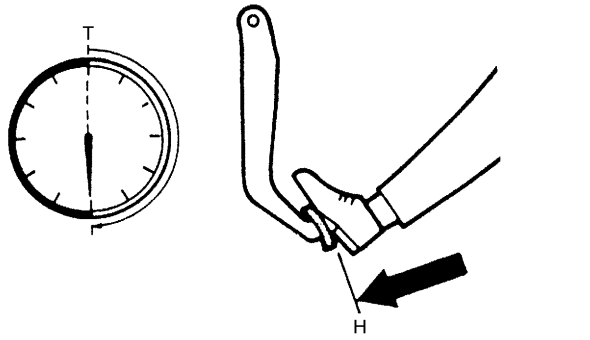
1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



I2RH01410009-01

H: Hold

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, brake booster is in good condition.



I2RH01410010-01

H: Hold	T: 30 seconds

Brake Booster Removal and Installation

AENDL70A4106023

NOTICE

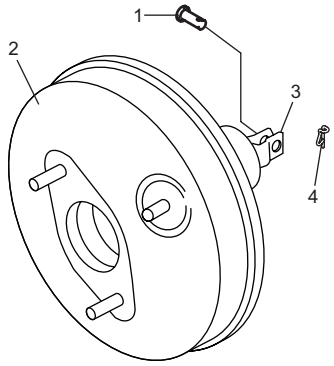
- **Observe the following cautions as master cylinder piston may fall out easily. If the piston falls out, do not re-insert the piston. Instead, change the master cylinder assembly with a new one.**
1. **Do not take off the piston cover until master cylinder is ready to assemble on the brake booster.**
2. **While handling, keep the piston upward.**
3. **While removing the master cylinder from brake booster, depress the brake pedal a few times with the engine stopped to make sure that no vacuum is left in the brake booster.**
- **Take care not to scratch or dent the outer surface of the piston. Any action in order to damage the piston, such as hitting or scratching must be avoided.**
- **Do not touch the piston directly. Hold the master cylinder body or reservoir while handling.**
- **Make sure no contamination is stuck to the piston. If contamination is found, remove it with a new dry cloth using caution not to pull out the piston. Do not use water or cleaner.**

Removal

1) Disconnect brake pipes from ABS hydraulic unit / Proportioning valve. ☞(Page 4A-11)
2) Remove brake master cylinder assembly from brake booster. ☞(Page 4A-14)
3) Disconnect vacuum hose from brake booster. ☞(Page 4A-17)
4) Remove push rod clevis pin clip and brake booster nuts and then remove brake booster.
5) Remove brake booster from dash panel.

Installation

1) Loosen brake pedal bracket nut and bolt.
2) Install new gasket to brake booster.
3) Install brake booster (2) to dash panel. Then connect push rod clevis (3) to pedal arm with clevis pin (1) and clip (4).



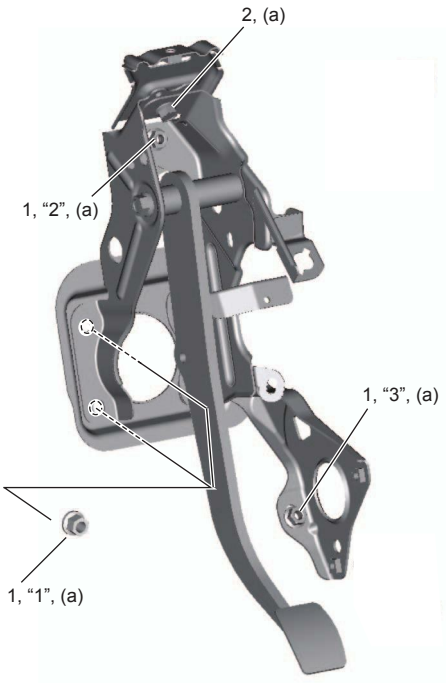
I8C50A410029-02

4) Tighten brake booster nuts and brake pedal bracket nuts to specified torque.“Brake Pedal Components” (Page 4A-7)

Tightening torque
Brake booster nut (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
Brake pedal bracket nut (b): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)

5) Tighten brake pedal bracket bolts.

Tightening torque
Brake pedal bracket bolt (c): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



IDL70A410005-02

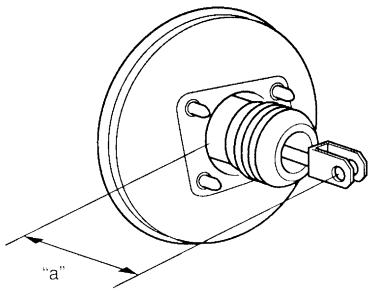
6) Install brake master cylinder assembly to brake booster. ☞(Page 4A-14)
7) Connect brake pipes to ABS hydraulic unit / Proportioning valve. ☞(Page 4A-11)
8) Bleed brake system. ☞(Page 4A-6)
9) Check brake pedal free height and play.
   - Brake pedal free height: ☞(Page 4A-8)
   - Brake pedal play: ☞(Page 4A-9)
10) Connect the connector of brake light switch. ☞(Page 4A-10)
11) Check each installed part for fluid leakage and make sure that brake system is operating properly.

Brake Booster Inspection

AENDL70A4106025

- Check brake booster for damage.
- Check brake booster for operation referring to "Operation Check" under "Brake Booster Function Check" (Page 4A-18).
- Check boot for damage and deterioration.
- Check for push clevis rod distance.
  If any malfunction is found, replace brake booster.

Push clevis rod distance
"a": 114.5 – 115.5 mm (4.508 – 4.547 in.)



I3RM0A410056-01

Specifications

Tightening Torque Specifications

AENDL70A4107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Brake pedal bracket nut	13	1.3	9.5	☞(Page 4A-8) / ☞(Page 4A-19)
Brake pedal bracket bolt	13	1.3	9.5	☞(Page 4A-8) / ☞(Page 4A-19)
Brake master cylinder fixing nut	13	1.3	9.6	☞(Page 4A-15)
Brake pipe flare nut	16	1.6	12.0	☞(Page 4A-15)
Brake booster nut	13	1.3	9.5	☞(Page 4A-19)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
"Brake Pedal Components" (Page 4A-7)
"Brake Hose and Pipe Components" (Page 4A-11)
"Brake Master Cylinder Components" (Page 4A-13)
"Brake Booster Components" (Page 4A-17)
"Fasteners Information" in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

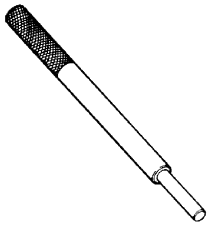
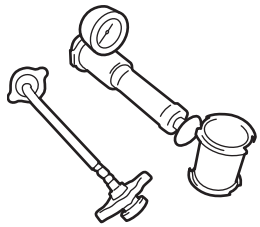
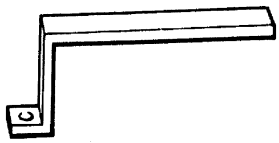
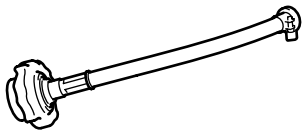
AENDL70A4108001

NOTE

Required service materials are also described in:
“Brake Master Cylinder Components” (Page 4A-13)

Special Tool

AENDL70A4108002

09916M44310 Valve guide remover (5 mm) ☞(Page 4A-15) / ☞(Page 4A-16) 	09918M78211 Radiator cap tester kit ☞(Page 4A-16) / ☞(Page 4A-16) 
09950M78220 Flare nut wrench (10 x 12 mm) ☞(Page 4A-14) / ☞(Page 4A-15) 	09952M16021 Booster piston rod adjuster ☞(Page 4A-15) 
09952M46010 Master cylinder attachment ☞(Page 4A-16) / ☞(Page 4A-16) 	

Front Brakes

General Description

Front Brake Description

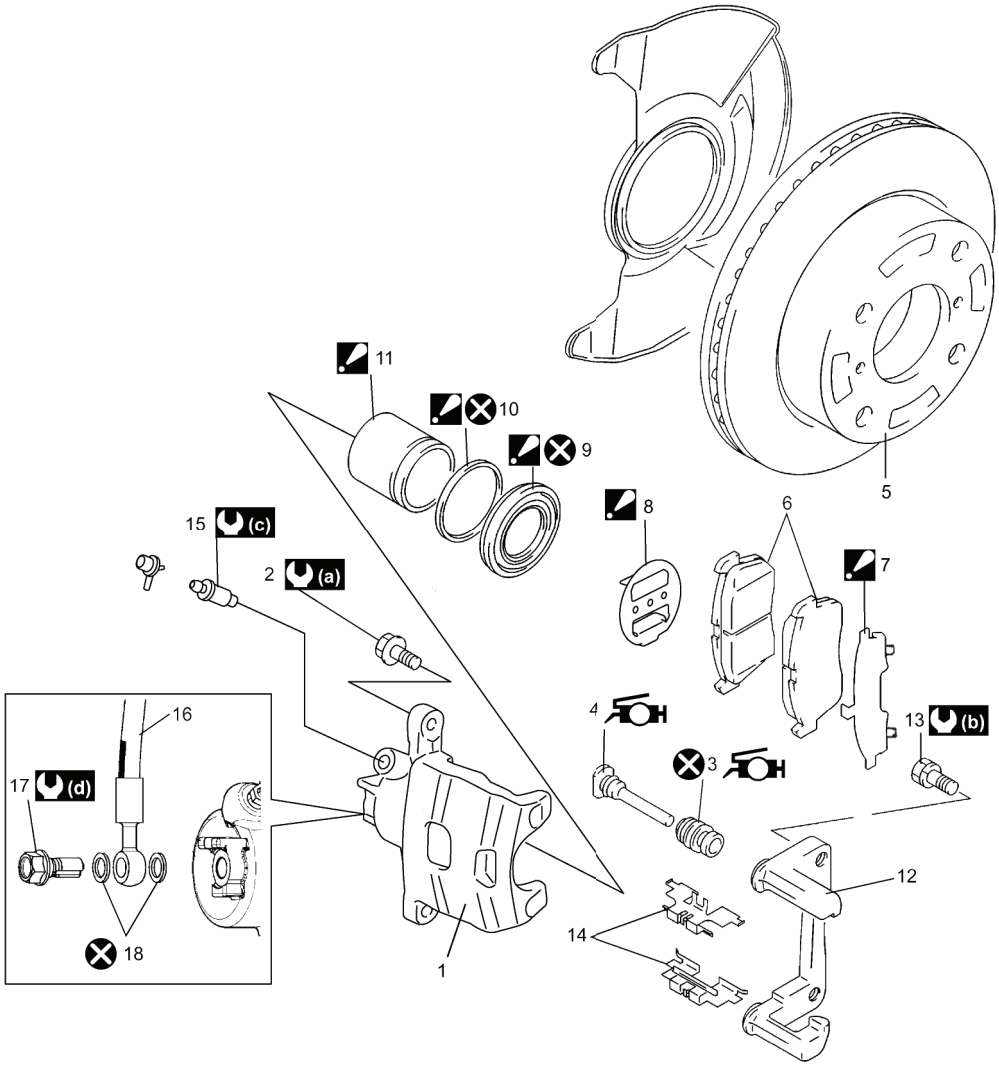
AENDL70A4201001

The front brake system is of a ventilated disc bake type for all models.

Repair Instructions

Front Brake Components

AENDL70A4206001



IDL70A420001-01

1. Caliper	9. Cylinder boot : Apply small amount of rubber grease included in piston seal set of supply parts or specified brake fluid.	17. Flexible hose joint bolt
2. Caliper pin bolt	10. Piston seal : Apply small amount of rubber grease included in piston seal set of supply parts or specified brake fluid.	18. Washer
3. Pin boot : Apply rubber grease included in pin boot set of supply parts.	11. Brake piston : Apply small amount of rubber grease included in piston seal set of supply parts or specified brake fluid.	(a) : 27 N·m (2.8 kgf-m, 20.0 lbf-ft)
4. Slide pin : Apply rubber grease included in pin boot set of supply parts.	12. Caliper carrier	(b) : 85 N·m (8.7 kgf-m, 63.0 lbf-ft)

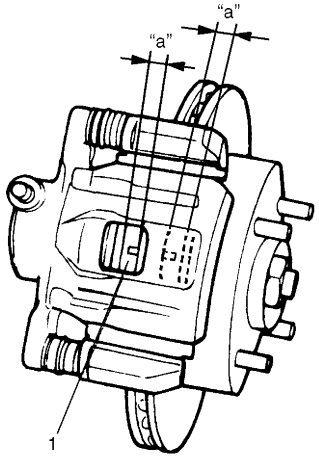
5. Brake disc	13. Caliper carrier bolt	(c) : 9 N·m (0.9 kgf-m, 7.0 lbf-ft)
6. Brake pad	14. Pad spring	(d) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
7. Shim : If brake pads are replaced, use new shim included in supply parts.	15. Bleeder plug	⊗ : Do not reuse.
8. Piston shim : If brake pads are replaced, use new piston shim included in supply parts.	16. Brake flexible hose	

Front Brake Pad On-Vehicle Inspection

AENDL70A4206002

Inspect pad linings (1) periodically according to maintenance schedule and whenever wheels are removed (for tire rotation or other reason). Check lining thickness of outside and inside pads.
If lining is worn and its thickness ("a" in figure) is less than the limit, all pads must be replaced at the same time.

Front brake pad thickness "a" (lining thickness)
Standard: 10 mm (0.43 in.)
Limit: 1 mm (0.08 in.)



I2RH01420001-01

Front Brake Pad Removal and Installation

AENDL70A4206003

⚠ CAUTION

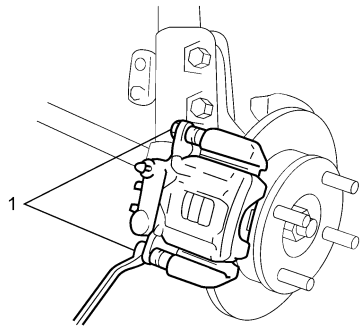
- **Be careful not to damage brake flexible hoses.**
- **Do not depress the brake pedal, while removing the brake pads.**

NOTE

- **Check for leakage of brake fluid when removing front brake pads and repair front brake caliper if leakage is found.**
- **Replace all the brake pads at the same time even if only one pad is defective.**

Removal

1) Hoist vehicle and remove front wheel. ☞(Page 2D-3)
2) Remove caliper pin bolts (1).



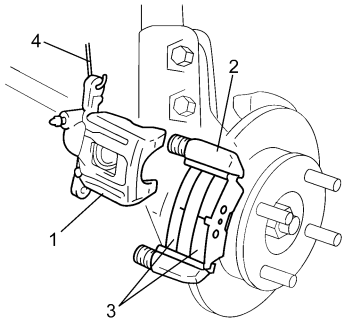
I8C50A420002-01

3) Remove caliper (1) from caliper carrier (2).

NOTE

Hang removed caliper (1) with a wire hook (4) to prevent brake hose from bending and twisting excessively or being pulled.

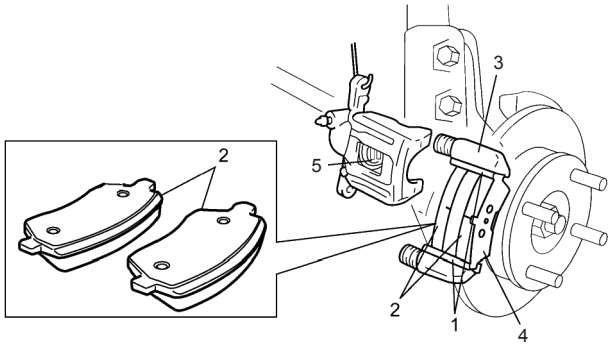
4) Remove brake pads (3).



I8C50A420003-01

Installation

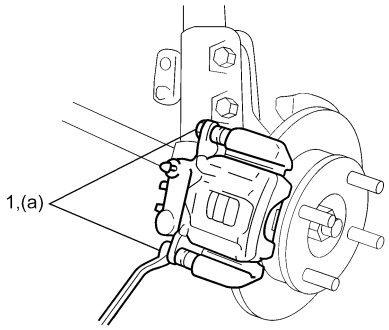
1) Insert piston shim (5) into brake piston.
2) Insert brake pad springs (1) into caliper carrier (3), and install brake pads (2) and shim (4).



IDL70A420002-02

3) Install caliper and tighten caliper pin bolts (1) to specified torque.

Tightening torque
Caliper pin bolt (a): 27 N·m (2.8 kgf-m, 20.0 lbf-ft)



I8C50A420005-01

4) Install front wheel. ☞(Page 2D-3)
5) Make sure that brake system is operating properly.

Front Brake Disc Removal and Installation

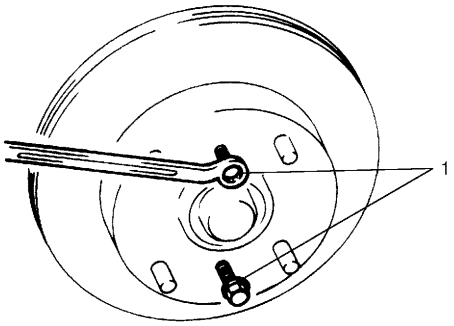
AENDL70A4206004

⚠ CAUTION

- **Be careful not to damage brake flexible hoses.**
- **Never depress brake pedal during service operation shown below.**

Removal

1) Remove caliper carrier from steering knuckle.
2) Pull off brake disc by 8 mm bolts (1).



I8C50A420006-01

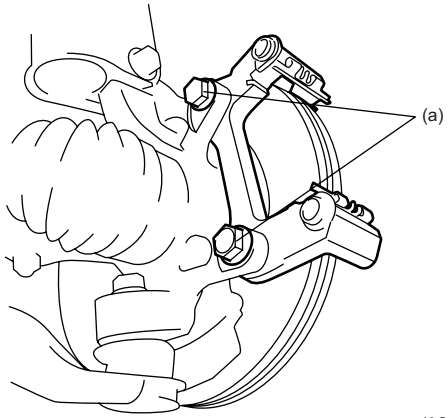
Installation

⚠ CAUTION

Make sure that brake flexible hose is not twisted while installing caliper.

1) Install brake disc to wheel hub.
2) Install caliper carrier to steering knuckle.

Tightening torque
Caliper carrier bolt (a): 85 N·m (8.7 kgf-m, 63.0 lbf-ft)



I8C50A420007-01

3) Make sure that brake system is operating properly.

Front Brake Disc and Pad Inspection

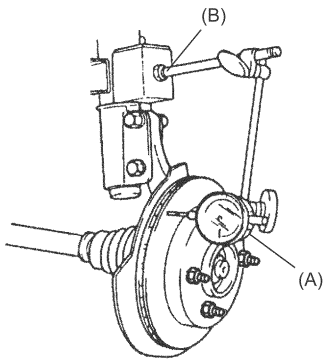
AENDL70A4206005

Brake Disc

- Install wheel nut when fixing brake disc to wheel hub.
- Using magnetic stand and dial gauge positioned at about 10 mm (0.39 in.) inward from periphery of disc, measure deflection of disc. If it exceeds the limit, correct or replace the brake disc.

Front brake disc deflection
Limit: 0.10 mm (0.004 in.)

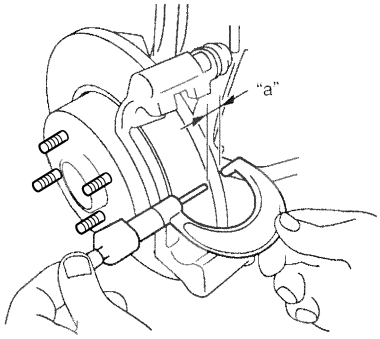
Special tool
(A): 09900M20607
(B): 09900M20701



I8C50A420008-01

- Using micrometer, measure thickness of brake disc. If it is less than limit, replace brake disc.

Front brake disc thickness "a"
Standard: 17.0 mm (0.67 in.)
Limit: 15.0 mm (0.59 in.)



I8C50A420009-01

Brake Pad

⚠ CAUTION

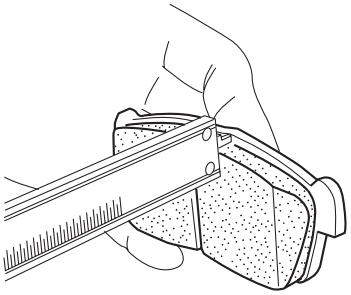
Never polish brake pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will remain on the lining and may damage brake disc. When brake pad lining requires correction, replace it with a new one.

NOTE

When brake pads are removed, visually inspect caliper for brake fluid leak. Correct leaking point, if any.

- Check all front brake pad lining for wear. If wear exceeds limit, replace.

Front brake pad thickness (lining thickness)
Standard: 10 mm (0.39 in.)
Limit: 1 mm (0.04 in.)



I7V20A420005-01

Front Brake Caliper Removal and Installation

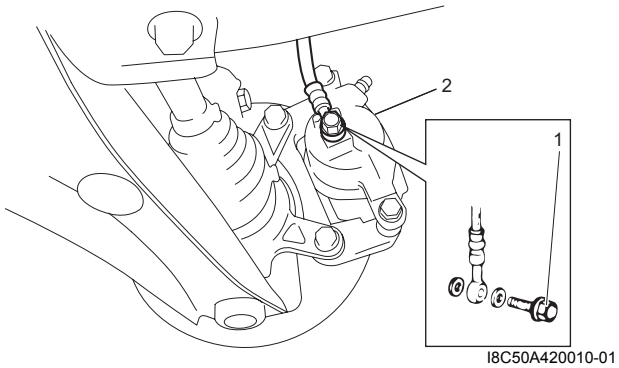
AENDL70A4206006

⚠ CAUTION

- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, on painted surface flush it with water immediately.**
- **Be careful not to damage brake flexible hoses.**
- **Do not depress brake pedal while removing brake pads.**
- **Do not reuse brake flexible hose washers. Otherwise, brake fluid may leak.**

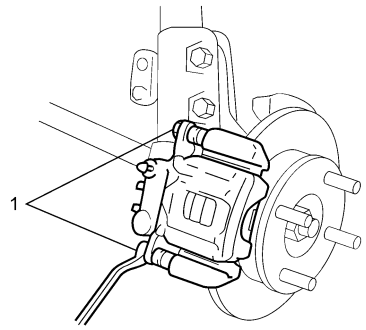
Removal

1) Hoist vehicle and remove front wheel. ☞(Page 2D-3)
2) Place a container below caliper to collect the brake fluid.
3) Remove flexible hose joint bolt (1) from caliper (2).



I8C50A420010-01

4) Remove caliper pin bolts (1).



I8C50A420002-01

5) Remove caliper from caliper carrier.

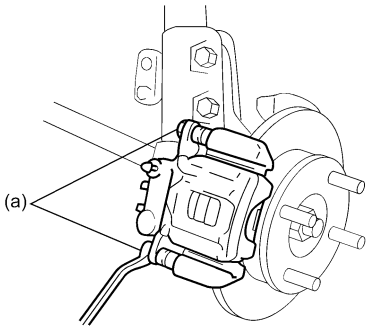
Installation

⚠ CAUTION

Make sure that brake flexible hose is not twisted while installing caliper.

1) Install caliper to caliper carrier.
Tighten caliper pin bolts to specified torque.

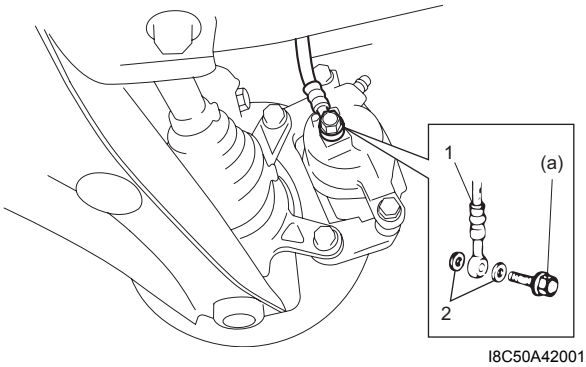
Tightening torque
Caliper pin bolt (a): 27 N·m (2.8 kgf-m, 20.0 lbf-ft)



I8C50A420011-01

2) Connect brake flexible hose (1) with new washers (2) to caliper as shown in figure. Tighten flexible hose joint bolt to specified torque.

Tightening torque
Flexible hose joint bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I8C50A420012-01

3) Fill reservoir with brake fluid and bleed brake system. ☞(Page 4A-6)
4) Make sure there is no leakage of the brake fluid.
5) Install front wheel. ☞(Page 2D-3)
6) Make sure that brake system is operating properly.

Front Brake Caliper Disassembly and Reassembly

AENDL70A4206007

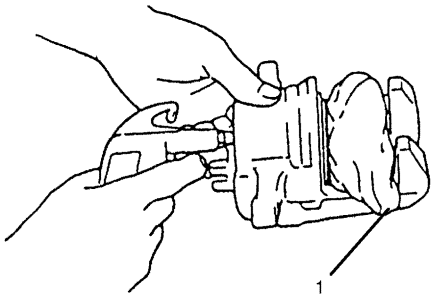
⚠ CAUTION

Handling brake piston and cylinder roughly can damage the inside (bore side) of cylinder.

Disassembly

⚠ WARNING

- **When removing brake piston, jumping-out piston can injure your fingers. Applying highly compressed air will cause piston to jump out of cylinder.**
- **Do not apply highly compressed air to the piston as it is. Place a cloth (1) to prevent brake piston from jumping-out. Gradually apply compressed air. Do not place your fingers in front of brake piston while applying compressed air.**



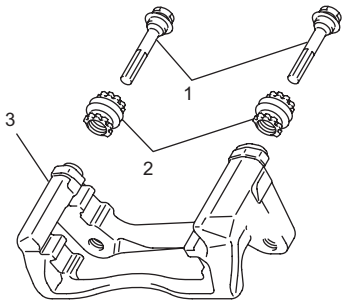
I2RH01420011-01

Caliper

1) Clean around caliper with brake cleaner before disassembly.
2) Remove brake piston by blowing air into flexible hose joint bolt installation hole.
3) Remove cylinder boot, piston seal and bleeder plug.

Slide pin

Remove slide pin (1) and pin boot (2) from caliper carrier (3).



I8C50A420013-01

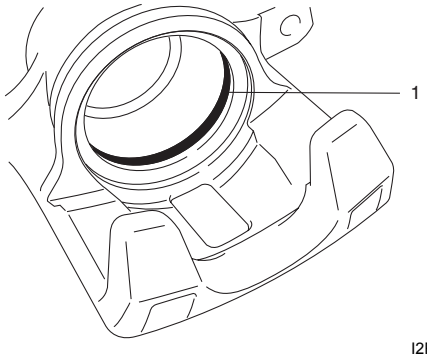
Reassembly

⚠ CAUTION

- **Use only the specified brake fluid to wash brake parts. Any other fluids or solvents are detrimental to the parts.**
- **Do not reuse the rubber parts (piston seal, cylinder boot and pin boot).**

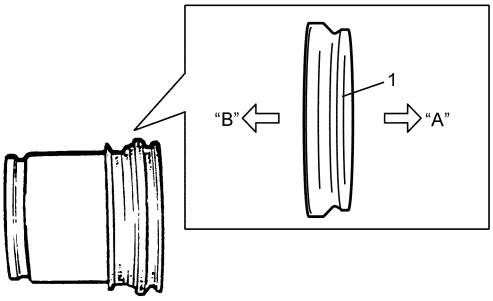
Caliper

1) Before installing brake piston into cylinder of caliper, perform the following steps.
   a) Wash all parts with specified brake fluid before installation.
   b) Check entire periphery of brake piston and inside surface of cylinder for rust, corrosion and any other damage. If check result is not OK, replace brake caliper assembly.
   c) After applying rubber grease included in piston seal set of supply parts or specified brake fluid, fit new piston seal (1) into groove in cylinder taking care not to twist it.



I2RH01420017-01

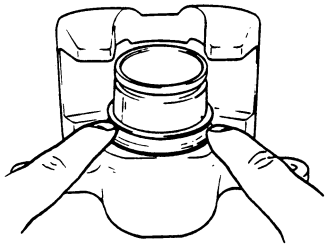
d) Apply rubber grease included in piston seal set of supply parts or specified brake fluid to new cylinder boot (1). And then install it onto piston as shown.



I8C50A420014-01

"A":	1 Single-grooved end directed cylinder side
"B":	2 Double-grooved end directed pad side

2) Fit cylinder boot with piston into boot groove in cylinder of caliper with fingers as shown.

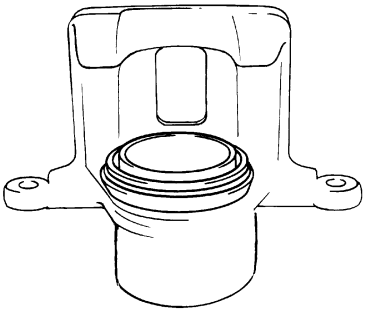


I2RH01420019-01

3) Insert piston into cylinder by hand and fit boot in boot groove on piston.

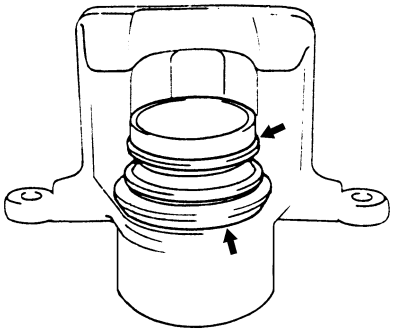
NOTE

Check that boot is fitted in boot groove securely all around piston and cylinder.



I2RH01420020-01

4) To confirm that boot is fitted in its groove in cylinder properly, pull piston a little outward without moving its fully out.

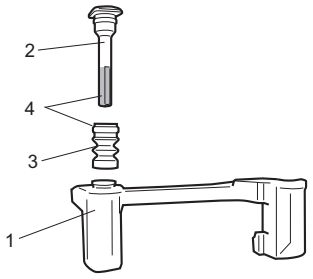


I7V10A420001-01

5) Insert piston into cylinder by hand.

Slide pin

1) Apply grease (4) included in supply parts to inside of new pin boot (3) and slide pin (2).
2) Install pin boots and slide pins to caliper carrier (1).



IDL70A420004-01

Front Brake Caliper Check

AENDL70A4206008

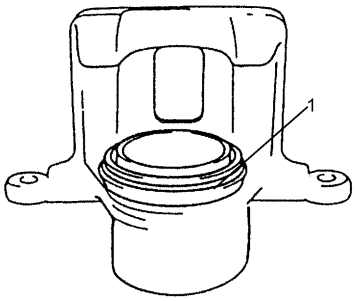
NOTE

Perform this check in the following cases.

- **When replacing the brake pads with new one.**
- **When checking the thickness of brake pad.**
- **Before reassembling the brake caliper.**

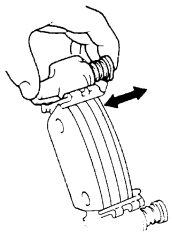
Caliper (Body) and Carrier
Check brake caliper body and carrier for deformation, crack, damage and rust. If defective, replace brake caliper and carrier.

Cylinder Boot
Check cylinder boot (1) for break, crack and brake fluid leak. If defective, overhaul or replace brake caliper.



I8RW01420003-01

Slide Pin
Before installing caliper to carrier, check for its smooth movement in thrust direction.
If defective, replace slide pin and boot.



I8RW01420004-01

Specifications

Tightening Torque Specifications

AENDL70A4207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Caliper pin bolt	27	2.8	20.0	☞(Page 4B-3) / ☞(Page 4B-4)
Caliper carrier bolt	85	8.7	63.0	☞(Page 4B-3)
Flexible hose joint bolt	23	2.3	17.0	☞(Page 4B-5)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Front Brake Components” (Page 4B-1)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A4208001

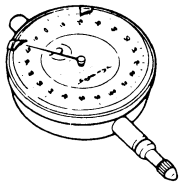
NOTE

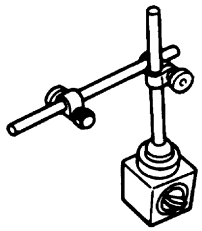
Required service materials are also described in:
“Front Brake Components” (Page 4B-1)

Special Tool

AENDL70A4208002

09900M20607 Dial gauge ☞(Page 4B-3)	09900M20701 Magnetic stand ☞(Page 4B-3)





Rear Brakes

General Description

Rear Brake Description

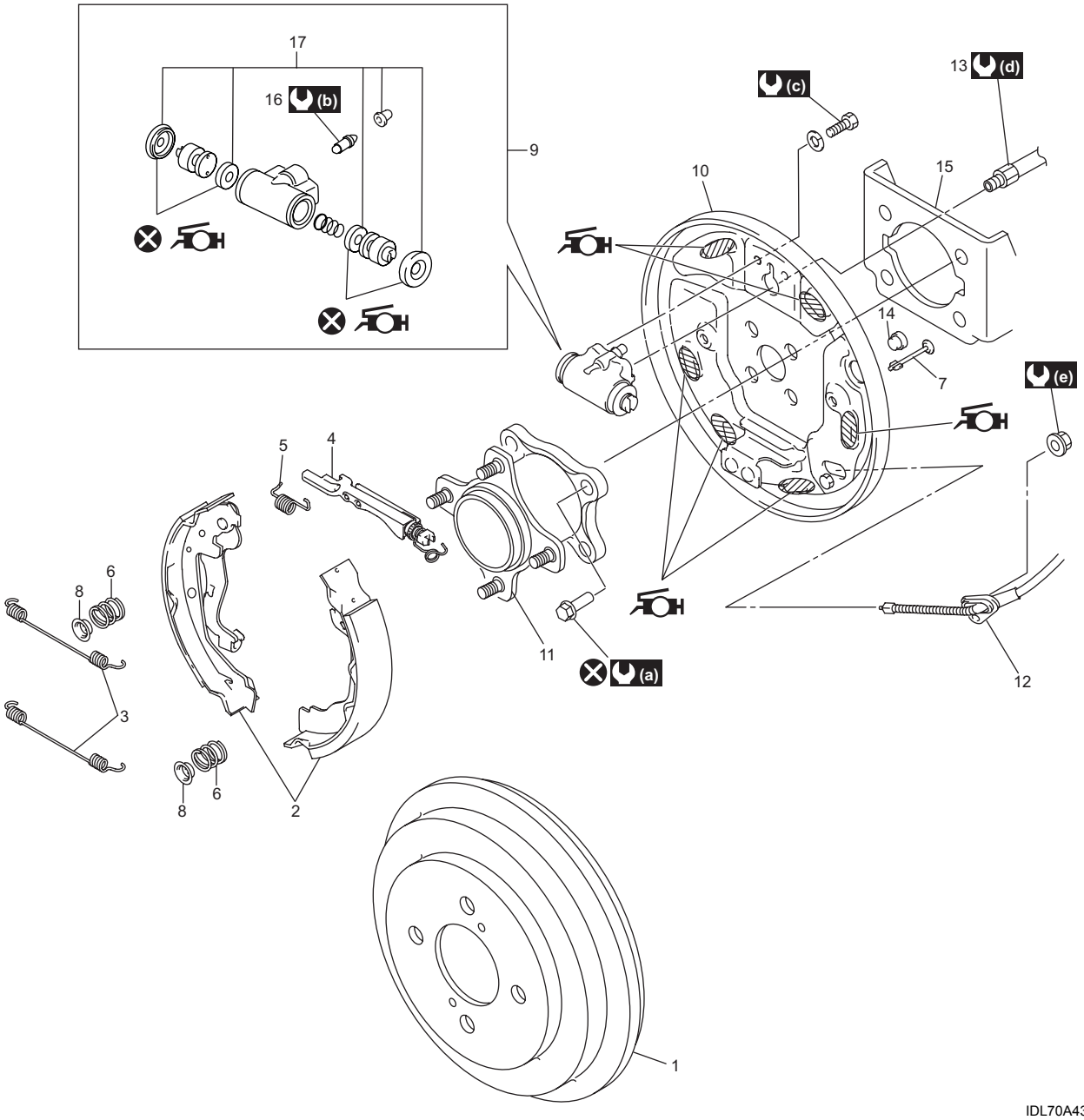
AENDL70A4301001

The rear brake system is of a leading-trailing type drum brake.

Repair Instructions

Rear Brake Components

AENDL70A4306001



IDL70A430001-01

1. Rear brake drum	9. Wheel cylinder	17. Wheel cylinder rubber kit : Apply small amount of rubber grease or specified brake fluid.
2. Brake shoe kit	10. Brake back plate : After cleaning back plate, apply heat-resistant brake grease or grease included in supply part.	(a) : 70 N·m (7.1 kgf-m, 51.6 lbf-ft)
3. Shoe return spring	11. Rear wheel hub assembly	(b) : 9 N·m (0.92 kgf-m, 6.6 lbf-ft)
4. Brake adjuster (strut)	12. Parking brake cable	(c) : 10 N·m (1.0 kgf-m, 7.4 lbf-ft)
5. Strut retaining spring	13. Rear brake pipe	(d) : 16 N·m (1.6 kgf-m, 12.0 lbf-ft)
6. Hold down spring	14. Plug	(e) : 11 N·m (1.1 kgf-m, 8.1 lbf-ft)
7. Shoe hold down pin	15. Rear axle	: Do not reuse.
8. Shoe hold down retainer	16. Bleeder plug	

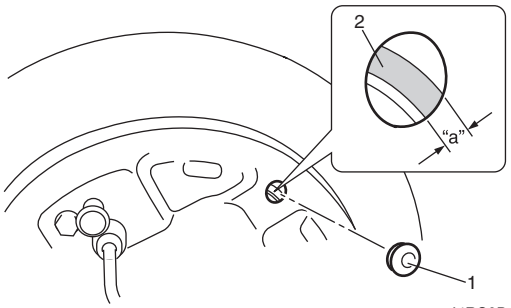
Rear Brake Shoe On-Vehicle Inspection

AENDL70A4306002

Amount of brake shoe wear can be checked as follows.

1) Hoist vehicle.
2) Remove rubber cover (plug) (1) from brake back plate.
3) Through hole in back plate, visually check for thickness “a” of brake shoe lining (2). If brake shoe lining is found significantly worn, inspect rear brake shoe lining thickness as follows.
   a) Remove rear brake drum. ☞(Page 4C-2)
   b) Inspect rear brake shoe lining thickness referring to “Brake Shoe” under “Rear Brake Drum and Shoe Inspection” (Page 4C-3).

Rear brake shoe lining thickness “a”
Standard: 3.9 mm (0.15 in.)
Limit: 1.0 mm (0.04 in.)



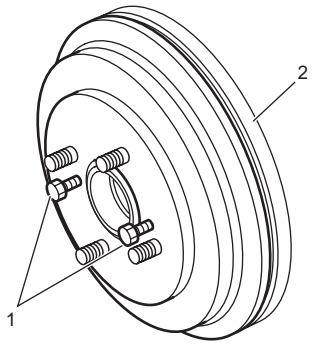
I4RS0B430004-01

Rear Brake Drum Removal and Installation

AENDL70A4306003

Removal

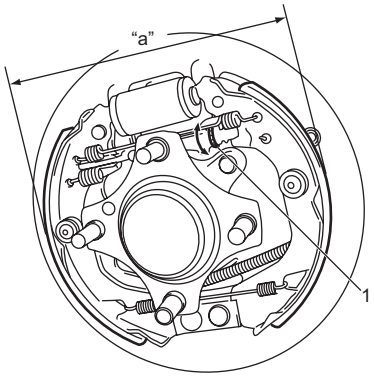
1) Hoist vehicle and remove rear wheel. ☞(Page 2D-3)
2) Release parking brake.
3) Remove rear brake drum (2) by screwing M8 bolts (1).



IAP70P431002-01

Installation

1) Check that inside of rear brake drum and rear brake shoes are free from dirt and oil.
2) Check outer diameter “a” of brake shoes. If it is out of the specified range below, adjust it by turning adjuster (1).
   Brake shoes outer diameter “a” =measured brake drum inside diameter – 0.5 to 1.0 mm (0.02 to 0.04 in.)



IBP80A430002-01

3) Install rear brake drum to rear wheel hub assembly.
4) Adjust parking brake cable referring to “Parking Brake Cable Removal and Installation” in Section 4D (Page 4D-2).
5) Install rear wheel referring to “Wheel (with Tire) Removal and Installation” in Section 2D (Page 2D-3).
6) Check that brake drum does not drag and brake provides proper braking. Perform brake test (foot brake and parking brake).

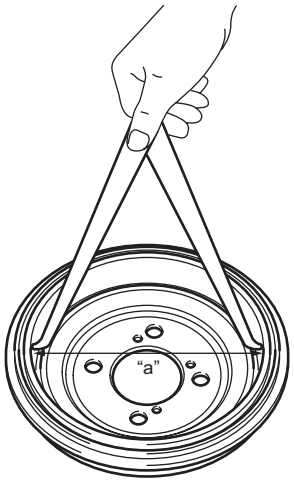
Rear Brake Drum and Shoe Inspection

AENDL70A4306004

Rear Brake Drum

- Check rear brake drum for damage, deformation and cracks. If check result is not OK, replace brake drum with new one.
- Inspect brake drum for wear.
  If drum inner diameter exceeds the limit or uneven or stepped wear is excessive, replace brake drum with new one.

Rear brake drum inner diameter “a”
Standard: 180 mm (7.08 in.)
Limit: 182 mm (7.16 in.)

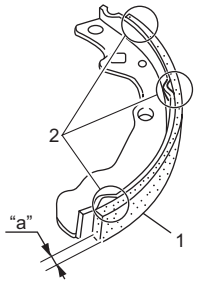


I9P60A431006-01

Rear Brake Shoe

- Check surface of lining (1) for hardening, excessive wear, peel-off and oil.
- Measure brake shoe thickness “a” (not including rim) at least three points. If any measured value is not as specified or if remarkable uneven wear is found, replace all the shoes of the vehicle.

Rear brake shoe lining thickness “a”
Standard: 3.9 mm (0.15 in.)
Limit: 1.0 mm (0.04 in.)



I9P60A431014-01

2. Inspection point

Rear Brake Shoe Removal and Installation

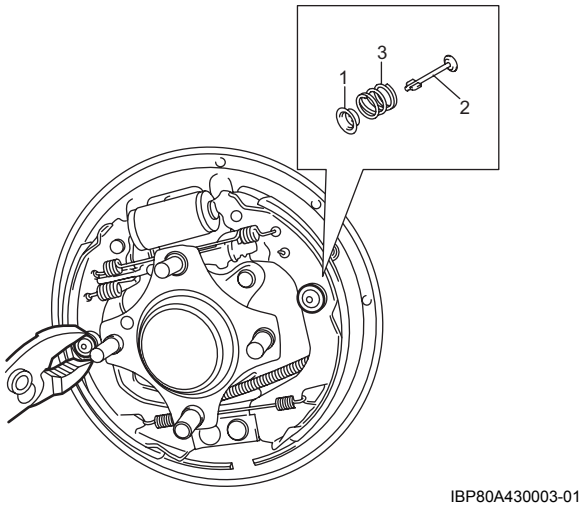
AENDL70A4306005

NOTE

Replace both right and left brake shoes as a set.

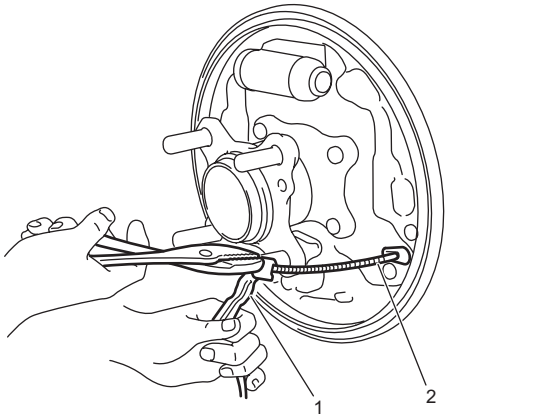
Removal

1) Remove rear brake drum. ☞(Page 4C-2)
2) Pushing and turning shoe hold down retainer (1), remove shoe hold down retainer, shoe hold down pin (2) and hold down spring (3) at both sides.



IBP80A430003-01

3) Remove shoe return springs, brake shoes and brake adjuster.
4) Disconnect brake shoe lever (1) from parking brake cable (2).



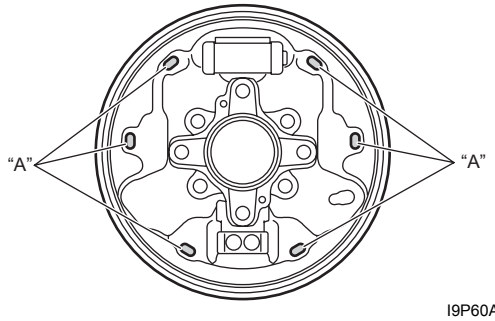
IBP80A430004-01

Installation

Reverse removal procedure, noting the following points.

- Before installing brake shoes to brake back plate, clean brake back plate and apply grease “A”.

  “A”: Heat-resistant brake grease



I9P60A431009-02

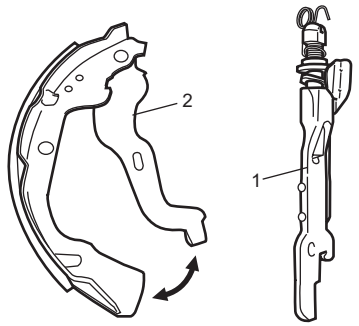
- Connect brake shoe lever to parking brake cable securely.
- Adjust parking brake cable. ☞(Page 4D-2)
- Check that brake drum is free from dragging and make sure that brake system operates properly.

Rear Brake Adjuster and Brake Shoe Lever Check

AENDL70A4306006

- Check ratchet of brake adjuster (1) assembly for wear or damage.
- Check shoe return springs, strut retaining spring, and hold down spring for damage, corrosion and weakening.
- Check for smooth movement of brake lever (2) along shoe rim.

If check result is not OK, repair or replace brake adjuster and/or brake shoe kit.



IBP80A430005-01

Wheel Cylinder Removal and Installation

AENDL70A4306007

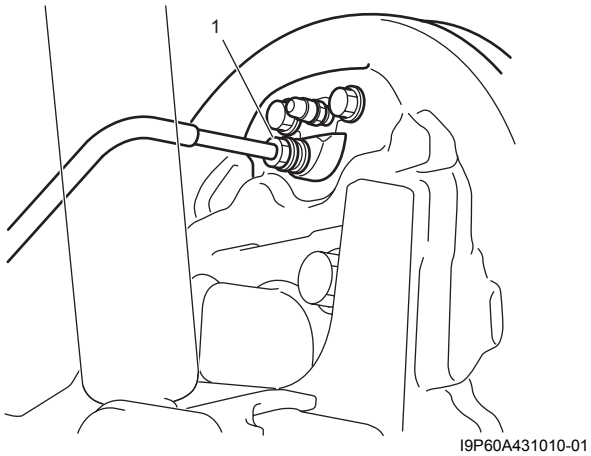
⚠ CAUTION

Brake fluid is extremely damaging to painted surfaces. If brake fluid contacts any painted surface, immediately wipe it off and flush the surface with water thoroughly.

Removal

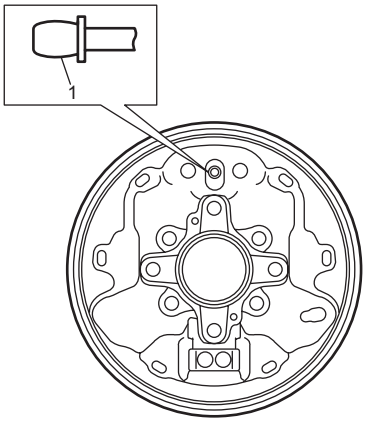
1) Remove rear brake shoes. ☞(Page 4C-3)
2) Loosen brake pipe flare nut (1) only to an extent in which fluid does not leak.

   Special tool
   : 09950M78220



I9P60A431010-01

3) Remove wheel cylinder mounting bolts. Disconnect brake pipe from wheel cylinder and put bleeder plug cap (1) onto pipe to prevent fluid from spilling.



I9P60A431011-01

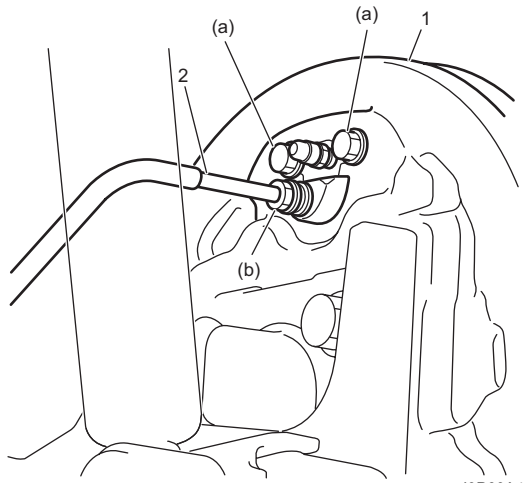
Installation

Reverse removal procedure, noting the following points.

- Install wheel cylinder to brake back plate (1), then connect brake pipe (2) to wheel cylinder.
- Tighten wheel cylinder mounting bolts and rear brake pipe flare nut to specified torque.

  Special tool
  : 09950M78220

  Tightening torque
  Wheel cylinder mounting bolt (a): 10 N·m (1.0 kgf-m, 7.4 lbf-ft)
  Rear brake pipe flare nut (b): 16 N·m (1.6 kgf-m, 12.0 lbf-ft)



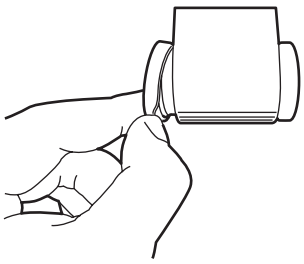
I9P60A431012-01

- Bleed air from brake system. ☞(Page 4A-6)
- Adjust parking brake cable. ☞(Page 4D-2)
- Check that brake drum is free from dragging and make sure that brake system operates properly.

Wheel Cylinder Inspection

AENDL70A4306008

- Check wheel cylinder for fluid leakage and boots for crack and damage. If check result is not OK, replace boots and cups.
- Inspect wheel cylinder for wear, cracks, corrosion or damage. If check result is not OK, replace wheel cylinder assembly with a new one.



I7V20A430004-02

Brake Back Plate Removal and Installation

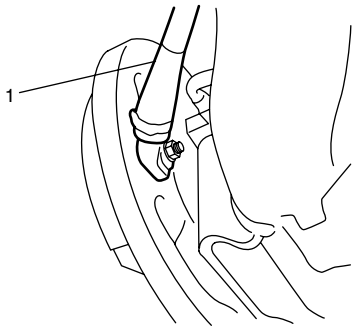
AENDL70A4306009

⚠ CAUTION

Brake fluid is extremely damaging to painted surfaces. If brake fluid contacts any painted surface, immediately wipe it off and flush the surface with water thoroughly.

Removal

1) Remove wheel cylinder. ☞(Page 4C-4)
2) Remove parking brake cable (1) from brake back plate.



I4RS0A430020-01

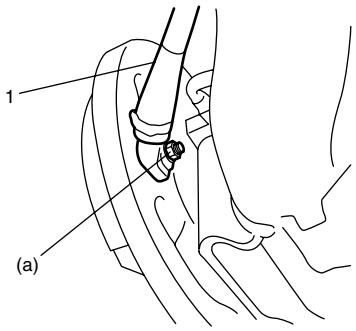
3) Remove rear wheel hub assembly. ☞(Page 3A-14).
4) Remove brake back plate.

Installation

Reverse removal procedure, noting the following points.

- Install parking brake cable (1) to brake back plate.

  Tightening torque
  Parking brake cable cap nut (a): 11 N·m (1.1 kgf-m, 8.1 lbf-ft)



I4RS0A430024-01

- Bleed air from brake system. ☞(Page 4A-6)
- Adjust parking brake cable. ☞(Page 4D-2)
- Check that brake drum is free from dragging and make sure that brake system operates properly.

Specifications

Tightening Torque Specifications

AENDL70A4307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Wheel cylinder mounting bolt	10	1.0	7.4	☞(Page 4C-4)
Rear brake pipe flare nut	16	1.6	12.0	☞(Page 4C-4)

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Parking brake cable cap nut	11	1.1	8.1	☞(Page 4C-5)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Rear Brake Components” (Page 4C-1)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A4308001

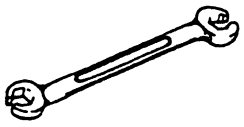
Material	SUZUKI recommended product or Specification		Note
Heat-resistant brake grease	—	—	☞(Page 4C-3)

NOTE

Required service materials are also described in:
“Rear Brake Components” (Page 4C-1)

Special Tool

AENDL70A4308002

09950M78220 Flare nut wrench (10 x 12 mm) ☞(Page 4C-4) / ☞(Page 4C-4)		

Parking Brake

General Description

Parking Brake Description

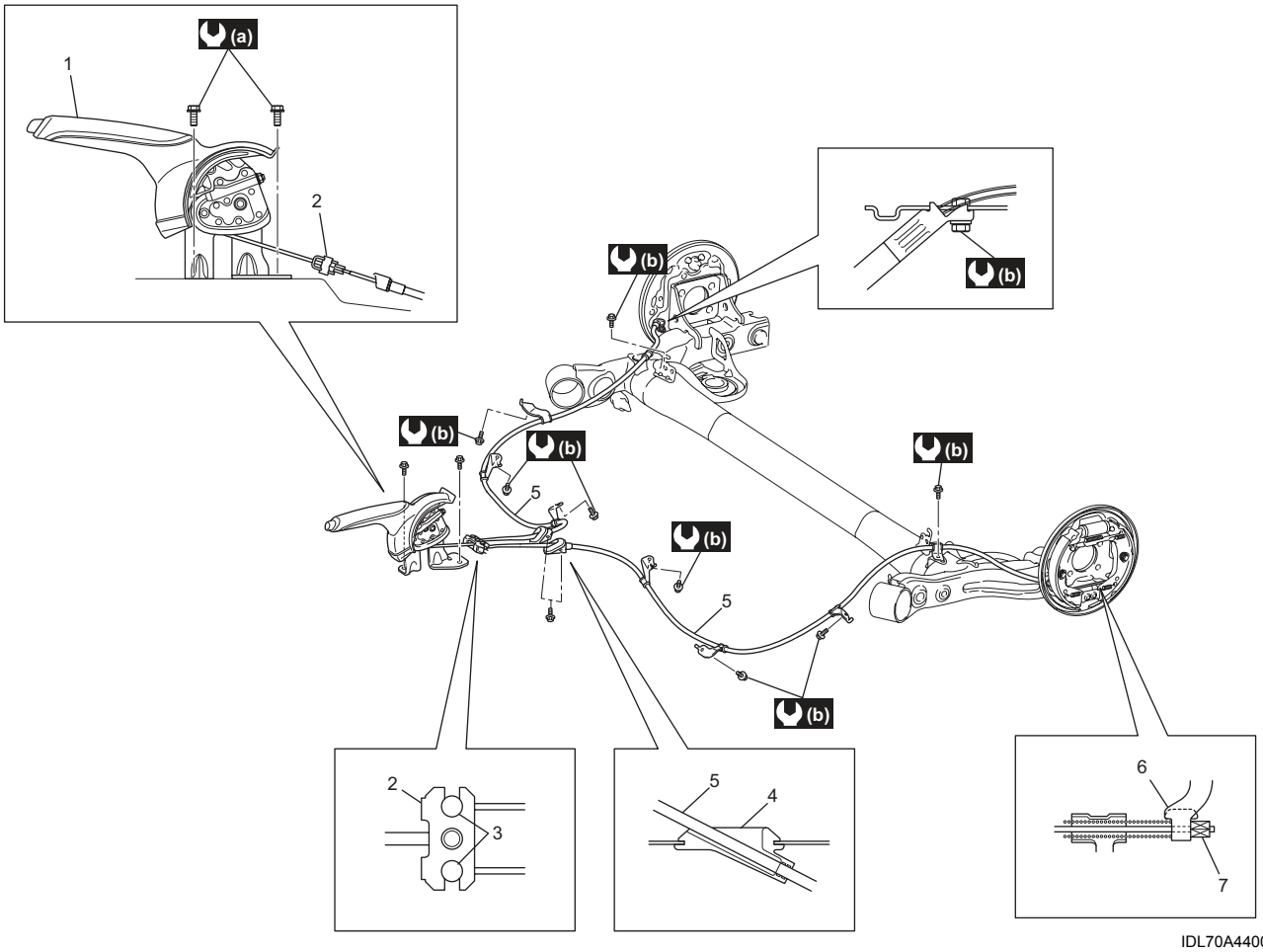
AENDL70A4401001

The parking brake system is mechanical. It applies brake force to only rear wheels by means of cable and mechanical linkage. The same brake shoes are used for parking and foot brakes.

Repair Instructions

Parking Brake Components

AENDL70A4406001



IDL70A440001-02

1. Parking brake lever	4. Grommet	7. Parking brake cable end (Shoe lever side)
2. Equalizer	5. Parking brake cable	(a) : 26 N·m (2.7 kgf-m, 19.5 lbf-ft)
3. Parking brake cable end (equalizer side)	6. Brake shoe lever	(b) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

Parking Brake Inspection and Adjustment

AENDL70A4406002

NOTE

Check the following conditions before parking brake inspection and adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Rear brake shoes are not worn beyond limit.**

Inspection

NOTE

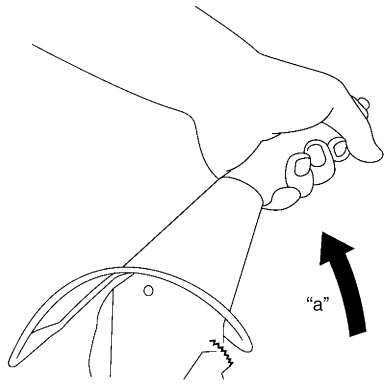
Brake warning light is checked when ignition switch is turned ON.

- When parking brake lever is pulled up, inspect the following items. If defect is found, adjust or replace parking brake cable.
  a. Operation of parking brake lever is smooth.
  b. Rear wheels are locked firmly.
  c. Operate parking brake lever with 200 N (20.4 kgf, 45.0 lbf) as shown, counting number of clicks ratchet notches generate.

NOTE

One click sound corresponds to one notch.

Parking brake stroke "a"
Stroke: 4 to 9 notches



I7V20A440002-01

- When parking brake lever is released, brake warning light turns off. Inspect brake warning light is turned on within 1 notch when parking brake lever is pulled up. If defective, check and/or repair the following items.

NOTE

Check that ABS warning light is turned off.

  a. Remaining amount of brake fluid
  b. Brake fluid switch (attached to brake master cylinder reservoir)
  c. Parking brake lever switch

Adjustment

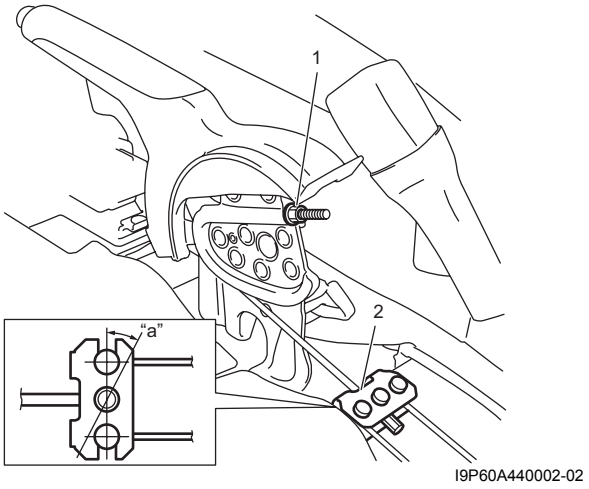
1) Remove console box. ☞(Page 9H-9)
2) Loosen adjusting nut (1) until parking brake cable tension is released.
3) Start engine and depress brake pedal more than 15 times with about 150 N (15.3 kgf, 33.7 lbf) so as to obtain proper drum-to-shoe clearance.
4) Stop engine and adjust parking brake lever stroke to specified value with adjusting nut (1).

NOTE

Parking brake lever must be released while adjusting.

5) Check equalizer (2) inclination angle. If angle is not as specified, inspect parking brake cable and rear brake shoe lining. ☞(Page 4C-3)

Equalizer inclination angle
"a": within 15 degrees



I9P60A440002-02

6) After completion of adjustment, make sure that brake drum is not dragging.

Parking Brake Cable Removal and Installation

AENDL70A4406003

Removal

1) Remove rear brake shoe with brake shoe lever. ☞(Page 4C-3)
2) Remove console box. ☞(Page 9H-9)
3) Disconnect parking brake cable from vehicle. ☞(Page 4D-1)

NOTE

If necessary to remove both right and left parking brake cables, repeat above step.

Installation

Reverse removal procedure, noting the following points.

- Install clamps properly. ☞(Page 4D-1)
- Tighten bolts to specified torque. ☞(Page 4D-1)
- Check that parking brake cable end is installed to equalizer and brake shoe lever securely.

- Adjust parking brake cable. ☞(Page 4D-2)
- After completion of installation and adjustment of parking brake lever stroke, make sure that brake system is operating properly.

Parking Brake Lever Removal and Installation

AENDL70A4406004

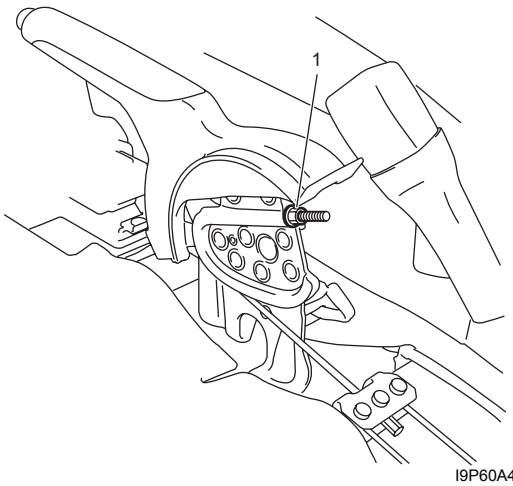
⚠ WARNING

Check the following conditions before parking brake lever removing.

- **Work on a flat place.**
- **Shift into "P" range or "1st" gear.**
- **Block drive wheels.**

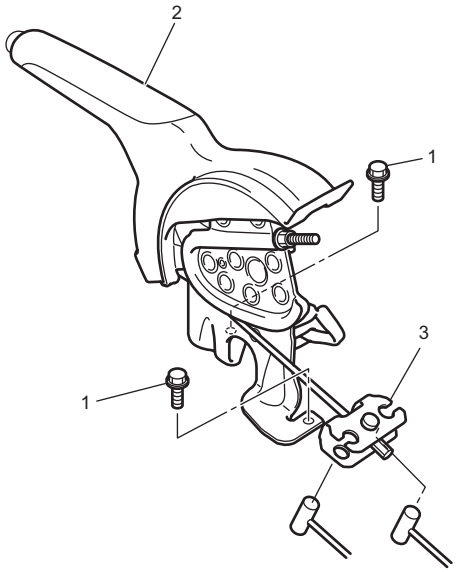
Removal

1) Remove console box. ☞(Page 9H-9)
2) Disconnect parking brake switch connector from parking brake lever.
3) Loosen parking brake cable adjusting nut (1).



I9P60A440004-01

4) Remove parking brake lever bolts (1) and then remove parking brake lever (2) with equalizer (3).

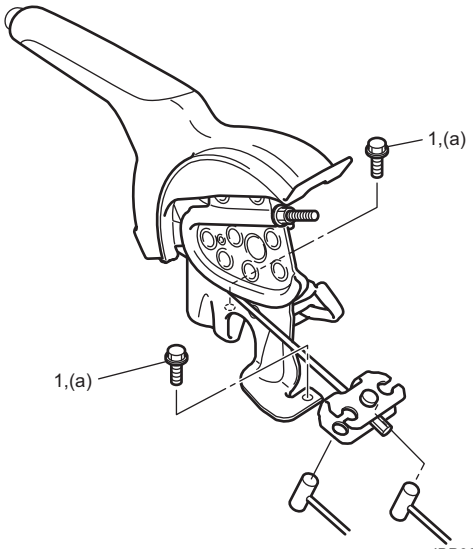


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Installation

1) Tighten parking brake lever bolts (1) to specified torque.

Tightening torque
Parking brake lever bolt (a): 26 N·m (2.7 kgf-m, 19.5 lbf-ft)



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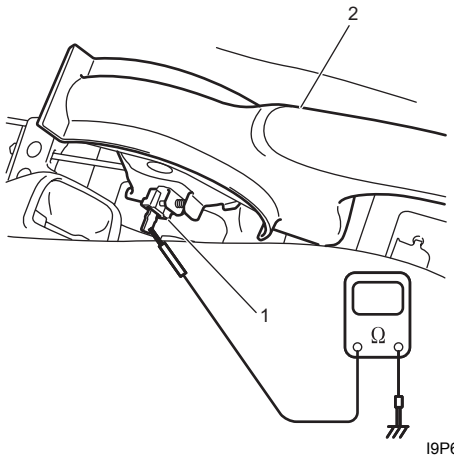
2) Connect parking brake cable to equalizer, then adjust parking brake cable. ☞(Page 4D-2)
3) Make sure that brake system operates properly.
4) Fit parking brake switch connector to parking brake lever
5) Install floor console rear box. ☞(Page 9H-10)

Parking Brake Switch Inspection

AENDL70A4406005

Check for continuity between parking brake switch terminal and ground as shown in figure. If found defective, replace parking brake lever.

Parking brake switch specification
Parking brake released: No continuity
Parking brake lever pulled up: Continuity



I9P60A440007-02

1. Parking brake switch	2. Parking brake lever

Specifications

Tightening Torque Specifications

AENDL70A4407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Parking brake lever bolt	26	2.7	19.5	☞(Page 4D-3)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Parking Brake Components” (Page 4D-1)
“Fasteners Information” in Section 0A (Page 0A-5)

ABS

Precautions

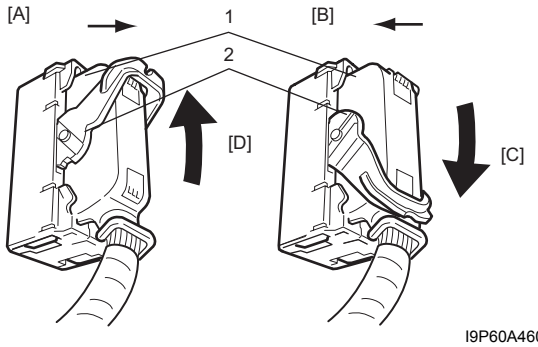
Precautions for Diagnosing Trouble

AENDL70A4500001

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow “ABS Check” (Page 4E-7).

- Before using SUZUKI scan tool, read its “Operator’s (Instruction) Manual” to know how to use it.
- If the vehicle was operated in any of the following conditions, ABS warning light may light momentarily but this does not indicate any fault in ABS.
  - The vehicle is driven with parking brake applied.
  - The vehicle is driven with brake dragging.
  - The vehicle is stuck in mud, sand, etc.
  - Wheel spins while driving.
  - Wheels are rotated while the vehicle was jacked up.
- Follow trouble diagnosis procedure described in “ABS Check” (Page 4E-7). If trouble diagnosis procedure is not followed properly, incorrect diagnosis may result. (If incorrect procedure is performed, other DTC may be stored in the ABS hydraulic unit / control module assembly.)
- When disconnecting ABS control module connector (1), pull up lock lever (2) of connector.

  When connecting the connector, set the connector in position on ABS hydraulic unit / control module assembly and pull down the lock lever (2) until it locks.



I9P60A460001-02

[A]: Disconnect	[C]: Pull down to disconnect
[B]: Connect	[D]: Pull up to connect

- Communication of ABS control module and other control module is established by CAN.
  Therefore, read “Precautions for Installing Mobile Communication Equipment” in Section 00 (Page 00-9) before inspection and handling CAN communication line.

General Description

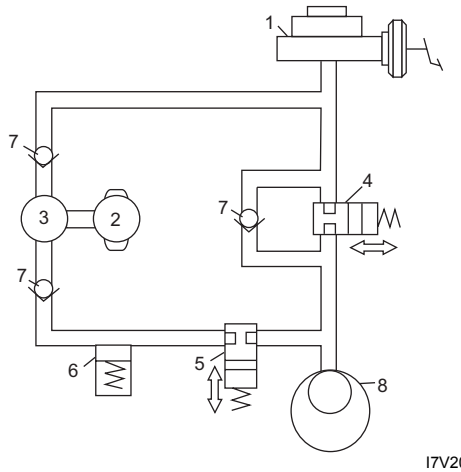
ABS Description

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The ABS (Anti-lock Brake System) controls the fluid pressure applied to the caliper or wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied.
This ABS is equipped with EBD (Electronic Brake force Distributions) function.
While brake is depressed not so hard as to activate ABS control, brake force is proportionally distributed between the front and rear brakes to prevent rear wheels from being locked too early for better stability of the vehicle.
If the EBD system fails, the EBD warning light (brake warning light) lights to inform the driver of the abnormality.

ABS Hydraulic Unit / Control Module Assembly

- ABS hydarulic unit / control module assembly detects wheel slip by the signal from wheel speed sensor of each wheel and sends control signals to the hydraulic unit.
  ABS hydraulic unit / control module assembly also monitors system conditions and stops the functions of ABS and lights the ABS warning light in case it judges that the system is faulty.
- ABS hydraulic unit is composed of inlet solenoid valves (4) (normally-opened valves), outlet solenoid valve (5) (normally closed-valves), pump (3), pump motor (2), reservoirs (6) and check valves (7). It activates the inlet and outlet solenoid valves by the signals from ABS / hydraulic unit / control module assembly and controls the brake fluid pressure applied on each wheel brake. (The following figure shows the circuit for one wheel, with inlet and outlet solenoid valves in OFF positions.)



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1. Master cylinder	8. Caliper or wheel cylinder

The hydraulic pressure control is performed in 3 modes: pressure increase, pressure keeping and pressure reduction.

- In the pressure increase mode, inlet and outlet solenoid valves are turned OFF, and the brake fluid pressure applied from the master cylinder to the caliper or wheel cylinder is increased.
- In the pressure keeping mode, the inlet solenoid valve is turned ON, and the brake fluid pressure in the caliper or wheel cylinder is kept constant.
- In the pressure reduction mode, inlet and outlet solenoid valves are turned ON, and the brake fluid pressure applied to caliper and wheel cylinder is released to the reservoir. Thus the brake pressure applied to the wheel likely to be locked is reduced. The brake fluid temporarily stored in the reservoir is pumped back into the master cylinder.

Wheel Speed Sensor

The wheel speed sensor (1) feeds pulse signals in proportion to the wheel speed to the ABS control module, which then calculates wheel speed based on such signal information.

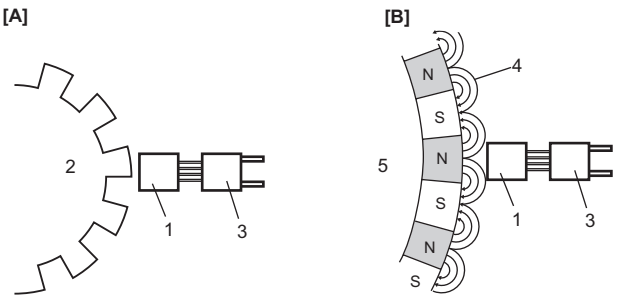
The pulse signal is generated at the front wheels and the rear wheels as follows.

Front

Front wheel speed is detected by the Magnetic Resistive Effect element type wheel speed sensor (1) and sensor ring (2). The wheel speed sensor is fixed to each steering knuckle. The sensor ring consists of a permanent magnet which has south poles and north poles. As it is located on the drive shafts, it turns along with the wheel.

Rear

Rear wheel speed is detected by the Magnetic Resistive Effect element type wheel speed sensor (1) and encoder (5). The wheel speed sensor is fixed to rear wheel hub assembly. The encoder consists of a permanent magnet which has south poles and north poles. As it is located on the wheel hubs, it turns along with the wheel.



IDL70A450021-02

[A]: Front	3. Integrated Circuit
[B]: Rear	4. Magnetic field lines

OBD System Description

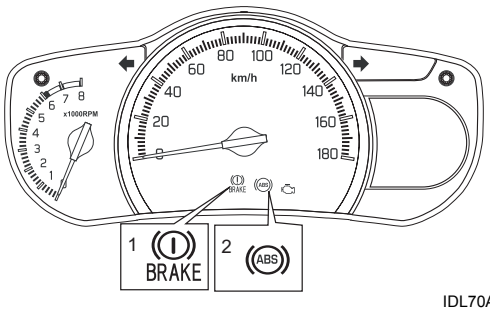
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ABS control module is built in ABS hydarulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ABS hydraulic unit / control module assembly monitors each input and output signal. When ABS hydarulic unit / control module assembly detects any malfunction, ABS warning light (2) and/or EBD warning light (brake warning light) (1) are turned ON to indicate the abnormality to the driver.

- When ignition is set “ON”, ABS warning light and EBD warning light (brake warning light) turn ON for 2 seconds to check its circuit.
- When no abnormality is detected (the system is in good condition), these lights turn OFF after 2 seconds. However, when parking brake is operated, EBD warning light (brake warning light) remains ON.
- When abnormality in the system is detected, ABS warning light and/or EBD warning light (brake warning light) are turned ON and DTC is stored in ABS hydraulic unit / control module assembly.



IDL70A450004-02

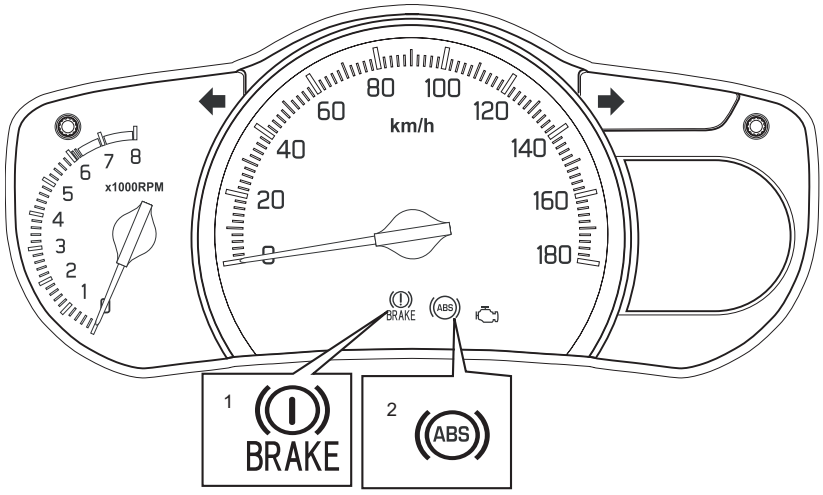
Fail-Safe Mode

If ABS hydraulic unit / control module assembly stores a DTC, ABS hydraulic unit / control module assembly stops ABS and/or EBD function corresponding to the faulty area. It is possible to confirm the stopped function(s) by the warning lights in combination meter. ☞(Page 4E-3)

Warning Light Description

AENDL70A4501006

There are two warning lights controlled by ABS hydraulic unit / control module assembly in combination meter. They give warning to driver by changing their modes: light ON / blinking / light OFF.



IDL70A450001-03

1. EBD warning light (brake warning light)	2. ABS warning light

Condition and Operation of Warning Lights

AENDL70A4501007

Warning light	Condition and operation
ABS warning light	If ABS has abnormality, the light turns “ON”.
EBD warning light (brake warning light)	• If EBD system has abnormality, the light turns “ON”. • If brake fluid level in reservoir is lower than minimum level, the light turns “ON”. • If parking brake lever is pulled up, the light turns “ON”.

DLC Description

AENDL70A4501004

Refer to “DLC Description” in Section 1A (Page 1A-4).

CAN Communication System Description

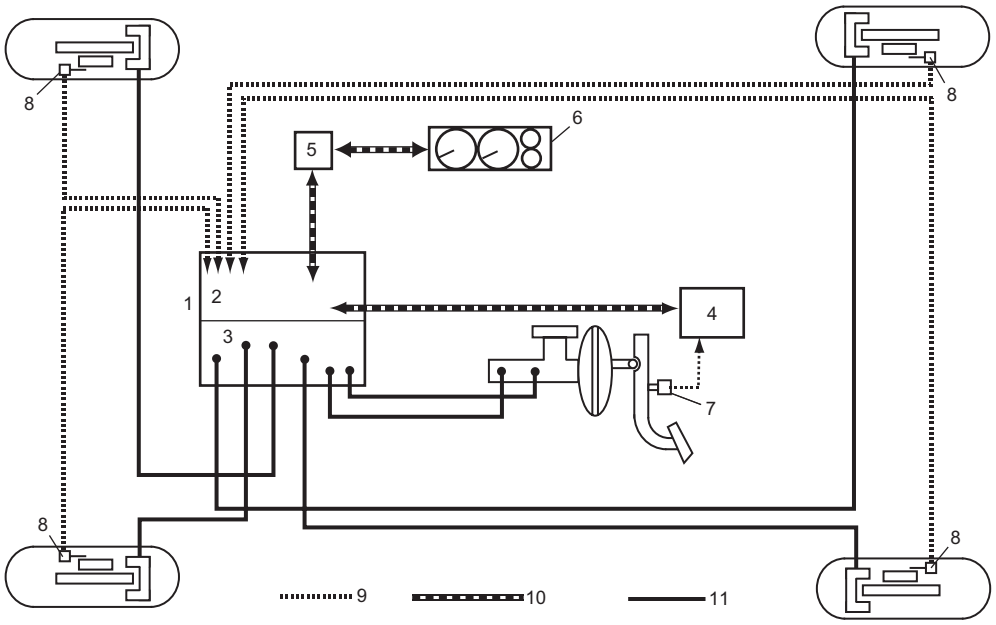
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Refer to “CAN Communication System Description” in Section 10H (Page 10H-1).

Schematic and Routing Diagram

ABS Diagram

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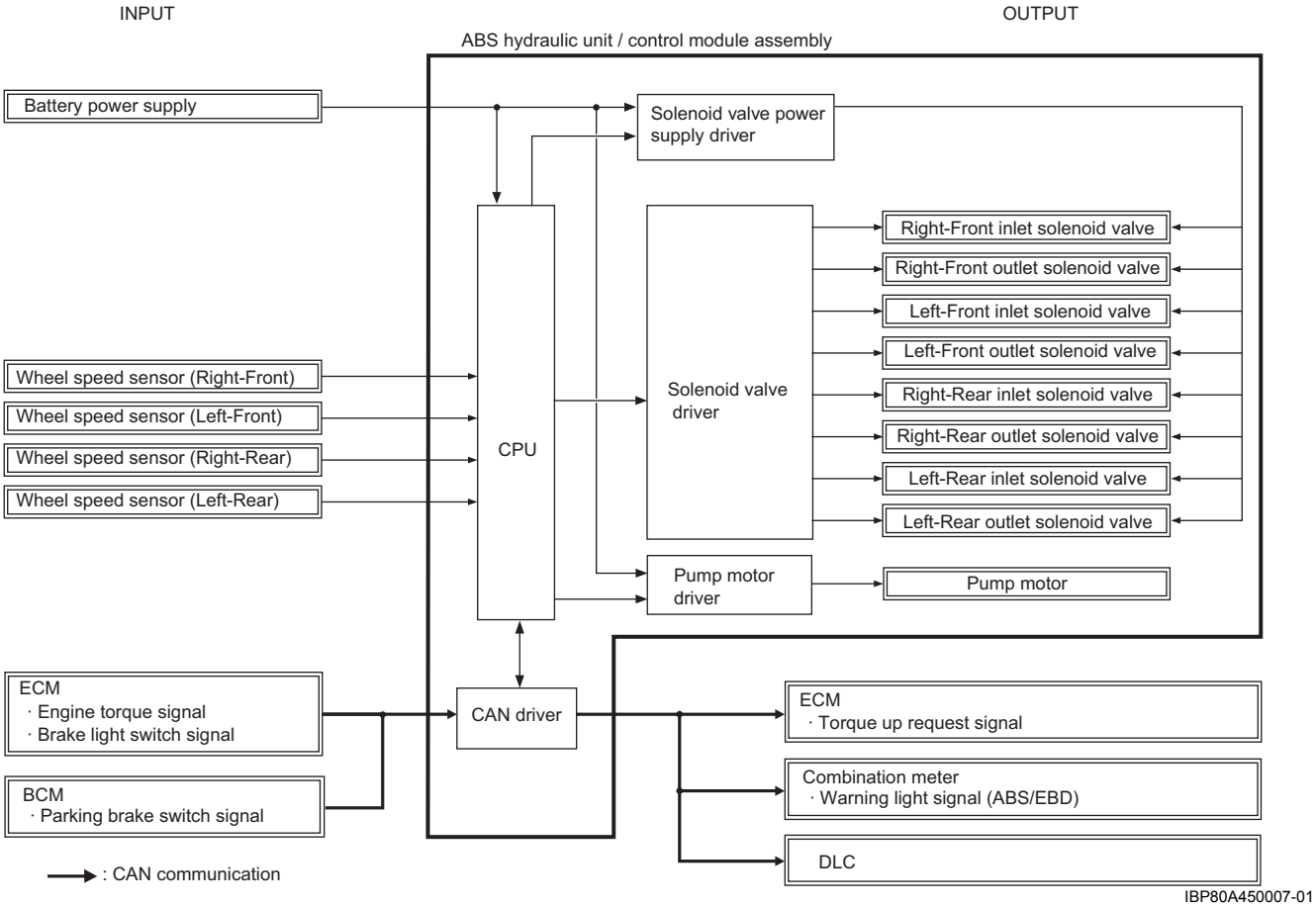


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1. ABS hydraulic unit / control module assembly	5. BCM	9. Electronic signal
2. ABS control module	6. Combination meter	10. CAN signal
3. Hydraulic unit	7. Brake light switch	11. Hydraulic circuit
4. ECM	8. Wheel speed sensor	

ABS Input / Output Diagram

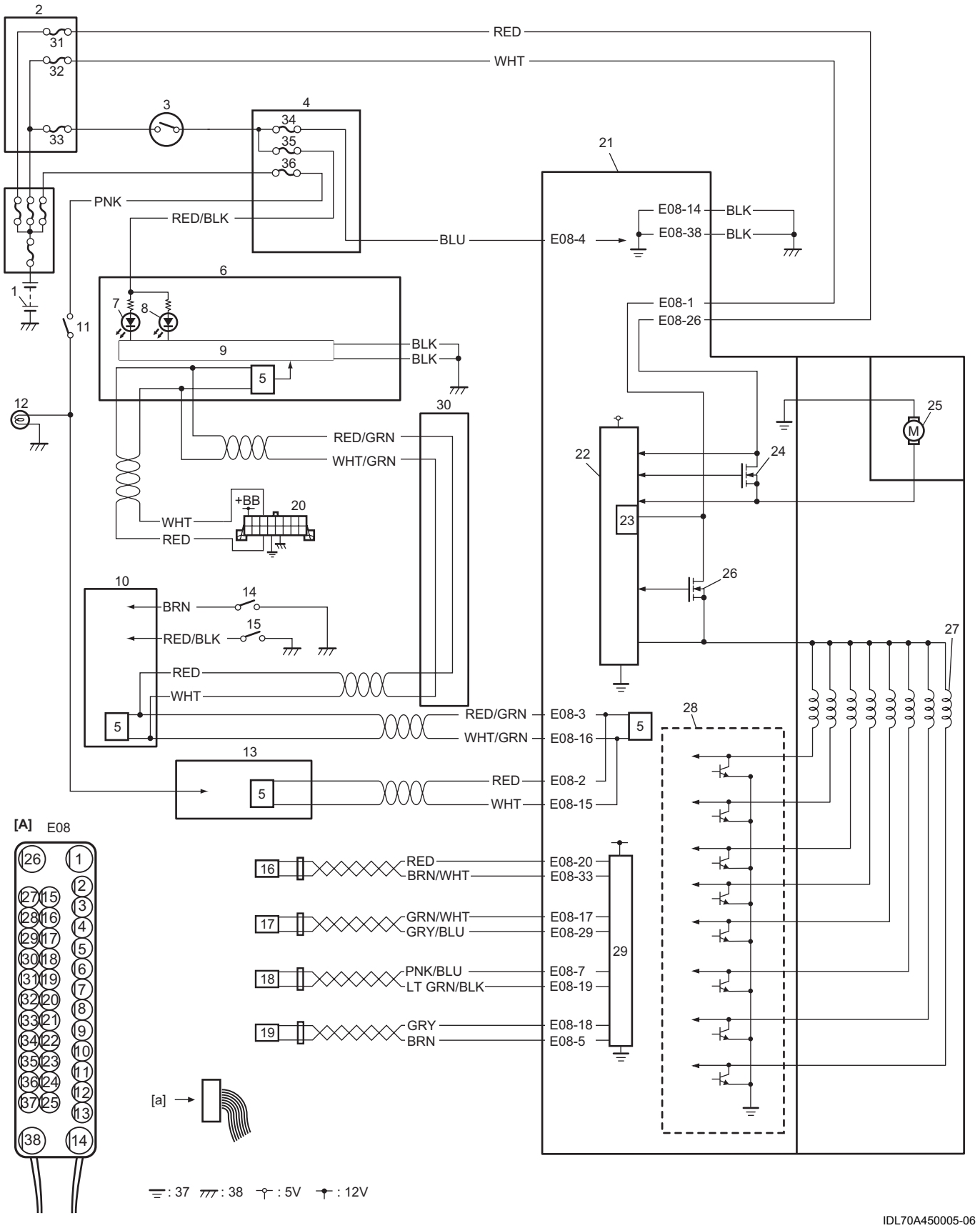
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ABS Circuit Diagram

AENDL70A4502003



IDL70A450005-06

[A]: ABS control module connector (View: [a])	13. ECM	26. Solenoid valve power supply relay
1. Battery	14. Brake fluid level switch	27. Solenoid valve
2. Individual circuit fuse box No.1	15. Parking brake switch	28. Solenoid valve relay

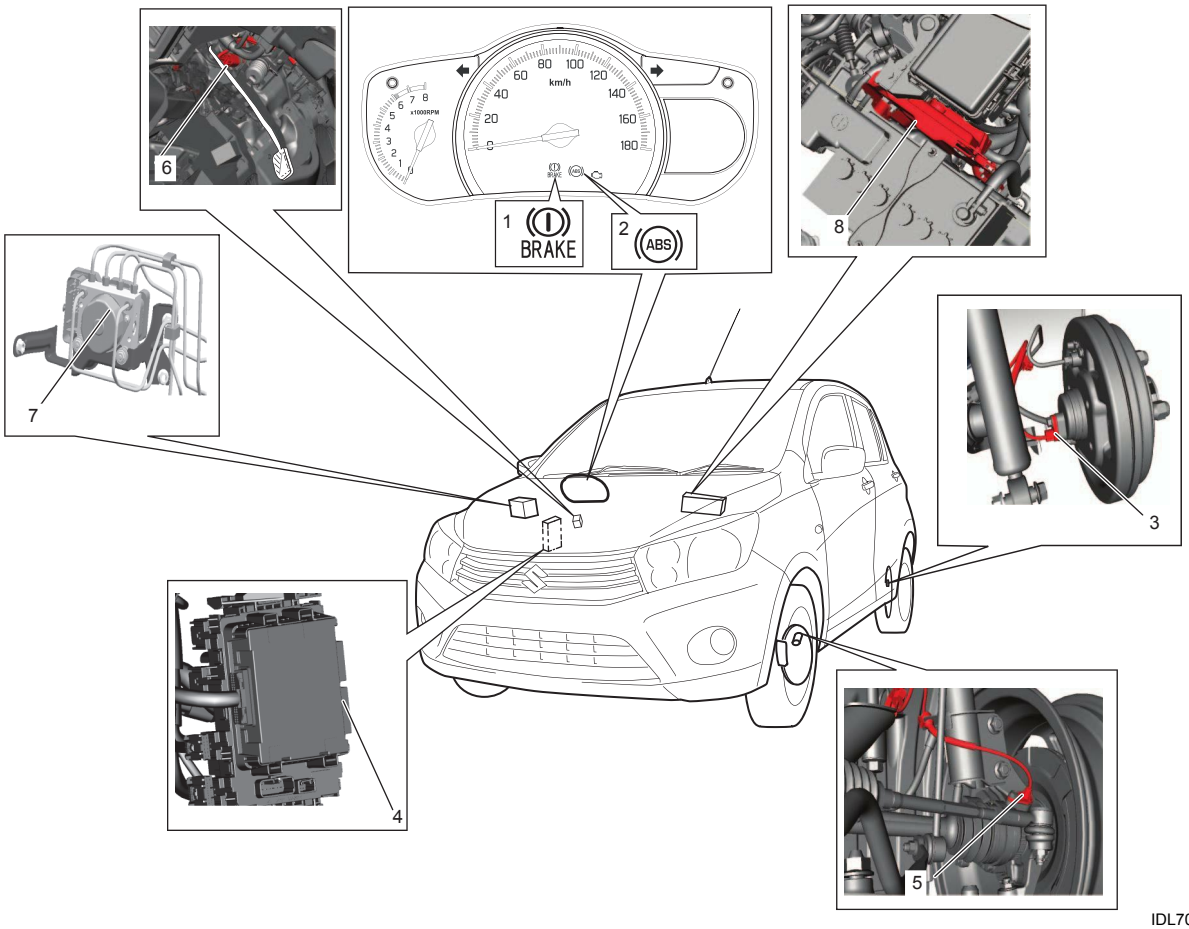
3. Ignition switch	16. Left-front wheel speed sensor	29. Wheel speed sensor driver
4. J/B	17. Right-front wheel speed sensor	30. P/S control module
5. CAN driver	18. Left-rear wheel speed sensor	31. “ABS MOT” fuse
6. Combination meter	19. Right-rear wheel speed sensor	32. “ABS SOL” fuse
7. ABS warning light	20. DLC	33. “IGN” fuse
8. EBD warning light (Brake warning light)	21. ABS hydraulic unit / control module assembly	34. “ABS” fuse
9. CPU (combination meter)	22. CPU	35. “MTR” fuse
10. BCM	23. Internal memory	36. “STOP” fuse
11. Brake light switch	24. Pump motor relay	37. Engine ground
12. Brake light	25. Pump motor	38. Ground

Terminal		Wire color	Circuit
E08	1	WHT	Solenoid valve power supply circuit
	2	RED	CAN communication line (high) for ECM
	3	RED/GRN	CAN communication line (high) for BCM
	4	BLU	Ignition power supply circuit
	5	BRN	Right-rear wheel speed sensor signal circuit
	7	PNK/BLU	Left-rear wheel speed sensor power supply circuit
	14	BLK	ABS control module ground circuit 1
	15	WHT	CAN communication line (low) for ECM
	16	WHT/GRN	CAN communication line (low) for BCM
	17	GRN/WHT	Right-front wheel speed sensor power supply circuit
	18	GRY	Right-rear wheel speed sensor power supply circuit
	19	LTGRN/BLK	Left-rear wheel speed sensor signal circuit
	20	RED	Left-front wheel speed sensor power supply circuit
	26	RED	Pump motor power supply circuit
	29	GRY/BLU	Right-front wheel speed sensor signal circuit
	33	BRN/WHT	Left-front wheel speed sensor signal circuit
	38	BLK	ABS control module ground circuit 2

Component Location

ABS Component Location

AENDL70A4503001



IDL70A450003-04

1. EBD warning light (Brake warning light)	4. BCM	7. ABS hydraulic unit / control module assembly
2. ABS warning light	5. Front wheel speed sensor	8. ECM
3. Rear wheel speed sensor	6. Brake light switch	

Diagnostic Information and Procedures

ABS Check

AENDL70A4504001

Refer to the description after the following general flow for details of each step.

Step	Action	Yes	No
1	**Malfunction analysis** 1) Perform “Customer complaint analysis” (Page 4E-8). 2) Perform “Problem symptom confirmation” (Page 4E-9). 3) Perform “DTC check, record and clearance” (Page 4E-9) and recheck DTC. *Is same DTC detected again after performing DTC clearance?*	Inspect and repair referring to applicable DTC troubleshooting, and then go to Step 6.	Go to Step 2.
2	**Visual inspection ☞(Page 4E-9)** 1) Perform “Visual Inspection” (Page 4E-10). *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 6.	Go to Step 3.

Step	Action	Yes	No
3	**Driving test** 1) Perform “Step 3: Driving Test” (Page 4E-10). *Is malfunction detected?*	Repair or replace malfunction part, and then go to Step 6.	Go to Step 4.
4	**Brakes diagnosis ☞(Page 4E-10)** 1) Inspect and repair brake system referring to “Brakes Symptom Diagnosis” in Section 4A (Page 4A-2). *Is malfunction detected?*	Repair or replace malfunction part, and then go to Step 6.	Go to Step 5.
5	**Intermittent problem check ☞(Page 4E-10)** 1) Check for intermittent troubles referring to “Intermittent Connection and Poor Contact Inspection” in Section 00 (Page 00-11). *Is malfunction detected?*	Repair or replace malfunction part, then go to Step 6.	Go to Step 6.
6	**Final confirmation test** 1) Perform “Step 6: Final Confirmation Test” (Page 4E-10). *Does trouble recur?*	Go to Step 4.	End.

Step 1: Malfunction Analysis

Customer complaint analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the following table will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date of Reg:	Date of problem:	Mileage:

Problem Symptoms	• ABS warning light abnormal: fails to turn on / fails to turn off • EBD warning light abnormal: fails to turn on / fails to turn off • Abnormal noise while vehicle is running: from motor, from valve, other_____ • Wheel is locked at braking: • Wheel skids at turning: • Pump motor does not stop (running): • Braking does not work: • Other:
Frequency of occurrence	• Continuous/Intermittent (times a day, a month)/ other_____
Conditions for Occurrence of Problem	• Vehicle at stop & ignition "ON": • When starting: at initial start only/at every start/other _____ • Vehicle speed: while accelerating/while decelerating/while stopping/ while turning/while running at constant speed/ other_____ • Road surface condition: paved road/rough road/snow-covered road/ other_____ • Chain equipment:
Environmental Condition	• Weather: fair/cloudy/rainy/snowy/other _____ • Temperature: °C (°F)
Diagnostic Trouble Code	• First check: No DTC/DTC ( ) • Second check after test drive: No DTC/DTC ( )

IAP70B450007-01

Problem symptom confirmation

If symptom in "Customer Questionnaire" is found or reproduced in the vehicle, confirm the symptom is problem or not. (This step should be done with the customer if possible.) Check warning light related to brake system referring to "EBD Warning Light (Brake Warning Light) Check" and "ABS Warning Light Check" under "Warning Light Check" (Page 4E-11).

DTC check, record and clearance

Perform "DTC Check" (Page 4E-11) procedure, record it and then clear it under "DTC Clearance" (Page 4E-12). Recheck DTC. ☞(Page 4E-11)

When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "DTC Check" (Page 4E-11) to proceed the diagnosis.

When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ABS control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to "Step 3: Driving Test" (Page 4E-10) to proceed to the diagnosis.

Step 2: Visual Inspection

As a preliminary step, be sure to perform visual check of the items that support proper function of the ABS. ☞(Page 4E-10)

Step 3: Driving Test
Test the vehicle at 40 km/h (25 mph) for at least two minutes including a turn to the right, a turn to the left and a vehicle stop using foot brake at least once to check if any trouble symptom (such as ABS warning light) exists.

Step 4: Brakes Diagnosis
Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis” in Section 4A (Page 4A-2) and based on symptoms appearing on the vehicle (symptoms observed through Steps 1 to 3). Repair faulty parts or replace them, if necessary.

Step 5: Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent Connection and Poor Contact Inspection” in Section 00 (Page 00-11) and related circuit of trouble code recorded in Step 1 to 5.

Step 6: Final Confirmation Test
Confirm that the problem symptom is not observed any more and ABS is free from any abnormal conditions. If what has been repaired is related to a malfunction DTC, clear the DTC once referring to “DTC Clearance” (Page 4E-12) and perform test driving and confirm that no DTC is indicated.

Visual Inspection

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Check the following parts and systems visually.

Inspection Item		Referring section
Battery	Level, leakage	“Battery Description” in Section 1J (Page 1J-1)
Connectors of electric wire harness	Disconnection, friction	“Intermittent Connection and Poor Contact Inspection” in Section 00 (Page 00-11)
Fuses	Burning	
Brake fluid	Level, leakage	“Brake Fluid Level Inspection” in Section 4A (Page 4A-5)
ABS warning light	Operation	“Warning Light Check” (Page 4E-11)
EBD warning light	Operation	
Other parts that can be checked visually		

ABS Symptom Diagnosis

AENDL70A4504003

Condition	Possible cause	Correction / Reference Item
ABS warning light remains ON for more than 2 seconds after setting ignition “ON”	Malfunctioning ABS function	*Perform ABS check. ☞(Page 4E-7)*
	Malfunctioning ABS warning light circuit	*Check ABS warning light circuit. ☞(Page 4E-18)*
ABS warning light does not turn ON after setting ignition “ON”	Malfunctioning ABS function	*Perform ABS check. ☞(Page 4E-7)*
	Malfunctioning CAN communication system function	*Check CAN communication system. ☞(Page 10H-8)*
	Malfunctioning ABS warning light circuit	*Check ABS warning light circuit. ☞(Page 4E-18)*
ABS warning light blinks	Improper air bleed from ABS hydraulic unit / control module assembly	*Perform ABS hydraulic unit operation check. ☞(Page 4E-30)*

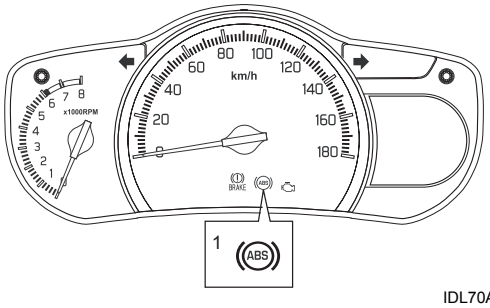
Condition	Possible cause	Correction / Reference Item
EBD warning light (Brake warning light) remains lit for more than 2 seconds after setting ignition "ON"	Parking brake applied	*Release parking brake and check that EBD warning light (brake warning light) turns OFF.*
	Insufficient amount of brake fluid	*Check brake fluid level. ☞(Page 4A-5)*
	Faulty parking brake switch circuit and/ or brake fluid level switch circuit	*Check BCM and its circuit. ☞(Page 10B-20)*
	Faulty parking brake switch and/or brake fluid level switch	*Check parking brake switch and/or brake fluid level switch.* *Parking brake switch: ☞(Page 4D-3)* *Brake fluid level switch: ☞(Page 4A-5)*
	Malfunctioning EBD system	*Perform ABS check. ☞(Page 4E-7)*
	Faulty ABS control module power supply and ground circuit	*Check ABS control module power supply and ground circuit. ☞(Page 4E-29)*
	Malfunctioning CAN communication system	*Check CAN communication system. ☞(Page 10H-8)*
	Faulty BCM	*Check BCM and its circuit. ☞(Page 10B-20)*
	Faulty ABS control module	*Replace ABS control module. ☞(Page 4E-33)*
	Malfunctioning EBD warning light circuit	*Check EBD warning light circuit. ☞(Page 4E-20)*
EBD warning light (Brake warning light) does not turn ON after setting ignition "ON"	Malfunctioning EBD function	*Perform ABS check. ☞(Page 4E-7)*
	Malfunctioning CAN communication system	*Check CAN communication system. ☞(Page 10H-8)*
	Malfunctioning EBD warning light circuit	*Check EBD warning light circuit. ☞(Page 4E-19)*

Warning Light Check

AENDL70A4504004

ABS Warning Light

1) Set ignition "ON".
2) Check that ABS warning light (1) comes ON for about 2 seconds and then goes OFF. If ABS warning light never lights up, go to "ABS Warning Light Does Not Come ON after Setting Ignition "ON"" (Page 4E-16). If ABS warning light remains ON and no DTC is stored in ABS control module, go to "ABS Warning Light Comes ON Steady" (Page 4E-18).



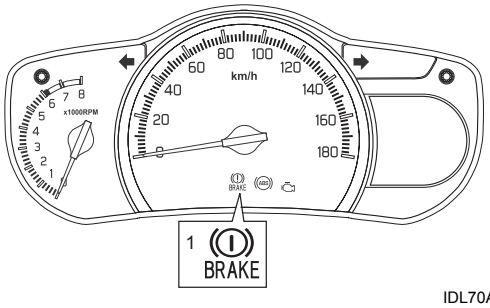
IDL70A450006-03

EBD Warning Light (Brake Warning Light)

NOTE

Perform this check on a level place.

1) Check brake fluid level. ☞(Page 4A-5)
2) Pull parking brake lever.
3) Set ignition "ON".
4) Check that EBD warning light (brake warning light) (1) comes ON. If EBD warning light (brake warning light) never lights up, go to "EBD Warning Light (Brake Warning Light) Does Not Come ON after Setting Ignition "ON"" (Page 4E-19).



IDL70A450007-02

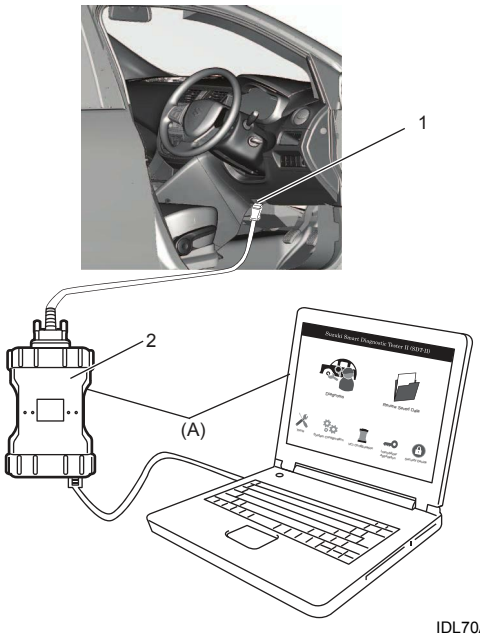
5) Release parking brake lever and check that EBD warning light goes OFF. If EBD warning light (brake warning light) remains ON and no DTC is stored in ABS control module, go to "EBD Warning Light (Brake Warning Light) Comes ON Steady" (Page 4E-20).

DTC Check

AENDL70A4504005

1) Check that ignition is "OFF".
2) Connect SUZUKI scan tool (PC and VCI (2)) to DLC (1).

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

3) Set ignition “ON”.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator’s manual for further details.If communication between scan tool and ABS control module assembly is not possible, check power supply and ground circuits of ABS control module. ☞(Page 4E-29) If check result is OK than go to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).
5) Confirm that ignition is “OFF” and disconnect SUZUKI scan tool from DLC after completing check.

DTC Clearance

AENDL70A4504006

⚠ WARNING

When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.

1) Check that ignition is “OFF”.
2) Connect SUZUKI scan tool to DLC.
3) Set ignition “ON”.
4) Clear DTC according to instructions displayed on scan tool. Refer to scan tool operator’s manual for further details.
5) Perform “Step 3: Driving Test” under “ABS Check” (Page 4E-7) and “DTC Check” (Page 4E-11) and confirm that NO DTC is displayed on scan tool.
6) Disconnect SUZUKI scan tool from DLC after completing the DTC clearance.

DTC Table

AENDL70A4504007

⚠ CAUTION

Be sure to perform “ABS Check” (Page 4E-7) before starting diagnosis.

NOTE

***: Whether ABS warning light or EBD warning light (brake warning light) lights up or not depends on DTC detecting condition.**

DTC	DTC name	DTC detecting condition	ABS warning light	EBD warning light
C1021 ☞(Page 4E-22)	Right-Front Wheel Speed Sensor Circuit Voltage	Wheel speed sensor signal is out of specified range.	Lights up	OFF
C1022 ☞(Page 4E-22)	Right-Front Wheel Speed Sensor or Encoder Signal Performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	OFF
C1025 ☞(Page 4E-22)	Left-Front Wheel Speed Sensor Circuit Voltage	Wheel speed sensor signal is out of specified range.	Lights up	OFF
C1026 ☞(Page 4E-22)	Left-Front Wheel Speed Sensor or Encoder Signal Performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	OFF
C1031 ☞(Page 4E-22)	Right-Rear Wheel Speed Sensor Circuit Voltage	Wheel speed sensor signal is out of specified range.	Lights up	OFF
C1032 ☞(Page 4E-22)	Right-Rear Wheel Speed Sensor or Encoder Signal Performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	OFF

DTC	DTC name	DTC detecting condition	ABS warning light	EBD warning light
C1033 ☞(Page 4E-22)	Wheel Speed Sensor Deviation	Abnormal wheel speed sensor signal is detected continuously at two or more wheel speed sensors.	*	*
		ABS control is activated for more than specified time.		
		Wheel speed sensor driver power supply voltage is out of specified range.		
C1035 ☞(Page 4E-22)	Left-Rear Wheel Speed Sensor Circuit Voltage	Wheel speed sensor signal is out of specified range.	Lights up	OFF
C1036 ☞(Page 4E-22)	Left-Rear Wheel Speed Sensor or Encoder Signal Performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	OFF
C1041 ☞(Page 4E-24)	Right-Front Inlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1042 ☞(Page 4E-24)	Right-Front Outlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1045 ☞(Page 4E-24)	Left-Front Inlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1046 ☞(Page 4E-24)	Left-Front Outlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1051 ☞(Page 4E-24)	Right-Rear Inlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1052 ☞(Page 4E-24)	Right-Rear Outlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1055 ☞(Page 4E-24)	Left-Rear Inlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1056 ☞(Page 4E-24)	Left-Rear Outlet Solenoid Valve Circuit Correlation	Solenoid output and solenoid monitor data disagree.	Lights up	Lights up
C1057 ☞(Page 4E-25)	Power Supply Voltage	ABS control module power supply voltage is higher than specified value.	*	*
		ABS control module power supply voltage is lower than specified value.		
C1061 ☞(Page 4E-26)	Pump Motor Circuit Performance	Pump motor power supply voltage is out of specified range.	Lights up	Lights up
		Pump motor is activated although pump motor control relay is OFF.		
		Pump motor is not activated although pump motor control relay is ON.		
C1062 ☞(Page 4E-27)	Solenoid Valve Continuous Operation Failure	Solenoid valve is activated for more than specified time using “Hydraulic control test” under “Utility” mode of SUZUKI scan tool.	Lights up	Lights up
C1063 ☞(Page 4E-24)	Solenoid Valve Power Supply Driver Circuit Performance	Solenoid valve power supply relay output is “ON”, although monitored output is “OFF”.	Lights up	Lights up
		Solenoid valve power supply relay output is “OFF”, although monitored output is “ON”.		
C1071 ☞(Page 4E-28)	ABS Control Module Internal Failure	ABS control module internal failure is detected.	Lights up	Lights up
C1090 ☞(Page 4E-28)	ECM Detect Rolling Counter Failure from ABS Control Module	ABS control module sends invalid CAN data to ECM.	OFF	OFF
C1091 ☞(Page 4E-28)	CAN Invalid Data from ECM	DTC concerned with ECM is detected.	OFF	OFF

DTC	DTC name	DTC detecting condition	ABS warning light	EBD warning light
C1094 ☞(Page 4E-28)	Torque Request Reject Status	ABS control module receives invalid CAN data from ECM (about engine torque control).	OFF	OFF
U0073 ☞(Page 4E-29)	Control Module Communication Bus Off	Impossible to receive and transmit CAN data.	OFF	OFF
U0100 ☞(Page 4E-29)	Lost Communication With ECM	ECM message data is missing from CAN communication.	OFF	OFF

Fail-Safe Table

AENDL70A4504025

When any of the following DTCs is detected, ABS control module changes the control to the fail-safe mode and ABS and EBD functions are deactivated until ABS control module judges the system is normal.

NOTE

- **O: Activated**
- **-: Deactivated**
- ***: Whether ABS is engaged in fail-safe mode or not depends on malfunction part. Fail-safe mode can be checked by lighting status of ABS warning light or EBD warning light (brake warning light).**
  - **– When ABS warning light lights up, ABS control is deactivated.**
  - **– When EBD warning light (brake warning light) lights up, EBD control is deactivated.**

DTC	Fail-safe operation		Fail-safe cancel condition
	ABS	EBD	
C1021 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1022 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal and “Driving Test” under “ABS Check” (Page 4E-7) is performed after switching ignition from “OFF” to “ON”.
C1025 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1026 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal and “Driving Test” under “ABS Check” (Page 4E-7) is performed after switching ignition from “OFF” to “ON”.
C1031 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1032 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal and “Driving Test” under “ABS Check” (Page 4E-7) is performed after switching ignition from “OFF” to “ON”.
C1033 ☞(Page 4E-22)	*	*	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1035 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1036 ☞(Page 4E-22)	-	o	When ABS control module judges the system to be normal and “Driving Test” under “ABS Check” (Page 4E-7) is performed after switching ignition from “OFF” to “ON”.
C1041 ☞(Page 4E-24)	-	-	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1042 ☞(Page 4E-24)	-	-	
C1045 ☞(Page 4E-24)	-	-	
C1046 ☞(Page 4E-24)	-	-	
C1051 ☞(Page 4E-24)	-	-	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1052 ☞(Page 4E-24)	-	-	

DTC	Fail-safe operation		Fail-safe cancel condition
	ABS	EBD	
C1055 ☞(Page 4E-24)	-	-	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1056 ☞(Page 4E-24)	-	-	
C1057 ☞(Page 4E-25)	*	*	When ABS control module judges the system to be normal when ABS control module detects system as normal after switching ignition from “OFF” to “ON”.
C1061 ☞(Page 4E-26)	-	-	When ABS control module judges the system to be normal and “Driving Test” under “ABS Check” (Page 4E-7) is performed after switching ignition from “OFF” to “ON”.
C1062 ☞(Page 4E-27)	-	-	When solenoid valve is sufficiently cooled down. (After continuous operation, inlet solenoid valve requires 300 seconds of suspension and outlet solenoid valve requires 50 seconds of suspension.)
C1063 ☞(Page 4E-24)	-	-	When ABS control module judges the system to be normal and “Driving Test” under “ABS Check” (Page 4E-7) is performed after switching ignition from “OFF” to “ON”.
C1071 ☞(Page 4E-28)	-	-	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1090 ☞(Page 4E-28)	o	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1091 ☞(Page 4E-28)	o	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
C1094 ☞(Page 4E-28)	o	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
U0073 ☞(Page 4E-29)	o	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.
U0100 ☞(Page 4E-29)	o	o	When ABS control module judges the system to be normal after switching ignition from “OFF” to “ON”.

Scan Tool Data

AENDL70A4504008

As the data values are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgement as abnormal should not be made by checking with these data alone.

Scan tool data	Vehicle condition	Condition / reference values
RF Wheel Speed	At stop (Stationary vehicle)	0 km/h (0mph)
LF Wheel Speed	At stop (Stationary vehicle)	0 km/h (0mph)
RR Wheel Speed	At stop (Stationary vehicle)	0 km/h (0mph)
LR Wheel Speed	At stop (Stationary vehicle)	0 km/h (0mph)
Battery Voltage	Ignition “ON” (Engine stopped)	10.0 - 14.0 V
Pump Motor Driver	Inactive (Pump motor not working)	0.0 V
	Active (Pump motor working)	13.0 - 15.0 V
Brake Switch	Depressed brake pedal	ON
	Released brake pedal	OFF

Scan Tool Data Definition

RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LF Wheel Speed (km/h, MPH): Wheel speed is ABS control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

Battery Voltage (V): Battery Voltage is an analog input signal read by ABS control module. ABS control module functions may be stopped if the battery voltage falls below or rises above programmed thresholds.

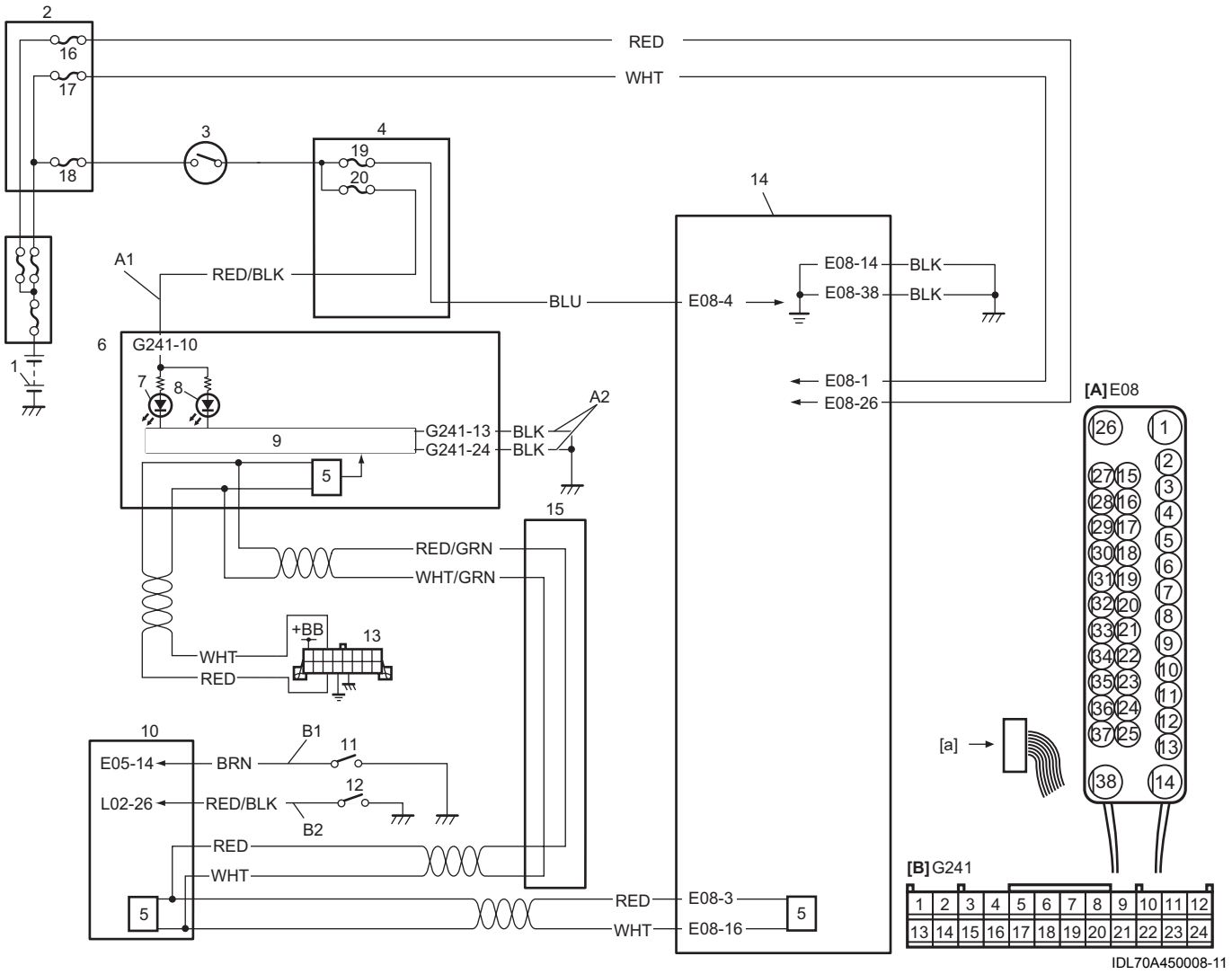
Pump Motor Driver (V): This parameter indicates operational condition of the pump motor driver (transistor).

Brake Switch (ON, OFF): This switch signals are provided to ABS control module whether the brake is active or not.

ABS Warning Light Does Not Come ON after Setting Ignition “ON”

AENDL70A4504009

Circuit Diagram



IDL70A450008-11

[A]: ABS control module connector (View: [a])	8. EBD warning light
[B]: Combination meter connector (View: [a])	9. CPU (combination meter)
A1: Combination meter power supply circuit	10. BCM
A2: Combination meter ground circuit	11. Brake fluid level switch
B1: Brake fluid level switch signal circuit	12. Parking brake switch
B2: Parking brake switch signal circuit	13. DLC
1. Battery	14. ABS control module
2. Individual circuit fuse box No. 1	15. P/S control module
3. Ignition switch	16. “ABS MOT” fuse
4. J/B	17. “ABS SOL” fuse
5. CAN driver	18. “IGN” fuse
6. Combination meter	19. “ABS” fuse
7. ABS warning light	20. “MTR” fuse

Circuit Description

Operation (ON/OFF) of ABS warning light is controlled by ABS control module through light driver module in combination meter.

If ABS is in good condition, ABS control module turns ON ABS warning light when ignition is set “ON”, keeps the light ON for 2 seconds and then turns it OFF. If any abnormality in the system is detected, ABS warning light is turned ON continuously by ABS control module. Also, the light is turned ON continuously by light driver module when the connector of ABS control module is disconnected.

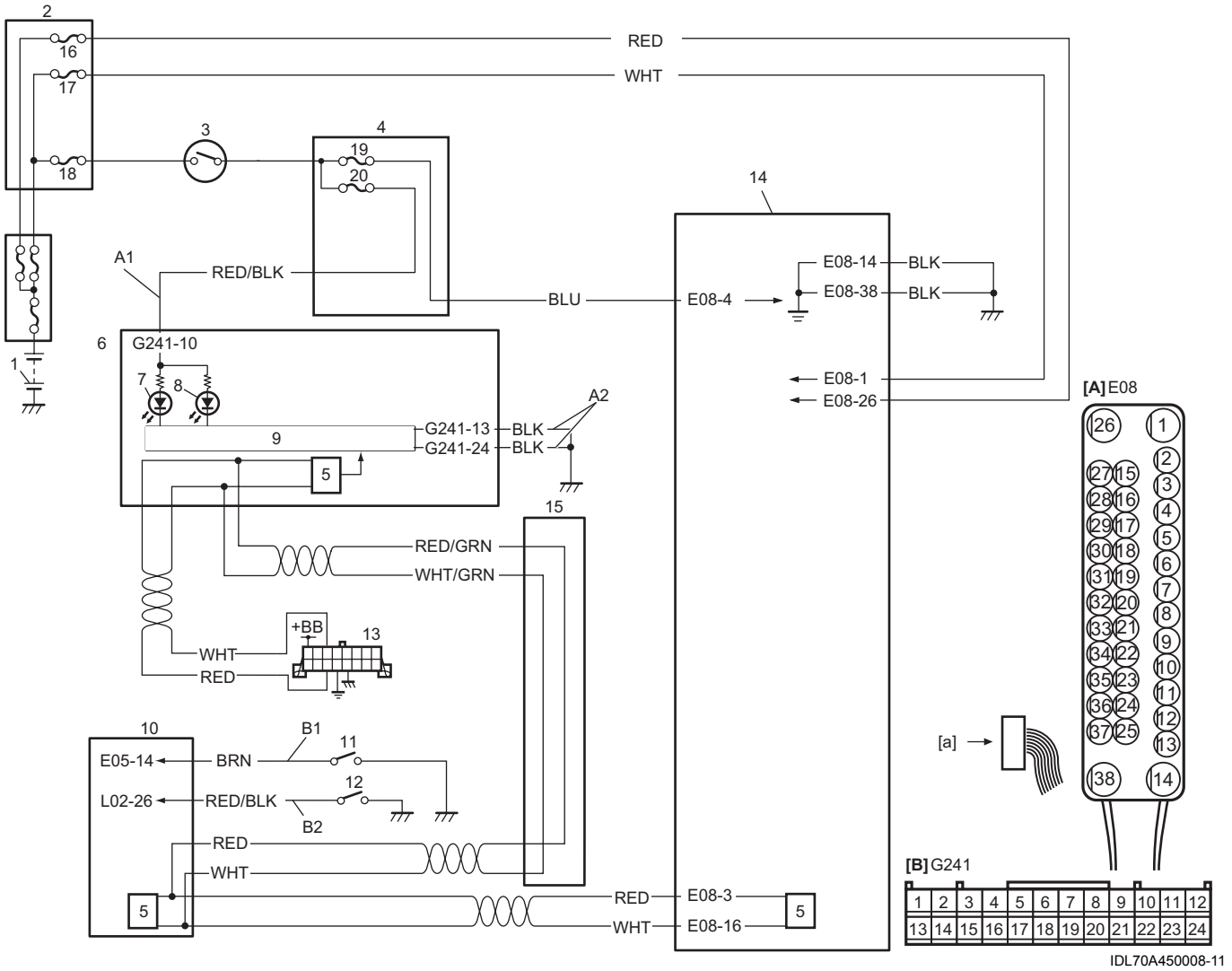
Troubleshooting

Step	Action	Yes	No
1	**Warning light check** 1) Set ignition “ON”. *Do other indicator lights light up?*	Go to Step 2.	Go to Step 4.
2	**DTC check** 1) Check DTC. ☞(Page 4E-11) *Is DTC U0073 detected?*	Go to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).	Go to Step 3.
3	**Combination meter check** 1) Replace combination meter. ☞(Page 9C-11) 2) Set ignition “ON”. *Does warning light stay OFF?*	Replace ABS hydraulic unit / control module assembly and recheck warning light operation. ☞(Page 4E-33)	End.
4	**Fuse check** *Is “MTR” fuse in good condition?*	Go to Step 5.	Replace “MTR” fuse and check for short circuit to ground.
5	**Combination meter power supply circuit check** 1) Remove combination meter. ☞(Page 9C-11) 2) Check for proper connection to “G241” connector. 3) If check result is OK, set ignition “ON”. 4) Measure voltage between “G241-13” and “G241-24” terminals and “G241-10”. *Is it battery voltage?*	Replace combination meter and recheck warning light operation. ☞(Page 9C-11)	Go to Step 6.
6	**Combination meter ground circuit check** 1) Set ignition “OFF”. 2) Measure resistance between following terminals: • “G241-13” and ground: 1 Ω or less • “G241-24” and ground: 1 Ω or less *Is check result OK?*	Repair “A1” circuit.	Repair “A2” circuit.

ABS Warning Light Comes ON Steady

AENDL70A4504010

Circuit Diagram



IDL70A450008-11

[A]: ABS control module connector (View: [a])	8. EBD warning light
[B]: Combination meter connector (View: [a])	9. CPU (combination meter)
A1: Combination meter power supply circuit	10. BCM
A2: Combination meter ground circuit	11. Brake fluid level switch
B1: Brake fluid level switch signal circuit	12. Parking brake switch
B2: Parking brake switch signal circuit	13. DLC
1. Battery	14. ABS control module
2. Individual circuit fuse box No. 1	15. P/S control module
3. Ignition switch	16. “ABS MOT” fuse
4. J/B	17. “ABS SOL” fuse
5. CAN driver	18. “IGN” fuse
6. Combination meter	19. “ABS” fuse
7. ABS warning light	20. “MTR” fuse

Circuit Description

Refer to “Circuit Description” under “ABS Warning Light Does Not Come ON after Setting Ignition “ON”” (Page 4E-16).

Troubleshooting

Step	Action	Yes	No
1	**ABS control module connector check** 1) Check for proper connection to ABS control module connector. *Is connection in good condition?*	Go to Step 2.	Connect connector securely.
2	**DTC check for ABS** 1) Perform “DTC check”. ☞(Page 4E-11) *Is there any DTC(s)?*	Go to applicable DTC troubleshooting.	Go to Step 3.
3	**ABS control module power supply and ground circuit check** 1) Check ABS control module power supply circuit and ground circuit. ☞(Page 4E-29) *Are the circuits in good condition?*	Go to Step 4.	Repair or replace defective wire harness.
4	**Combination meter check** 1) Replace combination meter. ☞(Page 9C-11) 2) Set ignition “ON”. *Does warning light stay on?*	Replace ABS hydraulic unit / control module assembly and recheck warning light operation.	End.

EBD Warning Light (Brake Warning Light) Does Not Come ON after Setting Ignition “ON”

AENDL70A4504011

Circuit Diagram

Refer to “Circuit Diagram” under “ABS Warning Light Does Not Come ON after Setting Ignition “ON”” (Page 4E-16).

Circuit Description

Refer to “Circuit Description” under “EBD Warning Light (Brake Warning Light) Comes ON Steady” (Page 4E-20).

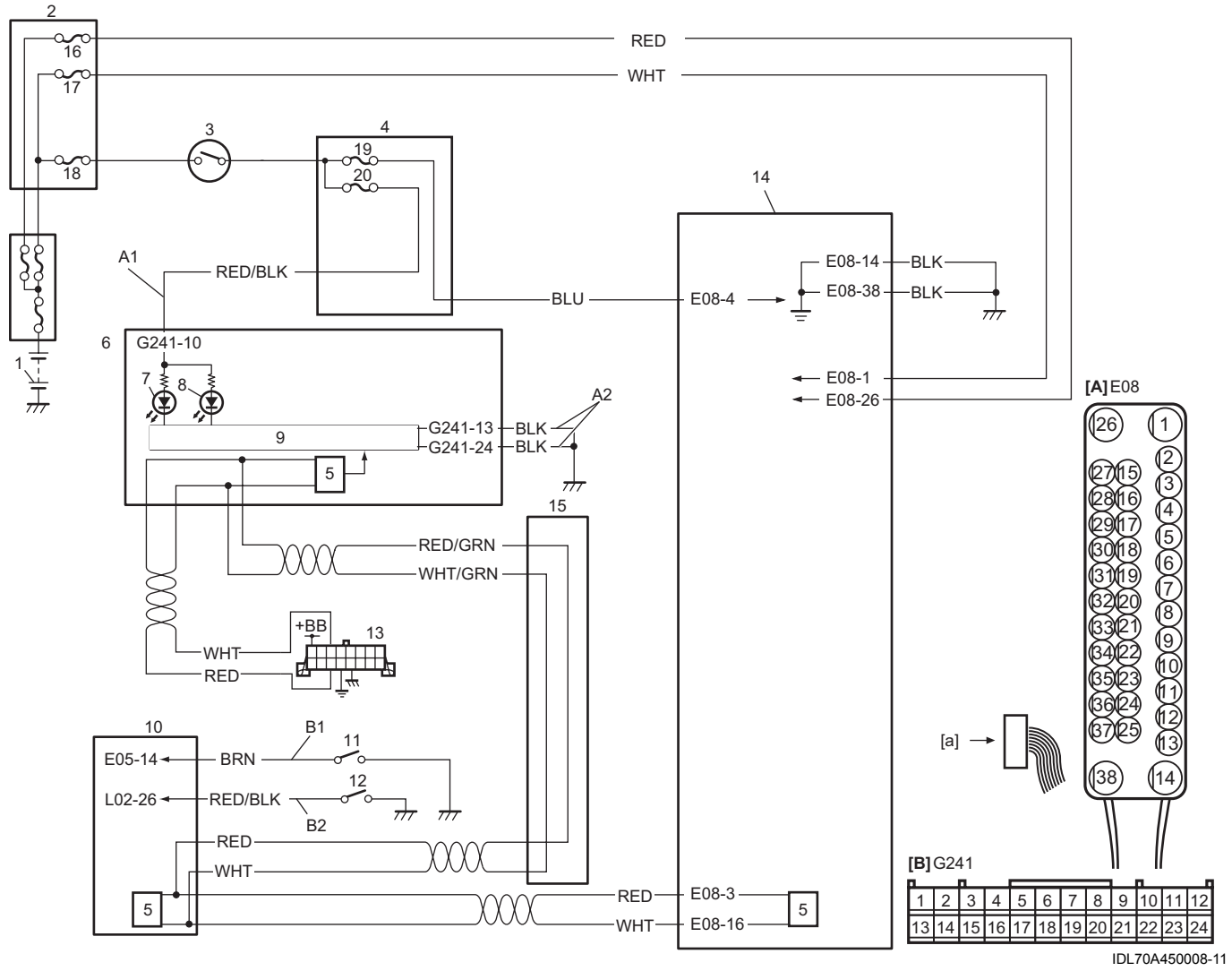
Troubleshooting

Refer to “Troubleshooting” under “ABS Warning Light Does Not Come ON after Setting Ignition “ON”” (Page 4E-16).

EBD Warning Light (Brake Warning Light) Comes ON Steady

AENDL70A4504012

Circuit Diagram



IDL70A450008-11

[A]: ABS control module connector (View: [a])	8. EBD warning light
[B]: Combination meter connector (View: [a])	9. CPU (combination meter)
A1: Combination meter power supply circuit	10. BCM
A2: Combination meter ground circuit	11. Brake fluid level switch
B1: Brake fluid level switch signal circuit	12. Parking brake switch
B2: Parking brake switch signal circuit	13. DLC
1. Battery	14. ABS control module
2. Individual circuit fuse box No. 1	15. P/S control module
3. Ignition switch	16. “ABS MOT” fuse
4. J/B	17. “ABS SOL” fuse
5. CAN driver	18. “IGN” fuse
6. Combination meter	19. “ABS” fuse
7. ABS warning light	20. “MTR” fuse

Circuit Description

EBD warning light (brake warning light) is controlled by ABS control module and BCM through light driver module in combination meter.

If EBD system is in good condition, ABS control module turns ON EBD warning light (brake warning light) when ignition is set “ON”, keeps it ON for 2 seconds and then turns it OFF.

EBD warning light (brake warning light) is turned ON continuously in the following conditions.

- EBD system has an abnormality
- Parking brake lever is pulled up

• Brake fluid level is lower than minimum level

The information of parking brake switch and brake fluid level are transmitted from BCM to light driver module in combination meter through CAN communication line.
Also, the warning light is turned ON continuously by light driver module when the connector of ABS control module is disconnected.

Troubleshooting

Step	Action	Yes	No
1	**ABS control module connector check** 1) Check for proper connection to ABS control module connector. *Is connection in good condition?*	Go to Step 2.	Connect connector securely.
2	**Parking brake and brake fluid level check** 1) Check the following points. • Parking brake is completely released. • Brake fluid level is above minimum level. ☞(Page 4A-5) *Are check results OK?*	Go to Step 3.	Release parking brake and check brake fluid level.
3	**ABS warning light operation check** 1) Set ignition “ON”. *Does ABS warning light come ON steady?*	Perform “ABS Warning Light Comes ON Steady” (Page 4E-18).	Go to Step 4.
4	**Parking brake switch signal circuit and brake fluid level switch signal circuit check** 1) Check that ignition is “OFF”. 2) Disconnect “E05” and “L02” connectors. 3) Check the following points. • Resistance between “B1” circuit and ground: infinity • Resistance between “B2” circuit and ground: infinity *Is check result OK?*	Go to Step 5.	• Check each applicable circuit for short to ground. If OK, check parking brake switch and/or brake fluid level switch. – Parking brake switch: ☞(Page 4D-3) – Brake fluid level switch: ☞(Page 4A-5)
5	**CAN communication circuit check** 1) Connect “E05” connector. 2) Perform “DTC Check” (Page 4E-11). *Is DTC U0073 detected?*	Go to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).	Go to Step 6.
6	**DTC check for BCM** 1) Check DTC for BCM. ☞(Page 10B-9) *Is DTC U0073 detected?*	Go to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).	Go to Step 7.
7	**Combination meter check** 1) Replace combination meter. ☞(Page 9C-11) 2) Set ignition “ON”. *Does EBD warning light stay on?*	Replace ABS hydraulic unit / control module assembly and recheck warning light operation. ☞(Page 4E-32)	End.

DTC C1021 / C1022 / C1025 / C1026 / C1031 / C1032 / C1033 / C1035 / C1036

AENDL70A4504013

DTC Detecting Condition and Trouble Area

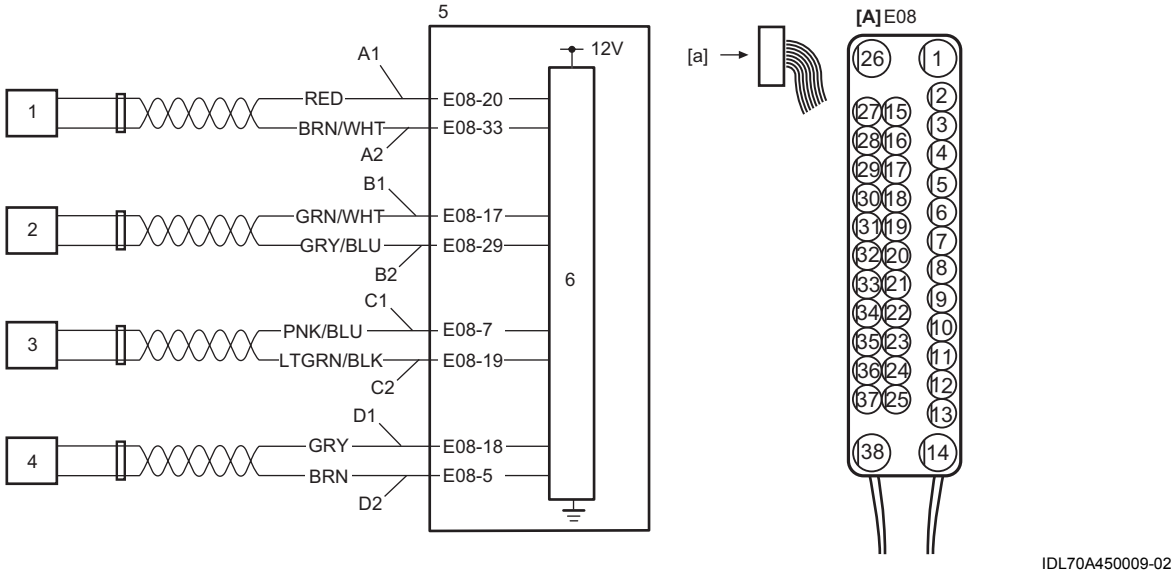
DTC Detecting Condition	Trouble Area
C1021/ C1025/ C1031/ C1035: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit Voltage Wheel speed sensor signal is out of specified range.	• Wheel speed sensor • Wheel speed sensor circuit • Wheel speed sensor encoder • ABS control module
C1022/ C1026/ C1032/ C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor or Encoder Signal Performance Abnormal wheel speed sensor signal is detected continuously.	
C1033: Wheel Speed Sensor Deviation • Abnormal wheel speed sensor signal is detected continuously at two or more wheel speed sensors. • ABS control is activated for more than specified time. • Wheel speed sensor driver power supply voltage is out of specified range.	

NOTE

When vehicle was placed in any of the following conditions, one of these DTCs may be set although sensor is in good condition. If such possibility is suspected, clear DTC once ☞(Page 4E-12) and check whether any abnormality exists or not by performing road test as described in Step 3 of "ABS Check" (Page 4E-7).

- **Vehicle was driven with parking brake lever pulled.**
- **Wheel spin occurred while driving.**
- **Wheel(s) was rotated while vehicle was jacked up.**

Circuit Diagram



IDL70A450009-02

[A]: ABS control module connector (View: [a])	C1: Left-rear wheel speed sensor power supply circuit	2. Right-front wheel speed sensor
A1: Left-front wheel speed sensor power supply circuit	C2: Left-rear wheel speed sensor signal circuit	3. Left-rear wheel speed sensor
A2: Left-front wheel speed sensor signal circuit	D1: Right-rear wheel speed sensor power supply circuit	4. Right-rear wheel speed sensor
B1: Right-front wheel speed sensor power supply circuit	D2: Right-rear wheel speed sensor signal circuit	5. ABS control module
B2: Right-front wheel speed sensor signal circuit	1. Left-front wheel speed sensor	6. Wheel speed sensor driver

DTC Confirmation Procedure

NOTE

Check that the following condition is met in this "DTC Confirmation Procedure".

- **DTC C1057 is not detected.**

1) Set ignition "ON".
2) Drive vehicle at 20 km/h or higher for more than 1 min.
3) Stop vehicle and turn ignition OFF.
4) Repeat Step 1) through Step 3) for 7 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check" (Page 4E-7).
2	**Tire pressure check** 1) Check that tire pressure is at specified value. *Is check result OK?*	Go to Step 3.	Adjust tire pressure or replace tire and recheck DTC.
3	**Wheel speed sensor power supply circuit and signal circuit check** 1) Set ignition "OFF". 2) Disconnect "E08" and each of wheel speed sensor connectors. 3) Check for proper connection to "E08" and each of wheel speed sensor connectors. 4) If connections are OK, check the following points. • Resistance of "A1", "A2", "B1", "B2", "C1", "C2", "D1" and "D2" circuits: less than 1 Ω • Resistance between each of "A1", "A2", "B1", "B2", "C1", "C2", "D1" and "D2" circuits and ground: infinity • Resistance between "A1" circuit terminal and other terminal at left-front wheel speed sensor connector: infinity • Resistance between "B1" circuit terminal and other terminal at right-front wheel speed sensor connector: infinity • Resistance between "C1" circuit terminal and other terminal at left-rear wheel speed sensor connector: infinity • Resistance between "D1" circuit terminal and other terminal at right-rear wheel speed sensor connector: infinity • Voltage of "A1", "A2", "B1", "B2", "C1", "C2", "D1" and "D2" circuits: approx. 0 V (When ignition is "ON") *Is check result OK?*	Go to Step 4.	Repair or replace defective wire harness.
4	**Wheel speed sensor signal check** 1) Check applicable wheel speed sensor for output voltage and waveform. ☞(Page 4E-34) *Is check result as specified?*	Replace ABS hydraulic unit / control module assembly and recheck DTC. ☞(Page 4E-33)	Go to Step 5.

Step	Action	Yes	No
5	**Wheel speed sensor check** 1) Check applicable wheel speed sensor. ☞(Page 4E-36) *Is check result OK?*	Go to Step 6.	Clean, repair or replace front wheel speed sensor. • Front wheel speed sensor: ☞(Page 4E-35) • Rear wheel speed sensor: ☞(Page 4E-35)
6	**Wheel speed sensor encoder check** 1) Check applicable wheel speed sensor encoder. ☞(Page 4E-36) *Is check result OK?*	Replace ABS hydraulic unit / control module assembly and recheck DTC.	Clean, repair or replace front wheel speed sensor encoder. • Front wheel speed sensor encoder: ☞(Page 4E-36) • Rear wheel speed sensor encoder: ☞(Page 4E-36)

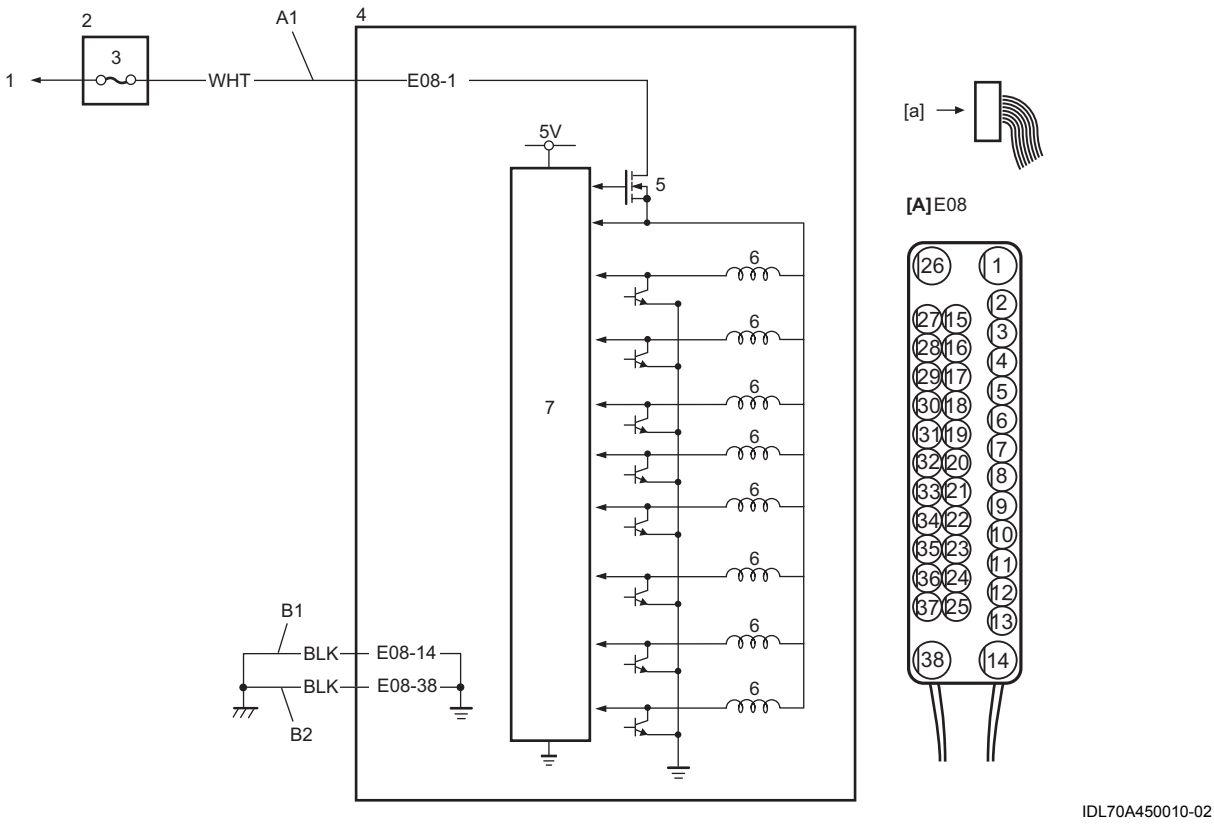
DTC C1041 / C1042 / C1045 / C1046 / C1051 / C1052 / C1055 / C1056 / C1063

AENDL70A4504014

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1041 / C1045 / C1051 / C1055: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Valve Circuit Correlation **C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Valve Circuit Correlation** Solenoid output and solenoid monitor data disagree.	• ABS control module power supply circuit • ABS control module ground circuit • ABS control module
C1063: Solenoid Valve Power Supply Driver Circuit Performance • Solenoid valve power supply relay output is “ON”, although monitored output is “OFF”. • Solenoid valve power supply relay output is “OFF”, although monitored output is “ON”.	

Circuit Diagram



IDL70A450010-02

[A]: ABS control module connector (View: [a])	1. Lead to battery	5. Solenoid valve power supply relay
A1: Solenoid valve power supply circuit	2. Individual circuit fuse box No. 1	6. Solenoid valve
B1: ABS control module ground circuit 1	3. "ABS SOL" fuse	7. CPU
B2: ABS control module ground circuit 2	4. ABS control module	

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check" (Page 4E-7).
2	**Solenoid valve power supply circuit and ABS control module ground circuit check** 1) Check solenoid valve power supply and ground circuits under "ABS Control Module Power Supply and Ground Circuit Check" (Page 4E-29). *Are check results OK?*	Replace ABS hydraulic unit / control module assembly and recheck DTC. ☞(Page 4E-33)	Repair or replace defective wire harness.

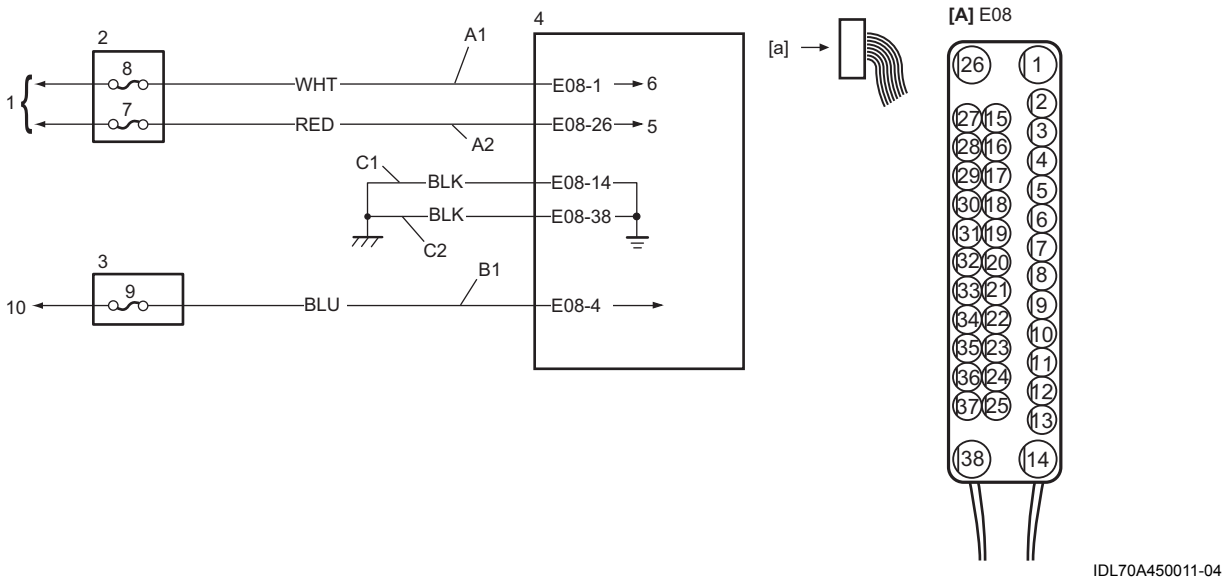
DTC C1057

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DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1057: Power Supply Voltage • ABS control module power supply voltage is higher than specified value. • ABS control module power supply voltage is lower than specified value.	• ABS control module power supply circuit • ABS control module ground circuit • Charging system • ABS control module

Circuit Diagram



IDL70A450011-04

[A]: ABS control module connector (View: [a])	1. Lead to battery	7. "ABS MOT" fuse
A1: Solenoid valve power supply circuit	2. Individual circuit fuse box No.1	8. "ABS SOL" fuse
A2: Pump motor power supply circuit	3. J/B	9. "ABS" fuse
B1: Ignition power supply circuit	4. ABS control module	10. Ignition power supply
C1: ABS control module ground circuit 1	5. Lead to pump motor relay	
C2: ABS control module ground circuit 2	6. Lead to solenoid valve power supply relay	

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check" (Page 4E-7).
2	**ABS control module assembly power supply circuit and ground circuit check** 1) Check ABS control module power supply circuit and ground circuit. ☞(Page 4E-29) *Are they in good condition?*	Go to Step 3.	Repair or replace defective wire harness.
3	**ABS control module power supply voltage check** 1) Measure voltage with engine running at 3,000 rpm. *Is voltage between 9.3 V and 16.8 V?*	Replace ABS hydraulic unit / control module assembly and recheck DTC. ☞(Page 4E-33)	Check charging system. ☞(Page 1J-4)

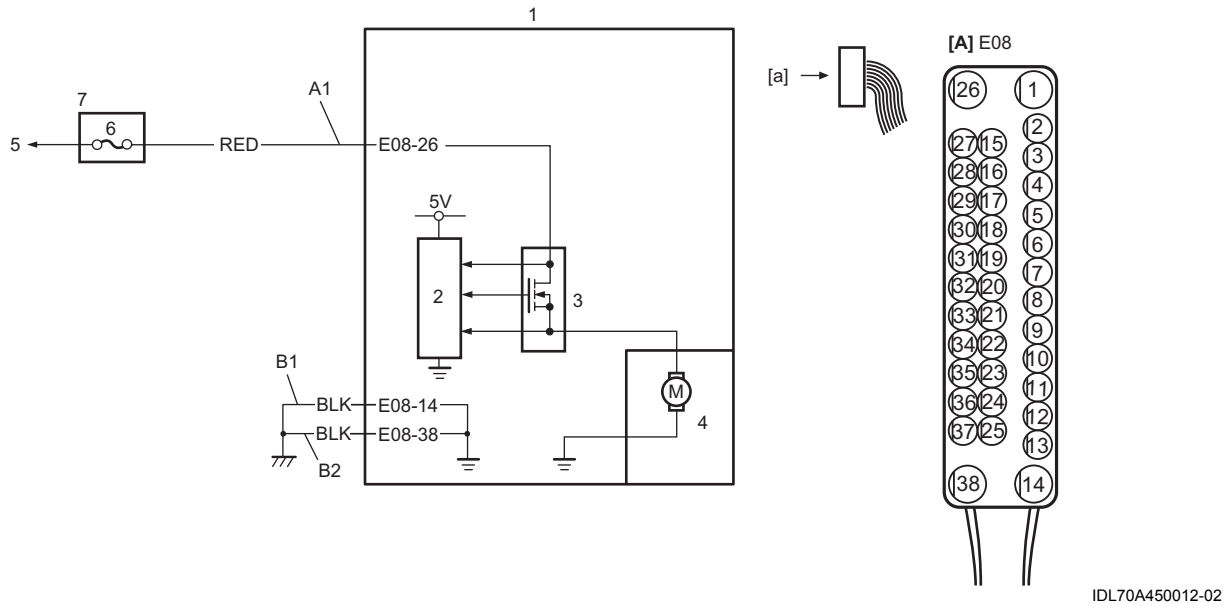
DTC C1061

AENDL70A4504016

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1061: Pump Motor Circuit Performance • Pump motor power supply voltage is out of specified range. • Pump motor is activated although pump motor control relay is OFF. • Pump motor is not activated although pump motor control relay is ON.	• ABS control module (pump motor) power supply circuit • ABS control module ground circuit • ABS control module

Circuit Diagram



IDL70A450012-02

[A]: ABS control module connector (View: [a])	1. ABS control module	5. Lead to battery
A1: Pump motor power supply circuit	2. CPU	6. "ABS MOT" fuse
B1: ABS control module ground circuit 1	3. Pump motor relay	7. Individual circuit fuse box No.1
B2: ABS control module ground circuit 2	4. Pump motor	

DTC Confirmation Procedure

1) Set ignition "ON".
2) Drive vehicle at 40 km/h or higher for more than 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check" (Page 4E-7).
2	**Pump motor power supply circuit check** 1) Check that ignition is "OFF". 2) Disconnect "E08" connector. 3) Check for proper connection to "E08-26" terminal. 4) If connection is OK, measure voltage between "E08-26" terminal and ground. *Is it 10 – 14 V?*	Go to Step 3.	Repair or replace "A1" circuit.
3	**ABS control module ground circuit check** 1) Measure resistance between each of "E08-14" and "E08-38" terminals and ground. *Is resistance less than 1 Ω?*	Replace ABS hydraulic unit / control module assembly and recheck DTC. ☞(Page 4E-33)	Repair or replace "B1" circuit and/or "B2" circuit.

DTC C1062

AENDL70A4504023

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1062: Solenoid Valve Continuous Operation Failure Solenoid valve is activated for more than specified time using "Hydraulic control test" under "Utility" mode of SUZUKI scan tool.	ABS control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check that ignition is “OFF”. 2) Leave vehicle for more than 5 minutes, for cooling down of ABS. 3) Perform “DTC Check” (Page 4E-11). *Is DTC C1062 detected?*	Replace ABS hydraulic unit / control module assembly and recheck DTC. ☞(Page 4E-33)	End.

DTC C1071

AENDL70A4504018

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1071: ABS Control Module Internal Failure ABS control module internal failure is detected.	ABS control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “ABS Check” performed?*	Go to Step 2.	Go to “ABS Check” (Page 4E-7).
2	**DTC check** 1) Perform “DTC Check” (Page 4E-11). *Is there DTC(s) other than C1071?*	Go to applicable DTC troubleshooting.	Replace ABS hydraulic unit / control module assembly and recheck DTC. ☞(Page 4E-33)

DTC C1090 / C1091 / C1094

AENDL70A4504024

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1090: ECM Detect Rolling Counter Failure from ABS Control Module ABS control module sends invalid CAN data to ECM.	• CAN communication circuit • ECM • ABS control module
C1091: CAN Invalid Data from ECM DTC concerned with ECM is detected.	
C1094: Torque Request Reject Status ABS control module receives invalid CAN data from ECM (about engine torque control).	

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “ABS Check” performed?*	Go to Step 2.	Go to “ABS Check” (Page 4E-7).
2	**DTC check** 1) Perform “DTC Check” (Page 4E-11). *Is there DTC(s) other than C1090, C1091 or C1094?*	Go to applicable DTC troubleshooting.	Go to Step 3.
3	**DTC check for ECM** 1) Check ECM for DTC. ☞(Page 1A-19) *Is DTC U0073 or U0121 detected?*	Go to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16) or “Troubleshooting for Lost Communication” in Section 10H (Page 10H-10).	Replace ABS hydraulic unit / control module assembly and recheck DTC. ☞(Page 4E-33)

DTC U0073

AENDL70A4504019

Refer to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).

DTC U0100

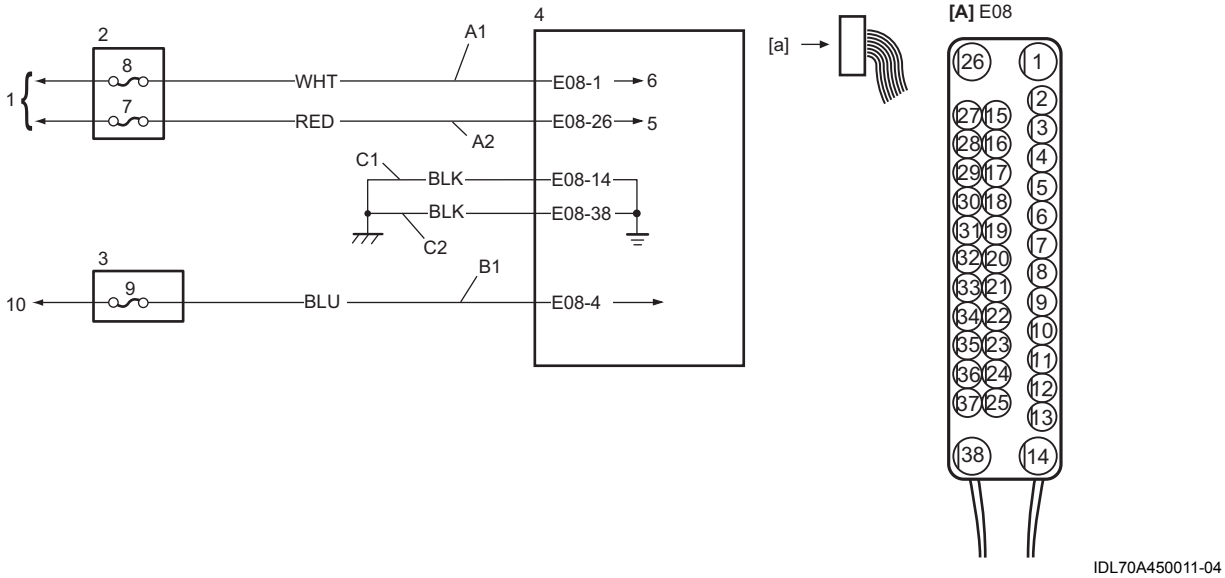
AENDL70A4504020

Refer to “Troubleshooting for Lost Communication” in Section 10H (Page 10H-10).

ABS Control Module Power Supply and Ground Circuit Check

AENDL70A4504022

Circuit Diagram



IDL70A450011-04

[A]: ABS control module connector (View: [a])	1. Lead to battery	7. “ABS MOT” fuse
A1: Solenoid valve power supply circuit	2. Individual circuit fuse box No.1	8. “ABS SOL” fuse
A2: Pump motor power supply circuit	3. J/B	9. “ABS” fuse
B1: Ignition power supply circuit	4. ABS control module	10. Ignition power supply
C1: ABS control module ground circuit 1	5. Lead to pump motor relay	
C2: ABS control module ground circuit 2	6. Lead to solenoid valve power supply relay	

Circuit Description

When the ignition switch is set “ON”, power is supplied to ABS control module. Then power is supplied to pump motor and solenoid valve in other line by the switching function in ABS control module.

Circuit Check

Step	Action	Yes	No
1	**Fuse check** *Are “ABS MOT” fuse, “ABS SOL” fuse and “ABS” fuse in good condition?*	Go to Step 2.	Replace fuse and check for short circuit to ground.
2	**Ignition power supply circuit check** 1) Check that ignition is “OFF”. 2) Disconnect “E08” connector. 3) Check for proper terminal connection to “E08” connector. 4) If connections are OK, set ignition “ON”. 5) Measure voltage between “E08-4” terminal and ground. *Is it 10 – 14 V?*	Go to Step 3.	Repair or replace “B1” circuit.

Step	Action	Yes	No
3	**Pump motor and solenoid valve power supply circuit check** 1) Check that ignition is “OFF”. 2) Measure voltage between each of “E08-26” and “E08-1” terminals and ground. *Are they 10 – 14 V?*	Go to Step 4.	Repair or replace “A1” circuit and/or “A2” circuit.
4	**ABS control module ground circuit check** 1) Measure resistance between each of “E08-14” and “E08-38” terminals and ground. *Is resistance less than 1 Ω?*	ABS control module power supply and ground circuits are in good condition.	Repair or replace “C1” circuit and/or “C2” circuit.

Repair Instructions

ABS Hydraulic Unit Operation Check

AENDL70A4506001

⚠ CAUTION

Make sure of the following conditions before ABS hydraulic unit operation check. Otherwise, ABS hydraulic unit operation can not be performed properly.

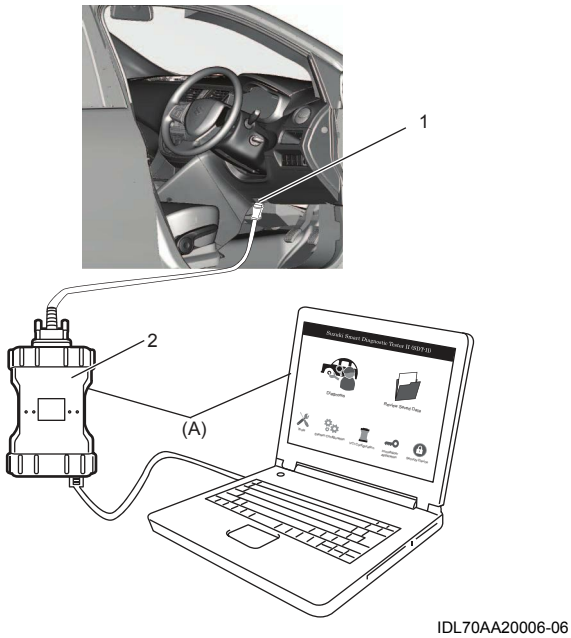
- **No air is trapped in brake system.**
- **Battery voltage is 11 V or more.**
- **Brakes are not dragged.**
- **ABS hydraulic unit / control module assembly does not detect DTC.**

NOTE

- **Operation check must be performed by 2 persons.**
- **Lighting or blinking of warning light stops when ignition is set “ON” after completing ABS hydraulic unit operation check.**

1) Set ignition “ON”.
2) Connect SUZUKI scan tool (PC and VCI (2)) to DLC (1) located around bottom of instrument panel on driver’s seat side.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



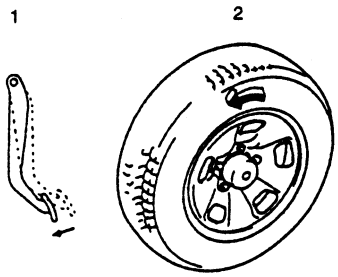
IDL70AA20006-06

3) Hoist vehicle until tire can be rotated.
4) Set transmission to neutral and release parking brake.
5) Set ignition “ON”, and select “Depressurization check” in “Hydraulic control test” under “Utility” mode of SUZUKI scan tool operator’s manual for further details.
   Refer to SUZUKI scan tool operator’s manual for further details.
6) Perform the following checks with help of another person.
   - Depressurization check

   Step on brake pedal (1) and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person’s hand. At this time, check whether the wheel rotates freely due to brake depressurization.

NOTE

Depressurization by SUZUKI scan tool is available for 0.5 seconds.



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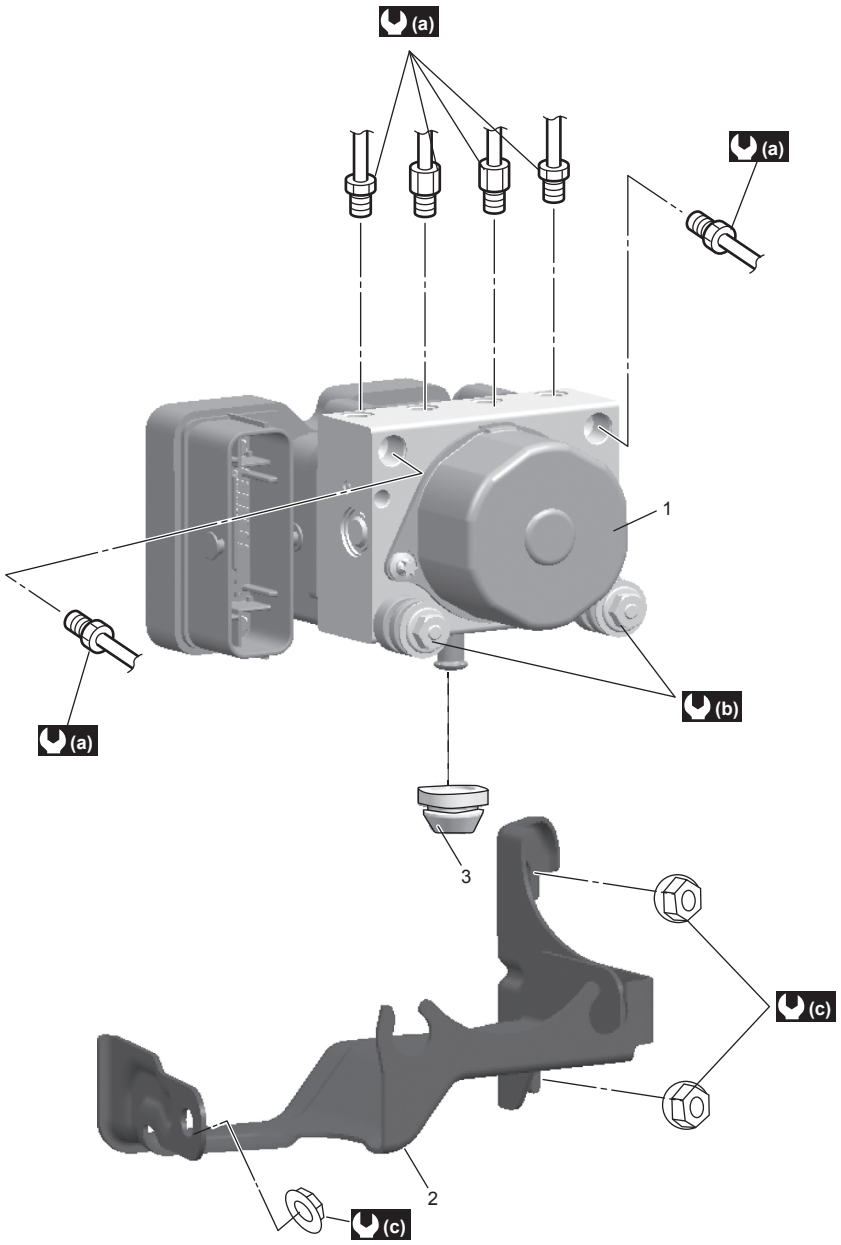
7) Check for all 4-wheels respectively.
8) Confirm ABS warning light is turned off after switching ignition from “OFF” to “ON”. Check for DTC and repair problem if lights are still lit.
9) If any faulty condition is found in Steps 6) and 7), replace ABS hydraulic unit /control module assembly.
10) After completing the check, confirm that ignition is “OFF” and then disconnect SUZUKI scan tool from DLC.

ABS Hydraulic Unit / Control Module Assembly Components

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NOTICE

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Failure to observe this precaution will spoil original performance of ABS hydraulic unit / control module assembly.



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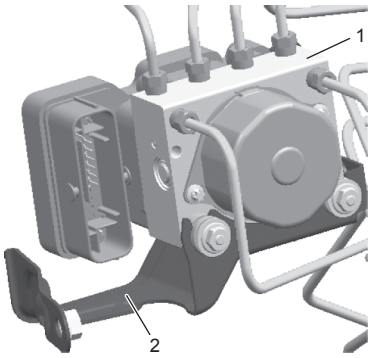
1. ABS hydraulic unit / control module assembly	3. Actuator mount damper	(b) : 9 N·m (0.92 kgf-m, 7.0 lbf-ft)
2. Actuator bracket	(a) : 16 N·m (1.6 kgf-m, 12.0 lbf-ft)	(c) : 26 N·m (2.7 kgf-m, 19.5 lbf-ft)

ABS Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

AENDL70A4506003

Check the following points. Repair or replace defective parts if defective.

- Check ABS hydraulic unit / control module assembly (1) for dents, crack, deformation and leakage.
- Check actuator bracket (2) and its mounting surface for dents, crack and deformation.
- Check ABS hydraulic unit / control module assembly nuts and actuator bracket bolts for looseness.
- Check ABS control module connector (ABS control module side and harness side) and its connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.



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ABS Hydraulic Unit / Control Module Assembly Removal and Installation

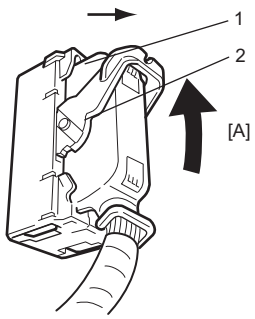
AENDL70A4506004

NOTICE

- **Be careful not to allow dust to enter ABS hydraulic unit / control module assembly.**
- **Do not place ABS hydraulic unit / control module assembly on its side or turn it upside down. Handling it in inappropriate way will spoil its original performance.**
- **Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Failure to observe this precaution will spoil original performance of ABS hydraulic unit / control module assembly.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. Flush pointed surface with water immediately if any fluid is spilled.**
- **Be sure to tighten every fastener to specified torque using torque wrench to avoid damage.**
- **Do not give an impact to hydraulic unit.**

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect ABS control module connector (1) by pulling up the lock lever (2).



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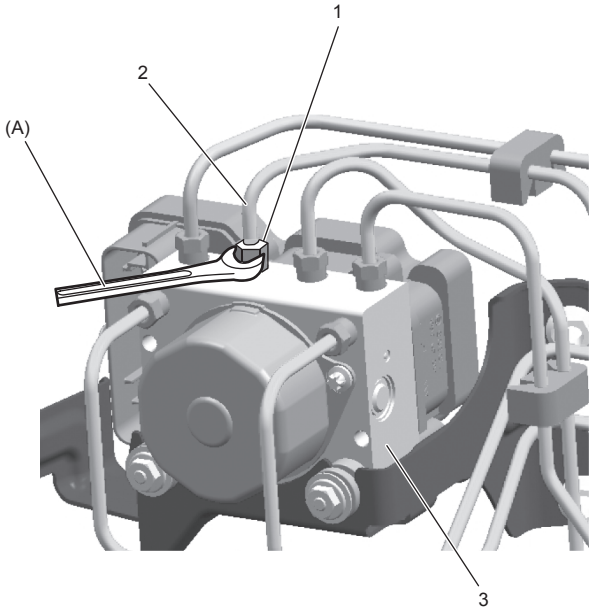
[A]: Pull up to disconnect

3) Loosen flare nuts (1) using special tool and disconnect brake pipes (2) from ABS hydraulic unit / control module assembly (3).

Special tool
(A): 09950M78220

NOTE

Put bleeder plug cap or the like onto each pipe to prevent fluid from spilling.



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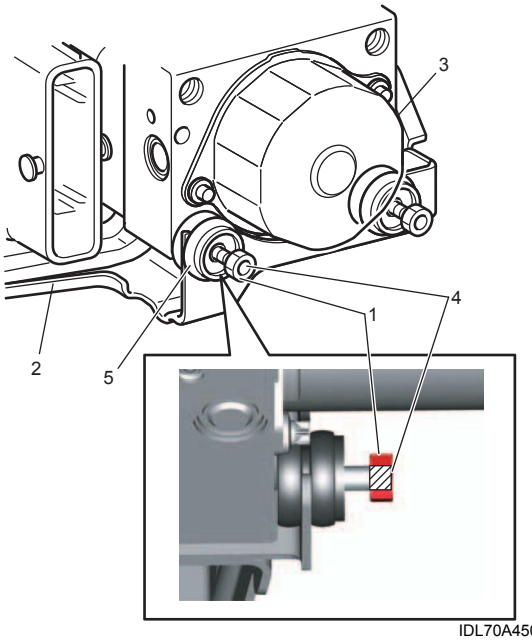
4) Remove ABS hydraulic unit / control module assembly and actuator bracket together. ☞(Page 4E-32)
5) Remove or loosen ABS hydraulic unit / control module assembly nuts (1) and remove ABS hydraulic unit / control module assembly (3) from actuator bracket (2).

NOTICE

Be careful not to damage bushing (5).

NOTE

If ABS hydraulic unit / control module assembly nuts are not removed, loosen each nut to the end of screw (4) as shown in figure.



IDL70A450015-01

Installation

Reverse removal procedures noting the following points.

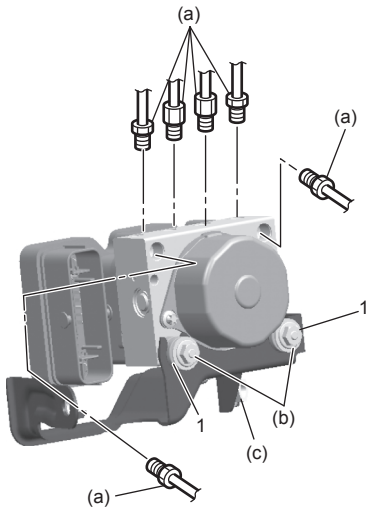
- Tighten brake pipe flare nuts, ABS hydraulic unit / control module assembly nuts and actuator bracket bolts to specified torque.
  Use special tool for flare nut tightening.

  Special tool
  (A): 09950M78220

  Tightening torque
  Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 12.0 lbf-ft)
  ABS hydraulic unit / control module assembly nut (b): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)
  Actuator bracket bolt (c): 26 N·m (2.7 kgf-m, 19.5 lbf-ft)

NOTICE

Be careful not to deform or scratch bushing (1) when installing ABS hydraulic unit / control module assembly.



IDL70A450016-02

- Bleed air out of brake system. ☞(Page 4A-6)
- Check for leakage of brake fluid and perform ABS hydraulic unit operation check. ☞(Page 4E-30)

Front and Rear Wheel Speed Sensor On-Vehicle Inspection

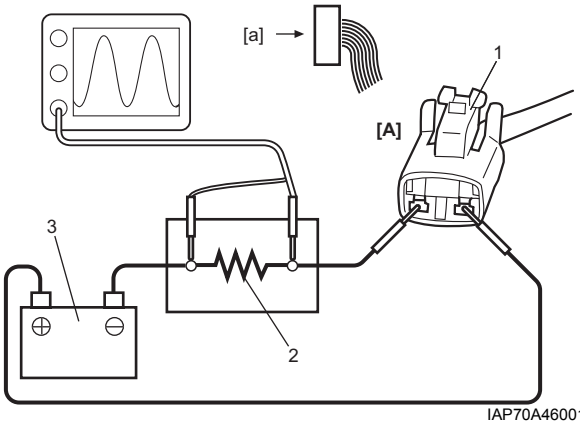
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NOTICE

Incorrect voltage and/or wrong connection cause damage to wheel speed sensor.

Output Voltage Inspection

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle until tire can be rotated.
3) Disconnect wheel speed sensor connector (1).
4) Set up measuring device as shown in figure.



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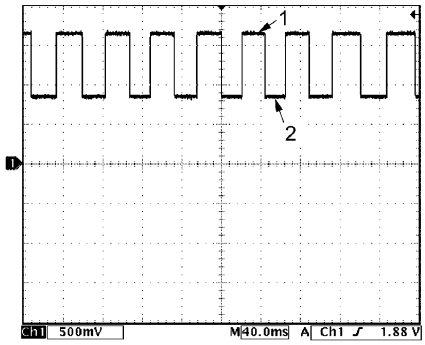
[A]:	Wheel speed sensor connector (View: [a])
2.	Resistance (100 Ω)
3.	Power supply (12 V)

5) Measure voltage at both ends of resistance without wheel rotation. If check result is not as specified, check sensor, mating encoder and their installation conditions.

Voltage at resistance (100 Ω) without wheel rotation
600 to 800 mV or 1200 to 1600 mV

6) Measure voltage at both ends of resistance while rotating wheel rotation and check that high (1) and low (2) voltages are as specified. Check that waveform is not disordered.

Voltage at resistance (100 Ω) with wheel rotating
Low voltage: 600 to 800 mV
High voltage: 1200 to 1600 mV



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Front Wheel Speed Sensor Removal and Installation

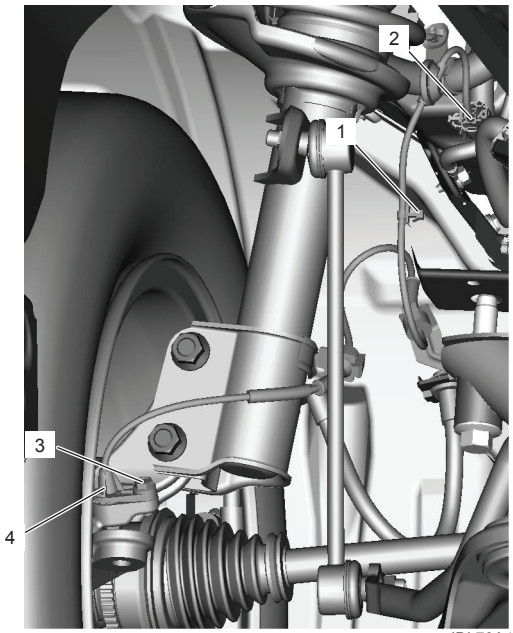
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NOTICE

Do not pull or twist wire harness strongly when removing or installing front wheel speed sensor.

Removal

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle a little and remove wheel.
3) Remove front fender lining. ☞(Page 9J-3)
4) Remove clip (1) and disconnect front wheel speed sensor connector (2).
5) Remove front wheel speed sensor bolt (3).
6) Remove front wheel speed sensor (4) from steering knuckle.



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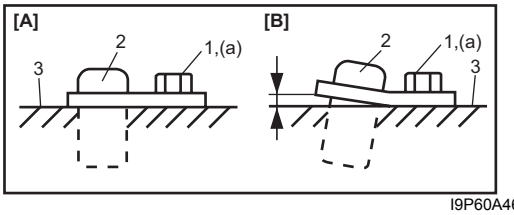
Installation

Reverse removal procedures noting the following points.

- Check that no iron powder attaches to sensing area of wheel speed sensor (2).
- Tighten front wheel speed sensor bolt (1) to specified torque.

Tightening torque
Front wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

- Check that there is no space between front wheel speed sensor and steering knuckle (3).



I9P60A460033-01

[A]: OK	[B]: NG

- Install wheel. ☞(Page 2D-3)

Rear Wheel Speed Sensor Removal and Installation

AENDL70A4506008

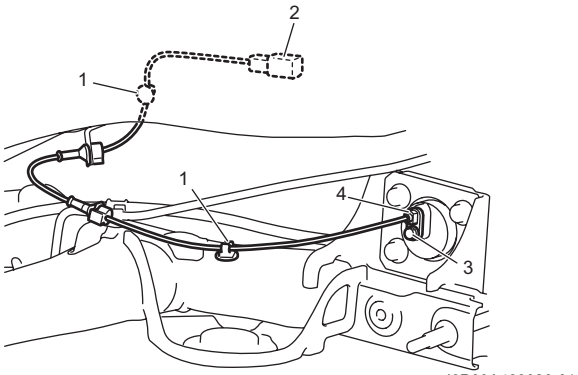
NOTICE

Do not pull or twist wire harness strongly when removing or installing rear wheel speed sensor.

Removal

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle a little and remove wheel.

3) Remove clips (1) and disconnect rear wheel speed sensor connector (2).
4) Remove rear wheel speed sensor bolt (3).
5) Remove rear wheel speed sensor (4) from rear wheel hub assembly.



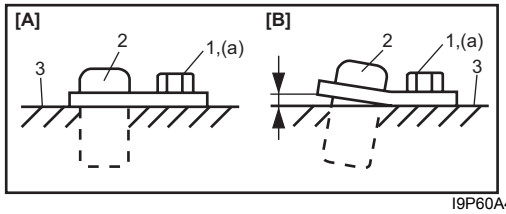
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Installation
Reverse removal procedure noting the following.

- Check that no iron powder attaches to sensing area of wheel speed sensor (2).
- Tighten wheel speed sensor bolt (1) to specified torque.

  Tightening torque
  Rear wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

- Check that there is no space between rear wheel speed sensor and rear wheel hub assembly (3).



I9P60A460033-01

[A]: OK	[B]: NG

- Install wheel. ☞(Page 2D-3)

Front and Rear Wheel Speed Sensor Inspection

AENDL70A4506007

Replace or clean wheel speed sensor if sensing area of front and rear wheel speed sensor(s) is damaged or covered with iron powder.

Front Wheel Speed Sensor Ring Removal and Installation

AENDL70A4506009

For removal and installation of front wheel speed sensor ring, refer to “Front Drive Shaft Disassembly and Reassembly”: Front in Section 3A (Page 3A-3).

Rear Wheel Speed Sensor Encoder Removal and Installation

AENDL70A4506010

NOTE

Rear wheel speed sensor encoder and rear wheel hub assembly are unified as an assembly. If encoder replacement is necessary, replace encoder as a rear wheel hub assembly.

For removal and Installation of rear wheel speed sensor encoder (included in rear wheel hub assembly), refer to “Rear Wheel Hub Assembly Removal and Installation”: Rear in Section 3A (Page 3A-14).

Front Wheel Speed Sensor Ring and Rear Wheel Speed Sensor Encoder Inspection

AENDL70A4506011

Front Wheel Speed Sensor Ring
Check front wheel speed sensor ring for crack, damage, or deformation.
Replace front wheel speed sensor ring if defective.

Rear Wheel Speed Sensor Encoder
Check rear wheel speed sensor encoder, referring to “Front and Rear Wheel Speed Sensor On-Vehicle Inspection” (Page 4E-34).

Specifications

Tightening Torque Specifications

AENDL70A4507001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Brake pipe flare nut	16	1.6	12.0	☞(Page 4E-34)
ABS hydraulic unit / control module assembly nut	9.0	0.92	7.0	☞(Page 4E-34)
Actuator bracket bolt	26	2.7	19.5	☞(Page 4E-34)
Front wheel speed sensor bolt	11	1.1	8.5	☞(Page 4E-35)
Rear wheel speed sensor bolt	11	1.1	8.5	☞(Page 4E-36)

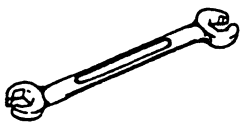
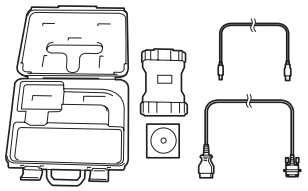
Reference:
For the tightening torques of fasteners not specified in this page, refer to:

“ABS Hydraulic Unit / Control Module Assembly Components” (Page 4E-32)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Special Tool

AENDL70A4508001

09950M78220 Flare nut wrench (10 x 12 mm) ☞(Page 4E-33) / ☞(Page 4E-34)		SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 4E-11) / ☞(Page 4E-30)	

Section 5

Transmission / Transaxle

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Precautions

Precautions

Precautions for Transmission / Transaxle

AENDL70A5000001

Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

General Precautions
Refer to “General Precautions” in Section 00 (Page 00-1).

Vehicle Lifting Points
Refer to “Vehicle Lifting Points” in Section 0A (Page 0A-7).

Fastener Caution
Refer to “Fastener Caution” in Section 00 (Page 00-5).

Fastener Information
Refer to “Fasteners Information” in Section 0A (Page 0A-5).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness.
Otherwise, electrical trouble may occur.

Manual Transmission/Transaxle

General Description

Manual Transaxle Construction

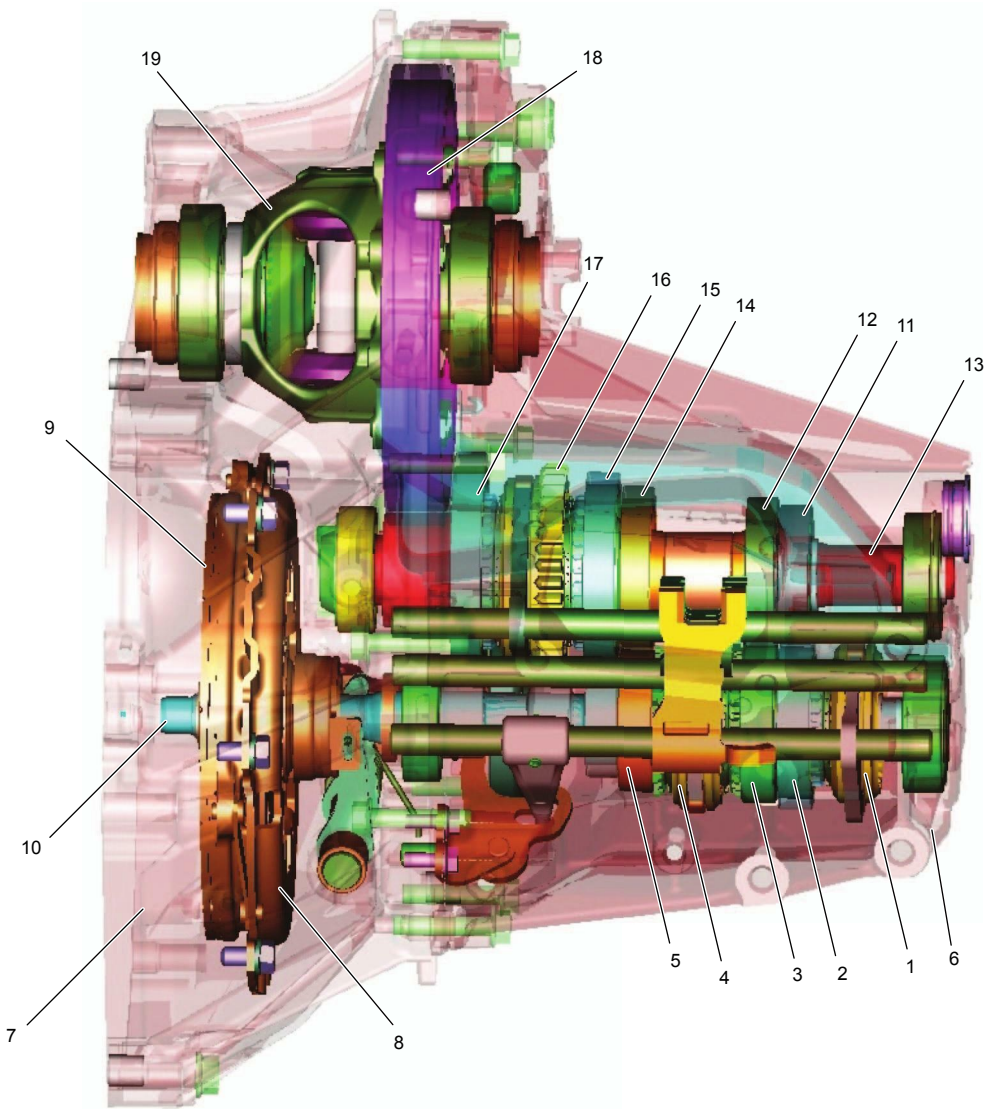
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The transaxle provides five forward speeds and one reverse speed by means of three synchromesh devices and three shafts: input shaft, countershaft and reverse gear shaft. All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

The low speed synchronizer sleeve & hub is mounted on countershaft and engaged with countershaft 1st gear or 2nd gear, while the high speed synchronizer sleeve & hub is mounted on input shaft and engaged with input shaft 3rd gear or 4th gear. The 5th speed synchronizer sleeve & hub on input shaft is engaged with input shaft fifth gear mounted on the input shaft.

The double cone synchronizing mechanism is provided to 2nd gear synchromesh device for high performance of shifting to 2nd gear.

The countershaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

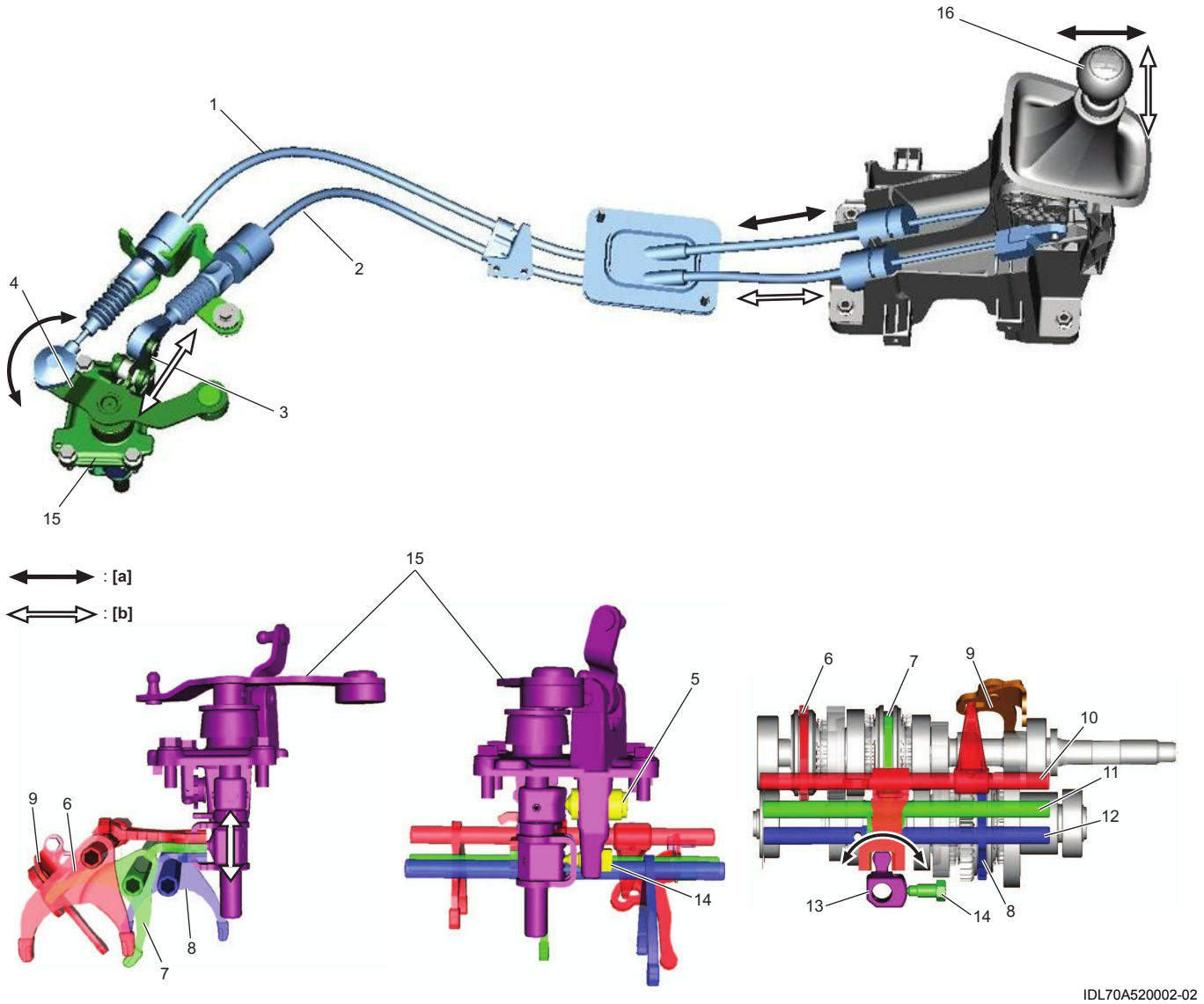


IDL70A520001-01

1. 5th speed synchronizer sleeve and hub	8. Clutch cover	15. Countershaft 2nd gear
2. Input shaft 5th gear	9. Clutch disc	16. Low speed synchronizer sleeve and hub
3. Input shaft 4th gear	10. Input shaft	17. Countershaft 1st gear
4. High speed synchronizer sleeve and hub	11. Countershaft 5th gear	18. Final gear
5. Input shaft 3rd gear	12. Countershaft 4th gear	19. Differential case
6. Left case	13. Countershaft	
7. Right case	14. Countershaft 3rd gear	

Gear Shift Mechanism

The gear shifting control system consists of the following main parts. Movement of gear shift control lever assembly (16) is transmitted to gear shift & select shaft assembly (15) through gear shift control cable (1) and gear select control cable (2).

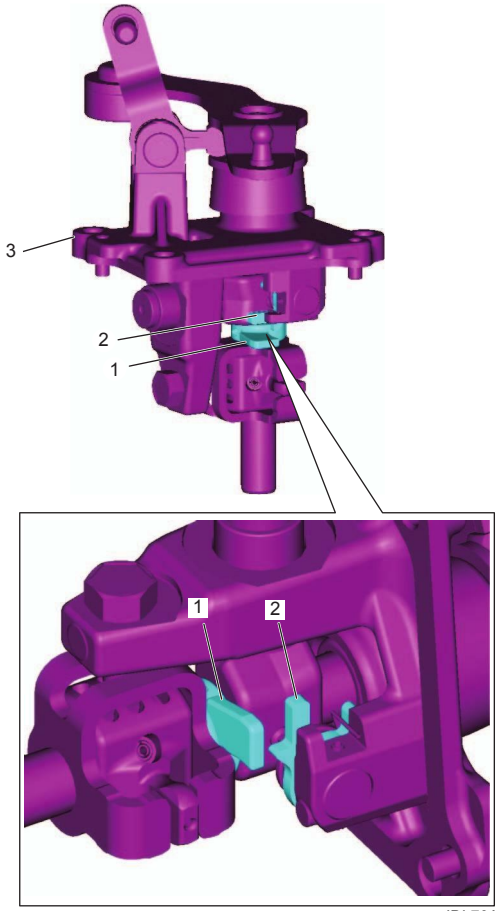


IDL70A520002-02

[a]: Direction of gear shift	5. Gear shift locating spring	11. High speed gear shift shaft
[b]: Direction of gear select	6. 5th gear shift fork	12. Low speed gear shift shaft
1. Gear shift control cable	7. High speed gear shift fork	13. Gear shift & select lever
2. Gear select control cable	8. Low speed gear shift fork	14. Gear shift interlock bolt
3. Select cable lever	9. Reverse gear shift lever	15. Gear shift & select shaft assembly
4. Shift cable lever	10. 5th & reverse gear shift shaft	16. Gear shift control lever assembly

Reverse Shift Prevention Mechanism Construction

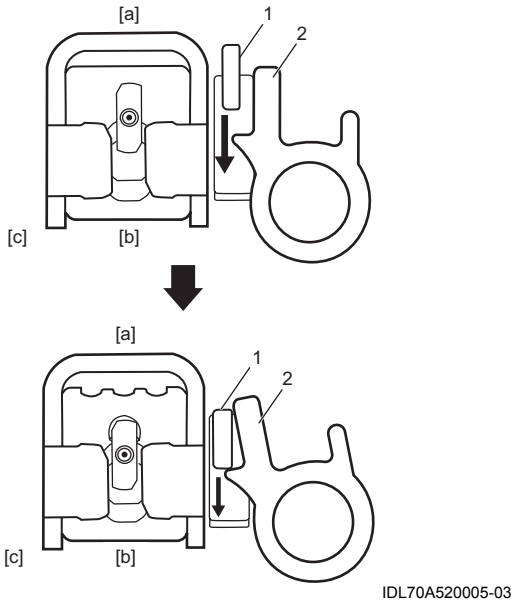
For the prevention of erroneous shifting from fifth gear to reverse gear, reverse interlock and detent lever (1) and revere shift limit yoke (2) are provided in the gear shift and select shaft assembly (3).



IDL70A520004-03

Operation

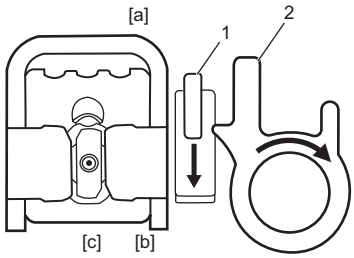
1) If shifting directly from 5th [a] to reverse [b] is attempted, the cubic part of the reverse interlock and detent lever (1) is blocked by the projection of the reverse shift limit yoke (2).



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[c]: 4th

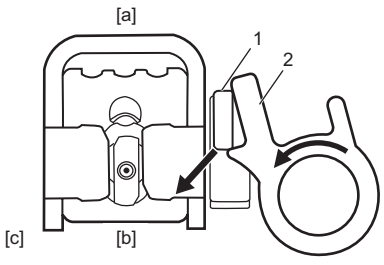
2) Then the cubic part of the reverse interlock and detent lever (1) pushes the projection of the reverse shift limit yoke (2). The reverse shift limit yoke (2) rotates and pushes the reverse interlock and detent lever (1) toward the neutral position.



IDL70A520007-03

[a]: 5th	[b]: Reverse	[c]: 4th

3) If the reverse shifting force is still applied to the shift lever, the cubic part of the reverse interlock and detent lever (1) rides over the projection of the reverse shift limit yoke (2), and the gear is shifted into the 4th. The reverse shift limit yoke (2) returns to its original position.



IDL70A520008-02

[a]: 5th	[b]: Reverse	[c]: 4th

Diagnostic Information and Procedures

Manual Transaxle Symptom Diagnosis

AENDL70A5204001

Condition	Possible cause	Correction / Reference Item
Gears slipping out of mesh	Worn shift fork shaft	*Replace shift fork shaft. ☞(Page 5B-31)*
	Worn shift fork or synchronizer sleeve	*Replace shift fork or synchronizer sleeve referring to "Gear Shift Shaft Components" (Page 5B-31), "Input Shaft Disassembly and Reassembly" (Page 5B-22) and/or "Countershaft Disassembly and Reassembly" (Page 5B-27).*
	Worn bearings on input shaft or countershaft	*Replace input shaft bearing or countershaft bearing.* *- Input shaft bearing: ☞(Page 5B-22)* *- Countershaft bearing: ☞(Page 5B-27)*
	Worn chamfered tooth on sleeve and gear	*Replace synchronizer sleeve and gear referring to, "Input Shaft Disassembly and Reassembly" (Page 5B-22) and/or "Countershaft Disassembly and Reassembly" (Page 5B-27).*
Hard shifting	Inadequate lubricant	*Replenish manual transaxle oil.*
	Maladjusted clutch cable	*Adjust clutch cable. ☞(Page 5C-4)*
	Distorted or broken clutch disc	*Replace clutch disc. ☞(Page 5C-9)*
	Damaged clutch pressure plate	*Replace clutch cover. ☞(Page 5C-9)*
	Worn synchronizer ring	*Replace synchronizer ring.* *- High speed and 5th speed synchronizer ring: ☞(Page 5B-22)* *- Low speed synchronizer ring: ☞(Page 5B-27)*
	Worn chamfered tooth on sleeve or gear	*Replace synchronizer sleeve and gear referring to, "Input Shaft Disassembly and Reassembly" (Page 5B-22) and/or "Countershaft Disassembly and Reassembly" (Page 5B-27).*
	Worn select cable lever bushings	*Replace select cable lever bushings. ☞(Page 5B-13)*
	Distorted shift shaft	*Replace shift shaft. ☞(Page 5B-31)*
	Broken gear shift control / select control cables	*Replace gear shift and select cable. ☞(Page 5B-8)*
Noise	Inadequate or insufficient lubricant	*Replenish manual transaxle oil.*
	Damaged or worn bearing(s)	*Replace bearing referring to, "Input Shaft Disassembly and Reassembly" (Page 5B-22) and/or "Countershaft Disassembly and Reassembly" (Page 5B-27).*
	Damaged or worn gear(s)	*Replace gear referring to, "Input Shaft Disassembly and Reassembly" (Page 5B-22) and/or "Countershaft Disassembly and Reassembly" (Page 5B-27).*
	Damaged or worn synchronizer parts	*Replace synchronizer parts referring to, "Input Shaft Disassembly and Reassembly" (Page 5B-22) and/or "Countershaft Disassembly and Reassembly" (Page 5B-27).*

Repair Instructions

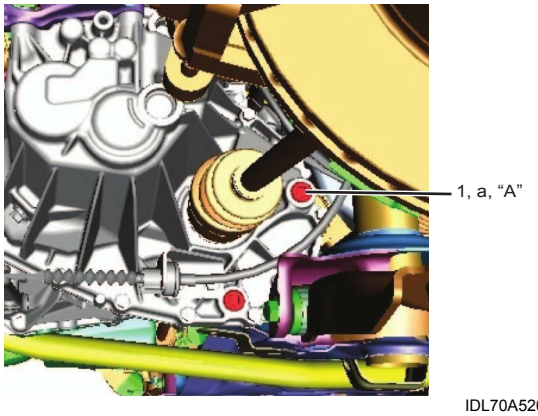
Manual Transaxle Oil Level Check

AENDL70A5206001

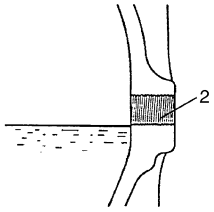
1) Hoist vehicle and check that there is no oil leakage. If leakage is found, repair it.
2) Remove oil level / filler plug (1) and check oil contamination and oil level reaches bottom of oil level / filler plug hole (2).
If oil is excessively dirty or insufficient, change or replenish it with specified oil up to oil filler plug hole.
3) Apply sealant to thread of level / filler plug, and then tighten it to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Transaxle oil level / filler plug (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)



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Manual Transaxle Oil Change

AENDL70A5206002

1) Before changing oil, stop engine and hoist vehicle horizontally.
2) Remove left splash cover.
3) With vehicle hoisted, check oil leakage. If leakage exists, correct it.
4) Remove oil level / filler plug (2).
5) Cover suspension frame with a board (4) to protect it from dripping oil, remove drain plug (1) and drain oil.

NOTE

Wipe oil off from suspension frame where the portions get wet with the transaxle oil.

6) Apply sealant to thread of drain plug, and tighten it to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Oil drain plug (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

7) Add new specified oil until oil level reaches lower end of oil filler plug hole (3) as shown in figure.

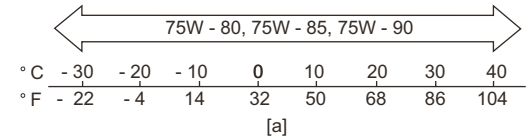
NOTE

It is highly recommended to use "SUZUKI GEAR OIL 75W-80".

Manual transaxle oil specification
: SUZUKI GEAR OIL 99000-22B21-036
: API GL-4

Manual transaxle oil capacity
Reference: 1.45 liters (3.06/2.55 US/Imp. pt)

Viscosity chart



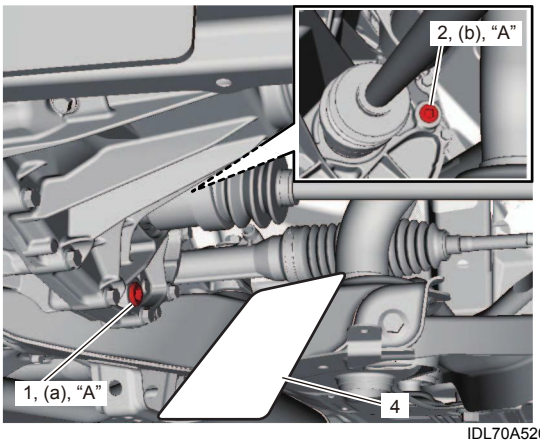
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[a]: Temperature

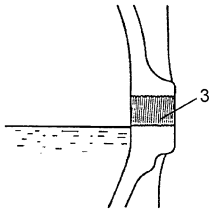
8) Apply sealant to thread of level / filler plug, and then tighten it to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Transaxle oil level / filler plug (b): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)



IDL70A520103-01



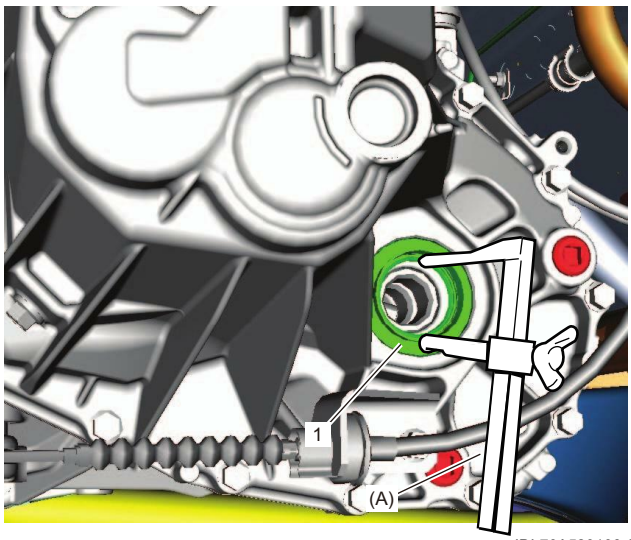
IAP70A320006-01

Differential Side Oil Seal Replacement

AENDL70A5206003

1) Hoist vehicle and drain transaxle oil.☞(Page 5B-5)
2) Remove front drive shaft. ☞(Page 3A-2)
3) Remove oil seal (1) using special tool.

Special tool
(A): 09913M50121



IDL70A520108-02

4) Install new oil seal (1) to specified position using special tool.

NOTE

- **When installing oil seal, face its spring side inward.**
- **Check that oil seal is installed horizontally to surface of case after installing oil seal.**

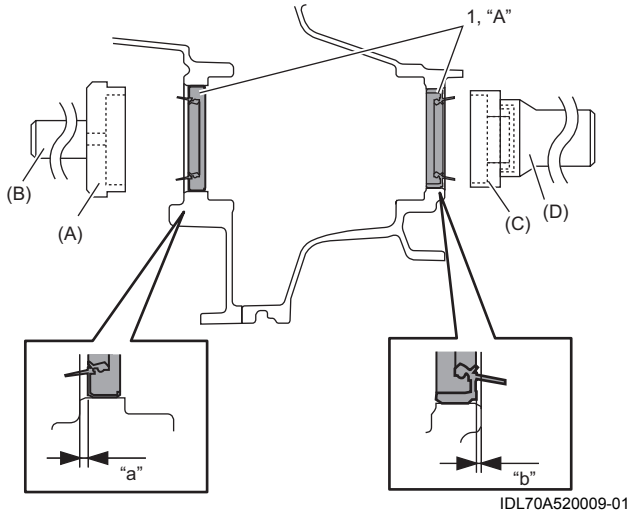
Special tool
(A): 09926M27610
(B): 09924M74510
(C): 09924M07720
(D): 09913M70123

Distance from case end face to left oil seal
"a": 2.1 – 3.1 mm (0.08 – 0.12 in.)

Distance from case end face to right oil seal
"b": 0.7 – 1.7 mm (0.03 – 0.07 in.)

5) Apply grease to oil seal lip and check drive shaft where oil seal contacts for smoothness.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

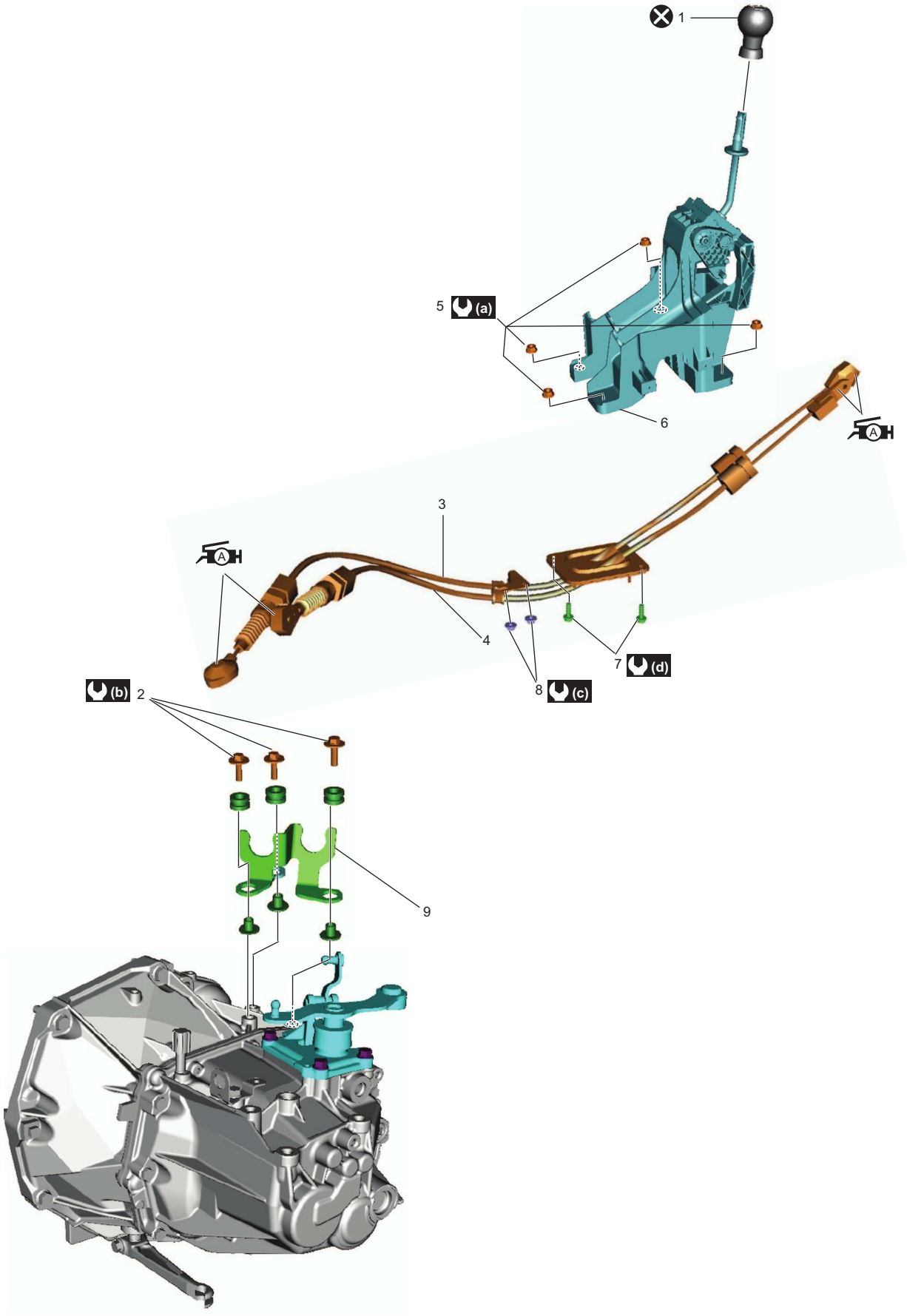


IDL70A520009-01

6) Insert front drive shaft. ☞(Page 3A-2)
7) Replenish transaxle oil. ☞(Page 5B-5)
8) Check differential side oil seal for oil leakage.

Gear Shift Control Lever and Cable Components

AENDL70A5206004



IDL70A520010-02

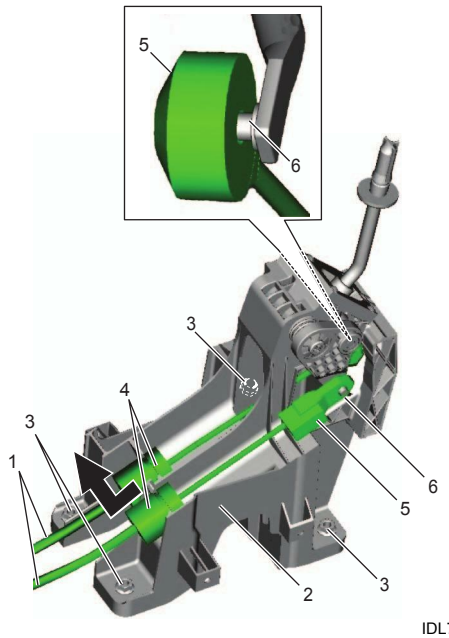
1. Gear shift control lever knob	8. Cable clamp nut
2. Cable bracket bolt	9. Cable bracket
3. Gear shift control cable : Apply grease 99000-25011 to cable ends.	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
4. Gear select control cable : Apply grease 99000-25011 to cable ends.	(b) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
5. Gear shift control lever assembly mounting nut	(c) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
6. Gear shift control lever assembly	(d) : 5.5 N·m (.60 kgf-m, 4.0 lbf-ft)
7. Cable grommet bolt	: Do not reuse.

Gear Shift Control Lever and Cable Removal and Installation

AENDL70A5206005

Removal

1) Remove battery and battery. ☞(Page 1J-5)
2) Remove console box. ☞(Page 9H-9)
3) Disconnect gear shift and select control cables (1) from gear shift control lever assembly (2) while pulling quick joint (4) in arrow direction as shown in figure.
4) Disconnect cables (1) from gear shift control lever assembly (2) while pulling quick joint (4) in arrow direction as shown in figure.
5) Remove nuts (3) and remove gear shift control lever assembly from floor panel.



IDL70A520106-02

6) Disconnect gear select and gear shift control cables from transaxle.
7) Remove cable grommet bolt, and then remove gear shift and select control cables from dash panel. ☞(Page 5B-7)

Installation

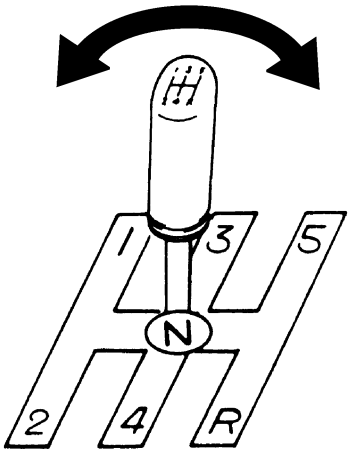
Reverse removal procedure noting the following.

- Tighten bolts and nuts to specified torque. ☞(Page 5B-7)
- Adjust gear select control cable. ☞(Page 5B-8)

Gear Select Control Cable Adjustment

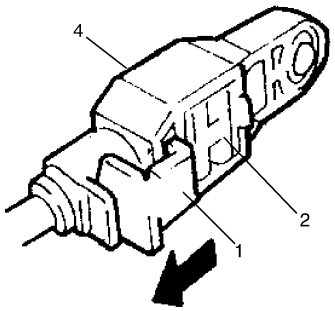
AENDL70A5206006

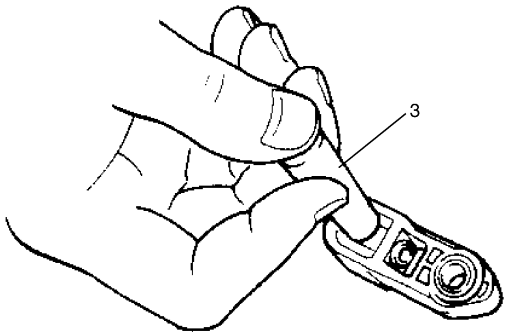
1) Move shift lever in arrow direction as shown in figure several times, and then confirm that shift lever is in neutral position.



I8C50A520037-02

2) Release lock plate (1) which restricts moving of cable end holder (2).
3) Push cable end holder (2) out from adjuster (4) using appropriate tool (3) to disengage cable.





I4RS0A520004-01

4) Apply grease to pivot (5) of gear shift control lever, and then install adjuster (1) into pin of gear shift control lever securely.

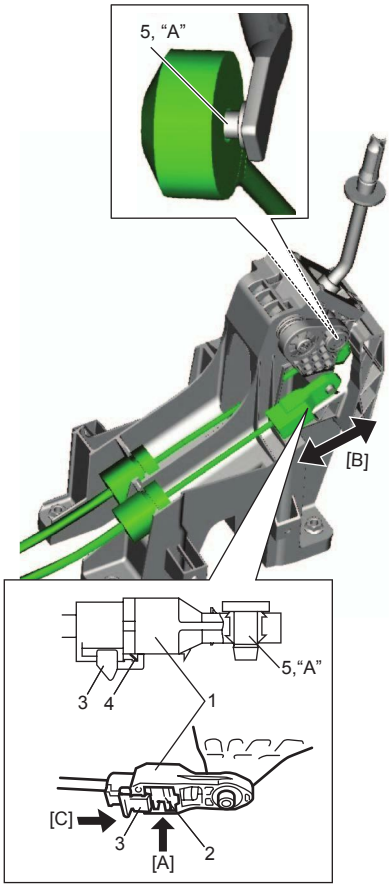
"A": Grease 99000–25011 (SUZUKI Super Grease A)

5) Push cable end holder (2) in direction [A].

NOTE

Do not apply force to adjuster in cable operation direction [B].

6) Slide lock plate (3) in direction [C], until it gets over the claw (4) of cable end holder.



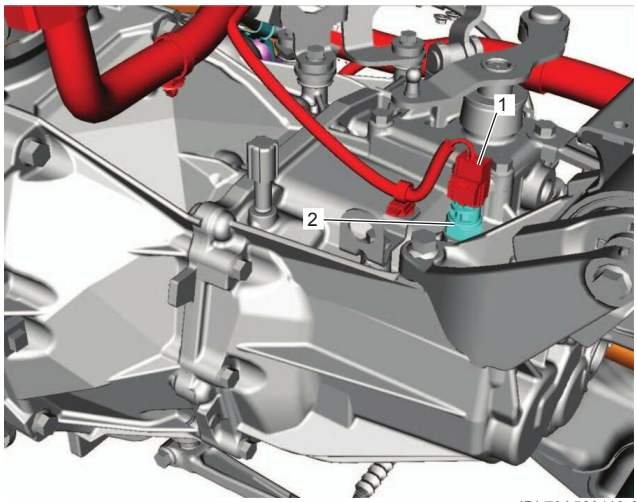
IDL70A520107-01

Back Up Light Switch Removal and Installation

AENDL70A5206007

Removal

1) Remove battery and battery. ☞(Page 1J-5)
2) Disconnect back up light switch connector (1).
3) Remove back up light switch (2).

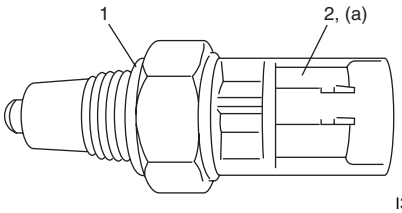


IDL70A520113-01

Installation

1) Apply oil to new O-ring (1) and tighten back up light switch (2) to specified torque.

Tightening torque
Back up light switch (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I3RH0A520006-01

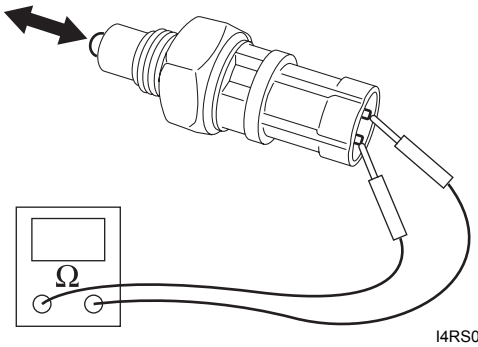
2) Connect back up light switch connector.
3) Install battery tray, battery, and then install coolant reservoir to battery tray.

Back Up Light Switch Inspection

AENDL70A5206008

Check back up light switch for function using ohmmeter. If faulty condition is found, replace back up light switch.

Back up light switch specification
Switch ON (Push): Continuity
Switch OFF (Release): No continuity



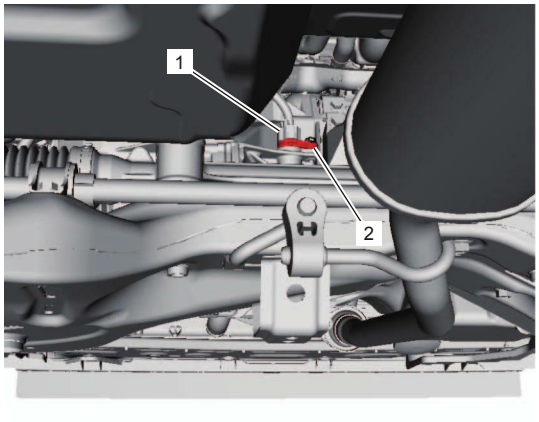
I4RS0A520011-01

VSS Removal and Installation (If Equipped)

AENDL70A5206036

Removal

1) Disconnect negative (–) cable at battery and hoist vehicle.
2) Disconnect VSS connector (1).
3) Remove VSS (2).

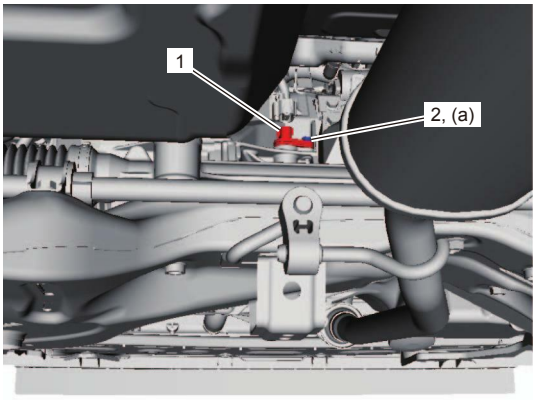


IDL70A520109-01

Installation

1) Apply oil to new O-ring, and then install it on VSS.
2) Install VSS (1) and tighten VSS bolt to specified torque.

Tightening torque
VSS bolt (a): 5 N·m (0.51 kgf-m, 4.0 lbf-ft)



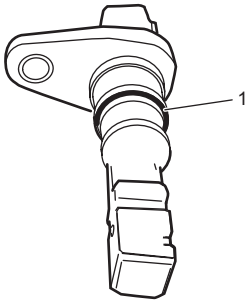
IDL70A520110-01

3) Connect VSS connector.
4) Lower vehicle and connect negative (–) cable at battery.

VSS Inspection (If Equipped)

AENDL70A5206057

1) Remove VSS. ☞(Page 5B-10)
2) Check the following points.
   - Check that O-ring (1) is free from damage.
   - Check that end face of sensor and speed sensor ring teeth are free from any metal particles and damage.



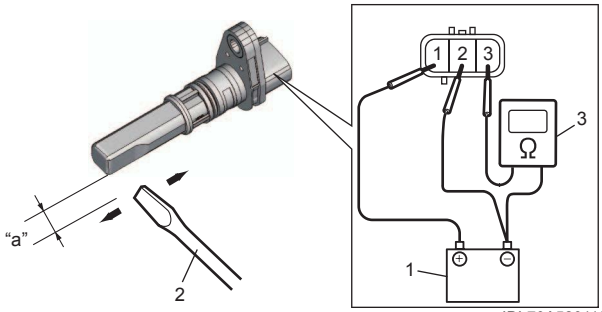
IDL70A520111-01

3) Check VSS as follows.
   If faulty condition is found, replace VSS.
   a) Connect battery (1) and ohmmeter (3) to VSS as shown in figure.
   b) Check that VSS resistance varies as specified below by passing ferromagnetic material (iron) (2) at VSS's side.

NOTE

Keep approximately 1 mm (0.03 in.) gap "a" between ferromagnetic material (iron) and end face of VSS.

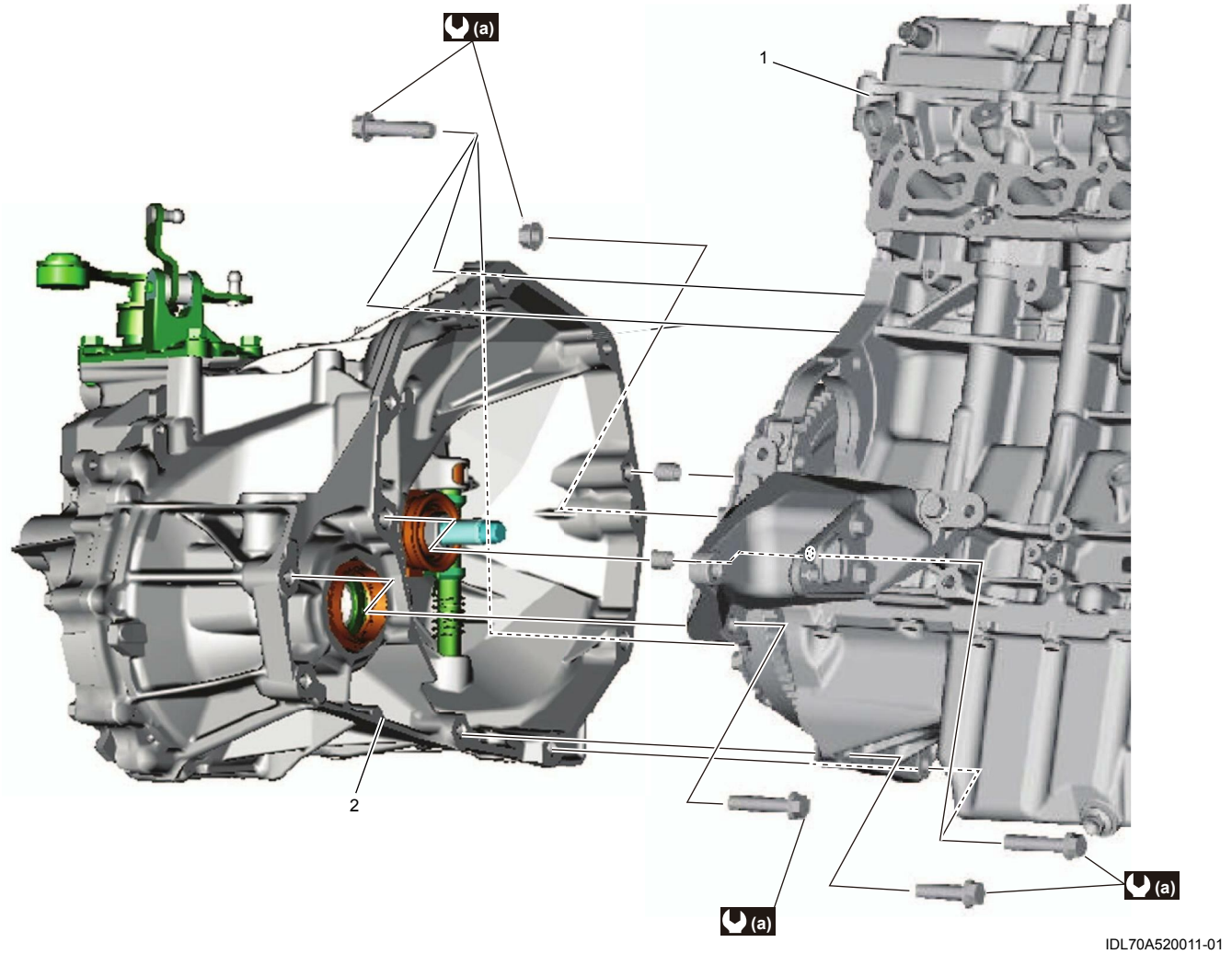
VSS resistance
Resistance alternates between 100 Ω or smaller (ON) and infinity (OFF)



IDL70A520112-01

Manual Transaxle Unit Components

AENDL70A5206010



IDL70A520011-01

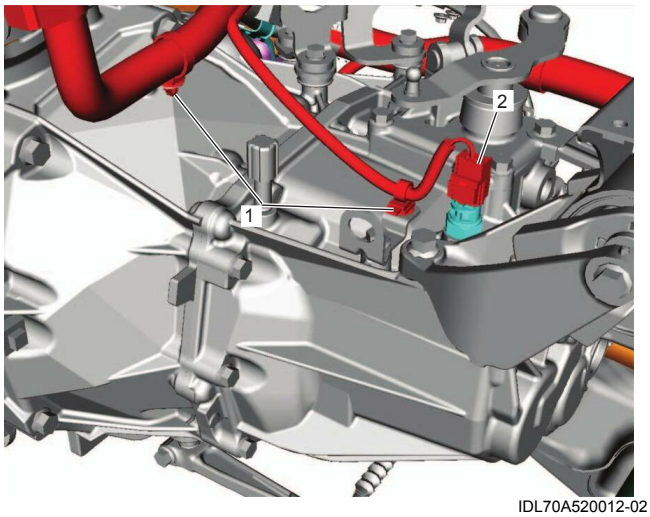
1. Engine	2. Manual transaxle unit	(a) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)

Manual Transaxle Unit Dismounting and Remounting

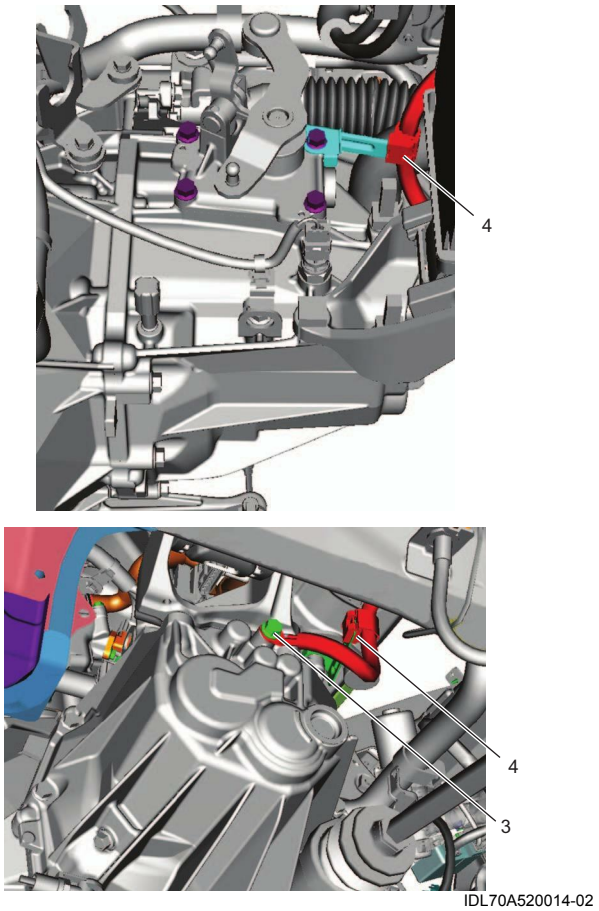
AENDL70A5206011

Dismounting

1) Place gear shift control lever in neutral, and remove battery and battery tray. ☞(Page 1J-5)
2) Drain transaxle oil. ☞(Page 5B-5)
3) Remove right and left engine undercover.
4) Remove front drive shaft assembly. ☞(Page 3A-2)
5) Remove exhaust pipe. ☞(Page 1K-4)
6) Remove starting motor. ☞(Page 1I-3)
7) Disconnect the following electric wires / connectors and clamp.
   - Engine harness clamp (1) and back up light switch connector (2).
   - Battery ground cable bolt (3) and clamp (4)
   - VSS connector: ☞(Page 5B-10)



IDL70A520012-02



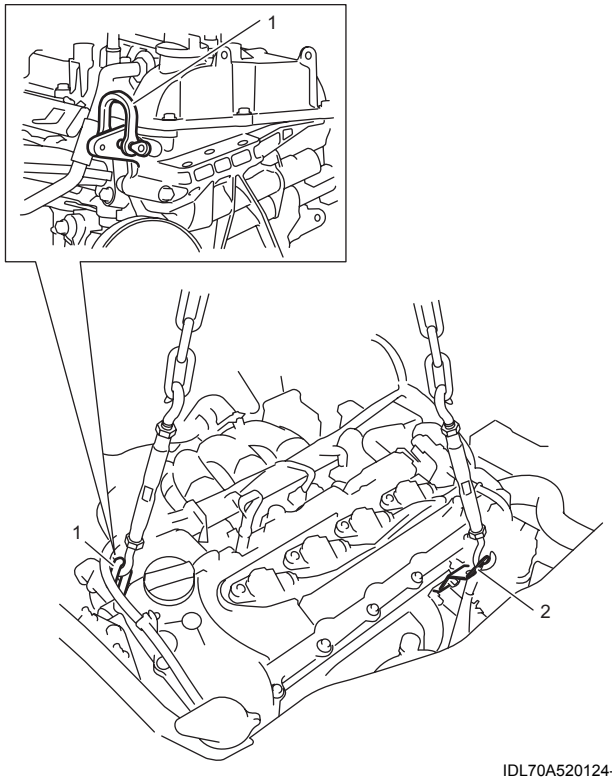
IDL70A520014-02

8) Loosen bolts and nuts fastening engine.
9) Support engine assembly using shackle (1), engine hooks (2) and chain hoist or engine crane.

NOTE

When supporting engine assembly, use engine hook (2) (genuine SUZUKI parts).

- **Engine hook: 11851-73K00**
- **Engine hook nut: 08316-1010A**



IDL70A520124-01

10) Remove engine left mounting and mounting bracket. ☞(Page 1D-17)
11) Support transaxle with transmission jack.
12) Remove bolts and nuts fastening engine and transaxle, and engine rear mounting bracket and transaxle, and then detach transaxle from engine.

Remounting

Reverse dismounting procedure noting the following points.

NOTICE

Failure to take proper precautions when remounting the manual transaxle can cause damage to parts.

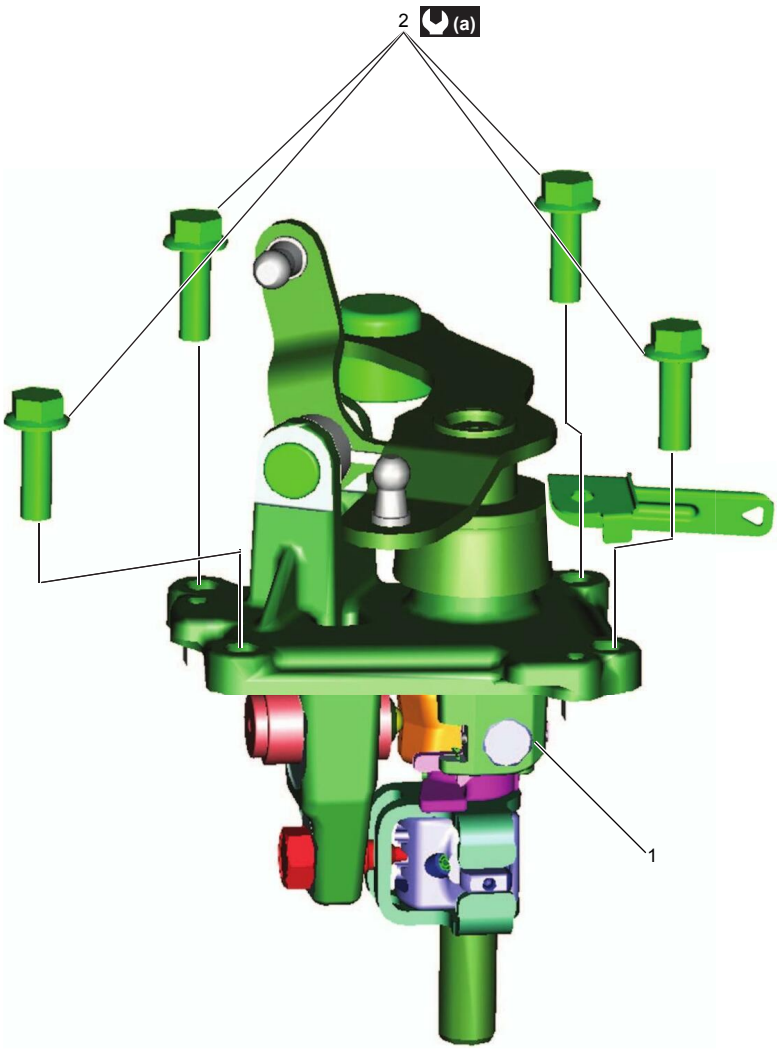
- **When installing the transaxle, be careful not to let the drive shaft scratch the oil seal.**
  Oil leaks may occur if the oil seal lip is scratched by the drive shaft.
- **Do not use a hammer when installing the drive shaft joint into the differential gear. Hitting the drive shaft joint with a hammer will damage the joint.**

- Tighten the following bolts and nut to specified torque.
  – Transaxle to engine bolt and nut: ☞(Page 5B-11)

  – Transaxle to engine rear mounting bracket bolt: ☞(Page 5B-11)
  – Engine left mounting bolt and nut: ☞(Page 1D-17)
- Set each clamp for wiring securely.
- Add transaxle oil. ☞(Page 5B-5)
- Check function of engine, clutch and transaxle.
- Check that there is no oil leakage at each connection.
- Check front wheel alignment. ☞(Page 2B-1)

Gear Shift and Select Shaft Assembly Components

AENDL70A5206012



IDL70A520015-03

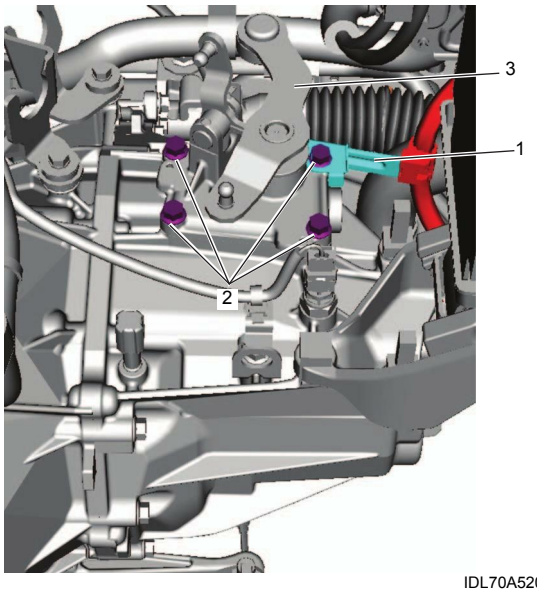
1. Gear shift & select shaft assembly	2. Gear shift guide case bolt	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

Gear Shift and Select Shaft Assembly Removal and Installation

AENDL70A5206013

Removal

1) Remove battery and battery tray. ☞(Page 1J-5)
2) Disconnect gear shift and select control cables from transaxle. ☞(Page 5B-8)
3) Remove engine harness bracket (1).
4) Remove gear shift guide case bolts (2) and then pull out gear shift & select shaft assembly (3).

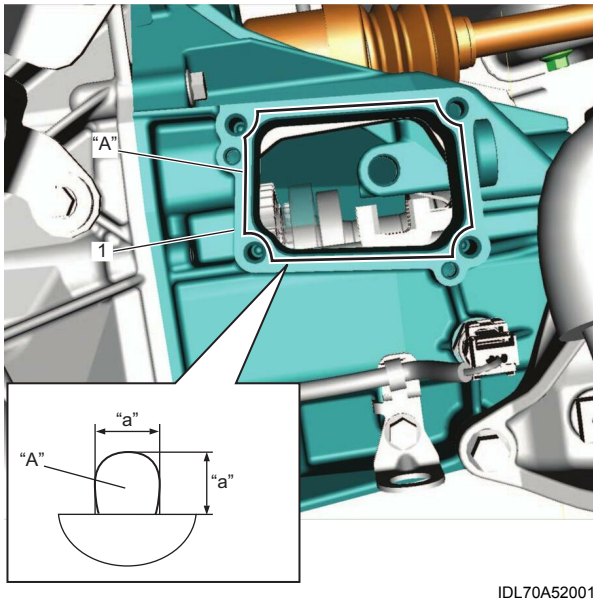


IDL70A520016-01

Installation

1) Clean mating surface of both gear shift and select shaft assembly (guide case) and transaxle left case (1), apply sealant to transaxle left case, and then install gear shift and select shaft assembly to transaxle left case.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

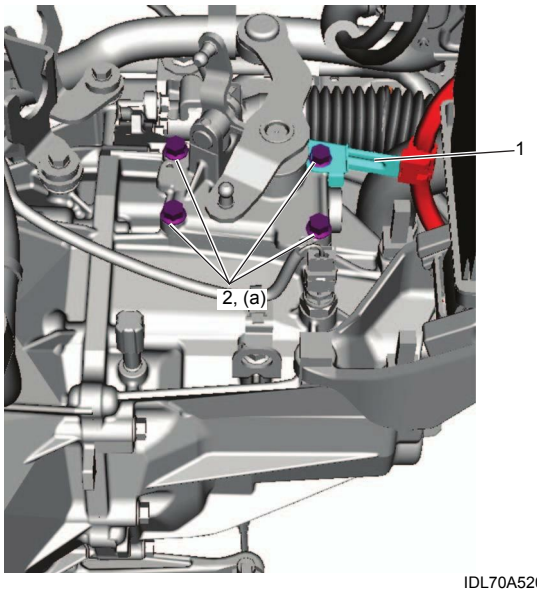


IDL70A520017-02

"a": 1.5 mm (0.059 in.)

2) Install engine harness bracket (1) and tighten gear shift guide case bolts (2) to specified torque.

Tightening torque
Gear shift guide case No.1 bolt and No.2 bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

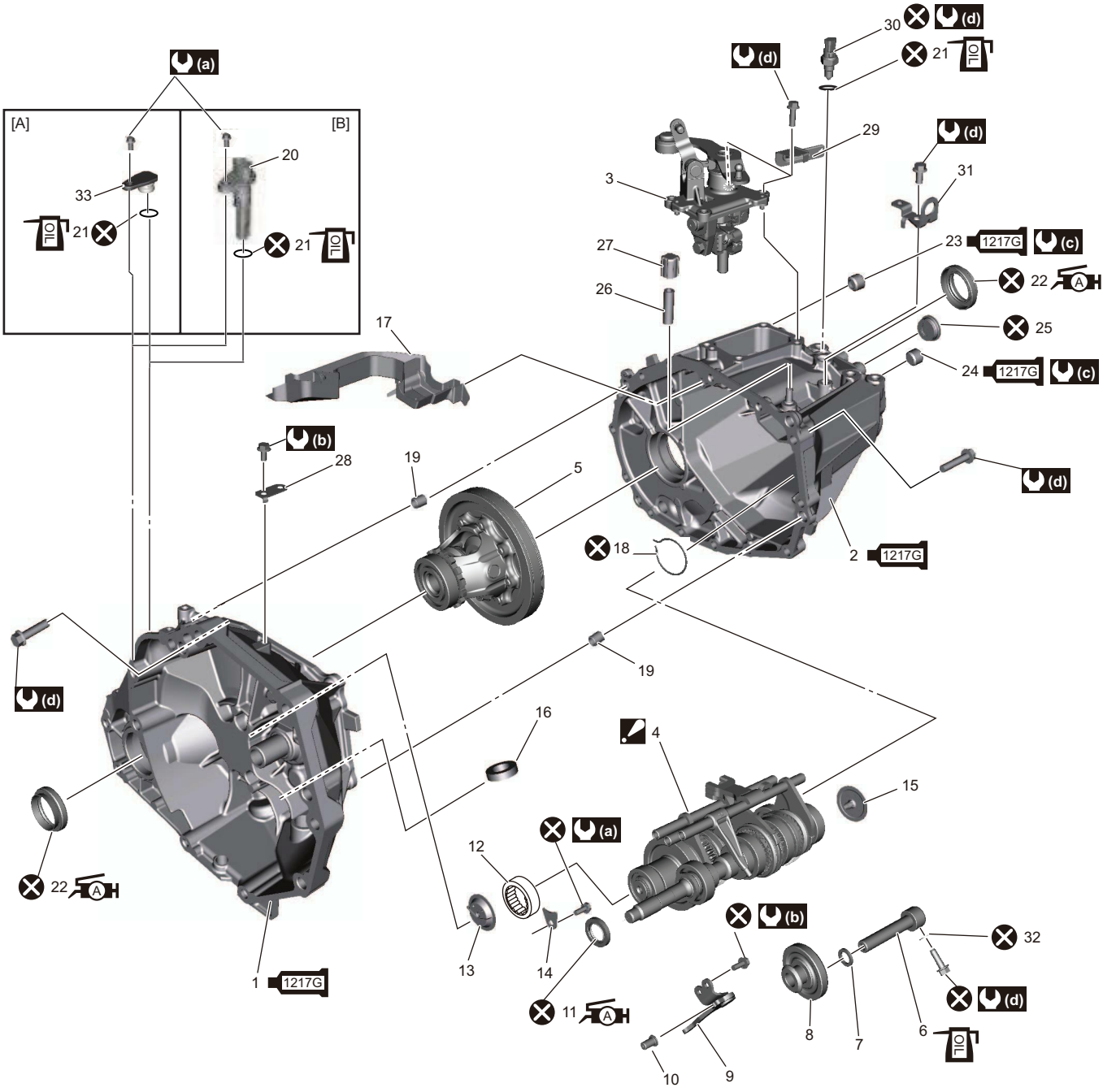


IDL70A520019-01

3) Connect gear shift and select control cables to transaxle. ☞(Page 5B-8)
4) Install battery tray and battery.
5) Check input shaft for rotation in each gear position.

Manual Transaxle Assembly Components

AENDL70A5206014



IDL70A520114-02

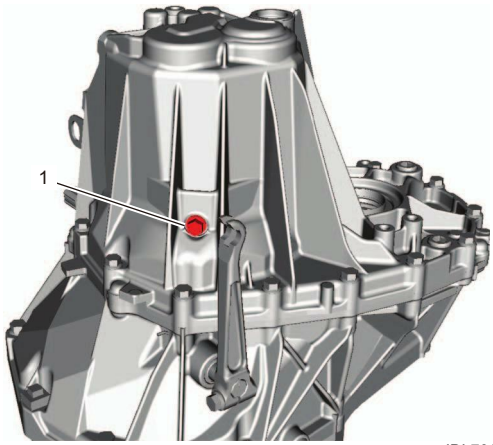
[A]: For vehicle equipped with ABS	13. Countershaft oil channel	27. Breather plug
[B]. For vehicle not equipped with ABS	14. Bearing stopper plate	29. Harness No.2 bracket
1217G 1. Transaxle right case : Apply sealant 99000-31260 to mating surface of right case and left case.	15. Input shaft oil channel	30. Back up light switch
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and gear shift and select shaft assembly.	16. Magnet	31. Transmission hook
3. Gear shift and select shaft assembly.	17. Oil gutter	32. Gasket
4. Input shaft and countershaft assembly : For details, refer to “Manual Transaxle Assembly Disassembly and Reassembly” (Page 5B-16).	18. Countershaft circlip	33. Cap
5. Differential assembly	19. Dowel pin	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
6. Reverse gear shaft	20. VSS	(b) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
7. Washer	21. O-ring	(c) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
8. Reverse idler gear	22. Oil seal : Apply grease 99000-25011 to oil seal lip.	(d) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
9. Reverse gear shift lever	1217G 23. Oil level / filler plug : Apply sealant 99000-31260 to threads.	: Do not reuse.
10. Reverse gear shift locating ball assembly	1217G 24. Oil drain plug : Apply sealant 99000-31260 to threads.	: Apply transaxle oil.
11. Input shaft oil seal : Apply grease 99000-25011 to oil seal lip.	25. Transaxle case plug	
12. Countershaft right bearing outer race	26. Breather hose	

Manual Transaxle Assembly Disassembly and Reassembly

AENDL70A5206016

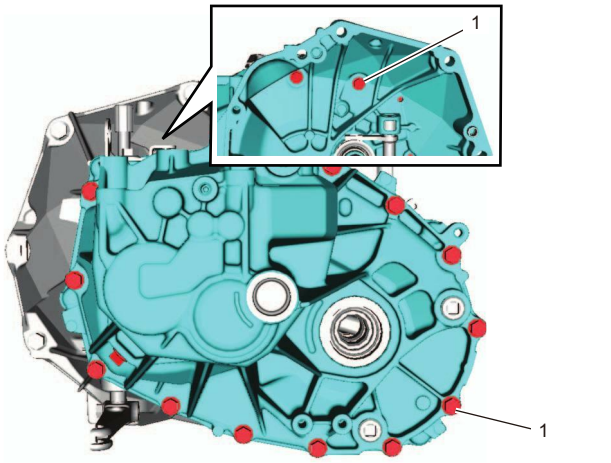
Disassembly

1) Remove gear shift and select shaft assembly. ☞(Page 5B-13)
2) Remove VSS. ☞(Page 5B-10)
3) Remove reverse gear shaft bolt (1) with gasket.



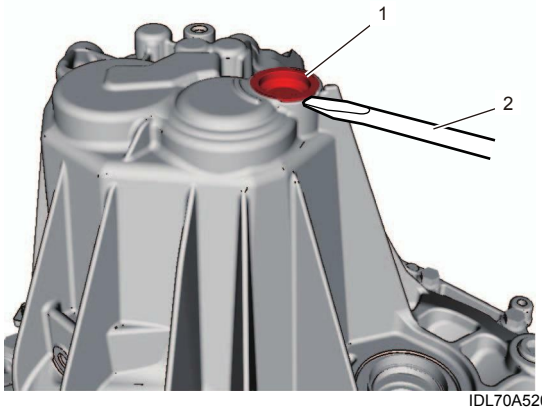
IDL70A520020-03

4) Remove transaxle case bolts (1).



IDL70A520021-02

5) Remove transaxle case plug (1) with flat-bladed screwdriver (2) or the like.



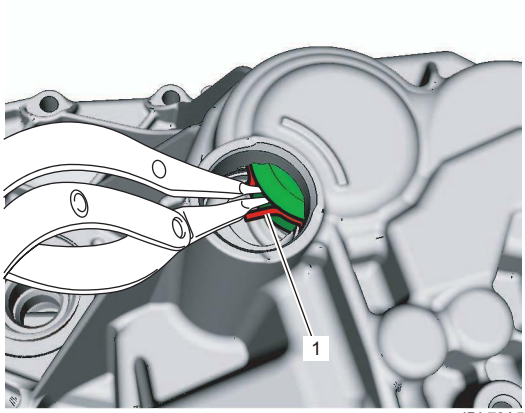
IDL70A520022-01

6) While expanding countershaft circlip (1) to unhook it from bearing groove, remove transaxle left case (2) from right case using special tool.

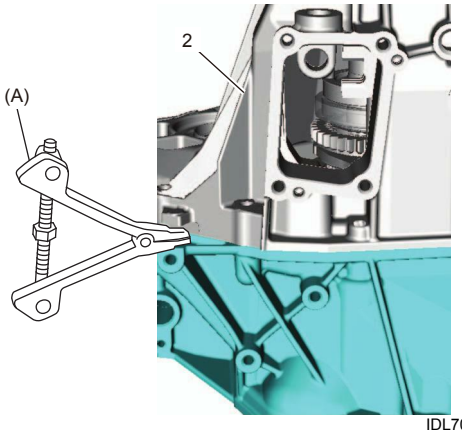
NOTE

When removing transaxle left case, circlip comes out with left case and bearing remains at countershaft side.

Special tool
(A): 09912M34510



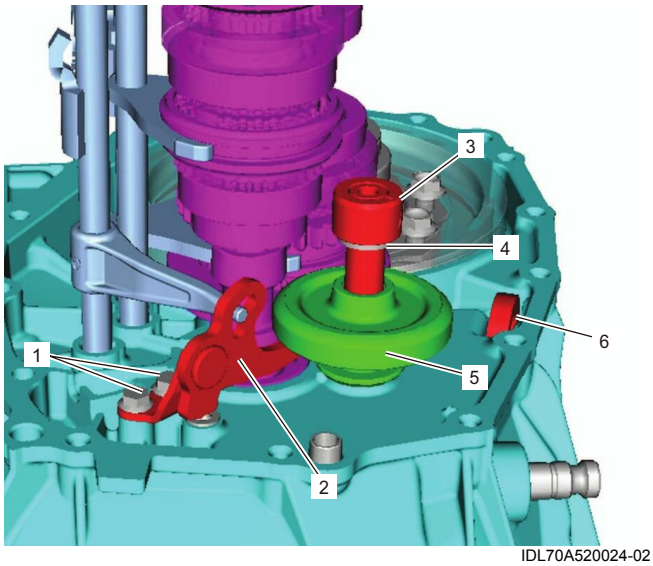
IDL70A520115-02



IDL70A520023-02

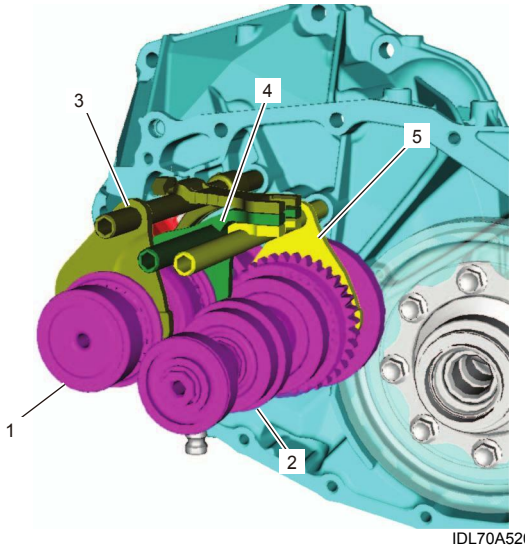
3. Countershaft left bearing

7) Remove reverse gear shift lever bolts (1) and reverse gear shift lever (2).
8) Remove reverse gear shaft (3), washer (4) and reverse idler gear (5).
9) Remove magnet (6) from right case.



IDL70A520024-02

10) Remove differential assembly from transaxle right case.
11) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, and then take out input shaft assembly (1), countershaft assembly (2), 5th and reverse gear shift shaft (3), high speed gear shift shaft (4) and low speed gear shift shaft (5).



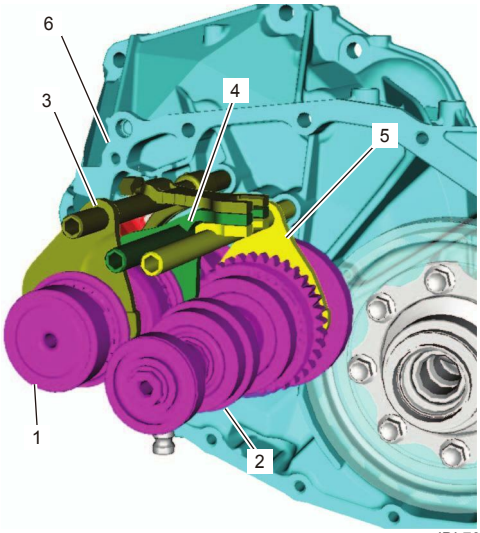
IDL70A520025-02

Reassembly

1) Install differential assembly into transaxle right case.
2) Join input shaft assembly (1), countershaft assembly (2), 5th and reverse gear shift shaft (3), high speed gear shift shaft (4) and low speed gear shift shaft (5) all together, and then install them into transaxle right case (6) so as not to damage oil seal by input shaft spline.

NOTE

- **Input shaft right bearing on shaft can be installed into transaxle right case (6) by tapping shaft with plastic hammer.**
- **Check that countershaft is engaged with final gear while installing.**



IDL70A520026-01

3) Install reverse idler gear (1), washer (2), reverse gear shaft (3) and reverse gear shift lever (4), and then tighten new reverse gear shift lever bolts (5) to specified torque.

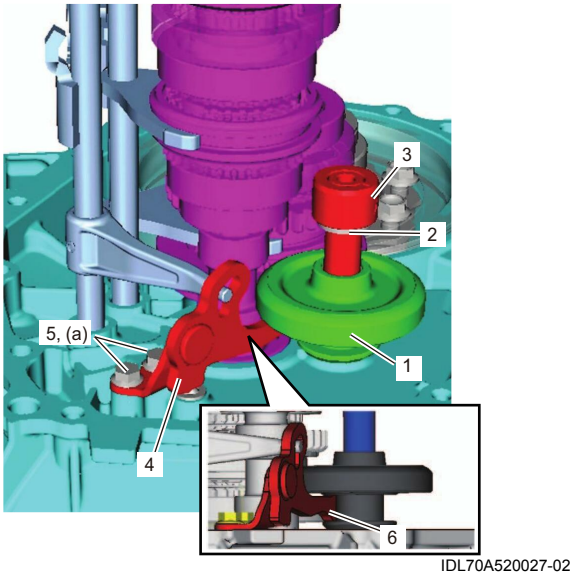
NOTICE

The reverse gear shift lever bolts are pre-coated with adhesive. If these bolts are reused, they may work loose.
Replace the reverse gear shift lever bolts with new ones whenever they are removed.

NOTE

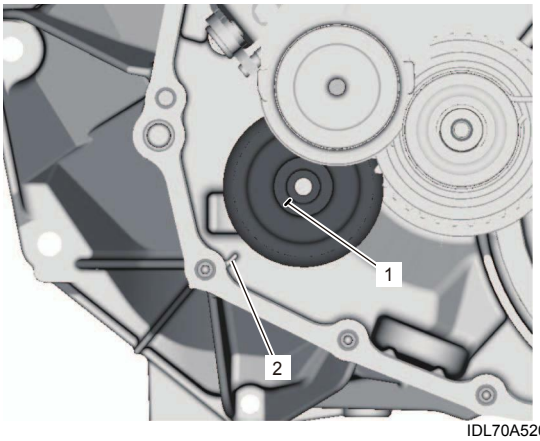
Position reverse gear shift lever not to touch outside diameter (6) of idler gear sleeve.

Tightening torque
Reverse gear shift lever bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



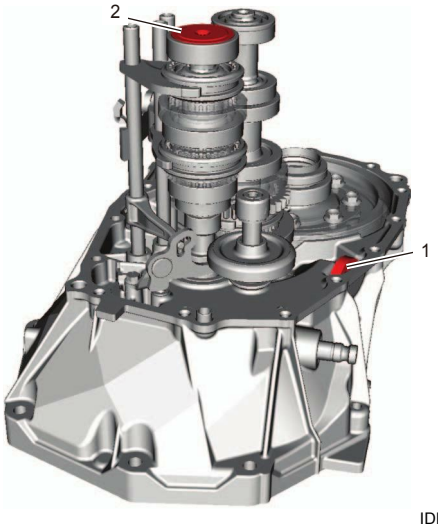
IDL70A520027-02

4) Align matchmark (1) of reverse idler gear assembly with matchmark (2) of transaxle right case.



IDL70A520028-01

5) Install magnet (1) to right case and input shaft oil channel (2) to input shaft.

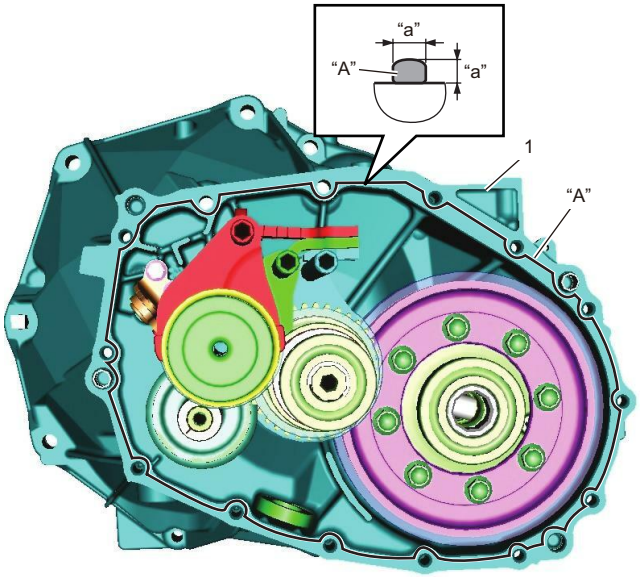


IDL70A520029-01

6) Clean mating surfaces of both right and left cases, and apply sealant to transaxle right case (1) as shown in figure.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant amount for transaxle right case
"a": 1.5 mm (0.059 in.)

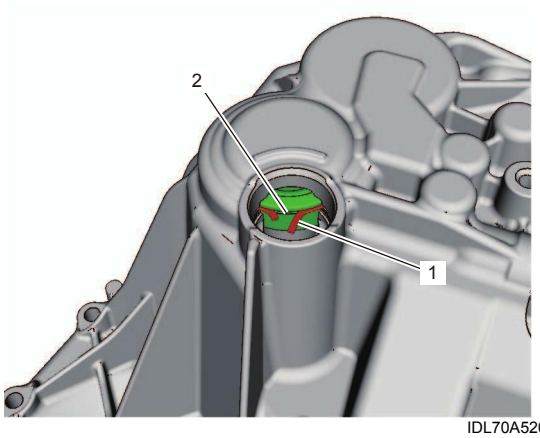


IDL70A520030-02

7) While expanding countershaft circlip (1) not to fit it into bearing groove (2), install transaxle left case onto right case, and install transaxle case bolts temporarily.
8) Turn transaxle assembly upside down so that countershaft bearing fits in left case and circlip fits in bearing groove.

NOTICE

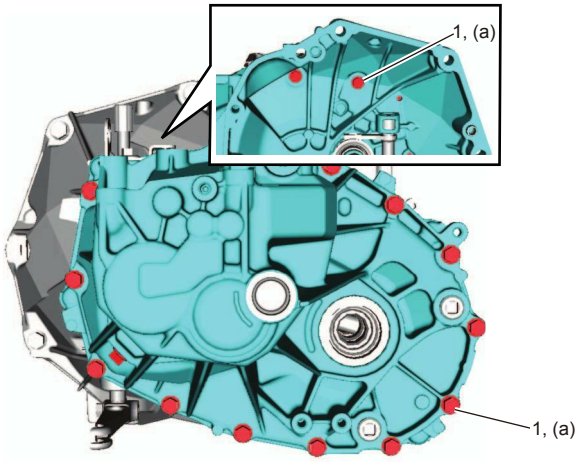
Fitting failure of circlip (1) into bearing groove (2) causes noise or breakage of countershaft related parts because of wrong positioning of countershaft.
Make sure to fit circlip into bearing groove.



IDL70A520031-01

9) Tighten transaxle case bolts (1) to specified torque.

Tightening torque
Transaxle case bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



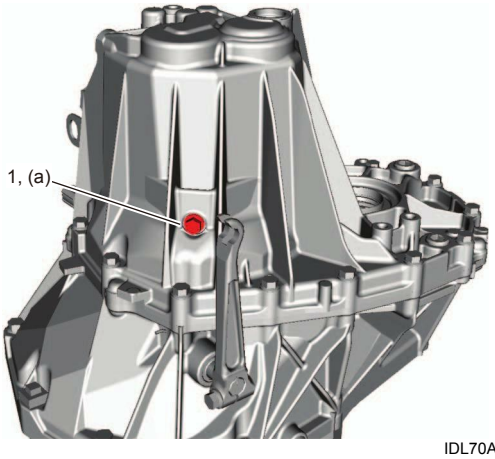
IDL70A520032-01

10) Tighten new reverse gear shaft bolt (1) with new gasket to specified torque.

NOTICE

The reverse gear shaft bolt is pre-coated with adhesive. If the bolt is reused, it may work loose.
Replace the reverse gear shaft bolt with new one whenever it is removed.

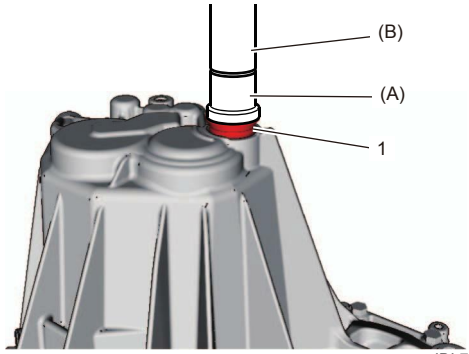
Tightening torque
Reverse gear shaft bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A520033-01

11) Install new transaxle case plug (1) using special tool.

Special tool
(A): 09924M74590
(B): 09924M74510



IDL70A520034-01

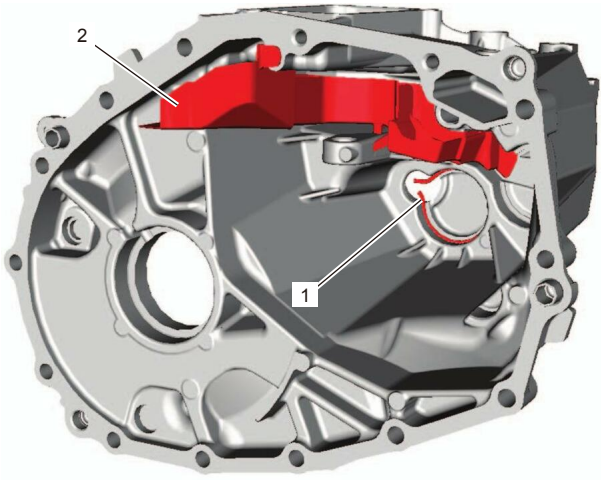
12) Install VSS. ☞(Page 5B-10)
13) Install gear shift and select shaft assembly. ☞(Page 5B-13)

Transaxle Left Case Disassembly and Reassembly

AENDL70A5206017

Disassembly

1) Remove differential side oil seal from transaxle left case, if necessary. ☞(Page 5B-6)
2) Remove circlip (1) and oil gutter (2), if necessary.



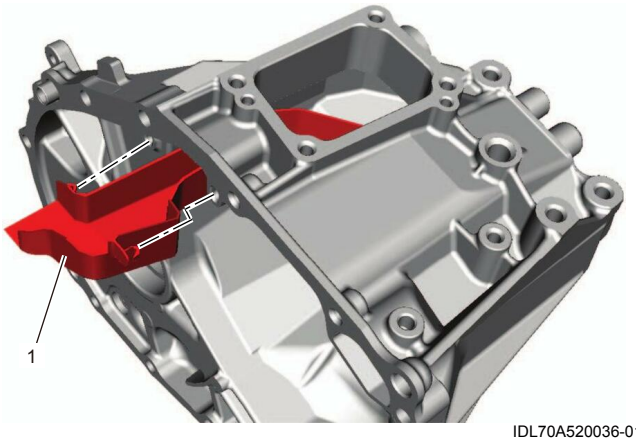
IDL70A520035-05

Reassembly

1) Install new circlip and oil gutter (1), if removed.

NOTE

When installing oil gutter, fit its claws into holes of transaxle left case securely.



IDL70A520036-01

2) Install new differential side oil seal to transaxle left case, if removed. ☞(Page 5B-6)

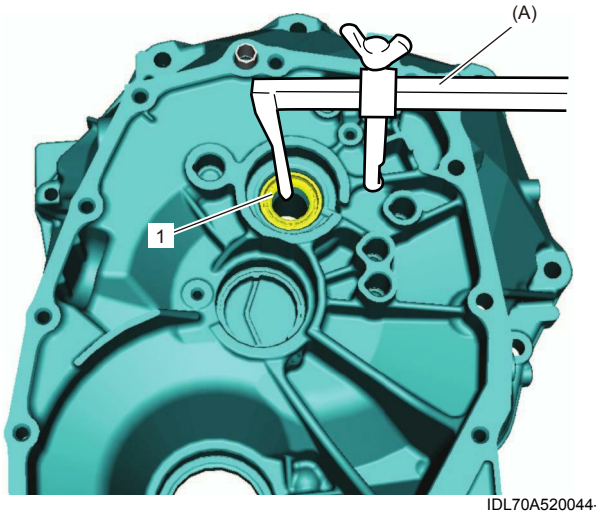
Transaxle Right Case Disassembly and Reassembly

AENDL70A5206018

Disassembly

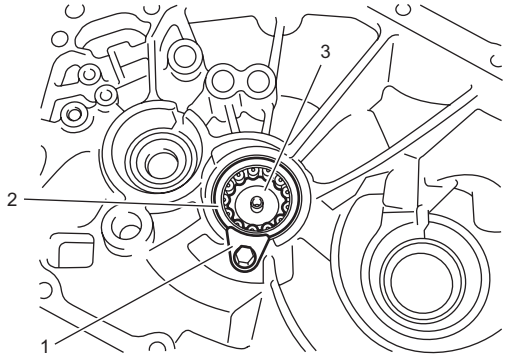
1) Remove differential side oil seal from transaxle right case, if necessary. ☞(Page 5B-6)
2) Remove input shaft oil seal (1) using special tool, if necessary.

Special tool
(A): 09913M50121



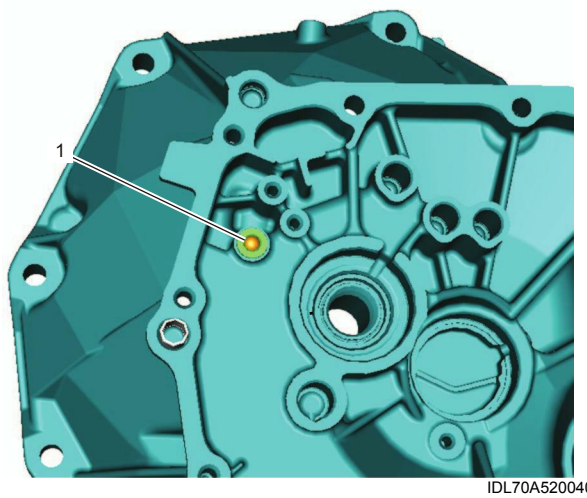
IDL70A520044-01

3) Remove bearing stopper plate (1), countershaft right bearing outer race (2) and oil channel (3), if necessary.



IDL70A520039-02

4) Remove reverse gear shift locating ball assembly (1), if necessary.



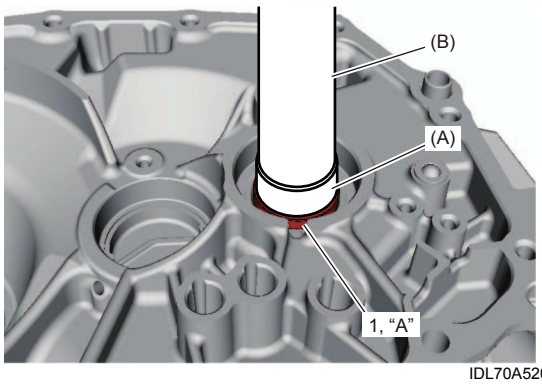
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Reassembly

1) Install new input shaft oil seal (1) facing its spring side upward up to bottom of transaxle right case hole, if removed. Use special tool and hammer for installation and apply grease to oil seal lip.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

Special tool
(A): 09926M37610M003
(B): 09913M80113

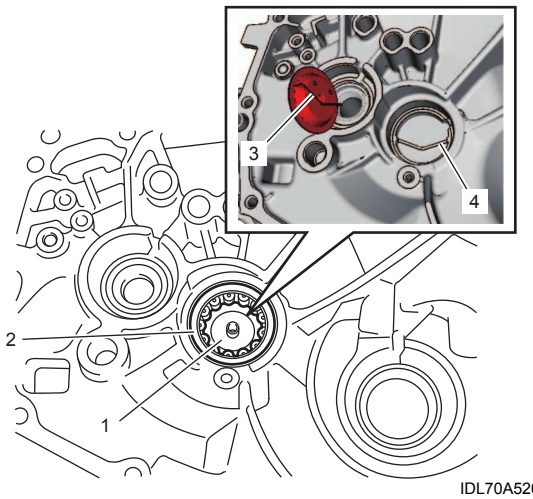


IDL70A520041-01

2) Install countershaft oil channel (1) and countershaft right bearing outer race (2), if removed.

NOTE

Install countershaft oil channel aligning its ridge (3) with ridge (4) of transaxle right case.



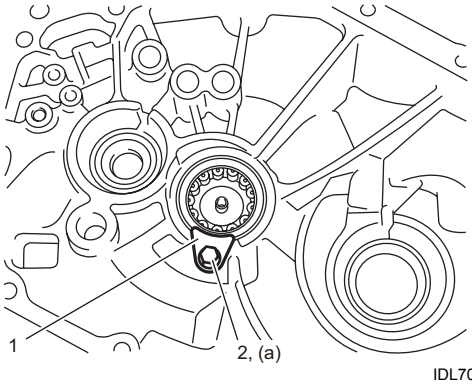
IDL70A520042-01

3) Install bearing stopper plate (1) and tighten new bearing stopper plate bolt (2) to specified torque.

NOTICE

The bearing stopper plate bolt is pre-coated with adhesive. If the bolt is reused, it may work loose.
Replace the bearing stopper plate bolt with new one whenever it is removed.

Tightening torque
Bearing stopper plate bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



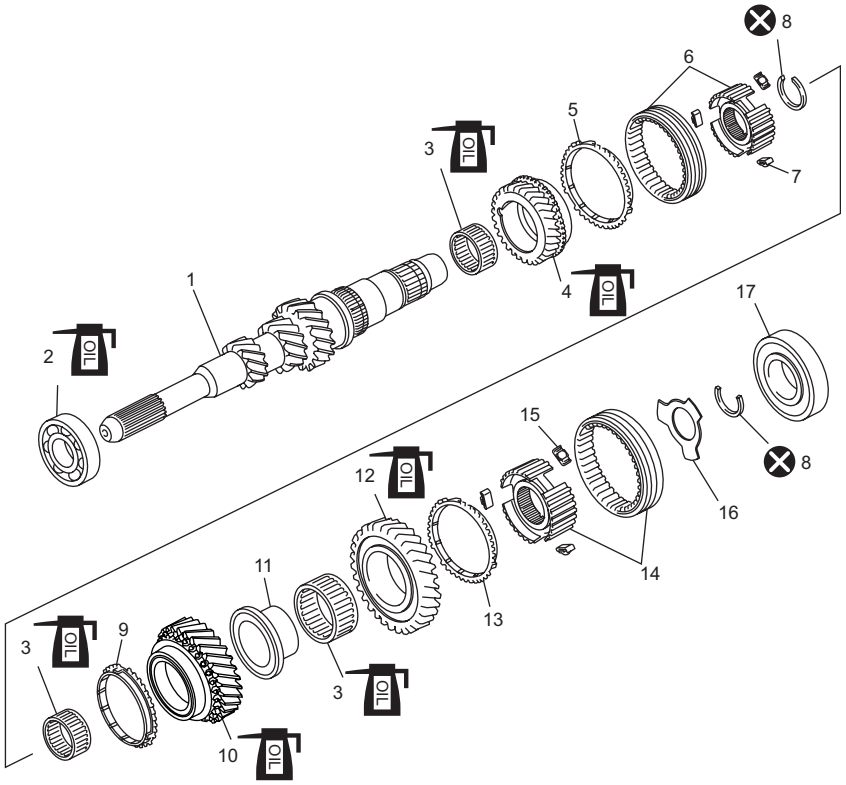
IDL70A520043-01

4) Install reverse gear shift locating ball assembly, if removed.

5) Install new differential side oil seal to transaxle right case, if removed. ☞(Page 5B-6)

Input Shaft Components

AENDL70A5206019



IDL70A520045-01

1. Input shaft	8. Circlip	15. 5th gear synchronizer key
2. Input shaft right bearing	9. 4th gear synchronizer ring	16. 5th gear synchronizer hub plate
3. Needle bearing	10. Input shaft 4th gear	17. Input shaft left bearing
4. Input shaft 3rd gear	11. Input shaft 5th gear spacer	: Do not reuse.
5. 3rd gear synchronizer ring	12. Input shaft 5th gear	OIL : Apply transaxle oil.
6. High speed synchronizer sleeve & hub	13. 5th gear synchronizer ring	
7. High speed synchronizer key	14. 5th gear synchronizer sleeve & hub	

Input Shaft Disassembly and Reassembly

AENDL70A5206020

Disassembly

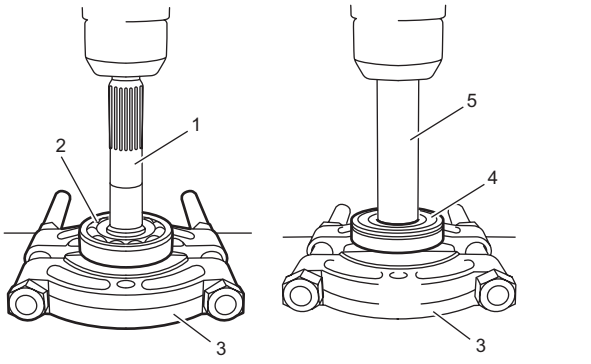
⚠ CAUTION

Using an inappropriate hydraulic press or bearing puller could cause personal injury. Use the hydraulic press and bearing puller which are capable of safely bearing a load of at least 5 tons (11,000 lbs).

NOTICE

Supporting the gear on the concave side of the bearing puller can cause damage to the gear.
Support the gear on the flat side of the bearing puller.

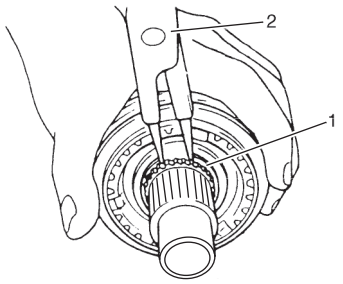
1) Remove input shaft right bearing (2) and left bearing (4) from input shaft (1) using bearing puller (3) and hydraulic press.



IDL70A520046-01

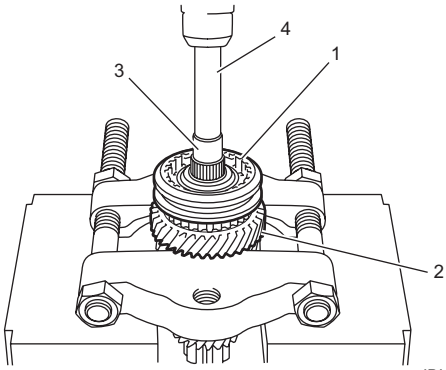
5. Metal stick

2) Remove circlip (1) using snap ring pliers (2).



IDL70A520048-01

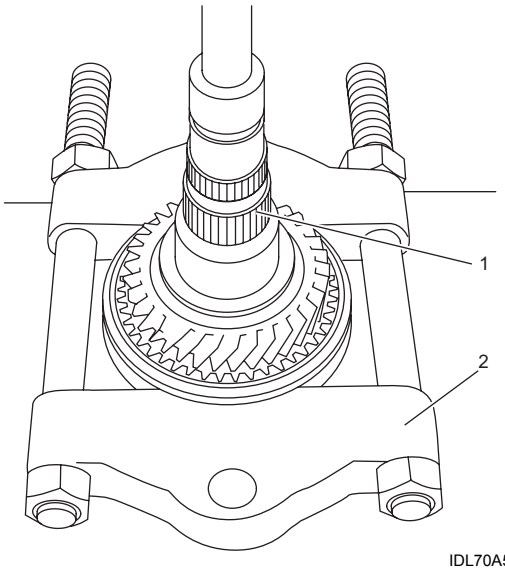
3) Remove 5th gear synchronizer hub plate.
4) Remove 5th gear synchronizer sleeve & hub assembly (1), 5th gear synchronizer ring and 5th gear (2) from input shaft (3) using bearing puller and hydraulic press.



IDL70A520049-01

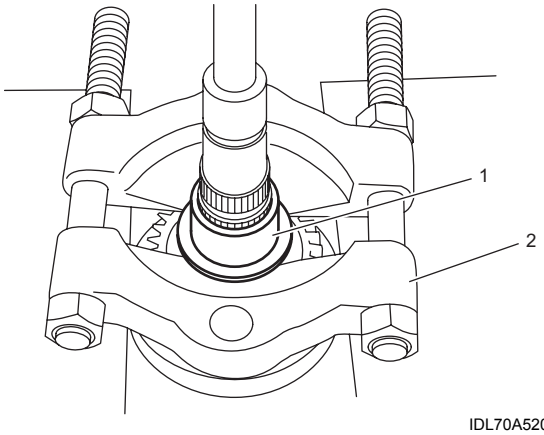
4. Metal stick

5) Remove 5th gear needle bearing from input shaft.
6) Remove 5th gear spacer according to the following procedure.
   a) Engage high speed synchronizer sleeve with 4th gear.
   b) Push down input shaft (1) a little using bearing puller (2) and hydraulic press.



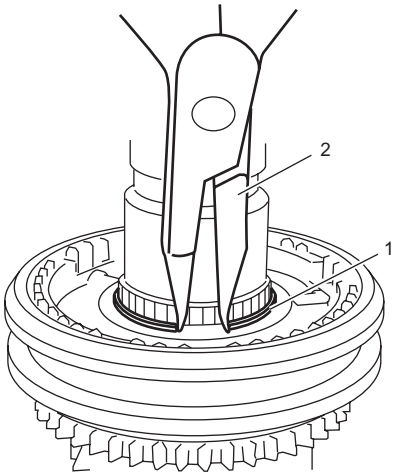
IDL70A520050-01

   c) Remove 5th gear spacer (1) using bearing puller (2) and hydraulic press.



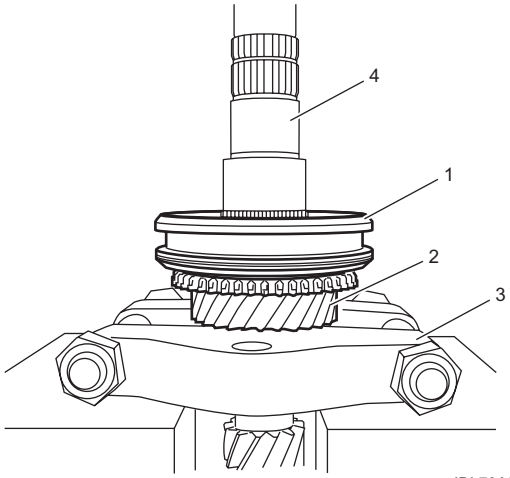
IDL70A520051-01

7) Remove 4th gear, 4th gear synchronizer ring and 4th gear needle bearing from input shaft.
8) Remove circlip (1) using snap ring pliers (2).



IDL70A520052-01

9) Remove high speed synchronizer sleeve & hub assembly (1) and 3rd gear (2) from input shaft (4) using bearing puller (3) and hydraulic press.



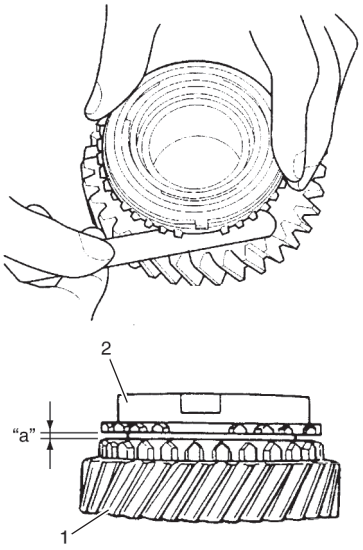
IDL70A520053-01

10) Remove 3rd gear needle bearing from input shaft.
11) Disassemble synchronizer sleeve & hub assembly.

Reassembly

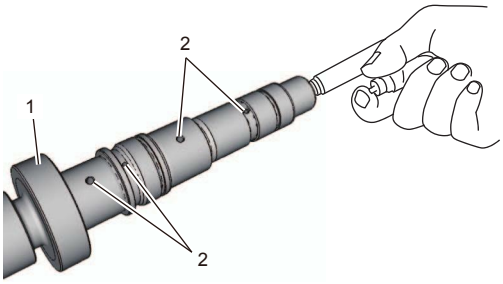
1) Clean all components thoroughly, check them for any abnormality and replace with new ones as necessary.
2) Check clearance “a” between synchronizer ring (2) and gear (1) and replace with new one, if necessary. Also, check gear teeth for damage.

Clearance “a” between synchronizer ring and gear (3rd, 4th and 5th)
Standard: 0.75 – 1.10 mm (0.030 – 0.043 in.)
Service limit: 0.45 mm (0.018 in.)



IDL70A520054-01

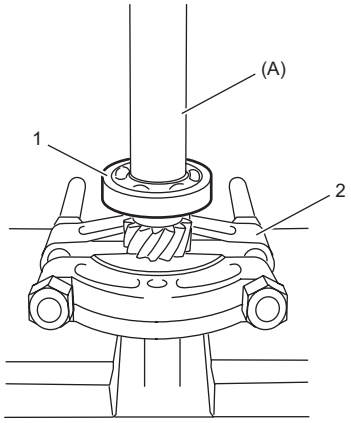
3) To ensure lubrication of input shaft (1), blow air into oil holes (2) as shown in figure and check that they are free from any obstruction.



IDL70A520055-01

4) Install right bearing (1) to input shaft (2) using special tool and hydraulic press.

Special tool
(A): 09913M80113



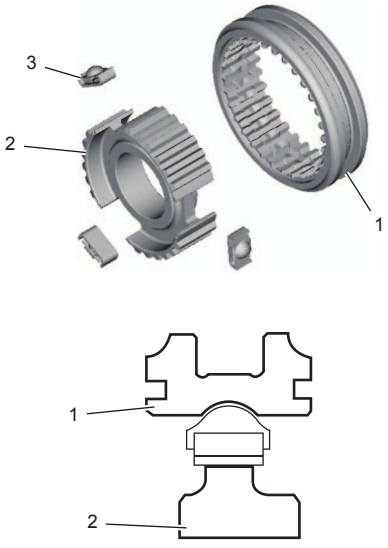
IDL70A520056-01

5) Fit high speed synchronizer sleeve (1) to hub (2) and 3 keys (3) as shown in figure.

NOTE

- **No specific direction is assigned to high speed synchronizer sleeve or each key but it is assigned as sleeve & hub assembly.**
- **Inside diameter of high speed synchronizer hub is larger than that of 5th gear synchronizer hub.**

Synchronizer key installation position



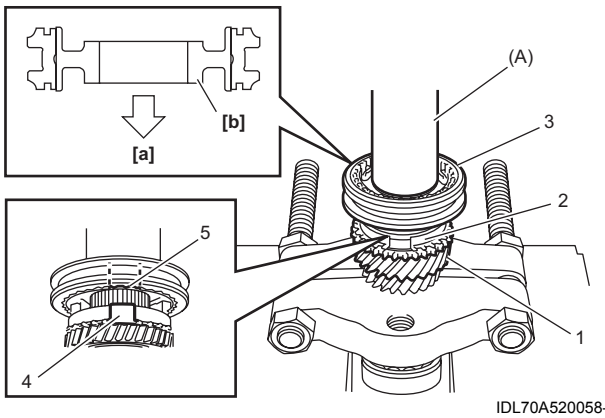
IDL70A520057-01

6) Install 3rd gear needle bearing and apply transaxle oil to it, and then install 3rd gear (1) and 3rd gear synchronizer ring (2) to input shaft.
7) Install high speed sleeve & hub assembly (3) using special tool and hydraulic press.

NOTE

- **While press-fitting sleeve & hub assembly, check that synchronizer ring keys (4) are aligned with key slots (5) in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**

Special tool
(A): 09913M84510

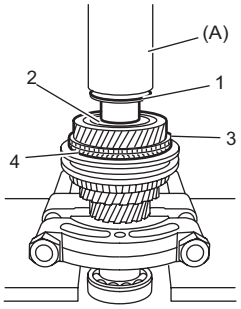


IDL70A520058-01

[a]: 3rd gear side	[b]: Long flange

8) Install new circlip.
9) Install 4th gear needle bearing (2) and apply transaxle oil to it, and then install synchronizer ring (4) and 4th gear (3).
10) Install 5th gear spacer (1) using special tool and hydraulic press.

Special tool
(A): 09913M84510



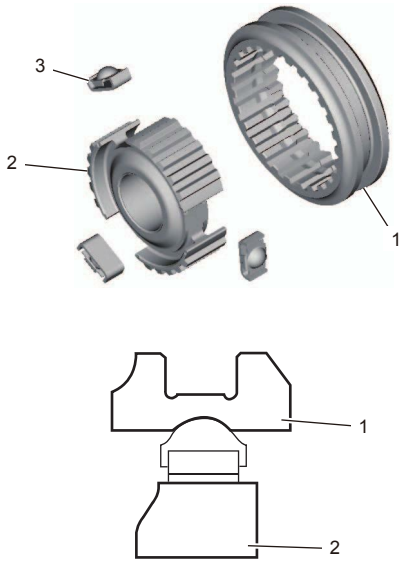
IDL70A520059-01

11) Install 5th gear needle bearing and apply transaxle oil to it, and then install 5th gear and synchronizer ring.
12) Fit 5th gear synchronizer sleeve (1) to hub (2) and 3 keys (3) as shown in figure.

NOTE

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Inside diameter of 5th gear synchronizer hub is smaller than that of high speed synchronizer hub.**

Synchronizer key installation position



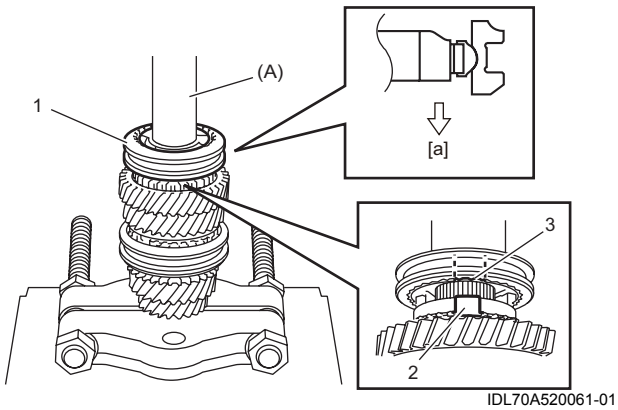
IDL70A520060-01

13) Install 5th gear synchronizer sleeve & hub assembly (1) using special tool and hydraulic press, and then install 5th gear synchronizer hub plate.

NOTE

- **While press-fitting sleeve & hub assembly, check that synchronizer ring keys (2) are aligned with key slots (3) in sleeve & hub assembly.**
- **Check free rotation of 5th gear after press-fitting sleeve & hub assembly.**

Special tool
(A): 09913M80113



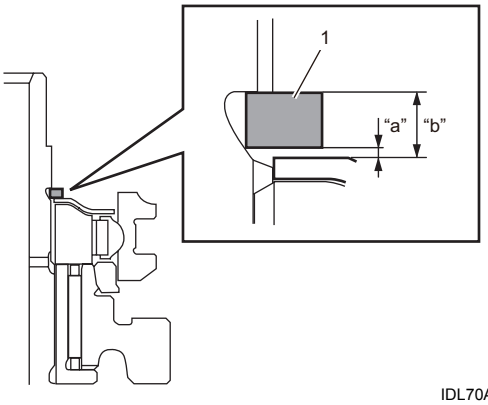
IDL70A520061-01

[a]: 5th gear side

14) Select new circlip (1) that makes thrust clearance “a” of 5th gear synchronizer hub plate 0.1 mm (0.004 in) or less and install it.

Available circlip thickness

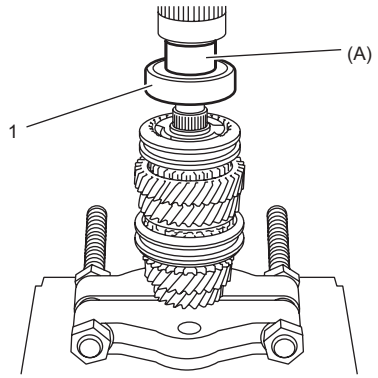
Clearance “b”	Circlip thickness
2.000 – 2.050 mm (0.0787 – 0.0807 in.)	2.00 mm (0.0787 in.)
2.050 – 2.100 mm (0.0807 – 0.0827 in.)	2.05 mm (0.0807 in.)
2.100 – 2.150 mm (0.0827 – 0.0846 in.)	2.10 mm (0.0827 in.)
2.150 – 2.200 mm (0.0846 – 0.0866 in.)	2.15 mm (0.0846 in.)
2.200 – 2.250 mm (0.0866 – 0.0886 in.)	2.20 mm (0.0866 in.)
2.250 – 2.300 mm (0.0886 – 0.0906 in.)	2.25 mm (0.0886 in.)



IDL70A520063-01

15) Press-fit left bearing (1) using special tool and hydraulic press.

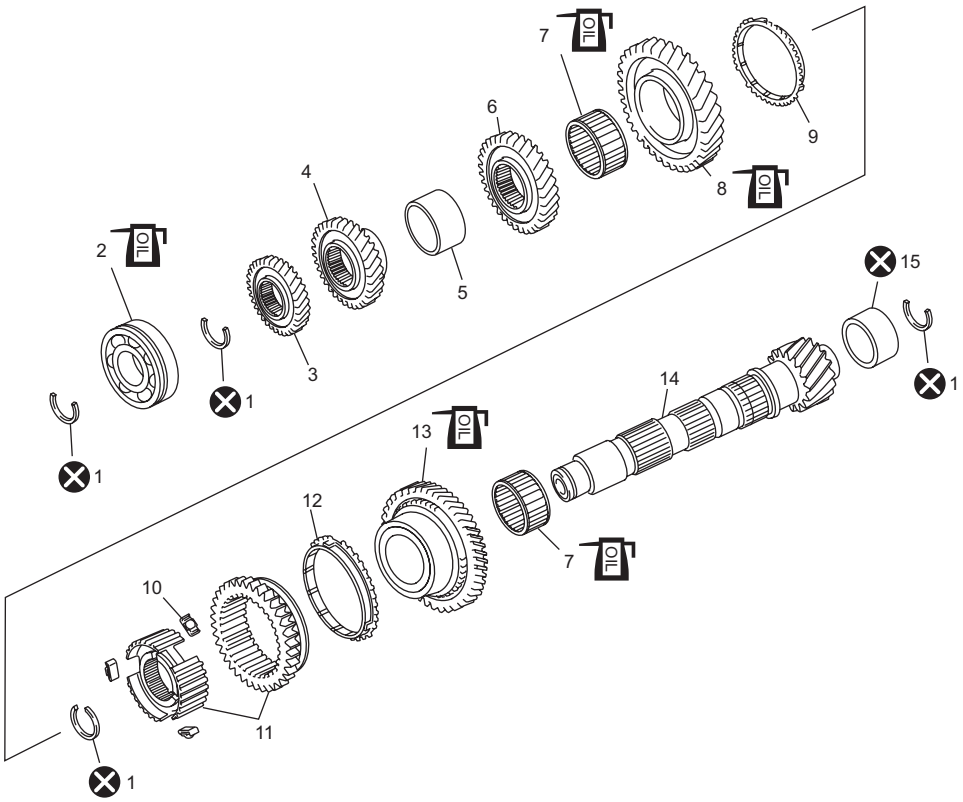
Special tool
(A): 09944M66060



IDL70A520064-01

Countershaft Components

AENDL70A5206038



IDL70A520067-01

1. Circlip	7. Needle bearing	13. Countershaft 1st gear
2. Countershaft left bearing	8. Countershaft 2nd gear	14. Countershaft

3. Countershaft 5th gear	9. 2nd gear synchronizer ring	15. Countershaft right bearing inner race
4. Countershaft 4th gear	10. Low speed synchronizer key	: Do not reuse.
5. Countershaft 3rd and 4th gear spacer	11. Low speed synchronizer sleeve & hub	: Apply transaxle oil.
6. Countershaft 3rd gear	12. 1st gear synchronizer ring	

Countershaft Disassembly and Reassembly

AENDL70A5206021

Disassembly

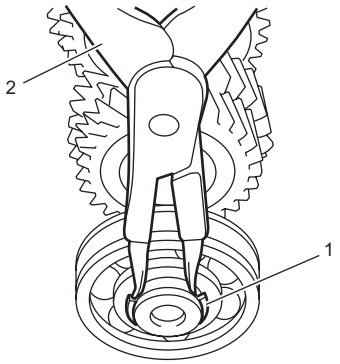
⚠ CAUTION

Using an inappropriate hydraulic press or bearing puller could cause personal injury. Use the hydraulic press and bearing puller which are capable of safely bearing a load of at least 5 tons (11,000 lbs).

NOTICE

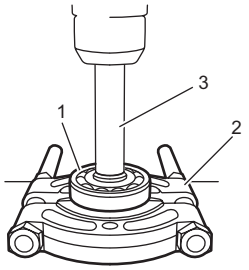
Supporting the gear on the concave side of the bearing puller can cause damage to the gear.
Support the gear on the flat side of the bearing puller.

1) Remove circlip (1) using snap ring pliers (2).



IDL70A520068-01

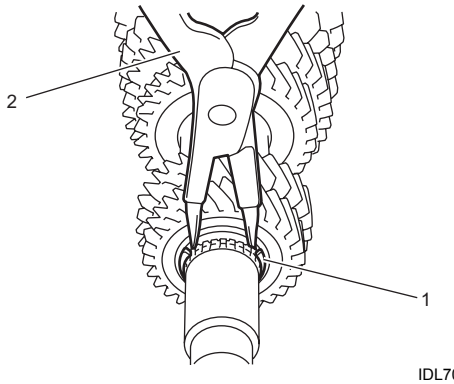
2) Remove left bearing (1) using bearing puller (2) and hydraulic press.



IDL70A520069-01

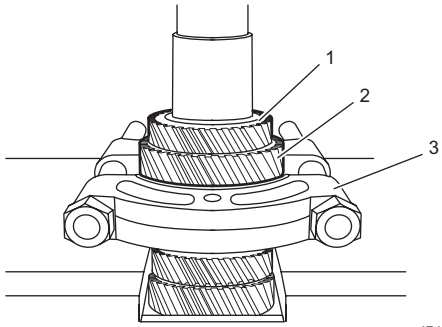
3. Metal stick

3) Remove circlip (1) using snap ring pliers (2).



IDL70A520070-01

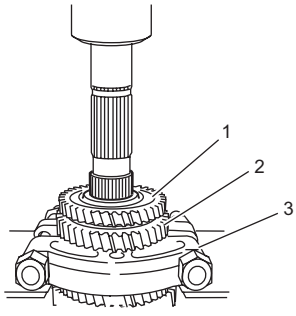
4) Apply bearing puller (3) to 4th gear (2) and remove 5th gear (1) together with 4th gear using hydraulic press.



IDL70A520072-01

5) Remove 3rd and 4th gear spacer.

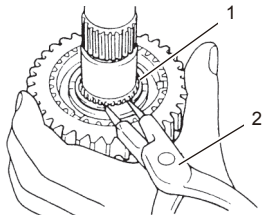
6) Apply bearing puller (3) to 2nd gear (2) and remove 3rd gear (1) together with 2nd gear using hydraulic press.



IDL70A520073-01

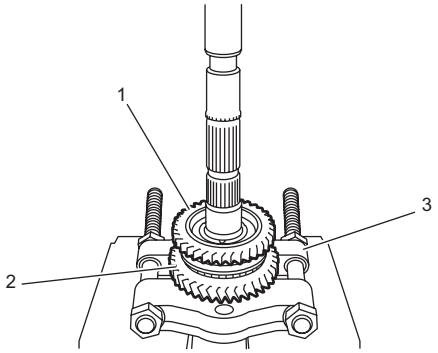
7) Remove 2nd gear synchronizer ring and 2nd gear needle bearing.

8) Remove circlip (1) using snap ring pliers (2).



IDL70A520074-01

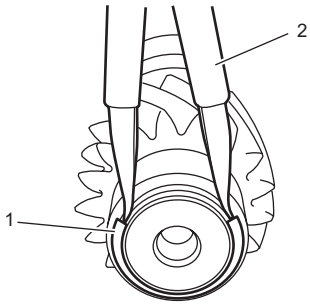
9) Apply bearing puller (3) to 1st gear (2) and remove low speed synchronizer sleeve & hub assembly (1), 1st gear synchronizer ring and 1st gear using hydraulic press.



IDL70A520075-01

10) Remove 1st gear needle bearing.

11) Remove circlip (1) using snap ring pliers (2).

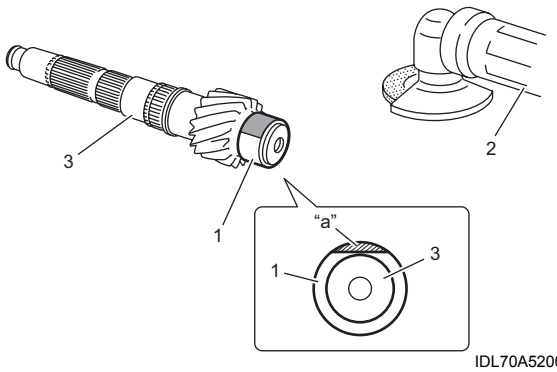


IDL70A520076-01

12) Grind portion “a” of right bearing inner race (1) using grinder (2) as shown.

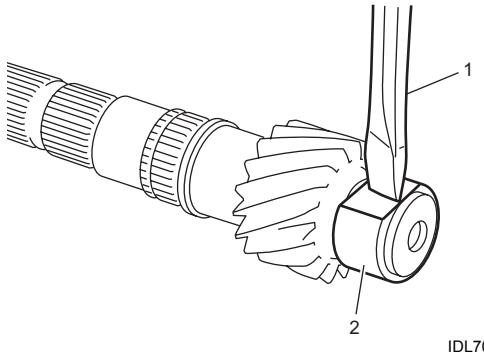
NOTICE

The shaft (3) will be damaged if the bearing is ground too much.
Limit the amount of grinding to the minimum amount necessary.



IDL70A520077-01

13) Break the thinnest portion of bearing inner race (2) with a chisel (1) and remove bearing inner race.



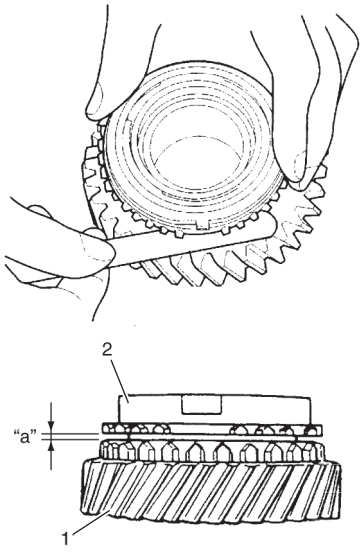
IDL70A520078-01

Reassembly

1) Clean all components thoroughly, check them for any abnormality and replace with new ones if necessary.

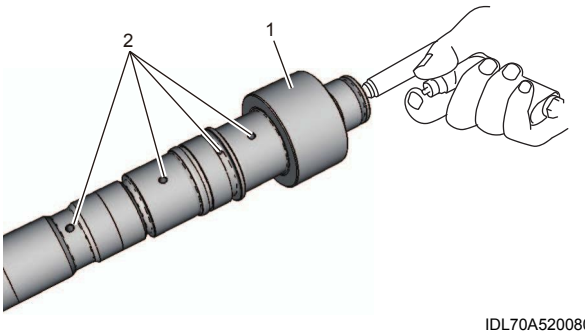
2) Check clearance “a” between synchronizer ring (2) and gear (1) and replace with new one, if necessary. Also, check gear teeth for damage.

Clearance “a” between synchronizer ring and gear (1st and 2nd)
Standard: 0.75 – 1.10 mm (0.030 – 0.043 in.)
Service limit: 0.45 mm (0.018 in.)



IDL70A520079-01

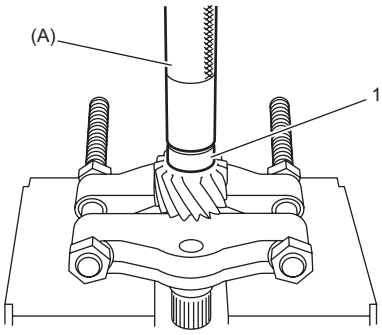
3) To ensure lubrication of countershaft (1), blow air into oil holes (2) as shown in figure and check that they are free from any obstruction.



IDL70A520080-01

4) Install right bearing inner race (1) using special tool and hydraulic press.

Special tool
(A): 09913M80113

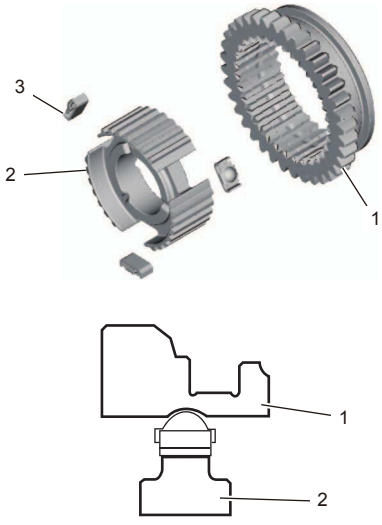


IDL70A520081-01

5) Install new circlip.
6) Fit low speed synchronizer sleeve (1) to hub (2) and 3 keys (3) as shown in figure.

NOTE

No specific direction is assigned to low speed synchronizer hub or each key but it is assigned as sleeve & hub assembly.



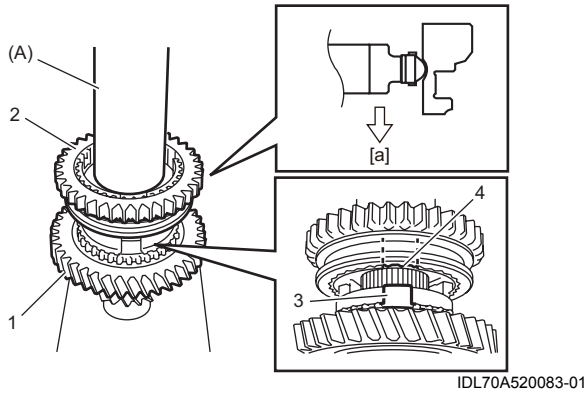
IDL70A520082-01

7) Install 1st gear needle bearing and apply transaxle oil to it, and then install 1st gear (1) and 1st gear synchronizer ring to countershaft.
8) Install low speed sleeve & hub assembly (2) using special tool and hydraulic press.

NOTE

- **While press-fitting sleeve & hub assembly, check that synchronizer ring keys (3) are aligned with key slots (4) in sleeve & hub assembly.**
- **Check free rotation of 1st gear (1) after press-fitting sleeve & hub assembly.**

Special tool
(A): 09940M51710

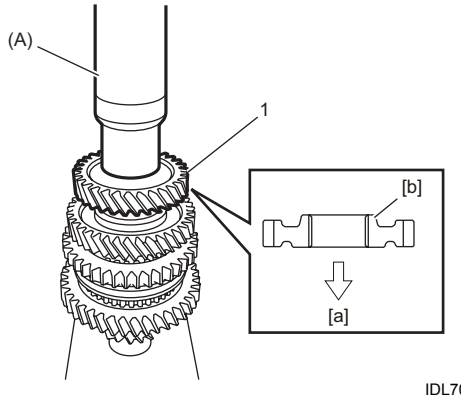


IDL70A520083-01

[a]: 1st gear side

9) Install new circlip.
10) Install 2nd gear needle bearing and apply transaxle oil to it, and then install 2nd gear synchronizer ring and 2nd gear to countershaft.
11) Install 3rd gear (1) using special tool and hydraulic press.

Special tool
(A): 09925M18011

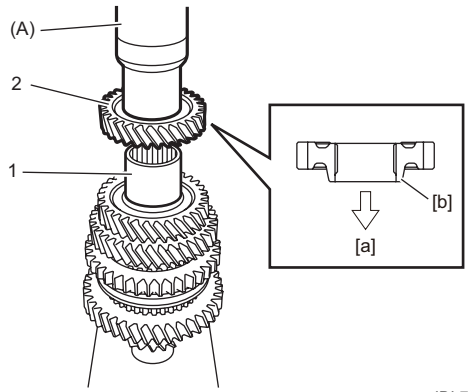


IDL70A520084-01

[a]: 2nd gear side	[b]: Long flange

12) Install 3rd and 4th gear spacer (1) and then install 4th gear (2) using special tool and hydraulic press.

Special tool
(A): 09925M18011

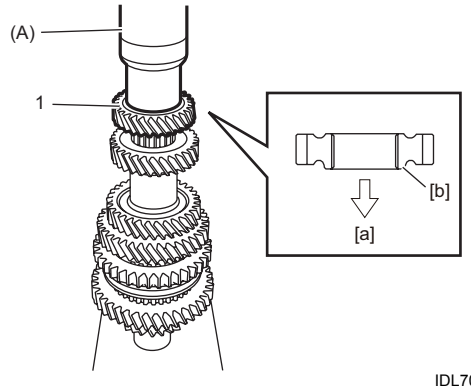


IDL70A520085-01

[a]: 3rd and 4th gear spacer side	[b]: Long flange

13) Install 5th gear (1) using special tool and hydraulic press.

Special tool
(A): 09925M18011



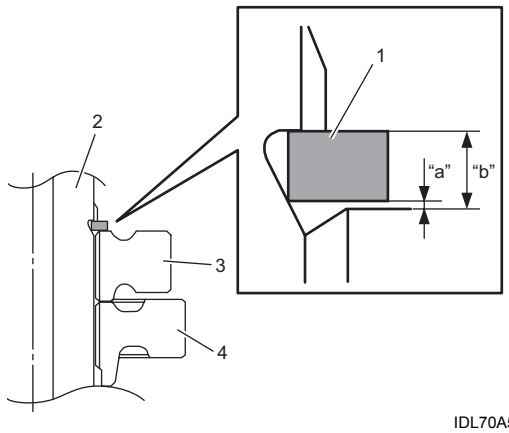
IDL70A520086-01

[a]: 4th gear side	[b]: Long flange

14) Select new circlip (1) that makes thrust clearance “a” of 5th gear 0.1 mm (0.004 in) or less and install it.

Available circlip thickness

Clearance “b”	Circlip thickness
2.150 – 2.200 mm (0.0846 – 0.0866 in.)	2.15 mm (0.0846 in.)
2.200 – 2.250 mm (0.0866 – 0.0886 in.)	2.20 mm (0.0866 in.)
2.250 – 2.300 mm (0.0886 – 0.0906 in.)	2.25 mm (0.0886 in.)
2.300 – 2.350 mm (0.0906 – 0.0925 in.)	2.30 mm (0.0906 in.)
2.350 – 2.400 mm (0.0925 – 0.0945 in.)	2.35 mm (0.0925 in.)
2.400 – 2.450 mm (0.0945 – 0.0965 in.)	2.40 mm (0.0945 in.)

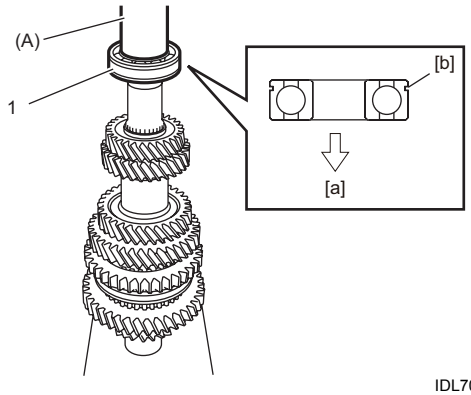


IDL70A520087-01

2. Countershaft	4. 4th gear
3. 5th gear	

15) Install left bearing (1) using special tool and hydraulic press.

Special tool
(A): 09913M80113



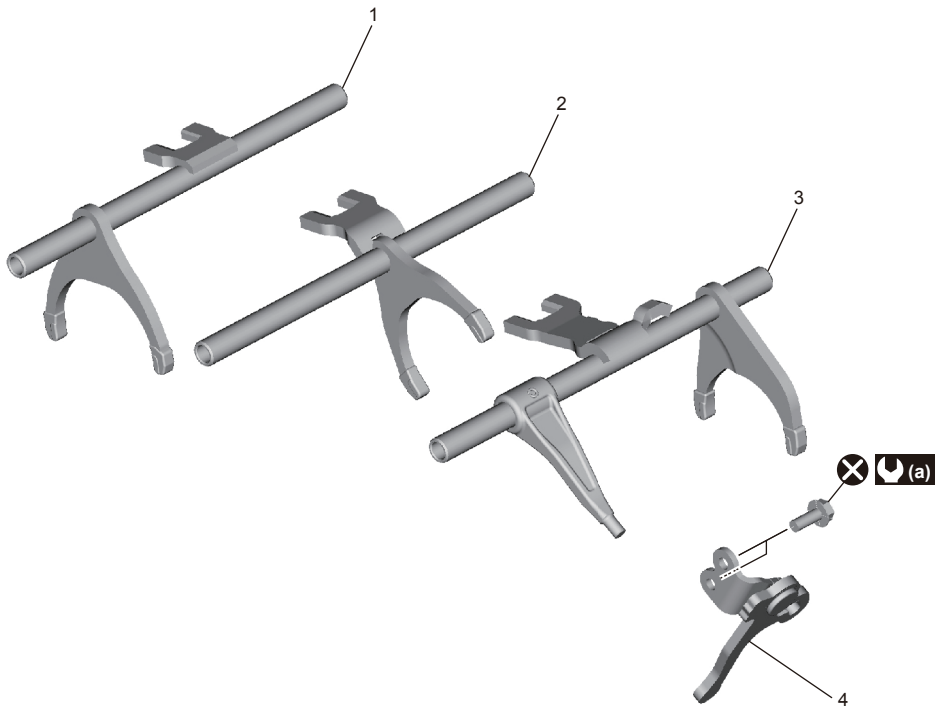
IDL70A520088-01

[a]: 5th gear side	[b]: Gloves

16) Install new circlip.

Gear Shift Shaft Components

AENDL70A5206023



IDL70A520089-01

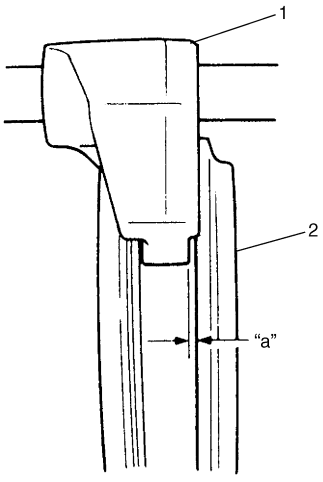
1. Low speed gear shift shaft	4. Reverse gear shift lever
2. High speed gear shift shaft	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. 5th and reverse gear shift shaft	: Do not reuse.

Gear Shift Shaft and Fork Inspection

AENDL70A5206025

1) Using feeler gauge, check clearance between fork (1) and sleeve (2) and replace those parts if it exceeds limit.

Clearance "a" between fork and sleeve
Service limit "a": 0.40 mm (0.0157 in.)

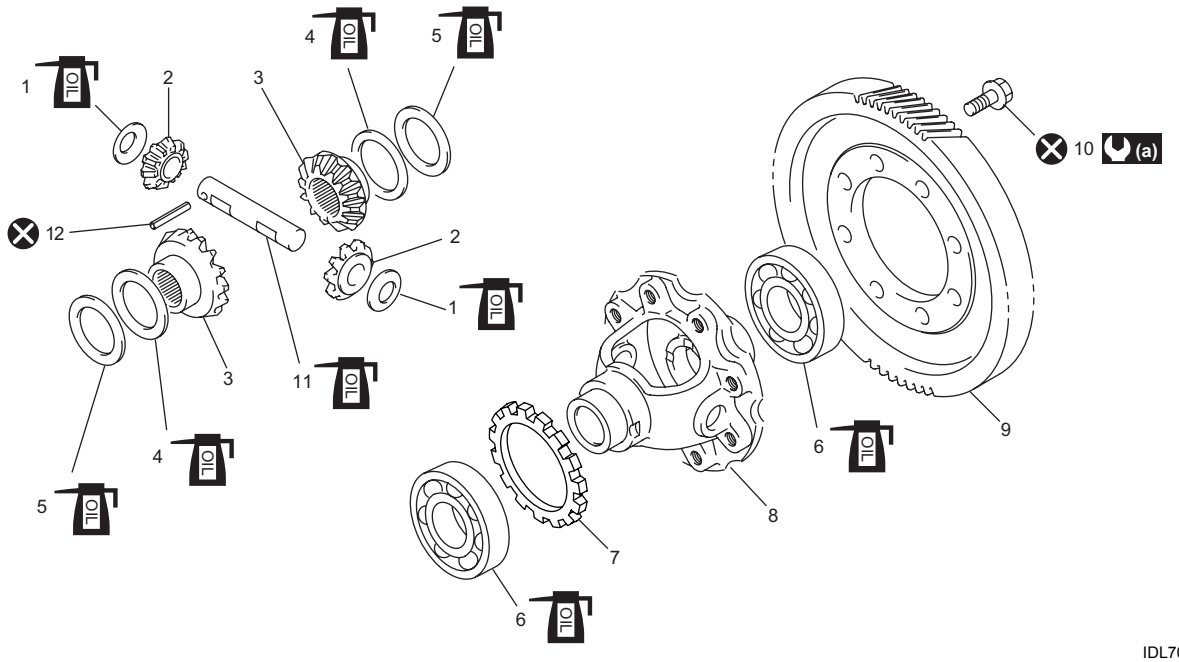


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2) Insert each gear shift shaft into case and check that it moves smoothly. If not, correct using oilstone, reamer or the like.

Differential Components

AENDL70A5206026



IDL70A520091-01

1. Differential pinion washer	6. Differential side bearing	11. Differential pinion shaft
2. Differential pinion	7. Speed sensor ring (if equipped)	12. Differential pinion shaft pin
3. Differential side gear	8. Differential case	(a) : 100 N·m (10.2 kgf-m, 74.0 lbf-ft)
4. Spring washer	9. Final gear	: Do not reuse.
5. Side gear washer	10. Final gear bolt	OIL : Apply transaxle oil.

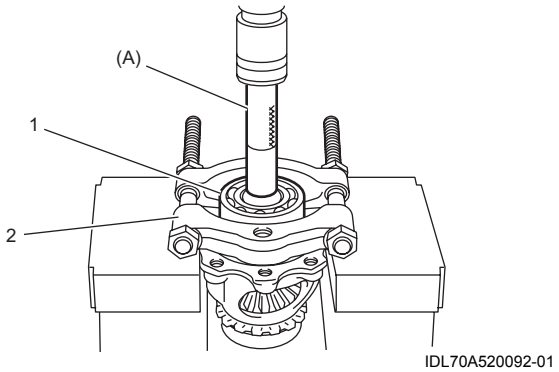
Differential Disassembly and Reassembly

AENDL70A5206027

Disassembly

1) Support differential case with soft jawed vise and remove final gear bolts, and then remove final gear.
2) Remove left side bearing (1) using special tool, bearing puller (2) and hydraulic press.

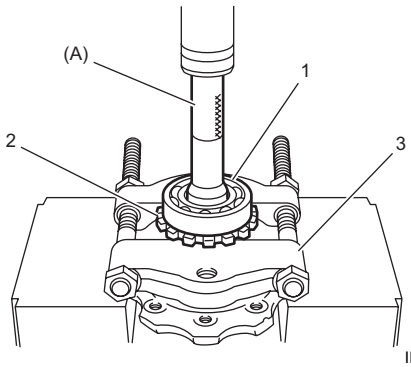
Special tool
(A): 09913M75821



IDL70A520092-01

3) Remove right side bearing (1) and speed sensor ring (if equipped) (2) using special tool, bearing puller (3) and hydraulic press. Support speed sensor ring (if equipped) or right side bearing on the flat side of the bearing puller.

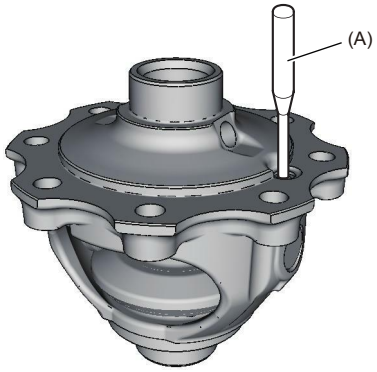
Special tool
(A): 09913M75821



IDL70A520093-01

4) Remove differential pinion shaft pin (1) using special tool and hammer, and then disassemble component parts.

Special tool
(A): 09922M85811



IDL70A520094-01

Reassembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Check that all parts are clean.

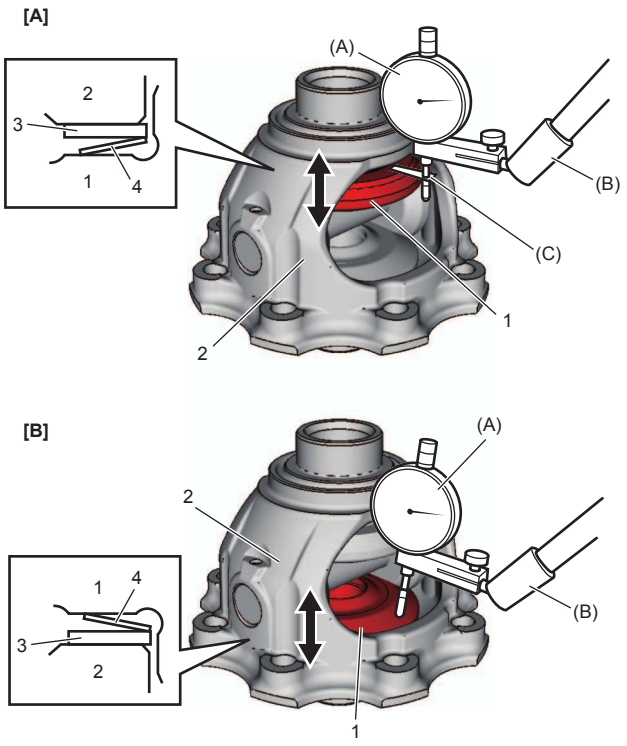
1) Install differential pinions, differential side gears (1), washers and pinion shaft to differential case (2) and measure thrust play of differential side gear at each side as follows.
   If measured value is out of specification, select suitable side gear washer (3) from the following available sizes, install it and check again.

   Special tool
   (A): 09900M20607
   (B): 09900M20701
   (C): 09952M06010

   a) Hold differential assembly with soft jawed vise and apply measuring tip or face of dial gauge to side gear as shown in figure.

   b) Move side gear up and down by hand and read dial gauge.

      Differential side gear thrust play
      0.03 – 0.31 mm (0.0012 – 0.0122 in.)



IDL70A520095-01

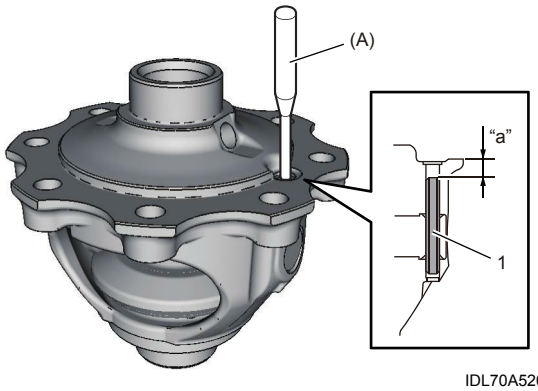
4. Spring washer	[B]: Left side
[A]: Right side	

Available side gear washer thickness

Thickness mm (in.)	Thickness mm (in.)
0.60 mm (0.0236 in.)	0.85 mm (0.0335 in.)
0.65 mm (0.0256 in.)	0.90 mm (0.0354 in.)
0.70 mm (0.0276 in.)	0.95 mm (0.0374 in.)
0.75 mm (0.0295 in.)	1.00 mm (0.0394 in.)
0.80 mm (0.0315 in.)	1.05 mm (0.0413 in.)

2) Install new differential pinion shaft pin (1) from left side until depth “a” becomes 7.20 – 7.60 mm (0.283 – 0.299 in.) as shown using special tool.

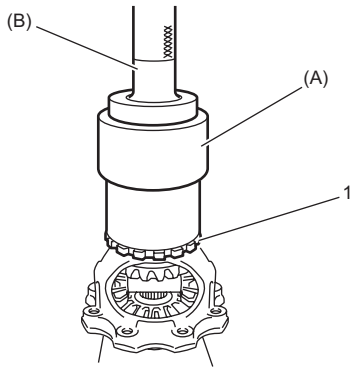
   Special tool
   (A): 09922M85811



IDL70A520096-01

3) Install speed sensor ring (1) using special tool and hydraulic press.

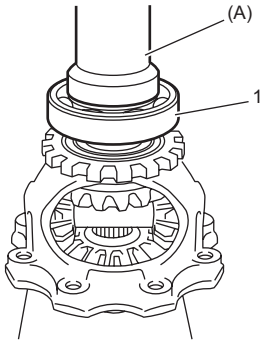
   Special tool
   (A): 09913M75510
   (B): 09944M77030



IDL70A520097-01

4) Install right side bearing (1) using special tool and hydraulic press.

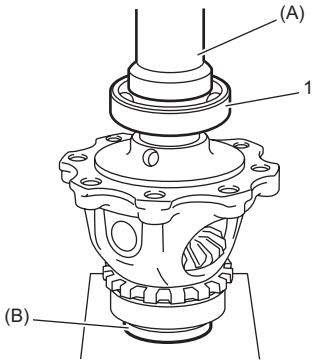
Special tool
(A): 09913M70123



IDL70A520098-01

5) Install left side bearing (1) using special tool and hydraulic press.

Special tool
(A): 09913M70123
(B): 09941M34513M004



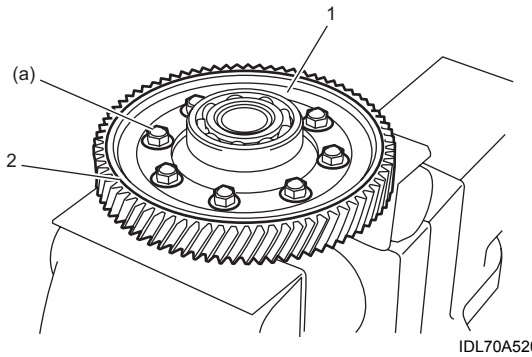
IDL70A520099-01

6) Support differential case with soft jawed vise and install final gear (1) directing its discrimination groove (2) upward, and then tighten new final gear bolts to specified torque.

NOTICE

The bolts may loosen during operation of the differential if any bolts other than the specified ones are installed.
Use only the specified new bolts.

Tightening torque
Final gear bolt (a): 100 N·m (10.2 kgf-m, 74.0 lbf-ft)



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Specifications

Tightening Torque Specifications

AENDL70A5207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Transaxle oil level / filler plug	21	2.1	15.5	☞(Page 5B-5) / ☞(Page 5B-5)
Oil drain plug	21	2.1	15.5	☞(Page 5B-5)
Back up light switch	23	2.3	17.0	☞(Page 5B-9)
VSS bolt	5	0.51	4.0	☞(Page 5B-10)
Gear shift guide case No.1 bolt and No.2 bolt	23	2.3	17.0	☞(Page 5B-14)
Reverse gear shift lever bolt	10	1.0	7.5	☞(Page 5B-18)
Transaxle case bolt	23	2.3	17.0	☞(Page 5B-19)
Reverse gear shaft bolt	23	2.3	17.0	☞(Page 5B-19)
Bearing stopper plate bolt	10	1.0	7.5	☞(Page 5B-21)
Final gear bolt	100	10.2	74.0	☞(Page 5B-34)

Reference:

For the tightening torques of fasteners not specified in this page, refer to:
“Gear Shift Control Lever and Cable Components” (Page 5B-7)
“Manual Transaxle Unit Components” (Page 5B-11)
“Gear Shift and Select Shaft Assembly Components” (Page 5B-13)
“Manual Transaxle Assembly Components” (Page 5B-15)
“Gear Shift Shaft Components” (Page 5B-31)
“Differential Components” (Page 5B-32)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A5208001

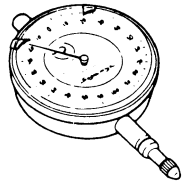
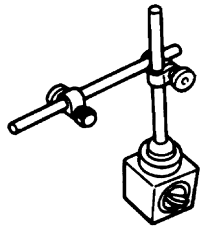
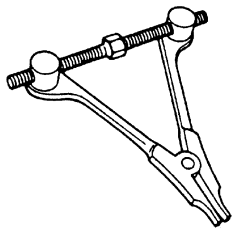
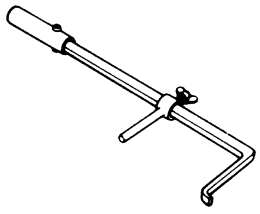
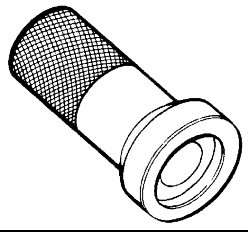
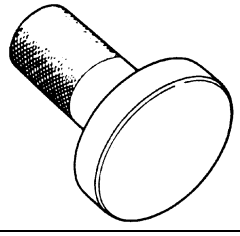
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 5B-6) / ☞(Page 5B-9) / ☞(Page 5B-21)
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞(Page 5B-5) / ☞(Page 5B-5) / ☞(Page 5B-5) / ☞(Page 5B-14) / ☞(Page 5B-19)

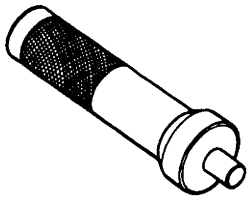
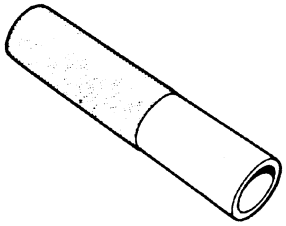
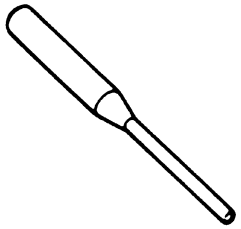
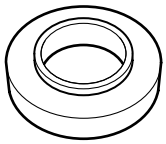
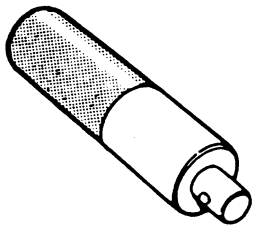
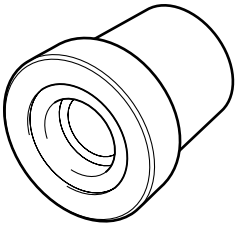
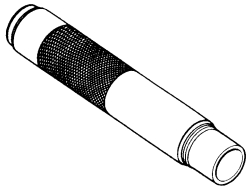
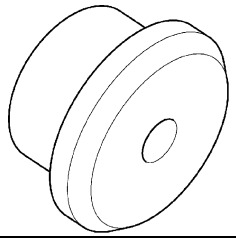
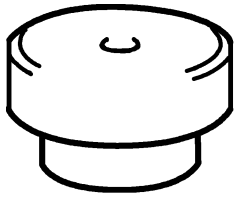
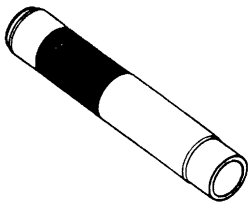
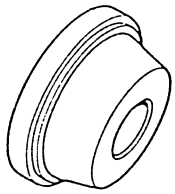
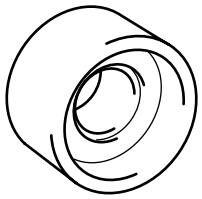
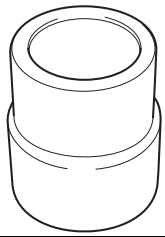
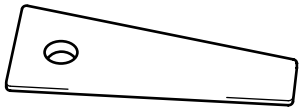
NOTE

Required service materials are also described in:
“Gear Shift Control Lever and Cable Components” (Page 5B-7)
“Manual Transaxle Assembly Components” (Page 5B-15)
“Input Shaft Components” (Page 5B-22)
“Countershaft Components” (Page 5B-26)
“Differential Components” (Page 5B-32)

Special Tool

AENDL70A5208002

09900M20607 Dial gauge ☞(Page 5B-33)		09900M20701 Magnetic stand ☞(Page 5B-33)	
09912M34510 Case separator ☞(Page 5B-17)		09913M50121 Oil seal remover ☞(Page 5B-6) / ☞(Page 5B-20)	
09913M70123 Bearing installer ☞(Page 5B-6) / ☞(Page 5B-34) / ☞(Page 5B-34)		09913M75510 Bearing installer ☞(Page 5B-33)	

09913M75821 Bearing installer attachment ☞(Page 5B-32) / ☞(Page 5B-32) 	09913M80113 Bearing installer ☞(Page 5B-21) / ☞(Page 5B-24) / ☞(Page 5B-25) / ☞(Page 5B-29) / ☞(Page 5B-30) 
09913M84510 Bearing installer ☞(Page 5B-25) / ☞(Page 5B-25) 	09922M85811 Spring pin remover (4.5 mm) ☞(Page 5B-32) / ☞(Page 5B-33) 
09924M07720 Synchronizer hub installer ☞(Page 5B-6) 	09924M74510 Bearing and oil seal handle ☞(Page 5B-6) / ☞(Page 5B-19) 
09924M74590 Input shaft oil seal installer attachment ☞(Page 5B-19) 	09925M18011 Transmission gear, bush and bearing installer ☞(Page 5B-29) / ☞(Page 5B-29) / ☞(Page 5B-30) 
09926M27610 Oil seal installer ☞(Page 5B-6) 	09926M37610M003 Bearing remover attachment ☞(Page 5B-21) 
09940M51710 Bearing installer ☞(Page 5B-29) 	09941M34513M004 Bearing installer adapter ☞(Page 5B-34) 
09944M66060 Bearing installer ☞(Page 5B-26) 	09944M77030 Bearing / cover installer support ☞(Page 5B-33) 
09952M06010 Dial gauge plate No.1 ☞(Page 5B-33) 	

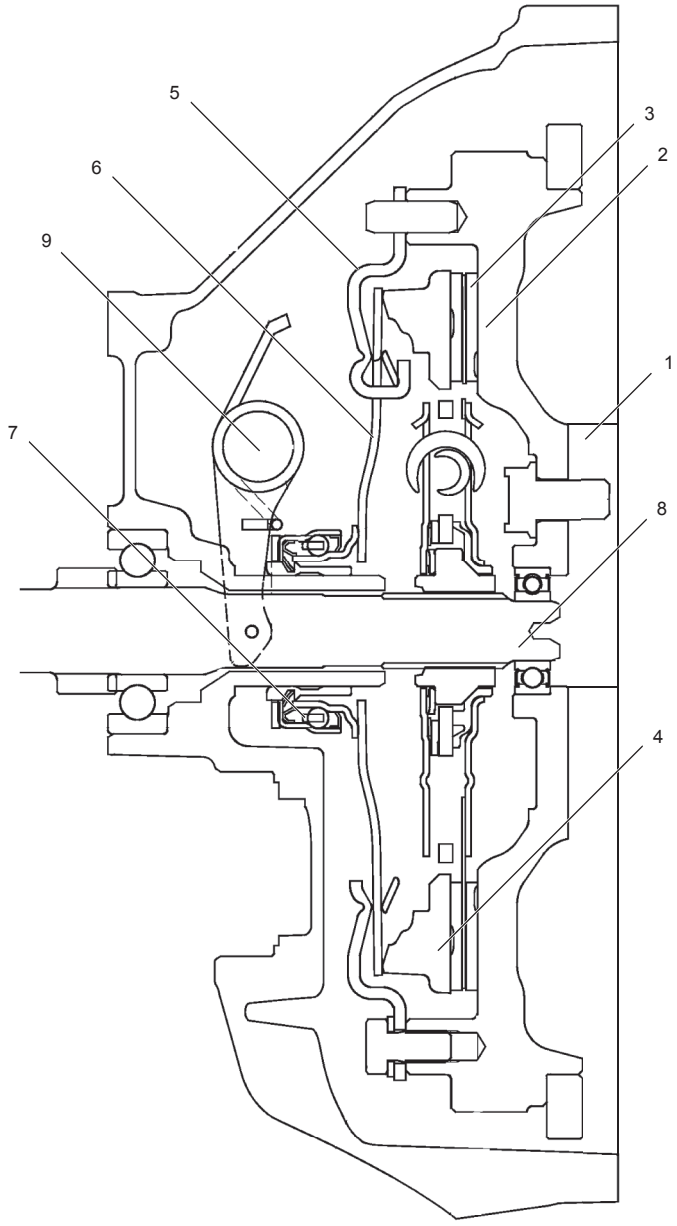
Clutch

General Description

Clutch Construction

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The clutch is a diaphragm spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapered fingers pointing inward.
The disc, carrying torsional coil springs, is positioned on the transaxle input shaft with an involute spline fit.
The clutch cover is secured to the flywheel, and carries diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against flywheel (with the disc in between), when the clutch release bearing is held back. This is the engaged condition of the clutch.
Depressing the clutch pedal causes the release bearing to advance and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, diaphragm spring pulls the pressure plate away from flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transaxle input shaft.



IDL70A530001-02

1. Crankshaft	4. Pressure plate	7. Release bearing
2. Flywheel	5. Clutch cover	8. Input shaft
3. Clutch disc	6. Diaphragm spring	9. Release shaft

Diagnostic Information and Procedures

Clutch System Symptom Diagnosis

AENDL70A5304001

Condition	Possible cause	Correction / Reference Item
Slipping	Maladjusted clutch cable	*Adjust clutch cable. ☞(Page 5C-4)*
	Worn or oily clutch disc surface	*Replace clutch disc. ☞(Page 5C-9)*
	Warped disc, pressure plate or flywheel surface	*Replace clutch disc, cover or flywheel.* *- Clutch disc and cover: ☞(Page 5C-9)* *- Flywheel: ☞(Page 1D-23)*
	Weakened diaphragm spring	*Replace clutch cover. ☞(Page 5C-9)*
	Rusted clutch cable	*Replace clutch cable. ☞(Page 5C-5)*
Dragging clutch	Maladjusted clutch cable	*Adjust clutch cable. ☞(Page 5C-4)*
	Weakened diaphragm spring or worn spring tip	*Replace clutch cover. ☞(Page 5C-9)*
	Rusted input shaft spline	*Lubricate input shaft spline.*
	Damaged or worn spline of transaxle input shaft	*Replace input shaft. ☞(Page 5B-22)*
	Excessively wobbly clutch disc	*Replace clutch disc. ☞(Page 5C-9)*
	Clutch facings broken or dirty with oil	*Replace clutch disc. ☞(Page 5C-9)*
Clutch vibration	Glazed (glass-like) clutch facings	*Repair or replace clutch disc. ☞(Page 5C-9)*
	Clutch facings dirty with oil	*Replace clutch disc. ☞(Page 5C-9)*
	Release bearing does not slide smoothly on input shaft bearing retainer	*Lubricate input shaft or replace release bearing. ☞(Page 5C-11)*
	Wobbly clutch disc or poor facing contact	*Replace clutch disc. ☞(Page 5C-9)*
	Weakened torsion springs in clutch disc	*Replace clutch disc. ☞(Page 5C-9)*
	Clutch disc rivets loose	*Replace clutch disc. ☞(Page 5C-9)*
	Distorted pressure plate or flywheel surface	*Replace clutch cover or flywheel.* *- Clutch disc and cover: ☞(Page 5C-9)* *- Flywheel: ☞(Page 1D-23)*
	Weakened engine mounting or loosened engine mounting bolt(s) and/or nut(s)	*Replace engine mounting or retighten engine mounting bolts and/or nuts. ☞(Page 1D-17)*
Noisy clutch	Worn or broken release bearing	*Replace release bearing. ☞(Page 5C-11)*
	Input shaft front bearing worn down	*Replace input shaft bearing. ☞(Page 5B-22)*
	Excessive rattle of clutch disc hub	*Replace clutch disc. ☞(Page 5C-9)*
	Cracked clutch disc	*Replace clutch disc. ☞(Page 5C-9)*
	Pressure plate and diaphragm spring rattling	*Replace clutch cover. ☞(Page 5C-9)*
Grabbing clutch	Clutch disc facings soaked with oil	*Replace clutch disc. ☞(Page 5C-9)*
	Clutch disc facings excessively worn	*Replace clutch disc. ☞(Page 5C-9)*
	Rivet heads protrude from clutch disc facing surface	*Replace clutch disc. ☞(Page 5C-9)*
	Weakened torsion springs	*Replace clutch disc. ☞(Page 5C-9)*

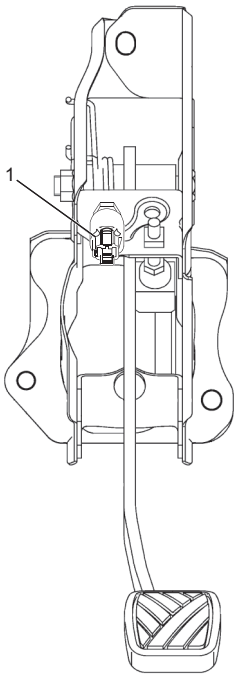
Repair Instructions

Clutch Pedal Position (CPP) Switch Removal and Installation

AENDL70A5306003

Removal

1) Disconnect connector of CPP Switch (1) with ignition OFF.
2) Remove CPP switch from clutch pedal bracket.



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Installation

1) Install CPP switch to clutch pedal bracket.
2) Adjust switch position. ☞(Page 5C-3)
3) Connect connector to CPP switch (1) securely.

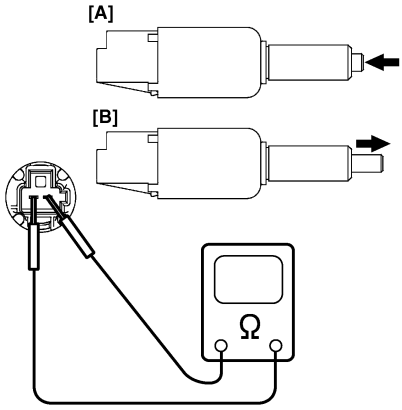
Clutch Pedal Position (CPP) Switch Inspection and Adjustment

AENDL70A5306004

Inspection

Check for resistance between terminals under each condition below. If check result is not satisfactory, replace switch.

CPP switch resistance
When switch shaft is pushed [A]: No Continuity
When switch shaft is free [B]: Continuity



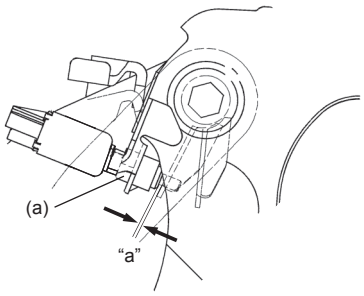
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Adjustment

With clutch pedal pulled towards driver's seat, adjust switch position so that clearance "a" between thread end and clutch pedal arm is within specification. Then tighten lock nut to specified torque.

Clearance between thread end and clutch pedal arm
"a": 0.50 – 1.50 mm (0.020 – 0.060 in.)

Tightening torque
Clutch Pedal Position switch lock nut (a): 7.5 N·m (0.76 kgf-m, 5.5 lbf-ft)



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Clutch Pedal Inspection

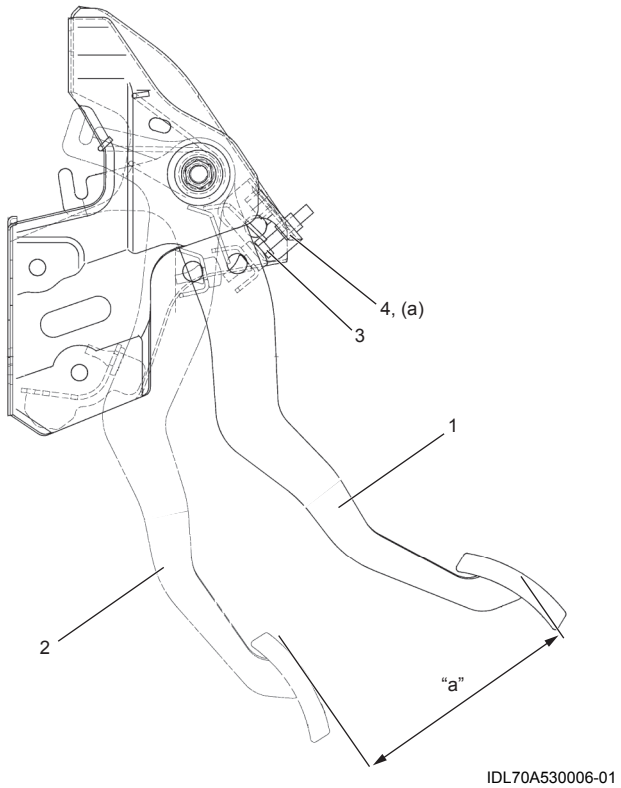
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Clutch Pedal Stroke

Measure distance between free position (1) and fully depressed position (2) on clutch pedal which is shown by "a" in figure. If clutch pedal stroke is out of specification, adjust it by turning clutch pedal adjusting bolt (3). Be sure to tighten clutch pedal lock nut (4) after adjustment.

Clutch pedal stroke
"a": 130 mm (5.12 in.)

Tightening torque
Clutch pedal lock nut (a): 5.5 N·m (0.6 kgf-m, 4.5 lbf-ft)

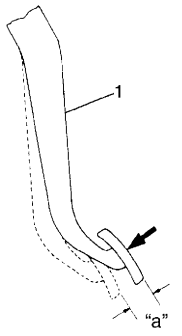


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Clutch Pedal Free Travel

1) Depress clutch pedal (1), stop at the moment when clutch resistance is felt, and measure its distance (clutch pedal free travel).
   Free travel should be within the following specification.
2) If free travel is out of specification, adjust clutch cable. ☞(Page 5C-4)

   Clutch pedal free travel “a”
   : 10 – 15 mm (0.39 – 0.59 in.)



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3) Recheck clutch pedal free travel.
   If clutch pedal free travel is out of specification, inspect clutch system.

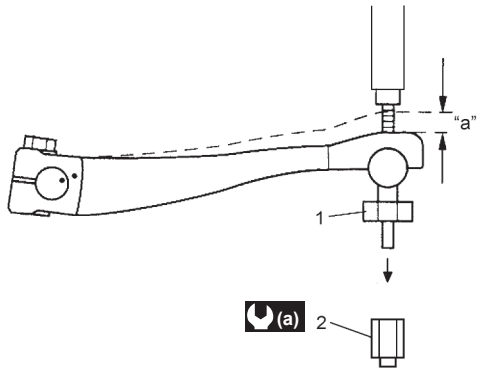
Clutch Cable Adjustment

AENDL70A5306006

1) Remove joint lock cap (2).
2) Adjust release arm free travel to specification with cable joint nut (1).

   Release arm free travel
   “a”: 0 – 2 mm (0 – 0.08 in.)

3) Install joint lock cap.

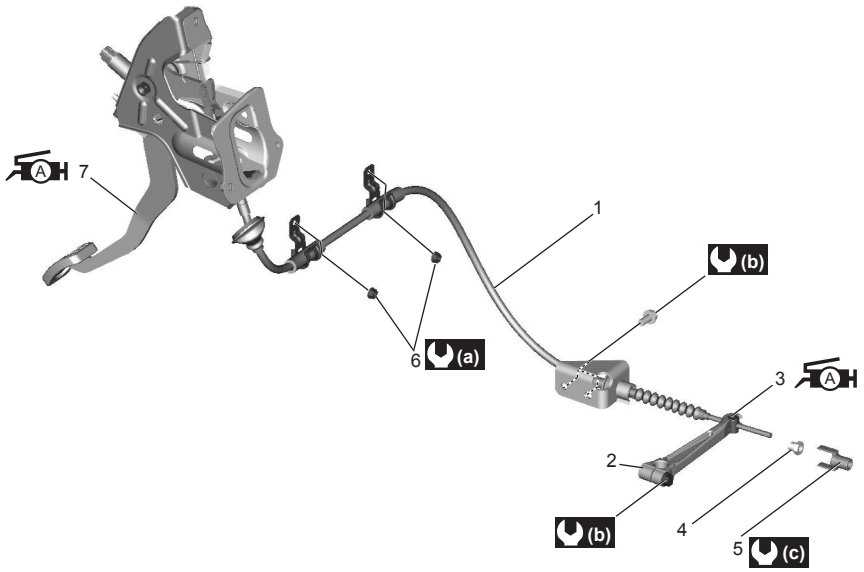


IDL70A530018-01

1) Check clutch pedal free travel referring to “Clutch Pedal Free Travel” under “Clutch Pedal Inspection” (Page 5C-3).
2) Check clutch for proper function with engine running.

Clutch Cable Components

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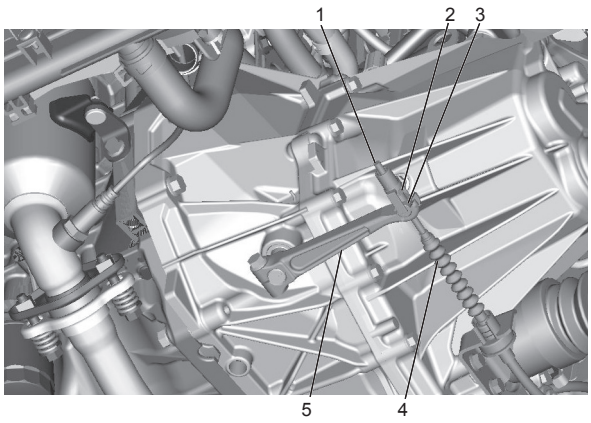
1. Clutch cable	6. Clamp bolt
2. Release arm	7. Clutch pedal : Apply grease 99000-25011 to clutch pedal refer to Step 4 of “Removal” in “Clutch Cable Removal and Installation”.
3. Joint pin : Apply grease 99000-25011 to joint pin.	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
4. Joint nut	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
5. Joint lock cap	(c) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

Clutch Cable Removal and Installation

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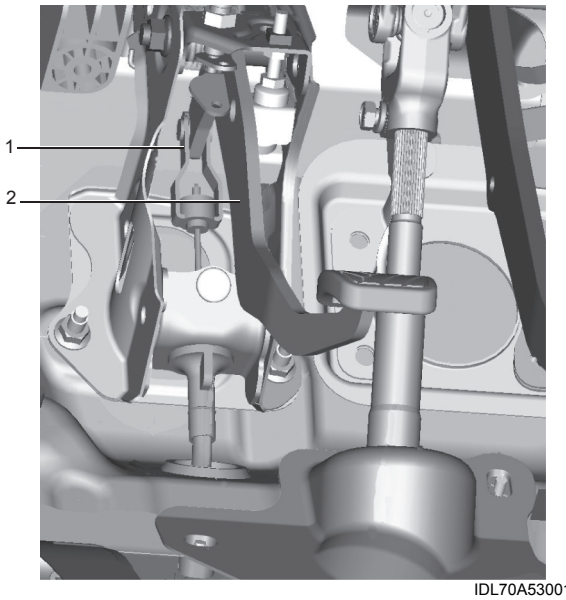
Removal

1) Remove joint lock cap (1).
2) Remove joint nut (2) and joint pin (3) from clutch cable (4).
3) Remove clutch cable (4) from release arm (5).



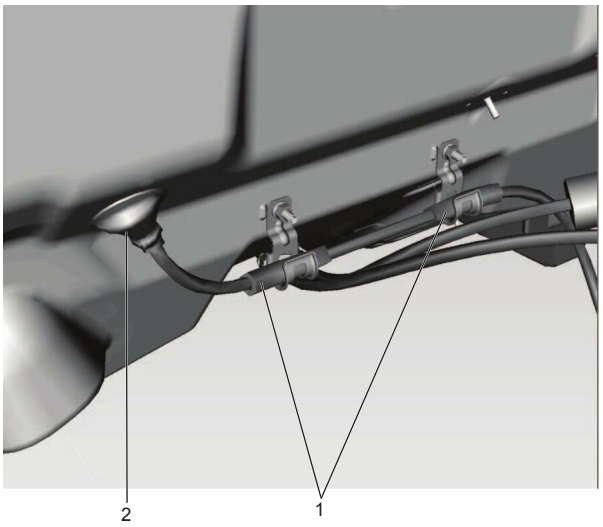
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4) Disconnect cable fitting (1) from clutch pedal (2).



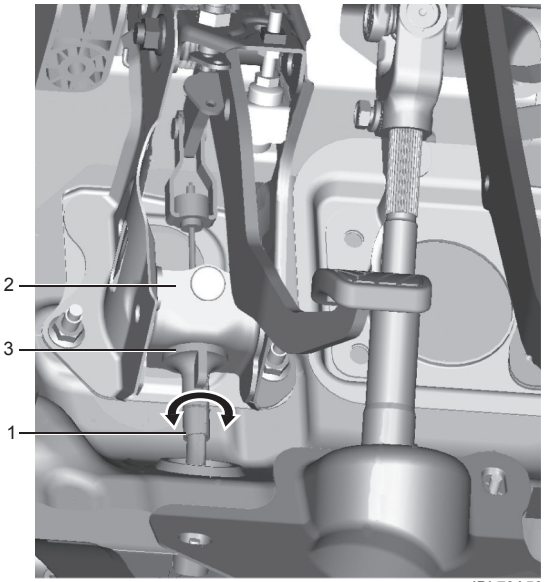
IDL70A530010-01

5) Remove clutch cable (1) from clutch cable clamp.
6) Remove cable grommet (2) from dash panel.



IDL70A530015-01

7) Remove clutch cable (1) from bracket (2) by turning casing cap (3) about 90° as shown.



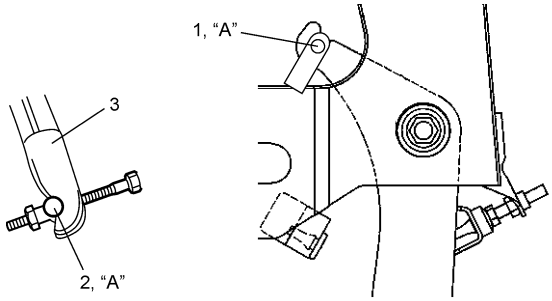
IDL70A530011-01

Installation

Reverse removal procedure noting the following points.

- Apply grease to cable fitting (1) and joint pin (2) before installing cable.

  "A": Grease 99000–25011 (SUZUKI Super Grease A)



I8C50A530014-01

3: Release arm

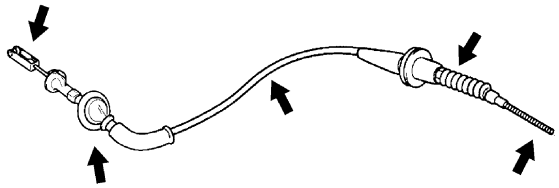
- Adjust clutch cable. ☞(Page 5C-4)
- Check clutch for proper function with engine running.

Clutch Cable Inspection

AENDL70A5306009

Inspect clutch cable, and if any of following condition is found, replace clutch cable.

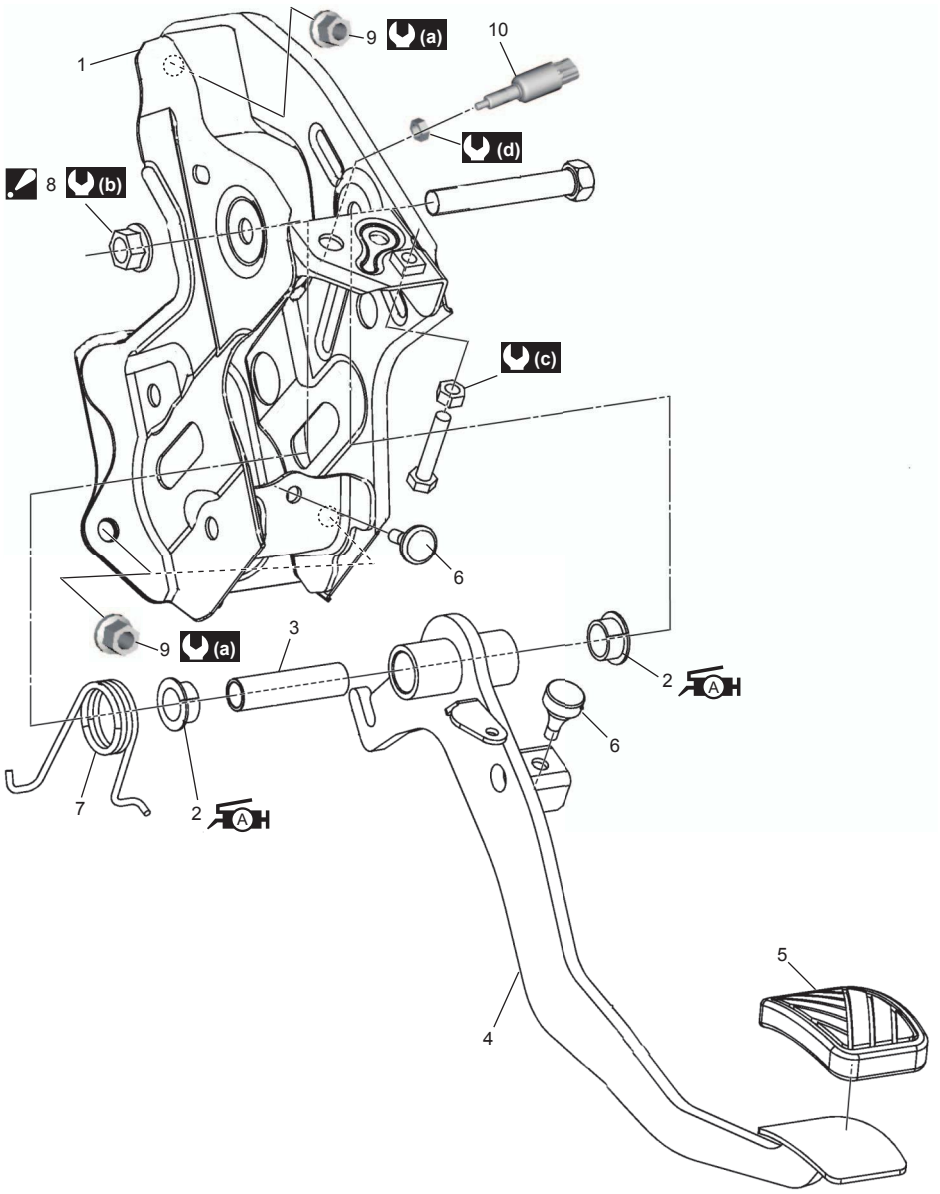
- Excessive cable friction
- Frayed cable
- Bent or kinked cable
- Broken boots
- Worn end



I8C50A530009-02

Clutch Pedal Assembly Components

AENDL70A5306010



IDL70A530012-02

1. Pedal bracket	8. Pedal shaft nut : For tightening order, refer to “Clutch Pedal Assembly Removal and Installation” (Page 5C-8).
A 2. Pedal bushing : Apply grease 9900-25011 to outside of bush.	9. Pedal bracket nut : For tightening order, refer to “Clutch Pedal Assembly Removal and Installation” (Page 5C-8).
3. Pedal shaft spacer	10. Clutch pedal position (CPP) switch
4. Clutch pedal	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
5. Pedal pad	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
6. Cushion	(c) : 5.5 N·m (0.6 kgf-m, 4.0 lbf-ft)
A 7. Return spring : Apply grease 99000-25011 to inside of spring.	(d) : 7.5 N·m (0.76 kgf-m, 5.5 lbf-ft)

Clutch Pedal Assembly Removal and Installation

AENDL70A5306011

Removal

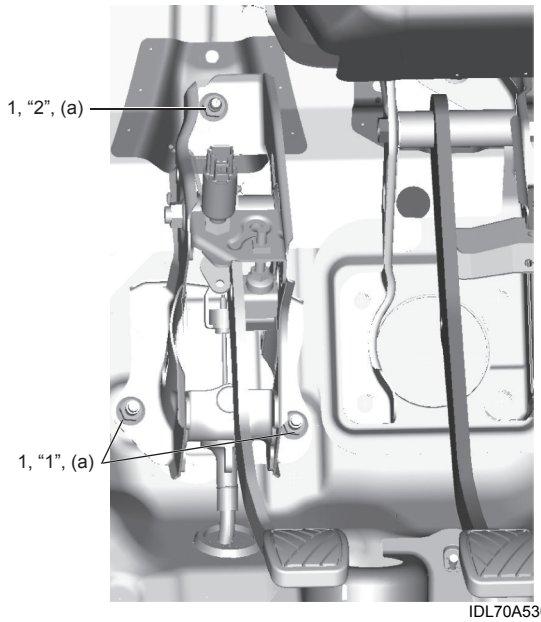
1) Disconnect connector of Clutch Pedal Position switch.
2) Remove clutch cable from clutch pedal. ☞(Page 5C-5)
3) Remove clutch pedal assembly from vehicle body. ☞(Page 4A-8)
4) Remove Clutch Pedal Position switch from pedal bracket, if necessary.
5) Remove clutch pedal from pedal bracket as needed.

Installation

Reverse removal procedure noting the following.

- Tighten pedal bracket nuts (1) to specified torque in numerical order (“1 - 2”).

  Tightening torque
  Pedal bracket nut: 13 N·m (1.3 kgf-m, 9.51 lbf-ft)



IDL70A530016-01

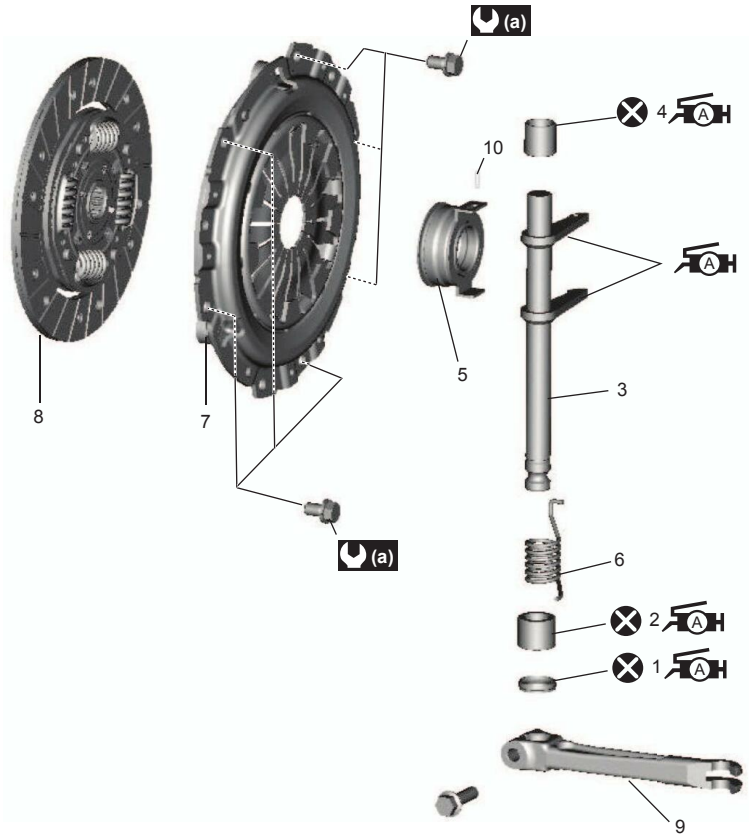
- Tighten bolt and nut to specified torque. ☞(Page 5C-7)
- Adjust clutch cable. ☞(Page 5C-4)
- Apply grease to cable fitting. ☞(Page 5C-5)

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Adjust the position of Clutch Pedal Position switch. ☞(Page 5C-3)
- Connect connectors to Clutch Pedal Position switch securely.

Clutch Cover and Clutch Disc Components

AENDL70A5306012



IDL70A530013-01

A 1. Clutch release shaft seal : Apply grease 99000-25011 to seal lip.	7. Clutch cover
A 2. Clutch release shaft No.2 bushing : Apply grease 99000-25011 to bushing inside.	8. Clutch disc
A 3. Clutch release shaft : Apply grease 99000-25011 to the end of release shaft arm.	9. Release arm
A 4. Clutch release shaft No.1 bushing : Apply grease 99000-25011 to bushing inside.	10. Pin
5. Release bearing	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
6. Return spring	Do not reuse.

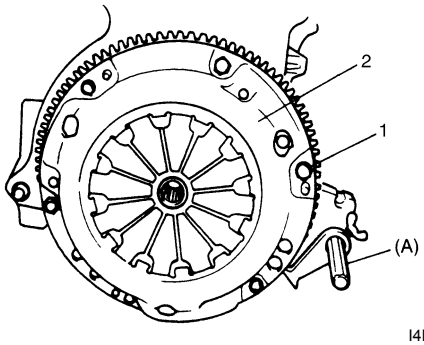
Clutch Cover and Clutch Disc Removal and Installation

AENDL70A5306013

Removal

1) Dismount manual transaxle. ☞(Page 5B-11)
2) Hold flywheel with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

Special tool
(A): 09924M17811



I4RS0A530014-01

Installation

NOTE

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

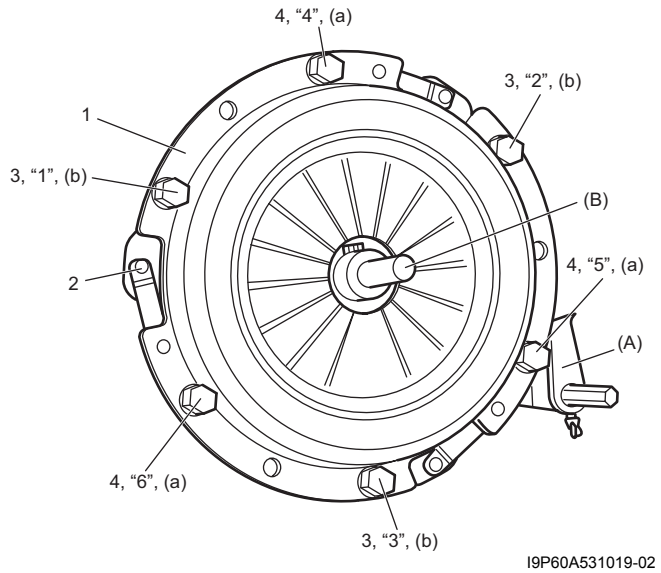
1) Hold flywheel with special tool (A).
2) Align clutch disc with crankshaft center using special tool (B) and install clutch cover (1).
3) Install and tighten clutch cover bolts using the following procedure:
   a) Tighten 3 bolts (3) by hand.
   b) Tighten other 3 bolts (4) evenly and gradually to 5.0 N·m (0.51 kgf-m, 4.0 lbf-ft).
   c) Fully tighten all bolts (3), (4) evenly and gradually to specified torque in numerical order ("1" – "6") starting from bolt nearby strut plate rivet (2).

NOTE

While tightening clutch cover bolts, make sure that clutch disc spline is centered.

Special tool
(A): 09924M17811
(B): 09923M36320

Tightening torque
Clutch cover bolt* (a): 5.0 N·m → 23 N·m (0.51 kgf-m → 2.3 kgf-m, 4.0 lbf-ft → 17.0 lbf-ft)
Clutch cover bolt (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



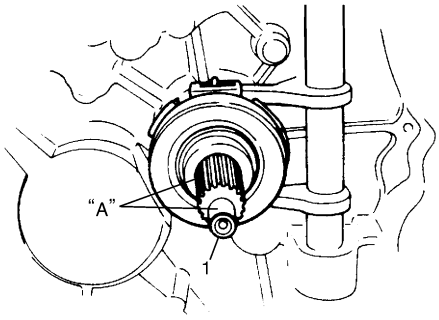
I9P60A531019-02

4) Slightly apply grease to input shaft (1), then join manual transaxle with engine. ☞(Page 5B-11)

"A": Grease 99000–25210 (SUZUKI Super Grease I)

NOTE

When inserting transaxle input shaft to clutch disc, turn crankshaft little by little to match the splines.



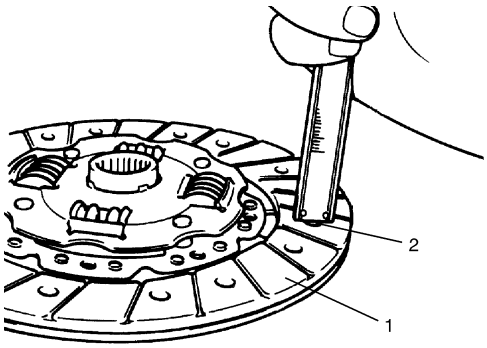
I4RS0A530018-01

Clutch Cover and Clutch Disc Inspection

AENDL70A5306014

Clutch Disc
Measure depth of rivet head depression, i.e. distance between rivet head and facing surface.
If depression is found to have reached service limit at any of rivet holes (2), replace clutch disc (1).

Rivet head depth
Standard: 0.90 – 1.50 mm (0.0354 – 0.0591 in.)
Limit: 0.5 mm (0.02 in.)



I4RS0A530019-01

Clutch Cover

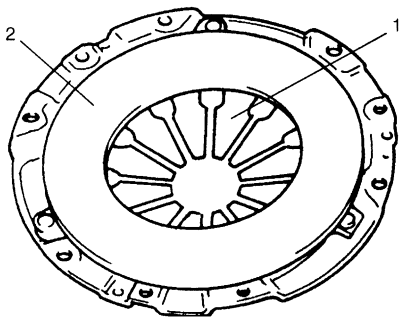
NOTE

Do not disassemble clutch cover into diaphragm spring and pressure plate.

Check clutch cover as follows.

- Check diaphragm spring (1) for abnormal wear or damage.
- Inspect pressure plate (2) for wear or heat spots.

If any abnormality is found, replace clutch cover.



I3RM0A530015-01

Clutch Release System Removal and Installation

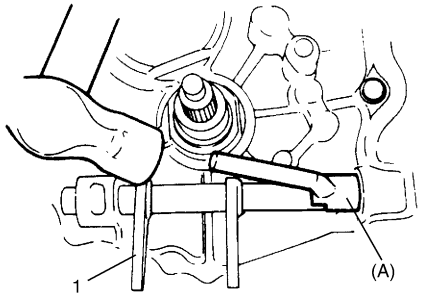
AENDL70A5306015

Removal

1) Remove release arm by loosening its bolt.
2) Take out release bearing by turning release shaft (1).
3) Drive out clutch release shaft No.2 bushing using special tool (A) and hammer. Release shaft seal will also be pushed out.

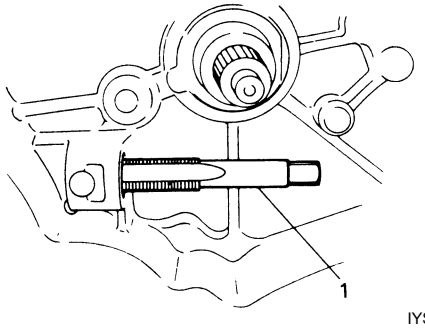
Special tool
(A): 09922M46010

4) Remove release shaft (1).



I4RS0A530020-01

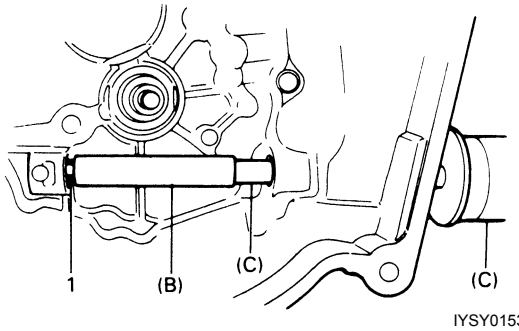
5) Remove clutch release shaft No.1 bushing as follows.
   a) Install tap (M16 X 1.5) (1) to clutch release shaft No.1 bush.



IYSY01531016-01

   b) Pull out clutch release shaft No.1 bushing using tap (1) and special tools.

Special tool
(B): 09923M46020
(C): 09930M30104



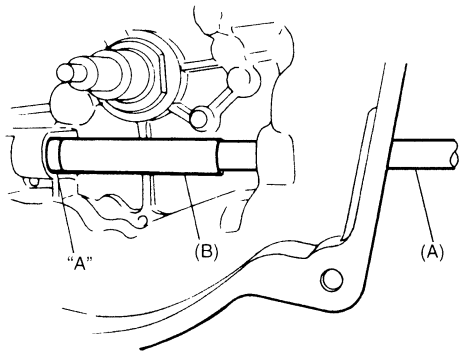
IYSY01531017-01

Installation

1) Drive in a new clutch release shaft No.1 bushing using special tools and hammer, and then apply grease to bushing inside.

Special tool
(A): 09943M88211
(B): 09923M46030

"A": Grease 99000–25011 (SUZUKI Super Grease A)



I3RM0A530016-01

2) Install release shaft.
3) Apply grease to clutch release shaft No.2 bushing (1) inside and press-fit it using the same special tool as in removal.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

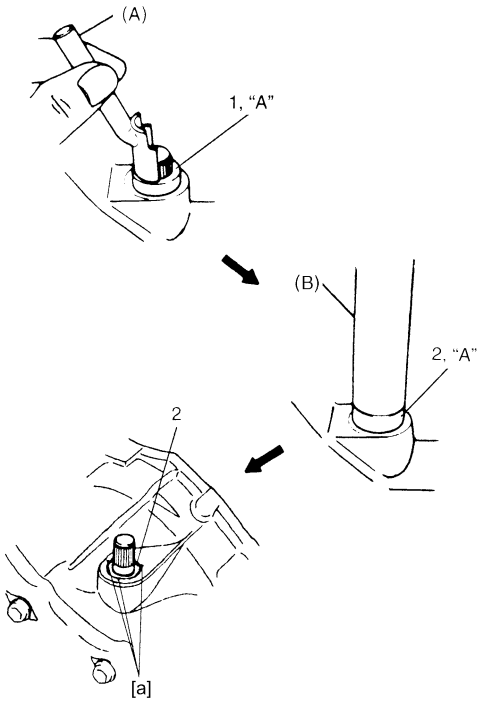
Special tool
(A): 09922M46010

4) Apply grease to release shaft seal (2) lip, and then install it till it is flush with case surface. Use special tool for this installation and face seal lip downward (inside).

"A": Grease 99000–25011 (SUZUKI Super Grease A)

Special tool
(B): 09925M98221

5) Caulk seal at 3 positions [a] shown in figure using caulking tool and hammer.



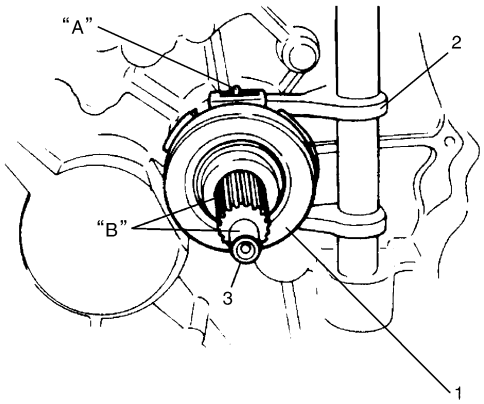
I8C50A530012-01

6) Apply grease to release shaft (2), then set release bearing (1).

"A": Grease 99000–25011 (SUZUKI Super Grease A)

7) Apply grease to input shaft (3) spline and front end as well.

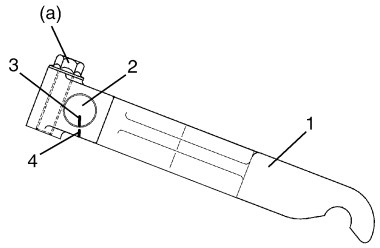
"B": Grease 99000–25210 (SUZUKI Super Grease I)



IBC50A530013-01

8) Set release arm (1) to release shaft (2) aligning punch mark (4) of release arm with punch mark (3) of release shaft, then tighten bolt to specified torque.

Tightening torque
Release arm bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I5RS0A530016-01

Clutch Release System Inspection

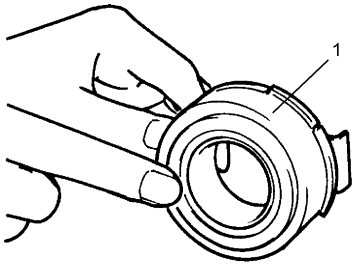
AENDL70A5306016

Clutch Release Bearing

Check clutch release bearing (1) for smooth rotation. If any abnormality is found, replace it.

NOTE

Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.

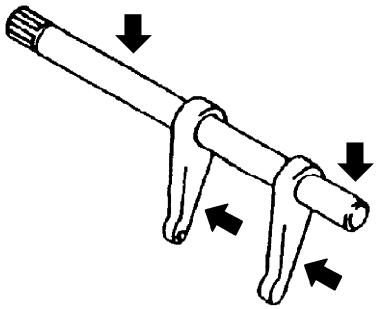


I7V20A531009-01

Clutch Release Shaft

Check clutch release shaft and its pin for deflection or damage.

If any abnormality is found, replace it.



I3RM0A530021-01

Specifications

Tightening Torque Specifications

AENDL70A5307001

NOTE

For fastener(s) with * (asterisk) below, refer to the specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Clutch Pedal Position switch lock nut	7.5	0.76	5.5	☞(Page 5C-3)
Clutch pedal lock nut	5.5	0.6	4.5	☞(Page 5C-3)
Pedal bracket nut	13	1.3	9.51	☞(Page 5C-8)
Clutch cover bolt*	5.0 N·m → 23 N·m (0.51 kgf-m → 2.3 kgf-m, 4.0 lbf-ft → 17.0 lbf-ft)			☞(Page 5C-10)
Clutch cover bolt	23	2.3	17.0	☞(Page 5C-10)
Release arm bolt	23	2.3	17.0	☞(Page 5C-12)

Reference:

For the tightening torques of fasteners not specified in this page, refer to:

"Clutch Cable Components" (Page 5C-5)

"Clutch Pedal Assembly Components" (Page 5C-7)

"Clutch Cover and Clutch Disc Components" (Page 5C-9)

"Fasteners Information" in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A5308001

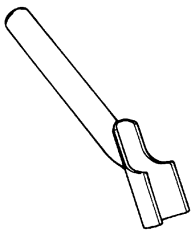
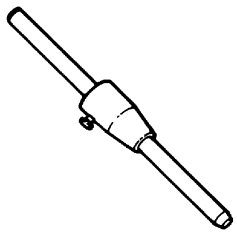
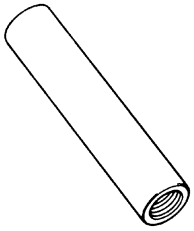
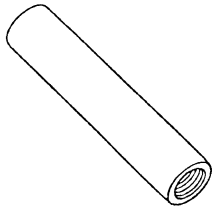
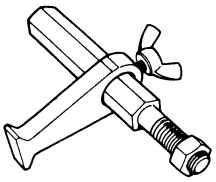
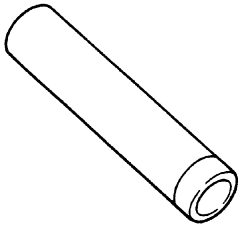
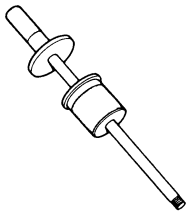
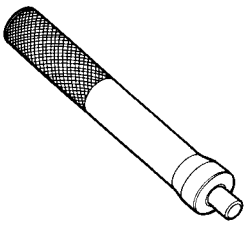
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 5C-6) / ☞(Page 5C-8) / ☞(Page 5C-11) / ☞(Page 5C-12) / ☞(Page 5C-12) / ☞(Page 5C-12)
	SUZUKI Super Grease I	P/No.: 99000–25210	☞(Page 5C-10) / ☞(Page 5C-12)

NOTE

Required service materials are also described in:
“Clutch Cable Components” (Page 5C-5)
“Clutch Pedal Assembly Components” (Page 5C-7)
“Clutch Cover and Clutch Disc Components” (Page 5C-9)

Special Tool

AENDL70A5308002

09922M46010 Clutch bushing remover ☞(Page 5C-11) / ☞(Page 5C-12) 	09923M36320 Clutch center guide (15 mm) ☞(Page 5C-10) 
09923M46020 Joint pipe ☞(Page 5C-11) 	09923M46030 Joint pipe ☞(Page 5C-11) 
09924M17811 Flywheel holder ☞(Page 5C-9) / ☞(Page 5C-10) 	09925M98221 Bearing installer ☞(Page 5C-12) 
09930M30104 Sliding shaft ☞(Page 5C-11) 	09943M88211 Pinion bearing installer ☞(Page 5C-11) 

Automated Manual Transaxle

Precautions

Precautions for Diagnosing Trouble

AENDL70A5400001

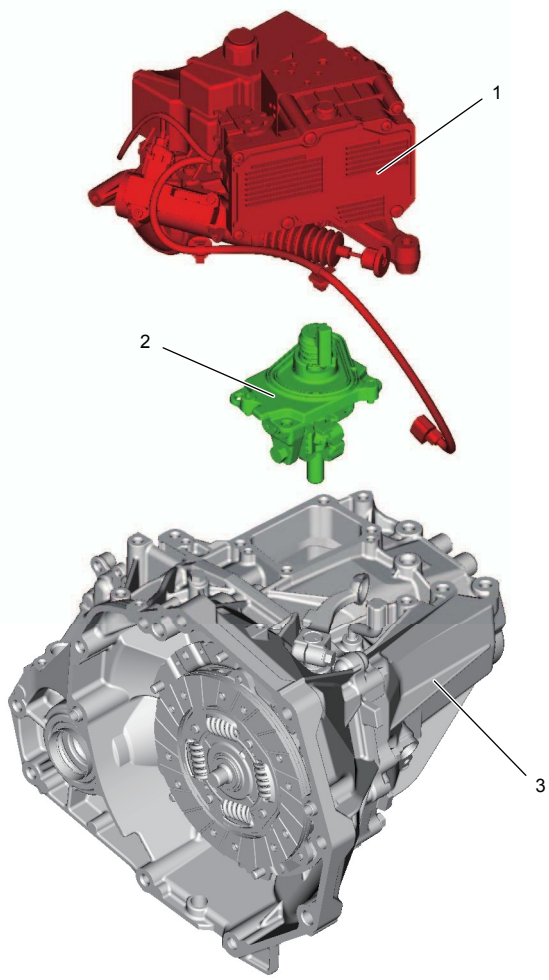
- Before using scan tool, read its Operator's Manual to know how to use it.
- When replacing TCM with used one, all learned gear change conditions which are stored in TCM memory should be cleared after the replacement referring to "TCM and Clutch Initialization" (Page 5D-81).
- Be sure to read "Precautions for Electrical Circuit Service" in Section 00 (Page 00-3) before inspection and observe what is written there.
- Communication of ECM, TCM incorporated in automated manual transaxle actuator unit and BCM is established by means of CAN. Therefore, handle CAN communication line with care referring to "Precautions for CAN Communication System" in Section 00 (Page 00-9).

General Description

Automated Manual Transaxle Description

AENDL70A5401001

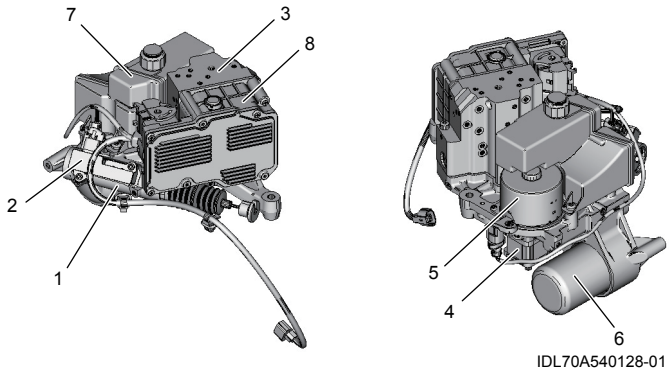
Automated manual transaxle consists of an automated manual transaxle actuator unit (1), gear shift and select shaft assembly (2) and manual transaxle (3).
The automated manual transaxle is a transaxle developed in conjunction with automated manual transaxle actuator unit added to a conventional manual transaxle. TCM controls clutch engagement / disengagement and gear changes electrically.



IDL70A540127-01

Automated Manual Transaxle Actuator Unit Construction

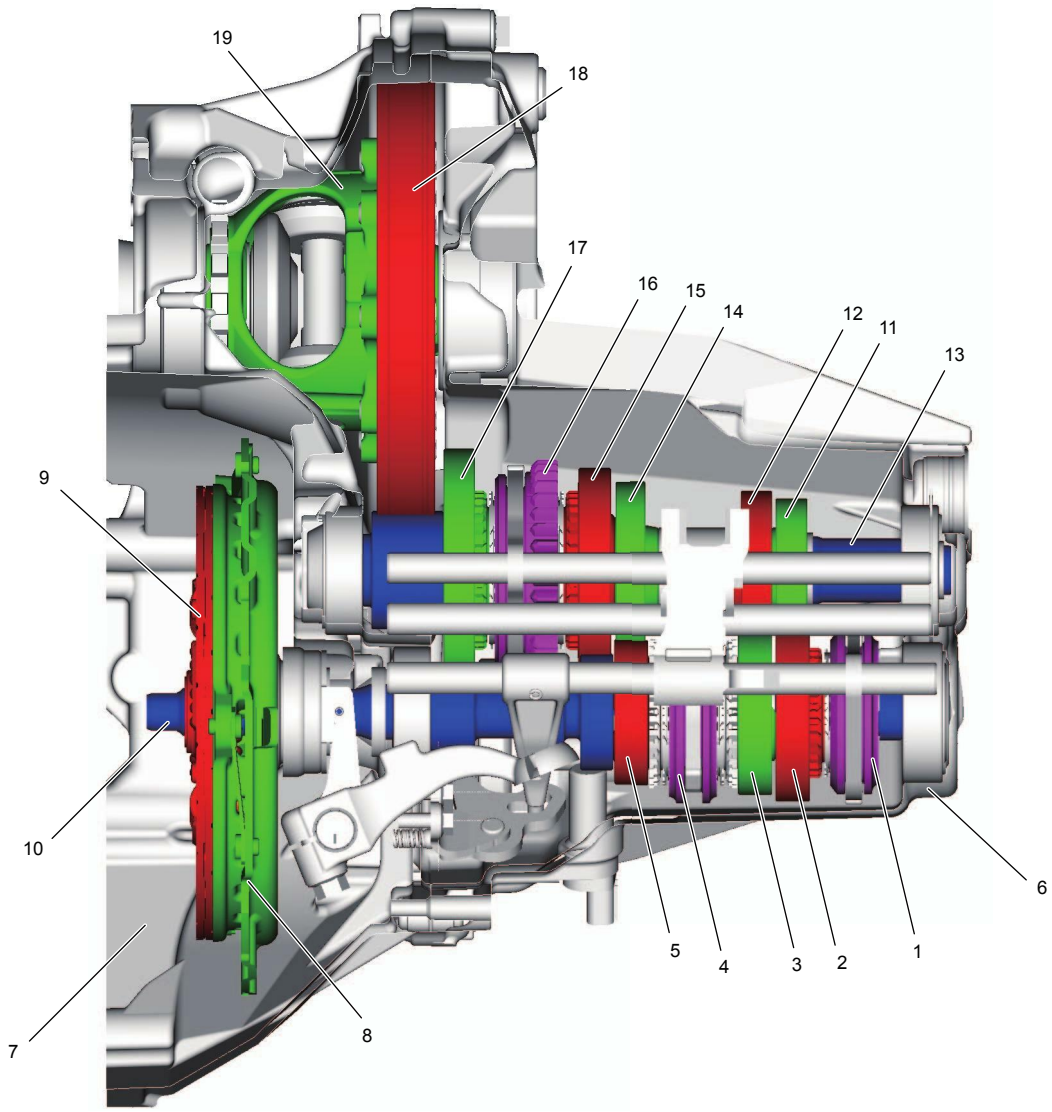
The automated manual transaxle actuator unit consists of a clutch actuator (1), clutch position sensor (2), valve body (3), electric motor (4), oil pump (5), accumulator (6), reservoir tank (7), and TCM (8). The valve body includes a shift position sensor, select position senor, pressure sensor, shift solenoid valve 1, shift solenoid valve 2, clutch solenoid valve and select solenoid valve. However, disassembling the automated manual transaxle actuator unit is not permitted.



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Manual Transaxle Construction

The manual transaxle provides five forward speeds and one reverse speed by means of three synchromesh devices and three shafts: input shaft, countershaft and reverse gear shaft. All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.



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1. 5th speed synchronizer sleeve and hub	8. Clutch cover	15. Countershaft 2nd gear
2. Input shaft 5th gear	9. Clutch disc	16. Low speed synchronizer sleeve and hub
3. Input shaft 4th gear	10. Input shaft	17. Countershaft 1st gear
4. High speed synchronizer sleeve and hub	11. Countershaft 5th gear	18. Final gear
5. Input shaft 3rd gear	12. Countershaft 4th gear	19. Differential case
6. Left case	13. Countershaft	
7. Right case	14. Countershaft 3rd gear	

Gear Shift and Clutch Operating Mechanism

When the shift selector is operated, the TCM incorporated in automated manual transaxle actuator unit controls the automated manual transaxle actuator unit based on the information inputted in it. The clutch solenoid valve causes the clutch to engage / disengage by moving the release shaft, and shift solenoid valve 1, shift solenoid valve 2 and select solenoid valve cause the gears to change by moving the shift fork.

System of the automated manual transaxle actuator unit to control clutch engagement / disengagement and gear change of the transaxle consists of the shift selector, clutch solenoid valve, shift solenoid valve 1, shift solenoid valve 2, select solenoid valve, VSS, clutch speed sensor, clutch position sensor, shift position sensor, select position sensor, brake light switch, driver's door switch and TCM and the automated manual transaxle actuator unit has the following functions. ☞(Page 5D-11)

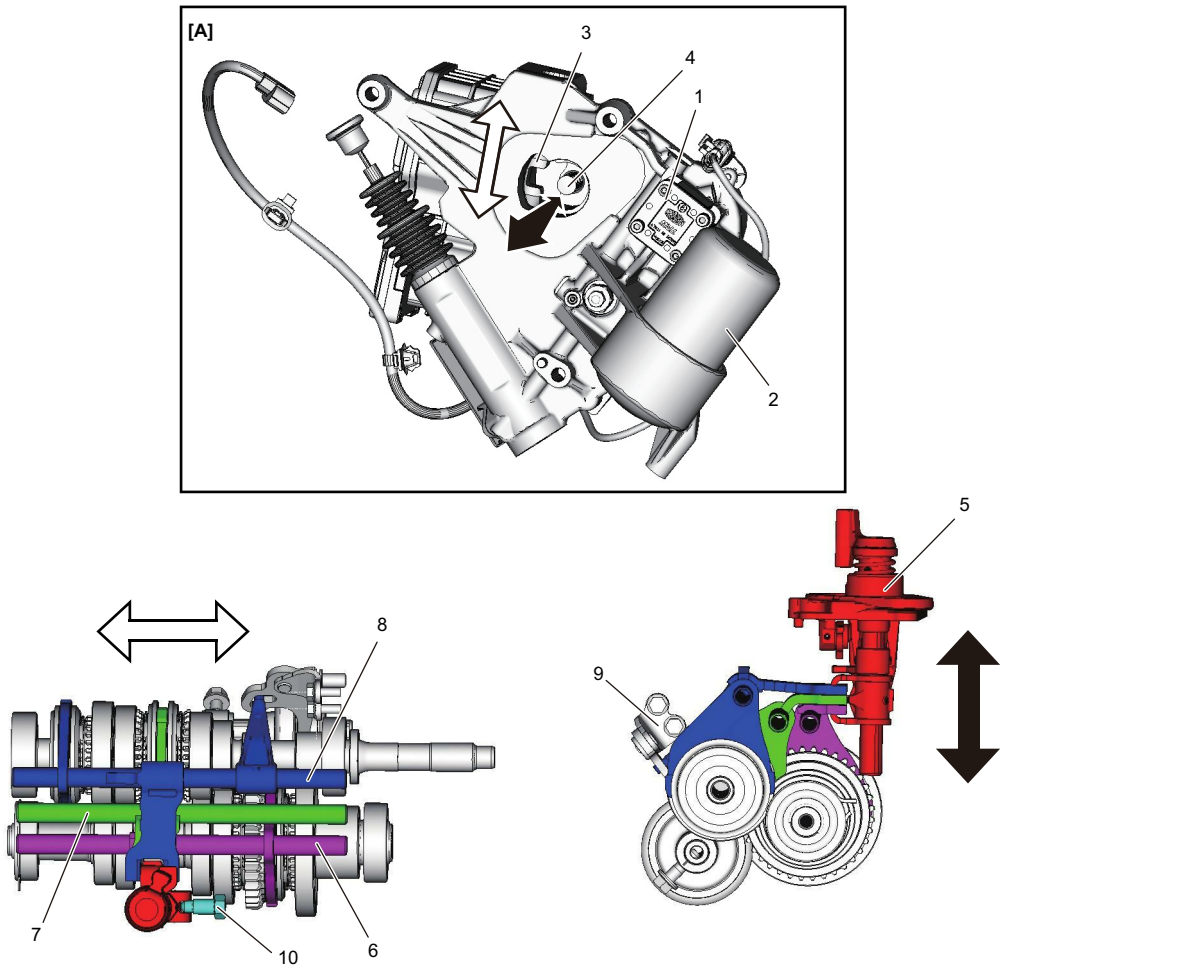
- Automated manual transaxle can be driven in D (drive) mode and M (manual) mode.
- Operation of shift selector from D to R or R to D is not effective when driver's door is open and the gear stays in neutral at this moment.
- If shift up operation by shift selector fails to engage gear to target position, shifting to higher gear is attempted. And, if shift down operation by shift selector fails to engage gear, the gear remains in a position before the shift down.
- The engine can be started only when the brake is applied and the shift selector is in N to prevent sudden movement of vehicle.
- Gear change is controlled by TCM according to the accelerator operation similarly to automatic transmission and creeping is also available with accelerator and brake pedal released.
- Similarly to conventional manual transaxle, it is possible to park the vehicle while the gear is engaged in reverse or 1st position with ignition "OFF".
- The gear is shifted from reverse, D or M to neutral automatically to prevent risk of danger when any one of the following conditions is met with engine running.
  - Driver's door is open without depressing brake pedal and accelerator pedal.
  - Driver does no operation for 10 minutes.
  - 5 seconds have passed after releasing brake pedal.
  - Specific malfunction is detected.

TCM Learning

The TCM monitors and learns conditions of the clutch and manual transaxle for optimum gear change. However, if clutch, gear shift and select shaft assembly, automated manual transaxle actuator unit or manual transaxle is removed or replaced, the learned values are deviated. Therefore, it is necessary to clear the learned value in the past using the SUZUKI scan tool when removing or replacing these parts and make the TCM initialize and learn necessary values again for optimum control of the clutch and transaxle. For initialization, refer to "TCM and Clutch Initialization" (Page 5D-81).

Gear Shift Mechanism

Electric motor (1) operated oil pump in the automated manual transaxle actuator unit accumulates oil pressure in the accumulator (2) and the pressurized oil operates both engage piston (3) and select piston (4). Receiving shift selector operation signal, the TCM causes the gears to change by moving engage piston and select piston in the automated manual transaxle actuator unit via gear shift and select shaft assembly (5).

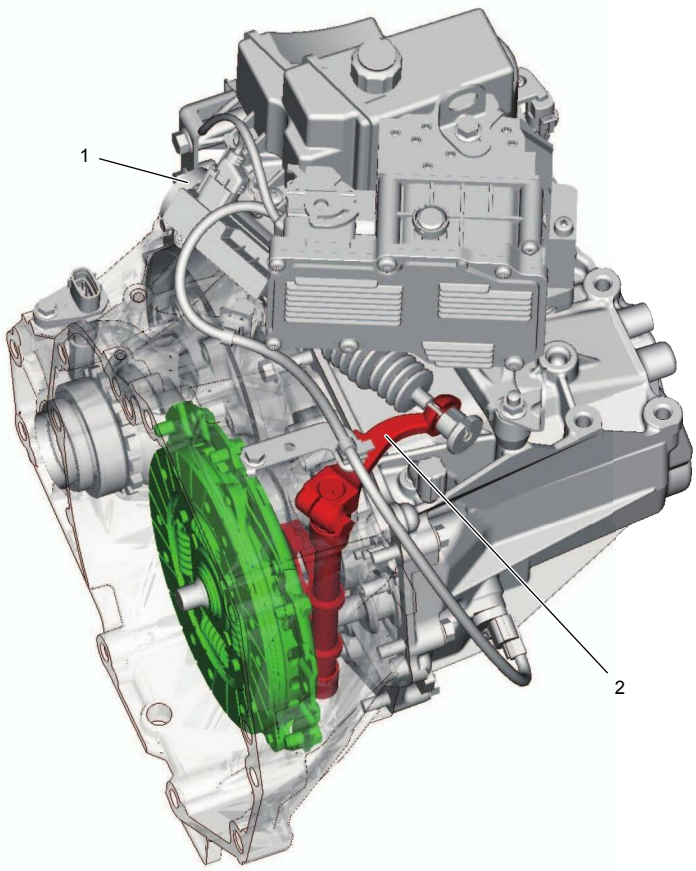


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[A]: Automated manual transaxle actuator unit viewed from bottom	7. High speed gear shift shaft	9. Reverse gear shift lever
6. Low speed gear shift shaft	8. 5th gear shift shaft	10. Gear shift interlock bolt

Clutch Operating Mechanism

Electric motor operated oil pump in the automated manual transaxle actuator unit accumulates oil pressure in the accumulator and the pressurized oil operates clutch mechanism. Receiving shift selector operation signal, the TCM causes the clutch actuator (1) and release arm (2) in the automated manual transaxle actuator unit to advance the release bearing and pushes on the tips of the tapered fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transaxle input shaft.



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Warning Buzzer Operation

The BCM sounds the warning buzzer in two patterns as follows.

Condition	Buzzer operation		
	On (sec.)	Off (sec.)	Time
When gear is disengaged and shifted to neutral automatically for safety reasons.	0.08	0.08	2
When shifting to reverse gear is inhibited due to vehicle condition.			
When cranking without depressing brake pedal.			
When clutch is overheating.	0.18	0.32	1
When shift selector lever position and actual gear position disagree.			

Function of Automated Manual Transaxle Control System Component

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Part name	Function
Clutch speed sensor	Detects clutch speed.
Clutch position sensor	Detects clutch position.
Shift position sensor	Detects position of engage piston.
Select position sensor	Detects position of select piston.
Pressure sensor	Detects oil pressure in automated manual transaxle actuator unit.
Clutch solenoid valve	Opens / closes oil circuit for moving clutch actuator.
Shift solenoid valve 1	Opens / closes oil circuit for moving engage piston.
Shift solenoid valve 2	
Select solenoid valve	Opens / closes oil circuit for moving select piston.
Clutch actuator	Operated by clutch solenoid valve for clutch engagement / disengagement.
Engage piston	Moves gear shift and select shaft assembly according to shift solenoid valves 1 and 2.
Select piston	Moves gear shift and select shaft assembly according to select solenoid valve.
Electric motor	Operates oil pump by demand from TCM.

Part name	Function
Oil pump	Generates oil pressure in automated manual transaxle actuator unit.
Accumulator	Accumulates oil pressure generated by oil pump.
TCM	• Controls gear shift and clutch operation. • Diagnoses automated manual transaxle control system components.
Gear shift and select shaft assembly	Transmits movement of engage piston and select piston in automated manual transaxle actuator unit to gear shift shaft.

Automatic Gear Shift Table

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Automatic gear shift schedule is shown in the following table. Road test the vehicle on a flat road in D range.

	Throttle opening (%)	Shift	Vehicle speed km/h (mile/h)	Remark
UP shift	80 to 100	1st → 2nd	25 (16)	There is no sudden change in accelerator opening. Hard brake is not being applied.
		2nd → 3rd	64 (40)	
		3rd → 4th	98 (61)	
		4th → 5th	130 to 139 (81 to 86)	
	40 to 70	1st → 2nd	17 to 23 (11 to 14)	
		2nd → 3rd	37 to 55 (23 to 34)	
		3rd → 4th	50 to 90 (31 to 56)	
		4th → 5th	68 to 120 (42 to 75)	
	10 to 30	1st → 2nd	14 (7)	
		2nd → 3rd	24 to 26 (15 to 16)	
		3rd → 4th	32 to 37 (20 to 23)	
		4th → 5th	45 to 48 (28 to 30)	
DOWN shift	80 to 100	5th → 4th	96 to 126 (60 to 78)	There is no sudden change in accelerator opening. Hard brake is not being applied.
		4th → 3rd	70 to 87 (43 to 54)	
		3rd → 2nd	32 to 61 (20 to 38)	
		2nd → 1st	13 (8)	
	40 to 70	5th → 4th	60 to 80 (37 to 50)	
		4th → 3rd	42 to 55 (26 to 34)	
		3rd → 2nd	—	
		2nd → 1st	—	
	10 to 30	5th → 4th	—	
		4th → 3rd	—	
		3rd → 2nd	—	
		2nd → 1st	—	

NOTE

The gear change is done at the shift point different from the above if any of the following conditions is met. Bear this in mind when performing inspection.

Shift hold control when accelerator (throttle) is quickly closed

When the accelerator is closed during acceleration, up-shift usually takes place in many cases because the gear change point for accelerator 0% opening is used as reference. With this control function, however, needless up-shift is avoided in accordance with the speed at which the accelerator is closed. As a result, the gear is held in the position used at that time. In this way, the engine brake can be used effectively and acceleration after that will be done smoothly.

Shift hold control using estimated gradient of slope

The gradient of the road surface is constantly estimated while the vehicle is running using the engine torque data and vehicle speed data. When it is judged as exceeding the specified value, needless up-shift is avoided. This maintains engine brake effective on a down-hill slope and suitable gear in used on a up-hill slope.

Coast down control when brake is applied

With this control, the gear change point is changed to the one for coast-down based on the brake signal and vehicle deceleration (calculated from the vehicle speed signal). Consequently, at hard braking, down-shift takes place at a higher vehicle speed than the normal down-shift vehicle speed and is over during deceleration. In this way, time lag at the time of re-acceleration (without this control, down-shift takes place after the accelerator pedal is depressed) is eliminated for smooth acceleration.

Automated Manual Transaxle Diagnosis General Description

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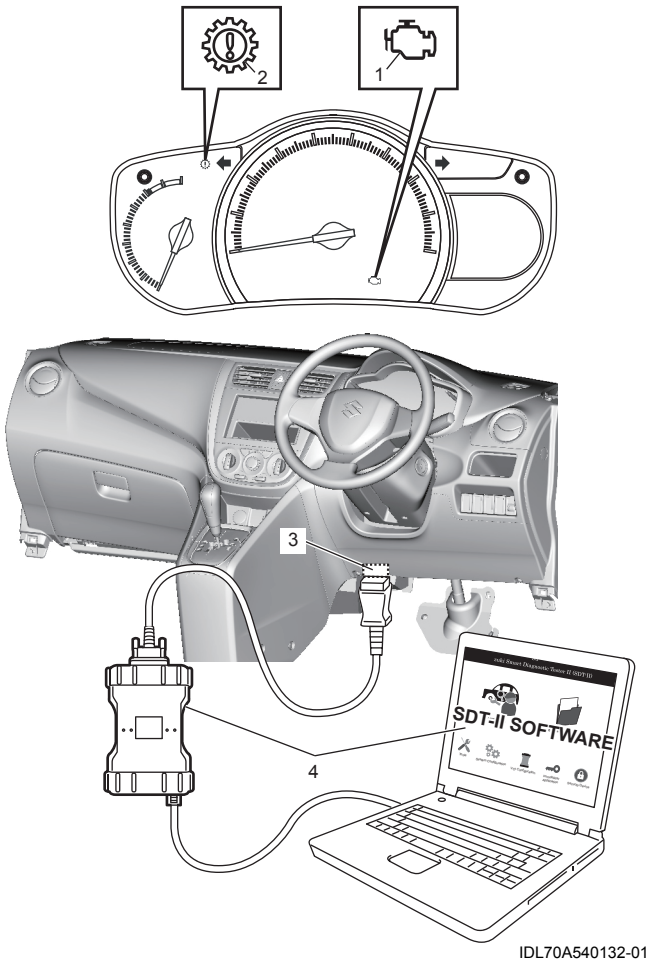
TCM has an On-Board Diagnosis System which detects a malfunction in this system.
When diagnosing a trouble in transaxle control including this system, be sure to have full understanding of “On-Board Diagnostic System Description” (Page 5D-7) and each item in “Precautions for Diagnosing Trouble” (Page 5D-1) and execute diagnosis according to “Automated Manual Transaxle System Check” (Page 5D-12) to obtain correct result smoothly.

On-Board Diagnostic System Description

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TCM has the following functions.

- When TCM detects a malfunction in automated manual transaxle control system, TCM turns on malfunction indicator lamp (MIL) (1) and/or automated manual transaxle warning light (2) and stores malfunction DTC in TCM memory.
- It is possible to communicate with TCM through data link connector (DLC) (3) by using SUZUKI scan tool (4). (Diagnostic information can be checked and cleared by using SUZUKI scan tool.)



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Warm-Up Cycle

A warm-up cycle means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °C (40 °F) from engine starting and reaches a minimum temperature of 70 °C (160 °F).

Driving Cycle

A “Driving Cycle” consists of engine startup, driving mode where a malfunction would be detected if present, and engine shutoff.

CAN Communication System Description

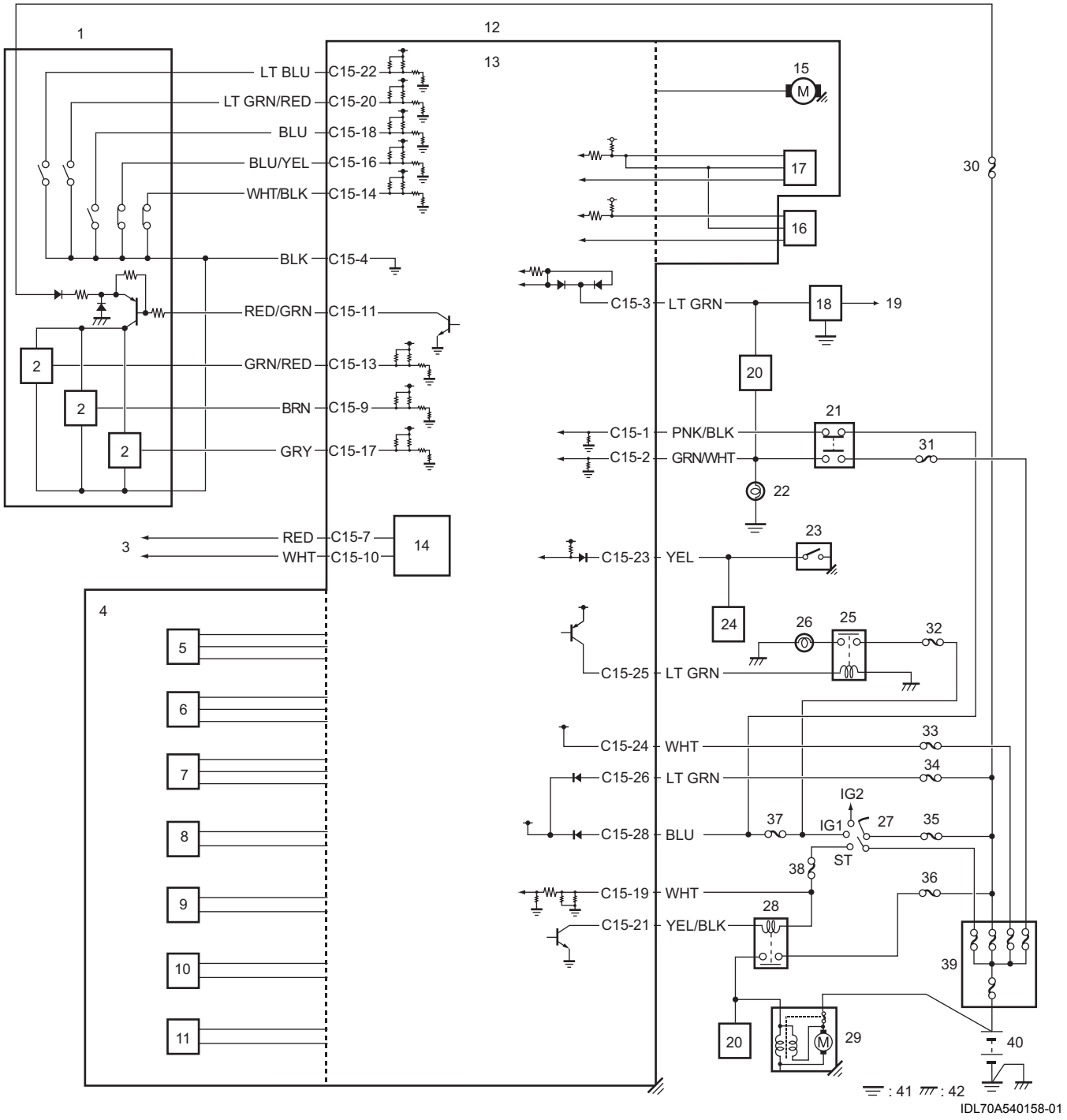
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Refer to “CAN Communication System Description” in Section 10H (Page 10H-1) for CAN communication system description.

Schematic and Routing Diagram

TCM Circuit Diagram

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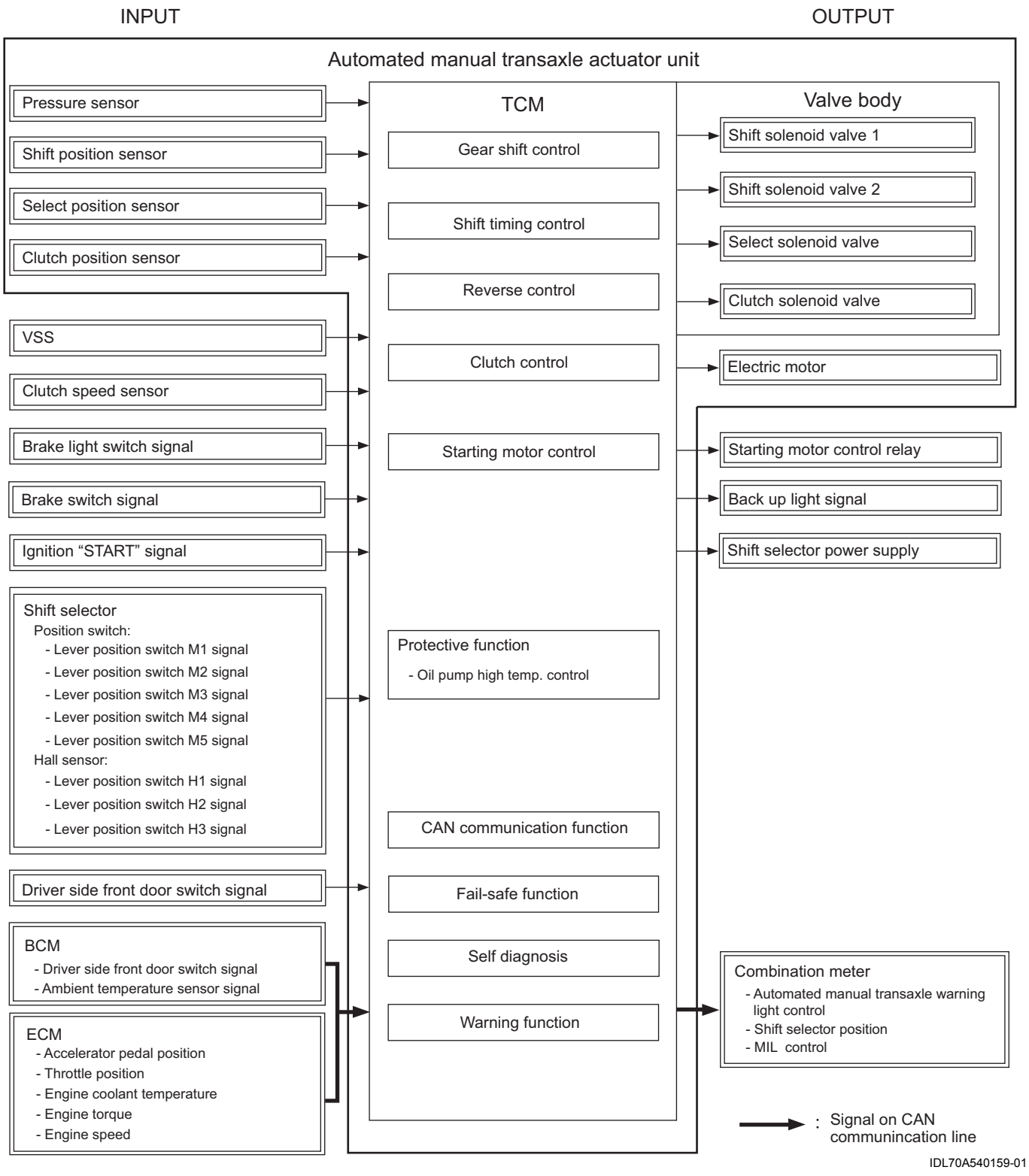


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1. Shift selector	12. Automated manual transaxle actuator unit	23. Driver side front door switch	34. “T/M” fuse
2. Hall sensor	13. TCM	24. BCM	35. “IGN” fuse
3. To control modules connected by CAN	14. CAN driver	25. Back up light relay	36. “ST” fuse
4. Valve body	15. Electric motor (automated manual transaxle actuator unit)	26. Back up light	37. “IG1 SIG” fuse
5. Shift position sensor	16. Clutch speed sensor	27. Ignition switch	38. “ST SIG” fuse
6. Select position sensor	17. Clutch position sensor (automated manual transaxle actuator unit)	28. Starting motor control relay	39. Main fuse box
7. Pressure sensor	18. VSS	29. Starting motor	40. Battery
8. Shift solenoid valve 1	19. To main relay	30. “T/M2” fuse	41. Engine ground
9. Shift solenoid valve 2	20. ECM	31. “STOP” fuse	42. Body ground
10. Clutch solenoid valve	21. Brake light switch	32. “BACK” fuse	
11. Select solenoid valve	22. Brake light	33. “T/M PUMP” fuse	

Electronic Shift Control Input / Output Diagram

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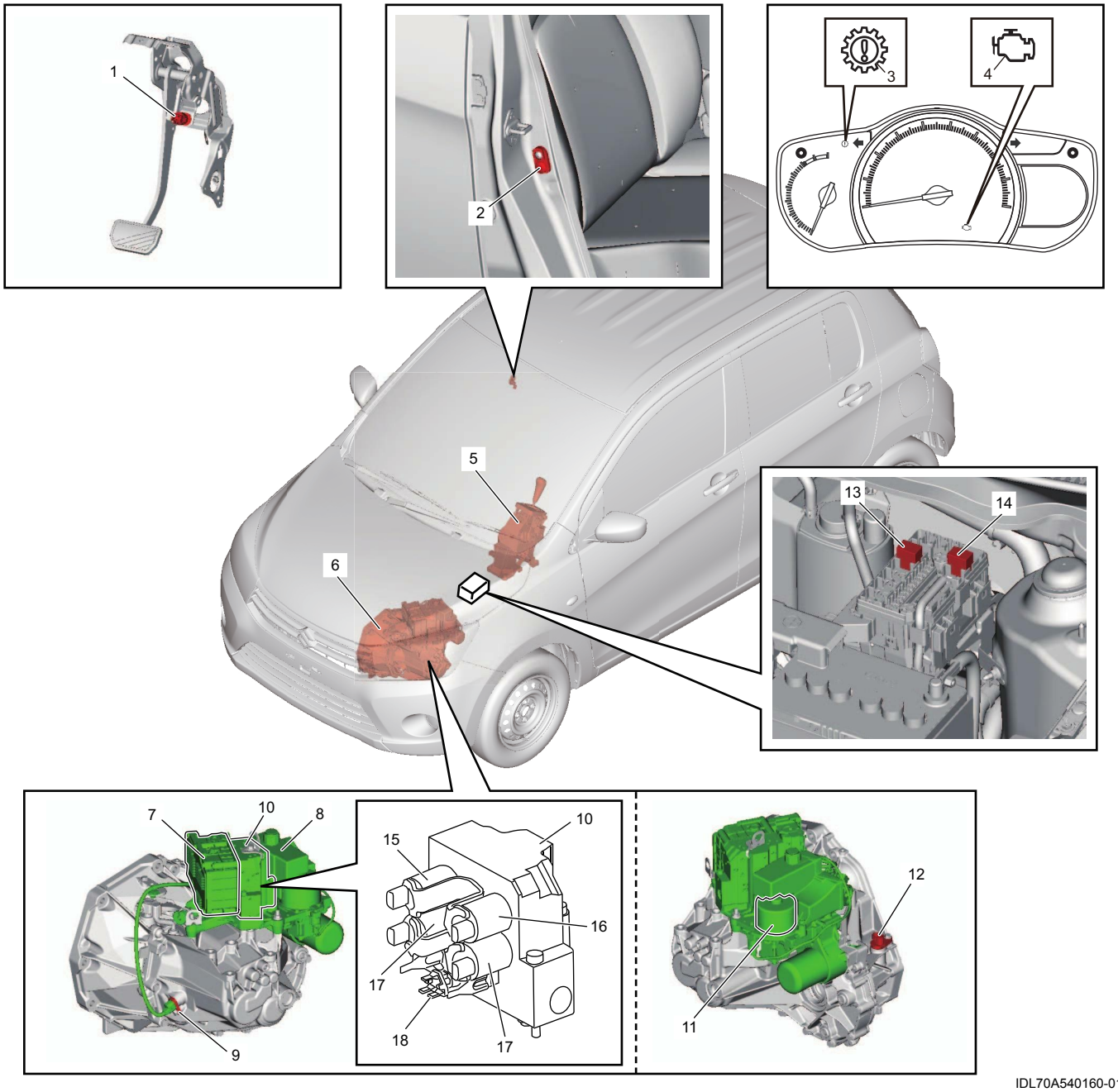


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Component Location

Electronic Shift Control System Component Location

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1. Brake light switch	7. TCM incorporated in automated manual transaxle actuator unit	13. Back up light relay
2. Driver side front door switch	8. Automated manual transaxle actuator unit	14. Starting motor control relay
3. Automated manual transaxle warning light	9. Clutch speed sensor	15. Select solenoid valve
4. MIL	10. Valve body (automated manual transaxle actuator unit)	16. Clutch solenoid valve
5. Shift selector	11. Electric motor (automated manual transaxle actuator unit)	17. Shift solenoid valve 1 and shift solenoid valve 2
6. Automated manual transaxle	12. VSS	18. Pressure sensor

Diagnostic Information and Procedures

Automated Manual Transaxle System Check

AENDL70A5404001

Step	Action	Yes	No
1	**Customer complaint analysis** 1) Perform customer complaint analysis. ☞(Page 5D-12) *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	**DTC / freeze frame data check, record and clearance** 1) Check for DTC. ☞(Page 5D-13) *Is there any DTC(s)?*	Print DTC and freeze frame data or write them down and clear them by referring to “DTC Clearance” (Page 5D-22). Then go to Step 3.	Go to Step 4.
3	**Visual inspection** 1) Perform visual inspection. ☞(Page 5D-13) *Is there any faulty condition?*	Repair or replace malfunction part. Then go to Step 11.	Go to Step 5.
4	**Visual inspection** 1) Perform visual inspection. ☞(Page 5D-13) *Is there any faulty condition?*	Repair or replace malfunction part. Then go to Step 11.	Go to Step 8.
5	**Trouble symptom confirmation** 1) Confirm trouble symptom. ☞(Page 5D-14) *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	**Rechecking and record of DTC / freeze frame data** 1) Recheck for and freeze frame data. ☞(Page 5D-14) *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	**Rechecking and record of DTC / freeze frame data** 1) Recheck for DTC and freeze frame data. ☞(Page 5D-14) *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	**Automated manual transaxle symptom diagnosis** 1) Check automated manual transaxle symptom diagnosis. ☞(Page 5D-14) *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Then go to Step 11.
9	**Troubleshooting for DTC** 1) Perform troubleshooting for applicable DTC. ☞(Page 5D-14) *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Then go to Step 11.
10	**Check for intermittent problems** 1) Check for intermittent problems. ☞(Page 5D-14) *Is there any faulty condition?*	Repair or replace malfunction part(s). Then go to Step 11.	Go to Step 11.
11	**Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test. ☞(Page 5D-14) *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 6.	End.

Step 1. Customer Complaint Analysis

Record details of the problem (failure, complaint) and how it occurred by the customer.

For this purpose, use of such a questionnaire from shown below will facilitate collecting information for proper analysis and diagnosis.

NOTE

The form is a standard sample. It should be modified according to characteristic of each market.

Customer questionnaire form (Example)

User name:	Model:	VIN:	
Date of issue:	Date of Reg.:	Date of problem:	Mileage:

PROBLEM SYMPTOMS
☐ Vehicle does not move (R, D, M)
☐ No upshift (☐ 1st to 2nd ☐ 2nd to 3rd ☐ 3rd to 4th ☐ 4th to 5th)
☐ No downshift (☐ 3rd to 2nd ☐ 2nd to 1st ☐ 4th to 3rd ☐ 5th to 4th)
☐ Shift lever cannot be operated (☐ N → D ☐ D → N ☐ N → R ☐ R → N ☐ D → M ☐ M → D)
☐ Noise (☐ Motor ☐ Gear ☐ Clutch ☐ Other _____)
☐ Automatic shift point too high or too low
☐ Excessive gear change shock (1st/2nd/3rd/4th/ 5th/Reverse)
☐ No kickdown
☐ Clutch slipping
☐ Others _____

VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Read	☐ Fair ☐ Cloudy ☐ Rain ☐ Always ☐ Other _____ (°F/ °C) ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Always ☐ Always ☐ Sometimes (times/ day, month) ☐ Only once ☐ Under certain condition ☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous ☐ Uphill ☐ Downhill ☐ Tarmacadam ☐ Gravel ☐ Other _____
Vehicle Condition	
Engine & transmission condition	☐ Cold/ ☐ Warming up phase/ ☐ Warmed up Engine speed (r/min.) Throttle opening (☐ Idle/ ☐ About % ☐ full)
Vehicle condition	☐ At stop/ ☐ During driving (☐ Constant speed ☐ Accelerating ☐ Decelerating ☐ Braking) ☐ Right hand corner ☐ Left hand corner ☐ Vehicle speed (km/h mile/h) ☐ Other _____

MTA warning lamp	☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Malfunction indicator lamp	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Diagnostic trouble code	First check: ☐ No code ☐ Malfunction code ( )
	Second check: ☐ No code ☐ Malfunction code ( )

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Step 2. DTC / Freeze Frame Data Check, Record and Clearance

First, check DTC (current DTC). ☞(Page 5D-21)
If DTC is indicated, print DTC and freeze frame data or write them down and then clear them. ☞(Page 5D-22)

Step 3 and 4. Visual Inspection

As a preliminary step, perform visual check of the items that support proper function of the engine and automated manual transaxle referring to “Visual Inspection” (Page 5D-14).

Step 5. Trouble Symptom Confirmation
Recheck DTC according to “DTC Confirmation Procedure” described in each DTC troubleshooting.

Step 6 and 7. Rechecking and Record of DTC and Freeze Frame Data
Refer to “DTC Check” (Page 5D-21) for checking procedure.

Step 8. Automated Manual Transaxle Symptom Diagnosis
Check the parts of the system suspected as a possible cause referring to “Automated Manual Transaxle Symptom Diagnosis” (Page 5D-35).

Step 9. Troubleshooting for DTC
Perform applicable DTC troubleshooting and repair or replace faulty parts.

Step 10. Check for Intermittent Problem
Check parts related to detected DTC (e.g. wire harness, connector, etc.). ☞(Page 00-11)

Step 11. Final Confirmation Test
Check that the problem symptom has gone and the vehicle is free from any abnormal conditions. If what has been repaired is related to DTC, clear DTC once, perform DTC confirmation procedure and check that no DTC is indicated.

Visual Inspection

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Visually check the following parts and systems.

Inspection item	Referring
• Automated manual transaxle gear oil ----- level, leakage	“Automated Manual Transaxle Oil Change” (Page 5D-82)
• Engine mountings ----- play, looseness, damage	“Engine Assembly Removal and Installation” in Section 1D (Page 1D-17)
• Suspension ----- play, looseness	“Suspension, Wheel and Tire Symptom Diagnosis” in Section 2A (Page 2A-1)
• Drive shafts ----- damage	“Front Drive Shaft Assembly On-Vehicle Inspection”: Front in Section 3A (Page 3A-2)
• Battery ----- indicator condition, corrosion of terminal	“Battery Inspection” in Section 1J (Page 1J-3)
• Connectors of electric wire harness ----- disconnection, friction	“Electronic Shift Control System Component Location” (Page 5D-11)
• Fuses ----- burning	
• Parts ----- installation, damage	
• Bolts ----- looseness	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible.	
• Automated manual transaxle warning light ----- Operation	“Automated Manual Transaxle Warning Light Check” (Page 5D-14)
• Malfunction indicator lamp ----- Operation	“MIL Check” (Page 5D-14)
• Charge warning light ----- Operation	“Generator Symptom Diagnosis” in Section 1J (Page 1J-3)
• Other parts that can be checked visually	

MIL Check

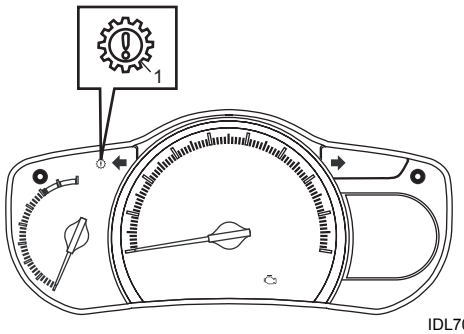
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Refer to “MIL Check” in Section 1A (Page 1A-19).

Automated Manual Transaxle Warning Light Check

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1) Set ignition “ON”.
2) Check that automated manual transaxle warning light (1) lights for about 2 sec. and then goes OFF. If anything faulty is found, refer to “Automated Manual Transaxle Warning Light Does Not Come ON at Ignition “ON” and Engine Stopped” (Page 5D-36) or “Automated Manual Transaxle Warning Light Remains ON after Engine Starts” (Page 5D-36).



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DTC Table

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NOTE

- **DTC with △ in the following table cannot be read with CAN communication OBD-II generic scan tool.**
- **For details of D/C (driving cycle), refer to "On-Board Diagnostic System Description" (Page 5D-7).**
- **Two or more DTCs of P188A, P188B, P188C, P188D, P188E or P188F could be detected simultaneously.**

DTC	DTC name	DTC detecting condition	DTC detection logic	Automated manual transaxle warning light	MIL
P0070 (△) ☞(Page 5D-37)	Ambient Air Temperature Sensor Circuit	This DTC is detected if any one of the following conditions is met. • Ambient temperature sensor signal is more than specified value. • Ambient temperature sensor signal is less than specified value.	1 D/C	Lights up	Off
P0560 ☞(Page 5D-39)	System Voltage	This DTC is detected if any one of the following conditions is met. • Power supply voltage from battery to TCM is out of specified range. • Power supply voltage from ignition switch to TCM is out of specified range.	1 D/C	Lights up	Lights up
P0562 ☞(Page 5D-39)	System Voltage Low	Power supply voltage from battery to TCM is lower than specified range.	1 D/C	Lights up	Lights up
P0572 (△) ☞(Page 5D-40)	Brake Switch "A" Circuit Low	There is no signal from brake light switch and brake switch for more than specified time.	1 D/C	Lights up	Off
P0573 (△) ☞(Page 5D-40)	Brake Switch "A" Circuit High	Vehicle is driven more than specified operating range, but brake light switch cannot be changed (stays ON).	1 D/C	Lights up	Off
P0604 ☞(Page 5D-42)	Internal Control Module Random Access Memory (RAM) Error	TCM internal failure (RAM error).	1 D/C	Lights up	Lights up
P060A ☞(Page 5D-42)	Internal Control Module Monitoring Processor Performance	TCM internal failure (SMP error).	1 D/C	Lights up	Lights up
P0615 (△) ☞(Page 5D-43)	Starter Relay Circuit	Request to starting motor control relay and feedback signal disagree.	1 D/C	Lights up	Off
P062F ☞(Page 5D-42)	Internal Control Module EEPROM Error	TCM internal failure (EEPROM error).	1 D/C	Lights up	Lights up
P0715 ☞(Page 5D-44)	Input / Turbine Speed Sensor "A" Circuit	There is no clutch speed sensor signal for more than specified time or clutch speed sensor signal is incorrect.	1 D/C	Lights up	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	Automated manual transaxle warning light	MIL
P0716 ☞(Page 5D-44)	Input / Turbine Speed Sensor “A” Circuit Range / Performance	Clutch speed rises rapidly.	1 D/C	Lights up	Lights up
P0720 ☞(Page 5D-46)	Output Speed Sensor Circuit	There is no VSS signal for more than specified time or VSS signal is incorrect.	1 D/C	Lights up	Lights up
P0721 ☞(Page 5D-46)	Output Speed Sensor Circuit Range / Performance	VSS signal rises rapidly.	1 D/C	Lights up	Lights up
P0805 ☞(Page 5D-48)	Clutch Position Sensor Circuit	This DTC is detected if any one of the following conditions is met. • Clutch position sensor signal is more than specified value for specified time. • Clutch position sensor signal is less than specified value for specified time.	1 D/C	Lights up	Lights up
P080A (△) ☞(Page 5D-49)	Clutch Position Not Learned	Clutch-contact-point learning (recognition of clutch engaging point) is not completed.	1 D/C	Lights up	Off
P0840 ☞(Page 5D-48)	Transmission Fluid Pressure Sensor / Switch “A” Circuit	This DTC is detected if any one of the following conditions is met. • Pressure sensor signal is more than specified value. • Pressure sensor signal is less than specified value.	1 D/C	Lights up	Lights up
P0841 ☞(Page 5D-48)	Transmission Fluid Pressure Sensor / Switch “A” Circuit Range / Performance	Pressure sensor signal rises rapidly.	1 D/C	Lights up	Lights up
P0904 ☞(Page 5D-48)	Gate Select Position Circuit	This DTC is detected if any one of the following conditions is met. • Select position sensor signal is more than specified value for specified time. • Select position sensor signal is less than specified value for specified time.	1 D/C	Lights up	Lights up
P0914 ☞(Page 5D-48)	Gear Shift Position Circuit	This DTC is detected if any one of the following conditions is met. • Shift position sensor signal is more than specified value for specified time. • Shift position sensor signal is less than specified value for specified time.	1 D/C	Lights up	Lights up
P0944 ☞(Page 5D-49)	Hydraulic Pressure Unit Loss of Pressure	Pressure sensor signal is less than specified value.	1 D/C	Lights up	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	Automated manual transaxle warning light	MIL
P0945 ☞(Page 5D-50)	Hydraulic Pump Relay Circuit / Open	Power supply voltage from battery to electric motor is lower than specified value.	1 D/C	Lights up	Lights up
P1702 ☞(Page 5D-42)	Internal Control Module Memory Check Sum Error	TCM internal failure (check sum error).	1 D/C	Lights up	Lights up
P1704 ☞(Page 5D-42)	Internal Control Module Memory EEPROM Error	TCM internal failure (EEPROM memory error).	1 D/C	Lights up	Lights up
P1706 (△) ☞(Page 5D-51)	Torque Request Communication Error From TCM	ECM detects abnormality of CAN communication data from TCM.	1 D/C	Off	Off
P1707 (△) ☞(Page 5D-51)	Torque Reduction Error From ECM	TCM detects a condition which is not acceptable for engine torque reduction in ECM.	1 D/C	Off	Off
P1711 ☞(Page 5D-39)	TCM Power Input Low Voltage	TCM power supply voltage from battery is lower than specified value for specified time.	1 D/C	Lights up	Lights up
P1844 (△) ☞(Page 5D-52)	Grid Position Not Learned	Grid learning (recognition of proper gear engagement) is not completed.	1 D/C	Lights up	Off
P184A ☞(Page 5D-53)	Pump Off failed	Oil pump functions for more than specified time.	1 D/C	Lights up	Lights up
P184B ☞(Page 5D-53)	Solenoid Driver “A” Circuit Range / Performance	Malfunction of solenoid driver “A” (driver for clutch solenoid valve and shift solenoid valve 1) is detected.	1 D/C	Lights up	Lights up
P184C ☞(Page 5D-53)	Solenoid Driver “A” Feedback Signal Range / Performance	This DTC is detected if any one of the following conditions is met. • Electric current of clutch solenoid is higher than specified value for specified time and feedback voltage is lower than specified value. • Electric current of clutch solenoid is lower than specified value for specified time and feedback voltage is higher than specified value.	1 D/C	Lights up	Lights up
P184D ☞(Page 5D-53)	Solenoid Driver “B” Circuit Range / Performance	Malfunction of solenoid driver “B” (driver for shift solenoid valve 2, select solenoid valve and back up light relay) is detected.	1 D/C	Lights up	Lights up
P184E ☞(Page 5D-54)	TCM Internal Supply Voltage “B” Circuit	Power supply for sub-microcomputer is out of specified range.	1 D/C	Lights up	Lights up
P184F (△) ☞(Page 5D-54)	TCM Internal Supply Voltage “C” Circuit	More than specified time has passed after power OFF (latch circuit OFF), but TCM stays ON.	1 D/C	Lights up	Off
P1850 ☞(Page 5D-55)	Gear Shift Odd Actuator Circuit	Malfunction of shift solenoid valve 1 is detected.	1 D/C	Lights up	Lights up
P1851 ☞(Page 5D-55)	Gear Shift Even Actuator Circuit	Malfunction of shift solenoid valve 2 is detected.	1 D/C	Lights up	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	Automated manual transaxle warning light	MIL
P1852 ☞(Page 5D-56)	Sensor Power Supply “A”	This DTC is detected if any one of the following conditions is met. • Power supply voltage for pressure sensor, clutch position sensor and clutch speed sensor is higher than specified value. • Power supply voltage for pressure sensor, clutch position sensor and clutch speed sensor is lower than specified value.	1 D/C	Lights up	Lights up
P1853 ☞(Page 5D-56)	Sensor Power Supply “B”	This DTC is detected if any one of the following conditions is met. • Power supply voltage for shift position sensor and select position sensor is higher than specified value. • Power supply voltage for shift position sensor and select position sensor is lower than specified value.	1 D/C	Lights up	Lights up
P1854 ☞(Page 5D-54)	TCM Internal Supply Voltage “A” Low	Power supply voltage for solenoid drivers is lower than specified value.	1 D/C	Lights up	Lights up
P1855 ☞(Page 5D-54)	TCM Internal Supply Voltage “A” High	More than specified time has passed after power load relay for solenoid drivers is OFF, power supply voltage for solenoid drivers is higher than specified value.	1 D/C	Lights up	Lights up
P185A (△) ☞(Page 5D-49)	Clutch End Stroke Position Selftune	Clutch-end-stroke-position learning (recognition of clutch stopper position) is not completed.	1 D/C	Lights up	Off
P185B (△) ☞(Page 5D-49)	Clutch Stroke Selftune	Clutch-stroke learning (recognition of distance between clutch closed position and clutch stopper) is not possible.	1 D/C	Lights up	Off
P185C ☞(Page 5D-56)	Hydraulic Pump Relay Circuit	This DTC is detected if any one of the following conditions is met. • Feedback electric current of electric motor is out of specified range. • Feedback voltage of electric motor is out of specified range. • Oil pressure is higher than specified value without operation of oil pump.	1 D/C	Lights up	Lights up
P185E ☞(Page 5D-57)	TCM Safety Function Failure	TCM internal failure (safety function control error).	1 D/C	Lights up	Lights up
P185F ☞(Page 5D-57)	TCM Safety Integrity Function Failure	MMP failure is detected by SMP in TCM.	1 D/C	Lights up	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	Automated manual transaxle warning light	MIL
P1884 (△) ☞(Page 5D-57)	Reverse Lamp Control Circuit	Malfunction of back up light relay and its circuit (open, shorted to power supply or shorted to ground) is detected.	1 D/C	Lights up	Off
P1885 (△) ☞(Page 5D-59)	Door Switch Circuit	Driver side front door switch signal is not inputted for specified time.	1 D/C	Lights up	Off
P1886 ☞(Page 5D-60)	Dual port RAM check	TCM internal failure (data integrity error).	1 D/C	Lights up	Lights up
P1888 ☞(Page 5D-55)	Clutch Actuator Circuit	Malfunction of clutch solenoid valve is detected.	1 D/C	Lights up	Lights up
P1889 ☞(Page 5D-55)	Gate Select Actuator Circuit	Malfunction of select solenoid valve is detected.	1 D/C	Lights up	Lights up
P188A ☞(Page 5D-60)	Transmission Range Sensor Circuit fault type “A”	None of shift selector position switch signals and hall sensor signals is inputted.	1 D/C	Lights up	Lights up
P188B ☞(Page 5D-60)	Transmission Range Sensor Circuit fault type “B”	None of shift selector position switch signals is inputted.	1 D/C	Lights up	Lights up
P188C ☞(Page 5D-62)	Transmission Range Sensor Circuit fault type “C”	None of M1 or M2 shift selector position switch signal, or H1, H2 or H3 hall sensor signal is not inputted or abnormal.	1 D/C	Lights up	Lights up
P188D ☞(Page 5D-64)	Transmission Range Sensor Circuit fault type “D”	M3, M4 and M5 shift selector position switch signals are not inputted.	1 D/C	Lights up	Lights up
P188E ☞(Page 5D-64)	Transmission Range Sensor Circuit fault type “E”	None of M3, M4 or M5 shift selector position switch signal is not inputted or abnormal.	1 D/C	Lights up	Lights up
P188F ☞(Page 5D-60)	Transmission Range Sensor Circuit fault type “F”	Failure of shift selector position switch signals and hall sensor signals except P188A, P188B, P188C, P188D and P188E.	1 D/C	Lights up	Lights up
P1902 ☞(Page 5D-66)	Transmission Range Sensor Supply Circuit	Request to shift selector power supply voltage and feedback signal disagree.	1 D/C	Lights up	Lights up
P1903 ☞(Page 5D-68)	Clutch Not Opening Before Gear Shifting	Clutch is not released before gear shifting.	1 D/C	Lights up	Lights up
P1904 ☞(Page 5D-68)	Clutch Closing During Engage	Clutch is engaged during gear shifting.	1 D/C	Lights up	Lights up
P1905 ☞(Page 5D-69)	Clutch Control Error	This DTC is detected if any one of the following conditions is met. • Clutch is engaged suddenly. • Clutch sticks at disengaged state.	1 D/C	Lights up	Lights up
P1906 ☞(Page 5D-70)	Gear Box Disengage Failed	Gear is not disengaged.	1 D/C	Lights up	Lights up
P1907 ☞(Page 5D-70)	Gear Box Shift Failed	Gear is shifted to unintended position.	1 D/C	Lights up	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	Automated manual transaxle warning light	MIL
P1908 ☞(Page 5D-70)	Gear Box Engage Failed	Gear cannot be engaged.	1 D/C	Lights up	Lights up
P1909 ☞(Page 5D-72)	Gear Box Unintended Gear Disengage	Gear is disengaged without request of disengagement.	1 D/C	Lights up	Lights up
P190A ☞(Page 5D-70)	Gear Box Shift Locked	Gear shift is not completed.	1 D/C	Lights up	Lights up
P190B ☞(Page 5D-72)	Gear Box Unintended Gear Engage	Gear is engaged without gear shift request.	1 D/C	Lights up	Lights up
P190C ☞(Page 5D-72)	Gearshift Endless	Gear shift is not completed within specified time.	1 D/C	Lights up	Lights up
P190D ☞(Page 5D-73)	Clutch Overspeed	Clutch speed exceeds specified value while gear is engaged.	1 D/C	Lights up	Lights up
P190E ☞(Page 5D-74)	Pump Overheating	Oil pump temperature exceeds specified value.	1 D/C	Lights up	Lights up
P190F (△) ☞(Page 5D-74)	Accumulator Failed	Accumulated oil volume exceeds specified limit.	1 D/C	Lights up	Off
P1980 (△) ☞(Page 5D-75)	System Misuse	This DTC is detected if the following conditions are met. • The number of gear shift exceeds specified value during specified period of time. • Oil pump temperature exceeds specified value.	1 D/C	Off	Off
P1981 (△) ☞(Page 5D-75)	CAN Invalid Data of Engine Torque	Engine torque value is incorrect.	1 D/C	Off	Off
P1982 ☞(Page 5D-42)	Internal Control Module EEPROM Error (Application)	TCM internal failure (EEPROM application error).	1 D/C	Lights up	Lights up
P1983 ☞(Page 5D-42)	Internal Control Module Monitoring Processor Output Failure	TCM internal failure (monitoring processor output failure).	1 D/C	Lights up	Lights up
P1984 ☞(Page 5D-57)	TCM Safety Input Preprocessing Failure	TCM internal failure (safety input preprocessing control error).	1 D/C	Lights up	Lights up
P1985 (△) ☞(Page 5D-51)	Torque Up Error From ECM	TCM detects a condition which is not acceptable for engine torque up in ECM.	1 D/C	Off	Off
P2712 ☞(Page 5D-76)	Hydraulic Power Unit Leakage	This DTC is detected if any one of the following conditions is met. • Oil leakage exceeds specified value while oil pump is not operating. • Oil leakage exceeds specified value while oil pump is operating.	1 D/C	Lights up	Lights up

DTC	DTC name	DTC detecting condition	DTC detection logic	Automated manual transaxle warning light	MIL
P2789 (△) ☞(Page 5D-76)	Clutch “A” Adaptive Learning at Limit	This DTC is detected if any one of the following conditions is met. • Clutch closed position is more than specified value. • Clutch closed position is less than specified value.	1 D/C	Lights up	Off
U0073 ☞(Page 5D-77)	Control Module Communication Bus Off	Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8)	1 D/C	Lights up	Lights up
U0100 ☞(Page 5D-77)	Lost Communication With ECM		1 D/C	Lights up	Lights up
U0140 (△) ☞(Page 5D-77)	Lost Communication With Body Control Module		1 D/C	Lights up	Off

DTC Check

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NOTE

In case that MIL turns on, the malfunction(s) is detected in either ECM or TCM and it stores the trouble information (DTC, freeze frame data, etc.) in its memory.
According to the varieties of scan tool, check the trouble information as follows.

- **SUZUKI scan tool:**
  It is necessary to check both ECM and TCM.
- **CAN communication OBD-II generic scan tool:**
  It is not necessary to check both ECM and TCM separately because the trouble information of both modules can be read and displayed at once.

1) Set ignition “OFF”.
2) Connect SUZUKI scan tool to DLC (1).

   Special tool
   (A): SUZUKI scan tool (SUZUKI SDT-II)

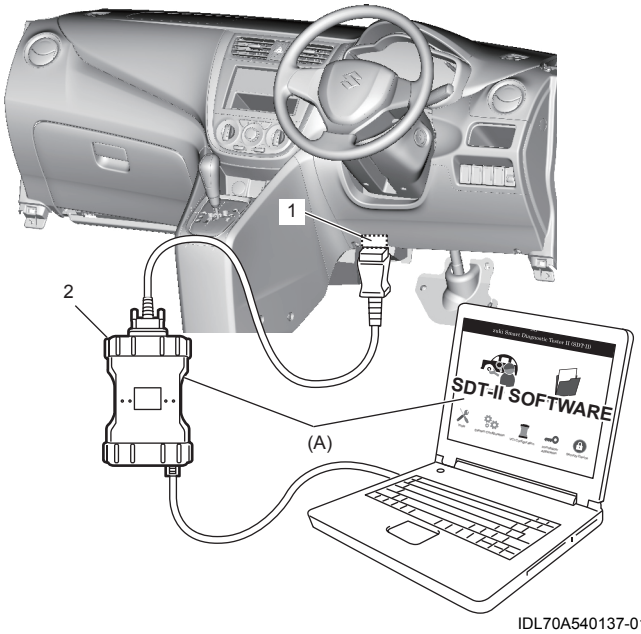
3) Set ignition “ON”.
4) Read DTC and freeze frame data according to instructions displayed on SUZUKI scan tool and print them or write them down. Refer to Operator's Manual of SUZUKI scan tool for further details.

NOTE

If communication between SUZUKI scan tool and TCM is not possible, perform the following checks:

- **Check communication condition between PC and VCI (2) using SUZUKI scan tool function.**
- **Check DLC power circuit and ground circuit.**
- **Check DLC cable. If necessary, check DLC cable by substituting a known-good DLC cable.**
- **Check CAN communication system. (“Control Module Communication Bus Off” is detected in any control module.) ☞(Page 10H-16)**

- **Check TCM power circuit and ground circuit. ☞(Page 5D-77)**



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5) After completing the check, set ignition “OFF” and disconnect SUZUKI scan tool from DLC.

DTC Clearance

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1) Set ignition “OFF”.
2) Connect SUZUKI scan tool to DLC (1).

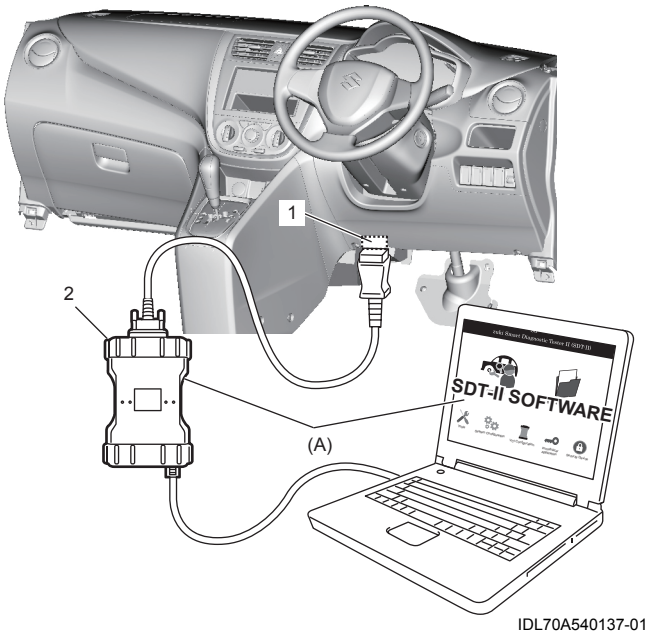
Special tool
(A): SUZUKI scan tool (SUZUKI SDT-II)

3) Set ignition “ON”.
4) Clear DTC according to instructions displayed on SUZUKI scan tool and print them or write them down. Refer to Operator's Manual of SUZUKI scan tool for further details.

NOTE

If communication between SUZUKI scan tool and TCM is not possible, perform the following checks:

- **Check communication condition between PC and VCI (2) using SUZUKI scan tool function.**
- **Check DLC power circuit and ground circuit.**
- **Check DLC cable. If necessary, check DLC cable by substituting a known-good DLC cable.**
- **Check CAN communication system. (“Control Module Communication Bus Off” is detected in any control module.) ☞(Page 10H-16)**
- **Check TCM power circuit and ground circuit. ☞(Page 5D-77)**



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5) After completing DTC clearance, set ignition “OFF” and disconnect SUZUKI scan tool from DLC.

NOTE

Confirmed DTC and freeze frame data stored in TCM memory are also cleared in the following cases. Be careful not to clear them before recording them.

- **When the same malfunction (DTC) is not detected again for 40 engine warm-up cycles.**
- **Even though the pending and confirmed DTCs are cleared, the permanent DTC will not be cleared.**

Fail-Safe Table

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TCM has fail-safe function that assures minimum driving performance even when the control system fails.
When any of the following DTC(s) is detected, TCM control enters the fail-safe mode as long as the failure condition associated with the DTC continues.

DTC	DTC name	Fail-safe operation	Fail-safe cancel condition
P0070 ☞(Page 5D-37)	Ambient Air Temperature Sensor Circuit	TCM functions assuming that ambient temperature is 20 °C (68 °F).	Recovers normal condition.
P0560 ☞(Page 5D-39)	System Voltage	TCM shifts gear to neutral if the following conditions are met while engine is running. • Vehicle is stopped. • Accelerator pedal is released. • Gear is engaged. • Brake pedal is released.	Recovers normal condition.
P0562 ☞(Page 5D-39)	System Voltage Low	Automated manual transaxle actuator unit cannot shift gear to other than neutral.	Recovers normal condition.
P0572 ☞(Page 5D-40)	Brake Switch “A” Circuit Low	• TCM inhibits creep control. • TCM substitutes brake switch (control signal) for brake light switch (brake light signal).	Recovers normal condition.
P0573 ☞(Page 5D-40)	Brake Switch “A” Circuit High		
P0604 ☞(Page 5D-42)	Internal Control Module Random Access Memory (RAM) Error	• TCM stops gear shift control. • TCM stops cranking.	Recovers normal condition.
P060A ☞(Page 5D-42)	Internal Control Module Monitoring Processor Performance	• TCM stops engine. • TCM stops gear shift control. • TCM disengages clutch.	Recovers normal condition.
P0615 ☞(Page 5D-43)	Starter Relay Circuit	TCM controls gear position to neutral when cranking.	Recovers normal condition or ignition is set to “ON”.
P062F ☞(Page 5D-42)	Internal Control Module EEPROM Error	• Automated manual transaxle is controlled in default mode. • TCM shifts gear to neutral.	Recovers normal condition.

DTC	DTC name	Fail-safe operation	Fail-safe cancel condition
P0715 ☞(Page 5D-44)	Input / Turbine Speed Sensor “A” Circuit	• When only clutch speed sensor is malfunctioning. – TCM substitutes VSS signal or engine speed sensor signal for clutch speed by calculation. • When VSS, engine speed sensor or APP sensor is malfunctioning. – TCM stops gear shift control. – TCM controls gear shift to neutral when vehicle is stopping, starting or creeping. – TCM substitutes engine speed sensor signal or VSS signal for clutch speed by calculation.	Recovers normal condition.
P0716 ☞(Page 5D-44)	Input / Turbine Speed Sensor “A” Circuit Range / Performance		
P0720 ☞(Page 5D-46)	Output Speed Sensor Circuit	• When only VSS is malfunctioning. – TCM stops gear shift control. – TCM stops starting / creeping control when gear is shifted from D to R or R to D. – TCM substitutes clutch speed sensor signal or engine speed sensor signal for vehicle speed by calculation. • When clutch speed sensor, engine speed sensor or APP sensor is malfunctioning. – TCM stops gear shift control. – TCM controls gear shift to neutral when vehicle is stopping, starting or creeping. – TCM substitutes engine speed sensor signal or clutch speed sensor signal for vehicle speed by calculation.	Recovers normal condition or ignition is set to “ON”.
P0721 ☞(Page 5D-46)	Output Speed Sensor Circuit Range / Performance		Recovers normal condition.
P0805 ☞(Page 5D-48)	Clutch Position Sensor Circuit	• TCM stops gear shift control. • TCM releases clutch when vehicle is stopping, starting or creeping. • TCM stops creep control. • TCM stops cranking. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value.	Recovers normal condition.
P080A ☞(Page 5D-49)	Clutch Position Not Learned	TCM restricts gear shift control except N, R and 1st gear.	Recovers normal condition.

DTC	DTC name	Fail-safe operation	Fail-safe cancel condition
P0840 ☞(Page 5D-48)	Transmission Fluid Pressure Sensor / Switch “A” Circuit	• TCM stops creep control. • TCM shifts gear to neutral if the following conditions are met. – Vehicle is stopped. – Accelerator pedal is released. – Gear is engaged. – Brake pedal is not depressed for more than specified time.	Recovers normal condition.
P0841 ☞(Page 5D-48)	Transmission Fluid Pressure Sensor / Switch “A” Circuit Range / Performance		
P0904 ☞(Page 5D-48)	Gate Select Position Circuit	• TCM stops gear shift control. • TCM stops cranking. • TCM stops starting / creeping control when selector lever is shifted from D to R or R to D.	Recovers normal condition.
P0914 ☞(Page 5D-48)	Gear Shift Position Circuit	TCM restricts gear shift control.	Recovers normal condition.
P0944 ☞(Page 5D-49)	Hydraulic Pressure Unit Loss of Pressure	• TCM stops gear shift control. • TCM controls gear shift to neutral when vehicle is stopping, starting or creeping.	Oil pressure is higher than specified value.
P0945 ☞(Page 5D-50)	Hydraulic Pump Relay Circuit / Open	TCM stops gear shift request to gears other than neutral when oil pressure is not enough.	Recovers normal condition.
P1702 ☞(Page 5D-42)	Internal Control Module Memory Check Sum Error	• TCM stops gear shift control. • TCM stops cranking.	Recovers normal condition.
P1704 ☞(Page 5D-42)	Internal Control Module Memory EEPROM Error	• TCM controls gear shift to neutral when vehicle is stopping.	Recovers normal condition.
P1706 ☞(Page 5D-51)	Torque Request Communication Error From TCM	—	—
P1707 ☞(Page 5D-51)	Torque Reduction Error From ECM	—	—
P1711 ☞(Page 5D-39)	TCM Power Input Low Voltage	• TCM restricts gear shifting. • TCM restricts oil pump operation.	Recovers normal condition.
P1844 ☞(Page 5D-52)	Grid Position Not Learned	• TCM stops vehicle start control. • TCM stops creep control. • TCM stops gear shift control.	Recovers normal condition.
P184A ☞(Page 5D-53)	Pump Off failed	TCM turns OFF oil pump for a specified period of time and turns ON when oil pressure becomes lower than specified value.	Ignition is set to “ON”.
P184B ☞(Page 5D-53)	Solenoid Driver “A” Circuit Range / Performance	• TCM stops gear shift control. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value.	Recovers normal condition.

DTC	DTC name	Fail-safe operation	Fail-safe cancel condition
P184C ☞(Page 5D-53)	Solenoid Driver “A” Feedback Signal Range / Performance	• TCM stops gear shift control. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value.	Recovers normal condition or ignition is set to “ON”.
P184D ☞(Page 5D-53)	Solenoid Driver “B” Circuit Range / Performance	TCM stops gear shift control.	Recovers normal condition.
P184E ☞(Page 5D-54)	TCM Internal Supply Voltage “B” Circuit	• TCM stops gear shift control. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value.	Recovers normal condition.
P184F ☞(Page 5D-54)	TCM Internal Supply Voltage “C” Circuit	—	—
P1850 ☞(Page 5D-55)	Gear Shift Odd Actuator Circuit	• TCM stops gear shift control. • TCM stops vehicle start after stopping vehicle.	Recovers normal condition.
P1851 ☞(Page 5D-55)	Gear Shift Even Actuator Circuit		
P1852 ☞(Page 5D-56)	Sensor Power Supply “A”	• TCM stops gear shift control. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value. • TCM stops creep control. • TCM stops cranking. • TCM releases clutch when vehicle is stopping, starting or creeping.	Recovers normal condition.
P1853 ☞(Page 5D-56)	Sensor Power Supply “B”	• TCM stops gear shift control. • TCM stops creep control. • TCM stops vehicle start control. • TCM stops cranking. • TCM stops engine when selector lever is shifted from D to R or R to D.	Recovers normal condition.

DTC	DTC name	Fail-safe operation	Fail-safe cancel condition
P1854 ☞(Page 5D-54)	TCM Internal Supply Voltage “A” Low	• TCM stops gear shift control. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value.	Recovers normal condition.
P1855 ☞(Page 5D-54)	TCM Internal Supply Voltage “A” High	—	—
P185A ☞(Page 5D-49)	Clutch End Stroke Position Selftune	—	—
P185B ☞(Page 5D-49)	Clutch Stroke Selftune	—	—
P185C ☞(Page 5D-56)	Hydraulic Pump Relay Circuit	—	—
P185E ☞(Page 5D-57)	TCM Safety Function Failure	• TCM stops engine. • TCM stops gear shift control. • TCM disengages clutch.	Ignition is set to “OFF”.
P185F ☞(Page 5D-57)	TCM Safety Integrity Function Failure	TCM disengages clutch.	—
P1884 ☞(Page 5D-57)	Reverse Lamp Control Circuit	—	—
P1885 ☞(Page 5D-59)	Door Switch Circuit	TCM controls gear position to neutral when vehicle is stopping without depressing brake pedal for a specified period of time.	Recovers normal condition.
P1886 ☞(Page 5D-60)	Dual port RAM check	• TCM stops gear shift control except neutral. • TCM controls gear position to neutral after vehicle stopping. • TCM stops creep control. • TCM stops cranking.	Recovers normal condition.
P1888 ☞(Page 5D-55)	Clutch Actuator Circuit	• TCM stops gear shift control. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value.	Recovers normal condition.
P1889 ☞(Page 5D-55)	Gate Select Actuator Circuit	• TCM stops gear shift control. • TCM shifts gear to neutral.	Recovers normal condition.

DTC	DTC name	Fail-safe operation	Fail-safe cancel condition
P188A ☞(Page 5D-60)	Transmission Range Sensor Circuit fault type “A”	• TCM cancels manual gear shift. • TCM controls gear position to neutral at vehicle low speed. • TCM stops creep control. • TCM stops vehicle start control.	After recovering normal condition, the following steps are performed. 1. Ignition is set to “ON”. 2. Gear is shifted to R, N, D and M holding each gear position for more than 1 second.
P188B ☞(Page 5D-60)	Transmission Range Sensor Circuit fault type “B”		
P188C ☞(Page 5D-62)	Transmission Range Sensor Circuit fault type “C”		
P188D ☞(Page 5D-64)	Transmission Range Sensor Circuit fault type “D”		
P188E ☞(Page 5D-64)	Transmission Range Sensor Circuit fault type “E”		
P188F ☞(Page 5D-60)	Transmission Range Sensor Circuit fault type “F”		
P1902 ☞(Page 5D-66)	Transmission Range Sensor Supply Circuit	—	—
P1903 ☞(Page 5D-68)	Clutch Not Opening Before Gear Shifting	TCM stops gear shift control.	Gear is shifted by selector lever normally.
P1904 ☞(Page 5D-68)	Clutch Closing During Engage	• TCM controls gear shift to neutral. • TCM stops gear shift until gear is shifted to neutral.	Ignition is set to “ON”.
P1905 ☞(Page 5D-69)	Clutch Control Error	• TCM stops gear shift control. • TCM stops engine if the following conditions are met. – Vehicle speed is lower than specified value. – Engine speed is lower than specified value. – Accelerator pedal is depressed less than specified value.	Ignition is set to “ON”.
P1906 ☞(Page 5D-70)	Gear Box Disengage Failed	TCM stops gear shift control.	Gear is shifted by selector lever normally.
P1907 ☞(Page 5D-70)	Gear Box Shift Failed	• TCM stops gear shift request. • TCM shifts gear to neutral.	Ignition is set to “ON”.
P1908 ☞(Page 5D-70)	Gear Box Engage Failed	TCM stops gear shift request.	Ignition is set to “ON”.
P1909 ☞(Page 5D-72)	Gear Box Unintended Gear Disengage	TCM controls gear position to neutral, and then gear shift to any gear becomes possible.	Ignition is set to “ON”.
P190A ☞(Page 5D-70)	Gear Box Shift Locked	If TCM fails to retry gear shift, gear stays in previous position and then gear shift to any gear becomes possible.	Ignition is set to “ON”.
P190B ☞(Page 5D-72)	Gear Box Unintended Gear Engage	TCM stops gear shift control.	Ignition is set to “ON”.
P190C ☞(Page 5D-72)	Gearshift Endless	TCM stops gear shift control.	Ignition is set to “OFF”.
P190D ☞(Page 5D-73)	Clutch Overspeed	TCM controls gear shift to neutral.	Clutch speed is lower than specified value.

DTC	DTC name	Fail-safe operation	Fail-safe cancel condition
P190E ☞(Page 5D-74)	Pump Overheating	• TCM restricts oil pump operation. • TCM restricts gear shift.	Oil pump temperature is lower than specified value for more than specified time, or ignition is set to “ON”.
P190F ☞(Page 5D-74)	Accumulator Failed	—	—
P1980 ☞(Page 5D-75)	System Misuse	TCM restricts gear shift.	Oil pump temperature is lower than specified value, or ignition is set to “ON”.
P1981 ☞(Page 5D-75)	CAN Invalid Data of Engine Torque	TCM uses temporary value.	Recovers normal condition.
P1982 ☞(Page 5D-42)	Internal Control Module EEPROM Error (Application)	• TCM stops creep control. • TCM stops vehicle start control. • TCM stops gear shift control.	Recovers normal condition.
P1983 ☞(Page 5D-42)	Internal Control Module Monitoring Processor Output Failure	• TCM stops engine. • TCM stops gear shift control. • TCM disengages clutch.	Recovers normal condition.
P1984 ☞(Page 5D-57)	TCM Safety Input Preprocessing Failure	• TCM stops engine. • TCM stops gear shift control. • TCM disengages clutch.	Ignition is set to “OFF”.
P1985 ☞(Page 5D-51)	Torque Up Error From ECM	—	—
P2712 ☞(Page 5D-76)	Hydraulic Power Unit Leakage	TCM restricts gear shift.	Ignition is set to “ON”.
P2789 ☞(Page 5D-76)	Clutch “A” Adaptive Learning at Limit	—	—
U0073☞(Page 5D-77)	Control Module Communication Bus Off	• TCM stops gear shift request to gears other than neutral. • TCM controls gear shift to neutral when vehicle stopping. • TCM stops vehicle start control. • TCM stops creep control. • TCM stops cranking.	Recovers normal condition.
U0100☞(Page 5D-77)	Lost Communication With ECM		
U0140☞(Page 5D-77)	Lost Communication With Body Control Module	TCM uses temporary value.	Recovers normal condition.

Scan Tool Data

AENDL70A5404009

As the data values given in the following table are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.
Also, condition in the following table that can be checked by the scan tool are those detected by TCM and output from TCM as commands and there may be cases where the automated manual transaxle or actuator is not operating (in the condition) as indicated by the scan tool.

NOTE

- **If communication between SUZUKI scan tool and TCM is not possible, perform the following checks:**
  - **Check communication condition between PC and VCI using SUZUKI scan tool function.**
  - **Check DLC power circuit and ground circuit.**
  - **Check DLC cable. If necessary, check DLC cable by substituting a known-good DLC cable.**
  - **Check CAN communication system. ("Control Module Communication Bus Off" is detected in any control module.) ☞(Page 10H-16)**
  - **Check TCM power circuit and ground circuit. ☞(Page 5D-77)**
- **The following scan tool data related to automated manual transaxle can be checked only by communicating with TCM.**

Scan tool data	Vehicle condition	Normal condition / Reference values
Input Shaft Revolution ☞(Page 5D-33)	• Vehicle: Stop • Shift selector: R, D or M range	0 rpm
	Vehicle: Running	The same value as engine speed reading
Output Shaft Revolution ☞(Page 5D-33)	• Vehicle: Stop • Shift selector: R, D or M range	0 rpm
	• Vehicle: Running at 10 km/h (6 mile/h) • Shift selector: R range	Approx. 100 rpm
Clutch Position Sensor ☞(Page 5D-33)	Ignition: "ON"	800 to 1500
	Engine: Idle speed	100 to 500
Select Position Sensor ☞(Page 5D-33)	Shift selector: R range	600 to 800
	Shift selector: N range	400 to 600
	Shift selector: D or M range	200 to 400
Shift Position Sensor ☞(Page 5D-33)	Shift selector: R range	600 to 800
	Shift selector: N range	600 to 800
	Shift selector: D or M range	200 to 400
Battery Voltage ☞(Page 5D-33)	Engine: Idle speed	13 to 15 V
Oil Pressure ☞(Page 5D-33)	• Shift selector: N range • Brake pedal: Released • Accelerator pedal: Released	4 to 6 MPa (40 to 60 bar)
Clutch Solenoid Control Value ☞(Page 5D-33)	Ignition: "ON"	0 mA
	Engine: Idle speed	264 to 794 mA
Select Solenoid Control Value ☞(Page 5D-33)	Ignition: "ON"	0 mA
	Gear is in shift operation with vehicle stationary with ignition "ON"	0 mA or more
Shift Solenoid No.1 (Odd Side) Control Value ☞(Page 5D-33)	Ignition: "ON"	0 mA
	Gear is in shift operation with vehicle stationary with ignition "ON"	0 mA or more
Shift Solenoid No.2 (Even Side) Control Value ☞(Page 5D-33)	Ignition: "ON"	0 mA
	Gear is in shift operation with vehicle stationary with ignition "ON"	0 mA or more
Engine Speed ☞(Page 5D-33)	• Engine: Specified idle speed after warming up • Shift selector: N range	650 to 750 rpm
Throttle Position ☞(Page 5D-33)	• Engine: Stop • Accelerator pedal: Released	0 to 10%
	• Engine: Stop • Accelerator pedal: Fully depressed	90 to 100%
Accel Effective Position ☞(Page 5D-33)	• Engine: Stop • Accelerator pedal: Released	0 to 2%
	• Engine: Stop • Accelerator pedal: Fully depressed	90 to 100%

Scan tool data	Vehicle condition	Normal condition / Reference values
ECT ☞(Page 5D-33)	Engine: Specified idle speed after warming up	Approx. 80 to 100 °C (176 to 212 °F)
Outside Air Temp ☞(Page 5D-33)	Engine: Cold and ignition “ON”	Outside air temperature is displayed.
Barometric Pressure ☞(Page 5D-33)	Engine: Cold and ignition “ON”	Barometric pressure is displayed.
Vehicle Speed ☞(Page 5D-33)	Vehicle: Running	The same value as speedometer reading
Clutch Control Status ☞(Page 5D-33)	• Ignition: “ON” • Shift selector: N range	Closed
	• Ignition: “ON” • Shift selector: Being shifted from N to D	Slipping Before Engaging
	• Ignition: “ON” • Shift selector: After completion of N to D shift	Slipping After Engaging
	• Engine: Idle speed • Shift selector: N range	Opened
Transmission Gear Selector Position ☞(Page 5D-33)	Shift selector: Mid point of gear shift	Shift in Progress
	Shift selector: R range	Reverse
	Shift selector: N range	Neutral
	Shift selector: D range	Drive
	Shift selector: M range	Manual Mode
Gear Position ☞(Page 5D-33)	Shift selector: Mid point of gear shift	Shift in Progress
	Shift selector: D range	1st
	• Vehicle: Running at 15 km/h (9 mile/h) • Shift selector: D range	2nd
	• Vehicle: Running at 25 km/h (16 mile/h) • Shift selector: D range	3rd
	• Vehicle: Running at 35 km/h (22 mile/h) • Shift selector: D range	4th
	• Vehicle: Running at 50 km/h (31 mile/h) • Shift selector: D range	5th
	Shift selector: R range	R
	Shift selector: N range	N
Manual Gear Position ☞(Page 5D-33)	Shift selector: D range	Gear Position Indication off
	• Shift selector: M range • Manual mode gear position: 1	1st
	• Shift selector: M range • Manual mode gear position: 2	2nd
	• Shift selector: M range • Manual mode gear position: 3	3rd
	• Shift selector: M range • Manual mode gear position: 4	4th
	• Shift selector: M range • Manual mode gear position: 5	5th
Estimated Clutch Temperature ☞(Page 5D-33)	Estimated clutch temperature: Same as engine coolant temperature after vehicle stopping	Approx. –40 to 350 °C (–40 to 662 °F)
Clutch High Temperature Control Status ☞(Page 5D-34)	Ignition: “ON”	Normal
	Estimated clutch temperature: Higher than 120 °C (248 °F)	Hot Mode 1
	Estimated clutch temperature: Higher than Hot Mode 1	Hot Mode 2
Lever Position Switch: M1 ☞(Page 5D-34)	Shift selector: R or N range	ON
	Shift selector: D, M, + or - range	OFF

Scan tool data	Vehicle condition	Normal condition / Reference values
Lever Position Switch: M2 ☞(Page 5D-34)	Shift selector: N, D, M, + or - range	ON
	Shift selector: R range	OFF
Lever Position Switch: M3 ☞(Page 5D-34)	Shift selector: M, + or - range	ON
	Shift selector: R, N or D range	OFF
Lever Position Switch: M4 ☞(Page 5D-34)	Shift selector: R, N, D, M or + range	ON
	Shift selector: - range	OFF
Lever Position Switch: M5 ☞(Page 5D-34)	Shift selector: R, N, D, M or - range	ON
	Shift selector: + range	OFF
Lever Position Switch: H1 ☞(Page 5D-34)	Shift selector: R range	ON
	Other than above condition	OFF
Lever Position Switch: H2 ☞(Page 5D-34)	Shift selector: N range	ON
	Other than above condition	OFF
Lever Position Switch: H3 ☞(Page 5D-34)	Shift selector: D, M, + or - range	ON
	Other than above condition	OFF
Driv Door SW (W/H) ☞(Page 5D-34)	Driver side front door: Open	ON
	Driver side front door: Close	OFF
Brake Pedal Switch No.1 ☞(Page 5D-34)	Brake pedal: Fully depressed	ON
	Brake pedal: Released	OFF
Brake Pedal Switch No.2 ☞(Page 5D-34)	Brake pedal: Released	ON
	Brake pedal: Fully depressed	OFF
Hydraulic Pump Active ☞(Page 5D-34)	Repeating gear shift operation with vehicle stationary with ignition “ON”	ON
	Other than above condition	OFF
Driv Door SW (CAN Signal from BCM) ☞(Page 5D-34)	Driver side front door: Open	Open
	Driver side front door: Close	Close
Parking Brake SW ☞(Page 5D-34)	Parking brake lever: Pulled	ON
	Parking brake lever: Released	OFF
A/C Comp Clutch ☞(Page 5D-34)	A/C compressor magnet clutch: Connected	ON
	A/C compressor magnet clutch: Released	OFF
Fuel Cut Active ☞(Page 5D-34)	Fuel Cut operating	ON
	Fuel Cut not operating	OFF
Transaxle Warning Light (Lighting) ☞(Page 5D-34)	Within 2 sec. after set ignition “ON”	ON
	Engine: Running with faulty condition	ON
	Engine: Running without faulty condition	OFF
Transaxle Warning Light (Flashing) ☞(Page 5D-34)	Clutch: Overheating	ON
	Clutch: Normal condition	OFF
MIL Request ☞(Page 5D-34)	Ignition: “ON”	ON
	Engine: Running with faulty condition	ON
	Engine: Running without faulty condition	OFF
Creep Control Active ☞(Page 5D-34)	• Engine: Running • Shift selector: D or M range • Brake pedal: Released	ON
	• Engine: Running • Shift selector: D or M range • Brake pedal: Depressed	OFF
	Ignition: “ON”	OFF
Driv Door SW ☞(Page 5D-35)	Driver side front door: Open	ON
	Driver side front door: Close	OFF
A/M State ☞(Page 5D-35)	Shift selector: D range	Automatic
	Shift selector: M range	Manual
Contact-point Learning Complete ☞(Page 5D-35)	After completion of contact-point learning	Complete
	Before completion of contact-point learning (after reset of learning)	Incomplete
Clutch Close Learning Complete ☞(Page 5D-35)	After completion of clutch close learning	Complete
	Before completion of clutch close learning (after reset of learning)	Incomplete

Scan tool data	Vehicle condition	Normal condition / Reference values
Clutch End Stroke Learning Complete ☞(Page 5D-35)	After completion of clutch end stroke learning	Complete
	Before completion of clutch end stroke learning (after reset of learning)	Incomplete
Clutch Stroke Check Complete ☞(Page 5D-35)	After completion of clutch-stroke learning	Complete
	Before completion of clutch-stroke learning (after reset of learning)	Incomplete
Grid Learning Complete ☞(Page 5D-35)	After completion of grid learning	Complete
	Before completion of grid learning (after reset of learning)	Incomplete

Scan Tool Data Definitions:

Input Shaft Revolution (rpm)
This parameter indicates input shaft speed detected by clutch speed sensor.

Output Shaft Revolution (rpm)
This parameter indicates output shaft speed calculated by multiplying input shaft speed and reduction gear ratio.

Clutch Position Sensor
This parameter indicates the states of clutch position sensor.

Select Position Sensor
This parameter indicates the states of select position sensor.

Shift Position Sensor
This parameter indicates the states of shift position sensor.

Battery Voltage (V)
This parameter indicates battery positive voltage inputted to TCM.

Oil Pressure (MPa)
This parameter indicates oil pressure detected by pressure sensor.

Clutch Solenoid Control Value (mA)
This parameter indicates control current value that TCM outputs to clutch solenoid valve.

Select Solenoid Control Value (mA)
This parameter indicates control current value that TCM outputs to select solenoid valve.

Shift Solenoid No.1 (Odd Side) Control Value (mA)
This parameter indicates control current value that TCM outputs to shift solenoid valve 1.

Shift Solenoid No.2 (Even Side) Control Value (mA)
This parameter indicates control current value that TCM outputs to shift solenoid valve 2.

Engine Speed (rpm)
This parameter indicates engine speed sent from ECM through CAN.

Throttle Position (%)
This parameter indicates throttle position sent from ECM through CAN.

Accel Effective Position (Accelerator Effective Position (%))
This parameter indicates accelerator pedal position sent from ECM through CAN.

ECT (Engine Coolant Temperature, °C, °F)
This parameter indicates engine coolant temperature sent from ECM through CAN.

Outside Air Temp (Outside Air Temperature, °C, °F)
This parameter indicates outside air temperature sent from BCM through CAN.

Barometric Pressure (kPa)
This parameter indicates barometric pressure sent from ECM through CAN.

Vehicle Speed (km/h)
This parameter indicates vehicle speed detected by VSS.

Clutch Control Status
This parameter indicates the states of clutch control.
Closed: Shift selector is in N with ignition “ON” and engine stopped. Slipping Before Engaging: Shift selector is being shifted from N to D with ignition “ON”. Slipping After Engaging: After completion of N to D shift with ignition “ON”
Opened: Shift selector is in N with engine idling.

Transmission Gear Selector Position
This parameter indicates shift position information.

Gear Position
This parameter indicates shift position information in drive mode.

Manual Gear Position
This parameter indicates shift position information in manual mode.

Estimated Clutch Temperature (°C, °F)
This parameter indicates estimated clutch temperature calculated by TCM.

Clutch High Temperature Control Status
This parameter indicates the states of clutch high temperature control. Normal: Estimated clutch temperature is less than 120 °C (248°F). Hot Mode 1: Estimated clutch temperature is higher than 120 °C (248°F). Hot Mode 2: Estimated clutch temperature is higher than hot mode 1.

Lever Position Switch: M1 (ON/OFF)
This parameter indicates the states of R or N range switch in shift select lever. ON: Shift selector is in R or N. OFF: Shift selector is in D, M, + or -.

Lever Position Switch: M2 (ON/OFF)
This parameter indicates the states of N, D, M, + or - range switch in shift select lever. ON: Shift selector is in N, D, M, + or -.OFF: Shift selector is in R.

Lever Position Switch: M3 (ON/OFF)
This parameter indicates the states of M, + or - range switch in shift select lever. ON: Shift selector is in M, + or -.OFF: Shift selector is in R, N or D.

Lever Position Switch: M4 (ON/OFF)
This parameter indicates the states of R, N, D, M or + range switch in shift select lever. ON: Shift selector is in R, N, D, M or +.OFF: Shift selector is in -.

Lever Position Switch: M5 (ON/OFF)
This parameter indicates the states of R, N, D, M or - range switch in shift select lever. ON: Shift selector is in R, N, D, M or -.OFF: Shift selector is in +.

Lever Position Switch: H1 (ON/OFF)
This parameter indicates the states of reverse sensor in shift select lever. ON: Shift selector is in R. OFF: Shift selector is in N, D, M, + or -.

Lever Position Switch: H2 (ON/OFF)
This parameter indicates the states of neutral sensor in shift select lever. ON: Shift selector is in N. OFF: Shift selector is in R, D, M, + or -.

Lever Position Switch: H3 (ON/OFF)
This parameter indicates the states of forward sensor in shift select lever. ON: Shift selector is in D, M, + or -.OFF: Shift selector is in R or N.

Driv Door SW (W/H) (Driver's Door Switch Wiring Harness) (ON/OFF)
This parameter indicates driver's door switch wiring harness. ON: Driver's door is open. OFF: Driver's door is closed.

Brake Pedal Switch No.1 (ON/OFF)
This parameter indicates brake light switch inputted to TCM.
ON: Brake light switch is ON. (Brake pedal depressed)
OFF: Brake light switch is OFF. (Brake pedal released)

Brake Pedal Switch No.2 (ON/OFF)
This parameter indicates brake switch inputted to TCM.
ON: Brake switch is ON. (Brake pedal released)
OFF: Brake switch is OFF. (Brake pedal depressed)

Hydraulic Pump Active (ON/OFF)
This parameter indicates the states of hydraulic pump.
ON: Hydraulic pump operating
OFF: Hydraulic pump not operating

Driv Door SW (CAN Signal from BCM) (Driver's Door Switch (CAN Signal from BCM))
This parameter indicates driver's door switch sent from BCM through CAN. Open: Driver's door is open. Close: Driver's door is closed.

Parking Brake SW (Parking Brake Switch) (ON/OFF)
This parameter indicates parking brake switch sent from BCM through CAN. ON: Parking brake lever is pulled. OFF: Parking brake lever is released.

A/C Comp Clutch (ON/OFF)
This parameter indicates air conditioner request information received from BCM through CAN.
ON: A/C request signal is ON.
OFF: A/C request signal is OFF.

Fuel Cut Active (ON/OFF)
This parameter indicates the state of fuel cut signal from ECM through CAN.
ON: Fuel injection is cut (output signal to injector is stopped).
OFF: Fuel injection is not cut.

Transaxle Warning Light (Lighting) (ON/OFF)
This parameter indicates the states of transmission warning light (lighting) output signal from TCM through CAN. ON: Within 2 sec. after ignition "ON" or engine is running with faulty condition. OFF: Engine is running in normal condition.

Transaxle Warning Light (Flashing) (ON/OFF)
This parameter indicates the states of transmission warning light (flashing) output signal from TCM through CAN. ON: Clutch is overheating. OFF: Clutch temperature is normal.

MIL Request (ON/OFF)
This parameter indicates the states of MIL output signal from TCM through CAN. ON: TCM requests combination meter to turn on MIL. OFF: TCM does not request combination meter to turn on MIL.

Creep Control Active (ON/OFF)
This parameter indicates the states of creep control.
ON: Creep control operating
OFF: Creep control not operating

Driv Door SW (Driver's Door Switch) (ON/OFF)
This parameter indicates driver's door switch inputted to TCM. ON: Driver's door is open. OFF: Driver's door is closed.

A/M State (Automatic / Manual State)
This parameter indicates the gear shifting mode. Automatic: Automatic gear shifting Manual: Manual gear shifting

Contact-point Learning Complete
This parameter indicates the states of contact-point learning. Complete: Contact-point learning is completed. Incomplete: Contact-point learning is not completed.

Clutch Close Learning Complete
This parameter indicates the states of clutch close learning. Complete: Clutch close learning is completed. Incomplete: Clutch close learning is not completed.

Clutch End Stroke Learning Complete
This parameter indicates the states of clutch end stroke learning. Complete: Clutch end stroke learning is completed. Incomplete: Clutch end stroke learning is not completed.

Clutch Stroke Check Complete
This parameter indicates the states of clutch stroke check. Complete: Clutch-stroke learning is completed. Incomplete: Clutch-stroke learning is not completed.

Grid Learning Complete
This parameter indicates the states of grid learning. Complete: Grid learning is completed. Incomplete: Grid learning is not completed.

Automated Manual Transaxle Symptom Diagnosis

AENDL70A5404010

Symptom \ Diagnostic item		Battery	Engine system	TCM	Electrical system: Shift selector	VSS	Brake light switch	Driver side front door switch	Ignition "START" signal	Pressure sensor	Clutch position sensor	Shift position sensor	Select position sensor	Clutch speed sensor	Ambient temperature sensor	Starting motor control relay drive signal	Back up light signal	Clutch solenoid valve	Shift solenoid valve 1	Shift solenoid valve 2	Select solenoid valve	Hydraulic system: Valve body	Clutch actuator	Transaxle system: Manual transaxle	Gear shift and select shaft assembly	Clutch link	Clutch lining
Poor vehicle run	Unable to start in D, M or R range	●	●	●	●	●	●			●	●	●	●	●		●		●	●	●	●	●	●	●	●	●	●
	Poor startability and acceleration in D, M or R range		●	●		●				●	●	●	●	●	●	●		●	●	●	●	●	●			●	●
	Engine speed increases quickly in D, M or R range	●	●	●	●	●				●	●	●	●	●				●			●	●	●	●	●	●	●
	Unable to switch to manual mode	●	●	●	●	●				●	●	●	●	●				●	●	●	●	●	●				
	No gear change in manual mode	●	●	●	●	●				●	●	●	●	●				●	●	●	●	●	●	●	●	●	●
	Unable to creep	●	●	●	●	●	●	●		●	●	●	●	●				●				●	●	●	●	●	●
	Engine stalls at vehicle stopping, creeping, starting or low speed running		●	●						●	●							●				●	●			●	●
Poor gear change	Engine speed increases (races) at gear change points in D, M or R range	●	●	●		●						●	●	●				●			●	●	●	●	●	●	●
	Unable to shift gear at vehicle stopping	●	●	●	●	●	●			●	●	●	●	●				●	●	●	●	●	●	●	●	●	
	Unable to change gear position at vehicle running	●	●	●		●				●	●	●	●	●				●	●	●	●	●	●	●	●	●	●
	Engine stalls at deceleration in D, M or R range	●	●	●						●	●							●				●	●			●	●
	Engine stalls when gear is shifted at vehicle running			●																		●	●	●	●		
Shock	Large starting shock in D, M or R range		●	●							●			●	●							●	●			●	●
	Large shock at gear change		●	●							●				●							●	●			●	●
Others	Back up light does not come on			●	●					●		●	●				●	●	●	●	●	●	●	●	●	●	
	Unable to start engine	●	●	●	●	●	●		●	●	●		●			●		●	●	●	●	●	●	●	●	●	

IDL70A540139-02

Automated Manual Transaxle Warning Light Does Not Come ON at Ignition “ON” and Engine Stopped

AENDL70A5404053

Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC related to CAN communication. *Is there CAN-DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**Combination meter check** 1) Check combination meter. ☞(Page 9C-9) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Replace combination meter.

Automated Manual Transaxle Warning Light Remains ON after Engine Starts

AENDL70A5404054

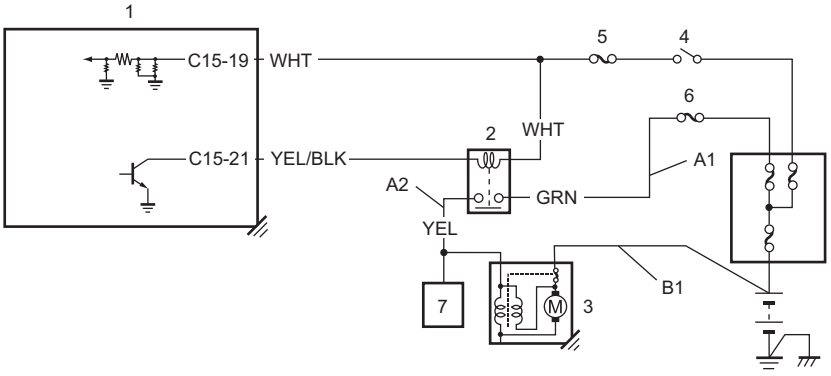
Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC. *Is there any DTC(s)?*	Go to troubleshooting for applicable DTC.	Replace combination meter and recheck DTC. ☞(Page 9C-11) If automated manual transaxle warning light still remains ON, replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)

Starting Motor Control Relay Circuit Check

AENDL70A5404055

Circuit Diagram



IDL70A540140-01

A1: Starting motor control relay power supply (switch side) circuit	2. Starting motor control relay	6. “ST” fuse
A2: Starting motor control relay signal circuit	3. Starting motor	7. ECM
B1: Starting motor power supply circuit	4. Ignition switch	
1. TCM	5. “ST SIG” fuse	

Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC. *Is there any DTC(s)?*	Go to troubleshooting for applicable DTC.	Go to Step 2.

Step	Action	Yes	No
2	**Starting motor control relay power supply (switch side) check** 1) With ignition “OFF”, remove starting motor control relay. 2) Check for proper terminal connection to starting motor control relay connector. 3) If connection is OK, check that voltage between “A1” and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**Starting motor control relay signal circuit check** 1) Disconnect “E01” connector from ECM and starting motor connector. 2) Check for proper terminal connection to starting motor connector. 3) If connection is OK, check the following points. • Resistance of “A2” circuit: less than 1 Ω • Resistance between “A2” circuit and ground: infinity *Is check result OK?*	Go to Step 4.	Repair or replace defective wire harness.
4	**Starting motor control relay check** 1) Check starting motor control relay. ☞(Page 5D-92) *Is check result OK?*	Go to Step 5.	Repair starting motor control relay.
5	**Starting motor power supply circuit check** 1) Disconnect starting motor cable. ☞(Page 1I-3) 2) Check for proper terminal connection to starting motor cable. 3) If connection is OK, check that voltage between “B1” and ground is battery voltage. *Is check result OK?*	Replace starting motor. ☞(Page 1I-3)	Repair or replace defective wire harness.

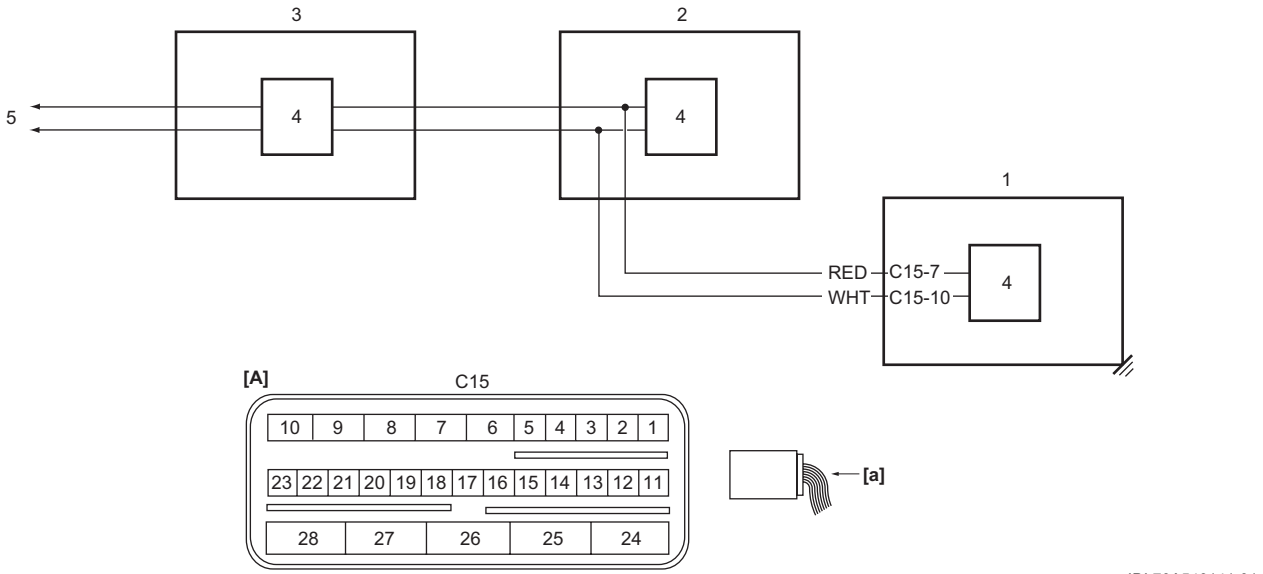
DTC P0070

AENDL70A5404056

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0070: Ambient Air Temperature Sensor Circuit This DTC is detected if any one of the following conditions is met. • Ambient temperature sensor signal is more than specified value. • Ambient temperature sensor signal is less than specified value. (1 D/C detection logic)	• TCM incorporated in automated manual transaxle actuator unit • BCM

Circuit Diagram



IDL70A540141-01

[A]: TCM connector (View: [a])	2. ECM	4. CAN driver
1. TCM	3. BCM	5. To other control modules connected by CAN

DTC Confirmation Procedure

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC U0073 or U0140 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check” (Page 5D-12).
2	**DTC check** *Is there any CAN-DTC detected?*	Go to troubleshooting for CAN-DTC. ☞(Page 10H-8)	Go to Step 3.
3	**DTC check** 1) Check DTC in BCM. *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)

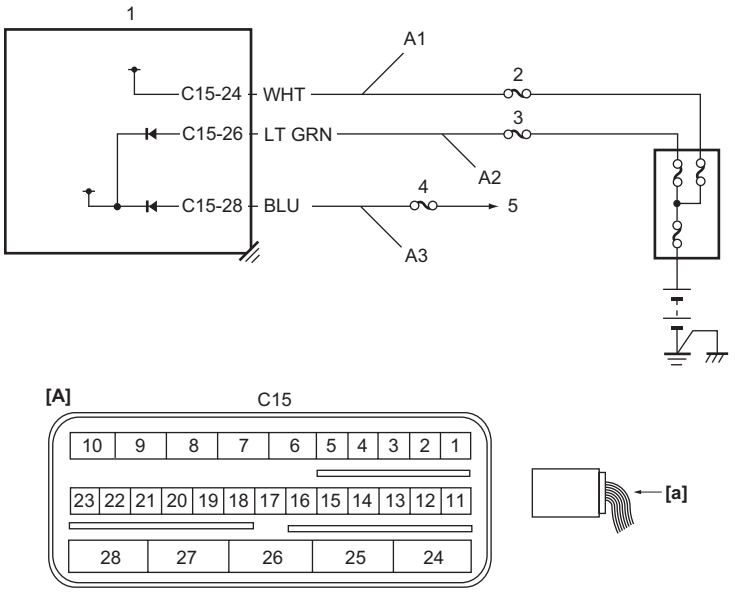
DTC P0560 / P0562 / P1711

AENDL70A5404057

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0560: System Voltage This DTC is detected if any one of the following conditions is met. • Power supply voltage from battery to TCM is out of specified range. • Power supply voltage from ignition switch to TCM is out of specified range. (1 D/C detection logic)	• TCM power supply circuit and/or ground circuit • Charging system • TCM incorporated in automated manual transaxle actuator unit
P0562: System Voltage Low Power supply voltage from battery to TCM is lower than specified range. (1 D/C detection logic)	
P1711: TCM Power Input Low Voltage TCM power supply voltage from battery is lower than specified value for specified time. (1 D/C detection logic)	

Circuit Diagram



IDL70A540142-01

[A]: TCM connector (View: [a])	A3: Ignition power supply circuit	3. "T/M" fuse
A1: Electric motor power supply circuit	1. TCM	4. "IG1 SIG" fuse
A2: TCM power supply circuit	2. "T/M PUMP" fuse	5. To ignition switch

DTC Confirmation Procedure

P0560

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0562 is not detected.**

1) Set ignition "ON".

P0562 / P1711

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check” (Page 5D-12).
2	**TCM power supply and ground circuit check** 1) Check TCM power supply and ground circuits. ☞(Page 5D-77) *Is check result OK?*	Go to Step 3.	Repair TCM power supply and/or ground circuit.
3	**Charging system check** 1) Check that charging system is working properly. ☞(Page 1J-4) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Repair or replace defective parts.

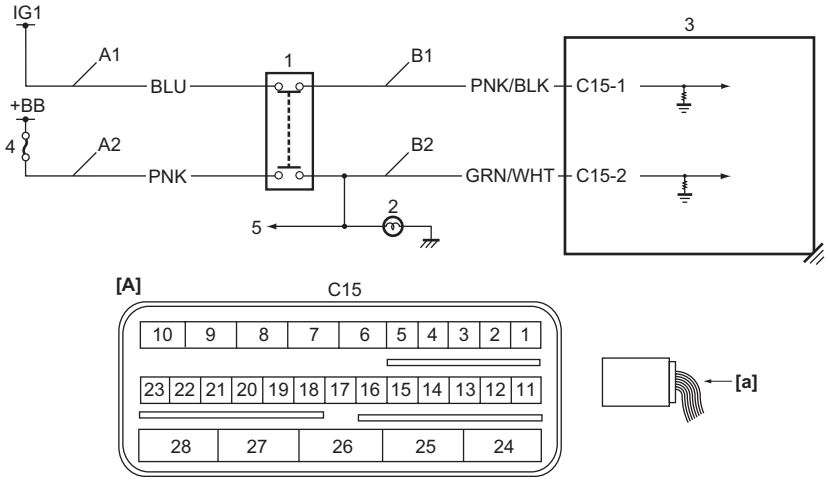
DTC P0572 / P0573

AENDL70A5404058

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0572: Brake Switch “A” Circuit Low There is no signal from brake light switch and brake switch for more than specified time. (1 D/C detection logic)	• Brake light switch and/or its circuit • TCM incorporated in automated manual transaxle actuator unit
P0573: Brake Switch “A” Circuit High Vehicle is driven more than specified operating range, but brake light switch cannot be changed (stays ON). (1 D/C detection logic)	

Circuit Diagram



IDL70A540143-01

[A]: TCM connector (View: [a])	B2: Brake light switch signal circuit	4. “STOP” fuse
A1: Brake switch power supply circuit	1. Brake light switch	5. ECM
A2: Brake light switch power supply circuit	2. Brake light	
B1: Brake switch signal circuit	3. TCM	

DTC Confirmation Procedure
P0572

NOTE

Check that the following conditions are satisfied in this procedure.

- **11 V < Battery voltage < 15 V**
- **11 V < Ignition voltage < 15 V**

1) Set ignition “ON”.
2) Depress and release brake pedal.

P0573

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P0720 or P0721 is not detected.**
- **11 V < Battery voltage < 15 V**
- **11 V < Ignition voltage < 15 V**

1) Start engine.
2) Drive vehicle at more than 40km/h (25 mile/h) continuously for more than 45 sec.
3) Stop vehicle continuously for more than 30 sec.
4) Repeat Step 2) - 3) 5 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check” (Page 5D-12).
2	**Brake light switch power supply circuit check** 1) With ignition “OFF”, disconnect brake light switch connector. 2) Check for proper terminal connection to brake light switch connector. 3) If connection is OK, set ignition “ON”. 4) Check that voltage between each of “A1” and “A2” circuits and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.

Step	Action	Yes	No
3	**Brake light switch signal circuit check** 1) With ignition “OFF”, disconnect “C15” connector from TCM. 2) Check for proper terminal connection to “C15” connector. 3) If connection is OK, check the following points. • Resistance of “B1” and “B2” circuits: less than 1 Ω • Resistance between each of “B1” and “B2” circuits and ground: infinity • Resistance between “B1” circuit terminal and other terminal at brake light switch connector: infinity • Resistance between “B2” circuit terminal and other terminal at brake light switch connector: infinity • Voltage of “B1” and “B2” circuits: approx. 0 V (When ignition is “ON”) *Is check result OK?*	Go to Step 4.	Repair or replace defective wire harness.
4	**Brake light switch check** 1) Check brake light switch. ☞(Page 4A-10) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Repair brake light switch.

DTC P0604 / P060A / P062F / P1702 / P1704 / P1982 / P1983

AENDL70A5404059

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0604: Internal Control Module Random Access Memory (RAM) Error TCM internal failure (RAM error). (1 D/C detection logic)	• TCM incorporated in automated manual transaxle actuator unit
P060A: Internal Control Module Monitoring Processor Performance TCM internal failure (SMP error). (1 D/C detection logic)	
P062F: Internal Control Module EEPROM Error TCM internal failure (EEPROM error). (1 D/C detection logic)	
P1702: Internal Control Module Memory Check Sum Error TCM internal failure (check sum error). (1 D/C detection logic)	
P1704: Internal Control Module Memory EEPROM Error TCM internal failure (EEPROM memory error). (1 D/C detection logic)	
P1982: Internal Control Module EEPROM Error (Application) TCM internal failure (EEPROM application error). (1 D/C detection logic)	
P1983: Internal Control Module Monitoring Processor Output Failure TCM internal failure (monitoring processor output failure). (1 D/C detection logic)	

DTC Confirmation Procedure

P0604

1) Open driver side front door.

P060A / P062F / P1704 / P1982 / P1983

1) Set ignition “ON”.

P1702

1) Set ignition “OFF”.
2) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P0604, P060A, P062F, P1702, P1704, P1982 or P1983 detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

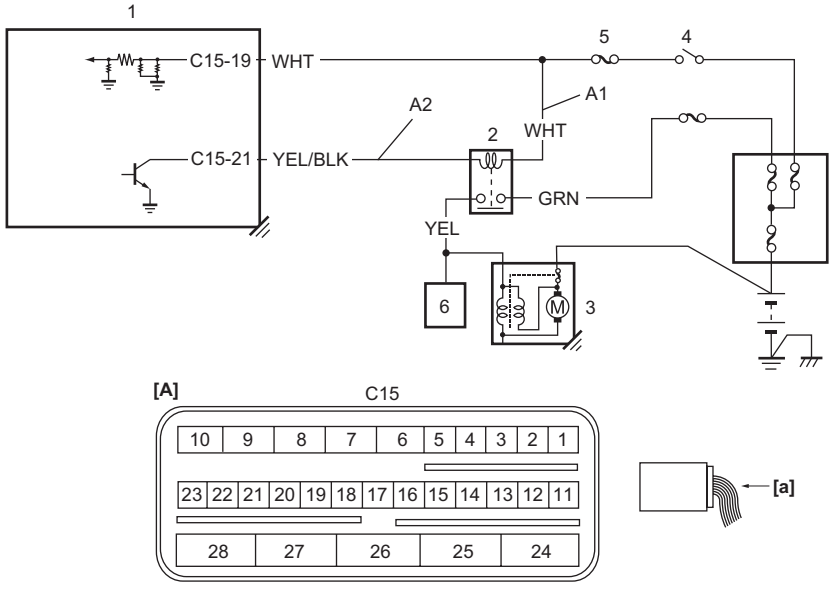
DTC P0615

AENDL70A5404060

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0615: Starter Relay Circuit Request to starting motor control relay and feedback signal disagree. (1 D/C detection logic but automated manual transaxle warning light does not light up)	• Starting motor control relay and/or its circuit • TCM incorporated in automated manual transaxle actuator unit

Circuit Diagram



IDL70A540144-01

[A]: TCM connector (View: [a])	1. TCM	4. Ignition switch
A1: Starting motor control relay power supply (coil side) circuit	2. Starting motor control relay	5. “ST SIG” fuse
A2: Starting motor control relay drive circuit	3. Starting motor	6. ECM

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Start engine, if possible.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).
2	**Starting motor control relay power supply (coil side) check** 1) With ignition "OFF", remove starting motor control relay. 2) Check for proper terminal connection to starting motor control relay connector. 3) If connection is OK, set ignition "START". 4) Check that voltage between "A1" and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**Starting motor control relay drive circuit check** 1) With ignition "OFF", disconnect "C15" connector from TCM. 2) Check for proper terminal connection to "C15" connector. 3) If connection is OK, check the following points. • Resistance of "A2" circuit: less than 1 Ω • Resistance between "A2" circuit and ground: infinity • Resistance between "A2" circuit terminal and other terminal at starting motor control relay connector: infinity • Voltage of "A2" circuit: approx. 0 V (When ignition is "START") *Is check result OK?*	Go to Step 4.	Repair or replace defective wire harness.
4	**Starting motor control relay check** 1) Check starting motor control relay. ☞(Page 5D-92) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Repair starting motor control relay.

DTC P0715 / P0716

AENDL70A5404061

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0715: Input / Turbine Speed Sensor "A" Circuit There is no clutch speed sensor signal for more than specified time or clutch speed sensor signal is incorrect. (1 D/C detection logic)	• Clutch speed sensor and/or its circuit • TCM incorporated in automated manual transaxle actuator unit
P0716: Input / Turbine Speed Sensor "A" Circuit Range / Performance Clutch speed rises rapidly. (1 D/C detection logic)	

DTC Confirmation Procedure
P0715

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P1852 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Start engine and run it at idle speed for 1 min.
2) Drive vehicle at more than 20 km/h (12 mile/h) continuously for 1 min.

P0716

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P1852 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Start engine and drive vehicle at more than 40 km/h (25 mile/h) continuously for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).
2	**Clutch speed sensor check** 1) Check clutch speed sensor. ☞(Page 5D-91) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Replace clutch speed sensor.

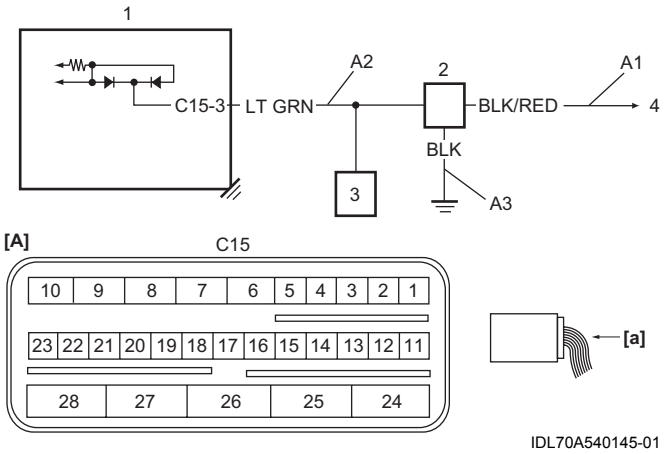
DTC P0720 / P0721

AENDL70A5404062

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0720: Output Speed Sensor Circuit There is no VSS signal for more than specified time or VSS signal is incorrect. (1 D/C detection logic)	• VSS and/or its circuit • TCM incorporated in automated manual transaxle actuator unit
P0721: Output Speed Sensor Circuit Range / Performance VSS signal rises rapidly. (1 D/C detection logic)	

Circuit Diagram



IDL70A540145-01

[A]: TCM connector (View: [a])	A3: VSS ground circuit	3. ECM
A1: VSS power supply circuit	1. TCM	4. To main relay
A2: VSS signal circuit	2. VSS	

DTC Confirmation Procedure

P0720

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P1909 or U0073 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Start engine and drive vehicle at more than 20 km/h (12 mile/h) continuously for 1 min.

P0721

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Start engine and drive vehicle at more than 40 km/h (25 mile/h) continuously for 45 sec.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).
2	**VSS power supply circuit check** 1) With ignition "OFF", disconnect VSS connector. 2) Check for proper terminal connection to VSS connector. 3) If connection is OK, set ignition "ON". 4) Check that voltage between "A1" and "A3" is battery voltage. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**VSS ground circuit check** 1) Check that voltage between "A1" and ground is battery voltage. *Is check result OK?*	Repair "A3" circuit.	Repair "A1" circuit.
4	**VSS signal circuit check** 1) With ignition "OFF", disconnect "C15" connector from TCM and "C01" connector from ECM. 2) Check for proper terminal connection to "C15" connector. 3) If connection is OK, check the following points. • Resistance of "A2" circuit: less than 1 Ω • Resistance between "A2" circuit and ground: infinity • Resistance between "A2" circuit terminal and other terminal at clutch speed sensor connector: infinity • Voltage of "A2" circuit: approx. 0 V (When ignition is "ON") *Is check result OK?*	Go to Step 5.	Repair or replace defective wire harness.
5	**VSS check** 1) Check VSS. ☞(Page 5D-92) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Replace VSS.

DTC P0805 / P0840 / P0841 / P0904 / P0914

AENDL70A5404063

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0805: Clutch Position Sensor Circuit This DTC is detected if any one of the following conditions is met. • Clutch position sensor signal is more than specified value for specified time. • Clutch position sensor signal is less than specified value for specified time. (1 D/C detection logic)	• Clutch position sensor (automated manual transaxle actuator unit) and/or its circuit • TCM incorporated in automated manual transaxle actuator unit
P0840: Transmission Fluid Pressure Sensor / Switch "A" Circuit This DTC is detected if any one of the following conditions is met. • Pressure sensor signal is more than specified value. • Pressure sensor signal is less than specified value. (1 D/C detection logic)	• Pressure sensor (automated manual transaxle actuator unit) and/or its circuit • TCM incorporated in automated manual transaxle actuator unit
P0841: Transmission Fluid Pressure Sensor / Switch "A" Circuit Range / Performance Pressure sensor signal rises rapidly. (1 D/C detection logic)	
P0904: Gate Select Position Circuit This DTC is detected if any one of the following conditions is met. • Select position sensor signal is more than specified value for specified time. • Select position sensor signal is less than specified value for specified time. (1 D/C detection logic)	• Select position sensor (automated manual transaxle actuator unit) and/or its circuit • TCM incorporated in automated manual transaxle actuator unit
P0914: Gear Shift Position Circuit This DTC is detected if any one of the following conditions is met. • Shift position sensor signal is more than specified value for specified time. • Shift position sensor signal is less than specified value for specified time. (1 D/C detection logic)	• Shift position sensor (automated manual transaxle actuator unit) and/or its circuit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

P0805

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P1852 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Set ignition "ON" for 1 min.

P0840 / P0841

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P1852 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Set ignition "ON".

P0904 / P0914

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P1853 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Set ignition “ON” for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P0805, P0840, P0841 or P0904 detected after performing “DTC Confirmation Procedure”?*	Replace sensor (automated manual transaxle actuator unit) and recheck DTC. ☞(Page 5D-87)	End.

DTC P080A / P185A / P185B

AENDL70A5404064

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P080A: Clutch Position Not Learned Clutch-contact-point learning (recognition of clutch engaging point) is not completed. (1 D/C detection logic)	• TCM incorporated in automated manual transaxle actuator unit
P185A: Clutch End Stroke Position Selftune Clutch-end-stroke-position learning (recognition of clutch stopper position) is not completed. (1 D/C detection logic)	
P185B: Clutch Stroke Selftune Clutch-stroke learning (recognition of distance between clutch closed position and clutch stopper) is not possible. (1 D/C detection logic)	

DTC Confirmation Procedure

1) Set ignition “ON” for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P080A, P185A or P185B detected after performing “DTC Confirmation Procedure”?*	Perform “TCM and Clutch Initialization” (Page 5D-81). If this DTC is detected again, replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P0944

AENDL70A5404065

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0944: Hydraulic Pressure Unit Loss of Pressure Pressure sensor signal is less than specified value. (1 D/C detection logic)	• Automated manual transaxle actuator unit • Automated manual transaxle actuator unit oil leakage

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0840 or P0841 is not detected.**

1) Set ignition “ON” for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P0944 detected after performing “DTC Confirmation Procedure”?*	Replace valve body (automated manual transaxle actuator unit) and recheck DTC. ☞(Page 5D-87)	End.

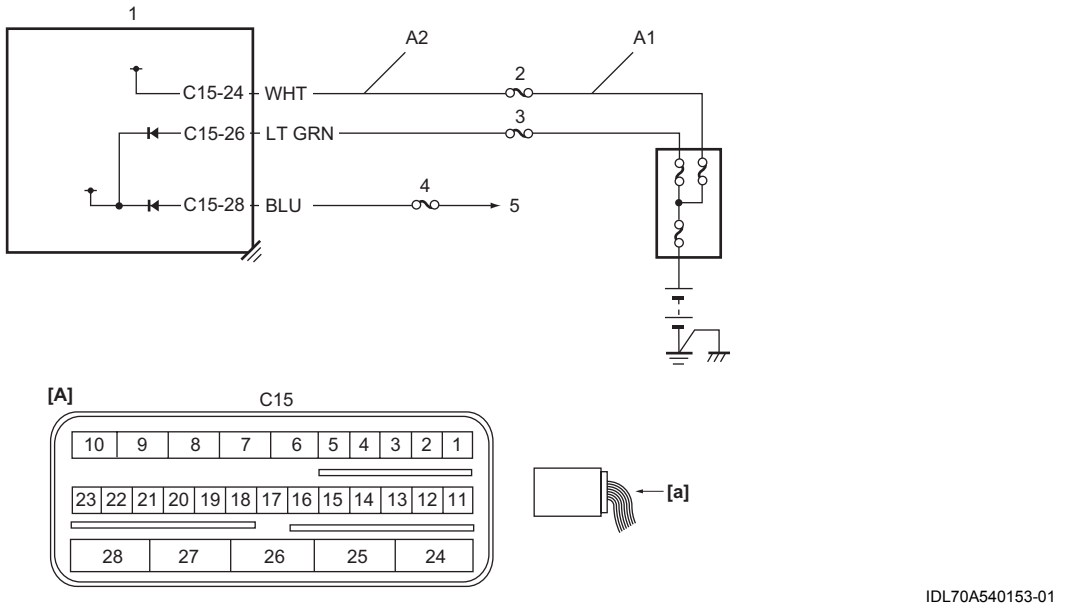
DTC P0945

AENDL70A5404066

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0945: Hydraulic Pump Relay Circuit / Open Power supply voltage from battery to electric motor is lower than specified value. (1 D/C detection logic)	• Electric motor power supply circuit • TCM incorporated in automated manual transaxle actuator unit • “M/T PUMP” fuse

Circuit Diagram



IDL70A540153-01

[A]: TCM connector (View: [a])	1. TCM	4. “IG1 SIG” fuse
A1: Electric motor power supply circuit 1	2. “T/M PUMP” fuse	5. To ignition switch
A2: Electric motor power supply circuit 2	3. “T/M” fuse	

DTC Confirmation Procedure

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).
2	**"M/T PUMP" fuse check** 1) Check "M/T PUMP" fuse for blowout. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**Electric motor power supply circuit check 1** 1) Set ignition "ON". 2) Check that voltage between "A1" and ground is battery voltage. *Is check result OK?*	Replace "M/T PUMP" fuse.	Repair or replace defective wire harness.
4	**Electric motor power supply circuit check 2** 1) With ignition "OFF", disconnect "C15" connector from TCM. 2) Check for proper terminal connection to "C15" connector. 3) If connection is OK, check the following points. • Resistance of "A2" circuit: less than 1 Ω • Resistance between "A2" circuit and ground: infinity • Resistance between "A2" circuit terminal and other terminal at "C15" connector: infinity • Voltage of "A2" circuit: approx. 0 V (When ignition is "ON"). *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Repair or replace defective wire harness.

DTC P1706 / P1707 / P1985

AENDL70A5404067

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1706: Torque Request Communication Error From TCM ECM detects abnormality of CAN communication data from TCM. (1 D/C detection logic but automated manual transaxle warning light does not light up)	• ECM • TCM incorporated in automated manual transaxle actuator unit
P1707: Torque Reduction Error From ECM TCM detects a condition which is not acceptable for engine torque reduction in ECM. (1 D/C detection logic but automated manual transaxle warning light does not light up)	
P1985: Torque Up Error From ECM TCM detects a condition which is not acceptable for engine torque up in ECM. (1 D/C detection logic but automated manual transaxle warning light does not light up)	

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC U0073 or U0100 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Start engine and drive vehicle.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).
2	**DTC check** *Is there any CAN-DTC detected?*	Go to troubleshooting for CAN-DTC. ☞(Page 10H-8)	Go to Step 3.
3	**DTC check** 1) Check DTC in ECM. *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)

DTC P1844

AENDL70A5404068

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1844: Grid Position Not Learned Grid learning (recognition of proper gear engagement) is not completed. (1 D/C detection logic)	TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

1) Set ignition "ON".

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1844 detected after performing "DTC Confirmation Procedure"?*	Perform "TCM and Clutch Initialization" (Page 5D-81). If this DTC is detected again, replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P184A

AENDL70A5404069

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P184A: Pump Off failed Oil pump functions for more than specified time. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0945 or P185C is not detected.**

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P184A detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P184B / P184C / P184D

AENDL70A5404070

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P184B: Solenoid Driver “A” Circuit Range/Performance Malfunction of solenoid driver “A” (driver for clutch solenoid valve and shift solenoid valve 1) is detected. (1 D/C detection logic)	TCM incorporated in automated manual transaxle actuator unit
P184C: Solenoid Driver “A” Feedback Signal Range/ Performance This DTC is detected if any one of the following conditions is met. • Electric current of clutch solenoid is higher than specified value for specified time and feedback voltage is lower than specified value. • Electric current of clutch solenoid is lower than specified value for specified time and feedback voltage is higher than specified value. (1 D/C detection logic)	
P184D: Solenoid Driver “B” Circuit Range/Performance Malfunction of solenoid driver “B” (driver for shift solenoid valve 2, select solenoid valve and back up light relay) is detected. (1 D/C detection logic)	

DTC Confirmation Procedure
P184B / P184D

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P184E is not detected.**
- **11 V < Battery voltage < 15 V**

1) Set ignition “ON” for 10 sec.

P184C

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P184B, P184D, P184E, P1854 or P1888 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Start engine and drive vehicle.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P184B, P184C or P184D detected after performing "DTC Confirmation Procedure"?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P184E / P184F / P1854 / P1855

AENDL70A5404071

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P184E: TCM Internal Supply Voltage "B" Circuit Power supply for sub-microcomputer is out of specified range. (1 D/C detection logic)	TCM incorporated in automated manual transaxle actuator unit
P184F: TCM Internal Supply Voltage "C" Circuit More than specified time has passed after power OFF (latch circuit OFF), but TCM stays ON. (1 D/C detection logic but automated manual transaxle warning light does not light up)	
P1854: TCM Internal Supply Voltage "A" Low Power supply voltage for solenoid drivers is lower than specified value. (1 D/C detection logic)	
P1855: TCM Internal Supply Voltage "A" High More than specified time has passed after power load relay for solenoid drivers is OFF, power supply voltage for solenoid drivers is higher than specified value. (1 D/C detection logic)	

DTC Confirmation Procedure
P184E

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition "ON" for 10 sec.

P184F / P1855

1) Set ignition "ON".

2) Set ignition “OFF”.

P1854

NOTE

Check that the following condition is satisfied in this procedure.

- **10 V < Battery voltage or 10 V < ignition voltage**

1) Set ignition “ON” for 10 sec.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P184E, P184F, P1854 or P1855 detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P1850 / P1851 / P1888 / P1889

AENDL70A5404072

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1850: Gear Shift Odd Actuator Circuit Malfunction of shift solenoid valve 1 is detected. (1 D/C detection logic)	• Shift solenoid valve 1 (automated manual transaxle actuator unit)
P1851: Gear Shift Even Actuator Circuit Malfunction of shift solenoid valve 2 is detected. (1 D/C detection logic)	• Shift solenoid valve 2 (automated manual transaxle actuator unit)
P1888: Clutch Actuator Circuit Malfunction of clutch solenoid valve is detected. (1 D/C detection logic)	• Clutch solenoid valve (automated manual transaxle actuator unit)
P1889: Gate Select Actuator Circuit Malfunction of select solenoid valve is detected. (1 D/C detection logic)	• Select solenoid valve (automated manual transaxle actuator unit)

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P184B, P184C, P184D, P184E or P1854 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Start engine and drive vehicle at more than 30 km/h (17 mile/h) continuously for more than 30 sec.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1850, P1851, P1888 or P1889 detected after performing "DTC Confirmation Procedure"?*	Replace solenoid valve (automated manual transaxle actuator unit) and recheck DTC. ☞(Page 5D-87)	End.

DTC P1852 / P1853

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1852: Sensor Power Supply "A" This DTC is detected if any one of the following conditions is met. • Power supply voltage for pressure sensor, clutch position sensor and clutch speed sensor is higher than specified value. • Power supply voltage for pressure sensor, clutch position sensor and clutch speed sensor is lower than specified value. (1 D/C detection logic)	TCM incorporated in automated manual transaxle actuator unit
P1853: Sensor Power Supply "B" This DTC is detected if any one of the following conditions is met. • Power supply voltage for shift position sensor and select position sensor is higher than specified value. • Power supply voltage for shift position sensor and select position sensor is lower than specified value. (1 D/C detection logic)	

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition "ON" for 10 sec.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1852 or P1853 detected after performing "DTC Confirmation Procedure"?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P185C

AENDL70A5404074

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P185C: Hydraulic Pump Relay Circuit This DTC is detected if any one of the following conditions is met. • Feedback electric current of electric motor is out of specified range • Feedback voltage of electric motor is out of specified range. • Oil pressure is higher than specified value without operation of oil pump. (1 D/C detection logic)	• Electric motor (automated manual transaxle actuator unit) and/or its circuit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P0840, P0841 are P1852 are not detected.**
- **10 V < Battery voltage**

1) Set ignition “ON”.
2) Select shift selector lever from N to D range.
3) Select shift selector lever from D to N range.
4) Repeat Step 2) - 3) continuously for more than 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P185C detected after performing “DTC Confirmation Procedure”?*	Replace electric motor (automated manual transaxle actuator unit) and recheck DTC. ☞(Page 5D-87)	End.

DTC P185E / P185F / P1984

AENDL70A5404075

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P185E: TCM Safety Function Failure TCM internal failure (safety function control error). (1 D/C detection logic)	TCM incorporated in automated manual transaxle actuator unit
P185F: TCM Safety Integrity Function Failure MMP failure is detected by SMP in TCM. (1 D/C detection logic)	
P1984: TCM Safety Input Preprocessing Failure TCM internal failure (safety input preprocessing control error). (1 D/C detection logic)	

DTC Confirmation Procedure

1) Set ignition “ON” for 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P185E, P185F or P1984 detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

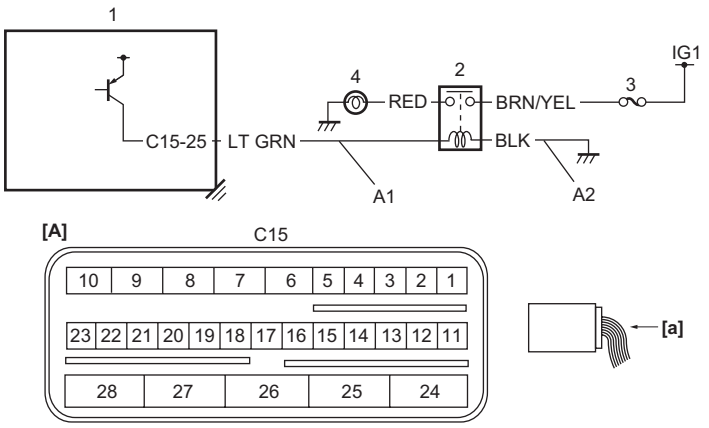
DTC P1884

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1884: Reverse Lamp Control Circuit Malfunction of back up light relay and its circuit (open, shorted to power supply or shorted to ground) is detected. (1 D/C detection logic)	• Back up light relay and/or its circuit • TCM incorporated in automated manual transaxle actuator unit

Circuit Diagram



IDL70A540146-01

[A]: TCM connector (View: [a])	1. TCM	4. Back up light
A1: Back up light relay drive circuit	2. Back up light relay	
A2: Back up light relay ground circuit	3. "BACK" fuse	

DTC Confirmation Procedure

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P184D, P184E or P1854 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Set ignition "ON".
2) Select shift selector lever to R range.
3) Select shift selector lever to N range.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).
2	**Back up light relay drive circuit check** 1) With ignition "OFF", remove back up light relay. 2) Check for proper terminal connection to back up light relay connector. 3) If connection is OK, set ignition "ON". 4) Check that voltage between "A1" and "A2" is battery voltage. *Is check result OK?*	Go to Step 4.	Go to Step 3.
3	**Back up light relay ground circuit check** 1) Check that voltage between "A1" and ground is battery voltage. *Is check result OK?*	Repair "A2" circuit.	Repair "A1" circuit. If this DTC is detected again, replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)
4	**Back up light relay check** 1) Check back up light relay. ☞(Page 5D-92) *Is check result OK?*	End.	Replace back up light relay.

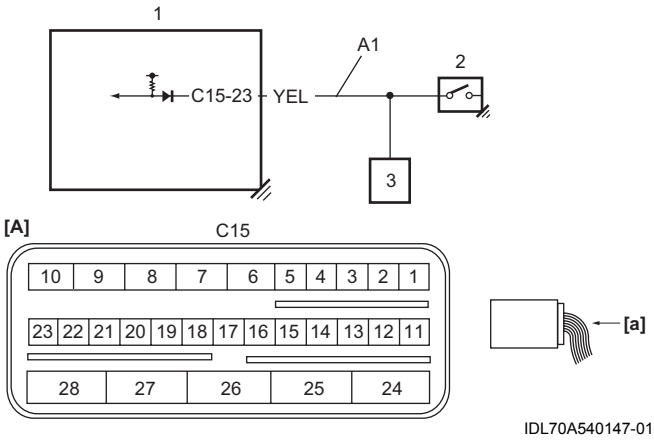
DTC P1885

AENDL70A5404077

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1885: Door Switch Circuit Driver side front door switch signal is not inputted for specified time. (1 D/C detection logic)	• Driver side front door switch circuit • TCM incorporated in automated manual transaxle actuator unit

Circuit Diagram



IDL70A540147-01

[A]: TCM connector (View: [a])	1. TCM	3. BCM
A1: Driver side front door switch signal circuit	2. Driver side front door switch	

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition “ON”.
2) Open driver side front door and then close it.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check” (Page 5D-12).
2	**Door switch signal circuit check** 1) With ignition “OFF”, disconnect “C15” connector from TCM, “L02” connector from BCM and driver side front door switch connector. 2) Check for proper terminal connection to “C15” connector and driver side front door switch connector. 3) If connections are OK, check the following points. • Resistance of “A1” circuit: less than 1 Ω • Resistance between “A1” circuit and ground: infinity • Resistance between “A1” circuit terminal and other terminal at “C15” connector: infinity • Voltage of “A1” circuit: approx. 0 V (When ignition is “ON”). *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Repair or replace defective wire harness.

DTC P1886

AENDL70A5404078

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1886: Dual Port RAM Check TCM internal failure (data integrity error). (1 D/C detection logic)	TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1886 detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

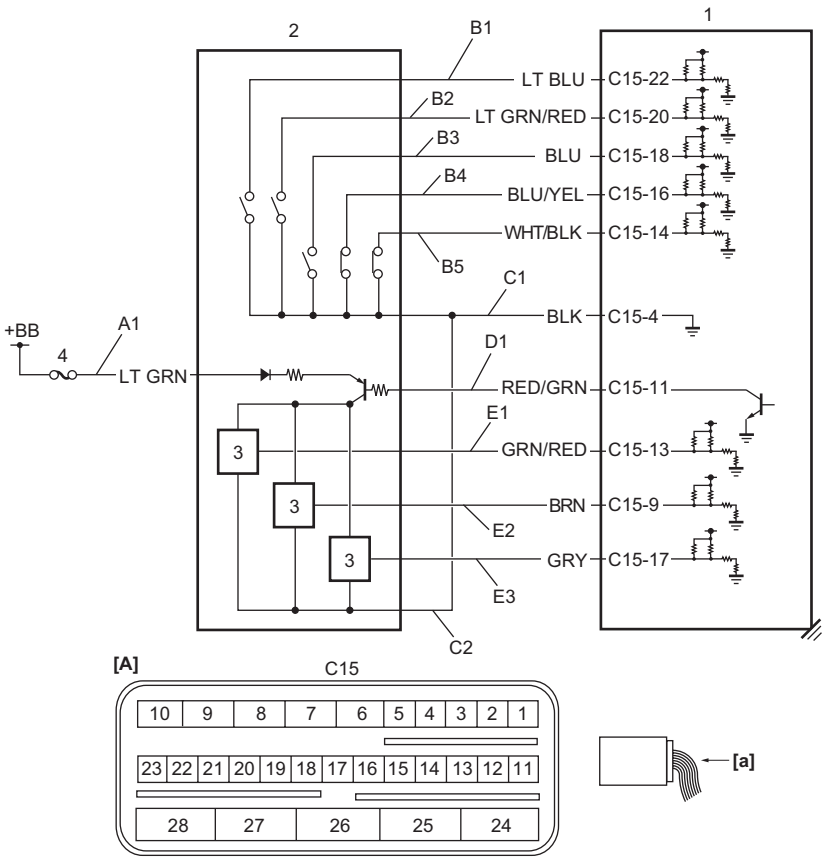
DTC P188A / P188B / P188F

AENDL70A5404079

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P188A: Transmission Range Sensor Circuit Fault Type “A” None of shift selector position switch signals and hall sensor signals is inputted. (1 D/C detection logic)	• Shift selector and/or its ground circuit • TCM incorporated in automated manual transaxle actuator unit
P188B: Transmission Range Sensor Circuit Fault Type “B” None of shift selector position switch signals is inputted. (1 D/C detection logic)	
P188F: Transmission Range Sensor Circuit Fault Type “F” Failure of shift selector position switch signals and hall sensor signals except P188A, P188B, P188C, P188D and P188E. (1 D/C detection logic)	

Circuit Diagram



IDL70A540148-02

[A]: TCM connector (View: [a])	B5: Lever position switch M5 signal circuit	E3: Lever position switch H3 signal circuit
A1: Shift selector power supply circuit	C1: Shift selector ground circuit 1	1. TCM
B1: Lever position switch M1 signal circuit	C2: Shift selector ground circuit 2	2. Shift selector
B2: Lever position switch M2 signal circuit	D1: Shift selector drive circuit	3. Hall sensor
B3: Lever position switch M3 signal circuit	E1: Lever position switch H1 signal circuit	4. "T/M2" fuse
B4: Lever position switch M4 circuit	E2: Lever position switch H2 signal circuit	

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition "ON".
2) Select shift selector lever to R, N, D, M, + and - range.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).

Step	Action	Yes	No
2	**Shift selector ground circuit check** 1) With ignition “OFF”, disconnect “C15” connector from TCM and shift selector connector. 2) Check for proper terminal connection to “C15” connector and shift selector connector. 3) If connections are OK, check the following points. • Resistance of “C1” and “C2” circuits: less than 1 Ω • Resistance between each of “C1” and “C2” circuits and ground: infinity • Resistance between “C1” circuit terminal and other terminal at shift selector connector: infinity • Resistance between “C2” circuit terminal and other terminal at shift selector connector: infinity • Voltage of “C1” and “C2” circuits: approx. 0 V (When ignition is “ON”). *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**Shift selector check** 1) Check shift selector. ☞(Page 5D-86) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Replace shift selector. ☞(Page 5D-84)

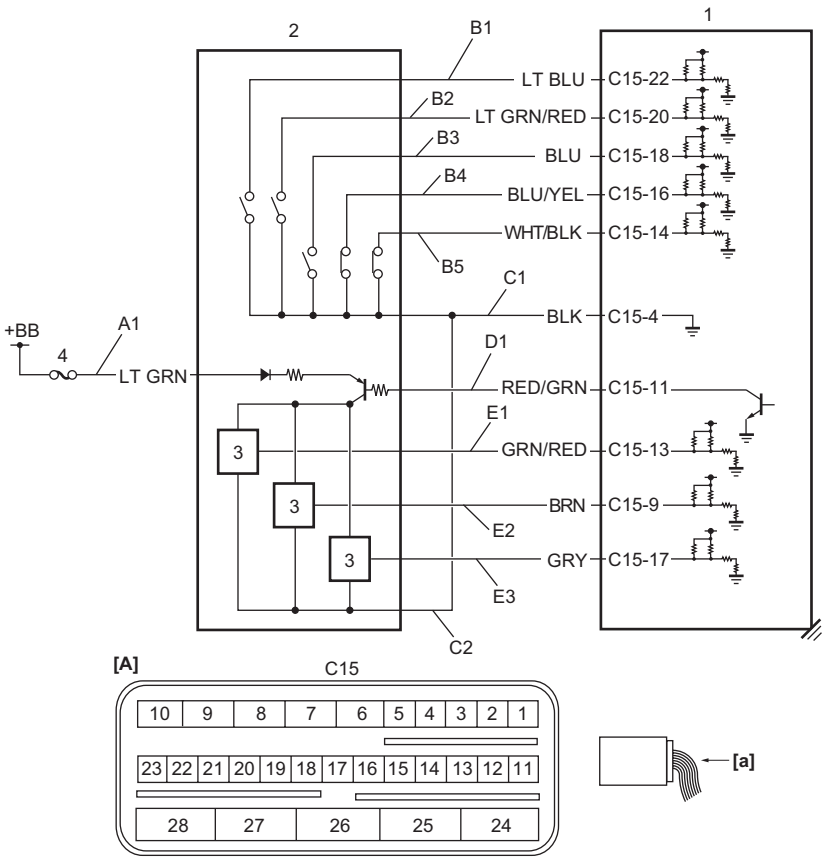
DTC P188C

AENDL70A5404080

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P188C: Transmission Range Sensor Circuit Fault Type “C” None of M1 or M2 shift selector position switch signal, or H1, H2 or H3 hall sensor signal is not inputted or abnormal. (1 D/C detection logic)	• Shift selector and/or its signal circuit • TCM incorporated in automated manual transaxle actuator unit

Circuit Diagram



IDL70A540148-02

[A]: TCM connector (View: [a])	B5: Lever position switch M5 signal circuit	E3: Lever position switch H3 signal circuit
A1: Shift selector power supply circuit	C1: Shift selector ground circuit 1	1. TCM
B1: Lever position switch M1 signal circuit	C2: Shift selector ground circuit 2	2. Shift selector
B2: Lever position switch M2 signal circuit	D1: Shift selector drive circuit	3. Hall sensor
B3: Lever position switch M3 signal circuit	E1: Lever position switch H1 signal circuit	4. "T/M2" fuse
B4: Lever position switch M4 signal circuit	E2: Lever position switch H2 signal circuit	

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition "ON".
2) Select shift selector lever to R, N, D, M, + and - range.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).

Step	Action	Yes	No
2	**Lever position switch signal circuit check** 1) With ignition “OFF”, disconnect “C15” connector from TCM and shift selector connector. 2) Check for proper terminal connection to “C15” connector and shift selector connector. 3) If connections are OK, check the following points. • Resistance of “B1”, “B2”, “E1”, “E2” and “E3” circuits: less than 1 Ω • Resistance between each of “B1”, “B2”, “E1”, “E2” and “E3” circuits and ground: infinity • Resistance between “B1” circuit terminal and other terminal at shift selector connector: infinity • Resistance between “B2” circuit terminal and other terminal at shift selector connector: infinity • Resistance between “E1” circuit terminal and other terminal at shift selector connector: infinity • Resistance between “E2” circuit terminal and other terminal at shift selector connector: infinity • Resistance between “E3” circuit terminal and other terminal at shift selector connector: infinity • Voltage of “B1”, “B2”, “E1”, “E2” and “E3” circuits: approx. 0 V (When ignition is “ON”). *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**Shift selector check** 1) Check shift selector. ☞(Page 5D-86) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Replace shift selector. ☞(Page 5D-84)

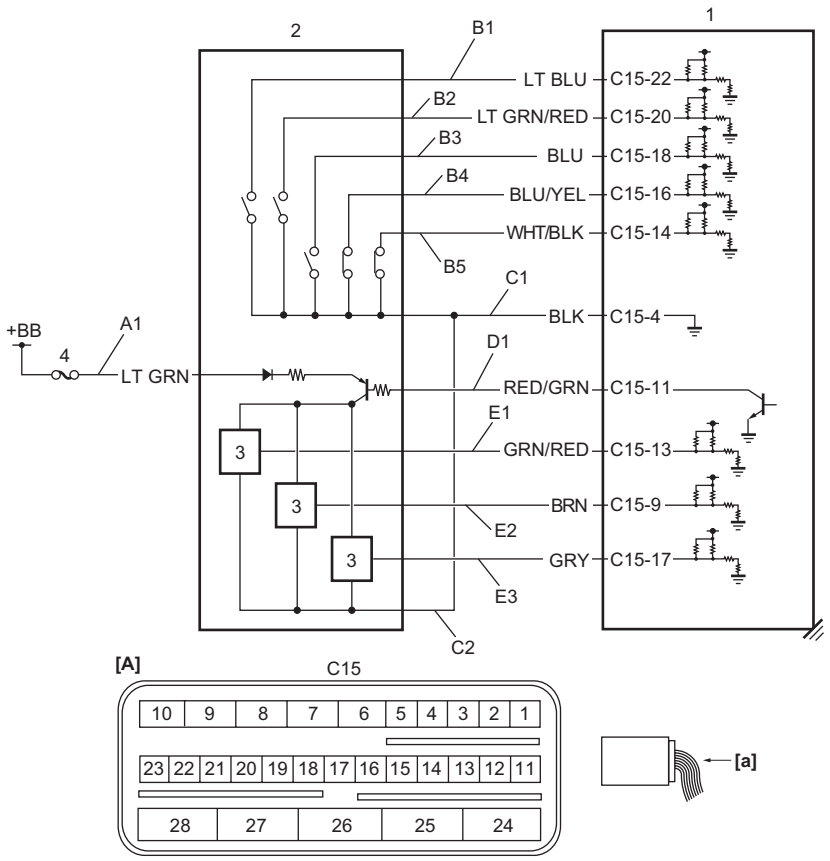
DTC P188D / P188E

AENDL70A5404081

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P188D: Transmission Range Sensor Circuit Fault Type “D” M3, M4 and M5 shift selector position switch signals are not inputted. (1 D/C detection logic)	• Shift selector and/or its signal circuit • TCM incorporated in automated manual transaxle actuator unit
P188E: Transmission Range Sensor Circuit Fault Type “E” None of M3, M4 or M5 shift selector position switch signal is not inputted or abnormal. (1 D/C detection logic)	

Circuit Diagram



IDL70A540148-02

[A]: TCM connector (View: [a])	B5: Lever position switch M5 signal circuit	E3: Lever position switch H3 signal circuit
A1: Shift selector power supply circuit	C1: Shift selector ground circuit 1	1. TCM
B1: Lever position switch M1 signal circuit	C2: Shift selector ground circuit 2	2. Shift selector
B2: Lever position switch M2 signal circuit	D1: Shift selector drive circuit	3. Hall sensor
B3: Lever position switch M3 signal circuit	E1: Lever position switch H1 signal circuit	4. “T/M2” fuse
B4: Lever position switch M4 signal circuit	E2: Lever position switch H2 signal circuit	

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition “ON”.
2) Select shift selector lever to R, N, D, M, + and - range.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check” (Page 5D-12).

Step	Action	Yes	No
2	**Lever position switch signal circuit check** 1) With ignition “OFF”, disconnect “C15” connector from TCM and shift selector connector. 2) Check for proper terminal connection to “C15” connector and shift selector connector. 3) If connections are OK, check the following points. • Resistance of “B3”, “B4” and “B5” circuits: less than 1 Ω • Resistance between each of “B3”, “B4” and “B5” circuits and ground: infinity • Resistance between “B3” circuit terminal and other terminal at shift selector connector: infinity • Resistance between “B4” circuit terminal and other terminal at shift selector connector: infinity • Resistance between “B5” circuit terminal and other terminal at shift selector connector: infinity • Voltage of “B3”, “B4” and “B5” circuits: approx. 0 V (When ignition is “ON”). *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**Shift selector check** 1) Check shift selector. ☞(Page 5D-86) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Replace shift selector. ☞(Page 5D-84)

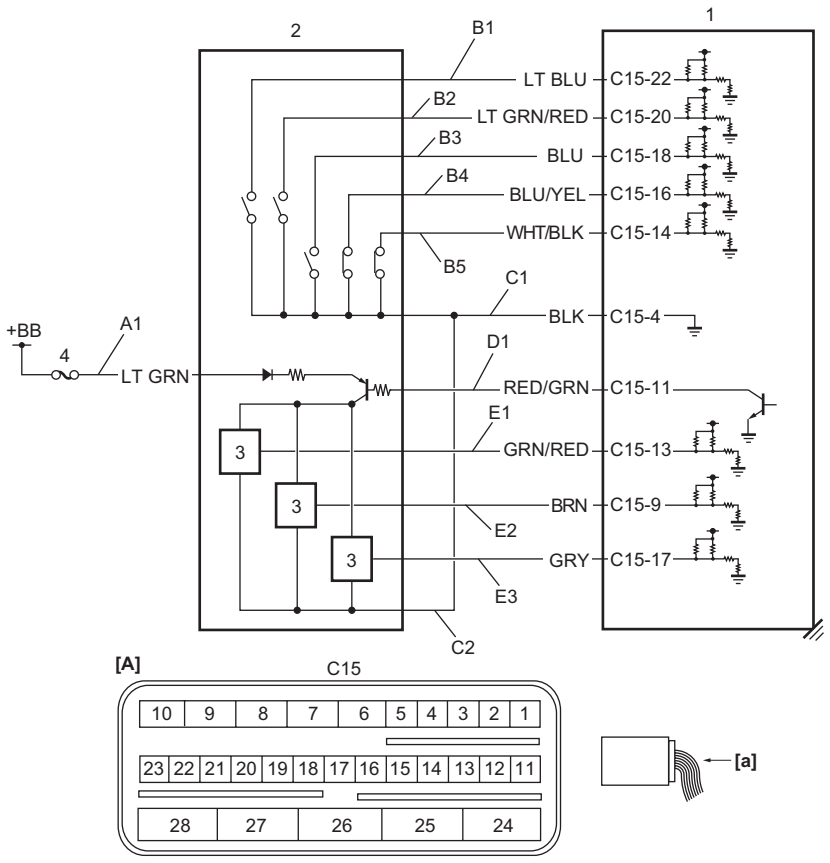
DTC P1902

AENDL70A5404082

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1902: Transmission Range Sensor Supply Circuit Request to shift selector power supply voltage and feedback signal disagree. (1 D/C detection logic)	• Shift selector power supply circuit and/or drive circuit • Shift selector • TCM incorporated in automated manual transaxle actuator unit • “T/M2” fuse

Circuit Diagram



IDL70A540148-02

[A]: TCM connector (View: [a])	B5: Lever position switch M5 signal circuit	E3: Lever position switch H3 signal circuit
A1: Shift selector power supply circuit	C1: Shift selector ground circuit 1	1. TCM
B1: Lever position switch M1 signal circuit	C2: Shift selector ground circuit 2	2. Shift selector
B2: Lever position switch M2 signal circuit	D1: Shift selector drive circuit	3. Hall sensor
B3: Lever position switch M3 signal circuit	E1: Lever position switch H1 signal circuit	4. “T/M2” fuse
B4: Lever position switch M4 signal circuit	E2: Lever position switch H2 signal circuit	

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition “ON”.
2) Select shift selector to R, N, D, M, + and - range.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check” (Page 5D-12).

Step	Action	Yes	No
2	**Shift selector power supply circuit check** 1) With ignition “OFF”, disconnect shift selector connector. 2) Check for proper terminal connection to shift selector connector. 3) If connection is OK, set ignition “ON”. 4) Check that voltage between “A1” and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**Shift selector drive circuit check** 1) With ignition “OFF”, disconnect “C15” connector from TCM. 2) Check for proper terminal connection to “C15” connector. 3) If connection is OK, check the following points. • Resistance of “D1” circuit: less than 1 Ω • Resistance between “D1” circuit and ground: infinity • Resistance between “D1” circuit terminal and other terminal at “C15” connector: infinity • Voltage of “D1” circuit: approx. 0 V (When ignition is “ON”). *Is check result OK?*	Go to Step 4.	Repair or replace defective wire harness.
4	**Shift selector check** 1) Check shift selector. ☞(Page 5D-86) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Replace shift selector. ☞(Page 5D-84)

DTC P1903 / P1904

AENDL70A5404083

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1903: Clutch Not Opening Before Gear Shifting Clutch is not released before gear shifting. (1 D/C detection logic)	• Clutch • Automated manual transaxle actuator unit • Valve body (automated manual transaxle actuator unit) • TCM incorporated in automated manual transaxle actuator unit
P1904: Clutch Closing During Engage Clutch is engaged during gear shifting. (1 D/C detection logic)	

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0805 or P1852 is not detected.**

1) Start engine.

2) Drive vehicle at more than 40 km/h (25 mile/h) continuously for more than 30 sec.
3) Stop vehicle.
4) Repeat Step 2) – 3) 3 times.
5) Repeat Step 2).

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).
2	**Clutch check** 1) Check clutch. ☞(Page 5D-116) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Repair clutch.

DTC P1905

AENDL70A5404084

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1905: Clutch Control Error This DTC is detected if any one of the following conditions is met. • Clutch is engaged suddenly. • Clutch sticks at disengaged state. (1 D/C detection logic)	• Valve body (automated manual transaxle actuator unit) • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P184B, P184C or P1888 is not detected.**

1) Start engine.
2) Drive vehicle at more than 20 km/h (12 mile/h) continuously more than 10 sec.
3) Stop vehicle.
4) Repeat Step 2) – 3) 3 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1905 detected after performing "DTC Confirmation Procedure"?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P1906 / P1908

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1906: Gear Box Disengage Failed Gear is not disengaged. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit
P1908: Gear Box Engage Failed Gear cannot be engaged. (1 D/C detection logic)	

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0914 or P1853 is not detected.**

1) Start engine.
2) Drive vehicle at more than 40 km/h (25 mile/h) continuously for 20 sec.
3) Stop vehicle.
4) Repeat Step 2) – 3) 7 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1906 or P1908 detected after performing "DTC Confirmation Procedure"?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P1907 / P190A

AENDL70A5404086

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1907: Gear Box Shift Failed Gear is shifted to unintended position. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit
P190A: Gear Box Shift Locked Gear shift is not completed. (1 D/C detection logic)	

DTC Confirmation Procedure
P1907

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0904, P184B, P184C, P184D, P1850, P1851, P1853, P1888 or P1889 is not detected.**

1) Start engine.
2) Drive vehicle at more than 40 km/h (25 mile/h) continuously for 20 sec.
3) Stop vehicle.
4) Repeat Step 2) – 3) 6 times.

P190A

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0904, P0914, P184B, P184C, P184D, P1850, P1851, P1853, P1888 or P1889 is not detected.**

1) Start engine.
2) Drive vehicle at more than 40 km/h (25 mile/h) continuously for 20 sec.
3) Stop vehicle.
4) Repeat Step 2) – 3) 11 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1907 or P190A detected after performing "DTC Confirmation Procedure"?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P1909 / P190B

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1909: Gear Box Unintended Gear Disengage Gear is disengaged without request of disengagement. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit
P190B: Gear Box Unintended Gear Engage Gear is engaged without gear shift request. (1 D/C detection logic)	

DTC Confirmation Procedure

P1909

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0914 or P1853 is not detected.**

1) Start engine.
2) Select shift selector to D range.
3) Select shift selector to N range.
4) Repeat Step 2) – 3) 4 times.

P190B

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC P0904, P0914 or P1853 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Set ignition “ON”.
2) Select shift selector to N range.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1909 or P190B detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P190C

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P190C: Gearshift Endless Gear shift is not completed within specified time. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

1) Start engine.
2) Drive vehicle at more than 40 km/h (25 mile/h) continuously for 20 sec.
3) Stop vehicle.
4) Repeat Step 2) – 3) 5 times.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P190C detected after performing "DTC Confirmation Procedure"?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P190D

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P190D: Clutch Overspeed Clutch speed exceeds specified value while gear is engaged. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following condition is satisfied in this procedure.
DTC P0715, P0716 or P1852 is not detected.

1) Start engine and drive vehicle at 40 km/h (25 mile/h) or more.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P190D detected after performing "DTC Confirmation Procedure"?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P190E

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P190E: Pump Overheating Oil pump temperature exceeds specified value. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

1) Set ignition “ON” for 1 min.
2) Select shift selector lever from N to D range.
3) Select shift selector lever from D to N range.
4) Repeat Step 2) - 3) continuously for more than 1 min.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P190E detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P190F

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P190F: Accumulator Failed Accumulated oil volume exceeds specified limit. (1 D/C detection logic but automated manual transaxle warning light does not light up)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **11 V < Battery voltage < 15 V**

1) Set ignition “ON” for 1 min.
2) Select shift selector lever from N to D range.
3) Select shift selector lever from D to N range.
4) Repeat Step 2) - 3) continuously for more than 1 min.
5) Without shift selector lever operation, pump is working.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P190F detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P1980

AENDL70A5404092

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1980: System Misuse This DTC is detected if the following conditions are met. • The number of gear shift exceeds specified value during specified period of time. • Oil pump temperature exceeds specified value. (1 D/C detection logic but automated manual transaxle warning light does not light up)	Excessive gear shift operation (misoperation)

DTC Confirmation Procedure

1) Start engine.
2) Select shift selector lever from N to D range.
3) Select shift selector lever from D to N range.
4) Repeat Step 2) - 3) continuously very fast.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1980 detected after performing "DTC Confirmation Procedure"?*	Leave vehicle with engine off and hood opened to cool oil pump.	End.

DTC P1981

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1981: CAN Invalid Data of Engine Torque Engine torque value is incorrect. (1 D/C detection logic but automated manual transaxle warning light does not light up)	• ECM • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

NOTE

Check that the following conditions are satisfied in this procedure.

- **DTC U0073 or U0100 is not detected.**
- **11 V < Battery voltage < 15 V**

1) Start engine and drive vehicle.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check" (Page 5D-12).

Step	Action	Yes	No
2	**DTC check** *Is there any CAN-DTC detected?*	Go to troubleshooting for CAN-DTC. ☞(Page 10H-8)	Go to Step 3.
3	**DTC check** 1) Check DTC in ECM. *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Clear DTC and check the following parts. • MAP sensor: ☞(Page 1C-6) • IAT sensor: ☞(Page 1C-10) • ECT sensor: ☞(Page 1C-6)

DTC P2712

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2712: Hydraulic Power Unit Leakage This DTC is detected if any one of the following conditions is met. • Oil leakage exceeds specified value while oil pump is not operating. • Oil leakage exceeds specified value while oil pump is operating. (1 D/C detection logic)	• Automated manual transaxle actuator unit • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P2712 detected after performing “DTC Confirmation Procedure”?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	End.

DTC P2789

AENDL70A5404095

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2789: Clutch “A” Adaptive Learning at Limit This DTC is detected if any one of the following conditions is met. • Clutch closed position is more than specified value. • Clutch closed position is less than specified value. (1 D/C detection logic)	• Clutch • TCM incorporated in automated manual transaxle actuator unit

DTC Confirmation Procedure

NOTE

Check that the following condition is satisfied in this procedure.

- **DTC P0805, P184B, P184C or P1852 is not detected.**

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	**TCM learning** 1) Perform “TCM and Clutch Initialization” (Page 5D-81). 2) Recheck DTC. ☞(Page 5D-21) *Is DTC P2789 still detected?*	Go to Step 2.	End.
2	**Clutch check** 1) Check clutch. ☞(Page 5D-116) *Is check result OK?*	Replace automated manual transaxle actuator unit and recheck DTC. ☞(Page 5D-87)	Repair clutch.

DTC U0073

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Refer to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).

DTC U0100

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Refer to “Troubleshooting for Lost Communication” in Section 10H (Page 10H-10).

DTC U0140

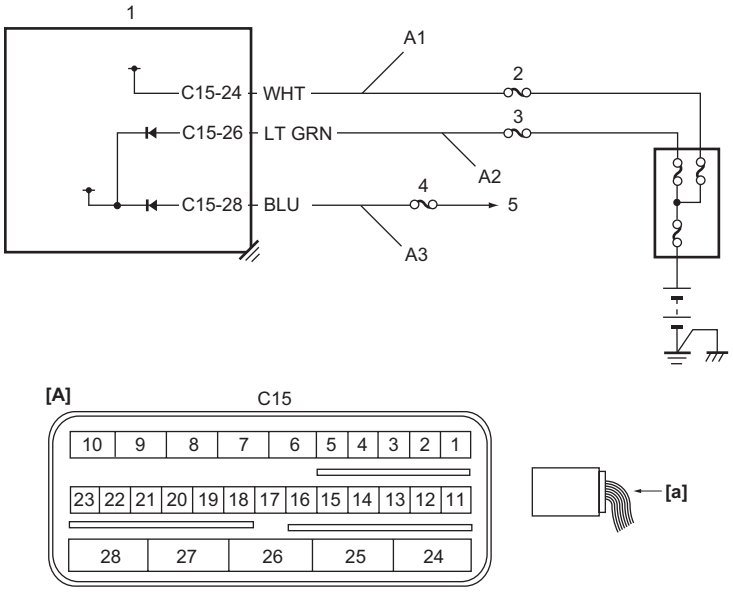
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Refer to “Troubleshooting for Lost Communication” in Section 10H (Page 10H-10).

TCM Power Supply and Ground Circuit Check

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Circuit Diagram



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[A]: TCM connector (View: [a])	A3: Ignition power supply circuit	3. “T/M” fuse
A1: Electric motor power supply circuit	1. TCM	4. “IG1 SIG” fuse
A2: TCM power supply circuit	2. “T/M PUMP” fuse	5. To ignition switch

Troubleshooting

Step	Action	Yes	No
1	**TCM power supply circuit check** 1) Set ignition “ON”. 2) Check that voltage between “A2” and ground is battery voltage. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.

Step	Action	Yes	No
2	**Electric motor power supply circuit check** 1) Check that voltage between “A1” and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**Automated manual transaxle actuator unit check** 1) Check automated manual transaxle actuator unit bolts for looseness. ☞(Page 5D-87) *Is check result OK?*	TCM power and ground circuit is in good condition.	Tighten automated manual transaxle actuator unit bolt to specified torque. ☞(Page 5D-87)

Inspection of TCM and Its Circuits

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TCM and its circuits can be checked at TCM wiring connectors by measuring voltage and pulse signal.

NOTICE

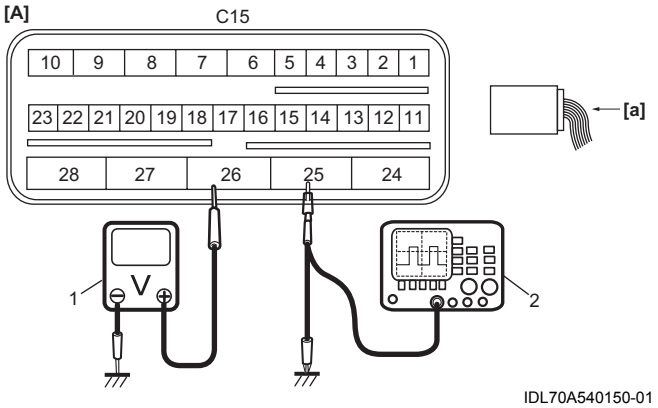
If you connect a voltmeter or an ohmmeter directly to the TCM terminals with the TCM connectors disconnected, you can damage the TCM.
Never connect a voltmeter or an ohmmeter directly to any terminal on the TCM with the TCM connectors disconnected.

Voltage and Signal Check

1) Check voltage and/or pulse signal at each terminal of connectors using voltmeter (1) and oscilloscope (2).

NOTE

- **As each terminal voltage is affected by battery voltage, check that it is 12 V or more when ignition is “ON”.**
- **Voltage with asterisk (*) cannot be measured using voltmeter because it is pulse signal. Check it using oscilloscope.**



[A]: TCM connector “C15” (View: [A])

Connector “C15”

Terminal No.	Wire color	Circuit	Normal voltage	Condition
C15-1	PNK/BLK	Brake switch signal circuit (normal close)	10 to 14 V	Ignition: “ON” Brake pedal: Released
			Approx. 0 V	Ignition: “ON” Brake pedal: Fully depressed
C15-2	GRN/WHT	Brake light switch signal circuit (normal open)	Approx. 0 V	Ignition: “ON” Brake pedal: Released
			10 to 14 V	Ignition: “ON” Brake pedal: Fully depressed

Terminal No.	Wire color	Circuit	Normal voltage	Condition
C15-3*	LT GRN	VSS signal circuit	Refer to reference waveform. "VSS signal" (Page 5D-80)	
C15-4	BLK	Shift selector ground circuit	Approx. 0 V	Constantly
C15-5	—	—	—	—
C15-6	—	—	—	—
C15-7*	RED	CAN (high) communication circuit	Refer to reference waveform. "CAN communication signal" (Page 5D-80)	
C15-8	—	—	—	—
C15-9	BRN	Lever position switch H2 signal circuit	Approx. 0 V	Ignition: "ON" Shift selector: N range
			10 to 14 V	Ignition: "ON" Shift selector: Other than N range
C15-10*	WHT	CAN (low) communication circuit	Refer to reference waveform. "CAN communication signal" (Page 5D-80)	
C15-11	RED/GRN	Shift selector drive circuit	Approx. 0 V	Ignition: "ON"
			8 V	Other than above condition
C15-12	—	—	—	—
C15-13	GRN/RED	Lever position switch H1 signal circuit	Approx. 0 V	Ignition: "ON" Shift selector: R range
			10 to 14 V	Ignition: "ON" Shift selector: Other than R range
C15-14	WHT/BLK	Lever position switch M5 signal circuit	10 to 14 V	Ignition: "ON" Shift selector: - range
			Approx. 0 V	Other than above condition
C15-15	—	—	—	—
C15-16	BLU/YEL	Lever position switch M4 signal circuit	10 to 14 V	Ignition: "ON" Shift selector: + range
			Approx. 0 V	Other than above condition
C15-17	GRY	Lever position switch H3 signal circuit	Approx. 0 V	Ignition: "ON" Shift selector: D, M, + or - range
			10 to 14 V	Ignition: "ON" Shift selector: Other than D, M, + or - range
C15-18	BLU	Lever position switch M3 signal circuit	Approx. 0 V	Ignition: "ON" Shift selector: M, + or - range
			10 to 14 V	Other than above condition
C15-19	WHT	Starting motor control relay signal circuit	10 to 14 V	Ignition: "START"
			Approx. 0 V	Other than above condition
C15-20	LT GRN/ RED	Lever position switch M2 signal circuit	10 to 14 V	Ignition: "ON" Shift selector: R range
			Approx. 0 V	Other than above condition
C15-21	YEL/BLK	Starting motor control relay drive circuit	10 to 14 V	Ignition: "START"
			Approx. 0 V	Other than above condition
C15-22	LT BLU	Lever position switch M1 signal circuit	10 to 14 V	Ignition: "ON" Shift selector: D, M, + or - range
			Approx. 0 V	Other than above condition
C15-23	YEL	Driver side front door switch signal circuit	10 to 14 V	Driver side front door: Close
			Approx. 0 V	Driver side front door: Open
C15-24	WHT	Electric motor power supply circuit	10 to 14 V	Constantly
C15-25	LT GRN	Back up light relay drive circuit	10 to 14 V	Ignition: "ON" Brake pedal: Depressed Shift selector: R range
			Approx. 0 V	Other than above condition
C15-26	LT GRN	TCM power supply circuit	10 to 14 V	Constantly
C15-27	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition
C15-28	BLU	Ignition ON signal circuit	10 to 14 V	Ignition: “ON”
			Approx. 0 V	Other than above condition

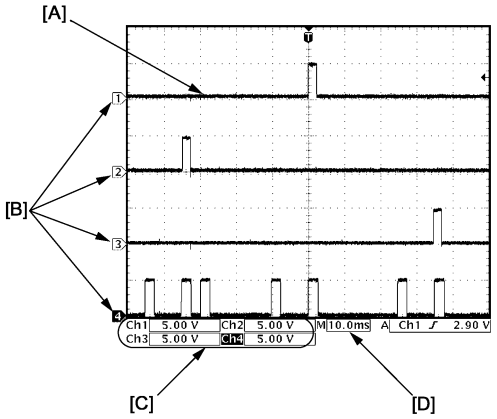
Reference Waveform

Oscilloscope display

Shown below is typical waveform display provided using oscilloscope.

NOTE

- **Display includes the following types of data:**



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[A]: Waveform of channel 1	[C]: VOLT/DIV of each channel
[B]: Ground level of each channel	[D]: TIME/DIV

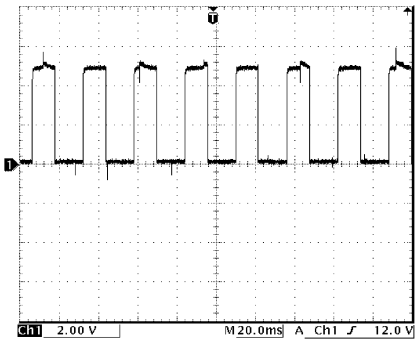
- **Waveform varies depending on measurement condition and vehicle spec.**

VSS signal

Channel	Probe	Terminal No.
1	+	C15-3
	–	Ground

Measurement condition

Engine: Drive vehicle at 20 km/h (12 mile/h)



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CAN communication signal

CAN (high) communication signal (1):

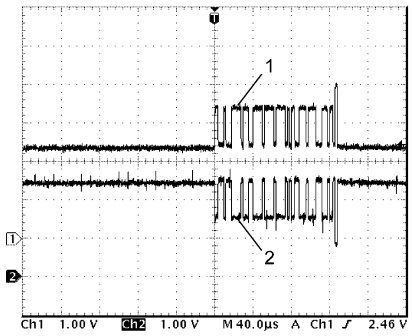
Channel	Probe	Terminal No.
1	+	C15-7
	–	Ground

CAN (low) communication signal (2):

Channel	Probe	Terminal No.
2	+	C15-10
	–	Ground

Measurement condition

- Engine: Stop
- Ignition: “ON”



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Repair Instructions

TCM and Clutch Initialization

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1) Select learning procedure in the following table.

Replacement / reinstallation	Initialization
• Manual transaxle or manual transaxle parts (separated from engine) • Automated manual transaxle actuator unit	All Learning Value Initialization
Gear shift and select shaft assembly	Shift Tower Initialization
• Clutch • Engine parts (after separation of manual transaxle from engine)	Clutch Assembly Initialization
New manual transaxle and new automated manual transaxle actuator unit	Clutch-contact-point learning Initialization

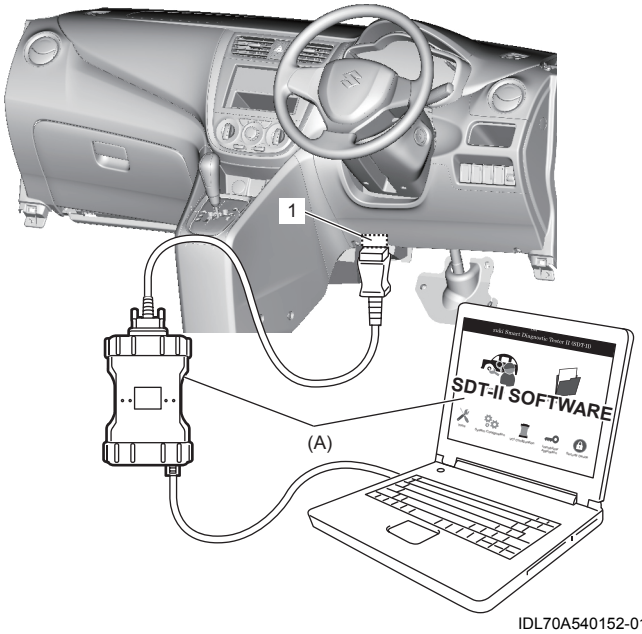
2) Perform selected initialization procedure as follows.

All Learning Value Initialization:

a) Set ignition “OFF”.

b) Connect SUZUKI scan tool to DLC (1).

Special tool
(A): SUZUKI scan tool (SUZUKI SDT-II)



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c) Set ignition “ON”.

d) Select “All Learning Value Initialization” function under “Utility” mode on SUZUKI scan tool, and follow the instructions displayed on SUZUKI scan tool.

e) Check that DTC P080A, P1844, P185A or P185B is not detected. ☞(Page 5D-21)

f) Check that release arm moves according to shift selector lever operation of N to D or D to N, and check parameter of “Clutch Control Status” displayed on SUZUKI scan tool as well. ☞(Page 5D-29)

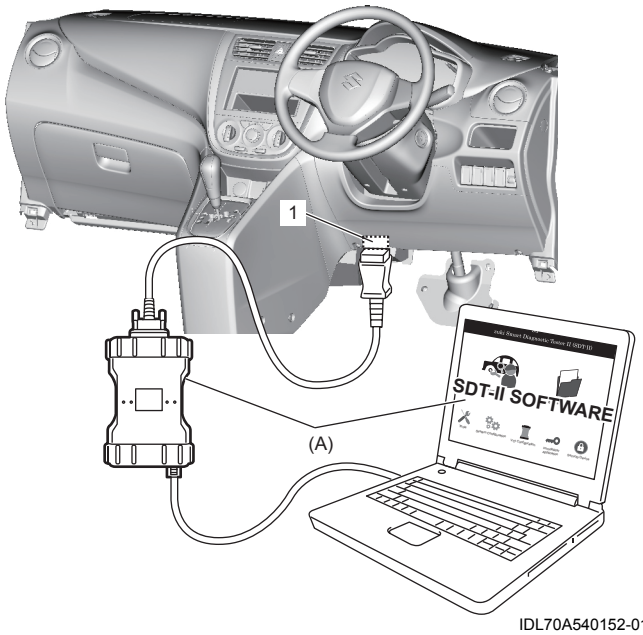
g) Check that combination meter (information display) shows N, 1st or R according to shift selector lever operation of N to D or R, and check parameter of “Gear Position” displayed on SUZUKI scan tool as well. ☞(Page 5D-29)

Shift Tower Initialization:

a) Set ignition “OFF”.

b) Connect SUZUKI scan tool to DLC (1).

Special tool
(A): SUZUKI scan tool (SUZUKI SDT-II)



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c) Set ignition “ON”.

d) Select “Shift Tower Initialization” function under “Utility” mode on SUZUKI scan tool, and follow the instructions displayed on SUZUKI scan tool.

e) Set ignition “OFF” for 5 sec.

f) Set ignition “ON”.

g) Check that DTC P1844 is not detected. ☞(Page 5D-21)

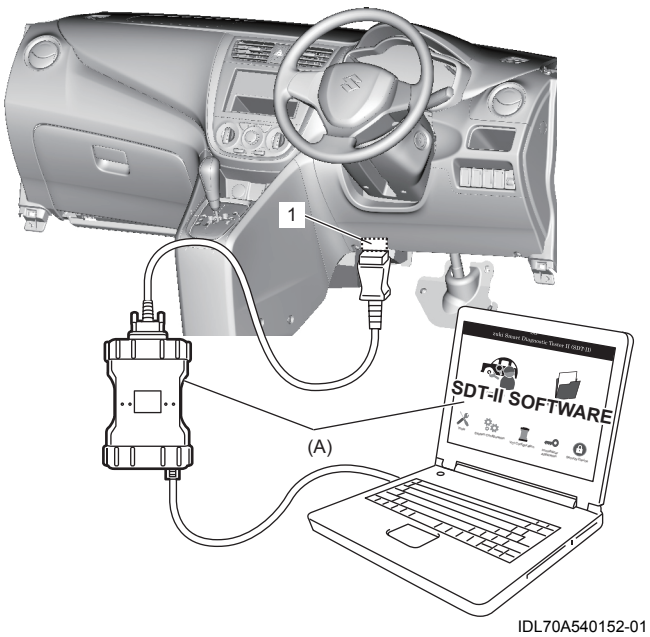
h) Check that release arm moves according to shift selector lever operation of N to D or D to N, and check parameter of “Clutch Control Status” displayed on SUZUKI scan tool as well. ☞(Page 5D-29)

Clutch Assembly Initialization:

a) Set ignition “OFF”.

b) Connect SUZUKI scan tool to DLC (1).

Special tool
(A): SUZUKI scan tool (SUZUKI SDT-II)



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c) Set ignition “ON”.
d) Select “Clutch Assembly Initialization” function under “Utility” mode on SUZUKI scan tool, and follow the instructions displayed on SUZUKI scan tool.
e) Check that DTC P080A, P185A or P185B is not detected. ☞(Page 5D-21)
f) Check that release arm moves according to shift selector lever operation of N to D or D to N, and check parameter of “Clutch Control Status” displayed on SUZUKI scan tool as well. ☞(Page 5D-29)
g) Check that combination meter (information display) shows N, 1st or R according to shift selector lever operation of N to D or R, and check parameter of “Gear Position” displayed on SUZUKI scan tool as well. ☞(Page 5D-29)

Clutch-contact-point Learning Initialization:

a) Start engine and run it for 20 sec.
b) Set ignition “OFF” for 5 sec.
c) Set ignition “ON”.
d) Check that DTC P080A or P185B is not detected. ☞(Page 5D-21)
e) Check that release arm moves according to shift selector lever operation of N to D or D to N, and check parameter of “Clutch Control Status” displayed on SUZUKI scan tool as well. ☞(Page 5D-29)
f) Check that combination meter (information display) shows N, 1st or R according to shift selector lever operation of N to D or R, and check parameter of “Gear Position” displayed on SUZUKI scan tool as well. ☞(Page 5D-29)

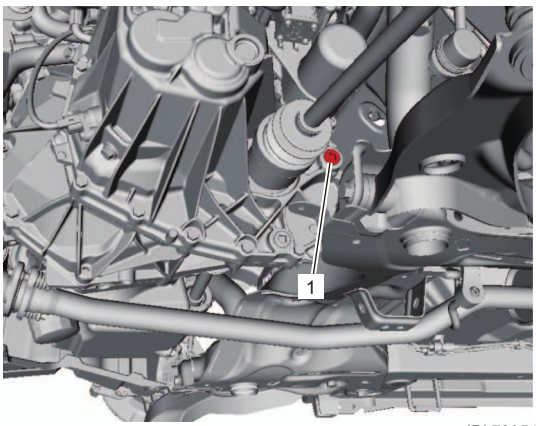
Automated Manual Transaxle Oil Level Check

AENDL70A5406051

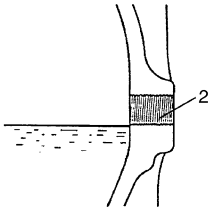
1) Hoist vehicle and check automated manual transaxle for oil leakage. Repair leaky point, if any.
2) Remove oil level / filler plug (1). Check oil contamination and check that oil level reaches lower end of oil level / filler plug hole (2).
If oil is excessively dirty or insufficient, change oil or add specified oil up to plug hole.
3) Apply sealant to thread of level / filler plug, and then tighten it to specified torque.

“A”: Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Transaxle oil level / filler plug (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)



IDL70A540001-01



IAP70A320003-01

Automated Manual Transaxle Oil Change

AENDL70A5406004

1) Before changing oil, stop engine and hoist vehicle horizontally.
2) Remove left splash cover.
3) With vehicle hoisted, check oil leakage. If leakage exists, correct it.
4) Remove oil level / filler plug (2).
5) Cover suspension frame with a board (4) to protect it from dripping oil, remove drain plug (1) and drain oil.

NOTE

Wipe oil off from suspension frame where the portions get wet with the transaxle oil.

6) Apply sealant to thread of drain plug, and tighten it to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Oil drain plug (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

7) Add new specified oil until oil level reaches lower end of oil filler plug hole (3) as shown in figure.

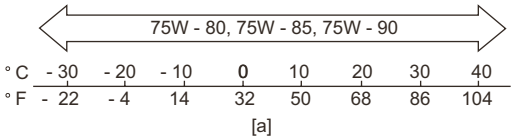
NOTE

It is highly recommended to use "SUZUKI GEAR OIL 75W-80".

Automated manual transaxle oil specification
: SUZUKI GEAR OIL 99000–22B21–036
: API GL–4 (For SAE classification, refer to viscosity chart)

Automated manual transaxle oil capacity
Reference: 1.45 liters (3.06/2.55 US/Imp. pt)

Viscosity chart



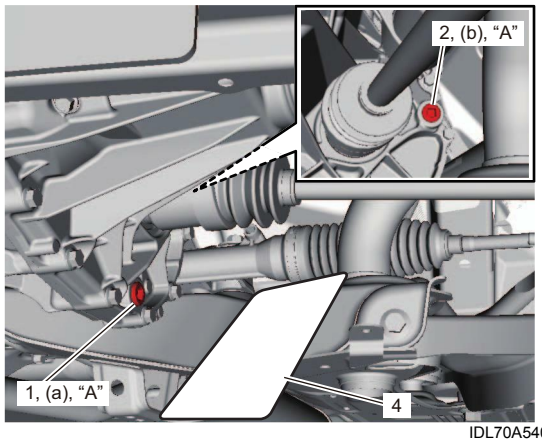
IAP70A520004-01

[a]: Temperature

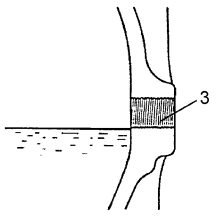
8) Apply sealant to thread of oil level / filler plug, and then tighten it to specified torque.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Transaxle oil level / filler plug (b): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)



IDL70A540002-02



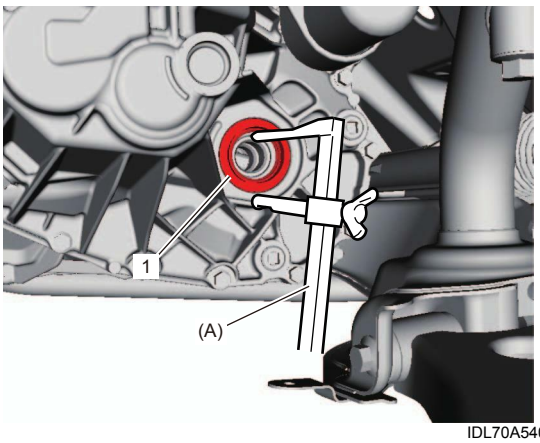
IAP70A320006-01

Differential Side Oil Seal Replacement

AENDL70A5406005

1) Hoist vehicle and drain transaxle oil. ☞(Page 5D-82)
2) Remove front drive shaft. ☞(Page 3A-2)
3) Remove oil seal (1) using special tool.

Special tool
(A): 09913M50121



IDL70A540003-01

4) Install new oil seal (1) to specified position using special tool.

NOTE

- **When installing oil seal, face its spring side inward.**
- **Check that oil seal is installed horizontally to surface of case after installing oil seal.**

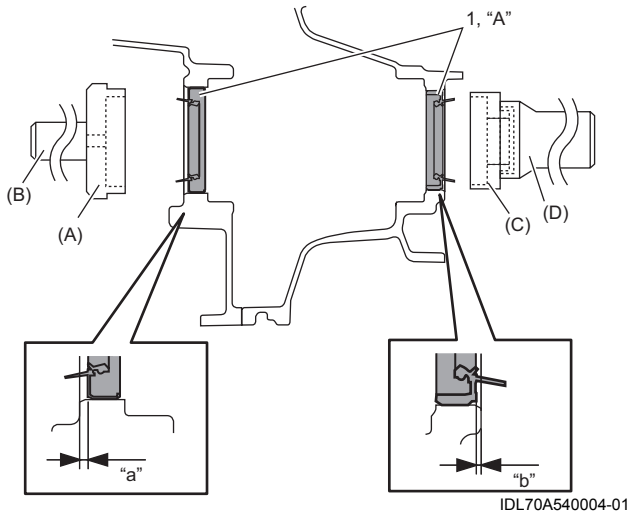
Special tool
(A): 09926M27610
(B): 09924M74510
(C): 09924M07720
(D): 09913M70123

Distance from case end face to left oil seal
"a": 2.1 – 3.1 mm (0.08 – 0.12 in.)

Distance from case end face to right oil seal
"b": 0.7 – 1.7 mm (0.03 – 0.07 in.)

5) Apply grease to oil seal lip. Then, check drive shaft where oil seal contacts and check its smoothness.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

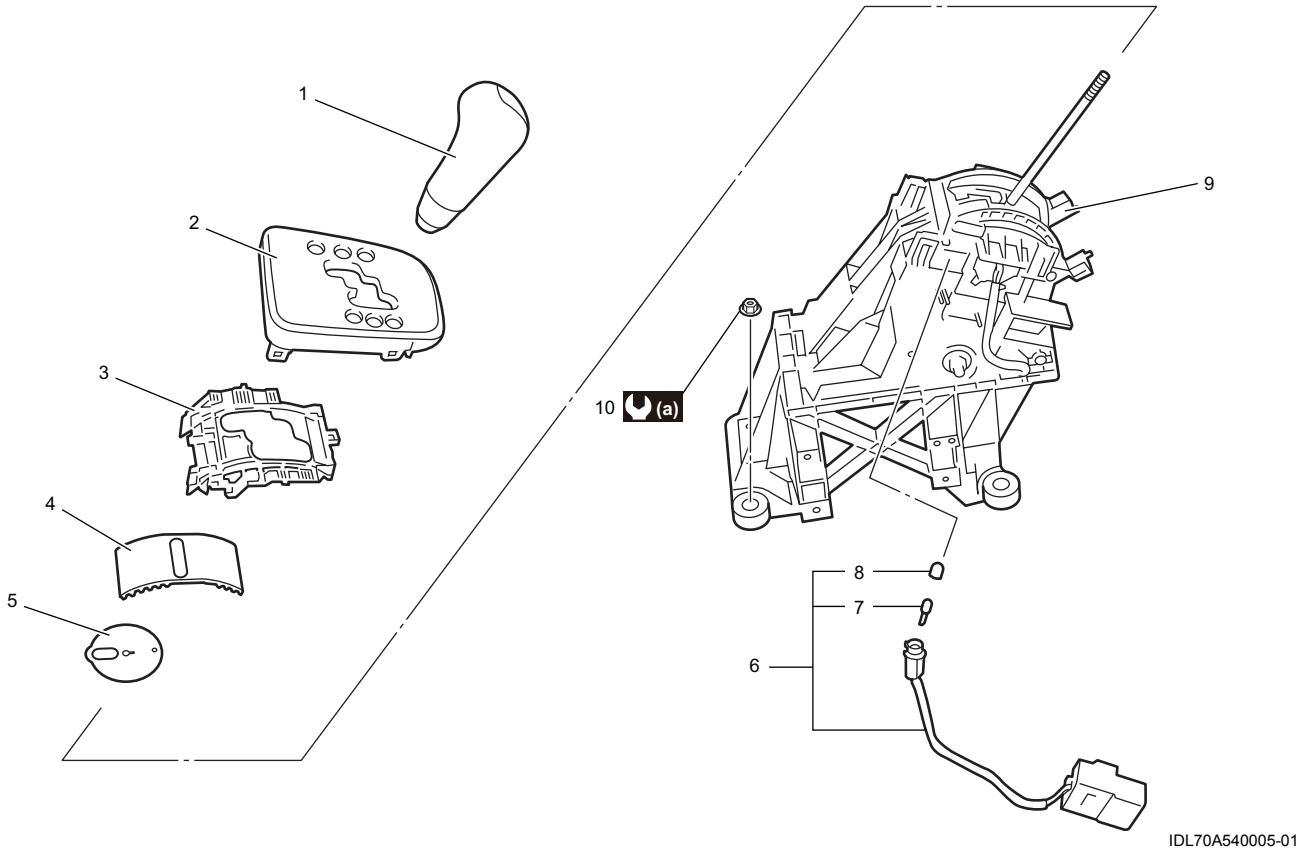


IDL70A540004-01

6) Install front drive shaft. ☞(Page 3A-2)
7) Add transaxle oil. ☞(Page 5D-82)

Shift Selector Components

AENDL70A5406006



IDL70A540005-01

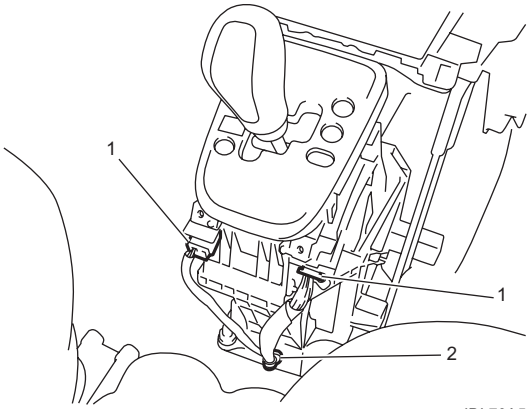
1. Shift selector knob	5. Lower slide cover	9. Shift selector
2. Shift selector indicator	6. Shift selector illumination light assembly	10. Shift selector nut
3. Light guide plate	7. Bulb	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
4. Upper slide cover	8. Bulb filter	

Shift Selector Removal and Installation

AENDL70A5406007

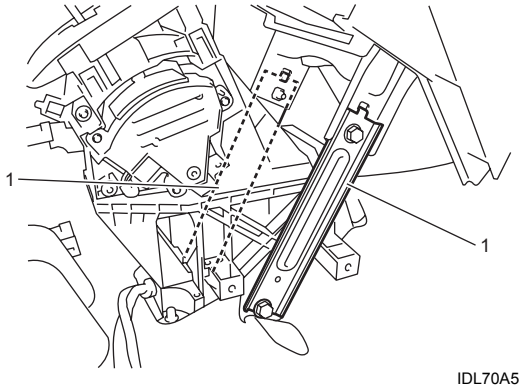
Removal

1) Shift select lever to neutral position.
2) Disconnect negative (–) cable at battery.
3) Remove instrument panel lower cover.
4) Disconnect 2 connectors (1) from shift selector and wiring harness clamp (2).



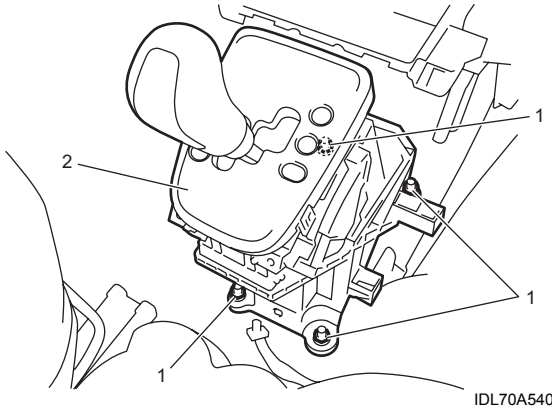
IDL70A540006-01

5) Remove steering support member lower braces (1).



IDL70A540007-01

6) Remove shift selector nuts (1) and shift selector (2).



IDL70A540008-01

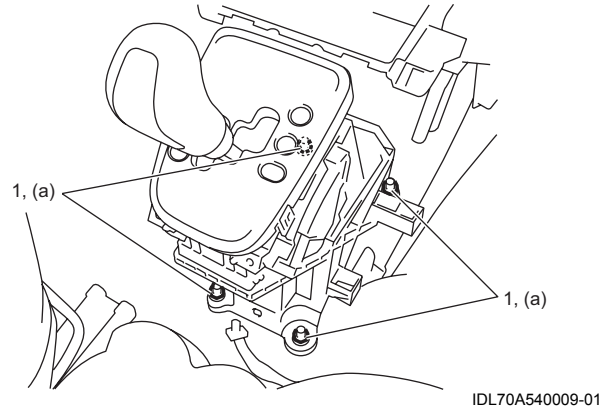
Installation

Reverse removal procedure noting the following point.

- Tighten shift selector nuts (1) to specified torque.

Tightening torque

Shift selector nut (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



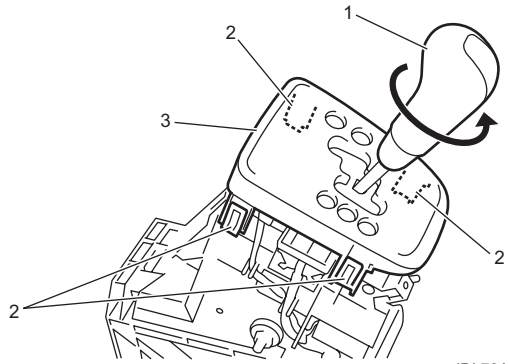
IDL70A540009-01

Shift Selector Disassembly and Reassembly

AENDL70A5406008

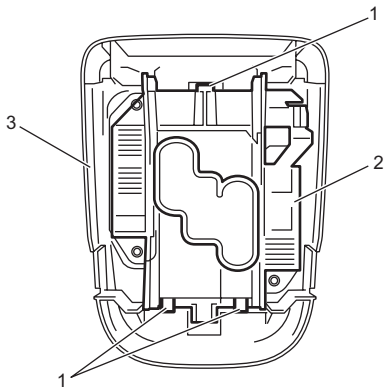
Disassembly

1) Remove shift selector knob (1) by rotating it counterclockwise.
2) Releasing claws (2), remove shift selector indicator assembly (3) and slide cover assembly.



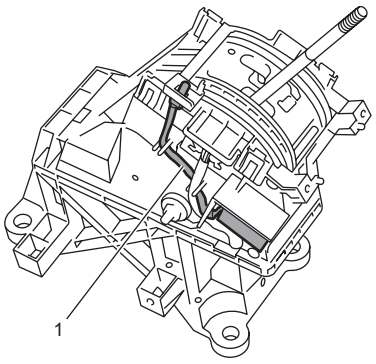
IDL70A540010-01

3) Releasing claws (1), remove light guide plate (2) from shift selector indicator (3).



IDL70A540011-01

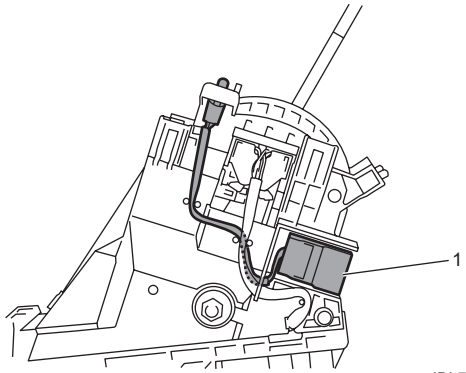
4) Remove shift selector illumination light assembly (1).



IDL70A540012-01

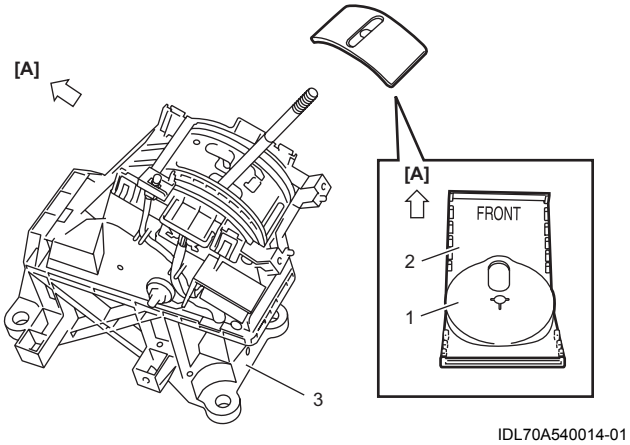
Installation

1) Install shift selector illumination light assembly (1).



IDL70A540013-01

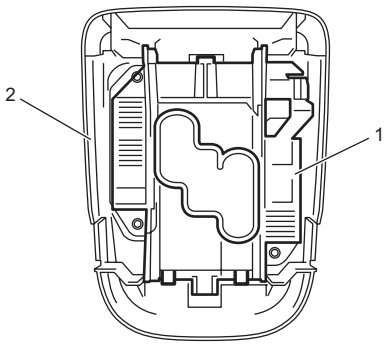
2) Install lower slide cover (1) to upper slide cover (2), and then install them to shift selector (3).



IDL70A540014-01

[A]: Front side

3) Install light guide plate (1) to shift selector indicator (2).



IDL70A540015-01

4) Install shift selector indicator assembly (1).

5) Install shift selector knob (2) onto shift selector by rotating it clockwise and set it in straight ahead position within specified range “a”.

NOTICE

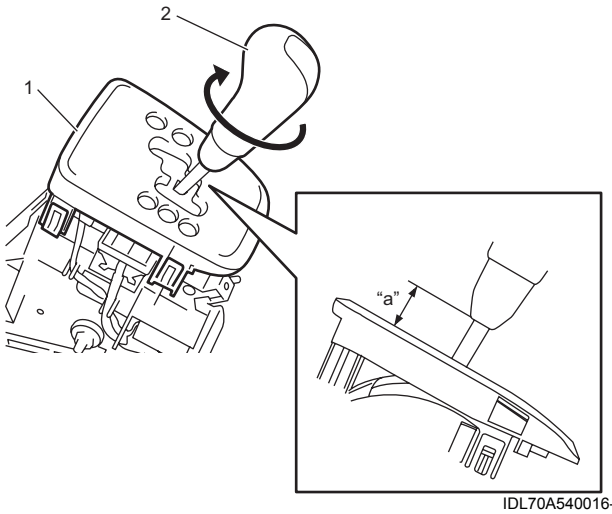
Rotating shift selector knob beyond specified range may damage the knob.
Do not rotate the knob excessively.

NOTE

The torque value is for reference.

Distance from shift selector indicator face to shift selector knob
“a”: 21.8 – 23.8 mm (0.86 – 0.94 in.)

Tightening torque
Shift selector knob: 8 N·m (0.82 kgf-m, 6.0 lbf-ft)



IDL70A540016-05

Shift Selector Inspection

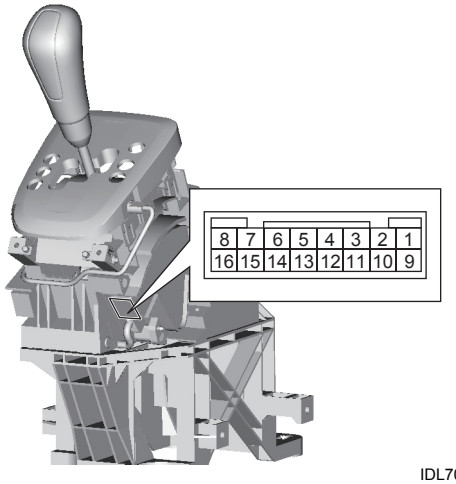
AENDL70A5406052

Position Switch

1) Remove instrument panel lower cover.
2) Disconnect shift selector position switch connector.
3) Check continuity between terminals at each shift position, reference to the following table.
If check result is not as specified, replace shift selector.

Shift position	Terminal No.					
	4	2	12	11	10	13
R	○			○	○	○
N	○	○		○	○	○
D		○		○	○	○
M		○	○	○	○	○
+		○	○	○		○
–		○	○		○	○

IDL70A540017-01

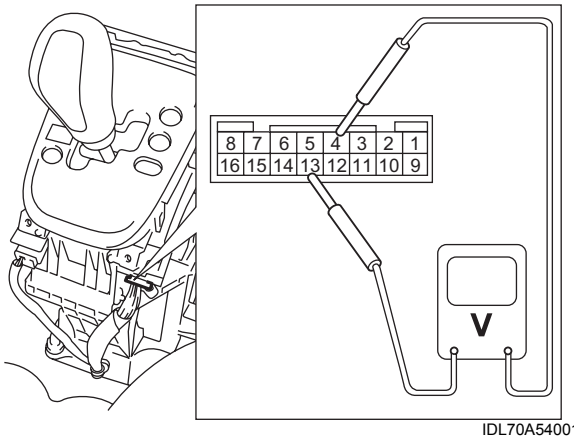


IDL70A540018-02

Hall Sensor

Check voltage between terminal “13” of shift selector connector and each terminal of each shift position, reference to the following table.
If check result is not as specified, replace shift selector.

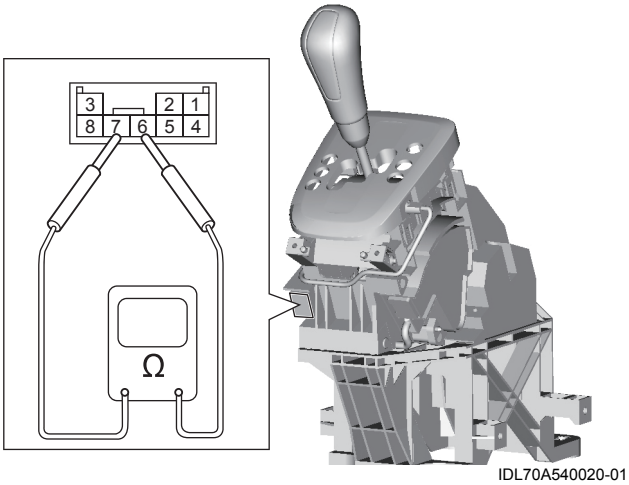
Shift position	Terminal No.		
	15	6	14
R	0 V	10 - 14 V	10 - 14 V
N	10 - 14 V	0 V	10 - 14 V
D	10 - 14 V	10 - 14 V	0 V
M	10 - 14 V	10 - 14 V	0 V
+	10 - 14 V	10 - 14 V	0 V
–	10 - 14 V	10 - 14 V	0 V



IDL70A540019-01

Illumination Light

1) Remove instrument panel lower cover.
2) Disconnect shift selector position sensor connector.
3) Check continuity between terminal “6” and “7” of shift selector lever connector.
   If check result is not as specified, replace defective part.



IDL70A540020-01

Automated Manual Transaxle Actuator Unit Removal and Installation

AENDL70A5406053

NOTICE

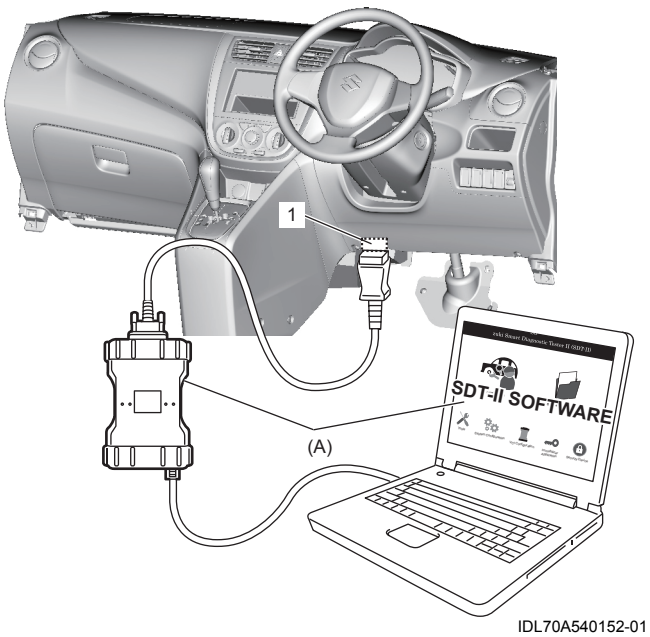
Performing the following prohibited operations will affect the original performance of automated manual transaxle actuator unit.

- **Do not disassemble the automated manual transaxle actuator unit.**
- **Do not remove the motor.**
- **Regarding automated manual transaxle actuator unit removal and installation, check specified torque and do not use impact tool.**
- **Use care not to allow dust to enter automated manual transaxle actuator unit.**
- **Do not place automated manual transaxle actuator unit on its side or upside down.**
- **Do not give an impact to hydraulic unit.**

Removal

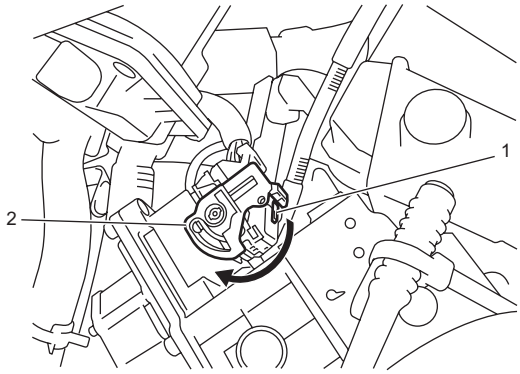
1) Set ignition “OFF”.
2) Connect SUZUKI scan tool to DLC (1).

Special tool
(A): SUZUKI scan tool (SUZUKI SDT-II)



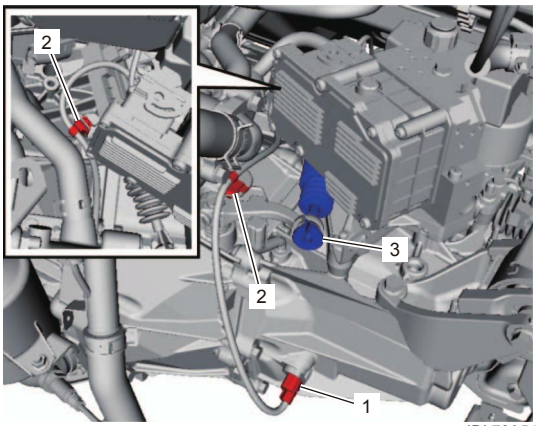
IDL70A540152-01

3) Set ignition “ON”.
4) Select “Oil Discharge” function under “Utility” mode on SUZUKI scan tool, and follow the instructions displayed on SUZUKI scan tool.
5) After completing “Oil Discharge”, set ignition “OFF” and disconnect SUZUKI scan tool from DLC.
6) Hoist vehicle and place select lever in N.
7) Remove battery and battery tray. ☞(Page 1J-5)
8) Disconnect automated manual transaxle actuator unit connector turning the lock lever (2) clockwise while releasing lock claw (1) by pushing it inward.



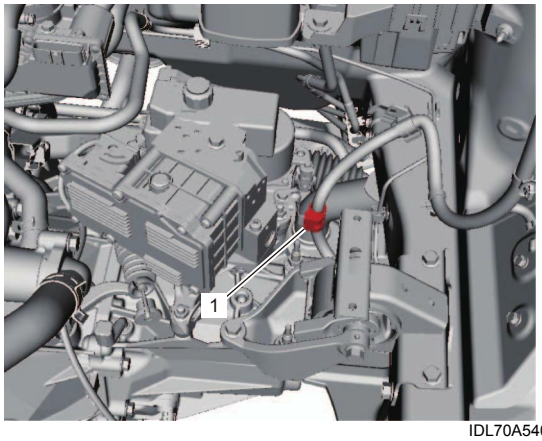
IDL70A540021-01

9) Disconnect clutch speed sensor connector (1) and wiring harness clumps (2).
10) Disconnect clutch rod (3).



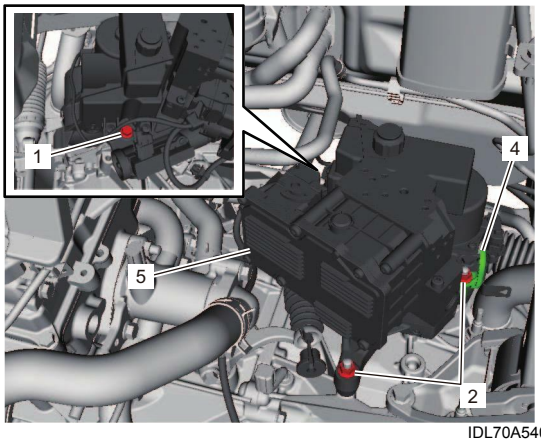
IDL70A540022-01

11) Disconnect ground cable clump (1).

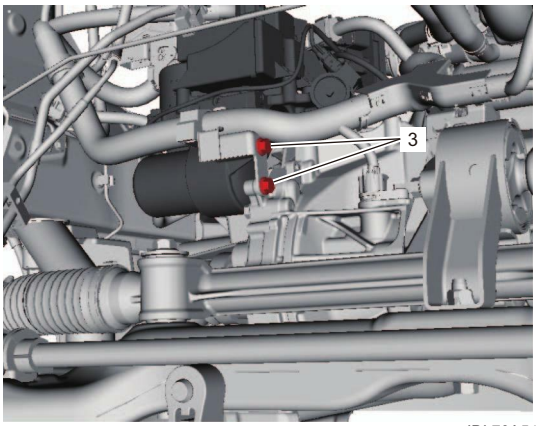


IDL70A540023-01

12) Remove automated manual transaxle actuator unit bolt (1), nuts (2) and actuator bracket bolts (3), and then remove transmission No.1 hook (4), automated manual transaxle actuator unit (5) and O-ring.



IDL70A540024-02



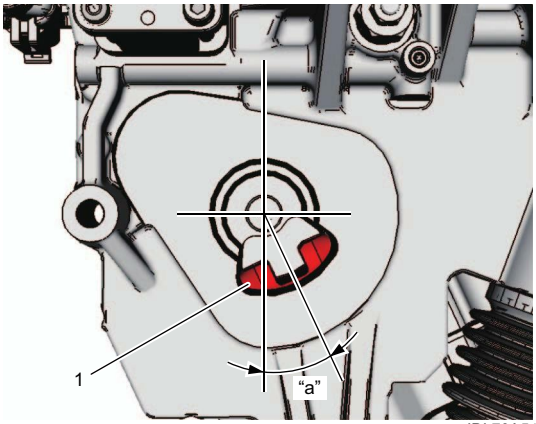
IDL70A540025-02

Installation

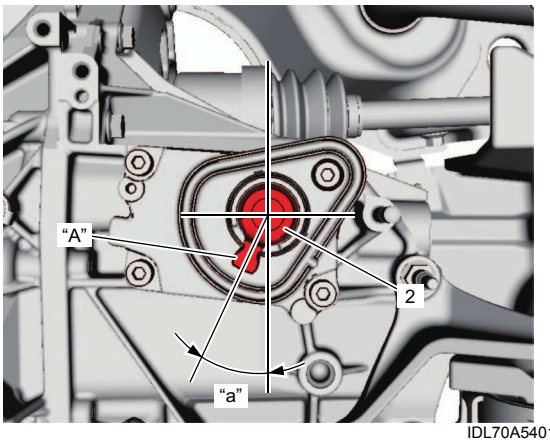
Reverse removal procedure noting the following points.

- Use new O-ring.
- Check that O-ring and gear shift and select shaft assembly are free from foreign material such as dust or oil.
- Check that shift rod (1) at the bottom of automated manual transaxle actuator unit and engage lever (2) on the top of gear shift and select shaft assembly are in N position “a” as shown in figure.
- Apply grease to engage lever.

  “A”: Grease 99000–25011 (SUZUKI Super Grease A)



IDL70A540161-01

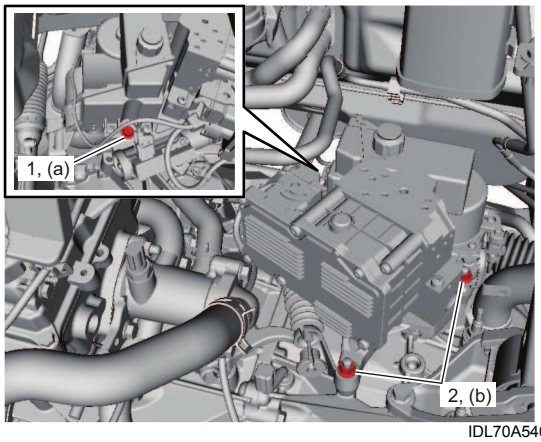


IDL70A540162-01

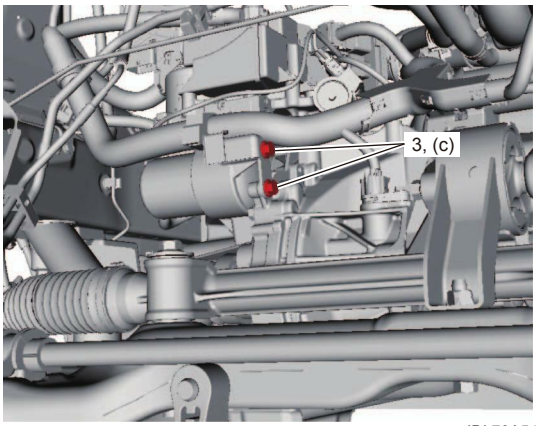
“a”: Approx. 25°

- Tighten automated manual transaxle actuator unit bolt (1), nuts (2) and actuator bracket bolts (3) to specified torque.

  Tightening torque
  Automated manual transaxle actuator unit bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
  Automated manual transaxle actuator unit nut (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
  Actuator bracket bolt (c): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A540026-02



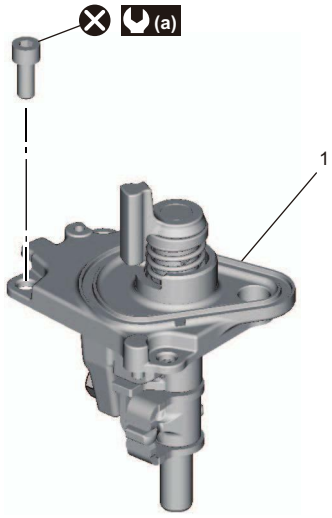
IDL70A540027-01

- Connect clutch rod, connector and fix wire harness with clamp securely.

- Initialize automated manual transaxle actuator unit. ☞(Page 5D-81)

Gear Shift and Select Shaft Assembly Components

AENDL70A5406058



IDL70A540154-02

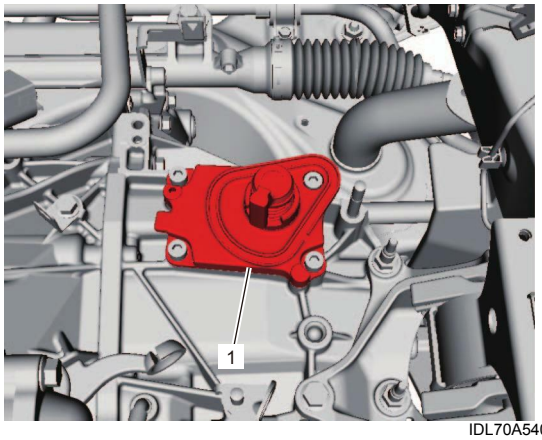
1. Gear shift and select shaft assembly	: Do not reuse.
(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)	

Gear Shift and Select Shaft Assembly Removal and Installation

AENDL70A5406054

Removal

1) Remove automated manual transaxle actuator unit. ☞(Page 5D-87)
2) Remove gear shift and select shaft assembly (1).



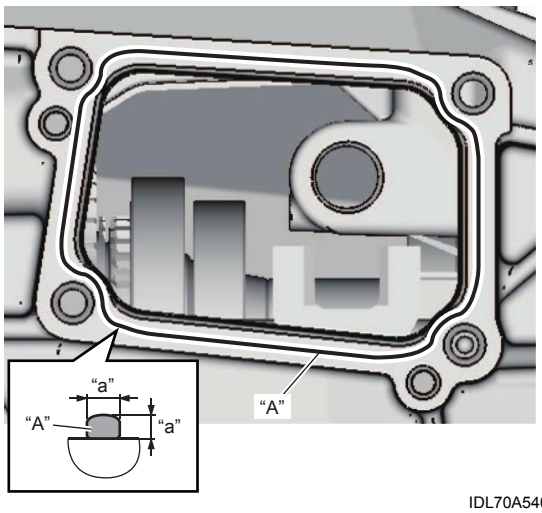
IDL70A540028-01

Installation

1) Install gear shift and select shaft assembly to transaxle left case as follows.
   a) Clean mating surfaces of gear shift and select shaft assembly and left case.
   b) Apply specified amount of sealant to left case as shown in figure.

      "A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

      Sealant amount for transaxle left case
      "a": 1.5 mm (0.059 in.)



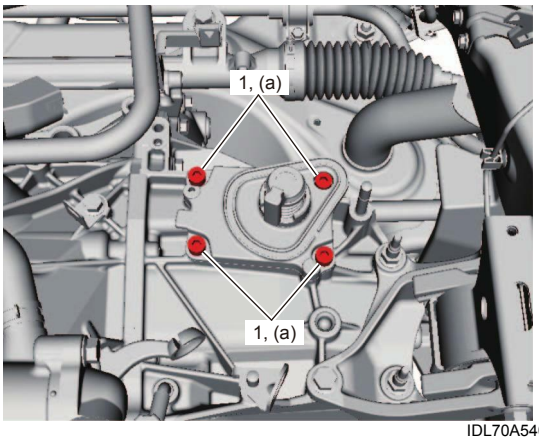
IDL70A540029-01

   c) Install gear shift and select shaft assembly to left case.
2) Tighten new gear shift and select shaft assembly bolts (1) to specified torque.

NOTICE

The gear shift and select shaft assembly bolts are pre-coated with adhesive. If the bolts are reused, they may work loose. Replace gear shift and select shaft assembly bolts with new ones whenever they are removed.

Tightening torque
Gear shift and select shaft assembly bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A540030-01

3) Install automated manual transaxle actuator unit. ☞(Page 5D-87)
4) Initialize gear shift and select shaft assembly. ☞(Page 5D-81)

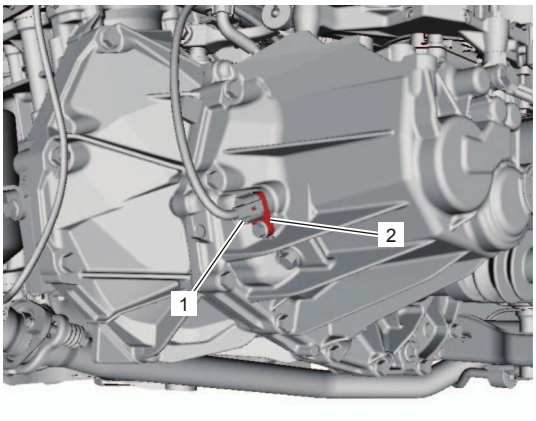
Clutch Speed Sensor Removal and Installation

AENDL70A5406018

Removal

1) Disconnect negative (–) cable at battery.

2) Hoist vehicle and drain transaxle oil. ☞(Page 5D-82)
3) Disconnect clutch speed sensor connector (1).
4) Remove clutch speed sensor (2).

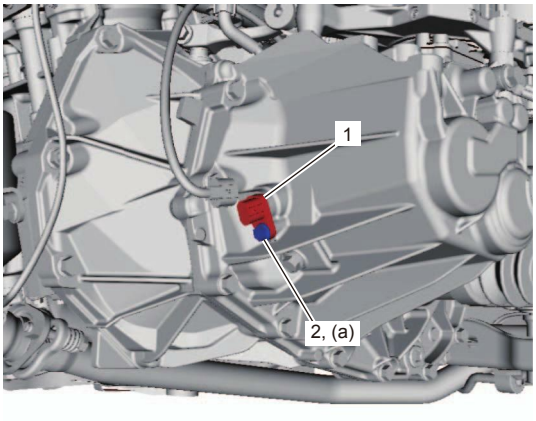


IDL70A540031-01

Installation

1) Apply oil to new O-ring, and then install it on clutch speed sensor.
2) Install clutch speed sensor (1) and tighten clutch speed sensor bolt (2) to specified torque.

Tightening torque
Clutch speed sensor bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



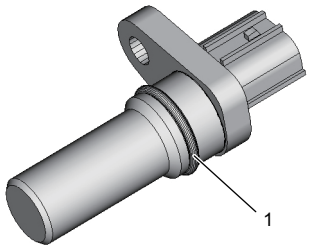
IDL70A540032-01

3) Add transaxle oil. ☞(Page 5D-82)
4) Connect clutch speed sensor connector.
5) Lower vehicle and connect negative (–) cable at battery.

Clutch Speed Sensor Inspection

AENDL70A5406055

1) Remove clutch speed sensor. ☞(Page 5D-90)
2) Check the following points.
   - Check that O-ring (1) is free from damage.
   - Check that end face of sensor and input shaft teeth (2nd gear) are free from any metal particles and damage.



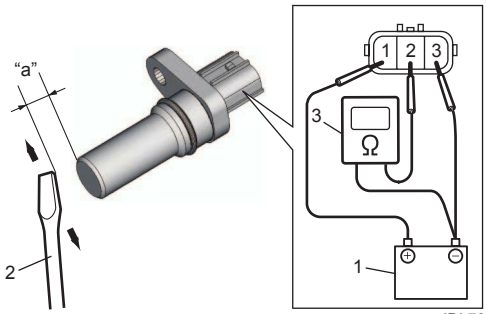
IDL70A540033-01

3) Check clutch speed sensor as follows.
   If faulty condition is found, replace clutch speed sensor.
   a) Connect battery (1) and ohmmeter (3) to clutch speed sensor as shown in figure.
   b) Check that clutch speed sensor resistance varies as specified below by passing ferromagnetic material (iron) (2) in front of clutch speed sensor.

NOTE

Keep approximately 1 mm (0.03 in.) gap "a" between ferromagnetic material (iron) and end face of clutch speed sensor.

Clutch speed sensor resistance
Resistance alternates between 220 Ω or smaller (ON) and infinity (OFF)



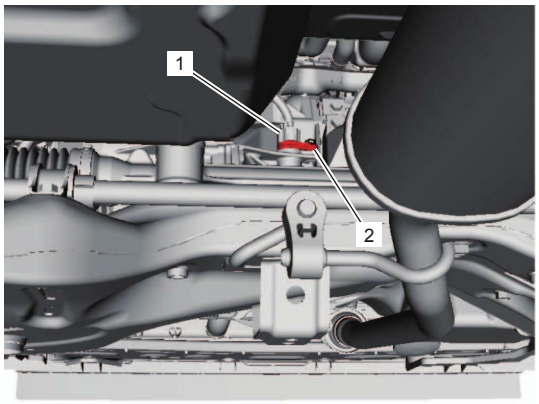
IDL70A540034-01

VSS Removal and Installation

AENDL70A5406024

Removal

1) Disconnect negative (–) cable at battery and hoist vehicle.
2) Disconnect VSS connector (1).
3) Remove VSS (2).

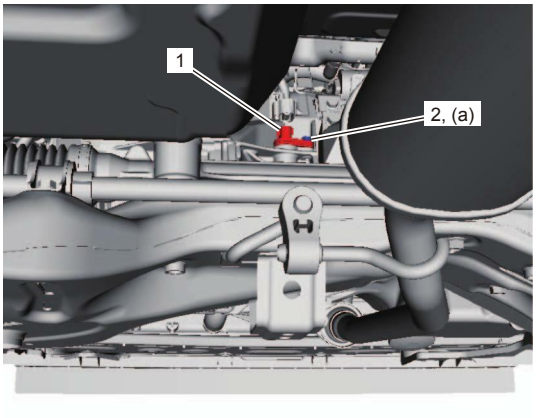


IDL70A540035-01

Installation

1) Apply oil to new O-ring, and then install it on VSS.
2) Install VSS (1) and tighten VSS bolt to specified torque.

Tightening torque
VSS bolt (a): 5 N·m (0.51 kgf-m, 4.0 lbf-ft)



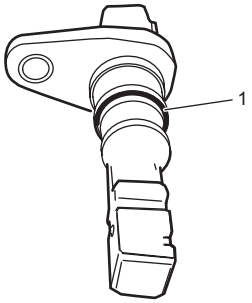
IDL70A540036-01

3) Connect VSS connector.
4) Lower vehicle and connect negative (–) cable at battery.

VSS Inspection

AENDL70A5406056

1) Remove VSS. ☞(Page 5D-91)
2) Check the following points.
   - Check that O-ring (1) is free from damage.
   - Check that end face of sensor and speed sensor ring teeth are free from any metal particles and damage.



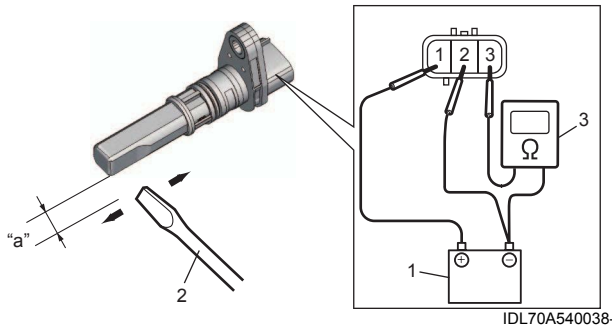
IDL70A540037-01

3) Check VSS as follows.
   If faulty condition is found, replace VSS.
   a) Connect battery (1) and ohmmeter (3) to VSS as shown in figure.
   b) Check that VSS resistance varies as specified below by passing ferromagnetic material (iron) (2) at VSS's side.

NOTE

Keep approximately 1 mm (0.03 in.) gap "a" between ferromagnetic material (iron) and end face of VSS.

VSS resistance
Resistance alternates between 100 Ω or smaller (ON) and infinity (OFF)



IDL70A540038-01

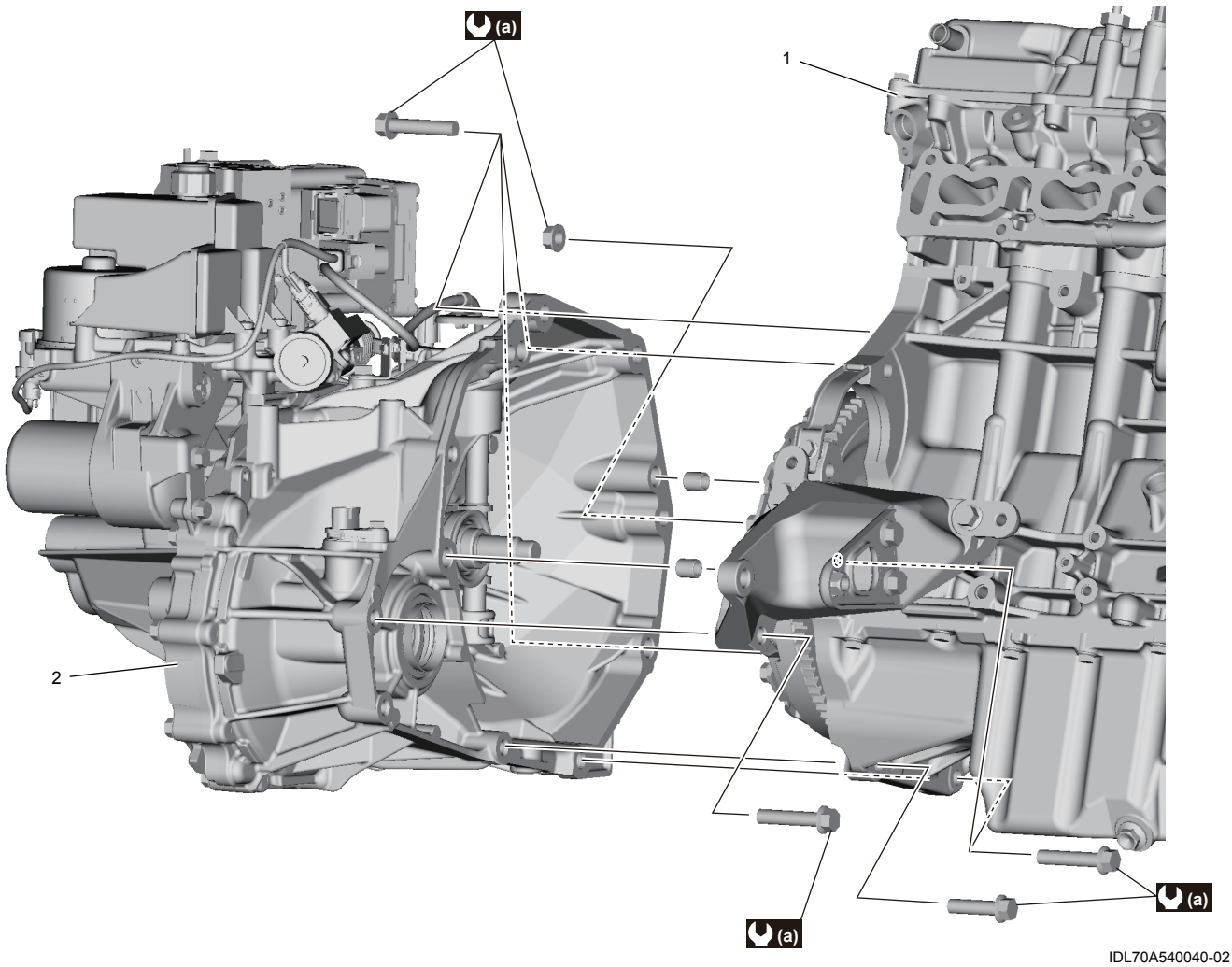
Starting Motor Control Relay and Back Up Light Relay Inspection

AENDL70A5406026

Refer to "Control Relay Inspection" in Section 10B (Page 10B-32).

Automated Manual Transaxle Unit Components

AENDL70A5406027



IDL70A540040-02

1. Engine	2. Automated manual transaxle and automated manual transaxle actuator unit	(a) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)

Automated Manual Transaxle Unit Dismounting and Remounting

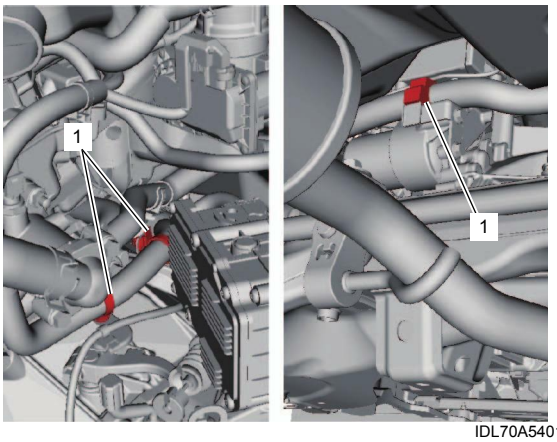
AENDL70A5406028

Dismounting

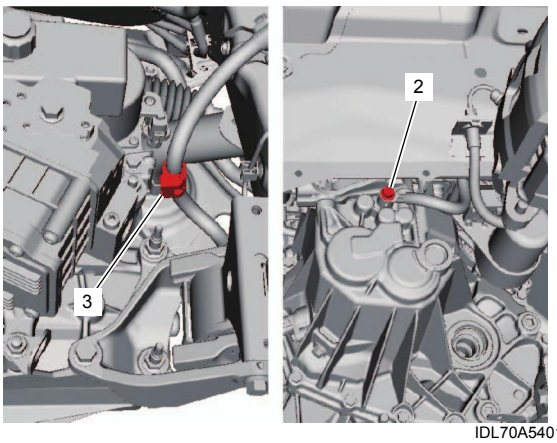
NOTE

If new automated manual transaxle and new automated manual transaxle actuator unit are to be installed as a set, start the dismounting procedure from Step 2).

1) If automated manual transaxle actuator unit is removed after dismounting automated manual transaxle, it is necessary to perform “Oil Discharge” function under “Utility” mode on SUZUKI scan tool before dismounting it referring to “Automated Manual Transaxle Actuator Unit Removal and Installation” (Page 5D-87) under Step 1) – 5).
2) Place select lever in N, and remove battery and battery tray. ☞(Page 1J-5)
3) Drain transaxle oil. ☞(Page 5D-82)
4) Remove right and left engine undercover.
5) Remove front drive shaft assembly. ☞(Page 3A-2)
6) Remove exhaust pipe. ☞(Page 1K-4)
7) Remove starting motor. ☞(Page 1I-3)
8) Disconnect the following electric wires / connectors and clamp.
   - Engine harness clamps (1)
   - Battery ground cable bolt (2) and clamp (3)
   - VSS connector: ☞(Page 5D-91)



IDL70A540155-01



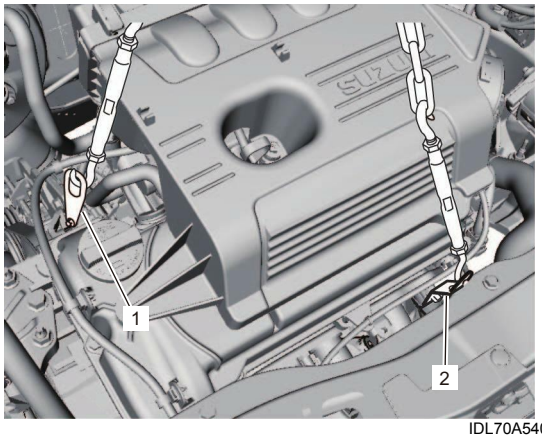
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9) Loosen bolts and nuts fastening engine.
10) Support engine assembly using engine hooks (1), (2) and chain hoist or engine crane.

NOTE

When supporting engine assembly, use engine hook (2) (genuine SUZUKI parts).

- **Engine hook: 11851-73K00**
- **Engine hook nut: 08316-1010A**



IDL70A540042-02

11) Remove engine left mounting and mounting bracket. ☞(Page 1D-17)
12) Support transaxle with transmission jack.
13) Remove bolts and nuts fastening engine and transaxle, and engine rear mounting bracket and transaxle, and then detach transaxle from engine.

Remounting

Reverse dismounting procedure noting the following points.

NOTICE

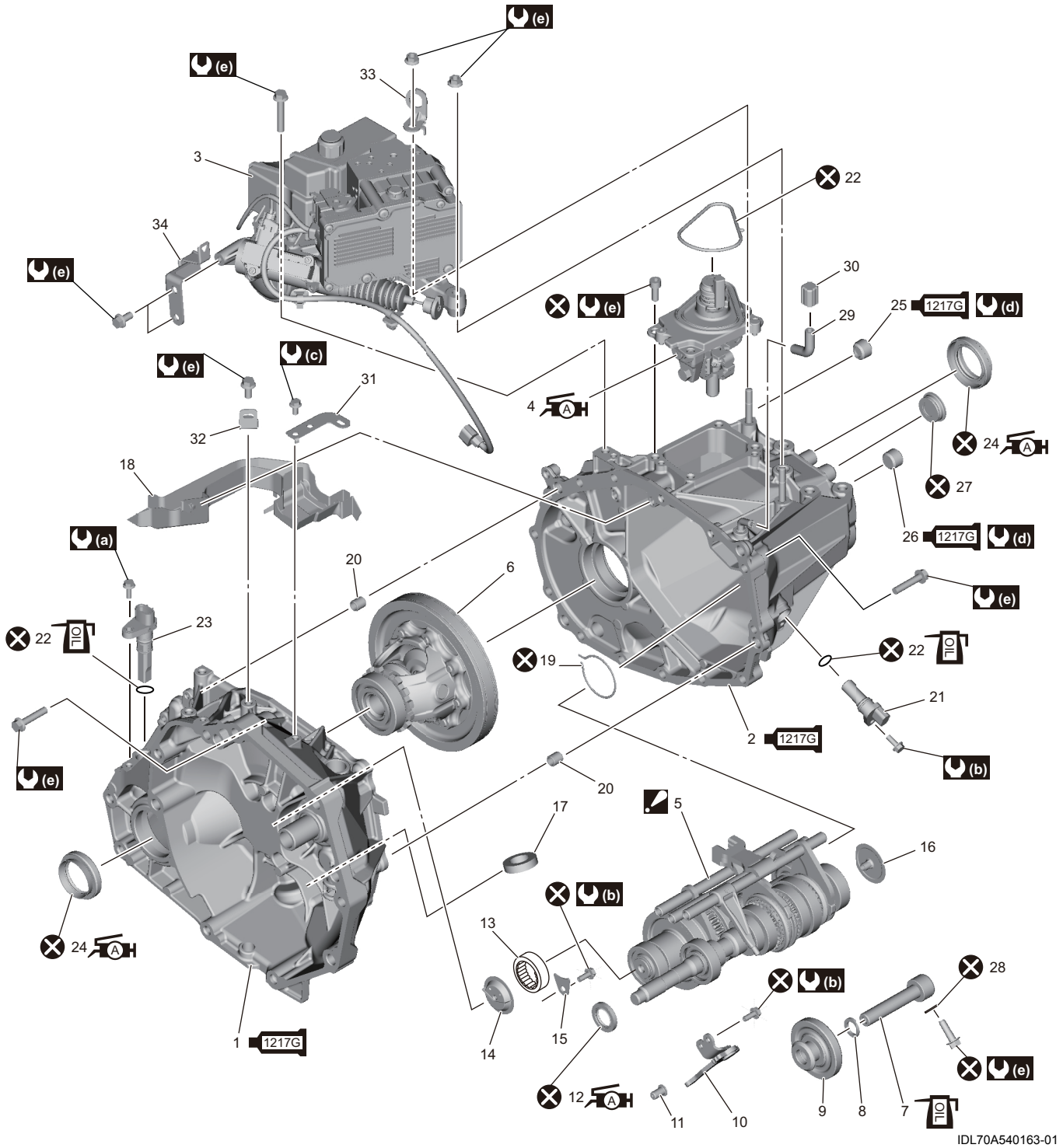
Failure to take proper precautions when remounting the manual transaxle can cause damage to parts.

- **When installing the transaxle, be careful not to let the drive shaft scratch the oil seal.**
  Oil leaks may occur if the oil seal lip is scratched by the drive shaft.
- **Do not use a hammer when installing the drive shaft joint into the differential gear. Hitting the drive shaft joint with a hammer will damage the joint.**

- Tighten the following bolts and nut to specified torque.
  - Transaxle to engine bolt and nut: ☞(Page 5D-93)
  - Transaxle to engine rear mounting bracket bolt: ☞(Page 5D-93)
  - Engine left mounting bolt and nut: ☞(Page 1D-17)
- Set each clamp for wiring securely.
- Add transaxle oil. ☞(Page 5D-82)
- Initialize automated manual transaxle.
  - When removed or new manual transaxle is installed, refer to “All Learning Value Initialization:” under “TCM and Clutch Initialization” (Page 5D-81).
  - When new manual transaxle and new automated manual transaxle actuator unit are installed as a set, refer to “Clutch-contact-point Learning Initialization:” under “TCM and Clutch Initialization” (Page 5D-81).
- Check function of engine, clutch and transaxle.
- Check that there is no oil leakage at each connection.
- Check front wheel alignment. ☞(Page 2B-1)

Automated Manual Transaxle Components

AENDL70A5406029



IDL70A540163-01

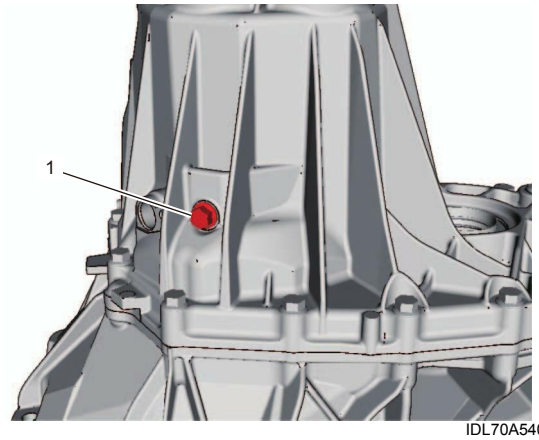
1217G 1. Transaxle right case : Apply sealant 99000-31260 to mating surface of right case and left case.	15. Bearing stopper plate	29. Breather hose
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and gear shift and select shaft assembly.	16. Input shaft oil channel	30. Breather plug
3. Automated manual transaxle actuator unit	17. Magnet	31. Harness No.1 bracket
A 4. Gear shift and select shaft assembly: Apply grease 99000-25011 to engage lever.	18. Oil gutter	32. Harness No.2 bracket
5. Input shaft and countershaft assembly : For details, refer to “Automated Manual Transaxle Disassembly and Reassembly” (Page 5D-96).	19. Countershaft circlip	33. Transmission No.1 hook
6. Differential assembly	20. Dowel pin	34. Actuator bracket
7. Reverse gear shaft	21. Clutch speed sensor	(a) : 5 N·m (0.51 kgf-m, 4.0 lbf-ft)
8. Washer	22. O-ring	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
9. Reverse idler gear	23. VSS	(c) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
10. Reverse gear shift lever	A 24. Oil seal : Apply grease 99000-25011 to oil seal lip.	(d) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
11. Reverse gear shift locating ball assembly	1217G 25. Oil level / filler plug : Apply sealant 99000-31260 to threads.	(e) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
A 12. Input shaft oil seal : Apply grease 99000-25011 to oil seal lip.	1217G 26. Oil drain plug : Apply sealant 99000-31260 to threads.	: Do not reuse.
13. Countershaft right bearing outer race	27. Transaxle case plug	: Apply transaxle oil.
14. Countershaft oil channel	28. Gasket	

Automated Manual Transaxle Disassembly and Reassembly

AENDL70A5406030

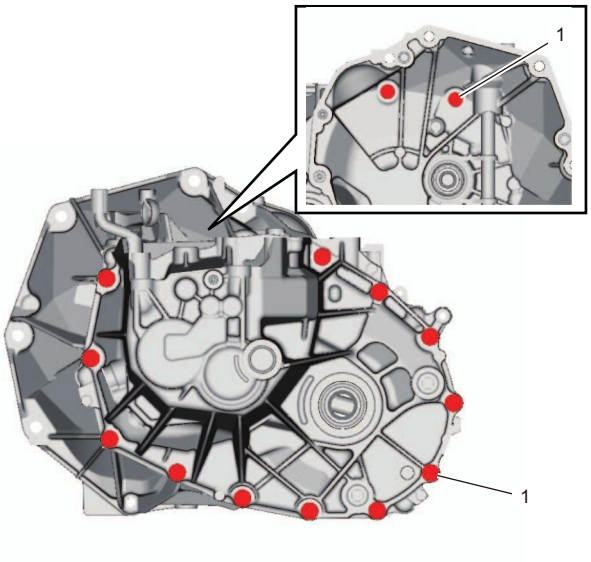
Disassembly

1) Remove automated manual transaxle actuator unit. ☞(Page 5D-87)
2) Remove gear shift and select shaft assembly. ☞(Page 5D-90)
3) Remove clutch speed sensor. ☞(Page 5D-90)
4) Remove VSS. ☞(Page 5D-91)
5) Remove reverse gear shaft bolt (1) with gasket.



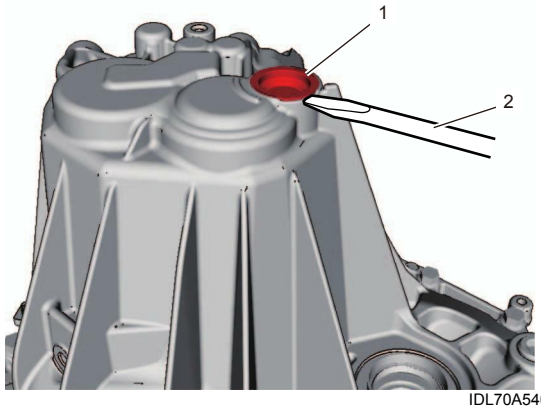
IDL70A540045-01

6) Remove transaxle case bolts (1).



IDL70A540046-01

7) Remove transaxle case plug (1) with flat-bladed screwdriver (2) or the like.



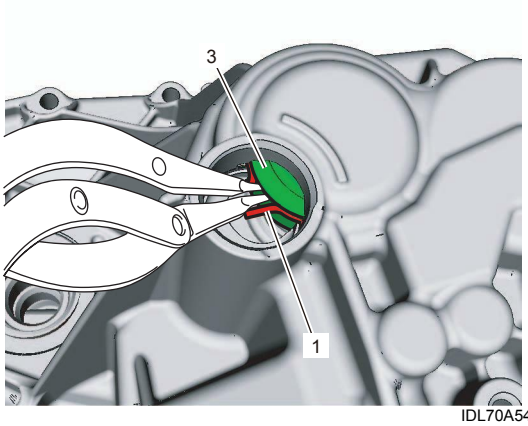
IDL70A540047-01

8) While expanding countershaft circlip (1) to unhook it from bearing groove, remove transaxle left case (2) from right case using special tool.

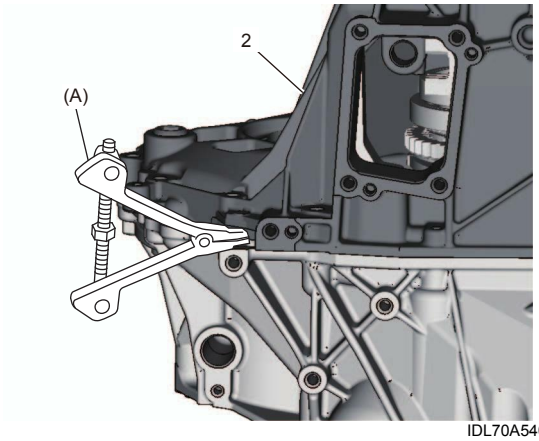
NOTE

When removing transaxle left case, circlip comes out with left case and bearing remains at countershaft side.

Special tool
(A): 09912M34510



IDL70A540048-01

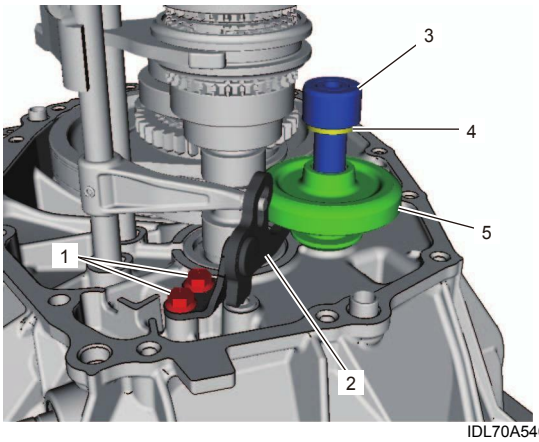


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3. Countershaft left bearing

9) Remove reverse gear shift lever bolts (1) and reverse gear shift lever (2).

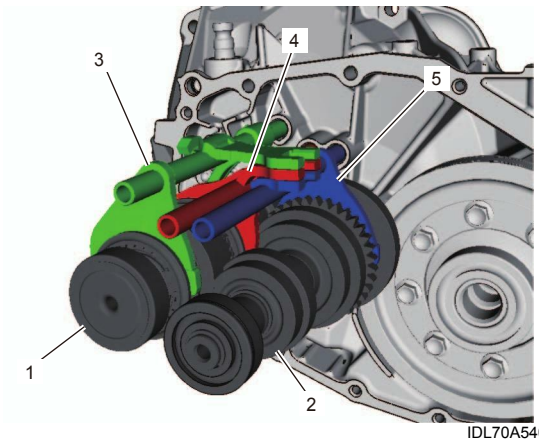
10) Remove reverse gear shaft (3), washer (4) and reverse idler gear (5).



IDL70A540050-01

11) Remove magnet from right case.

12) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, and then take out input shaft assembly (1), countershaft assembly (2), 5th and reverse gear shift shaft (3), high speed gear shift shaft (4) and low speed gear shift shaft (5).



IDL70A540051-01

13) Remove differential assembly from transaxle right case.

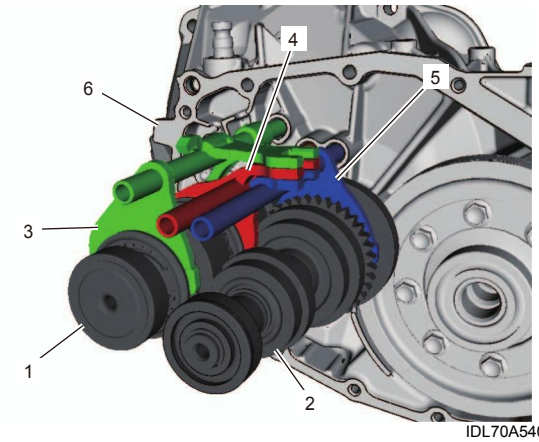
Reassembly

1) Install differential assembly into transaxle right case.

2) Join input shaft assembly (1), countershaft assembly (2), 5th and reverse gear shift shaft (3), high speed gear shift shaft (4) and low speed gear shift shaft (5) all together, and then install them into transaxle right case (6) so as not to damage oil seal by input shaft spline.

NOTE

- **Input shaft right bearing on shaft can be installed into transaxle right case (6) by tapping shaft with plastic hammer.**
- **Check that countershaft is engaged with final gear while installing.**



IDL70A540052-01

3) Install reverse idler gear (1), washer (2), reverse gear shaft (3) and reverse gear shift lever (4), and then tighten new reverse gear shift lever bolts (5) to specified torque.

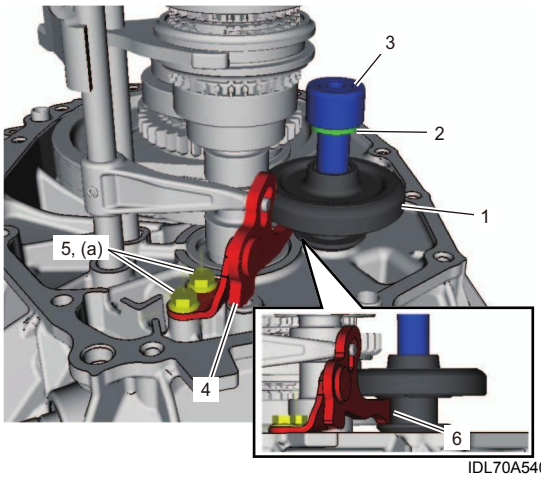
NOTICE

The reverse gear shift lever bolts are pre-coated with adhesive. If these bolts are reused, they may work loose.
Replace the reverse gear shift lever bolts with new ones whenever they are removed.

NOTE

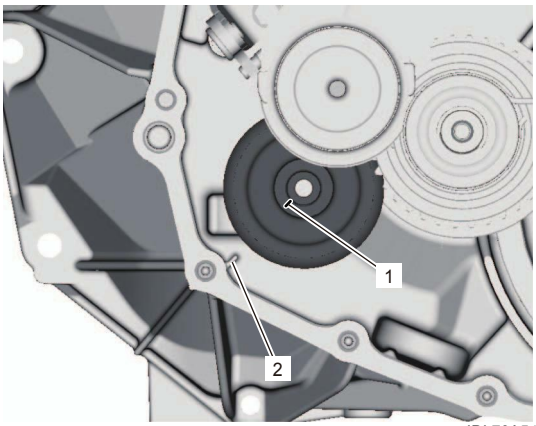
Position reverse gear shift lever not to touch outside diameter (6) of idler gear sleeve.

Tightening torque
Reverse gear shift lever bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



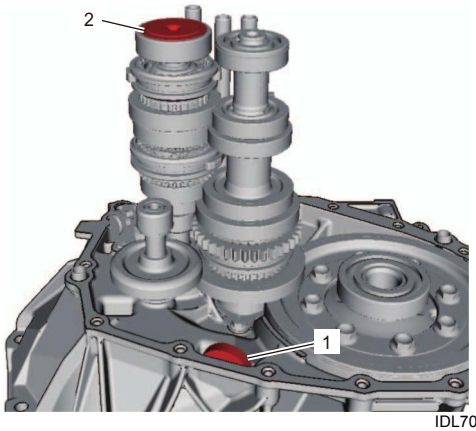
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4) Align matchmark (1) of reverse idler gear assembly with matchmark (2) of transaxle right case.



IDL70A540054-01

5) Install magnet (1) to right case and input shaft oil channel (2) to input shaft.

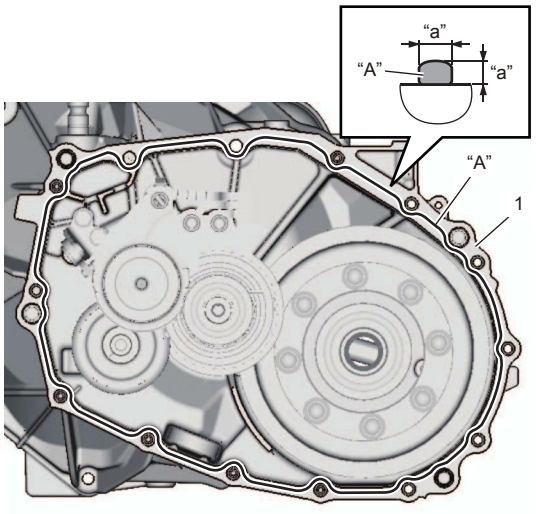


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6) Clean mating surfaces of both right and left cases, and apply sealant to transaxle right case (1) as shown in figure.

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant amount for transaxle right case
"a": 1.5 mm (0.059 in.)

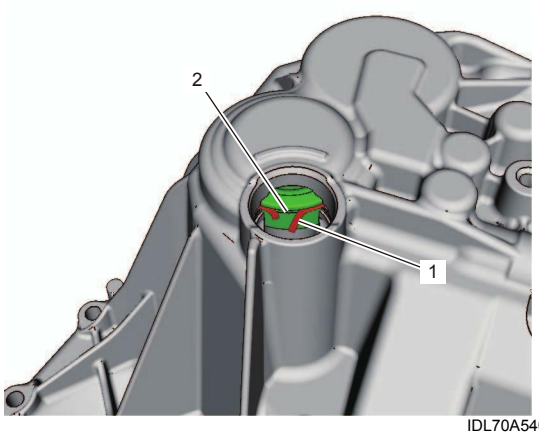


IDL70A540056-01

7) While expanding countershaft circlip (1) not to fit it into bearing groove (2), install transaxle left case onto right case, and install transaxle case bolts temporarily.
8) Turn transaxle assembly upside down so that countershaft bearing fits in left case and circlip fits in bearing groove.

NOTICE

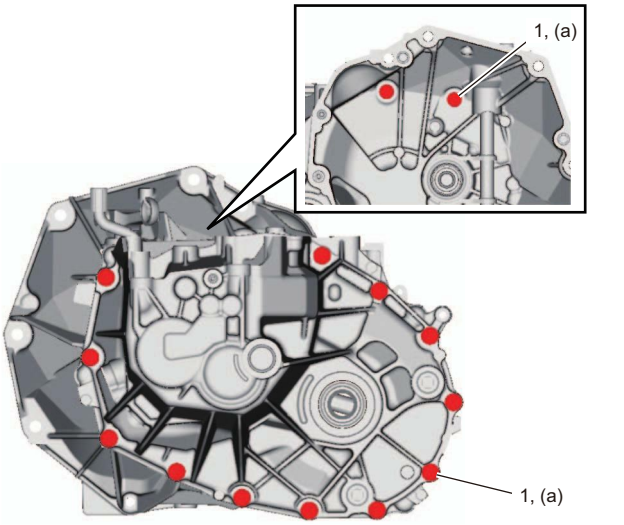
Fitting failure of circlip (1) into bearing groove (2) causes noise or breakage of countershaft related parts because of wrong positioning of countershaft.
Make sure to fit circlip into bearing groove.



IDL70A540057-01

9) Tighten transaxle case bolts (1) to specified torque.

Tightening torque
Transaxle case bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



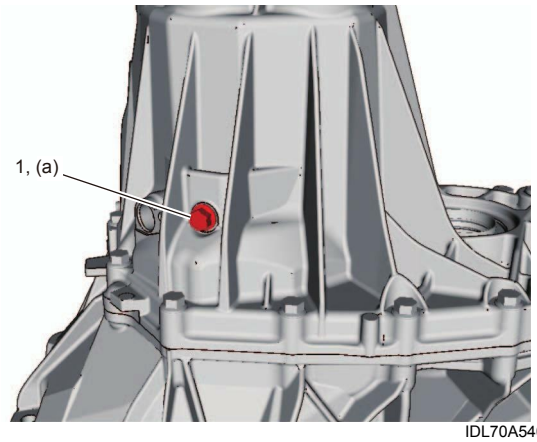
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10) Tighten new reverse gear shaft bolt (1) with new gasket to specified torque.

NOTICE

The reverse gear shaft bolt is pre-coated with adhesive. If the bolt is reused, it may work loose.
Replace the reverse gear shaft bolt with new one whenever it is removed.

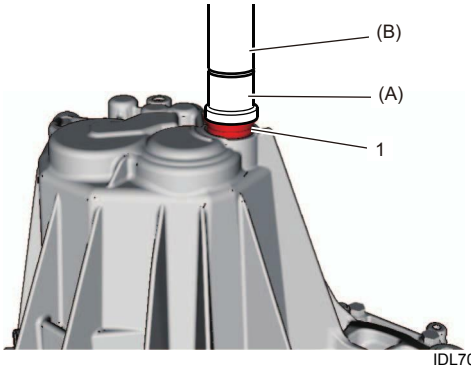
Tightening torque
Reverse gear shaft bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A540059-01

11) Install new transaxle case plug (1) using special tool.

Special tool
(A): 09924M74590
(B): 09924M74510



IDL70A540060-02

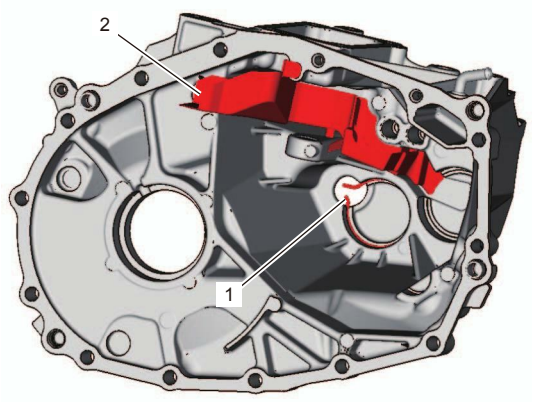
12) Install VSS. ☞(Page 5D-91)
13) Install clutch speed sensor. ☞(Page 5D-90)
14) Install gear shift and select shaft assembly. ☞(Page 5D-90)

Transaxle Left Case Disassembly and Reassembly

AENDL70A5406031

Disassembly

1) Remove differential side oil seal from transaxle left case, if necessary. ☞(Page 5D-83)
2) Remove circlip (1) and oil gutter (2), if necessary.



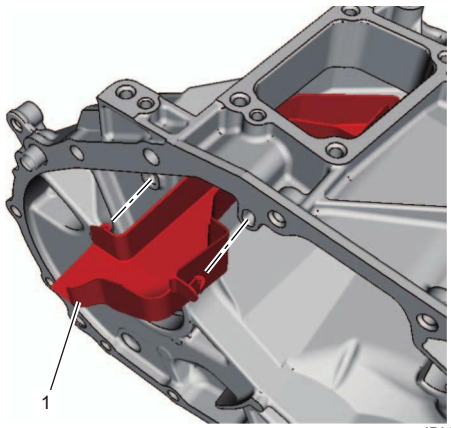
IDL70A540061-01

Reassembly

1) Install new circlip and oil gutter (1), if removed.

NOTE

When installing oil gutter, fit its claws into holes of transaxle left case securely.



IDL70A540062-02

2) Install new differential side oil seal to transaxle left case, if removed. ☞(Page 5D-83)

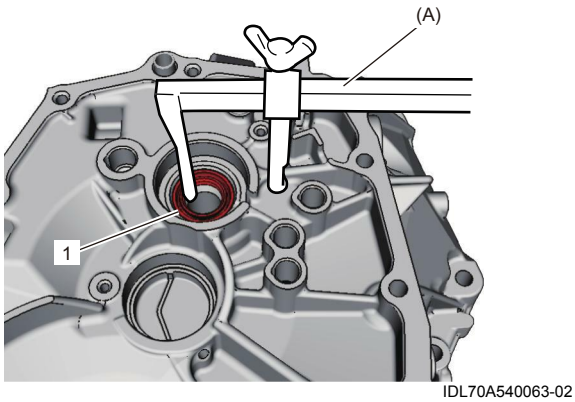
Transaxle Right Case Disassembly and Reassembly

AENDL70A5406035

Disassembly

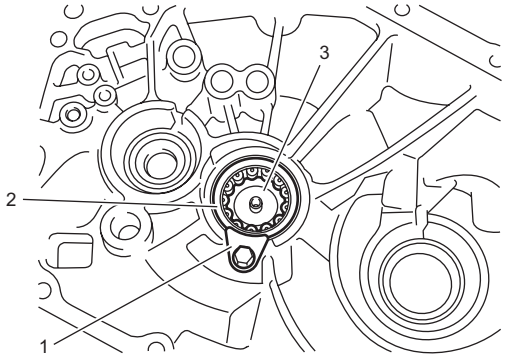
1) Remove differential side oil seal from transaxle right case, if necessary. ☞(Page 5D-83)
2) Remove input shaft oil seal (1) using special tool, if necessary.

Special tool
(A): 09913M50121



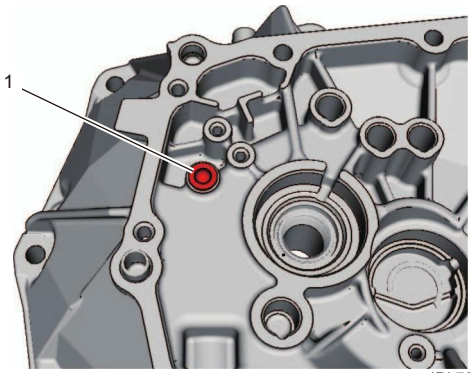
IDL70A540063-02

3) Remove bearing stopper plate (1), countershaft right bearing outer race (2) and oil channel (3), if necessary.



IDL70A540064-01

4) Remove reverse gear shift locating ball assembly (1), if necessary.



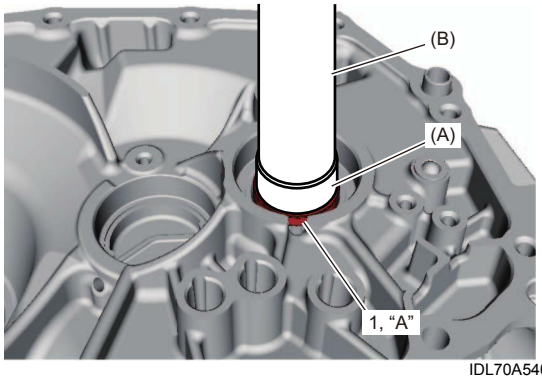
IDL70A540065-02

Reassembly

1) Install new input shaft oil seal (1) facing its spring side upward up to bottom of transaxle right case hole, if removed. Use special tool and hammer for installation and apply grease to oil seal lip.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

Special tool
(A): 09926M37610M003
(B): 09913M80113

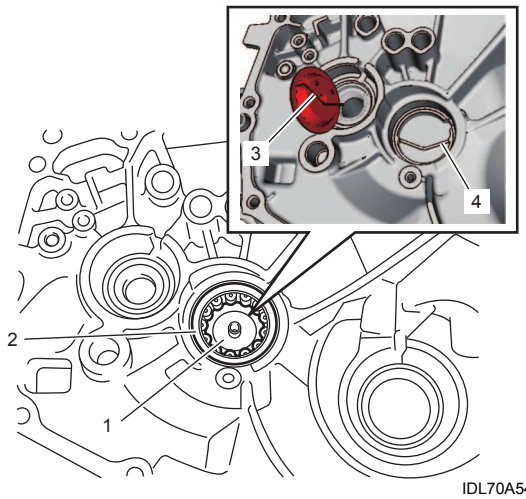


IDL70A540066-03

2) Install countershaft oil channel (1) and countershaft right bearing outer race (2), if removed.

NOTE

Install countershaft oil channel aligning its ridge (3) with ridge (4) of transaxle right case.



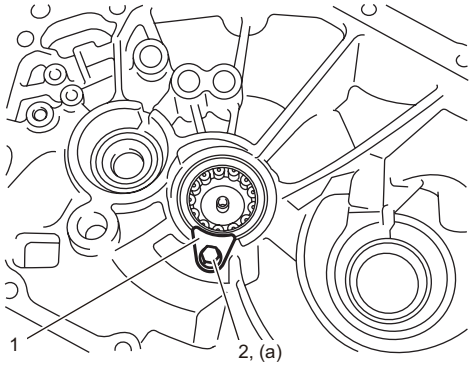
IDL70A540067-01

3) Install bearing stopper plate (1) and tighten new bearing stopper plate bolt (2) to specified torque.

NOTICE

The bearing stopper plate bolt is pre-coated with adhesive. If the bolt is reused, it may work loose.
Replace the bearing stopper plate bolt with new one whenever it is removed.

Tightening torque
Bearing stopper plate bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



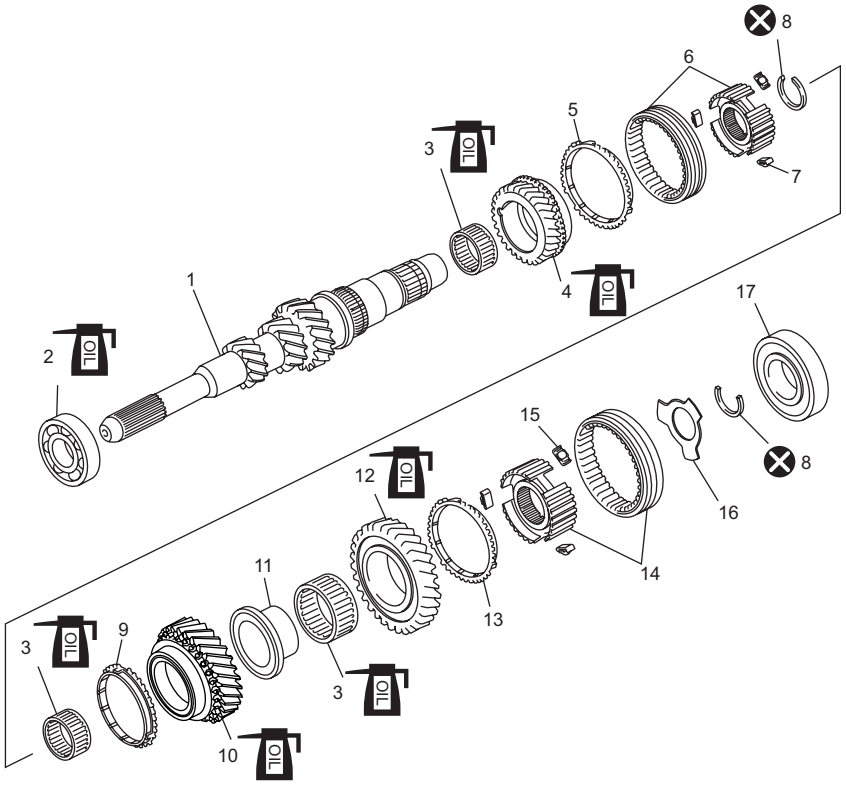
IDL70A540068-01

4) Install reverse gear shift locating ball assembly, if removed.

5) Install new differential side oil seal to transaxle right case, if removed. ☞(Page 5D-83)

Input Shaft Components

AENDL70A5406036



IDL70A540069-01

1. Input shaft	8. Circlip	15. 5th gear synchronizer key
2. Input shaft right bearing	9. 4th gear synchronizer ring	16. 5th gear synchronizer hub plate
3. Needle bearing	10. Input shaft 4th gear	17. Input shaft left bearing
4. Input shaft 3rd gear	11. Input shaft 5th gear spacer	⊗ : Do not reuse.
5. 3rd gear synchronizer ring	12. Input shaft 5th gear	OIL : Apply transaxle oil.
6. High speed synchronizer sleeve & hub	13. 5th gear synchronizer ring	
7. High speed synchronizer key	14. 5th gear synchronizer sleeve & hub	

Input Shaft Disassembly and Reassembly

AENDL70A5406037

Disassembly

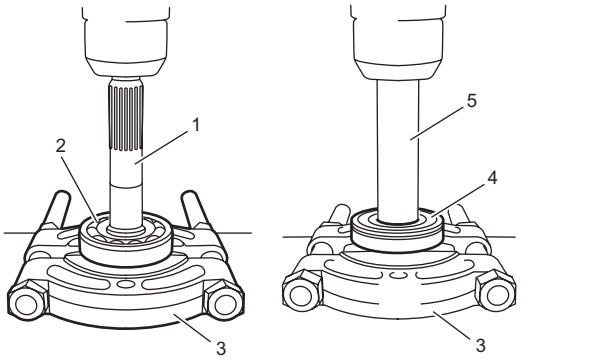
⚠ CAUTION

Using an inappropriate hydraulic press or bearing puller could cause personal injury. Use the hydraulic press and bearing puller which are capable of safely bearing a load of at least 5 tons (11,000 lbs).

NOTICE

Supporting the gear on the concave side of the bearing puller can cause damage to the gear.
Support the gear on the flat side of the bearing puller.

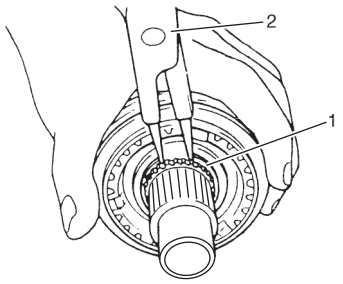
1) Remove input shaft right bearing (2) and left bearing (4) from input shaft (1) using bearing puller (3) and hydraulic press.



IDL70A540070-01

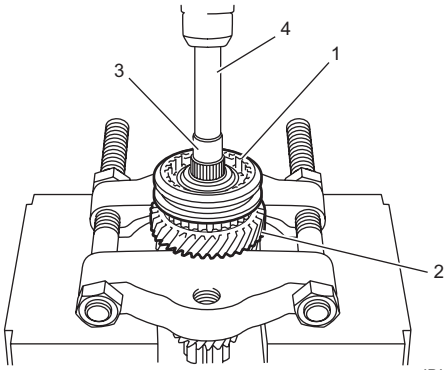
5. Metal stick

2) Remove circlip (1) using snap ring pliers (2).



IDL70A540071-01

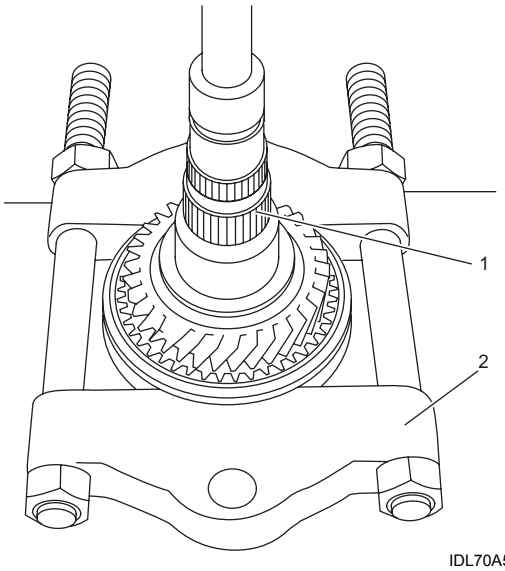
3) Remove 5th gear synchronizer hub plate.
4) Remove 5th gear synchronizer sleeve & hub assembly (1), 5th gear synchronizer ring and 5th gear (2) from input shaft (3) using bearing puller and hydraulic press.



IDL70A540072-02

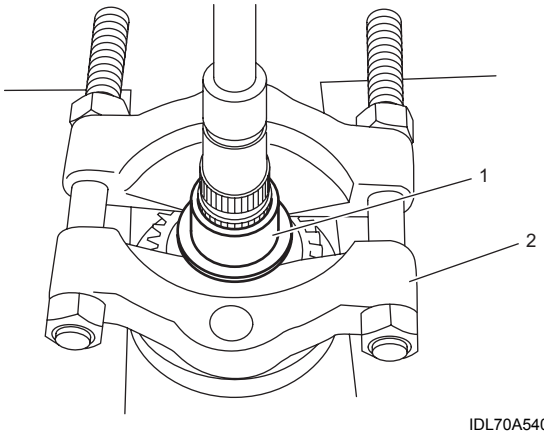
4. Metal stick

5) Remove 5th gear needle bearing from input shaft.
6) Remove 5th gear spacer according to the following procedure.
   a) Engage high speed synchronizer sleeve with 4th gear.
   b) Push down input shaft (1) a little using bearing puller (2) and hydraulic press.



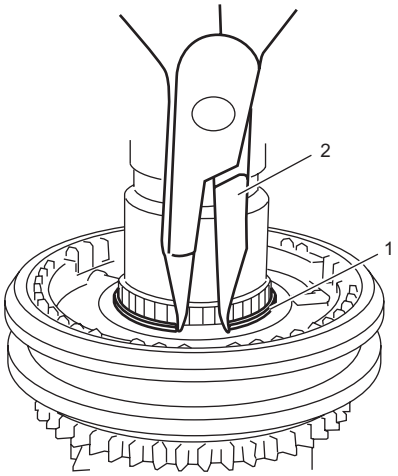
IDL70A540073-01

   c) Remove 5th gear spacer (1) using bearing puller (2) and hydraulic press.



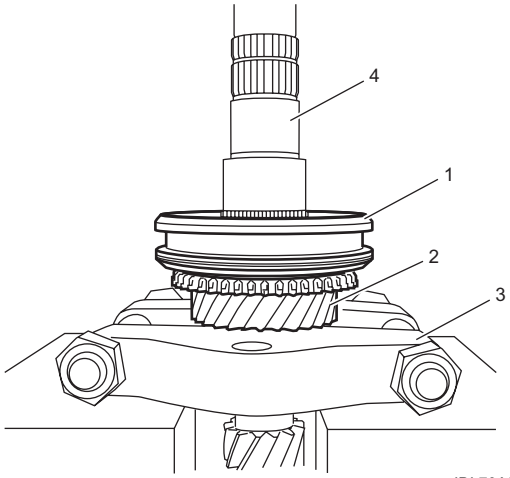
IDL70A540074-01

7) Remove 4th gear, 4th gear synchronizer ring and 4th gear needle bearing from input shaft.
8) Remove circlip (1) using snap ring pliers (2).



IDL70A540075-02

9) Remove high speed synchronizer sleeve & hub assembly (1) and 3rd gear (2) from input shaft (4) using bearing puller (3) and hydraulic press.



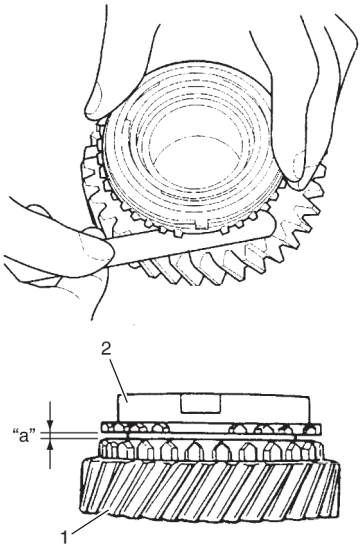
IDL70A540076-01

10) Remove 3rd gear needle bearing from input shaft.
11) Disassemble synchronizer sleeve & hub assembly.

Reassembly

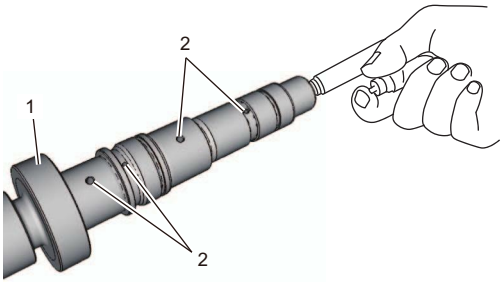
1) Clean all components thoroughly, check them for any abnormality and replace with new ones as necessary.
2) Check clearance “a” between synchronizer ring (2) and gear (1) and replace with new one, if necessary. Also, check gear teeth for damage.

Clearance “a” between synchronizer ring and gear (3rd, 4th and 5th)
Standard: 0.75 – 1.10 mm (0.030 – 0.043 in.)
Service limit: 0.45 mm (0.018 in.)



IDL70A540077-01

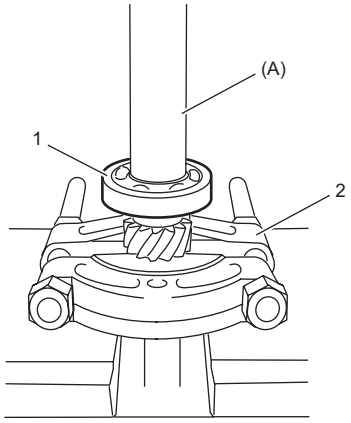
3) To ensure lubrication of input shaft (1), blow air into oil holes (2) as shown in figure and check that they are free from any obstruction.



IDL70A540078-02

4) Install right bearing (1) to input shaft (2) using special tool and hydraulic press.

Special tool
(A): 09913M80113



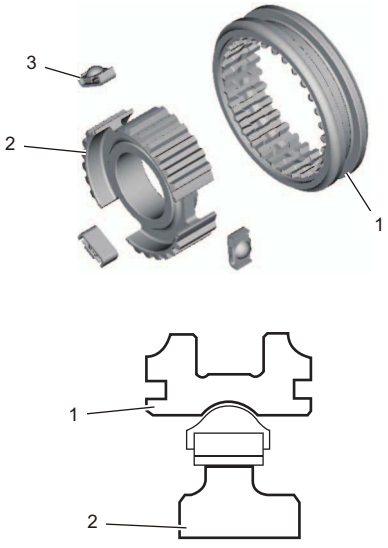
IDL70A540079-01

5) Fit high speed synchronizer sleeve (1) to hub (2) and 3 keys (3) as shown in figure.

NOTE

- **No specific direction is assigned to high speed synchronizer sleeve or each key but it is assigned as sleeve & hub assembly.**
- **Inside diameter of high speed synchronizer hub is larger than that of 5th gear synchronizer hub.**

Synchronizer key installation position



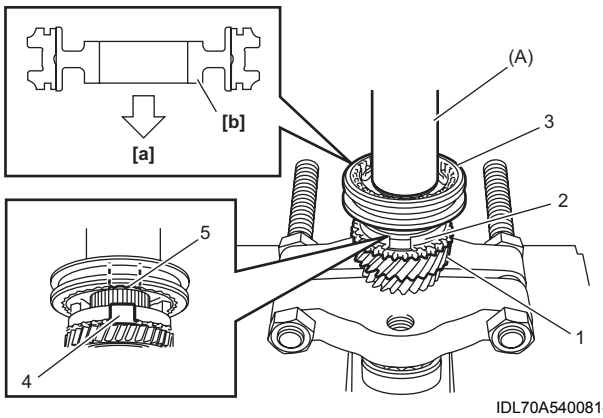
IDL70A540080-03

6) Install 3rd gear needle bearing and apply transaxle oil to it, and then install 3rd gear (1) and 3rd gear synchronizer ring (2) to input shaft.
7) Install high speed sleeve & hub assembly (3) using special tool and hydraulic press.

NOTE

- **While press-fitting sleeve & hub assembly, check that synchronizer ring keys (4) are aligned with key slots (5) in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**

Special tool
(A): 09913M84510

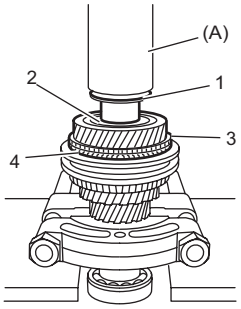


IDL70A540081-02

[a]: 3rd gear side	[b]: Long flange

8) Install new circlip.
9) Install 4th gear needle bearing (2) and apply transaxle oil to it, and then install synchronizer ring (4) and 4th gear (3).
10) Install 5th gear spacer (1) using special tool and hydraulic press.

Special tool
(A): 09913M84510



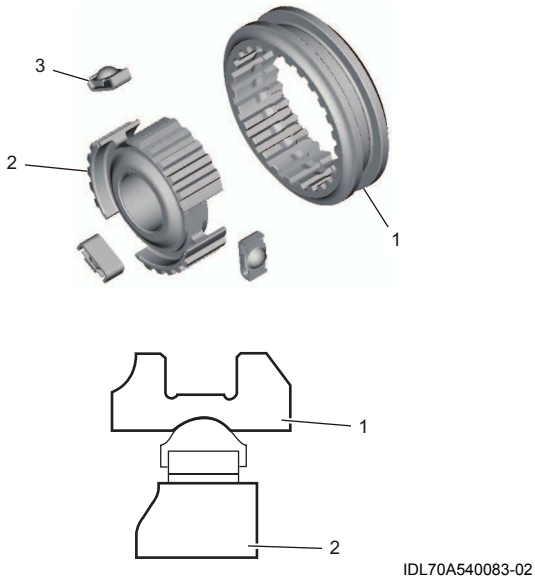
IDL70A540082-01

11) Install 5th gear needle bearing and apply transaxle oil to it, and then install 5th gear and synchronizer ring.
12) Fit 5th gear synchronizer sleeve (1) to hub (2) and 3 keys (3) as shown in figure.

NOTE

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Inside diameter of 5th gear synchronizer hub is smaller than that of high speed synchronizer hub.**

Synchronizer key installation position



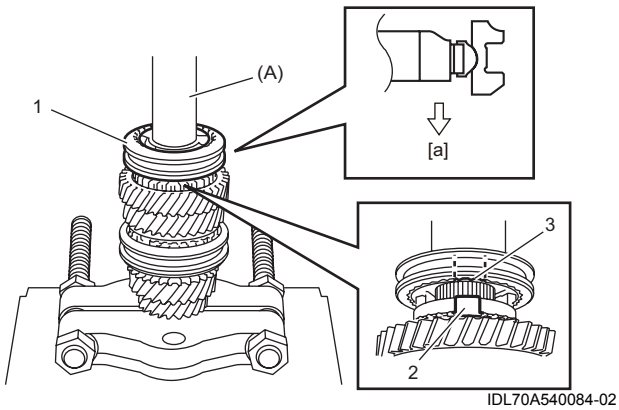
IDL70A540083-02

13) Install 5th gear synchronizer sleeve & hub assembly (1) using special tool and hydraulic press, and then install 5th gear synchronizer hub plate.

NOTE

- **While press-fitting sleeve & hub assembly, check that synchronizer ring keys (2) are aligned with key slots (3) in sleeve & hub assembly.**
- **Check free rotation of 5rd gear after press-fitting sleeve & hub assembly.**

Special tool
(A): 09913M80113



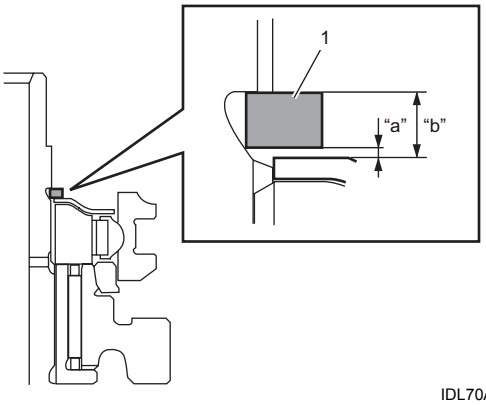
IDL70A540084-02

[a]: 5th gear side

14) Select new circlip (1) that makes thrust clearance “a” of 5th gear synchronizer hub plate 0.1 mm (0.004 in) or less and install it.

Available circlip thickness

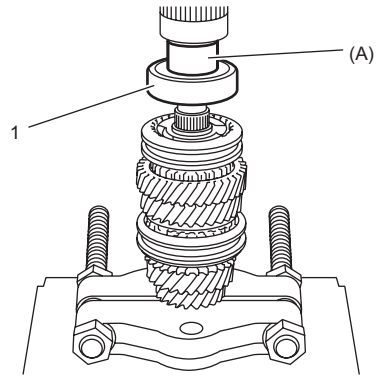
Clearance “b”	Circlip thickness
2.000 – 2.050 mm (0.0787 – 0.0807 in.)	2.00 mm (0.0787 in.)
2.050 – 2.100 mm (0.0807 – 0.0827 in.)	2.05 mm (0.0807 in.)
2.100 – 2.150 mm (0.0827 – 0.0846 in.)	2.10 mm (0.0827 in.)
2.150 – 2.200 mm (0.0846 – 0.0866 in.)	2.15 mm (0.0846 in.)
2.200 – 2.250 mm (0.0866 – 0.0886 in.)	2.20 mm (0.0866 in.)
2.250 – 2.300 mm (0.0886 – 0.0906 in.)	2.25 mm (0.0886 in.)



IDL70A540085-01

15) Press-fit left bearing (1) using special tool and hydraulic press.

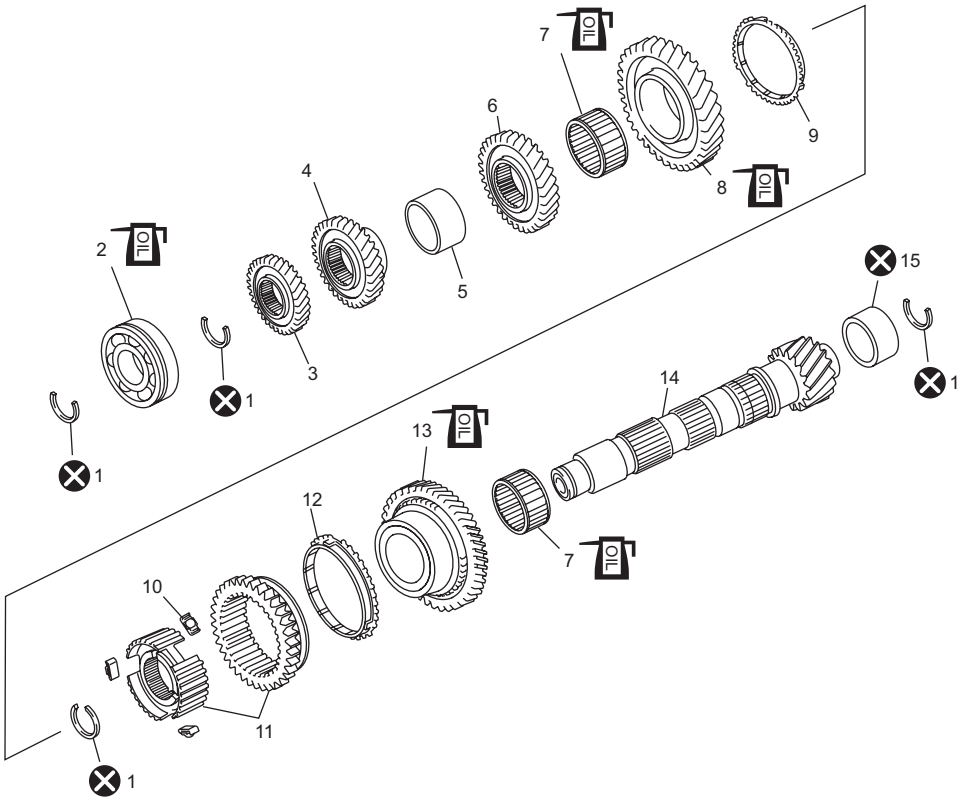
Special tool
(A): 09944M66060



IDL70A540086-01

Countershaft Components

AENDL70A5406039



IDL70A540087-02

1. Circlip	7. Needle bearing	13. Countershaft 1st gear
2. Countershaft left bearing	8. Countershaft 2nd gear	14. Countershaft
3. Countershaft 5th gear	9. 2nd gear synchronizer ring	15. Countershaft right bearing inner race
4. Countershaft 4th gear	10. Low speed synchronizer key	⊗ : Do not reuse.
5. Countershaft 3rd and 4th gear spacer	11. Low speed synchronizer sleeve & hub	OIL : Apply transaxle oil.
6. Countershaft 3rd gear	12. 1st gear synchronizer ring	

Countershaft Disassembly and Reassembly

AENDL70A5406040

Disassembly

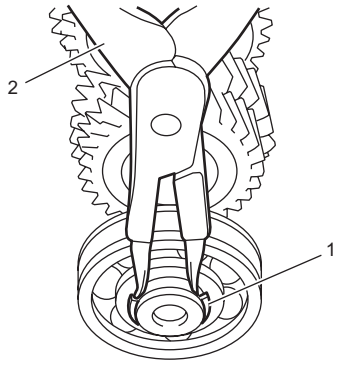
⚠ CAUTION

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NOTICE

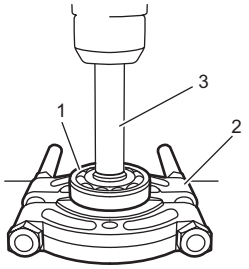
Supporting the gear on the concave side of the bearing puller can cause damage to the gear.
Support the gear on the flat side of the bearing puller.

1) Remove circlip (1) using snap ring pliers (2).



IDL70A540088-02

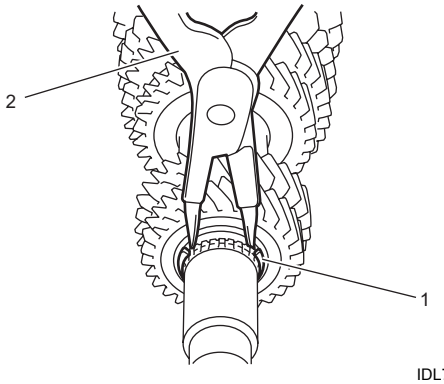
2) Remove left bearing (1) using bearing puller (2) and hydraulic press.



IDL70A540089-01

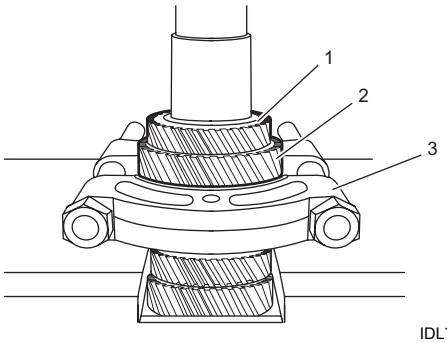
3. Metal stick

3) Remove circlip (1) using snap ring pliers (2).



IDL70A540090-02

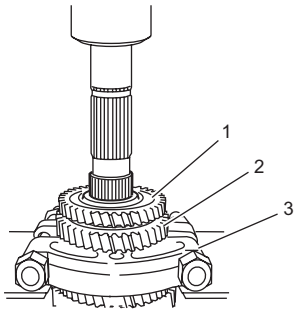
4) Apply bearing puller (3) to 4th gear (2) and remove 5th gear (1) together with 4th gear using hydraulic press.



IDL70A540091-01

5) Remove 3rd and 4th gear spacer.

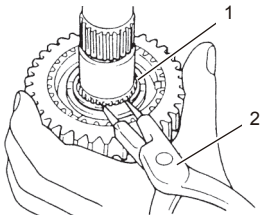
6) Apply bearing puller (3) to 2nd gear (2) and remove 3rd gear (1) together with 2nd gear using hydraulic press.



IDL70A540092-01

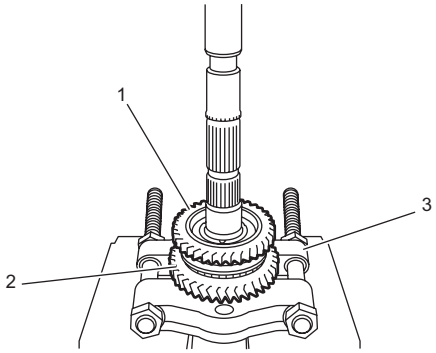
7) Remove 2nd gear synchronizer ring and 2nd gear needle bearing.

8) Remove circlip (1) using snap ring pliers (2).



IDL70A540093-02

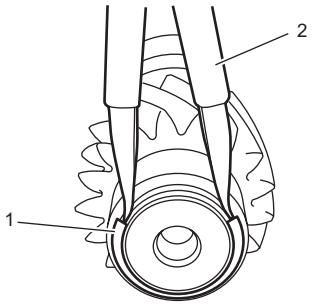
9) Apply bearing puller (3) to 1st gear (2) and remove low speed synchronizer sleeve & hub assembly (1), 1st gear synchronizer ring and 1st gear using hydraulic press.



IDL70A540094-01

10) Remove 1st gear needle bearing.

11) Remove circlip (1) using snap ring pliers (2).

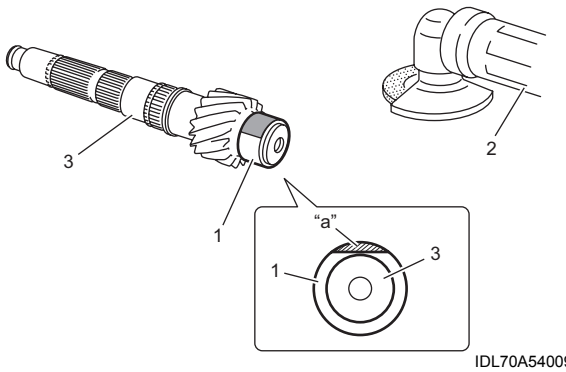


IDL70A540095-02

12) Grind portion “a” of right bearing inner race (1) using grinder (2) as shown.

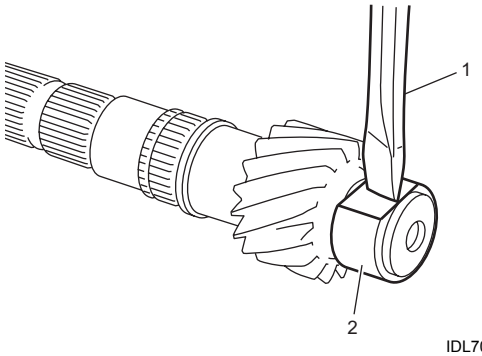
NOTICE

The shaft (3) will be damaged if the bearing is ground too much.
Limit the amount of grinding to the minimum amount necessary.



IDL70A540096-01

13) Break the thinnest portion of bearing inner race (2) with a chisel (1) and remove bearing inner race.

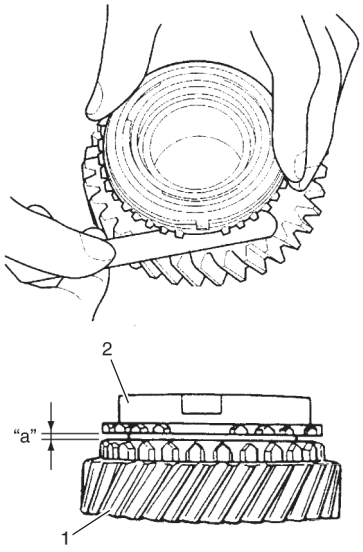


IDL70A540097-01

Reassembly

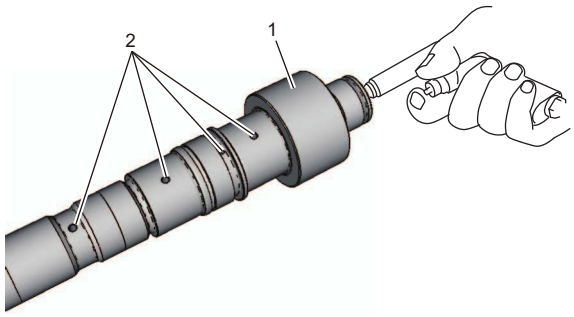
1) Clean all components thoroughly, check them for any abnormality and replace with new ones if necessary.
2) Check clearance “a” between synchronizer ring (2) and gear (1) and replace with new one, if necessary. Also, check gear teeth for damage.

Clearance “a” between synchronizer ring and gear (1st and 2nd)
Standard: 0.75 – 1.10 mm (0.030 – 0.043 in.)
Service limit: 0.45 mm (0.018 in.)



IDL70A540077-01

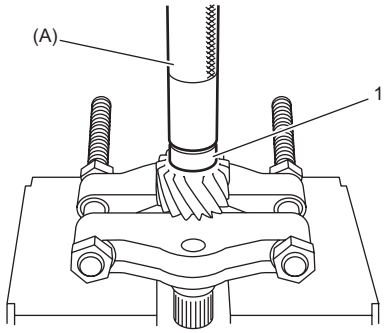
3) To ensure lubrication of countershaft (1), blow air into oil holes (2) as shown in figure and check that they are free from any obstruction.



IDL70A540099-02

4) Install right bearing inner race (1) using special tool and hydraulic press.

Special tool
(A): 09913M80113

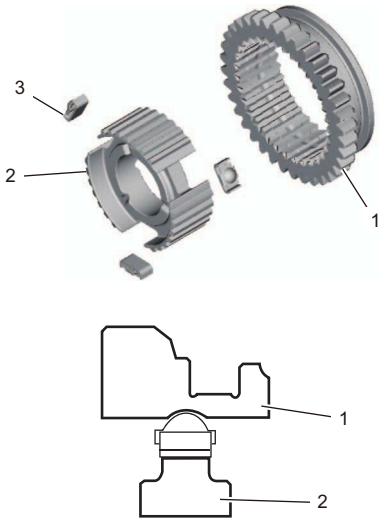


IDL70A540098-01

5) Install new circlip.
6) Fit low speed synchronizer sleeve (1) to hub (2) and 3 keys (3) as shown in figure.

NOTE

No specific direction is assigned to low speed synchronizer hub or each key but it is assigned as sleeve & hub assembly.



IDL70A540100-03

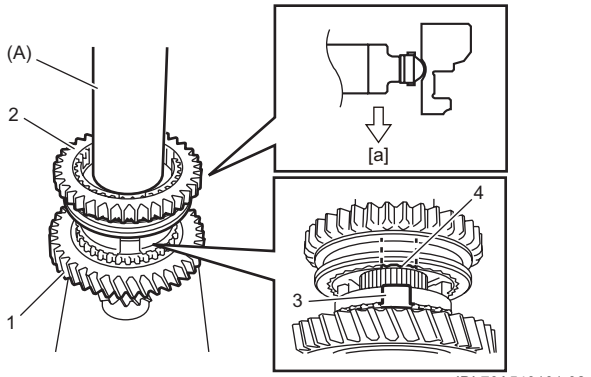
7) Install 1st gear needle bearing and apply transaxle oil to it, and then install 1st gear (1) and 1st gear synchronizer ring to countershaft.

8) Install low speed sleeve & hub assembly (2) using special tool and hydraulic press.

NOTE

- **While press-fitting sleeve & hub assembly, check that synchronizer ring keys (3) are aligned with key slots (4) in sleeve & hub assembly.**
- **Check free rotation of 1st gear (1) after press-fitting sleeve & hub assembly.**

Special tool
(A): 09940M51710

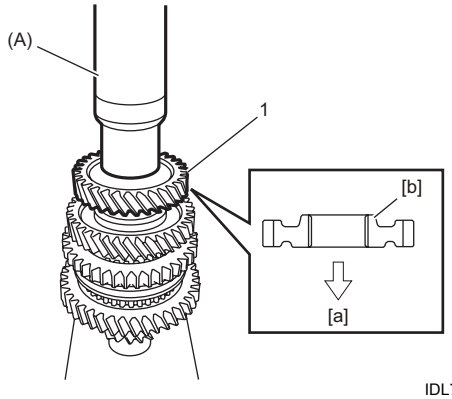


IDL70A540101-02

[a]: 1st gear side

9) Install new circlip.
10) Install 2nd gear needle bearing and apply transaxle oil to it, and then install 2nd gear synchronizer ring and 2nd gear to countershaft.
11) Install 3rd gear (1) using special tool and hydraulic press.

Special tool
(A): 09925M18011

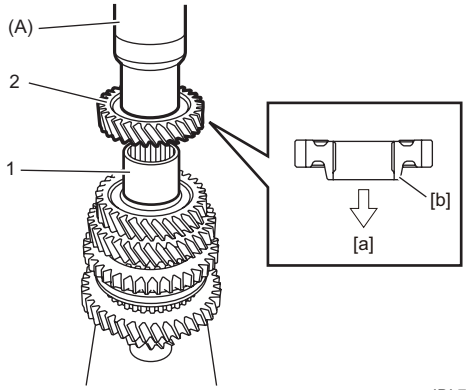


IDL70A540102-01

[a]: 2nd gear side	[b]: Long flange

12) Install 3rd and 4th gear spacer (1) and then install 4th gear (2) using special tool and hydraulic press.

Special tool
(A): 09925M18011

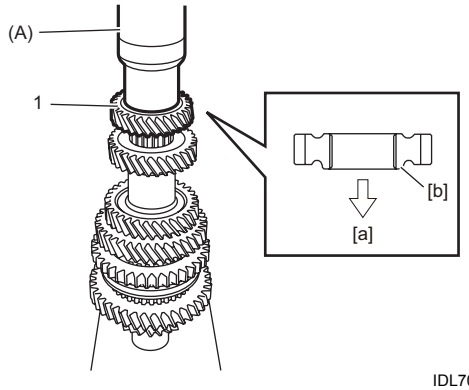


IDL70A540103-01

[a]: 3rd and 4th gear spacer side	[b]: Long flange

13) Install 5th gear (1) using special tool and hydraulic press.

Special tool
(A): 09925M18011



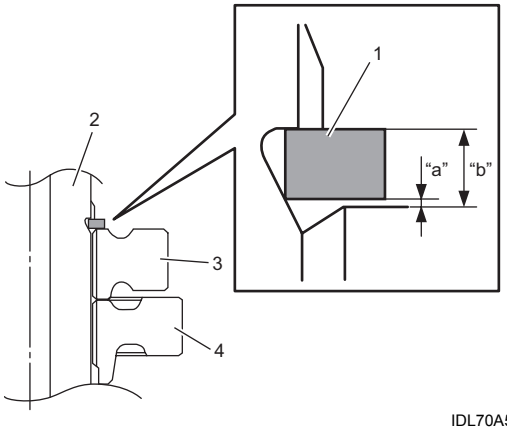
IDL70A540104-01

[a]: 4th gear side	[b]: Long flange

14) Select new circlip (1) that makes thrust clearance “a” of 5th gear 0.1 mm (0.004 in) or less and install it.

Available circlip thickness

Clearance “b”	Circlip thickness
2.150 – 2.200 mm (0.0846 – 0.0866 in.)	2.15 mm (0.0846 in.)
2.200 – 2.250 mm (0.0866 – 0.0886 in.)	2.20 mm (0.0866 in.)
2.250 – 2.300 mm (0.0886 – 0.0906 in.)	2.25 mm (0.0886 in.)
2.300 – 2.350 mm (0.0906 – 0.0925 in.)	2.30 mm (0.0906 in.)
2.350 – 2.400 mm (0.0925 – 0.0945 in.)	2.35 mm (0.0925 in.)
2.400 – 2.450 mm (0.0945 – 0.0965 in.)	2.40 mm (0.0945 in.)

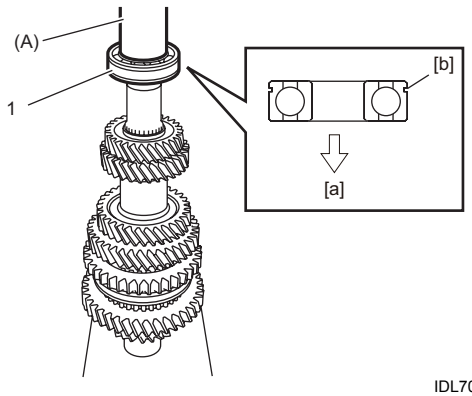


IDL70A540105-01

2. Countershaft	4. 4th gear
3. 5th gear	

15) Install left bearing (1) using special tool and hydraulic press.

Special tool
(A): 09913M80113



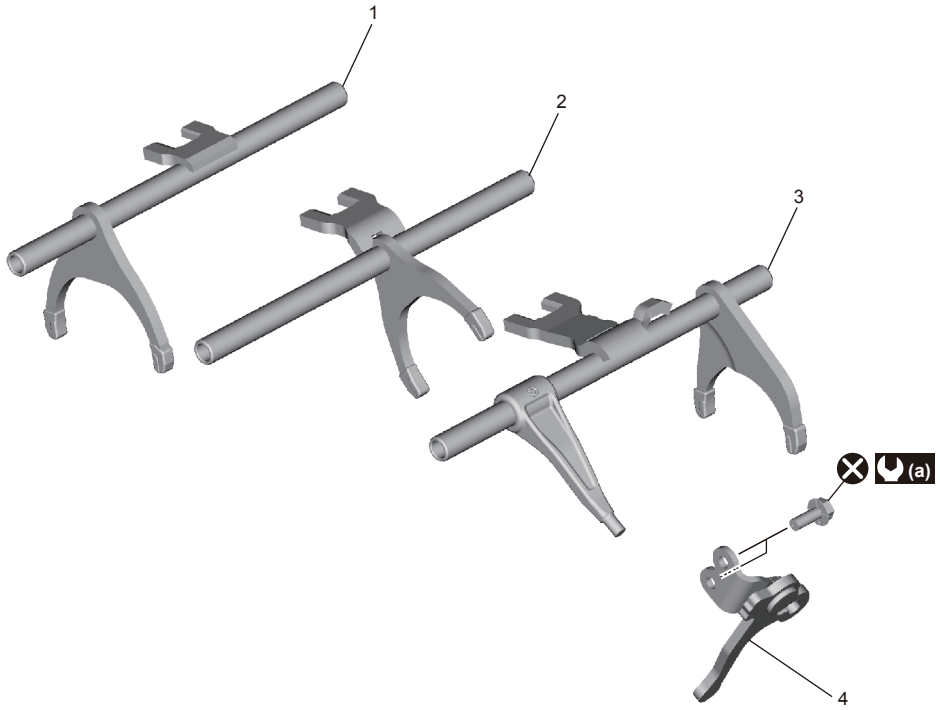
IDL70A540106-01

[a]: 5th gear side	[b]: Gloves

16) Install new circlip.

Gear Shift Shaft Components

AENDL70A5406059



IDL70A540157-01

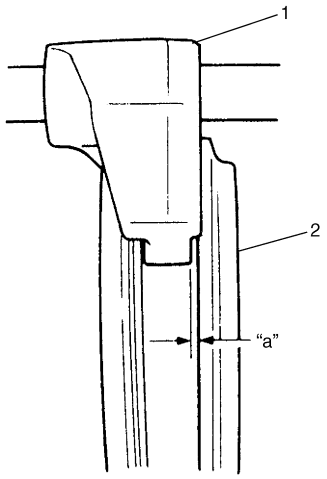
1. Low speed gear shift shaft	4. Reverse gear shift lever
2. High speed gear shift shaft	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. 5th and reverse gear shift shaft	: Do not reuse.

Gear Shift Shaft and Fork Inspection

AENDL70A5406044

1) Using feeler gauge, check clearance between fork (1) and sleeve (2) and replace those parts if it exceeds specified value.

Clearance "a" between fork and sleeve
Service limit: 0.40 mm (0.0157 in.)

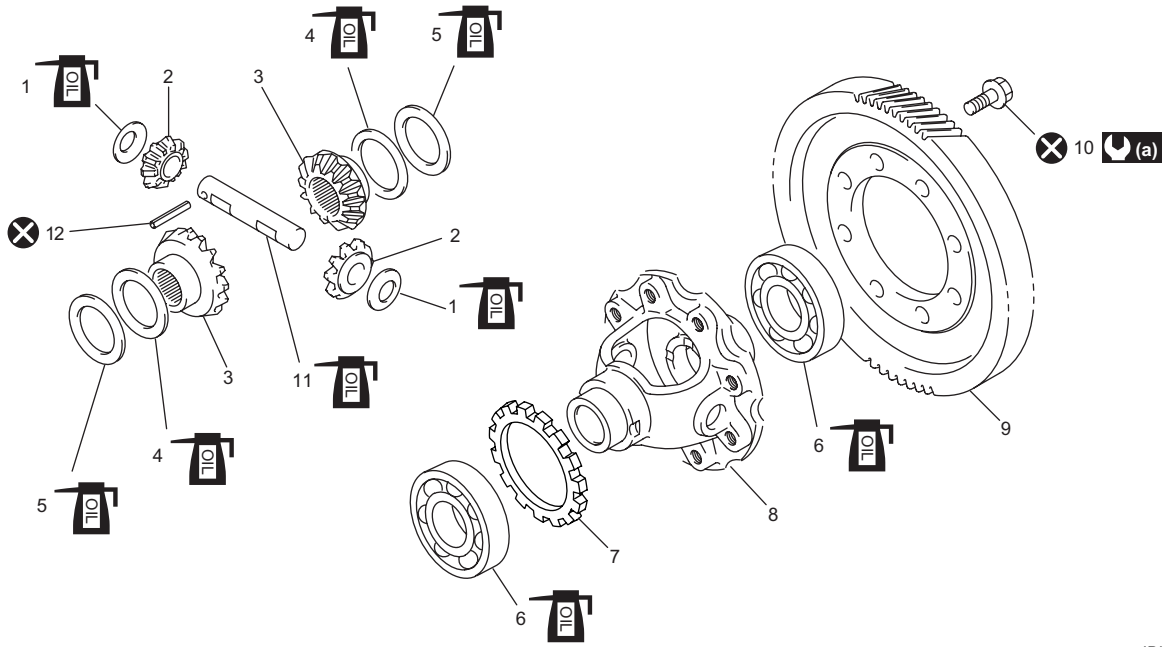


I2RH01520068-01

2) Insert each gear shift shaft into case and check that it moves smoothly. If not, correct burns or dents with oilstone, reamer or the like.

Differential Components

AENDL70A5406045



IDL70A540107-01

1. Differential pinion washer	6. Differential side bearing	11. Differential pinion shaft
2. Differential pinion	7. Speed sensor ring	12. Differential pinion shaft pin
3. Differential side gear	8. Differential case	(a) : 100 N·m (10.2 kgf-m, 74.0 lbf-ft)
4. Spring washer	9. Final gear	: Do not reuse.
5. Side gear washer	10. Final gear bolt	OIL : Apply transaxle oil.

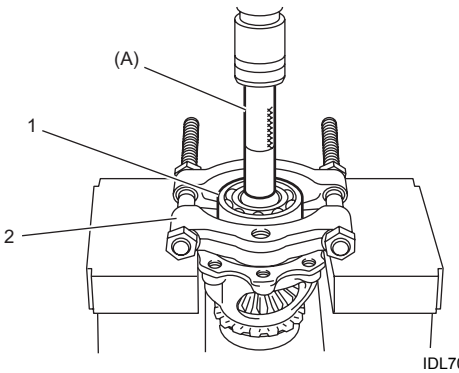
Differential Disassembly and Reassembly

AENDL70A5406046

Disassembly

1) Support differential case with soft jawed vise and remove final gear bolts, and then remove final gear.
2) Remove left side bearing (1) using special tool, bearing puller (2) and hydraulic press.

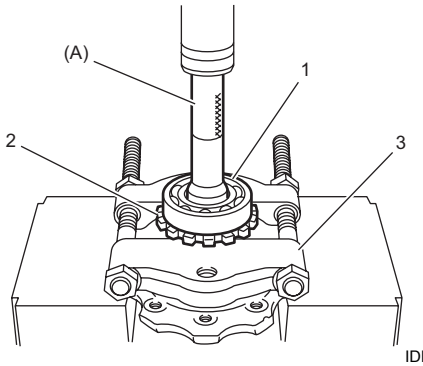
Special tool
(A): 09913M75821



IDL70A540108-01

3) Remove right side bearing (1) and speed sensor ring (2) using special tool, bearing puller (3) and hydraulic press. Support speed sensor ring on the flat side of the bearing puller.

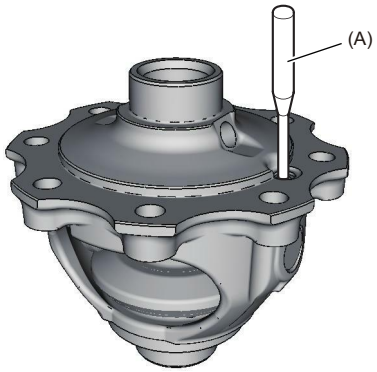
Special tool
(A): 09913M75821



IDL70A540109-01

4) Remove differential pinion shaft pin (1) using special tool and hammer, and then disassemble component parts.

Special tool
(A): 09922M85811



IDL70A540110-02

Reassembly

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Check that all parts are clean.

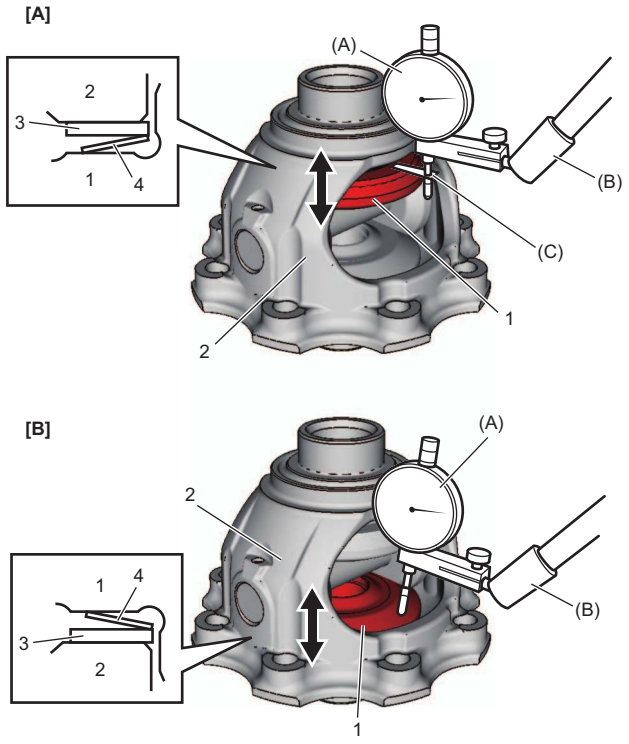
1) Install differential pinions, differential side gears (1), washers and pinion shaft to differential case (2) and measure thrust play of differential side gear at each side as follows.
If measured value is out of specification, select suitable side gear washer (3) from the following available sizes, install it and check again.

Special tool
(A): 09900M20607
(B): 09900M20701
(C): 09952M06010

a) Hold differential assembly with soft jawed vise and apply measuring tip or face of dial gauge to side gear as shown in figure.

b) Move side gear up and down by hand and read dial gauge.

Differential side gear thrust play
0.03 – 0.31 mm (0.0012 – 0.0122 in.)



IDL70A540111-02

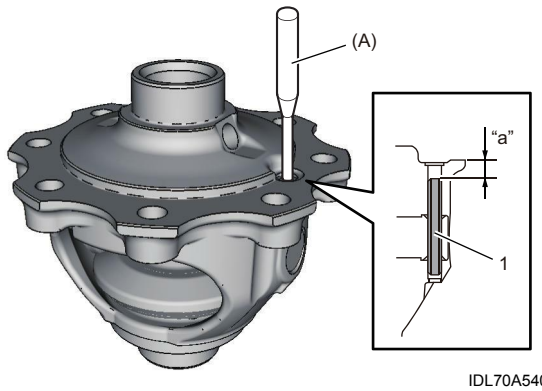
4. Spring washer	[B]: Left side
[A]: Right side	

Available side gear washer thickness

Thickness mm (in.)	Thickness mm (in.)
0.60 mm (0.0236 in.)	0.85 mm (0.0335 in.)
0.65 mm (0.0256 in.)	0.90 mm (0.0354 in.)
0.70 mm (0.0276 in.)	0.95 mm (0.0374 in.)
0.75 mm (0.0295 in.)	1.00 mm (0.0394 in.)
0.80 mm (0.0315 in.)	1.05 mm (0.0413 in.)

2) Install new differential pinion shaft pin (1) from left side until depth “a” becomes 7.20 – 7.60 mm (0.283 – 0.299 in.) as shown using special tool.

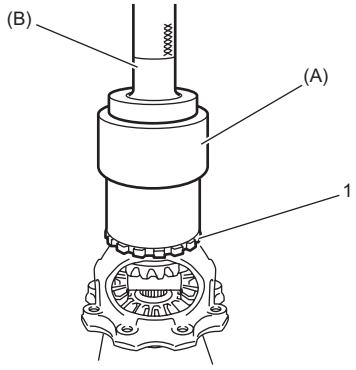
Special tool
(A): 09922M85811



IDL70A540112-02

3) Install speed sensor ring (1) using special tool and hydraulic press.

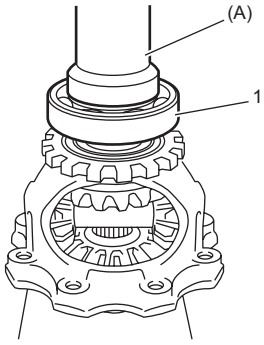
Special tool
(A): 09913M75510
(B): 09944M77030



IDL70A540113-01

4) Install right side bearing (1) using special tool and hydraulic press.

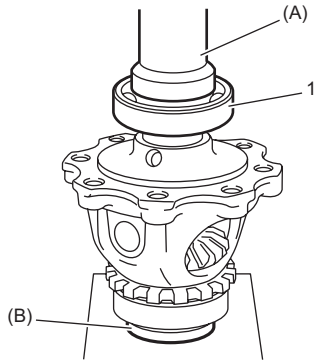
Special tool
(A): 09913M70123



IDL70A540114-01

5) Install left side bearing (1) using special tool and hydraulic press.

Special tool
(A): 09913M70123
(B): 09941M34513M004



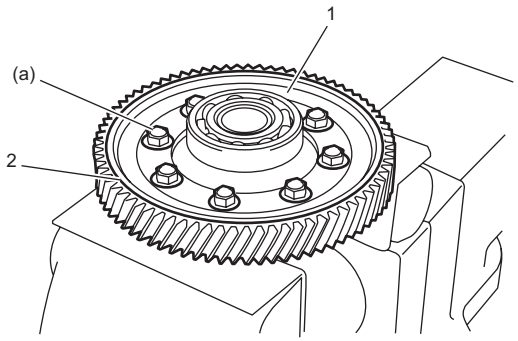
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6) Support differential case with soft jawed vise and install final gear (1) directing its discrimination groove (2) upward, and then tighten new final gear bolts to specified torque.

NOTICE

The bolts may loosen during operation of the differential if any bolts other than the specified ones are installed.
Use only the specified new bolts.

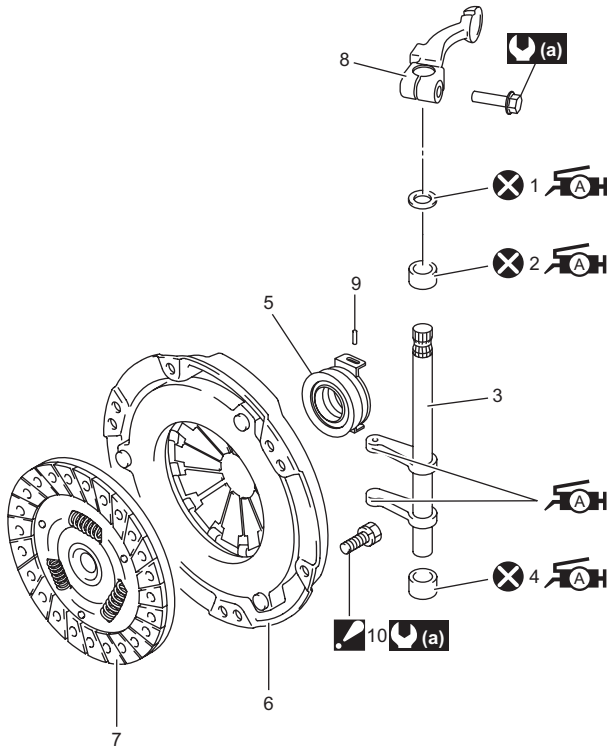
Tightening torque
Final gear bolt (a): 100 N·m (10.2 kgf-m, 74.0 lbf-ft)



IDL70A540116-01

Clutch Cover and Clutch Disc Components

AENDL70A5406047



IDL70A540118-01

1. Clutch release shaft seal : Apply grease 99000-25011 to seal lip.	7. Clutch disc
2. Clutch release shaft No.2 bushing : Apply grease 99000-25011 to bushing inside.	8. Release arm
3. Release shaft : Apply grease 99000-25011 to the end of release shaft arm.	9. Pin
4. Clutch release shaft No.1 bushing : Apply grease 99000-25011 to bushing inside.	10. Clutch cover bolt : For tightening order, refer to "Clutch Cover and Clutch Disc Removal and Installation" (Page 5D-115)
5. Release bearing	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
6. Clutch cover	: Do not reuse.

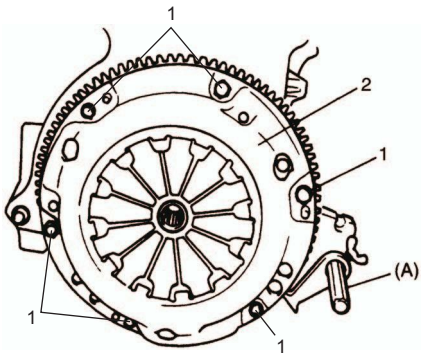
Clutch Cover and Clutch Disc Removal and Installation

AENDL70A5406048

Removal

1) Dismount manual transaxle. ☞(Page 5D-93)
2) Hold flywheel with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

Special tool
(A): 09924M17811



I9P60A531018-01

Installation

NOTE

Before assembling, check that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1) Hold flywheel with special tool (A).

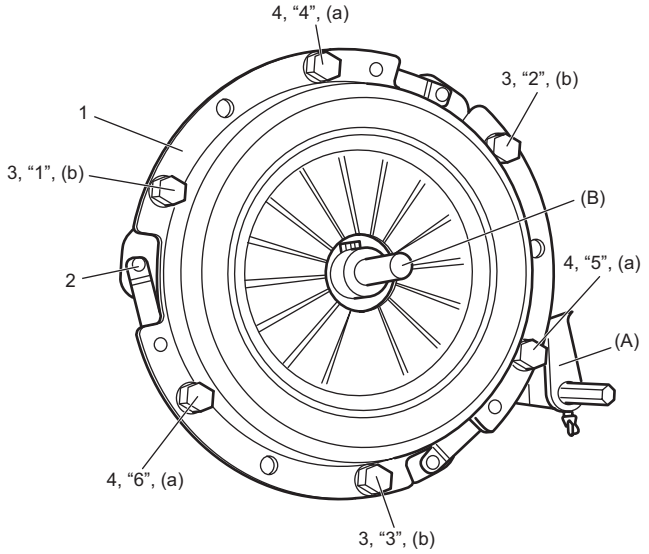
2) Align clutch disc with crankshaft center using special tool (B) and install clutch cover (1).
3) Install and tighten clutch cover bolts using the following procedure:
   a) Tighten 3 bolts (3) by hand.
   b) Tighten other 3 bolts (4) evenly and gradually to 5.0 N·m (0.51 kgf-m, 4.0 lbf-ft).
   c) Fully tighten all bolts (3), (4) evenly and gradually to specified torque in numerical order (“1” – “6”) starting from bolt nearby strut plate rivet (2).

NOTE

For centering of clutch disc spline, tighten clutch cover bolts while pushing clutch disc with special tool.

Special tool
(A): 09924M17811
(B): 09923M36320

Tightening torque
Clutch cover bolt* (a): 5.0 N·m → 23 N·m (0.51 kgf-m → 2.3 kgf-m, 4.0 lbf-ft → 17.0 lbf-ft)
Clutch cover bolt (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



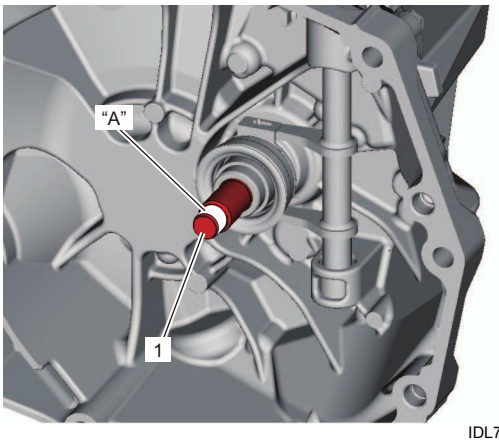
I9P60A531019-02

4) Slightly apply grease to input shaft (1), and then join manual transaxle with engine. ☞(Page 5D-93)

“A”: Grease 99000–25210 (SUZUKI Super Grease I)

NOTE

When inserting transaxle input shaft to clutch disc, turn crankshaft little by little to match the splines.



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5) Initialize clutch system. ☞(Page 5D-81)

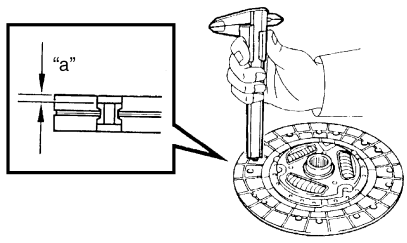
Clutch Cover and Clutch Disc Inspection

AENDL70A5406057

Clutch Disc

At clutch cover side of clutch disc, measure depth “a” of rivet head depression, i.e. distance between rivet head and facing surface.
If depression is found to have reached service limit at any of rivet holes, replace clutch disc.

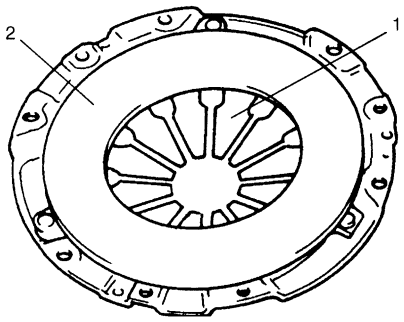
Rivet head depth
Standard: 0.9 – 1.5 mm (0.0354 – 0.0591 in.)
Limit: 0.5 mm (0.0197 in.)



I4RS0B540166-03

Clutch Cover

Check clutch cover as follows.
1) Check diaphragm spring (1) for abnormal wear or damage.
2) Check pressure plate (2) for wear or heat spots.
3) Replace clutch cover if defective.
   Do not disassemble it into diaphragm spring and pressure plate.



I3RM0A530015-01

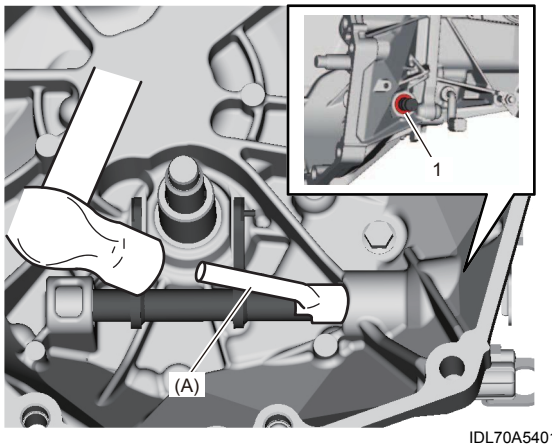
Clutch Release System Component Removal and Installation

AENDL70A5406049

Removal

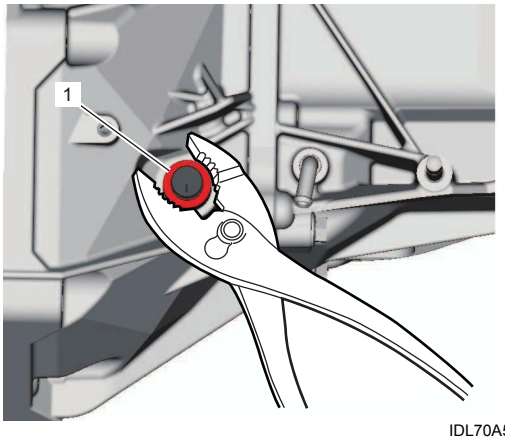
1) Remove release arm by loosening its bolt.
2) Remove release bearing by turning release shaft.
3) Remove clutch release shaft No.2 bushing and release shaft seal as follows.
   a) Drive out clutch release shaft No.2 bushing and release shaft seal (1) together using special tool (A) and hammer, and remove release shaft seal.

      Special tool
      (A): 09922M46010



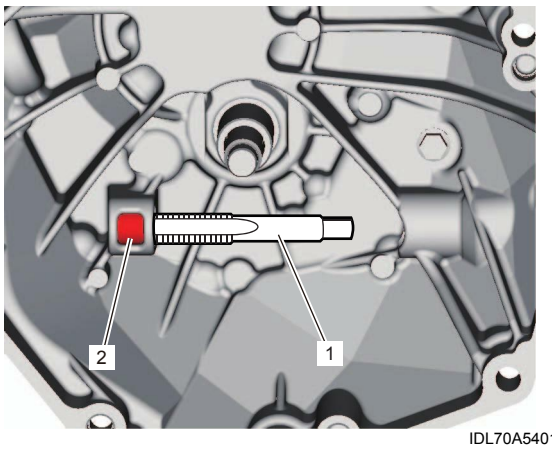
IDL70A540120-01

   b) Pry out clutch release shaft No.2 bushing (1) using pliers.



IDL70A540121-02

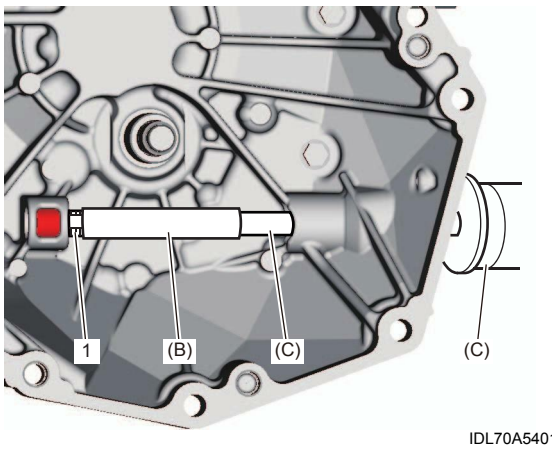
4) Remove release shaft.
5) Remove clutch release shaft No.1 bushing as follows, if necessary.
   a) Install tap (M16 X 1.5) (1) to clutch release shaft No.1 bushing (2).



IDL70A540122-01

   b) Connecting special tools to tap (1) and pull out No.1 bushing.

      Special tool
      (B): 09923M46020
      (C): 09930M30104



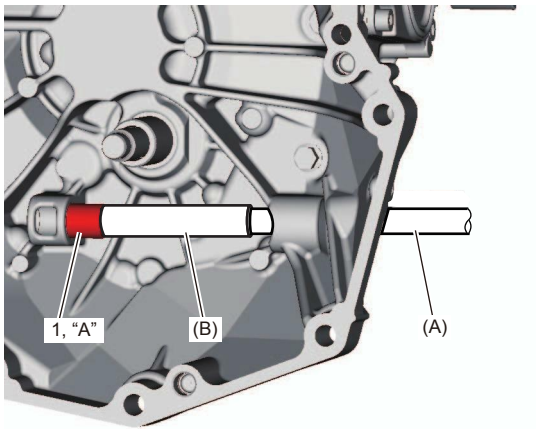
IDL70A540123-01

Installation

1) Press-fit a new No.1 bushing (1) using special tools and hammer, and then apply grease to bushing inside.

   Special tool
   (A): 09943M88211
   (B): 09923M46030

   "A": Grease 99000–25011 (SUZUKI Super Grease A)



IDL70A540124-01

2) Install release shaft.
3) Apply grease to No.2 bushing (1) inside and press-fit it using the same special tool used for removal.

“A”: Grease 99000–25011 (SUZUKI Super Grease A)

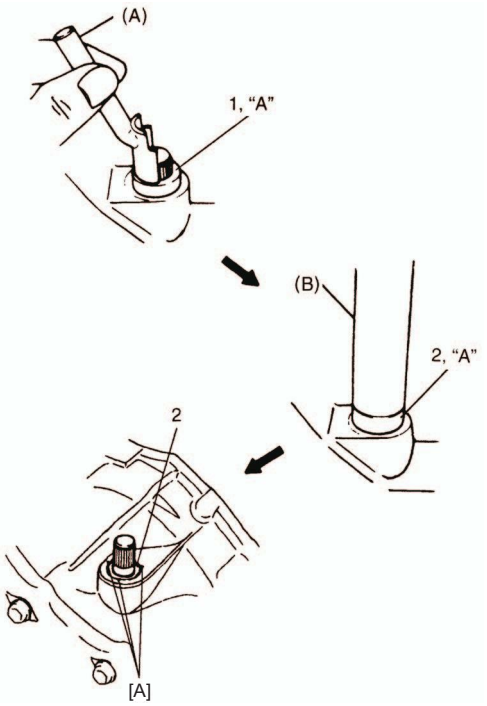
Special tool
(A): 09922M46010

4) Apply grease to release shaft seal (2) lip, and then install it with special tool facing its lip downward (inside) until it is flush with case surface.

“A”: Grease 99000–25011 (SUZUKI Super Grease A)

Special tool
(B): 09925M98221

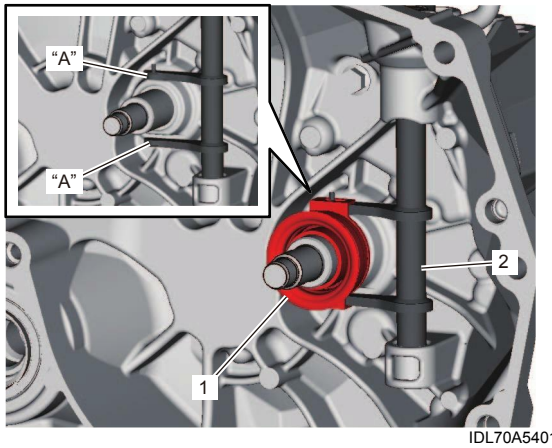
5) Caulk seal at [A] using caulking tool and hammer.



I9P60A531021-02

6) Apply grease to release shaft (2), and then set release bearing (1).

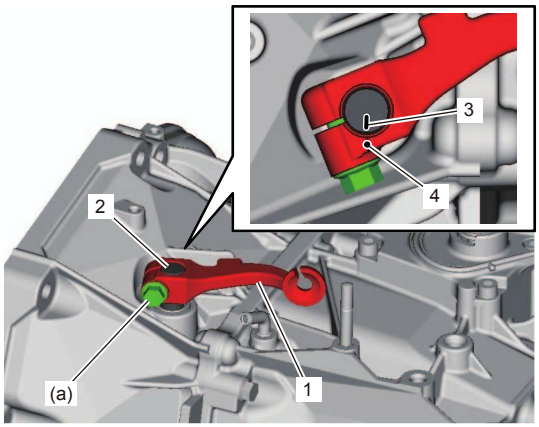
“A”: Grease 99000–25011 (SUZUKI Super Grease A)



IDL70A540125-01

7) Set release arm (1) to release shaft (2) aligning punch mark (4) of release arm with punch mark (3) of release shaft. Then tighten release arm bolt to specified torque.

Tightening torque
Release arm bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A540126-01

Clutch Release System Component Inspection

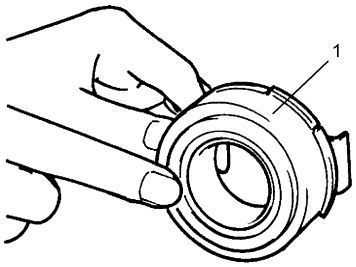
AENDL70A5406050

Clutch Release Bearing

Check clutch release bearing (1) for smooth rotation. If abnormality is found, replace it.

NOTICE

If the release bearing is washed, the grease contained within the release bearing may wash away, causing the bearing to seize up. Do not wash the release bearing.

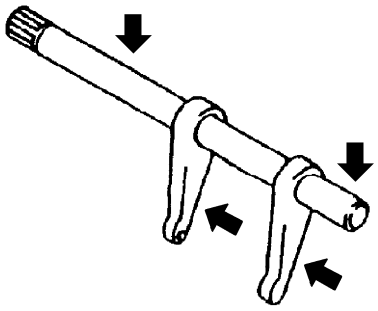


I7V20A531009-01

Clutch Release Shaft

Check clutch release shaft and its pin for deflection or damage.

If abnormality is found, replace it.



I3RM0A530021-01

Specifications

Tightening Torque Specifications

AENDL70A5407001

NOTE

For fastener(s) with * (asterisk) below, refer to the specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Transaxle oil level / filler plug	21	2.1	15.5	☞(Page 5D-82) / ☞(Page 5D-83)
Oil drain plug	21	2.1	15.5	☞(Page 5D-83)
Shift selector nut	13	1.3	9.5	☞(Page 5D-85)
Shift selector knob	8	0.82	6.0	☞(Page 5D-86)
Automated manual transaxle actuator unit bolt	23	2.3	17.0	☞(Page 5D-89)
Automated manual transaxle actuator unit nut	23	2.3	17.0	☞(Page 5D-89)
Actuator bracket bolt	23	2.3	17.0	☞(Page 5D-89)
Gear shift and select shaft assembly bolt	23	2.3	17.0	☞(Page 5D-90)
Clutch speed sensor bolt	10	1.0	7.5	☞(Page 5D-91)
VSS bolt	5	0.51	4.0	☞(Page 5D-92)
Reverse gear shift lever bolt	10	1.0	7.5	☞(Page 5D-98)
Transaxle case bolt	23	2.3	17.0	☞(Page 5D-99)
Reverse gear shaft bolt	23	2.3	17.0	☞(Page 5D-99)
Bearing stopper plate bolt	10	1.0	7.5	☞(Page 5D-101)
Final gear bolt	100	10.2	74.0	☞(Page 5D-114)
Clutch cover bolt*	5.0 N·m → 23 N·m (0.51 kgf-m → 2.3 kgf-m, 4.0 lbf-ft → 17.0 lbf-ft)			☞(Page 5D-116)
Clutch cover bolt	23	2.3	17.0	☞(Page 5D-116)
Release arm bolt	23	2.3	17.0	☞(Page 5D-118)

Reference:

For the tightening torques of fasteners not specified in this page, refer to:

"Shift Selector Components" (Page 5D-84)
"Gear Shift and Select Shaft Assembly Components" (Page 5D-90)
"Automated Manual Transaxle Unit Components" (Page 5D-93)
"Automated Manual Transaxle Components" (Page 5D-95)
"Gear Shift Shaft Components" (Page 5D-111)
"Differential Components" (Page 5D-112)
"Clutch Cover and Clutch Disc Components" (Page 5D-115)
"Fasteners Information" in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A5408001

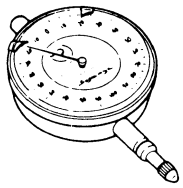
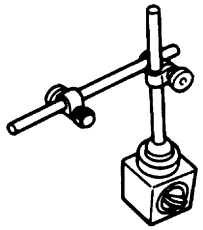
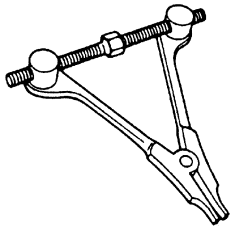
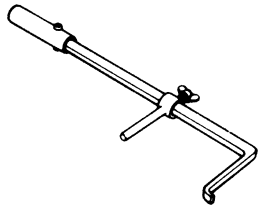
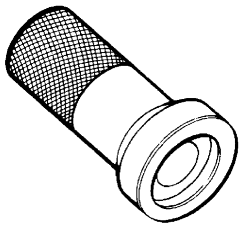
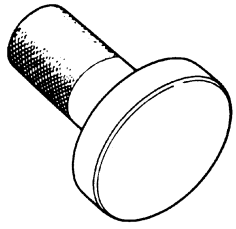
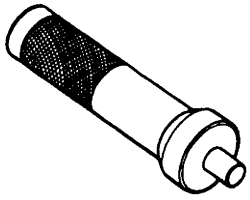
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 5D-83) / ☞(Page 5D-89) / ☞(Page 5D-100) / ☞(Page 5D-117) / ☞(Page 5D-118) / ☞(Page 5D-118) / ☞(Page 5D-118)
	SUZUKI Super Grease I	P/No.: 99000–25210	☞(Page 5D-116)
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞(Page 5D-82) / ☞(Page 5D-83) / ☞(Page 5D-83) / ☞(Page 5D-90) / ☞(Page 5D-98)

NOTE

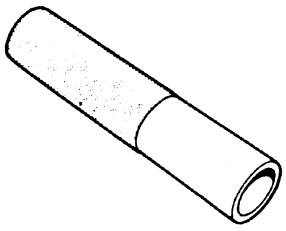
Required service materials are also described in:
“Automated Manual Transaxle Components” (Page 5D-95)
“Input Shaft Components” (Page 5D-102)
“Countershaft Components” (Page 5D-107)
“Differential Components” (Page 5D-112)
“Clutch Cover and Clutch Disc Components” (Page 5D-115)

Special Tool

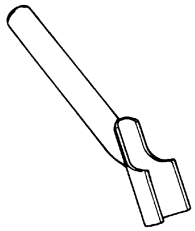
AENDL70A5408002

09900M20607 Dial gauge ☞(Page 5D-113)		09900M20701 Magnetic stand ☞(Page 5D-113)	
09912M34510 Case separator ☞(Page 5D-97)		09913M50121 Oil seal remover ☞(Page 5D-83) / ☞(Page 5D-100)	
09913M70123 Bearing installer ☞(Page 5D-83) / ☞(Page 5D-114) / ☞(Page 5D-114)		09913M75510 Bearing installer ☞(Page 5D-114)	
09913M75821 Bearing installer attachment ☞(Page 5D-112) / ☞(Page 5D-113)		09913M80113 Bearing installer ☞(Page 5D-100) / ☞(Page 5D-104) / ☞(Page 5D-105) / ☞(Page 5D-109) / ☞(Page 5D-111)	

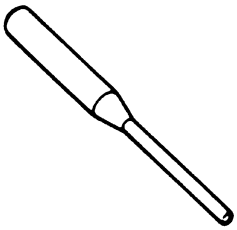
09913M84510
Bearing installer
☞(Page 5D-105) /
☞(Page 5D-105)



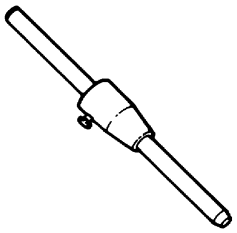
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Clutch bushing remover
☞(Page 5D-117) /
☞(Page 5D-118)



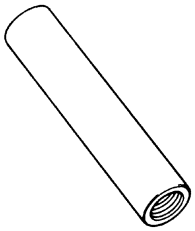
09922M85811
Spring pin remover (4.5 mm)
☞(Page 5D-113) /
☞(Page 5D-113)



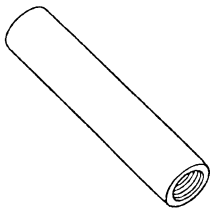
09923M36320
Clutch center guide (15 mm)
☞(Page 5D-116)



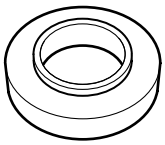
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Joint pipe
☞(Page 5D-117)



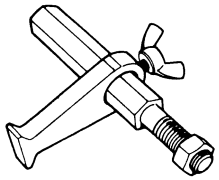
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Joint pipe
☞(Page 5D-117)



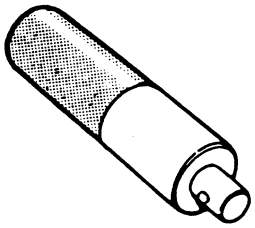
09924M07720
Synchronizer hub installer
☞(Page 5D-83)



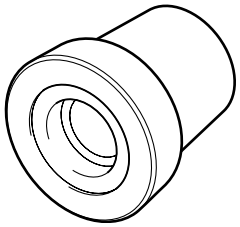
09924M17811
Flywheel holder
☞(Page 5D-115) /
☞(Page 5D-116)



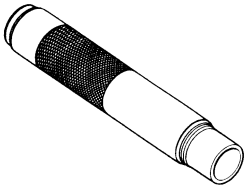
09924M74510
Bearing and oil seal handle
☞(Page 5D-83) /
☞(Page 5D-99)



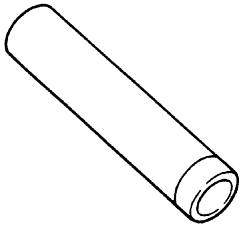
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Input shaft oil seal installer attachment
☞(Page 5D-99)



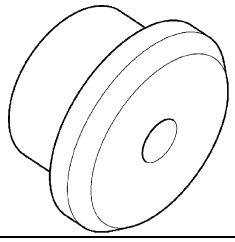
09925M18011
Transmission gear, bush and bearing installer
☞(Page 5D-110) /
☞(Page 5D-110) /
☞(Page 5D-110)



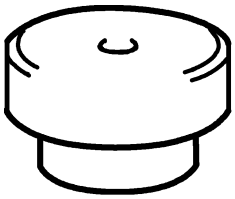
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Bearing installer
☞(Page 5D-118)



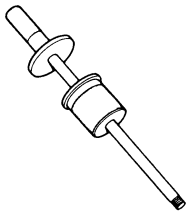
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Oil seal installer
☞(Page 5D-83)



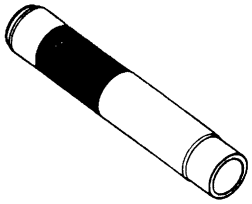
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Bearing remover attachment
☞(Page 5D-100)

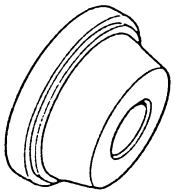
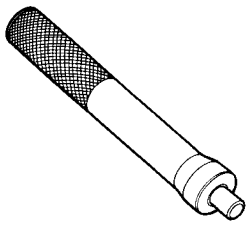
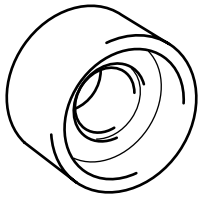
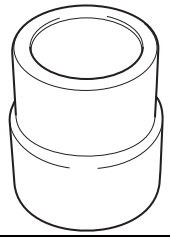
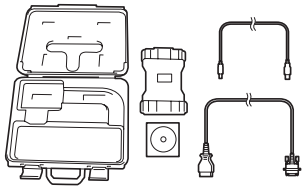


09930M30104
Sliding shaft
☞(Page 5D-117)



09940M51710
Bearing installer
☞(Page 5D-110)



09941M34513M004 Bearing installer adapter ☞(Page 5D-114) 	09943M88211 Pinion bearing installer ☞(Page 5D-117) 
09944M66060 Bearing installer ☞(Page 5D-106) 	09944M77030 Bearing / cover installer support ☞(Page 5D-114) 
09952M06010 Dial gauge plate No.1 ☞(Page 5D-113) 	SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 5D-21) / ☞(Page 5D-22) / ☞(Page 5D-81) / ☞(Page 5D-81) / ☞(Page 5D-81) / ☞(Page 5D-87) 

Section 6

Steering

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Precautions

Precautions

Precautions for Steering

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Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

Precautions for Steering Diagnosis
Refer to “Precautions on Steering General Diagnosis” in Section 6A (Page 6A-1).

Service Precautions of Steering Wheel and Column
Refer to “Precautions for Steering Wheel and Column Service” in Section 6B (Page 6B-1).

Fastner Caution
Refer to “Fastener Caution” in Section 6C (Page 6C-1).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness.
Otherwise, electrical trouble may occur.

Steering General Diagnosis

Precautions

Precautions on Steering General Diagnosis

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Since the problems in steering involve several systems, they must all be considered when diagnosing a complaint. To avoid being misled by an unclear symptom, always perform the road test first. Proceed with the following preliminary inspection and correct defects.

1) Inspect tires for proper pressure and uneven wear.
2) Hoist vehicle and inspect steering system for loose or damaged parts.
3) Spin front wheels. Inspect for out-of-round tires, out-of-balance tires, bent rims, loose and/or rough wheel bearings.

Diagnostic Information and Procedures

Steering Symptom Diagnosis

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Condition	Possible cause	Correction / Reference Item
Hard steering	Tire not adequately inflated	*Adjust tire pressure.*
	Malfunction of power steering system	*Check and correct. ☞(Page 6C-5)*
	Binding tie-rod end ball joint	*Replace tie-rod end. ☞(Page 6C-25)*
	Binding suspension arm ball joint	*Replace suspension arm. ☞(Page 2B-8)*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment. ☞(Page 2B-1)*
	Binding steering column	*Replace steering column. ☞(Page 6B-6)*
	Improper tooth contact between rack and pinion	*Check rack and pinion shaft rotation torque. ☞(Page 6C-29)* *If defective, replace steering gear case assembly. ☞(Page 6C-26)*
Too much play in steering	Wheel bearings worn	*Replace wheel bearing. ☞(Page 3A-8)*
	Loose steering gear box nut	*Tighten steering gear box nut. ☞(Page 6C-26)*
	Faulty steering gear case assembly	*Replace steering gear case assembly. ☞(Page 6C-26)*
	Worn steering shaft joint	*Replace steering column assembly. ☞(Page 6B-6)*
	Worn tie-rod end or tie-rod inside ball joint	*Replace tie-rod end or tie-rod. Refer to "Tie-Rod End Removal and Installation" in Section 6C (Page 6C-25) or "Tie-Rod / Rack Boot Removal and Installation" in Section 6C (Page 6C-28).*
	Worn suspension arm joint	*Replace suspension arm. ☞(Page 2B-8)*
	Improper tooth contact between rack and pinion	*Check rack and pinion shaft rotation torque. ☞(Page 6C-29)* *If defective, replace steering gear case assembly. ☞(Page 6C-26)*
Poor return ability	Binding tie-rod end ball joint	*Replace tie-rod end. ☞(Page 6C-25)*
	Binding suspension arm joint	*Replace suspension arm. ☞(Page 2B-8)*
	Binding steering column	*Replace steering column. ☞(Page 6B-6)*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment. ☞(Page 2B-1)*
	Faulty steering gear case assembly	*Replace steering gear case assembly. ☞(Page 6C-26)*
	Tires not adequately inflated	*Adjust tire pressure.*
	Improper tooth contact between rack and pinion	*Check rack and pinion shaft rotation torque. ☞(Page 6C-29)* *If defective, replace steering gear case assembly. ☞(Page 6C-26)*

Condition	Possible cause	Correction / Reference Item
Steering noise (Rattle or chuckle)	Loose steering gear box nut	*Tighten steering gear box nut. ☞(Page 6C-26)*
	Improper tooth contact between rack and pinion	*Check rack and pinion shaft rotation torque. ☞(Page 6C-29)* *If defective, replace steering gear case assembly. ☞(Page 6C-26)*
	Faulty steering gear case assembly	*Replace steering gear case assembly. ☞(Page 6C-26)*
	Broken or otherwise damaged wheel bearing(s)	*Replace wheel bearing(s). ☞(Page 3A-8)*
	Worn or stuck tie-rod end or tie-rod inside ball joint	*Replace tie-rod end or tie-rod. Refer to "Tie-Rod End Removal and Installation" in Section 6C (Page 6C-25) or "Tie-Rod / Rack Boot Removal and Installation" in Section 6C (Page 6C-28).*
Wander or poor steering stability	Mismatched tire or uneven tire pressure	*Replace or adjust tire pressure. ☞(Page 2D-3)*
	Loose suspension arm joint and tie-rod end	*Replace suspension arm or tie-rod end. Refer to "Suspension Arm Removal and Installation" in Section 2B (Page 2B-8) or "Tie-Rod End Removal and Installation" in Section 6C (Page 6C-25).*
	Faulty front strut assembly or mounting	*Replace front strut assembly or repair mounting. ☞(Page 2B-4)*
	Loose stabilizer bar	*Tighten or replace stabilizer bar or bushing. ☞(Page 2B-12)*
	Broken or sagging coil spring	*Replace coil spring. ☞(Page 2B-6)*
	Faulty front strut assembly (shock absorber)	*Replace front strut assembly (shock absorber). ☞(Page 2B-4)*
	Improper tooth contact between rack and pinion	*Check rack and pinion shaft rotation torque. ☞(Page 6C-29)* *If defective, replace steering gear case assembly. ☞(Page 6C-26)*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment. ☞(Page 2B-1)*
	Faulty steering gear case assembly	*Replace steering gear case assembly. ☞(Page 6C-26)*
Erratic steering when braking	Worn wheel bearing(s)	*Replace wheel bearing(s). ☞(Page 3A-8)*
	Broken or sagging coil spring	*Replace coil spring. ☞(Page 2B-6)*
	Faulty front strut assembly (shock absorber)	*Replace front strut assembly (shock absorber). ☞(Page 2B-4)*
	Wheel tires are inflated unequally	*Adjust tire pressure.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment. ☞(Page 2B-1)*
	Brakes not working in unison	*Check and repair brake system. ☞(Page 4A-1)*
	Brake disc stained with brake fluid	*Repair or replace disc. ☞(Page 4B-3)*
	Warped brake disc	*Replace brake disc. ☞(Page 4B-3)*
	Badly worn brake pad	*Replace brake pad. ☞(Page 4B-2)*

Steering System Inspection

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Check steering system referring to the following items.

Inspection Item		Referring section
Steering wheel	Play, rattle	"Steering Wheel Play Check" in Section 6C (Page 6C-23)
Tie-rod end	Looseness and damage	"Tie-Rod End Inspection" in Section 6C (Page 6C-26)
	Wheel alignment	"Front Wheel Alignment Inspection and Adjustment" in Section 2B (Page 2B-1)
Tie-rod end boot	Damage	"Tie-Rod End Boot On-Vehicle Inspection" in Section 6C (Page 6C-25)
Steering rack boot	Damage	"Steering Rack Boot Inspection" in Section 6C (Page 6C-28)

Inspection Item		Referring section
Steering shaft joint	Rattle and damage	“Steering Shaft Joint On-Vehicle Inspection” in Section 6C (Page 6C-26)
EPS system	Operation	“P/S System Check” in Section 6C (Page 6C-5)

Steering Wheel and Column

Precautions

Precautions for Steering Wheel and Column Service

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Service and Diagnosis
For diagnosis and servicing, refer to “Precautions for Air Bag System Service” in Section 8B (Page 8B-1).

Disabling Air Bag System
For disabling air bag system, refer to “Disabling Air Bag System” in Section 8B (Page 8B-47).

Enabling Air Bag System
For enabling air bag system, refer to “Enabling Air Bag System” in Section 8B (Page 8B-47).

Handling and Storage
For handling and storage, refer to “Precautions for Handling and Storage of Air Bag System Components” in Section 8B (Page 8B-1).

Disposal
For disposal, refer to “Precautions for Disposal of Air Bag” in Section 8B (Page 8B-2).

General Description

Steering Wheel and Column Construction

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This collapsible tube type steering column has the following three important features in addition to the steering function:

- The steering column is energy absorbing, designed to compress in a front-end collision.
- The ignition switch and steering lock assembly are mounted on this steering column.
- With the steering lock assembly mounted on the steering column, the ignition and steering operations can be locked to inhibit theft of the vehicle.

To insure the energy absorbing action, it is important that only the specified screws, bolts and nuts be used as designated, and that they are tightened to the specified torque. When the steering column is removed from the vehicle, special care must be taken in handling it. Use of a steering wheel puller or a sharp blow on the end of the steering shaft, leaning on the assembly, or dropping the assembly could shear the capsules which maintain steering column length and position.
The driver air bag (inflator) module is one of the supplemental restraint (air bag) system components and is mounted to the center of the steering wheel. During certain frontal crashes, the air bag system supplements the restraint of the driver’s and passenger’s seat belts by deploying the air bags. The air bag (inflator) module should be handled with care to prevent accidental deployment. When servicing, be sure to observe “Precautions for Air Bag System Service” in Section 8B (Page 8B-1).

Diagnostic Information and Procedures

Checking Steering Column for Accident Damage

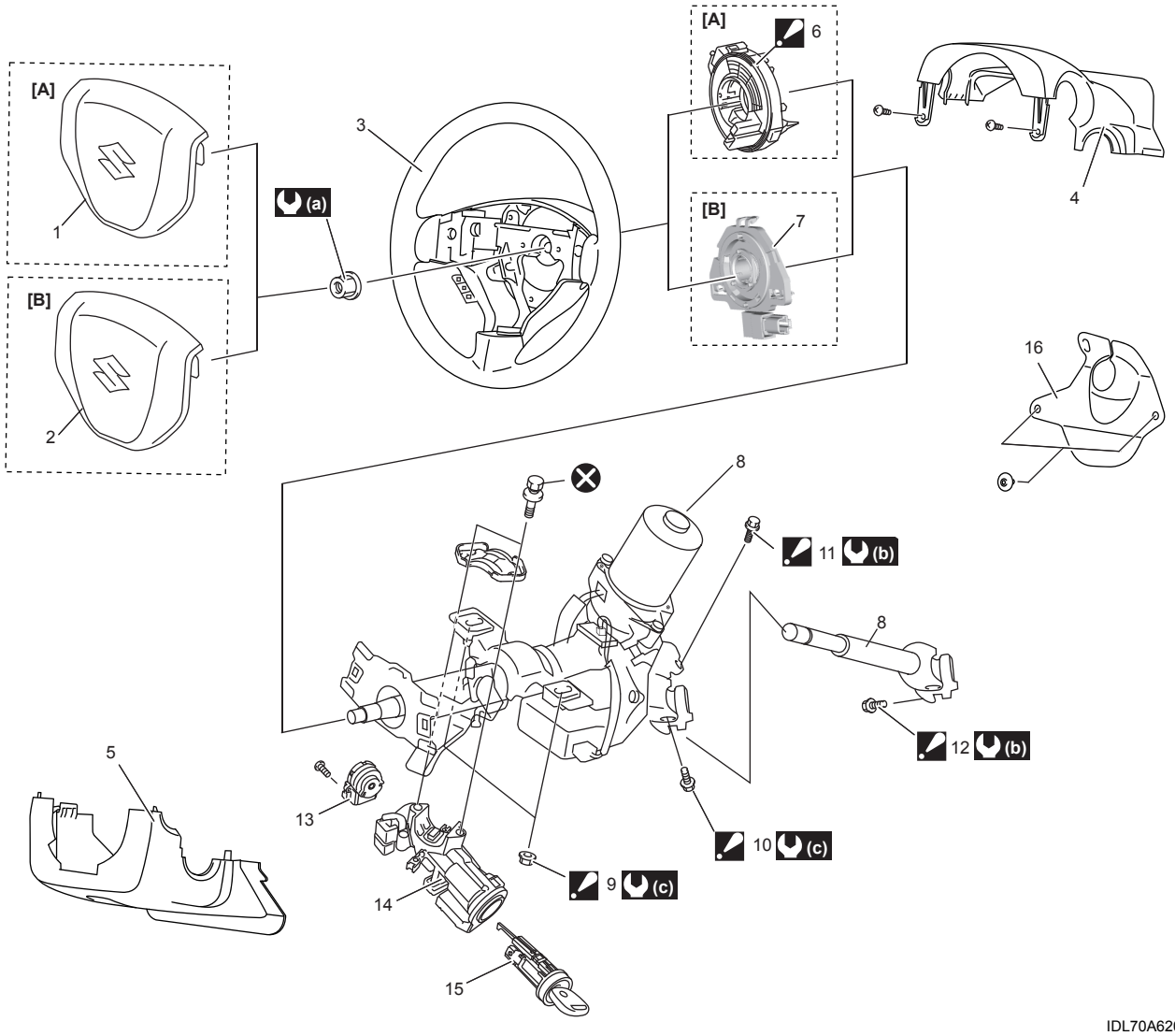
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Refer to “Steering Column Inspection” (Page 6B-8).

Repair Instructions

Steering Wheel and Column Components

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[A]: Air bag system model	7. Cancel cam	15. Ignition switch cylinder
[B]: Non-air bag system model	8. Steering column assembly	16. Steering joint cover
1. Driver air bag (inflator) module	9. Steering column upper nut : For installation, refer to “Steering Column Removal and Installation” (Page 6B-6).	(a) : 33 N·m (3.4 kgf-m, 24.5 lbf-ft)
2. Steering wheel pad	10. Steering column lower bolt : For installation, refer to “Steering Column Removal and Installation” (Page 6B-6).	(b) : 35 N·m (3.6 kgf-m, 25.8 lbf-ft)
3. Steering wheel	11. Steering column mounting nut : For installation, refer to “Steering Column Removal and Installation” (Page 6B-6).	(c) : 14 N·m (1.4 kgf-m, 10.5 lbf-ft)
4. Steering column upper cover	12. Steering column joint bolt : For installation, refer to “Steering Lower Shaft Removal and Installation” (Page 6B-11).	: Do not reuse.
5. Steering column lower cover	13. Ignition switch	
6. Contact coil cable assembly : Be sure to perform centering. ☞(Page 6B-5)	14. Steering lock assembly	

Steering Wheel Removal and Installation

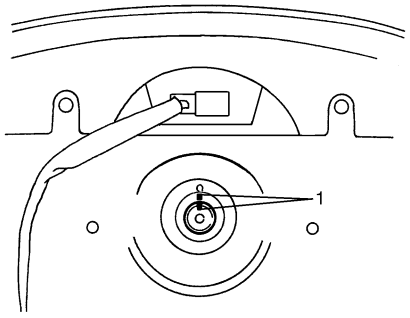
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NOTICE

- **For air bag model, the coil in the contact coil assembly will break if the contact coil is turned too much.Do not turn the contact coil more than about two-and-a-half turns in either direction from the neutral position.**
- **The impact energy absorbing function of the steering column assembly may be impaired if the steering column assembly receives an excessively large force.Be careful not to strongly impact the steering column assembly when removing and installing it.**

Removal

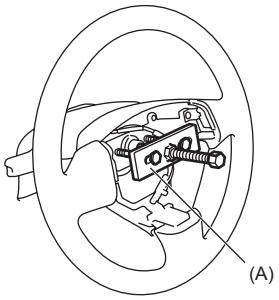
1) Turn steering wheel so that vehicle's front wheels are at straight-ahead position.
2) Disconnect negative (–) cable at battery.
3) Disable air bag system (if equipped). ☞(Page 8B-47)
4) Remove the following parts from steering wheel.
   - Air bag system model: Driver air bag (inflator) module. ☞(Page 8B-48)
   - Non-air bag system model: Steering wheel pad. ☞(Page 6B-1)
5) Remove steering shaft nut and then make alignment marks (1) on steering wheel and shaft for correct reinstallation.



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6) Remove steering wheel using special tool.

Special tool
(A): 09944M36011



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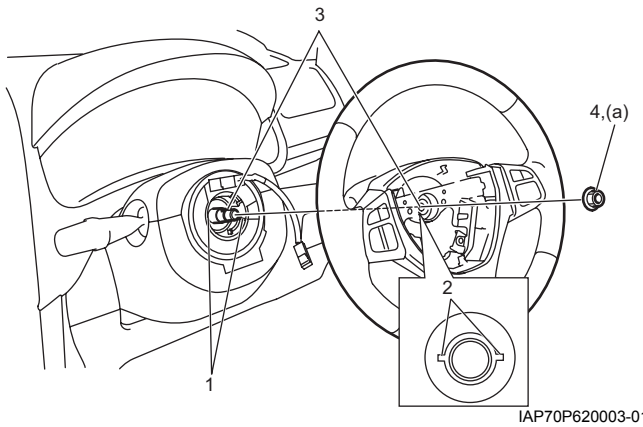
Installation

NOTICE

If the operations in Steps 1), 2) and 3) are omitted or not performed as instructed, the contact coil assembly will break when the steering wheel is turned.Be sure to perform Steps 1), 2) and 3) exactly as instructed.

1) Check that vehicle's front wheels are at straight-ahead position.
2) If contact coil is turned after removing steering wheel, center contact coil cable assembly. ☞(Page 6B-5)
3) Install steering wheel to steering shaft with 2 grooves (1) on contact coil cable assembly fitted in 2 lugs (2) on the back of steering wheel and also aligning marks (3) on steering wheel and steering shaft.
4) Tighten steering shaft nut (4) to specified torque.

Tightening torque
Steering shaft nut (a): 33 N·m (3.4 kgf-m, 24.5 lbf-ft)



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5) Install driver air bag (inflator) module or steering wheel pad to steering wheel. ☞(Page 8B-48)
6) Connect negative (–) cable at battery.
7) Enable air bag system (if equipped). ☞(Page 8B-47)

Contact Coil Cable Assembly Removal and Installation (Air Bag Model)

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NOTICE

The coil in the contact coil assembly will break if the contact coil is turned too much.Do not turn the contact coil more than about two-and-a-half turns in either direction from the neutral position.

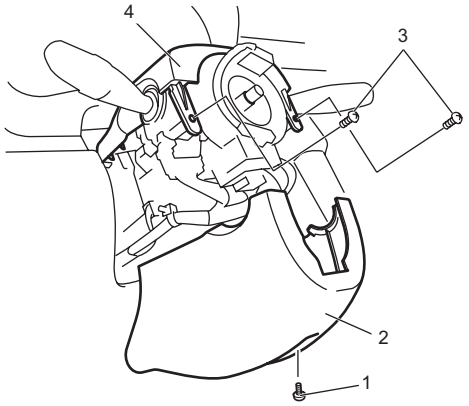
Removal

1) Turn steering wheel so that vehicle's front wheels are at straight-ahead position.
2) Remove steering wheel from steering column. ☞(Page 6B-3)

3) Remove standard screw (1) and then detach steering column lower cover (2).
4) Remove tapping screws (3) and then detach steering column upper cover (4).

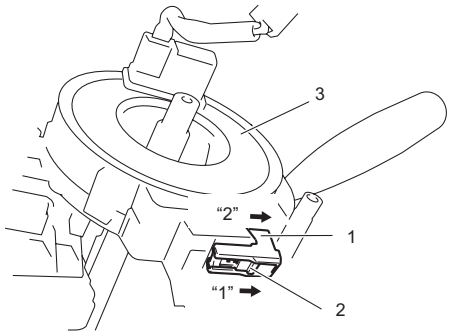
NOTE

If removal of steering column upper cover is difficult in this step, remove immobilizer control module, lighting switch and wiper switch. This will facilitate removal and/or installation.



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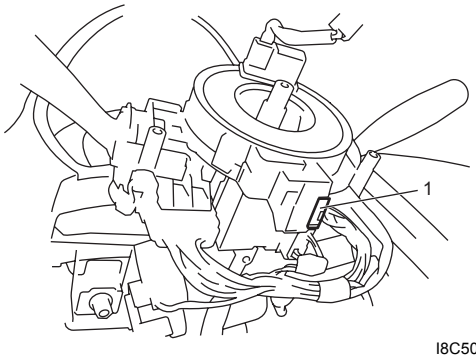
5) Disconnect contact coil connector (1) as follows.
   a) Release locking slider (2) by sliding it in arrow direction “1”.
   b) After unlocked, disconnect contact coil connector (1) by pulling it in arrow direction “2”.



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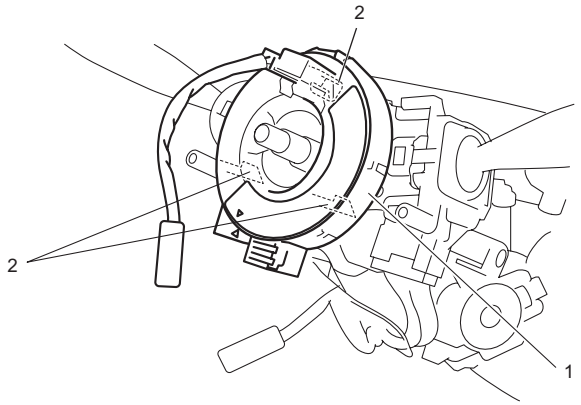
3: Contact coil cable assembly

6) Disconnect horn connector (1).



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7) Release tabs (2) and remove contact coil cable assembly (1).



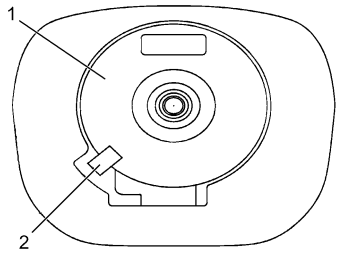
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Installation

1) Check that vehicle’s front wheels are at straight-ahead position and then ignition switch is at “LOCK” position.
2) Install contact coil cable assembly (1) to steering column securely.

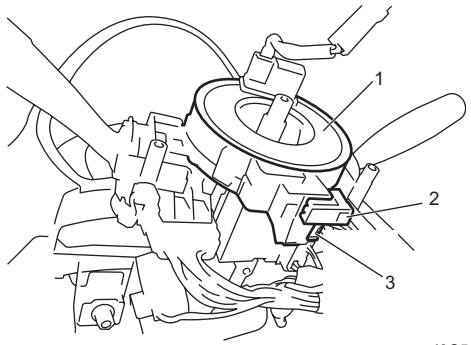
NOTE

New contact coil cable assembly is supplied with contact coil set and held at its center position with a lock pin (2). Remove this lock pin after installing contact coil cable assembly to steering column.



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3) Connect contact coil connector (2) and horn connector (3) to contact coil assembly securely.

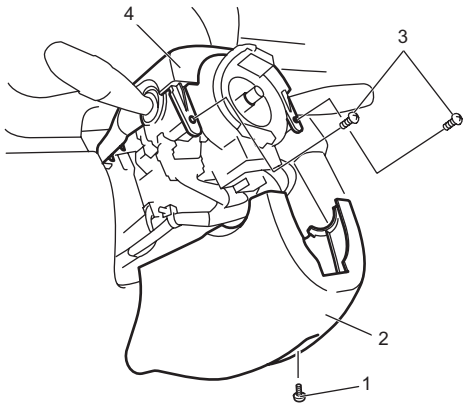


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4) Install steering column upper cover (4) by tapping screws (3).
5) Install steering column lower cover (2) by standard screw (1).

NOTICE

Lead wires will be damaged if they get pinched when you install the covers. Confirm that there are no wires caught between the covers before securing the covers.



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6) Install steering wheel to steering column. ☞(Page 6B-3)

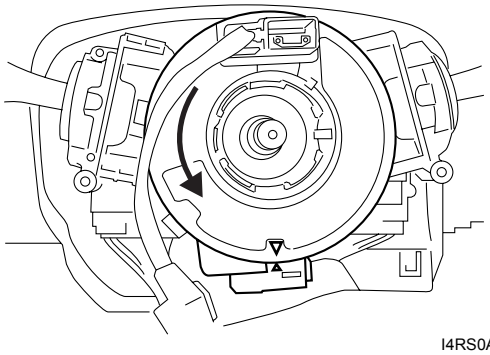
Centering Contact Coil Cable Assembly (Air Bag Model)

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1) Remove steering wheel according to “Steering Wheel Removal and Installation” (Page 6B-3)
2) Check that ignition switch is at “LOCK” position.
3) Turn contact coil counterclockwise slowly with a light force till contact coil will not turn any further.

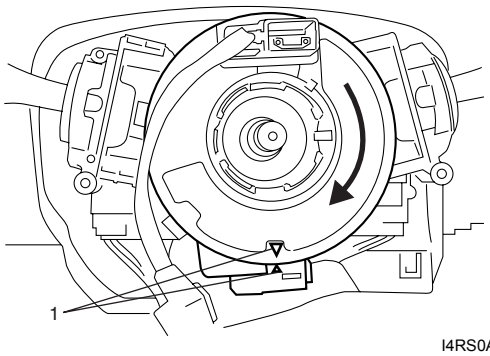
NOTE

Contact coil can turn about 5 turns at the maximum, that is, if it is at the center position, can turn about two and a half turns both clockwise and counterclockwise.



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4) From the position where contact coil became unable to turn any further (it stopped), turn it back clockwise about two and a half rotations and align center mark with alignment mark (1).

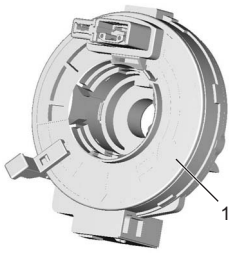


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Contact Coil Cable Assembly Inspection (Air Bag Model)

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- Inspect contact coil cable assembly (1) wire harness for any signs of scorching, melting, wear or damage. If defective, replace with new one.
- Check contact coil cable circuit. ☞(Page 8B-40)



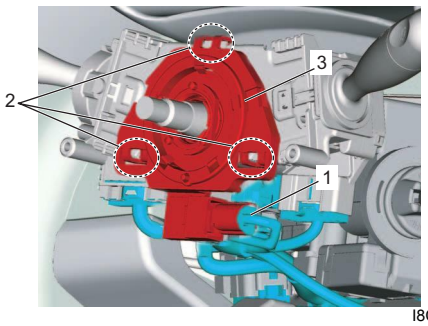
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Cancel Cam Removal and Installation (Non-Air Bag Model)

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Removal

1) Remove steering wheel and steering column cover (upper and lower) referring to Step 1), 2), 3) and 4) of “Removal” in “Contact Coil Cable Assembly Removal and Installation (Air Bag Model)” (Page 6B-3).
2) Disconnect horn connector (1) from cancel cam.
3) Release tabs (2) and then remove cancel cam (3) from steering column.



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Installation

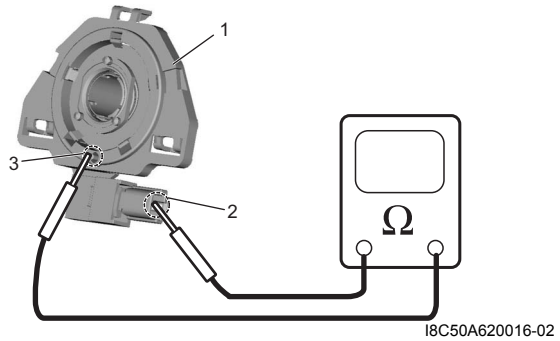
1) Check that vehicle’s front wheels are at straight-ahead position, and then check that ignition switch is at “LOCK” position.

2) Install cancel cam to steering column securely.
3) Connect horn connector to cancel cam.
4) Install steering wheel and steering column cover (upper and lower) referring to Step 4), 5) and 6) of "Installation" in "Contact Coil Cable Assembly Removal and Installation (Air Bag Model)" (Page 6B-3).

Cancel Cam Inspection (Non-Air Bag Model)

AENDL70A6206007

- Inspect cancel cam (1) for any signs of scorching, melting, wear or damage. If defective, replace with new one.
- Check for continuity between cancel cam terminal (2) and contact horn (3) as shown in figure.
  If check result is not OK, replace with new one.



I8C50A620016-02

Steering Column Removal and Installation

AENDL70A6206008

⚠ WARNING

For airbag module removal and installation refer to "Driver Air Bag (Inflator) Module Removal and Installation" in Section 8B (Page 8B-48).

NOTICE

The steering column assembly can be easily damaged during and after removal.
To avoid damaging the steering column assembly, be sure to take the following precautions when removing it and when setting it down after removal:

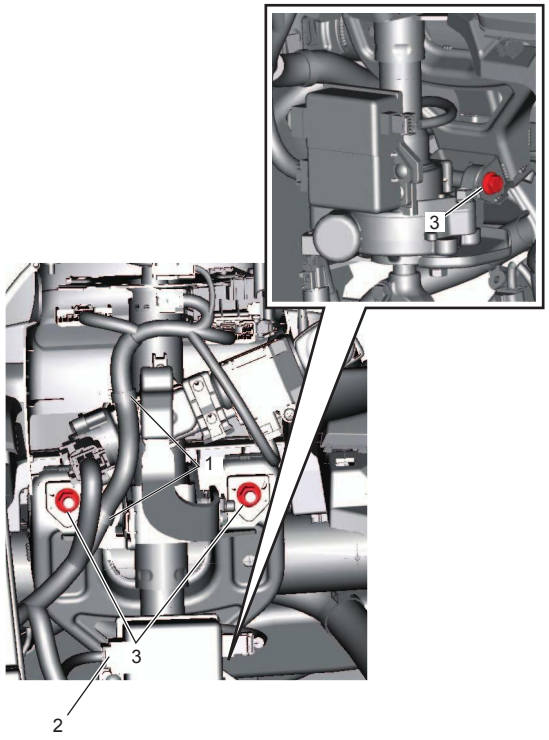
- **Do not release tilt lever with steering column mounting nuts loosened or steering column removed from vehicle. Doing so may increase operating force for tilt motion.**
- **The impact energy absorbing function of the steering column assembly may be impaired if the steering column assembly receives an excessively large force.**

Be careful not to strongly impact the steering column assembly when removing and installing it.

- **Never drop the steering column assembly on its end. This could collapse the steering shaft or loosen capsules that maintain the design length of the column.**
- **Do not lean the steering column assembly against something. This could cause it to bend or deform.**
- **Do not loosen the steering column upper nuts and lower bolt with steering shaft joint upper side bolt tightened. This could cause damage to the steering shaft joint of steering column.**

Removal

1) Remove contact coil cable assembly or cancel cam from steering wheel. Refer to "Contact Coil Cable Assembly Removal and Installation (Air Bag Model)" (Page 6B-3)or "Cancel Cam Removal and Installation (Non-Air Bag Model)" (Page 6B-5).
2) Remove immobilizer control module from steering lock assembly (if equipped). ☞(Page 10C-13)
3) Remove lighting switch and wiper switch.
   - Lighting switch: ☞(Page 9B-9)
   - Wiper switch: ☞(Page 9D-8)
4) Remove steering column hole cover.
5) Remove steering joint cover.
6) Remove steering lower shaft. ☞(Page 6B-11)
7) Detach steering column harness clamps (1) from its bracket and disconnect P/S control module connector (2).
8) Remove steering column lower bolt and upper nuts (3).



IDL70A620002-01

9) Remove steering column.
10) Remove steering lock assembly. ☞(Page 6B-8)

Installation

NOTICE

Tightening the fasteners in the wrong order may cause damage to the steering shaft joint of steering column.
Be sure to tighten the steering column lower bolt and upper nuts in the order given before installing the steering lower shaft.

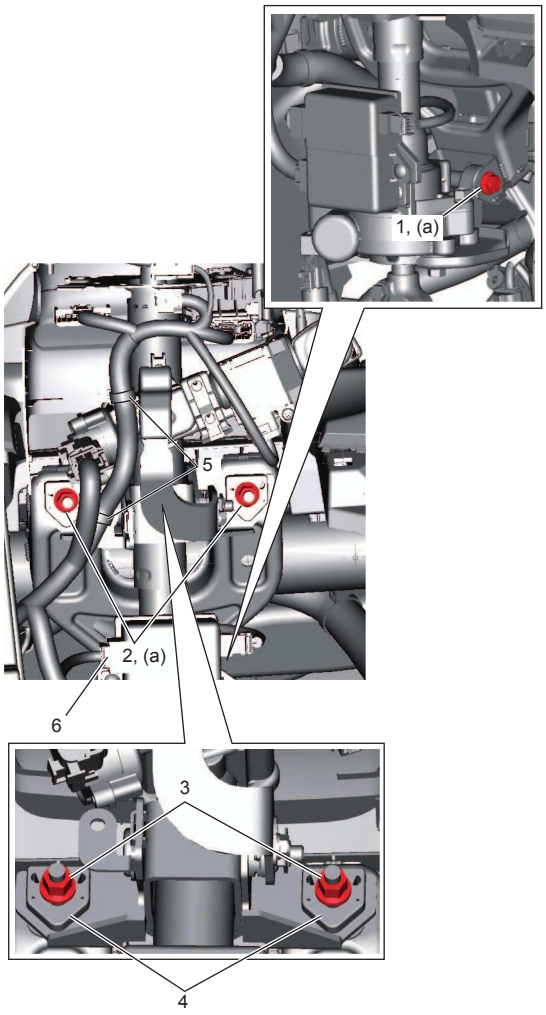
1) Check that vehicle's front wheels are at straight-ahead position.
2) Install steering lock assembly. ☞(Page 6B-8)
3) Install steering column. Then tighten steering column lower bolt (1) first and steering column upper nuts (2) to specified torque as shown in figure.

NOTE

- **When installing, make sure that clearance between bolt (3) and bracket (4) is 0 (zero).**
- **After installing tilt steering column, make sure that steering column moves upwards and downwards smoothly and stops when tilt lever is fixed.**

Tightening torque
Steering column lower bolt (a): 14 N·m (1.4 kgf-m, 10.5 lbf-ft)
Steering column upper nut (b): 14 N·m (1.4 kgf-m, 10.5 lbf-ft)

4) Attach steering column harness clamps (5) to its bracket and then connect P/S control module connector (6).



IDL70A620003-02

5) Install steering lower shaft. ☞(Page 6B-11)
6) Install steering joint cover.
7) Install lighting switch and wiper switch.
   - Lighting switch: ☞(Page 9B-9)
   - Wiper switch: ☞(Page 9D-8)
8) Install immobilizer control module to steering lock assembly (if equipped). ☞(Page 10C-13)
9) Install contact coil cable assembly or cancel cam. Refer to "Contact Coil Cable Assembly Removal and Installation (Air Bag Model)" (Page 6B-3)or "Cancel Cam Removal and Installation (Non-Air Bag Model)" (Page 6B-5).
10) Install steering wheel. ☞(Page 6B-3)
11) Install steering column hole cover.

Steering Column Inspection

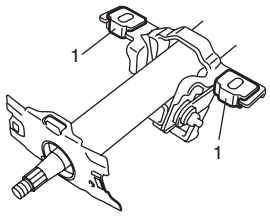
AENDL70A6206009

NOTE

Vehicles involved in accidents resulting in body damage, where steering column has been impacted or air bag deployed may have a damaged or misaligned steering column.

Check the following items for accident damage. If abnormality is found, replace steering column assembly with new one.

- Check that two capsules (1) are attached to steering column bracket securely.

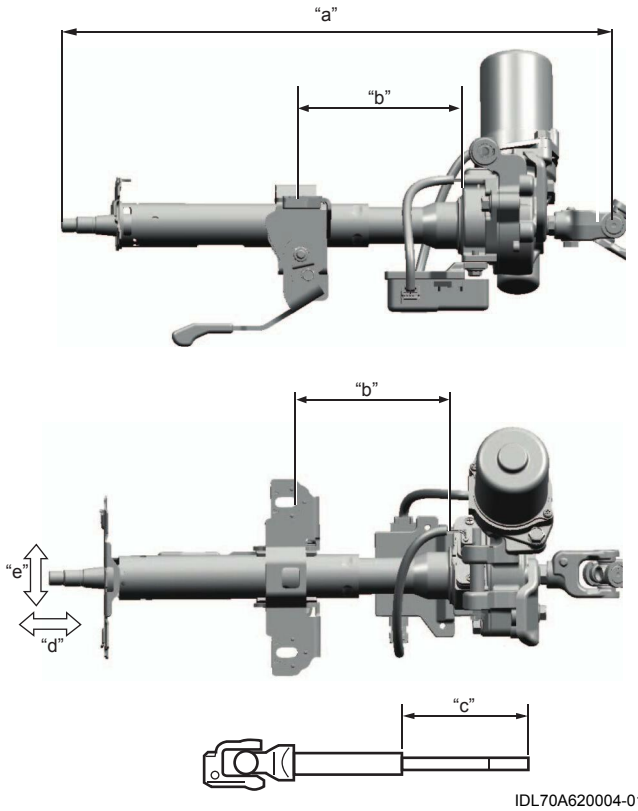


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- Take measurement “a”, “b” and “c” as shown in figure.

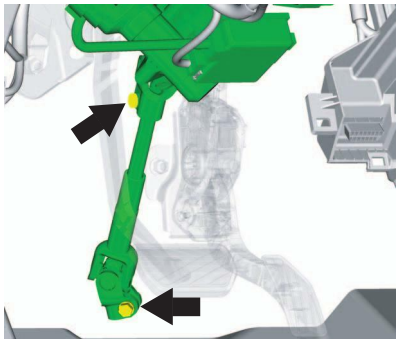
Power steering column length
“a”: 482.0 ± 2.5 mm (18.97 ± 0.098 in.)
“b”: 154.5 ± 1.2 mm (6.08 ± 0.047 in.)
“c”: 100.0 ± 1.3 mm (3.93 ± 0.051 in.)

- Check that there is no axial looseness “d” and no axially-vertical looseness “e” for steering column shaft.



IDL70A620004-01

- Check steering lower shaft joints and steering lower shaft for any damages such as crack, breakage, malfunction or excessive play.



I8C50B620009-01

- Check steering column shaft for smooth rotation.
- Check steering lower shaft and steering column for bend, cracks or deformation.

Steering Lock Assembly Removal and Installation

AENDL70A6206010

Removal

NOTICE

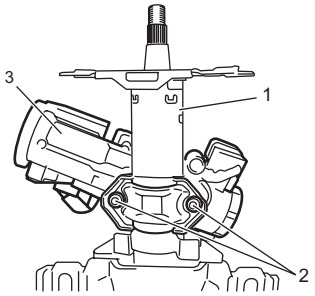
There are two different removal procedures for steering lock assembly (3) which depends on following parts to be replaced.

- **Steering column (1)**
- **Steering lock assembly**

Select proper removal procedure. Otherwise, steering column may be broken.

When reuse steering lock assembly

1) Remove steering column (1). ☞(Page 6B-6)
2) Loosen steering lock bolts (2) using center punch, then remove steering lock assembly (3) from steering column (1).



I8C50A620020-01

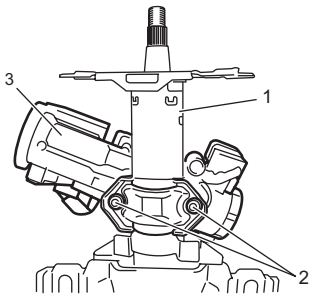
When reuse steering column

1) Remove steering column (1). ☞(Page 6B-6)
2) Cut bolt head of steering lock bolts (2) using grinder.

NOTICE

Be careful not to damage the steering column with excessive shock.

3) Remove steering lock assembly (3) from steering column (1).



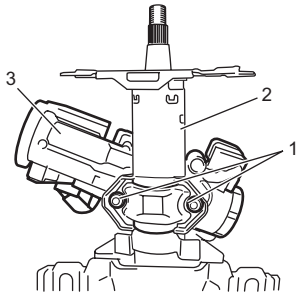
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Installation

Reverse removal procedure noting the following.

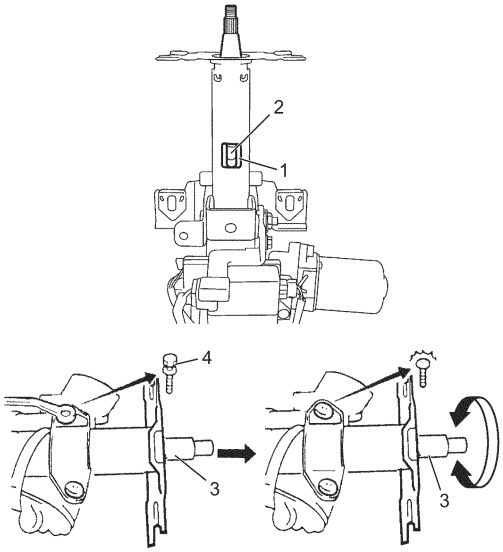
NOTICE

- **If steering lock bolts (1) are loosened using center punch, replace steering column (2) with new one. Also, must not be expose new steering column (2) to any shock.**
- **When steering lock assembly (3) is replaced, after installation, check that steering column and torque sensor.**
  - **Steering column: ☞(Page 6B-8)**
  - **Torque sensor: ☞(Page 6C-30)**
- **Never reuse steering lock bolts (1). Otherwise, steering lock assembly cannot be installed on steering column securely.**



I8C50A620021-01

- Align oblong hole (2) of steering shaft (3) to the center of hole (1) in steering column.
- Turn ignition key to “LOCK” position and pull it out, and align lug of steering lock assembly with hole of steering shaft.
- Tighten new steering lock bolts (4) until head of each bolt is broken off.
- Turn ignition key to “ACC” or “ON” position and check that steering shaft (3) rotates smoothly. And turn ignition key to “LOCK” position and pull it out, then check for lock operation.



I8C50A620022-01

- Install steering column. ☞(Page 6B-6)
- If ignition switch cylinder has been replaced, register ignition key transponder code in ECM. ☞(Page 10C-13)

Steering Lock Assembly Disassembly and Reassembly

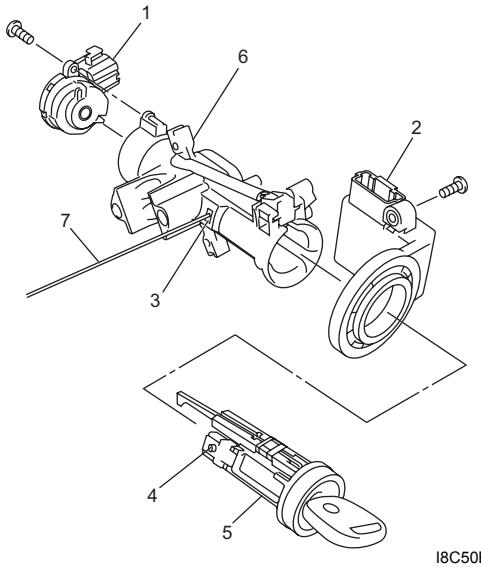
AENDL70A6206011

NOTE

- **Ignition switch and ignition switch cylinder can be replaced without removing steering lock assembly.**
- **When removing steering lock assembly, refer to “Steering Lock Assembly Removal and Installation” (Page 6B-8).**

Disassembly

1) Remove ignition switch (1). ☞(Page 6B-10)
2) Remove immobilizer control module (2) (if equipped). ☞(Page 10C-13)
3) Turn ignition key to “ACC” position, push lock button (4) on ignition switch cylinder by inserting rod which diameter is out 2 mm (7) into through hole (3).
4) Pull out ignition switch cylinder (5) from steering lock assembly (6).



I8C50B620013-02

Reassembly

Reverse removal procedure noting the following.

- Turn ignition key to “ACC” position, insert ignition switch cylinder to steering lock assembly securely.

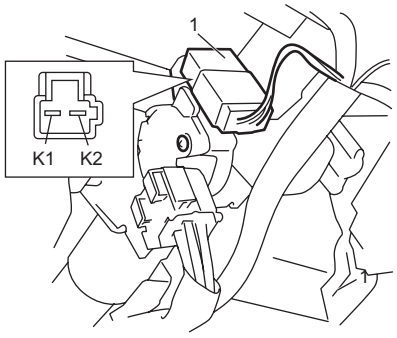
Steering Lock Assembly Inspection

AENDL70A6206012

NOTE

Steering lock assembly can be inspected on vehicle.

Disconnect connector from steering lock assembly, and measure resistance between terminals of steering lock assembly connector (1). If defective, replace steering lock assembly with new one.



[B] \ [A]	K1	K2
[C]	○	○
[D]		

I8C50A620024-02

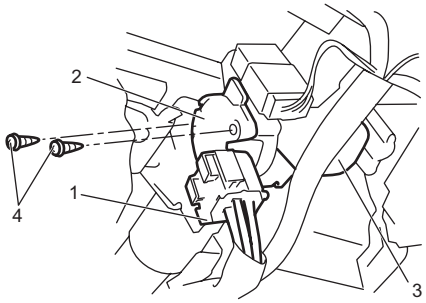
[A]: Terminal	[C]: Key inserted
[B]: Condition	[D]: Key pulled out

Ignition Switch Removal and Installation

AENDL70A6206013

Removal

1) Disconnect negative (–) cable at battery.
2) Turn steering wheel to remove tapping screws and standard screw, and then remove steering column upper cover and lower cover. ☞(Page 6B-3)
3) Confirm that ignition key is removed.
4) Disconnect connector (1) from ignition switch (2).
5) Remove screws (4), and then remove ignition switch (2) from steering lock assembly (3).



I8C50B620012-02

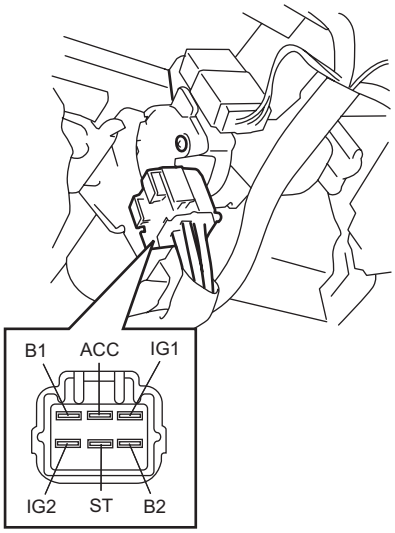
Installation

Reverse removal procedure.

Ignition Switch Inspection

AENDL70A6206014

- Check for continuity between terminals at each switch position. If check result is not as specified, replace ignition switch with new one.



Position \ Terminal	B1	B2	ACC	IG1	IG2	ST
LOCK						
ACC	○		○			
ON	○		○	○		
		○			○	
START	○			○		
		○				○

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Steering Lower Shaft Removal and Installation

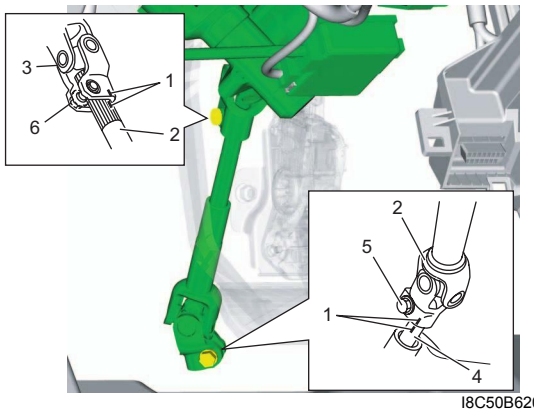
AENDL70A6206015

NOTICE

If the steering wheel of airbag model is turned with the steering lower shaft removed, the neutral setting of the contact coil may be disturbed. If it is turned in either direction more than about two-and-a-half turns, the contact coil will break.
Never turn the steering wheel with the steering lower shaft removed.

Removal

1) Turn steering wheel so that vehicle's front wheels are at straight-ahead position.
2) Turn ignition switch to "LOCK" position and remove key.
3) Remove steering joint cover.
4) Make alignment marks (1) to the following parts for a correct installation.
   - Steering lower shaft (2) and shaft joint of steering column (3)
   - Steering lower shaft (2) and pinion shaft (4)
5) Remove steering lower shaft joint bolts (5) and steering column joint bolt (6).
6) Remove steering lower shaft (2).

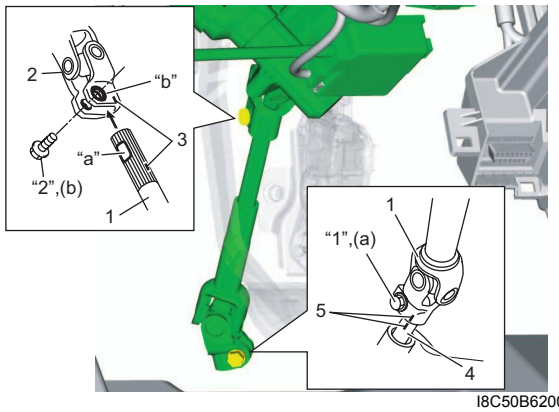


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Installation

1) Check that vehicle's front wheels are at straight-ahead position.
2) Align flat part "a" of steering lower shaft (1) with bolt hole "b" of steering shaft joint (2) of steering column as shown. Then insert steering lower shaft into steering lower shaft joint of steering column while aligning marks (3).
3) Fit joint part of steering lower shaft (1) onto pinion shaft (4) while aligning marks (5).
4) Tighten steering lower shaft joint bolt and steering column joint bolt to specified torque in numerical order of ("1" through "2") indicated in figure.

Tightening torque
Steering lower shaft joint bolt (a): 35 N·m (3.5 kgf-m, 25.8 lbf-ft)
Steering column joint bolt (b): 35 N·m (3.5 kgf-m, 25.8 lbf-ft)



I8C50B620011-02

Specifications

Tightening Torque Specifications

AENDL70A6207001

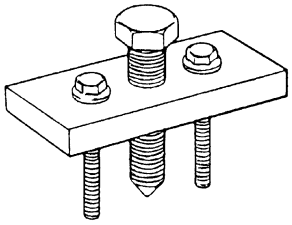
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Steering shaft nut	33	3.4	24.5	☞(Page 6B-3)
Steering column lower bolt	14	1.4	10.5	☞(Page 6B-7)
Steering column upper nut	14	1.4	10.5	☞(Page 6B-7)
Steering lower shaft joint bolt	35	3.5	25.8	☞(Page 6B-11)
Steering column joint bolt	35	3.5	25.8	☞(Page 6B-11)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
"Steering Wheel and Column Components" (Page 6B-1)
"Fasteners Information" in Section 0A (Page 0A-5)

Special Tools and Equipment

Special Tool

AENDL70A6208001

09944M36011 Steering wheel remover ☞(Page 6B-3)		

Power Assisted Steering System

Precautions

Fastener Caution

AENDL70A6300001

NOTICE

Failure to use correct fasteners or to properly use fasteners can cause parts or system damage.

- **When fasteners are removed, always reinstall them at the locations from which they were removed.**
- **All fasteners must be replaced with fasteners having the same part number. If a fastener of the correct part number is not available, a fastener of the same size having equal or higher strength may be used.**
- **This manual identifies and indicates special conditions for all non-reusable fasteners and fasteners requiring the use of thread-locking compound. Be sure to follow all instructions, including torque values.**

Precautions for Diagnosing Trouble

AENDL70A6300002

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

- Take a note of DTC indicated on SUZUKI scan tool.
- Before inspection, be sure to read “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3) and understand what is written there.
- As DTC is stored in memory of the P/S control module, be sure to clear memory after repair by performing the procedure described in “DTC Clearance” (Page 6C-8).

General Description

P/S System Description

AENDL70A6301001

Power steering system employs electronic power steering (EPS) system that is of a column assist type.
Electronic power steering (EPS) system consists of P/S control module and steering column assembly (including P/S motor and torque sensor).
Steering assist force is optimized by P/S control module in all vehicle speed ranges.
For location of P/S system component, refer to “Power Steering Control System Component Location” (Page 6C-4).

Description of P/S System Component Function

AENDL70A6301002

P/S system components		Function
Steering column assembly	**Torque sensor**	Using two circuits (i.e. main and sub circuits), torque sensor outputs voltages proportional to steering input torque and direction to P/S control module.
	P/S motor	P/S motor assists steering force by motor torque that is generated according to electric current value from the P/S control module.
P/S control module		• P/S control module determines the ratio and the direction to assist steering force based on the voltage from torque sensor, vehicle speed signal from ECM, and controls electric current value for P/S motor. • P/S control module judges engine’s condition (running or stopped) on engine speed signal from ECM

P/S system components	Function
ECM	• ECM outputs engine speed signal to P/S control module. • ECM outputs vehicle speed signal to P/S control module.
"P/S" warning light	"P/S" warning light comes on when P/S control module detects a trouble in the system.

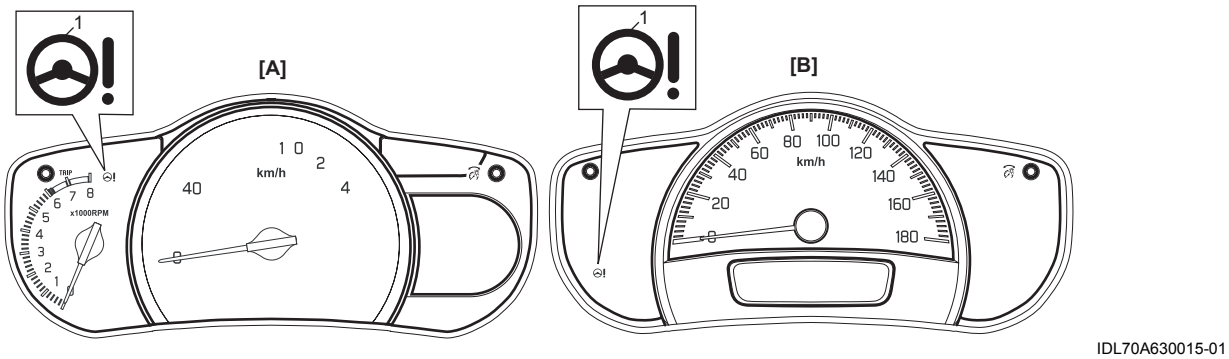
On-Board Diagnostic System Description

AENDL70A6301003

General Description

The P/S control module has an on-board diagnostic system which detects a malfunction in this system. When diagnosing troubles, be sure to have full understanding of the outline of each item in "Precautions for Diagnosing Trouble" (Page 6C-1), and then execute diagnosis according to "P/S System Check" (Page 6C-5).
The P/S control module performs on-board diagnosis (self-diagnosis) on the system and operates the "P/S" warning light (1) as follows.

- The "P/S" warning light lights when the ignition switch is turned to ON position (but the engine at stop) regardless of the condition of the P/S control system. This is only to check if the "P/S" warning light operates properly.
- If no trouble is found after engine start (while engine is running), the "P/S" warning light turns OFF.
- When the P/S control module detects a trouble the "P/S" warning light comes ON to warn the driver of the trouble. At the same time it stores the exact trouble area in memory inside of the P/S control module.



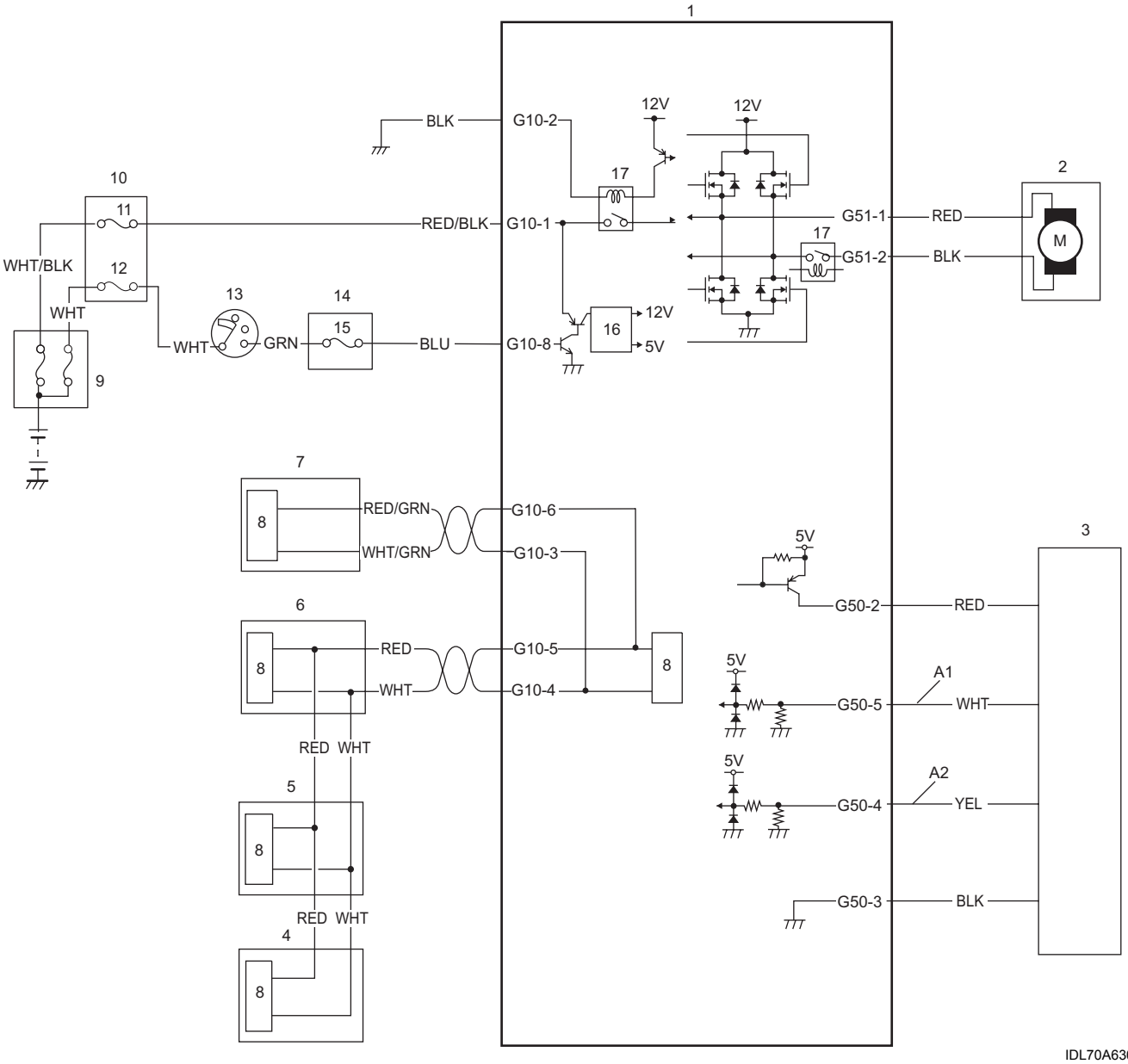
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[A] With tachometer	[B] Without tachometer

Schematic and Routing Diagram

P/S System Circuit Diagram

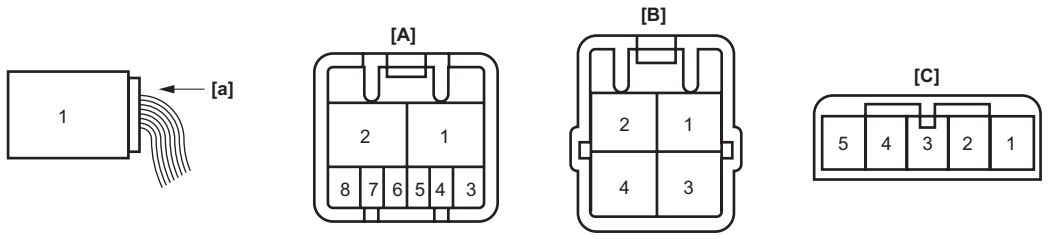
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IDL70A630001-04

A1. Torque sensor main circuit	6. BCM	13. Ignition switch
A2. Torque sensor sub circuit	7. Combination meter	14. Junction block assembly
1. P/S control module	8. CAN driver	15. “IG1 SIG” fuse
2. P/S motor	9. Main fuse box	16. Power supply circuit
3. Torque sensor	10. Individual circuit fuse box No.1	17. Fail-safe relay
4. ECM	11. “P/S” fuse	
5. ABS control module (If equipped)	12. “IGN” fuse	

Terminal Arrangement of P/S Control Module Connector (Viewed from Harness Side)



I8C50A630002-02

[A]: P/S control module connector “G10” (View [a])	[C]: Torque sensor connector “G50” (View [a])
[B]: P/S motor connector “G51” (View [a])	1. P/S control module

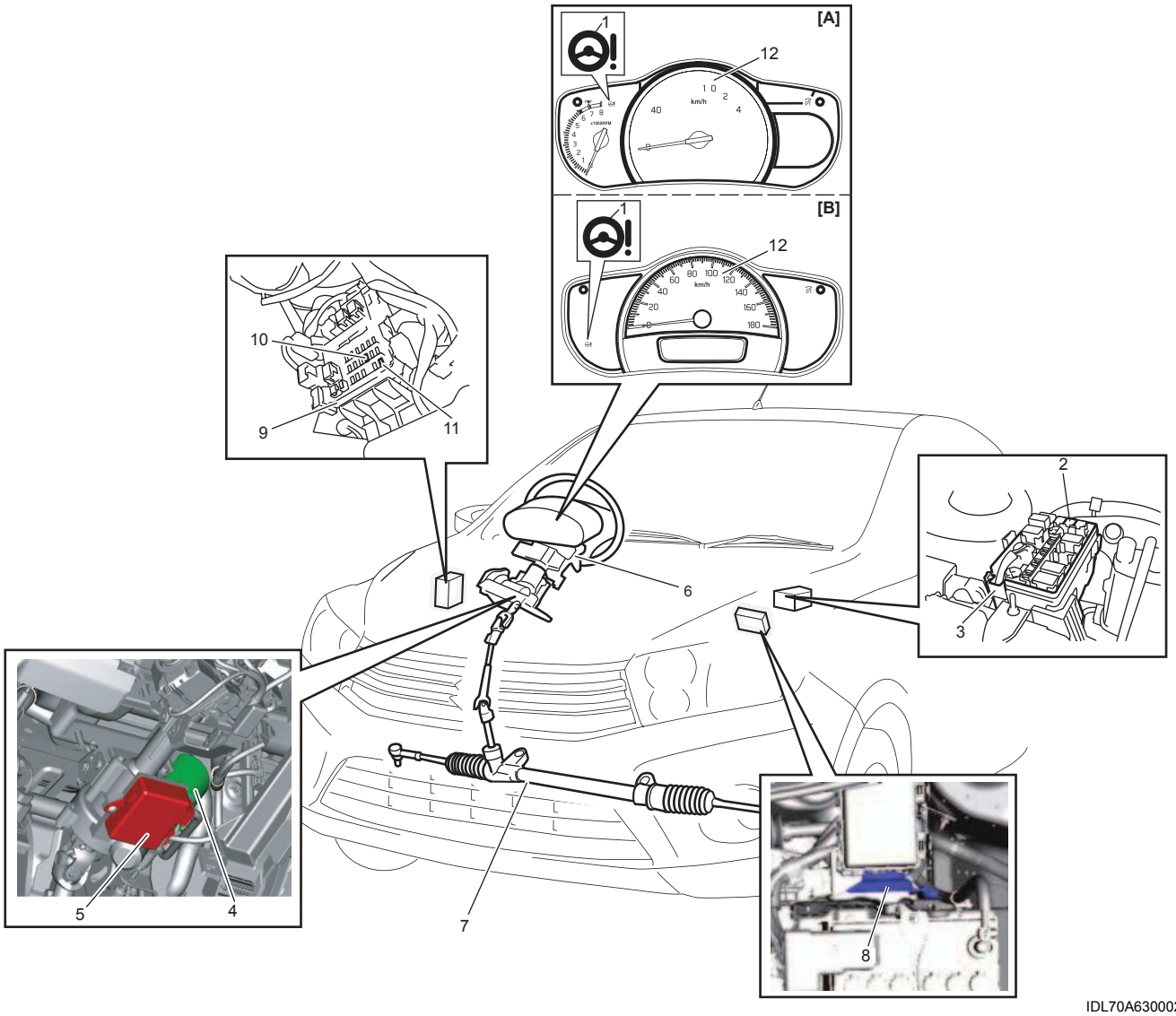
NOTE

For circuit name and terminal voltage, refer to “Inspection of P/S Control Module and Its Circuits” (Page 6C-19).

Component Location

Power Steering Control System Component Location

AENDL70A6303001



IDL70A630002-06

[A]: With tachometer	4. P/S motor	9. Junction block assembly
[B]: Without tachometer	5. P/S control module	10. “MTR” fuse
1. “P/S” warning light	6. Steering column assembly (including P/S motor and torque sensor)	11. “IG1 SIG” fuse
2. “P/S” fuse	7. Steering gear case assembly	12. Combination meter
3. Individual circuit fuse box No.1	8. ECM	

Diagnostic Information and Procedures

P/S System Check

AENDL70A6304001

⚠ WARNING

If you do not select a suitable route and take proper precautions when performing a road test, an accident can occur.

- **Select a level road with no traffic to minimize the risk of accident.**
- **Perform the test extremely carefully.**
- **Perform the road test using 2 persons, a driver and an assistant.**

Refer to the following items for the details of each step.

Step	Action	Yes	No
1	**Customer complaint analysis ☞(Page 6C-7)** 1) Perform customer complaint analysis. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	**DTC check, record and clearance ☞(Page 6C-7)** 1) Check for DTC (including pending DTC). *Is there any DTC(s)?*	Print DTC or write it down and clear it by referring to “DTC Clearance” (Page 6C-8) and go to Step 3.	Go to Step 4.
3	**Visual inspection ☞(Page 6C-7)** 1) Perform visual inspection. ☞(Page 6C-11) *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 5.
4	**Visual inspection ☞(Page 6C-7)** 1) Perform visual inspection. ☞(Page 6C-11) *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 8.
5	**Trouble symptom confirmation ☞(Page 6C-7)** 1) Confirm trouble symptom. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	**Rechecking and record of DTC ☞(Page 6C-7)** 1) Recheck for DTC. ☞(Page 6C-8) *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	**Rechecking and record of DTC ☞(Page 6C-7)** 1) Recheck for DTC. ☞(Page 6C-8) *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	**Steering symptom diagnosis and P/S system symptom diagnosis ☞(Page 6C-7)** 1) Check and repair. - Steering symptom diagnosis: ☞(Page 6A-1) - P/S system symptom diagnosis: ☞(Page 6C-12) *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.

Step	Action	Yes	No
9	**Troubleshooting for DTC ☞(Page 6C-8)** 1) Check and repair. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
10	**Intermittent problems check ☞(Page 6C-8)** 1) Check for intermittent problems. *Is there any faulty condition?*	Repair or replace malfunction part(s), and go to Step 11.	Go to Step 11.
11	**Final confirmation test ☞(Page 6C-8)** 1) Clear DTC if any. 2) Perform final confirmation test. *Is there any problem symptom, DTC or abnormal condition?*	Go to Step 6.	End.

Step 1: Customer Complaint Analysis
Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such an inspection form will facilitate collecting information to the point required for proper analysis and diagnosis. Check if the problem described in "Customer questionnaire" occurs actually in the vehicle if necessary. (This step should be performed with the customer if possible.)

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

Problem Symptoms	• Steering wheel feels heavy • Vehicle pulls to one side during straight driving • Poor recovery from turns • Too much play in steering • Abnormal noise while vehicle is running: from motor, from rack and pinion, other _____ • Other _____
Frequency of Occurrence	• Continuous/Intermittent (times a day, a month)/other _____
Conditions for Occurrence of Problem	• Vehicle at stop & ignition switch ON: • When starting: at initial start only/at every start/Other _____ • Vehicle speed while: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other _____ • Road surface condition: Paved road/rough road/snow-covered road/other _____ • Chain equipment:
Environmental Condition	• Weather: fair/cloudy/rain/snow/other _____ • Temperature: °F (°C)
DTC	• First check: No DTC/ DTC ( ) • Second check after driving test: No DTC/ DTC ( )

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NOTE

This form is a standard sample. It should be modified according to conditions characteristic of each market.

Step 2: DTC Check, Record and Clearance
Check DTC (current and pending DTC) referring to "DTC Check" (Page 6C-8).
If DTC is indicated, print it or write it down and then clear it referring to "DTC Clearance" (Page 6C-8).

Step 3 and 4: Visual Inspection
Visually check for "P/S" warning light performs proper condition and connector connects proper each parts referring to "Visual Inspection" (Page 6C-11).

Step 5: Trouble Symptom Confirmation
Based on information obtained in "Step 1: Customer Complaint Analysis" (Page 6C-7) and "Step 2: DTC Check, Record and Clearance" (Page 6C-7), confirm trouble symptoms. Also, reconfirm trouble symptom by performing test drive and turning steering wheel fully to right and left at stopped vehicle.

Step 6 and 7: Rechecking and Record of DTC
Refer to "DTC Check" (Page 6C-8) for checking procedure.

Step 8: Steering Symptom Diagnosis and P/S System Symptom Diagnosis
Perform basic steering system check first. ☞(Page 6A-1)
Near the end of the flow, check the parts of the system suspected as a possible cause referring to "P/S System Symptom Diagnosis" (Page 6C-12) and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic P/S system check) and repair or replace faulty parts, if any.

Step 9: Troubleshooting for DTC
Perform applicable DTC troubleshooting and repair or replace faulty parts.

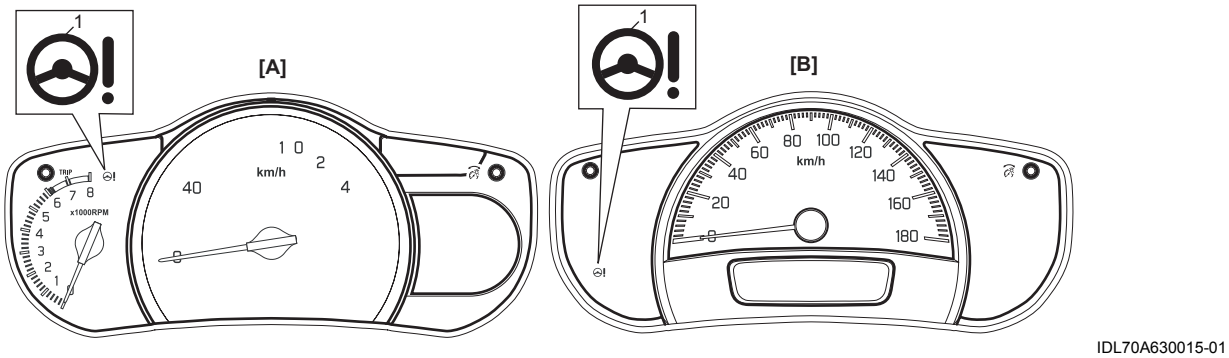
Step 10: Intermittent Problems Check
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11) and related circuit of DTC recorded in Step 2.

Step 11: Final Confirmation Test
Confirm that the problem symptom has gone and the P/S system is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

"P/S" Warning Light Check

AENDL70A6304002

1) Turn ignition switch to ON position (without engine running) and check if the "P/S" warning light (1) lights up. If the light does not light up, go to ""P/S" Warning Light Does Not Come ON with Ignition Switch Turned ON before Engine Starts" (Page 6C-12) of the diagnostic flows.
2) Start engine and check if the "P/S" warning light turns OFF. If light remains ON and no DTC is stored in P/S control module, go to ""P/S" Warning Light Remains ON Steady after Engine Starts" (Page 6C-13) for troubleshooting.



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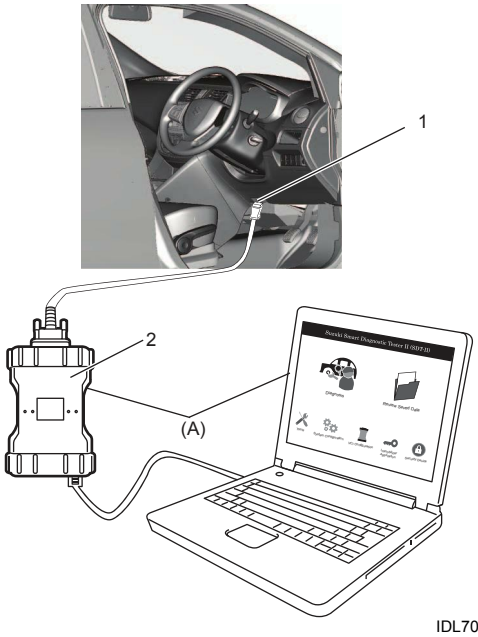
[A]: With tachometer	[B]: Without tachometer

DTC Check

AENDL70A6304003

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool (2) to DLC (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

3) Start engine.
4) Read DTC according to the instructions displayed on SUZUKI scan tool. For further details, refer to operator's manual for SUZUKI scan tool.

NOTE

If communication between SUZUKI scan tool and P/S control module is not possible, check the following points for recovery.

- **SUZUKI scan tool and communication cable.**
- **DLC power circuit and ground circuit.**
- **CAN communication system malfunction ("Control Module Communication Bus Off" is detected in any control module.)"CAN DTC (Lost Communication and Communication Bus Off) Table" in Section 10H (Page 10H-8)**

5) Turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Clearance

AENDL70A6304004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to DLC.
3) Turn ignition switch to ON position.

4) Clear DTC according to the instructions displayed on SUZUKI scan tool. For further details, refer to operator's manual for SUZUKI scan tool.
5) Turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Table

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NOTE

- **If you do not perform the P/S System Check before starting the DTC diagnosis, the diagnosis will show a false result.**
  Be sure to perform the "P/S System Check" (Page 6C-5)before starting the diagnosis.
- ***D/C (Driving Cycle) is a duration from an engine start-up to the following engine shut-off.**
  — 1 D/C: When a malfunction is detected in 1st driving cycle. DTC is detected as current DTC.

DTC	DTC item	DTC detecting condition	*D/C	"P/S" warning light
C1111 ☞(Page 6C-14)	Torque Sensor (Main) Circuit Malfunction	Voltage of torque sensor signal (main) circuit "G50-5" is higher than specified value (4.7 V) or lower than specified value (0.3 V) for more than specified time.	1	Light up
C1113 ☞(Page 6C-14)	Torque Sensor (Main and Sub) Signal Difference	Voltage difference between torque sensor terminals "G50-4" and "G50-5" is higher than specification continuously for more than specified time.	1	Light up
C1114 ☞(Page 6C-14)	Torque Sensor Power Supply (5 V) Circuit Malfunction	Voltage of 5V reference power supply for torque sensor circuit "G50-2" is higher than specified value (5.5 V) or lower than specified value (4.5V) for more than specified time.	1	Light up
C1115 ☞(Page 6C-14)	Torque Sensor (Sub) Circuit Malfunction	Voltage of torque sensor signal (sub) circuit "G50-4" is higher than specified value (4.7 V) or lower than specified value (0.3 V) for more than specified time.	1	Light up
C1141 ☞(Page 6C-15)	P/S Motor Circuit Voltage Malfunction	Voltage difference between of P/S motor output terminals "G51-1" and "G51-2" is higher than specified value (8.5 V) or lower than specified value (0.2 V) for more than specified time.	1	Light up
C1142 ☞(Page 6C-15)	P/S Motor Circuit Current Malfunction 1	Measured motor drive current is higher than target value by 10 A or more.	1	Light up
C1143 ☞(Page 6C-15)	P/S Motor Circuit Current too Large	Measured motor drive current is more than 45 A.	1	Light up
C1145 ☞(Page 6C-15)	P/S Motor Circuit Current Malfunction 2	Measured motor drive current is lower than 2A even if target motor drive current is more than 4A.	1	Light up
C1152 ☞(Page 6C-16)	Fail-Safe Relay Malfunction (Melting stuck)	Measured voltage of fail-safe relay contact is more than 5.5 V even if fail-safe relay off is commanded.	1	Light up
C1153 ☞(Page 6C-16)	Power Supply Voltage too Low or too high	Measured voltage of fail-safe relay contact is lower than 9 V or higher than 17.5 V even if engine speed is more than 600 rpm and fail-safe relay ON is commanded.	1	Light up
C1154 ☞(Page 6C-16)	Fail-Safe Relay Malfunction (Contact)	Measured voltage of fail-safe relay contact is lower than 4 V even if fail-safe relay ON is commanded.	1	Light up
C1155 ☞(Page 6C-16)	P/S Control Module Internal Failure	P/S control module has internal failure	1	Light up
C1157 ☞(Page 6C-17)	P/S Motor Relay Malfunction	P/S motor relay is ON even if P/S motor relay OFF is commanded during initial check.	1	Light up
C1160 ☞(Page 6C-17)	Assist Map Signal Failure	Assist map data is not set in P/S control module.	1	Light up

DTC	DTC item	DTC detecting condition	*D/C	"P/S" warning light
C1161 ☞(Page 6C-18)	CAN Invalid Data from Vehicle Speed	Invalid data is received from ECM.	1	Light off
C1162 ☞(Page 6C-18)	CAN Invalid Data from Engine Speed			Light up
C1166 ☞(Page 6C-18)	Reliability Defect of Vehicle Speed Data			Light off
U0073 ☞(Page 6C-18)	Control Module Communication Bus Off	Transmitting and receiving error of P/S control module for specified time continuously	1	Light off
U0100 ☞(Page 6C-18)	Lost Communication With ECM	CAN communication data from ECM cannot be received.	1	Light up
U0155 ☞(Page 6C-18)	Lost Communication With Instrument Panel Cluster (IPC) Control Module	CAN communication data cannot be received from combination meter.	1	Light up

Fail-Safe Table

AENDL70A6304006

When any of the following DTCs is detected, P/S control module enters fail-safe mode as long as malfunction continues to exist but that mode is cancelled when the following cancel condition is met.

DTC	Fail-safe operation	Fail-safe operation cancel condition
C1111 ☞(Page 6C-14)	P/S motor and fail-safe relay turned off.	Ignition switch turned to OFF position.
C1113 ☞(Page 6C-14)		
C1115 ☞(Page 6C-14)		
C1141 ☞(Page 6C-15)		
C1142 ☞(Page 6C-15)		
C1143 ☞(Page 6C-15)		
C1145 ☞(Page 6C-15)		
C1152 ☞(Page 6C-16)		
C1153 ☞(Page 6C-16)	P/S motor turned off.	Recovery from malfunction or ignition switch turned to OFF position.
C1154 ☞(Page 6C-16)		
C1155 ☞(Page 6C-16)	P/S motor turned off or P/S motor and fail-safe relay turned off.	
C1157 ☞(Page 6C-17)	P/S motor and fail-safe relay turned off.	Setting ignition OFF.
C1160 ☞(Page 6C-17)	Default assist map is applied.	Setting of correct assist map.
C1161 ☞(Page 6C-18)	Assist value is decreased to minimum.	Receipt of the normal data or setting ignition OFF.
C1162 ☞(Page 6C-18)	P/S motor turned off.	
C1166 ☞(Page 6C-18)	Assist value is decreased to minimum.	
U0100 ☞(Page 6C-18)	P/S motor turned off or assist value is decreased to minimum.	

Scan Tool Data

AENDL70A6304007

NOTE

- **If communication between SUZUKI scan tool and P/S control module is not possible, check the following points for recovery.**
  — Suzuki scan tool and communication table.
  — DLC power circuit and ground circuit.
  — CAN communication system malfunction ("Control module Communication Bus Off" is detected in any control module.)☞(Page 10H-8).
- ***1: The voltage and current of motor decrease gradually after few seconds when steering wheel is turned.**

Scan tool data	Vehicle condition	Normal condition / reference value
Power Supply Voltage	Ignition switch ON	About 12 – 14 V
Sensor Power Supply	Ignition switch ON	About 8 – 10 V
Sensor (Main) Torque	Steering wheel at neutral	About – 0.8 – +0.8 N·m
	Vehicle stops with steering wheel fully turned to right	+10.00 – +14.00 N·m
	Vehicle stops with steering wheel fully turned to left	–10.00 – –14.00 N·m
Sensor (Sub) Torque	Steering wheel at neutral	About –0.8 – +0.8 N·m
	Vehicle stops with steering wheel fully turned to right	–10.00 – –14.00 N·m
	Vehicle stops with steering wheel fully turned to left	+10.00 – +14.00 N·m
Control Torque	Steering wheel at neutral	About –0.8 – +0.8 N·m
	Vehicle stops with steering wheel fully turned to right	+7.16 N·m
	Vehicle stops with steering wheel fully turned to left	–7.22 N·m
Target MOT Current	Steering wheel at neutral	0.00 A
	Vehicle stops with steering wheel fully turned to right	30.00 A *1
	Vehicle stops with steering wheel fully turned to left	30.00 A *1
Measured MOT Current	Steering wheel at neutral	0.00 A
	Vehicle stops with steering wheel fully turned to right	20.00 – 30.00 A *1
	Vehicle stops with steering wheel fully turned to left	20.00 – 30.00 A *1
Vehicle Speed	Drive vehicle at 40 km/h which using chassis dynamometer or checking speedometer	About 40 km/h
Engine Speed	Ignition switch ON	0 rpm
	Engine running at idle speed after warming up	Specified idle speed
MOT Drive Voltage	Steering wheel at neutral	0 – 1 V
	Vehicle stops with steering wheel fully turned to right	6 – 8 V *1
IGN Switch Status	Ignition switch ON	ON
	Other than above condition	OFF
System Power Status	Current flowing to P/S control module power supply	ON
	Other than above condition	OFF
Fail Safe FET Status	Power steering system operates normally	ON
	Performing fail-safe operation	OFF

Visual Inspection

AENDL70A6304008

Visually check the following parts and system.

Inspection Item		Referring section
Battery	Level, leakage, indicator	"Battery Description" in Section 1J (Page 1J-1)
Connectors of electric wire harness	Disconnection friction	"Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)
Fuses	Burning	"Cautions in Body Electrical System Servicing" in Section 9A (Page 9A-1)
"P/S" warning light	Operation	""P/S" Warning Light Check" (Page 6C-8)
Other parts that can be checked visually		

P/S System Symptom Diagnosis

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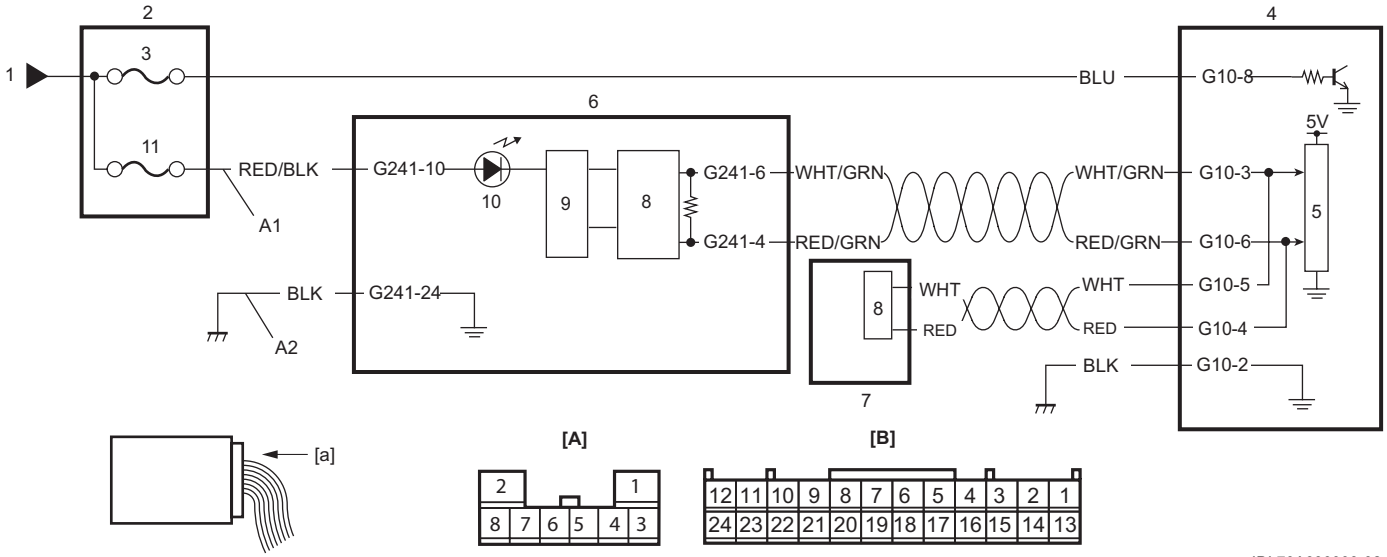
This section describes trouble diagnosis of the P/S system parts whose troubles are not indicated by Suzuki SDT Tool. When no malfunction is indicated by Suzuki SDT Tool and steering basic parts described in “Steering Symptom Diagnosis” in Section 6A (Page 6A-1) are all in good condition, check the following power steering system parts which may be a possible cause for each symptom of the steering.

Condition	Possible cause	Correction / Reference Item
Steering wheel feels heavy ***NOTE*** ***Perform “Steering Force Check” (Page 6C-23) before diagnosis.***	Improper installation of steering wheel	*Install steering wheel correctly.*
	Poor performance of torque sensor	*Check torque sensor. ☞(Page 6C-30)*
	Poor performance of P/S motor	*Check motor. ☞(Page 6C-31)*
	Malfunction of steering gear case assembly	*Replace steering gear case assembly. ☞(Page 6C-26)*
Steering wheel feels heavy momentarily when turning it to the left or right	Faulty pinion shaft rotation torque	*Check pinion shaft rotation torque.*
Poor recovery from turns	Poor performance of torque sensor	*Check torque sensor. ☞(Page 6C-30)*
	Malfunction of steering gear case assembly	*Replace steering gear case assembly. ☞(Page 6C-26)*
Vehicle pulls to one side during straight driving	Poor performance of torque sensor	*Check torque sensor. ☞(Page 6C-30)*
	Malfunction of steering gear case assembly	*Replace steering gear case assembly. ☞(Page 6C-26)*
Abnormal noise	Faulty pinion shaft rotation torque	*Check pinion shaft rotation torque.*

“P/S” Warning Light Does Not Come ON with Ignition Switch Turned ON before Engine Starts

AENDL70A6304011

Circuit Diagram



IDL70A630003-02

[A]: P/S control module connector “G10” (View [a])	2. Junction block assembly	7. BCM
[B]: Combination meter connector “G241” (View [a])	3. “IG1 SIG” fuse	8. CAN driver
A1. Combination meter power supply circuit	4. P/S control module	9. Meter driver
A2. Combination meter ground circuit	5. CPU	10. “P/S” warning light
1. Ignition power supply	6. Combination meter	11. “MTR” fuse

System Description

Operation (ON/OFF) of “P/S” warning light is controlled by P/S control module through combination meter.

If the P/S system is in good condition, P/S control module turns “P/S” warning light ON with the ignition switch ON, and then turns it OFF at the engine start. If an abnormality in the system is detected, “P/S” warning light is turned ON continuously by P/S control module. If P/S control module or CAN line is disconnected, “P/S” warning light is not turned ON.

Troubleshooting

Step	Action	Yes	No
1	**Warning light check** 1) Turn ignition switch ON. *Do the other warning lights come on?*	Go to Step 2.	Go to Step 4.
2	**DTC check** 1) Connect scan tool to DLC with ignition “OFF”. 2) When ignition is “ON”, check DTC. *Is there DTC U0073?*	Go to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).	Go to Step 3.
3	**Combination meter check** 1) Replace combination meter.☞(Page 9C-11) 2) Set ignition “ON”. *Does P/S warning light stay OFF?*	Replace P/S control module. “P/S Control Module Removal and Installation” (Page 6C-30)	End.
4	**Fuse check** *Is Circuit fuse for combination meter in good condition?*	Go to Step 5.	Replace fuse and check for short circuit to ground.
5	**Combination meter power supply circuit check** 1) Remove combination meter with ignition “OFF”. 2) Check for proper connection to combination meter connector. 3) If OK, when ignition is “ON”, measure voltage between “G241-10” and “G241-24”. *Is it 10 - 14 V?*	Replace combination meter and recheck warning light operation.☞(Page 9C-11)	Go to Step 6.
6	**Combination meter ground circuit check** 1) Set ignition “OFF”. 2) Measure resistance between “G241-24” terminal and ground. *Is it 1 Ω or less?*	Repair “A1” circuit.	Repair “A2” circuit.

“P/S” Warning Light Remains ON Steady after Engine Starts

AENDL70A6304012

Circuit Diagram

Refer to ““P/S” Warning Light Does Not Come ON with Ignition Switch Turned ON before Engine Starts” (Page 6C-12).

System Description

Refer to ““P/S” Warning Light Does Not Come ON with Ignition Switch Turned ON before Engine Starts” (Page 6C-12).

Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Start engine and recheck DTC of P/S control module. *Is there any DTC(s)?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**Combination meter check** 1) Replace combination meter. ☞(Page 9C-11) 2) Set ignition “ON”. *Does P/S warning light stay ON?*	Replace P/S control module.“P/S Control Module Removal and Installation” (Page 6C-30)	End.

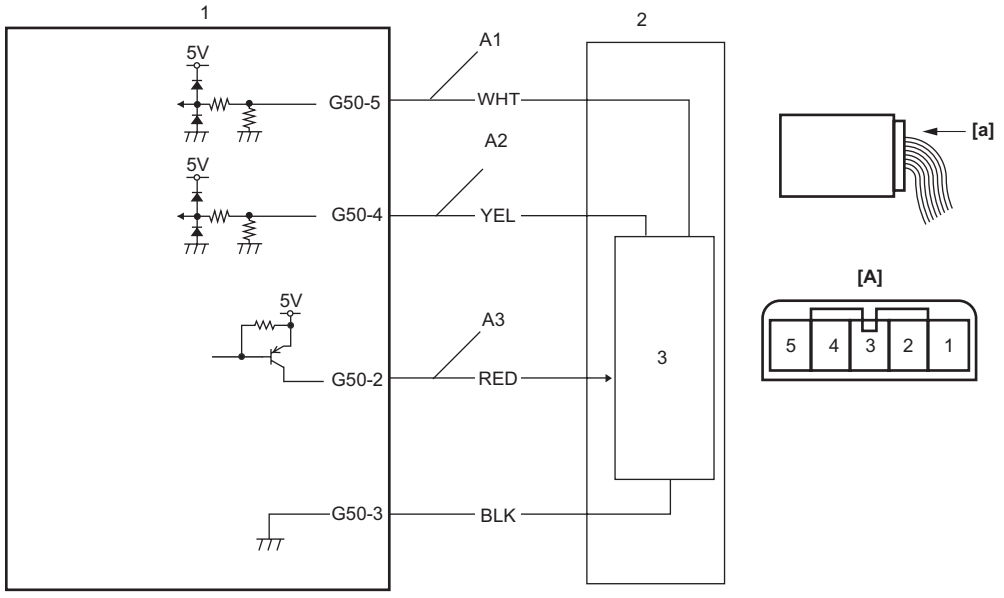
DTC C1111 / C1113 / C1114 / C1115

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1111: Torque Sensor (Main) Circuit Malfunction Voltage of torque sensor signal (main) circuit “G50-5” is higher than specified value (4.7 V) or lower than specified value (0.3 V) for more than specified time.	• Torque sensor circuit / connector • Torque sensor (steering column assembly) • P/S control module
C1113: Torque Sensor (Main and Sub) Signal Difference Voltage difference between torque sensor terminals “G50-5” and “G50-4” is higher than specification continuously for more than specified time.	
C1114: Torque Sensor Power Supply (5 V) Circuit Malfunction Voltage of 5V reference power supply for torque sensor circuit “G50-2” is higher than specified value (5.5 V) or lower than specified value (4.5V) for more than specified time.	
C1115: Torque Sensor (Sub) Circuit Malfunction Voltage of torque sensor signal (sub) circuit “G50-4” is higher than specified value (4.7 V) or lower than specified value (0.3 V) for more than specified time.	

Circuit Diagram



IDL70A630004-02

[A]: Torque sensor connector “G50” (View [a])	1. P/S control module
A1: Torque sensor signal (main) circuit	2. Torque sensor
A2: Torque sensor signal (sub) circuit	3. Torque sensor amplifier
A3. 5 V power supply for torque sensor	

DTC Confirmation Procedure

Upon completion of initial check drive vehicle.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “P/S System Check” performed?*	Go to Step 2.	Go to “P/S System Check” (Page 6C-5).
2	**Torque sensor circuit wire check** 1) Visually check torque sensor connector and torque sensor for open and short to ground. *Are they in good condition?*	Go to Step 3.	Repair or replace wiring.

Step	Action	Yes	No
3	**Torque sensor signal circuit voltage check** 1) Check insulation resistance between: "Torque sensor signal (Main) circuit (A1)" and vehicle body ground is infinity. "Torque sensor signal (Sub) circuit (A2)" and vehicle body ground is infinity. 2) With ignition switch turned to ON position, measure circuit voltage between: "Torque sensor signal (main) circuit (A1)" terminal and vehicle body ground is 0-1 V. "Torque sensor signal (sub) circuit (A2)" terminal and vehicle body ground is 0-1 V. *Is check result OK?*	Go to Step 4.	Torque sensor signal circuit wire is shorted to ground or power supply circuit.
4	**Torque sensor signal ground circuit check** 1) Measure voltage between torque sensor connector terminals "G50-3" and body ground. *Is voltage about 0 V?*	Go to Step 5.	Replace P/S control module.
5	**Torque sensor check** 1) Check torque sensor. ☞(Page 6C-30) *Is circuit in good condition?*	Replace P/S control module.	Replace torque sensor (steering column assembly).

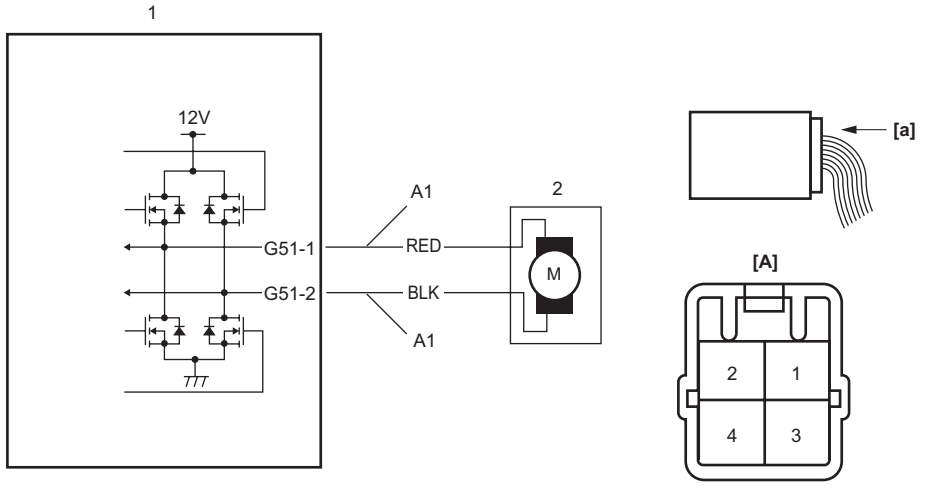
DTC C1141 / C1142 / C1143 / C1145

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1141: P/S Motor Circuit Voltage Malfunction Voltage difference between of P/S motor output terminals "G51-1" and "G51-2" is higher than specified value (8.5 V) or lower than specified value (0.2 V) for more than specified time.	• P/S control module wire / connector • P/S control module • P/S motor (steering column assembly)
C1142: P/S Motor Circuit Current Malfunction 1 Measured motor drive current is higher than target value by 10A or more.	
C1143: P/S Motor Circuit Current too Excessive Measured motor drive current is more than 45 A.	
C1145: P/S Motor Circuit Current Malfunction 2 Measured motor drive current is lower than 2A even if target motor drive current is more than 4A.	

Circuit Diagram



IDL70A630005-03

[A]: P/S motor connector “G51” (View [a])	1. P/S control module
A1. P/S motor output circuit	2. P/S motor

DTC Confirmation Procedure

1) Start engine.
2) Turn steering wheel fully in both direction.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “P/S System Check” performed?*	Go to Step 2.	Go to “P/S System Check” (Page 6C-5).
2	**P/S motor drive circuit wire check** 1) Disconnect P/S motor connector “G51”. 2) Check “P/S motor output circuit (A1)” wires for open and short to ground. *Is circuit in good condition?*	Go to Step 3	Repair “P/S motor output circuit (A1)” wires.
3	**P/S motor circuit check** 1) Check P/S motor and its circuit. ☞(Page 6C-31) *Is circuit in good condition?*	Replace P/S control module.	Replace P/S motor (steering column assembly).

DTC C1152 / C1154

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1152: Fail-Safe Relay Malfunction (Melted stuck) Measured voltage of fail-safe relay contact is more than 5.5 V even if fail-safe relay OFF is commanded.	P/S control module
C1154: Fail-Safe Relay Malfunction (Contact) Measured voltage of fail-safe relay contact is lower than 4 V even if fail-safe relay ON is commanded.	

DTC Troubleshooting

Replace P/S control module.

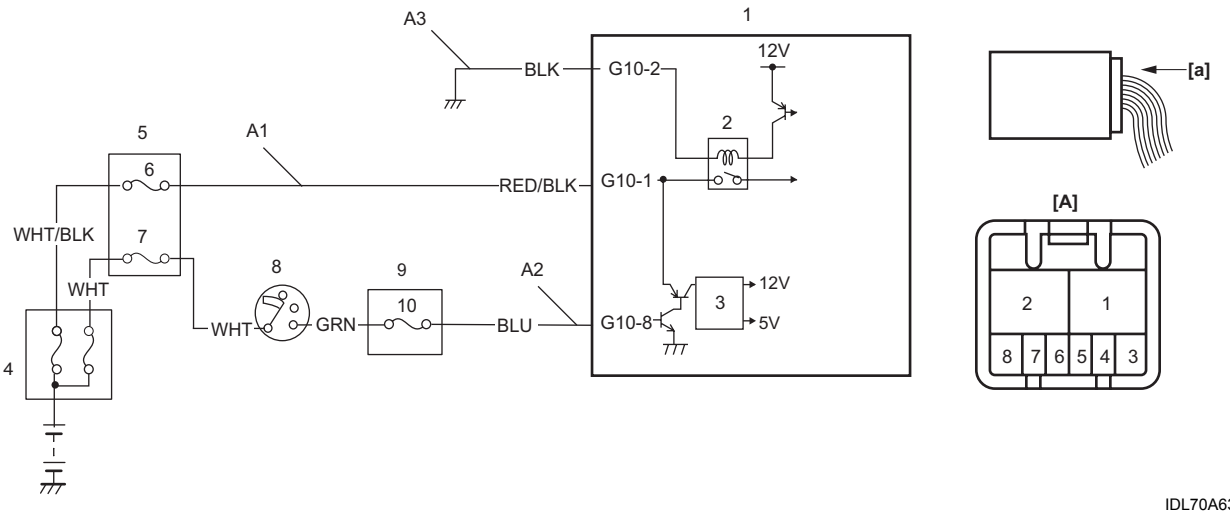
DTC C1153 / C1155

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1153: Power Supply Voltage Too Low or Too High Measured voltage of fail-safe relay contact is lower than 9 V or higher than 17.5 V even if engine speed is more than 600 rpm and fail-safe relay ON is commanded.	• Battery • Charging system wire / connector • Generator • P/S control module
C1155: P/S Control Module Internal Failure P/S control module has internal failure.	

Circuit Diagram



IDL70A630006-01

[A]: P/S control module connector “G10” (View [a])	1. P/S control module	5. Individual circuit fuse box No.1	9. J/B
A1: Main power supply for P/S control module circuit	2. Fail-safe relay	6. “P/S” fuse	10. “IG1 SIG” fuse
A2: IG1 power supply circuit	3. Power supply circuit	7. “IGN” fuse	
A3. Ground for P/S control module circuit	4. Main fuse box	8. Ignition switch	

DTC Confirmation Procedure

Run engine at idle speed for more than 5 seconds.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “P/S System Check” performed?*	Go to Step 2.	Go to “P/S System Check” (Page 6C-5).
2	**P/S control module power supply circuit check** 1) Disconnect P/S control module connector “G10”. 2) With ignition switch turned to ON position, check voltage between “Main power supply for P/S control module (A1)” wire and body ground. 3) With ignition switch turned to ON position, check voltage between “IG1 power supply for P/S control module (A2)” wire and body ground. *Is voltage about 12 V?*	Replace P/S control module.	Repair A1 circuit and A2 circuit and check charging system. ☞(Page 1J-12)

DTC C1157

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1157: P/S Motor Relay Malfunction P/S motor relay is ON even if P/S motor relay OFF is commanded during initial check.	P/S control module

DTC Troubleshooting

Replace P/S control module.

DTC C1160

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1160: Assist Map Signal Failure Assist map data is not set in P/S control module.	P/S control module

DTC Troubleshooting
Replace P/S control module.

DTC C1161 / C1162 / C1166

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
C1161: CAN Invalid Data from Vehicle Speed Invalid data is received from ECM.	• CAN communication circuit • ECM • P/S control module
C1162: CAN Invalid Data from Engine Speed Invalid data is received from ECM.	
C1166: Reliability Defect Of Vehicle Speed Data Invalid data is received from ECM.	

DTC Troubleshooting
C1161 / C1166
Refer to Confirmation Procedure for DTC P0500 Vehicle Speed Sensor “A” “DTC P0500” in Section 1A (Page 1A-69)

C1162
Refer to Confirmation Procedure for DTC P0335 Crankshaft Position Sensor “A” “DTC P0335 / P0336” in Section 1A (Page 1A-60)

DTC U0073

AENDL70A6304026

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8)

DTC U0100

AENDL70A6304028

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8)

DTC U0155

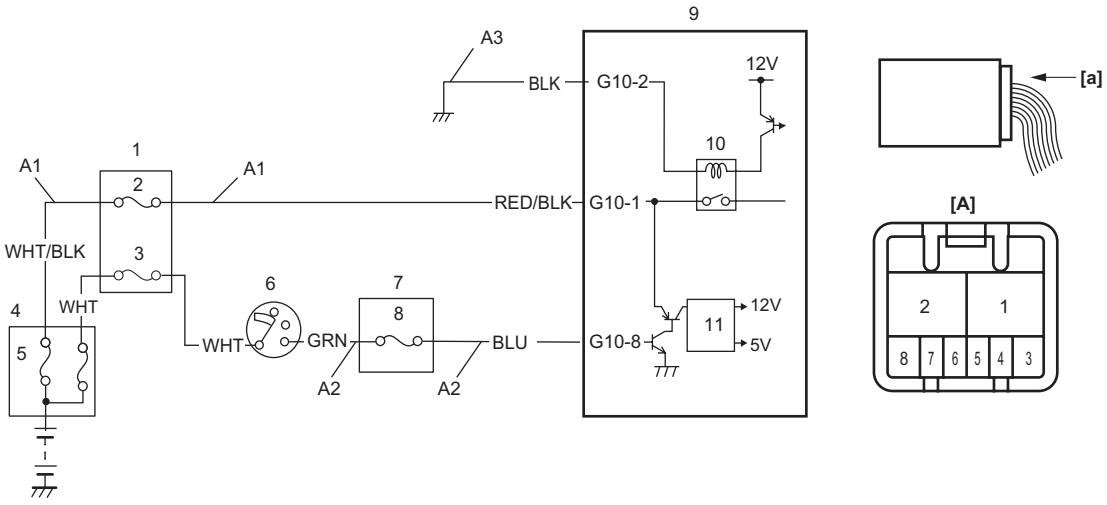
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Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8)

P/S Control Module Power Supply and Ground Circuit Check

AENDL70A6304020

Circuit Diagram



IDL70A630007-01

[A]: P/S control module connector (View [a])	2. "P/S" fuse	7. Junction block assembly
A1. Main power supply for P/S control module circuit	3. "IGN" fuse	8. "IG1 SIG" fuse
A2. Ignition switch signal for P/S control module circuit	4. Main fuse box	9. P/S control module
A3. Ground for P/S control module circuit	5. "Main" fuse	10. Fail-safe relay
1. Individual circuit fuse box No.1	6. Ignition switch	11. Power supply circuit

Step	Action	Yes	No
1	**Circuit fuse check** 1) Disconnect P/S control module connector "G10" with ignition switch turned OFF. 2) Check for proper connection to P/S control module connector at "G10-1", "G10-2" and "G10-8" terminals. 3) If OK, check "P/S" fuse and "IG1 SIG" fuse for blowing. *Are "P/S" fuse and "IG1 SIG" fuse in good condition?*	Go to Step 2.	Replace fuse(s) and check for short to ground in circuits connected to fuse(s).
2	**Power supply circuit check** 1) Measure voltage between "G10-1" terminal of P/S control module connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	"Main power supply for P/S control module circuit (A1)" wire is open.
3	**Ignition power supply circuit check** 1) Turn ignition switch to ON position. 2) Measure voltage between "G10-8" terminal of P/S control module connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 4.	"Ignition switch power supply circuit for P/S control module (A2)" wire is open.
4	**P/S control module ground circuit resistance check** 1) Turn ignition switch to OFF position. 2) Disconnect connector at "G10" from P/S control module. 3) Measure resistance between "G10-2" terminal of P/S control module connector and body ground. *Is resistance 1 Ω or less?*	Go to Step 5.	"Ground for P/S control module (A3)" wire is open or too high in resistance.
5	**P/S control module ground circuit voltage check** 1) Connect connector at "G10" to P/S control module. 2) Start engine. 3) Measure voltage between "G10-2" terminal of P/S control module connector and body ground when steering wheel fully turned to left or right. *Is voltage 0.3 V or less?*	P/S control module power supply and ground circuit is in good condition.	Repair or replace "ground for P/S control module (A3)" wire.

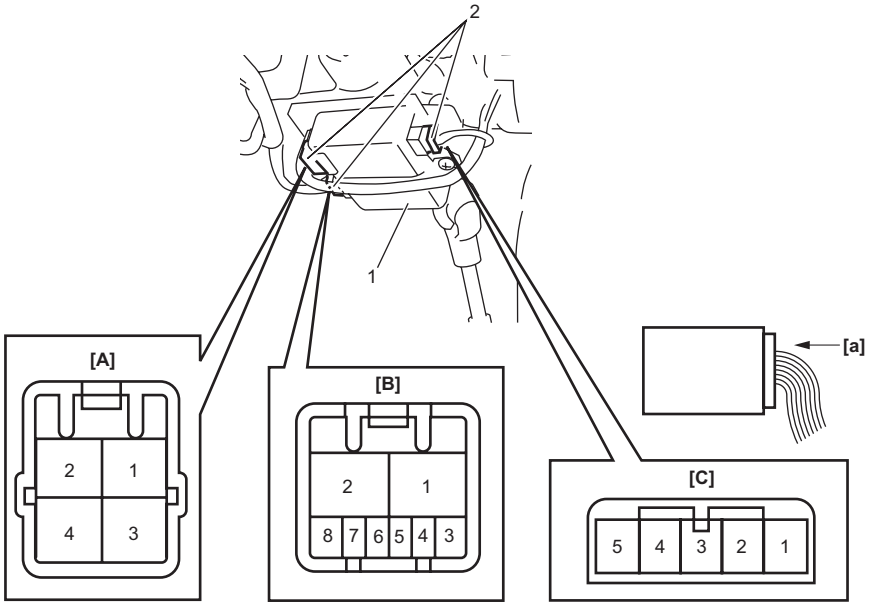
Inspection of P/S Control Module and Its Circuits

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The P/S control module (1) and its circuits can be checked at the P/S control module wiring connectors (2) by measuring voltage and resistance.

NOTICE

If you connect a voltmeter or an ohmmeter directly to the P/S control module by disconnecting the P/S control module connectors, you can damage the P/S control module.
Never connect a voltmeter or an ohmmeter directly to any terminal on the P/S control module by disconnecting the P/S control module connectors.



I8C50A630013-01

[A]: P/S motor connector “G51” (View [a])	[C]: Torque sensor connector “G50” (View [a])
[B]: P/S control module connector “G10” (View [a])	

Voltage Check

1) Remove steering column cover. ☞(Page 6B-3)
2) Check for voltage at each terminal with connectors connected to the P/S control module.

NOTE

As each terminal voltage is affected by the battery voltage, confirm if the battery voltage is 12 V or more when ignition switch is ON.

“G10” connector

Terminal	Circuit	Wire color	Normal voltage	Remarks
G10-1	Main power supply for P/S control module	RED/BLK	Approx. 12 V	Ignition switch is in any position
G10-2	Ground for P/S control module	BLK	0 V	Ignition switch is in any position
G10-3	CAN communication (CAN Low 2)	WHT/GRN	Approx. 3 V	Ignition ON
G10-4	CAN communication (CAN Low 1)	WHT/RED	Approx. 2.8 V Approx. 12 V	Ignition ON
G10-5	CAN communication (CAN High 1)	RED	0 – Approx. 3 V *1(“Reference waveform No.5” (Page 6C-22)	Ignition ON
G10-7	CAN communication (CAN High 2)	RED/GRN	0 – Approx. 5 V *1(“Reference waveform No.5” (Page 6C-22)	Ignition ON
G10-8	Ignition switch supply for P/S control module	BLU	Approx. 12 V	Ignition switch ON

“G51” connector

Terminal	Circuit	Wire color	Normal voltage	Remarks
G51-1	Motor out put (steering wheel turn light)	RED	0 – 12 V *1(“Reference waveform No.1” (Page 6C-21), “Reference waveform No.2” (Page 6C-22) or “Reference waveform No.3” (Page 6C-22))	Steering wheel turned left or right (measure voltage between “G51-1” and “G51-2”)
G51-2	Motor out put (steering wheel turn left)	BLK		
G51-3	—	—	—	—
G51-4	—	—	—	—

“G50” connector

Terminal	Circuit	Wire color	Normal voltage	Remarks
G50-2	5 V reference power supply for torque sensor	RED	Approx. 5 V	Ignition switch ON
G50-3	Ground for torque sensor	BLK	0 V	Ignition switch all positions
G50-4	Torque sensor signal (Sub)	YEL	Approx. 2.5 V	Steering wheel at neutral
			Approx. 1.2 V	Vehicle stops with steering wheel fully turned to right
			Approx. 3.8 V	Vehicle stops with steering wheel fully turned to left
G50-5	Torque sensor signal (Main)	WHT	Approx. 2.5 V	Steering wheel at neutral
			Approx. 3.8 V	Vehicle stops with steering wheel fully turned to right
			Approx. 1.2 V	Vehicle stops with steering wheel fully turned to left

NOTE

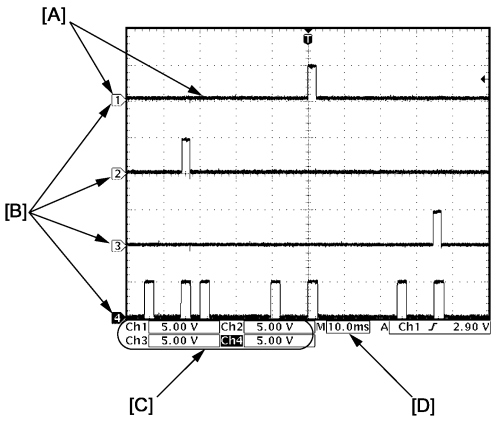
***1: Use oscilloscope for checking voltage of this circuit.**

Reference waveform

Shown below are reference waveforms observed at P/S control module terminals using oscilloscope.

NOTE

- **Waveform analysis is as follows.**



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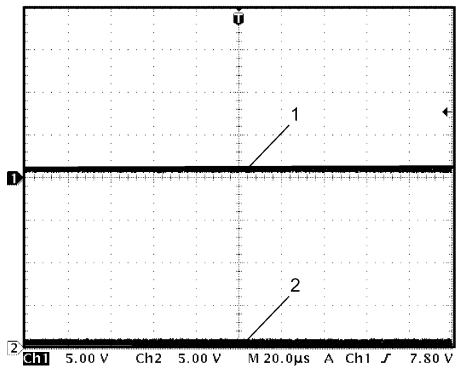
[A]: Waveform of channel 1	[C]: VOLT/DIV of each channel
[B]: Ground level of each channel	[D]: TIME/DIV

- **Waveform might change for measurement condition and vehicle spec.**

Reference waveform No.1

Motor output signal 1 (1), Motor output signal 2 (2), with engine idling.

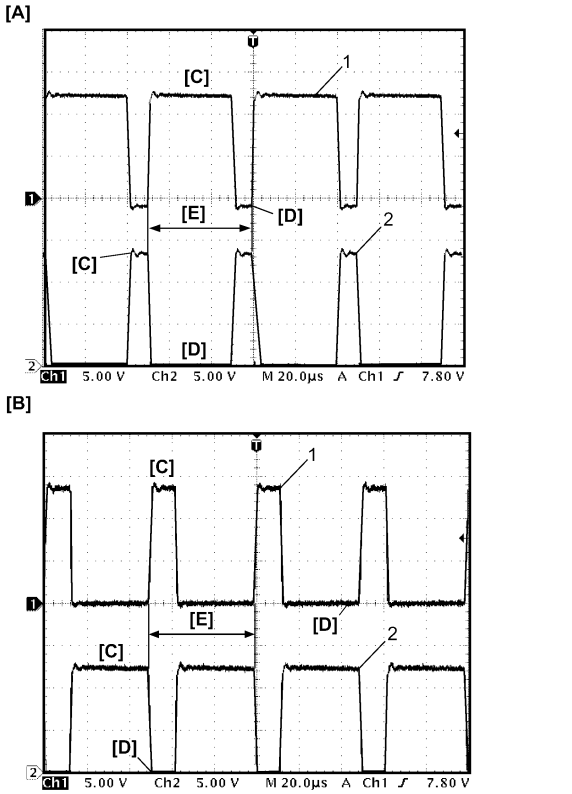
Measurement terminal	CH1: “G51-1” to vehicle body ground CH2: “G51-2” to vehicle body ground
Measurement condition	• Engine is idling and steering wheel at straight position



I8C50B630012-01

Reference waveform No.2
Motor output signal 1 (1), Motor output signal 2 (2), with engine idling

Measurement terminal	CH1: “G51-1” to vehicle body ground CH2: “G51-2” to vehicle body ground
Measurement condition	• Engine is idling and steering wheel is turned to left or right at turning speed of 90° /sec.

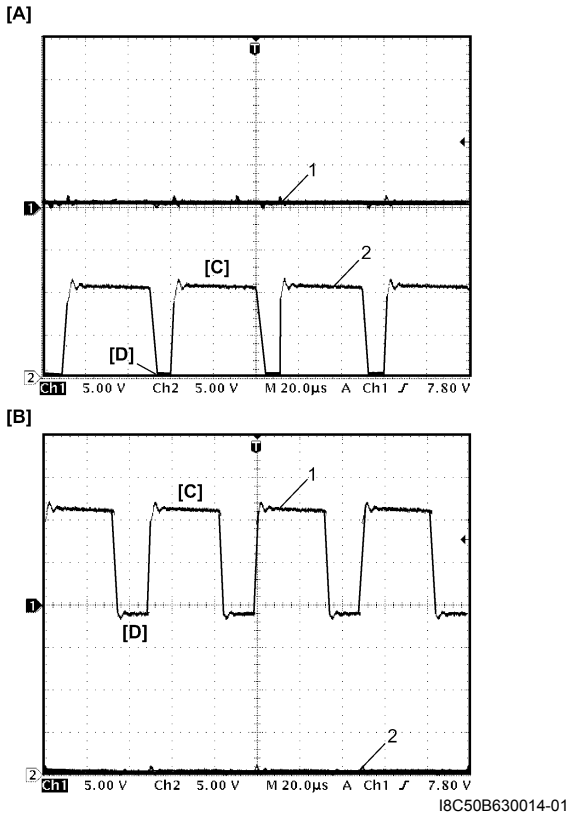


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[A]:	Steering wheel is turned left turning speed of 90° /sec.
[B]:	Steering wheel is turned right turning speed of 90° /sec.
[C]:	12 V ON
[D]:	GND ON
[E]:	1 duty cycle

Reference waveform No.3
Motor output signal 1 (1), Motor output signal 2 (2), with engine idling.

Measurement terminal	CH1: “G51-1” to vehicle body ground CH2: “G51-2” to vehicle body ground
Measurement condition	• Engine is idling and steering wheel is kept fully turned to left or right until it stops



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[A]:	Engine is idling and steering wheel is kept fully turned to left until it stops
[B]:	Engine is idling and steering wheel is kept fully turned to right until it stops
[C]:	12 V ON
[D]:	GND ON

Reference waveform No.4
Vehicle speed signal with vehicle running

Measurement terminal	CH1: “G10-7” to “G10-2”
Oscilloscope setting	Refer to “Reference waveform VSS Signal” under “Inspection of ECM and Its Circuits” in Section 1A (Page 1A-87).
Measurement condition	

Reference waveform
Refer to “Reference waveform VSS Signal” under “Inspection of ECM and Its Circuits” in Section 1A (Page 1A-87).

Reference waveform No.5
Engine speed signal with engine idling

Measurement terminal	CH1: “G10-6” to “G10-2”
Oscilloscope setting	Refer to “Reference waveform Engine revolution signal” under “Inspection of ECM and Its Circuits” in Section 1A (Page 1A-87).
Measurement condition	

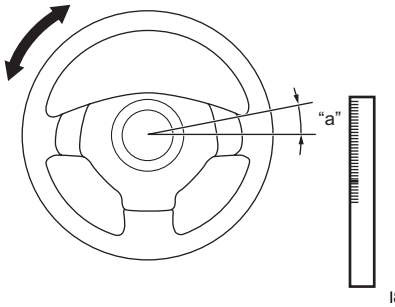
Reference waveform
Refer to “Reference waveform Engine revolution signal” under “Inspection of ECM and Its Circuits” in Section 1A (Page 1A-87).

Steering Wheel Play Check

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- Check steering wheel for looseness or rattle by moving it in its shaft direction and lateral direction.
  If check result is not OK, repair or replace faulty part (s).
- Check steering wheel for play, holding vehicle in straight-ahead position on the ground with engine stopped.
  If steering wheel play is not within specification, check the following components and replace any of them if defective.
  - Tie-rod end and tie-rod ball joint for wear
  - Suspension arm joint for wear
  - Steering shaft joint for wear
  - Steering pinion or rack gear for wear or breakage
  - Each part for looseness

Steering wheel play "a"
: 0 – 30 mm (0 – 1.2 in.)



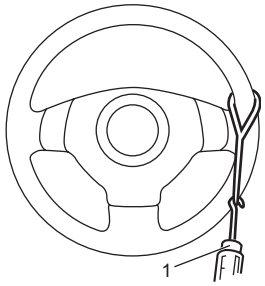
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Steering Force Check

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1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check if tire inflation pressure is as specified referring to the tire placard.
3) Start engine.
4) When engine idling, measure steering force by using spring balancer (1).

Steering force
: 30 N (3.0 kgf, 6.7 lbf) or Less

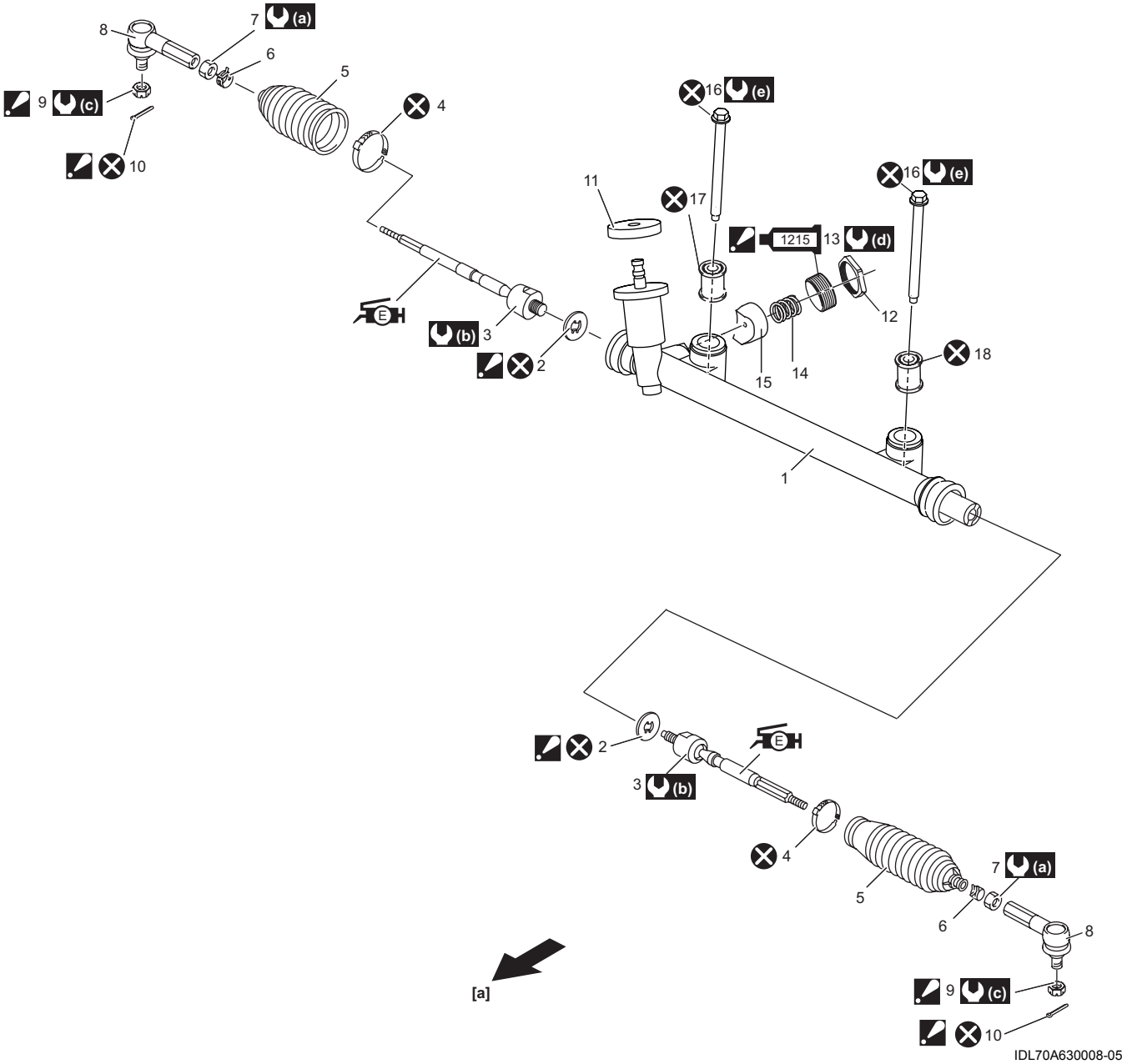


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Repair Instructions

Steering Gear Case Assembly Components

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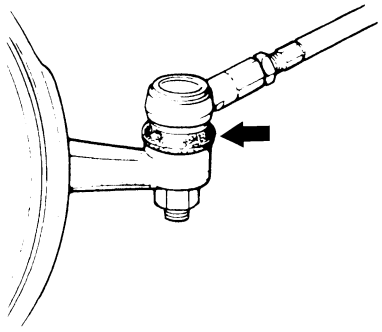
[a]: Forward	9. Tie-rod end nut : For tightening procedure of tie-rod end nut, refer to “Tie-Rod End Removal and Installation” (Page 6C-25).	18. Steering gear case bushing (Left)
1. Steering gear case	10. Cotter pin : For removing and installing procedure of cotter pin, refer to “Tie-Rod End Removal and Installation” (Page 6C-25).	(a) : 45 N·m (4.6 kgf-m, 33.5 lbf-ft)
2. Tie-rod end washer : For removing and installing procedure of tie-rod end washer, refer to “Tie-Rod / Rack Boot Removal and Installation” (Page 6C-28).	11. Steering gear case packing	(b) : 85 N·m (8.7 kgf-m, 63.0 lbf-ft)
3. Tie-rod	12. Rack damper screw lock nut : For handling, refer to “Pinion Shaft Rotation Torque Adjustment” (Page 6C-29).	(c) : 45 N·m (4.6 kgf-m, 33.2 lbf-ft)

4. Band	13. Rack damper screw : For handling, refer to “Pinion Shaft Rotation Torque Adjustment” (Page 6C-29).	(d) : 70 N·m (7.1 kgf-m, 52.0 lbf-ft)
5. Boot	14. Coil spring	(e) : 80 N·m (8.2 kgf-m, 59.0 lbf-ft)
6. Rack boot clip	15. Yoke	: Do not reuse.
7. Tie- rod end lock nut	16. Steering gear box bolt	E : Apply grease 99000-25050 to tie-rod and steering rack groove, refer to “Tie-Rod / Rack Boot Removal and Installation” (Page 6C-28).
8. Tie-rod end	17. Steering gear case bushing (Right)	1215 : Apply sealant 99000-31310 to rack damper screw, refer to “Pinion Shaft Rotation Torque Adjustment” (Page 6C-29).

Tie-Rod End Boot On-Vehicle Inspection

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Check boot for crack and damage.
If any defect is found, replace it with a new one.



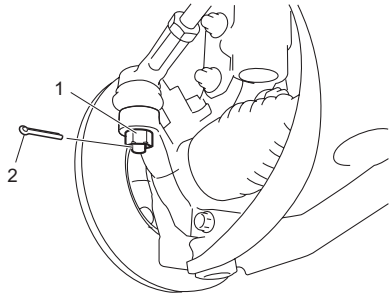
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Tie-Rod End Removal and Installation

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Removal

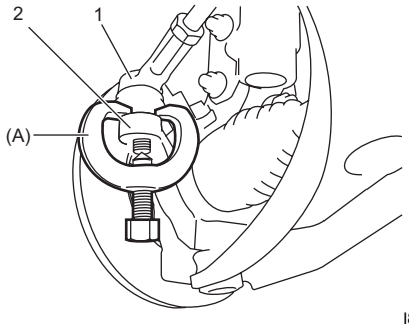
1) Hoist vehicle, and then remove front wheel. ☞(Page 2D-3)
2) Remove cotter pin (2), and tie-rod end nut (1) from tie-rod end.



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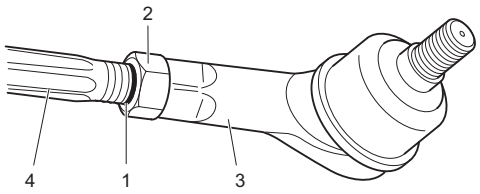
3) Disconnect tie-rod end (1) from steering knuckle (2) using special tool.

Special tool
(A): 09913M65210



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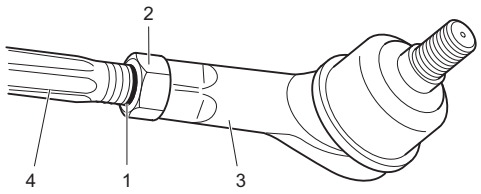
4) To facilitate adjustment after installation, make marking (1) of tie-rod end lock nut (2) position on tie-rod end thread. Then, loosen lock nut and remove tie-rod end (3) from tie-rod (4).



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Installation

1) Install tie-rod end lock nut (2) and tie-rod end (3) to tie-rod (4). Align lock nut with mark (1) on tie-rod thread.



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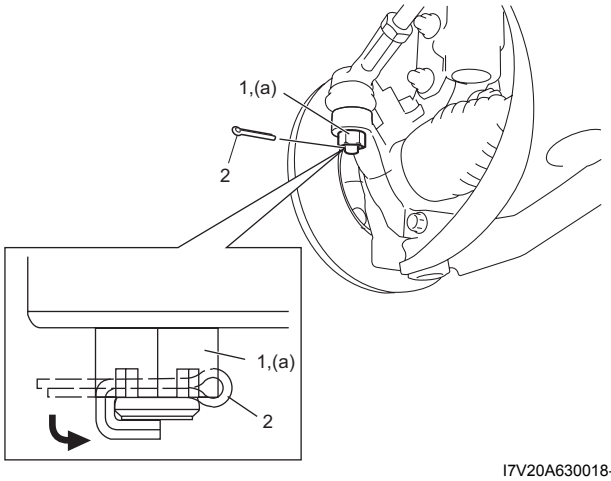
2) Connect tie-rod end to steering knuckle. Tighten tie-rod end nut (1) to specified torque.

Tightening torque
Tie-rod end nut (a): 45 N·m (4.6 kgf-m, 33.2 lbf-ft)

3) Install new cotter pin (2) and bend it.

NOTE

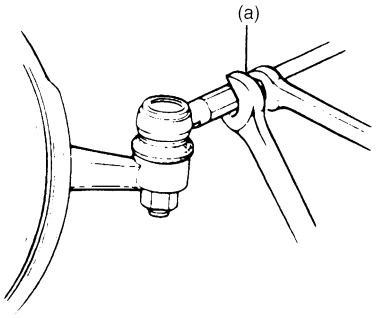
- **After tightening tie-rod end nut to specified torque, align a cotter pin slot in nut with hole in tie-rod end by giving minimum tightening turn to nut (maximum rotation angle 60°)**
- **Insert cotter pin fully as shown in figure. (With longer arm upward.) After inserting cotter pin, bend cotter pin as shown in figure.**



I7V20A630018-01

4) Install front wheel and tighten wheel nuts to specified torque. ☞(Page 2D-3)
5) Inspect for toe. ☞(Page 2B-1)
6) After confirming that the toe is as specified, tighten tie-rod end lock nut to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)

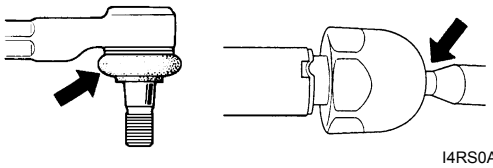


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Tie-Rod End Inspection

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- Inspect for play in tie-rod end ball joint.
- Inspect for play in tie-rod ball joint.
  If result of either inspection is not OK, replace with new one.

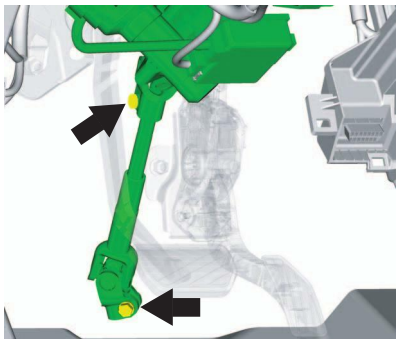


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Steering Shaft Joint On-Vehicle Inspection

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Check shaft joint for wear, breakage and any other damage. If defective, replace steering column assembly with new one.



I8C50B620009-01

Steering Gear Case Assembly Removal and Installation

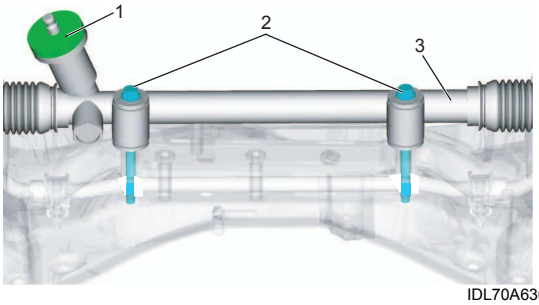
AENDL70A6306006

NOTICE

Failure to take proper precautions before starting the procedure below can result in damage to the contact coil of the air bag system.
Before starting the procedure below, set the front wheels in the straight-ahead position and then lock the steering wheel by removing ignition key.

Removal

1) Remove front suspension frame with steering gear case assembly. ☞(Page 2B-12)
2) Remove steering gear case packing (1).
3) Remove steering gear box bolts (2), then remove steering gear case assembly (3) from front suspension frame.



IDL70A630012-01

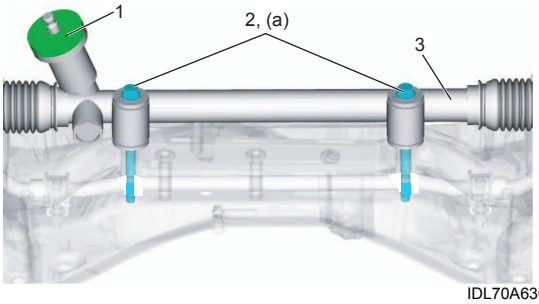
NOTICE

The steering gear case bolts are pre-coated with friction stabilizer. If these bolts are reused, they may work loose.
Never reuse the steering gear case bolts.

Installation

1) Install steering gear case packing (1).
2) Mount steering gear case assembly (2) to front suspension frame.
3) Install steering gear box bolts (3).

Tightening torque
Steering gear case bolt (a): 80 N·m (8.2 kgf-m, 59.0 lbf-ft)



IDL70A630013-02

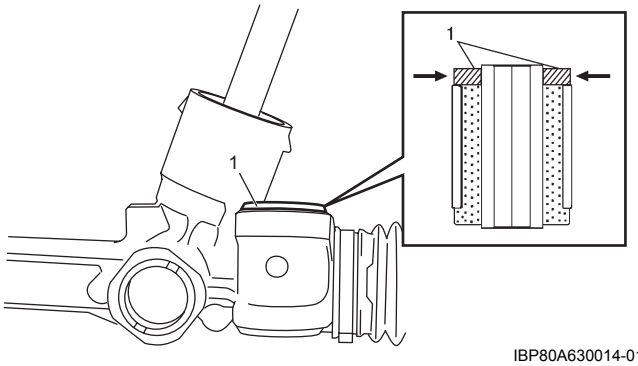
4) Install front suspension frame with steering gear case assembly. ☞(Page 2B-12)

Steering Gear Case Bushing Removal and Installation

AENDL70A6306007

Removal

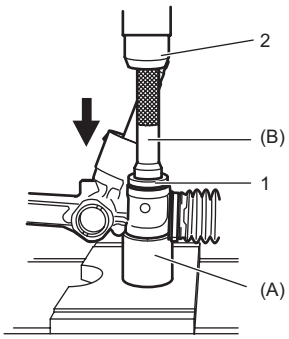
1) Remove steering gear case assembly. ☞(Page 6C-26)
2) Cut-off flange (rubber) part (1) of each steering gear case bushing using knife.



IBP80A630014-01

3) Push out steering gear case bushing (1) using hydraulic press (2) and special tools.

Special tool
(A): 09943M76310
(B): 09943M88211



IBP80A630015-01

Installation

1) Press fit new steering gear case bushing (1) using special tools and hydraulic press (2).

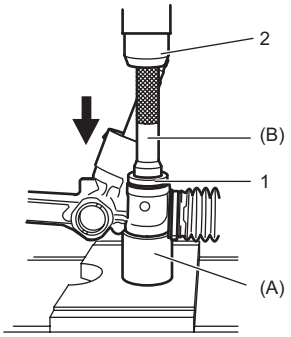
⚠ CAUTION

Do not reuse bushing.

NOTE

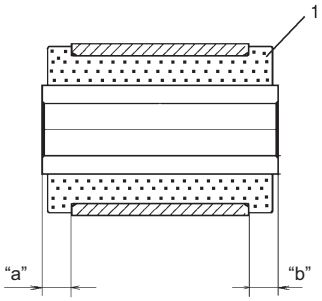
Before installing bushing, apply soapy water on its circumference to facilitate installation.

Special tool
(A): 09943M76310
(B): 09943M88211



IBP80A630015-01

2) Press-fit steering gear case bushing (1) so that dimensions “a” and “b” in figure become equal.



I7V10A220012-01

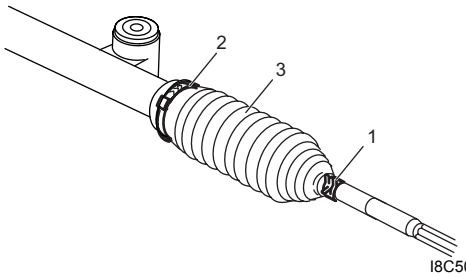
3) Install steering gear case assembly. ☞(Page 6C-26)

Steering Rack Boot Inspection

AENDL70A6306008

Check the following item. If defective, repair or replace it.

- Check rack boot (3) for deformation, deterioration or crack.
- Check rack boot clip (1) and band (2) for fitting.



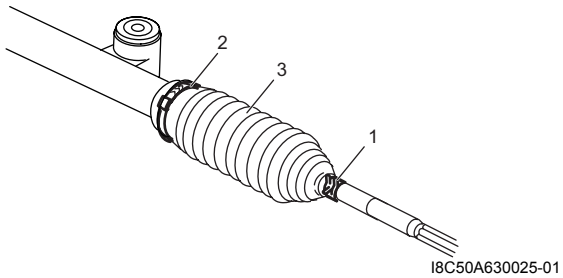
I8C50A630025-01

Tie-Rod / Rack Boot Removal and Installation

AENDL70A6306009

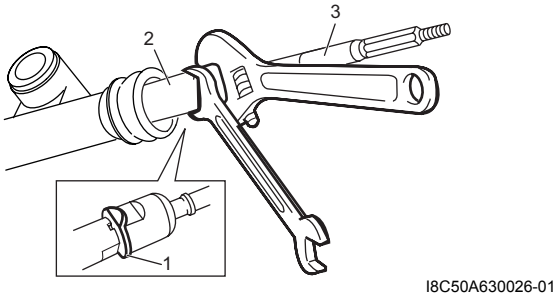
Removal

1) Remove steering gear case assembly. ☞(Page 6C-26)
2) Remove tie-rod end. ☞(Page 6C-25)
3) Remove boot band (2) and clip (1).
4) Remove boot (3) from tie-rod.



I8C50A630025-01

5) Unbend bent part of tie-rod lock washer (1).
6) Remove tie-rod (3) from rack (2) as shown.

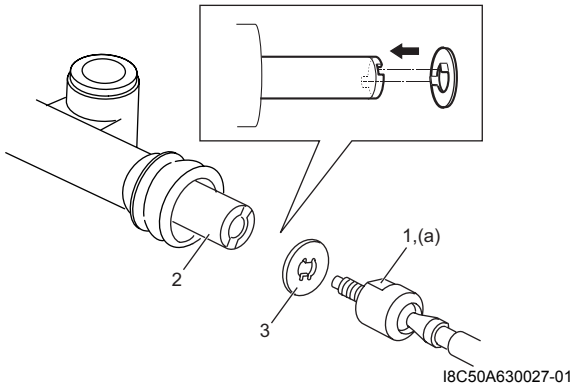


I8C50A630026-01

Installation

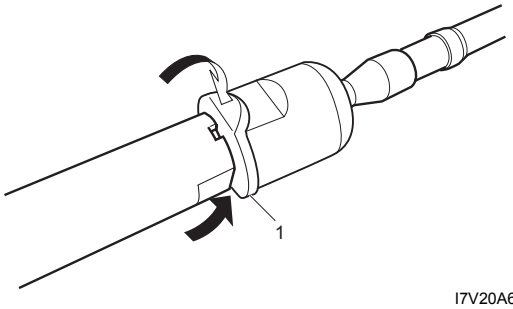
1) Install tie-rod (1) and new tie-rod lock washer (3) to rack (2), and then tighten tie-rod to specified torque.

Tightening torque
Tie-rod (a): 85 N·m (8.7 kgf-m, 63.0 lbf-ft)



I8C50A630027-01

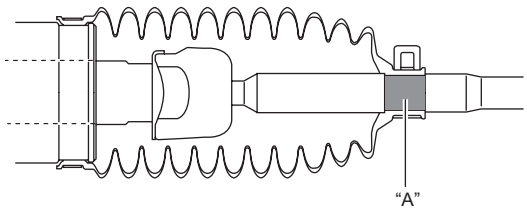
2) Bend lock washer (1) at 2 places as shown in figure.



I7V20A630025-01

3) Apply grease to section “A” of tie-rod indicated in figure. Position rack boot properly in grooves of gear case (or rack side mount) and tie-rod.
After this, check that boot is free from twist and dent.

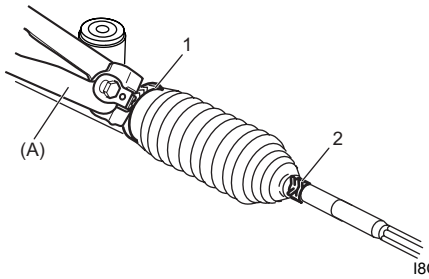
"A": Grease 99000–25050 (SUZUKI Super Grease E)



I8C50A630028-01

4) Fasten new band (1) using special tool, and install clip (2)

Special tool
(A): 09943M55010



I8C50A630029-01

5) Install tie-rod end. ☞(Page 6C-25)
6) Install steering gear case assembly. ☞(Page 6C-26)

Pinion Shaft Rotation Torque Inspection

AENDL70A6306010

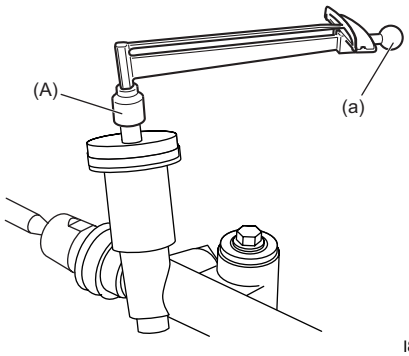
1) Remove steering gear case assembly. ☞(Page 6C-26)
2) Remove rack boots. ☞(Page 6C-28)
3) Pinion rotation torque should be checked with rack position centered using special tool.
Also, check if rack as a whole moves smoothly.
If check result is not as specified, adjust pinion shaft rotation torque.

NOTE

Adjust rack damper screw to average torque within rack stroke centered from pinion rotation angle ±180°.

Special tool
(A): 09941M75420

Tightening torque
Rotation torque of pinion (a): 0.8 - 1.3 N·m (0.08 - 0.13 kgf-m, 0.5 - 0.95 lbf-ft)



I8C50A630030-01

Pinion Shaft Rotation Torque Adjustment

AENDL70A6306011

NOTE

- **Perform pinion shaft rotation torque adjustment with rack stroke position is centered (steering wheel is straight-ahead position).**
- **Do not remove rack damper screw lock nut and rack damper screw so as to prevent damage to rack damper screw lock nut and rack damper screw.**

1) Remove steering gear case assembly. ☞(Page 6C-26)
2) Remove rack boots. ☞(Page 6C-28)
3) Loosen rack damper screw lock nut (1) using special tool.

Special tool
(A): 09941M75410

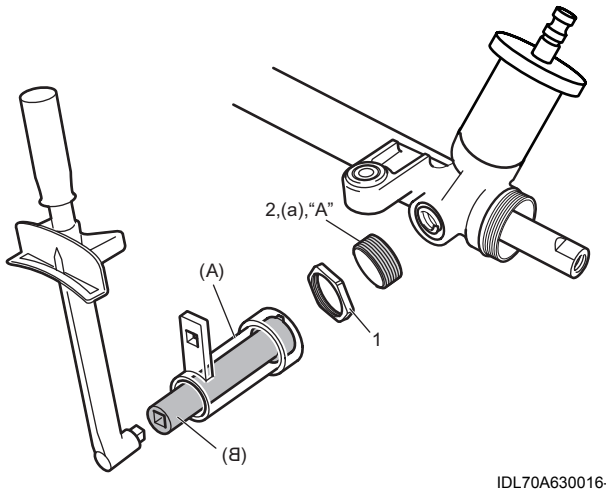
4) Remove rack damper screw (2) using special tool.

Special tool
(B): 09917M23611

5) Apply sealant "A" to rack damper screw (2) and then tighten it using special tool.

"A": Sealant 99000–31310 (Three Bond TB 1141G)

Tightening torque
Rack damper screw (a): 9.8 - 14.8 N·m (1.0 - 1.5 kgf-m, 7.2 - 10.9 lbf-ft)



IDL70A630016-01

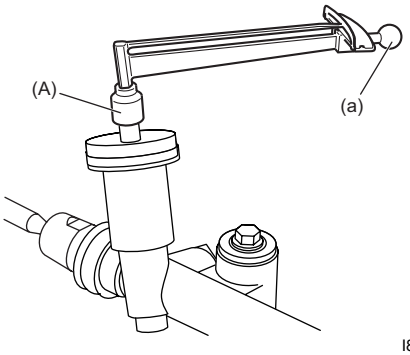
6) Tighten or loosen rack damper screw so as to adjust pinion rotation torque to specified torque using special tool.

NOTE

Adjust rack damper screw to average torque within rack stroke centered from pinion rotation angle ±180°.

Special tool
(A): 09941M75420

Tightening torque
Rotation torque of pinion: 0.8 - 1.3 N·m (0.08 - 0.13 kgf-m, 0.5 - 0.95 lbf-ft)



I8C50A630030-01

7) Using special tools, tighten rack damper screw lock nut (1) while holding rack damper screw (2).

Special tool
(A): 09941M75410

Special tool
(B): 09941M75420

Tightening torque
Rack damper screw lock nut: 70 N·m (7.1 kgf-m, 52.0 lbf-ft)

8) Recheck pinion rotation torque is specified torque.
9) Install rack boots. ☞(Page 6C-28)
10) Install steering gear case assembly. ☞(Page 6C-26)

P/S Control Module Removal and Installation

AENDL70A6306012

Removal

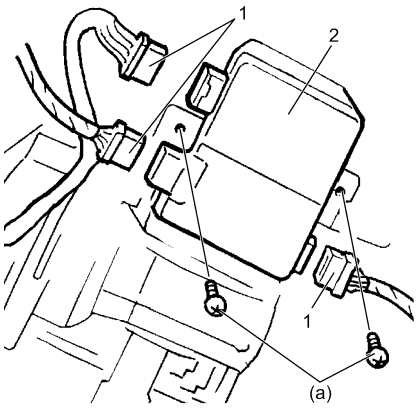
1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover.
3) Disconnect connector (1) from P/S control module.
4) Remove P/S control module (2) from steering column.

Installation

Reverse removal procedure noting the following.

- Tighten each screw to the specified torque.

Tightening torque
P/S control module mounting screw (a): 3 N·m (0.31 kgf-m, 2.2 lbf-ft)



I8C50A630031-03

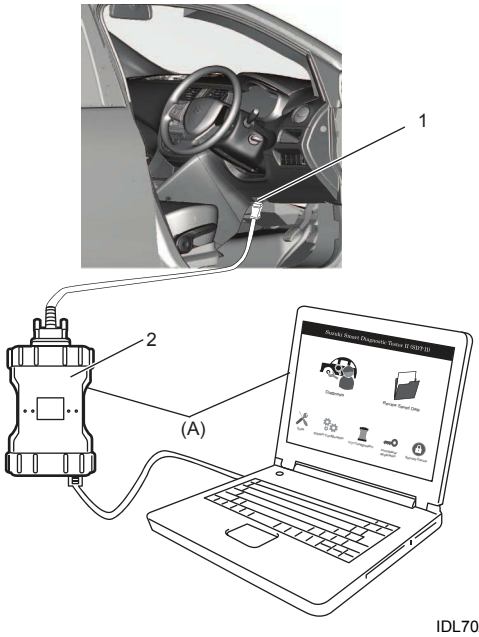
Torque Sensor and Its Circuit Inspection

AENDL70A6306013

Using SUZUKI Scan Tool

1) Connect SUZUKI scan tool (2) to DLC (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

2) With ignition switch turned to ON position, select "Data list" mode to check "Sensor (Main) Torque" and "Sensor (Sub) Torque" on SUZUKI scan tool.

Sensor torque
Main: About –0.8 – +0.8 N·m
Sub: About –0.8 – +0.8 N·m

3) If sensor torque is not as specified, remove steering wheel and steering lower shaft.
   - Steering wheel: ☞(Page 6B-3)
   - Steering lower shaft: ☞(Page 6B-11)

4) With ignition switch turned to ON position, select "Data list" mode to check "Sensor (Main) Torque" and "Sensor (Sub) Torque" on SUZUKI scan tool.
   If steering force is not as specified, check the following points.
   – Torque sensor harness and connector
   – Torque sensor (Steering column assembly)
   – P/S control module

Sensor torque
Main: About –0.8 – +0.8 N·m
Sub: About –0.8 – +0.8 N·m

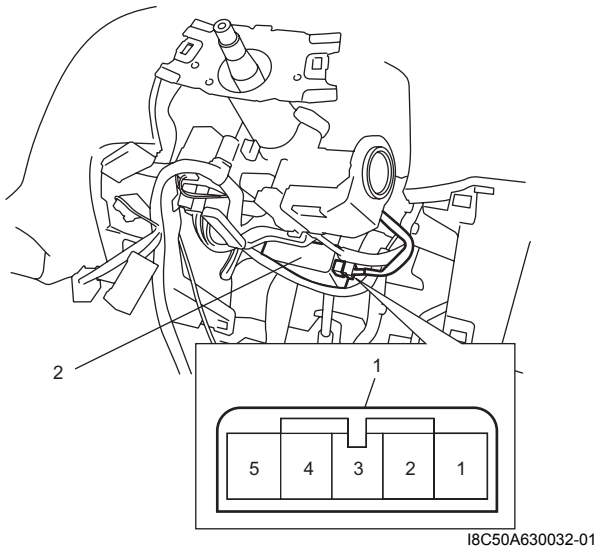
Using Voltmeter

1) Remove steering wheel, steering column cover and steering lower shaft.
   - Steering wheel: ☞(Page 6B-3)
   - Steering column cover☞(Page 6B-3)
   - Steering lower shaft: ☞(Page 6B-3)

2) With ignition switch turned to ON position, measure voltage between terminals "3" – "4" and "3" – "5" with torque sensor connector (1) connected to P/S control module (2).
   If steering force is not as specified, check the following points.
   – Torque sensor harness and connector
   – Torque sensor (Steering column assembly)
   – P/S control module

Torque sensor voltage between terminals "3"and "5"
Steering wheel at neutral: Approx. 2.5V
Steering wheel turned fully to right: Approx. 3.8V
Steering wheel turned fully to left: Approx. 1.2V

Torque sensor voltage between terminals "3"and "4"
Steering wheel at neutral: Approx. 2.5V
Steering wheel turned fully to right: Approx. 1.2V
Steering wheel turned fully to left: Approx. 3.8V



I8C50A630032-01

P/S Motor and Its Circuit Inspection

AENDL70A6306014

1) With ignition switch turned to OFF position, disconnect motor connector from P/S control module.

2) Measure resistance between terminals "1" and "2" of P/S motor connector (1).
   If check result is not as specified, replace steering column assembly.

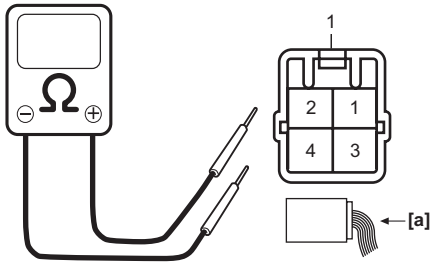
Motor circuit resistance

Between "1" and "2"	**Approx. 1 Ω**

3) Check for continuity between terminal "1" of P/S motor connector and body ground.
   If check result is not as specified, replace steering column assembly.

Motor circuit resistance

"1" and body ground	**No continuity**



I8C50A630033-01

1. P/S motor connector "G51" (View: [a])

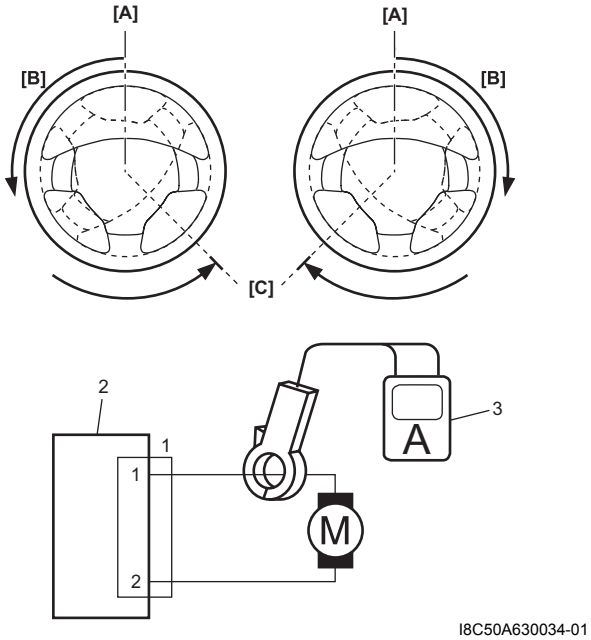
4) Hoist vehicle.

5) With ignition switch turned to OFF position, and connect P/S motor connector (1) to P/S control module (2).

6) Using ammeter (3), check that P/S motor current with engine idling is as indicated below. If check result is not as specified, check P/S control module. ☞(Page 6C-19)
If OK, replace steering column assembly.

Motor current at hoisted vehicle

Condition	When steering wheel is kept at straight-ahead position: [A]	When steering wheel is turned left or right at turning speed of 90° / sec.: [B]	When steering wheel is kept fully turned left or right: [C]
Motor current	Approx. 0 A	Approx. 3.0 – 4.2 A	Approx. 38 – 40 A



I8C50A630034-01

Specifications

Tightening Torque Specifications

AENDL70A6307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Tie-rod end nut	45	4.6	33.2	☞(Page 6C-26)
Tie-rod end lock nut	45	4.6	33.5	☞(Page 6C-26)
Steering gear case bolt	80	8.2	59.0	☞(Page 6C-27)
Tie-rod	85	8.7	63.0	☞(Page 6C-28)
Rotation torque of pinion	0.8 - 1.3	0.08 - 0.13	0.5 - 0.95	☞(Page 6C-29) / ☞(Page 6C-30)
Rack damper screw	9.8 - 14.8	1.0 - 1.5	7.2 - 10.9	☞(Page 6C-29)
Rack damper screw lock nut	70	7.1	52.0	☞(Page 6C-30)
P/S control module mounting screw	3	0.31	2.2	☞(Page 6C-30)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Steering Gear Case Assembly Components” (Page 6C-24)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A6308001

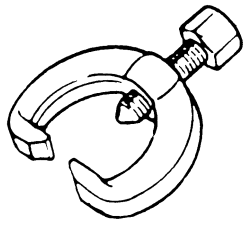
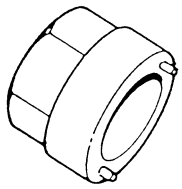
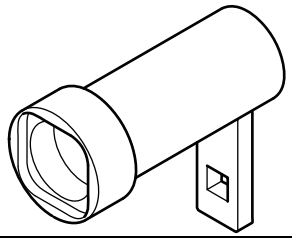
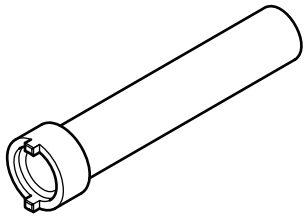
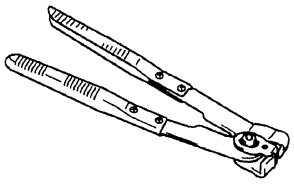
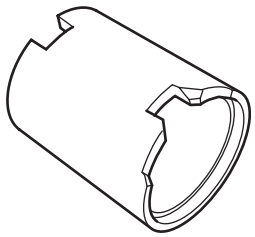
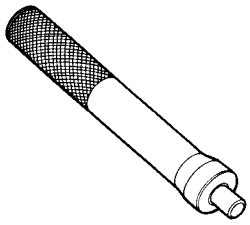
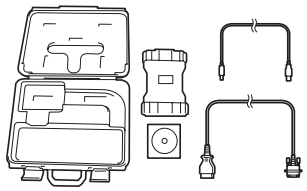
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease E	P/No.: 99000–25050	☞(Page 6C-29)
Sealant	Three Bond TB 1141G	P/No.: 99000–31310	☞(Page 6C-29)

NOTE

Required service materials are also described in:
“Steering Gear Case Assembly Components” (Page 6C-24)

Special Tool

AENDL70A6308002

09913M65210 Tie-rod end remover ☞(Page 6C-25)	
09917M23611 Ring nut wrench ☞(Page 6C-29)	
09941M75410 Lock nut wrench outer ☞(Page 6C-29) / ☞(Page 6C-30)	
09941M75420 Lock nut wrench inner ☞(Page 6C-29) / ☞(Page 6C-30) / ☞(Page 6C-30)	
09943M55010 Boot clamp pliers ☞(Page 6C-29)	
09943M76310 Bush remover ☞(Page 6C-27) / ☞(Page 6C-27)	
09943M88211 Pinion bearing installer ☞(Page 6C-27) / ☞(Page 6C-27)	
SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 6C-8) / ☞(Page 6C-30)	

Section 7

HVAC

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Precautions

Precautions

Precautions for HVAC

AENDL70A7000001

General Precautions
Refer to “General Precautions” in Section 00 (Page 00-1).

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3).

Faster Caution
Refer to “Fastener Caution” in Section 00 (Page 00-5).

Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

A/C System Caution
Refer to “HVAC System Caution” in Section 7B (Page 7B-1).

Precautions on Servicing A/C System
Refer to “Precautions for Servicing A/C System” in Section 7B (Page 7B-1).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness.
Otherwise, electrical trouble may occur.

HVAC System

Precautions

HVAC System Caution

AENDL70A7200001

⚠ CAUTION

When replenishing or changing refrigerant and compressor oil and when replacing parts, check that the material or the part to be used is appropriate to the A/C system installed in the vehicle being serviced.
Use of an incorrect material or part will result in leakage of refrigerant, damage to parts or other faulty condition.

Precautions for Servicing A/C System

AENDL70A7200002

Handling HFC-134a (R-134a) Refrigerant and Specified Compressor Oil

⚠ WARNING

Handle the HFC-134a (R-134a) refrigerant with care as follows. If not, it may cause severe injury such as blindness and frostbite.

- **Do not let refrigerant come in contact with skin and eyes by wearing safety glasses and gloves. In case of contact with skin or eyes, get medical attention.**
- **Keep the refrigerant away from fire. High temperature may cause toxic gas. Therefore, take care of much room ventilation.**
- **Do not keep the refrigerant container at temperature above 40 °C (104 °F); higher temperature may cause explosion.**

⚠ CAUTION

- **Do not expose bright metals to liquid refrigerant. Refrigerant combined with moisture is corrosive and tarnishes surfaces of bright metals including chrome.**
- **Do not discharge refrigerant into atmosphere.**
- **The specified compressor oil for use with the refrigerant is highly hygroscopic.**
  Keep internal parts of A/C system free from moisture and dirt. When disconnecting any line from system, install a blind plug or cap to the fitting immediately.
- **If pipes or hoses are replaced, replenish the system with compressor oil to specified amount from compressor suction side referring to "Replenishing Compressor Oil" in "Operation Procedure for Refrigerant Charge" (Page 7B-22).**

Handling A/C Cycle Part and Tooling

⚠ CAUTION

- **When connecting hoses and pipes, apply a few drops of compressor oil to O-ring.**
- **Replace O-ring with new one whenever hoses, pipes and parts are disconnected.**
- **Route drain hose to avoid any contact of drainage with vehicle components.**
- **If pipes or hoses are replaced, replenish the system with compressor oil to specified amount from compressor suction side referring to "Replenishing Compressor Oil" in "Operation Procedure for Refrigerant Charge" (Page 7B-22).**
- **When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.**

NOTE

Check local governmental regulations regarding working with refrigerator systems and its tooling.

Refrigerant Recovery
When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging HFC-134a (R-134a) refrigerant into atmosphere would cause adverse effect to environment. For proper method, refer to “Recovery” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).

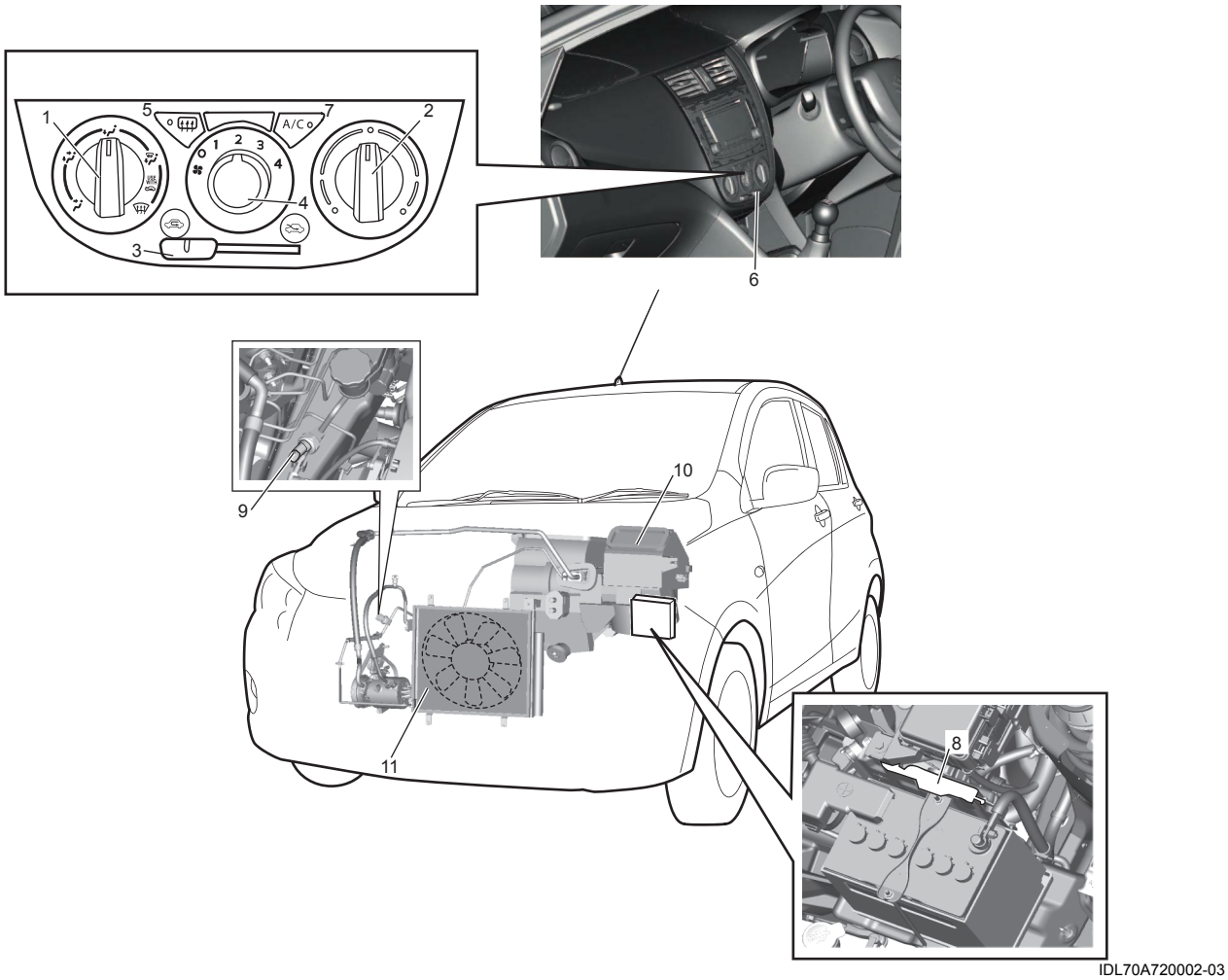
Refrigerant Charge
After performing compressor oil replenishment and evacuation, charge proper amount of refrigerant to A/C system referring to “Charge” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).

General Description

HVAC System Description

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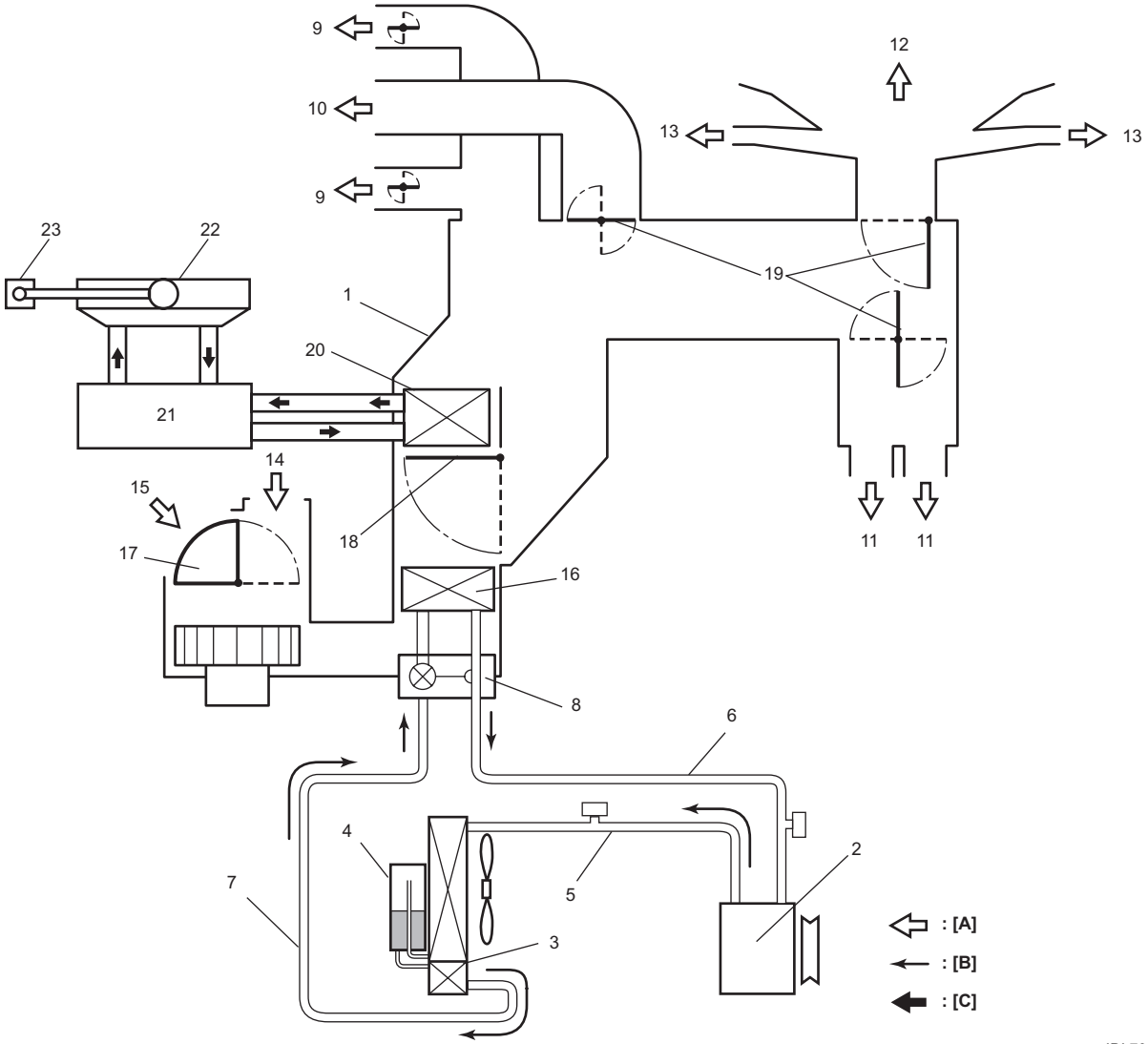
- This HVAC is of a manually controlled air conditioning type.
- Air flow, temperature control and air inlet mode can be changed by operating air flow selector (1), temperature selector (2) and air intake selector (3) respectively. Selection of desired position of these selectors is remote-controlled via control cables which, in turn, operate air flow control door, temperature control door and air intake door.
- Air flow can be adjusted in 4 steps, LO, ML, MH and HI by operating blower speed selector (4).
- Rear end door window defogger switch (5) is located on HVAC control unit (6).
- A/C switch (7) turns on and off the A/C system. Signal from A/C switch is transmitted to ECM (8). The ECM circuits related to the A/C system control, compressor relay and radiator cooling fan relay are controlled according to the signal. Refer to “A/C Operation Description at ECM” (Page 7B-5) for details.
- ECM controls evaporator temperature based on the signal received from evaporator temperature sensor. Refer to “A/C Operation Description at ECM” (Page 7B-5) for details.
- HVAC unit (10) incorporates blower motor unit, blower motor unit, heater core unit and evaporator unit as one unit.
- Each side ventilator has shutter mechanism
- The condenser (11) is of a sub-cool type. It is integral with receiver / dryer and mounted to the vehicle body in floating manner.



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9. Refrigerant pressure sensor

HVAC System Construction



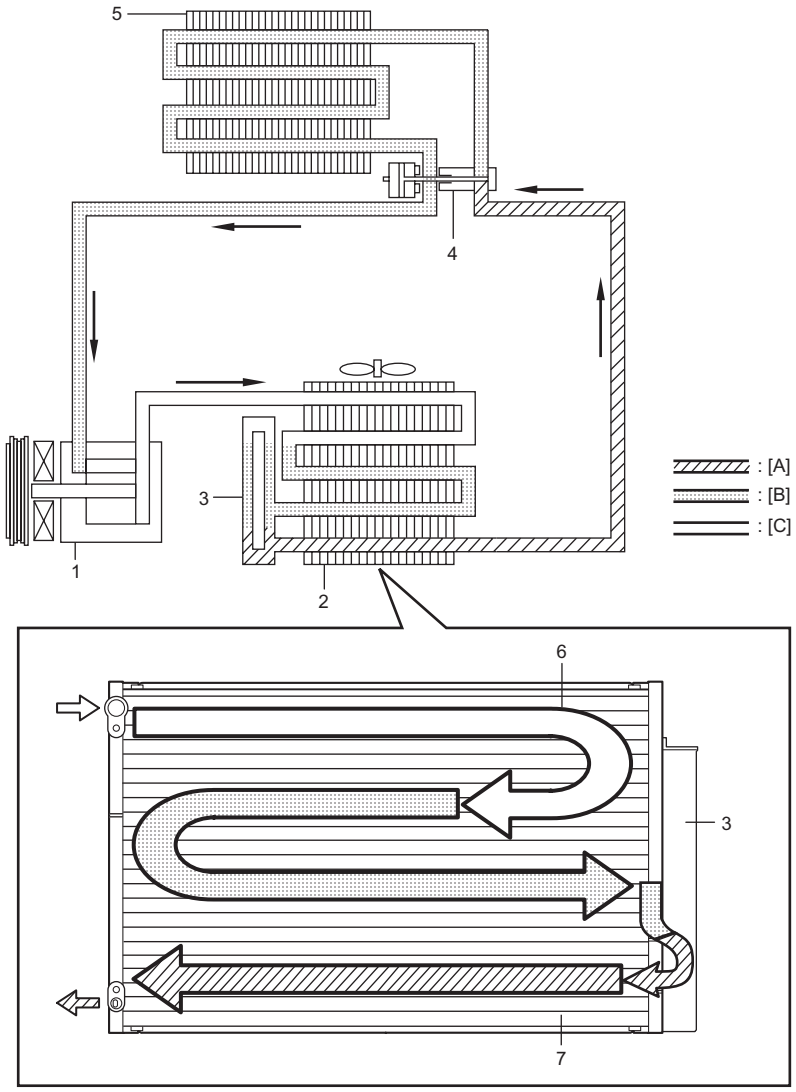
IDL70A720068-01

[A]: Air flow	7. Liquid pipe	16. Evaporator
[B]: Refrigerant flow	8. Expansion valve	17. Air intake door
[C]: Engine coolant flow	9. Side ventilation air	18. Temperature control door
1. HVAC unit	10. Center ventilation air	19. Air flow control door
2. Compressor	11. Front foot air	20. Heater core
3. Condenser assembly	12. Defroster air	21. Engine
4. Receiver/dryer	13. Demister air	22. Radiator
5. Discharge hose	14. Fresh air	23. Reservoir
6. Suction hose	15. Recirculation air	

Sub-Cool A/C System Description

AENDL70A7201002

In the sub-cool A/C system (condenser incorporating receiver/dryer), the inside of the condenser is divided into the condensation part and the sub-cooler part, and the receiver/dryer is located between them. In the receiver/dryer, the refrigerant is separated into the vapor refrigerant and the liquid refrigerant. Only the liquid refrigerant is delivered to the sub-cooler part of the condenser. The refrigerant is supercooled by the sub-cooler part of the condenser.



IBP80A721075-01

[A]: Liquid	1. Compressor	4. Expansion valve	7. Sub-cooler part
[B]: Vapor	2. Condenser	5. Evaporator	
[C]: Superheated vapor	3. Receiver/dryer	6. Condensation part	

A/C Operation Description at ECM

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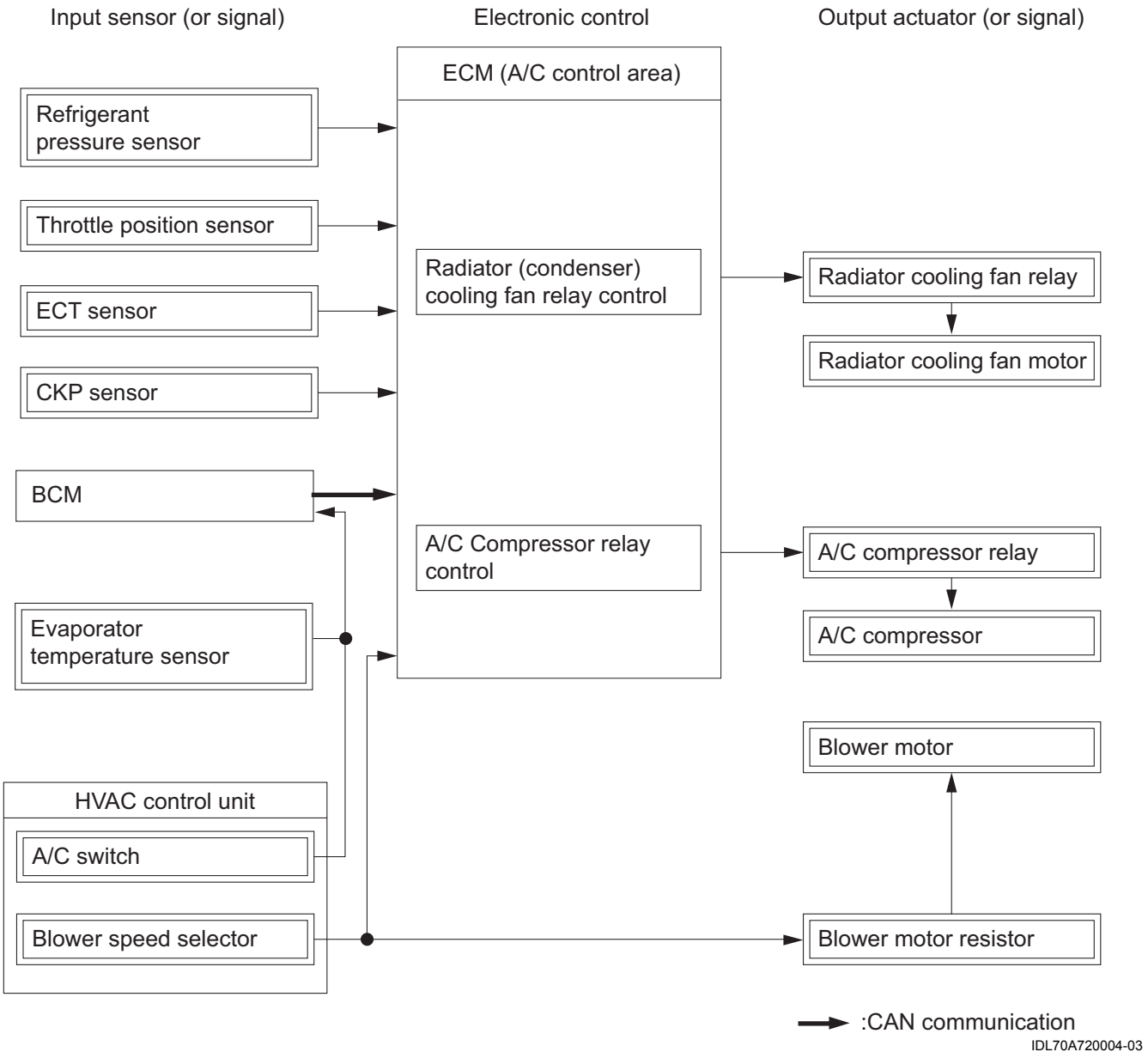
Upon receiving A/C switch ON signal from HVAC control unit, ECM controls A/C compressor relay and radiator (condenser) cooling fan relay as described below.
The A/C switch ON signal is sent from the HVAC control unit to BCM. Then it is transmitted to ECM as A/C request signal through CAN. For CAN communication system, refer to “CAN Communication System Description” in Section 10H (Page 10H-1).

Control item		Input sensor (or signal)	Description
A/C Compressor relay control	Evaporator temperature control	Evaporator temperature sensor	ECM controls the A/C compressor by turning A/C compressor relay ON/OFF according to request signal from BCM. BCM sends the signal based on the signal from evaporator temperature sensor to prevent evaporator from freezing.
	Control during low engine speed	CKP sensor (engine rpm)	ECM stops A/C compressor by turning A/C compressor relay OFF according to signal from CKP sensor (engine rpm) to prevent engine from stalling while engine speed is low.
	Control during high engine speed		ECM stops compressor by turning compressor relay OFF according to signal from CKP sensor (engine rpm) to prevent compressor from over-revolution while engine speed is high.
	Control at engine start		ECM stops A/C compressor temporarily by turning A/C compressor relay OFF according to signals from CKP sensor (engine rpm) to prevent A/C compressor from over-revolution while engine speed is high.
	Control at abnormal refrigerant pressure	Refrigerant pressure sensor	• ECM stops the compressor by turning compressor relay OFF according to signal from refrigerant pressure sensor to protect A/C system when refrigerant pressure is abnormal. • ECM stops compressor by turning compressor relay OFF when refrigerant pressure sensor malfunctions.
	Control during acceleration	Accelerator pedal position sensor and wheel speed sensor	• ECM stops A/C compressor temporarily by turning A/C compressor relay OFF according to signal from accelerator pedal position sensor to provide enough acceleration while accelerator pedal is fully depressed regardless of vehicle speed. • ECM stops the A/C compressor temporarily by turning A/C compressor relay OFF according to signal from throttle position sensor to provide enough acceleration when accelerator pedal is depressed more than specification while vehicle speed is low.
	Control at high engine coolant temperature	ECT sensor	• ECM stops the A/C compressor by turning A/C compressor relay OFF according to signal from ECT sensor to prevent overheating when engine coolant temperature is higher than specified level. • ECM stops A/C compressor by turning A/C compressor relay OFF when ECT sensor malfunctions.
Radiator (condenser) cooling fan relay control		Refrigerant pressure sensor and wheel speed sensor	ECM drives radiator cooling fan under the following conditions by turning radiator cooling fan relay ON according to signals from refrigerant pressure sensor and wheel speed sensor when A/C compressor relay is ON. • Vehicle speed is less than specified range • Vehicle speed is more than specified range and refrigerant pressure is more than specified range • Wheel speed sensor malfunction is not detected

Schematic and Routing Diagram

HVAC Electronic Control Input / Output Block Diagram

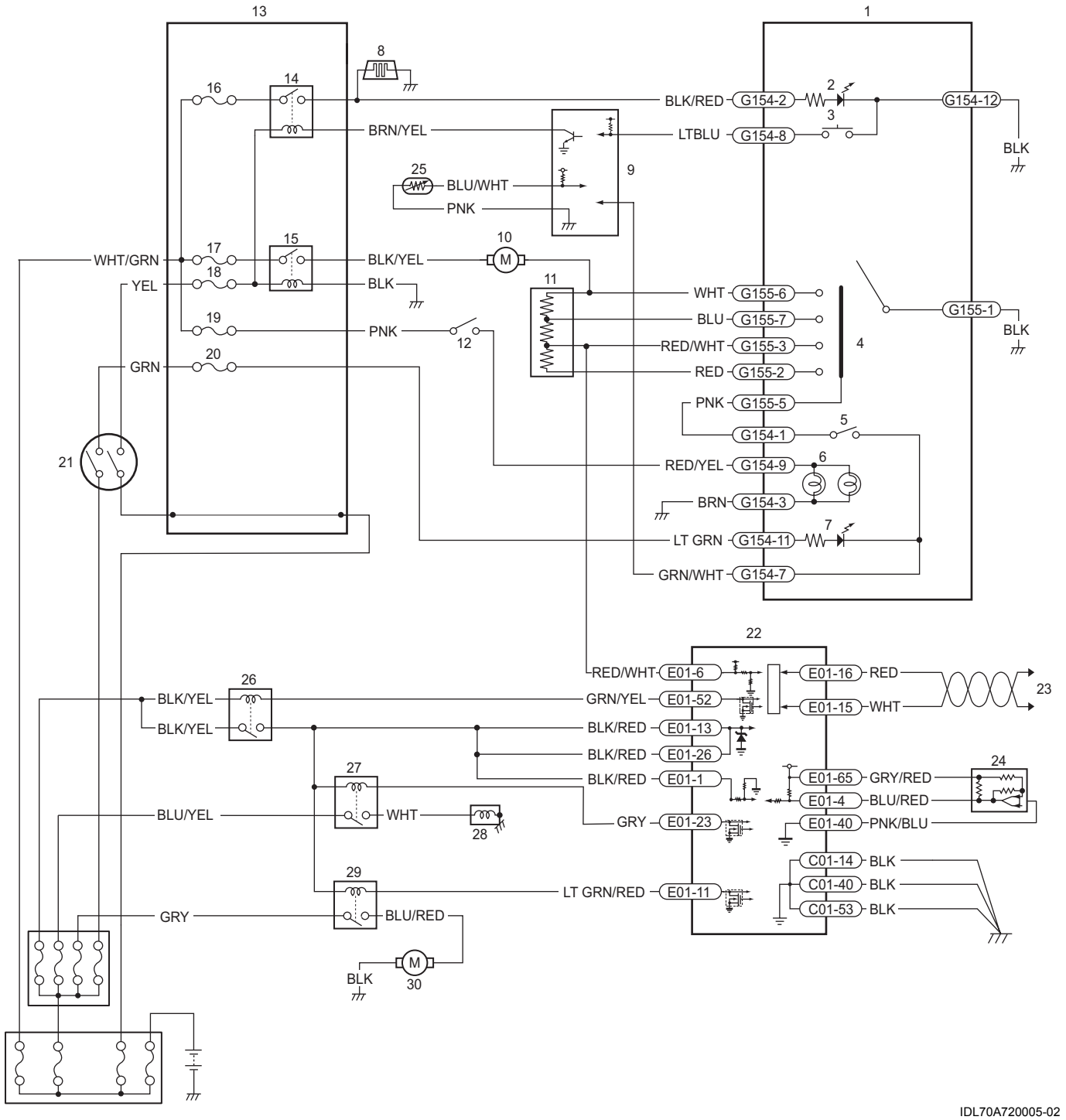
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HVAC Control System Circuit Diagram

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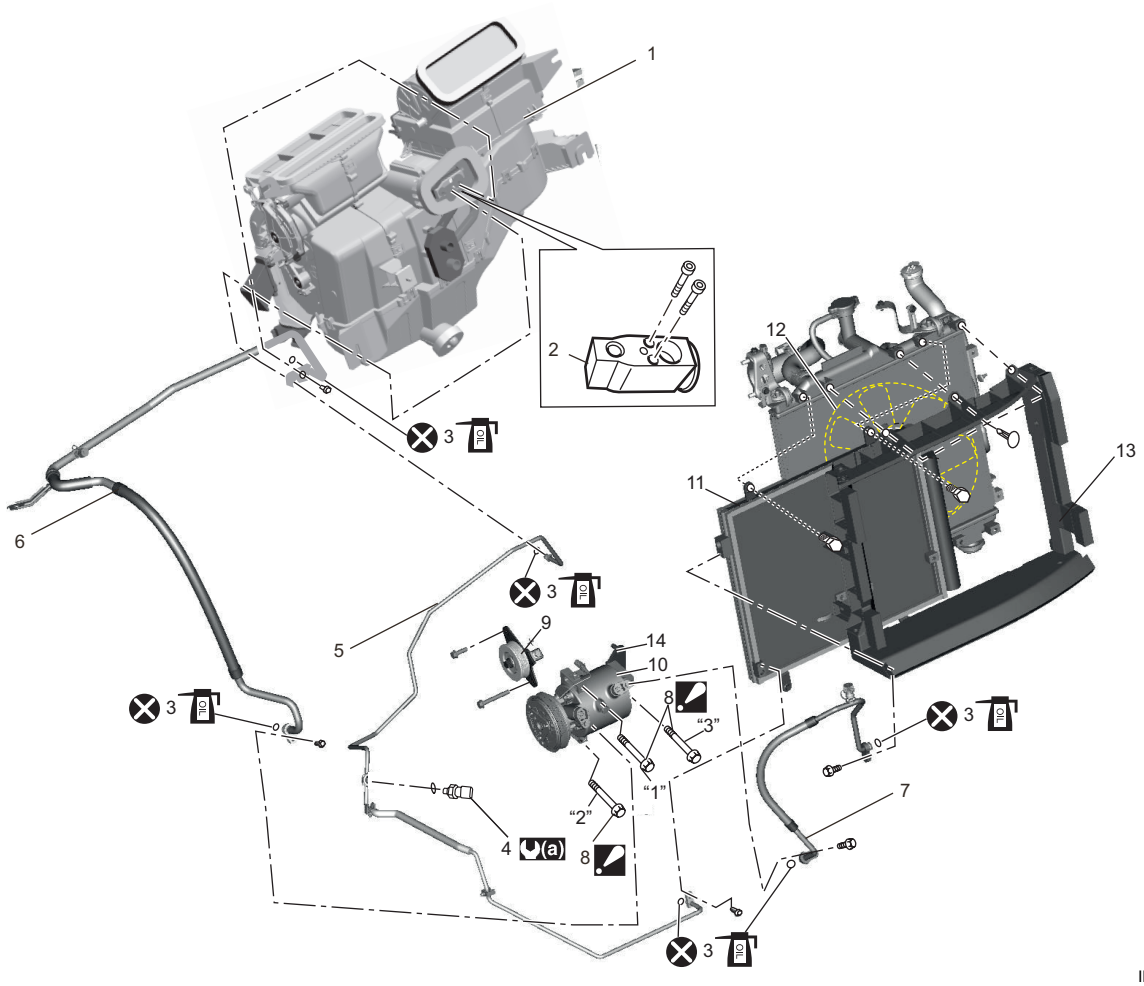
IDL70A720005-02

1. HVAC control unit	11. Blower motor resistor	21. Ignition switch
2. Rear defogger indicator	12. Lighting switch	22. ECM
3. Rear defogger switch	13. Junction block	23. Other control modules
4. Blower speed selector	14. Rear end door window defogger relay	24. Refrigerant pressure sensor
5. A/C switch	15. Blower motor relay	25. Evaporator temperature sensor
6. Illumination light	16. “RR DEF” fuse	26. Main relay
7. A/C indicator light	17. “BLW” fuse	27. A/C compressor relay
8. Rear defogger	18. “IG2 SIG” fuse	28. A/C compressor magnet clutch
9. BCM	19. “TAIL” fuse	29. Radiator cooling fan relay
10. Blower motor	20. “BACK” fuse	30. Radiator cooling fan motor

Component Location

A/C System Major Component Location

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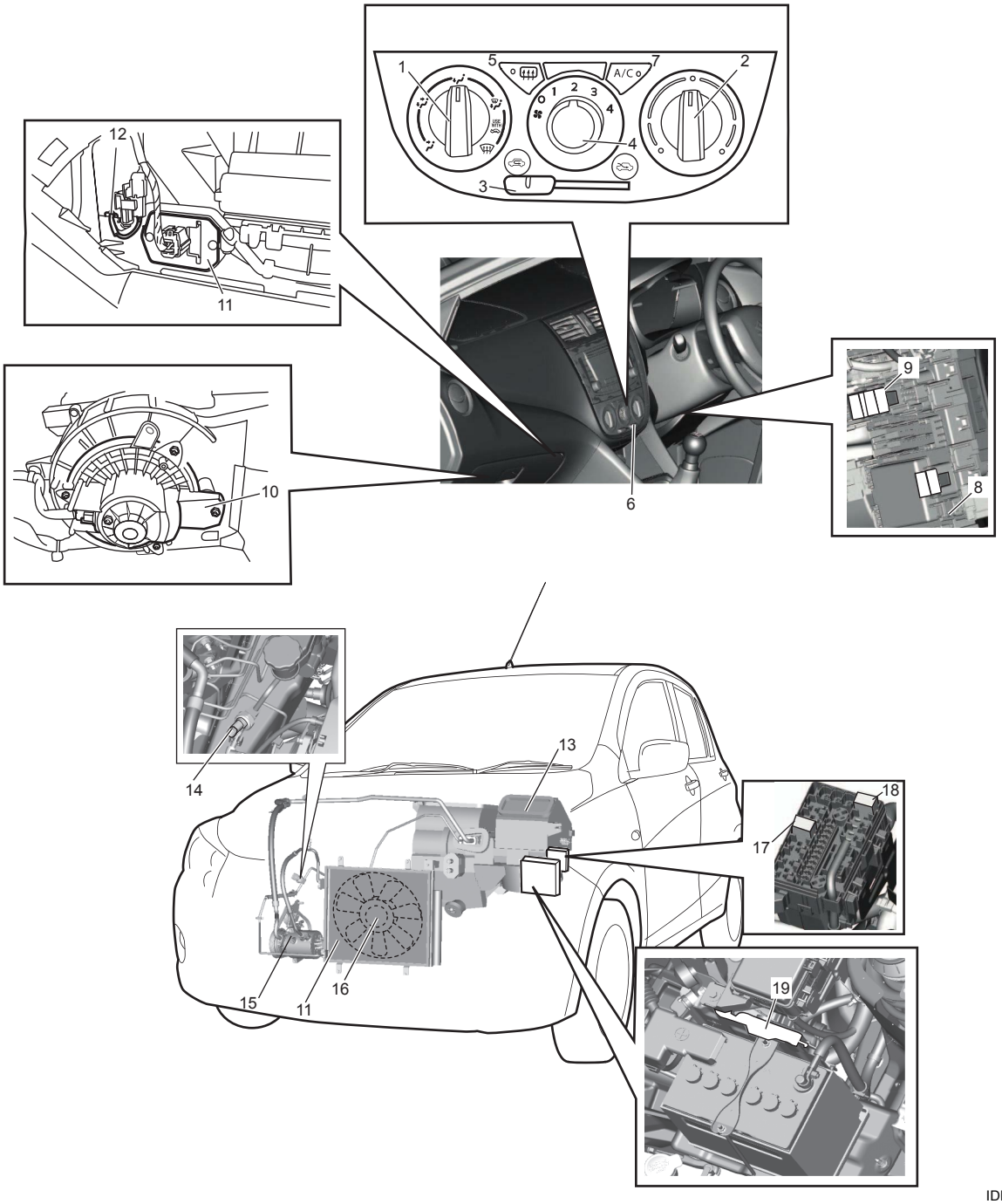


IDL70A720006-05

1. HVAC unit	7. Discharge hose	13. Radiator cover
2. Expansion valve	8. A/C compressor mounting bolt Tightening order: "1" → "2" → "3"	14. A/C compressor bracket
3. O-ring : Apply compressor oil	9. Tension pulley	(a) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
4. Refrigerant pressure sensor	10. A/C compressor	: Do not reuse.
5. Liquid pipe	11. Condenser	
6. Suction hose	12. Radiator cooling fan	

Electronic Control System Component Location

AENDL70A7203002



IDL70A720007-03

1. Air flow selector	8. Junction block	15. A/C compressor
2. Temperature selector	9. Blower motor relay	16. Radiator cooling fan motor
3. Air intake selector	10. Blower motor	17. A/C compressor relay
4. Blower speed selector	11. Blower motor resister	18. Radiator cooling fan relay
5. Rear defogger switch	12. Evaporator temperature sensor	19. ECM
6. HVAC control unit	13. HVAC unit	
7. A/C switch	14. Refrigerant pressure sensor	

Diagnostic Information and Procedures

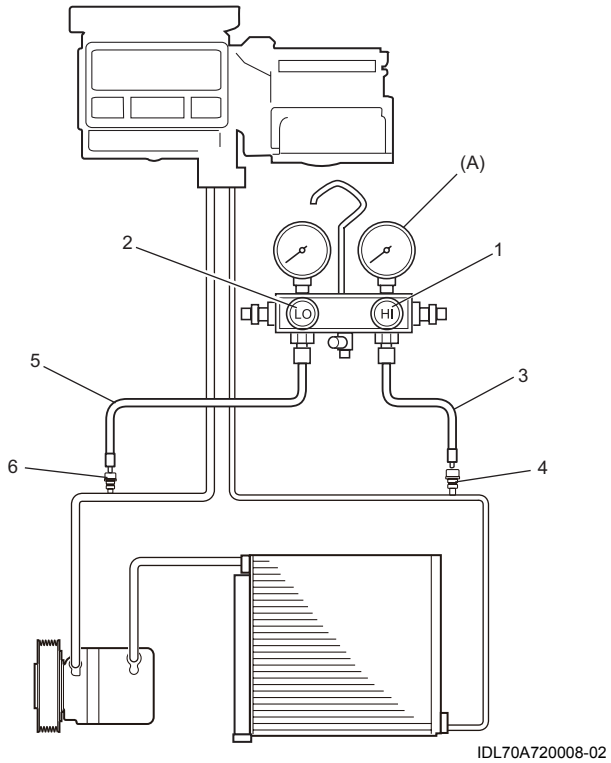
A/C System Performance Inspection

AENDL70A7204001

1) Check that vehicle and environmental conditions are as follows.
   - Vehicle is put indoors.
   - Ambient temperature is within 25 – 35 °C (77 – 95 °F).
   - Relative humidity is within 30 – 70%.
   - There is no wind indoors.
   - HVAC unit is normal.
   - Blower motor is normal.
   - There is no air leakage from air ducts.
   - Condenser fins are clean.
   - Battery voltage is about 12 V or more (battery in good condition).
   - Radiator cooling fan operates normally.
2) Check that high pressure valve (1) and low pressure valve (2) of manifold gauge (A) are firmly closed.

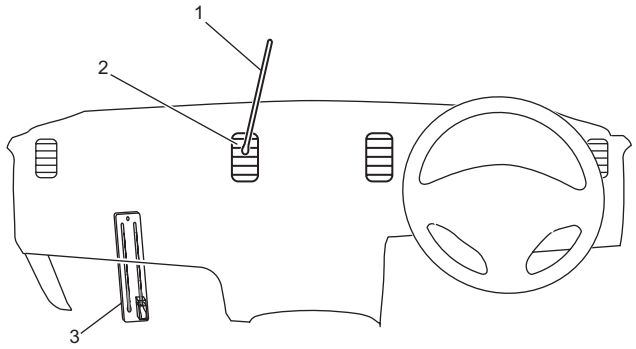
   Special tool
   (A): 09990M06020

3) Connect high pressure charging hose (3) to high pressure service valve (5) on vehicle and low pressure charging hose (4) to low pressure service valve (6).



IDL70A720008-02

4) Warm up engine to the normal operating temperature and keep it at the specified idle speed.
5) Turn A/C switch ON, and then set blower speed selector to maximum speed position, temperature selector to maximum cold position, air flow selector to face position, air intake selector to recirculation mode and side ventilation louver to open position. (Check that compressor and radiator cooling fan are working.)
6) Open all door windows, front doors and hood.
7) Wait for ten minutes to stabilize the A/C operation.
8) Put about 20 mm (0.8 in.) a dry bulb thermometer (1) in front of center ventilation louver. Put a wet-and-dry-bulb thermometer (2) near air inlet of HVAC unit.



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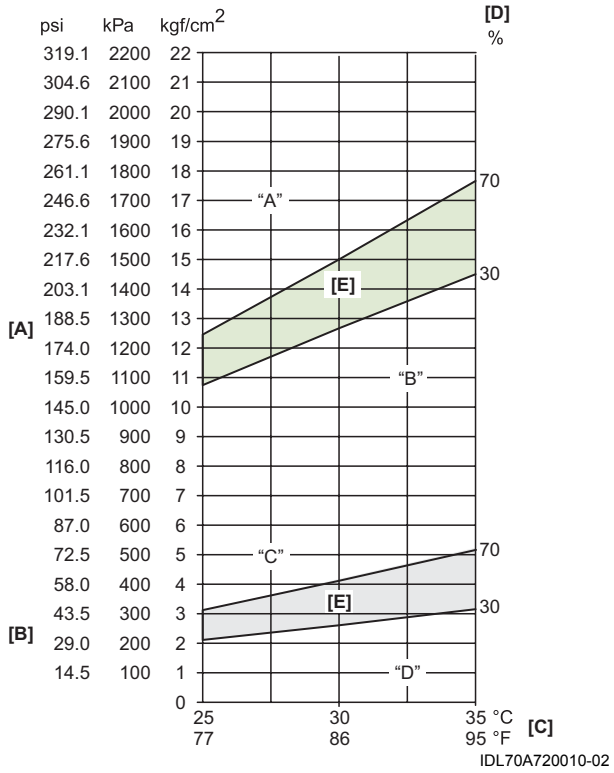
9) Check for each pressure of low side and high side if it is within shaded range in the following graph. If either gauge reading is out of specified pressure, correct defective part referring to the following table.
When diagnosing troubles of abnormal pressure on the low side and high side more specifically, refer to “Trouble Diagnosis for Abnormal Pressure” (Page 7B-14).

NOTE

Pressure registered on gauge varies with ambient temperature. Therefore, use the graphs when determining if pressures are normal or not.

Low side and high side pressure example. Gauges should read as follows when ambient temperature is 30 °C (86 °F)

Pressure on high pressure gauge (HI)	**1270 – 1500 kPa (12.9 – 15.2 kgf/cm^2)**
Pressure on low pressure gauge (LO)	**270 – 420 kPa (2.8 – 4.2 kgf/cm^2)**



[A]: Pressure of high pressure gauge	[C]: Ambient temperature	[E]: Acceptable range
[B]: Pressure of low pressure gauge	[D]: Humidity	

High pressure gauge

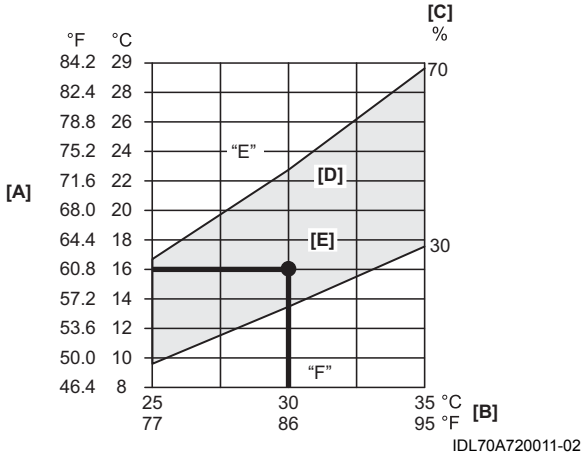
Condition	Possible cause	Correction
Pressure is higher than acceptable range (“A” area)	Refrigerant overcharged	Recharge.
	Expansion valve frozen or clogged	Check expansion valve.
	Clogged refrigerant passage of high pressure side	Clean or replace.
	Radiator cooling fan malfunction (Insufficient cooling of condenser)	Check radiator cooling fan.
	Dirty or bent condenser fins (Insufficient cooling of condenser)	Clean or repair.
	A/C compressor malfunction (Insufficient oil etc.)	Check A/C compressor.
	Engine overheat	Check engine cooling system. ☞(Page 1F-4)
Pressure is lower than acceptable range (“B” area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	A/C compressor malfunction (Insufficient compression)	Check A/C compressor.

Low pressure gauge

Condition	Possible cause	Correction
Pressure is higher than acceptable range (“C” area)	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	A/C compressor malfunction (Insufficient compression)	Check A/C compressor.
Pressure is lower than acceptable range (“D” area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too narrow)	Check expansion valve.
	Clogged refrigerant passage (crashed pipe)	Repair or replace.

10) Check correlation between inlet port temperature-and-outlet port temperature using the graph below. For example, if temperature near air inlet of HVAC unit is 30 °C (86 °F) and the one at air outlet of center ventilation louver is 17 °C (62.6 °F), their crossing point is within acceptable range as shown in the graph. In this case, cooling performance is satisfactory and proper.

11) If crossing point is out of acceptable range, diagnose trouble referring to the following table.



[A]: Temperature at air outlet of center ventilation louver	[C]: Humidity	[E]: Crossing point
[B]: Temperature near air inlet of HVAC unit	[D]: Acceptable range	

Thermometer at center ventilation louver

Condition	Possible cause	Correction
Crossing point is higher than acceptable range (“E” area)	Insufficient or excessive charge of refrigerant	Check refrigerant pressure.
	Dirty or bent evaporator fins	Clean or repair.
	Air leakage from cooling (heater) unit or air duct	Repair or replace.
	Malfunctioning, switch over function of door in cooling (heater) unit	Repair or replace.
	A/C compressor malfunction	Check A/C compressor.
Crossing point is lower than acceptable range (“F” area)	Insufficient air volume from center ventilation louver (Heater blower malfunction)	Check blower motor and fan.
	A/C compressor malfunction	Check A/C compressor.

Trouble Diagnosis for Abnormal Pressure

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NOTE

Normal pressure values on high pressure gauge (HI) and low pressure gauge (LO) in following table are measured when the temperature near air inlet of HVAC unit is about 30 °C (86 °F). As normal pressure values for both gauges vary depending on the ambient temperature, be sure to perform following steps before diagnosis of troubles.

1. **Measure the ambient temperature and using that temperature, read the normal high and low pressure values from the graph given in Step 9 of "A/C System Performance Inspection" (Page 7B-11).**
2. **Use these values in place of the normal pressure values in following table.**

Condition		Detail	Possible cause	Correction
Manifold gauge kPa (kgf/cm^2) (psi)				
LO	HI			
270 – 420 (2.8 – 4.2) (39.2 – 60.9)	1270 – 1500 (12.9 – 15.2) (184.2 – 217.5)	Normal condition	—	—
Negative pressure	500 – 600 (5.1 – 6.1) (72.5 – 87.0)	LO gauge reads negative pressure, while HI gauge reads extremely low pressure. Presence of frost around tubing to and from condenser assembly and expansion valve.	Dust particles accumulate or water droplets are frozen inside expansion valve, preventing the refrigerant from flowing.	Replace expansion valve. Replace condenser assembly. Evacuate A/C system and recharge system with fresh refrigerant.
Normal: 270 – 420 (2.8 – 4.2) (39.2 – 60.9) ↑ ↓ Abnormal: Negative pressure	Normal: 1270 – 1500 (12.9 – 15.2) (184.2 – 217.5) ↑ ↓ Abnormal: 700 – 1000 (7.1 – 10.2) (102 – 145)	During A/C operation, LO gauge sometimes indicates negative pressure, and sometimes normal pressure. Also HI gauge reading fluctuates between abnormal and normal pressure.	Expansion valve is frozen due to moisture in the system, temporarily shutting off refrigeration cycle.	Replace expansion valve. Replace condenser assembly. Evacuate A/C system and recharge system with fresh refrigerant.
50 – 150 (0.5 – 1.5) (7.25 – 21.8)	700 – 1000 (7.1 – 10.2) (102 – 145)	Both LO and HI gauges indicate low readings. Output air is slightly cold.	Insufficient refrigerant in system (Refrigerant leaking).	Using leak detector, check for leakage and repair if necessary. Recharge system with refrigerant to specified amount. If the pressure reading is almost 0 when manifold gauges are attached, check for any leakage, repair them, and evacuate the system.
450 – 550 (4.6 – 5.6) (62.3 – 79.8)		Pressure on LO gauge is high. Pressure on HI gauge is low. Both pressures become equal right after A/C is turned OFF.	Internal leakage in A/C compressor.	Check A/C compressor and repair or replace it if necessary.

Condition		Detail	Possible cause	Correction
Manifold gauge kPa (kgf/cm²) (psi)				
LO	HI			
450 – 550 (4.6 – 5.6) (62.3 – 79.8)	2000 – 2500 (20.4 – 25.5) (290 – 363)	High pressure reading on both LO and Hi gauges.	Overcharged A/C system. Faulty radiator cooling operation. Faulty radiator cooling fan operation.	Adjust refrigerant to specified amount. Clean condenser. Check and repair radiator cooling fan.
		High pressure reading on both Lo and HI gauges. Low pressure side tubing is not cold when touched.	Presence of air in A/C system (Improperly evacuated).	Replace condenser. Check quantity of compressor oil and presence of contaminants in oil. Evacuate system and recharge system with fresh refrigerant.
550 – 650 (5.6 – 6.6) (79.8 – 97.2)		High pressure reading on both LO and HI gauges. Large amount of frost or dew on the low pressure side tubing.	Faulty expansion valve. Refrigerant flow is not regulated properly.	Replace expansion valve.

A/C System Symptom Diagnosis

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Condition	Possible cause	Correction / Reference Item
Blower motor does not operate	Blown fuse	*Check related fuses, and then check for short circuit to ground.*
	Faulty blower motor relay	*Check blower motor relay. ☞(Page 7B-36)*
	Faulty blower motor resistor	*Check blower motor resistor. ☞(Page 7B-31)*
	Faulty blower speed selector	*Check blower speed selector. ☞(Page 7B-34)*
	Faulty wiring or grounding	*Repair or replace wiring if necessary.*
	Faulty blower motor	*Check blower motor. ☞(Page 7B-30)*
	Presence of foreign material	*Remove foreign material.*
Air outlet ports do not change or do not agree with air flow selector's position even if air flow selector is changed	Broken or bent air flow control cable	*Check air flow control cable.*
	Faulty air flow selector	*Check air flow selector.*
	Incorrect installation of air flow control cable	*Check position and adjust it if necessary.*
	Broken air flow control door assembly	*Repair air flow control door assembly.*
	Leaky or clogged air ducts	*Repair air ducts.*
Air intake door does not change even if air intake mode is changed	Broken or bent air intake control cable	*Check and repair air intake control cable, replace it if necessary.*
	Faulty air intake selector	*Check air intake selector.*
	Incorrect installation of air intake control cable	*Check position and adjust it if necessary.*
	Broken air intake door	*Repair air intake door.*
Warm air does not come out or insufficient heating (Incorrect temperature output)	Broken or bent temperature control cable	*Check and repair temperature control cable, replace if necessary.*
	Faulty temperature selector	*Check temperature selector.*
	Incorrect installation of temperature control cable	*Check position and adjust it as necessary.*
	Broken temperature control door	*Repair temperature control door assembly.*
	Clogged air ducts	*Repair air ducts.*
	Leaky or clogged heater core	*Replace heater core.*
	Leaky or clogged heater hoses	*Replace heater hoses.*
	Faulty thermostat	*Check thermostat. ☞(Page 1F-10)*
	Faulty ECT sensor	*Check ECT sensor. ☞(Page 1C-6)*

Condition	Possible cause	Correction / Reference Item
No cool air comes out (A/C compressor does not operate)	No refrigerant	*Recover refrigerant, evacuate and charge A/C system. ☞(Page 7B-22)*
	Blown fuse	*Check related fuses, and then check for short circuit to ground.*
	Faulty A/C switch	*Check A/C switch. ☞(Page 7B-36)*
	Faulty blower speed selector	*Check blower speed selector. ☞(Page 7B-34)*
	Faulty evaporator temperature sensor	*Check evaporator temperature sensor. ☞(Page 7B-31)*
	Faulty refrigerant pressure sensor	*Check refrigerant pressure sensor. ☞(Page 7B-34)*
	Faulty wiring or ground	*Repair wiring.*
	Faulty ECM and its circuit	*Check ECM. ☞(Page 1A-87)*
	Faulty magnet clutch	*Check magnet clutch. ☞(Page 7B-38)*
	Loose or broken compressor drive belt	*Check compressor drive belt. ☞(Page 7B-36)*
	Faulty A/C compressor	*Check A/C compressor.*
	Faulty A/C compressor relay	*Check A/C compressor relay. ☞(Page 7B-36)*
No cool air comes out (radiator cooling fan motor does not operate)	Blown fuse	*Check related fuses, and then check for short circuit to ground.*
	Faulty wiring or ground	*Repair wiring.*
	Faulty radiator cooling fan relay	*Check radiator cooling fan relay. ☞(Page 7B-36)*
	Faulty radiator cooling fan motor	*Check radiator cooling fan motor. ☞(Page 1F-10)*
	Faulty ECM	*Check ECM. ☞(Page 1A-87)*
Cool air does not come out or insufficient cooling (A/C compressor operates abnormally)	Insufficient or excessive charge of refrigerant	*Check amount of refrigerant and system for leakage. Recover refrigerant, evacuate and charge A/C system with refrigerant. ☞(Page 7B-22)*
	Clogged condenser	*Check condenser. ☞(Page 7B-26)*
	Clogged or frosted evaporator	*Check evaporator and evaporator temperature sensor.* *- Evaporator: ☞(Page 7B-31)* *- Evaporator temperature sensor: ☞(Page 7B-31)*
	Faulty evaporator temperature sensor	*Check evaporator temperature sensor. ☞(Page 7B-31)*
	Faulty expansion valve	*Check expansion valve. ☞(Page 7B-32)*
	Loose or broken compressor drive belt	*Check compressor drive belt. ☞(Page 7B-36)*
	Faulty magnet clutch	*Check magnet clutch. ☞(Page 7B-38)*
	Faulty A/C compressor	*Check A/C compressor.*
	Air in A/C system	*Replace condenser, and then evacuate and charge A/C system. ☞(Page 7B-22)*
	Air leakage from HVAC unit or air duct	*Repair HVAC unit or duct.*
	Faulty heater and ventilation system	*Check HVAC unit.*
	Faulty blower motor	*Check blower motor. ☞(Page 7B-30)*
	Excessive compressor oil in A/C system	*Drain excessive compressor oil from A/C system circuit and A/C compressor.*
Cool air comes out only intermittently	Faulty wiring connection	*Repair wiring.*
	Faulty evaporator temperature sensor	*Check evaporator temperature sensor. ☞(Page 7B-31)*
	Faulty expansion valve	*Check expansion valve. ☞(Page 7B-32)*
	Excessive moisture in A/C system	*Replace condenser, and then evacuate and charge A/C system. ☞(Page 7B-22)*
	Faulty magnet clutch	*Check magnet clutch. ☞(Page 7B-38)*
	Excessive amount of refrigerant	*Recover refrigerant, evacuate and charge A/C system. ☞(Page 7B-22)*

Condition	Possible cause	Correction / Reference Item
Cool air comes out only at high speed	Clogged condenser	*Check condenser. ☞(Page 7B-26)*
	Insufficient charge of refrigerant	*Check A/C system for leakage.*
	Air in A/C system	*Replace condenser, and then evacuate and charge A/C system. ☞(Page 7B-22)*
	Loose compressor drive belt	*Check compressor drive belt. ☞(Page 7B-36)*
	Faulty A/C compressor	*Check A/C compressor.*
Cool air does not come out only at high speed	Excessive amount of refrigerant	*Recover refrigerant, evacuate and charge A/C system. ☞(Page 7B-22)*
	Frosted evaporator	*Check evaporator and evaporator temperature sensor.* *- Evaporator: ☞(Page 7B-31)* *- Evaporator temperature sensor: ☞(Page 7B-31)*
Insufficient flow of cooled air	Clogged or frosted evaporator	*Check evaporator and evaporator temperature sensor.* *- Evaporator: ☞(Page 7B-31)* *- Evaporator temperature sensor: ☞(Page 7B-31)*
	Air leakage from HVAC unit or air duct	*Repair HVAC unit or air duct.*
	Faulty blower motor	*Check blower motor. ☞(Page 7B-30)*
	Faulty wiring or ground	*Repair wiring.*

Abnormal Noise Symptom Diagnosis of HVAC System

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Abnormal Noise from A/C Compressor

Condition	Possible cause	Correction / Reference Item
During A/C compressor operation, a rumbling noise is heard as to engine speed increases	Inadequate clearance in scroll area	*Replace A/C compressor. ☞(Page 7B-37)*
Loud noise is heard at certain rpm not proportional to engine speed	Loose or faulty compressor drive belt	*Adjust drive belt tension or replace drive belt. ☞(Page 7B-36)*
	Loose A/C compressor mounting bolts	*Retighten mounting bolts.*
Loud rattle is heard at low engine rpm	Loose A/C compressor clutch plate bolt	*Retighten clutch plate bolt.* *Replace A/C compressor if it has operated in rattling condition for a long time.*

Abnormal Noise from Magnetic Clutch

Condition	Possible cause	Correction / Reference Item
Rumbling noise is heard when A/C compressor is not in operation	Worn or damaged bearings	*Replace magnet clutch assembly. ☞(Page 7B-39)*
Chattering noise is heard when A/C compressor is in operation	Faulty magnet clutch clearance (excessive clearance)	*Adjust magnet clutch clearance. ☞(Page 7B-39)*
	Worn magnet clutch friction surface	*Replace magnet clutch assembly. ☞(Page 7B-39)*
	Compressor oil leaked from shaft seal, contaminating the friction surface	*Replace A/C compressor. ☞(Page 7B-37)*

Abnormal Noise from Tubing

Condition	Possible cause	Correction / Reference Item
Droning noise is heard from inside of the vehicle, but not particularly noticeable in engine compartment	Faulty tubing clamps	*Reposition clamps and increase number of clamps.*
	Resonance caused by pulsation from variations in refrigerant pressure	*Attach a silencer to tubing, or modify its position and length.*

Abnormal Noise from Condenser Assembly

Condition	Possible cause	Correction / Reference Item
Considerable vibration in condenser assembly	Resonance from condenser assembly bracket and body	*Firmly insert a a silencer between condenser assembly bracket and body.*

Abnormal Noise from Crankshaft Pulley

Condition	Possible cause	Correction / Reference Item
Large rattling noise is heard at idle or sudden acceleration	Loosen crankshaft pulley bolt	*Retighten bolt.*

Abnormal Noise from Tension Pulley

Condition	Possible cause	Correction / Reference Item
Clattering noise is heard from pulley	Worn or damaged bearing	*Replace tension pulley.*
Pulley cranks upon contact	Cracked or loose bracket	*Replace or retighten bracket.*

Abnormal Noise from Evaporator

Condition	Possible cause	Correction / Reference Item
Whistling sound is heard from evaporator	Depending on the combination of the interior / exterior temperatures, engine rpm and refrigerant pressure, the refrigerant flowing out of the expansion valve may make a whistling sound	*Slightly decreasing amount of refrigerant may stop this noise.* *Check expansion valve and replace it if faulty.*

Abnormal Noise from Blower Motor

Condition	Possible cause	Correction / Reference Item
Blower motor emits chirping sound in proportion to its speed of rotation	Worn or damaged motor brushes or commutator	*Replace blower motor.*
Fluttering noise or large droning noise is heard from blower motor	Leaves or other debris introduced from fresh air inlet to blower motor	*Remove debris and check that the screen at fresh air inlet is intact.*

Air Conditioning System Check

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Step	Action	Yes	No
1	**Customer complaint analysis ☞(Page 7B-19)** 1) Perform “Customer complaint analysis”. *Was customer complaint analysis performed*	Go to Step 2.	Perform customer complaint analysis.
2	**Visual inspection ☞(Page 7B-19)** 1) Perform “Visual inspection”. *Is there any faulty condition?*	Repair or replace defective part.	Go to Step 3.
3	**A/C system performance inspection ☞(Page 7B-19)** 1) Perform “A/C system performance inspection”. *Is there any faulty condition?*	Repair or replace defective part, and then go to Step 6.	Go to Step 4.
4	**Perform A/C system symptom diagnosis ☞(Page 7B-19)** 1) Check and repair A/C system. *Is there any faulty condition?*	Repair or replace defective part, and then go to Step 6.	Go to Step 5.

Step	Action	Yes	No
5	**Check for intermittent problem ☞(Page 7B-20)** 1) Check for intermittent problems. *Is there any faulty condition?*	Repair or replace defective part, and then go to Step 6.	Go to Step 6.
6	**Final confirmation test ☞(Page 7B-20)** 1) Perform "Final confirmation test". *Is there any malfunction?*	Go to Step 3.	End.

Description for Each Step

Step 1. Customer complaint analysis

Talk to customer, and then record details of the problem.

Customer questionnaire (Example)

Customer's Name:	Model:	VIN:	
Date of Issue:	Date of Reg:	Date of Problem:	Mileage:

Problem Symptoms	● A/C switch indicator lamp abnormal: fails to turn on/fails to turn off/flashes ● Abnormal noise while A/C compressor is working: from compressor/ from condenser fan motor other_____ ● Chattering from A/C compressor: ● Condenser fan motor does not work: ● A/C compressor does not work: ● Other:
Frequency of Occurrence	● Continuous/Intermittent (times a day, a month)/ other_____
Conditions for Occurrence of Problem	● Vehicle at stop & A/C compressor is working: ● For some time after A/C switch is ON: ● When outside air temperature is high: ● When outside air temperature is low: ● All the time:
Environmental Condition	● Weather: fair/cloudy/rain/snow/other_____ ● Temperature: °F (°C)
Diagnostic Trouble Code	● First check: Normal code/malfunctional code ( ) ● Second check after test drive: Normal code/malfunctional code ( )

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NOTE

The form is a standard sample. It should be modified according to conditions and characteristics of each locality.

Step 2. Visual inspection

As a preliminary step, be sure to perform visual check of the items that support proper function of the air conditioning system referring to "Visual Inspection" (Page 7B-20).

Step 3. A/C system performance inspection

Check A/C system suspected to be a possible cause referring "A/C System Performance Inspection" (Page 7B-11).

Step 4. A/C system symptom diagnosis

Check any part or system suspected to be a possible cause referring to "A/C System Symptom Diagnosis" (Page 7B-15).

Step 5. Check for intermittent problem
Check parts that are prone to cause intermittent problem (e.g. wire harness, connector, etc.), referring to "Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11).

Step 6. Final confirmation test
Check that trouble symptom has disappeared and A/C system is free from abnormal conditions.

Visual Inspection

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Check visually the following parts and systems.

Inspection item		Correction
• Battery	Electrolyte level and corrosion of terminals	"Battery Description" in Section 1J (Page 1J-1)
• Connectors of electric wire harness	Disconnection and friction	"Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)
• Fuses	Blowout	"Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)
• Parts	Installation and damage	—
• Other parts that can be checked visually		

Inspection of HVAC Control Unit and Its Circuit

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HVAC control unit and its circuits can be checked at HVAC control unit connectors by measuring voltage.

⚠ CAUTION

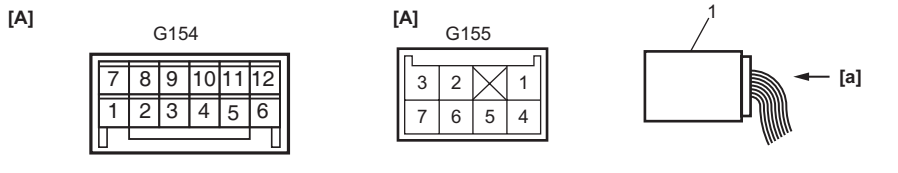
HVAC control unit can be checked only through connector. It is strictly prohibited to connect voltmeter to HVAC control unit with connectors disconnected from it.

Voltage Check

1) Remove HVAC control unit. ☞(Page 7B-33)
2) Connect "G155" connector and "G156" connector to HVAC control unit.
3) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, check that battery voltage is 12 V or more when ignition switch is ON.



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1. HVAC control unit	[A]: HVAC control unit connector (View: [a])

Terminal	Wire color	Circuit	Normal Voltage	Condition
G154-1	PNK	Ground for A/C switch	0 – 1 V	A/C switch: OFF or A/C switch: ON Blower speed selector: any position other than OFF
			10 – 14 V	A/C switch: ON Blower speed selector: OFF
G154-2	BLK/RED	Rear defogger indicator signal	0 – 1 V	Rear defogger: not in operation
			10 – 14 V	Rear defogger: in operation
G154-3	BRN	Ground for illumination	0 – 1 V	—
G154-4	—	—	—	—
G154-5	—	—	—	—

Terminal	Wire color	Circuit	Normal Voltage	Condition
G154-6	—	—	—	—
G154-7	GRN/WHT	A/C switch signal	0 – 1 V	A/C switch: ON Blower speed selector: any position other than OFF
			10 – 14 V	A/C switch or blower speed selector: OFF
G154-8	LTBLU	Rear defogger switch signal	0 – 1 V	Rear defogger: pushed
			Refer to “Inspection of BCM and Its Circuits” in Section 10B (Page 10B-20).	
G154-9	RED/YEL	Illumination switch signal	0 – 1 V	Lighting switch: OFF
			10 – 14 V	Lighting switch: ON
G154-10	—	—	—	—
G154-11	LTGRN	Ignition switch signal	0 – 1 V	Ignition switch: OFF
			10 – 14 V	Ignition switch: ON
G154-12	BLK	Ground for HVAC control unit	0 – 1 V	—
G155-1	BLK	Ground for blower speed selector	0 – 1 V	—
G155-2	RED	Blower speed selector (1st)	10 – 14 V	Blower speed selector: OFF
			0 – 1 V	Blower speed selector: any position other than OFF
G155-3	RED/WHT	Blower speed selector (2nd)	0 – 14 V	Blower speed selector: OFF
			Approx. 6 V	Blower speed selector: 1st position
			0 – 1 V	Blower speed selector: between 2nd and 4th position
G155-4	—	—	—	—
G155-5	PNK	Ground for A/C switch	0 – 1 V	A/C switch: OFF or A/C switch: ON Blower speed selector: any position other than OFF
			10 – 14 V	A/C switch: ON Blower speed selector: OFF
G155-6	WHT	Blower speed selector (4th)	10 – 14 V	Blower speed selector: OFF
			Approx. 9 V	Blower speed selector: 1st position
			Approx. 6 V	Blower speed selector: 2nd position
			Approx. 4 V	Blower speed selector: 3rd position
			0 – 1 V	Blower speed selector: 4th position
G155-7	BLU	Blower speed selector (3rd)	10 – 14 V	Blower speed selector: OFF
			Approx. 9 V	Blower speed selector: 1st position
			Approx. 5 V	Blower speed selector: 2nd position
			0 – 1 V	Blower speed selector: between 3rd and 4th position

A/C System Inspection at ECM

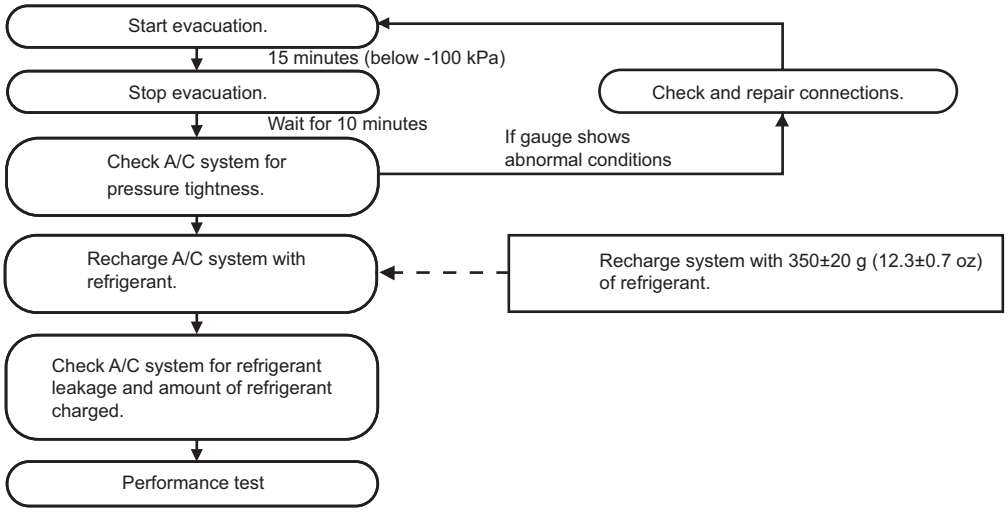
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Check the voltage related to A/C system at ECM terminals. ☞(Page 1A-87)

Repair Instructions

Operation Procedure for Refrigerant Charge

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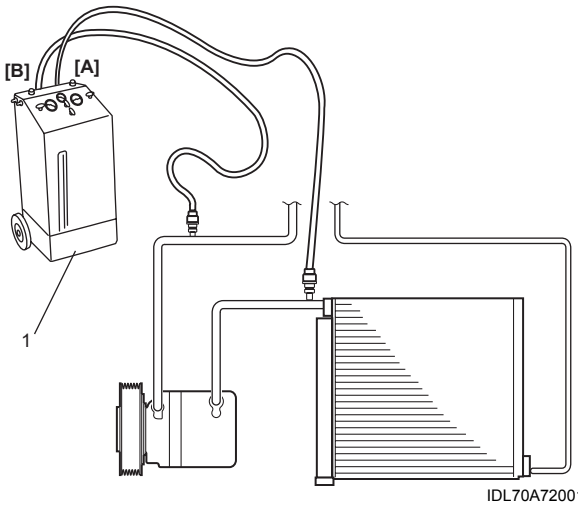
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Recovery

When discharging refrigerant out of A/C system, always recover it using refrigerant recovery and recycling equipment (1) because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environment.

NOTE

- **After recovering refrigerant from system, the amount of removed compressor oil must be measured to determine the amount of compressor oil for replenishment.**
- **When handling recovery and recycling equipment, follow the instruction manual for the equipment.**

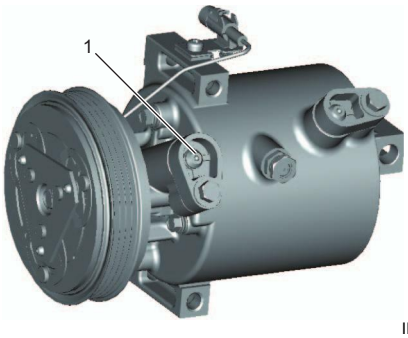


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[A]: High pressure	[B]: Low pressure

Replenishing Compressor Oil

It is necessary to replenish A/C compressor with compressor oil to specified amount from compressor suction side hole (1) before evacuating system and charging it with refrigerant.



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When charging refrigerant only

When charging refrigerant without replacing any component, replenish A/C compressor with compressor oil of the dame amount measured when recovering refrigerant (if not measured, add 10 cm^3 (10 ml, 0.33 US.oz, 0.35 Imp.oz) of oil).

When replacing A/C compressor

NOTICE

Use of a compressor oil other than the specified oil is inappropriate for the components of the A/C system and may cause problems with operation of the system.
Use only the specified compressor oil or equivalent.

Compressor oil is sealed in each new A/C compressor by the amount required for A/C system. Therefore, when installing a new A/C compressor, drain the calculated amount of oil from it.

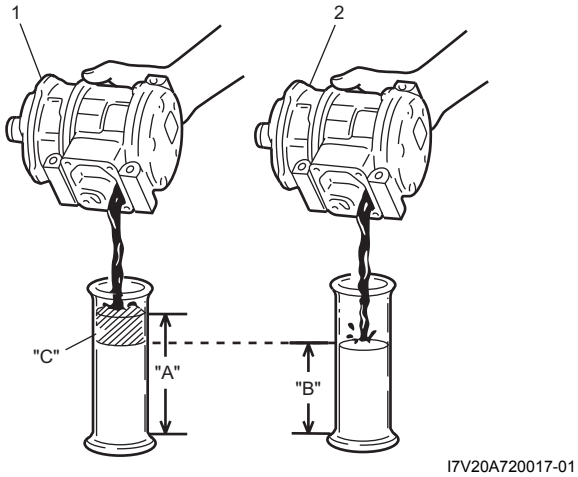
Amount of oil to be drained
"C" = "A" – "B"
"C": Amount of oil to be drained
"A": Amount of oil in a new A/C compressor (1)
"B": Amount of oil in removed A/C compressor (2)

NOTE

A/C compressor assembly supplied from factory is filled up with the following amount of oil.

: Compressor oil 99000M24120–842 (Compressor oil (250 ML) DH-PR)

Amount of oil in A/C compressor
80 – 90 cm³ (80 – 90 ml, 2.71 – 3.04 US.oz, 2.82 – 3.16 Imp.oz)



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When replacing other parts
Replenish the following amount of oil to A/C compressor.

Amount of compressor oil to be replenished
Evaporator: 25 cm³ (25 ml, 0.85 US.oz, 0.88 Imp.oz)
Condenser (with receiver/dryer): 20 cm³ (20 ml, 0.68 US.oz, 0.70 Imp.oz)
Hoses: 5 cm³ (5 ml, 0.17 US.oz, 0.18 Imp.oz) each
Pipes: 5 cm³ (5 ml, 0.17 US.oz, 0.18 Imp.oz) each

Evacuation

NOTICE

Attempting to evacuate the A/C system when refrigerant remains in the system will damage the vacuum pump.
Do not evacuate the A/C system before completely recovering the refrigerant from the system.

NOTE

If A/C system circuit is opened (exposed) to atmosphere, system must be evacuated using a vacuum pump. The A/C system should be fitted with a manifold gauge set, and should be evacuated for approximately 15 minutes.

1) Connect high pressure charging hose and low pressure charging hose of special tool (A) (manifold gauge set) respectively as follows:
   High pressure charging hose → High pressure charging valve (3) on discharge hose
   Low pressure charging hose → Low pressure charging valve (4) on suction pipe

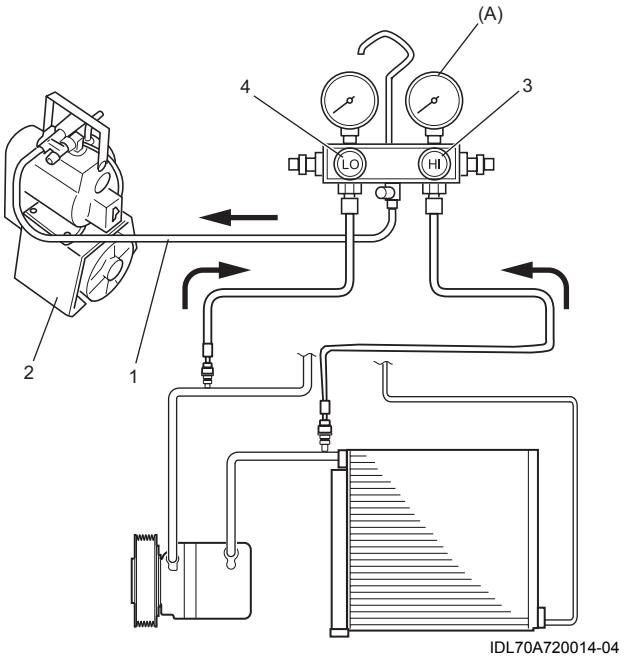
   Special tool
   (A): 09990M06020

2) Attach center charging hose (1) of manifold gauge set to vacuum pump (2).
3) Operate vacuum pump, and then open high pressure side valve (3) of manifold gauge set.
   If there is no blockage in the system, there will be an indication on high pressure gauge.
   When this occurs, open low pressure side valve (4) of the gauge set.
4) Approximately 10 minutes later, low pressure gauge should show a vacuum lower than –100 kPa (–1.0 kgf/cm², –760 mmHg, –14.7 psi), indicating that no leakage exists.

NOTE

- **If the system does not show a vacuum below –100 kPa (–1.0 kgf/cm², –760 mmHg, –14.7 psi), close both valves, stop vacuum pump and watch charge in reading of low pressure gauge.**
- **Increase in the gauge reading suggests of leakage. In this case, repair the system before continuing its evacuation.**
- **If the gauge shows a stable reading (suggesting no leakage), continue evacuation.**

5) Carry out evacuation for 15 minutes.
6) Continue evacuation until low pressure gauge indicates a vacuum below –100 kPa (–1.0 kgf/cm², –760 mmHg, –14.7 psi).
7) Close high pressure valve and low pressure valve.
8) Stop vacuum pump. Disconnect center charging hose from pump inlet. Now, the system is ready for charging refrigerant.



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Checking A/C System for Pressure Leakage
After completing the evacuation, close manifold gauge high pressure valve and low pressure valve and wait for 10 minutes. Check that low pressure gauge reading has not changed.

NOTE

If gauge reading moves closer to "0", there is leakage somewhere. Check the tubing connections and make necessary corrections.
Then, evacuate system once again and make sure that there is no leakage.

Charge

⚠ CAUTION

There is a risk of personal injury or health problems if the A/C system is charged with refrigerant incorrectly or if refrigerant containers are improperly handled.
Take the following precautions to reduce the risk of injury or health problems.

- **Perform the refrigerant charge operation with the engine stopped. Charge the high-pressure side first and then the low-pressure side. If you do not, the refrigerant may flow backward and cause the hose or refrigerant container to burst.**
- **Install the tap valve carefully following the instructions on the refrigerant container to prevent contact with the refrigerant.**
- **Be sure to empty the refrigerant container before discarding it to prevent possible health problems and other dangerous consequences.**
- **Never expose the refrigerant container to a heat higher than 40 °C (104 °F). Liquid refrigerant will turn into a toxic gas.**

NOTICE

Failure to take proper precautions when charging the A/C system can result in charging the system with the incorrect amount of refrigerant and can lead to poor system operation or damage to system components.

- **Since the A/C system has no sight glass, first recover refrigerant and evacuate the system, and then fill the system with the specified amount or refrigerant.**
- **Charge the system only when the A/C compressor is not hot to assure that you have used the correct amount of refrigerant.**
- **Check the pressure gauges before and during charging to assure that there is the correct amount of refrigerant in the system.**
- **Do not turn the refrigerant container upside down during charging. Doing so will cause liquid refrigerant to enter the A/C compressor and damage it.**

NOTE

The A/C system contains HFC-134a (R-134a). Described here is a method for charging the A/C system with refrigerant from the refrigerant service container.
When charging the system with the refrigerant recovered using the refrigerant recycling equipment, follow the procedure described in the equipment manufacturer's instruction manual.

Perform initial charge through high pressure side with the engine stopped.
Next, charge the system with refrigerant as follows from low pressure side with engine running.

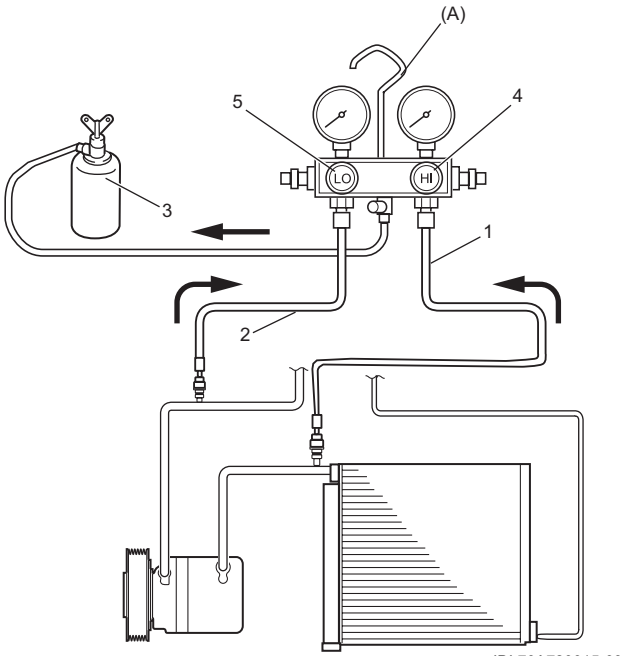
1) Check if hoses are routed properly after evacuating system.
2) Connect low pressure charging hose (2) and high pressure charging hose (1) of the manifold gauge set (A) in position. Then, open refrigerant container valve (3) to purge the charging line.

3) Open the high pressure side valve (4) to charge system with refrigerant.
4) After a while, open the low pressure side valve (5) and close the high pressure side valve.

⚠ WARNING

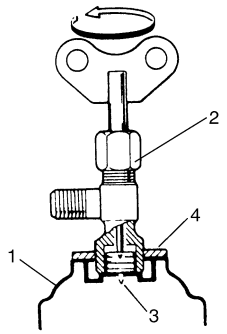
If the high-pressure side valve is not closed securely, the refrigerant may flow backwards and cause the hose or refrigerant container to burst, possibly resulting in a personal injury.
Close the high-pressure side valve securely.

5) Start engine and keep engine speed at 1500 rpm, and then operate A/C system.
6) Charge A/C system with vapor refrigerant. At this time, refrigerant container should be held upright.



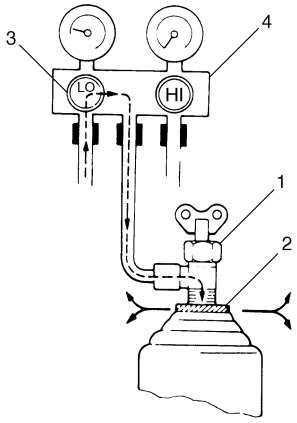
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7) When refrigerant container (1) is emptied, use the following procedure to replace it with a new refrigerant container.
   a) Close low pressure valve.
   b) Replace empty container with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve (2), use the following procedure for replacement.
      i) Turn handle of tap valve counterclockwise to retract needle (3), and then remove refrigerant container tap valve by loosening its plate nut (4).
      ii) Install refrigerant container tap valve to new refrigerant container.



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   c) Purge any air from center charging hose. When using refrigerant container tap valve, use the following procedure to purge air.
      i) Fully tighten refrigerant container tap valve (1), and then loosen (open) plate nut (2) slightly.
      ii) Open low pressure side valve (3) of manifold gauge set (4) a little.
      iii) As soon as refrigerant comes out with a “hiss” through a clearance between refrigerant container and tap valve, tighten plate nut as well as low pressure side valve.
      iv) Turn handle of tap valve clockwise so that its needle is screwed into the new container to make a hole for refrigerant flow.



I2RH01720019-01

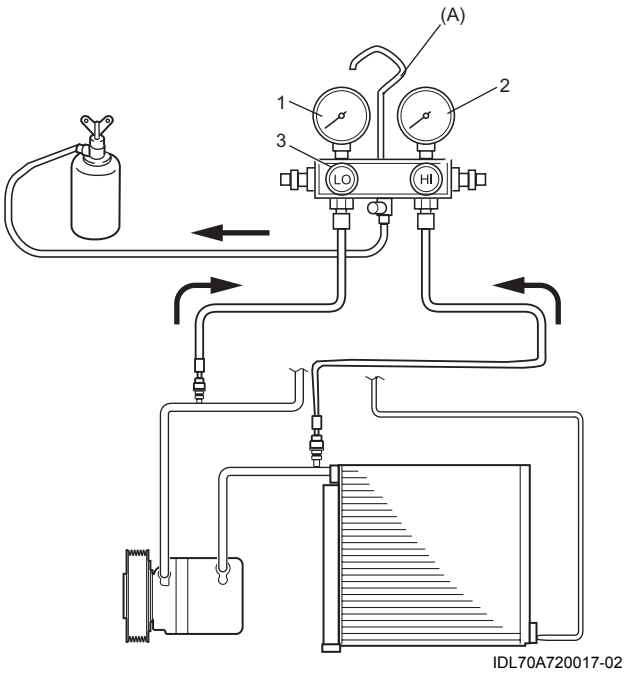
8) After the system is charged with specified amount of refrigerant or when low pressure gauge (1) and high pressure gauge (2) have indicated the following specified values, close low pressure side valve (3) on manifold gauge set (A).

Specified amount of refrigerant
350 ± 20 g (12.3 ± 0.7 oz)

Low pressure side and high pressure side example

Gauges should read as follows when ambient temperature is 30 °C (86 °F).	
Pressure on high pressure gauge	**1270 – 1500 kPa (12.9 – 15.2 kgf/cm²) (184.2 – 217.5 psi)**

Pressure on low pressure gauge	**270 – 420 kPa (2.8 – 4.2 kgf/cm²) (39.2 – 60.9 psi)**



IDL70A720017-02

Removal of Manifold Gauge Set

⚠ WARNING

If the manifold gauge set is removed carelessly, refrigerant under pressure may spray out of the high-pressure side of the A/C system. The refrigerant could contact your eyes or skin, causing injury.
Remove the manifold gauge set carefully, following the instructions provided below.

For the A/C system charged with specified amount of refrigerant, remove manifold gauge set as follows:

1) Close low pressure side valve of manifold gauge set. (High pressure side valve has already been closed during charging process.)
2) Close refrigerant container valve.
3) Stop engine.
4) Using shop rag, remove charging hoses from service valves. Perform this operation quickly.
5) Put caps on service valves.

Checking A/C System for Refrigerant Leakage
Whenever a refrigerant leakage is suspected in the system or any service operation has been performed which may result in malfunction of lines and connections, it is important to perform check for leakage.
Common sense should be used during refrigerant leakage test, since the need and extent of any such test will, in general, depend upon the nature of a complaint and the type of a service performed on the system.

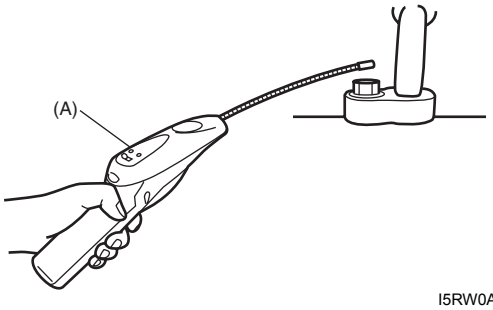
Liquid leakage detector

⚠ WARNING

If the refrigerant is exposed to a fire, it turns to a poisonous gas (phosgene).
Do not inhale the gas that is produced if refrigerant is exposed to fire.

There are a number of fittings and places throughout the A/C system where a liquid leak detector solution may be used to pinpoint refrigerant leakage.
By applying the solution to the area in question with a swab, bubbles will form within seconds if there is leakage.
For connections in such confined areas, as those around evaporator and condenser, electronic (refrigerant) leak detector is more practical for determining leakage.

Special tool
(A): 09990M86012



I5RW0A721054-01

Radiator Cooling Fan Removal and Installation

AENDL70A7206002

Refer to “Radiator Cooling Fan Assembly Removal and Installation” in Section 1F (Page 1F-11).

Radiator Cooling Fan Inspection

AENDL70A7206003

Refer to “Radiator Cooling Fan Assembly On-Vehicle Inspection” in Section 1F (Page 1F-10).

Condenser Assembly On-Vehicle Inspection

AENDL70A7206004

Check the following.

- Condenser fins for clogging.
  If clogged, wash condenser with water and dry it with compressed air.
- Condenser fins for leakage and breakage
  If any defects are found, repair or replace condenser.
- Condenser fittings for leakage
  If any defects are found, repair or replace condenser.

Condenser Assembly Removal and Installation

AENDL70A7206005

NOTICE

Condenser and radiator fins can easily be bent during removal of the condenser assembly.
Remove the condenser assembly carefully so as not to damage the condenser and radiator fins. If any of them is bent, straighten it using a flat-bladed screwdriver or pliers.

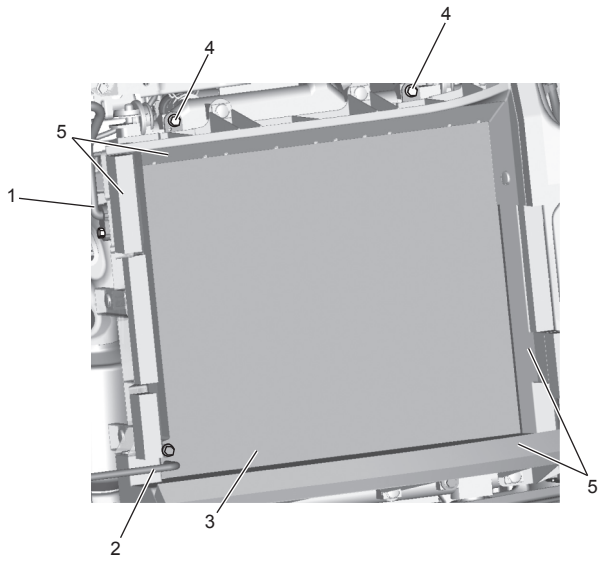
Removal

1) Recover refrigerant from A/C system referring to “Recovery” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).

NOTE

Measure the amount of removed compressor oil to determine how much compressor oil is required for replenishment.

2) Remove front bumper. ☞(Page 9H-1)
3) Remove radiator covers (5).
4) Disconnect discharge hose (1) and liquid pipe (2) from condenser assembly (3).
5) Remove condenser assembly mounting bolts (4).



IDL70A720018-03

6) Remove condenser assembly from radiator.

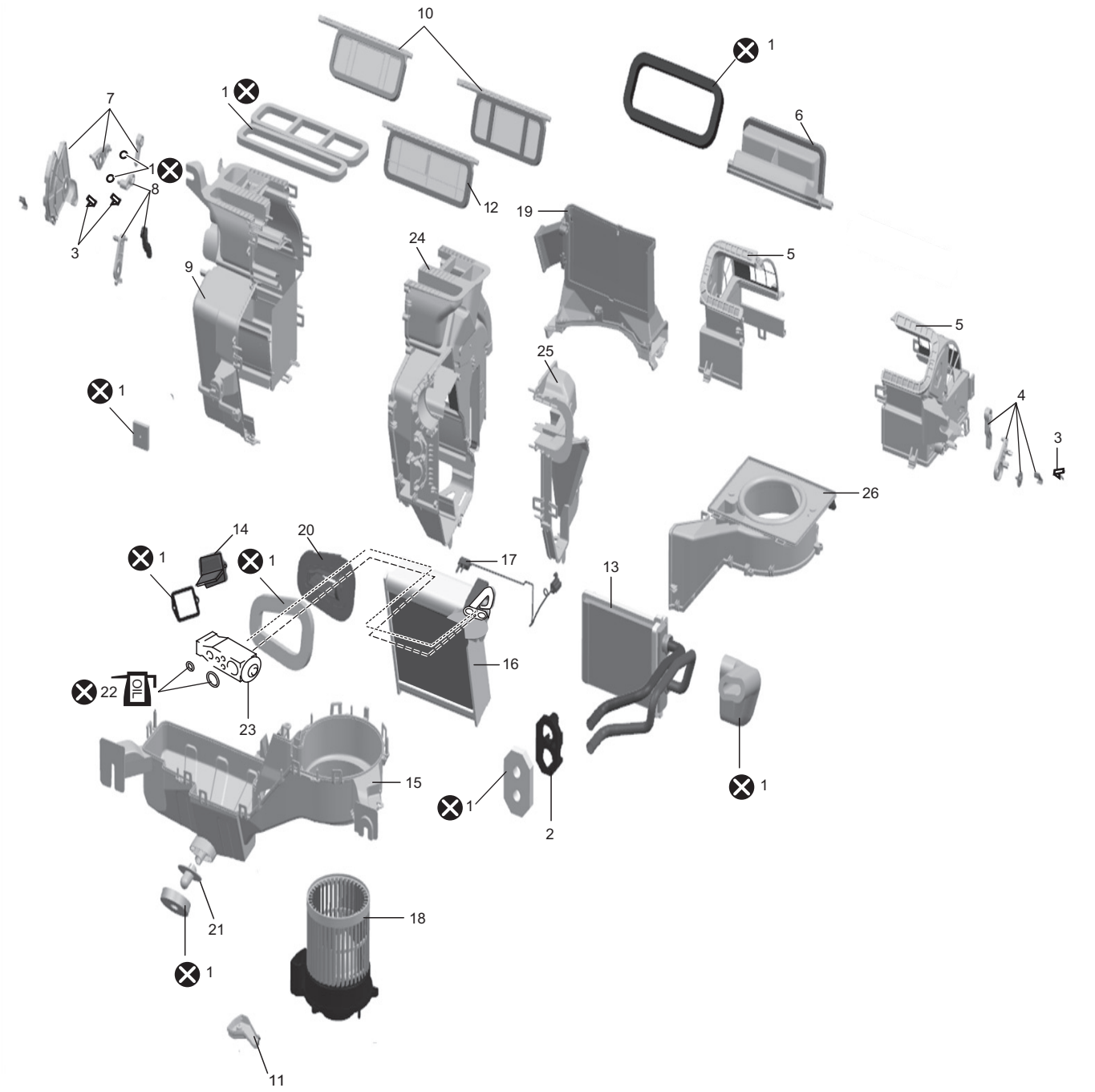
Installation

Reverse removal procedure noting the following points.

- Replenish A/C compressor with specified amount of compressor oil from compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).
- Apply compressor oil to new O-ring of discharge hose and liquid pipe.

HVAC Unit Components

AENDL70A7206007



IDL70A720019-03

1. Packing	8. Temperature control lever	15. Blower case	22. O-ring : Apply compressor oil.
2. Heater core pipe flange	9. Heater RH case	16. Evaporator	23. Expansion valve
3. Cable clamp	10. Air flow control door	17. Evaporator temperature sensor	24. Heater LH case
4. Air intake control lever	11. Blower motor side cover	18. Blower motor	25. Expansion valve cover
5. Air intake case	12. Temperature control door	19. Foot duct assembly	26. Scroll upper case
6. Air intake control door	13. Heater core	20. Grommet	: Do not reuse.
7. Air flow control lever	14. Blower motor resistor	21. Drain hose	

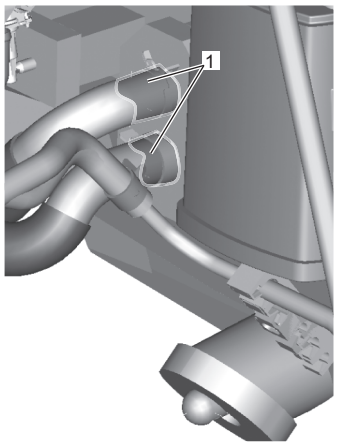
HVAC Unit Removal and Installation

AENDL70A7206008

Removal

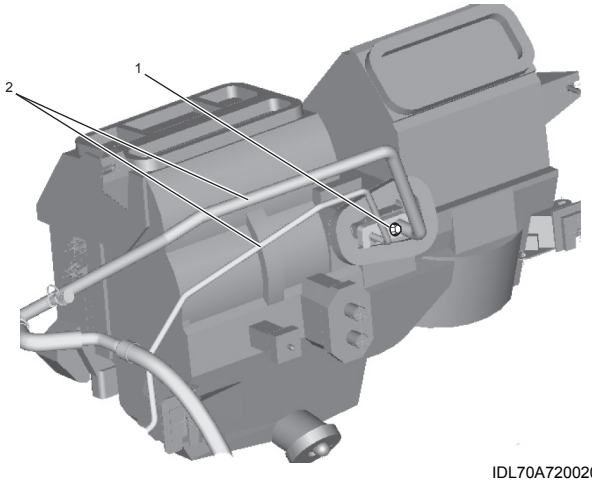
1) Recover refrigerant from A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).

2) Drain engine coolant. ☞(Page 1F-8)
3) Disconnect heater hoses (1) from HVAC unit.



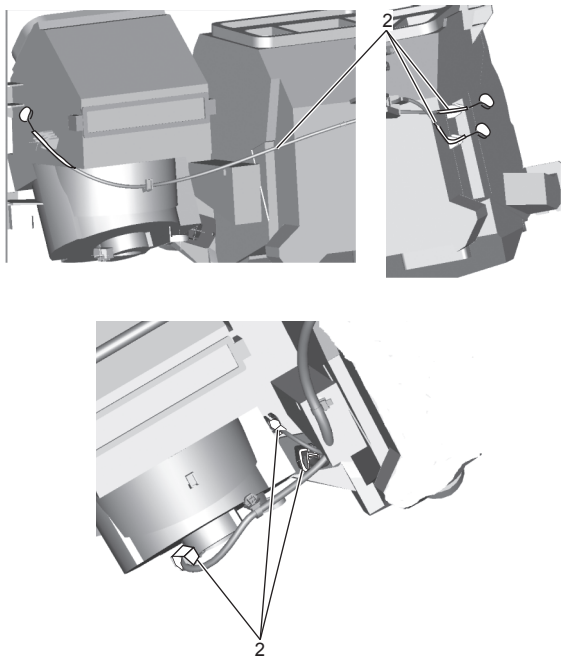
IDL70A720021-02

4) Remove bolt (1) and disconnect pipes (2) from expansion valve.



IDL70A720020-02

5) Remove instrument panel. ☞(Page 9C-12)
6) Remove control cables (1) and disconnect connectors (2).

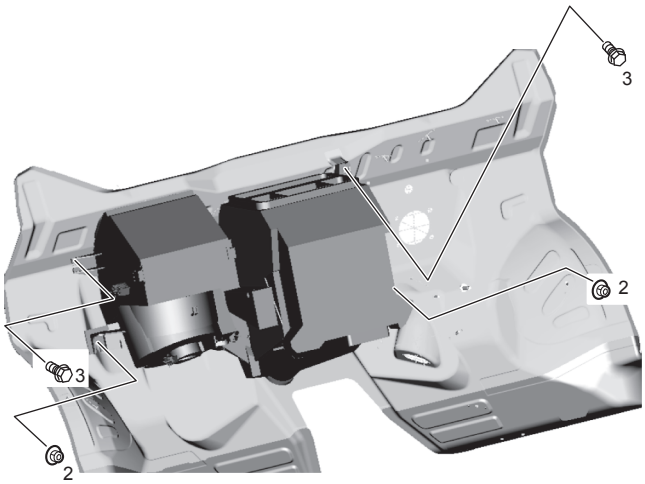


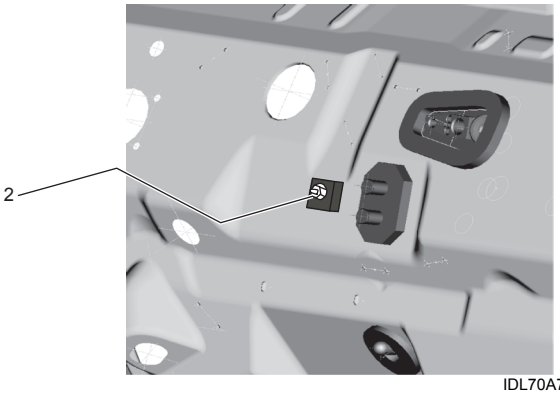
IDL70A720001-01

7) Remove HVAC unit (1) from vehicle body by removing nuts (2) and bolts (3).

NOTE

When removing HVAC unit, be careful not to spill engine coolant and compressor oil on vehicle floor.

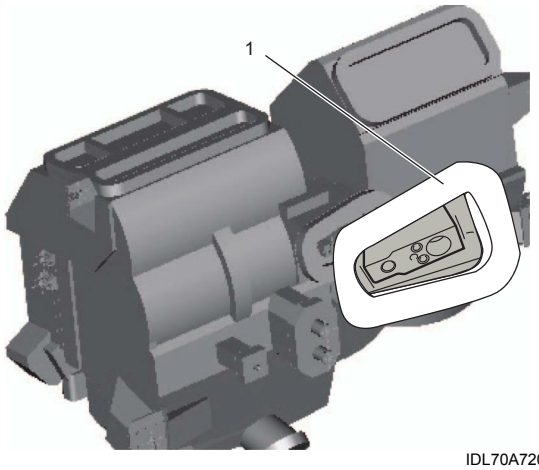




IDL70A720022-02

Installation
Reverse removal procedure noting the following instructions.

- Replenish compressor oil to specified amount through compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).
- Install the padding (1) to the installation hole uniformly.



IDL70A720023-01

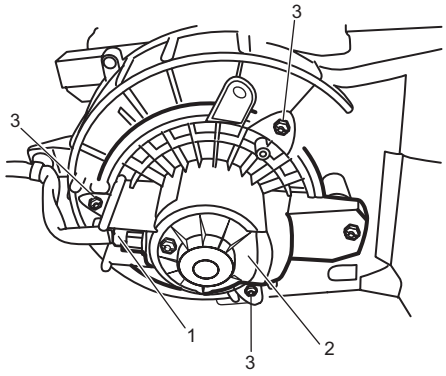
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).
- Refill cooling system with coolant. ☞(Page 1F-9)
- Adjust control cables. ☞(Page 7B-33)

Blower Motor Removal and Installation

AENDL70A7206009

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect connector (1) from blower motor (2).
3) Remove screws (3), and then remove blower motor from HVAC unit.



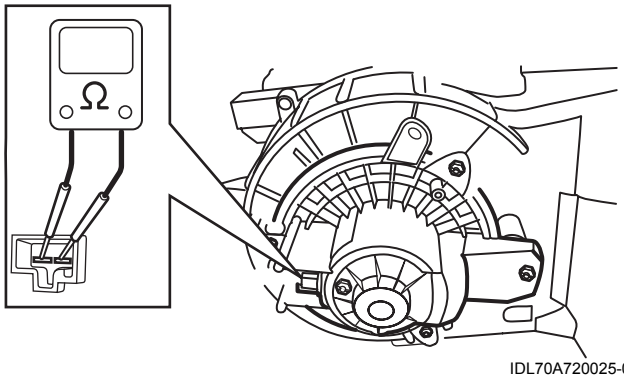
IDL70A720024-01

Installation
Reverse removal procedure.

Blower Motor Inspection

AENDL70A7206010

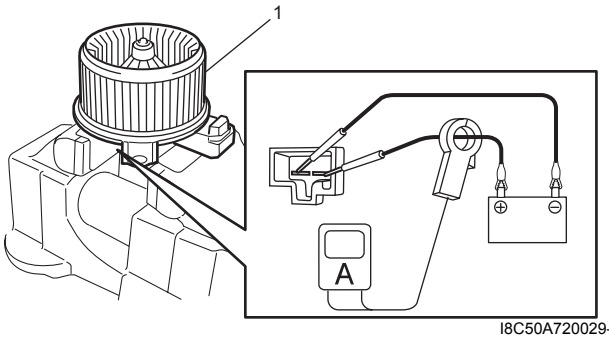
- Check blower motor for resistance between two terminals as shown.
  If there is no continuity, replace blower motor.



IDL70A720025-01

- Check for operation and current.
  a. Put blower motor (1) in a soft-jawed vise.
  b. Connect battery to blower motor as shown.
  c. Check if blower motor operates smoothly without noise.
  d. Check current to motor coil when voltage is applied for 1 min.
     If measured current is out of specification, replace blower motor.

     Blower motor specified current at 12 V
     18.9 A maximum at 20 – 25 °C (68 – 77 °F)



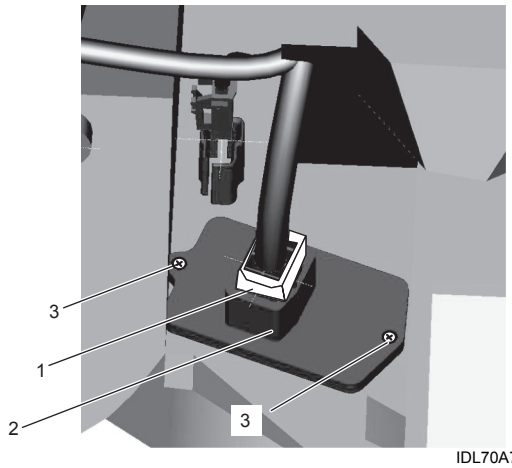
I8C50A720029-01

Blower Motor Resistor Removal and Installation

AENDL70A7206011

Removal

1) Disconnect negative (–) cable at battery.
2) Remove glove box. ☞(Page 9C-12)
3) Disconnect connector (1) from blower motor resistor (2), and then remove blower motor resistor from HVAC unit by removing screw (3).



IDL70A720026-01

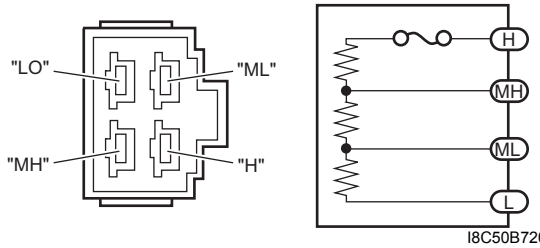
Installation
Reverse removal procedure.

Blower Motor Resistor Inspection

AENDL70A7206012

Measure each terminal-to-terminal resistance. If measured resistance is out of specification, replace blower motor resistor.

Blower motor resistor resistance (LHD model)
"H" – "MH": Approx. 0.5 Ω at 20 – 25 °C (68 – 77 °F)
"MH" – "ML": Approx. 0.6 Ω at 20 – 25 °C (68 – 77 °F)
"ML" – "L": Approx. 2.4 Ω at 20 – 25 °C (68 – 77 °F)



I8C50B720024-01

Evaporator Inspection

AENDL70A7206013

Check the following points.

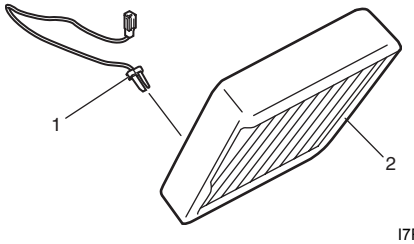
- Evaporator fins for clogging
  If any clog is found, wash out foreign material and air dry evaporator fins.
- Evaporator fins and breakage
  If any defects are found, repair or replace evaporator.
- Evaporator for leakage
  If any defects are found, repair or replace evaporator.

Evaporator Temperature Sensor Removal and Installation

AENDL70A7206014

Removal

1) Remove HVAC unit from vehicle. ☞(Page 7B-28)
2) Remove evaporator temperature sensor (1) from evaporator (2) by disassembling HVAC unit.

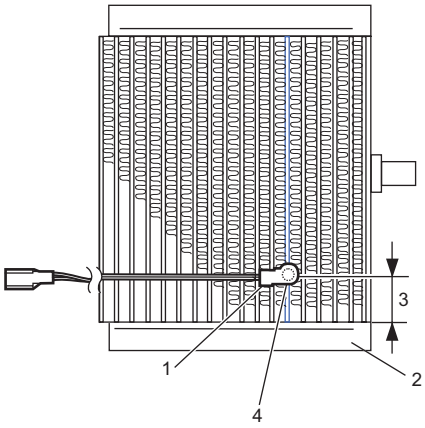


I7RW01721018-01

3) Put a mark on the evaporator at the position from where evaporator temperature sensor is removed.

Installation
Reverse the removal procedure noting the following.

- Install evaporator temperature sensor (1) at the specified position on evaporator (2) as shown.



IDL70A720027-01

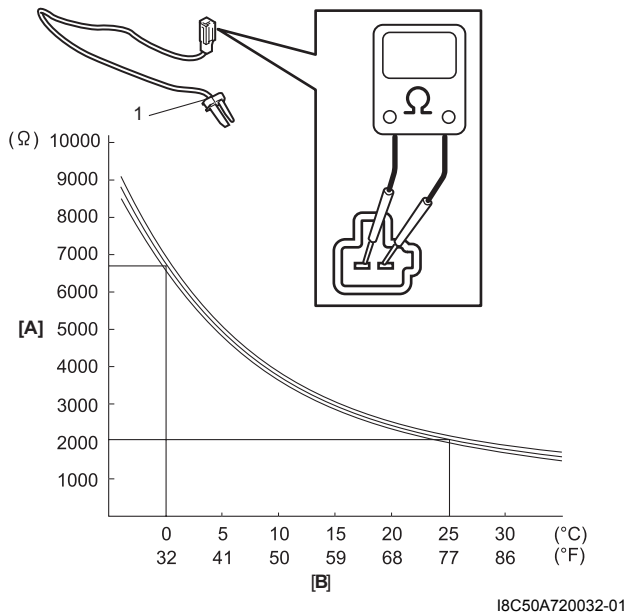
3.	60 mm
4.	Sensor part fixed to 13th fin from the left

Evaporator Temperature Sensor Inspection

AENDL70A7206015

Check resistance between terminals of evaporator temperature sensor (1).
If check result is not as specified, replace evaporator.

Evaporator temperature sensor resistance
0 °C (32 °F): 6.5 – 6.8 kΩ
25 °C (77 °F): 1.9 – 2.1 kΩ



I8C50A720032-01

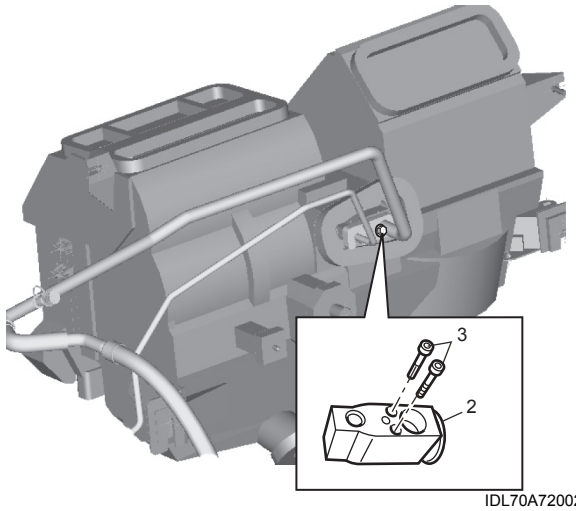
[A]:	Resistance
[B]:	Temperature

Expansion Valve Removal and Installation

AENDL70A7206016

Removal

1) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).
2) Loosen bolt (1) and remove pipes from expansion valve (2).
3) Loosen bolts (3) and remove expansion valve.



IDL70A720028-01

Installation

Reverse removal procedure noting the following instructions.

- Apply compressor oil to O-ring of expansion valve and pipes.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).

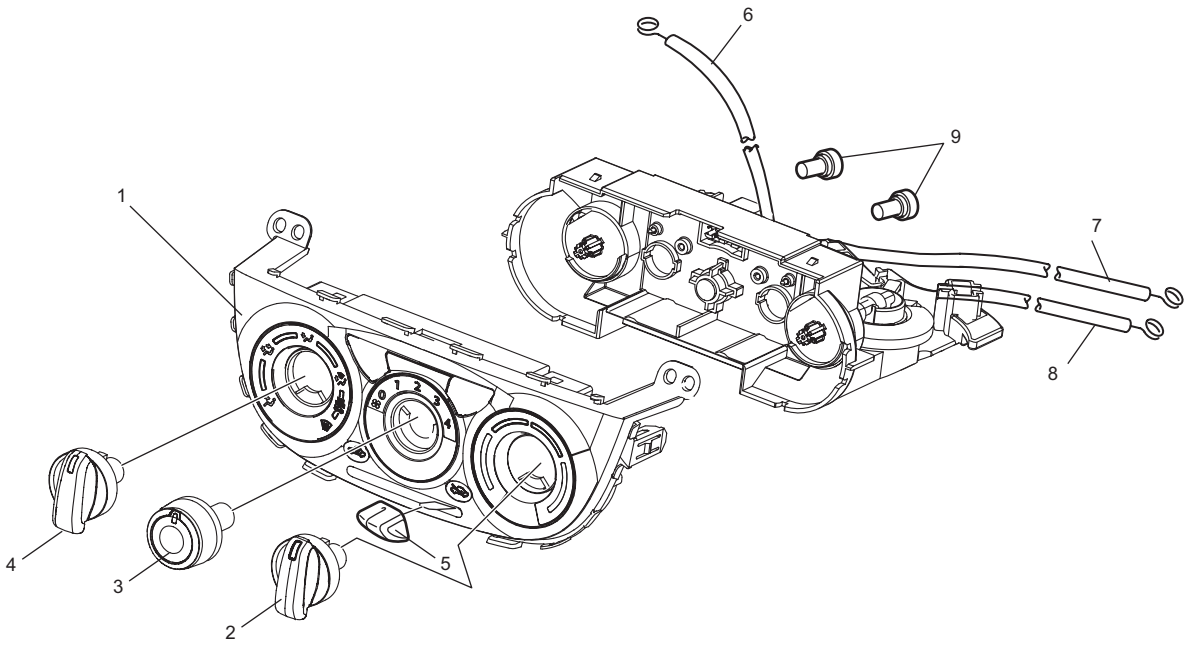
Expansion Valve Inspection

AENDL70A7206017

Refer to “A/C System Performance Inspection” (Page 7B-11).

HVAC Control Unit Components

AENDL70A7206018



IDL70A720029-02

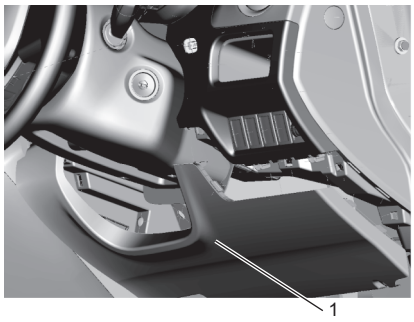
1. HVAC control unit	4. Airflow selector knob	7. Airflow control cable
2. Temperature selector knob	5. Air intake selector knob	8. Temperature control cable
3. Blower speed selector knob	6. Air intake control cable	9. Bulb

HVAC Control Unit Removal and Installation

AENDL70A7206019

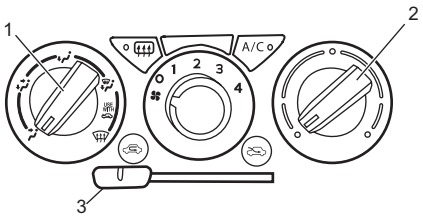
Removal

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover (1).



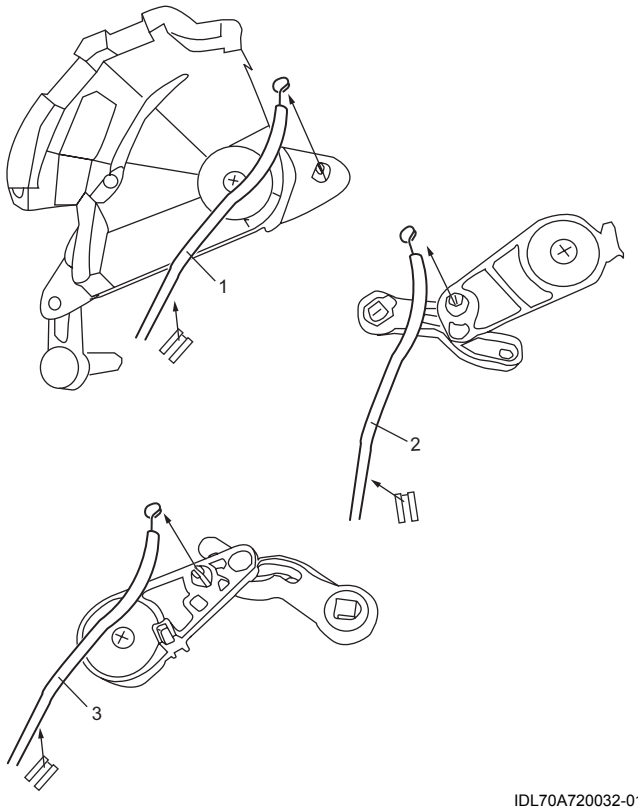
IDL70A720030-02

3) Remove glove box and glove box cover. ☞(Page 9C-12)
4) Check that airflow selector (1) is in “VENT” position, temperature selector (2) is in “MAX COOL” position and air intake selector (3) is in “RECIRC” position.



IDL70A720031-03

5) Disconnect airflow control cable (1), temperature control cable (2) and air intake control cable (3) from HVAC unit.



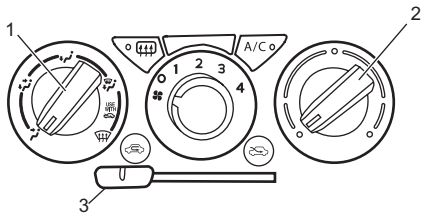
IDL70A720032-01

6) Disconnect HVAC control unit connectors, and then remove HVAC control unit (1) from instrument panel. ☞(Page 7B-32)

Installation

Reverse removal procedure noting the following.

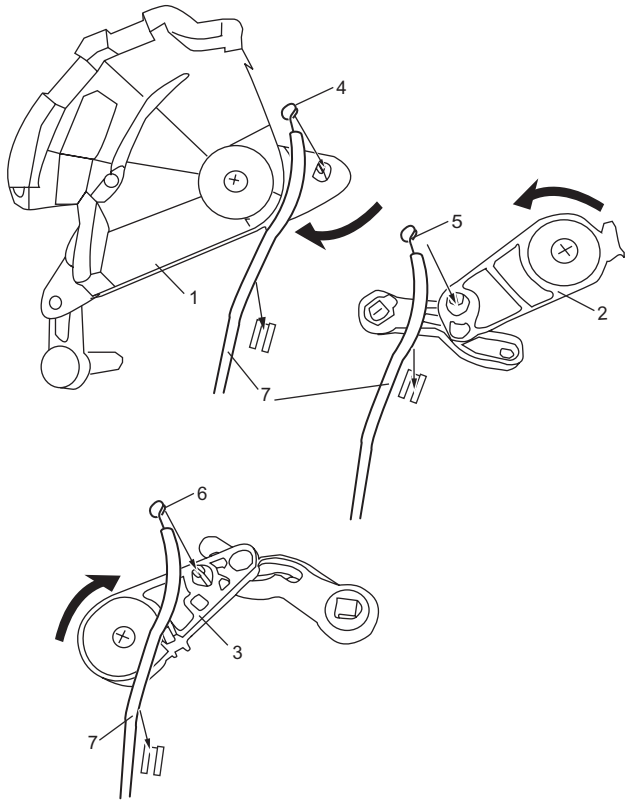
- Connect airflow control cable, temperature control cable and air intake control cable of HVAC control unit to links of HVAC unit as following.
  a. Check that airflow selector (1) is in “VENT” position, temperature selector (2) is in “MAX COOL” position and air intake selector (3) is in “RECIRC” position.



IDL70A720031-03

  b. Check that airflow control lever (1) is in “VENT” position, temperature control lever (2) is in “MAX COOL” position and air intake control lever (3) is in “Fresh” position as shown in figure.
  c. Fix airflow control inner cable (4) to pin of airflow control lever, temperature control inner cable (5) to pin of temperature control lever and air intake

control inner cable (6) to pin of air intake control lever, and then fix each outer cable (7) to each cable lock clamp.



IDL70A720033-02

NOTE

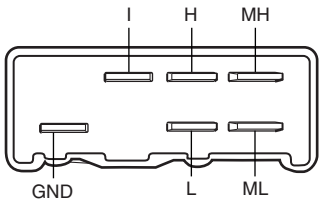
After installing control cables, make sure that control lever and plate moves smoothly and stops at proper position.

- Check that airflow outlet changes correctly as airflow selector is changed.
- Check that outlet temperature changes correctly as temperature selector is changed.
- Check that air intake control door changes correctly as air intake selector is changed.

Blower Speed Selector Inspection

AENDL70A7206020

Check blower speed selector for each terminal to terminal continuity. If check result is not as specified, replace HVAC control unit.



Position \ Terminal	GND	I	L	ML	MH	H
OFF	○					
1	○	○	○			
2	○	○		○		
3	○	○			○	
4	○	○				○

I4RS0A710019-01

Refrigerant Pressure Sensor and Its Circuit Inspection

AENDL70A7206021

⚠ CAUTION

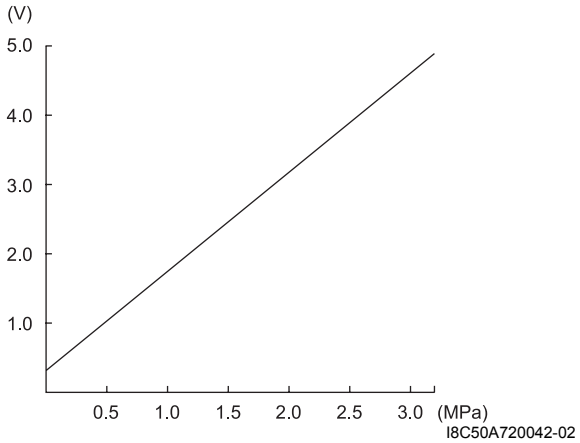
Before performing this inspection, be sure to read "Precautions for Engine" in Section 1 (Page 1-1).

1) Disconnect refrigerant pressure sensor connector.
2) Set ignition "ON".
3) Check that voltage between "GRY/RED" wire terminal and "PNK/BLU" wire terminal of refrigerant pressure sensor connector is 4.75 V to 5.25 V.
   If not, check refrigerant pressure sensor circuit.
4) Connect refrigerant pressure sensor with ignition OFF.
5) Connect manifold gauge set to the charging valves.

   Special tool
   (A): 09990M06020

6) Start engine and turn A/C switch ON.
7) Check refrigerant pressure sensor voltage at ECM connector. ☞(Page 1A-87)
   If voltage is not as specified, replace refrigerant pressure sensor.

Refrigerant pressure sensor voltage specifications (Refrigerant pressure measured by manifold gauge)
0.8 MPa (8.2 kgf/cm^2, 116 psi): 1.50 – 1.67 V
1.4 MPa (14.3 kgf/cm^2, 203 psi): 2.32 – 2.49 V
1.6 MPa (16.4 kgf/cm^2, 232 psi): 2.59 – 2.76 V
1.8 MPa (18.4 kgf/cm^2, 261 psi): 2.86 – 3.03 V



I8C50A720042-02

Refrigerant Pressure Sensor Removal and Installation

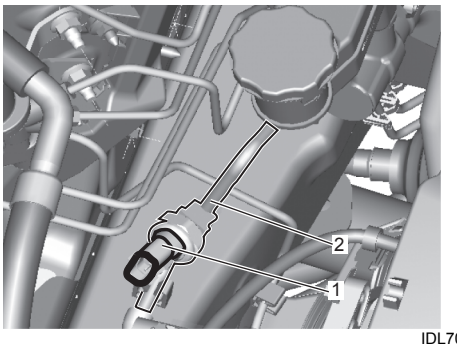
AENDL70A7206022

⚠ CAUTION

When tightening or loosening a fitting, use two wrenches, one for turning and the other for support.

Removal

1) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).
2) Disconnect negative (–) cable at battery.
3) Disconnect refrigerant pressure sensor connector.
4) Remove refrigerant pressure sensor (1) from liquid pipe (2).



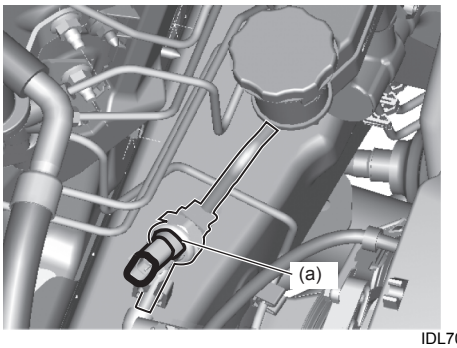
IDL70A720034-04

Installation

Reverse removal procedure noting the following instructions.

- Apply compressor oil to new O-ring of refrigerant pressure sensor.
- Tighten refrigerant pressure sensor to specified torque.

Tightening torque
Refrigerant pressure sensor (a): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)



IDL70A720042-02

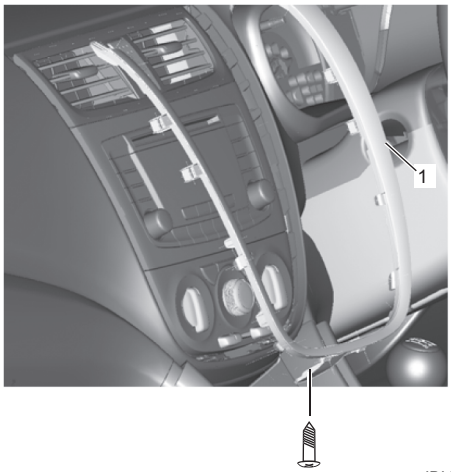
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge” (Page 7B-22).

Center Ventilation Louver Removal and Installation

AENDL70A7206023

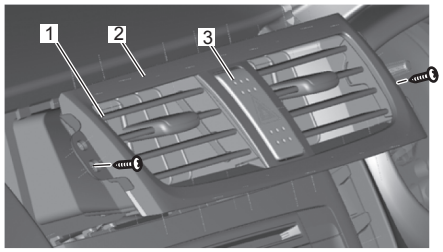
Removal

1) Remove instrument panel center ornament (1).



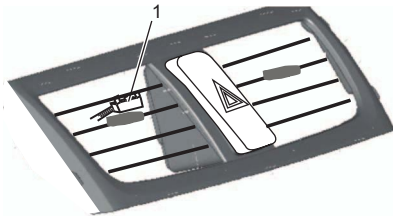
IDL70A720036-03

2) Remove center ventilation louver (1) with garnish (2) and hazard switch (3) from instrument panel.



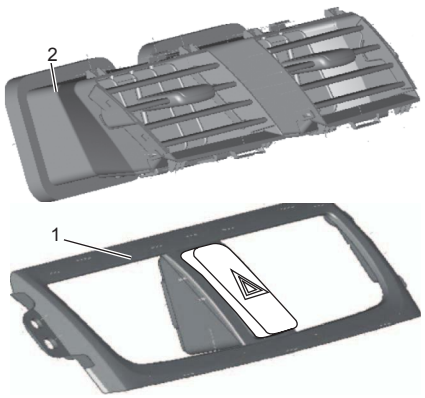
IDL70A720037-03

3) Disconnect hazard switch connector (1).



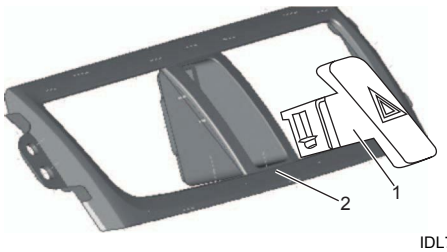
IDL70A720044-02

4) Remove garnish (1) from center ventilation louver (2).



IDL70A720038-04

5) Remove hazard switch (1) from garnish (2).



IDL70A720045-02

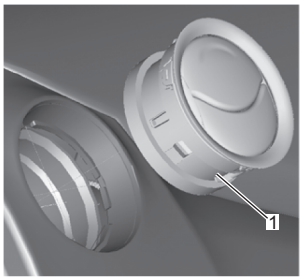
Installation
Reverse removal procedure.

Side Ventilation Louver Removal and Installation

AENDL70A7206024

Removal

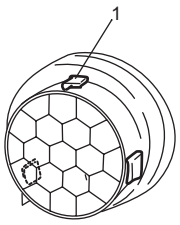
1) Pull out side ventilation louver (1) from instrument panel by inserting finger through louver fins and holding it from backside.



IDL70A720046-02

Installation
Reverse removal procedure noting the following.

- Install side ventilation louver to instrument panel positioning the smallest clip (1) at the top.



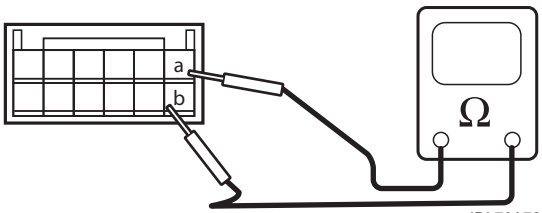
IDL70A720060-01

A/C Switch Inspection

AENDL70A7206027

- Check that there is continuity between terminal (a) and terminal (b) when A/C switch is at ON position.
- Check that there is no continuity between terminal (a) and terminal (b) when A/C switch is at OFF position.

If check result is not as specified, replace HVAC control unit.



IDL70A720043-03

HVAC System Relay Inspection

AENDL70A7206028

A/C Compressor Relay
Refer to “Control Relay Inspection” in Section 10B (Page 10B-32).

Radiator Cooling Fan Relay
Refer to “Control Relay Inspection” in Section 10B (Page 10B-32).

Blower Motor Relay
Refer to “Control Relay Inspection” in Section 10B (Page 10B-32).

Compressor Drive Belt Inspection and Adjustment

AENDL70A7206029

Inspection

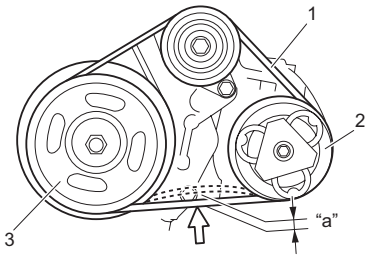
- Check compressor drive belt (1) for wear, crack, deformation and cleanliness. If any defect is found, replace the belt with new one. ☞(Page 7B-37)
- Check compressor drive belt tension by measuring how much it deflects when pushed at intermediate point between magnet clutch pulley (2) and crankshaft pulley (3) with about 100 N (10 kg) force after rotating crankshaft pulley 360°. If belt tension is out of specification, adjust belt tension referring to “Adjustment”.

Compressor drive belt tension “a”
: 7 – 8 mm (0.28 – 0.31 in.)

NOTE

When replacing drive belt, adjust drive belt tension to the following specifications.

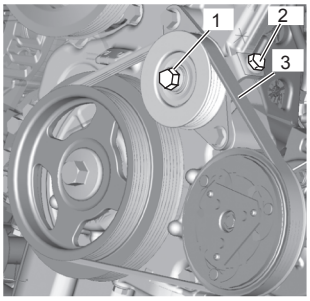
New compressor drive belt tension "a"
: 6 – 7 mm (0.24 – 0.28 in.)



IDL70A720047-02

Adjustment

1) Loosen tension pulley bolt (1).
2) Adjust belt tension by tightening or loosening tension pulley adjusting bolt (2).
3) Tighten tension pulley nut.
4) Rotate the crankshaft pulley 360°, and then recheck drive belt (3) tension.



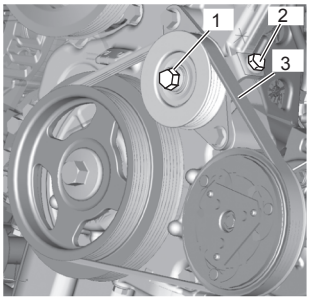
IDL70A720048-03

Compressor Drive Belt Removal and Installation

AENDL70A7206030

Removal

1) Loosen tension pulley bolt (1).
2) Loosen belt tension loosening tension pulley adjusting bolt (2).
3) Remove compressor drive belt (3).



IDL70A720048-03

Installation

Reverse removal procedure noting the following instruction.

- Adjust belt tension. ☞(Page 7B-36)

Compressor Assembly Removal and Installation

AENDL70A7206031

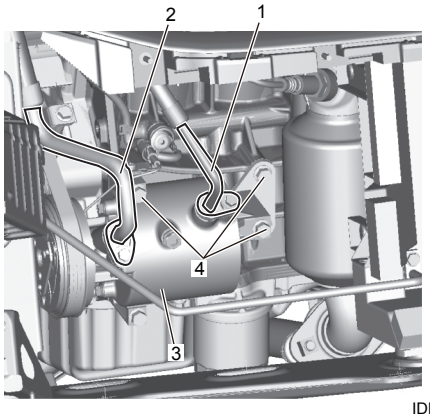
Removal

1) Run engine at idle speed with A/C ON for 10 minutes.
2) Stop the engine.
3) Disconnect negative (–) cable at battery.
4) Recover refrigerant from the A/C system with recovery and recycling equipment referring to "Recovery" in "Operation Procedure for Refrigerant Charge" (Page 7B-22).
5) Remove compressor drive belt. ☞(Page 7B-37)
6) Remove front bumper. ☞(Page 9H-1)
7) Disconnect magnet clutch lead wire connector.
8) Disconnect discharge hose (1) and suction hose (2) from A/C compressor (3).

NOTE

Using caps, seal open fittings immediately to keep moisture and foreign material out of the system.

9) Remove compressor mounting bolts (4), and then remove A/C compressor (3) from its bracket.

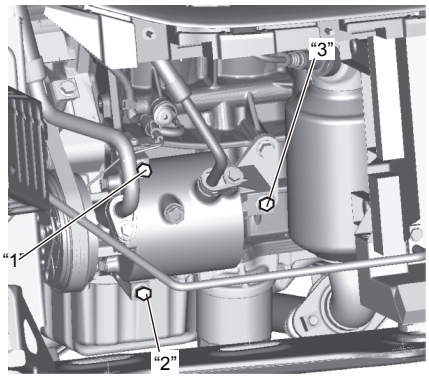


IDL70A720049-04

Installation

Reverse removal procedure noting the following instructions.

- If A/C compressor is replaced, replenish A/C system with new compressor oil referring to "Replenishing Compressor Oil" in "Operation Procedure for Refrigerant Charge" (Page 7B-22).
- Tighten compressor mounting bolts in numerical order ("1" – "3") as shown in figure.

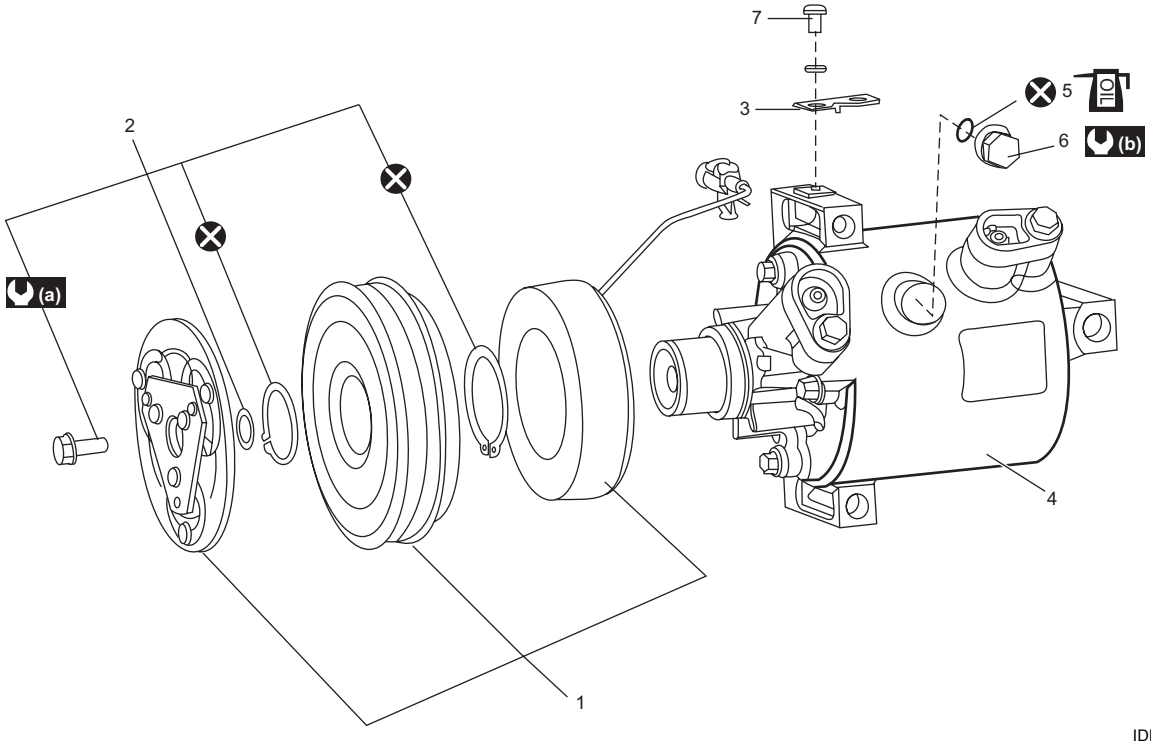


IDL70A720050-04

- Evacuate and charge the A/C system referring to "Evacuation" and "Charge" in "Operation Procedure for Refrigerant Charge" (Page 7B-22).
- Adjust drive belt tension. ☞(Page 7B-36)

Compressor Assembly Components

AENDL70A7206032



IDL70A720061-05

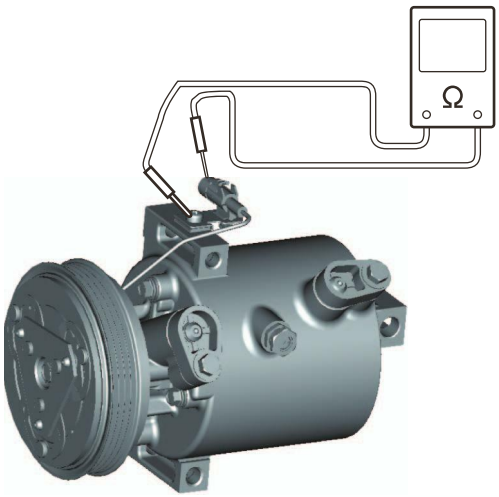
1. Magnet clutch assembly : (armature plate, pulley, magnet clutch)	5. Relief valve O-ring : Apply compressor oil	(b) : 11 N·m (1.2 kgf-m, 8.1 lbf-ft)
2. Clip set	6. Relief valve	: Do not reuse
3. Magnet clutch connector bracket	7. Magnet clutch connector bracket screw	
4. Compressor	(a) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)	

Magnet Clutch Inspection

AENDL70A7206033

- Check armature plate and magnet clutch pulley for wear and oil soak respectively.
- Check magnet clutch pulley bearing for noise, wear and grease leakage.
- Measure magnet clutch coil resistance at 20 °C (68 °F). If the measured resistance is out of specification, replace magnet clutch assembly.

Magnet clutch coil resistance
4.2 – 4.5 Ω (at 20 °C (68 °F))



IDL70A720051-01

Magnet Clutch Removal and Installation

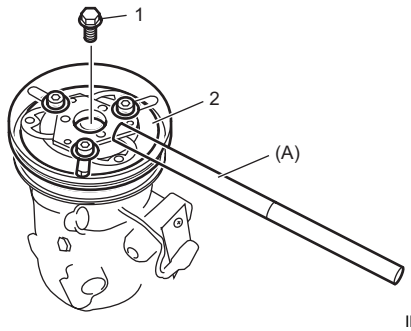
AENDL70A7206034

Removal

1) Remove A/C compressor from vehicle. ☞(Page 7B-37)
2) Fix armature plate (2) with special tool and remove armature plate bolt (1).

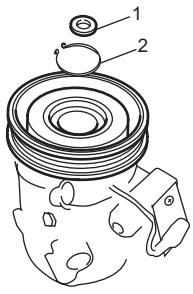
   Special tool
   (A): 09991M06310

3) Remove armature plate (2).



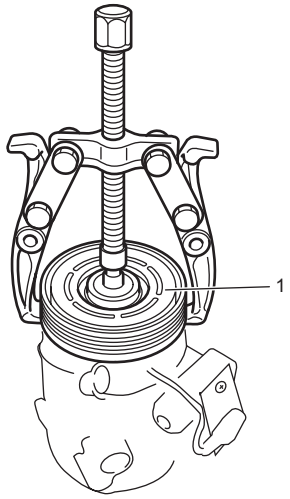
IDL70A720052-04

4) Remove shims (1) from shaft.
5) Remove circlip (2) by using snap ring pliers.



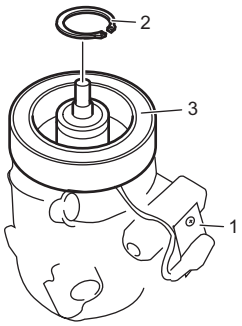
IDL70A720062-03

6) Remove magnet clutch pulley (1) by using puller.



IDL70A720063-02

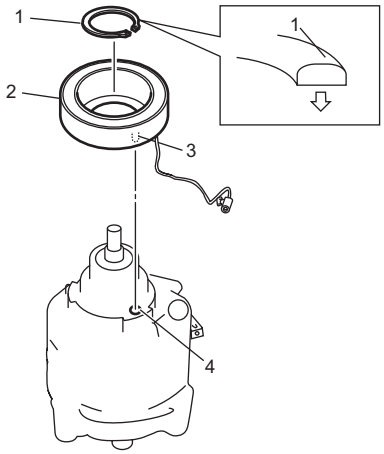
7) Remove circlip (1) by using snap ring pliers.
8) Remove magnet clutch lead wire from clamp (1).
9) Remove magnet clutch coil (3) from A/C compressor using puller.



IDL70A720064-01

Installation

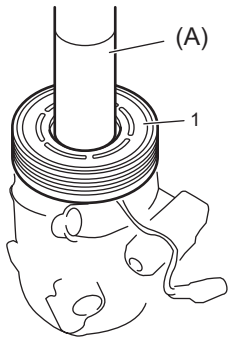
1) Install magnet clutch coil (2) fitting protrusion (3) of magnet clutch coil onto hole (4) of A/C compressor.
2) Install new circlip (1) directing the plane side downward by using snap ring pliers.



IDL70A720066-02

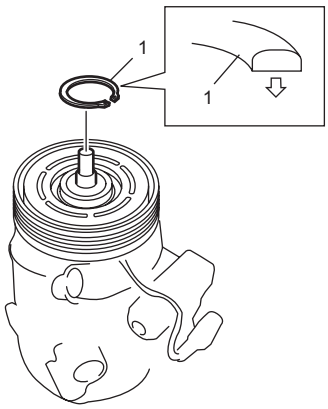
3) Press-fit magnet clutch pulley (1) by using special tool and hydraulic press.

   Special tool
   (A): 09913M84510



IDL70A720065-01

4) Install new circlip (2) directing the plane side downward by using snap ring pliers.

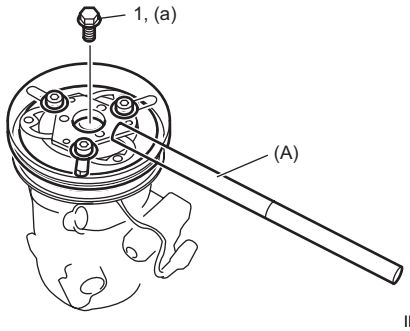


IDL70A720067-01

5) Install same amount shims as that when removed.
6) Tighten armature plate bolt (1) to specified torque.

Tightening torque
Armature plate nut (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

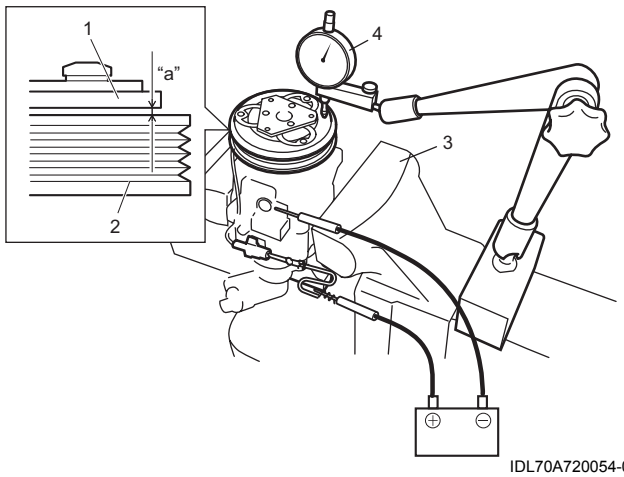
Special tool
(A): 09991M06310



IDL70A720053-02

7) Adjust clearance between armature plate (1) and pulley (2) by putting shim(s) on compressor shaft. To measure the clearance, perform the following steps.
   a) Put compressor in a soft jawed vise (3).
   b) Set dial gauge (4) on armature plate, and then adjust its pointer at 0.
   c) Connect battery positive terminal (+) to magnet clutch coil lead wire.
   d) Connect battery negative terminal (–) at compressor body assembly. (At this point, armature plate and magnet clutch pulley are kept in contact.)
   e) Disconnect battery negative terminal (–) from compressor body assembly. (At this point, armature plate and magnet clutch pulley are not in contact.)
   f) Read stroke of armature plate from dial gauge by performing step d) - e) repeatedly. (Stroke of armature plate is clearance between armature plate and magnet clutch pulley.)

Standard clearance between armature plate and magnet clutch pulley "a":
0.3 – 0.6 mm (0.0119 – 0.0236 in.)



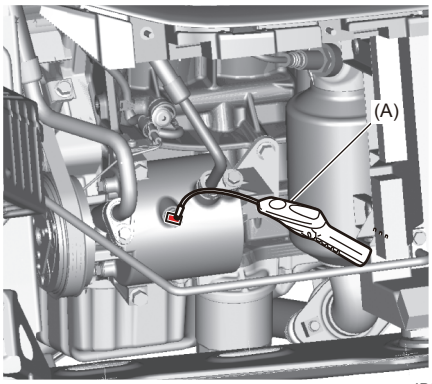
IDL70A720054-03

Relief Valve Inspection

AENDL70A7206035

By using special tool, check relief valve for refrigerant leakage.
If refrigerant leakage is found, replace the relief valve.

Special tool
(A): 09990M86012



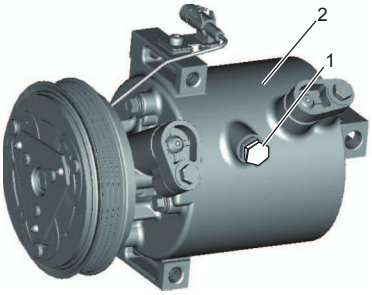
IDL70A720055-02

Relief Valve Removal and Installation

AENDL70A7206036

Removal

1) Recover refrigerant from the A/C system using recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge” (Page 7B-22). ☞(Page 7B-37)
2) Remove relief valve (1) from A/C compressor (2).



IDL70A720056-03

Installation

Reverse removal procedure noting the following instructions.

- Use new O-ring.
- Apply compressor oil to O-ring.
- Tighten relief valve to the specified torque.

Tightening torque
Relief valve (a): 11 N·m (1.2 kgf-m, 8.1 lbf-ft)



IDL70A720057-02

- Install A/C compressor. ☞(Page 7B-37)

Specifications

Tightening Torque Specifications

AENDL70A7207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Refrigerant pressure sensor	11	1.1	8.5	☞(Page 7B-35)
Armature plate nut	21	2.1	15.5	☞(Page 7B-40)
Relief valve	11	1.2	8.1	☞(Page 7B-41)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“A/C System Major Component Location” (Page 7B-9)
“Compressor Assembly Components” (Page 7B-38)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A7208001

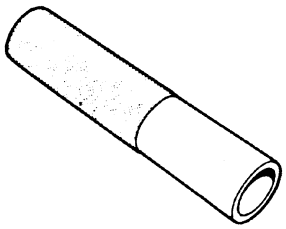
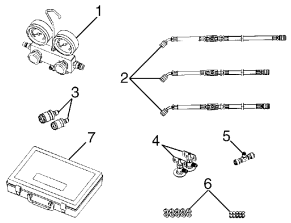
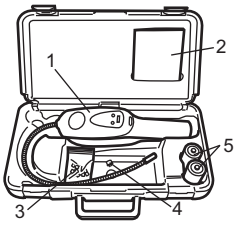
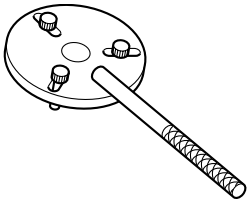
Material	SUZUKI recommended product or Specification		Note
Compressor oil	Compressor oil (250 ML) DH-PR	P/No.: 99000M24120–842	☞(Page 7B-23)

NOTE

Required service materials are also described in:
“A/C System Major Component Location” (Page 7B-9)
“HVAC Unit Components” (Page 7B-28)
“Compressor Assembly Components” (Page 7B-38)

Special Tool

AENDL70A7208002

09913M84510 Bearing installer ☞(Page 7B-39) 	09990M06020 Manifold gauge set (R134a) 1. Manifold gauge 2. Charging hoses 3. Quick connector 4. Refrigerant container tap valve 5. Refrigerant container T joint 6. Packing sets 7. Case ☞(Page 7B-11) / ☞(Page 7B-23) / ☞(Page 7B-34) 
09990M86012 Gas leak detector This kit includes following items. 1. Gas leak detector 2. Instruction manual 3. Filter 4. Sensor 5. Dry-cell battery (size D) ☞(Page 7B-26) / ☞(Page 7B-40) 	09991M06310 Armature plate holder ☞(Page 7B-39) / ☞(Page 7B-40) 

Section 8

Restraint

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Precautions

Precautions

Precautions for Restraint

AENDL70A8000001

Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

Fastener Caution
Refer to “Fastener Caution” in Section 00 (Page 00-5).

Precautions for Service and Diagnosis of Seat Belt
Refer to “Precautions for Service and Diagnosis of Seat Belt” in Section 8A (Page 8A-1).

Precautions for Air Bag System Service
Refer to “Precautions for Air Bag System Service” in Section 8B (Page 8B-1).

Precautions for Handling and Storage of Air Bag System Components
Refer to “Precautions for Handling and Storage of Air Bag System Components” in Section 8B (Page 8B-1).

Precautions for Disposal of Air Bag and Seat Belt Pretensioner
Refer to “Precautions for Disposal of Air Bag” in Section 8B (Page 8B-2).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness. Otherwise, electrical trouble may occur.

Seat Belts

Precautions

Precautions for Service and Diagnosis of Seat Belt

AENDL70A8100001

⚠ WARNING

Refer to “Precautions for Air Bag System Service” in Section 8B (Page 8B-1) to prevent air bag system being accidental deployment.

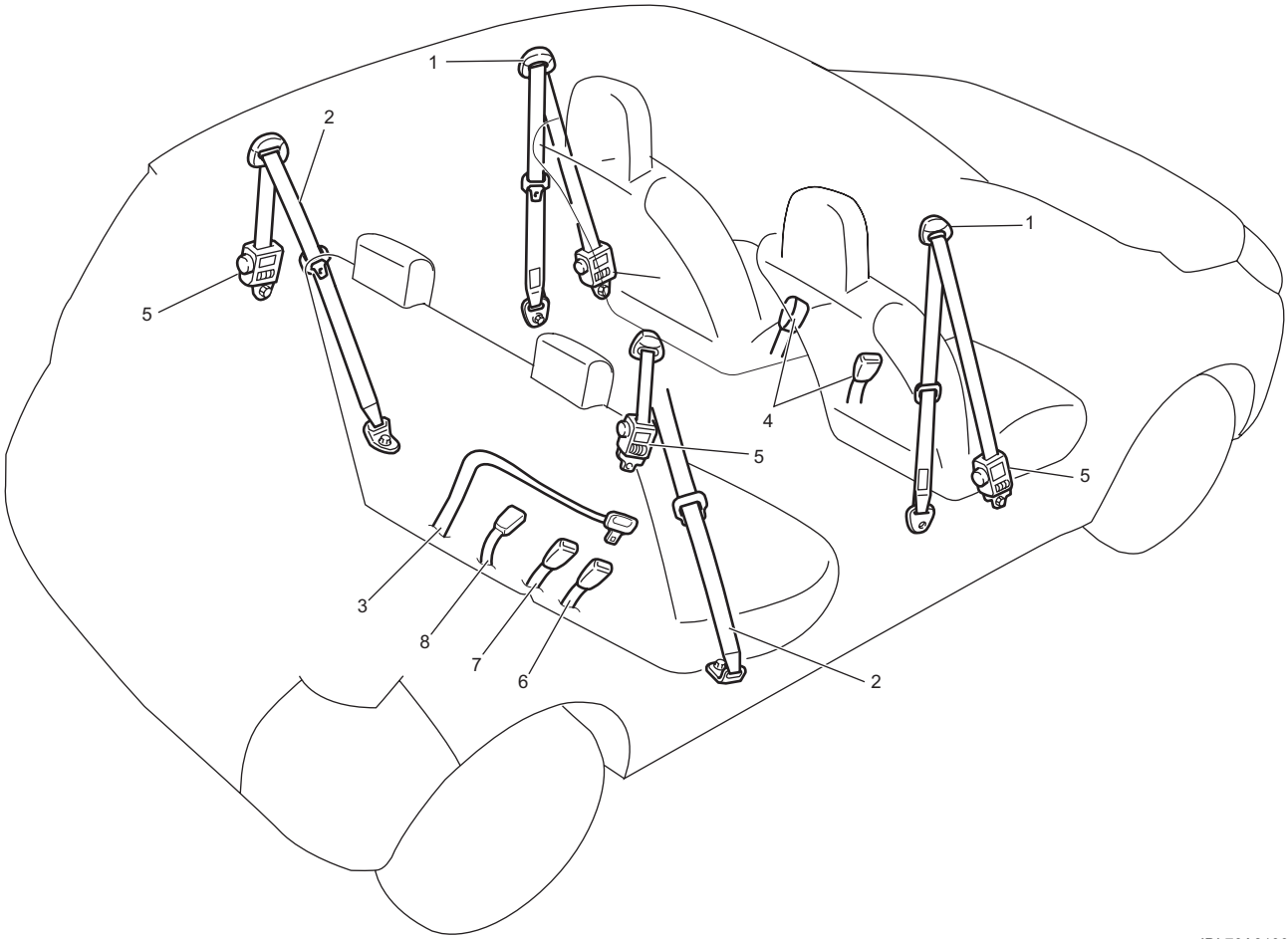
Before servicing or replacing seat belts, refer to the following precautionary items.

- Check that strap retractor and buckle are normal.
- Keep sharp edges and damaging objects away from belts.
- Avoid bending or damaging any portion of buckle or latch plate.
- Do not bleach or dye webbing. (Use only mild soap and lukewarm water to clean it.)
- Do not attempt any repair on seat belt assembly. If any defect is found, replace the seat belt as an assembly.
- Keep belts dry and clean at all times.
- Replace any defective part with a new one.
- Replace seat belt assembly whose webbing is cut or otherwise damaged.
- Do not put anything into trim panel opening which seat belt webbing passes through.
- After an accident, whether the seat belt pretensioner has been activated or not, be sure to perform checks and repairs described on “Repair and Inspection Required after Accident” in Section 8B (Page 8B-45).

General Description

Seat Belt Construction

AENDL70A8101001



IDL70A810001-02

1. Front seat belt (with ELR)	4. Front seat belt buckle	7. Rear seat belt buckle (right)
2. Rear seat belt (with ELR)	5. Retractor	8. Rear seat belt buckle (left)
3. Rear center seat belt	6. Rear seat belt buckle (center)	

Seat Belt with ELR

The seat belt with emergency locking retractor (ELR) is designed so that it locks immediately (to prevent the webbing from being pulled out of the retractor any further) when any of the following items is detected as exceeding each set value;

- Speed at which the webbing is pulled out of the retractor.
- Acceleration or deceleration of the vehicle speed.
- Inclination.

Seat Belt Reminder Function

When driver's seat belt is unfastened (under the following conditions), seat belt reminder light inform that driver's seat belt is unfastened. Seat belt reminder light located in combination meter as follows.

- Seat belt reminder light comes on when driver's seat belt is unfastened while ignition switch is at ON position.

Repair Instructions

Front Seat Belt Components

AENDL70A8106001

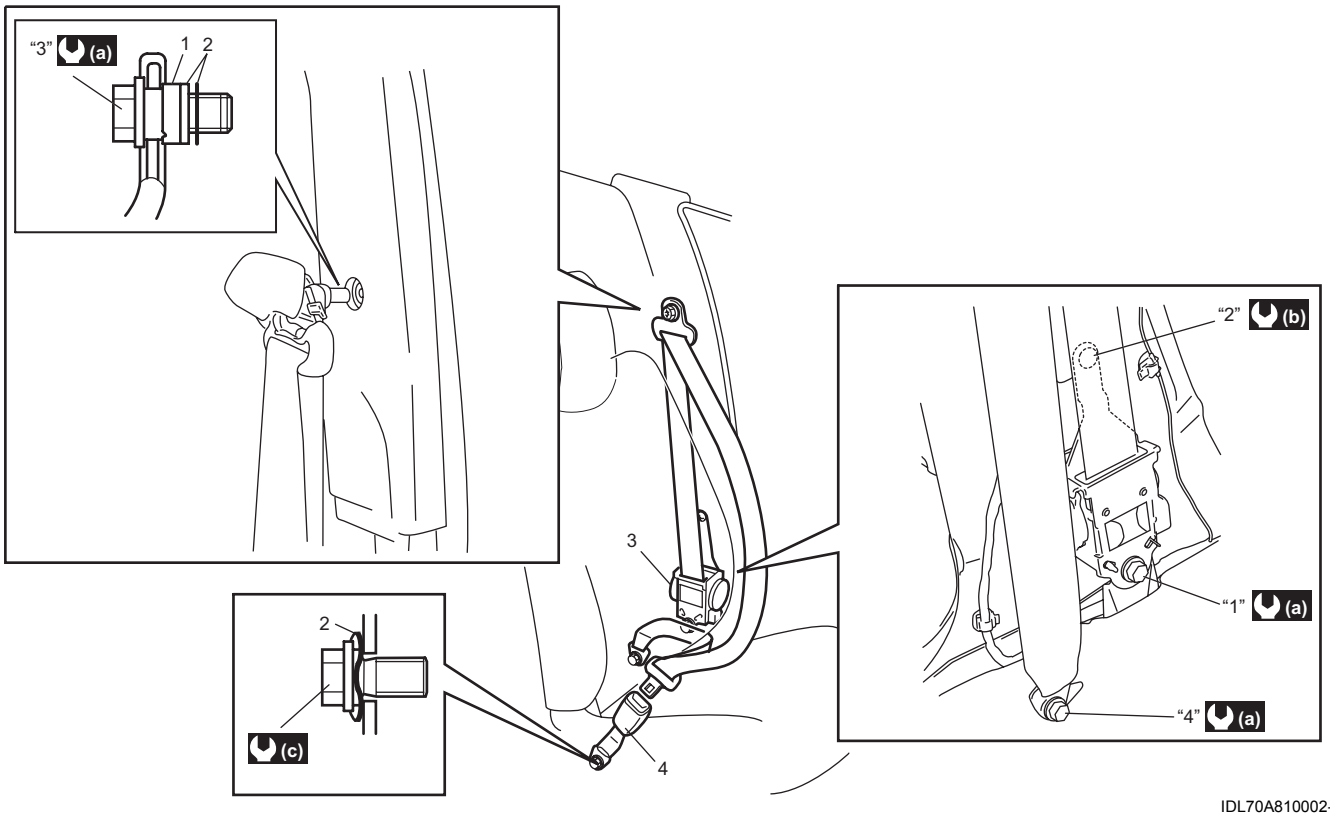
⚠ WARNING

When installing front seat belt, note the following:

- **Make sure the following points when replacing the seat belt. Failure to follow the procedure may result in the seat belt malfunction and personal injury.**
- **Tighten front seat belt bolts in numerical order ("1" – "4").**
- **Confirm that buckle moves back and forth by hand after tightening buckle bolt to specified torque.**

NOTE

The figure shows left side front seat belt. The following tightening torque is also applicable to right side front seat belt.



IDL70A810002-01

1. Spacer	3. Retractor	(a) : 43 N·m (4.4 kgf-m, 32.0 lbf-ft)
2. Washer	4. Front seat belt buckle	(b) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)

Front Seat Belt Removal and Installation

AENDL70A8106002

⚠ WARNING

- **Be sure to read "Precautions for Service and Diagnosis of Seat Belt" (Page 8A-1) before starting to work and observe every precaution during work. Neglecting them may result in personal injury.**

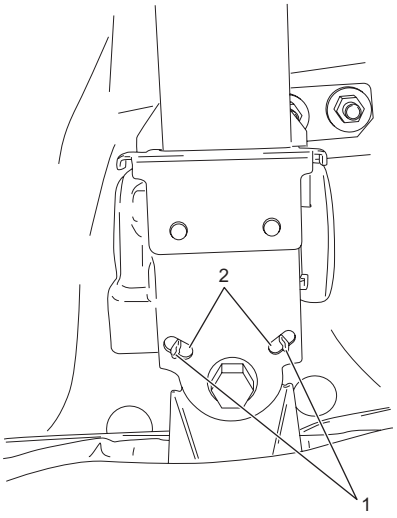
Removal

1) Remove center pillar trim. ☞(Page 9H-5)
2) Remove mounting bolts, then remove front seat belts from the vehicle. ☞(Page 8A-3)

Installation

Reverse removal procedure noting the following.

- Install retractor aligning its locating pin (1) of vehicle body with fitting hole (2).



IDL70A810005-01

- Tighten each bolt to specified torque in numerical order. ☞(Page 8A-3)

Front Seat Belt Inspection

AENDL70A8106003

⚠ WARNING

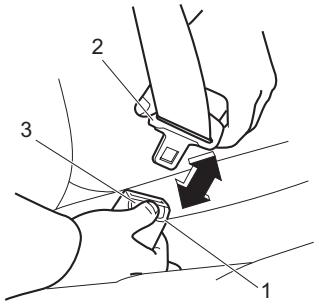
Be sure to read "Precautions for Service and Diagnosis of Seat Belt" (Page 8A-1), before starting to work and observe every precaution during work. Neglecting them may result in personal injury.

Seat belts and attaching parts can affect the vital components and systems of a vehicle.
Therefore, they should be inspected carefully and replaced with genuine parts only.

Seat Belt
The seat belt webbing or strap should be free from damage.

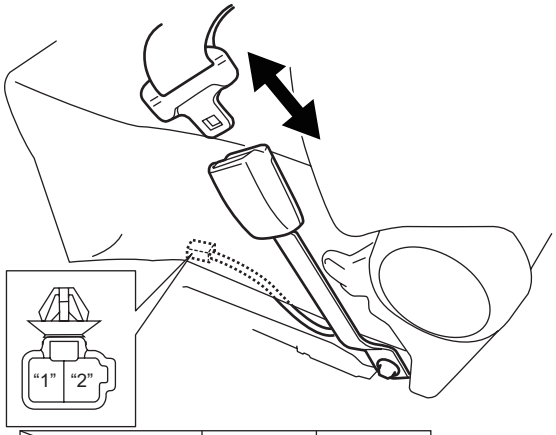
Anchor Bolt
Anchor bolts should be torqued to specification.

Belt Latch
It should be secure when latched.
The lock should be released by pressing release button (3) when tongue plate (2) is latched to buckle (1).



IAW101810007-01

Seat Belt Buckle Switch
Check driver side seat belt switch for continuity by using ohmmeter.



[A] \ [B]	"1"	"2"
Unfastened	○	○
Fastened		

IDL70A810007-01

[A]: Seat belt switch position	[B]: Terminal

Rear Seat Belt Components

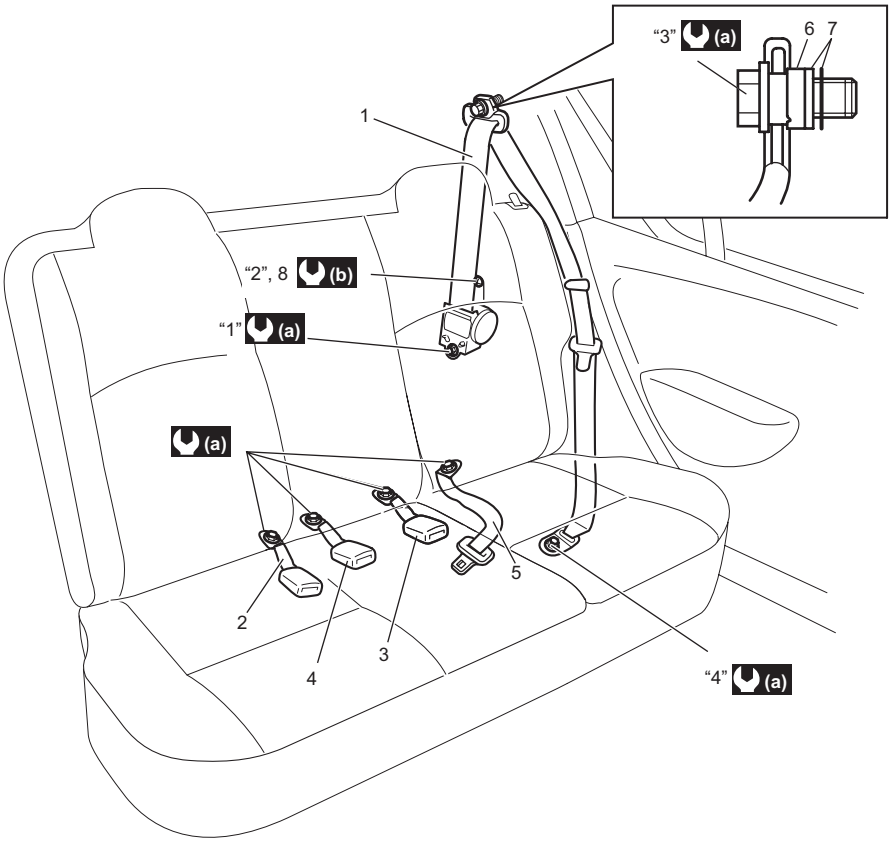
AENDL70A8106004

⚠ WARNING

When installing rear seat belt, tighten rear seat belt bolts and screw (left side only) in numerical order ("1" – "4").

NOTE

The figure shows left side rear seat belt. The following tightening torque is also applicable to right side rear seat belt.



IDL70A810003-03

1. Rear seat belt	5. Rear center seat belt	(a) : 43 N·m (4.4 kgf-m, 32.0 lbf-ft)
2. Rear seat belt buckle (center)	6. Spacer	(b) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
3. Rear seat belt buckle (left)	7. Washer	
4. Rear seat belt buckle (right)	8. Screw	

Rear Seat Belt Removal and Installation

AENDL70A8106005

⚠ WARNING

Be sure to read "Precautions for Service and Diagnosis of Seat Belt" (Page 8A-1) before starting to work and observe every precaution during work.

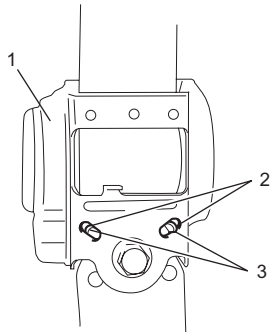
Removal

1) Remove rear seat cushion. ☞(Page 9G-4)
2) Remove rear quarter lower trim. ☞(Page 9H-5)
3) Remove mounting bolts and screw, then remove rear seat belt. ☞(Page 8A-5)

Installation

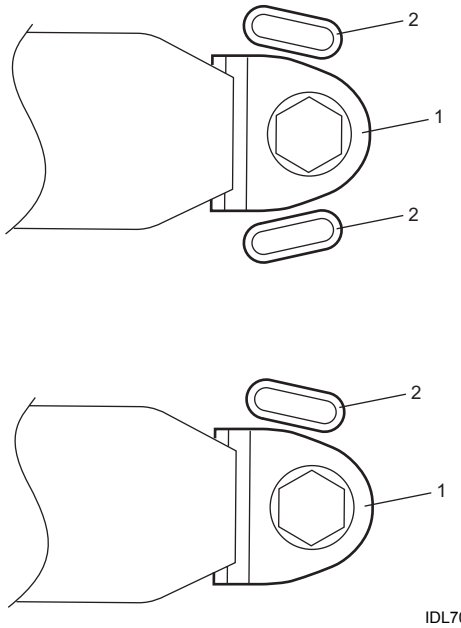
Reverse removal procedure noting the following.

- Install retractor (1) aligning its locating pin (3) of vehicle body with fitting hole (2).



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- Install seat belt anchor plate (1) making sure that it does not interfere with the convex part (2) of vehicle body.



IDL70A810004-01

Rear Seat Belt Inspection

AENDL70A8106006

⚠ WARNING

Be sure to read “Precautions for Service and Diagnosis of Seat Belt” (Page 8A-1) before starting to work and observe every precaution during work.

- Check the rear seat belt in the same way as “Front Seat Belt Inspection” (Page 8A-4).

Specifications

Tightening Torque Specifications

AENDL70A8107001

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Front Seat Belt Components” (Page 8A-3)
“Rear Seat Belt Components” (Page 8A-5)
“Fasteners Information” in Section 0A (Page 0A-5)

Air Bag System

Precautions

Precautions for Air Bag System Service

AENDL70A8200001

⚠ WARNING

- **Performing service operations on or around air bag system components or wiring without temporarily deactivating the air bag system may result in accidental activation of the air bag system. This could cause injury or the need for extra repairs to the air bag system.**
  Temporarily deactivate the air bag system before performing service operations on or around air bag system components.
  Follow the procedures described in "Disabling Air Bag System" (Page 8B-47).
- **If you disconnect the connector from the air bag (inflator) module with a screwdriver or the like, static electricity may trigger deployment of the air bag, which could result in personal injury. Never insert a screwdriver or the like between the air bag (inflator) module or the connector.**
- **If the steering wheel or instrument panel is modified, the air bag system will not work properly, which increases the risk of personal injury.**
  Do not modify steering wheel or instrument panel.

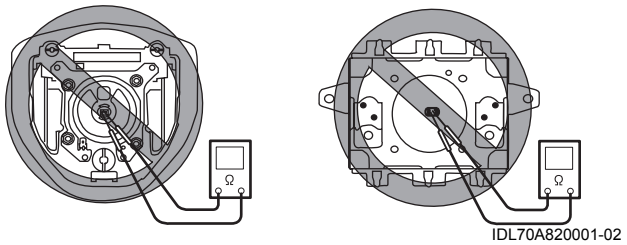
- When storing air bag system components, select a place where the ambient temperature is below 65 °C (149 °F).
- When applying paint around the air bag system related parts, be careful that the harness or connector will not be exposed to the paint mist.

Precautions for Handling and Storage of Air Bag System Components

AENDL70A8200002

⚠ WARNING

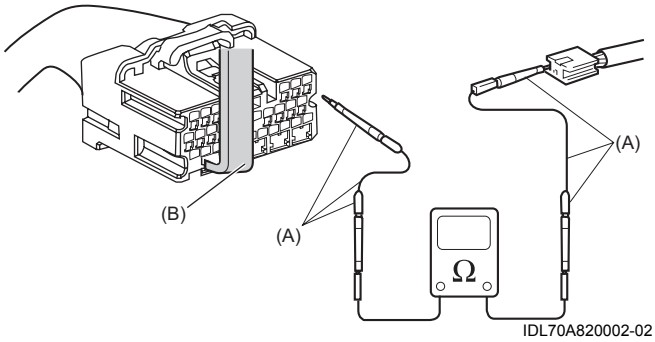
Measuring the resistance of any air bag (inflator) module (driver or passenger) with a tester is dangerous, as the electric current from the tester may trigger the air bag.
Never measure the resistance of an air bag (inflator) module.



IDL70A820001-02

When checking each wiring harness, use special tools (A) and (B) referring to "Use of Special Tools" (Page 8B-58).

Special tool
(A): 09932M76010
(B): 09932M75100



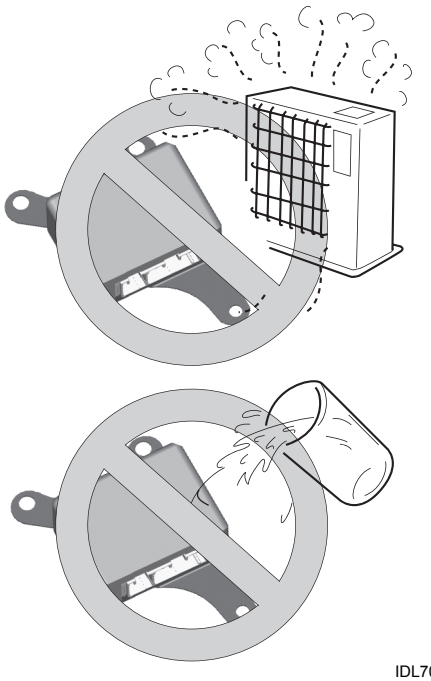
IDL70A820002-02

SDM

⚠ WARNING

- **If the SDM is not rigidly attached to the vehicle, it could accidentally cause the air bags to deploy when the air bag system is powered, possibly causing personal injury. Always check that the SDM is rigidly attached to the vehicle before supplying power to the air bag system.**
- **The SDM that has been involved in an accident severe enough to cause deployment of air bags is not guaranteed to provide its original performance.**
  Never use an SDM that has been involved in an air bag deployment accident. Refer to "Air Bag Diagnostic System Check" (Page 8B-7) for the SDM check procedure.

- Never dismantle SDM.
- When storing SDM, select a place where neither high temperature nor high humidity is anticipated and oil, water and dust are kept off.

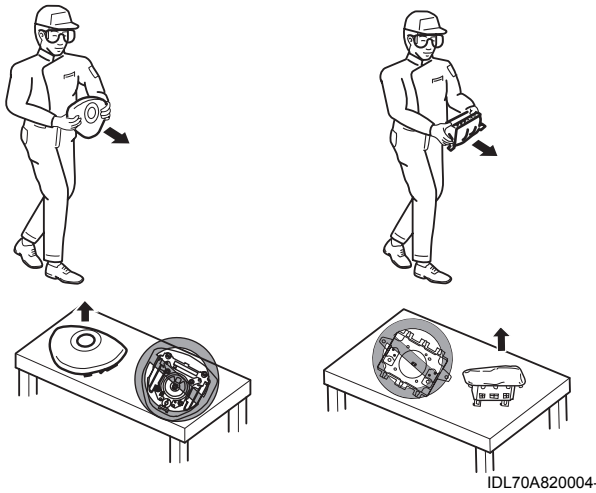


IDL70A820003-02

- If SDM has been dropped, replace it with a new one.
- If SDM installation part of floor is damaged, repair it completely before reinstallation.
- All SDM and mounting bracket fasteners must be carefully torqued and the arrow on the SDM must point toward the front of the vehicle to ensure proper operation of the air bag system.

Live (Undeployed) Air Bag (Inflator) Module

Special care is necessary when handling and storing live (undeployed) air bag (inflator) modules.
Accidental deployment of air bag (inflator) module could throw itself or objects around it in the air.



IDL70A820004-01

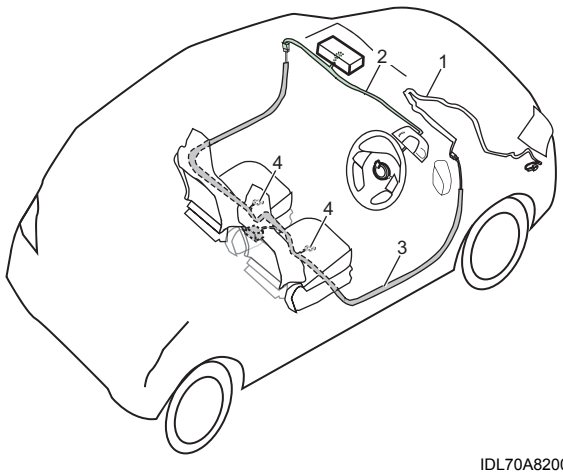
Deployed Air Bag (Inflator) Module

Refer to the procedure described under “Deployed Air Bag (Inflator) Module Disposal” (Page 8B-57).

Air Bag Wire Harness and Connector

Air bag wire harness is included in main harness (1), instrument panel harness (2) and floor harness (3). Air bag wire harness can be identified easily as the connector side wire harness is covered with a yellow protection tube or tape. Be careful when handling it.

- If damaged harness, connector or terminal is found on the air bag wire harness, replace the harness.
- When installing the air bag wire harness, be careful so that it is not caught or does not interfere with other parts.
- Check that air bag system ground points (4) are clean and ground terminals are securely fastened for optimum metal-to-metal contact. Poor ground connection can cause intermittent problems that are difficult to diagnose.



IDL70A820076-05

Precautions for Disposal of Air Bag

AENDL70A8200003

When disposal is necessary, deploy the air bag. ☞(Page 8B-53)

General Description

Air Bag System Construction

AENDL70A8201001

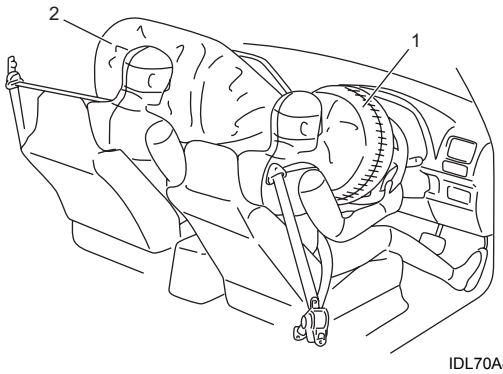
There are two types of air bag system in this model depending on vehicle specification.
Those are 2-channel air bag system and 1-channel air bag system.
2-channel air bag system consists of the following components.

- Driver and passenger air bag (inflator) modules
- Forward impact sensor
- SDM

1-channel air bag system consists of the following components.

- Driver air bag (inflator) module
- Forward impact sensor
- SDM

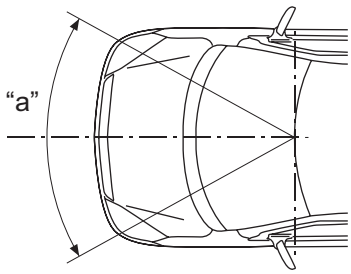
The driver air bag (inflator) module is deployed from the center of the steering column and the passenger air bag (inflator) module from the top of the instrument panel in front of the front passenger seat in occurrence of a front collision with an impact larger than a certain set value to supplement protection offered by the driver and front passenger seat belts.



IDL70A820005-01

1. Driver air bag	2. Passenger air bag (if equipped)

The air bag system is designed to activate only in severe frontal “a” collision. It is not designed to activate in rear impacts, rollovers, or minor frontal and sideward collisions, since it would offer no protection in those types of accidents.



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Air Bag System Input / Output Table

AENDL70A8201004

INPUT (sensor signal) \ OUTPUT (deployment & activation device)	Driver air bag (inflator) module	Passenger air bag (inflator) module (if equipped)
X-Y G sensor (longitudinal / lateral acceleration) in SDM	◯	◯
Forward impact-sensor	◯	◯

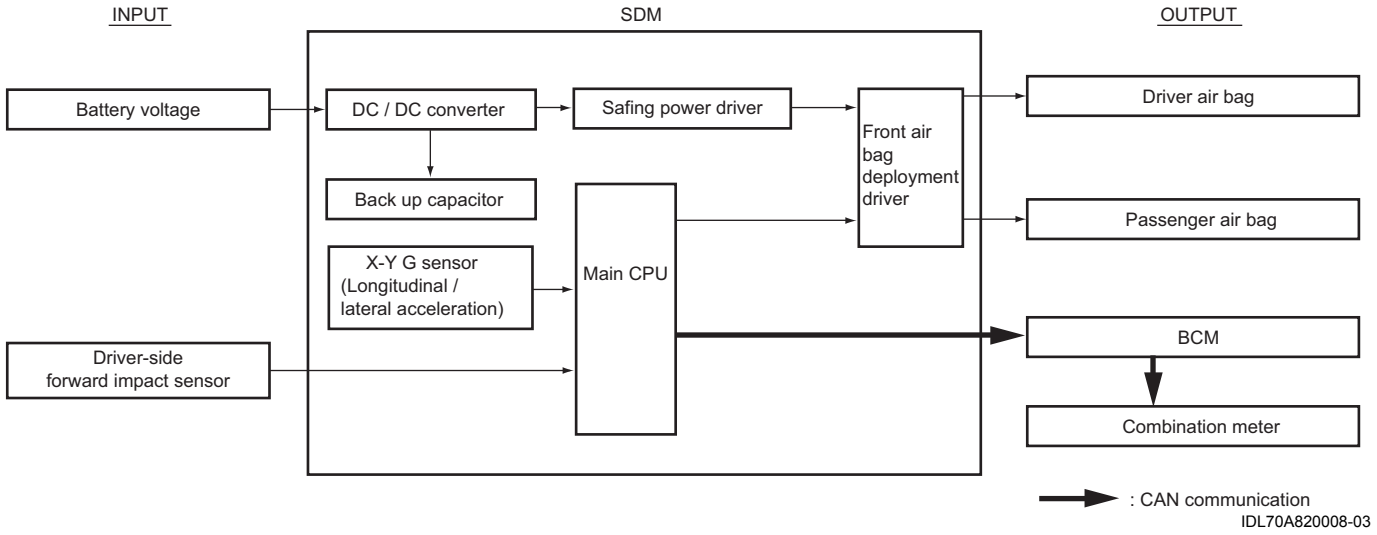
◯ : Applicable —— : Not applicable

IDL70A820007-02

Schematic and Routing Diagram

Air Bag System Input / Output Diagram

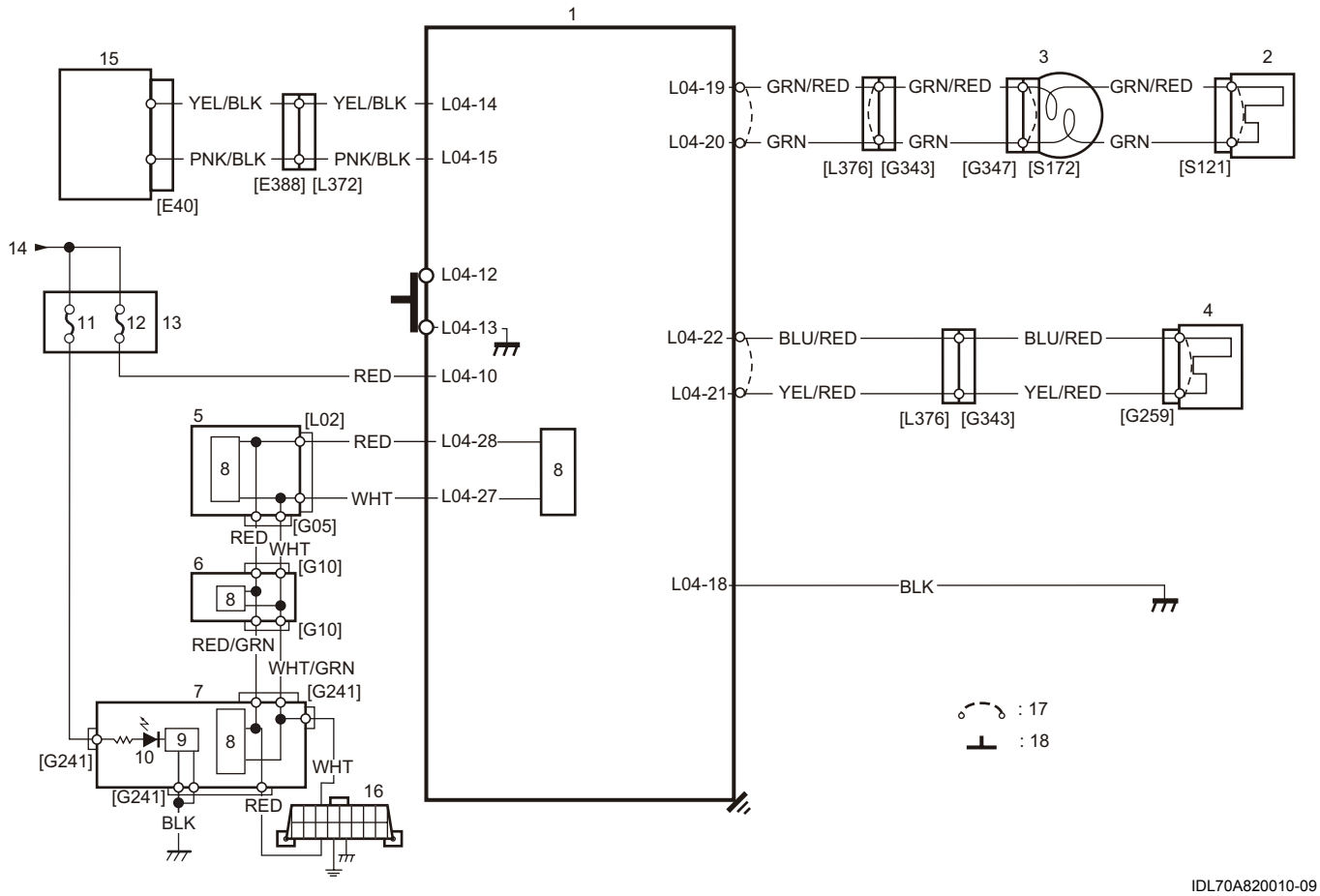
AENDL70A8202001



IDL70A820008-03

Air Bag System Circuit Diagram

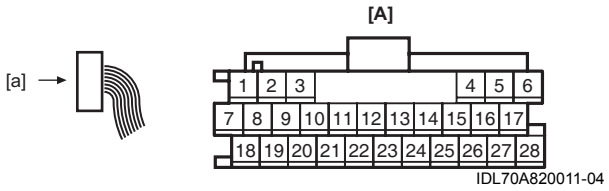
AENDL70A8202002



IDL70A820010-09

1. SDM	7. Combination meter	13. J/B
2. Driver air bag (inflator) module	8. CAN driver	14. From ignition switch
3. Contact coil assembly	9. CPU (combination meter)	15. Forward impact sensor
4. Passenger air bag (inflator) module (if equipped)	10. “AIR BAG” warning light	16. DLC
5. BCM	11. “MTR” fuse	17. Shorting bar
6. P/S control module	12. “A/B” fuse	18. Connection detection pin

Terminal arrangement of SDM



[A]: SDM connector "L04" (View: [a])

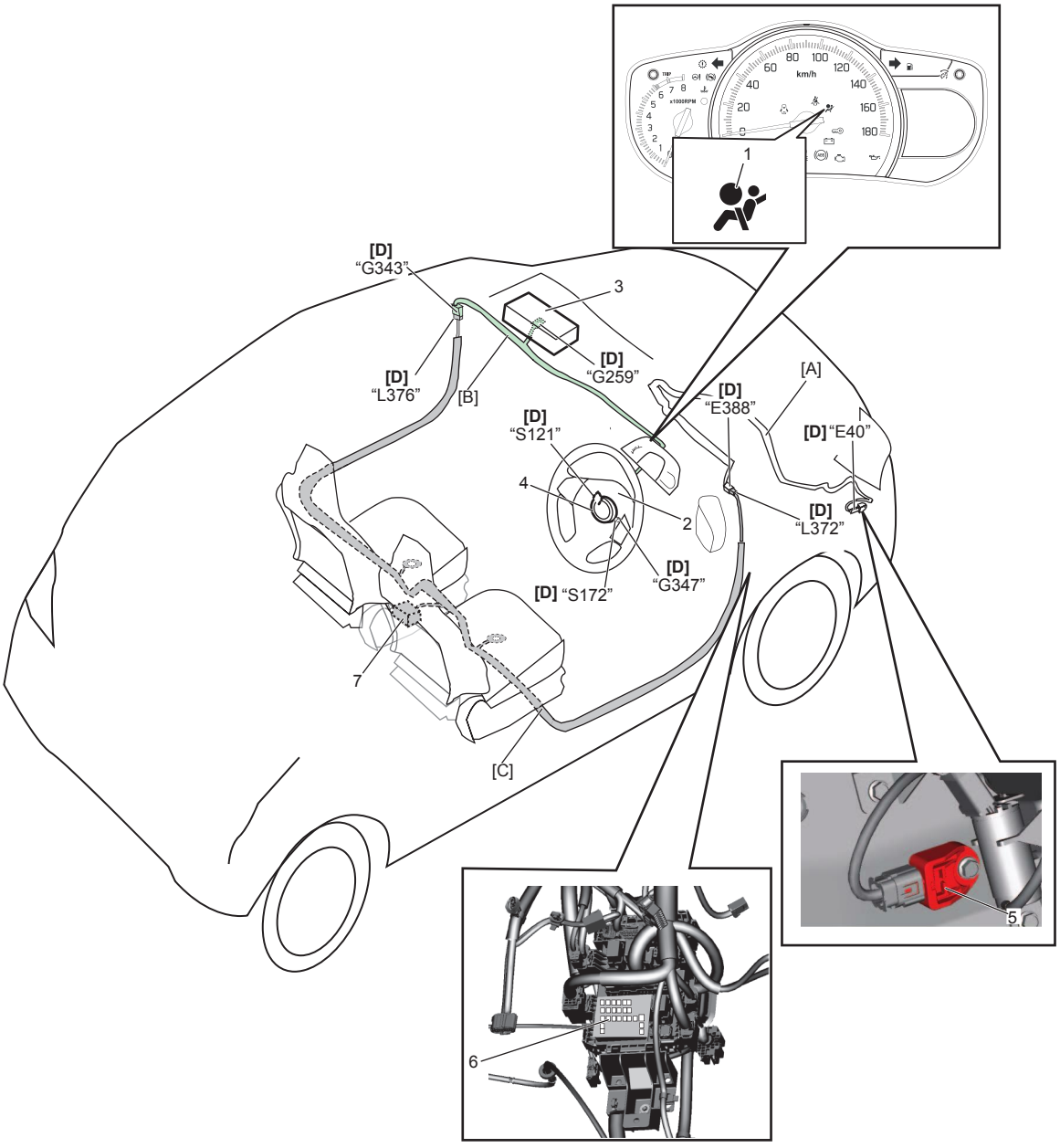
Connector "L04"

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
L04-10	RED	Power source	L04-20	GRN	Driver air bag (–)
L04-14	YEL/BLK	Forward impact sensor (+)	L04-21	YEL/RED	Passenger air bag (–)
L04-15	PNK/BLK	Forward impact sensor (–)	L04-22	BLU/RED	Passenger air bag (+)
L04-18	BLK	Ground	L04-27	WHT	CAN communication line (low)
L04-19	GRN/RED	Driver air bag (+)	L04-28	RED	CAN communication line (high)

Component Location

Air Bag System Component, Wiring and Connector Location

AENDL70A8203001



IDL70A820077-04

[A]: Main harness	1. "AIR BAG" warning light	5. Forward impact sensor
[B]: Instrument panel harness	2. Driver air bag (inflator) module	6. "A/B" fuse
[C]: Floor harness	3. Passenger air bag (inflator) module	7. SDM
[D]: Connector number	4. Contact coil assembly	

Diagnostic Information and Procedures

Air Bag Diagnostic System Check

AENDL70A8204001

Referring to “Precautions for Air Bag System Service” (Page 8B-1), check air bag system as follows.

Air Bag Diagnostic System Check Flow

Step	Action	Yes	No
1	**DTC check** 1) Check DTC referring to “DTC Check” (Page 8B-8). **NOTE** **If communication between SUZUKI scan tool and the vehicle cannot be established, perform “DLC and Its Circuit Check (No Communication with SDM)” (Page 8B-44).** 2) Clear DTC referring to “DTC Clearance” (Page 8B-8). *Is there any DTC(s) when rechecking?*	Go to applicable DTC diagnostic flow, and go to Step 5.	Go to Step 2.
2	**Visual inspection** 1) Perform visual inspection referring to “Visual Inspection” (Page 8B-7). *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 5.	Go to Step 3.
3	**Impact sign check** 1) Inspect vehicle for evidence of impact. *Are there any signs of impact?*	Inspect and replace components according to “Repair and Inspection Required after Accident” (Page 8B-45), and go to Step 5.	Go to Step 4.
4	**Intermittent problems check** 1) Check for intermittent problems referring to “Intermittent Connection and Poor Contact Inspection” in Section 00 (Page 00-11). *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 5.	Go to Step 5.
5	**Final confirmation test** 1) Confirm that the problem symptom has gone and the air bag system is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once, check DTC and check that no DTC is detected. *Is malfunction detected?*	Return to Step 1.	End.

Visual Inspection

AENDL70A8204002

Visually check the following parts and system.

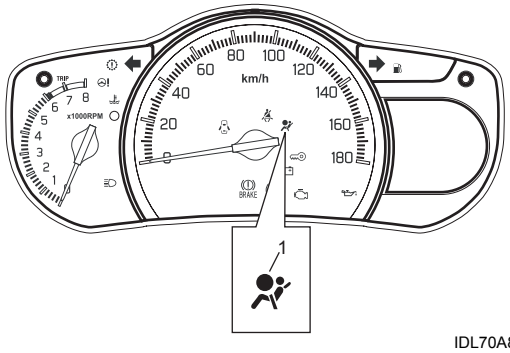
Inspection item		Referring section
Battery	Fluid level, leakage	“Battery Description” in Section 1J (Page 1J-1)
Connectors of electric wire harness	Disconnection, friction	“Intermittent Connection and Poor Contact Inspection” in Section 00 (Page 00-11)
Fuses	Open	“Air Bag System Component, Wiring and Connector Location” (Page 8B-6)
Air bag system component	Installation, damage	
Other parts that can be checked visually		

“AIR BAG” Warning Light Check

AENDL70A8204003

1) Set ignition “ON”.

2) Check that “AIR BAG” warning light (1) is on for 6 seconds. In case that “AIR BAG” warning light is not ON, refer to ““AIR BAG” Warning Light Does Not Come ON” (Page 8B-12). In case that “AIR BAG” warning light remains ON and no DTC is detected in SDM, refer to ““AIR BAG” Warning Light Comes ON Steady” (Page 8B-11).



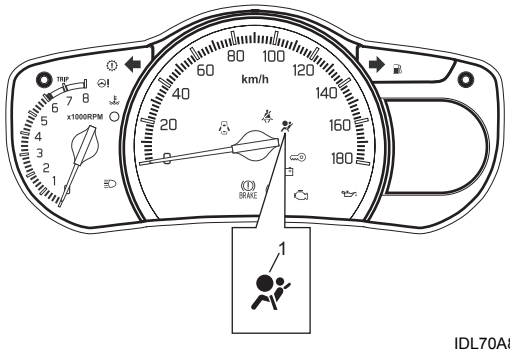
IDL70A820006-03

Self-Diagnosis Function

AENDL70A8204057

SDM also has self-diagnosis function that memorizes DTC when an error is detected. After understanding the following descriptions, perform troubleshooting referring to “Air Bag Diagnostic System Check” (Page 8B-7) when an error is detected.

- SDM always monitors system while ignition is “ON:”. If an error is detected, it notifies driver about the error by turning on “AIR BAG” warning light (1) and detected error is stored in SDM memory as DTC.
- “AIR BAG” warning light lights for 6 seconds when the ignition switch is turned to ON position to indicated that it operates properly and turn off if no error is found in air bag system.



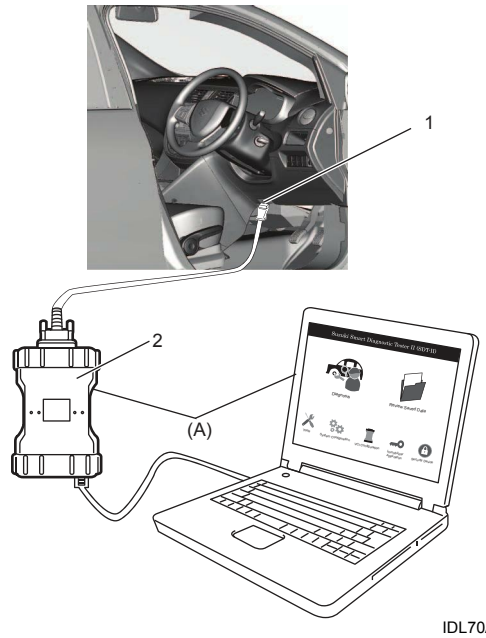
IDL70A820006-03

DTC Check

AENDL70A8204004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool (PC and VCI(2)) to DLC.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

3) Set ignition “ON”.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to Operator’s Manual of SUZUKI scan tool for further details.

NOTE

If communication between SUZUKI scan tool and the vehicle cannot be established, perform “DLC and Its Circuit Check (No Communication with SDM)” (Page 8B-44).

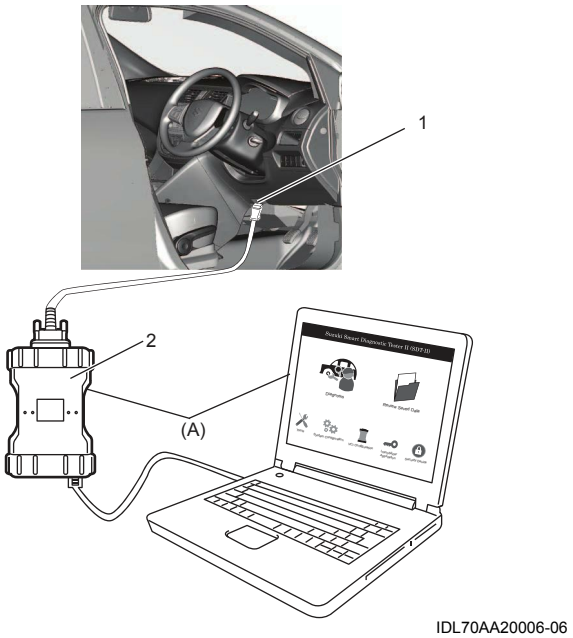
5) After completing the check, set ignition “OFF” and disconnect SUZUKI scan tool from DLC.

DTC Clearance

AENDL70A8204005

1) Connect SUZUKI scan tool (PC and VCI(2)) to DLC.

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

2) Set ignition “ON”.
3) Clear DTC according to instructions displayed on SUZUKI scan tool. Refer to Operator’s Manual of SUZUKI scan tool for further details.

NOTE

If communication between SUZUKI scan tool and the vehicle cannot be established, perform “DLC and Its Circuit Check (No Communication with SDM)” (Page 8B-44).

4) After completing DTC clearance, set ignition “OFF” and disconnect SUZUKI scan tool from DLC.

DTC Table

AENDL70A8204006

NOTE

DTCs with (*) mark are applicable to model with passenger air bag.

DTC	DTC name	DTC detecting condition
B1001-00 ☞(Page 8B-14)	SDM Wrong Assembly	SDM has inconsistent ID code.
B1002-00 ☞(Page 8B-14)	Intermittent Connection of SDM Connector	Faulty connection of SDM connector.
B1003-04 ☞(Page 8B-15)	SDM Internal Failure	Malfunctioning SDM internal circuit, G sensor, memory or CPU.
B1004-17 ☞(Page 8B-15)	Power Source Voltage too High	Power supply voltage is more than specified range.
B1004-18 ☞(Page 8B-16)	Power Source Voltage too Low	Power supply voltage is less than specified range.
B1031-00 ☞(Page 8B-17)	Scrapping Deployment Record	Software of SDM is corrupted.
B1032-00 ☞(Page 8B-17)	Front Air Bag Deployment Record	Deployment of front air bag has been recorded in SDM.
B1060-14 ☞(Page 8B-18)	Driver Air Bag (1st Stage) Circuit Shorted to Ground	Driver air bag (inflator) module circuit has been shorted to ground.
B1060-15 ☞(Page 8B-21)	Driver Air Bag (1st Stage) Circuit Shorted to Power Supply	Driver air bag (inflator) module circuit has been shorted to power supply.
B1060-1A ☞(Page 8B-26)	Driver Air Bag (1st Stage) Circuit Low Resistance	Driver air bag (inflator) module circuit resistance is less than specified range.
B1060-1B ☞(Page 8B-29)	Driver Air Bag (1st Stage) Circuit High Resistance	Driver air bag (inflator) module circuit resistance is more than specified range.
B1062-14* ☞(Page 8B-18)	Passenger Air Bag (1st Stage) Circuit Shorted to Ground	Passenger air bag (inflator) module circuit has been shorted to ground.
B1062-15* ☞(Page 8B-21)	Passenger Air Bag (1st Stage) Circuit Shorted to Power Supply	Passenger air bag (inflator) module circuit has been shorted to power supply.

DTC	DTC name	DTC detecting condition
B1062-1A* ☞(Page 8B-31)	Passenger Air Bag (1st Stage) Circuit Low Resistance	Passenger air bag (inflator) module circuit resistance is less than specified range.
B1062-1B* ☞(Page 8B-34)	Passenger Air Bag (1st Stage) Circuit High Resistance	Passenger air bag (inflator) module circuit resistance is more than specified range.
B1090-01 ☞(Page 8B-37)	Driver Forward Impact Sensor No Response	Forward impact sensor has communicated with no response or inconsistent ID code.
B1090-87 ☞(Page 8B-37)	Driver Forward Impact Sensor Communication Data Invalid	Forward impact sensor has communicated with invalid data.
B1090-95 ☞(Page 8B-37)	Driver Forward Impact Sensor Communication Data Inconsistent	Forward impact sensor has communicated with inconsistent data.
U0073-88 ☞(Page 8B-38)	Control Module Communication Bus Off	Transmitting and receiving error of SDM for specified time continuously.

Scan Tool Data

AENDL70A8204007

NOTE

If communication between SUZUKI scan tool and the vehicle cannot be established, perform "DLC and Its Circuit Check (No Communication with SDM)" (Page 8B-44).

Data list of SDM

Scan Tool Data	Normal Condition / Reference Value
System ID ☞(Page 8B-10)	1ch / 2ch
Battery Voltage ☞(Page 8B-10)	10 – 14 V
Backup Volt ☞(Page 8B-10)	27.0 V – 33.0 V
Driv A/B Ini Res ☞(Page 8B-10)	1.0 – 4.5 ohm
Pass A/B Ini Res ☞(Page 8B-10)	1.0 – 3.8 ohm

Scan Tool Data Definition

System ID (1ch / 2ch)
This parameter indicates number of initiator circuits.

Battery voltage (V)
Battery voltage is an analog input signal read by SDM.

Backup Volt (V)
This parameter indicates the capacity of the backup capacitor installed to maintain the ignition current (as much as possible) even when the power supply to SDM that ignites the inflator is shut off.

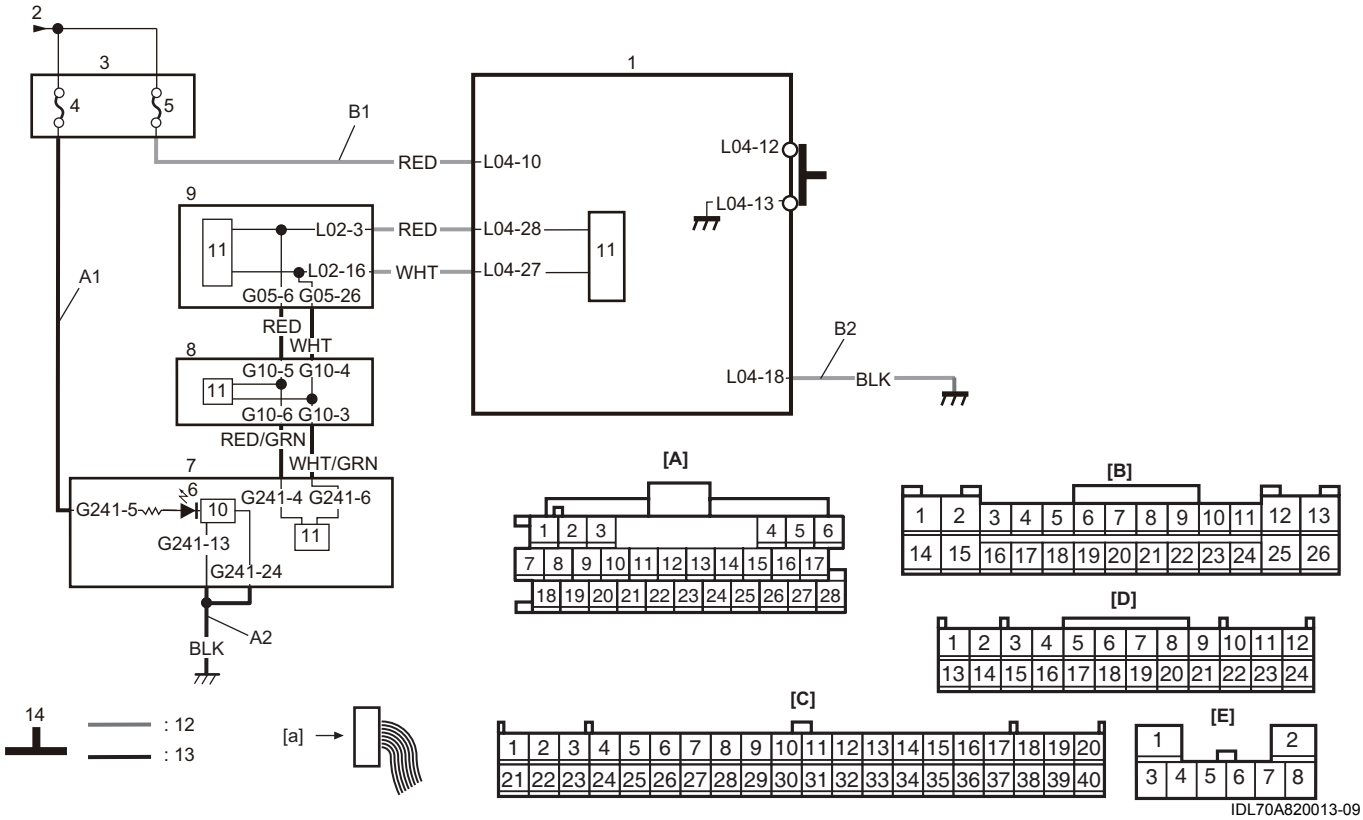
Driv A/B Ini Res (Driver air bag initiator resistance) (ohm)
This parameter indicates the resistance of the driver air bag initiator circuit.

Pass A/B Ini Res (Passenger air bag initiator resistance) (ohm)
This parameter indicates the resistance of the passenger air bag initiator circuit.

“AIR BAG” Warning Light Comes ON Steady

AENDL70A8204008

Circuit Diagram



[A]: “L04” connector (View: [a])	B2. SDM ground circuit	8. P/S control module
[B]: “L02” connector (View: [a])	1. SDM	9. BCM
[C]: “G05” connector (View: [a])	2. From ignition switch	10. CPU (combination meter)
[D]: “G241” connector (View: [a])	3. J/B	11. CAN driver
[E]: “G10” connector (View: [a])	4. “MTR” fuse	12. Floor harness
A1: Combination meter power supply circuit	5. “A/B” fuse	13. Instrument panel harness
A2: Combination meter ground circuit	6. “AIR BAG” warning light	14. Connection detection pin
B1: SDM power supply circuit	7. Combination meter	

Troubleshooting

Step	Action	Yes	No
1	**SDM connector check** 1) Check for proper connection to “L04” connector. *Is check result OK?*	Go to Step 2.	Connect connector securely.
2	**DTC check** 1) Perform “DTC Check” (Page 8B-8). *Is there any DTC(s)?*	Go to applicable DTC troubleshooting.	Go to Step 3.
3	**SDM power supply and ground circuit check** 1) Check SDM power supply and ground circuits. ☞(Page 8B-38) *Is check result OK?*	Go to Step 4.	Replace or repair defective circuit.
4	**CAN communication circuit check** 1) Check CAN communication circuit between SDM and combination meter. *Is check result OK?*	Go to Step 5.	Replace or repair defective circuit and/or component(s).

Step	Action	Yes	No
5	**Combination meter check** 1) Replace combination meter. ☞(Page 9C-11) 2) Set ignition “ON”. *Does “AIR BAG” warning light stay on?*	Replace SDM.	Replace floor harness, instrument panel harness or junction block.

NOTE

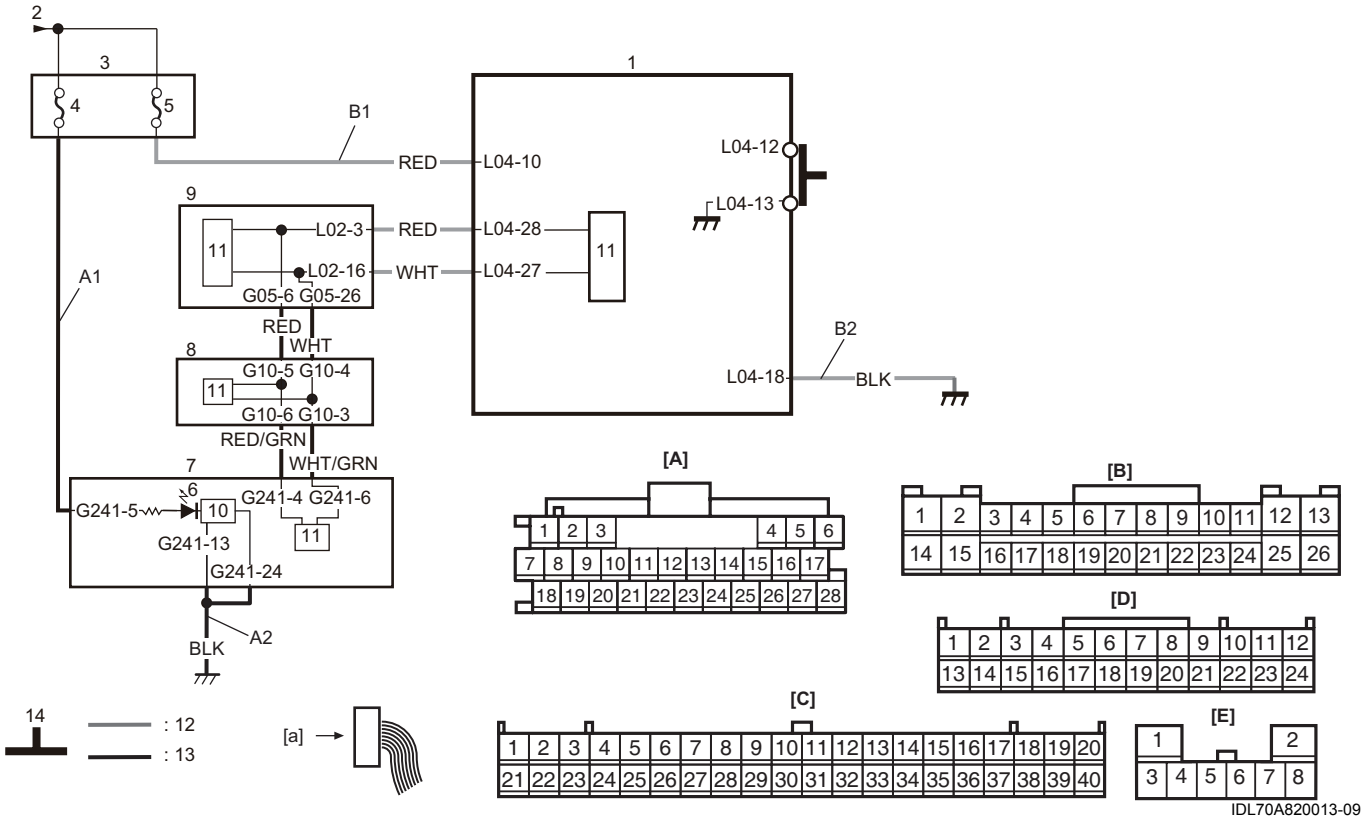
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check” (Page 8B-7) to check that the trouble has been solved.**

“AIR BAG” Warning Light Does Not Come ON

AENDL70A8204009

Circuit Diagram

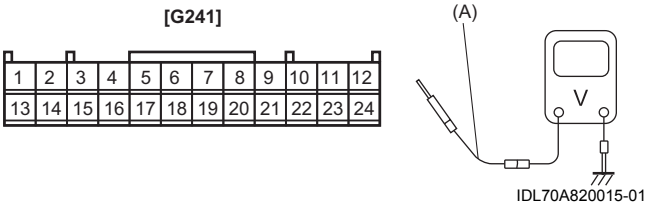
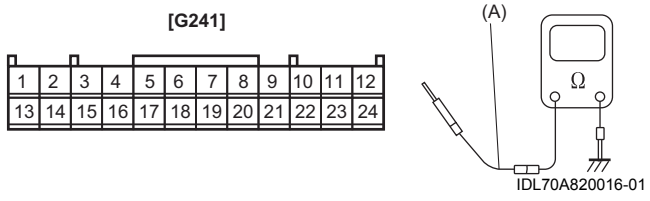


IDL70A820013-09

[A]: “L04” connector (View: [a])	B2. SDM ground circuit	8. P/S control module
[B]: “L02” connector (View: [a])	1. SDM	9. BCM
[C]: “G05” connector (View: [a])	2. From ignition switch	10. CPU (combination meter)
[D]: “G241” connector (View: [a])	3. J/B	11. CAN driver
[E]: “G10” connector (View: [a])	4. “MTR” fuse	12. Floor harness
A1: Combination meter power supply circuit	5. “A/B” fuse	13. Instrument panel harness
A2: Combination meter ground circuit	6. “AIR BAG” warning light	14. Connection detection pin
B1: SDM power supply circuit	7. Combination meter	

Troubleshooting

Step	Action	Yes	No
1	**Warning light check** 1) Set ignition “ON”. *Do other indicator lights come ON?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	**DTC check** 1) Check that ignition is “OFF”. 2) Connect scan tool to DLC. 3) Set ignition “ON”. 4) Check DTC. ☞(Page 8B-8) *Is DTC U0073-88 detected?*	Go to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).	Go to Step 3.
3	**Fuse check** *Is “MTR” fuse in good condition?*	Go to Step 4.	Replace “MTR” fuse and check for short circuit to ground.
4	**CAN communication circuit check** 1) Check CAN communication circuit between SDM and combination meter. *Is check result OK?*	Go to Step 5.	Replace or repair defective circuit and/or component(s).
5	**Combination meter power supply circuit check** 1) Check that ignition is “OFF”. 2) Remove combination meter. 3) Check for proper connection to “G241” connector. 4) If OK, set ignition “ON”. 5) Measure voltage between connector terminal “G241-5” and ground. **Special tool** **(A): 09932M76010**  *Is it 10-14 volt?*	Go to Step 6.	Repair A1 circuit.
6	**Combination meter ground circuit check** 1) Measure resistance between ground and each of the terminals “G241-13” and “G241-24”. **Special tool** **(A): 09932M76010**  *Is resistance less than 1 Ω?*	Replace combination meter and recheck DTC. ☞(Page 9C-11)	Repair “A2” circuit.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

DTC B1001-00

AENDL70A8204010

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1001-00: SDM Wrong Assembly SDM has inconsistent ID code.	SDM

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**Air bag system type check** 1) Identify SDM's channel number of air bag, judging from SDM part number. 2) Identify vehicle's channel number of air bag, judging from modules installed in vehicle. *Is SDM applicable to vehicle specification?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Change SDM with the one compatible with vehicle air bag specification.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

DTC B1002-00

AENDL70A8204011

DTC Detecting Condition and trouble Area

DTC detecting condition	Trouble area
B1002-00: Intermittent Connection of SDM Connector Faulty connection of SDM connector.	• SDM • SDM connector

Circuit Diagram

Refer to ""AIR BAG" Warning Light Comes ON Steady" (Page 8B-11).

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**SDM connector check** 1) Check for proper connection of SDM connector and "Connection detection pin" of SDM connector. *Are they in good condition?*	Replace SDM with new one and recheck DTC.	Check intermittent trouble. ☞(Page 00-11)

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

DTC B1003-04

AENDL70A8204012

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1003-04: SDM Internal Failure Malfunctioning SDM internal circuit, G sensor, memory or CPU.	SDM

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**DTC check** 1) Clear DTC. ☞(Page 8B-8) 2) Check that ignition is OFF. 3) Set ignition "ON". 4) Check DTC. ☞(Page 8B-8) *Is DTC B1003-04 still detected?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Check intermittent trouble. ☞(Page 00-11)

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

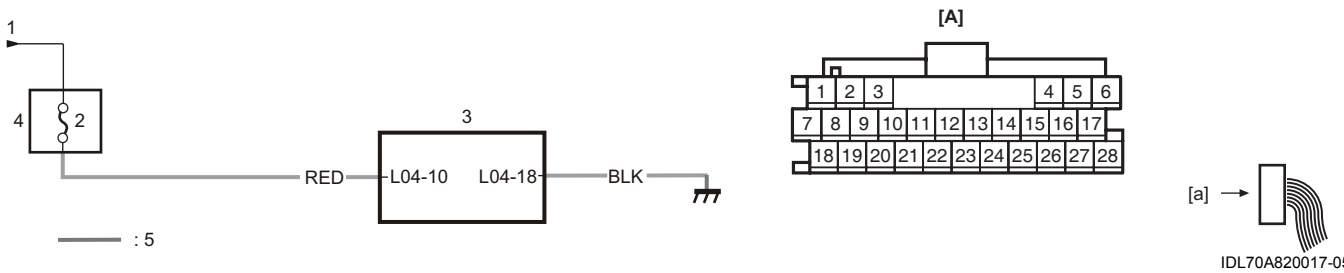
DTC B1004-17

AENDL70A8204014

DTC Detecting Condition and Trouble Area

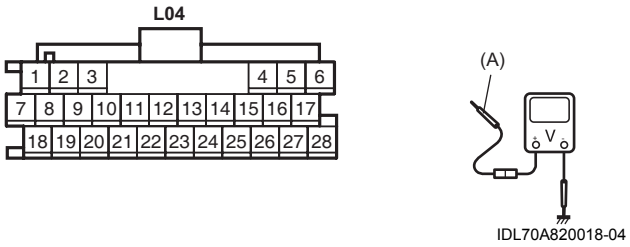
DTC detecting condition	Trouble area
B1004-17: Power Source Voltage Too High Power supply voltage is more than specified range.	• Charging system • SDM

Circuit Diagram



[A]: "L04" connector (View: [a])	2. "A/B" fuse	4. J/B
1. From ignition switch	3. SDM	5. Floor harness

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**SDM power supply voltage check** 1) Check that ignition is "OFF". 2) Disconnect "L04" connector. 3) Start engine and set engine speed at 3000 rpm or more. 4) Check voltage between "L04-10" terminal and ground. **Special tool** **(A): 09932M76010**  *Is 15 V or less?*	Go to Step 3.	Check charging system and repair wiring. ☞(Page 1J-4)
3	**DTC check** 1) Check that ignition is "OFF". 2) Connect "L04" connector. 3) Set ignition "ON". 4) Check DTC. ☞(Page 8B-8) *Is DTC B1004-17 detected?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Check for intermittent trouble. ☞(Page 00-11)

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

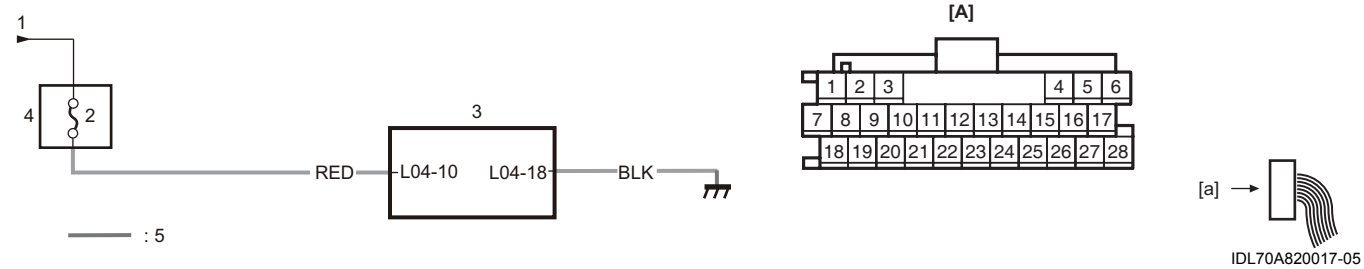
DTC B1004-18

AENDL70A8204053

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1004-18: Power Source Voltage Too Low Power supply voltage is less than specified range.	• Charging system • SDM

Circuit Diagram



[A]: "L04" connector (View: [a])	2. "A/B" fuse	4. J/B
1. From ignition switch	3. SDM	5. Floor harness

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**SDM power supply circuit and ground circuit check** 1) Check SDM power supply circuit and ground circuit. ☞(Page 8B-38) *Are SDM power supply circuit and ground circuit good?*	Go to Step 3.	Repair or replace defective part.
3	**DTC check** 1) Check that ignition is "OFF". 2) Connect "L04" connector. 3) Set ignition "ON". 4) Check DTC. ☞(Page 8B-8) *Is DTC B1004-18 detected?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Check for intermittent trouble. ☞(Page 00-11)

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

DTC B1031-00

AENDL70A8204056

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1031-00: Scrapping Deployment Record Software of SDM is corrupted.	SDM

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Replace SDM. ☞(Page 8B-48)	Go to "Air Bag Diagnostic System Check" (Page 8B-7).

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

DTC B1032-00

AENDL70A8204015

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1032-00: Front Air Bag Deployment Record Deployment of front air bag has been recorded in SDM.	If this DTC has been recorded even though air bag has not been deployed • SDM • Driver and/or Passenger air bag (inflator) module • Wiring harness between SDM and air bag (inflator) module.

NOTE

If DTC B1032-00 is stored in SDM, it is not possible to clear DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Replace SDM. ☞(Page 8B-48)	Go to "Air Bag Diagnostic System Check" (Page 8B-7).

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

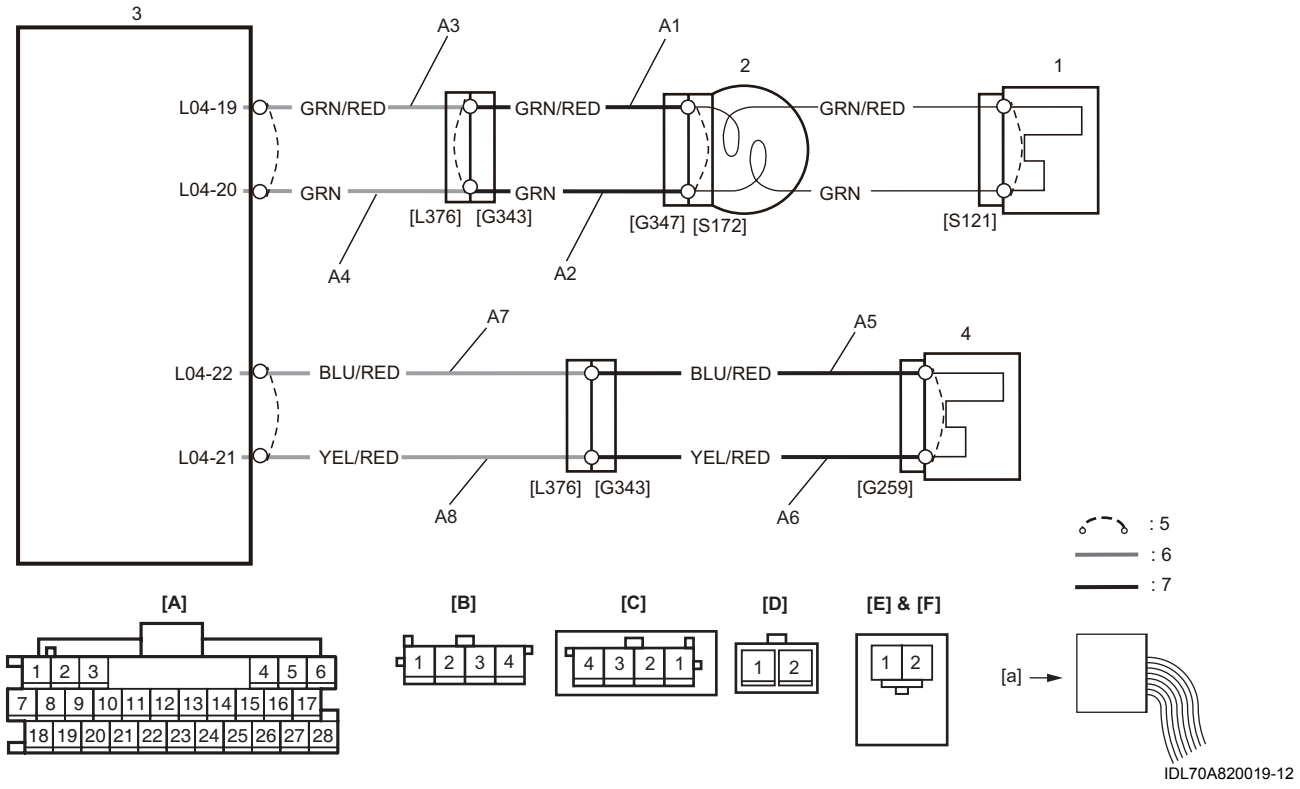
DTC B1060-14 / B1062-14

AENDL70A8204021

DTC Detecting Condition and Trouble Area

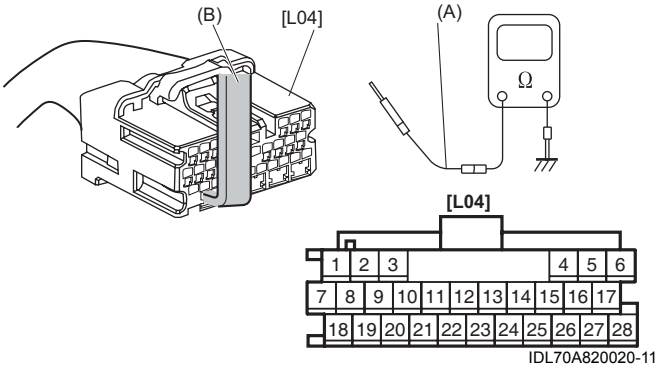
DTC detecting condition	Trouble area
B1060-14: Driver Air Bag (1st Stage) Circuit Shorted to Ground Driver air bag (inflator) module circuit has been shorted to ground.	• Driver air bag (inflator) module circuit • Passenger air bag (inflator) module circuit • Contact coil assembly • SDM
B1062-14: Passenger Air Bag (1st Stage) Circuit Shorted to Ground Passenger air bag (inflator) module circuit has been shorted to ground.	

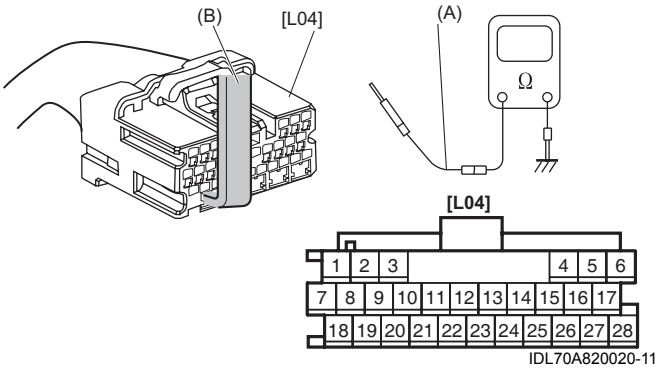
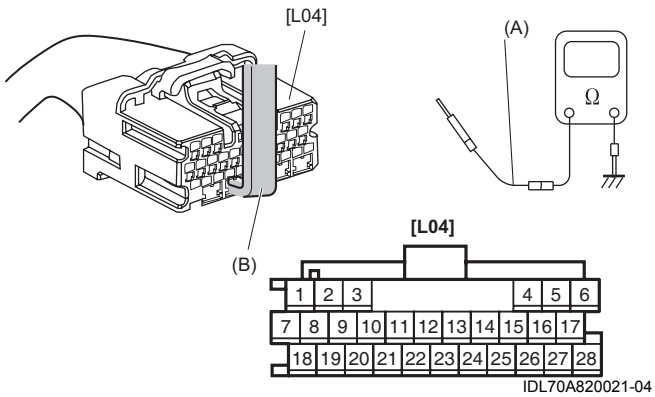
Circuit Diagram

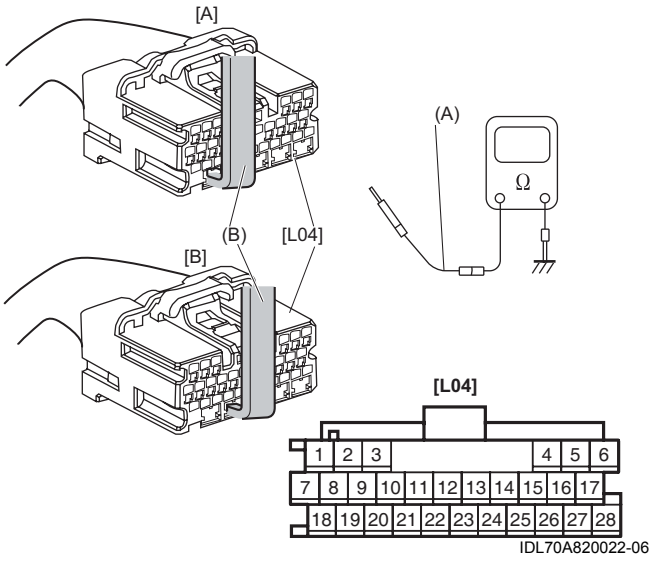


[A]: "L04" connector (View: [a])	A2: Driver air bag (inflator) module deployment signal ground circuit	1. Driver air bag (inflator) module
[B]: "L376" connector (View: [a])	A3: Driver air bag (inflator) module deployment signal output circuit	2. Contact coil assembly
[C]: "G343" connector (View: [a])	A4: Driver air bag (inflator) module deployment signal ground circuit	3. SDM
[D]: "G347" connector (View: [a])	A5: Passenger air bag (inflator) module deployment signal output circuit	4. Passenger air bag (inflator) module
[E]: "S121" connector (View: [a])	A6: Passenger air bag (inflator) module deployment signal ground circuit	5. Shorting bar
[F]: "G259" connector (View: [a])	A7: Passenger air bag (inflator) module deployment signal output circuit	6. Floor harness
A1: Driver air bag (inflator) module deployment signal output circuit	A8: Passenger air bag (inflator) module deployment signal ground circuit	7. Instrument panel harness

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**Driver air bag (inflator) module circuit check** 1) Check that ignition is "OFF". 2) Disconnect "G347" and "L04" connectors. 3) Release shorting bar in SDM connector inserting release tool (B). 4) Check the following point. • Resistance between each of "A3" and "A4" circuits and ground: infinity **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Go to Step 3.	Go to Step 5.

Step	Action	Yes	No
3	**Contact coil circuit check** 1) Connect “G347” connector. 2) Remove driver air bag (inflator) module from steering wheel. ☞(Page 8B-48) 3) Release shorting bar in SDM connector inserting release tool (B). 4) Check the following point. • Resistance between each of “A3” and “A4” circuits and ground: infinity **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Go to Step 4.	Replace contact coil assembly. ☞(Page 6B-3)
4	**Passenger air bag (inflator) module circuit check** 1) Check that ignition is “OFF”. 2) Disconnect “G259” connector. 3) Disconnect “L04” connector. 4) Release shorting bar in SDM connector inserting release tool (B). 5) Check the following point. • Resistance between each of “A7” and “A8” circuits and ground: infinity **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Go to Step 5.

Step	Action	Yes	No
5	**Floor harness circuit check** 1) Disconnect “L376” connector. 2) Release shorting bar in SDM connector inserting release tool (B). • [A]: to check driver air bag (inflator) module deployment circuits • [B]: to check passenger air bag (inflator) module deployment circuits 3) Check the following points. • Resistance between each of “A3” and “A4” circuits and ground: infinity • Resistance between each of “A7” and “A8” circuits and ground: infinity **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Replace instrument panel harness.	Replace floor harness.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance” (Page 8B-8), if any DTC is detected.**
- **Repeat “Air Bag Diagnostic System Check” (Page 8B-7) to check that the trouble has been solved.**

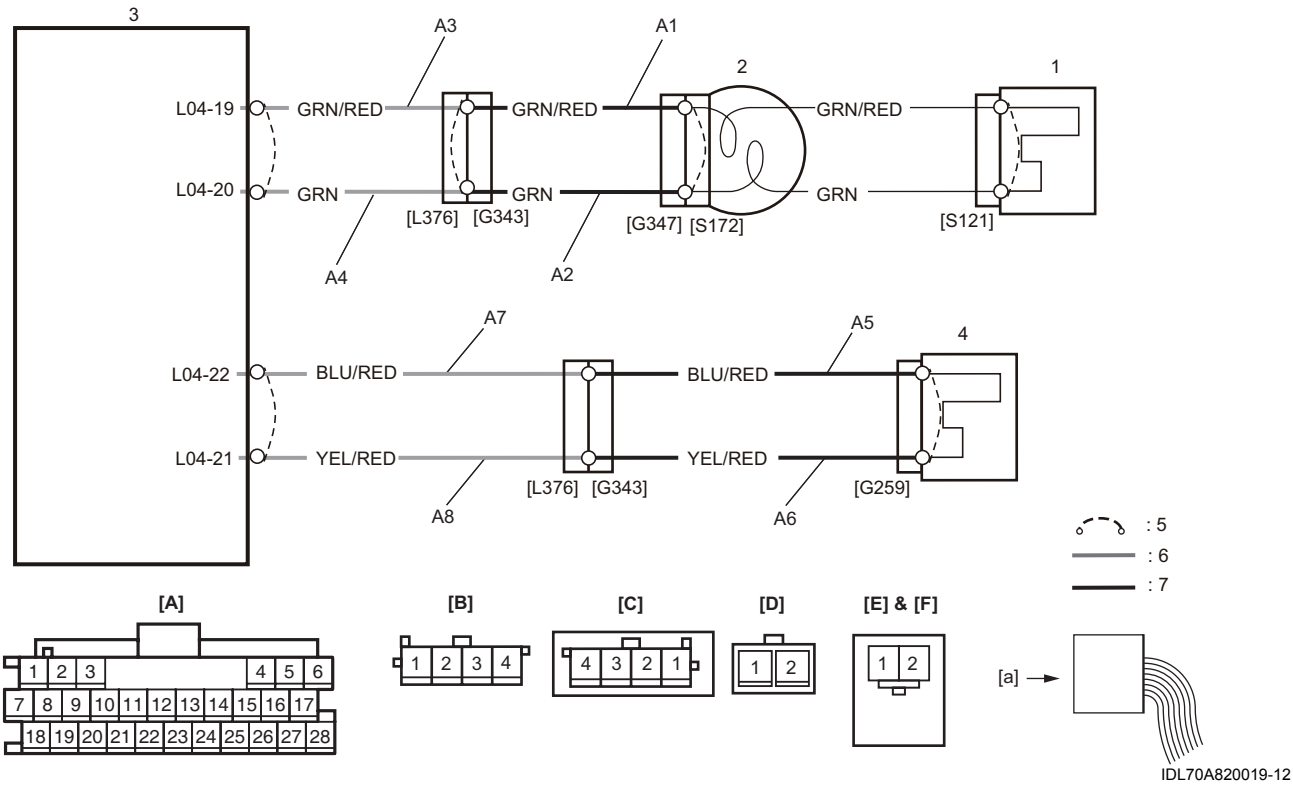
DTC B1060-15 / B1062-15

AENDL70A8204022

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1060-15: Driver Air Bag (1st Stage) Circuit Shorted to Power Supply Driver air bag (inflator) module circuit has been shorted to power supply.	• Driver air bag (inflator) module circuit • Passenger air bag (inflator) module circuit • Contact coil assembly • SDM
B1062-15: Passenger Air Bag (1st Stage) Circuit Shorted to Power Supply Passenger air bag (inflator) module circuit has been shorted to power supply.	

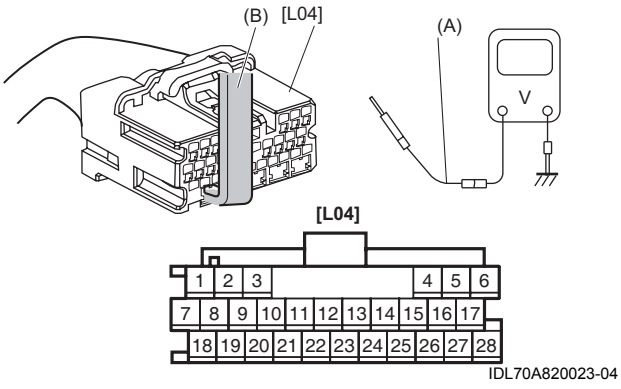
Circuit Diagram

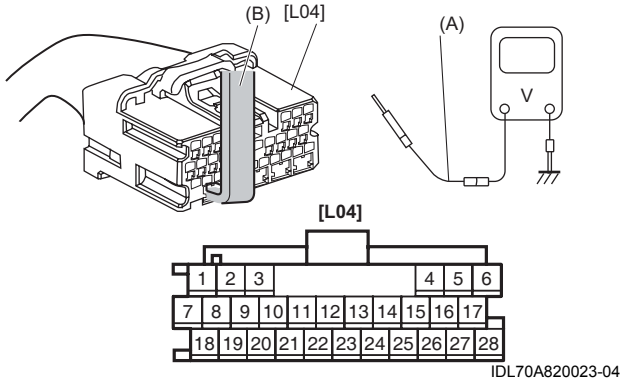


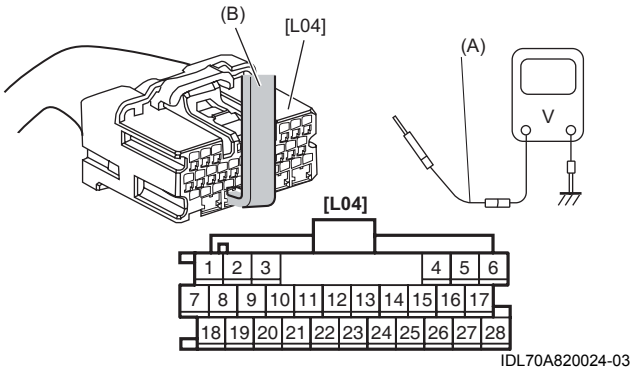
[A]: "L04" connector (View: [a])	A2: Driver air bag (inflator) module deployment signal ground circuit	1. Driver air bag (inflator) module
[B]: "L376" connector (View: [a])	A3: Driver air bag (inflator) module deployment signal output circuit	2. Contact coil assembly
[C]: "G343" connector (View: [a])	A4: Driver air bag (inflator) module deployment signal ground circuit	3. SDM
[D]: "G347" connector (View: [a])	A5: Passenger air bag (inflator) module deployment signal output circuit	4. Passenger air bag (inflator) module
[E]: "S121" connector (View: [a])	A6: Passenger air bag (inflator) module deployment signal ground circuit	5. Shorting bar
[F]: "G259" connector (View: [a])	A7: Passenger air bag (inflator) module deployment signal output circuit	6. Floor harness
A1: Driver air bag (inflator) module deployment signal output circuit	A8: Passenger air bag (inflator) module deployment signal ground circuit	7. Instrument panel harness

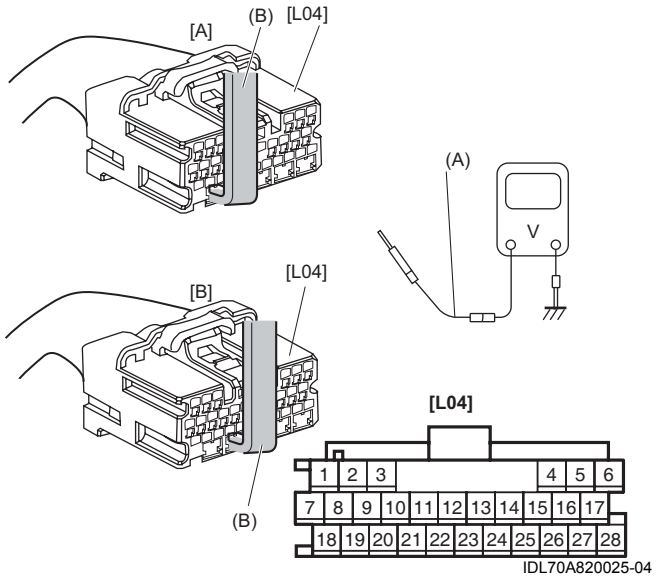
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).

Step	Action	Yes	No
2	**Driver air bag (inflator) module circuit check** 1) Check that ignition is “OFF”. 2) Disconnect “G347” and “L04” connectors. 3) Release shorting bar in SDM connector inserting release tool (B). 4) Set ignition “ON”. 5) Check the following point. • Voltage between each of “A3” and “A4” circuits and ground: 0 V **Special tool** **(A): 09932M76010** **(B): 09932M75100**  IDL70A820023-04 *Is check result OK?*	Go to Step 5.	Go to Step 3.

Step	Action	Yes	No
3	**Contact coil circuit check** 1) Check that ignition is “OFF”. 2) Connect “G347” connector. 3) Remove driver air bag (inflator) module from steering wheel. ☞(Page 8B-48) 4) Release shorting bar in SDM connector inserting release tool (B). 5) Set ignition “ON”. 6) Check the following point. • Voltage between “A3” and “A4” circuits and ground: 0 V **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Go to Step 4.	Replace contact coil assembly. ☞(Page 6B-3)

Step	Action	Yes	No
4	**Passenger air bag (inflator) module circuit check** 1) Check that ignition is “OFF”. 2) Disconnect “G259” connector. 3) Disconnect “L04” connector. 4) Release shorting bar in SDM connector inserting release tool (B). 5) Set ignition “ON”. 6) Check the following point. • Voltage between each of “A7” and “A8” circuits and ground: 0 V **Special tool** **(A): 09932M76010** **(B): 09932M75100**  IDL70A820024-03 *Is check result OK?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Go to Step 5.

Step	Action	Yes	No
5	**Floor harness check** 1) Check that ignition is “OFF”. 2) Disconnect “L376” connector. 3) Release shorting bar in SDM connector inserting release tool (B). • [A]: to check driver air bag (inflator) module deployment circuits • [B]: to check passenger air bag (inflator) module deployment circuits 4) Set ignition “ON”. 5) Check the following points. • Voltage between each of “A3” and “A4” circuits and ground: 0 V • Voltage between each of “A7” and “A8” circuits and ground: 0 V **Special tool** **(A): 09932M76010** **(B): 09932M75100**  IDL70A820025-04 *Is check result OK?*	Replace instrument panel harness.	Replace floor harness.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance” (Page 8B-8), if any DTC is detected.**
- **Repeat “Air Bag Diagnostic System Check” (Page 8B-7) to check that the trouble has been solved.**

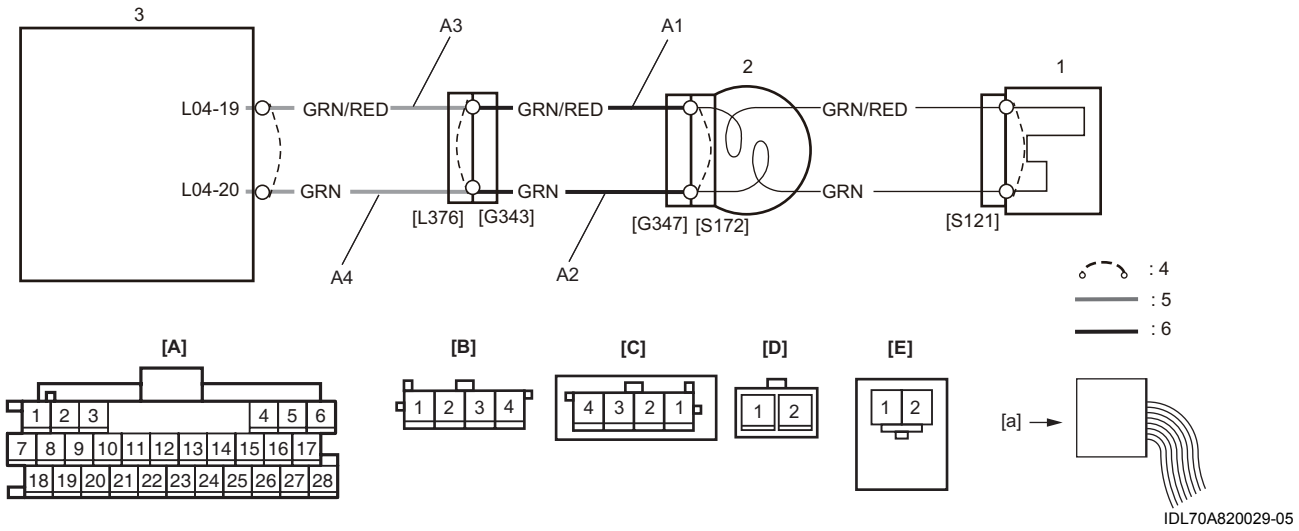
DTC B1060-1A

AENDL70A8204020

DTC Detecting Condition and Trouble Area

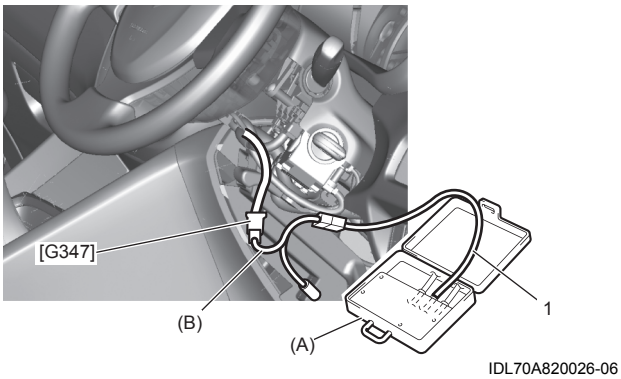
DTC detecting condition	Trouble area
B1060-1A: Driver Air Bag (1st Stage) Circuit Low Resistance Driver air bag (inflator) module circuit resistance is less than specified range.	• Driver air bag (inflator) module circuit • Contact coil assembly • Driver air bag (inflator) module • SDM

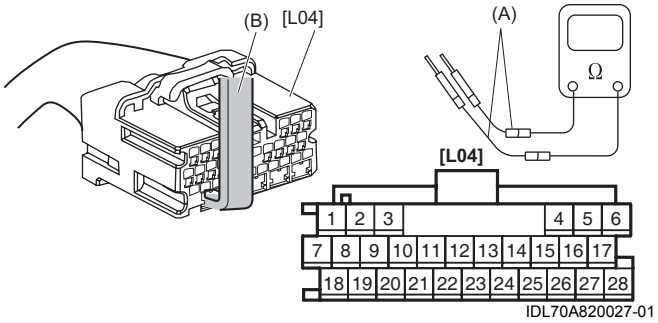
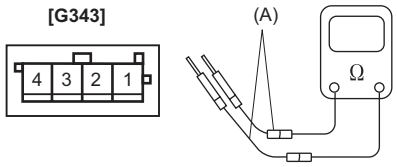
Circuit Diagram



[A]: "L04" connector (View: [a])	A1: Driver air bag (inflator) module deployment signal output circuit	2. Contact coil assembly
[B]: "L376" connector (View: [a])	A2: Driver air bag (inflator) module deployment signal ground circuit	3. SDM
[C]: "G343" connector (View: [a])	A3: Driver air bag (inflator) module deployment signal output circuit	4. Shorting bar
[D]: "G347" connector (View: [a])	A4: Driver air bag (inflator) module deployment signal ground circuit	5. Floor harness
[E]: "S121" connector (View: [a])	1. Driver air bag (inflator) module	6. Instrument panel harness

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**Driver air bag (inflator) module check** 1) Check that ignition is "OFF". 2) Disconnect "G347" connector. 3) Connect "BASE OF COLUMN" harness (1) of special tools (A) and (B) to "G347" connector. **Special tool** **(A): 09932M75011** **(B): 09932M78340**  IDL70A820026-06 4) Set ignition "ON". 5) Check DTC. ☞(Page 8B-8) *Is DTC B1060-1A detected?*	Go to Step 3.	Go to Step 5.

Step	Action	Yes	No
3	**Driver air bag (inflator) module circuit check** 1) Set ignition “OFF”. 2) Disconnect “L04” connector. 3) Release shorting bar in SDM connector inserting release tool (B). 4) Check the following point. • Resistance between “L04-19” and “L04-20” terminals: infinity **Special tool** **(A): 09932M76010** **(B): 09932M75100**  IDL70A820027-01 *Is check result OK?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Go to Step 4.
4	**Instrument panel harness circuit check** 1) Disconnect “L376” connector. 2) Check the following point. • Resistance of “G343-3” and “G343-4” terminals: infinity  IDL70A820028-02 *Is check result OK?*	Replace floor harness.	Replace instrument panel harness.
5	**Contact coil circuit check** 1) Check contact coil circuit. ☞(Page 8B-40) *Is contact coil circuit good?*	Replace driver air bag (inflator) module. ☞(Page 8B-48)	Replace contact coil assembly. ☞(Page 6B-3)

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance” (Page 8B-8), if any DTC is detected.**
- **Repeat “Air Bag Diagnostic System Check” (Page 8B-7) to check that the trouble has been solved.**

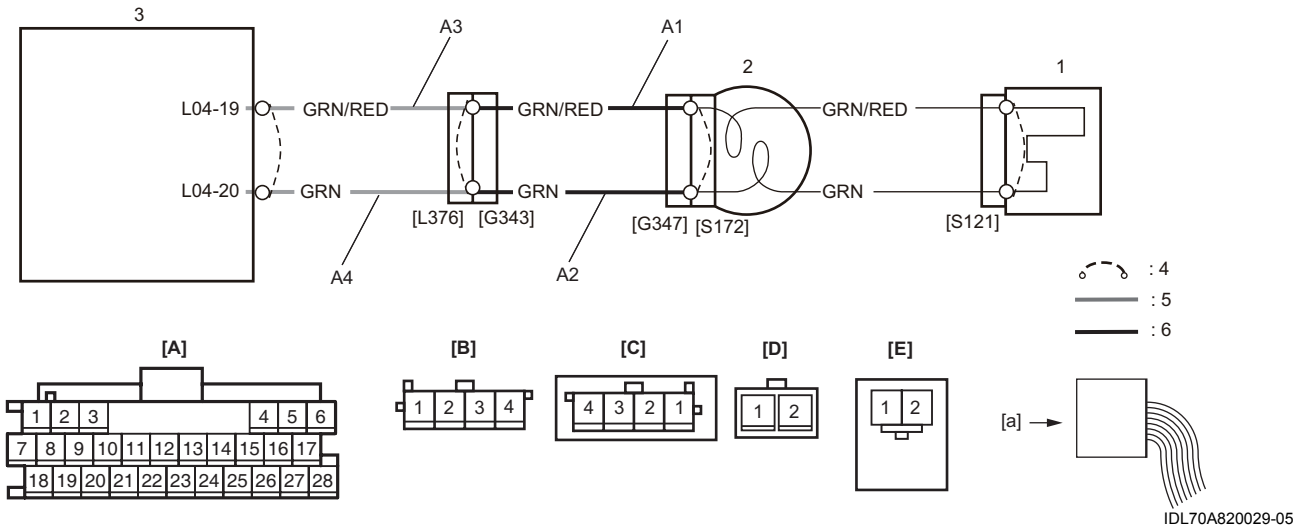
DTC B1060-1B

AENDL70A8204019

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1060-1B: Driver Air Bag (1st Stage) Circuit High Resistance Driver air bag (inflator) module circuit resistance is more than specified range.	• Driver air bag (inflator) module circuit • Contact coil assembly • Driver air bag (inflator) module • SDM

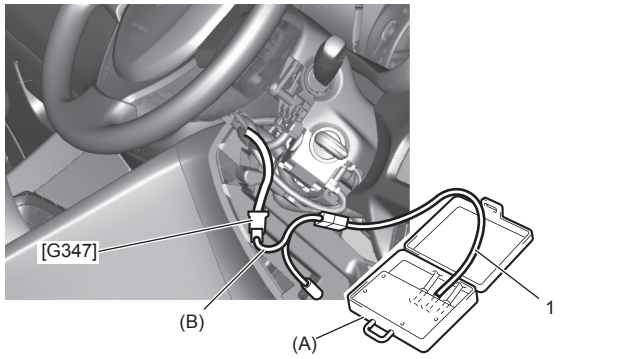
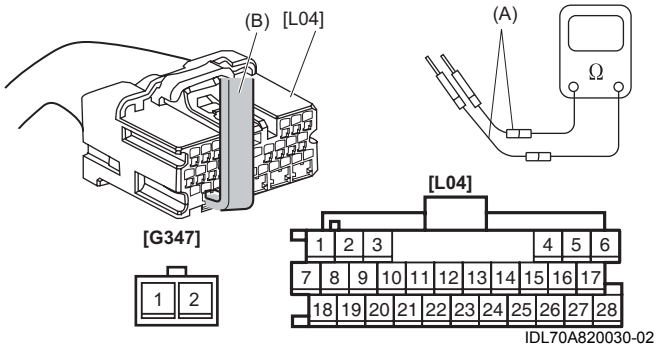
Circuit Diagram

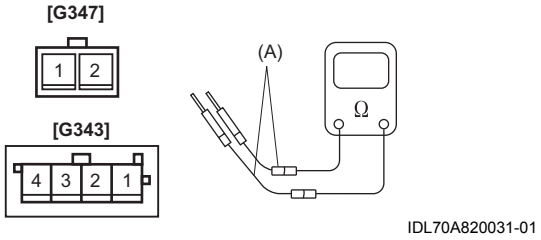


[A]: "L04" connector (View: [a])	A1: Driver air bag (inflator) module deployment signal output circuit	2. Contact coil assembly
[B]: "L376" connector (View: [a])	A2: Driver air bag (inflator) module deployment signal ground circuit	3. SDM
[C]: "G343" connector (View: [a])	A3: Driver air bag (inflator) module deployment signal output circuit	4. Shorting bar
[D]: "G347" connector (View: [a])	A4: Driver air bag (inflator) module deployment signal ground circuit	5. Floor harness
[E]: "S121" connector (View: [a])	1. Driver air bag (inflator) module	6. Instrument panel harness

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).

Step	Action	Yes	No
2	**Drive air bag (inflator) module check** 1) Check that ignition is “OFF”. 2) Check for proper connection to “G347” connector. 3) Disconnect “G347” connector. 4) Connect “BASE OF COLUMN” harness (1) of special tool (A) and (B) to “G347” connector. **Special tool** **(A): 09932M75011** **(B): 09932M78340**  IDL70A820026-06 5) Set ignition “ON”. 6) Check DTC. ☞(Page 8B-8) *Is DTC B1060-1B detected?*	Go to Step 3.	Go to Step 5.
3	**Driver air bag (inflator) module circuit check** 1) Set ignition “OFF”. 2) Check for proper connection to “L04” connector. 3) Disconnect “L04” connector. 4) Release shorting bar in SDM connector inserting release tool (B). 5) Check the following points. • Resistance between “L04-19” and “G347-2” terminals: 1 Ω or less • Resistance between “L04-20” and “G347-1” terminals: 1 Ω or less **Special tool** **(A): 09932M76010** **(B): 09932M75100**  IDL70A820030-02 *Is check result OK?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Go to Step 4.

Step	Action	Yes	No
4	**Instrument panel harness circuit check** 1) Check for proper connection to “L376” connector. 2) Disconnect “L376” connector. 3) Check the following point. • Resistance of “A1” and “A2” circuits: 1 Ω or less  IDL70A820031-01 *Is check result OK?*	Replace floor harness.	Replace instrument panel harness.
5	**Contact coil circuit check** 1) Check contact coil circuit. ☞(Page 8B-40) *Is contact coil circuit in good condition?*	Replace driver air bag (inflator) module. ☞(Page 8B-48)	Replace contact coil assembly. ☞(Page 6B-3)

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance” (Page 8B-8), if any DTC is detected.**
- **Repeat “Air Bag Diagnostic System Check” (Page 8B-7) to check that the trouble has been solved.**

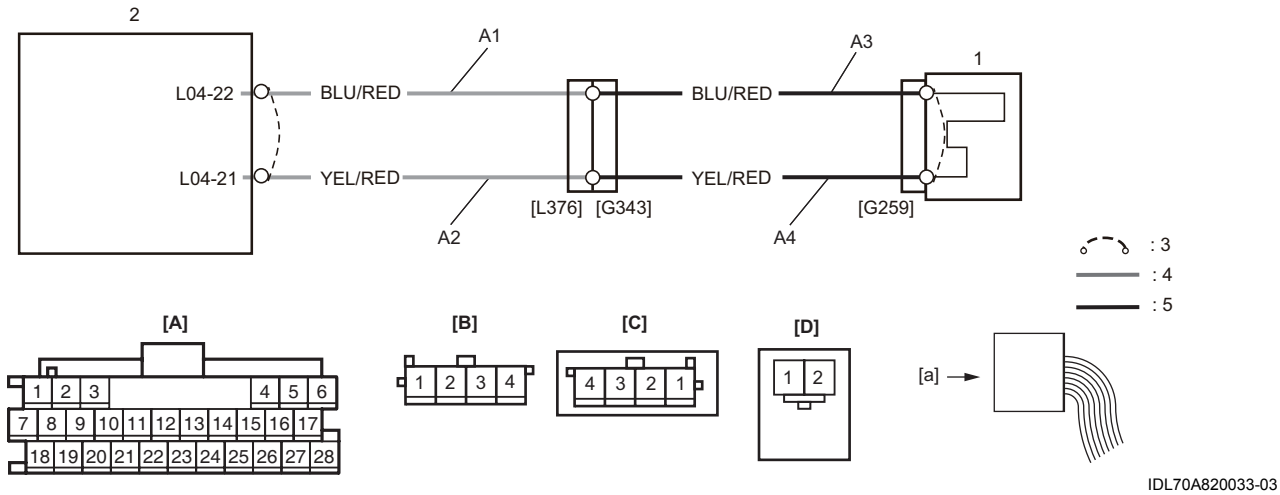
DTC B1062-1A

AENDL70A8204024

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1062-1A: Passenger Air Bag (1st Stage) Circuit Low Resistance Passenger air bag circuit resistance is less than specified range.	• Passenger air bag (inflator) module circuit • Passenger air bag (inflator) module • SDM

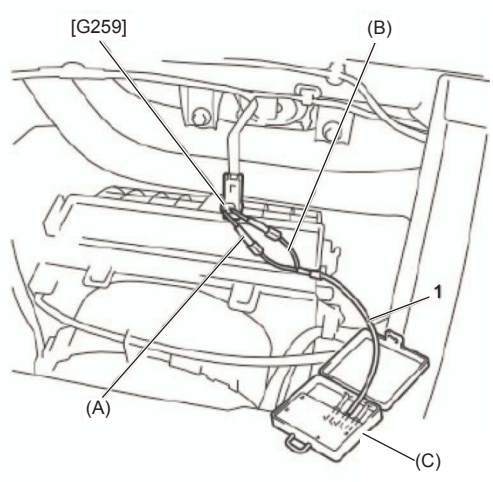
Circuit Diagram

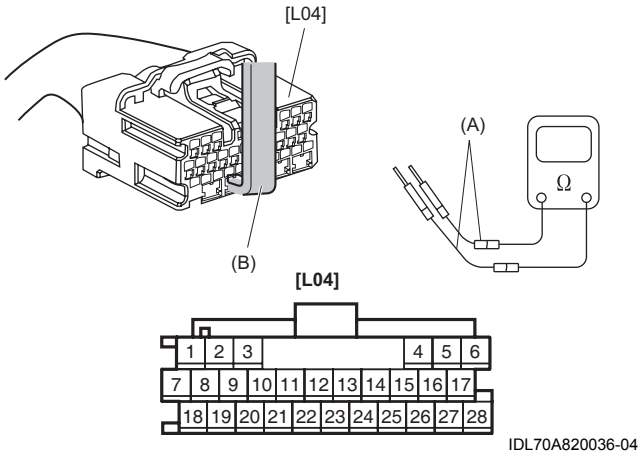
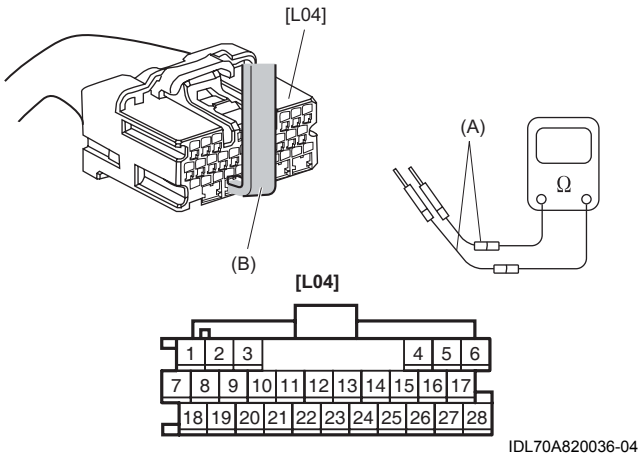


IDL70A820033-03

[A]: "L04" connector (View: [a])	A2: Driver air bag (inflator) module deployment signal ground circuit	3. Shorting bar
[B]: "L376" connector (View: [a])	A3: Driver air bag (inflator) module deployment signal output circuit	4. Floor harness
[C]: "G343" connector (View: [a])	A4: Driver air bag (inflator) module deployment signal ground circuit	5. Instrument panel harness
[D]: "G259" connector (View: [a])	1. Passenger air bag (inflator) module	
A1: Driver air bag (inflator) module deployment signal output circuit	2. SDM	

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**Passenger air bag (inflator) module check** 1) Check that ignition is "OFF". 2) Disconnect "G259" connector. 3) Connect "STEERING WHEEL" harness (1) of special tool (C) to special tools (A) and (B). 4) Connect special tools (A) and (B) to "G259" connector. **Special tool** **(A): 09932M76010** **(B): 09932M78310** **(C): 09932M75011**  IDL70A820035-05 5) Set ignition "ON". 6) Check DTC. ☞(Page 8B-8) *Is DTC B1062-1A detected?*	Go to Step 3.	Replace passenger air bag (inflator) module. ☞(Page 8B-50)

Step	Action	Yes	No
3	**Passenger air bag (inflator) module circuit check** 1) Set ignition “OFF”. 2) Disconnect “L04” connector. 3) Release shorting bar in SDM connector inserting release tool (B). 4) Check the following point. • Resistance between “L04-21” and “L04-22” terminals: infinity **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Go to Step 4.
4	**Floor harness check** 1) Disconnect “L376” connector. 2) Release shorting bar in SDM connector inserting release tool (B). 3) Check the following point. • Resistance between “L04-21” and “L04-22” terminal: infinity **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Replace instrument panel harness.	Replace floor harness.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

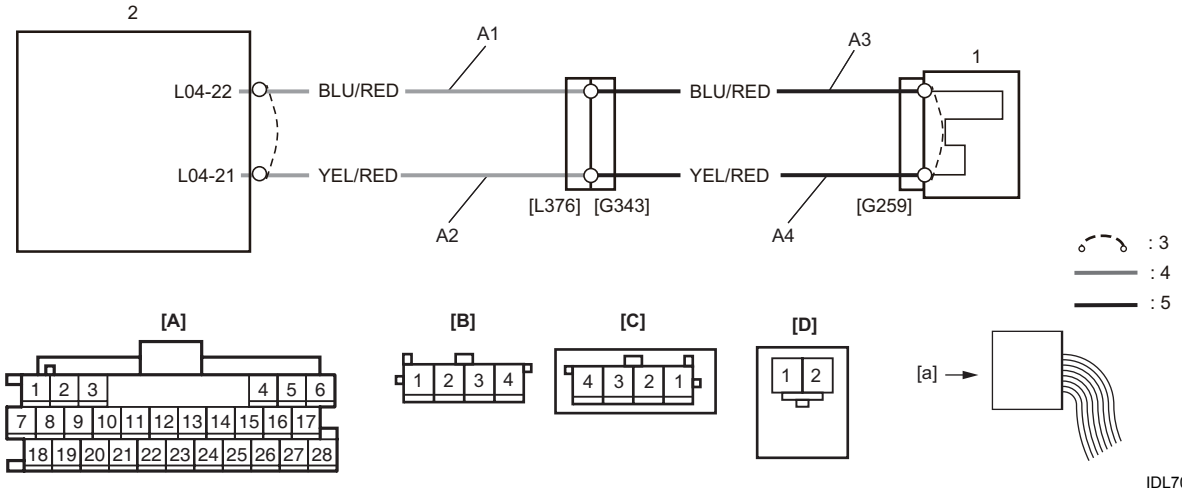
DTC B1062-1B

AENDL70A8204023

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1062-1B: Passenger Air Bag (1st Stage) Circuit High Resistance Passenger air bag (inflator) module circuit resistance is more than specified range.	• Passenger air bag (inflator) module circuit • Passenger air bag (inflator) module • SDM

Circuit Diagram

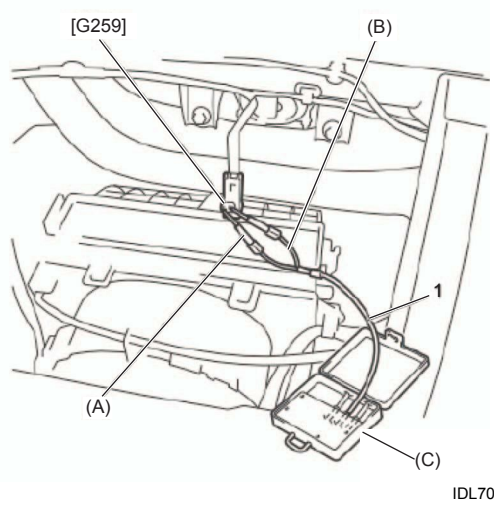


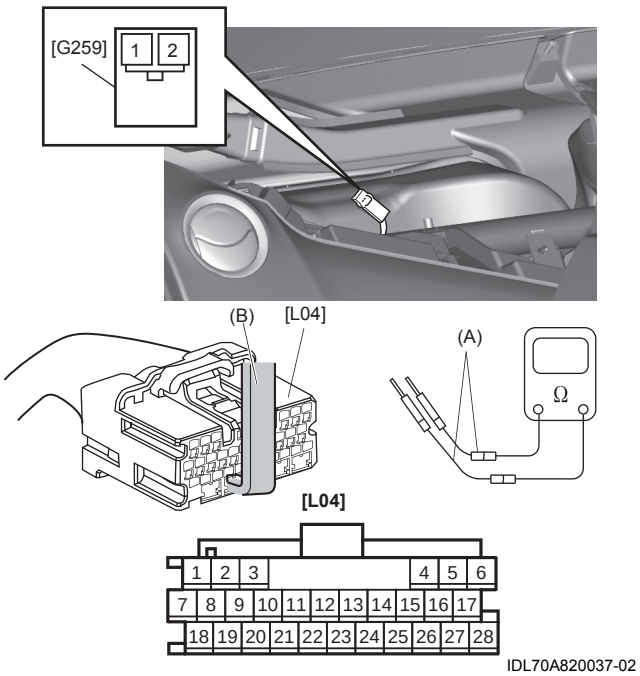
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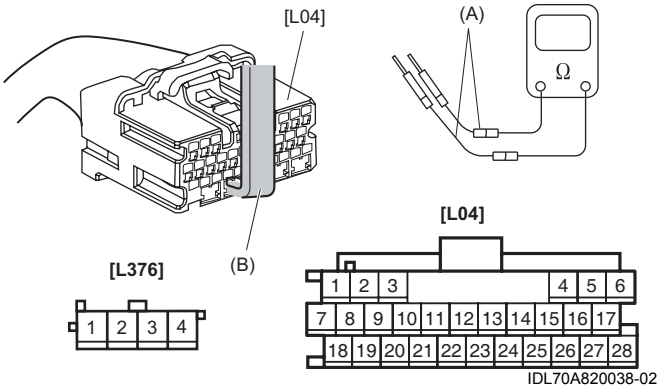
[A]: "L04" connector (View: [a])	A2: Driver air bag (inflator) module deployment signal ground circuit	3. Shorting bar
[B]: "L376" connector (View: [a])	A3: Driver air bag (inflator) module deployment signal output circuit	4. Floor harness
[C]: "G343" connector (View: [a])	A4: Driver air bag (inflator) module deployment signal ground circuit	5. Instrument panel harness
[D]: "G259" connector (View: [a])	1. Passenger air bag (inflator) module	
A1: Driver air bag (inflator) module deployment signal output circuit	2. SDM	

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).

Step	Action	Yes	No
2	**Passenger air bag (inflator) module check** 1) Check that ignition is “OFF”. 2) Check for proper connection “G259” connector. 3) Disconnect “G259” connector. 4) Connect “STEERING WHEEL” harness (1) of special tool (C) to special tools (A) and (B). 5) Connect special tool (A) and (B) to “G259” connector. **Special tool** **(A): 09932M76010** **(B): 09932M78310** **(C): 09932M75011**  IDL70A820035-05 6) Set ignition “ON”. 7) Check DTC. ☞(Page 8B-8) *Is DTC B1062-1B detected?*	Go to Step 3.	Replace passenger air bag (inflator) module. ☞(Page 8B-50)

Step	Action	Yes	No
3	**Passenger air bag (inflator) module circuit check** 1) Set ignition “OFF”. 2) Check for proper connection to “L04” connector. 3) Disconnect “L04” connector. 4) Release shorting bar in SDM connector inserting release tool (B). 5) Check following points. • Resistance between “L04-21” and “G259-2” terminals: 1 Ω or less • Resistance between “L04-22” and “G259-1” terminals: 1 Ω or less **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Go to Step 4.

Step	Action	Yes	No
4	**Floor harness circuit check** 1) Check for proper connection to “L376” connector. 2) Disconnect “L376” connector. 3) Release shorting bar in SDM connector inserting release tool (B). 4) Check the following point. • Resistance of “A1” and “A2” circuits: 1 Ω or less **Special tool** **(A): 09932M76010** **(B): 09932M75100**  *Is check result OK?*	Replace instrument panel harness.	Replace floor harness.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance” (Page 8B-8), if any DTC is detected.**
- **Repeat “Air Bag Diagnostic System Check” (Page 8B-7) to check that the trouble has been solved.**

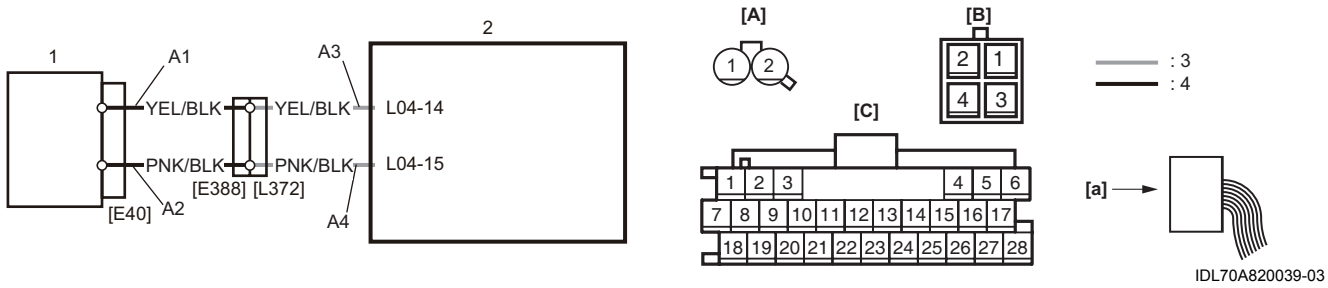
DTC B1090-01 / B1090-87 / B1090-95

AENDL70A8204054

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1090-01: Driver Forward Impact Sensor No Response Forward impact sensor has communicated with no response or inconsistent ID code.	• Forward impact sensor • Forward impact sensor circuit • SDM
B1090-87: Driver Forward Impact Sensor Communication Data Invalid Forward impact sensor has communicated with invalid data.	
B1090-95: Driver Forward Impact Sensor Communication Data Inconsistent Forward impact sensor has communicated with inconsistent data.	

Circuit Diagram



[A]: "E40" connector (View: [a])	A2: Forward impact sensor signal ground circuit	2. SDM
[B]: "L372" connector (View: [a])	A3: Forward impact sensor signal output circuit	3. Floor harness
[C]: "L04" connector (View: [a])	A4: Forward impact sensor signal ground circuit	4. Instrument panel harness
A1: Forward impact sensor signal output circuit	1. Forward impact sensor	

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Air Bag Diagnostic System Check" performed?*	Go to Step 2.	Go to "Air Bag Diagnostic System Check" (Page 8B-7).
2	**Forward impact sensor check** 1) Check that ignition is "OFF". 2) Replace forward impact sensor. ☞(Page 8B-52) 3) Set ignition "ON". 4) Check DTC. ☞(Page 8B-8) *Is DTC detected?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	End.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and check that all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance" (Page 8B-8), if any DTC is detected.**
- **Repeat "Air Bag Diagnostic System Check" (Page 8B-7) to check that the trouble has been solved.**

DTC U0073-88

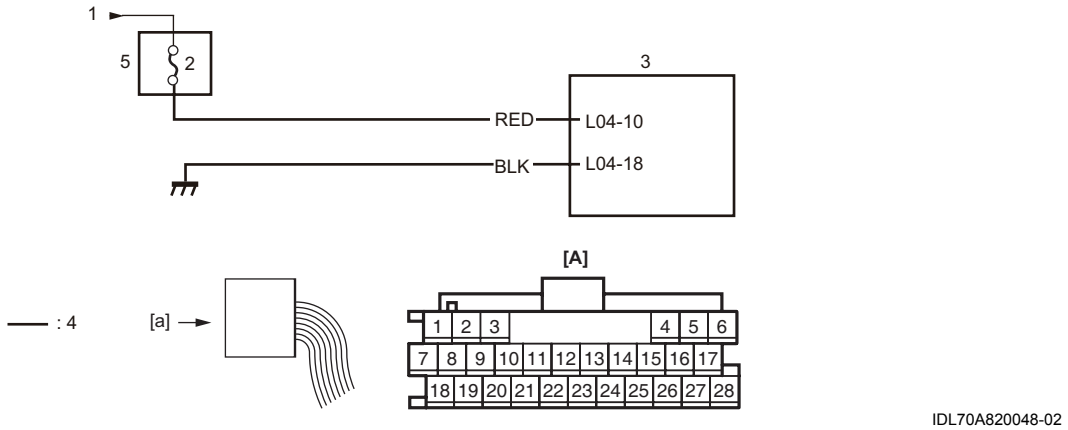
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Refer to "Troubleshooting for Communication Bus Off" in Section 10H (Page 10H-16).

SDM Power Supply and Ground Circuit Check

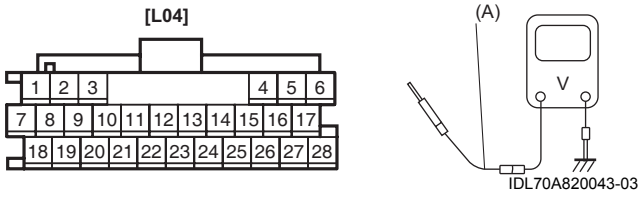
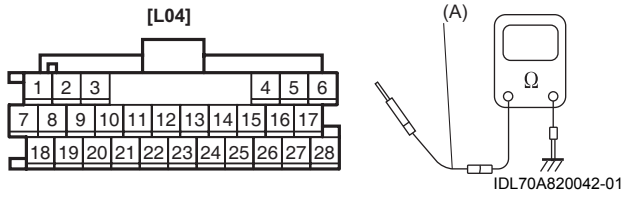
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Circuit Diagram



[A]: "L04" connector (View: [a])	2. "A/B" fuse	4. Floor harness
1. From ignition switch	3. SDM	5. J/B

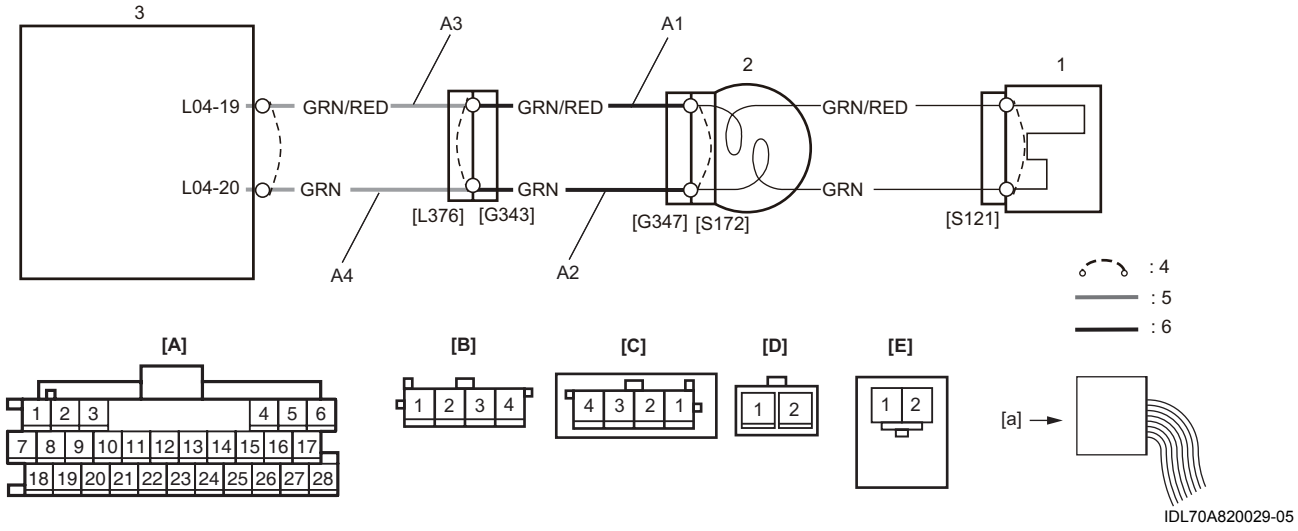
Troubleshooting

Step	Action	Yes	No
1	**Battery voltage check** 1) Check battery voltage. *Is voltage 10 - 14 V?*	Go to Step 2.	Check charging system and repair it. ☞(Page 1J-4)
2	**SDM connection check** 1) Check for proper connection to SDM connector. *Is it connected securely?*	Go to Step 3.	Check for intermittent trouble. ☞(Page 00-11)
3	**Fuse check** 1) Check that ignition is "OFF". 2) Check "A/B" fuse. *Is "A/B" fuse in good condition?*	Go to Step 4.	Replace floor harness and then replace "A/B" fuse.
4	**SDM power supply circuit check** 1) Check that ignition is "OFF". 2) Disconnect "L04" connector. 3) Set ignition "ON". 4) Measure voltage between "L04-10" terminal and ground. **Special tool** **(A): 09932M76010**  *Is voltage 10 – 14 V?*	Go to Step 5.	Replace floor harness.
5	**Ground circuit check** 1) Set ignition "OFF". 2) Measure resistance between "L04-18" terminal and ground. **Special tool** **(A): 09932M76010**  *Is resistance 1 Ω or less?*	SDM power supply circuit and ground circuit are in good condition.	Replace floor harness.

Contact Coil and Its Circuit Check

AENDL70A8204049

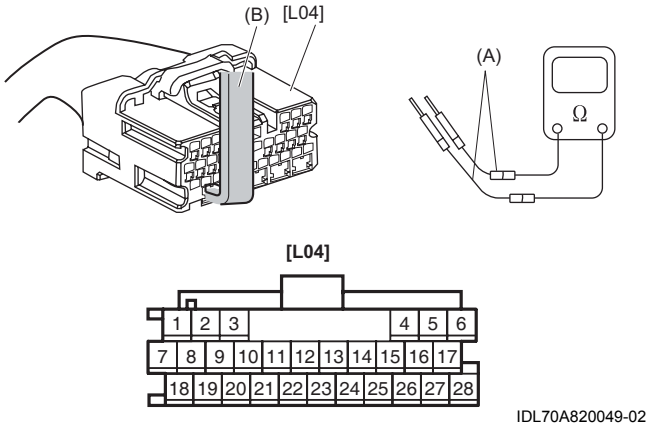
Circuit Diagram

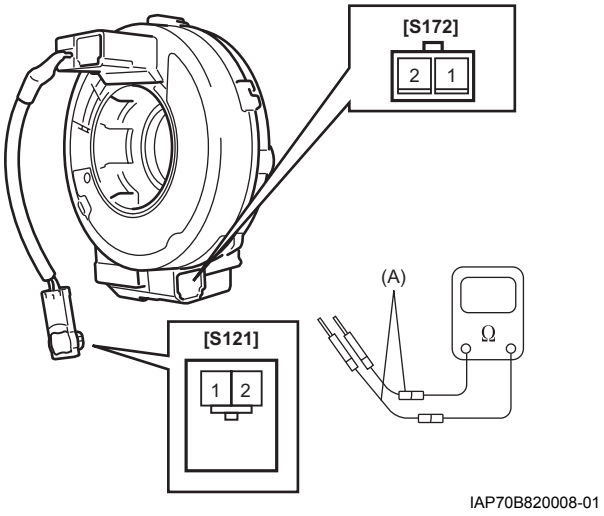


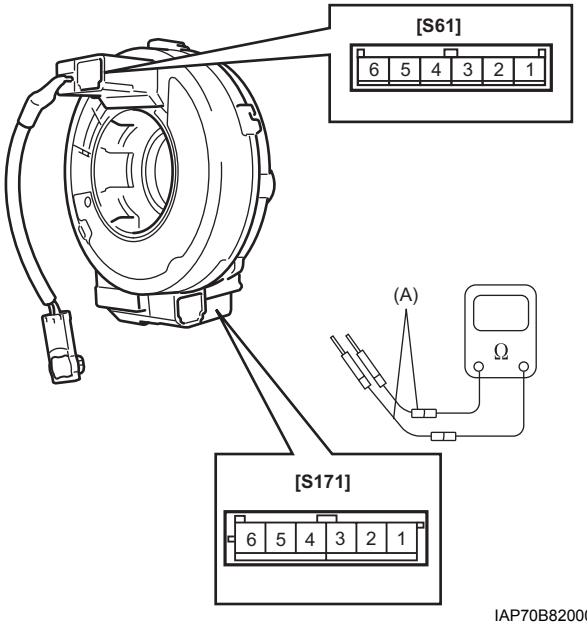
IDL70A820029-05

[A]: "L04" connector (View: [a])	A1: Driver air bag (inflator) module deployment signal output circuit	2. Contact coil assembly
[B]: "L376" connector (View: [a])	A2: Driver air bag (inflator) module deployment signal ground circuit	3. SDM
[C]: "G343" connector (View: [a])	A3: Driver air bag (inflator) module deployment signal output circuit	4. Shorting bar
[D]: "G347" connector (View: [a])	A4: Driver air bag (inflator) module deployment signal ground circuit	5. Floor harness
[E]: "S121" connector (View: [a])	1. Driver air bag (inflator) module	6. Instrument panel harness

Troubleshooting

Step	Action	Yes	No
1	**Driver air bag circuit check** 1) Remove driver air bag (inflator) module from steering wheel. ☞(Page 8B-48) 2) Disconnect “L04” connector. 3) Release shorting bar in SDM connector inserting release tool (B). 4) Check the following point. • Resistance between “L04-19” and “L04-20” terminals: infinity. **Special tool** **(A): 09932M76010** **(B): 09932M75100**  IDL70A820049-02 *Is check result OK?*	Go to Step 2.	Check for defective wire harness. If check result is OK, replace contact coil assembly. ☞(Page 6B-3)

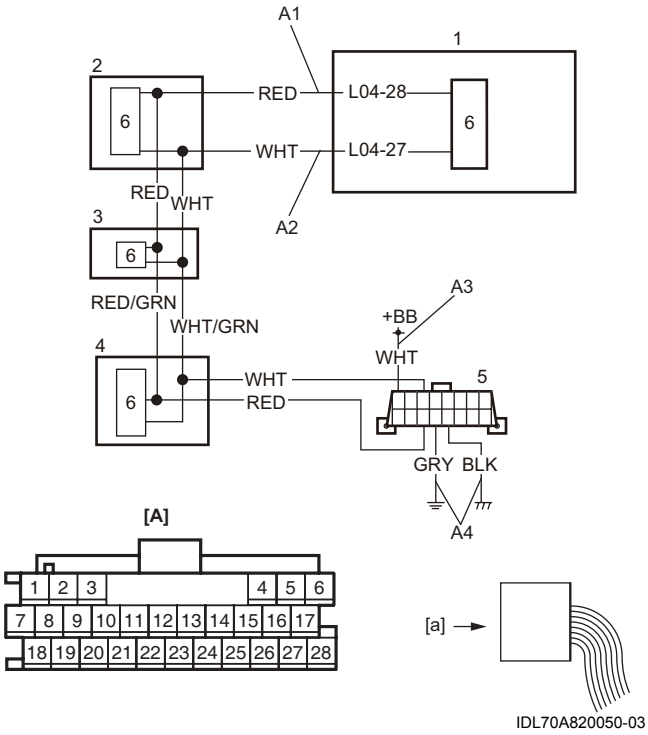
Step	Action	Yes	No
2	**Contact coil circuit (driver air bag (inflator) module circuit) check** 1) Remove contact coil assembly. ☞(Page 6B-3) 2) Check the following points. • Resistance between “S121-1” and “S172-1” terminals: 1 Ω or less • Resistance between “S121-2” and “S172-2” terminals: 1 Ω or less **Special tool** **(A): 09932M76010**  IAP70B820008-01 *Is check result OK?*	Go to Step 3.	Replace contact coil assembly. ☞(Page 6B-3)

Step	Action	Yes	No
3	**Contact coil circuit (horn circuit) check** 1) Check the following point. • Resistance between “S61-1” and “S171-1” terminals: 1Ω or less **Special tool** **(A): 09932M76010**  *Is check result OK?*	Go to Step 4.	Replace contact coil assembly. ☞(Page 6B-3)
4	**Contact coil circuit check** 1) Measure resistance between each terminal of contact coil and other terminals. *Is each measured resistance infinite?*	Contact coil and its circuit are in good condition.	Replace contact coil assembly. ☞(Page 6B-3)

DLC and Its Circuit Check (No Communication with SDM)

AENDL70A8204050

Circuit Diagram



[A]: SDM connector "L04" (view: [a])	A4: DLC ground circuit	4. Combination meter
A1: CAN communication (high) signal circuit	1. SDM	5. DLC
A2: CAN communication (low) signal circuit	2. BCM	6. CAN driver
A3: DLC power supply circuit	3. P/S control module	

Troubleshooting

Step	Action	Yes	No
1	**"AIR BAG" warning light check (SDM power supply simple check)** 1) Set ignition "ON". *Does "AIR BAG" warning light come ON for 6 seconds and then turn OFF?*	Go to Step 2.	Go to ""AIR BAG" Warning Light Comes ON Steady" (Page 8B-11) or ""AIR BAG" Warning Light Does Not Come ON" (Page 8B-12).
2	**Scan tool check** 1) Check the following points. • SDT software: updated software • DLC Cables: terminals and connection are in good condition. • PC and VCI: OK *Is check result OK?*	Go to Step 3.	Replace defective item and/or update software.
3	**DLC check** 1) Check that terminals of DLC are in good condition. *Is check result OK?*	Go to Step 4.	Replace DLC.
4	**DLC power supply circuit check** 1) Set ignition "ON". 2) Check the following point. • Voltage between A3 circuit and ground: 10 – 14 V *Is check result OK?*	Go to Step 5.	Repair or replace defective circuit.

Step	Action	Yes	No
5	**DLC ground circuit check** 1) Set ignition “OFF”. 2) Check the following point. • Resistance between A4 circuit and ground: 1 Ω or less *Is check result OK?*	Go to Step 6.	Repair or replace defective circuit.
6	**CAN communication circuit check** 1) Connect SUZUKI scan tool to DLC. 2) Check that SUZUKI scan tool can communicate with other control modules. ☞(Page 8B-44) *Is check result OK?*	Go to Step 7.	Refer to “Troubleshooting for Communication Bus Off” in Section 10H (Page 10H-16).
7	*Can SUZUKI scan tool communicate with SDM?*	END.	Refer to “Troubleshooting for Lost Communication” in Section 10H (Page 10H-10).

Repair and Inspection Required after Accident

AENDL70A8204052

⚠ WARNING

Failure to properly check and repair a vehicle that has been involved in an accident can result in unsafe operating conditions.

- **For any vehicle that was involved in an accident, check all air bag system components including the electrical harness and the areas where they are mounted, even if the air bag system was not activated. Any components deformed or otherwise damaged must be replaced.**
- **Never use air bag system parts from another vehicle.**
- **Do not repair the following parts. Replace any of them that are found faulty.**
  - **– Driver / Passenger air bag (inflator) modules**
  - **– Forward impact sensor**
  - **– SDM**
  - **– Contact coil**
  - **– Air bag wire harnesses (in main harness, instrument panel harness and floor harness)**
- **Perform all repair in a manner which assures that the vehicle’s original configuration is restored.**
- **The SDM that has been involved in an accident severe enough to cause deployment of air bags is not guaranteed to provide its original performance. Never use an SDM that has ben involved in an air bag deployment accident.**

Accident with Deployment / Activation – Component Replacement

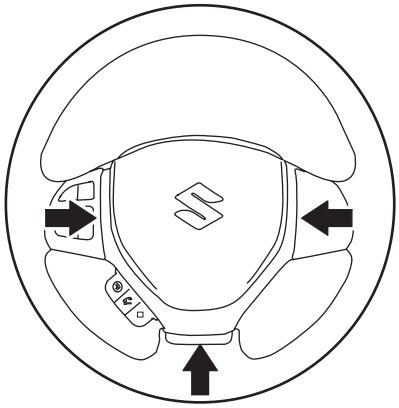
Replace the following components when driver and passenger air bags are deployed.

- Driver and passenger air bag (inflator) modules
- SDM
- Forward impact sensor

Accident with or without Deployment / Activation – Component Inspections

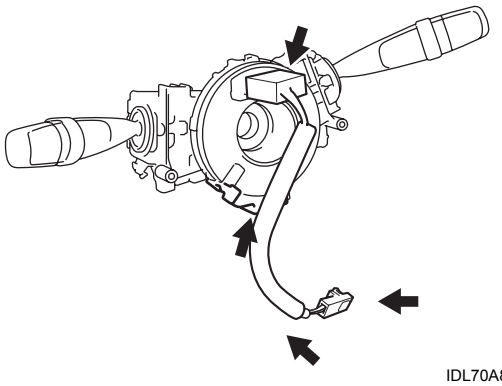
Check the following air bag components after any crash, whether the air bag system was activated or not. If any faulty condition is found in the following checks, replace the faulty component.

- Steering column and steering lower shaft
  - – Check for length, damage and bend according to “Checking Steering Column for Accident Damage” in Section 6B (Page 6B-1)
- Steering column bracket
  - – Check for damage and bend according to “Checking Steering Column for Accident Damage” in Section 6B (Page 6B-1).
- Steering wheel and driver air bag (inflator) module
  - – Check air bag (inflator) module for damage and installation condition.
  - – Check trim cover (pad surface) for crack.
  - – Check wire harness and connector for damage or tightness.



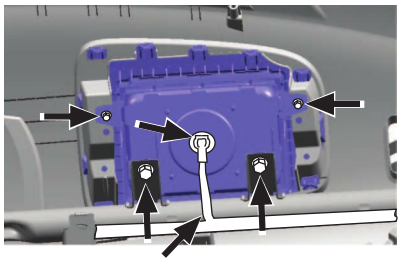
IDL70A820056-02

- Contact coil assembly
  - Check wire harness and connectors for damage or tightness.
  - Check contact coil case for damage.
  - Check contact coil circuit. ☞(Page 8B-40)



IDL70A820057-01

- Instrument panel member and reinforcement
  - Check for distortion, bend, crack or other damage.
  - Check instrument panel for cracks or deformation.
- Passenger air bag (inflator) module
  - Check for dents, crack, damage or installation condition.
  - Check harness and connector for damage or tightness.



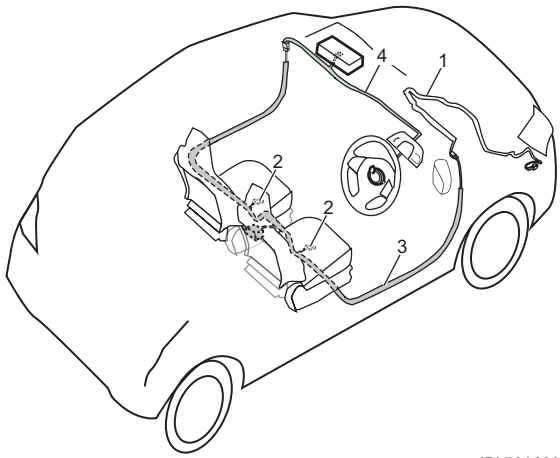
IDL70A820058-03

- SDM
  - Check for external damage such as deformation, scratch, crack, peeled paint.
  - Check SDM for deformation which prevents its proper installation (gap between SDM and SDM plate, etc.)
  - Check connector or lead wire of SDM for scorch, melt or damage.
  - Check SDM connector and terminals for tightness.
  - Check DTC and refer to corresponding diagnostic flow if any DTC is found.



IDL70A820061-01

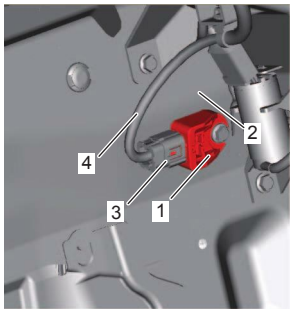
- Air bag wire harness and connectors
  - Check for damages, deformation or poor connections. ☞(Page 00-11)
  - Check wire harnesses for tightness.



IDL70A820060-02

1. Main harness	3. Floor harness
2. Ground point	4. Instrument panel harness

- Forward impact sensor
  - Check sensor (1) and apron side member (2) for damage, bend or rust.
  - Check connector (3) or lead wire (4) of forward impact sensor for scorch, melt or damage.



IDL70A820059-03

- “AIR BAG” warning light

– Perform “Air Bag Diagnostic System Check” (Page 8B-7)after vehicle is completely repaired.

Repair Instructions

Disabling Air Bag System

AENDL70A8206001

When servicing air bag system, related parts and any working around air bag (inflator) module, disable air bag (inflator) modules as follows.

Servicing item	Disabling procedure
• When disconnecting or connecting air bag system connectors. • When removing or installing air bag system components.	Disconnect negative (–) cable at battery. ☞(Page 8B-47)
• When servicing air bag system, related parts or working around air bag (inflator) module with ignition “OFF”.	
• When servicing air bag system, related parts or working around air bag (inflator) module with ignition “ON”.	Remove “A/B” fuse. ☞(Page 8B-47)
• When performing electric welding. • When there is a possibility that air bag system or related parts would be heated up to 93 °C (200 °F) and more by electric welding or paint baking process.	Disconnect negative (–) cable at battery and remove all air bag (inflator) modules. ☞(Page 8B-47)

Disabling Procedure (Disconnecting Negative (–) Battery Cable)

1) Set front wheels in straight ahead position.
2) Set ignition “OFF”.
3) Disconnect negative (–) cable at battery.
4) Wait for at least 90 seconds after performing step 3).

Disabling Procedure (Removing “A/B” Fuse)

NOTE

“AIR BAG” warning light will light if “A/B” fuse is disconnected, but this is normal and DTC for air bag system will not be detected.

1) Set ignition “OFF”.
2) Remove “A/B” fuse from J/B.
3) Wait for at least 90 seconds after performing step 2).
4) Start working and change ignition mode to “ON”.

Disabling Procedure (Disconnecting Negative (–) Battery Cable and Removing All Air Bag (Inflator) Modules)

1) Set front wheels in straight-ahead position.
2) Set ignition “OFF”.
3) Disconnect negative (–) cable at battery.
4) Wait for at least 90 seconds after performing step 3).
5) Remove all air bag (inflator) modules.

Enabling Air Bag System

AENDL70A8206002

1) Check that removed components are installed and/or disconnected connectors are connected properly.
2) Check that ignition is “OFF”.
3) Connect negative (–) cable at battery and/or install “A/B” fuse to J/B. ☞(Page 8B-6)
4) Set ignition “ON”.
5) Check if “AIR BAG” warning light flashes for about 6 seconds and then comes OFF.
6) Perform“Air Bag Diagnostic System Check” (Page 8B-7) if defective.

SDM Removal and Installation

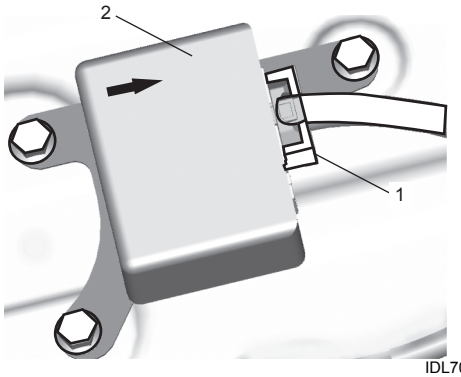
AENDL70A8206003

⚠ WARNING

If the SDM is handled roughly when performing the service operations described below, there is a risk of personal injury due to accidental activation of the air bag system. Read "Precautions for Air Bag System Service" (Page 8B-1) before starting the operations described below and follow all of the instructions provided.

Removal

1) Disable air bag system. ☞(Page 8B-47)
2) Remove console box. ☞(Page 9H-9)
3) Disconnect SDM connector (1).
4) Remove SDM (2) from vehicle.



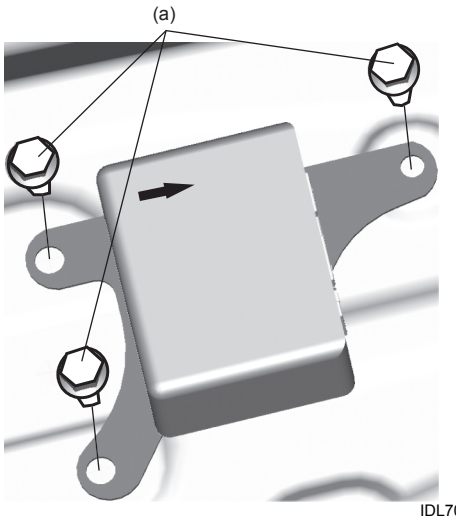
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Installation

Reverse removal procedure noting the following points.

- Check that none of the following faulty conditions exists.
  - Bend, scratch, deformation on mating surface of vehicle body where SDM is mounted.
  - Foreign matter or rust on mating surface of vehicle body where SDM is mounted.
- Check that arrow on the SDM points toward the front of the vehicle.
- Tighten SDM bolts to specified torque.

Tightening torque
SDM bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



IDL70A820051-03

- Enable air bag system. ☞(Page 8B-47)

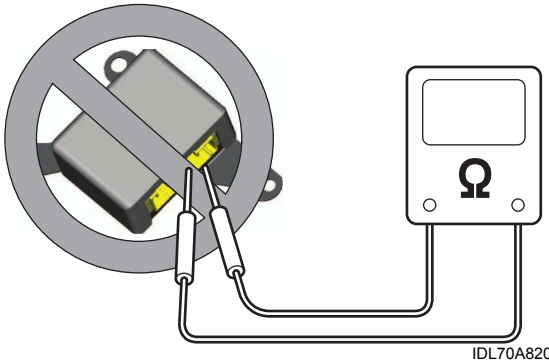
SDM Inspection

AENDL70A8206004

NOTICE

The SDM may not function properly if you do not handle it carefully.

- **Do not connect any type of tester to the SDM.**



IDL70A820054-02

- **Never repair or disassemble SDM.**
- **Replace the SDM if it has been dropped.**

If any faulty condition is found in the following checks, replace the SDM with new one.

- Check if air bag module is deployed.
- Check SDM for dents, crack or deformation.
- Check SDM connector for bend, corrosion or rust.
- Check DTC B1003-04 or B1032-00 is stored in SDM.

Driver Air Bag (Inflator) Module Removal and Installation

AENDL70A8206005

⚠ WARNING

Failure to take proper precautions when performing service on the driver air bag (inflator) module can result in personal injury or non-activation of the air bag in the event of a collision.

- **Never disassemble or repair an air bag (inflator) module. If any abnormal condition is found, replace the module with a new one.**
- **Carefully read "Precautions for Air Bag System Service" (Page 8B-1), "Precautions for Handling and Storage of Air Bag System Components" (Page 8B-1) and "Precautions for Disposal of Air Bag" (Page 8B-2) and follow all of the instructions provided.**

NOTICE

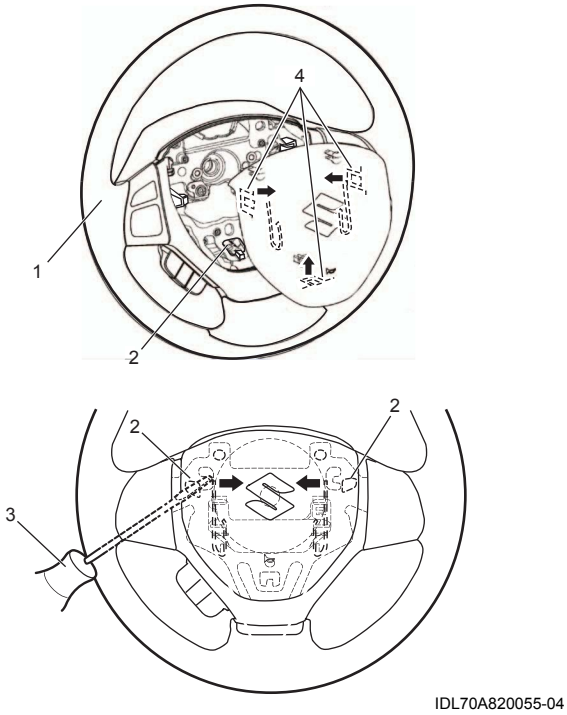
An air bag (inflator) module that has been dropped may not operate correctly.
Never use an air bag (inflator) module that has been dropped. Replace the module with a new one.

NOTE

Refer to "Repair and Inspection Required after Accident" (Page 8B-45) before replacing deployed air bag.

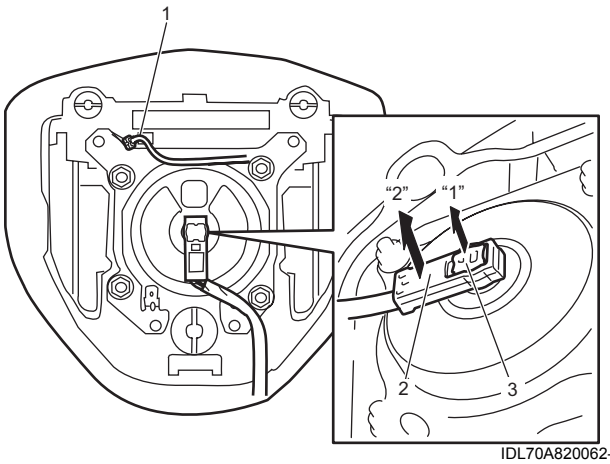
Removal

1) Disable air bag system. ☞(Page 8B-47)
2) Insert a flat bladed screwdriver (3) into service hole (2) of steering wheel (1) and push fitting (4) in arrow direction to release lock.



IDL70A820055-04

3) Remove air bag (inflator) module from steering wheel.
4) Disconnect horn connector (1).
5) Disconnect driver air bag (inflator) module connector (2) as shown in figure.
   a) Release lock (3).
   b) Disconnect connector with lock released.

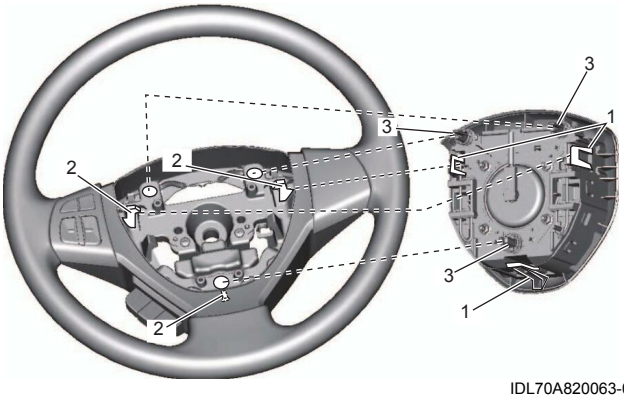


IDL70A820062-02

Installation

Reverse removal procedure noting the following points.

- Lock connector for driver air bag (inflator) module securely.
- Check that the harness does not get caught or protrude.
- Align pin (3).
- Fix fitting (1) of air bag (inflator) module to snap spring (2) securely.



IDL70A820063-02

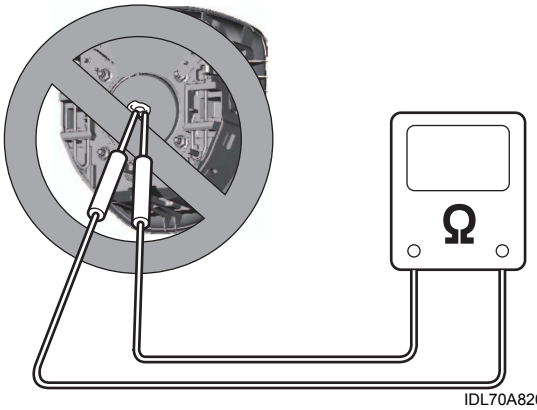
- Enable air bag system. ☞(Page 8B-47)

Driver Air Bag (Inflator) Module Inspection

AENDL70A8206006

⚠ WARNING

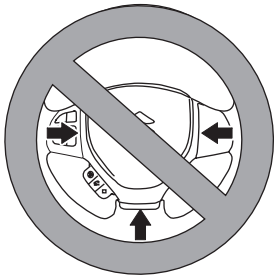
Failure to take proper precautions when checking the driver air bag (inflator) module can result in personal injury due to accidental deployment of the air bag. Never measure the resistance of the air bag (inflator) module.



IDL70A820064-01

Check air bag (inflator) module and if any of the following conditions is found, replace air bag (inflator) module or steering wheel with new one.

- Air bag being deployed.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Connector being damaged.
- Air bag (inflator) module bracket of steering wheel being deformed or damaged
- Unable to install new air bag (inflator) module smoothly (Clearance between steering wheel and air bag (inflator) module is uneven).



IDL70A820053-02

Passenger Air Bag (Inflator) Module Removal and Installation

AENDL70A8206007

⚠ WARNING

Failure to take proper precautions when performing service on the passenger air bag (inflator) module can result in personal injury or non-activation of the air bag in the event of a collision.

- **Never disassemble or repair an air bag (inflator) module. If any abnormal condition is found, replace the module with a new one.**
- **Carefully read "Precautions for Air Bag System Service" (Page 8B-1), "Precautions for Handling and Storage of Air Bag System Components" (Page 8B-1) and "Precautions for Disposal of Air Bag" (Page 8B-2) and follow all of the instructions provided.**

NOTICE

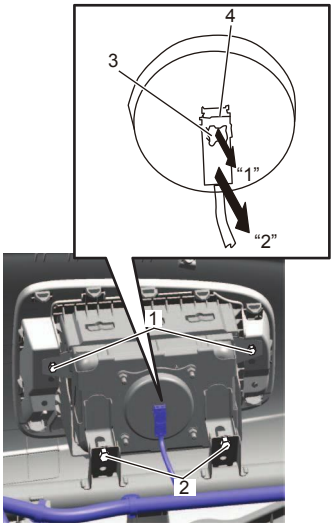
An air bag (inflator) module that has been dropped may not operate correctly. Never use an air bag (inflator) module that has been dropped. Replace the module with a new one.

NOTE

Refer to "Repair and Inspection Required after Accident" (Page 8B-45) before replacing a deployed air bag.

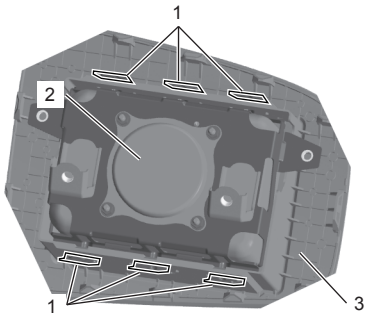
Removal

1) Disable air bag system. ☞(Page 8B-47)
2) Remove glove box. ☞(Page 9C-12)
3) Remove passenger air bag door screws (1).
4) Remove passenger air bag (inflator) module bolts (2).
5) Disconnect passenger air bag (inflator) module connector (4) as shown in figure.
   a) Release lock (3).
   b) Disconnect connector with lock released.



IDL70A820078-06

6) Release tabs (1), and then remove passenger air bag (inflator) module (2) from passenger air bag door (3).

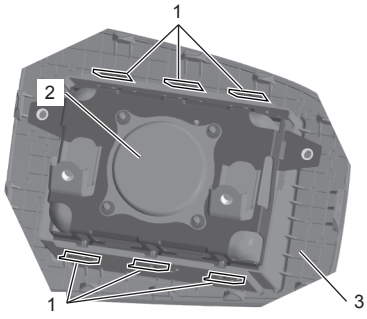


IDL70A820080-03

Installation

Reverse removal procedure noting the following points.

- Fit tabs (1) of passenger air bag (inflator) module (2) to passenger air bag door (3) securely.



IDL70A820080-03

- Lock connector for passenger air bag (inflator) module securely.
- Tighten passenger air bag (inflator) module bolts (1) to specified torque.

Tightening torque
Passenger air bag (inflator) module bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A820082-03

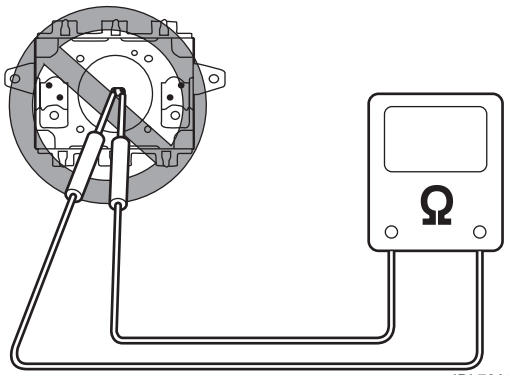
- Enable air bag system. ☞(Page 8B-47)

Passenger Air Bag (Inflator) Module Inspection

AENDL70A8206008

⚠ WARNING

Failure to take proper precautions when checking the passenger air bag (inflator) module can result in personal injury due to accidental deployment of the air bag. Never measure the resistance of air bag (inflator) module.



IDL70A820065-01

Check air bag (inflator) module and if any of the following conditions is found, replace air bag (inflator) module with new one.

- Air bag being deployed.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Connector being damaged.
- Bend or deformation of air bag (inflator) module bracket.

Forward Impact Sensor Removal and Installation

AENDL70A8206018

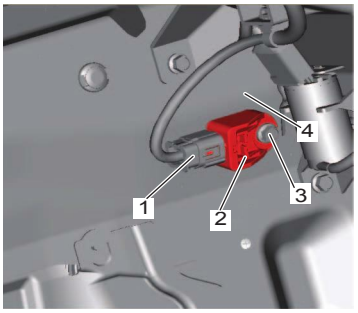
⚠ WARNING

Failure to take proper precautions when handling the air bag system sensors can result in personal injury due to non-deployed air bag system in the event of an accident or accidental air bag deployment.

- **Never impact or shake the sensors. Otherwise, proper operation of the sensors cannot be assured.**
- **Always tighten the mounting bolts to specified torque when installing the sensors. Otherwise, proper operation of the sensors cannot be assured.**

Removal

1) Disable air bag system. ☞(Page 8B-47)
2) Hoist vehicle a little and remove wheel. ☞(Page 2D-3)
3) Remove front fender lining. ☞(Page 9J-3)
4) Disconnect forward impact sensor connector (1).
5) Remove forward impact sensor bolt (3) and remove forward impact sensor (2) from apron side member (4).



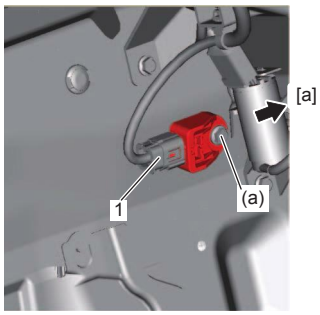
IDL70A820066-03

Installation

1) Check that none of the following faulty conditions exists.
   - Bend, deformation or rust on apron side member.
   - Foreign material on sensor.
2) Tighten forward impact sensor bolt to specified torque.

   Tightening torque
   Forward impact sensor bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)

3) Connect forward impact sensor connector (1) securely.



IDL70A820067-01

[a]: Vehicle forward

4) Install front fender lining. ☞(Page 9J-3)
5) Install wheel. ☞(Page 2D-3)
6) Enable air bag system. ☞(Page 8B-47)

Forward Impact Sensor Inspection

AENDL70A8206019

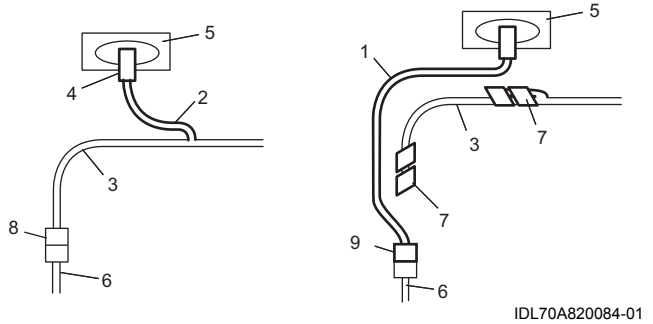
Check forward impact sensor and if any of the following conditions is found, replace it with new one.

- Driver air bag or passenger air bag has deployed.
- Check sensor for dents, crack or deformation.
- Check sensor connector (sensor side and harness side) for damage or crack.
- Check connector terminals for bend, corrosion or rust.

Passenger Air Bag (Inflator) Module Repair Harness Installation

AENDL70A8206022

Replace passenger air bag (inflator) module repair harness (1) according to the following procedure when the harness (2) connected to passenger air bag (inflator) module (5) through passenger air bag (inflator) module connector (4) and included in instrument panel harness (3) is damaged.

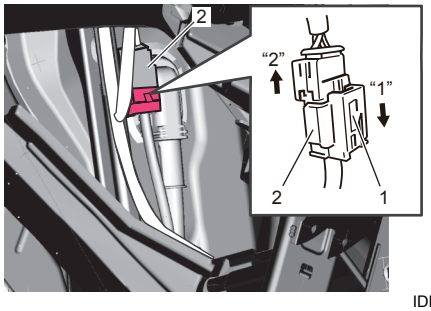


IDL70A820084-01

6.	Floor harness
7.	Insulating tape
8.	Floor harness joint (yellow) connector with passenger air bag (inflator) module harness included in instrument panel harness
9.	Floor harness joint (yellow) connector of passenger air bag (inflator) module repair harness

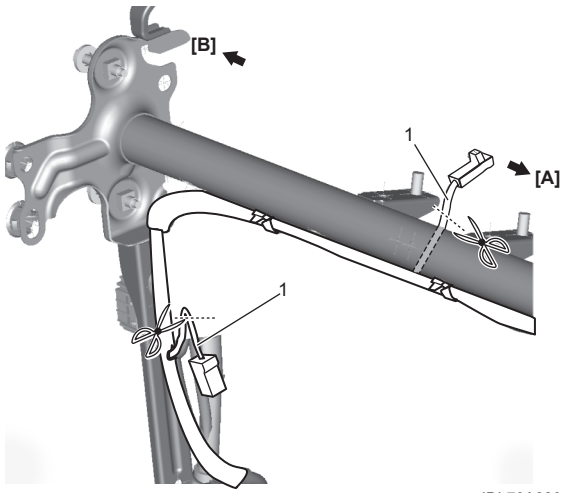
1) Disable air bag system. ☞(Page 8B-47)
2) Remove passenger air bag (inflator) module. ☞(Page 8B-50)

3) Disconnect passenger air bag (inflator) module connector (2) as follows.
   a) Release locking slider (1) by sliding it in arrow direction “1”.
   b) Disconnect passenger air bag (inflator) module connector by pulling it in arrow direction “2”.



IDL70A820081-05

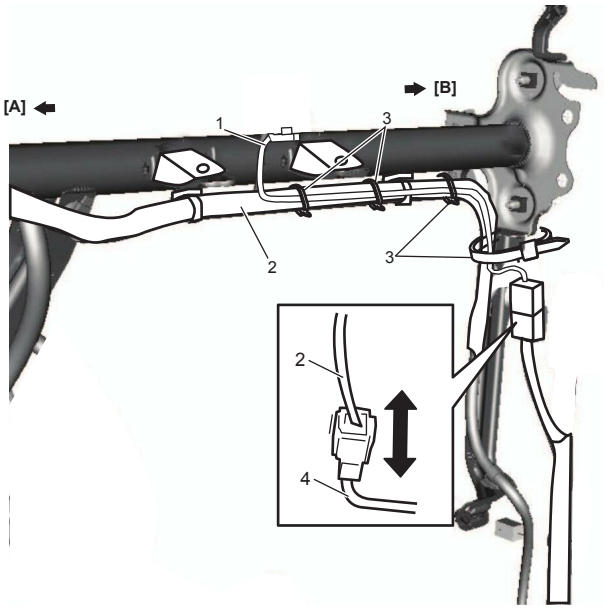
4) Cut off passenger air bag (inflator) module harness (1) included in instrument panel harness as shown, and then wrap the cut ends of the remaining harness with insulating tape to avoid interference with other parts.



IDL70A820085-03

[A]: Driver side	[B]: Passenger side

5) Fix passenger air bag (inflator) module repair harness (1) to instrument panel harness (2) and fasten the harness with clamps (3).
6) Connect passenger air bag (inflator) module repair harness to floor harness (4).



IDL70A820083-03

[A]: Driver side	[B]: Passenger side

7) Install passenger air bag (inflator) module. ☞(Page 8B-50)
8) Enable air bag system. ☞(Page 8B-47)
9) Check that no DTC is detected by SDM with ignition “ON”.

Air Bag (Inflator) Module Disposal

AENDL70A8206023

⚠ WARNING

If live air bag (inflator) modules are disposed of without being deployed beforehand using the proper procedure, there is a risk of personal injury and health problems from contact with the harmful substances that may come out if the deployment container seal is broken.
Before disposing of any live air bag (inflator) modules, deploy them using the specified procedure. Never dispose of any live ones through ordinary refuse dispose channels.

Air bag (inflator) module can be deployed inside or outside the vehicle. Deployment method depends upon final disposition of vehicle. Review the following instructions in order to determine which will work best in a given situation.

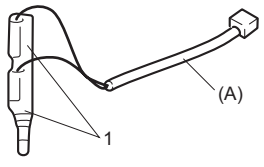
- Deployment Outside the Vehicle:
  When you intend to return the vehicle to service, deploy air bag (inflator) module(s) outside the vehicle.
- Deployment inside the Vehicle:
  When vehicle will be destroyed, or salvaged for component parts, deploy air bag module(s) installed on vehicle.

⚠ WARNING

Failure to take proper precautions when deploying an air bag (inflator) module can result in severe personal injury.
Take all of the following precautions when deploying an air bag (inflator) module:

- **Strictly follow the procedure described in this section.**
- **Read "Precautions for Air Bag System Service" (Page 8B-1) and follow all of the instructions provided.**
- **Only one person should perform this work to avoid accidental deployment.**
- **Perform this work in a well-ventilated area as smoke is produced when air bag (inflator) module is deployed.**
- **Wear safety glasses throughout the disposal procedure from very beginning. The air bag (inflator) module will immediately be activated when a 12-volt battery is connected.**
- **Wear suitable ear protection when deploying air bag (inflator) module. Also, advise persons in nearby area to wear suitable ear protection.**
- **Do not deploy two or more air bag (inflator) modules at the same time.**
- **Never connect the deployment harness to any 12-volt battery before connecting it to the air bag (inflator) module. The deployment harness must remain shorted and not be connected to a 12-volt battery until preparation for activation of the air bag (inflator) module is completed.**
- **Never disconnect banana plug (1) till deployment harness (A) is connected to vehicle battery as static electricity may cause accidental deployment of air bag.**
- **Check that there is no open, short or damage in deployment harness and adapter cable of special tool.**

Special tool
(A): 09932M75031



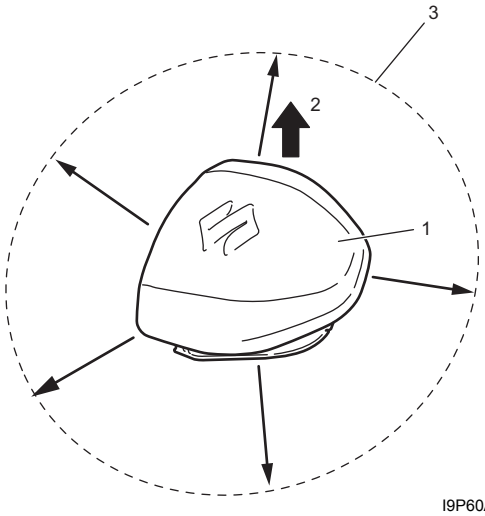
I8G001821052-01

Deployment Outside the Vehicle
Removal
Remove air bag (inflator) module from vehicle.

- Driver air bag (inflator) module: ☞(Page 8B-48)
- Passenger air bag (inflator) module: ☞(Page 8B-50)

Setting
Driver air bag (inflator) module

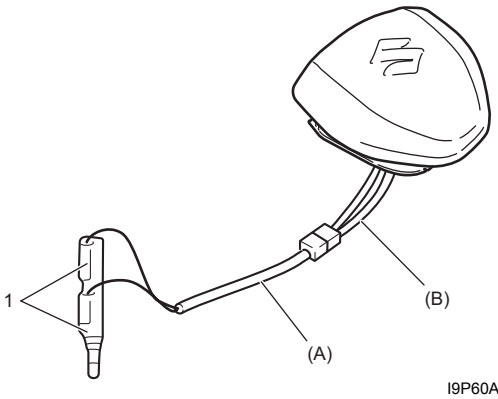
1) Clear space (3) on ground about 185 cm (6.1 ft) in diameter where driver air bag (inflator) module (1) is set for deployment. Paved and outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where there is no activity and sufficient ventilation is provided.
   Check that no loose or flammable object exists within deployment area.
2) Place driver air bag (inflator) module with its vinyl trim cover facing up (2) on ground in Step 1).



I9P60A820083-01

3) Connect deployment harness (A) and adapter cable (B) to driver air bag (inflator) module.

Special tool
(A): 09932M75031
(B): 09932M76510



I9P60A820084-01

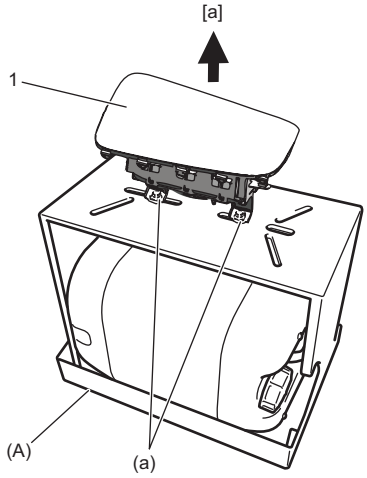
1. Banana plug

Passenger air bag (inflator) module

1) Turn deployment surface upward and tighten to deployment fixture (A) to specified torque using passenger air bag (inflator) module bolt.

Tightening torque
Passenger air bag (inflator) module bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

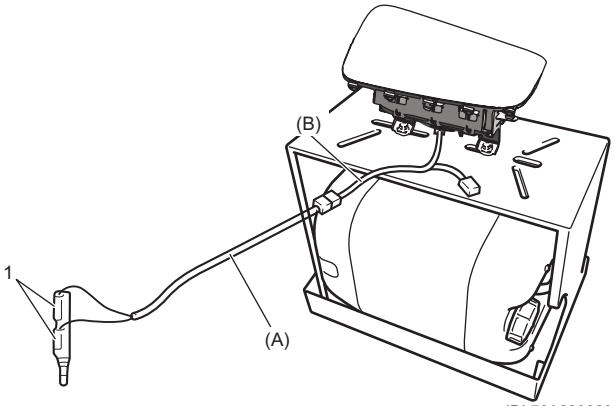
Special tool
(A): 09932M75041



IDL70A820068-01

2) Connect deployment harness (A) and adapter cable (B) to passenger air bag (inflator) module.

Special tool
(A): 09932M75031
(B): 09932M76510



IDL70A820069-01

1. Banana plug

Deployment

1) Clear space (4) on ground about 185 cm (6 ft) in diameter where air bag (inflator) module or is set for deployment. Paved and outdoor location where there is no activity is preferred. If outdoor location is not available, use space on shop floor where is no activity and sufficient ventilation is provided. Check that no loose or flammable object exists within deployment area.
2) Stretch deployment harness (A) from air bag (inflator) module to its full length 10m (33 ft).

Special tool
(A): 09932M75031

3) Place 12 V vehicle battery (1) near the shorted end of deployment harness (A).
4) Check that area around air bag (inflator) module is clear of all people and loose or flammable objects.
5) Separate two banana plugs (2) on deployment harness.
6) Connect deployment harness to 12 V vehicle battery.

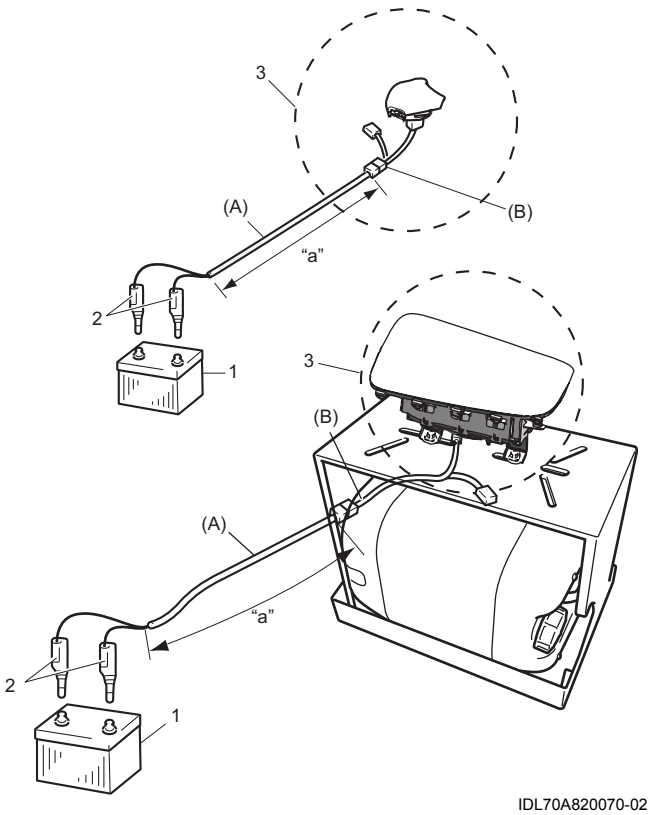
⚠ WARNING

Failure to take proper precautions when handling a deployed air bag may result in a fire, personal injury or health problems.

- **Wait for at least 30 minutes before touching any metal surface of an activated air bag (inflator) module.**
- **Make sure to leave air bag (inflator) module for 30 minutes or more after deployment to prevent accident due to remaining heat. After checking that air bag (inflator) module has become cold, dispose of it.**
- **Do not pour water, oil, etc. over an air bag (inflator) module immediately after this activation.**
- **Follow all of the procedures described in this section.**

NOTE

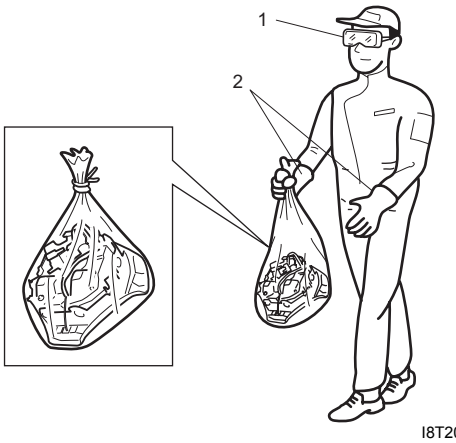
- **When air bag (inflator) module deploys, rapid gas expansion will create substantial report. Wear suitable ear protection. Notify all people in nearby area that you intend to deploy air bag (inflator) module and suitable ear protection should we worn.**
- **When driver air bag (inflator) module deploys, driver air bag (inflator) module may jump about 30 cm (1 ft) vertically. This is normal reaction to force of rapid gas expansion inside of drive air bag (inflator) module.**
- **After air bag (inflator) module has been deployed, surface of air bag (inflator) may contain powdery residue. This powder consists primarily of cornstarch (used to lubricate bag (inflator) as it inflates) and by-products of chemical reaction.**



IDL70A820070-02

3. Clear space 185 cm (6 ft)
"a". 10 m (33 ft)

7) Put on safety glasses (1) and pair of shop gloves (2) to protect your eyes and hands from possible irritation and heat when handling deployed air bag (inflator) module.
8) Dispose of deployed air bag (inflator) module through normal refuse channels after it has cooled for at least 30 minutes and tightly seal air bag (inflator) module in strong vinyl bag.



I8T201821025-01

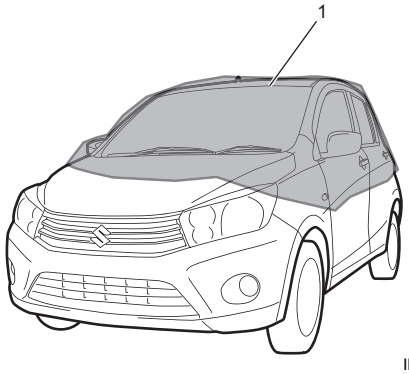
9) Wash your hands with mild soap and water.

Deployment Inside the Vehicle

1) Place vehicle on safe place and fully close all windows.

⚠ CAUTION

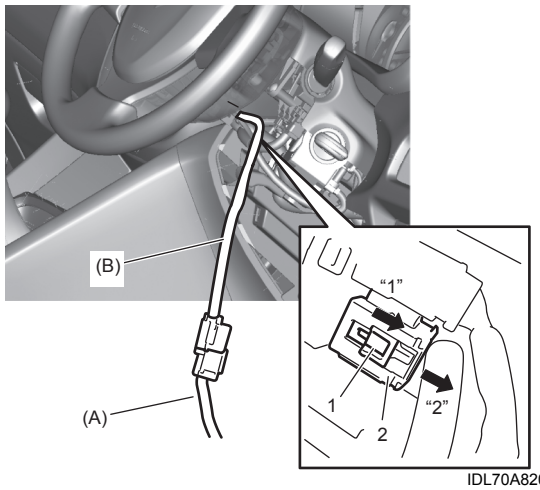
When the air bag (inflator) module is deployed in the vehicle, the window glass may break, scattering the glass and interior pieces around the vehicle, which may result in a personal injury.
Cover all the vehicle windows with drop cloth, a blanket or any similar item (1).



IDL70A820071-01

2) Disable air bag system. ☞(Page 8B-47)
3) Connect special tool as follows.
Driver air bag (inflator) module
   a) Remove steering column lower cover. ☞(Page 6B-1)
   b) Disconnect contact coil assembly connector (2) as follows.
      i) Release locking slider (1) by sliding it in direction of arrow "1".
      ii) Disconnect contact coil assembly connector (2) by pulling it in direction of arrow "2".
   c) Connect deployment harness (A) and adapter cable (B) to contact coil side.

Special tool
(A): 09932M75031
(B): 09932M78332



IDL70A820072-03

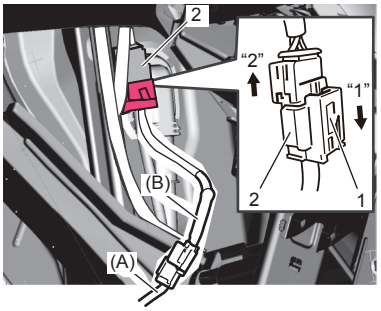
Passenger air bag (inflator) module

a) Remove glove box. ☞(Page 9C-12)

b) Disconnect passenger air bag (inflator) module connector (2) as follows.
   i) Release locking slider (1) by sliding it in arrow direction “1”.
   ii) Disconnect passenger air bag (inflator) module connector by pulling it in arrow direction “2”.

c) Connect deployment harness (A) and adapter cable (B) at passenger air bag (inflator) module side.

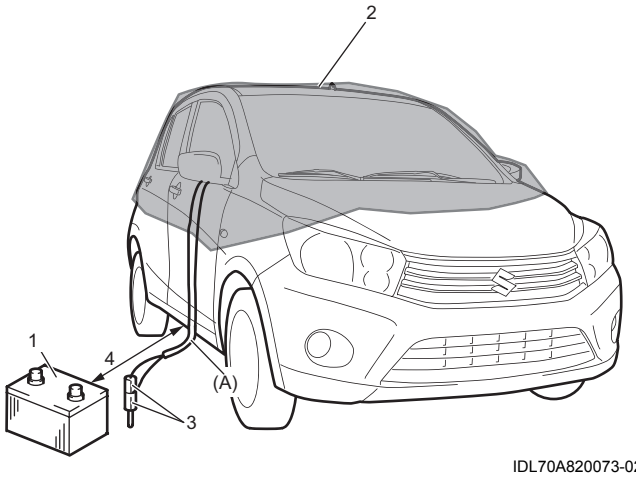
Special tool
(A): 09932M75031
(B): 09932M78332



IDL70A820086-05

4) Check that there is no person inside vehicle or in nearby area.
5) Remove any flammable object or any object that can be flown off due to deployed air bag (inflator) module from the vehicle.
6) Place 12 V vehicle battery (1) near shorted end of deployment harness.

Special tool
(A): 09932M75031



IDL70A820073-02

2.	Blanket
3.	Banana plug
4.	10 m (33 ft)

7) Separate banana plug of deployment harness.
8) Connect banana plug of deployment harness to battery.

⚠ CAUTION

Failure to take proper precautions when handling a deployed air bag may result in a fire, personal injury or health problems.

- **Do not place a deployed air bag (inflator) module near any flammable objects because it is hot enough to start a fire.**
- **Do not pour water, oil, etc. over an air bag (inflator) module immediately after its deployment.**
- **Wait for at least 30 minutes before touching any metal surface of a deployed air bag (inflator) module.**
- **Follow all of the procedures described in this section.**

NOTE

- **When air bag (inflator) module deploys, rapid gas expansion will create substantial report.**
  Wear suitable ear protection. Notify all people in nearby area that you intend to deploy air bag (inflator) module and suitable ear protection should be worn.
- **After air bag (inflator) module has been deployed, surface of air bag (inflator) may contain powdery residue. This powder consists primarily of cornstarch (used to lubricate bag (inflator) as it inflates) and by-products of chemical reaction.**

Deployed Air Bag (Inflator) Module Disposal

AENDL70A8206024

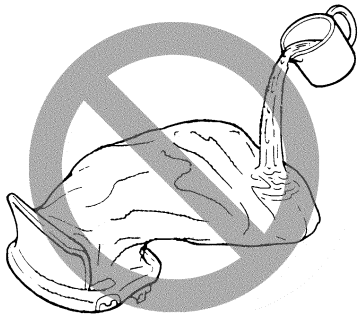
⚠ WARNING

If live air bag (inflator) modules are disposed to without being deployed beforehand using proper procedure, there is a risk of personal injury and health problems from contact with the harmful substances that may come out if the deployment container seal is broken.
Before disposing of any live air bag (inflator) modules, deploy them using the specified procedure.
Never dispose of any live ones through ordinary refuse disposal channels.

Deployed air bag (inflator) module can be disposed of in the same way which is used for disposal of any other parts. For their disposal, however, the following points should be noted.

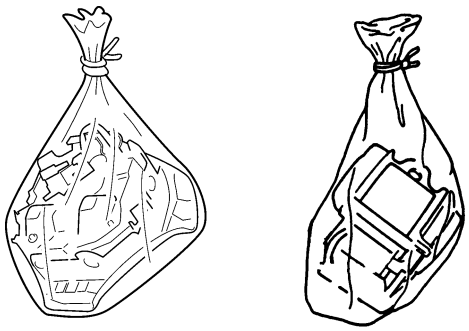
- Immediately after deployment air bag inflator module is hot. Wait for 30 minutes to cool it off before handling it.

- Never apply water and oil, etc. to deployed air bag (inflator) module to cool it off. Do not get on deployed air bag (inflator) module.



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- After the air bag (inflator) module has been deployed, surface of air bag may contain a powdery residue. As with many service procedures, wear gloves and safety glasses.
- When disposing of the deployed air bag (inflator) module, seal it in a vinyl bag.



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- When air bag (inflator) module has been deployed inside vehicle, leave it as installed to vehicle and scrap it.
- Wash your hands with mild soap and water after handling them.

Specifications

Tightening Torque Specifications

AENDL70A8207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
SDM bolt	9.0	0.92	7.0	☞(Page 8B-48)
Passenger air bag (inflator) module bolt	23	2.3	17.0	☞(Page 8B-51) / ☞(Page 8B-54)
Forward impact sensor bolt	9.0	0.92	7.0	☞(Page 8B-52)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

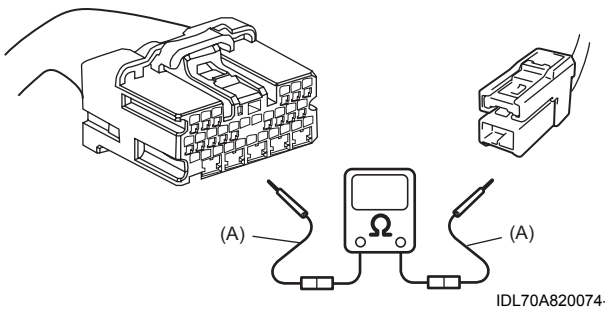
Use of Special Tools

AENDL70A8208001

Be familiar with tools listed under heading “Special Tool”. Study proper use of measurement tools such as Air Bag Driver, Connector Test Adapter Kit and Digital Multimeter.

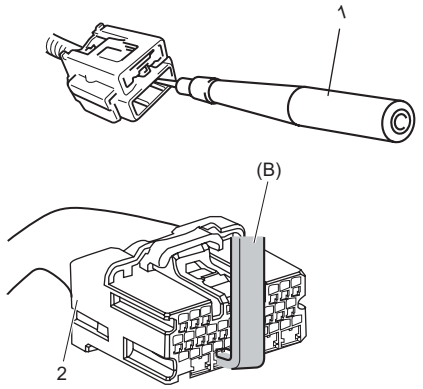
Special tool
(A): 09932M76010
(B): 09932M75100

This must be used whenever a diagnostic procedure requests checking or probing a terminal.
Using the appropriate adapter in special tool (A) will check that no damage to terminal will occur from multimeter probe, such as spread or bend.



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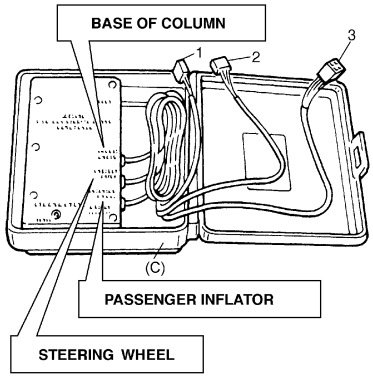
The adapter (1) will also give an idea of whether or not contact tension is sufficient, helping to find an open or intermittent open due to poor terminal contact. SDM shorting bar release tool (B) is included in connector test adapter kit. Inserting it into the SDM connector (2) will release the shorting bar.



IDL70A820075-02

Special tool
(C): 09932M75011

This tool is used as a diagnostic aid and safety device to prevent inadvertent air bag (inflator) module deployment. The load tool has three connectors attached to its case which are electrically functional and serve as resistive load substitutions.
Use “STEERING WHEEL” connector instead of resistance load of driver / passenger air bag (inflator) modules.
Use “BASE OF COLUMN” connector instead of resistance load of driver air bag (inflator) module and contact coil.
Do not use “PASSENGER INFLATOR”.
By connecting load tool instead of inflator modules, service work to decide location of cause of trouble - whether it is in harness or in component - can be performed.

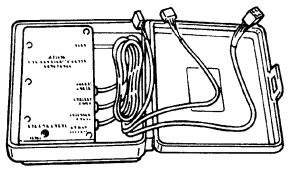
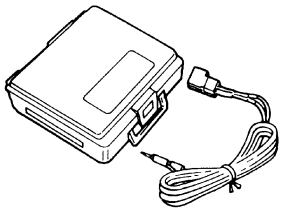
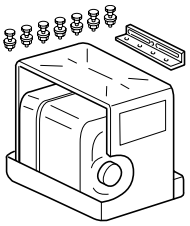
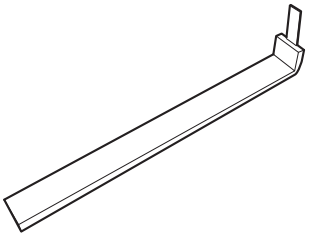


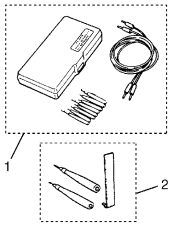
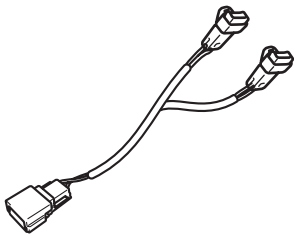
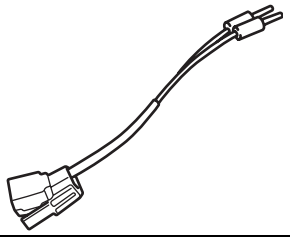
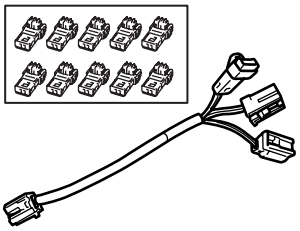
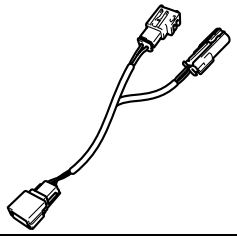
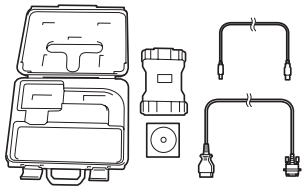
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1.	Driver air bag (inflator) module and contact coil to connector
2.	Driver / passenger air bag (inflator) modules to connector
3.	Not used

Special Tool

AENDL70A8208002

09932M75011 Air bag driver / Passenger load tool ☞(Page 8B-27) / ☞(Page 8B-30) / ☞(Page 8B-32) / ☞(Page 8B-35) / ☞(Page 8B-59)	
09932M75031 Air bag deployment harness ☞(Page 8B-54) / ☞(Page 8B-54) / ☞(Page 8B-55) / ☞(Page 8B-55) / ☞(Page 8B-56) / ☞(Page 8B-57) / ☞(Page 8B-57)	
09932M75041 Passenger air bag (inflator) module deployment fixture ☞(Page 8B-55)	
09932M75100 Shorting bar release tool ☞(Page 8B-1) / ☞(Page 8B-19) / ☞(Page 8B-20) / ☞(Page 8B-20) / ☞(Page 8B-21) / ☞(Page 8B-23) / ☞(Page 8B-24) / ☞(Page 8B-25) / ☞(Page 8B-26) / ☞(Page 8B-28) / ☞(Page 8B-30) / ☞(Page 8B-33) / ☞(Page 8B-33) / ☞(Page 8B-36) / ☞(Page 8B-37) / ☞(Page 8B-41) / ☞(Page 8B-58)	

09932M76010 Connector test adapter set This set includes the following items. 1. Connector test adapter kit (09932-75020), 2. Connector test adapter & shorting bar release tool (09932-76020) ☞(Page 8B-1) / ☞(Page 8B-13) / ☞(Page 8B-13) / ☞(Page 8B-16) / ☞(Page 8B-19) / ☞(Page 8B-20) / ☞(Page 8B-20) / ☞(Page 8B-21) / ☞(Page 8B-23) / ☞(Page 8B-24) / ☞(Page 8B-25) / ☞(Page 8B-26) / ☞(Page 8B-28) / ☞(Page 8B-30) / ☞(Page 8B-32) / ☞(Page 8B-33) / ☞(Page 8B-33) / ☞(Page 8B-35) / ☞(Page 8B-36) / ☞(Page 8B-37) / ☞(Page 8B-39) / ☞(Page 8B-39) / ☞(Page 8B-41) / ☞(Page 8B-42) / ☞(Page 8B-43) / ☞(Page 8B-58)	
09932M76510 Deployment adapter cable ☞(Page 8B-54) / ☞(Page 8B-55)	
09932M78310 Adapter cable ☞(Page 8B-32) / ☞(Page 8B-35)	
09932M78332 Deployment adapter cable ☞(Page 8B-56) / ☞(Page 8B-57)	
09932M78340 Deployment adapter cable ☞(Page 8B-27) / ☞(Page 8B-30)	
SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 8B-8) / ☞(Page 8B-8)	

Section 9

Body, Cab and Accessories

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Precautions

Precautions

Precautions on Body, Cab and Accessories

AENDL70A9000001

Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

General Precautions
Refer to “General Precautions” in Section 00 (Page 00-1).

Fastener Caution
Refer to “Fastener Caution” in Section 00 (Page 00-5).

Precautions for Body Service
Refer to “Precautions for Body Service” (Page 9-1).

Fastener Caution for Body Service:
Refer to “Fastener Caution for Body Service” (Page 9-1).

Precaution for Vehicle Equipped with Supplemental Restraint (Airbag) System
Refer to “Precautions for Vehicle Equipped with Supplemental Restraint (Air Bag) System” in Section 00 (Page 00-7).

Precautions for Electrical Circuit System
Refer to “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3).

Precaution for CAN Communication System
Refer to “Precautions for CAN Communication System” in Section 00 (Page 00-9).

Cautions in Body Electrical System Servicing
Refer to “Cautions in Body Electrical System Servicing” in Section 9A (Page 9A-1).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness. Otherwise, electrical trouble may occur.

Precautions for Body Service

AENDL70A9000004

⚠ WARNING

For vehicles equipped with a Supplemental Restraint (Air Bag) System:
When servicing vehicle body, if shock may be applied to air bag system components or parts, a serious injury may take place, disconnect those parts beforhand.

Fastener Caution for Body Service

AENDL70A9000003

NOTICE

- **Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary.**
- **Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.**

Wiring Systems

Precautions

Cautions in Body Electrical System Servicing

AENDL70A9100001

When servicing the electric systems, observe the cautions described in “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3) to protect electrical parts and to prevent a fire.

General Description

Abbreviations

AENDL70A9101001

Refer to the “Abbreviations” in Section 0A (Page 0A-1) for the general abbreviations.

Abbreviation	Full spelling	Abbreviation	Full spelling
2WD	2 Wheel Drive Vehicles	J/C	Joint connector
4WD	4 Wheel Drive Vehicles	KLS	Keyless Start System
A/B	Air Bag	L	Left
ACC	Accessory	LED	Light Emitting Diode
CAN	Controller Area Network	LHD	Left Hand Drive Vehicle
COMB	Combination	LO	Low
DSL	Diesel engine	OCV	Oil Control valve
DPF®	Diesel Particulate Filter	P/N	Power Normal
ELCM	EVAP leak check module	R	Right
ESP®	Electronic Stability Program	RHD	Right Hand Drive Vehicle
FWD	Forward	K/S	Keyless / Security
HI	High	ST	Starter
IF EQPD	If equipped	TCSS	Traction Control Support System
ILL	Illumination	TPMS	Tire Pressure Monitoring System
IND	Indicator	VIM	Variable Intake Manifold
INT	Intermittent	VSV	Vacuum switching valve
J/B	Junction block	5 dr	5 door

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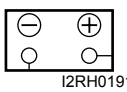
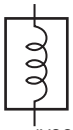
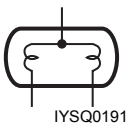
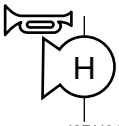
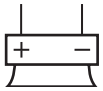
Wire / Connector Color Symbols

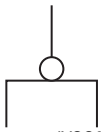
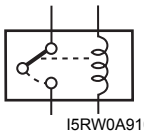
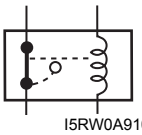
AENDL70A9101002

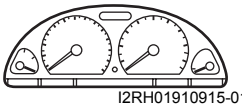
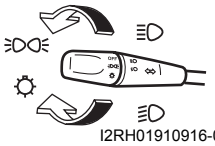
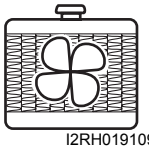
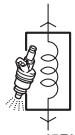
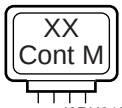
Refer to “Wire Color Symbols” in Section 0A (Page 0A-5).

Symbols and Marks

AENDL70A9101003

Battery  I2RH01910910-01	Ring- terminal ground  IYSQ01910915-01	Ground  IYSQ01910916-01	Normal fuse  IYSQ01910917-01	Slow blow fuse  IYSQ01910918-01
Circuit breaker  IYSQ01910919-01	Coil, Solenoid  IYSQ01910920-01	Heater  IYSQ01910921-01	Bulb  IYSQ01910922-01	Bulb  IYSQ01910923-01
Cigarette lighter  IYSQ01910924-01	Motor  IYSQ01910925-01	Pump  IYSQ01910926-01	Horn  I2RH01910911-01	Speaker  I5JB0B910995-02

Buzzer	Chime	Capacitor	Thermistor	Reed switch
 IYSQ01910929-01	 IYSQ01910930-01	 IYSQ01910931-01	 IYSQ01910932-01	 IYSQ01910933-01
Resistance	Variable resistance	Variable resistance	Transistor NPN	Transistor PNP
 IYSQ01910934-01	 IYSQ01910935-01	 IYSQ01910936-01	 IYSQ01910937-01	 IYSQ01910938-01
Photo transistor	Diode	Zener diode	Light emitting diode	Photo diode
 IYSQ01910939-01	 IYSQ01910940-01	 IYSQ01910941-01	 IYSQ01910942-01	 IYSQ01910943-01
Piezoelectric element	Connected harnessed	Crossing harness	Ring terminal	Connector
 IYSQ01910944-01	 IYSQ01910945-01	 IYSQ01910946-01	 IYSQ01910947-01	 IYSQ01910948-01
Normally-open relay	Normally-closed relay	Normally-open switch	Normally-closed switch	
 I5RW0A910982-01	 I5RW0A910983-01	 I5RW0A910984-01	 I5RW0A910985-01	

Ignition switch	Keyless entry	Immobilizer system	Combination meter	Lighting switch
 I2RH01910912-01	 I3JA01910902-01	 I5RH01910901-01	 I2RH01910915-01	 I2RH01910916-01
Headlight leveling	Hazard warning light	Front fog light	Rear fog light	Spark plug
 I3JA01910904-01	 I3JA01910905-01	 I3JA01910906-01	 I3JA01910907-01	 I2RH01910921-01
Radiator cooling fan	Fuel pump	Fuel injector	XX control module	Windshield wiper
 I2RH01910922-01	 I3JA01910908-01	 I5RW0A910987-01	 I2RH01910925-01	 I3JA01910909-01
Windshield washer	Rear wiper	Rear washer	Rear defogger	Power window
 I3JA01910910-01	 I3JA01910911-01	 I3JA01910912-01	 I2RH01910930-01	 I3JA01910913-01
Power door lock	Power mirror	A/B	Pretensioner	Passenger side
 I3JA01910914-01	 I3JA01910915-01	 I3JA01910916-01	 I3JA01910917-01	 I3JA01910918-01
Driver side	Seat heater	A/C	Power steering	Side-air bag (R)

 I3JA01910919-01	 I2RH01910938-01	 I3JA01910920-01	 I3JA01910921-01	 I4JA01910901-01
Side-air bag (L)	Side curtain air bag (R)	Side curtain air bag (L)	Glow plug	
 I4JA01910902-01	 I5RS0A910958-01	 I5RS0A910959-01	 I5RW0A910986-01	

How to Read Connector Layout Diagram

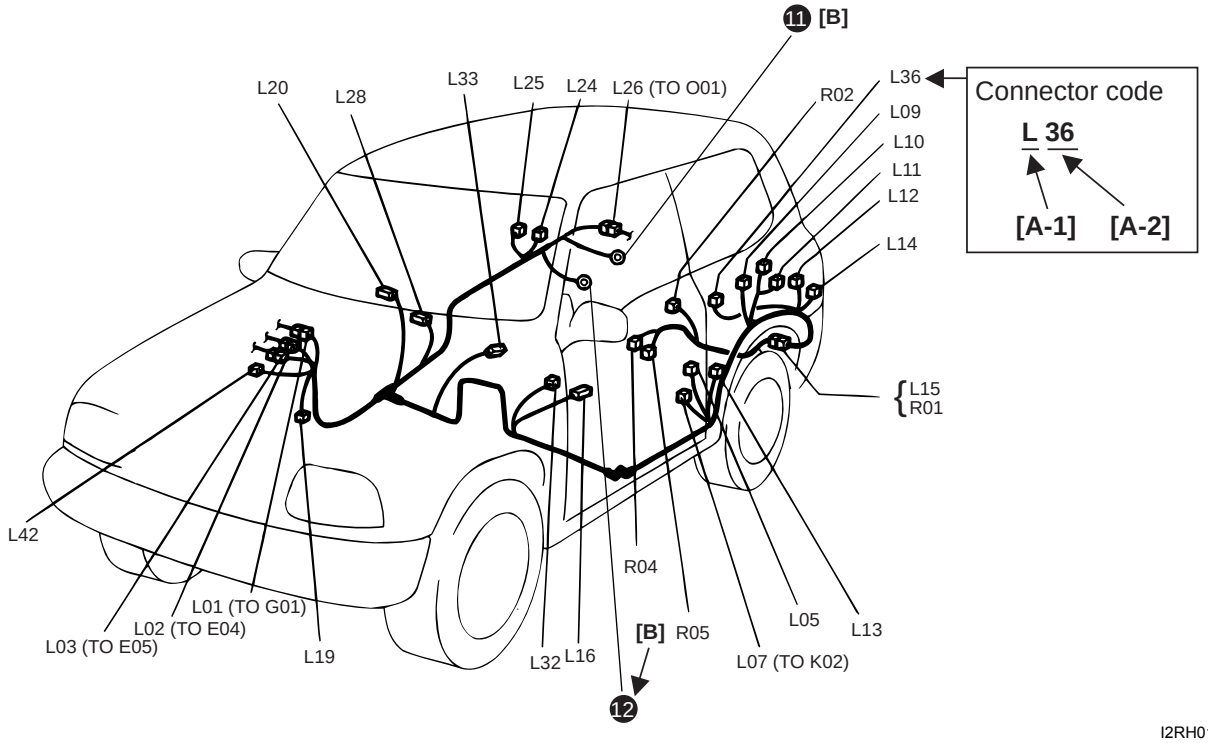
AENDL70A9101004

[A-1]: Harness symbol and corresponding harness name

A: Battery cable
B: A/C harness
C: Engine harness
D: Injector harness, Oil pressure switch wire
E: Main harness, Power steering wire
F: Console wire
G: Instrument panel harness, Instrument panel antenna wire
J: Side door wire (including P/W related wires)
K: Interior light harness, Roof wire, Roof radio antenna wire, Rear speaker wire
L: Floor harness, Floor antenna wire, Coupling harness, Accessory socket wire, G sensor wire
M: Rear bumper harness
O: Rear end area harness/wires (except Rear bumper harness)
Q: Side curtain-air bag wire, Side-air bag harness, Pretensioner harness
R: Fuel pump wire
S: Contact coil

[A-2]: Connector Number

[B]: Ground point No.



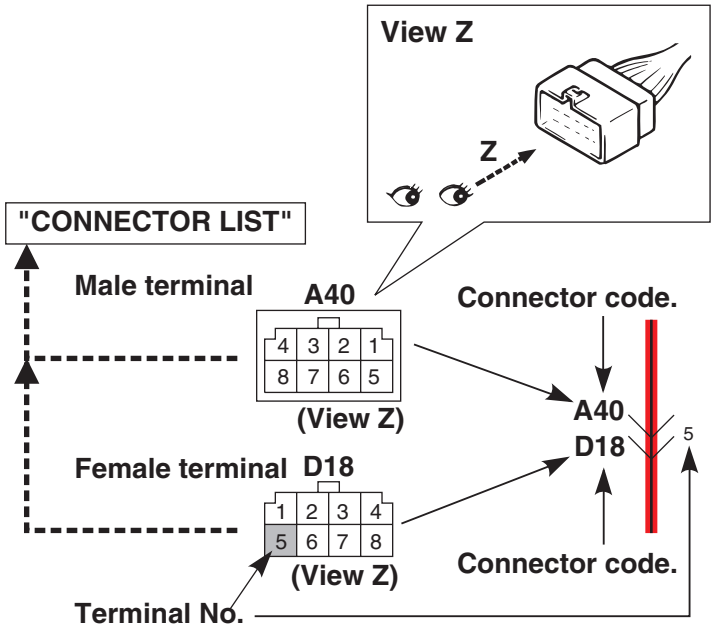
I2RH01910901-01

How to Read Connector Codes and Terminal Nos.

AENDL70A9101005

1) Connector code/Terminal No./Terminal layout
   - The connector shape and terminal layout shown in this manual are those viewed from “Z” in the illustration.

Refer to “List of Connectors” (Page 9A-79).

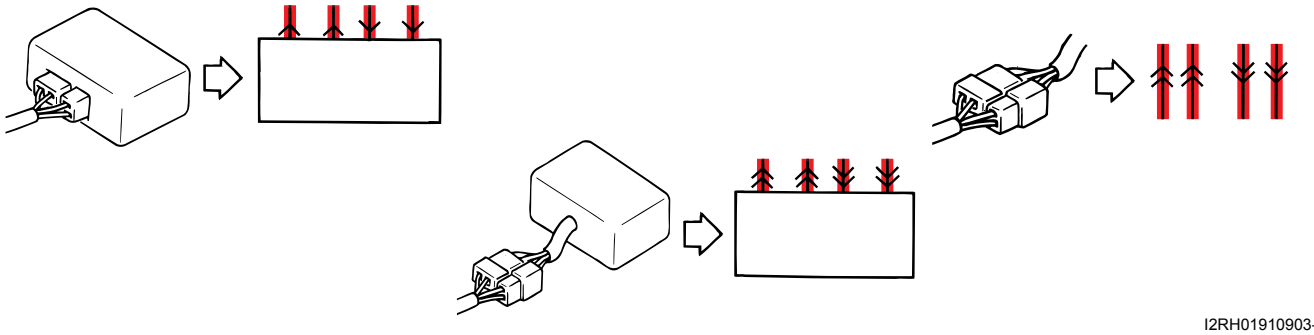


I5RW0A910988-02

NOTE

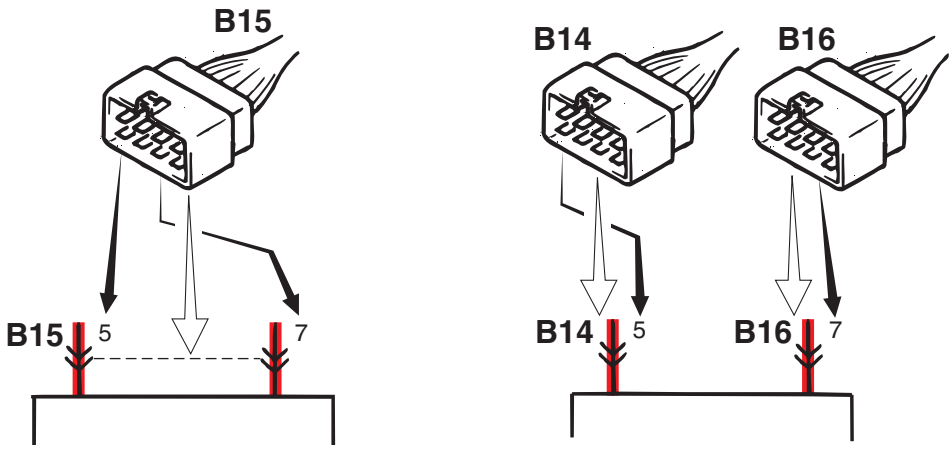
Molded terminal numbers that are different from the above can be found on some connectors in rare cases.
These molded numbers are not applied in this manual.

2) Connector type



I2RH01910903-01

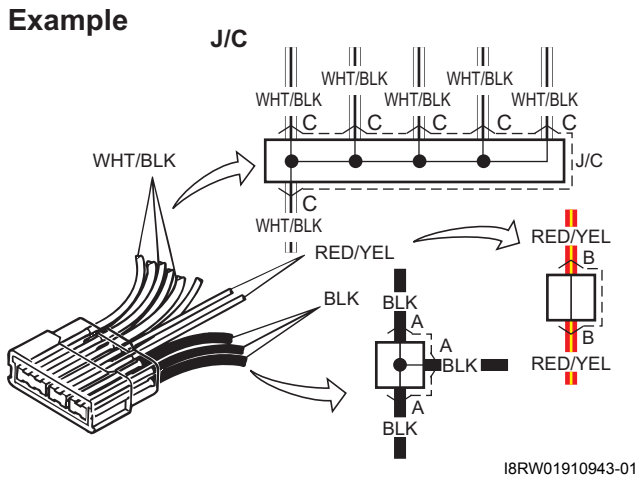
3) Terminals in one connector (Broken line) (B15)/Terminals in different connectors (B14, B16)



I5RW0A910995-03

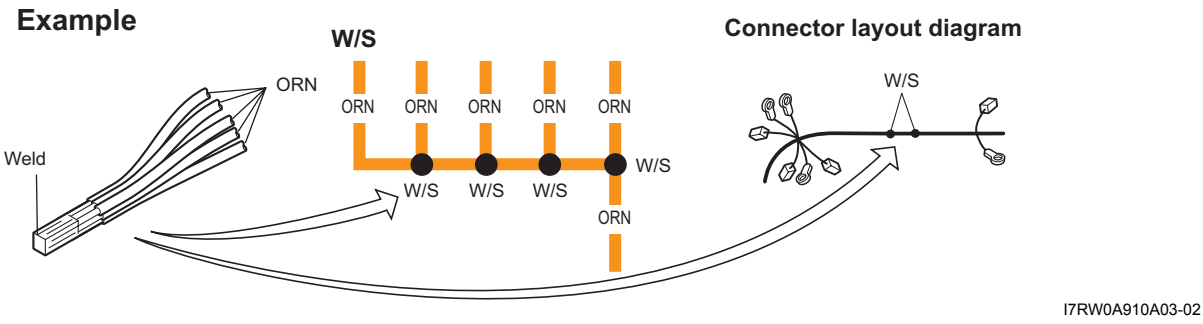
4) Joint connector (J/C)

- Several different wires with the same wire color are joined as a part of J/C.

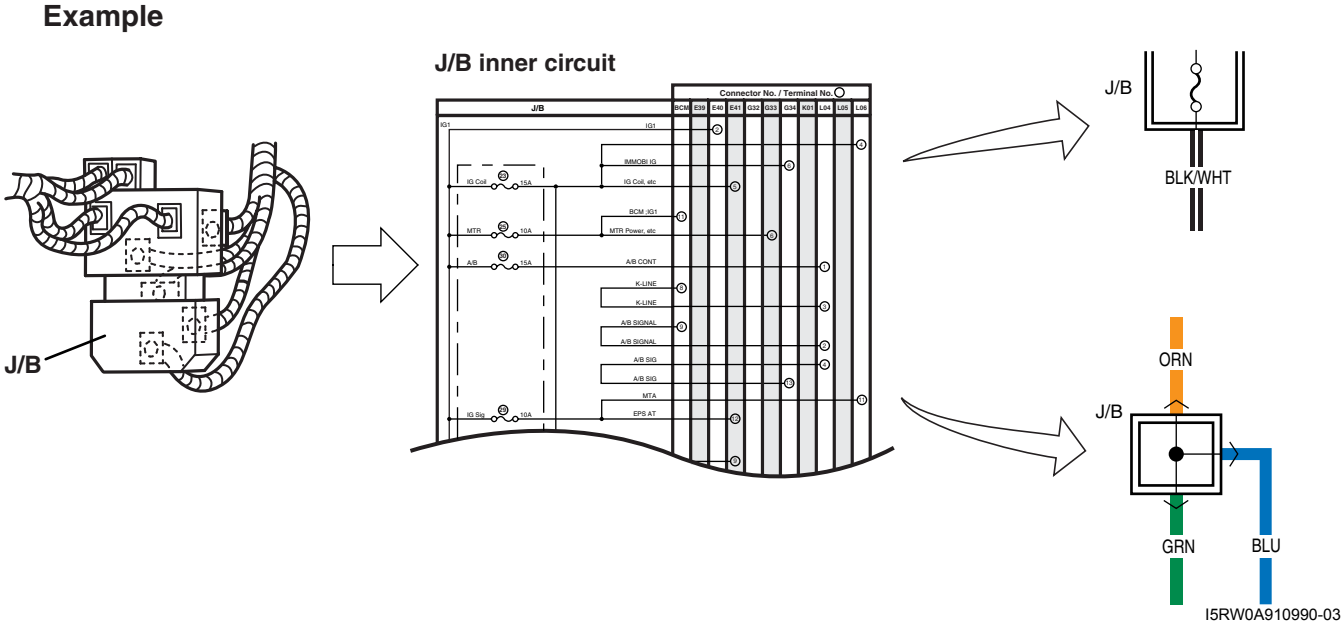


5) Weld splice (W/S)

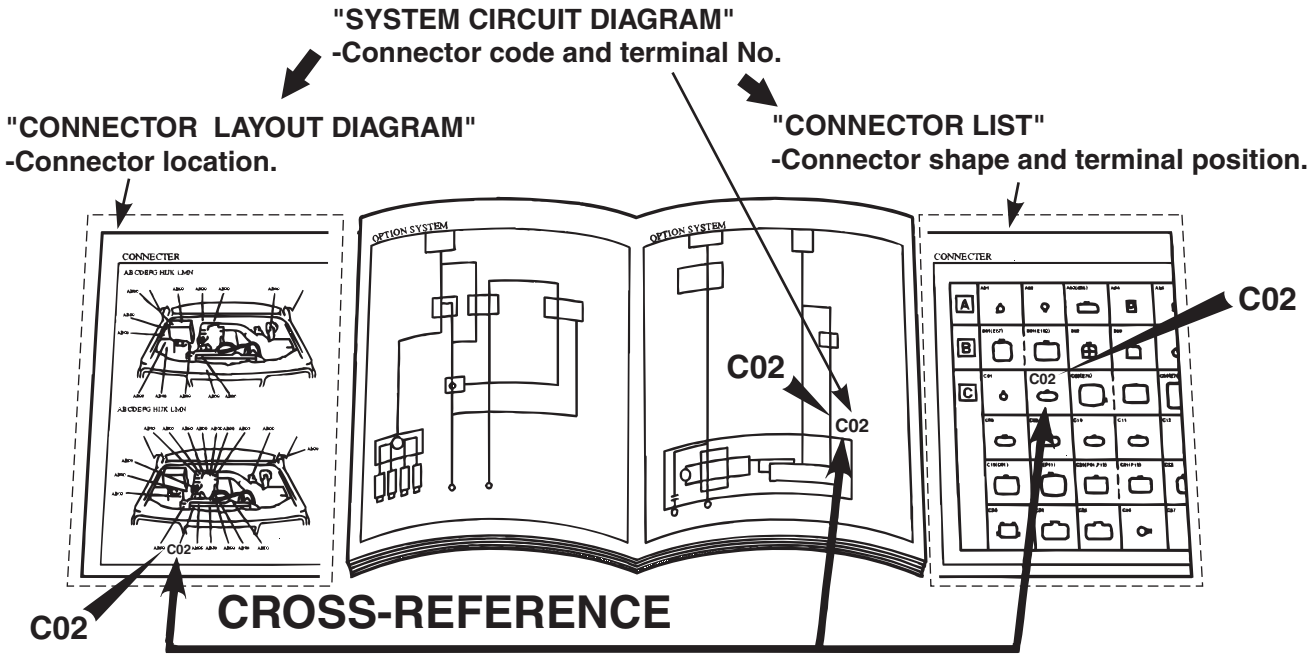
- Several different wires with the same wire color are joined by welding at a W/S.



6) Junction block (J/B)



7) Connector location, shape and terminal No.
Refer to “Connector Layout Diagram” (Page 9A-8).
Refer to “System Circuit Diagram” (Page 9A-31).
Refer to “List of Connectors” (Page 9A-79).

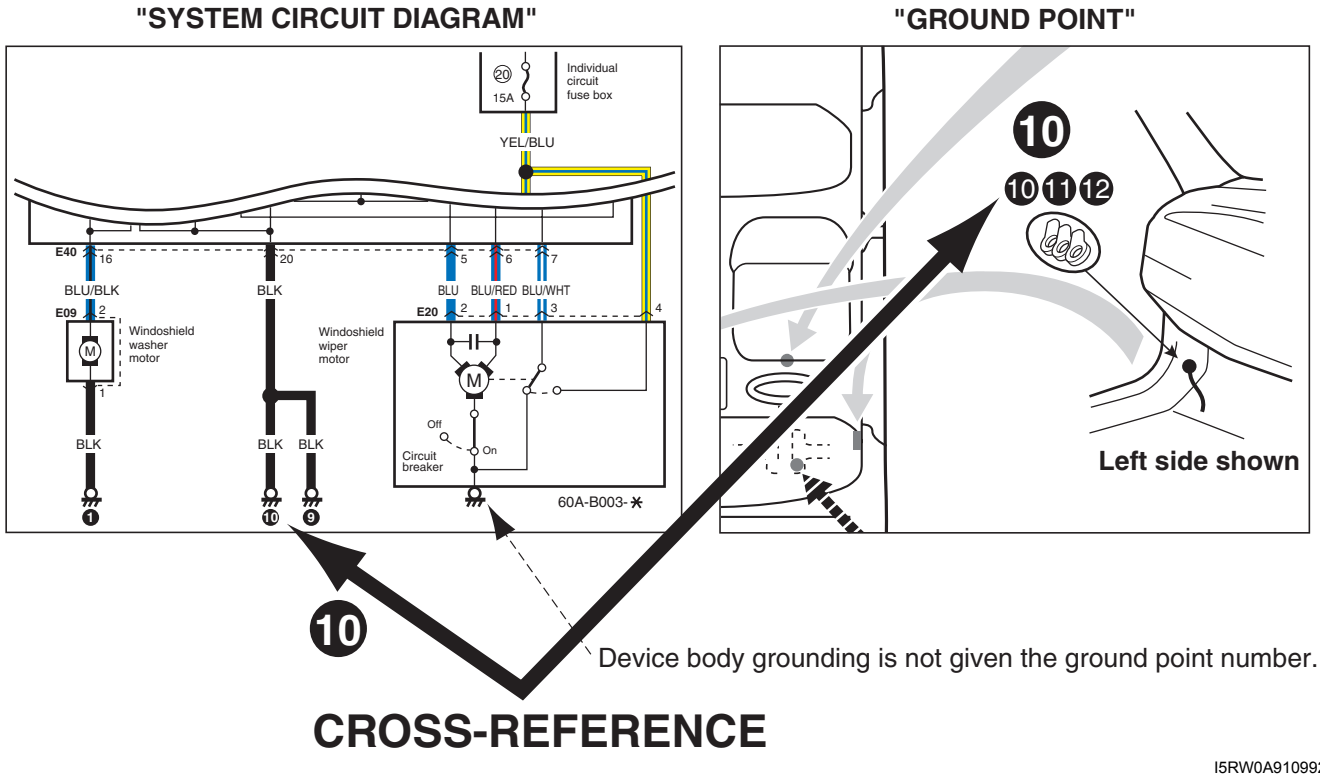


I5RW0A910991-02

How to Read Ground Point

AENDL70A9101006

Refer to “System Circuit Diagram” (Page 9A-31).
Refer to “Ground (Earth) Point” (Page 9A-18).

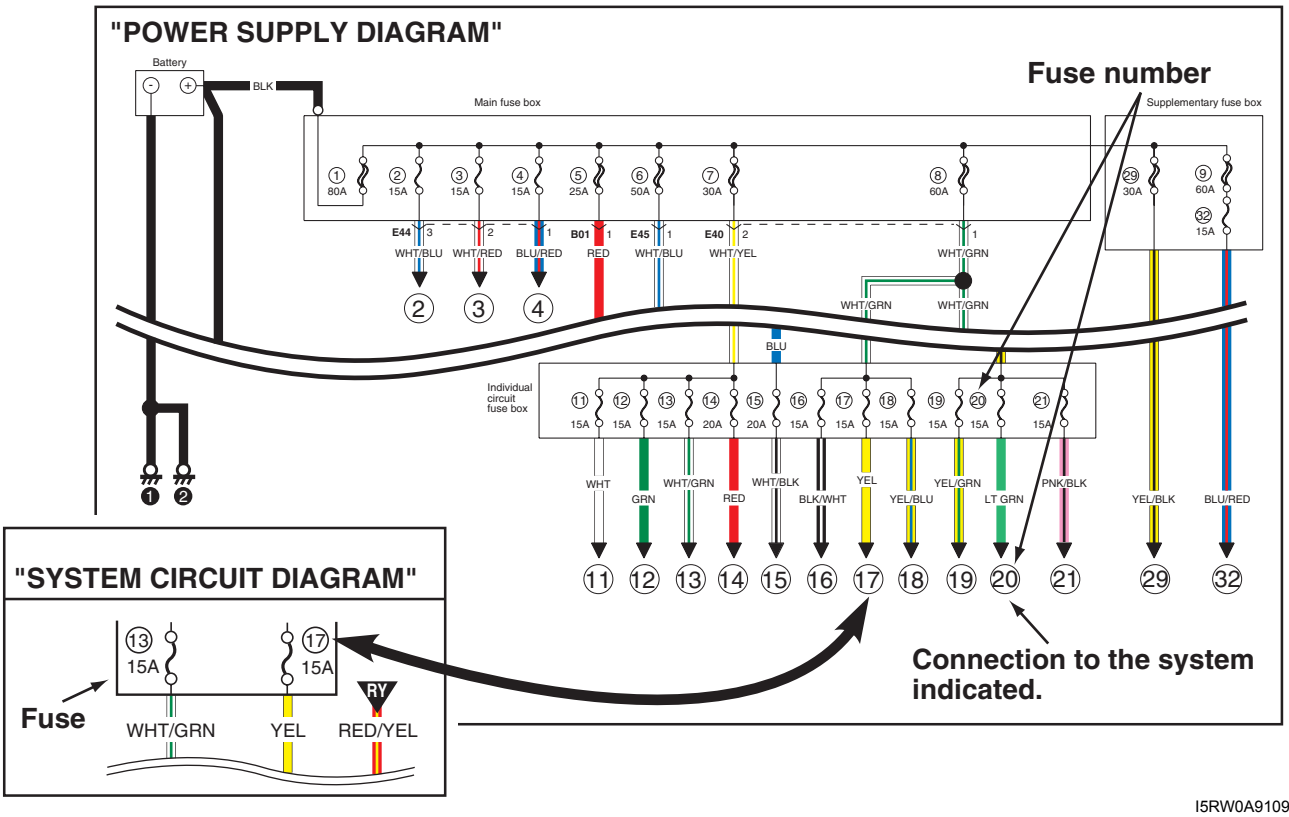


I5RW0A910992-02

How to Read Power Supply Diagram

AENDL70A9101007

Refer to “Power Supply Diagram” (Page 9A-20).
Refer to “System Circuit Diagram” (Page 9A-31).



I5RW0A910993-02

How to Read System Circuit Diagram

AENDL70A9101008

The circuit diagram is designed so the current flows from the top of the diagram (power source) to the bottom of the diagram (ground) as if giving an image of water flow.

[A]: Fuse No.

[B]: Circuit jumping page / direction

NOTE

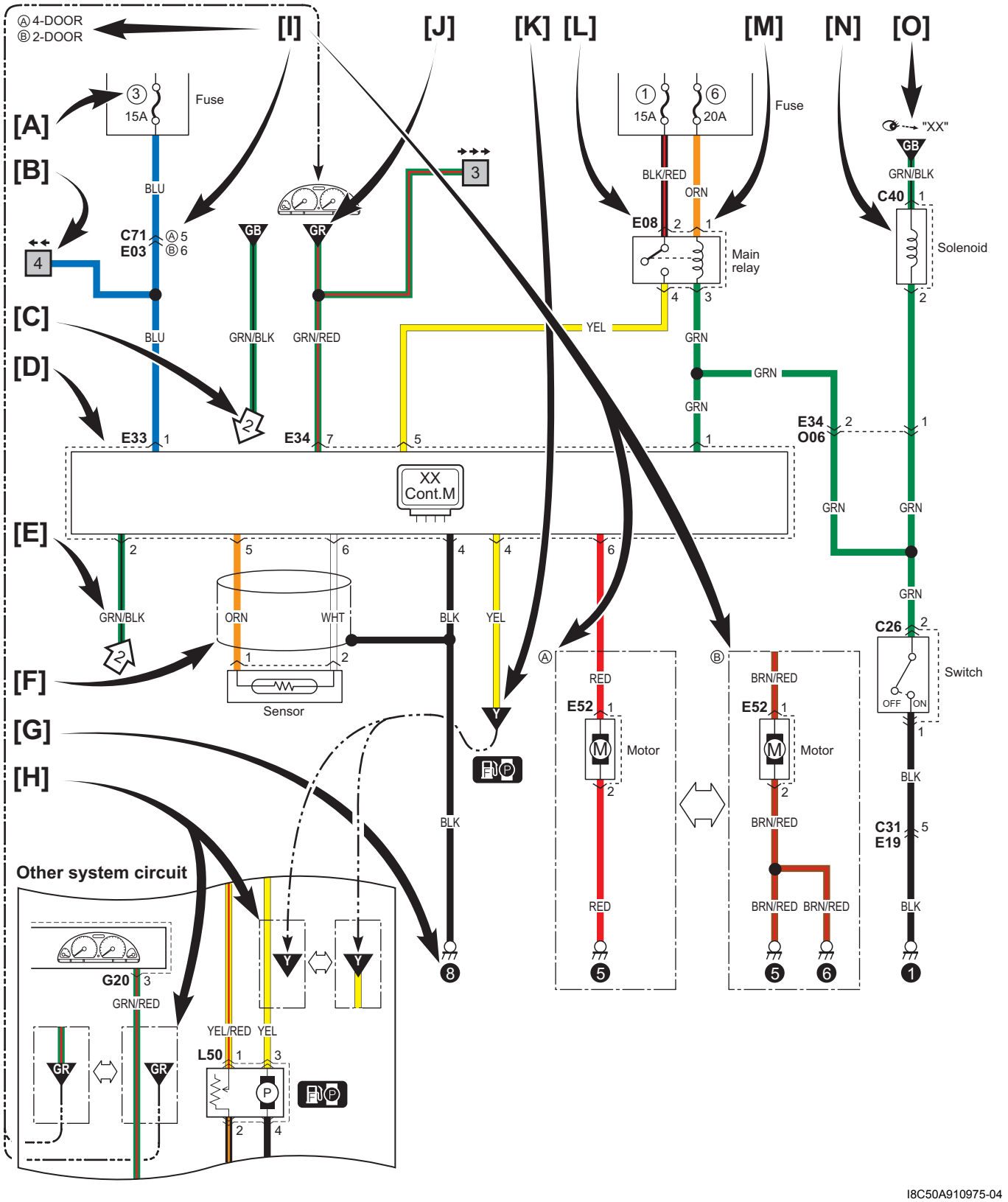
This means "Jump to the page directed with the arrow(s) by their number."
(For example: "Two arrows directing left" means "Jump to two pages before".)
You will find the same symbol with the arrows directing opposite in the referenced page. The circuit continues between the symbols.

[C]: Circuit jumping point / direction

NOTE

The circuit continues to the same symbol with opposite direction within the page.
You will find the other symbol in the direction of the arrow.

[D]: Terminals-in-one-connector mark
[E]: Wire color
[F]: Shield wire
[G]: Ground point
[H]: "From" or "To" (With ID letter (s))
[I]: Specification variation
The white arrow between A and B means "or".
[J]: "From" (With ID letter (s))
[K] "To" (With ID letter (s))
[L]: Connector code
[M]: Terminal No.
[N]: Symbol mark
[O]: "SEE" mark



Connector Layout Diagram

Connector Layout Diagram

AENDL70A910A001

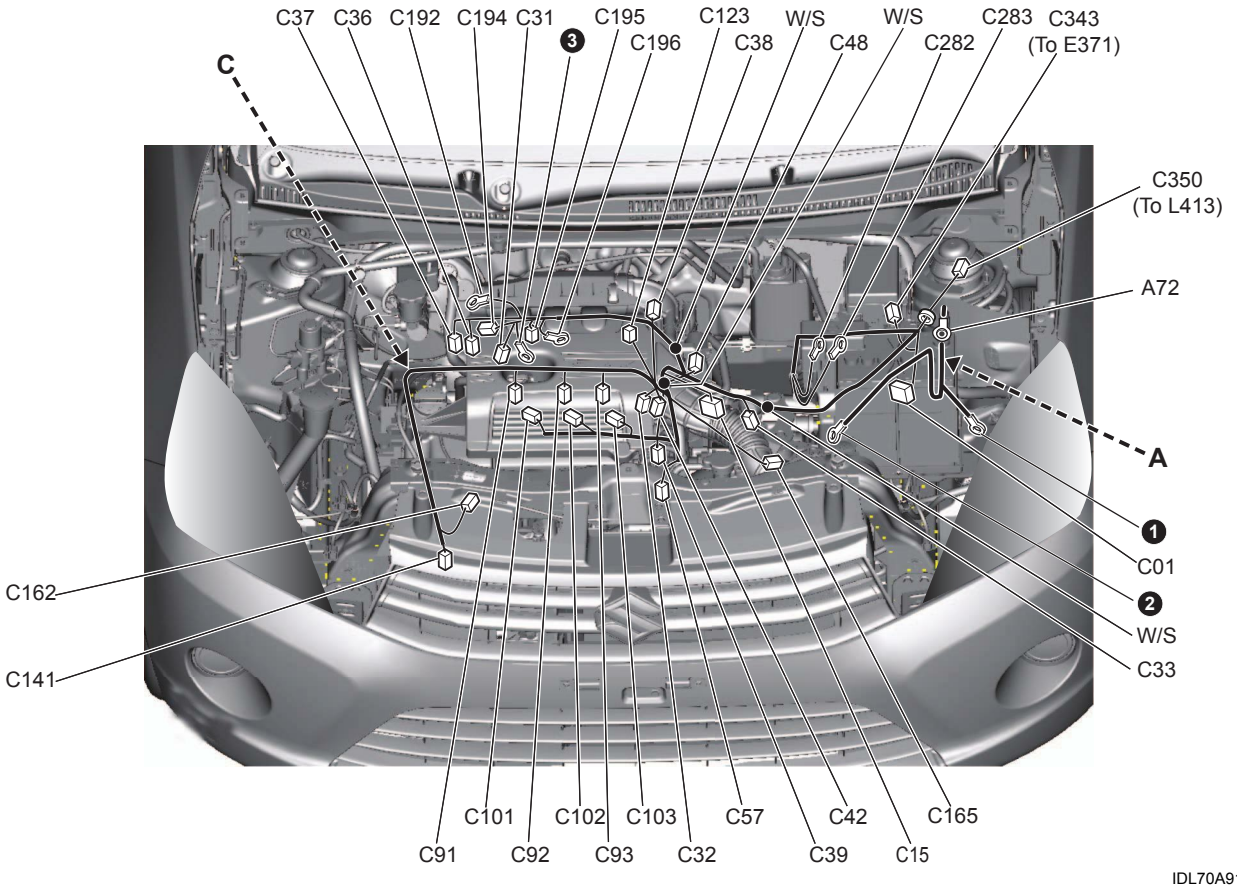
Refer to “Engine Compartment” (Page 9A-9).
Refer to “Instrument Panel” (Page 9A-12).

Refer to “Door, Roof” (Page 9A-15).
Refer to “Floor” (Page 9A-16).
Refer to “Rear” (Page 9A-18).

Engine Compartment

AENDL70A910A002

A: Battery Cable / C: Engine Harness



IDL70A910901-10

A: Battery cable

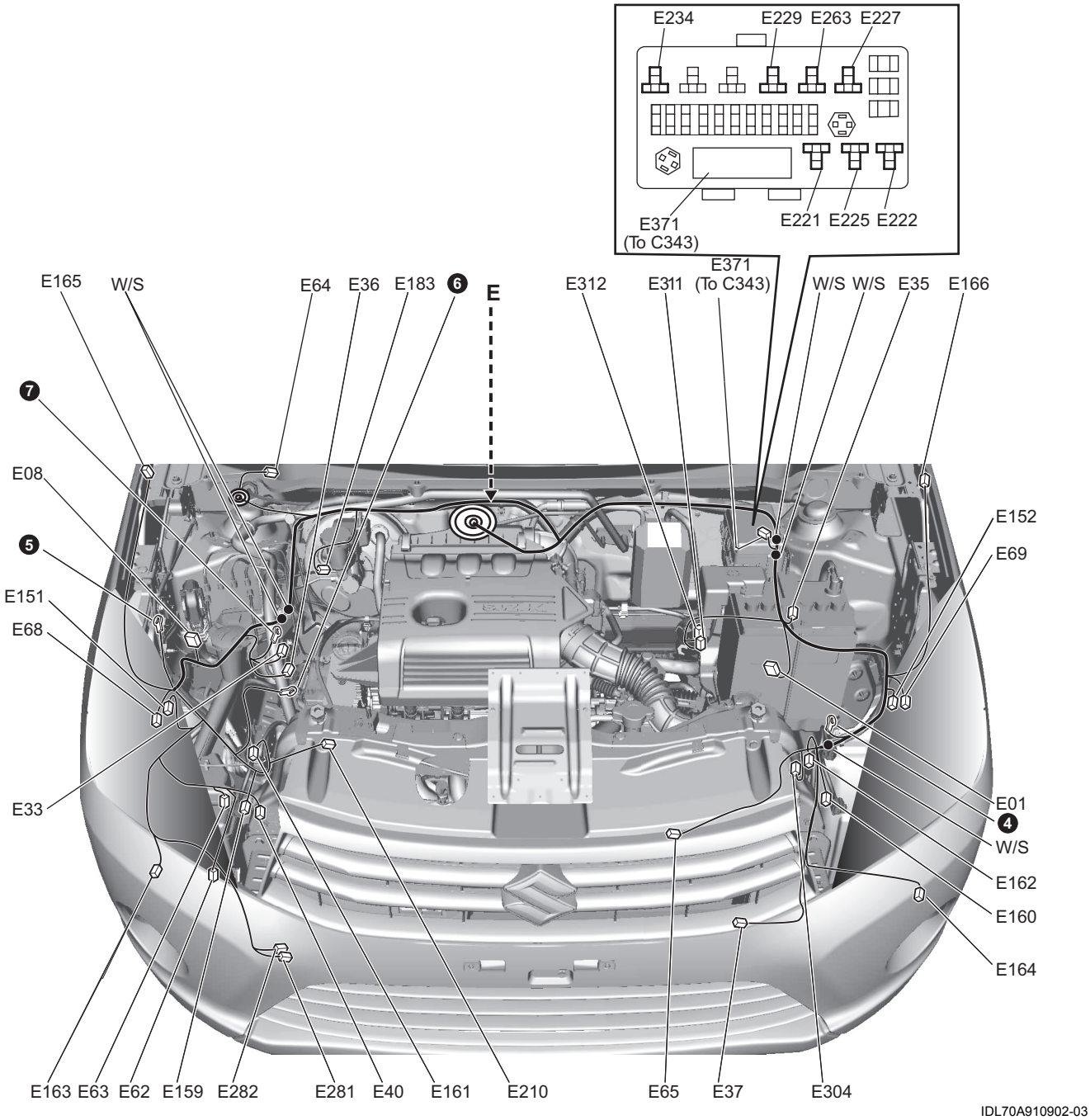
No.	Color	Connective position	Remarks
A01	-	Battery (-)	

C: Engine harness

No.	Color	Connective position	Remarks
C01	BRN	ECM	
C15	BLK	AMT control module	AMT model
C31	GRY	CKP sensor	
C32	BLU	CMP sensor	
C33	GRY	Vehicle speed sensor	Without ABS model
C36	BLU	MAP sensor	
C37	BLK	Knock sensor	
C38	BLK	IAT sensor	
C39	BLK	ECT sensor	
C42	BLK	HO2S-1	
C48	BLK	Electric throttle body	
C57	GRY	O2S-2	
C91	GRY	Fuel injector No.1	
C92	GRY	Fuel injector No.2	
C93	GRY	Fuel injector No.3	
C101	GRY	Ignition coil No.1	
C102	GRY	Ignition coil No.2	
C103	GRY	Ignition coil No.3	

No.	Color	Connective position	Remarks
C123	BLU	EVAP canister purge valve	
C141	GRY	A/C compressor	
C162	N	Engine oil pressure switch	
C165	BLK	Back-up light switch	M/T model
C192	—	Generator (+B)	
C194	BLK	Generator	
C195	BLK	Starting motor	
C196	—	Starting motor (+B)	
C282	—	Main fuse box	
C283	—	Main fuse box	
C343	N	Main harness (To E371)	
C350	—	Floor harness (To L413)	

E: Main Harness



IDL70A910902-03

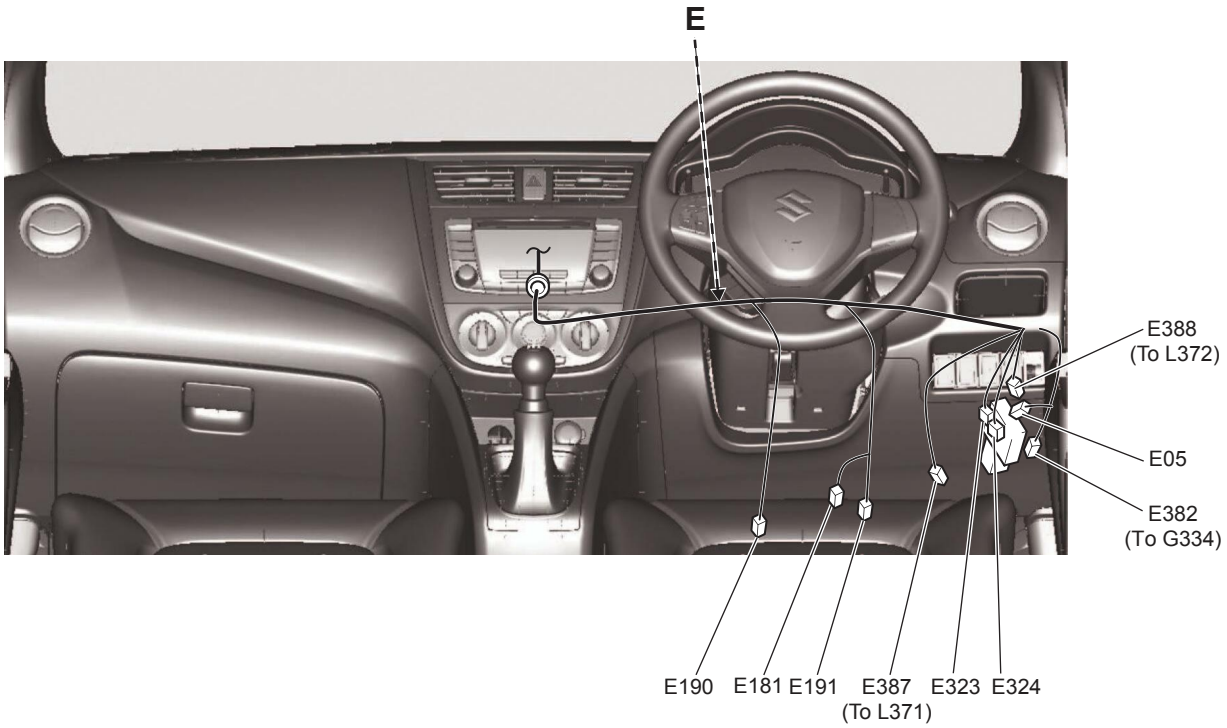
E: Main harness

No.	Color	Connective position	Remarks
E01	BLK	ECM	
E08	BLK	ABS control module	ABS model
E33	N	Wheel speed sensor (Front-right)	ABS model
E35	BLK	Wheel speed sensor (Front-left)	ABS model
E36	BLK	A/C refrigerant pressure sensor	
E37	BLK	Outside air temperature sensor	AMT model
E40	YEL	Forward impact sensor (Driver side)	Airbag model
E62	GRN	Windshield washer motor	
E63	BLU	Rear washer motor	If equipped
E64	GRY	Windshield wiper motor	
E65	BLK	Radiator cooling fan motor	
E68	GRY	Headlight leveling actuator (R)	
E69	GRY	Headlight leveling actuator (L)	
E151	BLK	Headlight (R)	
E152	BLK	Headlight (L)	
E159	GRY	Front turn signal light (R)	
E160	GRY	Front turn signal light (L)	
E161	BLK	Front position light (R)	
E162	BLK	Front position light (L)	
E163	BLK	Front fog light (R)	If equipped
E164	BLK	Front fog light (L)	If equipped
E165	N	Side turn signal light (R)	without power mirror turn signal light
E166	N	Side turn signal light (L)	without power mirror turn signal light
E183	GRY	Brake fluid level switch	
E210	BLK	Hood latch switch	If equipped
E221	BLK	Main relay	
E222	BLK	Radiator cooling fan relay	
E225	BLK	Starting motor relay	
E227	BLK	Fuel pump relay	
E229	BLK	A/C compressor relay	
E234	BLK	Front fog light relay	
E263	BLK	Back-up light relay	AMT model
E281	BLK	Horn	
E282	BLK	Horn	
E304	GRY	Security horn (Siren)	if equipped
E311	BRN	Main fuse box	
E312	GRY	Main fuse box	
E371	N	Engine harness (To C343)	

Instrument Panel

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E: Main Harness

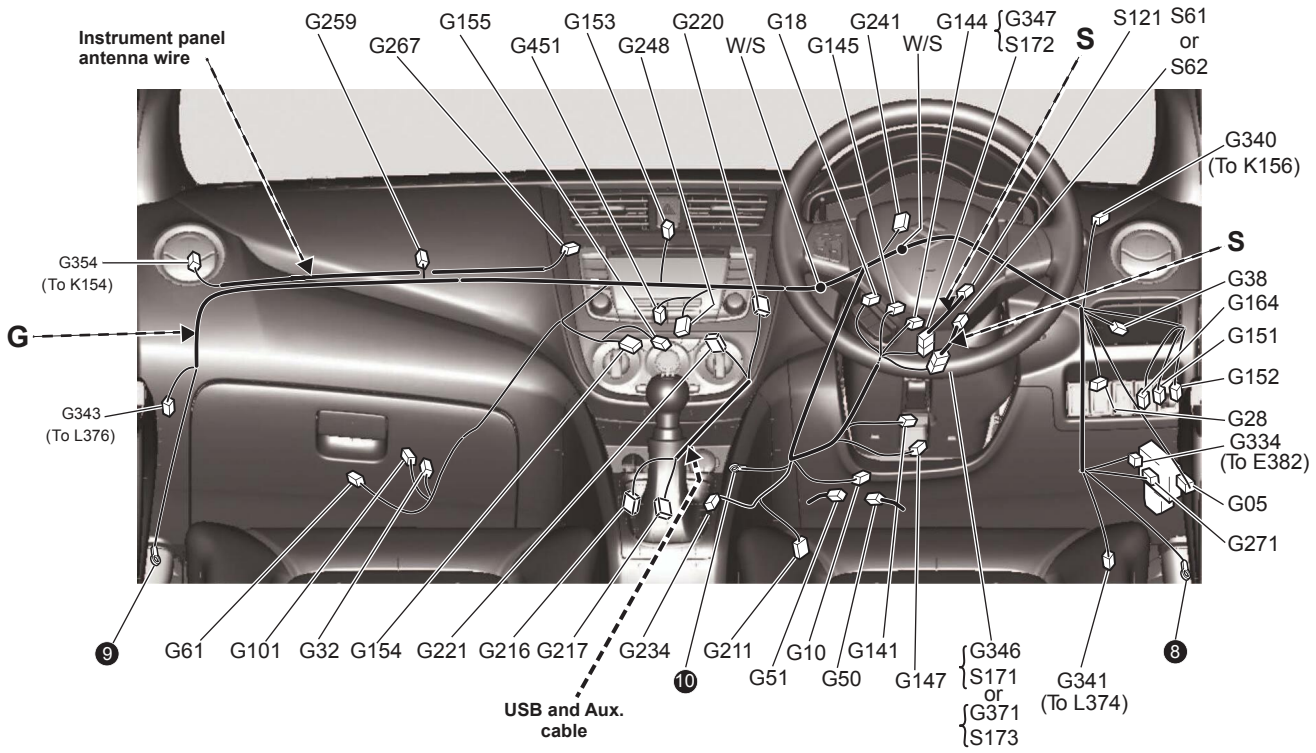


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E: Main harness

No.	Color	Connective position	Remarks
E05	GRY	BCM (Included in junction block)	
E181	N	Brake light switch	
E190	BLK	CPP (Clutch pedal position) switch	M/T model
E191	BLK	APP (Acceleration pedal position) sensor	
E323	N	J/B	
E324	N	J/B	
E382	BLK	Instrument panel harness (To G334)	
E387	BLU	Floor harness (To L371)	
E388	YEL	Floor harness (To L372)	

G: Instrument Panel Harness, Instrument Panel Antenna Wire, USB & AUX. cable / S: Contact Coil



IDL70A910905-15

G: Instrument panel harness

No.	Color	Connective position	Remarks
G05	N	BCM	
G10	N	P/S control module	
G18	-	Immobilizer control module	
G28	GRY	Security control module	Optional
G32	N	Evaporator temperature sensor	
G38	-	Shock sensor	If equipped
G50	GRN	P/S control module	
G51	BLK	P/S control module	
G61	N	Blower motor	
G101	N	Blower motor resistor	
G141	BLK	Combination switch (wiper)	
G144	N	Combination switch (lamp)	
G145	N	Main switch (key)	
G147	N	Ignition switch	
G151	GRN	Front fog light switch	If equipped
G152	BLK	Headlight leveling switch	
G153	N	Hazard switch	
G154	-	HVAC control unit	
G155	BRN	Blower speed selector	
G164	BLU	Valet switch (security switch)	Optional
G211	BLK	DLC	
G234	BLK	Accessory socket	
G241	-	Combination meter	
G248	BLU	Audio	If equipped
G259	BLK	Passenger inflator	Airbag model
G271	N	J/B	
G334	BLK	Main harness (To E382)	
G340	-	Roof harness (To K156)	
G341	GRY	Floor harness (To L374)	
G343	YEL	Floor harness (To L376)	
G346	N	Contact coil (To S171)	Airbag model

No.	Color	Connective position	Remarks
G347	YEL	Contact coil (To S172)	Airbag model
G371	-	Contact coil (To S173)	without Airbag model
G451	GRY	MIC connector (Audio)	with bluetooth

G: Instrument panel audio antenna wire

No.	Color	Connective position	Remarks
G267	BLK	Audio	
G354	BLK	Roof audio antenna wire (To K154)	

G: USB and Aux. cable

No.	Color	Connective position	Remarks
G216	—	USB connector	If equipped
G217	—	Aux. connector	If equipped
G220	—	Audio (Aux. connector)	If equipped
G221	—	Audio (USB connector)	If equipped

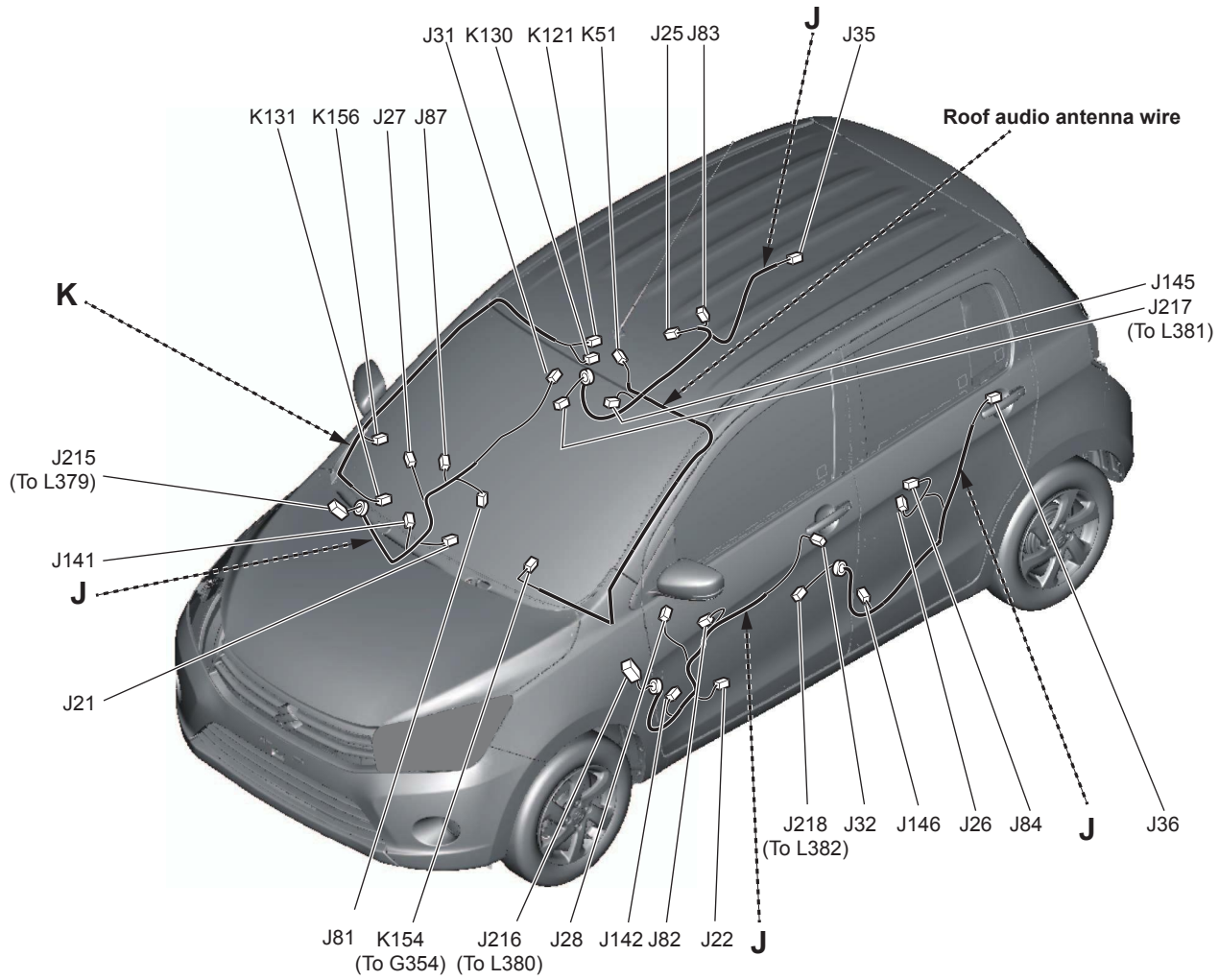
S: Contact coil

No.	Color	Connective position	Remarks
S61	—	Steering switch (Horn, Microphone, Audio control)	Airbag model
S62	—	Steering switch (Horn)	
S121	—	Driver inflator	Airbag model
S171	—	Instrument panel harness (To G346)	Airbag model
S172	—	Instrument panel harness (To G347)	Airbag model
S173	—	Instrument panel harness (To G371)	

Door, Roof

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J: Front and Rear Door Wire and Rear Door Wire / K: Roof Wire, Roof Audio Antenna Wire



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J: Door wire (Driver side)

No.	Color	Connective position	Remarks
J21	BLK	Front power window motor (R) (Driver side)	
J27	N	Power mirror assembly (Driver side)	If equipped
J31	BLK	Front door lock motor (R) (Driver side)	
J81	BLK	Power window main switch	
J87	—	Power mirror switch	If equipped
J141	N	Front speaker (R)	
J215	N	Floor harness (To L379)	

J: Door wire (Passenger side)

No.	Color	Connective position	Remarks
J22	BLK	Front power window motor (L) (Passenger side)	
J28	N	Power mirror assembly (Passenger side)	If equipped
J32	GRY	Front door lock motor (L) (Passenger side)	
J82	N	Power window sub switch	
J142	N	Front speaker (L)	
J216	N	Floor harness (To L380)	

J: Rear door wire

No.	Color	Connective position	Remarks
J25	BLK	Rear power window motor (R)	
J26	BLK	Rear power window motor (L)	

No.	Color	Connective position	Remarks
J35	GRY	Rear door lock motor (R)	
J36	GRY	Rear door lock motor (L)	
J83	N	Rear power window sub switch (R)	
J84	N	Rear power window sub switch (L)	
J145	BLK	Rear speaker (R)	
J146	BLK	Rear speaker (L)	
J217	N	Floor harness (To L381)	
J218	N	Floor harness (To L382)	

K: Roof wire

No.	Color	Connective position	Remarks
K51	N	Interior light	
K130	—	Microphone (MIC unit)	with bluetooth
K131	N	J/B	
K156	N	Instrument panel harness (To G340)	with bluetooth

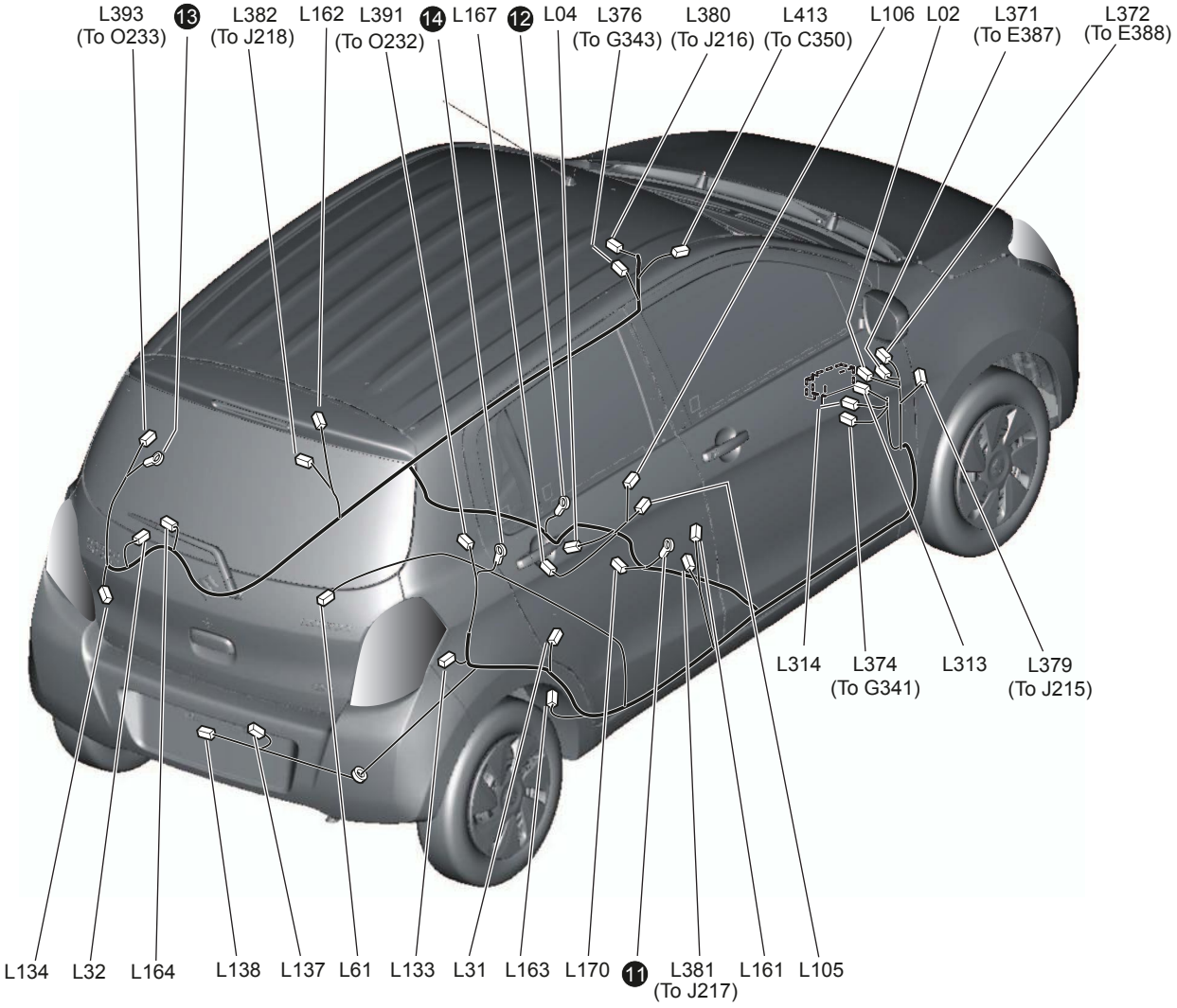
K: Roof audio antenna wire

No.	Color	Connective position	Remarks
K121	—	Roof audio antenna amplifier	
K154	—	Instrument panel antenna wire (To G354)	

Floor

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L: Floor Harness



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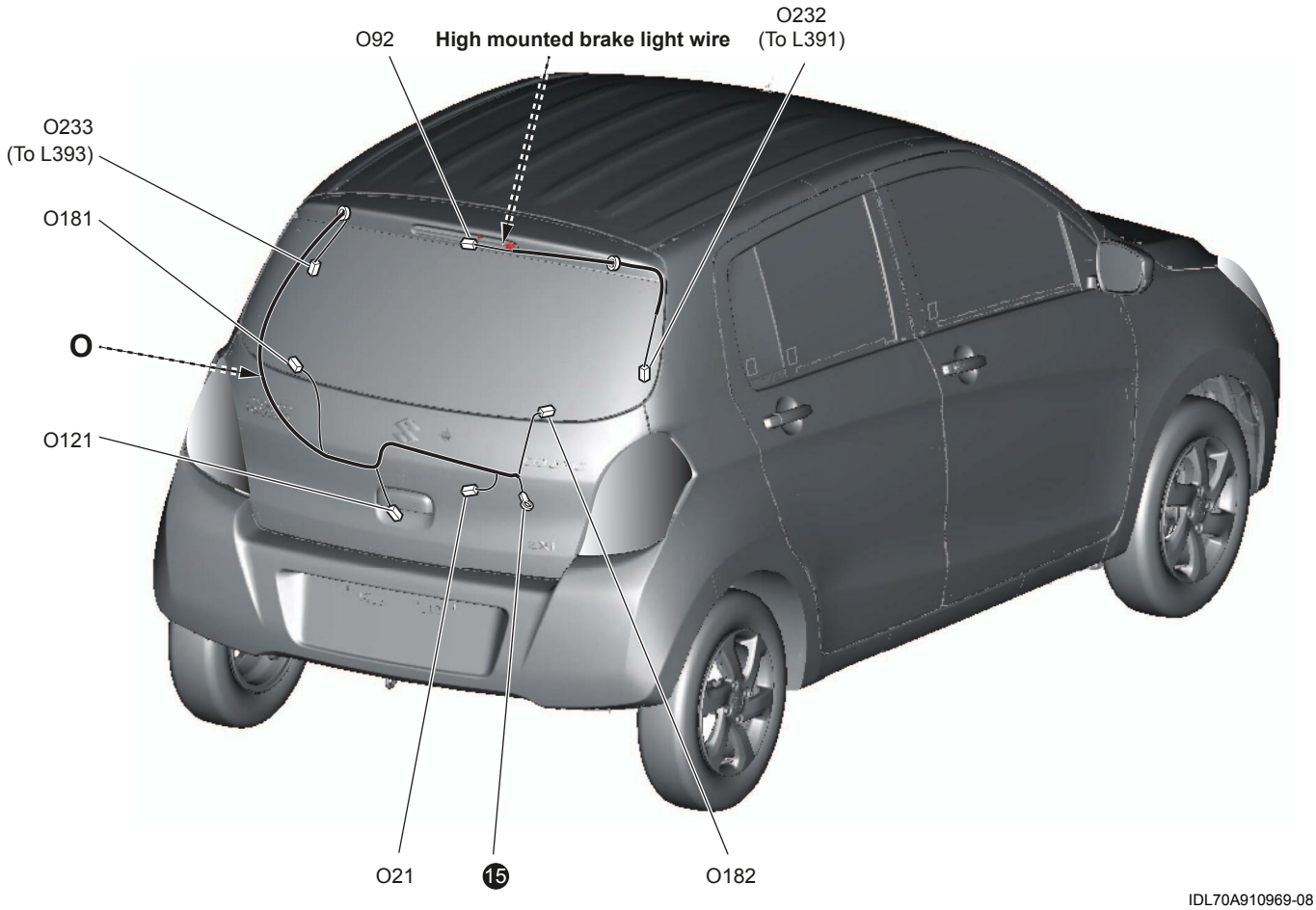
L: Floor harness

No.	Color	Connective position	Remarks
L02	GRY	BCM (Included in junction block)	
L04	YEL	A/B SDM	Airbag model
L31	N	Wheel speed sensor (Rear-right)	ABS model
L32	N	Wheel speed sensor (Rear-left)	ABS model
L61	BLK	Fuel pump and gauge	
L105	-	AMT shift selector No.1	AMT model
L106	-	AMT shift selector No.2	AMT model
L133	N	Rear combination light (R)	
L134	N	Rear combination light (L)	
L137	N	License plate light No.1	
L138	N	License plate light No.2	
L161	N	Front door switch (Driver side)	
L162	N	Front door switch (Passenger side)	
L163	N	Rear door switch (R)	
L164	N	Rear door switch (L)	
L167	BLK	Parking brake switch	
L170	N	Seat belt switch (Driver side)	
L313	YEL	J/B	Airbag model
L314	N	J/B	
L371	BLU	Main harness (To E387)	
L372	YEL	Main harness (To E388)	
L374	GRY	Instrument panel harness (To G341)	
L376	YEL	Instrument panel harness (To G343)	
L379	N	Door harness (Driver side) (To J215)	
L380	N	Door harness (Passenger side) (To J216)	
L381	N	Rear door wire (R) (To J217)	
L382	N	Rear door wire (L) (To J218)	
L391	N	Rear end door harness (To O232)	
L393	N	Rear end door harness (To O233)	
L413	-	Engine harness (To C350)	

Rear

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O: Rear End Door Harness, High Mounted Brake Light Wire



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O: Rear end door harness

No.	Color	Connective position	Remarks
O21	N	Rear wiper motor	If equipped
O121	-	Rear end door solenoid	
O181	BLK	Rear defogger (+)	If equipped
O182	BLK	Rear defogger (–)	If equipped
O233	N	Floor harness (To L393)	

O: High mounted brake light wire

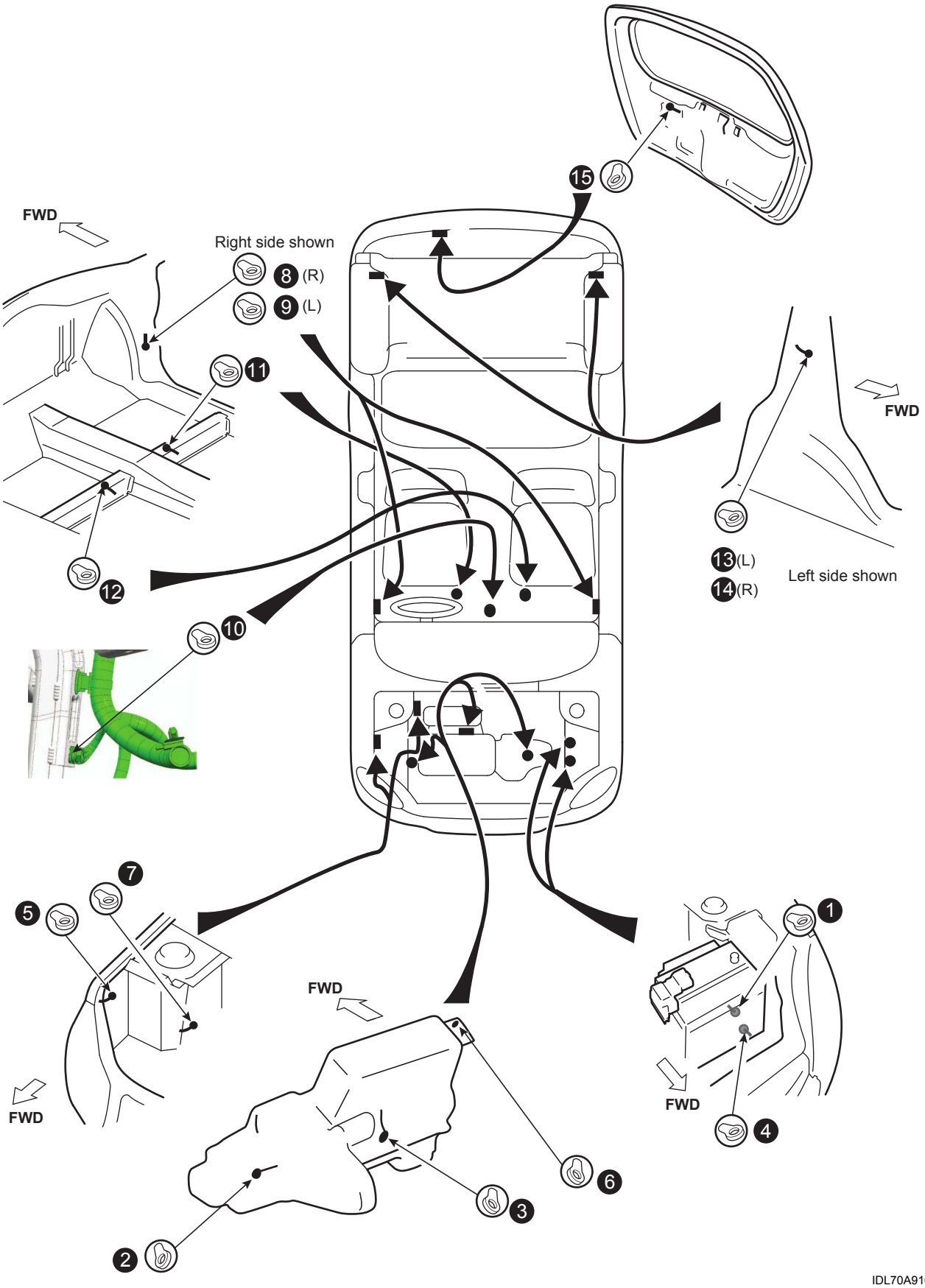
No.	Color	Connective position	Remarks
O92	N	High mounted brake light	
O232	N	Floor harness (To L391)	

Ground Point

Ground (Earth) Point

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Refer to “Connector Layout Diagram” (Page 9A-8).

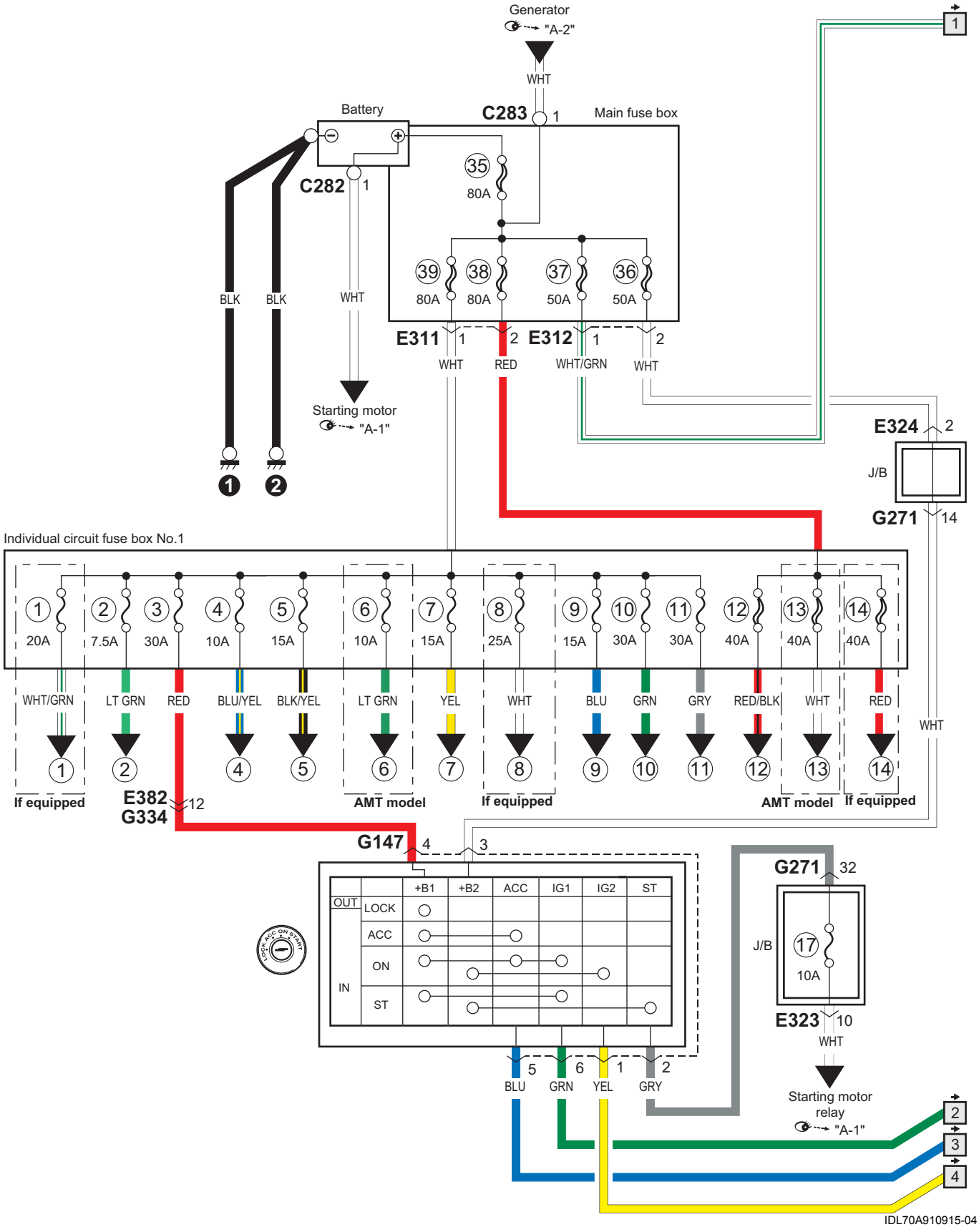


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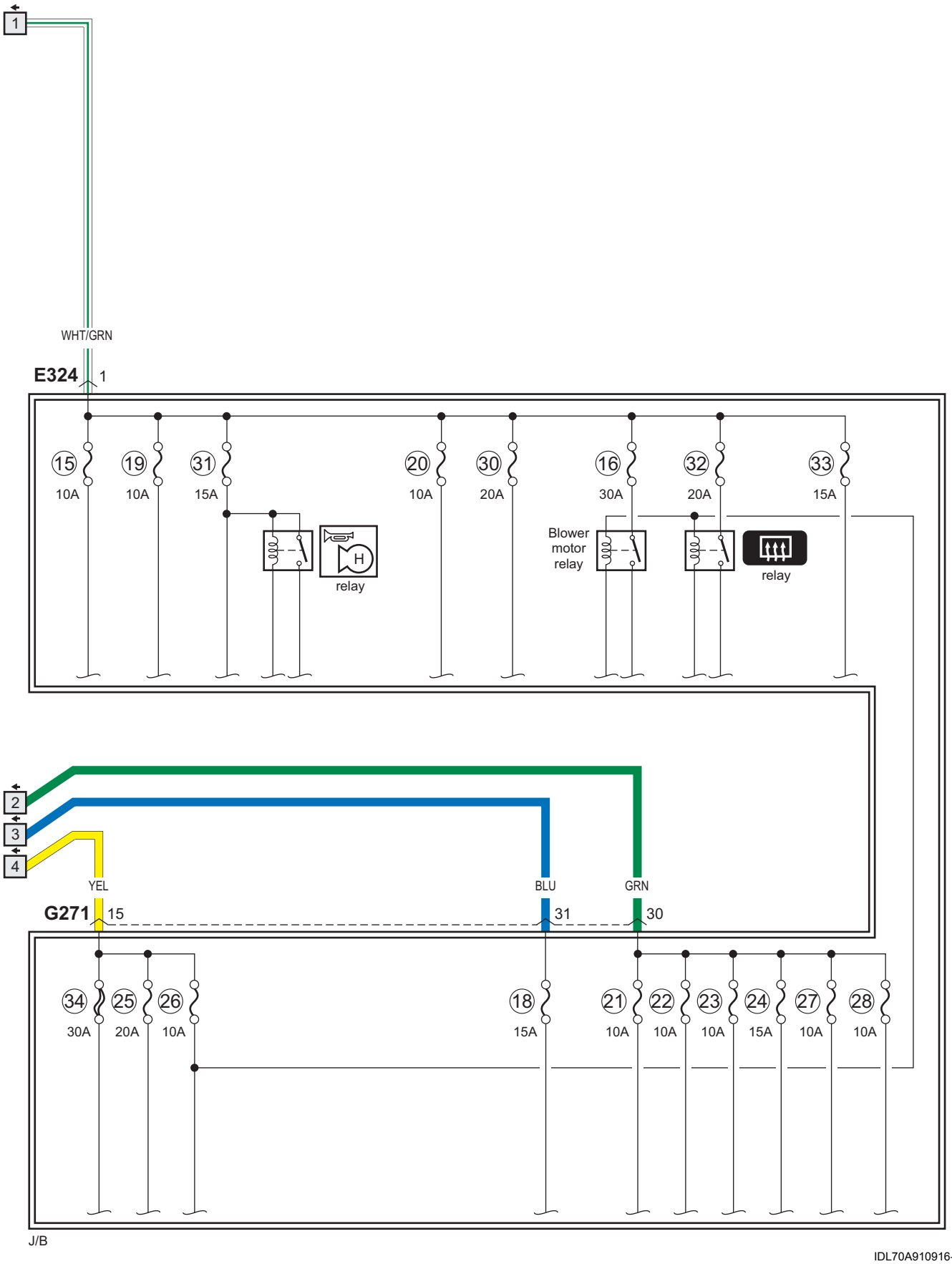
Power Supply Diagram

Power Supply Diagram

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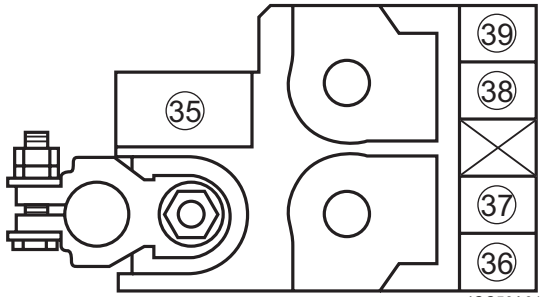
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Fuses and the Protected Parts

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The chart below describes what parts each fuse protects.

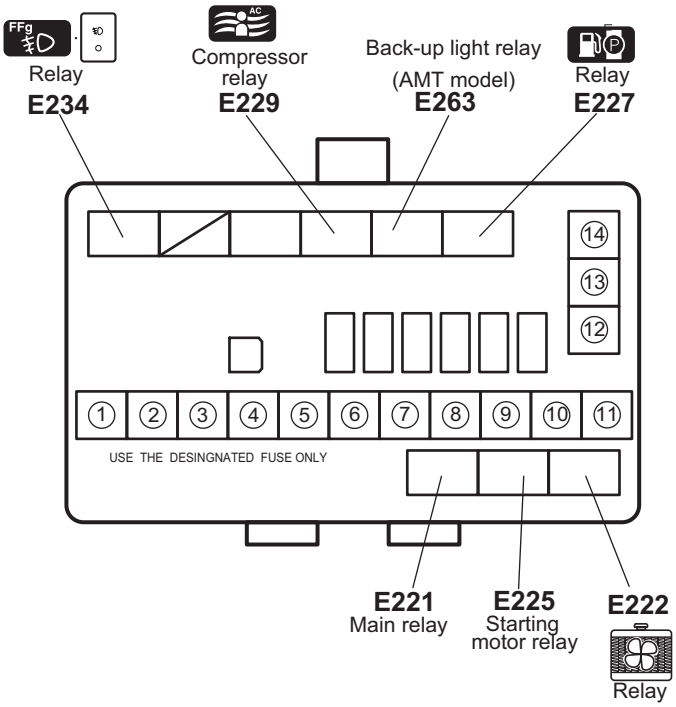
Fuses in Main Fuse Box



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No.	Fuse	Protected circuit
㉟	80 A	All electric circuit
		Battery
		Generator
㊱	50 A	Individual circuit fuse box No.2 (In J/B)
㊲	50 A	Individual circuit fuse box No.2 (In J/B)
㊳	80 A	Individual circuit fuse box No.1
㊴	80 A	Individual circuit fuse box No.1

Individual Circuit Fuse Box No. 1

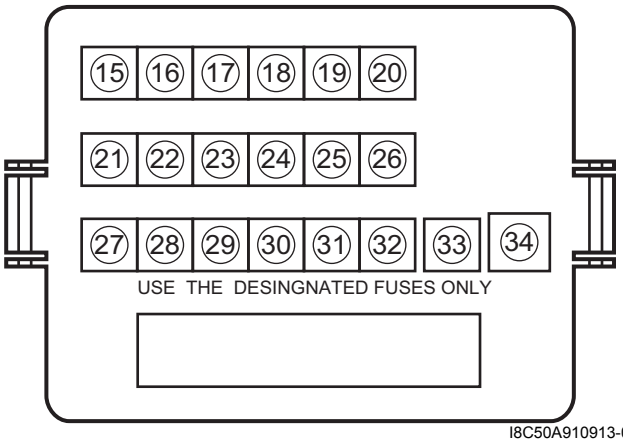


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No.	Fuse	Description on the cover	Protected circuit
①	20 A	FR FOG	Front fog light relay
②	7.5 A	T/M2	AMT shift selector no. 1
③	30 A	IGN	Ignition switch
④	10 A	CPRSR	A/C compressor relay
⑤	15 A	FI	Main relay
⑥	10 A	T/M	AMT control module
⑦	15 A	H/L R	Headlight (R)
⑧	25 A	ABS SOL	ABS control module
⑨	15 A	H/L L	Headlight (L)
⑩	30 A	ST	Starting motor relay
⑪	30 A	RDTR	Radiator cooling fan relay
⑫	40 A	P/S	P/S control module
⑬	40 A	T/M PUMP	AMT control module

No.	Fuse	Description on the cover	Protected circuit
⑭	40 A	ABS MOT	ABS control module

Individual Circuit Fuse Box No. 2 (In J/B)



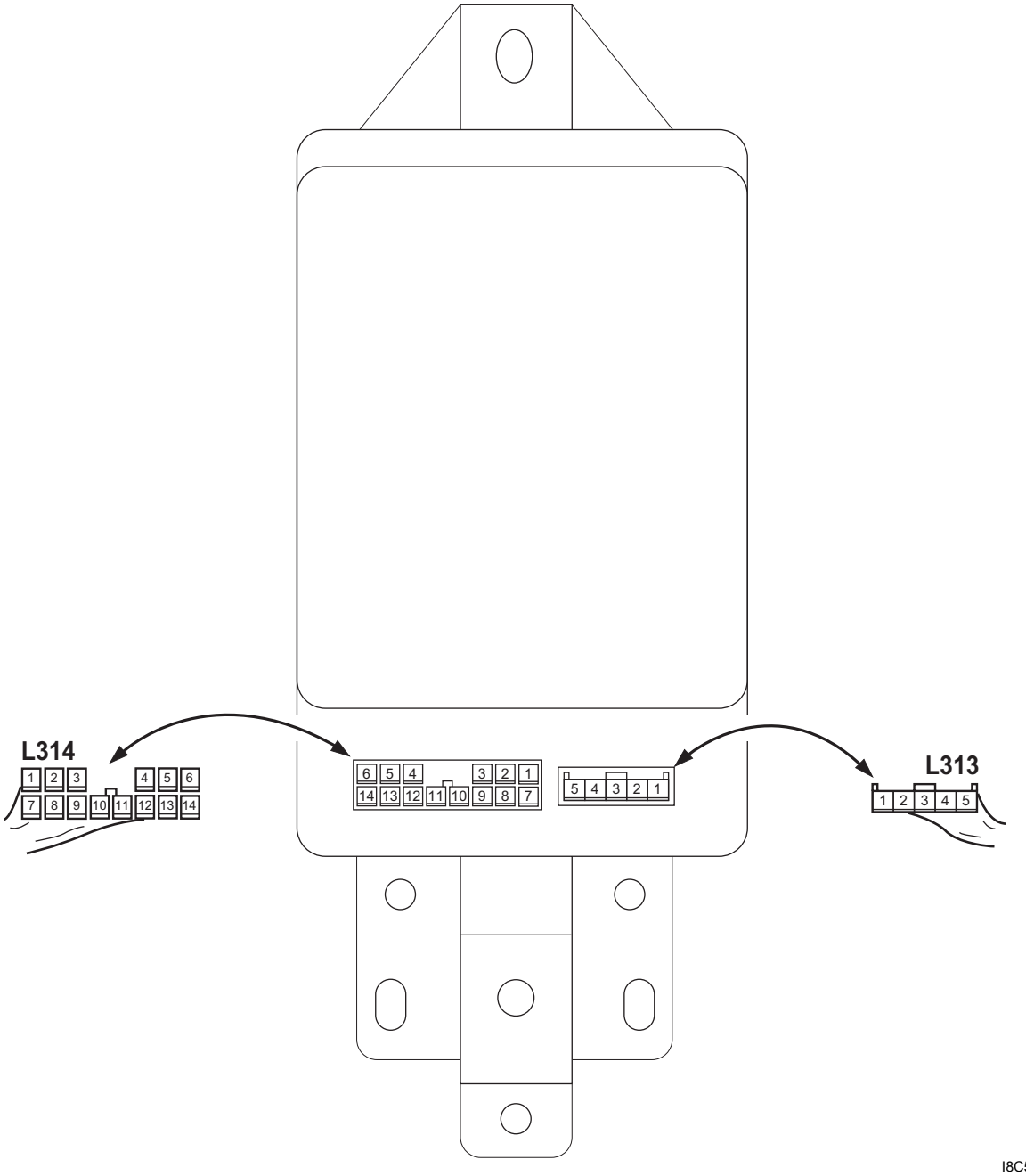
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No.	Fuse	Description on the cover	Protected circuit
⑮	10 A	STOP	Brake light switch
⑯	30 A	BLW	Blower motor relay
⑰	10 A	ST SIG	Starting motor relay
⑱	15 A	ACC	Accessory socket
⑲	BLANK	BLANK	BLANK
⑳	10 A	TAIL	Combination switch lamp
㉑	10 A	BACK	Back-up lamp relay
			HVAC control unit
㉒	10 A	ABS	ABS control module
㉓	10 A	MTR	Combination meter
㉔	15 A	IG COIL	Ignition coil No.1
			Ignition coil No.2
			Ignition coil No.3
㉕	20 A	WIP	Combination switch wiper
			Windshield washer motor
			Windshield wiper motor
			Rear washer motor
			Rear wiper motor
㉖	10 A	IG2 SIG	Rear defogger relay
			Blower motor relay
㉗	10 A	IG1 SIG	AMT control module
			Power steering control module
㉘	10 A	A/B	A/B SDM
㉙	BLANK	BLANK	BLANK
㉚	20 A	D/L	BCM (Included in junction block)
㉛	15 A	HORN-HAZ	Horn relay
			BCM (Included in junction block)
㉜	20 A	RR DEF	Rear defogger relay
			HVAC control unit
㉝	15 A	DOME	Audio
			DLC
			TCM
			BCM main (Included in junction block)
			Interior light
㉞	30 A	P/W	Power window main switch
			Power window sub switch

Junction Block (J/B) Connector / Fuse Layout

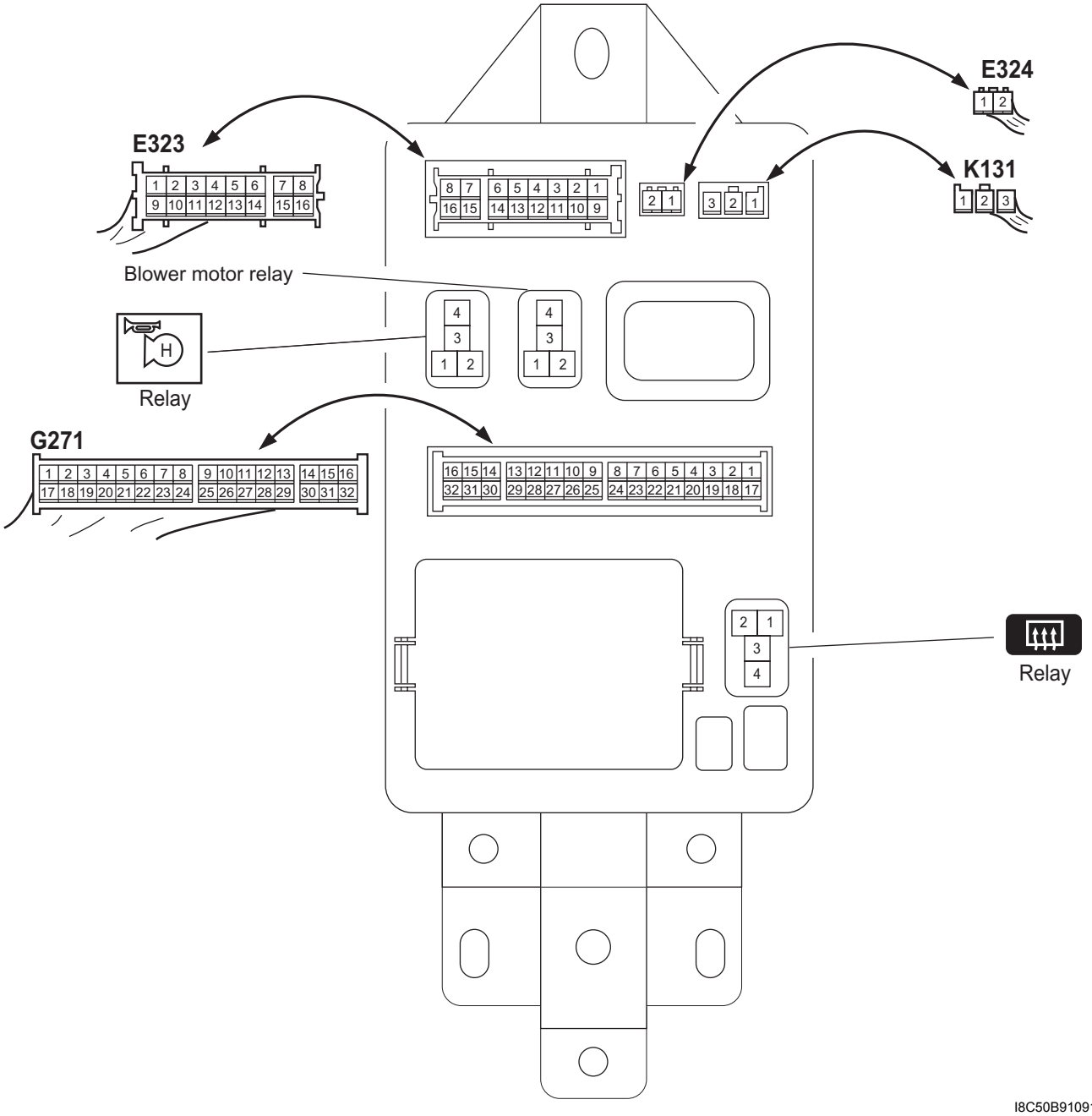
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Controller Side



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Relay Side



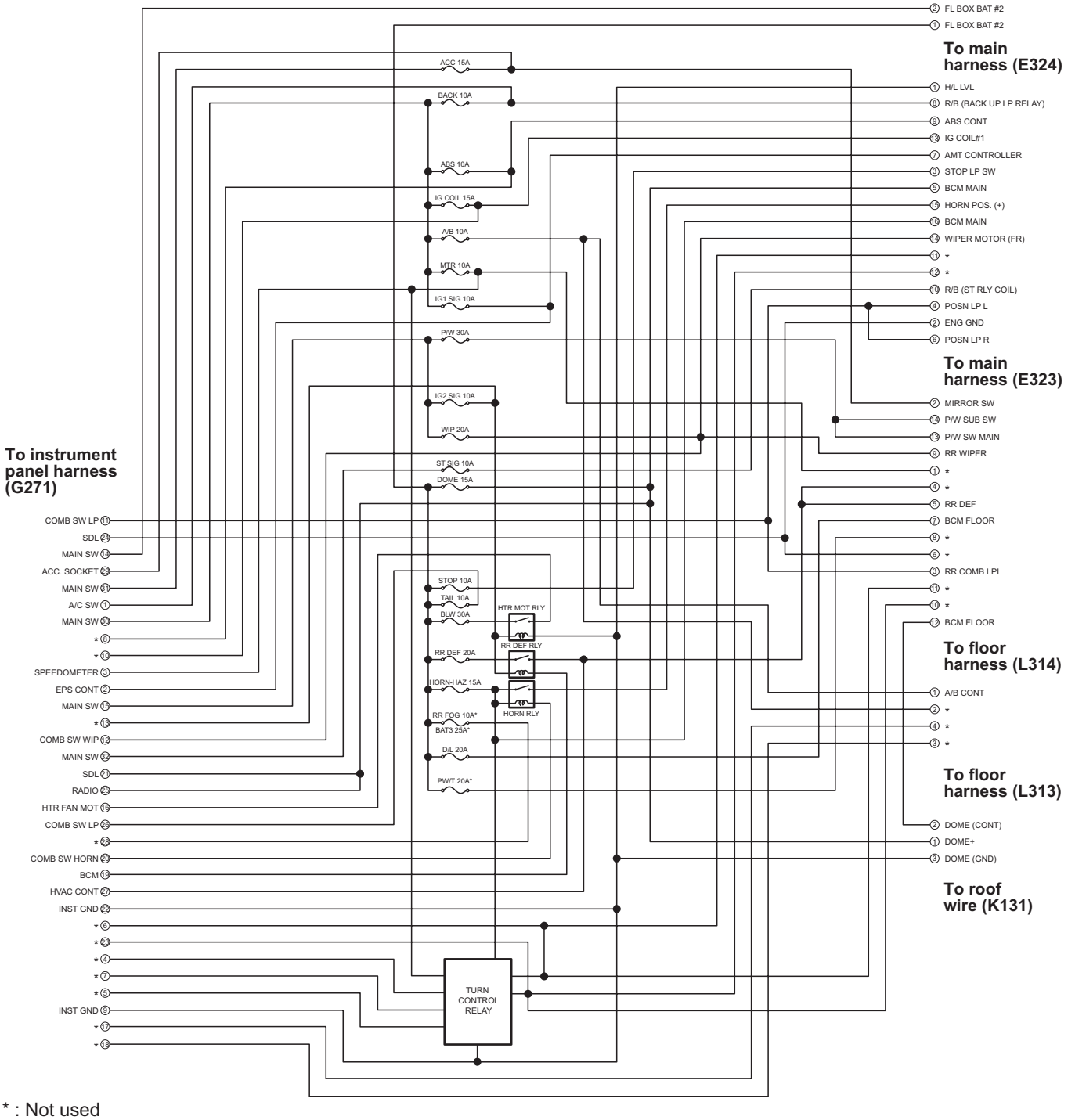
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Junction Block Inner Circuit (Overview)

AENDL70A910D004

Abbreviations

Abbreviation	Full spelling	Abbreviation	Full spelling
AS	Assistant (Front passenger)	LP	Lamp
CTR	Center	O/H	Over head
DR	Driver	R/B	Relay box
F-L	Front Left	R-L	Rear Left
F-R	Front Right	R-R	Rear Right
FR	Front	RR	Rear
INP	Instrument panel	S/H	Seat heater
LEV	(Headlight) leveling		

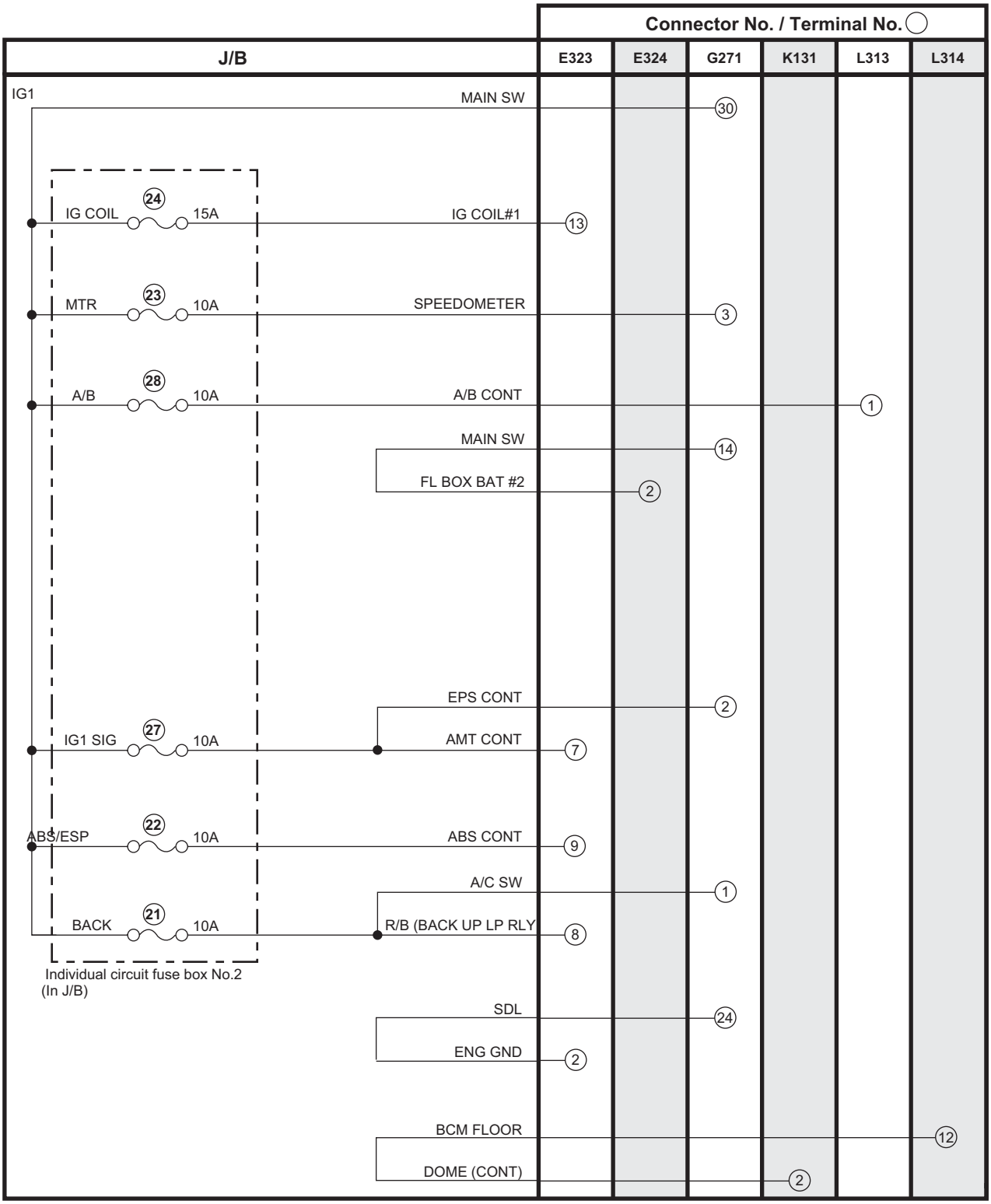


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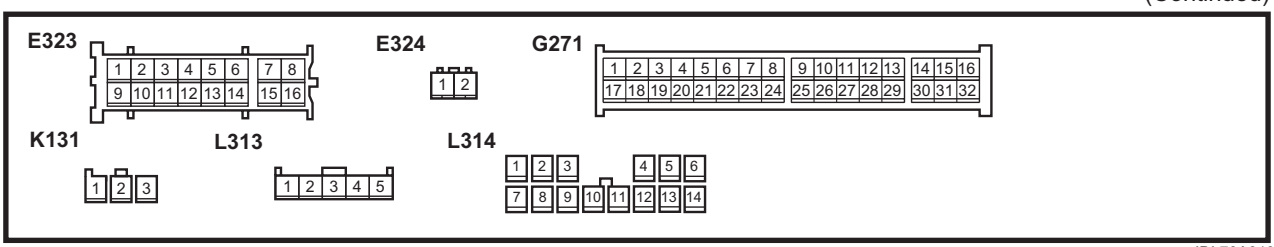
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Junction Block Inner Circuit (Detail)

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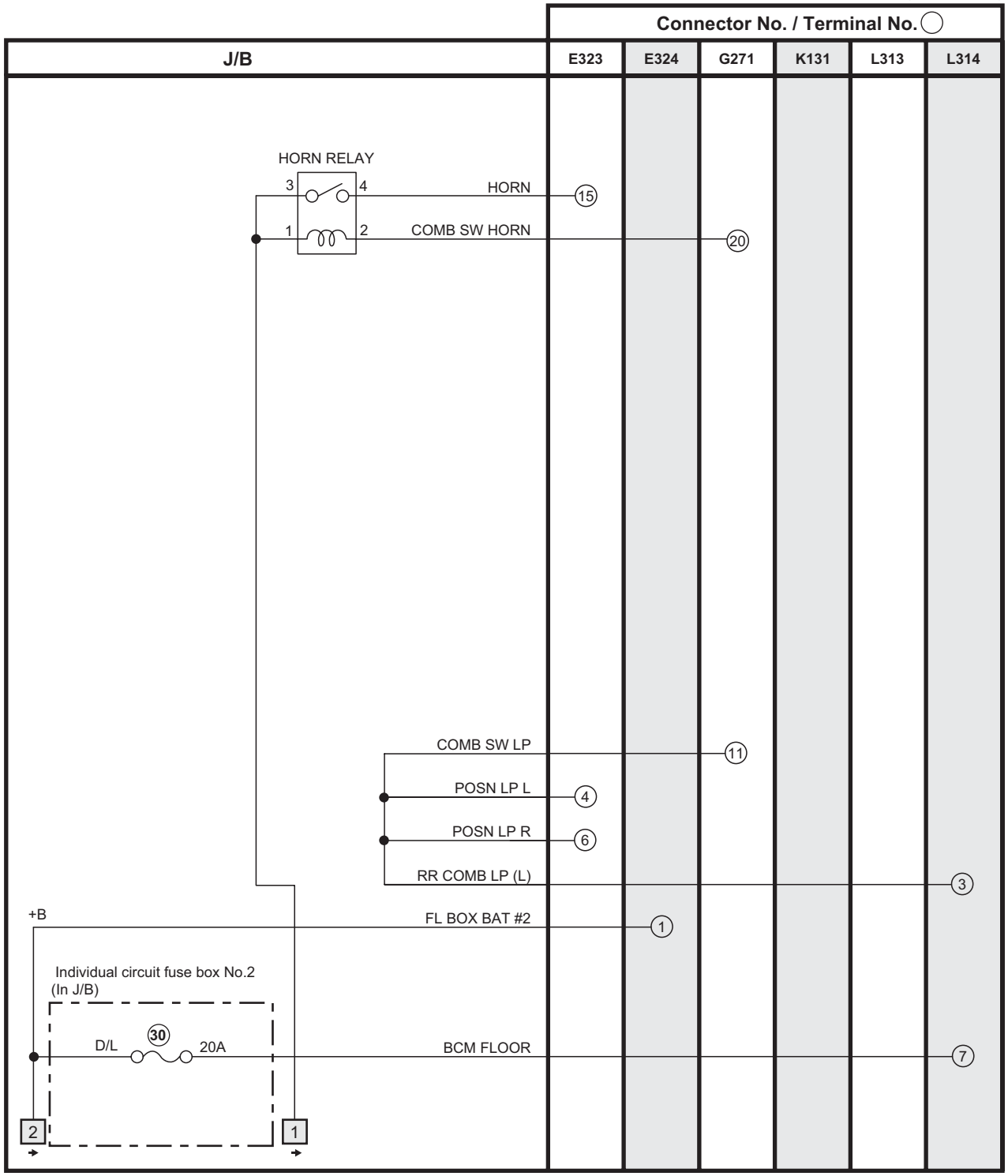


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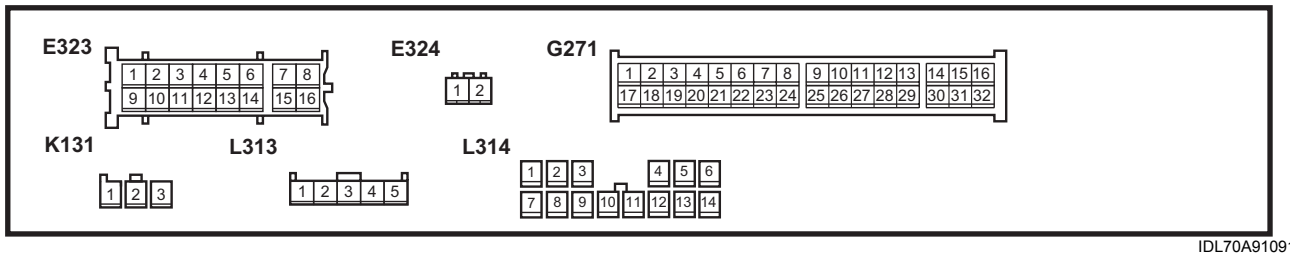


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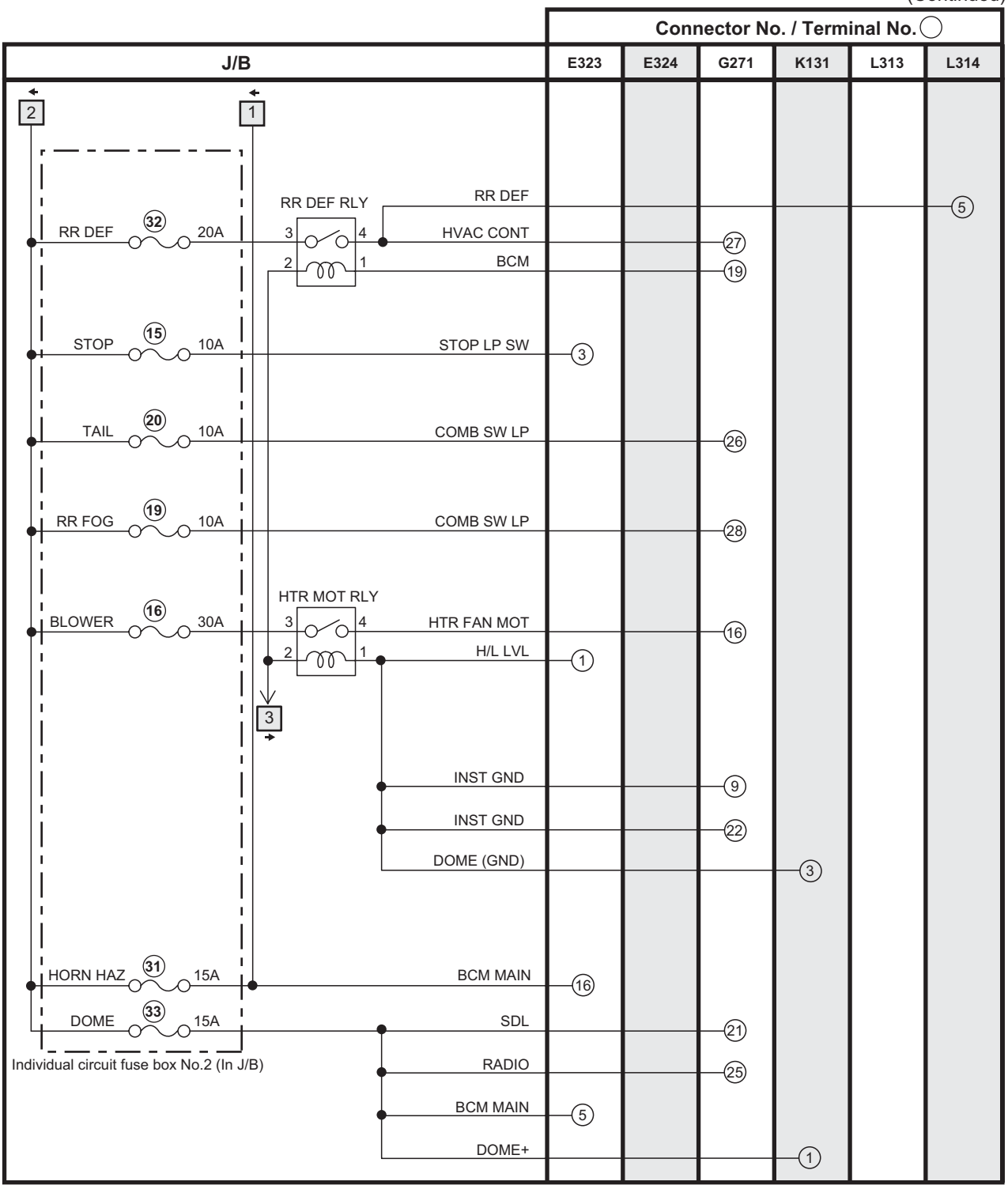


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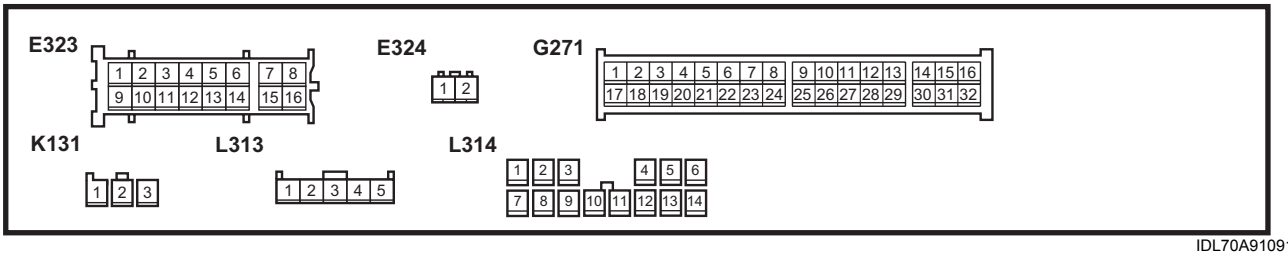


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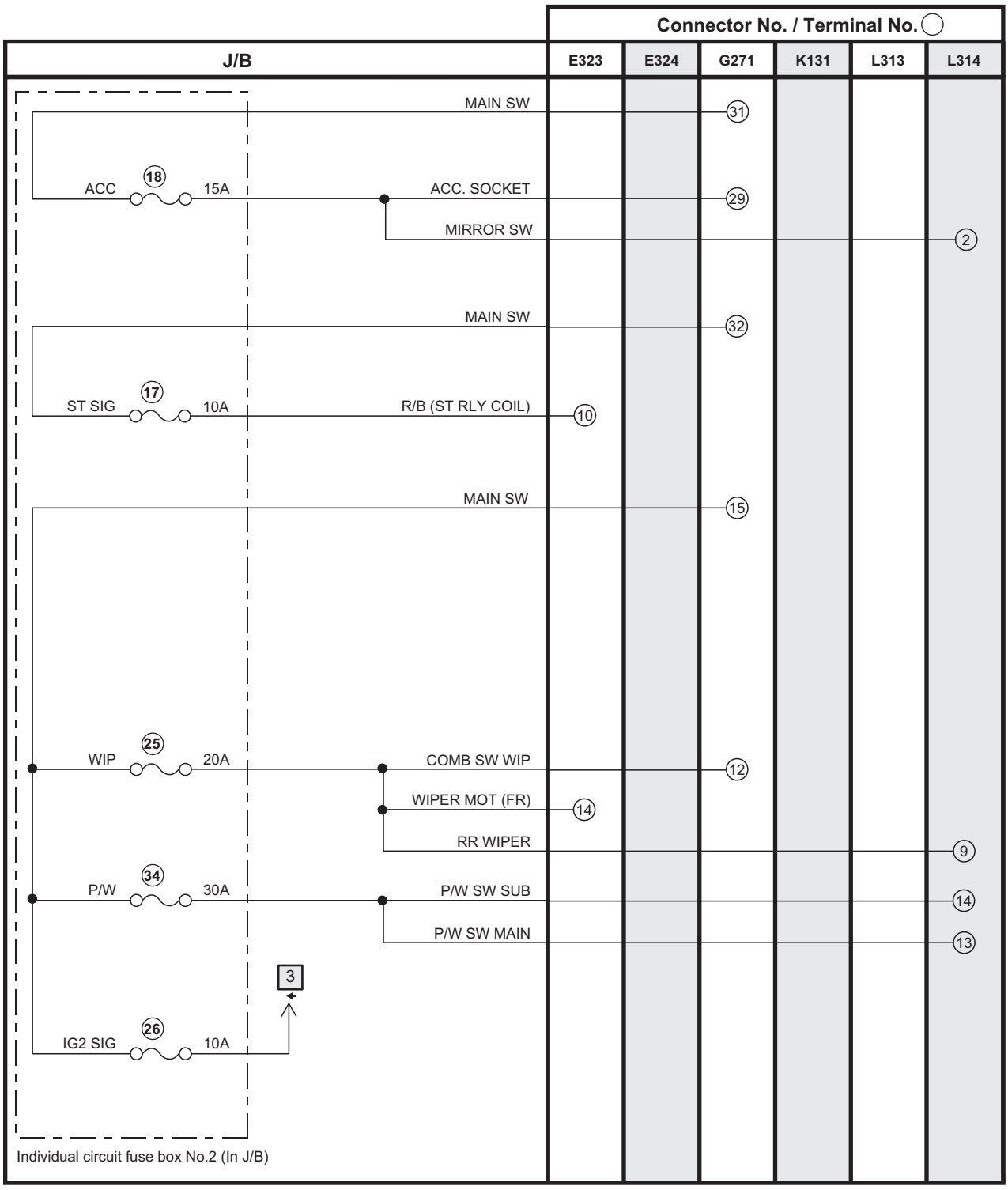


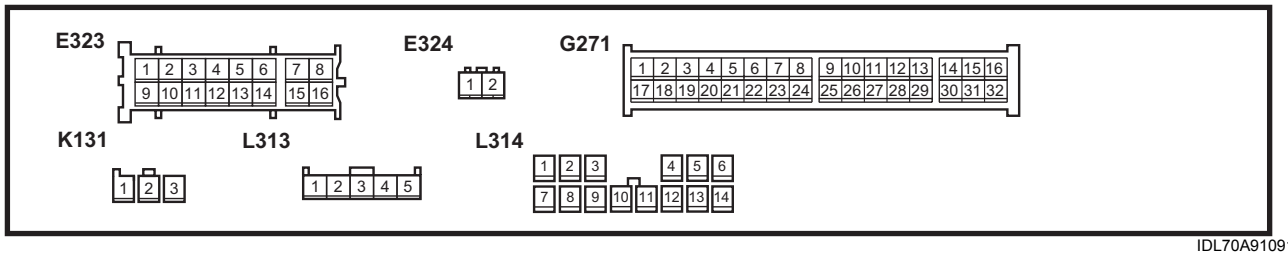
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System Circuit Diagram

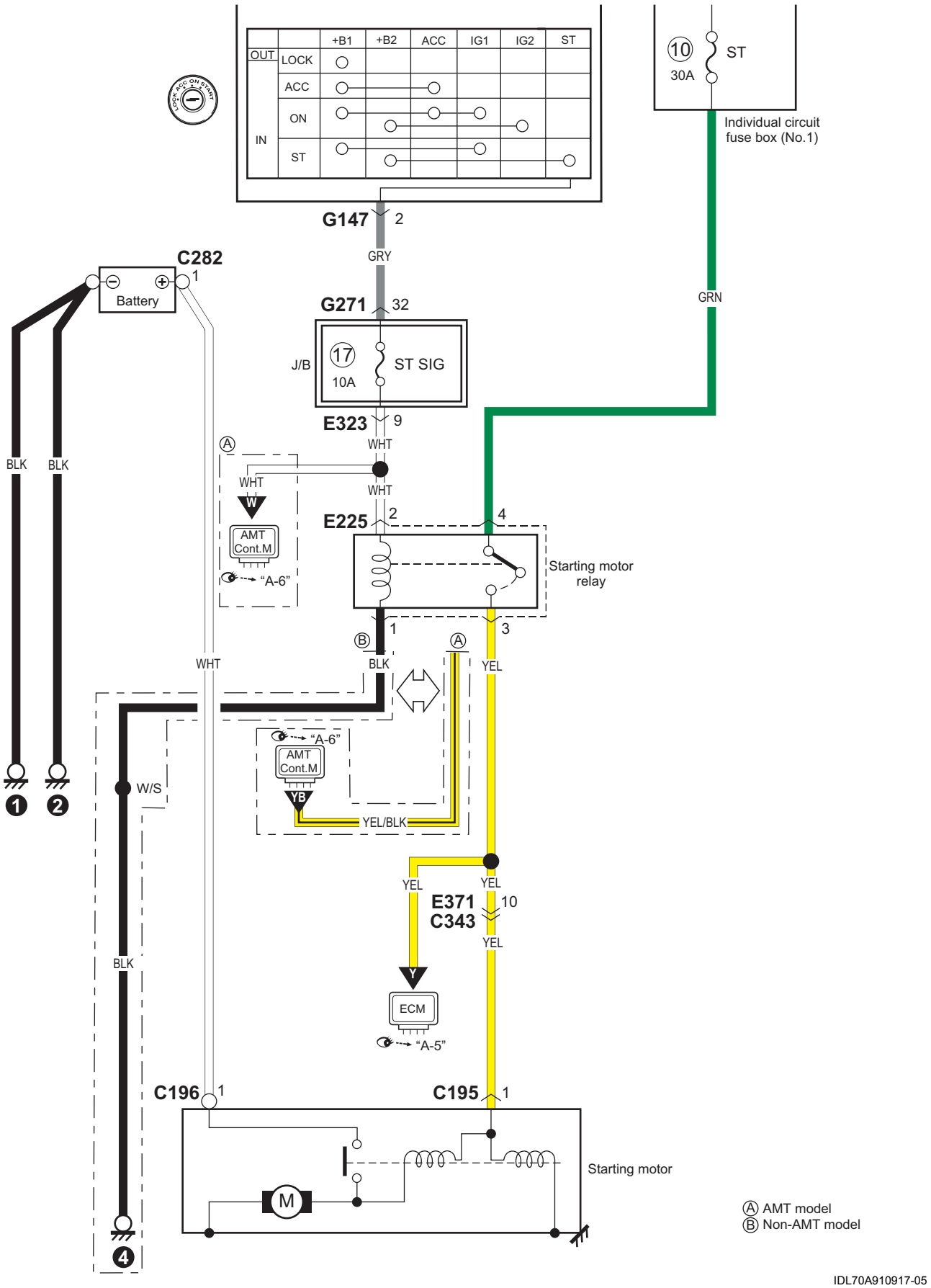
System Circuit Diagram

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Refer to “A-1 Cranking System Circuit Diagram” (Page 9A-32).
Refer to “A-2 Charging System Circuit Diagram” (Page 9A-33).
Refer to “A-3 Ignition System Circuit Diagram” (Page 9A-34).
Refer to “A-4 Cooling System Circuit Diagram” (Page 9A-35).
Refer to “A-5 Engine and A/C Control System Circuit Diagram” (Page 9A-36).
Refer to “A-6 AMT Control System Circuit Diagram” (Page 9A-40).
Refer to “A-8 Body Control System Circuit Diagram” (Page 9A-42).
Refer to “A-9 CAN Circuit Diagram” (Page 9A-46).
Refer to “A-10 Security Control System Circuit Diagram” (Page 9A-47).
Refer to “B-1 Windshield Wiper and Washer Circuit Diagram” (Page 9A-49).
Refer to “B-2 Rear Wiper and Washer Circuit Diagram” (Page 9A-50).
Refer to “B-3 Rear Defogger Circuit Diagram” (Page 9A-51).
Refer to “B-4 Power Window Circuit Diagram” (Page 9A-52).
Refer to “B-5 Power Door Lock Circuit Diagram” (Page 9A-54).
Refer to “B-6 Power Mirror Circuit Diagram” (Page 9A-56).
Refer to “B-7 Horn Circuit Diagram” (Page 9A-57).
Refer to “C-1 Combination Meter Circuit Diagram” (Page 9A-58).
Refer to “D-1 Headlight System Circuit Diagram” (Page 9A-60).
Refer to “D-2 Clearance, Tail and Licence Plate Light System Circuit Diagram” (Page 9A-61).
Refer to “D-3 Front Fog Light System Circuit Diagram” (Page 9A-62).
Refer to “D-4 Illumination Light System Circuit Diagram” (Page 9A-63).
Refer to “D-5 Interior Light System Circuit Diagram” (Page 9A-64).
Refer to “D-6 Turn Signal and Hazard Warning Light System Circuit Diagram” (Page 9A-65).
Refer to “D-7 Brake Light System Circuit Diagram” (Page 9A-67).
Refer to “D-8 Back-Up Light System Circuit Diagram” (Page 9A-68).
Refer to “D-9 Headlight Beam Leveling System Circuit Diagram” (Page 9A-69).
Refer to “E-1 Heater System Circuit Diagram” (Page 9A-70).
Refer to “F-1 Air Bag System Circuit Diagram” (Page 9A-72).
Refer to “F-2 Anti-Lock Brake System Circuit Diagram” (Page 9A-73).
Refer to “F-4 Power Steering System Circuit Diagram” (Page 9A-75).
Refer to “G-1 Audio System Circuit Diagram” (Page 9A-76).
Refer to “G-2 Accessory Socket System Circuit Diagram” (Page 9A-78).

A-1 Cranking System Circuit Diagram

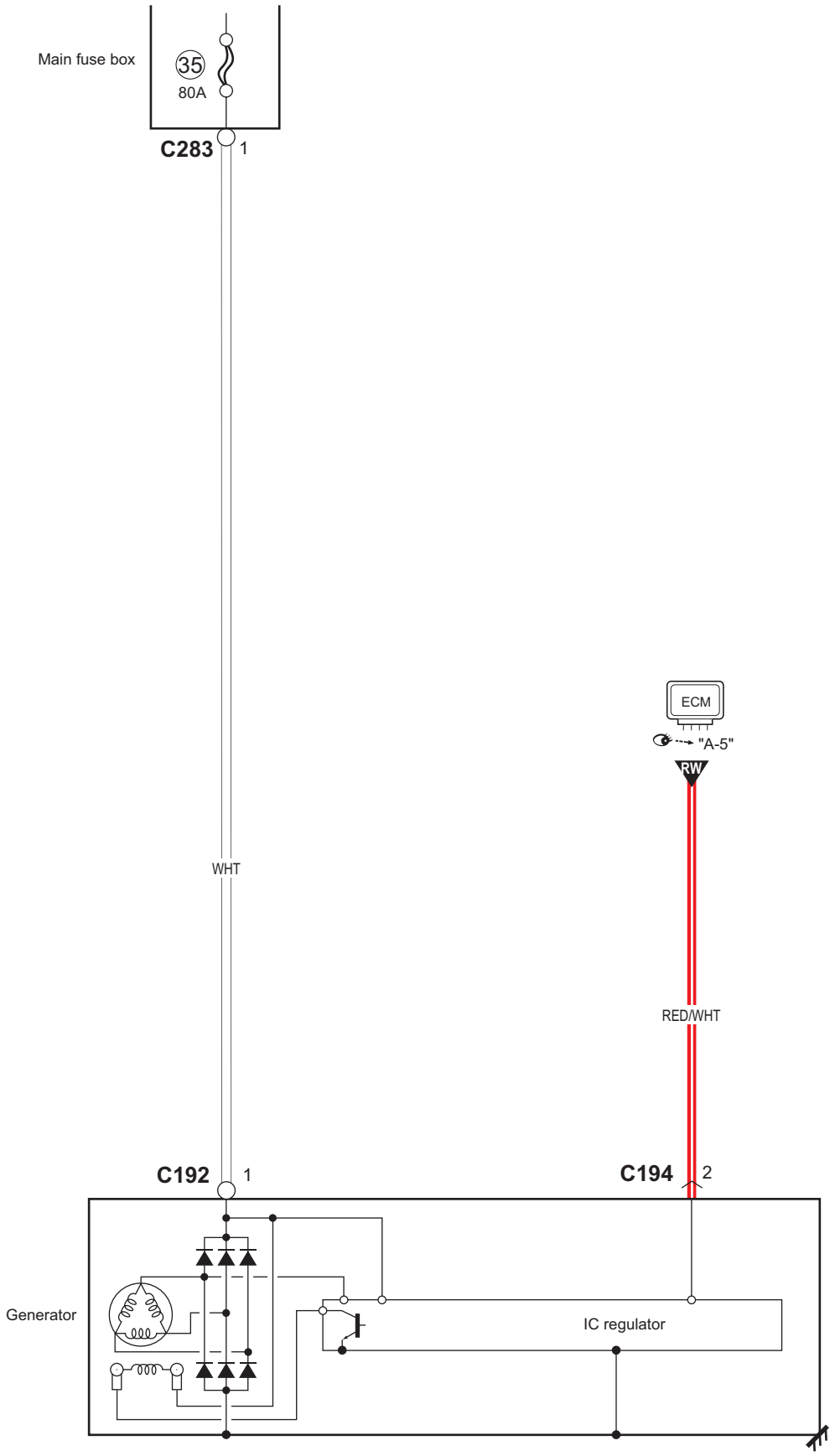
AENDL70A910E002



IDL70A910917-05

A-2 Charging System Circuit Diagram

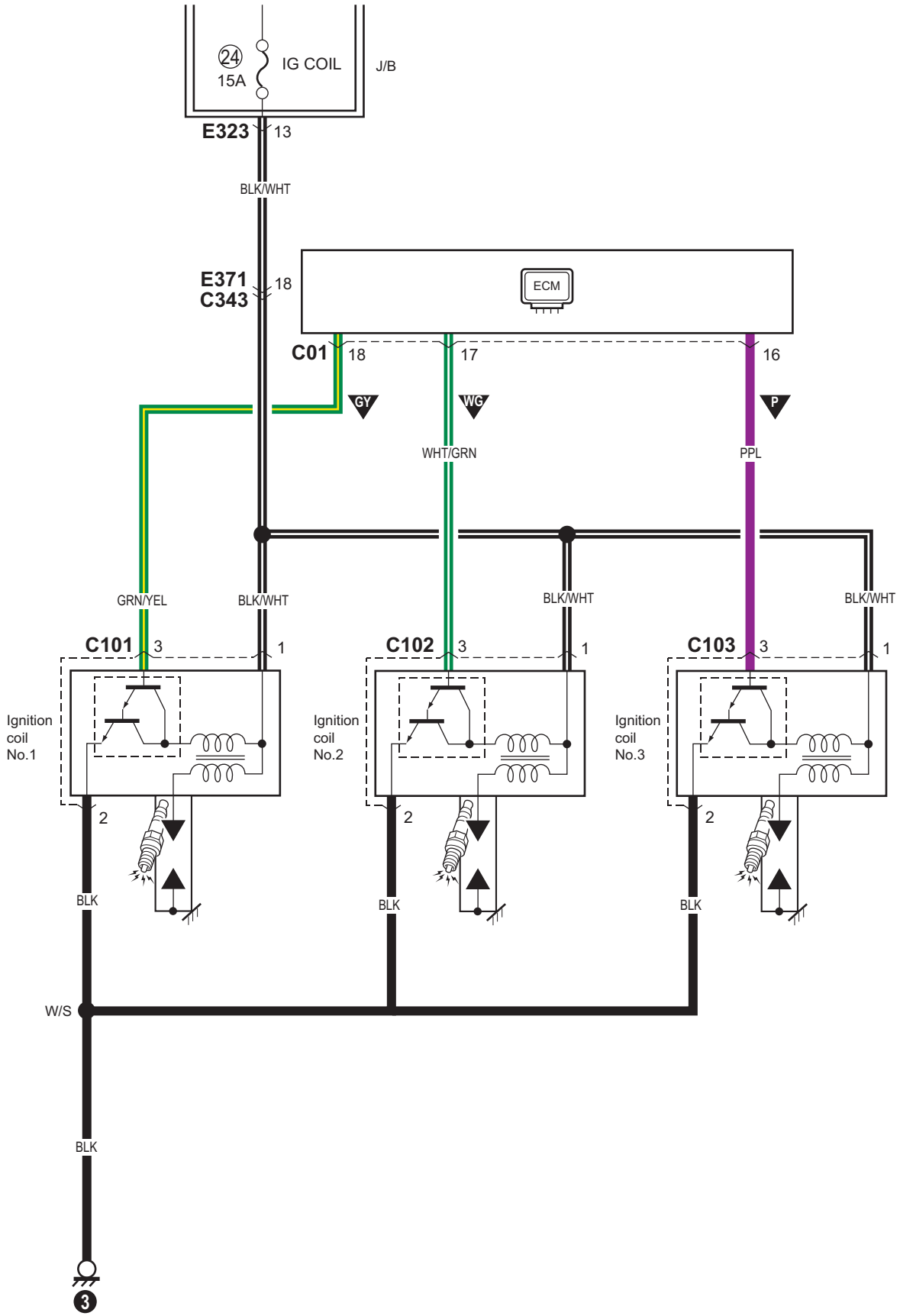
AENDL70A910E004



IDL70A910918-02

A-3 Ignition System Circuit Diagram

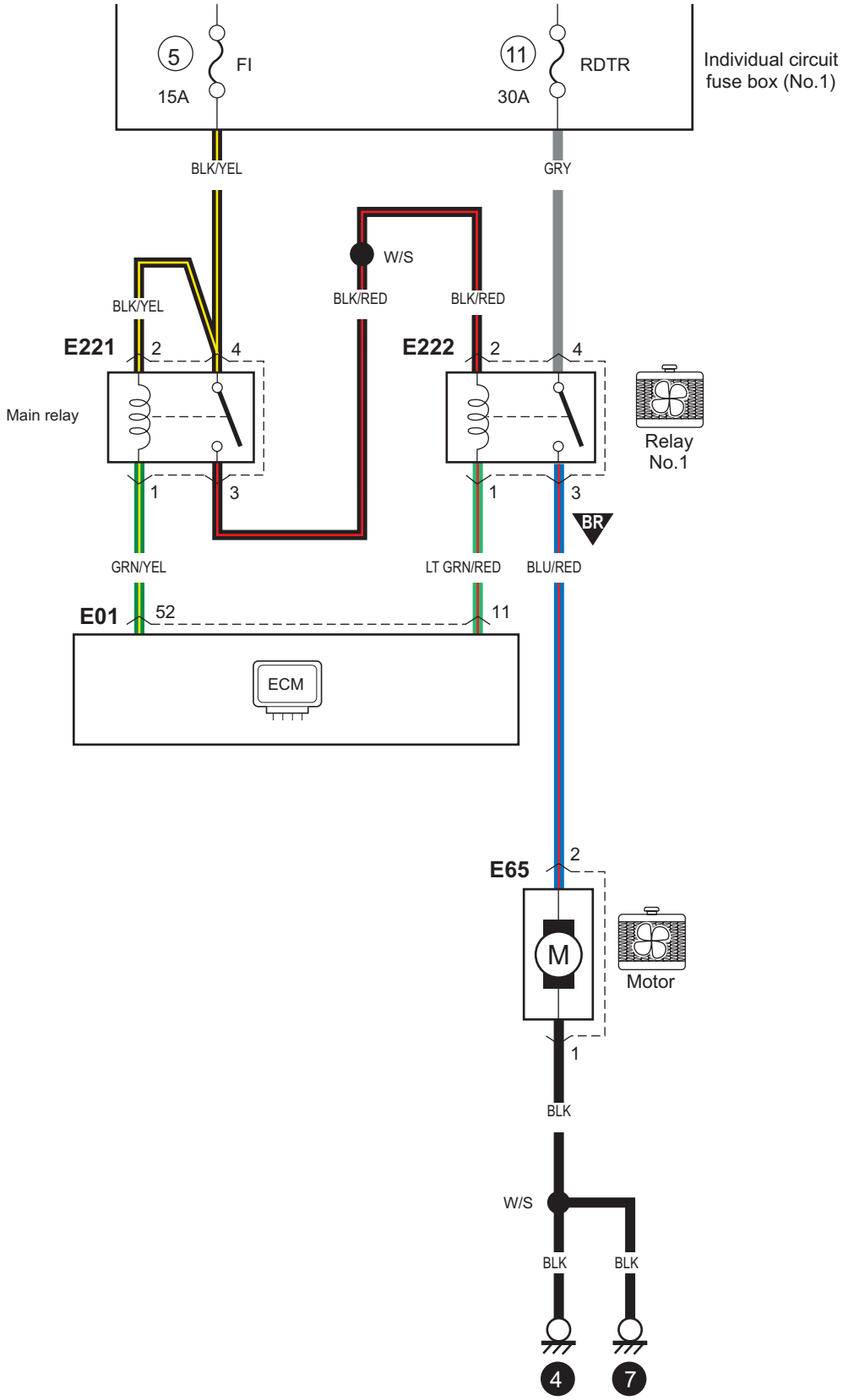
AENDL70A910E005



IDL70A910919-03

A-4 Cooling System Circuit Diagram

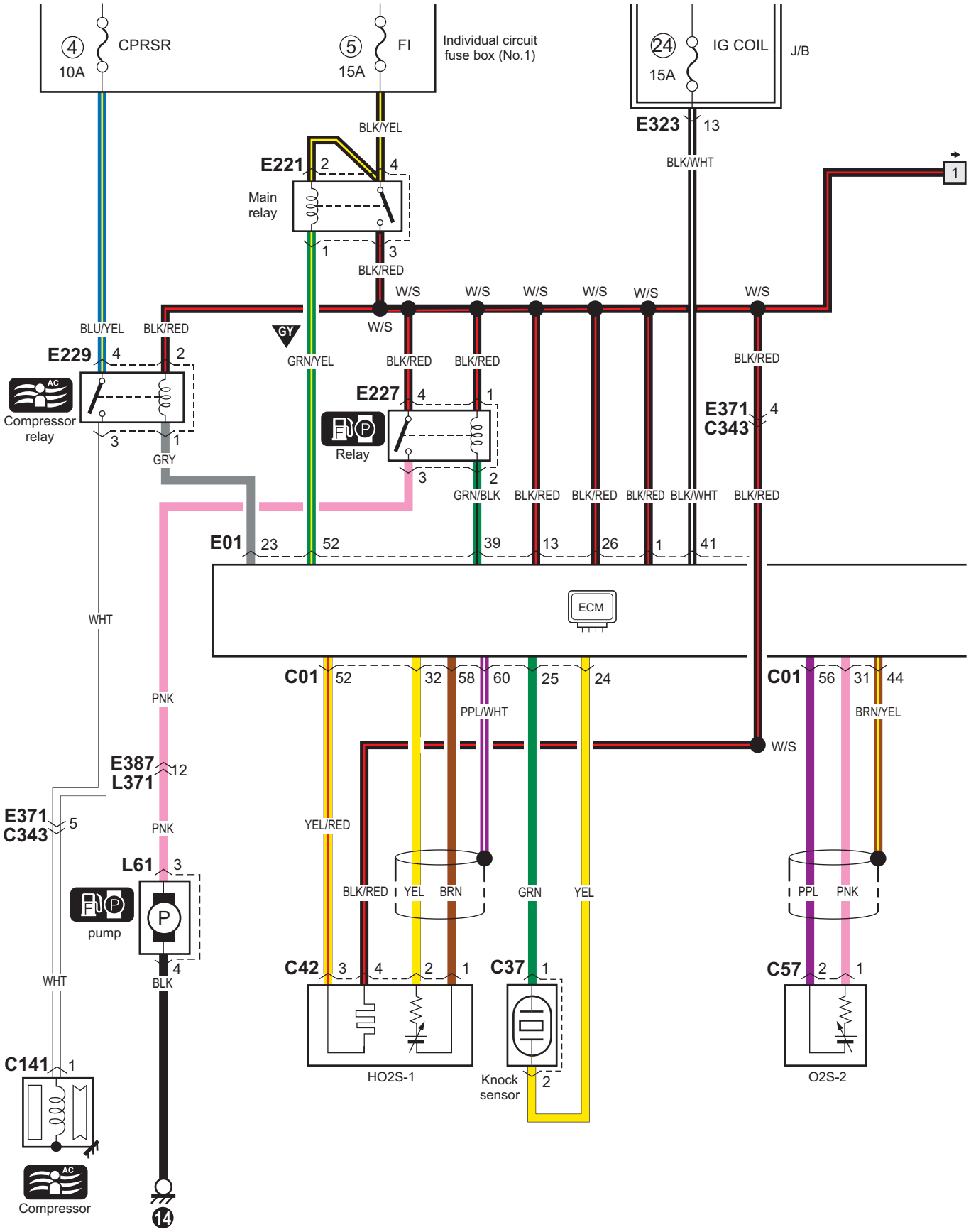
AENDL70A910E006



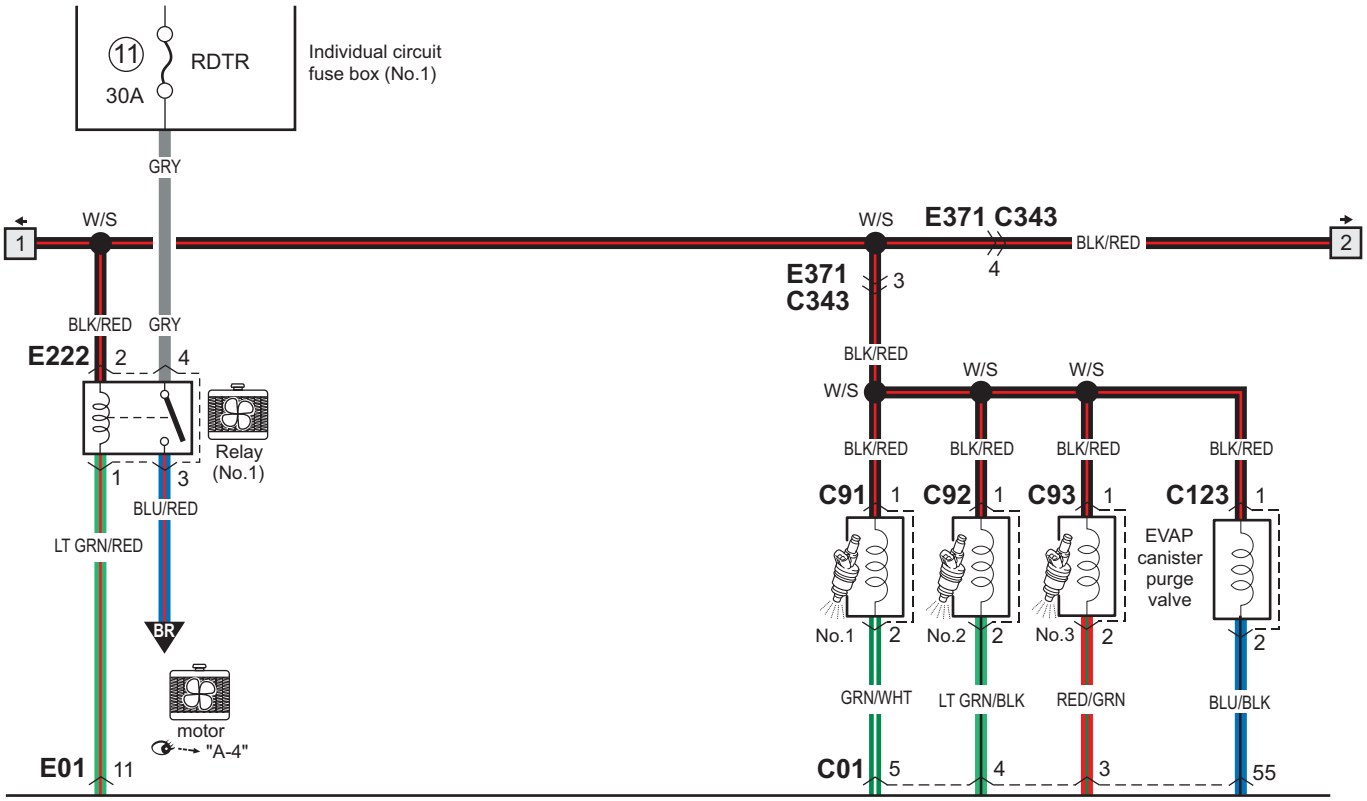
IDL70A910920-05

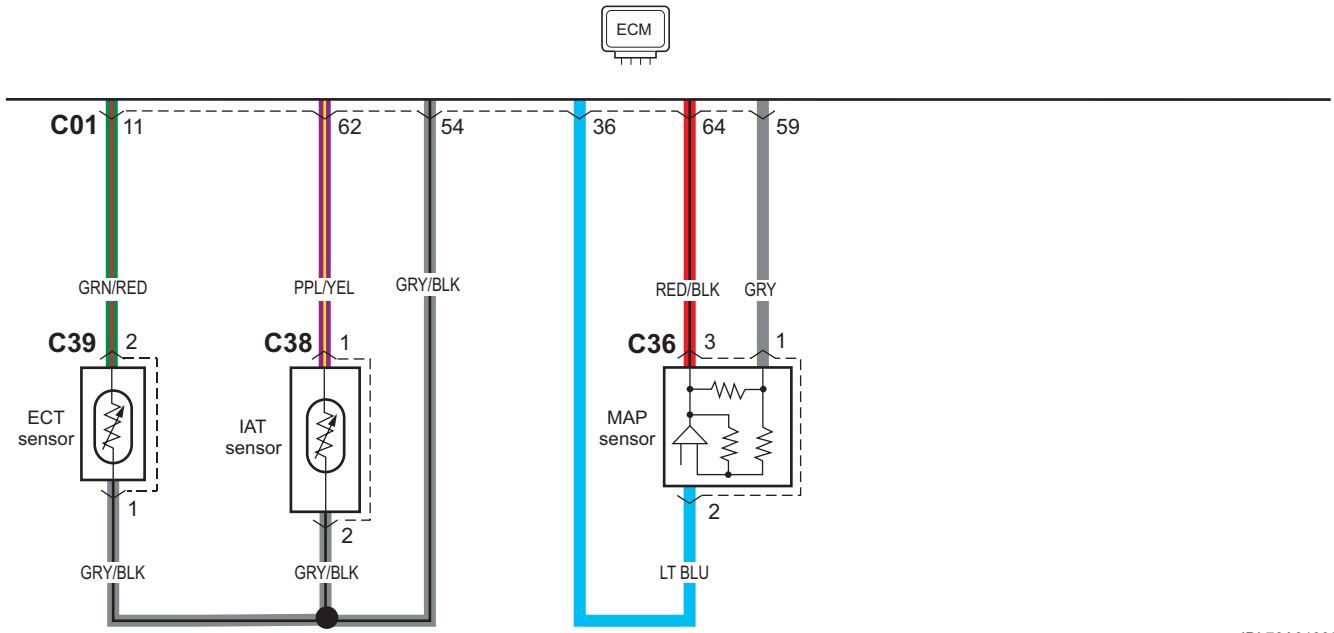
A-5 Engine and A/C Control System Circuit Diagram

AENDL70A910E007

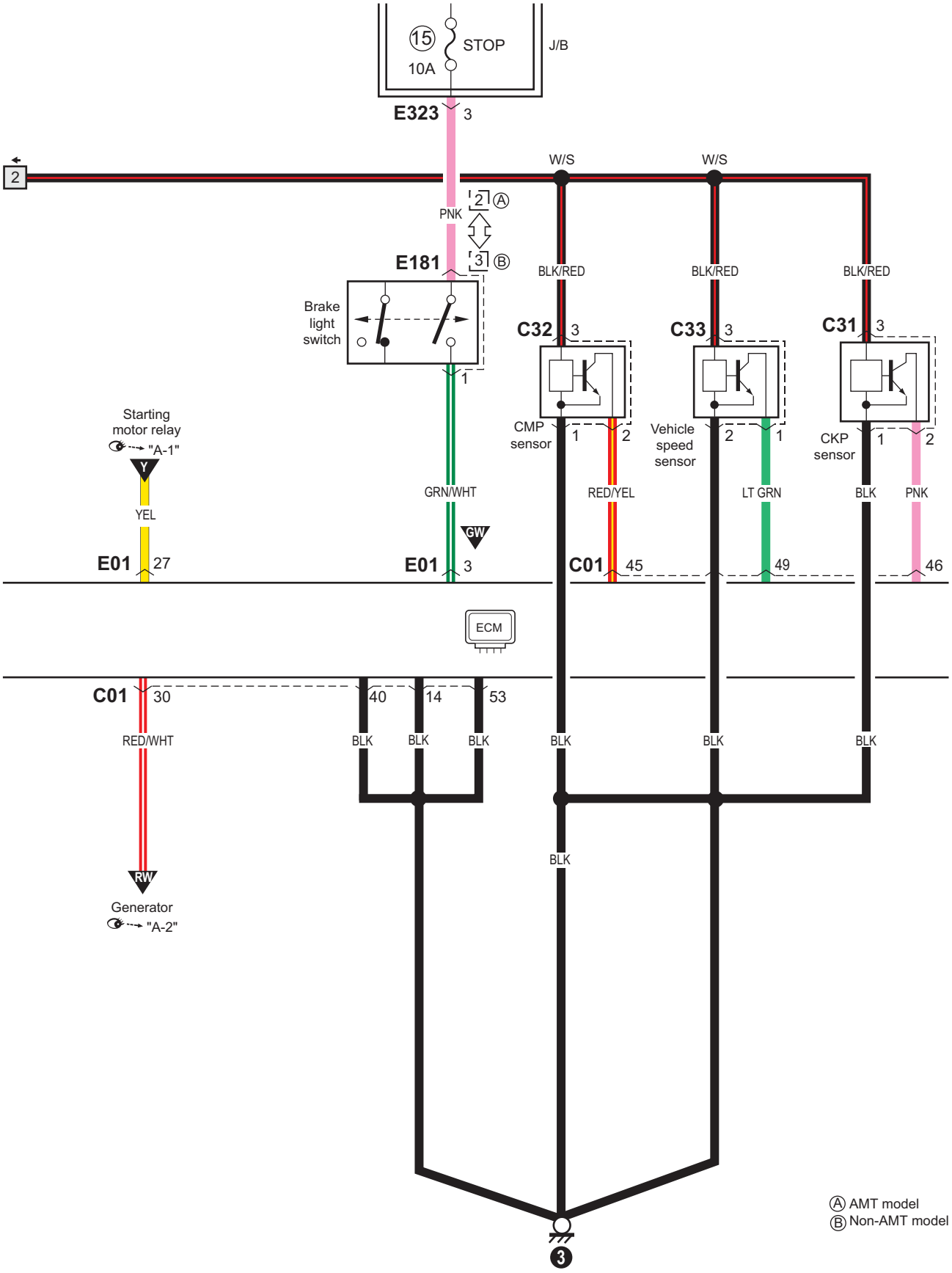


IDL70A910921-07

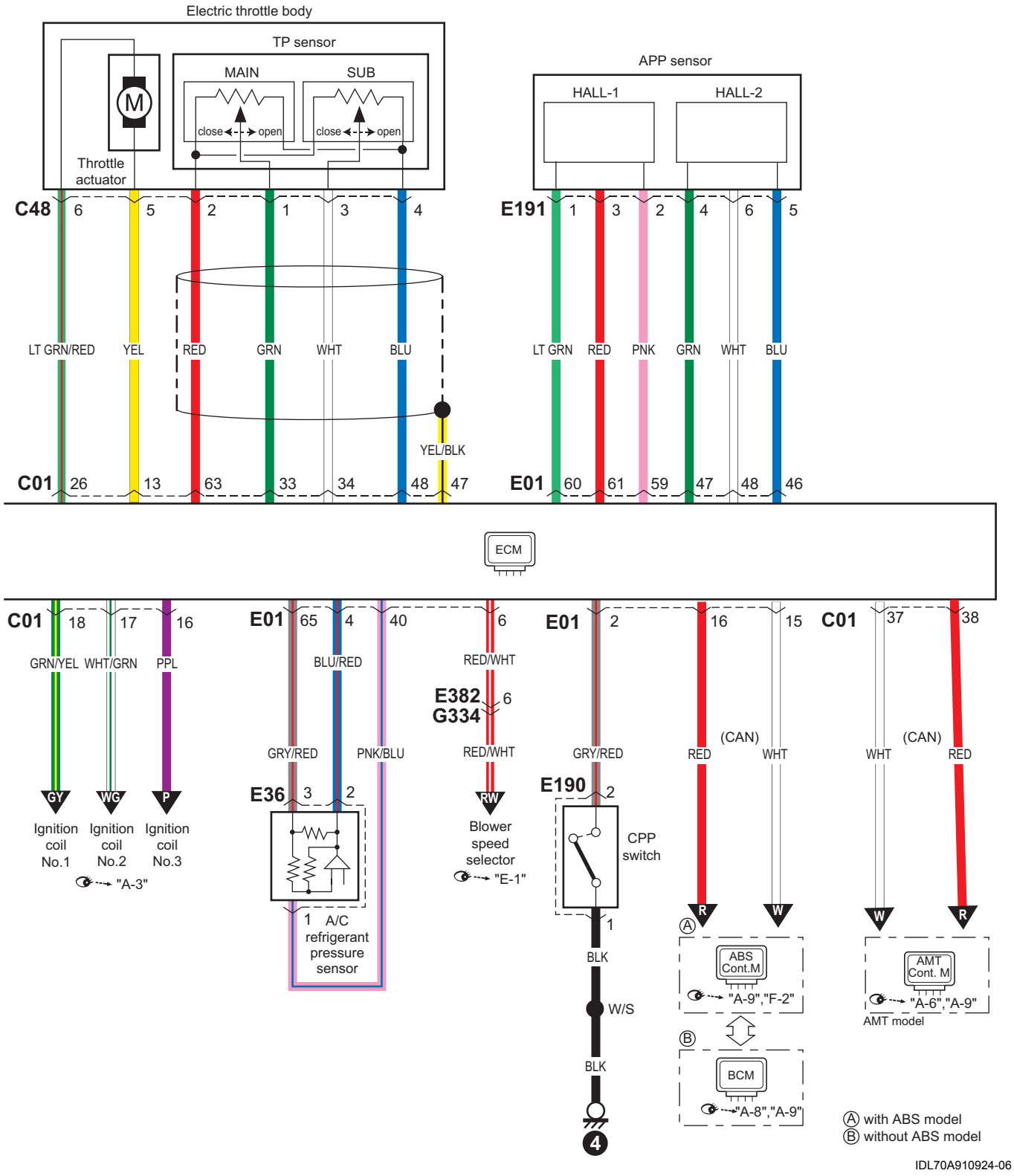




IDL70A910922-07

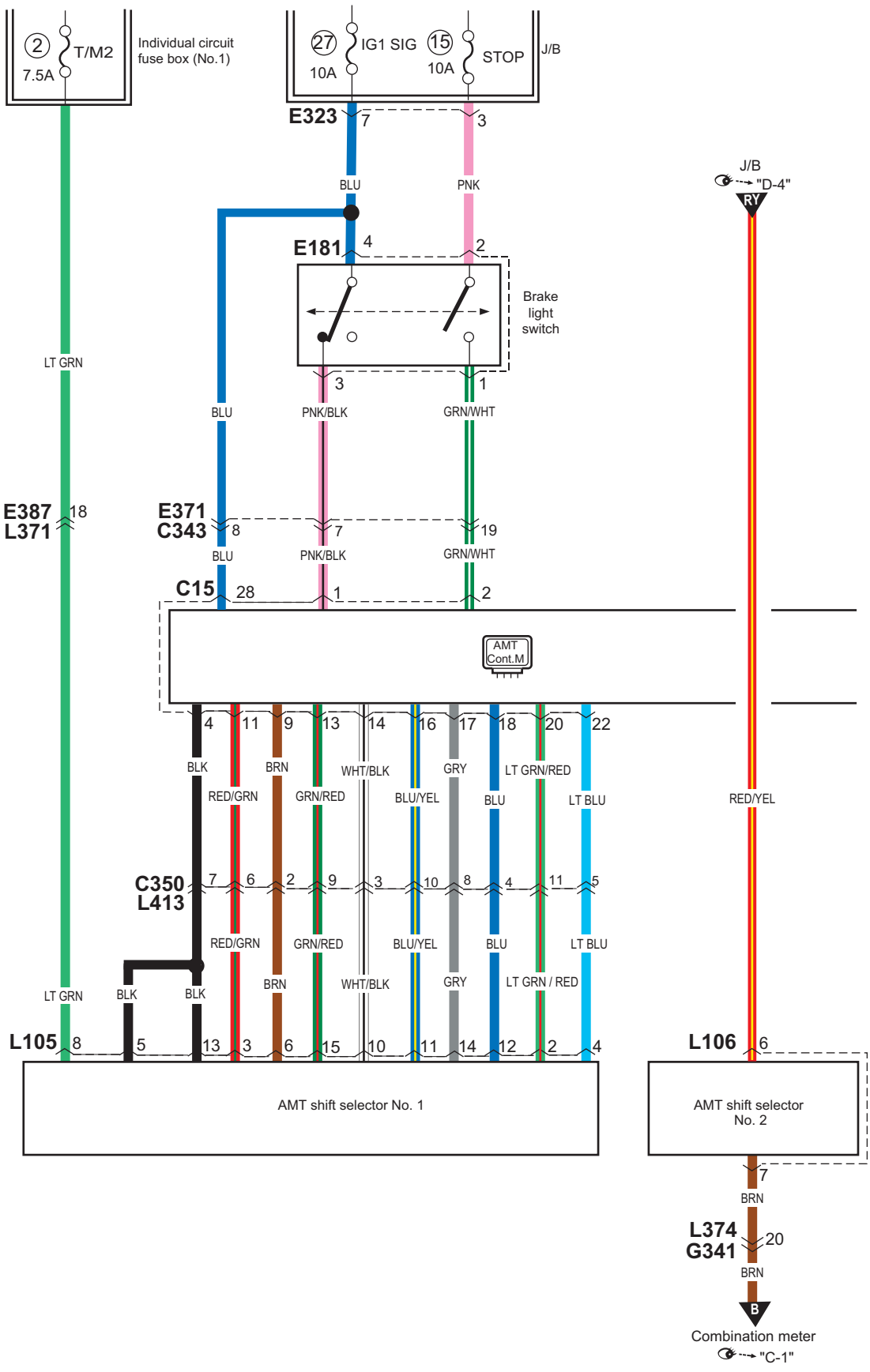


IDL70A910923-08

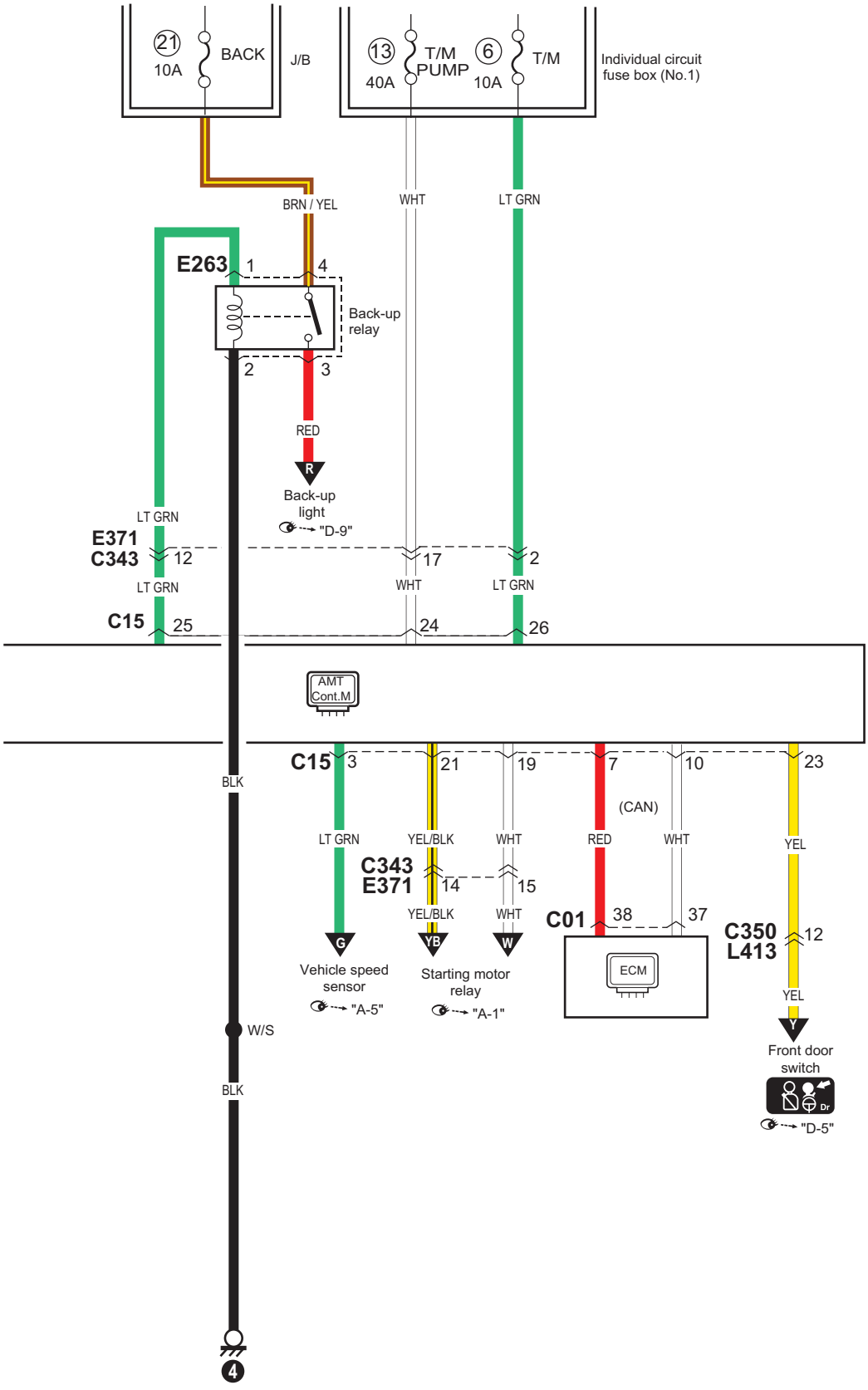

Electric throttle body
TP sensor
MAIN
SUB
close
open
close
open
M
Throttle actuator
APP sensor
HALL-1
HALL-2
C48
6
5
2
1
3
4
LT GRN/RED
YEL
RED
GRN
WHT
BLU
YEL/BLK
C01
26
13
63
33
34
48
47
E191
1
3
2
4
6
5
LT GRN
RED
PNK
GRN
WHT
BLU
E01
60
61
59
47
48
46
ECM
C01
18
17
16
GRN/YEL
WHT/GRN
PPL
GY
WG
P
Ignition coil No.1
Ignition coil No.2
Ignition coil No.3
"A-3"
E01
65
4
40
BLU/RED
GRY/RED
PNK/BLU
E36
3
2
1
A/C refrigerant pressure sensor
6
RED/WHT
E382
G334
6
RED/WHT
RW
Blower speed selector
"E-1"
E01
2
GRY/RED
E190
2
CPP switch
1
BLK
W/S
BLK
4
16
15
RED
(CAN)
WHT
R
W
A
ABS Cont.M
"A-9","F-2"
B
BCM
"A-8","A-9"
C01
37
38
WHT
(CAN)
RED
W
R
AMT Cont. M
"A-6","A-9"
AMT model
A with ABS model
B without ABS model
IDL70A910924-06

A-6 AMT Control System Circuit Diagram

AENDL70A910E038



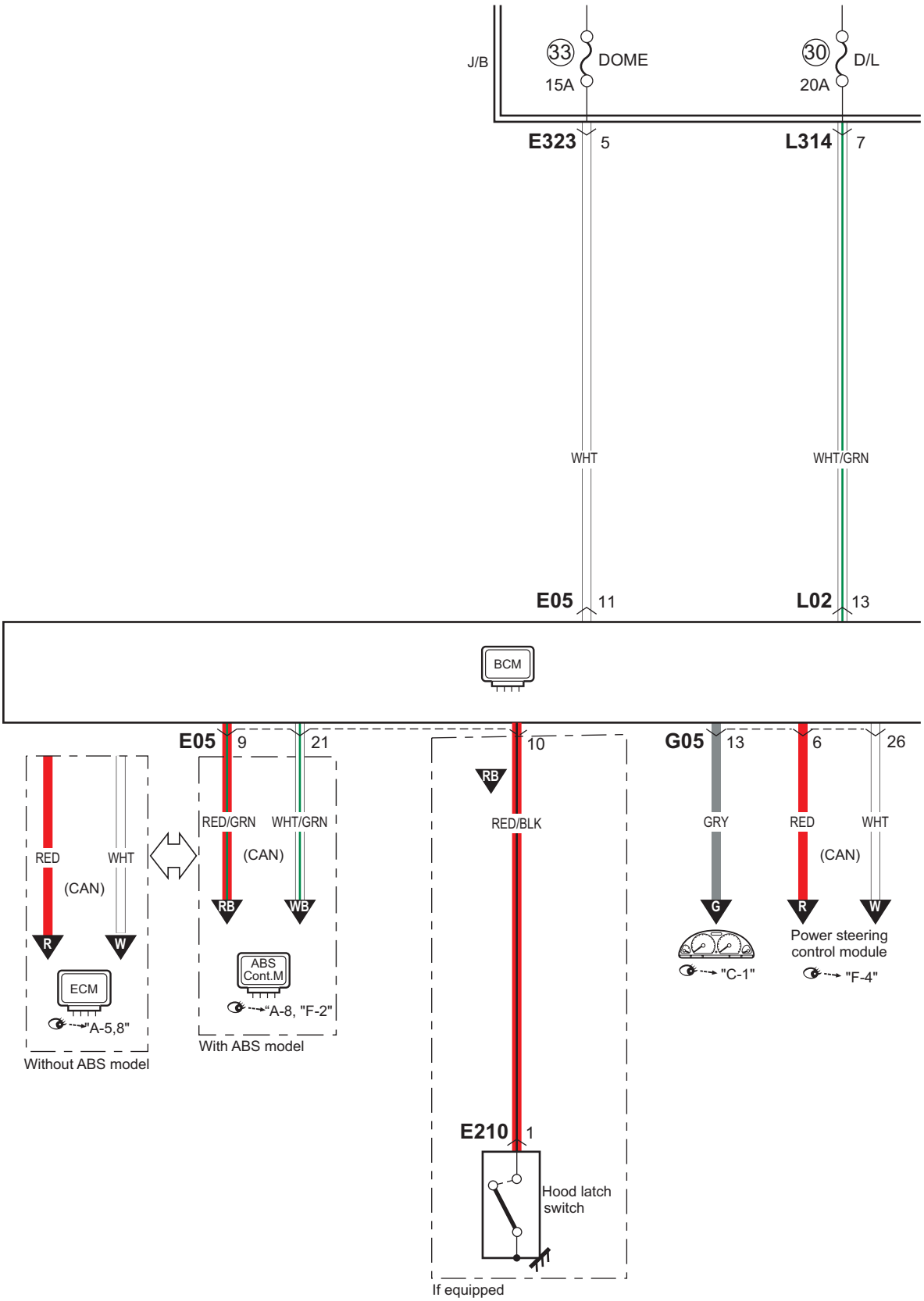
IDL70A910926-07



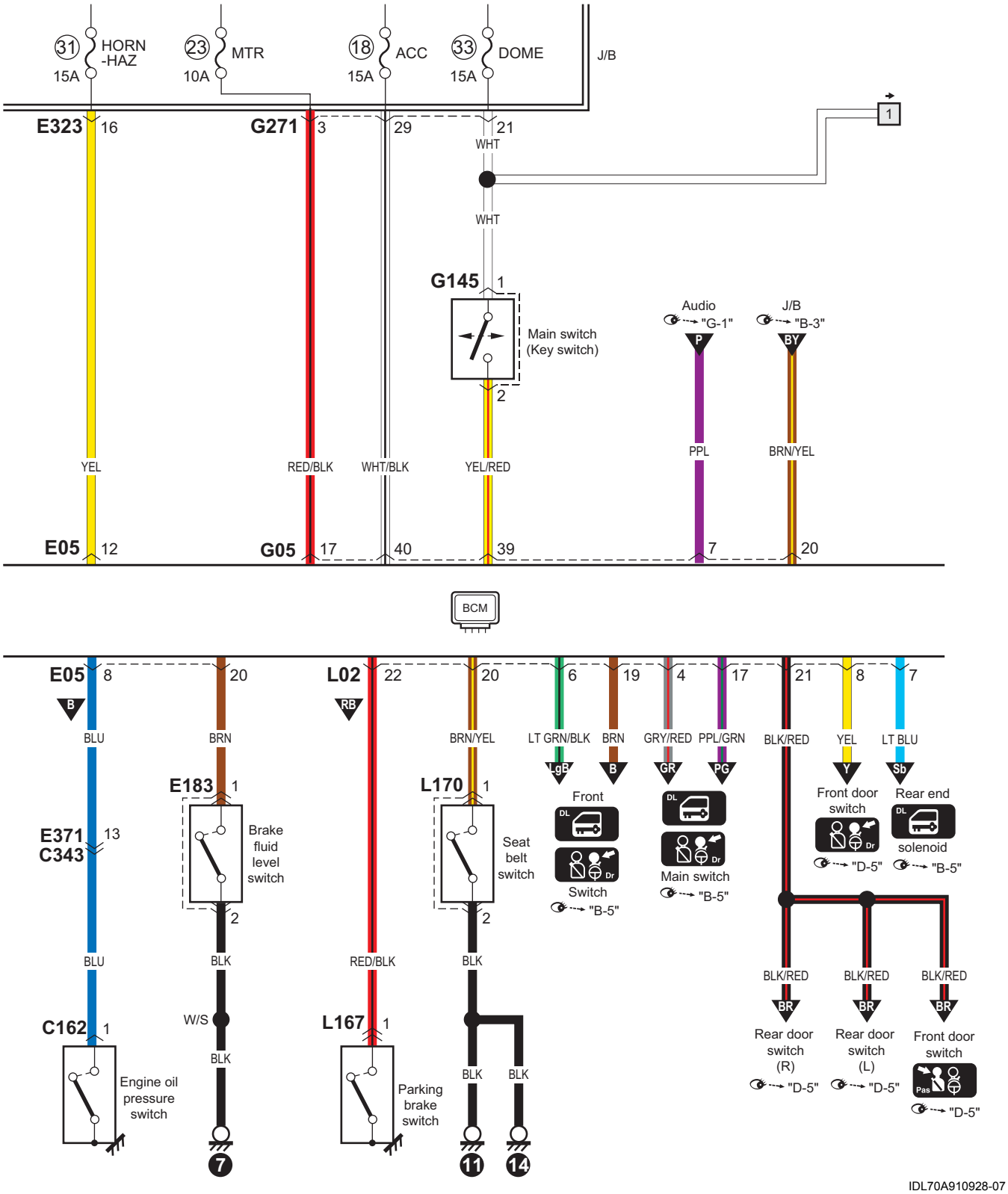
IDL70A910982-03

A-8 Body Control System Circuit Diagram

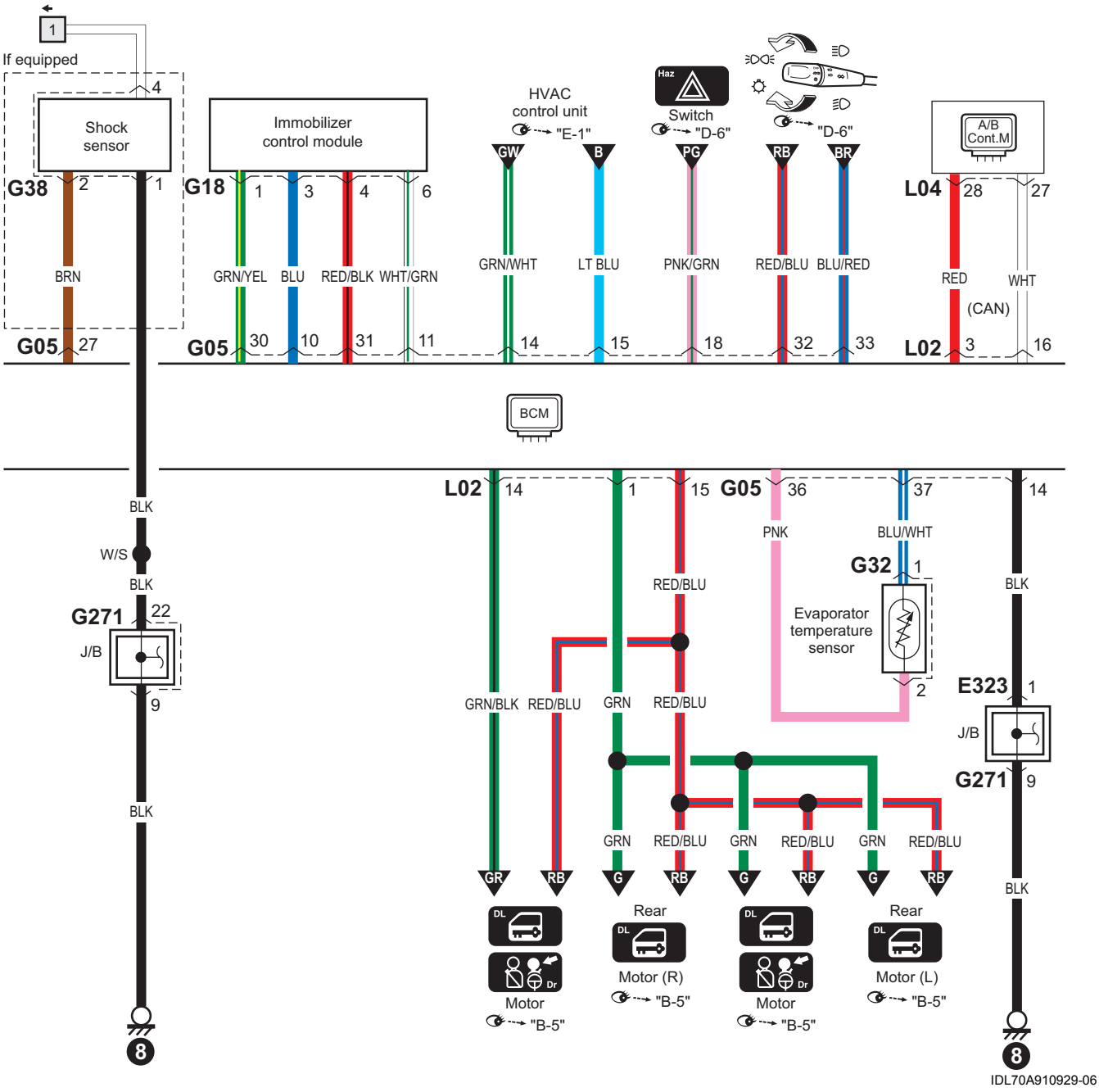
AENDL70A910E010

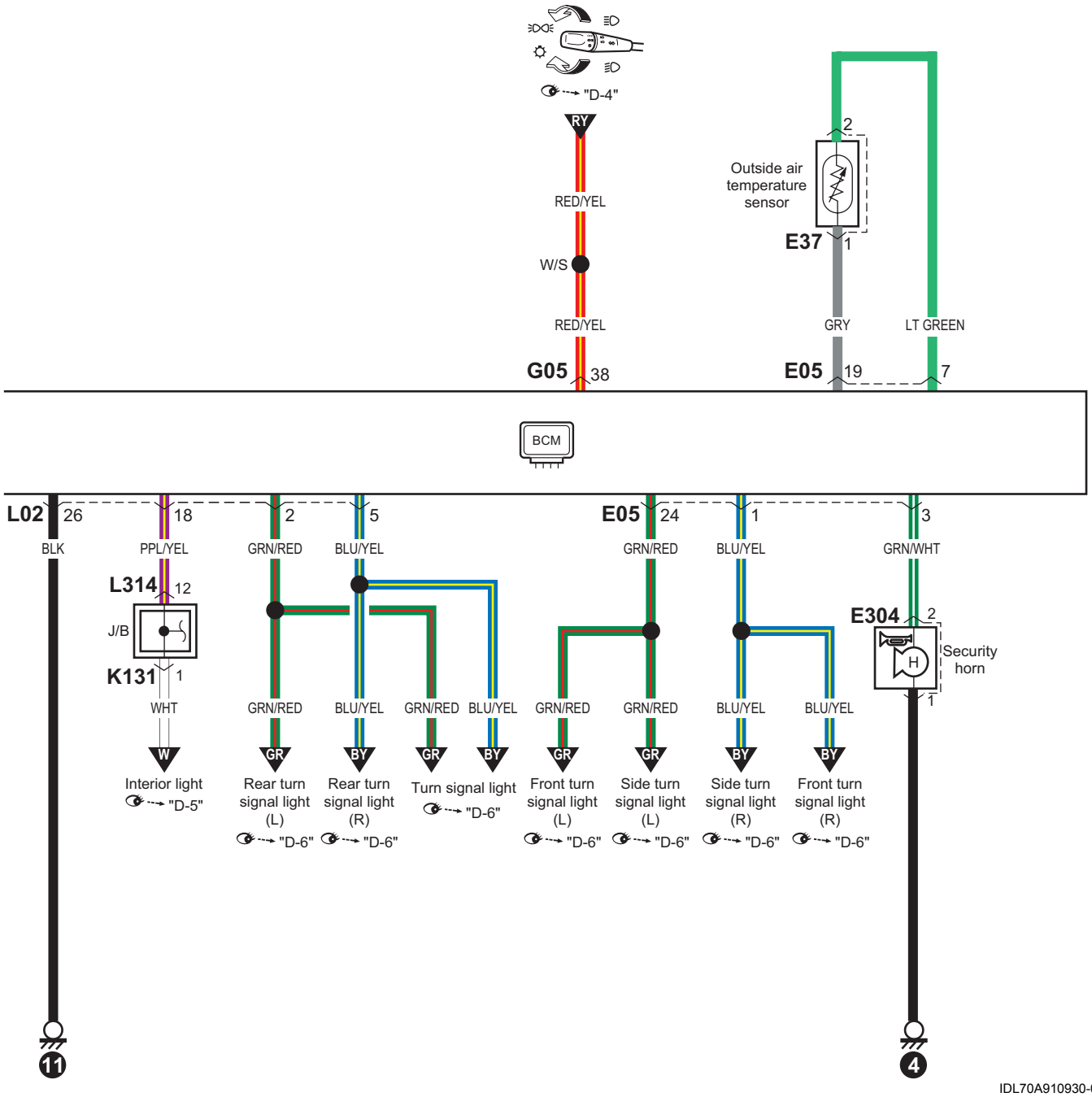


IDL70A910927-05



IDL70A910928-07

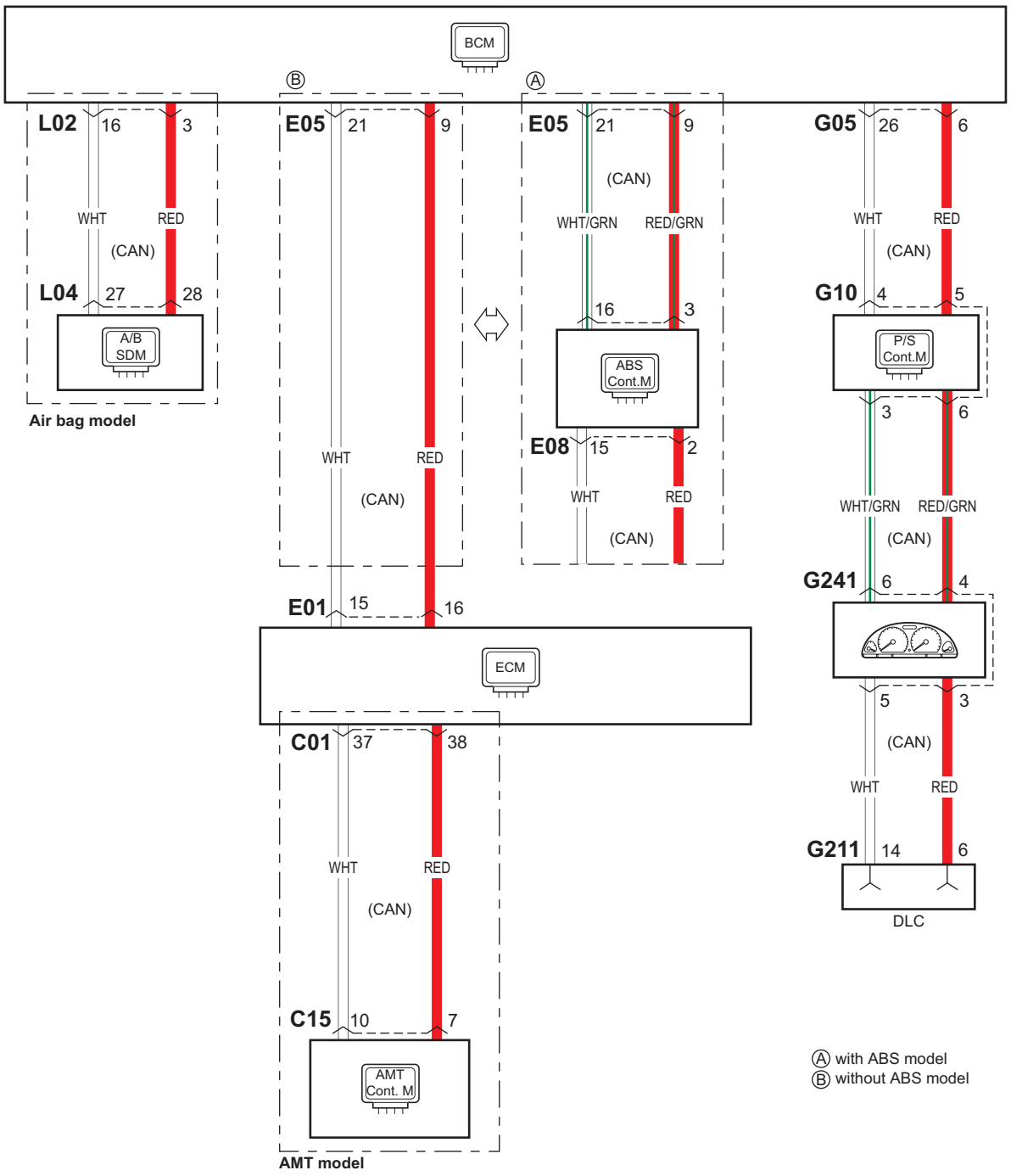

1
If equipped
4
Shock sensor
G38
2
1
BRN
G05
27
Immobilizer control module
G18
1
3
4
6
GRN/YEL
BLU
RED/BLK
WHT/GRN
G05
30
10
31
11
HVAC control unit
"E-1"
GW
B
PG
RB
BR
GRN/WHT
LT BLU
PNK/GRN
RED/BLU
BLU/RED
14
15
18
32
33
Haz
Switch
"D-6"
"D-6"
A/B Cont.M
L04
28
27
RED
WHT
(CAN)
L02
3
16
BCM
BLK
W/S
BLK
G271
22
J/B
9
BLK
8
L02
14
1
15
G05
36
37
14
PNK
BLU/WHT
G32
1
Evaporator temperature sensor
2
RED/BLU
BLK
GRN/BLK
RED/BLU
GRN
RED/BLU
E323
1
J/B
G271
9
GRN
RED/BLU
GRN
RED/BLU
GRN
RED/BLU
GR
RB
G
RB
G
RB
G
RB
DL
Dr
Motor
"B-5"
Rear
DL
Motor (R)
"B-5"
DL
Dr
Motor
"B-5"
Rear
DL
Motor (L)
"B-5"
BLK
8
IDL70A910929-06



IDL70A910930-05

A-9 CAN Circuit Diagram

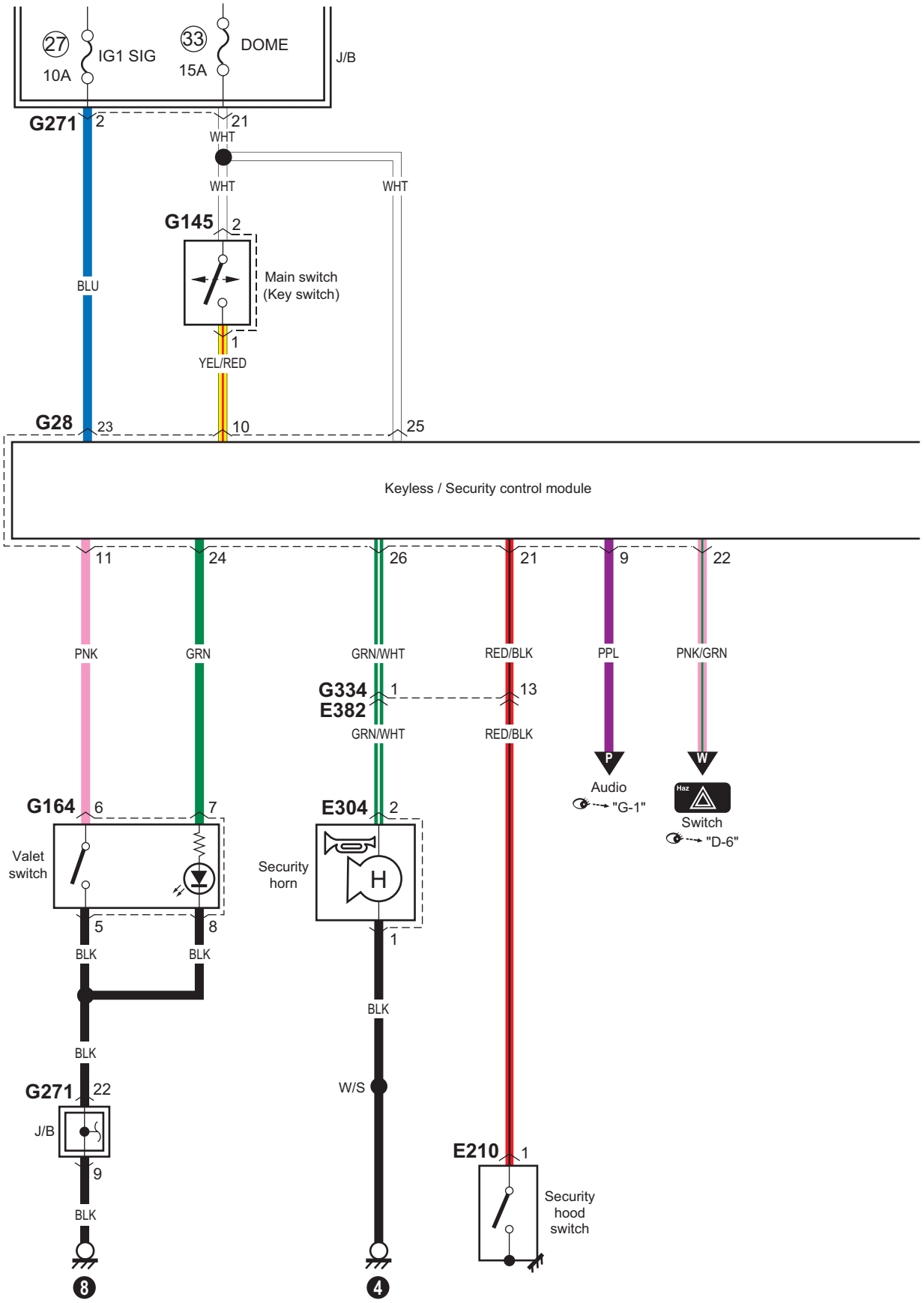
AENDL70A910E011



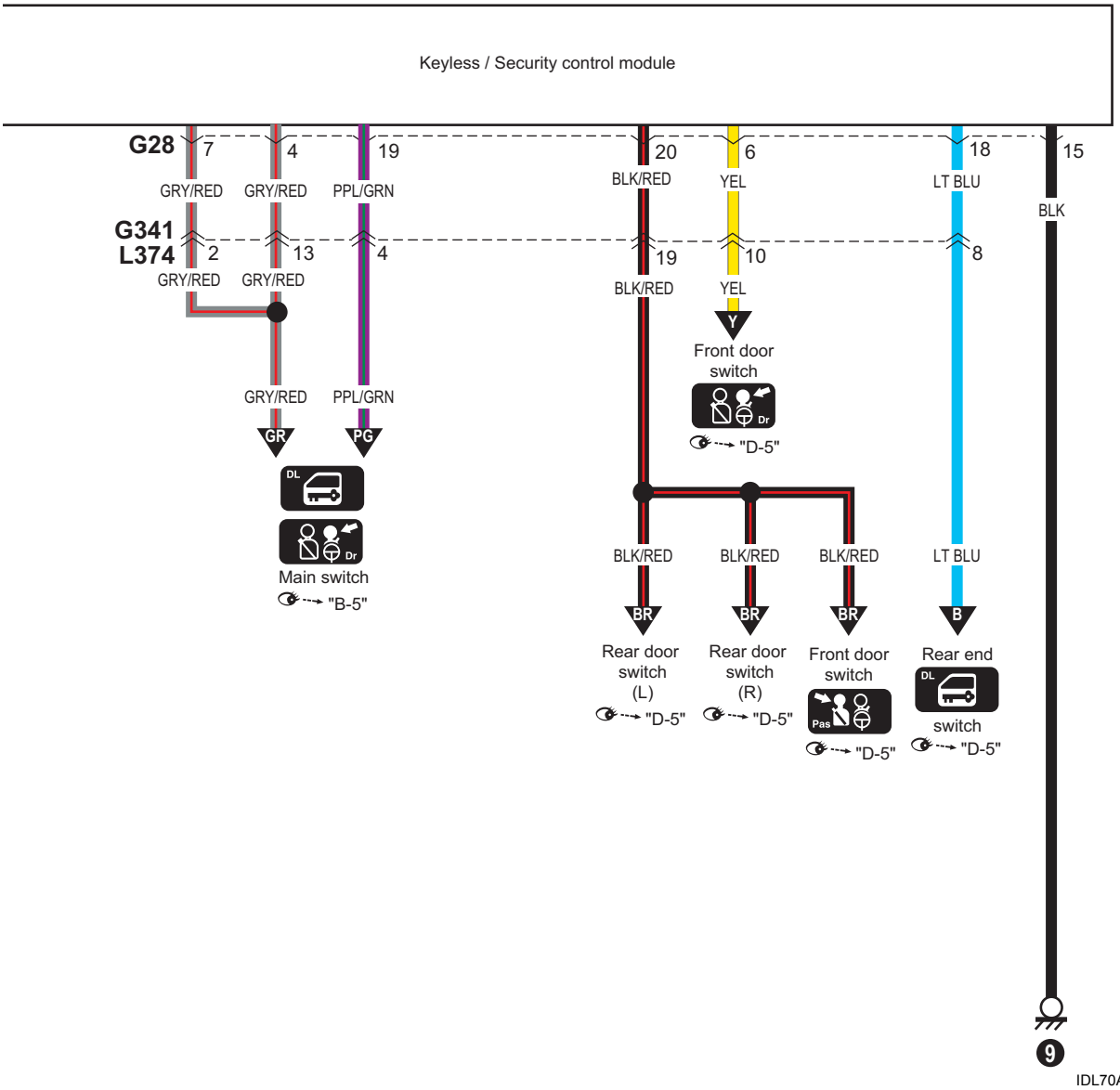
IDL70A910963-06

A-10 Security Control System Circuit Diagram

AENDL70A910E039

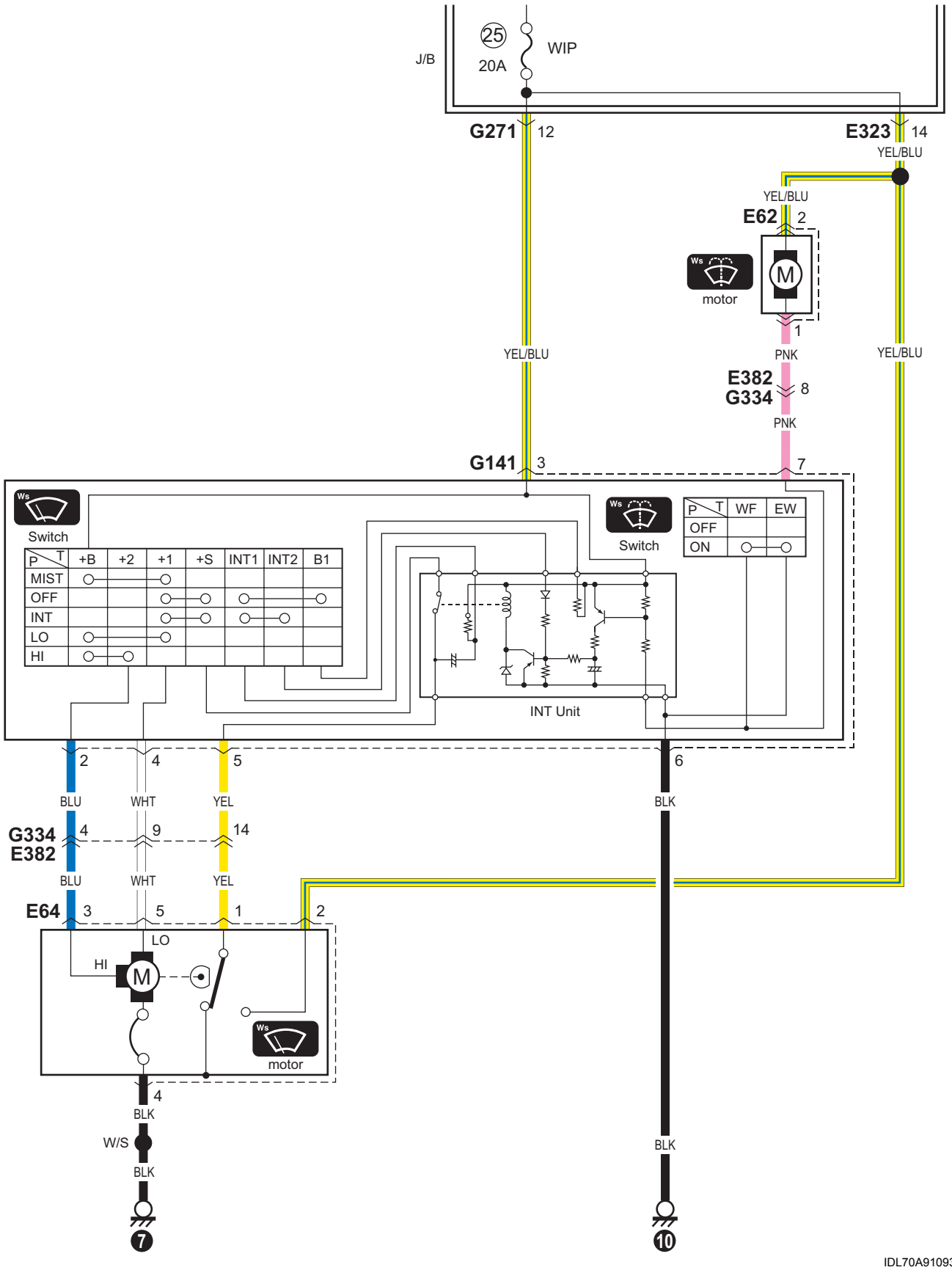


IDL70A910965-06


Keyless / Security control module
G28
G341
L374
7
4
19
20
6
18
15
2
13
4
19
10
8
GRY/RED
GRY/RED
PPL/GRN
BLK/RED
YEL
LT BLU
BLK
GRY/RED
GRY/RED
BLK/RED
YEL
GRY/RED
PPL/GRN
GR
PG
Y
Front door switch
"D-5"
DL
Dr
Main switch
"B-5"
BLK/RED
BLK/RED
BLK/RED
LT BLU
BR
BR
BR
B
Rear door switch (L)
"D-5"
Rear door switch (R)
"D-5"
Front door switch
Pas
"D-5"
Rear end
DL
switch
"D-5"
9
IDL70A910966-04

B-1 Windshield Wiper and Washer Circuit Diagram

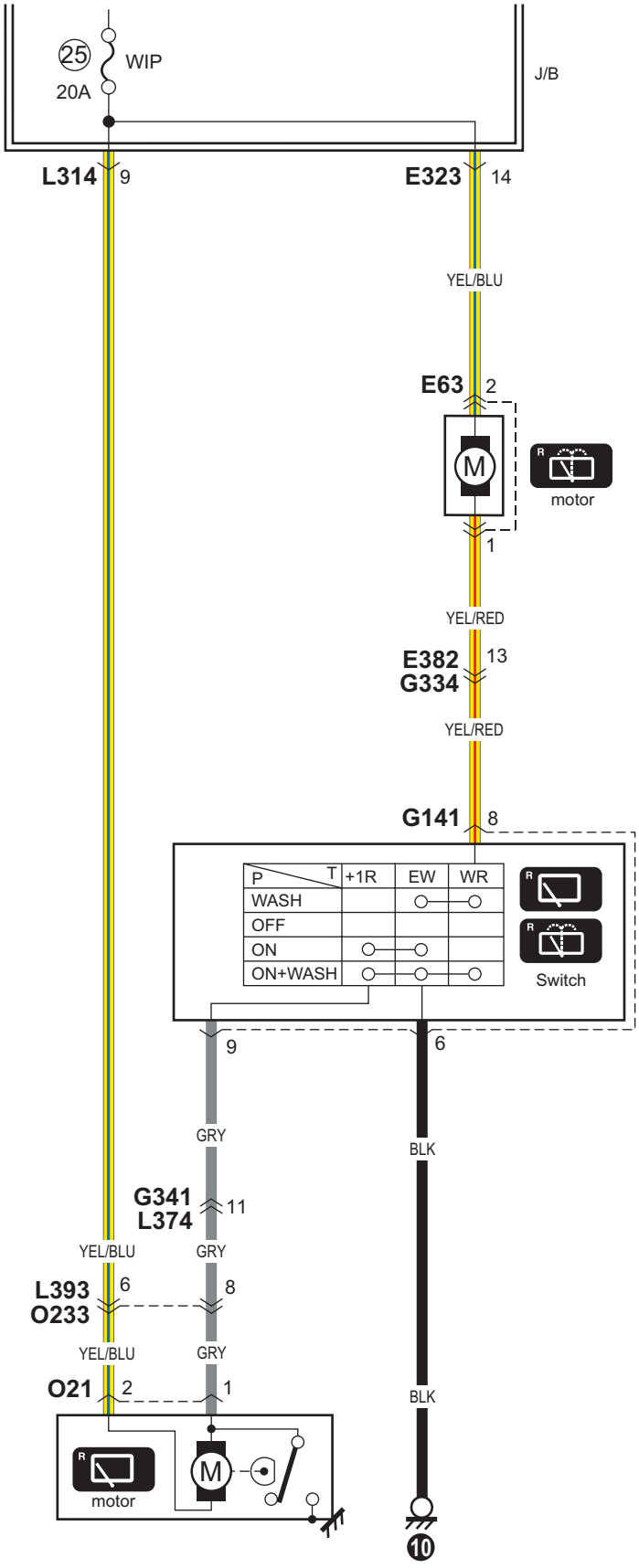
AENDL70A910E013



IDL70A910932-04

B-2 Rear Wiper and Washer Circuit Diagram

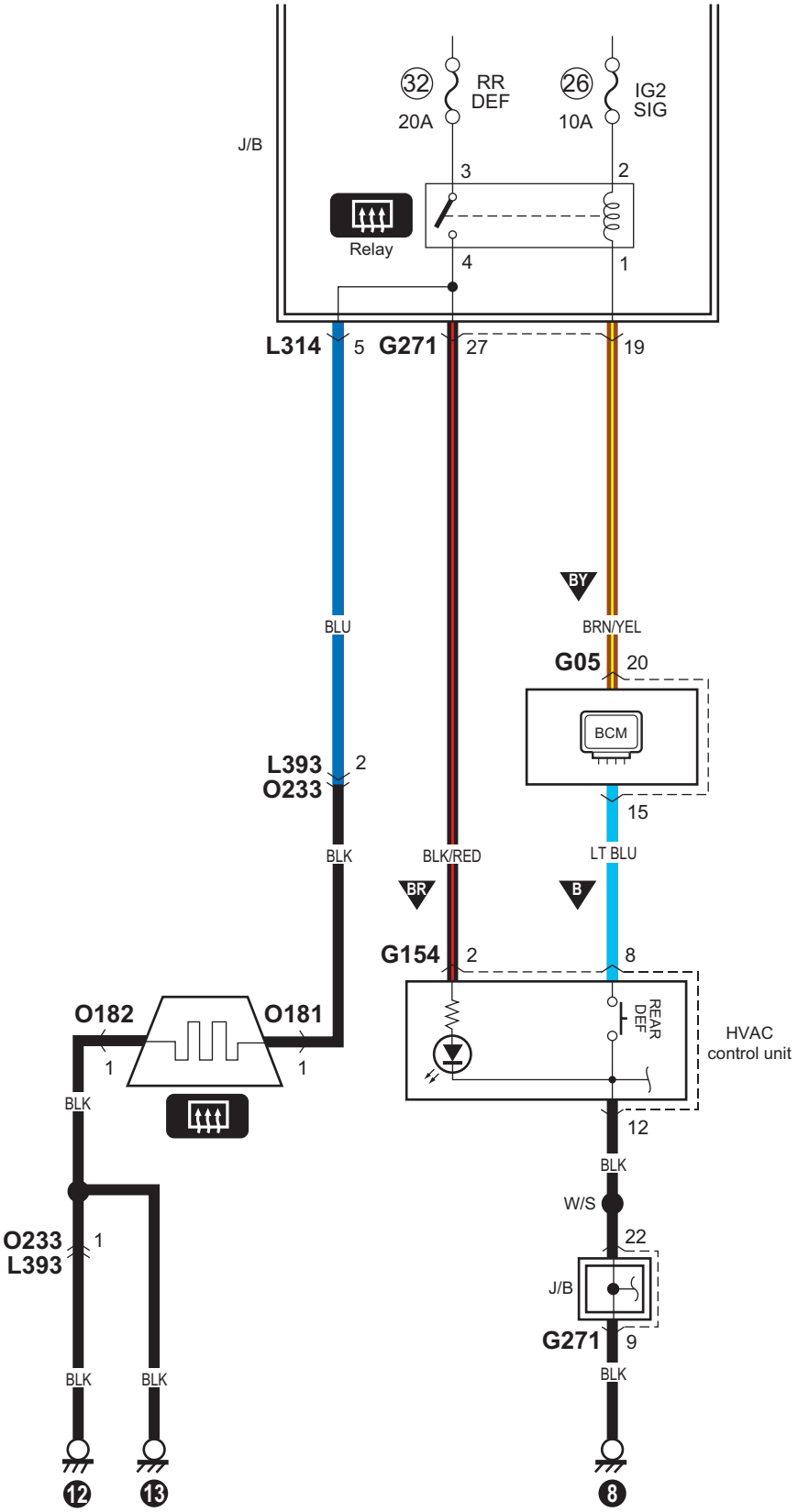
AENDL70A910E014



IDL70A910933-04

B-3 Rear Defogger Circuit Diagram

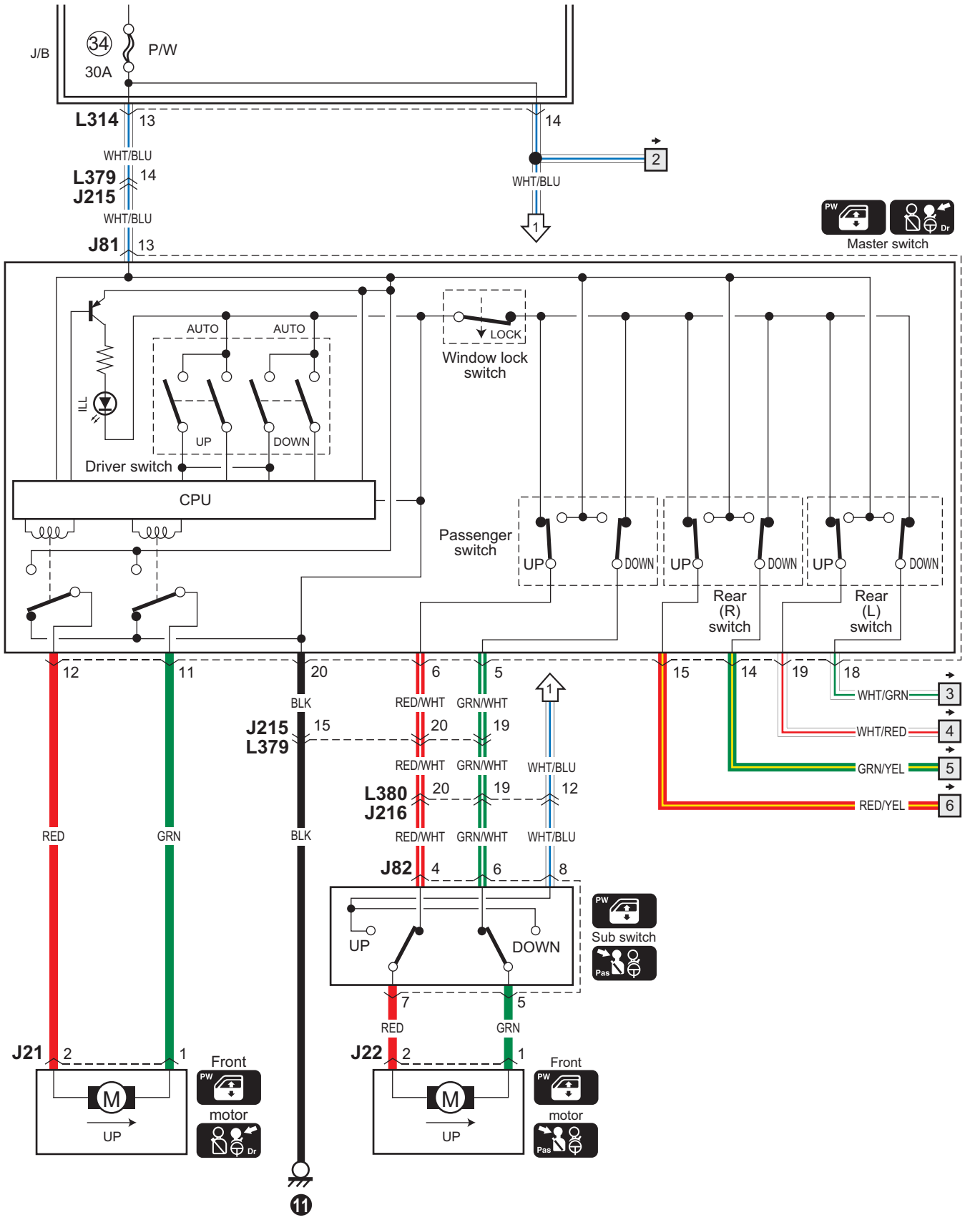
AENDL70A910E015



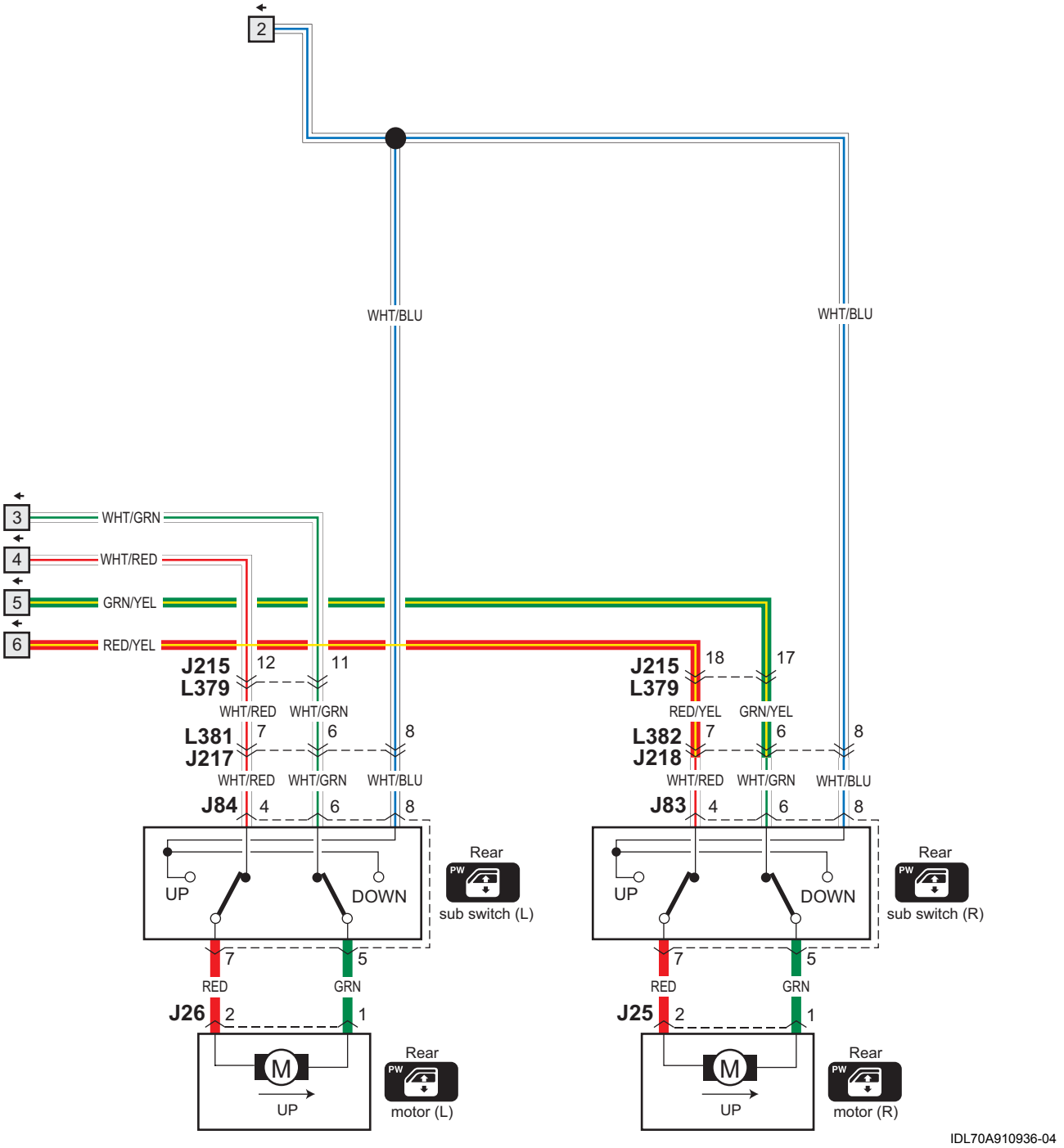
IDL70A910934-05

B-4 Power Window Circuit Diagram

AENDL70A910E016



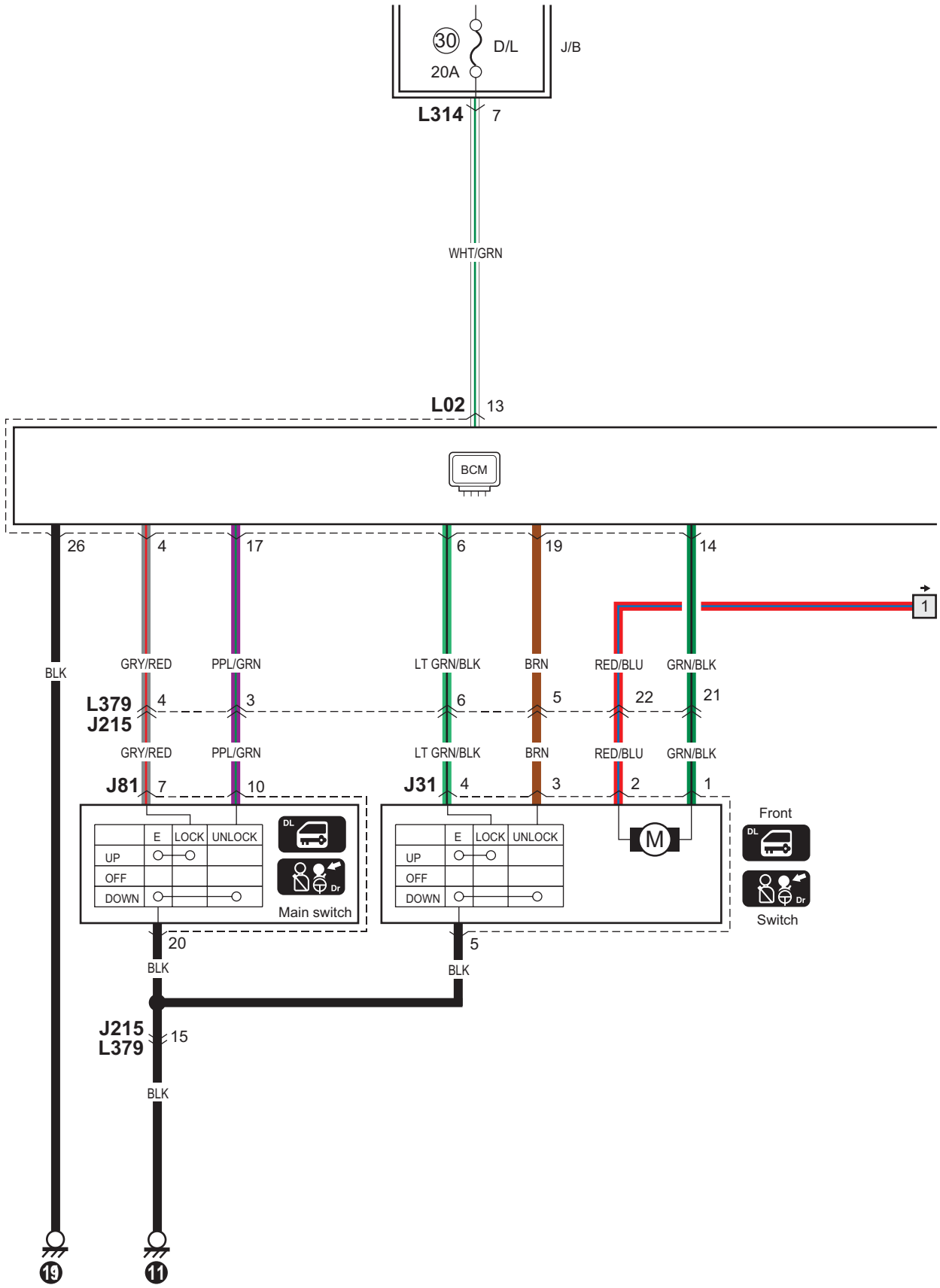
IDL70A910935-04



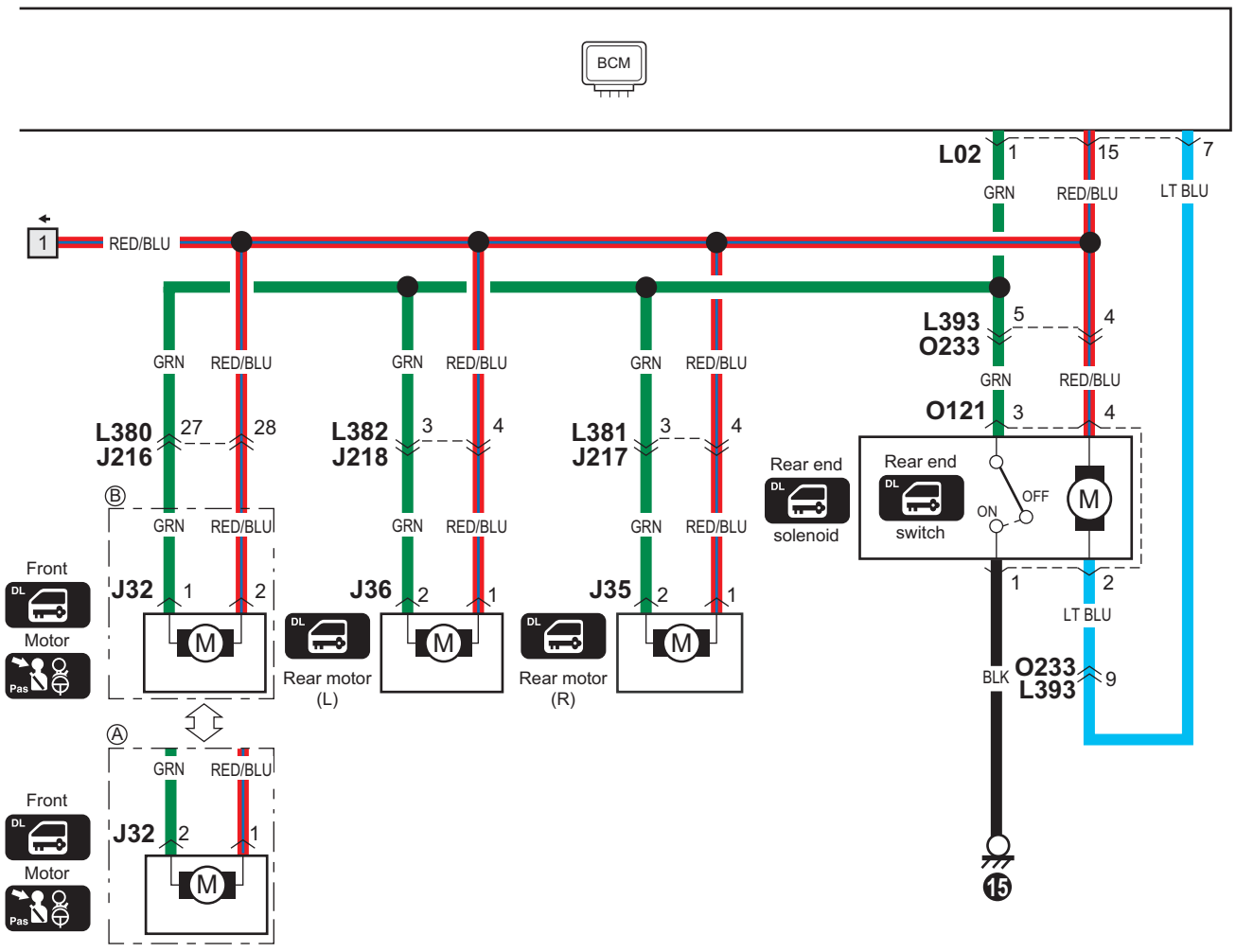
IDL70A910936-04

B-5 Power Door Lock Circuit Diagram

AENDL70A910E017



IDL70A910937-05

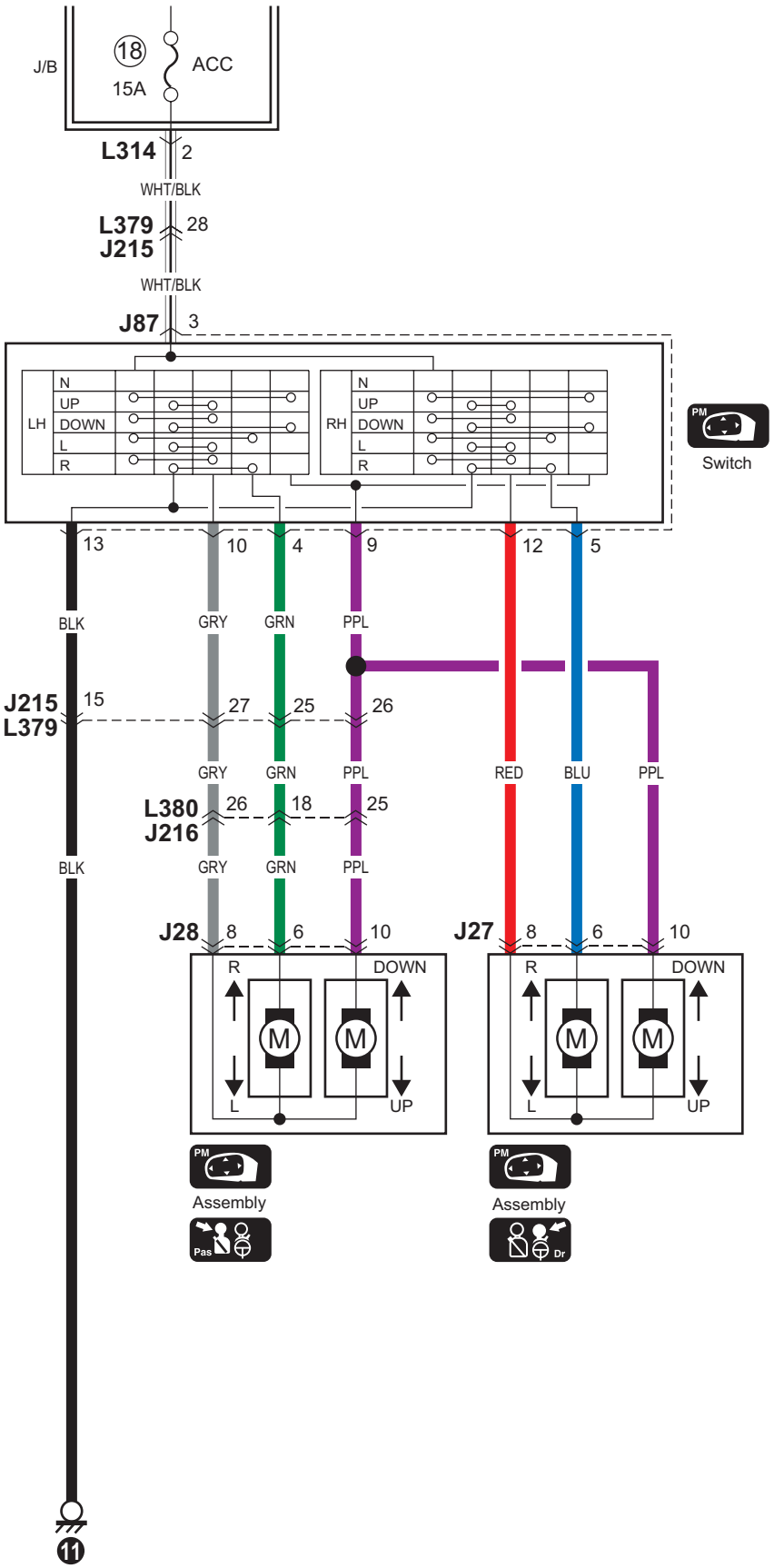


Ⓐ with keyless enty model
Ⓑ without keyless enty model

IDL70A910938-05

B-6 Power Mirror Circuit Diagram

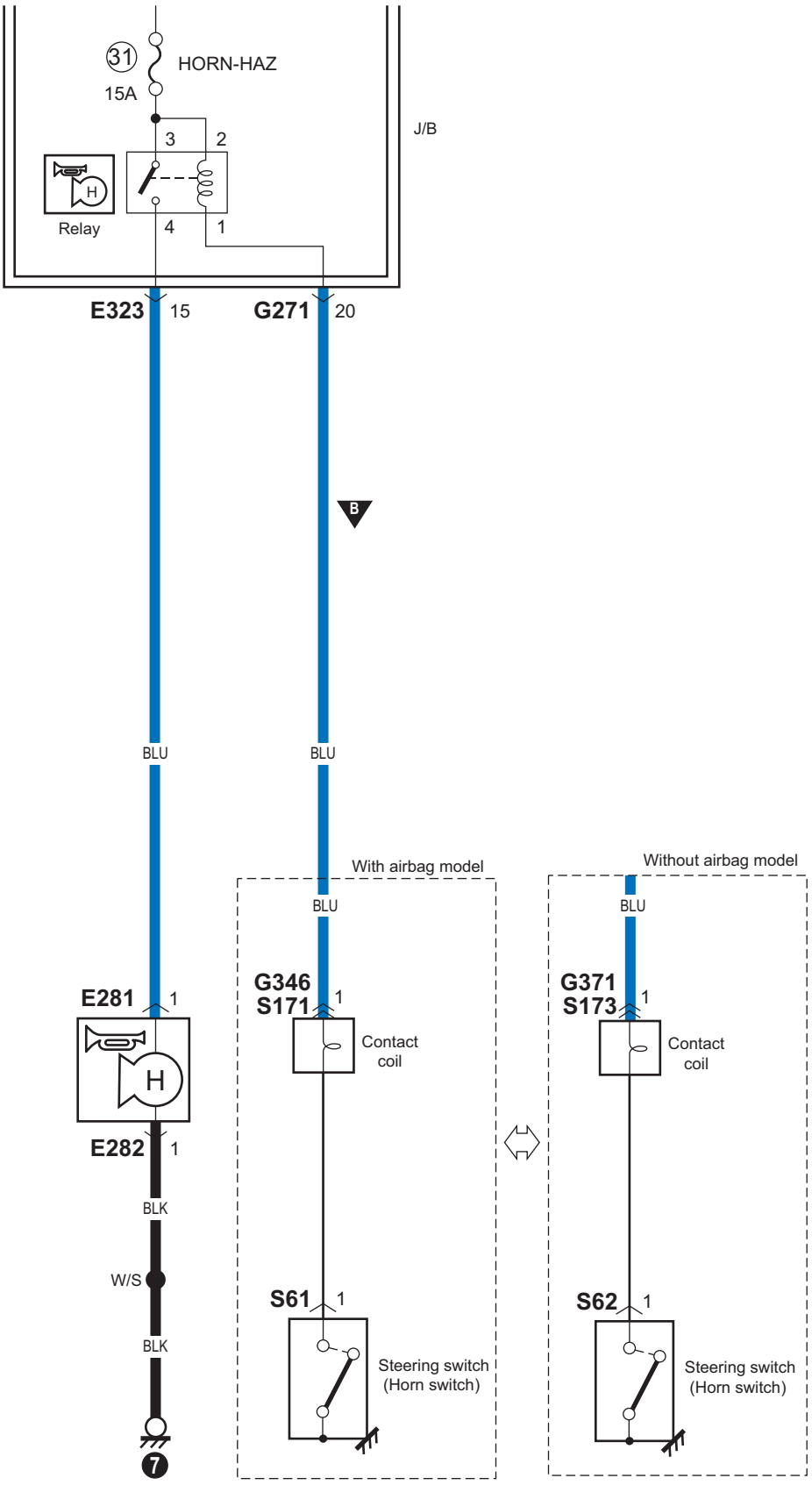
AENDL70A910E040



IDL70A910967-04

B-7 Horn Circuit Diagram

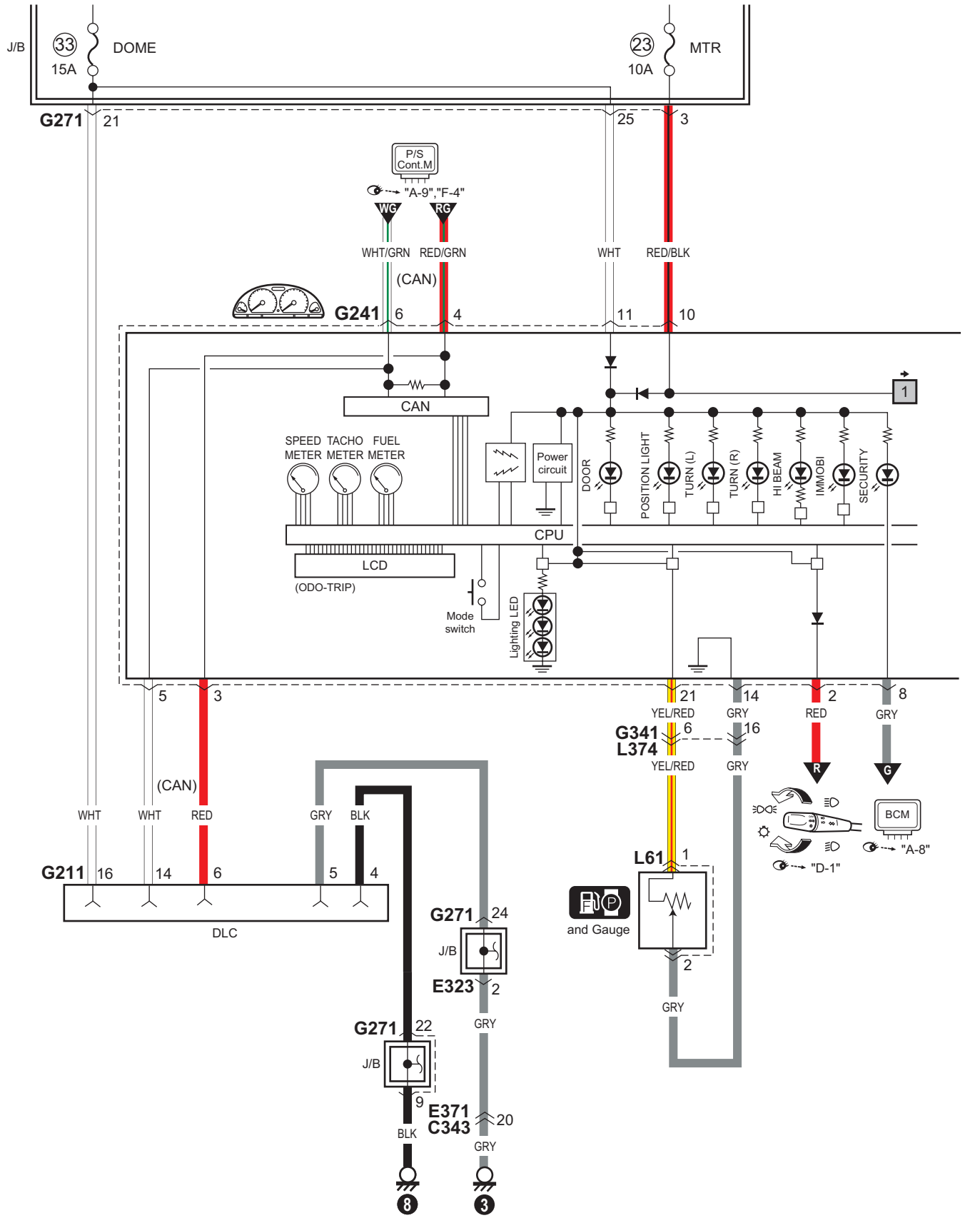
AENDL70A910E018



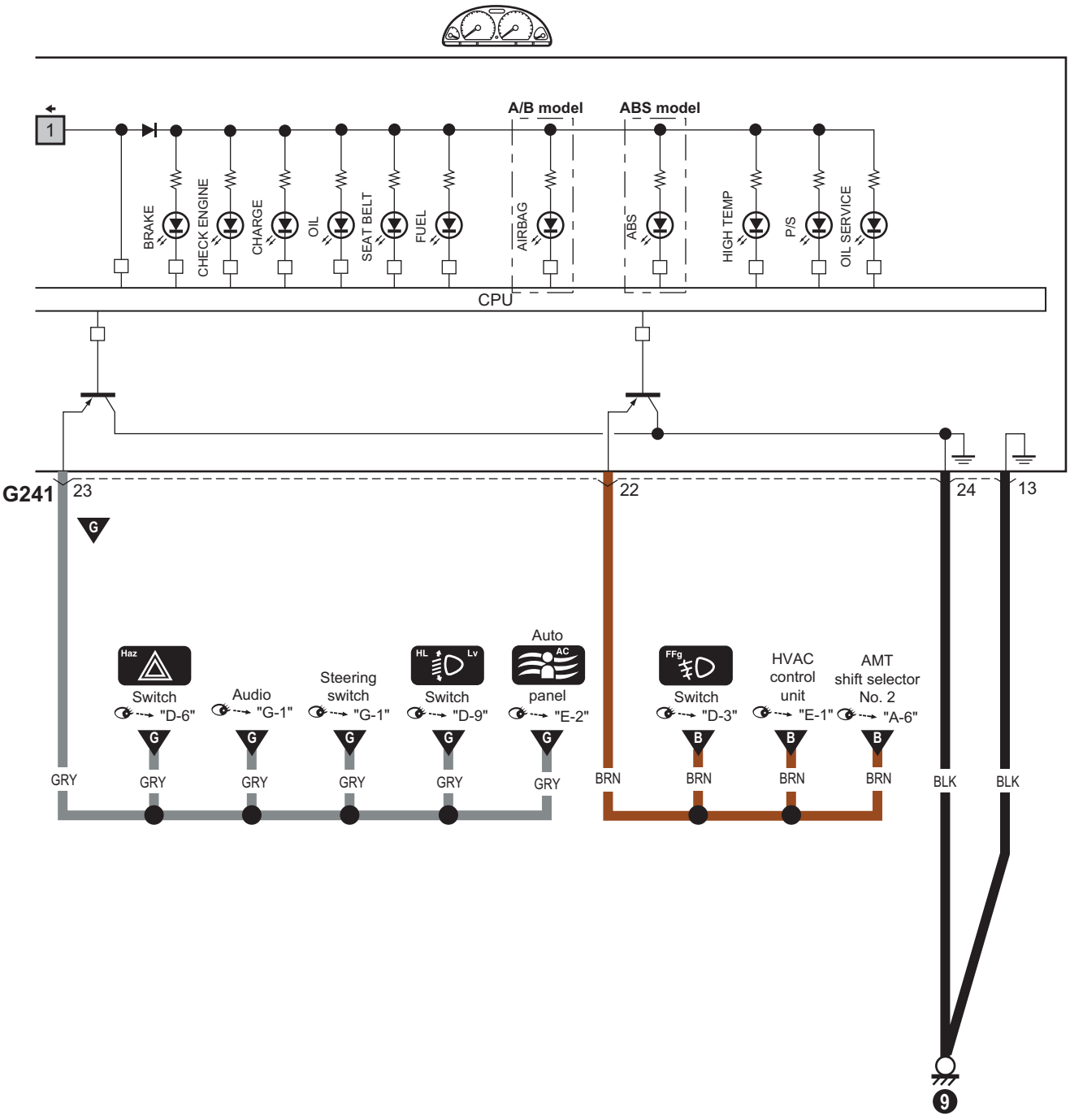
IDL70A910939-05

C-1 Combination Meter Circuit Diagram

AENDL70A910E019

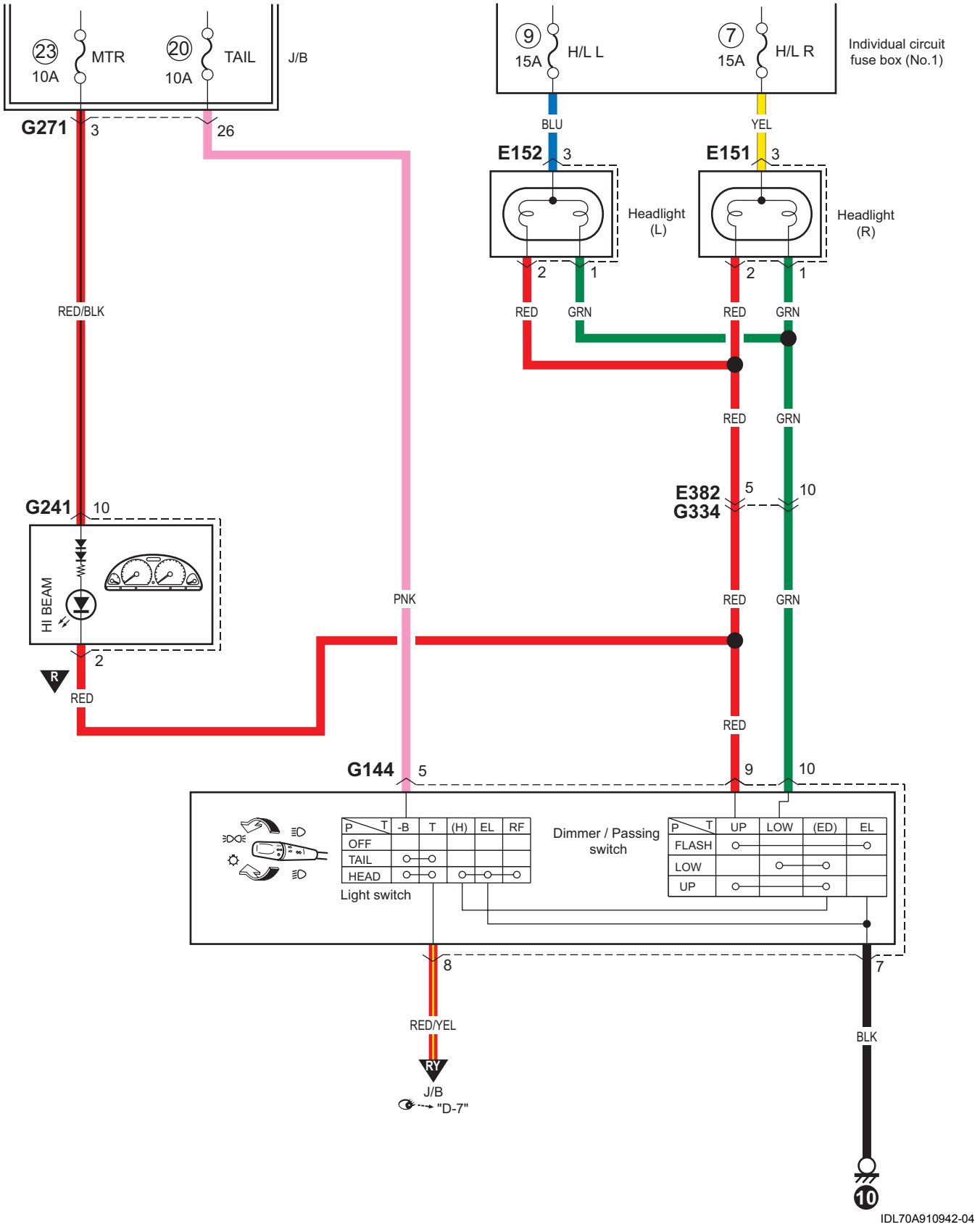


IDL70A910940-06


A/B model
ABS model
1
BRAKE
CHECK ENGINE
CHARGE
OIL
SEAT BELT
FUEL
AIRBAG
ABS
HIGH TEMP
P/S
OIL SERVICE
CPU
G241
23
22
24
13
G
Haz
Switch
"D-6"
Audio
"G-1"
Steering
switch
"G-1"
HL
Lv
Switch
"D-9"
Auto
AC
panel
"E-2"
FFg
Switch
"D-3"
HVAC
control
unit
"E-1"
AMT
shift selector
No. 2
"A-6"
GRY
BRN
BLK
B
9
IDL70A910959-05

D-1 Headlight System Circuit Diagram

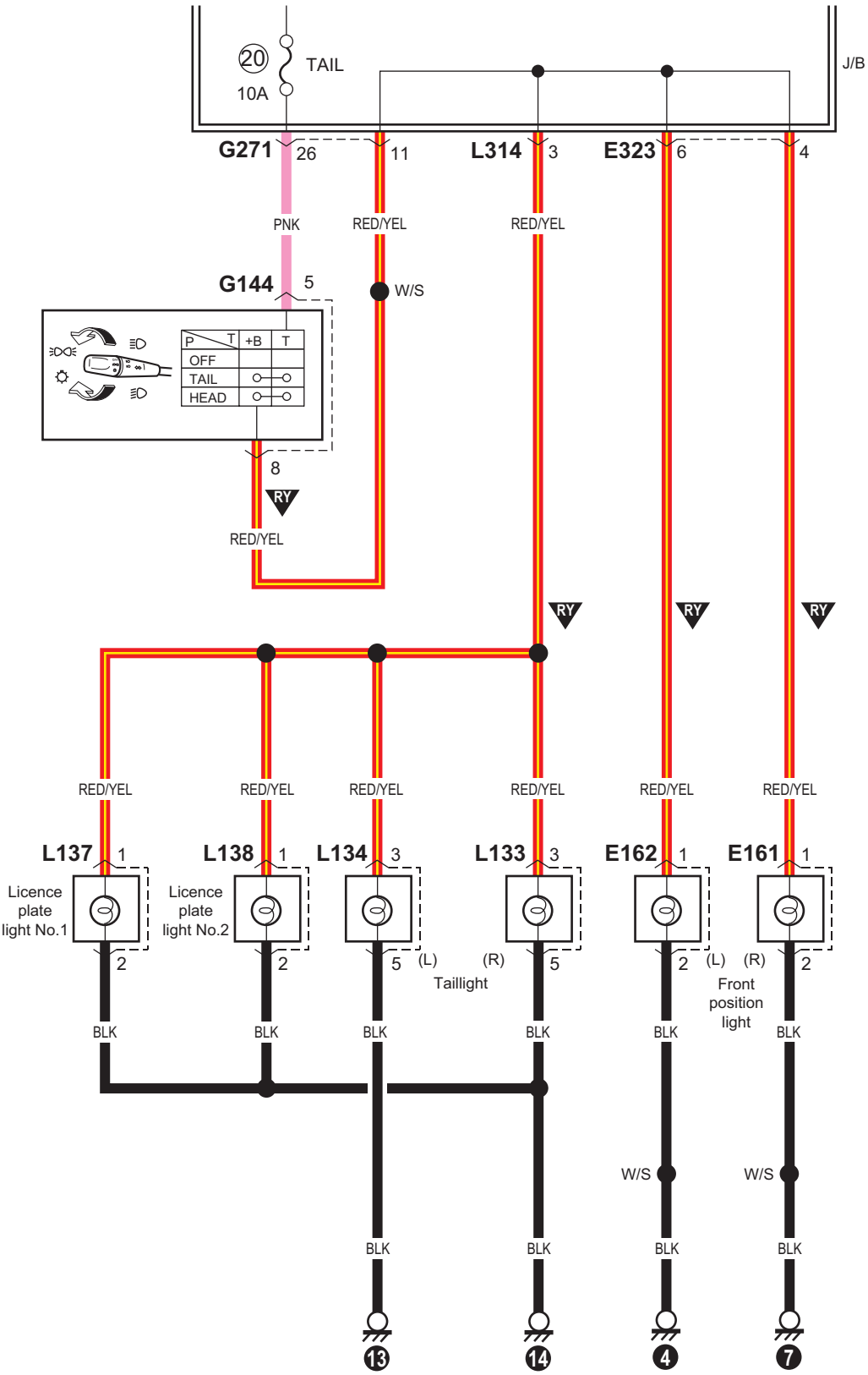
AENDL70A910E021



IDL70A910942-04

D-2 Clearance, Tail and Licence Plate Light System Circuit Diagram

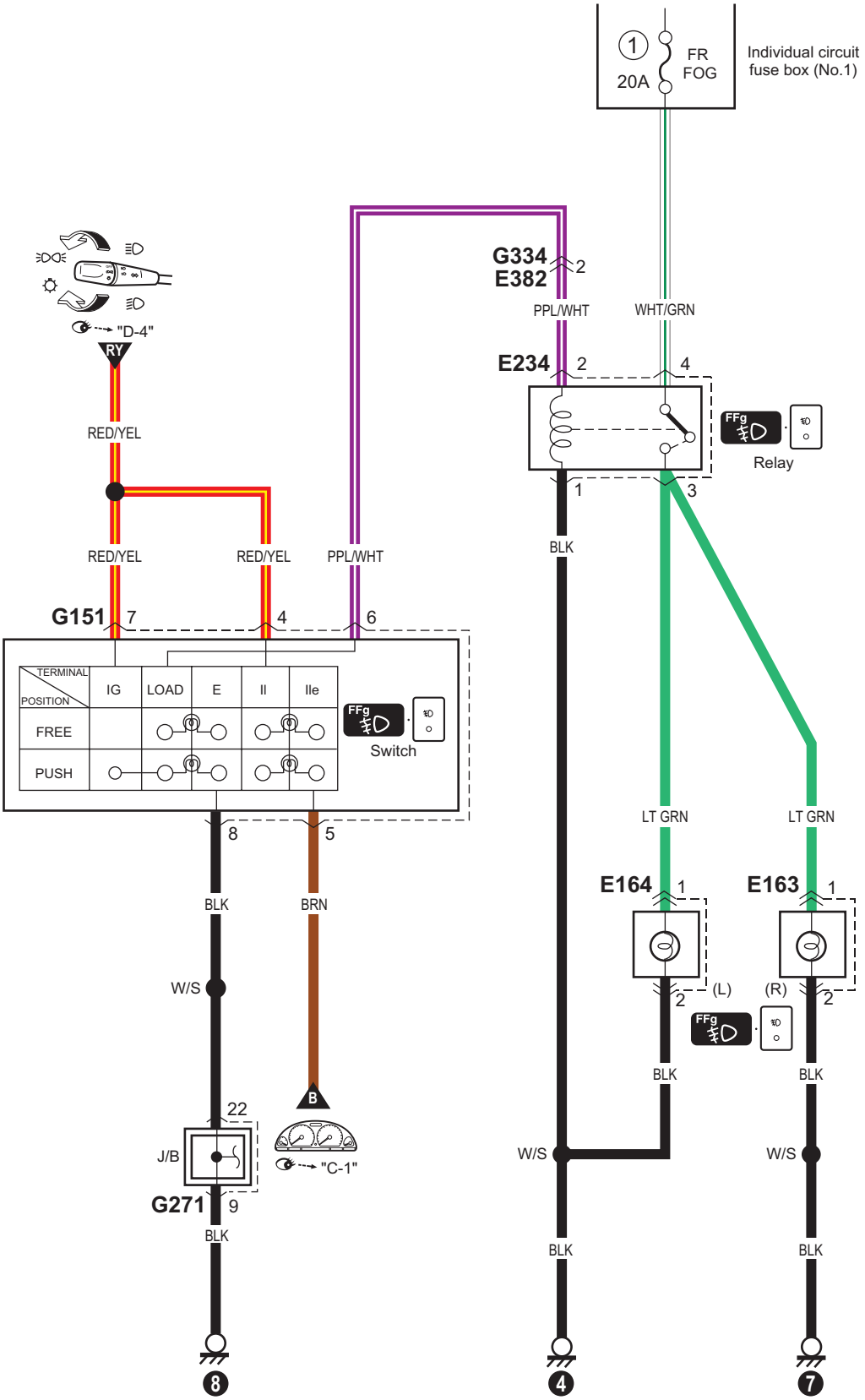
AENDL70A910E022



IDL70A910943-08

D-3 Front Fog Light System Circuit Diagram

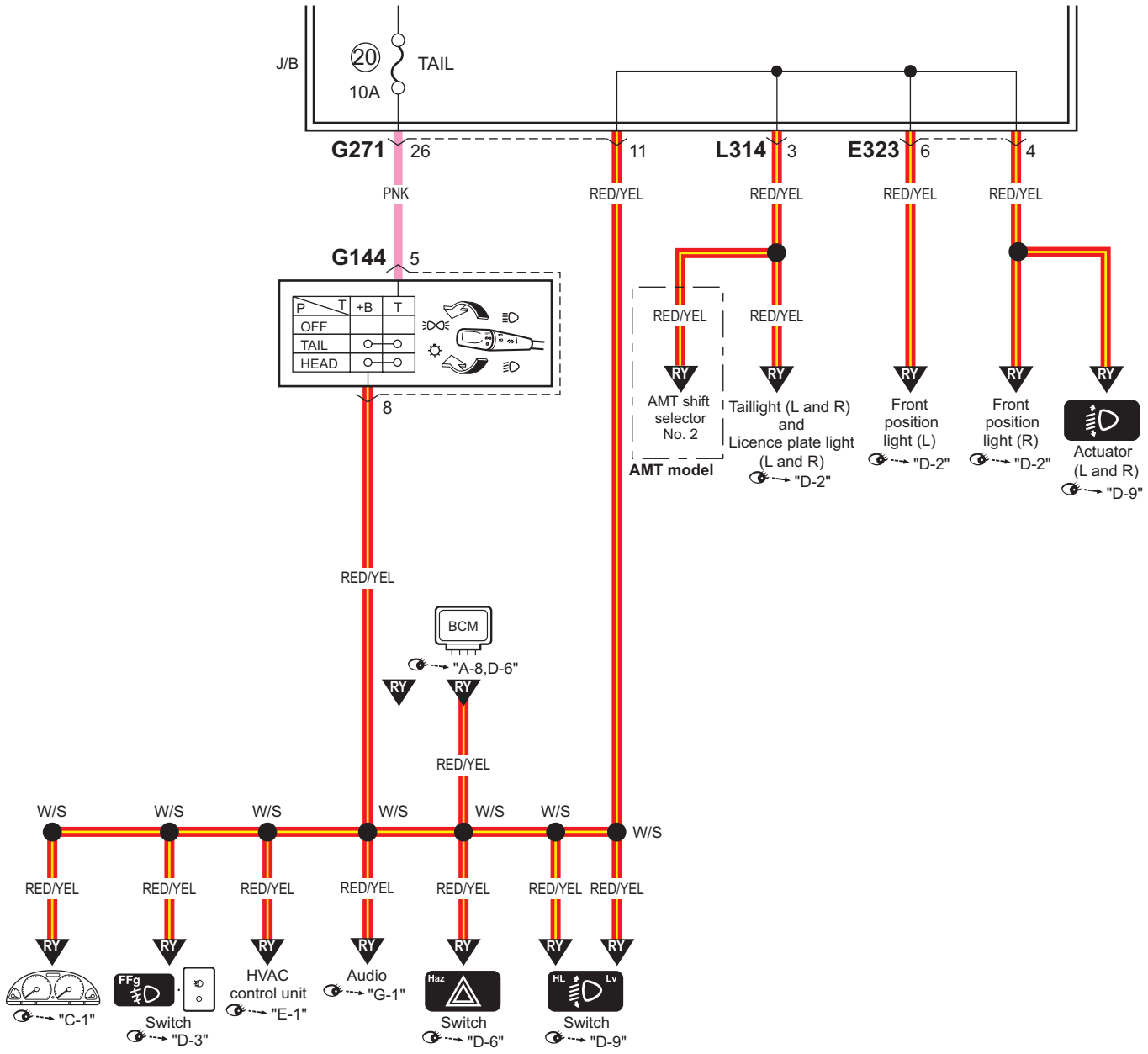
AENDL70A910E023



IDL70A910945-03

D-4 Illumination Light System Circuit Diagram

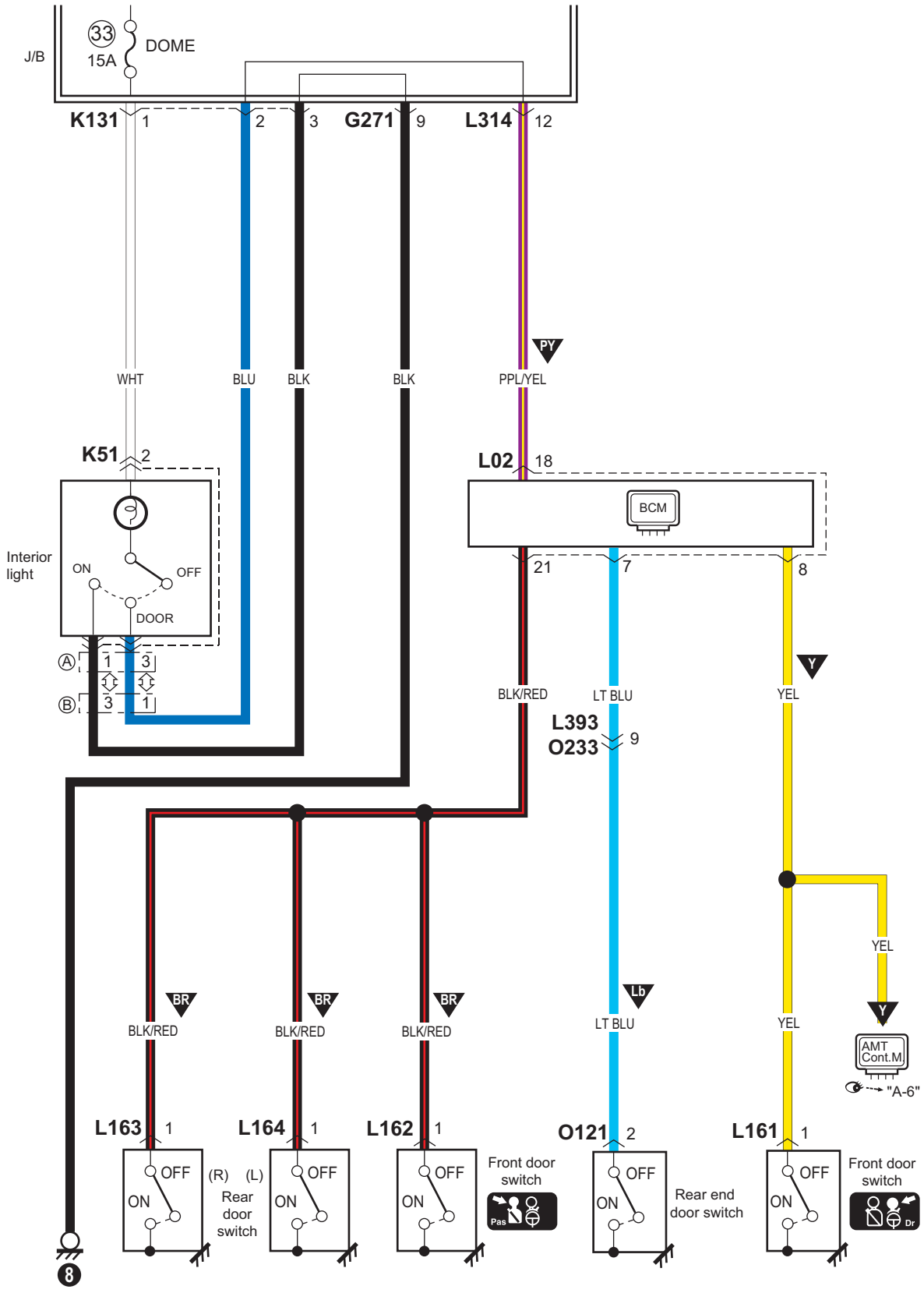
AENDL70A910E024



IDL70A910946-04

D-5 Interior Light System Circuit Diagram

AENDL70A910E025

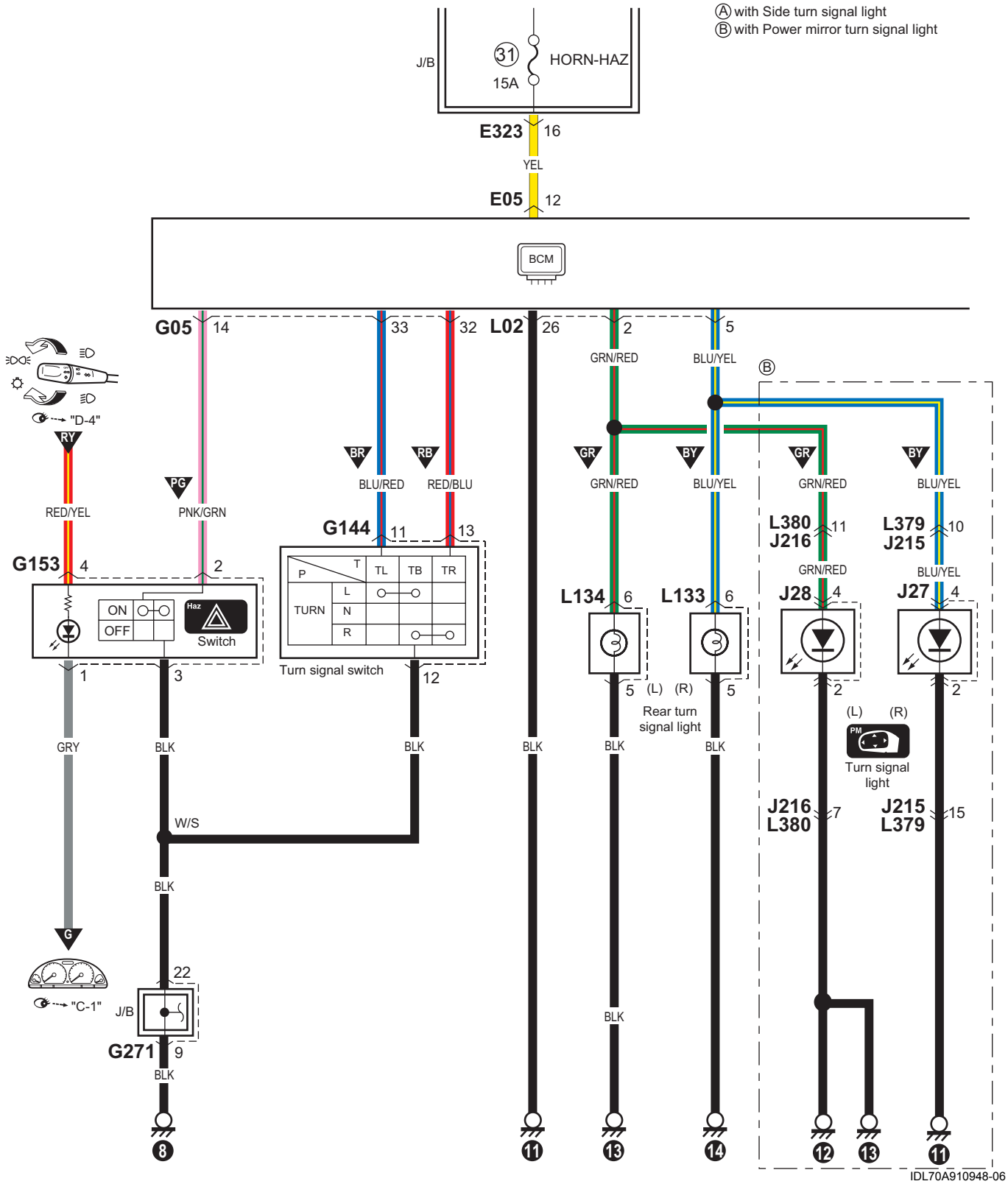


Ⓐ with MIC
Ⓑ without MIC

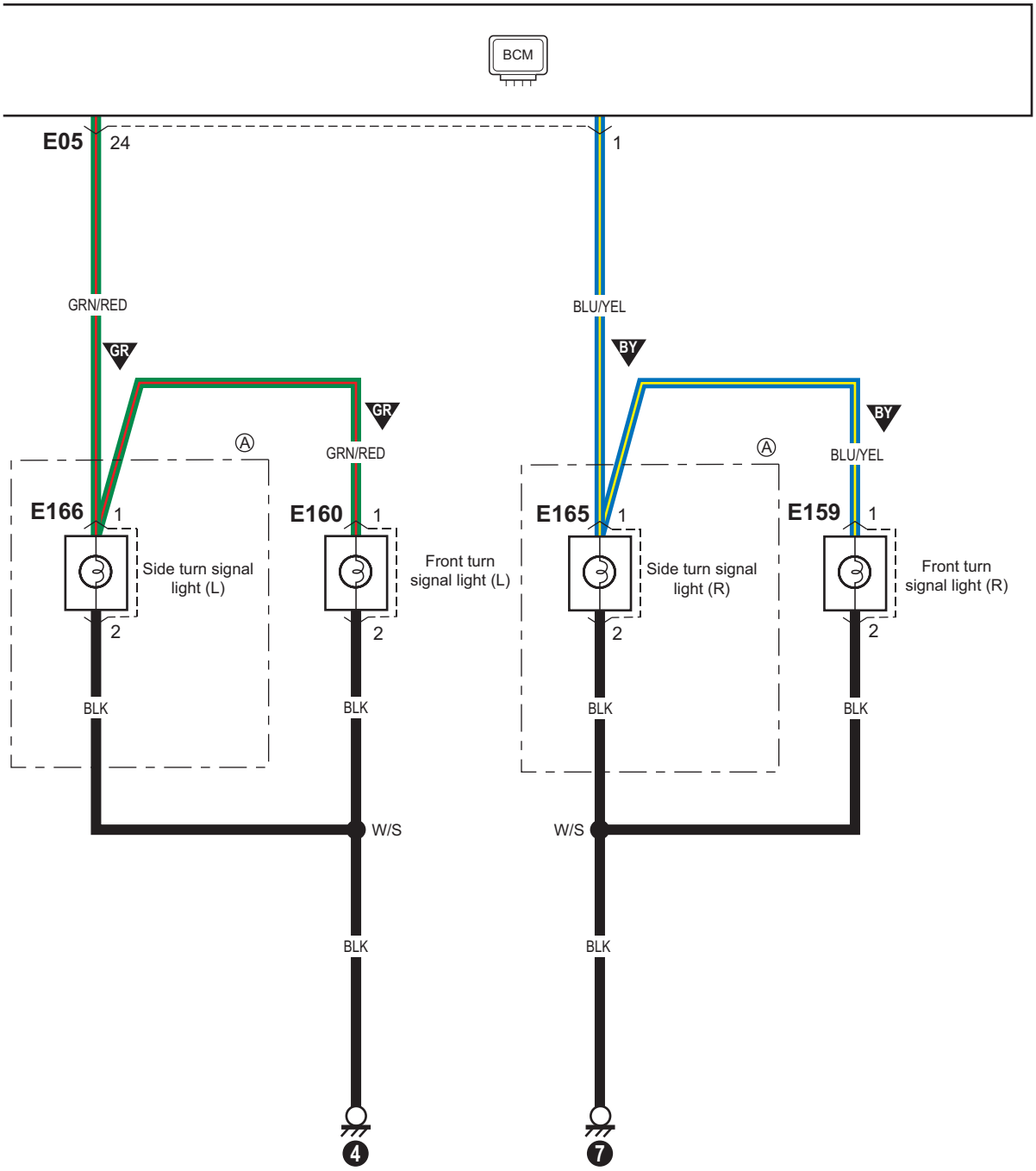
IDL70A910947-05

D-6 Turn Signal and Hazard Warning Light System Circuit Diagram

AENDL70A910E026



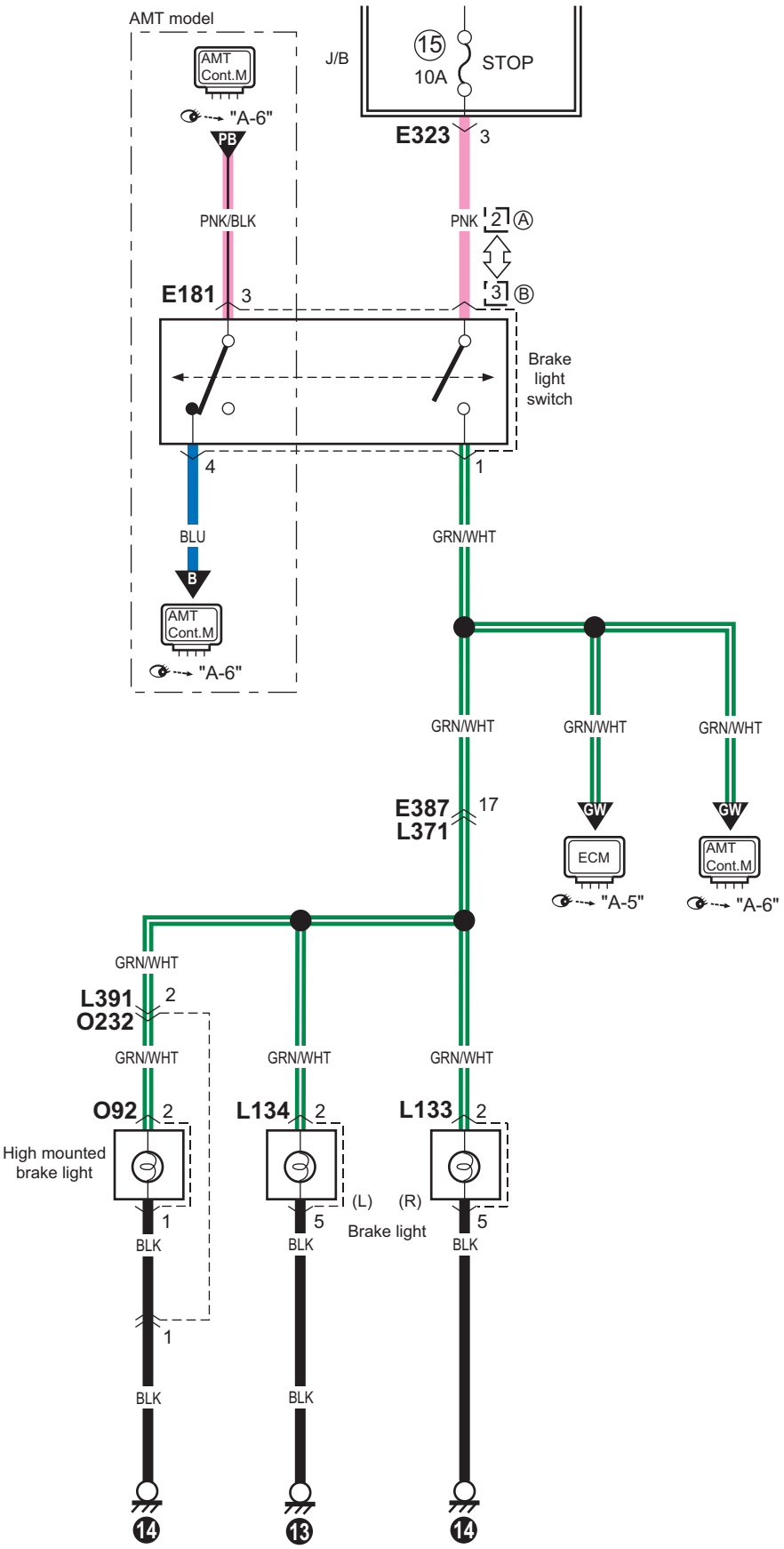
Ⓐ with Side turn signal light
Ⓑ with Power mirror turn signal light



IDL70A910949-05

D-7 Brake Light System Circuit Diagram

AENDL70A910E027

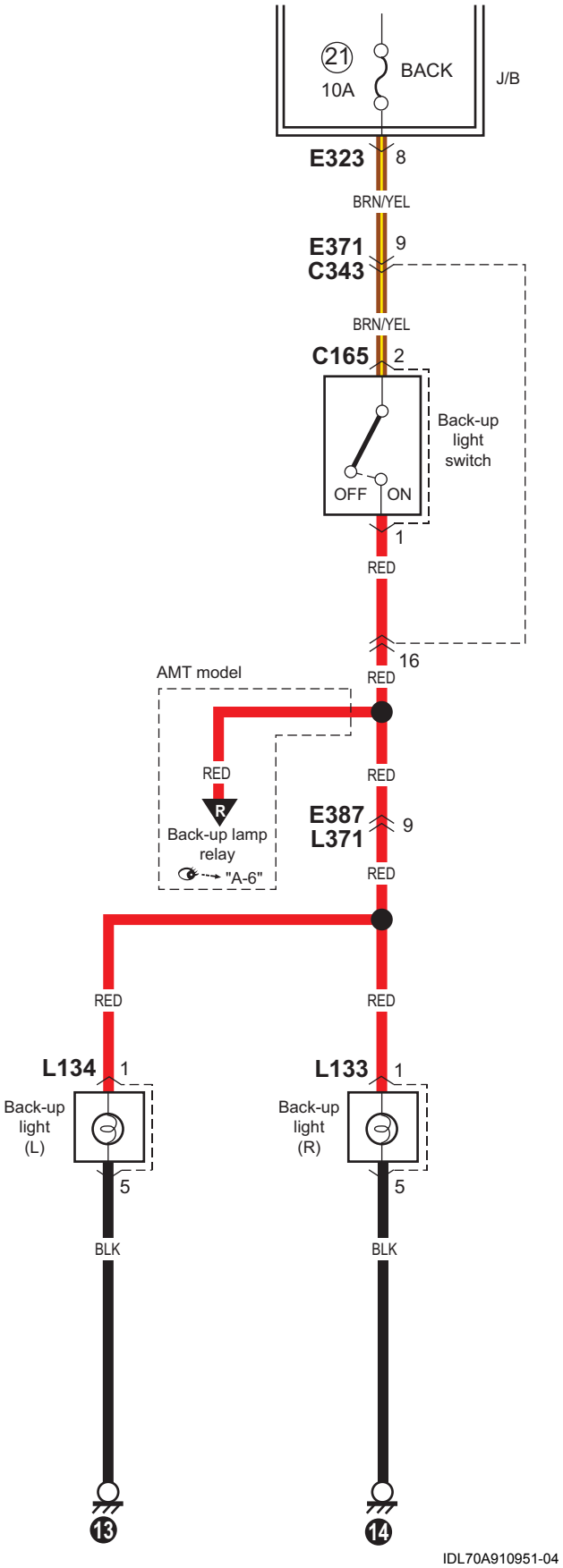


Ⓐ AMT model
Ⓑ Non-AMT model

IDL70A910950-05

D-8 Back-Up Light System Circuit Diagram

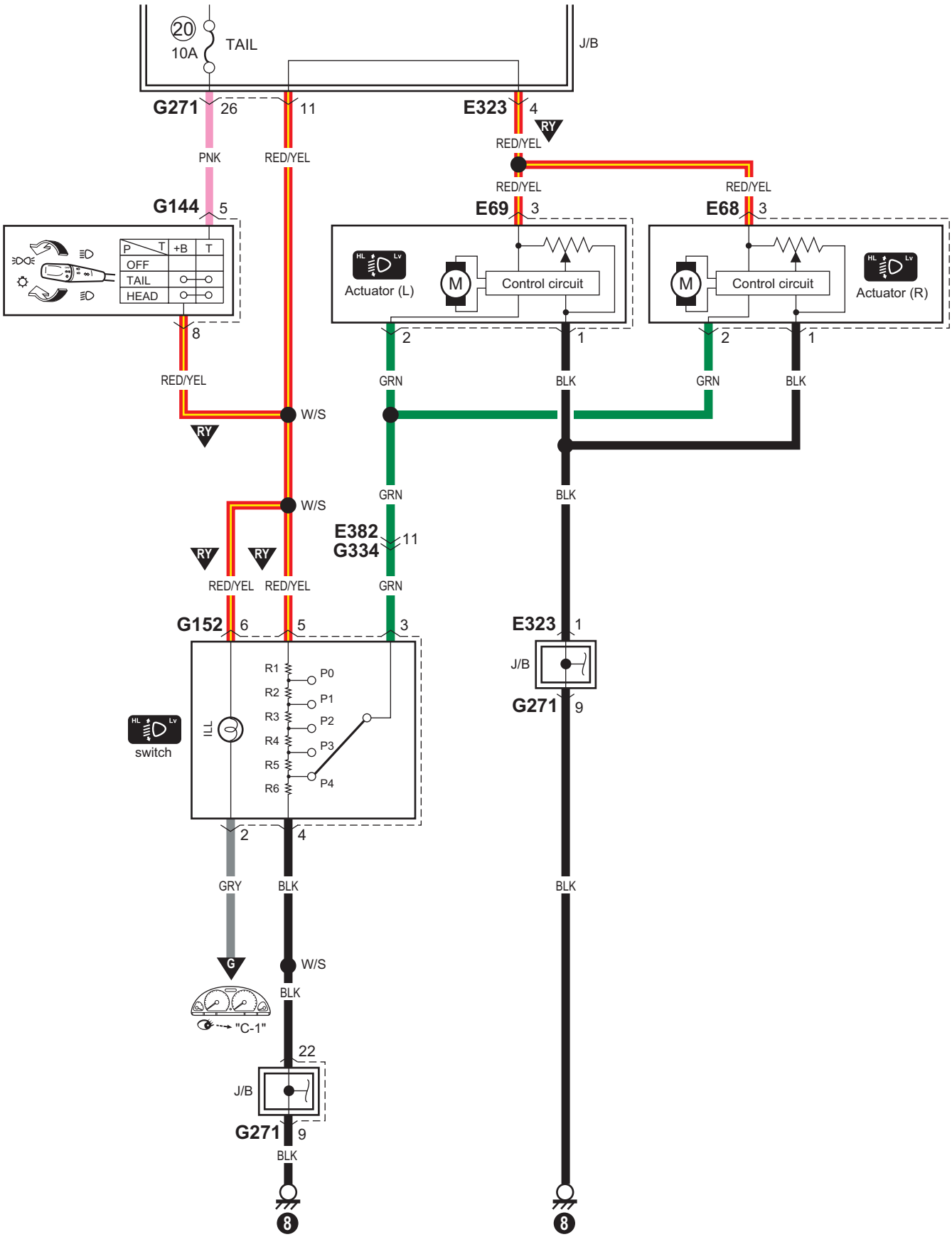
AENDL70A910E028



IDL70A910951-04

D-9 Headlight Beam Leveling System Circuit Diagram

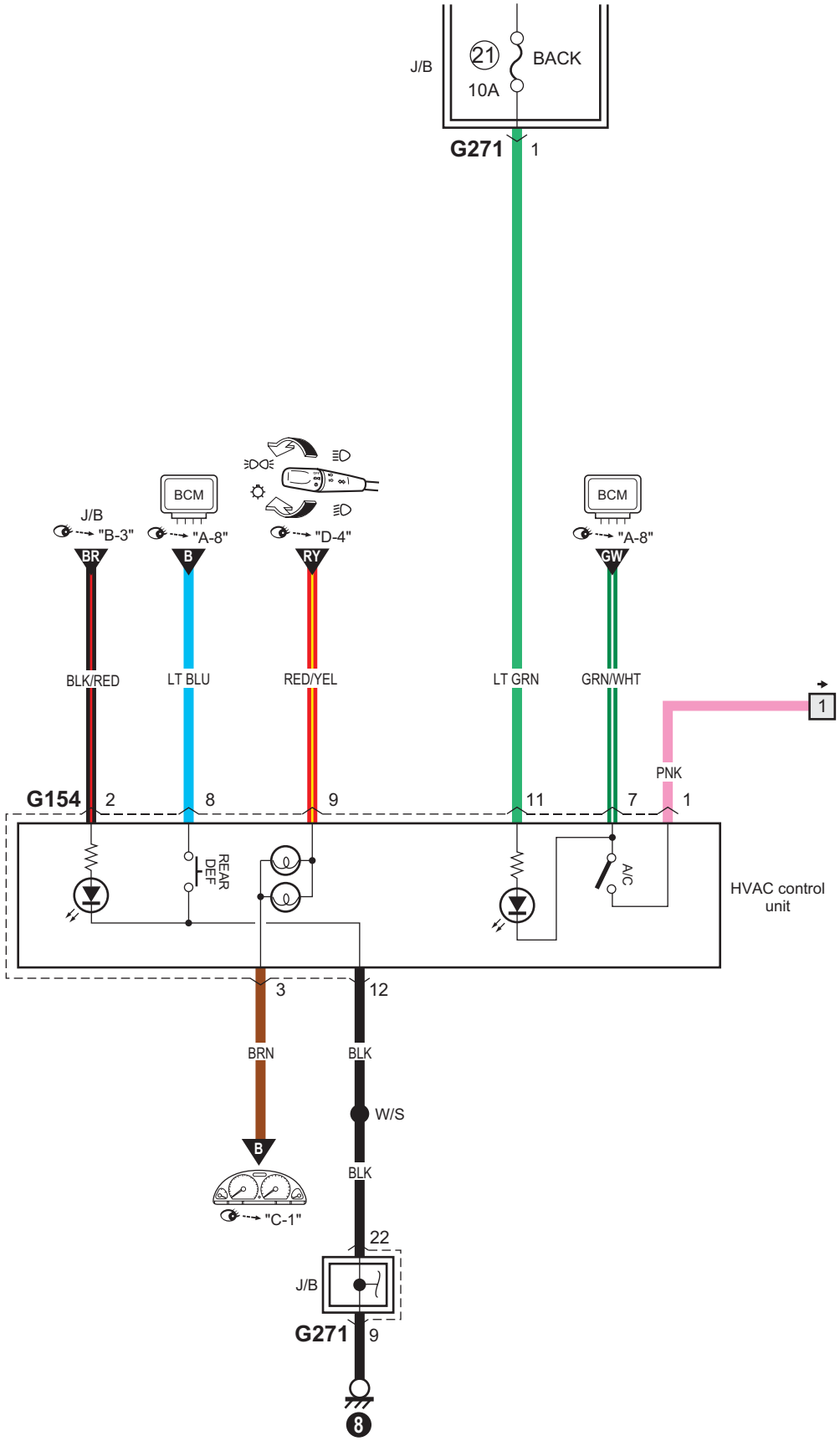
AENDL70A910E029



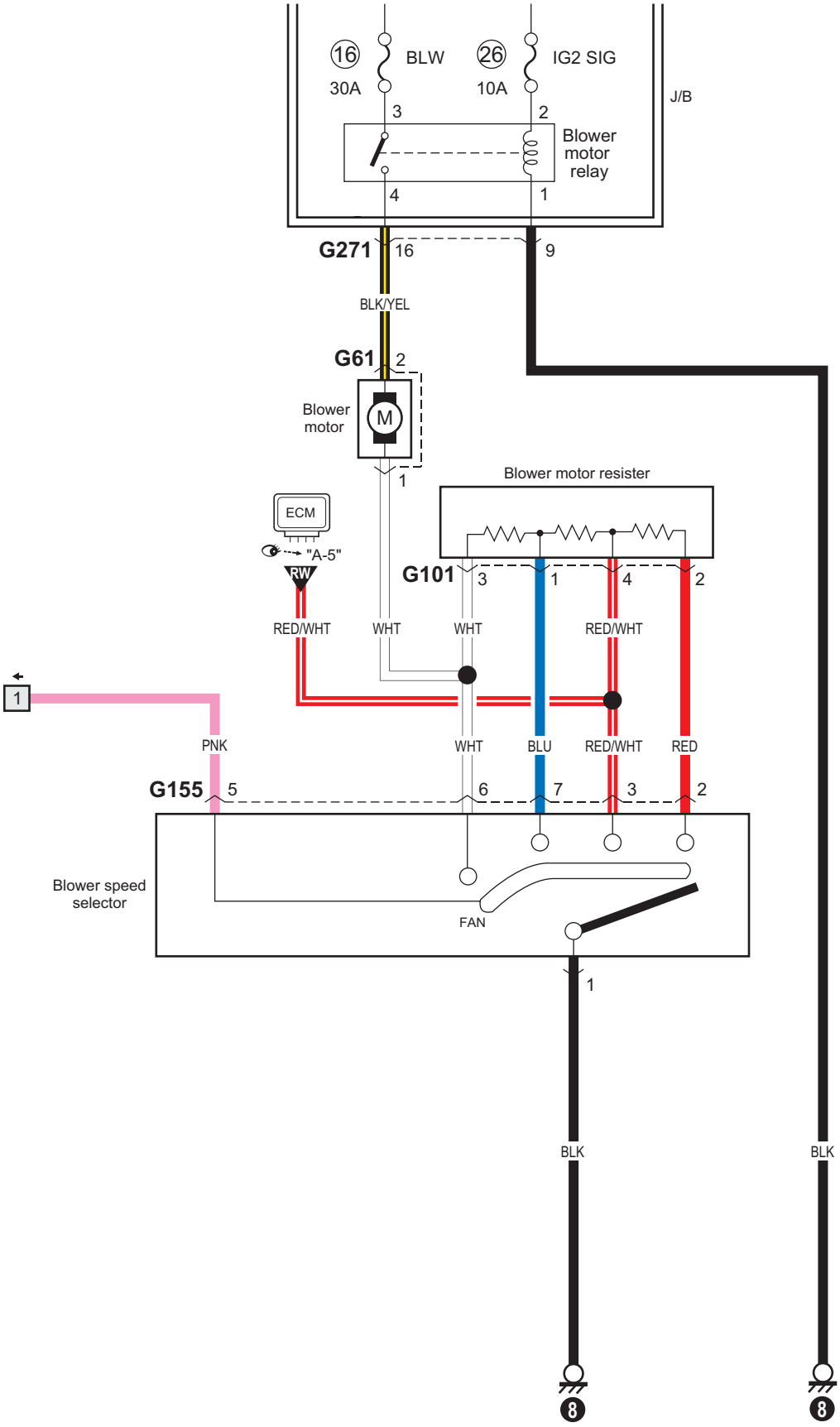
IDL70A910952-03

E-1 Heater System Circuit Diagram

AENDL70A910E031



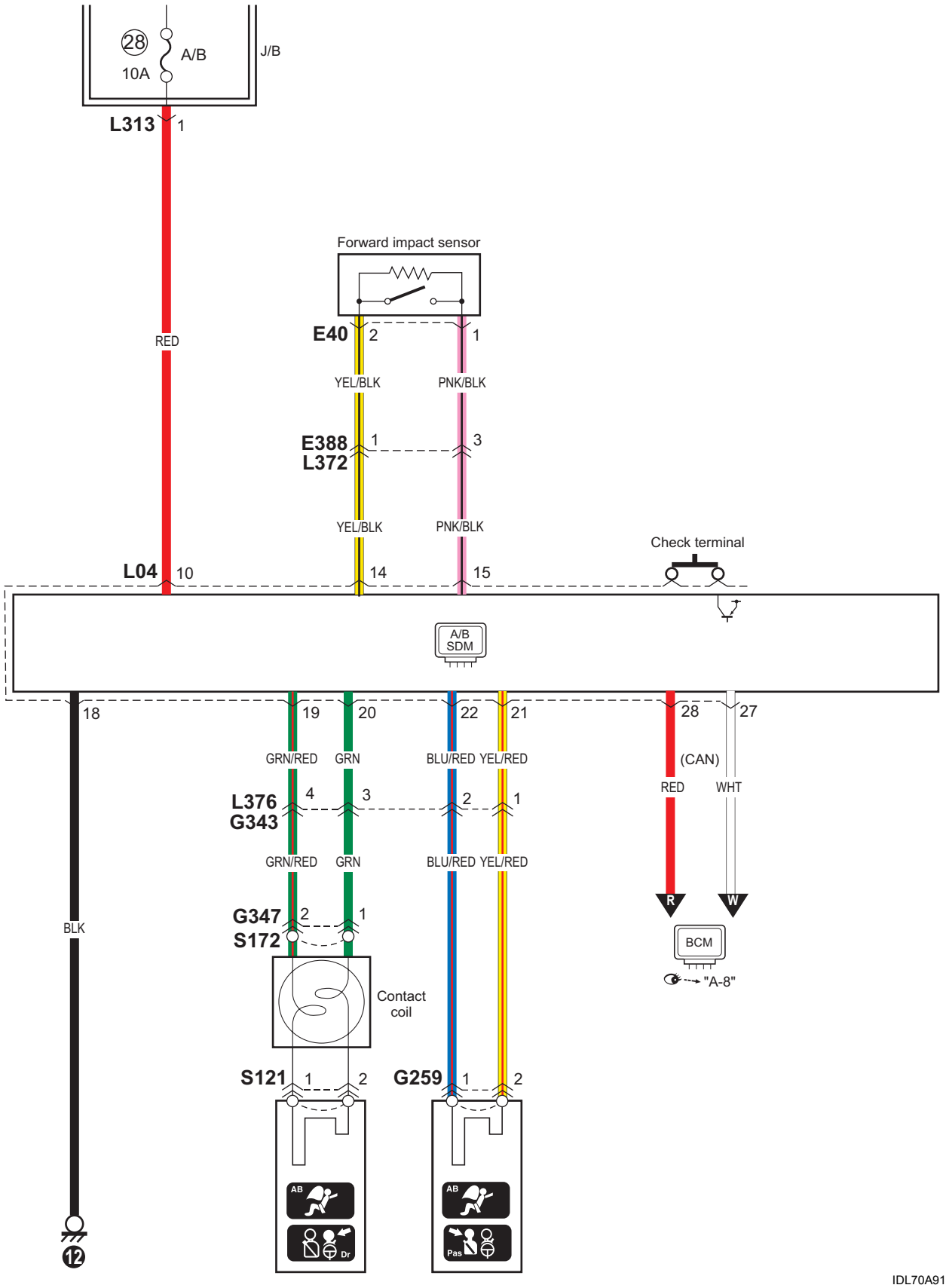
IDL70A910953-03



IDL70A910954-02

F-1 Air Bag System Circuit Diagram

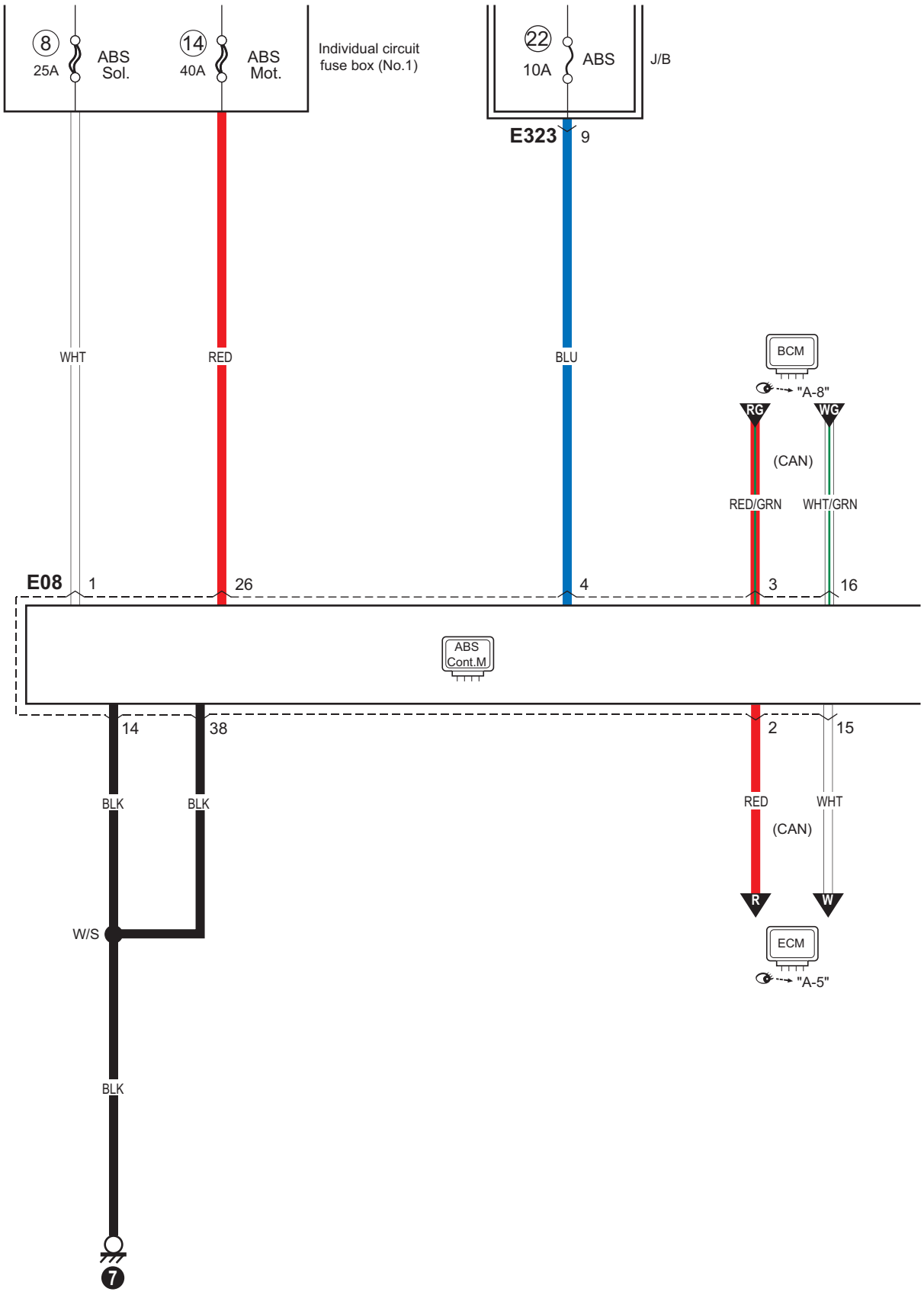
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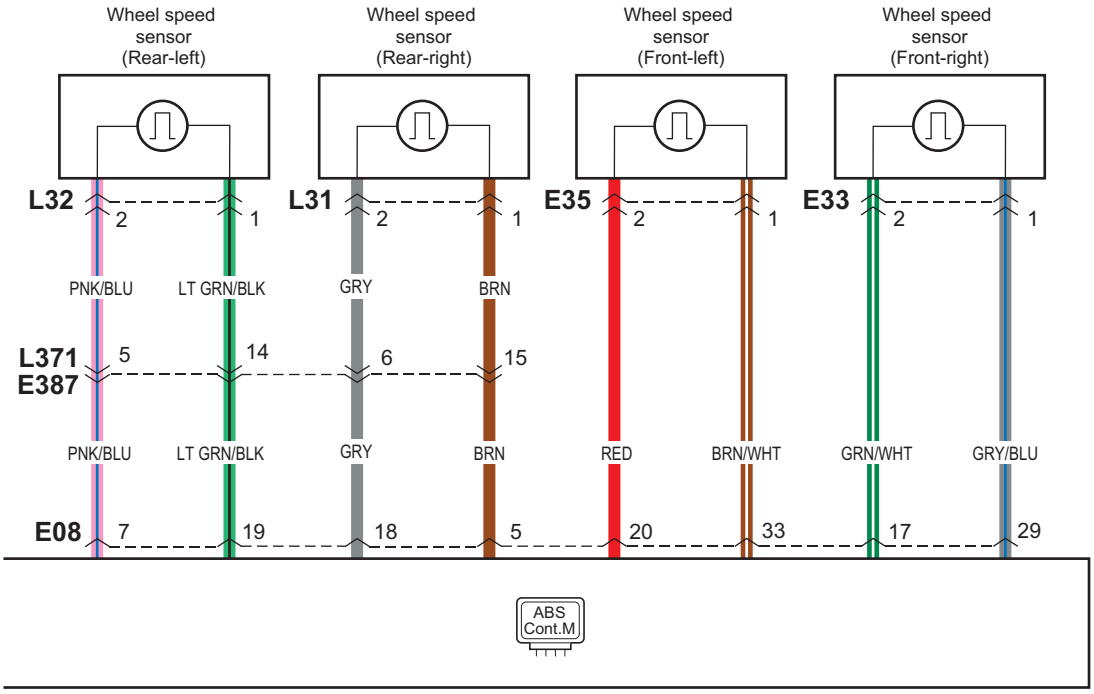
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F-2 Anti-Lock Brake System Circuit Diagram

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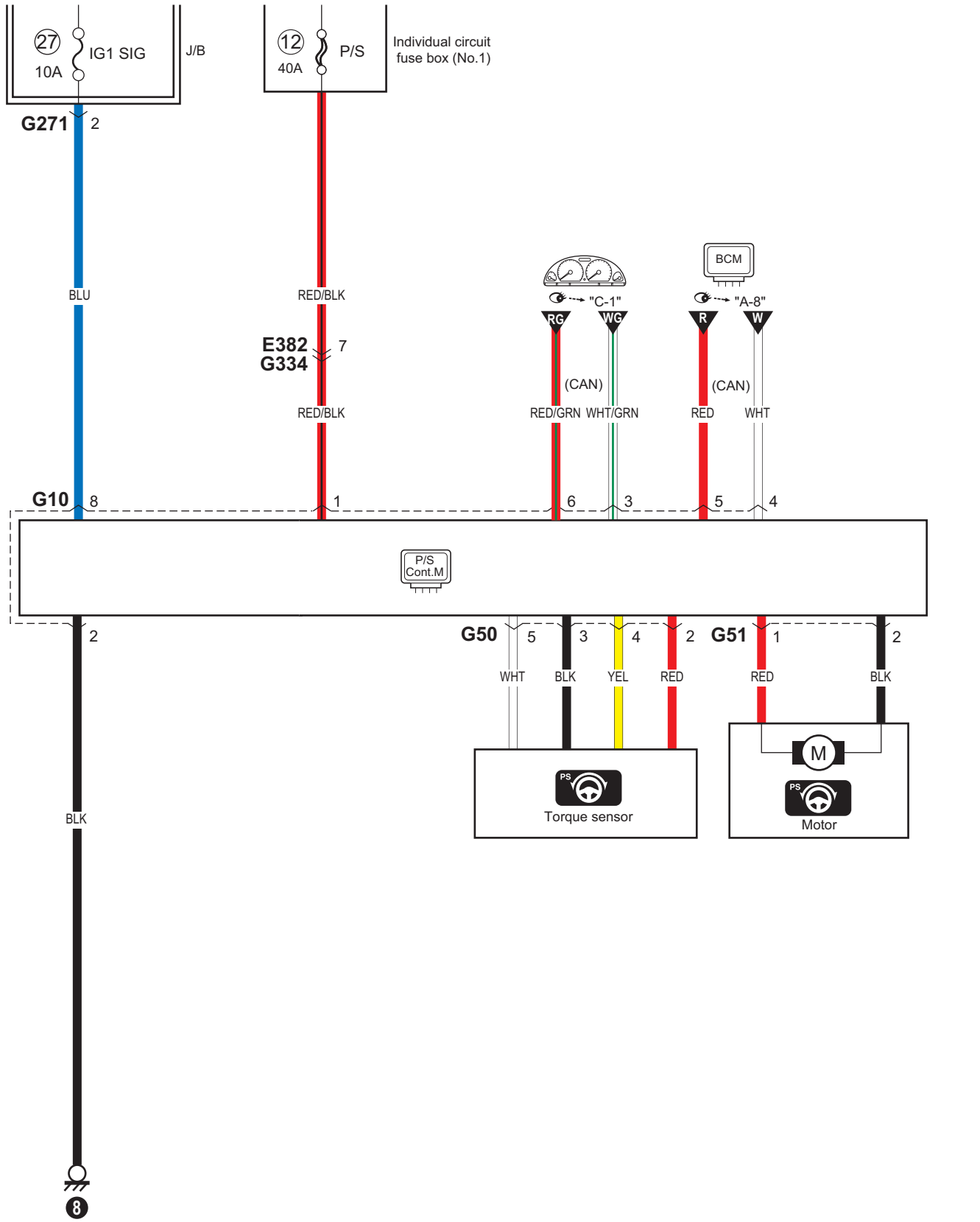
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IDL70A910957-05

F-4 Power Steering System Circuit Diagram

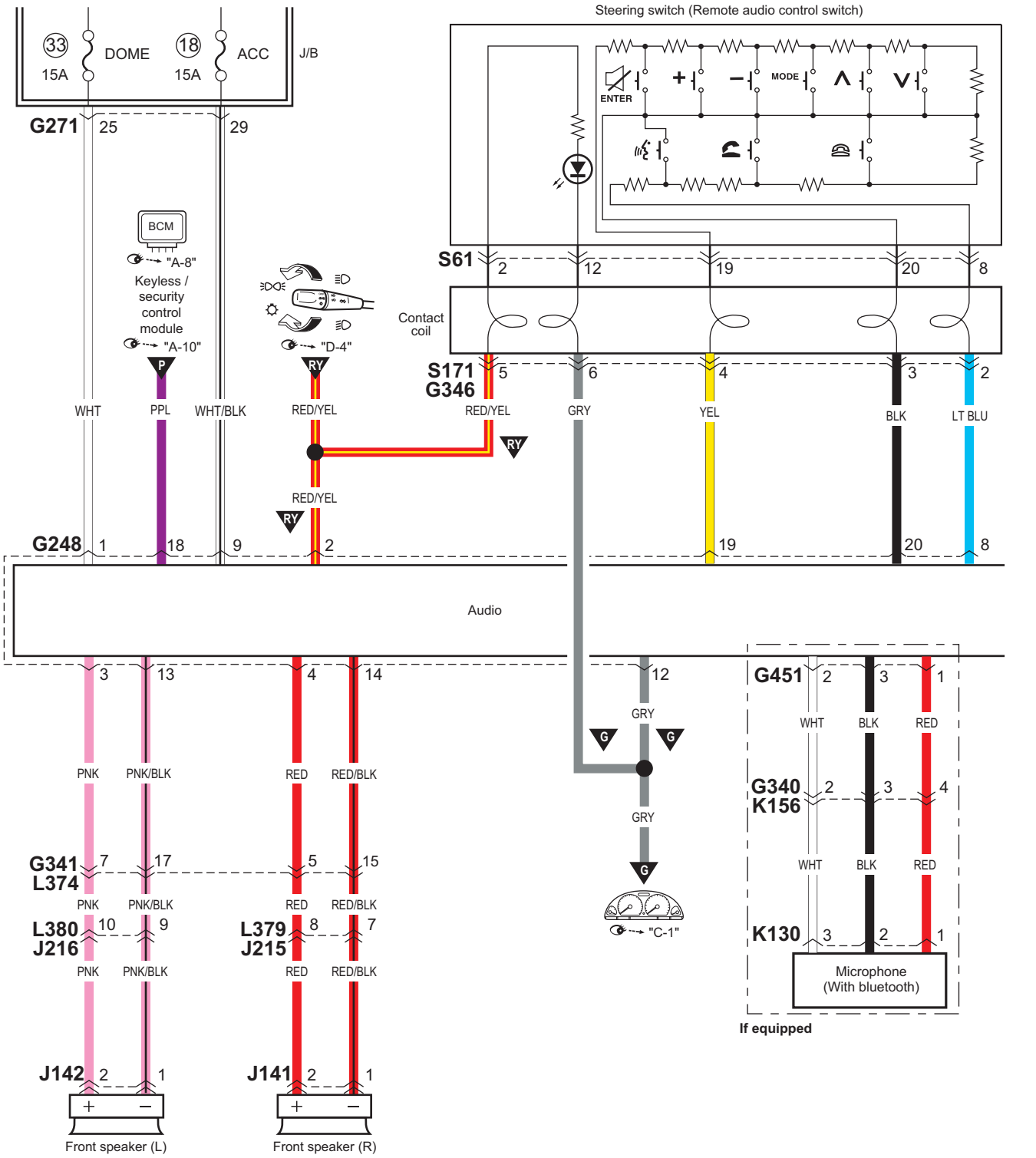
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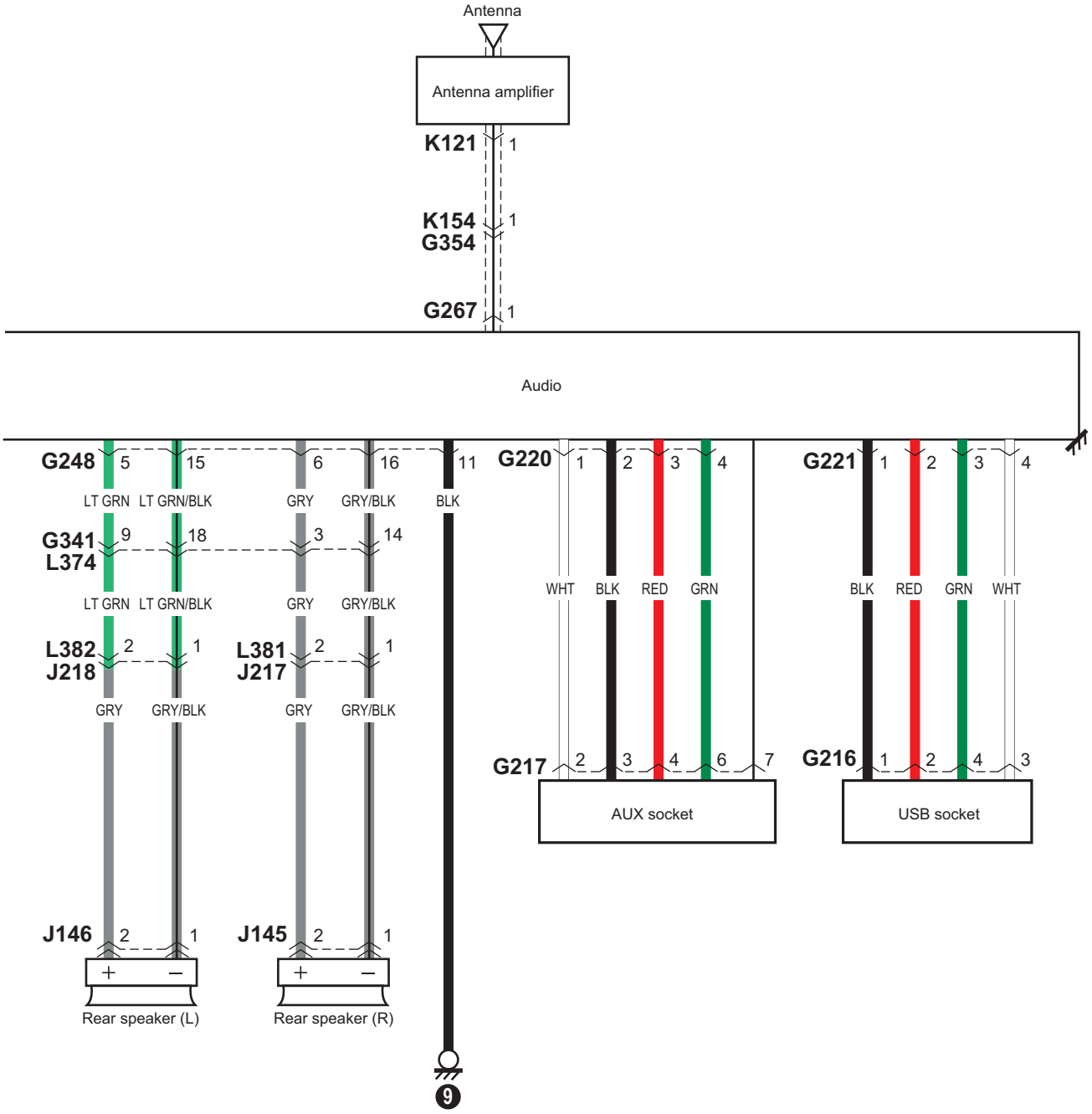
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G-1 Audio System Circuit Diagram

AENDL70A910E036



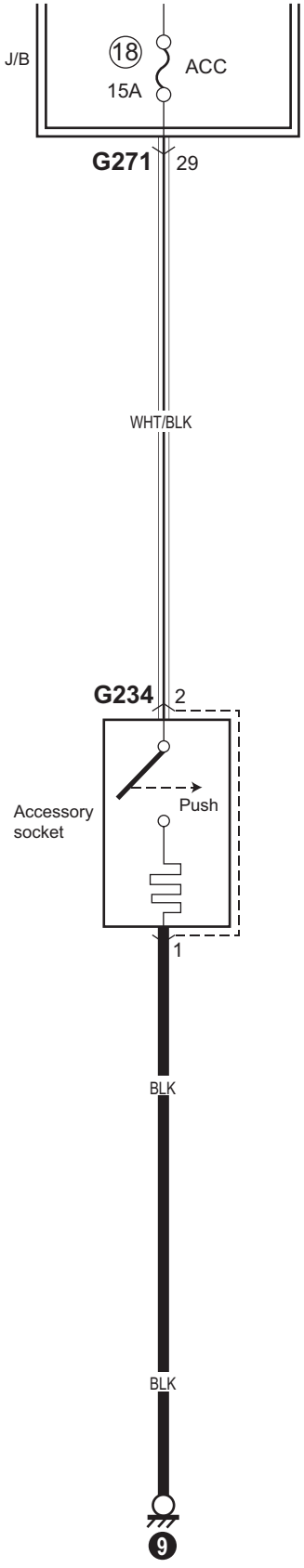
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IDL70A910961-05

G-2 Accessory Socket System Circuit Diagram

AENDL70A910E037



IDL70A910962-03

List of Connector

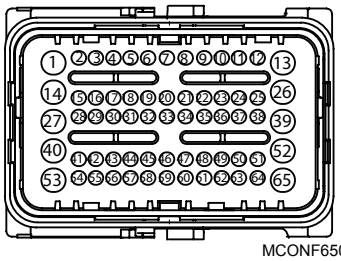
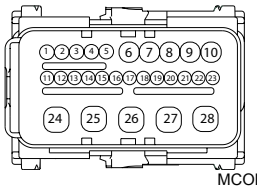
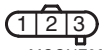
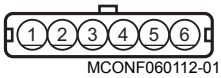
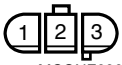
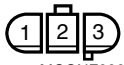
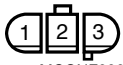
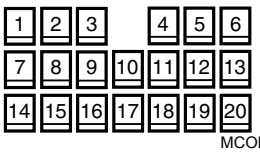
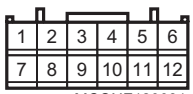
List of Connectors

AENDL70A910F001

Refer to “C Connector” (Page 9A-79).
Refer to “E Connector” (Page 9A-80).
Refer to “G Connector” (Page 9A-81).
Refer to “J Connector” (Page 9A-82).
Refer to “K Connector” (Page 9A-82).
Refer to “L Connector” (Page 9A-83).
Refer to “O Connector” (Page 9A-83).
Refer to “S Connector” (Page 9A-84).

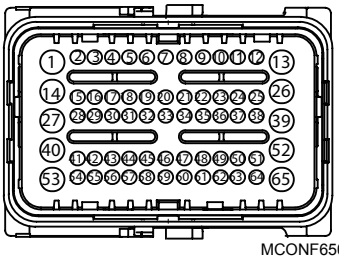
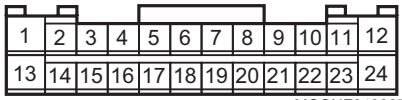
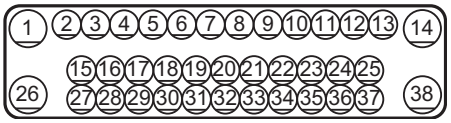
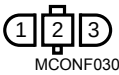
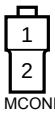
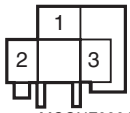
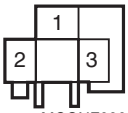
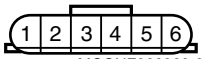
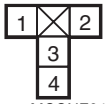
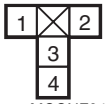
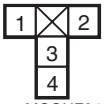
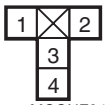
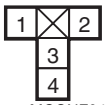
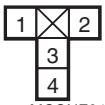
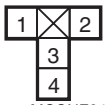
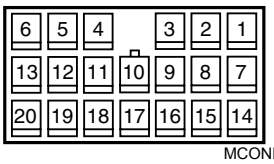
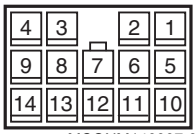
C Connector

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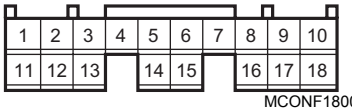
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C39  MCONF020173-01	C42  MCONF040081-01	C48  MCONF060112-01	C57  MCONF020049-01	C91  MCONF020328-01	C92  MCONF020328-01
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C162  MCONF010029-01	C165  MCONF020173-01 M/T model	C192  MCONF010078-01	C194  MCONF020391-01	C195  MCONF010021-01	C196  MCONF010138-01
C282  MCONF010078-01	C283  MCONF010082-01	C343 (TO E371)  MCONF200008-01		C350 (TO L413)  MCONF120081-01	

E Connector

AENDL70A910F003

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MCONF020200-01
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AMT model</td><td>E183
 
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E388 (TO L372)

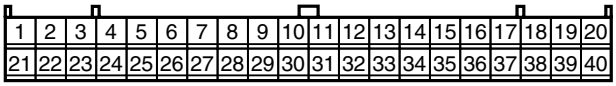


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G Connector

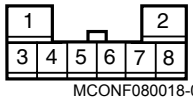
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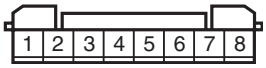
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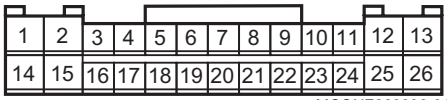
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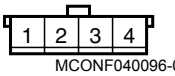
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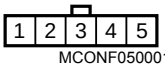
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Optional

G50



MCONF050001-01

G51



MCONF040009-01

G61



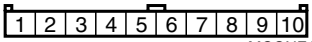
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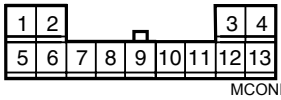
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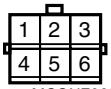
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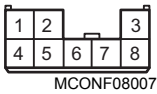
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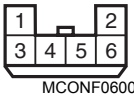
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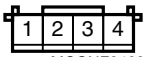
If equipped

G152



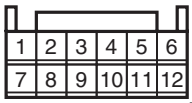
MCONF060078-01

G153



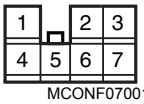
MCONF040098-01

G154



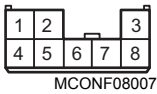
MCONF120052-01

G155



MCONF070016-01

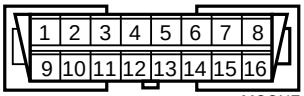
G164



MCONF080073-01

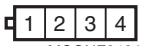
Optional

G211



MCONF160023-01

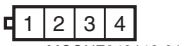
G216



MCONF040146-01

If equipped

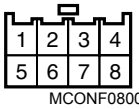
G217



MCONF040146-01

If equipped

G220



MCONF080033-02

If equipped

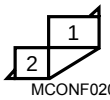
G221



MCONF040183-01

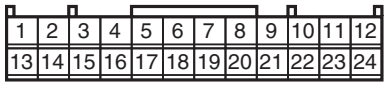
If equipped

G234



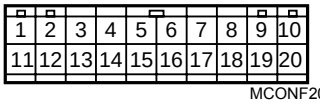
MCONF020116-01

G241



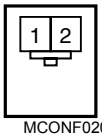
MCONF240014-01

G248



MCONF200012-01

G259



MCONF020207-01

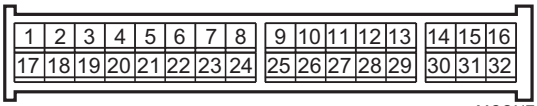
If equipped

G267



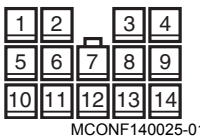
MCONM010040-01

G271



MCONF320021-01

G334 (TO E382)

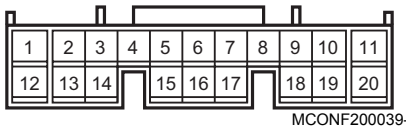
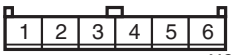


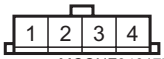
MCONF140025-01

G340



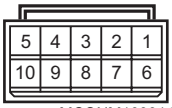
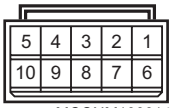
MCONM040047-01

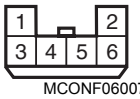
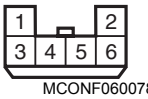
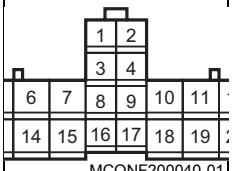
G342	G343 (TO L376)	G346 (TO S171)	G347 (TO S172)
 MCONF200039-01	 MCONM040026-01	 MCONF060080-01	 MCONF020212-01

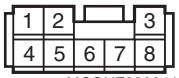
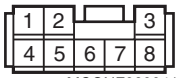
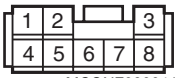
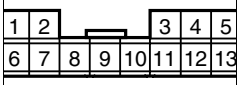
G354 (TO K154)	G451
 MCONF010046-01	 MCONF040177-01 If equipped

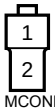
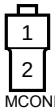
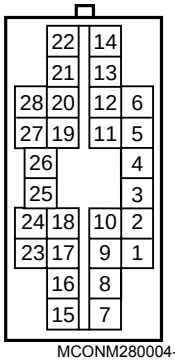
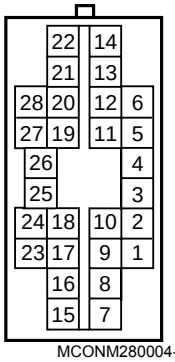
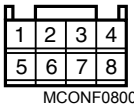
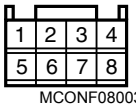
J Connector

AENDL70A910F005

J21	J22	J25	J26	J27	J28
 MCONF020236-01	 MCONF020236-01	 MCONF020236-01	 MCONF020236-01	 MCONM100014-01	 MCONM100014-01

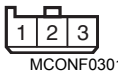
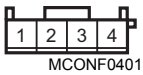
J31	J32	J32	J35	J36	J81
 MCONF060078-01	 MCONF020268-01 With keyless entry model	 MCONF060078-01 Without keyless entry model	 MCONF020151-01	 MCONF020268-01	 MCONF200040-01

J82	J83	J84	J87	J141	J142
 MCONF080041-01	 MCONF080041-01	 MCONF080041-01	 MCONF130011-01	 MCONF020008-01	 MCONF020008-01

J145	J146	J215 (TO L379)	J216 (TO L380)	J217 (TO L381)	J218 (TO L382)
 MCONF020008-01	 MCONF020008-01	 MCONM280004-01	 MCONM280004-01	 MCONF080035-01	 MCONF080035-01

K Connector

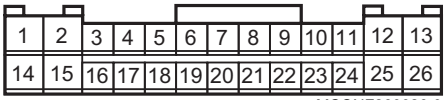
AENDL70A910F006

K51	K121	K130	K131	K154 (TO G354)	K156 (TO G340)
 MCONF030134-01	 MCONF010046-01	 MCONF030165-01 With bluetooth	 MCONF030134-01	 MCONM010040-01	 MCONF040180-01

L Connector

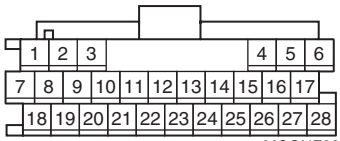
AENDL70A910F007

L02



MCONF260026-01

L04



MCONF280017-01

Airbag model

L31



MCONM020057-01

ABS model

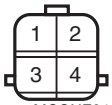
L32



MCONM020057-01

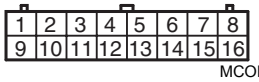
ABS model

L61



MCONF040145-01

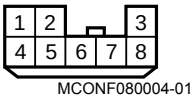
L105



MCONF160024-01

AMT model

L106



MCONF080004-01

AMT model

L133



MCONF060075-01

L134



MCONF060075-01

L137



MCONF020323-01

L138



MCONF020323-01

L161



MCONF010100-01

L162



MCONF010100-01

L163



MCONF010100-01

L164



MCONF010100-01

L167



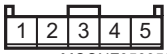
MCONF010021-01

L170



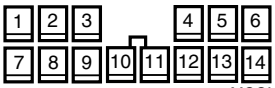
MCONF020268-01

L313



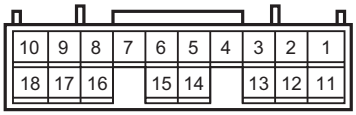
MCONF050059-01

L314



MCONF140008-01

L371 (TO E387)



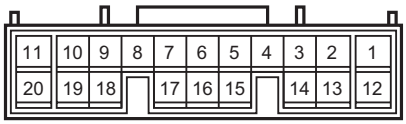
MCONM180010-01

L372 (TO E388)



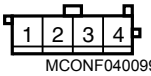
MCONM040022-01

L374 (TO G341)



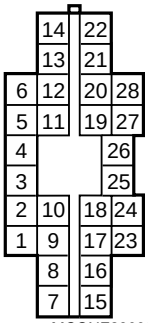
MCONM200011-01

L376 (TO G343)



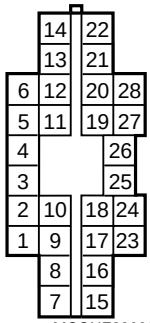
MCONF040099-01

L379 (TO J215)



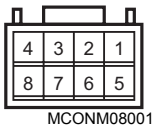
MCONF280006-01

L380 (TO J216)



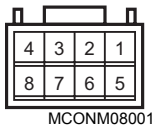
MCONF280006-01

L381 (TO J217)



MCONM080018-01

L382 (TO J218)



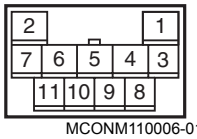
MCONM080018-01

L391 (TO O232)



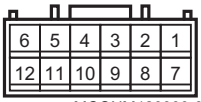
MCONM020057-01

L393 (TO O233)



MCONM110006-01

L413 (TO C350)



MCONM120009-01

O Connector

AENDL70A910F008

O21



MCONF020321-01

If equipped

O92



MCONF020026-01

O121



MCONF040143-01

O181



MCONF010021-01

If equipped

O182



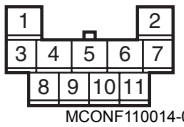
MCONF010021-01

If equipped

O232 (TO L391)

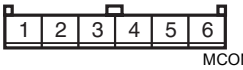
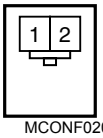
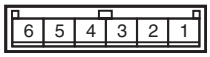


MCONF020151-01

O233 (TO L393)  MCONF110014-01					

S Connector

AENDL70A910F011

S61		S62	S121	S171 (TO G346)	S172 (TO G347)
 MCONF060080-01		 MCONF010121-01	 MCONF020207-01	 MCONM060037-01	 MCONM020065-01
With airbag		Without airbag	With airbag	With airbag	With airbag
S173 (TO G371)					
 MCONM010042-01 Without airbag					

Reassembling Note for Wiring Harness

Reassembling Note for Wiring Harness

AENDL70A910H001

Refer to “Around Engine” (Page 9A-85)
Refer to “Around Battery” (Page 9A-87)
Refer to “Around Strut” (Page 9A-89)
Refer to “Around Instrument Panel” (Page 9A-91)
Refer to “Around Main Floor” (Page 9A-93)
Refer to “Rear End Door Harness” (Page 9A-95)

Ground Bolt Used on Painted Panels

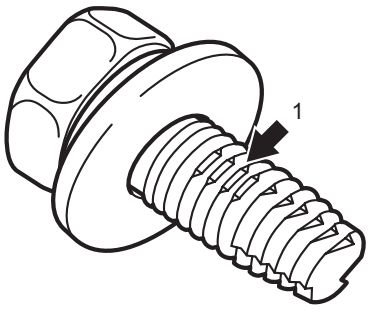
The bolts are specially designed to get good metal-to-metal contact on painted panels.
Be sure to use the specified ground bolt.
Using an ordinary bolt can cause poor grounding on painted panels.

⚠ CAUTION

Using this bolt on aluminum blocks will damage the screw hole of the block. Never use this bolt on aluminum blocks.

NOTE

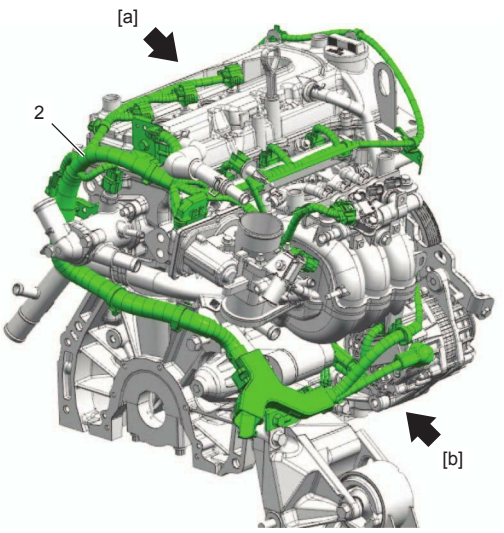
This ground bolt is not used on the engine block, the transmission case or the steering column mounting bracket (non-painted). Identify the bolt with the paint-scratch shape (1) on the screw.

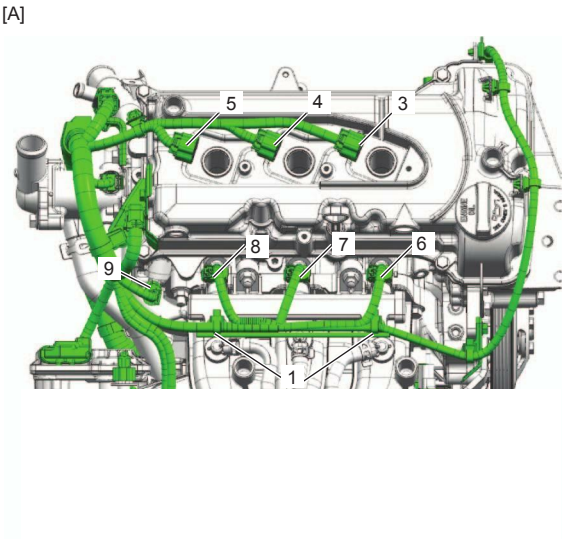


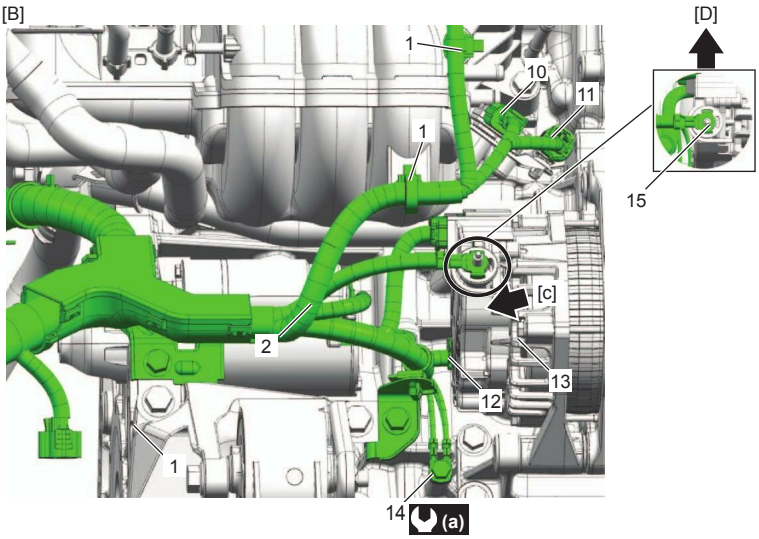
I7V10A910944-03

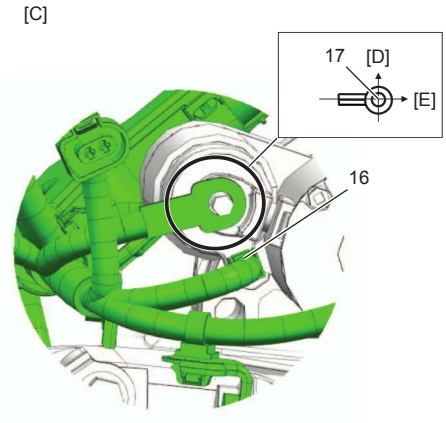
Around Engine

AENDL70A910H002



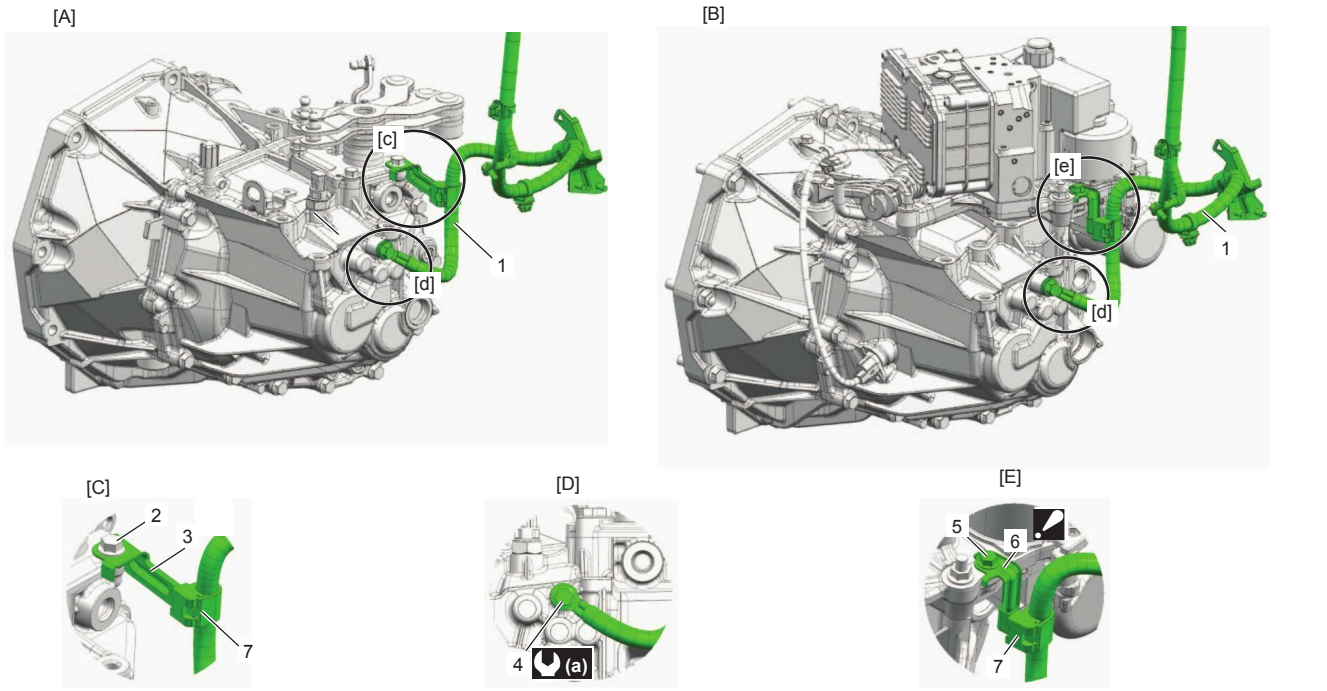






IDL70A910970-03

[A]: View [a]	2. Engine harness	8. Fuel injector #3	14. GND bolt
[B]: View [b]	3. Ignition coil #1	9. CMP sensor	15. Generator (+B)
[C]: View [c]	4. Ignition coil #2	10. MAP sensor	16. Starting motor :Keep the connector lock upward.
[D]: Upward	5. Ignition coil #3	11. Knock sensor	17. Starting motor (+B)
[E]: Forward	6. Fuel injector #1	12. CKP sensor	(a) : 11 N·m (1.1 kgf-m, 8.1 lbf-ft)
1. Clamp	7. Fuel injector #2	13. Generator	

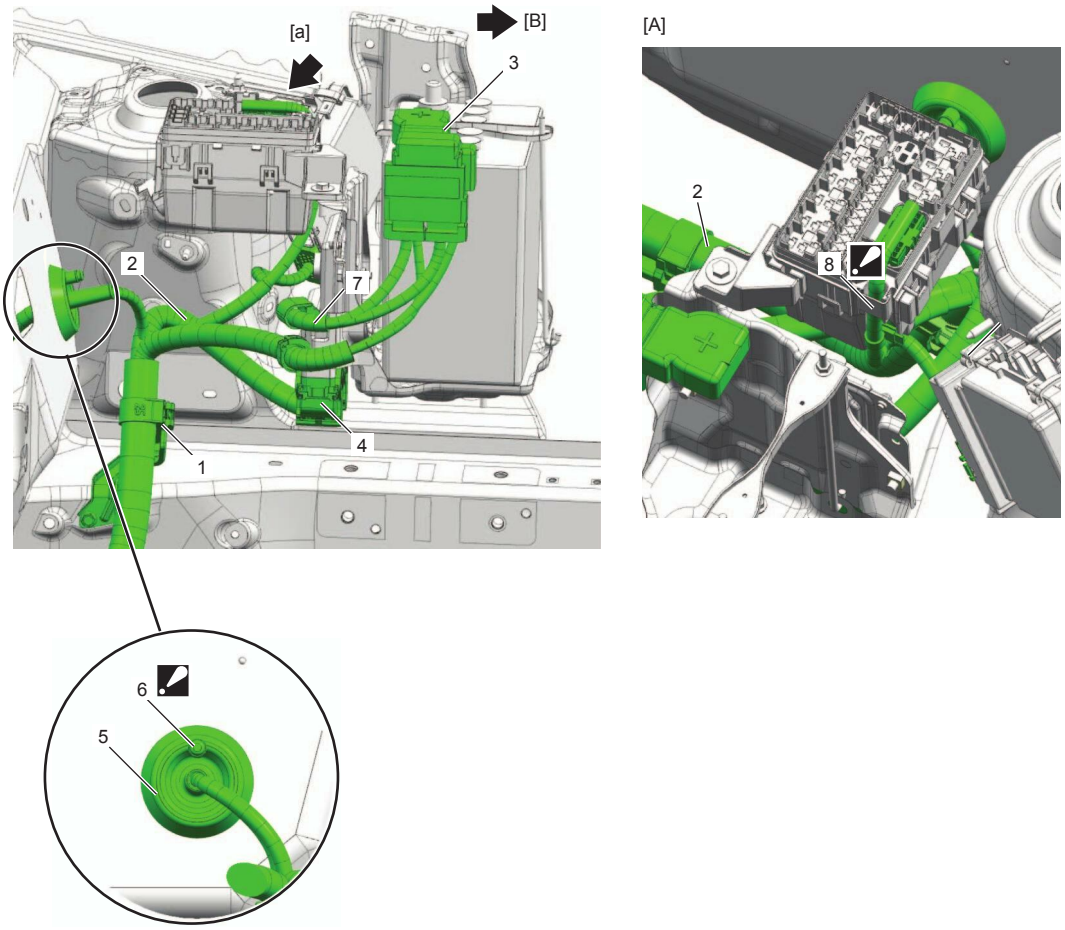


IDL70A910971-06

[A]: M/T	1. Battery ground cable	6. Battery cable mounting bracket (AMT model) : Install bracket so that the stopper touches AMT unit.
[B]: AMT	2. Gear shift guide case bolt	7. Clamp
[C]: Detail [c]	3. Battery cable mounting bracket	(a) : 25.3 N·m (2.6 kgf-m, 18.7 lbf-ft)
[D]: Detail [d]	4. GND bolt	
[E]: Detail [e]	5. Battery bracket cable bolt	

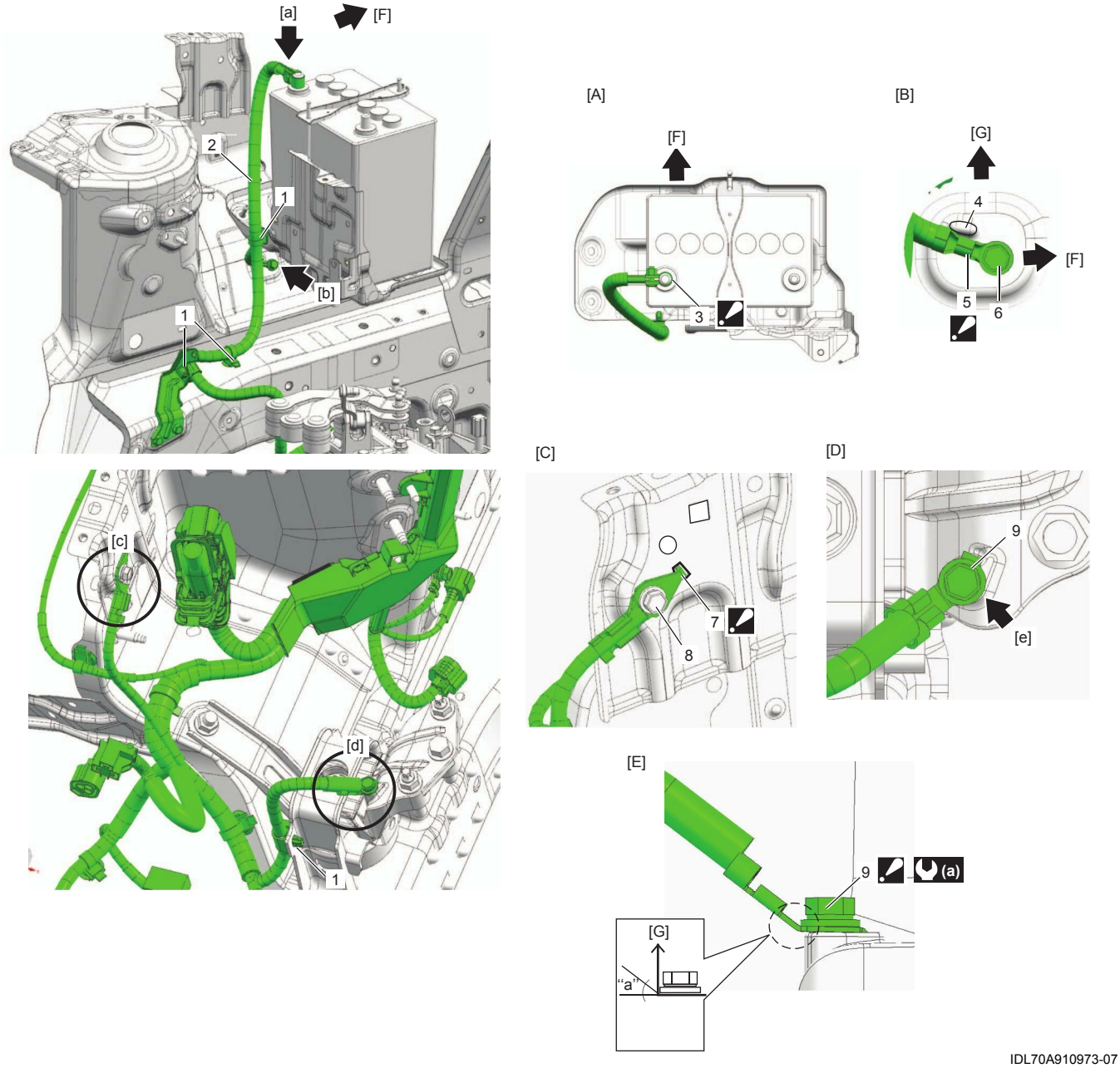
Around Battery

AENDL70A910H003



IDL70A910972-07

[A]: View [a]	3. Battery (+)	7. Main harness
[B]: Forward	4. ECM	8. To main harness : Close the hinged side cover after connecting main harness connector.
1. Clamp	5. Grommet	
2. Engine harness	6. Nipple : Keep the nipple upside while assembling the grommet.	



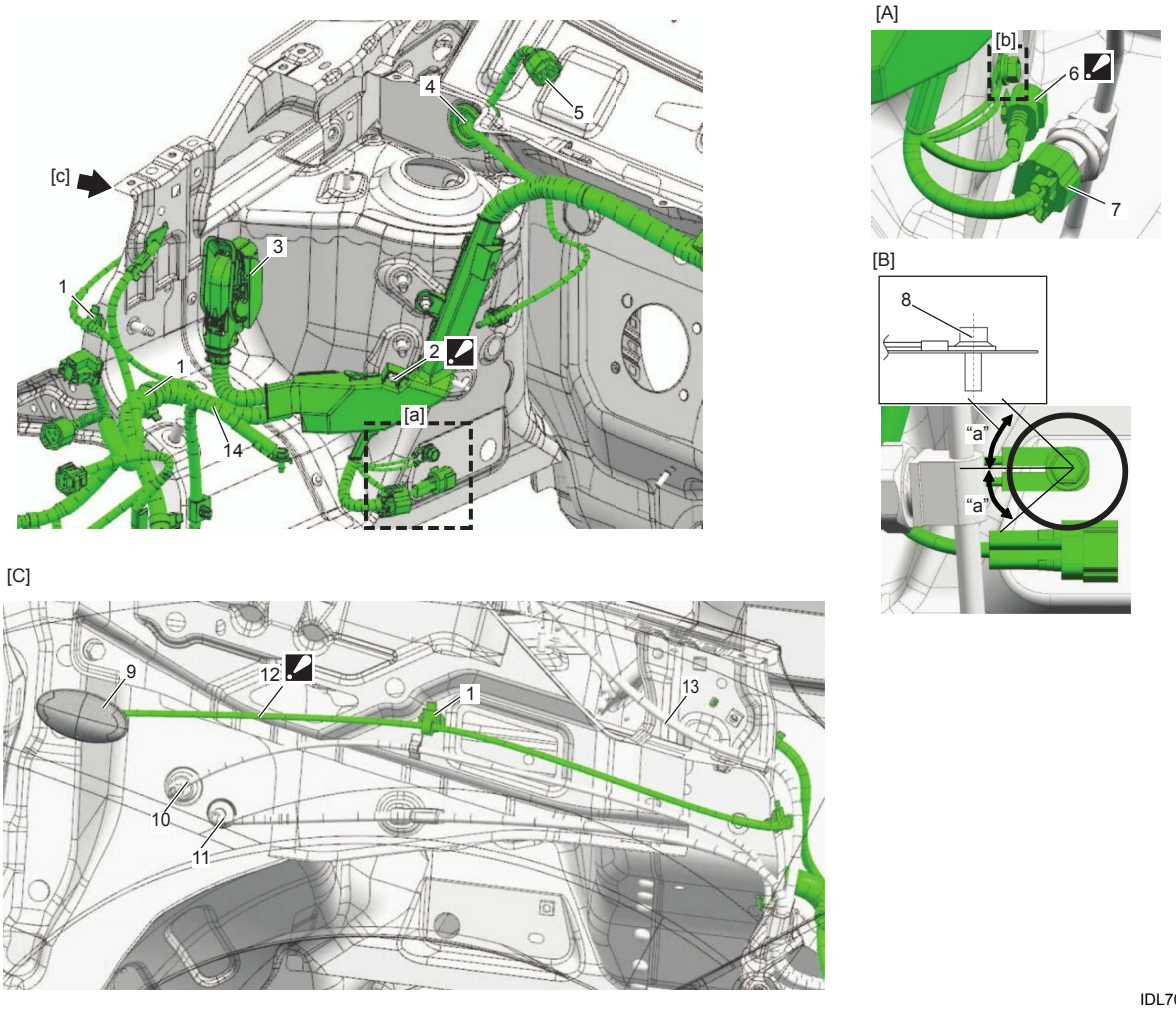
IDL70A910973-07

[A]: View [a]	[G]: Upward	6. GND bolt
[B]: View [b]	1. Clamp	7. W/S ground terminal : Fix the terminal stopper to the specific hole before tightening the bolt.
[C]: Detail [c]	2. Battery ground cable	8. GND bolt
[D]: Detail [d]	3. Battery (-)	9. GND bolt : Keep the angle of the terminal-bend as shown and fix the stopper such that the terminal touches engine mount.
[E]: View [e]	4. Battery ground terminal stopper	(a) : 11 N·m (1.1 kgf-m, 8.1 lbf-ft)
[F]: Forward	5. Battery body ground terminal : Keep the battery body ground terminal below stopper while tightening the bolt.	“a”. 45°

Around Strut

Right Side

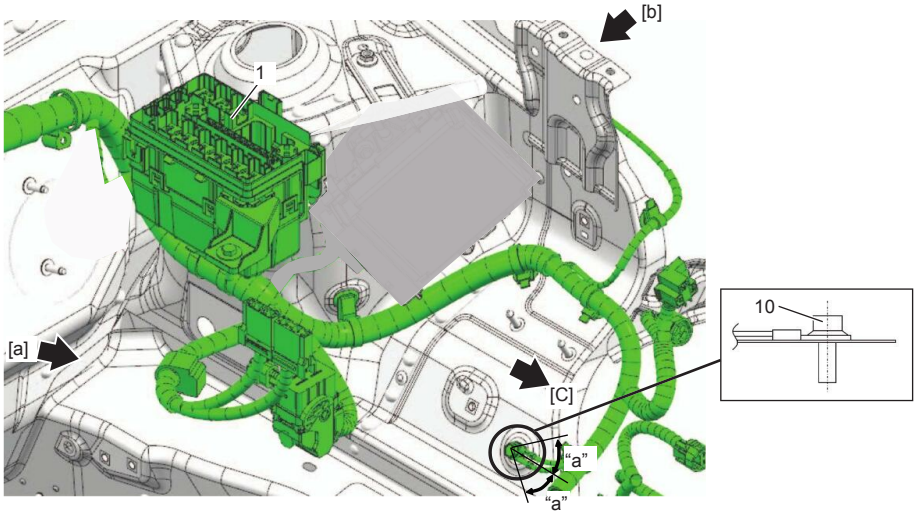
AENDL70A910H004



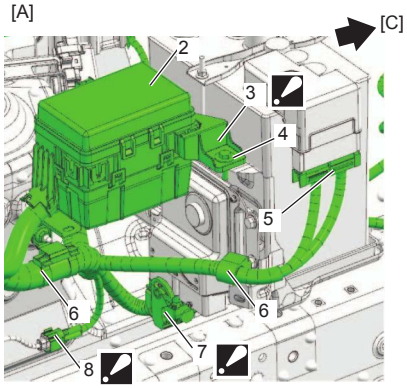
IDL70A910974-08

[A]: Detail [a]	4. Grommet	10. Hood release cable
[B]: Detail [b]	5. Wiper motor	11. Rear washer hose
[C]: View [c]	6. Wheel speed sensor (Front-right) (ABS model) : Fix the connector to body.	12. Main harness branch for side turn signal light (R) (Without power mirror turn signal light model) : Fix the branch above hood release cable.
1. Clamp	7. A/C refrigerant pressure sensor	13. Windshield washer hose
2 Protector . : Fix the protector with stud.	8. GND bolt	14. Main harness
3. ABS control module (ABS model)	9. Side turn signal light (R) (Without power mirror turn signal light model)	"a". ±45°

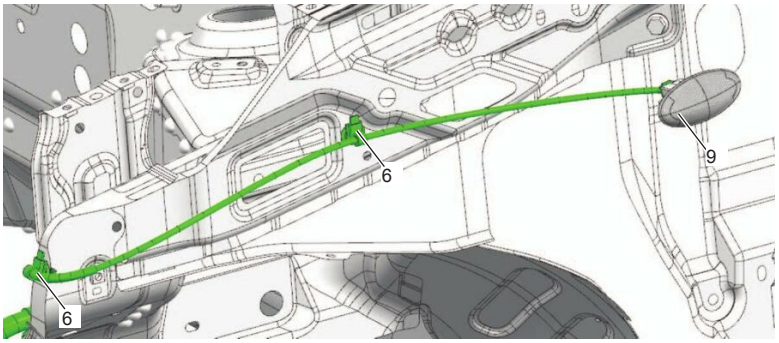
Left Side



[A]



[B]



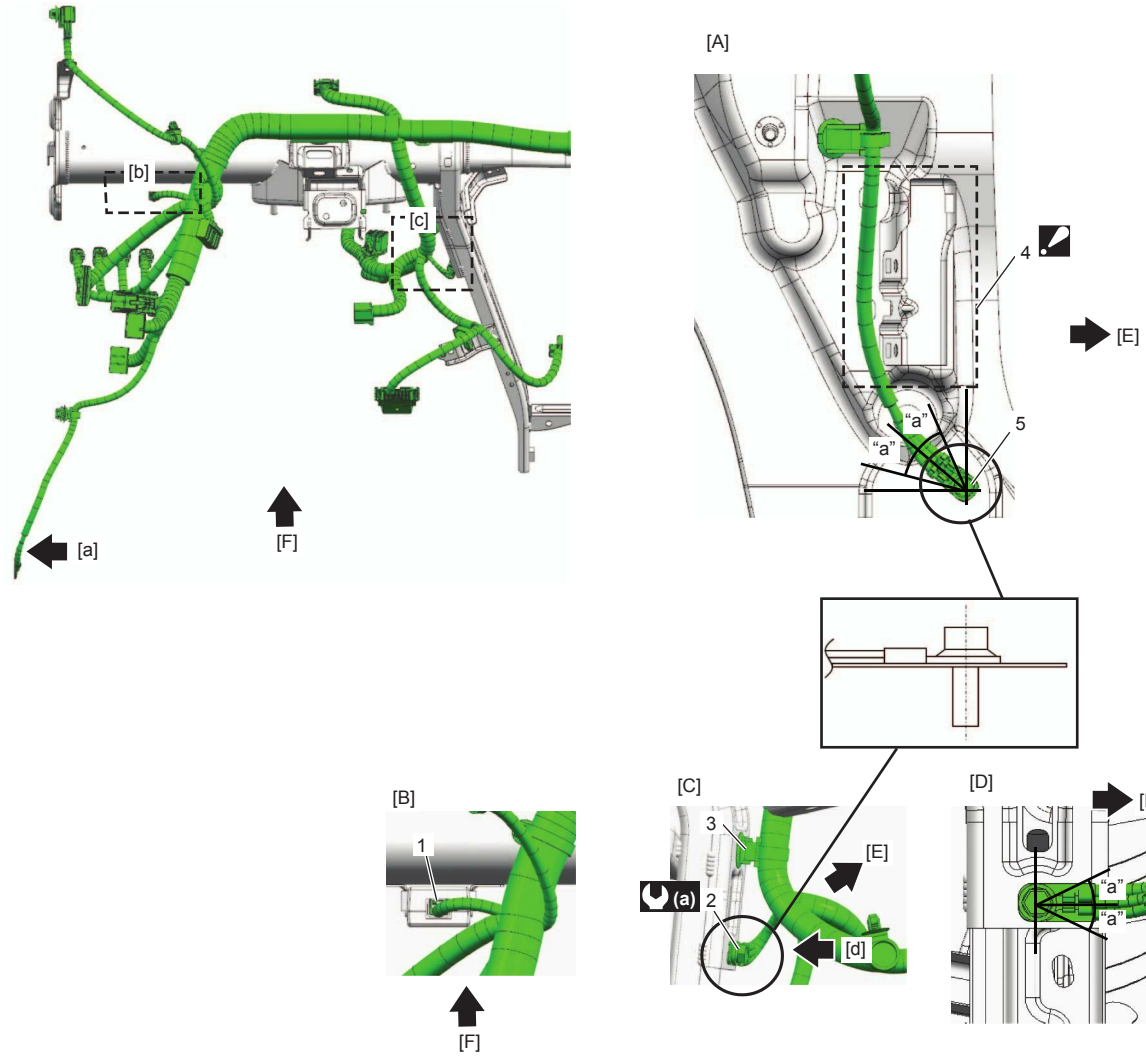
IDL70A910975-07

[A]: View [a]	3. Relay box bracket : Fix relay box bracket to battery tray.	8. Wheel speed sensor (Front-left) (ABS model) : Fix the connector to body
[B]: View [b]	4. Relay box bolt	9. Side turn signal light (L) (Without power mirror turn signal light model)
[C]: Forward	5. Main fuse box	10. GND bolt
1. Relay box	6. Clamp	"a". ±45°
2 Relay box cover . : Assemble the relay box cover after connecting the engine harness connector.	7. ECM : Assemble ECM to battery tray, keep the tray in hand and connect main harness connector to ECM.	

Around Instrument Panel

AENDL70A910H005

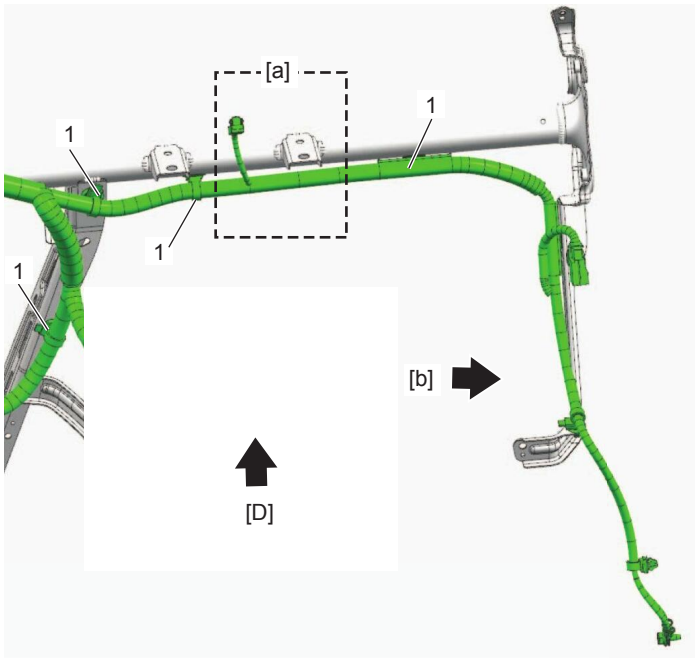
Inside the Instrument Panel (Right Side)



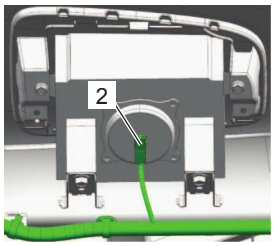
IDL70A910976-07

[A]: View [a]	[F]: Viewed from front	5. GND bolt
[B]: Detail [b]	1. Shock sensor	"a". ±30°
[C]: Detail [c]	2. GND bolt	(a): 8.8 N·m (0.9 kgf-m, 6.5 lbf-ft)
[D]: View [d]	3. Clamp	
[E]: Forward	4. Bracket :Do not interfere harness with bracket.	

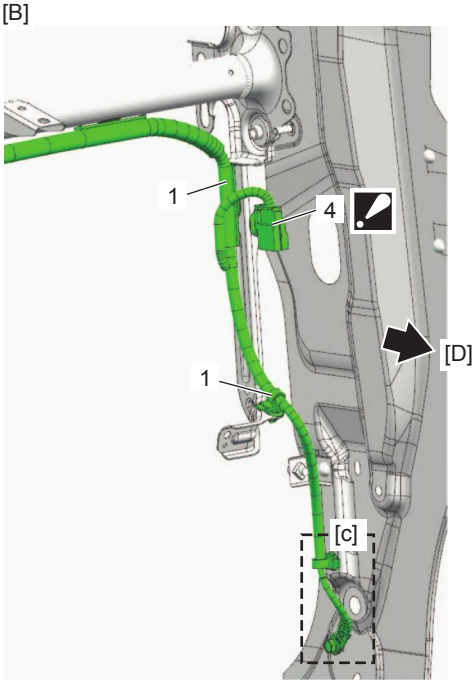
Inside the Instrument Panel (Left Side)



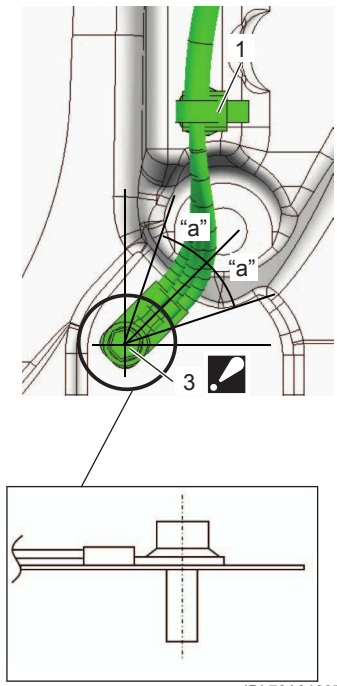
[A]



[B]



[C]



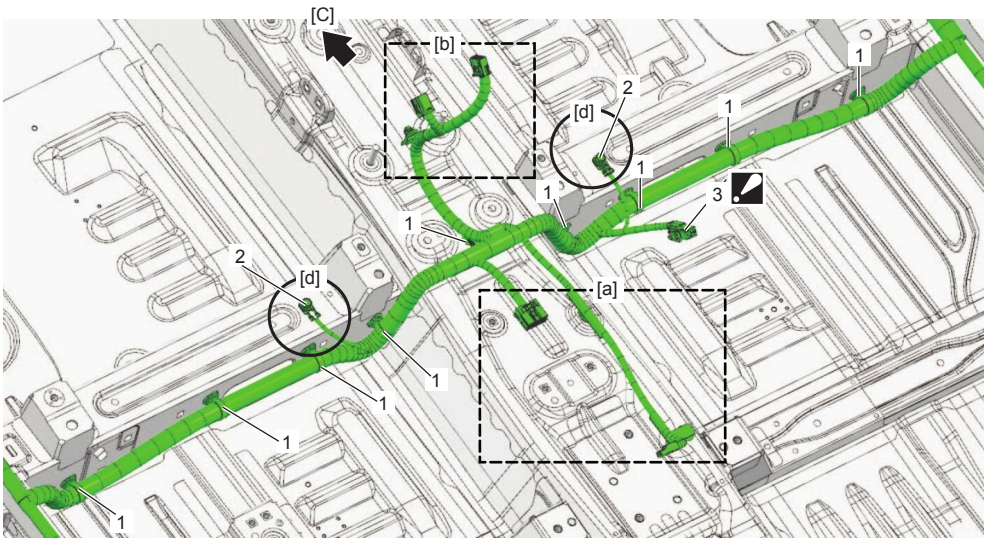
IDL70A910977-04

[A]: Detail [a]	[D]. Viewed from front	3. GND bolt
[B]: View [b]	1. Clamp	4. Floor harness : Set the connector clamp from front side.
[C]: Detail [c]	2. Passenger air bag (inflator) module	"a". ±30°

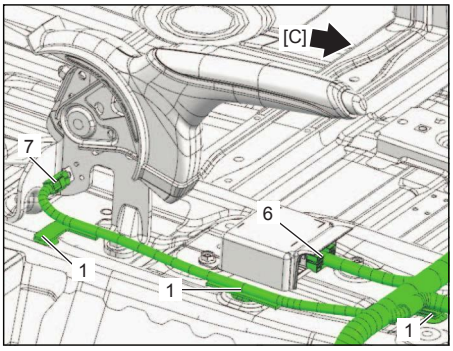
Around Main Floor

Front Part

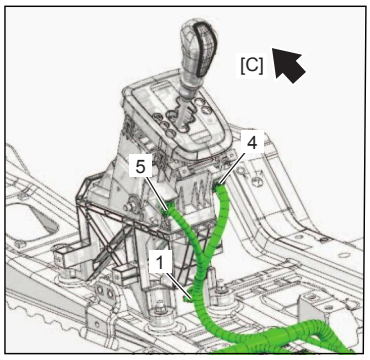
AENDL70A910H006



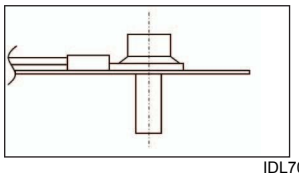
[A]



[B]



[D]



IDL70A910980-05

[A]: Detail [a]	1. Clamp	5. AMT shift selector #2
[B]: Detail [b] (AMT model)	2. GND bolt	6. SDM (Air bag model)
[C]: Forward	3. Driver seat belt switch :Take out the harness from floor-carpet-hole.	7. Parking brake switch
[D]: Detail [d]	4. AMT shift selector #1	

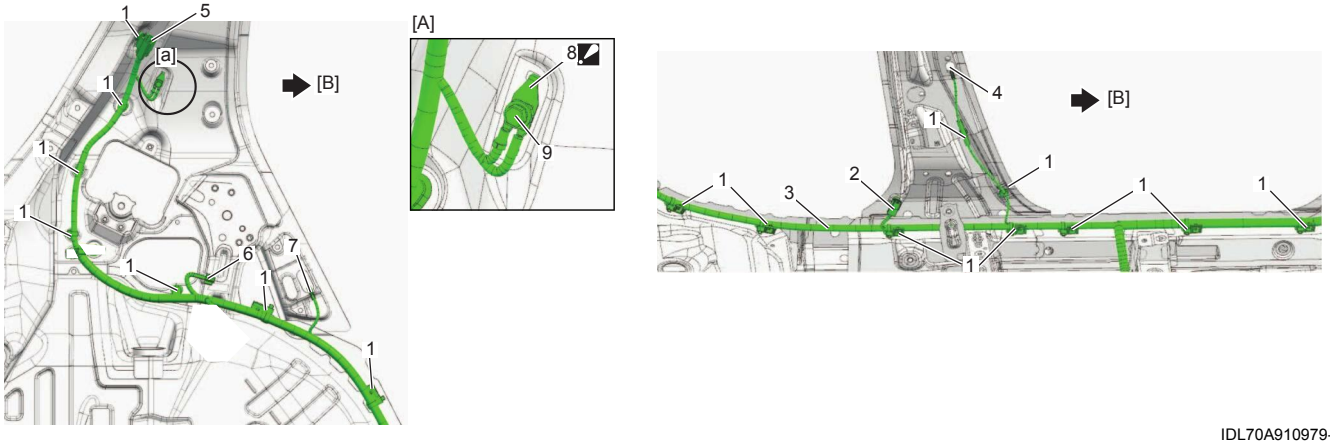
Right Side



IDL70A910978-05

[A]: Detail [a]	4. Front door switch (Driver side)	9. Grommet
[B]: Forward	5. High mounted brake light	10. Ground terminal : Set the terminal to hole and then tighten GND bolt.
1. Clamp	6. Rear combination light (R)	11. GND bolt
2. Rear door wire (R)	7. Wheel speed sensor (Rear-right) (ABS model) : Fix the connector to body	
3. Floor harness	8. Rear door switch (R) : Pass the rear door switch connector wire under the washer hose.	

Left Side

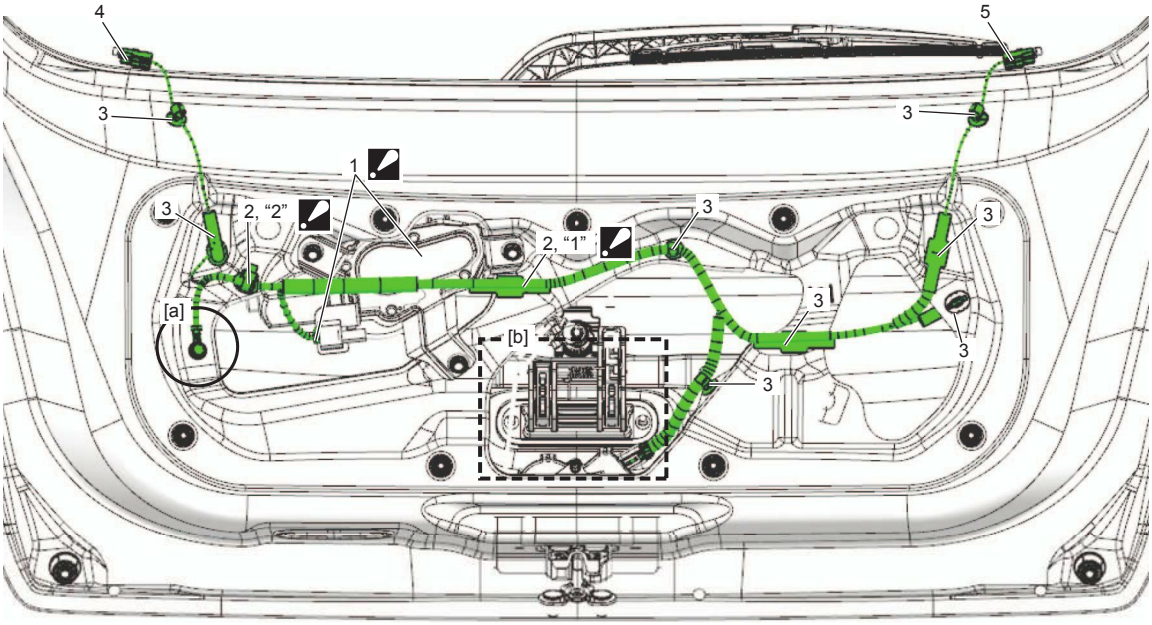


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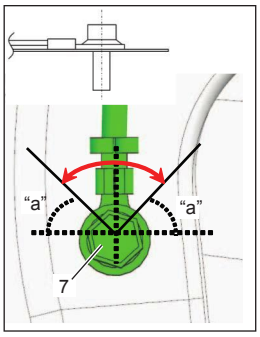
[A]: Detail [a]	3. Floor harness	7. Rear door switch (L)
[B]: Forward	4. Front door switch (Passenger-side)	8. Ground terminal : Set the terminal to hole and then tighten GND bolt.
1. Clamp	5. Rear end door wire	9. GND bolt
2. Rear door wire (L)	6. Wheel speed sensor (Rear-left) (ABS model) : Fix the connector to body	

Rear End Door Harness

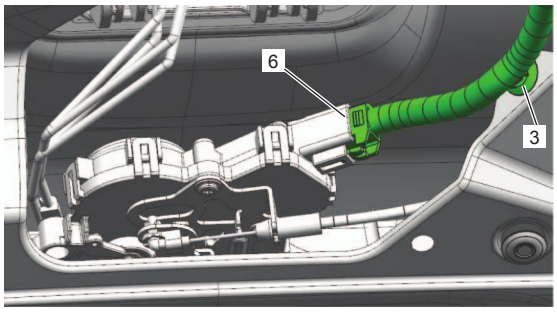
AENDL70A910H007



[A]



[B]



IDL70A910981-03

[A]: Detail [a]	3. Clamp	7. GND bolt
[B]: Detail [b]	4. Rear defogger (–)	"a". ±45°
1. Rear wiper motor : Assemble rear wiper motor before assembling rear end door harness.	5. Rear defogger (+)	
2. Clamp : Fix clamps in the order "1" – "2" after assembling rear wiper motor.	6. Rear end door switch and solenoid	

Specifications

Tightening Torque Specifications

AENDL70A910S001

Reference:

For the tightening torques of fasteners not specified in this page, refer to:

"Around Engine" (Page 9A-85)
"Around Battery" (Page 9A-87)
"Around Instrument Panel" (Page 9A-91)
"Fasteners Information" in Section 0A (Page 0A-5)

Lighting Systems

General Description

Lighting System Description

AENDL70A9201001

Turn Signal and Hazard Warning Light
The turn signal light and hazard warning light are controlled by BCM.
For keyless entry model, when the door lock is locked or unlocked via transmitter, BCM “answer back” by using the hazard warning light and dome light.
For details, refer to “BCM General Description” in Section 10B (Page 10B-1).

Headlight Leveling System
The headlight leveling system consists of a headlight leveling switch and a headlight leveling actuator. It controls the light axis in the vertical direction by moving the reflector in the headlight. When the headlight leveling switch is activated, the resistance of the headlight leveling switch varies according to its position (0 to 4) and a signal voltage based on that resistance is output to the headlight leveling actuator. Then, headlight leveling actuator adjusts the vertical angle of the reflector in the headlight according to the signal voltage, thereby adjusting the light axis as well.

Front Fog Light
The front fog light circuit is arranged in series with the lighting switch circuit to light up the front fog light via the front fog light relay. When the lighting switch is turned on (to “HEAD” position or “CLEARANCE” position) and the front fog light switch is turned ON, the power is supplied to the front fog light via the front fog light relay to light it up.

Dome Light
The dome light operates by itself while the dome light switch is turned ON. When it is at the “DOOR” position, however, BCM judges each input signal (from each door switch, etc.) to turn ON/OFF the dome light.
The dome light have such function as to prevent continuous lighting due to any door being left open (function to protect the battery of BCM against discharging) so that the light is turned OFF automatically if it is left ON for longer than a specified period of time.
For details, refer to “BCM General Description” in Section 10B (Page 10B-1).

Schematic and Routing Diagram

Lighting System Circuit Diagram

AENDL70A9202001

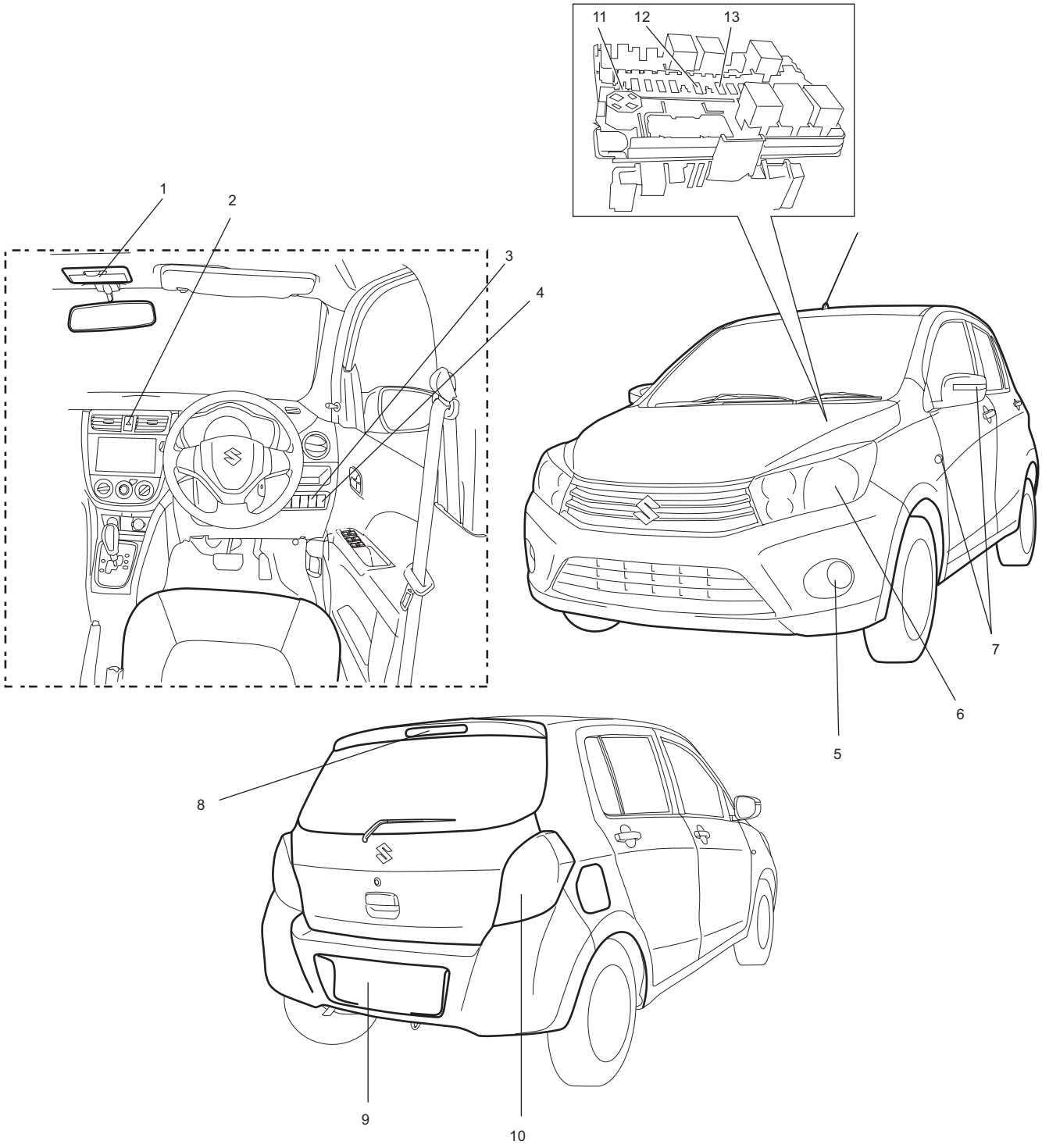
Refer to the following items for the details of lighting system wiring circuit diagram.

- Headlight system: “D-1 Headlight System Circuit Diagram” in Section 9A (Page 9A-60).
- Clearance and license plate light system: “D-2 Clearance, Tail and Licence Plate Light System Circuit Diagram” in Section 9A (Page 9A-61).
- Front fog light system: “D-3 Front Fog Light System Circuit Diagram” in Section 9A (Page 9A-62).
- Interior light system: “D-5 Interior Light System Circuit Diagram” in Section 9A (Page 9A-64).
- Turn signal and hazard warning light system: “D-6 Turn Signal and Hazard Warning Light System Circuit Diagram” in Section 9A (Page 9A-65).
- Brake light system: “D-7 Brake Light System Circuit Diagram” in Section 9A (Page 9A-67).
- Back-up light system: “D-8 Back-Up Light System Circuit Diagram” in Section 9A (Page 9A-68).
- Headlight leveling system: “D-9 Headlight Beam Leveling System Circuit Diagram” in Section 9A (Page 9A-69).

Component Location

Lighting System Component Location

AENDL70A9203002

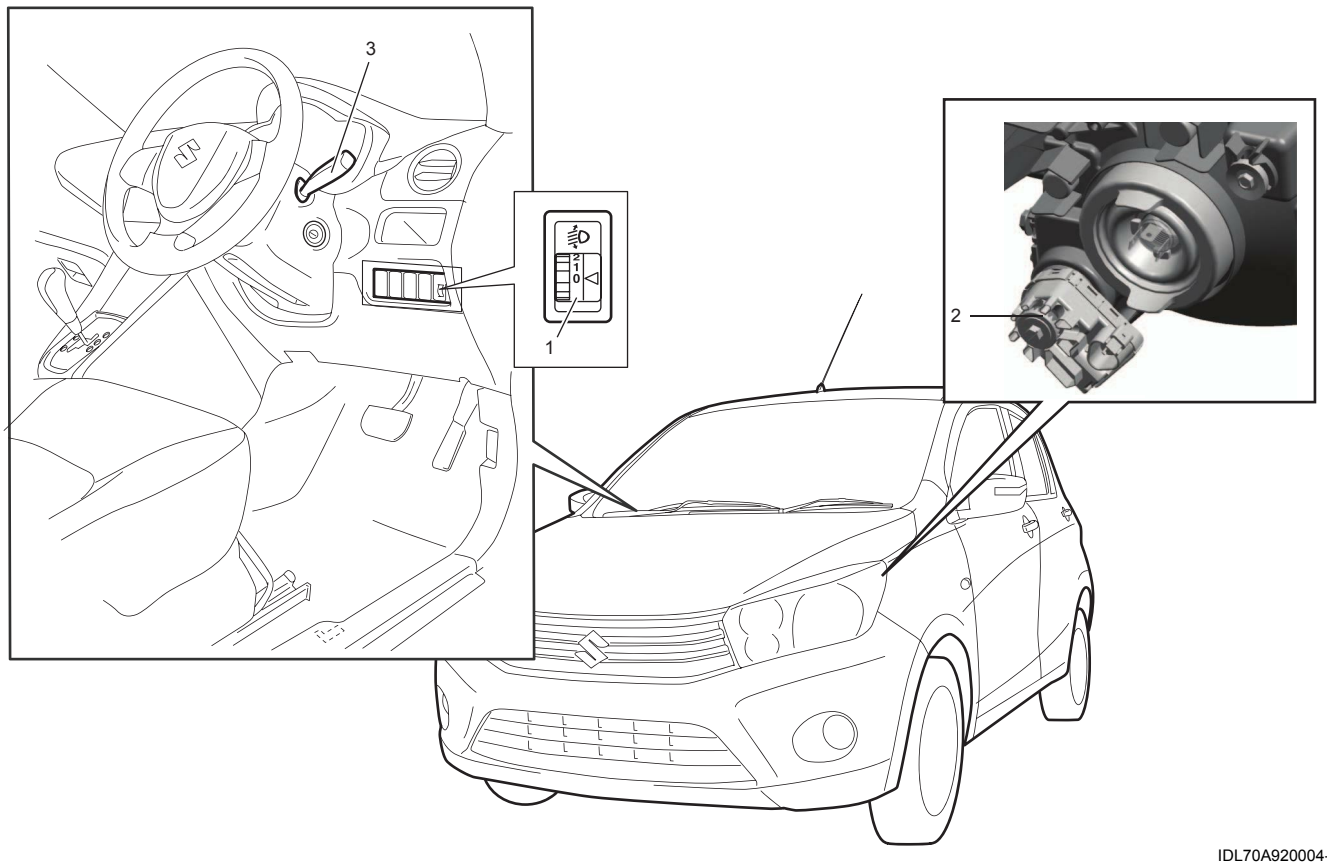


IDL70A920013-06

1. Dome light	5. Front fog light (If equipped)	9. License plate light	13. Fuse - Head lamp right side
2. Hazard switch	6. Headlight unit	10. Rear combination light	
3. Front fog light switch (If equipped)	7. Side turn signal light (*In ORVM for higher variant)	11. Fuse - Front fog lamp	
4. Headlight leveling switch	8. High mount stop light	12. Fuse - Head lamp right side	

Headlight Leveling System Component Location

AENDL70A9203001



IDL70A920004-04

1. Headlight leveling switch	2. Headlight leveling actuator (included in headlight unit)	3. Lighting switch

Diagnostic Information and Procedures

Lighting System Symptom Diagnosis

AENDL70A9204001

Condition	Possible cause	Correction / Reference Item
Low or high beam does not light up	Faulty system circuit (including relays and fuses)	*Repair wiring. ☞(Page 9A-60)*
	Blown bulbs	*Replace bulbs.*
	Faulty lighting or dimmer switch	*Replace switch. ☞(Page 9B-9)*
Clearance, tail and license plate light do not light up	Faulty system circuit (including relays and fuses)	*Repair wiring. ☞(Page 9A-61)*
	Blown bulbs	*Replace bulbs.*
	Faulty lighting switch	*Replace switch. ☞(Page 9B-9)*
Front fog light does not light up (if equipped)	Faulty system circuit (including relays and fuses)	*Repair wiring. ☞(Page 9A-62)*
	Blown bulbs	*Replace bulbs.*
	Faulty front fog light switch	*Replace switch. ☞(Page 9B-12)*
	Lighting or dimmer switch	*Replace switch. ☞(Page 9B-9)*
Dome light does not light up	Faulty system circuit (including relays and fuses)	*Repair wiring. ☞(Page 9A-64)*
	Blown bulbs	*Replace bulbs.*
	Faulty dome light switch	*Check dome light switch. ☞(Page 9B-10)*
	Faulty door switch	*"Door Switch Inspection" in Section 9F (Page 9F-12)*

Condition	Possible cause	Correction / Reference Item
Turn signal and hazard warning light does not flash or flashes at high rate	Faulty system circuit (including relays and fuses)	*Repair wiring. ☞(Page 9A-65)*
	Blown bulbs	*Replace bulbs.*
	Faulty lighting or turn signal light switch	*"Lighting Switch Inspection" (Page 9B-9)*
	Faulty hazard switch	*"Hazard Warning Switch Inspection" (Page 9B-10)*
	Faulty BCM	*"Inspection of BCM and Its Circuits" in Section 10B (Page 10B-20)"BCM Removal and Installation" in Section 10B (Page 10B-29)*
Brake light does not light up or stay on	Faulty system circuit (including relays and fuses)	*Repair wiring. ☞(Page 9A-67)*
	Blown bulbs	*Replace bulbs.*
	Faulty brake light switch	*"Brake Light Switch Inspection" in Section 4A (Page 4A-10) and/or "Brake Light Switch Removal and Installation" in Section 4A (Page 4A-9)*
Back-up light do not light up	Faulty system circuit (includes relay and fuse)	*Repair wiring. ☞(Page 9A-68)*
	Faulty back-up light switch	*"Back Up Light Switch Inspection" in Section 5B (Page 5B-9)*
Headlight leveling system does not operate (if equipped)	Faulty system circuit (includes relay and fuse)	*Repair wiring. ☞(Page 9A-69)*
	Faulty headlight leveling switch	*"Headlight Leveling Switch Inspection" (Page 9B-8)*
	Faulty headlight leveling actuator	*"Headlight Leveling Actuator Inspection" (Page 9B-7)*
	Faulty headlight unit	*Check headlight unit for damage or deformation.*

Repair Instructions

Headlight Unit Removal and Installation

AENDL70A9206001

⚠ WARNING

To avoid danger of being burnt, do not touch the bulb when it is hot.

⚠ CAUTION

- **Do not touch glass surface of bulb, to avoid deterioration as the case may be unclear when bulb lights on in dirty condition.**
- **Replace headlight bulb only with replacement bulb of correct specifications and wattage.**

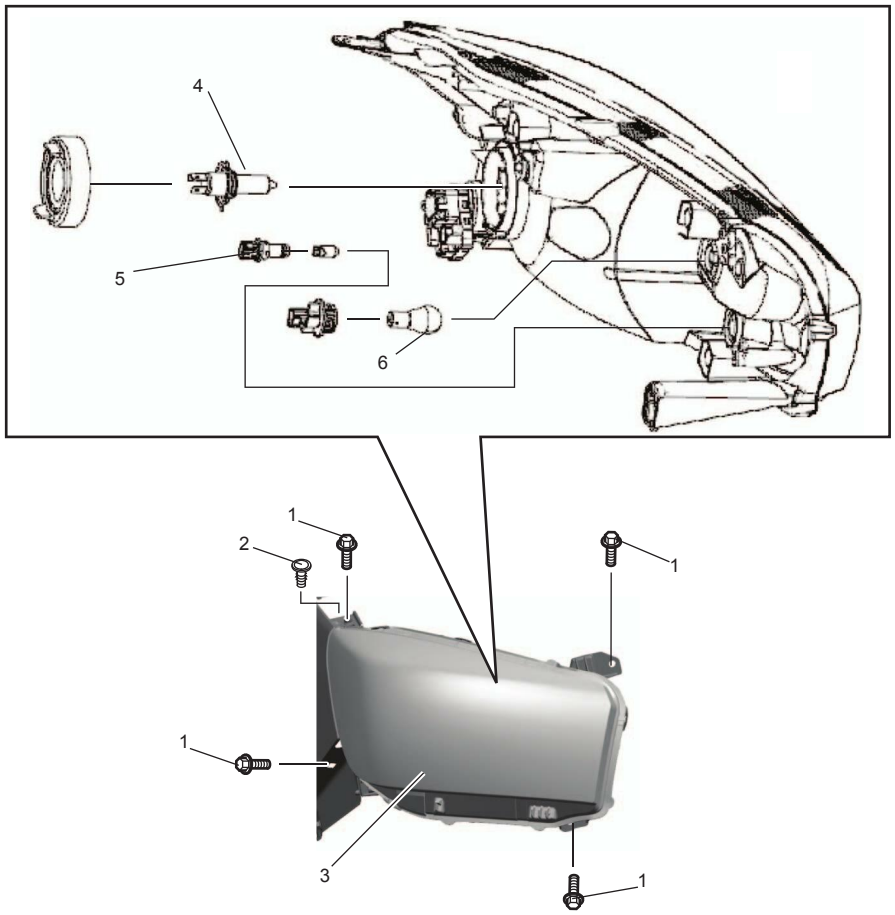
NOTE

- **Bulb(s) can be replaced with headlight unit installed on vehicle.**
- **After replacing headlight unit and/or highlight bulb(s), check and adjust headlight.☞(Page 9B-6)**

Removal

1) Turn lighting switch to OFF position.
2) Remove front bumper. ☞(Page 9H-1)
3) Remove headlight unit bolts (1) and clip (2).
4) Detach headlight unit (3) from vehicle.

5) Disconnect connectors from headlight unit by pushing lock lever.
Replace bulb(s) if necessary.



IDL70A920005-03

4. Headlight bulb	6. Turn signal light bulb
5. Clearance light bulb	

Installation

Reverse removal procedure noting the following.

- Install headlight unit by fixing the locator (1) and clip (2).
- Install screws in numerical order as shown in figure (3, “1” - 3, “4”).



IDL70A920006-02

- After installation, be sure to inspect and adjust aiming. ☞(Page 9B-6)

Headlight Aiming Adjustment with Screen

AENDL70A9206002

NOTE

- **Unless otherwise obligated by local regulations, adjust headlight aiming according to the following procedure.**
- **If any of the following services on headlight components is performed, be sure to adjust aiming.**
  - **Headlight unit replacement.**
  - **Headlight unit removal and installation.**
- **When inspecting and adjusting headlight with leveling system, set the leveling switch to "0" position with ignition switch turned ON.**

1) Make sure the following items.
   - Place vehicle on a flat surface in front of blank wall (screen) (1) ahead of headlight surface.

Distance "a"
10 m (33 ft.)

   - Adjust air pressure of all tires to the specified value respectively.
   - Bounce vehicle body up and down by hand to stabilize suspension.
   - Carry out aiming with a person of 75 kg (165 lb) seated on driver seat.
2) Check to see if hot spot (high intensity zone) of each low beam axis falls as shown in figure.

NOTE

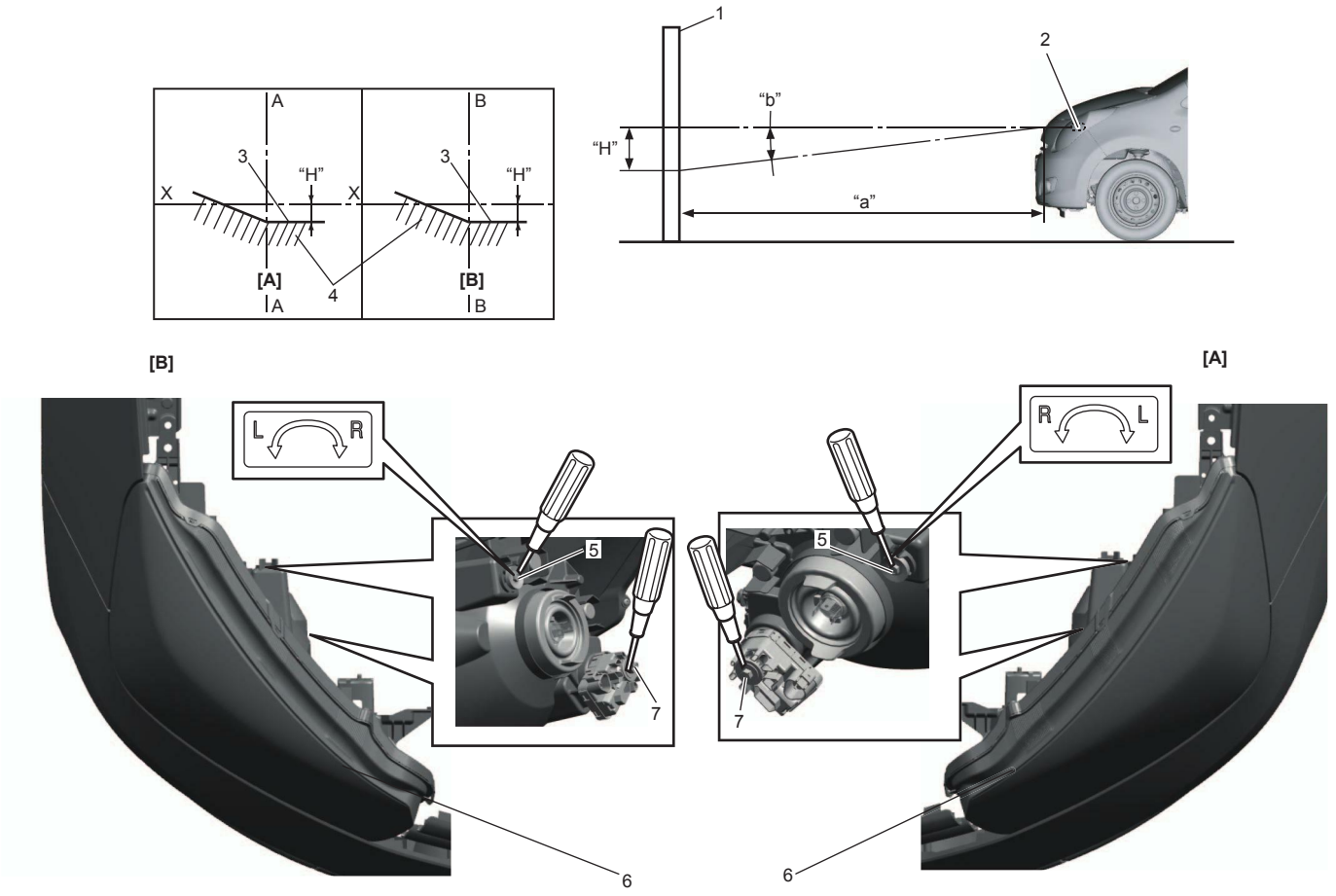
If the headlights interfere with each other and the cut line is not clearly visible, cover the headlight on one side. This facilitates aiming adjustment.

Hot spot specification
Angle "b": 0.75° (Specification)
Calculated distance "H": Approx. 130 mm (5.12 in.)

3) Using Phillips screwdriver, align headlight aiming to specification by adjusting aiming gear if it is not set properly.

NOTE

For aiming adjustment, adjust height of optical axis using aiming gear (5) first and then adjust horizontal direction of optical axis using aiming gear (7).



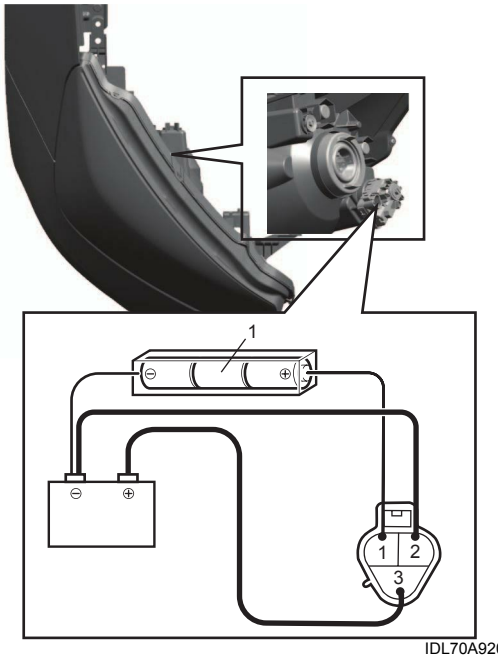
IDL70A920007-04

[A]: Left headlight	4. Hot spot	A-A: Vertical center line of left headlight bulb
[B]: Right headlight	5. Aiming gear (for right / left adjustment)	B-B: Vertical center line of right headlight bulb
1. Wall (Screen)	6. Headlight housing	
2. Headlight bulb	7. Aiming gear (for up/down adjustment)	
3. Cut line (bounding line)	X-X: Horizontal center line of headlight bulbs	

Headlight Leveling Actuator Inspection

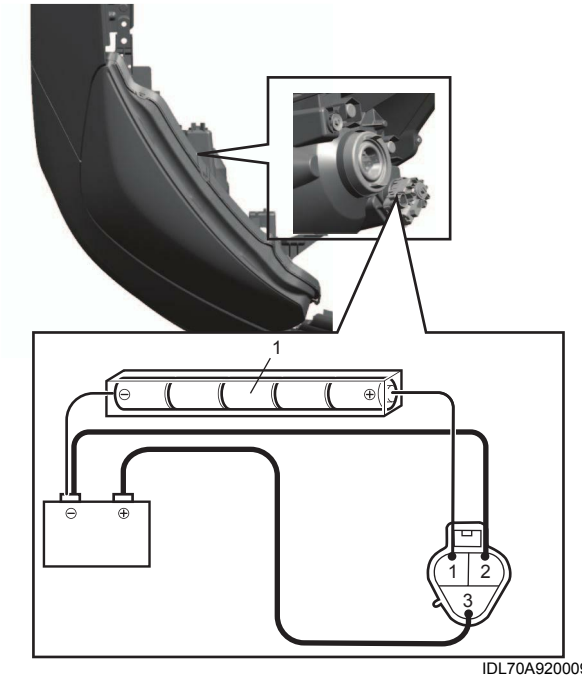
AENDL70A9206003

1) Disconnect headlight leveling actuator connector.
2) Arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V), and connect them as shown in figure. Then check that reflector of headlight moves downward
.



IDL70A920008-01

3) Arrange 5 new 1.5 V batteries (1) in series (check that total voltage is 7.5 – 8.0 V) and connect them as shown in figure. Then check that reflector of headlight moves upward.



IDL70A920009-01

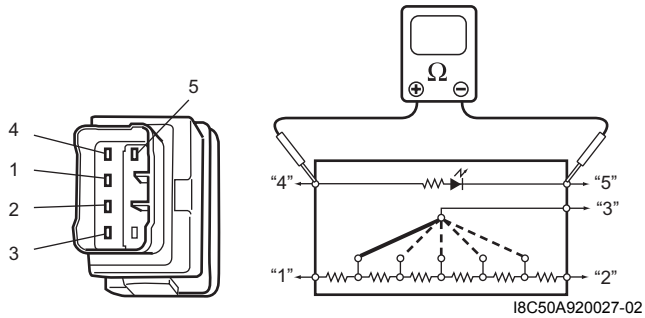
Headlight Leveling Switch Inspection

AENDL70A9206004

Check for resistance between terminals at each switch position.
If check result is not as specified, replace switch.

NOTE

- **Measure it by diode range of circuit tester as shown because there is diode between terminal "4" and "5".**
- **Connect circuit tester positive (+) probe to "4" terminal of valet switch and negative (–) probe to "5" terminal.**



I8C50A920027-02

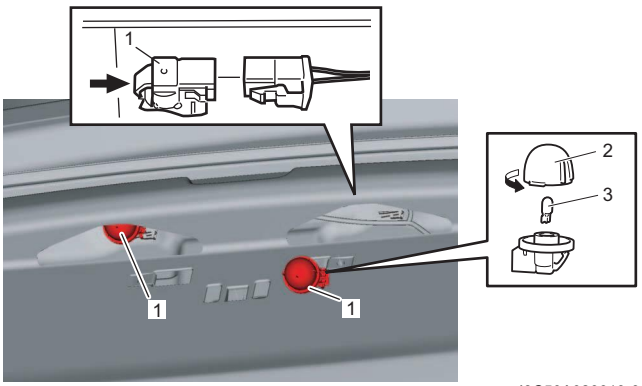
Switch position	Terminal	Resistance (Ω)
—	1 and 2	Approx. 4600
0	2 and 3	Approx. 3920
1	2 and 3	Approx. 3240
2	2 and 3	Approx. 2560
3	2 and 3	Approx. 1880
4	2 and 3	Approx. 1200
—	4 and 5	Continuity

License Light Assembly Removal and Installation

AENDL70A9206005

Removal

1) Remove rear bumper. ☞(Page 9H-2)
2) Push locking part in arrow direction, and then remove license light assembly (1).
3) Disconnect connector from license light assembly (1).



I8C50A920013-01

2. License light lens	3. Bulb

Installation

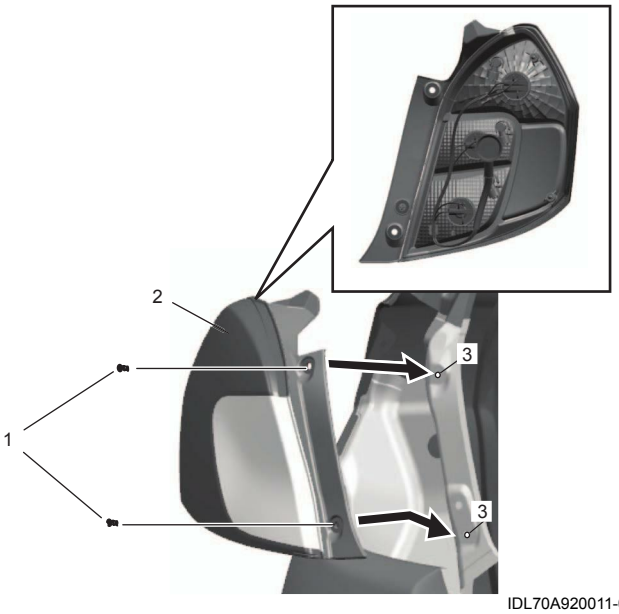
Reverse removal procedure.

Rear Combination Light Removal and Installation

AENDL70A9206006

Removal

1) Remove rear combination light bolts (1).
2) Detach rear combination light (2) as shown in figure.



IDL70A920011-03

3. Grommet

NOTE

Check grommet (3) for deterioration. Replace as necessary.

3) Disconnect connector from rear combination light.

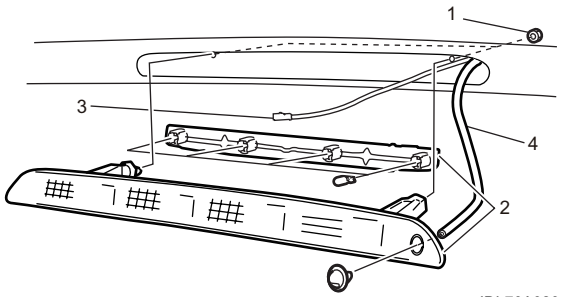
Installation
Reverse removal procedure.

High Mount Stop Light Removal and Installation

AENDL70A9206007

Removal

1) Remove nuts (1) and then, detach high mount stop light (2) from vehicle.
2) Disconnect connector (3) and rear washer hose (4) from high mount stop light.

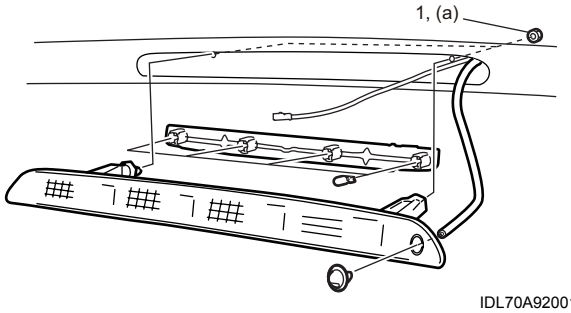


IDL70A920014-04

Installation
Reverse removal procedure noting the following point.

- Tighten high mount stop light nut to specified torque.

Tightening torque
High mount stop light bolt (a): 2.0 N·m (0.2 kgf-m, 1.5 lbf-ft)



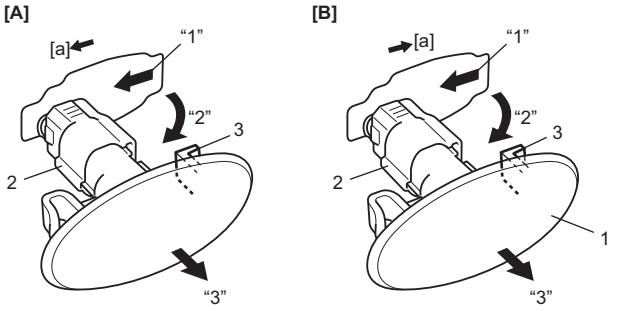
IDL70A920017-01

Side Turn Signal Light Removal and Installation

AENDL70A9206008

Removal

1) Unlock a hook (3) by moving the side turn signal light. Then, remove side turn signal light (1).
2) Disconnect connector (2) from side turn signal light.



I8C50A920028-02

[A]: Left side turn signal light	[a]: Vehicle forward
[B]: Right side turn signal light	

NOTE

Side turn signal light cannot be disassembled. Replace side turn signal light as a unit when bulb is blown or lens is broken.

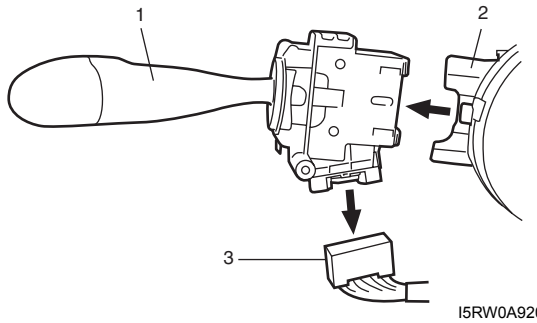
Installation
Reverse removal procedure.

Lighting Switch Removal and Installation

AENDL70A9206009

Removal

1) Remove column cover. ☞(Page 6B-3)
2) Remove lighting switch (1) from steering column (2) and disconnect its connector (3).



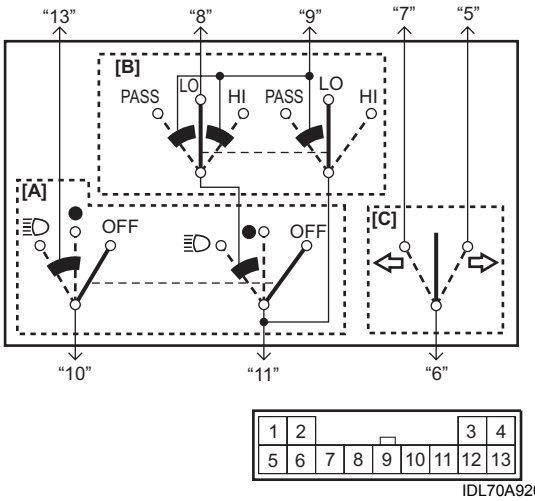
I5RW0A920008-01

Installation
Reverse removal procedure.

Lighting Switch Inspection

AENDL70A9206010

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



IDL70A920001-02

[A]:	Lighting switch
[B]:	Dimmer switch
[C]:	Turn signal light switch

Lighting and Dimmer Switch

[B] \ [A]		13	10	11	9	8
OFF						
•	LOW	○—○				
	HI	○—○				
≡D	LOW	○—○		○		○
	HI	○—○		○	○	
PASS				○	○	

I8C50B920007-02

[A]:	Terminal	[B]:	Switch position

Turn Signal Light Switch

[B] \ [A]	7	6	5
⇦	○	○	
⇨		○	○

IDL70A920003-01

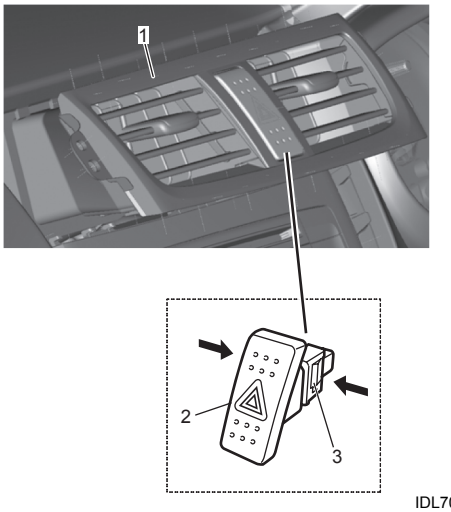
[A]:	Terminal
[B]:	Switch position

Hazard Warning Switch Removal and Installation

AENDL70A9206011

Removal

1) Remove center ventilation louver (1). ☞(Page 9C-12)
2) Disconnect connector, and then remove hazard warning switch (2) from center upper box while releasing the locks (3).



IDL70A920015-01

Installation

Reverse removal procedure.

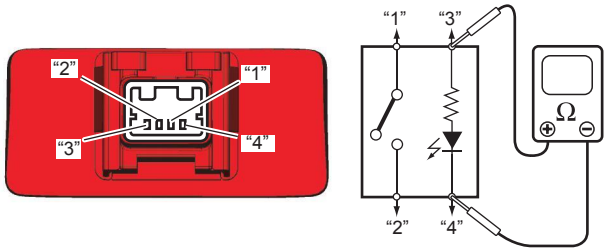
Hazard Warning Switch Inspection

AENDL70A9206012

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.

NOTE

Set tester to diode range when checking continuity between terminals at each switch position.



[B] \ [A]	"1"	"2"	"3"	"4"
OFF			○ ○	
ON	○—○		○ ○	

IDL70A920010-01

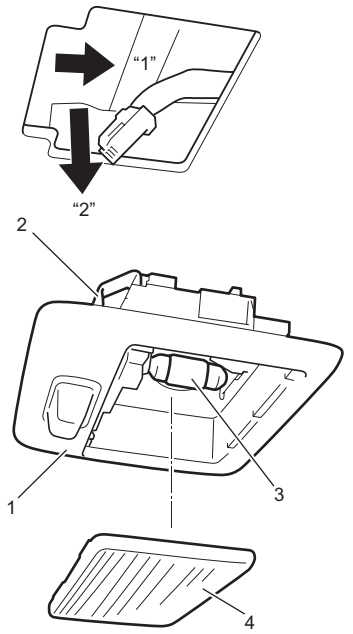
[A]:	Terminal
[B]:	Switch position

Dome Light (without MIC) Removal and Installation

AENDL70A9206014

Removal

1) Push dome light (1) in arrow direction "1" and remove dome light in arrow direction "2".
2) Disconnect connector from dome light.
3) If necessary, remove bulb (3).



IDL70A920016-01

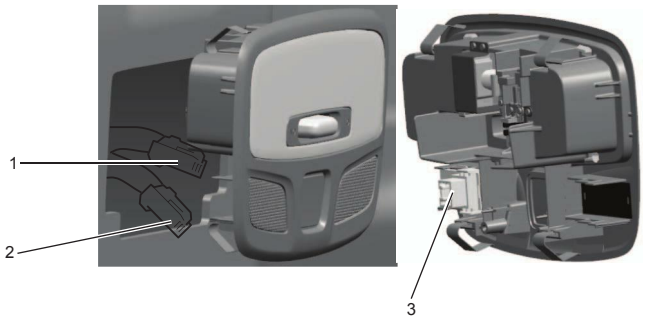
Installation
Reverse removal procedure.

Dome Light (with MIC) Removal and Installation

AENDL70A9206019

Removal

1) Remove dome light assembly.
2) Disconnect wiring connector (1 and 2) from MIC (3) and dome light assembly.
3) If necessary, remove bulb.



IDL70A920012-01

Installation
Reverse removal procedure.

Front Fog Light Assembly Removal and Installation (If Equipped)

AENDL70A9206015

⚠ WARNING

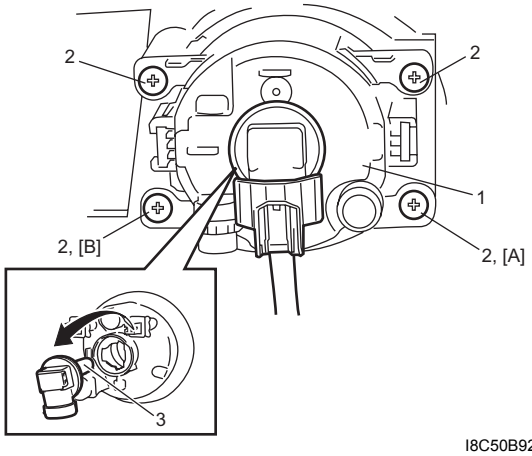
Touching a hot bulb may cause a burn.
Do not touch any bulb when it is hot.

⚠ CAUTION

- **If you touch the glass surface of a bulb with your bare hand, the oils from your skin can cause the bulb to overheat and burst when the lights are on.**
  Do not touch any bulb when removing the headlight housing.

Removal

1) Remove front bumper. ☞(Page 9H-1)
2) Disconnect connector from fog light.
3) Remove fog light screws (2), and remove front fog light assembly (1).



I8C50B920011-02

[A]: Left side	3. Fog light bulb
[B]: Right side	

Installation
Reverse removal procedure nothing the following:

- After installing, adjust aiming. ☞(Page 9B-11)

Front Fog Light Aiming Adjustment with Screen (If Equipped)

AENDL70A9206016

Basic Aiming

NOTE

- **Unless otherwise obligated by local regulations, adjust front fog light aiming according to the following procedure.**
- **An example in case that the light-to-wall distance is 10 m is shown in the illustration. The beam descending distance "H" is calculated when "a" is 10 m with the specification angle "b" (1.14°).**

1) Make sure the following items.
   - Place vehicle on a flat surface in front of blank wall (screen) (1) ahead of front fog light surface.

     Distance between screen and front fog light "a": 10 m (32.8 ft.)

- Adjust air pressure of all tires to the specified value respectively.
- Bounce vehicle body up and down by hand to stabilize suspension.
- Carry out aiming with a person of 75 kg (165 lb) seated on driver seat.

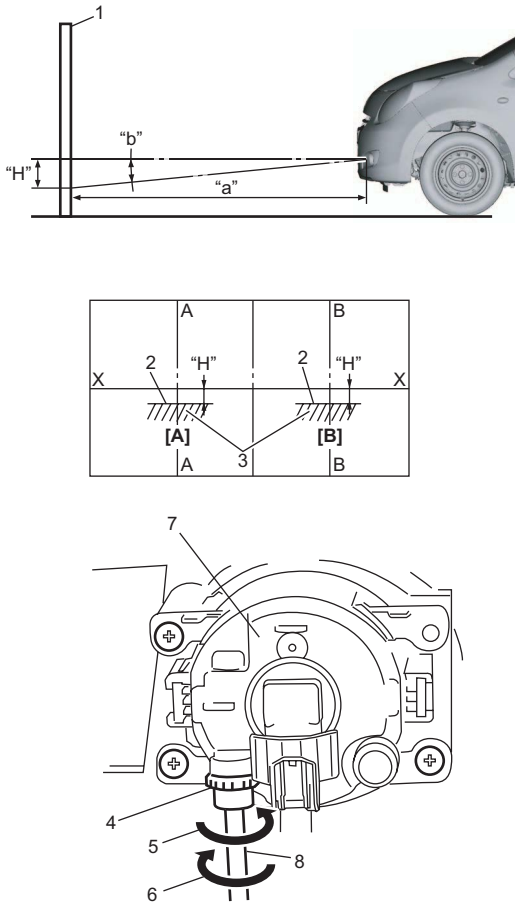
2) Check to see if hot spot (high intensity zone) of each front fog light axis falls as shown in the figure.

NOTE

If the fog lights interfere with each other and the cut line is not clearly visible, cover the fog light on one side. This facilitates aiming adjustment.

Hot spot specification
Angle "b": 1.14° (Specification)
Calculated distance "H": Approx. 199 mm (7.83 in.)

3) If it is not set properly, using phillips screwdriver (8) align front fog light to specification by rotating aiming gear.



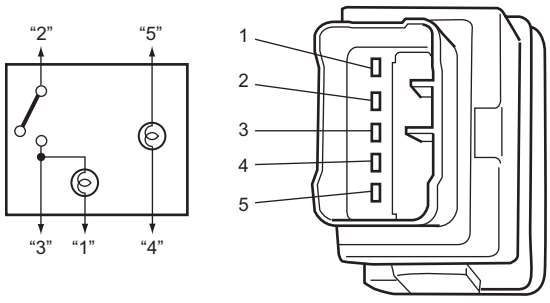
I8C50A920008-01

2.	Bounding line
3.	Hot spot
4.	Aiming gear (for up / down adjustment)
5.	Upward adjustment
6.	Downward adjustment
7.	Front fog light assembly
X-X:	Horizontal center line of front fog light bulb
A-A:	Vertical center line of left front fog light bulb
B-B:	Vertical center line of right front fog light bulb
[A]:	Left front fog light
[B]:	Right front fog light

Front Fog Light Switch Inspection (If Equipped)

AENDL70A9206017

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



[B] \ [A]	2	3
OFF		○
ON	○	○

IBC50A920001-01

[A]: Terminal
[B]: Switch position

Front Fog Light Relay Inspection (If Equipped)

AENDL70A9206018

Refer to "Control Relay Inspection" in Section 10B (Page 10B-32).

Specifications

Electric Bulb Capacity

AENDL70A9207001

Name	Capacity	Name	Capacity
Headlight	12V 60/55W (H4)	Rear turn signal light	12V 21W
Front turn signal light	12V 21W	Back-up light	12V 21W
Side turn signal light	12V 5W	High mount stop light	12V 5W
Front fog light	12V 35W	License plate light	12V 5W
Tail light and stop light	12V 21/5W		

Tightening Torque Specifications

AENDL70A9207002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
High mount stop light bolt	2.0	0.2	1.5	☞(Page 9B-9)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
"Fasteners Information" in Section 0A (Page 0A-5)

Instrumentation / Driver Info. / Horn

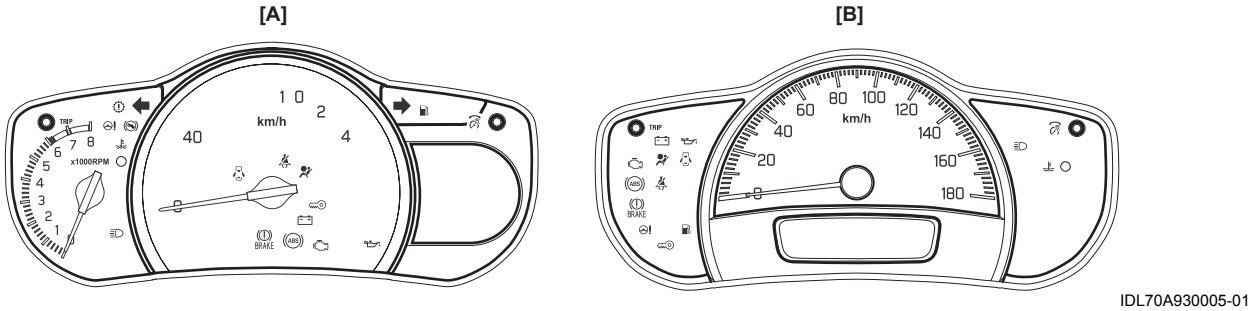
General Description

Combination Meter Description

AENDL70A9301001

Combination meter uses signals (information) from each control module by CAN communication to control speedometer, tachometer, warning light and indicator light (other than high beam indicator light).
For more information on CAN communication data received by combination meter, refer to “CAN Communication System Description” in Section 10H (Page 10H-1).

Speedometer
ECM calculates vehicle speed using signal from wheel speed sensor and sends vehicle speed signal through CAN communication to combination meter. Then, combination meter drives speedometer based on vehicle speed signal.



IDL70A930005-01

[A]: With tachometer	[B]: Without tachometer

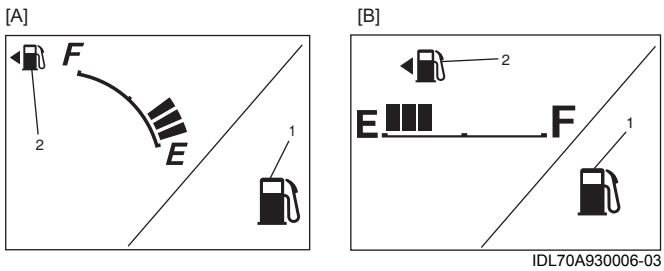
Tachometer
ECM calculates engine speed using signal from CKP sensor and sends engine speed signal through CAN communication to combination meter. Then, combination meter drives tachometer based on engine speed signal.

LCD
Fuel meter
When the ignition switch is in the “ON” position, this gauge gives an approximate indication of the amount of the fuel tank. “F” stands for full and “E” stands for empty.

NOTE

- **If the last segment blinks, it means that the fuel is almost empty.**
- **If the low fuel warning light comes on, fill the fuel tank immediately.**

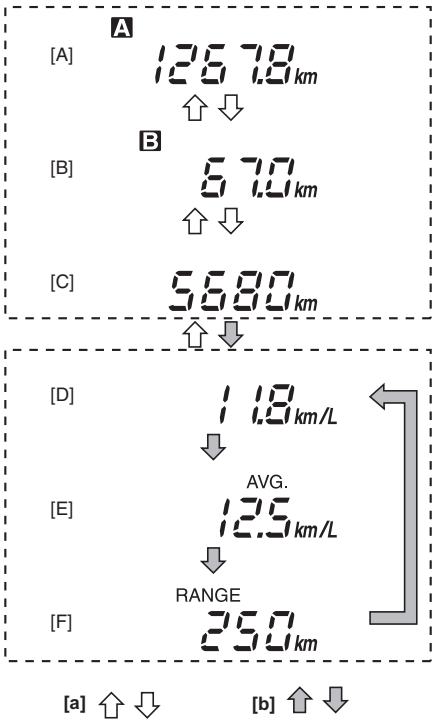
The activation point of the low fuel warning light (1) varies depending on road conditions (for example, slope or curve) and driving conditions because of fuel moving in the tank.
The mark (2) indicates that the fuel filling door is located on the left side of the vehicle.

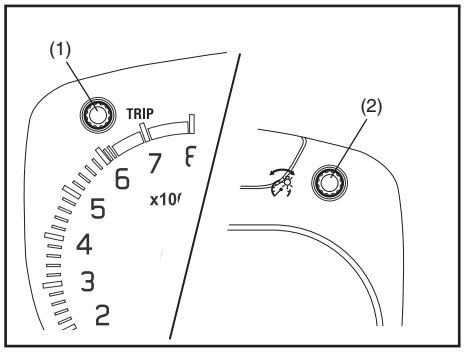


IDL70A930006-03

[A]: With tachometer	[B]: Without tachometer

Trip meter / Odometer / Fuel consumption / Driving range
LCD can display odometer, trip meter “A” and trip meter “B”, instantaneous fuel consumption, average fuel consumption or driving range. Every pushing of MODE switch changes item on display.
Also, illumination control can be changed while lighting switch is turned ON.





[c]

IDL70A930007-03

[A]: Trip meter “A”	[D]: Instantaneous fuel consumption	[a]: Push the trip meter selector knob (1).
[B]: Trip meter “B”	[E]: Average fuel consumption	[b]: Push the indicator selector knob (2).
[C]: Odometer	[F]: Driving range	[c]: Instrument cluster

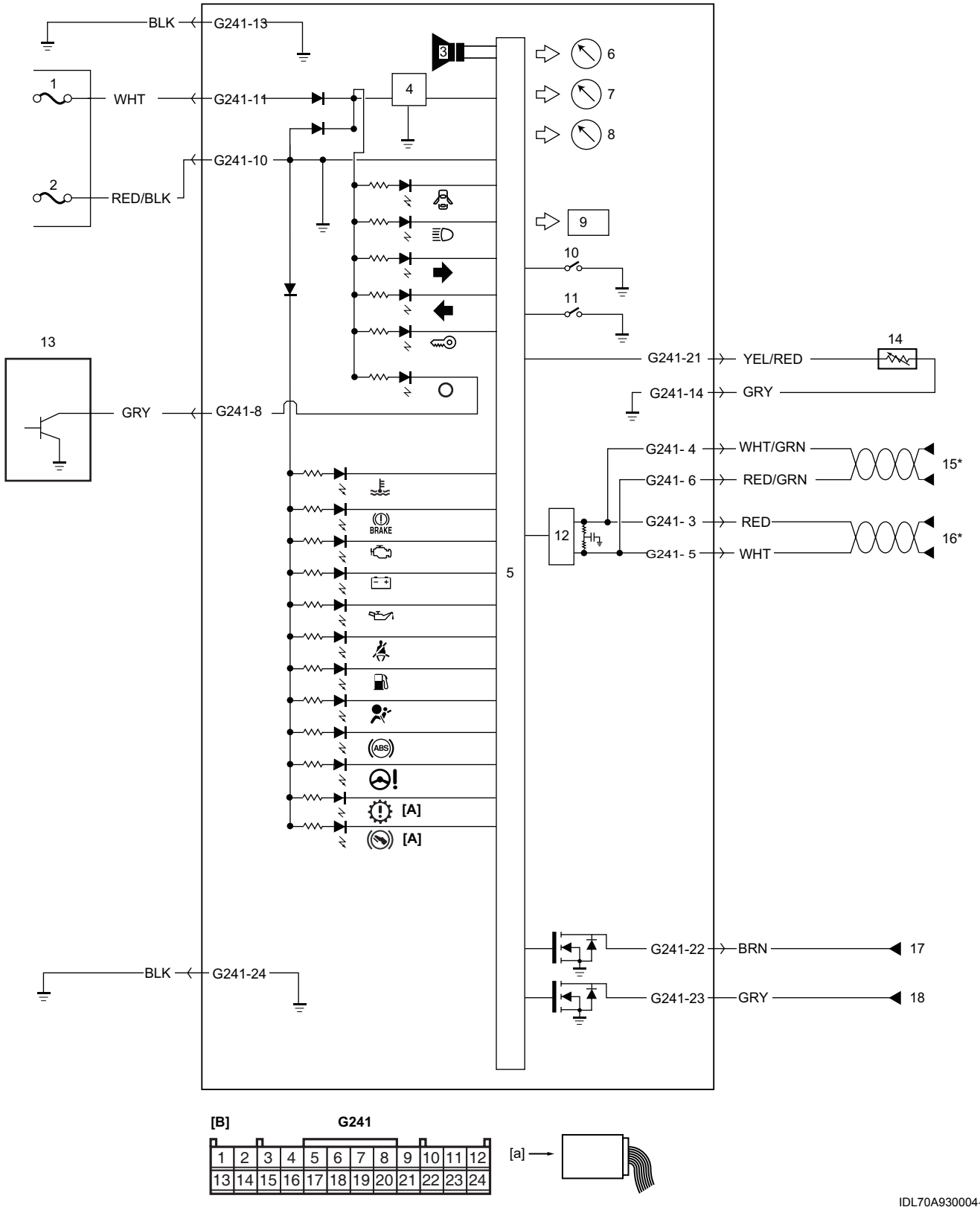
Schematic and Routing Diagram

Combination Meter Circuit Diagram

AENDL70A9302001

NOTE

For details marked with (*), refer to "CAN Communication System Circuit Diagram" in Section 10H (Page 10H-5).



IDL70A930004-05

[A]:	AMTmodel	6.	Speedometer	13.	BCM
[B]:	Combination meter harness connector (View: [a])	7.	Tachometer (if equipped)	14.	Fuel level sensor
1.	“DOME” fuse	8.	Fuel meter	15.	EPS*
2.	“MTR” fuse	9.	LCD	16.	DLC*
3.	Buzzer	10.	Trip switch	17.	Bulb illumination signal
4.	Voltage regulator circuit	11.	Mode switch	18.	LED illumination signal
5.	MPU	12.	CAN driver		

NOTE

For circuit name and terminal voltage, refer to “Inspection of Combination Meter and Its Circuit” (Page 9C-9).

Diagnostic Information and Procedures

Combination Meter diagnosis

AENDL70A9304001

Combination meter controls operation of each meter, warning light and indicator light using information sent from each control module through CAN communication.
For this reason, it is necessary to diagnose trouble according to the following inspection procedure when operation of combination meter is found faulty.

1) Check combination meter power and ground circuits.
2) Using SUZUKI scan tool, check each DTC of all control modules.
   - If some DTC of some control module appears during inspection in Step 2), go to applicable DTC diag. flow.
   - If any of troubles described in table below has occurred independently even though DTC display is normal during inspection in Step 2), inspect subject place according to instructions in table below.

Defective item	Possible cause	Correction / Reference item
Low fuel warning light	Fuel level sensor	“Fuel Pump Inspection” in Section 1G (Page 1G-24)
	System circuit (including relay and fuse)	“Inspection of Combination Meter and Its Circuit” (Page 9C-9)
Seat belt reminder light	Seat belt buckle switch	“Front Seat Belt Inspection” in Section 8A (Page 8A-4)
	System circuit (including relay and fuse)	“Inspection of BCM and Its Circuits” in Section 10B (Page 10B-20)
Oil pressure warning light	Oil pressure switch	“Oil Pressure Switch Inspection” in Section 1E (Page 1E-3)
	System circuit (including relay and fuse)	“Inspection of BCM and Its Circuits” in Section 10B (Page 10B-20)
Charge warning light	Generator	“Generator Test” in Section 1J (Page 1J-4)
	System circuit (including relay and fuse)	“Inspection of BCM and Its Circuits” in Section 10B (Page 10B-20)
Brake warning light	Parking brake switch	“Parking Brake Switch Inspection” in Section 4D (Page 4D-3)
	Brake fluid level switch	“Brake Fluid Level Inspection” in Section 4A (Page 4A-5)
	System circuit (including relay and fuse)	“Inspection of BCM and Its Circuits” in Section 10B (Page 10B-20)
Open door warning light	Door switch	“Door Switch Inspection” in Section 9F (Page 9F-12)
	System circuit (including relay and fuse)	“Inspection of BCM and Its Circuits” in Section 10B (Page 10B-20)
High beam indicator light	Headlight switch (lighting switch)	“Lighting Switch Inspection” in Section 9B (Page 9B-9)
	Combination meter terminal voltage	“Inspection of Combination Meter and Its Circuit” (Page 9C-9)
	System circuit (including relay and fuse)	“C-1 Combination Meter Circuit Diagram” in Section 9A (Page 9A-58)

Defective item	Possible cause	Correction / Reference item
Turn signal indicator light	Turn signal light switch (lighting switch)	"Lighting Switch Inspection" in Section 9B (Page 9B-9)
	System circuit (including relay and fuse)	"Inspection of BCM and Its Circuits" in Section 10B (Page 10B-20)

DTC Table

AENDL70A9304003

DTC	DTC Name	DTC detecting condition	Warning	Fail-safe
B1802 ☞(Page 9C-5)	Power Source Voltage too Low	Voltage across "MTR" fuse is less than lower limit voltage (8.0 V) for specified or longer time.	Off	—
B1810 ☞(Page 9C-6)	Fuel Level Sensor Circuit / Open	Fuel level signal has not been input for specified or longer time.	Off	—
B1820 ☞(Page 9C-7)	Internal Control Module EEPROM Error	Memory in combination meter is faulty.	Off	—
B1840 ☞(Page 9C-7)	Vehicle Speed Invalid Data	Combination meter received abnormal vehicle speed data from ECM.	—	—
B1841 ☞(Page 9C-8)	Outside Air Temperature Invalid Data	Combination meter received abnormal outside air temperature data from BCM.	—	—
B1842 ☞(Page 9C-8)	Fuel Consumption Invalid Data	Combination meter received abnormal fuel consumption data from ECM.	—	—
B1902 ☞(Page 9C-8)	Control Module Programming Error	Internal programming error of combination meter	—	—
U0073 / U0100 / U0101 / U0121 / U0131 / U0140 / U0151 ☞(Page 9C-9)	Control Module Communication Bus Off	Refer to "CAN DTC (Lost Communication and Communication Bus Off) Table" in Section 10H (Page 10H-8)	Lights "ON"	—
	Lost Communication With ECM		Lights "ON"	—
	Lost Communication With TCM		Lights "ON"	—
	Lost Communication With ABS Control Module		Lights "ON"	—
	Lost Communication With Power Steering Control Module		Lights "ON"	—
	Lost Communication With Body Control Module		Lights "ON"	—
	Lost Communication With Keyless Start Control Module		Lights "ON"	—
	Lost Communication With Restraints Control Module		Lights "ON"	—

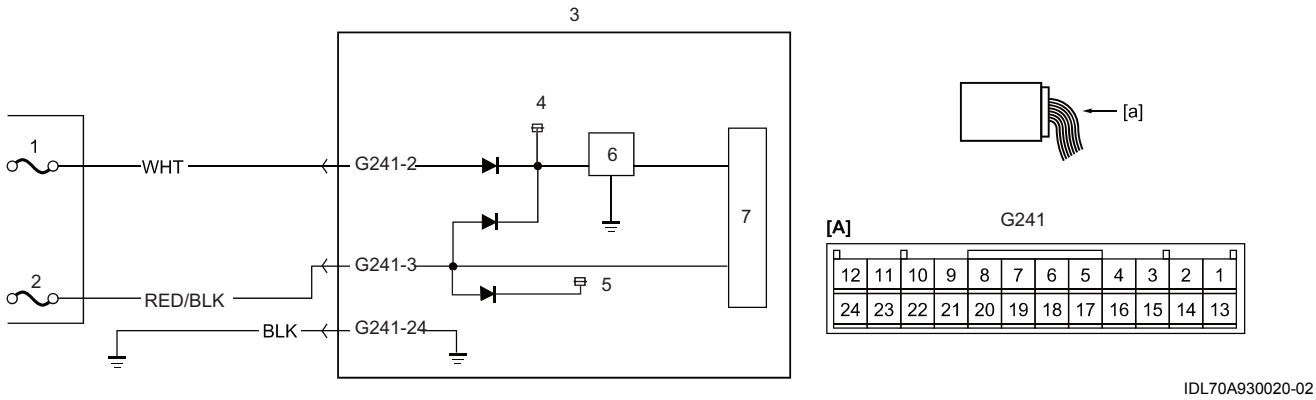
DTC B1802

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1802: Power supply voltage too low Voltage across "MTR" fuse is less than lower limit voltage (8.0 V) for specified or longer time.	• Combination meter power supply circuit • Combination meter ground circuit • Combination meter

Circuit Diagram



IDL70A930020-02

[A] Combination meter connector (View: [a])	4. Battery supply
1. "DOME" fuse	5. Ignition supply
2. "MTR" fuse	6. Voltage regulator circuit
3. Combination meter	7. MPU

DTC Troubleshooting

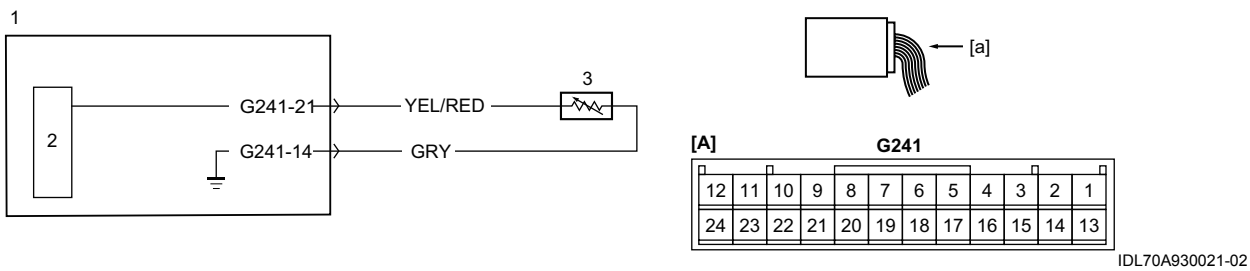
Step	Action	Yes	No
1	**DTC check** 1) Clear DTC. 2) Check that ignition is "OFF". 3) Set ignition "ON". 4) Check DTC. *Is DTC B1802 still detected?*	Go to Step 2.	Check for intermittent trouble.☞(Page 00-11)
2	**Combination meter power supply and ground circuit check** 1) Check combination meter power supply and ground circuits.☞(Page 9C-9) *Is check result OK?*	Go to Step 3.	Repair defective wire harness.
3	**Combination meter power supply voltage check** 1) Check power supply voltage with engine speed at 3,000 rpm *Is voltage 10 – 15 V?*	Replace combination meter and recheck DTC.☞(Page 9C-9)	Check charging system.☞(Page 1J-4)

DTC B1810

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1810: Fuel level sensor circuit / open Fuel level signal has not been input for specified or longer time.	• Combination meter • Fuel level sensor • Fuel level sensor circuit



IDL70A930021-02

[A]: Combination meter connector (View: [a])	2. MPU
1. Combination meter	3. Fuel level sensor

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Clear DTC. 2) Check that ignition is “OFF”. 3) Set ignition “ON”. 4) Check DTC. *Is DTC B1810 still detected?*	Go to Step 2.	Check for intermittent trouble.☞(Page 00-11)
2	**Fuel level sensor check** 1) Check fuel level sensor. ☞(Page 1G-24) *Is check result OK?*	Go to Step 3.	Replace fuel level sensor and recheck DTC. ☞(Page 1G-21)
3	**Fuel level sensor circuit check** 1) Check that ignition is “OFF”. 2) Disconnect combination meter and fuel level sensor connectors. 3) Check for proper connection to combination meter and fuel level sensor terminals. 4) If connections are OK, check circuit between combination meter connector and fuel level sensor for open circuit, short to ground or short to power supply. *Is check result OK?*	Replace combination meter and recheck DTC.☞(Page 9C-11)	Repair defective wire harness and recheck DTC.

DTC B1820

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1820: Internal control module EEPROM error Memory in combination meter is faulty.	• Combination meter • Parking sensor system control module • LIN communication circuit

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Clear DTC. 2) Check that ignition is “OFF”. 3) Set ignition “ON”. 4) Check DTC *Is DTC B1820 still detected?*	Replace combination meter and recheck DTC. ☞(Page 9C-11)	Check for intermittent trouble.☞(Page 00-11)

DTC B1840

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DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1840: Vehicle Speed Invalid Data Combination meter received abnormal vehicle speed data from ECM.	• Wheel speed sensor • ABS control module • ECM • Combination meter

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC in ABS control module.☞(Page 4E-11) *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**DTC check** 1) Check DTC in ECM.☞(Page 1A-19) *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace combination meter and recheck DTC.☞(Page 9C-11)

DTC B1841

AENDL70A9304013

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1841: Outside Air Temperature Invalid Data Combination meter received abnormal outside air temperature data from BCM.	• Outside air temperature sensor • BCM • Combination meter

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC in BCM.☞(Page 10B-9) *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace combination meter and recheck DTC.☞(Page 9C-11)

DTC B1842

AENDL70A9304008

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1842: Fuel Consumption Invalid Data Combination meter received abnormal fuel consumption data from ECM.	• ECM • Combination meter

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC in ECM.☞(Page 1A-19) *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace combination meter and recheck DTC.☞(Page 9C-11)

DTC B1902

AENDL70A9304010

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1902: Control Module Programming Error Internal programming error of combination meter	Combination meter

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC and replace combination meter.☞(Page 9C-11) *Is there any DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Check for intermittent trouble.

DTC U0073 / U0100 / U0121 / U0131 / U0140 / U0151

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Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8)

Scan Tool Active Test

AENDL70A9304012

Active control is possible for the following items using active test function of SUZUKI scan tool.

⚠ CAUTION

- **Set the parking brake and block the wheels. After confirming the safe conditions, execute this active test.**
- **This active test can be executed in the following conditions.**
  - **– Vehicle: stop**
  - **– Engine: stop**

Test item	Test content
ECT Meter (Sweep)	The “ECT meter (Sweep)” mode allows you to drive the ECT meter from MIN to MAX.
Fuel Meter (Sweep)	The “Fuel meter (Sweep)” mode allows you to drive the fuel meter from MIN to MAX.
Tacho meter (Sweep)	The “Tachometer (Sweep)” mode allows you to drive the tachometer from MIN to MAX.
Speed meter (Sweep)	The “Speedometer (Sweep)” mode allows you to drive the speedometer from MIN to MAX.
ECT Meter (Direct)	The “ECT meter (Direct)” mode allows you to drive the ECT meter to directed position.
Fuel Meter (Direct)	The “Fuel meter (Direct)” mode allows you to drive the fuel meter to directed position.
Tacho meter (Direct)	The “Tachometer (Direct)” mode allows you to drive the tachometer to directed position.
Speed meter (Direct)	The “Speedometer (Direct)” mode allows you to drive the speedometer to directed position.
Warning Buzzer	The “Warning buzzer control” mode allows you to turn the warning buzzer on and off.

Inspection of Combination Meter and Its Circuit

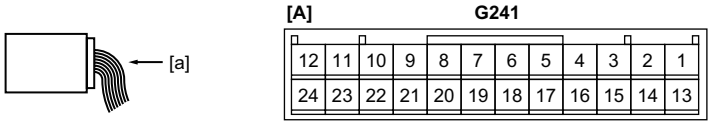
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1) Remove combination meter. ☞(Page 9C-11)
2) Connect connector to combination meter.
3) Check voltage and/or pulse signal using voltmeter and oscilloscope.

NOTE

- **As each terminal voltage is affected by the battery voltage, confirm that it is 12 V or more when the ignition switch is turned to ON position.**
- **Terminal with asterisk (*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**

G241 (View A)



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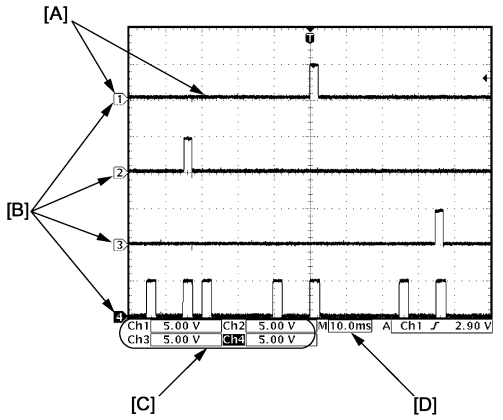
Terminal	Wire color	Circuit	Normal voltage	Condition
G241-2	RED	Lighting switch (high beam switch)	Approx. 12.0 V	Headlight switch at other than high beam or passing position.
			Approx. 0 V	Headlight switch at high beam or passing position.
G241-3*	RED	CAN communication line (High 2) to DLC	Refer to reference waveform. “CAN Communication Signal” under “Inspection of ECM and Its Circuits” in Section 1A (Page 1A-87)	
G241-4*	RED/GRN	CAN communication line (High 1) to EPS		
G241-5*	WHT	CAN communication line (Low 2) to DLC	Refer to reference waveform. “CAN Communication Signal” under “Inspection of ECM and Its Circuits” in Section 1A (Page 1A-87)	
G241-6*	WHT/GRN	CAN communication line (Low 1) to EPS		

Terminal	Wire color	Circuit	Normal voltage	Condition
G241-8	GRY	Theft deterrent light	0←→14 V	Theft deterrent light blinks.
			10 - 14 V	Other than above position.
G241-10	RED/BLK	Power supply	Approx. 12.0 V	Ignition switch is at ON position.
G241-11	WHT	Backup power source	Approx. 12.0 V	Ignition switch is at any position.
G241-13	BLK	Signal ground (Body)	Approx. 0 V	Ignition switch is at any position.
G241-14	GRY	Fuel level sensor ground	Approx. 0 V	Ignition switch is at any position.
G241-21	YEL/RED	Fuel level sensor signal	Approx. 2.3 - 7.6 V	Ignition switch is at ON position (voltage varies depending on fuel level).
G241-22	BRN	Bulb illumination output	Refer to reference waveform.	
G241-23	GRY	LED illumination output	Refer to reference waveform.	
G241-24	BLK	Power ground (Body)	Approx. 0 V	Ignition switch is at any position.

Reference Waveform

NOTE

- **Waveform analysis is as follows.**



I8T401111066-01

[A]: Waveform of channel 1	[C]: VOLT/DIV of each channel
[B]: Ground level of each channel	[D]: TIME/DIV

- **Waveform might change for measurement condition and vehicle spec.**

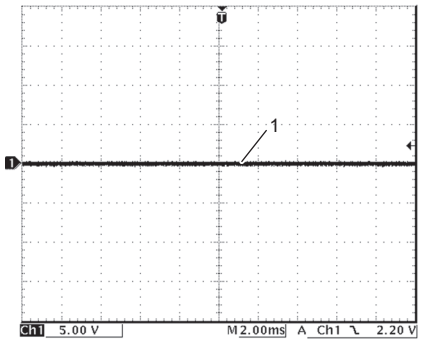
Illumination pulse output signal (1)

Channel	Probe	Terminal No.
1	+	G241-22
	+	G241-23
	–	G241-13

Measurement condition

- Ignition: “ON”
- Lighting switch: Other than OFF position
- Illumination control: 6th position (Brightest)

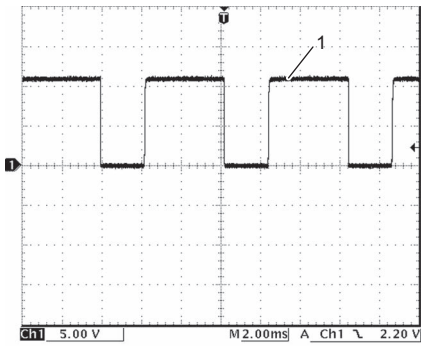
Illumination control 6th position (Brightest)



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- Ignition: “ON”
- Lighting switch: Other than OFF position
- Illumination control: 3rd position

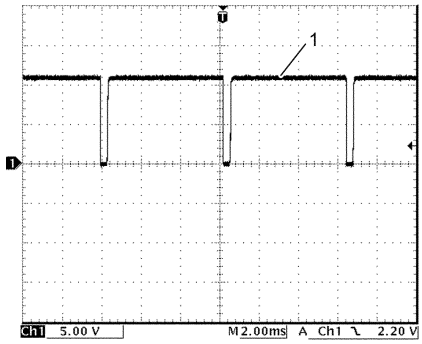
Illumination control 3rd position



I9P60A930013-01

- Ignition: “ON”
- Lighting switch: Other than OFF position
- Illumination control: 1st position (Dimmest)

Illumination control 1st position (Dimmest)



I9P60A930038-01

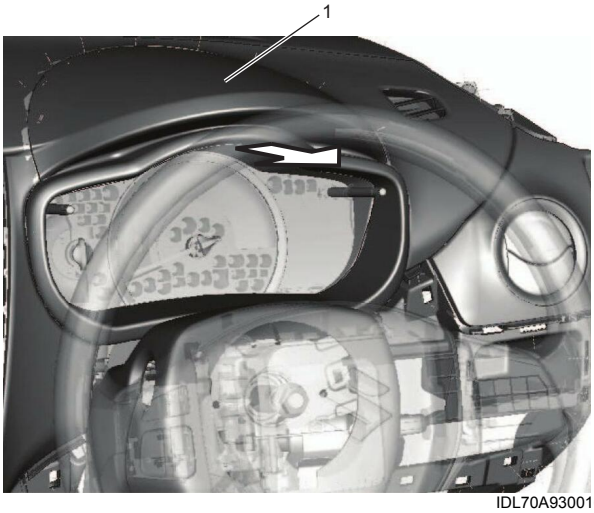
Repair Instructions

Combination Meter Removal and Installation

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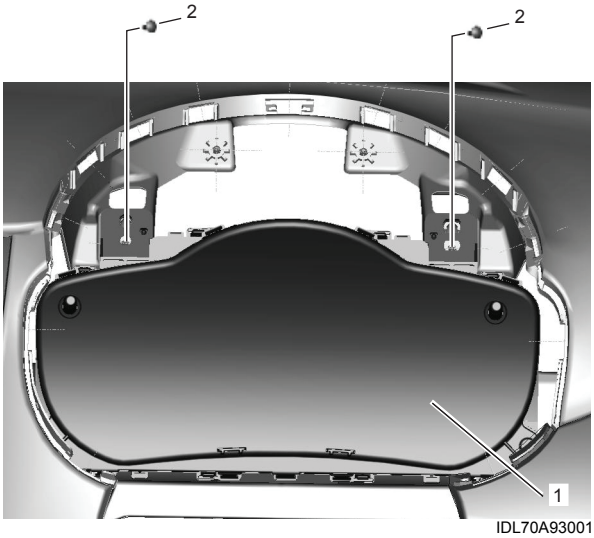
Removal

1) Remove combination meter cluster panel (1) by pulling it in arrow direction.

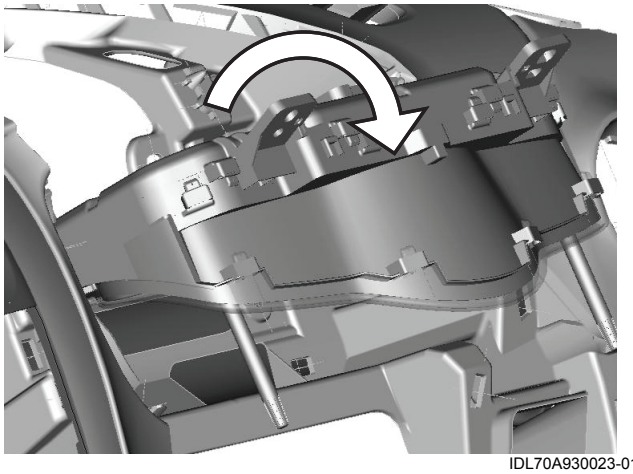


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2) Remove screws (2) and then remove combination meter (1) by pulling it in arrow direction.



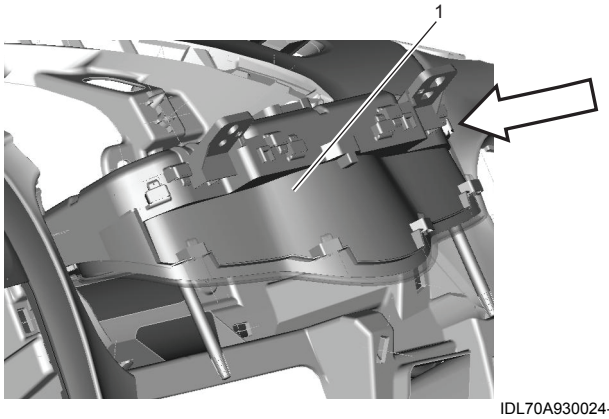
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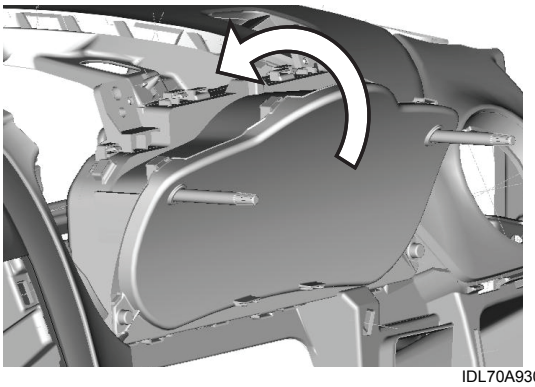
Installation

1) Insert speedometer (1) in Instrument panel as shown, taking care of scratch on lens.

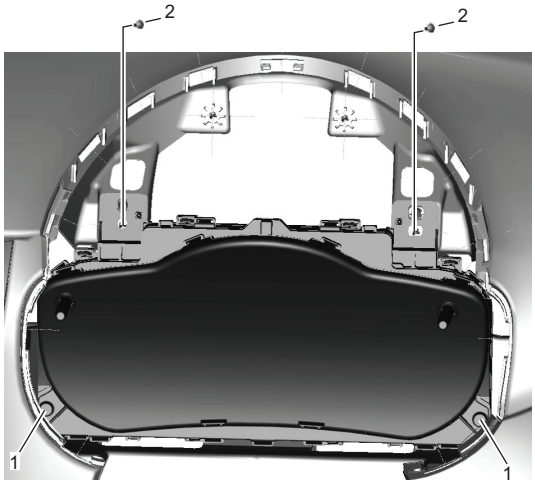


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2) Rotate the speedometer after inserting.


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3) Insert speedometer clips (1) and tighten screws (2).



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Instrument Panel Removal and Installation

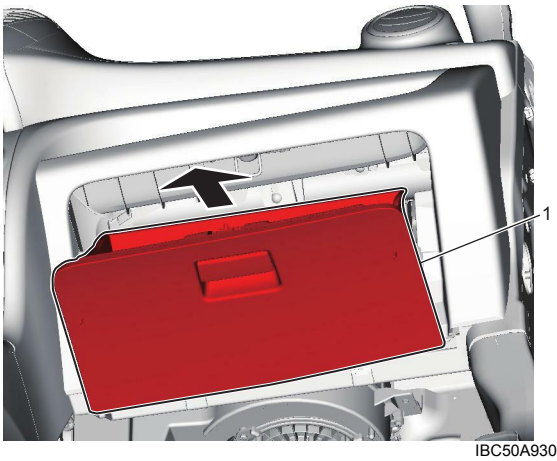
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⚠ WARNING

Refer to "Air Bag Warning" in Section 00 (Page 00-6) before starting service work.

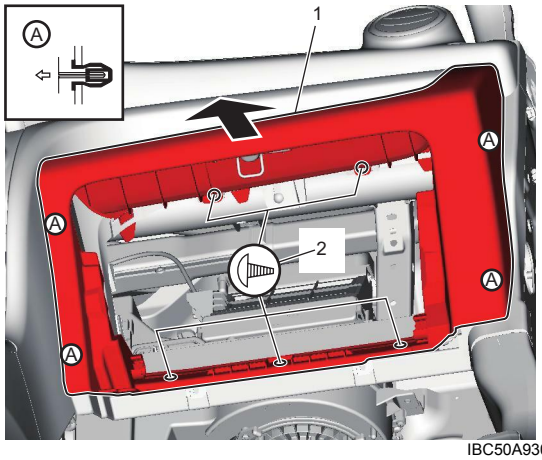
Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system. ☞(Page 8B-47)
3) Remove steering column. ☞(Page 6B-6)
4) Remove right and left dash side trim. ☞(Page 9H-5)
5) Remove glove box (1) pulling it in arrow direction.



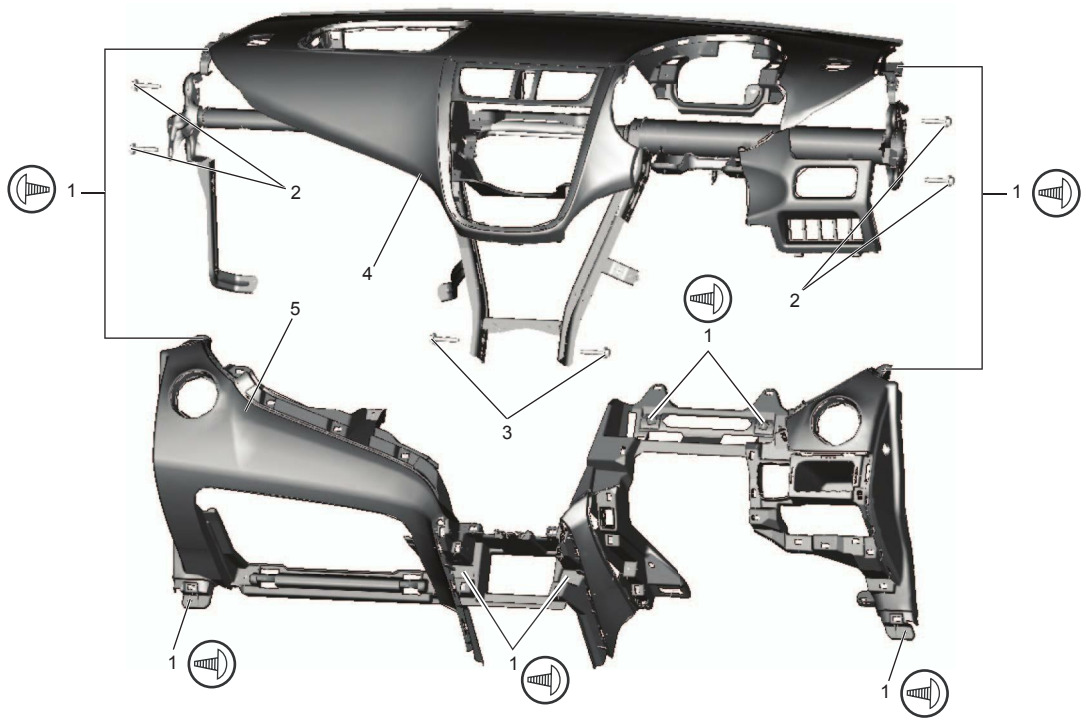
IBC50A930002-01

6) Remove screws (2), and then remove glove box cap (1) pulling it in arrow direction.



IBC50A930003-01

7) Remove front floor console box and console box stiffener. ☞(Page 9H-9)
8) Remove right and left front pillar upper trim. ☞(Page 9H-5)
9) Disconnect the following electric connectors, wire and cables.
   - Instrument panel connectors
   - Heater control cables
   - Antenna feeder connector
   - Ground wire
10) Remove screws (1), instrument panel upper bolts (2), instrument panel lower bolts (3) and clips.
11) Before removing instrument panel, confirm that all electric connectors, wires and cables are disconnected from instrument panel and vehicle body panel with the instrument panel floated.
12) Remove instrument panel with steering support member and instrument panel harness.
13) Detach instrument upper panel (4) from instrument lower panel (5).



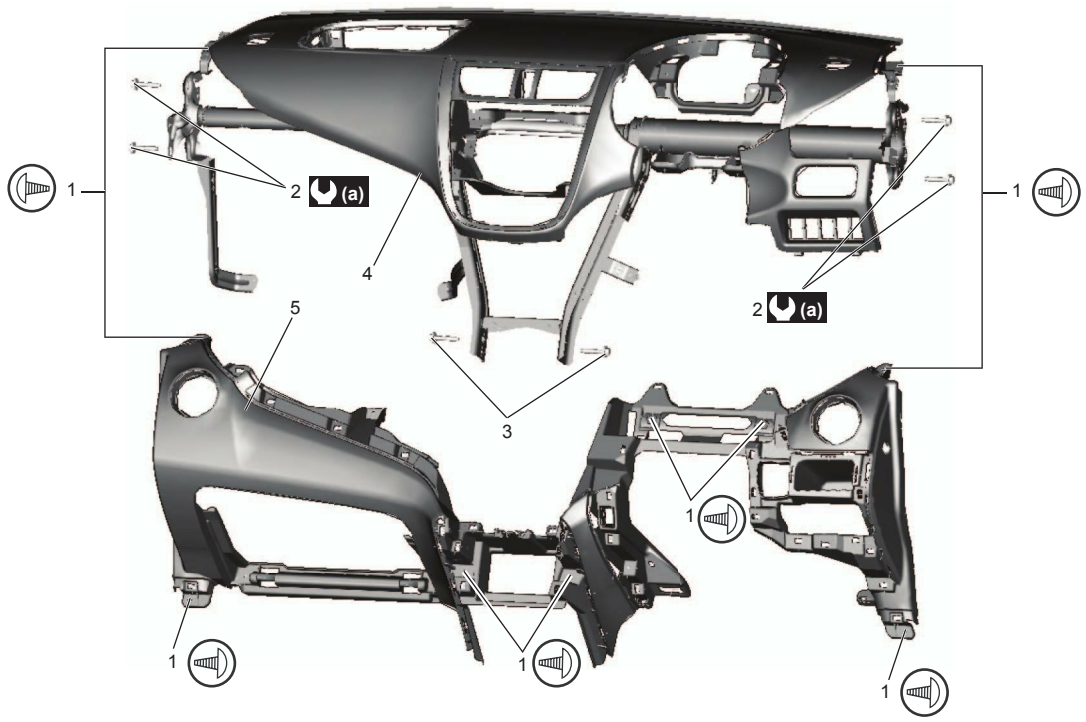
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Installation

Reverse removal procedure noting the following points.

- When installing each part, be careful not to catch any cable or wiring harness.
- Tighten instrument panel bolts to specified torque.

  Tightening torque
  Instrument panel upper bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A930010-07

- Adjust heater control cables. ☞(Page 7B-33)
- After completing installation, enable air bag system. ☞(Page 8B-47)

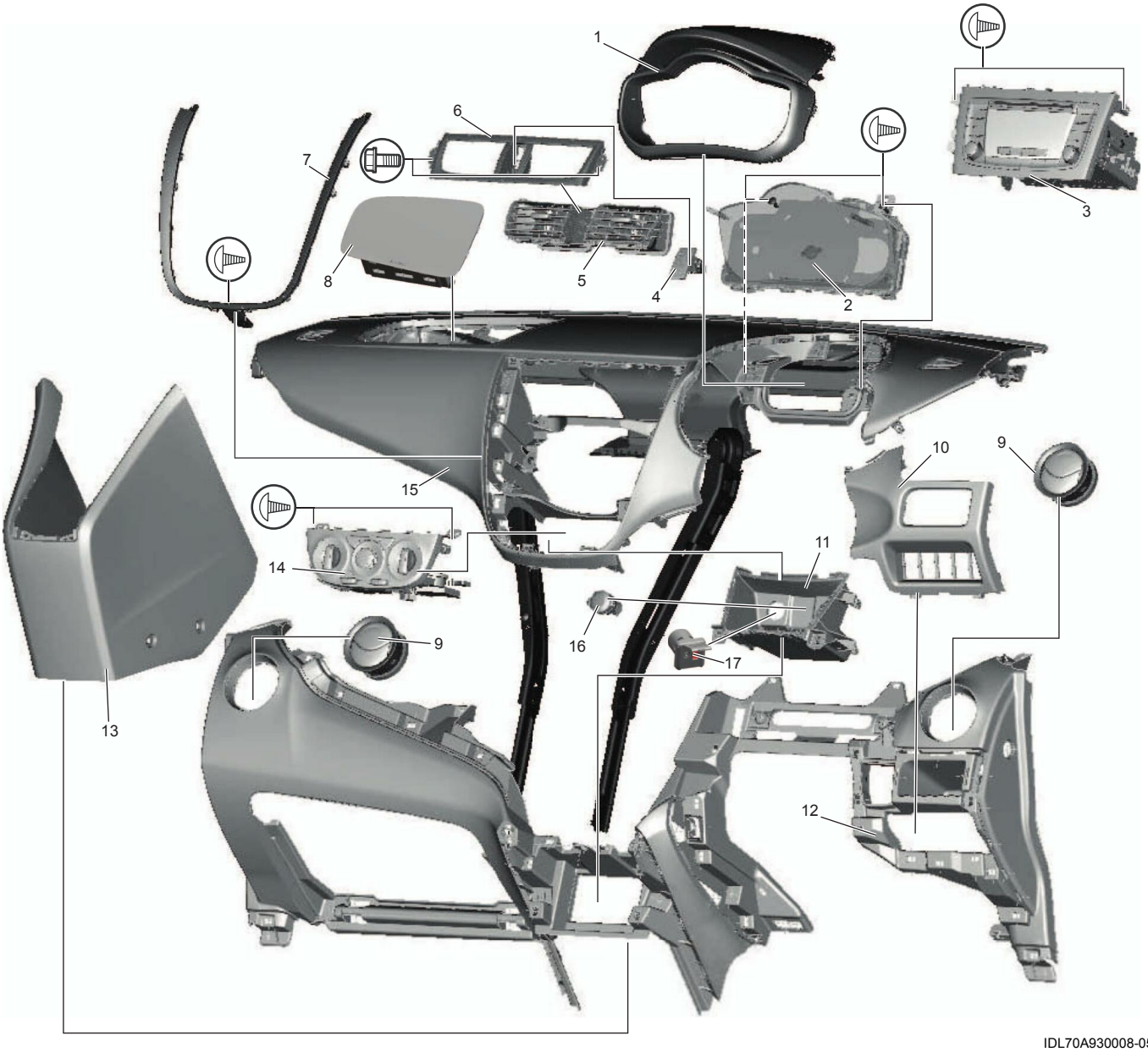
Instrument Panel Disassembly and Reassembly

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Disassembly

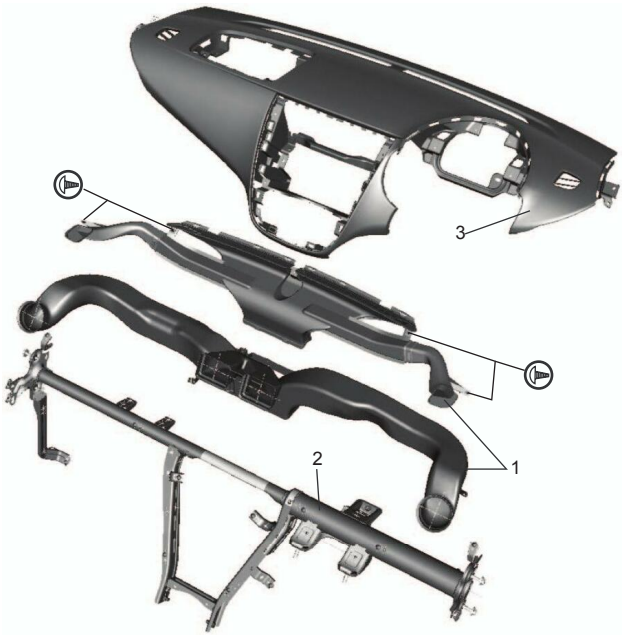
1) Remove each part from instrument panel as shown in figure.

- Combination meter cluster panel (1)
- Combination meter (2)
- Audio unit (3)
- Hazard switch (4)
- Center ventilation louver (5)
- Garnish center ventilation louver (6)
- Center garnish trim (7)
- Passenger air bag (inflator) module (8) ☞(Page 8B-50)
- Side ventilation louver (9)
- Switch bezel (10)
- Lower box (11)
- Lower instrument panel (12)
- Instrument panel lower cover (13)
- HVAC control unit (14)
- Instrument panel main upper (15)
- Accessory socket (16)
- USB/AUX socket (17) (If equipped)



IDL70A930008-05

2) Remove ventilation duct (1) and steering support member (2) from instrument panel (3).



IDL70A930012-01

Reassembly

Reverse disassembly procedure noting the following.

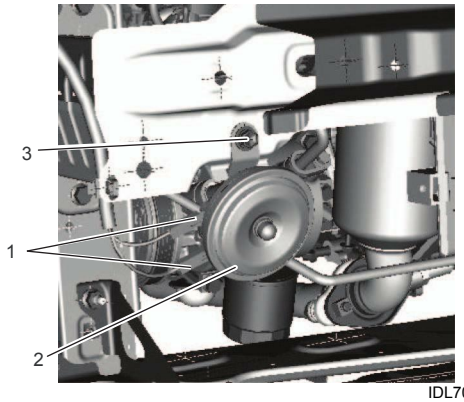
- Adjust heater control cables. ☞(Page 7B-33)
- Install passenger air bag (inflator) module. ☞(Page 8B-50)

Horn Removal and Installation

AENDL70A9306005

Removal

1) Remove front bumper. ☞(Page 9H-1)
2) Disconnect horn connectors (1).
3) Remove horn mounting bolt (3) and then remove horn (2).



IDL70A930014-01

Installation

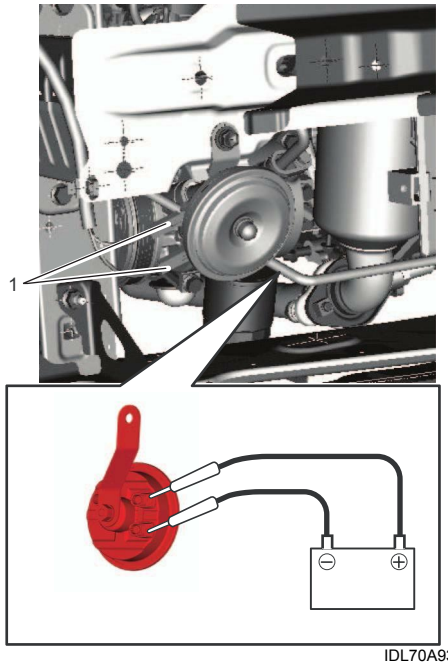
Reverse removal procedure noting the following.
Tighten horn mounting bolt to specified torque.

Tightening torque
Horn mounting bolt: 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

Horn Inspection

AENDL70A9306006

1) Remove front bumper. ☞(Page 9H-1)
2) Disconnect horn connectors (1).
3) Connect battery positive (+) terminal and negative (–) terminal as shown in figure.
   If horn does not sound, replace horn.



IDL70A930015-01

Horn Relay Inspection

AENDL70A9306007

Refer to “Control Relay Inspection” in Section 10B (Page 10B-32).

Specifications

Tightening Torque Specifications

AENDL70A9307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Instrument panel upper bolt	23	2.3	17.0	☞(Page 9C-13)
Horn mounting bolt	10	1.0	7.5	☞(Page 9C-15)

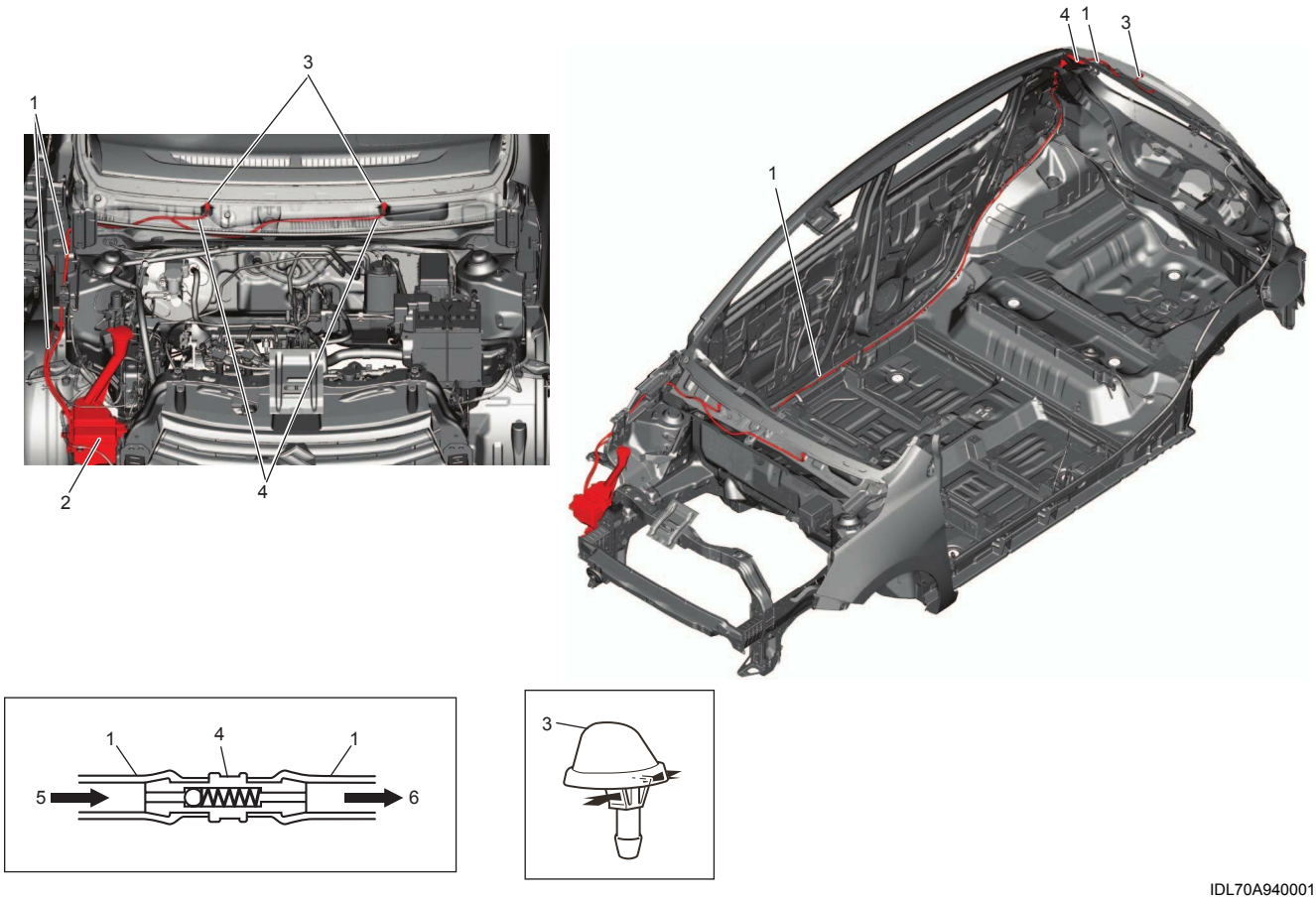
Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Fasteners Information” in Section 0A (Page 0A-5)

Wipers / Washers

Schematic and Routing Diagram

Washer Tank and Hose Routing Diagram

AENDL70A9402001



IDL70A940001-03

1. Washer hose	3. Washer nozzle	5. From washer tank
2. Washer tank	4. Check valve	6. To washer nozzle

Wiper and Washer Circuit Diagram

AENDL70A9402002

For details of wiper and washer system wiring diagram, refer to “B-1 Windshield Wiper and Washer Circuit Diagram” in Section 9A (Page 9A-49) and “B-2 Rear Wiper and Washer Circuit Diagram” in Section 9A (Page 9A-50).

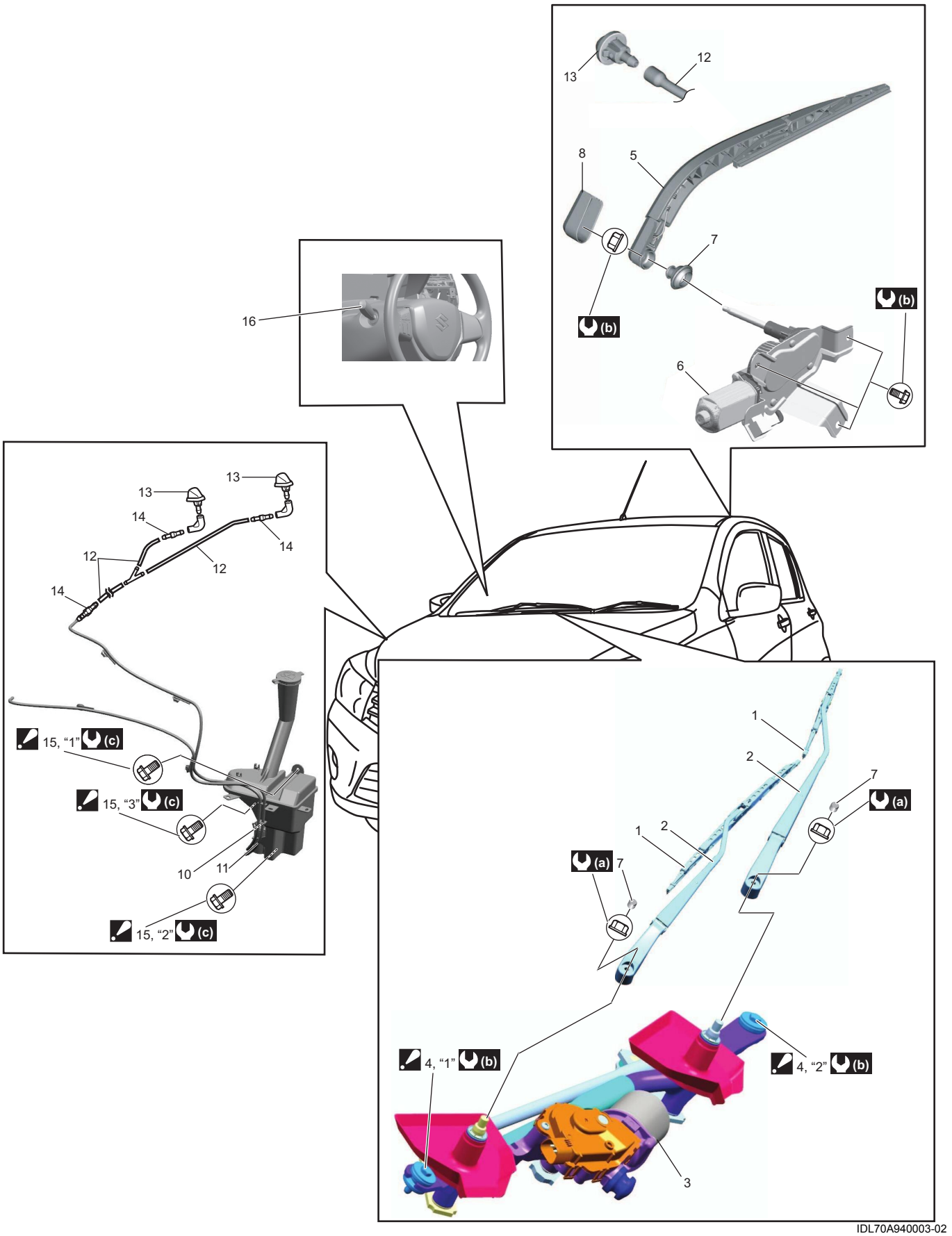
Component Location

Wiper and Washer Component Location

AENDL70A9403001

NOTE

The figure below shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at opposite side.



IDL70A940003-02

1. Windshield wiper blade	8. Rear wiper arm cover	15. Washer tank bolt : Tighten bolts in numerical order (“1” through “3”).
2. Windshield wiper arm	9. Washer tank	16. Wiper and washer switch

3. Windshield wiper motor assembly	10. Windshield washer pump	(a) : 16 N·m (1.6 kgf-m, 12.0 lbf-ft)
4. Windshield wiper motor bolt : Tighten bolts in numerical order (“1” through “2”).	11. Rear washer pump	(b) : 8 N·m (0.82 kgf-m, 6.0 lbf-ft)
5. Rear wiper arm and blade assembly	12. Washer hose	(c) : 4 N·m (0.41 kgf-m, 3.0 lbf-ft)
6. Rear wiper motor assembly	13. Washer nozzle	
7. Wiper pivot cap	14. Check valve	

Diagnostic Information and Procedures

Windshield Wiper and Washer Symptom Diagnosis

AENDL70A9404001

Condition	Possible cause	Correction / Reference Item
Windshield wiper malfunction	Windshield wiper motor	*“Windshield Wiper Motor Operation Inspection” (Page 9D-5)*
	Wiper-and-washer switch	*“Wiper-and-Washer Switch Inspection” (Page 9D-9)*
	System circuit (including fuse)	*“B-1 Windshield Wiper and Washer Circuit Diagram” in Section 9A (Page 9A-49)*
Windshield washer malfunction	Washer hose or nozzle	*Clean or repair clogged hose and/or nozzle.*
	Windshield washer pump	*“Washer Pump Inspection” (Page 9D-4)*
	Wiper-and-washer switch	*“Wiper-and-Washer Switch Inspection” (Page 9D-9)*
	System circuit (including fuse)	*“B-1 Windshield Wiper and Washer Circuit Diagram” in Section 9A (Page 9A-49)*

Rear Wiper and Washer Symptom Diagnosis

AENDL70A9404002

Condition	Possible cause	Correction / Reference Item
Rear wiper malfunction	Rear wiper motor	*“Rear Wiper Motor Inspection” (Page 9D-7)*
	Wiper-and-washer switch	*“Wiper-and-Washer Switch Inspection” (Page 9D-9)*
	System circuit (includes fuse)	*“B-2 Rear Wiper and Washer Circuit Diagram” in Section 9A (Page 9A-50)*
Rear washer malfunction	Washer hose or nozzle	*Clean or repair clogged hose and/or nozzle.*
	Rear washer pump	*“Washer Pump Inspection” (Page 9D-4)*
	Wiper-and-washer switch	*“Wiper-and-Washer Switch Inspection” (Page 9D-9)*
	System circuit (includes fuse)	*“B-2 Rear Wiper and Washer Circuit Diagram” in Section 9A (Page 9A-50)*

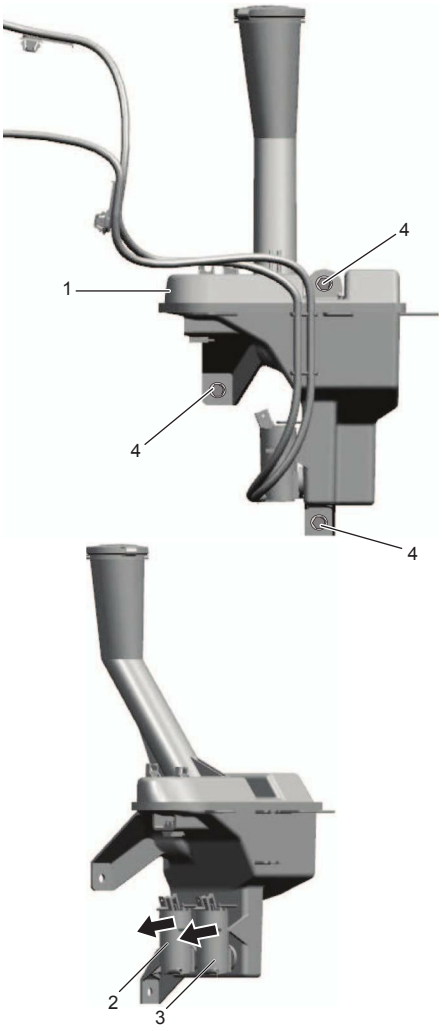
Repair Instructions

Washer Tank and Washer Pump Removal and Installation

AENDL70A9406001

Removal

1) Remove front bumper and right side headlight unit. ☞(Page 9B-4)
2) Disconnect electrical connectors and hoses from windshield washer pump and rear washer pump.
3) Remove washer tank bolts (4) and then remove washer tank (1).
4) Remove windshield washer pump (2) and rear washer pump (3) from washer tank (1) by pulling them in arrow directions.

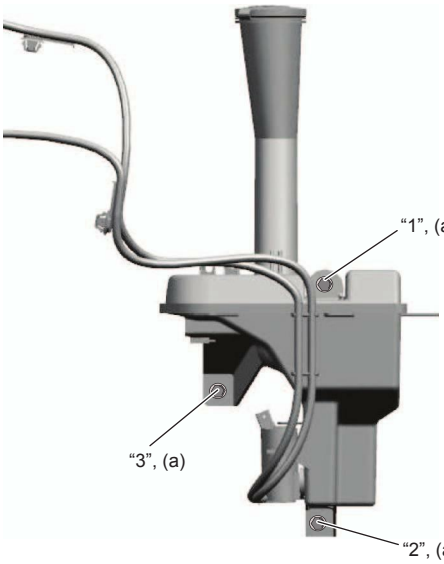


IDL70A940004-05

Installation

Reverse removal procedure noting the following.

- Tighten washer tank bolts to specified torque in numerical order (“1” through “3”).



IDL70A940030-02

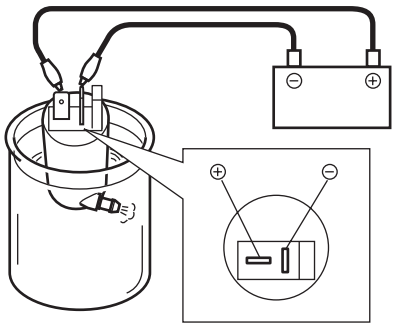
Tightening torque
Washer tank bolt (a): 4 N·m (0.41 kgf-m, 3.0 lbf-ft)

- After installation, be sure to check and adjust headlight aiming. ☞(Page 9B-6)

Washer Pump Inspection

AENDL70A9406002

1) Remove windshield washer pump and rear washer pump. ☞(Page 9D-3)
2) Connect battery and washer pump as shown and check each washer pump for operation.
   If pump does not operate or any abnormality is found, replace abnormal washer pump. ☞(Page 9D-3)



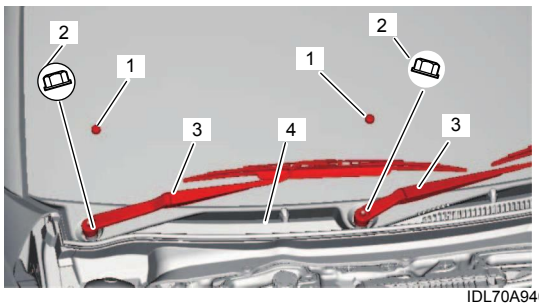
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Windshield Wiper Removal and Installation

AENDL70A9406003

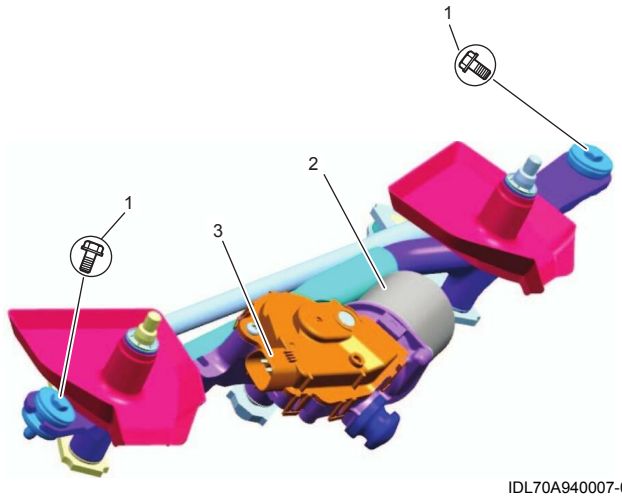
Removal

1) Remove wiper pivot caps (1) and windshield wiper arm nuts (2), and then remove windshield wiper arms (3) with wiper blades.
2) Remove cowl top garnish (4). ☞(Page 9H-3)



IDL70A940006-01

3) Disconnect electrical connector (3) from windshield wiper motor assembly (2).
4) Remove bolts (1), and remove windshield wiper motor assembly.



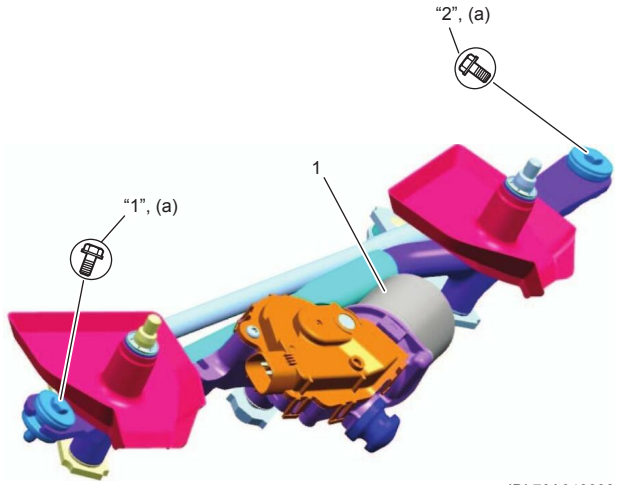
IDL70A940007-01

Installation

Reverse removal procedure noting the following.

- Install windshield wiper motor assembly (1), and tighten bolts to specified torque in numerical order (“1” through “2”) as shown.

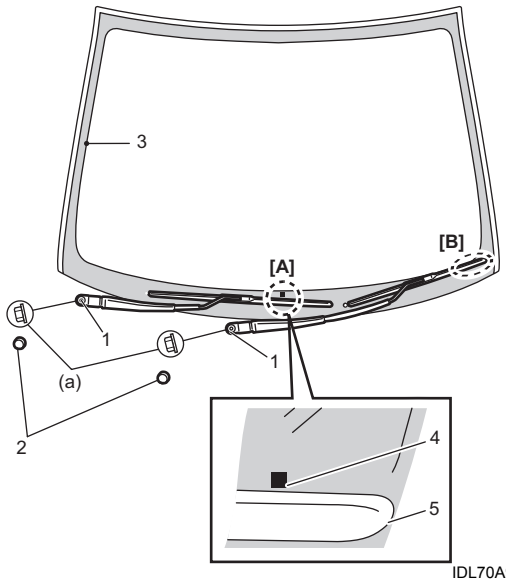
  Tightening torque
  Windshield wiper motor bolt (a): 8 N·m (0.82 kgf-m, 6.0 lbf-ft)



IDL70A940008-01

- Install windshield wiper arms (1) with wiper blades at specified position as shown in figure, and then tighten windshield wiper arm nuts (2) to specified torque.

  Tightening torque
  Windshield wiper arm nut (a): 16 N·m (1.6 kgf-m, 12.0 lbf-ft)

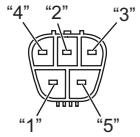


IDL70A940009-04

[A]: Align tip of blade (5) with matchmark	4. Matchmark on ceramic line
[B]: Align blade with ceramic line	5. Windshield wiper blade
2. Wiper pivot cap	
3. Ceramic line	

Windshield Wiper Motor Operation Inspection

AENDL70A9406004



IDL70A940010-01

NOTE

Wiper motor connector

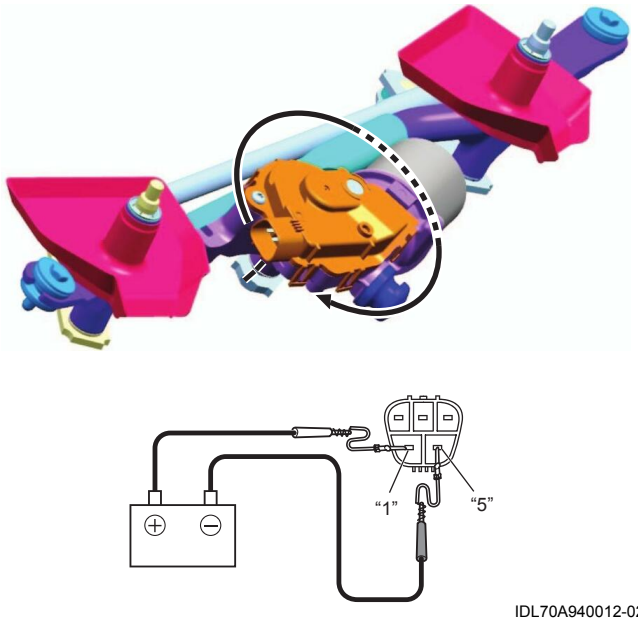
Before inspection, confirm battery voltage is 12 V or higher.

1) Put marks (1) on windshield wiper motor as a stop position.



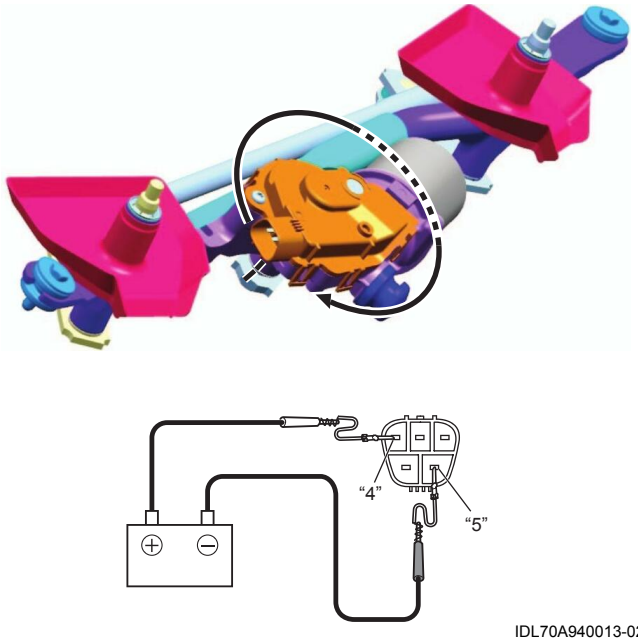
IDL70A940011-03

2) Connect battery and windshield wiper motor as shown and check that windshield wiper motor runs at low speed.
   If abnormality is found, replace windshield wiper motor assembly. ☞(Page 9D-4)



IDL70A940012-02

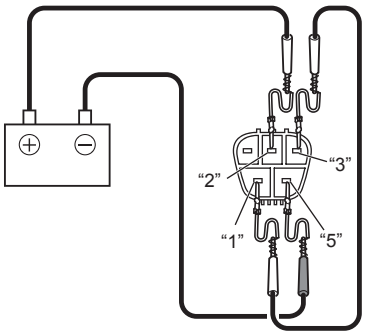
3) Connect battery and windshield wiper motor as shown and check that windshield wiper motor runs at high speed.
If abnormality is found, replace windshield wiper motor assembly. ☞(Page 9D-4)



IDL70A940013-02

4) Check automatic stop operation as follows.
   a) Connect battery positive (+) lead to windshield wiper motor connector terminal "1" and negative (–) lead to terminal "5", and operate windshield wiper motor at low speed.
   b) Disconnect battery positive (+) lead from windshield wiper motor connector terminal "1" and stop windshield wiper motor anywhere except at marked position (1).
   c) Bridge windshield wiper motor connector terminals "3" and "1" with a jumper wire and connect battery positive (+) lead to terminal "2" and connect battery negative (–) lead to terminal "5" of wiper motor connector.
   Check that windshield wiper motor turns once and then stops at marked position (1).





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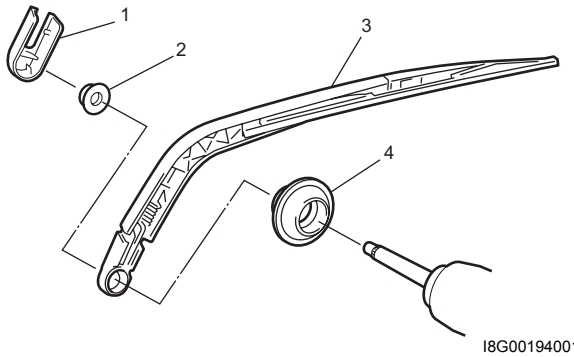
   d) Repeat step a) to c) several times and check that windshield wiper motor stops at specified position every time.
   If abnormality is found, replace windshield wiper motor assembly. ☞(Page 9D-4)

Rear Wiper Removal and Installation

AENDL70A9406005

Removal

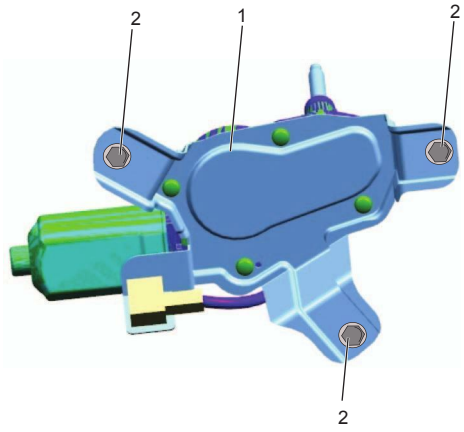
1) Remove rear wiper arm cover (1), rear wiper arm nut (2), rear wiper arm and blade assembly (3) and rear wiper pivot cap (4).



I8G001940014-01

2) Remove rear end door trim. ☞(Page 9J-7)

3) Disconnect rear wiper motor connector from rear wiper motor (1).
4) Remove rear wiper motor bolts (2) and remove rear wiper motor assembly.



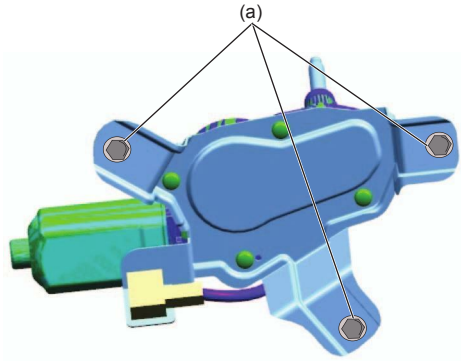
IDL70A940015-01

Installation

Reverse removal procedure noting the following.

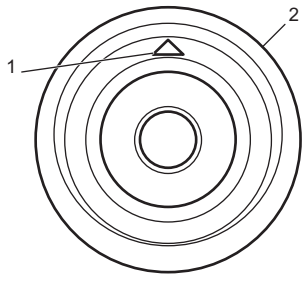
- Tighten rear wiper motor bolts to specified torque.

  Tightening torque
  Rear wiper motor bolt (a): 7 N·m (0.71 kgf-m, 5.5 lbf-ft)



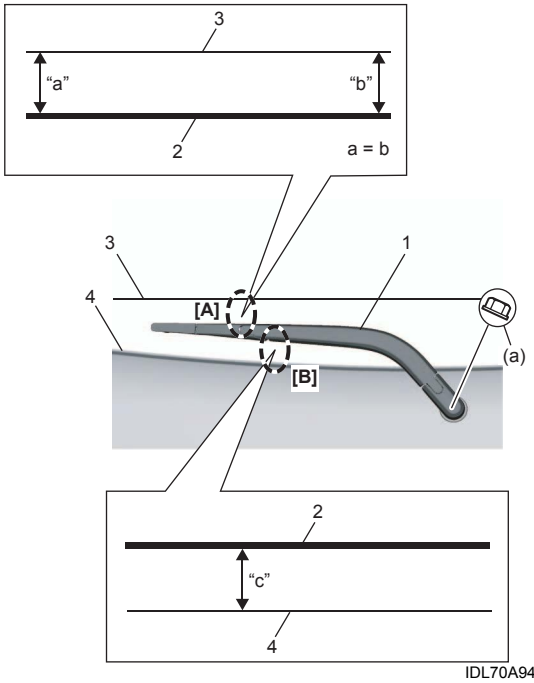
IDL70A940016-02

- When installing rear wiper pivot cap (2), position a match mark (1) topside as shown.



IDL70A940031-01

- Install rear wiper arm and blade assembly (1) to specified position as shown in figure.



IDL70A940017-04

[A]: For vehicle equipped with rear defogger	3. Defogger wire in rear end door window
[B]: For vehicle not equipped with rear defogger	4. Ceramic line
c. 10 mm (0.39 in)	
2. Rear wiper blade	

- Tighten rear wiper arm nut to specified torque.

  Tightening torque
  Rear wiper arm nut: 8 N·m (0.82 kgf-m, 6.0 lbf-ft)

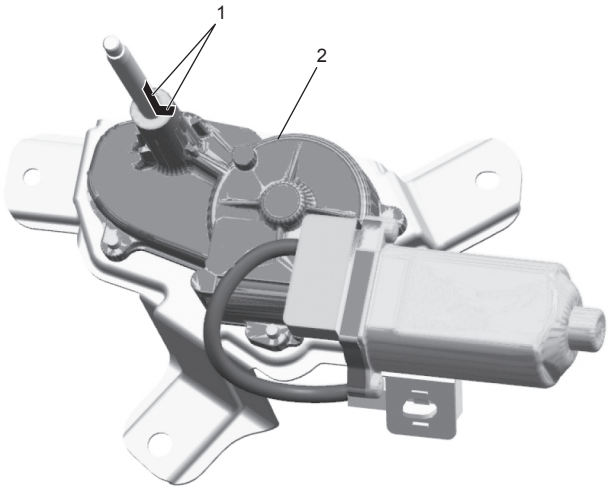
Rear Wiper Motor Inspection

AENDL70A9406006

NOTE

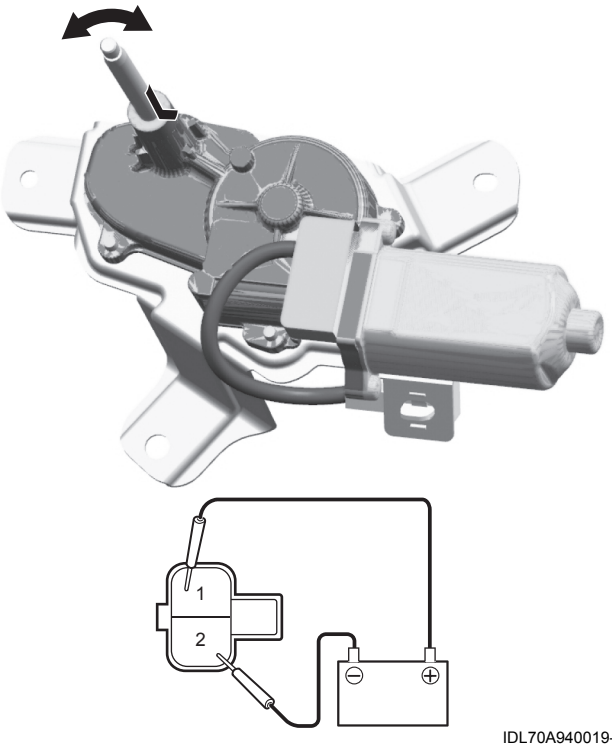
Before inspection, confirm battery voltage is 12 V or higher.

1) Put marks (1) on rear wiper motor (2) as a stop position as shown.



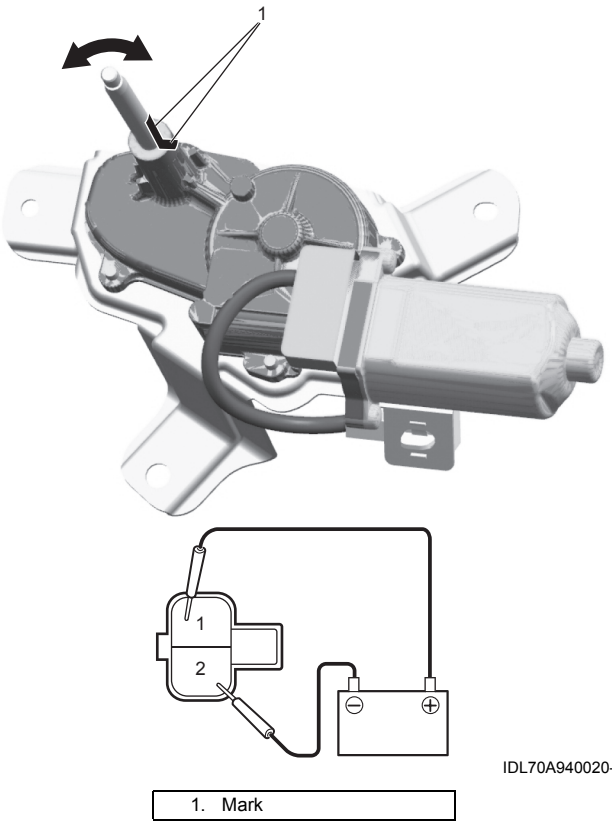
IDL70A940018-01

2) Connect battery and rear wiper motor as shown, and check rear wiper motor runs smoothly.
If abnormality is found, replace rear wiper motor assembly.



IDL70A940019-02

3) Check automatic stop operation as follows.
   a) Connect battery positive (+) lead to rear wiper motor terminal “1” and negative (–) lead to terminal “2”, and operate rear wiper motor.
   b) Disconnect battery negative (–) lead from rear wiper motor connector terminal “2” to stop rear wiper motor turning.
   c) Contact battery negative (–) lead to rear wiper motor body as ground circuit.
   d) Check that rear wiper motor turns once and then stops at marked position (1).



IDL70A940020-01

1. Mark

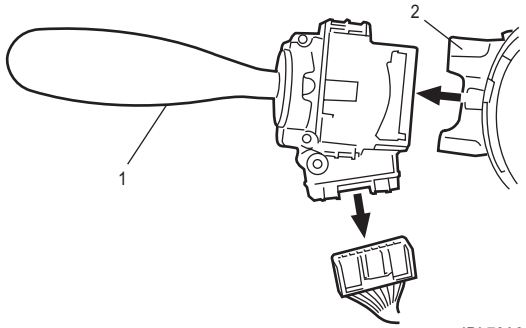
   e) Repeat Step a) to c) several times and check that rear wiper motor stops at specified position every time.
   If abnormality is found, replace rear wiper motor assembly.

Wiper-and-Washer Switch Removal and Installation

AENDL70A9406007

Removal

1) Turn ignition switch to OFF position.
2) Remove steering column covers. ☞(Page 6B-3)
3) Disconnect electrical connector and remove wiper-and-washer switch (1) from steering column (2).



IDL70A940021-02

Installation

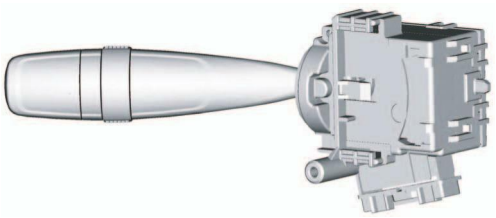
Reverse removal procedure.

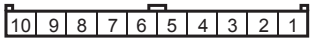
Wiper-and-Washer Switch Inspection

AENDL70A9406008

Wiper-and-Washer Switch

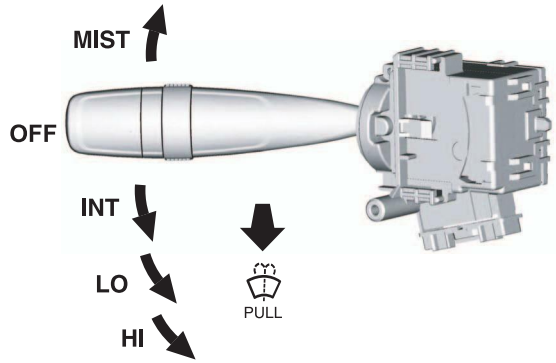
Check for continuity between terminals at each switch position.
If abnormality is found, replace wiper-and-washer switch. ☞(Page 9D-8)

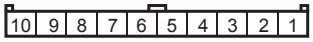




IDL70A940022-03

Windshield wiper-and-washer switch



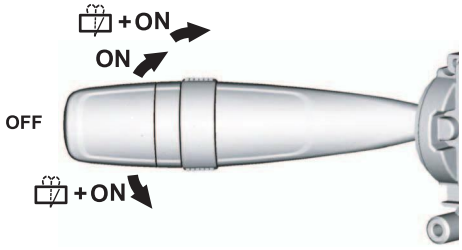


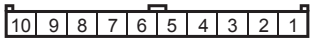
[B] \ [A]	2	3	4	5	6	7
MIST		○	○			
OFF			○	○		
INT			○	○		
LO		○	○			
HI	○	○				
PULL					○	○

IDL70A940023-02

[A]: Terminal	[B]: Switch position

Rear wiper-and-washer switch





[B] \ [A]	6	8	9
ON +	○	○	○
ON	○		○
OFF			
ON +	○	○	

IDL70A940026-02

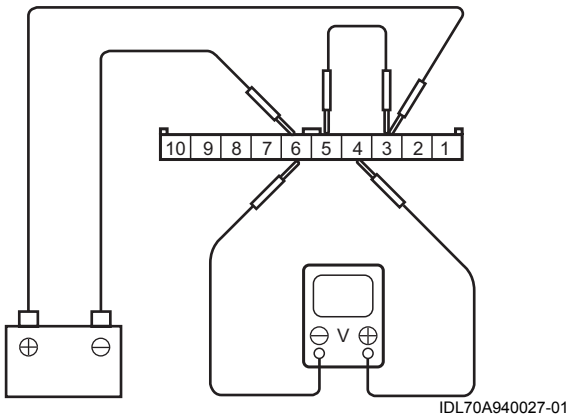
[A]: Terminal	[B]: Switch position

Intermittent Wiper Circuit

NOTE

Before inspection, confirm battery voltage is 12 V or higher.

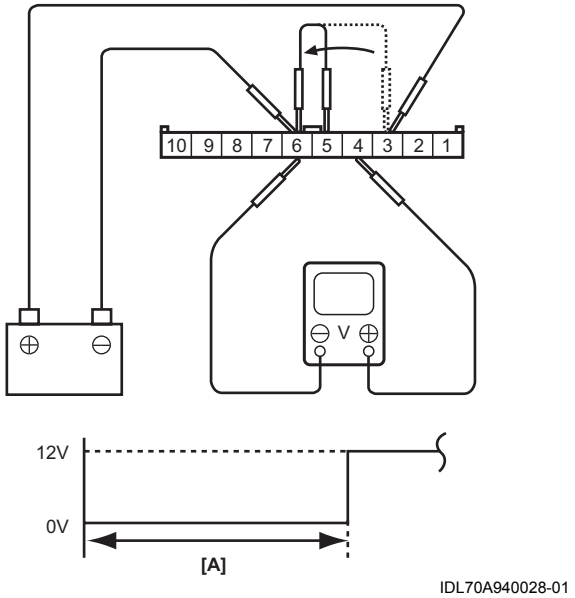
1) Disconnect wiper-and-washer switch connector.
2) Turn windshield wiper switch to INT position.
3) Connect battery positive (+) lead to wiper-and-washer switch terminal “3” and its negative (–) lead to terminal “6”.
4) Connect voltmeter positive (+) lead to wiper-and-washer switch terminal “4” and negative (–) lead to terminal “6”.
5) Check that voltage between terminals “4” and “6” is standard battery voltage (10 – 14 V).
6) Bridge terminals “3” and “5” with a jumper wire.



IDL70A940027-01

7) Disconnect jumper-wire end from terminal “3”.
8) Check that voltage between terminals “4” and “6” changes as shown when disconnected-jumper-wire end is connected to terminal “6”.

If any abnormality is found, replace wiper-and-washer switch.



IDL70A940028-01

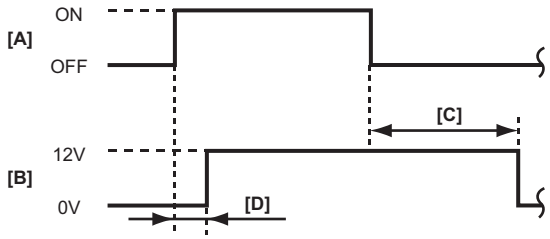
[A]:	2.3 – 4.3 sec.

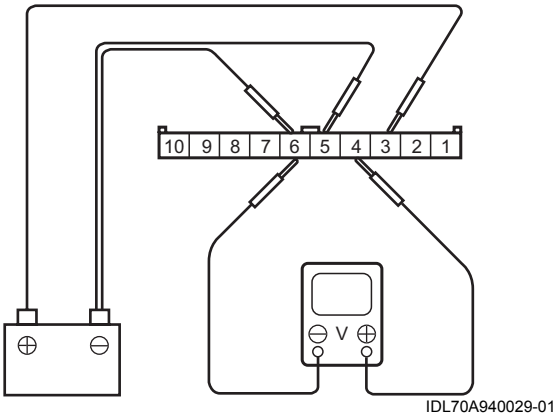
Washer Linked Circuit

NOTE

Before inspection, confirm battery voltage is 12 V or higher.

1) Disconnect wiper-and-washer switch connector.
2) Make sure that windshield wiper switch is at OFF position.
3) Connect battery positive (+) lead to wiper-and-washer switch terminal “3” and negative (–) lead to terminal “6”.
4) Connect voltmeter positive (+) lead to wiper-and-washer switch terminal “4” and negative (–) lead to terminal “6”.
5) Connect another battery-negative-lead to wiper-and-washer switch terminal “5”.
6) Turn windshield washer switch to ON position. Check that voltage between wiper-and-washer switch terminal “4” and “6” increases to approximately 12 V from 0 V in 0.3 seconds. If abnormality is found, replace wiper-and-washer switch.
7) Turn windshield washer switch back to OFF position. Check that voltage between wiper-and-washer switch terminal “4” and “6” decreases to 0 V after 2.2 seconds. If abnormality is found, replace wiper-and-washer switch.





IDL70A940029-01

[A]:	Windshield wiper switch
[B]:	Voltage
[C]:	Approx. 2.2 sec.
[D]:	Approx. 0.3 sec.

Specifications

Tightening Torque Specifications

AENDL70A9407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Washer tank bolt	4	0.41	3.0	☞(Page 9D-4)
Windshield wiper motor bolt	8	0.82	6.0	☞(Page 9D-5)
Windshield wiper arm nut	16	1.6	12.0	☞(Page 9D-5)
Rear wiper motor bolt	7	0.71	5.5	☞(Page 9D-7)
Rear wiper arm nut	8	0.82	6.0	☞(Page 9D-7)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Wiper and Washer Component Location” (Page 9D-1)
“Fasteners Information” in Section 0A (Page 0A-5)

Glass / Windows / Mirrors

Precautions

Precautions for Working on Glass

AENDL70A9500001

Precautions for Applying Primer

- Primer has an important role to enhance adhesion effect. Primer used for body and that for glass are different. Be sure to use appropriate one. (Do not use same gauze and nozzle for both types.)
- Put masking tape to instrument panel and other parts to protect them against primer.
- Shake primer container well before opening it and apply primer evenly.
- Do not apply primer to body surface where adhesive still remains.
- If primer is attached to any place other than intended area by mistake, remove it immediately using white gasoline.
- Refer to primer maker's instruction for proper handing and drying time.

Precautions for Applying Adhesive

- Install glass within 5 minutes after applying adhesive.
- Adjust nozzle for adhesive so that you can apply adhesive in such shape as specified as "Shape of Adhesive" described in section for installation of each glass.
- If adhesive is attached to any place other than intended area by mistake, remove it immediately using white gasoline.
- After applying adhesive, keep windows open when opening and closing door and do not apply any impact to the windshield until the adhesive is completely dry.
- If necessary move vehicle gently.
- Do not dry the adhesive by using infrared lamp or the like.

Precautions for Working on Power Window

AENDL70A9500002

Precautions for Installation and Replacement

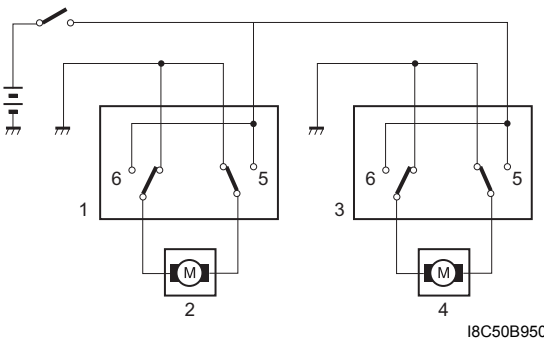
- Do not expose power window regulator assembly to any excessive impact like dropping it.
- Do not activate motor when regulator assembly is alone without door glass.
- If vehicle body near regulator assembly has been damaged, check that if regulator assembly has also been damaged.

General Description

Power Window System Description (If Equipped)

AENDL70A9501001

- Power window system consists of driver side power window switch (1), passenger side power window switch (3), driver side power window regulator (2) and passenger side power window regulator (4).
- Each door window has a power window circuit individually. The remote switches located at individual doors can only operate each window.



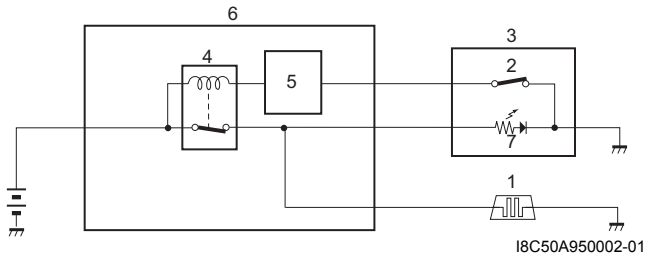
I8C50B950001-01

5. Manual down switch	6. Manual up switch

Rear Defogger System Description

AENDL70A9501002

- Rear defogger system consists of rear defogger (1), rear defogger switch (2) (HVAC control unit (3)), rear defogger relay (4) and BCM (5).
- BCM monitors rear defogger switch condition when ignition switch is turned “ON” and turns “ON” rear defogger relay, thereby causing rear defogger to operate. After a certain time, BCM turns “OFF” relay to discontinue operation of rear defogger.



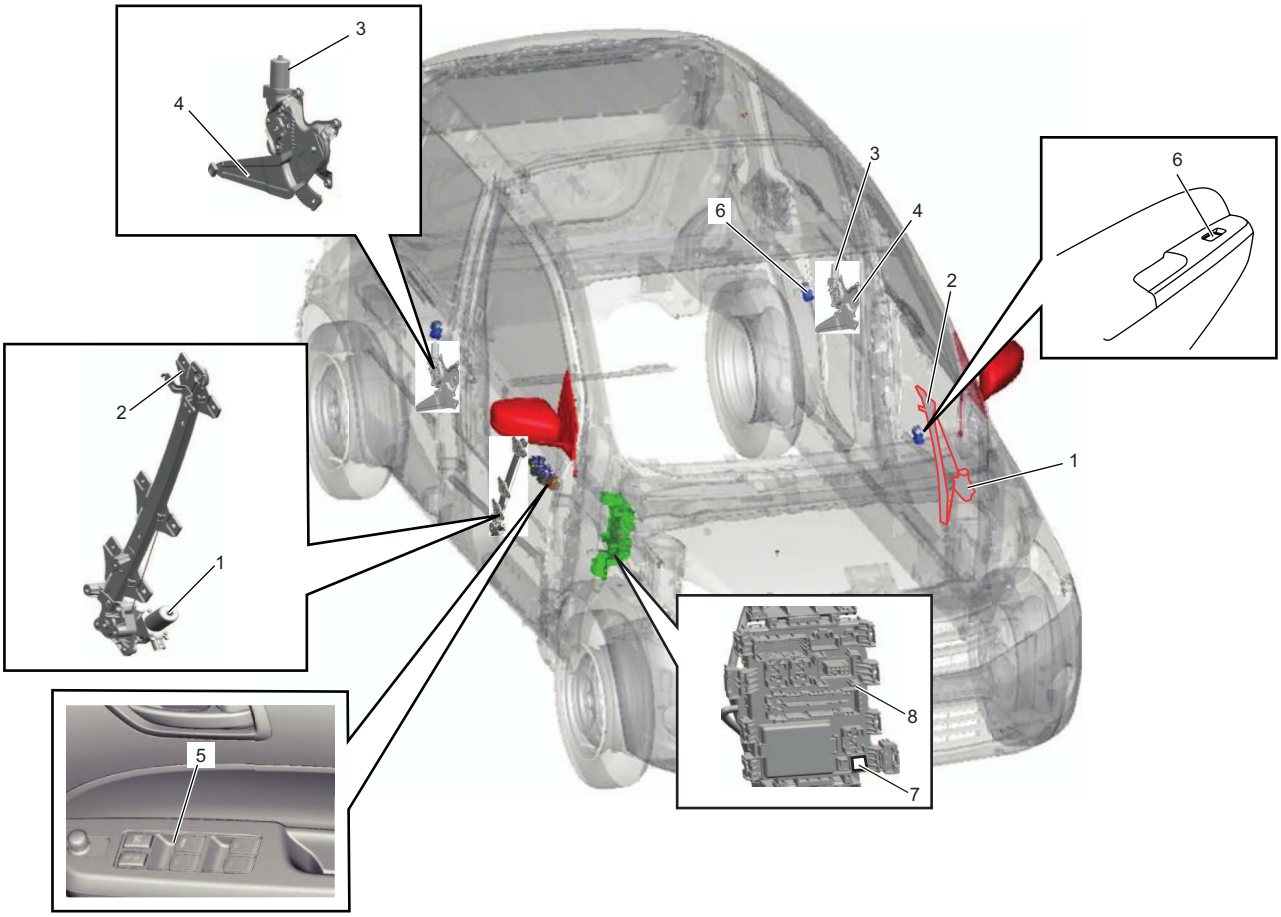
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6. Junction block	7. Rear defogger indicator

Component Location

Power Window Component Location

AENDL70A9503001

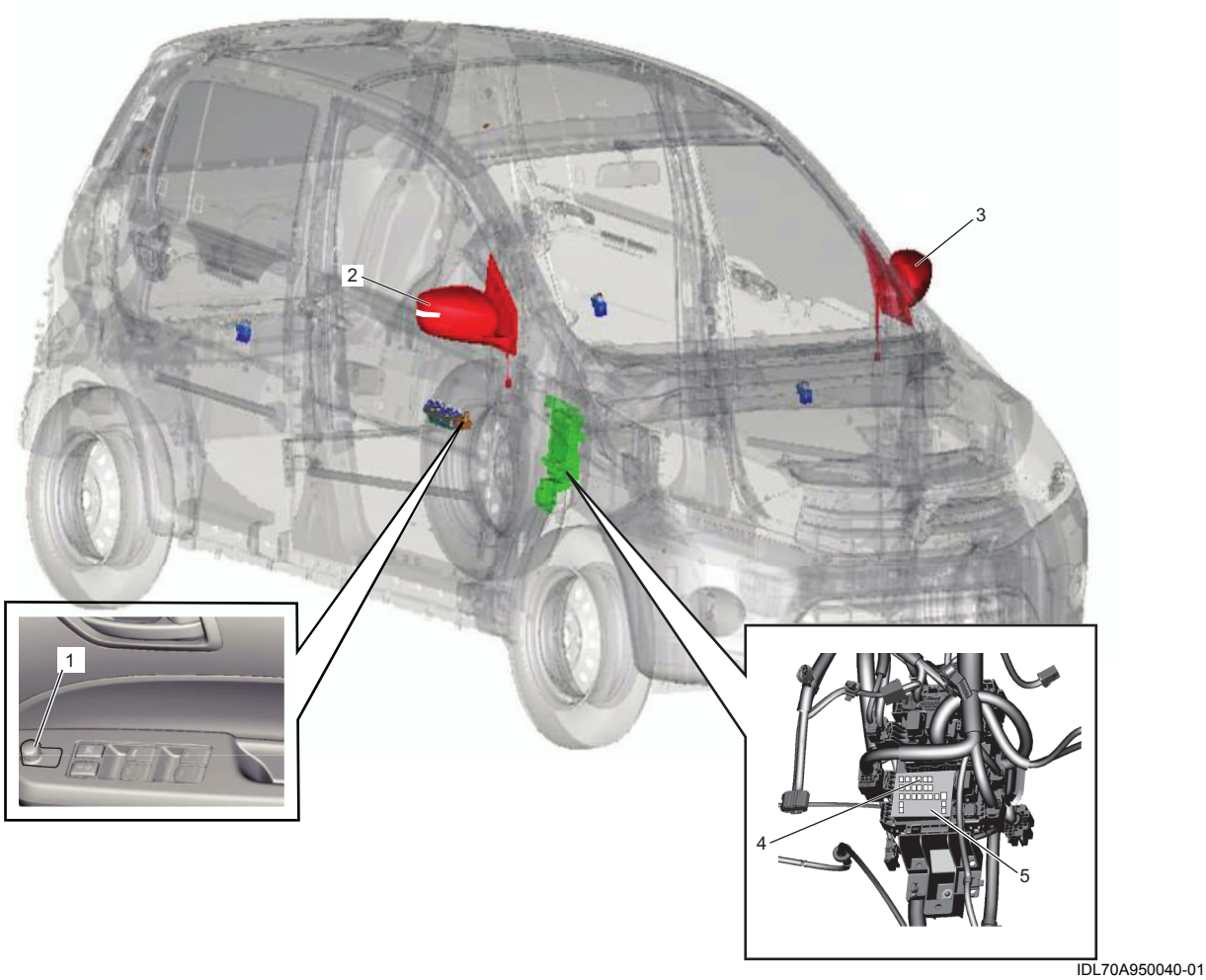


IDL70A950039-01

1. Driver / passenger power window motor	5. Power window main switch
2. Driver / passenger power window regulator	6. Power window sub switch (passenger / rear right / rear left)
3. Rear power window motor (R) / (L)	7. “P/W” fuse
4. Rear power window regulator (R) / (L)	8. Individual circuit fuse box No.2 (in J/B)

Power Door Mirror Component Location (If Equipped)

AENDL70A9503002

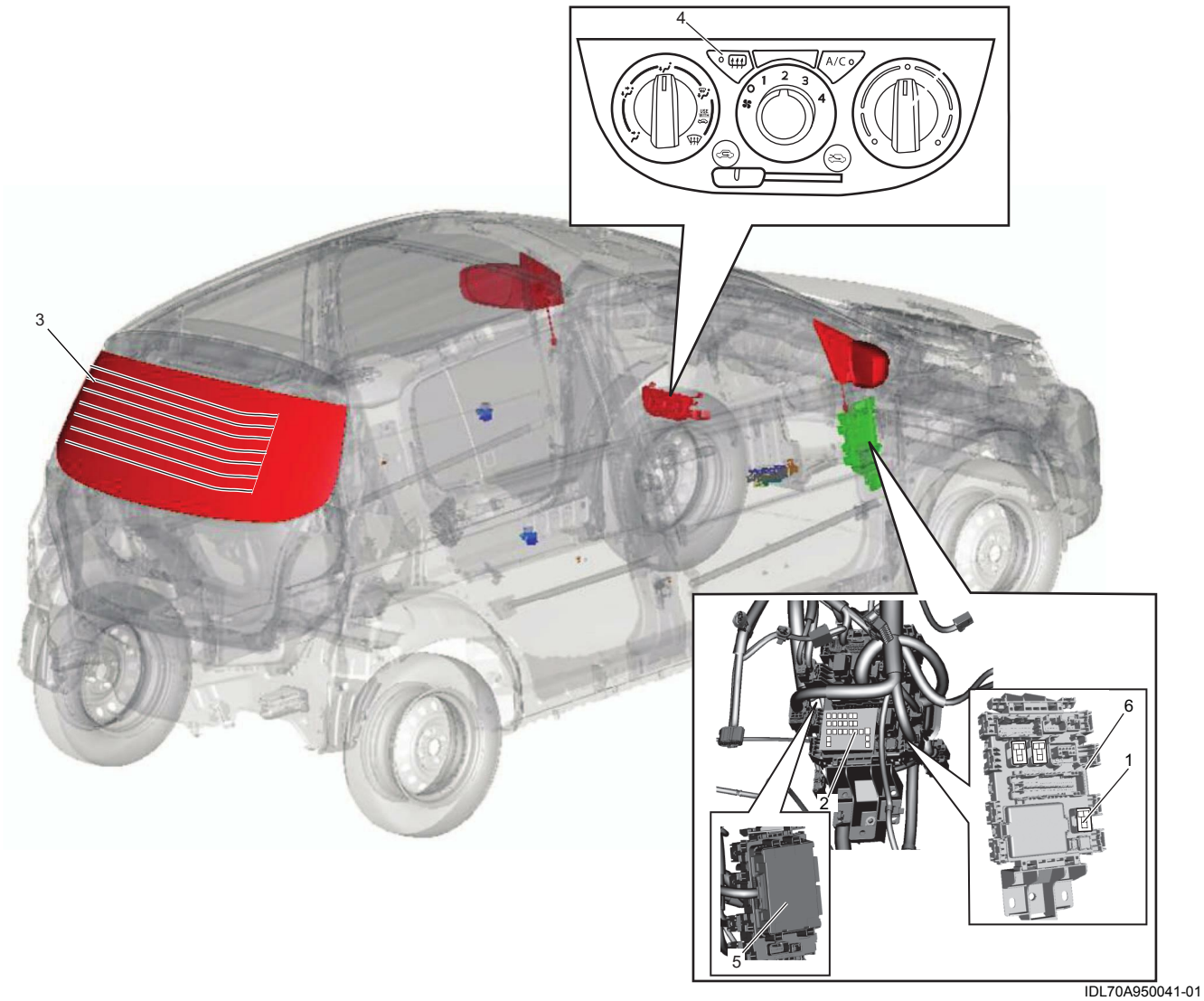


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1. Power door mirror switch	4. “ACC” fuse
2. Power door mirror assembly (R)	5. Individual circuit fuse box No. 2 (in J/B)
3. Power door mirror assembly (L)	

Rear Defogger Component Location

AENDL70A9503003



IDL70A950041-01

1. Rear defogger relay	4. Rear defogger switch
2. “RR DEF” fuse	5. BCM
3. Rear defogger	6. Individual circuit fuse box No.2 (in J/B)

Schematic and Routing Diagram

Power Window System Circuit Diagram

AENDL70A9502001

Refer to “B-4 Power Window Circuit Diagram” in Section 9A (Page 9A-52).

Rear Defogger System Circuit Diagram

AENDL70A9502002

Refer to “B-3 Rear Defogger Circuit Diagram” in Section 9A (Page 9A-51).

Diagnostic Information and Procedures

Power Window System Symptom Diagnosis (If Equipped)

AENDL70A9504002

Condition	Possible cause	Correction / Reference Item
All power windows cannot operate	Faulty wiring	*Repair wiring.*
	Faulty power window main switch	*"Power Window Main Switch Inspection" (Page 9E-22)*
One of the power window cannot operate	Faulty wiring	*Repair wiring.*
	Faulty power window regulator and/or motor	• *Front: ☞(Page 9E-16)* • *Rear: ☞(Page 9E-22)*
	Faulty power window main switch	*"Power Window Main Switch Inspection" (Page 9E-22)*
	Faulty power window sub switch	*"Power Window Sub Switch Inspection" (Page 9E-23)*
Auto down function does not operate	Faulty power window main switch	*"Power Window Main Switch Inspection" (Page 9E-22)*
Abnormal noise	Loose window regulator mounting bolts	*Tighten window regulator mounting bolts.* • *Front: ☞(Page 9E-13)* • *Rear: ☞(Page 9E-18)*
	Worn or broken power window regulator sliding and rotating parts	*Replace window regulator.* • *Front: ☞(Page 9E-16)* • *Rear: ☞(Page 9E-22)*
	Poor greasing	*Lubricate.* • *Front: ☞(Page 9E-13)* • *Rear: ☞(Page 9E-18)*

Power Door Mirror Control System Symptom Diagnosis (If Equipped)

AENDL70A9504003

Condition	Possible cause	Correction / Reference Item
All power door mirrors do not operate	Blown fuse	*Replace fuse and check for short circuit.*
	Faulty power door mirror switch	*"Power Door Mirror Switch Inspection (If Equipped)" (Page 9E-23)*
	Faulty wiring or ground	*Repair wiring.*
One of the power door mirrors cannot operate	Faulty power door mirror switch	*"Power Door Mirror Switch Inspection (If Equipped)" (Page 9E-23)*
	Faulty wiring or ground	*Repair wiring.*
Power door mirrors cannot move smoothly	Some object is pinched in power mirror	*Remove foreign material.*
	Mirror comes out of position	*Install mirror in position. ☞(Page 9E-23)*

Rear Defogger Symptom Diagnosis

AENDL70A9504001

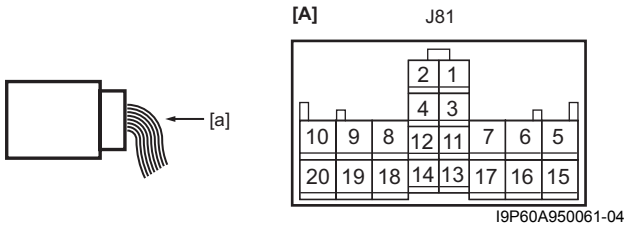
Condition	Possible cause	Correction / Reference Item
Rear defogger does not operate	Faulty system circuits (including relay and fuse)	*"B-3 Rear Defogger Circuit Diagram" in Section 9A (Page 9A-51)*
	Rear defogger switch	*"Rear Defogger Switch Inspection (If Equipped)" (Page 9E-24)*
	Rear defogger wire	*"Rear Defogger Wire Inspection" (Page 9E-24)*
	BCM	*"Inspection of BCM and Its Circuits" in Section 10B (Page 10B-20)*

Inspection of Power Window Main Switch and Its Circuit

AENDL70A9504004

Voltage Check

1) Remove sash bracket inner garnish, door trim and power window main switch. ☞(Page 9E-13)
2) Connect connector to power window main switch and set ignition "ON".
3) Check voltage using circuit tester.



[A]: Power window main switch connector (View: [a])

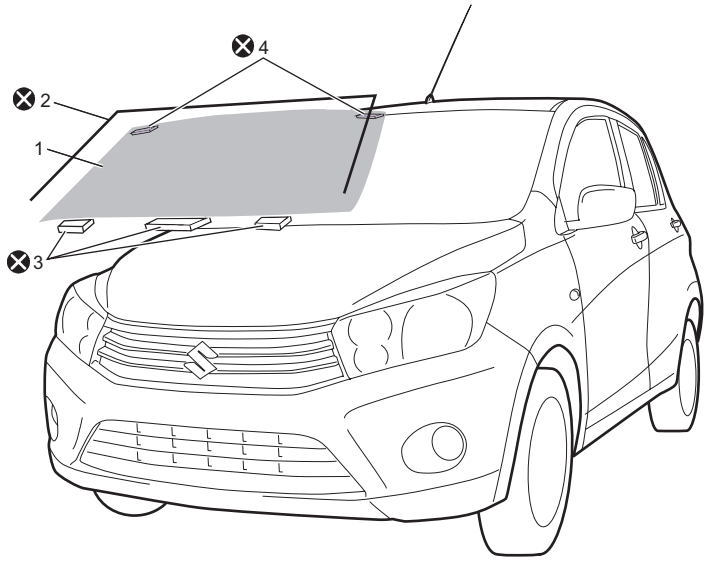
J81 connector

Terminal No.	Wire color	Circuit	Normal voltage	Condition
J81-5	GRN/WHT	Passenger power window switch (DOWN)	Approx. 12 V	Passenger window switch: DOWN
			Approx. 0 V	Other than above condition
J81-6	RED/WHT	Passenger power window switch (UP)	Approx. 12 V	Passenger window switch: UP
			Approx. 0 V	Other than above condition
J81-11	GRN	Driver power window motor (DOWN)	Approx. 12 V	Driver window switch: DOWN
			Approx. 0 V	Other than above condition
		Driver power window motor (AUTO DOWN)	Approx. 12 V	Driver window switch: AUTO DOWN
			Approx. 0 V	Other than above condition
J81-12	RED	Driver power window motor (UP)	Approx. 12 V	Driver window switch: UP
			Approx. 0 V	Other than above condition
J81-13	WHT/BLU	IG1 power supply	Approx. 12 V	Ignition “ON”
			Approx. 0 V	Ignition “OFF” or “ACC”
J81-14	GRN/YEL	Rear left power window switch (DOWN)	Approx. 12 V	Rear left window switch: DOWN
			Approx. 0 V	Other than above condition
J81-15	RED/YEL	Rear left power window switch (UP)	Approx. 12 V	Rear left window switch: UP
			Approx. 0 V	Other than above condition
J81-18	WHT/GRN	Rear right power window switch (DOWN)	Approx. 12 V	Rear right window switch: DOWN
			Approx. 0 V	Other than above condition
J81-19	WHT/RED	Rear right power window switch (UP)	Approx. 12 V	Rear right window switch: UP
			Approx. 0 V	Other than above condition
J81-20	BLK	Ground for power window main switch	Approx. 0 V	Ignition “OFF”, “ACC” or “ON”

Repair Instructions

Windshield Components

AENDL70A9506001



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1. Windshield glass	3. Windshield glass stopper	⊗ Do not re use
2. Windshield molding	4. Glass upper fastner	

Windshield Removal and Installation

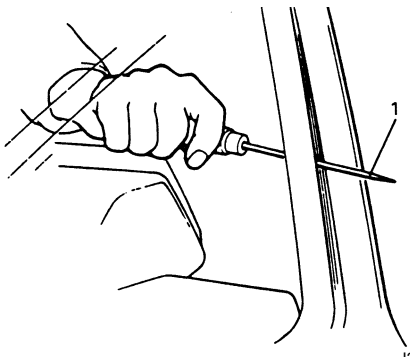
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Preparation

Item to be prepared	Usage
Eyeleteer	Drilling hole in adhesive
Piano string and wood stick (or commercial windshield knife)	Cutting adhesive
Knife	To cut off adhesive for finishing
White gasoline and gauze	To degrease and clean adhesive surface
Caulking gun	To apply adhesive
Rubber sucker grip	To hold glass
Adhesive (YOKOHAMA rubber WS-212 or equivalent)	To bond glass
Primer for glass (Yokohama rubber MS-90S or equivalent)	To pretreat adhesive surface
Primer for adhesive surface (Yokohama rubber RC-50E or equivalent)	To pretreat adhesive surface
Masking tape	Protection against scratch
Alcohol	To degrease knife
Adhesive tape	To secure windshield molding

Removal

1) Clean inside, outside and around glass.
2) Remove wiper arms. ☞(Page 9D-4)
3) Remove cowl top garnish. ☞(Page 9H-3)
4) Using masking tape, cover body surface around glass to prevent any damage when cutting the adhesive.
5) Remove inner rear view mirror. ☞(Page 9E-12)
6) Remove sun visor. ☞(Page 9H-7).
7) Remove front pillar trim. ☞(Page 9H-5)
8) Remove instrument panel, if necessary. ☞(Page 9C-12)
9) Remove roof lining, if necessary. ☞(Page 9H-7)
10) Remove or cut windshield molding.
11) Make hole into adhesive with eyeleteer (1) and pass piano string through it.



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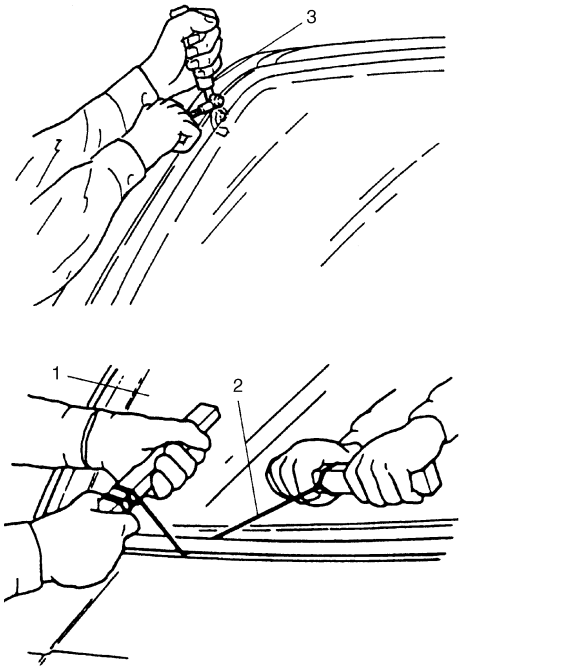
12) Cut all adhesive of windshield (1) with piano string (2).

NOTICE

Windshield knife may damage windshield. Take proper care while cutting adhesive using windshield knife (3) so as not to damage windshield.

NOTE

Use piano string as close as possible to glass to prevent damage to body and instrument panel.

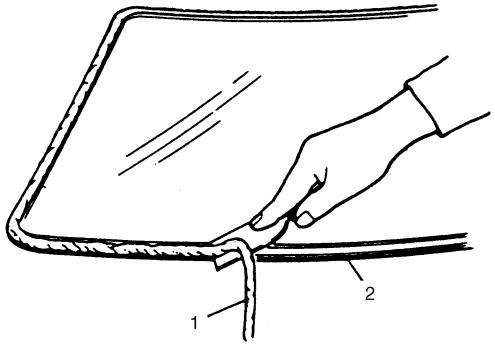


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13) Using knife (1), smoothen adhesive remaining (2) on body side (3) and maintain thickness of adhesive to be 1 to 2 mm (0.04 – 0.07 in.).

NOTE

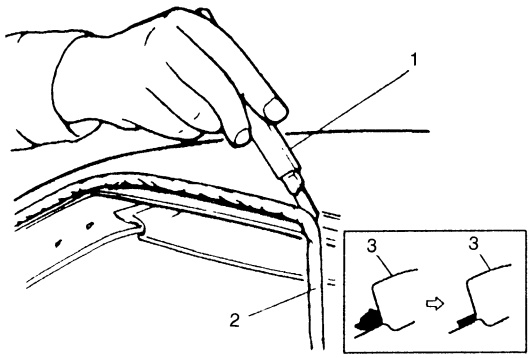
If windshield is to be reused, be careful to remove adhesive (1) not to damage primer application surface (2).



I2RH01950043-01

NOTE

Before using knife, degrease it with alcohol or the like.



I2RH01950042-01

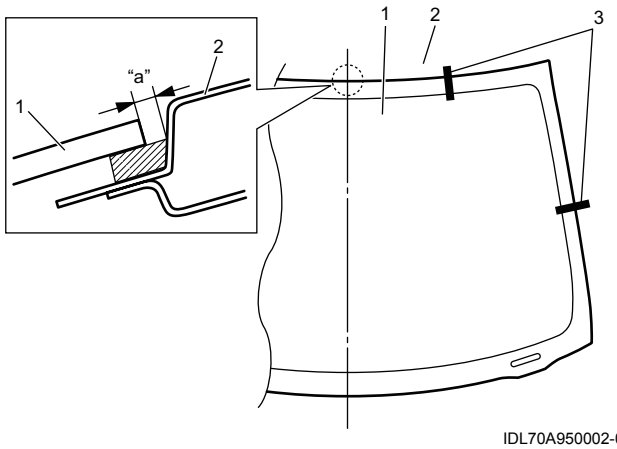
Installation

NOTE

For proper handling and drying time of primer and adhesive, refer to their maker's instruction.

1) To determine installing position of windshield (1) to body (2), position glass against body so that clearance between upper end of windshield and body is approximately 4.0 mm (0.16 in.) and clearances between each side end (right and left) of windshield and body are even.
Then put alignment marks (3) on windshield and body.

Windshield clearance
"a": approx. 4.0 mm (0.16 in.)

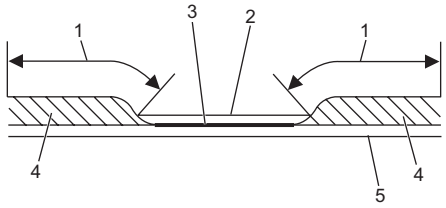


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2) Clean contact surfaces of old adhesive (4) left on body. Apply primer (2) where paint or bare metal is exposed (3).

NOTE

Do not apply primer on adhesive.



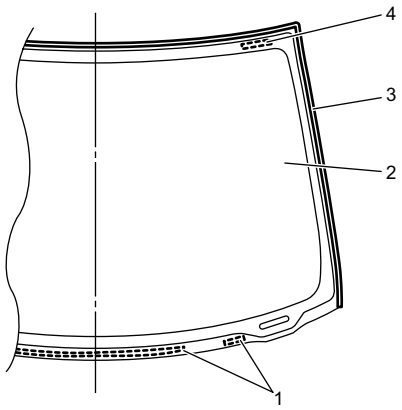
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1. Do not apply primer	2. Body panel

3) Clean area about 30 to 50 mm (1.19 to 1.96 in.) from the edge of windshield with gauze and white gasoline. Dry white gasoline for 10 minutes or more.

4) Apply primer onto windshield molding mounting area on windshield (2) and install new windshield molding (3) to windshield.

5) Install new spacers (1) and must apply primer before fixing the fasteners (4) to windshield.



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6) Apply primer to adhesive application area on windshield.

NOTE

- **Do not touch primer coated surface.**

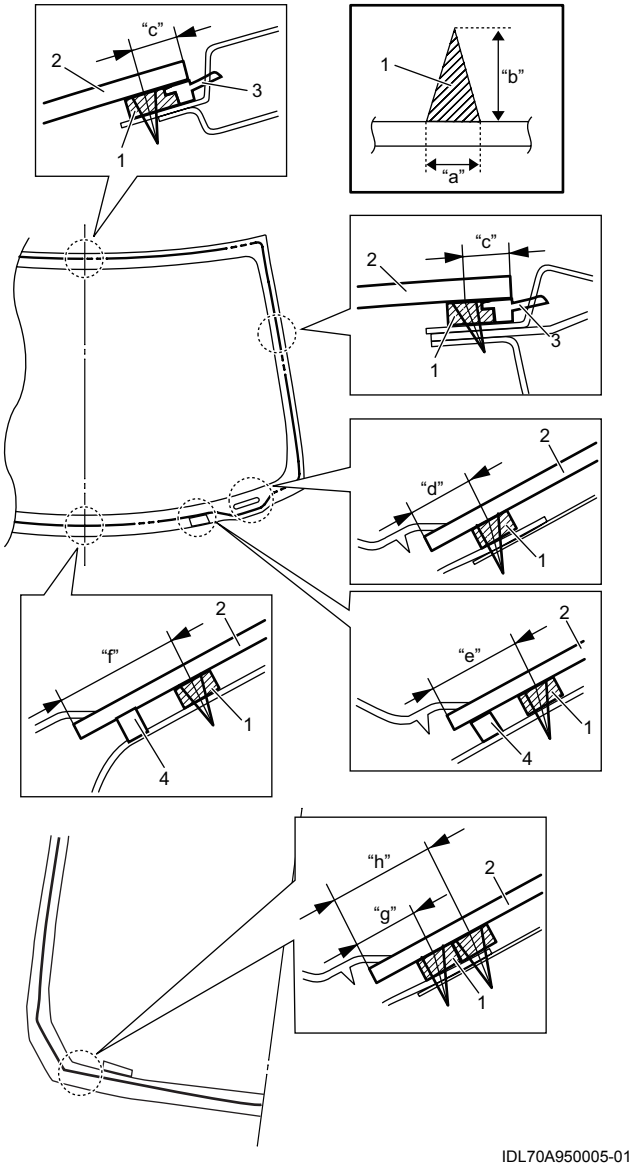
7) Apply adhesive (1) as shown in figure.

⚠ CAUTION

- **Attach windshield (2) on body within 5 minutes from applying adhesive.**
- **Use rubber sucker grip to carry glass after adhesive is applied.**

Adhesive amount and application area on windshield

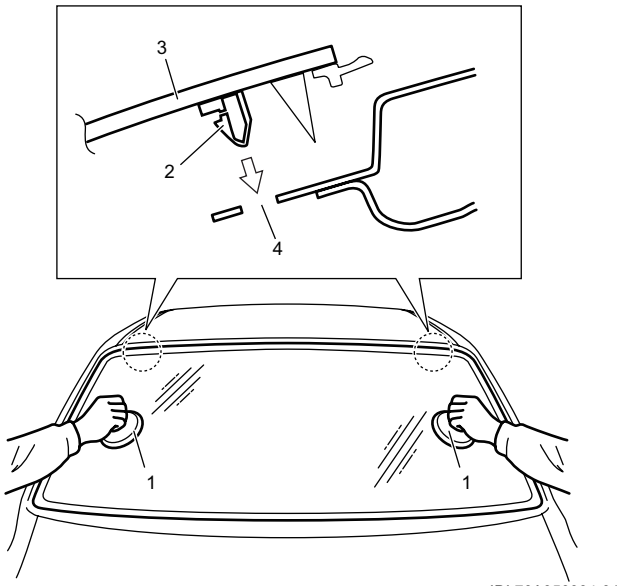
Width of adhesive "a": Approx. 7.0 mm (0.28 in.)
Height of adhesive "b": Approx. 15.0 mm (0.59 in.)
Application area
"c": Approx. 17 mm (0.67 in.),
"d": Approx. 9.6 mm (0.38 in.),
"e": Approx. 43.0 mm (1.7 in.),
"f": Approx. 44.0 mm (1.73 in.),
"g": Approx. 37.0 mm (1.46 in.),
"h": Approx. 44.0 mm (1.73 in.).



IDL70A950005-01

3. Windshield molding	4: Spacer

8) Holding windshield (3) with rubber sucker grips (1), align fasteners (2) with holes (4) of body, align alignment marks put in Step 1) and install windshield.



IDL70A950004-01

9) Dry adhesive.

NOTICE

- **Open or close doors with all door glasses open until adhesive is fully hardened.**
- **Hold windshield molding with tape until it is fixed.**
- **Do not drive until adhesive is fully hardened.**

10) Check for water leakage 1 or 2 hours after installing windshield. If leakage is found, remove and install windshield again.

NOTE

- **Do not apply excessive water pressure during water leakage check.**



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- **Do not blow compressed air directly to adhesive applied part when drying.**
- **Do not dry forcibly using infrared light or the like.**

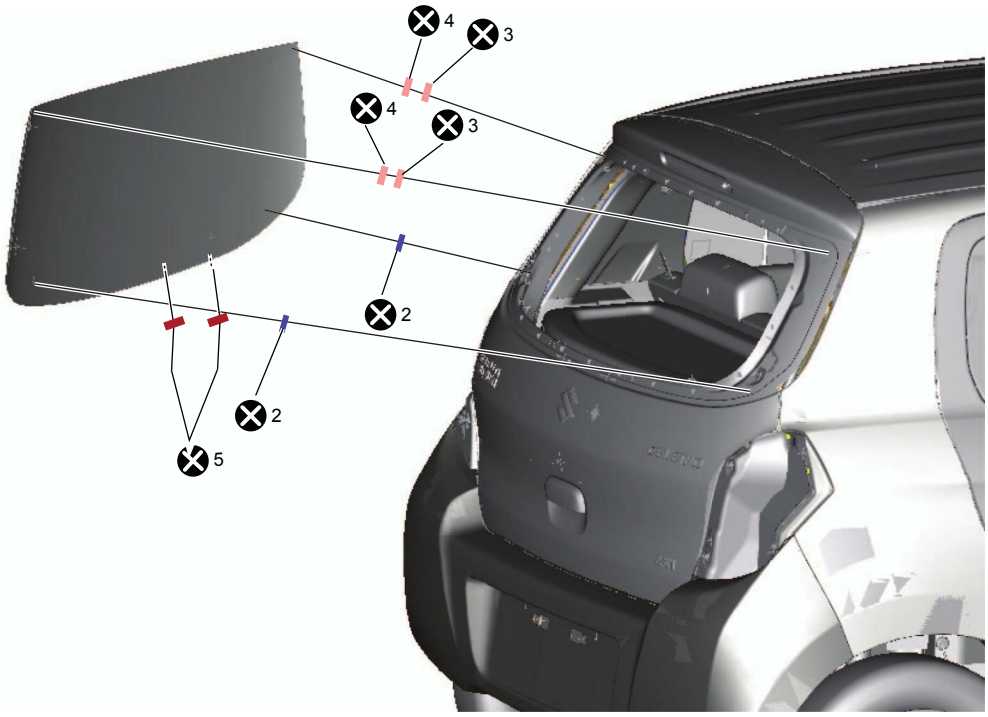
11) Install head lining if it has been removed. ☞(Page 9H-7)

12) Install instrument panel if it has been removed. ☞(Page 9C-11)

13) Install inner rear view mirror.☞(Page 9E-12)
14) Install cowl top garnish. ☞(Page 9H-3)
15) Install wiper arms. ☞(Page 9D-4)

Rear End Door Window Glass Components

AENDL70A9506003



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1. Rear end door glass	⊗ : Do not reuse.
2. Fastener	

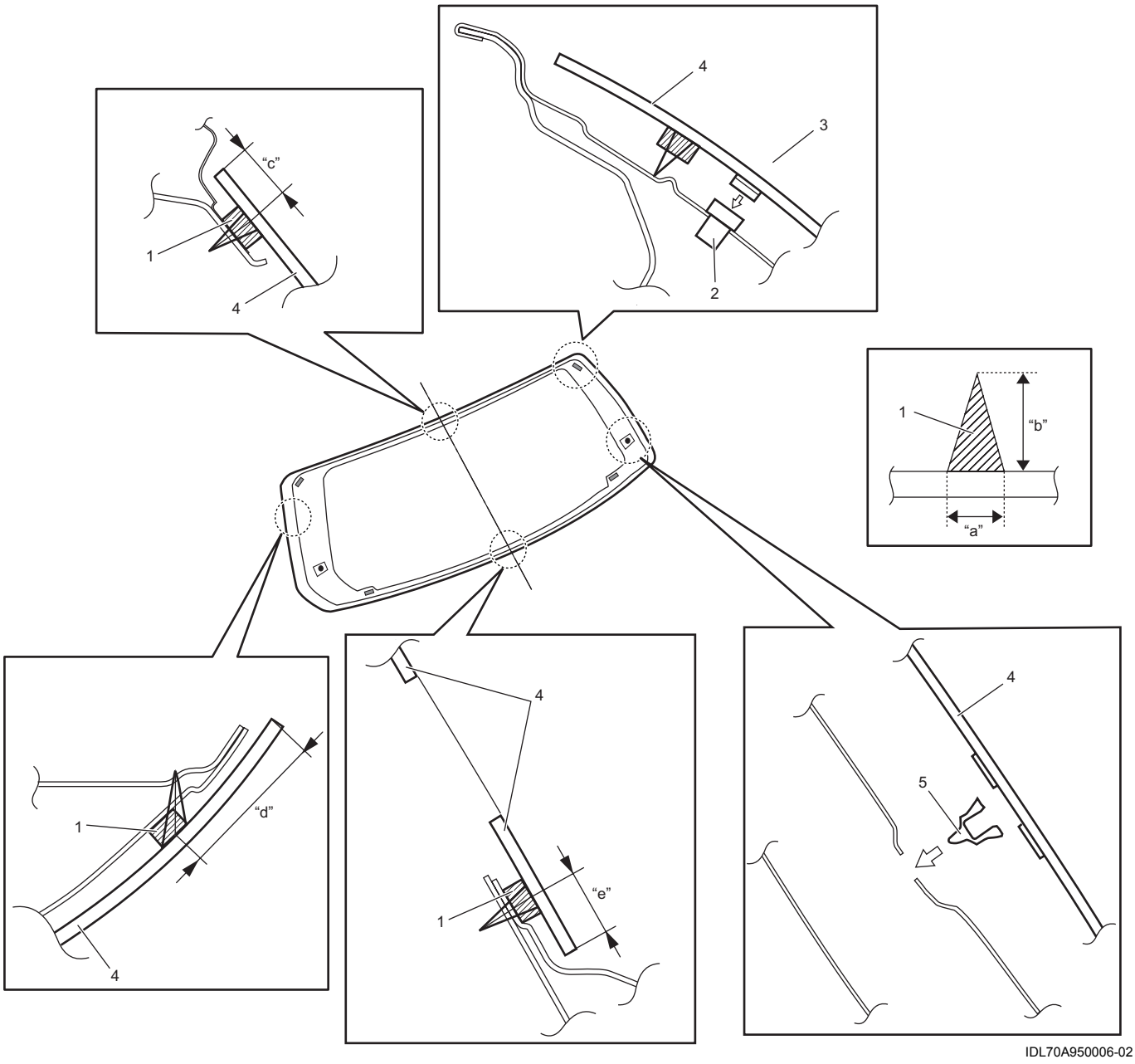
Rear End Door Window Glass Removal and Installation

AENDL70A9506004

Preparation, removal and installation procedure are basically the same as “Windshield Removal and Installation” (Page 9E-7), however, note the following points.

- Remove rear wiper motor before removing rear end door window glass. ☞(Page 9D-6)
- Be careful not to damage connectors during removal and installation.
- Apply adhesive (1) as shown in figure.
- Locate glass fasteners (female) (2) so that they will fit with glass fastener (male) (3) when attaching glass.
  - With the position of fastener (3) properly aligned.

Adhesive amount and application area on rear end door window glass
Width of adhesive “a”: Approx. 6.0 mm (0.24 in.)
Height of adhesive “b”: Approx. 13.0 mm (0.51 in.)
Application area
“c”: Approx. 15.0 mm (0.59 in.)
“d”: Approx. 30.6 mm (1.20 in.)
“e”: Approx. 18.0 mm (0.71 in.)



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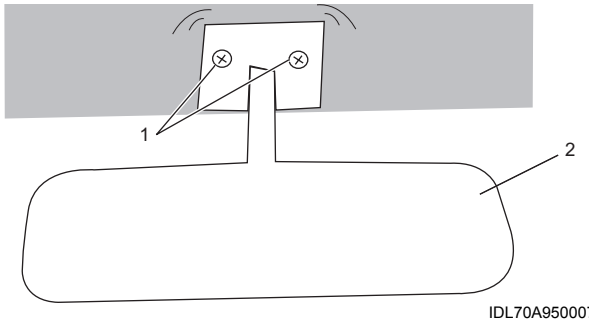
4. Rear end window glass	5. Glass fastener clip

Inner Rear View Mirror Removal and Installation

AENDL70A9506021

Removal

1) Remove inner rear view mirror screw (1).
2) Remove inner rear view mirror (2).



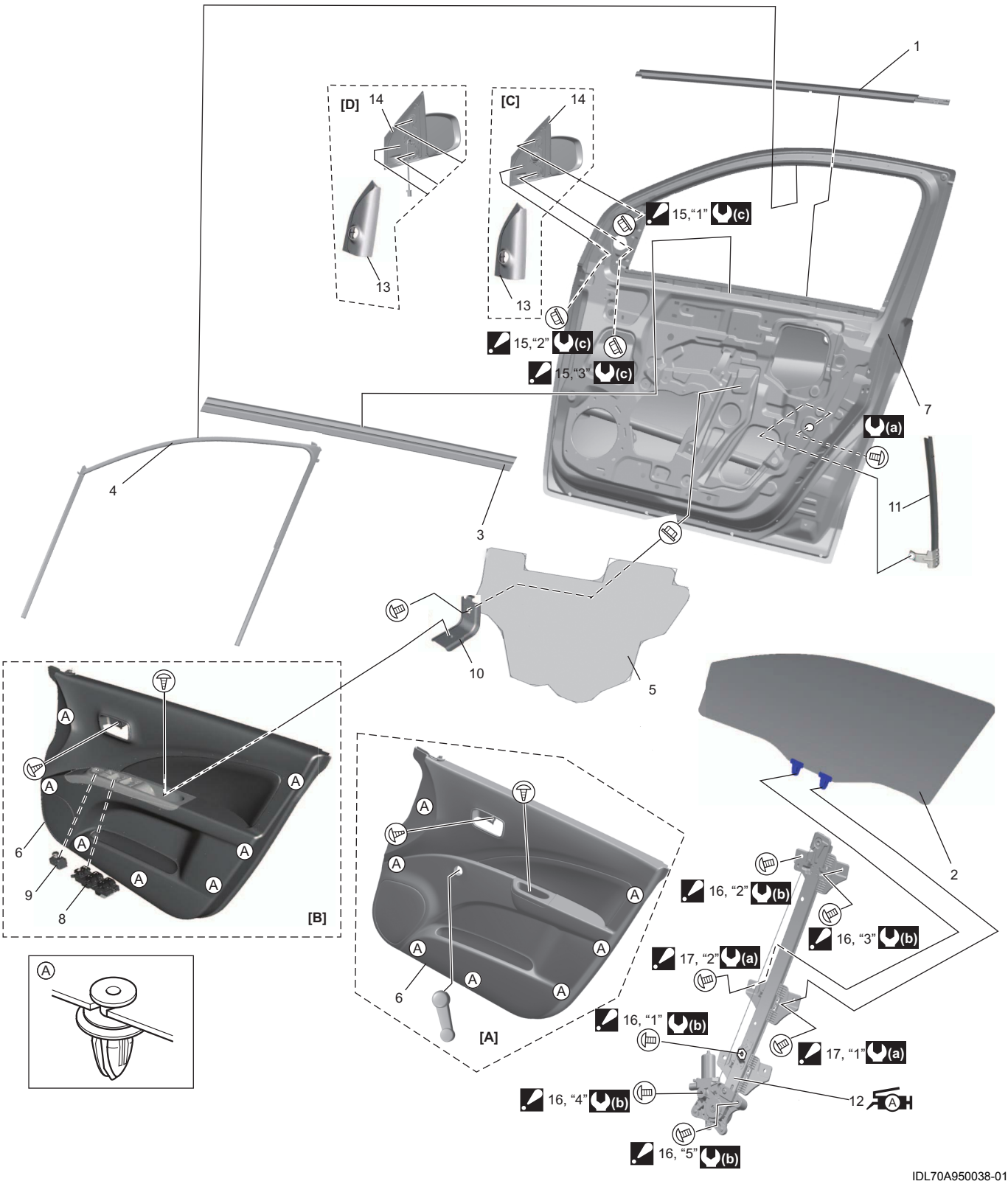
IDL70A950007-01

Installation

Reverse removal procedure.

Front Door Components

AENDL70A9506005



IDL70A950038-01

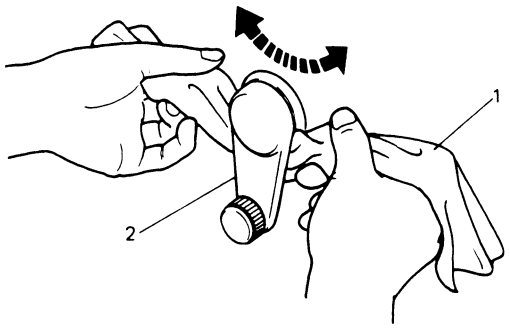
[A]: Manual window type	5. Door sealing cover	13. Sash bracket inner garnish
[B]: Power window type	6. Door trim	14. Door mirror
[C]: Without power window mirror	7. Door panel	15. Door mirror nut : Tighten nuts in order of “1” to “3”
[D]: With power window mirror	8. Power window main switch	16. Front door regulator screw : Tighten screws in order of “1” to “5”
1. Front door outer weather-strip	9. Power window mirror switch (if equipped)	17. Front door glass screw : Tighten screws in order of “1” to “2”
2. Front door glass	10. Door trim bracket	(a) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
3. Front door inner weather-strip	11. Front door rear sash	(b) : 8.4 N·m (0.86 kgf-m, 6.2 lbf-ft)
4. Glass run	A 12. Window regulator assembly : Apply lithium grease 99000-25011 to sliding part.	(c) 7.9 N·m (0.81 kgf-m, 6.0 lbf-ft)

Front Door Glass Removal and Installation

AENDL70A9506006

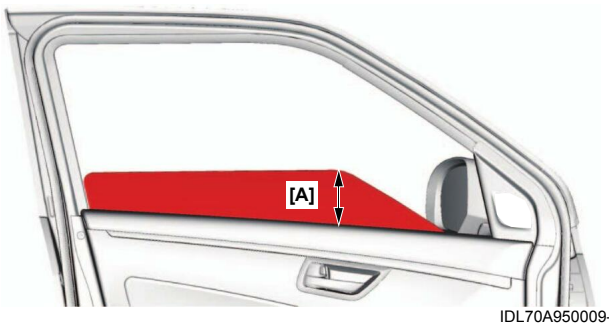
Removal

1) For manual window type, remove window regulator handle (2).
   For its removal, pull off snap using cloth (1) as shown in figure.



IYSY01950008-01

2) Lower rear door glass fully for manual window type door.
3) For power window type door. lower the front door glass to about 150 mm (5.91 in.) from the lower edge of window.



IDL70A950009-01

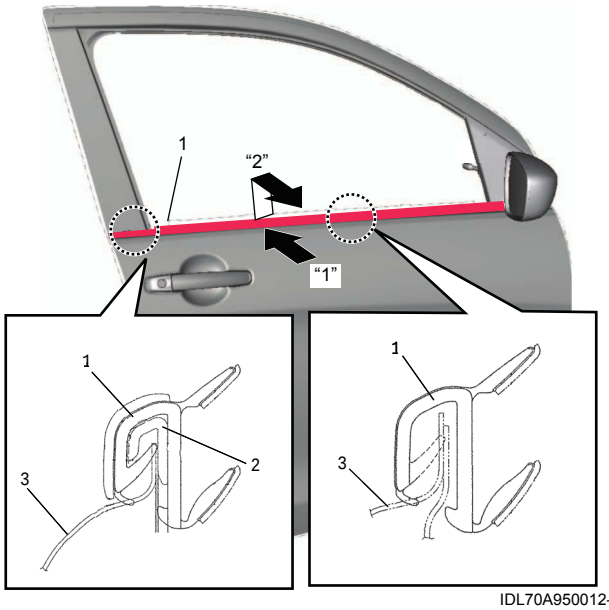
[A]: About 150 mm (5.91 in.)

4) Disconnect negative (–) cable at battery.
5) Remove sash bracket inner garnish (1).
6) Remove screws (2), clips, and door trim (3) by pulling it in arrow direction.



IDL70A950010-02

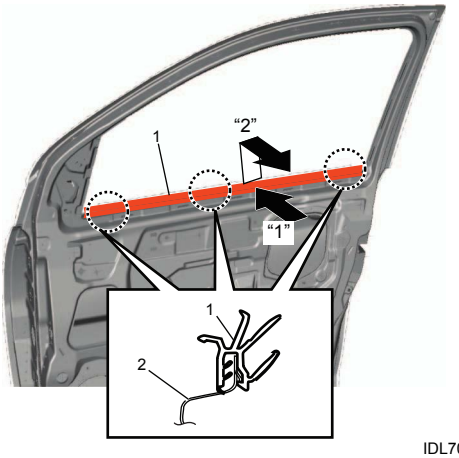
7) Disconnect connectors of door harness.
8) Remove front door outer weather-strip (1) by moving it in arrow directions in order (“1” to “2”) as shown.



IDL70A950012-01

2. Claw	3. Front door outer panel

9) Remove front door inner weather-strip (1) by pulling it in arrow direction in order (“1” to “2”) as shown in figure.



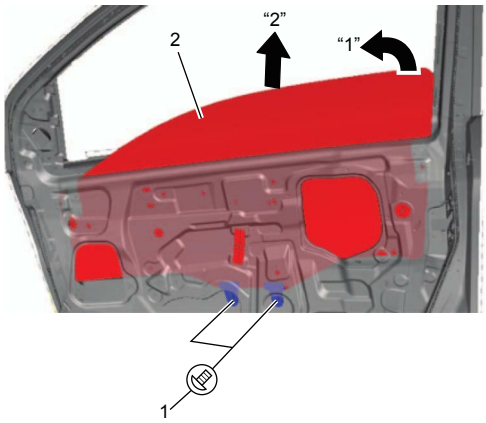
IDL70A950043-01

10) Remove door trim bracket (1) and door sealing cover (2).



IDL70A950044-03

11) Remove screws (1) and remove front door glass (2) by moving it in arrow directions in order “1” to “2” as shown.



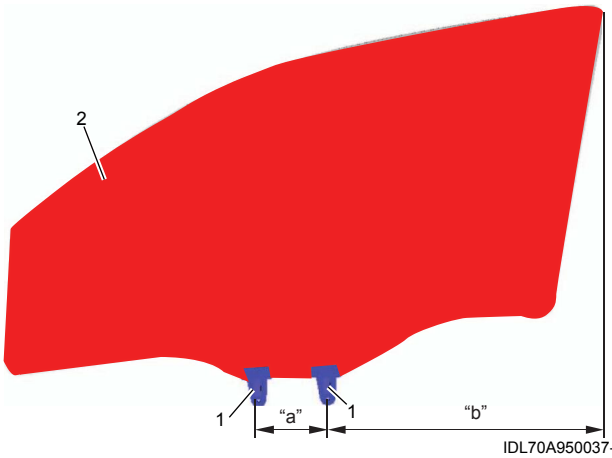
IDL70A950013-02

Installation

Reverse removal procedure noting the following points.

- Install door glass holders (1) to specified position of front door glass (2) if they are removed from front door glass.

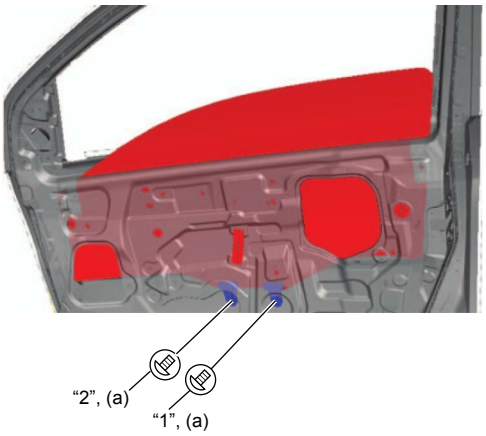
Front door glass holder installation position
“a”: 101 – 103 mm (3.98 in. – 4.05 in.)
“b”: 416.2 – 418.2 mm (16.39 in. – 16.46 in.)



IDL70A950037-02

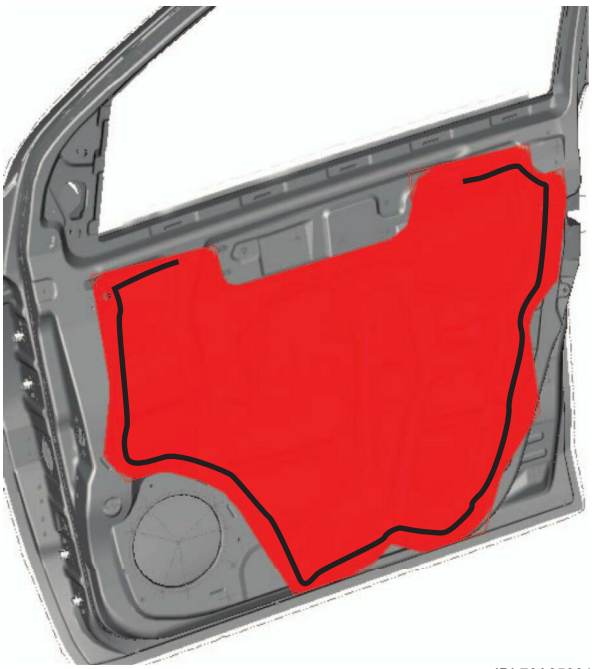
- Tighten front door glass screws in order “1” to“2” to specified torque.

Tightening torque
Front door glass screw (a): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)



IDL70A950015-02

- If front door outer weather-strip is deformed, replace it with new one.
- Fix door sealing cover (1) with butyl tape (2).



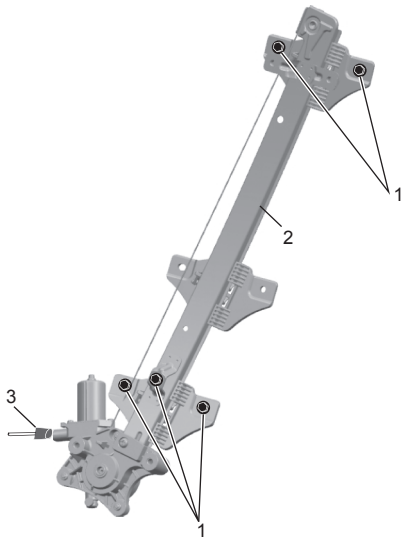
IDL70A950016-01

Front Window Regulator Removal and Installation

AENDL70A9506007

Removal

1) Remove front door glass. ☞(Page 9E-14)
2) Disconnect power window motor connector (3) (Power window type).
3) Remove front window regulator screws (1).
4) Remove front window regulator assembly (2).



IDL70A950017-01

Installation

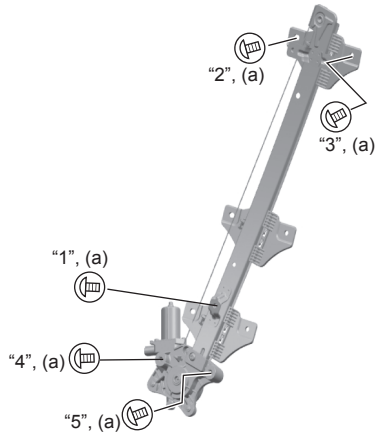
Reverse removal procedure noting the following points.

- Apply grease to sliding portions of window regulator assembly.

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Tighten front window regulator screws (1) and front door glass screws (2) to specified torque.

  Tightening torque
  Front window regulator screw (a): 8.4 N·m (0.86 kgf-m, 6.2 lbf-ft)



IDL70A950018-01

Front Window Regulator Assembly Inspection

AENDL70A9506008

Manual Window Regulator

Check the following parts for wear, damage, smooth operation and lubrication:

- Check regulator sliding and rotating parts.

Power Window Regulator

NOTICE

Disconnect power window motor connector from power window motor.

Check motor movement as follows.

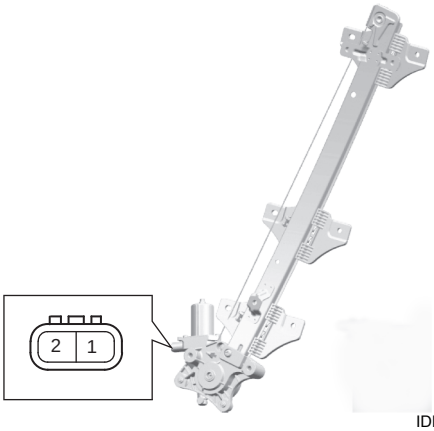
1) Connect battery positive terminal to terminal “2” and battery negative (–) terminal to terminal “1”. (UP operation)
2) Connect battery positive terminal to terminal “1” and battery negative (–) terminal to terminal “2”. (DOWN operation)

If operation is not smooth, check glass run, door outer weather-strip, door inner weather-strip and grease in link. If those parts are in good condition, replace window regulator assembly.

Power window motor operation

Terminal number / Operation direction	1	2
UP	⊖	⊕
DOWN	⊕	⊖

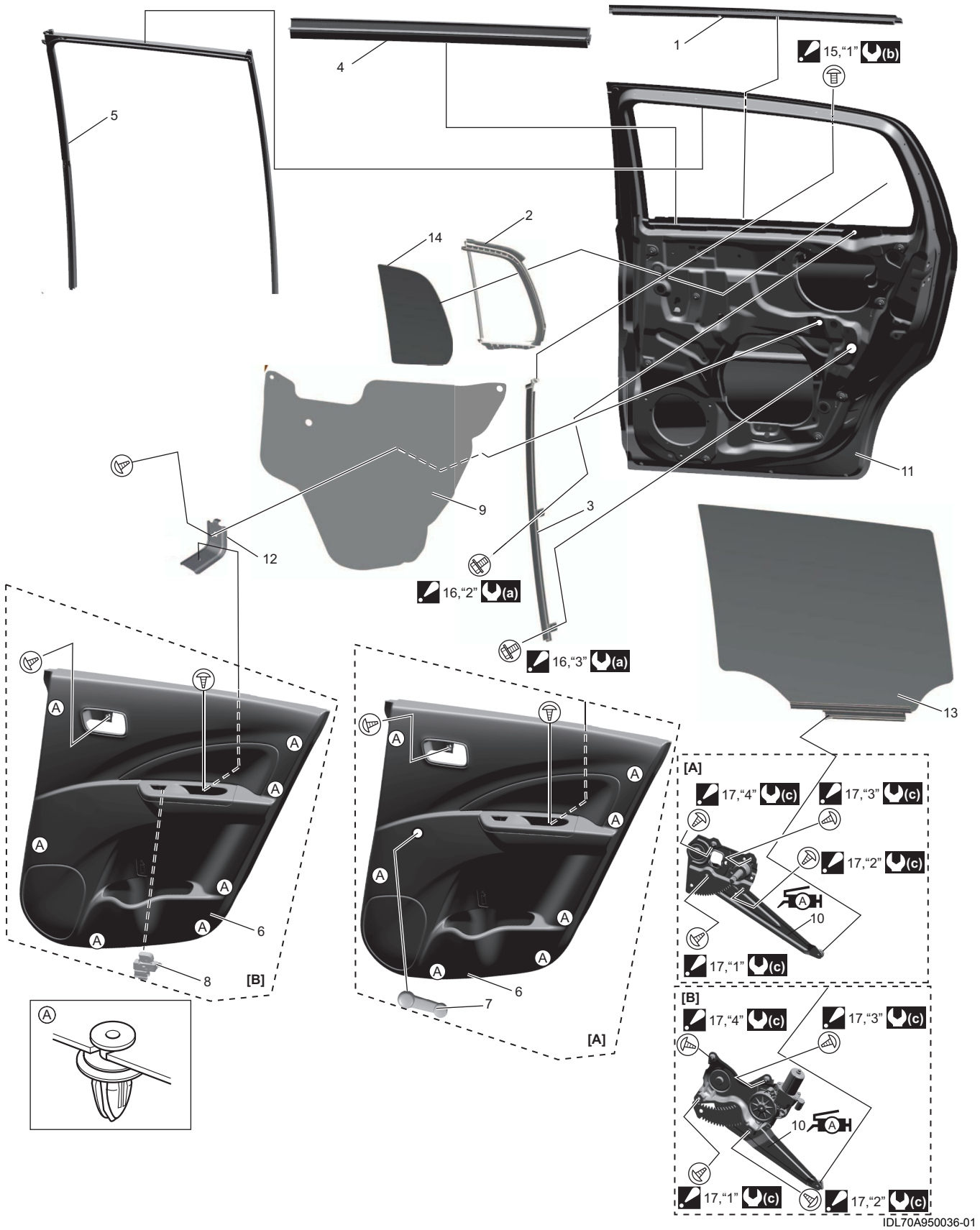
I9P60A950034-01



IDL70A950019-01

Rear Door Components

AENDL70A9506009



IDL70A950036-01

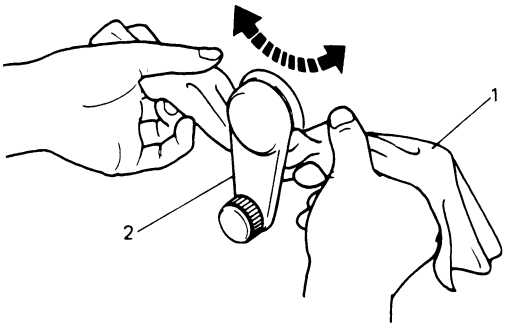
[A]: Manual window type	7. Window regulator handle	15. Rear door sash screw : Tighten bolts and screw in order of “1” to “3”
[B]: Power window type	8. Power window sub switch	16. Rear door sash bolt : Tighten bolts and screw in order of “1” to “3”
1. Rear door outer weather-strip	9. Door sealing cover	17. Rear window regulator screw : Tighten bolts in order of “1” to “4”
2. Rear door quarter glass weather-strip	10. Rear window regulator assembly : Apply grease 99000-25011 to sliding parts.	(a) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
3. Rear door sash	11. Door panel	(b) : 3.0 N·m (0.31 kgf-m, 2.5 lbf-ft)
4. Rear door inner weather-strip	12. Door trim bracket	(c) 8.4 N·m (0.86 kgf-m, 6.2 lbf-ft)
5. Glass run	13. Rear door glass	
6. Door trim	14. Rear door quarter glass	

Rear Door Glass Removal and Installation

AENDL70A9506010

Removal

1) For manual window type, remove window regulator handle (2).
For its removal, pull off snap using cloth (1) as shown in figure.



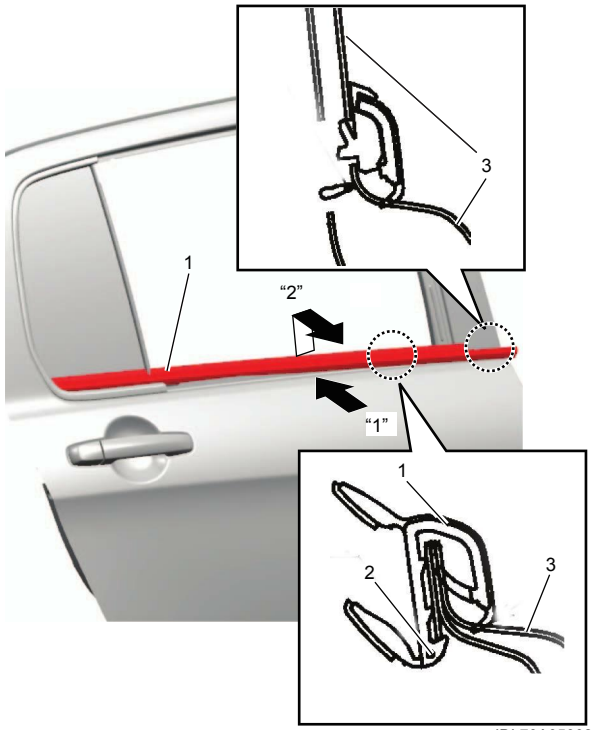
IYSY01950008-01

2) Lower rear door glass fully.
3) Disconnect negative (–) cable at battery.
4) Remove screws (1) and clips, and then remove door trim (2) by pulling it in arrow direction, and then disconnect connectors of door harness.



IDL70A950020-02

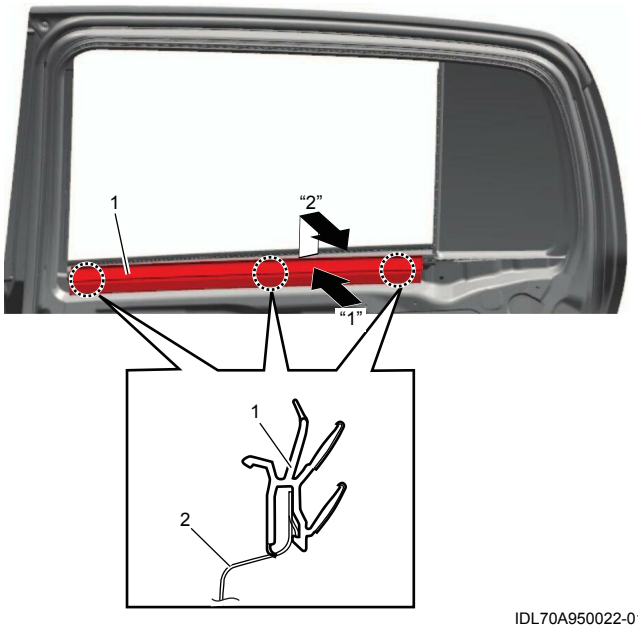
5) Remove rear door outer weather-strip (1) by moving it in arrow directions in order “1” to “2” as shown in figure.



IDL70A950021-01

2. Claw	3. Rear door outer panel

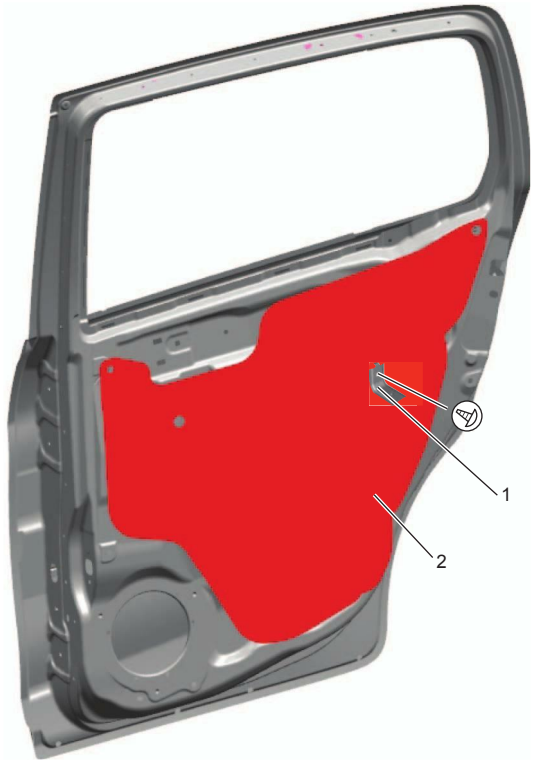
6) Remove rear door inner weather-strip (1) by pulling it in arrow direction in order “1” to “2” as shown in figure.



IDL70A950022-01

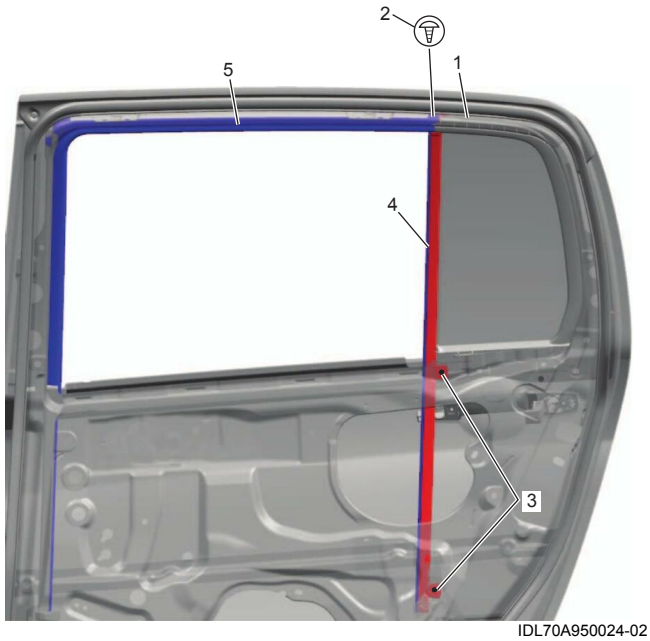
2. Rear door inner panel

7) Remove door trim bracket (1) and door sealing cover (2).



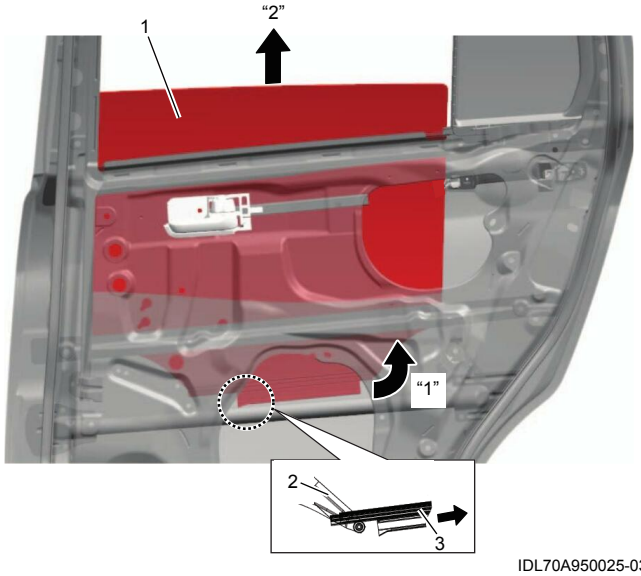
IDL70A950023-02

8) Turn over weather-strip (1) and remove rear door sash screw (2).
9) Remove rear door sash bolts (3) and remove rear door sash (4) and glass run (5).



IDL70A950024-02

10) Turn rear door glass (1) in direction of arrow "1" to remove glass bottom channel (3) from rear window regulator assembly (2) and then remove rear door glass in direction of arrow "2".



IDL70A950025-03

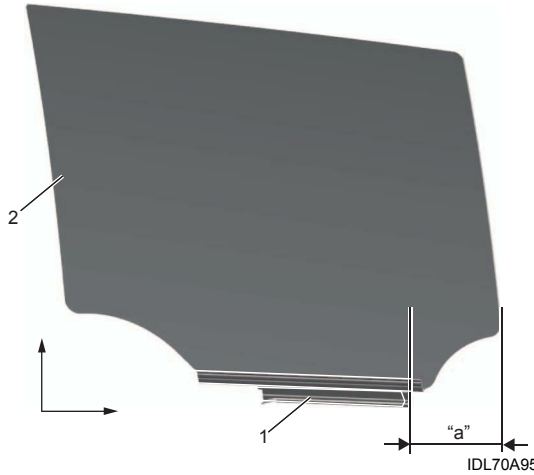
11) Remove glass bottom channel from rear door glass if necessary.

Installation

Reverse removal procedure noting the following points.

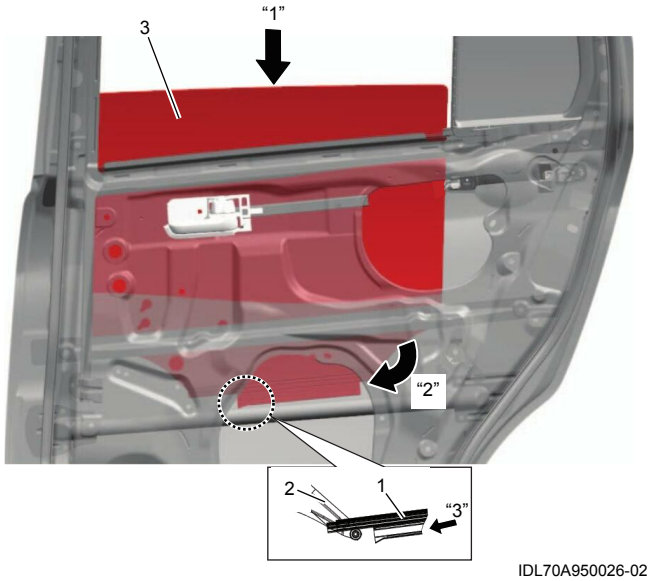
- Install glass bottom channel (1) to specified position of rear door glass (2) if it is removed from rear door glass.

Rear door glass installation position
"a": 124.9 mm (4.917 in.)



IDL70A950027-03

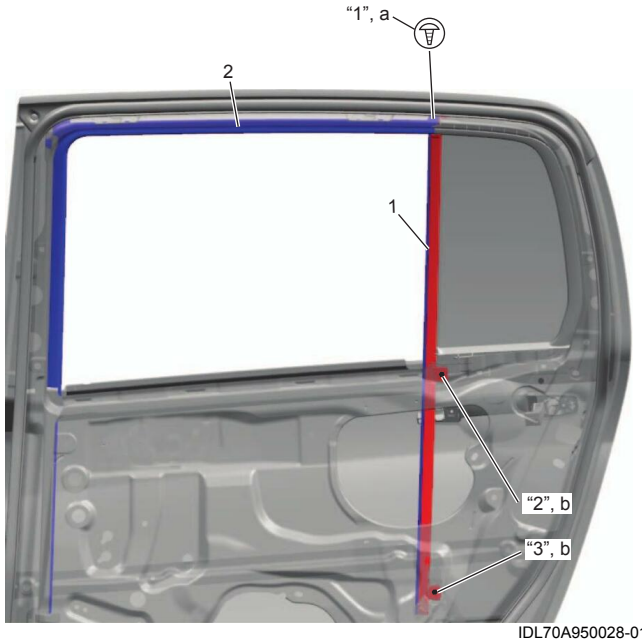
- Insert rear door glass (3) in direction of arrow “1” and turn in direction of arrow “2” to move glass bottom channel (1) in direction of arrow “3” and fit to rear window regulator assembly (2).



IDL70A950026-02

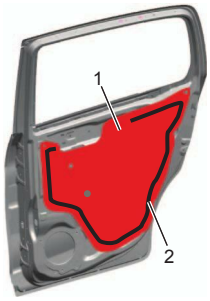
- Tighten rear door sash screw and rear door sash bolts in order of “1” to “3” to specified torques.

Tightening torque
Rear door sash screw (a): 3.0 N·m (0.31 kgf-m, 2.5 lbf-ft)
Rear door sash bolt (b): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)



IDL70A950028-01

- If rear door outer weather-strip is deformed, replace it with new one.
- Fix door sealing cover (1) with butyl tape (2).



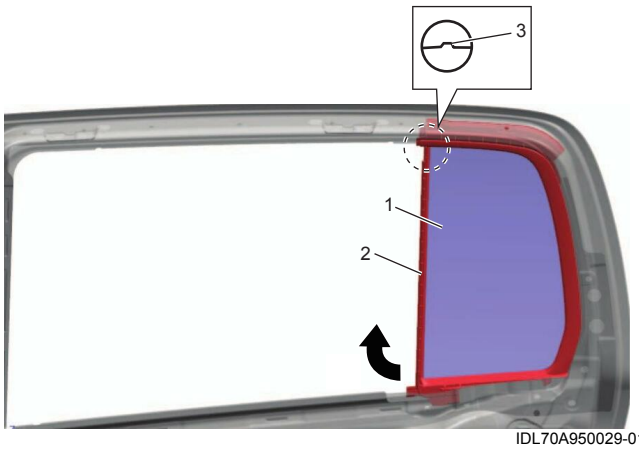
IDL70A950045-01

Rear Door Quarter Glass Removal and Installation

AENDL70A9506022

Removal

1) Remove rear door sash and glass run referring to “Rear Door Glass Removal and Installation” (Page 9E-19).
2) Remove rear door quarter glass (1) and rear door quarter glass weather-strip (2) in arrow direction by rotating them around the notch (3).



IDL70A950029-01

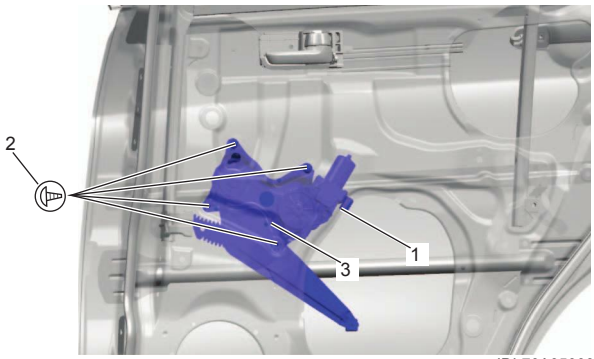
Installation
Reverse removal procedure.

Rear Window Regulator Assembly Removal and Installation

AENDL70A9506011

Removal

1) Remove rear door glass. ☞(Page 9E-19)
2) Disconnect power window motor connector (1).
3) Remove window regulator screw (2) and remove rear window regulator assembly (3).



IDL70A950030-01

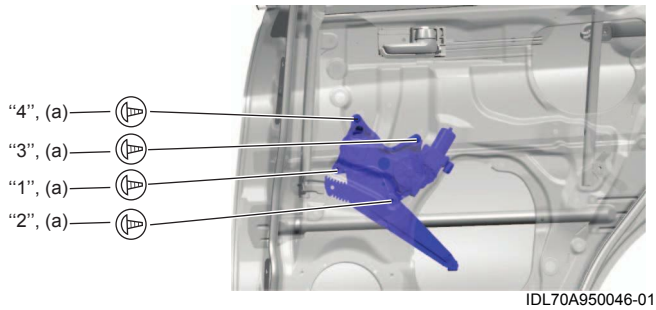
Installation
Reverse removal procedure noting the following.

- Apply grease to sliding and rotating portions of window regulator.

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Install rear window regulator and tighten rear door window regulator mounting screws in order (“1” to “4”) to specified torque.

  Tightening torque
  Rear window regulator screw (a): 8.4 N·m (0.86 kgf-m, 6.2 lbf-ft)



IDL70A950046-01

Rear Window Regulator Assembly Inspection

AENDL70A9506012

NOTICE

Disconnect connectors from power window motor before checking regulator operation.

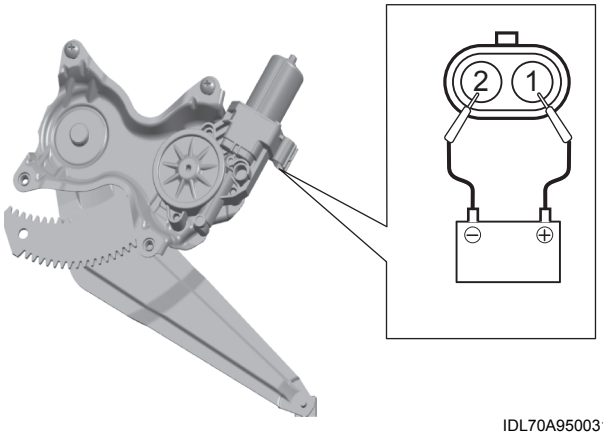
Check motor movement as follows.

1) Connect battery positive terminal to terminal “2” and connect battery negative terminal to terminal “1”. (UP operation)
2) Connect battery positive terminal to terminal “1” and connect battery negative terminal to terminal “2”. (DOWN operation)

If operation is not smooth, check glass run, door outer weather-strip, door inner weather-strip and grease in link. If those parts are in good condition, replace window regulator assembly.

Power window motor operation

Terminal number / Operation direction	1	2
UP	⊖	⊕
DOWN	⊕	⊖



IDL70A950031-01

Power Window Main Switch Inspection

AENDL70A9506023

Check power window main switch for terminal voltage. ☞(Page 9E-5).
If check results is not as specified, replace power window main switch.

Power Window Sub Switch Inspection

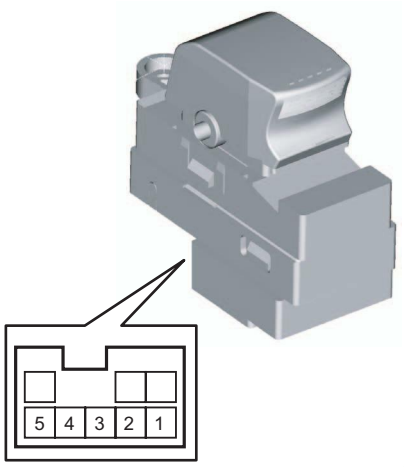
AENDL70A9506024

Check continuity between terminals at each switch position.
If check result is not as specified, replace power window sub switch.

Power window sub switch (passenger and rear) continuity

Power window switch position \ Terminal	1	2	3	4	5
Up (Keep pulling up)		○	○	○	○
OFF	○	○		○	
Down (Keep pushing down)	○			○	○

I9P60A950051-02



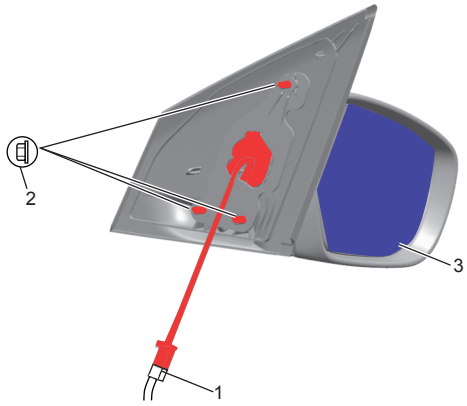
I9P60A950052-02

Door Mirror Removal and Installation

AENDL70A9506025

Removal

1) Remove sash bracket inner garnish. ☞(Page 9E-14)
2) For power door mirror model, remove front door trim. ☞(Page 9E-14)
3) For power door mirror model, disconnect power door mirror connector (1).
4) Remove door mirror nuts (2) and remove door mirror (3).



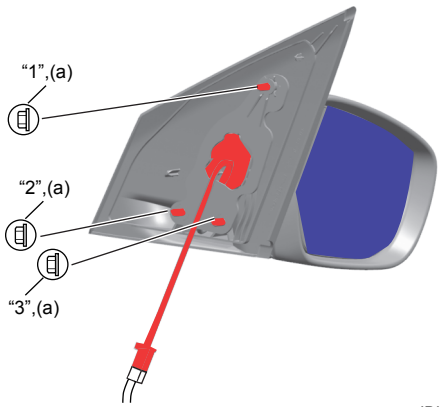
IDL70A950032-01

Installation

Reverse removal procedure noting the following points.

- Check operation of door mirror after installation.
- Tighten door mirror nuts in order “1” - “3” to specified torque.

Tightening torque
Door mirror nut (a): 7.9 N·m (0.81 kgf-m, 6.0 lbf-ft)



IDL70A950033-01

Power Door Mirror Switch Inspection (If Equipped)

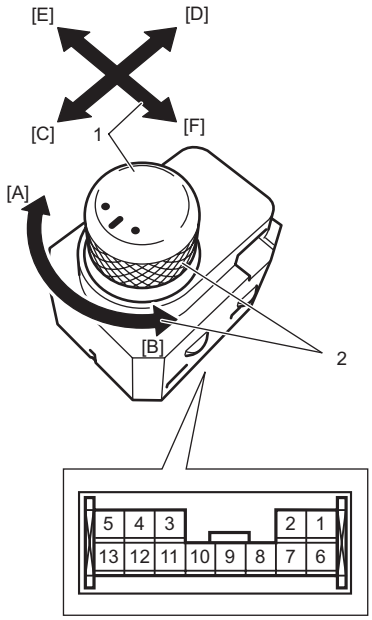
AENDL70A9506026

Check continuity between terminals at each switch position.
If check result is not as specified, replace switch.

Power door mirror switch continuity

Switch/Position \ Terminal		3	4	5	9	10	12	13
R/L switch	Angle switch							
L	Up	○			○			
	Down	○				○		○
	Right	○				○		
	Left	○	○					○
R	Up	○			○			
	Down	○					○	○
	Right	○		○			○	
	Left	○		○				○

I9P60A950058-02



I9P60A950060-01

[A]: Right side power door mirror	[E]: Right
[B]: Left side power door mirror	[F]: Left
[C]: Up	1. Angle switch
[D]: Down	2. R/L switch

Rear Defogger Relay Inspection

AENDL70A9506027

Refer to “Control Relay Inspection” in Section 10B (Page 10B-32).

Rear Defogger Switch Inspection (If Equipped)

AENDL70A9506013

Check rear defogger switch for terminal-to-terminal continuity. If check result is not as specified, replace HVAC control unit.

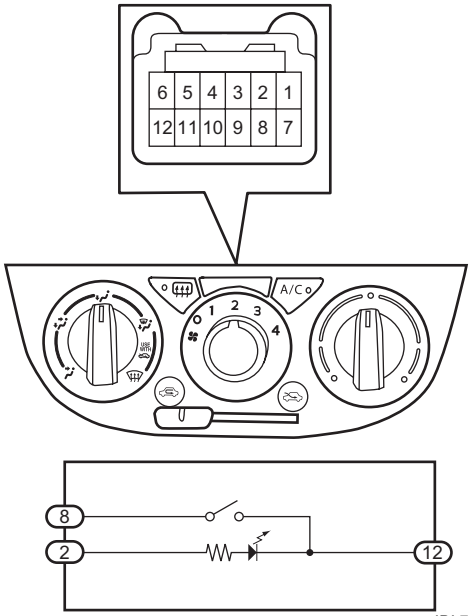
NOTE

To perform measurement with rear defogger indicator, use diode range of circuit tester.

Rear defogger switch continuity

Terminal / Position	8	12	2
OFF			
ON			

IBL80A722020-01



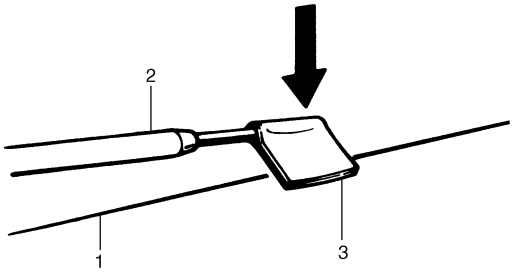
IDL70A950034-01

Rear Defogger Wire Inspection

AENDL70A9506015

NOTE

- **When cleaning rear end door window glass, use a dry cloth to wipe it along heat wire (1) direction.**
- **When cleaning glass, do not use detergent or abrasive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with positive probe (2) wrapped with a tin foil (3) which should be held down on wire by finger pressure.**



I2RH01950002-01

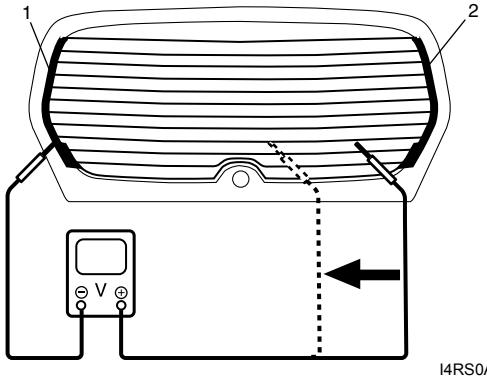
Wire Damage Inspection

1) Start engine and then turn ON rear defogger switch.
2) Measure voltage at the center of each defogger wire.

Defogger wire voltage
Center of each defogger wire: 4 – 6 V

3) If measured voltage is out of specification, touch voltmeter negative (–) lead to defogger wire ground terminal end (1).
4) Touch voltmeter positive (+) lead with a foil strip to defogger wire power source terminal end (2), then move it along wire to defogger wire ground terminal end (1).

The place where voltmeter fluctuates from 0 – 1 V to 10 – 12 V is where there is open.
If found defective, repair defogger wire or replace rear end door glass if necessary.



I4RS0A950030-01

Specifications

Tightening Torque Specifications

AENDL70A9507001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Front door glass screw	5.5	0.56	4.0	☞(Page 9E-15)
Front window regulator screw	8.4	0.86	6.2	☞(Page 9E-16)
Rear door sash screw	3.0	0.31	2.5	☞(Page 9E-21)
Rear door sash bolt	5.5	0.56	4.0	☞(Page 9E-21)
Rear window regulator screw	8.4	0.86	6.2	☞(Page 9E-22)
Door mirror nut	7.9	0.81	6.0	☞(Page 9E-23)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Front Door Components” (Page 9E-13)
“Rear Door Components” (Page 9E-18)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A9508001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 9E-16) / ☞(Page 9E-22)

NOTE

Required service materials are also described in:
“Front Door Components” (Page 9E-13)
“Rear Door Components” (Page 9E-18)

Security and Locks

General Description

Key Coding Construction

AENDL70A9601001

Key is used for ignition of vehicle and for locking or unlocking the doors using the key cylinder on the doors. Key is cut on both edges to make them reversible. Key identification is obtained from five-character key code stamped on key code tag. Using this key code, key code cutting combination can be determined from a code list (available to owners of key cutting equipment from suppliers).

Power Door Lock System Description (If Equipped)

AENDL70A9601002

Power door lock system consists of a power door lock switch, door lock actuator relay (in BCM) and door lock actuators (door lock assemblies).
When a lock / unlock signal is sent from the door key cylinder switch or power door lock switch to BCM, it controls the door lock actuator relay in it to activate each door lock actuator so that each door is locked / unlocked.

Keyless Entry System Description (If Equipped)

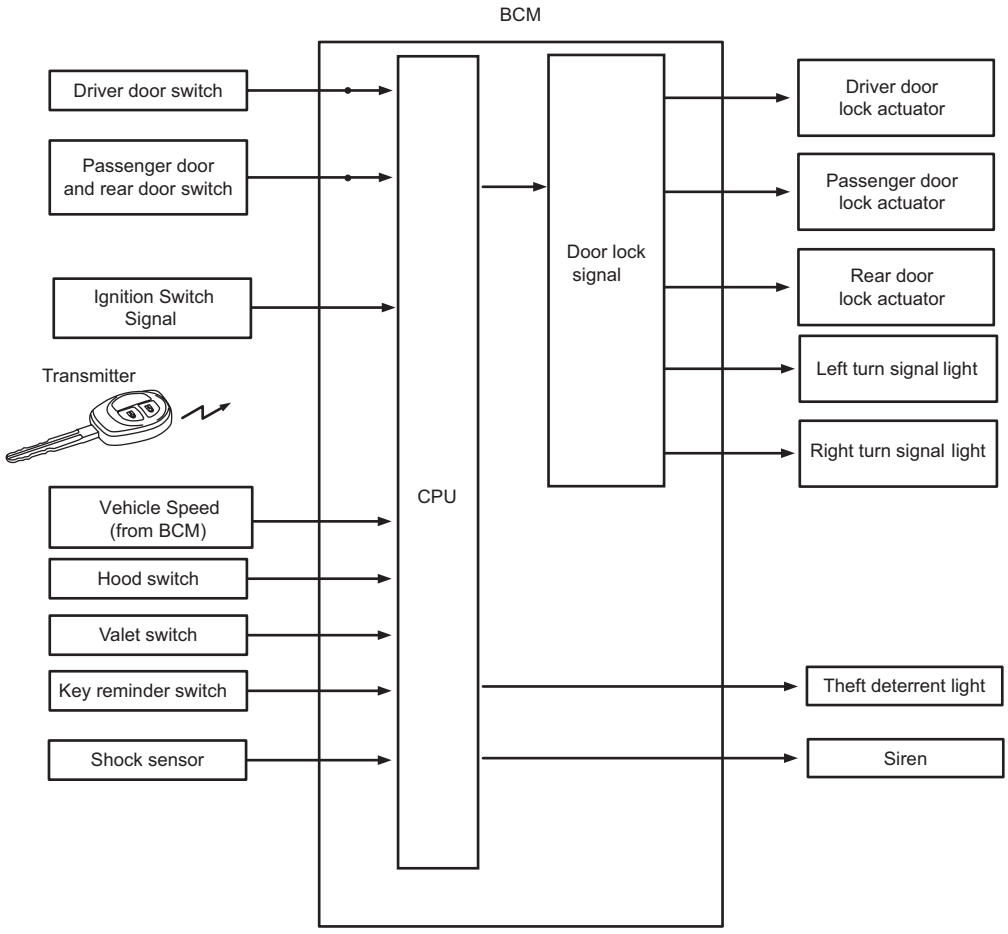
AENDL70A9601003

Keyless entry system consists of a BCM, transmitter, door switches and door lock actuators (door lock assemblies). When the “Lock” or “Unlock” button of the transmitter is pressed, the transmitter sends a “Lock” or “Unlock” signal to BCM. And then BCM verifies if the received signal agrees with the registered code. When BCM judges their agreement, it makes each door lock actuator operate so that all door locks are locked or unlocked.
Also, when the door lock is locked or unlocked via transmitter, BCM control “answers back” using the hazard warning light and dome light. When any door is half open or fully open or the ignition key is inserted in ignition key cylinder, BCM prevents door lock actuators from operating.

Schematic and Routing Diagram

Power Door Lock and Keyless Entry System Input / Output Diagram (If Equipped)

AENDL70A9602001



IDL70A960016-01

Power Door Lock and Keyless Entry System Circuit Diagram (If Equipped)

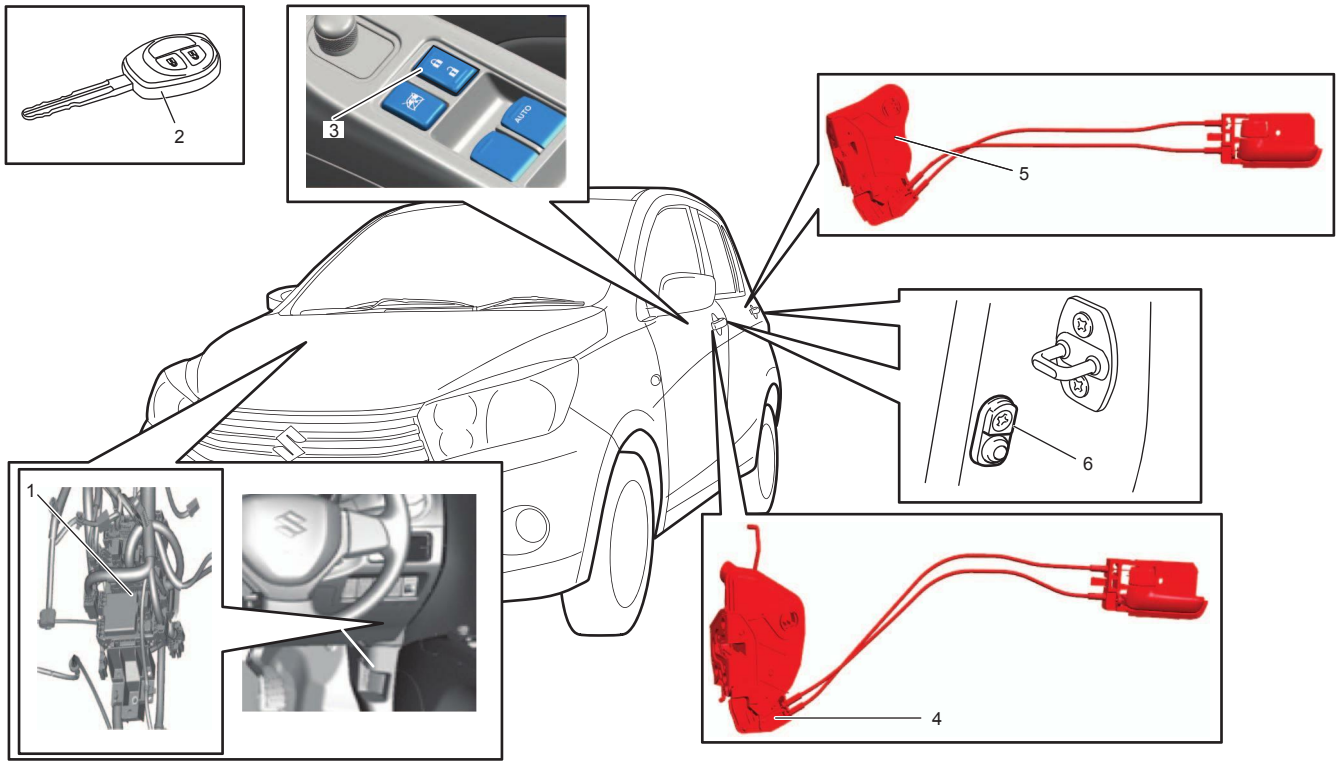
AENDL70A9602002

Refer to “Body Electrical Control System Circuit Diagram” in Section 10B (Page 10B-4).

Component Location

Power Door Lock and Keyless Entry System Component Location (If Equipped)

AENDL70A9603001



IDL70A960014-01

1. BCM	3. Power door lock switch	5. Rear door lock actuator (door lock assembly)
2. Transmitter	4. Front door lock actuator (door lock assembly)	6. Door switch

Diagnostic Information and Procedures

Power Door Lock System Symptom Diagnosis (If Equipped)

AENDL70A9604001

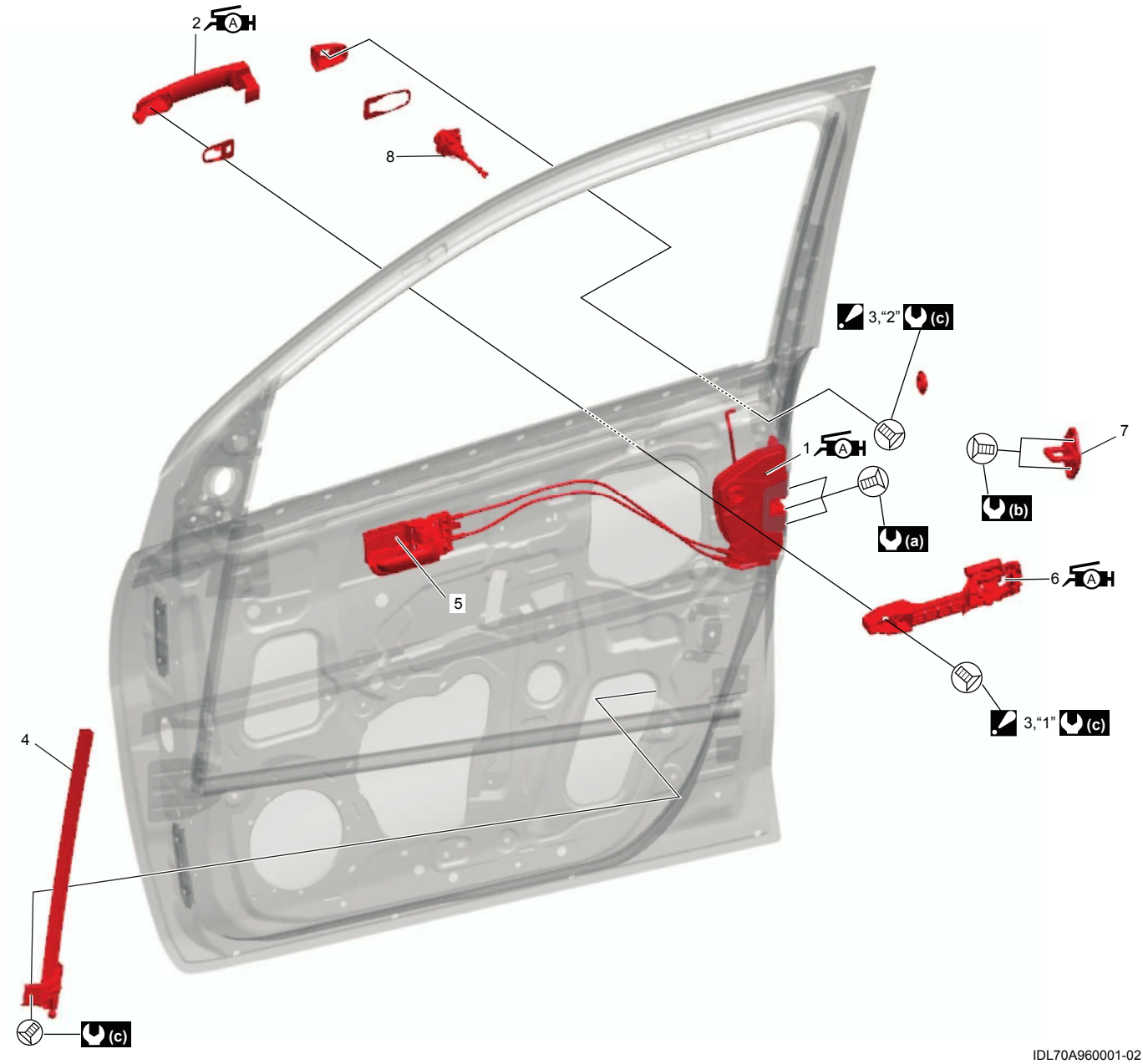
Condition	Possible cause	Correction / Reference Item
All doors cannot be locked / unlocked by all of switches (power door lock switch or key cylinder switch)	BCM	*"Inspection of BCM and Its Circuits" in Section 10B (Page 10B-20)*
	System circuit (including relay and fuse)	*"Body Electrical Control System Circuit Diagram" in Section 10B (Page 10B-4)*
	Power door lock switch	*"Power Door Lock and Keyless Entry System Input / Output Diagram (If Equipped)" (Page 9F-2)*
All doors cannot be locked / unlocked by only keyless entry transmitter (keyless entry system)	Transmitter	*Replace transmitter battery.*
	BCM	*"Inspection of BCM and Its Circuits" in Section 10B (Page 10B-20)*
	System circuit (including relay and fuse)	*"Body Electrical Control System Circuit Diagram" in Section 10B (Page 10B-4)*
	Door switch	*"Door Switch Inspection" (Page 9F-12)*
	Key reminder switch in ignition switch	*"Steering Lock Assembly Inspection" in Section 6B (Page 6B-10)*

Condition	Possible cause	Correction / Reference Item
Dome light does not light when doors are unlocked by keyless entry transmitter (keyless entry system)	Dome light	*Check dome light switch, position and bulb.*
	BCM	*"Inspection of BCM and Its Circuits" in Section 10B (Page 10B-20)*
	System circuit (including relay and fuse)	*"D-5 Interior Light System Circuit Diagram" in Section 9A (Page 9A-64)*
Hazard warning lights do not light when doors are locked/unlocked by keyless entry transmitter (keyless entry system)	BCM	*"Inspection of BCM and Its Circuits" in Section 10B (Page 10B-20)*
	System circuit (including bulb, relay and fuse)	*"D-6 Turn Signal and Hazard Warning Light System Circuit Diagram" in Section 9A (Page 9A-65)*

Repair Instructions

Front Door Lock Assembly Components

AENDL70A9606001



IDL70A960001-02

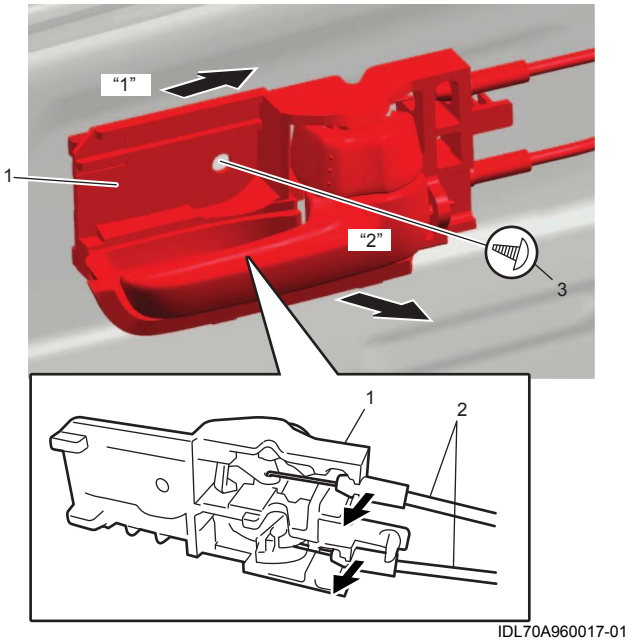
1. Front door lock assembly : Apply SUZUKI super grease A 99000-25011 to rotation / sliding parts.	5. Inside door handle : Install screw after installing door trim.	(a) : 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)
2. Outside door handle (outer) : Apply SUZUKI super grease A 99000-25011 to rotation / sliding parts.	6. Outside door handle (inner) : Apply SUZUKI super grease A 99000-25011 to rotation / sliding parts.	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Outside door handle screw : Tighten in the shown order (“1” to “2”).	7. Door latch striker	(c) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
4. Front door sash	8. Key cylinder	

Front Door Lock Assembly Removal and Installation

AENDL70A9606002

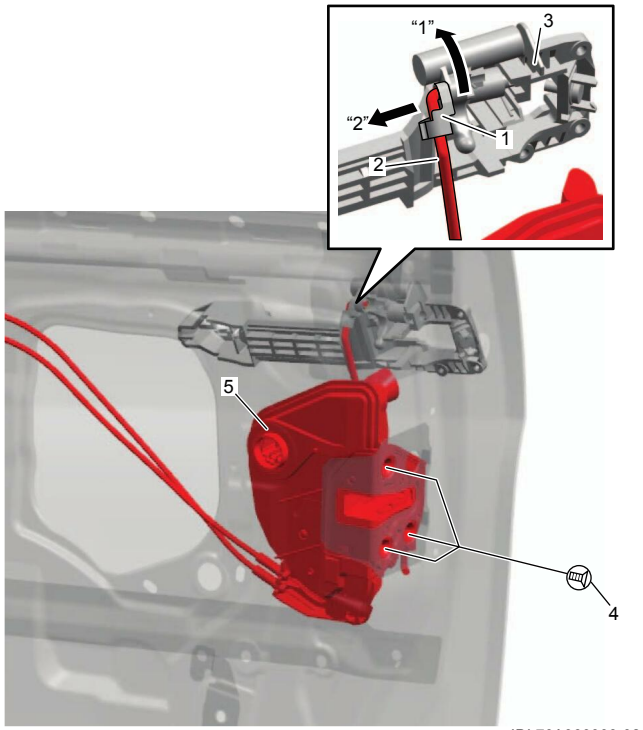
Removal

1) Remove front door glass. ☞(Page 9E-14)
2) Disconnect connector from door lock motor (if equipped).
3) Remove screw (3), and then remove inside handle bezel (1) from door panel as shown in figure.
4) Disconnect door lock wires (2) from inside handle bezel (1) by pulling out each wire in arrow direction.



IDL70A960017-01

5) Disconnect door opening control rod (1) from outside handle as shown in figure.
6) Disconnect door lock control rod (2) from key cylinder as shown in figure.
7) Remove screws (4) and then remove door lock assembly (5).



IDL70A960003-02

8) Remove nuts and then remove outside handle if necessary.

Installation

Reverse removal procedure noting the following.

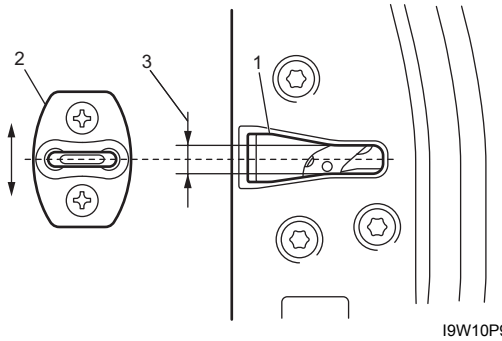
- Apply grease to sliding parts and rotation parts of door lock assembly.

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Tighten door lock screws and bolt to specified torque.

  Tightening torque
  Door lock screw: 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)

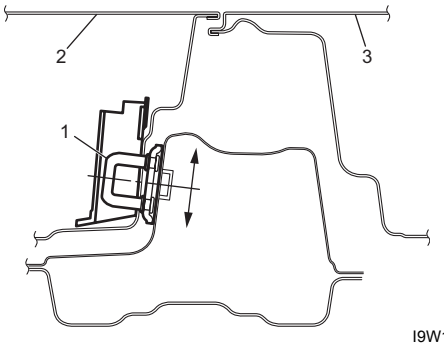
- Move door latch striker (2) up or down to align its center with the center of groove (3) on door lock assembly (1) as shown in figure.



I9W10P960004-01

- Move door latch striker (1) to adjust front door panel surface (2) flat with rear door panel surface (3) as shown in figure.

  Tightening torque
  Door latch striker screw: 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I9W10P960005-01

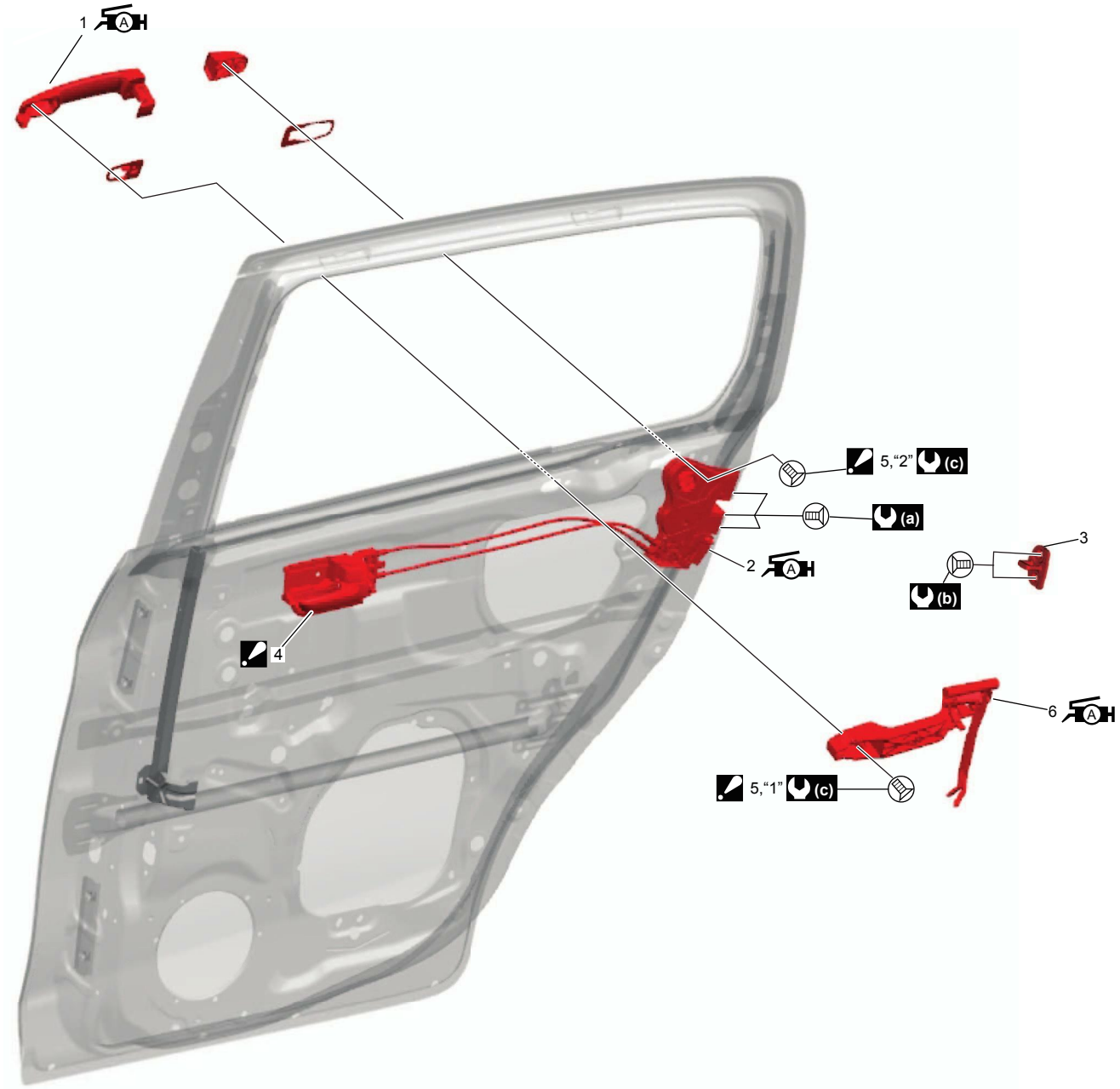
Front Door Lock Assembly Inspection

AENDL70A9606003

- Check that door opens and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closes completely in the fully latched position.
- Adjust door latch striker position, if necessary. ☞(Page 9F-5)

Rear Door Lock Assembly Components

AENDL70A9606004



IDL70A960004-01

1. Outside door handle (outer) : Apply SUZUKI super grease A 99000-25011 to rotation / sliding parts.	6. Outside door handle (inner) : Apply SUZUKI super grease A 99000-25011 to rotation / sliding parts.
2. Rear door lock assembly : Apply SUZUKI super grease A 99000-25011 to rotation / sliding parts.	(a) : 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)
3. Door latch striker	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
4. Inside door handle : Install screw after installing door trim.	(c) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
5. Outside door handle screw : Tighten in the shown order ("1" – "2").	

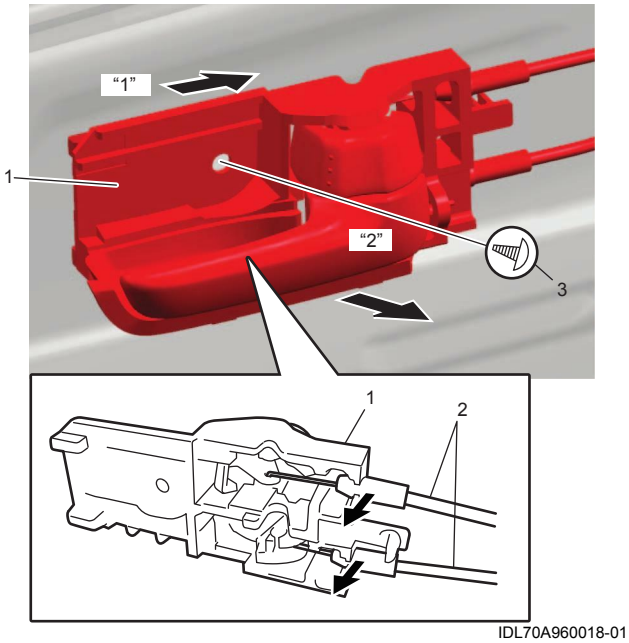
Rear Door Lock Assembly Removal and Installation

AENDL70A9606005

Removal

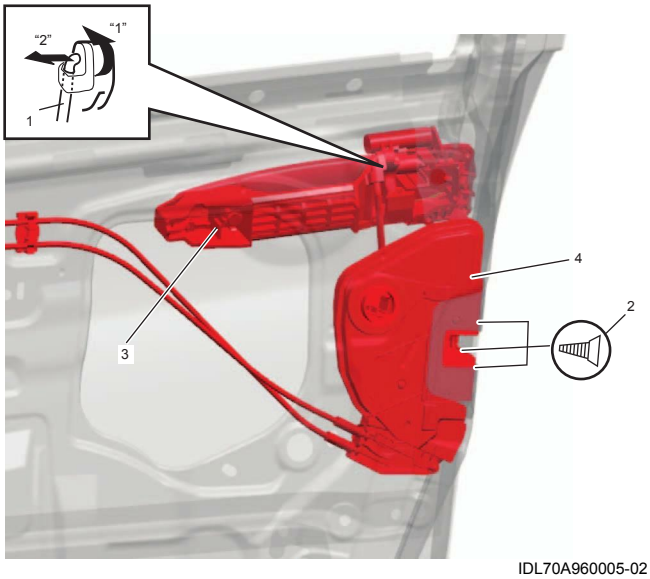
1) Remove rear door glass. ☞(Page 9E-19)
2) Disconnect connector from door lock actuator (if equipped).

3) Remove screws (3), and then remove inside handle bezel (1) from door panel as shown in figure.
4) Disconnect door lock wires (2) from inside handle bezel (1) by pulling out each wire in arrow direction.



IDL70A960018-01

5) Remove door opening control rod (1) from outside handle (3) as shown in figure.
6) Remove screws (2) and bolt (3), and then remove door lock assembly (4).



IDL70A960005-02

Installation

Reverse removal procedure noting the following.

- Apply grease to sliding parts of door lock assembly and outside handle.

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Install outside handle as shown in "Rear Door Lock Assembly Components" (Page 9F-7).
- Tighten door lock screws to specified torque.

  Tightening torque
  Door lock screw: 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)

- Adjust door latch striker. ☞(Page 9F-5)

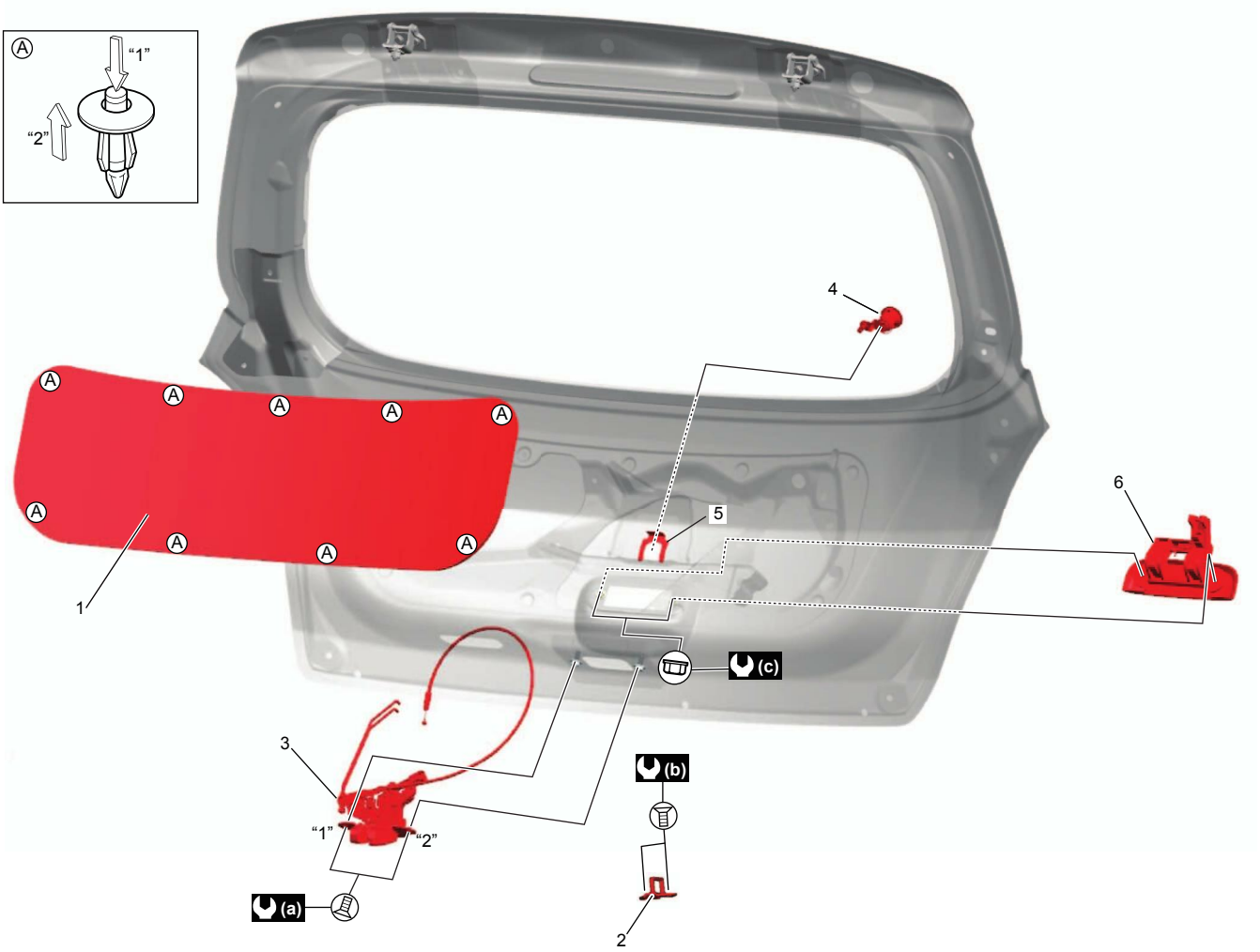
Rear Door Lock Assembly Inspection

AENDL70A9606006

- Check that door opens and closes smoothly and properly.
- Check that door stops in the secondary latch position properly (preventing door from opening freely) and that door closes completely in the fully latch position.
- Adjust door latch striker position, if necessary. ☞(Page 9F-7)

Rear End Door Lock Assembly Components

AENDL70A9606007



IDL70A960006-02

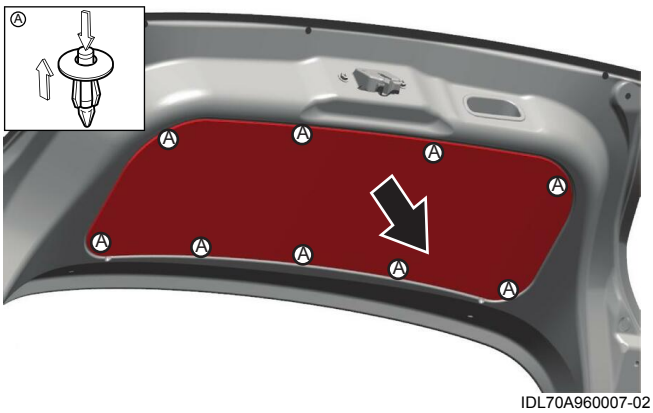
1. Rear end door trim	6. Rear end door handle
2. Door latch striker	(a) : 8.5 N·m (0.85 kgf-m, 6.2 lbf-ft)
3. Rear end door lock assembly : apply lithium grease 99000-25011 to sliding part.	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
4. Key cylinder	(c) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
5. Key cylinder retainer	

Rear End Door Lock Assembly Removal and Installation

AENDL70A9606008

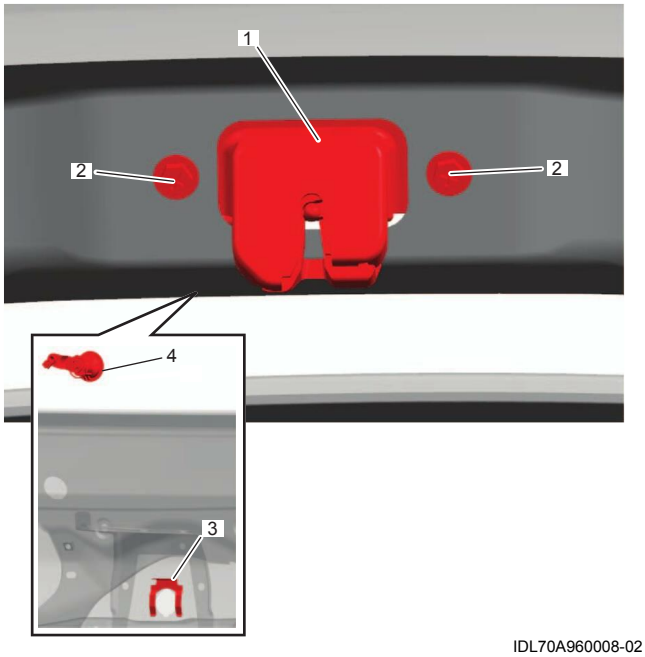
Removal

1) Remove door trim (1) from rear end door panel.



IDL70A960007-02

2) Remove door lock bolts (2), and then remove door lock assembly (1).
3) Remove key cylinder retainer (3), and then remove key cylinder (4) if necessary.



IDL70A960008-02

Installation

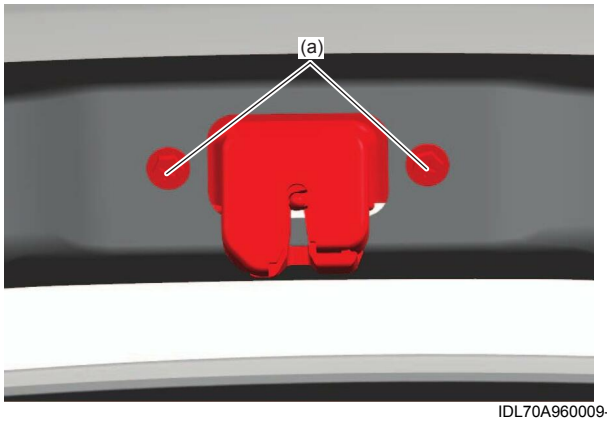
Reverse removal procedure noting the following.

- Apply grease to sliding parts of door lock assembly.

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Tighten rear end door lock bolt to specified torque.

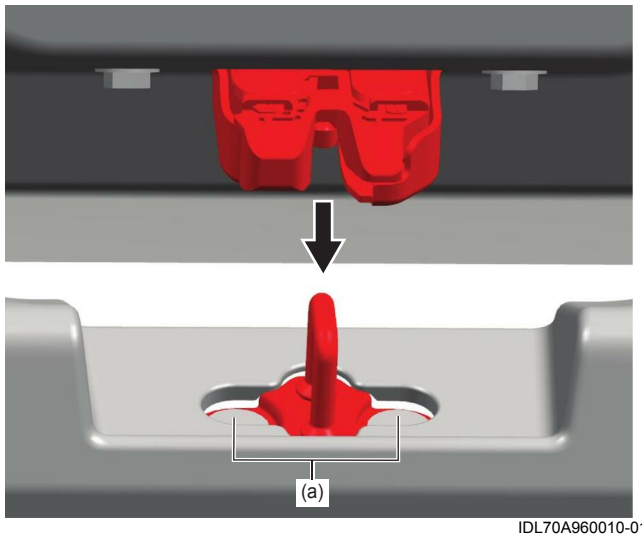
  Tightening torque
  Rear end door lock bolt (a): 8.5 N·m (0.85 kgf-m, 6.2 lbf-ft)



IDL70A960009-01

- Adjust door latch striker so that its center aligns with the center of groove in door latch base.

  Tightening torque
  Rear end door striker screw (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



IDL70A960010-01

Rear End Door Lock Assembly Inspection

AENDL70A9606009

- Check that door opens and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closes completely in the fully latched position.
- Adjust door latch striker position, if necessary. ☞(Page 9F-9)

Power Door Lock Switch Inspection (If Equipped)

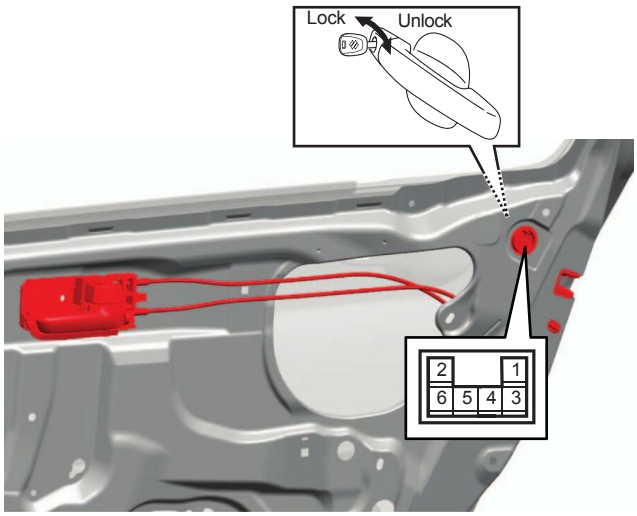
AENDL70A9606010

Refer to “Power Window Main Switch Inspection” in Section 9E (Page 9E-22).

Driver Side Door Key Cylinder Switch Inspection (If Equipped)

AENDL70A9606011

1) Remove driver side front door trim. ☞(Page 9E-14).
2) Disconnect door lock connector from door lock assembly
3) Check for continuity between terminals at each switch position. If check result is not as specified, replace door lock assembly.



Operation \ Terminal	5	3	4
Lock	○		○
Unlock	○	○	

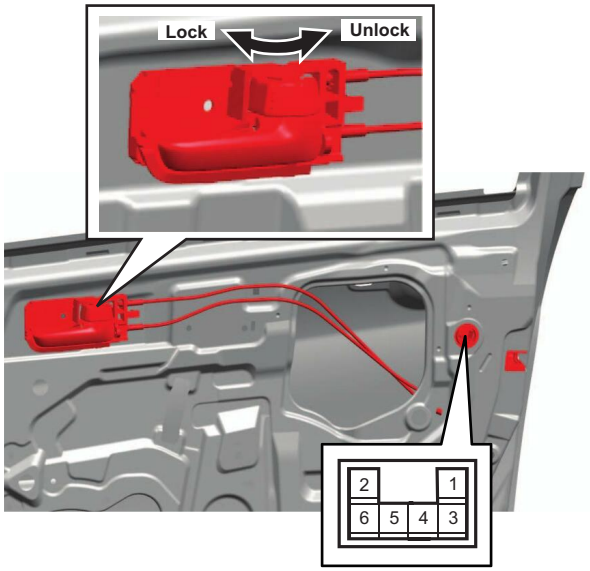
IDL70A960011-01

Power Door Lock Actuator Inspection (If Equipped)

AENDL70A9606012

1) Remove door trim.
   - Front door trim: ☞(Page 9E-14)
   - Rear door trim: ☞(Page 9E-19)
2) Disconnect connector from door lock actuator.
3) Connect battery positive (+) and negative (–) terminals to the door lock actuator terminals as shown in figure.
   If it does not operate as specified in the following table, replace door lock assembly.

Front door

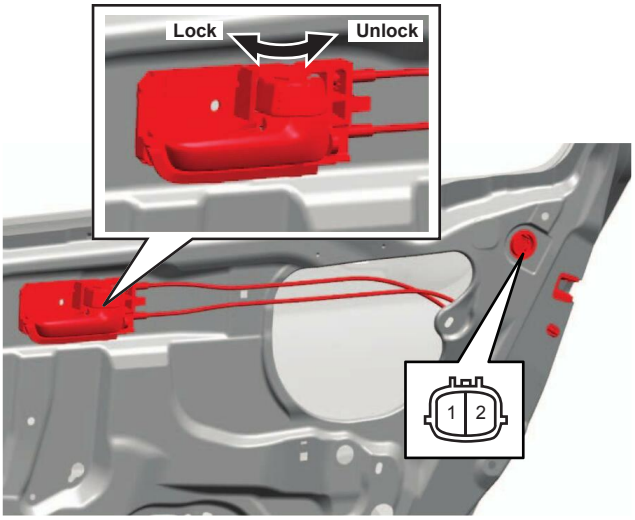


[D] \ [C]	[A]	1	2
	[B]	1	2
Lock → Unlock		⊖	⊕
Unlock → Lock		⊕	⊖

IDL70A960019-01

[A]: Driver side	[C]: Terminal
[B]: Passenger side	[D]: Switch position

Rear door



[D] \ [C]	1	2
Lock → Unlock	⊖	⊕
Unlock → Lock	⊕	⊖

IDL70A960013-01

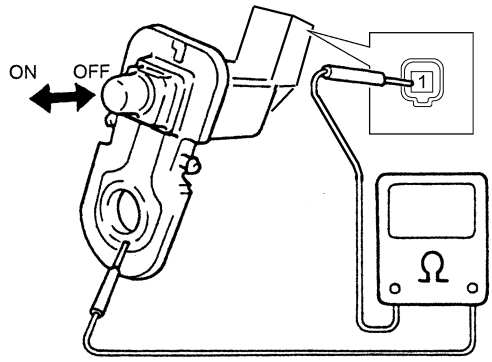
[A]: Terminal	[B]: Switch position

Door Switch Inspection

AENDL70A9606013

Front / Rear Door

Remove door switch from body panel and check switch for continuity. If found defective, replace switch.



[B] \ [A]	1	body
OFF (door closed)		
ON (door open)	○——	——○

I8C50A960037-01

[A]: Terminal	[B]: Switch position

Transmitter Battery Replacement (If Equipped)

AENDL70A9606014

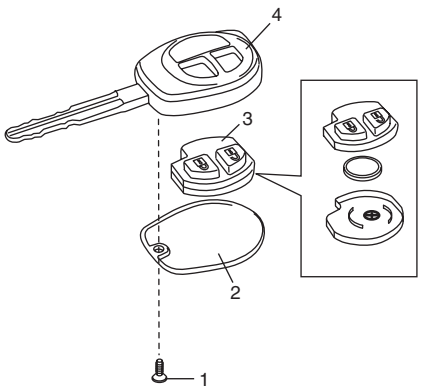
If transmitter becomes unreliable, replace transmitter battery as follows.

1) Remove screw (1) and transmitter cover (2).
2) Remove transmitter (3) from transmitter holder (4).

⚠ CAUTION

Use care not to allow grease or dirt to stick to the printed circuit board and the battery.

3) With tip of flat blade screwdriver put in slot of transmitter, pry it open.
4) Replace the battery (lithium disc-type CR 1616 or equivalent battery) so its (+) terminal faces “+” mark on transmitter.
5) Fit together transmitter (3) and install it into transmitter holder (4).
6) Install transmitter cover (2) and screw (1).
7) Make sure that door locks can be operated with transmitter.



I4RS0B960014-01

NOTE

- **To prevent theft, be sure to break the transmitter before discarding it.**
- **Dispose of the used battery properly according to applicable rules or regulations. Do not dispose of lithium batteries with ordinary household trash.**

Transmitter Code Programming (If Equipped)

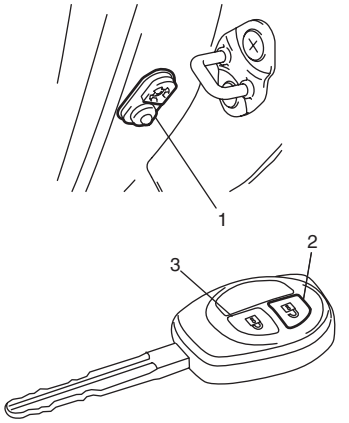
AENDL70A9606015

NOTE

- **Three transmitter codes can be registered.**
- **When a new transmitter code is registered, the oldest one will be cleared.**

If transmitter or BCM is replaced with a new one or additional transmitter(s) is necessary, program transmitter code(s).

1) Confirm that all doors are closed and ignition key is out of ignition key cylinder.
2) Open driver side door.
3) Turn ignition switch to ON position, and then remove ignition key from ignition key cylinder within 10 seconds after that.
4) Push and release driver side door switch (1) at 3 times by hand within 20 seconds after removing ignition key from ignition key cylinder.
5) Turn ignition switch to ON position, and then remove ignition key from ignition key cylinder within 10 seconds after that. All doors automatically lock and unlock once.
   This indicates that the system is in registration mode.
6) Push “LOCK” or “UNLOCK” button (2) on transmitter (3) within 20 seconds after Step 5). All doors automatically lock and unlock once.
   This indicates that code registration is completed.
7) If an additional transmitter needs to be programed, repeat the procedure of Step 1).



I4RS0B960010-01

Specifications

Tightening Torque Specifications

AENDL70A9607001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Door lock screw	4.5	0.46	3.5	☞(Page 9F-5) / ☞(Page 9F-8)
Door latch striker screw	10	1.0	7.5	☞(Page 9F-6)
Rear end door lock bolt	8.5	0.85	6.2	☞(Page 9F-10)
Rear end door striker screw	23	2.3	17.0	☞(Page 9F-10)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Front Door Lock Assembly Components” (Page 9F-4)
“Rear Door Lock Assembly Components” (Page 9F-7)
“Rear End Door Lock Assembly Components” (Page 9F-9)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A9608001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 9F-5) / ☞(Page 9F-8) / ☞(Page 9F-10)

NOTE

Required service materials are also described in:
“Front Door Lock Assembly Components” (Page 9F-4)
“Rear Door Lock Assembly Components” (Page 9F-7)
“Rear End Door Lock Assembly Components” (Page 9F-9)

Seats

Precautions

Precautions for Seat

AENDL70A9700001

⚠ WARNING

Be sure to read "Precautions for Air Bag System Service" in Section 8B (Page 8B-1) before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the air bag system and the seat belt pretensioner (if equipped) when necessary.

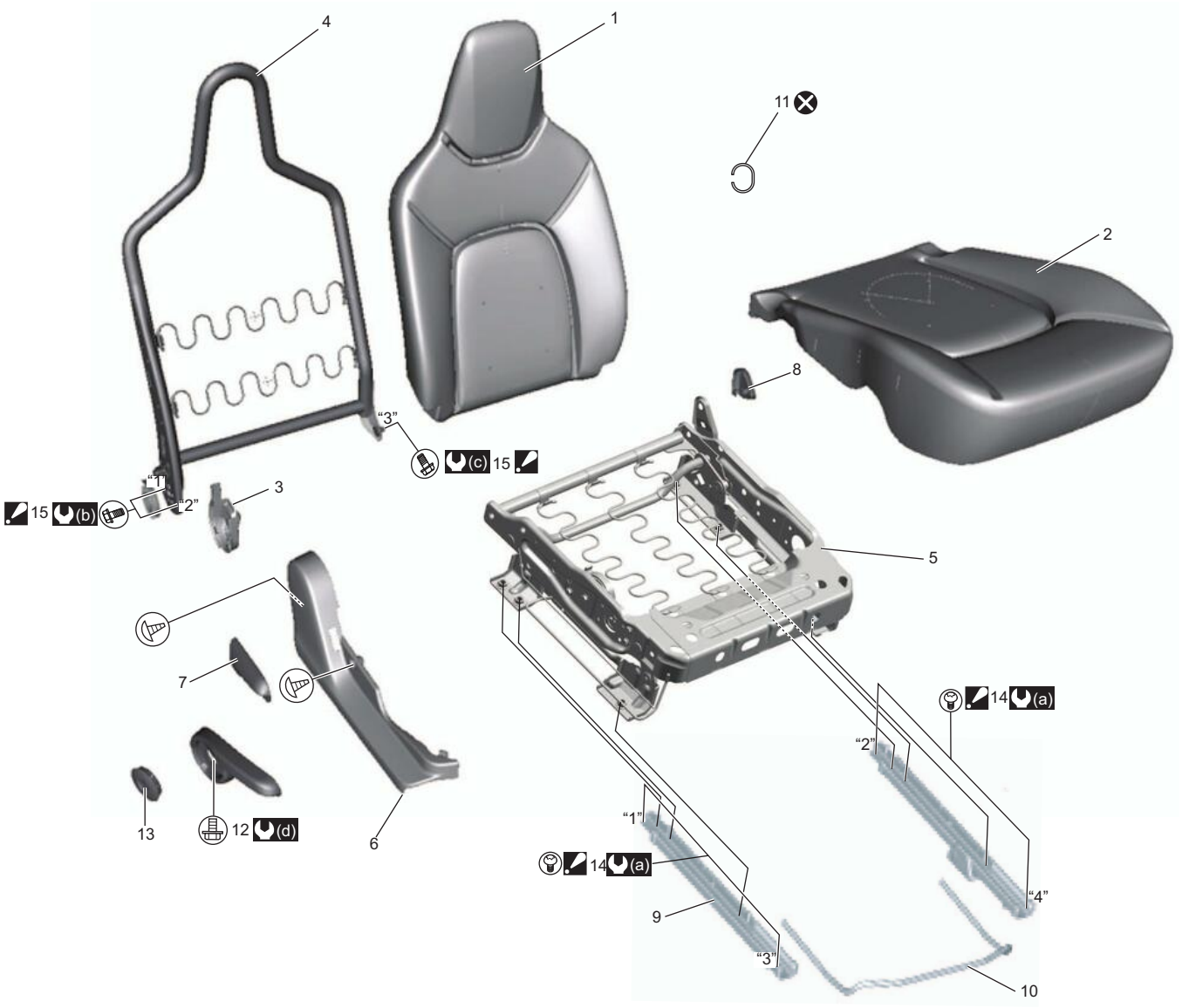
Air Bag Warning

Refer to "Air Bag Warning" in Section 00 (Page 00-6).

Repair Instructions

Front Seat Components

AENDL70A9706001



IDL70A970004-02

1. Front seat back	8. Hinge cover	15. Reclining bolt : Tighten bolts in numerical order (“1” through “3”).
2. Front seat cushion assembly	9. Adjuster	(a) : 23 N·m (2.3 kgf-m, 16.9 lbf-ft)
3. Front seat back frame cover	10. Adjuster handle	(b) : 50 N·m (5.1 kgf-m, 36.9 lbf-ft)
4. Front seat back frame	11. Trim ring	(c) : 8.3 N·m (0.8 kgf-m, 6.1 lbf-ft)
5. Front seat cushion frame	12. Seat lifter lever (if equipped)	(d) : 16.1 N·m (1.6 kgf-m, 11.9 lbf-ft)
6. Reclining outside cover	13. Seat lifter lever cap (if equipped)	: Do not reuse.
7. Reclining knob	14. Front seat mounting bolt : Tighten bolts in numerical order (“1” through “4”).	

Front Seat Removal and Installation

AENDL70A9706002

Removal

1) Disable air bag system. ☞(Page 8B-47)
2) Disconnect seat belt switch connector and side-air bag connector (if equipped).
3) Remove four mounting bolts and then remove front seat assembly.
4) Disassemble front seat assembly if necessary. ☞(Page 9G-1)

Installation

Reverse removal procedure noting the following.

- Tighten front seat mounting bolts in numerical order and to specified torque. ☞(Page 9G-1)

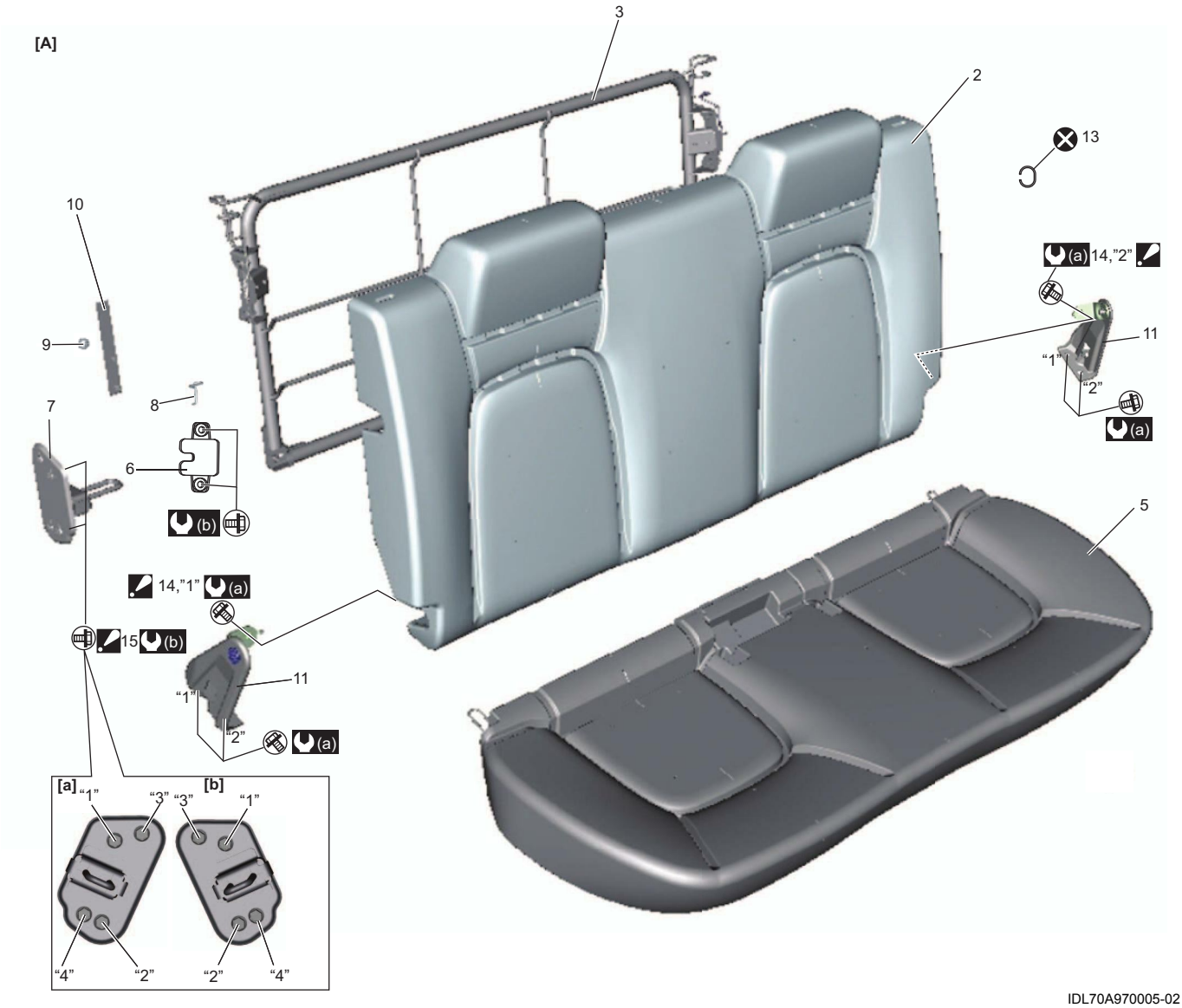
⚠ CAUTION

Be sure to use new bolts with pre-coated adhesive. Otherwise, bolts may loosen.

- Enable air bag system. ☞(Page 8B-47)

Rear Seat Components

AENDL70A9706003



IDL70A970005-02

[B]



IDL70A970006-02

[A]: Bench seat	5. Rear seat cushion pad	13. Trim ring
[B]: Separate seat	6. Rear seat back lock	14. Rear hinge bolt : Tighten bolts in numerical order. • Separate seat "1" through "4" • Bench seat: "1" through "2"
[a]: Right side	7. Rear seat back striker	15. Rear seat back striker bolt : Tighten bolts in numerical order ("1" through "4").
[b]: Left side	8. Rear seat back lock wire	(a) : 43 N·m (4.4 kgf-m, 31.7 lbf-ft)
1. Rear seat back trim	9. Rear seat back lock band stopper	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
2. Rear seat back pad	10. Rear seat back lock band	: Do not reuse.
3. Rear seat back frame	11. Rear side hinge assembly	
4. Rear seat cushion trim	12. Rear center hinge assembly (separate seat)	

Rear Seat Removal and Installation

AENDL70A9706004

Removal

1) Fold rear seat back forward, and then remove rear seat back assembly from rear hinges.
2) Simply pull up front-end hooks of rear seat cushion and then remove rear seat cushion assembly.
3) Disassemble rear seat cushion assembly and seat back assembly if necessary. ☞(Page 9G-3)

Installation

Reverse removal procedure noting the following.

- Tighten rear seat back bolts to specified torque. ☞(Page 9G-3)

Specifications

Tightening Torque Specifications

AENDL70A9707001

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Front Seat Components” (Page 9G-1)
“Rear Seat Components” (Page 9G-3)
“Fasteners Information” in Section 0A (Page 0A-5)

Exterior Trim / Interior Trim

Precautions

Precautions for Exterior Trim / Interior Trim

AENDL70A9800001

⚠ WARNING

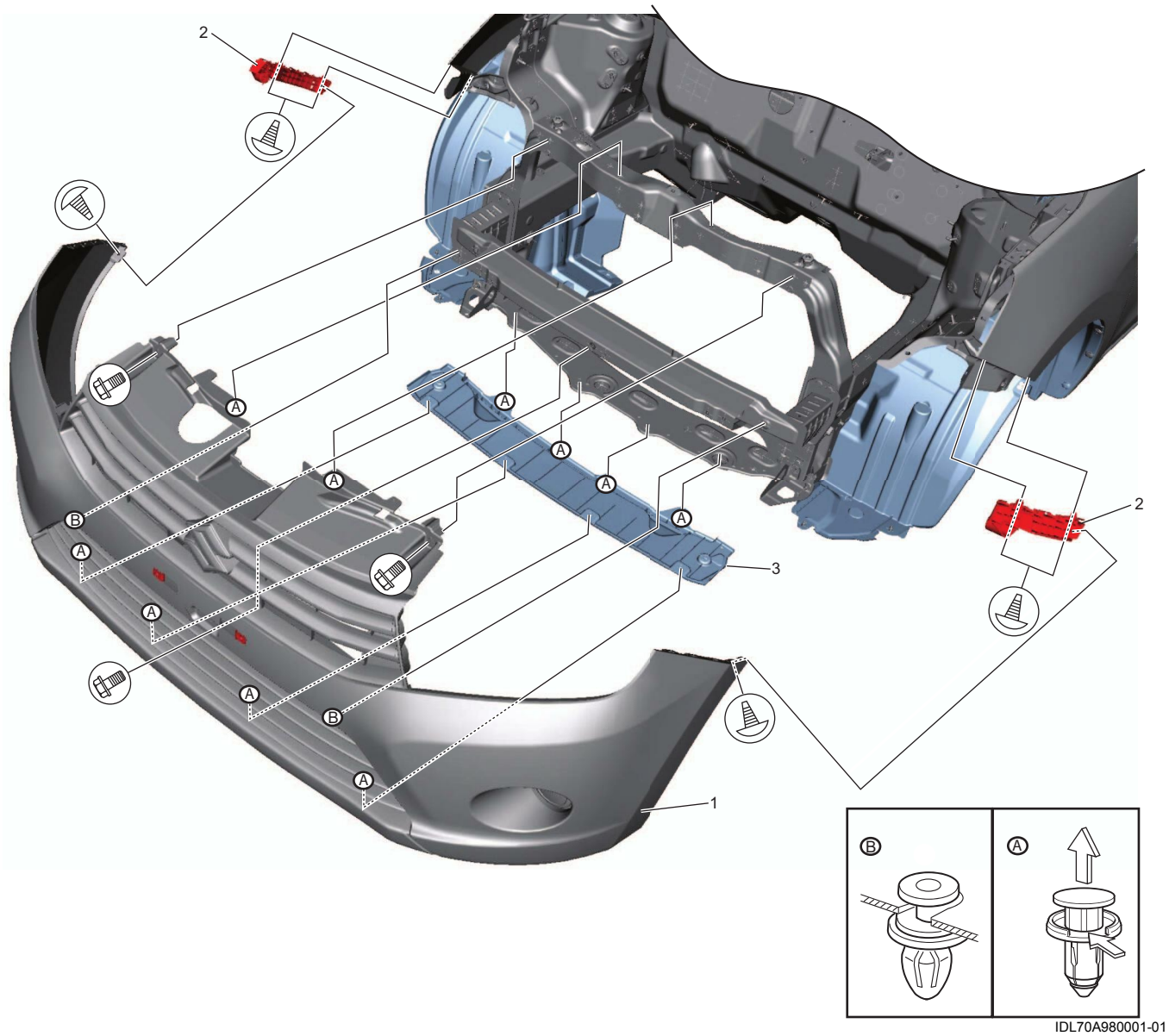
Be sure to read “Precautions for Air Bag System Service” in Section 8B (Page 8B-1) before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the air bag system and the seat belt pretensioner when necessary.

Repair Instructions

Front Bumper Assembly Removal and Installation

AENDL70A9806001

For removal and installation of front bumper assembly, refer to the figure.



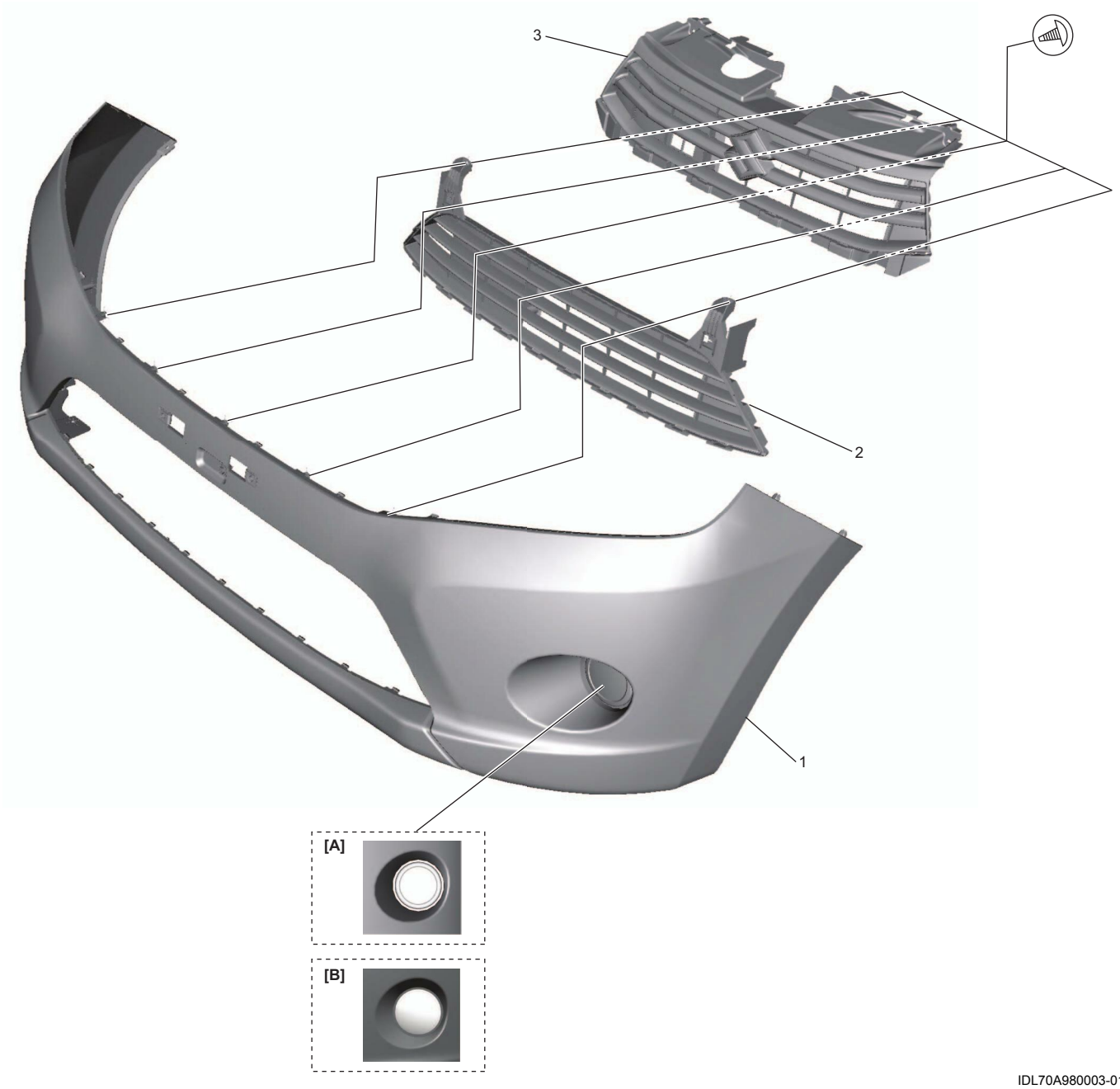
IDL70A980001-01

1. Front bumper assembly	3. Front bumper lower member
2. Front bumper holder	

Front Bumper Assembly Disassembly and Reassembly

AENDL70A9806002

For disassembly and reassembly of front bumper assembly, refer to the figure.



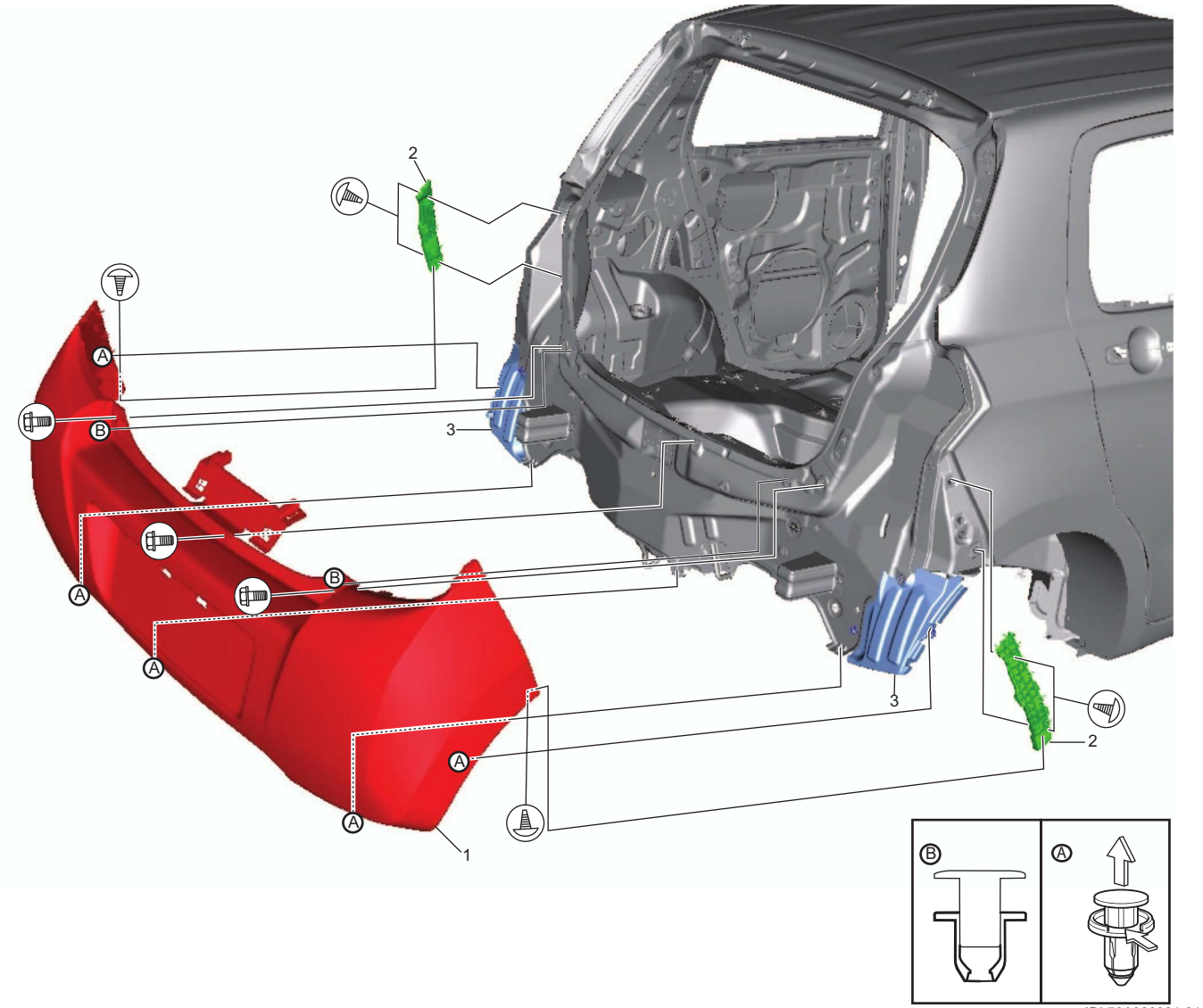
IDL70A980003-01

[A]: Without fog light	2. Front bumper lower radiator grille
[B]: With fog light	3. Front bumper upper radiator grille
1. Front bumper	

Rear Bumper Assembly Removal and Installation

AENDL70A9806003

For removal and installation of rear bumper assembly, refer to the figure.



IDL70A980021-01

1. Rear bumper	3. Rear fender lining
2. Rear bumper holder	

Cowl Top Garnish Removal and Installation

AENDL70A9806004

Removal

1) Remove wiper arm. ☞(Page 9D-4)
2) Remove cowl top side garnish (3) sliding it in arrow direction.

⚠ CAUTION

- **Be careful not to tear hood rear seal (4).**
- **When removing cowl top side garnish, remove it with cowl top garnish from vehicle body and separate them.**

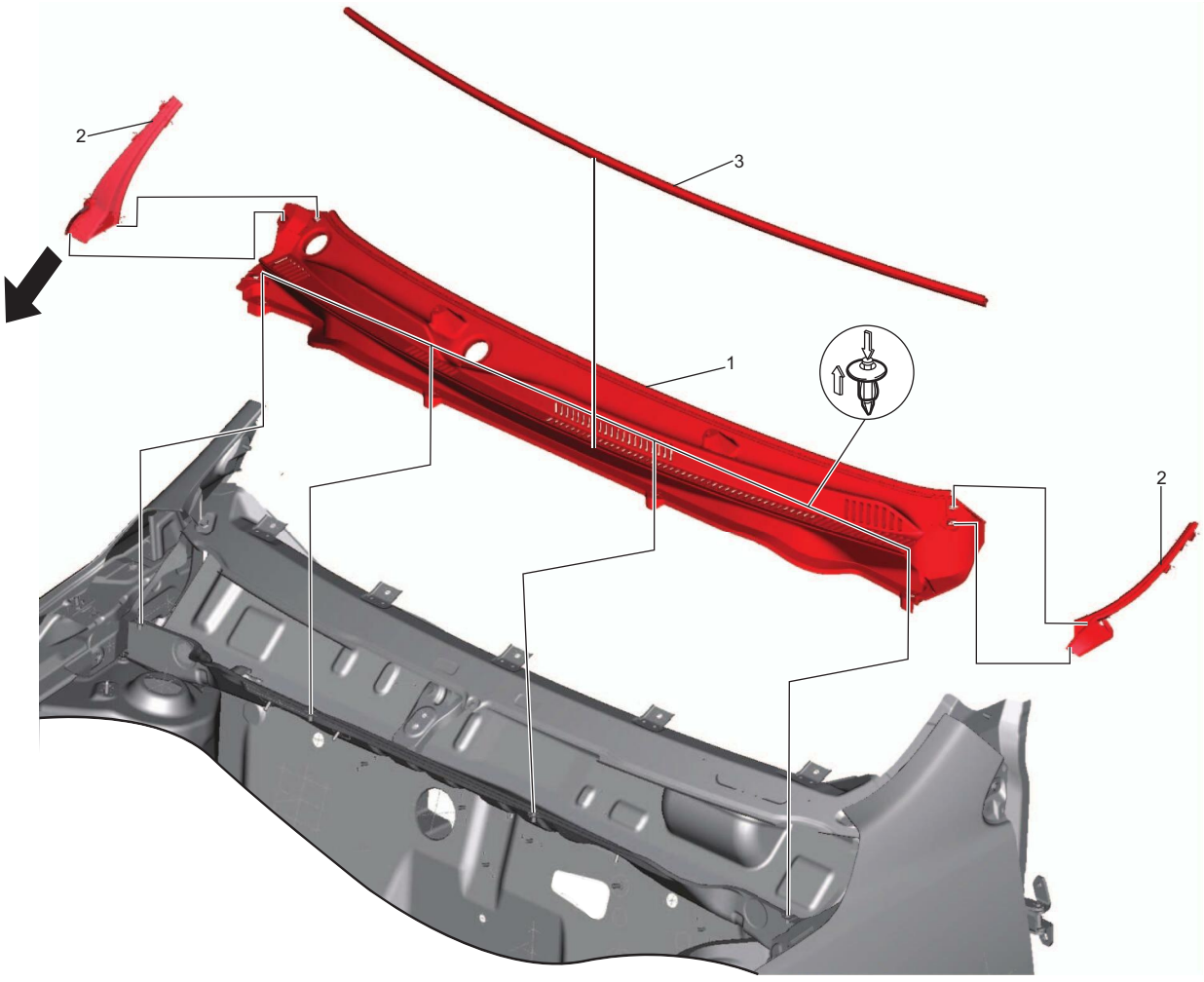
3) Remove cowl top garnish (1).

Installation

Reverse removal procedure.

⚠ CAUTION

- **Check claws of cowl top garnish covers and replace them with new ones if necessary.**
- **Use care not to damage lip of windshield molding.**



IDL70A980005-01

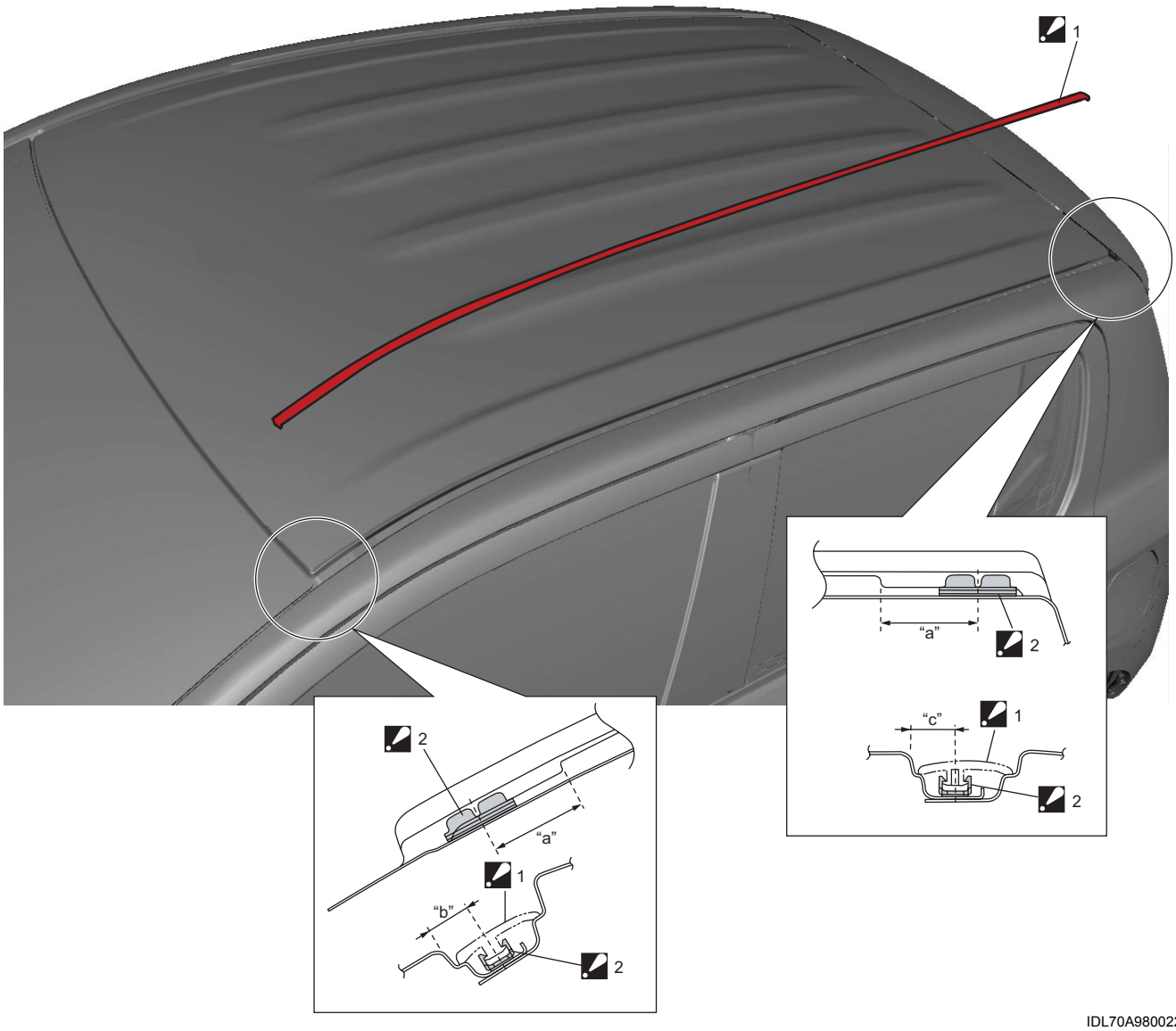
Roof Molding Removal and Installation

AENDL70A9806005

For removal and installation of roof molding, refer to the figure.

⚠ CAUTION

When reusing roof molding, handle it with care so as not to deform it.



IDL70A980022-02

1. Roof molding : When installing roof molding, install its front-end first.	"b": 9.2 – 10.2 mm (0.363 – 0.401 in.)
2. Roof molding clip : Roof molding clip must be installed at specified position on vehicle body with epoxy adhesive.	"c": 8.6 – 9.6 mm (0.339 – 0.377 in.)
"a": 41 – 43 mm (1.62 – 1.69 in.)	

Trim Removal and Installation

AENDL70A9806006

Removal

Front pillar trim

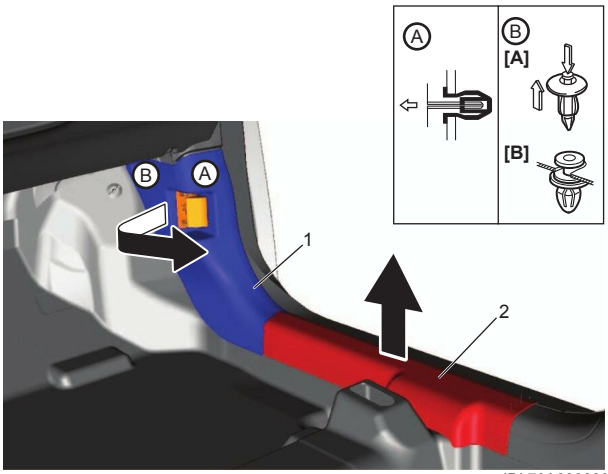
- Remove front pillar trim (1) pulling it in arrow direction.



IDL70A980006-01

Dash side trim and front side-sill scuff

- Remove dash side trim (1) and then remove front side-sill scuff (2) pulling them in arrow directions.

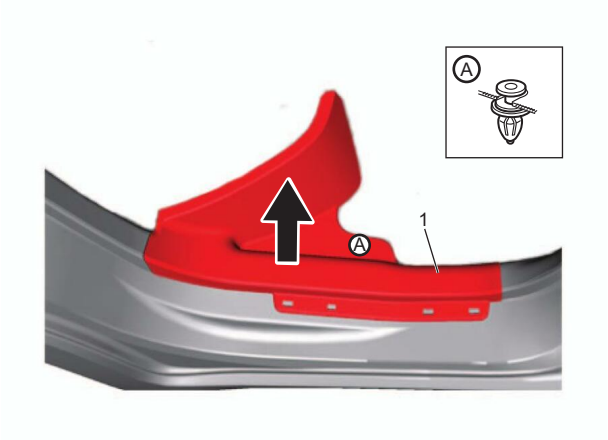


IDL70A980009-02

[A]: Driver side	[B]: Passenger side

Rear side-sill scuff

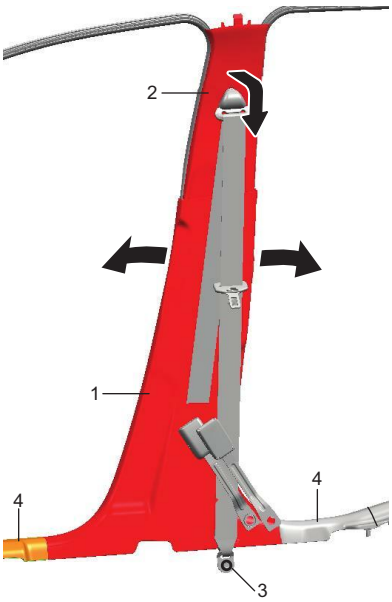
- Remove rear side-sill scuff (1) pulling it in arrow direction.



IDL70A980010-01

Center pillar trim

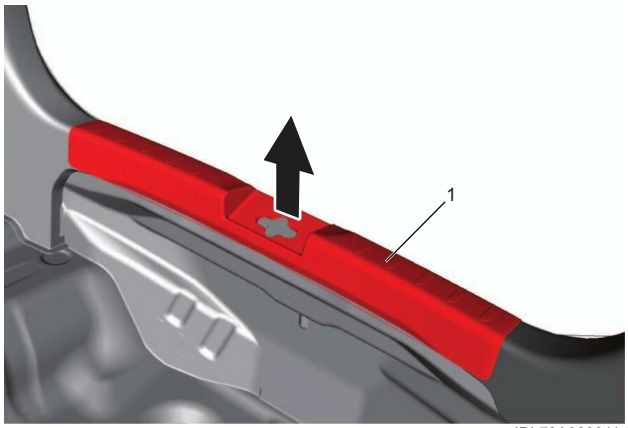
1) Remove front and rear side-sill scuffs (4).
2) Remove front seat belt anchor plate bolt (3).
3) Remove center pillar lower trim (1) and then remove upper trim (2) pulling them in arrow directions.



IDL70A980024-01

Tail end trim

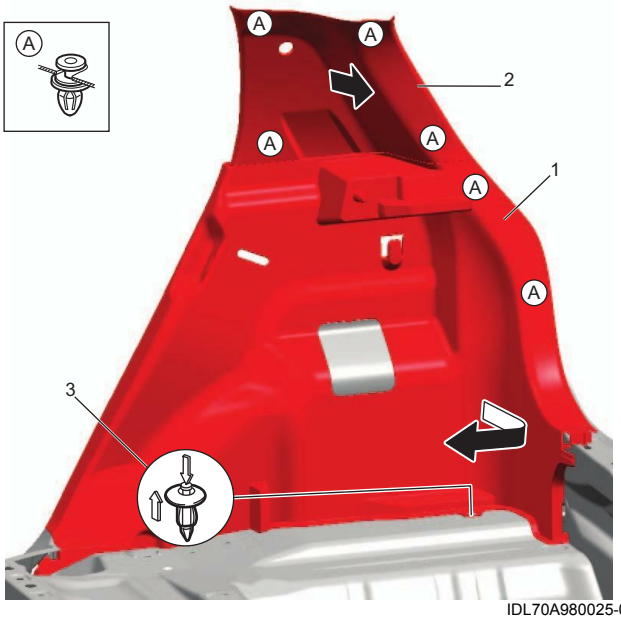
- Remove tail end trim (1) pulling it in arrow direction.



IDL70A980011-01

Quarter inner trim

1) Remove rear side-sill scuff and tail end trim.
2) Remove rear seat belt anchor plate bolt.
3) Remove clips (3) and then remove quarter inner lower trim (1) pulling it in arrow direction.
4) Remove quarter inner upper trim (2) pulling it in arrow direction.



IDL70A980025-02

Installation

⚠ CAUTION

When installing front pillar trim, use care to avoid that the claws of front pillar trim are stuck in the side-curtain air bag (inflator) module or its harness (if equipped).

Head Lining Removal and Installation

AENDL70A9806008

Removal

1) Disable air bag system. ☞(Page 8B-47)
2) Remove sun visor (2).
3) Remove room mirror. ☞(Page 9E-12)
4) Remove front pillar trims, center pillar upper trims and rear quarter upper trims. ☞(Page 9H-5)
5) Remove assistant grip (3).
6) Remove head lining clips (4) and (5), and then remove head lining (1).

Reverse removal procedure noting the following.

- Tighten front seat belt anchor plate bolt to specified torque. ☞(Page 8A-3)
- Tighten rear seat belt anchor plate bolt to specified torque. ☞(Page 8A-5)

Floor Carpet Removal and Installation

AENDL70A9806007

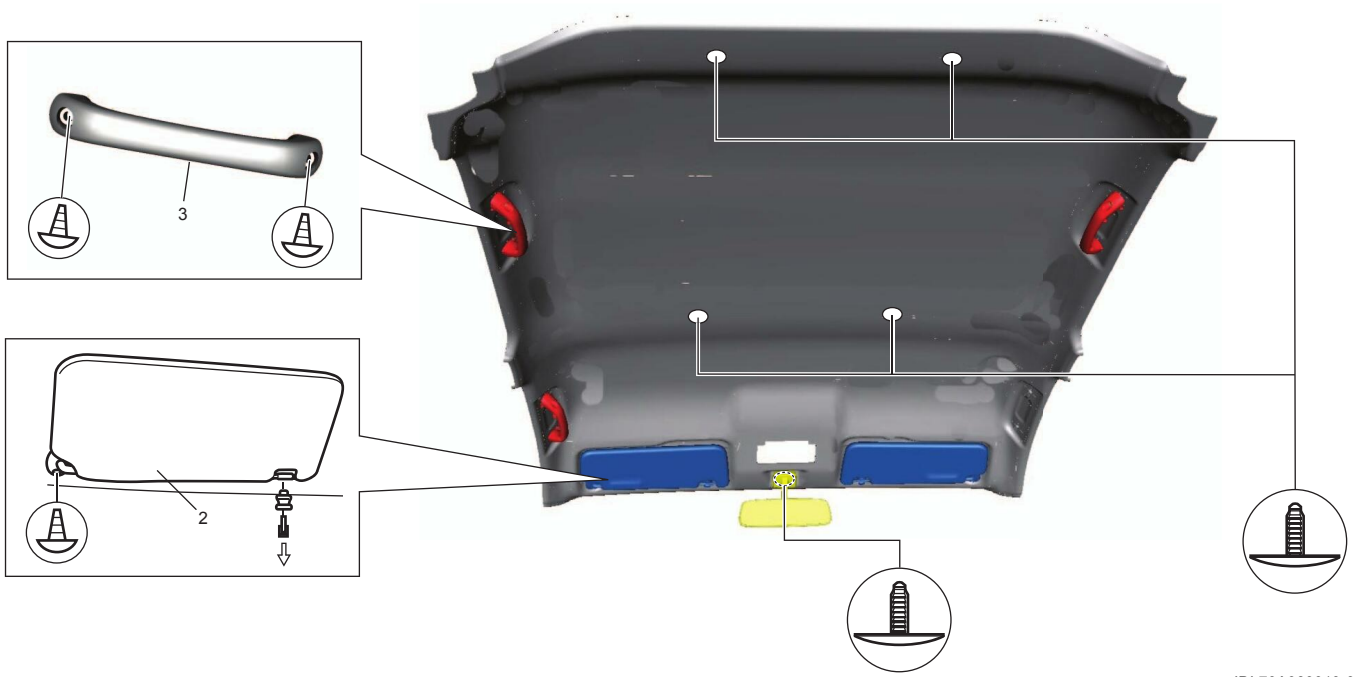
Removal

1) Remove front seats and rear seat.
   - Front seat: ☞(Page 9G-2)
   - Rear seat: ☞(Page 9G-4)
2) Remove side-sill scuffs (front and rear), dash side trims, center pillar lower trims, tail end trim and rear quarter lower trims. ☞(Page 9H-5)
3) Remove console box. ☞(Page 9H-9)
4) Remove floor carpet.

Installation

Reverse removal procedure noting the following.

- Tighten front seat mounting bolts to specified toque. ☞(Page 9G-1)
- Tighten rear hinge bolts to specified torque. ☞(Page 9G-3)



IDL70A980013-02

Installation

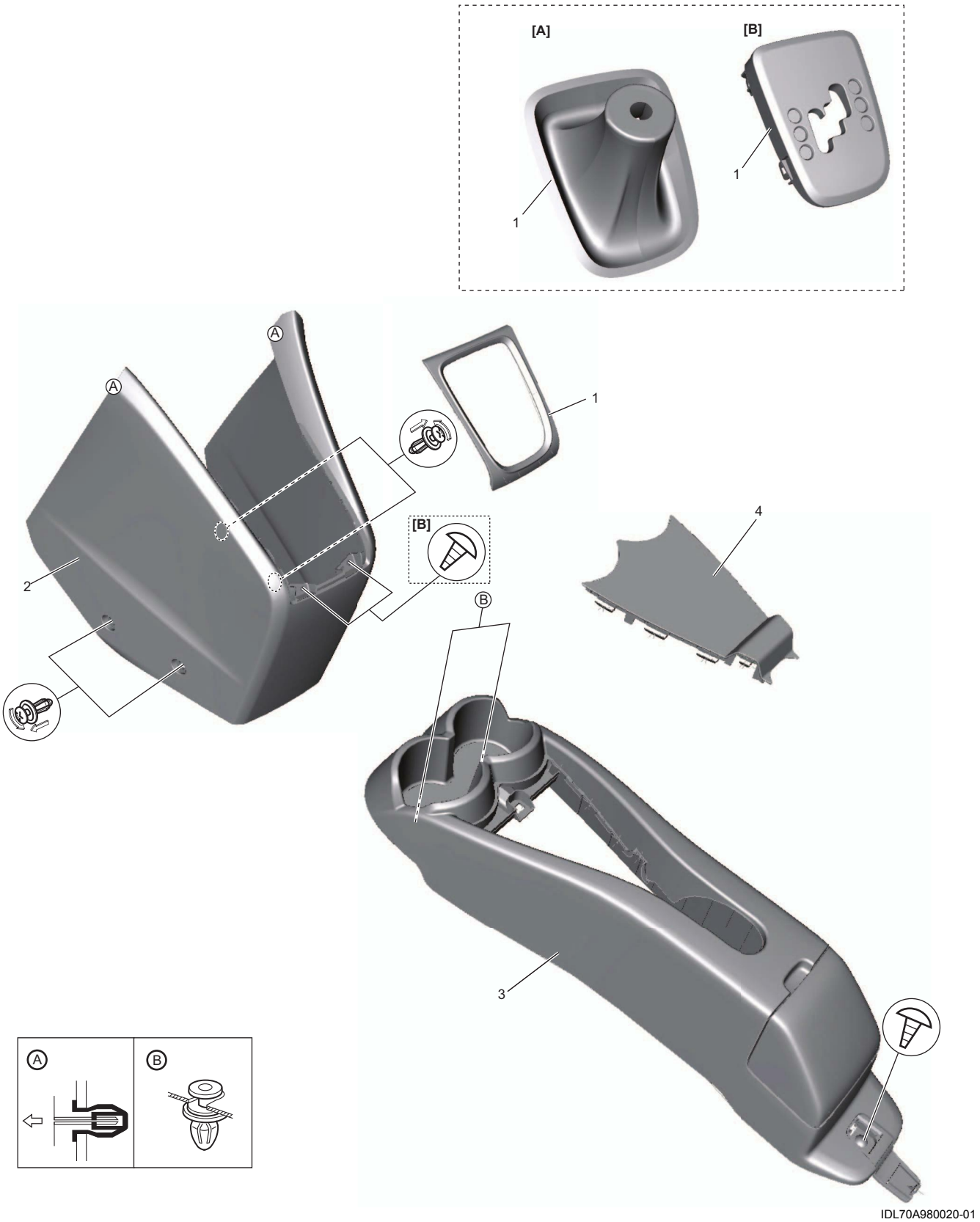
Reverse removal procedure noting the following.

- Enable air bag system after installation. ☞(Page 8B-47)

Console Box Removal and Installation

AENDL70A9806010

For removal and installation of console box, refer to the figure.



IDL70A980020-01

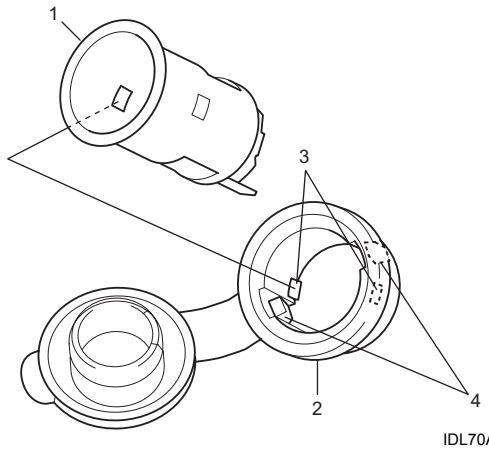
[A]: M/T model	1. Front floor console box garnish	3. Rear floor console box
[B]: AMT model	2. Front floor console box	4. Floor console box cap

Accessory Socket Removal and Installation

AENDL70A9806011

Removal

1) Push claws (3) outward and pull out socket body (1).
2) Push claws (4) inward and pull out socket cover (2) (if equipped).



IDL70A980018-02

Installation

Reverse removal procedure.

Specifications

Plastic Parts Specifications (for Reference)

AENDL70A9807001

Plastic Parts Material

⚠ CAUTION

As exterior and interior resin parts have material description on their back, use it as reference information. Also, when heating is needed in any service work, remove or protect resin parts as necessary.

Description of material classification code is as follows.

PA 66 - G F 30

1 2 3 4 5

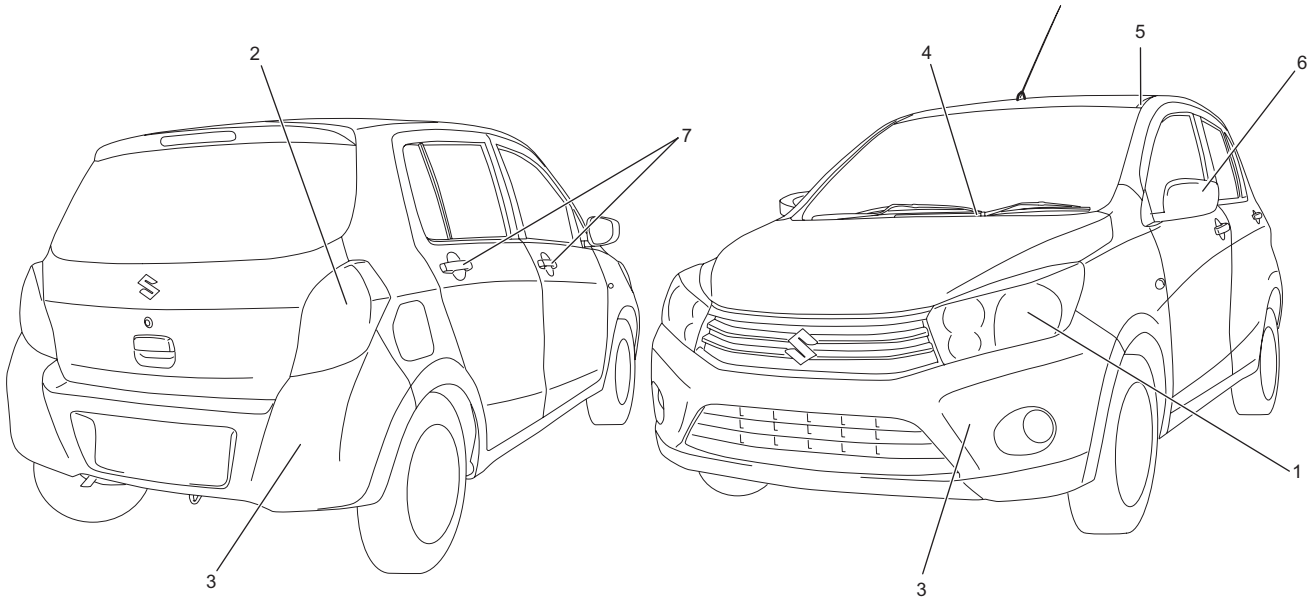
I8C50A980018-01

1. Material
2. Material variation (PA only) : 6, 66, etc.
3. Sub-material : “G” means glass, “M” means metal and “T” means talcum.
4. Sub-material shape: “B” means ball, “D” means powder and “F” means fiber.
5. Mixture ratio of sub material

Mark	Plastic name
ABS	Acrylonitrile-butadiene-styrene
AEPDS	Acrylonitrile-(Ethylene-Propylene-Diene)-styrene
ASA	Acrylonitrile-styrene-acrylate
EPDM	Terpolymer of ethylene, propylene and a diene with the residual unsaturated portion of the polymerized diene in the side chain
EPM	Ethylene-propylene copolymer
PA	Polyamide
PBT	Polybutylene terephthalate
PC	Polycarbonate
PE	Polyethylene
PET	Polyethylene terephthalate
PMMA	Poly methyl methacrylate
POM	Polyoxymethylene
PP	Polypropylene
PPE	Poly phenylene ether

Mark	Plastic name
PS	Polystyrene
PVC	Polyvinyl chloride
TEO	Thermoplastic elastomer, olefin
TPE	Thermoplastic elastomer
UP	Unsaturated polyester

Major Plastic Parts and Installation Positions
Body exterior



IDL70A980017-01

	Parts name		Mark	Heat resistant temperature limit (°C (°F))
1	Head light	Lens	PC	130 (266)
		Housing	PP-T20	130 (266)
2	Rear combination light	Lens	PMMA	100 (212)
		Housing	ASA	100 (212)
3	Bumper	Front / Rear	PP+EPM-TD15	80 (176)
4	Cowl top garnish		PP-TD15	80 (176)
5	Roof molding		TEO	80 (176)
6	Door mirror	Visor mirror cover	ASA	80 (176)
		Gasket	TPE	80 (176)
7	Outside door handle	Housing	PC+PBT-GF10	80 (176)
		Handle	PC+PBT-GF10	80 (176)

Body interior

	Parts name		Mark	Heat resistant temperature limit (°C (°F))
1	Front pillar trim		PP	80 (176)
2	Center pillar trim	Upper	PP	80 (176)
		Lower	PP+EPM-TD15	80 (176)
3	Rear quarter trim	Upper / Lower	PP	80 (176)
4	Side-sill scuff	Front / Rear	PP	80 (176)
5	Dash side trim		PP	80 (176)
6	Tail end trim		PP	80 (176)
7	Door trim	Front / Rear	PP+EPM-TD15	80 (176)
		Rear end	PP+EPM-TD15	80 (176)
8	Instrument panel	Upper / Lower	PP+EPM-TD25	80 (176)

	Parts name		Mark	Heat resistant temperature limit (°C (°F))
9	Console box	Front / Rear	PP+EPM-TD25	80 (176)
10	Console box front garnish		PP+EPM-TD25	80 (176)

Hood / Fenders / Doors

Precautions

Precautions for Hood / Fender / Door

AENDL70A9A00001

Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

Handling of Rear End Door Balancer (Damper)
Refer to “Rear End Door Assembly Removal and Installation” (Page 9J-7).

Repair Instructions

Hood Removal and Installation

AENDL70A9A06001

Removal

NOTICE

Place cloth to prevent vehicle body from any damage.

1) Remove hood hinge bolts (hood side) (3), and then remove hood (1).
2) Remove hood hinge (2) after removing front fender if necessary. ☞(Page 9J-3)

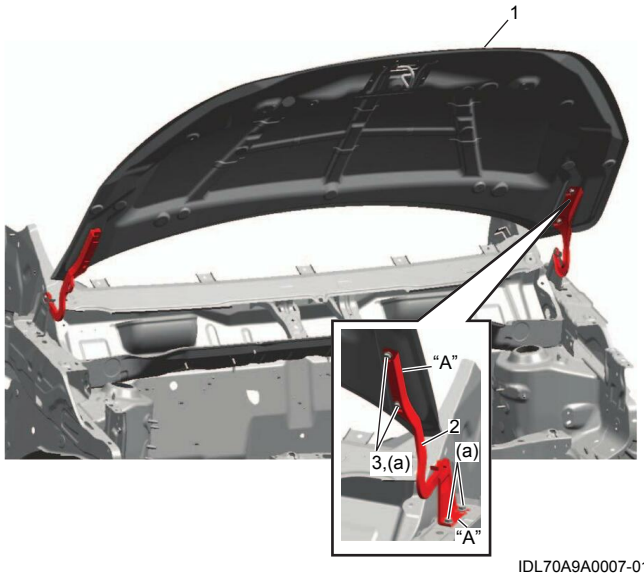
Installation
Reverse removal procedure noting the following.

- Apply sealant “A” to contact face of hood hinge.

  “A”: Sealant 99000–31110 (SUZUKI Bond No.1215)

- Adjust hood lock position if necessary. ☞(Page 9J-1)
- Tighten hood hinge bolts to specified torque.

  Tightening torque
  Hood hinge bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



IDL70A9A0007-01

Hood Inspection and Adjustment

AENDL70A9A06002

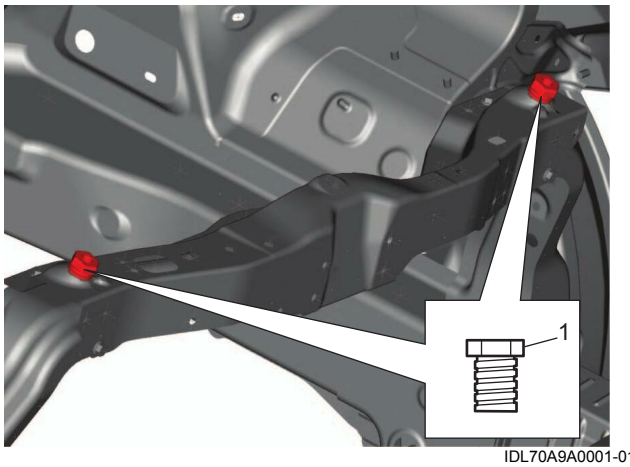
Inspection

- Check that hood opens and closes smoothly and properly.
  Lubricate if necessary.
- Check that hood stops in secondary latched position properly and that hood closes completely in fully latched position.
- Adjust hood latch position, if necessary.

Adjustment
Front-and-back and right-and-left adjustment

1) Loosen hood hinge bolts (hood side) and adjust hood clearance. ☞(Page 9K-19)
2) Tighten hood hinge bolts (hood side) to specified torque. ☞(Page 9J-1)

Height adjustment
Adjust hood height with front fender by tightening or loosing hood cushion (1).

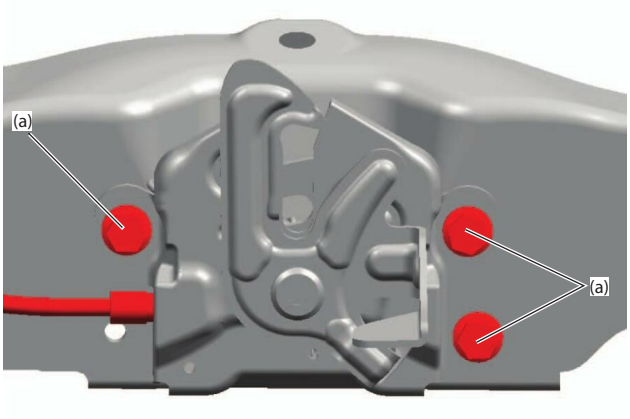


IDL70A9A0001-01

Hood latch position adjustment

1) Adjust hood latch position by loosening hood latch bolts.
2) Tighten hood latch bolts to specified torque.

Tightening torque
Hood latch bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



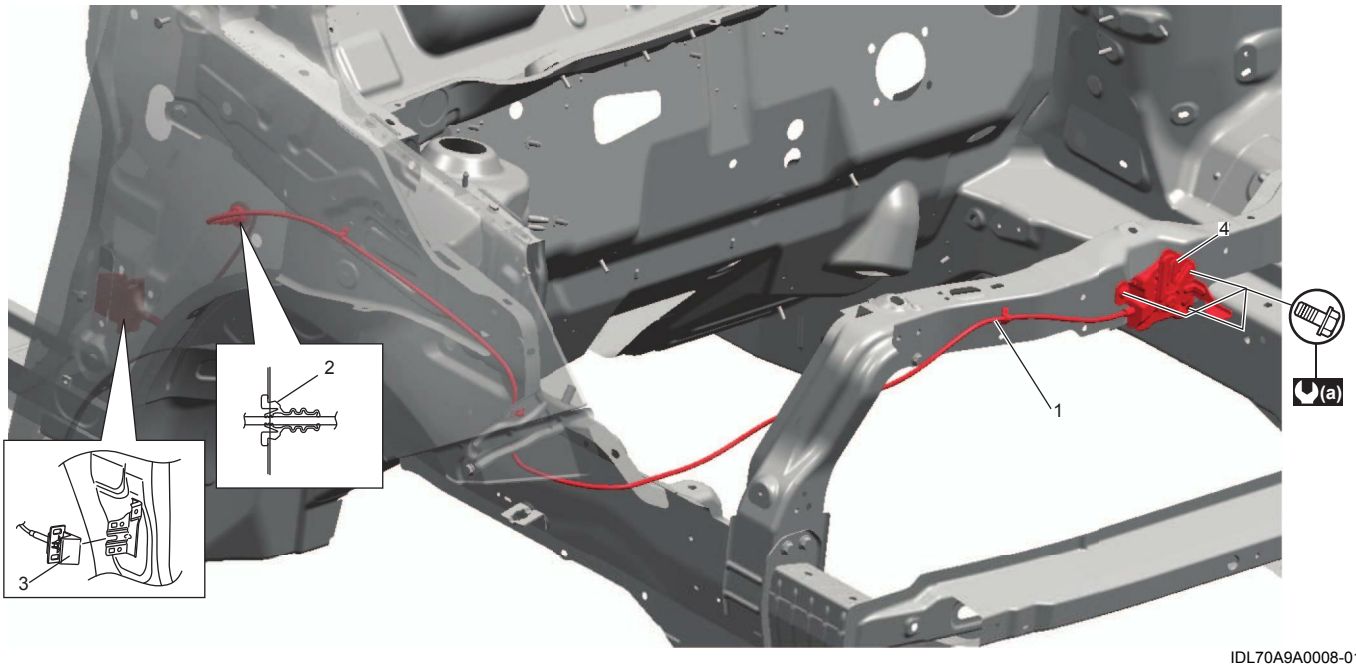
IDL70A9A0002-01

3) Make sure the hood is locked smoothly and securely.

Hood Release Cable Removal and Installation

AENDL70A9A06003

For removal and installation of hood release cable, refer to the figure.

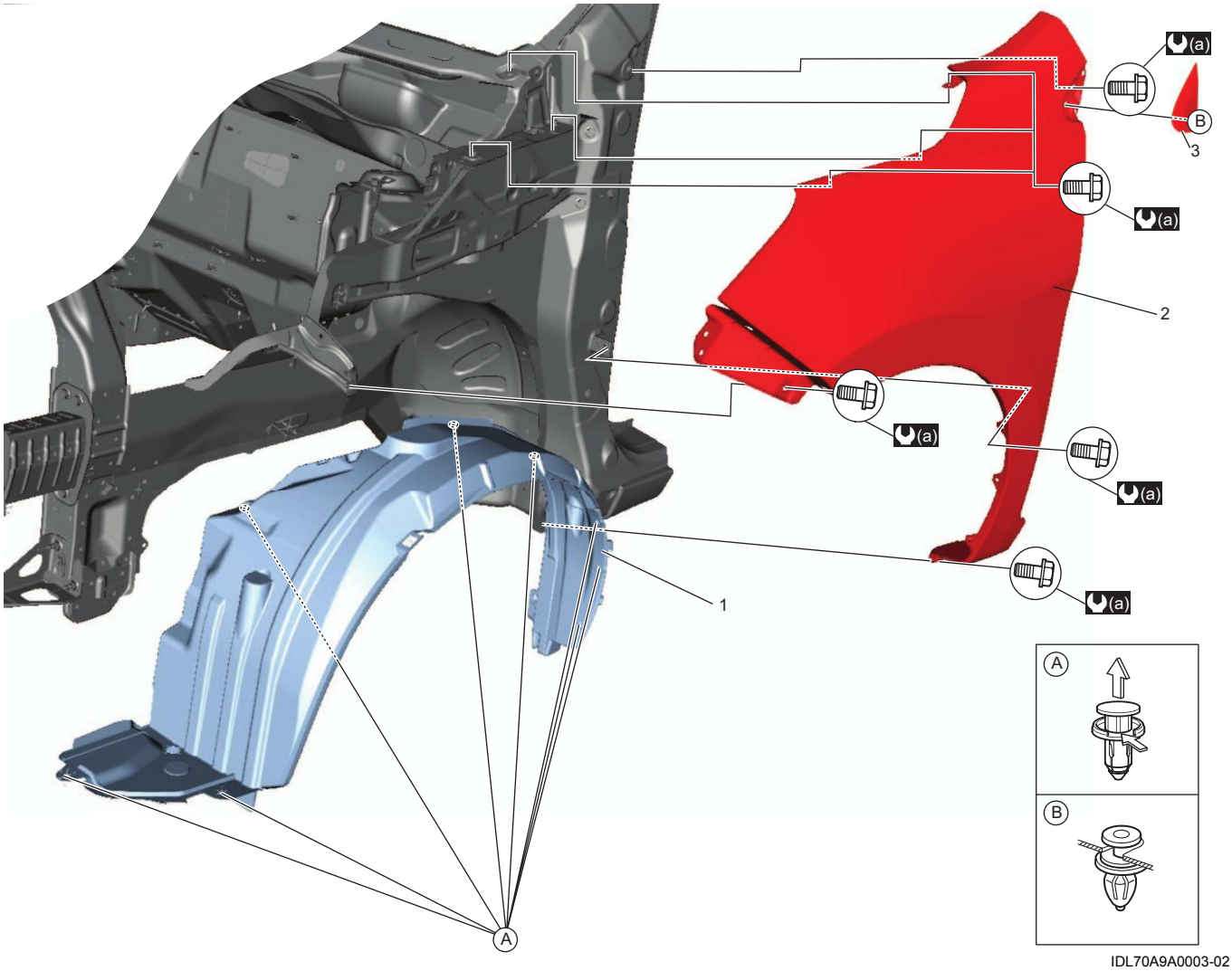


IDL70A9A0008-01

1. Hood release cable	4. Hood latch
2. Grommet	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Hood release lever	

Front Fender Components

AENDL70A9A06004



IDL70A9A0003-02

1. Front fender lining	3. Front pillar outer garnish
2. Front fender	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

Front Fender Removal and Installation

AENDL70A9A06005

Removal

1) Remove front fender lining.
2) Remove front bumper and front bumper holder. ☞(Page 9H-1)
3) Remove headlight assembly. ☞(Page 9B-4)
4) Remove side turn signal light. ☞(Page 9B-9)
5) Remove cowl top side garnish cover. ☞(Page 9H-3)
6) Remove front pillar outer garnish.
7) Remove front fender.

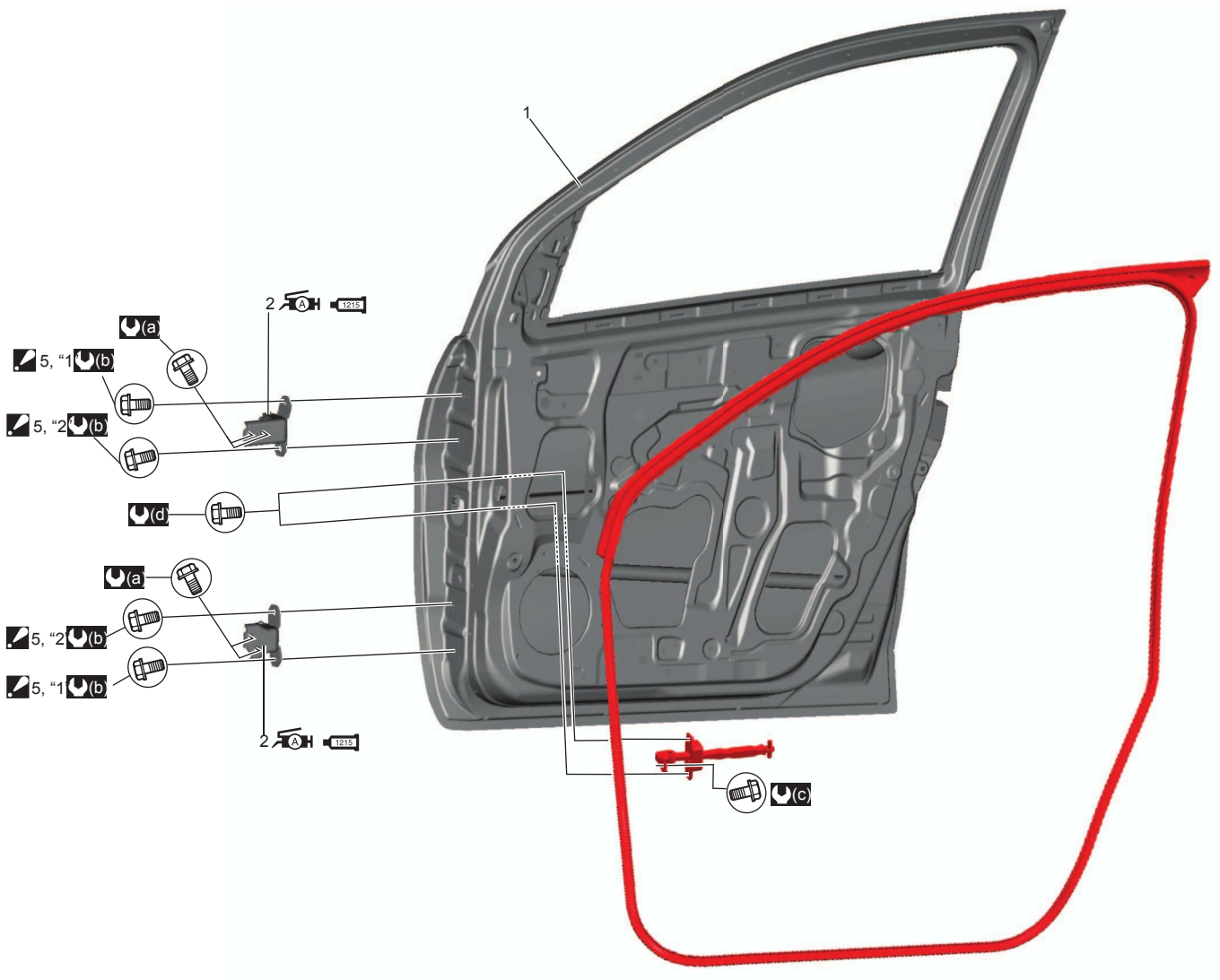
Installation

Reverse removal procedure noting the following.

- Tighten front fender bolts to specified torque. ☞(Page 9J-3)
- If paint on any fender bolt is peeled off, be sure to apply paint again.
- Adjust panel clearance. “Panel Clearance” in Section 9K (Page 9K-19)
- After installation, be sure to check and adjust headlight aiming. ☞(Page 9B-6)

Front Door Assembly Components

AENDL70A9A06006



IDL70A9A0004-03

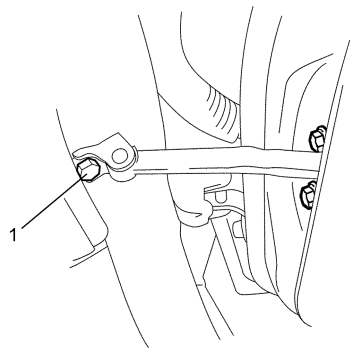
1. Door panel	4. Front door opening weather-strip	(b) : 26.5 N·m (2.7 kgf-m, 19.5 lbf-ft)
A 1215 2. Door hinge : Apply lithium grease 99000-25011 to rotating part. : Apply sealant 99000-31110 to contact face.	5. Door hinge bolt : Tighten them in numerical order ("1" and "2").	(c) : 20.5 N·m (2.1 kgf-m, 15.1 lbf-ft)
3. Door open stopper	(a) : 26.5 N·m (2.7 kgf-m, 19.5 lbf-ft)	(d) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)

Front Door Assembly Removal and Installation

AENDL70A9A06007

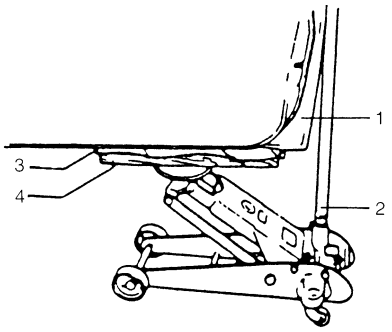
Removal

1) Remove front fender. ☞(Page 9J-3)
2) Remove front door trim. ☞(Page 9E-14)
3) Disconnect door harness connectors from each electrical device in front door assembly.
4) Remove door open stopper bolt (1).



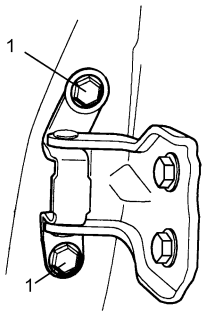
I8C50A9A0006-01

5) Support door panel (1) using a jack (2) with rags (3) and a piece of wood (4) placed between jack and door panel as shown.



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6) Remove front door hinge bolts (1), and then remove front door assembly.



I8C50A9A0015-01

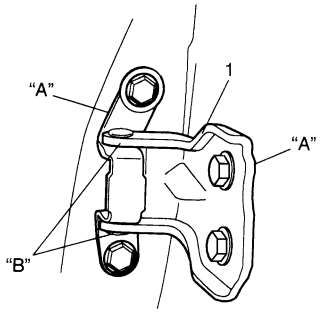
7) Remove door hinges if necessary.
8) Remove door open stopper if necessary. ☞(Page 9J-4)

Installation

Reverse removal procedure noting the following.

- Apply sealant “A” to contact face of door hinge (1) and apply grease “B” to rotating part of door hinge (1).

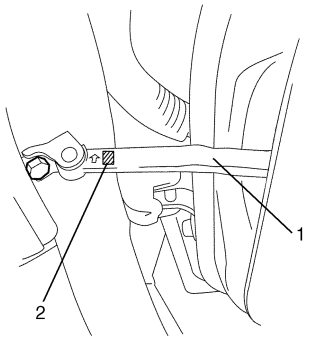
  “A”: Sealant 99000–31110 (SUZUKI Bond No.1215)
  “B”: Grease 99000–25011 (SUZUKI Super Grease A)



I6RW0B9A0003-01

- Tighten front door hinge bolts and door open stopper bolt to specified torque. ☞(Page 9J-4)
- When installing door open stopper (1), make sure punch mark (2) is faces up.

  Door open stopper installing direction
  Left side door: Punch mark “L” faces upward
  Right side door: Punch mark “R” faces upward

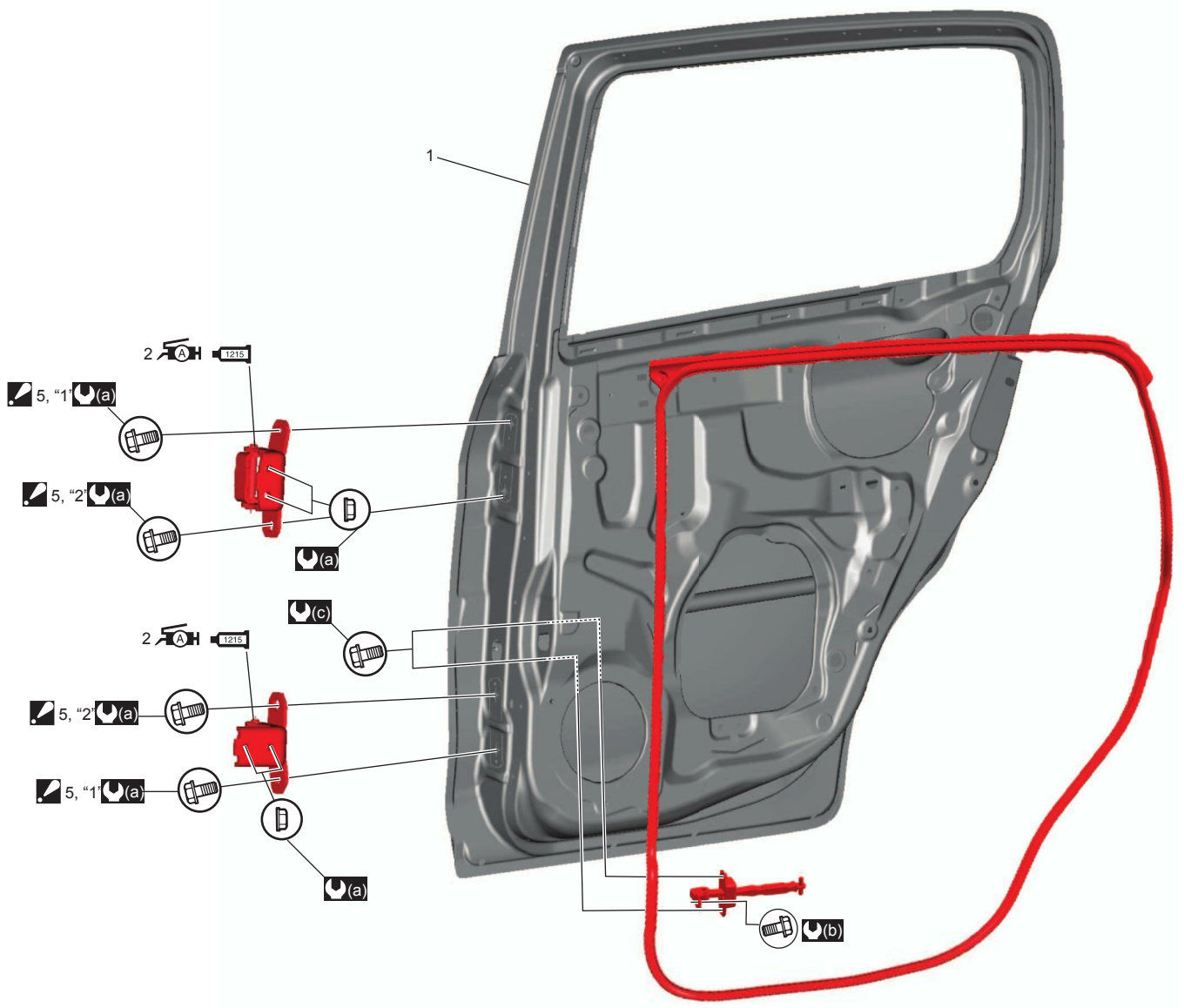


I6RW0B9A0004-01

- Adjust door latch striker position. ☞(Page 9F-5)
- Adjust door position. “Panel Clearance” in Section 9K (Page 9K-19)
- After installation, check looseness by opening and closing door several times.

Rear Door Assembly Components

AENDL70A9A06008



IDL70A9A0009-02

1. Door panel	4. Rear door opening weather-strip	(b) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
A H 1215 2. Door hinge : Apply lithium grease 99000-25011 to rotating part. : Apply sealant 99000-31110 to contact face.	5. Door hinge bolt : Tighten them in numerical order ("1" and "2").	(c) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
3. Door open stopper	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)	

Rear Door Assembly Removal and Installation

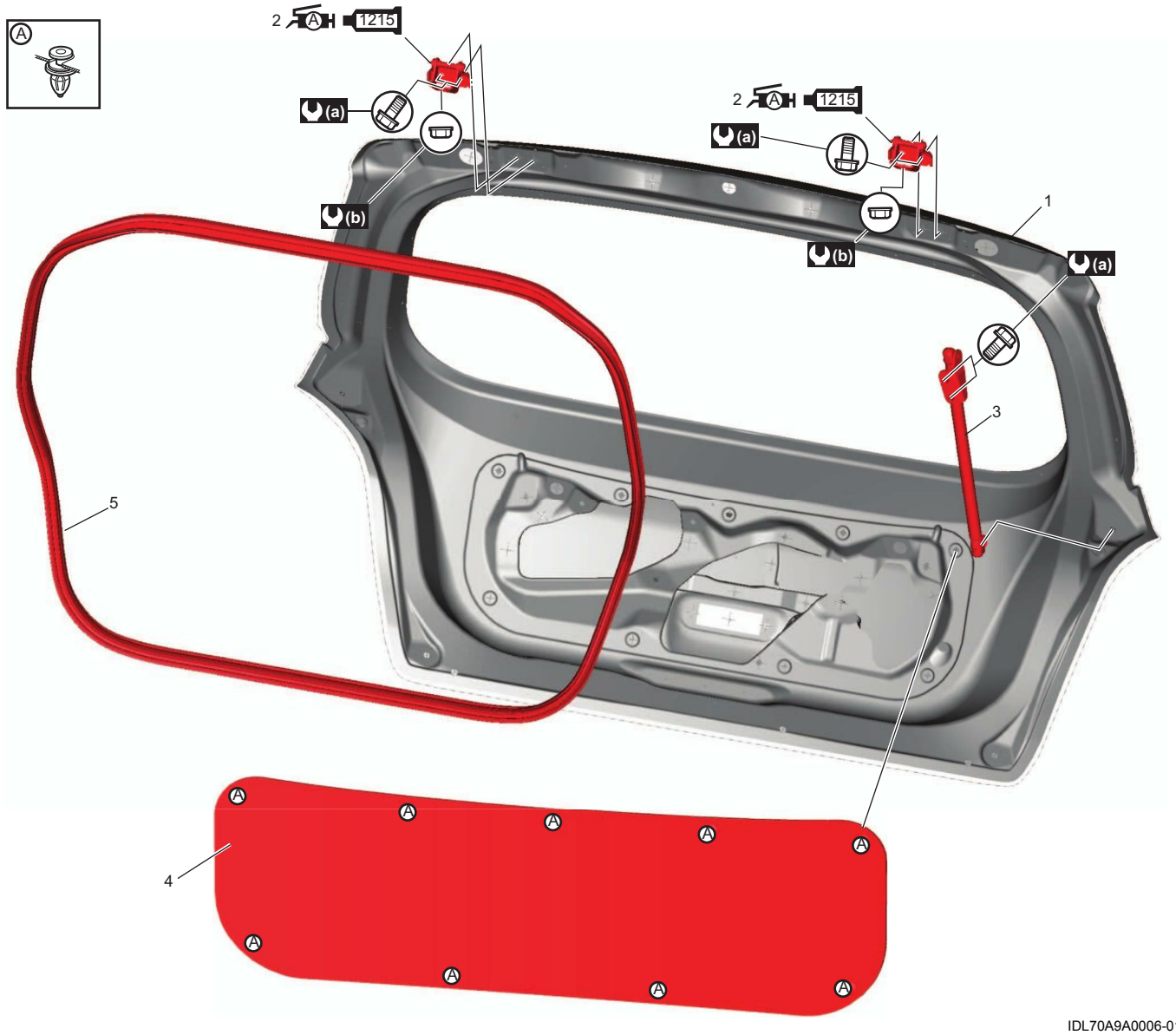
AENDL70A9A06009

Refer to "Front Door Assembly Removal and Installation" (Page 9J-4) as removal and installation procedures are basically the same. However, note the following.

- Tighten rear door hinge bolts and nuts to specified torque. ☞(Page 9J-6)

Rear End Door Assembly Components

AENDL70A9A06010



IDL70A9A0006-01

1. Rear end door panel	4. Rear end door trim	(b) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
A 1215 2. Rear end door hinge : Apply lithium grease 99000-25011 to door hinge moving section. : Apply sealant 99000-31110 to contact face.	5. Rear end door opening wether-strip	
3. Rear end door balancer	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)	

Rear End Door Assembly Removal and Installation

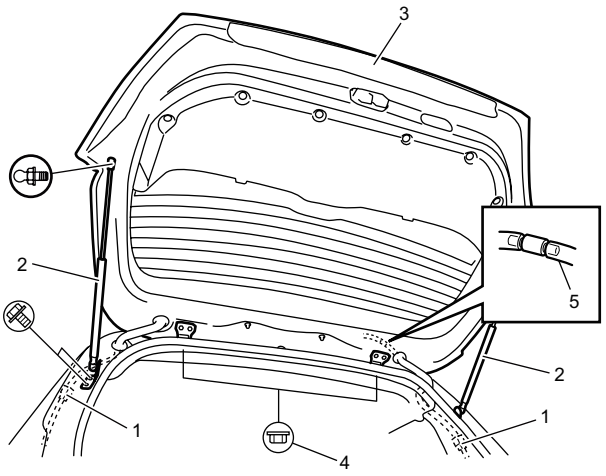
AENDL70A9A06011

⚠ WARNING

When rear end door balancers are not installed and door is open, the door slams shut by its own weight.
Use care to avoid personal injury and damage of vehicle body.

Removal

1) Remove head lining. ☞(Page 9H-7)
2) Disconnect rear end door harness connectors (1) and washer hose (5).
3) Remove rear end door balancers (2).
4) Remove rear end door hinge nuts (4), and then remove rear end door assembly (3) with rear end door hinges.
5) Remove rear end door hinges, rear end door balancers, rear end door trim and/or rear end door opening weather-strip if necessary. ☞(Page 9J-7)
6) Remove rear wiper motor assembly if necessary. ☞(Page 9D-6)



IDL70A9A0012-01

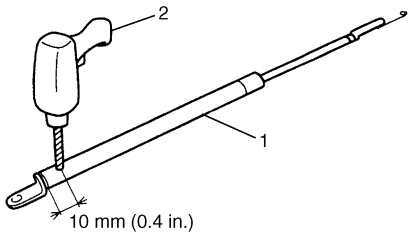
⚠ CAUTION

Handling of rear end door balancer (damper)

- **Handle balancer carefully. Do not scar or scratch exposed surface of its piston rod, and never allow any paint or oil stuck on its surface.**
- **Do not turn piston rod with balancer fully extended.**
- **Do not disassemble balancer (1) because its cylinder is filled with gas.**

Discarding of rear end door balancer (damper)

- **The gas itself in balancer is harmless but it may issue out of the hole together with chips generated by the drill (2). Therefore, be sure to wear goggle when drilling.**
- **Using a 2 to 3 mm (0.08 to 0.12 in.) drill (2), make a hole and remove gas inside as shown before discarding.**



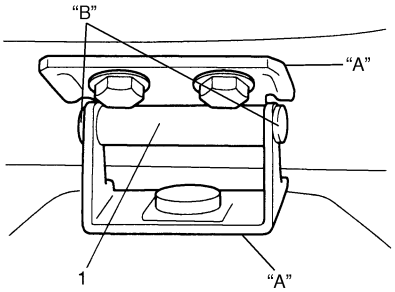
I2RH019A0010-01

Installation

Reverse removal procedure noting the following.

- Tighten bolts and nuts to specified torque. ☞(Page 9J-7)
- Adjust door latch striker position. ☞(Page 9F-9)
- Adjust door cushion to prevent door contacts body when closed.
- Apply sealant to contact face “A” of door hinge (1) and apply grease to rotating part “B” of door hinge (1). Specified sealant and grease.

“A”: Sealant 99000–31110 (SUZUKI Bond No.1215)
“B”: Grease 99000–25011 (SUZUKI Super Grease A)

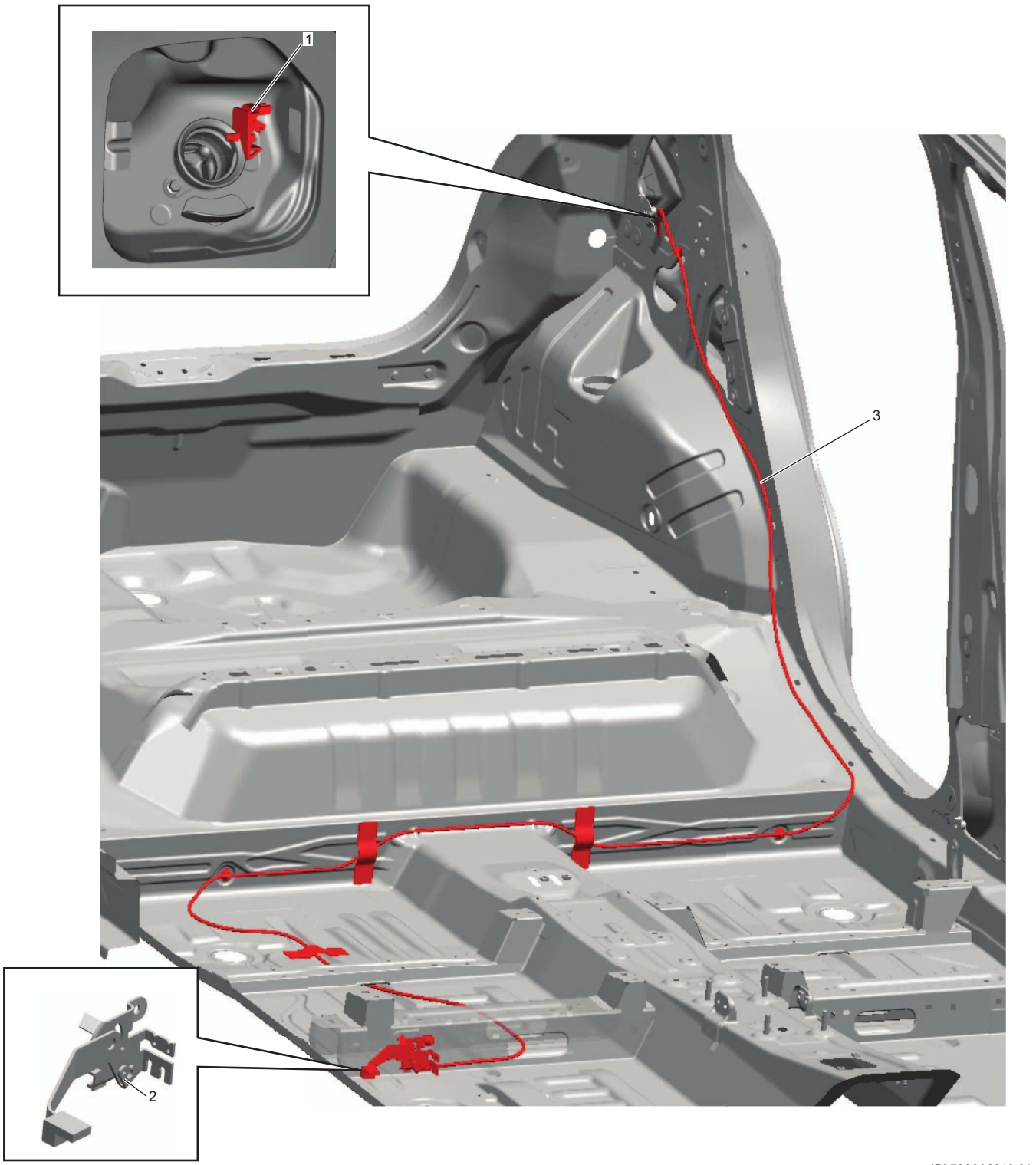


I2RH019A1012-01

Fuel Filler Door Opener Cable, Rear End Door Opener Cable Removal and Installation

AENDL70A9A06012

- For removal and installation of fuel filler door opener cable (3), refer to the figure.
- When removing fuel filler door opener cable, remove fuel filler door opener (1) and fuel filler door opener lever assembly (2) first.



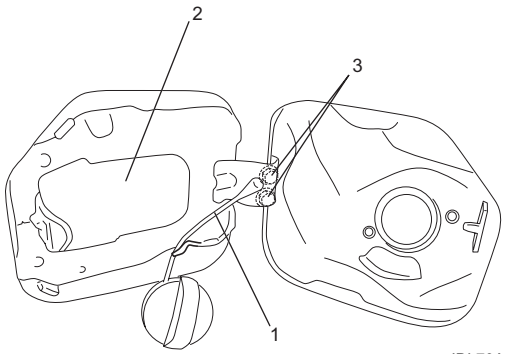
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Fuel Filler Door Removal and Installation

AENDL70A9A06013

Removal

1) Remove fuel filler cap tether (if equipped) (1) from fuel filler door (2).
2) Remove fuel filler door bolts (3) and remove fuel filler door (2).



IDL70A9A0011-02

Installation
Reverse removal procedure.

All Latches, Hinges and Locks Inspection

AENDL70A9A06014

Door

- Check that front, rear and rear end doors open and close smoothly and lock securely when closed.
- If any abnormality is found, lubricate hinge and latch or repair door lock system.

Engine Hood

- Check that secondary latch operates properly (check that secondary latch keeps hood from opening all the way even when pulling hood release handle inside vehicle.)
- Check that hood opens and closes smoothly and properly and hood locks securely when closed.
- If any abnormality is found, lubricate hinge and latch, or repair hood lock system.

Specifications

Tightening Torque Specifications

AENDL70A9A07001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Hood hinge bolt	10	1.0	7.5	☞(Page 9J-1)
Hood latch bolt	10	1.0	7.5	☞(Page 9J-2)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
“Hood Release Cable Removal and Installation” (Page 9J-2)
“Front Fender Components” (Page 9J-3)
“Front Door Assembly Components” (Page 9J-4)
“Rear Door Assembly Components” (Page 9J-6)
“Rear End Door Assembly Components” (Page 9J-7)
“Fasteners Information” in Section 0A (Page 0A-5)

Special Tools and Equipment

Recommended Service Material

AENDL70A9A08001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞(Page 9J-5) / ☞(Page 9J-8)
Sealant	SUZUKI Bond No.1215	P/No.: 99000–31110	☞(Page 9J-1) / ☞(Page 9J-5) / ☞(Page 9J-8)

NOTE

Required service materials are also described in:
“Front Door Assembly Components” (Page 9J-4)
“Rear Door Assembly Components” (Page 9J-6)
“Rear End Door Assembly Components” (Page 9J-7)

Body Structure

Precautions

Precautions for Body Structure

AENDL70A9B00001

Operation

⚠ WARNING

Failure to take proper precautions when performing the body repair work can result in severe personal injury.
Be sure to take the following precautions to reduce the risk of injury.

- **Wear clothing and protective items suitable for operation.**
- **Before attempting any body repair, be sure to disconnect negative (–) cable at battery.**
- **When using the body frame repair device for pulling-out operation, avoid standing in front of the pulling chain.**
- **Whenever repairing the body panel work near the fuel tank using flames or sparks, be sure to remove the fuel tank from the vehicle and prevent the removed fuel tank from fuel leakage. ☞(Page 1G-19)**

High-Strength Steel

NOTICE

Body panels of high-strength steel with the tensile strength more than 590 MPa will remarkably loose its strength by cutting, heating and welding.
Replace them with new spare panels and apply specified spot welding condition in the repair work, referring to "Sheet Metal Description" (Page 9K-5) for tensile strength of steel panels.

Body Panel Repair

NOTICE

Failure to take proper precautions when performing body repair work can reduce original strength of the body.

- **The number of spot welded points should be increased by 20 to 30% in number from original welding points. The numbers and locations of the welding points in the drawings show the original spot welding.**
- **Although the spot welding is recommended in the repair procedure, you shall adopt plug welding when the panel thickness for welding points exceeds the performance of your spot welding device. Take the following precautions to reduce the risk of the strength reduction.**
  For the plug welding, select hole diameter referring to the following table according to the panel thickness and type of the steel panel.
- **Select hole diameter for plug welding referring to the following table according to panel thickness and type of steel panel.**

Panel thickness	Hole diameter for plug weld
1.0 mm (0.04 in.) or less *	ø 6.0 (ø 0.24 in.) or more
1.0 mm – 1.5 mm (0.04 in. – 0.06 in.)*	ø 8.0 (ø 0.31 in.) or more
1.5 mm (0.06 in.) or more *	ø 10.0 (ø 0.39 in.) or more

*** ø10.0 (ø0.39 in.) or more for parts using high-tensile steel panel**

- **Refer to "Sheet Metal Description" (Page 9K-5) for types and thickness of steel panels.**
- **Before welding, always remove paint layer and plating from body panels at every welding point to prevent incomplete welding. Also, always apply welding primer/spot sealer to prevent rust on welding points.**
- **When installing new parts, refer to "Body Dimensions" and "Panel Clearance" (Page 9K-19).**
- **After repairing body panels, apply seam sealer, cavity protection, underbody coating and anti-corrosion compound to all areas originally protected by the manufacture referring to "Sealant Application Areas" in Section 9L (Page 9L-2), "Undercoating Application Areas" in Section 9L (Page 9L-10) and "Anti-Corrosion Compound Application Area" in Section 9L (Page 9L-11).**

Precautions for Working on Air Bag System

⚠ WARNING

Failure to take proper precautions when performing the body repair work can result in severe personal injury.
Be sure to take the following precautions to reduce the risk of injury.

- **When performing repair work around air bag system related parts, be careful not to apply strong impact with hammer or impact wrench.**
- **When performing sheet metal work near air bag system related parts, be sure to check system for function (that air bag warning light lights up properly).**

General Description

Body Repair Description

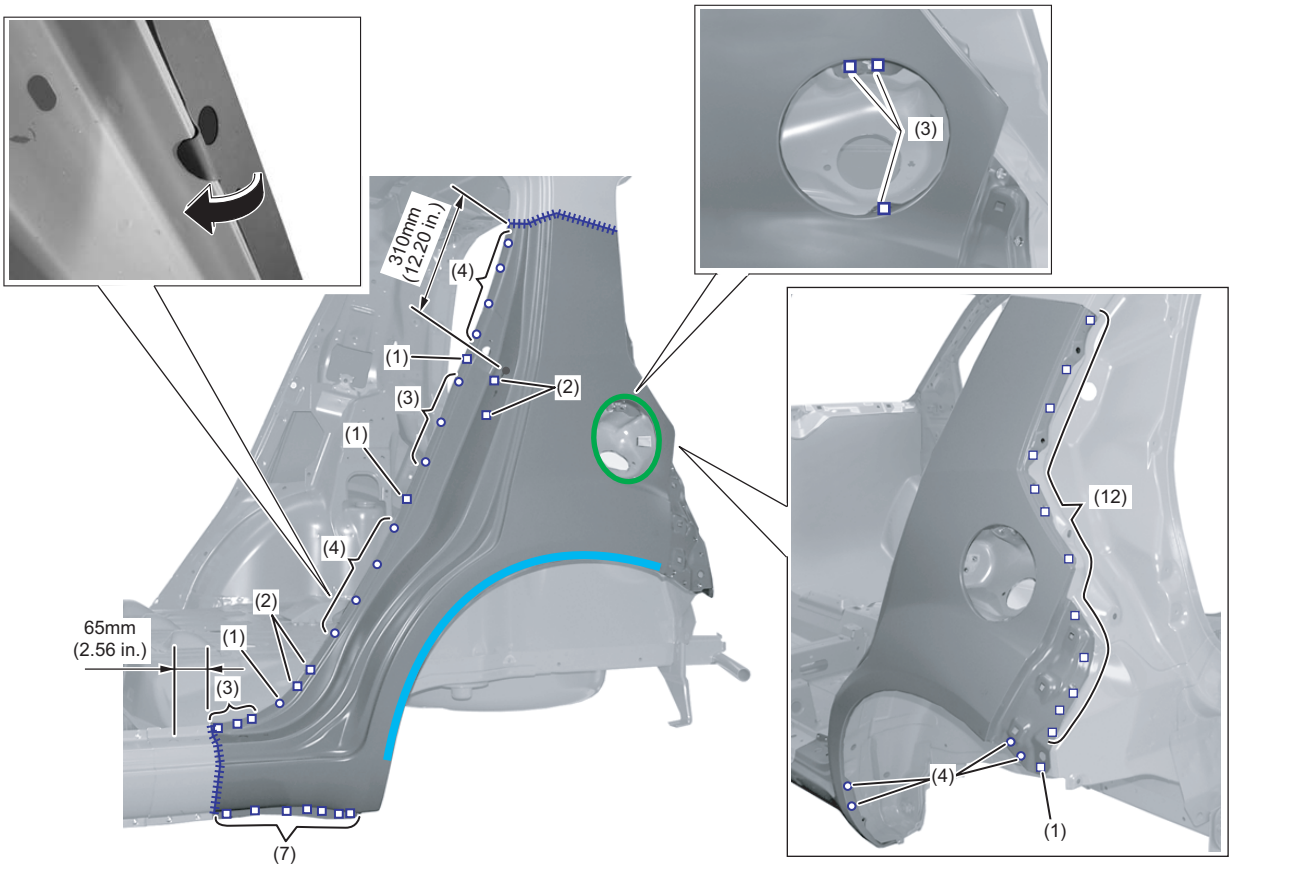
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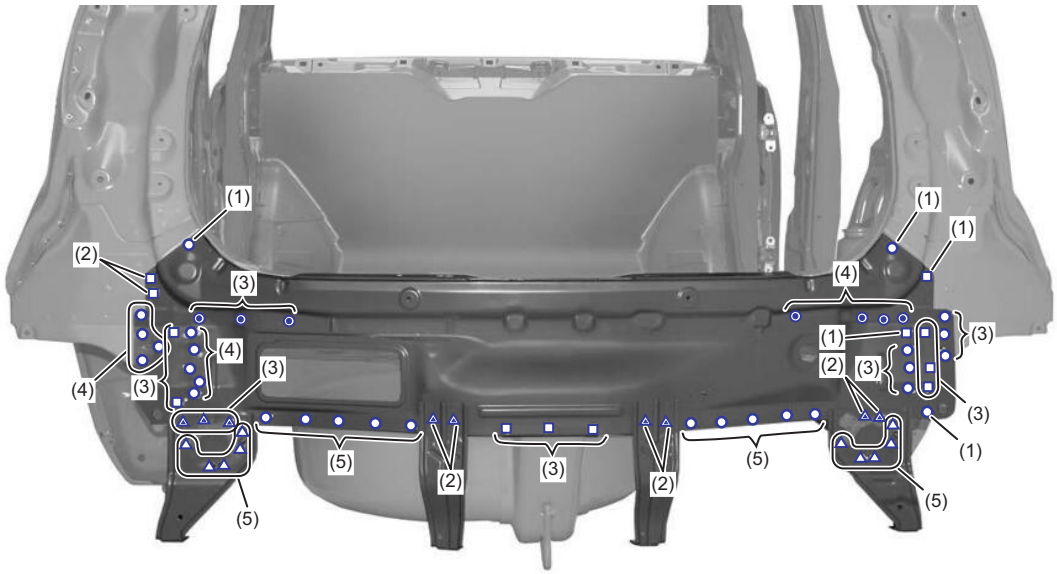
NOTE

Body repair work consists of "diagnosis, removal, installation and replacement" of body parts and "rust-proofing" etc.

- **Use SUZUKI genuine service parts and materials and follow repair instructions in this manual to ensure repair quality. Body repair work should be performed by qualified technicians.**
- **This manual dose not describe most of panel repair works as cutting, drilling and welding and frame corrections. Refer to the SUZUKI body repair training DVD for such technics.**
- **Be noted that most of important information are inserted as symbols into every illustration. The following description of symbol definitions is essential for the body repair procedures.**
- **Most of repair procedures are described on the left side of the vehicle. Most parts of the vehicle are almost symmetrical in the welding spots. A separate repair procedure for the right side is shown only if the construction or welding spots are significantly different.**
- **Refer to the following for plastic parts and sealer application area.**
  - **– "Plastic Parts Specifications (for Reference)" in Section 9H (Page 9H-10)**
  - **– "Sealant Application Areas" in Section 9L (Page 9L-2)**

Symbols





IAW1019B0028-02

Symbol	Definition	Remarks
	Detach Welding (one panel thickness)	This symbol indicates that only one panel should be removed from panel structure.
	Detach Welding (two panel thickness)	This symbol indicates that two panels should be removed from panel structure.
	Make Cut	
	Spot Welding (two panel thickness)	Use a spot weld machine appropriate for the type and thickness of the panel of the welding point.
	Spot Welding (three panel thickness)	
	Plug Welding (two panel thickness)	
	Plug Welding (three panel thickness)	
	Either Spot or Plug Welding (two panel thickness)	If the spot welding is conducted, be sure to use a spot weld machine appropriate for the type and thickness of the panel of the welding point.
	Either Spot or Plug Welding (three panel thickness)	
	Tack Welding	
	Continuous MIG-Welding	
	Brazing	
	Adhesive	
	Body Sealer	This mark is used for important points that need water proof treatment especially.
	Foamed Material	
( )	The Number of Welding	

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Sheet Metal Description

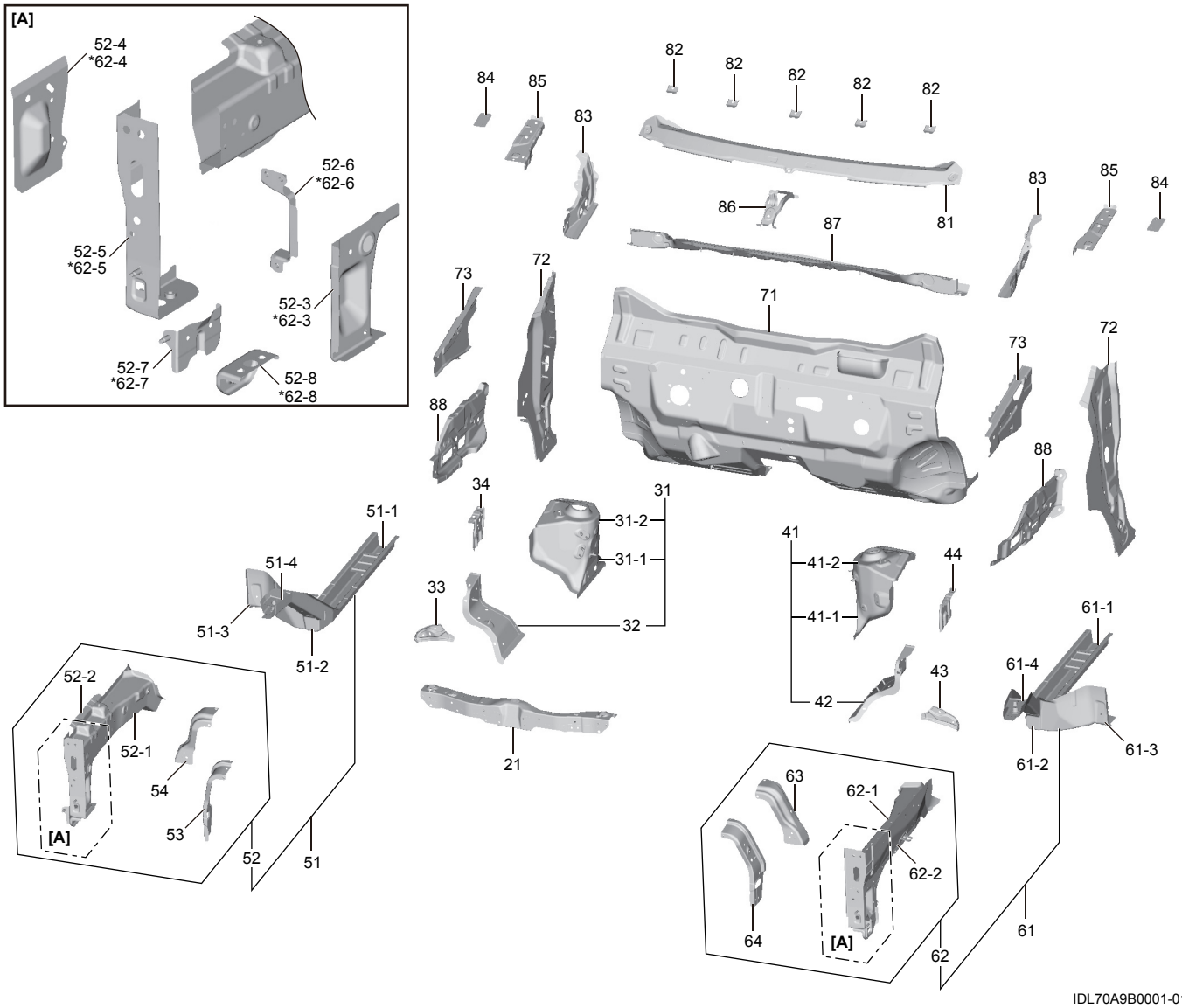
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This section contains information for body repair (welding) work.

NOTE

All the numbered panels in figure are supplied available as spare parts.

Front Body

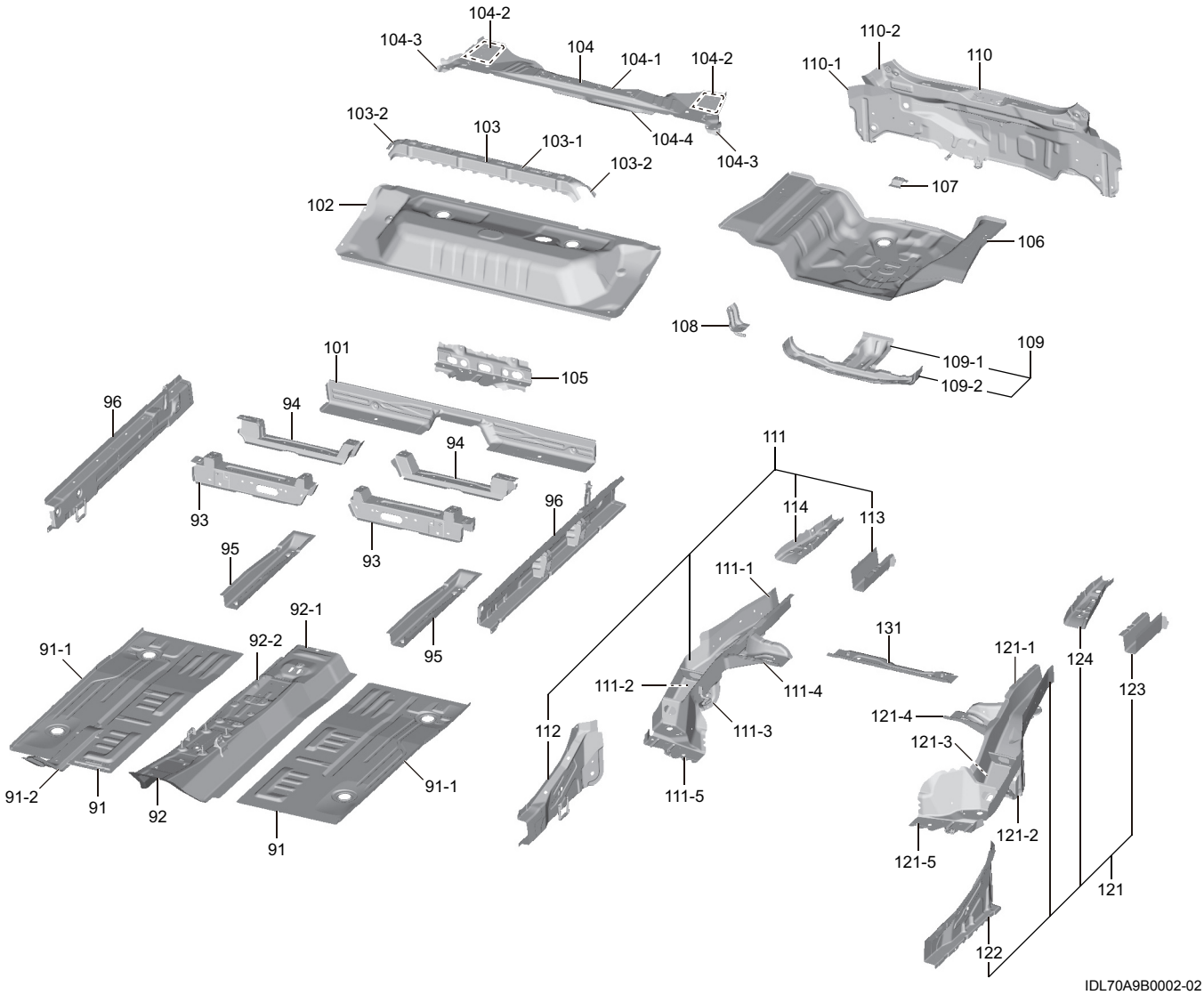


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No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
21	Hood lock member	1		(bolt-on part)	
31	Fender apron panel (R)	1			
31-1	Fender apron front panel (R)				0.8 (0.031)
31-2	Suspension upper bracket (R)				2.0 (0.079)
32	Apron front extension (R)	1			1.4 (0.055)
33	Front fender lower bracket (R)	1			0.8 (0.031)
34	Front fender bracket (R)	1			1.0 (0.039)
41	Fender apron panel (L)	1			
41-1	Fender apron front panel (L)				0.8 (0.031)
41-2	Suspension upper bracket (L)				2.0 (0.079)
42	Apron front extension (L)	1			1.4 (0.055)
43	Front fender lower bracket (L)	1			0.8 (0.031)

No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
44	Front fender bracket (L)	1			1.0 (0.039)
51	Front side member (R)	1			
51-1	Suspension frame rear mounting bracket (R)		○	590	1.6 (0.063)
51-2	Dash side member (R)		○	590	2.0 (0.079)
51-3	Dash lower side extension (R)		○		1.4 (0.055)
51-4	Suspension frame front mounting reinforcement (R)		○		1.2 (0.047)
52	Apron side member (R)	1			
52-1	Apron side member (R)				1.6 (0.063)
52-2	Apron side member outer panel (R)			590	1.4 (0.055)
52-3	Apron side inner front extension (R)		○	440	1.4 (0.055)
52-4	Apron side outer front extension (R)		○	440	1.4 (0.055)
52-5	Front bumper member plate (R)				1.6 (0.063)
52-6	Apron side inner front gusset (R)		○	440	1.2 (0.047)
52-7	Tie down hook reinforcement (R)		○		1.6 (0.063)
52-8	Tie down hook (R)		○		2.6 (0.102)
52-9	Engine mount bracket				2.3 (0.091)
53	Lamp support inner brace (R)	1			1.6 (0.063)
54	Lamp support outer brace (R)	1			1.4 (0.055)
61	Front side member (L)	1			
61-1	Suspension frame rear mounting bracket (L)		○	590	1.6 (0.063)
61-2	Dash side member (L)		○	590	2.0 (0.079)
61-3	Dash lower side extension (L)		○		1.4 (0.055)
61-4	Suspension frame front mounting reinforcement (L)		○		1.2 (0.047)
62	Apron side member (L)	1			
62-1	Apron side member (L)		○		1.6 (0.063)
62-2	Apron side member outer panel (L)		○	590	1.4 (0.055)
62-3	Apron side inner front extension (L)		○	440	1.4 (0.055)
62-4	Apron side outer front extension (L)		○	440	1.4 (0.055)
62-5	Front bumper member plate (L)				1.6 (0.063)
62-6	Apron side inner front gusset extension (L)		○	440	1.2 (0.047)
62-7	Tie down hook reinforcement (L)		○		1.6 (0.063)
62-8	Tie down hook (L)		○		2.6 (0.102)
63	Lamp support inner brace (L)	1			1.6 (0.063)
64	Lamp support outer brace (L)	1			1.4 (0.055)
71	Dash panel	1			0.8 (0.031)
72	Dash side panel (R, L)	1		440	1.0 (0.039)
73	Dash side front panel (R, L)	1			1.4 (0.055)
81	Cowl top panel	1			0.6 (0.024)
82	Instrument panel upper bracket	5			1.0 (0.039)
83	Cowl side panel (R, L)	1			1.0 (0.039)
84	Front hood hinge patch (R, L)	1			1.2 (0.047)
85	Cowl side reinforcement (R, L)	1			1.0 (0.039)
86	Wiper unit center bracket	1	○		1.0 (0.039)
87	Cowl front panel	1	○		0.6 (0.024)
88	Cowl side outer member (R, L)	1			0.6 (0.024)

Floor



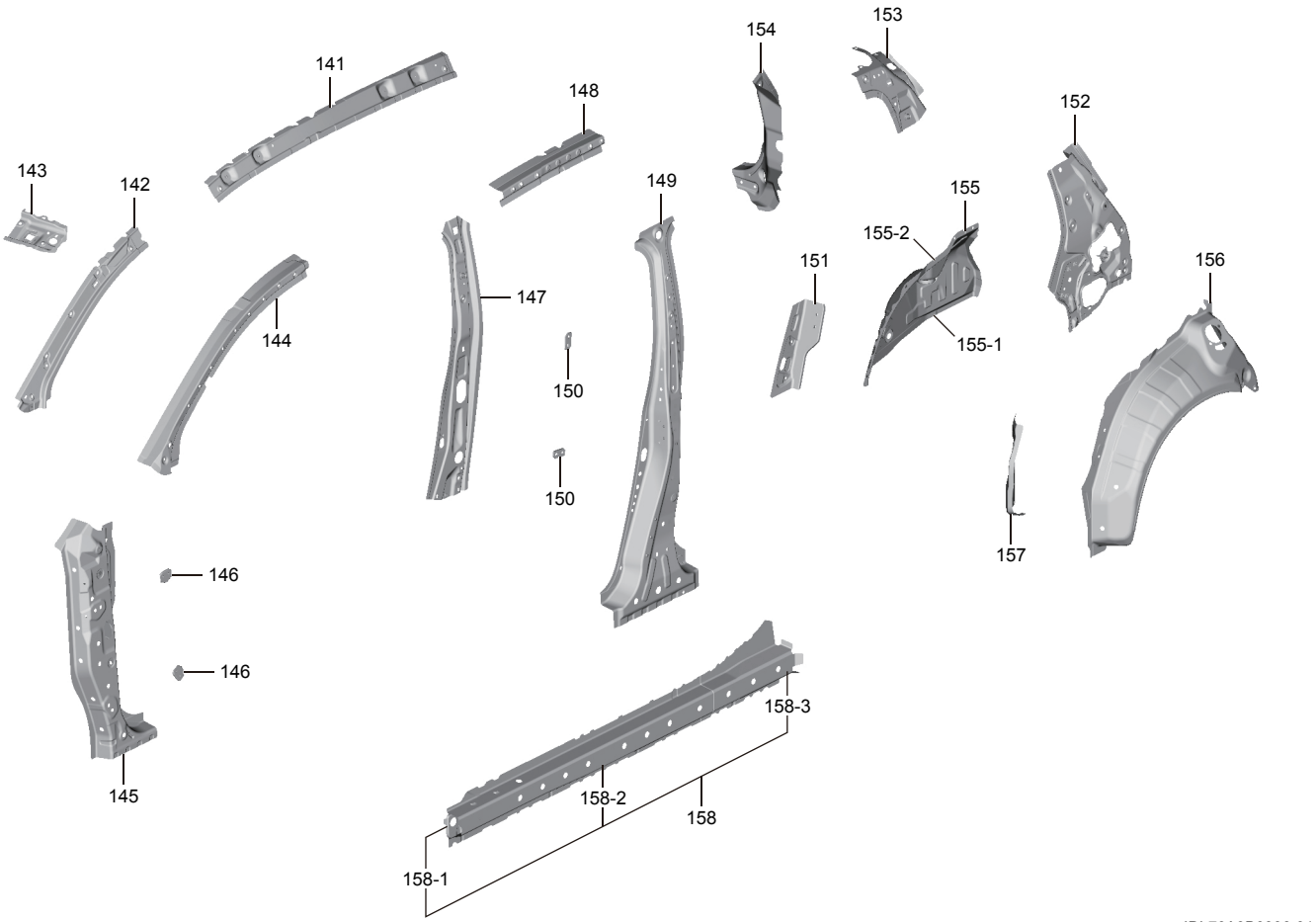
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[A]: With rear bumper member	[B]: Without rear bumper member

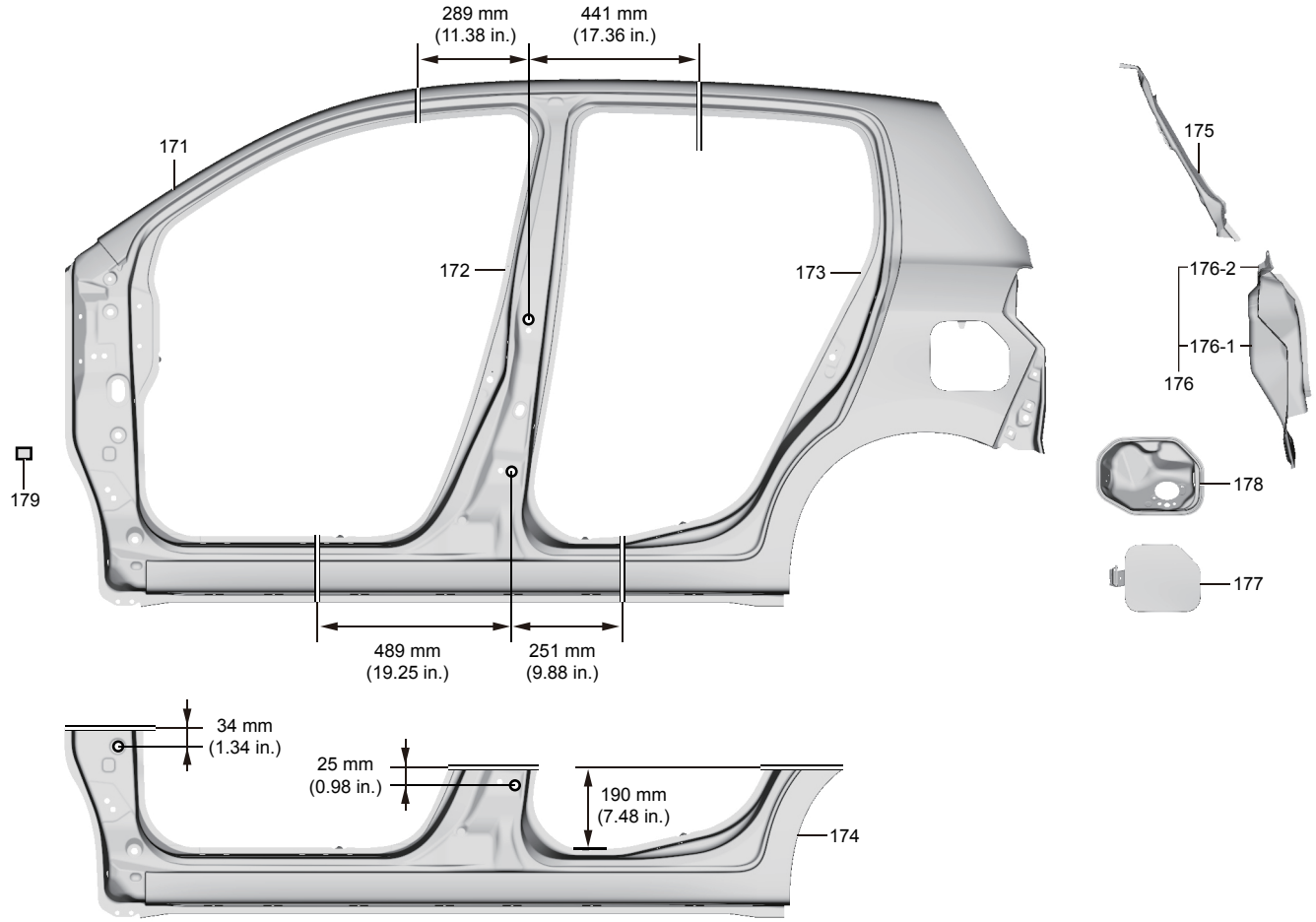
No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
91	Main floor panel (R, L)	1			
91-1	Main floor panel (R, L)				0.65 (0.026)
91-2	Main floor reinforcement (R)				1.8 (0.071)
92	Main floor tunnel	1			
92-1	Main floor tunnel				0.8 (0.031)
92-2	Main floor tunnel reinforcement				0.8 (0.031)
93	Floor panel No.1 crossmember (R, L)	1			1.2 (0.047)
94	Floor panel No.2 crossmember (R, L)	1			0.8 (0.031)
95	Floor side rear member (R, L)	2			0.7 (0.028)
96	Side sill inner panel (R, L)	1	○	590	1.0 (0.039)
101	Rear floor front panel	1		440	1.2 (0.047)
102	Rear floor center panel	1			0.7 (0.028)
103	Rear seat support member	1			
103-1	Rear seat support member				0.65 (0.026)
103-2	Rear seat support member extension (R, L)				0.6 (0.024)
104	Rear floor seat mounting panel	1			
104-1	Rear floor seat mounting panel			440	1.4 (0.055)

No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
104-2	Rear seat mounting reinforcement (R, L)		○		1.4 (0.055)
104-3	Rear floor seat mounting panel reinforcement (R, L)				1.0 (0.039)
104-4	Rear floor stiffener				0.6 (0.024)
105	Fuel tank front bracket	1			1.4 (0.055)
106	Rear floor rear panel	1			0.6 (0.024)
107	Spare tire bracket	1			1.4 (0.055)
108	Muffler rear hanger	1			1.2 (0.047)
109	Rear floor 3rd crossmember	1			
109-1	Towing hook member		○		1.4 (0.055)
109-2	Rear floor 3rd crossmember				1.0 (0.039)
110	Rear skirt panel	1			
110-1	Rear skirt panel				0.65 (0.026)
110-2	Tail end member				0.6 (0.024)
111	Rear floor side member (R)	1			
111-1	Rear floor side front member (R)		○		1.8 (0.071)
111-2	Trailing arm outside bracket (R)		○		1.4 (0.055)
111-3	Trailing arm inside bracket (R)		○		2.0 (0.079)
111-4	Rear floor side member extension (R)				1.6 (0.063)
111-5	Rear floor side member front extension (R)		○	440	1.8 (0.071)
112	Rear floor compartment (R)	1	○	590	1.2 (0.047)
113	Rear floor side rear member (R)	1	○		1.6 (0.063)
114	Rear floor side member reinforcement (R)	1	○	590	1.2 (0.047)
121	Rear floor side member (L)	1			
121-1	Rear floor side front member (L)		○		1.8 (0.071)
121-2	Trailing arm outside bracket (L)		○		1.4 (0.055)
121-3	Trailing arm inside bracket (L)		○		2.0 (0.079)
121-4	Rear floor side member extension (L)				1.6 (0.063)
121-5	Rear floor side member front extension (L)		○	440	1.8 (0.071)
122	Rear floor compartment (L)	1	○	590	1.2 (0.047)
123	Rear floor side rear member (L)	1	○		1.6 (0.063)
124	Rear floor side member reinforcement (L)	1	○	590	1.2 (0.047)
131	Rear floor 2nd crossmember	1		440	1.4 (0.055)

Side Body



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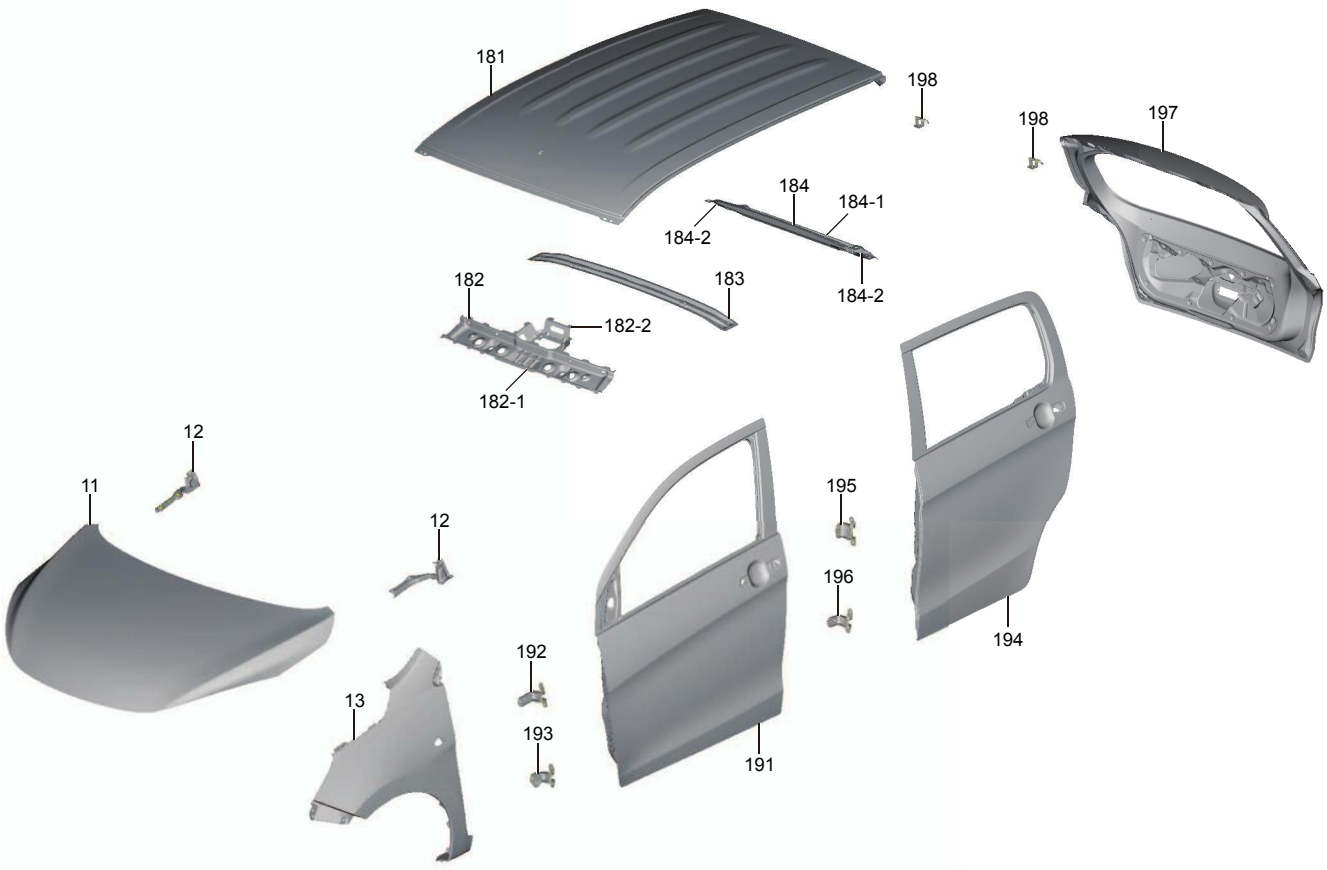


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No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
141	Roof side inner rail (R, L)	R: 1 L: 1		590	0.8 (0.032)
142	Front pillar inner panel (R, L)	R: 1 L: 1		440	1.0 (0.039)
143	Front pillar inner extension (R, L)	R: 1 L: 1			0.65 (0.026)
144	Front pillar upper reinforcement (R, L)	R: 1 L: 1		440	1.2 (0.047)
145	Front door hinge reinforcement (R, L)	R: 1 L: 1			1.2 (0.047)
146	Front door hinge retainer (R, L)	R: 1 L: 1			1.2 (0.047)
147	Center pillar inner panel (R, L)	R: 1 L: 1		590	0.8 (0.032)
148	Roof side inner reinforcement (R, L)	R: 1 L: 1		590	0.8 (0.032)
149	Rear door hinge reinforcement (R, L)	R: 1 L: 1		590	1.4 (0.055)
150	Rear door hinge retainer (R, L)	R: 1 L: 1			4.5 (0.177)
151	Rear door striker reinforcement (R, L)	R: 1 L: 1			0.8 (0.032)
152	Quarter inner panel (R, L)	R: 1 L: 1			0.7 (0.028)

No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
153	Quarter inner extension (R, L)	R: 1 L: 1			1.0 (0.039)
154	Rear lamp house inner panel (R, L)	R: 1 L: 1			0.65 (0.026)
155	Wheel house inner panel (R, L)	R: 1 L: 1			
155-1	Wheel house inner panel (R, L)				0.65 (0.026)
155-2	Rear shock absorber reinforcement (R, L)				2.3 (0.091)
156	Rear wheel house outer panel (R, L)	R: 1 L: 1			0.6 (0.024)
157	Rear wheel house front reinforcement (R, L)	R: 1 L: 1			1.2 (0.047)
158	Side sill strength (R, L)	R: 1 L: 1			
158-1	Side sill strength front reinforcement (R, L)		○	440	1.4 (0.055)
158-2	Side sill strength (R, L)			590	1.0 (0.039)
158-3	Side sill rear strength (R, L)				1.0 (0.039)
171	Side body outer (A pillar) panel (R, L)				0.65 (0.026)
172	Side body outer (B pillar) panel (R, L)	R: 1 L: 1			0.65 (0.026)
173	Side body outer (Quarter) panel (R, L)	R: 1 L: 1			0.65 (0.026)
174	Side body outer (Side sill) panel (R, L)	R: 1 L: 1			0.65 (0.026)
175	Side body outer extension (R, L)	R: 1 L: 1			0.65 (0.026)
176	Rear lamp house outer panel (R, L)	R: 1 L: 1			
176-1	Rear lamp house outer panel (R, L)				0.65 (0.026)
176-2	Side body outer lower extension (R, L)	R: 1 L: 1			0.65 (0.026)
177	Fuel filler door panel	1	○		0.7 (0.028)
178	Fuel filler box	1			0.7 (0.028)

Hood / Fender / Door / Roof



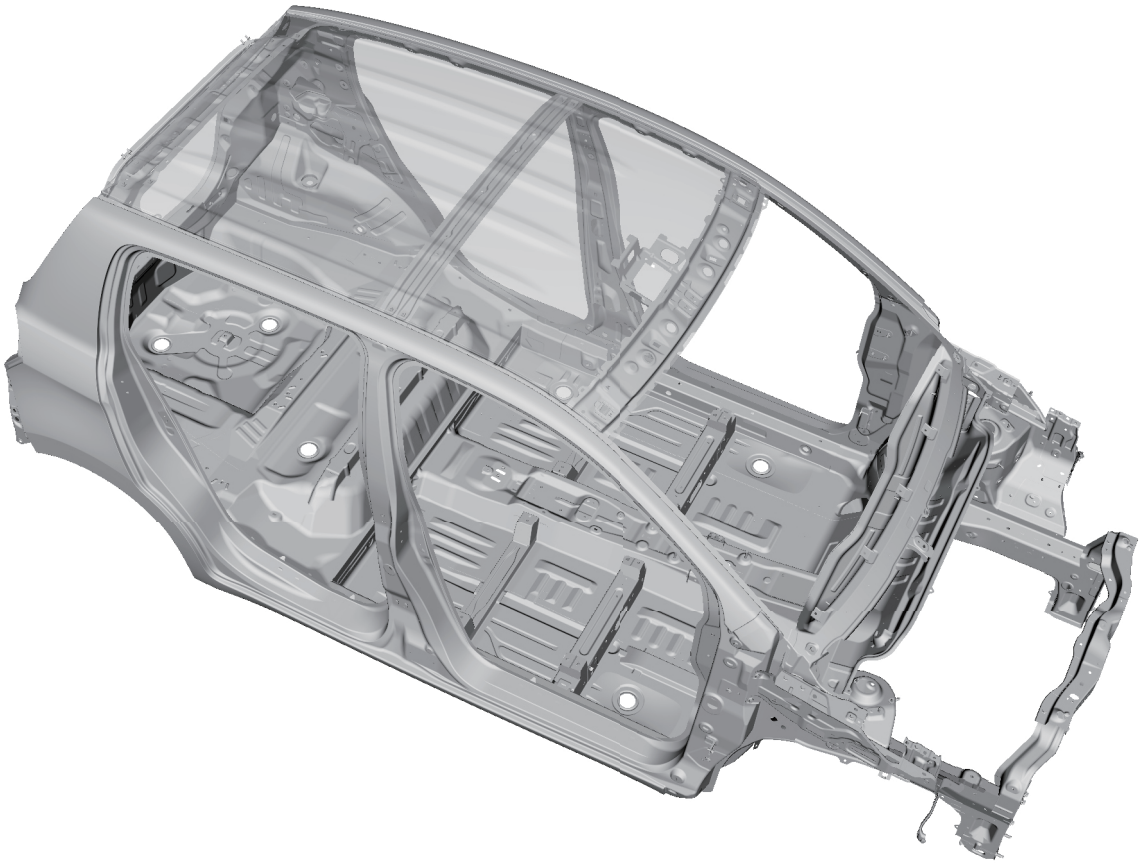
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No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
11	Hood panel	1		340	0.55
12	Front hood hinge (R, L)	R: 1 L: 1	(bolt-on part)		
13	Front fender panel (R, L)	R: 1 L: 1		340	0.6 (0.024)
181	Roof panel	1			0.6 (0.024)
182	Roof front inner member	1			
182-1	Roof front inner member				0.6 (0.024)
182-2	Room lamp front bracket				0.65 (0.026)
183	Roof center inner member	1		590	0.8 (0.031)
184	Roof back inner member	1			
184-1	Roof back inner member				0.6 (0.024)
184-2	Back door hinge reinforcement (R, L)				1.0 (0.039)
191	Front door panel (R, L)	R: 1 L: 1		340	0.65 (0.026)
192	Front door upper hinge (R, L)	R: 1 L: 1	(bolt-on part)		
193	Front door lower hinge (R, L)	R: 1 L: 1	(bolt-on part)		
194	Rear door panel (R, L)	R: 1 L: 1		340	0.65 (0.026)
195	Rear door upper hinge (R, L)	R: 1 L: 1	(bolt-on part)		
196	Rear door lower hinge (R, L)	R: 1 L: 1	(bolt-on part)		
197	Back door panel	1	○		0.65 (0.026)

No.	Part name	Qty.	Double sided galvannealed steel	High-strength steel (Tensile strength (MPa))	Thickness (mm (in.))
198	Back door hinge	2	(bolt-on part)		

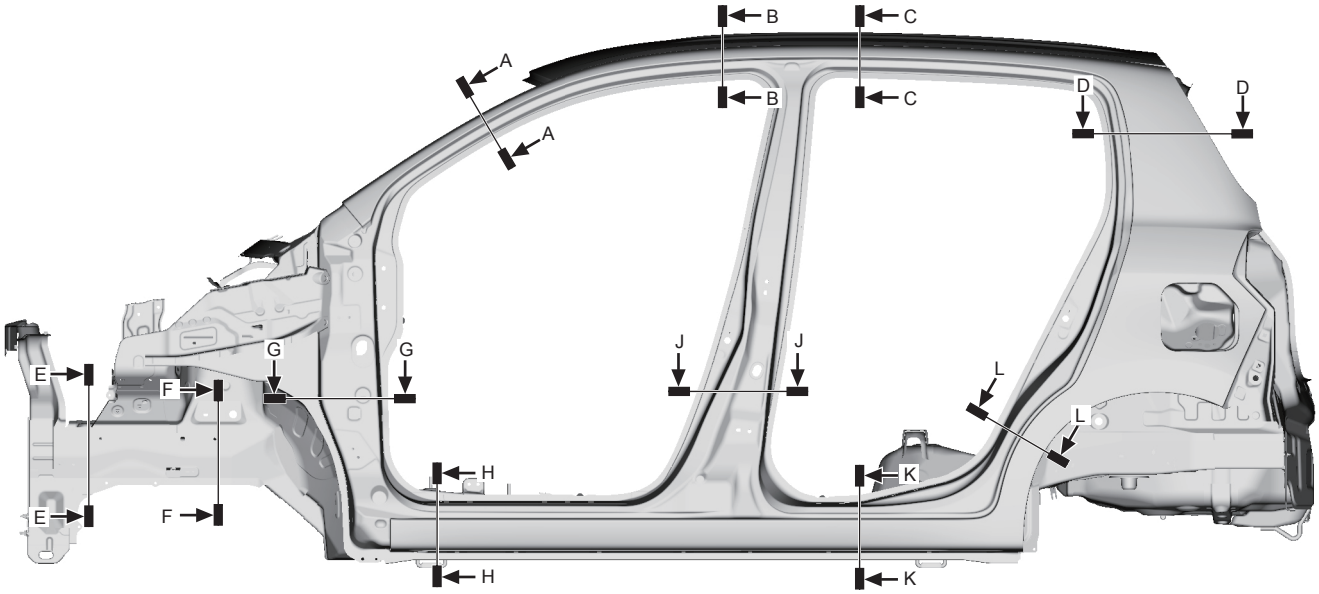
Body Structure Description

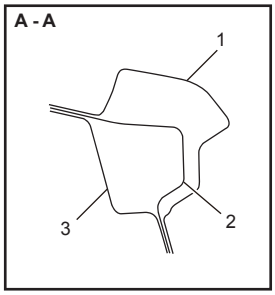
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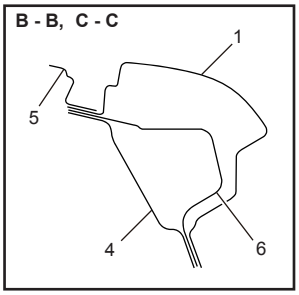


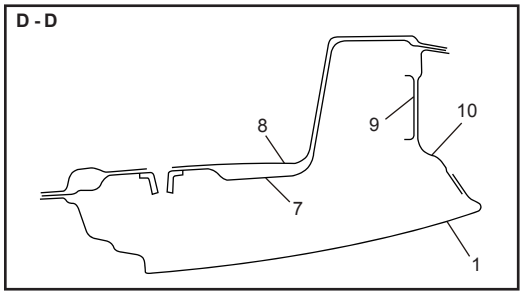
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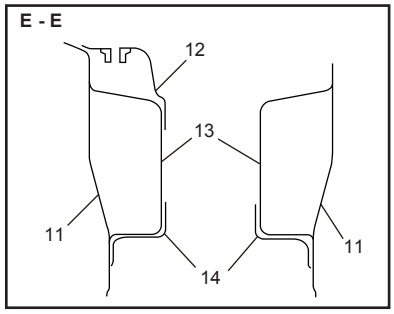
Cross-sections

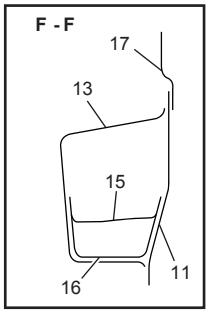


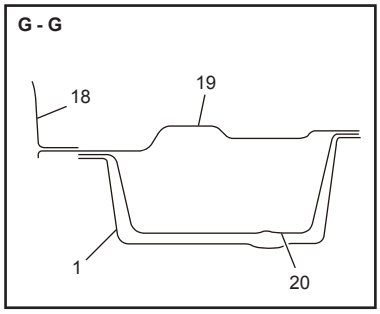


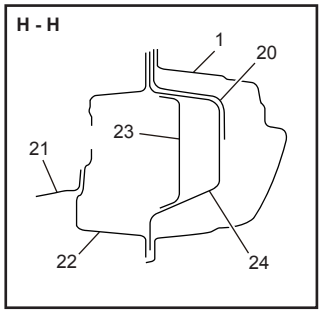


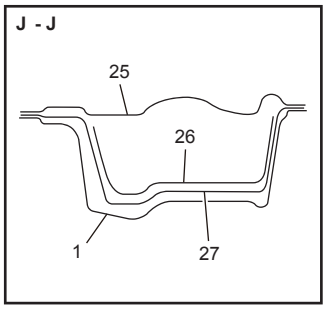


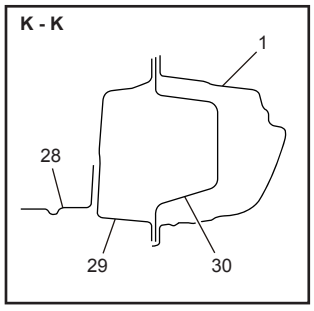


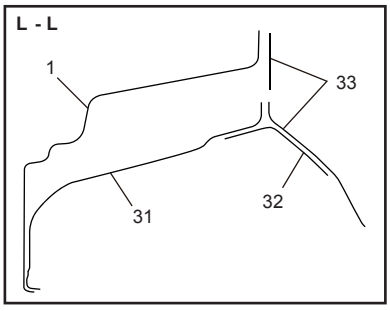












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1. Side body outer panel	12. Engine mount bracket	23. Side sill front reinforcement
2. Front pillar upper reinforcement	13. Apron side member	24. Side sill strength
3. Front pillar inner panel	14. Apron side inner front extension	25. Center pillar inner panel
4. Roof side inner rail	15. Suspension frame front mounting reinforcement	26. Center pillar upper reinforcement
5. Roof panel	16. Dash side member	27. Rear door hinge reinforcement
6. Roof side reinforcement	17. Fender apron panel	28. Rear floor side member front extension
7. Quarter inner extension	18. Dash panel	29. Rear floor compartment
8. Quarter inner panel	19. Dash side panel	30. Side sill rear strength
9. Back door balancer reinforcement	20. Front door hinge reinforcement	31. Wheel house outer panel
10. Side body outer extension	21. Main floor panel	32. Rear wheel house front reinforcement
11. Apron side member outer panel	22. Side sill inner panel	33. Wheel house inner panel

Checking and Straightening Benches Instruction

AENDL70A9B01004

General Notes



I9W10P9B0256-01

- Bench and jig systems are essential for accurate and efficient repairs of deformed body structures.
- On the Bench and jig system, it will be easy to check chassis parts for dimensional accuracy, alignment, components location and secure exact welding of new body parts.
- Universal jig systems are also available in the market.
- Celette offers a special jig kit for this model. For further information on jig kit, please contact “Celette: www.celette.com”
- Also the use of universal computerized body measuring system is recommended in case if you do not use the jig system.

Use of Computerized Measuring Systems

- Reference points for measuring body frame and body structure can be found in the vehicle specific measurement data sheet from the measuring system manufacturers.
- Contact the system manufacturer for details on installations and operations.
- Always follow the operation manual of the measuring system manufacturer.

Application

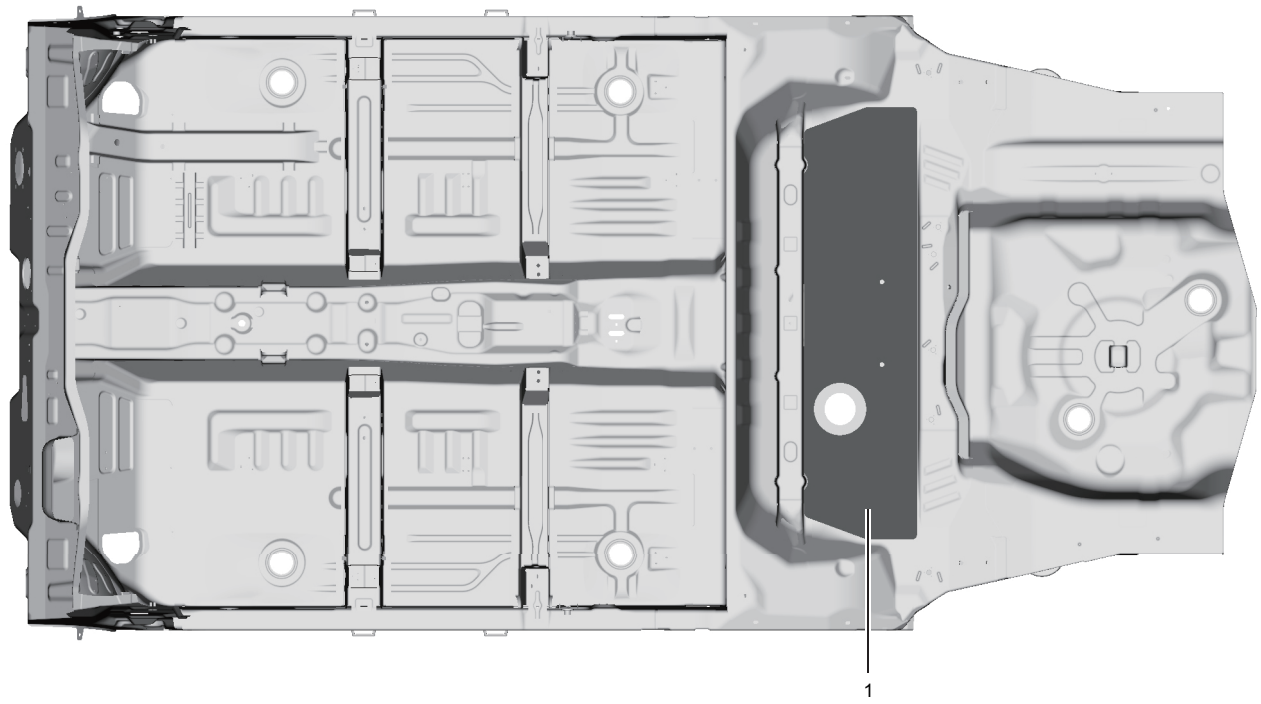
The use of a computerized measuring system is recommended in following cases.

- Removals of members, frames, struts and wheel housings are required before completing the frame deformation correction.
- Dents, creases, buckling or deformation exist on the vehicle floor panels or body frames.

Component Location

Silencer Sheet Installation Area

AENDL70A9B03001



IDL70A9B0010-01

Sheet thickness

No.	Part name	Thickness
1	Seat riser panel sheet	3.0 mm (0.118 in.)

Diagnostic Information and Procedures

Inspection for Body Damage

AENDL70A9B04001

Inspect the body damage in the following procedure.

	Procedure	Reference
1	Identification of transmission routes of impact	“Transmission Routes of Impact” (Page 9K-17)

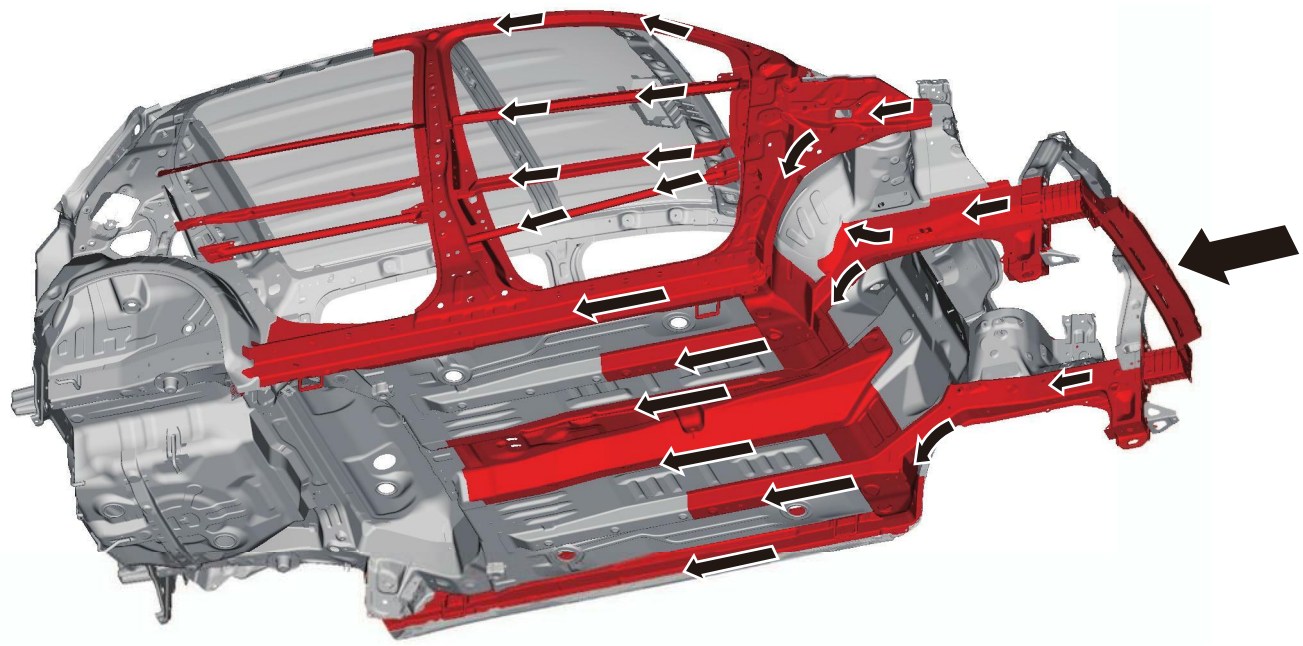
	Procedure	Reference
2	Measurement before repair	• “Panel Clearance” (Page 9K-19) • “Front Body Dimensions” (Page 9K-21) • “Rear End Door Dimensions” (Page 9K-23) • “Side Body Outside Dimensions” (Page 9K-24) • “Side Body Inside Dimensions” (Page 9K-26) • “Windshield Dimensions” (Page 9K-28) • “Under Body Dimensions” (Page 9K-29) • “Engine Compartment Dimensions with Mechanical Parts” (Page 9K-31) • “Front Under Body Dimensions with Mechanical Parts” (Page 9K-32)
3	Repair (maintenance)	Perform required work.
4	Measurement after repair	• “Panel Clearance” (Page 9K-19) • “Front Body Dimensions” (Page 9K-21) • “Rear End Door Dimensions” (Page 9K-23) • “Side Body Outside Dimensions” (Page 9K-24) • “Side Body Inside Dimensions” (Page 9K-26) • “Windshield Dimensions” (Page 9K-28) • “Under Body Dimensions” (Page 9K-29) • “Engine Compartment Dimensions with Mechanical Parts” (Page 9K-31) • “Front Under Body Dimensions with Mechanical Parts” (Page 9K-32)

Transmission Routes of Impact

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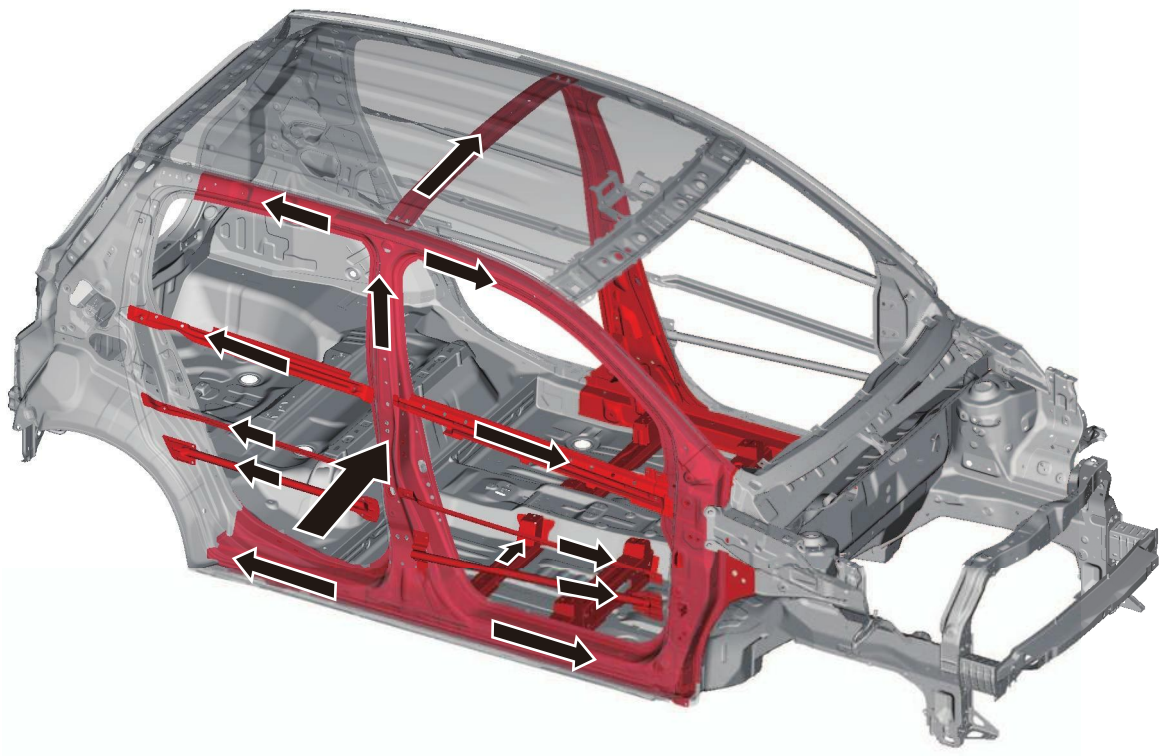
Identify the places to which a collision impact is transmitted referring to the following figures.

Frontal Collision



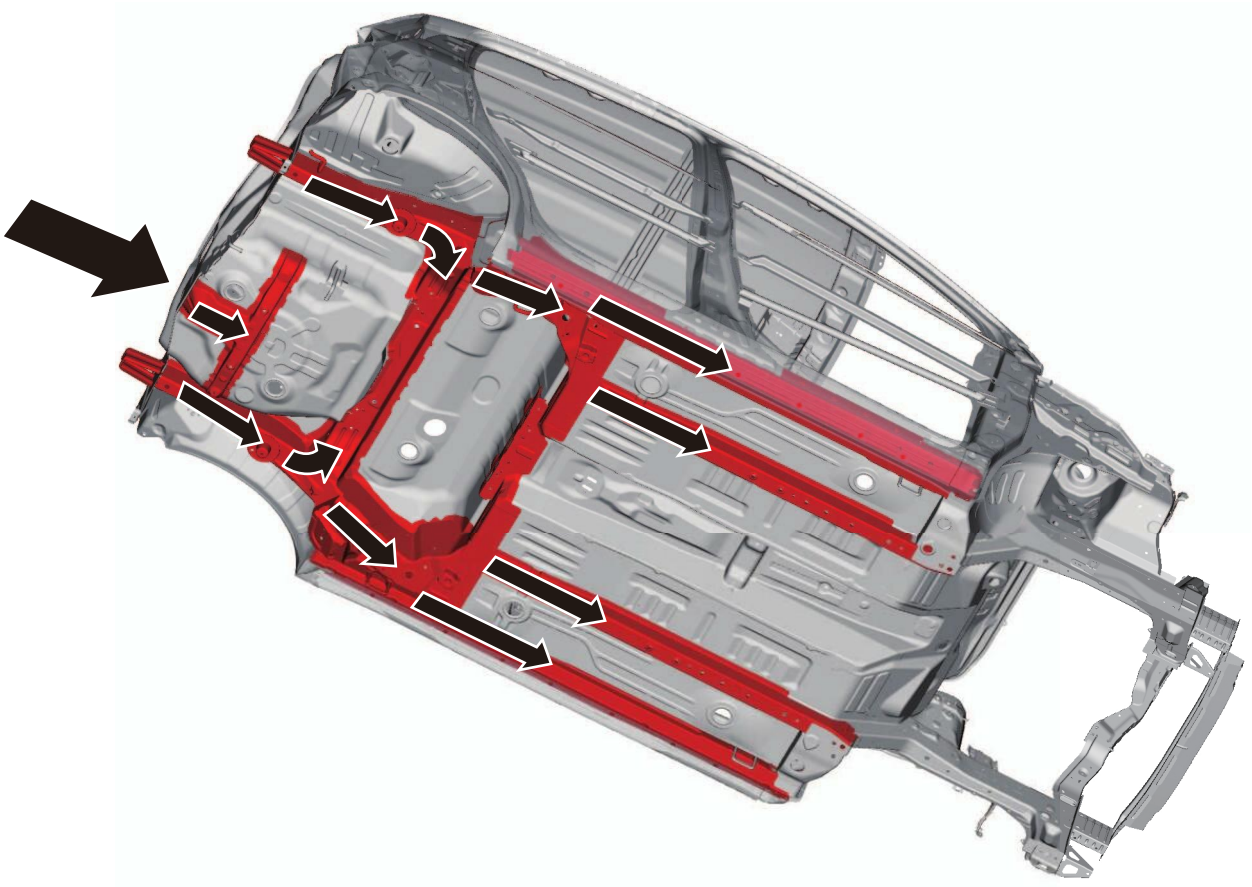
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Sideward Collision



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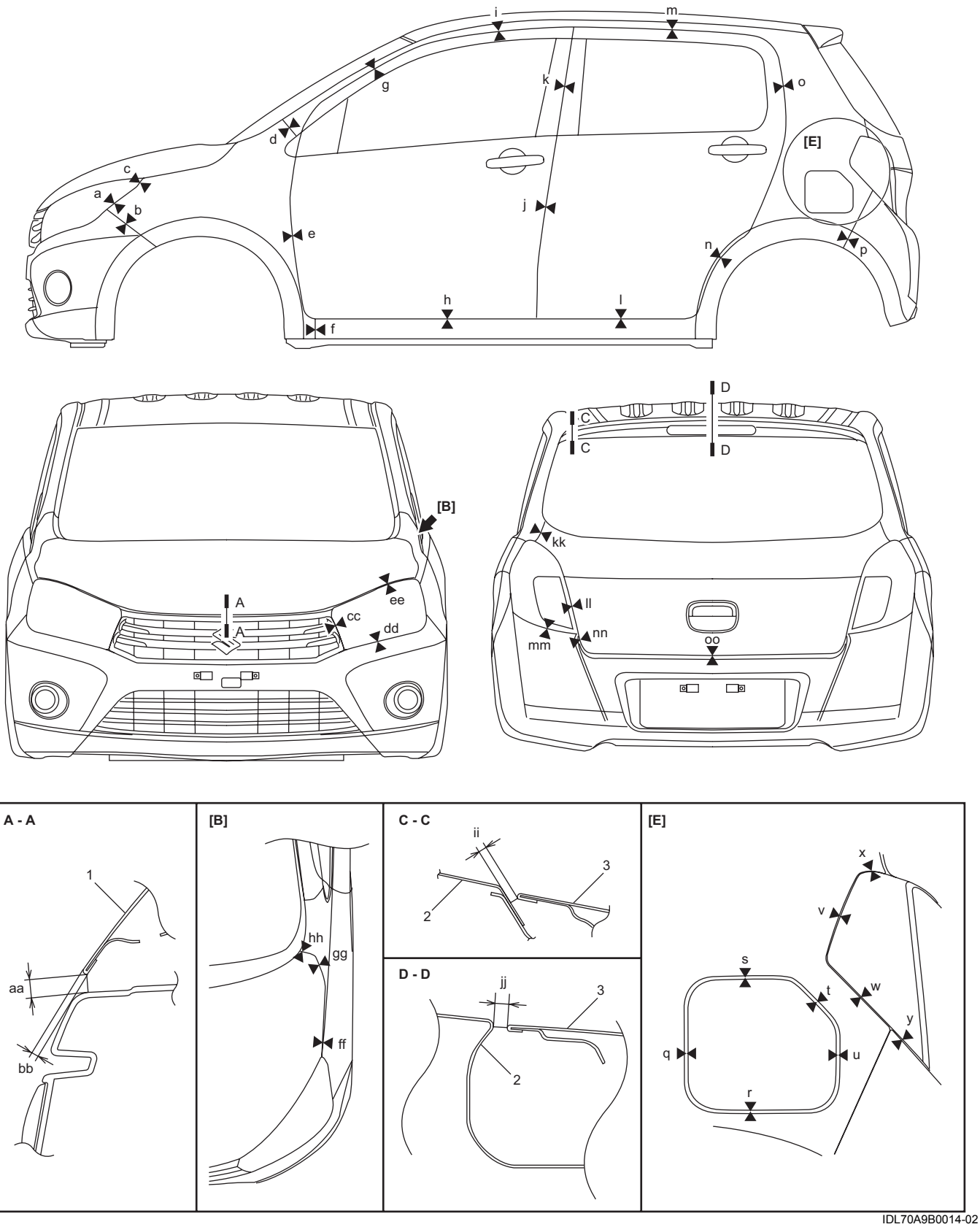
Rear Collision



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Panel Clearance

AENDL70A9B04003



IDL70A9B0014-02

1. Hood	m: 5.0 ± 1.0 mm (0.197 ± 0.039 in.)	cc: 3.0 ± 1.0 mm (0.118 ± 0.039 in.)
2. Roof	n: 4.5 ± 1.0 mm (0.177 ± 0.039 in.)	dd: 2.0 ± 1.0 mm (0.079 ± 0.039 in.)
3. Back door	o: 4.5 ± 1.0 mm (0.177 ± 0.039 in.)	ee: 4.4 ± 1.0 mm (0.173 ± 0.039 in.)

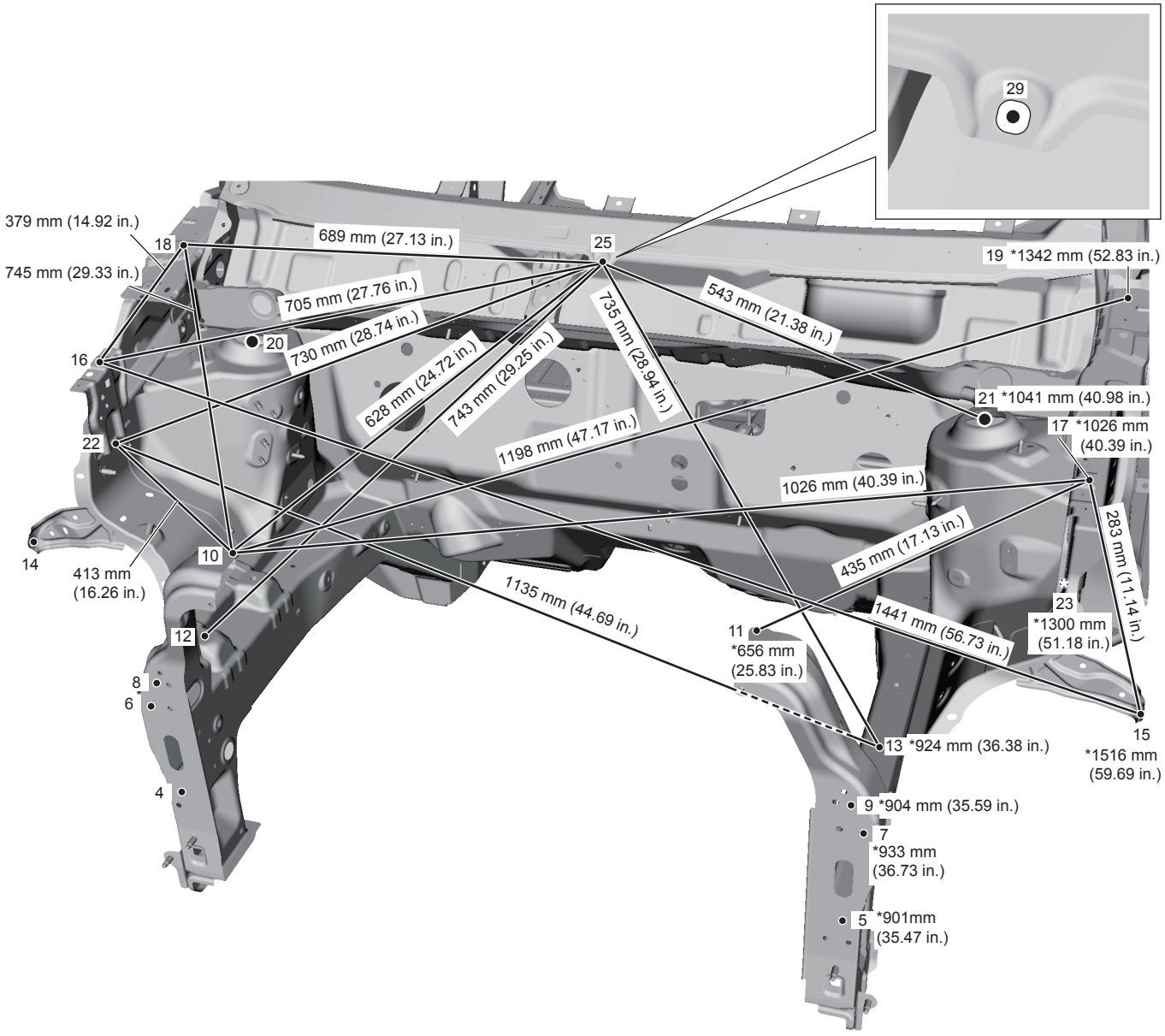
a: 2.0 + 0.5, -1.0 mm (0.079 + 0.020, - 0.039 in.)	p: 0.5 ± 0.5 mm (0.020 ± 0.020 in.)	ff: 3.6 ± 1.0 mm (0.142 ± 0.039 in.)
b: 0.5 ± 0.5 mm (0.020 ± 0.020 in.)	q: 3.3 ± 1.0 mm (0.130 ± 0.039 in.)	gg: 5.0 ± 1.0 mm (0.197 ± 0.039 in.)
c: 2.0 ± 0.5 mm (0.079 ± 0.020 in.)	r: 3.0 ± 1.0 mm (0.118 ± 0.039 in.)	hh: 6.0 ± 1.0 mm (0.236 ± 0.039 in.)
d: 2.6 ± 1.0 mm (0.102 ± 0.039 in.)	s: 3.4 ± 1.0 mm (0.134 ± 0.039 in.)	ii: 3.5 ± 1.0 mm (0.138 ± 0.039 in.)
e: 4.5 ± 1.0 mm (0.177 ± 0.039 in.)	t: 3.4 ± 1.0 mm (0.134 ± 0.039 in.)	jj: 7.0 ± 1.0 mm (0.276 ± 0.039 in.)
f: 2.0 ± 1.0 mm (0.079 ± 0.039 in.)	u: 3.4 ± 1.0 mm (0.134 ± 0.039 in.)	kk: 5.2 ± 1.0 mm (0.205 ± 0.039 in.)
g: 5.0 ± 1.0 mm (0.197 ± 0.039 in.)	v: 1.5 ± 1.0 mm (0.059 ± 0.039 in.)	ll: 5.0 ± 1.0 mm (0.197 ± 0.039 in.)
h: 5.9 ± 1.0 mm (0.232 ± 0.039 in.)	w: 1.5 ± 1.0 mm (0.059 ± 0.039 in.)	mm: 2.0 ± 1.0 mm (0.079 ± 0.039 in.)
i: 5.0 ± 1.0 mm (0.197 ± 0.039 in.)	x: 1.5 ± 1.0 mm (0.059 ± 0.039 in.)	nn: 5.2 ± 1.0 mm (0.205 ± 0.039 in.)
j: 4.5 ± 1.0 mm (0.177 ± 0.039 in.)	y: 1.5 ± 1.0 mm (0.059 ± 0.039 in.)	oo: 6.0 ± 1.0 mm (0.236 ± 0.039 in.)
k: 4.5 ± 1.0 mm (0.177 ± 0.039 in.)	aa: 7.0 ± 1.0 mm (0.276 ± 0.039 in.)	
l: 5.9 ± 1.0 mm (0.232 ± 0.039 in.)	bb: 2.4 ± 1.0 mm (0.094 ± 0.039 in.)	

Front Body Dimensions

AENDL70A9B04004

NOTE

- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **The number with "ø" is circle diameter and measurement unit is "mm".**



IDL70A9B0015-02

Point	Position		
4	Front bumper upper member installation hole (lower side)	R	ø 13 hole center (weld nut M8)
5	↑	L	↑
6	Front bumper upper member installation hole (upper side)	R	↑
7	↑	L	↑
8	Headlight installation hole	R	ø 7 hole center (weld nut M6)
9	↑	L	↑
10	Lamp support member (rear side) installation hole	R	ø 9 hole center (weld nut M6)
11	↑	L	↑

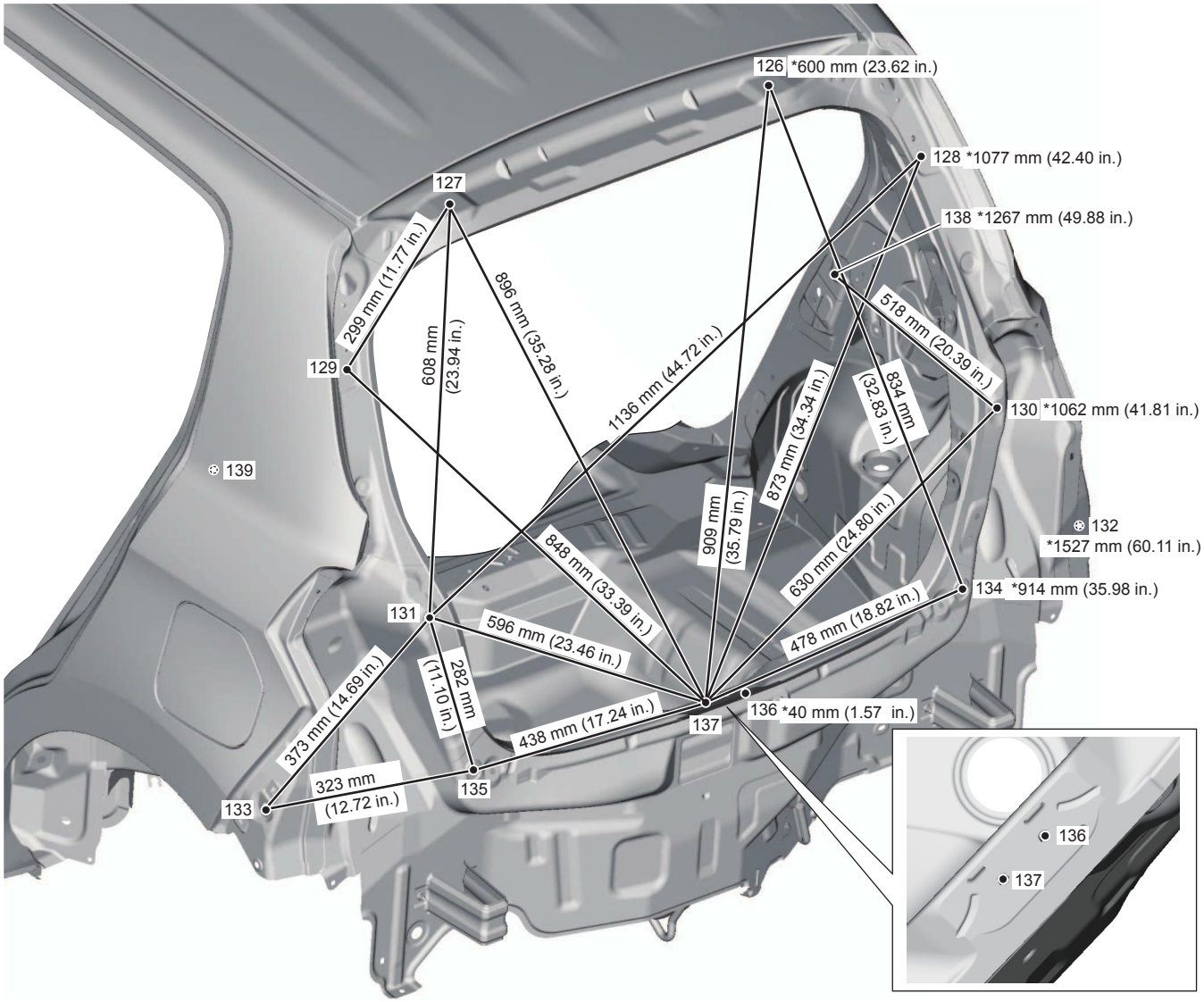
Point	Position		
12	Engine right mounting installation hole (front side) (Point 13 left-right asymmetry)	R	ø 11 hole center (weld nut M10)
13	Engine left mounting installation hole (front side) (Point 12 left-right asymmetry)	L	ø 12 hole center (weld nut M10)
14	Front fender installation hole	R	ø 7 hole center (weld nut M6)
15	↑	L	↑
16	Front fender installation hole	R	↑
17	↑	L	↑
18	Hood hinge installation hole (rear side)	R	ø 9 hole center (weld nut M6)
19	↑	L	↑
20	Front strut installation hole	R	ø 52 hole center
21	↑	L	↑
22	Apron front extension jig hole	R	ø 8 hole center
23	↑	L	↑
25	Cowl top garnish installation hole	—	□ 10 mm hole center

Rear End Door Dimensions

AENDL70A9B04005

NOTE

- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **The number with "ø" is circle diameter and measurement unit is "mm".**



IDL70A9B0016-01

Point	Position		
126	Back door hinge installation hole	R	ø 8.2 hole center
127	↑	L	8.2 x 10 mm hole center
128	Rear end door balancer installation hole (lower)	R	ø 12 hole center (weld nut M8)
129	↑	L	↑
130	Rear combination light installation hole	R	ø 7 hole center (weld nut M6)
131	↑	L	↑
132	Bumper holder installation hole	R	ø 15 hole center
133	↑	L	↑
134	Rear bumper installation hole	R	Weld nut M6
135	↑	L	↑
136	Rear end door striker installation hole	R	□ 14 mm hole center (weld nut M8)
137	↑	L	↑
138	Rear door striker installation hole	R	ø 8 hole center

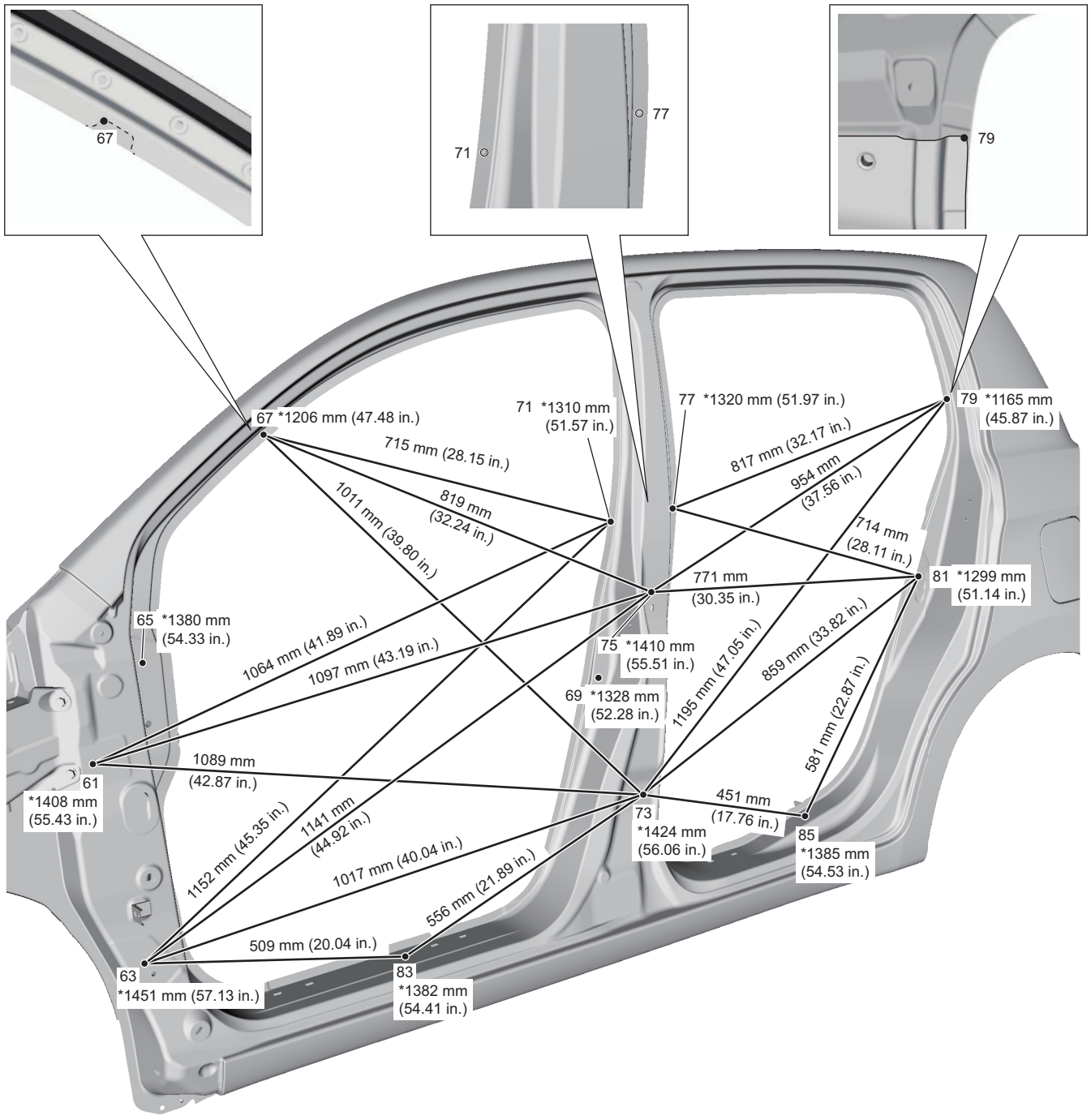
Point	Position		
139	↑	L	↑

Side Body Outside Dimensions

AENDL70A9B04006

NOTE

- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **The number with "ø" is circle diameter and measurement unit is "mm".**



IDL70A9B0017-02

Point	Position		
60	Front door upper hinge installation hole (front side)	R	ø 14 hole center (weld nut M8)
61	↑	L	↑

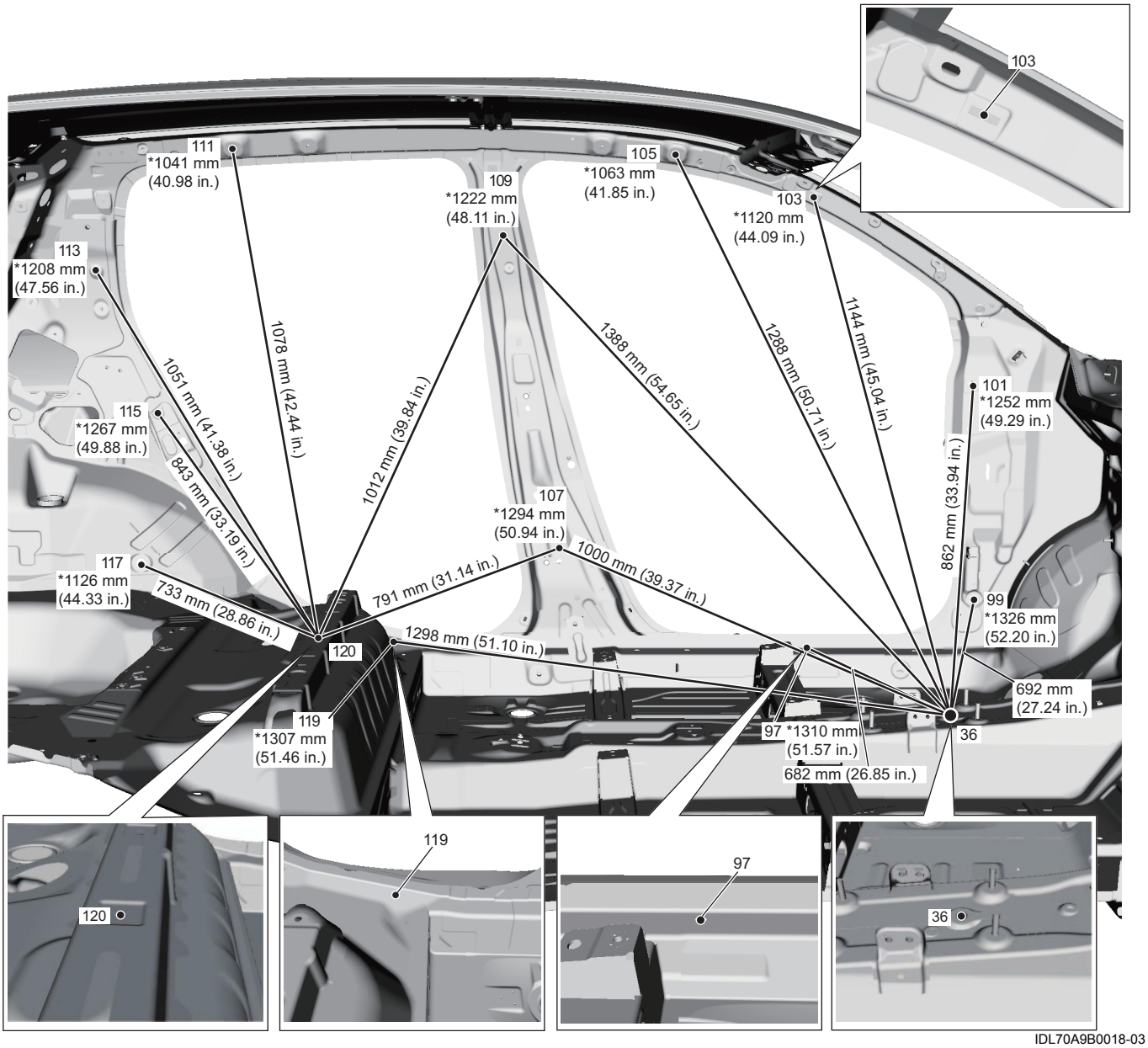
Point	Position		
62	Front door lower hinge installation hole (upper side)	R	ø 14 hole center (weld nut M8)
63	↑	L	↑
64	Front fender installation hole	R	ø 9 hole center (weld nut M6)
65	↑	L	↑
66	Side body outer panel (rear side of front-pillar)	R	Notch (concave upper side)
67	↑	L	↑
68	Front door switch installation hole	R	ø 17 hole center
69	↑	L	↑
70	Side body outer panel (front side of center-pillar)	R	Protrusion center
71	↑	L	↑
72	Rear door lower hinge installation hole (rear side)	R	ø 14 hole center
73	↑	L	↑
74	Rear door upper hinge installation hole (upper side)	R	ø 14 hole center
75	↑	L	↑
76	Side body outer panel (rear side of center-pillar)	R	Protrusion center
77	↑	L	↑
78	Side body outer panel (front side of quarter-pillar)	R	Edge (concave upper side)
79	↑	L	↑
80	Rear door switch installation hole	R	ø 17 hole center
81	↑	L	↑
82	Front side sill scuff installation hole (center)	R	□ 6.5 x 14 hole center
83	↑	L	↑
84	Rear side sill scuff installation hole (rear side)	R	□ 6.5 x 11.5 hole center
85	↑	L	↑

Side Body Inside Dimensions

AENDL70A9B04007

NOTE

- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **Use point 36 as datum point to check symmetry of body dimensions.**
  Measure distance between point 36 and each point on vehicle left side and vehicle right side for symmetry check.
- **The number with "ø" is circle diameter and measurement unit is "mm".**



IDL70A9B0018-03

Point	Position		
36	Parking cable bracket installation hole (front side)	—	ø 15 hole center
96	Harness installation hole	R	7 x 12 mm hole center
97	↑	L	↑
98	Dash side trim installation hole	R	ø 15 hole center
99	↑	L	↑
100	Steering support member installation hole (upper side)	R	ø 12 hole center
101	↑	L	↑

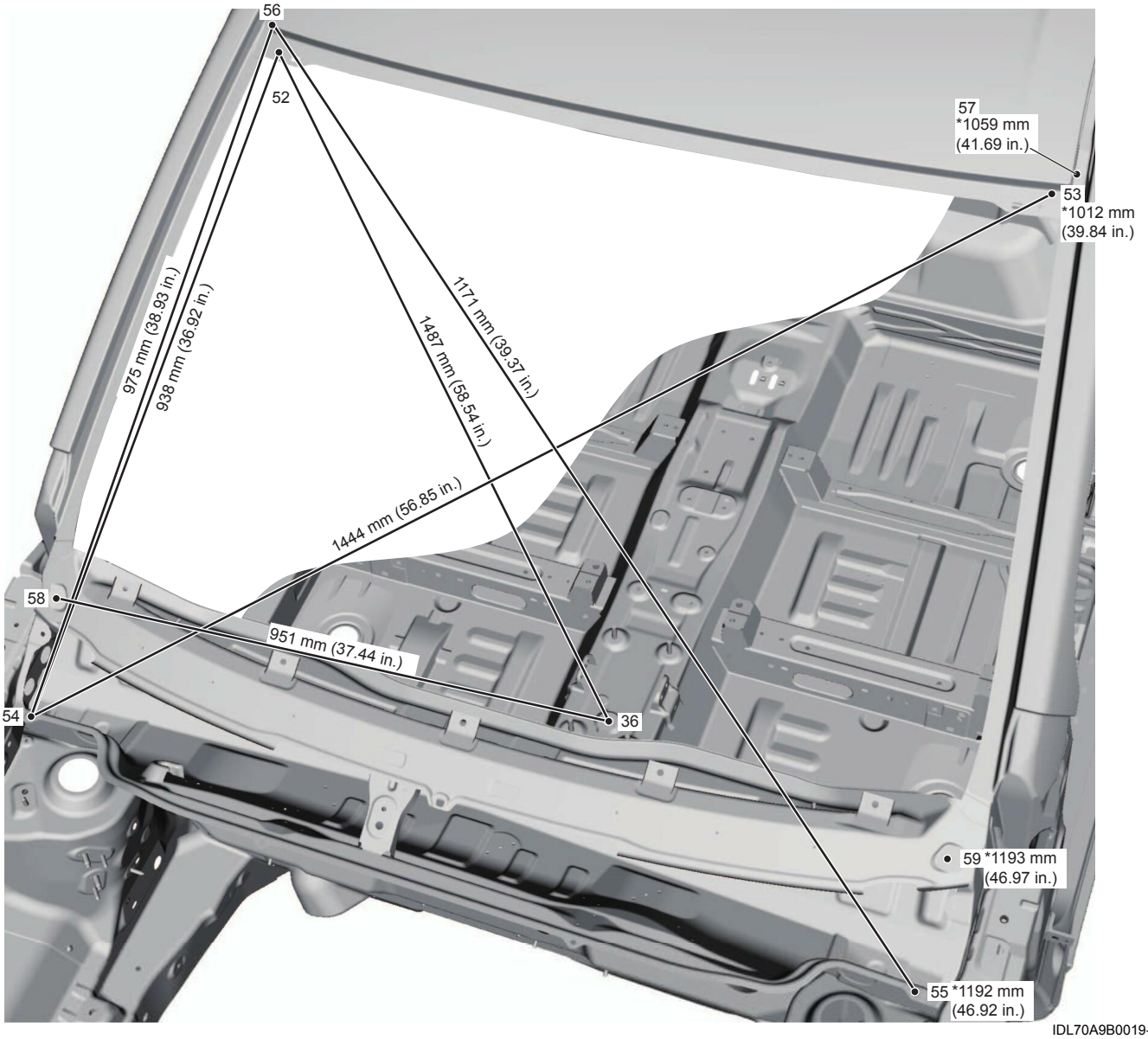
Point	Position		
102	Front pillar trim installation hole	R	6 x 21 mm hole center
103	↑	L	↑
104	Front assistant grip installation hole (front side)	R	□ 8 hole center
105	↑	L	↑
106	Center pillar inner rail jig hole	R	ø 7 hole center
107	↑	L	↑
108	Front shoulder adjuster installation hole	R	ø 13 hole center (weld nut M10)
109	↑	L	↑
110	Rear assistant grip installation hole (rear side)	R	□ 8 hole center
111	↑	L	↑
112	Quarter inner upper panel jig hole	R	ø 8 hole center
113	↑	L	↑
114	Rear door striker reinforcement jig hole (upper side)	R	ø 7 hole center
115	↑	L	↑
116	Wheel speed sensor jig hole	R	ø 20 hole center
117	↑	L	↑
118	Harness installation hole	R	12 x 17 mm hole center
119	↑	L	↑
120	Carpet installation hole	—	ø 7 hole center

Windshield Dimensions

AENDL70A9B04008

NOTE

- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **Use point 36 as datum point to check symmetry of body dimensions.**
  Measure distance between point 36 and each point on vehicle left side and vehicle right side for symmetry check.
- **The number with "ø" is circle diameter and measurement unit is "mm".**



IDL70A9B0019-01

Point	Position		
36	Parking cable bracket installation hole (front side)	—	ø 8 hole center (weld nut M8)
52	Roof panel jig hole	R	ø 8 hole center
53	↑	L	↑
54	Cowl top garnish installation hole	R	ø 7 hole center
55	↑	L	↑
56	Roof panel	R	Tip part
57	↑	L	↑
58	Cowl top panel jig hole	R	ø 6 hole center

Point	Position		
59	↑	L	↑

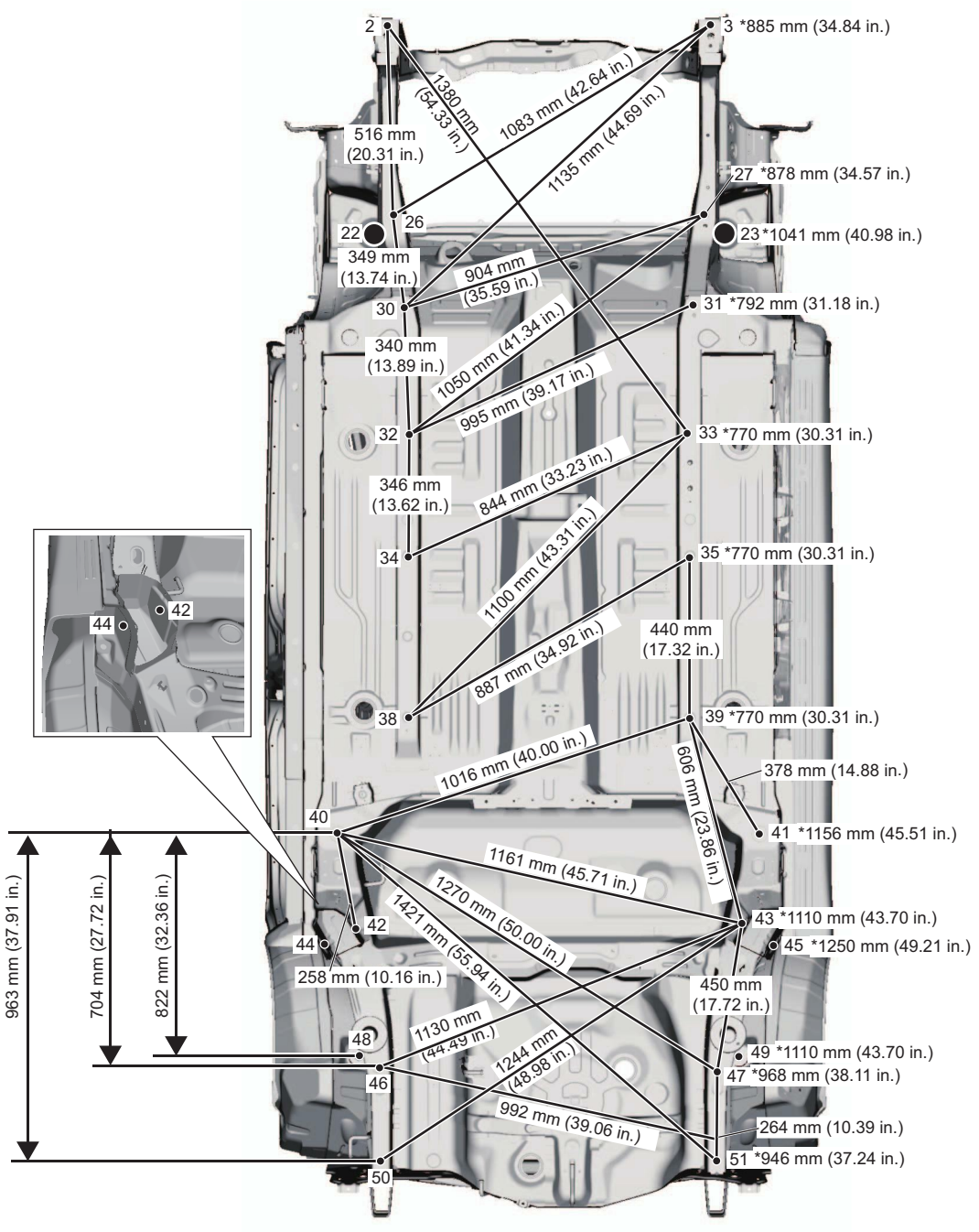
Under Body Dimensions

AENDL70A9B04009

NOTE

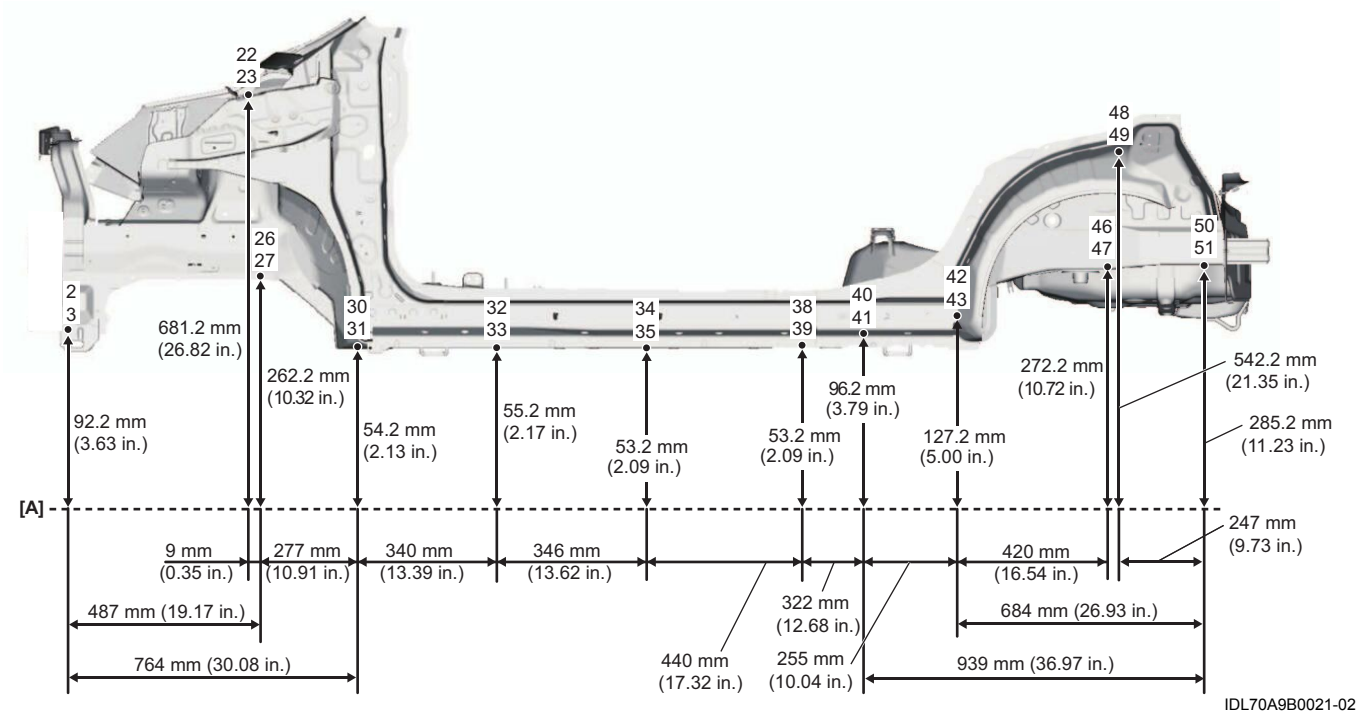
- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **The number with "ø" is circle diameter and measurement unit is "mm".**

Bottom View (Straight-Line Dimensions)



IDL70A9B0020-02

Side View (Projection Dimensions)



[A]: Imaginary datum line

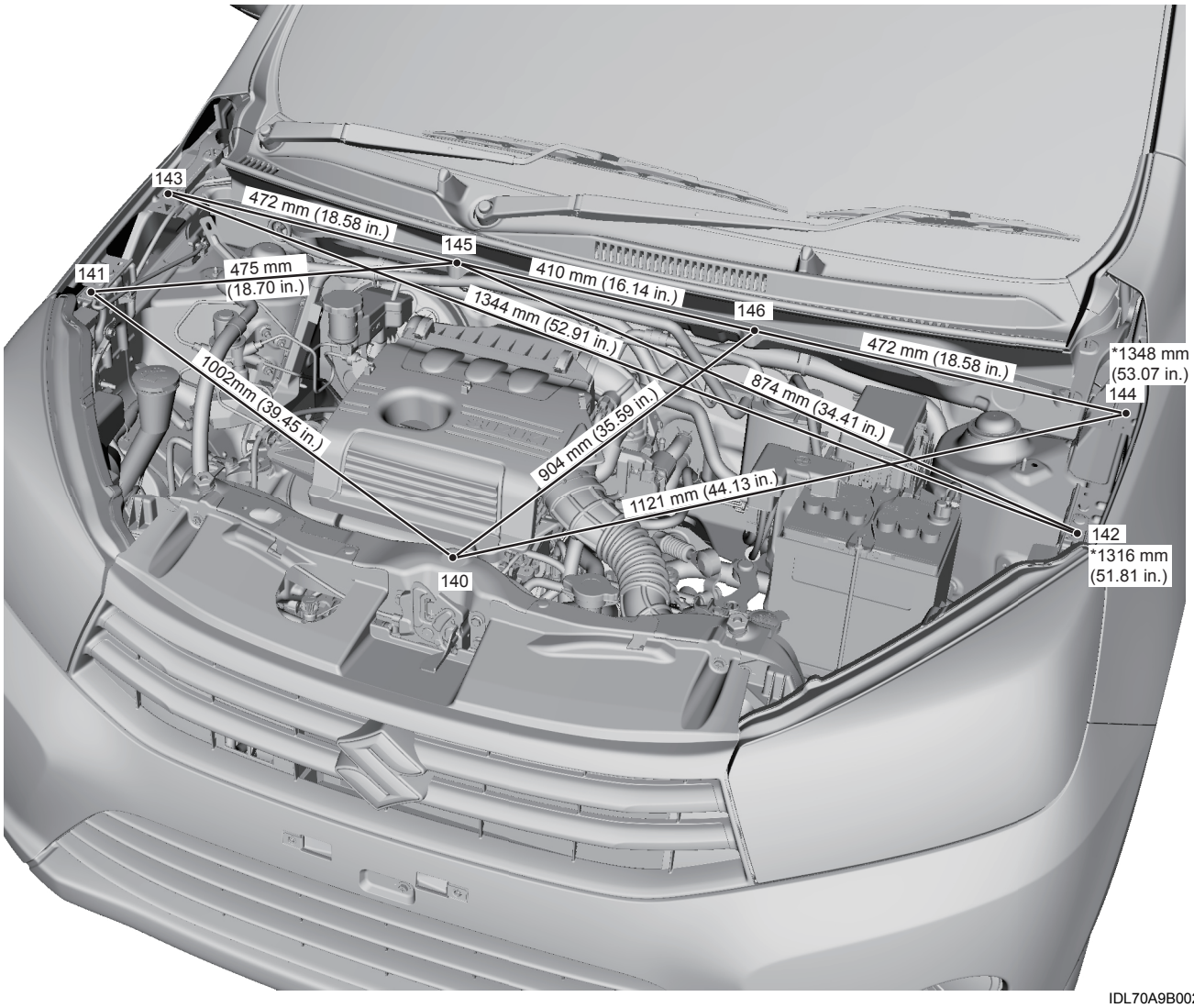
Point	Position		
2	Front lower cross member installation hole	R	ø 12 hole center (weld nut M8)
3	↑	L	↑
22	Front strut installation hole	R	ø 52 hole center
23	↑	L	↑
26	Suspension frame installation hole (front side)	R	ø 17 hole center (weld nut M14)
27	↑	L	↑
30	Suspension frame installation hole (rear side)	R	ø 16 hole center (weld nut M14)
31	↑	L	↑
32	Dash lower member jig hole	R	ø 12 hole center
33	↑	L	↑
34	Floor side rear member jig hole	R	ø 15 hole center
35	↑	L	↑
38	Floor side rear member jig hole	R	ø 15 hole center
39	↑	L	↑
40	Rear floor side front member jig hole	R	ø 25 hole center
41	↑	L	↑
42	Trailing arm installation side (inside hole)	R	ø 15 hole center (weld nut M12)
43	↑	L	↑
44	Trailing arm installation side (outside hole)	R	ø 16.8 hole center
45	↑	L	↑
46	Rear floor side front member jig hole	R	ø 10 hole center
47	↑	L	↑
48	Rear shock absorber installation hole	R	ø 24 hole center
49	↑	L	↑
50	Rear floor side rear member jig hole	R	ø 16 hole center
51	↑	L	↑

Engine Compartment Dimensions with Mechanical Parts

AENDL70A9B04010

NOTE

- **Values in this dimensional drawing are provided for reference only. Refer to "Front Body Dimensions" (Page 9K-21) when correct values are needed.**
- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **The number with "ø" is circle diameter and measurement unit is "mm".**



IDL70A9B0022-01

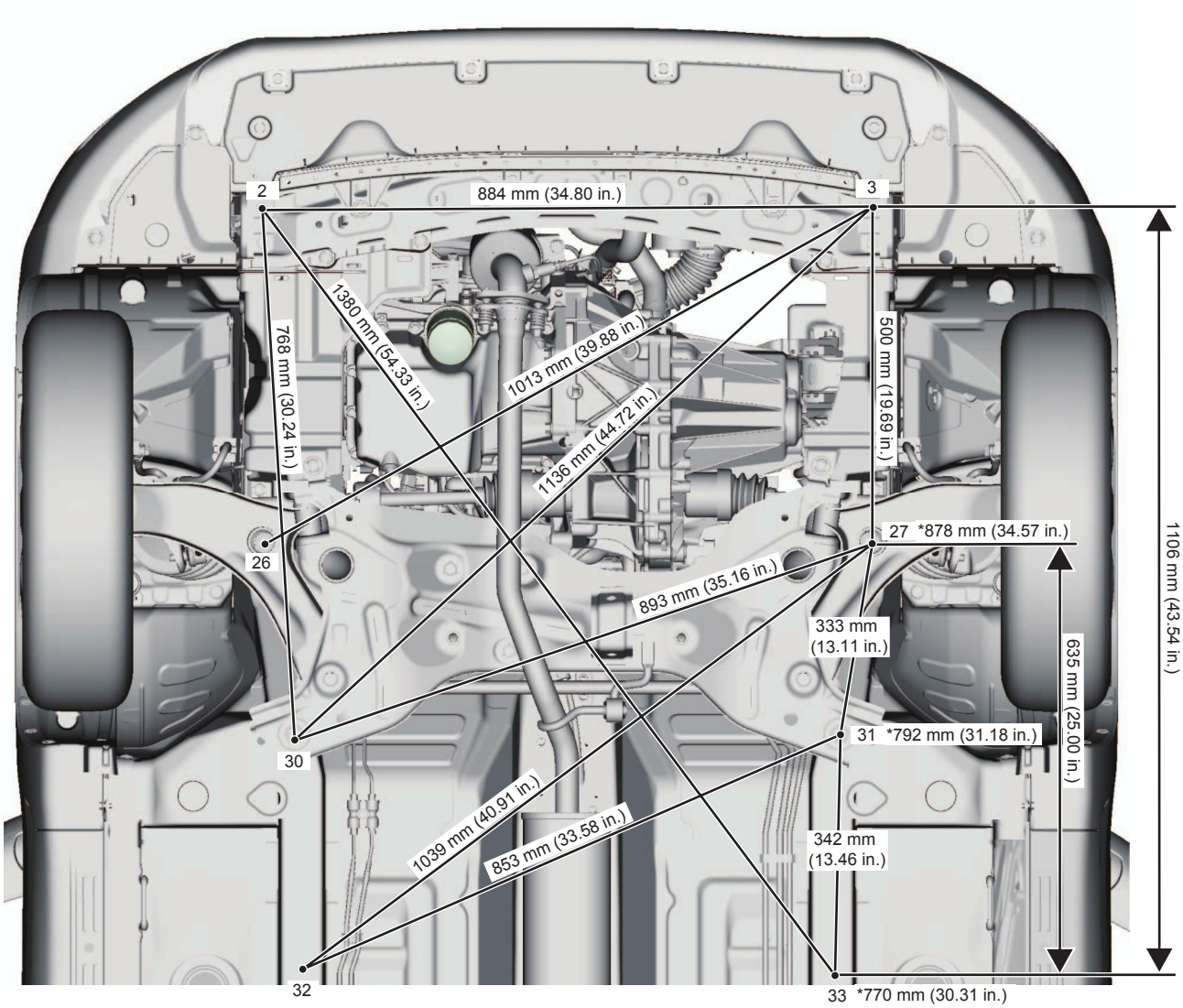
Point	Position		
140	Hood cushion installation hole	—	ø 10.4 hole center
141	Headlight installation bolt	R	M6 bolt head center
142	↑	L	↑
143	Front fender installation bolt	R	↑
144	↑	L	↑
145	Cowl top garnish installation clip (not lateral center of vehicle body)	R	Clip head center
146	↑	L	↑

Front Under Body Dimensions with Mechanical Parts

AENDL70A9B04011

NOTE

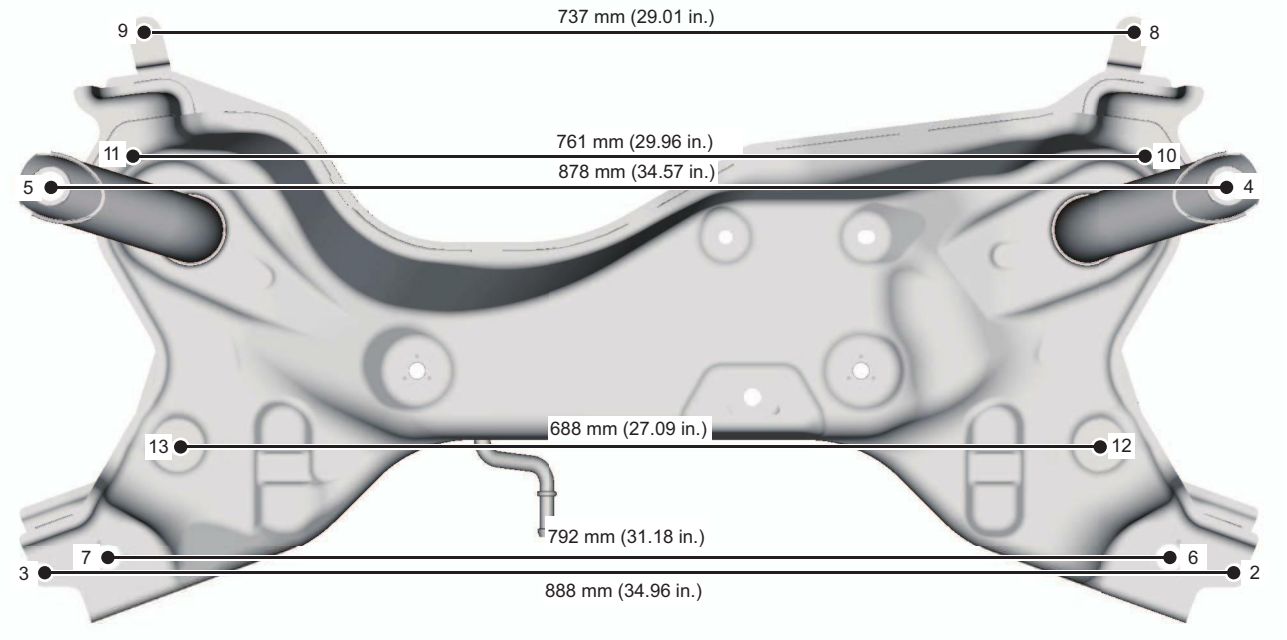
- **Values in this dimensional drawing are provided for reference only. Refer to "Under Body Dimensions" (Page 9K-29) when correct values are needed.**
- **The dimensions with "*" are distance to same point on opposite side.**
- **In principle, body dimensions in the figure below are symmetrical. Adopt the dimension for the opposite side if the dimension is not mentioned in the figure below.**
- **The number with "ø" is circle diameter and measurement unit is "mm".**



IDL70A9B0023-01

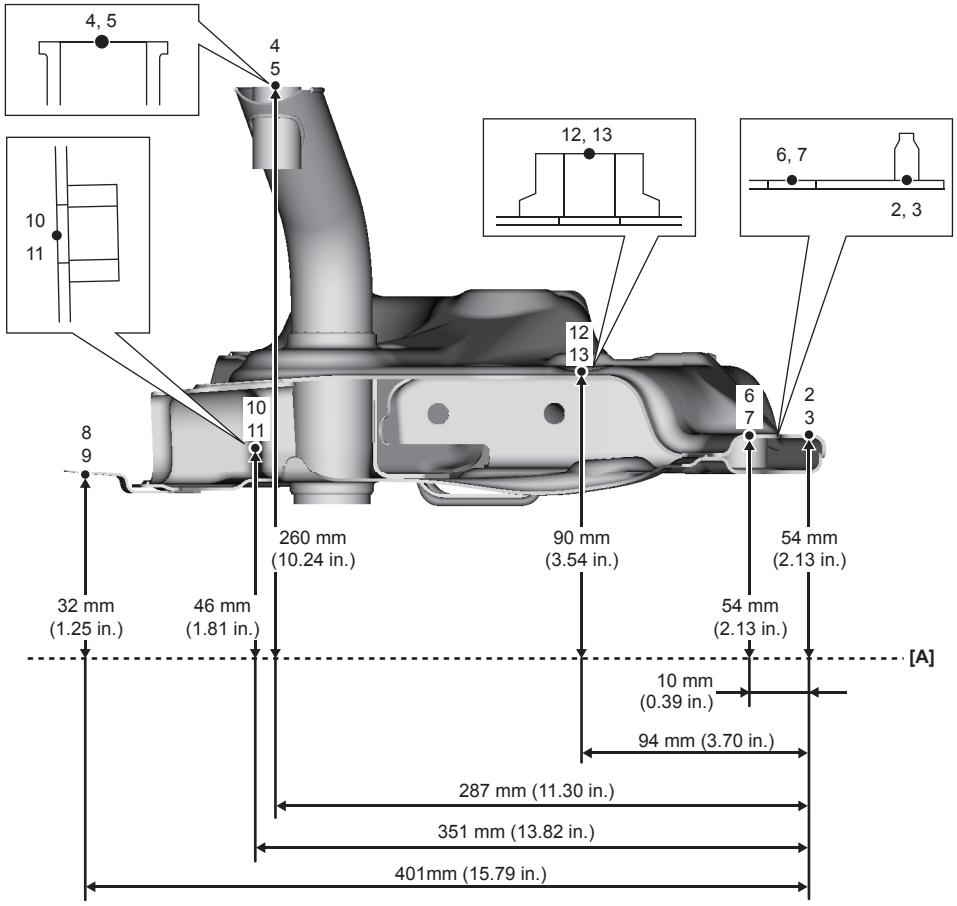
Point	Position		
2	Front lower cross member installation bolt (front side)	R	M8 bolt head center
3	↑	L	↑
26	Suspension frame installation bolt (front side)	R	M14 bolt head center
27	↑	L	↑
30	Suspension frame installation bolt (rear side)	R	↑
31	↑	L	↑
32	Dash lower member jig hole	R	ø 12 hole center
33	↑	L	↑

Top View



IDL70A9B0024-02

Side View



IDL70A9B0025-01

[A]: Imaginary datum line

Point	Position		
2	Front suspension frame locating stud	R	ø 12 stud bottom end center
3	↑	L	↑
4	Front suspension frame installation hole	R	ø 22 hole center
5	↑	L	↑
6	Front suspension frame installation hole	R	ø 20 hole center
7	↑	L	↑
8	Engine under cover bracket	R	ø 7 hole center
9	↑	L	↑
10	Suspension arm installation hole	R	Weld nut M14
11	↑	L	↑
12	↑	R	↑
13	↑	L	↑

Repair Instructions

Hood Lock Member and Lamp Support Brace Removal and Installation

AENDL70A9B06001

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**



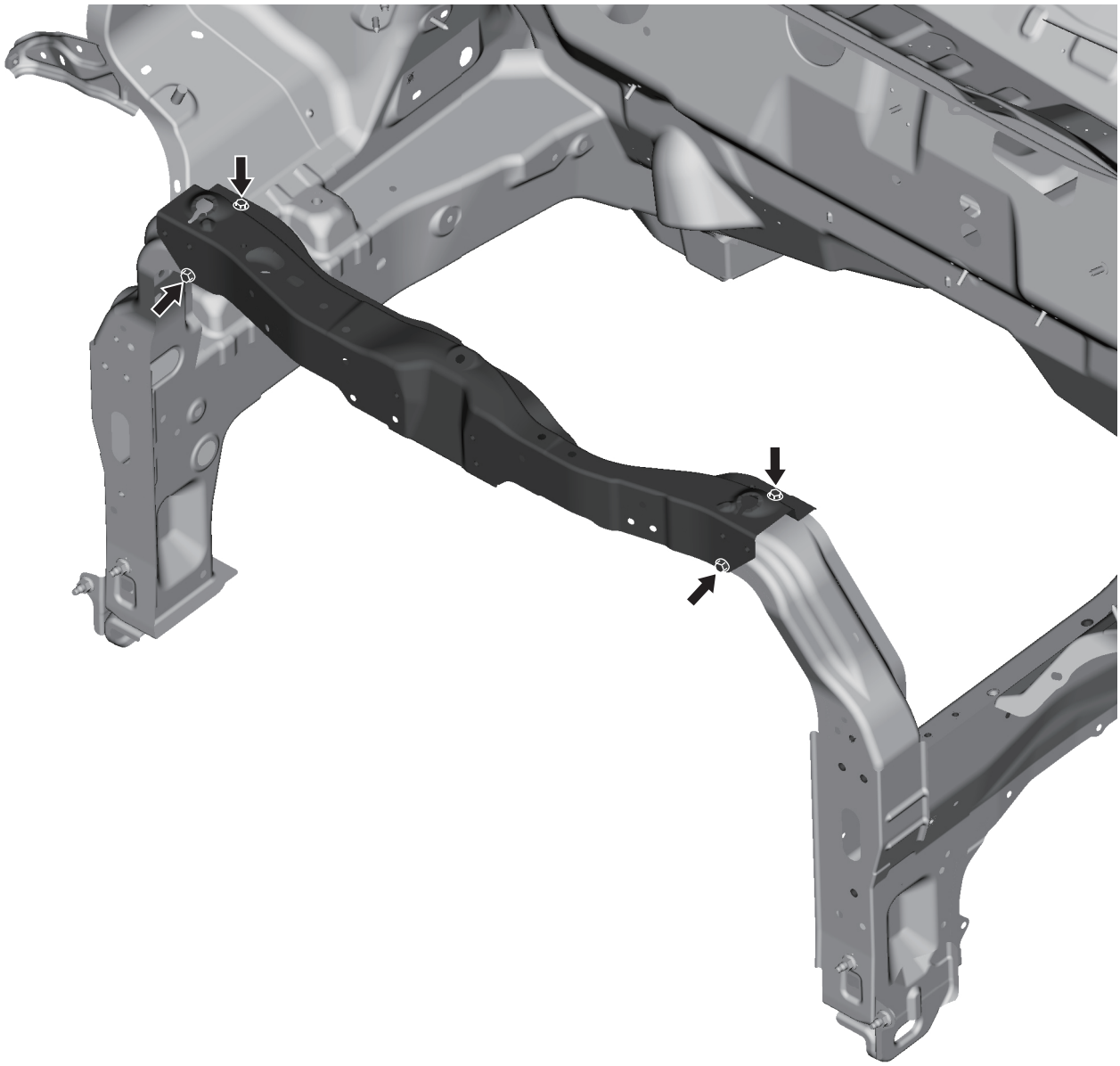
IDL70A9B0026-01

General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

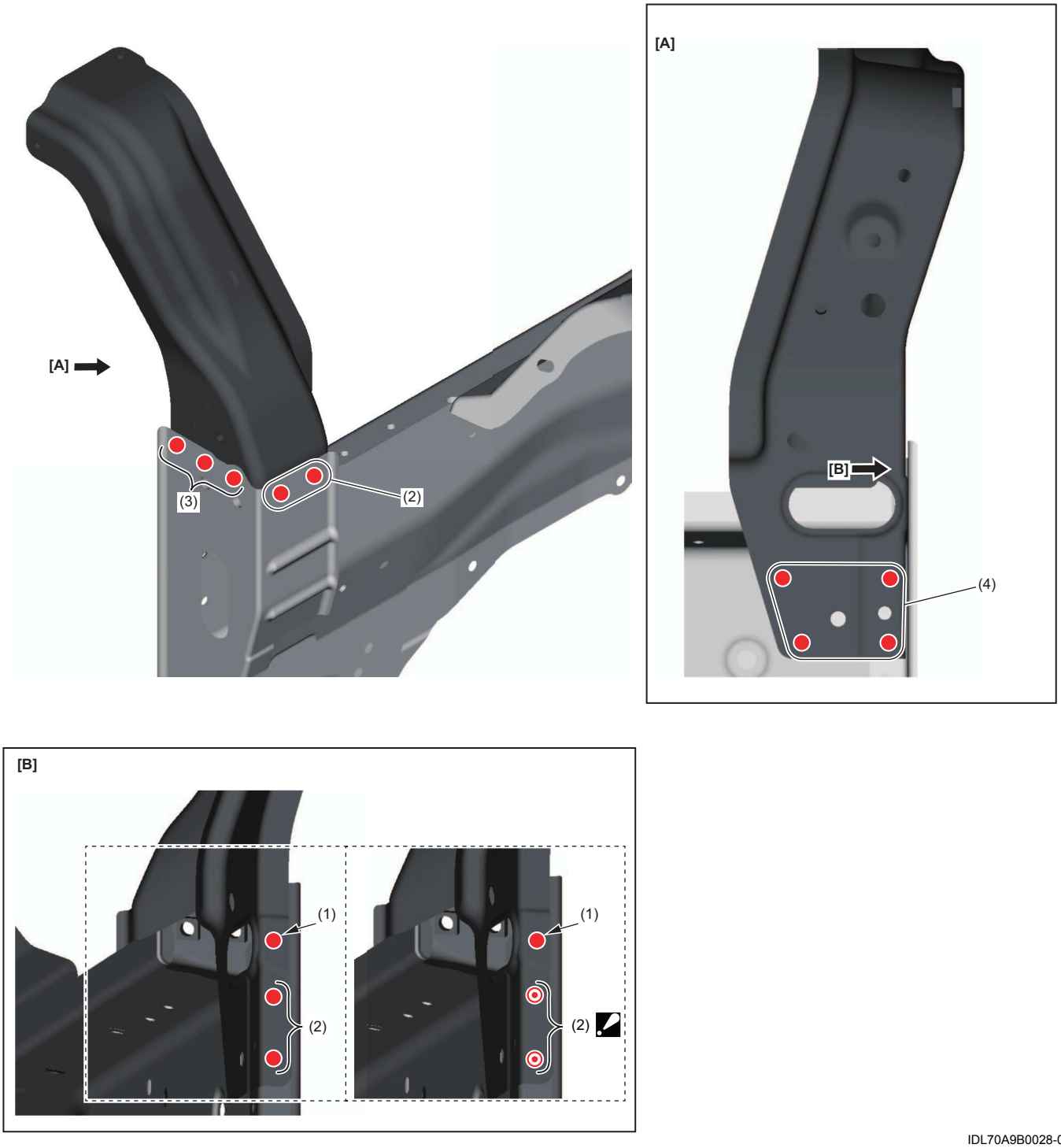
Removal

1) Unscrew 4 bolts.
2) Remove hood lock member.



IDL70A9B0027-01

3) Drill out welding spots and remove lamp support brace.



IDL70A9B0028-04

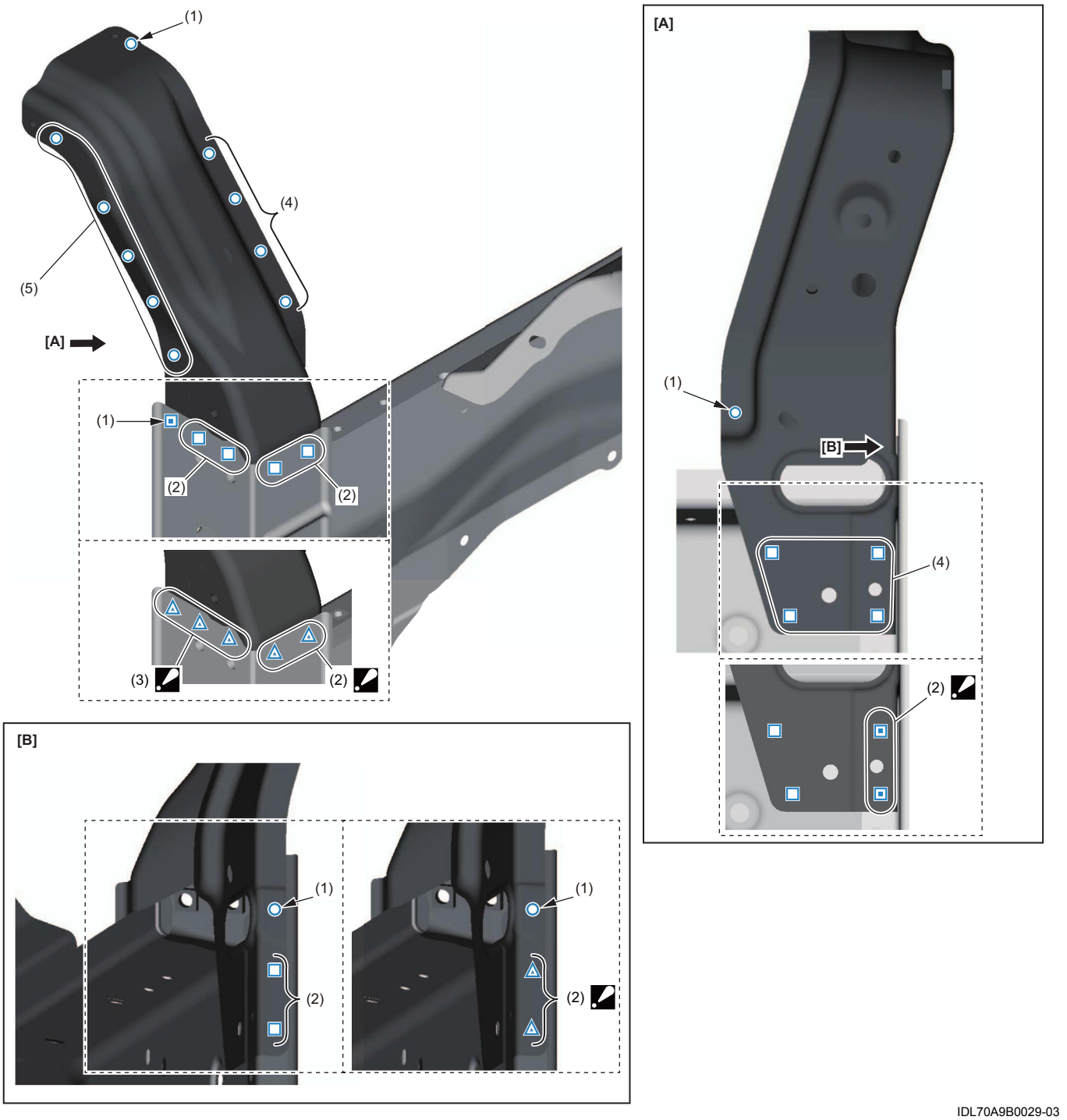
: This symbol indicates that apron side member and lamp support brace are replaced at the same time.

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-21)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

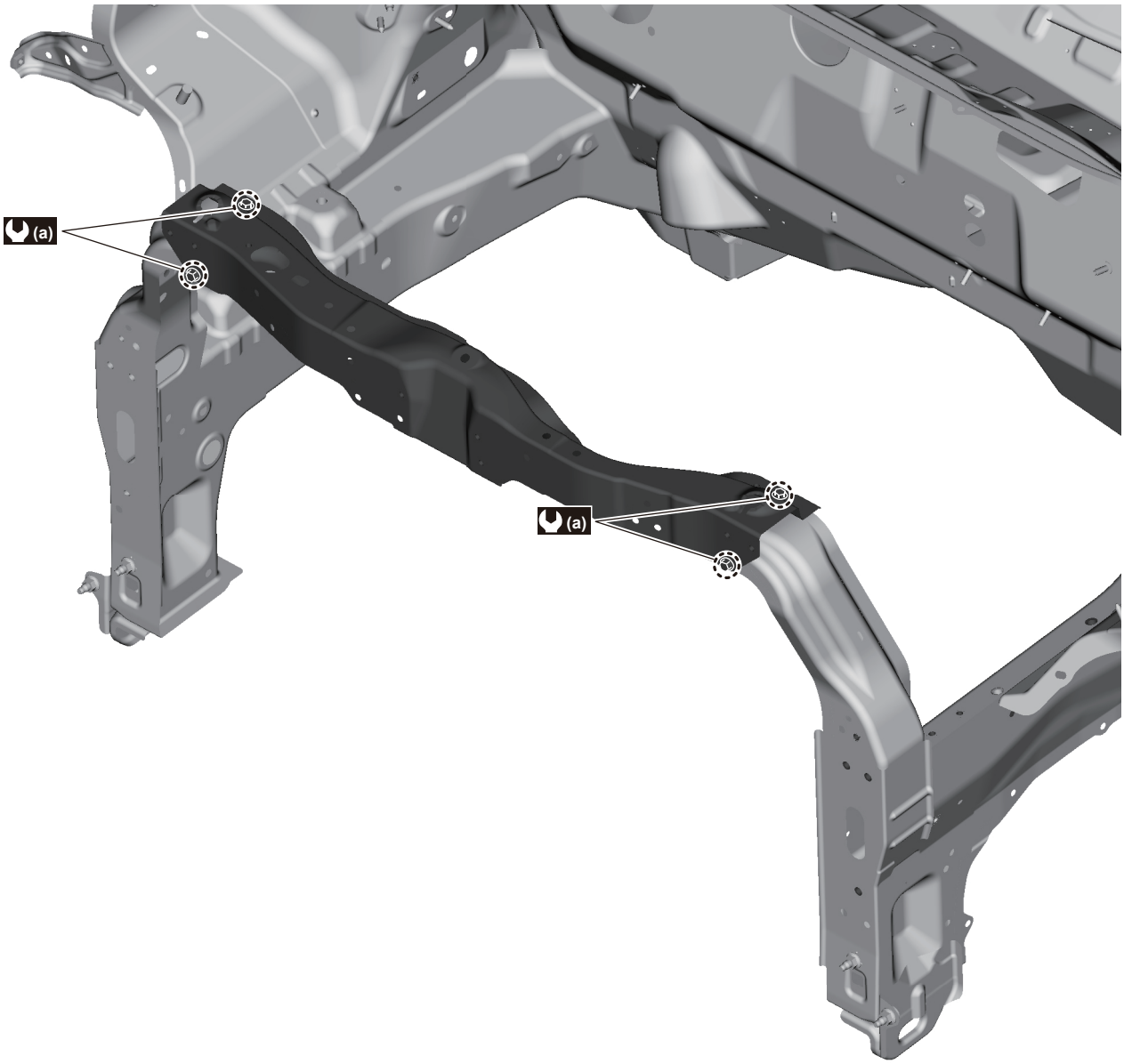
1) Install lamp support brace.
2) Conduct resistance spot weld or plug weld.



IDL70A9B0029-03

: This symbol indicates that apron side member and lamp support brace are replaced at the same time.

3) Install hood lock member.
4) Tighten 4 bolts to specified torque.



IDL70A9B0030-01

(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

5) Apply painting and coatings to repaired or replace parts.

Front Fender Bracket and Front Fender Lower Bracket Removal and Installation

AENDL70A9B06002

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**



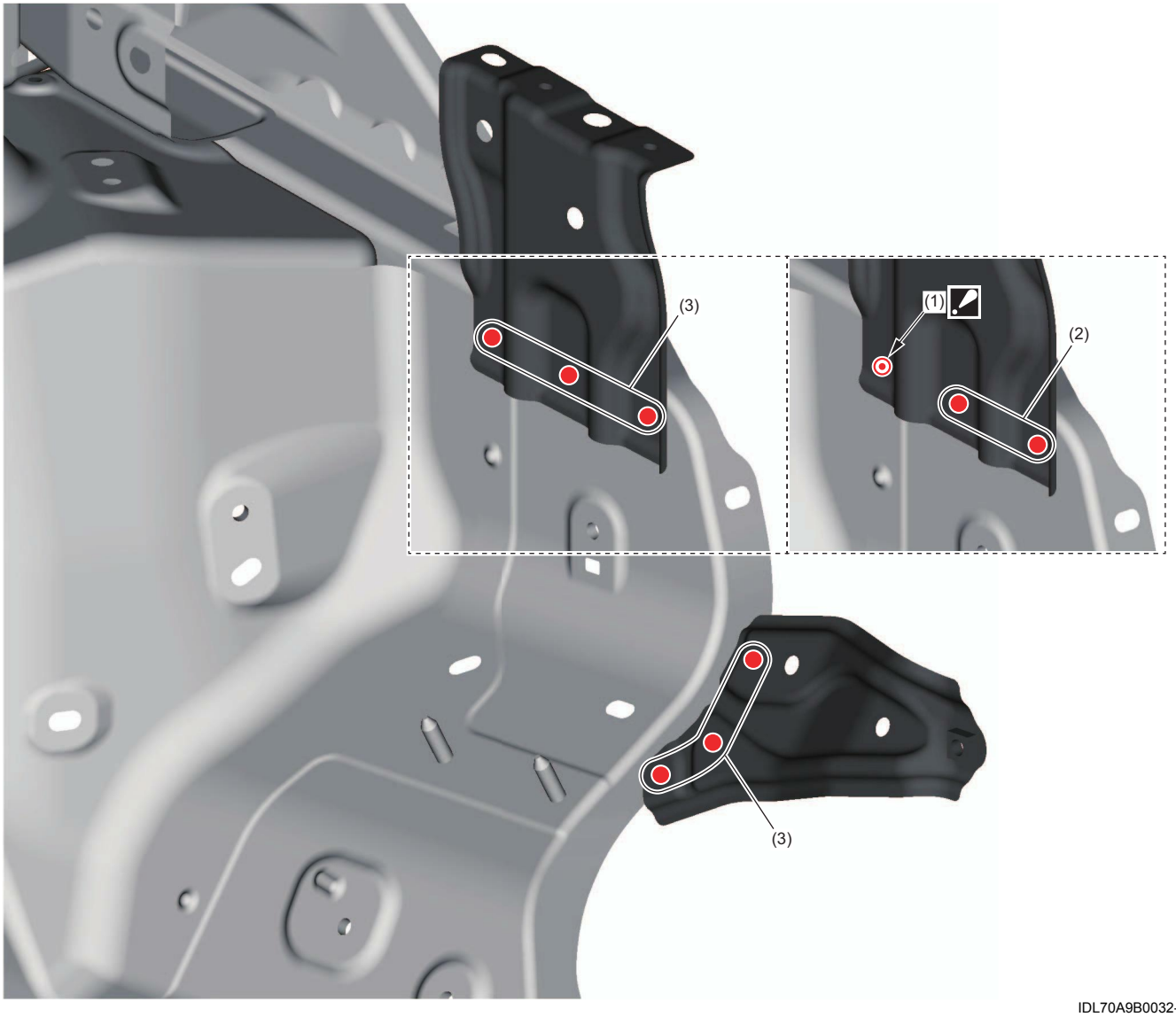
IDL70A9B0031-01

General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

Removal

1) Drill out welding spots and remove front fender bracket and front fender lower bracket.



IDL70A9B0032-02

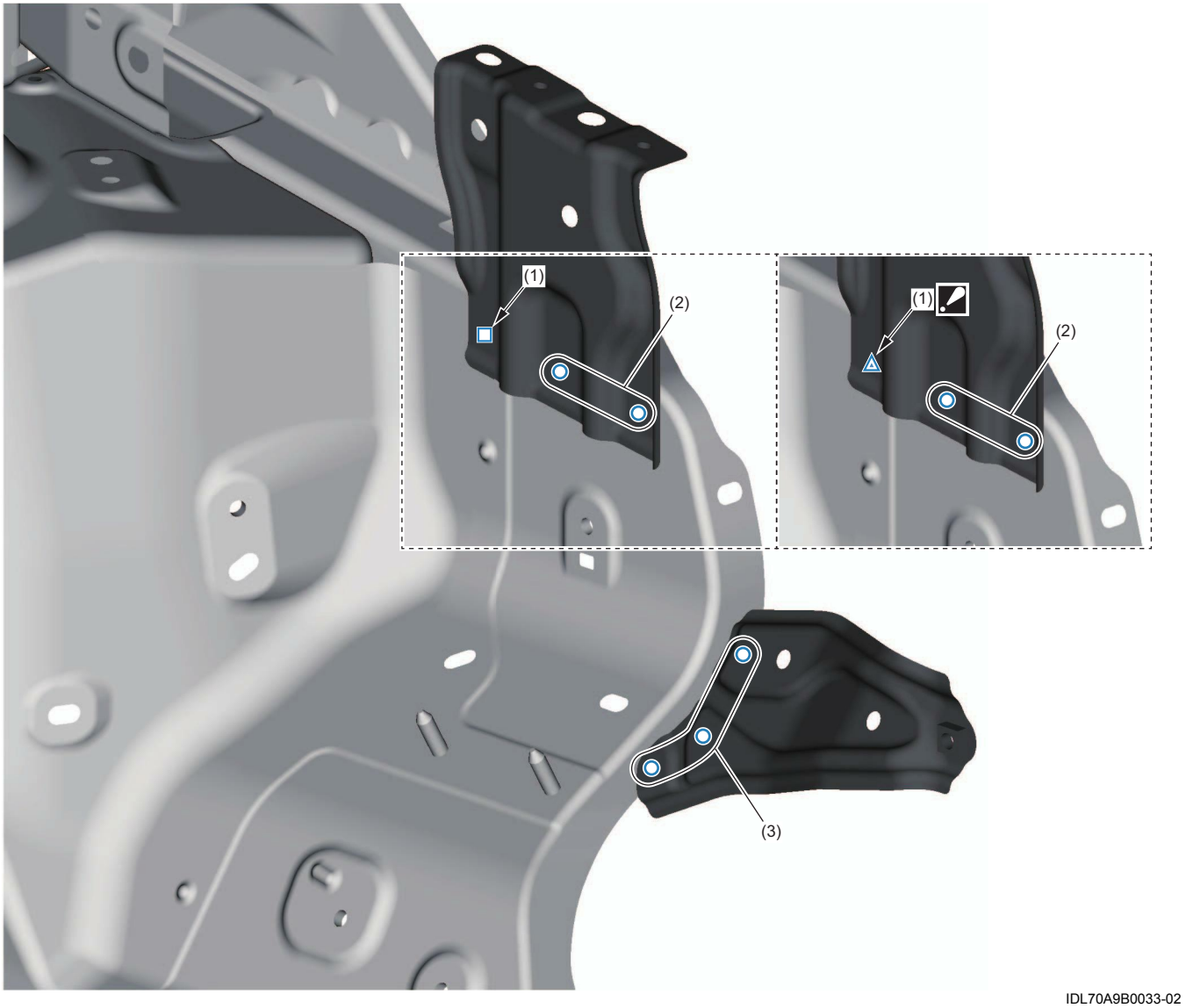
: This symbol indicates that front fender lower bracket and fender apron extension are replaced at same time.

Installation

NOTE

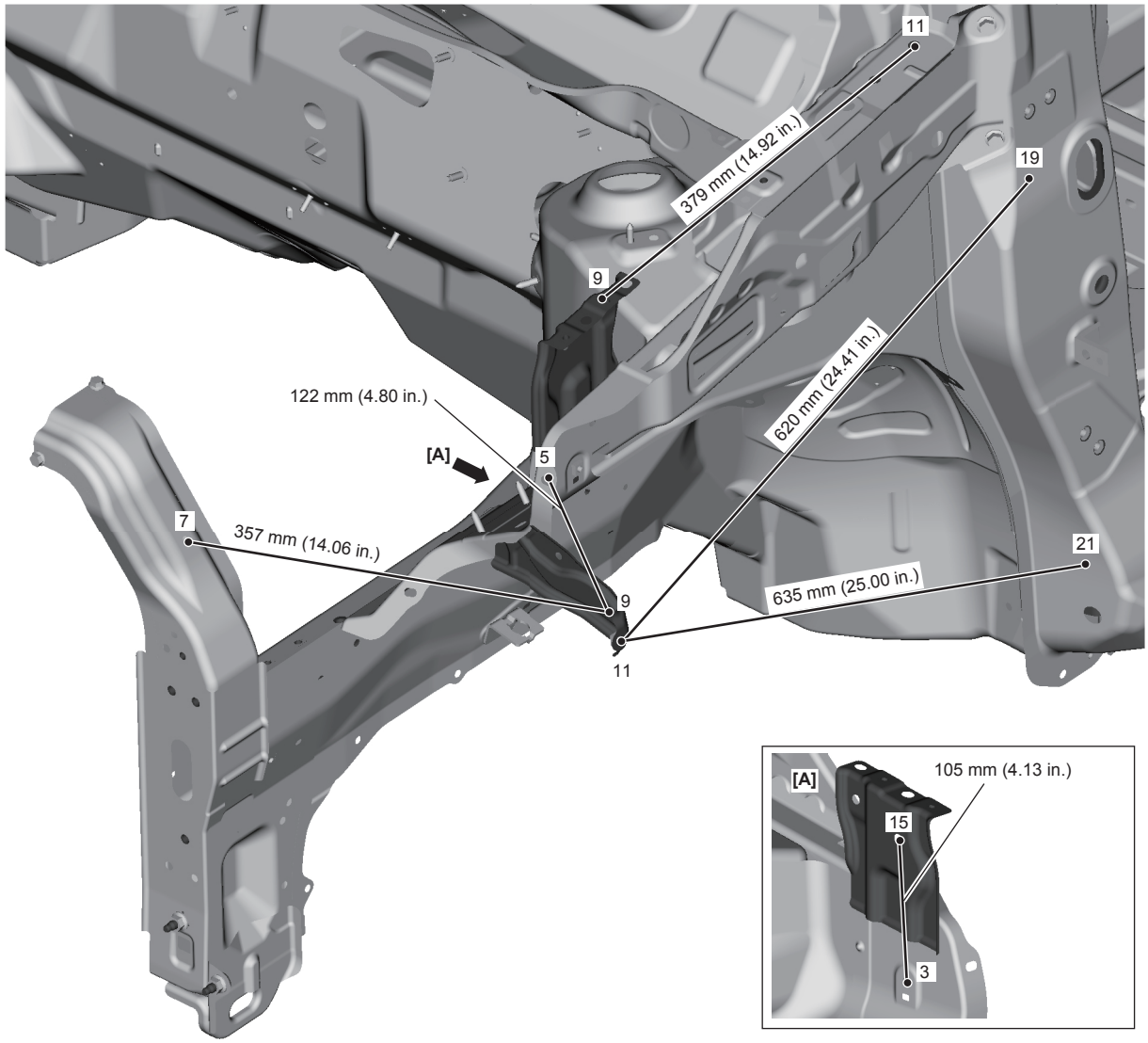
- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-21)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install front fender bracket and front fender lower bracket
2) Conduct resistance spot weld.



IDL70A9B0033-02

: This symbol indicates that front fender lower bracket and fender apron extension are replaced at same time.



IDL70A9B0034-01

Point	Position		
2	Fender apron extension installation hole	R	ø8 hole center (weld nut M6)
3	↑	L	↑
4	Fender apron extension jig hole	R	7 x 12 mm hole center
5	↑	L	↑
6	Lamp support outer jig hole	R	↑
7	↑	L	↑
8	Front fender lower jig hole	R	ø7 hole center
9	↑	L	↑
10	Front fender lower installation hole	R	ø7 hole center (weld nut M6)
11	↑	L	↑
12	Front fender installation hole	R	↑
13	↑	L	↑
14	Front fender jig hole	R	ø8 hole center
15	↑	L	↑
16	Hood hinge installation hole (rear side)	R	ø9 hole center (weld nut M6)
17	↑	↑	↑
18	Front door upper hinge installation hole (front side)	R	ø14 hole center (weld nut M8)
19	↑	L	↑
20	Front door upper hinge installation hole (upper side)	R	ø14 hole center (weld nut M8)
21	↑	L	↑

Apron Side Member Removal and Installation

AENDL70A9B06003

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**
- **Front fender bracket and front fender lower bracket ☞(Page 9K-39)**
- **Cowl side outer member ☞(Page 9K-50)**
- **Dash side front panel, cowl side panel and cowl side reinforcement ☞(Page 9K-53)**
- **Fender apron panel, fender apron extension ☞(Page 9K-57)**



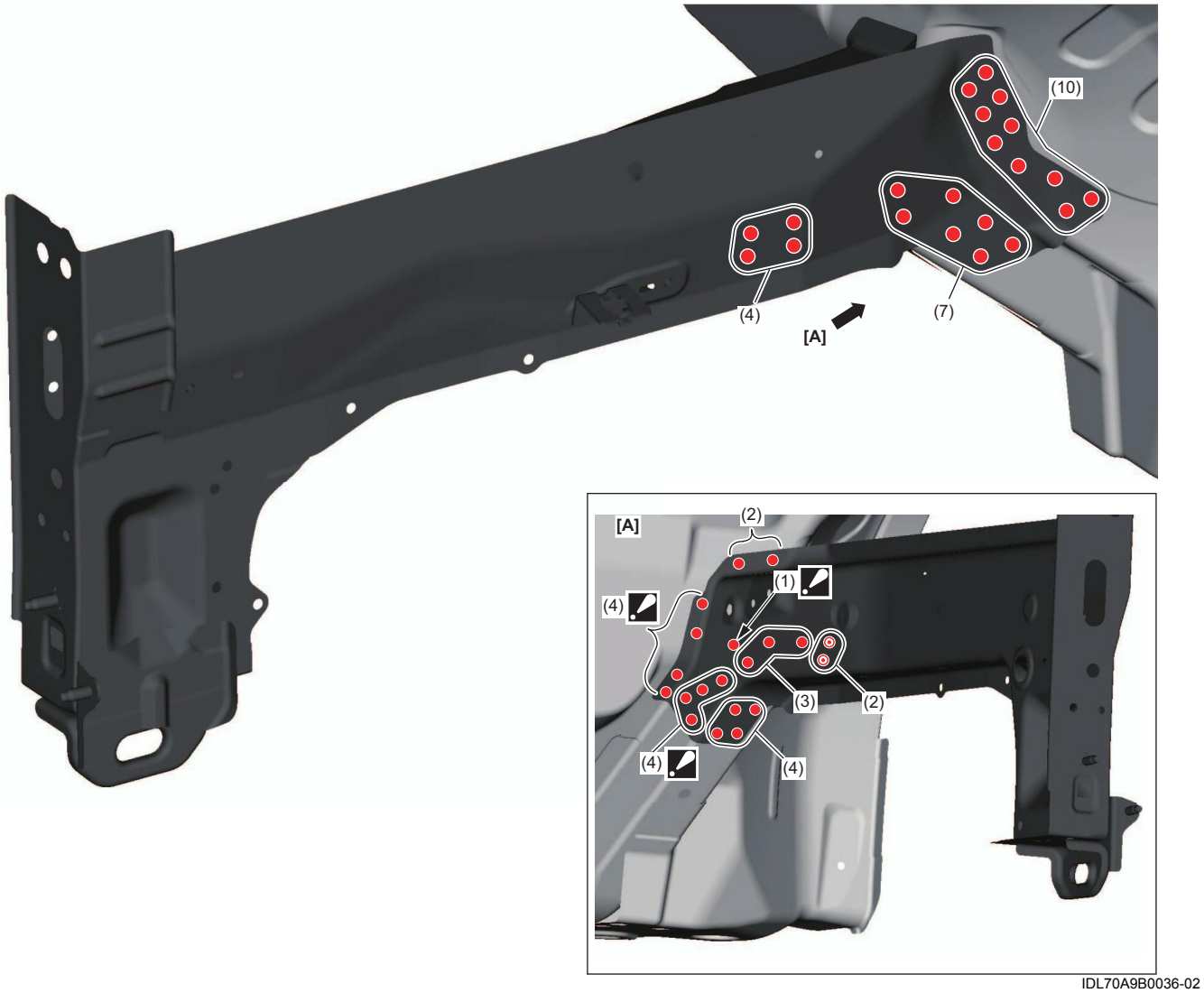
IDL70A9B0035-01

General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

Removal

1) Drill out welding spots and remove apron side member.



IDL70A9B0036-02

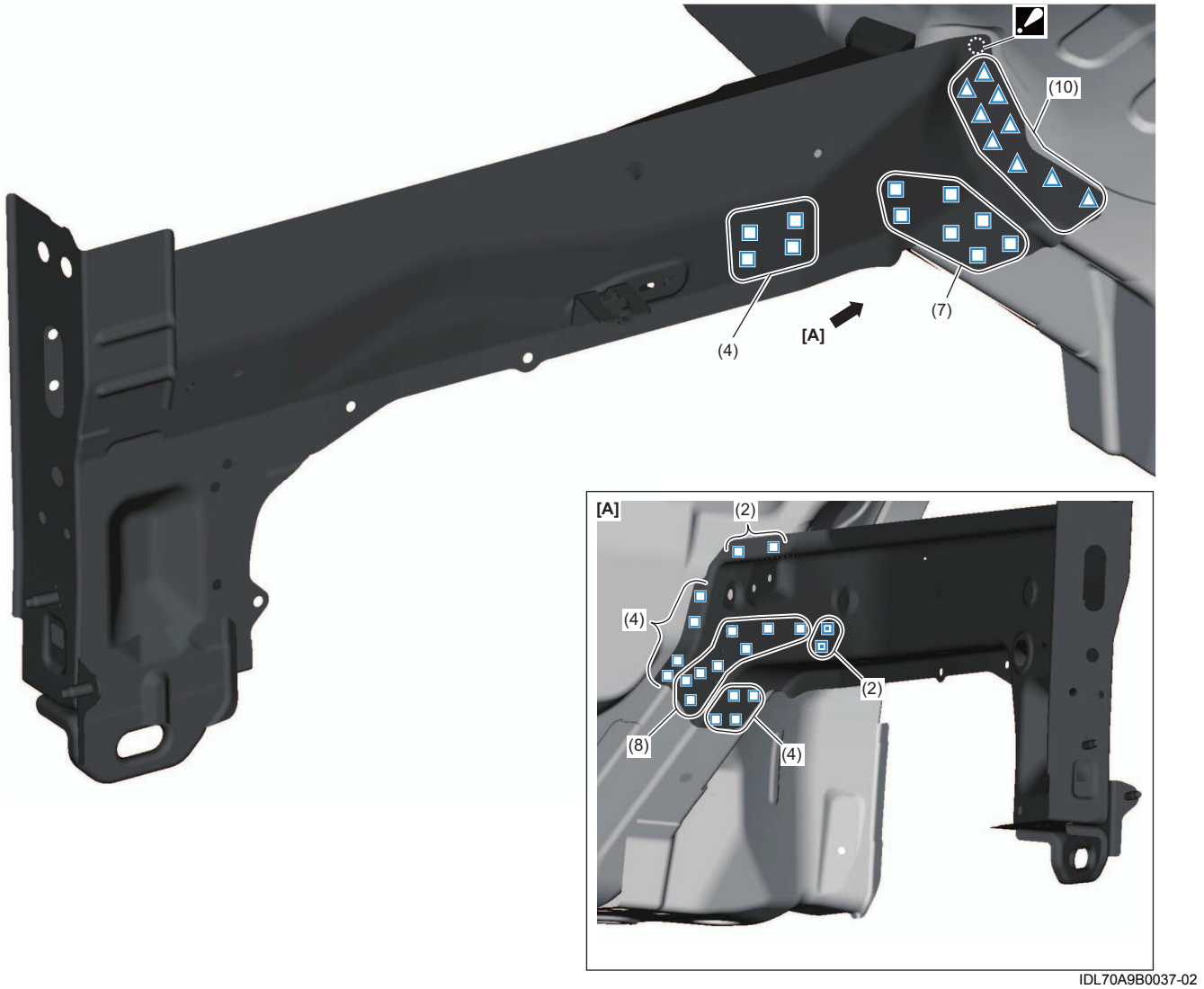
: Grind welding spots using belt sander, if necessary.

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **– ☞(Page 9K-21)**
  - **– ☞(Page 9K-29)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install apron side member.
2) Conduct resistance spot weld and plug weld.



IDL70A9B0037-02

: This symbol indicates that apron side member and fender apron panel are replaced at the same time.

Apron Side Member (Partial) Removal and Installation

AENDL70A9B06004

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**



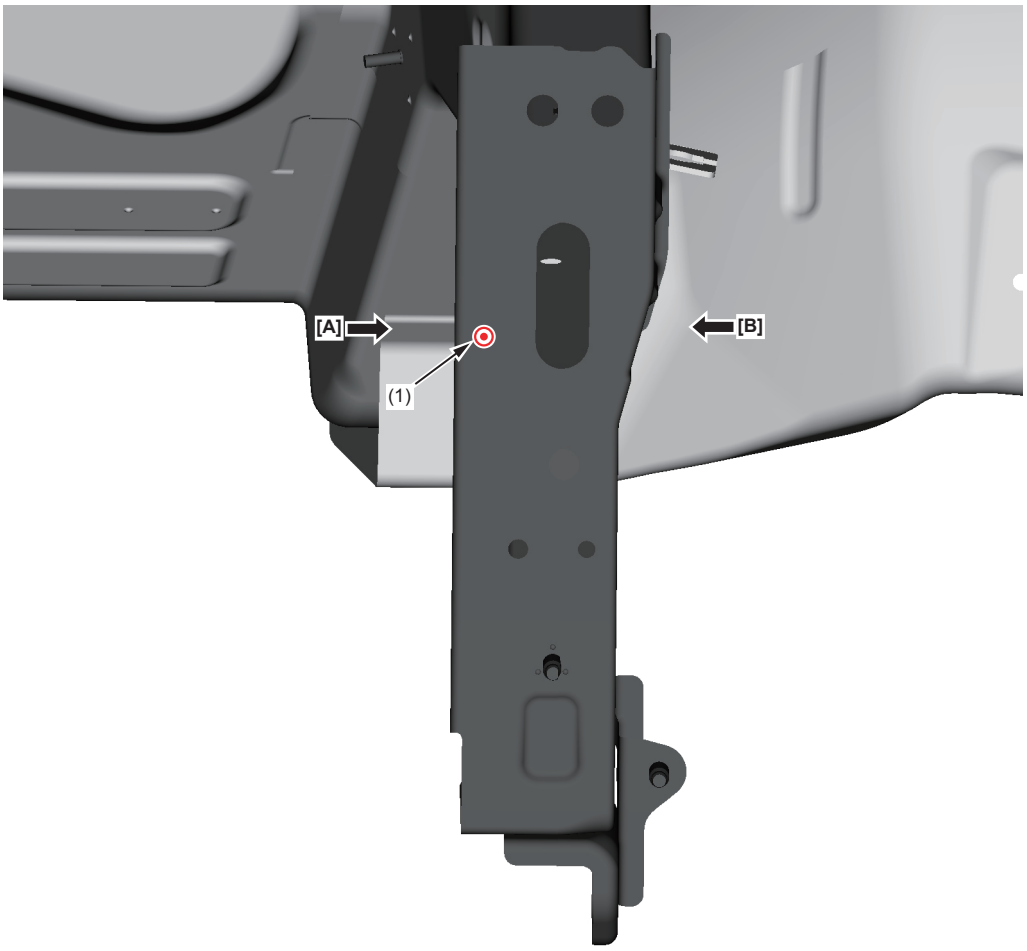
IDL70A9B0038-01

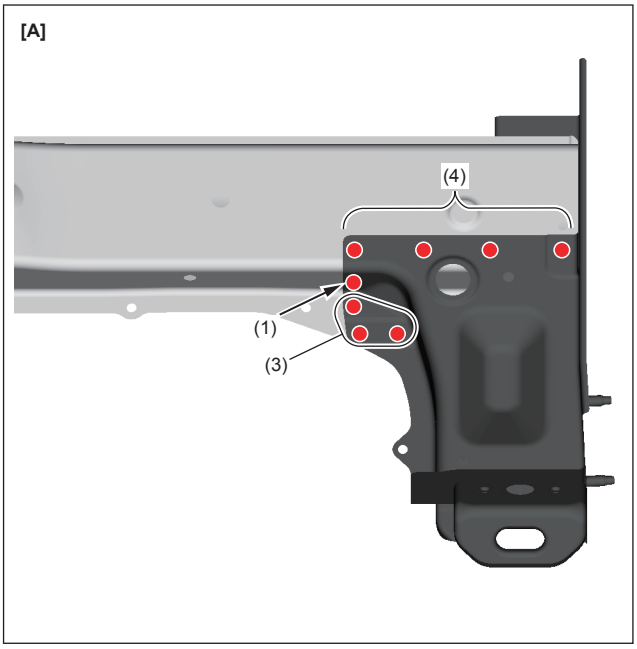
General Notes

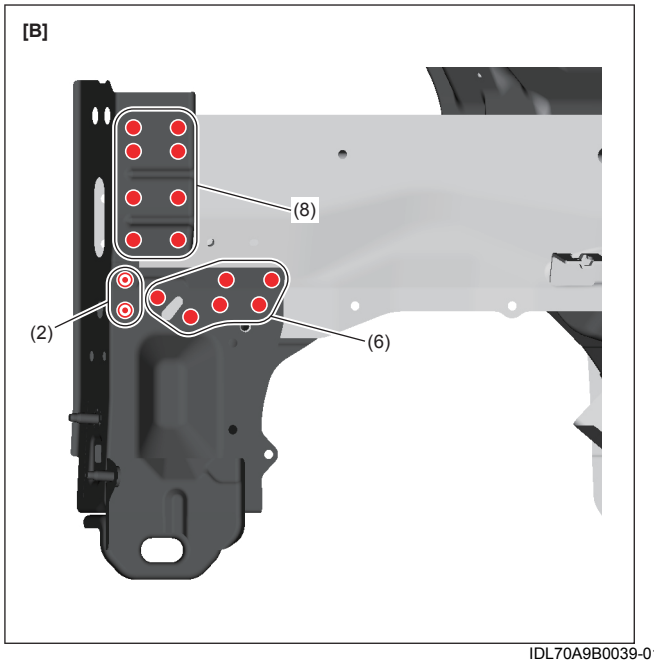
Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

Removal

1) Drill out welding spots and remove front bumper member upper plate.
2) Drill out welding spots and remove apron side member extension, apron side outer member extension and front bumper member lower plate.







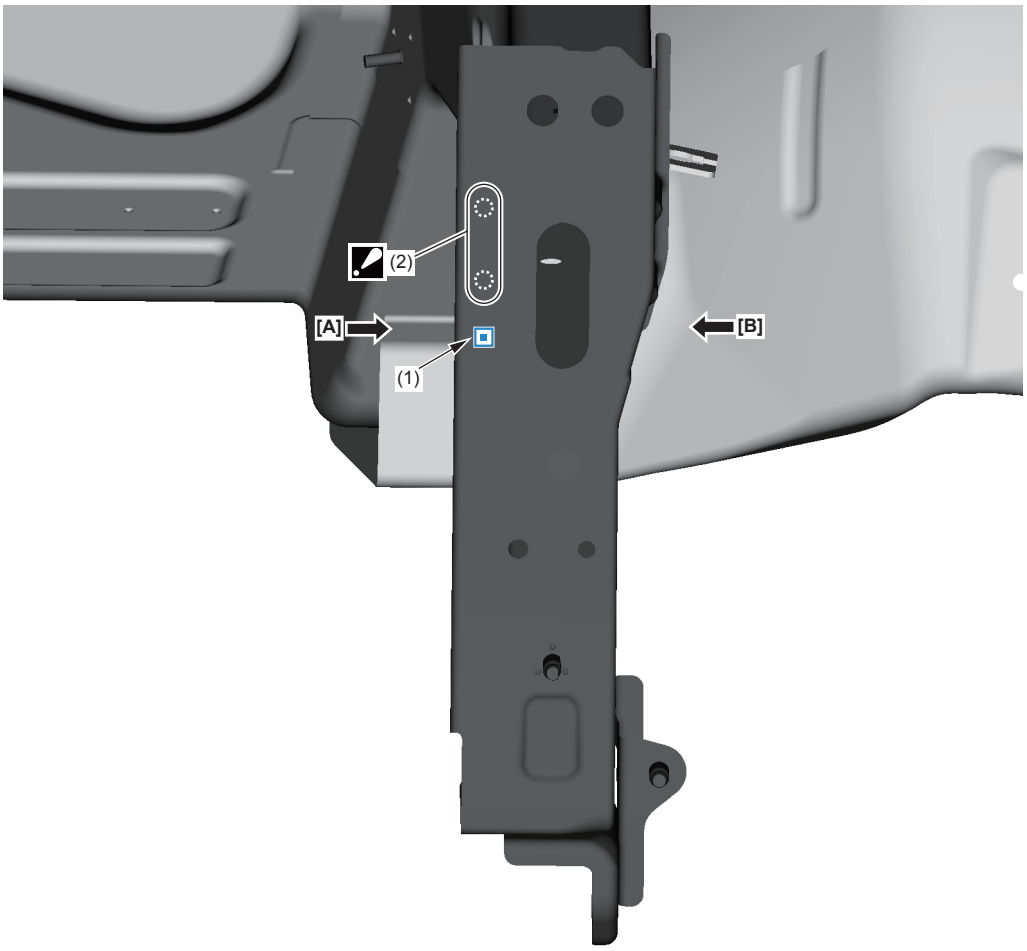
IDL70A9B0039-01

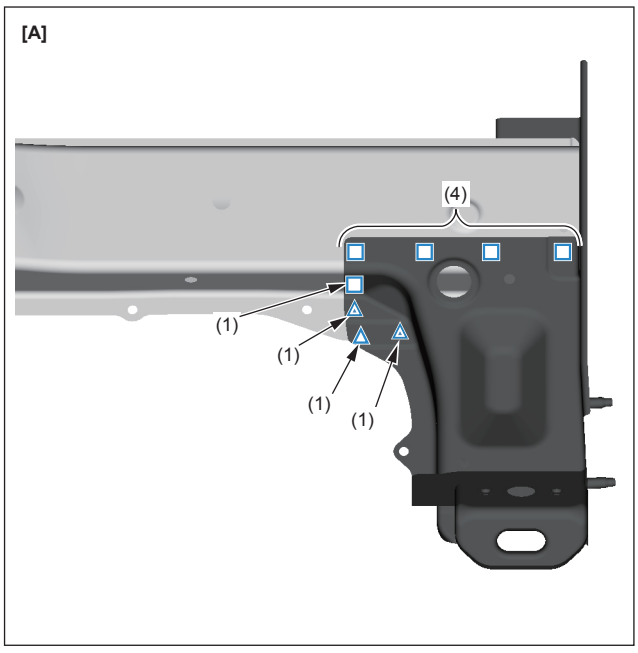
Installation

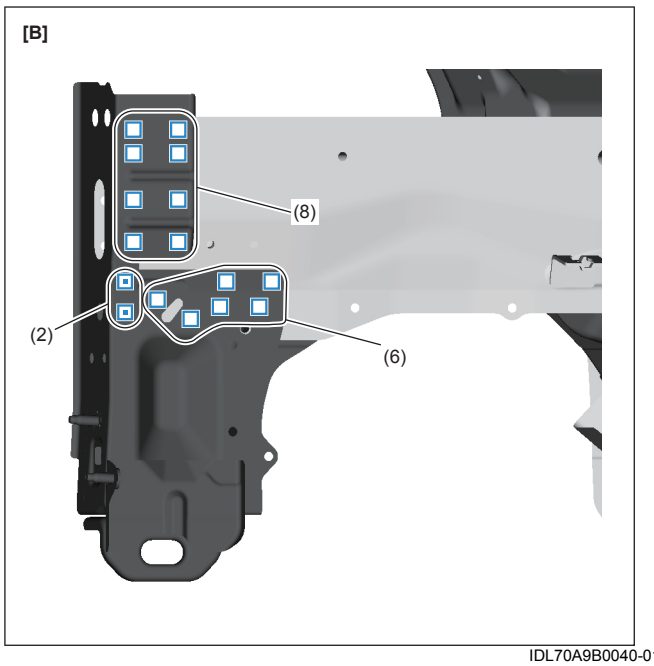
NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **– ☞(Page 9K-21)**
  - **– ☞(Page 9K-29)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install apron side member extension, apron side outer member extension and front bumper member lower plate.
2) Conduct plug weld.
3) Install front bumper member upper plate.
4) Conduct plug weld.







IDL70A9B0040-01

[A]:	Vehicle inside
[B]:	Vehicle outside
:	This symbol indicates that apron side member and lamp support brace are replaced at the same time.

Cowl Side Outer Member Removal and Installation

AENDL70A9B06005

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**



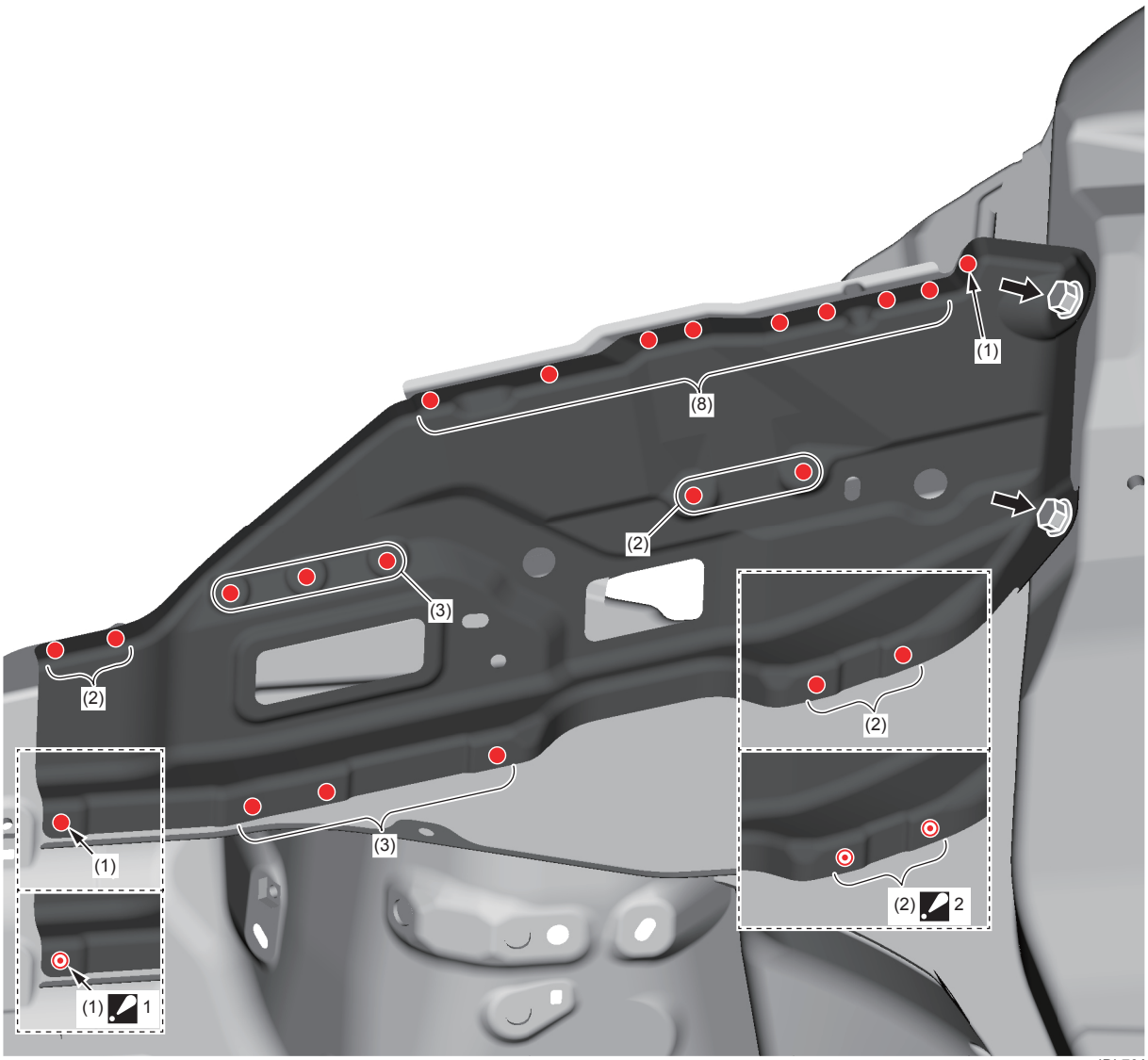
IDL70A9B0041-01

General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

Removal

1) Unscrew 2 bolts.
2) Drill out welding spots and remove cowl side outer member.



IDL70A9B0042-02

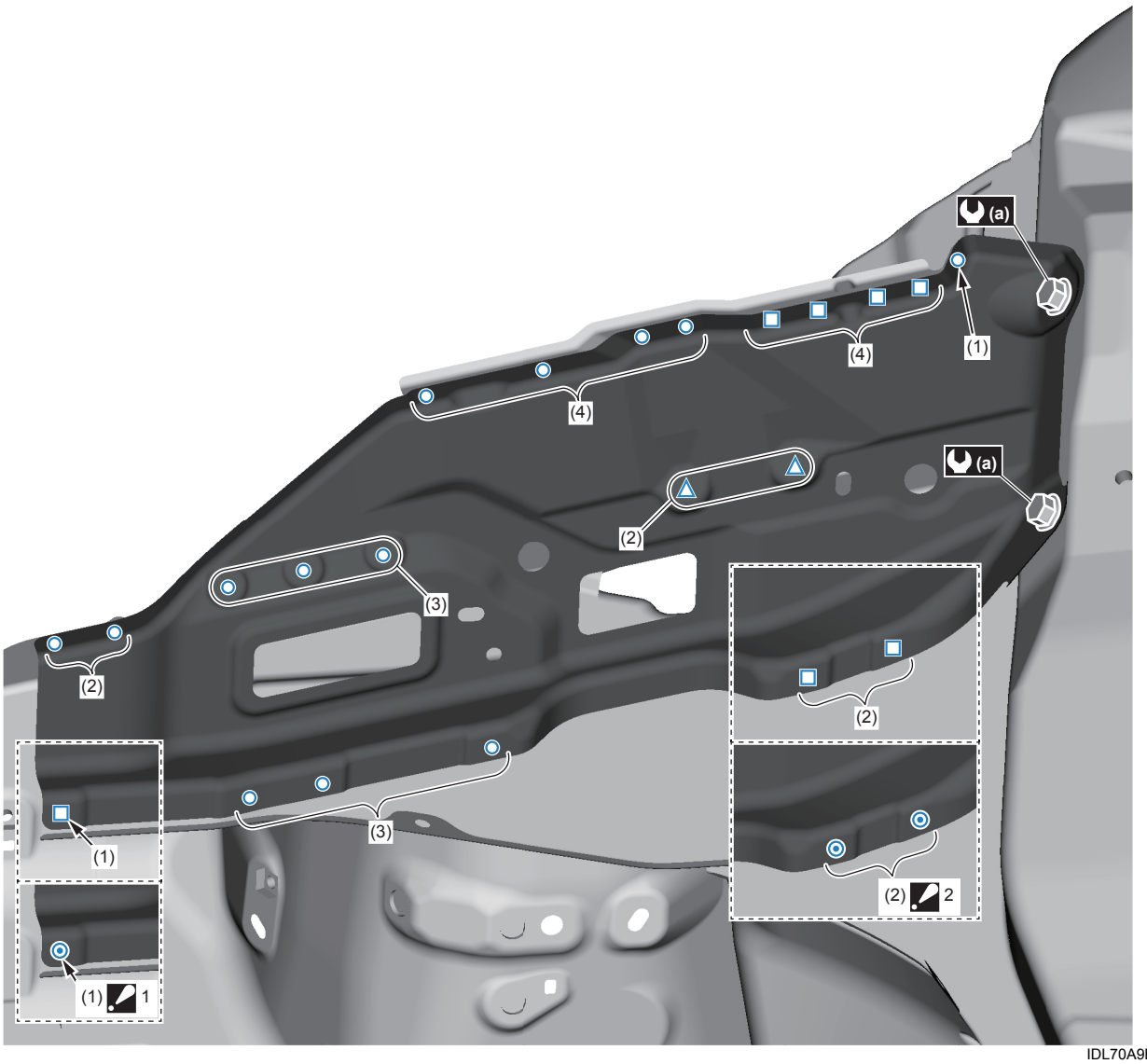
1:	This symbol indicates that cowl side outer member and fender apron extension are replaced at the same time.
2:	This symbol indicates that cowl side outer member and dash side front panel are replaced at the same time.

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-21)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install cowl side outer member, tighten 2 bolts temporarily and adjust position relative to adjoining parts.
2) Conduct resistance spot weld and plug weld.
3) Tighten 2 bolts to specified torque.



IDL70A9B0043-02

1:	This symbol indicates that cowl side outer member and fender apron extension are replaced at the same time.
2:	This symbol indicates that cowl side outer member and dash side front panel are replaced at the same time.
(a) :	23 N·m (2.3 kgf-m, 17.0 lbf-ft)

Dash Side Front Panel, Cowl Side Panel and Cowl Side Reinforcement Removal and Installation

AENDL70A9B06006

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**
- **Cowl side outer member ☞(Page 9K-50)**



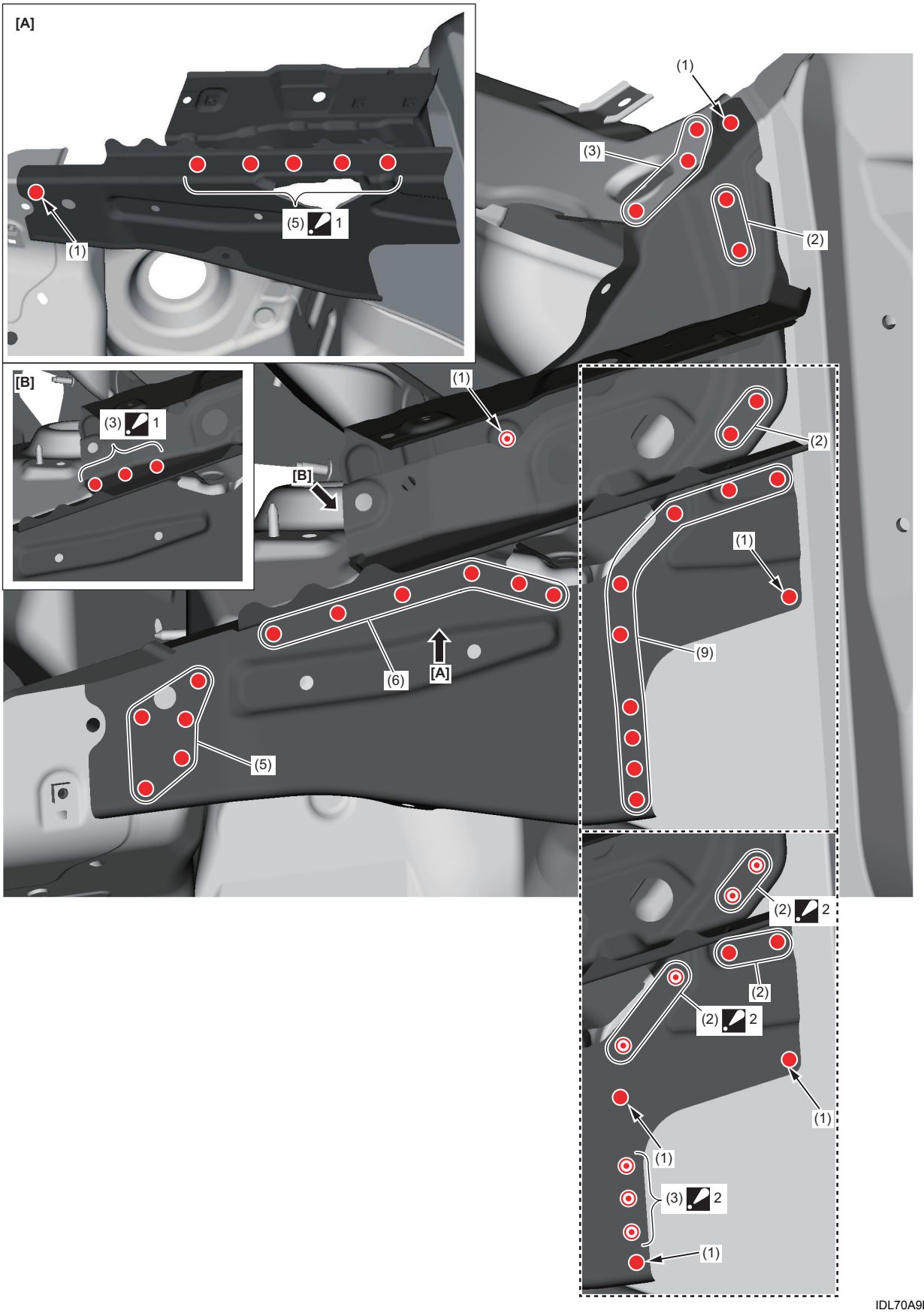
IDL70A9B0044-01

General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

Removal

1) Drill out welding spots and remove dash side front panel with cowl side panel and cowl side reinforcement.



IDL70A9B0045-02

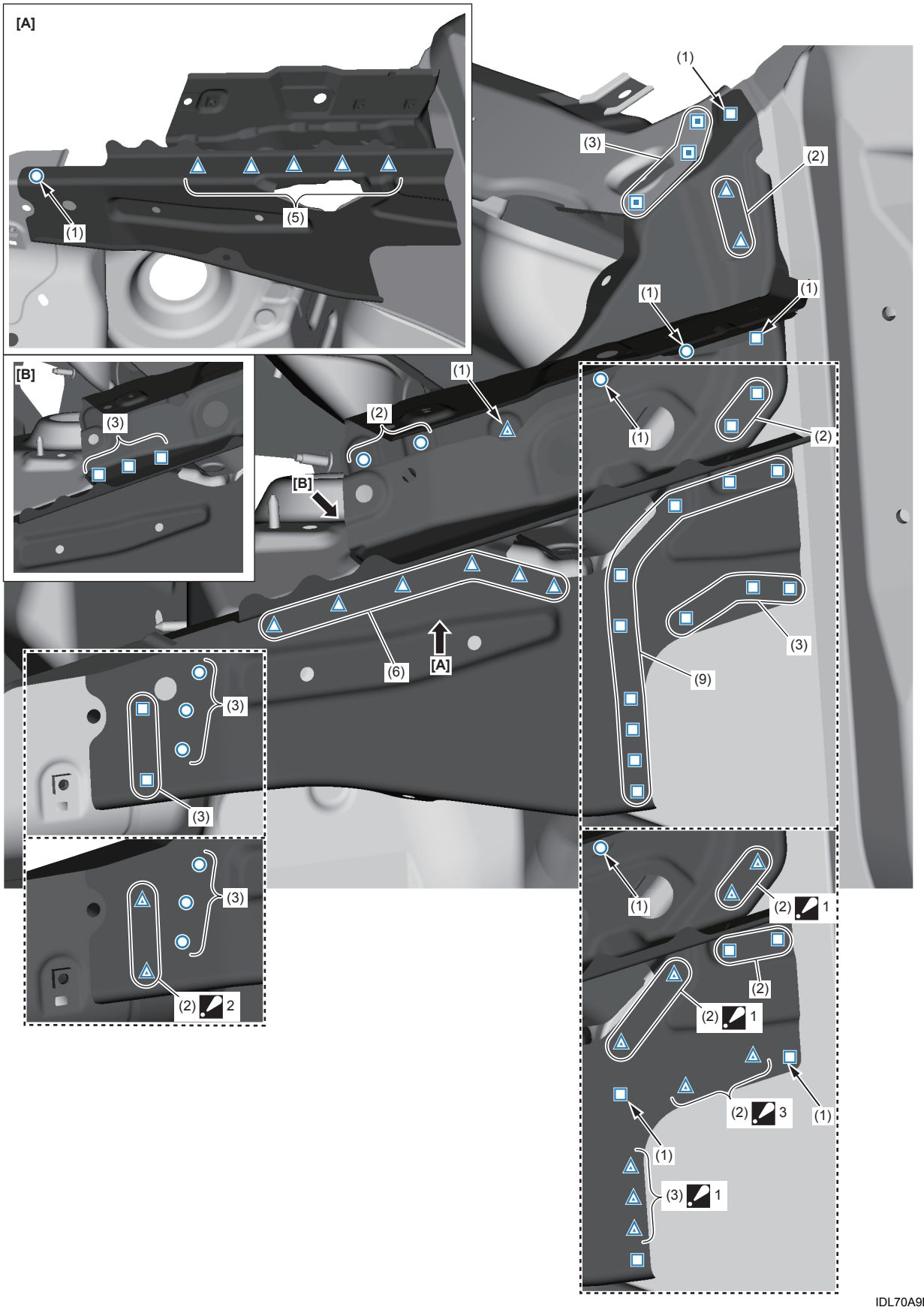
[A]:	Vehicle left side
[B]:	Vehicle right side
1:	Grind welding spots using belt sander, if necessary.
2:	This symbol indicates that dash side front panel and dash side panel are replaced at the same time.

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-21)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install dash side front panel with cowl side panel and cowl side reinforcement.
2) Conduct resistance spot weld or plug weld.



IDL70A9B0046-02

[A]:	Vehicle left side
[B]:	Vehicle right side
1:	This symbol indicates that dash side front panel and dash side panel are replaced at the same time.
2:	This symbol indicates that dash side front panel, fender apron panel and fender apron extension are replaced at same time.
3:	This symbol indicates that dash side front panel and cowl side outer member are replaced at same time.

Fender Apron Panel and Fender Apron Extension Removal and Installation

AENDL70A9B06007

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**
- **Front fender lower bracket ☞(Page 9K-39)**
- **Dash side front panel, cowl side panel and cowl side reinforcement ☞(Page 9K-53)**



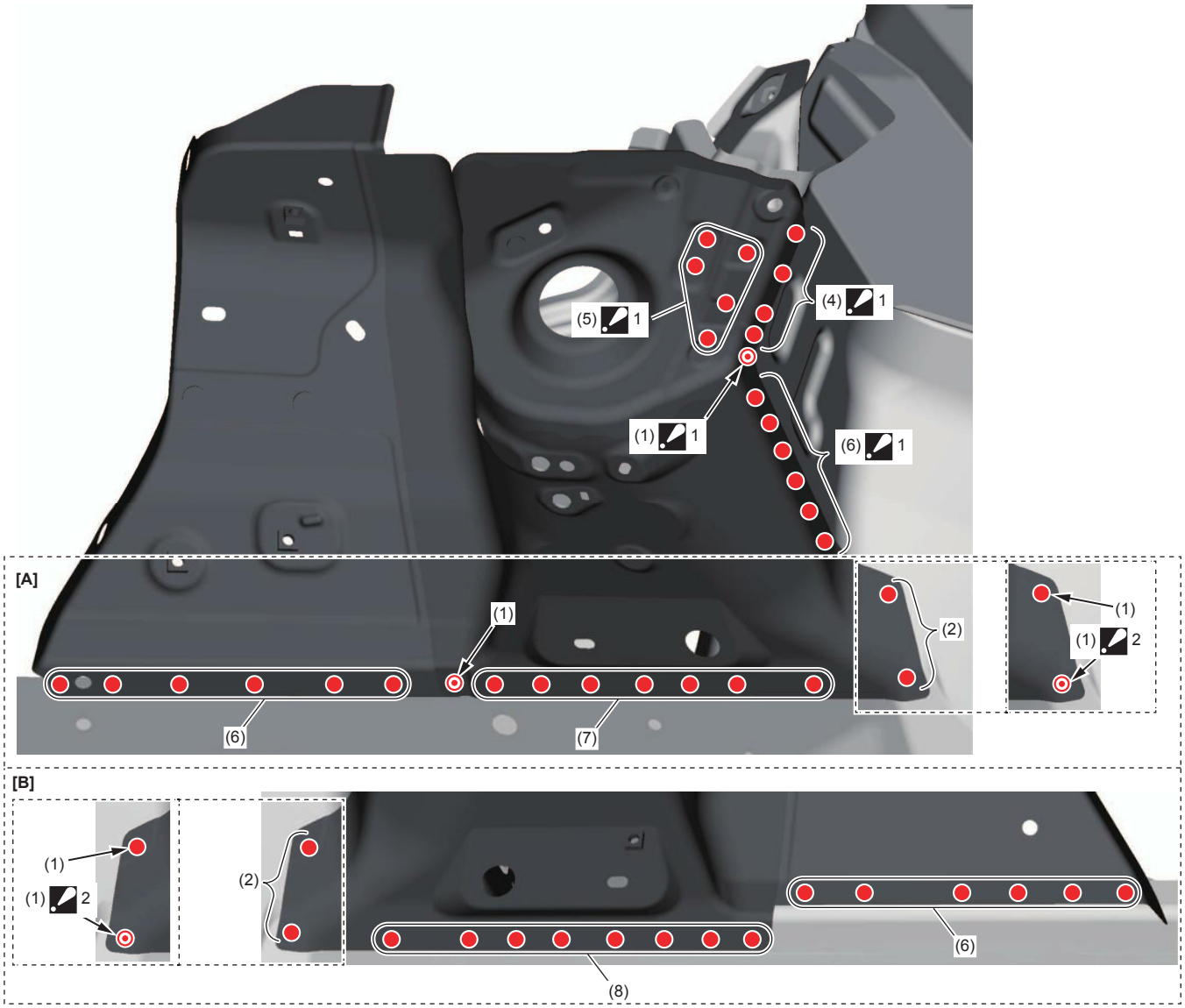
IDL70A9B0047-01

General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

Removal

1) Drill out welding spots and remove fender apron panel and fender apron extension.



IDL70A9B0048-03

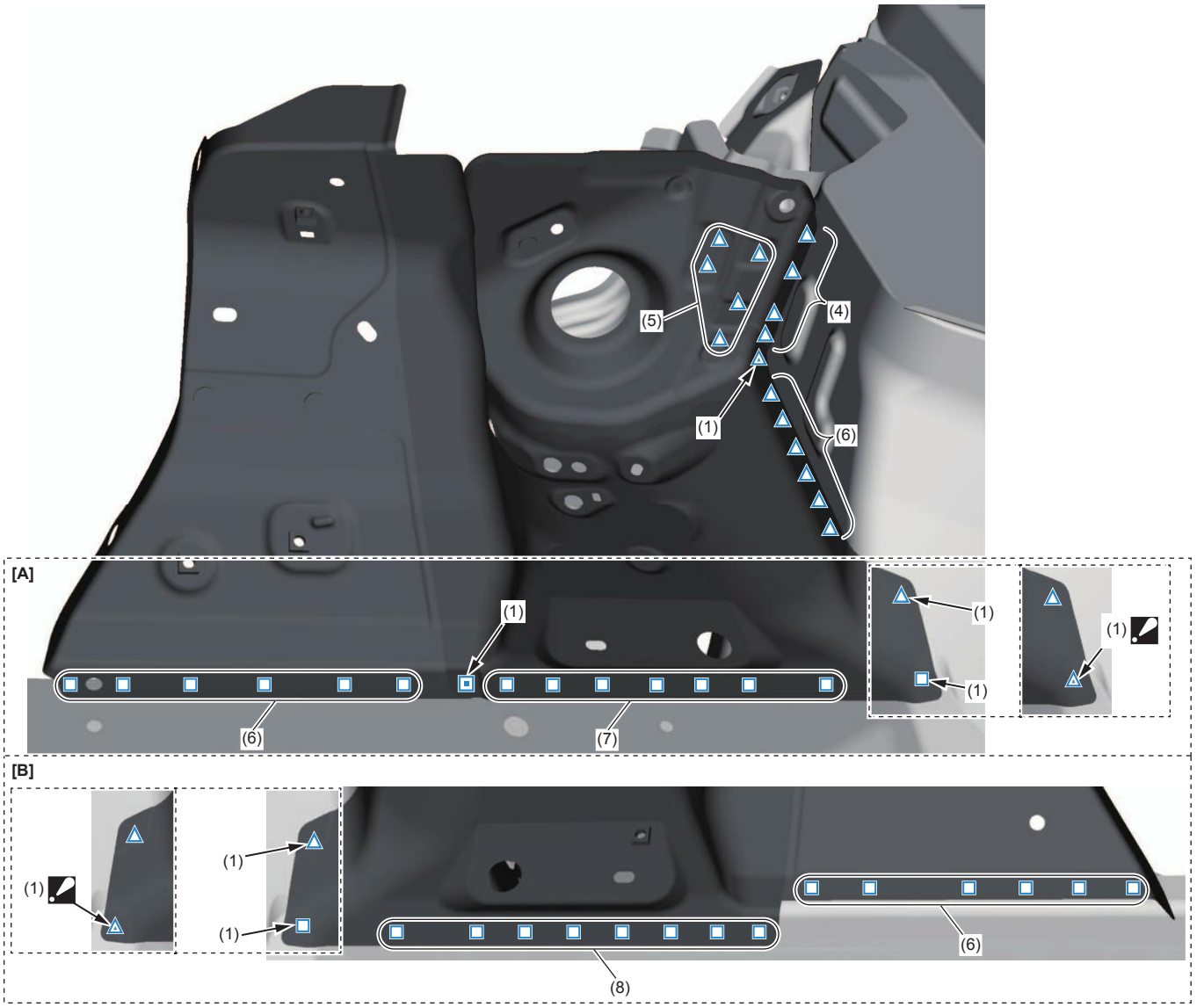
[A]:	Vehicle left side
[B]:	Vehicle right side
1:	Grind welding spots using belt sander, if necessary.
2:	This symbol indicates that fender apron panel, fender apron extension and apron side member are replaced at same time.

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **☞(Page 9K-21)**
  - **☞(Page 9K-29)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install fender apron panel and fender apron extension.
2) Conduct plug weld or resistance spot weld.



IDL70A9B0049-01

[A]:	Vehicle left side
[B]:	Vehicle right side
[C]:	Passenger side
[D]:	Driver side
:	This symbol indicates that fender apron panel, fender apron extension and apron side member are replaced at same time.

Fender Apron Extension Removal and Installation

AENDL70A9B06008

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**
- **Front fender lower bracket ☞(Page 9K-39)**
- **Dash side front panel, cowl side panel and cowl side reinforcement ☞(Page 9K-53)**



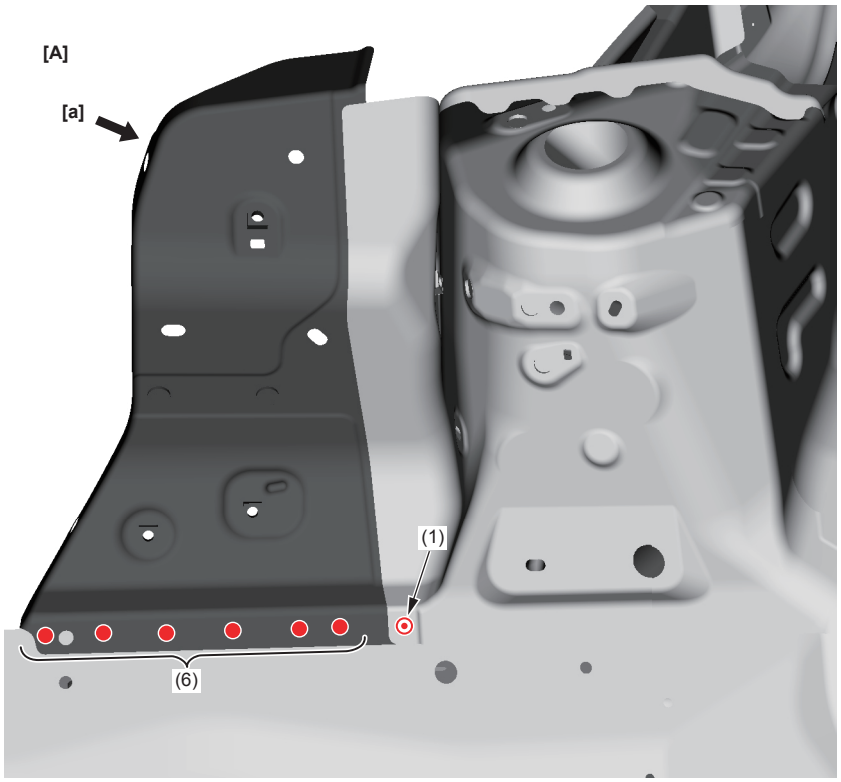
IDL70A9B0050-01

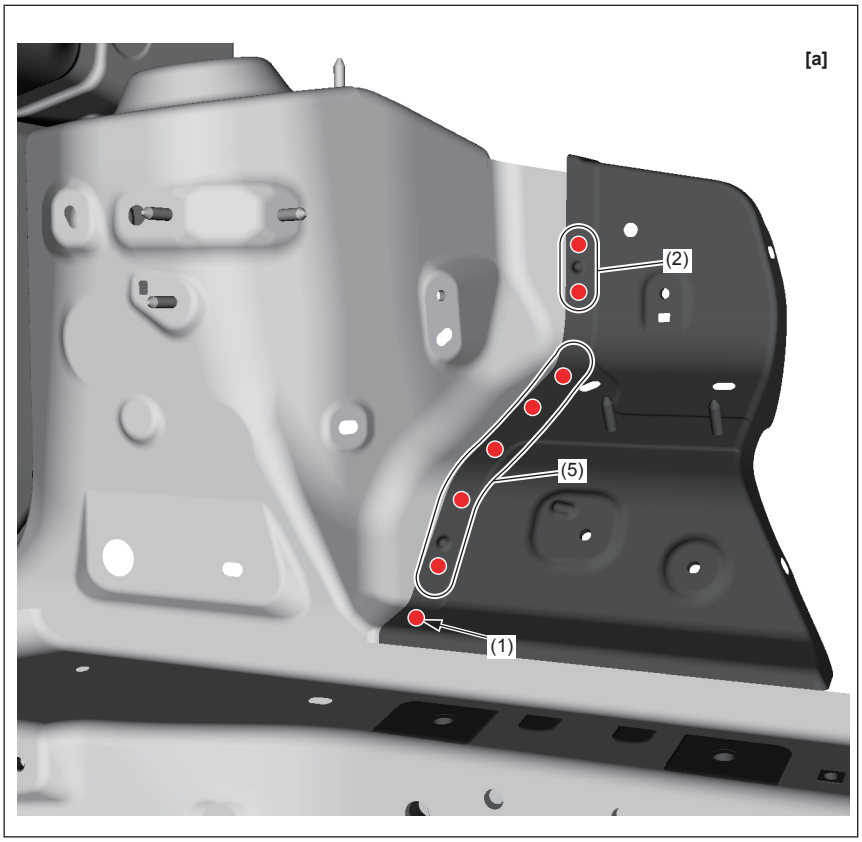
General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

Removal

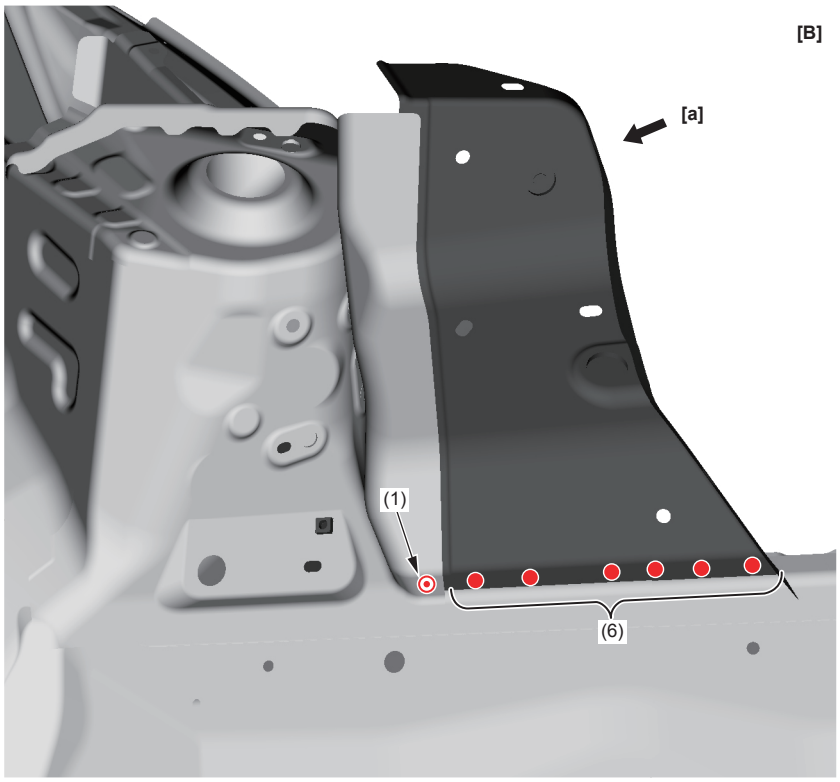
1) Drill out welding spots and remove fender apron extension.

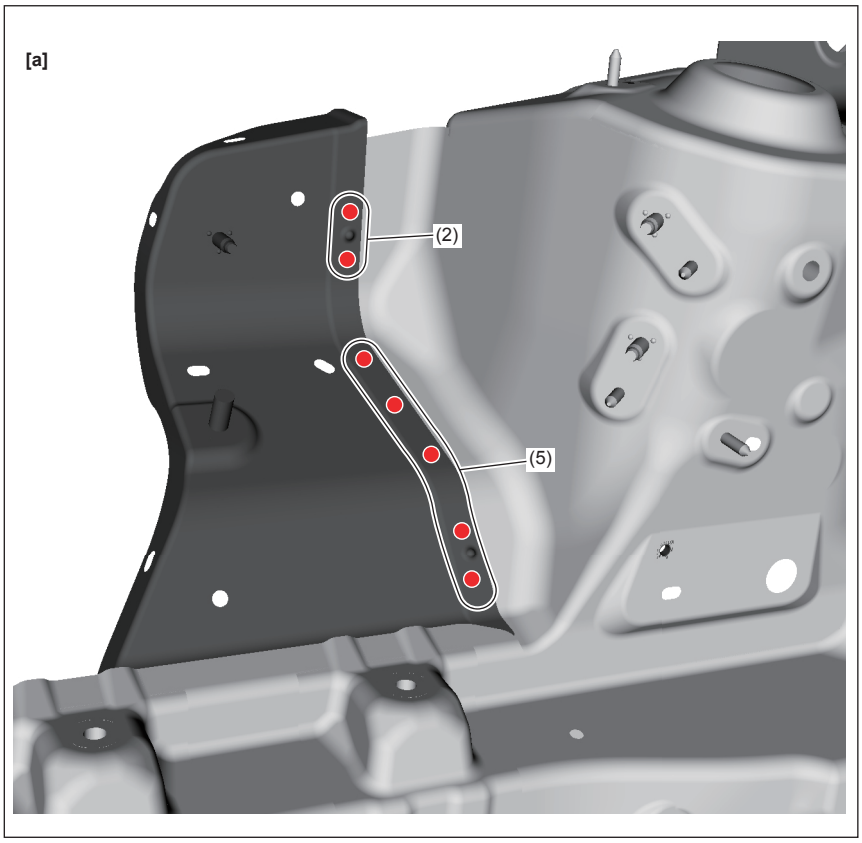




IDL70A9B0051-01

[A]: Vehicle left side





IDL70A9B0052-02

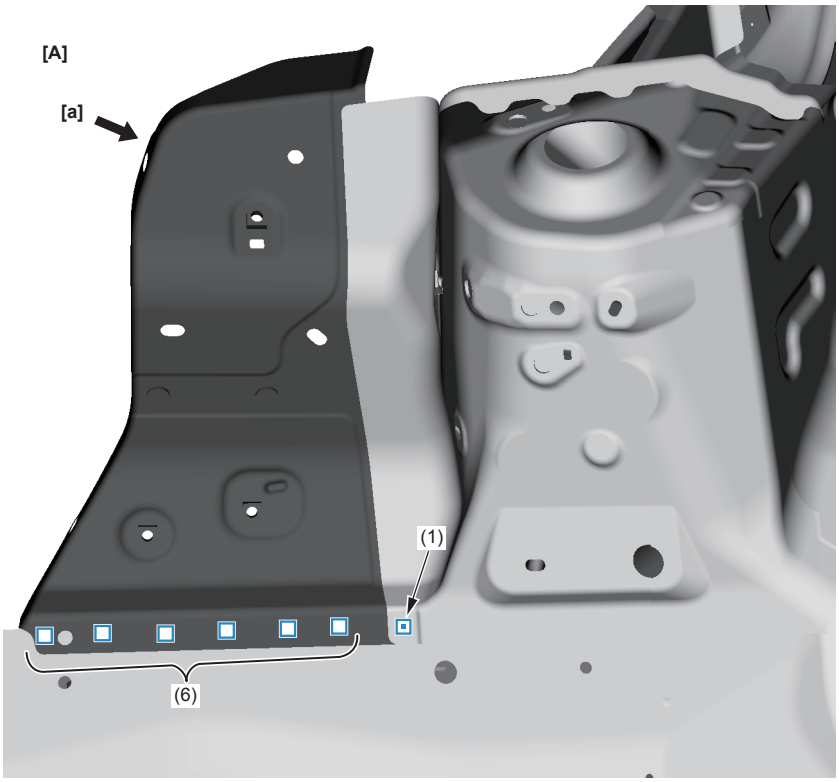
[B]: Vehicle right side

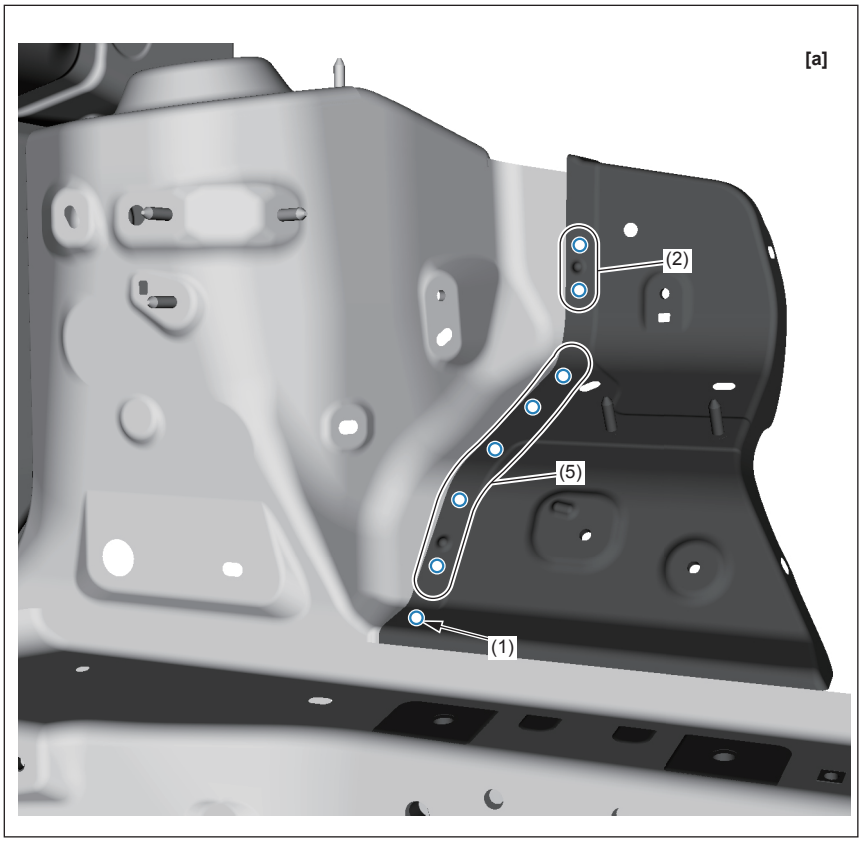
Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-21)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

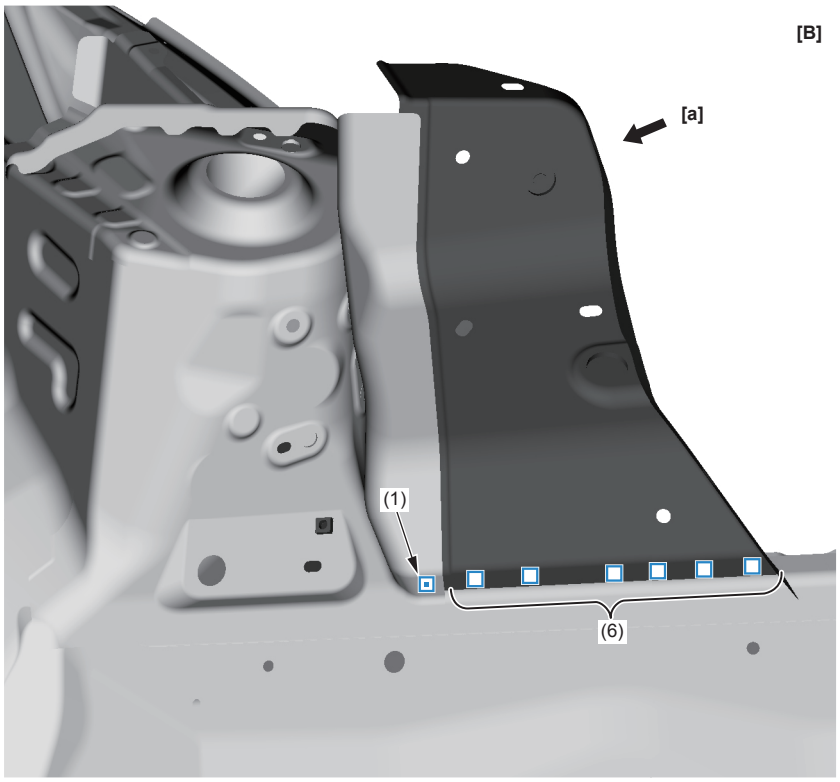
1) Install fender apron extension.
2) Conduct plug weld or resistance spot weld.

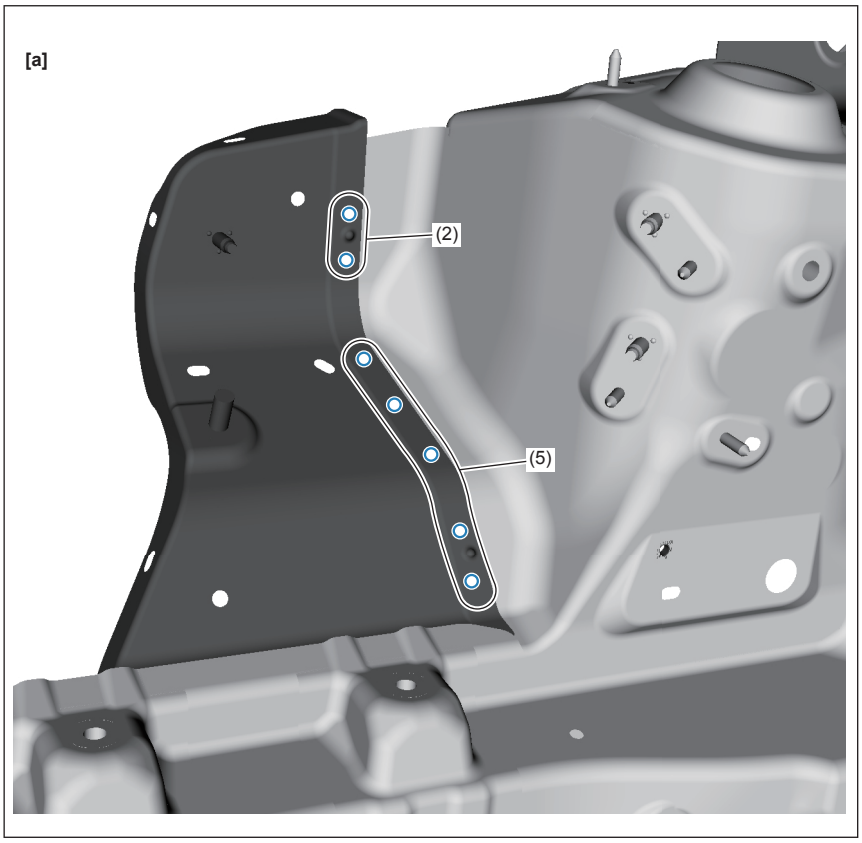




IDL70A9B0053-01

[A]: Vehicle left side





IDL70A9B0054-02

[B]: Vehicle right side

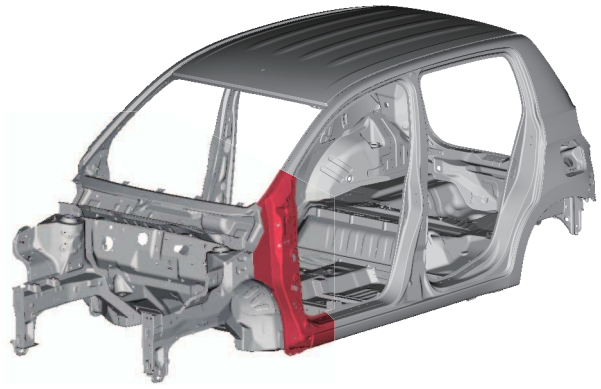
A-Pillar Outer Panel Removal and Installation

AENDL70A9B06009

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**
- **Cowl side outer member ☞(Page 9K-50)**
- **Dash side front panel with cowl side panel and cowl side reinforcement ☞(Page 9K-53)**



IDL70A9B0055-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

Removal

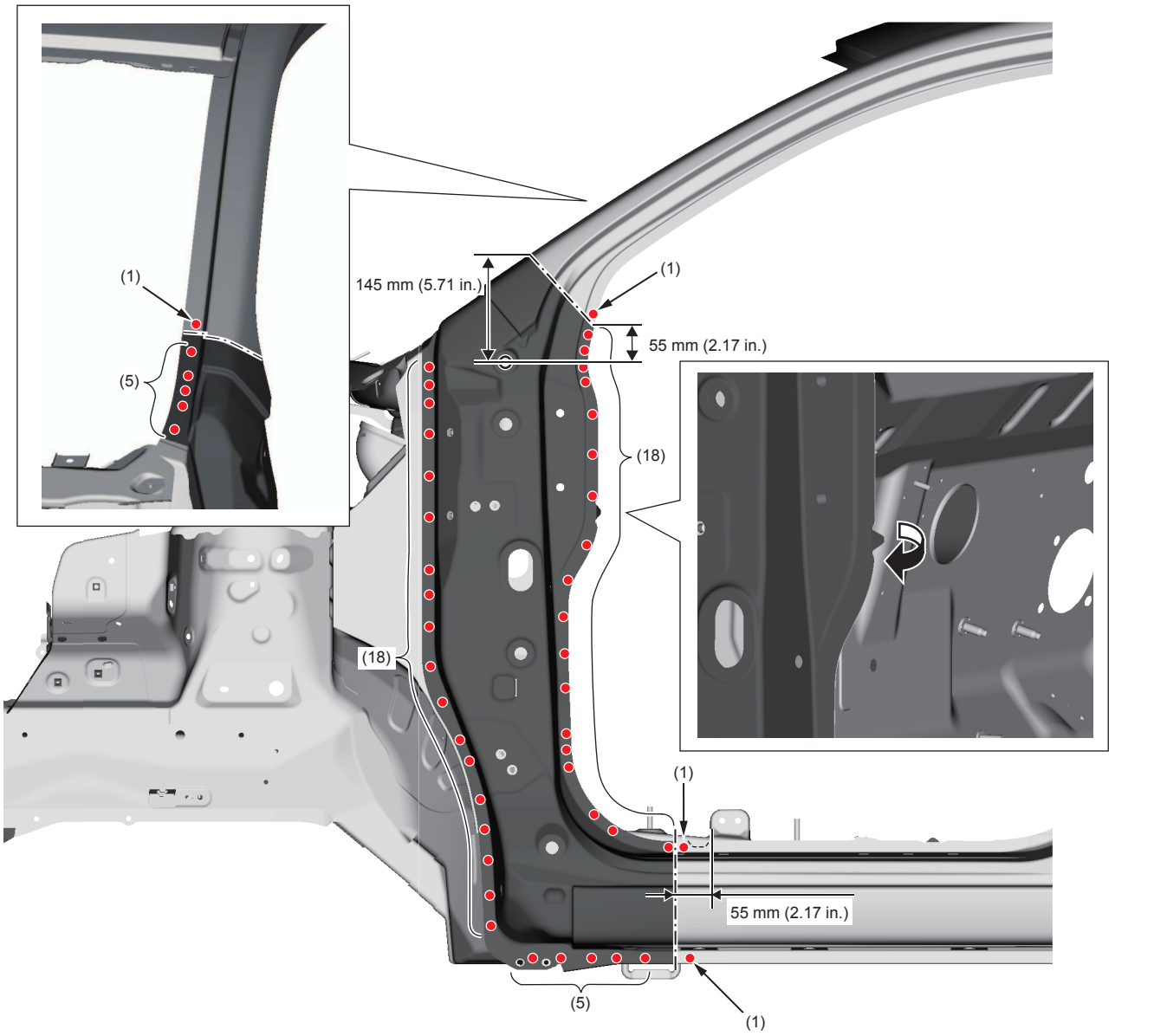
1) Mark at the shown position and cut A-pillar outer panel.

NOTICE

You may accidentally cut the parts under the A-pillar outer panel or the parts under the side sill outer panel when cutting the A-pillar outer panel.
Take sufficient care not to damage the parts under the A-pillar outer panel or the parts under the side sill outer panel when cutting the A-pillar outer panel.

2) Drill out welding spots.

3) Bend open metal tab (arrow) and remove A-pillar outer panel.



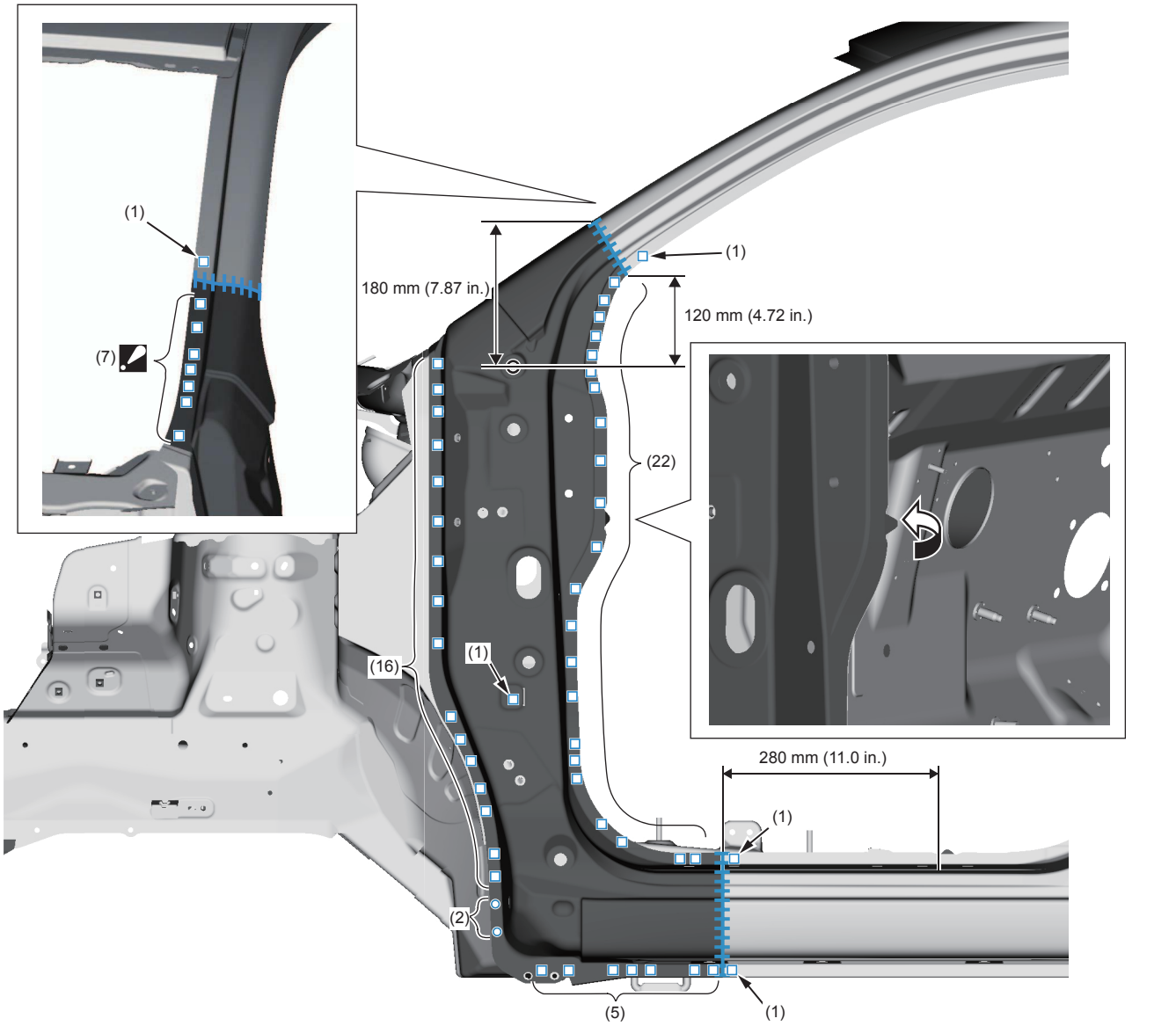
IDL70A9B0056-01

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-24)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install new A-pillar outer panel to vehicle body and cut in stacked condition.
2) Install A-pillar outer panel.
3) Conduct resistance spot weld and plug weld.
4) Conduct continuous weld.
5) Apply anticorrosion wax to back side of continuous weld part.
6) Bend in metal tab (arrow) of A-pillar outer panel.



IDL70A9B0057-01

: Conduct resistance spot weld as three panel thickness.

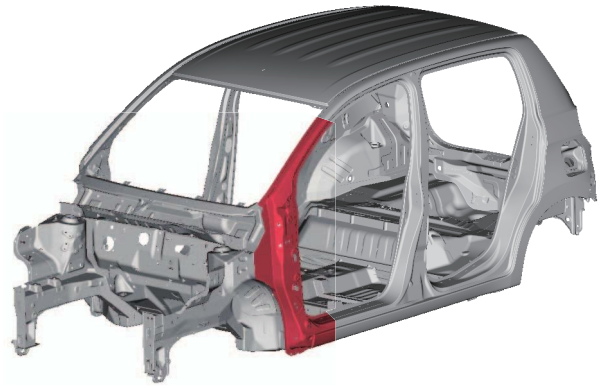
A-Pillar Outer Panel, Front Door Hinge Reinforcement and Dash Side Panel Removal and Installation

AENDL70A9B06010

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**
- **Cowl side outer member ☞(Page 9K-50)**
- **Dash side front panel, cowl side panel and cowl side reinforcement ☞(Page 9K-53)**



IDL70A9B0058-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

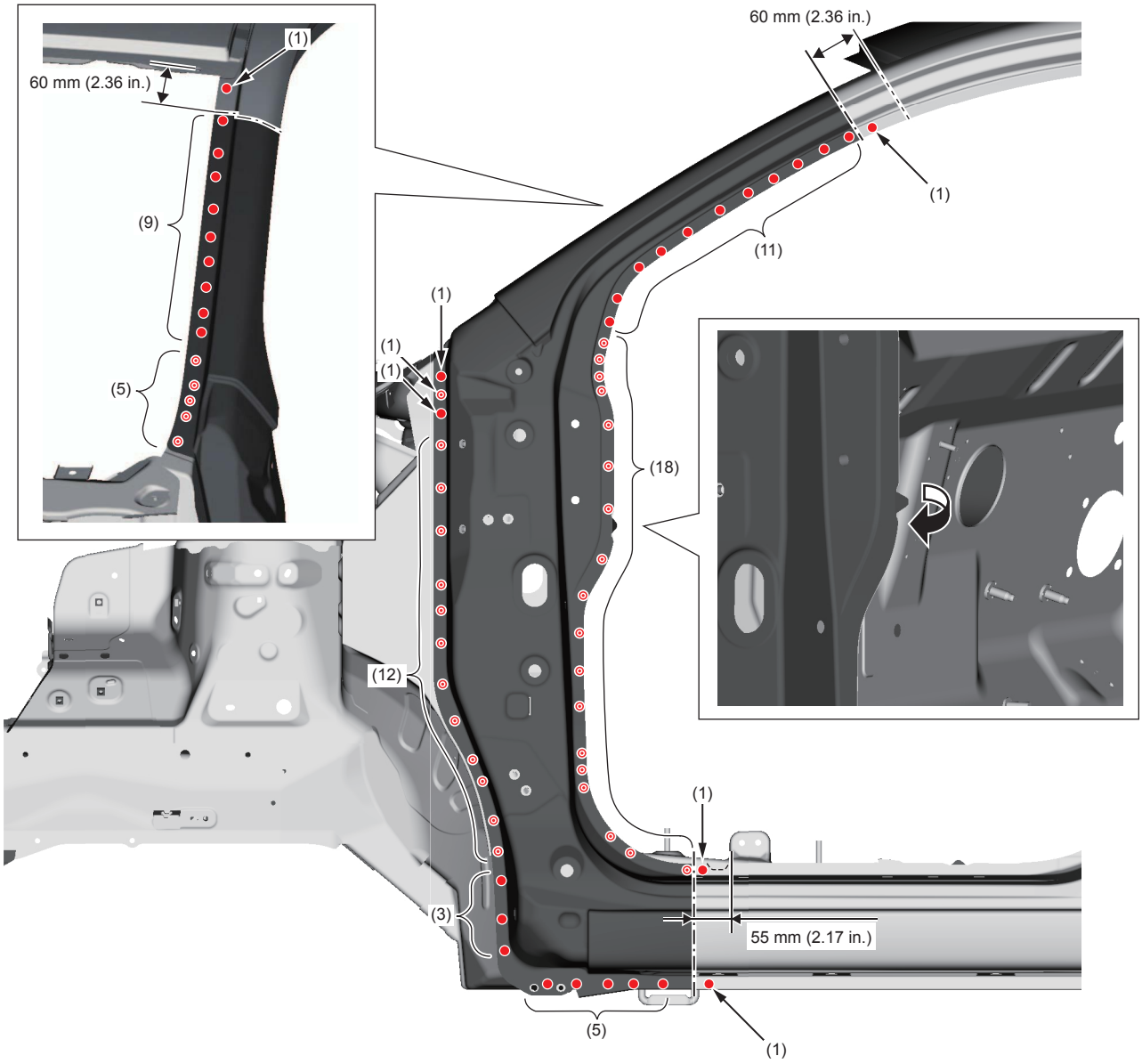
Removal

1) Mark at the shown position and cut A-pillar outer panel.

NOTICE

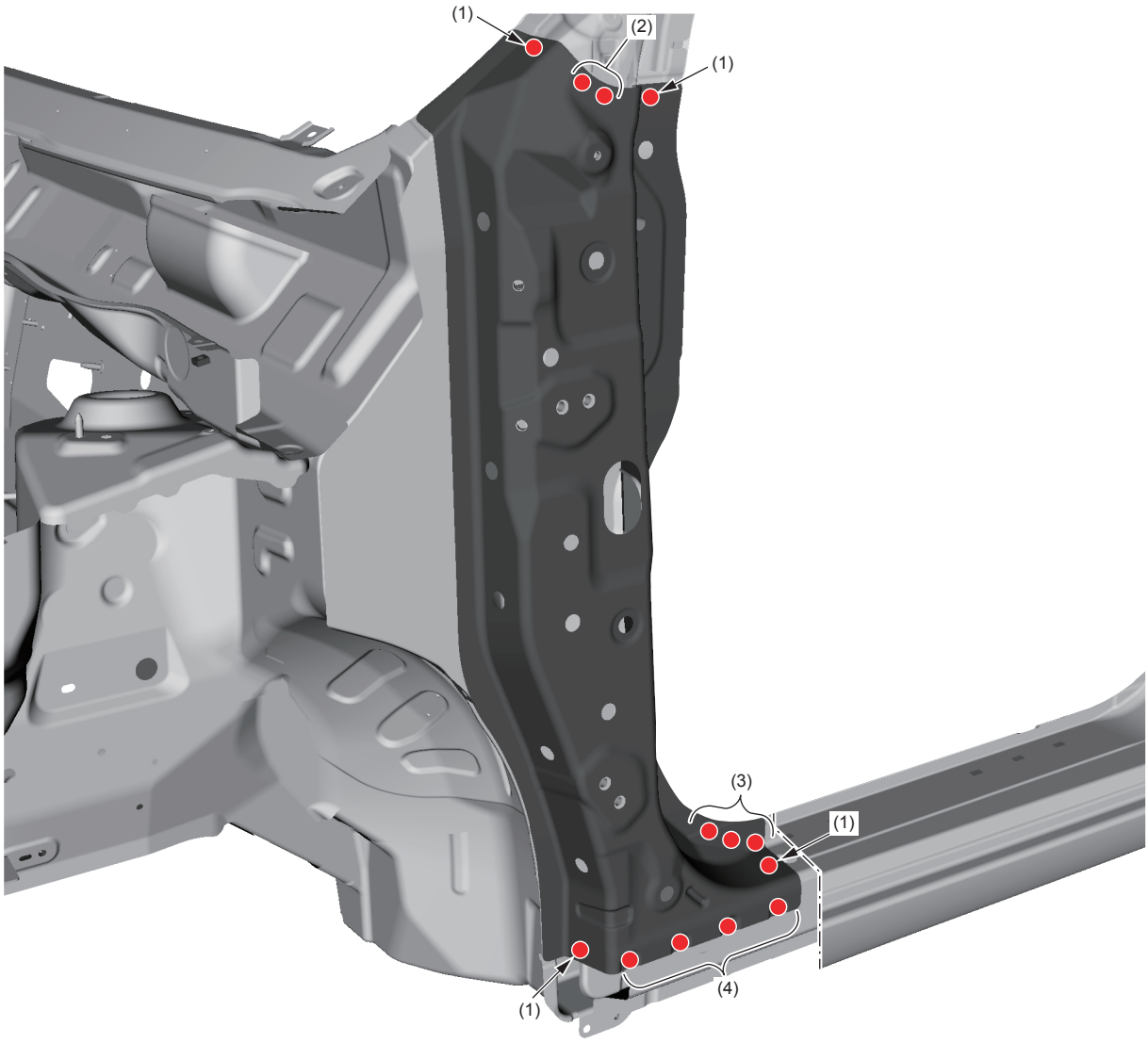
You may accidentally cut the parts under the A-pillar outer panel or the parts under the side sill outer panel when cutting the A-pillar outer panel.
Take sufficient care not to damage the parts under the A-pillar outer panel or the parts under the side sill outer panel when cutting the A-pillar outer panel.

2) Drill out welding spots.
3) Bend open metal tab (arrow) and remove A-pillar outer panel.



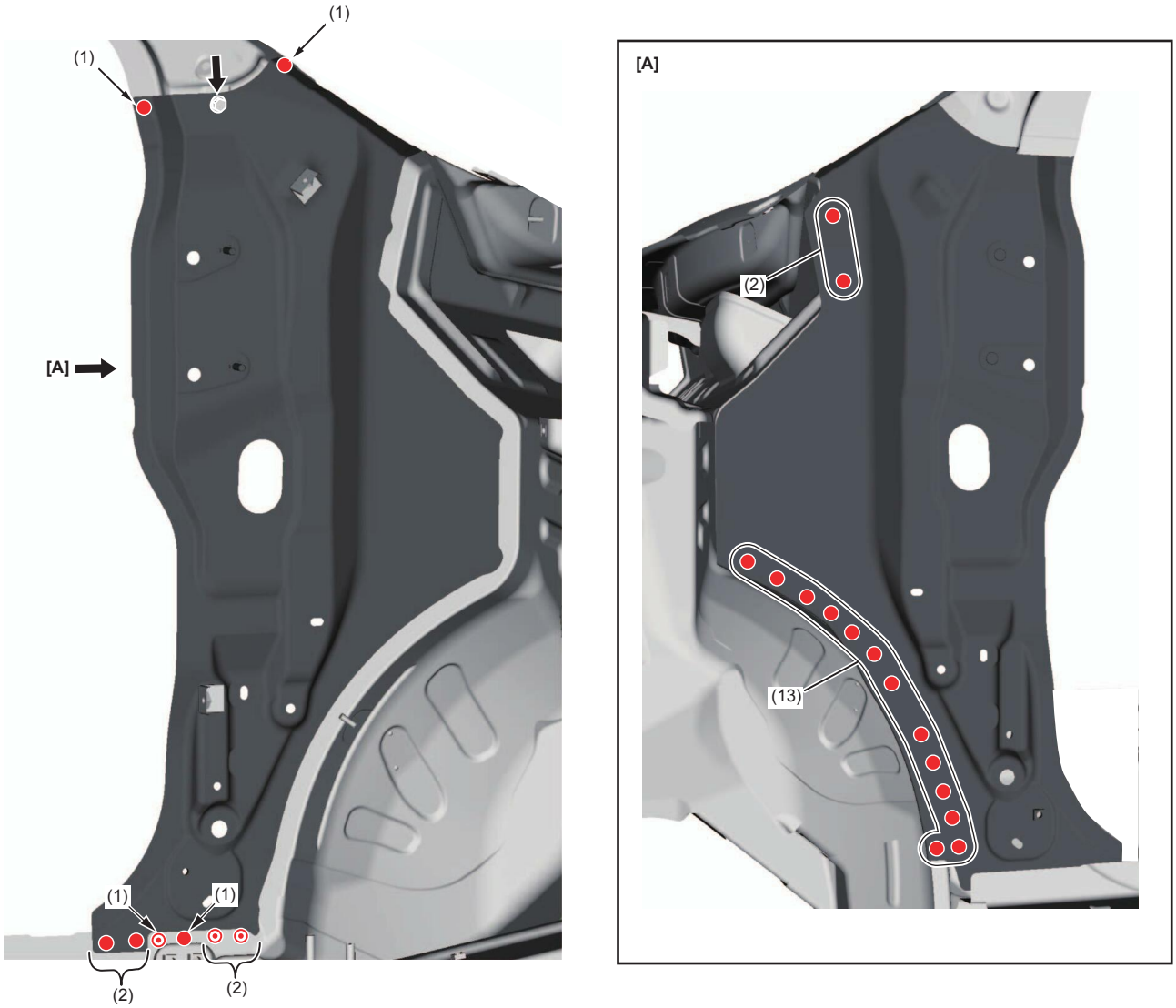
IDL70A9B0059-02

4) Drill out welding spots and remove front door hinge reinforcement, door hinge retainer and front door hinge upper reinforcement.



IDL70A9B0060-02

5) Drill out welding spots.
6) Unscrew bolt and remove dash side panel.



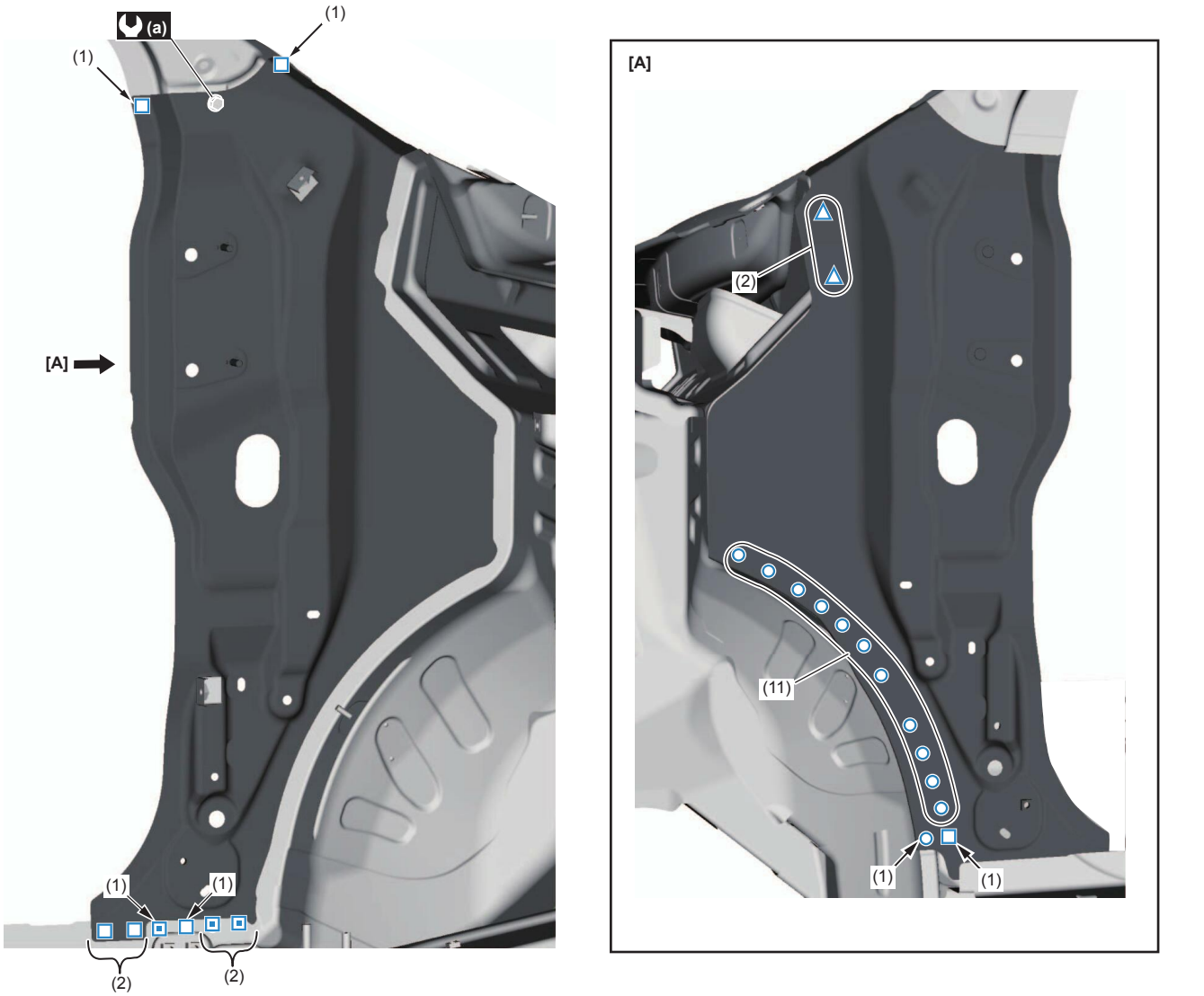
IDL70A9B0061-01

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **– ☞(Page 9K-24)**
  - **– ☞(Page 9K-26)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

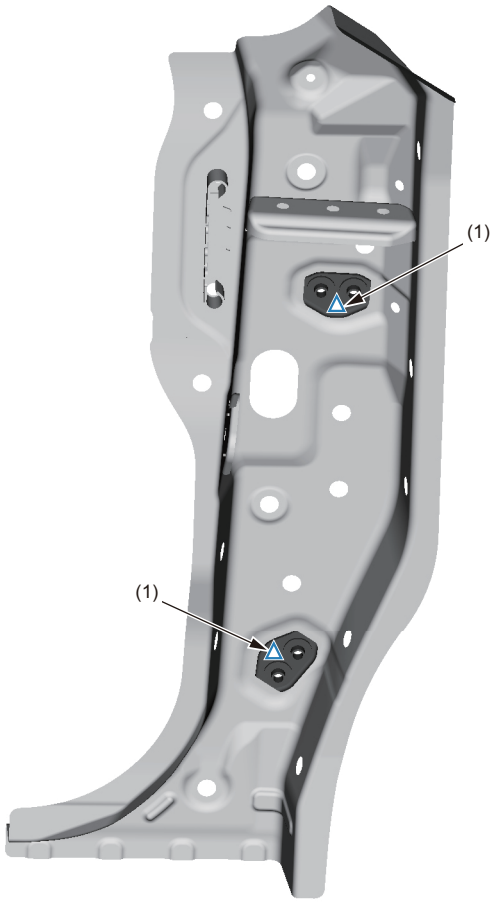
1) Install dash side panel.
2) Conduct resistance spot weld and plug weld.
3) Tighten bolt to specified torque.



IDL70A9B0062-01

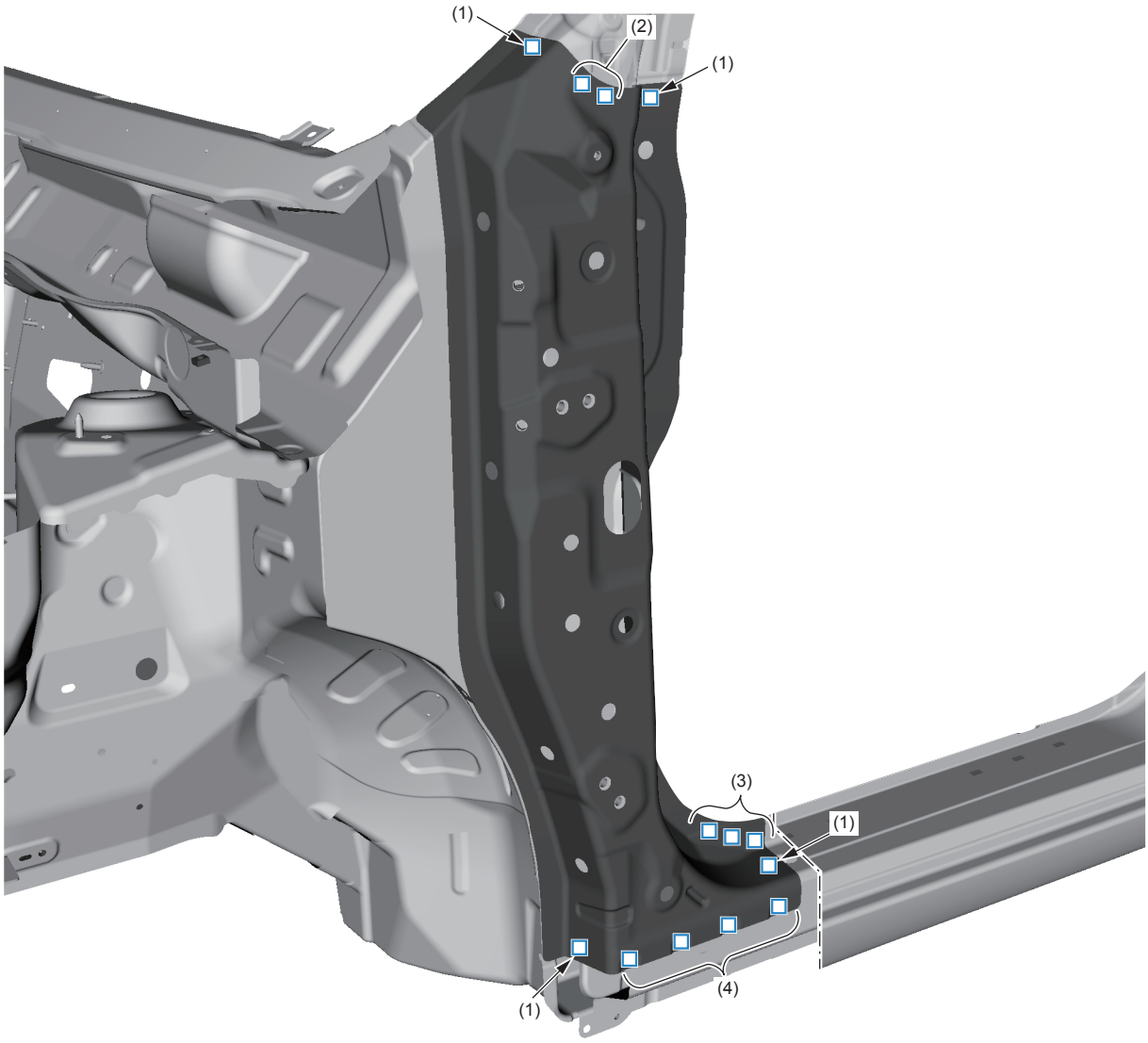
(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

4) Install door hinge retainer and front door hinge upper reinforcement.
5) Conduct resistance spot weld or plug weld.



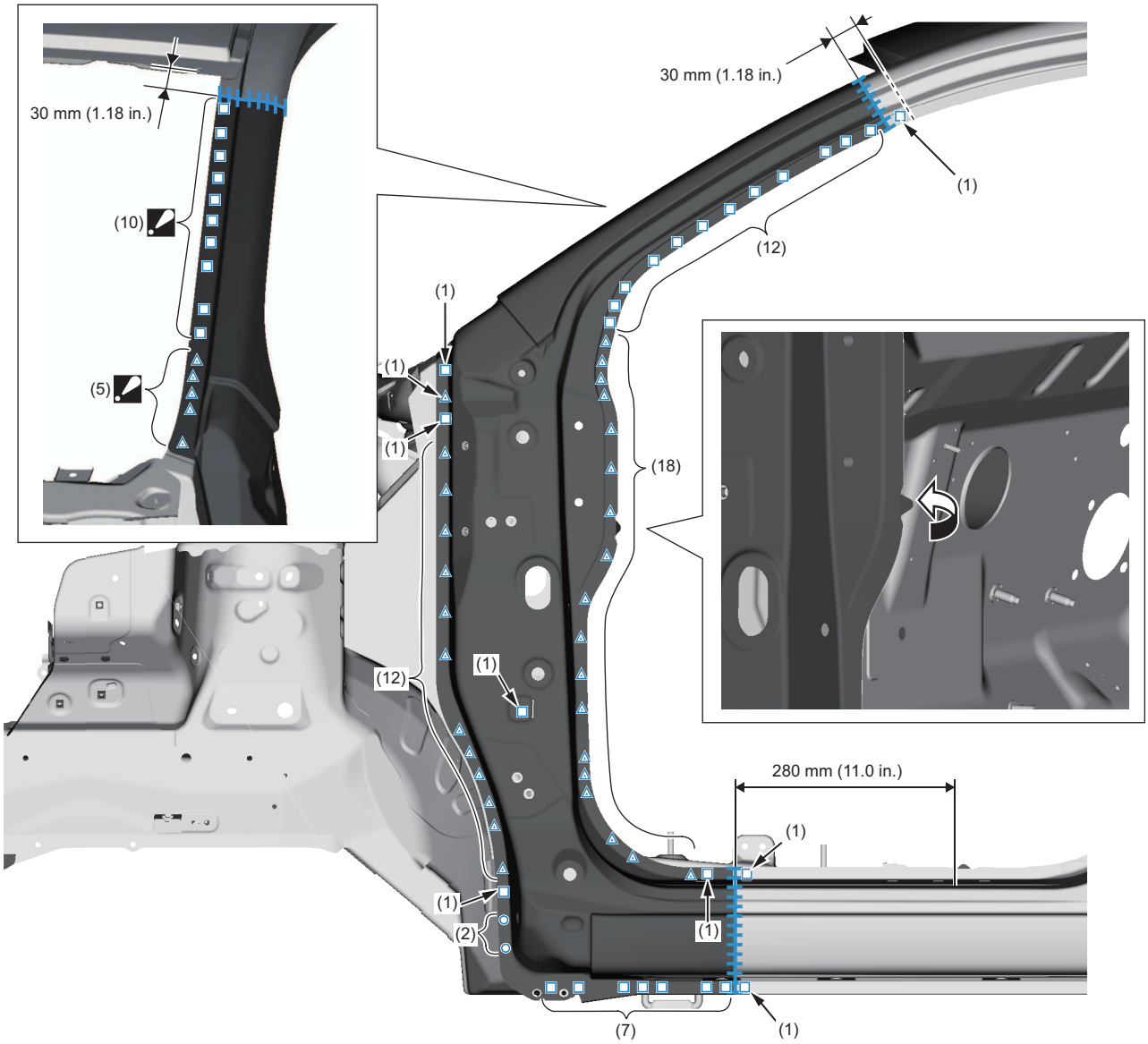
IDL70A9B0063-01

6) Install front door hinge reinforcement.
7) Conduct plug weld.



IDL70A9B0064-02

8) Install new A-pillar outer panel to vehicle body and cut in stacked condition.
9) Install A-pillar outer panel.
10) Conduct resistance spot weld and plug weld.
11) Conduct continuous weld.
12) Apply anticorrosion wax to back side of continuous weld part.
13) Bend in metal tab (arrow) of A-pillar outer panel.



IDL70A9B0065-03

: Conduct resistance spot weld as three panel thickness.

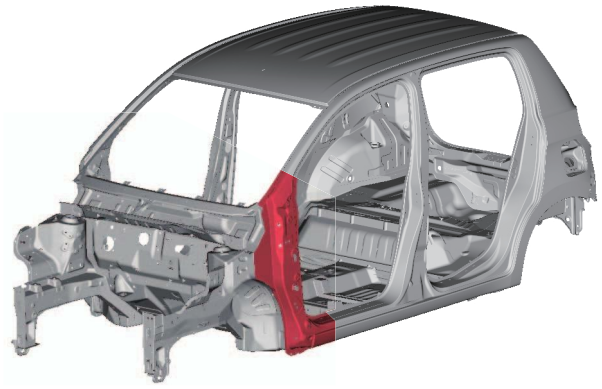
A-Pillar Outer Panel, Front Door Hinge Reinforcement, Dash Side Panel, Front Pillar Inner Panel and Front Pillar Upper Reinforcement Removal and Installation

AENDL70A9B06011

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Hood lock member and lamp support brace ☞(Page 9K-34)**
- **Cowl side outer member ☞(Page 9K-50)**
- **Dash side front panel, cowl side panel and cowl side reinforcement ☞(Page 9K-53)**



IDL70A9B0066-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

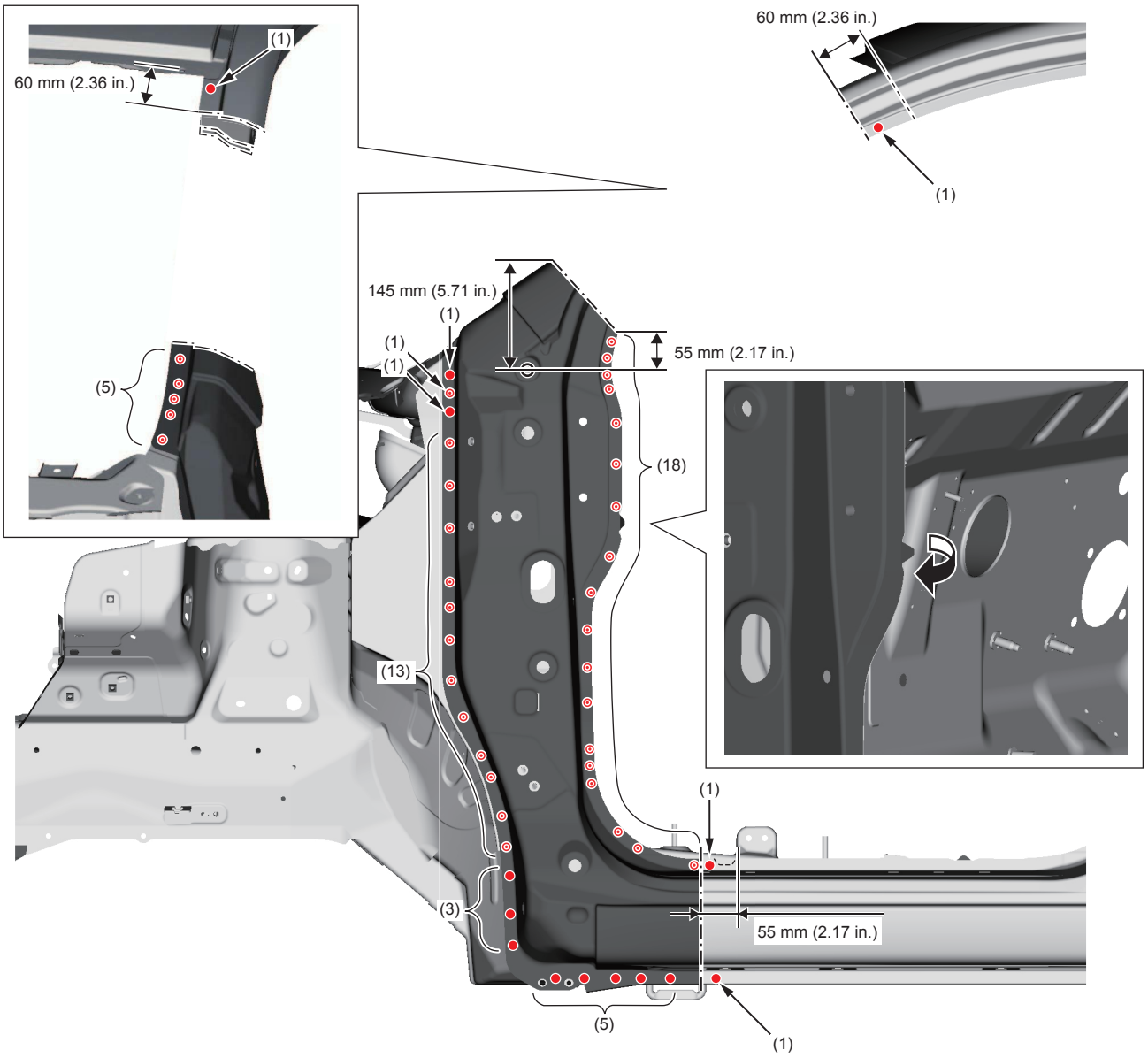
Removal

1) Mark at the shown position and cut A-pillar outer panel, front pillar inner panel and front pillar upper reinforcement at the same time at shown rough cutting position.

NOTICE

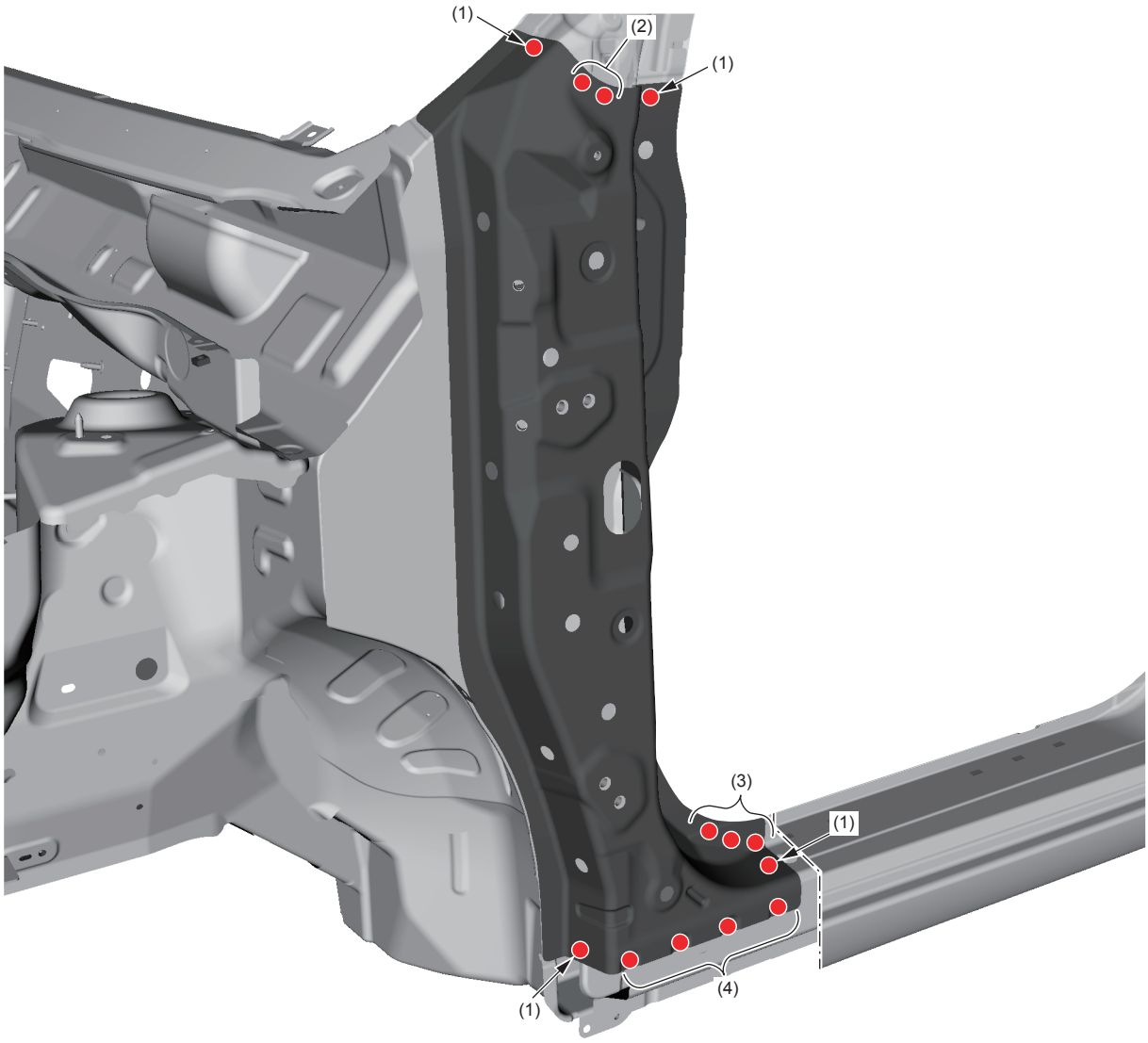
You may accidentally cut the parts under the side sill outer panel when cutting the side sill outer panel. Take sufficient care not to damage the parts under the side sill outer panel when cutting the side sill outer panel.

2) Mark at the shown position and cut A-pillar outer panel.
3) Drill out welding spots.
4) Bend open metal tab (arrow) and remove A-pillar outer panel.



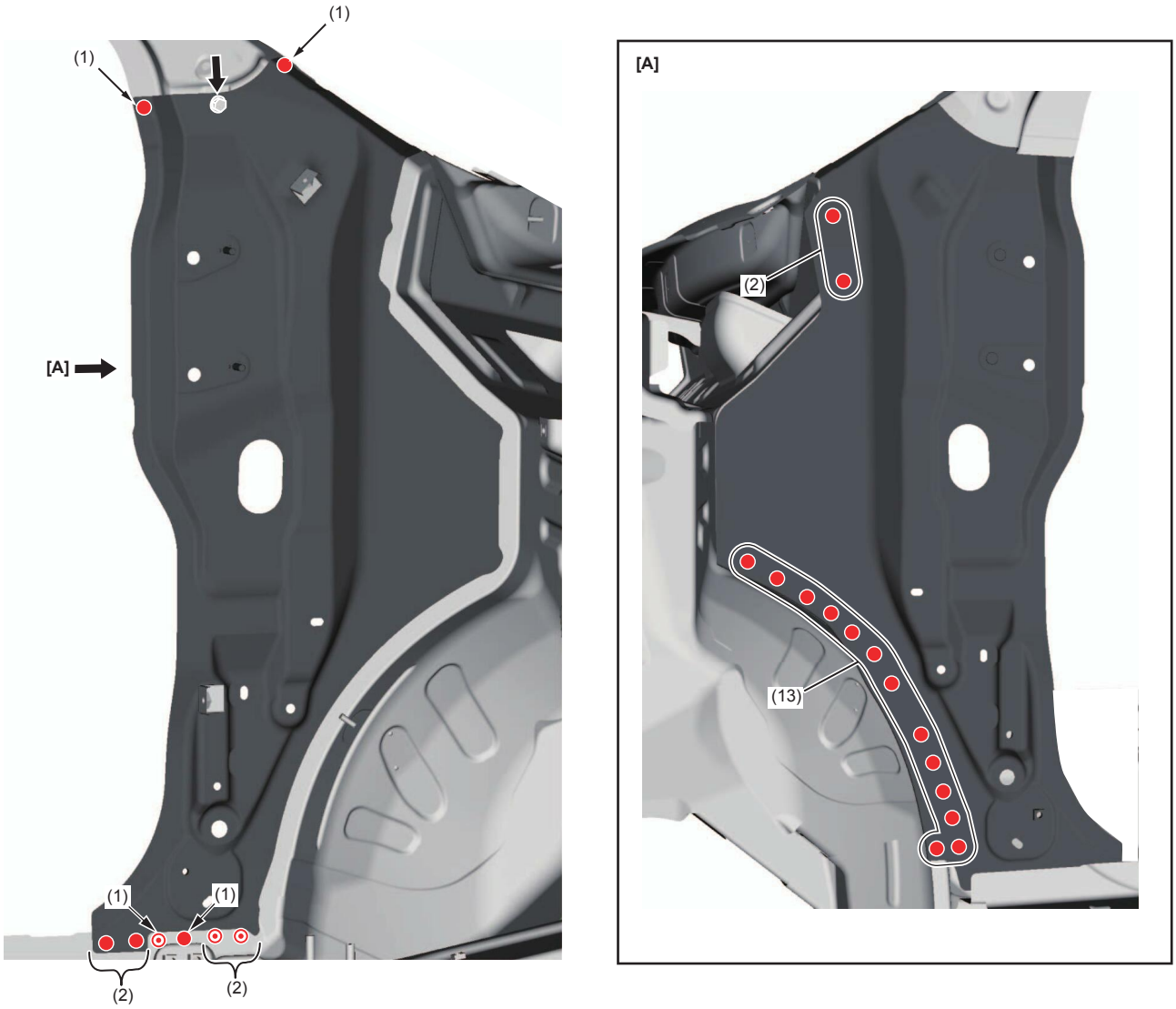
IDL70A9B0067-03

5) Drill out welding spots and remove front door hinge reinforcement, door hinge retainer and front door hinge upper reinforcement.



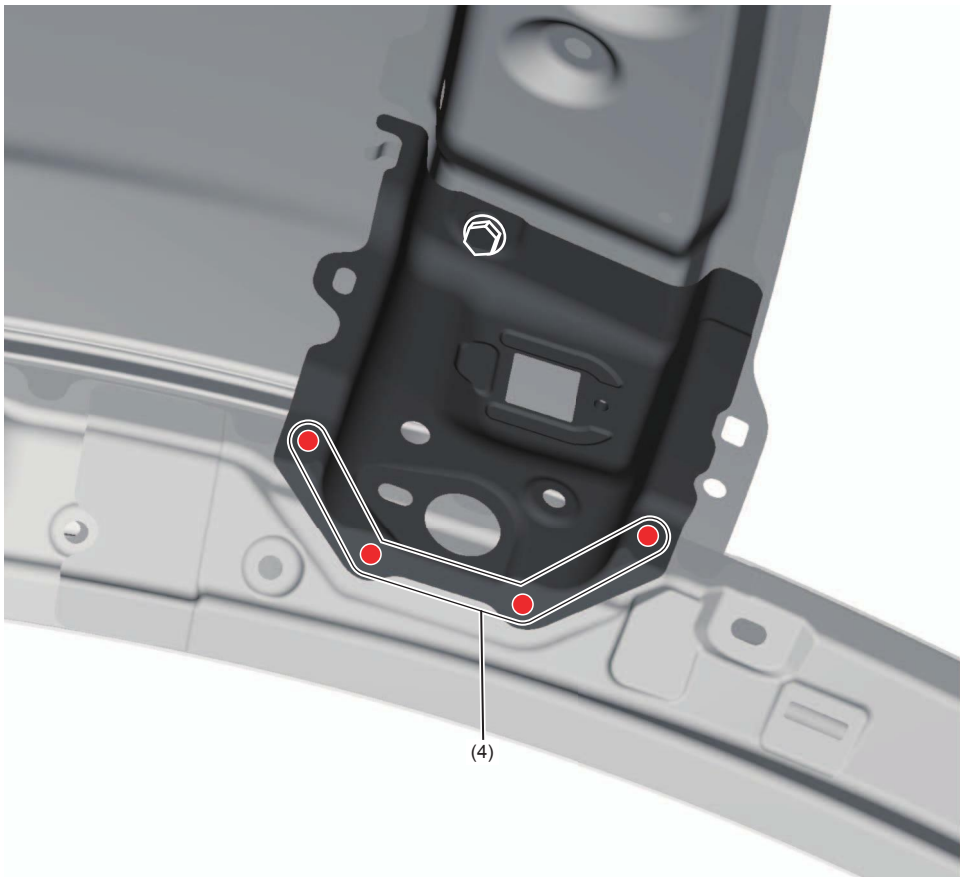
IDL70A9B0060-02

6) Drill out welding spots.
7) Unscrew bolt and remove dash side panel.



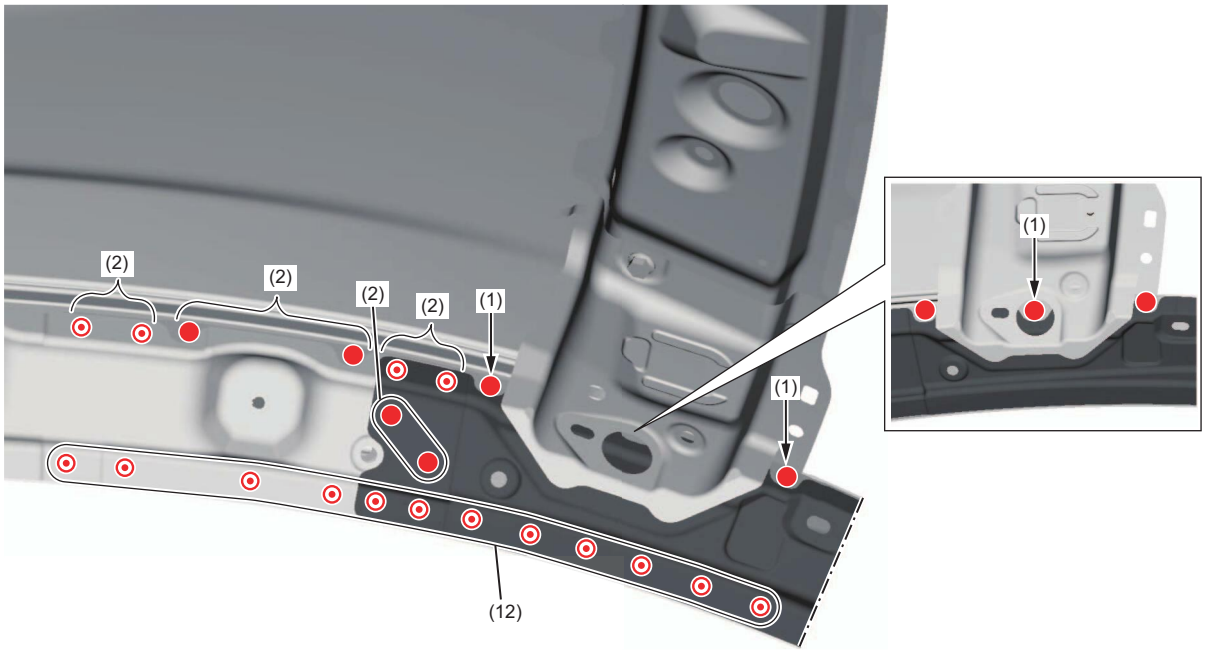
IDL70A9B0061-01

8) Drill out welding spots and remove front pillar upper extension.



IDL70A9B0068-02

9) Drill out welding spots and remove front pillar inner panel and front pillar upper reinforcement.



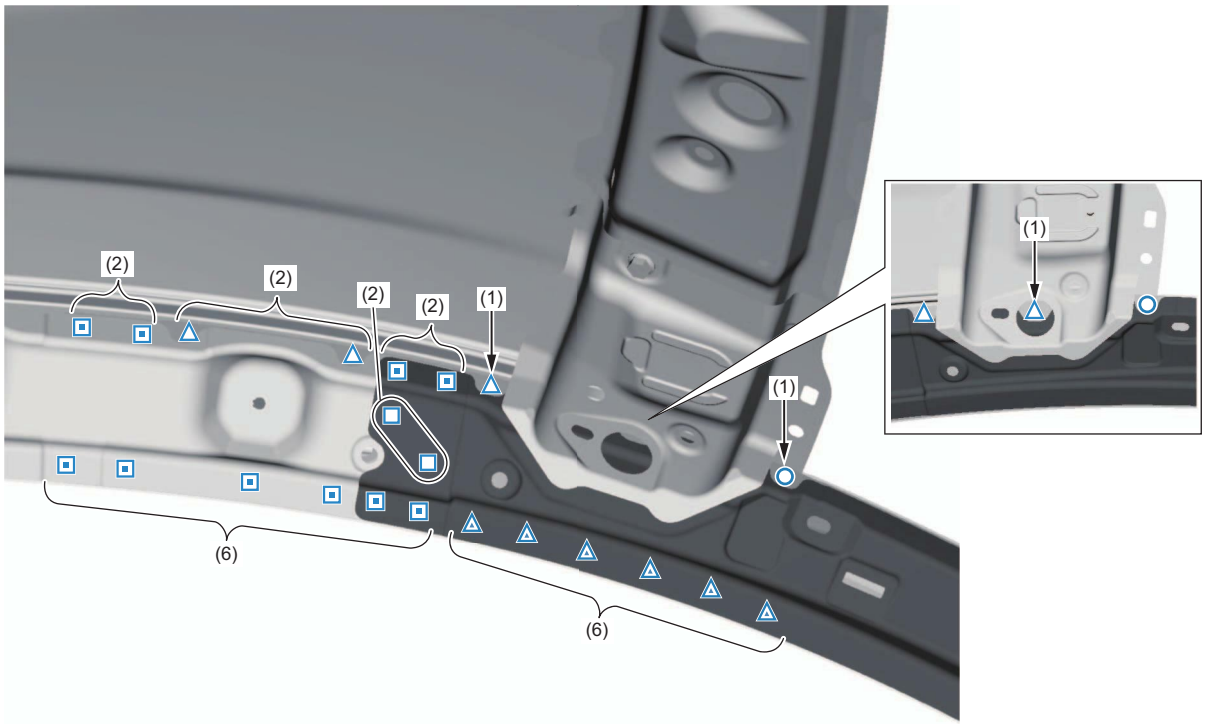
IDL70A9B0069-03

Installation

NOTE

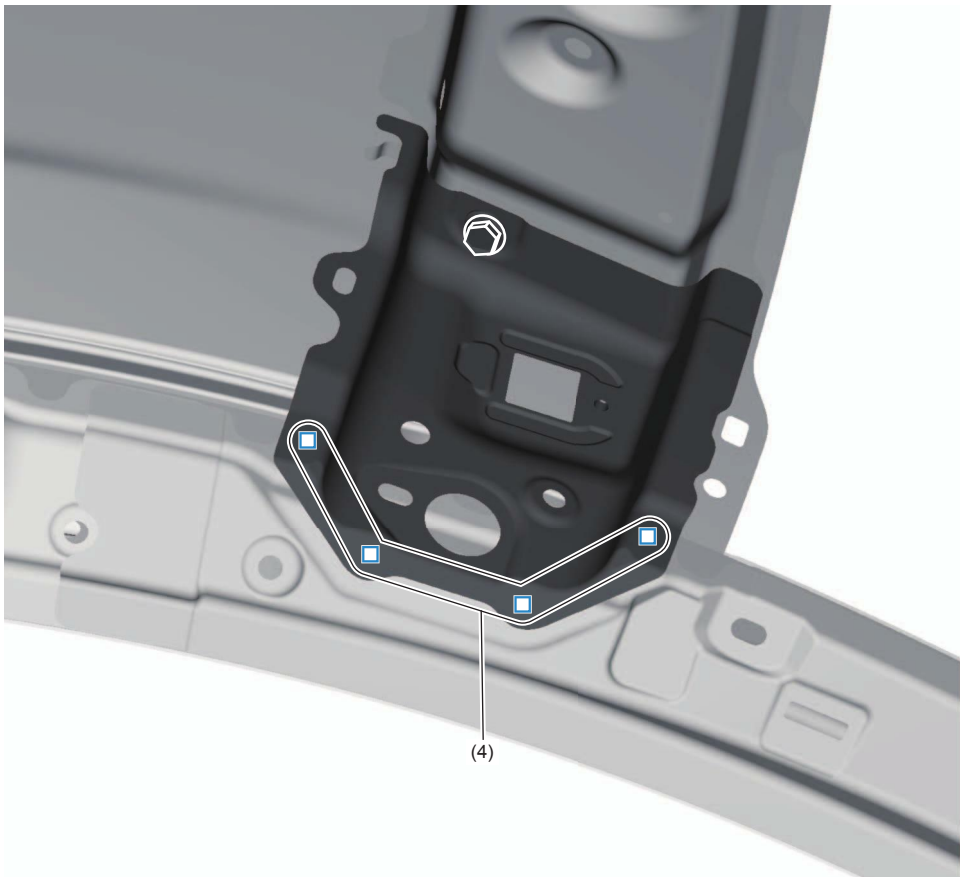
- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **– ☞(Page 9K-28)**
  - **– ☞(Page 9K-24)**
  - **– ☞(Page 9K-26)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install front pillar inner panel and front pillar upper reinforcement.
2) Conduct plug weld.



IDL70A9B0070-03

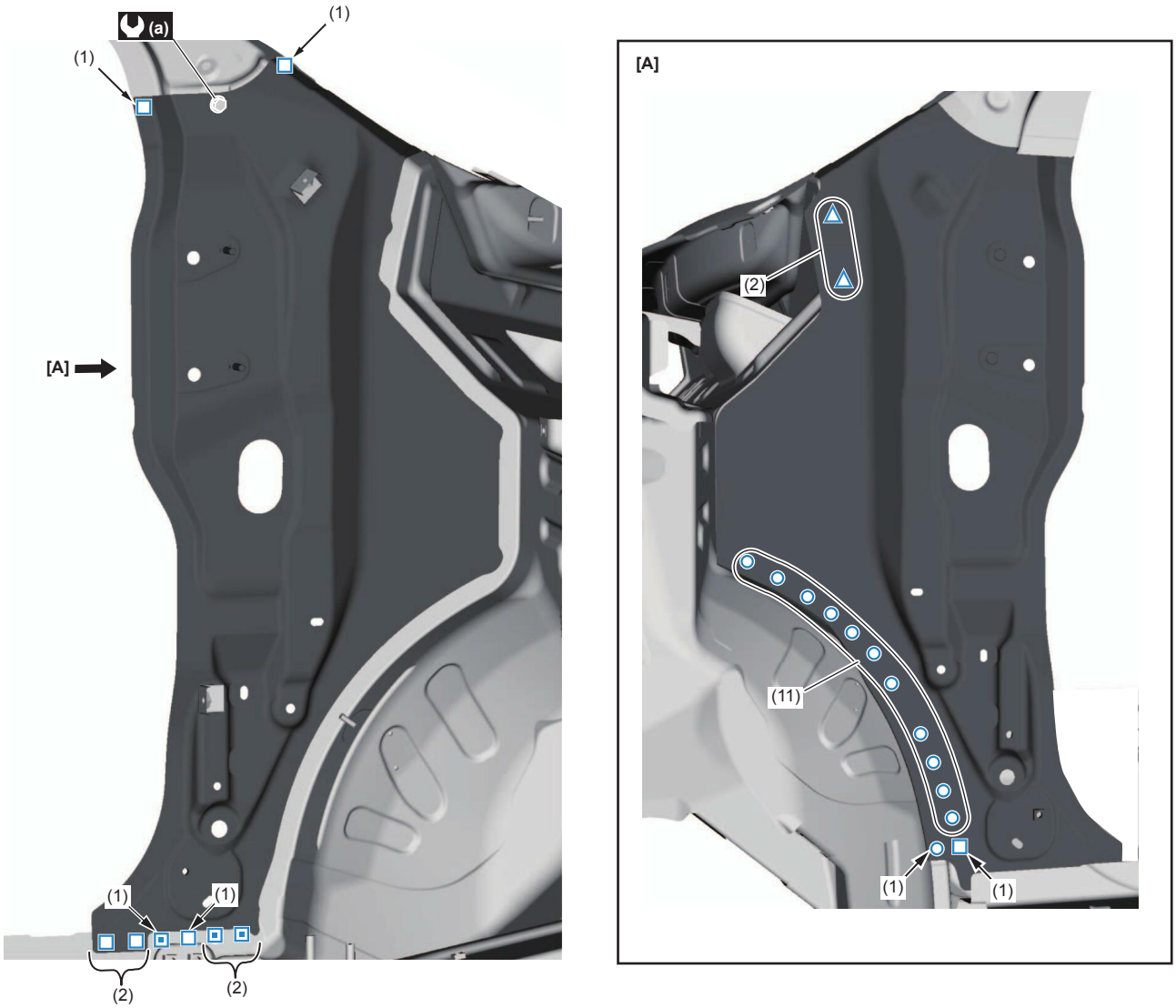
3) Install front pillar upper extension.
4) Conduct plug weld.



IDL70A9B0071-02

(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

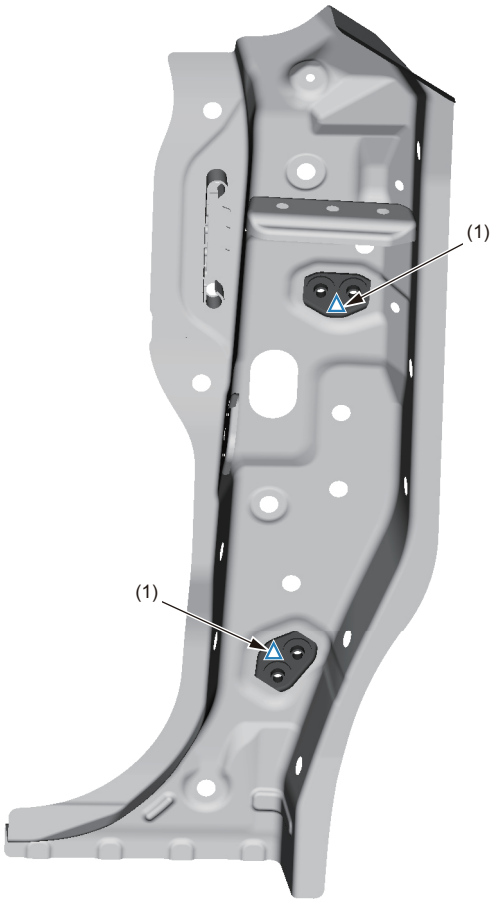
5) Install dash side panel.
6) Conduct resistance spot weld and plug weld.
7) Tighten bolt to specified torque.



IDL70A9B0062-01

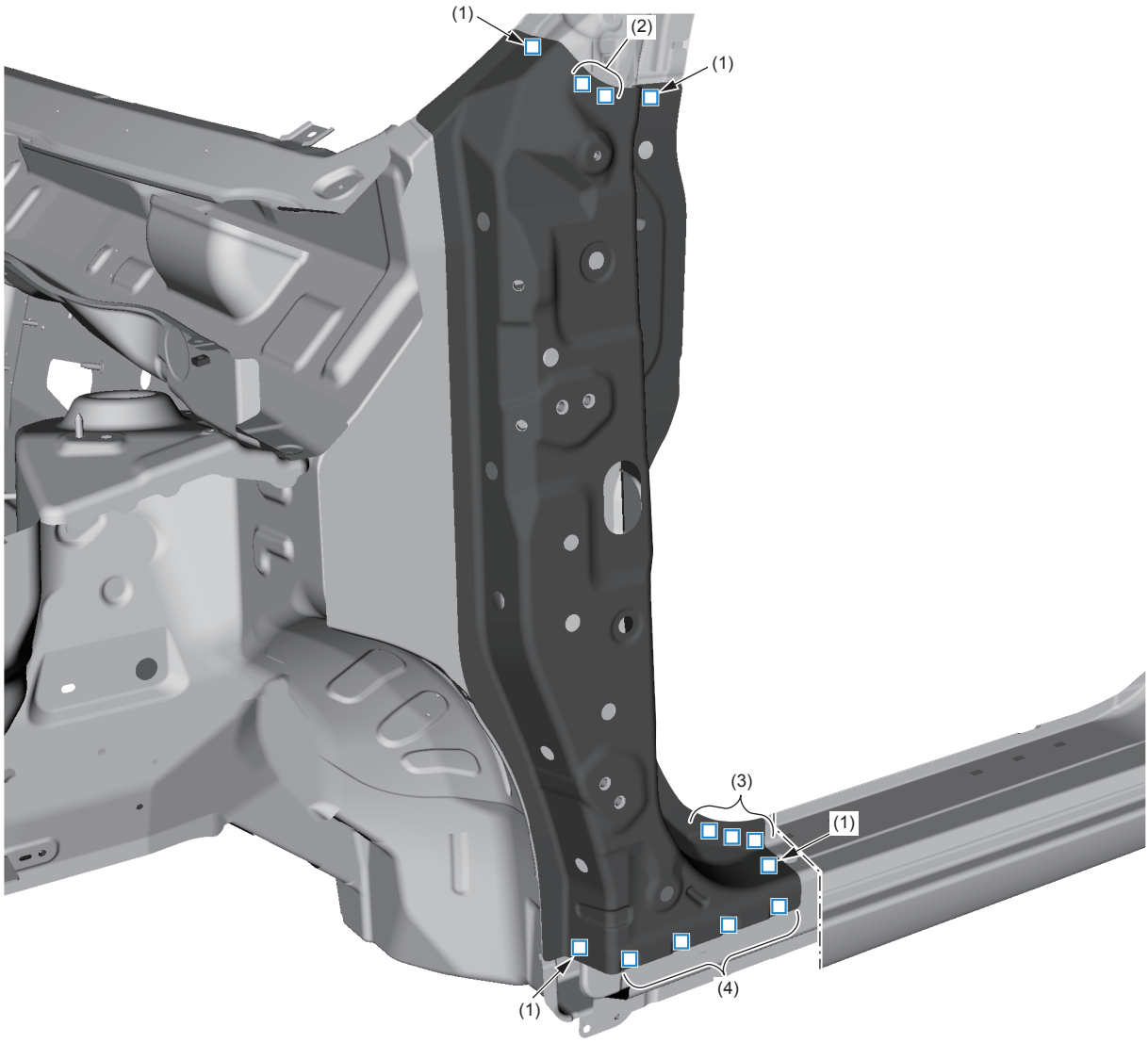
(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

8) Install door hinge retainer and front door hinge upper reinforcement.
9) Conduct resistance spot weld or plug weld.



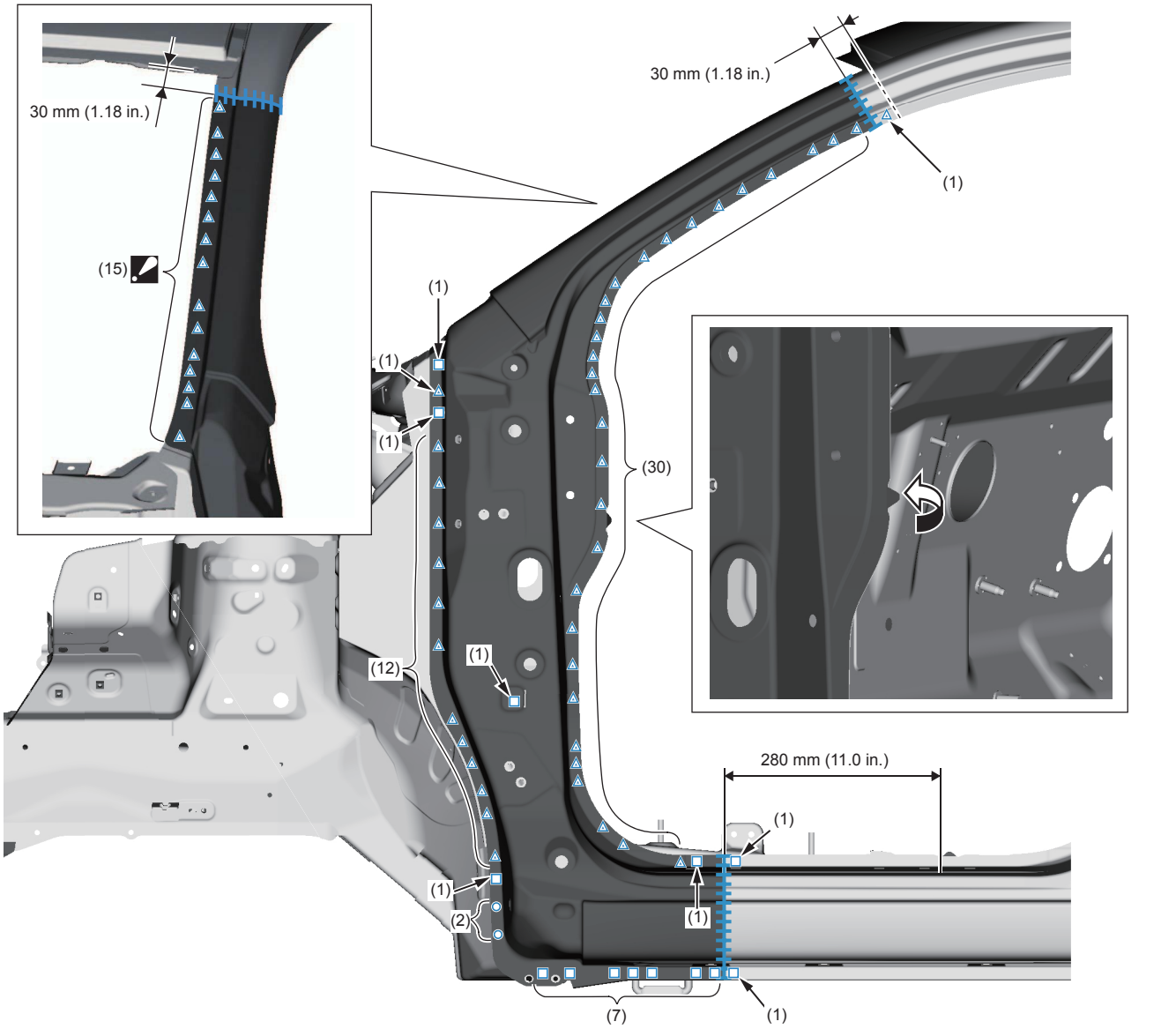
IDL70A9B0063-01

10) Install front door hinge reinforcement.
11) Conduct plug weld.



IDL70A9B0064-02

12) Install new A-pillar outer panel to vehicle body and cut in stacked condition.
13) Install A-pillar outer panel.
14) Conduct resistance spot weld and plug weld.
15) Conduct continuous weld.
16) Apply anticorrosion wax to back side of continuous weld part.
17) Bend in metal tab (arrow) of A-pillar outer panel.



IDL70A9B0072-02

: Conduct resistance spot weld as three thickness.

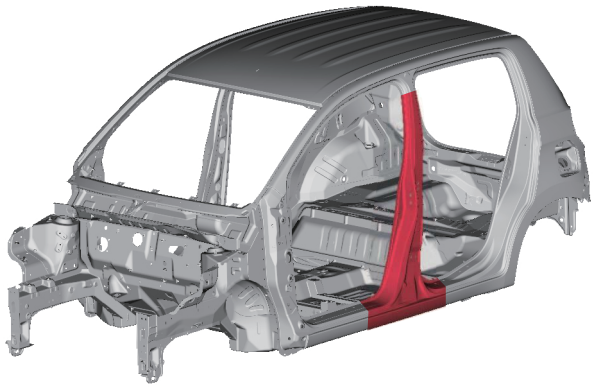
B-Pillar Outer Panel Removal and Installation

AENDL70A9B06012

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Fuel filler door panel ☞(Page 9J-9)**



IDL70A9B0073-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

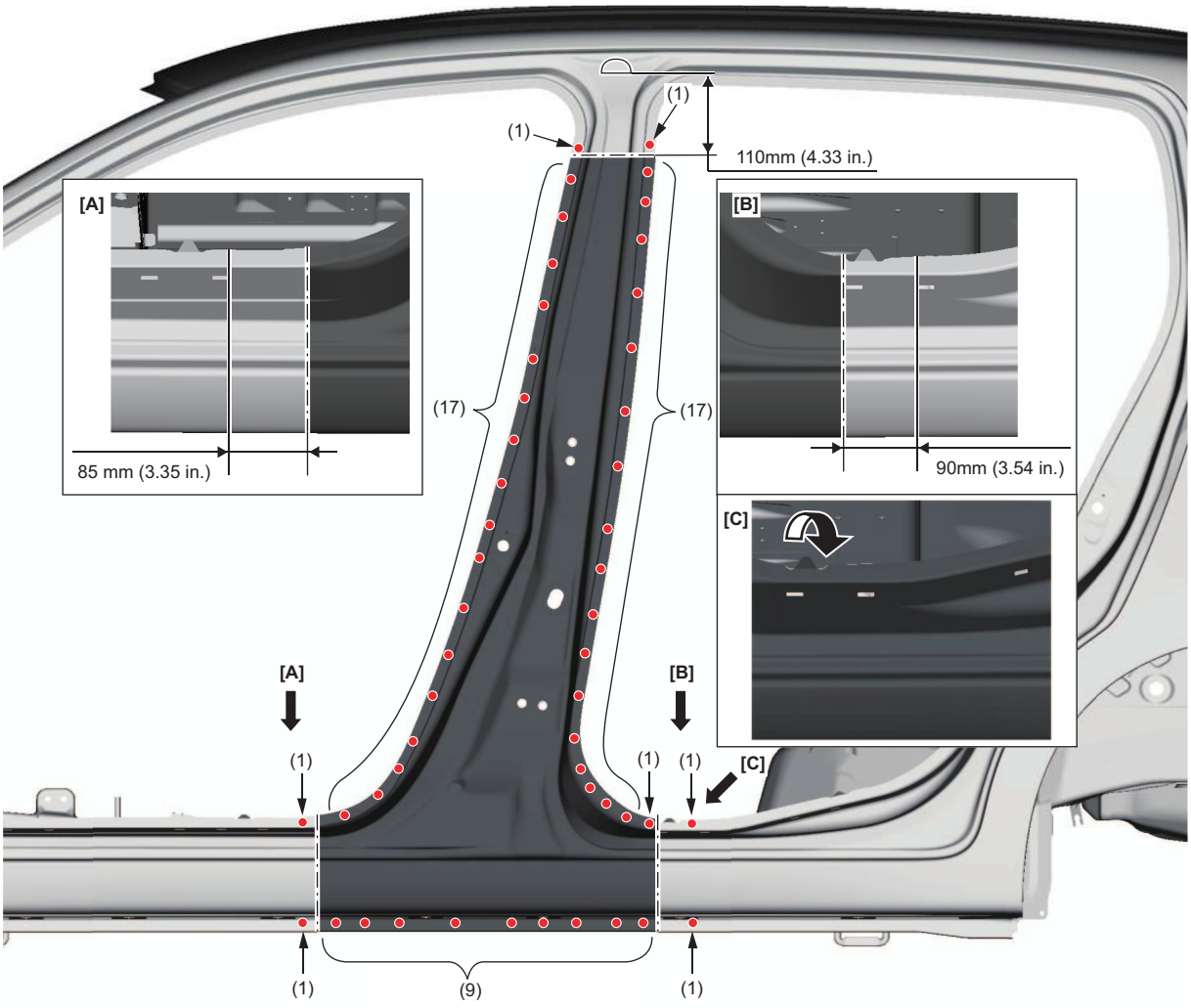
Removal

1) Mark at the shown position and cut B-pillar outer panel.

NOTICE

You may accidentally cut the parts under the roof panel or the parts under the side sill outer panel when cutting the B-pillar outer panel.
Take sufficient care not to damage the parts under the roof panel or the parts under the side sill outer panel when cutting the B-pillar outer panel.

2) Drill out welding spots and remove B-pillar outer panel.



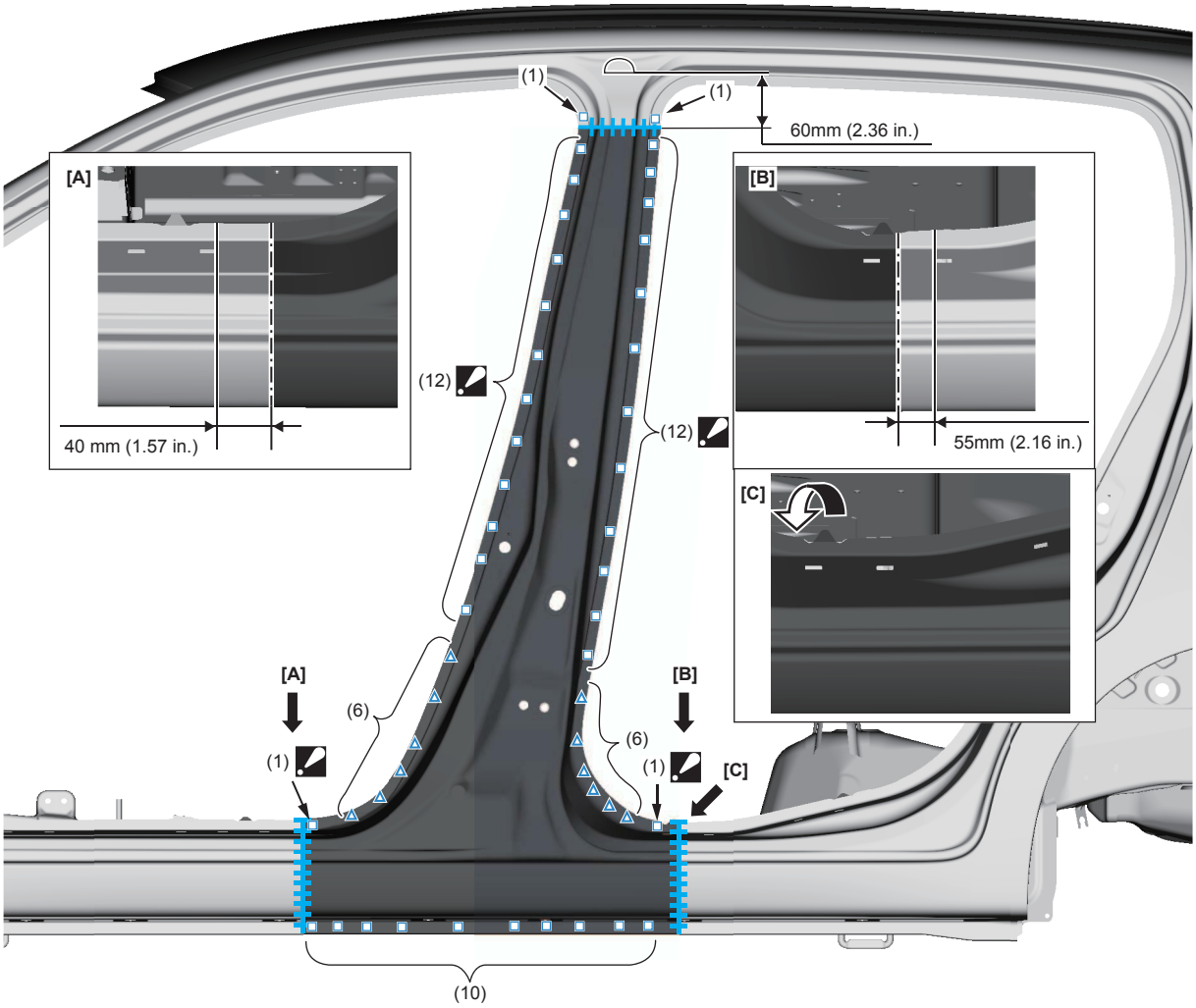
IDL70A9B0074-03

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-24)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install new B-pillar outer panel to vehicle body and cut in stacked condition.
2) Install B-pillar outer panel.
3) Conduct plug weld or resistance spot weld.
4) Conduct continuous weld.
5) Apply anticorrosion wax to back side of continuous weld part.



IDL70A9B0075-02

: Conduct resistance spot weld as three panel thickness.

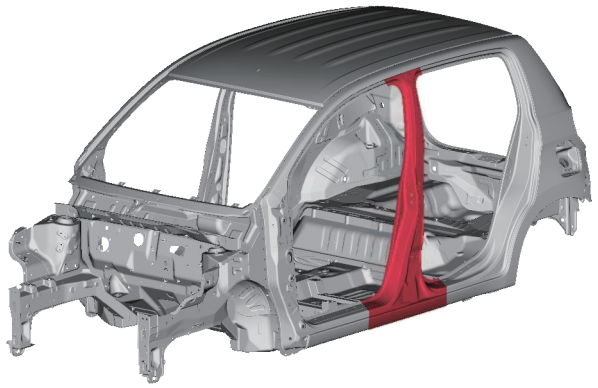
B-Pillar Outer Panel, Rear Door Hinge Reinforcement and Center Pillar Inner Panel Removal and Installation

AENDL70A9B06013

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**



IDL70A9B0076-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

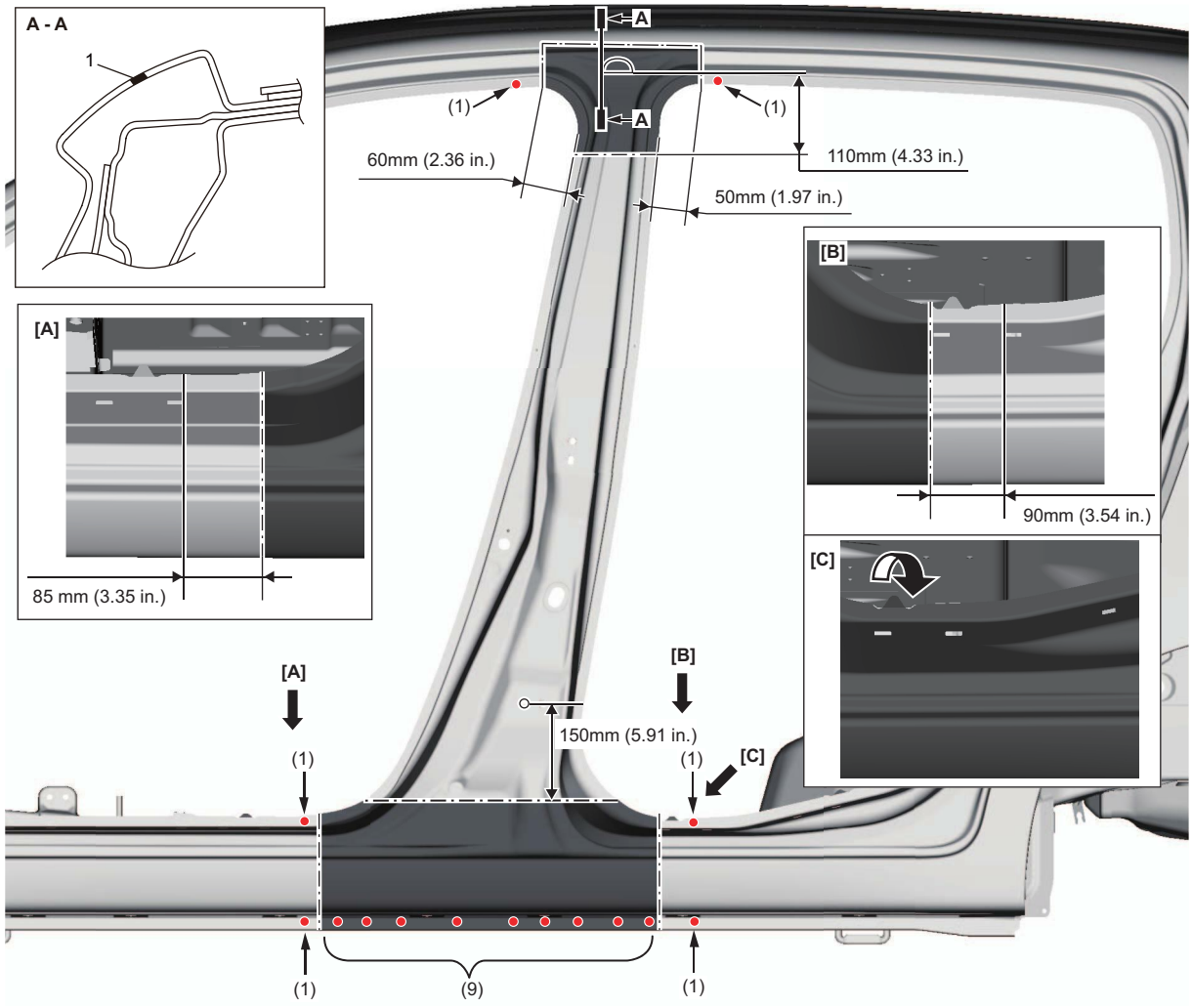
Removal

1) Mark at the shown position and cut B-pillar outer panel.

NOTICE

You may accidentally cut the parts under the roof panel or the parts under the side sill outer panel when cutting the B-pillar outer panel.
Take sufficient care not to damage the parts under the roof panel or the parts under the side sill outer panel when cutting the B-pillar outer panel.

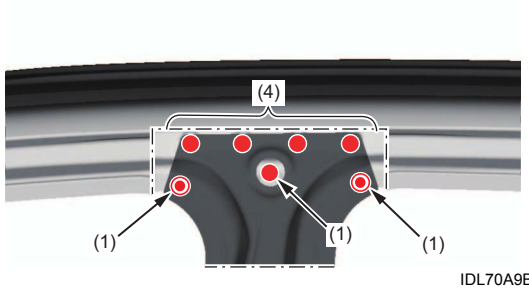
2) Cut B-pillar outer panel, rear door hinge reinforcement and outer pillar inner panel at the same time at shown rough cutting position.
3) Drill out welding spots and remove B-pillar outer panel.



IDL70A9B0077-03

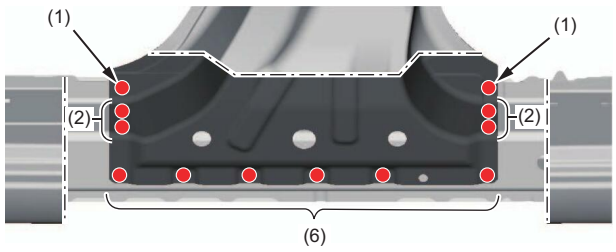
1. B-pillar outer panel cut position (Cut around here)

4) Drill out welding spots and remove upper part of rear door hinge upper reinforcement and upper part of center pillar inner panel.



IDL70A9B0078-01

5) Drill out welding spots and remove lower part of rear door hinge lower reinforcement.



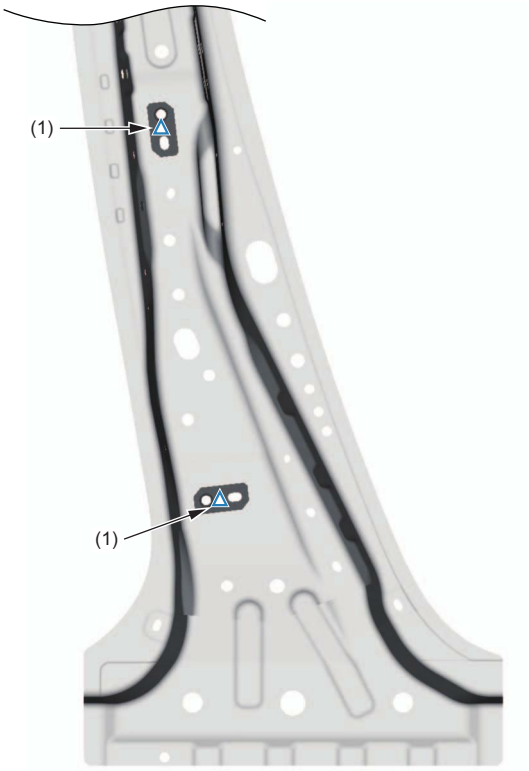
IDL70A9B0079-03

Installation

NOTE

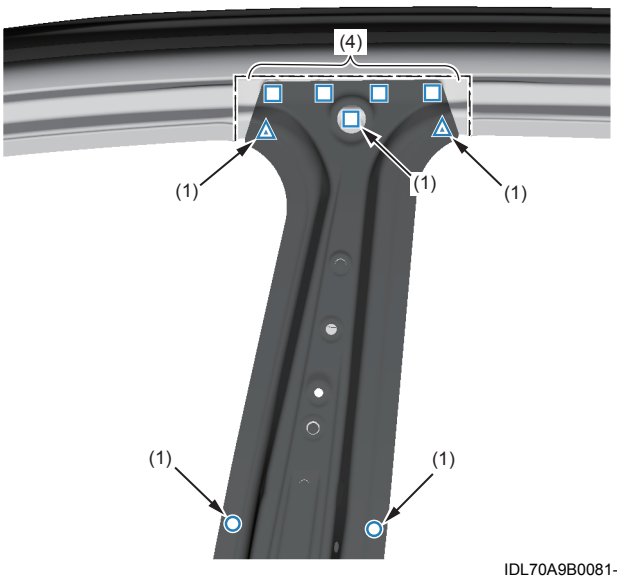
- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **☞(Page 9K-24)**
  - **☞(Page 9K-26)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install rear door hinge retainers (2 pcs.).
2) Conduct resistance spot weld.

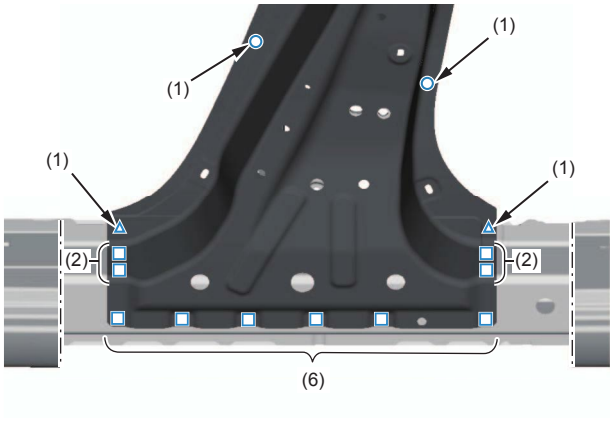


IDL70A9B0080-01

3) Install rear door hinge upper reinforcement and rear door hinge lower reinforcement.
4) Conduct plug weld or resistance spot weld.

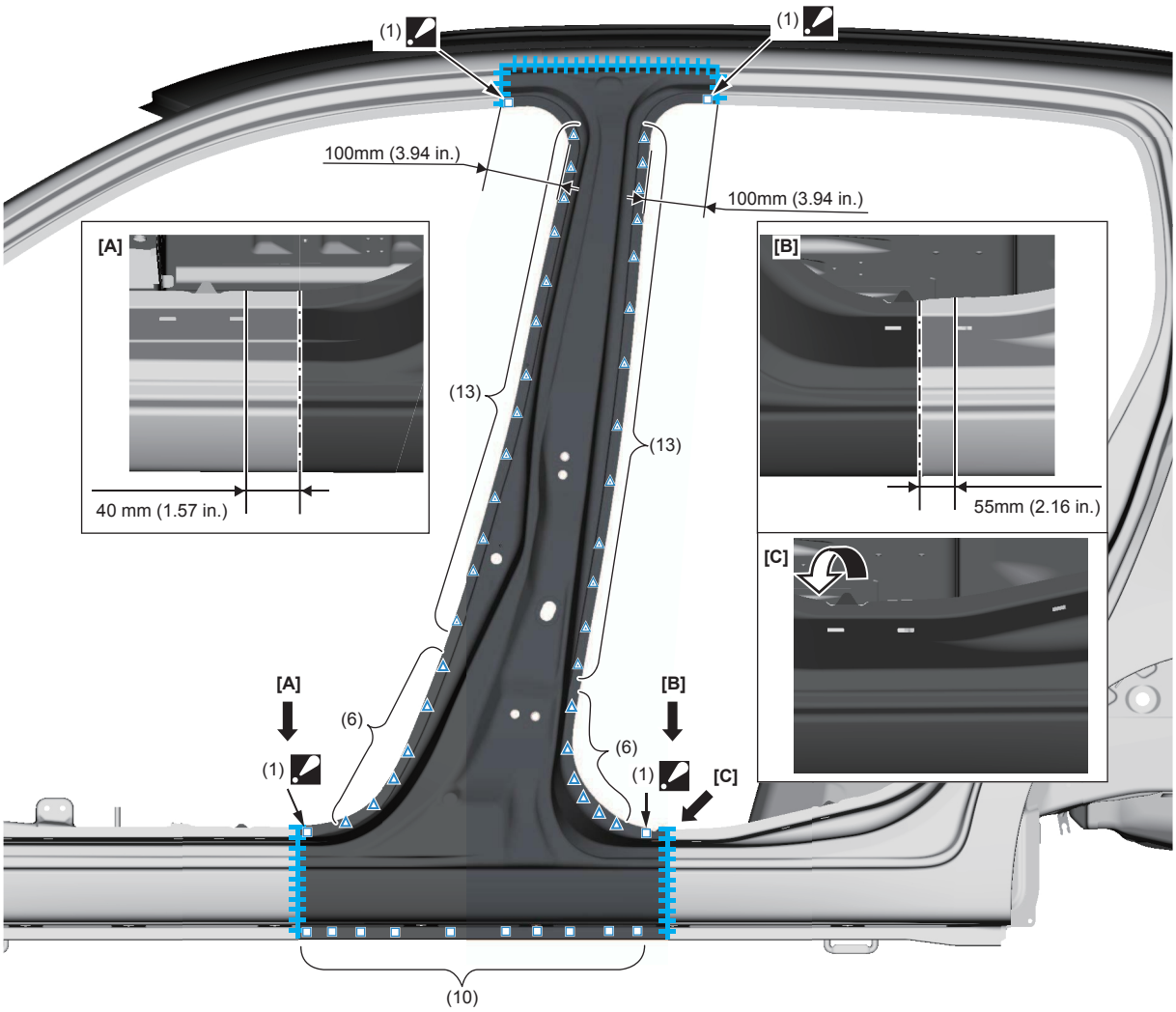


IDL70A9B0081-02



IDL70A9B0082-01

5) Install new B-pillar outer panel to vehicle body and cut in stacked condition.
6) Install B-pillar outer panel to vehicle body.
7) Conduct plug weld or resistance spot weld.
8) Conduct continuous weld.
9) Apply anticorrosion wax to back side of continuous weld part.



IDL70A9B0083-02

: Conduct resistance spot weld as three panel thickness.

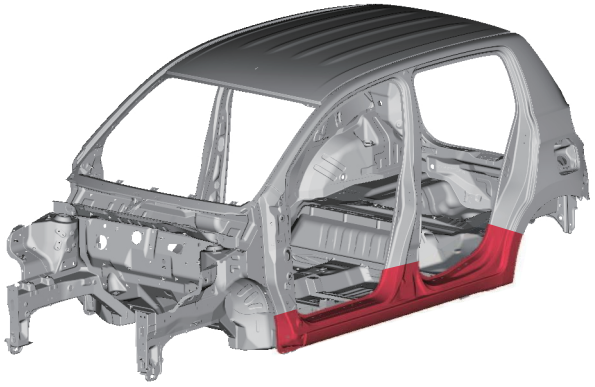
Side Sill Outer Panel Removal and Installation

AENDL70A9B06014

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Fuel filler door panel ☞(Page 9J-9)**



IDL70A9B0084-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

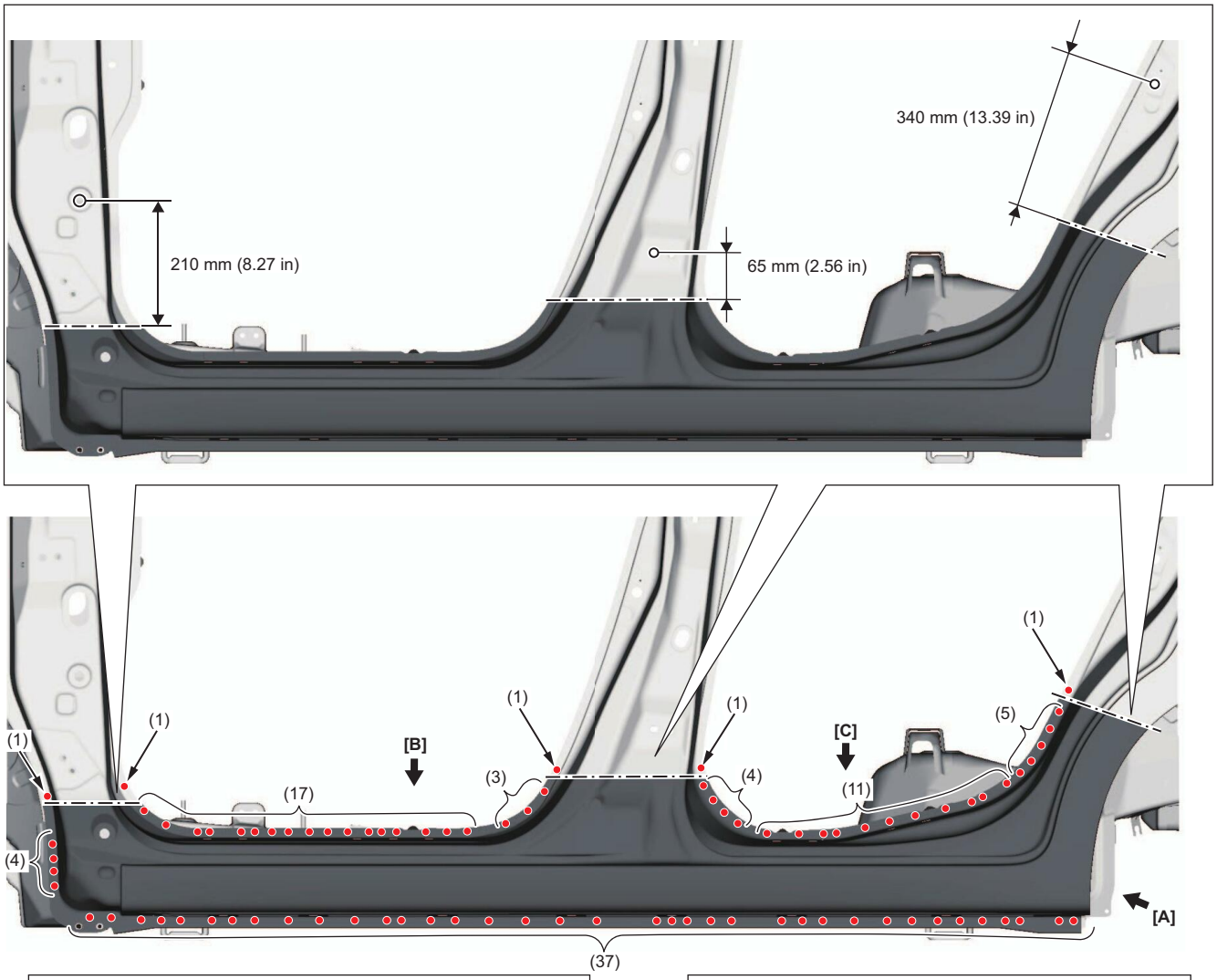
Removal

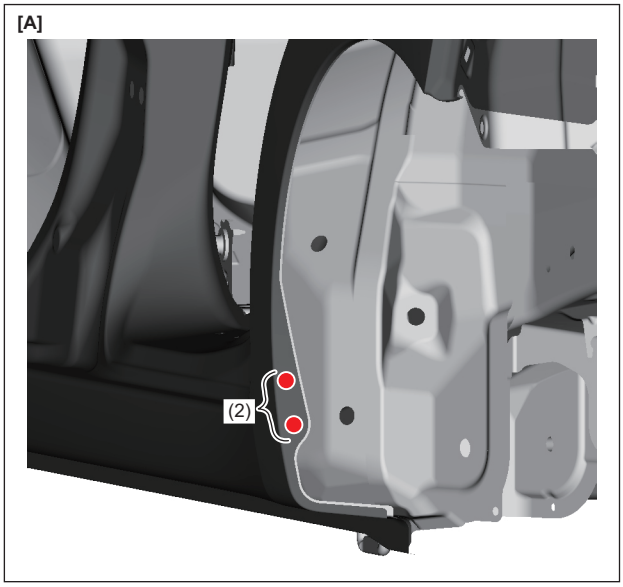
1) Mark at the shown position and cut side sill outer panel.

NOTICE

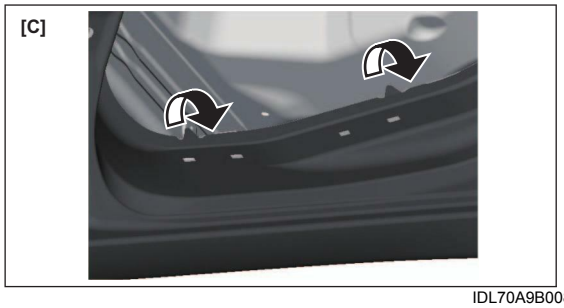
You may accidentally cut the parts under the side sill outer panel when cutting the side sill outer panel. Take sufficient care not to damage the parts under the side sill outer panel when cutting the side sill outer panel.

2) Drill out welding spots.
3) Bend open 3 metal tabs (arrow) and remove side sill outer panel.









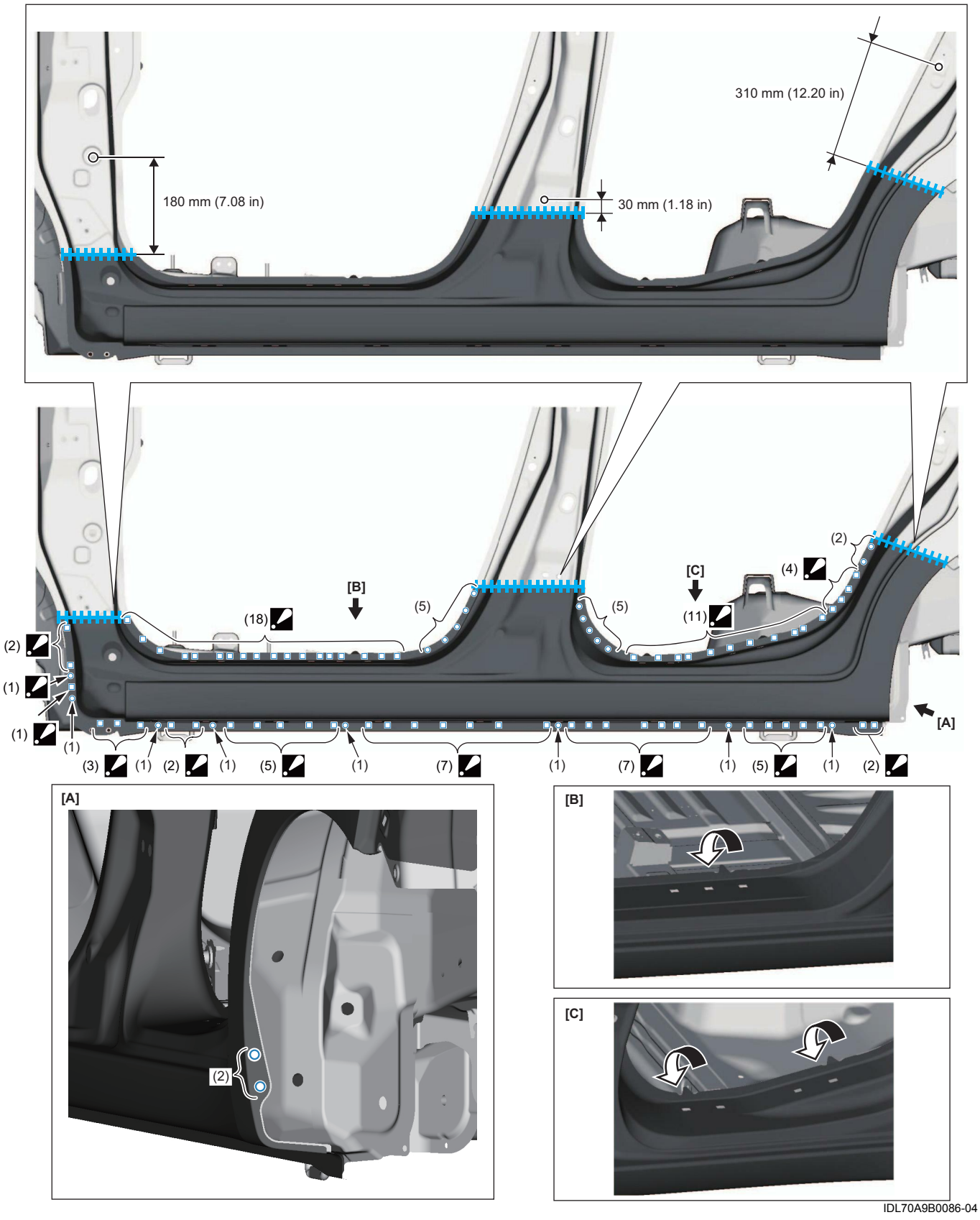
IDL70A9B0085-03

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **☞(Page 9K-24)**
  - **☞(Page 9K-26)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install new side sill outer panel to vehicle body and cut in stacked condition.
2) Apply sealer to side sill outer panel.
3) Install side sill outer panel.
4) Conduct resistance spot weld and plug weld.
5) Conduct continuous weld.
6) Apply anticorrosion wax to back side of continuous weld part.
7) Bend in 3 metal tabs (arrow) of side sill outer panel.



IDL70A9B0086-04

: Conduct resistance spot weld as three panel thickness.

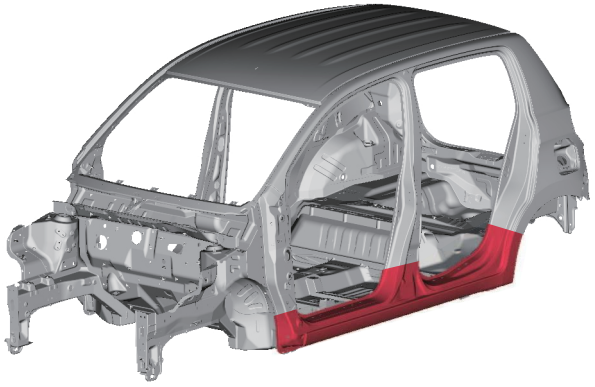
Side Sill Outer Panel and Side Sill Strength Removal and Installation

AENDL70A9B06023

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Fuel filler door panel ☞(Page 9J-9)**



IDL70A9B0084-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

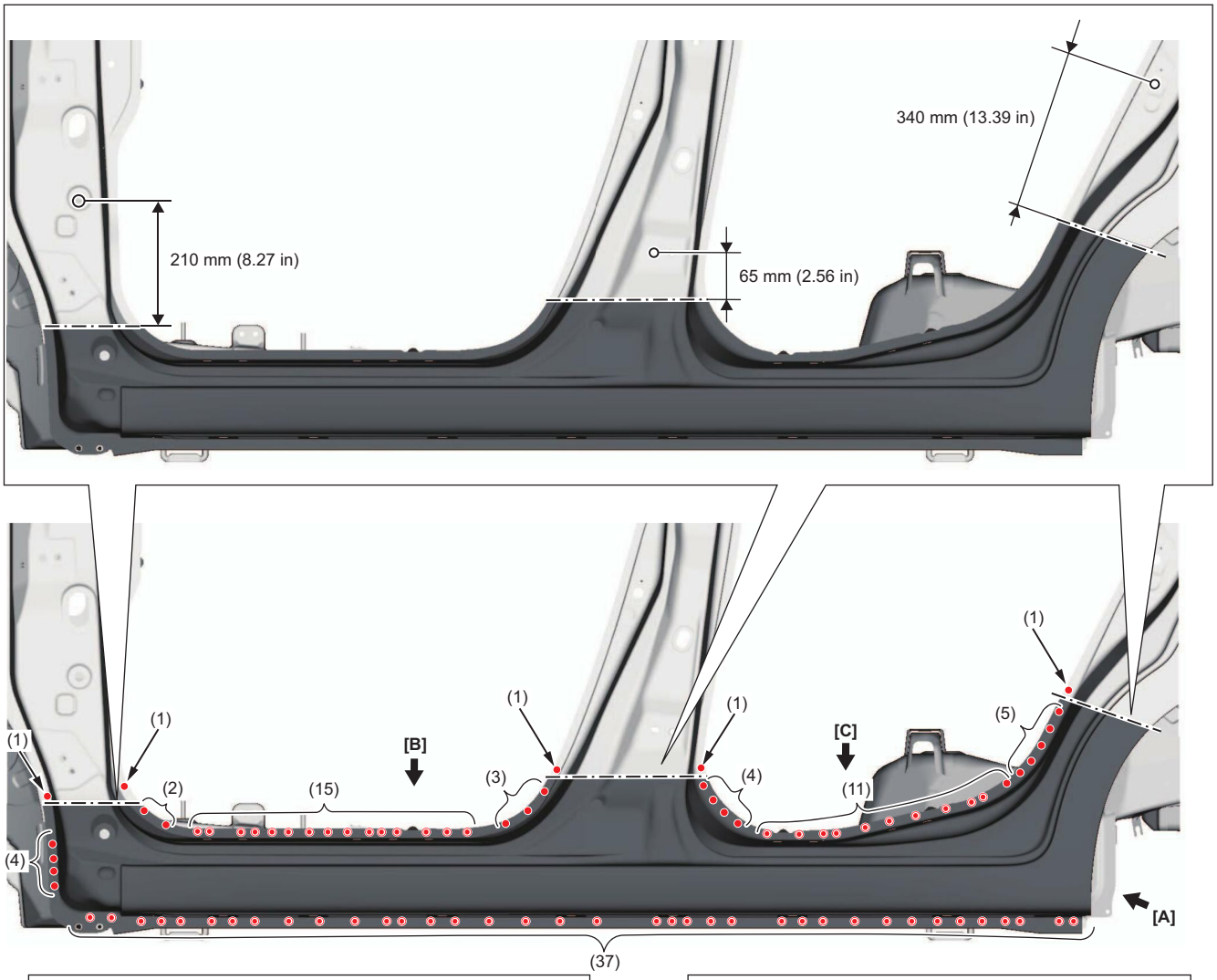
Removal

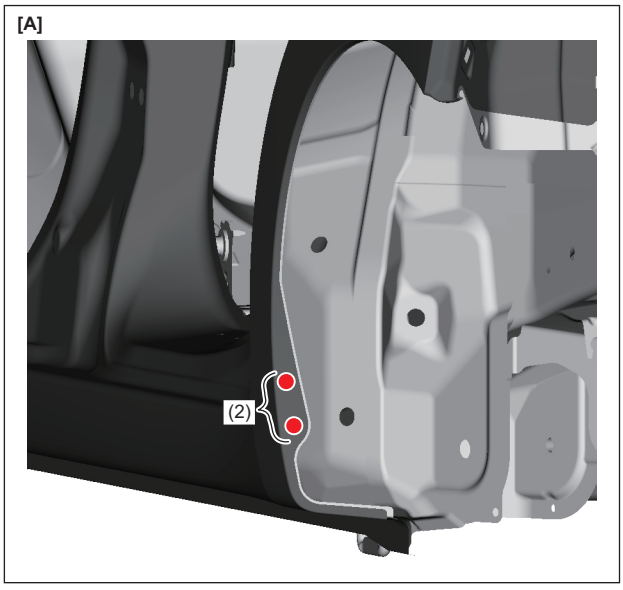
1) Mark at the shown position and cut side sill outer panel.

NOTICE

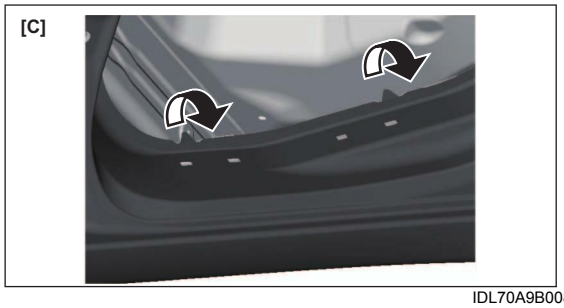
You may accidentally cut the parts under the side sill outer panel when cutting the side sill outer panel. Take sufficient care not to damage the parts under the side sill outer panel when cutting the side sill outer panel.

2) Drill out welding spots.
3) Bend open metal tab (arrow) and remove side sill outer panel.



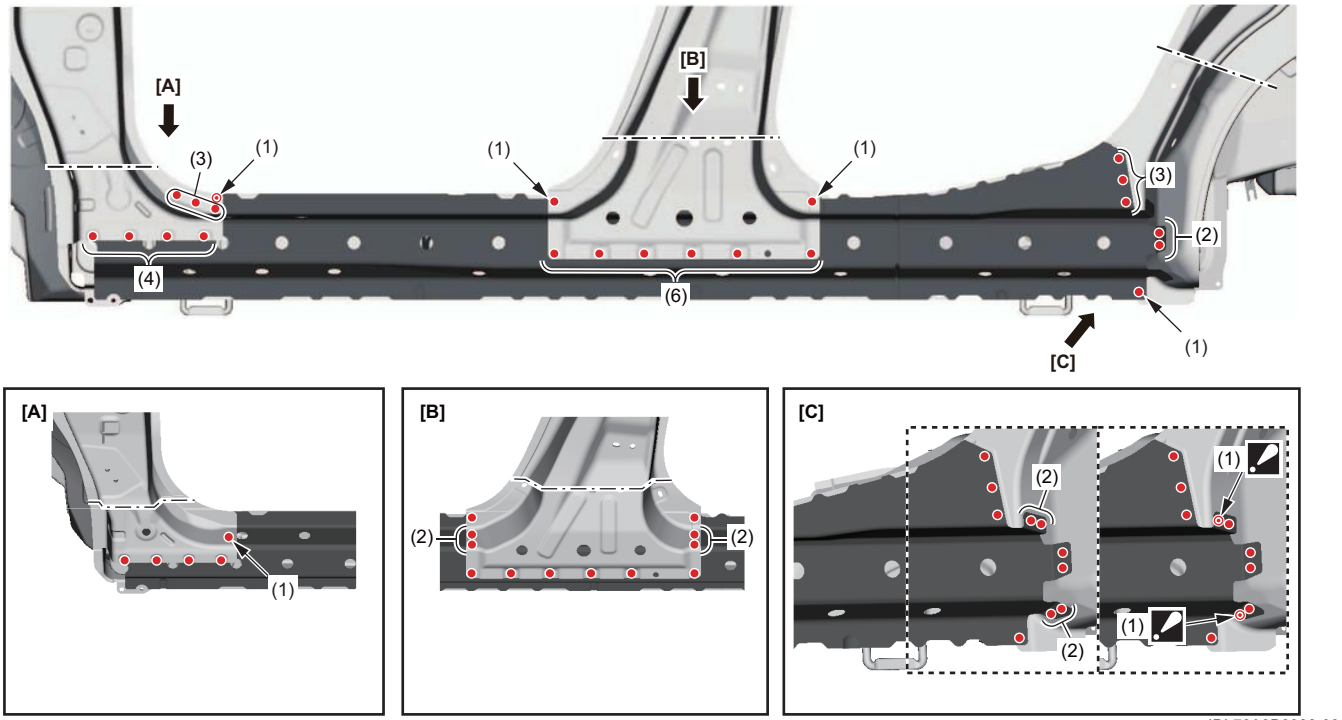






IDL70A9B0087-04

4) Drill out welding spots and remove side sill strength.



IDL70A9B0088-03

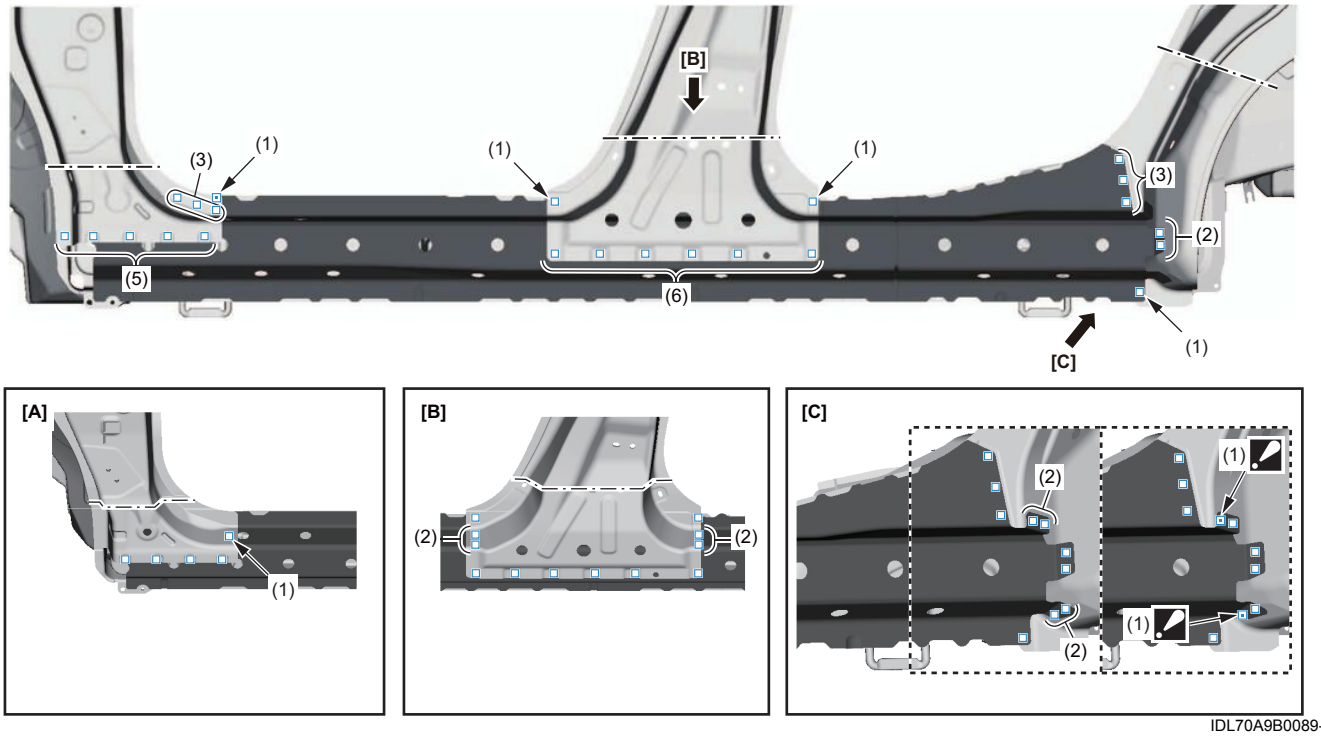
: This symbol indicates that quarter-pillar outer panel, rear wheel house outer panel are replaced at the same time.

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **Side body outside: ☞(Page 9K-24)**
  - **Side body inside: ☞(Page 9K-26)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

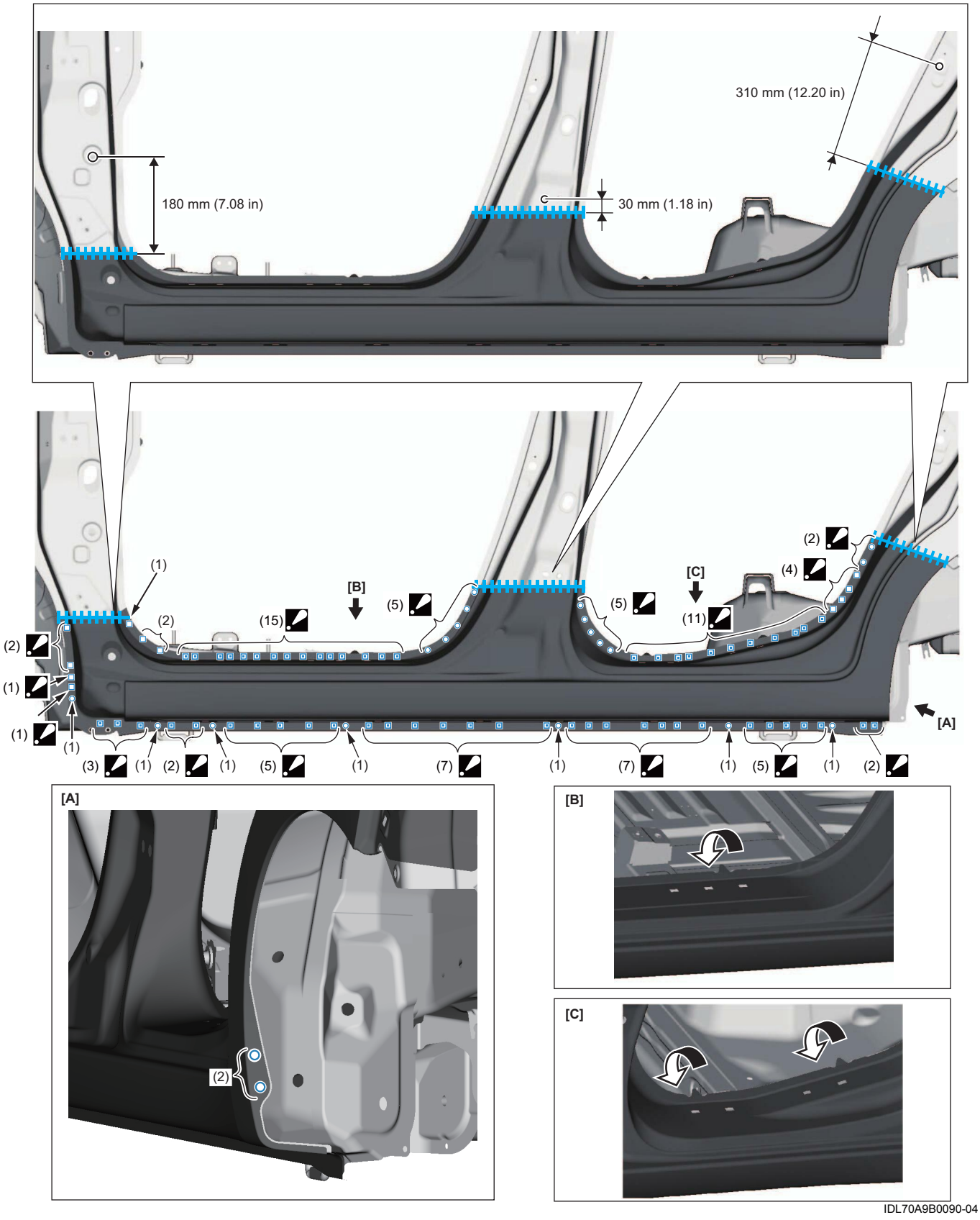
1) Install new side sill strength to vehicle body.
2) Conduct resistance spot weld and plug weld.



IDL70A9B0089-04

: This symbol indicates that quarter-pillar outer panel, rear wheel house outer panel are replaced at the same time.

3) Install B-pillar outer panel, rear door hinge reinforcement and center pillar inner panel, if removed. ☞(Page 9K-91)
4) Install new side sill outer panel to vehicle body and cut in stacked condition.
5) Install side sill outer panel.
6) Conduct resistance spot weld and plug weld.
7) Conduct continuous weld.
8) Apply anticorrosion wax to back side of continuous weld part.
9) Bend in metal tab (arrow) of side sill outer panel.



IDL70A9B0090-04

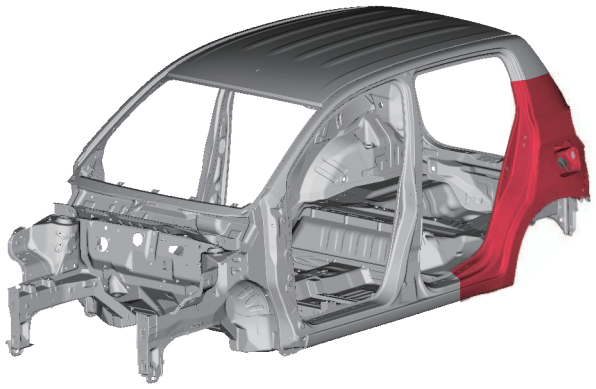
Quarter-Pillar Outer Panel Removal and Installation

AENDL70A9B06015

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Fuel filler door panel ☞(Page 9J-9)**



IDL70A9B0091-01

Precautions

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- The dimensions shown in the figure are reference values when cutting replacement part placed on top of existing part. Determine most appropriate cutting (or joint) line considering both size of replacement part and condition of existing part.

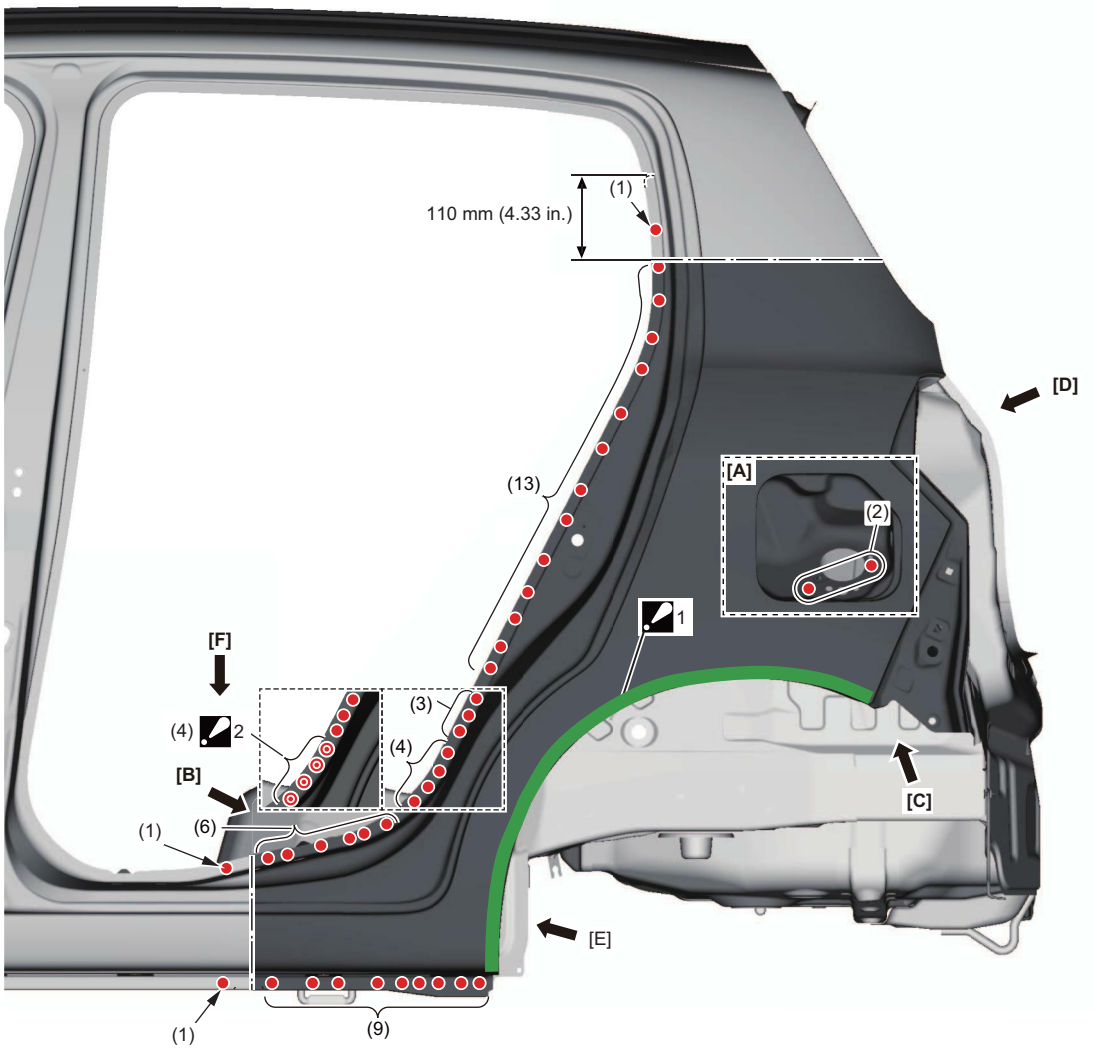
Removal

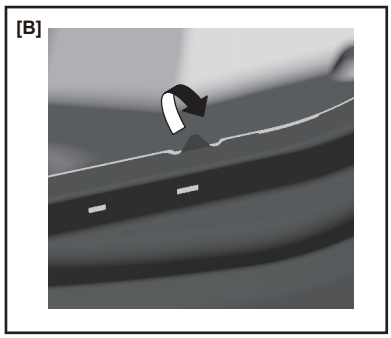
1) Mark at the shown position and cut quarter-pillar outer panel.

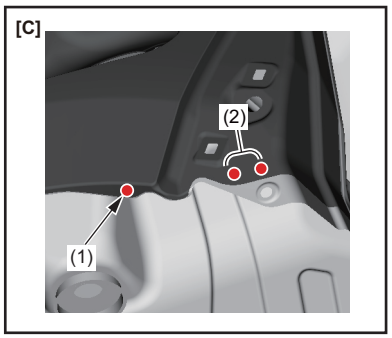
NOTICE

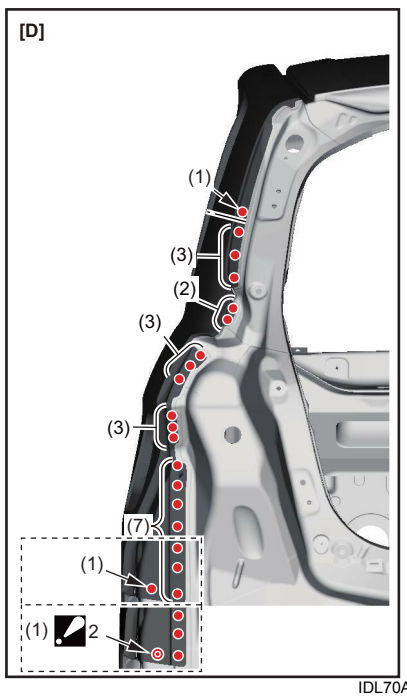
You may accidentally cut the parts under the roof panel or the parts under the side sill outer panel when cutting the B-pillar outer panel.
Take sufficient care not to damage the parts under the roof panel or the parts under the side sill outer panel when cutting the B-pillar outer panel.

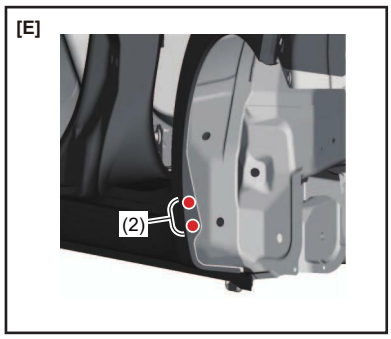
2) Drill out welding spots.
3) Bend open metal tab (arrow) and remove quarter-pillar outer panel.

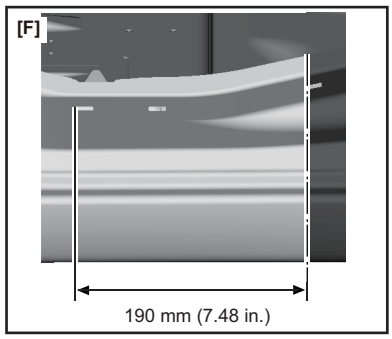












IDL70A9B0092-04

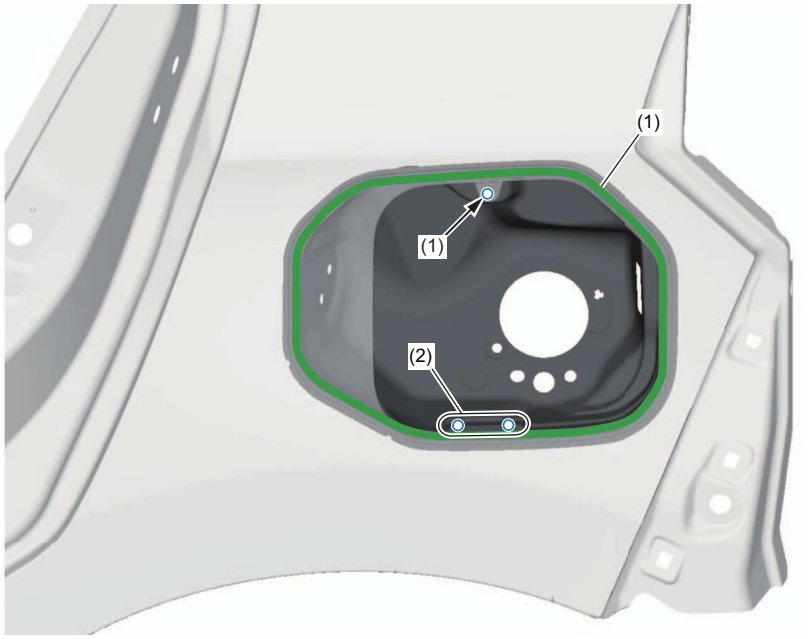
1:	When heating around sealer application portion to detach body sealer, be sure that temperature of said portion does not reach 170 °C (338 °F).
2:	This symbol indicates that quarter-pillar outer panel and rear wheel house outer panel are replaced at the same time.
[A]:	Vehicle left side

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **☞(Page 9K-24)**
  - **☞(Page 9K-26)**
  - **☞(Page 9K-23)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

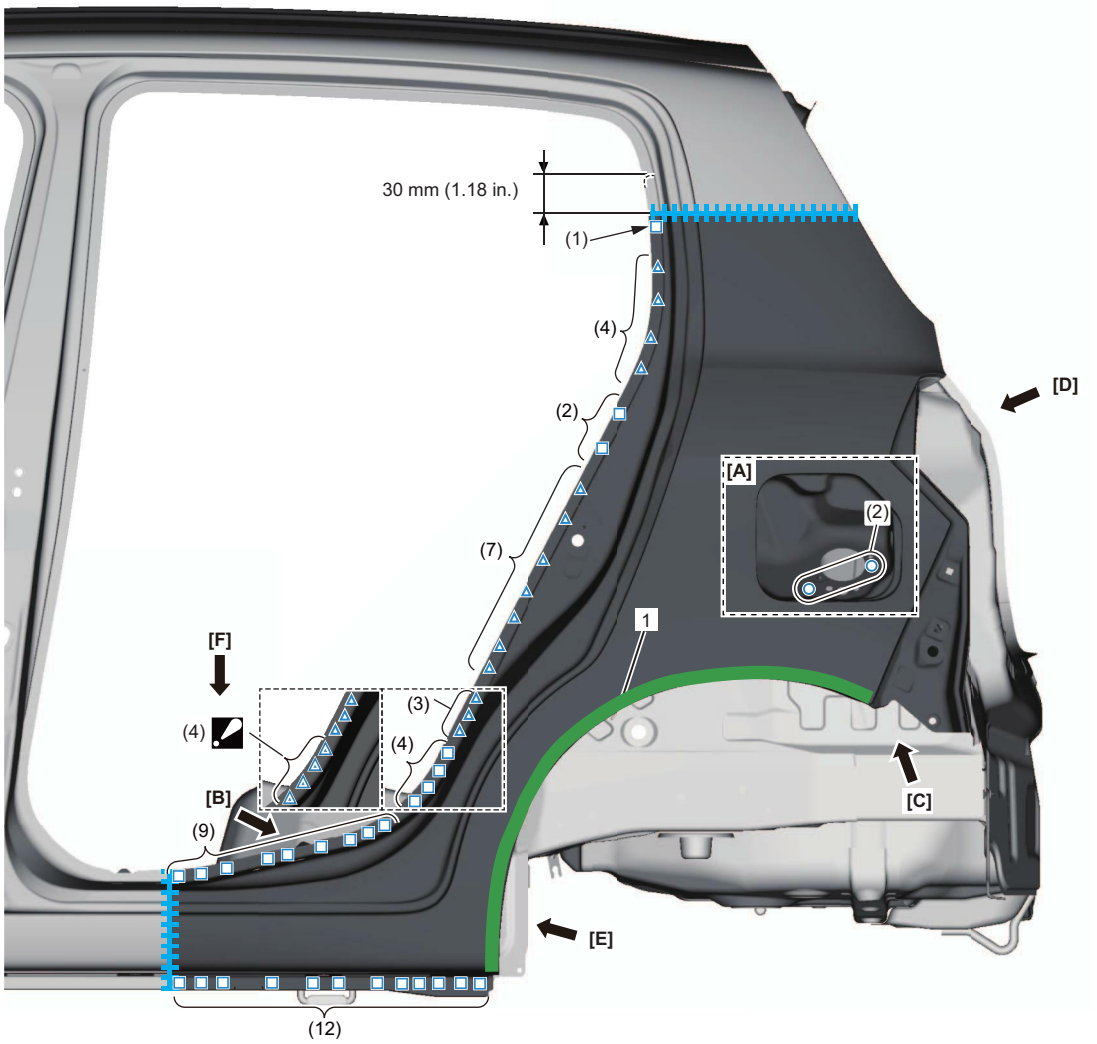
1) Apply body sealer to fuel filler box.
2) Install fuel filler box.
3) Conduct resistance spot weld.

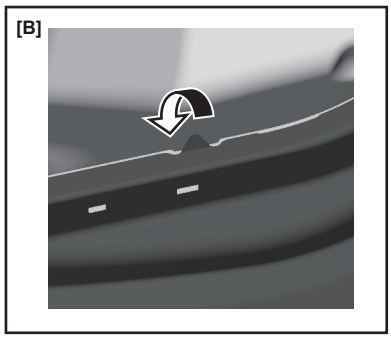


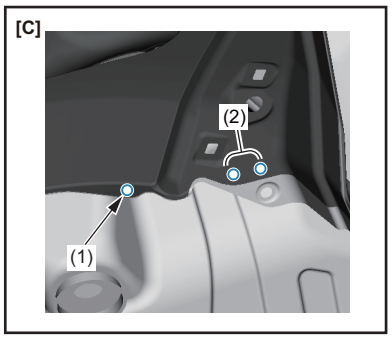
IDL70A9B0093-03

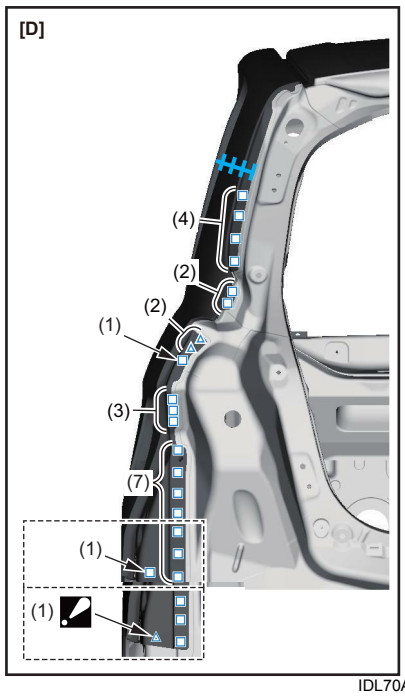
1. Applied part of body sealer.

4) Install new quarter-pillar outer panel to vehicle body and cut in stacked condition.
5) Remove quarter-pillar outer panel and apply body sealer.
6) Reinstall quarter-pillar outer panel to vehicle body.
7) Conduct resistance spot weld or plug weld.
8) Conduct continuous weld.
9) Apply anticorrosion wax to back side of continuous weld part.
10) Bend in metal tab (arrow) of quarter-pillar outer panel.

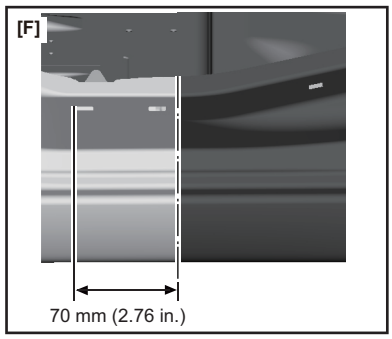












IDL70A9B0094-04

:	This symbol indicates that quarter-pillar outer panel and rear wheel house outer panel are replaced at the same time.
[A]:	Vehicle left side
1.	Applied part of body sealer.

Rear Wheel House Outer Panel Removal and Installation

AENDL70A9B06016

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Quarter-pillar outer panel ☞(Page 9K-104)**



IDL70A9B0095-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- Rear wheel house front reinforcement is to be reused.
- Side sill strength (partially) is to be reused.

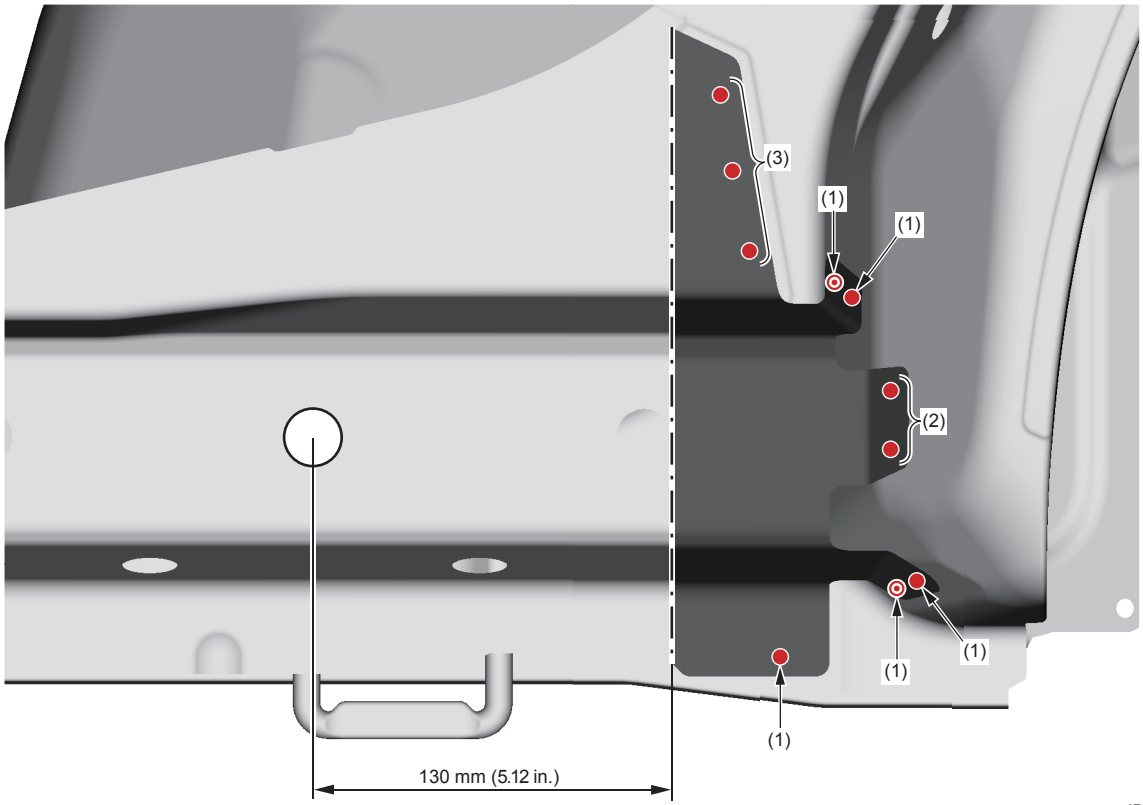
Removal

1) Mark at the shown position and cut side sill strength.

NOTICE

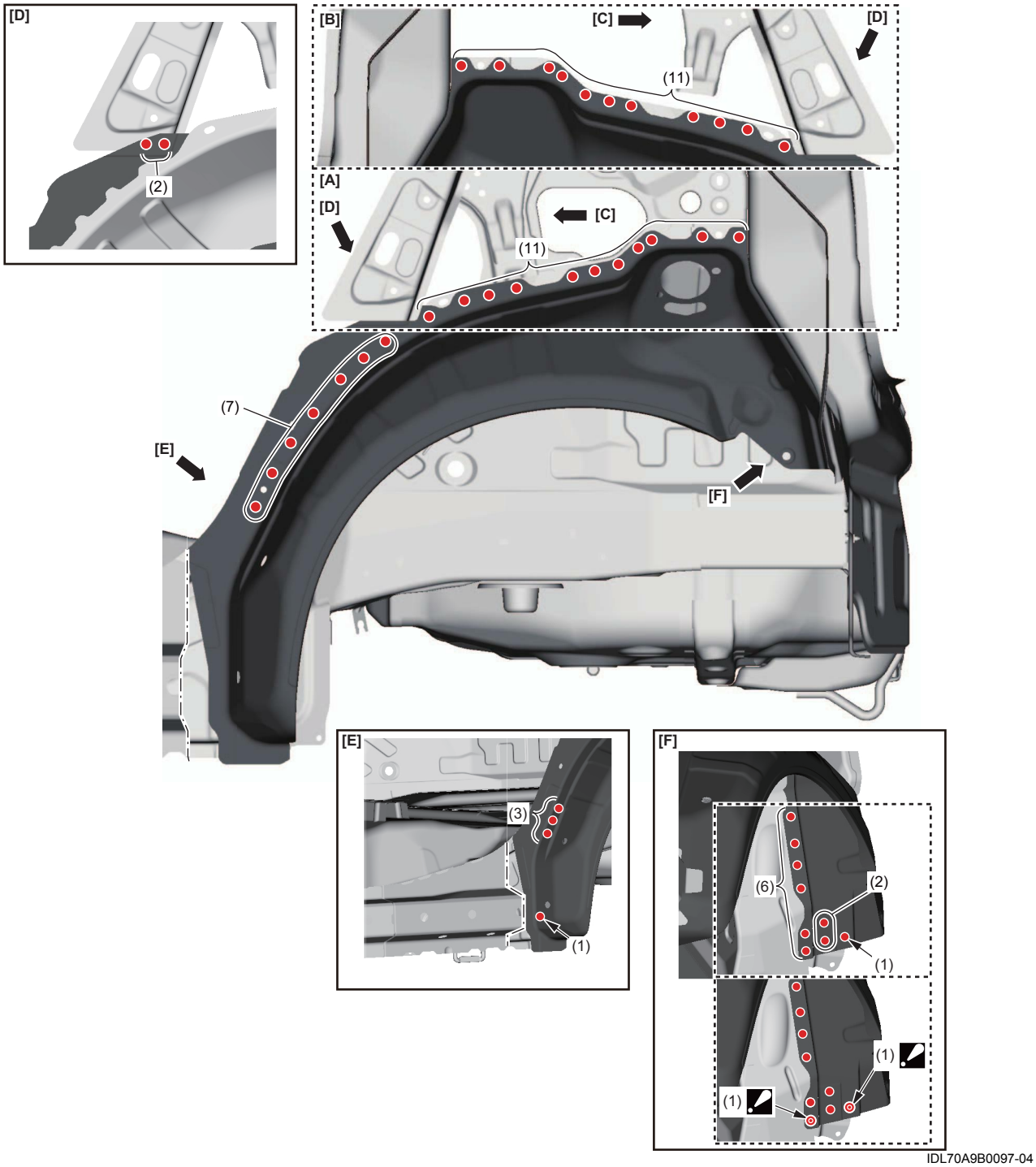
You may accidentally cut the parts under the side sill strength when cutting the side sill strength. Take sufficient care not to damage the parts under the side sill strength when cutting the side sill strength.

2) Drill out welding spots and remove side sill strength partially.



IDL70A9B0096-02

3) Drill out welding spots and remove rear wheel house outer panel.



IDL70A9B0097-04

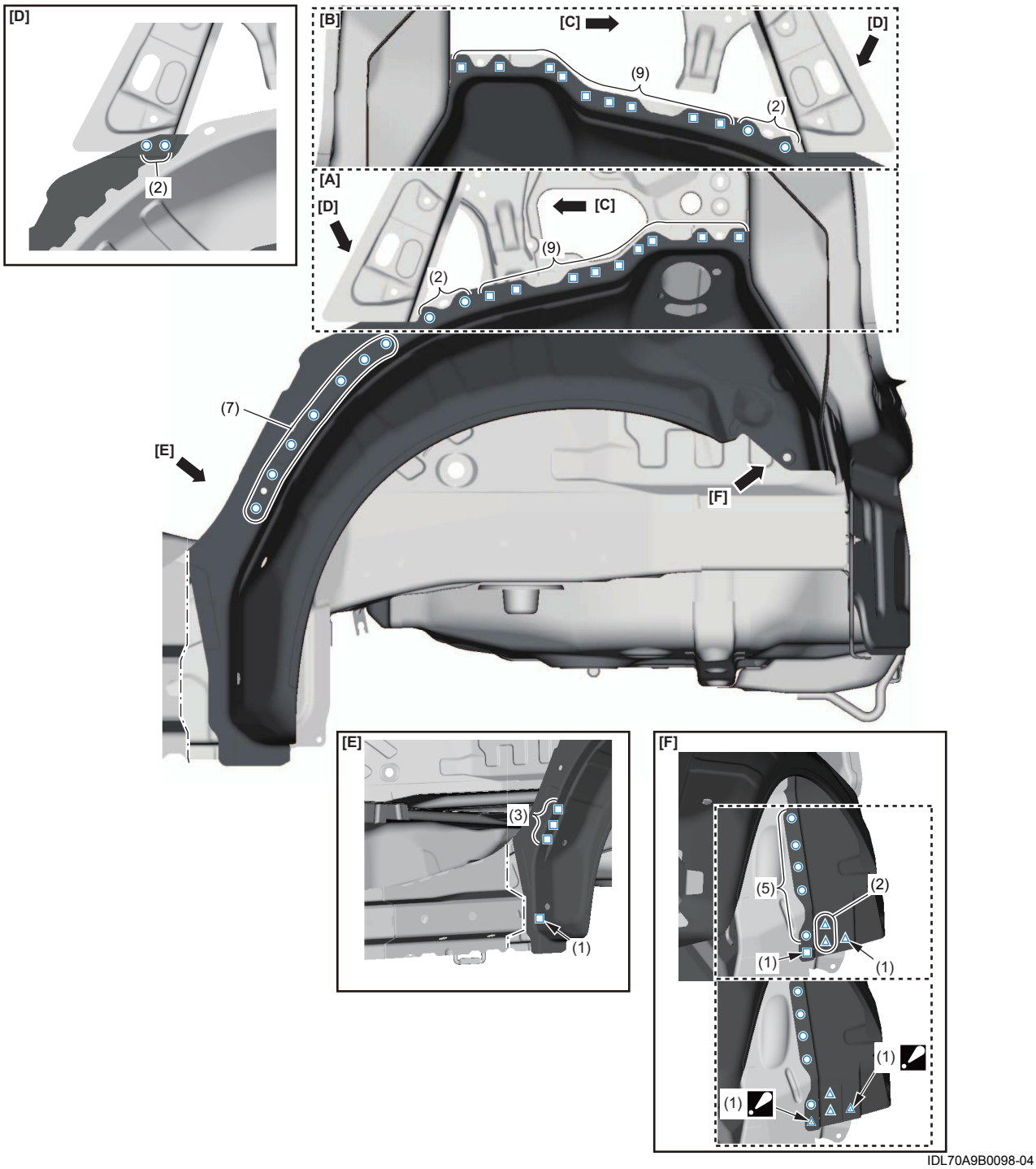
[A]:	Vehicle left side
[B]:	Vehicle right side
[C]:	Vehicle forward
:	This symbol indicates that rear wheel house outer panel and rear lamp house panel are replaced at the same time.

Installation

NOTE

Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-26)

1) Install rear wheel house outer panel.
2) Conduct resistance spot weld and plug weld.

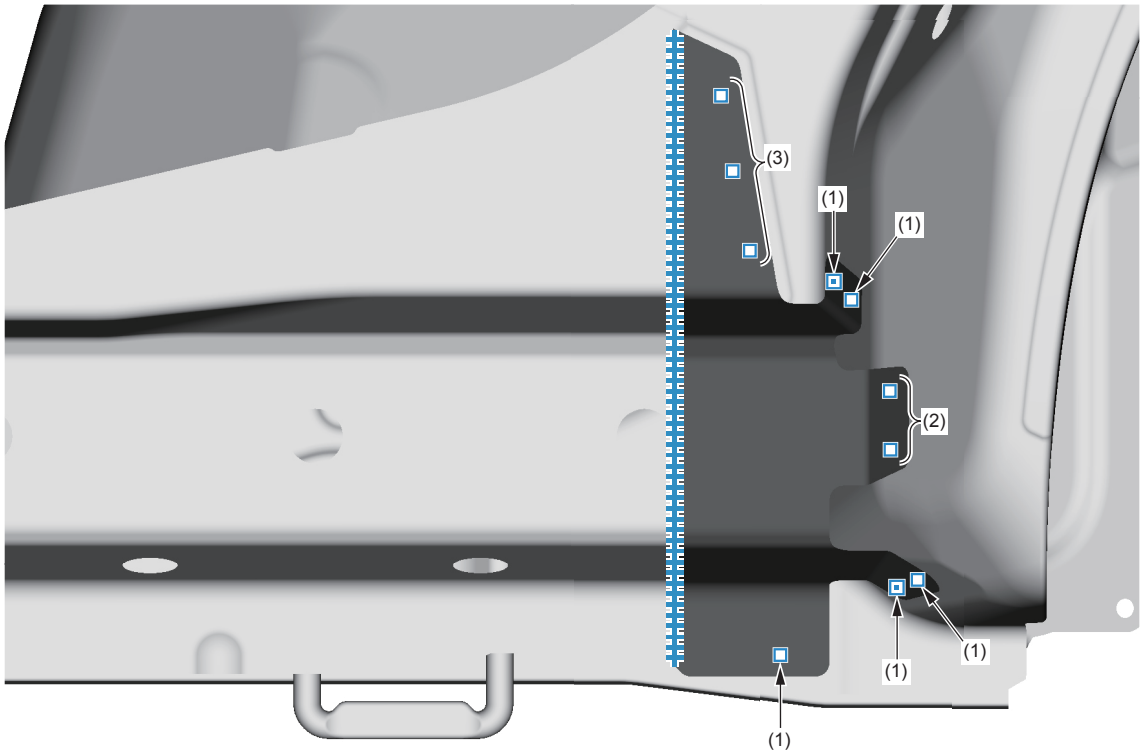


IDL70A9B0098-04

[A]:	Vehicle left side
[B]:	Vehicle right side
[C]:	Vehicle forward
:	This symbol indicates that rear wheel house outer panel and rear lamp house panel are replaced at the same time.

3) Install side sill strength partially to vehicle body.

4) Conduct plug weld.



IDL70A9B0099-01

Back Panel Removal and Installation

AENDL70A9B06017

NOTE

The figure below shows condition where following parts are removed.

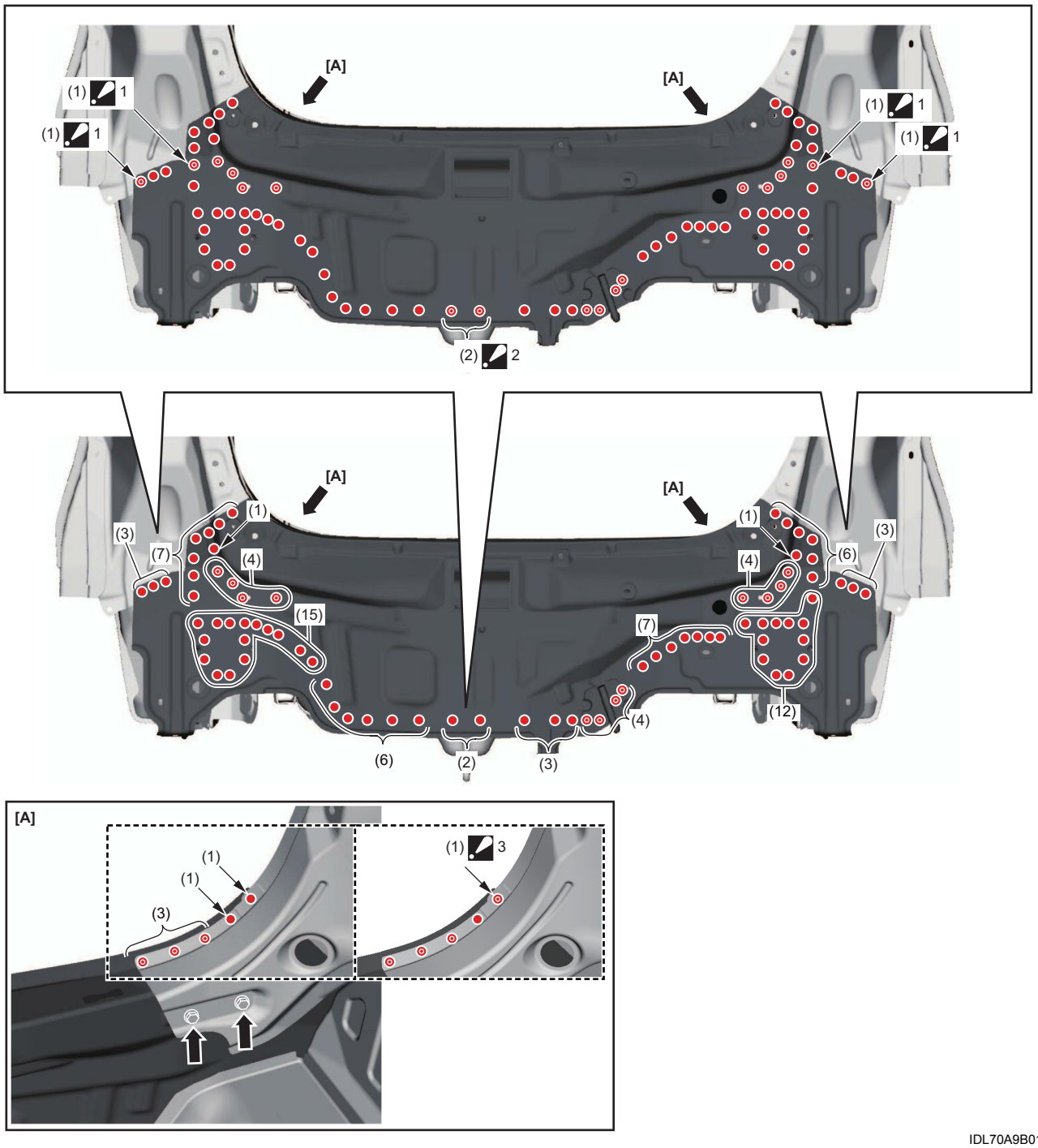
- **Front fender ☞(Page 9J-3)**



IDL70A9B0100-01

Removal

1) Drill out welding spots.
2) Unscrew 4 bolts and remove back panel.



IDL70A9B0101-04

1:	This symbol indicates that back panel and rear lamp house outer panel are replaced at the same time.
2:	This symbol indicates that back panel and rear floor rear panel are replaced at the same time.
3:	This symbol indicates that back panel and rear lamp house inner panel are replaced at the same time.

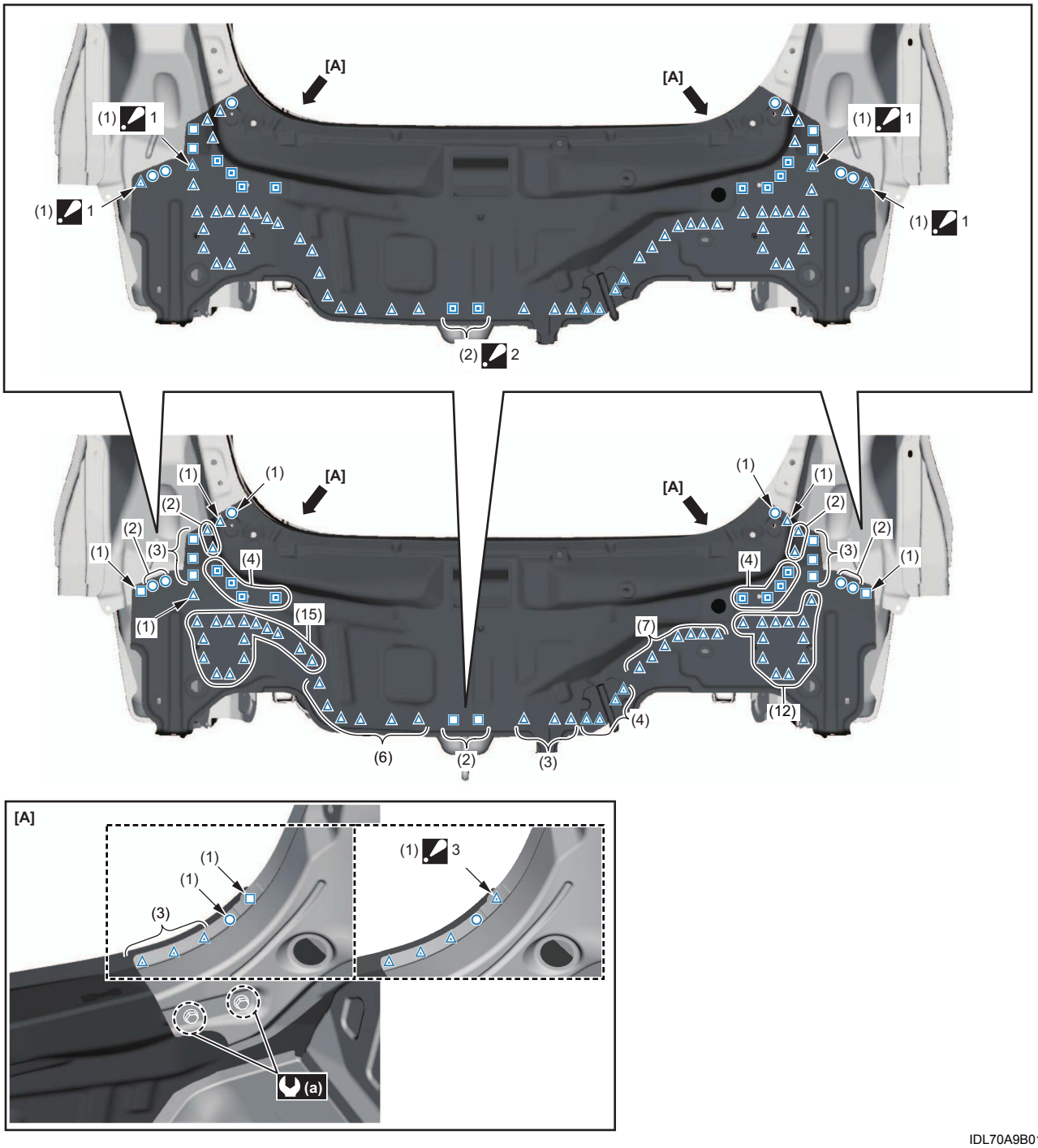
Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-23)**
- **Proceed repair while taking into consideration installation of parts that affect appearance. ☞(Page 9K-19)**

1) Install back panel.
2) Conduct resistance spot weld and plug weld.

3) Tighten 4 bolts to specified torque.



IDL70A9B0102-03

1:	This symbol indicates that back panel and rear lamp house outer panel are replaced at the same time.
2:	This symbol indicates that back panel and rear floor rear panel are replaced at the same time.
3:	This symbol indicates that back panel and rear lamp house inner panel are replaced at the same time.
(a) :	10 N·m (1.0 kgf-m, 7.5 lbf-ft)

Rear Floor Rear Panel Removal and Installation

AENDL70A9B06018

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Back Panel ☞(Page 9K-112)**



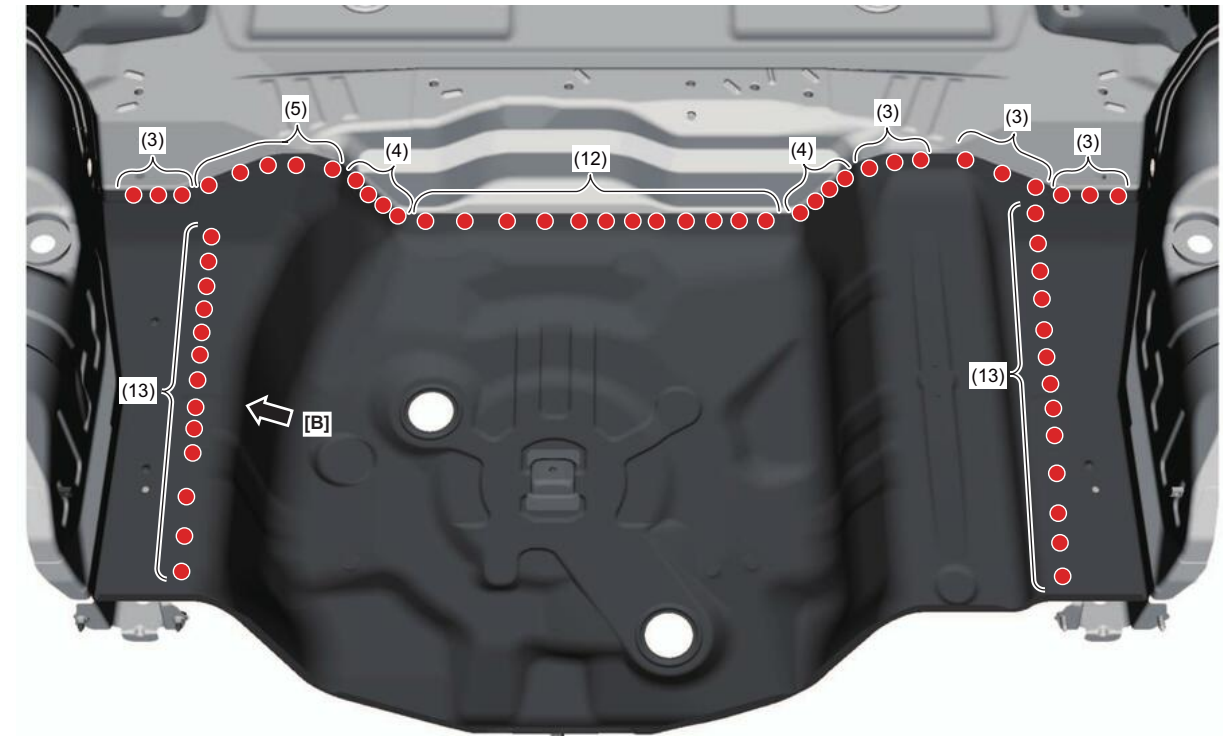
IDL70A9B0103-01

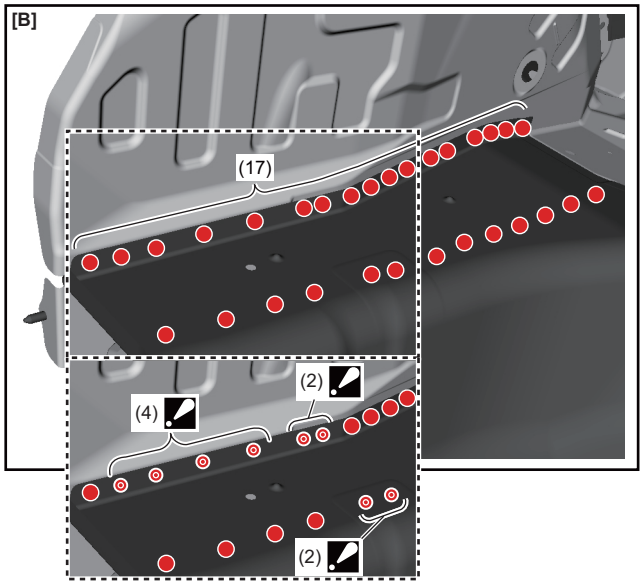
Removal

1) Drill out welding spots and remove rear floor rear panel.

NOTE

Bend open both ends of rear floor center panel flange, if necessary.





IDL70A9B0104-01

: This symbol indicates that rear floor rear panel and rear floor side rear member are replaced at the same time.

Installation

NOTE

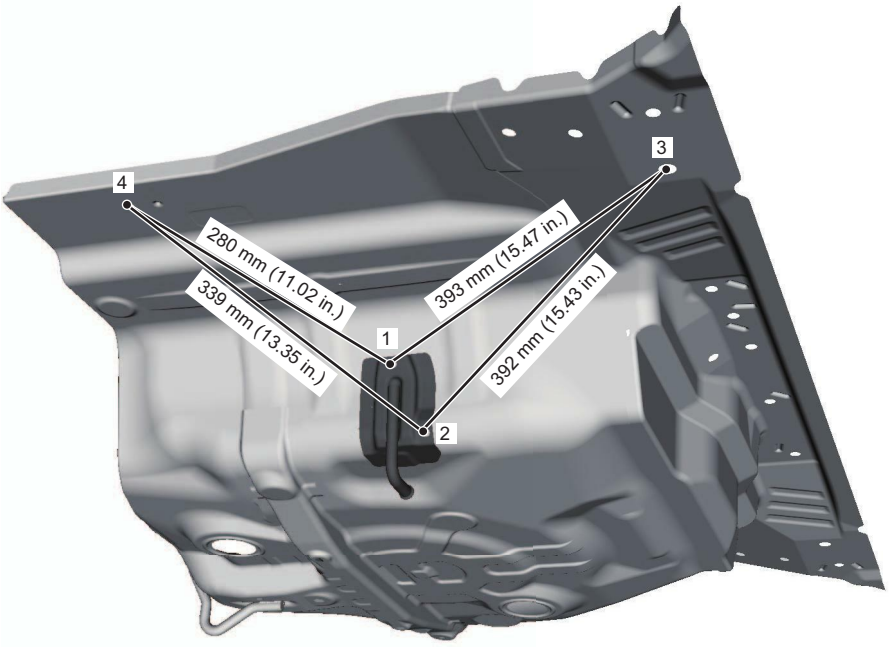
Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-29)

1) Install spare tire bracket.
2) Conduct resistance spot weld.



IDL70A9B0105-01

3) Install muffler rear hanger to vehicle body as shown in the figure.

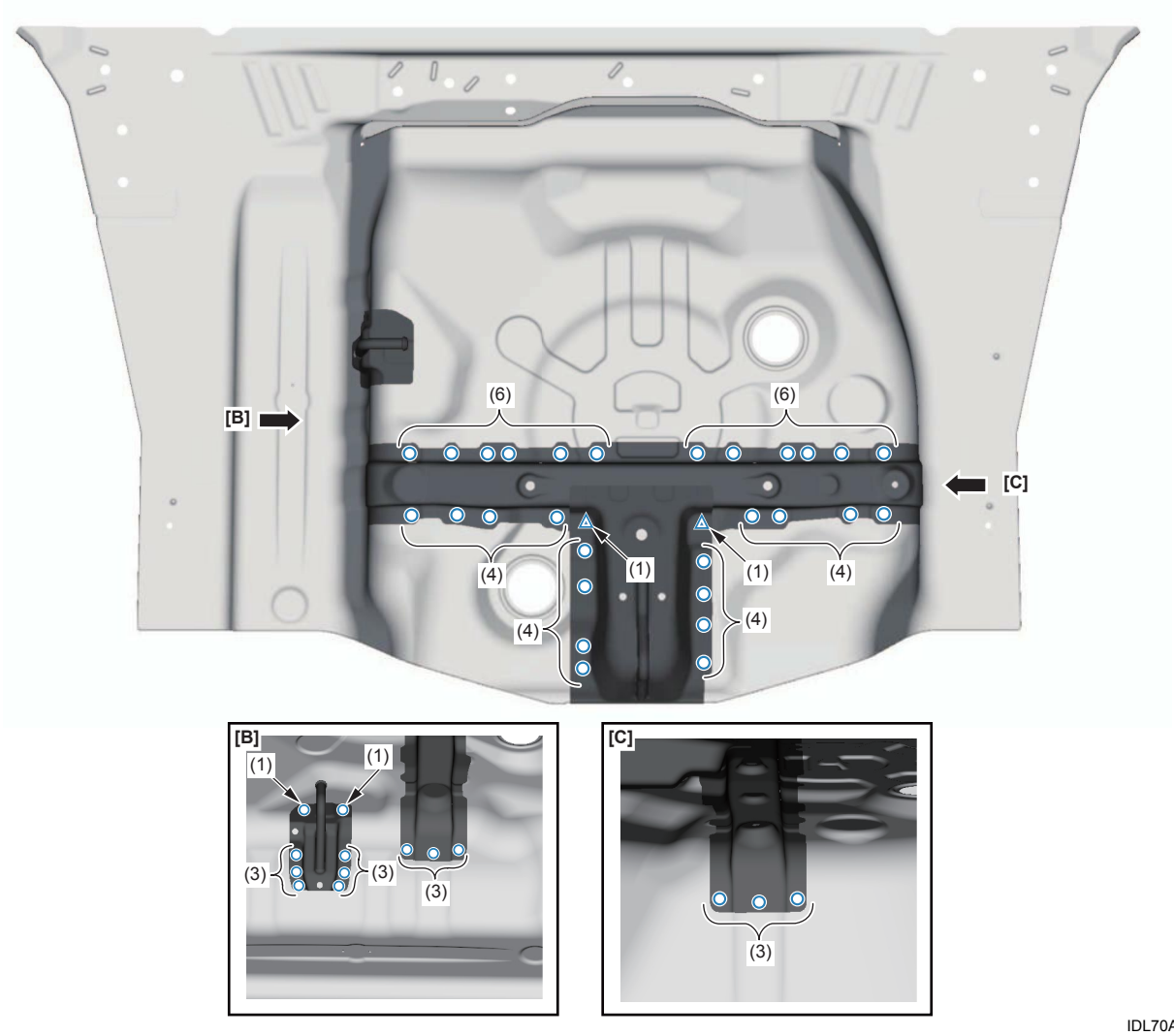


IDL70A9B0106-02

Point	Position		
1	Muffler rear hanger jig hole (Upper side)	—	ø8 hole center
2	Muffler rear hanger jig hole (Lower side)	—	↑
3	Rear floor seat mounting panel jig hole	R	ø15 hole center
4	Rear floor rear panel jig hole	R	ø7 hole center

4) Install rear floor 3rd crossmember and towing hook member, muffler rear hunger.

5) Conduct resistance spot weld.



IDL70A9B0107-01

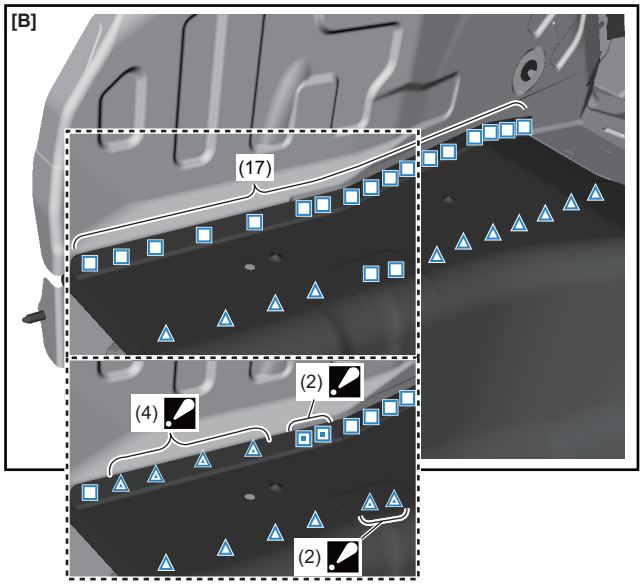
6) Install rear floor rear panel.

NOTE

Bend in both ends of rear floor center panel flange, if necessary.

7) Conduct resistance spot weld and plug weld.





IDL70A9B0108-01

: This symbol indicates that rear floor rear panel and rear floor side rear member are replaced at the same time.

Rear Floor Side Rear Member, Rear Floor Side Member Rear Reinforcement and Rear Floor Rear Panel (Partial) Removal and Installation

AENDL70A9B06019

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Back Panel ☞(Page 9K-112)**



IDL70A9B0109-01

General Notes

- Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.
- Rear floor rear panel is to be reused.

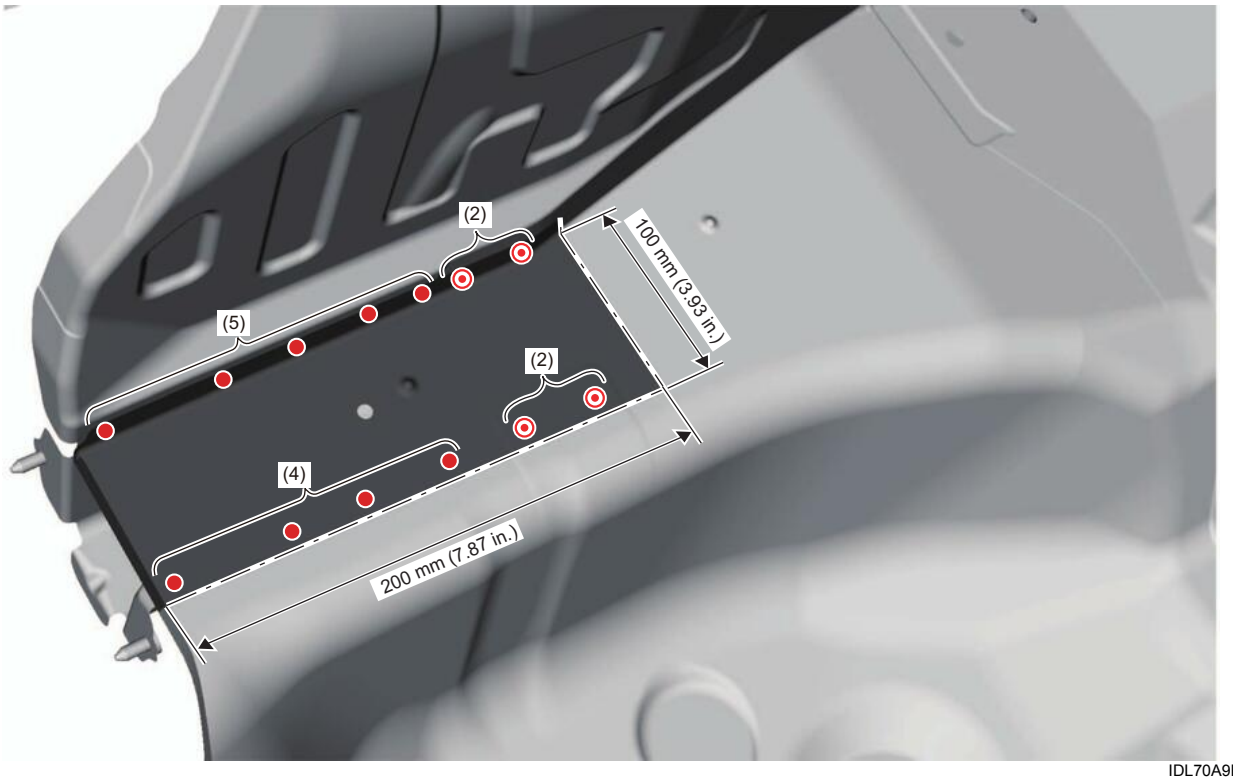
Removal

1) Mark at the shown position and cut rear floor rear panel.

NOTICE

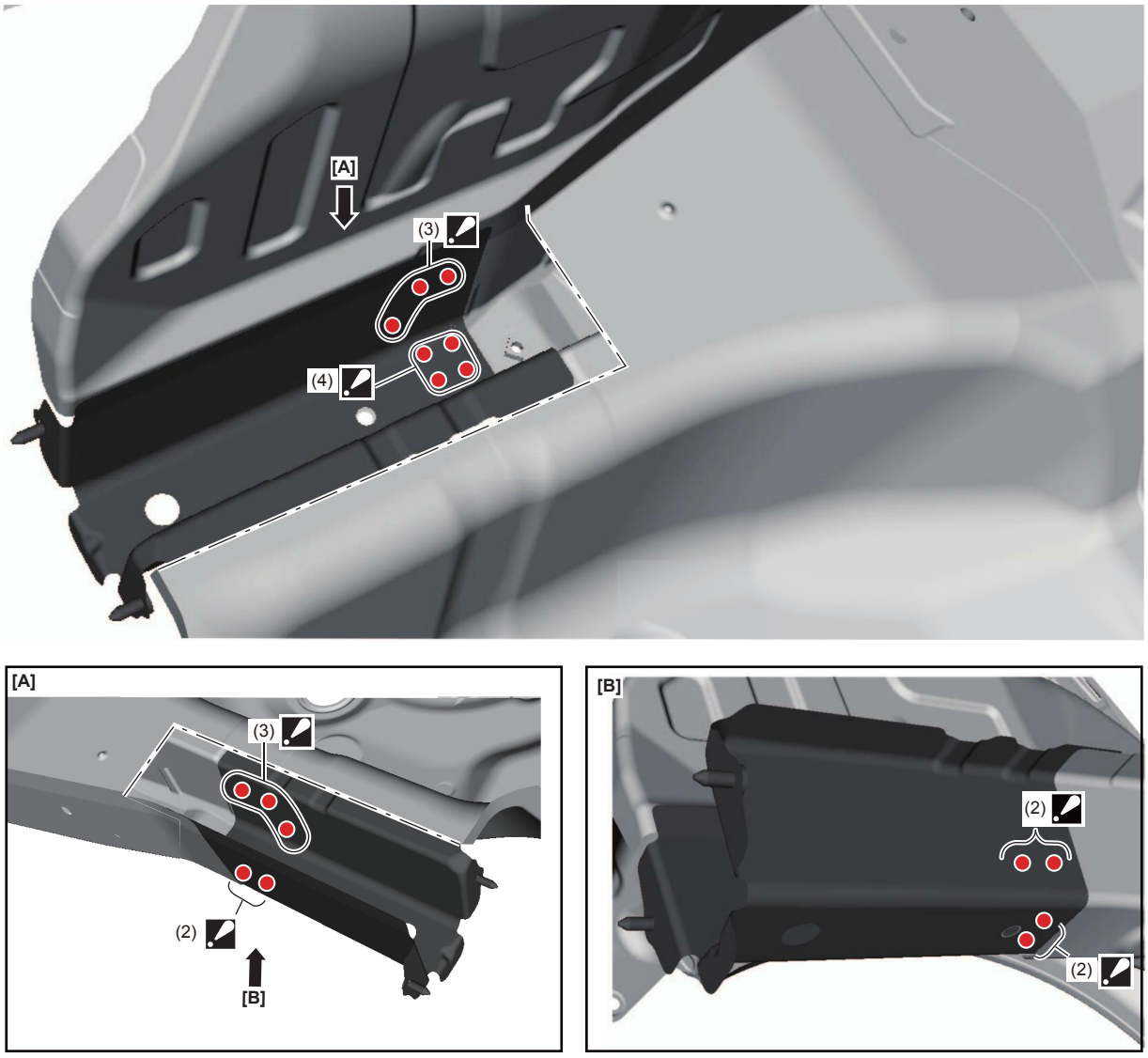
You may accidentally cut the parts under the rear floor rear panel when cutting the rear floor rear panel.
Take sufficient care not to damage the parts under the rear floor rear panel when cutting rear floor rear panel.

2) Drill out welding spots and remove rear floor rear panel.



IDL70A9B0110-01

3) Drill out welding spots and remove rear floor side rear member and rear floor side member rear reinforcement.



IDL70A9B0111-01

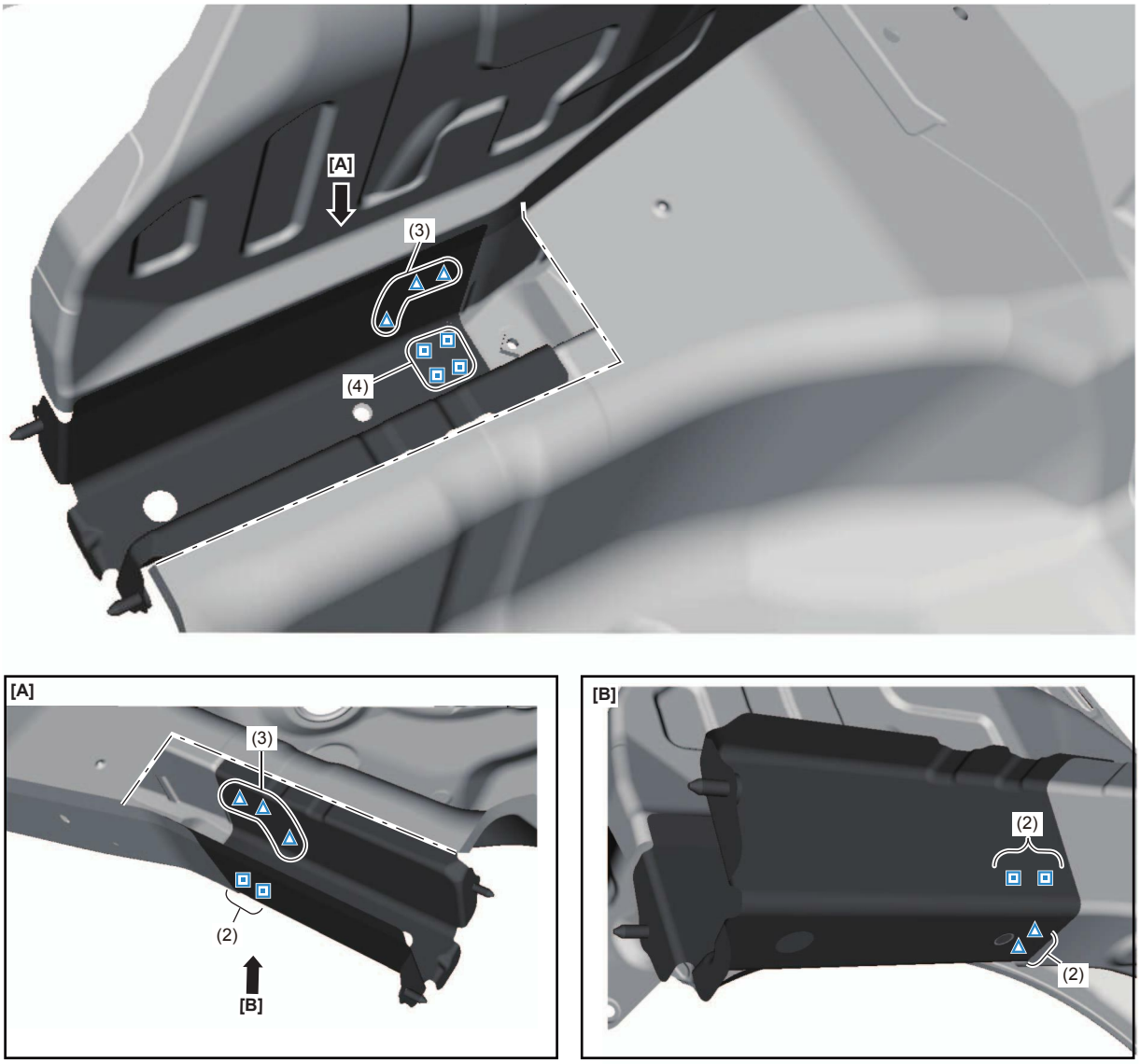
: Grind welding spots using belt sander, if necessary.

Installation

NOTE

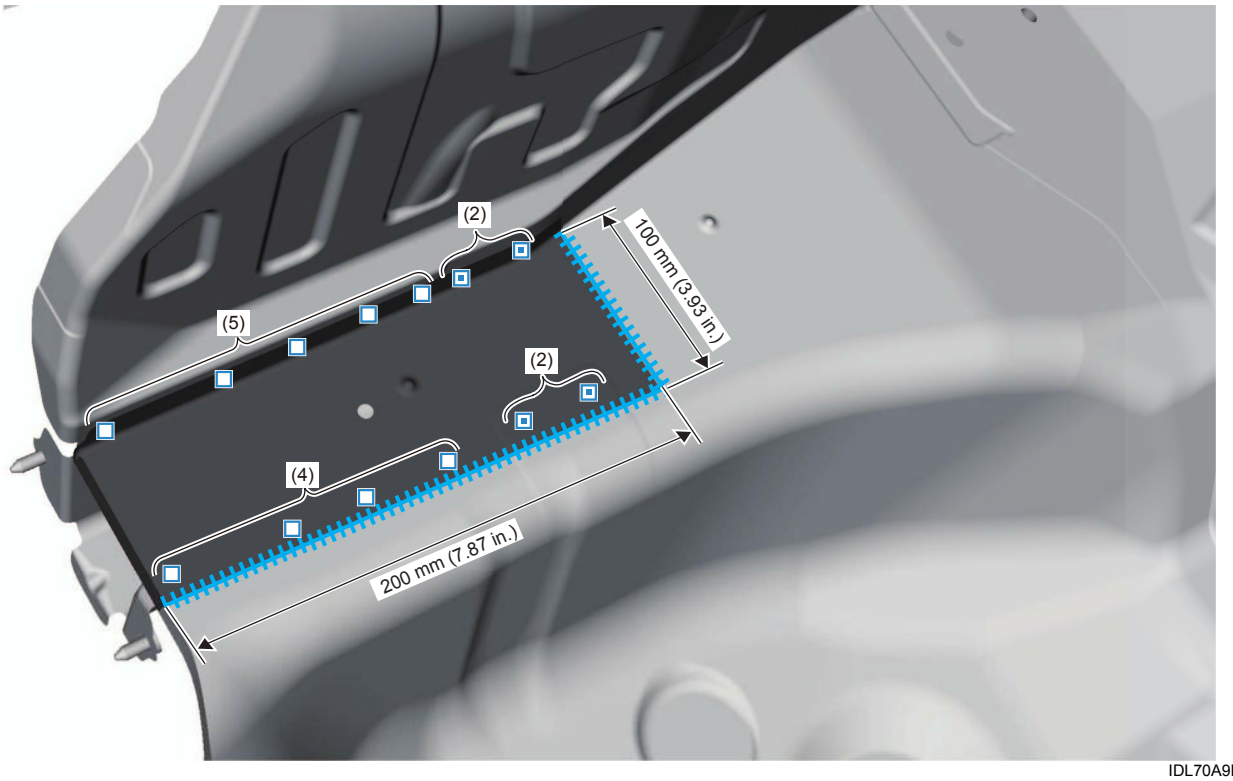
Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-29)

1) Install rear floor side rear member and rear floor side member rear reinforcement.
2) Conduct resistance spot weld or plug weld.



IDL70A9B0112-01

3) Install rear floor rear panel.
4) Conduct resistance spot weld or plug weld.
5) Conduct continuous weld.
6) Apply anticorrosion wax to back side of continuous weld part.



IDL70A9B0113-01

Rear Lamp House Panel Removal and Installation

AENDL70A9B06020

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**
- **Back panel ☞(Page 9K-112)**



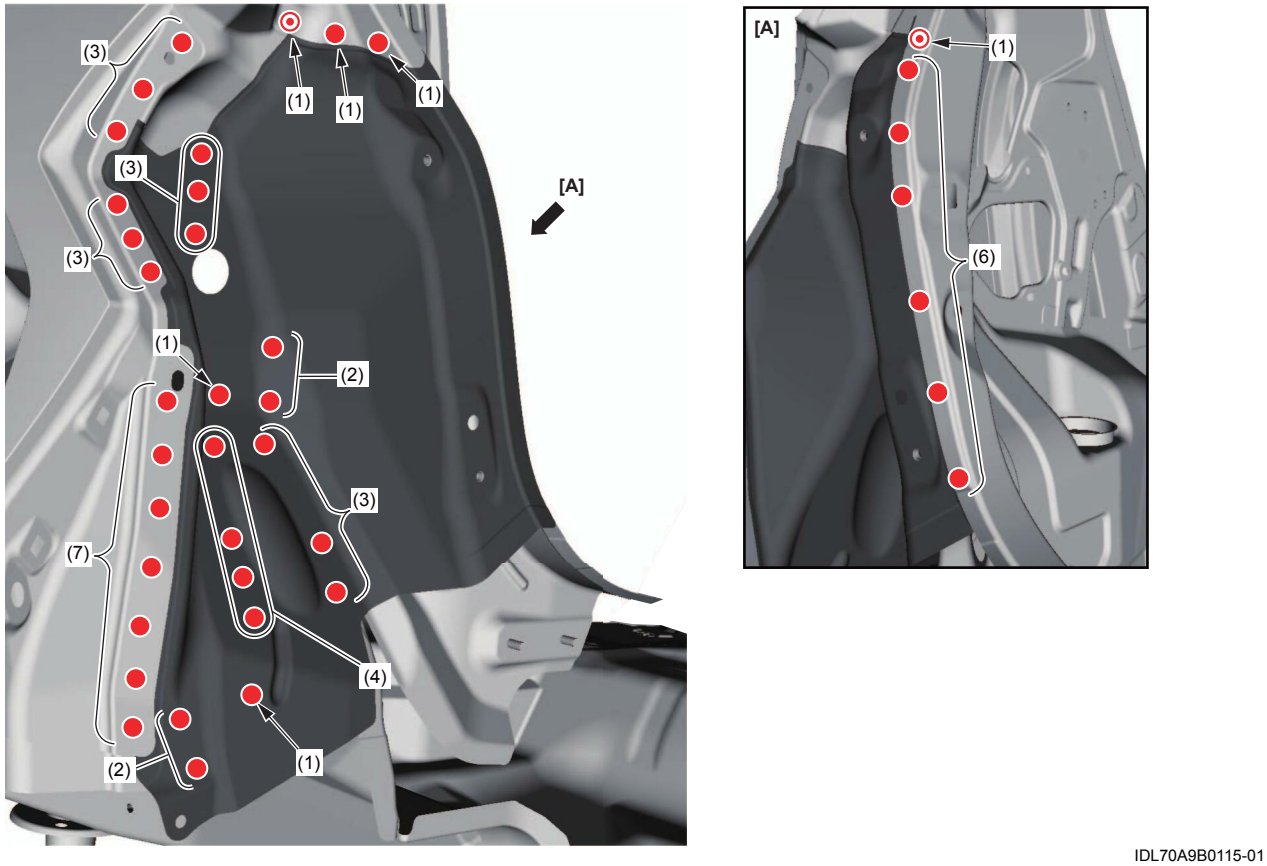
IDL70A9B0114-01

General Notes

Welding method and number of welding points are the same on both sides. This repair instruction shows procedure for left side.

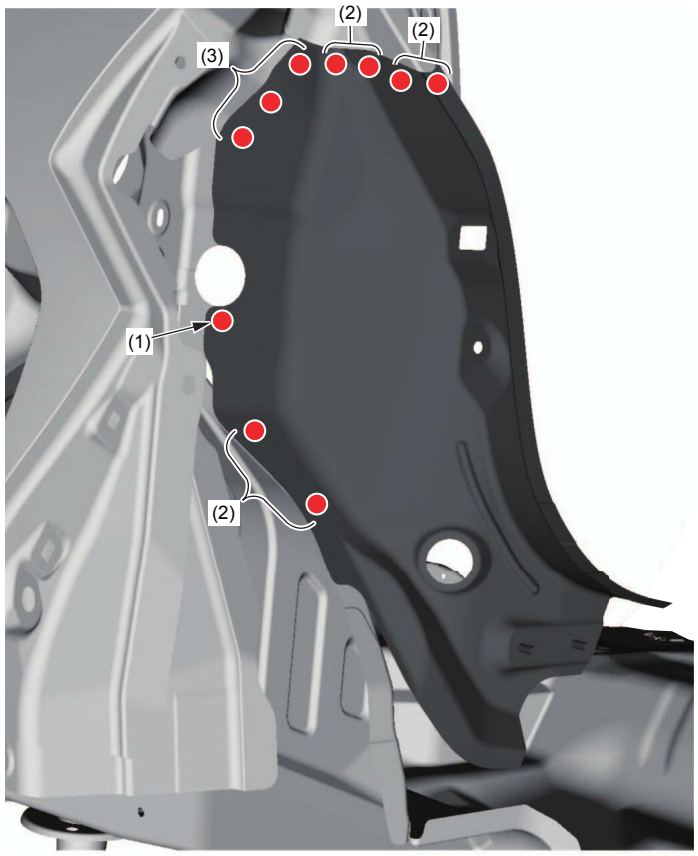
Removal

1) Drill out welding spots and remove rear lamp house outer panel.



IDL70A9B0115-01

2) Drill out welding spots and remove rear lamp house inner panel.



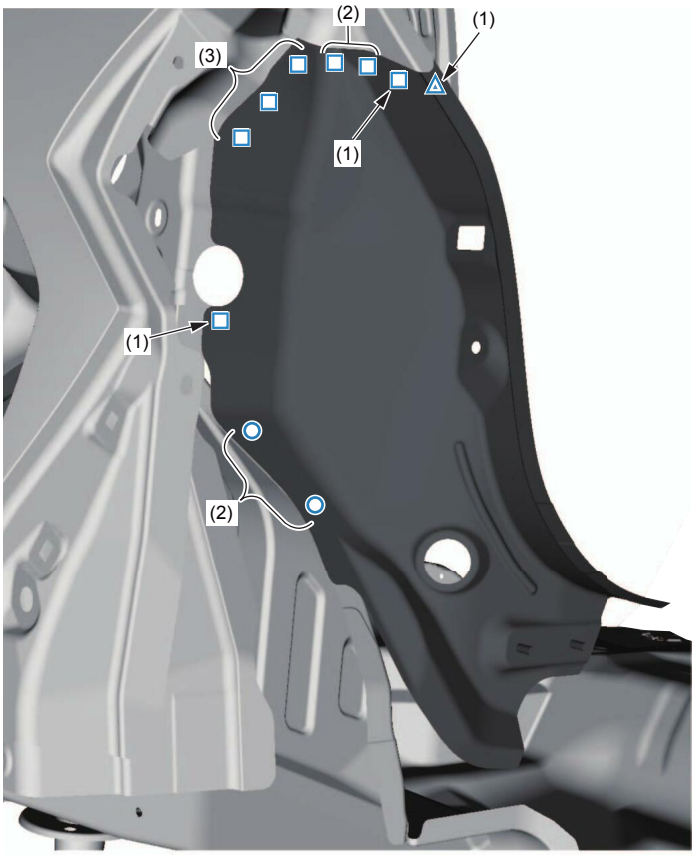
IDL70A9B0116-01

Installation

NOTE

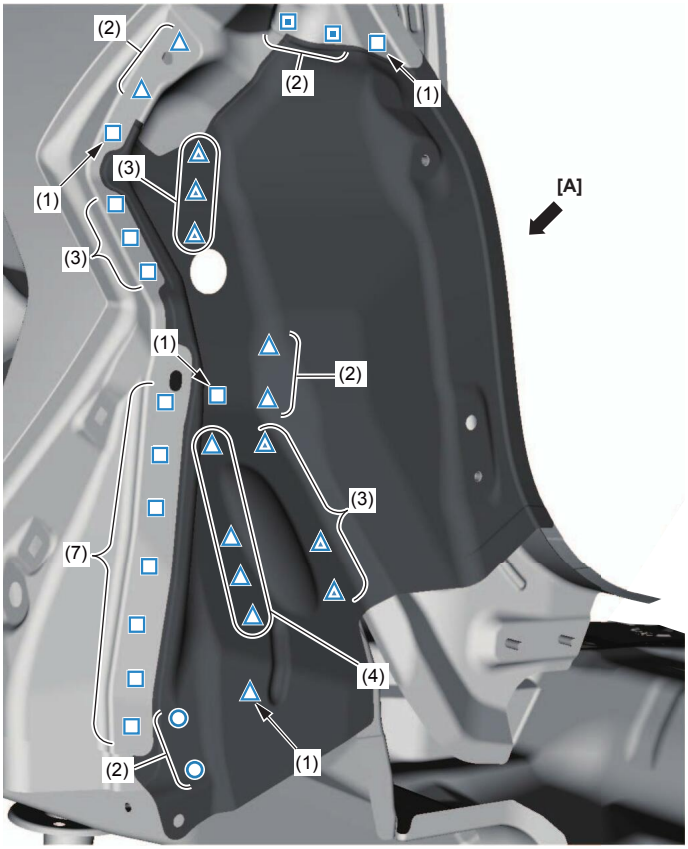
- **Before conducting any weld, check installation position and condition for installation part(s). ☞(Page 9K-23)**

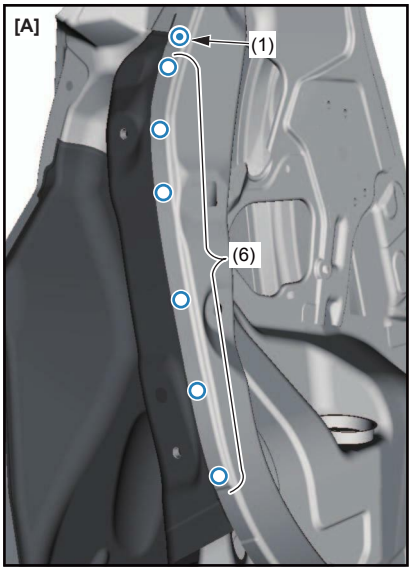
1) Install rear lamp house inner panel.
2) Conduct resistance spot weld and plug weld.



IDL70A9B0117-01

3) Install rear lamp house outer panel.
4) Conduct resistance spot weld and plug weld.





IDL70A9B0118-01

Roof Panel Removal and Installation

AENDL70A9B06021

NOTE

The figure below shows condition where following parts are removed.

- **Front fender ☞(Page 9J-3)**



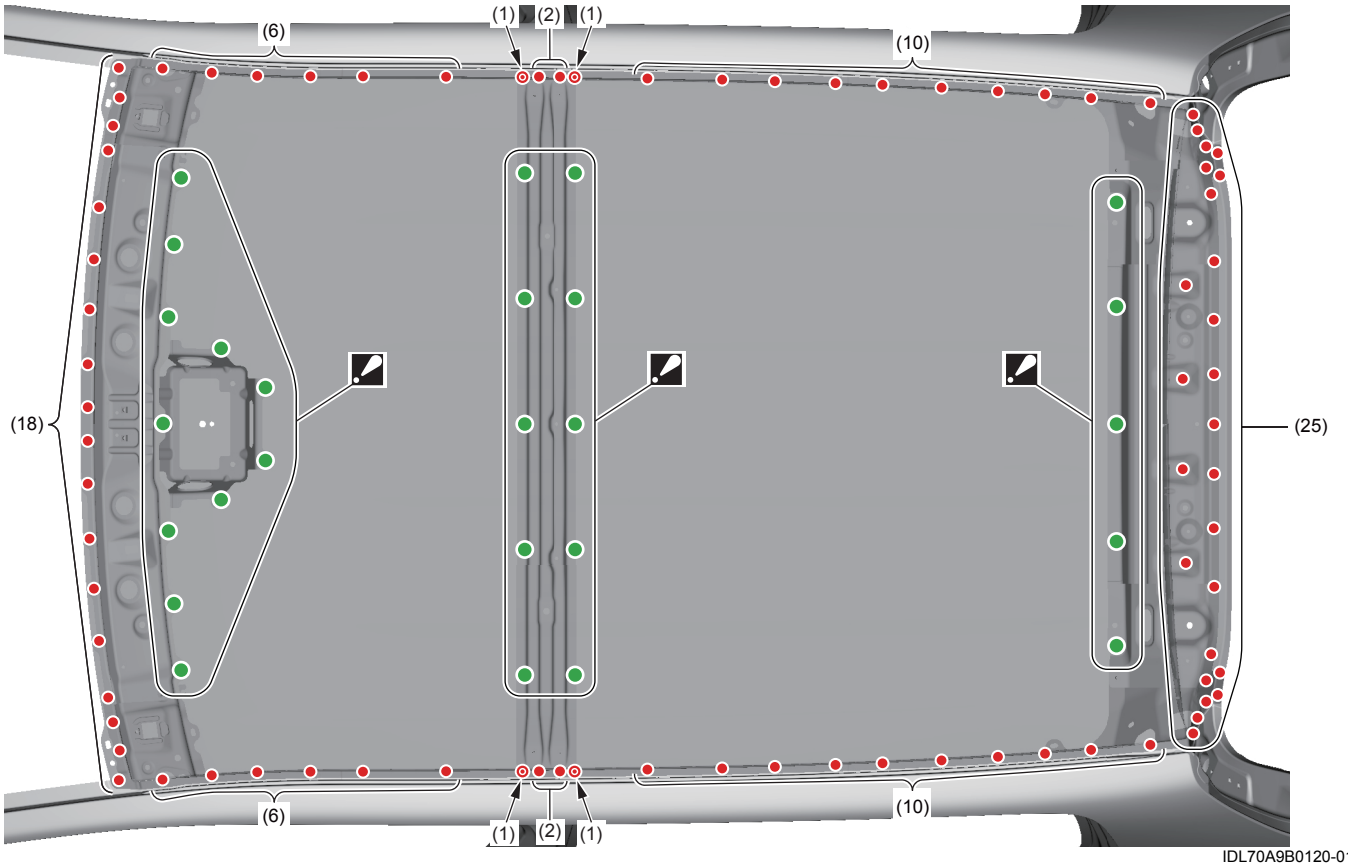
IDL70A9B0119-01

General Notes

Roof carrier brackets are to be reused.

Removal

1) Drill out welding spots and remove 4 roof carrier brackets and roof panel.



IDL70A9B0120-01

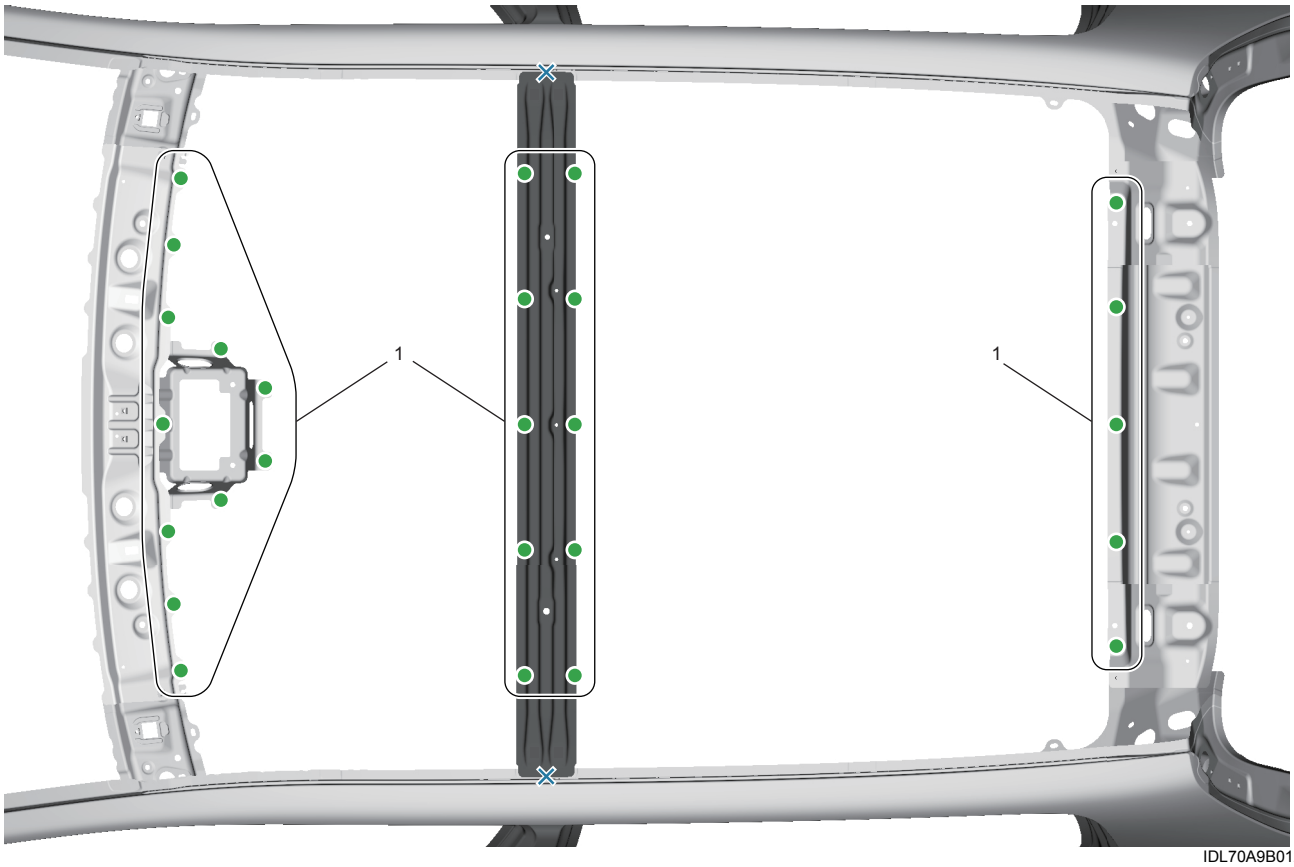
: When heating around sealer application portion to detach body sealer, be sure that temperature of said portion does not reach 170 °C (338 °F).

Installation

NOTE

- **Before conducting any weld, check installation position and condition for installation part(s).**
  - **☞(Page 9K-23)**
  - **☞(Page 9K-28)**

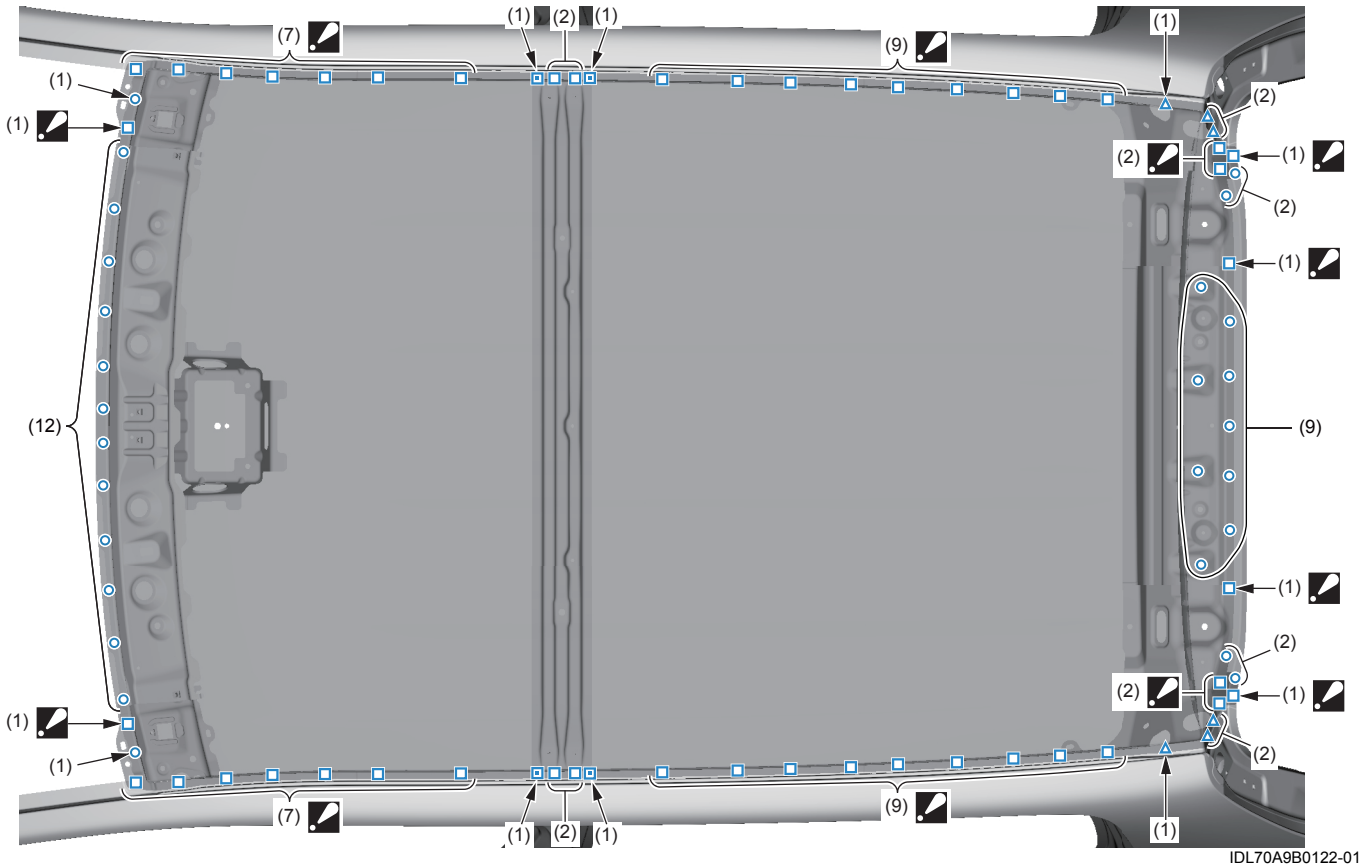
1) Conduct tack welding to roof panel center No. 2 member, roof panel center No. 3 member and roof panel center No.4 member.
2) Apply body sealer to roof front inner rail, roof panel center No. 2 member, roof panel center No.1 member, roof panel center No.3 member, roof panel center No.4 member and roof back inner member.



IDL70A9B0121-01

1. Applied part of body sealer.

3) Install roof panel and 4 roof carrier brackets.
4) Conduct resistance spot weld.
5) Conduct plug weld.



: Conduct resistance spot weld as three panel thickness.

Specifications

Tightening Torque Specifications

AENDL70A9B07001

Reference:

For the tightening torques of fasteners not specified in this page, refer to:

“Hood Lock Member and Lamp Support Brace Removal and Installation” (Page 9K-34)

“Cowl Side Outer Member Removal and Installation” (Page 9K-50)

“A-Pillar Outer Panel, Front Door Hinge Reinforcement and Dash Side Panel Removal and Installation” (Page 9K-69)

“A-Pillar Outer Panel, Front Door Hinge Reinforcement, Dash Side Panel, Front Pillar Inner Panel and Front Pillar Upper Reinforcement Removal and Installation” (Page 9K-77)

“Back Panel Removal and Installation” (Page 9K-112)

“Fasteners Information” in Section 0A (Page 0A-5)

Paint / Coatings

General Description

Anti-Corrosion Treatment

AENDL70A9C01001

⚠ CAUTION

Failure to follow standard shop practices when performing the operations described below, particularly wearing eye protector, may result in a personal injury.
Follow standard shop practices when performing anti-corrosion treatment.

- Steel sheets used for panels of this vehicle are given the following rustproof treatments.
  - Electro-galvanization on both surfaces for all steel sheets
  - Cathodic electro-deposited primer coating for all steel sheets
  - Rustproof wax coating on inside surfaces of door and side sill panels that are exposed to staying moisture
  - Vinyl coating on floor panel underside and wheel house inside surfaces
  - Sealer application to door panel hems, panel-to-panel joints in engine compartment and other similar panel portions
- The following describes the points that should be respected during the painting and rustproof coating involved in vehicle body repair operations.
  - Follow manufacturer's instructions when using any types of paint and sealing material.
  - When replacing panels, repairing damage to them, or doing any other operations that disturb rustproof treatment of panels, it is essential to recoat affected surfaces with rustproof primers after thoroughly cleaning the areas.
  - Sealer application and rustproof waxing should be performed only after application of rustproof primer.
  - Apply sealer to the specified areas such as hems, overlap joints and seams during panel replacement and repair to prevent entry of dust and provide anticorrosion barriers. Select a quality sealer that is adequate in flexibility and paint adhesion characteristic for application to these areas.
  - To fill open joints, use a caulking material.
  - When painting repaired areas, use techniques generally accepted for metal surface preparation, undercoating (vinyl coating) and color painting.
  - For places where ordinary undercoating materials are difficult to use, such as door and side sill insides, use rustproof wax, a penetrative compound.
  - When applying sealer during undercoating operation, avoid applying sealer to engine related components, strut/shock absorber mountings and rotating components. Also avoid blocking body drain holes with coating or sealing materials.
- Application of anti-corrosion and sealing materials should be performed in the following procedure:
  a. Clean and prepare metal surface.
  b. Apply primer.
  c. Apply sealer (for any originally sealed areas).
  d. Apply color paint to necessary areas such as hem flanges, exposed joints and underbody components.
  e. Apply rustproof wax (penetrative compound).
  f. Apply undercoating (vinyl coating).
- Plastic parts painting
  Of plastic parts, those made of hard Acrylonitrile Butadiene Styrene (ABS) can be coated with general acrylic lacquers in the following procedure without need for using primer.
  a. Wash part to be painted in cleaning solvent.
  b. Apply acrylic lacquer to part.
  c. Dry part for the time specified by lacquer manufacturer. Proper drying temperature is between 60 and 70°C (140 and 158°F).

Reference
Parts made of Acrylonitrile Butadiene Styrene (ABS) can be distinguished from those made of other plastic materials, such as polypropylene and vinyl, using the following method.

1) Cut small piece of material from invisible area of plastic part to be tested using a sharp blade.
2) Hold the cut piece in pincers and put it over a flame.
3) If the piece burns generating very black smoke while leaving residue suspending in air, the plastic part is made of Acrylonitrile Butadiene Styrene (ABS). (If it is made of polypropylene, the smoke generated during burning is not distinctively visible.)

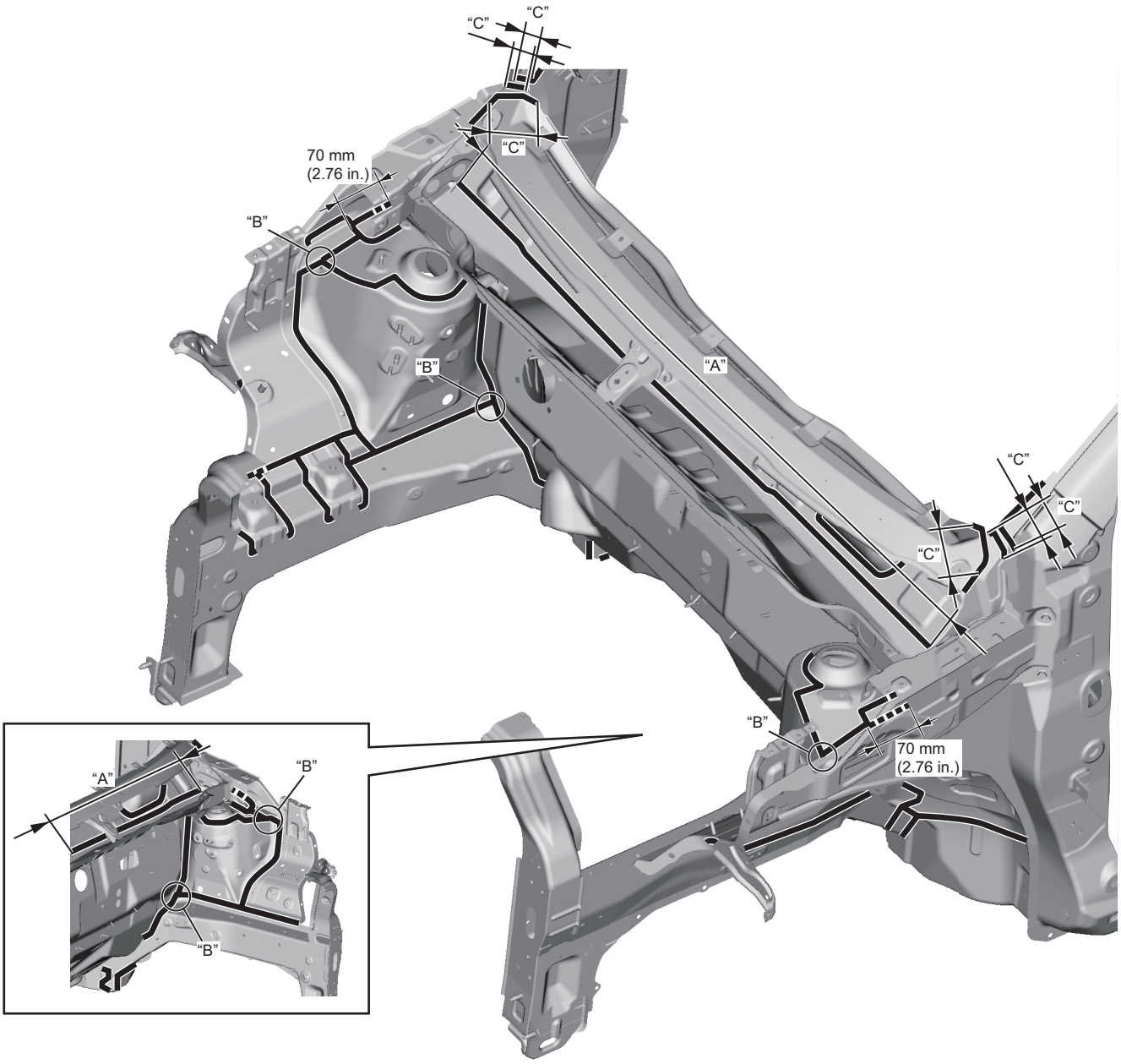
Repair Instructions

Sealant Application Areas

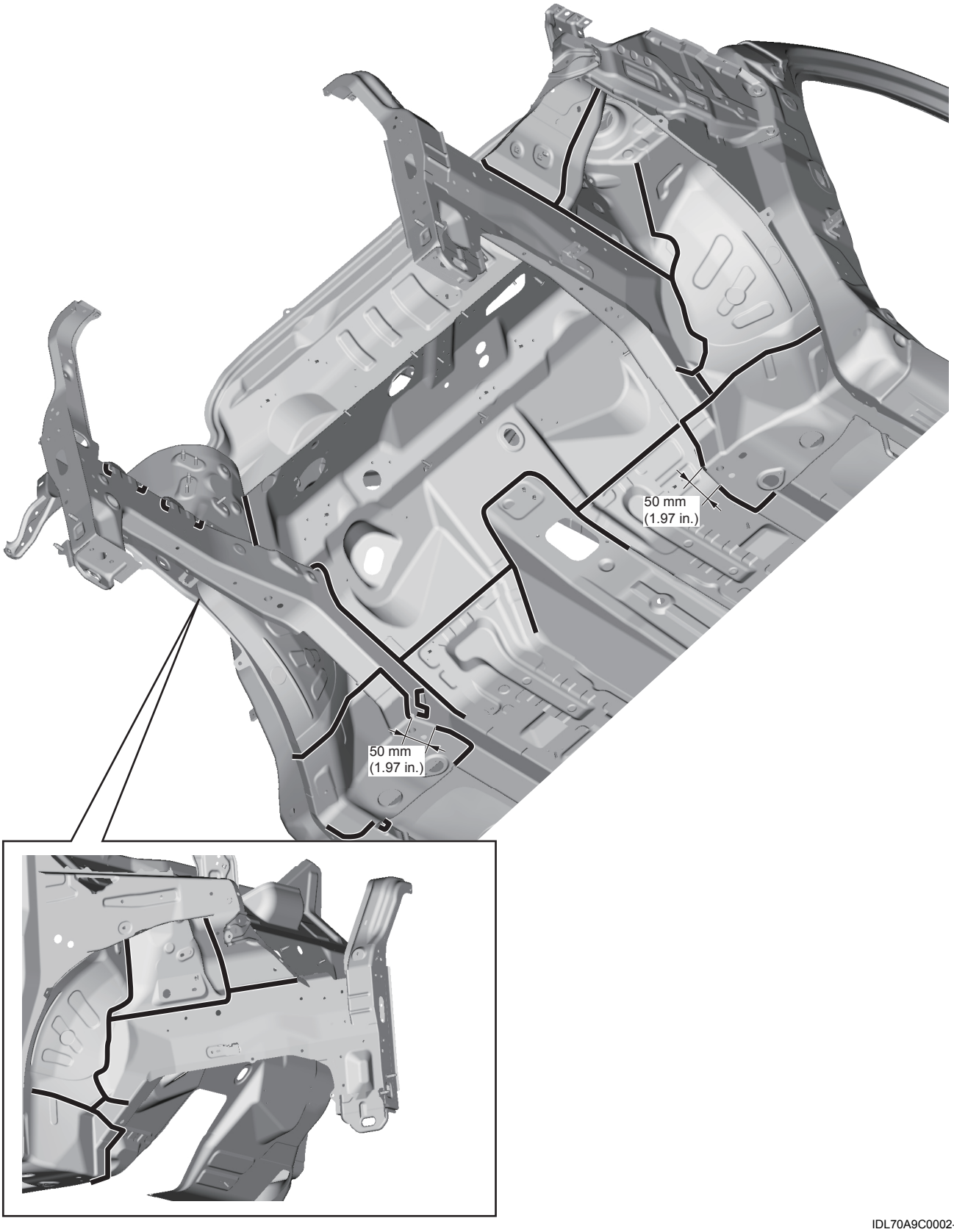
AENDL70A9C06001

Apply sealant referring to the following figures.

Engine Compartment and Dash Side Panel



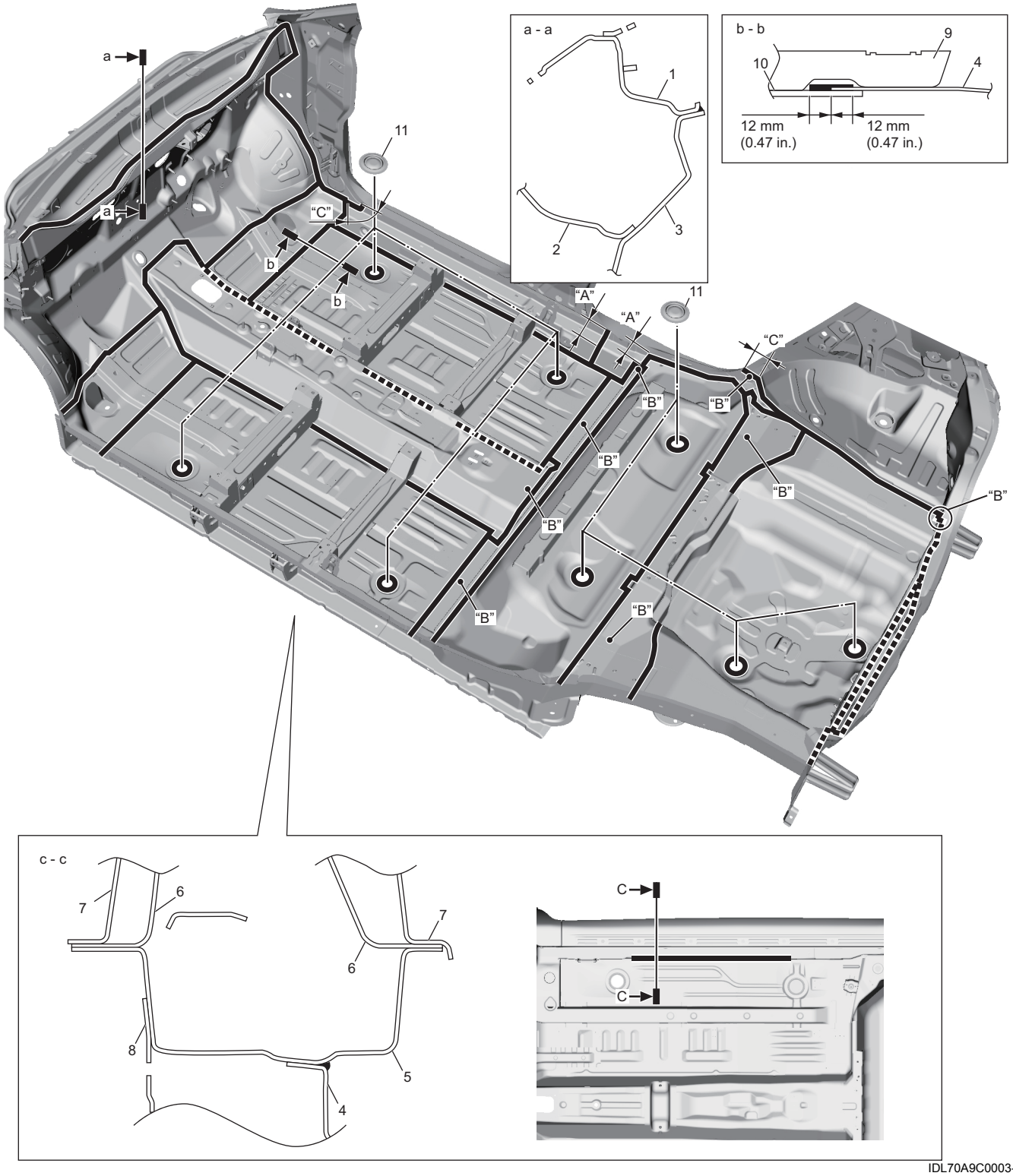
IDL70A9C0001-04



IDL70A9C0002-01

“A”: Smooth out sealant with a brush.	“B”: Fill hole with sealant.	“C”: Wipe off excess sealant.

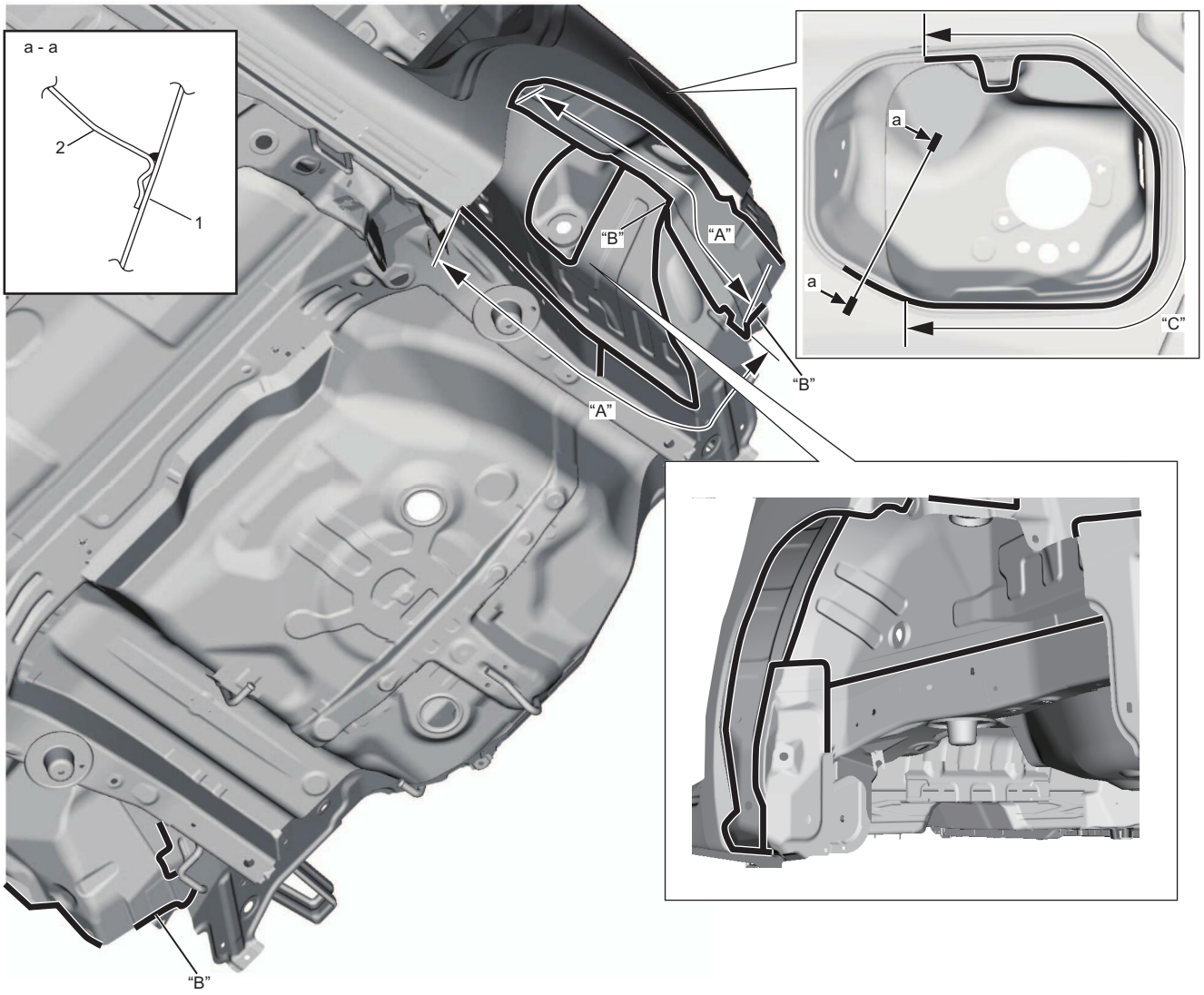
Dash Panel and Floor



IDL70A9C0003-03

"A": Smooth out sealant with a brush.	3. Dash panel	8. Floor panel No.1 crossmember
"B": Fill hole with sealant.	4. Main floor panel	9. Dash lower pad
"C": Wipe off excess sealant.	5. Side sill inner panel	10. Dash panel lower extension
1. Cowl top panel	6. Side sill strength	11. Cap
2. Cowl front panel	7. Side body outer panel	

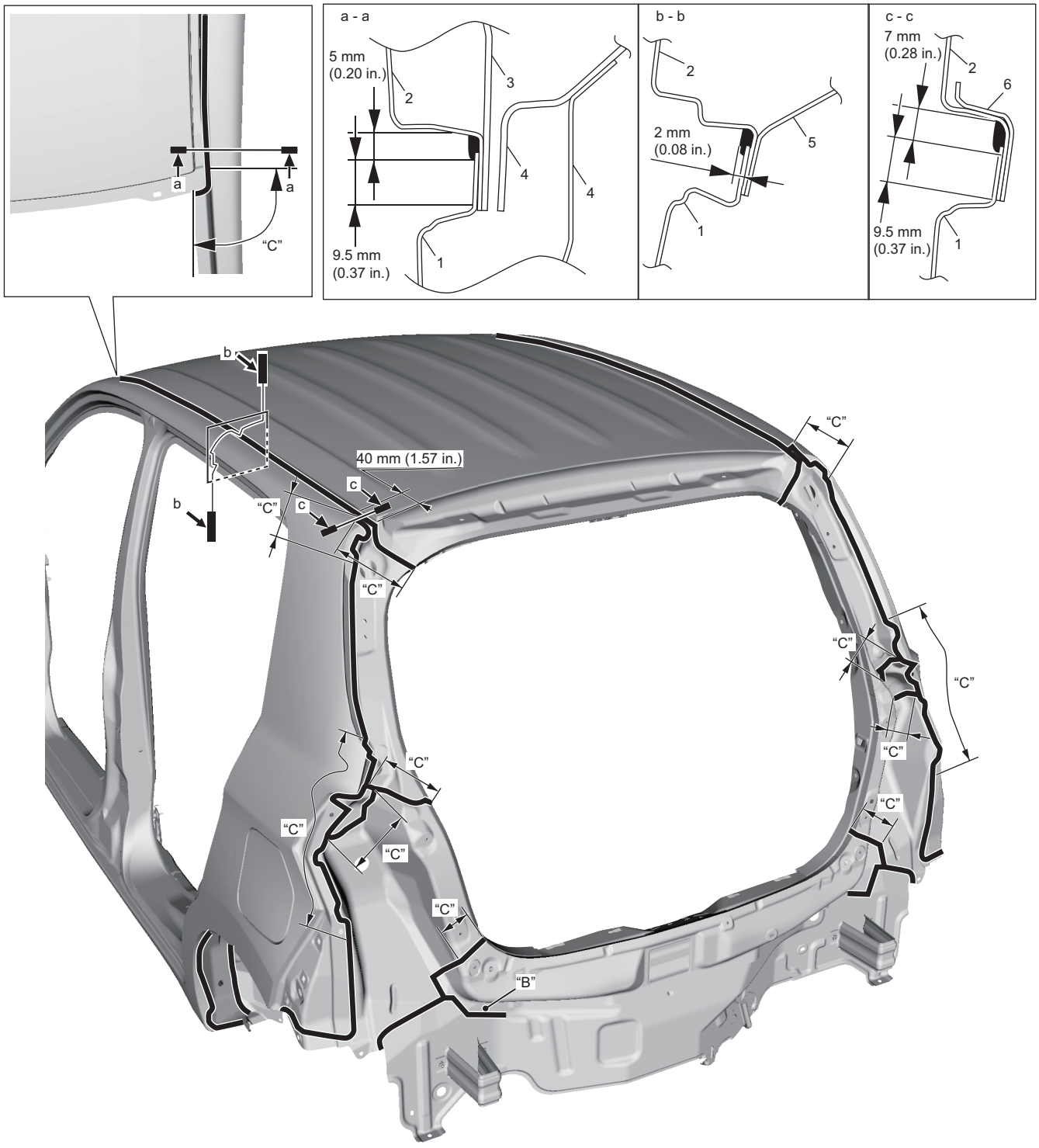
Rear Wheel Housing



IDL70A9C0004-03

"A": Smooth out sealant with a brush.	"C": Wipe off excess sealant.	2. Fuel filler box
"B": Fill hole with sealant.	1. Side body outer panel	

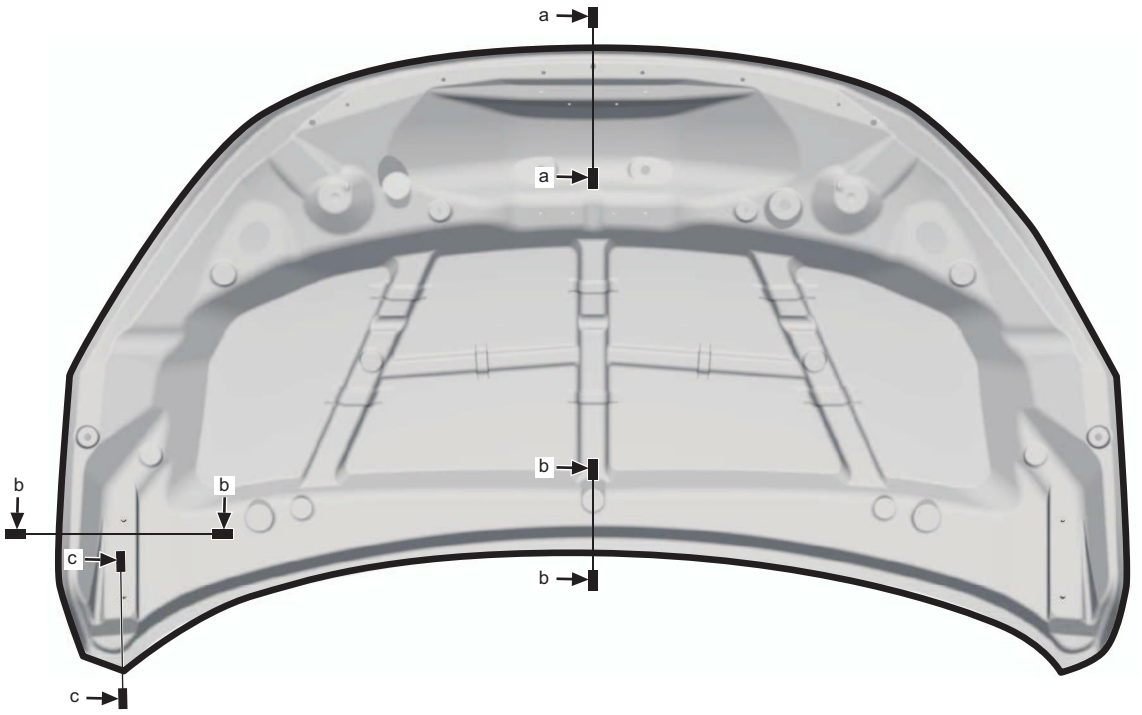
Back Panel and Roof

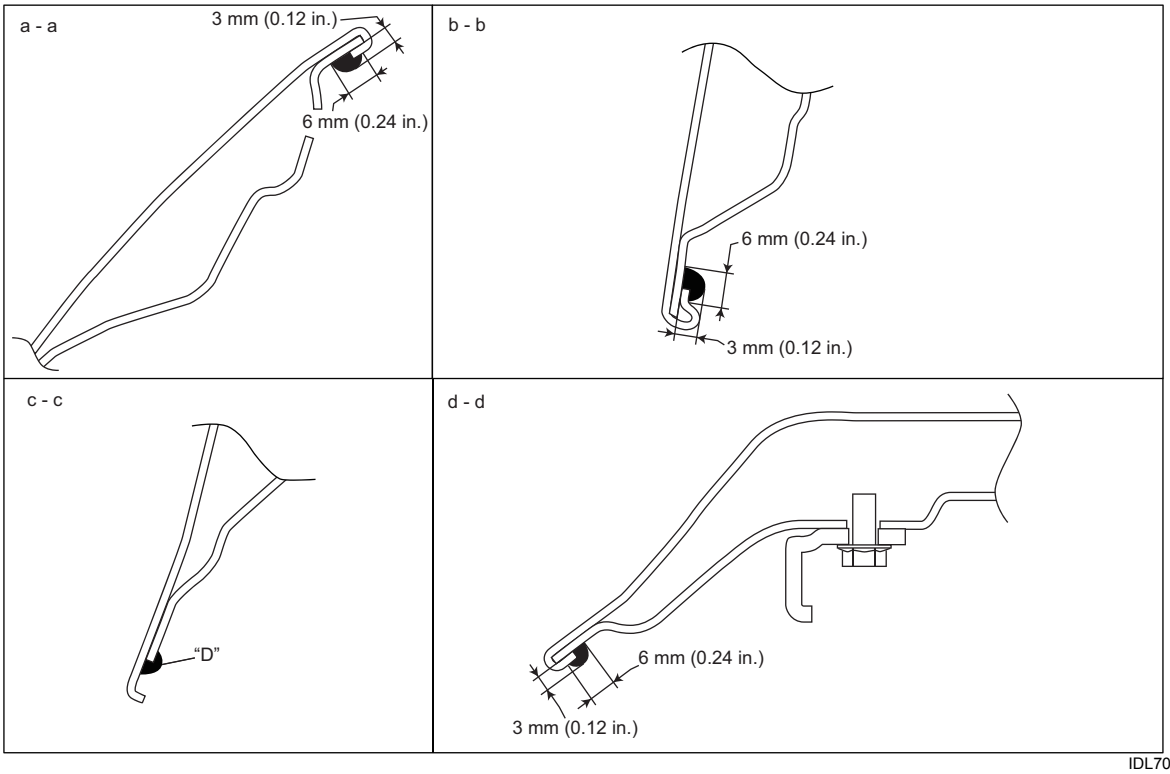


IDL70A9C0005-02

"A": Smooth out sealant with a brush.	1. Roof panel	4. Front pillar inner extension
"B": Fill hole with sealant.	2. Side body outer panel	5. Roof side inner rail
"C": Wipe off excess sealant.	3. Front pillar upper reinforcement	6. Quarter inner extension

Hood

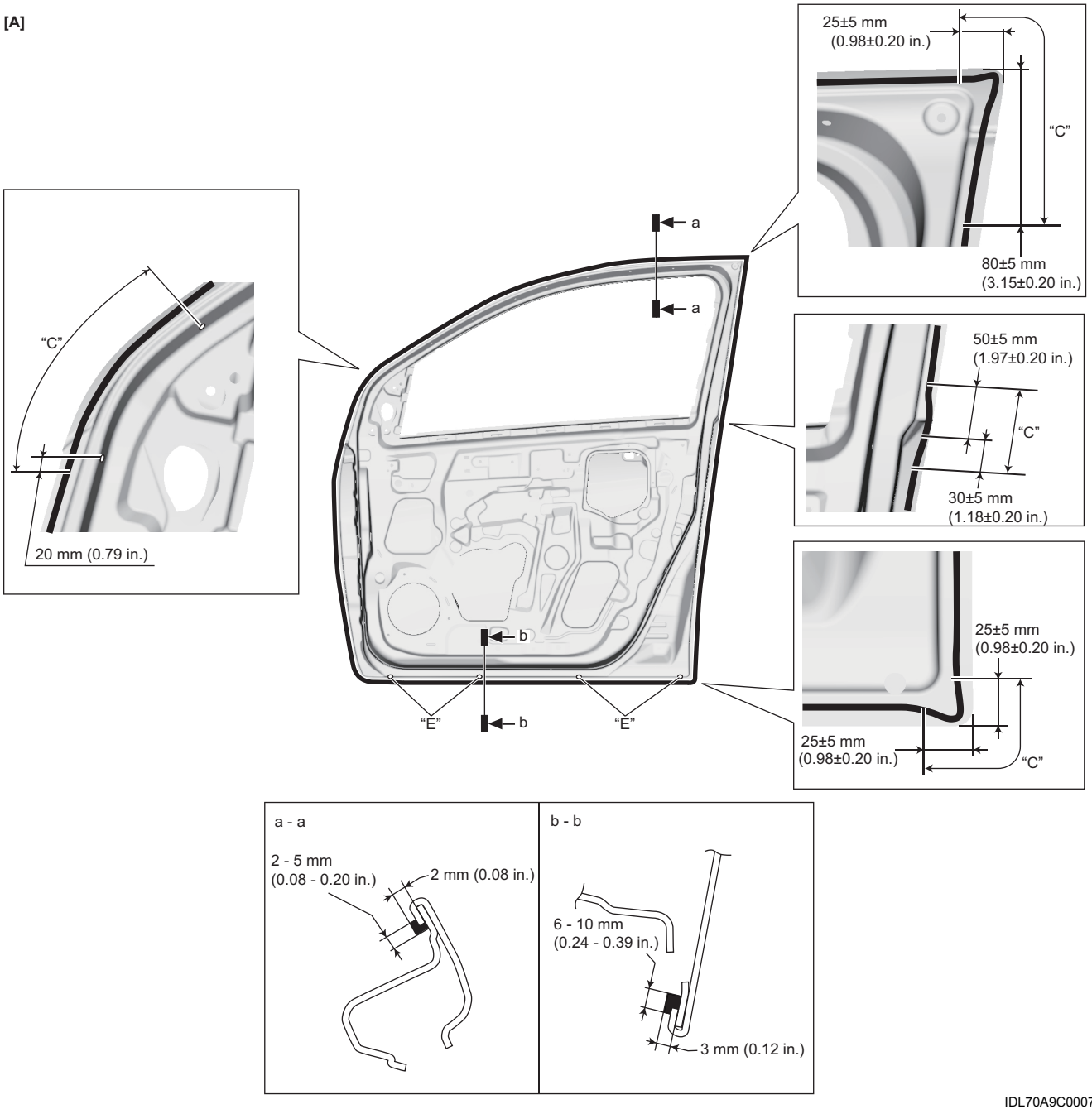




IDL70A9C0006-03

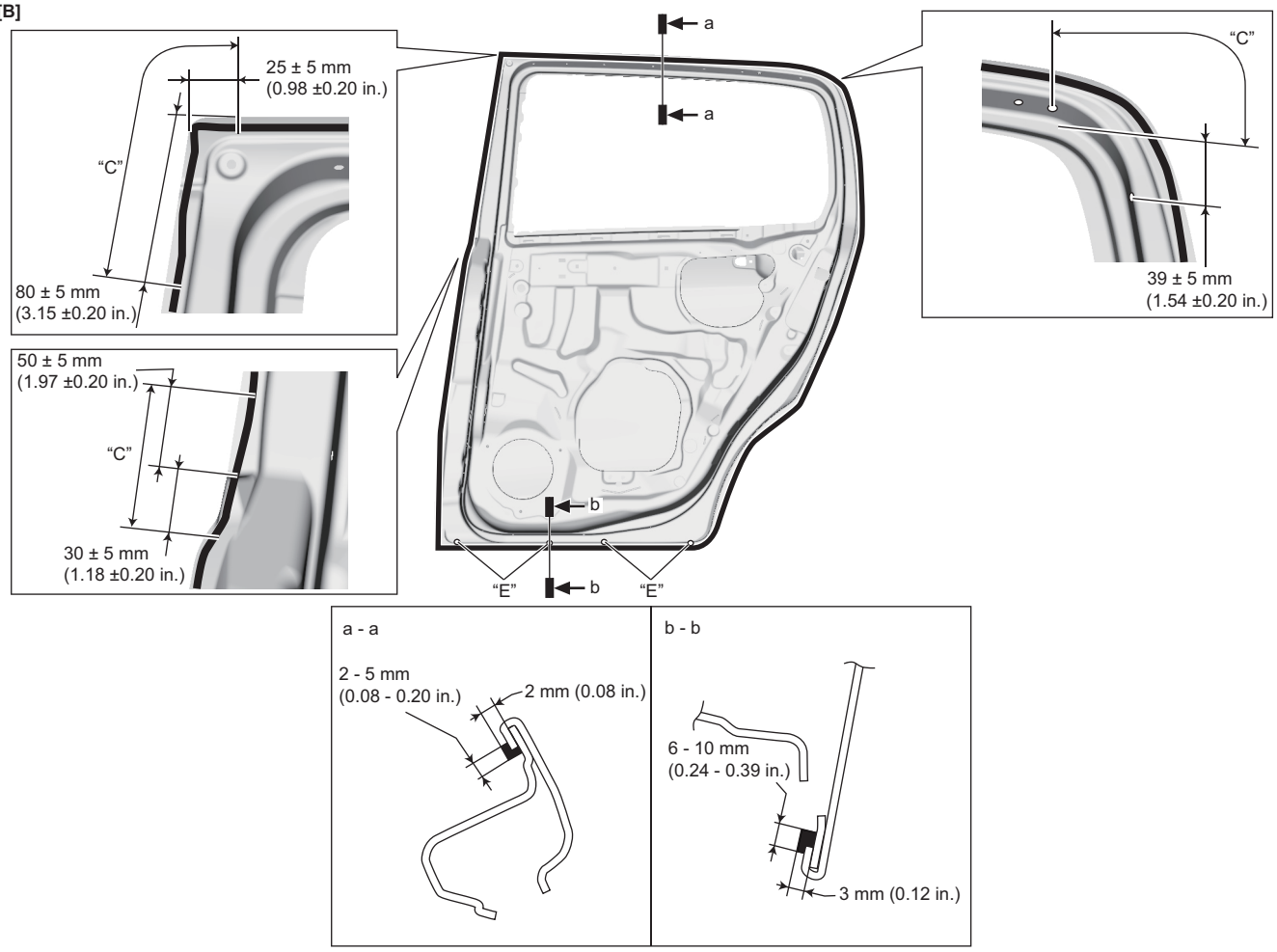
"D" Apply sealant and cover flange-end surely.

Door

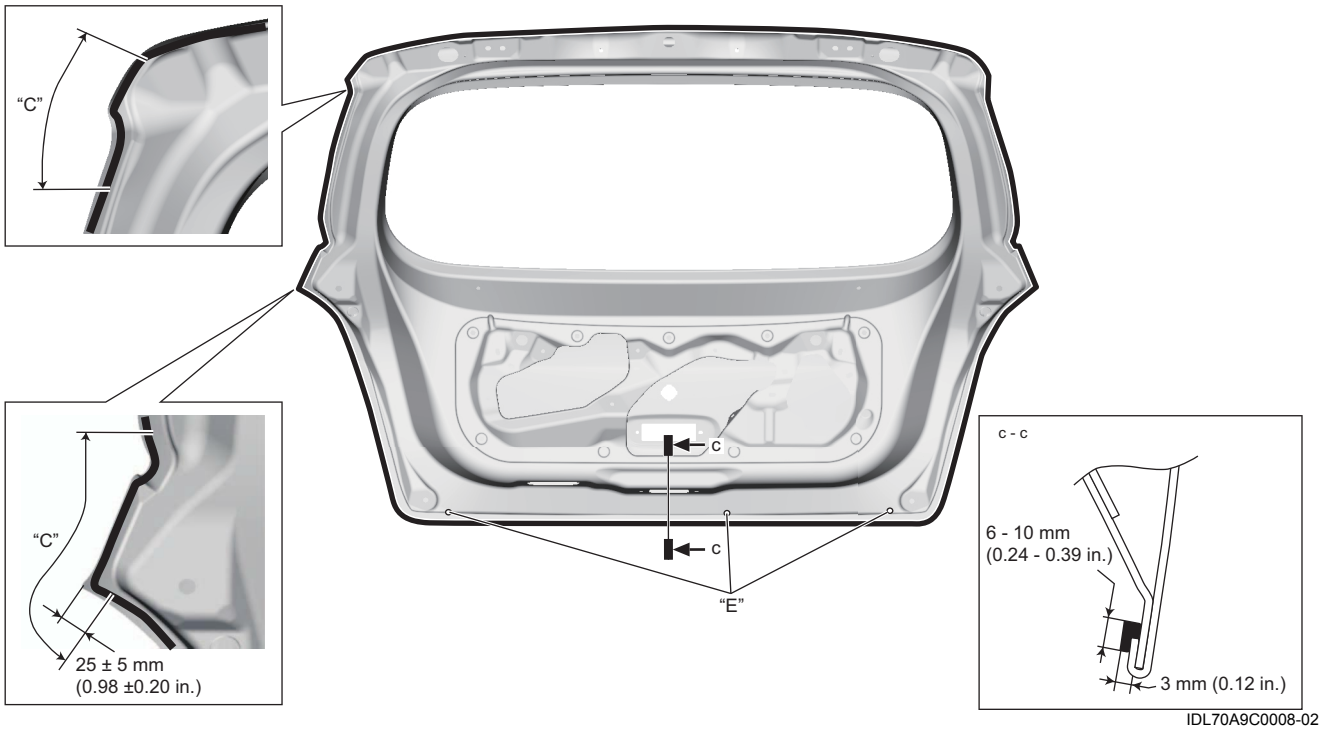


IDL70A9C0007-02

[B]



[C]



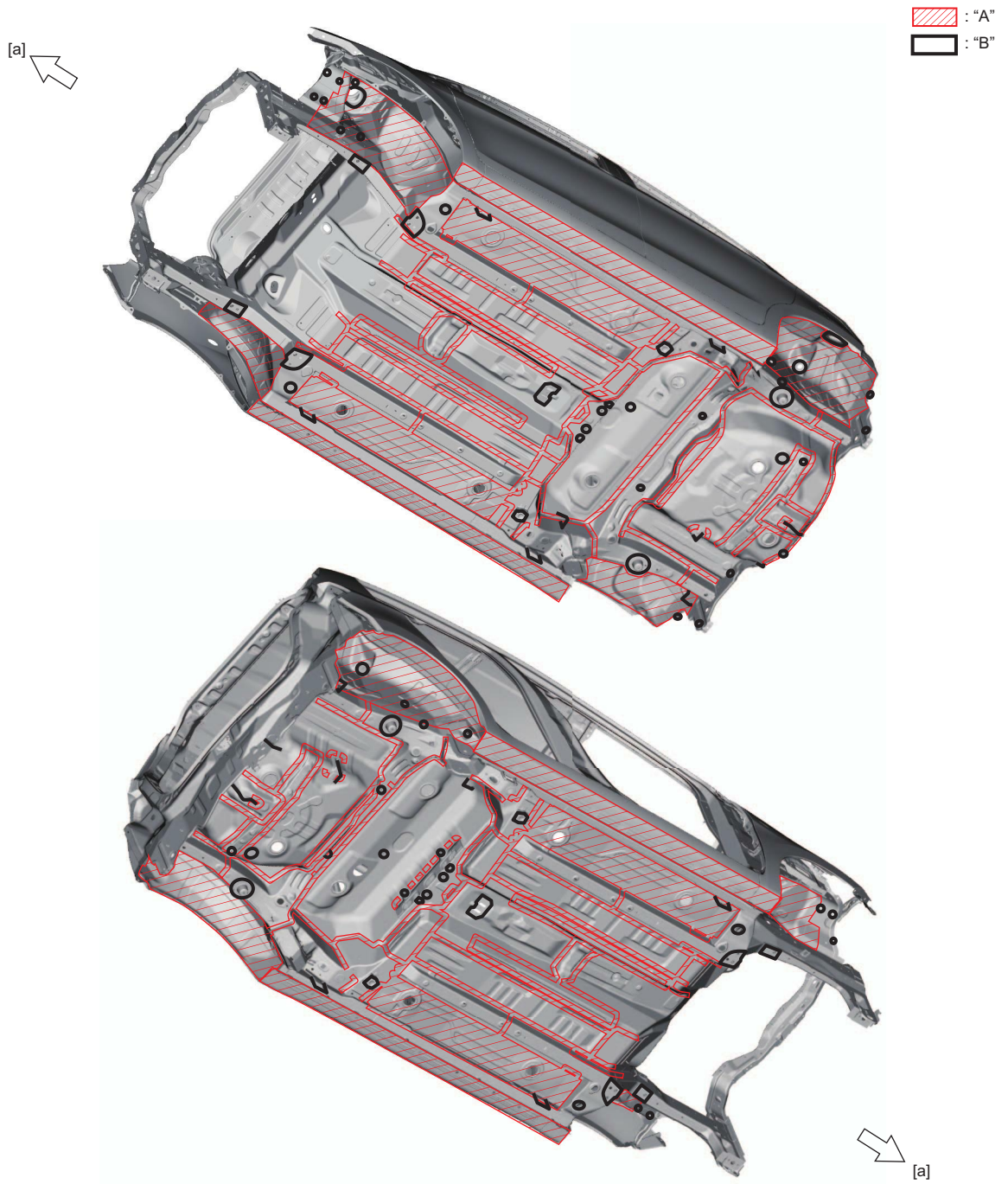
IDL70A9C0008-02

[A]: Front door	[C]: Rear end door	"E": Do not fill drain holes with sealant.
[B]: Rear door	"C": Wipe off excess sealant.	

Undercoating Application Areas

AENDL70A9C06002

Apply undercoating referring to the following figures.



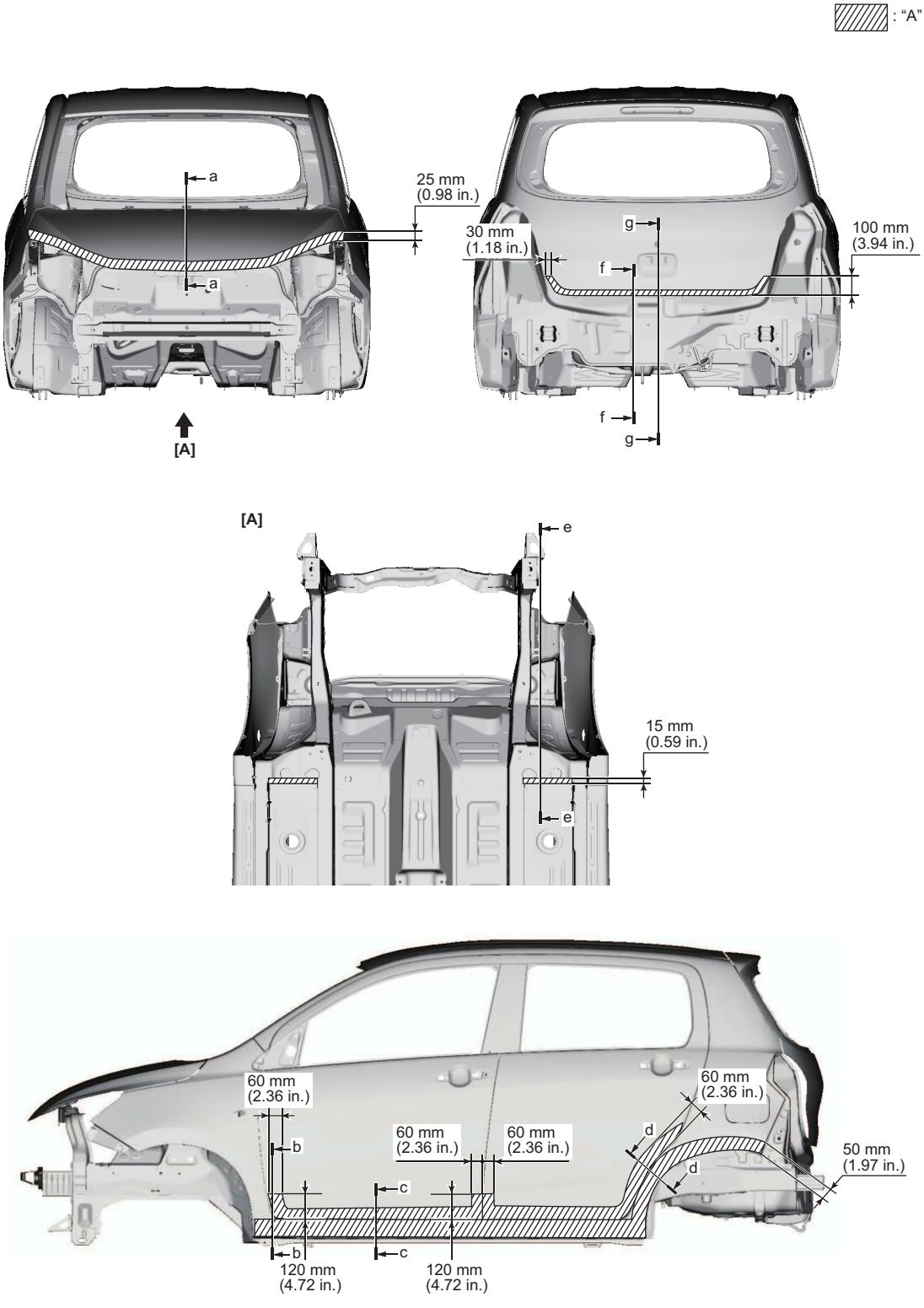
IDL70A9C0009-05

[a]: Vehicle forward	“A”: Apply undercoating.	“B”: Do not apply undercoating and stone-guard coating.

Anti-Corrosion Compound Application Area

AENDL70A9C06003

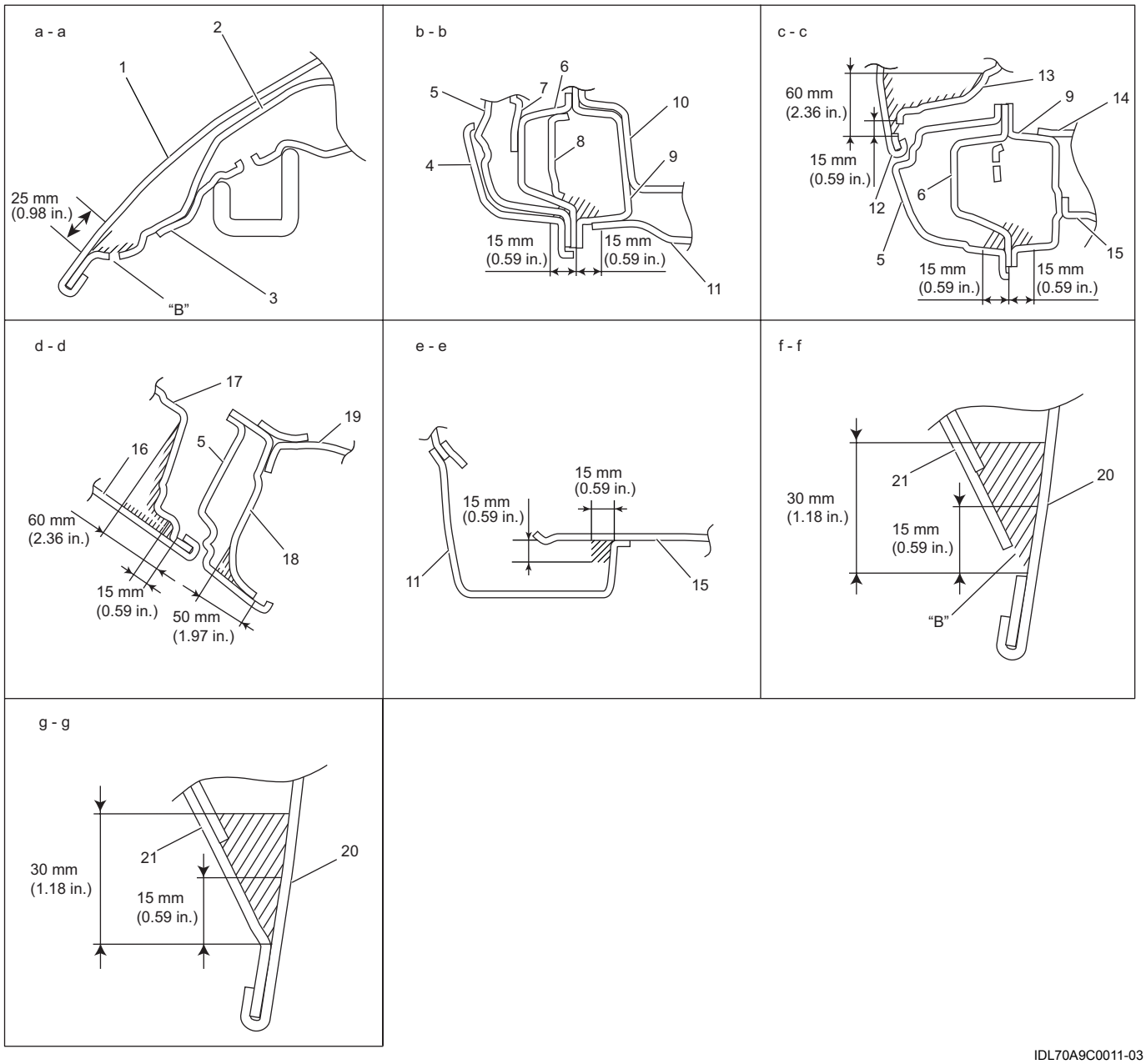
Apply anti-corrosion compound referring to the following figures.



IDL70A9C0010-04

[A]: View A – dash panel	"A": Apply rustproof wax (hot wax).

: "A"



IDL70A9C0011-03

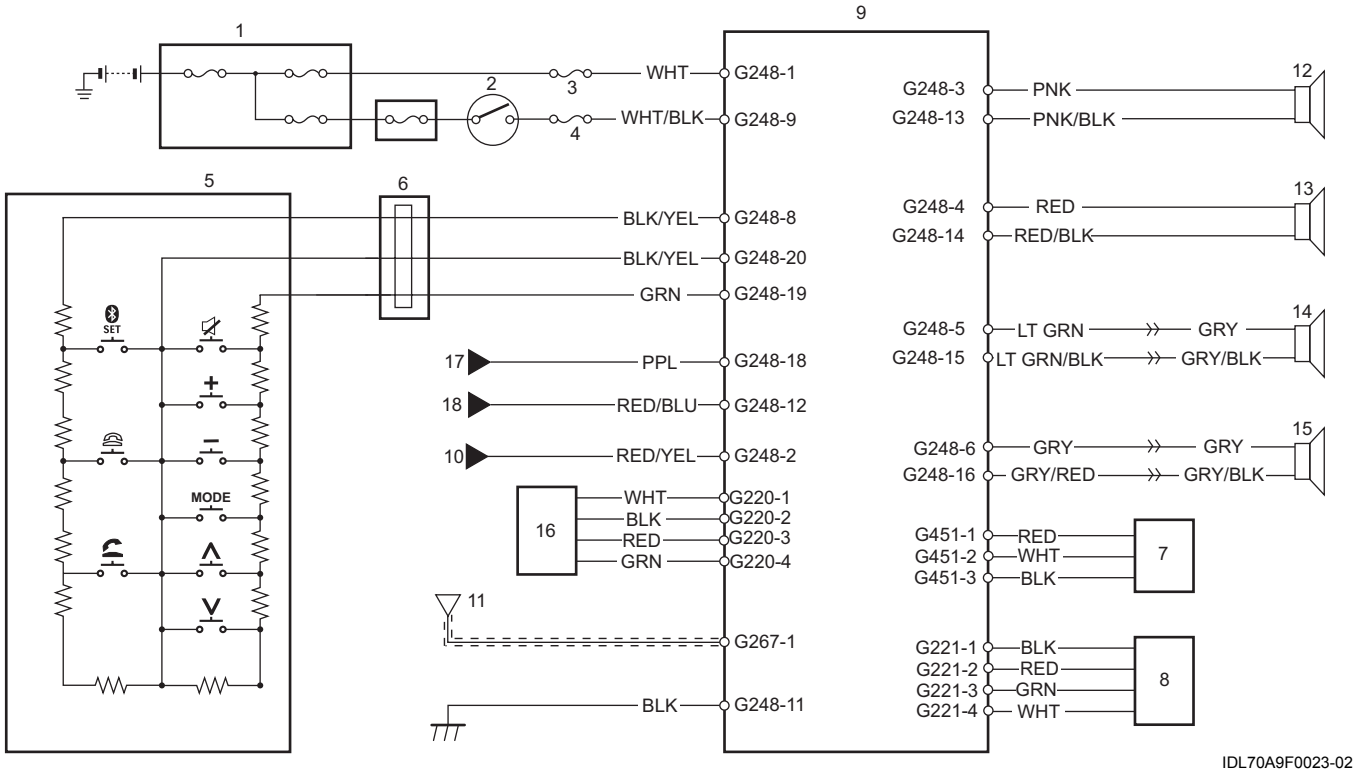
"A": Apply rust proof wax (hot wax).	7. Front door hinge reinforcement	15. Main floor panel
"B": Do not fill drain holes with rust proof wax.	8. Side sill strength front reinforcement	16. Rear door outer panel
1. Front hood outer panel	9. Side sill inner panel	17. Rear door inner panel
2. Front hood inner panel	10. Dash panel	18. Wheel house outer panel
3. Hood lock striker reinforcement	11. Dash lower side extension	19. Wheel house inner panel
4. Front fender panel	12. Front door outer panel	20. Rear end door outer panel
5. Side body outer panel	13. Front door inner panel	21. Rear end door inner panel
6. Side sill strength	14. Floor panel No.1 crossmember	

Audio Visual / Navigation

Schematic and Routing Diagram

Audio System Circuit Diagram

AENDL70A9F02001



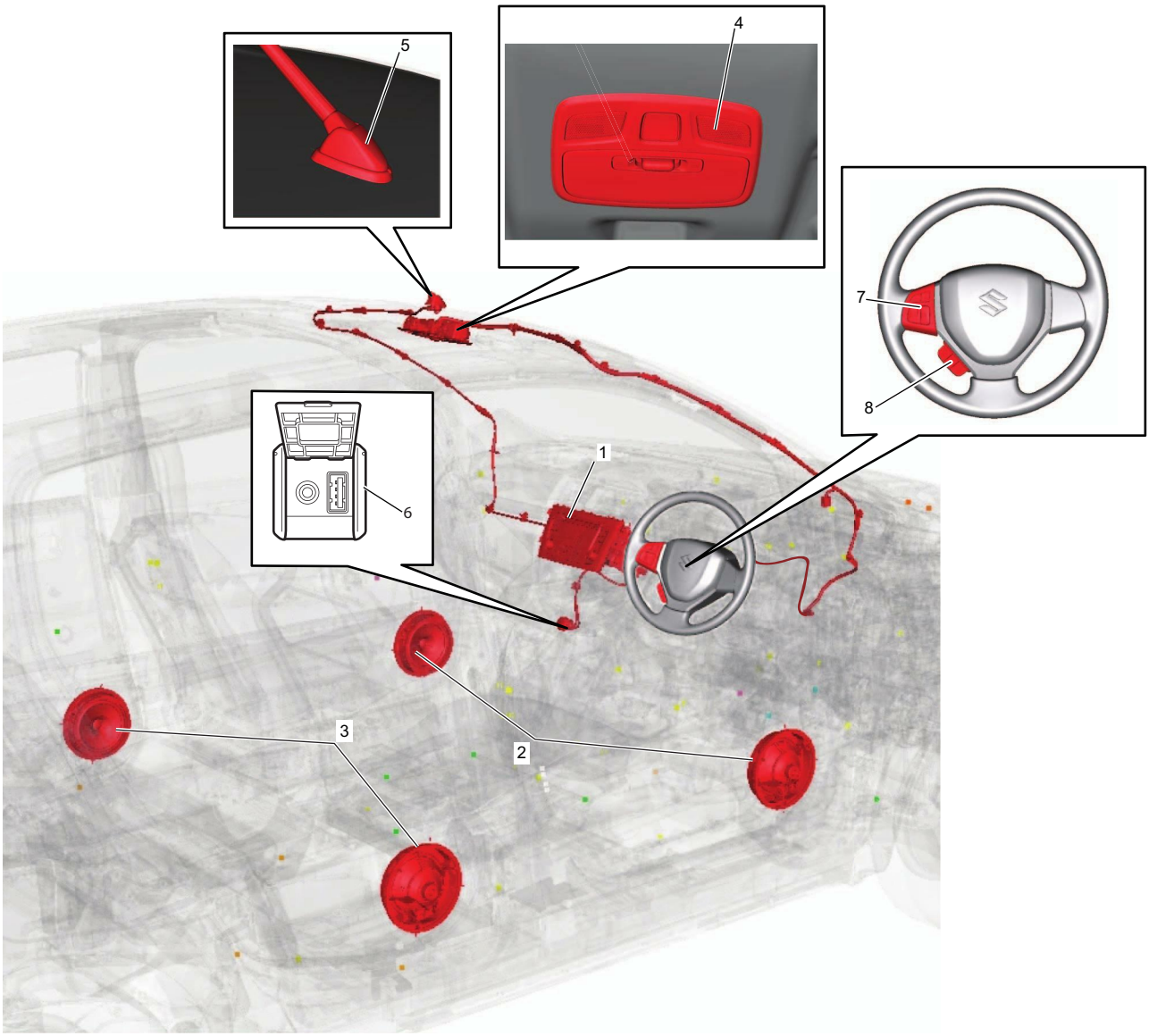
IDL70A9F0023-02

1. Junction block	7. Microphone (if equipped)	13. Right side front door speaker
2. Ignition switch	8. USB socket (if equipped)	14. Left side rear door speaker
3. “DOME” fuse	9. Audio unit	15. Right side rear door speaker
4. “ACC” fuse	10. Lighting switch	16. AUX socket (if equipped)
5. Steering switch (Audio control and hands-free switch)	11. Radio antenna	17. To BCM
6. Contact coil	12. Left side front door speaker	18. Combination meter

Component Location

Audio System Component Location

AENDL70A9F03001



IDL70A9F0016-01

1. Audio unit	4. Dome light (Microphone) (if equipped)	7. Remote audio steering switch
2. Front door speaker (if equipped)	5. Antenna	8. Handsfree switch
3. Rear door speaker (if equipped)	6. USB/AUX socket (if equipped)	

Diagnostic Information and Procedures

Audio System Symptom Diagnosis

AENDL70A9F04001

Before performing this trouble diagnosis, be sure to remove any faulty symptom caused by erroneous handling, referring to owner's manual of the audio unit. Then diagnose troubles on vehicle side according to the table below. If handling is correct and there is nothing abnormal on vehicle side, replace the audio unit with a known-good one and check it again.

Condition	Possible cause	Correction / Reference Item
Audio unit cannot turn ON	Audio connector	*"Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)*
	Audio unit power and ground circuit	*"Inspection of Audio Unit and Its Circuit" (Page 9O-3)*
	Audio unit power and ground circuit wire	*"Audio System Circuit Diagram" (Page 9O-1)*

Condition	Possible cause	Correction / Reference Item
Poor radio reception	Radio antenna connector	*"Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)*
	Antenna or antenna feeder	*"Antenna, Antenna Base and Antenna Feeder Inspection" (Page 9O-7)*
Speakers do not sound	Speaker connector	*"Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)*
	Speaker circuit	*"Inspection of Audio Unit and Its Circuit" (Page 9O-3)*
	Speaker circuit wire	*"Audio System Circuit Diagram" (Page 9O-1)*
Illumination light does not light up	Illumination circuit	*"Inspection of Audio Unit and Its Circuit" (Page 9O-3)*
	Illumination circuit wire	*"Audio System Circuit Diagram" (Page 9O-1)*
Audio system is operative, but remote switch does not control audio system	Remote audio control switch	*Check remote audio control switch"Steering Switch (Audio Control Switch and Hands-Free Switch) Inspection (If Equipped)" (Page 9O-6).*
	Contact Coil faulty	*Replace contact coil*
	Remote audio control switch circuit faulty	*Check audio circuit"Audio System Circuit Diagram" (Page 9O-1)*
Impossible to call using hands-free system (if equipped)	Microphone connector	*"Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)*
	Microphone	*"Inspection of Audio Unit and Its Circuit" (Page 9O-3)*
	Hands-free switch connector	*Check Steering switch connectors for connection."Intermittent Connection and Poor Contact Inspection" in Section 00 (Page 00-11)*
	Hands-free switch	*"Steering Switch (Audio Control Switch and Hands-Free Switch) Inspection (If Equipped)" (Page 9O-6)*
	Hands-free switch circuit	*"Audio System Circuit Diagram" (Page 9O-1)*

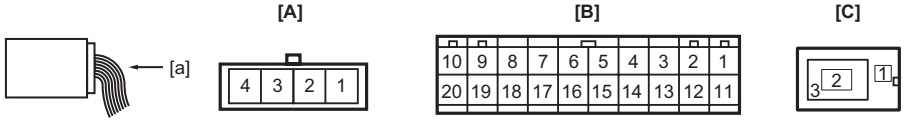
Inspection of Audio Unit and Its Circuit

AENDL70A9F04002

1) Remove audio unit from vehicle. ☞(Page 9O-5)
2) Connect connector to audio unit.
3) Check voltage and/or pulse signal using voltmeter and oscilloscope.

NOTE

- **As each terminal voltage is affected by the battery voltage, confirm that it is 12 V or more when the ignition switch is turned to ON position.**
- **Terminal with asterisk (*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**



IDL70A9F0004-01

[A] "G231" connector (Microphone (if equipped)) (View: [a])	[C] "G267" connector (radio antenna feeder) (View: [a])
[B] "G248" connector (audio unit) (View: [a])	

[A] G231 connector (microphone (if equipped))

Terminal No.	Circuit	Normal Voltage	Condition
G231-2*	Microphone signal	—	Audio: "ON"
		Refer to reference waveform.	
G231-3	Ground for microphone	Approx. 0V	Ignition: "OFF","ACC" or "ON"

G231-4	Power source for microphone	Approx. 5V	Ignition: “ACC” or “ON”

[B] G248 connector (audio unit)

Terminal	Circuit	Normal voltage	Condition
G248-1	Back up power source	Approx. 12 V	Ignition switch is at all positions.
G248-2	Power source (illumination)	Approx. 12 V	Lighting switch is at other than OFF position.
		Approx. 0 V	Lighting switch is at OFF position.
G248-3*	Left side front door speaker (+)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-4*	Right side front door speaker (+)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-5*	Left side rear door speaker (+)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-6*	Right side rear door speaker (+)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-7	—	—	—
G248-8	Steering switch (hands-free switch)	Approx. 3.3 V	Ignition: “ACC” or “NO”
G248-9	Ignition switch	Approx. 12 V	Ignition switch is at other than OFF position.
		Approx. 0 V	Ignition switch is at OFF position.
G248-10	—	—	—
G248-11	Ground	Approx. 0 V	Ignition switch is at all positions.
G248-12	Illumination signal	Refer to “Inspection of Combination Meter and Its Circuit” in Section 9C (Page 9C-9)	
G248-13*	Left side front door speaker (–)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-14*	Right side front door speaker (–)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-15*	Left side rear door speaker (–)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-16*	Right side rear door speaker (–)	Approx. 6 V	Audio unit switch is at ON position.
		Other than above condition, refer to reference waveform. “Speaker / microphone wave” (Page 9O-5)	
G248-17	—	—	—
G248-18	Vehicle speed signal	Refer to “Inspection of BCM and Its Circuits” in Section 10B (Page 10B-20)	
G248-19	Steering switch (audio control switch)	Approx. 3.3 V	Ignition: “ACC” or “NO”
G248-20	Ground for steering switch	Approx. 0 V	Ignition: “OFF”, “ACC” or “NO”

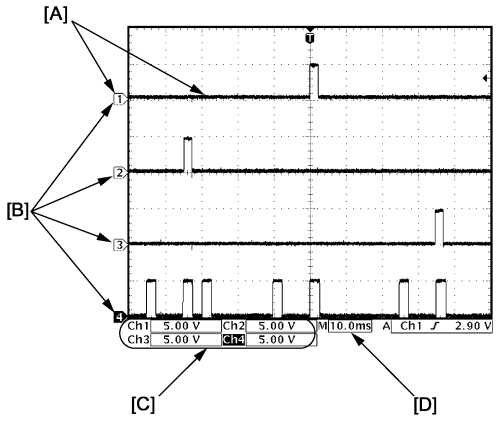
G267 connector (radio antenna feeder)

Terminal No.	Circuit	Normal Voltage	Condition
G267-1	Power source for radio antenna amplifier	Approx. 12V	Audio: “ACC” or “ON”
G267-2	Radio antenna amplifier signal	—	—
G267-3	Radio antenna amplifier shield ground circuit	Approx. 0V	Ignition: “OFF”, “ACC” or “ON”

Reference Waveform

NOTE

- **Waveform analysis is as follows.**



I8T401111066-01

[A]: Waveform of channel 1	[C]: VOLT/DIV of each channel
[B]: Ground level of each channel	[D]: TIME/DIV

- **Waveform might change for measurement condition and vehicle spec.**

Speaker / microphone wave

Microphone signal

Channel	Probe	Terminal No.
1	+	G231-2
	-	G231-3

Left side front door speaker signal (1)

Channel	Probe	Terminal No.
1	+	G248-3
	–	G248-13

Right side front door speaker signal (1)

Channel	Probe	Terminal No.
1	+	G248-4
	–	G248-14

Left side rear door speaker signal (1)

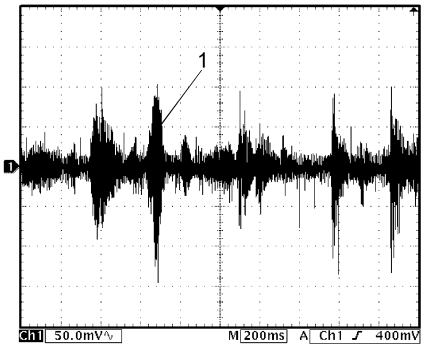
Channel	Probe	Terminal No.
1	+	G248-5
	–	G248-15

Right side rear door speaker signal (1)

Channel	Probe	Terminal No.
1	+	G248-6
	–	G248-16

Measurement condition

Audio switch: ON



IAW1019F0005-02

1. Speaker/microphone signal

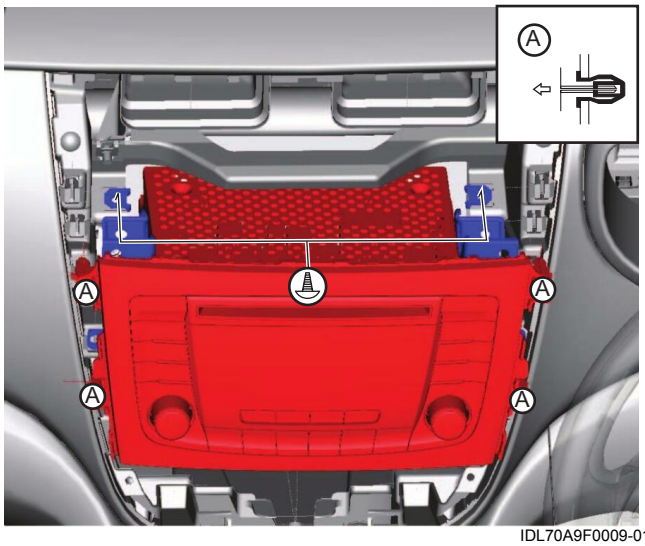
Repair Instructions

Audio Unit Removal and Installation

AENDL70A9F06001

Removal

1) Remove center ventilation louver from instrument panel. ☞(Page 7B-35)
2) Remove screws (2), and then remove audio unit (1) from instrument panel.



IDL70A9F0009-01

3) Disconnect connectors from audio unit.

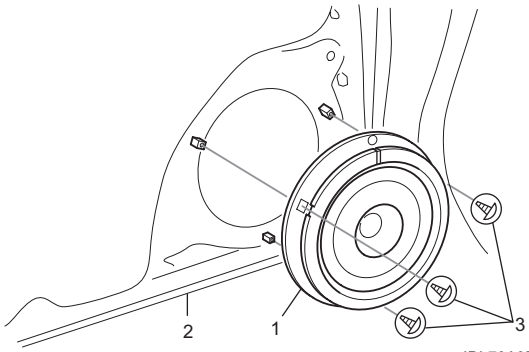
Installation
Reverse removal procedure.

Front / Rear Door Speaker Removal and Installation (If Equipped)

AENDL70A9F06003

Removal

1) Remove front or rear door trim.
   - Front door trim: ☞(Page 9E-14)
   - Rear door trim: ☞(Page 9E-19)
2) Remove screws (3), and then remove speaker (1) from door panel (2).
3) Disconnect connector from speaker (1).



IDL70A9F0005-01

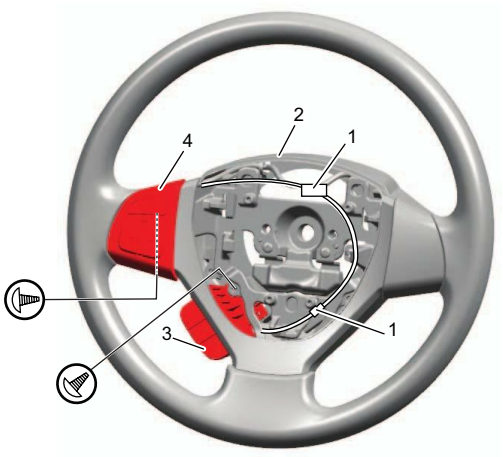
Installation
Reverse removal procedure.

Steering Switch (Audio Control Switch and Hands-Free Switch) Removal and Installation (If Equipped)

AENDL70A9F06009

Removal

1) Remove steering wheel.☞(Page 6B-3)
2) Remove screws and disconnect connectors (1).
3) Remove steering wheel cover (2) and hands-free switch (3) (if equipped) from steering wheel.
4) Remove audio control switch (4) (if equipped) from steering wheel.



IDL70A9F0026-01

Installation

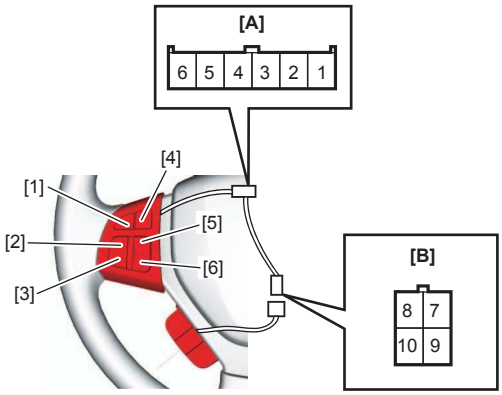
1) Reverse the removal process.

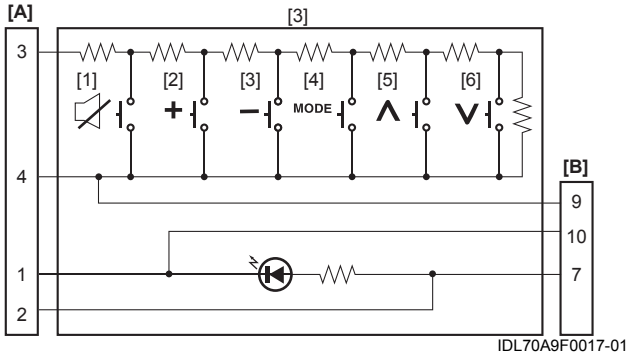
Steering Switch (Audio Control Switch and Hands-Free Switch) Inspection (If Equipped)

AENDL70A9F06008

1) Remove driver air bag (inflator) module.☞(Page 8B-48)
2) Disconnect steering switch connector.
3) Check switch for resistance between “3” and “4” terminals under each condition below.
   If check result is not satisfactory, replace remote audio control switch.

Remote audio control switch resistance
All switches released (OFF): 5693.5 – 5808.5 Ω
Switch “1” pushing on (ON): 629.6 – 642.4 Ω
Switch “2” pushing on (ON): 703.9 – 718.1 Ω
Switch “3” pushing on (ON): 812.8 – 829.2 Ω
Switch “4” pushing on (ON): 990.9 – 1011.0 Ω
Switch “5” pushing on (ON): 1317.7 – 1344.3 Ω
Switch “6” pushing on (ON): 2129.5 – 2172.5 Ω

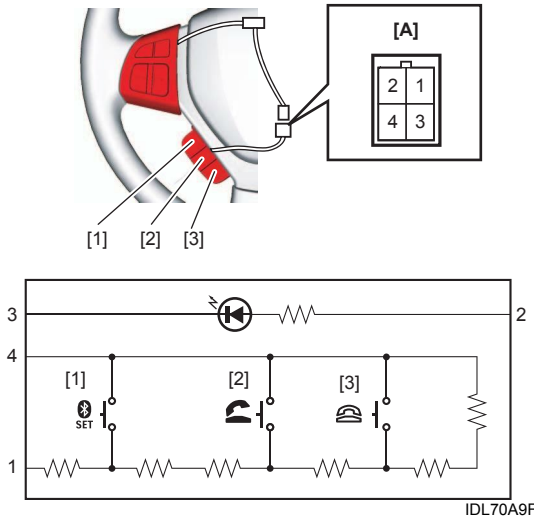




IDL70A9F0017-01

4) Check handsfree switch for resistance between “1” and “4” terminals under each condition below.
   If check result is not satisfactory, replace remote audio control switch.

Hands-free switch resistance
All switches released (OFF): 5693.5 – 5805.5 Ω
Switch “1” pushing on (ON): 629.6 – 642.4 Ω
Switch “2” pushing on (ON): 812.8 – 829.2 Ω
Switch “3” pushing on (ON): 1317.7 – 1344.3 Ω



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5) Check for continuity between terminals “2” and “3”

Microphone Removal and Installation

AENDL70A9F06010

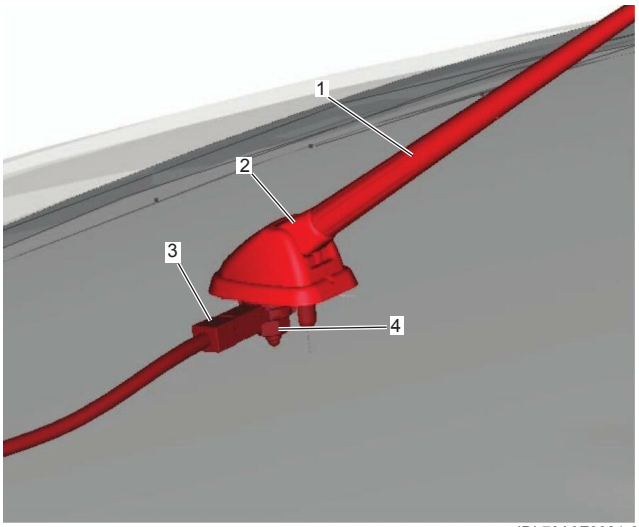
Refer to “Dome Light (without MIC) Removal and Installation” in Section 9B (Page 9B-10).

Antenna Base Removal and Installation

AENDL70A9F06004

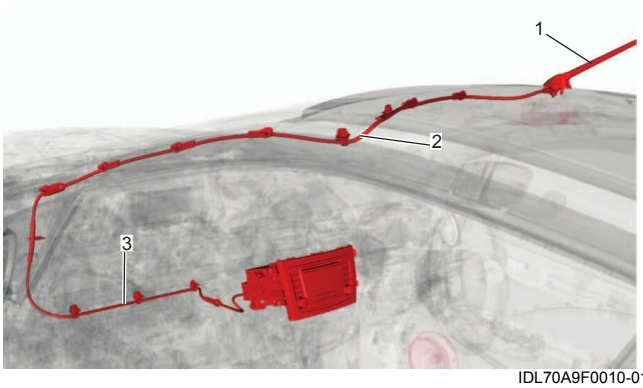
Removal

1) Remove head lining. ☞(Page 9H-7)
2) Remove antenna (1) from antenna base (2).
3) Loosen antenna feeder nut (4) and remove antenna feeder (3) from antenna base (2).
4) Remove antenna base (2) from vehicle.



IDL70A9F0021-01

5) Remove antenna feeders (roof side and instrument panel side).



IDL70A9F0010-01

1. Antenna	3. Antenna feeder (instrument panel side)
2. Antenna feeder (roof side)	

Installation

Reverse removal procedure noting the following point.

- Tighten antenna feeder nut to specified torque.

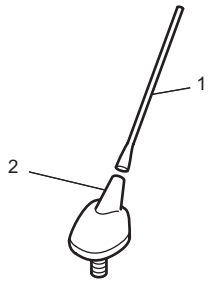
Tightening torque
Antenna feeder nut: 2.85 N·m (0.29 kgf-m, 2.1 lbf-ft)

Antenna, Antenna Base and Antenna Feeder Inspection

AENDL70A9F06005

Antenna and Antenna Base

Check antenna (1) and antenna base (2) for deformation and damage.
If any faulty condition exists, replace antenna and/or antenna base.

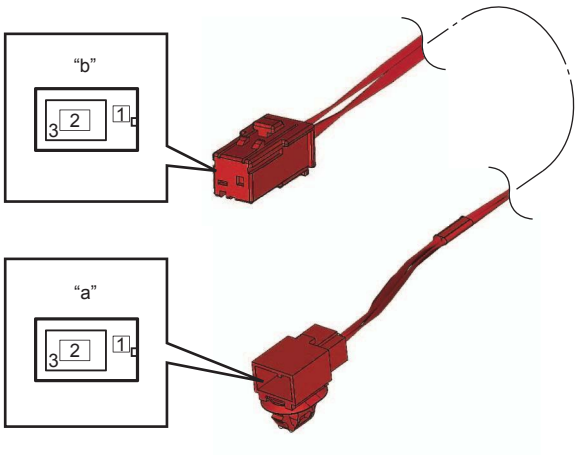


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Antenna Feeder (Roof Side)

1) Disconnect antenna feeder connector (between roof side and instrument panel side).
2) Check for continuity as shown in figure.
If check there is no continuity, replace antenna feeder (1).

Connector / Terminal	To radio antenna feeder cable (instrument panel)	To radio antenna
1	“a”	“b”
2	“a”	“b”
3	“a”	“b”

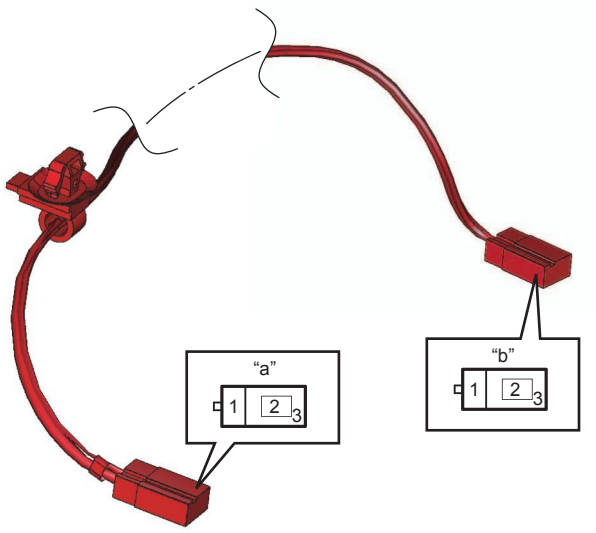


IDL70A9F0019-01

Antenna Feeder (Instrument Panel Side)

1) Disconnect antenna feeder connector (between roof side and instrument panel side).
2) Check for continuity as shown in figure.
   If check there is no continuity, replace antenna feeder (1).

Connector / Terminal	To audio unit	To radio antenna feeder cable (roof)
1	“a”	“b”
2	“a”	“b”
3	“a”	“b”



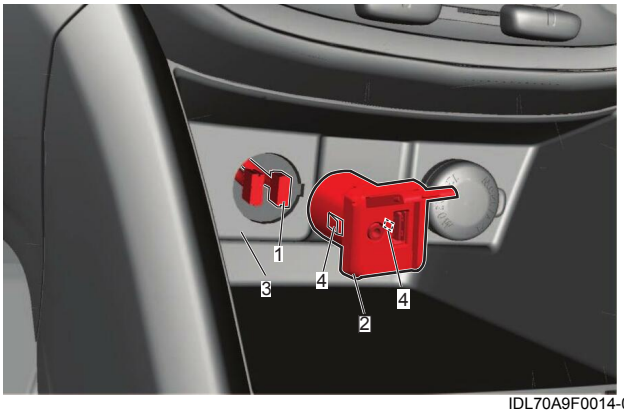
IDL70A9F0020-01

USB/AUX Socket Removal and Installation (If Equipped)

AENDL70A9F06006

Removal

1) Disconnect USB socket connector (1), and then remove USB/AUX socket (2) from instrument panel (3) while releasing the locks (4).



IDL70A9F0014-01

Installation

Reverse removal procedure.

USB Socket Inspection

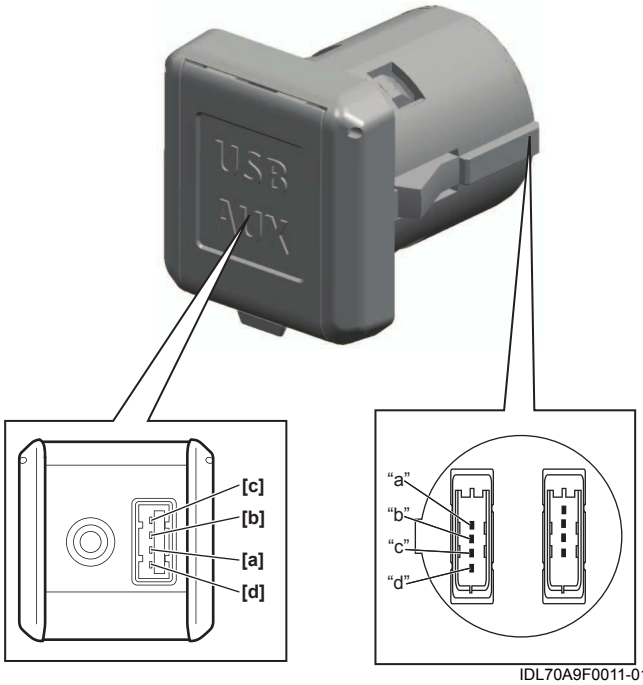
AENDL70A9F06007

Check continuity between each terminal of socket side and harness side of USB socket as shown in figure.
If check result is not as specified, replace USB socket.

USB socket continuity

Terminal	
[a]	“a”
[b]	“b”
[c]	“c”
[d]	“d”

I9P60A9F0025-01



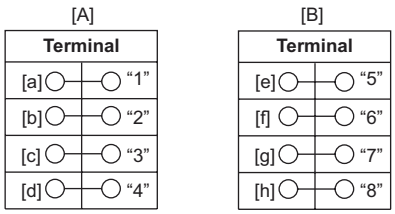
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USB/AUX Harness Inspection

AENDL70A9F06011

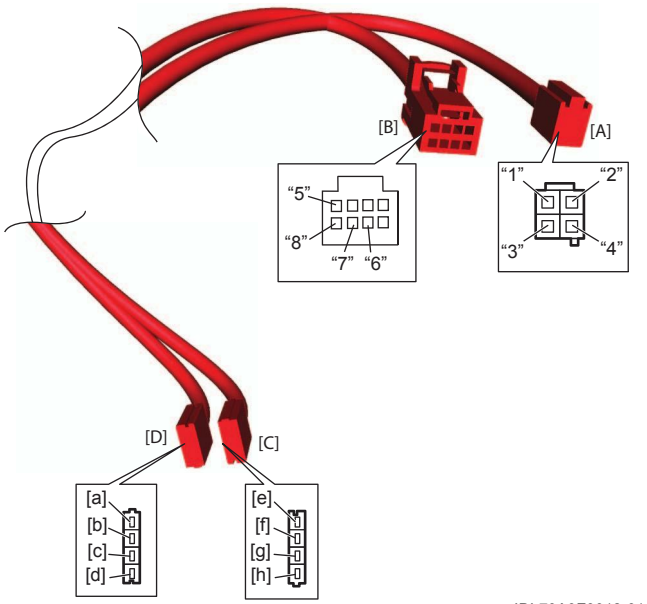
Check continuity between each terminal of USB/AUX socket side and audio unit side of USB/AUX harness connectors as shown in figure.
If check result is not as specified, replace USB harness.

USB/AUX harness continuity



IDL70A9F0013-01

[A] USB cable continuity	[B] AUX cable continuity



IDL70A9F0012-01

[A]: To audio unit (USB) ("G216" connector)	[C]: To AUX connector ("G222")
[B]: To audio unit (AUX) ("G217" connector)	[C]: To USB connector ("G221")

Specifications

Tightening Torque Specifications

AENDL70A9F07001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Antenna feeder nut	2.85	0.29	2.1	☞(Page 9O-7)

Reference:
For the tightening torques of fasteners not specified in this page, refer to:
"Fasteners Information" in Section 0A (Page 0A-5)

Section 10

Control Systems

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Precautions

Precautions

Precautions for Control Systems

AENDL70AA000001

Air Bag Warning
Refer to “Air Bag Warning” in Section 00 (Page 00-6).

General Precautions
Refer to “General Precautions” in Section 00 (Page 00-1).

Precautions for CAN Communication System
Refer to “Precautions for CAN Communication System” in Section 00 (Page 00-9).

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service” in Section 00 (Page 00-3).

Precautions for Vehicle Equipped with ABS System
Refer to “Precautions for Vehicle Equipped with Supplemental Restraint (Air Bag) System” in Section 00 (Page 00-7).

Reassembling Note for Wiring Harness
Be sure to observe “Reassembling Note for Wiring Harness” in Section 9A (Page 9A-84) whenever installing wiring harness. Otherwise, electrical trouble may occur.

Body Electrical Control System

Precautions

Precautions for Diagnosing Trouble

AENDL70AA200001

- Before using scan tool, read its Operator's (Instruction) Manual to know how to use it.
- Clear all DTCs after completing troubleshooting.

Precautions for Replacing Ignition Key

AENDL70AA200002

Ignition key incorporates the transponder. Therefore, register the transponder code when ignition key is replaced or added. ☞(Page 10B-29)

Precautions for Transmitter Disposal

AENDL70AA200003

- To prevent theft, be sure to break transmitter before disposing it.
- Dispose of the used battery properly according to applicable rules or regulations. Do not dispose of lithium batteries with ordinary household trash.

Precautions for Replacing BCM

AENDL70AA200004

- When replacing the BCM, replace it with a new one.
- After BCM is replaced with new one, perform "Immobilizer Key Registration" using SUZUKI scan tool. ☞(Page 10B-29)
- When BCM and ECM are replaced at the same time, refer to "ECM Registration" in Section 10C (Page 10C-13) for their registration.
- All ignition keys must be ready for the registration.

General Description

BCM General Description

AENDL70AA201001

The BCM incorporates relays and controllers which constitute the following control systems.

- Dome light control
- Turn signal light control
- Door lock control (if equipped)
- Rear end door window defogger control (if equipped)
- Warning buzzer control
- Seat belt reminder control (if equipped)
- Theft deterrent light (if equipped)

Dome Light Control

When the dome light switch is in the door position, the BCM turns on or off the dome light as follows:

Light ON control

When any of the following conditions is met, the BCM turns on the dome light.

- An ON signal by opening a door is sent from any one of door switches to the BCM
- Door lock actuator is unlocked by unlock signal from keyless entry transmitter
- All door switches are turned off by closing all doors and an OFF signal from the key reminder switch by removing ignition key from the ignition key cylinder is sent to the BCM
- All door switches are turned off by closing all doors and power door lock switch in the door is pressed in unlock direction with the ignition key removed from the ignition key cylinder

Light OFF control

When any of the following conditions is met, the BCM turns off the dome light.

- 15 seconds have elapsed from the time that after all door switches are turned off by closing all doors
- The door lock actuator is locked by the lock signal from the keyless entry transmitter
- All door switches are turned off by closing all doors and an ON signal is sent from the key reminder switch with the ignition key remained in the ignition key cylinder
- The battery running down protection function is working

- All door switches are turned off by closing all doors and power door lock switch in the door is pressed in lock direction with the ignition key removed from the ignition key cylinder

Battery running down protection function
To protect the battery from unnecessary discharging, the BCM turns off the dome light and open door warning light in the combination meter when any door is left open for longer than 15 minutes.

Turn Signal Light Control
When the turn signal switch lever is turned up or down, a signal is sent from the switch to the BCM. Accordingly, the BCM operates flashing of the turn signal light. When turning the switch on and off momentarily in situations such as lane changes, the BCM flashes the turn signal lights for a pre-set number of times.

Door Lock Control
Power door lock control
When a lock/unlock signal is sent from the key cylinder switch or power door lock switch to the BCM, the door lock actuator relay in the BCM is controlled to activate each door lock actuator so that each door is locked/unlocked. For details, refer to “Power Door Lock System Description (If Equipped)” in Section 9F (Page 9F-1).

Door lock cancel control
When an air bag deployment signal is sent from the SDM to the BCM, the door lock actuator relay in the BCM is controlled to unlock all door lock actuators.

Keyless entry control
When a door lock signal from the keyless entry transmitter is sent to BCM, it controls the door lock actuator relay in it and activates each door lock actuator to lock / unlock each door.
For details, refer to “Keyless Entry System Description (If Equipped)” in Section 9F (Page 9F-1).

Rear Defogger Control
When a rear defogger switch ON or OFF signal is sent from the HVAC control module to the BCM, it controls the rear defogger relay to turn on or off the rear end door window defogger and indicator.
For details, refer to “Rear Defogger System Description” in Section 9E (Page 9E-2).

Warning Buzzer Control
When any of “Key reminder function”, “Lights ON reminder function” and “Seat belt reminder function” is at work, the BCM transmits the buzzer request signal to the combination meter through CAN communication.
For details, refer to “Combination Meter Description” in Section 9C (Page 9C-1).

Seat Belt Reminder Control
The BCM judges whether the driver wears the seat belt or not when vehicle is running. If the driver is not wearing the seat belt under the specified conditions, the BCM turns on the seat belt reminder to warn the driver.
For details, refer to “Seat Belt Construction” in Section 8A (Page 8A-2).

Theft Deterrent Light
Theft deterrent light is controlled by BCM and blinks to warn the unauthorized person that the vehicle is equipped with security system. Theft deterrent light blinks when door is closed with keyless entry transmitter. It blinks fast for initial 5 seconds and slowly after that. The blinking pattern will change whenever there is some trouble in shock sensor circuits and ignition is ON.

CAN Communication System Description

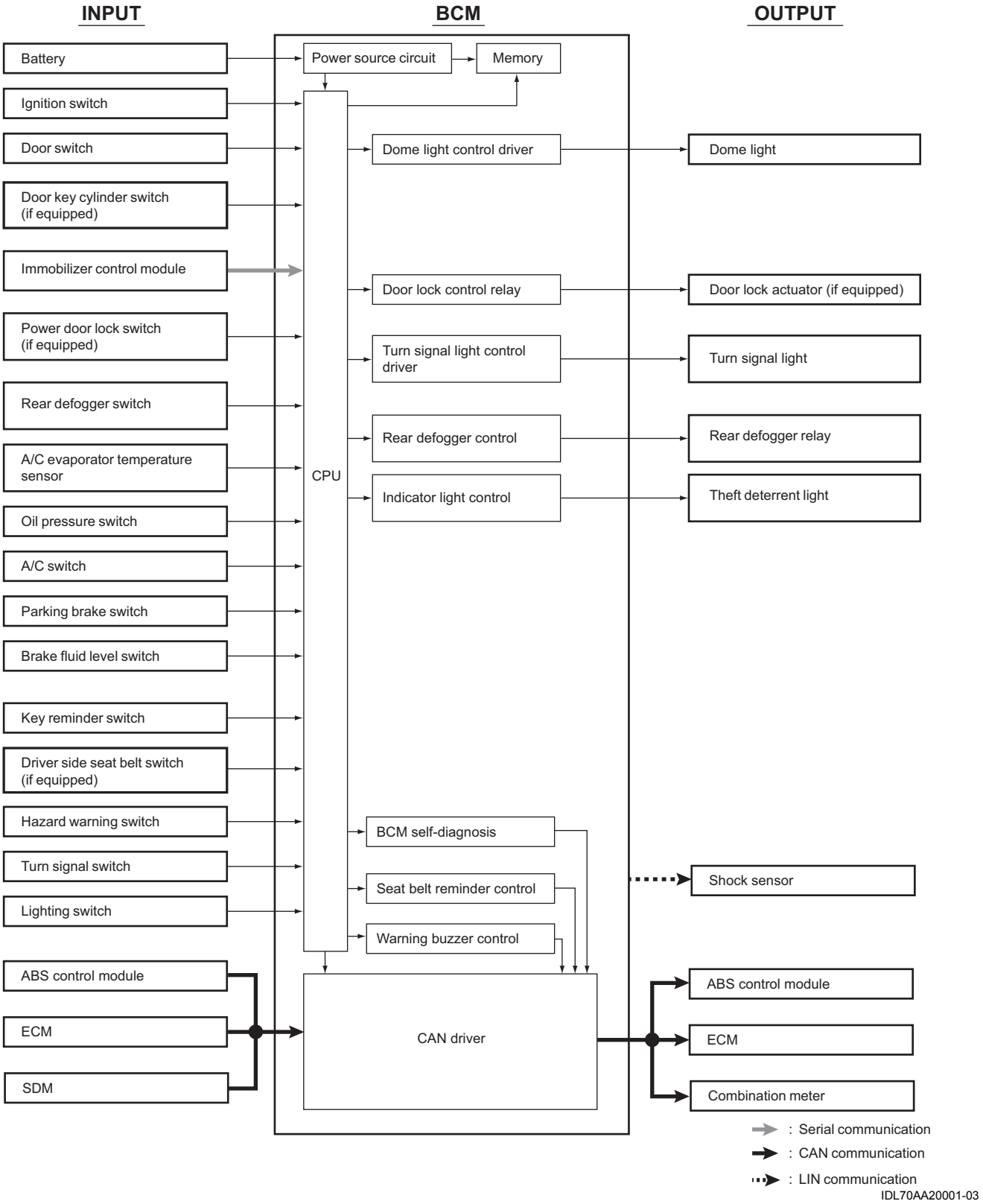
AENDL70AA201002

BCM uses CAN communication to communicate with other control modules except shock sensor. BCM uses LIN communication to communicate with shock sensor (if equipped). For more detail of CAN communication, refer to “CAN Communication System Description” in Section 10H (Page 10H-1).

Schematic and Routing Diagram

BCM Input / Output Diagram

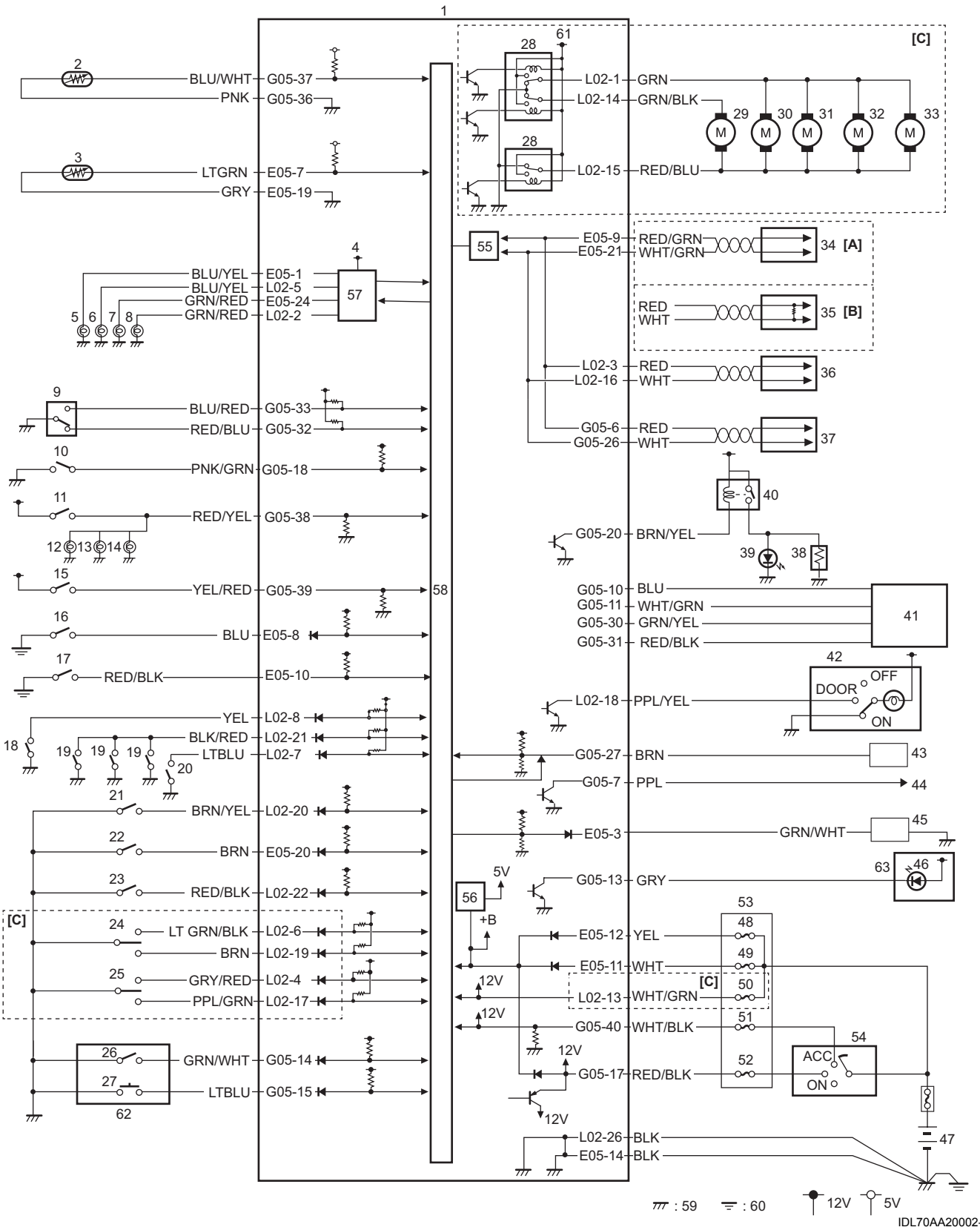
AENDL70AA202001



IDL70AA20001-03

Body Electrical Control System Circuit Diagram

AENDL70AA202002



IDL70AA20002-17

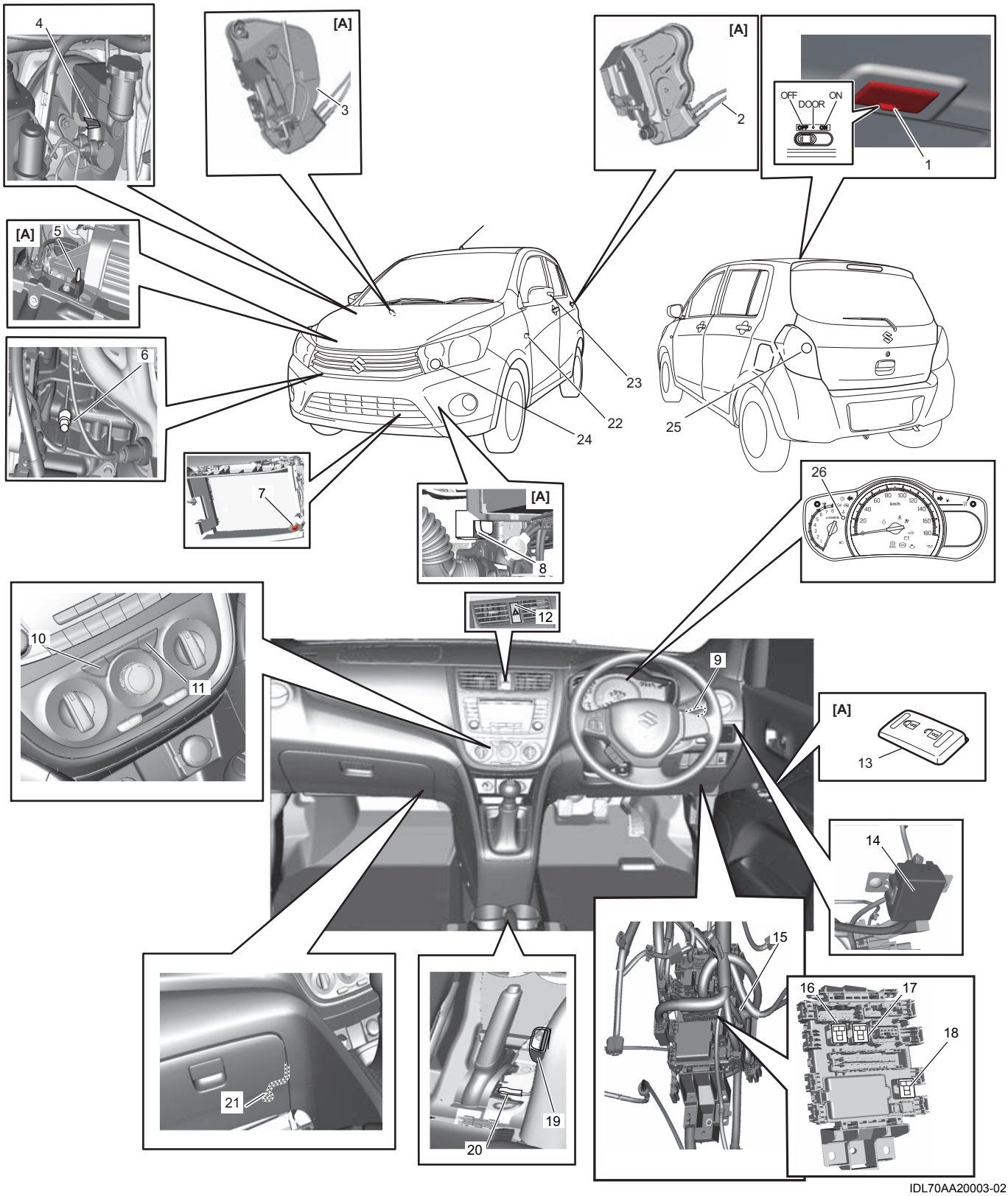
[A]: ABS model	20. Rear end door switch	42. Dome light
[B]: Non-ABS model	21. Driver seat belt buckle switch (if equipped)	43. Shock sensor (if equipped)
[C]: Power door lock model	22. Brake fluid level switch	44. Audio unit
1. BCM	23. Parking brake switch	45. Siren
2. Evaporator temperature sensor	24. Door key cylinder switch	46. Theft deterrent light

3. Outside air temperature sensor (if equipped)	25. Power door lock switch	47. Battery
4. Via “HORN/HAZ” fuse	26. A/C switch	48. “HORN/HAZ” fuse
5. Front right turn signal light	27. Rear defogger switch (if equipped)	49. “DOME” fuse
6. Rear right turn signal light	28. Door lock actuator relay	50. “D/L” fuse
7. Front left turn signal light	29. Driver door lock actuator	51. “ACC” fuse
8. Rear left turn signal light	30. Passenger door lock actuator	52. “MTR” fuse
9. Turn signal switch	31. Rear door lock actuator (R)	53. J/B
10. Hazard warning switch	32. Rear door lock actuator (L)	54. Ignition switch
11. Lighting switch	33. Rear end door lock actuator	55. CAN driver
12. Clearance light	34. ABS control module	56. Power supply circuit
13. Tail light	35. ECM	57. Turn signal circuit
14. License light	36. SDM (air bag model)	58. CPU
15. Key reminder switch	37. P/S control module	59. Body ground
16. Oil pressure switch	38. Rear defogger (if equipped)	60. Engine ground
17. Hood switch	39. Rear defogger indicator light (if equipped)	61. Via “D/L” fuse
18. Driver door switch	40. Rear defogger relay (if equipped)	62. HVAC control unit
19. Other than driver door switch	41. Immobilizer control module	63. Combination meter

Component Location

BCM and Related System Component Location

AENDL70AA203001



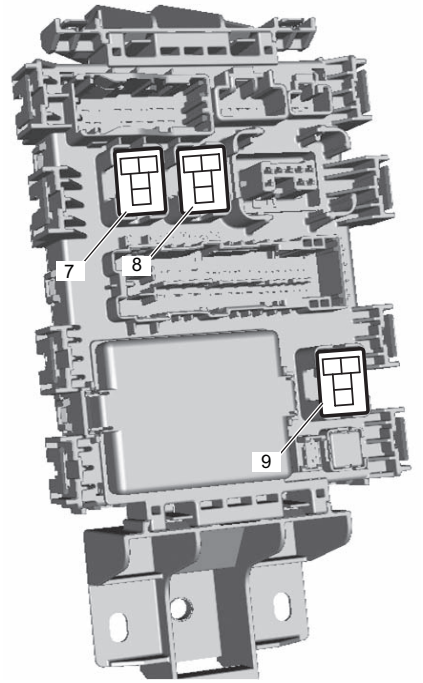
IDL70AA20003-02

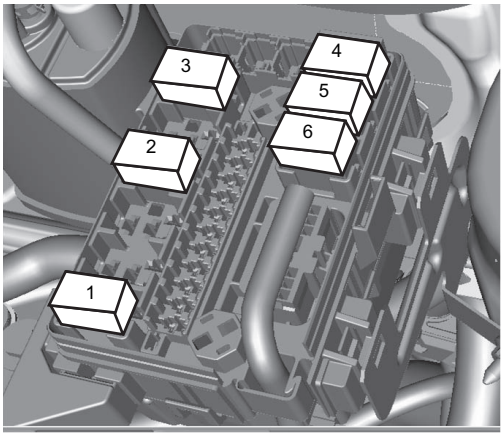
[A]. Power door lock model	9. Lighting switch (included in turn signal switch)	18. Rear defogger relay (if equipped)
1. Dome light	10. Rear defogger switch (if equipped)	19. Driver seat belt buckle switch (if equipped)
2. Rear door lock actuator	11. A/C switch	20. Parking brake switch
3. Front door lock actuator (driver side: incorporated in key cylinder switch)	12. Hazard warning switch	21. Evaporator temperature sensor

4. Brake fluid level switch	13. Power door lock switch	22. Side turn signal light (without door mirror turn signal light model)
5. Hood switch (if equipped)	14. Shock sensor (if equipped)	23. Side turn signal light (door mirror turn signal light model)
6. Oil pressure switch	15. BCM	24. Front turn signal light
7. Outside air temperature sensor (if equipped)	16. Horn relay	25. Rear turn signal light
8. Siren (if equipped)	17. Blower fan motor relay	26. Theft deterrent light

Control Relay Component Location

AENDL70AA203002





IDL70AA20004-02

1. Front fog light relay (if equipped)	4. Radiator cooling fan relay	7. Horn relay
2. Compressor relay	5. Starting motor relay	8. Blower fan motor relay
3. Fuel pump relay	6. Main relay	9. Rear defogger relay (if equipped)

Diagnostic Information and Procedures

Body Electrical Control System Check

AENDL70AA204002

Step 1: Customer Complaint Analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such a questionnaire form as shown in the figure will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (example)

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg:	Date of problem:	Mileage:

Problem Symptoms	・Power door lock system does not operate ・Keyless entry system does not operate ・Rear defogger does not operate ・Warning buzzer does not sound ・Dome light does not light ・Other_____
Frequency of Occurrence	・Continuous / Intermittent (times a day, a month) / Other_____
Environmental Condition	・Weather: Fine / Cloudy / Rain / Snow / Other_____ ・Temperature: ℃(°F)
Diagnostic Trouble Code	・Normal code / Malfunction code ( )

IDL70AA20005-01

Step 2: DTC Check
Check DTC stored in BCM memory. ☞(Page 10B-9)
In case that current DTC is detected:
Perform applicable DTC troubleshooting for current DTC and repair or replace faulty parts.
In case that history DTC is detected:

1) Record DTC and then clear DTC once.
2) Perform "Step 3: Trouble Symptom Confirmation" (Page 10B-9).
3) Referring to "circuit diagram" and "trouble area" in applicable DTC troubleshooting, confirm related parts where intermittent trouble is easy to occur (e.g., wire harness, connector, etc.) for detected history DTC.
4) Check intermittent trouble. ☞(Page 00-11)

NOTE

Never perform DTC troubleshooting.

In case that there is no DTC:

1) Perform "Step 3: Trouble Symptom Confirmation" (Page 10B-9).
2) If there is "Symptom Diagnosis" procedure for any possible cause, perform corresponding "Symptom Diagnosis" procedure.

NOTE

"Symptom Diagnosis" procedures for body electrical control system are described in each section.

Step 3: Trouble Symptom Confirmation
Check if what the customer claimed in "Customer Questionnaire" is actually found in the vehicle and if that symptom is found. (This step should be shared with the customer if possible.) Also, check if DTC is detected or not.

Step 4: Final Confirmation Test
Confirm that the problem symptom has gone and the body electrical control system is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, recheck the DTC and confirm that no DTC is indicated.

BCM Self-Diagnosis Function

AENDL70AA204001

Description
BCM monitors conditions of the system components and its circuit when ignition is in "ON". When an abnormality in the system occurs, BCM performs controls as follows.

Self-Diagnosis Function
When an abnormality in the system occurs, the are where that abnormality lies is stored in the memory of EEPROM in BCM.

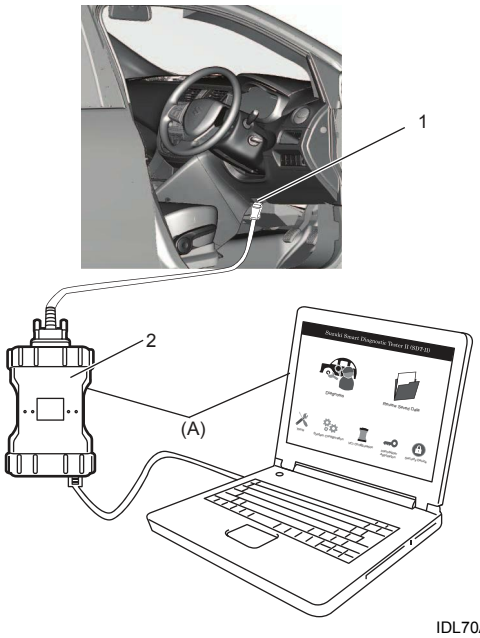
Fail-Safe Control
When DTC is detected, BCM enters fail-safe mode as long as malfunction continues, but that mode is canceled when BCM recovers normal condition. "Fail-Safe Table" (Page 10B-11)

DTC Check

AENDL70AA204006

1) Confirm that ignition is "OFF".
2) Connect SUZUKI scan tool (PC and VCI(2)) to DLC (1).

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

3) Set ignition "ON".
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator's manual for further details.

NOTE

If communication between SUZUKI scan tool and BCM is not possible, check related items according to the following points for recovery.

- **Communication condition between PC and VCI(2) using SUZUKI scan tool function**
- **DLC power circuit and ground circuit**
- **DLC cable (If necessary, check DLC cable by replacing it with a known-good DLC cable.)**
- **CAN communication system malfunction ("Control Module Communication Bus Off" is detected in any control module)**
- **BCM power circuit and ground circuit**

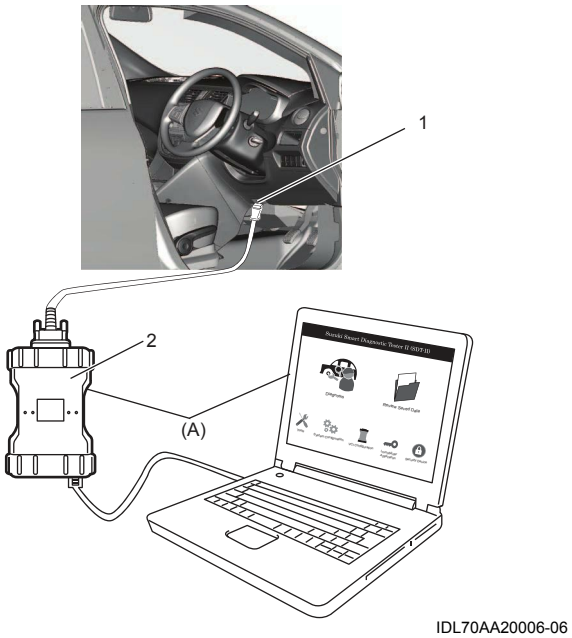
5) After completing the check, set ignition "OFF" and disconnect SUZUKI scan tool from DLC.

DTC Clearance

AENDL70AA204007

1) Confirm that ignition is OFF.
2) Connect SUZUKI scan tool (PC and VCI(2)) to DLC (1).

Special tool
(A): SUZUKI scan tool (Suzuki SDT-II)



IDL70AA20006-06

3) Set ignition “ON”.

4) Erase DTC according to instructions displayed on scan tool. Refer to SUZUKI scan tool operator’s manual for further details.

5) After completing clearance, set ignition “OFF” and disconnect SUZUKI scan tool from DLC.

DTC Table

AENDL70AA204004

DTC	DTC name	DTC detecting condition
B1123 ☞(Page 10B-14)	DOME Fuse Circuit/Open	Input terminal voltage from DOME fuse is continuously lower than 3.3 V for specified time.
B1133 ☞(Page 10B-15)	Battery Voltage too High	Backup power supply circuit voltage from “DOME” fuse is continuously higher than 16.0 V for specified time.
B1141 ☞(Page 10B-16)	Outside Air Temperature (Ambient Temperature) Sensor Circuit Open	Outside air temperature sensor signal circuit voltage is higher than 4.68 V for specified time continuously.
B1142 ☞(Page 10B-16)	Outside Air Temperature (Ambient Temperature) Sensor Circuit Short to Ground	Outside air temperature sensor signal circuit voltage is lower than 0.14 V for specified time continuously.
B1145 ☞(Page 10B-17)	A/C Evaporator Temperature Sensor Circuit High	Evaporator temperature sensor signal circuit voltage is higher than 4.85 V for specified time continuously.
B1146 ☞(Page 10B-17)	A/C Evaporator Temperature Sensor Circuit Low	Evaporator temperature sensor signal circuit voltage is higher than 0.15 V for specified time continuously.
B1157 ☞(Page 10B-18)	Air Bag Deployment Signal Input	Air bag deployment signal is fed from SDM to BCM.
B1158 ☞(Page 10B-18)	LIN Lost Communication With Shock Sensor	Receiving error of LIN communication data from shock sensor for specified time continuously.
B1159 ☞(Page 10B-18)	Shock Sensor Circuit	Malfunction of LIN communication data from shock sensor is detected.

DTC	DTC name	DTC detecting condition
B1167	Immobilizer Information Mismatched	Refer to “DTC Table” in Section 10C (Page 10C-4).
B1168	Password Mismatched	
B1169	Registration Failure	
B1170	EEPROM Access Error	
B1173	Transponder Unregistered	
B1175	Immobilizer Information Unregistered	
B1176	Specification Information Unregistered	
B1188	Transponder Communication Error	
B1189	Immobilizer Antenna Communication Error	
B1190	Engine Switch Malfunction	
U0073 ☞(Page 10B-19)	Control Module Communication Bus Off	BCM fails to transmit and receive the data via CAN for specified time continuously.
U0100 ☞(Page 10B-19)	Lost Communication With ECM	Receiving error of the data from ECM via CAN for specified time continuously.
U0101 ☞(Page 10B-19)	Lost Communication With TCM	Receiving error of the data from TCM via CAN for specified time continuously.
U0151 ☞(Page 10B-19)	Lost Communication With Restraints Control Module	Receiving error of the data from SDM via CAN for specified time continuously.

Fail-Safe Table

AENDL70AA204005

When DTC is detected, BCM enters fail-safe mode as long as malfunction continues to exist but that mode is canceled when BCM recovers normal condition.

DTC	DTC name	Fail-safe operation
B1123 ☞(Page 10B-14)	DOME Fuse Circuit/Open	Stop operations of keyless entry control module.
B1133 ☞(Page 10B-15)	Battery Voltage too High	—
B1141 ☞(Page 10B-16)	Outside Air Temperature (Ambient Temperature) Sensor Circuit Open	BCM outputs outside air temperature –40 °C (–40 °F).
B1142 ☞(Page 10B-16)	Outside Air Temperature (Ambient Temperature) Sensor Circuit Short to Ground	BCM outputs outside air temperature 87.5 °C (189. 5°F).
B1145 ☞(Page 10B-17)	A/C Evaporator Temperature Sensor Circuit High	BCM assumes that evaporator temperature is –40 °C (–40 °F).
B1146 ☞(Page 10B-17)	A/C Evaporator Temperature Sensor Circuit Low	BCM assumes that evaporator temperature is 60 °C (140 °F).
B1157 ☞(Page 10B-18)	Air bag deployment signal input	BCM stops lock operation at power door lock switch until ignition switch is set “OFF”.
B1158 ☞(Page 10B-18)	LIN Lost Communication With Shock Sensor	Stop operations of pre-warn function and full blast function. After setting ignition “ON”, theft deterrent light will flash for 15 sec.
B1159 ☞(Page 10B-18)	Shock Sensor Circuit	Stop operations of pre-warn function and full blast function. After setting ignition “ON”, theft deterrent light will flash for 15 sec.
B1170 ☞(Page 10B-19)	Internal Control Module EEPROM Error	For vehicles with shock sensor, stop siren answer-back function, panic alarm function and anti-theft function.
U0073 ☞(Page 10B-19)	Control Module Communication Bus Off	-
U0100 ☞(Page 10B-19)	Lost Communication With ECM	BCM controls with default value.
U0151 ☞(Page 10B-19)	Lost Communication With Restraints Control Module	BCM controls with default value.

Scan Tool Data

AENDL70AA204003

NOTE

- **If communication between SUZUKI scan tool and the BCM is not possible, check related items according to the following points for recovery.**
  - **Communication condition between PC and VCI using SUZUKI scan tool function**
  - **DLC cable (If necessary, check DLC cable by replacing it with a known-good DLC cable.)**
  - **DLC power circuit and ground circuit**
  - **CAN communication system malfunction ("Control Module Communication Bus Off" is detected in any control module)**
  - **BCM power circuit and ground circuit**
- ***: Applicable to power door lock model.**

Scan tool data	Normal condition / Reference value	Condition
Outside Air Temp	The same value as outside air temperature	Measure environmental temperature of front bumper
Battery Voltage	10 – 14 V	Engine: Running
A/C Evaporator Temp	0 – 5 °C (32 – 41 °F)	A/C compressor: ON Temperature selector: Maximum cool position Blower speed selector: Low
Vehicle Speed	Value same as speedometer reading	In driving
Engine Speed	650 – 750 rpm	Engine: Idle speed with no load applied after warming up
Driv Door SW	ON	Driver door: Opened
	OFF	Other than above condition
Pass Door SW	ON	Other than driver door: Opened
	OFF	Other than above condition
Back Door/Trunk SW	ON	Rear end door: Opened
	OFF	Other than above condition
Rear Defogger SW	ON	Rear defogger switch: Pushed
	OFF	Other than above condition
Door Key SW (Lock)*	ON	Driver key cylinder switch: "Lock" position
	OFF	Other than above condition
Door Key SW (Unlock)*	ON	Driver key cylinder switch: "Unlock" position
	OFF	Other than above condition
Power door lock SW*	ON	Power door lock switch: "Lock" position
	OFF	Other than above condition
Power door Unlock SW*	ON	Power door lock switch: "Unlock" position
	OFF	Other than above condition
Key Reminder SW	KeyIn	Ignition key: Inserted in ignition key cylinder
	Pulled	Other than above condition
Tail Light SW	ON	Lighting switch: "CLEARANCE" or "HEAD" position
	OFF	Other than above condition
Turn Signal Light R SW	ON	Turn signal switch (R): ON
	OFF	Other than above condition
Turn Signal Light L SW	ON	Turn signal switch (L): ON
	OFF	Other than above condition
Hazard SW	ON	Hazard warning switch: ON
	OFF	Other than above condition
Driv Seatbelt SW	Fasten	Driver seat belt: Fasten
	Unfasten	Other than above condition
Brake Fluid Level	Low	Brake fluid level switch: ON (brake fluid level lower than MIN level)
	Normal	Brake fluid level switch: OFF (brake fluid level at MIN level or higher)
Parking Brake SW	ON	Parking brake lever: Pull
	OFF	Parking brake lever: Release

Scan tool data	Normal condition / Reference value	Condition
Oil Pressure SW	OFF	Engine: Running
	ON	Other than above condition
A/C SW	ON	Ignition: “ON” Blower speed selector: Other than OFF position A/C switch: ON
	OFF	Other than above condition
Ignition 1 Switch	ON	Ignition: “ON”
	OFF	Other than above condition
ACC Switch	ON	Ignition: “ACC” or “ON”
	OFF	Other than above condition
Turn Signal Light	0	Flashing setting of turn signal light: 0
	+1	Flashing setting of turn signal light: +1
	+2	Flashing setting of turn signal light: +2
	+3	Flashing setting of turn signal light: +3
Auto Drive Lock Mode	Vehicle Speed	When locking doors according to vehicle speed.
	Shift Position	When locking doors according to shift position.
	Passive	When locking doors without auto mode.
Auto Drive Unlock Mode	Ignition Key	When unlocking doors according to ignition key condition.
	Shift Position	When unlocking doors according to shift position.
	Passive	When unlocking doors without auto mode.
Shock Sensor Setting	Active	Shock sensor function for antitheft system is enabled.
	Passive	Shock sensor function for antitheft system is not enabled.
Hood Switch	ON	ON: Hood is open
	OFF	OFF: Hood is closed
Answer- back (Siren)	Active	Siren chirps in answer-back.
	Passive	Siren does not chirp in answer-back.
Door Unlock	1 Action	All doors are unlocked at the same time by 1st action.
	2 Action	Driver’s side door is unlocked by the 1st action and other doors are unlocked by the 2nd action.
Pre-warn Sensitivity	OFF/Level 1 ~ Level 15	Level14: Default value
Full Blast Sensitivity	OFF/Level 1 ~ Level 15	Level9: Default value

Scan Tool Active Test Table

AENDL70AA204025

SUZUKI scan tool includes output test function which can force operation of the following actuators and relays of systems controlled by the BCM. When a malfunction is found in system controlled by BCM, execute output test for easy judgment of whether the malfunction is on the input or output side of the BCM. For detailed information on operation of SUZUKI scan tool, refer to “SUZUKI Scan Tool Operator’s Manual”.

Hazard Warning Light	Door	Rear Defogger
Interior (Dome) Light	Siren	
Warning Buzzer	Alarm indicator	

Scan Tool Utility Table

AENDL70AA204021

SUZUKI scan tool has setting change function of the BCM as follows. For more information, refer to “SUZUKI Scan Tool Operator’s Manual”.

Item		Setting	Description
Configuration	Turn Signal Light	0 / +1 / +2 / +3	For situations such as lane changes, it is possible to set the number of times the turn signal lights flash when turn signal switch is momentarily switched on and off. 0: Turn signal lights flash once when turn signal switch is turned on 1 time. +1: Turn signal lights flash 2 times when turn signal switch is turned on 1 time. (+1 time on and off for 1 time switching on) +2: Turn signal lights flash 3 times when turn signal switch is turned on 1 time. (+2 time on and off for 1 time switching on) +3: Turn signal lights flash 4 times when turn signal switch is turned on 1 time. (+3 time on and off for 1 time switching on)
	Answer-back (Siren)	ON/OFF	Setting of siren chirp in answer-back (ON/OFF) is switched.
	Security Alarm	ON/OFF	Setting of security alarm (ON/OFF) is switched.
	Shock Sensor	ON/OFF	Setting of shock sensor function on security alarm (ON/OFF) is switched.
	Auto Drive Unlock	Passive/Ignition Key/Shift Position	Setting condition for unlocking all doors automatically (Passive/ Ignition Key/Shift Position)
	Auto Drive Lock	Passive/Vehicle Speed/Shift Position	Setting condition for locking all doors automatically (Passive/ Vehicle Speed/Shift Position)
	Shock Sensor Pre-warn Sensitivity	OFF/Level 1~Level 15	Setting of shock sensor pre-warn sensitivity (OFF, Level 1,...., Level 15) is switched.
	Shock Sensor Full Blast Sensitivity	OFF/Level 1~Level 15	Setting of shock sensor full blast sensitivity (OFF, Level 1,...., Level 15) is switched.
	Door Unlock	1 Action/2 Action	Setting of door unlock function (1 Action / 2 Action) is switched.

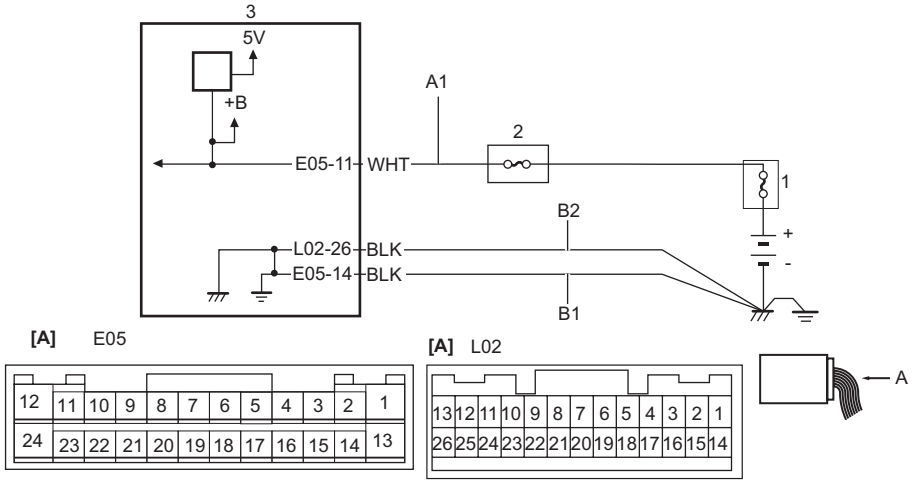
DTC B1123

AENDL70AA204022

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1123: DOME Fuse Circuit/Open Input terminal voltage from DOME fuse is continuously lower than 3.3 V for specified time.	• DOME fuse • BCM • “DOME” fuse wire / connector

Circuit Diagram



IDL70AA20007-03

[A]: BCM connector (View: A)	B2: BCM ground No. 2 circuit	3. BCM
A1: BCM power supply circuit	1. Main fuse	
B1: BCM ground No. 1 circuit	2. “DOME” fuse	

DTC Confirmation Procedure
Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	**DOME fuse check** 1) Set ignition “OFF”. 2) Check “DOME” fuse. *Is it in good condition?*	Go to step 2.	Replace “DOME” fuse.
2	**BCM power supply circuit check** 1) Disconnect “E05” connector from BCM. 2) Check for proper terminal connection of “E05” connector. 3) If connection is OK, check that voltage between “A1” circuit and ground is battery voltage. *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**BCM ground circuit check** 1) Check that resistance between each of “B1” and “B2” circuit and ground: Approximately 0 Ω. *Is check result OK?*	Go to Step 4.	Repair or replace defective wire harness.
4	**DTC check** 1) Clear DTC. 2) Set ignition “OFF”. 3) Perform DTC confirmation procedure, and recheck for DTC. *is DTC B1123 still detected?*	Replace BCM and recheck DTC.	End.

DTC B1133

AENDL70AA204009

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1133: Battery Voltage Too High Backup power supply circuit voltage from “DOME” fuse is continuously higher than 16.0 V for specified time.	• Charging system • BCM

DTC Confirmation Procedure

1) Start engine, if possible.

DTC Troubleshooting

Step	Action	Yes	No
1	**Charging system check** 1) Check charging system. ☞(Page 1J-4) *Is it in good condition?*	Replace BCM and recheck DTC.	Repair charging system.

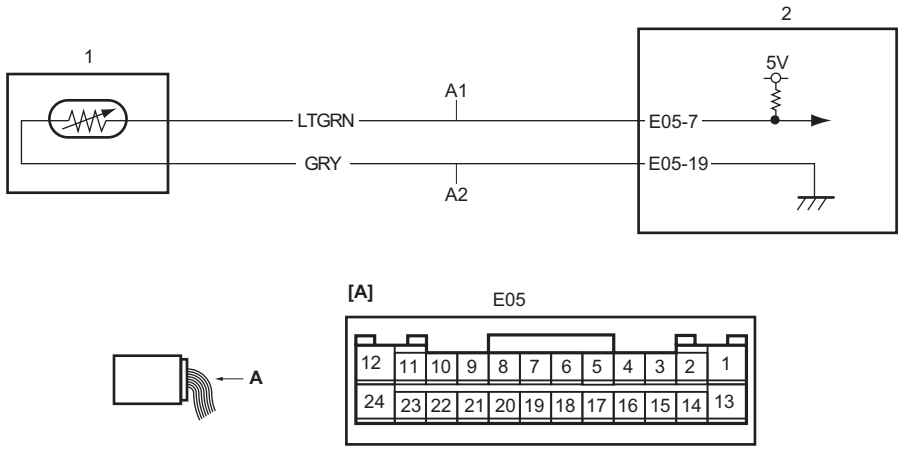
DTC B1141 / B1142

AENDL70AA204023

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1141: Outside Air Temperature (Ambient Temperature) Sensor Circuit Open Outside air temperature sensor signal circuit voltage is higher than 4.68 V for specified time continuously.	• Outside air temperature sensor circuit / connector • Outside air temperature sensor • BCM
B1142: Outside Air Temperature (Ambient Temperature) Sensor Circuit Short to Ground Outside air temperature sensor signal circuit voltage is lower than 0.14 V for specified time continuously.	

Circuit Diagram



IDL70AA20008-02

[A]: BCM connector (View A)	A2: Outside air temperature sensor ground circuit	2. BCM
A1: Outside air temperature sensor signal circuit	1. Outside air temperature sensor	

DTC Confirmation Procedure

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	**Outside air temperature sensor circuit check** 1) Confirm that ignition is “OFF”. 2) Disconnect outside air temperature sensor and “E05” connector. 3) Check for proper terminal connection to outside air temperature sensor and “E05” connector. 4) If connectors are OK, check the following points. • Resistance of “A1” and “A2” circuits: less than 3 Ω • Resistance between “A1” circuit and ground: infinity • Resistance between “A1” and “A2” circuit terminals at outside air temperature sensor connector: infinity • Voltage of “A1” and “A2” circuits:0-1 V (when ignition is “ON”) *Are they in good condition?*	Go to step 3.	Repair or replace defective wire harness.
2	**Outside air temperature sensor check** 1) Check outside air temperature sensor. ☞(Page 10B-30) *Is it in good condition?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	Replace outside air temperature sensor. ☞(Page 10B-30)

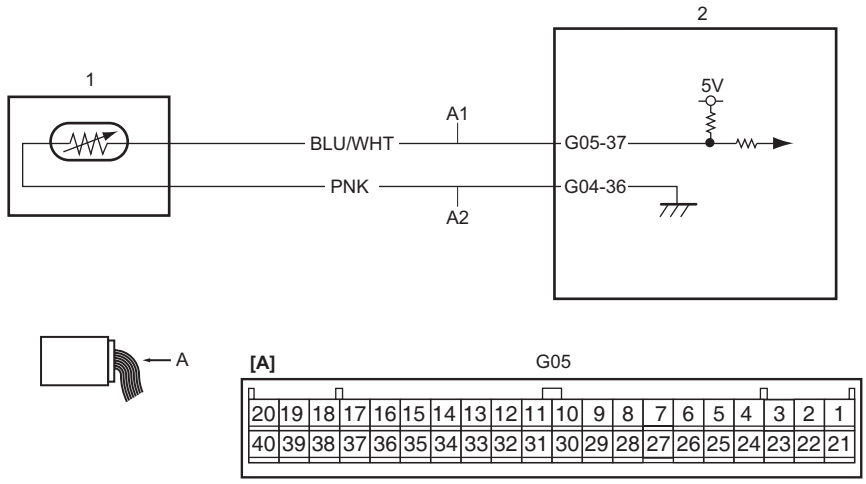
DTC B1145 / B1146

AENDL70AA204010

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1145: A/C Evaporator Temperature Sensor Circuit High Evaporator temperature sensor signal circuit voltage is higher than 4.85 V for specified time continuously.	• Evaporator temperature sensor circuit / connector • Evaporator temperature sensor • BCM
B1146: A/C Evaporator Temperature Sensor Circuit Low Evaporator temperature sensor signal circuit voltage is lower than 0.15 V for specified time continuously.	

Circuit Diagram



IDL70AA20009-03

[A]: BCM connector (View A)	A2: Evaporator temperature sensor ground circuit	2. BCM
A1: Evaporator temperature sensor signal circuit	1. Evaporator temperature sensor	

DTC Confirmation Procedure

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	**Evaporator temperature sensor circuit** 1) Confirm that ignition is “OFF”. 2) Disconnect evaporator temperature sensor and “G05” connector. 3) Check for proper terminal connection to evaporator temperature sensor and “G05” connector. 4) If connections are OK, check the following points. • Resistance of “A1” and “A2” circuits: less than 3 Ω • Resistance between “A1” circuit and ground: infinity • Resistance between “A1” and “A2” circuit terminals at evaporator temperature sensor connector: infinity • Voltage of “A1” and “A2” circuits: 0 - 1 V (when ignition is “ON”) *Are they in good condition?*	Go to Step 2.	Repair or replace defective wire harness.
2	**Evaporator temperature sensor check** 1) Check evaporator temperature sensor. ☞(Page 7B-31) *Is it in good condition?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	Replace evaporator temperature sensor.

DTC B1157

AENDL70AA204012

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1157: Air Bag Deployment Signal Input Air bag deployment signal is fed from SDM to BCM.	• SDM • BCM

DTC Confirmation Procedure

1) Set ignition “ON”.
2) Set ignition “OFF”.
3) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC. ☞(Page 10B-9) 2) Perform “DTC Confirmation Procedure” (Page 10B-18) and then recheck DTC. *Is DTC B1157 still detected?*	Go to Step 2.	Check for intermittent trouble. ☞(Page 00-11)
2	**DTC recheck** 1) Replace SDM. ☞(Page 8B-48) 2) Perform “DTC Confirmation Procedure” (Page 10B-18) and then recheck DTC. *Is DTC B1157 still detected?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	END.

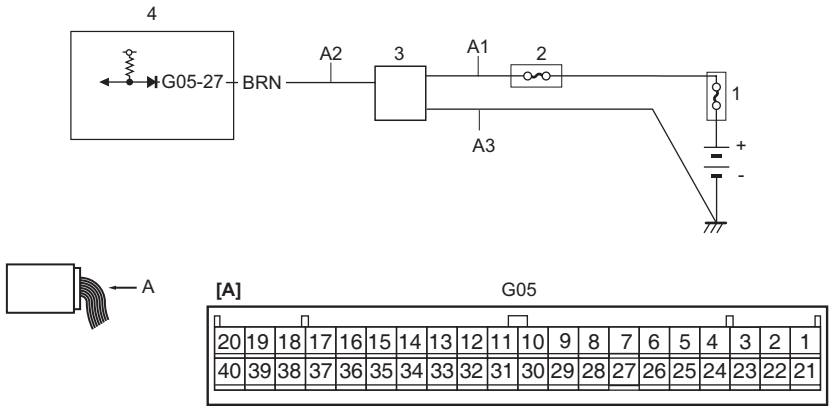
DTC B1158 / B1159

AENDL70AA204024

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1158: LIN Lost Communication With Shock Sensor Receiving error of LIN communication data from shock sensor for specified time continuously.	• LIN communication line / connector • BCM • Shock sensor • Shock sensor power supply circuit • “DOME” fuse
B1159: Shock Sensor Circuit Malfunction of LIN communication data from shock sensor is detected.	

Circuit Diagram



IDL70AA20010-04

[A]: BCM connector (View A)	A3: Shock sensor signal circuit	3. Shock sensor
A1: Shock sensor power supply circuit	1. Main fuse	4. BCM
A2: Shock sensor ground circuit	2. “DOME” fuse	

DTC Confirmation Procedure

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	**Shock sensor power supply circuit check** 1) Set ignition “OFF”. 2) Check following points. • “DOME” fuse. • Voltage between “A1” circuit and body ground: Battery voltage *Are they in good condition?*	Go to step 2.	Replace “DOME” fuse or defective wire.
2	**Shock sensor ground circuit check** 1) Check resistance between “A3” circuit and ground: Approximately 0 Ω *Is it in good condition?*	Go to Step 3.	Replace defective wire.
3	**Shock sensor signal circuit check** 1) Disconnect shock sensor and connector “G05”. 2) Check for proper terminal condition to shock sensor and connector “G05”. 3) If connections are OK, check following points. • Resistance of “A2” circuit and ground: infinity • Resistance between end terminals of “A2” circuit: Approximately 0 Ω • Resistance between “A2” circuit terminal and other terminal at BCM connector: infinity *Is it in good condition?*	Go to Step 4.	Repair or replace defective wire.
4	**DTC recheck** 1) Replace shock sensor. 2) Perform “DTC Confirmation Procedure” (Page 10B-19)and then recheck DTC. *Is DTC B1158 still detected?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	End.

DTC B1170

AENDL70AA204013

Refer to “DTC B1170” in Section 10C (Page 10C-9).

DTC U0073

AENDL70AA204014

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

DTC U0100

AENDL70AA204015

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

DTC U0101

AENDL70AA204026

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8).

DTC U0151

AENDL70AA204016

Refer to “CAN DTC (Lost Communication and Communication Bus Off) Table” in Section 10H (Page 10H-8)

Inspection of BCM and Its Circuits

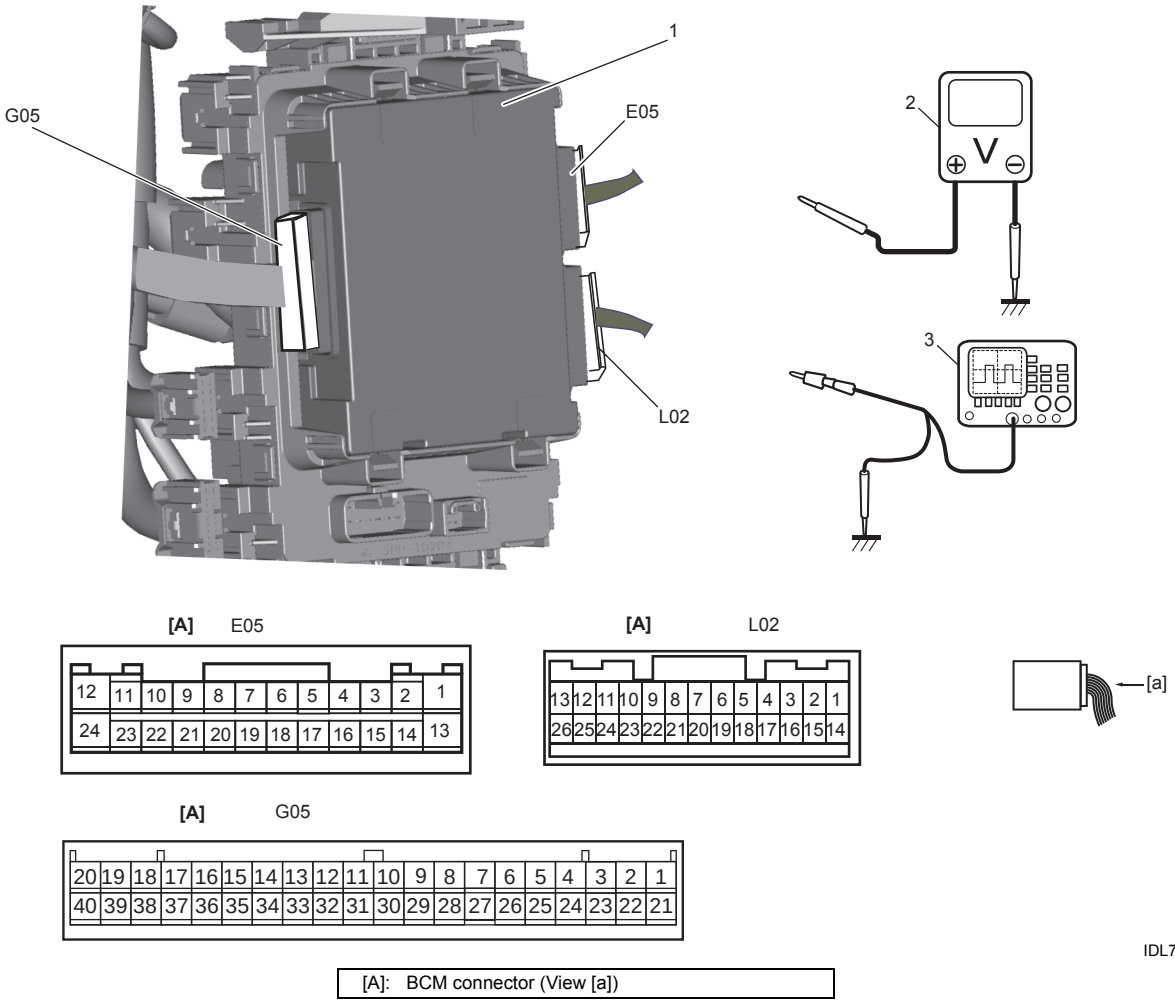
AENDL70AA204018

Voltage and Signal Check

Check voltage and/or pulse signal of BCM (1) using voltmeter (2) and oscilloscope (3)

NOTE

- **Check that battery voltage is 11 V or more.**
- **The voltage of terminal with asterisk (*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope.**



IDL70AA20011-07

[A]: BCM connector (View [a])

Terminal	Wire Color	Circuit	Normal voltage	Condition
E05-1	BLU/YEL	Front and Side turn signal light signal (R)	0 ← → 14 V	Front right turn signal light: Blinking
E05-2	—	—	—	—
E05-3	GRN/WHT	Security siren	10 – 14 V	Siren: Blaring after opening any door without unlocking the door (which is locked with keyless entry transmitter) with keyless entry transmitter
E05-4	—	—	—	—
E05-5	—	—	—	—
E05-6	—	—	—	—
E05-7	LTGRN	Outside air temperature sensor signal	About 2.7 V	Ignition: “ON” Outside air temperature: 0 °C (32 °F)
			About 1.6 V	Ignition: “ON” Outside air temperature: 20 °C (68 °F)

Terminal	Wire Color	Circuit	Normal voltage	Condition
E05-8*	BLU	Oil pressure switch signal	Refer to “Oil pressure switch signal” (Page 10B-24).	
			Approx. 0 V	Ignition: “ON” Engine: Stopped
E05-9*	RED (Non ABS model) RED/GRN (ABS model)	CAN communication line (high)	Refer to “CAN communication signal” (Page 10B-24)	
E05-10*	RED/BLK	Hood latch switch	Refer to “Hood latch switch signal” (Page 10B-25).	
			Approx. 0 V	Hood latch switch: Opened
E05-11	WHT	Backup power supply	10 – 14 V	—
E05-12	YEL	Power supply for hazard warning light	10 – 14 V	—
E05-13	—	—	—	—
E05-14	BLK	Ground for BCM	Approx. 0 V	—
E05-15	—	—	—	—
E05-16	—	—	—	—
E05-17	—	—	—	—
E05-18	—	—	—	—
E05-19	GRY	Ground for outside air temperature sensor	Approx. 0 V	—
E05-20*	BRN	Brake fluid level switch signal	Refer to “Brake fluid level switch signal, power door lock switch signal (Unlock), driver door key cylinder switch signal and driver seat belt buckle switch signal” (Page 10B-25).	
			0 – 1 V	Ignition switch: “ON” Brake fluid level: Lower than MIN level
E05-21*	WHT (Without ABS model) WHT/GRN (ABS model)	CAN communication line (low)	Refer to “CAN communication signal” (Page 10B-24).	
E05-22	—	—	—	—
E05-23	—	—	—	—
E05-24	GRN/RED	Front and side turn signal light signal (L)	0 ← → 14 V	Left turn signal light: Blinking

Terminal	Wire Color	Circuit	Normal voltage	Condition
G05-1	—	—	—	—
G05-2	—	—	—	—
G05-3	—	—	—	—
G05-4	—	—	—	—
G05-5	—	—	—	—
G05-6*	RED	CAN communication line (high)	Refer to “CAN communication signal” (Page 10B-24).	
G05-7*	PPL	Vehicle speed signal	Refer to “Vehicle speed signal” (Page 10B-25).	
G05-8	—	—	—	—
G05-9	—	—	—	—
G05-10	BLU	Immobilizer control module	—	—
G05-11	WHT/GRN	Immobilizer control module	—	—
G05-12	—	—	—	—
G05-13	GRY	Theft deterrent light signal	0 ← → 14 V	Theft deterrent light: Blink
			10 – 14 V	Other than above condition

Terminal	Wire Color	Circuit	Normal voltage	Condition
G05-14	GRN/WHT	A/C switch signal	10 – 14 V	Ignition: “ON” Blower speed selector: OFF A/C switch: Released
			Approx. 0 V	Ignition: “ON” Blower speed selector: Other than OFF position A/C switch: Pushed
G05-15	LTBLU	Rear defogger switch signal	Refer to “Rear defogger switch signal” (Page 10B-26).	
			Approx. 0 V	Ignition: “ON” Rear defogger switch: Pushed
G05-16	—	—	—	—
G05-17	RED/BLK	Power source (IG)	10 – 14 V	Ignition: “ON”
			Approx. 0 V	Ignition: “OFF”
G05-18*	PNK/GRN	Hazard warning switch signal	Refer to “Hazard warning switch signal and turn signal switch signal” (Page 10B-26).	
			Approx. 0 V	Hazard warning switch: ON
G05-19	—	—	—	—
G05-20	BRN/YEL	Rear defogger relay control (if equipped)	Approx. 0 V	Engine: Running Rear defogger switch: ON
			10 – 14 V	Other than above condition
G05-21	—	—	—	—
G05-22	—	—	—	—
G05-23	—	—	—	—
G05-24	—	—	—	—
G05-25	—	—	—	—
G05-26	WHT	CAN communication line (low)	Refer to “CAN communication signal” (Page 10B-24).	
G05-27	BRN	Shock sensor LIN communication signal	Refer to “Shock sensor LIN communication signal” (Page 10B-26).	
G05-28	—	—	—	—
G05-29	—	—	—	—
G05-30	GRN/YEL	Immobilizer control module	—	—
G05-31	RED/BLK	Immobilizer control module	—	—
G05-32*	RED/BLU	Turn signal switch signal (R)	Refer to “Hazard warning switch signal and turn signal switch signal” (Page 10B-26).	
			Approx. 0 V	Ignition: “ON” Turn signal switch (R): ON
G05-33*	BLU/RED	Turn signal switch signal (L)	Refer to “Hazard warning switch signal and turn signal switch signal” (Page 10B-26).	
			Approx. 0 V	Ignition: “ON” Turn signal switch (L): ON
G05-34	—	—	—	—
G05-35	—	—	—	—
G05-36	PNK	Ground for evaporator temperature sensor	Approx. 0 V	—
G05-37	BLU/WHT	Evaporator temperature sensor signal	About 3.2 V	Ignition: “ON” A/C outlet port temperature: 0 °C (32 °F)
			About 1.8 V	Ignition: “ON” A/C outlet port temperature: 25 °C (77 °F)
G05-38	RED/YEL	Lighting switch signal (CLEARANCE)	10 – 14 V	Lighting switch: “CLEARANCE” position or “HEAD” position
			Approx. 0 V	Lighting switch: OFF
G05-39	YEL/RED	Key reminder switch signal	10 – 14 V	Ignition key: Inserted to ignition key cylinder
			Approx. 0 V	Ignition key: Pulled out from ignition key cylinder

Terminal	Wire Color	Circuit	Normal voltage	Condition
G05-40	WHT/BLK	Power source (ACC)	10 – 14 V	Ignition: “ACC” or “ON”
			Approx. 0 V	Ignition: “OFF”

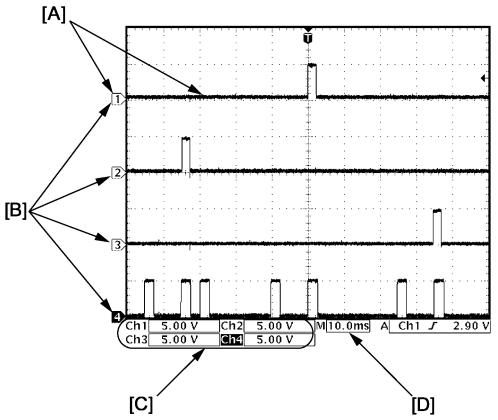
Terminal	Wire Color	Circuit	Normal voltage	Condition
L02-1*	GRN	Other than driver door lock actuator control (Unlock)	10 – 14 V	Unlock signal is output for other than driver door actuator
			Approx. 0 V	Other than above condition
L02-2	GRN/RED	Rear left turn signal light signal	0 ← → 14 V	Rear left turn signal light: blink
L02-3*	RED	CAN communication line (high)	Refer to “CAN communication signal” (Page 10B-24).	
L02-4*	GRY/RED	Power door lock switch signal (Lock) (if equipped)	Refer to “Power door lock switch signal (Lock), rear end door switch signal, driver door switch signal and other than driver door switch signal” (Page 10B-27).	
			0 – 1 V	Power door lock switch: “Lock” position
L02-5	BLU/YEL	Rear right turn signal light signal	0 ← → 14 V	Rear right turn signal light: blink
L02-6*	LTGRN/BLK	Driver door key cylinder switch signal (Lock) (if equipped)	Refer to “Brake fluid level switch signal, power door lock switch signal (Unlock), driver door key cylinder switch signal and driver seat belt buckle switch signal” (Page 10B-25).	
			0 – 1 V	Door key cylinder switch: “Lock” position
L02-7*	LTBLU	Rear end door switch signal	Refer to “Power door lock switch signal (Lock), rear end door switch signal, driver door switch signal and other than driver door switch signal” (Page 10B-27).	
			Approx. 0 V	Rear end door: Opened
L02-8*	YEL	Driver door switch signal	Refer to “Power door lock switch signal (Lock), rear end door switch signal, driver door switch signal and other than driver door switch signal” (Page 10B-27).	
			Approx. 0 V	Driver door: Opened
L02-9	—	—	—	—
L02-10	—	—	—	—
L02-11	—	—	—	—
L01-12	—	—	—	—
L02-13	WHT/GRN	Power supply for door lock actuator (if equipped)	10 – 14 V	Ignition switch is at all positions
L02-14*	GRN/BLK	Driver door lock actuator control (Unlock)	10 – 14 V	Unlock signal is output for driver door actuator
			Approx. 0 V	Other than above condition
L02-15*	RED/BLU	Door lock actuator control (Lock) (if equipped)	10 – 14 V	Lock signal is output for all door lock actuators
			Approx. 0 V	Other than above condition
L02-16*	WHT	CAN communication line (low)	Refer to “CAN communication signal” (Page 10B-24).	
L02-17*	PPL/GRN	Power door lock switch signal (Unlock) (if equipped)	Refer to “Brake fluid level switch signal, power door lock switch signal (Unlock), driver door key cylinder switch signal and driver seat belt buckle switch signal” (Page 10B-25).	
			Approx. 0 V	Power door lock switch: “Unlock” position
L02-18	PPL/YEL	Dome light signal	10 – 14 V	Dome light switch: “DOOR” position Dome light: Does not light up
			Approx. 0 V	Dome light switch: “DOOR” position Dome light: Light up
L02-19*	BRN	Driver door key cylinder switch signal (Unlock) (if equipped)	Refer to “Brake fluid level switch signal, power door lock switch signal (Unlock), driver door key cylinder switch signal and driver seat belt buckle switch signal” (Page 10B-25)	
			Approx. 0 V	Door key cylinder switch: “Unlock” position

Terminal	Wire Color	Circuit	Normal voltage	Condition
L02-20*	BRN/YEL	Driver seat belt buckle switch signal	Refer to “Brake fluid level switch signal, power door lock switch signal (Unlock), driver door key cylinder switch signal and driver seat belt buckle switch signal” (Page 10B-25)	
			Approx. 0 V	Ignition switch: ON Driver seat belt: Unfastened
L02-21*	BLK/RED	Other than driver door switch signal	Refer to “Power door lock switch signal (Lock), rear end door switch signal, driver door switch signal and other than driver door switch signal” (Page 10B-27).	
			Approx. 0 V	Other than driver door: Opened
L02-22*	RED/BLK	Parking brake switch signal	Refer to “Parking brake switch signal” (Page 10B-26).	
			Approx. 0 V	Ignition switch: ON Parking brake lever: Pulled up
L02-23	—	—	—	—
L02-24	—	—	—	—
L02-25	—	—	—	—
L02-26	BLK	Ground for BCM	Approx. 0 V	—

Reference Waveform

NOTE

- **Waveform analysis is as follows.**



I8T401111066-01

[A]: Waveform of channel 1	[C]: VOLT/DIV of each channel
[B]: Ground level of each channel	[D]: TIME/DIV

- **Waveform might change depending on measurement condition and vehicle spec.**

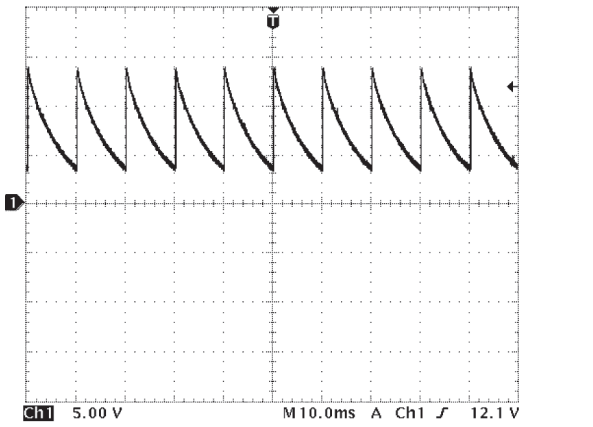
Oil pressure switch signal

Oil pressure switch signal:

Channel	Probe	Terminal No.
1	+	E05-8
	-	E05-14

Measurement condition

- Engine: Running



IDL70AA20018-01

CAN communication signal

CAN communication signal (High) (1):

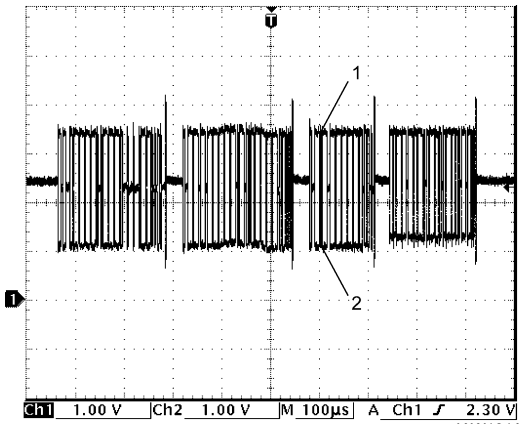
Channel	Probe	Terminal No.
1	+	E05-9 G05-6 L02-3
	–	E05-14

CAN communication signal (Low) (2):

Channel	Probe	Terminal No.
2	+	E05-21 G05-26 L02-16
	–	E05-14

Measurement condition

- Ignition: “ON”



IAW101A20014-01

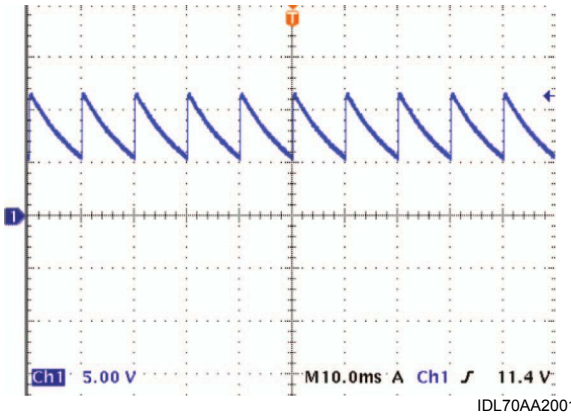
Hood latch switch signal

Hood latch switch signal:

Channel	Probe	Terminal No.
1	+	E05-10
	-	E05-14

Measurement condition

- Hood: Closed



IDL70AA20019-02

Brake fluid level switch signal, power door lock switch signal (Unlock), driver door key cylinder switch signal and driver seat belt buckle switch signal

Brake fluid level switch signal:

Channel	Probe	Terminal No.
1	+	E05-20
	-	E05-14

Measurement condition

- Ignition: “ON”
- Brake fluid level switch: OFF (brake fluid level: higher than MIN level)

Power door lock switch signal (Unlock):

Channel	Probe	Terminal No.
1	+	L02-17
	-	E05-14

Measurement condition

- Power door lock switch (Unlock): OFF

Driver door key cylinder switch signal (Lock):

Channel	Probe	Terminal No.
1	+	L02-6
	-	E05-14

Measurement condition

- Driver door key cylinder switch (Lock): OFF

Driver door key cylinder switch signal (Lock):

Channel	Probe	Terminal No.
1	+	L02-19
	-	E05-14

Measurement condition

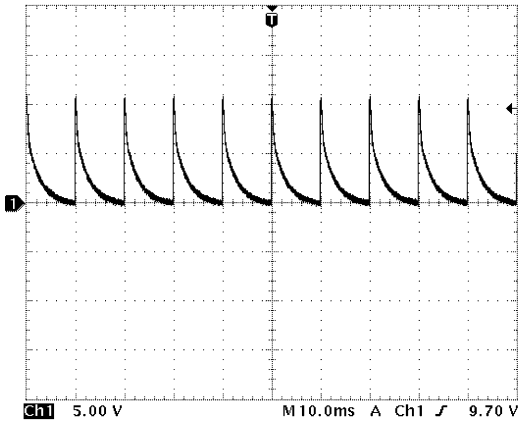
- Driver door key cylinder switch (Unlock): OFF

Driver seat belt buckle switch signal:

Channel	Probe	Terminal No.
1	+	L02-20
	-	E05-14

Measurement condition

- Ignition: “ON”
- Driver seat belt: Fastened



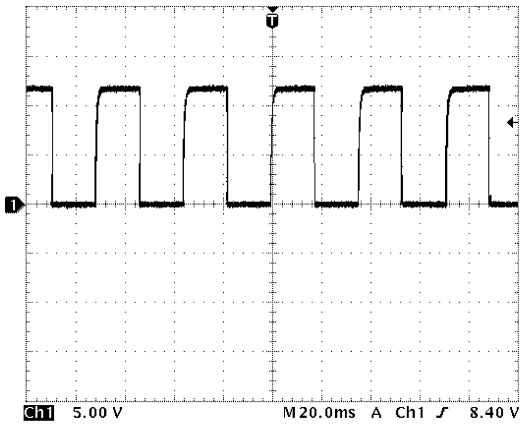
I9W10PA20015-01

Vehicle speed signal

Channel	Probe	Terminal No.
1	+	G05-7
	-	E05-14

Measurement condition

- Vehicle speed: 40 km/h (25 mph)



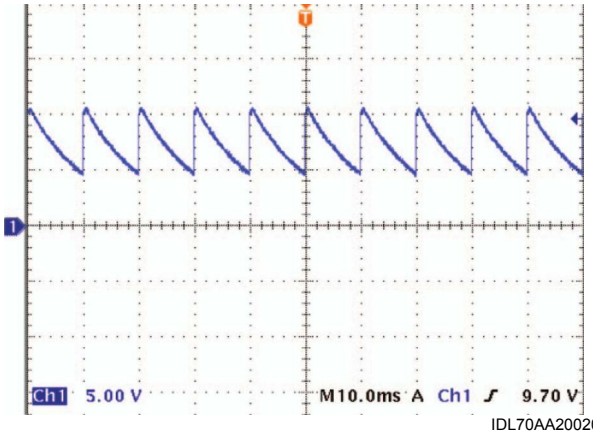
IAW101A20021-01

Rear defogger switch signal

Channel	Probe	Terminal No.
1	+	G05-15
	-	E05-14

Measurement condition

- Ignition switch: “ON”
- Rear defogger switch: OFF



IDL70AA20020-02

Hazard warning switch signal and turn signal switch signal

Hazard warning switch signal:

Channel	Probe	Terminal No.
1	+	G05-18
	-	E05-14

Measurement condition

- Hazard warning switch: OFF

Turn signal switch signal (R):

Channel	Probe	Terminal No.
1	+	G05-32
	-	E05-14

Measurement condition

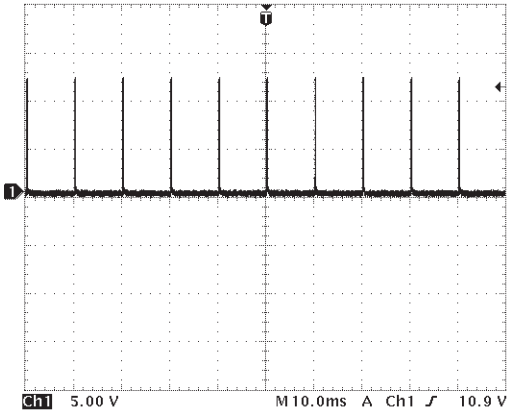
- Ignition: “ON”
- Turn signal switch (R): OFF

Turn signal switch signal (L):

Channel	Probe	Terminal No.
1	+	G05-33
	-	E05-14

Measurement condition

- Ignition: “ON”
- Turn signal switch (L): OFF



IDL70AA20021-05

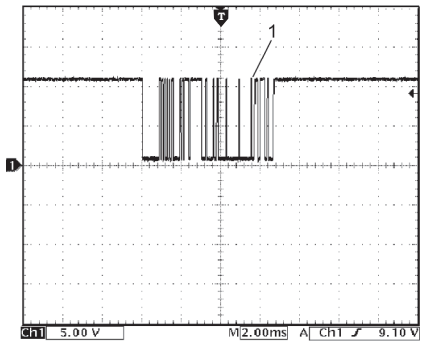
Shock sensor LIN communication signal

Shock sensor LIN communication signal (1):

Channel	Probe	Terminal No.
1	+	G05-26
	-	E05-14

Measurement condition

- Ignition: “ON”



IDL70AA20022-01

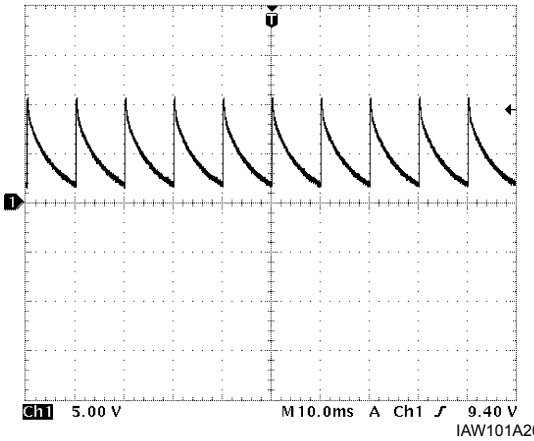
Parking brake switch signal

Parking brake switch signal:

Channel	Probe	Terminal No.
1	+	L02-22
	-	E05-14

Measurement condition

- Ignition: “ON”
- Parking brake lever: Released



IAW101A20015-01

Power door lock switch signal (Lock), rear end door switch signal, driver door switch signal and other than driver door switch signal

Power door lock switch signal:

Channel	Probe	Terminal No.
1	+	L02-4
	-	E05-14

Measurement condition

- Power door lock switch (Lock): OFF

Rear end door switch signal:

Channel	Probe	Terminal No.
1	+	L02-7
	-	E05-14

Measurement condition

- Rear end door: Closed

Driver door switch signal:

Channel	Probe	Terminal No.
1	+	L02-8
	-	E05-14

Measurement condition

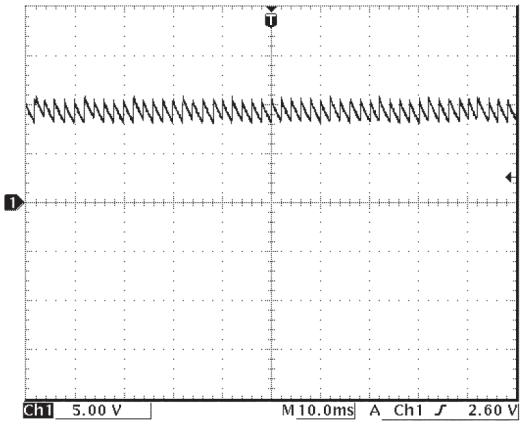
- Driver door: Closed

Other than driver door switch signal:

Channel	Probe	Terminal No.
1	+	L02-21
	-	E05-14

Measurement condition

- Other than driver door: Closed

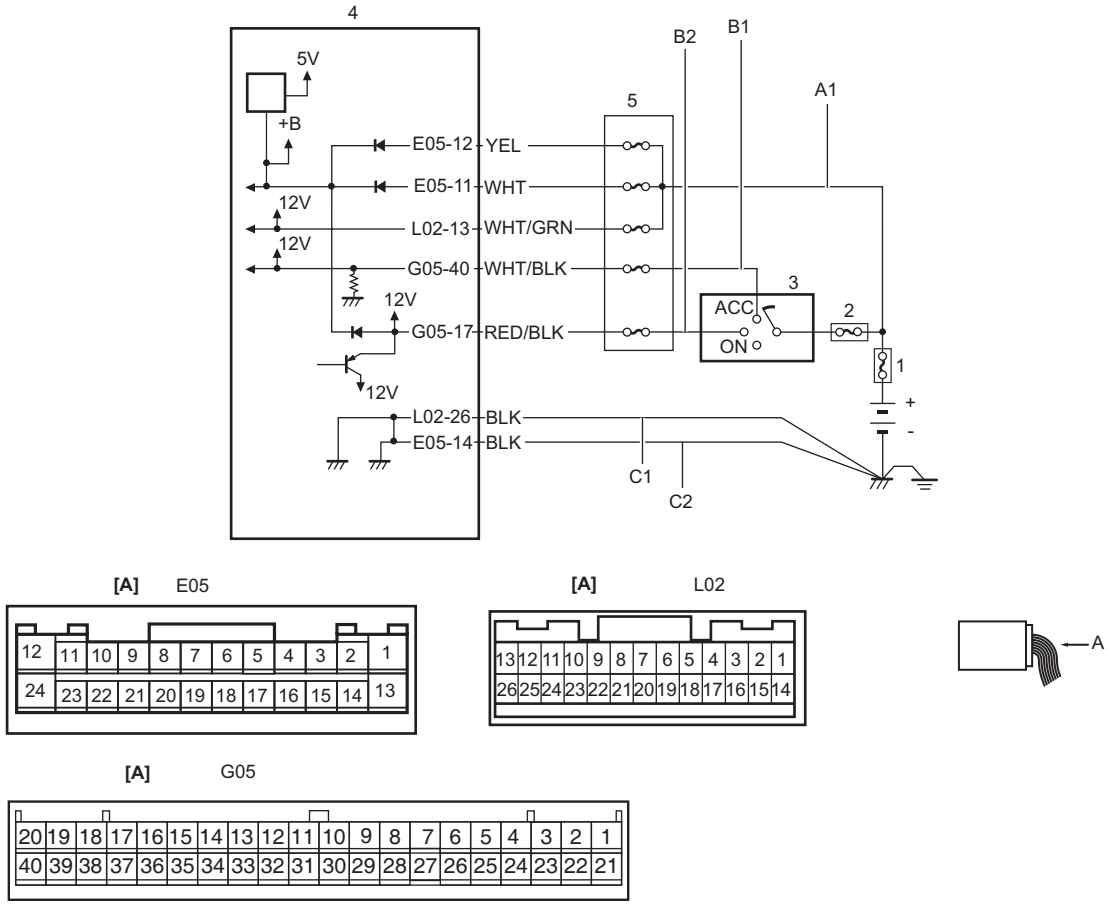


IDL70AA20023-01

BCM Power Circuit and Ground Circuit Check

AENDL70AA204019

Circuit Diagram



IDL70AA20012-02

[A]: BCM connector (View: A)	C1: BCM ground circuit 1	3. Ignition switch
A1: Backup supply circuit	C2: BCM ground circuit 2	4. BCM
B1: Ignition switch signal circuit 1	1. Main fuse box	5. Junction block
B2: Ignition switch signal circuit 2	2. Individual circuit fuse box No.1	

Troubleshooting

⚠ CAUTION

BCM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to BCM connector directly.

NOTE

- **Before troubleshooting, perform following items.**
  - **Check that battery voltage is 12 V or higher.**
  - **Check related fuses of BCM power circuit.**
    If a fuse is blown out, check the circuits connected to the blown fuse whether any of them is short to ground. If the circuit is OK, replace the fuse.

1) Measure voltage between each terminal of BCM connector and body ground in the following table. If each measured voltage is out of specified voltage, repair or replace related part.

Terminal	Specified voltage			Related part
	Ignition switch: OFF	Ignition switch: ACC	Ignition switch: ON	
"E05-11" to body ground	Battery voltage			Backup power supply circuit (A1)
"E05-12" to body ground				
"L02-13" to body ground				
"G05-40" to body ground	0 – 1 V	Battery voltage		• Ignition switch signal circuit (B1) • Ignition switch ☞(Page 6B-10)
"G05-17" to body ground	0 – 1 V	0 – 1 V	Battery voltage	• Ignition switch signal circuit (B2) • Ignition switch ☞(Page 6B-10)

2) Measure voltage between each terminal of backup power supply circuit and BCM ground terminal in the following table.
If each measured voltage is out of specified voltage, repair or replace related part.

Terminal	Specified voltage		Related part
	Ignition switch: OFF	Ignition switch: ON	
"E05-11" to "L02-26"	Battery voltage		BCM ground circuit (C1)
"E05-11" to "E05-14"			BCM ground circuit (C2)

Repair Instructions

Ignition Key Registration

AENDL70AA206003

NOTE

- **Refer to "SUZUKI Scan Tool operator's Manual" for the procedure of immobilizer registration.**
- **It is possible to register 4 ignition keys in the BCM.**
- **If the BCM is replaced, register all ignition keys.**
- **Refer to "Transmitter Code Programming (If Equipped)" in Section 9F (Page 9F-12) for remote controller registration.**

1) Perform "Immobilizer Key Registration" to clear all ID codes already registered. Keep all ignition keys ready for registration.
2) Register ignition key ID code using "Immobilizer Key Registration" function in SUZUKI scan tool.

BCM Registration

AENDL70AA206004

NOTE

When the ECM and the BCM are replaced with new ones at the same time, perform "Immobilizer Key Registration" instead of "ECM Registration" using SUZUKI scan tool and immobilizer cable. Refer to "SUZUKI Scan Tool Operator's Manual" for the immobilizer registration.

After the BCM is replaced with new one, register ignition key ID code in the BCM using SUZUKI scan tool and immobilizer cable.

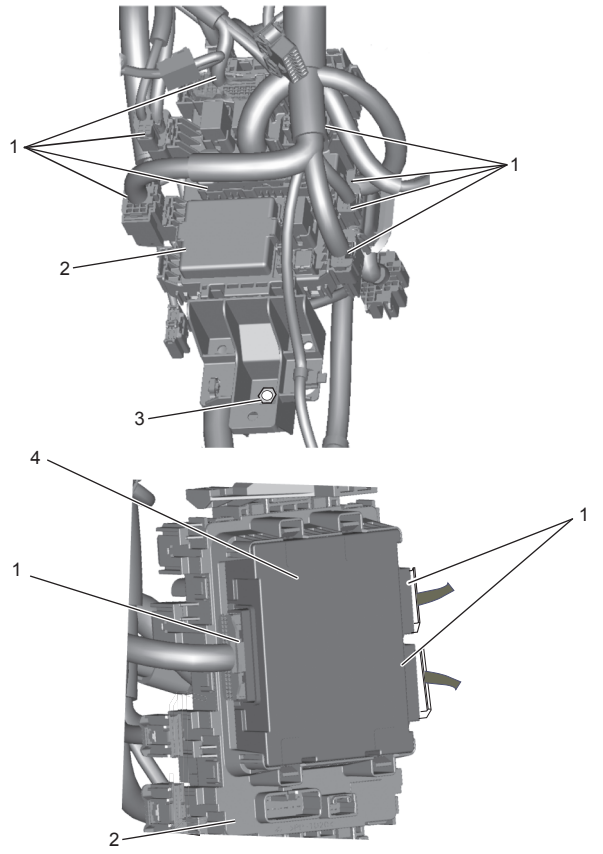
1) Keep all ignition keys ready for registration.
2) Perform "Immobilizer Key Registration" in "Immobilizer" menu indicated on SUZUKI scan tool. Refer to "SUZUKI Scan Tool Operator's Manual".

BCM Removal and Installation

AENDL70AA206001

Removal

1) Disconnect negative (-) cable at battery.
2) Disable air bag system. ☞(Page 8B-47)
3) Remove steering column hole cover. ☞(Page 6B-1)
4) Remove dash side trim. ☞(Page 9H-5)
5) Disconnect connectors (1).
6) Disconnect wiring harness clamps from J/B (2).
7) Remove nuts (3), and then J/B (2) with BCM (4).
8) Remove BCM (4) from junction block assembly (2).



IDL70AA20013-04

Installation

Reverse removal procedure noting the following points.

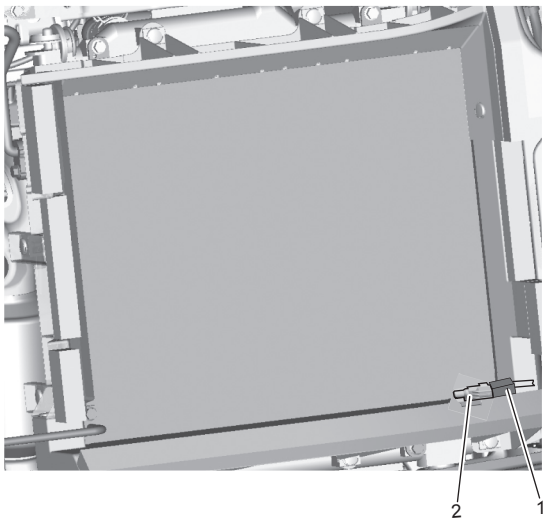
- Connect connectors securely.
- Enable air bag system. ☞(Page 8B-47)
- If BCM is replaced, perform “BCM Registration” (Page 10B-29).

Outside Air Temperature Sensor Removal and Installation

AENDL70AA206005

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper. ☞(Page 9H-1)
3) Disconnect connector (1) from outside air temperature sensor.
4) Remove outside air temperature sensor (2) from front bumper upper member.



IDL70AA20015-07

Installation

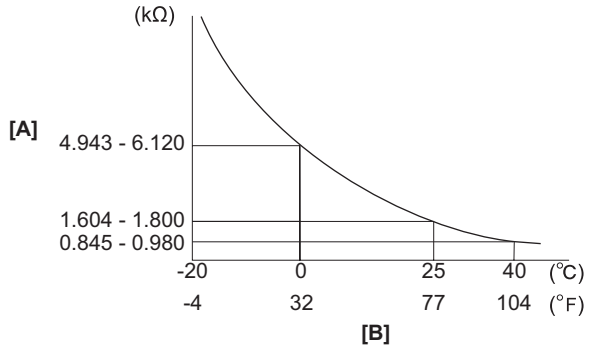
Reverse removal procedure.

Outside Air Temperature Sensor Inspection

AENDL70AA206006

Measure resistance of outside air temperature sensor using ohmmeter.
If check result is not as specified, replace outside air temperature sensor.

Outside air temperature sensor resistance
0 °C (32 °F): 4.93 – 6.12 kΩ
25 °C (77 °F): 1.62 – 1.79 kΩ
40 °C (104 °F): 0.84 – 0.99 kΩ



IDL70AA20014-02

[A]: Resistance	[B]: Temperature

Procedure for Switching Security Alarm

AENDL70AA206008

Using SUZUKI Scan Tool

Select “Security Alarm” referring to “Scan Tool Utility Table” (Page 10B-13).

Not Using Suzuki Scan Tool

NOTE

- **Perform Step 3) - 4) within 15 sec. If it is not possible to perform Step 3) - 4) within 15 sec., repeat this procedure from Step 1). If unnecessary operations such as opening doors during this procedure are performed, switching mode will be cancelled.**
- **This procedure can be performed by customized menu of combination meter.**

1. Check that the vehicle is in stationary condition.
2. Perform following steps:
   – Set ignition “OFF”.
   – Close all doors.
   – Unlock doors.
   – Set ignition “ON”.
3. Turn lighting switch to “ON’ and “OFF” position for 4 times continuously.
4. Lock and unlock driver door lock lever for 3 times continuously.
5. After performing step 4), setting of switching is completed. According to the setting, BCM will sound buzzer.
   Repeating from Step 1) - 4) again will change the switching mode. Switching mode will be changed in order of “OFF”, “ON” and “OFF” and BCM will sound buzzer accordingly.

Switching mode	Buzzer
“OFF” mode → “ON” mode	4 times
“ON” mode → “OFF” mode	Once

Procedure for Switching Shock Sensor

AENDL70AA206009

Setting of shock sensor function in security alarm will switch it to “ON” mode or “OFF” mode.
Select “Shock Sensor” referring to “Scan Tool Utility Table” (Page 10B-13) to switch shock sensor.

NOTE

This procedure can be performed by customized menu of combination meter.

Procedure for Switching Shock Sensor Full Blast Sensitivity

AENDL70AA206010

Setting of shock sensor full blast sensitivity can be switched in 16 levels (OFF, Level 1,....., Level 15). The level with bigger number can detect weaker vibration.
Select “Shock Sensor Full Blast Sensitivity” referring to “Scan Tool Utility Table” (Page 10B-13).

NOTE

This procedure can be performed by customized menu of combination meter.

Procedure for Switching Shock Sensor Pre-warn Sensitivity

AENDL70AA206011

Setting of shock sensor pre-warn sensitivity can be switched in 16 levels (OFF, Level 1,....., Level 15). The level with bigger number can detect weaker vibration.
Select “Shock Sensor Pre-warn Sensitivity” referring to “Scan Tool Utility Table” (Page 10B-13).

NOTE

This procedure can be performed by customized menu of combination meter.

Procedure for Switching Door Unlock

AENDL70AA206012

When unlocking doors by inserting key in driver’s side door or by pushing “UNLOCK” button of transmitter, setting of unlocking mode can be switched.

- 1 Action: All doors are unlocked at the same time by the 1st action.
- 2 Action: Driver’s side door is unlocked by the 1st action and other doors are unlocked by the 2nd action.

Select “Door Unlock” referring to “Scan Tool Utility Table” (Page 10B-13).

NOTE

This procedure can be performed by customized menu of combination meter.

Procedure for Switching Auto Drive Unlock

AENDL70AA206013

Setting condition for unlocking all doors automatically (Passive/Ignition Key/ Shift Position) is switched.
Select “Auto Drive Unlock” referring to “Scan Tool Utility Table” (Page 10B-13).

NOTE

This procedure can be performed by customized menu of combination meter.

Procedure for Switching Auto Drive Lock

AENDL70AA206014

Setting condition for locking all doors automatically (Passive/Vehicle Speed/ Shift Position) is switched.
Select “Auto Drive Lock” referring to “Scan Tool Utility Table” (Page 10B-13).

NOTE

This procedure can be performed by customized menu of combination meter.

Transmitter Battery Replacement (If Equipped)

AENDL70AA206007

NOTE

- **To prevent theft, be sure to break the transmitter before discarding it.**
- **Dispose of the used battery properly according to applicable rules or regulations. Do not dispose of lithium batteries with ordinary household trash.**

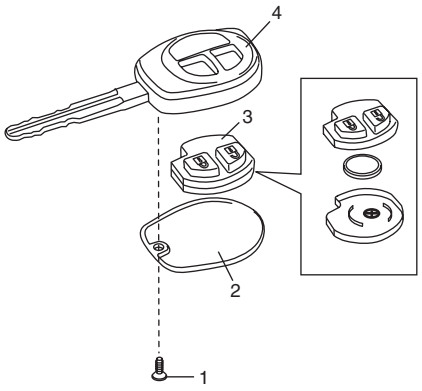
If transmitter becomes unreliable, replace transmitter battery as follows.

1) Remove screw (1) and transmitter cover (2).
2) Remove transmitter (3) from transmitter holder (4).
3) With tip of flat-bladed screwdriver put in slot of transmitter, pry it open.

⚠ CAUTION

Do not allow grease or dirt to stick to the printed circuit board and the battery.

4) Replace the battery (lithium disc-type CR 1616 or equivalent battery) so that its (+) terminal faces "+" mark on transmitter.
5) Fit together parts of transmitter and install parts of transmitter into transmitter holder.
6) Install transmitter cover and screw.
7) Check that door locks can operate with transmitter.



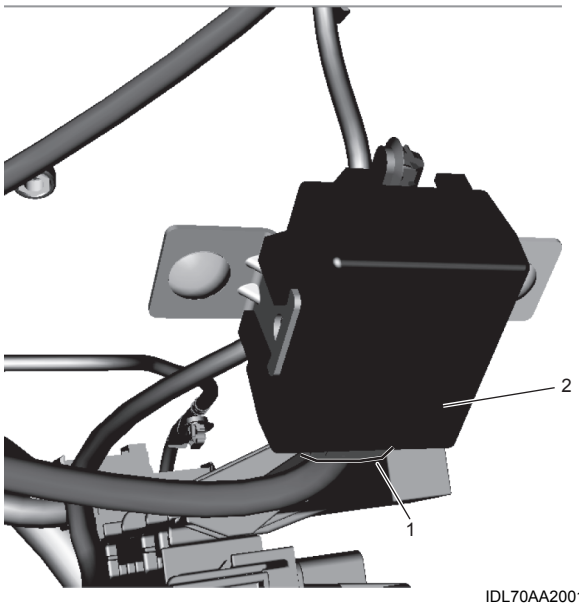
I4RS0B960014-01

Shock Sensor Removal and Installation

AENDL70AA206015

Removal

1) Disconnect negative(-) cable at battery.
2) Remove instrument panel side garnish.
3) Disconnect shock sensor connector (1).
4) Remove screw and then remove shock sensor (2).



IDL70AA20017-02

Installation

Reverse removal process.

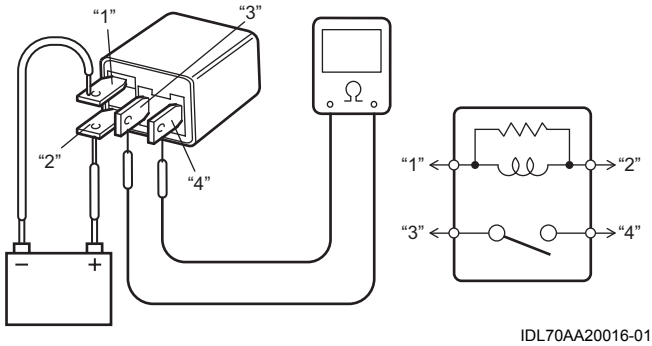
Control Relay Inspection

AENDL70AA206002

1) Disconnect relay(s) to be checked. ☞(Page 10B-7)
2) Check that there is no continuity between terminals "3" and "4".
   If check result shows there is fault, replace relay.
3) Measure resistance between "1" and "2" terminals of relay.
   If check result is not as specified, replace relay.

   Relay resistance
   Between terminal "1" and "2": Approx 170 Ω at 20 °C (68 °F)

4) Connect battery positive (+) terminal and negative (–) terminal to relay as shown in the figure, check for continuity between terminals "3" and "4".
   If there is no continuity when relay is connected to the battery, replace relay.

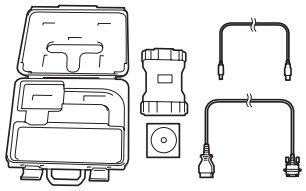


IDL70AA20016-01

Special Tools and Equipment

Special Tool

AENDL70AA208001

SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 10B-9) / ☞(Page 10B-9)		

Immobilizer Control System

Precautions

Precautions for Diagnosing Trouble

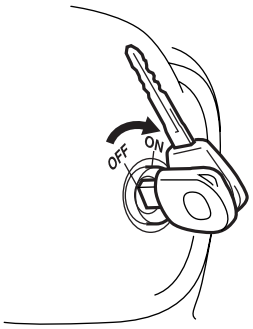
AENDL70AA300001

- Immobilizer control system is controlled by BCM and ECM. Before diagnosing troubles, refer to “Precautions for Diagnosing Trouble” in Section 10B (Page 10B-1).

Precautions for Immobilizer System

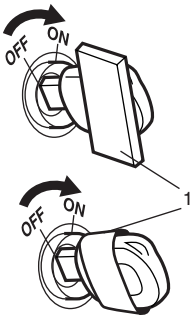
AENDL70AA300003

- Do not turn ON ignition switch with ignition key in contact with another one or quite close to another one. Otherwise, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



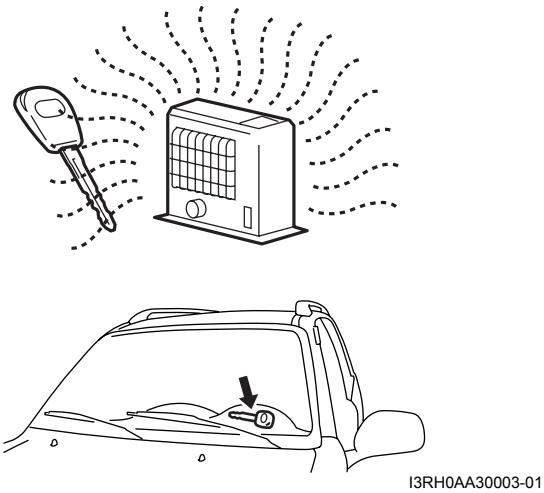
I3RH0AA30001-01

- Do not turn ON ignition switch by using ignition key with any type of metal (1) wrapped around its grip or in contact with it. Otherwise, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



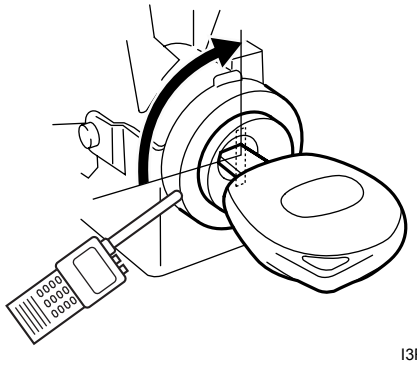
I3RH0AA30002-01

- Do not leave ignition key in a place where temperature is high. High temperature may damage the transponder built in the ignition key.



I3RH0AA30003-01

- Do not turn ignition switch to ON position when any radio antenna is close to coil antenna. Otherwise, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30004-01

General Description

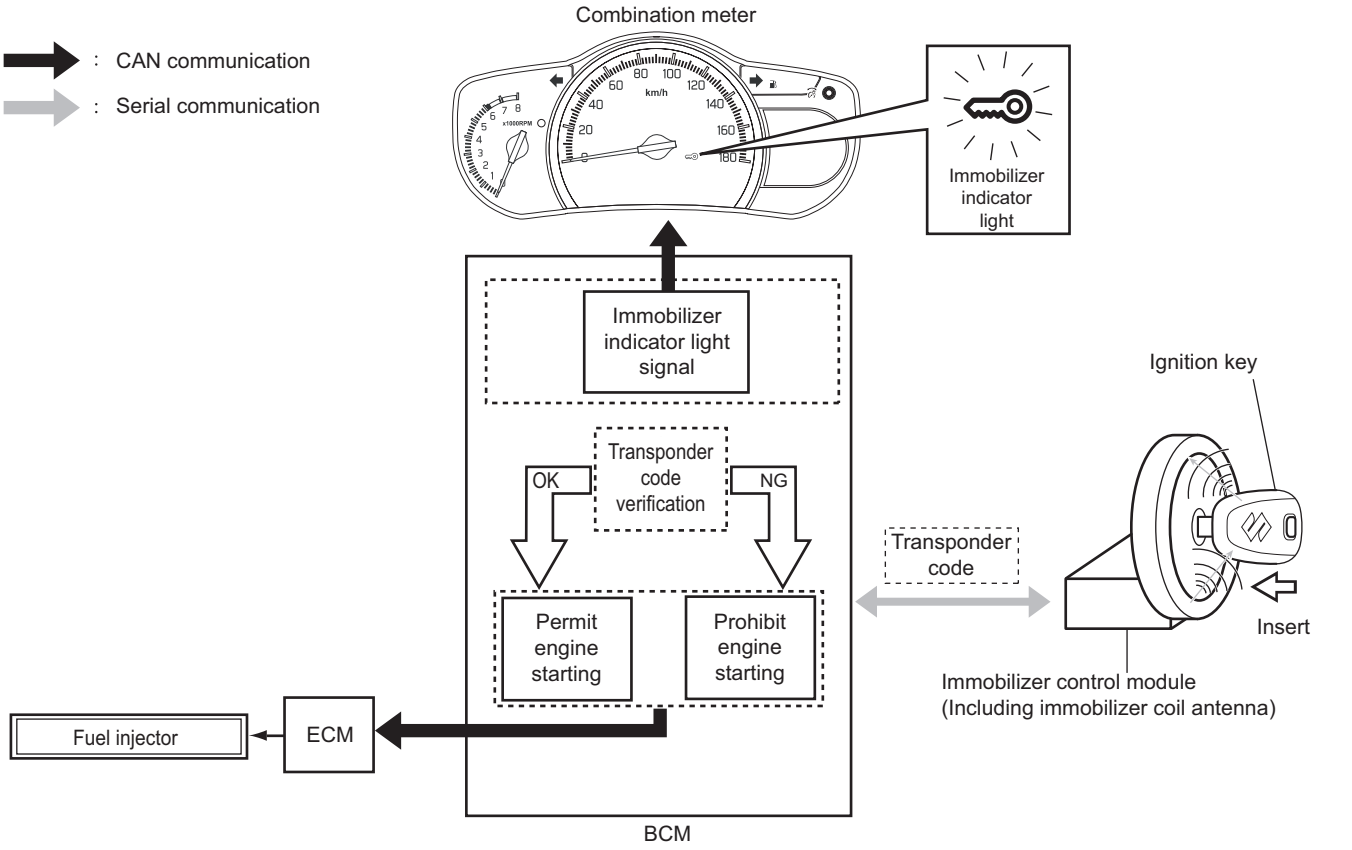
Immobilizer Control System Description

AENDL70AA301001

When the ignition switch is set “ON”, the immobilizer coil antenna receives transponder code from the ignition key. The immobilizer coil antenna then transmits the transponder code thus received to BCM by means of serial communications.
BCM compares this transponder code with the transponder code that has already been registered in BCM.

- If both the transponder codes agree, BCM sends engine start permission signal to ECM via CAN communication.
- If both the transponder codes do not agree, BCM sends engine start prohibition signal to ECM via CAN communication.

Upon receipt of the engine start prohibition signal, ECM prohibits fuel injection and ignition to occur, thereby prohibits the engine from starting.
At the same time, BCM or ECM sends a signal to the combination meter, requesting illumination or blinking of the immobilizer indicator light. The driver is then alerted to presence of an abnormality by lighting or blinking of the immobilizer indicator light.



IDL70AA30004-01

CAN Communication System Description

AENDL70AA301002

ECM and BCM are using CAN communication to communicate with other control modules. For more detail of CAN communication, refer to “CAN Communication System Description” in Section 10H (Page 10H-1).

Schematic and Routing Diagram

Immobilizer Control System Circuit Diagram

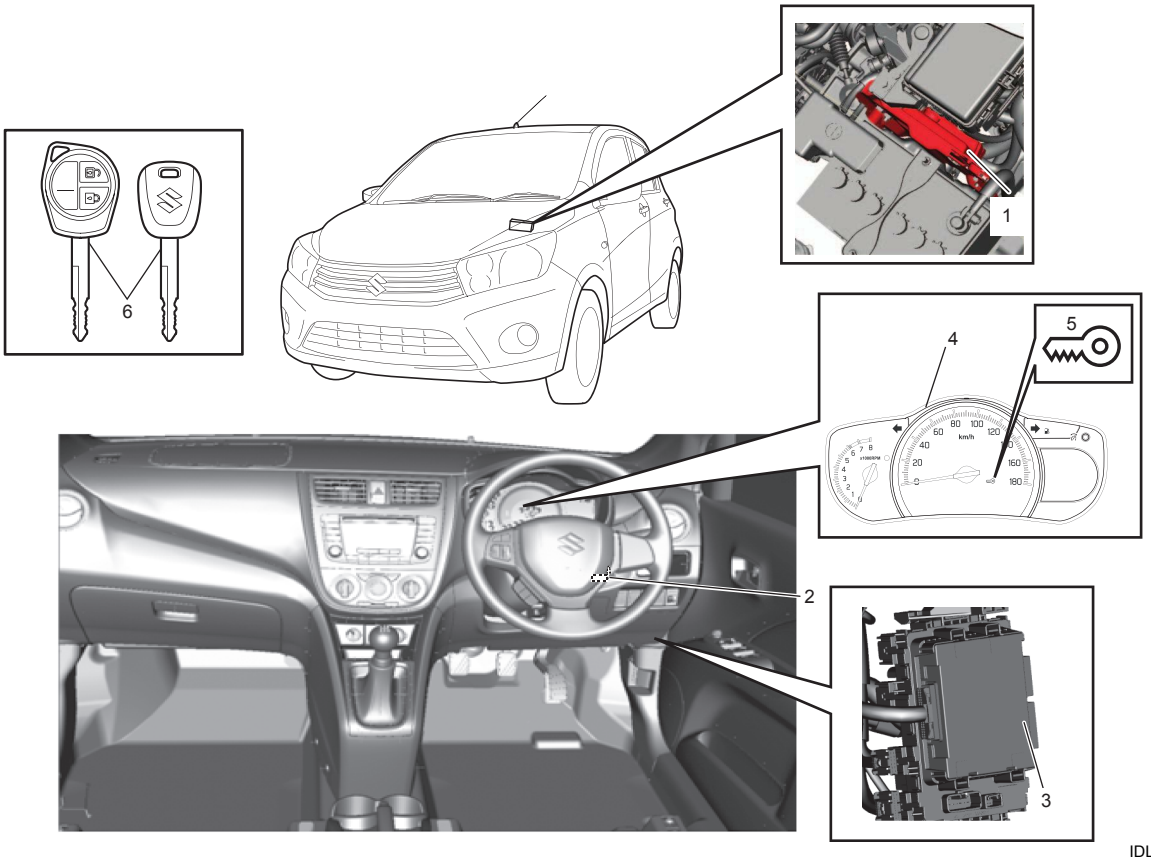
AENDL70AA302001

Refer to “Body Electrical Control System Circuit Diagram” in Section 10B (Page 10B-4).

Component Location

Immobilizer Control System Component Location

AENDL70AA303001



IDL70AA30001-02

1. ECM	4. Combination meter
2. Immobilizer control module	5. Immobilizer indicator light
3. BCM	6. Ignition key

Diagnostic Information and Procedures

Immobilizer Control System Check

AENDL70AA304001

Step	Action	Yes	No
1	**Engine start check** 1) Start engine. *Does engine start?*	Immobilizer control system is in good condition.	Go to Step 2.
2	**DTC check** 1) Check DTC. ☞(Page 10C-3) *Is DTC detected?*	Go to applicable DTC troubleshooting.	Go to “Engine Basic Inspection” in Section 1A (Page 1A-32).

Immobilizer Control System Self-Diagnosis Function

AENDL70AA304011

ECM and BCM monitor each of the input and output signals of the immobilizer system, and they are equipped with a self-diagnosis function which displays DTC when an abnormality is detected.
Also, when an abnormality is detected, immobilizer indicator light blinks or lights up to warn the driver.

Conditions vary depending on the details of the abnormality, but the basic lighting patterns indicate the following

- Lighting: Engine can be started
- Blinking: Engine cannot be started

DTC Check

AENDL70AA304002

- ECM: Refer to “DTC Check” in Section 1A (Page 1A-19).
- BCM: Refer to “DTC Check” in Section 10B (Page 10B-9).

DTC Clearance

AENDL70AA304003

- ECM: Refer to “DTC Clearance” in Section 1A (Page 1A-20).
- BCM: Refer to “DTC Clearance” in Section 10B (Page 10B-9).

DTC Table

AENDL70AA304004

NOTE

- **When immobilizer DTC is detected on ECM, troubleshoot DTC item first and check whether the same DTC is indicated on the BCM.**
- ***1: Whether immobilizer indicator light comes on or not depends on the trouble condition.**

ECM

DTC	DTC name	DTC detecting condition	Immobilizer indicator light
P1610 ☞(Page 10C-5)	Immobilizer ID and/or Password Not Registered	Immobilizer ID code is not registered.	Blinking
P1611 ☞(Page 10C-5)	Password Not Matched	Stored password is incorrect.	Off
P1622 ☞(Page 10C-6)	EEPROM Reading / Writing Error	EEPROM in ECM is corrupted.	Blinking*1
P1642 ☞(Page 10C-6)	Immobilizer Communication Line Error	Communication error with BCM.	Blinking
P1644 ☞(Page 10C-7)	Immobilizer ID Mismatched	Verification error between ECM and BCM.	Blinking
P1645 ☞(Page 10C-7)	ID Code Communication Error	Communication error with controller.	Blinking or lighting
P1646 ☞(Page 10C-7)	ID Code Incorrectness	CAN communication error.	Blinking or lighting

BCM

DTC	DTC name	DTC detecting condition	Immobilizer indicator light
B1167 ☞(Page 10C-8)	Immobilizer Information Mismatched	Verification error between BCM and ECM.	Off
B1168 ☞(Page 10C-9)	Password Mismatched	Wrong password is inputted.	Off
B1169 ☞(Page 10C-9)	Registration Failure	Registration failure of ECM or ignition key.	Off
B1170 ☞(Page 10C-9)	EEPROM Access Error	Reading / writing error in EEPROM is detected.	Lighting
B1173 ☞(Page 10C-10)	Transponder Unregistered	Transponder code in the transponder built in ignition key is not registered.	Blinking

DTC	DTC name	DTC detecting condition	Immobilizer indicator light
B1175 ☞(Page 10C-10)	Immobilizer Information Unregistered	Immobilizer ID code is not registered in BCM.	Blinking
B1176 ☞(Page 10C-11)	Specification Information Unregistered	Vehicle specification is not registered in BCM.	Blinking
B1188 ☞(Page 10C-11)	Transponder Communication Error	Verification error between ignition key and BCM.	Blinking
B1189 ☞(Page 10C-11)	Immobilizer Antenna Communication Error	Communication error with immobilizer control module (built-in immobilizer coil antenna).	Blinking
B1190 ☞(Page 10C-12)	Engine Switch Malfunction	Immobilizer control module is faulty.	Blinking

DTC P1610

AENDL70AA304006

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1610: Immobilizer ID and/or Password Not Registered Immobilizer ID code is not registered.	• ECM ID code is not registered in BCM • ECM • CAN communication circuit / connector • Control module connected with CAN communication line

DTC Troubleshooting

Step	Action	Yes	No
1	**Engine registration** 1) Perform “ECM Registration” (Page 10C-13). 2) Recheck DTC. ☞(Page 10C-3) *Is DTC P1610 still detected?*	Go to Step 2.	End. (ECM was not registered)
2	**DTC check** 1) Check DTC in BCM. ☞(Page 10B-9) *Is DTC B1173, B1175 or B1176 detected?*	Go to troubleshooting for applicable DTC.	Go to Step 3.
3	**DTC check** 1) Check DTC related to CAN communication. *Is there any CAN-DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Replace ECM and recheck DTC.

DTC P1611

AENDL70AA304007

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1611: Password Not Matched Stored password is incorrect.	• BCM or ECM which was used in another vehicle has been installed • ECM • BCM

DTC Troubleshooting

Step	Action	Yes	No
1	**Engine registration** 1) Perform “ECM Registration” (Page 10C-13). 2) Recheck DTC. ☞(Page 10C-3) *Is DTC P1611 still detected?*	• Replace ECM and recheck DTC. If DTC P1611 is still detected, replace BCM and recheck DTC. – ECM: ☞(Page 1C-1) – BCM: ☞(Page 10B-29)	End. (ECM was not registered)

DTC P1622

AENDL70AA304008

DTC Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
P1622: EEPROM Reading / Writing Error EEPROM in ECM is corrupted.	ECM

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check that ignition is “OFF”. 2) Set ignition “ON”. 3) Recheck DTC. *Is DTC P1622 still detected?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	End. (Intermittent trouble)

DTC P1642

AENDL70AA304009

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1642: Immobilizer Communication Line Error Communication error with BCM.	• CAN communication circuit / connector • Control module connected with CAN communication line • ECM • BCM

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC related to CAN communication. *Is there any CAN-DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**CAN communication circuit check** 1) Check CAN communication circuit referring to “Diagnosis Procedure” in “Troubleshooting for Communication Bus Off”. ☞(Page 10H-16) *Is check result OK?*	• Replace ECM and recheck DTC. If DTC P1642 is still detected, replace BCM and recheck DTC. – ECM: ☞(Page 1C-1) – BCM: ☞(Page 10B-29)	Repair or replace defective wire harness.

DTC P1644

AENDL70AA304012

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1644: Immobilizer ID Mismatched Verification error between ECM and BCM.	• Ignition key • ECM ID code is not registered in BCM • Ignition key is not registered • Immobilizer control module circuit / connector • Immobilizer control module • BCM power supply / ground circuit • ECM • BCM

DTC Troubleshooting

NOTE

If the BCM is one that was already registered with another vehicle (used item), ignition key cannot be registered in it. Always install a new BCM when replacement is necessary.

Step	Action	Yes	No
1	**DTC check** 1) Check DTC in BCM. ☞(Page 10B-9) *Is DTC B1188, B1189 or B1190 detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**BCM power supply and ground circuit check** 1) Check BCM power supply and ground circuits. ☞(Page 10B-28) *Is check result OK?*	Go to Step 3.	Repair or replace defective wire harness.
3	**ECM registration** 1) Perform “ECM Registration” (Page 10C-13). 2) Recheck DTC. *Is DTC P1644 still detected?*	Go to Step 4.	End. (ECM was not registered)
4	**Ignition key registration** 1) Perform “Immobilizer Key Registration”. ☞(Page 10C-13) 2) Check that ignition is “OFF”. 3) Set ignition “ON”. 4) Recheck DTC. *Is DTC P1644 still detected?*	• Replace ECM and recheck DTC. If DTC P1644 is still detected, replace BCM and recheck DTC. – ECM: ☞(Page 1C-1) – BCM: ☞(Page 10B-29)	End. (Ignition key was not registered)

DTC P1645 / P1646

AENDL70AA304010

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble Area
P1645: ID Code Communication Error Communication error.	• CAN communication circuit • ECM • BCM
P1646: ID Code Incorrectness CAN communication error.	

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check DTC related to CAN communication. *Is there any CAN-DTC(s) detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**CAN communication circuit check** 1) Check CAN communication circuit referring to "Diagnosis Procedure" in "Troubleshooting for Communication Bus Off". ☞(Page 10H-16) *Is check result OK?*	• Replace ECM and recheck DTC. If DTC P1646 is still detected, replace BCM and recheck DTC. – ECM: ☞(Page 1C-1) – BCM: ☞(Page 10B-29)	Repair or replace defective wire harness.

DTC B1167

AENDL70AA304013

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1167: Immobilizer Information Mismatched Verification error between BCM and ECM.	• ECM ID code is not registered in BCM • Ignition key is not registered • ECM • BCM

DTC Troubleshooting

NOTE

If the BCM is one that was already registered with another vehicle (used item), ignition key cannot be registered in it. Always install a new BCM when replacement is necessary.

Step	Action	Yes	No
1	**DTC check** 1) Check DTC in ECM. ☞(Page 1A-19) *Is there any DTC detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**DTC recheck** 1) Perform "ECM Registration" (Page 10C-13). 2) Check that ignition is "OFF". 3) Set ignition "ON". 4) Recheck DTC. *Is DTC B1167 still detected?*	Go to Step 3.	End. (ECM was not registered)
3	**Ignition key registration** 1) Perform "Immobilizer Key Registration". ☞(Page 10C-13) 2) Check that ignition is "OFF". 3) Set ignition "ON". 4) Recheck DTC. *Is DTC B1167 still detected?*	• Replace BCM and recheck DTC. If DTC B1167 is still detected, replace ECM and recheck DTC. – BCM: ☞(Page 10B-29) – ECM: ☞(Page 1C-1)	End. (Ignition key was not registered)

DTC B1168

AENDL70AA304014

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1168: Password Mismatched Wrong password is inputted.	Wrong password is inputted

DTC Troubleshooting

Step	Action	Yes	No
1	**Immobilizer password input** 1) Input immobilizer password again. 2) Confirm that ignition is “OFF”. 3) Set ignition “ON”. 4) Recheck DTC. ☞(Page 10C-3) *Is DTC B1168 still detected?*	Recheck immobilizer password.	End. (Wrong password was inputted)

DTC B1169

AENDL70AA304015

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1169: Registration Failure Registration failure of ECM or ignition key.	• Power supply circuit / connector • CAN communication circuit / connector • ECM • BCM

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** *Is there any DTC(s) other than B1169 detected?*	Go to troubleshooting for applicable DTC.	Go to Step 2.
2	**ECM registration** 1) Perform “ECM Registration” (Page 10C-13). 2) Confirm that ignition is “OFF”. 3) Set ignition “ON”. 4) Recheck DTC. ☞(Page 10C-3) *Is DTC B1169 still detected?*	Replace ECM and recheck DTC. ☞(Page 1C-1)	Replace BCM and recheck DTC. ☞(Page 10B-29)

DTC B1170

AENDL70AA304016

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1170: EEPROM Access Error Reading / writing error in EEPROM is detected.	• BCM

DTC Confirmation Procedure

1) Set ignition “ON”.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC. ☞(Page 10C-4) 2) Set ignition “OFF”. 3) Perform “DTC Confirmation Procedure” (Page 10C-9) and then recheck DTC. *Is DTC B1170 still detected?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	End.

DTC B1173

AENDL70AA304017

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1173: Transponder Unregistered Transponder code in the transponder built in ignition key is not registered.	• Ignition key is not registered • BCM

DTC Troubleshooting

NOTE

Inability to register the ignition key may be caused by improper ignition key or some malfunction in it.

Step	Action	Yes	No
1	**Ignition key registration** 1) Perform “Ignition Key Registration”. ☞(Page 10C-13) 2) Confirm that ignition is “OFF”. 3) Set ignition “ON”. 4) Recheck DTC. ☞(Page 10C-3) *Is DTC B1173 still detected?*	Replace BCM and recheck DTC.	End. (Ignition key was not registered)

DTC B1175

AENDL70AA304018

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1175: Immobilizer Information Unregistered Immobilizer ID code is not registered in BCM.	• Ignition key is not registered • BCM

DTC Troubleshooting

NOTE

If immobilizer registration can not be performed normally, check the following points.

- **Check ignition key whether it is good key or not.**
- **Check that there is no DTC related to CAN communication.**
- **Check ECM to ensure that it is of proper specification.**

Step	Action	Yes	No
1	**Ignition key registration** 1) Perform “Immobilizer Key Registration”. ☞(Page 10C-13) 2) Check that ignition is “OFF”. 3) Set ignition “ON”. 4) Recheck DTC. *Is DTC B1175 still detected?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	End. (Ignition key was not registered)

DTC B1176

AENDL70AA304019

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1176: Specification Information Unregistered Vehicle specification is not registered in BCM.	• Ignition key is not registered • BCM

DTC Troubleshooting

Step	Action	Yes	No
1	**Ignition key registration** 1) Perform “Immobilizer Key Registration”. ☞(Page 10C-13) 2) Check that ignition is “OFF”. 3) Set ignition “ON”. 4) Recheck DTC. *Is DTC B1176 still detected?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	End. (Ignition key was not registered)

DTC B1188

AENDL70AA304020

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1188: Transponder Communication Error Verification error between ignition key and BCM.	• Ignition key is not registered • Ignition key • BCM

DTC Troubleshooting

NOTE

- **Before performing troubleshooting, read “Precautions for Immobilizer System” (Page 10C-1).**
- **If the BCM is one that was already registered with another vehicle (used item), ignition key cannot be registered in it. Always install a new BCM when replacement is necessary.**

Step	Action	Yes	No
1	**Engine start check** 1) Start engine using the spare ignition key. *Does engine start?*	End. (Ignition key was not registered)	Go to Step 2.
2	**Ignition key registration** 1) Perform “Immobilizer Key Registration”. ☞(Page 10C-13) 2) Check that ignition is “OFF”. 3) Set ignition “ON”. 4) Recheck DTC. *Is DTC B1188 still detected?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	End. (Ignition key was not registered)

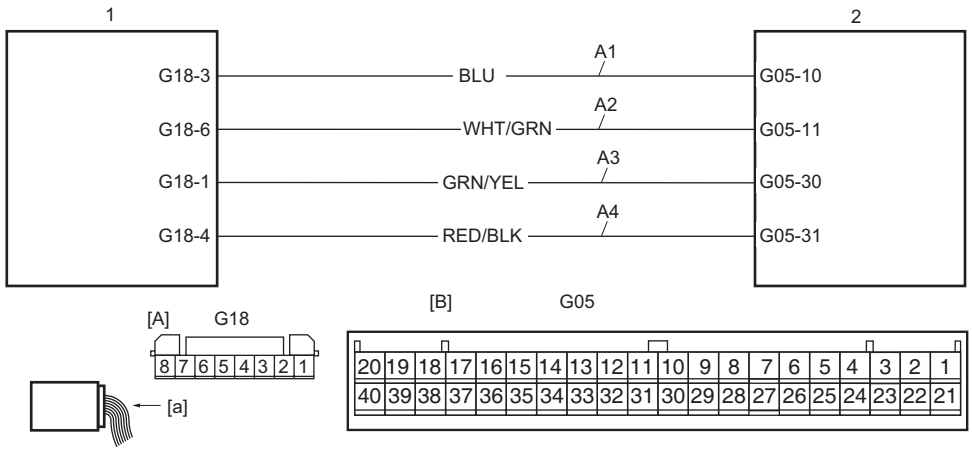
DTC B1189

AENDL70AA304021

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble area
B1189: Immobilizer Antenna Communication Error Communication error with immobilizer control module (built-in immobilizer coil antenna).	• Immobilizer control module circuit / connector • Immobilizer control module • BCM

Circuit Diagram



IDL70AA30002-02

[A]: Immobilizer control module connector (View: [a])	A2: Immobilizer control module signal circuit 2	1. Immobilizer control module (including immobilizer coil antenna)
[B]: BCM connector (View: [a])	A3: Immobilizer control module signal circuit 3	2. BCM
A1: Immobilizer control module signal circuit 1	A4: Immobilizer control module signal circuit 4	

DTC Confirmation Procedure

1) Set ignition “ON” for 10 sec.

DTC Troubleshooting

Step	Action	Yes	No
1	**Immobilizer control module signal circuit check** 1) Check that ignition is “OFF”. 2) Disconnect “G18” and “G05” connectors. 3) Check for proper terminal connection to “G18” and “G05” connectors. 4) If connections are OK, check the following points. • Resistance of “A1”, “A2”, “A3” and “A4” circuits: less than 1 Ω • Resistance between each of “A1”, “A2”, “A3” and “A4” circuits and ground: infinity • Resistance between circuit terminal and other terminals at “G18” connector: infinity *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**DTC check** 1) Replace immobilizer control module. ☞(Page 10C-13) 2) Perform “DTC Confirmation Procedure” (Page 10C-12) and then recheck DTC. *Is DTC B1189 still detected?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	End.

DTC B1190

AENDL70AA304022

DTC Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
B1190: Engine Switch Malfunction Immobilizer control module is faulty.	Immobilizer control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Clear DTC. ☞(Page 10C-4) 2) Set ignition “OFF”. 3) Check DTC. ☞(Page 10C-3) *Is DTC B1190 still detected?*	Replace immobilizer control module and recheck DTC. ☞(Page 10C-13)	End. (Intermittent trouble)

Repair Instructions

Immobilizer Control Module Removal and Installation

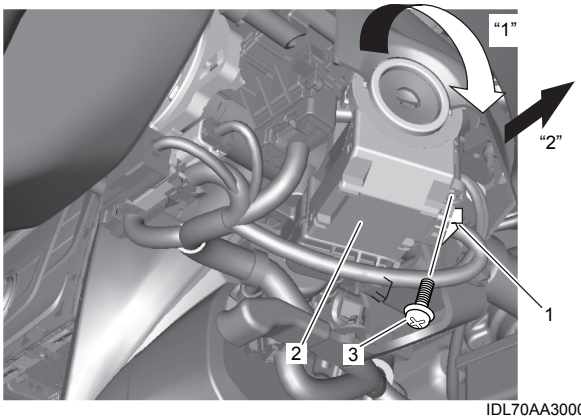
AENDL70AA306001

⚠ CAUTION

- **As immobilizer control module consists of precision parts, be careful not to expose it to excessive shock.**
- **Do not disassemble immobilizer control module.**

Removal

1) Set ignition “OFF”.
2) Remove steering column upper and lower covers.
   - With air bag: ☞(Page 6B-3)
   - Without air bag: ☞(Page 6B-5)
3) Disconnect connector (1) from immobilizer control module (2).
4) Remove screw (3) from immobilizer control module.
5) Remove immobilizer control module from steering lock assembly as shown in figure.



IDL70AA30003-02

Installation

Reverse removal procedure.

Ignition Key Registration

AENDL70AA306002

Refer to “Ignition Key Registration” in Section 10B (Page 10B-29).

ECM Registration

AENDL70AA306003

After ECM is replaced with new one, register BCM information to the ECM using SUZUKI scan tool and immobilizer cable.

NOTE

- **When ECM is replaced with new one, refer to “Procedure after ECM Replacement” or “Registration for ECM Replacement”. ☞(Page 1C-1)**
- **When ECM and BCM are replaced with new ones at the same time, perform “Immobilizer Key Registration” instead of “ECM Registration” using SUZUKI scan tool and immobilizer cable. Refer to “SUZUKI Scan Tool Operator’s Manual” for the immobilizer registration.**

- Perform “ECM Registration” in “Immobilizer” menu according to instructions displayed on SUZUKI scan tool.

BCM Registration

AENDL70AA306004

Refer to “BCM Registration” in Section 10B (Page 10B-29).

Communication System

Precautions

Precautions for Diagnosing Trouble

AENDL70AA800002

- Before using SUZUKI scan tool, read its “Operator’s (Instructions) Manual” to know how to use it.
- Diagnosing only the control modules which communicate through CAN communication is not enough in order to accurately diagnose any communication system. Check communication condition of overall system by checking each component of the system and diagnose trouble by putting all information together.
- It may be possible that CAN system has trouble because of blown fuse or low battery voltage. Before troubleshooting, check that fuse, battery voltage and charging system are normal.
- CAN communication error is detected if connectors of control modules which are connected to CAN communication line or applicable fuse is either removed or connected while the ignition is ON.
- Check that no equipment or option other than original parts is connected to CAN bus. If such any item is connected, disconnect it before troubleshooting.
- If any DTC appears together with “Lost Communication” (Reception error) and/or “Communication Bus Off”, start troubleshooting of CAN communication first.
- Before diagnosing trouble, be sure to check equipment of vehicle being serviced as well as control modules connected to CAN communication line.
- Be sure to clear all DTCs after completing troubleshooting.

General Description

CAN Communication System Description

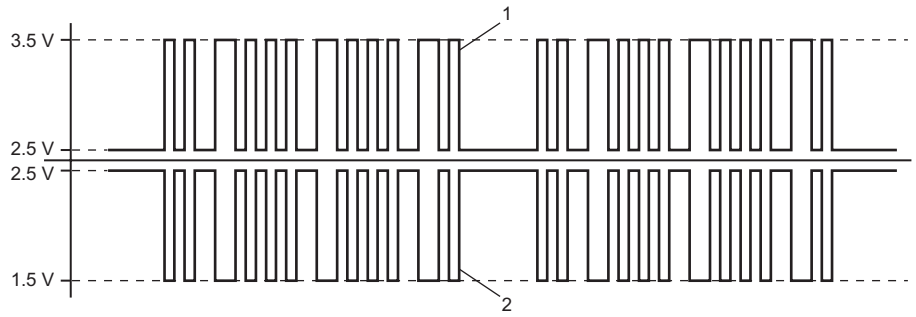
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System Description

Communication for each control module and device is established through continuous input / output of ON/OFF digital signals with various data items being managed in parallel. Transmitting / receiving these data is called as serial communication interface.
A serial communication interface that is CAN protocol (a communication standard) has been adopted for in-car communication system.
In addition, BCM, ECM, TCM (AMT model), combination meter, P/S control module, ABS control module (ABS model) and SDM (air bag model) transmit / receive data through a twisted pair of two communication lines (CAN High and CAN Low) connected through CAN communication. Data obtained by a specific control module can be shared with the other control module through CAN.

CAN Communication Signal

CAN communication system is a serial communication system for transmitting multiple data items (values from sensors, control data and control signals) as ON-OFF digital signals through communication line. This system uses two lines (CAN High and CAN Low) for the communication circuit to maintain high reliability even when used for high-speed serial communication.
Serial communication is established as shown below with 2.5 V as the reference level for both CAN High signal (1) and CAN Low signal (2). The range of CAN High signal is from 2.5 V to about 3.5 V and that of CAN Low signal is from 2.5 V to about 1.5 V. When both are at 2.5 V, signal is judged as OFF. When CAN High signal is 3.5 V and CAN Low signal is 1.5 V (that is, when the difference between High voltage and Low voltage is more than about 2 V), the signal is judged as ON. For this reason, it is a feature of CAN communication signal that signal waveform is symmetrical between CAN High and CAN Low signals with respect to 2.5 V level. CAN communication fails when the symmetrical signal form collapses.



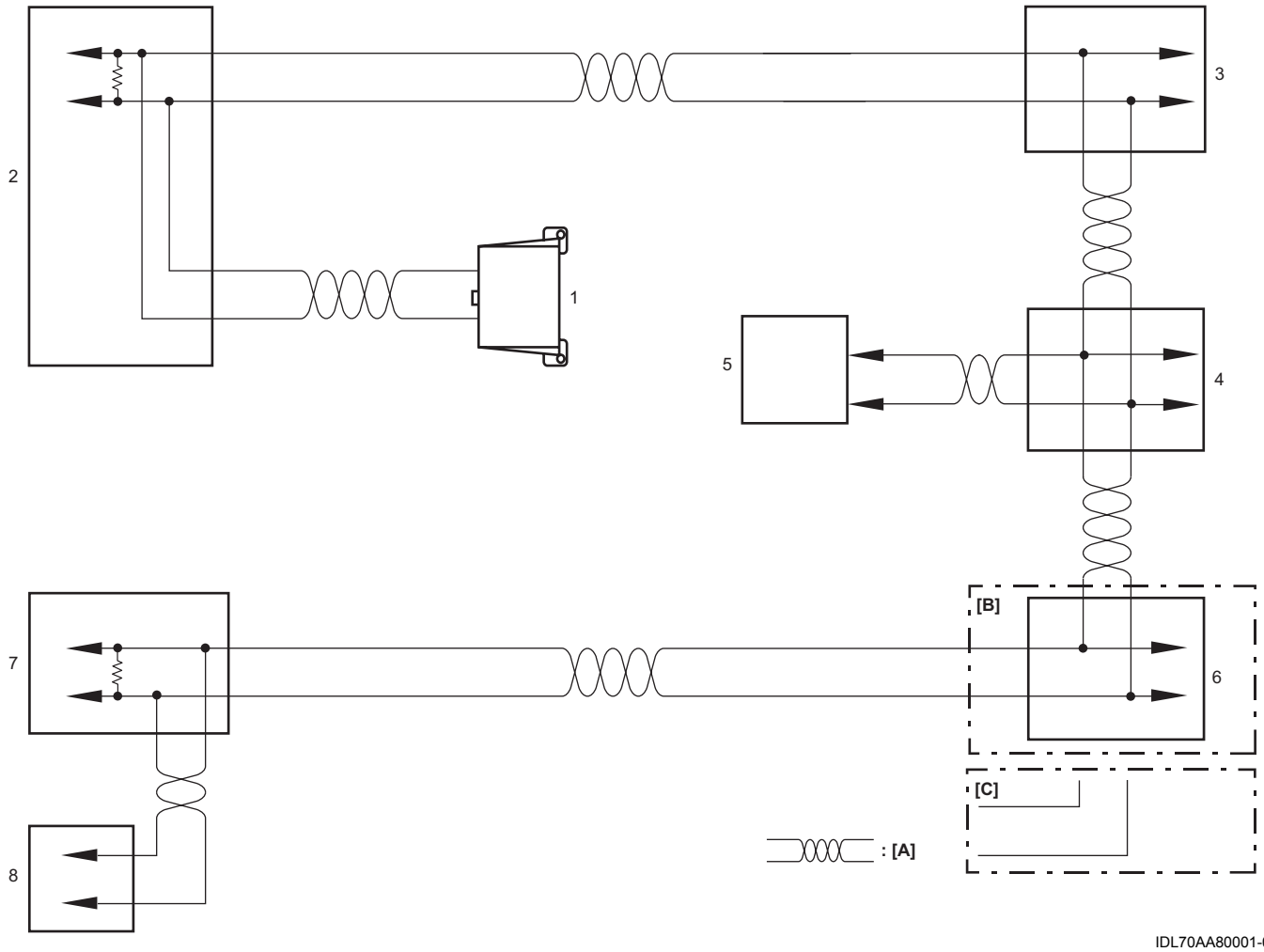
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CAN Communication System Diagnosis General Description

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SUZUKI scan tool is used for diagnosis in this section. Communication method between SUZUKI scan tool and each control module is depicted by the following figure.

Special tool
: SUZUKI scan tool (Suzuki SDT-II)



IDL70AA80001-03

[A]: CAN communication line	[B]: With ABS	[C]: Without ABS	

	Control module	Communication with scan tool	Monitor of CAN-DTC	Bus check function
1	DLC	—	—	—
2	Combination meter	CAN	Available	Available
3	P/S control module	CAN	Available	Available
4	BCM	CAN	Available	Available
5	SDM (air bag model)	CAN	Available	Available

	Control module	Communication with scan tool	Monitor of CAN-DTC	Bus check function
6	ABS control module (ABS model)	CAN	Available	Available
7	ECM	CAN	Available	Available
8	TCM (AMT model)	CAN	Available	Available

CAN Communication System Transmitting and Receiving Data Table

AENDL70AA801003

NOTE

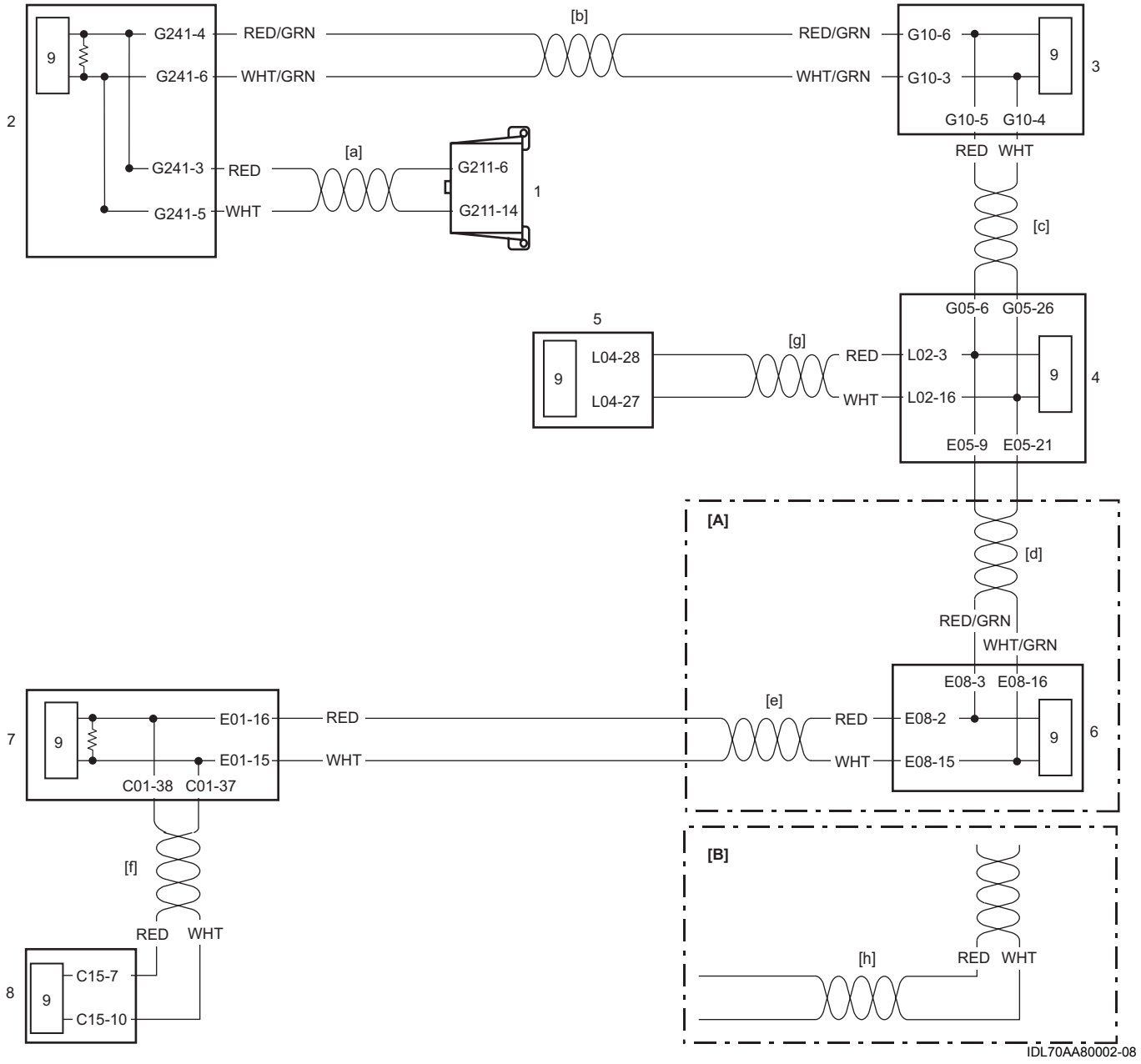
- **T (Transmitting): When two or more control modules start transmission at the same time, control module transmitting the highest priority information enters data transmission mode and all other control modules enter reception mode.**
- **R (Receiving): All control modules connected with CAN communication lines receive all information on CAN communication line. Each control module selects only necessary information and uses it for control function.**
- **ECM calculates and determines vehicle speed based on VSS signal and transmits the information to other control modules through CAN.**

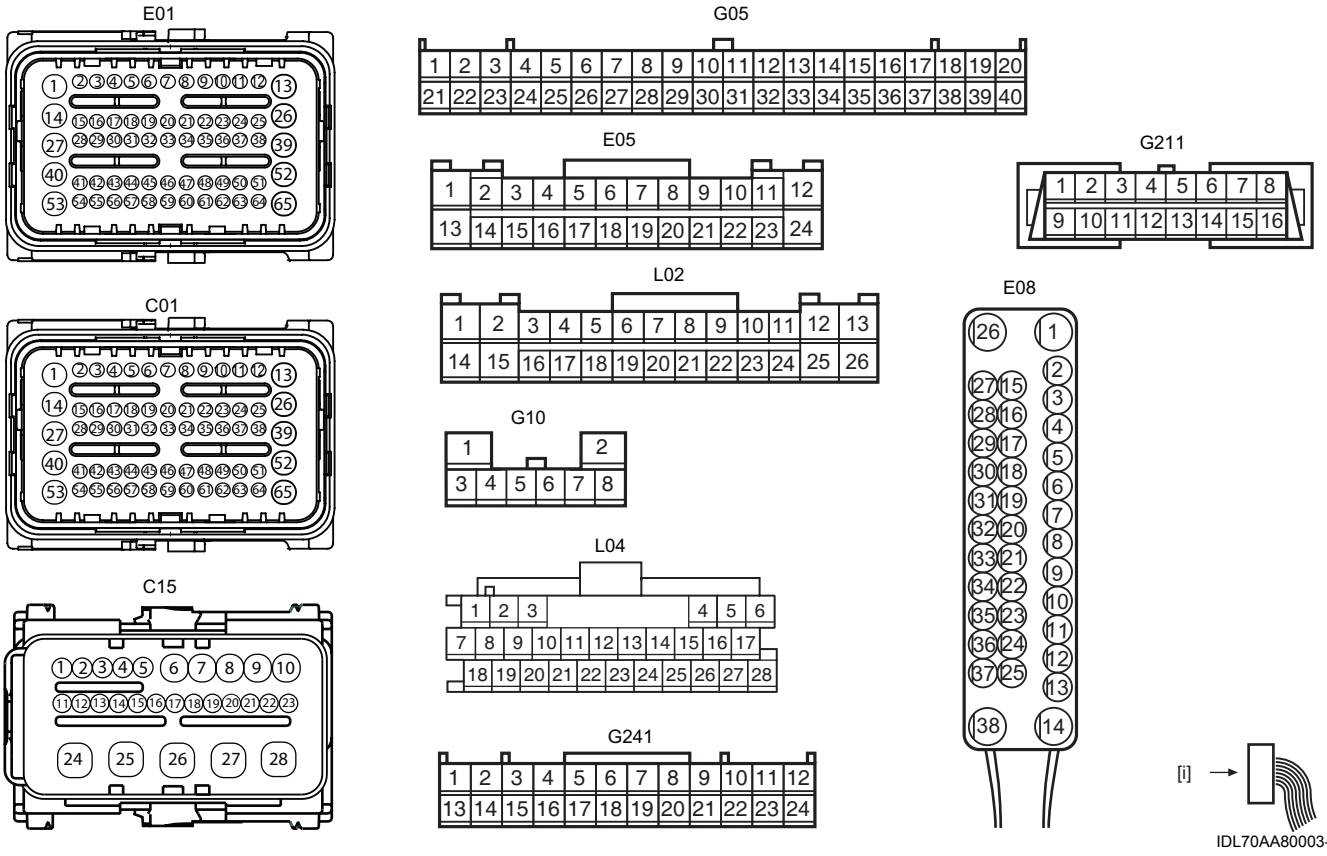
	ECM	TCM (AMT model)	BCM	Combination meter	P/S control module	ABS control module (ABS model)	SDM (air bag model)
Engine torque signal	T	R				R	
Accelerator position signal	T	R					
Throttle position signal	T	R					
Engine speed signal	T	R	R	R	R	R	
Fuel cut signal	T	R					
A/C compressor clutch signal	T	R					
MIL control signal	T			R			
Engine coolant temperature signal	T	R		R			
Engine oil information signal	T			R			
Immobilizer indicator light control signal	T		T	R			
Vehicle speed signal	T		R	R	R		
Fuel consumption signal	T			R			
Brake light switch signal	T	R	R			R	
Charge system signal	T			R			
Barometric pressure signal	T	R					
Buzzer request signal		T	T	R			
Transmission shift position signal	R	T	R	R			
Transmission warning light signal	R	T		R			
Illumination ON signal			T	R			
Depress brake indicator light signal		T		R			
Brake fluid level switch signal			T	R			
Oil pressure switch signal	R		T				
Park brake switch signal		R	T	R			
A/C switch status	R		T				
Electric load signal	R		T	R			
Turn signal switch status		R	T	R			
Door switch status		R	T	R			
Driver seat belt switch signal			T	R			
Passenger seat belt switch signal			T	R			
Rear seat belt switch signal			T	R			
A/C evaporator temperature signal	R		T				
Outside air temperature signal	R		T	R			
Information display request signal			T	R			
ABS equipped signal	R			T			
P/S warning light signal				R	T		
Warning light signal (ABS)				R		T	
Brake warning light signal (EBD)				R		T	
Air bag warning light signal				R			T
Wheel speed signal	R					T	

Schematic and Routing Diagram

CAN Communication System Circuit Diagram

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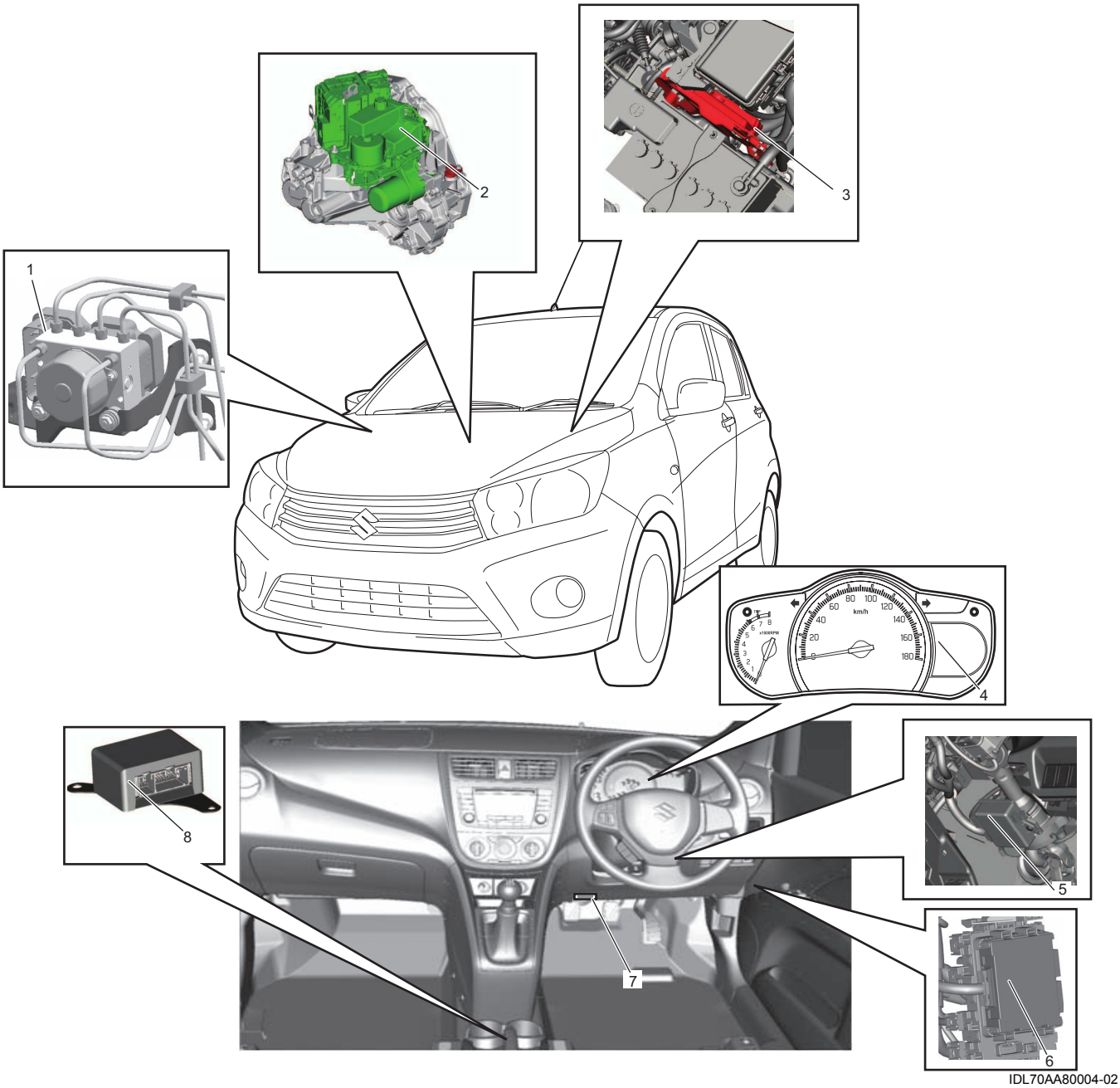


[A]: With ABS	2. Combination meter	7. ECM
[B]: Without ABS	3. P/S control module	8. TCM (AMT model)
[a] to [h]: CAN communication line (linked with diagnosis flows [a] to [h] of “Diagnosis Flow Selection Table”)	4. BCM	9. CAN driver
[i]: Connector view	5. SDM (air bag model)	
1. DLC	6. ABS control module	

Component Location

CAN Communication System Component Location

AENDL70AA803001



IDL70AA80004-02

1. ABS control module (ABS model)	5. P/S control module
2: TCM (AMT model)	6. BCM
3. ECM	7. DLC
4. Combination meter	8. SDM (air bag model)

Diagnostic Information and Procedures

CAN Communication Check

AENDL70AA804001

Using Suzuki scan tool, execute “Communication Malfunction DTC” under “Bus check” and check DTCs of all control modules connected to CAN Communication Bus.

Condition	Possible cause	Correction / Reference Item
Only history DTC is detected in either of system	Check the following: 1. Disconnect and connect all control module connectors connected to the CAN communication line. 2. Check all control module power sources (including fuses) connected to the CAN communication line. 3. Start the engine and check DTC while idling. 4. If the detected DTC is a history DTC, there may be a temporary malfunction due to poor connection at the connector or faulty power supply.	—
“Control Module Bus Off” is detected in either of system (current DTC)	Perform “Troubleshooting for Communication Bus Off”	*☞(Page 10H-16)*
Only “Lost Communication” is detected in either of system (current DTC)	Perform “Troubleshooting for Lost Communication”	*☞(Page 10H-10)*
“Not Found” is indicated in “Connection to CAN Bus”.	Check if Suzuki scan tool is communicable by connecting it to another vehicle.	—
	Perform “Troubleshooting for Lost Communication”	*☞(Page 10H-10)*

CAN DTC (Lost Communication and Communication Bus Off) Table

AENDL70AA804002

DTC No.	Detecting item	Detecting condition
ECM		
U0073 ☞(Page 10H-16)	Control Module Communication Bus Off	ECM fails to transmit and receive the data via CAN for specified time continuously.
U0101 ☞(Page 10H-10)	Lost Communication With TCM	Receiving error of data from TCM via CAN for specified time continuously.
U0121 ☞(Page 10H-10)	Lost Communication With ABS / ESP® Control Module	Receiving error of data from ABS control module via CAN for specified time continuously.
U0131 ☞(Page 10H-10)	Lost Communication With Power Steering Control Module	Receiving error of ECM from P/S control module for specified time continuously.
U0140 ☞(Page 10H-10)	Lost Communication With Body Control Module	Receiving error of data from BCM via CAN for specified time continuously.
U0155 ☞(Page 10H-10)	Lost Communication With Instrument Panel Cluster (IPC) Control Module	Receiving error of data from combination meter via CAN for specified time continuously.
ABS control module		

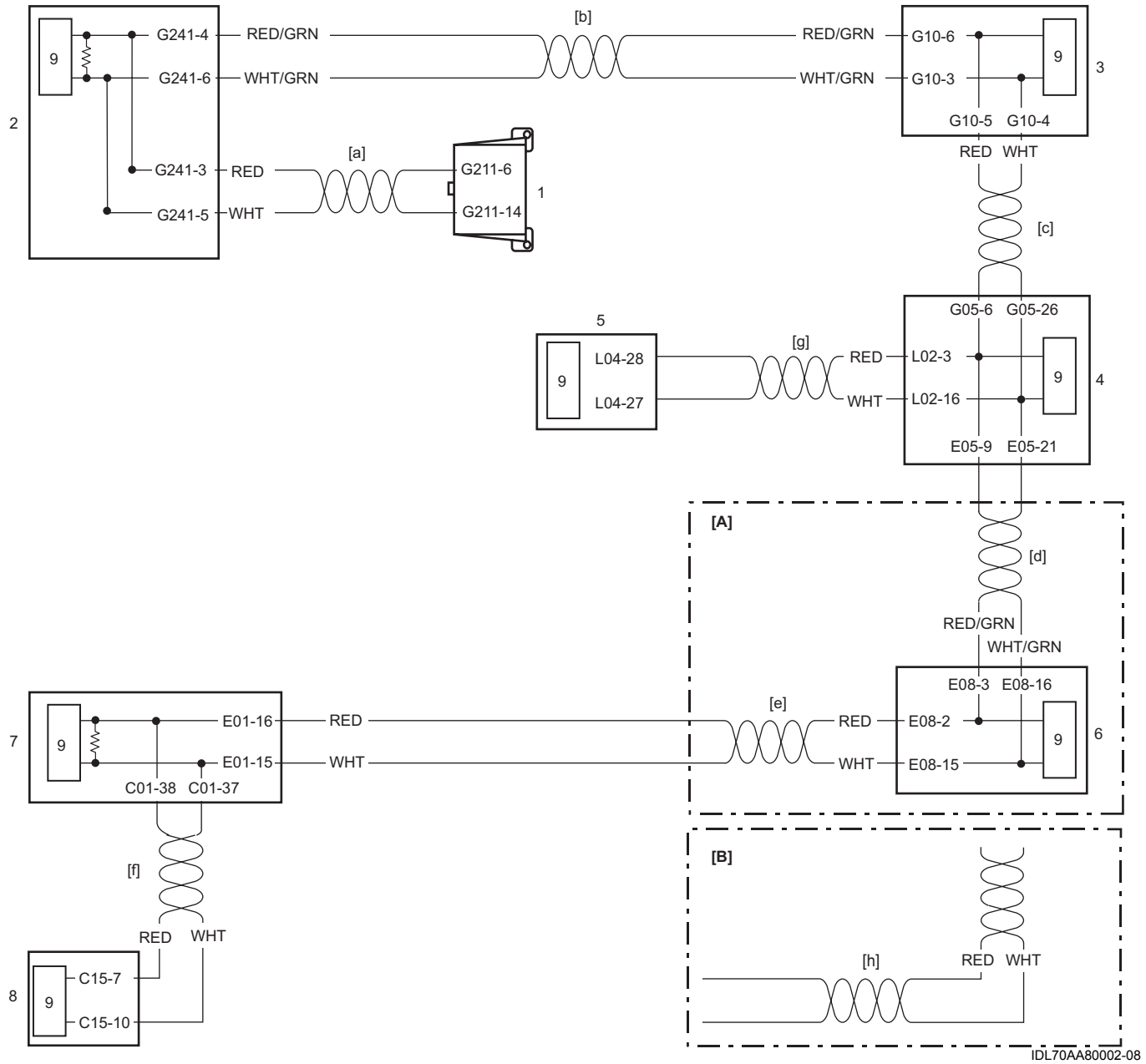
DTC No.	Detecting item	Detecting condition
U0073 ☞(Page 10H-16)	Control Module Communication Bus Off	ABS control module fails to transmit and receive the data via CAN for specified time continuously.
U0100 ☞(Page 10H-10)	Lost Communication With ECM	Receiving error of data from ECM via CAN for specified time continuously.
TCM (AMT model)		
U0073 ☞(Page 10H-16)	Control Module Communication Bus Off	TCM fails to transmit and receive the data via CAN for specified time continuously.
U0100 ☞(Page 10H-10)	Lost Communication With ECM	Receiving error of data from ECM for specified time continuously.
U0140 ☞(Page 10H-10)	Lost Communication With Body Control Module	Receiving error of data from BCM for specified time continuously.
BCM		
U0073 ☞(Page 10H-16)	Control Module Communication Bus Off	BCM fails to transmit and receive the data via CAN for specified time continuously.
U0100 ☞(Page 10H-10)	Lost Communication With ECM	Receiving error of data from ECM for specified time continuously.
U0101 ☞(Page 10H-10)	Lost Communication With TCM	Receiving error of data from TCM for specified time continuously.
U0151 ☞(Page 10H-10)	Lost Communication With Restraints Control Module	Receiving error of data from restraints control module for specified time continuously.
SDM (air bag model)		
U0073-88 ☞(Page 10H-16)	Control Module Communication Bus Off	SDM fails to transmit and receive the data via CAN for specified time continuously.
P/S control module		
U0073 ☞(Page 10H-16)	Control Module Communication Bus Off	P/S control module fails to transmit and receive the data via CAN for specified time continuously.
U0100 ☞(Page 10H-10)	Lost Communication With ECM	Receiving error of data from ECM for specified time continuously.
U0155 ☞(Page 10H-10)	Lost Communication With Instrument Panel Cluster (IPC) Control Module	Receiving error of data from combination meter via CAN for specified time continuously.
Combination meter		
U0073 ☞(Page 10H-16)	Control Module Communication Bus Off	Combination meter fails to transmit and receive the data via CAN for specified time continuously.
U0100 ☞(Page 10H-10)	Lost Communication With ECM	Receiving error of data from ECM for specified time continuously.
U0101 ☞(Page 10H-10)	Lost Communication With TCM	Receiving error of data from TCM for specified time continuously.

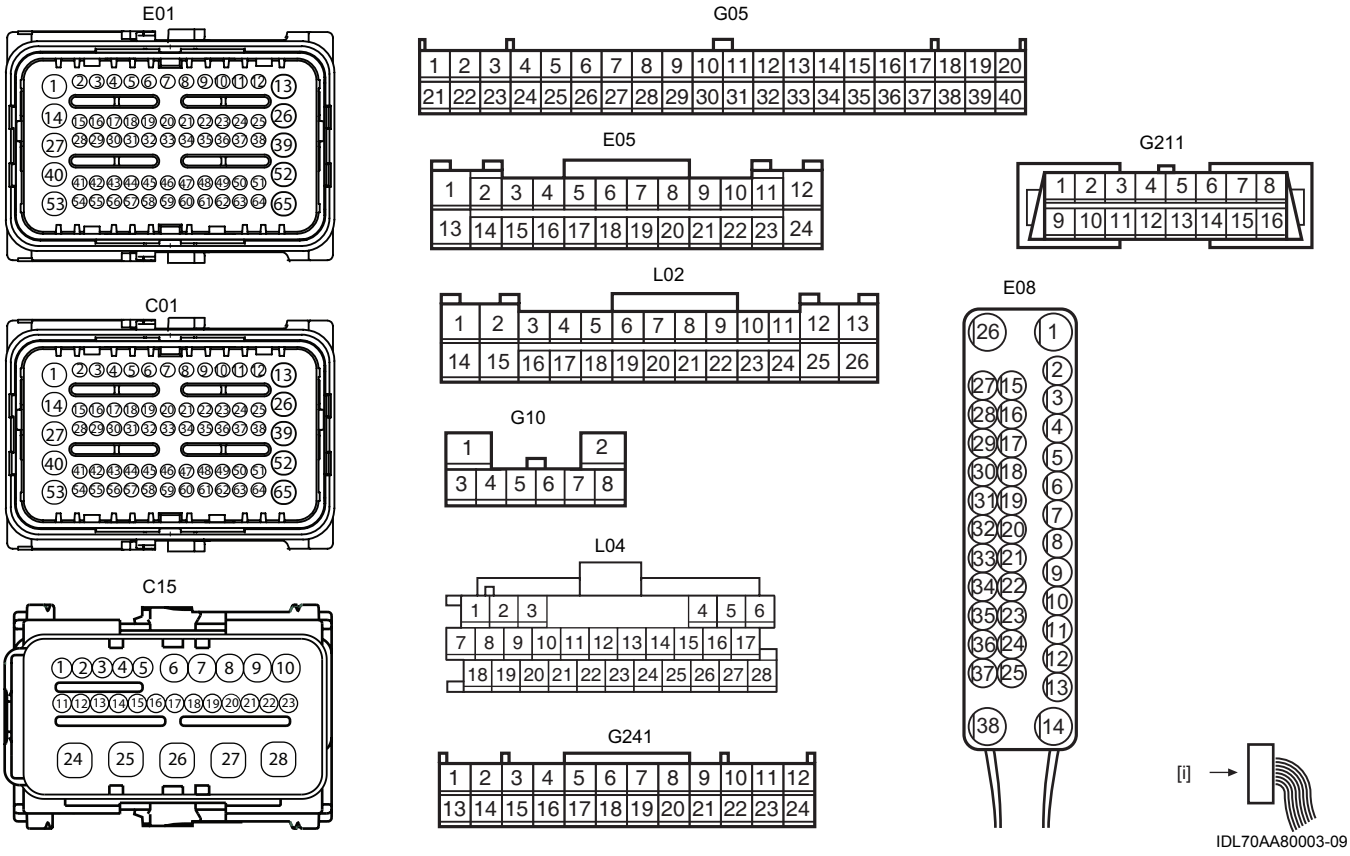
DTC No.	Detecting item	Detecting condition
U0121 ☞(Page 10H-10)	Lost Communication With ABS / ESP® Control Module	Receiving error of data from ABS control module for specified time continuously.
U0131 ☞(Page 10H-10)	Lost Communication With Power Steering Control Module	Receiving error of data from P/S control module for specified time continuously.
U0140 ☞(Page 10H-10)	Lost Communication With Body Control Module	Receiving error of data from BCM for specified time continuously.

Troubleshooting for Lost Communication

AENDL70AA804003

Circuit Diagram





[A]: With ABS	2. Combination meter	7. ECM
[B]: Without ABS	3. P/S control module	8. TCM (AMT model)
[a] to [h]: CAN communication line (linked with diagnosis flows [a] to [h] of "Diagnosis Flow Selection Table")	4. BCM	9. CAN driver
[i]: Connector view	5. SDM (air bag model)	
1. DLC	6. ABS control module	

Diagnosis Procedure

NOTE

- **Be sure to perform "CAN Communication Check" (Page 10H-8) before performing this flow.**
- **Occurrence of multiple troubles is not included in the scope of this trouble diagnosis.**

When "Lost Communication" is detected in any control module, perform inspection according to the following procedure.

1) Turn ignition switch to OFF position and connect Suzuki scan tool to DLC.
2) Set ignition "ON".
3) Select "Communication Bus Check" menu of SUZUKI scan tool and check for communication-disabled control module (control module which indicates "Not Found" in "Connection to CAN Bus").
4) Based on above check results, select applicable diagnosis flow code ([a] to [h]) from "Diagnosis Flow Selection Table" (Page 10H-12).
5) Perform troubleshooting according to selected diagnosis flow.

Diagnosis Flow Selection Table

NOTE

- **If an individual control module fails to communicate, check whether power circuit or ground circuit of the control module is in good condition, referring to system circuit diagram before diagnosing trouble according to diagnosis flow.**
- **If it is not possible to select suitable diagnosis flow from "Diagnosis Flow Selection Table" or "two or more diagnosis flows are selectable", perform "Troubleshooting for Communication Bus Off" (Page 10H-16).**
- **Diagnosis flows [a] to [h] are linked with CAN communication lines [a] to [h] of "Circuit Diagram" (Page 10H-10).**

ABS model

Communication-disabled control module	Diagnosis flow
All control modules communicating by CAN	[a] ☞(Page 10H-12)
P/S control module, BCM, SDM (air bag model), ABS control module, ECM and TCM (AMT model)	[b] ☞(Page 10H-13)
BCM, SDM (air bag model), ABS control module, ECM and TCM (AMT model)	[c] ☞(Page 10H-13)
ABS control module, ECM and TCM (AMT model)	[d] ☞(Page 10H-13)
ECM and TCM (AMT model)	[e] ☞(Page 10H-14)
TCM (AMT model)	[f] ☞(Page 10H-14)
SDM (air bag model)	[g] ☞(Page 10H-15)

Without ABS model

Communication disabled control module	Diagnosis flow
All control modules communicating by CAN	[a] ☞(Page 10H-12)
P/S control module, BCM, SDM (air bag model), ECM and TCM (AMT model)	[b] ☞(Page 10H-13)
BCM, SDM (air bag model), ECM and TCM (AMT model)	[c] ☞(Page 10H-13)
TCM (AMT model)	[f] ☞(Page 10H-14)
SDM (air bag model)	[g] ☞(Page 10H-15)
ECM and TCM (AMT model)	[h] ☞(Page 10H-15)

Troubleshooting
Diagnosis flow: [a]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect combination meter connector. 3) Check for proper connection to DLC and combination meter connector. 4) If connections are OK, check CAN communication circuit [a] between DLC and combination meter connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**Combination meter terminating resistance check** 1) Connect combination meter connector. 2) Disconnect ECM connector "E01". 3) Measure resistance between "G211-6" and "G211-14" terminals of DLC. *Is resistance 114 – 134 Ω?*	Go to "Troubleshooting for Communication Bus Off" (Page 10H-16).	Replace combination meter and recheck DTC. ☞(Page 9C-11)

Diagnosis flow: [b]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect combination meter connector and P/S control module connector “G10”. 3) Check for proper connection to combination meter connector. 4) If connections are OK, check CAN communication circuit [b] between combination meter connector and P/S control module connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**CAN communication circuit resistance check** 1) Connect combination meter connector. 2) Measure resistance between “G10-6” and “G10-3” terminals of P/S control module connector. *Is resistance 114 – 134 Ω?*	Replace P/S control module and recheck DTC. ☞(Page 6C-30)	Replace combination meter and recheck DTC. ☞(Page 9C-11)

Diagnosis flow: [c]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect P/S control module connector and BCM connector “G05”. 3) Check for proper connection to P/S control module connector and BCM connector. 4) If connections are OK, check CAN communication circuit [c] between P/S control module connector and BCM connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**CAN communication circuit resistance check** 1) Connect P/S control module connector. 2) Measure resistance between “G05-6” and “G05-26” terminals of BCM connector. *Is resistance 114 – 134 Ω?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	Replace P/S control module and recheck DTC. ☞(Page 6C-30)

Diagnosis flow: [d]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect BCM connector “E05” and ABS control module connector. 3) Check for proper connection to BCM connector and ABS control module connector. 4) If connections are OK, check CAN communication circuit [d] between BCM connector and ABS control module connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.

Step	Action	Yes	No
2	**CAN communication circuit resistance check** 1) Connect BCM connector “E05”. 2) Measure resistance between “E08-3” and “E08-16” terminals of ABS control module connector. *Is resistance 114 – 134 Ω?*	Replace ABS control module and recheck DTC. ☞(Page 4E-33)	Replace BCM and recheck DTC. ☞(Page 10B-29)

Diagnosis flow: [e]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect ABS control module connector and ECM connector “E01”. 3) Check for proper connection to ABS control module connector and ECM connector “E01”. 4) If connections are OK, check CAN communication circuit [e] between ABS control module connector and ECM connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**CAN communication circuit resistance check** 1) Connect ECM connector “E01”. 2) Measure resistance between “E08-2” and “E08-15” terminals of ABS control module connector. *Is resistance 114 – 134 Ω?*	Replace ABS control module and recheck DTC. ☞(Page 4E-33)	Replace ECM and recheck DTC. ☞(Page 1C-1)

Diagnosis flow: [f]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect TCM connector and ECM connector “C01”. 3) Check for proper connection to TCM connector and ECM connector. 4) If connections are OK, check CAN communication circuit [f] between TCM connector and ECM connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**CAN communication circuit resistance check** 1) Connect ECM connector. 2) Disconnect combination meter connector. 3) Measure resistance between “C15-7” and “C15-10” terminals of TCM connector. *Is resistance 114 – 134 Ω?*	Replace TCM and recheck DTC. ☞(Page 5D-87)	Replace ECM and recheck DTC. ☞(Page 1C-1)

Diagnosis flow: [g]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect BCM connector “L02” and SDM connector. 3) Check for proper connection to BCM connector and SDM connector. 4) If connections are OK, check CAN communication circuit [g] between BCM connector and SDM connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**CAN communication circuit resistance check** 1) Connect BCM connector “L02”. 2) Disconnect ECM connector “E01”. 3) Measure resistance between “L04-27” and “L04-28” terminals of SDM connector. *Is resistance 114 – 134 Ω?*	Replace SDM and recheck DTC. ☞(Page 8B-48)	Replace BCM and recheck DTC. ☞(Page 10B-29)

Diagnosis flow: [h]

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect BCM connector “E05” and ECM connector “E01”. 3) Check for proper connection to ECM connector and BCM connector. 4) If connections are OK, check CAN communication circuit [h] between ECM connector and BCM connector for open circuit. *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**CAN communication circuit resistance check** 1) Connect ECM connector “E01”. 2) Measure resistance between “E05-9” and “E05-21” terminals of BCM connector. *Is resistance 114 – 134 Ω?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	Replace ECM and recheck DTC. ☞(Page 1C-1)

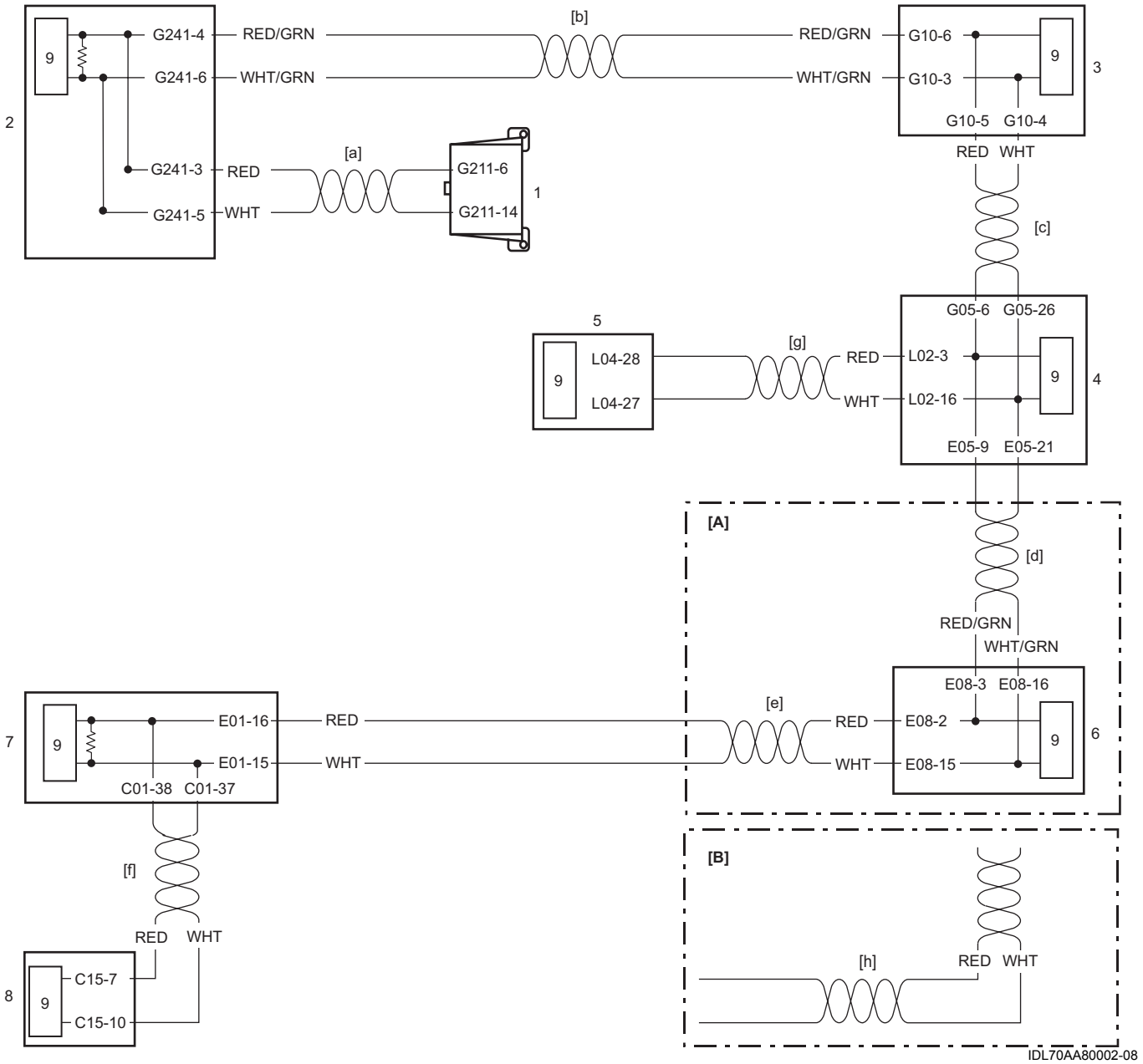
Troubleshooting for Communication Bus Off

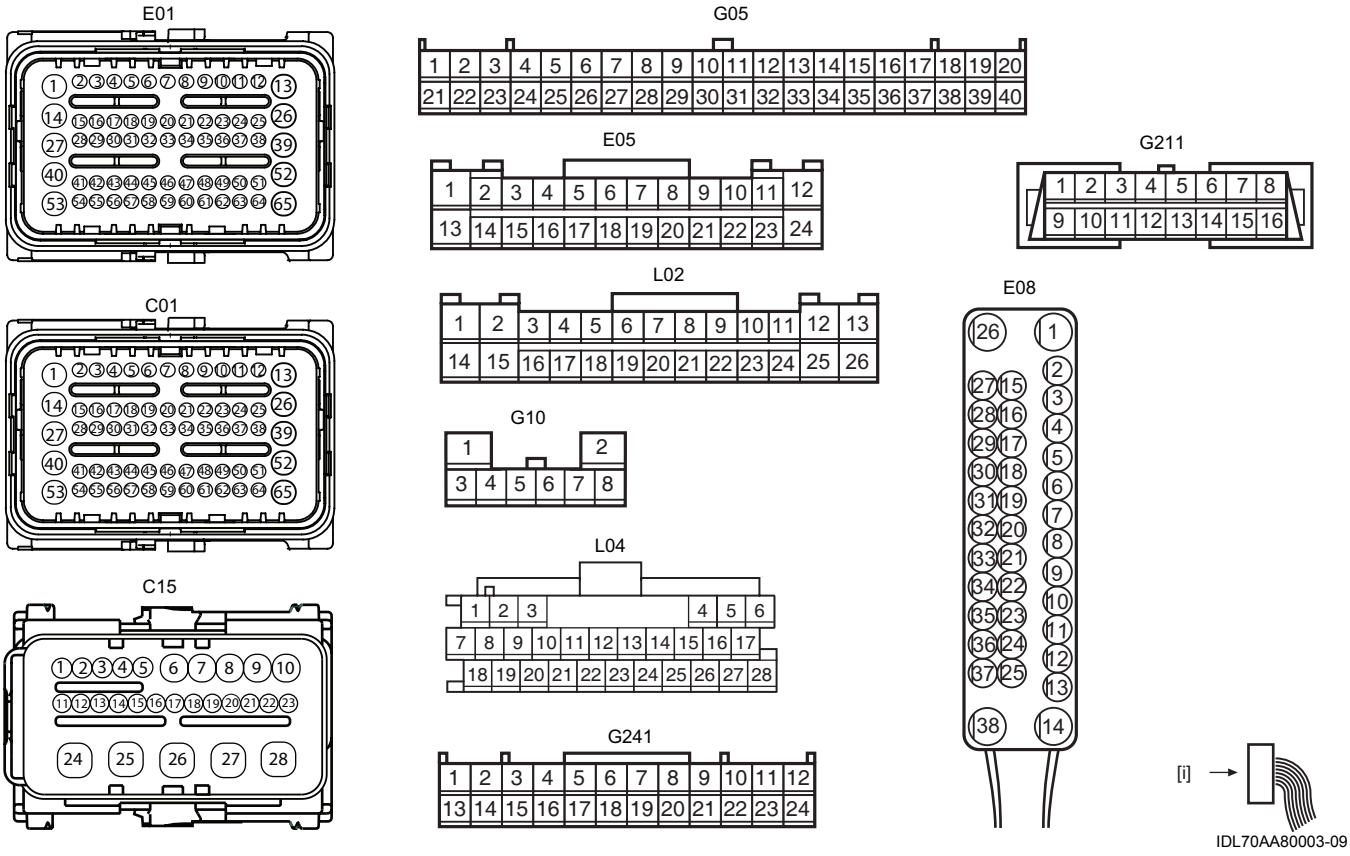
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NOTE

Be sure to perform “CAN Communication Check” (Page 10H-8)before performing this flow.

Circuit Diagram





[A]: With ABS	2. Combination meter	7. ECM
[B]: Without ABS	3. P/S control module	8. TCM (AMT model)
[a] to [h]: CAN communication line (linked with diagnosis flows [a] to [h] of "Diagnosis Flow Selection Table")	4. BCM	9. CAN driver
[i]: Connector view	5. SDM (air bag model)	
1. DLC	6. ABS control module	

Diagnosis Procedure

When "CAN Communication Bus Off" is detected in any control modules, or when it is not possible to communicate with all control modules with CAN using SUZUKI scan tool, check according to following procedure.

1) Connect oscilloscope or SUZUKI scan tool to DLC when ignition is OFF.
2) Using oscilloscope or oscilloscope function of SUZUKI scan tool, observe waveform in the following condition when ignition is ON.

Channel	Probe	Terminal No.
1	+	G211-6 ☞(Page 10H-16)
	–	Ground
2	+	G211-14 ☞(Page 10H-16)
	–	Ground

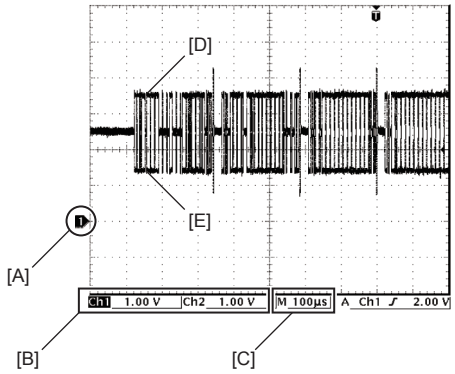
3) Compare observed signal waveform and waveforms given as "Reference Waveform". Find the most similar signal waveform and identify the system which has trouble and the cause of trouble. ☞(Page 10H-18)
4) Perform troubleshooting. ☞(Page 10H-21)

Reference Waveform

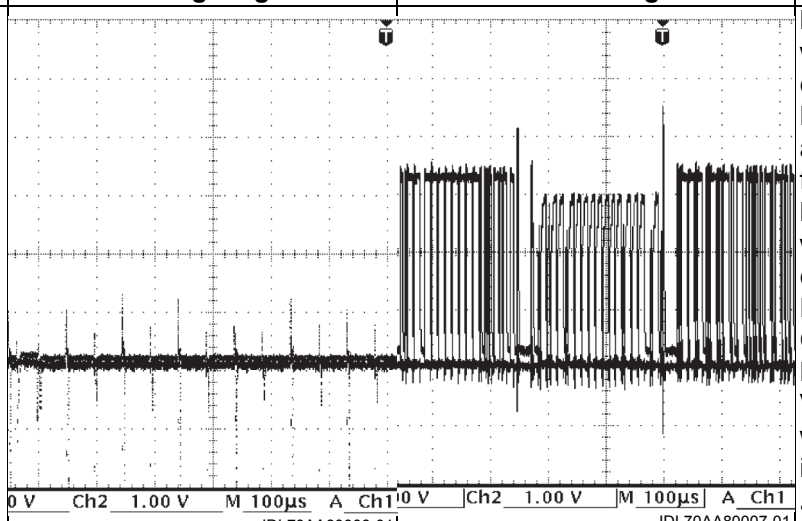
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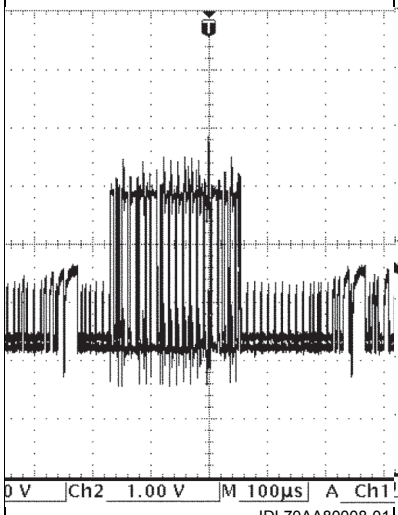
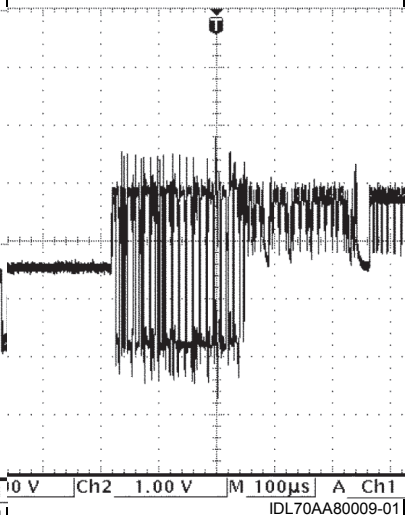
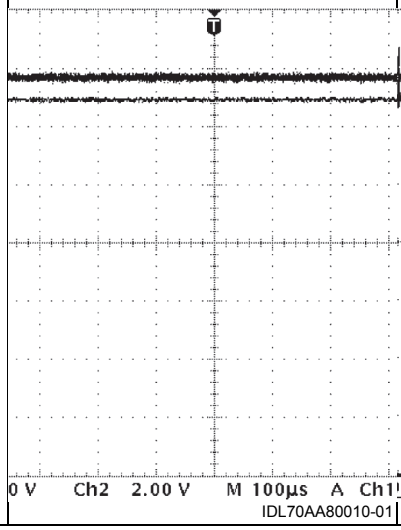
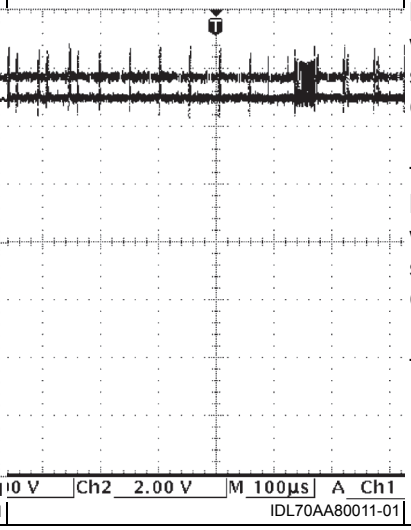
Waveforms in "Examples of abnormal waveforms" are selected examples of CAN communication waveforms seen when an abnormality occurs. However, these waveforms may not be exactly the same in appearance as observed waveforms. Therefore, to identify an abnormal condition, select the waveform that is most similar to the observed waveform from "Examples of abnormal waveforms" (Page 10H-18).

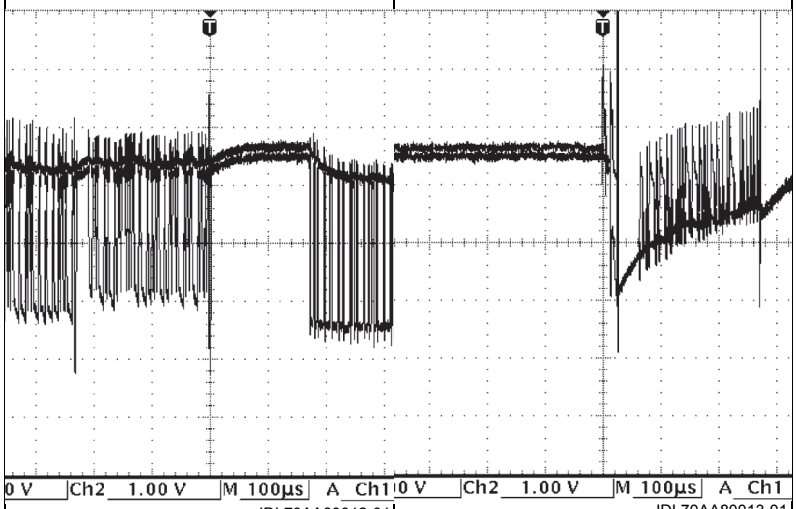
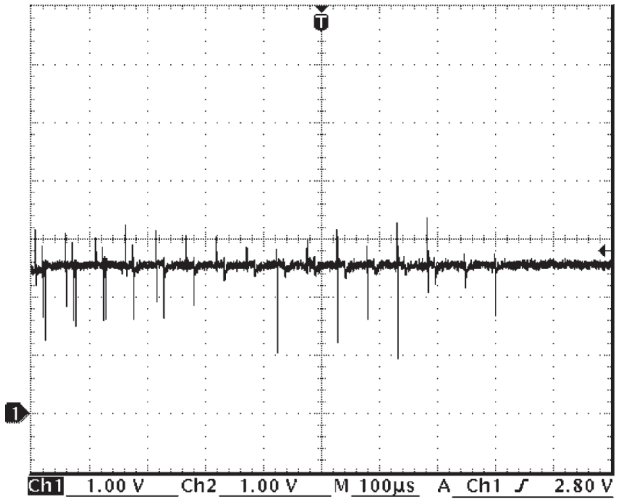
Normal waveform

Normal waveform		Description
 IDL70AA80005-01		Reference voltages for both CAN High signal and CAN Low signal are 2.5 V. Waveform of CAN High signal is 2.5 –3.5 V and that of CAN Low signal is 2.5 – 1.5 V.
[A]: Ground level of each channel	[D]: Waveform of channel 1(CAN High signal)	
[B]: VOLT/DIV of each channel	[E]: Waveform of channel 2 (CAN Low signal)	
[C]: TIME/DIV of each channel		

Examples of abnormal waveforms

Possible cause	Characteristic waveform		Description
	CAN High signal	CAN Low signal	
Shorted to ground	 IDL70AA80006-01	IDL70AA80007-01	**In case CAN High signal wire is shorted to ground circuit** Both of CAN High signal and CAN Low signal are fixed to GND level (0 V) **In case CAN Low signal wire is shorted to ground circuit** Reference level of both CAN High signal and CAN Low signal is GND level (0 V) and CAN High signal waveform oscillates irregularly. • CAN High signal: Between 0 V and 3.5 V • CAN Low signal: Fixed to 0 V

Possible cause	Characteristic waveform		Description
	CAN High signal	CAN Low signal	
Opened	 IDL70AA80008-01	 IDL70AA80009-01	**In case CAN High signal wire is open** Reference voltages for both CAN High signal and CAN Low signal are 2.5 V and these waveform oscillates irregularly. • CAN High signal: Between 4.0 V and 1.0 V • CAN Low signal: Between 2.5 V and 1.0 V. **In case CAN Low signal wire is open** Reference voltages for both CAN High signal and CAN Low signal are 2.5 V and these waveforms oscillate irregularly. • CAN High signal: Between 2.5 V and 4.0 V • CAN Low signal: Between 1.0 V and 4.0 V.
Shorted to power supply circuit (12 V)	 IDL70AA80010-01	 IDL70AA80011-01	**In case CAN High signal wire is shorted to power supply circuit (12 V)** CAN High signal is fixed to 12 V and CAN Low signal is fixed to 11 V. **In case CAN Low signal wire is shorted to power supply circuit (12 V)** CAN High signal is fixed to 11 V and CAN Low signal is fixed to 12 V.

Possible cause	Characteristic waveform		Description
	CAN High signal	CAN Low signal	
Shorted to power supply circuit (5 V)	 IDL70AA80012-01	IDL70AA80013-01	**In case CAN High signal wire is shorted to power supply circuit (5 V)** Reference voltages for both CAN High signal and CAN Low signal are 4.5 V and these waveforms oscillate irregularly. • CAN High signal: Between 5.5 V and 3.5 V • CAN Low signal: Between 5.0 V and 1.0 V. **In case CAN Low signal wire is shorted to power supply circuit (5 V)** Reference voltage is 4.5 V and phase is the same for both CAN High signal and CAN Low signal, and waveforms oscillate irregularly between 6.0 V and 1.0 V.
CAN High signal and CAN Low signal wires are shorted to each other	 IDL70AA80014-01		Both CAN High signal and CAN Low signal are fixed to near 2.5 V.

Troubleshooting

NOTE

- **Before diagnosing trouble, be sure to check equipment of vehicle being serviced as well as control modules connected to CAN communication line.**
- **Before using scan tool, read its Operator's Manual to know how to use it.**
- **When performing "Communication Bus Check" using SUZUKI scan tool in this troubleshooting, refer to "Judgment of Communication Bus Check" (Page 10H-23).**

Step	Action	Yes	No
1	**CAN communication circuit check** 1) Disconnect negative (–) cable at battery. 2) Disconnect connectors from all the control modules communicating by CAN. ☞(Page 10H-5) 3) Check for proper connection to each CAN communication circuit at all control module (communicating by CAN) connectors and DLC. 4) If connections are OK, check the following points of each CAN communication circuit based on results found in Steps 3) of "Diagnosis Procedure" (Page 10H-17). • Open circuit • Short to power circuit • Short to ground circuit • Short to CAN communication wire with each other *Is check result OK?*	Go to Step 2.	Repair or replace defective wire harness.
2	**ECM terminating resistance check** 1) Connect "E01" connector to ECM. 2) Measure resistance between the following terminals. • Without ABS: "E05-9" and "E05-21" terminals of BCM connector • With ABS: "E08-2" and "E08-15" terminals of ABS control module connector *Is resistance between 114 – 134 Ω?*	Go to Step 3.	Replace ECM and recheck DTC. ☞(Page 1C-1)
3	**Combination meter terminating resistance check** 1) Connect "G241" connector to combination meter. 2) Measure resistance between "G211-6" and "G211-14" terminals of DLC. *Is resistance between 114 – 134 Ω?*	Go to Step 4.	Replace combination meter and recheck DTC. ☞(Page 9C-11)
4	**Combination meter, P/S control module, BCM, ABS control module (ABS model) and ECM communication check** 1) Connect connectors to P/S control module, BCM and ABS control module (ABS model). 2) Connect negative (–) cable at battery. 3) Set ignition "ON". 4) Select "Communication Bus Check" menu of SUZUKI scan tool. 5) Check that CAN communication is in normal condition for combination meter, P/S control module, BCM, ABS control module (ABS model) and ECM. ☞(Page 10H-23) *Is communication normal?*	Perform "Communication Check". ☞(Page 10H-23)	Go to Step 5.

Step	Action	Yes	No
5	**P/S control module communication check** 1) Set ignition “OFF”. 2) Disconnect P/S control module connector. 3) Connect the following terminals of P/S control module connector using service wires. • Between “G10-6” and “G10-5” terminals • Between “G10-3” and “G10-4” terminals 4) Set ignition “ON”. 5) Select “Communication Bus Check” menu of SUZUKI scan tool. 6) Check that CAN communication is in normal condition for combination meter, BCM, ABS control module (ABS model) and ECM. ☞(Page 10H-23) *Is communication normal?*	Replace P/S control module and recheck DTC. ☞(Page 6C-30)	Go to Step 6.
6	**BCM communication check** 1) Set ignition “OFF”. 2) Disconnect service wires from P/S control module connector, and then connect connector to P/S control module. 3) Disconnect “L02”, “G05” and “E05” connectors from BCM. 4) Connect the following terminals of BCM connectors using service wires. • Between “G05-6” and “E05-9” terminals • Between “G05-26” and “E05-21” terminals 5) Set ignition “ON”. 6) Select “Communication Bus Check” menu of SUZUKI scan tool. 7) Check that CAN communication is in normal condition for combination meter, P/S control module, ABS control module (ABS model) and ECM. ☞(Page 10H-23) *Is communication normal?*	Replace BCM and recheck DTC. ☞(Page 10B-29)	Go to either of the following. • Without ABS: Go to Step 8. • With ABS: Go to Step 7.
7	**ABS control module communication check** 1) Set ignition “OFF”. 2) Disconnect service wires from BCM connectors, and then connect connectors to BCM. 3) Disconnect ABS control module connector. 4) Connect the following terminals of ABS control module connector using service wires. • Between “E08-2” and “E08-3” terminals • Between “E08-15” and “E08-16” terminals 5) Set ignition “ON”. 6) Select “Communication Bus Check” menu of SUZUKI scan tool. 7) Check that CAN communication is in normal condition for combination meter, P/S control module, BCM and ECM. ☞(Page 10H-23) *Is communication normal?*	Replace ABS control module and recheck DTC. ☞(Page 4E-33)	Go to Step 8.

Step	Action	Yes	No
8	**Combination meter communication check** 1) Set ignition “OFF”. 2) Disconnect service wires from connector(s) for the following control module, and then connect connector(s) to each control module. • Without ABS: BCM • With ABS: ABS control module 3) Replace combination meter. ☞(Page 9C-11) 4) Set ignition “ON”. 5) Select “Communication Bus Check” menu of SUZUKI scan tool. 6) Check that CAN communication is in normal condition for combination meter, P/S control module, BCM, ABS control module (ABS model) and ECM. ☞(Page 10H-23) *Is communication normal?*	End.	Replace ECM and recheck DTC. ☞(Page 1C-1)

Communication Check

SDM (air bag model)

1) Set ignition “OFF”.
2) Connect “L04” connector to SDM.
3) Set ignition “ON”.
4) Select “Communication Bus Check” menu of SUZUKI scan tool.
5) Confirm that CAN communication between control modules and SDM which have been already connected are in normal condition. ☞(Page 10H-23)
6) If any malfunction is found, replace SDM and recheck DTC. ☞(Page 8B-48)

TCM (AMT model)

1) Set ignition “OFF”.
2) Connect “C15” connector to TCM.
3) Set ignition “ON”.
4) Select “Communication Bus Check” menu of SUZUKI scan tool.
5) Confirm CAN communication that control modules and TCM which have been already connected are in normal condition. ☞(Page 10H-23)
6) If any malfunction is found, replace TCM and recheck DTC.

Judgment of Communication Bus Check

When performing “Communication Bus Check” by using Suzuki scan tool, refer to the following table for judgment.

Judgment	Display of Communication Bus Check
Normal	All connected control modules (communicating by CAN) are displayed in “Controller” and “Found” is displayed in “Connection to CAN Bus”.
Abnormal	All connected control modules (communicating by CAN) are displayed in “Controller” but some control module (s) indicates “Not Found” in “Connection to CAN Bus”.

Special Tools and Equipment

Special Tool

AENDL70AA808001

SUZUKI scan tool (Suzuki SDT-II) — ☞(Page 10H-2)	